

Chapter 3. Electron. Structure and physical parameters

The electron and positron appear to be the smallest stable elementary particles possessing an elementary charge. The electron is a compound system, consisting of three helical structures and possessing two proper frequencies (while the free positron possesses only one). Investigating the behaviour of the electron we may understand the complex interaction processes between helical structures in CL space. At the same time the electron may play a role of a test probe for estimation of the basic CL space parameters. Due to its complex structure it is referenced in some places as “electron system”.

3.1 Electron structure and basic features.

3.1.1 Structure configuration

The electron is a compound helical structure of type: $H_1^2: -(+(-))$, so it is composed of three single coil helical structures.

The configuration of the electron was already shown in Fig. 2.13 a. In Fig. 3.1 a sketch of the electron is shown and the basic dimensions are denoted by letters. We will use this notations later in order to determine the physical dimensions of the electron components.

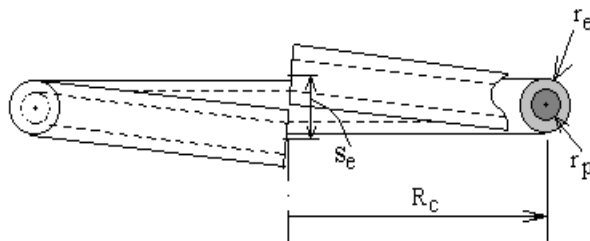


Fig. 3.1

Sketch of the electron's structure

The electron consists of an external negative shell and an internal positive shell with a core. Each shell includes a boundary helix, which encloses an internal RL(T) structure of same type prisms (matter and handedness). The positive shell with a core is the positron (Fig. 2.13.c). The intrinsic gravitation of the electron is not strong enough in order to keep the twisted SG field locked. So the

CL space disturbance propagates in a far field, i. e. the system exhibits a charge. The external E-filed lines were shown in Fig. 2.47A and discussed in §2.15.2.2. The electron has two internal rectangular lattices of twisted type (RL(T)). The external helical shell serves as a boundary of the negative RL(T), while the positron helical shell - a boundary of the positive RL(T). Due to a different helicity, the both RL(T) practically are not connected. This is illustrated by Fig. 3.1.A.

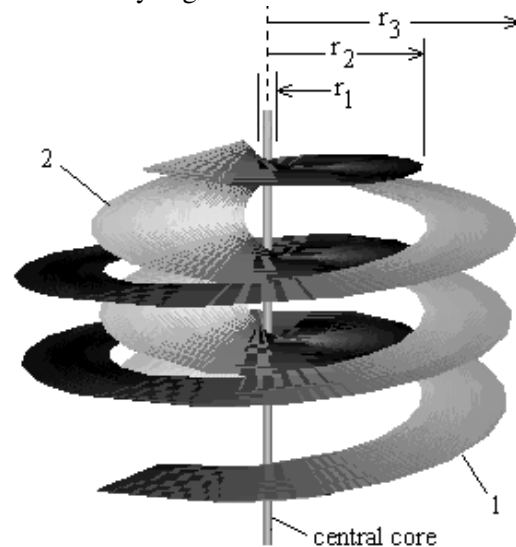


Fig. 3.1.A

Layers of both internal RL(T) structures of the electron

Figure 3.1.A shows only the radial layers connected to the boundary helical cores. The layer 1 (negative) is connected to the external shell, while the layer 2 (positive) - to the positron helical shell. The radial layers between the helical coils are not shown, but they follow the same helical configuration. Their axial configuration was already shown in Fig. 2.16.b and 2.18.b. The negative central core is positioned along the axis of the central hole. It is evident, that the interaction between SG(CP) of the two RL(T) is minimized due to the following two features:

- concentric symmetry
- helicity mismatch (between the right and left helicity) between both types of RL(T).

The shown configuration allows a free axial motion of the positron inside of the external negative shell. At the same time, the helicity mismatch

and the self adjusted concentric symmetry, provide conditions of ideal bearing. A similar freedom and motion conditions possesses the negative core inside the hole of the positive RL(T) with a radius r_l .

In some conditions of extremely high velocity, or operation in a low ZPE CL space domain, the electron may lose its internal positron and convert to a degenerated electron. The degenerated electron is shown respectively in (Fig. 2.13.b)

It is more difficult for the positron to loose its central core, because it is very thin (3 prisms diameters) and its interaction with the external CL space is much weaker. The degenerated electron or positron, however, preserve their internal RL(T), and consequently their dimensions and second order helicity. These features allows them to recombine again in a normal electron. If the central core is lost, it could be regenerated by the trapping mechanism (discussed in §2.8.2). The oscillation is illustrated by Fig. 3.2.

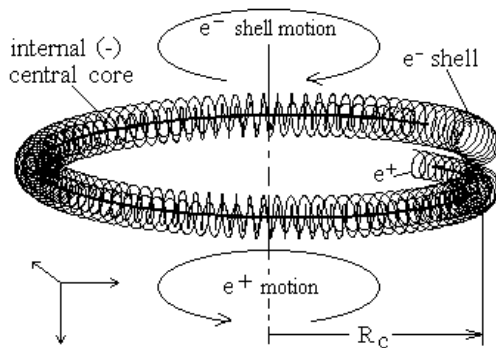


Fig. 3.2
Oscillating electron

We can distinguish two simple oscillating systems: “electron shell - positron”, and “positron shell - central core”. As a result, the electron oscillates in a complex way. It is evident that every one simple system has its own proper resonance frequency.

3.1.2 Proper frequency of the oscillating system “electron shell - positron”.

Let us analyse the system “electron shell - positron”, in order to determine what kind of factors define the proper resonance frequency.

It is evident that the resonance frequency should depend on two types of interaction forces: the intrinsic gravitation between the electron and positron from one side, and the interaction between the EM field of the system and NRM and SPM vectors of CL space, from the other. The SG (CP) field between the electron shell and the positron is spatially structured by their RL(T). The both lattices although have opposite handedness and the radial stripes meet themselves at angle, which is in the range between 170 and 150 deg (see Fig. 3.1.A). This angle is determined by the radius to helical step ratio of the electron structure as a single coil SOHS. When the system oscillates with its proper frequency (Compton frequency), the individual vectors of both type radial stripes meet themselves for a very short time. Having in mind, that the calculated xyz node distance of CL space was of the order of $d_{nb} = 1.0975 \times 10^{-20}$ (m), and the central axes of the electron is $2\pi R_c$, we estimate that a simple cell from a positive RL(T) could be aligned at a single cell of a negative RL(T) for a time no longer than $1E-40$ sec. The prism diameter is at least 12 times smaller than the minimal node distance of RL. So the time during which the radial stripes between both RL(T) may appear aligned is extremely short and the SG interaction between both RL(T)s may not take place. This means that the SG field is not able to propagate between the two RL(T) lattices. **As a result of this, the gravitational mass of the positron with its RL(T) appears hidden for the external observer.** The positron E field is propagated by the RL(T). When the positron is inside the electron, its positive field could not pass through the RL(T) of the electron shell, because of the different handedness. **So the E field of the positron in this case also appears hidden.**

Let us analyse now the SG field leaking between the nodes. If the electron overall shape, for example was not a coil but a straight compound FOHS, the leaking SG field would be different for a case when the positron is inside, and when part of it is outside of the electron’s shell. But for the coil shape as shown in Fig. 3.1 the partially coming out positron core does not go away from the electron’s shell. Hence, the returned forces for this kind of shape will be significantly reduced.

From the considerations, discussed above, we may accept that the resonance frequency of the

electron depends mostly on the EM interaction with the Cosmic Lattice. This conclusion will become more apparent in the next chapters of BSM.

When the electron oscillates, a portion of a positive charge alternatively appears on both sides of the electron. The interaction of these charges with the lattice in fact influences the motion of the whole electron system.

The dependence of the electron resonance frequency from the CL space features at different values of ZPE complicates the analysis. However, when considering its motion in CL space of normal ZPE and constant node distance, the analysis is simplified, and the electron resonance frequency can be considered very stable. In this and following chapters, we will see that in all cases of photon generation and detection, the electron system is involved.

The quantum feature of the electron could not be explained if it is considered only as a passive system. The electron self-energy is a discussed topic, now, in Modern physics. Some quantum processes without such energy could not be explained. The BSM model of the electron shows that it has the ability to store energy. We can distinguish two different energy “reservoirs”, capable to store kinetic energy. The first one is the oscillation energy between electron’s negative RL(T) lattice and the internal positron. The second one (much smaller) is the oscillation energy between the positron positive RL(T) lattice and the central negative core.

The total kinetic energy of the oscillating electron interacts directly with the CL space environment by inertial and EM fields.

Experimental evidence exists about the ability of the electron to accumulate energy after it has been dumped. Such conditions are created in experiments observing the transition between the normal and the superconductivity state of the matter.

The superconductivity will be discussed in details in Chapter 4. Here only some features will be mentioned. In the superconductivity state of the matter, where CL domains possess a ZPE energy, the positron could come out and can be attracted externally to the electron shell. In conditions of low ZPE, the internal energy stored in the RL(T) can be dumped. When the ZPE is gradually rising to a normal value, the electron system recombines, but it needs to restore its lost energy. So if the conduc-

tor temperature is elevating slowly, the electron heat capacity exhibits a peak. The peak, known as electronic specific heat coefficient is clearly observable in the experiments. Figure 3.3 demonstrates this feature for one type of superconductor (BSM interpretation).

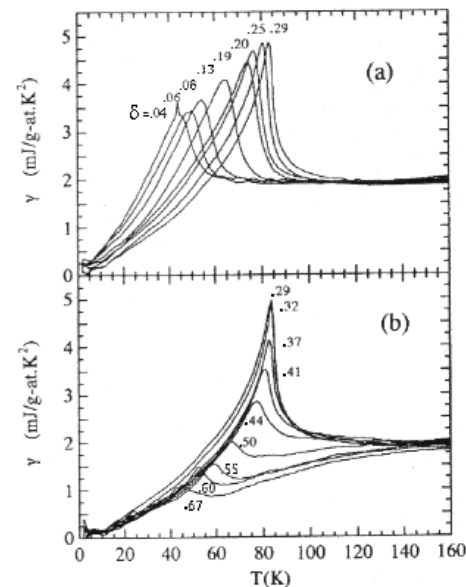


Fig. 3.3

Specific electronic heat coefficient as a function of the superconductor temperature (Courtesy of J. W. Loram et al., 1997)

According to BSM theory, however, not the whole energy of the specific heat goes for refilling the electron self energy. Part of it goes to refill the ZPE of the domains inside the conductor.

When the electron is in motion driven by external field, it oscillates and automatically keeps its internal energy at a nominal value. If the electron has a very low velocity (approaching zero), then the stored energy is still able to modulate the CL space, causing an electrical field. The stored energy provides momentum, which keeps the two subsystems in continuous motion. So this energy is very important factor, influencing the system behaviour in a CL space.

Analysing the dynamics of the electron-positron oscillations we see that: When the positron is inside of the electron shell, the field of its RL(TP) is completely shielded, so it could not exhibit a static charge. When it is oscillating, however, con-

ditions for charge appearance occur periodically from both ends of the electron shell. The oscillating “electron - positron” system interacts with the CL nodes, which are congregated in magnetic protodomains, synchronised by the SPM frequency. In such aspect, the SPM frequency appears a quite strong factor. In Chapter 2 we saw, that it is responsible for the quantum waves. It is enough strong factor able to affect the oscillational motion of the “electron - positron” system. The most important common feature between the CL space parameters and the electron is:

- **The first proper frequency of the electron system (electron shell - positron) is equal to the CL node SPM frequency. In the Earth gravitational field these two frequencies are equal to the Compton frequency.**
- **The above feature means that the energy of the oscillating electron system is supplied directly by the CL space ZPE via resonance transfer. Consequently, in CL space environments, the energy reservoir of electron system is always filled up.**

Let us imagine that an electron is put in a CL space with constant spatial and time parameters, but away from any gravitational or EM field. We may call such a system a fundamental oscillator and may use one of its parameter, namely the first proper frequency as a stabilized frequency etalon. **Its period could serve as a time base** for investigation of the interaction between the helical structures and the CL space, so the CL space parameters to be estimated quantitatively. We may call the frequency of such electron **a fundamental frequency**. Despite the fact that it is not a primary frequency etalon (as we will see in Chapter 12) it is quite convenient for exploring the CL space parameters.

