Quantum mechanics and the "Emission & Regeneration" Unified Field Theory.

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(This paper is an extract of [11] listed in section Bibliography.)

Abstract

The origin of the limitations of our standard theoretical model is the assumption that the energy of a particle is concentrated at a small volume in space. The limitations are bridged by introducing artificial objects and constructions like particles wave, gluons, strong force, weak force, gravitons, dark matter, dark energy, etc.

The proposed approach models subatomic particles such as electrons and positrons as focal points in space where continuously fundamental particles are emitted and absorbed, fundamental particles where the energy of the electron or positron is stored as rotations defining longitudinal and transversal angular momenta (fields). Interaction laws between angular momenta of fundamental particles are postulated in that way, that the basic laws of physics (Coulomb, Ampere, Lorentz, Maxwell, Gravitation, etc.) can be derived from the postulates. This methodology makes sure, that the approach is in accordance with the basic laws of physics, in other words, with well proven experimental data.

Due to the dynamical description of the particles the proposed approach has not the limitations of the standard model and is not forced to introduce artificial concepts or constructions.

All forces are the product of interactions between angular momenta of fundamental particles (electromagnetic interactions) described by QED. Interactions like QCD and Gauge/Gravity Duality are simply the product of the insufficiencies of the SM and not required.

Contents

1 Introduction.

The proposed approach models subatomic particles such as electrons and positrons as focal points in space where continuously fundamental particles (FPs) are emitted and absorbed, fundamental particles where the energy of the electron or positron is stored as rotations defining longitudinal and transversal angular momenta (fields).

To find the laws of interactions between the angular momenta of Fundamental Particles (FPs) a recursive procedure was followed until the well proven laws of physics (Coulomb, Ampere, Lorentz, Maxwell, Gravitation, bending of particles and interference of photons, Bragg, etc.), which describe the forces between particles, were obtained. This methodology makes sure, that the approach is in accordance with the basic laws of physics, in other words, with well proven experimental data.

Fig. 1 shows shematically the difference between the proposed approach and the mainstream theory.

