Chapter 3. Structure and physical parameters of the electron

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 the CL space. In 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.

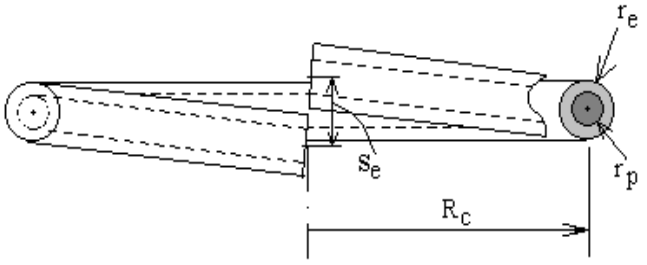

Fig. 3.1
Sketch of the electron's structure

The electron consists of an external negative shell and an internal positive shell with a core. Both shells include a helix as a boundary enclosing internal RL(T) structures. 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 IG 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.

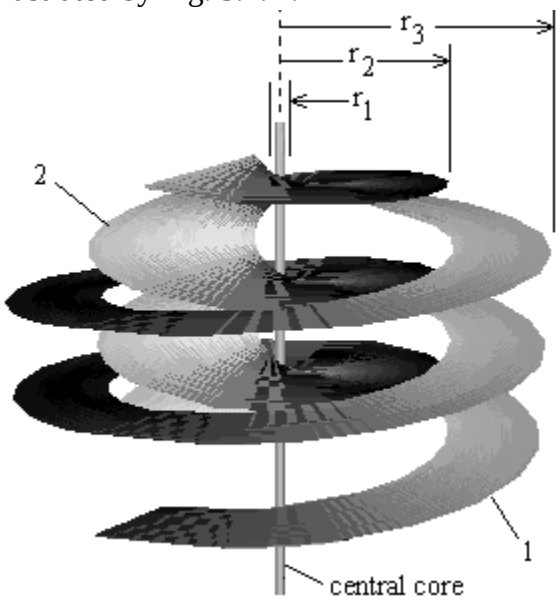

Fig. 3.1.A
Layers of both internal RL(T) structures of the electron

Figure 3.1.A shows only the radial layers connecting 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 intermediate 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 with thickness of 3 prisms diameter, is positioned along the axis of the trapping hole. It is evident, that the interaction between IG(CP) of the two RL(T) is minimized due to the following two features:

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

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 trapping hole of the positive RL(T).

In some conditions of extremely high velocity, or operation in 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, from negative CL nodes. The oscillation is illustrated by Fig. 3.2.

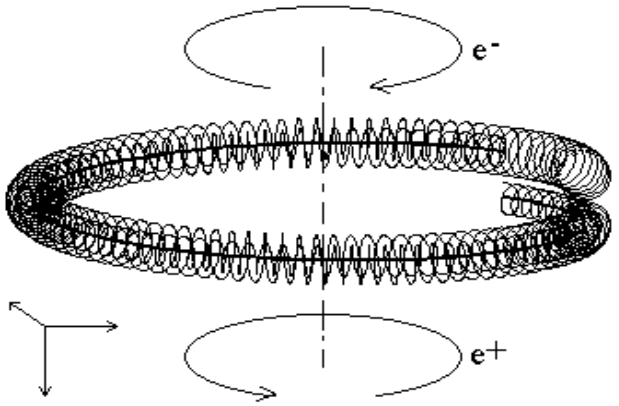

Fig. 3.2
Oscillating electron

We can distinguish two simple oscillation 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 analyse, first, the system “electron shell - positron”, in order to determine what kind of factors define the proper resonance frequency.

From a first gland, 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 IG (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 the both type radial stripes meet themselves for a very short time. Having in mind, that the calculated *xyz* node distance of CL space was in the order of $d_{nb} = 1.0975\times10^{-20}$ (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 IG interaction between both RL(T)s may not take place. This means that the IG 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 filed 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 filed of the positron in this case also appears hidden.**

Let analyse now the IG field leaking between the nodes. If the electron overall shape, for example was not a coil but straight compound FOHS, the leaking IG 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. 5.1 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 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 this 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 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 photons 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 the 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 rasing to a normal value, the electron system recombines, but it needs to restore its lost energy. So if the conductor 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).