The proper frequency of such system is equal to the SPM frequency of the CL node, which is equal to the well known Compton frequency (valid for the Earth gravitational field).

$$\nu_{ep} = \nu_{SPM} = \nu_c \quad (3.1)$$

where: ν_{ep} - is the proper frequency of the electron shell - positron, ν_c - is the Compton frequency

The relation (3.1) will become more apparent through the course of the BSM theory.

The Compton frequency is estimated by the Compton wavelength: $\nu_c = c/\lambda_c$ (3.1.a)

where: λ_c - is a Compton wavelength, c - is the light velocity

It is known (from all physical courses) that the Compton wavelength is given by Eqs. (5.1):

$$\lambda_c = \frac{h}{m_e c} = 2.4263 \times 10^{-12} \text{ m} \quad (3.1.b)$$

where: h - is the Plank's constant

m_e - is the mass of the electron

The fundamental frequency appears more general parameter, than the Compton one. The fundamental frequency was defined for electron in CL space away from heavy objects, while the Compton frequency is measured in the Earth gravitational field. Secondly, the electron mass is involved in the determination of the Compton frequency. The mass of the charged particles may have mass deficiency, due to the charge potential field in CL space, in comparison with the neutral particle (as the neutron). This possibility, however, is not enough investigated in BSM theory and we will rely on the estimated Compton frequency. Despite the fact, that the Compton frequency is estimated in the Earth gravitational field, we will use it instead of the fundamental frequency. **For the purpose of our analysis we will accept that the above defined fundamental frequency is equal to the Compton frequency and the fundamental period is equal to the Compton time.**

$$\nu_o \approx \nu_c = 1.23559 \times 10^{20} \text{ Hz} \quad (3.2)$$

$$t_c = \frac{1}{\nu_o} \approx \frac{1}{\nu_c} = 8.0933 \times 10^{-21} \text{ sec} \quad (3.3)$$

From the provided so far analysis, we may summarize the basic features of the electron:

- **In CL space with normal ZPE, the electron possesses internal stored energy. This energy keeps the oscillations of the electron subsystems.**
- **The electron obtains a proper resonance frequency equal to the SPM frequency of the CL space.**
- **The adjustment of the electron proper frequency to the SPM one, may provide explanation of one of the effects of the General relativity: the gravitational redshift of photons emitted in a strong gravitational field.**

3.1.3 Proper frequency of the oscillating system “positron-central core”.

The proper resonance frequency of the “positron - central core” system appears different from the first proper frequency of the electron due to its different volume and core dimensions.

When the positron is free (outside of electron shell), its behaviour is similar to the oscillating system: “electron shell - positron” Its proper frequency, however, is different, due to its different external environments. The behaviour of the free positron will be discussed in §3.9.3. It will be shown, that the positron - core proper frequency is related to the Compton frequency by the simple expression:

$$v_{pc} = 2v_c \quad \text{- for free positron} \quad (3.3.a)$$

where: v_{pc} - is the proper frequency of the system “positron - central core”.

Additional difference appears for oscillations with small and large amplitudes, when the positron is inside of the electron shell. These features are discussed in §3.5, §3.9.3 and in Chapter 4. The proper frequencies for smaller and larger amplitudes are the following:

$$v_{pc}' = 3v_c \quad \text{- for positron inside of the electron} \quad (3.3.b)$$

(small amplitudes)

$$v_{pc} = 2v_c \quad \text{- for positron inside of the electron} \quad (3.3.c)$$

(large amplitudes)

The proper frequency of the positron inside the electron in a case of large amplitudes is the same as the proper frequency of the free positron. This conclusion will become more evident in the course of the BSM theory.

3.2 Electron oscillations and lattice pumping effect leading to a photon emission. “Annihilation” or change of state of the matter.

We can distinguish two types of electron frequency oscillations: **weak** (small amplitudes of oscillation) and **strong** (large amplitudes).

Oscillations with weak amplitudes appear, when the electron is forced to move in the lattice space. The amplitude is much smaller than 180 deg deviation of the positron in comparison to the electron shell. It does not lead to generation of EM

wave (photon). The oscillations have small amplitude, induced between the interaction of the electron proper frequency and the SPM frequencies of the CL nodes. The positron in the activated electron oscillates reversibly around the middle position. When a portion of the positron goes out it is not any more shielded by the electron external shell and portion of positive charges appear periodically in both sides. The invoked alternative field interacts with the external negative field created by the electron shell, while the latter interacts with the CL space. The electron in this case induces waves in CL space. The interaction between the induced waves and SPM frequency of CL domains exhibits a quantum effect. Its features are discussed later in this Chapter.

In the **strong amplitude oscillations**, the amplitude may reach 180 deg and over. So this type of oscillation may lead to a separation of the positron from electron system or recombination, as well. Such separation or recombination is always accompanied with absorption or emission of high energy photons. Oscillations with strong amplitudes appear in many observed physical phenomena: electron - positron “annihilation”; 1^1S_0 singlet of parapositronium activated by different methods: by X or gamma rays, by bremsstrahlung, by high energy electron or positrons and so on. It could be activated also by a collision of accelerated electron to a target or a collision with a high energy particle, including a quasiparticle wave. All these processes are accompanied with emission of two or three gamma photons, depending of the amount of activated energy. Let us analyse the dynamical behaviour of the energetically activated electron, leading to emission of two gamma photons.

We can analyse the example of interaction between a normal electron and a positron. They may have initial velocities or may start from a rest. In both cases they will have different potential energies. Let us assume that the potential energy (equal to the energy of activation) is equal to 511 keV. When the both system accelerated by the attractive Coulomb forces approach each other, the external positron will be directed (by the interacted proximity electrical fields) to enter into the electron system and to replace the internal positron. Although its energy does not permit to expel the internal positron completely. As a result, the both

positrons will start to oscillate in the inside hole of the electron shell. Initially the external positron will not hit the helical shell of the internal one, because of the repulsive fields around their edges, so some gap could exist. Once they start oscillations, this gap will be eliminated, because the positron shells around both ends are always inside of the electron RL(T) hole, where no space for stable EQ formation exists. Then the both positrons will oscillate as a single structure. As a result of this, the amount of the positive charge will oscillate alternatively at both sides, and they will interact with the external shell negative charge. In fact the electron system usually is not fixed in the space and both the positron and the external shell will oscillate around a common equilibrium position. The periodically appeared positive charge and the moving negative charge will cause a lattice disturbance. This disturbance however will be not propagated far from the system, because the relative speed of the oscillating structures, as we will see later, is close to the speed of light. The oscillation energy from a single cycle is very small in order to overcome the intrinsic gravitation and to escape from the system, so it is accumulated in the surrounding CL space. The oscillating system in such way provides some kind of energy of the surrounding CL nodes, increasing their ZPE. We may call this effect a **lattice pumping effect**. (A pumping effect will be also discussed later when explaining the photon emission process in the atoms). As a result of this, a pumped energy becomes accumulated in both sides of the electron. Knowing, that the EQ only could handle an excess energy, the latter will produce a large number of EQs of both types (positive and negative). At the same time, the pumping is an energetic process and should have opposite reaction from the CL space. This means that, the CL space should have a saturation number for the number density of the generated EQs for unit volume. Consequently the increased amount of both type EQ will continuously reduce the spatial modulation properties or E-fields of the oscillating system., and the efficiency of the pumping process. We see, that conditions exist for multiple oscillations with gradually reduced amplitude. During the duration of this process the proper resonance frequency of the electron, however, is not changed, because it has enough stored internal energy. When the pumping process falls

below some critical level, the accumulated energy in the CL space domains from the both sides of the electron, will be suddenly released as two quantum waves (photons). Note, that the pumping velocities of the electron positron shells had initial value of the linear light velocity. The pumping process in this case is optimal and completely symmetrical. The released two quantum waves have 180 deg direction and are orthogonally polarized. They are first harmonics of the SPM frequency, every one possessing an energy of 511 keV. The both waves are orthogonally polarized because this is a condition for easier separation of the pumped energy from the both sides of the electron. The quantum waves are emitted when the effective strong type of oscillations are attenuated. They are neutral type waves, i. e. equally affecting the right and left handed nodes. The time of the oscillations and the finite time required for the energy mixing between the both types of nodes is obviously related. It is determined by the intrinsic property of the CL space and the electron. This time is known as a Positronium life time, and its value in vacuum is 145 psec.

But what happens with the final state of the system? At the end of the oscillations the half of both positrons are equally out of the external electron shell. So the amount of the negative field lines from the electron external shell is equal to the amount of the positive field lines from the half of both positrons. The both type of the field lines are interconnected in proximity, and the far electrical field disappears. The obtained new structure is relatively stable and its mass is equal to the sum of the electron and positron masses. Such small neutral mass will appear undetectable. For this reason it seems that the electron and positron are **annihilated, but annihilation is a misinterpretation from a point of view of BSM space concept, since the mass of the elementary particles is not equivalent to matter**.

We described one type of pumping effect between small particles whose peripheral part is moving with a light velocity. In atoms where the electron is moving in the electrical field of the proton and the SG field is much stronger, another type of pumping effect exists. It will be discussed in Chapter 6.

3.3 Confined motion of the electron. Electron spin.

One important feature of the electron is its confined motion in the CL space. It is a result of the interaction between the SG field of the internal negative RL structure of the electron with the oscillating CL nodes of the surrounding CL space, in which magnetic lines (CL space energy circulated in closed loops) are created. The anomalous magnetic moment of the electron (discussed later) in such environments is an important factor for the preferred screw-like motion of the electron. The large R/r_e ratio also facilitates such type of motion.

As a result, the whole electron system rotates with a spin direction determined by its second order handedness. The positron system has the same second order helicity and handedness as the electron system. Therefore, the electron system and the free positron, both, always tend to perform a screw-like type of motion. This type of motion we call a “**confined motion**”. The electron structure is moving and rotating like a screw. The efficiency of the confined motion depends on two factors: the motion velocity, from one side, and the momentum interaction between the proper frequency oscillations and the momentum of SPM vector of the stationary nodes, from the other. **In the case, when the tangential velocity of the electron is equal to the speed of light (linear), the motion is called an optimal confined motion.** The corresponding axial velocity of the electron is called an **optimal confined velocity**. For velocities below the optimal confined one, the electron motion is **completely screw like**. For velocities above the optimal confined one, the system exhibits a **quasi screw type** of motion.

In a completely screw-like motion, all the points, lying on the central core, pass through a common helical trajectory. In a quasi-screw type of motion, every point of the central core has its own helical trajectory. In both types of confined motion, no one point lying in the core curved axis could exceed the linear light velocity. **The axial electron velocity for an optimal confined motion is 2.187×10^6 (m/s), corresponding to an electron energy of 13.6 eV.**

The axial and tangential velocities for the two types of confined motions are illustrated in Fig. 5.4.,

where the electron is shown as a single coil, while the trajectory - by a dashed line.,

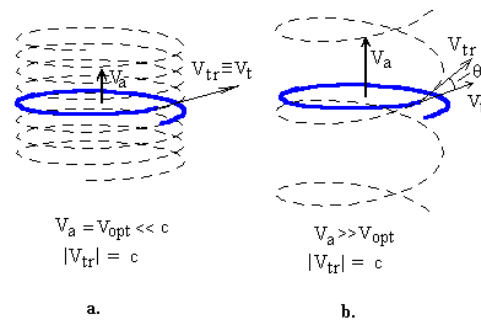


Fig. 3.4

Two types of confined motions of the electron. The electron is shown by a thick solid line and its trajectory by a dashed line

Figure 3.4.a illustrates a case with a complete screw type of motion at optimal velocity V_{opt} , while 3.4.b - a case with a quasi-screw type of motion. For both cases the trajectory of the front end of the electron is shown (dashed lines), with the momentum position of the electron (thick solid line). The axial and tangential trace velocities are denoted as V_a and V_{tr} , and their ranges are shown below the drawing. The velocity vector V_t indicates the electron-positron oscillation.