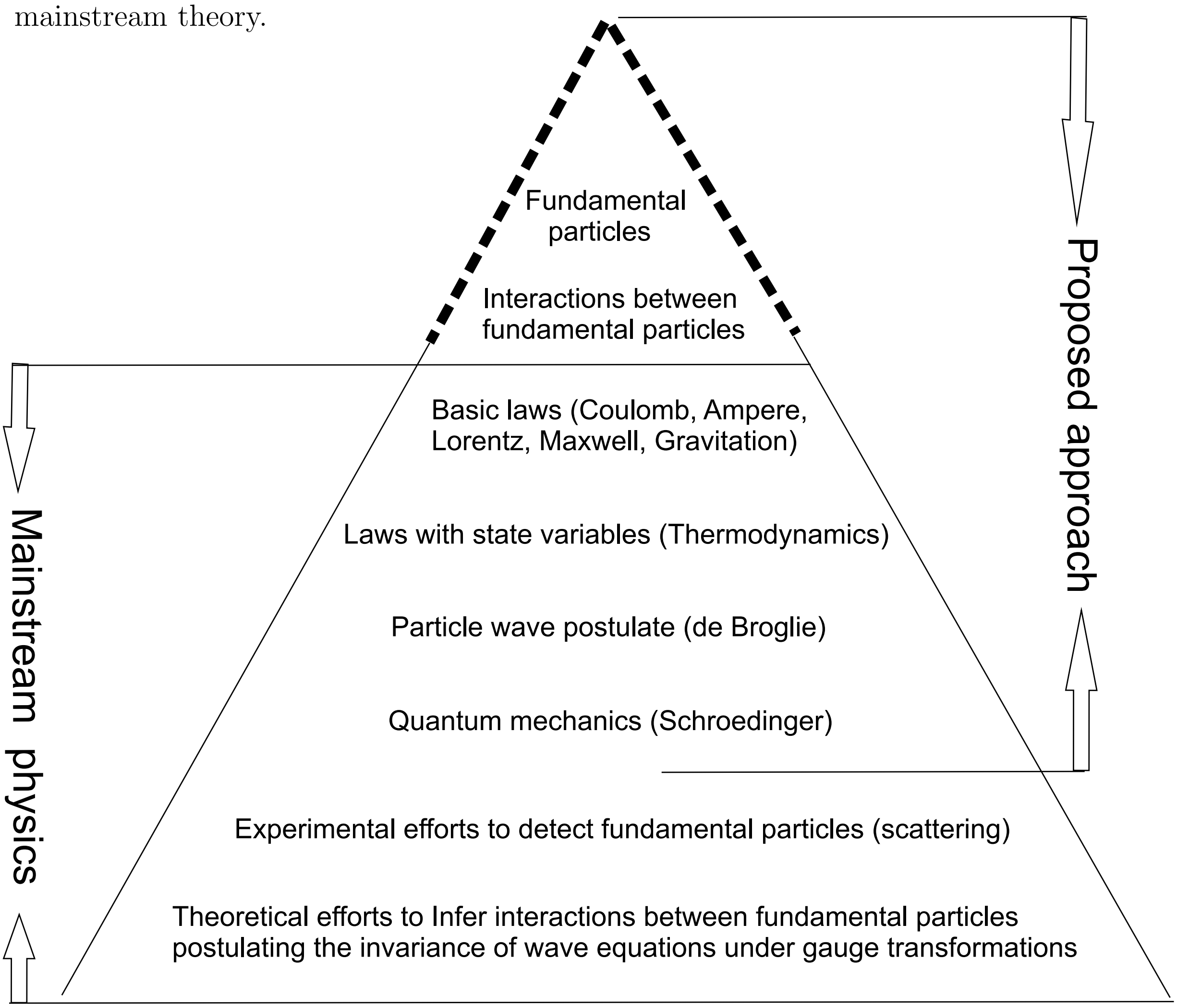


Figure 1: Methodology followed by the present approach

The approach is based on the following main conceptual steps:

The energy of an electron or positron is modeled as being distributed in the space around the particle‘s radius r_o and stored in fundamental particles (FPs) with longitudinal and transversal angular momenta. FPs are emitted continuously with the speed $v_e\ \bar{s}_e$ and regenerate the electron or positron continuously with the speed $v_r\ \bar{s}$. There are two types of FPs, one type that moves with light speed and the other type that moves with nearly infinite speed relative to the focal point of the electron or positron.

The concept is shown in Fig. 2.