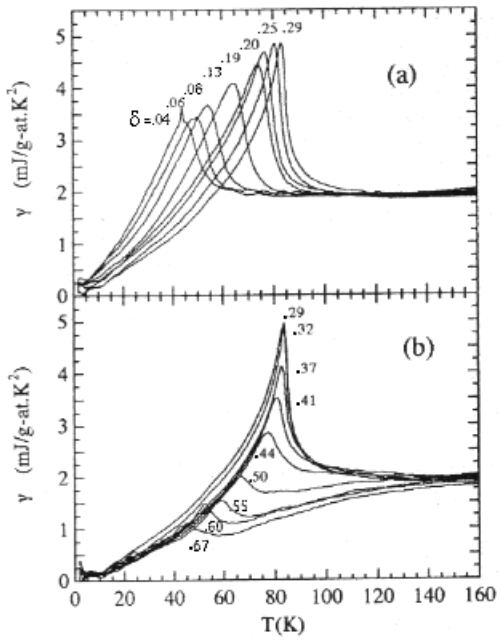

Fig. 3.3
Specific electronic heat coefficient in function of the superconductor temperature (Plot data from of J. W. Loram et al., 1997)

According to BSM theory, however, not all the 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 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 ex-

hibit a static charge. When it is oscillating, however, conditions 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 oacillational 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 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).

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

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):

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

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.**

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

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

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 as the oscillation 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:

$$\nu_{pc} = 2\nu_c \quad \text{- for free positron} \qquad (3.3.a)$$

where: ν_{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:

$$\nu_{pc}' = 3\nu_c \quad \text{- for positron inside of the electron (small amplitudes)} \qquad (3.3.b)$$

$$\nu_{pc} = 2\nu_c \quad \text{- for positron inside of the electron (large amplitudes)} \qquad (3.3.c)$$

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"; $1'S_o$ singlet of parapositronium activated by different methods: by X or gamma rays, by bremshtrahlung, 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 related with emission of two or three gamma photons, depending of the amount of activated energy. Let analyse the dynamical behaviour of the energy 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 rest. In both cases they will have different potential energies. Let assuming 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 exists. 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 exists 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 seams, that the electron and positron are **annihilated. In fact this is only a change of the state of the 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 IG field is much stronger, another type of pumping effect exists. It will be discussed in Chapter 6.

3.3 Confine motion of the electron. Electron spin.

One important feature of the electron is its confine motion in the lattice space. One factor facilitating this type of motion is the large R/r_e ratio. The main factor for the screw like motion, however, is the interaction between the oscillating (stationary) CL nodes from one side and the induced E field by the internal RL(T) from the other. This field is propagated by the BSM interaction of IG. This interaction causes a formation of negative EQs, arranged in a spatial helical configuration of same handedness as the RL(T). This configuration has an additional second order helicity due to the second order helicity of the electron. 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. So the electron system and the free positron, both, always tends 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 of two factors: the motion velocity and the momentum interaction between the proper frequency oscillations and the momentum of SPM vector of the stationary nodes. In the case, when the tangential velocity of the electron is equal to the speed of light (linear), the motion is called an **optimal confine motion.** The corresponding axial velocity of the electron is called an **optimal confined velocity**. For velocities below the optimal confine one, the electron motion is **completely screw like.** For velocities above the optimal confine 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 own helical trajectory. In both types of confine 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 confine motions are illustrated in Fig. 5.4., where the electron is shown as a single coil, while the trajectory - by a dashed line.,

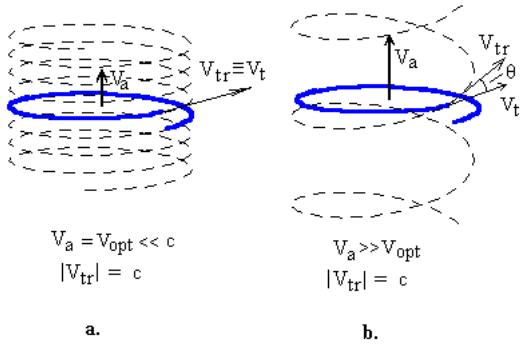

Fig. 3.4

Two types of confine motions of the electron. The electron is shown by a blue 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 blue 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 a electron spin. In normal motion conditions, the spin should have one preferred direction, determined of 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 with 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 IG type of interaction. This kind of IG 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. In 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 (po apparently the helical structure twisting) but the involved IG 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 posses a selfenergy.

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

- **The electron exhibits a confine (screw type) motion in the lattice space**
- **The electron posses 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 IG (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. Figure 3.4.A illustrates the modulation of the surrounding CL nodes at the optimal confined motion of the electron (13.6 eV).