Due to the interaction with the CL space, the oscillating system “positron - electron shell”, induces a magnetic field. As a result, the whole electron system exhibits some small momentum with alternatively changing direction. This could be attributed to the electron spin. At condition of normal motion, the spin should have one preferred direction, determined by the conditions for motion with less resistance. Then a question may arise: What is the physical explanation of the $\mp \frac{h}{2}$ spin value assigned to the electron? To reply to this question, we have to distinguish between three cases:

- electron spin when the electron is in a motion around the proton
- electron spin flipping in EMR technique
- electron polarisation

In Chapters 6, 7 and 8 we will see that the proton has its own handedness. The electron trajectory appears as a closed loop curve (with a shape like a digit 8) around the proton, so it also has its own handedness. As a result of this, two combina-

tions are possible: (1) the electron close loop curve and the proton are both with a same handedness. (2) They both are with different handedness. As a result of these, the Quantum Mechanical spin has two values, which are known as $\pm \frac{h}{2}$ spins.

In a conditions of normal motion of the free electron, the phase of the two oscillating systems “positron - electron shell” and “positron - central core” are automatically adjusted for a less resistance in the interactions with the CL nodes. The interaction energy of the first oscillating system is much larger than the second one. In some experiments like in EMR, the oscillating phases of the both system may be temporally affected (so called spin flipping)

In some motion cases, a collimated electron (positron) beam is striking a plane under angle. The reflected electrons (positrons) in this case exhibit a strong polarisation. This effect, however, is not related to the same type of Quantum Mechanical spin, which appears in the optical spectrum. According to the BSM, it is a result of the off-axial momentum obtained in the internal rectangular lattice of the oscillating internal positron during the impact. This effect is experimentally observed. The obtained momentum is preserved and appears quite strong, because the internal rectangular lattices contains a large intrinsic matter and the off-axis oscillation is a SG type of interaction. This kind of SG interaction through the RL(T) internal structure affects directly the external E-field of the electron, so the oscillation energy is transferred to the electron’s electrical field. This affects the motion of the electron in a way that its behaviour becomes detectable. At the same time, this effect shows that the internal RL(T) has some freedom to oscillate. Such kind of oscillation may cause a minor change of the spatial geometry of the electron (more specifically the helical structure twisting) but the involved SG field can accumulate comparatively large energy. Consequently, the electron and the positron may have ability to store internal energy. This conclusion independently confirms the accepted feature of the electron to possess a selfenergy.

The discussed so far basic features of the electron are summarized below:

- **The electron exhibits a confined (screw type) motion in the lattice space**

- **The electron possesses internal energy well. In CL domain of normal ZPE, the stored energy provides stable oscillations of the electron system components.**
- **The effect known as “annihilation” of electron and positron is in fact a damped oscillation of the compound system “electron - free positron”, terminating with emission of two gamma photons at 511 KeV.**
- **The photon emission is a sudden release of the energy pumped in the surrounding CL space due to the self dumped electron oscillations. The released energy is propagated through the CL space as a quantum wave (photon).**
- **The quantum motion of the electron is a result of interaction between the compound oscillating momentum of the electron system from one side and the SPM vector of the surrounding CL space, from the other.**
- **The oscillating electron could be considered as a fundamental frequency etalon, if placed in CL space of normal ZPE, away from massive objects. Its frequency value in the Earth gravitational field is the Compton frequency. The fundamental frequency provides an absolute time base for analysis of processes at atomic level in a frame of absolute coordinates.**

3.4 Electrical field of the electron at confined motion

The electrical field of the electron is created by the SG (TP) forces of the internal RL(T). This forces form a highly ordered spatial field, which modulates the external CL space, causing a formation of electrical quasispheres in the surrounding CL space. The field is different for the cases of “static” (not moving) and “dynamical” (moving) electron. The static case is mostly theoretical, because the electrons always have some velocities.

In a case of “static” electron, the electrical field has a maximal radius, which is practically determined, by the surrounding noise level, defined by the noise of the “permittivity fluctuations” of the CL space.

In a case of “dynamical” electron, the situation is different, and very dependable on the elec-

tron velocity. In the confined motion the electron rotates, so its negative RL(T) structure can modulate the external CL space only to a range limited by the velocity of light. It is apparent that such modulation create aligned EQs. Since the electron is moving we may introduce running EQs, like in the analysis of the photon wavetrain in Chapter 2. In §2.11.2.2 and §2.11.3 we have concluded that the energy through aligned EQs is propagated with a helical light velocity, which is larger than the linear light velocity, c , propagated by MQs (This is possible due to the quantum properties of CL space defined by the bumps shape of MQ and EQ - SPM vector spends more time in the bumps). Keeping in mind the above considerations, it is reasonable to accept that the radial extensions of EQs around a confined moving electron may overpass the boundary exhibiting a spatial features, similar as *sinc* function (related to a spherical Bessel function of first kind) shown in Fig. 3.4.A.

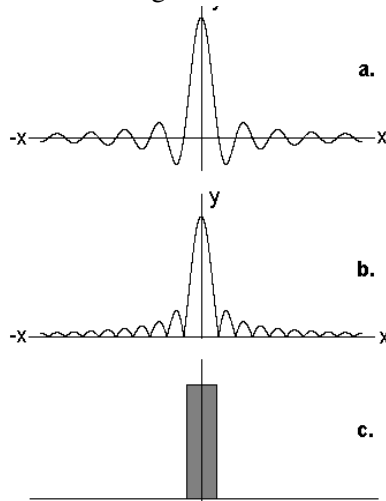


Fig. 3.4.A. Modulation of CL space by electron at confined motion. **a.** The curve portions above and below the horizontal axes corresponds to a same type EQs (negative for electron) but with SPM vectors having an opposite phase rotation; **b:** a curve with inverted parts of the curve in **b.** - providing the total E-field energy of the moving electron

Fig. 3.4.A shows the EQs in a radial section of the field generated by the electron in confined motion. The points, where the sinc curve intercepts the horizontal axes are points where the EQs convert to MQs. The portion of the sinc curve below the axis x are in fact the same electrical charge but with SPM vectors at phase of π . For this reason the

curve **b.** showing these part above the axis x represents the total electrical field of the confined moving electron. In the real E-field the sides of the sinc function falls rapidly below the Zero Point Energy (dynamical) of the CL space. For this purpose, we may consider an equivalent distribution, having a rectangular shape with an area equal to the whole area of the field shown in **b.** This equivalent field, shown in **c.** is characterised by equivalent radius R_{eq} .

Using the equivalent field will facilitate the further analysis, since we may show graphically the gradual conversion of the EQs to MQs only up to the first crossing point.

Figure 3.4.A illustrates the modulation of the surrounding CL nodes at one particular confined motion of the electron. The axial velocity in this case is equal $v_{ax} = \alpha c/2$, corresponding to energy of 3.4 eV. The tangential rotational velocity is equal to $c/2$, while the conversion of EQs to QMs becomes at radius $R = 2R_c$.

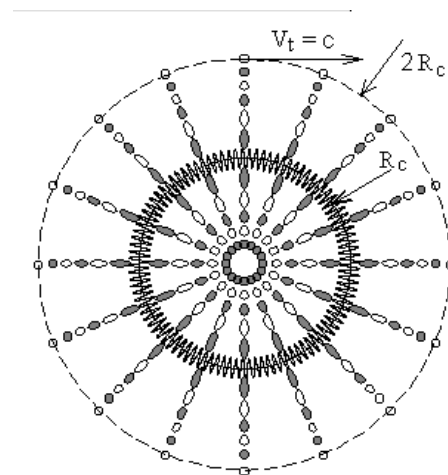


Fig. 3.4.A
CL nodes modulation at confined motion of the electron at 3.41 eV.

Figure 3.5 shows the radial configuration of confined motion of electron with an axial velocity of $(\alpha c)/3$, corresponding to energy of 1.51 eV. A diametrical section dy with the orientation of the long axes of EQ is shown. These axes coincide with the E-field lines, shown by dashed lines. The radial dependence of the E-field and the tangential

CL node momentum are shown in the bottom part of the figure.

If making analogy between the radial E field configuration of the electron and the field configuration of the radial section of the wavetrain of a quantum wave (see §2.11.3), we will find the following similar features:

- They, both, have boundary conditions provided by MQs.

- The E-field lines are aligned

From the other hand they have the following distinctive features:

- The integrity of the E-field in the quantum wave is kept by the phase synchronized SPM vectors of EQs. Both types of EQs are equally affected (for a neutral wave) or complimentary affected (for a quasiparticle wave)

- The integrity of the stationary E field of the electron is kept by the SG(TP) field of its internal rectangular lattice.

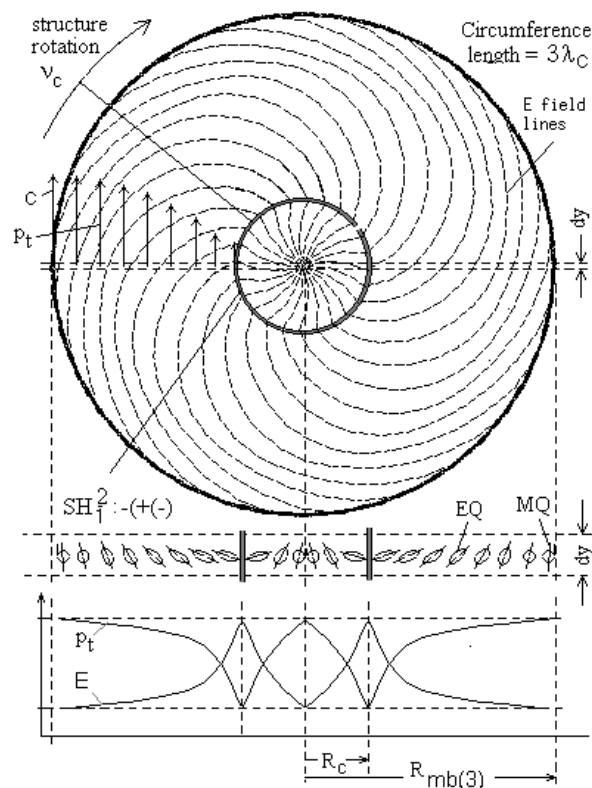


Fig. 3.5

Radial configuration of E field of the electron at confined velocity corresponding to energy of 1.51 eV)

Let us focus on the integrity feature of the E-field for a quantum wave (photon) and electron field. In the case of quantum wave, the E-field integrity is kept by the alignment of the EQ in helical trajectories and we can distinguish two types of integrity: - along the helical trajectories and between them. Both types of integrity takes place in a cylindrical volume with a radius equal to the boundary radius and a volume length of λ_c . In the case of electron, the equivalent boundary circumference length is equal to λ_c , which is the same for a first harmonic quantum wave (photon with energy of 511 KeV), however, the axial length is much smaller, since it is defined by the helical step of the electron se, which is much smaller than λ_c . Such space, does not allows fulfilment of both types of E-field integrities, as in the quantum wave. Consequently only one type of integrity is possible, and this is the alignment of the EQ in field lines. For the far field the negative EQ's of the electron may repel each other, so they must be radially aligned, but the picture in the near field is different. All EQ of same type are synchronized by one and a same source - the internal RL(T) of the electron. Then in the proximity near field, the negative EQs are able to influence stronger the neighbouring nodes of opposite handedness (by abcd CL node axes). As a result, the neighbouring CL nodes of opposite handedness get some complementary motions, but their energy could not compensate the field of the negative EQ, whose source is the SG field of RL(T).