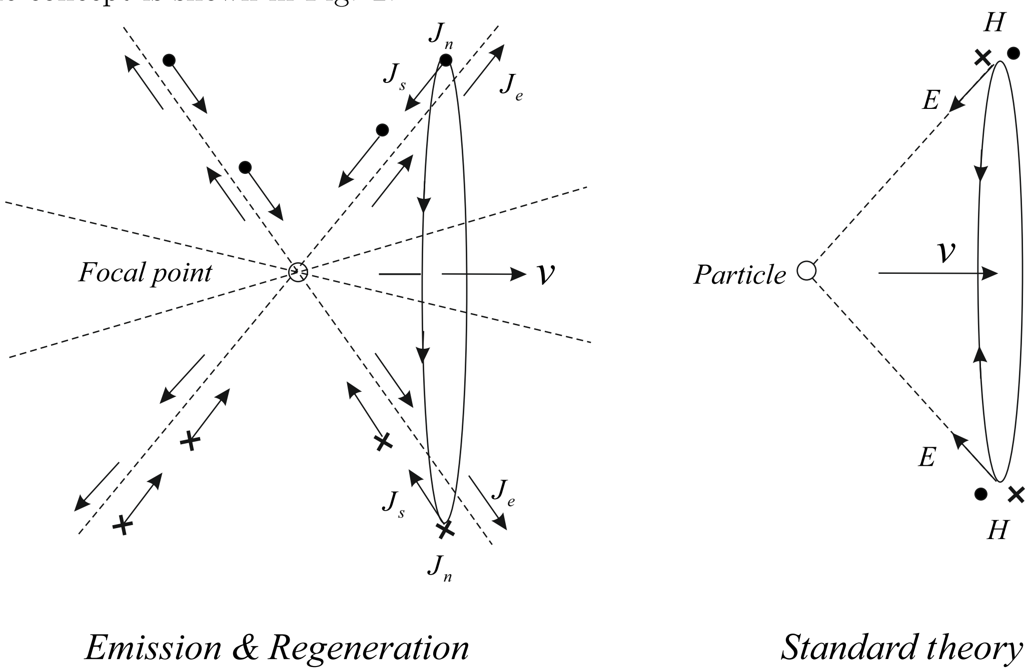


Figure 2: Particle as focal point in space

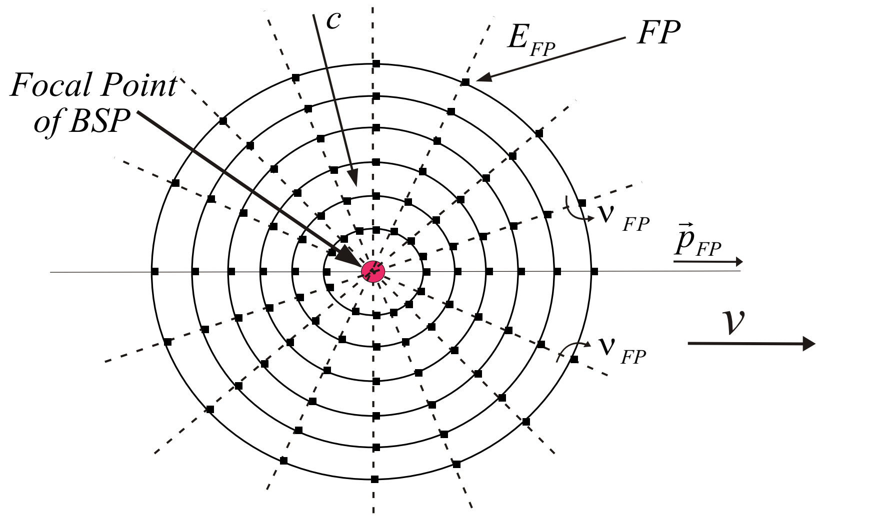
Electrons and positrons emit and are regenerated always by different types of FPs (see sec. 14) resulting the accelerating and decelerating electrons and positrons which have respectively regenerating FPs with light and infinite speed.

The density of FPs around the particle‘s radius r_o has a radial distribution and follows the inverse square distance law.

The concept is shown in Fig. 3

Field magnitudes $d\bar{H}$ are defined as square roots of the energy stored in the FPs. Interaction laws between the fields $d\bar{H}$ of electrons and positrons are defined to obtain pairs of opposed angular momenta $\bar{J}_n$ on their regenerating FPs, pairs that generate linear momenta $\bar{p}_{FP}$ responsible for the forces.

Based on the conceptual steps, equations for the vector fields $d\bar{H}$ are obtained that allow the deduction of all experimentally proven basic laws of physics, namely, Coulomb, Ampere, Lorentz, Gravitation, Maxwell, Bragg, Stern Gerlach and the flattening of galaxies’ rotation curve.



$$dE = dN_{FP}\,E_{FP} \qquad dN_{FP} = \omega_{FP}\,dV = \frac{1}{2\pi}\frac{E}{E_{FP}}\,d\kappa$$

Figure 3: Regenerating Fundamental Particles of a BSP

Note: In this approach
Basic Subatomic Particles (**BSPs**) are:

- for $v < c$ the electron and the positron
- for $v = c$ the neutrino

Complex Subatomic Particles (**CSPs**) are:

- for $v < c$ the proton, the neutron and nuclei of atoms.
- for $v = c$ the photon.

BSPs and CSPs with speeds $v < c$ emit and are regenerated by FPs that are provided by the emissions of other BSPs and CSPs with speeds $v < c$.

BSPs and CSPs with $v = c$ don't emit and are not regenerated by FPs and move therefore independent from other particles.

2 Space distribution of the energy of basic subatomic particles.

The total energy of a basic subatomic particle (BSP) with constant $v \neq c$ is

$$E = \sqrt{E_o^2 + E_p^2} \qquad E_o = m\,c^2 \qquad E_p = p\,c \qquad p = \frac{m\,v}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{1}$$

The total energy $E = E_e$ is split in

$$E_e = E_s + E_n \qquad with \qquad E_s = \frac{E_o^2}{\sqrt{E_o^2 \,+\, E_p^2}} \qquad and \qquad E_n = \frac{E_p^2}{\sqrt{E_o^2 \,+\, E_p^2}} \tag{2}$$

and differential emitted dE_e and regenerating dE_s and dE_n energies are defined

$$dE_e = E_e\, d\kappa = \nu\ J_e \qquad dE_s = E_s\, d\kappa = \nu\ J_s \qquad dE_n = E_n\, d\kappa = \nu\ J_n \tag{3}$$

with the distribution equation

$$d\kappa = \frac{1}{2}\,\frac{r_o}{r^2}\, dr\ \sin\varphi\, d\varphi\, \frac{d\gamma}{2\pi} \tag{4}$$

The distribution equation $d\kappa$ gives the part of the total energy of a BSP moving with $v \neq c$ contained in the differential volume $dV = dr\ r d\varphi\ r \sin\varphi\ d\gamma$.

