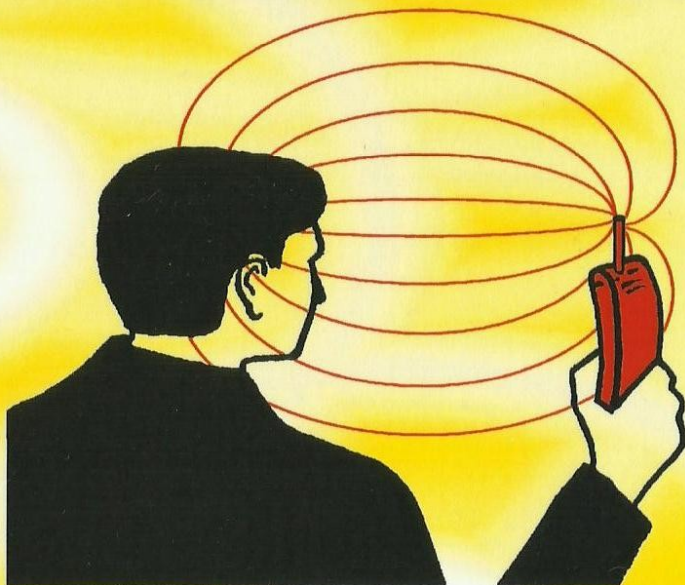


Konstantin Meyl

part 1

Scalar waves



From an extended vortex and field theory
to a technical, biological and historical use
of longitudinal waves.

Edition belonging to the lecture and seminar
„Electromagnetic Environmental Compatibility“

Edition belonging to the seminar **part 1 - 3**
„Electromagnetic Environmental Compatibility“
by **Prof. Dr. Konstantin Meyl**

From Maxwell's field equations only the well-known (transverse) Hertzian waves can be derived, whereas the calculation of longitudinal scalar waves gives zero as a result. This is a flaw of the field theory, since scalar waves exist for all particle waves, like e.g. as plasma wave, as photon- or neutrino radiation. Starting from Faraday's discovery, instead of the formulation of the law of induction according to Maxwell, an extended field theory is derived, which goes beyond the Maxwell theory with the description of potential vortices (noise vortices) and their propagation as a scalar wave, but contains the Maxwell theory as a special case. With that the extension is allowed and doesn't contradict textbook physics.

Besides the mathematical calculation of scalar waves this book contains a voluminous material collection concerning the information technical use of scalar waves, if the useful signal and the usually interfering noise signal change their places, if a separate modulation of frequency and wavelength makes a parallel image transmission possible, if it concerns questions of the environmental compatibility for the sake of humanity (bio resonance, among others) or to harm humanity (electro smog).

From an extended vortex and field theory
to a technical, biological and historical use
of longitudinal waves.

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Scalar Waves

Edition belonging to the lecture and seminar
“Electromagnetic environmental compatibility”
of

Professor Dr.-Ing. Konstantin Meyl

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Preface to the lecture, 1st Edition 1996

The theme encloses the electromagnetic compatibility of both technical and biological systems. Only part of the electromagnetic wave can be considered for function troubles, namely the part that was absorbed and has rolled up to a vortex. The activity depends on the number of created vortices and of their lifetime, their decay.

The eddy current only manifests in conducting materials. In the air and in dielectric materials on the other hand the vortex of the electric field will form, also called the potential vortex. To calculate and to measure this vortex is our goal.

First we'll carry out a survey of the problems and the usual methods. From the analysis of unsolved problems the need for the introduction of the new vortex phenomena is deduced and an adequate field-theoretical approach will be chosen. Afterwards the potential vortices are calculated and their properties are discussed and interpreted.

For the purpose of proving their existence, on the one hand the Schrödinger equation will be derived and on the other hand the quantum properties of the most important elementary particles will be calculated and compared with the well-known measured values. Measurement and calculation are in excellent agreement for weight, charge, magnetic moment and spin. So the theory not only proofs its correctness, in addition it demonstrates it can achieve much more. The theory takes us to the unification of the well-known interactions and physical phenomena and shows itself as an unified theory.

In the practical conversion and usage of the theory there will not only be informed but by all means also be provoked as an entrance in a fruitfully discussion. Fundamental questions will be taken up like: What is information, energy, temperature or smell? The connection to the theme of the electromagnetic environmental compatibility is formed by the technical and the biological usage of the potential vortices, the energy transmission of Nikola Tesla exactly like the in a similar way functioning nerve conduction. Here we already can expect biological reactions.

This lecture, held for the first time in the winter semester of 1995/96, is available in book form, as an edition belonging to the lecture. This lecture will not deliver ready recipes or instructions. The goal is reached when the critical sense of the listeners and readers has been inspired and discussions have been set going. Everybody has to draw the consequences out of such a theory by him- or herself.

In addition to this lecture a seminar is offered, wherein several themes are supplemented or deepened, different theories are compared and possible consequences are discussed. The appearance of an edition belonging to the seminar has started in 1998^{<1>}.

Regarding the conversion of consequences both politicians and scientists are equally addressed, because the electromagnetic environmental compatibility has developed to one of the most urgent problems of today's world. But in last consequence all of us bury the worldwide responsibility for our environment.

<1>: K. Meyl: Electromagnetic environmental compatibility, Part 2 and 3 of this book, Edition belonging to the seminar.

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1. Introduction

Here the extremely controversially discussed question of the environmental compatibility of electromagnetic fields will be persuaded. Limits should inform what is incompatible and what is compatible. But there are as many limits as there are commissions and specialists. And besides that differ the results from each other for several powers of ten. In course of time the legitimate doubts become unmistakable and the representatives of science slowly get to feel the burden of proof.

For the sake of efficiency, the actual discussion concerning the theme of electro-smog is analysed and the necessity to involve an until now unnoticed field phenomenon in the discussion about limits is derived: It concerns vortices of the electric field. These potential vortices, as they are called, have the corresponding properties to show biological effects even at the lowest field strengths. In any case it is not possible to exclude that at present the wrong physical phenomena are measured and made responsible.

A parable should bring clarity.

Lets imagine that the to us well-known and over our sense of touch understandable physical phenomenon of the temperature is unknown to us, neither measurable nor perceptible. Our weather station only exists of a barometer that could show us the air pressure and deliver us indications if good or bad weather is to be feared.

We ready realize that there exists a connection between the air pressure and our health and make the to us well-known phenomenon responsible. When the pointer points to good weather we can go out lightly dressed. With bad weather we should take a coat, so we know from experience.

Now we imagine the realistic situation that in winter we have a weather situation of high pressure but it's stone-cold outside. The weather station will display high temperatures with the result that some people will walk around with short-sleeved and open shirt, only to lie in bed with a cold in the evening. Of course the air pressure was to blame! Logically the "pressure sensitive", as they are called mocking, demand the limits for the allowed pressure to be reduced so far that no consequences for health are to be feared.

Concerning the theme of allowed limits, science is asked and science proceeds in a systematic way: the pressure is investigated in the laboratory, isolated from all other parameters and so it is discovered that man catches no cold even at a substantially higher air pressure, so there is no reason to alter the limits.

Actually we would expect these at any time reproducible results to have a calming effect on the minds of the participants of the discussion and on the population. Instead the pressure sensitives time and again cite new knowledge that won't fit in the scheme. So is for instance stated that draught causes the same health problems although this pseudo effect has nothing at all to do with the air pressure. So owing to incomprehensibility and emotions the discussion about limits becomes a farce.

The fact that sensitive people react to effects of air electricity and possibly get ill without proof that some today measurable physical quantities are responsible should make us think. It is little calming watching our scientists poking at the dense fog whereas at the same time among the runners of the new telecommunication networks there spreads something like a gold-digger mood.

To introduce a new technology is not difficult, but to abolish it for reasons of the electromagnetic environmental compatibility is almost impossible!

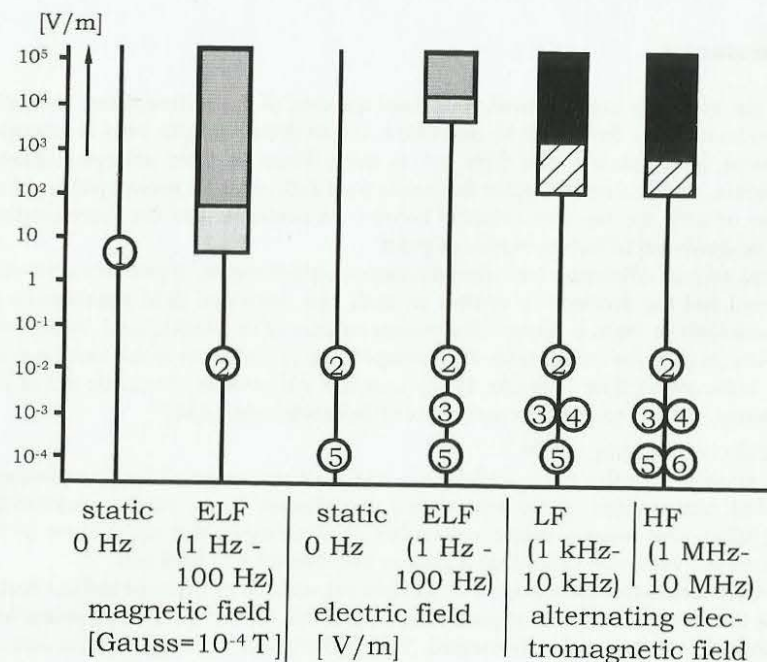


Fig. 1.1: Discussion about limits

- Limits for professional exposition (electronics engineers) and
- ▨ Limits for non-professional exposition (population in general) according to the Recommendation of IRPA/INIRC^{<ii>}.
- ▤ Limits according to VDE 0848 / 1989
- ▥ Limits according to VDE 0848 / 1992

* experimentally determined threshold values of reactions of biological systems^{<i>}:

- 1 Increase of the activity of movement of birds
- 2 deflection of divining-rods
- 3 influence on the time of reaction of men
- 4 conditional reflexes of fish without electrical organs
- 5 conditional reflexes of fish with electrical organs
- 6 conditional muscular reflexes of men

taken from:

- <i>: H.L. König: Unsichtbare Umwelt (Wetterfühlgk.), 5. Aufl., Bild 111, S. 123
 Verlag Moos & Partner München, ISBN 3-89164-058-7
 <ii>: Habiger u.a., EMV, Verlag Technik, Berlin 1992, S. 152

1.1 Discussion about limits

Whoever follows the public discussions concerning electro smog always sees two arguing parties, whose standpoints lie so far apart that they inevitably talk at cross purposes and there can be found no consensus.

On one side the "affected" find together who maintain to have found the electromagnetic radiation as the damaging cause for their problems. They are to be taken serious, even when only their personal sensitivity serves as means of measurement and proof and a more or less distinct sensitivity against electromagnetic phenomena. This group occasionally finds support of homeopaths who can base on reproducible laboratory results that fit as few into the view of life of science as the empirical statements of affected and possibly hurt people.

On the other side stand the representatives of the energy-supply companies and the runners of radio networks who argue with the needs of our modern industrial society and give "limits" prescribed to them by scientists. These, for their part, proceed according to strictly scientific methods. Their presented results are reproducible and there's no doubt about them.

The limits after all are fixed far below those that are recommended from a scientific viewpoint. Nevertheless both groups are separated from consensus by powers of ten. When we want to know how deep the ditch is we want to bridge, we should take a look at the determined limits (Fig. 1.1).

The limits stem from the IRPA (International Radiation Protection Association) an organ of the World Health Organization that in turn has appointed the INIRC (International Non Ionizing Radiation Committee). These now state to have used all available scientific research results as basis for the given guidelines.

Moreover a safety range was worked into them. So the limits were fixed at substantially lower levels to guarantee that no health damage arises. In this way first the limits were determined for the people who for reasons of profession are exposed to electromagnetic fields.

For the population in general the limits for the so called non-professional exposition were reduced further to one half till one fifth for reasons of caution and care. In Fig. 1.1 these limits are registered. Thereby is distinguished between magnetic fields and electric fields that appear stationary or at extremely low frequencies (ELF describes frequencies between 1 Hz and 100 Hz). Moreover limits for low-frequency (1-10 kHz) and high-frequency (1-10 MHz) alternating electromagnetic fields are given.

The graph should serve as a rough orientation and show us the proportion of scale. As further information some thresholds of measured reactions of biological systems are registered (after König^{<i>}). Because a logarithmic scale was chosen to fit all the values on one graph it becomes clear that between the first reactions and the recommended limits there lie up to five powers of ten. The ditch seems to be insurmountable.

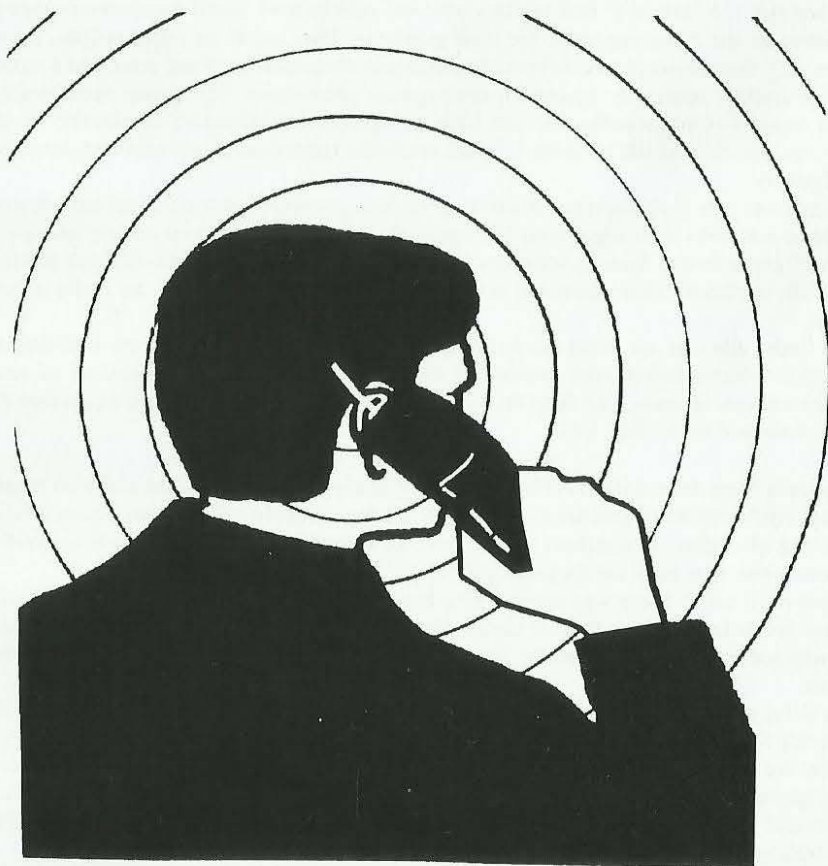


Fig. 1.2: Set of problems of environmental compatibility by means of the example of the handheld wireless telephones (handy).

<i>: L.v.Klitzing: Neurophysiologische Einflüsse durch elektromagnetische Felder während und nach der Exposition, Med. Universität zu Lübeck

1.2 Wireless telephones

Measuring technical surveys with regard to the influence of brain currents by digital radio signals by the university hospital in Lübeck have startled handy manufacturers and users equally ⁴⁷. Although in this case measurement errors could be detected, the „bugaboo on the wall“ remains that we are sitting unsuspecting in a restaurant and a neighbour draws his handy out of his pocket to make a digital telephone call. Thereby synchronizing the brain currents within a radius of 100 meters on the broadcasting signal and occupying our brain useless with technical signals. The derivation will show that from the start this can't happen to all visitors, because as a prerequisite conditions of resonance must be fulfilled. But would there be an affected, he or she for sure would have considerable problems, because informations that are not picked up over the sense organs can neither be classified timely nor as regards content.

An affected whose brain has picked up technical signals not even is able to register by itself that it was fed with incorrect informations. It would be reasonable when the visitors of the restaurant would defend themselves and put the radio operator on the doorstep. The number of restaurants where apart from cats and dogs also handy's have to stay outside is increasing. How should we keep out of the way of electromagnetic fields? Should we walk around permanently with a steel helmet or even better in a knight's armour and even go to bed with them? It would be worse than in the dark middle ages.

Summarizing: it should be guaranteed that the operation of electro technical apparatus causes neither health damage nor unintentional influence or irritation. A systematic and scientific procedure should investigate in the laboratory all relevant physical phenomena individually for their interaction. Electro physics bases on two phenomena in connexion with electro-smog: on the one hand the radiation and on the other hand the thermal effect, but at a close look both factors prove to be of only little importance!

In **radiation measurements** the intensity of the electromagnetic wave at a certain place is determined. In laboratory experiments the field strength is increased so long till biological reactions are observed. Thermal limits are determined in a similar way. As said, the values lie about powers of ten above those that possibly bother you when you hold a handy to your ear. It is true that the microwave radiation penetrates into your head but we also know that it marches out again on the other side and this visit in your head happens with the speed of light.

Exactly like this are guest in your body constantly your local radio station, your local television station the satellites with hundreds of programs and anyway the whole radio technical world even when you did not invite them.

For an electromagnetic wave to become receivable, the field strength must lie clearly above the common noise signal and this can only be achieved by a permanent overlap, by standing waves, like in a cavity tuned to a specific frequency or an antenna. As long as people don't let themselves grow antennas on their heads they hardly have to fear direct biological effects of electromagnetic waves.

That leaves as the second phenomenon the **thermal effect**. With a handy held to your cheek there comes into being a local fever in your head. But that is not at all unusual or unnatural for the human body. Something like that happens to a far greater degree when you take a hot foot bath or let yourself be irradiated at one side from the sun at a tourist grill.

Power of waves:

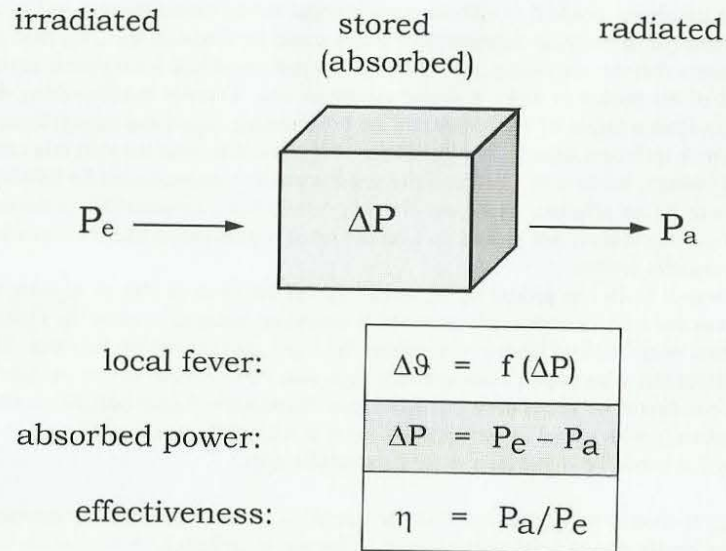


Fig. 1.3: Damping of waves and ability to absorb of a body (our head) if we are making a phone call with a handy.

a contribution to the theme dielectric losses

- capacitor
- high-frequency welding
- microwave oven

<i>: K. Meyl: Potentialwirbel Band 1 [A1] (only in German), INDEL Verlag, Villingen-Schwenningen 1990, ISBN 3-9802 542-1-6
 <ii>: K. Meyl: Potentialwirbel Band 2 [A2] (out of print), INDEL Verlag, Villingen-Schwenningen 1992, ISBN 3-9802 542-2-4

1.3 Absorption of waves

The with the theme dealing physicians logically have to put up with criticism that they work only with two phenomena that not at all can be involved authoritative in the causes for biological effects. A third factor can be considered, a field phenomenon until now stayed unnoticed by science: the vortex of the electric field, the so called potential vortex. A vortex is to be considered as an oscillation around a fixed point. Through that a permanent overlap is caused, like what happens at an antenna only that the vortex is not bound to the dimension of an antenna. The potential vortex is contracting and in this way reaches extremely high energy densities at very little spatial measurement, densities that lie far above those that field strength measurements are pretending to us [A1]^{<i>}.

When again you take the handy at hand with which you „blow“ the pulsed microwaves into your head. Don't worry, because with the speed of light and without provable damage almost everything comes out again on the other side, but only almost everything. A little damping of the wave has taken place and your head has absorbed this part of the irradiated wave (Fig. 1.3). Who claims this is already the thermal factor actually should realize that there exists no corresponding term in the wave equation. Here there are found merely two dual vortex phenomena as a possible *damping term*: the eddy current and the potential vortex. An eddy current damping is ruled out because of the bad conductivity of the head. But this favours his dual anti-vortex, the potential vortex [A1]^{<ii>}.

Seen physically the following is taking place in your head: the absorbed waves roll themselves up to vortices and through that become localized and overlap themselves permanently (Fig. 1.4b). In the course of time the vortices decay and produce the well-known eddy losses that lead to the measurable increase in temperature. When reactions or biological effects arise, simply and solely the vortex can be considered as the possible cause. Thereby play two points an important role: the number of the generated vortices and their lifetime that is determined by the time of decay.

In anticipation of the mathematical calculation of the potential vortices it is pointed out here that these are favoured not only by a low conductivity, but also by a high dielectricity. Because water has an unusual high dielectricity ($\epsilon_r = 80$) and our head consists predominantly of water doubts in dealing with handy's are reasonable.

Also the relaxation time constant representative for the lifetime can be calculated [A2]^{<ii>}. We must proceed from the assumption that both the number of the vortices and their lifetime, that is all the at a fixed point in time in our head existing and effective vortices, can be a cause and therefore have to be considered and investigated scientifically.

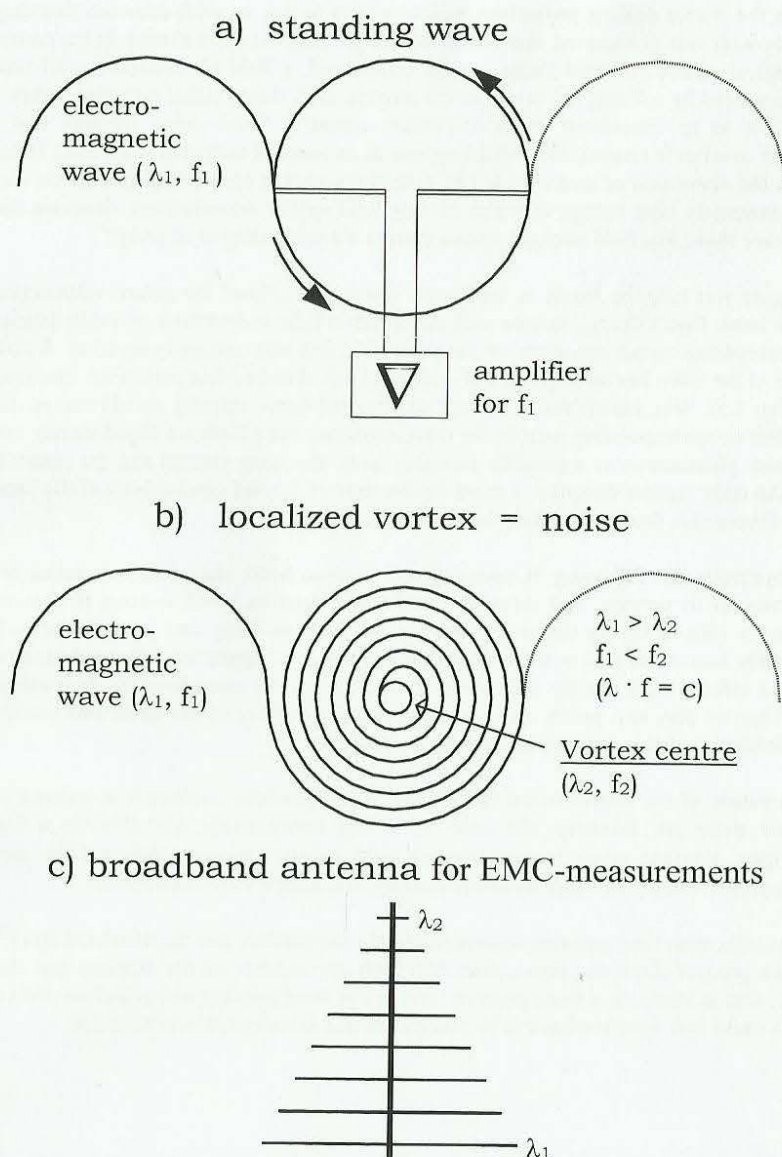


Fig. 1.4: Measurement of localized waves and vortices

1.4 Overlap effect

The graph at the left (Fig. 1.4) should clarify once more that only the in space localized and permanently overlapping field appearances can be considered as a cause for biological effects. This can concern an over an antenna standing wave (a) or a vortex (b) which is to be taken as localized by nature.

It would be allowed in general speak only of a vortex because the standing wave can by all means be understood as a special case of the vortex. The essential difference is that the vortex is not bound to the size of a fixed antenna and can contract itself at any time to achieve in this way a substantial higher energy density. As a result this than will lead to an increased biological effectiveness.

It should be pointed at a further omission. In the discussion about limits, without exception, the absolute field strength of the broadcasting signal is valued and not the type of modulation. The last mentioned should actually not at all play a role according to the prevailing scientific opinion.

Totally different is the case with a vortex that acts damping. Such a vortex shows near it's centre a considerable smaller wavelength than more to the outside and through that it has a big frequency bandwidth [A5]¹. It is to be expected that in the extremely broadband pulsed signals of the digital networks the creation of vortices (or eddies) will be favoured considerably stronger than in amplitude- or frequency-modulated signals (AM/FM/C-network). In connexion with analog modulated radio- or handy-signals until now there never has been reported of any synchronization of the brain currents with cell-phone-signals from a comparison of the EEG with the broadcasting signal.

Interestingly the for EMC-measurements usual stepped broadband antennas have exactly the construction that certainly would be favourable to the measuring technical registration of vortex phenomena (Fig. 1.4c).

With the dipole antennas of different lengths for different wavelengths there still are measured waves and not vortices but these measuring techniques is certainly accommodating to the until now unnoticed and stayed undiscovered vortex phenomenon. So there are some good reasons that the vortex is a dominating influential factor for EMC-problems.

By means of the example of the handheld wireless telephones can be studied and discussed with which set of problems the very young discipline of science of the environmental compatibility has to fight in the future. And in which ways there can be found approaches towards a solution of the problem. When the comfortable and trodden out ways of textbook physics do not lead to the goal than we will have to force our own way through the jungle of science.

At first we'll have to obtain a short overview of the actual level of research and knowledge. From the criticism to this we than can derive the tasks of the electromagnetic environmental compatibility and in particular the unsolved tasks.

<i>: K. Meyl: Wirbel des elektrischen Feldes, eine neue Störquelle?
 EMC Journal 1/95, 6. J, S. 56-59.

EC environmental compatibility

is the ability of a biological/technical system ^{<i>},
|

- to fulfil a certain function (task of operation)
- under given conditions of usage
(aspect of compatibility: irradiated interference radiation)
- during its life / time of use (aspect of reliability)
 stressing its environment and other systems/objects
 which exist in it by electromagnetic interferences
(aspect of compatibility: emitted interference radiation)
- endangering such systems/objects (protection of health
 and safety at work)
- or even threatening them (case of damage).

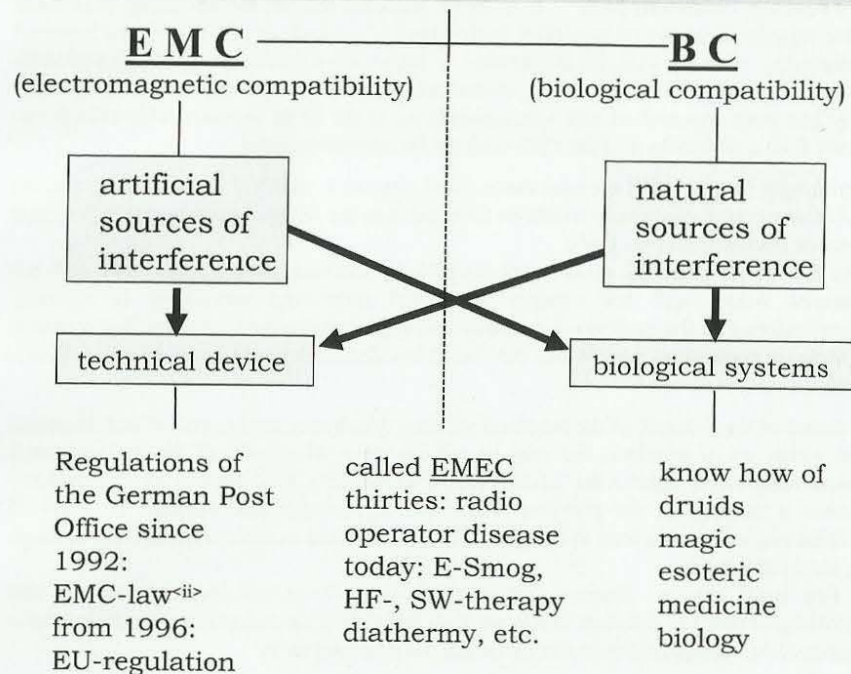


Fig. 2.1: Overview concerning environmental compatibility

<i>: E. Habiger: EMV-übergreifende Aspekte zu benachbarten Problemfeldern, Elektrik 48 (1994), Heft 5/6, Seite 163-161
 <ii>: EMVG: Gesetz über die elektromagnetische Verträglichkeit von Geräten, Bundesgesetzblatt Teil I vom 9.11.1992, S. 1864

2. Tasks

2.1 Tasks of the electromagnetic environmental compatibility

The environmental compatibility (EC) forms the generalization that includes both the electromagnetic compatibility (EMC) and the biological compatibility (BC). Besides the technical and functional goals of an undisturbed functional course it also pursues ethical and moral goals.

Technology should benefit to humanity and at the same time be in accordance with nature. This goal will not be reached when this technology directly or indirectly is endangering humanity.

A direct attack on the health of people poses for instance the military usage of technical apparatus or the negligent usage, by pretended ignorance and unsuspicion.

Is a technology posing a danger to the environment so humanity endangers itself indirectly with this technology. After all are human beings a product of their environment. We always should reckon on the environmental sins taking revenge on us sooner or later.

In fig. 2.1 a formal definition is given that in particular concerns the claims for an undisturbed functional course: it concerns the compatibility aspects of unallowed emitted and irradiated interference radiations, the reliability and quality safety with which a function and task is fulfilled and finally the questions of the protection of health and the safety at work.

Moreover fig. 2.1 provides an overview and the structure of the 2nd chapter. First we'll treat the electromagnetic compatibility (EMC) that first of all deals with the influence of artificial but also natural interference sources on technical apparatus.

After that we'll throw a glance at the appearing fields in nature. The biological compatibility (BC) deals with the influence on biological systems.

An especially sensitive area of the environmental compatibility (EC) than describes the with a cross-link hinted influence of artificial interference sources on biological systems that is popularly described as „electro smog“.

The numerous aspects of the environmental compatibility for instance in the areas of chemistry and biology that certainly are important, but do not fall in the area of electromagnetism, can't be treated in the here marked framework.

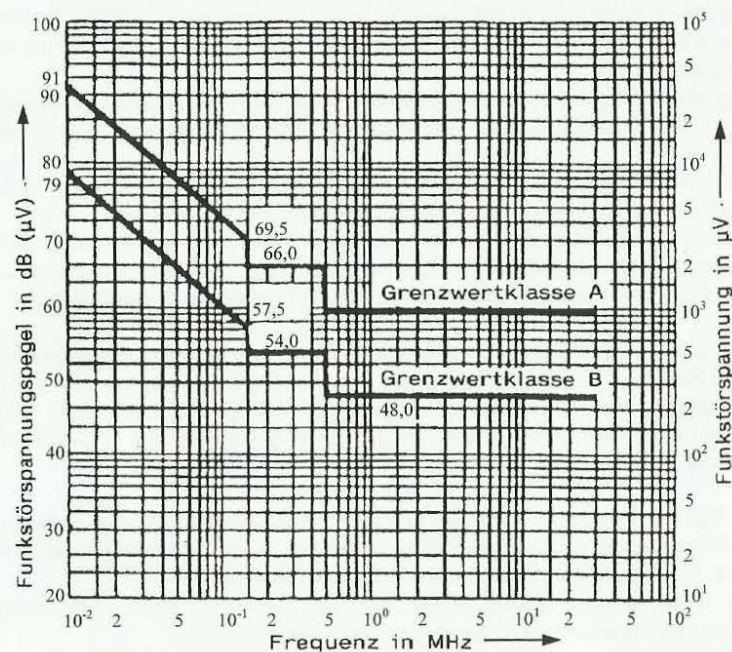


Fig. 2.2: Classes of limits according to VDE 0871
(since 1-1-96: VDE 0875)

2.2 Tasks of the electromagnetic compatibility (EMC)

First of all the EMC (electromagnetic compatibility) is concerned with the function of technical apparatus. Correspondingly rational and dry sounds the official definition: "electromagnetic compatibility (EMC) describes the ability of an electrical setting-up (i.e. of a construction element, of a construction group, of an apparatus or of an installation) to function in an electromagnetic environment without stressing this environment by electromagnetic effects in an unallowed fashion".

Actually it concerns an old need for protection that should be as old as the usage of electro technical apparatus. But in the beginning no one cared about it. The spark gaps with which Heinrich Hertz 1888 in Karlsruhe has carried out the first radio technical experiments were genuine „polluters“, that would have been detectible at several hundreds of kilometres distance with modern receivers. For these installations that he had assembled in the lecture room with his students, today he would hardly get a permission of operation and the since 1996 required declaration of conformity he would get not at all.

1925, as in Germany the number of radio listeners had exceeded the limit of one million, for the first time a need for protection appears in the certificate of approval for radio receivers: "The public telegraphs and telephone installations must not be disturbed by the radio receiver".

Later on every backside of the good old steam radios there was found the following hint (translated): "This apparatus meets the interference radiation regulations of the German Post Office". So the manufacturers were urged to measure the emission of their apparatus and in particular to screen the HF-oscillators in the superhet-receivers.

Since the fifties, in the VDE-institute EMC-examinations in the present day sense are taken. The main point of the measurements and the by the VDE recommended limits, however is about interferences bound to a circuit. On the supply lines of the network the prevailing conditions are reproducible so that standards can be put through (Fig. 2.2).

For measurements of interference radiation maybe the time was not ripe enough or the necessity was not big enough. The usual argumentation was: what we can't measure reproducibly, can not be forbidden and certainly not be put under punishment. Therefore merely recommendations were issued or impositions weak as wax were made like: "the interference field strength ... must be so small that an undisturbed reception is guaranteed as soon as the minimum field strength for utilization exists at the place where the antenna is mounted".

In common parlance that means something like: "as long as no one bleats, everything is allowed". Within a connected industrial area there even existed an officially legitimized fools freedom. Merely at the fence of the industrial area limits had to be fulfilled.

Specially for the line-frequency of the screen one has decided to build a loophole in the law so that one didn't have to throw the TV sets, that so successfully had conquered the living rooms, out of the window. Of course the flickering screens did interfere exactly as before but this EMC-interference now was officially approved.

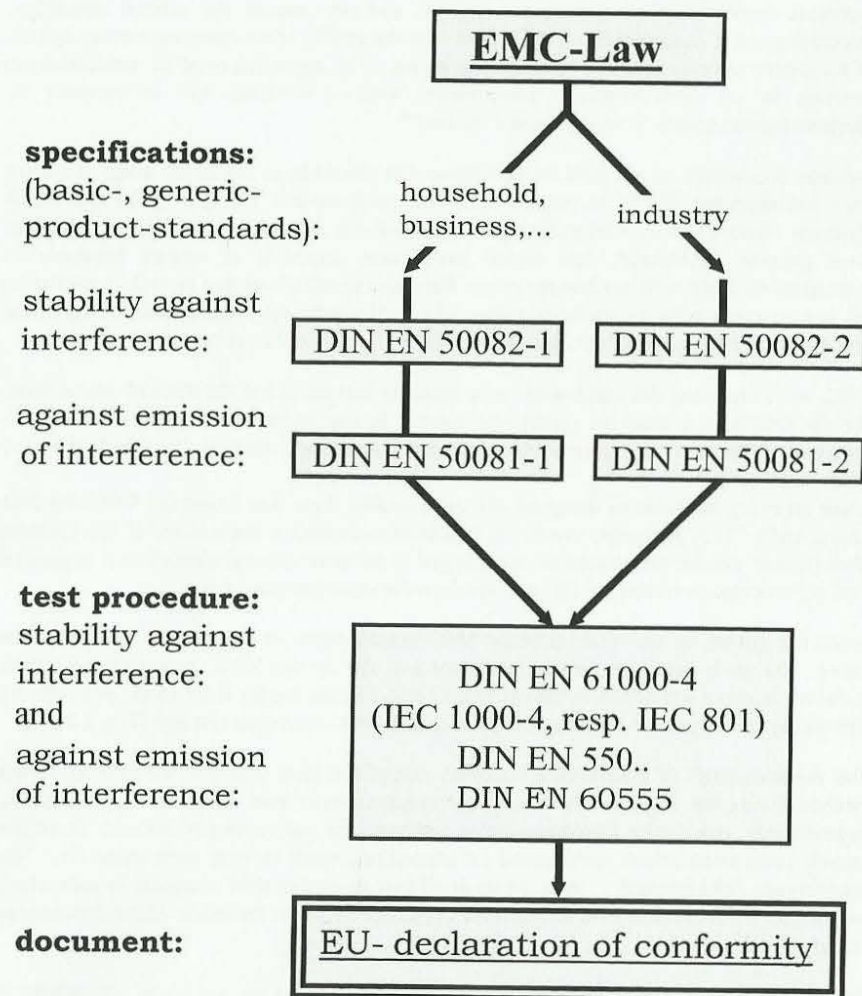


Fig. 2.3: The way to EU conformity

2.3 Declaration of conformity

In the EMC times seem to have gone as the standardizers had to fit in with the insufficiencies of technology. Meanwhile the conditions have turned up. We owe this circumstance first of all the EMC-law of 1992 that doesn't name any limits but it states the political intention to demand from technical apparatus and installations an appropriate stability against interference and at the same time limit the sent out interference.

As a consequence of this law the measurement facilities and measurement processes had to be standardized to get reproducible measurement results that are not influenced by the electromagnetic environment. That goes so far that even the floor covering of a measurement hall is dictated because the conductivity of the floor influences the degree of reflexion. Normally the examinee is situated on a revolving plate that is turned around for 360° during the measurement of the radio interference field strength. Is it however not possible to turn the examinee than the antenna has to be led around it, thereby again increasing the dimensions of the measurement hall. The distance to the antenna should be up to 10 meters. Moreover it must be possible to move the antenna up till a height of 4 meters to register the influence of the reflexions on the floor.

Moreover there is to plan a reflexion free zone around the measurement track (in elliptical form) that depends on the reachable damping of reflexions of the used absorber. Used are pyramids of foam material soaked with carbon and increasingly tiles of ferrite or shieldings of wallpaper.

Taken all together for a measurement hall doing justice to standards there result considerable measurements of for instance 18 m length x 10 m width x 7 m height.

Let's again come to talk about the EMC-law with which only the intention but not the way is fixed. To form the claims catalogue in a way that is fulfillable in general, some concrete prescriptions, the so called standards, have to be worked out. This task was transferred to the European Committee for electro technical standardization CENELEC, which has established the workgroup TC 110 to at first work out some standards:

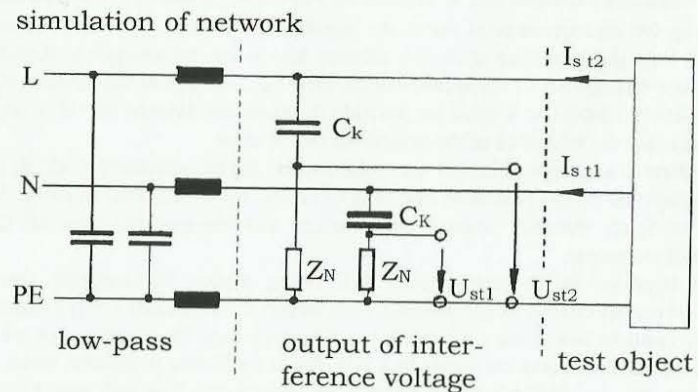
The **basic standards** deal independent of product with general questions of the EMC, of the testing process and of the measurement environment.

The **generic standards** likewise deal independent of product with the so called fundamental technical standards for apparatus in their dependence of the respective electromagnetic environment (protected computer room or medical room, environment of the house, office or industry).

The **product standards** concern the EMC-standards referring to products (7 product families / approx. 50 products).

In Fig. 2.3 the arduous way through the jungle of paragraphs for a technical apparatus is outlined. Corresponding to the requirements of use, first the relating ES-standards for the apparatus have to be determined and than have to be measured according to own test standards based on the fundamental technical standards. When the allowed limits for stability against interference and for sending out interferences are not exceeded, the EC-declaration of conformity is handed out. Since 1.1.96 that declaration is needed when apparatus are commercialized or - stated more exactly - "put in circulation" and operated. When still further EC-guidelines are met in the end the CE-hallmark is awarded. Since 1.1.96 only with this hallmark the access to the common market of the EC is possible. Violations can be punished with fines and if need be with imprisonment. But there are great national differences in the EC. The Federal Republic of Germany with fines of up to 50,000 Euro counts as expensive for criminals.

Simulation of network for the measurement of the interference voltages U_{st1} and U_{st2} .



impedance Z_n of the simulation of networks for industry networks in the range of 0.15 to 30 MHz

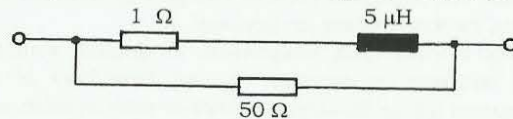


Fig. 2.4: Simulation of network for the measurement of interference voltages.

2.4 EMC-techniques to measure the emission of interference

Actually we already can be glad that it came to an europe-wide agreement for the regulation of the EMC-set of problems. But the question if we can be satisfied with what we have reached is still outstanding. All too often the lowest common denominator of the measurable and checkable was sought and not so much the technical possible was taken into consideration.

The main emphasis is put on the measurement of the **emission of interferences**. Traditionally the **interferences bound to a circuit** are registered in a frequency range up to 30 MHz. The corresponding wavelengths thereby can correspond with the length of the supply lines and form standing interference waves. Primarily the spectrum of the **interference currents** is measured e.g. over a HF-current converter. These currents produce a voltage drop over the internal resistance of the feeding network. Because the properties of the networks can vary very strong, a standardized end-resistor is required for the measurement of the **interference voltage**. For this purpose an imitation of the network is switched between the network and the examinee. This imitation in addition has the task to keep away the interference signals that come from the supplying network with the help of filter-elements (Fig. 2.4).

The measurement of the **interference radiation**, the field-bound interference emission, takes place between 30 MHz and 1 GHz. For that a free field or an absorber-hall with little or no reflexions is required. The standardized distances of measurement are 3, 10 and 30 meters. The electric field strength is determined with dipole broadband antennas, the magnetic field strength with frame antennas. It must be possible to both vary the receiving antenna between horizontal and vertical polarization and to adjust the receiving antenna in the height and the position to the test object.

Typical measurement set up to measure the emission of interferences bound to a conductor <i>

- A: shielded link conductor
- B: bundle of conductors folded like a meander
- C: connection to the reference mass
- ME: receiver of interference signal
- NNB: Simulation of network
- PO: test object

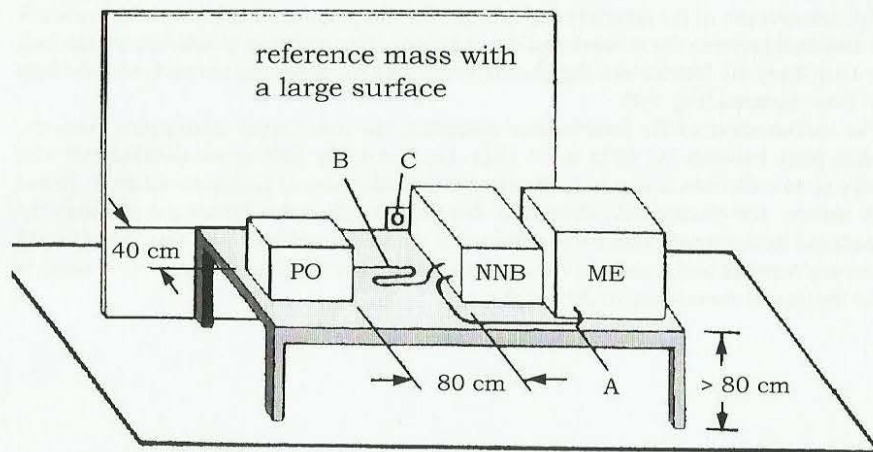


Fig. 2.5: Measurement set up to measure the emission of interferences bound to a conductor.<i>

2.5 Electro-Smog

There is almost no end to the possibilities of variation and one needs already a lot of overview and experience to determine the field strength maximum. Nevertheless we have to ask ourselves if in this way really all emissions of interference are understandable, that popularly are described as „electro smog“.

Smog is the combination of the terms **Smoke** and **Fog**. It therefore describes a pressure on the environment with fog like smoke. When for instance in the case of smog alarm all interference sources are switched off, which means all kilns are brought to a stop and all automobiles are stopped, than the fog like smoke therefore still is not vanished from the air. It just distributes itself and dissolves only very slowly.

The transfer of the smog idea on the electromagnetic interference radiation is bound to fail because, when the test object is switched off no emission of interference at all is detectable with the usual measurement means. Nevertheless the rainbow-press is trying to enumerate almost all electromagnetic field phenomena under the term „electro smog“ without consideration of the fact that this term is not at all a collection term.

From the sight of an expert one can only speak of smog when something like smog remains and stays active further after the switching off of an electro technical apparatus. It should be a phenomenon that is not understandable by the standardized measurements of interference radiation. Such a phenomenon would be e.g. the vortex of the electric field. However vortices are virtually not measurable in a direct way because they have the unpleasant property to whirl about around the measurement probe. But they will be detectable by their eddy losses and in the case of the electric field vortex appear as noise. Until now the standardizer however haven't planned to investigate the influence of an apparatus on the noise in the environment. Here we still grope in the dark.

At least the vortex shows a storing property that would justify the use of the idea „smog“. We'll have to investigate the phenomenon.

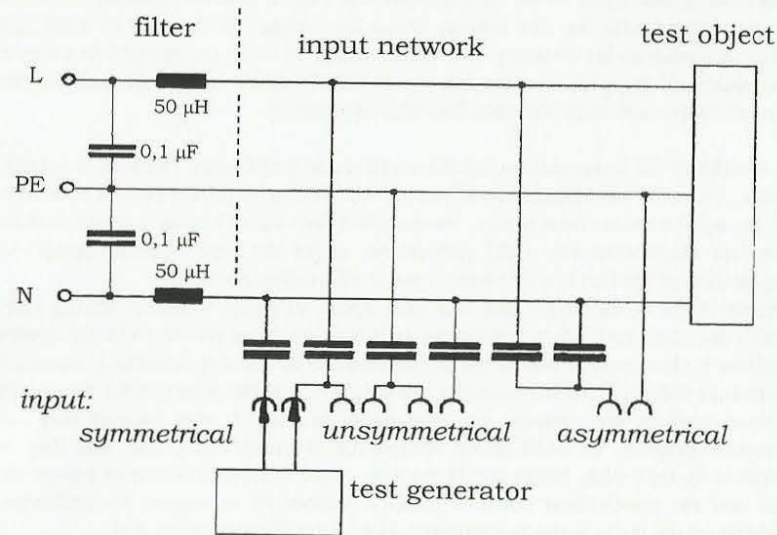


Fig. 2.6: Picking up of interference voltages in network lines. <i>

2.6 EMC-techniques to measure the stability against interference

The question is: what kind and what intensity of an electromagnetic interference can an apparatus cope with without limiting it regarding its technical function.

For that *test generators* are used and with their help interference signals are produced in the test object. Fig. 2.6 shows the possibilities of a symmetrical, of an unsymmetrical and of an asymmetrical production of interference voltage signals in the power supply lines of an examinee. Over and above that the testing possibilities and testing methods are numerous. In principle the following processes are used:

1. The simulation and production of interference factors typical for the network like harmonic waves on network voltages, overlapping signal voltages, changes of network voltage, decrease of network voltage, network interruptions, network unsymmetries and network frequency changes.
2. The production of both energy-poorer and energy-rich interference impulses like they can form in energy-networks by switching acts or by the effect of lightning (burst).
3. The simulation of the course of events when static electricity discharges.
4. Low-frequency magnetic fields like those that can form by network frequency operating and loading currents or by short-circuit and lightning currents in the form of a pulse.
5. The stability against interference against the influence of an electromagnetic field also called radio interference firmness. For this purpose high-frequency generators and broadband antennas are used to expose the examinee to electromagnetic fields in a frequency range between 10 kHz and 18 GHz. At the moment tests are only performed between 27 and 500 MHz. The modulation of the carrier wave should be possible to be able to imitate the interferences by radio technology as realistic as possible. Thereby the field strength values can by all means reach up to several 100 V/m.

In accordance with expectation the result of this irradiation with an outside field is that every conduction path and every wire can act as an antenna and therefore can produce high-frequency currents and measurable potentials. Building parts of the analog technology as a consequence battle with problems of drift whereas with digital logic parts and computer parts the danger exists that switching states change unintentionally. Let us remember again the overlap effect of fig. 1.4. The electromagnetic wave itself marches with the speed of light through the examinee. When a small part of the wave finds an object that it can use as an antenna than the localized overlap comes into play. This than as a cause is responsible for the effective and measurable antenna currents. Until here the text books help us to explain the problems that happen and to remove them logically.

However time and again cases are reported where textbook physics can't help us any further. Spectacular cases even came to court like e.g. the ABS (Antilock Braking System) of a truck that had failed due to EMC-interference radiation. As a consequence the brakes had failed. When after that the local radiation pollution is measured no anomaly at all can be discovered. The measurable field strength is not higher as is usual in the whole area. Maybe you also have made the experience that often the causes can't be found when your computer suddenly "crashes" out of the blue.

Here the mentioned vortex of the electric field is capable to deliver plausible explanations because it is not bound to the geometry of an antenna and in addition is highly active without being detectable with the usual EMC measurement methods of the interference radiation measurement!

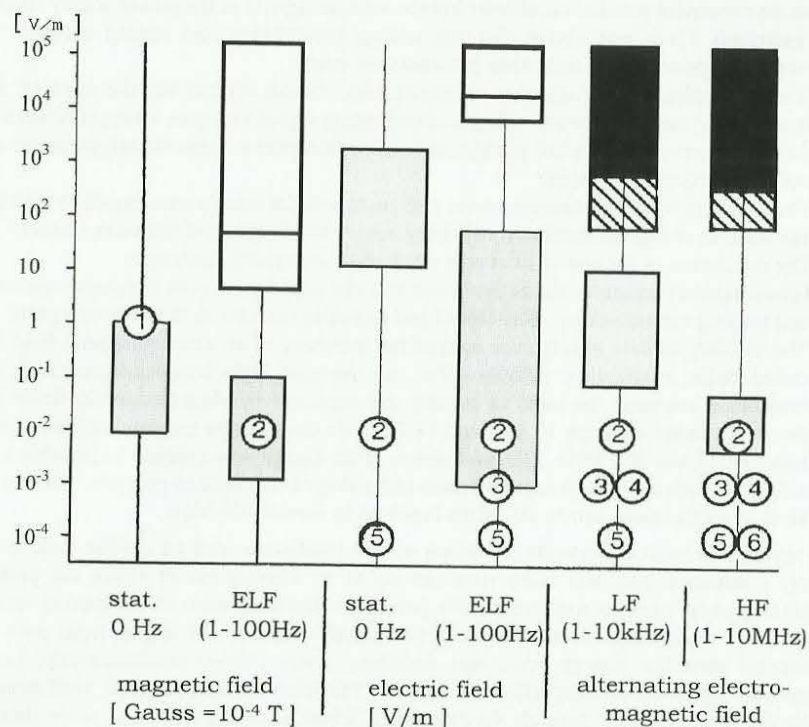


Fig. 2.7: Intensities of natural electromagnetic fields
(electric, magnetic and
electromagnetic fields)

In addition to fig. 1.1, page 2,
magnetic field in Gauss ($= 10^{-4}$ T),
electric field in V/m.

2.7 Tasks of the biological compatibility

The second leg of the environmental compatibility (EC) forms the biological compatibility (BC) besides the electromagnetic environmental compatibility. Whereas the interests of the EMC are looked after by electrotechnical engineers and electrophysicists, with the BC also doctors, biologists and architects are addressed.

Moreover this leg is already very old and already existed long before artificial interference sources could be created by mankind. The interaction between the arising interference sources in nature and the biological systems in general and specially men always interested the doctors, the priests, the druids and geomants, that not seldom looked after several functions in personal union equally. Unfortunately they as a rule have kept their knowledge and capabilities as secret knowledge, didn't make any recordings and merely initiated and trained their respective successors. Through that a great deal got lost and today non-medical practitioners, homeopaths and esoterics trouble themselves to take up to the far-reaching buried knowledge.

Because this concerns pure knowledge by experience, often the with the topic occupied persons themselves are not capable to say anything about the physical backgrounds and causes. One concentrates entirely on the under certain circumstances reachable results and only in rare cases on reproducible effects. In some areas the scientific assignment already has succeeded, have parascientific phenomena managed their admission in the so called "exact sciences", but in most experience disciplines the assignment is still due. There still is a lot to do here.

In the time as there not yet were operated any artificial interference sources on our planet, the senses of man naturally were a whole lot sharper for his electromagnetic environment as today. Today, where there scarcely is a place on earth where we are not irradiated by terrestrial transmitters, by satellites or by the netfrequency that is measurable everywhere. In the bluntness of our senses perhaps the hybris of modern man is founded, with which he wants to rise himself above esotericism, geomancy and other sciences of experience and thereby dispute the electric and magnetic fields their biological effectiveness.

The fields of natural origin form an electromagnetic environment for men, that they have adapted to and that they probably need for a life in accordance with nature. The evolution has taken care for a corresponding adaptation.

In fig. 2.7 in addition to the limits from fig. 1.1 the intensities of natural electromagnetic fields are registered¹⁰. They lie clearly lower as the recommended limits but exactly in the area wherein the first reactions of living beings are observable.

When we ask us how much electromagnetism is good for us and how much harms us so the obvious answer is: exactly as much radiation as nature dictates in the fluctuations between day and night, between the months, years and in the end between the cycles of sunspots of 11 years. Here the guide value is found that man and nature have adapted themselves to. In fig. 2.7 the corresponding area between the natural minimum and maximum values is given.

Irradiation strengths of the field radiation in the biosphere and how the optical windows are situated in the atmosphere<i>.

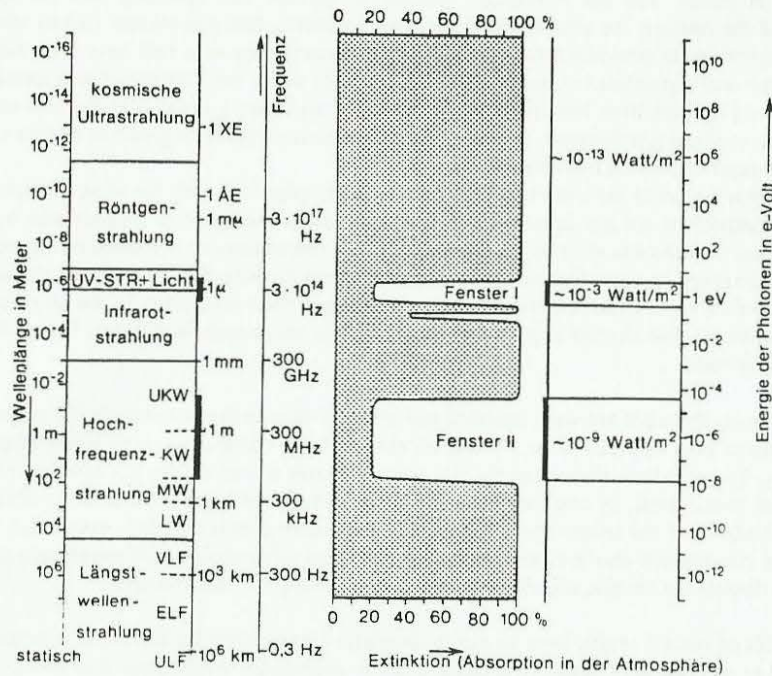


Fig. 2.8: Absorption dependent on frequency in the atmosphere

<i>: taken from: H.L. König: Unsichtbare Umwelt (Wetterfühlgk.), 5. Aufl., Bild 8, Seite 14, Verl. Moos & Partner München, ISBN 3-89164-058-7

2.8 Natural fields

Our electromagnetic environment has something to offer:

From the magnetic north pole to the magnetic south pole of the earth run the field lines of the **earth's magnetic field** that we are exposed to. With a compass we use the vector character of the magnetic field to fix our position. The induction averaged over time is approx. 50 μT . But it is overlapped by short-time fluctuations caused by **geomagnetic storms** in the ionosphere.

These storms again are caused by the eddy currents and the currents of charged particles that come from the sun. At the same time these eddy currents in the ionosphere together with the earth's magnetic field form a protective shield with a excellent screening effect for us inhabitants of earth.

In several layers like for instance the ozone and Heavise layers a filtering and damping until the complete suppression of the very broad cosmic spectrum is caused. This extraterrestrial spectrum of radiation doesn't leave a single frequency out and has a lethal intensity for us.

Only for a little window in the frequency spectrum, radiation can pass almost undamped, as can be seen in fig. 2.8: the light with the spectrum of the colors. For this nature has donated man a sense organ so that man can protect himself against too high dose values. After all, who will look voluntarily into the sun? We only get into trouble when our sense organ doesn't function any more (for instance in the fringe range of the visible spectrum, the UV-range).

For other frequencies of electromagnetic radiation man neither has a sense organ but that doesn't mean that he is not influenced by these. Here, as in the UV-range he only indirectly notices that he has got too high a dose when he has to discover some influences on his well-being and his health. Without the help of neutral measurement apparatus he himself by no means is in a position to make a connection between an excessive exposition to radiation and his health problems.

When natural field strengths should be used as a measure for technical limits, so there should be paid attention to the fact that nature doesn't know intense continuous irradiation. The values are subject to powerful fluctuations that leave men and nature the chance to regenerate.

The television stations not even think it is necessary to reduce their broadcasting power after the end of broadcasts and further sprinkle the sleeping population with test signals, with senseless pictures of going by underground or nonstop program advertisements. People need the intermissions. That again shows how good nature means it with us.

V/m in the
case of 1 kHz
bandwidth

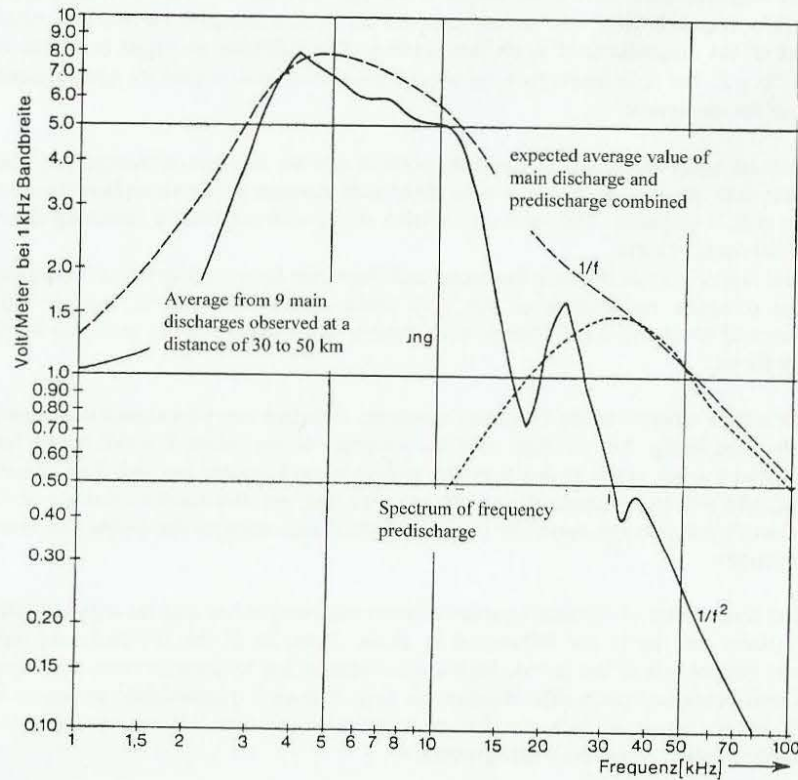


Fig. 2.9: Spectrum of frequency of one lightning, measured field strength at a distance of 1.6 km from the place of origin. See Watt and Maxwell:^{<i,ii>}

from:

<i>: H.L. König: Unsichtbare Umwelt (Wetterfühlgk.), 5.Aufl., Bild 38, Seite 27, Verl. Moos & Partner München, ISBN 3-89164-058-7, see <ii>.

2.9 Electricity of the air

The electrostatic field strength of the earth lies between 50 and 500 V/m. That is a whole lot considering that voltages off 60 Volts can be lethal for man. But a living person distorts the terrestrial E-field for reason of his own field and his electric conductivity, so that there exists no danger for him as long as he doesn't grow into the sky.