From the above considerations it is apparent that all E-field lines of the electron are connected to the internal RL(T), as shown in Fig. 3.5. The EQ polarisation is changing gradually from the strongest value, near the helical shell, to weakest one, near the boundary defined by MQs. The lines are bent and terminated at the boundary zone by MQ (only for a rotating electron). The field line intensity is proportional to the polarisation of EQ. Then one important feature emerges: **The electrical field lines of the electron are not strongly connected between themselves, and have a freedom for taking a proper space position.** This is very important effect, because when the electron is moving in a not homogeneous CL space, as in the metal crystals, its E-field lines could automatically sense the lower resistant domains. This effect pro-

vides one very important feature: **a path sensing property of the moving electron.** The path sensing property is related to the NRM cycle, so it can operate faster than the quantum magnetic interaction, which is related to the SPM cycle.

The radial configuration shows, also, another important feature: **the angular frequency of the rotating electron in the optimal confined velocity is equal to the angular frequency of the SPM vector, associated to the MQ at the boundary zone.**

At the bottom part of Fig. 3.5 the radial dependence of the tangential CL node momentum of the SPM vectors is shown. The same momentum is illustrated also by arrows in the radial section. The shape of the curve presenting this momentum is determined by the orientations of the EQs. The long axis of EQ has a larger momentum than the shorter one. The shape of the radial dependence of the tangential node momentum is not calculated, but given as an example. Assuming that the node inertial mass is one a same for MQ and EQ, we may right:

$$p_t(R_c) = m_n c = m_n 2\pi R_c / t_c = m_n 2\pi R_c v_c$$

Fig. 3.6 shows the radial dependence of some field variables for the confined velocity in which the electron axial velocity is $\alpha_c/3$ (the electron makes one turn for a time equal to $3t_c$).

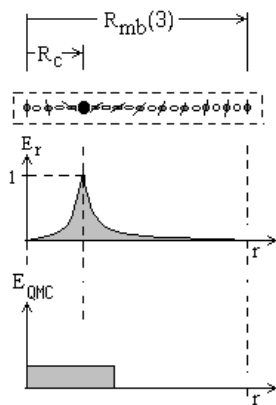


Fig. 3.6

E-field parameters of electron with a confined velocity of $\alpha_c/3$.

The radial dependence of the equivalent E-field intensity is shown as E_r and normalized to the maximum value at the radius equal to R_c . By re-

shaping the shaded area of E_r to a rectangle, we obtain the equivalent electrical radius, which should correspond to the Quantum mechanical radius of the electron RQM. This radius will be determined in §3.11.

We should not be surprised, that some of the internal E-field lines are shown as connected. In fact the E-field line intensities in the internal side of the radial section are expected to converge to zero (or MQ) at the centre. The reason for this comes from a consideration that the diametrically opposite EQs (in respect to the central axis) get opposite SPM phase synchronization from the RL(T).

So far, the radial section of the E-field in the confined motion of the electron was discussed. What are the boundary conditions and the field configuration in the axial section? The E-field configuration in the vicinity to the electron shell has been shown in Fig. 2.47.A, and it is given again in Fig. 3.7.

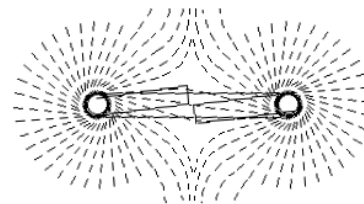


Fig. 3.7

Axial section of the proximity E-field lines of the electron

At confined motion, the boundary condition of the E-field in a radial plane (perpendicular to the motion axis) has a circular shape as shown in Fig. 3.5. The boundary section in an axial plane (passing through the axis of motion), however, is not circular but slightly elliptical, as shown in Fig. 3.8. It is evident, that the concentration of E-field is also not homogeneous and will have a different spatial configuration. As a result of this, the density of the terminating E-field lines at the boundary section is not uniform as in the radial section. The boundary section is illustrated in Fig. 3.8, where the denser E-field line termination is presented by denser points.

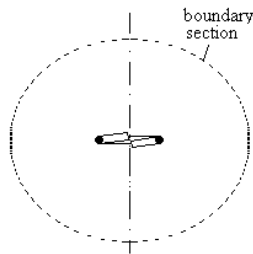


Fig. 3.8

Axial boundary section of the electron at confined velocity. The terminated E-field line density is shown as a point density

From the radial and axial E-field line configuration we see that at the confined motion, the boundary conditions zone has a shape of oblate spheroid whose axis coincide with the rotational axis of the moving electron. The density of the terminated E-field lines is larger at the equator and lower at the poles. In such configuration, the E-field lines still possess strong guiding feature, which keeps the electron orientation in its screw type of motion. In the next paragraph we will see, that at motion with velocities lower, than the optimal one, the circumference length of the central section is equal to $n\lambda_{SPM\ MQ}$, where n is an integer and the boundary shape in the axial section of the E-field also approaches a sphere, so the magnetic radius of the moving electron approaches a sphere for $n > 1$.

Only for the region inside of the boundary surface, the E-field appears not uniform. For a “static” electron or moving electron with axial velocity higher, than the optimal one, the E-field configuration is different, and in many cases may appear to have a uniform spherical shape. The helical configuration, although, is always preserved.

We may summarize:

- **At optimal confined motion of the electron, the E-field is locked in a boundary surface, whose central sections has circumference length of $\lambda_{SPM\ MQ}$**
- **Inside the boundary surface the E-field possesses a helical configuration**
- **The boundary surface at confined motion with low n number has a shape of slightly oblate spheroid, with maximum density of**

terminated E-field lines in the equatorial region

- **At velocity much lower than the optimal one, the boundary surface is much larger and approaches the shape of sphere.**
- **The high efficiency confined motion of the electron is supported by its electrical field**
- **The moving electron possesses a path sensing property, due to the relative freedom of its electrical lines.**

3.5 Dynamical properties of the electron in confined motion

3.5.1 Oscillation properties at optimal confined velocity

For electron moving **with an optimal confined velocity** the following relation (3.6) is valid:

$$(\text{rotational frequency of electron shell}) = (\text{electron-positron proper frequency}) = (\text{SPM MQ frequency})$$

We may say, that the motion with an optimal velocity is a motion at first harmonic of SPM (as for the quantum wave).

The second two terms of the expression (3.6) are always equal to the Compton frequency, independently from the electron velocity. This is so, because the positron edge is moving in the proximity E-field of the external negative shell. This E-field, influenced by the proximity SG(CP) field, is “carried” by the electron negative E-field and is not affected by the electron velocity. Due to the proximity of SG(CP) field, it has a constant value for any sub optimal velocity. The central negative core, also, oscillates in the negative E-field in the proximity of SG(CP) field.

The motion environments for both types of oscillating system are illustrated in Fig. 3.9

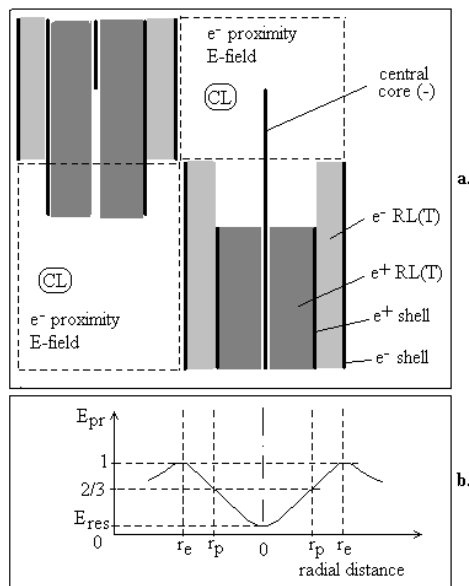


Fig. 3.9
Motion environments around the edges of the electron

Figure 3.9.a shows the motion environment of the positron and the central negative core. Figure 3.9.b shows the radial dependence of the negative proximity electrical field E_{pr} in the motion region, near the external electron shell. This field does not fall completely to zero in the central core axis, but to some residual value E_{res} . The oscillation conditions then are different for the positron shell and for the central core. If assuming a linear dependence of E_{pr} on the radial distance inside of r_e , the positron E-field will interact with the negative proximity field, lying above $2/3E_r$, while the central core - with the field R_{res} . The interaction forces for the positron then are attractive but with a small cosine between the vectors. The interaction forces for the negative core are repulsive but with a cosine equal to zero. The electron and positron helical shell, however has their own energy storage system RL(T), while the central core does not have such one.

The oscillation conditions of the **positron - central core system** will be discussed later in this chapter and in Chapter 4 (about the superconductivity). It will become evident, that depending on

the external conditions and the strength of the invoked oscillations, this system will get two different proper frequencies

- (1). case: for small amplitude oscillations: $3v_c$
- (2) case: for large amplitude oscillations and free positron: $2v_c$

Let us analyse now the first case. As a result of the simultaneous oscillations of both systems, the moving electron exhibits a ‘hammer drill’ effect, which facilitates the displacement (and simultaneous folding and unfolding) of the CL nodes. In this case, the oscillating internal positron with its core oscillating at third harmonic, provides a ‘hammering’ effect, whose momentum is tangential to the helical trajectory. This effect, from one side, provides alternative component of the electron rotational motion, and from the other, contributes to the average velocity stabilization. The motion property of the electron due to the ‘hammer drill’ effect are discussed in the next paragraph.

For a motion with a velocity lower than the optimal one, the direction of the oscillation is still tangential to the trajectory and the ‘hammer drill’ effect is still working. For velocity above the optimal one, however, the momentum of oscillation is not tangential to the trajectory (see Fig. 3.4.b) and the effect is significantly reduced. The ‘hammer drill’ effect is stronger at the optimal confined motion, less stronger in the range of lower velocities and negligible for higher velocities. In all cases however, it contributes to the screw type of motion of the electron, together with its electrical field.

3.5.2 Motion properties of the oscillating electron. Quantum motion.

We may denote the oscillation system as a e^-/e^+ system. From Fig. 3.9.a we see, that the positron shell with its RL(T) oscillates in the negative proximity field of the electron, whose radial dependence is shown in Fig. 3.9.b.

The SPM EQ phases are synchronised along the E-field lines, while their long axis orientation depends on the radius. From the configuration shown in Fig. 3.5 and 3.6 we see, that the cosine between the tangential vector of the electron shell and EQ long axis approaches 90 deg. The same is valid for the positron motion inside of the electron. The EQ SPM momentum in this direction is reduced. In

such case the electron moves and oscillates with less resistance. The hummer drill effect of the central core also contributes to the motion. Such motion conditions are valid only when the radial boundary circumference is equal to a whole number of Compton wavelengths. Only at such condition one full rotation of the external electron shell in CL space, contains whole number of its subsystem oscillations. It is obvious that similar motion conditions are valid for preferred selected velocities. We may call this type of electron motion a **quantum motion**.

Consequently, in conditions of quantum motion, we may refer the motion of the electron-positron system with its proper frequency directly to the SPM frequency of the CL space.

Both, the proper frequency of the e^-/e^+ system and the SPM frequency of the boundary have one and a same value equal to the Compton frequency.

Let us analyse the NRM and SPM of the CL stationary node during one cycle of SPM. The duration of the cycle is equal to the Compton time (period). During this time the direction of NRM and SPM vector changes in 3D space. Figure 3.10 illustrates the timing diagram of both vectors in 2D drawing, where **a.** - shows the spatial direction of the CL node NRM vector as sinusoids at step of $\pi/4$, **b.** shows the positions of the CL node SPM vector.

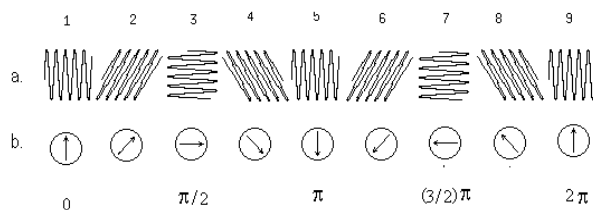


Fig. 3.10

NRM and SPM vector during one Compton period

The NRM(CP), shown in Fig. 3.10.a has one and a same momentum for the opposite direction of 180 deg. The NRM(TP), however has a different momentum due to the twisted parts of the prisms. For this reason the NRM(CP) appears, to have twice shorter cycle, than NRM(TP). The SPM vector, however, is determined by the NRM(TP). **In**

such aspect we may consider, that the NRM(CP) serves as a stroboscopic carrier of NRM(TP), providing in this way stronger quantum features of the CL space. Having in mind the fixed positions of the CL nodes and SPM MQ synchronization, it becomes evident that the quantum features are simultaneously temporal and spatial.