The concept is shown in Fig. 4.

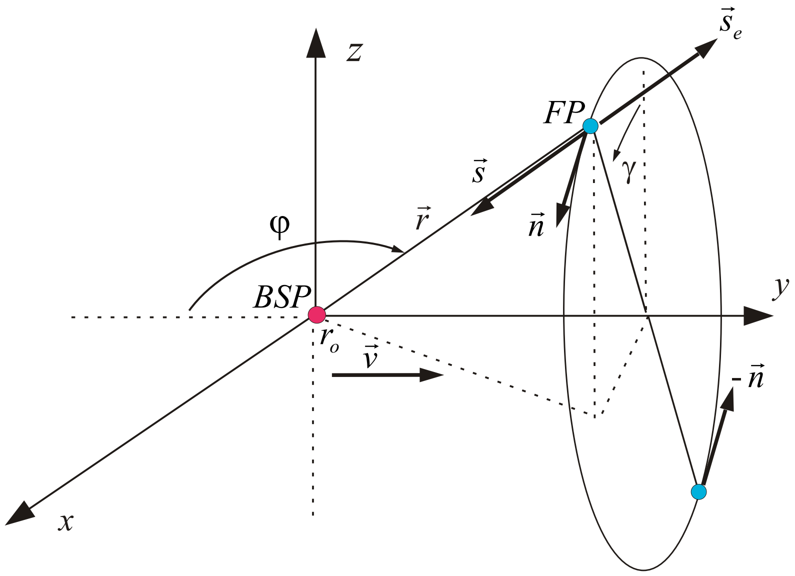


Figure 4: Unit vector $\bar{s}_e$ for an emitted FP and unit vectors $\bar{s}$ and $\bar{n}$ for a regenerating FP of a BSP moving with $v \neq c$

The differential energies are stored as rotations in the FPs which define the longitudinal angular momenta $\bar{J}_e = J_e\ \bar{s}_e$ of emitted FPs and the longitudinal $\bar{J}_s = J_s\ \bar{s}$ and transversal $\bar{J}_n = J_n\ \bar{n}$ angular momenta of regenerating FPs (see also Fig. 2).

The rotation sense in moving direction of emitted longitudinal angular momenta $\bar{J}_e$ defines the sign of the charge of a BSP. Rotation senses of $\bar{J}_e$ and $\bar{J}_s$ are always opposed. The direction of the transversal angular momentum $\bar{J}_n$ is the direction of a right screw that advances in the direction of the velocity v and is independent of the sign of the charge of the BSP.

Conclusion: The elementary charge is replaced by the energy (or mass) of a resting electron ($E_e = 0.511\ MeV$). The charge of a complex SP (e.g. proton) is given by the difference between the **constituent** numbers of BSPs with positive $\bar{J}_e^{(+)}$ and negative $\bar{J}_e^{(-)}$ that integrate the complex SP, multiplied by the energy of a resting electron. As examples we have for the proton with $n^+ = 919$ and $n^- = 918$ and a binding energy of $E_{B_{prot}} = -0.43371\ MeV$ a charge of $(n^+ - n^-) * 0.511 = 0.511\ MeV$, and for the neutron with $n^+ = 919$ and $n^- = 919$ and a binding energy of $E_{B_{neutr}} = 0.34936\ MeV$ a charge of $(n^+ - n^-) * 0.511 = 0.0\ MeV$.

The unit of the charge thus is the Joule (or kg). The conversion from the electric current I_c (Ampere) to the mass current I_m is given by

$$I_m = \frac{m}{q}\ I_c = 5,685631378 \cdot 10^{-12}\ I_c\ \left[\frac{kg}{s}\right] \tag{5}$$

with m the electron mass in kilogram and q the elementary charge in Coulomb.

Note: The Lorentz invariance of the charge from today's theory has its equivalent in the invariance of the difference between the **constituent** numbers of BSPs with positive $\bar{J}_e^{(+)}$ and negative $\bar{J}_e^{(-)}$ that integrate the complex SP, multiplied by the energy of a resting electron. In the present paper the denomination **charge** will be used according the previous definition.