Maybe the dinosaurs had to become extinct because they were to big and for instance the E-field near the ground had risen with a jump by a meteorite that brought a high charge from the cosmos. That would explain why the smaller living beings could survive the natural disaster.

Also the *thunderstorm electricity* can become life-threatening. Burns, heart and brain failures are the most common consequences. After all the probability to be struck by lightning is four times higher as to have six right ones in the lottery.

Over the lightning channel of approx. 1 meter in diameter charges between 10 and 200 C are transported what results in current strengths of 2000 up to 200,000 A. The main discharge lasts between 10 and 50 μ sec. With the preceding and all the following discharges it lasts over a second.

Field strengths on the scale of 4,000 V/m are typical but in a distance of 5 km these wear off to 8 V/m. The frequency spectrum of a lightning reaches 4 powers of ten into the range of the radio waves. In fig. 2.9 is shown the field strength measured in a distance of 1.6 km from the place of origin^{<i,ii>}.

The origin of lightnings is still an unsolved problem after the well-known models (Wilson) are not in a position to explain the reason for the origin of the potential difference of more than 100 million Volts required for the ionization of the air. Also the lightnings that struck in the direction of the ionosphere still are mysterious.

We'll have to come back to this^{<iii>}.

<i>: H.L. König: Unsichtbare Umwelt (Wetterfühlgkeit), 5. Aufl., Bild 38, Seite 27, Verlag Moos & Partner München, ISBN 3-89164-058-7, according to <ii>.

<ii>: A. D. Watt and E. L. Maxwell: Characterisic of Atmospheric Noise from 1 to 100 Kc/s. Symposium on the Propagation of VLF Waves, Boulder, Col., Paper 35, Jan.1957.

<iii>: see Part 1, chapter 5.4 and part 2, chapter 14.11.

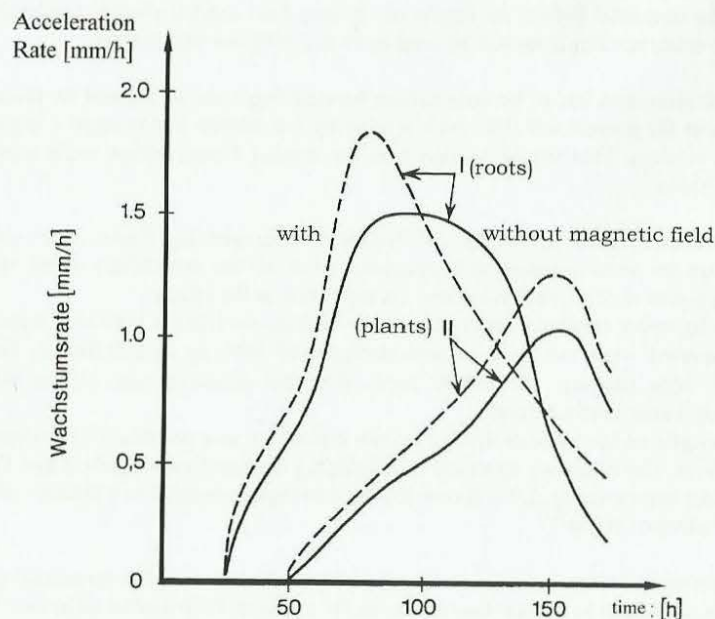


Fig. 2.10 A: Effect of a static magnetic field of 100 kA/m (0,12 Tesla) on the root (I) and on the plant (II) of barley seeds.
plants in the magnetic field: dotted line
plants for checking: drawn line
according to Novitskii^{<iii>}

<iii>: Novitskii, Yu.I.: Effects of a magnetic field on the dry seeds of some cereals. Proceedings of Conference on the Effect of Magnetic Fields on Biological Objects, Moscow, p. 52, 1966.
Taken from: H.L. König: Unsichtbare Umwelt (Wetterfühligkeit), 5. Aufl., Bild 72, S. 73, Verlag Moos & Partner München, ISBN 3-89164-058-7

2.10 Biological effects

The in fig. 2.1 indicated connection between the EMC and the BC, by some authors inofficially described as EMC-environment (EMCE), describes the effect of artificial fields on biological systems. This concerns the sensitive range of tasks that is discussed extremely controversially in the public. The problem thereby is that the artificially produced field strengths lie above the natural field strengths for several scales.

In the thirties first reports about troubles were provided by navy radio operators that complained about headache, dizziness, concentration failure and indisposition. Besides these negative reports concerning the so called "radio operator disease" at the same time medical usages concerning high-frequency therapy were tested. In the beginning this **diathermy** called healing method still was a short wave irradiation. Today it is extended into the microwave range and uses the thermal effect of electromagnetic rays. The increased temperature of the tissue causes an increased local blood flow. This supports healing processes, loosens cramped muscles and can help in case of rheumatic fever.

The advantage of the HF-irradiation compared to contact heat by a hot-water bottle or by infrared rays is the higher penetration depth. Herein short waves are superior to microwaves. But microwaves can be better focussed on a certain part of the body.

Is the temperature further increased, so the tissue is damaged. This is used for the treatment of cancer and is called **hyperthermy**. Because cancer cells as a rule are flowed with blood worse than healthy cells, they are more sensitive to heat and therefore are faster destroyed than healthy cells at a correspondingly increased temperature. In this way for instance in the USA cattle with a so called cancer eye are treated. For that the spot suffering from cancer is irradiated with 2MHz-waves for 30 seconds with a handheld apparatus of 10 Watts broadcasting power. The rate of succes is given to be 90%!

The method of hyperthermy has not yet been able to establish in the area of the medicine for humans. Also at our college corresponding research work is carried out in co-operation with the radiological clinic of the university of Freiburg (Germany)^{<i>}.

The thermal effects of high-frequency fields are therefore well-known and subject of scientific research. On the other hand and in spite of numerous publications, non-thermal effects even today are denied by some scientists as non-existent^{<ii>}. Here only a few counter-examples will be listed.

Fig. 2.10 A shows the effect of a static magnetic field of 0.12 Tesla on the root (I) and on the plant (II) of barley seeds. The readable effect is an acceleration of the growth of the treated seeds (dotted line) compared to the plants for checking (drawn line)^{<iii>}.

<i>: H. Schulz, W. Oppitz: Lokale Hyperthermie durch hochfrequente Wirbelströme, Medizin Technik 1, 1987.

<ii>: G. Nimtz: Mikrowellen, Einführung in Theorie und Anwendung. 2. Aufl., BI-Wissenschaftsverlag 1990, ISBN 3-411-03203-0

<iii>: Novitskii, Yu.I.: Effects of a magnetic field on the dry seeds of some cereals. Proceedings of Conference on the Effect of Magnetic Fields on Biological Objects, Moscow, p. 52, 1966; taken from: H.L. König: Unsichtbare Umwelt, fig.72, p. 73, Verlag Moos & Partner München, ISBN 3-89164-058-7

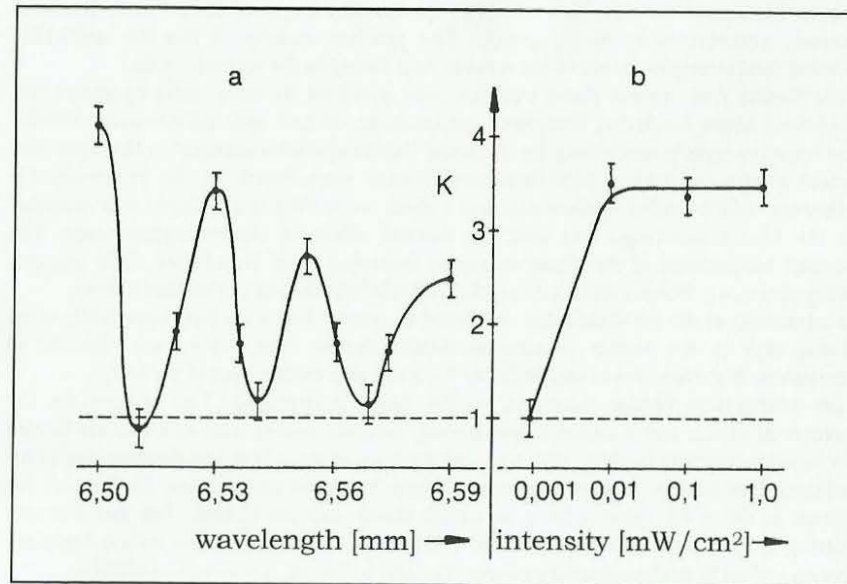


Fig. 2.10 B: Measured increase in the production (K) of colicin by colibacteria as a microwave effect

- a) as a function of the wavelength,
 - b) as a function of the intensity of the microwaves,
- according to Keilmann^{<i>}.

taken from:

<i>: H. L. König: Unsichtbare Umwelt (Wetterfähigkeit), 5. Aufl., Bild 106, S. 111. Verlag Moos & Partner München, ISBN 3-89164-058-7

A static field naturally produces no induction and hence no heating will arise. In the case of alternating fields the thermal effect in experiments is excluded by working with extremely low stimulations. The example after fig. 2.10 B shows the measured increase in the production (K) of colicin by colibacteria at only 0.01 mW/cm² microwave power^{<i>}.

In addition the example provides the interesting information that obviously only a certain frequency and its harmonic waves increase the production, other frequencies on the other hand remain inactive. Because only minimal field strengths are used it more likely concerns an information-technical as an energetic effect (curve a). This statement is supported by the observation that an increase of the intensity not at all necessarily as a consequence also increases the production (curve b). What the colibacteria need is obviously neither energy nor heat but only a certain frequency that stimulates the colicin production or the growth.

Should it really be confirmed that biological effects of electric and magnetic fields can be produced by certain frequencies and can't happen by an energy transition so the discussions about limits must seem ample meaningless.

Maybe the one or the other in thought already draws a connection to the **acceleration**, the accelerated growth of kids, which is observed world-wide and stronger in cities than in the country. It started for approx. 100 years simultaneous with the electrification of the homes in the towns. In Asia the acceleration and also the electrification have started later. Other growth stimulating effects like radio waves, X-ray examinations, atomic tests and provable also the nourishment with vitamin B6 happened only until much later and at the most could support the actual effect.

But how should a proof be offered when anyway the field strength not at all can have a decisive influence on the growth of man after the statement of fig. 2.10 B? Which information is authoritative? Where is the responsible frequency window? Does the information actually manifest as frequency? Is the authoritative influential factor also in this case not at all noticed and measured?

A lot of pressing questions are still outstanding. But in any case the numerous influential factors detected in experiments do not at all let themselves reduce to a sole factor, for instance the nourishment. For a family doctor it may be comfortable to be able to give an easy explanation: „Cause is the nourishment!“ With such a reductionism on the other hand the actual cause stays in the dark and the asked questions in this way won't let themselves be answered.

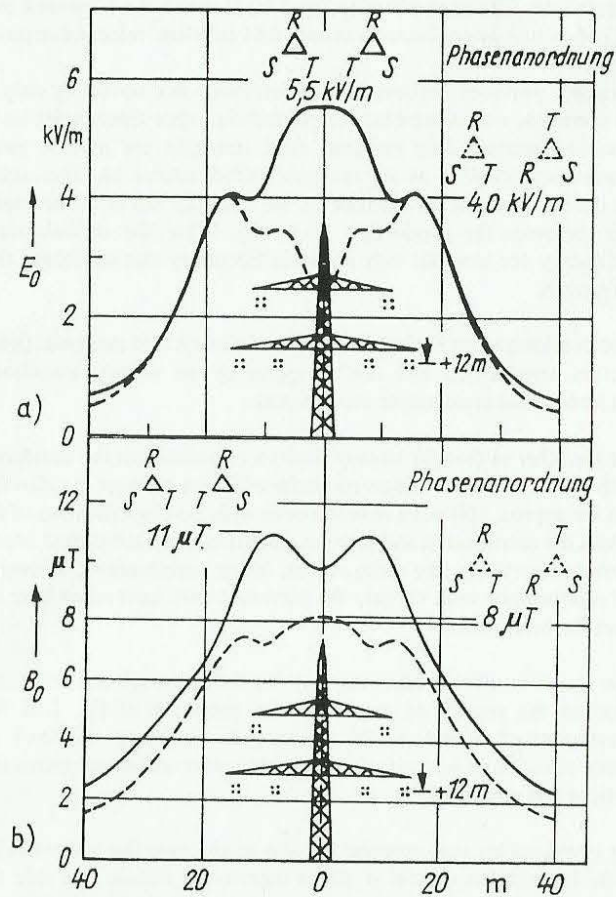


Fig. 2. 11: profile of the 50-Hz-field on the ground at 380kV/1kA in each circuit.^{<i>}

a) electric field,
b) magnetic field.

taken from:

<i>: E. Habiger u. a.: Elektromagnetische Verträglichkeit, fig. 7.3, page 147 and Fig. 7.1, page 146, 2nd Ed., 1992. Berlin, München: Verlag Technik.

2.11 Artificial fields

The scepticism of people feeling close to nature is especially directed against artificial fields that man can't see nor hear nor smell. Objects of doubt are first of all the installations for the creation, distribution and conversion of electric energy.

An essential role plays the fact how close the supplying and the draining conductors are to each other, so that the respective fields can compensate each other. The worst solution one can think of is realized at the electrified railway. Here the rails and the earth are used as the draining conductor for the current while there exists an ample large distance to the supplying conductor. A compensation is almost impossible thus causing gigantic interference fields that are detectable even at a distance of 10 kilometers. The increased putting on of railway engines fed by rectified current is likely to aggravate the set of problems because the non-sinusoidal absorption of current is strongly afflicted with harmonic waves.

With high tension transmission lines (fig. 2.11) the interference field strength is reduced when the three cables are suspended with only little distance between them. But even the selected phase order can play a role. Of course the optimal compensation effect is guaranteed with cables in the earth. But these are expensive and technically not realizable for such high voltage levels.

In the eighties also the computer screens got in the headlines. The terminals are furnished with a cathode ray tube and have a very broad radiation spectrum that already starts at 0 Hz. Here already static maximum values of 64 kV/m are measured^{<i>}!

Frequency range	Measured maximum values E_{\max} resp. H_{\max}	30 cm in front of the screen
static field (0 Hz)	64 kV/m	
50 Hz, 60 Hz	10 V/m and 0,2 - 1 A/m	
5 Hz - 1 kHz	1800 V/m and 4 A/m	10 V/m and 0,6 A/m
50 Hz - 0,5 MHz	1 A/m	
15 kHz - 220 kHz	50 V/m and 1,1 A/m	15 V/m and 0,17 A/m
3 MHz - 300 MHz	< 0,2 V/m	

Fig. 2.11: Electromagnetic fields from screens^{<i>}

system	used frequency about	measured value
radio broadcasting station (MW 20 kW)	600 kHz	2...17 V/m
radio broadcasting station (SW 100 kW)	15 MHz	1...25 V/m
SOS-transmitter on a ship (100 W)	410 kHz	1...3 V/m
Epitaxiedevice (induction oven)	450 kHz	37...400 V/m
HF-welting press (welding of plastic foils)	27,12 MHz	70...85 V/m
radar on a ship (TRN 311)	9,3 GHz	1...30 $\mu\text{W}/\text{cm}^2$
radar of an airplane	9,2 GHz	450... 2800 $\mu\text{W}/\text{cm}^2$
domestic appliances measured in a distance of 30 cm:		
hand mixer	50 Hz	50 V/m
refrigerator	50 Hz	60 V/m

Fig. 2.12: the electric field strength resp. Power density
in our environment.^{<i>}

taken from:

<i>: E. Habiger u. a. : Elektromagnetische Verträglichkeit, Fig. 7.2, page 146,
2. Ed., 1992, Berlin, München: Verlag Technik, ISBN 3-341-00993-0

2.12 Protection against artificial fields

Artificial fields more or less always occur in the neighbourhood of electric apparatus and installations. Especially problematic are those that work with the free radiation of electromagnetic fields, that is all the radio broadcasting stations, handheld and radar transmitters.

Herewith it is important that not needed parts of the antennas are shielded, that antennas with little close by field pollution are used and that the stand should be situated at least 3 km remote from inhabited areas. For instance at radar installations damping values of 10 dB and more can be obtained only by using a corresponding tree growth.

This obviously concerns a damping of the waves in a dielectric manner. We'll have to come back to this because textbook physics does not know a corresponding damping term in the wave equation.

The radiation leaking out in case of the high-frequency welding of plastic foils and of the microwave oven should be minimized.

In the case of induction ovens or of motors an active shielding often causes problems so that for simple domestic appliances like a hand mixer and especially for the electric hair-dryer non proportionally high field strength values are measured. Fig. 2.12 informs about it.

Protective measures for the operator are hardly possible. To protect uninvolved people not only the apparatus but also the rooms and eventually whole parts of buildings had to be shielded and grounded.

Sometimes also fairly simple possibilities are helpful like e.g. the usage of a remote control. By clearing away the cable salad at the workplace and at the sleeping place induction loops can be removed. Alarm-clocks operated by batteries should have preference over those operated by the network. Mattresses with metal in them and spring-beds which clearly act as an antenna should be avoided. In extreme cases even so called "current-free switches" and shielded network lines are recommended (fig. 2.13).

In the area of the network supply lines a choking coil can help decrease the spreading of high-frequency interference radiation. It is especially important that all the conducting metallic objects like e.g. water pipes, heatings, steel racks, machines, switching racks, steel armaments and metallic windows should be grounded properly, because otherwise extremely high static charges could result instead of a shielding. Construction biologists recommend to when possible do without metals when building houses and furnishing, what of course is only realizable with limitation.

In any case numerous measures are known that to a lesser extent find their legitimation in classical physics, but more likely in *precaution*. As long as we do not know which phenomenon causes the electrosmog and we don't have a measuring-instrument at our disposal, precaution is really the only thing we can do irrespective of the effectiveness of the measures and of the arising costs.

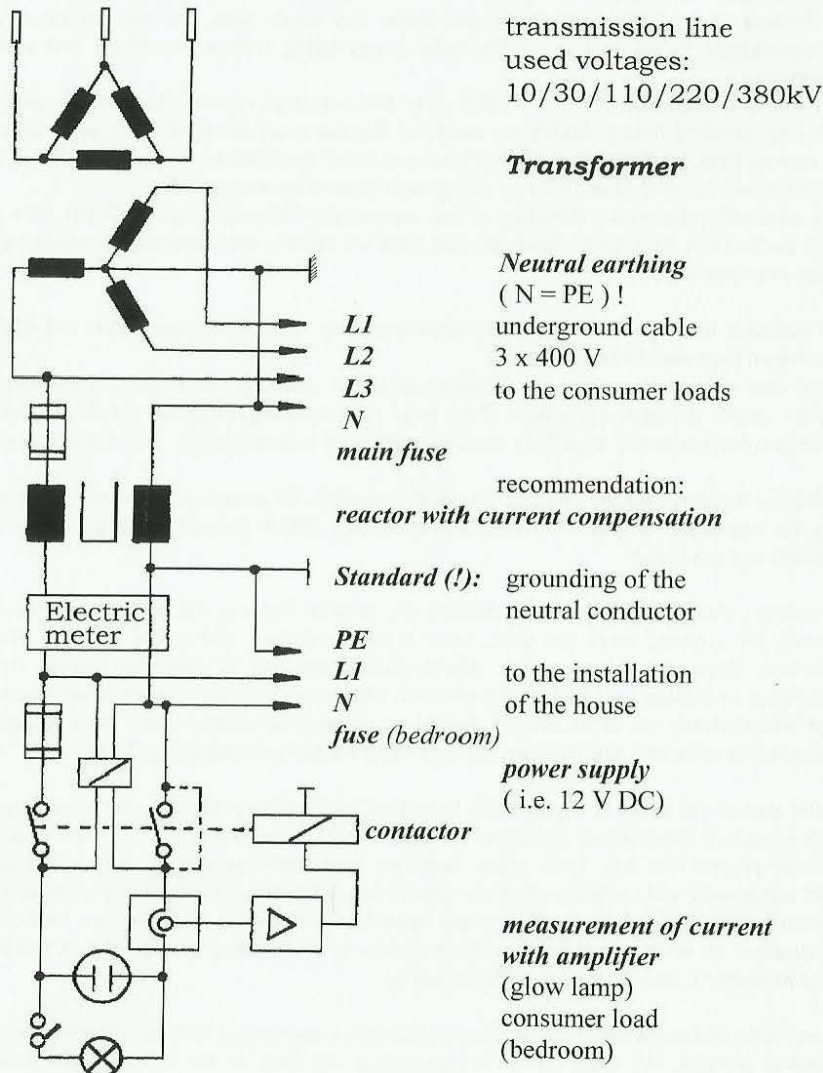


Fig. 2.13: About the circuitry and the problems involved
with a "current-free switches" installation

2.13 Unsolved tasks

The report concerning the actual state of research could be continued at will. But the expositions should suffice, to understand what are the tasks of the electromagnetic environmental compatibility (fig. 2.1) and which questions still have to be supplied with a solution. One can get deeper into every of the addressed points and then discover that some questions can be expressed sharper and maybe conceivable answers can be found, but at the same time and unavoidable the number of new questions increases faster.

Let us again take up the example of the handheld wireless telephones (chapter 1.2). At least it now is clear to us that the usage of the built-in microwave antenna of a handy is problematic. In the interior of an automobile it never should be used. If, however, one uses the antenna installed on the outside on the sheet metal then the damping and screening effect of the sheet metal chassis is advantageous at least for the handy user.

With that of course the central question is not answered. The question of what the cause is for the interfering and at worst health endangering effect of the HF-radiation. Field freedom we can't find anywhere on this world. Possibly we even need the fields. But then the question is how much is necessary, how much is healthy and how much makes us ill.

The gap of explanation especially gets clear in the case of the static or of the low-frequency magnetic field: away from technical interference sources normally fields on the scale of 10 nT are measurable. Construction biologists say that 20 nT, so twice that value, should not be exceeded at the sleeping place and maybe 50 nT at the desk. These values however are determined purely empirical.

When a person is examined in a nuclear magnetic resonance tomograph that person is exposed to a field that lies between 0.2 and 1.5 Tesla, that is a value 7 till 8 powers of ten higher than before mentioned without this leading to the death of that person. Entirely on the contrary this method is regarded as especially caring and safe compared to the X-ray examination.

Here again the legitimation of the thesis put forward is entirely confirmed. The thesis that the well-known physically measurable and controllable phenomena can not be considered as a cause and that possibly a until now undiscovered field phenomenon should be called to account.

Should such a phenomenon exist it should be derived, calculated and proved. We must go to endless troubles and try everything. The actual difficulties wherein the electromagnetic environmental compatibility is stuck are a challenge.

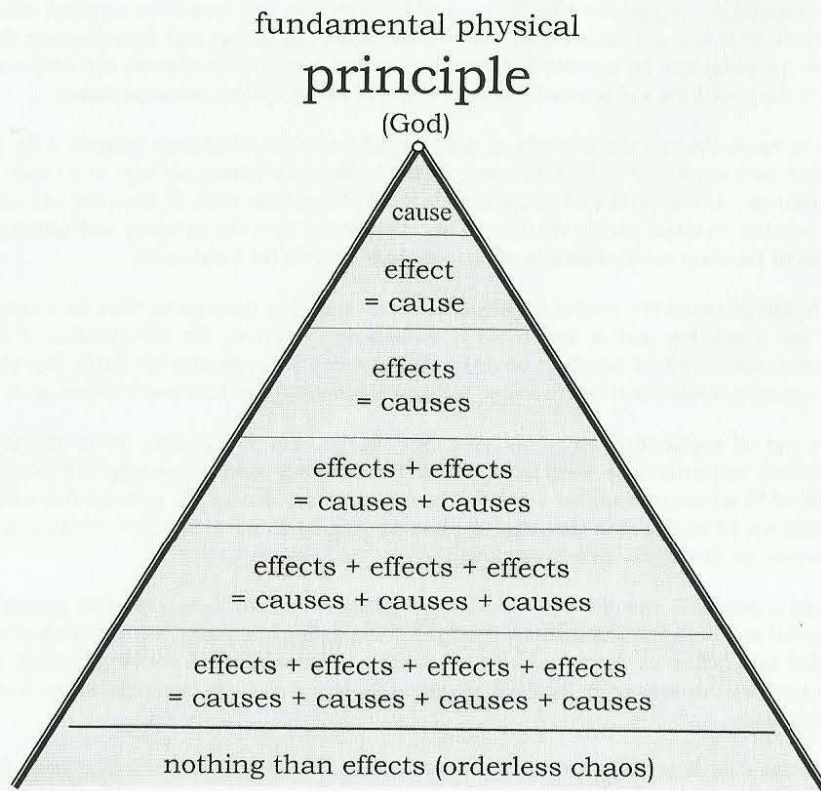


Fig. 3.0: pyramid of causality

vortices are a consequence of the principle of causality

3. Approach

In the question, if there exists a still unknown phenomenon that influences the electromagnetic environmental compatibility, we must fall back far until upon the roots of our physical understanding. Here we find a fundamental principle that until today is not doubted and that is regarded as elementary: the principle of causality. Every result of a measurement, every interpretation is checked for causality and only after passing this examination it is accepted and published.

This principle of cause and effect has established, not only in physics but also in many other disciplines of science. Is an effect observed, so there immediately is asked for the cause. This principle encounters us in daily life^{<i>}.

When all observable and measurable effects ever can be assigned to a cause without force and without exceptional regulations then the logical result is a pyramid of causality. On top a fundamental physical principle is found, that is regarded as given by nature or as given by god and that with its properties is responsible as the cause for different effects. These effects again appear as the cause for new effects and so on (Fig. 3.0).

Sometime we have removed us so far from the top of the pyramid that a direct reference to the describable effects can't be made anymore, so the impression could arise that it concerns an isolated and independent discipline. We should take care not to think in such a monocausal way, because both delimitation and avoidance of interdisciplinary working methods will inevitably steer us into a dead end.

This pyramid of causality stands for the vision of a "unified theory", like it is demanded and sought-after by numerous research scientists. But as long as it is not found, we'll have to do with unsolved problems of causality. About this any number of examples can be given.

A physical principle based on the principle of causality is the vortex. This the eddy current demonstrates us clearly. The cause for its origin is an alternating field. According to Faraday's law of induction this induces a voltage that in a conducting medium results in a current according to Ohm's law. Around this current according to Ampère's law an alternating field forms, that points perpendicular to the current and overlaps the original alternating field. This induced field first of all is an effect that overlaps the cause and itself becomes the cause. The effect that follows from that further overlaps and forms a new cause etc. In this way vortices form.

Vortices quasi represent the principle of causality.

^{<i>}: When for instance a woman complains: "Doctor, my left knee hurts" (effect). The doctor diagnoses the cause: "Yes, that comes with age!" With that causality is established. "But doctor", says the woman, "my right knee is exactly as old as my left knee!" And already the doctor has a new problem of causality.

Principle of Causality:

	cause	→	effect
quantum physical approach:	quanta	→	fields
field-theoretical approach:	fields	→	quanta

violations of the principle of causality:

1. monopoles exist
2. starting point for the strong interaction
3. fields and quanta are a cause at the same time
4. hypothetical particles (gluons, quarks, etc.)
5. transmission of information with speeds faster than light
 - with photons (University of Berkeley)
 - with microwaves (University of Cologne)
 - with laser beams (Technical Univ. of Vienna)
6. transmission of energy with speeds faster than light
 - with scalar waves (Nicola Tesla)

Fig. 3.1: Causality or the principle of cause and effect

3.1 Principle of causality

Our physical view of life strictly obeys the rules of causality, the principle of cause and effect. But there are numerous cases, where causality at first could not be fulfilled anymore. Here alternate solutions had to be found to not endanger this very successful principle. A few examples should clarify this:

1. Technically it is impossible to produce a magnetic monopole. When a north pole is produced then the accompanying south pole is also formed. In the same way only the positive and negative pole can be assembled as the so called dipole. In the microcosm however we find monopoles. Electrons are such particles. To restore causality we must grant the microcosm its own laws that are not valid in the macrocosm. But this monocausal hypothesis contradicts the observation that the microcosm represents an image of the macrocosm and vice versa. Doubts if this assertion is allowed are reasonable.
2. Like charges repel each other and that the more the smaller the distance gets. In an atomic nucleus positively like charged protons are together at the smallest possible room without any repulsion happening. Arithmetically seen all atomic nuclei would have to explosively fly to pieces. But because this doesn't happen, shortly a new and supposedly fundamental interaction, the strong interaction, was introduced to save causality. Nevertheless this interaction now holds the like particles in a not explained manner together. Causality could be obtained only by the introduction of a new fundamental phenomenon.
3. When causality should hold as the supreme principle, it should be demanded with priority for the fundamental phenomena of physics. Instead, in quantum electrodynamics the particle is attributed the same physical reality as the field. With the wave-particle duality Heisenberg has given out the corresponding formula of compromise. This slaps the face of the principle of cause and effect.

Causality on principle allows only two approaches for a solution: the *quantum physical approach*, which holds the quanta as the cause for the fields, and the *field-theoretical approach*, wherein only the fields act as the cause. For both approaches there are good arguments. The field theorists cite that fields can exist also in the vacuum, so that there exist fields without particles but never particles without fields. Against that the quantum physicists hold that somewhere, even when quite far away, there exist particles and that the measurable fields merely are their action at a distance.

Both approaches first arouse the impression to be fully equal. In the course of the discoveries in the area of quantum physics, the corresponding approach has been able to establish. But it demands that all phenomena have to be understood as a consequence of particles. So should *gravitons* make gravitation possible, should *gluons* hold everything together and the *quarks* form the basic building parts. Meanwhile there is only worked with *hypotheses*. Out of poverty quantum physics meanwhile has said goodbye to strict causality, after the number of the violations of causality has risen that much and in every respect there is a lack of models of explanation. It seems as if the end is reached, as if the quantum physical approach to a large extend is exhausted.

Field-theoretical approach:

3rd Maxwell equation

$$\text{Div } \mathbf{B} = 0 \quad (3.3)$$

4th Maxwell equation

$$\text{Div } \mathbf{D} = \rho_{\text{el}} \quad (3.4)$$

With the relations of material:

$$\mathbf{B} = \mu \cdot \mathbf{H} \quad (3.5)$$

$$\mathbf{D} = \varepsilon \cdot \mathbf{E} \quad (3.6)$$

$$\mu \cdot \text{Div } \mathbf{H} = 0 \quad (3.3^*)$$

$$\varepsilon \cdot \text{Div } \mathbf{E} = \rho_{\text{el}} \quad (3.4^*)$$

H: source free
vortex field

E: non-vortical
source field

New field-theoretical approach:

$$\text{Div } \mathbf{D} = 0 \quad (3.7)$$

thus: $\text{Div } \mathbf{H} = 0$ (3.3^{**}) and

$$\text{Div } \mathbf{E} = 0 \quad (3.7^*)$$

H and E: source free vortex fields!

Einstein:

"Is it conceivable, that a field theory permits us to understand the atomistic and quantum structure of reality? This question by almost all is answered with **No**. But I believe that at the moment nobody knows anything reliable about it"^{<i>}.

Pauli:

"The electric elementary quantum e is a stranger in Maxwell-Lorentz' electrodynamics"^{<ii>}.

Fig. 3.2: The field-theoretical approach

<i>: A. Einstein: Grundzüge der Relativitätstheorie, S 162, Anhang II; 5. Aufl., Vieweg, Braunschweig 1974.

<ii>: W. Pauli: Aufsätze und Vorträge über Physik und Erkenntnistheorie. Vieweg, Braunschweig 1961, entnommen aus:
H. G. Küssner: Grundlagen einer einheitlichen Theorie der physikalischen Teilchen und Felder. Musterschmidt-Verlag Göttingen 1976, S. 161.

3.2 Field-theoretical approach

The field-theoretical approach is the very much older one. Until the last turn of the century the world in this respect still was in order. Max Planck, by the discovery of quanta, has plunged physics into a crisis.

Albert Einstein, who, apart from his lightquanta hypothesis, in his soul actually was a field theorist, writes: „Is it feasible that a field theory allows us to understand the atomistic and quantum structure of reality?“. This question by almost all is answered with **No**. But I believe that at present nobody knows anything reliable about it"^{<i>}.

By the way the "No" can be justified by the fact that the field description after Maxwell is by no means able to the formation of structure so that it is not possible for quanta to appear as a consequence. The field-theoretical approach could, obstructed by Maxwell's field theory, not further be pursued and to this until today nothing has changed.

Nevertheless it would be an omission to not at least have tried this approach and have it examined for its efficiency. Maybe the above mentioned problems of causality let themselves be solved much more elegantly. For this however the Maxwell theory must be reworked to a pure field theory. With the well-known formulation it offends against the claim of causality, since it is field theory and quantum theory at the same time. To Maxwell himself the quanta were still unknown, but today we know that the fourth Maxwell equation is a quantum equation:

$$\text{div } \mathbf{D} = \rho_{\text{el}} \quad (3.4)$$

After this the electric field is a source field whereby the individual charge carriers, like e.g. electrons, act as sources to form in their sum the space charge density ρ_{el} . The other three Maxwell equations are pure wave equations. In this way the third equation identifies the magnetic field as source free:

$$\text{div } \mathbf{B} = 0 \quad (3.5)$$

This for Pauli probably was the reason to call, „the electric elementary quantum e a stranger in Maxwell-Lorentz' electrodynamics"^{<ii>}.

Let's return to the principle of causality according to which in the field-theoretical approach the fields should act as a cause and not the particles. In a corresponding field description quanta logically have not lost anything. It is only consistent to likewise demand freedom of sources of the electric field:

$$\text{div } \mathbf{D} = 0 \quad (3.7)$$

When the electric field is not a source field, then what is it? The magnetic field is a vortex field. Hence it would be obvious to also conceive the electric field as a vortex field. Numerous reasons speak for it:

1. A non-vortical gradient field, like it is formed by charge carriers, merely represents a special case of the general vortex field. Only by the generation of quanta a source field can form as a special case.
2. The electromagnetic wave teaches us the duality between the **E**- and the **H**-field that are directed perpendicular to each other and are in a fixed relation to each other. If one of them is a vortex field then also the dual field must be a vortex field.

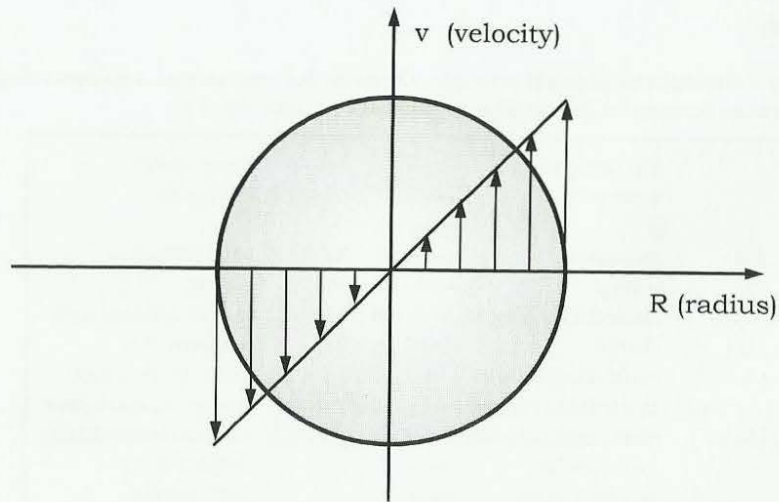


Fig. 3.4a: Velocity distribution $v(R)$ for a vortex with rigid-body rotation

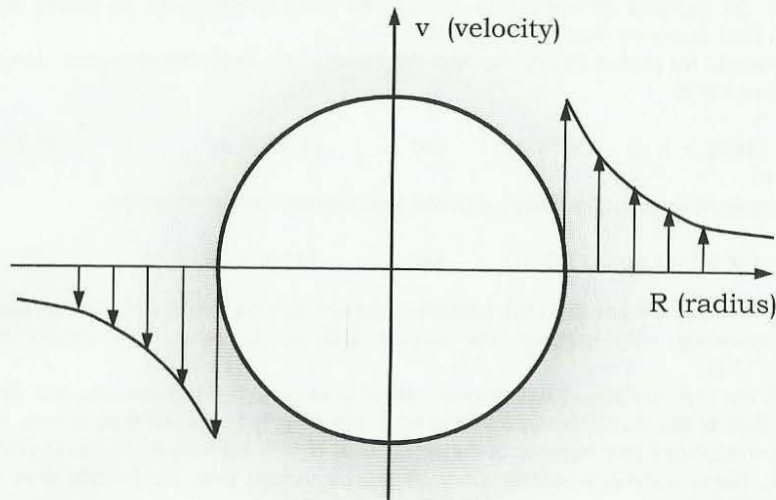


Fig. 3.4b: Velocity distribution $v(R)$ in a potential vortex (see Lugt ^{<i>}>).

<i> Lugt, Hans J.: Vortex flow in nature and technology. Krieger publishing company, Florida 1995; page 30 and 31, ISBN 0-89464-916-7

For a complete duality from the existence of electric monopoles, individual in the space charge density ρ_{el} contained charge carriers, the claim for **magnetic monopoles** is derived. In spite of intensive search such north or south pole particles however until now could not be found. Herein from the sight of criticism is seen a confirmation for the assumption that Maxwell's field theory is self-contained and hence in principle may not be extended. The critics have a problem of causality: They postulate source fields that at the same time should be vortex fields. But if one asks how one should imagine such a field that is scalar and at the same time vectorial, then it looks as if no one has ever made any thoughts about it.

The from causality derived solution of the problem of lacking duality requires to extend the Maxwell theory in one point, by introducing the potential vortex of the electric field here and at the same time make a cut in another place:

$$\boxed{\text{div } \mathbf{D} = 0} \quad (3.7)$$

With this formulation, the assumption of a **freedom of sources** in principle, the complete duality already is reached: Now neither magnetic nor electric monopoles exist (Fig. 3.3)! At first we have to accept the loss of the electron hoping that the calculation in the end works out; the "exchange" vortices against particles, by which the quanta can be banned from the field theory, suggests that the elementary particles themselves are nothing else as spherical vortices that have found to an own physical reality.

3.4 Flow vortices

In fluid engineering convincing and strong indications for the correctness of the chosen approach can be found. It benefits us that hydrodynamic vortices are visible or can be the injection of smoke, e.g. in a wind-tunnel.

Already **Leonardo da Vinci** had observed at liquids that there exist *two dual basic types of plane vortices*: "Among the vortices one is slower at the centre than at the sides, another is faster at the centre than at the sides."

A vortex of the first type, also called "*vortex with rigid-body rotation*", is formed for instance by a liquid in a centrifuge that due to its inertia of mass is pressed to the edge because there the largest velocity exists. In an analogous way the electromagnetic vortex in electrically conductive material shows the well-known "skin effect" (Fig. 3.4a).

To explain the other vortex **Newton** describes the experiment where a rod is dipped into a liquid as viscous as possible and then is turned. In this *potential vortex* the velocity of the particle increases the closer to the rod it is (Fig. 3.4b).

The duality of both vortex phenomena becomes obvious when we make ourselves clear that in the experiment with the centrifuge the more liquid presses to the edge the less viscous the medium is. And that on the other hand the potential vortex forms the stronger the more viscous the medium is. As conclusion we read in text books that the *viscosity of the liquid decides whether a vortex with rigid-body rotation or a potential vortex is formed*.

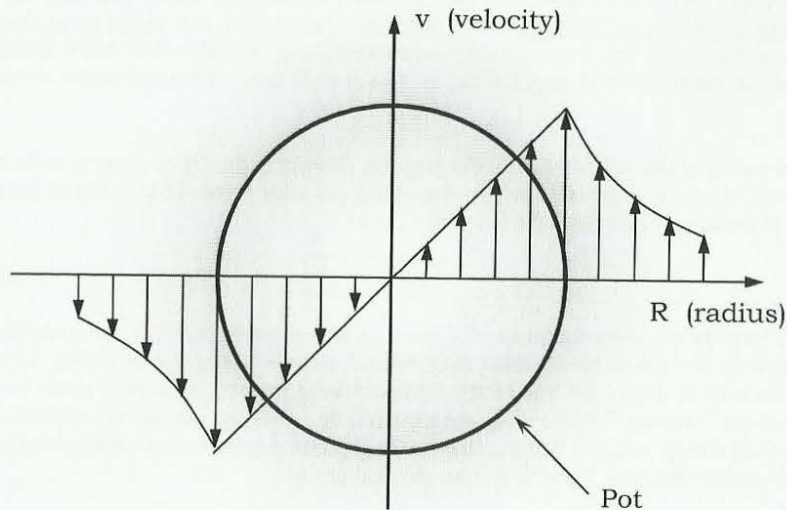


Fig. 3.5: Combination of a vortex with rigid-body rotation and a potential vortex (Lugt^{<i>i>}).

3.5 Rankine vortex

When we, in a third experiment, immerse the centrifuge filled with water into a tough medium and let the centrifuge rotate, then inside the centrifuge a vortex with rigid-body rotation forms and outside the centrifuge a potential vortex forms (Fig. 3.5).

It is obvious that one vortex always causes the other vortex with the opposite properties and so the *existence of one causes that of the other*. So in the first case, that of the vortex with rigid-body rotation, outside the centrifuge potential vortices will form in the surrounding air, whereas in the second case, that of the potential vortices, the turning rod itself can be interpreted as a special case of a vortex with rigid-body rotation.

Hence in all conceivable experiments the condition always is fulfilled that in the centre of the vortex the same state of "peace", that we can fix as "zero", prevails as in infinity.

When we take a tornado as an example, thus a whirlwind. In the "eye of the cyclone" there's no wind at all. But when I go away from this spot, then I'm blown to the outside. I can really feel the vortex with rigid-body rotation in the inside. If, however, I am standing on the outside, then the potential vortex tries to pull me into the vortex. This potential vortex is responsible for the structure and in the end also for the size of the tornado.

At the radius of the vortex, the place with the largest speed of the wind, an equilibrium prevails. The vortex with rigid-body rotation and the potential vortex at this point are equally powerful. Their power again is determined by the viscosity, which thereby fixes the radius of the vortex.

Therefore meteorologists pursue with interest whether a tornado forms over land or over water. Over the ocean for instance it sucks itself full with water. In that way the potential vortex increases in power, the radius of the vortex gets smaller and the energy density increases dangerously.

If the knowledge from hydrodynamics is transferred to the area of electromagnetism, then the role of the viscosity is taken over by the electric conductivity. The well-known current eddy occurs in the conductor, whereas its counterpart, the postulated potential vortex, forms in the bad-conducting medium, with preference in the dielectric. *The duality of both vortices is expressed by the fact that the electric conductivity of the medium decides whether current eddies or potential vortices can form and how fast they decay, i.e. convert their energy into heat.*

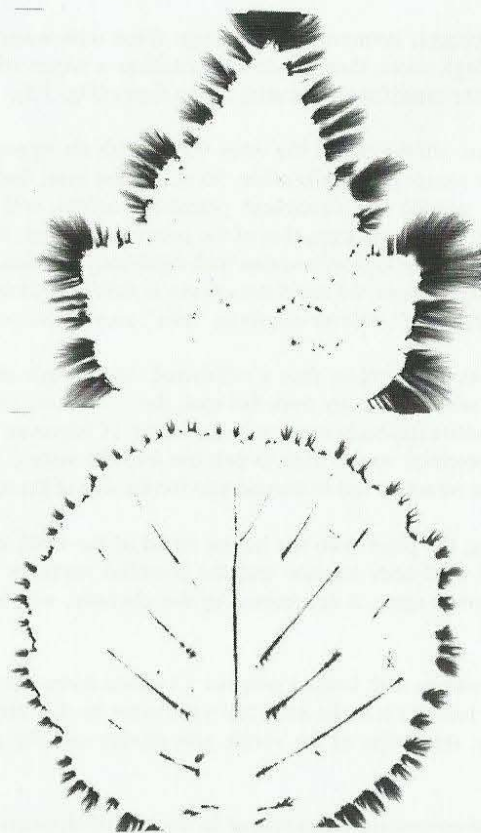


Fig. 3.6: Kirlian photograph of leaves^{<i>}
structured corona discharges

<i>: (produced by students of electronics in the laboratory for power electronics of the Author, University of Applied Sciences Furtwangen 1991)

<ii>: Küpfmüller, Karl: Einführung in die theoretische Elektrotechnik, Springer-Verlag Berlin, 12. Auflage 1988, page 453

<iii>: Küpfmüller, Karl: Einführung in die theoretische Elektrotechnik, Springer-Verlag Berlin, 12. Auflage 1988, page 208

3.6 Vortex and anti-vortex

Fig. 3.5 shows that vortex and dual anti-vortex mutually cause each other. In **high tension transmission lines** we find a striking example for the combination of current eddy and potential vortex. Within the conductor current eddies are formed. Thus the current density increases towards the surface of the conductor (skin effect). Outside of the conductor, in the air, the alternating fields find a very bad conducting medium. If one follows the text book opinion, then the field outside the conductor should be an irrotational gradient field. But this statement causes unsolvable problems.

When *vortices* occur *inside the conductor*, then for reasons of a detachment of the vortices without jumps at the interface to the dielectric, also the fields in the air surrounding the conductor must have the form and the properties of vortices. Nothing would be more obvious as to also mathematically describe and interpret these so-called gradient fields as *vortex fields*. When looking exact this argument even is mandatory.

The as laws of field refraction known *boundary conditions*^{<ii>} in addition demand *steadiness* at the interface of the conductor to the dielectric and don't leave us any other choice. If there is a vortex field on one side, then also the field on the other side is a vortex field, otherwise we offend against the law! Here an obvious *failure of the Maxwell theory* is present.

Outside the conductor, in the air, where the alternating fields find a very bad conducting medium the potential vortex not only exists theoretical; it even shows itself. Dependent among others on the frequency and the composition of the surface of the conductor, the potential vortices form around the conductor. When the thereby induced potentials exceed the initial voltage, then impact ionisation takes place and the well-known **corona discharge** is produced. Everyone of us can hear this as crackling and see the sparkling skin with which high tension transmission lines cover themselves.

In accordance with the text books also a gradient field increases towards the surface of the conductor, but an even shining would be expected and not a crackling. Without potential vortices the observable structure of the corona would remain an unsolved phenomenon of physics (Fig. 3.6).

But even without knowing the structure-shaping property of the potential vortices, that in addition acts supporting and that we'll have to derive, it can be observed well that especially roughness on the surface of the conductor stimulate the formation of vortices and can produce vortices. If one is looking for a reason why with large frequency the very short impulses of discharge always emerge from roughness^{<iii>}, then very probable potential vortices are responsible for it. By means of a **Kirlian photograph** it can be shown that the corona consists of structured separate discharges (Fig. 3.6).

With this the approach is motivated, formulated and given reasons for. The expositions can't replace a proof, but they should stand a critical examination. Mathematical and physical evidence will be furnished later.

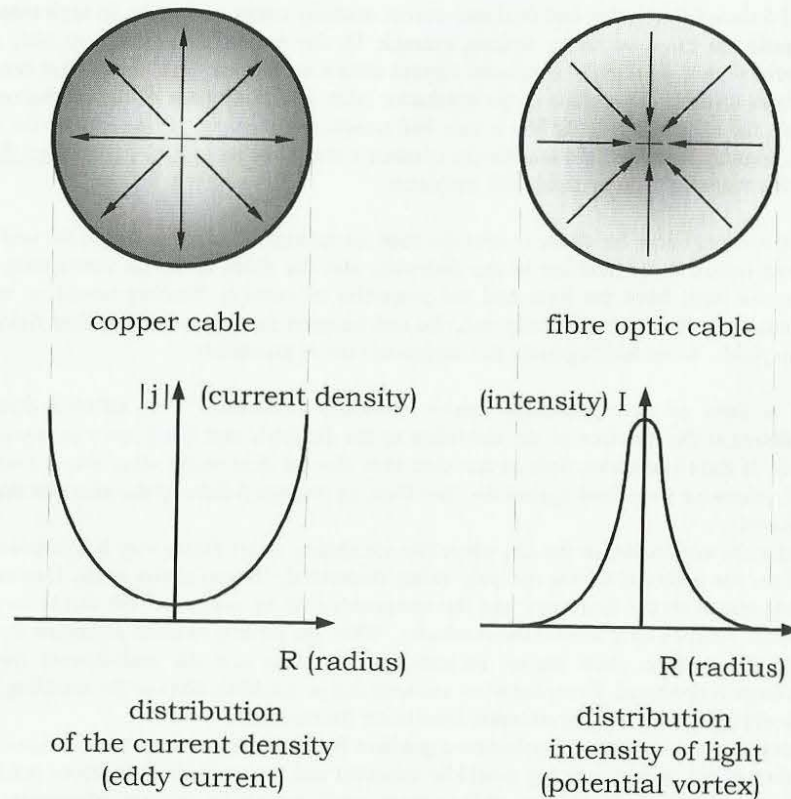


Fig. 4.1: The distribution in principle of the intensity of light within a fibre optic cable^{<i>} compared to the distribution of the current density in a copper cable

<i> Meyl, Konstantin: Potentialwirbel, Band 1: Diskussionsbeiträge zur naturwissenschaftlichen Deutung und zur physikalisch-technischen Nutzung, basierend auf einer mathematischen Berechnung neu entdeckter hydro-tischer Wirbel, INDEL GmbH, Verlagsabteilung, Villingen-Schwenningen 1990, ISBN 3-9802-542-1-6

4. Properties

4.1 Concentration effect

It can be assumed that until now there does not yet exist a technical application for the here presented potential vortex theory unless the phenomenon was used by chance and unconsciously. About this the transmission of optical light signals over fibre optic cable can be given as a typical example.

Compared to a transmission of energy impulses over a copper cable fibre optic cables show a considerable **better degree of effectiveness**. The derived potential vortex theory provides a conclusive explanation for this phenomenon and therefore is put here to discussion: If we cut through a fibre optic cable and look at the distribution of a light impulse over the cross-section, then we observe a concentration in the centre of the conductor (fig. 4.1).

Here the duality between the vortices of the magnetic and of the electric field comes to light. Whereas the current eddies in a copper conductor cause the "*skin effect*" as is well-known, potential vortices show a "*concentration effect*" and align themselves with the vortex centre. The measurable and in fig. 4.1 shown distribution of the light intensity in a fibre optic cable may confirm this phenomenon, the orientation of the potential vortex on the vortex centre.

For instance the calculation of the resistance of a copper cable provides as an important result an apparent decrease of the resistance directed towards the conductor surface. There the associated better conductivity as a consequence causes an increased current density. In the reversed direction, towards the centre of the conductor, consequently a decrease of the effective conductivity would be present, and this result is independent of the used material. According to the rules of duality this is a condition for the formation of potential vortices. As already said the conductivity is responsible for it, if the expanding eddy current with its skin effect or the contracting potential vortex with its concentration effect is predominant.

Usual fibre optic materials possess not only a small conductivity, but in addition a high dielectricity. This additionally favours the formation of vortices of the electric field. If one consciously or unconsciously supports the potential vortices, then there is a possibility that the life of the fibre optic cable is negatively influenced because of the concentration effect. Of course it can not be excluded that other effects, like e.g. reflections or the modes of the light are involved in the concentration effect. But it should be guaranteed that this actually concerns causal phenomena and doesn't concern only alternative explanations out of ignorance of the active vortex phenomenon.

The formal mathematical reason for the concentration effect provides the reverse sign in Faraday's law of induction compared to Ampère's law (see also equation 3.1 and equation 3.8 in fig. 3.3).

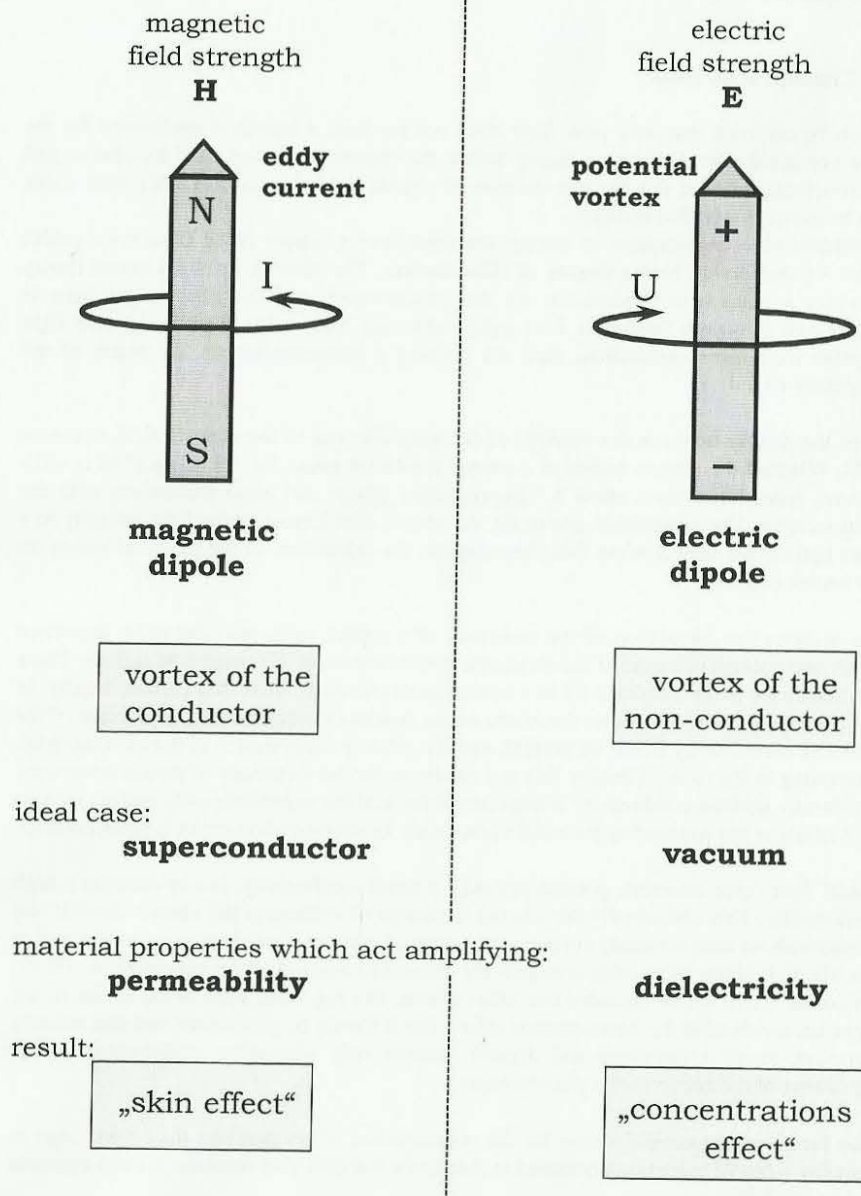


Fig. 4.2: The acting as a dipole of current eddies and potential vortices

4.2 Duality of the vortex properties

The rules of duality dictate for the vortex of the electric and of the magnetic field the following characteristics:

- Whereas currents and eddy currents demand a good conductivity, potentials and potential vortices can only form with bad conductivity, thus in a *dielectric* and best in the *vacuum*.
- Eddy currents run apart, strive towards infinity and thus show the well-known "skin effect" with a spatially limited arrangement of the conductor. According to the rules of duality the potential vortex will strive towards the vortex centre and in this way will show a "concentration effect".
- Another property of vortices is shown in fig. 4.2.
On the left side a plane eddy current is indicated. Since the discovery of Ampère's law it is well-known to us that such a circular current (I) forms a *magnetic dipole* standing perpendicular to the vortex plane.
On the right hand side the dual phenomenon is sketched. Here charges are piled up circularly to a planar potential vortex (U). Thereby an *electric dipole* forms, standing perpendicular to the vortex plane. This relation directly follows from the equations of the field-theoretical approach.
Whereas circular currents and *current eddies* produce *magnetic dipoles*, the postulated *potential vortices* will form *electric dipoles*.

With these three interesting properties some key questions of quantum physics, that until now have stayed a mystery to science (fig. 4.4), can be answered conclusively and without compulsion e.g.:

I. Why are there no magnetically charged particles?

The better the conductivity of a medium is, the higher as a consequence the number of free charge carriers is, the more strongly eddy currents are formed. The answer to question I is inferred from the opposite case:

In the ideal vacuum no charge carriers at all are present, why no currents, no current eddies and consequently no magnetic poles can exist.

With this well-known fact the first question already is answered. The question why in the microcosm there can not exist magnetically charged elementary particles, why the search for magnetic monopoles doesn't make any sense. Let's ask further:

II. Why are there only electrically charged particles?

Let us for that consider the dual conditions. The worse the conductivity of a medium is, the more the potential vortex will be favoured that because of this property also can be understood as the vortex of the dielectric.

In the mentioned extreme case of the ideal vacuum, no electric conductivity is present for reason of the missing charge carriers. But this circumstance favours the potential vortex and that, according to fig. 4.2, forms *electric poles* and with this also the second question would be answered clearly.

It can be traced back to the boundary conditions of the microcosm that without exception electrically charged particles are entitled to exist; a realization derived from the field-theoretical approach, that covers all experiences.

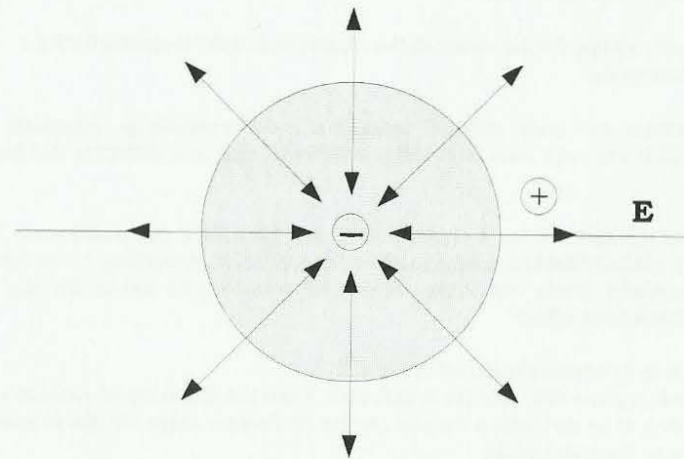
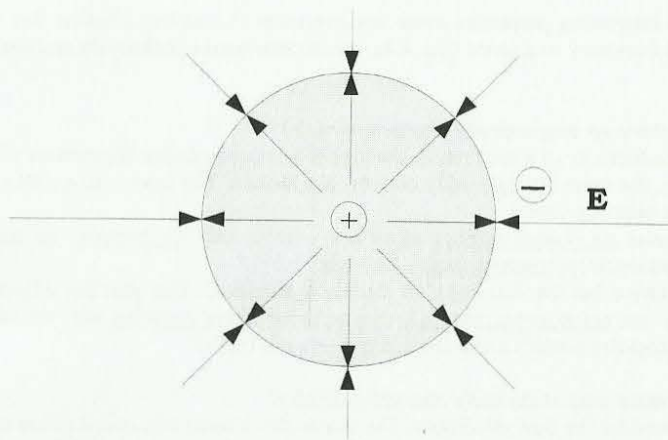
the positron e^+ the elektron e^-

Fig. 4.3: Elementary particles as configurations of potential vortices

4.3 Derivation of the electron as an elementary vortex

The next key question necessarily has to be brought to a conclusive answer to save the principle of causality, so that we no longer have to postulate an own physics with its own laws for the microcosm:

III. Why do these particles show as monopoles?

More concrete the question has to read:

Where is the positive pole in a negatively charged electron, if it should be an electric dipole?

The only possible answer is:

In the centre of the particle!

Thus in the centre of the electron its positive pole is hidden and in the centre of the positron its negative pole is hidden. But we only observe these particles from the outside and for reason of the field conditions of the electron we measure a negative charge and for its antiparticle, the positron, a positive charge. If in each case we wanted to measure the electric fields included in the inside, we had to destroy the particle. Then a proof would not be possible anymore.

Here also a persistent mistake is eliminated by the for a long time known axiom that monopoles can not exist at all if one considers continuity. By means of technical-physical experiments this axiom is sufficiently secured.

The quantum physical approach is standing on uncertain ground if it is postulated that other laws of nature should apply to particle physics, if a second approach, the field-theoretical approach, is conceivable that does not know these problems.

The discussed concentration effect gives the potential vortex a structure shaping property. With that also the fourth key question can be answered:

IV. Why do the particles have the form of spheres?

The potential vortex is favoured in the particle-free vacuum of the microcosm because of the missing conductivity. In connection with the concentration effect the following conclusion can be drawn:

The extremely mighty potential vortex exerts a high pressure on the microcosm and on each particle.

With that also the fourth key question, why stable elementary particles are spherical, can be answered by the potential vortex theory:

Only the sphere is able to withstand a high outside pressure.

All other forms, like e.g. dipoles formed like a rod or a club would be instable in the presence of the extremely concentrating potential vortex. They would be immediately destroyed by the pressure of the potential vortex.