The temporal quantum features of the NRM(T) of a stationary CL node are illustrated in Fig. 3.11, where: **a.** - shows the SPM vector phases, **b.** - the CL node resonance momentum, **c.** - the time phase of SPM vector in one spatial direction (denoted as positive), **d.** - the time phase of the SPM vector in a opposite spatial direction (denoted as negative)

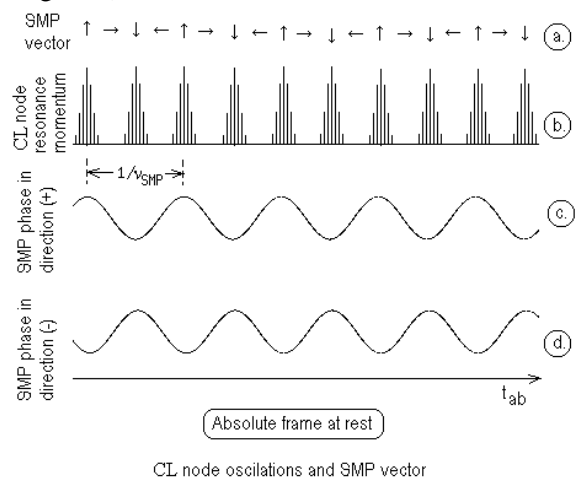


Fig. 3.11

Temporal quantum features of CL node vectors

Let us assume that the electron motion is invoked by external E-field with a relatively small gradient, so the e^-/e^+ oscillation amplitude is small. Then the main disturbance of the CL space, due to the electron motion is from the electron E-field, while the disturbance effect of the e^-/e^+ oscillations on the CL space could be neglected). In order to analyse this motion we have to take into account the frame of the reference. For this reason we will use the concept of the virtual observer.

Let us imagine that a virtual observer, sitting in the front edge of the electron (external shell), observes the motion of the positron edge using its virtual fundamental clock. So its time base is the Compton time. Let us accept that the peripheral ve-

locity of the electron is equal to a linear light velocity, and the PP (phase propagated) SMP vector is synchronized to appear in the same direction. If the SMP frequency is equal to the electron proper frequency, the virtual observer will see both vectors vibrating in phase. But this means that the SMP phase is propagated together with the virtual observer with velocity, which is strictly dependent on the node SMP frequency and node spacing. In this conditions, the virtual observer will move with velocity equal to a linear light velocity. The task of the virtual observer is to register the timing diagram of electron in absolute units. Knowing a priori that he moves with a light velocity he may prefer to reference the local velocities to the light velocity. Then the timing diagrams of the electron system oscillation from his point of view will look like this shown in Fig. 3.12.

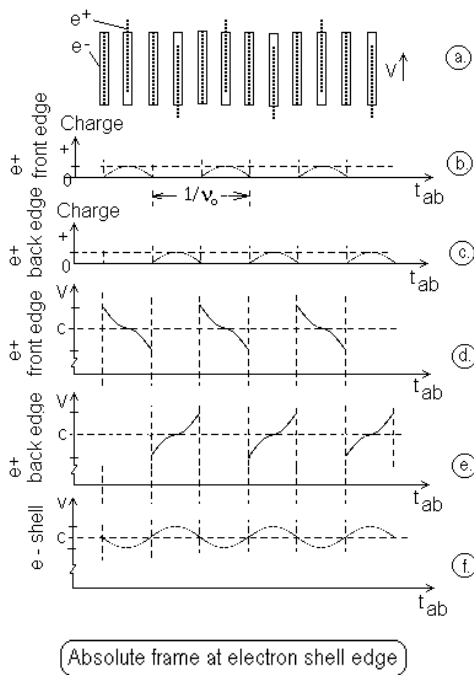


Fig. 3.12

Timing diagrams of electron system motion with simultaneous oscillations at first proper (Compton) frequency

The amplitudes of motion, velocity and oscillating charge are exaggerated in the drawings. In fact they are intrinsically small.

The electron is shown in **a.** as a cylindrical oscillating body for simplicity. It is assumed that the electron shell moves with light velocity and the velocity of the front and back positron ends are

shown respectively in **d.** and **e.** The sharp velocity spikes corresponds to a maximal interaction with the CL space. They are responsible for the synchronization of the electron oscillation with the SMP vectors of the nodes. The periodical appearance of the positive charge from both sides of electron interacts with the lattice space and is responsible for the phase locking conditions. As a result of the positive charge oscillations the external shell practically will not have exactly light velocity but will possess **a small AC (alternative) component around the DC component of the light velocity.** The value of this AC component is automatically self regulated due to the oscillation interactions between the electron and the CL space.

Equivalently we may consider that the electron always oscillates with its frequency ν_0 , but meets the SMP vectors of the surrounding nodes with a correct phase.

We may accept, that small oscillations of the whole electron system around the linear light velocity are possible. The interaction at this conditions with the CL space, however, is significant. As a result of this, the quantum effect is significant. The positron - central core oscillations also contributes to the “hammer drill” effect. Having in mind, that the proper frequency of the positron-core (for small amplitudes) is three times the e^-/e^+ proper frequency (Compton), the alternative electron motion will get a third harmonic in phase.

From the condition of phase synchronization between the e^-/e^+ proper frequency and the CL node SPM frequency (both equal to the Compton one), it follows that for one full turn of the electron the following relations are valid:

$$\lambda_{SPMMQ} = 2\pi R_{mb}$$

$$\lambda_c = 2\pi R_c$$

These are the same relations, assumed in §3.4 from the analogy with the first harmonic quantum wave. The second relation shows that the Compton wavelength can be considered as a path that any point lying on the external helical shell of the electron structure passes for one Compton period, when the tangential velocity of the rotating electron is equal to the light velocity. This relation is used in §3.6 for determination the physical dimensions of electron’s material structure.

3.6 Dimensions of the electron.

The intrinsic mass of the electron is much smaller than the proton. Then we can assume that the electron does not shrink the lattice space (this will become evident later). Let us consider a confine motion of an electron with an optimal velocity. In this case, the peripheral part will move with a speed of light. We may consider however that the light velocity corresponds to the radius R instead of $f(R+r_e)$. This is acceptable (and will be evident later) because, from one side, the ratio r_e/R is small (0.0229), and from the other, the CL disturbance effect from the higher velocity at $(R+r_e)$ will be biased by the lower velocity at $(R-r_e)$. Then taking into account the screw like motion, the following relation is valid:

peripheral velocity: c - path: $\sqrt{4\pi^2 R^2 + (s_e)^2}$
 axial velocity: v_{op} - path: s
 Then the axial velocity is:

$$v_{op} = \frac{cs_e}{\sqrt{4\pi^2 R^2 + s_e^2}} \quad (3.6)$$

Equation (3.6) gives the axial electron velocity for its optimal confined motion. This velocity is very specific and practically it appears in many cases related with electron motion. (for example the electron motion in the lowest stable orbits in atoms). Then our guess (which will be confirmed later) is: this is the velocity of the a_o orbit in the Bohr atom model, corresponding to energy of 13.6 eV.

$$v_{op} = \frac{q_o^2}{2h\epsilon_o} = \alpha c \quad (3.7)$$

where: q_o - is the electron charge,
 h - is the Plank's constant
 ϵ_o - is the permittivity of vacuum
 α - is the fine structure constant

We will prefer to express the velocity by the fine structure constant α , whose physical meaning will be revealed right away.

$$\alpha = \frac{v_{op}}{c} \quad (3.8)$$

The fine structure constant is the ratio between the axial and tangential velocity of the electron at its optimal confine motion. (The tangential velocity at the optimal confine motion is equal to the linear light velocity).

We see that the fine structure constant, from one side is very basic parameter, and from the other, it helps to determine the electron dimensions. We see, also, that it is a dimensionless ratio of one and same parameter - velocity. Consequently, the fine structure constant will be not affected of eventual lattice space shrinkage (filed curvature).

Combining eqs. (3.6), (3.7) and (3.8) we get the step to radius ratio of the electron.

$$\frac{R}{s_e} = \frac{\sqrt{1-\alpha^2}}{2\pi\alpha} = 21.809 \quad (3.9)$$

From Eq. (3.9) we see, that the fine structure constant is completely determined by the radius R and the helical step s_e . It is convenient to express α directly by the ratio R/s_e .

$$\alpha = \frac{1}{2\pi} \left(\frac{R^2}{s_e^2} + \frac{1}{4\pi^2} \right)^{-1/2} \quad (3.10)$$

In order to derive another equation about the electron, we will analyse its trajectory at optimal confined motion.

Having in mind the E-filed integrity we may express the path of one point of the central core, for example the frond edge, per one cycle time of the electron proper frequency:

$$path = 2\pi R = ct_c = c \frac{1}{v_c} \quad (3.11)$$

Solving the system of (3.9) and (3.11), we get the values for R and s_e .

$$R = 3.86159 \text{ E-13 (m)} \\ s = 1.77061 \text{ E-14 (m)}$$

It is not a surprise, that the obtained value of R is exactly equal to the Compton radius, however, we obtained the value of the helical step, that is very important initial result. Returning to Fig. 3.1 and Fig. 3.2 we see that the helical step could not be less than $2r_e$, because the positron then could not be able to come partly out in order to make oscillation. It also could not be much larger and this will become evident in Chapter 6 (because then the negative muon will be not able to crash and decay to a positron if his step is too large. In most of the experiments performed by positive muons it is found that they could oscillate longitudinally until they decay to a positron). The helical step similarity between the muon and electron (positron) according

to BSM is obvious. The electron (positron) could be regarded as a single coil structure of that of muon. From these considerations and from the stable appearance of the fine structure constant in the electron spectrometry, we may accept, that the edges of the external electron shell are just touching. This means that:

$$s_e \approx 2r_e \quad (3.12)$$

According to the discussion given in §3.11.2, **the relation between s_e and r_e is more accurately given by the gyromagnetic factor**. This is a dimensionless physical factor, theoretically calculated and experimentally determined with very high accuracy (see Eq. (3.23.c)). Then the small electron radius r_e is directly obtained from the relation:

$$s_e = g_e r_e = 2.002319 r_e \quad (3.12.a)$$

The ratio between the electron and positron small radii is determined by the accepted ratio between the left and right handed prisms: $2/3$. This ratio is further confirmed by quantum motion of the electron (discussed later in this Chapter), the fractional quantum Hall effect (discussed in Chapter 4, Superconductivity), and by the BSM interpretation of the τ particle decay. According to this ratio we have:

$$r_p/r_e = 2/3. \quad (3.13)$$

Then the dimensions of the electron are the following:

$$\begin{aligned} R &= 3.86159 \text{ E-13 (m)} \\ r_e &= 8.8428 \text{ E-15 (m)} \\ r_p &= 5.8952 \text{ E-15 (m)} \\ s &= 1.77061 \text{ E-14 (m)} \\ R/r_e &= 43.669 \\ R/r_p &= 65.5 \end{aligned}$$

The shown above dimensions define also the positron.

The thickness of the boundary helical core (assuming to be equal to 3 prisms diameter) is very small in comparison to the r_e and r_p . This is evident from the calculations in §2.14, where the CL node distance along $abcd$ axes is found to be: $d_{na} \approx 0.872 \times 10^{-21} [m]$. Having in mind that this distance is larger than the sum of the right handed and left handed prism lengths, the prisms diameter then is at least one order below this value. The helical core thickness is only three prism diameters, so it is negligible in comparison to r_p . Then, practically,

for many calculations, we may consider, that the internal RL(T) of the positron has external radius of r_p , and the internal RL(T) of electron is from r_p to r_e . Realistically some radial gap should exist between the electron internal RL(T) and the positron structure. This could be explained, if having in mind that the radial thickness of the electron's negative RL(T) is less than half of the radius r_e , so this shell it is not completed like the RL shells of the positron. Then its average radial node density is larger than this of the positron, and in the process of RL twisting, its internal radius may not shrink so much.