3 Definition of the field magnitudes dH_s and dH_n.

The field dH at a point in space is defined as that part of the square root of the energy of a BSP that is given by the distribution equation $d\kappa$. The differential values dE and dH refere to the differential volume $dV = dr\ r\ d\varphi\ r\ \sin\varphi\ d\gamma$ (see also eq. (2)). For the emitted field we have

$$d\bar{H}_e = H_e\ d\kappa\ \bar{s}_e \qquad with \qquad H_e^2 = E_e \tag{6}$$

The longitudinal component of the regenerating field at a point in space is defined as

$$d\bar{H}_s = H_s\ d\kappa\ \bar{s} \qquad with \qquad H_s^2 = E_s = \frac{E_o^2}{\sqrt{E_o^2\ +\ E_p^2}} \tag{7}$$

The transversal component of the regenerating field at a point in space is defined as

$$d\bar{H}_n = H_n \, d\kappa \, \bar{n} \qquad with \qquad H_n^2 = E_n = \frac{E_p^2}{\sqrt{E_o^2 \, + \, E_p^2}} \tag{8}$$

For the total field magnitude H_e it is

$$H_e^2 = H_s^2 \, + \, H_n^2 \qquad\qquad with \qquad\qquad H_e^2 = E_e \tag{9}$$

The vector $\bar{s}_e$ is an unit vector in the moving direction of the emitted FP (Fig. 4). The vector $\bar{s}$ is an unit vector in the moving direction of the regenerating FP. The vector $\bar{n}$ is an unit vector transversal to the moving direction of the regenerating FP and oriented according the right screw rule relative to the velocity $\bar{v}$ of the BSP.

Conclusion: BSPs are structured particles with emitted and regenerating FPs with longitudinal and transversal angular momenta. The rotation sense of the angular momenta of the emitted FPs defines the sign of the charge of the BSP. The longitudinal angular momenta of the regenerating FPs define the rest energy and the transversal angular momenta of the regenerating FPs define the kinetic energy of the BSP.

4 Linear momentum generated out of opposed angular momenta.

Fig. 5 shows how the linear momentum dp is calculated out of the opposed angular momenta $\bar{J}_n$ and $-\bar{J}_n$ for a single moving subatomic particle (SP). For the single particle it is $dp = 0$ what means that $p = mv$ is constant in time.

Two SPs interact trough the cross or scalar products of the angular momenta of their FPs. For SP "1" and SP "2" we can write in a general form:

$$J \, \bar{e} = \sqrt{J_1} \, \bar{e}_1 \, \times \, \sqrt{J_2} \, \bar{e}_2 \tag{10}$$

with $\bar{e}$ the unit vector. With $dE_i = \nu \; J_i = E_i \; d\kappa_i$ and $E_i = E_i(v)$ and $d\kappa = d\kappa(r_o, r, \varphi, \gamma)$ we get

$$dE \, \bar{e} = \sqrt{E_1} \, d\kappa_1 \, \bar{e}_1 \, \times \, \sqrt{E_2} \, d\kappa_2 \, \bar{e}_2 \tag{11}$$

and with $dH_i = \sqrt{E_i} \, d\kappa_i$ we get

$$dE \, \bar{e} = dH_1 \, \bar{e}_1 \, \times \, dH_2 \, \bar{e}_2 = d\bar{H} \times d\bar{H}_2 \tag{12}$$