I. Why in our environment normally no magnetically charged particles do exist?

(the vacuum has no conductivity)

II. Why are there only electrically charged particles?

(in the vacuum only potential vortices can exist)

III. Why do these particles show as monopoles?

(the other pole is locked up in the inside of the vortex oscillation)

IV. Why do the particles have the form of spheres?

(for reason of the outside pressure by the concentration effect)

V. Why is the elementary quantum stable?

(without conductivity no decay of vortices takes place)

VI. Why does for every particle of matter exist an antiparticle?

(there are two swirl directions with equal rights)

VII. Why are particles and antiparticles incompatible?

(contrary swirl directions)

Fig. 4.4: Key questions of quantum physics

4.4 Quanta as field vortices

The field-theoretical approach demands removing the electron from the field equations (eq. 3.7) and at the same time introducing the potential vortex of the electric field. With this vortex phenomenon there now is a possibility that the electromagnetic wave spontaneously rolls up to a vortex in case it is disturbed from the outside. The vortex particle that is formed in such a way owes its *physical reality* on the one hand the concentration effect of the potential vortex, that compresses this particle to the dimension of a tiny *sphere* and on the other hand its *localization* for reason of the oscillation around a fixed point.

The spherical elementary particles are being compressed to inconceivably small dimensions. Therefore they are capable to bind a comparatively high energy in their inside. This is confirmed by the mass-energy relation $E = mc^2$. (4.1)

The fact that the energy is dependent on the speed of light can be judged to be a clear indication that quanta actually are nothing but *oscillating electromagnetic packages*, vortical oscillations of empty space.

The next question reads:

V. Why is the elementary quantum stable?

The worse the conductivity is, the more the potential vortex will be favoured, the more strongly the concentration effect will form, the smaller the spherical phenomena will get - the larger the authoritative *relaxation time* will be, i.e. the slower the decay of vortices and with that the more stable the vortex phenomenon will be.

In the microcosm, that comes the ideal case of a particle-free vacuum very close, the *spherical vortices because of the missing conductivity have an absolute stability*.

VI. Why does for every particle of matter exist an antiparticle?

Since every vortex can also oscillate

in the opposite direction, there always exist two *forms of formation* of spherical vortices *with equal rights*, one of them is assigned to the world of matter and the other to the world of anti-matter.

VII. Why are particles and antiparticles incompatible?

For reason of the *contrary swirl direction* they are incompatible to each other. They have the tendency to destroy each other mutually, like two trains that want in the opposite direction on a single-tracked distance.

The quantum physical approach does not have an answer to these key questions. Until now scientists have merely thought about to what the observable contraction in the microcosm and the macrocosm can be traced back. Because the approach was not able to furnish an answer, without further ado some new matter was introduced: the *gluons*. These binding particles should be able to exert the necessary pressure. But until now no one has been able to observe or detect this fabulous matter. Nobody knows its structure and its composition. Despite missing evidence it is stated that this matter is mass less and at the same time lumped; it is invisible because it can't interact with any other matter, not even with the supposed building parts of the atomic nuclei, the quarks. But at the same time there should be exerted a pressure on the quarks, for which reason quarks again should be able to interact with gluons.

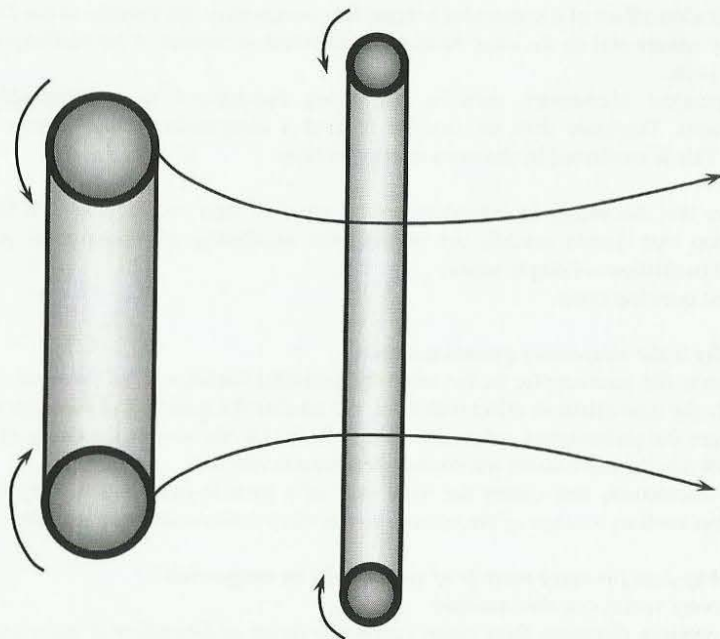


Fig. 4.5: Two coaxial oscillating vortex rings (Lugt^{<i>i>}).

<i>i> Lugt, Hans J.: Vortex flow in nature and technology. Krieger publishing company, Florida 1995; page 42, ISBN 0-89464-916-7

4.5 The photon

The ability to form structures as a consequence of the concentration effect gives the potential vortex a number of highly interesting properties. To derive these properties we can make work easier when we fall back upon the observations and experiences of *flow dynamics*.

Here the *vortex ring* takes a special place. Its vortex centre is not closed, for which reason it is not stationary and propagates in space with a constant speed. It can be observed that the velocity of propagation increases with the ring diameter becoming smaller. By means of the vortex rings, that skilful smokers can produce with pointed lips, these properties can be made visible.

Now if two vortex rings run into each other with the same axis and direction of rotation then both oscillate around each other, by one vortex attracting the other vortex, thereby accelerating and thus contracting it. The second vortex then slips through the core opening and gets again slower and larger. Now the first vortex accelerates and plays the same game (fig. 4.5).

It would be obvious for the vortex of the electric field to have a corresponding property. The electron e^- and with the opposite swirl direction the positron e^+ will form such a potential vortex corresponding to the derivation. Two electrons, as like charged particles, would repel each other and surely will be out of the question for such a configuration. An electron and a positron however will attract each other and because of their incompatibility they will mutually destroy unless they open their vortex centres to form a vortex ring. Now the e^- shows its positively charged centre that shows the same swirl direction as the e^+ seen from the outside. Therefore the vortices don't hurt each other, when the positron slips through the opened vortex centre of the electron and vice versa.

This oscillating electron-positron pair has strange properties: seen from the outside one moment it is negatively charged and the next moment it is positively charged. Therefore over time on the average **no charge** will be *measurable* and **no electromagnetic interaction** will take place.

One moment the particle is matter and the next moment it is anti-matter. Hence **no mass at all** can be attributed to the particle. Interactions primarily takes place between both dual vortices. We can predict, the particle has neither mass nor charge. The environment merely sees a fast oscillating particle that only within every half cycle is capable of an interaction.

The centre of the oscillating particle is open, for which reason *it is not stationary* anymore. Instead it propagates in z-direction with the swirl velocity, which is *the speed of light*, in this way preventing a rotation around the x- or y- axis (fig. 4.6). In this way a **polarizability** is present.

The only possible and, as we will see, necessarily taking place rotation around the z-axis gives the particle a spin of the magnitude of a quantum of angular momentum. After all the rotation for e^- and e^+ is of the same magnitude with a spin of each time $\frac{1}{2} \cdot \hbar$. There should be paid attention to the fact that for the case of an opposite sense of direction of the respective rotation around the common z-axis the spin on the average will be zero.

In addition the particle is characterized by an outstanding property: a periodically taking place oscillation with any frequency, but that frequency has to be constant.

We now only have to take a table of particles to hand. Actually we will find a corresponding particle that has all these properties: the γ -quanta, also called photon.

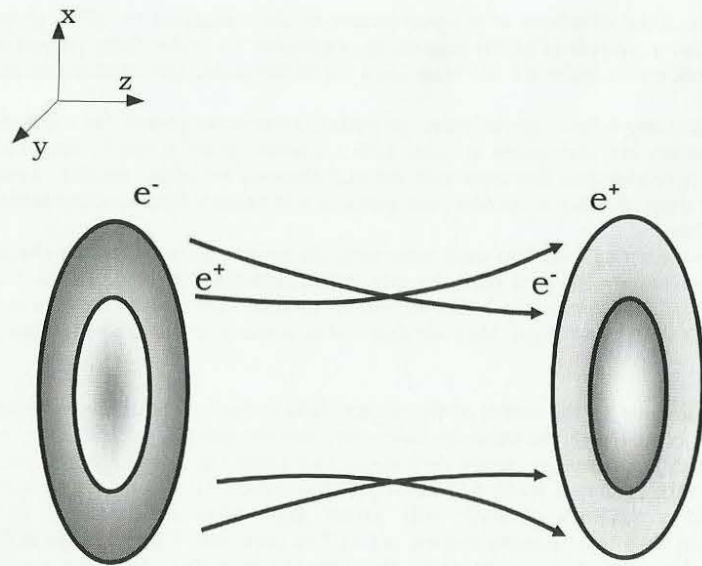
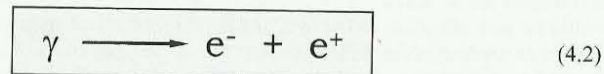


Fig. 4.6: The photon as oscillating electron-positron pair

The decay of the γ - quanta (photon)^{<i>}
 (= pair creation = Bethe-Heitler-process 1934):



<i> Nachtmann, Otto: Phänomene und Konzepte der Elementarteilchenphysik, Vieweg, Braunschweig 1986, S. 135, ISBN 3-528-08926-1

4.6 Pair creation

Proof for the correctness of the model concept provides the decay of the photon in an electron and a positron in the presence of a strong field, as for instance in an atomic nucleus. This observable decay is called pair creation or Bethe-Heitler process^{<i>}:



In this process the elementary vortices for a short time get back their localization and are therefore detectable. Otherwise the electron and positron have the form of a sphere, the photon however rather has the form of two oscillating discs.

The photon doesn't participate in the electromagnetic interaction, because the electric field lines run from one disc to the other (from + to -). The field lines are not open as they are for e^- or e^+ (fig. 4.3). To open up the field lines an energy is necessary that corresponds to the sum of the two formed particles. But from this it by no means follows that this amount of energy will be released in the reversed and much better known process, where matter and anti-matter annihilate under emission of γ -quanta. At the end of the derivation the vortex model will provide us the desired answers on questions of the energy of photons. Here first of all only the properties will be concerned.

Experiments, in which *light shows as a particle*, are the photoelectric effect, the Compton effect and a lot more. According to the by Maxwell developed classical theory of light however is *light an electromagnetic wave* that is not quantized in any way, neither as sphere nor as disc. the *wave nature of light* as well has a physical reality and is secured by experiment. This is witnessed by the interference patterns of overlapping coherent light beams.

A concept in which light could exist at the same place and the same time both as wave and as corpuscle could never be brought into accord with the principle of causality. Formulas of compromise, like the *uncertainty principle of Heisenberg* that refers to the point of view of the observer, can't change anything about this dilemma. The *dual nature of light*, that in this context is gladly spoken of, rather consists of the fact that dependent on the local field conditions, any time and *spontaneously the wave can roll up to a vortex*.

As an example of a violation of the principle of causality it has been indicated under point 3 (fig. 3.1) that both fields and quanta at the same time should be the cause of something. This concept was formulated by **Maxwell** and written down in modern quantum electrodynamics by **Dirac** but in the field-theoretical approach we have dropped this concept because it violates all rules of causality in an elementary manner. Therefore it only is consistent, if we hold the view that the *light is either wave or particle* but never is both at the same time.

In the spontaneous transition of the wave to the particle all the important properties are conserved: the *propagation with the speed of light*, the *characteristic frequency of the oscillation* and the mentioned *polarizability*.

The process of rolling up possibly takes place already in the laboratory, in a bubble chamber and at the latest in our eyes. To receive the electromagnetic wave, we had to have antennas. We actually see the photons. It therefore would be obvious if our cells to see only could perceive vortices, in this case photons. We don't possess a sense organ for fields and waves.

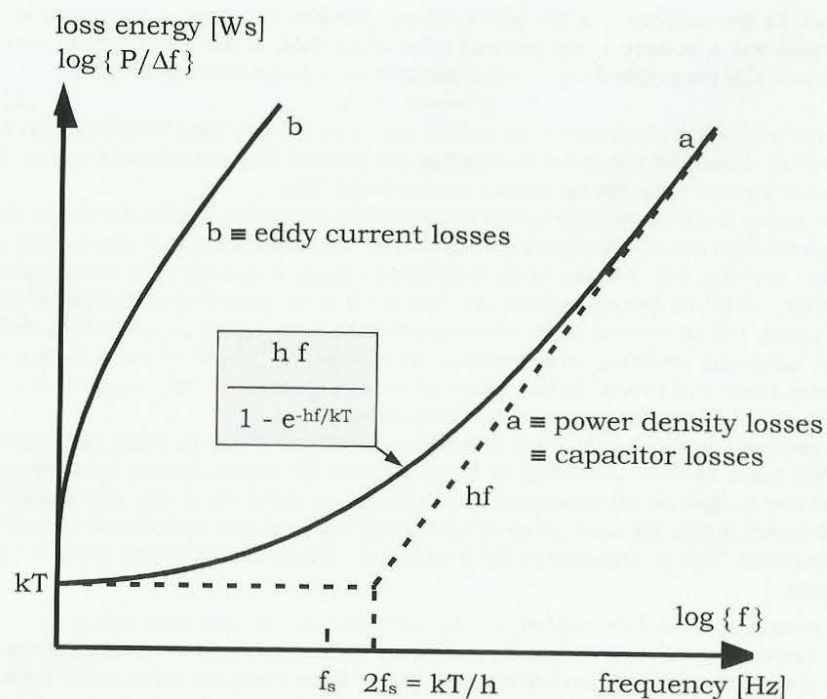


Fig. 4.7: The power density shown against frequency for noise (a) according to Küpfmüller^{<i>}, as well as for dielectric losses of a capacitor (also a) and for eddy current losses (b) according to Meyl^{<ii>} (b in visible duality to a).

<i> Küpfmüller, Karl: Einführung in die theoretische Elektrotechnik, Springer-Verlag Berlin, 12. Auflage 1988, ISBN 3-540-18403-1

<ii> Meyl, Konstantin: Dreidimensionale nichtlineare Berechnung von Wirbelstromkupplungen, Dissertation Universität Stuttgart 1984

4.7 Noise

If, according to the field-theoretical approach, there exist electric field vortices then they will not only form the elementary particles in the vacuum, but will also macroscopically form and have an effect in larger dimensions.

Assuming a wave that rolls up to a plane vortex it would be obvious if polarization and velocity of propagation are conserved in the process. But how does it stand about the frequency?

The wave now will walk round a stationary point, the vortex centre. The propagation with the speed of light c will remain existent as the swirl velocity. For a plane circular vortex, where the path for a revolution on the outside is very much longer than near the vortex centre, there arises a longer wave length and as a consequence a lower frequency on the outside as more to the inside. With this property the vortex proves to be a *changer of frequency*: the vortex transforms the frequency of the causing wave in an evenly spectrum, that starts at low frequencies and stretches to very high frequencies (fig. 1.4).

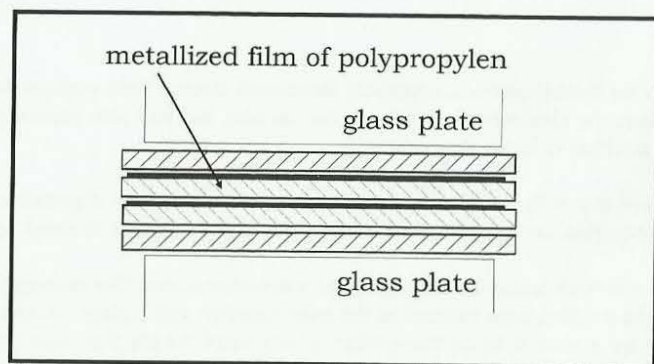
Exactly this property we observe in "white noise". The consistent conclusion would be that this concerns the vortex of the electric field. Anyone can, without big expenses, convince himself or herself of the localization, of the property to change the frequency and of the circumstance that vortices can be very easily influenced, that they avoid or again whirl about a place of disturbance, for instance an antenna. For that one only needs to tune a radio receiver to a weak and noisy station and move oneself or some objects around, then one is able to directly study the influences from the manipulation of the receiving signal. But already the fact that the using and measurability of signals is limited by noise makes clear, which attention the potential vortex should be given.

Within a limited frequency range the power of the Nyquist or resistance noise is independent of frequency (fig. 4.7). This should be clarified particularly by the term "white noise" analogous to white light, where all visible spectral ranges independent of frequency have the same energy density.

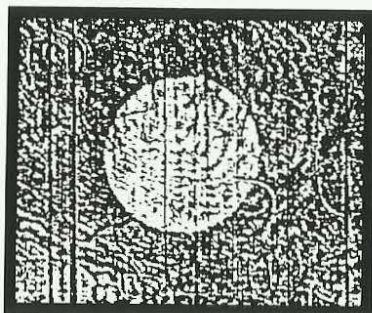
But this relation doesn't hold for high frequencies of any magnitude. Here another noise-effect appears, that is said to have its cause in the quantum structure of energy^{<i>}. Untouched by possible interpretations an increasing power of the noise is measured, that more and more turns into a being proportional to frequency (fig. 4.7, curve a).

Interestingly this curve shows a remarkable *duality* to the power curve of eddy currents, likewise shown against the frequency, that for instance can be measured at eddy current couplings^{<ii>} (fig. 4.7, curve b). This circumstance suggests a dual relation of the potential vortex of the electric field in bad conducting media on the one hand and the eddy current in conductive materials on the other hand^{<iii>}.

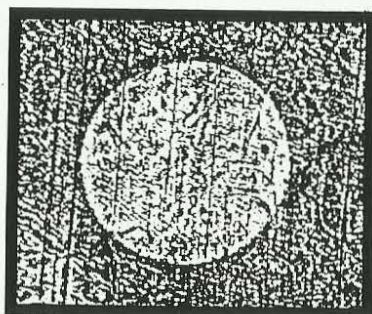
<iii> Meyl, Konstantin: Wirbel des elektrischen Feldes, EMC Journal 1/95, 6. J, ISSN 0945-3857, S. 56 - 59.



a) measurement set up according to Yializis and others^{<i>}



b) after 40 hours



c) after 52 hours

Fig. 4.8: Measurement set up (a) and photo of vortex structure in a metallized polypropylen layer capacitor (at 450 V/ 60 Hz/ 100°C) Observation of the formation of a vortex (b) and (c). (110 fold magnification), according to Yializis et al.^{<i>}

<i>: A. Yializis, S. W. Cichanowski, D. G. Shaw: Electrode Corrosion in Metallized Polypropylene Capacitors, Proceedings of IEEE, International Symposium on Electrical Insulation, Boston, Mass., June 1980;

4.8 Capacitor losses

Next the dielectric losses in a capacitor fed with an alternating voltage are measured and likewise put on against the frequency. At first the course is independent of the frequency, but towards higher frequencies it increases and shows the same characteristic course of the curve as the before mentioned power of the noise (fig. 4.7, curve a).

This excellent agreement suggests the assumption that the dielectric losses are nothing but *eddy losses*.

These vortex phenomena, caused by time-varying fields, are not only found in ferromagnetic and conductive materials, but equally as dual phenomena in dielectrics and non-conductors.

As examples of practical applications the induction welding or the microwave oven can be mentioned. The process can be described in other words as follows: in both examples the cause is posed by high-frequency alternating fields that are irradiated into a dielectric as an electromagnetic wave, there roll up to potential vortices and eventually decay in the vortex centre. The desired and used thermal effect arises during this diffusion process.

The striving in the direction of the vortex centre gives the potential vortex of the electric field a *structure shaping property*. As a consequence of this "*concentration effect*" circular vortex structures are to be expected, comparable to the visible vortices in flow dynamics (e.g. tornados and whirlwinds). At the same time the dual anti-vortex arises, the diverging eddy current. It takes, as is well-known, the given structure of the conductor, so in the technical literature one correspondingly talks of a "*skin effect*".

Now if conductor and non-conductor meet as they do in a capacitor, then at the boundary area visible structures will form. Circles would be expected, if the eddy current in the inside and striving to the outside is equally powerful as the potential vortex that comes from the outside and concentrates.

Actually such circular structures are observed on the aluminium of high tension capacitors, when they were in operation for a longer period of time. The formation of these circles, the cause of which until now is considered to be unsolved, is already experimentally investigated and discussed on an international level by scientists (fig. 4.8)^{<i>}, ^{<ii>}.

These circular vortex structures can be seen as a visible proof^{<iii>} for the existence of potential vortices of the electric field.

<ii>: D. F. Taylor, On the Mechanism of Aluminium Corrosion in Metallized Film Capacitors, IEEE Transactions on EI-19, August 1984, No.4, pp.288-293.

<iii>: Meyl, Konstantin: Wirbel des elektrischen Feldes, EMC Journal 1/95, 6.J, ISSN 0945-3857, S. 56-59.

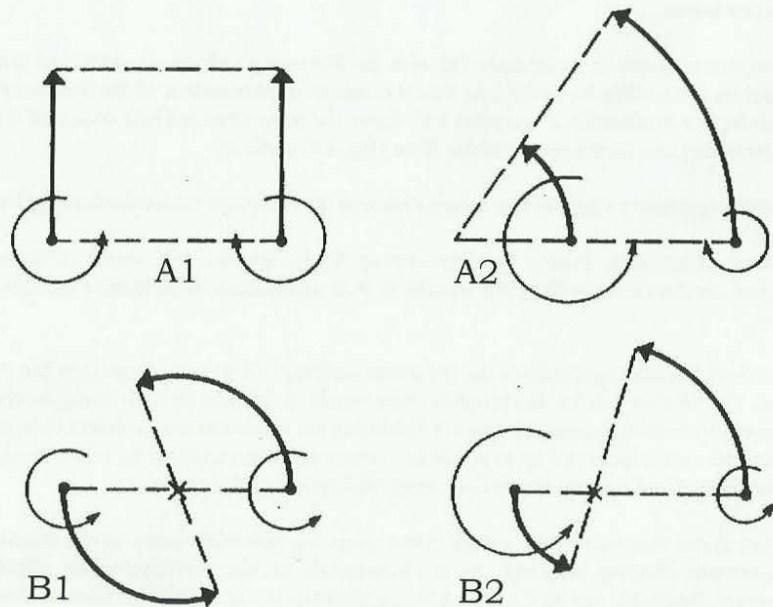
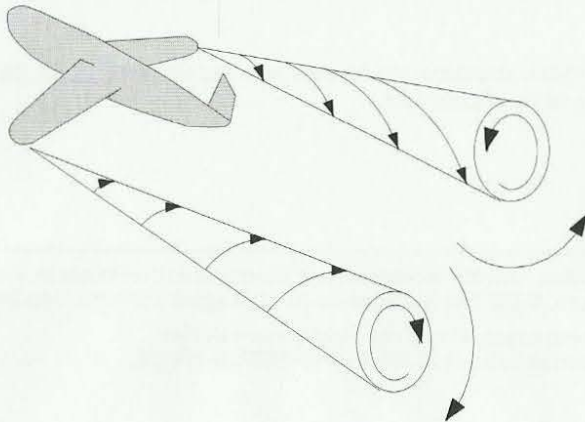


Fig. 4.9: Motion of two point vortices. (Lugt^{<i>i>})
 A. with opposite direction of rotation
 B. with the same direction of rotation
 1. for equal vortex strength
 2. for unequal vortex strength

Example from practice for case A1:
 vortex pair behind an airplane



4.9 Vortex lines and vortex streets

It can be assumed that the vortex of the electric field is relevant with regard to the electromagnetic environmental compatibility. This then holds not only for microcosmic and microscopic vortices, but also for macroscopic and larger dimensions. The individual vortices can join together to balls and lines. For the study of this process it is useful to again fall back upon experiences of flow dynamics.

The co-operation of individual point vortices has been investigated thoroughly in flow dynamics. Without any outside manipulation an individual vortex rotates on the spot. That changes in the case of two neighbouring vortices. Now it depends on their mutual strength and sense of rotation. If they have the opposite sense of rotation and equal strength then their centres of rotation move straight forward in the same direction. If however the direction of rotation is the same then both vortices rotate around each other (fig. 4.9).

In this way a multitude of point vortices is capable, to form in the first case whole *vortex streets* and in the second case *spherical vortex balls*. In principle a *vortex string* can also consist of a multitude of potential vortices pointing in the same direction; but it has the tendency to roll up to a vortex ball in case it is disturbed from the outside, as can be shown very clear by means of computer simulations^{<i>i>}.

As a starting-point for a discussion the thesis can be put forward that also electric field vortices, in nature usually consisting of a multitude of individual point vortices, appear as vortex strings and vortex balls.

Perhaps historians see in this property an answer to the question, how it was possible for the Romans to build streets straight as a die in the wilderness. Their land surveyors, the Augures, had at their disposal neither laser, nor any other suitable gauges. Their most important tool was the Lituus, the crook, that at its upper end was rolled up like a vortex in the sense of a flat coil shaped like a spiral.

The question poses what this strange object was used for. Perhaps the roman land surveyors tracked down any vortex lines with this crook and then used them to orientate themselves?

History still holds a lot of secrets, but for now only this indication is given. The following seminar will give enough opportunities for speculations and discussions^{<ii>}.

<i>i>: Lugt, Hans J.: Vortex flow in nature and technology. Krieger publishing company, Florida 1995; p.38, fig. 3.25, 3.26 and 3.27, ISBN 0-89464-916-7

<ii>: K. Meyl: Elektromagnetische Umweltverträglichkeit Teil 2 und 3 Seminarumdrucke, INDEL Verlag VS; see part 2 and 3 of this book.

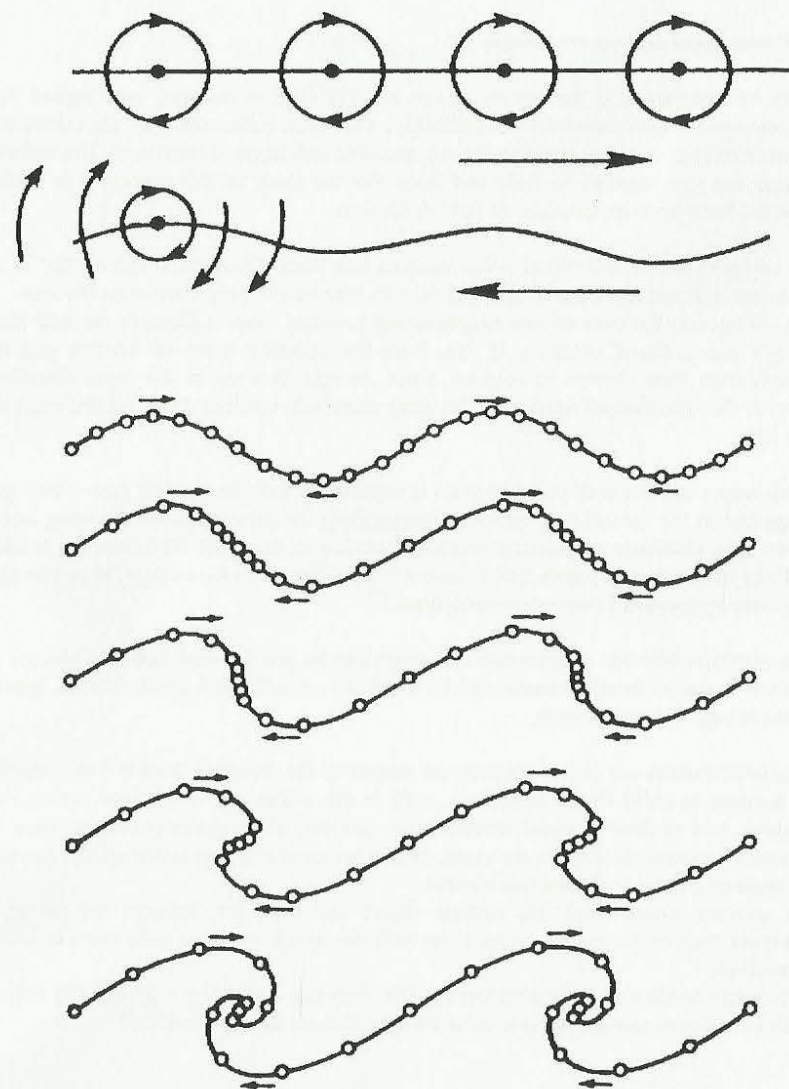


Fig. 4.10: The rolling up of a vortex chain to a vortex ball for the smallest disturbance (case B1 in fig. 4.9) (Rosenhead ^{<i>}).

<i>: L. Rosenhead: Formation of vortices from a surface of discontinuity. Proc. Roy. Soc. A 134, 1931, 170. taken from:

Lugt, Hans J.: Vortex flow in nature and technology. Krieger publishing company, Florida 1995; page 39, figure 3.29, ISBN 0-89464-916-7

4.10 Water colloids as vortex balls

We have to realize that in the biosphere we are staying in a relatively ideal dielectric. The two "capacitor plates" are being formed by the ionosphere and the earth. The potential vortex will, as said, be favoured by a bad conductivity and by a high dielectricity. Consequently it will dominate and take effect in the biosphere. In which way it takes effect is the central theme of the electromagnetic environmental compatibility.

Life in this world consists predominantly of water and water has a very high dielectricity! With that the effectiveness and the long life of the potential vortex increases. The human head for instance contains 70% and plants contain over 90% water! But it does not simply concern H₂O, but structured water in a colloidal form. These water colloids could be vortex balls because they consist of a large number of water molecules in a spherical arrangement. They form independent and insoluble particles with a negative electric charge (fig. 4.11).

Water is not equal water thanks to this structure. One can buy healing water and corresponding sources are well-known and famous. Many an effect can be explained by means of a chemical analysis but not everything.

The highest age in this world is reached by the inhabitants of Hunza, in the mountains of northern India at the foothill of the Hindu Kush, at an altitude of 2500 meters. They drink some muddy glacial water that is strongly colloidal. Hence it would be obvious that plants and also we ourselves need such water for our physique. Processes are known with which the advantageous vortex balls, say colloids, are produced artificially by mechanic or chemical treatment ^{<i>}. Levitated water, as it is called and as it is for sale nowadays, is said to be more healthy. Unfortunately people predominantly work empiric in this area, because science occupies itself with this topic only little or not at all.

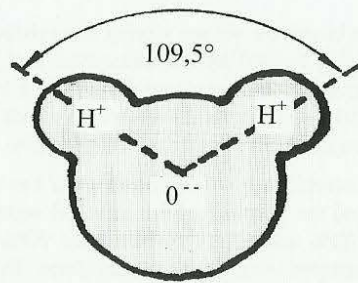
Another problem is the fact that the colloids again fall apart quickly. The like negative charge favours this process. The liquid crystals have to be stabilized from the outside. In the case of the Hunza-water the colloids are surrounded by a vegetable layer of fatty acid and are protected in this way ^{<ii>}. It possibly is very obliging to nature, if the water colloids also in biological systems are stabilized in that way.

Everyone of us knows that fresh spring water tastes much better than stale, bottled water, even if the chemical analysis turns out of be absolutely identical. For this fact classical science is not able to give a cause - a further problem of causality. In any case should potential vortices with their structure shaping property be considered as a cause for the formation of water colloids. It surely causes no difficulties at all to interpret the colloids as vortex balls.

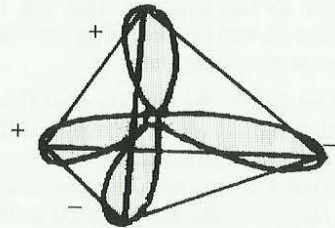
<i> V. Schauburger: Die Entdeckung der Levitationskraft, Implosion 1995 Nr. 112 und:

N. Harthun: Naturgemäße Technik - Wege für die Forschung nach Viktor Schauburger, Verlag Delta Design, Berlin 1996.

<ii> Flanagan: Elixier der Jugendlichkeit, Waldthausen Verlag Ritterhude 1992, orig.: Elixir of Ageless

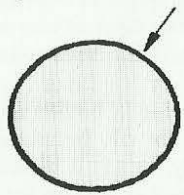


H₂O: the angle of the bond between 2 H molecules = 104,5°
angle of the bond in excited state = 109,5°

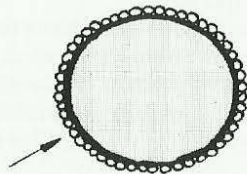


electron orbital diagram of energy (excited H₂O) = tetraeder
most stable liquid crystal = 8 tetraeder = star of octaeder

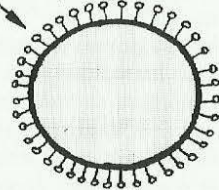
unprotected colloid



artificially protected
colloid (soap molecule)



Colloid protected by albuminoids or fatty acids
(in living systems)



4.11 Phenomenon of transport

The vortex principle is self-similar. This means that the properties of an individual vortex also for the collection of numerous vortices again appear and can be observed in a similar manner. That's why a vortex ball behaves entirely similar as an individual isolated vortex. The same concentration effect, that keeps the vortex together, shows its effect for the vortex ball and keeps it together also.

Something corresponding holds for a basic property of potential vortices, being of a completely different nature. It is the property *to bind matter in the vortex and carry it away with the vortex*. Well-known are the vortex rings that skilful cigarette smokers can blow in the air. Of course also non-smokers can produce these air eddies with their mouth but these remain invisible. Solely by the property of the vortex ring to bind the smoke it becomes visible to the human eye.

If our potential vortex transports something then it rather should be a dielectric material, so preferably water. Therefore if in the environmental air we are surrounded by potential vortices that we can detect for instance as noise, then they are capable with their "*phenomenon of transport*", to pick up water and to keep it in the vortex. In this way the *atmospheric humidity* is explicable as the ability of the air particles to bind comparatively heavy water molecules. If the vortex falls apart then it inevitably releases the water particles and it *rains*. This is merely a charming alternative for the classical representation without claim to completeness.

Already the Romans have made use of this phenomenon to find water and sources. About this Vitruv⁴² (from 23 BC) in his 8th book about architecture writes: "Before sunrise one has to lie down on the earth at the places, where to search for water,... and one has to look at the area... Then one has to dig at the place where there appears curling and in the air rising moist steam. Because this characteristic can not occur at a place where there is no water". The at a certain time of day and in certain seasons occasional in meadows and corn fields observable streaks or circular mostly moist places with differing vegetation, have to be judged as an infallible sign for the existence of this phenomenon.

This phenomenon of transport again appears for the discussed *water colloids*. The involved water molecules form a spherical object with a negative charge. They turn their negatively charged side to the outside and point with the positively charged end in the direction of the middle of the sphere. There, no longer discernible from the outside, a negatively charged ion can be, that is stuck, that no longer can escape and that gives the whole colloid a characteristic property. In this way nature knows various water colloids that constitute plants and animals. But starting at a temperature of 41°C the *liquid crystals* fall apart. This not by chance is the temperature at which a person dies.

Already 10 millivolts per liquid crystal suffice for the electrically induced death.

The to a colloid identical structure we find in the structure of the *atoms*. Here the atomic nucleus is held in the inside of a vortex-like cloud of electrons, the atomic hull. We'll hit the phenomenon of transport a last time, when we derive the *elementary particles*. For the photon is already discernible the tendency of an elementary vortex, to take another vortex in its inside. Merely because the electron and positron are evenly matched a stable configuration is prevented for the photon.

Fig. 4.11: Water molecules and water colloids

In chapter vortex calculation used differential operations:

field pointer (vector = **bold**):

$$\mathbf{A} = \mathbf{e}_x \cdot A_x + \mathbf{e}_y \cdot A_y + \mathbf{e}_z \cdot A_z$$

Gradient of the scalar function of position V:

$$\text{grad } V = \mathbf{e}_x \cdot \delta V / \delta x + \mathbf{e}_y \cdot \delta V / \delta y + \mathbf{e}_z \cdot \delta V / \delta z \quad (\text{R1})$$

Divergence of the vector **A**:

$$\text{div } \mathbf{A} = \delta A_x / \delta x + \delta A_y / \delta y + \delta A_z / \delta z \quad (\text{R2})$$

Curl (vortex density) of the vector **A**:

$$\begin{aligned} \text{curl } \mathbf{A} = & \mathbf{e}_x \cdot (\delta A_z / \delta y - \delta A_y / \delta z) + \\ & + \mathbf{e}_y \cdot (\delta A_x / \delta z - \delta A_z / \delta x) + \\ & + \mathbf{e}_z \cdot (\delta A_y / \delta x - \delta A_x / \delta y) \end{aligned} \quad (\text{R3})$$

Laplace operator Δ :

$$\Delta \mathbf{A} = \delta^2 \mathbf{A} / \delta x^2 + \delta^2 \mathbf{A} / \delta y^2 + \delta^2 \mathbf{A} / \delta z^2 \quad (\text{R4})$$

arithmetic rules:

$$\Delta \mathbf{A} = \text{grad div } \mathbf{A} - \text{curl curl } \mathbf{A} \quad (\text{R5})$$

$$\text{div rot } \mathbf{A} = 0 \quad (\text{R6})$$

$$\mathbf{A} \times \mathbf{B} = -\mathbf{B} \times \mathbf{A} \quad (\text{R7})$$

$$\text{div } (\mathbf{A} \times \mathbf{B}) = \mathbf{B} \text{ curl } \mathbf{A} - \mathbf{A} \text{ curl } \mathbf{B} \quad (\text{R8})$$

$$\text{curl } (\mathbf{A} \times \mathbf{B}) = (\mathbf{B} \text{ grad}) \mathbf{A} - (\mathbf{A} \text{ grad}) \mathbf{B} + \mathbf{A} \text{ div } \mathbf{B} - \mathbf{B} \text{ div } \mathbf{A} \quad (\text{R9})$$

$$\mathbf{A} \times (\mathbf{B} \times \mathbf{C}) = \mathbf{B} \cdot (\mathbf{A} \cdot \mathbf{C}) - \mathbf{C} \cdot (\mathbf{A} \cdot \mathbf{B}) \quad (\text{R10})$$

* important equations are given in a box

* new equations are underlined twice.

Fig. 5.0: Collection of formulas for vector analysis

5. Derivation and interpretation

Vortices cause big problems to every measuring technician. They have the unpleasant property to whirl around the sensor even if it is as small as possible. Vortices avoid the smallest disturbance and then can hardly be detected reproducibly.

From the well-known eddy current we know of this problematic. *Instead of the vortex*, we are forced to measure and analyse any effects that arise from the vortex. These can be measurements of the eddy losses or effects back on the stimulating field. But only provided that the effect actually occurs.

The prerequisite for an increase in temperature by eddy losses is that the vortex falls apart. In an ideal medium it unfortunately will not do us this pleasure.

As vortex of the dielectric the potential vortex will find fairly ideal conditions in air or in water. How should a vortex be detected, if it does not produce any effect? The classical measuring technique is here at its wits' end.

From the duality to the well-known eddy current and by means of observation in the previous chapters numerous properties of the potential vortex have been derived. But these are not all the properties. The mathematical calculation of the electric vortex field, that we want to turn to now, will reveal still further meaningful and highly interesting properties.

The observation is important, but it can't replace an exact calculation. A strictly mathematical derived result has occasionally more expressiveness than a whole book full of explanations. It will be a big help to derive and to discuss the field equation that all considerations are based on.

We facilitate the mathematical work by vector analysis. Therefore it is useful that we choose the differential form (equation 5.1 and 5.4) instead of the integral form (equations 3.1 and 3.2 resp. 3.8).

1. Ampère's law:

$$\text{curl } \mathbf{H} = \mathbf{j} + \delta \mathbf{D} / \delta t \quad (5.1)$$

with $\mathbf{H} = \mathbf{H}(\mathbf{r}, t)$

and Ohm's law:

$$\mathbf{j} = \sigma \cdot \mathbf{E} \quad (5.2)$$

dielectric displacement:

$$\mathbf{D} = \varepsilon \cdot \mathbf{E} \quad (3.6)$$

relaxation time:

$$\tau_1 = \varepsilon / \sigma \quad (5.3)$$

$$\text{curl } \mathbf{H} = \varepsilon \cdot (\mathbf{E} / \tau_1 + \delta \mathbf{E} / \delta t) \quad (5.1^*)$$

2. Faraday's law of induction (extended according to duality rules)

$$-\text{curl } \mathbf{E} = \mathbf{B} / \tau_2 + \delta \mathbf{B} / \delta t \quad (5.4)$$

with $\mathbf{E} = \mathbf{E}(\mathbf{r}, t)$

and the flux density:

$$\mathbf{B} = \mu \cdot \mathbf{H} \quad (3.5)$$

$$-\text{curl } \mathbf{E} = \mu \cdot (\mathbf{H} / \tau_2 + \delta \mathbf{H} / \delta t) \quad (5.4^*)$$

$$-\text{curl curl } \mathbf{E} = \mu \cdot (1 / \tau_2) \cdot \text{curl } \mathbf{H} + \mu \cdot \delta (\text{curl } \mathbf{H}) / \delta t \quad (5.5)$$

insert equation 5.1*:

$$-\text{curl curl } \mathbf{E} = \mu \cdot \varepsilon \cdot (\mathbf{E} / \tau_1 \tau_2 + (1 / \tau_2) \cdot \delta \mathbf{E} / \delta t + (1 / \tau_1) \cdot \delta \mathbf{E} / \delta t + \delta^2 \mathbf{E} / \delta t^2) \quad (5.5^*)$$

$$-\text{curl curl } \mathbf{E} = \Delta \mathbf{E} - \text{grad div } \mathbf{E} = \Delta \mathbf{E}, \quad (R5)$$

if:

$$\text{div } \mathbf{E} = 0 \quad (3.7^*)$$

abbreviation:

$$\mu \cdot \varepsilon = 1 / c^2 \quad (5.6)$$

3. fundamental field equation:

$$\underbrace{\Delta \mathbf{E} \cdot c^2}_a = \underbrace{\delta^2 \mathbf{E} / \delta t^2}_b + \underbrace{(1 / \tau_1) \cdot \delta \mathbf{E} / \delta t}_c + \underbrace{(1 / \tau_2) \cdot \delta \mathbf{E} / \delta t}_d + \underbrace{\mathbf{E} / \tau_1 \tau_2}_e \quad (5.7)$$

Fig. 5.1: Derivation of the fundamental field equation.

5.1 Fundamental field equation

We'll start from Ampère's law which provides a value for the current density at any point of space and this value corresponds to the vortex density of the magnetic field strength

$$\text{curl } \mathbf{H} = \mathbf{j} + \delta \mathbf{D} / \delta t \quad (5.1)$$

We'll use Ohm's law:

$$\mathbf{j} = \sigma \cdot \mathbf{E}, \quad (5.2)$$

the dielectric displacement:

$$\mathbf{D} = \varepsilon \cdot \mathbf{E} \quad (3.6)$$

and the relaxation time:

$$\tau_1 = \varepsilon / \sigma, \quad (5.3)$$

that indicates how fast the current eddies decay. So far we can fall back upon well-known relations.

The result is:

$$\text{curl } \mathbf{H} = \varepsilon \cdot (\mathbf{E} / \tau_1 + \delta \mathbf{E} / \delta t) \quad (5.1^*)$$

The new electric field vortices demand the introduction of a corresponding time constant τ_2 , that should describe the decay of the potential vortices, as an extension. The extended Faraday law of induction now provides a potential density, that at any point of space corresponds to the vortex density of the electric field strength:

$$-\text{curl } \mathbf{E} = \mathbf{B} / \tau_2 + \delta \mathbf{B} / \delta t \quad (5.4)$$

with the flux density

$$\mathbf{B} = \mu \cdot \mathbf{H}, \quad (3.5)$$

The result fulfils the required duality to equation 5.1*:

$$-\text{curl } \mathbf{E} = \mu \cdot (\mathbf{H} / \tau_2 + \delta \mathbf{H} / \delta t) \quad (5.4^*)$$

If we again apply the curl to equation 5.4*

$$-\text{curl curl } \mathbf{E} = \mu \cdot (1 / \tau_2) \cdot \text{curl } \mathbf{H} + \mu \cdot \delta (\text{curl } \mathbf{H}) / \delta t \quad (5.5)$$

and insert equation 5.1*, we obtain:

$$-\text{curl curl } \mathbf{E} = \mu \cdot \varepsilon \cdot (\mathbf{E} / \tau_1 \tau_2 + (1 / \tau_2) \cdot \delta \mathbf{E} / \delta t + (1 / \tau_1) \cdot \delta \mathbf{E} / \delta t + \delta^2 \mathbf{E} / \delta t^2) \quad (5.5^*)$$

which according to the rules of vector analysis can still be further simplified:

$-\text{curl curl } \mathbf{E} = \Delta \mathbf{E} - \text{grad div } \mathbf{E}$, where we should remember that the divergence has to vanish ($\text{div } \mathbf{E} = 0$, fig. 3.2, equation 3.7*), should the corresponding field vortex be inserted.

Furthermore the following well-known abbreviation can be inserted: $\mu \cdot \varepsilon = 1 / c^2$ (5.6)

With that the relation with the speed of light c simplifies to the sought-for field equation:

$$\underbrace{\Delta \mathbf{E} \cdot c^2}_a = \underbrace{\delta^2 \mathbf{E} / \delta t^2}_b + \underbrace{(1 / \tau_1) \cdot \delta \mathbf{E} / \delta t}_c + \underbrace{(1 / \tau_2) \cdot \delta \mathbf{E} / \delta t}_d + \underbrace{\mathbf{E} / \tau_1 \tau_2}_e \quad (5.7)$$

This equation describes the spatial (a) and temporal (b, c, d) distribution of a field vector. It describes the electromagnetic wave (a, b) with the influences that act damping. As damping terms the well-known eddy current (c) and in addition the newly introduced potential vortex (d) appear.

Field vector: $\psi = \mathbf{E}, \mathbf{H}, \mathbf{j}, \mathbf{B}$ or \mathbf{D}

1. elliptic potential equation:
(stationary: $t \longrightarrow \infty$ resp. $\delta/\delta t = 0$)

$$\underbrace{\Delta\psi \cdot c^2}_a = \underbrace{\psi/\tau_1\tau_2}_e \quad (5.8)$$

2. hyperbolic equation:
(undamped wave equation)

$$\underbrace{\Delta\psi \cdot c^2}_a = \underbrace{\delta^2\psi/\delta t^2}_b \quad (5.9)$$

3. parabolic equation:
(vortex equation)

$$\underbrace{\Delta\psi \cdot c^2}_a = \underbrace{(1/\tau) \cdot \delta\psi/\delta t}_{c/d} \quad (5.10)$$

$$\begin{aligned} \text{decay time of the eddy currents} = \\ \text{relaxation time:} \quad \tau_1 &= \varepsilon/\sigma \end{aligned} \quad (5.3)$$

$$\begin{aligned} \text{decay time of the potential vortices} = \\ \text{relaxation time:} \quad \tau_2 &\sim \mu \cdot \sigma \end{aligned} \quad (5.11)$$

Fig. 5.2: mathematically divisible individual cases.

5.2 Mathematical interpretation of the fundamental field equation

Every specialist will be surprised to find the *Poisson equation* (a, e) again as a term in the wave equation. This circumstance forces a completely new interpretation of stationary fields upon us. The new damping term, that is formed by the potential vortices (d), is standing in between.

Let us start with a mathematical analysis. We have applied the curl to equation 5.4*, then inserted equation 5.1* and obtained a determining equation for the electric field strength \mathbf{E} . Of course we could as well have applied the curl to equation 5.1* and inserted equation 5.4*. This would have resulted in the determining equation for the magnetic field strength \mathbf{H} .

If we insert Ohm's law (5.2) and cancel down the specific conductivity, or we put in the relations of material (3.5) or (3.6) and cancel down by μ respectively ε , then the field equation can likewise be written down for the current density \mathbf{j} , for the induction \mathbf{B} or for the dielectric displacement \mathbf{D} .

It just is phenomenal that at all events equation 5.7 doesn't change its form at all. The field vector is thus arbitrarily interchangeable! This circumstance is the foundation for the claim of this field equation to be called fundamental.

It does make sense to introduce a neutral descriptive vector ψ as a substitute for the possible field factors $\mathbf{E}, \mathbf{H}, \mathbf{j}, \mathbf{B}$ or \mathbf{D} .

The fundamental field equation 5.7 consists of three different types of partial differential equations: a hyperbolic (b), a parabolic (c and d) and an elliptic (e) type. On the left-hand side each time the Laplace operator (a) is found which describes the spatial distribution of the field factor.

The potential equation of the elliptic type (e) is known as *Poisson equation*. It describes the stationary borderline case of a worn off temporal process ($t \longrightarrow \infty$, resp. $\delta/\delta t = 0$). With this equation potentials and voltages can be calculated exactly like stationary electric currents (5.8).

The hyperbolic equation (b), known as wave *equation*, shows a second derivative to time, which expresses an invariance with regard to time reversal; or stated otherwise: the direction of the time axis can be reversed by a change of sign of t , without this having an influence on the course of frequency. Wave processes hence are reversible. Equation 5.7 makes clear that a wave without damping by no means can exist in nature. For that both time constants (τ_1 and τ_2) would have to have an infinite value, which is not realizable in practice. Seen purely theoretical, undamped waves could withdraw themselves from our measuring technique (5.9).

Both vortex equations of the parabolic type (c and d) only show a first derivative to time. With that they are no longer invariant with regard to time reversal. The processes of the formation and the decay of vortices, the so-called diffusion, are as a consequence irreversible. Seen this way it is understandable that the process of falling apart of the vortex, where the vortex releases its stored energy as heat e.g. in form of eddy losses, can not take place in reverse. This *irreversible process of diffusion* in the strict thermodynamic sense increases the entropy of the system (5.10).

Because it poses an useful simplification for mathematical calculations, often the different types of equations are treated isolated from each other. But the physical reality looks different.

field vector: $\psi = \mathbf{E}, \mathbf{H}, \mathbf{j}, \mathbf{B}$ or \mathbf{D}

1. Borderline case: no conductivity (vacuum)

($\sigma = 0$; $1/\tau_1 = \sigma/\varepsilon = 0$):

$$\underbrace{\Delta\psi \cdot c^2}_a = \underbrace{\delta^2\psi/\delta t^2}_b + \underbrace{(1/\tau_2) \cdot \delta\psi/\delta t}_d \quad (5.12)$$

(damping by potential vortices)

2. Borderline case: ideal conductivity (superconductor)

($1/\sigma = 0$; $1/\tau_2 = 0$):

$$\underbrace{\Delta\psi \cdot c^2}_a = \underbrace{\delta^2\psi/\delta t^2}_b + \underbrace{(1/\tau_1) \cdot \delta\psi/\delta t}_c \quad (5.12^*)$$

(damping by eddy currents)

3. Diffusion equation

$$\underbrace{\Delta\psi \cdot c^2}_a = \underbrace{(1/\tau) \cdot \delta\psi/\delta t}_{c/d} + \underbrace{\psi/\tau_1\tau_2}_e \quad (5.12^{**})$$

(vortex)

Fig. 5.3: Two borderline cases of the damping of waves and the diffusion equation for the decay of vortices

5.3 Physical interpretation of the fundamental field equation

In nature the different types of equations always occur in a combined manner.

1. Let's take the concrete case of the particle-free vacuum. Here the specific conductivity is zero. The relaxation time constant $\tau_1 = \varepsilon/\sigma$ responsible for the decay of vortices tends towards infinity according to equation 5.3 and the terms (c) and (e) are cancelled from the field equation 5.7. What remains is the by potential vortices (d) damped wave equation (b) (equation 5.12).

2. The reversed case (with $\tau_2 \longrightarrow \infty$) will consequently occur in materials without resistance, *super conducting materials*. We now are dealing with the well-known case of the wave damped by eddy currents (equation 5.12*).

Virtually all in nature existing materials however don't fulfil these boundary conditions, from which it follows that both damping terms always occur together and in addition the stationary term (e) becomes active.

It is true that every *antenna* demonstrates that the electromagnetic wave is convertible in high-frequency alternating currents and voltages, which then are amplified in the receiver. But until this fundamental equation was written down it however was not understood that this transition takes place by means of a vortex. Used are either antennas from well conducting material, or wave guides and horn radiators, which only have a minimal conductivity, because they are filled with air. Actually the wave can be converted in two dual ways: by means of the rolling up to current eddies or to potential vortices (fig. 1.4).

Now we finally are capable to explain, why wave guides make possible a better degree of effectiveness: Owing to the concentration effect of the potential vortex the HF-power is bound in the inside and not emitted until the antenna is reached as happens for a wire for reason of the skin effect.

Therefore, physically, one has to imagine this relation, which describes the transition of an electromagnetic wave into a vortex, in the way that the wave spontaneously can roll up to a vortex in case it is disturbed from the outside. The more vortices are generated, the larger consequently is the *damping of the wave* (equations 5.12 and 5.12*).

3. The life span of the vortices is limited and is determined by the electric conductivity. The at first stored vortices decay with their respective time constant τ . This process is described by the diffusion equation 5.12**. The final stage of the decaying vortices finally is described by the Poisson equation (a, e: equation 5.8).

If the vortex falls apart, it converts the in the vortex stored energy in heat. These processes are known from the eddy current. We speak of *heating losses*, that the stationary currents cause in the conductor material.

But new is the concept that such vortex phenomena can occur as *dielectric losses* in capacitors or in the air. The microwave oven or induction welding are good examples of this.

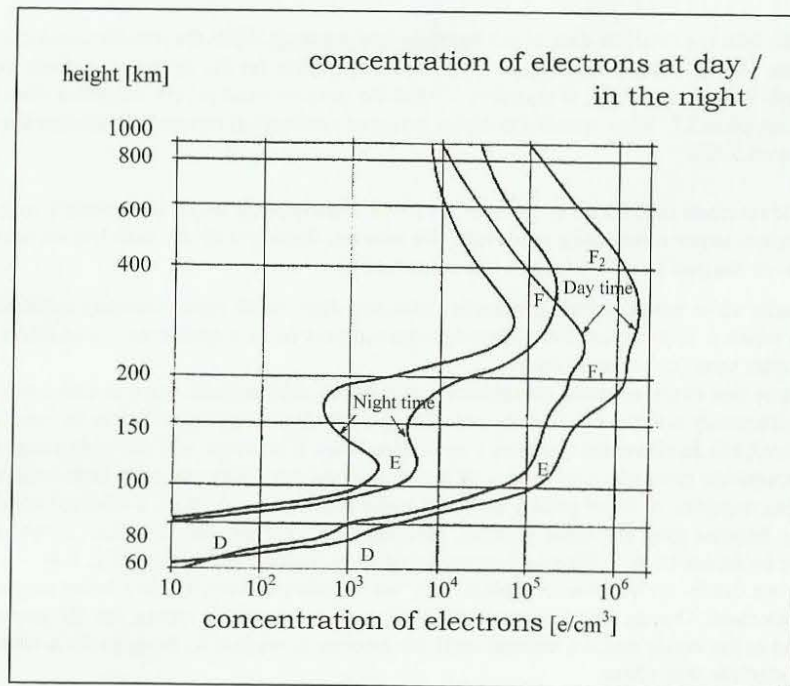


Fig. 5.4: The dependency on height of the ionisation in the ionosphere for medium latitudes.

left curve: for a minimum of sun spots

right curve: for a maximum of sun spots

5.4 Phenomenological interpretation of the fundamental field equation

How does a *damping by vortices* take effect in practice? First of all we notice that the reception of broadcastings gets worse. "The information signal is neglectable regarding the noise" explains the radio engineer and means, the number of vortices increases at the expense of the wave intensity.

Why, does the pupil ask, is it so cold in space? There the sun shines day and night and in addition much more intensely than on earth! The correct answer would have to read that because of the extremely small conductivity no diffusion process can take place. We owe the warmth on our earth solely the here taking place decay of vortices. Responsible is the conductivity of the atmosphere.

In 60 km to 500 km height over the earth's surface, the region which is called the ionosphere, the gases predominantly exist in ionized form. There a very good conductivity prevails and eddy current losses are the result. Correspondingly high are the measurable temperatures. Besides the diffusion process the eddy currents carry out a damping of the cosmic radiation. We say the sunlight is filtered and reduced to a for nature bearable intensity.

But not all frequencies are damped in the same way (fig. 2.8). We observe a blue shift, if we look into the actually black sky. The blue sky doesn't show any spots or clouds. The reason is to be sought in the skin effect of the eddy currents, which strive outwards. Since no edge of a conductor is present here, no skin can form. The vortices spread evenly over the ionosphere.

The potential vortex however is able to structure. It merely needs a bad conductivity and this it finds in lower heights between 1 km and 10 km. It damps the wave and with that also the light, for which reason we say it becomes darker, the sun disappears behind clouds.

The clouds well visibly form the discussed vortex balls and vortex strings. Clouds can form virtually from the nowhere during intense solar irradiation, i.e. the waves can roll up to vortices. But as a rule this takes place above the oceans. Here also the phenomenon of transport has an effect. Because of the high dielectricity the water surface favours the formation of potential vortices. So the vortices bind individual water molecules and carry them away. If a diffusion process takes place, in which the vortex decays, then it rains. This can happen in two different ways:

1. Either the conductivity increases. If for instance during intense solar irradiation air ions form, the sun is able to break up clouds and fog. Or when the air is raised in higher layers with better conductivity, because a mountain forces this, then it rains at the mountain edge.
2. For potential vortices the electric field is standing perpendicular to them. If at one point an exceptionally lot of vortices join together, which let the cloud appear particularly dark to black, then the danger exists that the ionization field strength for air is reached, in which case a conductive air channel forms along which the stored up charges discharge. Also lightning is a diffusion process, in which potential vortices decay and rain can form.

In connexion with the electromagnetic environmental compatibility great importance is attributed in particular to the storage and the decay of electric vortices. There not only is an academic-scientific interest in the question, how many potential vortices are generated, how many are stored and how many decay, if we make a telephone call with a handy, if we are staying under a high-tension line or if we are eating food, which has been heated up in a microwave oven. The necessary mathematical description is provided by the fundamental field equation 5.7.

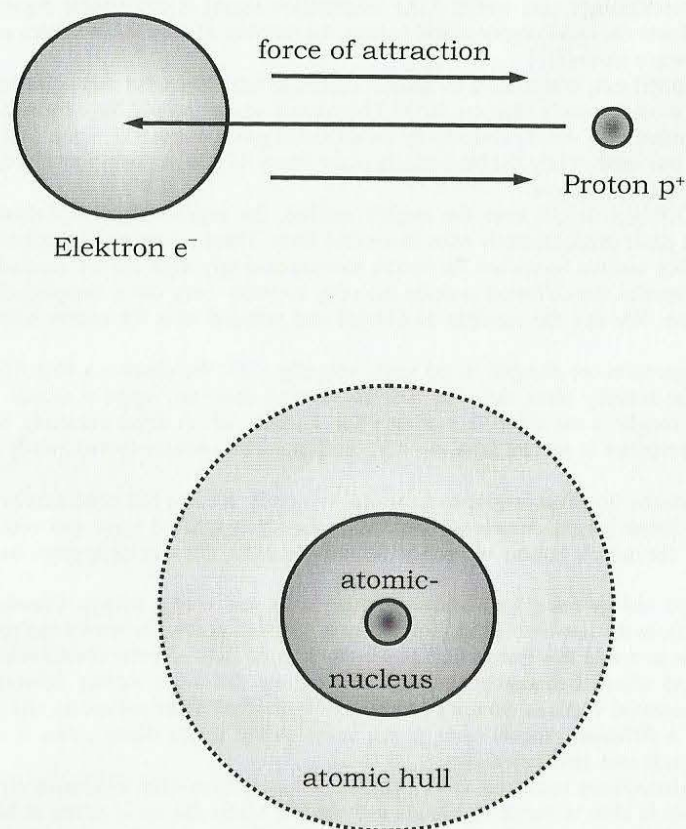


Fig. 5.5: A possible structure of atoms in the view of the fundamental field equation

condition for equilibrium:

$$\tau_1 = \tau_2$$

(5.13)

5.5 Atomistic interpretation of the fundamental field equation

Let's again turn to the smaller, the atomistic dimensions. Here positively charged protons and negatively charged electrons are found. Both are *matter particles* and that means that seen from the outside both have the *identical swirl direction*. For reason of the unequal charge conditions they attract each other mutually and according to fig. 4.9 rotate around a common centre of mass as differently heavy pair. Chemists say: "the light electron orbits the heavy atomic nucleus". With small balls they try to explain the atomic structure.

But the model is no good; it contradicts causality in the most elementary manner. We are dealing with the problem that according to the laws of electrodynamics a centripetally accelerated electron should emit electromagnetic waves and continuously lose energy, to eventually plunge into the nucleus.

Our experience teaches that this fortunately is not true - and Niels **Bohr** in order to save his model of the atom was forced to annul the laws of physics with a postulate founded in arbitrariness.

Actually this state only exists for a very short time and then something unbelievable happens: the electron can't be distinguished as an individual particle anymore. "*It is smeared over the electron orbit*" do certain people say; "*it possesses a dual nature*" says **Heisenberg**. Besides the corpuscular nature the electron should in case of its "second nature" form a *matter wave*. "*the position of the electron is to be looked at as a resonance which is the maximum of a probability density*", do explain us **de Broglie** and **Schrödinger**.

These explanations can hardly convince. If the electron loses its particle nature in its second nature, then it also will lose its typical properties, like for instance its mass and its charge, but this is not the case.

The vortex theory provides clear and causal answers: if the electron were a ball it continuously would lose energy, therefore another configuration forms that does not know this problem. Here the phenomenon of transport takes an effect. The electron opens its vortex centre and takes the tiny protons and neutrons as atomic nucleus up into itself. The Bohr electron orbit with that is not a path anymore, but is occupied by the whole particle as spherical shell. This is confirmed by the not understood measurements exactly like the photos of individual atoms with the scanning electron microscope.