The RL(T) of the positron also has some finite internal radius. This is its internal hole radius in which the central core oscillates.

The internal holes of both RL(T) of the electrons are not affected, if the internal structure is lost. The probability of the positron to lose the central core is much lower. However, it may regenerate the lost negative core by the trapping mechanism.

The large ratio R/r_e and R/r_p favours the confine motion of the electron and positron in the lattice space.

From Eq. (3.10) and the above made calculations, we found that the fine structure constant α is completely determined by the ratio of R/s_e . But this ratio together with the radius r_e (according to the analysis in Chapter 2) are determined by the balances of forces between the internal RL(T), the bending helical core and the CL space forces (E - filed).

Consequently, we may conclude, that:

- **The embedded fine structure constant permits indirect estimations of the CL space parameters by using of the geometrical parameters of the electron**
- **The dimensions of the electron, are dependable on the CL space parameters.**

The second conclusion shows one very important feature of the electron. It may help to explain some effects in the General Relativity, for example, the red shift of a photon emitted in a strong gravitational field.

The above obtained dimensions appear very useful for solving the following tasks:

- estimation of CL space parameters: static and dynamic pressure

- derivation of theoretical equation for estimation of Newtonian mass (mass equation)
- derivation of theoretical equation for a background temperature of CL space
- calculation of the proton dimensions, including its substructures

In solving the above tasks, we will use the geometrical parameters of the electron. They could serve as a basic reference units.

It is useful to know, that any one of the geometrical parameters of electron can be expressed by the known physical constants. These expressions are given below.

$$R_c = \frac{c}{2\pi\nu_e} \quad \text{Compton radius} \quad (3.13.a)$$

$$s_e = \frac{\alpha c}{\nu_e \sqrt{1 - \alpha^2}} \quad \text{helical step} \quad (3.13.b)$$

$$r_e = s_e/g_e \quad \text{small radius} \quad (3.13.c)$$

$$r_p = \frac{2}{3}r_e \quad \text{positron small radius}$$

3.7 Interaction between the moving electron and the external electrical field

When the electron is forced to move by external electrical field it exhibits a confined motion. If the accelerating field possesses an axial symmetry and the electron has some initial velocity it will be accelerated by the field, but will preserve its straight trajectory. In the interaction process, the external field interacts directly with the electron. The interaction forces of the accelerating field, may be considered applied to the circumference at radius equal to its equivalent electrical radius R_{eq} . For a symmetrical field, the forces acts as a symmetrical “pull-up” forces and do not cause change of the straight line trajectory of the electron.

From the other hand, the interaction process between a moving electron and an external magnetic field is different.

3.8 Interaction between a moving electron and an external magnetic field

The process of interaction between a moving electron and external magnetic field is explained by the help of Fig. 3.13. In this figure the central plane of the radial section of the electron field is shown.

The electron axis is perpendicular to the drawing plane. The external magnetic field is presented by parallel lines with arrow pointing the field direction. The interaction takes place only in the circumference with radius R_{bm} . The magnetic field lines can include only magnetic quasisphears (not disturbed CL nodes), whose phases are synchronized. In the radial section of the electron field, the circumference at radius R_{bm} , only, include magnetic quasisphears. Due to the electron rotation in its screw-like motion, the effective forces from both sides of the axis OO' are different.

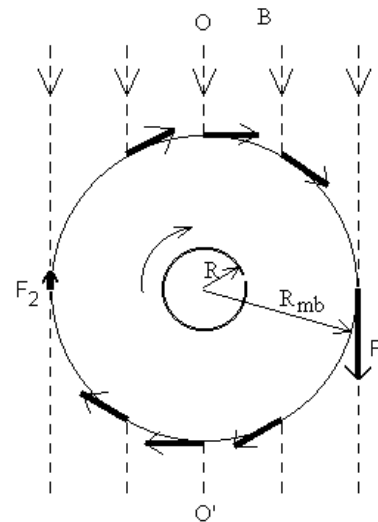


Fig. 3.13

Interaction forces between external magnetic field and the field of the moving electron

In the drawing presented in Fig. 3.13, only two interaction forces, F_1 and F_2 , aligned with the direction of magnetic field B are shown, for simplicity. The right side of the electron single coil structure will get acceleration from the magnetic field, while the left side - deceleration. This will cause the electron to get angular momentum around the axis OO' . The electron containing kinetic energy will make a cyclotron curve in a counter clockwise direction. For stronger magnetic field, the field lines are denser and the cyclotron radius will be smaller. If the direction of the magnetic field is reversed, the cyclotron rotation will be in a clockwise direction. The classical equation for the cyclotron radius is:

$$r = \frac{m_e v}{qB} \tag{3.14}$$

where: m_e is the electron mass, v is the velocity, q is the electron charge and B is the magnetic field.

Accelerated electron makes a circle with an angular frequency ω named a cyclotron frequency.

$$\omega = \frac{v}{r} = \frac{qB}{m_e} \tag{3.15}$$

In §3.4 and Fig. 3.8, it was shown, that the boundary conditions for electron with optimal confined velocity has a shape of oblate spheroid, and the density of the terminated E-field lines is larger at its equator. The simplified presentation of the interaction mechanism, presented above is equally valid also for this case.

Fig. 3.14 shows the electron motion in quadrupole magnetic field. If the electron moves exactly in the centre of the field along the axis normal to the drawing plane, the field will exercise symmetrical forces on the magnetic boundary radius and it will not get deviation. If the electron is slightly of the central axis, it will get a helical trajectory around this axis. The shown type of magnetic field is used in the synchrotron accelerators.

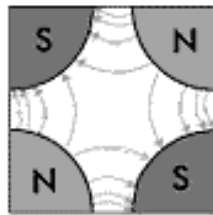


Fig. 3.14
Quadrupole magnetic field

3.9 Quantum motion at optimal and suboptimal velocities. Quantum velocities.

3.9.1 Quantum stabilised velocities and their corresponding energy levels

From the axial boundary section of the electron E-field with confined motion as shown in Fig. 3.8, we see that the E-field is restricted in a near spherical volume. The exact boundary conditions, i. e. the isolated magnetic quasispheres are valid

only for a part of the total E-field volume. This volume could be approximated with a cylindrical volume with a base approximately equal to the central section of the spherical volume with radius R_{mb} and small thickness. For the optimal confined motion, corresponding to energy 13.6 eV, the boundary condition is $2\pi R_{mb} = \lambda_{SPM MQ}$. The next possible boundary conditions, is fulfilled, when the boundary radius of the external surface is equal to $2\lambda_{SPM MQ}$. In this case the electron rotates with a twice lower frequency. Similar type of motion is possible if the circumference length is equal to n times $\lambda_{SPM MQ}$. so the rotational frequency of the electron is respectively v_c/n . The n appears to be a **subharmonic number** in a similar way as in the quantum wave (photon).

Fig. 3.15 a. and b. shows the radial distribution of the equivalent E-field for rotational frequency of $v_c/3$. and $v_c/6$. , respectively.

The electrical field parameters of the moving electron in both cases are shown in Fig. 3.15.

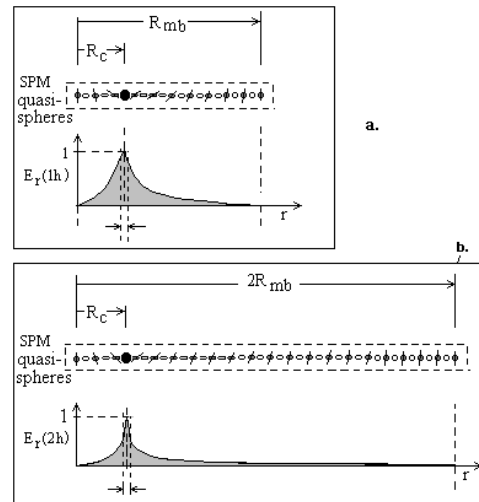


Fig. 3.15

Radial E-field and boundary conditions of the electron for confined motion with: a. - $n=3$; b. $n=6$

Having in mind, that the electrical charge is one and a same, we see from Fig. 3.15 that for a subharmonic number $n > 1$ the equivalent radial section of E-field will occupy an area of $(nR_c)^2$. Consequently, the energy density of any subharmonic normalized to the first one ($n = 1$) is inverse proportional to the subharmonic (number). At the

same time, the E-field density within the range of $0 < r < R_c$, do not decrease proportionally to n^2 , because the field lines have different orientations, as shown in Fig. 3.7. This feature assures a stable proper resonance frequency of the electron as a self-oscillating system.

As a result of described above features, the **moving electron exhibits a quantum motion at preferable velocities**. This velocities define preferable kinetic energies of the electron.

Let us determine what are the resistive forces, which oppose the optimal confined motion at the quantum subharmonics. They are two:

- The CL resistance due to the rotation of the electron E-field;
- The CL resistance due to displaced CL nodes by the electron volume

The resistance from the rotated E-field is smaller at confined motion, because part of the radial circumference of the E-field is isolated. The isolation effect is only a partial, so the electron is still able to interact with some external electrical field.

The second resistive force, mentioned above, is from the displaced and folded CL nodes. (They do not pass through the RL(T) structures of the electron). Larger tangential velocity causes a larger number of folding and restoring nodes. This means a larger resistance of the CL space when the electron is accelerating (this issue is discussed in Chapter 10).

The tangential velocity of the electron external shell at different subharmonic numbers is:

$$v_t(n) = \frac{c}{n} = \frac{2\pi R_c}{t_c n} = \frac{2\pi R_c v_c}{n} \quad (3.16)$$

where: n - is the subharmonic number

Knowing that the fine structure constant gives the relation between the tangential and axial velocity for an optimal confined motion, we can work directly with the axial velocity, expressed by the equation.

$$v(n) = \frac{\alpha c}{n} \quad \text{- axial velocity} \quad (3.16.a)$$

Eq. (3.16.a) is in fact the classical velocity of the electron as a function of n . Putting this velocity in the classical formulae $E = 0.5mv^2$ we get the cor-

responding energy level for such velocities in electron volts.

$$E_{ev} = \frac{1}{2}m_e [v(n)]^2 \frac{1}{q} = \frac{1}{2} \frac{m_e \alpha^2 c^2}{n^2} \frac{1}{q} = \frac{1}{2} \frac{h v_c \alpha^2}{n^2} \frac{1}{q} \quad (\text{eV}) \quad (3.17)$$

where: m_e is the electron mass, q - is the electron charge

One useful expression, derived from (3.17) is the equation of the axial velocity. Its average value should not exceed the linear light velocity.

$$v(n) = \frac{\alpha}{n} \sqrt{\frac{h v_c}{m_e}} \quad (3.17.a)$$

We may denote the preferred energy levels as **SPM subharmonic energy levels**, and the corresponding velocities - **SPM subharmonic velocities or quantum velocities of the electron**, knowing that they are referenced to the SPM frequency of the magnetic quasisphere. In other words they are the preferable quantum levels of interactions.

Table 3.1 shows the energetic and boundary parameters of the first six quantum levels, where: l_{mb} is the circumference length of the radial section, v is the axial velocity of the electron, E is the energy level in (eV).