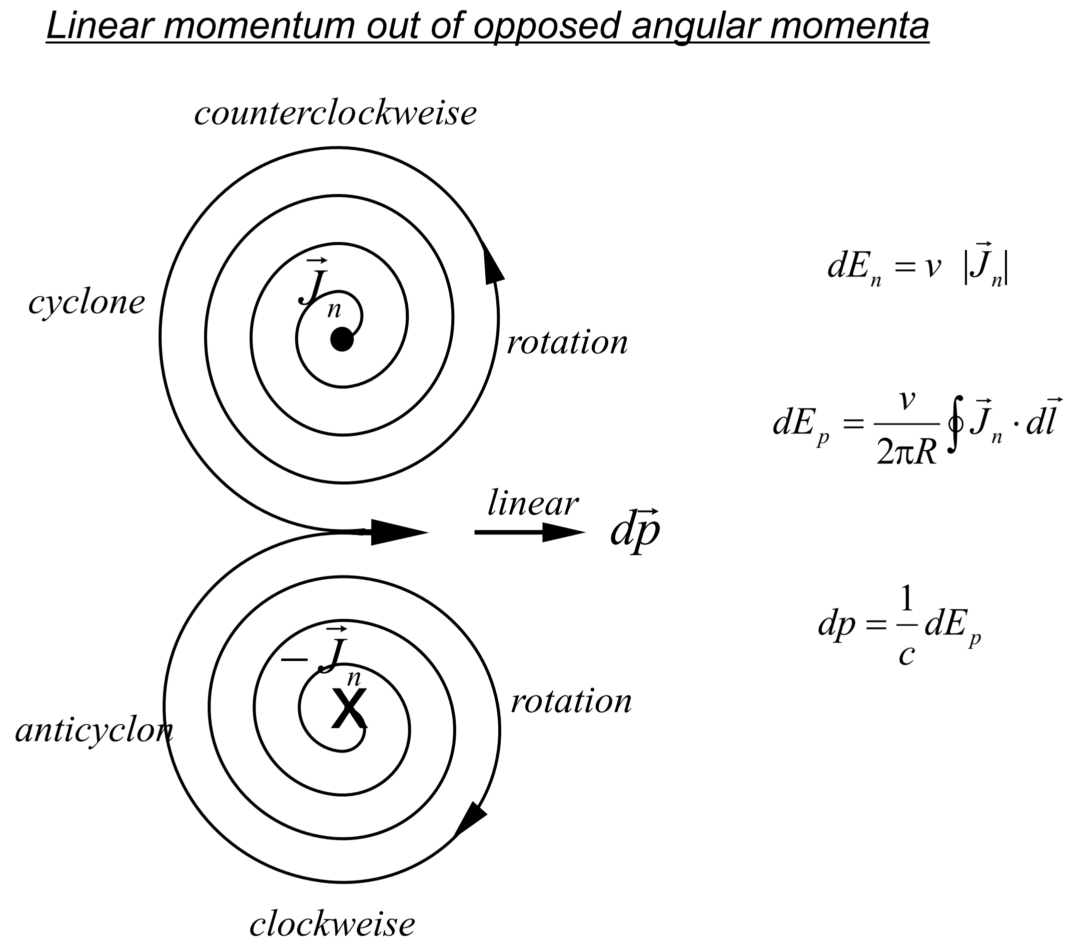


Figure 5: Generation of linear momentum out of opposed angular momenta

We define that

$$dE_p^{'} \, \bar{e} = \sqrt{E_1} \int_{r_o}^{\infty} d\kappa_1 \, \bar{e}_1 \; \times \; \sqrt{E_2} \int_{r_o}^{\infty} d\kappa_2 \, \bar{e}_2 = \int_{r_o}^{\infty} \bar{d}H_1 \; \times \; \int_{r_o}^{\infty} \bar{d}H_2 \tag{13}$$

and that

$$dE_p = \frac{1}{2\pi R} \oint dE_p^{'} \, \bar{e} \cdot d\bar{l} \qquad dp = \frac{1}{c} dE_p \qquad dF = \frac{dp}{dt} \tag{14}$$

Note: For the Coulomb interaction $\bar{e}_i = \bar{s}_i$. For the Ampere interaction $\bar{e}_i = \bar{n}_i$ and for the inductive interaction $\bar{e}_1 = \bar{n}_1$ and $\bar{e}_2 = \bar{s}_2$ and the cross product has to be changed to the scalar product.

5 Interaction laws for field components and generation of linear momentum.

The interaction laws for the field components $d\bar{H}_s$ and $d\bar{H}_n$ are derived from the following interaction postulates for the longitudinal $\bar{J}_s$ and transversal $\bar{J}_n$ angular momenta.

1) If two fundamental particles from two static BSPs cross, their longitudinal rotational momenta J_s generate the following transversal rotational momentum

$$\bar{J}_{n_1}^{(s)} = -\ \mathrm{sign}(\bar{J}_{s_1})\ \mathrm{sign}(\bar{J}_{s_2})\ (\sqrt{J_{s_1}}\ \bar{s}_1\ \times\ \sqrt{J_{s_2}}\ \bar{s}_2) \tag{15}$$