But now an electron does in its inside have the opposite swirl direction as the proton seen from the outside. As a consequence a *force of repulsion* will occur, which can be interpreted as the to the outside directed current eddy. the *force of attraction* for reason of the opposite charge works in the opposite direction and can be interpreted as the potential vortex effect.

If both vortices are equally powerful: $\tau_1 = \tau_2$ (5.13)
or if both forces are balanced, as one usually would say, then the object which we call an atom is in a stable state.

It probably will be a result of the incompatible swirl direction, why a very big distance results, if the electron becomes an enveloping electron. On such a shell not too many electrons have room. Because of the rotation of their own, the electron spin, they form a magnetic dipole moment, which leads to a magnetic attraction of two electrons if they put their spin axis antiparallely.

As a "frictionless" against one another rotating pair they form two half-shells of a sphere and with that occupy the innermost shell in the hull of an atom. If the positive charge of the nucleus is still not balanced with that, then other electrons is left only the possibility to form another shell. Now this next electron takes the whole object up into itself. The new shell lies further on the outside and naturally offers room to more as only two vortices.

approach:

$$\mathbf{E}(\mathbf{r}, t) = \boldsymbol{\psi}(\mathbf{r}, t) \cdot e^{-\omega t} \quad (5.17)$$

with $\omega = 1/\tau = (1/\tau_1 + 1/\tau_2)/2 \quad (5.18)$

we insert the approach 5.17 and its derivations:

$$\delta \mathbf{E} / \delta t = -\omega \cdot \boldsymbol{\psi} \cdot e^{-\omega t} + (\delta \boldsymbol{\psi} / \delta t) \cdot e^{-\omega t} \quad (5.17^*)$$

$$\delta^2 \mathbf{E} / \delta t^2 = \omega^2 \cdot \boldsymbol{\psi} \cdot e^{-\omega t} - 2\omega \cdot (\delta \boldsymbol{\psi} / \delta t) \cdot e^{-\omega t} + (\delta^2 \boldsymbol{\psi} / \delta t^2) \cdot e^{-\omega t} \quad (5.17^{**})$$

into the fundamental field equation 5.7:

$$\Delta \mathbf{E} \cdot c^2 = \delta^2 \mathbf{E} / \delta t^2 + (1/\tau_1) \cdot \delta \mathbf{E} / \delta t + (1/\tau_2) \cdot \delta \mathbf{E} / \delta t + \mathbf{E} / \tau_1 \tau_2$$

and divide by $e^{-\omega t}$:

$$\begin{aligned} \Delta \boldsymbol{\psi} \cdot c^2 &= \boldsymbol{\psi} / \tau_1 \tau_2 & (5.19) \\ &- \omega \cdot \boldsymbol{\psi} \cdot (1/\tau_1 + 1/\tau_2) & (a) = (e) \\ &+ (1/\tau_1 + 1/\tau_2) \cdot \delta \boldsymbol{\psi} / \delta t & (c, d) \\ &+ \omega^2 \cdot \boldsymbol{\psi} - 2\omega \delta \boldsymbol{\psi} / \delta t + \delta^2 \boldsymbol{\psi} / \delta t^2 & (c, d) \\ & & (b) \end{aligned}$$

insert the frequency according to equation 5.18:

$$\begin{aligned} \Delta \boldsymbol{\psi} \cdot c^2 &= \boldsymbol{\psi} / \tau_1 \tau_2 & (5.19^*) \\ &- (\boldsymbol{\psi} / 2) \cdot (1/\tau_1 + 1/\tau_2)^2 & (a) = (e) \\ &+ (1/\tau_1 + 1/\tau_2) \cdot \delta \boldsymbol{\psi} / \delta t & (c, d) \\ &+ (\boldsymbol{\psi} / 4) \cdot (1/\tau_1 + 1/\tau_2)^2 & (c, d) \\ &- (1/\tau_1 + 1/\tau_2) \cdot \delta \boldsymbol{\psi} / \delta t + \delta^2 \boldsymbol{\psi} / \delta t^2 & (b) \\ & & (b) \end{aligned}$$

summarized with equation 5.18:

$$\Delta \boldsymbol{\psi} \cdot c^2 = \boldsymbol{\psi} / \tau_1 \tau_2 - \omega^2 \cdot \boldsymbol{\psi} + \delta^2 \boldsymbol{\psi} / \delta t^2 \quad (5.20)$$

Fig. 5.6: Derivation of the Klein-Gordon equation (5.20) from the fundamental field equation (5.7)

5.6 Derivation of the Klein-Gordon equation

The valid model of the atom today still raises problems of causality, as has been explained. An improvement was provided by an equation, which was proposed by the mathematician Schrödinger 1926 as a model description. This equation in this way missed the physical root, but it nevertheless got international acknowledgment, because it could be confirmed experimentally. Looking backwards from the result then the physical interpretation of the *probability density of the resonance of the waves* could be pushed afterwards.

$$i \cdot \hbar \cdot \delta \boldsymbol{\psi} / \delta t = U \cdot \boldsymbol{\psi} - (\hbar^2 / 2m) \cdot \Delta \boldsymbol{\psi} \quad (5.14)$$

The **Schrödinger equation** is valid for matter fields (of mass m), while the interaction with a outside force field the energy U indicates. It can be won from a wave equation by conversion, which possibly is the reason why it usually is called a wave equation, although in reality it is a diffusion equation, so a vortex equation.

For the derivation Schrödinger gives the approach of a harmonic oscillation for the complex wave function $\boldsymbol{\psi}$:

$$\boldsymbol{\psi}(\mathbf{r}, t) = \boldsymbol{\phi}(\mathbf{r}) \cdot e^{-i \omega t}, \quad (5.15)$$

if the entire time dependency can be described by one frequency $f = W/h$

(de-Broglie relation): $\omega = 2\pi f = W \cdot 2\pi/h = W/\hbar \quad (5.16)$

The high-put goal is: if the structure of the atom is determined by the fundamental field equation 5.7 then one should be able to derive the experimentally secured Schrödinger equation and to mathematically describe the discussed special case. Also we select at first an approach:

$$\mathbf{E}(\mathbf{r}, t) = \boldsymbol{\psi}(\mathbf{r}, t) \cdot e^{-\omega t}, \quad (5.17)$$

with $\omega = 1/\tau = (1/\tau_1 + 1/\tau_2)/2 \quad (5.18)$

We insert the approach 5.17 and its derivations into the field equation 5.7 and divide by the damping term $e^{-\omega t}$:

$$\begin{aligned} \Delta \boldsymbol{\psi} \cdot c^2 &= \boldsymbol{\psi} / \tau_1 \tau_2 - \omega \cdot \boldsymbol{\psi} \cdot (1/\tau_1 + 1/\tau_2) + (1/\tau_1 + 1/\tau_2) \cdot (\delta \boldsymbol{\psi} / \delta t) + \\ &+ \omega^2 \cdot \boldsymbol{\psi} - 2\omega \delta \boldsymbol{\psi} / \delta t + \delta^2 \boldsymbol{\psi} / \delta t^2 \end{aligned} \quad (5.19)$$

If as the next step the angular frequency according to equation 5.18 is inserted, then summarized the provisional intermediate result results:

$$\Delta \boldsymbol{\psi} \cdot c^2 = \boldsymbol{\psi} / \tau_1 \tau_2 - \omega^2 \cdot \boldsymbol{\psi} + \delta^2 \boldsymbol{\psi} / \delta t^2 \quad (5.20)$$

The derived equation 5.20 represents formally seen the *Klein-Gordon equation*, which is used for the description of matter waves in quantum mechanics and which particularly in the quantum field theory (e.g. mesons) plays an important role. Even if it often is regarded as the relativistic invariant generalization of the Schrödinger equation, it at a closer look is incompatible with this equation and as "genuine" wave equation it is not capable of treating vortex problems correctly, like e.g. the with the Schrödinger equation calculable quantization of our microcosm.

$$\text{Schrödinger approach } \psi(\mathbf{r}, t) = \phi(\mathbf{r}) \cdot e^{-i\omega t} \quad (5.15)$$

with: $f = W/h$; de-Broglie relation:

$$\omega = 2\pi f = W \cdot 2\pi/h = W/\hbar \quad (5.16)$$

the derivation:

$$\delta\psi/\delta t = -i\omega \cdot \psi$$

rewritten for ψ :

$$\psi = (i/\omega) \cdot \delta\psi/\delta t \quad (5.21)$$

2. derivation:

$$\delta^2\psi/\delta t^2 = -i\omega \cdot \delta\psi/\delta t \quad (5.22)$$

inserted in equation 5.20:

$$\Delta\psi \cdot c^2 = \psi/\tau_1\tau_2 - 2i\omega \cdot \delta\psi/\delta t \quad (5.23)$$

= sought-for Schrödinger equation (usual notation):

$$i \cdot \hbar \cdot \delta\psi/\delta t = U \cdot \psi - (\hbar^2/2m) \cdot \Delta\psi \quad (5.14)$$

comparison of coefficients is needed:

Einstein relation (with the speed of light c):

$$\text{with (5.16): } W = m \cdot c^2 = \omega \cdot \hbar \quad (5.24)$$

coefficient of the

$$\text{imaginary part: } -2i\omega = 2(\omega/i) = 2mc^2/i\hbar \quad (5.25)$$

comparison of coefficients

for the

real part:

$$1/\tau_1\tau_2 c^2 = U \cdot 2m/\hbar^2 \quad (5.26)$$

kinetic energy of a particle moving with the speed v :

$$\frac{1}{2} \cdot m \cdot v^2 = W - U \quad (5.27)$$

v = group velocity of the matter wave:

$$v = hf/mc = \hbar\omega/mc \quad (5.28)$$

$$\text{Eq. 5.27: } U = W - \frac{1}{2} \cdot m \cdot (\hbar\omega/mc)^2 \quad (5.27^*)$$

$$\text{Eq. 5.24: } W = \omega \cdot \hbar; (\hbar\omega/mc) = c; \text{ resp.: } m/\hbar = \omega/c^2$$

In eq. 5.27* the sought-for coefficient reads (according to eq. 5.26):

$$\begin{aligned} U \cdot 2m/\hbar^2 &= 2\omega/c^2 \hbar \cdot [\omega \cdot \hbar - \frac{1}{2} \cdot m \cdot c^2] \\ &= 2\omega/c^2 \hbar \cdot [\omega \cdot \hbar - \frac{1}{2} \cdot \omega \cdot \hbar] = \underline{\underline{(\omega/c)^2}} \quad (5.29) \end{aligned}$$

Fig. 5.7: Derivation of the time dependent Schrödinger equation

5.7 Derivation of the time dependent Schrödinger equation

With the Schrödinger approach 5.15 and its derivations the derivation is continued:

$$\psi(\mathbf{r}, t) = \phi(\mathbf{r}) \cdot e^{-i\omega t}, \quad (5.15)$$

$$\delta\psi/\delta t = -i\omega \cdot \psi, \quad \text{bzw.} \quad \psi = (i/\omega) \cdot \delta\psi/\delta t \quad (5.21)$$

$$\delta^2\psi/\delta t^2 = -i\omega \cdot \delta\psi/\delta t \quad (5.22)$$

The for a harmonic oscillation won relations according to equation 5.21 and 5.22 are now inserted into equation 5.20:

$$\Delta\psi \cdot c^2 = \psi/\tau_1\tau_2 - 2i\omega \cdot \delta\psi/\delta t \quad (5.23)$$

This is already the sought-for **Schrödinger equation**, as we will see in a moment, when we have analysed the coefficients. Because, besides equation 5.16 for the total energy W , also the Einstein relation is valid (with the speed of light c):

$$W = m \cdot c^2 = \omega \cdot \hbar, \quad (5.24)$$

we can replace the coefficients of the imaginary part by:

$$2(\omega/i) = 2m c^2/i\hbar \quad (5.25)$$

To achieve that equation 5.23, as required, follows from the Schrödinger equation 5.14, a comparison of coefficients is carried out for the real part:

$$\frac{1}{\tau_1\tau_2} c^2 = U \cdot 2m/\hbar^2 \quad (5.26)$$

If the kinetic energy of a particle moving with the speed v is:

$$\frac{1}{2} \cdot m \cdot v^2 = W - U, \quad (5.27)$$

then according to De Broglie this particle has the wavelength h/mv . The consideration of the particle as matter wave demands an agreement with the wave length c/f of an electromagnetic wave (with the phase velocity c). The particle hence has the speed v , which corresponds with the group velocity of the matter wave:

$$v = hf/mc = \hbar\omega/mc, \quad (5.28)$$

if we insert v into equation 5.27:

$$U = W - \frac{1}{2} \cdot m \cdot (\hbar\omega/mc)^2 \quad (5.27^*)$$

According to equation 5.24 on the one hand the total energy is $W = \omega \cdot \hbar$ and on the

other hand the relation 5.28 gives $(\hbar\omega/mc) = c$ resp.: $m/\hbar = \omega/c^2$.

Inserted into equation 5.27* the sought-for coefficient reads (according to eq. 5.26):

$$\begin{aligned} U \cdot 2m/\hbar^2 &= 2\omega/c^2 \hbar \cdot [\omega \cdot \hbar - \frac{1}{2} \cdot m \cdot c^2] \\ &= 2\omega/c^2 \hbar \cdot [\omega \cdot \hbar - \frac{1}{2} \cdot \omega \cdot \hbar] = \underline{\underline{(\omega/c)^2}} \quad (5.29) \end{aligned}$$

comparison of coefficients 5.26 is fulfilled if:

$$\frac{1}{\tau_1 \tau_2} c^2 = U \cdot 2m/\hbar^2 = (\omega/c)^2 \quad (5.30)$$

the angular frequency is given by equation 5.18. Therefore has to be valid:

$$\frac{1}{\tau_1 \tau_2} = \frac{1}{4} (1/\tau_1 + 1/\tau_2)^2 \quad (5.31)$$

resp.:

$$\sqrt{1/\tau_1 \tau_2} = \frac{1}{2} (1/\tau_1 + 1/\tau_2) \quad (5.32)$$

arithmetic average = geometric average, if:

$$1/\tau_1 = 1/\tau_2 \text{ and: } \boxed{\tau_1 = \tau_2} \quad (5.13)$$

is valid. Eq. 5.23 is divided by c^2 and eqs. 5.30 and 5.25 are inserted:

$$\boxed{\Delta\psi = U \cdot \psi \cdot (2m/\hbar^2) + (2m/i\hbar) \cdot \delta\psi/\delta t} \quad (5.14*)$$

= time dependent Schrödinger equation 5.14.

replace $\delta\psi/\delta t$ acc. to eq. 5.21 with $\omega = W/\hbar$ acc. to eq. 5.24:

$$\Delta\psi = U \cdot \psi \cdot (2m/\hbar^2) + (2m/i\hbar) \cdot \psi \cdot (-i) \cdot W/\hbar \quad (5.33)$$

Schrödinger approach 5.15 for the function of position $\phi(r)$:

$$\Delta\phi = (U \cdot 2m/\hbar^2 - W \cdot 2m/\hbar^2) \cdot \phi \quad (5.34)$$

$$\boxed{\Delta\phi = -2m/\hbar^2 (W - U) \cdot \phi} \quad (5.35)$$

= time independent Schrödinger equation.

Fig. 5.8: Derivation of the time independent Schrödinger equation

5.8 Derivation of the time independent Schrödinger equation

The goal is reached if we are capable to fulfil the comparison of coefficients 5.26:

$$U \cdot 2m/\hbar^2 = (\omega/c)^2 = 1/\tau_1 \tau_2 c^2 \quad (5.30)$$

The angular frequency ω is given by equation 5.18. Therefore has to be valid:

$$\frac{1}{4} (1/\tau_1 + 1/\tau_2)^2 = 1/\tau_1 \tau_2 \quad (5.31)$$

resp.:

$$\frac{1}{2} \cdot (1/\tau_1 + 1/\tau_2) = \sqrt{1/\tau_1 \tau_2} \quad (5.32)$$

As is well-known the arithmetic and the geometric average only correspond in case the variables are identical. In this case, as already required in equation 5.13:

$$\tau_1 = \tau_2. \quad (5.13)$$

has to hold.

From this we can draw the conclusion that the Schrödinger equation is just applicable to the described *special case* (according to eq. 5.13), in which the eddy current, which tries to increase the particle or its circular path and the potential vortex, which keeps the atoms together and also is responsible for the stability of the elementary particles, are of identical order of magnitude.

As a check equation 5.23 is divided by c^2 and equations 5.30 and 5.25 are inserted:

$$\boxed{\Delta\psi = U \cdot \psi \cdot (2m/\hbar^2) + (2m/i\hbar) \cdot \delta\psi/\delta t} \quad (5.14*)$$

This is the *time dependent Schrödinger equation 5.14* resolved for $\Delta\psi$.

Next we replace $\delta\psi/\delta t$ according to equation 5.21 with $\omega = W/\hbar$ acc. to equation 5.24:

$$\Delta\psi = U \cdot \psi \cdot (2m/\hbar^2) + (2m/i\hbar) \cdot \psi \cdot (-i) \cdot W/\hbar \quad (5.33)$$

If we separate the space variables $\phi(r)$ from time by the Schrödinger approach 5.15 we obtain:

$$\Delta\phi = (U \cdot 2m/\hbar^2 - W \cdot 2m/\hbar^2) \cdot \phi \quad (5.34)$$

This equation 5.34 for the function of space coordinates $\phi(r)$ is the *time independent Schrödinger equation*:

$$\boxed{\Delta\phi = -2m/\hbar^2 (W - U) \cdot \phi} \quad (5.35)$$

The solutions of this equation which fulfil all the conditions that can be asked of them (of finiteness, steadiness, uniqueness etc.), are called *eigenfunctions*. The existence of corresponding discrete values of the energy W , also called *eigenvalues of the Schrödinger equation*, are the mathematical reason for the different quantum postulates.

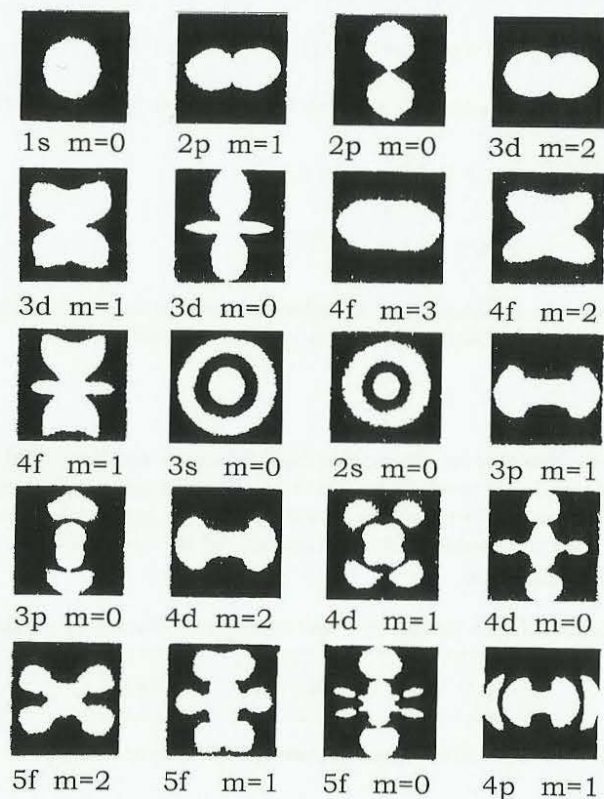


Fig. 5.9: Photographs of models of the probability densities for different states of the hydrogen atom.

The densities are symmetrical if rotated around the vertical axis<i>

taken from:

<i> U. Gradmann/H. Wolter: Grundlagen der Atomphysik, AVG, Frankfurt a. M. 1971, P. 190.

5.9 Interpretation of the Schrödinger equation

The interpretation of the Schrödinger equation is still disputed among physicists, because the concept of wave packets contradicts the corpuscular nature of the elementary particles. Further the difficulty is added that wave packets at a closer look never are connected, run apart more or less fast, and really nothing can hinder them doing that. But for a particle the connexion represents a physical fact. Then there can be no talk of causality anymore.

The monocausal division into two different levels of reality, in a space-timely localization and in an energetic description, does not represent a solution but rather the opposite, the abolition of the so-called dual nature. As has been shown, the potential vortex is able to achieve this with the help of its concentration effect.

But from the introduction of this new field phenomenon arises the necessity to interpret the causes for the calculable and with measuring techniques testable solutions of the Schrödinger equation in a new way. Laws of nature do not know a possibility to choose! If they have been accepted as correct, they necessarily have to be applied.

Three hundred years ago the scholars had an argument, whether a division of physical phenomena, like **Newton** had proposed it, would be allowed to afterwards investigate them in the laboratory individually and isolated from other influences or if one better should proceed in an integrated manner, like for instance **Descartes** with his cartesian vortex theory. He imagined the celestial bodies floating in ethereal vortices.

One absolutely was aware that the whole had to be more than the sum of every single realization, but the since **Demokrit** discussed vortex idea had to make room for the overwhelming successes of the method of Newton. And this idea after 2100 years was stamped, to in the meantime almost have fallen into oblivion.

Today, where this recipe for success in many areas already hits the limits of the physical possibilities, we should remember the teachings of the ancients and take up again the vortex idea. It of course is true that only details are calculable mathematically and that nature, the big whole, stays incalculable, wherein problems can be seen.

If we consider the fundamental field equation 5.7, we find confirmed that actually no mathematician is capable to give a generally valid solution for this four-dimensional partial differential equation. Only restrictive special cases for a harmonic excitation or for certain spatial boundary conditions are calculable. The derived Schrödinger equation is such a case and for us particularly interesting, because it is an eigenvalue equation. The eigenvalues describe in a mathematical manner the with measuring techniques testable structures of the potential vortex .

Other eigenvalue equations are also derivable, like the Klein-Gordon equation or the Lionville equation, which is applied successfully in chaos theories. So our view opens, if chaotic systems like turbulences can be calculated as special cases of the same field equation and should be derivable from this equation.

The in pictures recorded and published structures, which at night should have come into being in corn fields, often look like the eigenvalues of a corresponding equation. The ripe ears thereby lie in clean vortex structures flat on the soil. Possibly potential vortices have charged the ears to such high field strength values that they have been pulled to the soil by the Coulomb forces.

Consequences resulting from the derivation of the Schrödinger equation from the fundamental field equation 5.7:

1. Any experiment which confirms the Schrödinger equation is with that able to confirm at the same time the existence of the newly discovered potential vortex and the correctness of the field-theoretical approach.

2. Properties of the atomic hull and of the atomic nucleus, which can be described with the Schrödinger equation, can as of now be interpreted as an electromagnetic phenomenon.

3. There exist no particles or wave packets from matter waves, but only configurations consisting of potential vortices and current eddies.

4. There exists no matter! What we call matter is nothing but an electromagnetic state of oscillation of empty space.

The relation between the energy of oscillation and the mass is described by the relation named after Albert Einstein

$$E = mc^2$$

(6.1 = 5.24)

Fig. 6.1: Derivation of the Schrödinger equation, power of proof and consequences

6. Theory of objectivity

6.1 Proof

A new theory only has chances on acknowledgment if it is provable. For that physical phenomena in the sense of the new theory are calculated and independently of this experiments are being carried out. If the calculations are confirmed by reproducible measurement results, then with that the correctness of the approach is proven.

In the here presented case we have chosen the field-theoretical approach instead of the usual quantum physical approach. As a consequence of this we had found as a new phenomenon the vortex of the electric field. With regard to the normally used Maxwell theory this resulted in changed field equations in a dual formulation. If both equations, each of which describes a source-free vortex field, are inserted into each other the result is an only in time and space formulated, generally valid and hence fundamental field equation (5.7, fig. 5.1).

This equation has many special cases; one of them, the Schrödinger equation, could be derived by using an approach which was harmonic in time. We renounced to give special solutions of the Schrödinger equation, because these are printed in numerous text books.

On the other hand experiments are known, which are capable to confirm the theoretical solutions and thus to prove the Schrödinger equation. The eigenvalues of the equation describe for instance the shell-shaped structure of the atoms with the by Niels Bohr given radii.

Now this already proven equation was derived from the new field-theoretical approach. Thus for the special case, the area where the Schrödinger equation is valid, the new theory can be said to be proven (fig. 6.1).

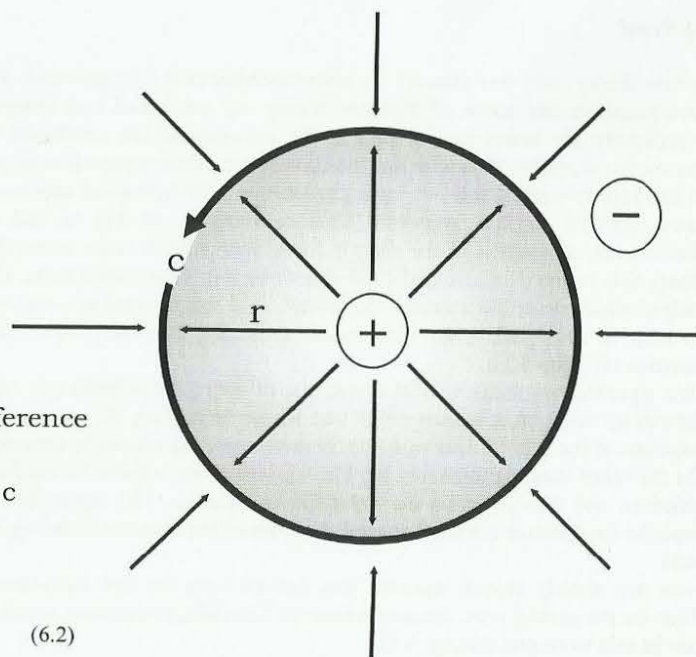
We still are not content with that and put another stone on top: we will calculate the quantum properties of the elementary particles for ourselves. These until now have only been measured. Today is merely sought for symmetries and for models of explanation, like e.g. the quark-hypothesis. From a calculation science is miles and miles away. We will compare the calculation results with the measurement values. Then everyone can check and compare for him or herself.

The conditions in an elementary particle are completely different. Here it concerns the vortex itself, whereas the model of the atom merely describes vortex properties, so-called actions at a distance. The differences in size and distances for an atom lie more than five powers of ten over those of a particle.

Here a new problem of causality comes to light, at which we now must have a critical look: the question of the by Einstein postulated constancy and universality of the speed of light. Seen from a relativistic and subjective point of view of an observer, Einstein by all means may be right. But may such a theory be generalized? How are the measurements concerning the speed of light and the relativity of space and time to be judged when looking at them objectively?

The current measurements of speeds faster than light speak a clear language and represent a challenge (fig. 3.1, violation of the principle of causality no. 5).

The electron as a spherical capacitor (see fig. 4.3):



field theoretical approach (vortex particles):

The amount of energy bound in the inside of the particle is identical with the free and measurable amount of energy on the outside of the particle.

(If the number of particles is left unchanged):

In an isolated system the sum of the energy is constant.

(particle = electromagnetic vortex)

Energy is a state description of electromagnetism.

Fig. 6.2: Derivation of the law of conservation of energy

6.2 Law of conservation of energy

Let the starting-point for our considerations be the electromagnetic wave in a particle-free vacuum. Here no vortices appear, so that the plane wave can propagate undamped with the speed of light, and in this way a transport of energy takes place. Electric and magnetic energy each are the same magnitude.

Let's now imagine the symmetry is disturbed as the wave is "slowed down" on one side. As a possible result *the wave rolls up to a spherical vortex.*

As we will see such a process is possible, for instance at impact on a strong field. Thus part of the energy is bound in the inside. This part from now on withdraws itself from every possibility to measure it. We can only measure the second part of the field energy, with which the particle interacts with its neighbourhood.

We can assume that:

The amount of energy bound in the inside of the particle is identical with the free and measurable amount of energy on the outside of the particle.

The same energy $W_e = 0,51 \text{ MeV}$, we attribute to the electron for reason of its mass with the help of the Einstein relation (6.1), is also bound in its inside. This conclusion is also applicable to other elementary particles and with that to all matter.

We here again recognize the principle of the duality between the to the outside striving eddy current in the inside of the elementary vortex and the concentrating potential vortex on the outside. Thus also seen energetically both are of the same magnitude.

Whereas in the case of the electromagnetic wave it concerns a symmetrical oscillation around "zero", by the process of quantization, by the rolling up to a spherical vortex, there forms an energetic state of space different from zero. The order of magnitude is determined by the number of elementary vortices, of which the particles and all matter consist.

Anti-matter forms the opposite energetic state and this again is for the particles of matter available in their inside in a bound form.

As long as we do not artificially produce new elementary vortices and thus keep the number of available vortices constant, the energetic state will not change, or as it is formulated in text books:

In an isolated system the sum of the energy is constant.

The law of conservation of energy is not an axiom, but follows without compulsion from the vortex theory. It is not elementary, but a consistently derivable consequence of the field-theoretical approach, according to which solely the field acts as cause for all other physical phenomena, also for the conservation of energy. Because the cause of it is the electromagnetic field, the following has to hold:

Energy is a state description of electromagnetism.

Now we finally can explain why energy can be converted. Different forms of energy only are different forms of formation of the same phenomenon.

Of course this statement of the field-theoretical approach does not yet explain what, for instance, the temperature has to do with electromagnetism. I ask for some patience; no question will be left unanswered.

From

$$\boxed{c \sim r} \quad (6.2)$$

follows:

The speed of light determines the size of the elementary particles.

Energy of a capacitor:

$$W = Q^2/C, \quad (6.3)$$

written down for the electron (with the Einstein relation):

$$W_e = e^2/C_e = m_e c^2 = 0,51 \text{ MeV} \quad (6.1)$$

Capacity of a spherical capacitor:

$$C_e = \epsilon_0 \cdot 4\pi r_e \quad (6.4)$$

"classical" radius of the electron^{<i>} is:

$$r_e = e^2/\epsilon_0 \cdot 4\pi \cdot W_e \quad (6.5)$$

$$\boxed{r_e = 2,82 \cdot 10^{-15} \text{ m}} \quad (6.6)$$

in the case of Kuchling^{<ii>} the radius of the electron is:

$$\boxed{r_e = 1,41 \cdot 10^{-15} \text{ m}} \quad (6.7)$$

Fig. 6.3: Calculation of the radius of the electron.

<i>: Mende, Simon: Physik, Gl. 10.39, VEB-Leipzig, 4. Aufl.

<ii>: Kuchling: Physik, Gl. At4, VEB-Leipzig, bis einschl. 11. Auflage 1974

6.3 Radius of the electron

For the crucial process, in which the electromagnetic wave rolls up to a vortex, it is for reasons of continuity to be expected that the **velocity of propagation** remains equal that thus for the vortex oscillation exactly like for the electromagnetic wave the speed of light is determining. The **direction of propagation** in the case of the vortex takes place perpendicular to the in fig. 6.2 shown field direction of the electric field strength. Not even in that both field-phenomena differ.

Summarizing: the propagation takes place with the speed of light c along a circular path with the perimeter $U = 2\pi r$. Therefore holds:

$$\boxed{c \sim r} \quad (6.2)$$

According to this equation the radius and with that the size of the electron is determined by the speed of light. Therefore the question of the size of the electron is raised.

The energy interpretation predicts that for the theoretical case of a change of size the energy density in the inside of the particle is influenced that however the quantity of the included energy remains unchanged. We therefore can further proceed from the assumption that the bound amount of energy is independent of the size of the particle.

Consequently for the elementary quantum the energy $W_e = 0,51 \text{ MeV}$ is assumed, which it has according to the Einstein relation $W_e = m_e c^2$. For the electron of mass m_e the with measuring techniques determined value is inserted.

The spherical electrode of a spherical capacitor with the above given energy W_e (according to eq. 6.1) and the capacity C_e (according to equation 6.4, fig. 6.3) represents a very realistic model of the negatively charged particle.

In this manner the classical radius of the electron is calculated to be^{<i>}: $r_e = 2,82 \cdot 10^{-15} \text{ m}$.

But in the case of Kuchling it only is half this size^{<ii>}, what according to equation 6.2 would mean that in the case of Kuchling the light would be on the way only half this fast^{<iii>}. Therefore if one is careful, one prefers to be silent concerning this delicate theme and if one is honest, one admits not to know anything exact.

Not only the electron but also all the other elementary particles are according to the field-theoretical approach formed from concentrated potential vortices. For these equation 6.2 hence has to hold in the same manner, so that more generalized we can conclude:

The speed of light determines the size of the elementary particles.

This statement is incompatible with the assumption of a constant speed of light. Because then all elementary particles would have identical size. As is known, however, are the building parts of the atomic nucleus, the protons and neutrons very much smaller than individual electrons. The constancy of the speed of light is to be questioned.

This question is of such an elementary importance that we are not content with these considerations and in addition undertake a mathematical derivation in the sense of the field approach.

<iii>: Difference = Thomas factor

The Maxwell laws, source free (figures 3.2 and 3.3):

$$\text{Div } \mathbf{D} = 0 \quad (3.7) \quad \text{and} \quad \text{Div } \mathbf{B} = 0 \quad (3.3)$$

Faraday's law of induction and Ampère's law

$$\mathbf{E} = \mathbf{E}(\mathbf{r}, t) \text{ with } 1/\tau_2 = 0: \quad \mathbf{H} = \mathbf{H}(\mathbf{r}, t) \text{ with } \mathbf{j} = 0 \text{ resp. } 1/\tau_1 = 0$$

$$\boxed{\text{curl } \mathbf{E} = -\delta \mathbf{B} / \delta t} \quad (5.4) \quad \boxed{\text{curl } \mathbf{H} = \delta \mathbf{D} / \delta t} \quad (5.1)$$

$$\text{with: } \mathbf{B} = \mu \cdot \mathbf{H} \quad (5.5) \quad \text{and} \quad \mathbf{D} = \varepsilon \cdot \mathbf{E} \quad (3.6)$$

if we again apply the curl to equation 5.4 and insert equation 5.1 (cf. fig. 5.1, eq. 5.5):

$$-\text{curl curl } \mathbf{E} = \mu \cdot \delta(\text{curl } \mathbf{H}) / \delta t = \mu \cdot \varepsilon \cdot \delta^2 \mathbf{E} / \delta t^2 \quad (5.5)$$

$$\text{thanks to missing divergence: } \text{div } \mathbf{E} = 0 \quad (3.7^*)$$

(fig. 5.2):

$$= \text{wave equation: } \boxed{\Delta \mathbf{E} \cdot c^2 = \delta^2 \mathbf{E} / \delta t^2} \quad (5.9^*)$$

$$\text{with the speed of light } c: \quad \mu \cdot \varepsilon = 1/c^2 \quad (5.6)$$

Hertz' wave = transverse wave = plane wave with:
direction of propagation:

$$\boxed{v = dx/dt} \quad (6.8)$$

$$\boxed{\mathbf{E} = E_z}, \quad \boxed{\mathbf{D} = D_z}, \quad \boxed{\mathbf{H} = H_y}, \quad \boxed{\mathbf{B} = B_y} \quad (6.8^*)$$

curl operation (in y-direction): with equation 5.4:

$$\text{curl } \mathbf{E} = -d\mathbf{E}/dx = -d\mathbf{B}/dt \quad (6.9)$$

$$\text{with 6.8: } d\mathbf{E} = (dx/dt) \cdot d\mathbf{B} = v \cdot d\mathbf{B} \quad (6.9^*)$$

$$\text{or generally: } \boxed{\mathbf{E} = \mathbf{v} \times \mathbf{B}} \quad (6.10)$$

Fig. 6.4: Derivation of the laws of transformation

<i>: Prof. G. Bosse in his text book in reversed direction derives the Faraday law of induction from the law of transformation 6.10, which he again derives from considerations about the Lorentz force. G. Bosse, Grundlagen der Elektrotechnik II, BI 183, Hochschultaschenbücher-Verlag, Mannheim 1967

6.4 The Maxwell field equations

The laws of transformation of the electromagnetic field shall form the starting-point for the coming up considerations. To exclude any doubts with regard to the interpretation, the equations will be derived from the Maxwell laws under the assumption that no sources or charge carriers are present (fig. 3.2 and 3.3) and as a consequence no current density is to be expected ($\mathbf{j} = 0$).

This corresponds to the vanishing of the time independent terms, which consequently are responsible for the occurring of force effects like e.g. the Lorentz force. Only at the end of this derivation we can understand the sense of this assumption (with $1/\tau_1 = 0$ and $1/\tau_2 = 0$). The procedure at first corresponds to that of fig. 5.1. Here the fundamental field equation had been derived from Faraday's law of induction and Ampère's law. With the assumptions made this time the in fig. 5.2 treated undamped wave equation is left (5.9, here 5.9*). Whom the derivation is still present can go in at this point.

In a sufficiently great distance from the source we are dealing with a plane wave, in which the field factors only depend on the direction of propagation x . The Hertz' wave is a transverse wave, in which the field pointers oscillate perpendicular to the direction of propagation and in addition stand perpendicular to each other:

$$\boxed{v = dx/dt} \quad (6.8), \quad \boxed{\mathbf{E} = E_z, \quad \mathbf{D} = D_z, \quad \mathbf{H} = H_y, \quad \mathbf{B} = B_y} \quad (6.8^*)$$

The curl, applied to the electric field pointer, itself points in the y -direction:

$\text{curl } \mathbf{E} = -d\mathbf{E}/dx$. This for the transverse wave carried out curl operation is now compared with Faraday's law of induction (5.4):

$$\text{curl } \mathbf{E} = -d\mathbf{E}/dx = -d\mathbf{B}/dt \quad (6.9)$$

The relation won in a mathematical way, with the speed fixed by (6.8), reads:

$$d\mathbf{E} = (dx/dt) \cdot d\mathbf{B} = v \cdot d\mathbf{B} \quad (6.9^*)$$

The result of this derivation at first only is valid for the introduced simplification, for instance for the case of the transverse electromagnetic wave. Better known is apart from that the generalized formulation, which among others by G. Bosse^{<i>} is called law of transformation.

$$\boxed{\mathbf{E} = \mathbf{v} \times \mathbf{B}} \quad (6.10)$$

With Ampère's law (5.1) we now should proceed in an analogous manner. The result is:

$$\boxed{\mathbf{H} = -\mathbf{v} \times \mathbf{D}} \quad (6.10^*)$$

This equation 6.10* is given among others by Simonyi^{<ii>}. Now that we know, under which circumstances these equations of transformation can be derived from the Maxwell equations, the actual work can start.

<ii>: K. Simonyi, Theoretische Elektrotechnik, 7. Auflage VEB Verlag Berlin 1979. pp. 921 - 924; In addition see chapter 27.8 in part 3 of this book.

Laws of transformation:

$$\text{and} \quad \boxed{\mathbf{E} = \mathbf{v} \times \mathbf{B} = \mathbf{v} \times \mu \cdot \mathbf{H}} \quad (6.10)$$

$$\boxed{\mathbf{H} = -\mathbf{v} \times \mathbf{D} = -\mathbf{v} \times \varepsilon \cdot \mathbf{E}} \quad (6.10^*)$$

*We experience the magnetic field as an electric field
and the electric field as a magnetic field
simply and solely for reason of the same relative motion.*

The component of the direction of motion perpendicular to the area defined by the field pointers:

$$\text{and} \quad \mathbf{E} = \mathbf{v} \cdot \mu \cdot \mathbf{H} \quad (6.11)$$

$$\mathbf{H} = -\mathbf{v} \cdot \varepsilon \cdot \mathbf{E} \quad (6.11^*)$$

with the relations of material:

$$\mathbf{B} = \mu \cdot \mathbf{H} \quad (3.5)$$

$$\mathbf{D} = \varepsilon \cdot \mathbf{E} \quad (3.6)$$

with the speed of light:

$$c = 1/\sqrt{\mu \cdot \varepsilon} \quad (5.6)$$

additional field:

$$\text{resp.} \quad \mathbf{E}_z = -v^2 \cdot \mu \cdot \varepsilon \cdot \mathbf{E} = -(v^2/c^2) \cdot \mathbf{E} \quad (6.12)$$

$$\mathbf{H}_z = -v^2 \cdot \varepsilon \cdot \mu \cdot \mathbf{H} = -(v^2/c^2) \cdot \mathbf{H} \quad (6.12^*)$$

basic field: \mathbf{E} resp. \mathbf{H} (at $v = 0$)

measurable overall field: (if $v \neq 0$)

$$\text{resp.} \quad \boxed{\mathbf{E}_0 = \mathbf{E} + \mathbf{E}_z} \quad (6.13)$$

$$\boxed{\mathbf{H}_0 = \mathbf{H} + \mathbf{H}_z} \quad (6.13^*)$$

Fig. 6.5: Properties of transformation of the electromagnetic field.

6.5 Equations of transformation

As a consequence of the in fig. 6.5 again written down laws of transformation of the electromagnetic field (6.10 and 6.10*) magnetic phenomena can be traced back to electric phenomena and vice versa. The mathematical formulation reveals us the two sides of the same medal and points to a perfect duality between both fields and their factors of description.

Because a way exists, as is shown here, in which the equations of transformation can be derived from the Maxwell field equations, the same generally valid and extensive importance should be attributed to them. They can with the same right be called the foundation of electromagnetism. Wherein does lie its message for physics, the always curious researcher will ask? For that the relations of material 3.5 and 3.6 are completed:

$$\boxed{\mathbf{E} = \mathbf{v} \times \mu \cdot \mathbf{H}} \quad (6.10) \quad \text{und} \quad \boxed{\mathbf{H} = -\mathbf{v} \times \varepsilon \cdot \mathbf{E}} \quad (6.10^*)$$

The here presented equations state, that we measure an electric field strength \mathbf{E} , if we are moving with regard to a magnetic field \mathbf{H} with the speed \mathbf{v} and vice versa.

The electric and the magnetic field therefore prove to be an *experience* of the observing person and we can say:

We experience the magnetic field as electric field and the electric field as magnetic field simply and solely for reason of the relative motion.

Let's assume, v is the component of the relative velocity (6.8), which stands perpendicular to the area defined by the field pointers (6.8*), then the equations of transformation (6.9* with 3.5) now read:

$$\mathbf{E} = \mathbf{v} \cdot \mu \cdot \mathbf{H} \quad (6.11) \quad \text{and} \quad \mathbf{H} = -\mathbf{v} \cdot \varepsilon \cdot \mathbf{E} \quad (6.11^*)$$

If we are moving with the velocity v in a basic field which is present with the field strength \mathbf{E} , then according to equation 6.11* we observe a magnetic field, which again according to equation 6.11 is to be interpreted as an additional electric field \mathbf{E}_z :

$$\mathbf{E}_z = -v^2 \cdot \mu \cdot \varepsilon \cdot \mathbf{E} = -(v^2/c^2) \cdot \mathbf{E} \quad (6.12)$$

In duality equation 6.11 inserted into equation 6.11* provides for the magnetic field strength a corresponding additional field \mathbf{H}_z :

$$\mathbf{H}_z = -v^2 \cdot \mu \cdot \varepsilon \cdot \mathbf{H} = -(v^2/c^2) \cdot \mathbf{H} \quad (6.12^*)$$

We obviously owe the measurable overlap fields in a laboratory simply and solely to the relative velocity v with which the laboratory is moving. But now we must pay attention to the fact that a terrestrial laboratory rotates along with the earth, that the earth orbits the sun and the sun again rotates around the centre of the milky way. Eventually the whole milky way is on the way in the cosmos with a galactic, for us hardly understandable speed. If we further take into consideration that for every subsystem an additional field occurs as a consequence of the relative motion with regard to the super ordinate system, then one additional field follows after the next and overlaps this one.

Let's imagine, the relative velocity could be reduced towards zero - and maybe we are moving around such a cosmic point - then here no overlapping field would be measurable.

<*>: A derivation using vectors is written in chapter 28 (part 3).

Additional field (from fig. 6.5):

$$E_z = - (v^2/c^2) \cdot E \quad (6.12)$$

and

$$H_z = - (v^2/c^2) \cdot H \quad (6.12^*)$$

Superposition of the fields:

The additional field (E_z resp. H_z) overlaps the basic field (E resp. H) to produce the measurable overall field (E_0 resp. H_0):

$$E_0 = E + E_z = E \cdot (1 - v^2/c^2) \quad (6.13)$$

$$H_0 = H + H_z = H \cdot (1 - v^2/c^2) \quad (6.13^*)$$

transformed:

$$\left(1 - \frac{v^2}{c^2}\right) = \frac{E_0}{E} = \frac{H_0}{H} \quad (6.14)$$

for the Lorentz contraction holds apart from that:

$$\left(1 - \frac{v^2}{c^2}\right) = \left(\frac{1}{l_0}\right)^2 \quad (6.14^*)$$

From the comparison

$$\frac{E_0}{E} = \frac{H_0}{H} = \left(\frac{1}{l_0}\right)^2 \quad (6.14^{**})$$

the proportionality:

$$\boxed{E, H \sim 1/l^2} \quad \text{and} \quad \boxed{E_0, H_0 \sim 1/l_0^2} \quad (6.15)$$

Fig. 6.6: The field dependency of the Lorentz contraction

6.6 Field overlap

Field vectors can be superpositioned. In this manner the additional field E_z resp. H_z which depends on the velocity, according to equation 6.10, overlaps the respective basic field (E resp. H) to produce the measurable overall field (E_0 resp. H_0):

$$E_0 = E + E_z = E \cdot (1 - v^2/c^2) \quad (6.13)$$

$$H_0 = H + H_z = H \cdot (1 - v^2/c^2) \quad (6.13^*)$$

In the result something surprising the factor $(1 - v^2/c^2)$ appears, which is well-known from the special theory of relativity and for instance appears in the Lorentz contraction.

If we rewrite both equations for the characteristic factor and compare with the in a purely mathematical way, over the Lorentz transformation, won length contraction

$(1 - v^2/c^2) = (l/l_0)^2$, then it becomes clear that the Lorentz contraction physically seen should have its cause in the changed field conditions which a with relativistic speed moving body finds with regard to a resting body.

$$1 - \frac{v^2}{c^2} = \frac{E_0}{E} = \frac{H_0}{H} = \left(\frac{l}{l_0}\right)^2 \quad (6.14)$$

The equation is a compulsionless consequence of known physical laws. In this derivation actually no new factor was introduced and nevertheless a completely new picture for the natural scientific reality results^{<i>}.

In our observer system, where the field E_0 exists, a rule has its proper length l_0 . In another system, which is moving with the speed v relative to the observer, as a consequence of the here prevailing field E the corresponding rule has a length l . In which relation the factors stand to each other, is described by equation 6.14. Accordingly the following proportionality holds:

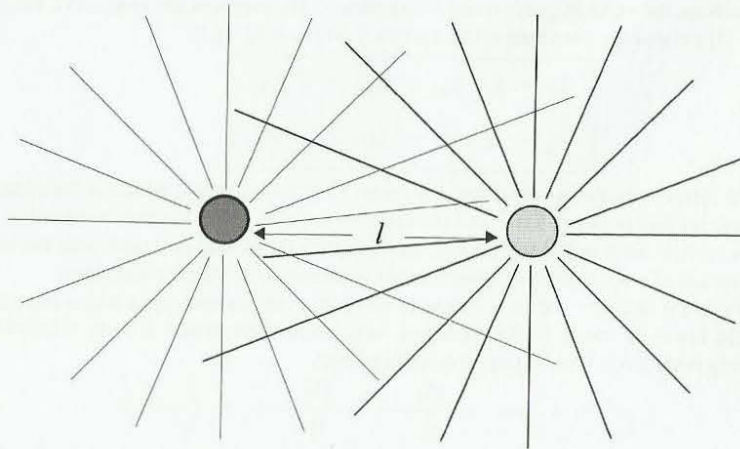
$$\boxed{E, H \sim 1/l^2} \quad \text{und} \quad \boxed{E_0, H_0 \sim 1/l_0^2} \quad (6.15)$$

If we are exterior to a very fast moving body with velocity v , we immediately can observe how this body for reason of its relative velocity experiences the calculated additional field and in this way experiences a length contraction. If the observer is moving along with the body, then he purely subjective seen doesn't detect a length contraction, because he himself and his entire measuring technique is subjected to the same length contraction.

From the axiomatic approach what would be, if the field, which itself only represents an experience, would determine perceptible space and its dimensions, quickly a fundamental realization can develop if the described experiences should coincide with real observations.

<i>: Because in this point of view the subjective status of the observer is determining, it is not completely impossible that there is an error in the interpretation of the equations of transformation (6.10 and 6.10*). But because we started from the same point of view of the observer for the derivation of the length contraction from the Lorentz transformation, here the same error is to be expected. In putting both results equal (6.14), a like constituted error on both sides will cancel out in any case and the result stays above all doubts.

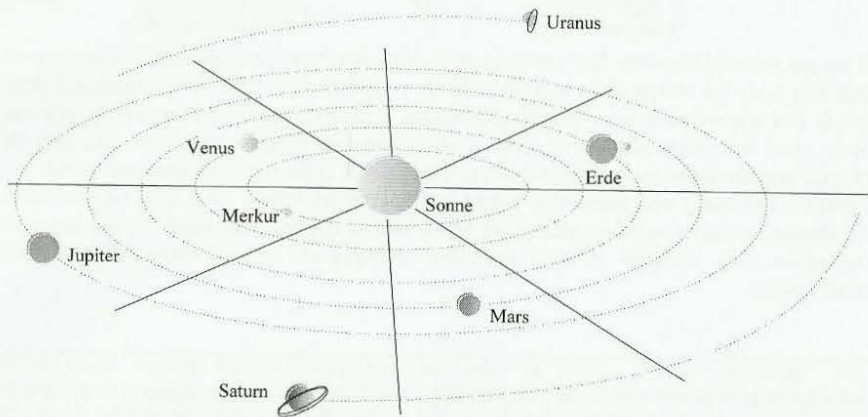
$$E, H \sim 1/l^2 \quad \text{and} \quad E_0, H_0 \sim 1/l_0^2 \quad (6.15)$$



(Model):

Two particles of matter each in the field of the other particle.

Two elementary particles or two accumulations of matter consisting of these are able to reduce the distance to each other for reason of their fields, which we interpret as a force of attraction.



B: (Example): The orbits of the planets in the field of the sun.

Fig. 6.7: The influence of the field on interactions.

6.7 Field dependent curvature of space

Let's assume, an accumulation of matter, as big as our earth, wanted to fly past the sun in the distance earth-sun. But it would not succeed. Because the fields arising from the sun decreases with increasing distance and according to equation 6.15 as a consequence the size of the particles of matter increases. The planet hence is more strongly contracted on its side turned towards the sun, as on the turned away "night side". It bends towards the sun and its flight path becomes a circular path around the sun. That is the *interaction known as gravitation*.

To an earth inhabitant this curvature reveals itself merely in the observation that the duration of sunshine at daytime is longer, than it would be expected to be under the assumption of the earth as a homogeneous sphere. In this context one willingly speaks of a curvature of space. Actually it is a curvature of matter under the influence of the field dependent length contraction.

Exactly this contraction the planets owe their circular orbits around the sun and by no means the equilibrium of forces between the force of attraction and the centrifugal force (fig. 6.7 B). It obviously is a fundamental mistake to think that gravitation would causally be connected with a force effect.

If, in this context, we speak of a force of attraction for the sake of our subjective observation, then we must realize that it merely can concern an auxiliary term founded in usefulness.

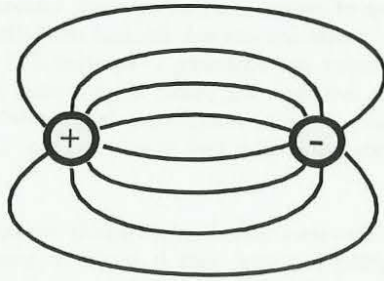
A thought experiment should bring us clarity (fig. 6.7 A). The field, which surrounds every particle of matter, reaches till infinity but becomes less effective with increasing distance. If the distance between two particles is l , then one particle is in the field of the other particle. As a consequence of the field the length l reduces and in this way the size determining field increases, which again leads to a further reduction of length etc. As a consequence it can be observed that both particles are moving towards each other. We speak of a force of attraction, because we can't register the influence of the field with our senses.

In this way the consistent result that we and our environment at daytime must be smaller than in the night will as well remain hidden. We experience the effect only indirectly as gravitational pull of the earth.

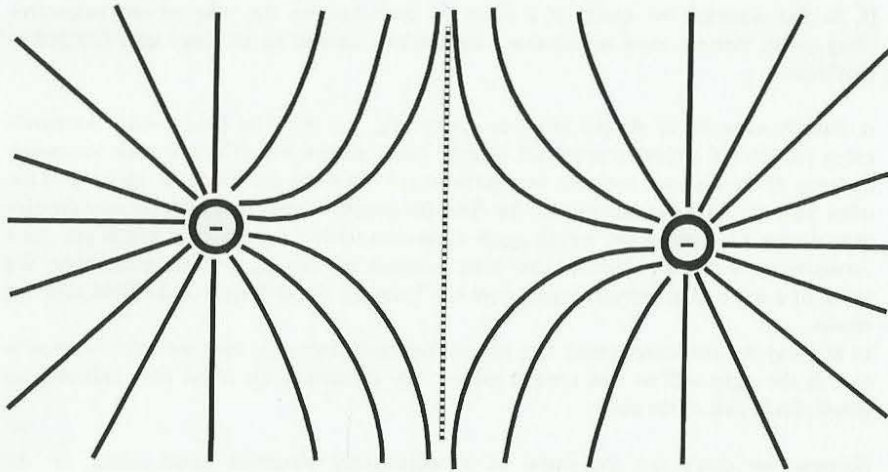
Because we don't see the cause of a subjectively observed force effect, for the electromagnetic interaction, just as for the gravitation, the field dependency of the length contraction will be responsible. Hence the following conclusion holds for both interactions equally way:

Two elementary particles or two accumulations of matter consisting of these are able to reduce the distance to each other for reason of their fields, which we interpret as a force of attraction.

Now the question still is open, why gravitation only knows forces of attraction, whereas the electromagnetic interaction also permits forces of repulsion and which are the causal fields for each.



A: The field lines of the E-field for unlike charged particles



B: The field lines of the E-field for equal charged particles

The electromagnetic interaction of a particle is a result of the influence of the open field lines arising from it on the dimensions of space.

Fig. 6.8: The influence of the open field lines of the E-field

6.8 Electromagnetic interaction

A convincing answer to the open question provides us the analysis of the course of the field lines, on the one hand for charged particles and on the other hand for uncharged particles, which do not participate in the electromagnetic interaction.

If at first we consider electrically charged particles, like e.g. electrons, protons or ions. Then all in common is that the towards infinity running field lines of the electric field are open. With this field the particle is able to interact with its environment. We measure a charge and an electromagnetic force effect. In the case of unequal charges, as is well-known, a field amplification and attractive acting forces are observed whereas for equal charges a field reduction results and repulsion is observed.

If we make a connection between the field conditions and the electromagnetic interaction in the sense of the proportionality (6.15), then the particle in reality is able to influence the distance to other particles merely with the help of its electric field. For unequal charges a compression of field lines arises, in which one particle stays in the focussed field of the other and vice versa. In this way a contraction of all lengths occurs and the observable attraction happens (fig. 6.8 A).

For equal charges the opposite case is present, in which even a local field freedom can occur (fig. 6.8 B). If the field tends towards zero on the dashed line, then the distance will go to infinity (according to eq. 6.15). Consequently, the observable effect that both bodies go away from each other, will reach to infinity.

Actually the electromagnetic interaction proves to be a result of the field dependent length contraction.

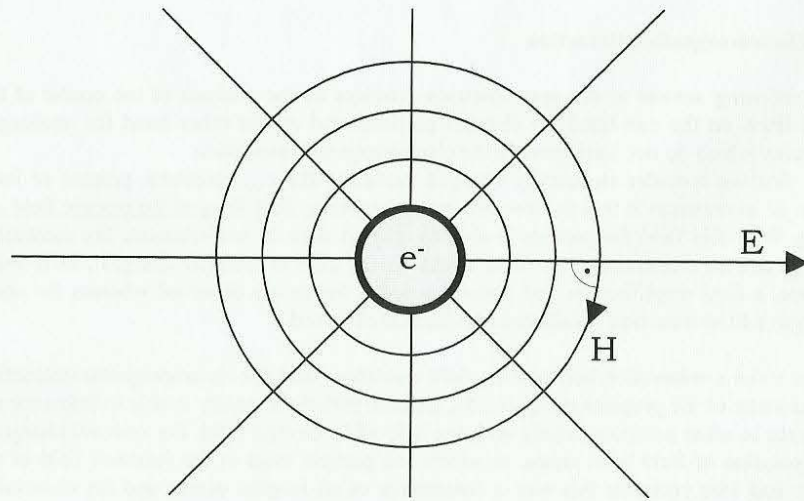
The electromagnetic interaction of a particle is a result of the influence of the open field lines arising from it on the dimensions of the space, in which it is.

It is important that the field lines are open, for which reason they are bent away from like charges and are directed towards unlike charges. Subjectively seen we find out that as a consequence of the field reduction repulsive force effects and as a consequence of the field compression attractive acting force effects are observed (fig. 6.8).

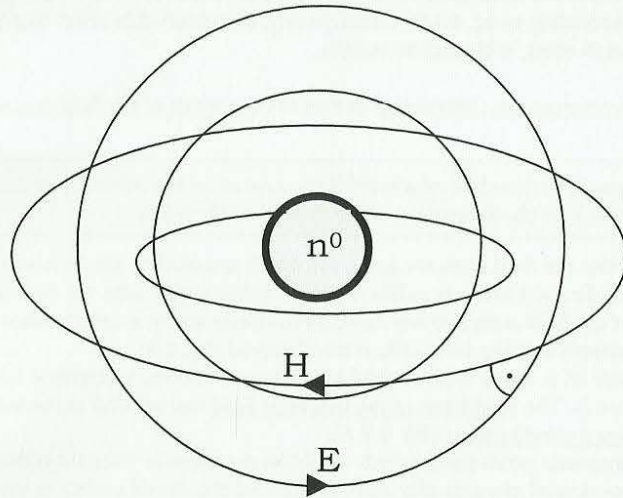
The consequence of every electric field is, as is well-known, a magnetic field standing perpendicular on it. The field lines of the magnetic field run parallel to the surface of the particle and have a closed course (fig. 6.9 A).

Therefore no magnetic poles form, which would be measurable. Seen from the outside the particle behaves neutral magnetically seen, because of the closed course of the field lines. An artificial field reduction and as a consequence observable forces of repulsion, like in the case of the electromagnetic interaction, hence in principle are impossible.

The effect of the magnetic field thus is limited to a geometrical manipulation of the environment, namely the curvature of space, with which we have founded the phenomenon of the attraction of masses and of the gravitation.



A: The open field lines of the E-field and the closed field lines of the H-field of an electrically charged particle (e.g. e^-)



B: The closed field lines of the E-field and H-field of an electrically uncharged particle (e.g. of the neutron n^0).

Gravitation is a result of the influence of the field lines with a closed course running parallel to the surface of the particles on the dimensions of the space, in which they are.

Fig. 6.9: The influence of the closed field lines of the H-field.

6.9 Gravitation

For uncharged, neutral particles (neutron, atom, molecule etc.) both the magnetic and the perpendicular on them standing electric field lines have a closed course. Now both run parallel to the surface of the particle (fig. 6.9 B).

As is said, the density of field lines with a closed course can't be influenced from the outside. If we approach a particle, the consequence of an increase of the density without exception is a decrease of the linear measures and thus a larger force of attraction. For this case of field lines with a closed course, for which in general it doesn't give a field attenuation and no forces of repulsion, there holds:

Gravitation is a result of the influence of the field lines with a closed course running parallel to the surface of the particles on the dimensions of the space, in which they are.

Both interactions logically have an infinite range. Both form a whole in the influence of the fields on the size conditions.

It surely is of the greatest importance that for this derivation of the field dependency of the Lorentz contraction from the known equations of transformation of the electromagnetic field we could do completely without the introduction of new factors of description or neglects.

Solely by consistent derivation and interpretation of the result the unification already has succeeded and the electromagnetic interaction and the gravitation could, with the derived field dependent Lorentz contraction, be traced back to a single basic phenomenon. Doing so we have to pay attention to the fact that the observer is subjected to the same Lorentz contraction as his measuring technique and therefore he can't see the field dependency at all. Merely as being an exterior observer it in rare cases will be possible to him to see the curvature of space in the presence of strong fields.

From this for an astronaut practical consequences result. If he namely would land on Jupiter, he would think flat hills to be gigantic mountains, that small he would be! Vice versa if he landed on the moon, high mountains would appear to be insignificant hills, not because of wrong altitude readings of the terrestrial mission control and measurement centre, but only because of his own body size. The astronauts of the Apollo missions were not prepared for this circumstance and after their landing on the moon were completely surprised, how little validity learned textbook physics has, hardly has one left the earth. They have brought photographs with them which prove the Lorentz contraction to depend on the field and therefore on gravitation.

The fact that force effects should arise from the interactions is an auxiliary concept and auxiliary description of the observing person founded in pure usefulness. The Lorentz force therefore shouldn't be regarded as cause anymore. It actually appears only as property of the field factors. Seen this way it only would be consistent to do without space charges and currents as a result of moving charges and to assume a source-free and quanta-free field description (fig. 6.4: $j = 0$).

From an unified theory it is demanded that it besides the electromagnetic interaction and the gravitation also is able to integrate the strong and the weak interaction. We will also solve this problem.