Table 3.1

n	Effective boundary radius	l_{mb}	v [m/sec]	E [eV]
1	R_{mb}	$\lambda_{SPM MQ}$	2.187E6	13.6
2	$2R_{mb}$	$2\lambda_{SPM MQ}$	1.094E6	3.401
3	$3R_{mb}$	$3\lambda_{SPM MQ}$	7.292E5	1.5117
4	$4R_{mb}$	$4\lambda_{SPM MQ}$	5.469E5	0.8054
5	$5R_{mb}$	$5\lambda_{SPM MQ}$	4.375E5	0.544
6	$6R_{mb}$	$6\lambda_{SPM MQ}$	3.646E5	0.3779

The energy levels of the Bohr atom are given by Eq. (3.18).

$$E_n = \frac{-2\pi\epsilon_0 q^2}{a_0} \left(\frac{1}{n^2}\right) \quad (3.18)$$

where: a_0 is the Bohr radius

The derived Eq. (3.17) gives exactly the same energy levels as the Eq. (3.18). While the Eq. (3.18) is based on the atomic model, suggested by Bohr, the proposed by BSM equation (3.17) expresses directly the electron quantum behaviour in

the CL space. Consequently, the quantum behaviour is intrinsic feature of the electron. Then it can appear in the combine motion between the electron and proton. In the Hydrogen atom, every possible subharmonic number of the electron quantum motion defines the bottom level of the series. They are the following:

Table 3.1

Subharmonic number	Lowest level in [eV]	Series name
1	13.6	Lymen
2	3.4	Balmer
3	1.51	Pashen
4	0.85	Bracket
5	0.544	Pfund
6	0.3779	Sixth

These levels, when considered as a quantum numbers are more stable than any other transitional levels, because of the complimentary interactions between the oscillating electron and the oscillating CL nodes. (The SPM frequency of the CL nodes are phase synchronized by the Zero Point Waves, which always exists in a normal CL space).

Similar motion conditions exist not only for the electrons in the Hydrogen atom but for any other atom. In the second case, however, the energy levels are modified due to the common positions of the protons in the nucleus, the stronger nuclear SG field and the orbital interactions.

3.9.2 First harmonic motion and Rydberg constant

The Rydberg constant (known also as Rydberg) is involved in the well known Rydberg-Ritz formula. It is a measurable parameter by the atomic spectroscopy. It may be expressed in wavenumbers, electron volts, or wavelength. The constant value has a very slow change from element to element. For the very heavy atoms, the Rydberg in wavenumbers is given by the equation:

$$R_{\infty} = \frac{m_e c \alpha^2}{2h} = 1.09737315 \times 10^7 \quad [\text{m}^{-1}] \quad (3.19)$$

For the Hydrogen atom it is little bit smaller.

$$R_H = \left(\frac{m_e m_p}{m_e + m_p} \right) \frac{q^4}{8c \epsilon_0^2 h^3} = 1.09677587 \times 10^7 \quad (3.19.a)$$

where: the term in the bracket is known as reduced electron mass

The Rydberg constant, according to BSM, is defined directly by the condition of the first harmonic quantum motion of the electron.

For a first harmonic motion, the electron energy in SI units is:

$$E = h\nu_c = hc\sigma \quad (3.20)$$

where: $\sigma = 1/\lambda_c$ is the wavenumber

The quantum energy level according to Eq. (3.17) for $n = 1$ in SI units is given by Eq. (3.21), while in (eV) - by Eq. (3.21.a)

$$E = \frac{1}{2} \frac{h\nu_c \alpha^2}{1^2} = \frac{1}{2} (h\nu_c \alpha^2) \quad [\text{J}] \quad (3.21)$$

$$E(\text{eV}) = \frac{1}{2} (h\nu_c \alpha^2) / q = 13.6057 \quad [\text{eV}]$$

Equating (3.20) and (3.21), and solving for σ , we get the value of Rydberg in wavenumbers.

$$\sigma = \frac{\nu_c \alpha^2}{2c} = 1.09737315 \times 10^7 \quad [\text{m}^{-1}] \quad (3.21.a)$$

If making a substitution $m_e = (h\nu_c)/c^2$ in Eq. (3.19) it converts to Eq. (3.21.a). Consequently:

- **The Rydberg constant corresponds to the electron's motion at first SPM harmonic (a case of optimal confined motion).**

The Rydberg constant, according to Eq. (3.21.a) (containing only CL space parameters) appears to be a parameter of the CL space. The fine structure constant is also a CL space parameter, but estimated by the electron parameters. In §3.11 it will be shown, that the electron parameters in fact are defined by the CL space parameters, because they determine the shape and dimensions of the electron. There is one very small contribution from the bending resistance forces of the helical core, that are not defined by the CL space parameters. This small contribution, in fact, gives the general relativistic deviation. Ignoring the latter one for now, we can make a conclusion, that:

- **The Rydberg constant is a CL space parameter**

In the table of fundamental constants, the Rydberg constant is given also in frequency units, and in energy units. In the latter case, when estimated in (eV) it corresponds to 13.6 eV - the energy of the electron optimal confined motion.

One question may arise: Why the accurate value obtained by Eq. (3.21.a) matches exactly the Rydberg for the massive element and not for the Hydrogen? The explanation is the following:

The Rydberg constant can be regarded as an energy parameter of the CL space. When a photon is emitted as a result of CL pumping, an exact equivalence exists between the pumped and the photon energy.

CL pumped energy = photon energy

For this reason the signature of the Rydberg constant appears in the atomic spectra. This gives a possibility for its experimental estimation. The pumping conditions in atoms are obtained by the circling of the electron around the much heavier nucleus. They both are not fixed in the CL space, but only by their masses. **So for the pumping effect of the stationary CL space (in our case the Earth local field) we have to consider their common motion.** For the much heavier nucleus, the comparative electron mass become intrinsically small. **Then the heavier nuclei could be considered as a fixed in CL space.** From the other hand, the Hydrogen nuclei is lighter, and could be not considered as fixed in the space. We see, that Rydberg constant approaches the maximum value at heaviest atom and is smaller for the Hydrogen. For this reason the reduced electron mass is used in the Eq. (3.19.a) (the bracket term). While the Rydberg is proportional to the photon energy it appears, that, **the CL pumping efficiency is highest, when the electron circle around a stationary fixed nucleus.**

The above made conclusion is confirmed, also by the Positronium transition $1^3S_1 - 2^3S_1$, discussed in §3.17.4.

Let us find the physical meaning of the electron reduced mass. The bracket term of the electron reduced mass, can be presented in a form:

$$\left(\frac{m_e m_p}{m_e + m_p}\right) = \eta m_e \quad (3.21.b)$$

where:

$$\eta = \frac{m}{m_m + m} \quad \text{is the CL pumping efficiency} \quad (3.21.c)$$

m - is the mass of the heavier nucleus around which the electron is circling orbiting

Then the expression of the Rydberg constant takes a more general form, in which the CL pumping efficiency is explicitly involved.

$$R_y = \eta \frac{v_c \alpha^2}{2c} \quad (3.21.d)$$

Equation (3.21.d) shows, that the Rydberg constant apart of the lattice parameters depends only on the pumping efficiency, determined by the involved masses.

The pumping efficiency for the Hydrogen atom is 0.9994557, while for the Positronium it is 0.5.

We may summarize that:

- **The electron exhibits a quantum motion due to the interaction between SPM MQ frequency and the proper frequency of the electron-positron system**
- **The quantum levels of the electron velocity are defined by kinetic energies at which the electron exhibits a screw-like type of motion with a less resistance**
- **The rotational electron frequencies for the quantum levels are subharmonics of SPM MQ frequency, including also the first harmonic.**
- **The quantum levels of the electron velocity define the bottom levels of the Hydrogen series and are relevant also for other atoms.**
- **The Rydberg constant is directly defined by the first harmonic quantum motion (optimal confined motion)**
- **The CL pumping effect obtains a maximum value, when the electron is orbiting in a fixed orbit around a heavier charge particle, for example the proton.**

3.9.3 Quantum properties of the positron system

We found that the oscillations with small amplitudes are relevant for the quantum motion of the electron at suboptimal velocities. The same amplitude conditions should be relevant for the positron quantum motion. When compared to the electron, the confined motion of the positron has some similarities and some differences.

The similarities are the following:

- a same type of boundary conditions

- a similar screw-like type of motion

The differences are the following:

- The external motion environment of the central oscillating core is different

- The proper frequency is different

At first glance, the efficiency of the positron quantum motion could look much lower, in comparison to the electron, because the system has only one internal RL(T), and the intrinsic matter of the central core is much smaller. This, however, is partly compensated by the increased hummer drill effect, as we will see from the following analysis.

When the positron system oscillates inside the electron with small amplitudes, the central core oscillates in slightly negative external field, as was shown in Fig. 3.9.b.

The oscillating conditions of the central core of the free positron, however, are different. Now, the external negative field is missing, and the gradient of the positive E-field falls to zero. For small amplitude oscillations of the free positron, we may accept, that the central core oscillates in environment of MQ nodes. But the SPM frequency of the external and internal MQ's is one and a same. Then the oscillating central core will exhibit stronger hummer drill effect. This will partly compensate the efficiency of the free positron quantum interaction in comparison to the electron. The optimal interaction will be obtained at such positron rotation, at which the phase difference between the PP SPM vector and the proper frequency of the free positron is zero. To obtain this motion conditions we need to know the free positron proper frequency. Experiments with positrons provide confidence about its inertial mass, but this is not enough in order to obtain the proper frequency. The Planck's constant may appear different, when estimated by the electron and positron parameters (and this will become evident by the course of BSM.) So in first we will make some theoretical analysis, and then we will look for experimental confirmation.

Let us make comparison between the electron system and the free positron in order to find the conditions, when their central cores exhibit one and same resistive momentum. Let us analyse in first, the motion of both systems when they have one and a same tangential velocity of their external shells. We may use the classical equation for the proper frequency of oscillation system:

$$f = \frac{1}{2\pi} \sqrt{\frac{k}{m}} \quad (3.21.c)$$

The inertial mass of the central core should contribute to m - parameter, while the repulsive forces between the negative core and external field should affect the spring constant k - parameter.

a) Inertial considerations of positron- core system

In the case of electron, the positron shell, moves in a CL domain with SPM momentum, which according to Eq(3.5) (see also Fig. 3.5) is given by: $k_{hb}p_t(R_{mb})$

In this case the central core is carried by the positron shell, and for small oscillations it does not feel the above SPM momentum. In case of free positron, however, the core will exhibit momentum $p_t(R_{mb})$. Then its inertial interaction appears lower, and it will behave as a lower inertial mass, that according to Eq. (3.21.c) will means a higher proper frequency.

b) k - parameter considerations

Here we have to consider two electrical components: external component and internal one - the latter is related to the trapping hole effect (discussed in §2.8.2).

In a case of internal positron, the negative core exhibits a slightly repulsive force from the external negative field of the electron (see Fig. 3.9). In a case of free positron, the external field is positive. The E-field interaction of the central core with that field is not so strong, because the core does not posses RL(T). However, it may obtain a small external attraction due to the positive external field. The internal trapping force, however is not affected and predominates the external one. The SG(CP) forces are also unchanged. It is obvious, that the k parameter in case of internal positron will be larger, than for the free positron.

We see, that the factors m and k , both change in a same direction so: the proper frequency of the free positron is expected to be lower, in comparison to the internal one. In fact we could not expect much change of the m factor, between both cases, because, the SG(CP) is focused onto the central core and is much stronger.

In order to find out what is the possible oscillating frequency of the free positron we will analyse the oscillations of the positronium, known as

Ps $1^3S_1 - 2^3S_1$. It leads to emission of a photon at wavelength of 243 nm. This positronium is a result of common oscillation motion between a normal electron and a free positron. The energy of the emitted photon is 5.1 eV. The only possible quantum energy level transition for this value is $(13.6 \text{ eV} - 3.4 \text{ eV})/2 = 5.1 \text{ eV}$. It is not difficult to guess, that the electron participate in the oscillations with its optimal quantum velocity, corresponding to energy level of 13.6 eV. Then the positron energy is 3.4 eV. Obviously this is a velocity with a stronger larger quantum effect. The oscillation process, leading to a photon emission is analysed in more details in §3.17.3. The level difference is divided by two, because, the two masses are similar. This reduces the efficiency of the lattice pumping by a factor of two in comparison with the Hydrogen series, where the mass ratio of proton/electron is very large and the proton could be considered as a stationary body.

Other emissions from the above mentioned combination are not observed. It is reasonable to not expect another quantum energy levels, because the interaction properties of the central core in comparison with those of the positron shell are very weak. The boundary conditions for the quantum motion of the electron and free positron are one and a same. Then the energy level of 3.4 eV should correspond to the optimal confined motion of the free positron, which means that its oscillation frequency is twice larger than the first proper frequency of the normal electron, or twice the Compton frequency.

$$v_{pc} = 2v_c \quad (3.22.a)$$

where: v_{pc} - is the proper frequency of the free positron system

The relation (3.22.a) is confirmed also by the fractional quantum Hall experiments, discussed in Chapter 4.