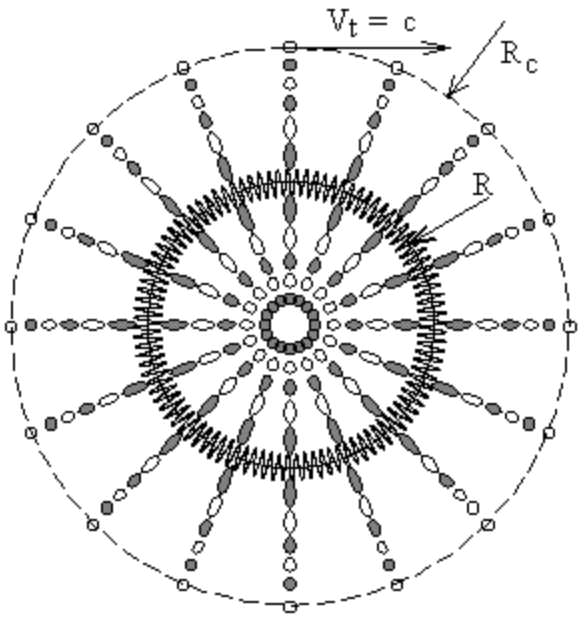

Fig. 3.4.A
CL nodes modulation at optimal confined motion of the electron

Fig. 3.5 shows the radial configuration of the same field by E-field lines. In this figure 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 tangential node momentum also is shown in the bottom part of the figure.

Let make analogy between the radial E field configuration of the electron and the field configuration of the first harmonic quantum wave (see §2.11.3). The similarity between them are the following:

- They, both, have boundary conditions provided by MQ and determined by λ_{hb}
- The E-field lines are aligned

The distinguishing features are the following:

- The integrity of the E-filed in the quantum wave is kept by the energy motion from node to node. The both types of EQ are equally affected (for a neutral wave) or complimentary affected (for a quasiparticle wave)

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

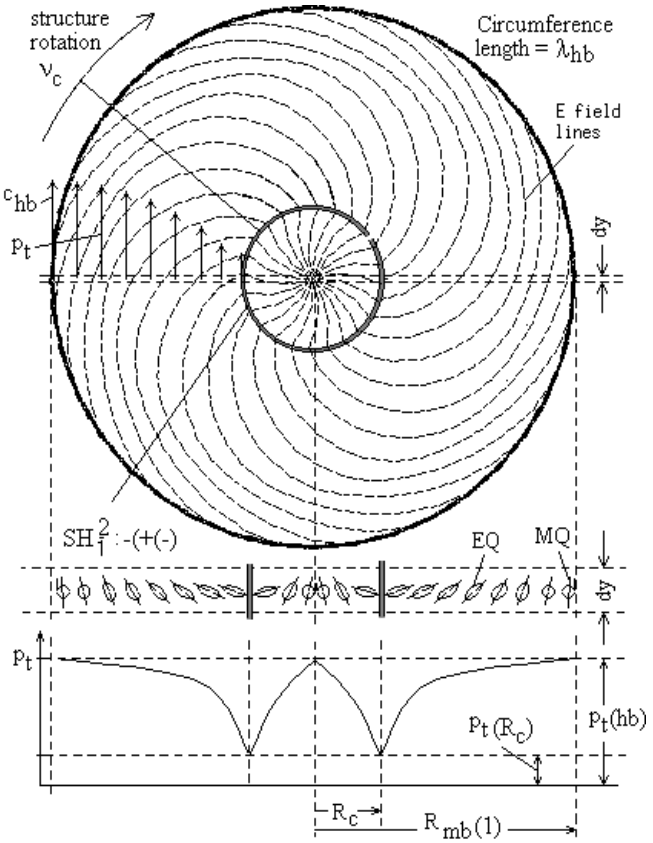

Fig. 3.5
Radial configuration of E field of the electron at optimal confined velocity (energy of 13.6 eV)

The magnetic boundary condition in both cases is determined by the helical boundary wavelength λ_{hb}, related to the Compton wavelength λ_c by the boundary factor k_{hb}, used in the relation $\lambda_{he} = \lambda_c k_{he}$. It was shown in Chapter 2, that the value $k_{hb} = 4$, matches well to the Rayleigh criterion for detection of monochromatic wave by diffraction limited optics. In this Chapter we will show, that this value fits well, also, to the quantum motion conditions of the electron. From Fig. 3.4.1 we see that, when the tangential velocity of the electron central axis (curve) is equal to the light velocity, any point of its external shell makes a full rotation for one proper cycle. The length of this trajectory per one cycle is equal to the Compton wavelength. Then: $\lambda_c = 2\pi R_c = 2\pi R_{mb}(1)/k_{hb}$, or:

$$R_{mb}(1) = k_{hb} R_c = 4R_c \qquad (3.4)$$

where: $R_{mb}(1)$ - is the magnetic boundary radius for boundary conditions, equal to the size of λ_{SPM} (defined by the MQ).