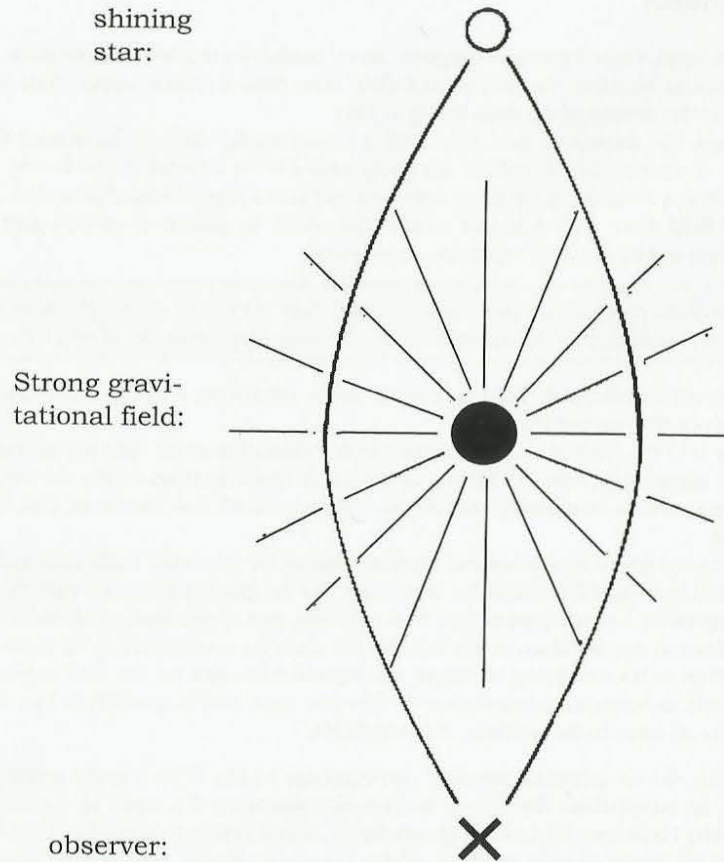


Fig. 6.10: Diversion of the light by a strong gravitational field.

$$\text{Speed of light of the wave: } c = \lambda \cdot f \quad (6.16)$$

For the wavelength λ holds (because of eq. 6.15): $E, H \sim 1/\lambda^2$

From equation (6.16) follows (with $f = \text{constant}$):

$$E \sim 1/c^2, \quad H \sim 1/c^2 \quad (6.17)$$

The speed of light depends on the field.

6.10 Field dependent speed of light

But not only matter is bent towards a gravitational field. If we only think of the much cited phenomenon that the ray of light of a star is diverted towards the sun, if it passes very close to the sun on its way to us, like this has been observed for the first time during an eclipse of the sun in 1919 (fig. 6.10).

Quite obviously the field of the sun also slows down the speed of light. On the side of the ray of light which is turned towards the sun, the field is somewhat larger and the speed of light correspondingly is slower than on the side which is turned away, and with that the ray of light changes its direction in the observable manner. Exactly this relation willingly is interpreted as a consequence of a curvature of space.

The extremely strong field of a black hole can divert the light down to a circular path, in order to in this way catch and bind it. The light now orbits the black hole like planets the sun.

At this point the open-minded reader already might have tapped the confirmation of the proportionality 6.2 ($c \sim r$), which has been derived from the vortex model (fig. 6.2).

The sceptic is offered still another derivation: for the borderline case that the relative velocity v tends towards the speed of light c (fig. 6.6), according to equation 6.13 the measurable overall field E_0 (and also H_0) will go to zero and equation 6.12, with $E_z = -E$ (and $H_z = -H$), will again turn into the wave equation (5.9*) after double differentiation (fig. 6.4).

The speed $v = c$ so to speak forms the escape velocity, with which the electromagnetic wave runs away from the cosmic field. Under these circumstances of course neither an attraction of masses nor an electromagnetic interaction can be exerted on the wave.

If E_0 goes to zero at the same time l_0 tends to infinity (equation 6.15, fig. 6.6); i.e. the wave spreads all through space. This result entirely corresponds to the observations and experiences.

For the wave length λ and in the end for the velocity of propagation c only the self-field of the wave E, H is responsible. Because of

$$c = \lambda \cdot f \quad (6.16)$$

and the proportionality from equation 6.15: $E, H \sim 1/\lambda^2 \quad (6.17^*)$

we obtain the new relation:

$$E, H \sim 1/c^2 \quad (6.17)$$

If the speed of light in the presence of matter decreases, then we now also know why. It is the field, which surrounds matter, that slows down the speed of light. Therefore a gravitational field is able to divert a ray of light in the same manner as matter which flies past. Finally moves the speed of light in the proportionality 6.17 to the place of the linear measure (in 6.15).

But if the rule fails one will try to replace by an optical measurement arrangement. In this manner the field dependency of the Lorentz contraction should be measurable; but it isn't!

From the comparison of the derived proportionalities:

$$(6.15): \quad (6.17) \quad E, H \sim \frac{1}{l^2} \sim \frac{1}{c^2}$$

follows:

$$l \sim c$$

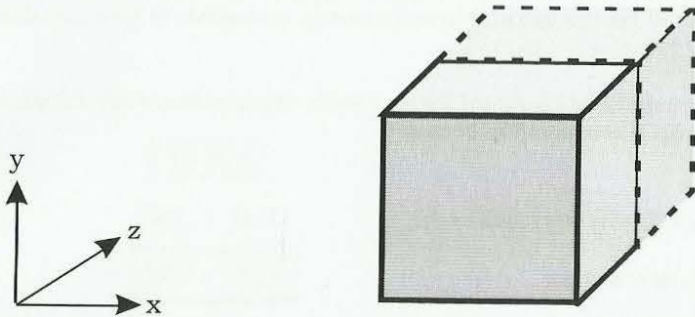
(6.18)

The speed of light is proportional to the measurement path.

The variable speed of light is being measured with itself.

The result at all events is a constant value.

The constancy of the speed of light is based on a measurement which is faulty from the principle.



Because of $c \sim r$: physical length contraction

Fig. 6.11: Derivation of the length contraction
(field dependent Lorentz contraction)

6.11 Universality

Why can't the rule be replaced by an optical measurement arrangement? The crucial indication provides the comparison of both derived proportionalities 6.15 and 6.17. According to them holds the same field dependency for both the Lorentz contraction and the speed of light:

$$1/l^2 \sim 1/c^2 \quad \text{oder} \quad \boxed{l \sim c} \quad (6.18)$$

If the rule has proved to be useless, then we will experience the same disaster if we measure optically, i.e. with the speed of light.

Obviously both, the length l and the speed of light c as a length per unit of time, depend in the same manner on the respective local field strength. On the one hand do both measuring methods lead to the same result; but on the other hand will anything which can't be measured with one method, neither be measured with the other method.

If now the speed of light is being measured optically, then the measurement path will be proportional to the speed of light and as a result will the unknown factor be measured with itself. The result of this measurement, which is faulty from the principle, at all events is a constant value, because here two variables which stand in direct proportionality to each other are related to each other.

Was the famous experiment of Michelson and Morley unnecessary, the result trivial? And how does it stand about the postulate of the universality of the speed of light?

If we for that consider a cube (fig. 6.11). And we assume that the speed of light is a vectorial quantity, which in our experiment is for instance in one direction twice as large, as in the direction of the other two space axes. By means of the mentioned influence of the speed of light on the spatial length is, as a consistent consequence, the cube along this edge pulled apart to a cuboid. We however register this spatial body with our eyes, which is with the speed of light and that has increased proportionally to the length of the edges, for which reason we as subjective observer still see a cube in front of us and not a cuboid. If we trust an apparent objective measurement more than our sense organ and measure the three lengths of the edges of the cuboid again with a rule then we get three times the same length, which is a cube.

We probably are dealing with an optical deception using the true meaning of the word.

If the by Einstein postulated universality and constancy of the speed of light in reality doesn't exist at all, we in no way would be capable to register this; neither to observe nor to measure it.

The Galilean theorem of the addition of speeds objectively seen still is valid, even if the fact that the speed of light apparently is independent of the speed of the source pretends us the opposite.

If for instance a light source is moved towards a receiving device or away from it, then the speeds will overlap, like for the passenger, who marches in a driving train against or in the driving direction through the corridor. For the ray of light also the fields, which influence the speed of light and the measurement equipment, overlap. As a consequence will a measuring technician, who himself is exposed to this overlapping field, always observe and "measure" the identical speed of light. The observer as a result imagines, there is an universality of the speed of light.

The field takes over the function of the aether.

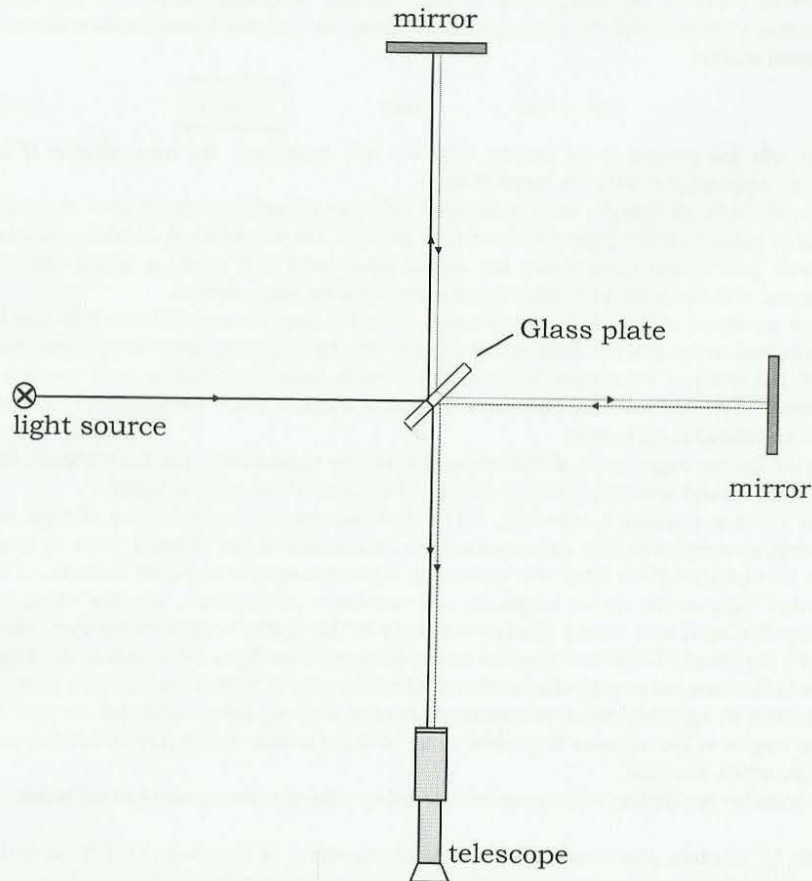


Fig. 6.12: Experiment of Michelson and Morley to detect an aetherwind ^{<i>}

<i>: A.P.French: Special Relativity, Massachusetts Institute of Technology, 1966.

<ii>: Nikola Tesla: "This is the same as writing a business letter and forgetting the subject you wish to write about". To Einstein's Theories, Rare Book and Manuscript Library, Columbia University, 15.4.1932.

<iii>: Einstein proceeds in the same manner with the time dilatation, by assuming a time constant by definition for the derivation to present at the end of his derivation a variable time. And with that he presents a result which contradicts his approach completely.

6.12 Aether

Important experiments like the one of Doppler concerning the redshift or the one of Bradley concerning the aberration of the stars show only too clearly, where the influence of the speed of light subjectively still is perceptible, or for laboratory experiments like the one of Michelson and Morley, where the influence isn't perceptible anymore, because the length of the interferometers always changes proportionally to the speed of light.

The look in the stars at the same time is a look in cosmic areas, where completely other field conditions prevail and as a consequence completely other values for the speed of light and for the dimensions of space are present. The mentioned observations suggest that we together with our measuring station are moving through the cosmos and therefore a relative velocity has to be present with regard to an aether which determines the respective speed of light.

If we however constrict our range of vision and retire in a laboratory, then we no longer are capable to observe the influence of the field on the speed of light. The experiments of Michelson which Maxwell had prompted to and which Morley with a higher precision had repeated with the goal, to detect the aether, inevitably had to turn out negatively. The laboratory experiments resulted in the misleading picture, as if the earth was resting in the aether.

The not understood measurements will suggest any observer, he forms the centre of the universe and everything rotates around him, entirely in the sense of the Ptolemaean view of life, which, although long ago abolished, here belated has experienced support.

With a Swabia caper Albert Einstein has prevented a relapse into the dark Middle Ages and removed the open contradiction in the question of the aether, which once is measured as moving and another time as resting, by without further ado abolishing the aether. With that he undoubtedly has solved a central problem of physics and at the same time created a new one. As is known does the speed of light have a certain value, and therefore the question is raised, what determines its size. Exactly for this purpose a luminiferous aether had been introduced, however it is constituted.

Scientifically it does make little sense, to make an assumption, if at the end of the derivation the prerequisite is deleted without substitute. In such a case either in the approach or in the derivation is a principal error^{<iii>}. Nikola Tesla comments on the working method of Einstein with the applicable comparison, as if Einstein had, while he was writing a business letter, forgotten completely the subject he wanted to write about (fig. 6.12^{<ii>}).

The answer, which removes all contradictions and is entirely in accord with all observations and measurements, is obvious. Naturally a luminiferous aether exists, which determines the velocity of propagation and of course it by no means is bound to the observer.

As has been derived in figures 6.5 and 6.6, will for a relative velocity v arise a field, which according to proportionality 6.17 determines the speed of light. With that we have derived completely:

The field takes over the function of the aether.

The equations 6.10 also answer the question, why no aetherwind is being observed, although such a wind actually is present: we experience, as we have discovered, an E-field with „head wind“ as a resting H-field and vice versa and therefore we aren't capable to detect the head wind in the aether.

Key questions of quantum physics (fig. 4.4 + continuation):

IV. Why do the particles have the form of spheres?

(with increasing E-field decreases c)

VIII. Why is the elementary quantum localized?

(in the vortex centre: $c = 0$, see figures 4.3 and 6.2)

IX. Why do the elementary particles have a spin?

(spherical form demands field compensation)

X. Why is the magnitude of the spin quantized?

(cosmic basic field determines the need of E_z)

XI. Why can speeds faster than light occur in a tunnel?

(a reduction of the cosmic basic field can only be realized locally in a tunnel)

to XI:

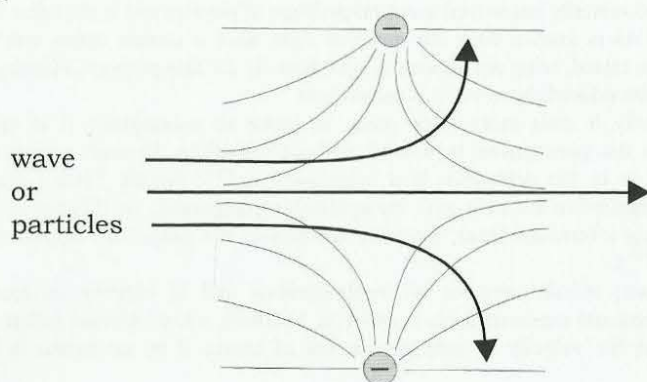


Fig. 6.13: Consequences concerning the field dependency of the speed of light: spin effect and tunnel effect ^{<i>i,ii>}

<i>: Nimtz, G.: Instantanes Tunneln, Tunnelexperimente mit elektromagnetischen Wellen, Phys.Bl.49, VCH Weinheim (1993) Nr.12, S. 1119-1120<*>

<ii>: Thoma, P., Weiland, T.: Wie real ist das Instantane Tunneln? Phys.Bl.50, VCH Weinheim (1994) Nr.4, S. 359-361<*>

<*>: The measurement results are in accord with the theory of objectivity, not however the contradictory attempts to interpret them <i> and <ii> et al.

6.13 Spin and tunnel effect

Only with the field dependency of the speed of light (6.17) we can understand, why the *elementary quanta* can form *as spheres*, like is drawn in the figs 4.3 and 6.2. In the *centre* the field lines run together, i.e. the *field increases and the speed of light decreases*. Only in this way it will be possible for the vortex oscillation to everywhere occur with the speed of light, even in the inside of the particle. In the centre of the vortex particle the field in theory will become infinitely large and the *speed of light zero*. This circumstance again is the foundation why the *elementary particles are localized* and it answers key question VIII of quantum physics. The absence of a speed after all is the characteristic of an immobile thing.

The field dependency of the speed of light answers also further basic and up to today unanswered key questions of quantum physics, like why the elementary particles have a spin (IX) and why the magnitude of the spin is quantized (X).

A vortex particle after all does not exist alone in the world, but it is in the field of other particles. We can call this the cosmic basic field (E resp. H). This basic field overlaps the self-field and takes effect the strongest in the area of the spherical shell, where the self-field is correspondingly small. In order to keep the form of a sphere, this influence of the basic field has to be compensated. The *additional field* (E_z resp. H_z according to eq. 6.12) *necessary for the compensation* is produced by the particle, by rotating in a spiral around itself with a speed v which increases towards the outside of the spherical shell. Therefore does the elementary particles have a spin. The electron spin is therefore determined by the cosmic basic field.

Another effect of the field dependent speed of light is the tunnel effect. As an example we consider the two differently charged particles shown in fig. 6.8 A. The open, outside of the particles running, field lines of the electric field are predominantly bent towards the each time oppositely charged particle. If another particle wants to pass between the two, then it gets into an area of increased field strength. As a consequence it will be slowed down, because here a smaller speed of light is present.

Water molecules show with their polar nature exactly this property. Water has a remarkably high dielectricity ϵ and slows down the speed of light correspondingly according to equation 5.6 ($\epsilon \cdot \mu = 1/c^2$). The refraction of light at the water surface is an observable result of the reduced speed of light in the presence of matter.

If we now examine the case in which the two particles have the same charge as is shown in fig. 6.8 B (and fig. 6.13 belonging to XI). The field lines repel each other, so that exactly in between the two particles a field free area forms, in which the speed of light goes to infinity! This area acts like a tunnel. If we send through a particle exactly here, then purely theoretically seen it won't need any time to run through the tunnel, and for a short time the signal becomes infinitely fast.

If a particle hits only slightly besides the tunnel, then it will one-sidedly be slowed down and diverted by the respective field. We call this process reflection or scattering. Only the few particles, which exactly hit the tunnel, arrive behind the hurdle and in the ideal case even almost without loss of time.

The current measurements of speeds faster than light demonstrate in a convincing manner the superiority of the field-theoretical approach with regard to the nowadays normally used quantum physical approach.

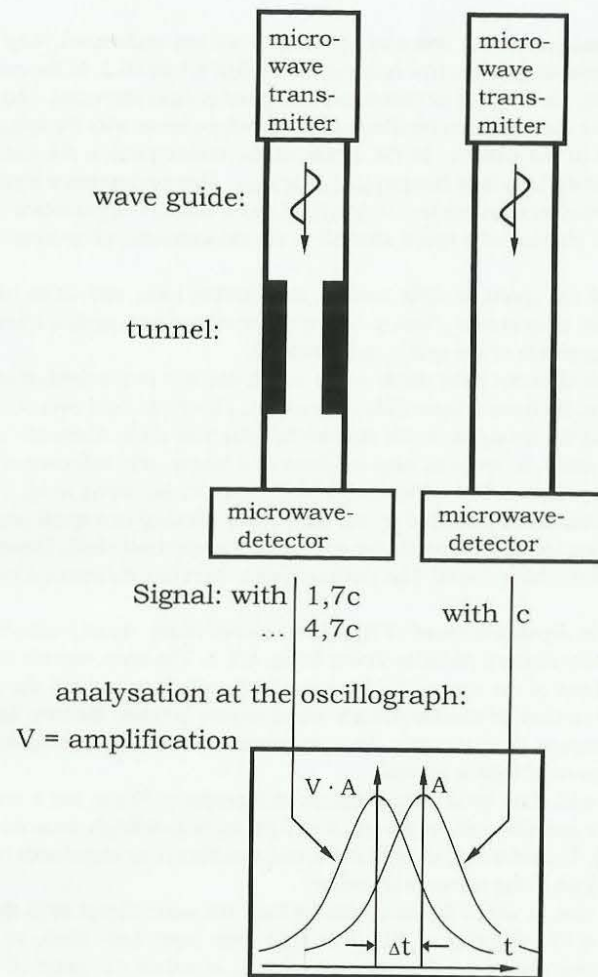


Fig. 6.14: The microwave experiment at the II. Physical Institute of the University of Cologne to measure speeds faster than light.^{<i>}

<i>: Nimtz, G.: New Knowledge of Tunneling from Photonic Experiments, Proc. of the Adriatico Research Conference, 1996, World Scientific Publishing Company

6.14 Interpretation of the measured speed faster than light

Now the attempt can be undertaken, to interpret the spectacular experiments, in which a speed faster than light has been measured. It is reported^{<ii>} that in experiments with photons at the University of California in Berkeley on an average a speed of 1.7 times the speed of light has been measured by Prof. Raymond Chiao and his co-workers. At the Technical University of Vienna Prof. Dr. Ferenc Krausz already has obtained 2.4 times the, according to Einstein at maximum obtainable, speed of light with tunnelling laser light.

The first measurements of speeds faster than light have been carried out with microwaves at the University of Cologne^{<ii>} by Prof. Dr. Günter Nimtz and co-workers. They at first had published the measurement of a speed 2.5 times the speed of light. In the meantime they even have transmitted a symphony of Mozart with a speed almost 10 times the speed of light and with that have contradicted Einstein's hypothesis, according to which the speed of light in vacuum would be the highest possible speed for the transmission of signals. The different experiments only resemble each other in the point that the particles have to tunnel, because one has put a barrier in their way. This "tunnelling" apparently is the cause for obtaining speeds faster than light. With the prevailing physical view of life these measurement results are incompatible.

In the measurement set up in Cologne the microwaves are sent through a wave guide, which they pass with the speed of light. If a parts with narrowed cross-section is inserted, where the microwaves actually don't fit through at all, then the signal gets damped strongly. Now however arrives nevertheless a small part of the signal at the other end of the wire, but much faster than allowed, namely with the measurable speed faster than light. The answer of the here presented potential vortex theory reads as follows: the waves picked up by the wave guide run up to the entry of the tunnel, in order to find out that they don't fit through. They are reflected or absorbed. A small part however rolls up to potential vortices and these fit through the tunnel. They however have to be compressed additionally. In the derivation of the photon (fig. 4.5 and 4.6) we had seen that the inner vortex always is faster than the bigger one, through which it slips through. The compression therefore causes an increase in speed. In flow dynamics is known an analogy: the Venturi-tube. The flow-technical potential vortices also confirm exactly this property. One can as well start with the Lorentz contraction (fig. 6.6, eq. 6.14^{*}). This states that a particle moving with a higher speed actually becomes smaller and not only appears to be smaller as an optical deception of the observer. Because only smaller particles fit through the tunnel, the particles, measurable at the other end, must be correspondingly faster; quod erat demonstrandum. In the same manner also the experiments of Berkeley can be explained physically, because here is worked with photons from the start^{<i>}. With that the process of rolling up the wave can be left out. The tunnel lets pass only compressed and therefore faster light particles.

<i>: R.Y.Chiao, P.G.Kwiat, A.M.Steinberg: Schneller als Licht? Spektrum der Wiss. 10/93

<ii>: B. Schuh, Gespenstisch fixe Wellen, DIE ZEIT Nr. 45, 5.11.93, S. 43.

<ii>: Enders, A., Nimtz, G.: Photonic-tunneling experiments, Physical Review B, Vol. 47, No. 15 (1993), pp. 9605-9609.

<ii>: Enders, A., Nimtz, G.: Evanescent-mode propagation and quantum tunneling, Physical Review E, Vol. 48, No.1 (1993), pp. 632-633.

"The theory of relativity is not a physical theory... it is a mathematical poetic idea, a deduction from impossible premises."^{<i>}

Oskar Kraus

"The theory of relativity is a mathematical masquerade, behind which is hidden an inextricable ball of a mixing up of ideas, contradictions, fallacies, arbitrary assumptions and ignoring of healthy logic."^{<i>}

Erich Ruckhaber

"The theory of relativity not only is fantastic, but also of an inconsistency which in the history of science not yet has been present."^{<i>}

Harald Nordenson

"A physics of hybrids, of contradictions and fantastic confusions, nonsense!"^{<ii>}

Johann Marinsek

"This is absurd."^{<iii>} (regarding mass-energy interpretation)

Nikola Tesla

"In my experiments I have destroyed billions of atoms, without having observed any emissions of energy."^{<4i>}

Nikola Tesla

Fig. 6.15: Some statements regarding the theory of relativity.

<i>: Walter Theimer: Die Relativitätstheorie, Seite 7, Francke Verlag, Bern, 1977, ISBN 3-7720-1260-4

<ii>: Johann Marinsek: Rationale Physik, S. 163, dbv-Verlag TU Graz, 1989, ISBN 3-7041-0176-1

<iii>: Nikola Tesla, To Einstein's Theories, Rare Book and Manuscript Library, Columbia University, 15.4.1932. Entnommen aus J.T.Ratzlaff: Tesla Said, Tesla Book Company, pp. 238, ISBN 0-914119-00-1

<4i>: Nikola Tesla, Franz Ferzak World and Space Publications 1985.

6.15 Definition of the speed of light

If a light signal propagates in space, then as a consequence of the velocity of propagation c , it at a certain point in time t is in a distance r of the light source:

$$r = c \cdot t \quad (6.19)$$

Should the speed of light become smaller for instance by Δc , then the light signal obviously has covered a distance less by Δr or the time interval has changed by Δt :

$$r + \Delta r = (c + \Delta c) \cdot (t + \Delta t) \quad (6.20)$$

This equation describes purely mathematically the most general case which can be assumed. By writing out the multiplication and subtraction of equation 6.18 the change in distance considered for itself is:

$$\Delta r = c \cdot \Delta t + t \cdot \Delta c + \Delta c \cdot \Delta t \quad (6.21)$$

The answer of mathematics is that the change in distance can have its cause in a change in time, in a change of speed or in both. We now want to turn to the physical interpretation and have a closer look at the two possibilities, in which either c or t is to be taken constant (see fig. 6.16).

In the first case the speed of light c is constant and as a consequence the change $\Delta c = \text{zero}$. The mathematical formulation (according to eq. 6.21) therefore reads:

case 1:

$$c = \frac{\Delta r}{\Delta t}$$

(relativity)

(6.22)

If in this conception world a change in distance is observed, for instance the Lorentz contraction, then in order to save this relation inevitably a change in time, for instance a time dilatation, has to make the compensation. Einstein in an applicable manner speaks of relativity, because according to his opinion in the case of both variables, the length contraction and the time dilatation, it only concerns observed changes.

For the time dilatation experiments are given. But for the measurement of time always only atomic clocks are available and their speed of running of course could also be influenced by the Lorentz contraction. In any case it can't be claimed the time dilatation is proven experimentally as long as we do not know the mechanisms of decay of atoms. Otherwise the statements of the theory of relativity are familiar to us, for which reason further remarks seem unnecessary.

In the second case the time t is constant and consequently the change $\Delta t = \text{zero}$. At a closer look this case is much more obvious, since why should time change. After all time has been stipulated by definition.

After all, we are the ones who tell, what simultaneity is.

The mathematical formulation for this case reads (eq. 6.21 with $\Delta t = 0$):

case 2:

$$\Delta c = \frac{\Delta r}{t}$$

(objectivity)

(6.23)

This equation does open up for us an until now completely unknown and fundamentally other way of looking at the physical reality.

Concerning the definition of the speed of light c [m/s]:

r [m] = distance of the light source:

$$r = c \cdot t \quad (6.19)$$

For changes, observed or measured:

$$r + \Delta r = (c + \Delta c) \cdot (t + \Delta t) \quad (6.20)$$

$$= c \cdot t + c \cdot \Delta t + \Delta c \cdot t + \Delta c \cdot \Delta t$$

Change in distance:

$$\Delta r = c \cdot \Delta t + t \cdot \Delta c + \Delta c \cdot \Delta t \quad (6.21)$$

2 possible causes:

with $\Delta c = 0$
case 1:

$$c = \frac{\Delta r}{\Delta t} \quad (6.22)$$

$c = \text{constant}$

$$\Delta r \sim \Delta t \quad (6.23)$$

= time dilatation

Δr = observable
length contraction

Theory of relativity

with $\Delta t = 0$
case 2:

$$\Delta c = \frac{\Delta r}{t} \quad (6.23)$$

$t = \text{constant}$

$$\Delta c \sim \Delta r \quad (6.25 = 6.2)$$

= universality

Δr = physical
length contraction

Theory of objectivity

Fig. 6.16: Theory of relativity and theory of objectivity, derivation and comparison.

6.16 Relativity and objectivity

New to the second case (equation 6.23) is particularly the proportionality contained in it:

$$\Delta c \sim \Delta r \quad (6.25 = 6.2)$$

But to us it is not new, because we have derived the same proportionality from the model concept (equation 6.2, fig. 6.2), in which the elementary particles are understood as spherical vortices.

Equation 6.25 unconcealed brings to knowledge that any change of the speed of light c [m/s] in the same way leads to a change of the radius r [m], the distance between two points in space or even the length of an object, e.g. a rule. Such a rule after all consists of nothing but spherical atoms and elementary particles and for their radius r again the proportionality 6.25 holds. Therefore it is to be set:

$$r \sim l \quad (6.26)$$

und taken both together we already had derived as equation 6.18 (fig. 6.11) from the field dependency. Here the vortex model as well finds a confirmation of its correctness, as in the derivation from the equations of transformation of the electromagnetic field. Because all three, the derivation according to the model, the physical and the mathematical derivation, lead to the same result, this second case should be called "objective".

With that the first case, which describes the subjective perception of an observer, is not supposed to be devaluated. It contains the *definition of reality, according to which only is real what also is perceptible*. The theory of relativity of Poincaré and Einstein is based on this definition.

With the second case, the case with a variable speed of light, we however get serious problems, since we observe with our eyes, and that works with the speed of light. If that changes, we can't see it, as already said. If we could see it, then "reality" would have a completely different face and we surely would have great difficulties, to find our way around. In this "objective world" neither electromagnetic interactions nor gravitation would exist, so no force effects at all. Because all distances and linear measures depend on the speed of light, everything would look like in a distortion mirror.

The concept of an "objective world" at first has not a practical, but rather a theoretical and mathematical sense. The distinction between an observation domain and a model domain is founded in pure usefulness.

The *observation domain* should correspond to *case 1* and the *model domain* to *case 2*. The mathematical derivation tells us, how we can mediate between both domains (equation 6.21): This mediation amounts to a *transformation*, which provides us the instruction, how a transition from the observation into a not perceptible model concept, from the relativity into an objectivity has to.

Theory of relativity	Theory of objectivity
<p>speed of light: $c = \text{constant}$</p> $c = \frac{\Delta r}{\Delta t} \quad (6.22)$ <p>consequences: time dilatation and length contraction observable</p>	<p>absolute time: $t = \text{constant}$</p> $\Delta c = \frac{\Delta r}{t} \quad (6.23)$ <p>consequences: universality and length contraction real</p>

model-transformation:

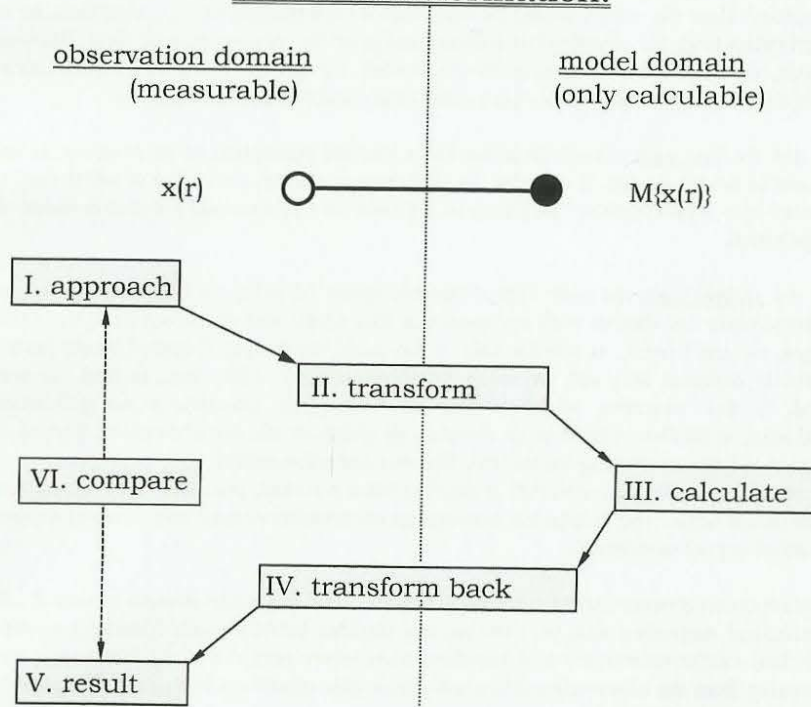


Fig. 6.17: Model-transformation between
theory of relativity and theory of objectivity.

6.17 Transformation

The **observation domain** is, as the name already expresses, perceptible (observable) with the help of our sense organs and measurable with corresponding apparatus. The special theory of relativity for the most part provides us the mathematics needed for that. And in that is assumed a constant speed of light. Because a length contraction is being observed and can be measured, a time dilatation must arise as a consequence. Such is the consistent statement of this theory. Because we already could make us clear that it concerns a subjective theory, of course caution is advisable if generalizations are being made, like the one of the inductive conclusion of the length contraction on the time dilatation. We'll come to speak about that in this chapter (fig. 6.20).

The **model domain** however is not observable to us and only accessible in a mathematical manner. Here the time is a constant. On the other hand do the radii of the particles and all other distances and linear measures stand in direct proportionality to the speed of light. If that changes, then does that lead to a change in length. The length contraction occurs physically, which means actually. We propose the name "theory of objectivity" for the valid theory which is derivable with this prerequisite and independent of the point of view of the observer.

The importance of this model domain and of the possible model calculations is founded in the circumstance that many physical relations within our observation domain aren't recognized by us and can't be mathematically derived. Besides is only all to often worked with unallowed generalizations and with pure hypotheses. Such a thing does not even exist in the model domain.

The model domain can be tapped over a **transformation**. For that we select an approach $x(r)$ in the to us accessible observation domain. This then is transformed into the model domain by a calculation instruction $M\{x(r)\}$. Here we can calculate the sought-for relation in the usual manner and transform back again the result according to the same calculation instruction $M^{-1}\{x(r)\}$ but in the reversed direction. After being returned in our familiar observation domain, the result can be compared and checked with measurement results (fig. 6.17).

In this way we will derive, calculate and compare the quantum properties of the elementary particles with the known measurement values. Here we remind you of the fact that all attempts to calculate the quantum properties conventionally, without transformation, until now have failed. Not even a systematization may succeed, if it concerns for instance explanations for the order of magnitude of the mass of a particle.

A transformation at first is nothing more than an in usefulness founded mathematical measure. But if a constant of nature, and as such the quantum properties of elementary particles until now have to be seen, for the first time can be derived and calculated with a transformation then this measure with that also gains its physical authorization.

We now stand for the question: how does the instruction of transformation $M\{x(r)\}$ read, with which we should transform the approach and all equations from the observation domain into the model domain?

general relations:	special theory of relativity	theory of objectivity
domain of validity:	observation domain	model domain
speed of light c [m/s]:	$c = c_0$ = constant	$c \sim r$ (6.25)
field strengths (6.15)	(6.15) + (6.18)	
H [A/m]:	$H \sim 1/r^2$	$H \sim 1/r$ (6.27*)
E [V/m]:	$E \sim 1/r^2$	$E \sim 1/r$ (6.27)
because of eq. (5.6) $\varepsilon \cdot \mu = 1/c^2$ is valid:		
μ [Vs/Am]:	$\mu_0 = \text{const.}$	$\mu \sim 1/r$ (6.28*)
ε [As/Vm]:	$\varepsilon_0 = \text{const.}$	$\varepsilon \sim 1/r$ (6.28)
relations of material: $B = \mu \cdot H$ (3.5): B [Vs/m ²]	$B \sim 1/r^2$	$B \sim 1/r^2$ (6.29*)
$D = \varepsilon \cdot E$ (3.6): D [As/m ²]	$D \sim 1/r^2$	$D \sim 1/r^2$ (6.29)
e.g. spherical capacitor capacity: C [As/V] = $\varepsilon 4\pi r$ (6.4)		$C = \text{const.}$ (6.30)
charge: Q [As] = $C \cdot U$ (6.31)		$Q = \text{const.}$ (6.32)
energy: W [VAs] = Q^2/C (6.1)		$W = \text{const.}$ (6.33)
with energy-mass relation: (5.24) and (6.1) $W = mc^2$		
mass m [kg = VAs ³ /m ²]		$m \sim 1/r^2$ (6.34)
relaxation time τ_1 [s]:		$\tau_1 = \text{const.}$ (6.35)
with $\tau_1 = \varepsilon/\sigma$ (5.3)		
specific conductivity σ [A/Vm]:		$\sigma \sim 1/r$ (6.36)

Fig. 6.18: Transformation of the dependencies on radius

6.18 Transformation table

The attempt to write down at this point already a closed mathematical relation as instruction of transformation, would be pure speculation. Such an instruction first must be verified by means of numerous practical cases, i.e. be tested for its efficiency and correctness. But we not even know the practical examples necessary for this purpose, if we apply the transformation for the first time.

For this reason it unfortunately is not yet possible, to calculate absolute values in a direct way. We have to be content to work with proportionalities and to carry out comparisons. In fig. 6.18 the proportionalities are compared in the way, how they would have to be transformed: on the left side, how they appear and can be observed in the view of the special theory of relativity, and on the right side, how they can be represented and calculated in the theory of objectivity.

The change, which here would have to be transformed, is the physical length contraction, which is the change in length as it depends on the speed of light. For spherical symmetry the length l becomes the radius r (eq. 6.26), of which is to be investigated the influence.

In the observation domain we had derived the proportionality (6.15 + 6.18):

$$E \sim 1/r^2 \quad \text{und} \quad H \sim 1/r^2.$$

The field of a point charge or of a spherical capacitor confirms this relation:

$$E = Q/\varepsilon 4\pi r^2.$$

Because the speed of light in our observation is constant, also both constants of material which are related to it (eq. 5.6: $\varepsilon \cdot \mu = 1/c^2$), the dielectricity ε and the permeability μ , are to be taken constant.

With that the same proportionality as for the field strengths also holds for the induction B and the dielectric displacement D :

$$B \sim 1/r^2 \quad \text{and} \quad D \sim 1/r^2.$$

In the model domain everything looks completely different. Here the radius and any length stands in direct proportionality to the speed of light. In this way we get problems with our usual system of units, the M-K-S-A-system (Meter-Kilogram-Second-Ampere). The basic unit Meter [m] and as a consequence also the unit of mass Kilogram [kg = VAs³/m²] appear here as variable. It would be advantageous, to introduce instead the Volt [V] as basic unit.

But in any case does the dimension of a quantity show us, in which proportionality it stands to the unit of length. This in the model domain then is authoritative! As an example does the speed of light have the dimension Meter per Second. In the model domain there consequently has to exist a proportionality to the length r [m].

The speed of light determines with equation 5.6 again the constants of material:

$$\mu$$
 [Vs/Am] $\sim 1/r$ and ε [As/Vm] $\sim 1/r$ (6.28)

According to the model holds unchanged:

$$B$$
 [Vs/m²] $\sim 1/r^2$ and D [As/m²] $\sim 1/r^2$. (6.29)

But if we insert the proportionalities 6.28 and 6.29 into the equations of material 3.5 and 3.6, then holds for the field strengths:

$$H$$
 [A/m] $\sim 1/r$ and E [V/m] $\sim 1/r$. (6.27)

Further dependencies of the radius can be read in the same manner either by inserting into well-known laws or immediately from the dimension.

In the observation domain:

energy density of a field:

$$w = (\varepsilon \cdot E^2 + \mu \cdot H^2)/2 \sim 1/r^4 \quad (6.37)$$

energy: $W \sim 1/r \quad (6.38)$

with $c = \text{constant}$ and $W = m \cdot c^2$: $m \sim 1/r \quad (6.39)$

e^- is bigger and lighter than p^+ or n^0 !

$$\frac{m}{m_0} \stackrel{(6.39)}{=} \frac{r_0}{r} \stackrel{(6.26)}{=} \frac{l_0}{1} \stackrel{(6.24^*)}{=} \frac{1}{\sqrt{1 - (v/c)^2}} \quad (6.40)$$

In the model domain:

e.g. spherical capacitor

capacity: $C [\text{As/V}] = \varepsilon 4\pi r \quad (6.4) \quad C = \text{const.} \quad (6.30)$

charge: $Q [\text{As}] = C \cdot U \quad (6.31) \quad Q = \text{const.} \quad (6.32)$

energy: $W [\text{VAs}] = Q^2/C \quad (6.1) \quad W = \text{const.} \quad (6.33)$

(6.33) means: law of conservation of energy!

relaxation time $\tau_1 [\text{s}]$: $\tau_1 = \text{const.} \quad (6.35)$

with $\tau_1 = \varepsilon/\sigma \quad (5.3)$

specific conductivity $\sigma [\text{A/Vm}]$: $\sigma \sim 1/r \quad (6.36)$

(6.36) means: elementary vortices are indestructible!

Fig. 6.19: Interpretation of the dependencies on radius

6.19 Interpretation of the transformation table

The transformation should tell us, what we would see if the variable speed of light would be observable to us. Doing so highly interesting results come out.

The energy density of a field is as is known $w = (\varepsilon \cdot E^2 + \mu \cdot H^2)/2 \quad (6.37)$

In the **observation domain** will, according to fig. 6.19, decrease the energy density w proportional to $1/r^4$. Multiplied with the respective volume we obtain for the energy itself the proportionality: $W \sim 1/r \quad (6.38)$

If we make use of the Einstein relation $W = m \cdot c^2$ with $c = \text{constant}$ holds also for the mass m : $m \sim 1/r \quad (6.39)$

In this manner we finally find out, why the small nucleons (protons and neutrons) subjectively seen are heavier than the very much larger electrons. As a consequence does a relativistic particle experience the increase of mass (with the length contraction according to equation 6.24*):

$$\frac{m}{m_0} \stackrel{(6.39)}{=} \frac{r_0}{r} \stackrel{(6.26)}{=} \frac{l_0}{1} \stackrel{(6.24^*)}{=} \frac{1}{\sqrt{1 - (v/c)^2}} \quad (6.40)$$

This result is experimentally secured. Our considerations therefore are entirely in accord with the Lorentz-transformation. There at least is no reason to doubt the correctness.

In the model domain we with advantage assume a spherical symmetry. As easily can be shown with equations 6.4 and 6.31, are the capacity and charge of a spherical capacitor independent of the radius (6.30 and 6.32). In that case also the from both values calculable energy (6.1) must be constant. We come to the same conclusion, if take we the above equation 6.37 for the energy density of a field or if we carry out a verification of dimensions:

$$W [\text{VAs}] = \text{const.} \quad (6.33)$$

This simple result is the physical basis for the **law of conservation of energy**. With that we have eliminated an axiom.

The result states that the energy stays the same, even if the radius, the distance or the speed of an object should change. To the subjectively observing person it shows itself merely in various forms of expression. Consequently is the energy, as is dictated by the here presented field theory, formed by binding in the inside of the quanta the same amount of energy but of the opposite sign. The amount of energy therefore is bound to the number of the present particles, as we already had derived.

Under the assumption of a constant time (6.35) there results for the electric conductivity σ , by calculating backwards over the equation of the relaxation time (5.3), the proportionality:

$$\sigma [\text{A/Vm}] \sim 1/r \quad (6.36)$$

Maybe the result surprises, because it can't be observed. Actually we know that the macroscopically observed conductivity in reality only represents an approximated averaged measure for the mobility of free charge carriers. In a particle-free vacuum however this well-known interpretation doesn't make sense anymore. Hence it is recommended, to only work with the relaxation time constants. Who nevertheless wants to continue to work with σ as a pure factor of description, can do this. But he mustn't be surprised, if in the model domain with decreasing radius the conductivity suddenly increases. But this is necessary, because otherwise the elementary particles would collapse. Only by the increase of the conductivity, which is produced by the spherical vortex itself, will the expanding eddy current build up in the inside of the particles, which counteract the from the outside concentrating potential vortex.

Approach:

- a. The particles don't decay by themselves, but only by a corresponding disturbance from the outside.
- b. The decay time is the statistical average in which such a disturbance can occur and take effect.
- c. The elementary particles consist of an integral and finite number of elementary vortices, which can't decay anymore for their part.
- d. If the compound particles get into the disturbing range of influence of high-frequency alternating fields, then they are stimulated to violent oscillations and in that way can be torn apart into individual parts.
- e. As disturbing factor the high-frequency fields of flying past neutrinos are considered primarily.
- f. Authoritative for the threshold of decay and with that also for the rate of decay is the distance, in which the neutrinos fly past the particle.
- g. The distance becomes the larger, the smaller the particle is. If the particle thus experiences a relativistic length contraction, then it will, statistically seen, to the same extent become more stable.

That has nothing to do at all with time dilatation.

We are entitled to demand a simultaneity, after all we are the ones, who tell what that is.

Fig. 6.20: Proposal for an interpretation of the particle decay

<i>: Walter Theimer: Die Relativitätstheorie, Seite 106, Francke Verlag, Bern, 1977, ISBN 3-7720-1260-4

6.20 Particle decay

We still have to get rid of a fundamental misunderstanding. It concerns the problem of the time dilatation. Here the model domain doesn't give us any difficulty, because it dictates a constant and therefore by us definable time. In the relativistic view however should in moving systems clocks go wrong. But how does one want to explain a time dilatation physically, if it merely represents a purely mathematical result of the actually taking place length contraction on the one hand and the postulate of a constant speed of light on the other hand?

Nobody has troubled more about the physical interpretation than Einstein himself. But he had as less as we nowadays the possibility to verify the so-called phenomenon experimentally, by accelerating a laboratory clock to values close to the speed of light.

Only atomic particles can, e.g. in accelerator systems, be brought on such high speeds and then be observed for their properties. But also these experiments don't have any power of proof, as long as we don't know the atomistic structure of the particles and there exists the danger of misinterpretations.

So the slowing down of the rate of decay of instable particles at high speeds willingly is cited as "proof" for time dilatation^{<i>}. "The most cited example for the time dilatation is the "long-living" meson. The μ -meson is a charged particle, which exists only $2,2 \cdot 10^{-6}$ seconds if it is observed in rest. Then it decays ... About 10 % of the mesons reach the earth's surface. Even if they fly with approximately the speed of light, they at least must have used $30 \cdot 2,2 \cdot 10^{-6}$ seconds, in order to reach the earth. Their "life" therefore by the movement has been extended for a multiple... to the supporters of the theory of relativity here the time dilatation is revealed..."

This "proof" however is worthless, as long as "the structure and the mechanism of decay of the particle are not known", like W. Theimer^{<i>} expresses himself.

On the basis of the new field theory the approach standing on the left page is dared (fig. 6.20). Accordingly the particles don't decay by themselves, but only by a corresponding disturbance from the outside, which for instance is triggered by the high-frequency fields of flying past neutrinos. The closer the neutrinos fly past the particle, the sooner it will decay. But the distance becomes the larger, the smaller the particle is. If the particle thus experiences a relativistic length contraction, then it will, statistically seen, to the same extent become more stable.

That has nothing to do at all with time dilatation, as this proposal for an interpretation shows (fig. 6.20). The same effect of course also occurs, if atomic clocks are taken for a fly in a plane and compared to identically constructed clocks on earth.

The time was stipulated by us and therefore should be able to keep its universal validity. *We are entitled to demand a simultaneity, after all we are the ones, who tell what simultaneity is.*

An interesting technical use would be the acceleration of the rate of decay in order to dispose of radioactively contaminated waste. For that the waste has to be irradiated by collecting and focussing free neutrinos or with the help of a neutrino transmitter, like one which will be discussed in chapter 9. After such a neutrino shower dangerous radioactive waste would be reusable or at most be harmless domestic refuse.

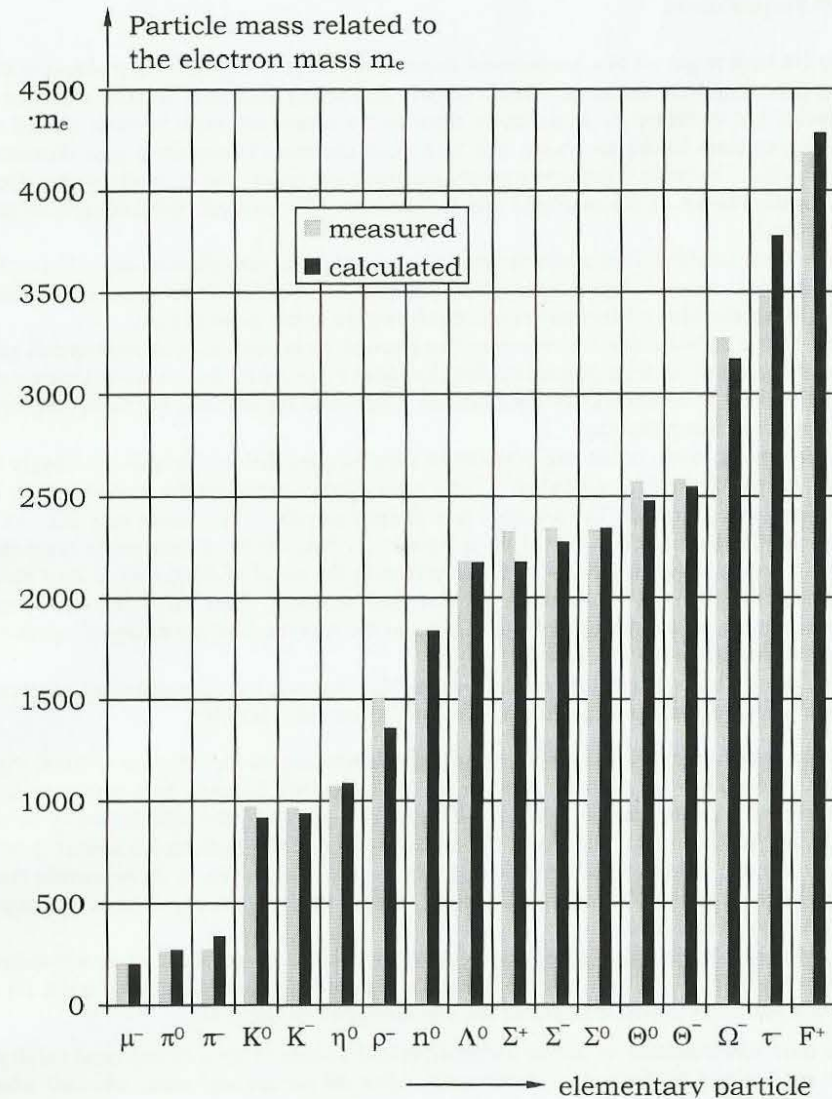


Fig. 7.0: The comparison with power of proof:

- the measured particle mass
- the calculated particle mass

7. Proof

Ample evidence is available for the correctness of the theory of objectivity. The field dependent change in length is observed and used as *magnetostriction or electrostriction*. If a ferromagnetic material, e.g. a nickel rod, is brought into an alternating magnetic field, then *field dependent longitudinal length oscillations* are observed. In the same manner barium titanate or quartz crystal oscillates in the electric field if a high-frequency alternating voltage is applied.

A practical application forms the *production of ultrasound*.

In this chapter are, as already announced, the *quantum properties of the elementary particles calculated* and in this way is furnished perhaps the most convincing *proof for the existence of potential vortices and for the correctness of the field-theoretical approach* and the theory which is based on it.

A special challenge represents the *calculation of the particle mass*. This mass stretches from 207 electron masses of the myon over 1839 of the neutron into the order of magnitude of 18513 electron masses (Y^0). Doing so not only can be tested, if the calculated values correspond with the measured ones. Also the gaps have to correspond, i.e. where there doesn't exist a discrete mathematical solution also no particle should exist. The fig. 7.0 standing on the left page anticipates the result and shows that even this strict condition is fulfilled. The agreement of the calculated with the measured results is excellent. If in individual cases small deviations become visible, we always have to bear in mind that the measurements as a rule are analysed statistically and the results are falsified if small particles creep in unrecognized. Particle physics nowadays has at its disposal extremely precise gauges, but even here remaining errors can't be excluded.

Quantum physics is occupied with further taking apart the elementary particles into hypothetic particles, the quarks, and to sort these according to properties and symmetries. Seen strictly causal this procedure thus corresponds to the *quantum physical approach*. We however have taken the *field-theoretical approach*, and this excludes the introduction of hypothetic particles from the start. It should be our goal to derive and to explain the quantum structure as a field property. Yes, we even want to calculate it, with which we would have overtaken quantum physics in the scientific competition with one leap.

Strong support our approach has experienced by current experiments, in which *matter* was transformed *in electromagnetic waves* - practically the reversal of the rolling up of waves to vortices. To do so at the Massachusetts Institute of Technology (David Pritchard and others) sodium atoms were dematerialized in waves by lattice scattering^{<?>}. According to Einstein one surely could have blown the whole M.I.T. in the air with the occurring mass defect; but don't worry, no emission of energy whatsoever has been observed, entirely as predicted by the vortex theory.

With the classical radius of the electron $r_e = 2,82 \cdot 10^{-15} \text{ m}$:

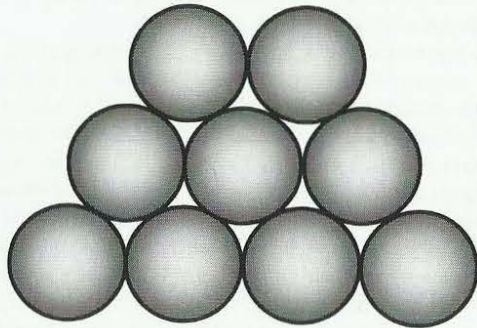
$$C_e = \epsilon_0 \cdot 4\pi r_e = 3,135 \cdot 10^{-25} \text{ F} \quad (6.4^*)$$

$$U_e = e/C_e = 511 \text{ kV} \quad (6.31^*)$$

(constant independent of r_e)

Formation forms (vortex properties):

I. Amassing (formation of vortex balls):



II. Overlapping (phenomenon of transport)

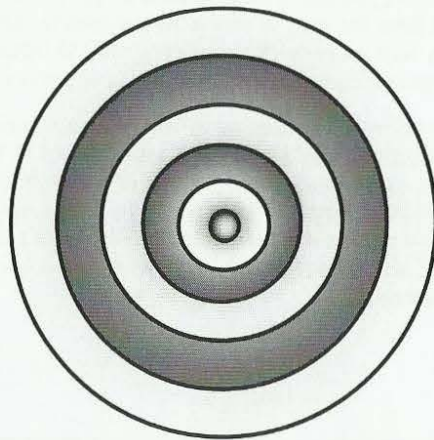


Fig. 7.1: The amassing and overlapping of elementary vortices

7.1 Elementary vortices

We had derived the electron and the positron as elementary vortices (fig. 4.3). Before we can go in the calculation, we must gain a clear picture of the possible configurations of vortices, which for reason of the derived properties are possible. For that we start with the elementary vortex and afterwards we predict the behaviour of interaction which can be expected.

Actually only one single particle is really elementary. According to the realizations of the new theory it is an elementary vortex in the form of a sphere. Its size is determined by the speed of light and this again by the local field strength; its stability is founded in the concentration effect of the potential vortex. The whirling takes place everywhere with the speed of light, even in the vortex centre, where all field lines run together, where the field increases infinitely and the speed of light goes to zero. This last circumstance owes the elementary vortex its localization.

We can attribute a charge to this vortex for reason of the field lines which on the outside run towards infinity and which we can measure (fig. 4.3). This is the smallest indivisible unit, the elementary charge e . Structure and course of the field lines suggest to understand and to calculate the elementary vortex as a spherical capacitor. By basing on the classical radius of the electron r_e given in fig. 6.3 the capacity according to equation 6.4 is calculated to be:

$$C_e = \epsilon_0 \cdot 4\pi r_e = 3,135 \cdot 10^{-25} \text{ F} \quad (6.4^*)$$

Here the theory of objectivity has provided us the realization that even for a change of the radius of the electron the capacity remains unchanged constant (6.30), and this entirely corresponds to our observation.

Between the hull of the elementary vortex, measured at the radius r_e , and its centre, respectively also with regard to infinity, there exists according to equation 6.31 the tension voltage of:

$$U_e = e/C_e = 511 \text{ kV} \quad (6.31^*)$$

It as well is constant and independent of the size of the elementary vortex.

Since a different solution is refused, we'll have to assume that all elementary particles consist of an integer multiple of elementary vortices. For that the amassing, like closely packed tennis balls, or the overlapping of individual vortices in the form of shells, like in the case of an onion (phenomenon of transport) can be considered.

The among each other occurring forces of attraction can be traced back to the fact that every elementary vortex is compressed by the field of its neighbour as a consequence of the field dependent speed of light. This field as a rule is for the small distances considerably larger than the field on the outside. Therefore do compound elementary particles not have the twofold or triple mass, but at once the 207-fold (myon) or the 1836-fold (proton) mass. After all there is no other explanation for the fact that there don't exist lighter particles (with a mass less than 207 electron masses).

a. The electron-positron pair

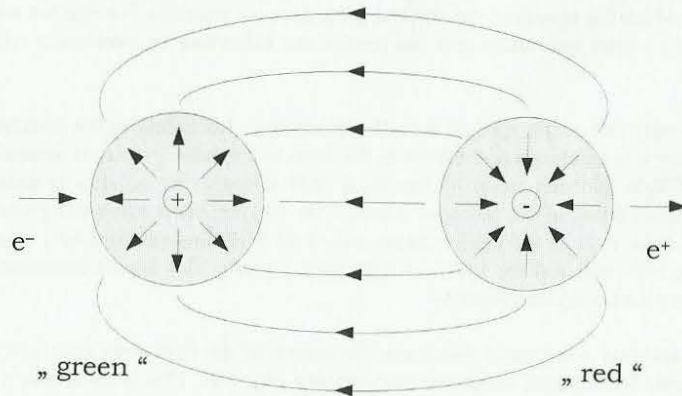
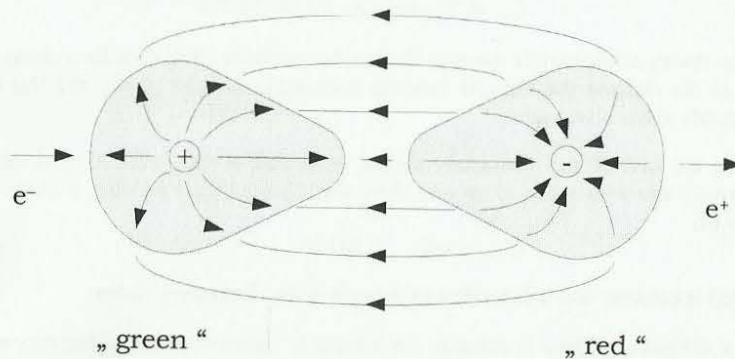
b. The $e^- - e^+$ pair for a small distance:

Fig. 7.2: The electron-positron pair annihilation

7.2 Matter and anti-matter

For the amassing or overlapping of elementary vortices several cases must be distinguished, because two inverse forms of formation are possible for the elementary vortex: the negatively charged electron and the positively charged positron. Whereas in the case of the electron the vortex produces a component of the electric field which points from the inside to the outside, has the field in the case of the positron the opposite direction for reason of a reversed swirl direction.

This statement can be generalized: if we consider the elementary particles from the outside, then we assign the particles with a swirl direction identical to that of the electron to the world of matter and call the particles with the opposite swirl direction anti-matter. It now is strongly recommended, to take colours to hand, in order to optically clarify the properties of vortices. The electron will be marked as a green sphere and the antiparticle, the positron, as a red sphere.

If we now look into the world of matter, then appears our **world of matter** to us "green", the world of **anti-matter** however "red". The uniform green colour of all the in our world existing elementary particles however doesn't exclude that red anti-vortices can exist hidden in the inside of the green vortices, where we can't discover them. But they must be completely covered, otherwise a disastrous reaction occurs, the pair annihilation, as a consequence of the oppositely directed property of the vortices which cancel out.

By means of the **pair annihilation** a dematerialization can occur, because every elementary vortex keeps in its inside the same amount of energy with opposite sign and the fusion of two inverse particles can result in a zero sum of the energy. The best known example is the annihilation of an electron-positron pair under emission of radiation discovered by Klemperer in 1934. In the upper representation (fig. 7.2a) the elementary vortices still are symmetrical, but the outside field lines already are "bent" and linked together in such a way that, with the exception of the ones in the direction of the axis, no interaction takes place which can be measured.

The two particles for reason of the different charge approach each other quickly, and the closer they are, the larger the mutual force of attraction becomes; a vicious circle, which leads to the asymmetry shown in the lower sketch (fig. 7.2b) and only comes to rest, if both particles have destroyed themselves mutually.