Consequently, the free positron exhibits a quantum motion at 3.4 eV, due to the interaction between the CL node SPM and the proper frequency of the system.

The maximum confined velocity of the positron appears to be one half of the optimal confined velocity of the electron. The positron may not have another quantum velocity and energy level in CL space with normal ZPE, due to the decreased quantum effect in comparison to the electron.

3.9.4 Electron acceleration

For velocities higher than the optimal one, the electrons can be accelerated by two methods: by electrical field or by magnetic wave. There are two distinguished features between both types of acceleration.

In case of electrical field acceleration, (considering a symmetrical field), the external field pull the electron by its surrounding E-field. The accelerating force may be considered as applied at the electron equivalent radius. In this case the stretched helical trajectory have the same handedness as the second order handedness of the electron.

In case of wave type acceleration by magnetic field, the accelerated field interacts only with the electrons E-field lines terminated with a MQ's. For velocities much higher than the optimal one, these MQ's are arranged in very stretched helical trajectories, which tends to delay from the AC phase of the magnetic field. The alternative magnetic field is synchronized with the electron momentum velocity in order to not miss the phase of the electron proper frequency. At large velocity however, the quantum effect of the electron oscillation is small. Then the proper frequency could not be kept synchronized to the SMP MQ frequency of the accelerating field. As a result a squeezing effect may appear constantly between them. This effect, may reduce the reaction of the accelerated electron that will appear as an opposite magnetic field (as in the selfinduction). Due to reduced reaction, the acceleration effect appears more effective. In very high velocity may appear also, that the electron could rotate in a reversed direction. (In this case the effect is similar as mechanical acceleration of screw with larger step to diameter ratio by sliding nut).

From the provided simplified analysis it appears that a high energy (velocity) acceleration of an electron beam is more effective when provided by alternative magnetic field. This type of acceleration is used in the synchrotron accelerators.

3.10 Magnetic moment, gyromagnetic factor and Quantum mechanical spin of the moving electron

3.10.1. Magnetic moment

The confine motion of the electron means, that it rotates continuously. Consequently, its electrical field creates waves in the CL space. The waves accompany the moving electron as closed magnetic lines, formed of connected in loops magnetic protodomains. In uniform, not disturbed by other particles CL space, the magnetic lines are circles around the electron trace. The direction of the induced magnetic field is determined by the axial direction of the “screwing” electron.

For electron moving with a velocity closer to the optimal one, the motion behaviour is strongly influenced by the oscillation properties of the electron. When bundle of electron is moving with such velocity, the common synchronization effect is also very strong. This provides a strong modulation effect on the lattice space, appearing as an magnetic field.

Let us analyse the magnetic disturbance of the CL space from a single electron, moving with the optimal confine velocity, corresponding to energy of 13.6 eV. For one full turn of the external shell, the electron-positron system makes one cycle, whose period is the Compton time. The induced magnetic field in this conditions is characterized by the **electron magnetic moment**. It is given by the equation:

$$\mu_e = \frac{qh}{4\pi m_e} \left(1 + \frac{\alpha}{2\pi}\right) \quad [\text{A m}^2] \quad (3.23)$$

where: q - is the electron charge, h - is a Plank constant, m_e is the electron mass and α - is the fine structure constant.

The electron magnetic moment is considered anomalous, so far, because of the second term in the brackets. But according to BSM model of the electron, α is completely determined by the electron radius R and step s_e (see Eq. 3.8). Consequently, this term shows the contribution of the helical step of the electron, due to the screw type effect. The electron motion at this velocity is affected stronger and the effect is detectable. **Therefore**,

the magnetic moment of the electron suggested by BSM should not be considered anomalous.

Let us explain, why the magnetic moment is increased when α is larger. The dependence of α , on the ratio R/s_e was given by Eq. (3.8). For default value of α , this ratio is:

$R/s_e = 21.809$. Fig. 3.16 shows a plot of the fractional change of α , for R/s_e range from 21 to 23.

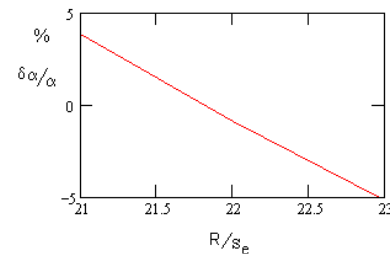


Fig. 3.16

R_c/s_e ratio as an estimation factor of the fine structure constant

We see, that for small range of R_c/s_e , the change of α is linear but not perfectly. The physical explanation of the R_c/s_e change and its direct effect on the magnetic moment is a following:

The electron parameters: R_c , r_e , s_e , are dependable on the forces balance, between the internal RL(T), external CL space and the helical core bending (see Eq. (2,8)). In this balance, the strong SG forces are involved including the electrical field created by RL(T) lattice of the electron's external shell whose energy is included in the SG energy balance. The balance causes adjustment of some of the parameters of the helical structures. For a SOHS, some parameters, such as the radius R_c and the step s_e are stronger affected than for the FOHS. (this was discussed in §2.8, Chapter 2). Therefore, if the CL space parameters are changed (for example the node distance), the twisting of the internal rectangular lattice will be affected. This twisting of RL controls the angle of the external E-field lines, emerging outside of the helical shell. Consequently, the magnetic moment is dependent on the degree of RL twisting and the helical step s_e of the SOHS.

The magnetic moment is a measurable parameter.

3.10.2 Gyromagnetic factor and Quantum mechanical spin

3.10.2.1. Gyromagnetic factor

While Quantum mechanics can not provide a reasonable classical explanation of the electron's spin. BSM model of the electron allows such explanation for a first time, as will be shown below.

Let us first show some of the known QM properties of the electron, which are related to the spin. One of them is the intrinsic magnetic moment of the electron, known as a Bohr magneton (because the Bohr atomic model is used for its derivation).

$$\mu_B = \frac{qh}{4\pi m_e} = 9.273 \times 10^{-24} \text{ (J/T)} \quad (3.23.a)$$

where: q - electron charge, h - Planck's constant and m_e - mass of the electron.

According to QM model the expected magnetic moment of the electron must be $\mu_e = \pm(1/2)\mu_B$. However the measured value turns out to be about twice that.

$$\mu_e = \pm(1/2)g\mu_B \quad (3.23.b)$$

where: the parameter g is a dimensionless coefficient, called gyromagnetic ratio or g -factor.

Accurate measurements of the g -factor are possible by using physical effects, such as Electron Spin Resonance and Lamb shifts. The accurate value of g -factor given by NIST is

$$g_e = -2.0023193$$

One experiment demonstrating the estimation of the g -factor based on an ESR is popular in universities physical laboratories. (for example an experiment provided by Leybold-Heraeus, based on a manuscript of Prof. H. K. Sheiner, Elensburg). The g -factor is estimated by ESR data according to equation:

$$g_e = \frac{h f}{\mu_B B} \quad (3.23.b.1)$$

where: μ_B - is the Bohr magneton (theoretical value), h - is the Planck's constant. The ratio (f/B) is estimated directly from the experiment.

According to the theoretical treatment, the g -factor is expressed by a series containing only the fine structure constant as a physical parameter. In

the BSM model of electron the fine structure constant is an embedded parameter. The derived Eq. (3.13.b) shows that the helical step of the electron is expressible by the fine structure constant and CL space parameters. Therefore, it is not difficult to guess, that the dimensionless g -factor is defined from the ratio between the helical step s_e and the small radius r_e of the electron.

$$g_e = s_e/r_e = 2.0023193 \quad (3.23.c)$$

Consequently, the g -factor allows us to determine the small electron radius (as the helical step s_e was determined in §3.6).

One strong prove of the correctness of Eq. (3.23.c) is the calculation of the Static CL pressure using the derived in §3.13.3 equations (3.51) and (3.53). They both should give one and a same value. In Eq. (3.51) the volume of FOHS of the electron participate, while in Eq. (3.53) the g -factor is involved. When using g -factor given in (3.23.c) Eq. (3.51) and (3.53) give the exact same value up to the 10th significant digit. For any other value of g -factor the results departs significantly (in Eq. (3.53) g -factor is squared).

One may argue, that the relation (3.23.c) is not exactly a same for the free positron, because $r_p = (2/3)r_e$, while their inertial masses are equal. In case of positron, however, number of other factors should be also considered: the different proper frequency (defining different optimal confined velocity), the different physical dimensions, the different intrinsic matter densities of the right and left prisms and the different intrinsic time constants of the two substances of intrinsic matter.

3.10.2.2. Quantum Mechanical spin of electron

The electron spin is well known quantum mechanical property of the electron. Its signature is apparent in spectral lines and some experiments, for example, Electron Spin Resonance (ESR). The value of the spin is

$$s = \frac{h}{4\pi} = 5.2729 \times 10^{-35} \text{ (J.s)}$$

Let us analyse the Eq. (3.23.b.1) for measurement of the electron spin by ESR method. If putting dimensions of the involved parameters, the g -factor appears as a ratio of torques (Js/Js) or a ratio of en-

ergies (J/J). The torque ratio indicates that the QM spin has an angular momentum. It is similar as the dimensions of the Planck's constant, which physical meaning is revealed later in this chapter. In §3.5.1 it was shown how the oscillating electron interacts with the SPM vector. It is apparent that the magnetic field created by the confined motion (with a spatial parameters defined by the electron magnetic radius - see §3.11) will influence the phase of the electron oscillation with its first proper frequency (Compton). **Consequently, the proximity magnetic field may serve as a directional reference of the QM spin of electron.**

Then we may formulate the following physical properties of the QM spin of electron. For an optimal confined motion (first harmonic velocity) we may have the following two cases of QM spin:

$S = +(1/2) h$ - The moving edge of the internal positron matches the phase of the SPM vector

$S = -(1/2) h$ - The moving edge of the internal positron is in antiphase with the phase of the SPM vector

The proximity field SPM vector serves as a directional reference.

Physically, it is quite understandable how the BSM electron interacts with the SPM vector phase. The partial appearance of the edges of the internal positron beyond the edges of the external negative FOHS (with a frequency ν_c) creates a pulsating field having the same frequency as the SPM vector of the CL nodes, so they may interact strongly. The distance between both edges of the electron structure (the helical step s_e) is much shorter than the Compton and magnetic radius of the electron (see §3.11). Then the pulsating magnetic field from both, the leading and trailing edges may get a phase lock to the external field SPM phase. This will correspond respectively QM spin value of the electron. This is a feature of the hummer drill effect of the electron confined motion as discussed in §3.5.2. While this effect is strongest at the optimal confined motion (13,6 eV), it is also valid for sub-optimal confined motion with subharmonic numbers $n = 2, 3$ and so on, but with a degrading strength. This is possible due to the time quantum properties of the SPM quasisphere, which is discussed later in §3.12.2. Additional features clarifying the interaction related to QM spin are discussed in §7.7.1, Chapter 7.

When the electron is moving in closed orbit around the proximity field of the proton it gets one additional reference direction defined by the overall shape of the proton structure. This provides conditions for additional splitting of the observed spectral lines in the strong Zeeman effect. This issue is discussed in Chapter 7.

Summary:

- **The magnetic moment of the electron is a parameter expressing its spatial and velocity stabilizing properties. The large magnetic moment of the electron (in comparison to the proton's one) is a result of its fast rotation in confined motion in comparison with the proton.**
- **In absence of magnetic field, the large magnetic moment of the electron assures its straight forward motion despite the displacement of the CL nodes. In environments of external magnetic field, the magnetic moment causes the electron to perform a motion in a cyclotron curve.**
- **The gyromagnetic factor is a parameter of the electron structure. It appears to be a ratio between the helical step of the electron and its radius.**
- **The oscillating structure of the electron with a first proper frequency equal to the SPM (Compton) frequency of the external magnetic field allows a strong quantum interactions with the CL space.**
- **The BSM model of the electron allows for a first time a classical explanation of its Quantum Mechanical spin.**