Let to analyse the difference between E-field integrity in a case of quantum wave, and in a case of electron. In a case of quantum wave, the E-field integrity is kept by the alignment of the EQ in helical trajectories. The length of these trajectories for one SPM cycle varies between λ_c and λ_{hb} (for a first harmonic quantum wave), depending of helical radius. We can distinguish two types of integrity in the quantum wave: one - along the helical trajectories and second - between them. This integrity, however, is realised in a cylindrical volume with a radius equal to the boundary radius and a volume length of λ_c. The electron has a pretty large ratio between the coil radius and the helical step (this ratio is 21.8 and it will be shown in the next paragraphs). While the circumference for the optimal velocity is equal to λ_{hb}, if regarded as a cylindrical volume, its length is pretty short. 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. One may argue, that the negative EQ's may repel each other, as between two charges of same type. Here the situation, although, is different. In the case of induced EQ between two charges of same type, the synchronization condition is not uniquely defined, because the RL(T) of the both charges are not synchronize between themselves. In a case of one charge, all EQ of same type are synchronized by the same source - the internal RL(T). Then the negative EQ are able to influence stronger the neighbouring nodes of opposite handedness. So the latter get some complementary motions as a passive neighbours, but their energy could not compensate the field of the negative EQ, directly induces by the RL(T). Saying in other words, the induced EQ of same handedness have a strong reference point - the negative RL(T) of the helical structure, while the neighbouring nodes of opposite handedness does not have a reference point.

All the field lines are connected to the internal RL(T) of the electron. The EQ polarisation is gradually changing from the strongest value, near the helical shell, to weakest one, near the boundary. 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 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 not homogeneous CL space, as in the metal crystals, its E-filed lines could automatically sense the lower resistant domains. This effect provides one very important feature: **a path sensing property of the moving electron.** The path sensing property is related to the NRM cycle and can operate faster than the quantum magnetic interaction, that is related to the SPM cycle.

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

In the bottom part of Fig. 3.5 the radial dependence of the tangential node momentum 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 larger momentum than the shorter one. The shape of the radial dependence of the tangential node momentum is not calculated, but given as example. Assuming that the node inertial mass is one a same for MQ and EQ, we may right:

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

$$p_t(R_{mb}) = m_n c_{hb} = m_n 2\pi R_{mb}/\nu_c$$

While the above feature does not give a proof that the ratio between R_{mb} and R_c is equal to 4, the quantum motion of the "positron - core" system will help us to do this. This will be discussed in one of the next paragraphs. Apart of this, from the analogy with the first harmonic quantum wave, it appears that the following relation is valid.

$$\frac{R_{mb}}{R_c} = \frac{p_t(R_c)}{p_t(R_{mb})} = \frac{c_{hb}}{c} = \frac{\lambda_{hb}}{\lambda_c} = k_{hb} \qquad (3.5)$$

Fig. 3.6 shows the radial dependence of some field variables for the optimal confined velocity.

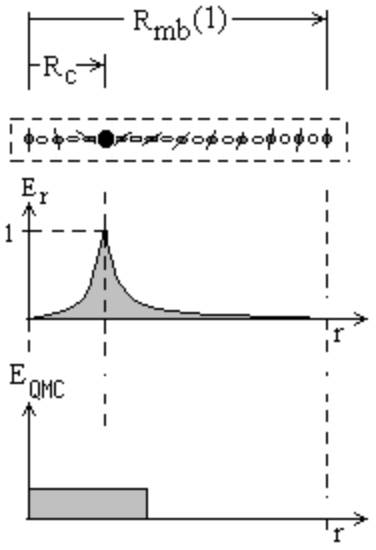

Fig. 3.6
E-field parameters at optimal confined velocity

The radial dependence of the E-filed intensity is shown as E_r and normalized to the maximum value at the radius equal to R_c. By reshaping the shaded area of E_r to rectangle, we obtain the equivalent electrical radius. This radius will be determined in §3.11.

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 is, the diametrical opposite EQ, getting SPM modulation of opposite direction.