The electron and the positron had the same amount of, but oppositely directed swirl activity, so that purely arithmetically seen a zero sum of the rest energy results. But it should be paid attention to both particles having some kinetic energy on the occasion of the relative motion to each other and if they rotate around their own axis also rotational energy. An emission of annihilation radiation occurs, is the explanation of particle physics. With the knowledge of the photon (fig. 4.6) we can interpret the annihilation radiation as a consequence of the phenomenon of transport. The faster and consequently smaller vortex, for instance the green one, slips into the red one and sees the green inside, which is compatible for it. Unfortunately it only can remain there, as long as it is smaller, thus is faster, and therefore it shoots out on the other side again. Now the electromagnetic force of attraction fully takes effect. It is slowed down and the red vortex correspondingly accelerates. The process is reversed.

These around each other oscillating vortices, so we had derived, have a characteristic frequency (colour), are polarizable and are moving forward with the speed of light as a consequence of the open vortex centre. It therefore concerns the photon.

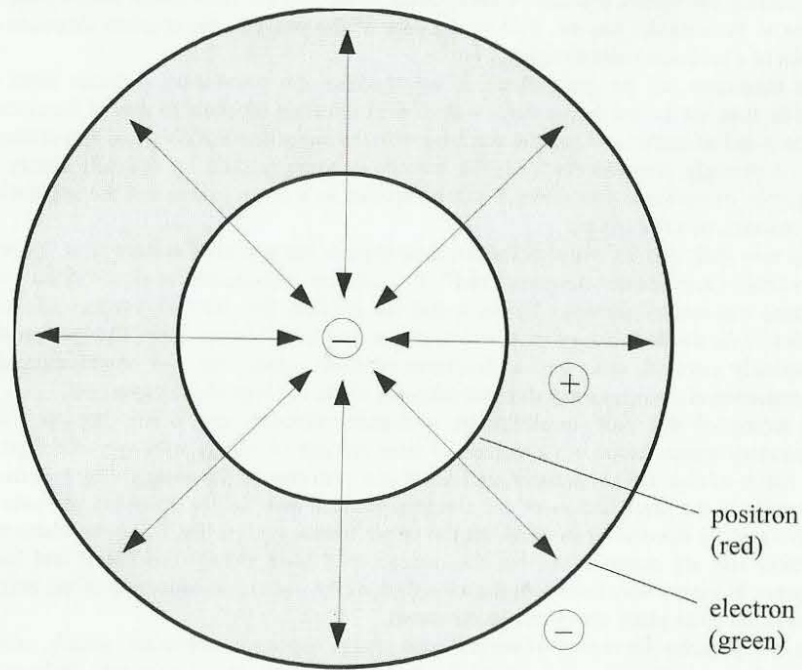


Fig. 7.3: Theoretical final state of the positronium
= static γ -quant (photon).

7.3 Positronium

But before the two elementary vortices, the electron and the positron, are annihilated under emission of radiation, they will for a short time take a shell-shaped, a bound state, in which one vortex overlaps the other.

Its formation we can imagine as follows: an electron, flying past a resting positron, is caught by this for reason of the electromagnetic attraction and spirals on an elliptic path towards the positron. In doing so its angular velocity increases considerably. It will be pulled apart to a flat disc for reason of the high centrifugal forces, to eventually lay itself around the positron as a closed shell.

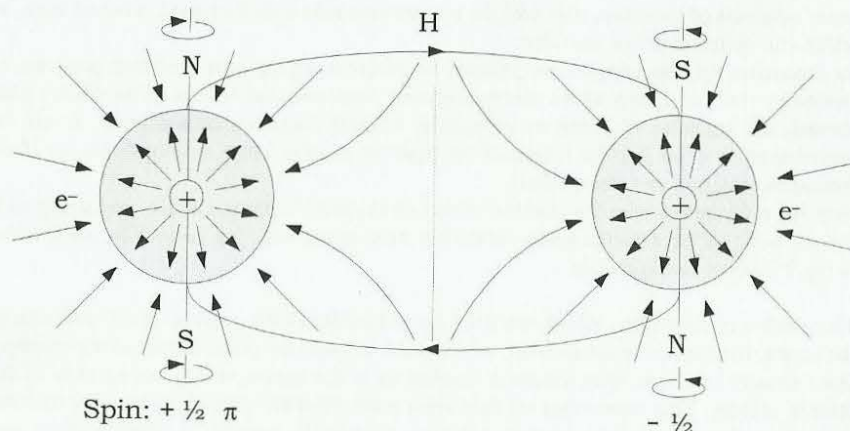
Now the red positron sees the electron vortex so to speak "from the inside" and doing so it sees as well red; because the green vortex has a red centre and vice versa! The result is the in fig. 7.3 given configuration.

The number of field lines, which run from the red border of the positron in the direction of the centre, is identical to the number, which point towards the green border of the electron. Here already the same state has been reached as in the centre, which corresponds to the state at infinity. That means that no field lines point from the green border to the outside; seen from the outside the particle behaves electrically neutral. It doesn't show any electromagnetic interaction with its surroundings.

If the particle were long-living, then it undoubtedly would be the lightest elementary particle besides the electron; but without stabilizing influence from the outside the positronium can't take the in fig. 7.3 shown state at all. The positron takes up the kinetic energy which is released if the electron becomes a shell around it. But before the bound state can arise, which would identify the positronium as an elementary particle, the equal rights of both vortices comes to light. With the same right, with which the electron wants to overlap the positron, it itself vice versa could also be overlapped.

If the stabilization of the one or the other state from the outside doesn't occur, then the stated annihilation under emission of γ -quanta is the unavoidable consequence (fig. 4.6).

a. The electron pair:



b. The electron pair for a small distance:

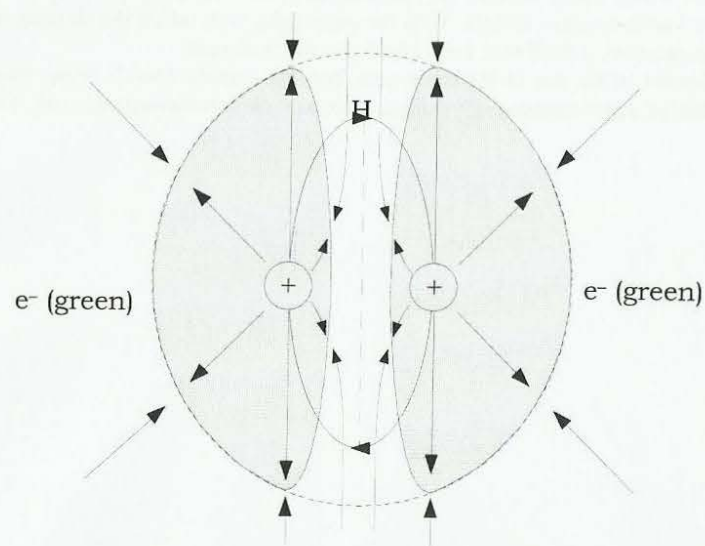


Fig. 7.4: Two electrons with oppositely directed spin

7.4 Dipole moment

As electrically charged spheres elementary vortices have a magnetic dipole moment along their axis of rotation as a consequence of the rotation of their own (fig. 7.4). This is measurable very precisely and for the most important elementary particles also known quantitatively. In contrast to the angular momentum the magnetic moment can't be constant according to the here presented theory. It should slightly change, if we increase the field strength in the laboratory.

In a particle consisting of several elementary vortices the vortices mutually increase the local field strength. Therefore we measure at the proton, which consists of three vortices, not the triple, but only the 2,793-fold of the nuclear magneton which can be expected for reason of its mass. Also the neutron has instead of the double only the 1,913-fold nuclear magneton. The deviations therefore are explicable as a consequence of the surrounding fields.

Prerequisite for this point are two other, still unanswered, key questions of quantum physics:

XII: Why is measured for the proton approximately the triple of the magnetic dipole moment which can be expected for reason of the charge?

XIII: Why does the neutron, as an uncharged particle, actually have a magnetic moment?

These questions can only be brought to a conclusive answer, if we have derived the vortex structures of the respective particles.

The elementary vortex, as a consequence of the spin along its axis, forms a magnetic north pole and a south pole. Another possibility to interact with an external field or with other particles is founded on this property. This shall be studied by means of two electrons, which form an **electron pair**.

For reason of the equal charge the two electrons at first will repel each other. If they rotate of their own they however will mutually contract, which, seen from the outside, is interpreted as a force of attraction. And in addition will they align their axes of rotation antiparallely. While they now rotate in the opposite direction, a magnetic force of attraction occurs.

As is shown in fig. 7.4, the magnetic dipole field in this way is compensated towards the outside, as is clarified by the field line (H) with a closed course. Between both electrons a space free of E-field stretches. If both vortices are a small distance apart they lay themselves around this space like two half-shells of a sphere. A particle forms which seen from the outside is magnetically neutral, but it carries the double elementary charge (fig. 7.4b).

The exceptional affinity is always restricted to two vortices of equal charge with an opposite direction of rotation. Further vortices can't be integrated anymore and are repelled. This property of vortices covers the quantum condition (Pauli's exclusion principle) for the spin quantum number perfectly.

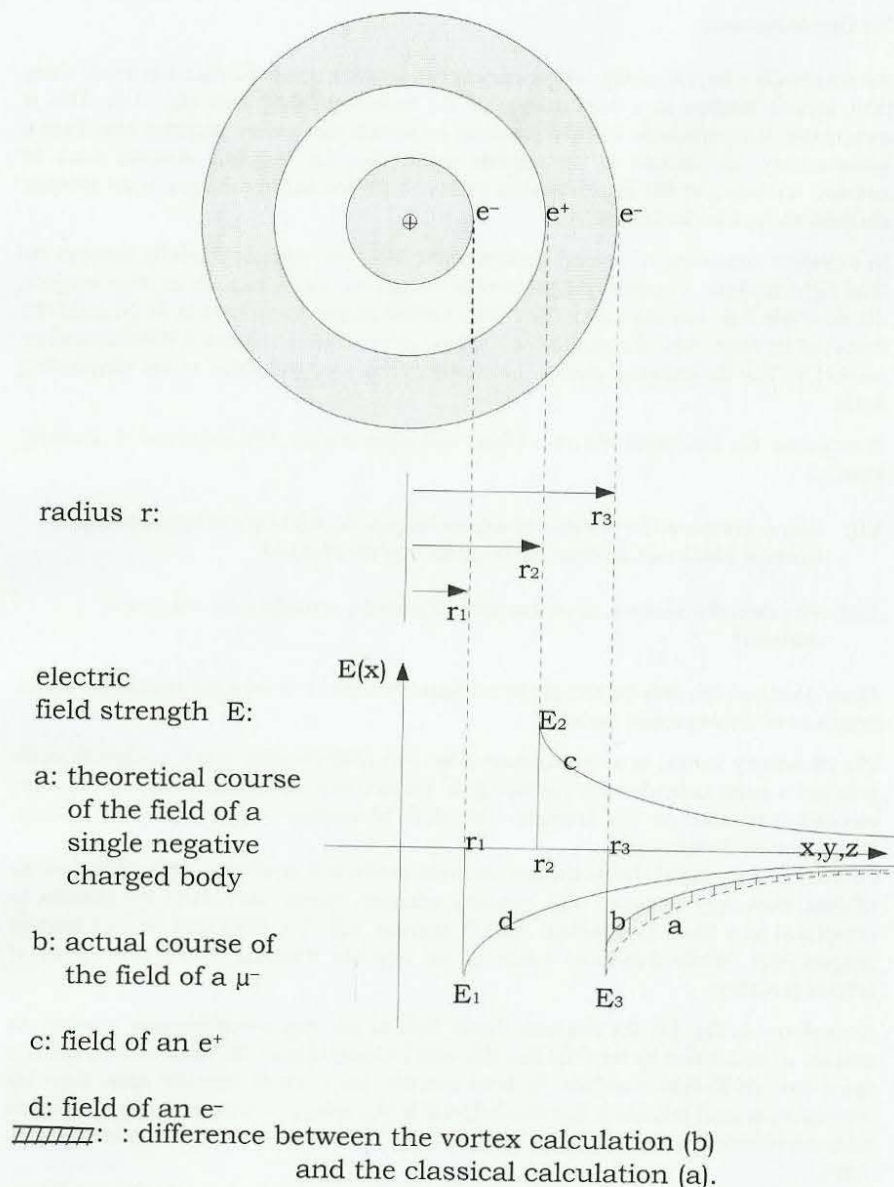


Fig. 7.5: The myon and the electric field $E(x)$ of the three elementary vortices

7.5 Myon

We now have discussed all conceivable possibilities, which two elementary vortices can form: the creation of a pair for like charge and the annihilation under emission of photons via the formation of the positronium as an intermediate result for unequal charge. Next another elementary vortex shall be added and all different possibilities and configurations will be derived, which can be formed by amassing or overlapping.

The positronium can, as said, only take the in fig. 7.3 shown bound structure, if it is stabilized from the outside. This task now a further electron shall take over. According to the shell model the innermost elementary vortex an electron (e^-), is overlapped by a positron (e^+) and that again overlapped by an electron (e^-).

With an in the sum single negative charge, a completely symmetric structure as well as a half-integer spin this particle will show a behaviour corresponding to a large extent to that of the electron. Merely the mass will be considerably larger, because every vortex each time compresses the other two.

It therefore concerns the myon (μ^-), which also is called **"heavy electron"**. The myon was discovered 1937 in the cosmic radiation (Anderson and others).

In fig. 7.5 are drawn above each other the shell-shaped structure of the myon and the electric field $E(x)$ of the three elementary vortices.

It is visible that merely in the proximity of the particle the actual course of the field deviates from and is smaller, than the course which theoretically can be expected for a single negatively charged body. The difference is marked by a hatching.

We now can tackle the calculation of the myon. For that the following considerations to begin with are useful:

Mass is an auxiliary term founded in usefulness, which describes the influence of the electromagnetic field on the speed of light and with that on the spatial extension of the "point mass".

Without exception the local cosmic field E_0 has an effect on a free and unbound elementary vortex, thus on an individual e^- or e^+ , and determines so its size and its mass. But as long as we haven't determined this field strength, the calculation of its quantum properties won't succeed.

Instead the masses of compound particles will be compared to each other, which are so heavy that the field strength of the neighbouring vortices is predominant over the basic field E_0 , so that a neglect of E_0 seems to be allowed. The course of the calculation is made for all elementary particles in the same manner, which is explained hereafter.

Spherical capacitor: (r_i = inner radius; r_a = outer radius)

$$U = \int_{r_i}^{r_a} E \, dr \quad (7.1)$$

Electron ($r_i = 0$ and $r_a = r_e$): $U = 511 \text{ kV} = \text{const.}$ (6.31*)

$$U_1 = U_2 = U_3 = U_4 = \dots = U_n \quad (7.2)$$

At The radius r_1 is valid: $E(r_1) = E_1$ and

$$U_1 = \int_0^{r_1} E_1 \, dr = E_1 r_1 = U_2 = \int_{r_1}^{r_2} E_1 \, dr = E_1 (r_2 - r_1) \quad (7.1^*)$$

At the radius r_2 is valid for the 2nd and 3rd shell $E(r_2) = E_2$:

$$U_2 = \int_{r_1}^{r_2} E_2 \, dr = E_2 (r_2 - r_1) = U_3 = \int_{r_2}^{r_3} E_2 \, dr = E_2 (r_3 - r_2) \quad (7.1^{**})$$

comparison of the radii:

$$(7.1^*) \quad (7.1^{**})$$

$$\Delta r = r_1 = r_2 - r_1 = r_3 - r_2 = \dots = r_n - r_{n-1} \quad (7.3)$$

resp.:

$$r_2 = 2 \cdot r_1; \quad r_3 = 3 \cdot r_1; \quad \dots; \quad \boxed{r_n = n \cdot r_1} \quad (7.4)$$

comparison of the field strengths: (7.1* with 7.1** with Eq. (7.2):

$$E_1 = E_2 = E_3 = \dots = E_n \quad (7.5)$$

Theory of objectivity, fig. 6.18:

$$\boxed{E \sim 1/r} \quad (6.25)$$

see fig. 7.5:

$$E_1(r_3) = E_{31} = -E_1 \cdot (r_1/r_3)$$

$$E_2(r_3) = E_{32} = E_2 \cdot (r_2/r_3)$$

$$E_0 = \text{cosmic basic field: (negligible)}$$

$$E(r_3) = E_{31} + E_{32} + E_0 = E_1 \cdot (r_2 - r_1)/r_3 + E_0 \quad (7.6)$$

$$\boxed{\frac{E(r_3)}{E_1} = \frac{2 \cdot r_1 - r_1}{3 \cdot r_1} = \frac{1}{3}} \quad (7.7)$$

Fig. 7.6: Calculation of the electric field strength $E(r)$ of the myon from its dependency on radius

7.6 Calculation of the vortex fields

The tension voltage of an elementary vortex, like for a spherical capacitor, is determined by integrating over the electric field strength from the inner radius r_i up to the outer radius r_a :

$$U = \int_{r_i}^{r_a} E \, dr \quad (7.1)$$

For the electron ($r_i = 0$ und $r_a = r_e$) we already have carried out the integration and determined the tension voltage to be 511 kV (equation 6.31*).

Doing so we further had discovered that it won't change, if the radius r varies. Even for a shell configuration, in which electrons and positrons alternately overlap, the approach is valid:

$$U_1 = U_2 = U_3 = U_4 = \dots = U_n \quad (7.2)$$

At a certain radius all elementary vortices show the same density of field lines and with that also the identical field strength, so that we can solve the integral (7.1) for the each time neighbouring vortex shells and can compare the results:

At the radius r_1 with $E(r_1) = E_1$ the agreement, according to equation 7.1* (fig. 7.6), is valid for the innermost and the overlapped vortex shell.

At the radius r_2 with $E(r_2) = E_2$ the agreement according to equation 7.1** (fig. 7.6) is valid analogously for the 2nd and 3rd shell.

If still more shells are present, then we can arbitrarily repeat this procedure. For the radius of each shell we always obtain relation 7.3, which, related to the innermost radius, provides the following simple expression for the individual radii:

$$r_2 = 2 \cdot r_1; \quad r_3 = 3 \cdot r_1; \quad \dots; \quad r_n = n \cdot r_1 \quad (7.4)$$

From the comparison of the integration results 7.1* and 7.1** follows further that all elementary vortices produce the same field strength:

$$E_1 = E_2 = E_3 = \dots = E_n \quad (7.5)$$

We infer from the transformation table (fig. 6.18, eq. 6.27) that the field strengths E and H decrease with $1/r$. In fig. 7.5 the decrease of the fields with $1/r$ is shown. Up to the radius r_3 the field of the innermost vortex E_1 has worn off to the value $E_{31} = -E_1 \cdot (r_1/r_3)$.

This field is overlapped by $E_{32} = E_2 \cdot (r_2/r_3)$ as well as the cosmic basic field E_0 :

$$E(r_3) = E_{31} + E_{32} + E_0 = E_1 \cdot (r_2 - r_1)/r_3 + E_0 \quad (7.6)$$

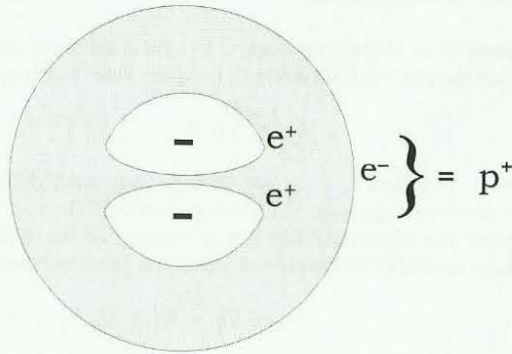
The local basic field E_0 is not known, but it is very small with regard to the field of the neighbouring vortex shells, so that a neglect seems to be allowed.

From equation (7.6) in this way follows with the radius relation (7.4):

$$\frac{E(r_3)}{E_1} = \frac{2 \cdot r_1 - r_1}{3 \cdot r_1} = \frac{1}{3} \quad (7.7)$$

For the shell-shaped configuration of the myon (fig. 7.5) relation (7.7) indicates, which field the outside vortex shell is exposed to. From this can already be seen, how much it is compressed thanks to the field dependent speed of light and how much its mass as a consequence is increased.

Structure of the proton p^+ :



Calculation:

structure consisting of two shells, inner vortices with $2 \cdot E_1$, field strength at the outer radius r_2 :

$$E(r_2) = 2 \cdot E_{21} = 2 \cdot E_1 \cdot (r_1/r_2) = E_1 \quad (7.8)$$

Comparison of p^+ (7.8) with μ^- (7.7) (z_e = number of the elementary vortices being involved with)

in building up the structure, here each time $z_e = 3$:

Comparison of the radii with $E \sim 1/r$ (6.27)

$$\frac{r_p}{r_\mu} = \frac{z_{e\mu}}{z_{ep}} \cdot \frac{E_\mu(r_3)}{E_p(r_2)} = \frac{3}{3} \cdot \frac{1/3}{1} = \frac{1}{3} \quad (7.9)$$

Theory of objectivity (fig. 6.18): $m \sim 1/r^2$ (6.34)

$$\frac{m_p}{m_\mu} = \frac{z_{ep}}{z_{e\mu}} \cdot \left(\frac{r_\mu}{r_p}\right)^2 = \frac{3}{3} \cdot \left(\frac{3}{1}\right)^2 = 9 \quad (7.10)$$

$$m_p/m_e = 9 \cdot (m_\mu/m_e) = 9 \cdot 207 = \underline{1863} \quad (7.11)$$

Measurement value, proton mass: $m_p = \underline{1836} \cdot m_e$

Resp.:

measurement value myon mass $m_\mu = 207 \cdot m_e$

myon calculated value: $m_\mu = 204 \cdot m_e$. (error = 1,5%)

Since we, by using this calculation method, for the first time succeeded in deriving the mass of an elementary particle from that of another particle, the particle mass isn't a constant of nature anymore.

Fig. 7.7: Calculation of the proton

7.7 Calculation of the proton

If we again remember the affinity of two elementary vortices, which rotate with opposite spin. They align their axis of rotation antiparallel and form a very probable, but not particularly tight bound pair (fig. 7.4).

If we this time start with a positron pair, then does this pair have a double positive elementary charge. The two e^+ hence exert a particularly big force of attraction on electrons flying past them. If they have cached one and put it round as a shell, like a coat, then they will never again give it back! To again remove the electron, a triple positive charge would be necessary. But such a particle can't exist at all. The new particle therefore has an absolute stability and a very big mass, because the positron pair is considerably compressed by its outer shell. The total charge is single positive. With these properties it actually only can concern the proton. Its structure is shown in fig. 7.7.

We can start from the assumption that both positrons are very close together in the inside and thus each forms the half of a sphere. For the calculation of the proton mass we then can assume as an approximation a structure of two shells, in which the inner vortex will have the double charge and the double field ($2 \cdot E_1$). With equation 7.4 the field strength at the outer radius r_2 is:

$$E(r_2) = 2 \cdot E_{21} = 2 \cdot E_1 \cdot (r_1/r_2) = E_1 \quad (7.8)$$

If we want to compare the results of the p^+ (7.8) and the μ^- (7.7), then it should be considered that the field of the innermost elementary vortex E_1 only is equal, if the number z_e of the elementary vortices involved in building up the particle is identical. Here with each time $z_e = 3$ this is the case. Because of equation 6.27 ($E, H \sim 1/r$) now also the radii are comparable:

$$\frac{r_p}{r_\mu} = \frac{z_{e\mu}}{z_{ep}} \cdot \frac{E_\mu(r_3)}{E_p(r_2)} = \frac{3}{3} \cdot \frac{1/3}{1} = \frac{1}{3} \quad (7.9)$$

The mass of a particle first is determined by the number of the elementary vortices z_e . According to the theory of objectivity (fig. 6.18) however also the radius has an influence on the mass:

$$m \sim 1/r^2 \quad (6.34)$$

This proportionality should be applied to the $p^+ - \mu^-$ - comparison.

$$\frac{m_p}{m_\mu} = \frac{z_{ep}}{z_{e\mu}} \cdot \left(\frac{r_\mu}{r_p}\right)^2 = \frac{3}{3} \cdot \left(\frac{3}{1}\right)^2 = 9 \quad (7.10)$$

The calculation provides a nine times bigger mass for the proton with regard to the mass of the myon. Therefore the mass of the proton related to the mass of the electron is:

$$m_p/m_e = 9 \cdot (m_\mu/m_e) = 9 \cdot 207 = \underline{1863} \quad (7.11)$$

It would be favourable, to start from the with measuring techniques determined value for the mass of the proton $m_p/m_e = 1836$ and calculate backwards the related mass of the myon.

Then we obtain 204 as the calculated value instead of the measurement value $m_\mu/m_e = 207$. The reason for the deviation of 1.5 percent is caused by the neglect of the cosmic field E_0 with regard to the field of the neighbouring elementary vortex. This neglect takes very much less effect for the relatively heavy proton than for the light myon.

The cosmic field therefore will compress the myon more strongly and increase the mass more strongly as is calculated here, in agreement with the measurement results.

Summarizing: since we, by using this calculation method, for the first time succeeded in deriving the mass of an elementary particle from that of another particle, the particle mass isn't a constant of nature anymore.

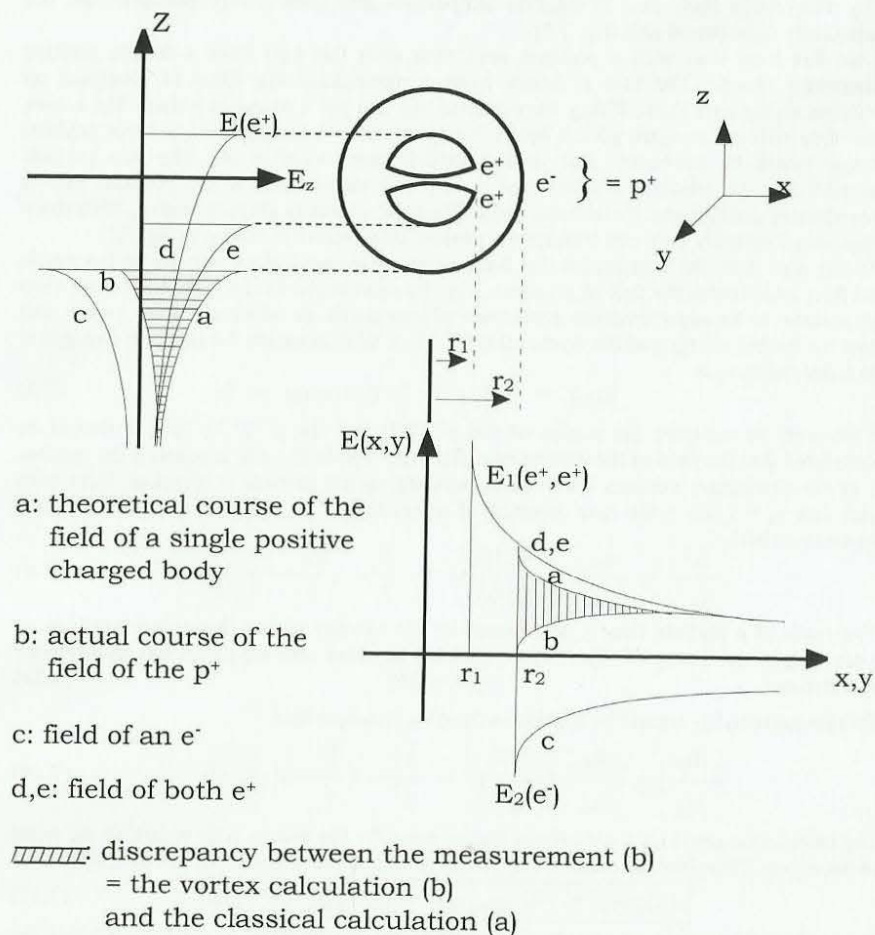


Fig. 7.8: The proton and the electric field of the three elementary vortices in x-, y- and z-direction

7.8 "Strong interaction"

A central question of nuclear physics concerns the forces which keep the atomic nucleus, which consists of many neutrons and protons, together and give it its very good stability in spite of the like positive charge (key question XIV fig. 7.13).

According to today's textbook opinion (course of the field indicated with a in fig. 7.8) the forces of repulsion between the individual protons increase further as the distance gets smaller, to obtain immense values within the nucleus. They theoretically had to be overcome by new and unknown nuclear forces. Therefore physicists assume the hypothesis of a "strong interaction". But they are mistaken.

The answer to this open question is provided by the course of the field (b) for the proton, sketched in fig. 7.8. We see that the electric field at first indeed still increases if we approach the proton, but in the proximity it contrary to all expectations decreases again until it is zero. With that then also any force of repulsion has vanished! But the course of the field follows without compulsion from the overlap of the three individual elementary vortex fields.

The field direction in the z-direction even is reversed! In this topsy-turvy world, in theory, an electromagnetic force of attraction between two like charged protons can occur. We conclude:

A strong interaction doesn't exist at all. The usually given values for "range" and "strength" just represent a misinterpretation. The hatched drawn area marks the difference which is misinterpreted by quantum physics. The model concept over and above that answers another mysterious property of the proton. As an electrically charged particle with a spin it first of all should form a magnetic moment for reason of the rotating charge. But until now the measurable order of magnitude couldn't be explained.

7.9 Magnetic moment of the proton

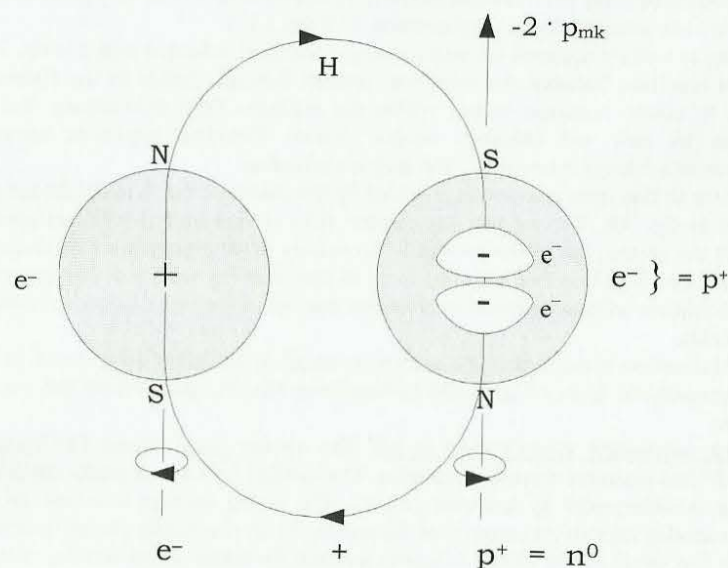
If the inner positrons rotate around each other with oppositely pointing spin, then the magnetic field line is already closed within the particle and no effect in x- or y-direction is observable from the outside.

As pair they however still can rotate together around the z-axis and they'll do that. The overlapping electron for reason of its rotation of its own will likewise build up a magnetic dipole moment along its axis of rotation. It also will align its axis in the z-direction, so that now all three elementary vortices have one field axis. Being comparable to individually "elementary magnets" aligned in the same direction they produce a triple magnetic moment (key question XII fig. 7.13).

If we namely would start with a single positively charged body according to the theory of quantum mechanics, then we would have expected the value of the nuclear magneton μ_N as the magnetic moment for the proton $\mu_m = e \cdot \hbar / 2m$. Opposite to that provide experiments with protons the approx. threefold value as already predictable by the new vortex theory. In addition does the direction of the vector μ_{mp} correspond with the spin-axis, so as if the proton were negatively charged. The reason for that is that only the outermost elementary vortex determines the spin of the particle, and that is actually a negatively charged electron! Also this excellent agreement in the case of the proton can be judged as proof for the correctness of the vortex model.

<i>: The nuclear magneton has the value of: $\mu_{mk} = 5,0508 \cdot 10^{-27} \text{ Am}^2$

a. n^0 if the e^- amasses to a p^+ .



b. n^0 if the e^- is overlapped by an e^+ of the p^+

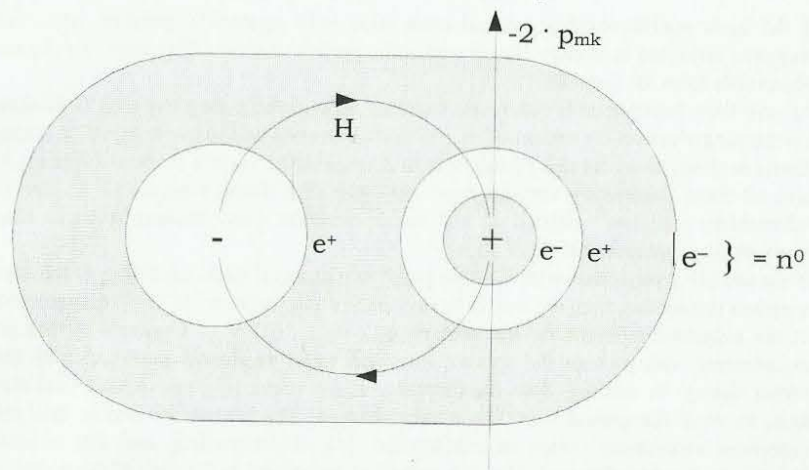


Fig. 7.10: The neutron with magnetic dipole field H

7.10 Structure of the neutron

Until now could not be solved, why despite its missing charge also the neutron n^0 has a magnetic moment. The experimentally determined value is approx. the double of the nuclear magneton. Further was with measuring techniques an only 0,14% bigger mass with regard to the proton determined. The difference is approximately two and a half electron masses. And how reads the answer in the view of the potential vortex theory?

It is obvious that a positively charged proton and a negatively charged electron mutually attract and amass together (fig. 7.10a). A pair annihilation can't occur, because the electron, which jackets both positrons, prevents this. The formation of an outer shell is not permitted by the high stability of the proton. It would have to be a positron shell, which instead of neutrality would produce a double positive charge. Conceivable is however the configuration, in which one of the two e^+ of the proton takes up the e^- in its inside and overlaps it (fig. 7.10b).

At first appears the amassing of p^+ and e^- to be the obvious answer to the structure of the neutron also in view of the small increase in mass. Since both elementary particles (p^+ and e^-) have a spin, will they align their axes of rotation antiparallely and rotate against one another, exactly like an electron pair. But we now have unequal conditions: the proton brings the triple magnetic moment, the electron however only the single, and its field line will be closed by the proton. The difference which remains is the measurable double nuclear magneton, with which key question XIII (fig. 7.13) would be answered exhaustively.

This structure is shown in fig. 7.10a and has as rest mass the by only one electron mass increased proton mass, but it will deviate from this value, when the unequal partner come closer. Doing so the electron will be more strongly compressed by the heavier proton as vice versa.

Mass, magnetic moment and charge thus correspond to a large extent with the measurement values. Problems are seen concerning the spin and the stability.

Set of problems concerning **spin**: both the e^- and the p^+ have a half-integer spin, for which reason this configuration should have an integer spin.

Set of problems concerning **stability**: the neutron decays as is well-known in a p^+ and an e^- , but this object should be shorter-lived as determined by experiments. If namely the partner come each other very close, then the field strength of the p^+ , contrary to expectation, doesn't increase but decreases, as is shown in fig. 7.8. The e^- therefore can only be bound very, very loosely; in z-direction it even will be repelled!

For these reasons is the open structure, which is shown in fig. 7.10a, not feasible as an isolated elementary particle, but only in a spatially extended network, like it is present in an atomic nucleus. In this case the neutron is, as is well-known, lighter by the mass defect, which is interpreted as binding energy.

Possibly it only concerns an intermediate stage. The heavier final product of the n^0 then could look like is shown in fig. 7.10b. For this version the line of the magnetic field already is closed partly within the particle, so that also here the approx. double nuclear magneton remains as a rest with a sense of orientation, as if the neutron were negatively charged.

Without charge and with the $\frac{1}{2}$ spin it in this configuration fulfils all important quantum properties of the neutron, even that of the stability.

the field of the e^- : $E_{31}^{(-)} = -E_1 (r_1/r_3)$,

the field of the e^+ : $E_{32} = E_2 (r_2/r_3) = E_1 (r_2/r_3)$

and in addition the e^+ : $E_{31} = E_1 (r_1/r_3)$.

$$E(r_3) = E_{31}^{(-)} + E_{32} + E_{31} + \cancel{E_0} \quad \text{negligible}$$

With the radius relation (eq. 7.4): $r_2 = 2 r_1$ und $r_3 = 3 r_1$
The total field is:

$$\frac{E(r_3)}{E_1} = -\frac{r_1}{r_3} + \frac{r_2}{r_3} + \frac{r_1}{r_3} = -\frac{1}{3} + \frac{2}{3} + \frac{1}{3} = \frac{2}{3} \quad (7.12)$$

With $z_{en} = 4$ elementary vortices

$$\frac{r_n}{r_p} = \frac{z_{ep}}{z_{en}} \cdot \frac{E_p(r_2)}{E_n(r_3)} = \frac{3}{4} \cdot \frac{1}{2/3} = \frac{9}{8} = 1,125 \quad (7.13)$$

n^0 is 12,5% bigger than p^+

$$\frac{m_n}{m_p} = \frac{z_{en}}{z_{ep}} \cdot \left(\frac{r_p}{r_n}\right)^2 = \frac{4}{3} \cdot \left(\frac{8}{9}\right)^2 = 1,05 \quad (7.14)$$

n^0 is 5% heavier than p^+

Fig. 7.11: Calculation of the mass of the neutron

7.11 Calculation of the neutron

The calculation of the mass for the structure of the neutron according to fig. 7.10b has still remained open.

Because in this book for the first time has been shown, how the mass can be calculated, if the particles are understood as potential vortices, we also in this case again want to make use of this possibility.

We have, like for the μ^- , a structure of three shells with the radii r_1 , r_2 and r_3 . At the outer radius r_3 the fields of the elementary vortices on the inside have an effect on the electron on the outside: like is the case for the μ^-

the field of the e^- : $E_{31}^{(-)} = -E_1 (r_1/r_3)$,

the field of the e^+ : $E_{32} = E_2 (r_2/r_3) = E_1 (r_2/r_3)$

and in addition the e^+ : $E_{31} = E_1 (r_1/r_3)$.

The total field is, with the radius relation equation 7.4:

$$\frac{E(r_3)}{E_1} = -\frac{r_1}{r_3} + \frac{r_2}{r_3} + \frac{r_1}{r_3} = -\frac{1}{3} + \frac{2}{3} + \frac{1}{3} = \frac{2}{3} \quad (7.12)$$

If we compare the neutron, in which now $z_e = 4$ elementary vortices are involved, with the proton:

$$\frac{r_n}{r_p} = \frac{z_{ep}}{z_{en}} \cdot \frac{E_p(r_2)}{E_n(r_3)} = \frac{3}{4} \cdot \frac{1}{2/3} = \frac{9}{8} = 1,125 \quad (7.13)$$

then we infer from the arithmeically determined result that the neutron according to the radius is 12,5% bigger than the proton. The mass is calculated to:

$$\frac{m_n}{m_p} = \frac{z_{en}}{z_{ep}} \cdot \left(\frac{r_p}{r_n}\right)^2 = \frac{4}{3} \cdot \left(\frac{8}{9}\right)^2 = 1,05 \quad (7.14)$$

The particle therefore has a mass which is 5% larger than for the proton, slightly more as has been measured for the neutron. The difference is acceptable. The particle after all is structured very asymmetrically, in which the reason is to be seen, why the uncharged particle, looked at from close up, nevertheless shows an observable charge distribution.

Decay equations if neutrinos are involved:

$$n^0 \longrightarrow p^+ + e^- + \bar{\nu}_e \quad (7.15)$$

$$n^0 + \nu_e \longrightarrow p^+ + e^- \quad (7.15^*)$$

$$\mu^- \longrightarrow e^- + \bar{\nu}_e + \nu_\mu \quad (7.16)$$

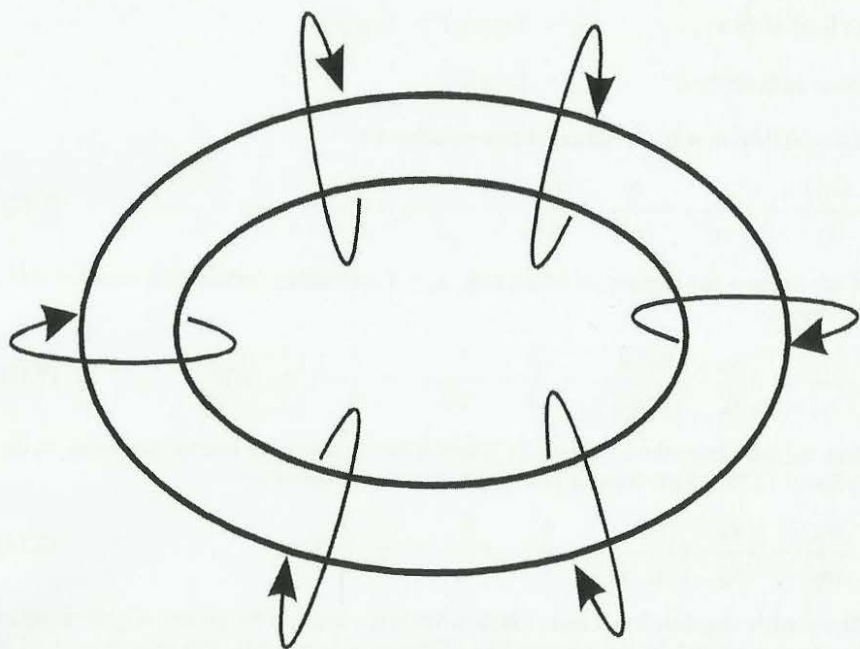


Fig. 7.12: The electron-neutrino as a ring-like vortex

7.12 β -decay

In the case of the calculated quasistable particles, the μ^- and the n^0 , the verification by means of the well-known decay processes is still due. Also free neutrons, those which are not bound in an atomic nucleus, decay. But with an average life of 918 seconds they are by far the longest living among the quasistable elementary particles.

Should the neutron decay be triggered by neutrinos, then obviously a distant flying past does not suffice. For that the electron is bound in the proton too tight. There probably has to occur a direct "crash", in which a neutrino is used, since the decay equation reads:

$$n^0 \longrightarrow p^+ + e^- + \bar{\nu}_e \quad (7.15)$$

As could be expected a proton p^+ , an electron e^- and the mentioned electron-antineutrino $\bar{\nu}_e$ are formed. What here is written down as the emission of an antiparticle, is equivalent to the absorption of the particle $\bar{\nu}_e$, in this case of the neutrino. The reaction equation 7.15 can be reformulated accordingly $\bar{\nu}_e$:

$$n^0 + \nu_e \longrightarrow p^+ + e^- \quad (7.15^*)$$

Also for the decay of the myon an electron-neutrino is used. In both cases it provides the energy necessary for the decay. But we can really understand the β -decay only, after we have got to know these particles better.

Without charge and without mass neutrinos show hardly any interactions with matter and as a consequence they possess the enormous ability of penetration - as is well-known.

They are said to participate in the „weak interaction“, which should trigger a conversion of the concerned particles, which is their decay. Pauli already has postulated the neutrino 1930 theoretically, because the transition from a half-integer spin to an integer spin for the n^0 -decay otherwise wouldn't have been explicable.

If we imagine an elementary vortex is being born, but the local field strength and energy isn't sufficient for obtaining a quantized state. The result is an incomplete potential vortex, which has an open vortex centre and as a consequence shows no localization at all. In the form of a vortex ring it oscillates around itself, while it continually turns its inside to the outside and then again to the inside.

One moment the vortex ring is green, then it is red again, one moment matter, then anti-matter, one moment positively charged and the next moment negatively charged. In contrast to the photon the number of the involved elementary vortices z_e for the neutrino is odd (for the ν_e $z_e = 1$). Perpendicular to the direction of propagation the neutrino has a spin ($s/\hbar = 1/2$) for reason of a rotation, which overlaps the pulsating oscillation.

This vortex ring is, as said, not a member of stationary matter, because it doesn't form a „black hole“ in its centre, where the speed of light becomes zero. But it has an absolute stability like every elementary vortex, even if it only occurs incomplete and hence not in any quantized form. This concept of the electron-neutrino as an open oscillating elementary vortex in the form of a ring-like vortex covers the experimentally determined realizations unexpectedly well.

A strong interaction doesn't exist. The electric field in the proximity of the proton goes to zero within the range which is determined with measuring techniques.

A weak interaction doesn't exist. That interaction only is a special case of the electromagnetic interaction which appears in a weakened form.

XII: Why does the proton have approximately 3 times the magnetic moment which can be expected for reason of the only single charge?

(3 elementary vortices)

XIII: Why does the neutron as an uncharged particle anyway have a magnetic moment?

(Structure of the n^0)

XIV: What owes the atomic nucleus, which consists of like charges, its stability?

(Course of the field of the p^+ , instead of "strong interaction")

XV: Why does the free neutron decay, although it is stable as a particle of the nucleus?

(Interaction with neutrinos)

XVI: Why do neutrinos nevertheless participate in the "weak interaction", although they have no mass and no charge?

(Oscillating charge)

XVII: How can be given reasons for the finite range of the "weak interaction"?

(Reaction cross-section for particle decay)

Fig. 7.13: Further key questions of quantum physics
(Continuation of figures 4.4 and 6.13)

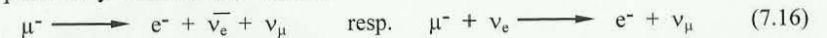
7.13 "Weak interaction"

Let's now look again at the β -decay of the neutron, in which a neutrino ν_e is used. But this by no means will be a process of the weak interaction. Instead will neutrinos, contrary to the textbook opinion, participate in the electromagnetic interaction. They after all are one moment positively charged and the next moment negatively charged. With slow-acting gauges this it is true can't be proven, because the interaction is zero on the average. But this charged oscillating vortex ring can exert a considerable effect while approaching a neutron, which is based solely on the electromagnetic interaction.

The neutron is stimulated to synchronous oscillations of its own by the high-frequency alternating field of the neutrino, until it in the case of the collision releases the bound electron, which takes up the energy provided by the neutrino and transports it away. The interaction obviously is only very weak due to the oscillation. But a physical independency of it has to be disputed.

The finite range, which is given in this context, indicates the reaction cross-section around the n^0 -particle, within which the "crash" and as a consequence the β -decay occurs. This range is considerable larger as the particle itself. The electromagnetic interaction for such small distances after all is so violent, even if it only occurs in pulses, that the neutrino is thrown out of its path and can fly directly towards the neutron.

Perhaps we now understand also the β -decay of the myon. It actually were to be expected that without outside disturbance an absolute stability could exist because of the ideal symmetry of the μ^- . On our planet we however are in every second bombarded with approx. 66 milliard (billion) neutrinos per cm^2 ^{<i>}. Obviously it takes 2,2 μs on the average till a neutrino ν_e flies past a myon so close that it decays. In doing so it stimulates the outside elementary vortex to violent oscillations by trying to synchronize it. In this case the electron-neutrino ν_e carries away with it the two outer, and therefore weaker bound, elementary vortices of the myon, which meanwhile are oscillating synchronously. The innermost vortex, an electron e^- , is left behind. The decay of the myon which takes place with a probability of almost 100 % reads:



Thus a different neutrino ν_μ , is formed which can be distinguished from the ν_e and is called myon-neutrino since it forms from the μ^- . Actually it even has a similar structure of three shells, as is shown in fig. 7.5. But the vortex centre is open and the particle isn't stationary anymore. In the picture now only a momentarily state is shown, in which the ν_μ appears green on the outside and red in its open centre. As already for the ν_e oscillates also here the inside to the outside and vice versa, this time merely as a packet of three shells, so that also this particle shows all the typical neutrino properties discussed for the example of the ν_e .

The for potential vortices typical and already discussed phenomenon of transport here has an effect. In particular in connexion with vortex rings this property is known from hydrodynamics. It thus can be observed, how vortex rings bind matter and carry away with them. Because the neutrino is not quantized, it neither is restricted with regard to its ability to transport elementary vortices. Consequently even bigger configurations are conceivable, like configurations of 5 shells, 7 shells etc..

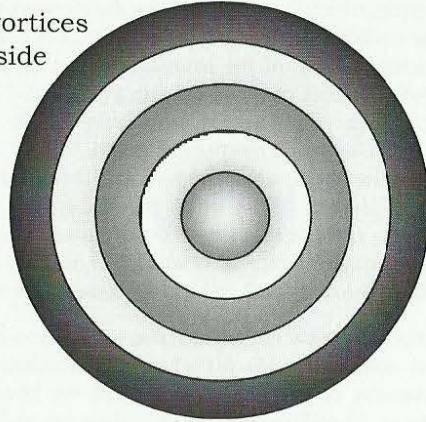
a: the structure of the tau-neutrino with 5 shells

colour of the elementary vortices
from the outside to the inside

gn/rd/gn/rd/gn

i.e.

$e^-/e^+/e^-/e^+/e^- = \nu_\tau$



b: the heavy and stable variant of the tau particle

(gn/rd + gn/rd)gn

resp.

$(e^-/e^+ + e^-/e^+)e^- = \tau$

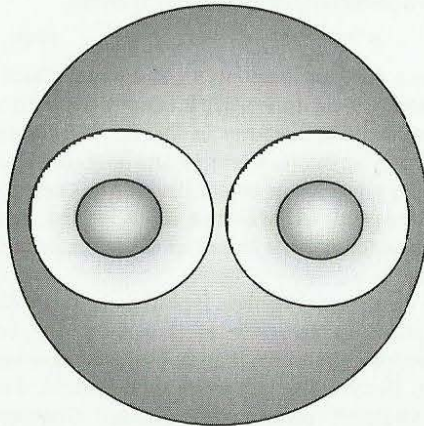


Fig. 7.14: Tau-neutrino and tau particle

7.14 Tau particle

In the table of the leptons after the e^- and the μ^- as the next particle the tau particle τ^- is found with its accompanying neutrino ν_τ . The obvious solution for the tau particle is the structure of five shells, as is shown in fig. 7.14a. With that the electron would have another particularly heavy relative with otherwise very similar properties.

For the myon the neutrino was stable, the particle itself however instable. We after all have explained the particle decay as a consequence of an outside disturbance, and disturbances always are based on interactions. Correspondingly should, with the small possibility for an interaction, also the neutrino ν_τ of the tau particle have a better stability than the particle τ^- itself.

Without doubt this structure of 5 shells fulfils all known quantum properties like spin, charge etc. Merely the check of the mass is still due. This we now want to calculate for the structure shown in fig. 7.14a.

$$m_5 = m_p \cdot \left(\frac{Z_{\nu\tau}}{Z_{ep}} \right)^3 \cdot \left(-\frac{r_1}{r_5} + \frac{r_2}{r_5} - \frac{r_3}{r_5} + \frac{r_4}{r_5} \right)^2 \quad (7.17)$$

$$m_5 = 1836 \cdot \left(\frac{5}{3} \right)^3 \cdot \left(\frac{2}{5} \right)^2 \cdot m_e = \underline{\underline{1360 \cdot m_e}} \quad (7.17^*)$$

But the for the tau particle measured value is considerable higher.









Even if this structure is the only possible in the case of the neutrino ν_τ for reason of the complete symmetry, will the tau particle however change its structure by itself if another structure exists, which is more stable, thus in which the particle can take a bigger mass. Such a maximum provides the structure shown in fig. 7.14b after checking all possible configurations with five elementary vortices:

$$m_\tau = m_p \cdot \left(\frac{Z_{\nu\tau}}{Z_{ep}} \right)^3 \cdot \left(\left(-\frac{r_1}{r_3} + \frac{r_2}{r_3} \right) \cdot 2 \right)^2 \quad (7.18)$$

$$m_\tau = 1836 \cdot \left(\frac{5}{3} \right)^3 \cdot \left(\frac{2}{3} \right)^2 \cdot m_e = \underline{\underline{3778 \cdot m_e}} \quad (7.18^*)$$

This value now lies 8% above the measurement values. It would be obvious, if unbound tau particles predominantly would take the structure shown in fig. 7.14b. The remaining error becomes explicable, if a very small number of tau particles in the lighter structure according to fig. 7.14a are involved with a correspondingly smaller probability.

The enormous variety of kinds of decay, and not a single one of the dominating ones has a probability of over 50%, makes it more difficult for us, to be able to directly infer the inner structure of a particle from the decay products. It nevertheless should be mentioned that after all 35% of all decays take place by taking up and using a neutrino ν_e or ν_τ , entirely in accordance with the model of the myon decay (equation 7.16).

name	mass (m/m _e) measu- -red	mass (m/m _e) cal- cula- ted	el.- vorti- ces z _e	char- ge Q	ra- dius r/r _p	inner structure of The elementary vortices, colour: (gn=green; rd=red) from the inside to the outside
e ⁻	1	-	1	-1	-	 Fig. 4.3 gn
γ ⁰	-	136	2	0	3	 Fig. 7.3 rd/gn
μ ⁻	207	204	3	-1	3	 Fig. 7.5 gn/rd/gn
η ⁰	1072	1088	4	0	1,5	 rd/gn/rd/gn
(ρ ⁻)	1509	1360	5	-1	1,5	 Fig. 7.14a gn/rd/gn/rd/gn
D ⁰	3650	3672	6	0	1	 rd/gn...rd/gn
D ⁺ or F ⁺	3658 till 4188	4284	7	+1	1	 gn/rd...rd/gn
(B ⁰)	10321	8704	8	0	0,75	 rd/gn...rd/gn

7.15 Table of vortices of the calculated leptons and mesons compared with measurement values (Part 1).

7.15 Pions

Unlike the leptons, which we could derive and calculate fairly completely, the mesons don't have a half-integer spin. With this characteristic property they therefore can't represent an individually overlapped elementary particle and they probably will consist of the amassing in pairs of individual configurations of potential vortices. This kind of bond can't be particularly tight. Consequently we don't know any stable mesons.

The most important basic building part of the mesons we have got to know over the positronium in fig. 7.3. It necessarily has to amass to another particle, otherwise it annihilates under emission of a γ-quanta, as already mentioned. This γ⁰-particle, as it will be named here, has the mass of:

$$m_{\gamma^0} = (2/3)^3 \cdot (1/2)^2 \cdot 1836 \cdot m_e = 136 \cdot m_e \quad (7.19)$$

which only can be determined arithmetically. As a partner, to which the γ⁰-particle can amass, first of all another γ⁰-particle should be considered. Because both partner will rotate against one another, this new particle would not have a spin and moreover would be uncharged. The mass now would be twice as big with:

$$m_{\pi^0} = 2 \cdot m_{\gamma^0} = 272 \cdot m_e \quad (7.19^*)$$

But the two γ⁰-particles will come very close together and mutually feel the local, in the same direction orientated, distribution of the field, which will lead to a weakening of the field and as a consequence to a slight reduction of the mass.

With these properties it probably concerns the uncharged pion π⁰. This model concept finds an excellent confirmation in the two possible kinds of decay, which can be regarded as equivalent:

$$\pi^0 \longrightarrow \gamma + \gamma \quad \text{with a probability of 99\%}$$

and



$$\pi^0 \longrightarrow \gamma + e^- + e^+ \quad \text{with a probability of 1\%}$$

Also in the case of the charged pion π[±] the observable decay offers a big help, which will take place with a frequency of almost 100 %:

$$\pi^\pm \longrightarrow \mu^\pm + \nu_\mu$$

The equation doesn't state anything about the fact, if a neutrino ν_e is used in the process. But it points at the circumstance that the partner of the γ⁰-particle for the π[±] most likely is a myon μ[±]. The mass will be smaller than the sum of both building parts:

$$(204 + 136) \cdot m_e = 340 \cdot m_e$$

name	mass (m/m _e) measured	masse (m/m _e) calculated	elem.- vortices z _e	charge Q	inner structure of The elementary vortices, colour: (gn=green; rd=red) from the inside to the outside
B ⁻	11194	9793 +?	9 +?	-1	 r/r _p = 0,75 gn/rt...rt/gn
(Y ⁰)	18513	17001 +?	10 +?	0	 r/r _p = 0,6 rt/gn...rt/gn

Some compound configurations






π ⁰	264	272	4	0	 2 x fig. 7.3 γ ⁰ + γ ⁰ = π ⁰
π ⁻	273	340	5	-1	 fig. 7.3 + fig. 7.5 μ ⁻ + γ ⁰ = π ⁻
τ ⁻	3487	3778	5	-1	 fig. 7.14b (2x gn/rd)/gn r/r _p = 2
(K ⁰)	974	918 +?	6 +?	0	 (2x rd/gn)/rd/gn
(K ⁻)	967	939 +?	11 +?	-1	 (rd/gn + gn)/rd/gn + 3 γ ⁰

Fig. 7.16: Table of vortices of the calculated leptons and mesons compared with measurement values (Part 2).

7.16 Table of vortices of the mesons

The numerous kinds of decay for K-mesons suggest that these strange particles will consist of various combinations of amassed together and in pairs rotating γ⁰- and μ[±]-particles. The possibilities of combination now already have increased in such a way that for every kaon and other mesons several solutions can be proposed. To avoid unfounded speculations, only a few clues will be given.

Besides the γ⁰-particles also heavier arrangements should be considered as partner for the spin and as a building part for kaons and other mesons.

If for instance a π⁰ is overlapped by a γ⁰, then this particle has an arithmetically determined mass of 918 m_e. It therefore can concern a building part of the uncharged kaon K⁰.

The likewise with three γ⁰ formed configuration of 6 shells however, if it actually would stay stable for the duration of a measurement, would have the mass of 3672 electron masses^{<i>}.

A very much better detectability must be attributed to the configuration of 4 shells which consists of two γ⁰, so to speak a heavy relative of the γ⁰ and the π⁰. It among others should be able to decay like a π⁰. With this property and with an arithmetically determined mass of 1088 m_e it actually only can concern the η⁰-meson. Solely according to the numeric value the η⁰-meson could also consist of four π⁰-mesons; but the decay in only two light quants speaks against it.

The kaon-puzzle in addition is made more difficult by the spontaneously possible ability to change of the involved γ⁰-particles during a process of decay, as is made clear by the numerous kinds of decay. These dependent pion halves can be "swallowed" or "spit out" by neutrinos in the process, they can form from incident light or be emitted as photons and eventually they even can break up in their individual parts.

In fig. 7.16 the possible configurations of potential vortices are sketched and the respective, according to the new theory calculated, mass is given. If above that the other decay products and quantum properties, which can be given for the vortex structures, are added, like e.g. charge, spin and if need be magnetic moment, then an assignment without doubts to the until now only from measurements known elementary particles is possible. In order to better be able to assess the efficiency of the potential vortex theory, the measurement values are compared to the calculated values.

Some terms are put in brackets, because it can be assumed that the calculated part only concerns the dominating part, to which further γ⁰ or other small configurations of vortices will amass for reason of its high mass. Correspondingly should the mass in that case be corrected slightly.

<i>: It could e.g. concern the D⁰-meson.


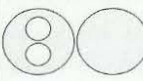

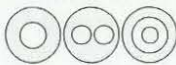


name	way of decay	mass (m/m _e) measured	mass (m/m _e) calculated	elem.- vortices z _e	charge Q	Inner structure of the baryon vortices
p ⁺	stable	1836	- (reference value)	3	+1	fig. 7.8  r/r _p = 1 (2x e ⁺)/e ⁻
n ⁰	p ⁺ + e ⁻ + ν _e (100%)	1839	1837	4	0	 figure 7.10a p ⁺ + e ⁻
			1934	4	0	 figure 7.10b n ⁰ r/r _p = 1,13
Λ ⁰	p ⁺ + π ⁻ (64%)	2183	(2176)	8	0	 γ ⁰ + p ⁺ + μ ⁻ (64%)
	n ⁰ + π ⁰ (36%)		2187 (2206)	8	0	 γ ⁰ + n ⁰ + γ ⁰ (36%)
Σ ⁺	p ⁺ + π ⁰ (51%)	2328	(2108+?)	7 + ?	+1	γ ⁰ + p ⁺ + γ ⁰ (+?) (51%)
	n ⁰ + π ⁺ (49%)		2142+? 2177	9	+1	γ ⁰ + e ⁺ + p ⁻ + μ ⁰ (49%)
Σ ⁻	p ⁺ + π ⁻ (100%)	2343	2274	9	-1	 γ ⁰ + n ⁰ + μ ⁻ (100%)

Fig. 7.17: Table of vortices used for the calculation of the most important baryons with suggestions for the structure (Part 3).

7.17 Table of vortices of the baryons

The number of possibilities of combination quickly increases, if only a few elementary vortices extend the structure of a particle. This probably is the reason for the large number of observable hyperons, which recently have been produced artificially and observed with the help of particle accelerators.

Both the neutron and the lambda particle can exist in a lighter and a heavier variant. At the moment of the decay, as it for instance is observed in a bubble chamber, according to expectation the state with the smaller mass takes the bigger probability. But in the amassing with further particles as building part of bigger and heavier hyperons the heavier structure is more likely. This circumstance should be considered in calculating the mass of the hyperons.

In figures 7.17 and 7.18 the most important baryons are listed, which are characterised in the way that one of the amassed together packets of vortices is a nucleon, thus a proton or a neutron.

The given, from measurements known, kinds of decay are able to confirm the inner structure pretty good. Of course an infinitely lot of combinations are conceivable and numerous predictions are possible. But speculations are unnecessary from the time on where we are able to calculate the particles.

The restriction to the few in the table listed particles seeming to be important hence doesn't limit the universal importance of the theory of objectivity in any way.