So far, the radial section of the E-field in the optimal 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. We should not be surprised, that some of the internal E-field lines are connected. It was mentioned, that this is possible, because they are generated by one and a same internal rectangular lattice, and the space is enough close. **For the far field this condition is disturbed due to the accumulated phase differences in the EQ's.**

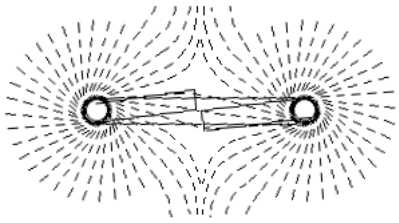

Fig. 3.7

The boundary condition for optimal confined motion is the same, i. e. the circumference length of the section is equal to $\lambda_{SPM\,MQ}$. The boundary section in a plane normal to the coil plane, however, is not circular, but slightly elliptical. It is evident, that the concentration of E-field is also not homogeneous, but with different configuration. As a result of this, the density of the terminating E-filed 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

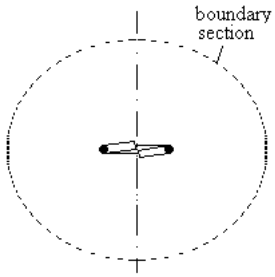

Fig. 3.8
Axial boundary section of the electron at optimal confined velocity. The terminated E-filed line density is shown as a point density

From the radial and axial E-filed line configuration we see, that at the optimal 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-filed lines is larger at the equator and lower at the poles. In such configuration, the E-field lines still posses 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

an integer number of $\lambda_{SPM\,MQ}$, and the shape of the boundary surface approaches a sphere.

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 optimal confined motion has a shape of slightly oblate spheroid, with maximum density of terminated E-field lines in the equatorial region**
- **At velocity lower than the optimal one, the boundary surface 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 optimal confined velocity** the following relation (3.6) is valid:

(rotational frequency of electron shell) = (electron-positron proper frequency) = (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 of the electron velocity. This is so, because the positron edge is moving in the proximity E-filed of the external negative shell. This E-field, influenced by the proximity IG(CP) filed, is "carried" by the electron negative E-filed and is not affected by the electron velocity. Due to the proximity of IG(CP) filed, it has a constant value for any sub optimal velocity. The central negative core, also, oscillates in the negative E-filed in the proximity of IG(CP) filed.

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

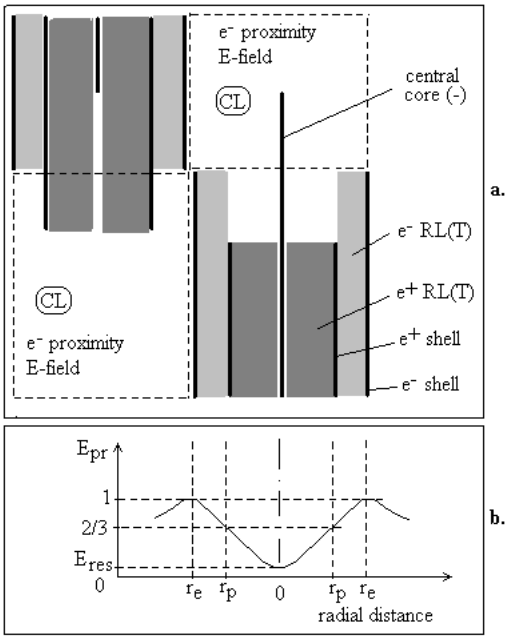

Fig. 3.9
Motion environments around the edges of the electron

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} inside of radius r_e, the positron E-filed will interact with the negative proximity filed, 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

our 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 this system exhibits two different proper frequencies depending of the external conditions and the strength of the invoked oscillations.

(1). case: for small amplitude oscillations: $3\nu_c$

(2) case: for large amplitude oscillations and free positron: $2.25\nu_c$

Let analyse now the first case. In result of the simultaneous oscillations of both systems, the moving electron obtains a 'hummer drill" effect, which facilitates the the displacement (and simultaneous folding and unfolding) of the 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 "hummer 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 "hummer 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) and the effect is significantly reduced. The "hummer 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 of 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 whole number of Compton wavelengths. Only in such condition one full rotation of the external electron shell in CL space, contains whole number of its subsystem oscillations. It is obvious, that such motion condition 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 same value equal to the Compton frequency.

Let to 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.

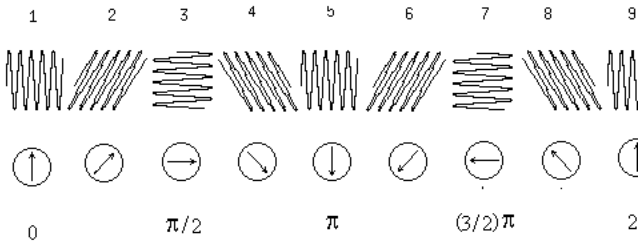

Fig. 3.10
NRM and SPM vector during one Compton period

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)

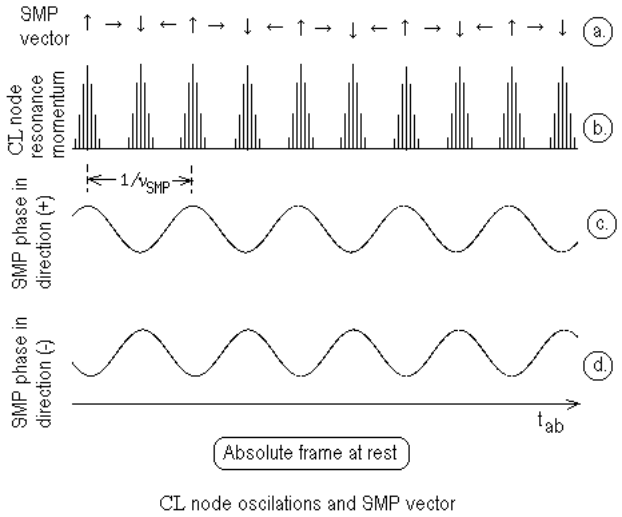

Fig. 3.11
Temporal quantum features of CL node vectors

Let the electron motion is invoked by external E-filed 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 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 accepting that the peripheral velocity 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 priory 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.

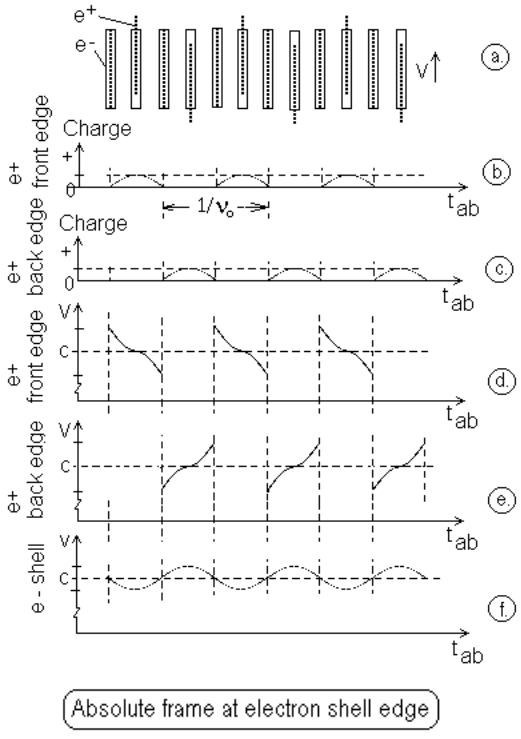

Fig. 3.12
Timing diagrams of electron system motion with simultaneous oscillations at first proper (Compton) frequency

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 **c.** and **d.** 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 the 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_o, 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, because the helical light velocity is k_{hb} times larger. 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 "hummer 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:

$\lambda_{SPMMQ} = 2\pi R_{mb}$; and $\lambda_c = 2\pi R_c$.

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 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 electron dimensions.

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 consider a confine motion of an electron with 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: $\sqrt{4\pi^2R^2 + (s_e)}$

axial velocity: υ - path: s

Then the axial velocity is:

$$\upsilon = \frac{cs_e}{\sqrt{4\pi^2R^2 + s_e^2}} \qquad (3.6)$$

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.

$$\upsilon = \frac{q_o}{2h\varepsilon_o}^2 = \alpha c \qquad (3.7)$$

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.

$$\alpha = \frac{\upsilon}{c} \qquad (3.8)$$

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.

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

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.

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

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:

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

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

R = 3.86159 E-13 (m)
s = 1.77061 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:

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

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:

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

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 decay. According to this ratio we have:

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

Then the dimensions of the electron are the following:

R = 3.86159 E-13 (m)
r_e = 8.8428 E-15 (m)
r_p = 5.8952 E-15 (m)
s = 1.77061 E-14 (m)
R/r_e = 43.669
R/r_p = 65.5

The shown above dimensions define also the positron.

The thickness of the helical shell 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 trapping 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 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 fine structure constant provides indirect estimation of the CL space parameters by the geometrical parameters of the electron**
- **The dimensions of the electron, are dependable of the CL space parameters.**

The second conclusion shows one very important feature of the electron. From one side, it may help to explain some effects in the General Relativity, and from the other - some cosmological effects, related with the observed galactic red shifts.

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 has direct expression by the fundamental physical constants. These expressions are given below.

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

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

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

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

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 filed, but will preserve its straight trajectory. In the interaction process, the external filed 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.

The interaction process between moving electron and external magnetic field is a 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 external magnetic field is presented by parallel lines with arrow pointing the filed direction. The interaction take place only in the circumference with radius R_{bm}. The magnetic field lines can include only magnetic quasispheres (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 quasispheres. According to the field integrity condition, they should be energetically connected to the adjacent EQ of the electron field. Due to the electron rotation in its screw like motion, the effective forces from both sides of the axis OO' are different.