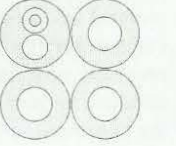
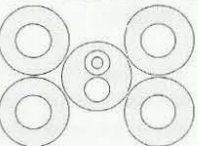

name	way of decay	mass (m/m _e) measured	mass (m/m _e) calculated	elem.-vortices z _e	charge Q	Inner structure of the baryon vortices
Σ^0	$\Lambda^0 + \gamma$ (100%)	2334	2342	10	0	 $n^0 + \gamma^0 + \gamma^0 + \gamma^0$ (100%)
Θ^0	$\Lambda^0 + \pi^0$ (100%)	2573	2478	12	0	 $n^0 + \gamma^0 + \gamma^0 + \gamma^0 + \gamma^0$ (100%)
Θ^-	$\Lambda^0 + \pi^-$ (100%)	2586	2546	13	-1	 $n^0 + \gamma^0 + \gamma^0 + \gamma^0 + \mu^-$ (100%)
(Ω^-)	$\Lambda^0 + K^-$ (69%)	3273	3172 +?	17 +?	-1	$n^0 + \gamma^0 + \gamma^0 + ?$ (31%: ? = div.)

Fig. 7.18: Table of vortices used for the calculation of the most important baryons with suggestions for the structure (Part 4).

8. Unified theory

With the theory of objectivity the longed for goal of a "theory of everything" (TOE), of an universal theory, seems to have moved within reach. If in the nineteenth century still promising field theories and approaches were being discussed, then has at the latest Einstein's theory of relativity destroyed all hopes in such a theory. Science as a consequence has become very much more modest and understands a TOE only as the unification of all known interactions.

Einstein has stated the minimum demand so^{<i>}: "a theory should be favoured by far, in which the gravitational field and the electromagnetic field together would appear as an unity". It is evident that a subjective or relativistic observer theory never is able to achieve this.

The presented theory of objectivity made it possible that the unification here for the first time actually has succeeded. This undoubtedly brings science a whole lot further, but it still is not sufficient to lie one's hands in one's lap being content with oneself. After all we still know very much more phenomena, which likewise should be unified. After all it is no accident that both Maxwell and Einstein, to name only two prominent representatives, after completion of their well-known works have struggled for the question, what sort of phenomenon it concerns in the case of the temperature and how this could be integrated in their theory.

The requirement reads: We must be able to derive all basic factors, which influence our system of units with their basic units, as a compulsionless result from the new theory. Besides the dimensions of space and time which determine our continuum, the explanation and unification of the basic factors mass and charge has to be tackled. If we have succeeded in doing so, we'll also tackle the problem of the fifth and last basic factor, which until now has put itself in the way of any unified theory as the question of fate, the problem of the temperature.

<i>: Einstein, A.: Grundzüge der Relativitätstheorie, Vieweg+Sonnen, Braunschweig 1973, 5. Aufl., WTB 58. Seite 97.

"A theory should be favoured by far, in which the gravitational field and the electromagnetic field together would appear as a whole"^{<i>}.

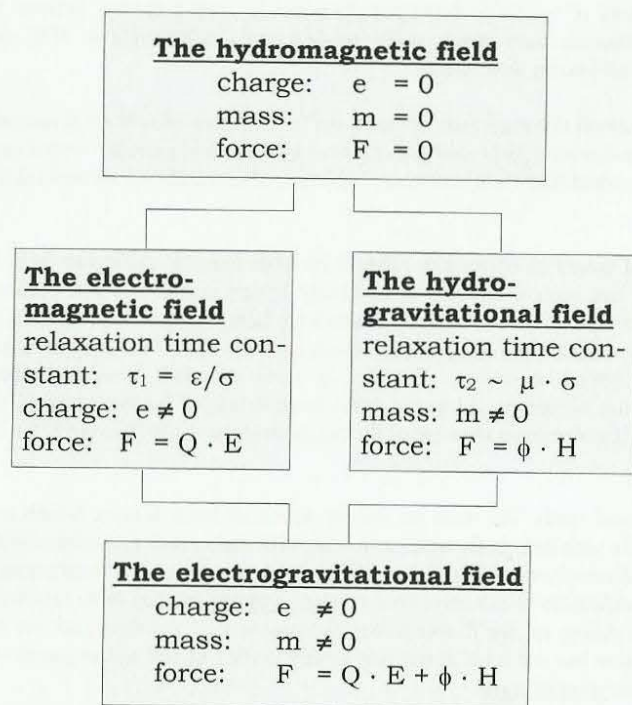


Fig. 8.1: Structuring of the fields and definition of terms

<i>: Einstein, A. : Grundzüge der Relativitätstheorie, Vieweg + Sohn, Braunschweig 1973, 5. Aufl. , WTB 58.

<ii>: derived from the Greek hydro (= water).

8.1 Structure of the field theory

In contrast to Maxwell's theory the new field theory, which we derived from duality, is also able to describe fields, in which no particles and no quanta exist. It probably is justified and useful in the sense of a clearer communication, to give the new field a name of its own.

The author recommends the introduction of the term "hydrotic field". In it should be expressed, which importance *water* has for both the like named potential vortex and this field^{<ii>}.

As we already have worked out, the hydrotic field is favoured particularly by polar materials and by a high dielectricity. *Water* is a corresponding and in the biosphere of our planet dominating material.

Whereas we had to correct the concept of a vortex free electric field, we had until now, considerable, we can take over the description of the magnetic field unchanged. This then should also be valid for its name. The new field which consists of both correspondingly is called hydromagnetic field.

In fig. 8.1 we recognize the structure. At the top stands the "hydromagnetic field", which is described mathematically by the equations of dual electrodynamics in fig. 3.3. It does not know quanta and as logical consequence neither charge nor mass. If we insert these equations, Ampère's law and the dual formulated Faraday law of induction, into each other, then there results as a mathematical description of our space-time-continuum the fundamental field equation (5.7, fig. 5.1). As a new physical phenomenon the potential vortex appears, which gives the hydromagnetic field a new and important property: this field can be quantized.

Starting-point is the wave, which for corresponding interference effects can spontaneously roll up to a vortex, which as highly concentrated spherical vortex finds a new right to exist and finds to a new physical reality.

The in the described manner formed particles show specific properties of their own. We now are able to attribute them for instance a charge or a mass. And these properties also can be investigated and described individually and isolated from each other. Thus are formed the two special cases, strange by nature, on the one hand the well-known, with the help of the Maxwell equations describable "electromagnetic field" and on the other hand the new "hydrogravitational field".

If we overlap the results of the two special cases, e.g. by adding the force effects of electric charges and accelerated masses, then we summarized obtain a field, which we accordingly should call "electrogravitational". This case is not at all unknown. Already Niels Bohr in this way has calculated the radii of the electron orbits in the hull of his model of the atom, to mention only one example. We can summarize:

*The hydromagnetic field is the all encompassing and with that most important field. Apart from that the electromagnetic field of the currents and the eddy currents and the hydro-gravitational field of the potentials and the potential vortices merely describe the two possible and important special cases. For reasons of pure usefulness for every special case a characteristic factor of description is introduced, the **charge** and the **mass**.*

Auxiliary terms (description of quantum properties):

* mass * charge * temperature * Planck's quantum of action

The hydromagnetic field does not know any quanta.

Structure of the fundamental field equation 5.7 (fig. 5.1):

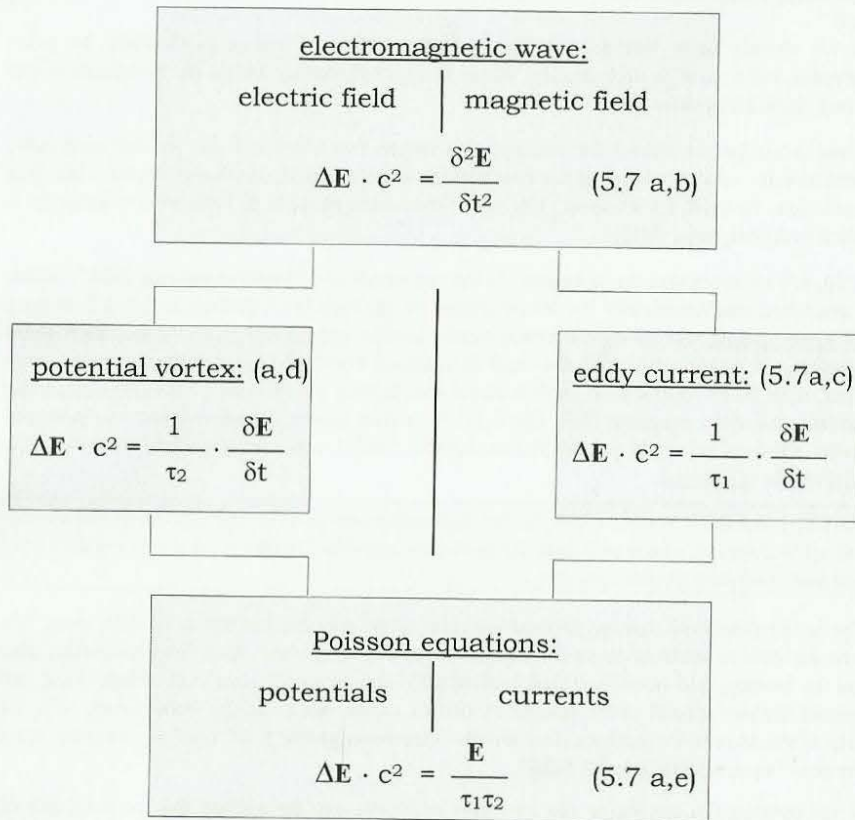


Fig. 8.2: Unified theory

- * electromagnetic interaction (open field lines)
- * gravitation (closed field lines)
- * strong interaction (does not exist)
- * weak interaction (only special aspect)

The interactions are a result of the field dependent speed of light.

8.2 Unification of the interactions

The discovery and introduction of the hydromagnetic field makes the desired unification possible, because the electromagnetic resp. Maxwell field, which describes the electromagnetic interaction, and the hydrogravitational field of the gravitation can be derived from this field as a consequence of the formation of quanta.

The kind of the interaction is caused by the course of the field lines of the field quanta which form as spherical vortices: the open field lines make the *electromagnetic interaction* possible. And the field lines with a closed course lead to *gravitation*. Both are a direct result of the field dependent speed of light. A more perfect unification seems hardly possible.

As the next step the *unification with the strong and the weak interaction* is required, but it could be shown that those don't exist at all. It just concerns misinterpretations with much fantasy, which should help explain the difference between a wrong theory and the physical reality.

Numerous *auxiliary terms* for the description of the quantum properties exist, like for instance *mass, charge or Planck's quantum of action*. The prerequisite for their usability naturally is the existence of the quanta. But until these have found to a physical reality, the auxiliary terms are unnecessary. The hydromagnetic field does not know quanta, quantum properties or auxiliary descriptions. It will be shown that, according to expectation, also the *temperature* is a typical quantum property, which comes within the group of the auxiliary terms. In this way also the temperature is fitted into the unified theory without compulsion.

Without the by us for reasons of usefulness introduced auxiliary terms the **fundamental field equation** is left with its description of a **spatial-temporal principle**. If a **world equation** should exist, then this field equation 5.7 has the best prerequisites.

For the fundamental field equation the division in four parts is repeated like already for the hydromagnetic field (fig. 8.1). It likewise consists of four individual parts, the wave (b), the two vortex phenomena (c and d) and the time independent term (e) (fig. 8.2). Whereas the duality still is combined in the wave, it comes to light clearly for the vortices to again be combined in the fourth case. Here arise however potentials and currents, which again can react and oscillate with each other, for instance as L-C-resonant circuit in an electronic circuit, with which the principle is repeated.

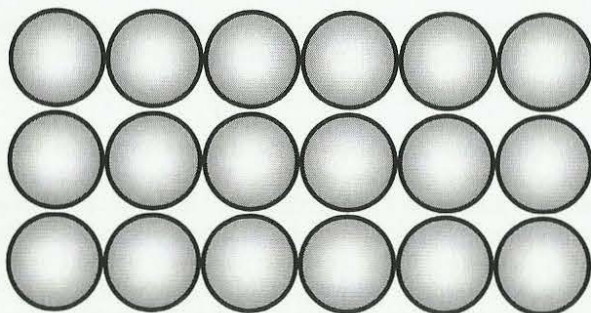
This principle is shown clearer for the phenomenon of the temperature as in all other cases. If we start at the top in the picture in fig. 8.2 we have an electromagnetic wave, which is absorbed and thus becomes a vortex. If the vortex falls apart, then eddy losses are formed. We observe that the temperature rises and propagates in the well-known manner.

We have arrived in the bottom box, but this again can be taken as the top box for the now following process, because the *equation of heat conduction* is a *vortex equation* of type c or d! We discover a *self-similarity*:

The spatial-temporal principle formulated mathematically by the fundamental field equation can be carried over into itself time and again.

Temperature is the oscillation of contraction of the elementary vortices resulting from the speed of light depending on field strength.

a. at absolute zero temperature:



b. if thermally excited:

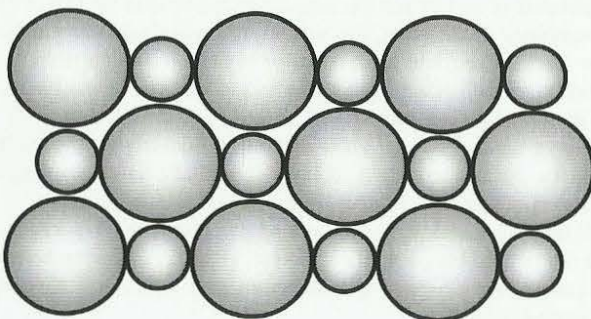


Fig. 8.3: Temperature as an oscillation of size for the speed of light depending on field strength

8.3 Temperature

Following the atomic view, in the case of heat it concerns kinetic energy of the molecules, which carry out more or less violent oscillations. In the case of gaseous materials with this concept, basing on mechanical models, actually successful calculations are possible, like for instance the speed distribution of gases won by Maxwell from theoretical considerations concerning probability.

But the attempt to apply the formulas of the kinetic theory of gases to solids and liquids only succeeds, if additional supplements and improvements are introduced. Since at all events it concerns temperature, thus the same physical quantity, of course also an uniform interpretation should be demanded, which in addition should stand in full accord to the presented design of an integrated theory (TOE).

Against the background of the new theory of objectivity we consider, what happens, if for instance the local field strength is increased by a flying past particle. The matter located at this point is contracted for a short time. By coming closer to each other, the individual elementary vortices mutually reinforce their field and are further compressed. Sometime this process comes to a standstill, is reversed and swings back.

At the same time every single particle, which in this way carries out an oscillation of size, has an effect on its neighbours with its field, to also stimulate these to the same oscillation, but delayed by some time. This phenomenon spreads in all directions. The propagation only will become stationary, if all neighbouring elementary vortices pulsate with the same amplitude. It now should be recorded:

The oscillation of contraction of the elementary vortices we call temperature.

Also this thermodynamic state variable therefore is a result of the variable speed of light. At the absolute zero of temperature no oscillation takes place anymore, whereas the upper limit lies in infinity. Since the cause for temperature represents an oscillation of the local electromagnetic field strength around the cosmic field strength, the following phenomena must be considered as excitation and cause, as dictated by the fundamental field equation 5.7:

1. Electromagnetic waves (b) are able to stimulate matter particles to synchronous oscillations of contraction by their alternating field. In doing so energy in form of heat is transferred to the particles, with the result that their temperature is increased. The wave is absorbed completely, if the thermal oscillation corresponds with the frequency of the wave.

We speak of thermal radiation.

2. But also the two dual vortices, the eddy current (c) and the potential vortex (d) can cause oscillations of contraction. This immediately becomes clear, if we consider a vortex as the special case of the wave, in which the oscillation takes place around a more or less stationary vortex centre. In the case of the decay of vortices, of the transition of energy from vortices to matter, the increase in temperature is measurable.

In the case of this process of diffusion we speak of eddy losses and of loss heat.

Answers to open questions of thermodynamics:

1. **Temperature** occurs *independent of the state* in which the matter is (unified theory).
2. Temperature even occurs in **solids**, where a purely kinetic interpretation fails (unification).
3. Each *elementary particle is carrier of a temperature*.
4. **Expansion** with increasing temperature because of the increasing *need for room* for larger amplitude of oscillation (principle: bi-metal-thermometer).
5. For **solids** the thermal oscillation of size is primarily passed on by the electrons in the atomic hull. Good *electric conductors* therefore at the same time also have a high *thermal conductivity*. (principle: electrical resistance thermometer).
6. For **gases** the entire atoms carry out this task, for which reason a *kinetic auxiliary description* becomes applicable.
7. For *extreme amplitudes of oscillation* the atoms partly or entirely lose their enveloping electrons, when they change into the **plasma state**.
8. The **second law** of thermodynamics loses its claim to be absolute and at best reads: with today's technology we are not capable, to design a cyclic working machine, which does nothing else, as to withdraw heat from a heat container and to convert it into mechanical work.

Fig. 8.4: Questions concerning thermodynamics

3. Flying past particles, in particular unbound and free movable charge carriers (e) produce an alternating field for other fixed particles. Doing so kinetic energy can be transformed in temperature, thus in energy of pulsation. A good example is the inelastic collision. But it can also be pointed to numerous chemical reactions. Whoever searches for a concrete example, takes two objects in his hands and rubs them against one another. In that case the particles which are at the frictional surfaces are being moved past each other in very small distance, in this way causing oscillations of pulsation, which propagate into the inside of the objects according to the thermal conductivity. *We speak of friction heat.*

This model concept provides sound explanations for a whole number of open questions (fig. 8.4), i.e. why the temperature occurs independent of the state (1) and even in solids, where a purely kinetic interpretation fails (2). Every single elementary particle after all is carrier of a temperature (3).

With increasing temperature most materials expand, because the need for room, purely geometrically seen, increases for larger amplitude of oscillation (4). This principle is used in the case of a bi-metal thermometer.

In the case of solids the thermal oscillation of size is passed on primarily by the electrons in the atomic hull (5). Good electric conductors therefore at the same time also have a high thermal conductivity. An example of an application is the electric resistance thermometer. In the case of gases the entire atoms carry out this task, for which reason a kinetic theory becomes applicable as an auxiliary description (6).

For extreme amplitudes of oscillation the atoms partly or entirely lose their enveloping electrons, when they change into the plasma state (7).

Finally the model concept even limits the second law of thermodynamics, which contains the postulate that it is impossible to design a cyclic working machine, which does nothing else, as to withdraw heat from a heat container and to convert it into mechanical work (8).

8.4 Heat energy

The discussed oscillation of contraction shows two characteristic properties, which must be looked at separately: the amplitude and the frequency.

Temperature describes solely the amplitude of the oscillation of size.

The heat energy however is determined by both, by the amplitude as well as by the frequency.

Consequently the ideas of temperature and heat energy should be kept strictly apart. It therefore isn't allowed to set this oscillation equal to the electromagnetic wave in tables of frequency.

To be correct two tables should be given, one for the wave, characterized by a propagation with the speed of light, and another one for oscillations of contraction, thus for stationary phenomena and phenomena bound to matter. The latter indeed can likewise propagate relatively fast by fluctuations of pressure in the case of acoustical sound frequencies or by free movable charge carriers in the case of heat conduction, but the velocity of propagation for sound or heat is as is well-known still considerably smaller than the speed of light. Thus an assignment without doubts can be made as to which kind of oscillation it concerns.

Temperature describes the amplitude of the oscillation of size of all spherical vortices.

The **heat energy** however is determined by both, the amplitude and the frequency.

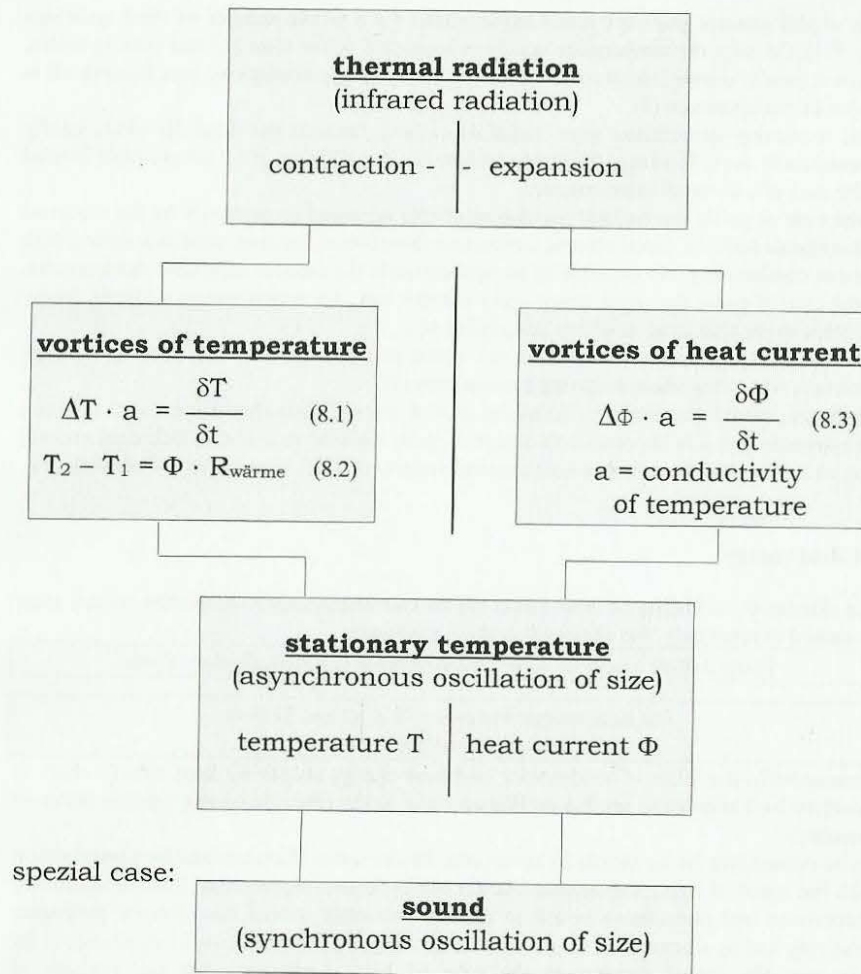


Fig. 8.5: Heat conduction resp. sound

8.5 Sound

The close relationship of longitudinal sound waves with the oscillations of contraction of thermally heated matter becomes particularly clear for ultrasound, where the arising heat in the inside of the body which is exposed to sound can be measured directly. The fundamental difference consists of the fact that the produced sound waves not only have the same frequency, but also the same phase, what needs not be the case for the temperature. The apparently uncoordinated occurring oscillations of size of the temperature, which as a rule occupy more space if the intensity increases, form a *"thermal noise"*.

The oscillation of size with the same phase is not realizable at all in a spatial formation of particles, with one exception, the case that all particles expand and afterwards again contract simultaneously and in the same time. We can observe such a synchronization of the pulsation oscillations of all elementary vortices in the case of a *pulsar*. For us a pulsar looks like a "lighthouse" in space which shines with a fixed frequency.

In reality it as well can concern a constantly shining sun, which carries out a synchronized, thermal oscillation of size, like a *gigantic low-frequency loudspeaker*. During the phase of contraction of the star its emitted light stays back. To us the pulsar looks dark. In addition the field strength is extremely increased and the light becomes correspondingly slow. During the phase of expansion the conditions are reversed and we observe a light flash.

Exactly the pulsar unambiguously confirms the here presented theory of the variable, field dependent speed of light.

The well-known fact that the microcosm represents a copy of the macrocosm, already suggests that each atom is capable of the same oscillation of size as a pulsar: if next to the oscillating atom a resting one is placed, then does this one see a smaller field during the phase of contraction because of the increasing distance. It hence becomes bigger itself. If the pulsating neighbouring atom afterwards expands, it however becomes smaller. The at first resting atom in this way becomes a *"pulsar" oscillating with opposite phase*.

The oscillating atom has stimulated the neighbouring atom as well to an oscillation of size, and this process will be repeated with the closest neighbouring atom. We *speak of heat conduction*.

To which extent the average distance between neighbouring atoms is influenced while a material is heated, solely depends on the structure of the atomic lattice. For matter with a fixed lattice according to expectation a smaller heat expansion will occur, as for the unordered structure of gases, in which we find confirmed well-known relations.

In a for potential vortices characteristic property *sound waves and thermal waves of contraction* correspond:

The propagation of potential vortex fields takes place as a longitudinal wave.

In this point vortex fields clearly differ from the transverse propagating electromagnetic waves. In the notation of mathematics they are called **"Scalar waves"**.

1. Ampère's law (see fig 5.1):

$$\text{curl } \mathbf{H} = \varepsilon \cdot (\mathbf{E}/\tau_1 + \delta\mathbf{E}/\delta t) \quad (5.1^*)$$

with relaxation time $\tau_1 = \varepsilon/\sigma$ (5.3)

transformed: $\delta\mathbf{E}/\delta t = (1/\varepsilon) \cdot \text{curl } \mathbf{H} - \mathbf{E}/\tau_1$ (5.1**)

integrated: $\mathbf{E} = \int [(\text{curl } \mathbf{H})/\varepsilon - \mathbf{E}/\tau_1] dt$ (5.1***)

2. Faraday's law of induction (in analogy):

$$-\text{curl } \mathbf{E} = \mu \cdot (\mathbf{H}/\tau_2 + \delta\mathbf{H}/\delta t) \quad (5.4^*)$$

transformed: $\delta\mathbf{H}/\delta t = -(1/\mu) \cdot \text{curl } \mathbf{E} - \mathbf{H}/\tau_2$ (5.4**)

integrated: $-\mathbf{H} = \int [(\text{curl } \mathbf{E})/\mu + \mathbf{H}/\tau_2] dt$ (5.4***)

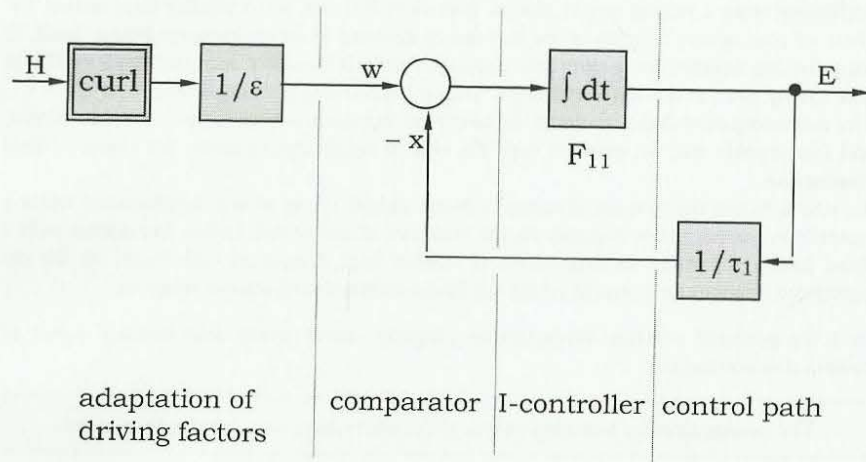
3. Signal flow diagram of the field equation 5.1***:

Fig. 8.6: Control technical analysis of the dual equations of the hydromagnetic field.

8.6 Basic principle of cybernetics

Surely can be attributed also information to the potential vortex. But how should information be formed? Is *information a form of energy*? Energy occurs as a consequence of the *formation of potential vortices*. Without this phenomenon there wouldn't be any energy.

Can information be described by means of a mathematical equation?

To be able to answer these questions, we subject the *fundamental field equation to a control technical analysis*. If it actually concerns a world equation, then an answers should be possible.

We again take up Ampère's law 5.1* from fig. 5.1 and remodel it according to the time derivative (5.1**). If the equation now is integrated over the time (5.1***), a *signal flow diagram* can be drawn (fig. 8.6).

The structure of a regulatory circuit is clearly visible. The individual paragraphs are described in an analogous way as for a technical control system. The execution of the curl operation on the field pointer of the magnetic field strength \mathbf{H} and the multiplication with $1/\varepsilon$ accordingly form an *adaptation of driving factors*. In the *comparator* the difference for control from driving factor w and controlling factor x is formed and supplied to an *integral controller*. The *control path has a purely proportional behaviour* and consists of the processing of the measurement value of the electric field strength \mathbf{E} with $1/\tau_1$, in which τ_1 describes the relaxation time of the eddy currents.

In technical control systems such a structure is found remarkably seldom, although it has an invaluable advantage: it possesses a *stability in principle*. Not a single adjustment of the controller exists, in which the closed regulatory circuit could become unstable, because it shows a *proportionally delaying behaviour of first order*. Possible changes of the adjustment of the controller or of the control path merely take effect on the speed, with which the regulatory circuit is able to follow changes of the driving factor.

This control technical basic principle convinces by its simplicity and efficiency. It meets us again in identical form in the second field equation 5.4*, the extended Faraday's law of induction. In dual formulation the electric field strength now appears as input factor and the magnetic field strength as output factor. Both *regulatory circuits are coupled and connected with each other*, by deriving their driving factor each time from the controlling factor of their dual partner. Is this structure actually efficient and meaningful?

Every regulatory circuit needs a target value, which is dictated from the outside. Let us think of the numerous control systems in nature. At all events a higher intelligence would be necessary for all the target values. This problematic is comparable to the question, what existed first: the egg from which a hen hatches or the hen without which no eggs can exist.

Without a given target, evolution would not exist.

The *connected regulatory circuit structure* provides the matching answer: cybernetic systems, which usually and as is well-known strive to a state of balance, get their *target value from their dual "partner"*. It is crucial that correspondingly dual systems are self-sufficient and can form and develop independently out of themselves without target values of a third side. This basic principle of cybernetics undoubtedly is brilliant.

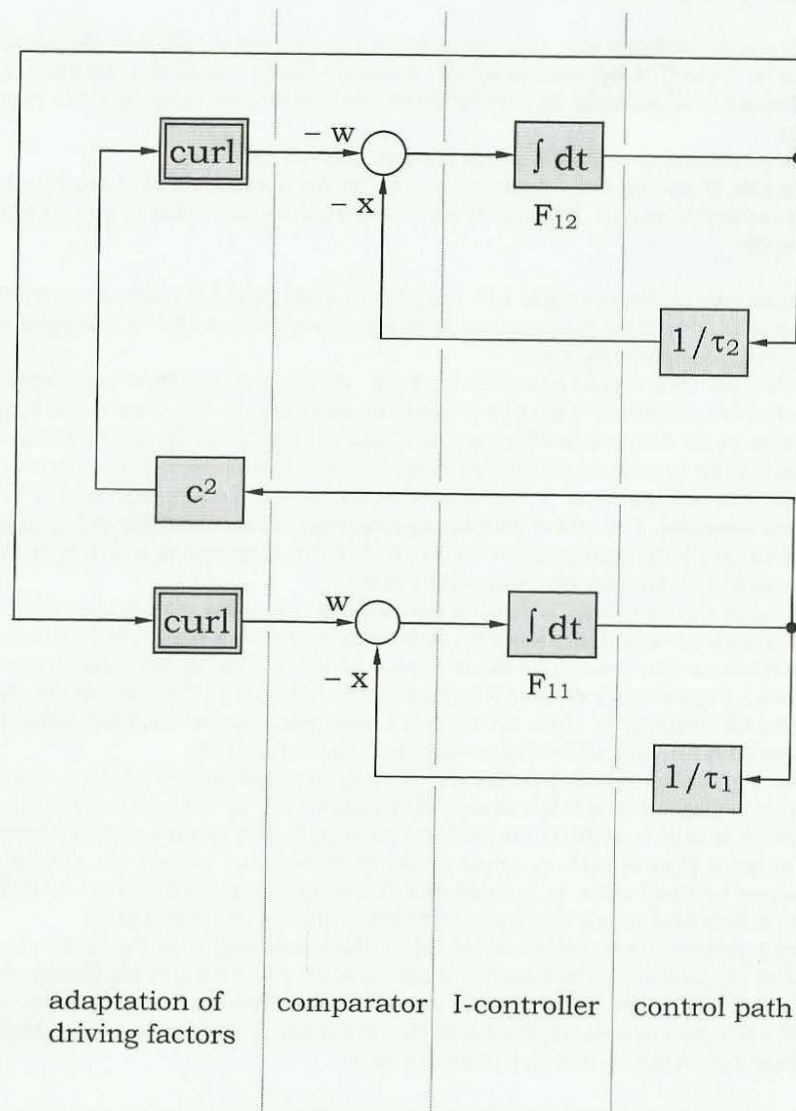


Fig. 8.7: Signal flow diagram of the fundamental field equation with adaptive structure.

8.7 Adaptive regulatory circuit structure

If out of the nowhere something like the cosmos or like life on earth should form, then the *connected regulatory circuit structure* basing on duality probably is the only possible and conceivable. Thus it merely concerns the *control technical representation of the fundamental field equation*.

The question for the efficiency not only concerns the stability, but equally the possibility of both systems, to oscillate and to communicate with each other by the coupling and the associated exchange of information.

Fig. 8.7 shows the signal flow diagram of both regulatory circuits. These are switched in line and form a coupled circuit, which itself can be interpreted as a third regulatory circuit. Also this one shows a change of sign in the circuit like the other two circuits.

The information technical interpretation could turn out as follows: information about a regulatory process in the lower regulatory circuit F_{11} caused for instance by a disturbance is communicated over the coupled circuit to the upper regulatory circuit F_{12} . In this case F_{11} acts as transmitter and F_{12} as receiver of the information. Afterwards both exchange their places, because F_{12} for its part reacts by a regulatory process and reports to F_{11} . The regulatory circuits adapt to each other. Obviously it concerns the basic structure of an *adaptive regulatory circuit*.

To analyse the coupled circuit the examination of individual special cases is recommended. If the regulatory circuits F_{11} and F_{12} are opened up in the way that the time constants τ_1 and τ_2 go towards infinity, then the double integral effect is left. Analyses of technical regulatory circuit teach us that such systems always tend to instability. Because in addition the target value is zero, an oscillation around zero will arise, which we call electromagnetic wave.

If one of both time constants becomes finite, e.g. τ_2 , then damping of the waves will occur. The "subordinate" cascade regulatory circuit F_{12} will adjust itself and now has a proportional delaying behaviour of first order. Together with the integral controller of the open F_{11} -circuit the coupled circuit will show the typical and more or less optimal regulatory behaviour of a damped oscillation.

These special cases correspond with the mathematical (fig. 5.2) and the physical (fig. 5.3) interpretation of the fundamental field equation. In addition a spatial rotation, a swirling will occur because of the double execution of the curl operation.

If interpreted control technically then vortices are the temporally stable, spatial swing of a field pointer around a centre, the vortex centre.

Without potential vortices no stability, no matter, no energy nor information would exist!

As can be looked up in Goethe's Faust, it always has been a desire of humanity, to find out, "what keeps the world together in the heart of hearts".

electric field	—	magnetic field
potential	—	current
capacitor	—	coil
Faraday's law of induction	—	Ampère's law
potential vortex	—	eddy current
convergence	—	divergence
dielectricity	—	permeability
non-metal	—	metal
isolator	—	electric conductor
tuned cavity	—	antenna
cold	—	hot
Yin	—	Yang
female	—	male
minus	—	plus
introverted	—	extroverted
stability	—	dynamics
water	—	fire
implosion	—	explosion

Fig. 8.8: Table of dual correspondences
(as a supplement to chapter 3.3 and fig. 4.2).

8.8 Information

The search for an answer for numerous philosophers and physicists was tantamount to the search for a world formula. Of course mustn't be forgotten that a formula only is a mathematical description and never the physical reality itself. It is a mathematical tool in the hand of a person and not the world or the cosmos itself, which he tries to understand. What keeps the world together in the heart of hearts, has to be more than only a pure apparatus of formulas. Actually the fundamental field equation tells us more. It reveals us a basic *principle basing on duality* in which the dual partners mutually dictate target values and goals. This principle convinces by its simplicity and efficiency. Apart from the "*self regulation*" it obviously also has the fundamental possibility of a "*self organization*" and the "*generation of information*". The field equations of the hydromagnetic field thus are the starting-point for the formation not only of matter and energy, but also of information. Accordingly holds:

Information is nothing but a structure of electromagnetic vortex fields!

This statement is new and to a large extent incompatible with the conception world of Norbert Wiener, who goes as the founder of cybernetics. From N. Wiener stems the sentence: "information is information, not matter and not energy".

We hold against it that obviously a fairly direct connection exists. We have worked out that only the vortex can show a stable adaptive regulatory circuit structure. Only the vortex and not the wave exists in two forms of formation dual to each other, and the *principle of duality* again is the prerequisite for the formation of information, of self organization and finally for the evolution. In fig. 8.8 well-known dual partnerships are listed. From it follows in a consistent way that for the *production of information* without exception the electromagnetic vortices should be considered.

But how can this so important duality occur, how can it form? This question is closely associated with the question of the formation of vortices. The signal flow diagram (fig. 8.7) to that says that the dual regulatory circuits F_1 and F_2 can only exist by the coupled circuit, which provides them the necessary target values and at the same time forwards the respective information. In this way of the oscillations and the more or less damped wave F_1 and F_2 communicate with each other.

The electromagnetic wave serves solely the mediation of information and energy.

With that falls a central role upon the wave, so that vice versa is valid:

Without wave no vortices, no duality and consequently no evolution can exist.

According to the to date state of knowledge the basic principle of cybernetics forms the basis for matter and energy as well as for information. Since the wave can only serve the transmission of information, the principle of duality and the *vortex* will function as *carriers of information*. We are entitled, to speak of **vortex information**. this by no means is characterized by special frequencies or modulations of frequencies. This is prevented by the property of the vortices which allows them to change the frequency. On the other hand various configurations of vortices are possible and numerous combinations and modulations are conceivable.

If technical apparatus generate vortices, then they produce information. Here a serious danger with regard to the environmental compatibility can not be excluded.

Equivalent things:

- * **elements of the fundamental field equation 5.7**
- * **elements of the Greek philosophy of nature**
- * temperaments
- * (impulses of growth)

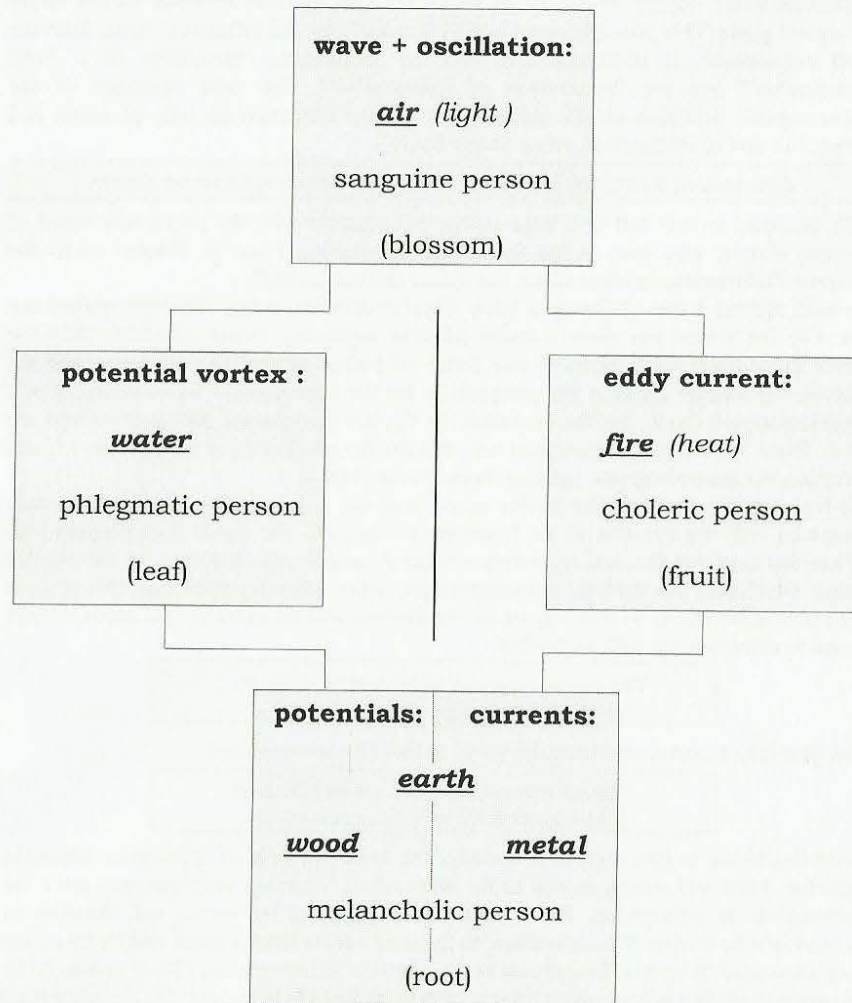


Fig. 8.9: The theory of four elements of the old Greek philosophy of nature (Aristotle and others)

8.9 Philosophy of nature

Seen in the view of the philosophy of nature now two dual points of view are possible. The optimistic one would be:

We and our environment on the one hand are a result of the cybernetic principle and on the other hand of our observation point of view which should be valued relativistically.

If really everything should be electromagnetism, a phenomenon which can't be grasped directly by humans, then the pessimist would come to the conclusion: *everything is nothing. What we observe is nothing but a deception of the senses.* Perhaps therefore famous philosophers of antiquity, like Empedokles or Demokritos have ended their life in the crater of the Etna. According to the theory of the atom of **Demokritos** (470 to 380 B.C.) the formation of matter, earth and celestial bodies will occur by means of **formation of vortices**.

Empedokles (482 to 420 B.C.) was the first to develop a theory basing on four elements, which was continued and improved by **Plato** (428 to 348 B.C.) and **Aristotle** (384 to 322 B.C.). Accordingly these elements are changeable into each other and mixable with each other. From them all bodies are build up.

The terms "air, water, fire and earth", with which the philosophers have described the four elements, are of course not identical with the ones in our translation and conception world, but they were used in a philosophical sense as a substitute for the description of the respective basic principle.

There also have been different approaches, to translate these terms differently, e.g. by an assignment to the four states of matter (solid, liquid, gaseous, plasma). But the ancient texts don't get easier to read in that way.

Fig. 8.9 shows the obvious assignment to the four building parts of the fundamental field equation 5.7. It would be worth an attempt, to exchange the terms in the translations of ancient texts and to translate air with wave, water with potential vortex and fire with eddy current. The term earth has two sides, which should be translated with potential instead of wood and current instead of metal.

Let's try the translation this way with the theory of Plato^{<i>}, by correspondingly translating anew the talk of Timaios about the formation of the world. The perception of smell then is described as follows: *"...as the potential vortex turns into waves (or) the wave into potential vortices, the smells are formed during this transition, and smells are smoke or fog. But fog is the transition of waves into vortices, the transition of the vortex into waves however smoke"*.

Plato here provides an indisputable and conclusive interpretation of the fundamental field equation. In this equation the potential vortex acts as damping term in the wave equation, what in the case of waves rolling up to vortices will show to the observer in the way that the electromagnetic waves and therefore also the light will be damped. We say, the visibility gets worse and speak of fog. If the damping phenomenon disappears again, as the potential vortices break up, then Plato speaks of smoke.

Numerous ancient texts, which until now only could be "interpreted" philosophically, in this way turn out to be a rational textbook description of natural scientific phenomena. They anyway only get readable and understandable for the general public with the modern technical terms.

<i>: Platon: Sämtliche Werke 5, Rowohlt's Klassiker Nr. 47, S. 188, 66e

Optimist:

We and our environment on the one hand are a result of the cybenetic principle and on the other hand of our observation point of view which should be valued relativistically.

Pessimist:

Everything is nothing. What we observe is nothing but a deception of the senses.

Plato^{<i>} (talk of Timaios about the formation of the world)
description concerning the perception of smell:

"...as water (the potential vortex) turns into air (waves) or air (the wave) into water (potential vortices), the smells are formed during this transition, and smells are smoke or fog. But fog is the transition of air (waves) into water (vortices), the transition of water (vortex) into air (waves) however smoke"

changed translation with the technical terms:

<u>air</u>	=	<u>wave</u>
<u>water</u>	=	<u>potential vortex</u>
<u>fire</u>	=	<u>eddy current</u>

As a consequence:

smell is vortex information

Fig. 9.0: The explanation of Plato concerning the formation of smell, smoke and fog^{<i>}

9. Usage

If the newly discovered vortex phenomenon of the vortex of the electric field exists, then it will be possible to practically use it. Whereas we still think about possibilities for technical usage, there by all means exists the possibility, that nature already is successfully using the vortex for a long time. We should look precise at things. We can only learn of nature.

Remarkable about the passage of Plato (fig. 9.0) is not only the fact, that the potential vortex already was known for two and a half thousand years and was taken into consideration for an interpretation, but also the realization of Plato, that during the described transition the smells form. Smell thus would be a vortex property.

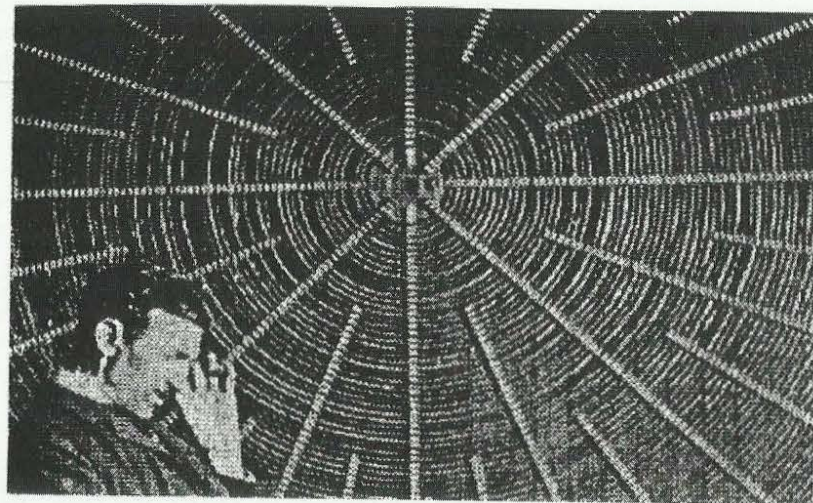
After all vortices are able to bind information as can be inferred from the basic principle of cybernetics. With this vortex property and the statement of Plato smell obviously would be nothing else than pure information which by potential vortices is stored, distributed and eventually is caught by the hair cells for smell of the nose.

If now a dog takes up a track, does it then run after vortices which remained behind or does it analyse, according to the encyclopaedia, the chemistry left behind, or does it combine both? Does the bloodhound for instance interpret the vortical oscillations of chemical substances like lattice oscillations or the movements of the electrons in the atomic hull? A lot of work awaits the research scientist of vortices here. The seminar will offer opportunity, to deepen this topic^{<i>}.

Only if technicians exist, who put an electronic box on the table with a button, at which they adjust the wanted scent of rotten eggs to lavender, we honestly can claim to have understood the phenomenon of the smell.

For the majority of the people a theory only wins its sense by the practical applicability, and therefore we'll have to develop and present a technical usage on the basis of the vortex theory.

<i>: Suggestions for appropriate seminar themes: the meaning of smell, taste, the aroma therapy, the homeopathy or the effect of aetheric oils. (To that in part 3, INDEL Verlagsabt. 2003)



The basic experiment
with the Tesla coil:

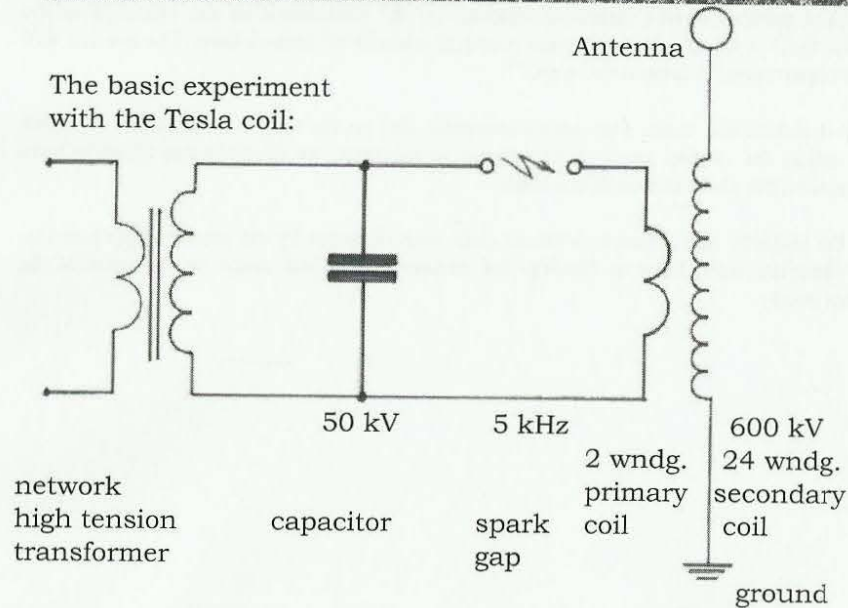


Fig. 9.1: High tension transmitter of Nikola Tesla

9.1 Longitudinal electric waves

It is important, that experts struggle for problem solutions. Only if the discussion about limits doesn't come to a result which can be grasped and verified, then also in the environmental compatibility the willingness will grow, to accept a not yet known phenomenon as a further and possibly crucial influential factor.

Already for a hundred years there has been a dispute of experts. At that time scientists all over the world were trying to verify the experiments of Heinrich Hertz. Then from America the message came, Hertz had been mistaken and the electromagnetic wave would have completely other properties. The scientists in Europe were indignant, but they had to take the message seriously, because it after all came from the important experimental physicist **Nikola Tesla** (1856-1943), who with his inventions of the rotary field and of the asynchronous motor has stamped today's electric energy technology as no other.

As a result Lord Kelvin boarded a steamship as a mediator and sailed 1897 to New York to convince Tesla from the opposite. But the experiments, which Tesla presented his Lordship, didn't give rise to any doubts^{<i>}

, and thus Kelvin returned to Europe with the message: "Both are right, Tesla as well as Hertz. Whereas the electromagnetic wave which Hertz has detected, is a transverse wave, does Tesla work with a longitudinal wave".

Lord Kelvin as a result started to draw most different *vortex models*, because it was clear to him, that a propagation as a longitudinal standing wave analogous to the sound wave only is conceivable, if quantized structures exist, which knock each other mutually. Kelvin therefore assumed vortex structures of the electromagnetic field. His vortex models were published and landed in the curiosity box of orthodox science.

Heinrich Hertz did have a big advantage. He could refer to Maxwell and calculate his wave with the field equations. For modern technology the mathematical calculability is almost an indispensable prerequisite!

For Tesla wave there however neither was a mathematical nor a physical theory. The only thing Tesla had, were presentable experiments.

In Colorado Springs he had build a 10 kW transmitting installation and lighted 200 fluorescent lamps of 50 Watt each on a mountain in the Rocky Mountains in a distance of 25 miles. With that he had completely transmitted the transmission power of 10 kW, as can be inferred from the press reports at that time. With Hertzian waves, which propagate spatially, this experiment even today, after over 100 years, wouldn't be realizable technologically. According to the law of the square of the distance one isn't even able to let glow a tiny little lamp in such a distance.

For sure his rotary field theory was a big help for Tesla in all experiments. Actually a *rotary field* can be seen as the *special case of a planar vortex*.

Thus Tesla obviously was able, to use the potential vortex without even knowing it. Tesla has stimulated a loosely coupled high tension coil wound like a spiral to self-resonant oscillations and emitted the produced vortices over an antenna (fig. 9.1). On the receiver side the process was then reversed.

<i>: N. Tesla; III. The Singular Misconception of the Wireless (Famos Scientific Illusions), Electrical Experimenter, Feb. 1919, p. 732.

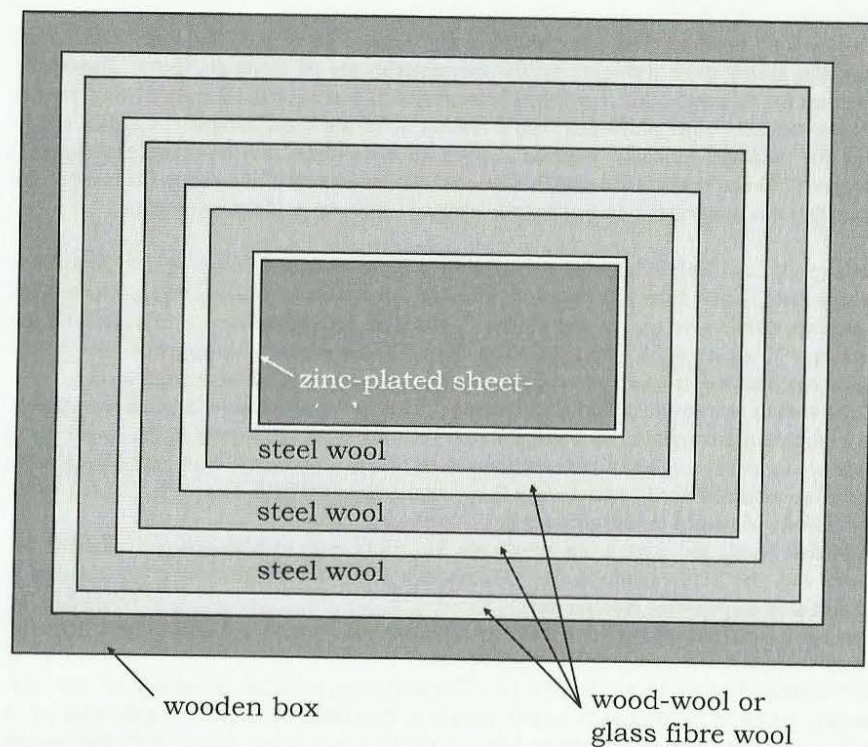


Fig. 9.2: Orgone accumulator according to Wilhelm Reich.<i>

9.2 Medical technical usage

Nikola Tesla at his time was extremely popular in the area of medicine. With his inventions injuries were cured and pain eased. Modern *diathermy* goes back to his work. But Tesla at that time has treated the patients with vortices, whereas today, possibly out of ignorance, electromagnetic waves are used. These however have in contrast to potential vortices only a small penetration depth. Today in addition only the effect of heat is considered and in no way the information technical effect of electric vortices. Here we are missing the comparison, to be able to say, if the treatment with a Tesla apparatus was more successful than with modern microwave radiators.

The experiments of **Wilhelm Reich** (1897-1957) aimed in the same direction. Exactly as Tesla 55 years before also Reich emigrated to America in 1939. He had specialized in catching and collecting vortices, which he called "orgone", from the air. In this way he could store up high energies over time and then use them purposeful. With his "*orgone accumulator*" he was able to cure wounds faster and to ease pain. He also treated cancer and a lot of forms of anaemia. Technically Reich could demonstrate, that charged capacitor plates discharge faster under the influence of his apparatus. His orgone accumulator for instance is a wooden box, filled with wool of steel and wood, which alternate in layers. He said that the reason for this construction is, that metals repel the orgone energy, whereas organic materials become charged and accumulate it. That holds in his opinion to a particularly high degree for water.

Reich concludes that no material and no device are known, with which the orgone energy could be shielded. This with regard to the environmental compatibility of the vortex phenomenon should make us thoughtful.

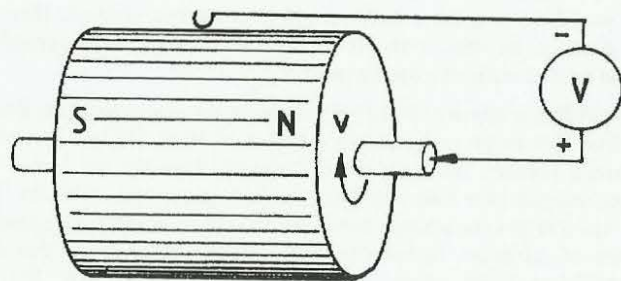
As a supplement it should be mentioned, that Reich already at the end of the forties has pointed to the *dying of the forests* and he has made a direct connection to the orgone energy. Reich was slandered and mocked and died in the prison of Connecticut, while his writings were burned publicly.

Not much better fared the Austrian forester **Viktor Schauburger** (1885-1958), who also can be described as visionary. He was able to produce water with a particularly good conductivity. His water in addition goes for medicinal and healthy. Also to him travelled cancer patients of far away to get this water.

Schauberger spoke of the natural treatment of the water, whatever he meant with that. In any case he build with great success installations to transport wood by floating it and even installations to mine ore with so-called *double twist pipes*, which made possible a transport without friction even of materials, which are heavier than the "*means of transport*" water. It could be proven that no contact with the pipe took place. This was scientifically investigated and confirmed at the university of Stuttgart 1952 by Prof. Pöpel. Quite obviously in the double twist pipe vortices have formed, which have bound the material to be transported (see phenomenon of transport).

Today you can buy *levitated water* at over 100 selling points in Europe, of which is claimed, that it is prepared according to instructions of Schauburger. Unfortunately we aren't able to ask him anymore, if he agrees with such a "centrifuged" water. Thus the test of the effectiveness has to be left to everyone himself or herself.

A: Concerning the functioning of the Faraday generator
 $(\mathbf{E} = \mathbf{v} \times \mathbf{B})$:



B: Construction of the flying disc:

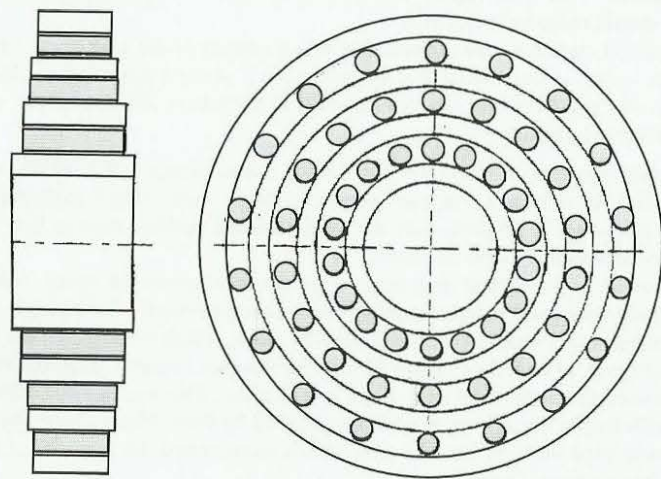


Fig. 9.3: Applications of the Faraday generator^{<i>}
 in the flying disc of Prof. John Searl

9.3 Flying objects

The medium of **Viktor Schauberg** always was the water. He could produce light effects and very high temperatures with it with only minimal excitation in the form of impulses. An installation, which had been built according to his plans at the company of Siemens, eventually melted at 4000°C by improper operation, as he himself stated. According to that the machine would have released more energy than used, thus a *perpetuum mobile*.

The authorities of the state in the Third Reich were impressed and put Schauberg in a concentration camp, where he was instructed to build a "*flying saucer*" under permanent supervision together with fellow prisoners. For him it's all about the concentration effect and the usage of the as a result occurring *implosion* in contrast to our today's "technology of explosion and fire" as Schauberg was accustomed to express himself.

It is not known, if Schauberg's "*repulsive*" ever has took off.

A disc, which has proven its suitability to fly, was constructed and built by the english technician **John R. R. Searl**, although he said he can't explain the effect. He also had big difficulties, to get the apparatus under control. A disc broke through the ceiling and the roof of his laboratory and disappeared to never be seen again. Five other flying discs, which he after this experience started in the open, went lost in the same manner.

Without knowing the effect, he of course neither could assess the dangers. His experiments have claimed serious injuries and a casualty. While he 1985 was put in prison under a pretext, his laboratory and his house were burned down and all documents destroyed. Now he works on a technical usage. According to the principle it concerns a *Faraday machine*. Thereby a permanent magnet, magnetized in axial direction, is turned. Now the magnetic induction B for a relative velocity v is measured as an electric field strength E according to equation 6.10: $\mathbf{E} = \mathbf{v} \times \mathbf{B}$. (6.10)

Because the vectors are arranged as standing perpendicular to each other, will arise a tension voltage in radial direction (direction of E -field) which can be taken off. Apart from the friction *no further force of reaction* occurs in the case of the *Faraday generator*. Because of the small gain of energy until today no application ready for the market exists. But this principle, to convert magnetic field energy into electric, already has moved the nature of many inventors. Professor Searl has reversed this old principle. Whereas normally the component of the velocity towards the centre of rotation decreases, it increases in Searl's case. For that he works with roller pivoted concentric rings, which he drives by a small electric motor (fig. 9.3). Doing so something inexplicable for him happens: After switching off the motor the revolutions per minute don't decrease again, but increase audibly and increase further, until the produced electric field shows the well-known *high tension phenomena*: corona discharges, formation of ozone, ionisation of the air and production of a vacuum in the inside of the disc.

The rings and rollers consist of several layers, which are built up similar to a bi-metal. The only explanation I can think of is that a change in structure would occur as a result of the physical length contraction which is caused by the increase of the E -field in the direction of the centre of rotation. The bi-metals try to withdraw themselves from this change by an increase of their rotation of their own (fig. 6.5). To compensate the field the disc builds up a spin, as also the elementary particles do (fig. 6.13). While the formation of vacuum prevents sparking in the inside of the flying disc, and the revolutions per minute further increase because there is no air friction whatsoever, the disc weighing 5 tons all of a sudden takes off the ground and according to reports of eyewitnesses shoots vertically upwards.

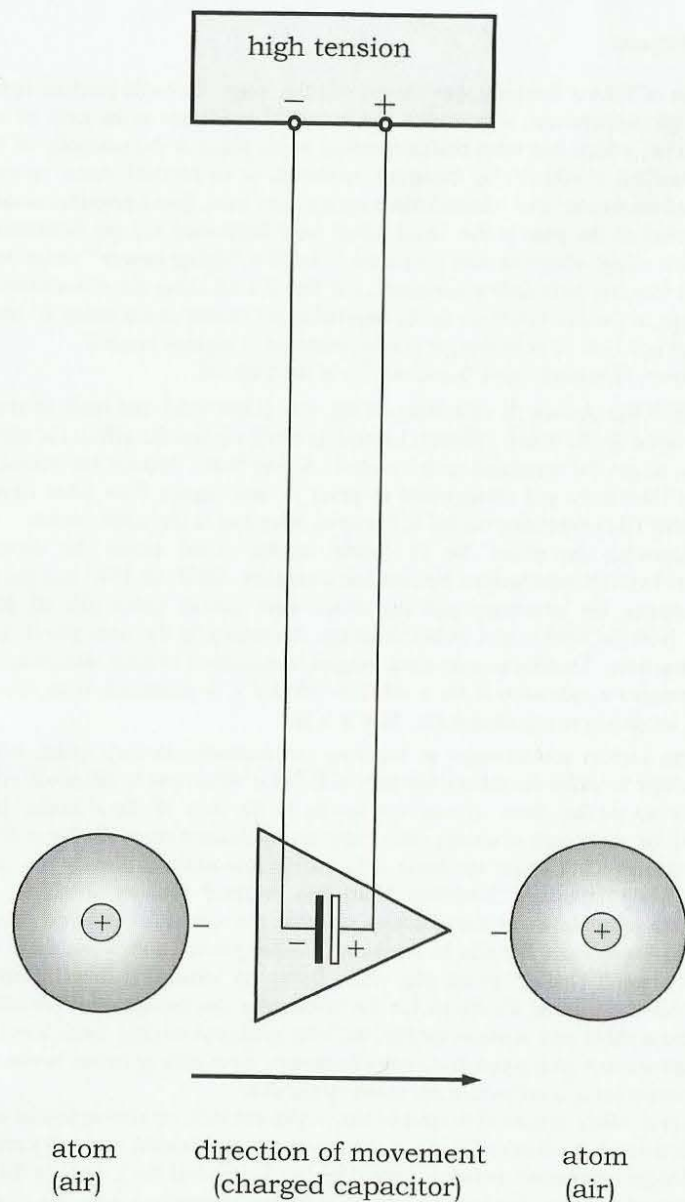


Fig. 9.4: Capacitor experiment concerning the so-called electro-gravitation according to Prof. Biefeld / Dr. Brown

9.4 Electro gravitation?

Wild speculations circulate about the mechanism of the flight of a "flying saucer", which should function *without sound* and *without combustion*, and for which *no sound barrier* exists, as pilots have observed. The talk is about cancelling gravitation or about an "electro gravitation".

Reproducible in any case is an experiment, which has been systematically investigated by the american professor **Biefeld** and his pupil **T. Brown** from 1925. Accordingly does a body charged to high tension show a *force effect in the direction of its positively charged pole*. As a check for oneself a capacitor can be suspended on its connection wires and it can be observed, how it moves visibly in the direction of the positive pole in case it is charged (fig. 9.4).

Because the Biefeld-Brown effect depends on direction, it actually can't concern gravitation at all but merely a not understood electromagnetic interaction. In the neighbourhood of the capacitor pole air molecules are found, and their negatively charged atomic hull is attracted by the positive pole. At the same time the atomic nucleus is repelled. By that the air atoms in the presence of the high tension capacitor become unsymmetrical, causing the force of attraction due to the smaller distance to exceed the force of repulsion. At the negatively charged end the conditions are exactly reversed. There a repulsion occurs.

Because the polarized air atoms and molecules are sucked in, no pressure can build up and as a result no sound barrier can occur. Experiments with charged and uncharged rockets have brought the interesting result, that the electrically charged rockets flew many times as far as the uncharged ones (5-6 times as high)^{<i>}.

Many a person now perhaps starts to dream of the flying carpet but, as said, it isn't an "effect of antigravitation". Does "free energy" actually exist, we have to ask ourselves? From the gravitation the soviet physicist **Landau** calculates an energy density of 16 megawatt hours per cubic meter for the earth's surface. Immediately inventors are found, who want to use this *gravitational energy*.

Nikola Tesla in his laboratory in Manhattan has incidentally built *resonators*, of which he could bring *all electric, magnetic and mechanic factors in resonance*. On an evening stroll he fastened a battery operated vibrator to the tubular steel scaffolding of a new building and let everything shake and wobble. In his laboratory such a device once got out of control by inattentiveness and triggered an *earthquake*. In that way the road surfacing and pipes were burst and window panes got broken. The police penetrating his laboratory only could see, how Tesla forcible finished the experiment with a sledge-hammer.

The experiments which got out of control of Tesla, Searl and Schauburger have one thing in common: *it concerns constructions with an unipolar arrangement of the field*.

Tesla had arranged the magnetic field in a unipolar way, as he has reported himself, Searl had realized electric unipolar fields in a construction similar to the electron, and Viktor Schauburger had specialized in producing unipolar structures with water vortices.

In the case of the corresponding technical usage, which can be interpreted as making use of the occurring "*spin coupling*", therefore in principle utmost caution is imperative.

<i>: Rho Sigma (Dr. Rolf Schaffranke): Forschung in Fesseln, das Rätsel der Elektro-Gravitation, Ventla-Verlag, Wiesbaden, 1972, Page 67.

Nikola Tesla: „Ere many generations pass our machinery will be driven by power obtainable at any point in the Universe This idea is not new, we find it in the marvellous myths of Antheus, who derives energy from the earth... Everywhere in the universe there is energy. Is this energy static or kinetic? If static, our hopes are in vain; if kinetic, and this we know it is for certain, then it is a more question of time when men will succeed in attaching their machinery to the very wheel work of nature". New York, the 20th may 1891, American Institute of Electrical Engineers.

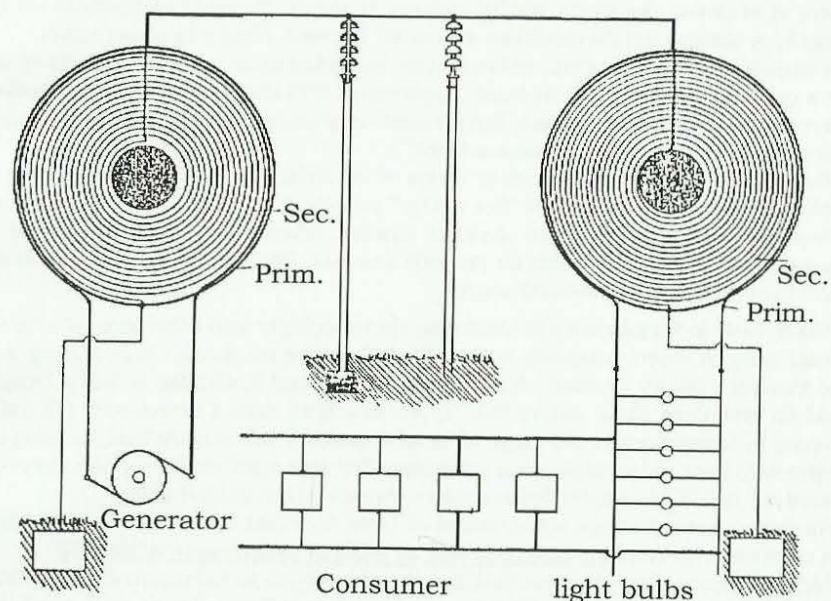


Fig. 9.5: Energy transmission bound to a wire,
Patent No. 593,138 (1897) of Tesla.

<i>: Philadelphia Public Ledger, Nov. 2, 1933

<ii>: Dr. Nikola Tesla: Complete Patents, Tesla Book Company, New Edition 1983, Compiled by J. T. Ratzlaff, ISBN 0-960356-8-2, page 301-304.

9.5 Free energy?

Furthermore is reported of **Tesla**, he would have developed a "*converter for space energy*" and 1931 have built it in a luxury car (Pierce Arrow)^{<i>}. The car was a 145 km/h fast, doing so the asynchronous motor (presumably built by Westinghouse) furnished 80 HP at 1800 Rpm. The "free energy" the converter, build by Tesla himself, got from a 1.8 m long antenna. Because the motor ran without adaptation of frequency in slipping operation, it had to be cooled correspondingly. It was on the way in trial run for over a week. Now we of course want to know, of what this "free energy" consists, which Tesla will have used and of which he already 1891 had spoken in the American Institute of Electrical Engineers.

For the electron as a spherical vortex we have calculated an electric tension voltage of 511 kV between its surface and its centre respectively infinity (equation 6.31*, fig. 7.1). The highest level of tension voltage normally used for the high tension transmission lies at 380 kV (effective value); for a direct current transmission it is 500 kV. Although still higher tension voltages would be desirable, they are avoided. This is no accident. Experiments with higher tension voltages namely have resulted in inexplicable high losses.

We have an explanation: the *electrons are taken apart* on the way. Their inner energy amounts with the outer energy to zero. The charge carrier, which in the power station as result of an energy conversion has been sent on a journey, is in danger to vanish into thin air (e.g. corona) for tension voltages above 511 kV. The transmitter of Nikola Tesla however (fig. 9.1 and 9.5) worked with 600 kV and more. He said, with his experiments he had *destroyed billions of particles without being able to observe an emission of energy* and made fun of the misinterpretation of Einstein of the already at that time well-known mass-energy relation $E = mc^2$.

For the purpose of a one wire or a wireless energy transmission the tension voltage therefore has to be higher than 511 kV. With Teslas equipment however the electrons shouldn't be destroyed, but merely be pulled apart to *plane circular vortices* with help of the today as *Tesla coil* known winding. These then could be sent on a journey over the antenna, to again be caught and formed back in spherical electrons by the receiver antenna. As long as the electrons don't fall apart, they keep their structure and quantum property. Quanta pass on an excitation, for instance a bump, in form of a longitudinal *standing wave*, by one particle bumping the neighbouring particle, analogous to sound waves, where one gas molecule passes the bump on to the neighbour. The transmission hence takes place as *longitudinal scalar wave*.

Electrons pulled apart to planar vortices in addition haven't got a *closed vortex centre* anymore on their journey. For the by Tesla in his laboratory used and publicly presented one wire energy transmission (1897, Patent Nr. 593,138) the transmission hence doesn't take place in the wire, but as *vortices around the wire*. That explains, why only a relatively thin conductor, which normally should have melted, was necessary for a demonstrated power transmission of 10 kW. Tesla however could show, that the wire stayed cold and virtually no heating losses were measurable^{<ii>} (fig. 9.5).

He himself said, that this one wire transmission technology is much better than the alternating current technology full of losses, which stems from him as well. Tesla must have known the limit of 511 kV very exactly, because on several photographs one can see, that he changed the coiling technique off this value.

<i>: Philadelphia Public Ledger, Nov. 2, 1933

<ii>: resp. Tesla's lost inventions, VAP, page 36 and page 48, 49.

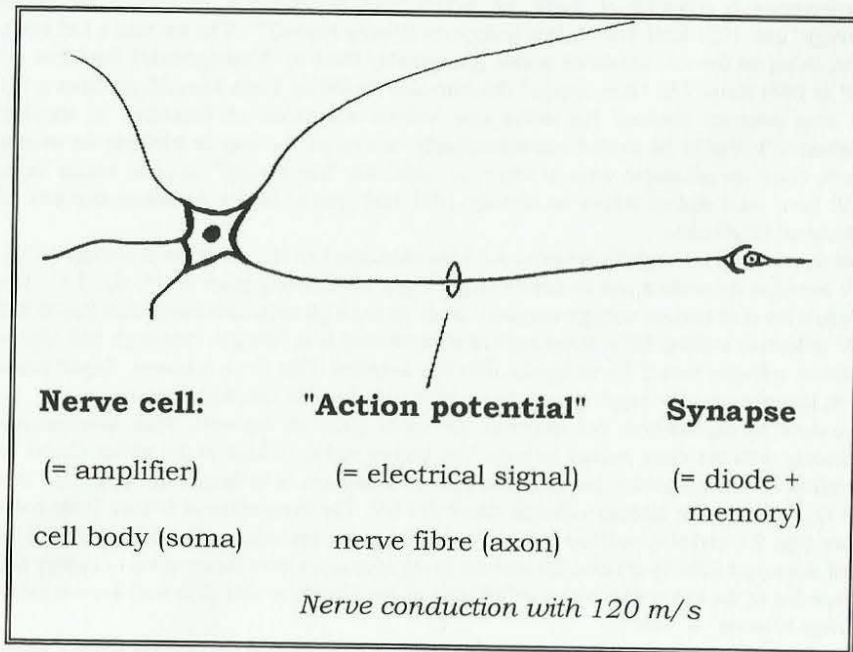


Fig. 9.6: Nerve cell and message processing (neurons)

- Material information conduction: at plants
- Information conduction with hormones: at simple animals
- Electrical information conduction: at higher developed creatures
- Analog transmission: from 10% and more difference in potential, and
- Digital transmission: number of the action potentials
- Modulated information: i.e. complex modulation of the action potential (the potential vortices)

9.6 Nerve conduction and action potential

Technical solutions often are only a suboptimum and many times they are anything but an optimum. In many cases the feasibility stands in the foreground. In the question of the current distribution at that time the decision was made for the worse system, the full of losses three phase system, because no current meters were available for the free of losses one wire technology. Without being able to collect money from the consumer, it wouldn't have been possible for the energy distribution installations to pay for themselves.

Compared to that is nature with its selection principle merciless and without compromises. Only *the most efficient system has a chance* to survive and to spread. If it's about transmitting information in an electric way and two different principles present themselves, then in nature only the better one will be brought into action.

Let's take a look at the *nerve conduction* in the human body. In the synapses ion concentrations and electric potentials of 70 to 90 mV arise. Here with conventional gauges the activity of a nerve can be detected. From a measurement of the transmission time of synapse to synapse the velocity of the signal is determined. If we however want to measure between the switch points on the line, then we have to find out, that for instance with an ammeter actually nothing is measurable. In addition the nerve fibre has a *miserable conductivity*.

The biologist calls the electric signal just *"action potential"* and draws a *vortex-like ring* around the nerve fibre and speaks of a mixed digital and analogue information transmission.

The doctor on the other hand knows two different types, fast and slow nerves. In the inside both are built up virtually identical. A characteristic difference consists of the fact, that the *fast nerves* are jacketed with a *thick fat layer*.

The technician would say, they are better isolated, but why they therefore should be faster, he hardly would be able to answer. If we however assume, that the action potentials or our potential vortices oscillate around the conductor, thus exactly in the isolation layer and are forwarded there, then possibly an explanation would have been found.

The nerve conduction moreover has much in common with the one wire system of Tesla:

1. *Charges and electric potentials are transmitted.*
2. *Doing so a transport of charge carriers, thus an electric current on the line, isn't detectable.*
3. *Consequently no losses worth mentioning occur.*
4. *Decisive for the functioning is the dielectric insulator material, which surrounds the conductor and not the electric resistance of the conductor.*
5. *In contrast to electric circuits a draining conductor is unnecessary.*

It looks as if the one wire system is not new at all, as would nature use it already for ages in the highest perfection. We realize immediately, why our *head does without a ventilator* and how the *high of signal processing density* can be explained. Compared with our brain modern personal computer (PC) with their backward cable technology are far less than a suboptimum.

With regard to the pressure on the environment by *interference radiation* we had derived, that currents and eddy currents with the skin effect direct their radiation to the outside, whereas potential vortices with their concentration effect direct it to the inside. Probably for this reason the *radiation field of a person is environmentally better compatible than that of a PC*.

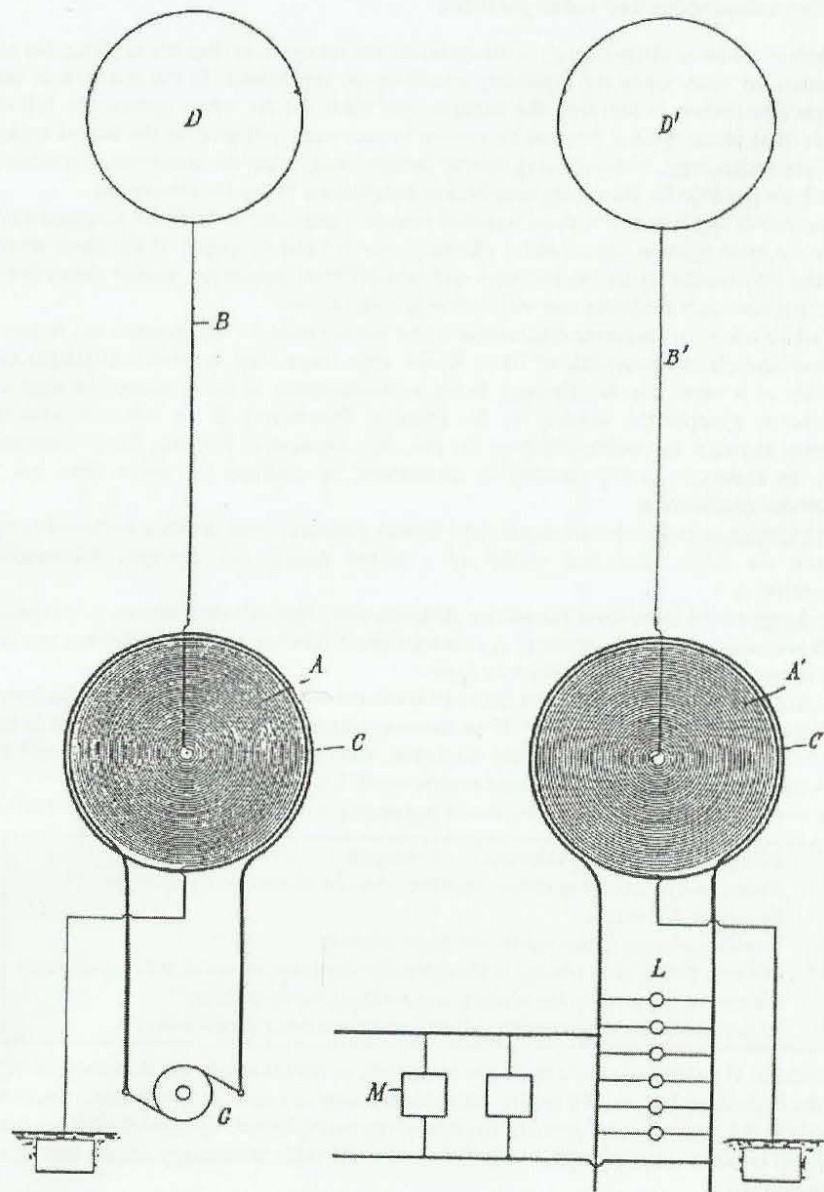


Fig. 9.7: Wireless energy transmission,
Patent No. 645,576 (1900) of Tesla.^{<i>}

<i>: Dr. Nikola Tesla: Complete Patents, Tesla Book Company, page 311-321.

9.7 Wireless energy transmission technology

Tesla still went a step further. He has cut the wire connection between transmitter and receiver (fig. 9.5) and instead has installed each time a spherical electrode (fig. 9.7). With this facility he now was able, to transmit energy completely wireless (1900, Patent No. 645,576). Building on this principle Tesla already 1890 had built a **radio remote control** for a battery operated submarine and had presented his patented system the navy. But they weren't able, to recognize the strategic importance of the radio technology and rejected with the words: "It's too advanced!" (fig. 9.8).

Tesla further had proven with this technology the mentioned proof concerning the **existence of longitudinal electromagnetic waves**. There exist descriptions, partly of Tesla himself, how he, inside or also outside his laboratory, goes in search of *oscillation nodes of the standing wave* with a measuring receiver^{<i>}.

He names several *conditions for the wireless energy transmission*:

1. "**perfect resonance**" (same frequency) of transmitter and receiver
2. Installation of the receiver on an "**oscillation node**" (maximum).

Important is also the measurement of the velocity of propagation, and that isn't constant from the start for a wave, which oscillates in the direction of propagation. From the research of earthquakes we know, that the *longitudinal waves* are *faster* than the as well occurring transverse waves. Usually the distance to the epicentre is determined from the difference in transmission time.

In the patent specification the measurement is described^{<i>}. Tesla has sent longitudinal radio signals from his transmitter in Colorado Springs once around the earth along the earth's surface and determined a transmission time of 0,08484 seconds. This corresponds to a frequency of approx. 6 Hz. He saw his result confirmed, as he could find the oscillation node of the standing wave again (according to $\lambda/2$) in his laboratory (on the ground plate).

For the full wave length λ the Schumann resonance, which describes a standing wave of an around the earth running Hertzian wave, lies as is well-known at 7.8 Hz! Tesla calculates for his wave a speed **1.6 times the speed of light** assuming the polar radius of the earth to be 6363 km.

Also this measurement result confirms, that Tesla didn't use the Hertzian wave. Tesla found the off-beat concept of Einstein, the speed of light would be the fastest possible velocity of signal transmission, only funny. If however today is claimed, 1993 in tunnelling experiments for the first time a speed faster than light has been measured, then this just isn't true. Possibly also the Tesla wave tunnelled, as the vortices for a small conductivity of the air contract and as a result of the length contraction become correspondingly fast.

Later Tesla after several goes in vain even succeeded in building a *high tension tube as a tunnel*, with which the velocity of the signal could be increased arbitrarily. Tesla with that pursued the goal to be able to make radio contact with other worlds^{<i>}.

<i>: N.Tesla: Art of Transmitting Electrical Energy Through the Natural Mediums, US-Patent No. 787,412, 18.4.1905, Complete Patents pp. 397-402.

<ii>: M. Cheney: Tesla, Man out of Time, Barnes & Noble Books, New York, 1993, und S. 309, Omega-Verlag, 1996, ISBN 3-930243-01-6

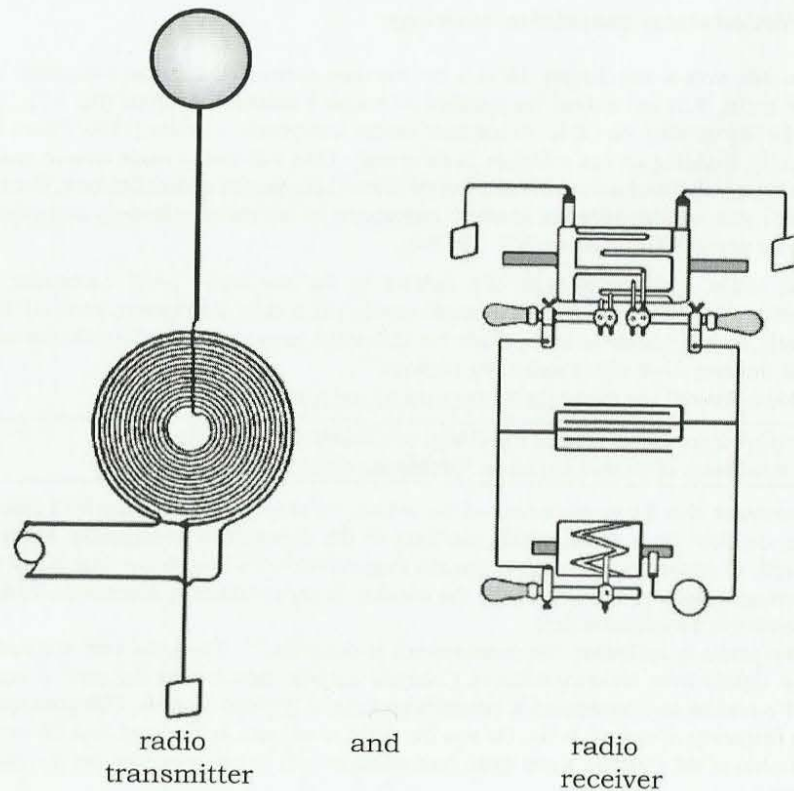
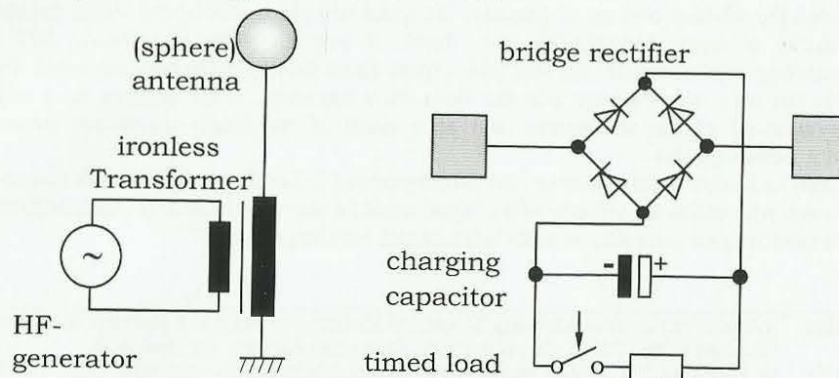


Fig. 9.8: Energy wave broadcasting system,
Patent No. 787, 412 (1900) of Tesla.

In today's switching technical notation:



9.8 Measuring and switching technique of Nikola Tesla

As an important and accepted experimental physicist with 14 doctor titles and carrier of the Edison medal Tesla always has held on to his measurement results. Not a theoretical interpretation but exclusively correct carried out measurements have shown him the physical reality. But the by Tesla won measurement results were already for 100 years hard to digest and couldn't be brought into accord with any theory. Therefore a switching technical analysis of the by Tesla described and carried out experiments should give us now information over the nature of the free energy, the tachyon energy, the orgone, or however fantastic the terms may read.

The *Tesla coil*, according to the instructions of the inventor, is a flat coil wound like a spiral in contrast to the copies today on sale which, surely out of ignorance, are mostly cylindrical. Its peculiarity probably is to be seen in the circumstance, that charges moved through the wire of the coil inevitably increase their angular velocity towards the centre. In this way the electrons, which at first are spherical elementary vortices, are pulled apart to vortex rings like planar discs.

Tesla switches the "secondary" called flat coil between two "terminals". Following he sends, stimulated by his "primary", charge carriers from one terminal to the other and back again and produces a *standing resonant oscillation*.

Mostly replaces Tesla one of both terminals by the earth. He thus assumes, that now the *earth as a spherical electrode* takes over the function of one terminal. That he again infers from the observation, that a by the transmitter wireless fed little lamp goes out, if he cuts the connection to the ground. Doing so the oscillation collapses. Radio sets on the other hand can also be operated without grounding, as we know.

The degree of effectiveness of today's distribution technology of current due to the heating losses lies clearly beneath 100 per cent. Without the losses of the wiring it lies close to 100 per cent for the discussed one wire energy transmission. There the vortex rings are guided nicely one after another along the line like beads drawn over a string. This result even is to be expected, as far as no vortex "jumps off" the wire or "falls apart".

For the wireless version Tesla however to his own surprise had to find out that more energy could be received, than his transmitter produced. The measured degree of effectiveness lay above 100 per cent! He therefore called his transmitter a *"Magnifying Transmitter"* (fig. 9.10). The further transmitter and receiver were away of each other, the further the received energy increased. Tesla inferred from this, that there had to exist free energy and that he had caught that too.

Consequently he had built a *receiver for free energy* and registered for patent (1901, Patent No. 685,957, fig. 9.9). Tesla states that the amount of energy depends on the size of the "terminal". Of today's sight we could be willing, to describe this receiver plate as a solar panel, but we should know, that the apparatus produced energy *even at night*. In addition the energy gain was considerable higher than for today's solar panels. Tesla spoke of *"radiations"*, of an *unknown radiation* and he in his lifetime has in vain sought-for help of explanation.

The vortex model will also in this question be a valuable help to us.

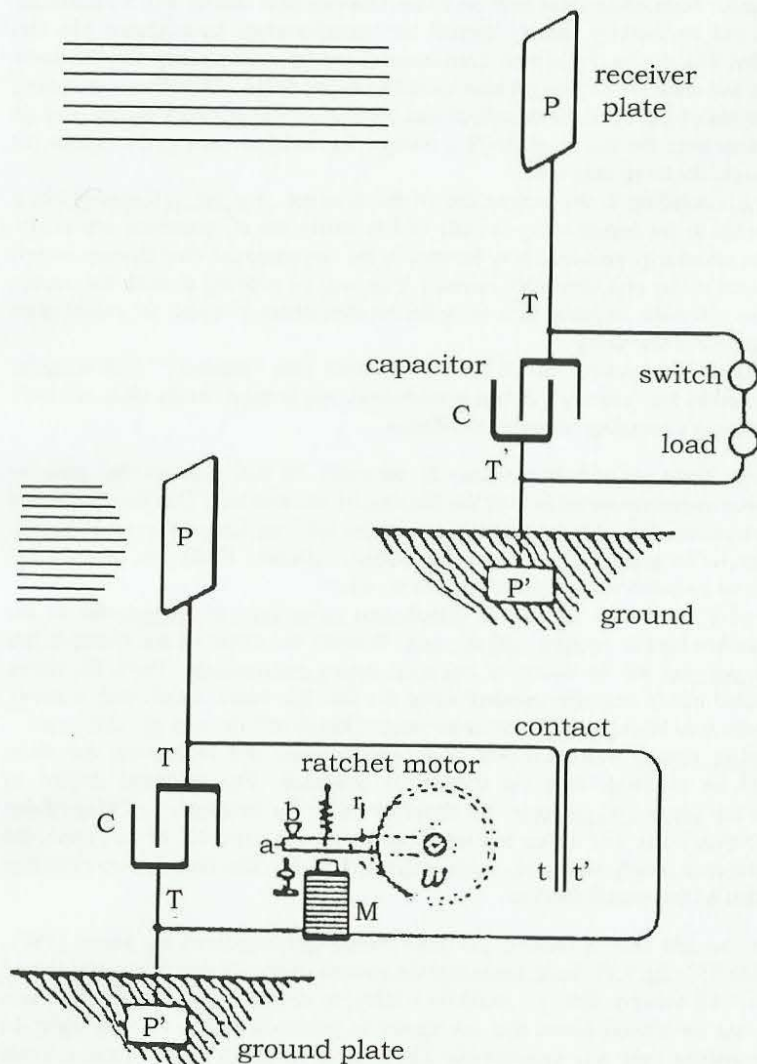


Fig. 9.9: Receiver for "free energy",
Patent No. 685,957 (1901) of Tesla

9.9 Energy technical usage

The answer of the potential vortex theory could turn out as follows:

If at the transition of the one wire to the wireless transmission the ring-like vortices is purloined the guiding wire the vortices immediately begin to turn around each other, as is observable for flow-technical ring-like vortices. In this way the ring-like vortex the next moment shows its inside. If it before was an electron vortex (fig. 4.3), then it now shows as positron, if it was negatively charged, then it now is positively charged. Following it oscillates back again, etc. Wit that the *ring-like vortex* on the average has *no measurable charge* and *no mass*, because it alternately forms matter and anti-matter. Without interaction it has an enormous *ability of penetration*. In physics such particles are called *neutrinos*.

Tesla thus had, apart from his transmitted energy wave, which turned out to be neutrino radiation, by chance also caught neutrinos which oscillated synchronously.

According to the actual level of knowledge do neutrinos penetrate the earth and appear also on the night side. The order of magnitude in every second amounts to approx. 66 billion neutrinos per square centimetre. It is a true bombardment. If we would be able, to collect and convert all neutrinos, the won energy would be entirely sufficient, to cover the need for energy of the world population (approx. 27 W/m^2). We merely have to materialize them, thus give them mass, charge and the necessary localization. Tesla was able to do that experimentally. Let's record:

The ring-like vortices, which Tesla with his transmitter has sent on a journey as *electrons* with an open vortex centre, are *neutrinos* (fig. 7.12). Tesla requests that transmitter and receiver operate in resonance, thus with the *same frequency*. Under this condition the receiver collects in all oscillating vortices, so that no one is lost.

If the neutrinos for instance are just positively charged when leaving the transmitter electrode, then an *electromagnetic force of attraction* takes place, if the receiver electrode at the same time is negatively charged. The required operation with the same frequency and opposite phase guarantees that also the next moment, if both, the neutrino and the receiver, have changed their polarity, the electromagnetic attraction is preserved.

It is obvious, that strange neutrinos which fly past and by chance oscillate synchronously are as well attracted. In that way the power collected in the receiver capacitor will increase further and degrees of effectiveness of over 100% are obtainable. Tesla discharges the receiver capacitor timed with the frequency of resonance (fig. 9.9) and points to the difficulty of an exact keeping of the *condition of synchronisation*.

Tesla indeed did work on a theory of his own, but never published it. The patent office and his lawyers had to proceed from the Maxwell theory, although Tesla knew only too good, that his apparatus in no way could be described with this theory. It therefore can't be excluded, that important facts in his patent specifications haven't been mentioned at all - or even worse - consciously or unconsciously in an inapplicable manner have been explained with the Maxwell theory.

Perhaps this is the more profound reason, why the numerous Tesla imitations don't want to function quite so well. With the new theory there should be some changes, and we should accept the challenge for the sake of humanity.

The transmitter tower of Tesla (57 m high with a spherical electrode of 21 m) for the transmission in multiplex mode of operation (according the inventor) of:

- telephone calls
- telegraph services
- teleprinter services
- radio programmes
- navigation signals
- time signals
- video signal



Fig. 9.10: The planned transmitter Wardenclyffe of Tesla on Long Island, 7.5 MW (1902).

9.10 Environmental compatibility

We now can summarize the different observations and try to find answers for the in the first chapter raised questions concerning the electromagnetic environmental compatibility. The by Tesla used *longitudinal energy wave* is a *potential vortex wave* in the sense of the vortex model of Kelvin, which we again could identify as *neutrino radiation* (Dirac). Also other, partly quite fantastic terms, are known like "*radiations*" (Tesla), "*orgone radiation*" (Reich), "*tachyons*" (Feinberg), "*grid radiation*" (Hartmann), "*bioradiation*" or "*water veins*".

Actually these rays have nothing to do with water as a cause. Water with its high dielectricity however favours and influences the course and the local distribution of the radiation. The maximums of the standing wave considered for themselves result lines in straight as a die in the landscape. Of Tesla is known, that he measuring technically could detect the cross points of the lines, which he called oscillation nodes.

There exist so-called dowsers, who can make these *standing waves* out even without technical aids. For that they hold a fork in their hands, which suddenly moves over such lines.

Let's remember that the same potential vortices are used at the nerve conduction as *reaction potentials to conduct stimuli*. If ring-like vortices arrive at a muscle, it contracts without knowing, if the signal was sent from the brain over the spinal cord or picked up from the environment over the fork and the hand.

Thus if the same signals, which we use for the tasks of controlling and thinking, are also produced by technical apparatus, then this touches the question of the environmental compatibility in a direct way. Above extremely strong points of resonance, which are called "geopathic zones", now and then even is warned about "*psychotronics*", a function trouble of the brain, which can show in a *disturbance of the waking consciousness*.

A possible explanation would be that the brain is occupied with so much vortices picked up from the outside, that it isn't able anymore to accomplish its actual tasks. For *muscle cramps* or an inexplicable crash of a PC an correspondingly interpretation would be obvious.

As long as no gauges are available, the highest caution is imperative.

If Tesla had been able to put into operation his transmitter tower for longitudinal waves ("World Telegraphy", Wardenclyffe, Long Island, s. fig. 9.10) with the estimated power of 7.5 Megawatt and thus had been able to realize his dream of a world-wide wireless communication, then this could have had hardly estimable consequences for the health of the world population.

Shortly before the completion of the project, in the year 1905, Tesla without notice let stop all work. He to that never made an explanation to anyone. Officially it was said, his financial backer **J. P. Morgan** would have withdrawn his financial means. In any case was Tesla financially ruined with this step.

Perhaps also **T. A. Edison** was behind it, who was his opponent at that time. Edison committed himself engaged for the use of direct current. Against the alternating current, preferred by Tesla, Edison argued with *unhealthy risks*, and with that he perhaps wasn't so wrong at all.

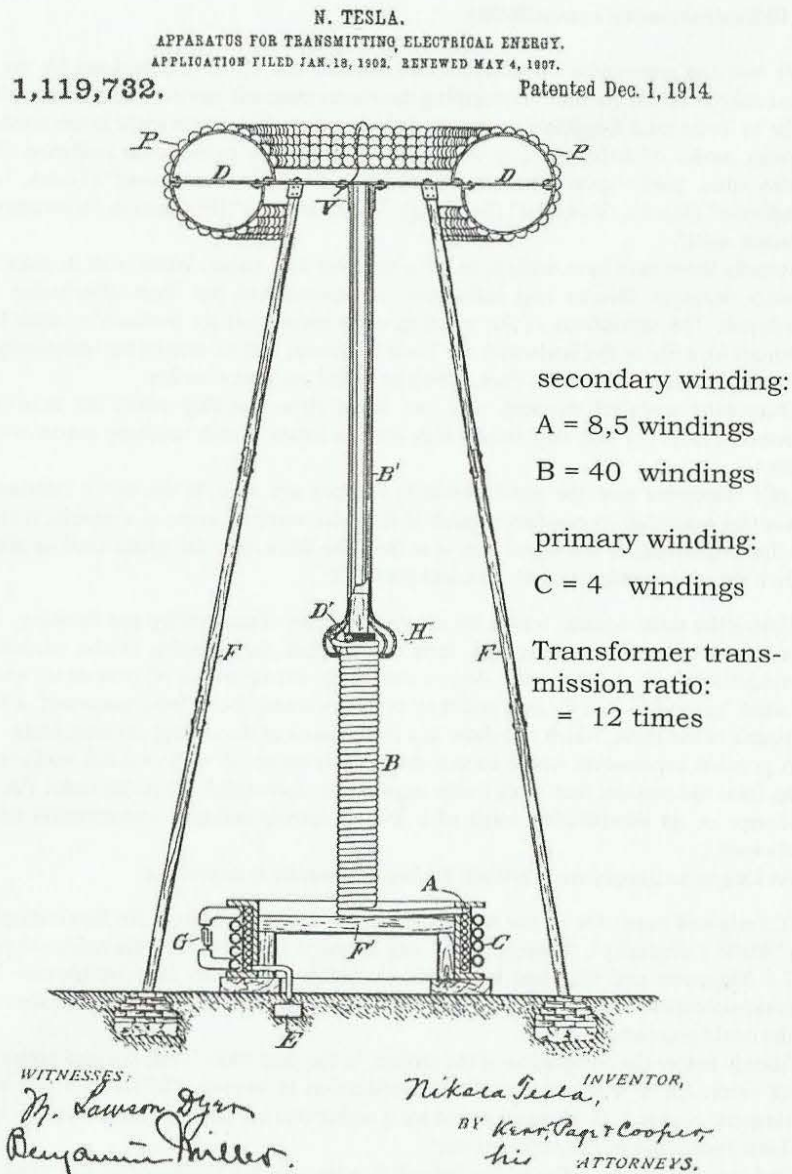


Fig. 9.11: Concerning the technology of the Wardenclyffe transmitter (fig. 9.10).^{<i>}

<i>: Dr. Nikola Tesla: Complete Patents, (J.T.Ratzlaff), Tesla Book Company (1983), ISBN 0-960356-8-2, P. 435.

9.11 Ecologically fair usage

Tesla not only has stimulated ecologically fair usages of the energy radiation. To that can be counted the use of a Tesla transmitter as a *radiation weapon*^{<i>} as well as the mentioned building of a *Tesla interferometer*, the low-frequency interferences of which can lead to mighty gravitational waves and with help of which it should be possible, to produce earthquakes, to sink ships or to shoot down planes from the sky^{<i>}. Against the background of two world wars it can be understood, why Tesla has drawn attention to the possibilities of a use of his system for the purpose of defence.

In today's sight a technology like Tesla's *wireless energy transmission* (fig. 9.11) hardly would have any chance of a large technical use, because it should be reckoned with enormous problems of environmental compatibility. After all had come out in our considerations, that entirely in contrast to the Hertzian wave just of the Tesla energy wave direct biological effects are to be expected. A purposeful medical use of the Tesla rays however can be imagined.

The collecting of "free" energy waves with a *neutrino receiver* at first undoubtedly would be a clean and ecologically fair alternative to the present energy technology, with which we heat or nuclearly contaminate our environment. But even the use of free energy converters has limits. Should it turn out that the *Photosynthesis* uses such a materialization, in which the necessary free electron for the chemical reaction actually is produced from a caught neutrino in the so-called reaction centre and thus the reaction energy is won, then for an as usual excessive use by men it can't be excluded anymore, that the plants on earth die and nothing grows anymore.

I in contrast attribute big chances to the *one wire transmission technology*. Because for an use of alternative and regenerative energy sources, like the sun in the desert or the geothermal energy in Iceland, the transport of energy has to be made over large distances through the oceans the small losses and the possibility to be able to use sea cables, play a big role. In the residential areas and conurbations on the other hand it has a positively effect, that by the concentration effect of the potential vortices the *interference radiation* is directed inward. Laid on the bottom of a sea or of a river, such a line in addition is protected against the effects of lightning and sabotage, and it neither spoils the countryside, as the old-fashioned high tension pylons do.

For transportation tasks the mentioned *making use of the spin coupling* would surely be the most suitable drive. The denser the medium, the more efficient would be the driving effect, for which reason not only flying objects, but quite particularly also ships and submarines could be operated non-polluting in this way without combustion and without exhaust fumes. Build up effects by the water pressure or the sound barrier don't occur. But control might not be entirely unproblematic. If for the reason of a *unipolar arrangement of the field* a relative velocity to compensate the field becomes necessary, then a correspondingly build up arrangement will do so without considering losses. It is no accident that most apparatus which got well-known have flown the builder sooner or later "past his ears" (note of the translator: broke into pieces). Till a commercially utilizable flying saucer has been built, many technological hurdles have to be taken.

Claims to an up-to date environmental policy

in view of longitudinal electromagnetic energy waves

- = Tesla waves = neutrino radiation = scalar waves
- = potential vortex waves:

1. Gauges must be developed and built, with which the energy waves can be measured.

2. All technical apparatus should be tested regarding the emission of energy waves. Harmful radiation should be avoided.

3. Only such transmitter antennas may be brought into action, which emit a minimum of energy waves.

4. The ability of biological systems to absorb energy waves should be determined. To that also belongs the question, how many vortices collect locally and how fast they fall apart.

5. Limits for allowed pressure produced by artificially energy waves should be fixed, regulations and laws enacted.

6. The in nature available energy waves should be brought to a technical use, with the goal of a natural energy production.

Fig. 9.12: Catalogue of claims concerning the environmental compatibility in the view of the new field theory.

9.12 Claims concerning the environmental compatibility

Now we still not know, if the using of a handy or another electronic device poses a danger to the user. Now, we surely can't exclude a danger, and the statement of the manufacturer, it is safe because all limits have been met, is worth nothing, as long as the part of longitudinal waves isn't measured. Therefore stands at the very top of the list of the catalogue of claims (fig. 9.12) the development and the building of *gauges to measure Tesla radiation*. More than half the 700 patents of Nikola Tesla concern the building of transmitter and receiver installations for energy waves. Here a lot of valuable clues are found, especially as he himself has built and used some of the switching circuit designs. In the seminar a rebuild is discussed, with which 1995 the existence of longitudinal waves could be proven [A7].

For an earthquake always both, the transverse and the longitudinal wave, occur simultaneously and, taken exact the same is valid for the sound wave, even if the transverse part doesn't get too far in the air. The emission of both parts in analogy is almost to be expected of an electromagnetic wave generator or transmitter. Actually both waves are detectable at the receiving point: The useful transverse wave and the longitudinally propagating vortices, which show as noise (fig. 4.7). If the vortices are predominant and the useful signal goes under in the noise, then a interruption of the radio operation occurs. Also small gardeners immediately near a radio station have made experiences as e.g. in a distance of one kilometre from the transmitter of RIAS-Berlin. They were able to light their allotments day and night with a neon tube, to which they merely had tied a free wire. The radio station immediately insinuated, that they in an illegal manner had tapped their useful wave and damped it. But it can't be excluded, that the transmitter has sent a longitudinal part in the ether too, which was responsible for the energy transport. But that suggests, that also at other transmitter antennas, thus for the mobile phones, the unwelcome parts is transmitted even than, if we don't use it at all.

Still another problem is added. If in a modern receiver radio waves arrive, then they roll up to a standing wave and according to fig. 1.4 to a vortex over the antenna. According to that we aren't able anymore to distinguish, if the transmission took place as Hertzian wave or as Tesla wave. The separation of both sorts of waves has to take place before the antenna is reached.

An up-to date measurement arrangement would look as follows: In front of the receiver antenna a path with a tunnel, which represents an insurmountable obstacle for the transverse waves (fig. 6.14), is placed. Then only the longitudinal waves pass the tunnel, and these at the end of the tunnel can be recorded and analysed with conventional technology. The tunnel is an elegant possibility, to make use of the part of Tesla waves. After all only this part is relevant with regard to the electromagnetic environmental compatibility. Concerning the above asked question we can take home at least one important realization. The probability is quite high, that you actually notice nothing of the handy radiation, because not every system react in the same manner to certain vortices. The **resonance conditions regarding frequency, phase and position** always have to be fulfilled, if an absorption of energy waves should occur. (fig. 2.10 B, E. coli bacteria).

On the other hand it however can't be excluded, that just you or me *synchronize according to frequency and collect 100 % of the transmitted energy radiation*. In contrast to the Hertzian wave *plays for that the distance to the source of interference only a secondary role!* Seen that way worries would by all means be entitled ...

From Indian mysticism:

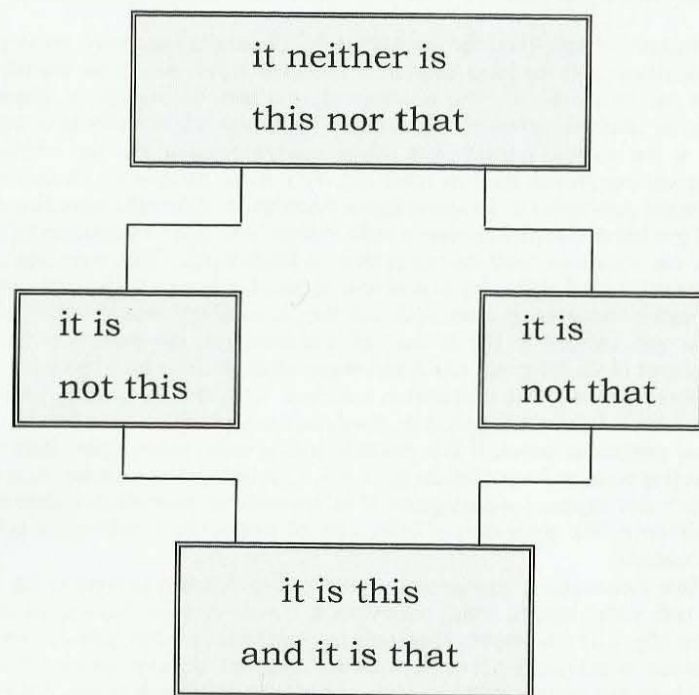


Fig. 9.13: The structure of the world equation, an example from Indian mysticism

9.13 Epilogue belonging to part 1

The correctness of a new theory not by all means guarantees, that it also is accepted. A new theory must be used. Only if a concrete need exists then an acknowledgement is to be expected if at first only by the direct beneficiaries.

In november 1994 in Munich the trade fair "Electronica" took place. Here invited by the Deutschen Gesellschaft für EMV-Technologie (German association for EMC-technology, note of the translator) the books about potential vortices [A1, A2] were honoured with a prize by an internationally renowned EMC-scientist. The number of people, who the potential vortex theory helps further to find answers to problems, which until now aren't explicable, grows further.

Nevertheless, nobody should believe that something will be changed to the content of the text books in the shelves that fast. Habit and laziness encourage to further use the to date interpretation, even if a new theory has ready a better and convincing answer. It will take some time, to give an example, till the heating of water in a microwave oven is explained as eddy losses, as is described sound by the potential vortex theory already today.

The discovery of a physical phenomenon may happen in a fright second. Its acknowledgement on the other hand as a rule is a lengthy procedure. If we look back in history we find out that even in the past it hasn't been otherwise.

Of the four fundamental phenomena in fig. 8.2 at first the tension voltages and the charges have been discovered by **Coulomb** (5.7e).

(5.7c): An effect of the eddy currents was observed already 1825 by the French physicist **Arago**. He discovered that a magnetic needle suspended above a rotating disc tends to rotate along. Out of ignorance he named the effect "rotational magnetism".

But the eddy currents could only be mathematically described with the help of two laws, the law of **Ampère** (1820) and the law of induction of **Faraday** (1831). Because the effect due to the eddy current losses rather was regarded as disturbing, technical applications or patents at first have stayed out. At first **Rüdenberg** has carried out fundamental calculations for eddy current brakes in 1906. The discovery and usage of the "skin effect" is to be attributed to **Tesla**.

(5.7b): The electromagnetic wave for the first time was mathematically described by **Maxwell** (1864). He had aimed to calculate the light and he could show, that his theory actually could correctly describe all properties of the light. With that he was able to prove the correctness of his theory. But he had to deal with many sceptics, because he had postulated the dielectric displacement, without however in his lifetime being able to measure it because of its smallness.

This may be the reason, why the discovery is attributed to Heinrich **Hertz** and was and is spoken of the Hertzian wave. Neutrally seen Hertz at first was nothing more than a enthusiastic pupil, who had worked through the "Treatise"^{<i>}, Maxwells books. All results, which Hertz could observe experimentally, already were contained in the Maxwell-theory and published.

<i>: James Clerk Maxwell: A Treatise on Electricity & Magnetism, vol. 2, Chapter XX: Electromagnetic Theory of Light. Dover Publ. New York

But the great mathematical description of Maxwell at first had a purely academic importance. The interest of the general public on the other hand concentrates on the practical applicability. **Hertz** had experimented with antennas and has laid the foundations of the building of a gauge for electromagnetic waves (1888). The wireless transmission of invisible waves was convincing. It was an entirely new technology, which stimulated fantasy in view of a technical usage. A practical man, who was stimulated by the theoretical realizations, was **Marconi**. He goes for the inventor of the radio (1895, Nobel prize: 1909).

Between the three summits, first the *calculation* and at the same time *discovery*, second the *measurement* and third the *usage* of the wave phenomenon lay 31 years, and the radio technology is developing still further, even today. In the area of the cellular phone network and the telecommunication even a kind of gold mining mood prevails, which can't be impressed much even by hints of an electromagnetic environmental compatibility.

In the euphoria of the past 100 years is fallen into oblivion completely, that besides the by Hertz detected transverse wave in the wave equation according to **Laplace** and according to the *original version of Maxwell* also a *longitudinal wave* was described mathematically. This one was discovered and detected by **Tesla** in numerous experiments. With reference to his discovery Tesla initially had asserted publicly, Hertz had been at fault, with which he undoubtedly was wrong and had incurred the wrath and the scorn of the scientific community. As a result of this development his experiments haven't been reproduced and the *discovery of the scalar wave* could fall into oblivion.

Not enough with such sanctions against the inconvenient freethinker Tesla a series of professors like **Gibbs** and **Heaviside** have made cuts and discarded all parts from the original version of the Maxwell equations, which by that time weren't considered to be experimentally proven by experiments of Ampère, of Faraday, of Ohm and Hertz. With that the scalar waves fell victim to the axe, what, though it had encountered severe criticism, finally entered as textbook opinion into all textbooks, after Hertz also had sanctioned this measure.

If the field equations according to Maxwell in today's revised version don't describe scalar waves anymore, then all orthodox scientists, who want to bear reference to that, have to bear one thing in mind: discarding a term of an equation is the same as neglecting it. But the term only may be neglected if it is sufficiently small. The first thing every student learns in the physical practical training is that this first has to be tested. For that the term has to be measured and its order of magnitude must be determined. Then it is little helpful and extremely unscientific, if at first is neglected and on the basis of the revised field equations, which have put all *scalar waves* to zero, is demonstrated that the neglect was allowed or even necessary.

A practical example are the longitudinal wave parts, like they occur and are proven in the near-field of a transmitter antenna. Considering the order of magnitude a neglect is out of the question. On the other hand they should not exist at all according to textbook physics, because they had fallen victim to the axe. Since most scientists in present time do not know about the cutting action anymore, they are postulating field vortices anew in the proximity of an antenna. Field vortices, which are propagating longitudinally in the direction of a field pointer as a scalar wave.

With that they calculate their own arbitrary assumption^{<i>}.

If in the practical training of physics a student unevaluated neglects an essential factor of influence, then his experiment goes as not passed. The experiment must be repeated so long until according to the approved methods of scientific soundness all used neglects have been tested individually and have undergone an error consideration.

Do we now have to deny the cutting action, which had been plotted by Gibbs, Heaviside and others, having the necessary scientific soundness? Do we have to review and rework all textbooks concerning the illegal neglect? Since the cutting action a gap gapes in the field theory.

(5.7d): The *potential vortex* fills the remaining gap in fig. 8.2. Several research scientists and scientists can be named, who already could observe this phenomenon: in front of all goes Nikola Tesla for discoverer of the Tesla currents, very weak currents which are said to cause extremely high potentials. Here presumably cause and effect have been mixed up, because weak currents never can produce high potentials. Actually the potentials prove to be a result of the potential vortices, whereas the currents aren't more than a result, nothing but leak currents. At least Tesla could use the vortex, but without a usable theory he neither could calculate nor adequately explain it. Besides Tesla Wilhelm Reich should be mentioned, who has collected the vortices in his orgone accumulator.

Mostly only certain aspects were observed and investigated: by **Tesla** the planar vortex, by **Reich** the influence on the weather, by **Schauberger** the water vortices and by all three the medical and biological aspect. The list of names is incomplete and could arbitrarily be continued.

With the discovery of the potential vortex (1990) the basis for the building of a gauge and the technical usage of the physical phenomenon is laid [A1]. It not only concerns the search for water, but also the detecting of the vortex balls and vortex streets, of the standing waves of the energy radiation in the air, at the workplace, at the bedroom, in clinics, in recreational areas and hotels. As explained at the start, neither the field strength of a Hertzian wave nor the arising heat development can be made responsible for biological or technical harm.

It primarily are the newly discovered vortices of the electric field, which take effect. The effects can, as we have seen, as well be good for health as bad for health. Intensity, plane of polarization, vortex configurations and many other characteristics play a role here. To research these influential factors gauges for vortices will be needed as well.

We have to realize that in the technical domain the electromagnetic compatibility of an apparatus is determined by its sensitiveness to vortices, thus by the fact how many and which vortices can cause a function trouble. To determine the environmental compatibility of a product the emitted vortices, the energy radiation, have to be measured. Limits for high tension lines, for screens or handheld phones must be given in units of the potential vortices. The potential vortex has shown us the way to a unified theory and has brought along a new picture and understanding of our environment. It with that wants to show us the correct way for an ecologically compatible dealing with nature.

Part 1: Edition belonging to the lecture:

"Electromagnetic Environmental Compatibility"

Prof. Dr.-Ing. Konstantin Meyl

Scalar waves

Abstract:

1. Auflage 1996, 4. Auflage and 1st English Edition 2003

Both technical and biological systems can be influenced by electromagnetic fields, whereby numerous questions still are open, like e.g. concerning limits and the nature of physical interference fields. The book shall do justice to the circumstance, that a fact oriented discussion about „electrosmog“ implies an analysis of possible reasons, a mathematical derivation and a physical argumentation.

We proceed from the assumption, that only that part of the electromagnetic wave should be considered for malfunctions, which has been absorbed and which has rolled up to a field vortex. The effectiveness depends on the amount of the produced vortices and on the life span, the decay of vortices.

Analogous to the sound wave vortices in space are propagating as longitudinal waves. In this context is pointed to numerous effects. Examples for the technical and biological use of these standing waves are the energy transmission of Nikola Tesla as well as the nerve conduction, which functions in a corresponding manner. If the same vortices, which man uses for conduction of information, are emitted by technical devices, then biological reactions can't be excluded anymore and worries with regard to „electrosmog“ seem to be justified.

**Causes, phenomena
and natural scientific consequences**

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- * Potentialwirbel Band 1, 1990, ISBN 3-9802 542-1-6 (German), 14 €
- * Potentialwirbel Band 2, 1992, ISBN 3-9802 542-2-4 14 €
- * Elektromagnetische Umweltverträglichkeit, Teil 1, 2 and 3 (German), ISBN 3-9802 542-8-3, 3-9802 542-9-1 and 3-9802 542-7-5. Each 16 €
- * Scalar wave technology, 2003, documentation and manual to the demonstration-kit and to the experimental-kit (translated and copied).
- * Sendetechnik der Götter, historischer Sciencefictionroman, (in German) 1.Aufl. 2004, ISBN 3-9802 542-5-9, 14 €
- * Neutrinopower, Johannes von Buttlar im Gespräch mit Prof. Dr. Konstantin Meyl, (Discussion in German) Argo-Verlag 2000, 23 €

Fig. 30.14: Contacting address and list of deliverable books

Table of formula symbols

Electric field			Magnetic field		
E	V/m	Electric field strength	H	A/m	Magnetic field strength
D	As/m ²	Electric displacement	B	Vs/m ²	Magnetic induction
U	V	Tension voltage	I	A	Current
ϵ	As/Vm	Dielectricity: $\epsilon = \epsilon_r \cdot \epsilon_0$	μ	Vs/Am	Permeability: $\mu = \mu_r \cdot \mu_0$
Q	As	Charge	ϕ	Vs	Magnetic flux
e	As	Elementary charge	m	kg	Mass
τ_2	s	Relaxation time constant of the potential vortices	τ_1	s	Relaxation time constant of the eddy currents: $\tau_1 = \epsilon/\sigma$

other symbols:

A	m ²	Area	Q	Nm = J	Heat energy
a	m	Distance	r, R	m	Radius, radius of the earth
b	m	Width	r_e	m	Radius of the electron
c	m/s	Speed of light	s	Nms	Spin
c_0	m/s	Speed of light in vacuum	t	s	Time, time to orbit
C_e	As/V	Capacity of the electron	T	K	Temperature
C_p	J/K	Heat capacity	U	Nm	Potential energy
d	m	Thickness	U_e	V	Tension voltage of the electron
E, W	Nm	Energy	v	m/s	Velocity
f	1/s	Frequency	V	m ³	Volume
F	N	Force	W	Nm	Energy
G	m ³ /kg·s ²	Gravitational constant	w	N/m ²	Energy density
g	m/s ²	Gravitational acceleration of the earth	W_e	Nm	Energy of the electron
h	m	Height	z_e	-	Number of the involved elementary vortices
h	Nms	Planck's quantum of action	λ	m	Wave length
h	Nms	Quantum of angular momentum: $\hbar = h/2\pi$	ω	s ⁻¹	Angular frequency, angular velocity
j	A/m ²	Current density	σ	A/Vm	Specific electric conductivity
J	kg·m ²	Moment of inertia	ρ	kg/m ³	Density $\rho = m/V$
$J \cdot \omega^2$	kg·m ² /s	Angular momentum	ρ_{el}	As/m ³	Electric space charge density
k	Nm/K	Boltzmann constant	$\psi(r, t)$		Complex wave function
l	m	Length	$\phi(r)$		Function of space coordinates
m	kg	Mass	Φ		Golden Proportion
M	kg	Mass of the earth			
$n, v = 1, 2, 3, \dots$		Running parameters			
N	-	Constant			
O	m ²	Surface area			
p_m	Am ²	Magnetic moment			

Definitions:

Speed of light	$c = 1/\sqrt{\epsilon \cdot \mu}$	m/s
Speed of light in a vacuum	$c_0 = 1/\sqrt{\epsilon_0 \cdot \mu_0}$	m/s
Moment of inertia (orbit)	$J = m \cdot r^2$	kg·m ²
Mom. of i. (homogeneous sphere)	$J = (2/5)m \cdot r^2$	kg·m ²
Angular velocity	$\omega = v/r = 2\pi/t$	1/s
Surface area of a sphere	$O = 4 \cdot \pi \cdot r^2$	m ²
Volume of a sphere	$V = (4/3) \cdot \pi \cdot r^3$	m ³

Concerning vector analysis:

Bold print = field pointer (vector);

further information in fig. 5.0 in part 1

Prof. Dr.-Ing. Konstantin Meyl:

Scalar wave technology

for the transmission of electric scalar waves

Abstract:

1. Auflage 2000, 2. Auflage and 1st English edition 2003

This book is recommended to people, who search the entry into the world of the by the author discovered potential vortices and their propagation as a scalar wave by experimental means. It starts with the instructions to six extraordinary experiments. Doing so an electric radiation is proven, which transmits energy, and that even faster than the light. Also more energy can arrive at the receiver then is put into the transmitter. Who entertains a doubt, will be able to understand the experiments with this book in his hand, to afterwards test the experiments with the gauges, which he is familiar with.

The 1st edition in English at first only includes the instructions for the experiments. In a subsequent edition it will be complemented with a collection of test protocols and progress reports. These are organized into three groups: one group is striving to explain the behaviour of the transmission line conventionally, a legitimate concern, which in a number of points also is able to convince. A second group only is interested in those phenomena of the experiment, which can't be explained conventionally and which prove the existence of scalar waves, whereas the third research group continually strives for new spectacular experiments and practical applications.

Documentation

Belonging to the experimentation and demonstration kit
for the transmission of electric scalar waves

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