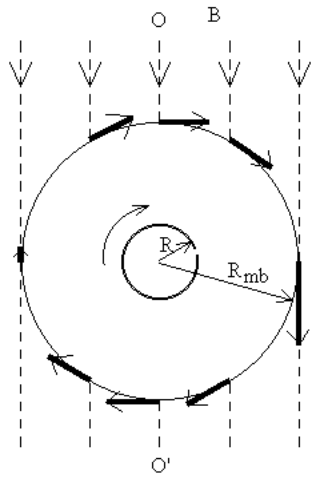

Fig. 3.13
Interaction forces between external magnetic field and the field of the moving electron

(In the drawing only two resultant forces 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 filed lines are denser and the cyclotron radius will be smaller. If the direction of the magnetic field is changed 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.

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

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-filed 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 filed is used in the synchrotron accelerators.

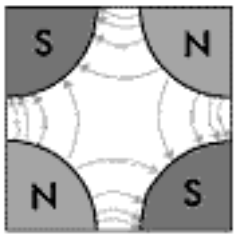

Fig. 3.14
Quadrupole magnetic field

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 at the optimal confined motion, 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 twice lower frequency. The electrical field parameters of the moving electron in both cases are shown in Fig. 3.15.

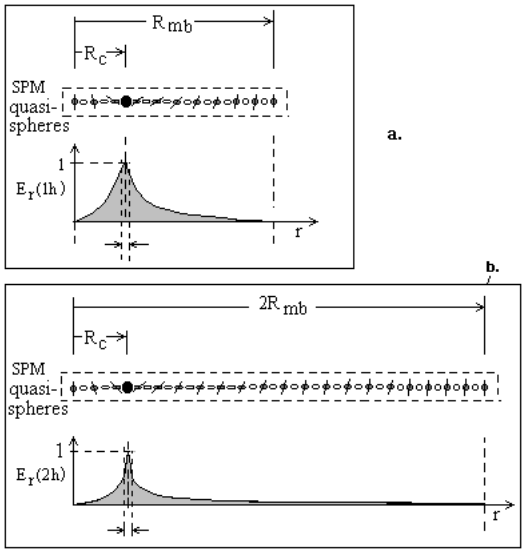

Fig. 3.15

Radial E-field and boundary conditions of the electron for motion with two consecutive boundary conditions

Similar type of motion is possible if the circumference length is equal to n times $\lambda_{SPM\ MQ}$. In these conditions, the rotational frequency of the electron is respectively $\nu_c/n.$. The **n** appears to be **a subharmonic number** in a similar way as in the quantum wave (photon).

Having in mind, that the electrical charge is one and a same, from Fig. 3.15 we see, that for the *n* subharmonic, the radial energy becomes distributed in n^2 larger area, than in the first harmonic. This is not valid only for the proximity field, as indicated in the drawing. Consequently, the energy density outside of the proximity field is inverse proportional to the subharmonic number. In the same time the constant energy in the proximity field keeps the normal self energy of the electron at constant value. The latter condition assures a stable proper resonance frequency of the electron oscillating systems.

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

Let 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 exactly at motion with subharmonics, 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 work.

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

$$\upsilon_t(n) = \frac{c}{n} = \frac{2\pi R_c}{t_c n} = \frac{2\pi R_c \nu_c}{n} \qquad (3.16)$$

where: *n* - is the subharmonic number

Knowing that the fine structure constant gives the relation between the tangential and axial velocity, we can work directly with the axial velocity, which in fact is the classical velocity of the moving electron.

$$\upsilon(n) = \frac{\alpha c}{n} \qquad (3.16.a)$$

Then the energy levels (in electron volts) for the quantum motion are given by Eq. (3.17)

$$E_{ev}(n) = \frac{1}{2} m_e [\upsilon(n)]^2 \frac{1}{q} = \frac{1}{2} \frac{m_e \alpha^2 c^2}{n^2} \frac{1}{q} = \frac{1}{2} \frac{h\nu_c \alpha^2}{n^2} \frac{1}{q} \qquad (3.17)$$

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.

$$\upsilon(n) = \frac{\alpha}{n} \sqrt{\frac{h\nu_c}{m_e}} \qquad (3.17.a)$$

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	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).

$$E_n = \frac{-2\pi\varepsilon_o q^2}{a_o}\left(\frac{1}{n^2}\right) \qquad (3.18)$$

where: a_o is the Bohr radius

The derived Eq. (3.17) gives exactly the same energy levels as the Eq. (3.18). While the Eq. (3.17) is based on the atomic model, suggested by Bohr, the proposed by BSM equation (3.18) 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 define 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 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 and the stronger nuclear IG field.

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:

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

For the Hydrogen atom it is little bit smaller.

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

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:

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

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)

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

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

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

$$\sigma = \frac{\nu_c\alpha^2}{2c} = 1.09737315\times10^7 \ [\text{m}^{-1}] \qquad (3.21.a)$$

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:

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

where:

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

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.

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

Equation (3.21.d) shows, that the Rydberg constant apart of the lattice parameters, depends only of 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 screw type of motion with a less resistance**
- **The rotational 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 frame.**

3.9.3 Quantum properties of the positron system

We saw 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. The confine motion of the positron has some similarities and some differences in comparison to electron.

The similarities are the following:

- same boundary conditions
- a similar screw type of motion

The differences are the following:

- The external motion environment of the oscillating core is different
- The proper frequency is different

In a first gland, the efficiency of the positron quantum motion could look much lower, in comparison to the electron, because the the system has only one internal RL(T), and the intrinsic matter of the central ore 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 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 Plank's constant may have different value, when estimated by the 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 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 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:

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

The inertial mass of the central core should contribute to ***m*** - parameter, while the repulsive forces between the negative core and external field to 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 - related to the trapping hole effect.

In a case of internal positron, the negative core exhibits a slight 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 slight external attraction due to the positive external field. The internal trapping force, however is not affected and predominates the external one. The IG(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 IG(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 eV - 3.4 eV)/2 = 5.1 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 week. 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.

$$\nu_{pc} = 2\nu_c \qquad (3.22.a)$$

where: ν_{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.

3.10 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 selfindunction). 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.

3.11 Magnetic moment and gyromagnetic factor of the moving electron

3.11.1. 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 velocity near 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 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:

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

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 to explain, why the magnetic moment is increased when α is larger. The dependence of α, from 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.

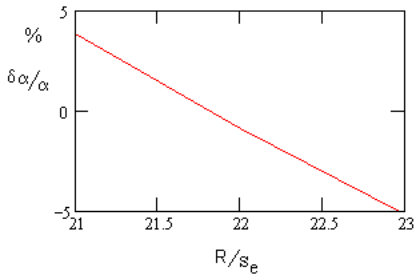

Fig. 3.16
R_c/s_e ratio as an estimation factor of the fine structure constant

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 IG forces are involved including the electrical field created by RL(T) lattice of the electron's external shell whose energy is included in the IG energy balance. The balance causes adjustment of some of the parameters of the helical structures. In this adjustment, the second order parameters as the radius R_c and the step s_e are stronger affected than the first order ones (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 RL twisting and the second order step s_e.

The magnetic moment is a measurable parameter.

3.11.2 Gyromagnetic factor

Firstly we must emphasize the differences between two different parameters related to the gyromagnetic properties of the electron: a gyromagnetic factor and a gyromagnetic ratio.

The gyromagnetic ratio is a ratio of the magnetic moment to the spin. It is given by the equation:

$$\gamma_e = 4\pi\mu_e/h = 1.760859 \times 10^{-11} \quad [s^{-1}T^{-1}] \qquad (3.23.a)$$

The parameter gyromagnetic factor, g_e, is related to the gyromagnetic ratio, but it is dimensionless. Its relation to the Bohr magnetic moments, μ_B, is given by the equation:

$$g_e = \frac{2|\mu_e|}{\mu_B} = 2|\mu_e|\frac{qh}{4\pi m_e} \qquad (3.23.b)$$

$$g_e = -2.0023193$$

where: $\mu_e = -928.476362 \times 10^{-26}$ [J/T] - the magnetic moment of the electron, h - is the Planck's constant and m_e - is the mass of the electron.

In the conventional physics, the gyromagnetic factor is theoretically evaluated and then experimentally measured with tremendous accuracy. This means that it is a real physical parameter of the electron. It is dimensionless parameter as the fine structure constant. According to the theoretical treatment, the ***g*** factor is expressed by a series containing only the fine structure constant as a physical parameter. So it is real QED parameter. From the point of view of BSM, it is not difficult to guess, that this parameters is defined from the ratio between the helical step an the small electron radius.

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

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

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.

One additional reason that the simple equation (3.23.c) is directly valid for the electron, comes from the fact that the Planck's constant is estimated by the electron parameters.

Summary:

- **The magnetic moment of the electron is a parameter expressing its spatial and velocity stabilizing properties. Its large magnetic moment (in comparison to the proton's one) is a result of its open helical structure, the**

equality between the core length and λ_{SPM} and the quantum interaction it exhibits with the CL nodes.

- **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 along 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.**