If both sides of eq. (15) are multiplied with $\sqrt{\nu_{s_1}\ d\kappa_1}$ and $\sqrt{\nu_{s_2}\ d\kappa_2}$, with ν_s the rotational frequency, results the differential energy

$$dE_{n_1}^{(s)} = \left|\ \sqrt{\nu_{s_1}\ J_{s_1}\ d\kappa_1}\ \bar{s}_1 \times \sqrt{\nu_{s_2}\ J_{s_2}\ d\kappa_2}\ \bar{s}_2\ \right| \tag{16}$$

or

$$dE_{n_1}^{(s)} = |\ dH_{s_1}\ \bar{s}_1 \times dH_{s_2}\ \bar{s}_2\ | \qquad with \qquad dH_{s_i}\ \bar{s}_i = \sqrt{\nu_{s_i}\ J_{s_i}\ d\kappa_i}\ \bar{s}_i \tag{17}$$

If at the same time two other fundamental particles from the same two static BSPs generate a transversal rotational momentum $-\bar{J}_{n_1}^{(s)}$, so that the components of the pair are equal and opposed, the generated linear momentum on the two BSPs is

$$dp = \frac{1}{c}\ dE_p^{(s)} \qquad with \qquad dE_p^{(s)} = \left| \int_{r_{r_1}}^{\infty} dH_{s_1}\ \bar{s}_1 \times \int_{r_{r_2}}^{\infty} dH_{s_2}\ \bar{s}_2 \right| \tag{18}$$

2) If two fundamental particles from two moving BSPs cross, their transversal rotational momenta J_n generate the following rotational momentum.

$$\bar{J}_1^{(n)} = -\ \mathrm{sign}(\bar{J}_{s_1})\ \mathrm{sign}(\bar{J}_{s_2})\ (\sqrt{J_{n_1}}\ \bar{n}_1\ \times\ \sqrt{J_{n_2}}\ \bar{n}_2) \tag{19}$$

If both sides of the equation are multiplied with $\sqrt{\nu_{n_1}\ d\kappa_1}$ and $\sqrt{\nu_{n_2}\ d\kappa_2}$, with ν_n the rotational frequency, and the absolute value is taken, it is

$$dE_1^{(n)} = |\ dH_{n_1}\ \bar{n}_1 \times dH_{n_2}\ \bar{n}_2\ | \qquad with \qquad dH_{n_i}\ \bar{n}_i = \sqrt{\nu_{n_i}\ J_{n_i}\ d\kappa_i}\ \bar{n}_i \tag{20}$$

If at the same time two other fundamental particles from the same two moving BSPs cross, and their transversal rotational momenta generate a rotational momentum $-\bar{J}_1^{\prime(n)}$, so that the components of the pair are equal and opposed, the generated linear momentum on the two BSPs is

$$dp = \frac{1}{c}\, dE_p^{(n)} \qquad with \qquad dE_p^{(n)} = \left| \int_{r_{r_1}}^{\infty} dH_{n_1}\, \bar{n}_1 \times \int_{r_{r_2}}^{\infty} dH_{n_2}\, \bar{n}_2 \right| \tag{21}$$

3) If a FP 1 with an angular momentum $\bar{J}_1$ crosses with a FP 2 with a longitudinal angular momentum $\bar{J}_{s_2}$, the orthogonal component of $\bar{J}_1$ to $\bar{J}_{s_2}$ is transferred to the FP 2, if at the same instant between two other FPs 3 and 4 an orthogonal component is transferred which is opposed to the first one. (see Fig. 10)

6 Fundamental equations for the calculation of linear momenta between subatomic particles.

The Fundamental equations for the calculation of linear momenta according to the interaction postulates are:

a) The equation for the calculation of linear momentum between two static BSPs according postulate **1**) is

$$dp_{stat}\; \bar{s}_R = \frac{1}{c} \oint_R \left\{ \frac{\bar{dl} \cdot (\bar{s}_{e_1} \times \bar{s}_{s_2})}{2\pi R} \int_{r_1}^{\infty} H_{e_1}\, d\kappa_{r_1} \int_{r_2}^{\infty} H_{s_2}\, d\kappa_{r_2} \right\} \bar{s}_R \tag{22}$$

where $H_{e_1}\ d\kappa_{r_1} \bar{s}_{e_1}$ is the longitudinal field of the emitted FPs of particle 1 and $H_{s_2}\ d\kappa_{r_2} \bar{s}_{s_2}$ is the longitudinal field of the regenerating FPs of particle 2. The unit vector $\bar{s}_R$ is orthogonal to the plane that contains the closed path with radius R.

The linear momentum generated between two static BSPs is the origin of all movements of particles. The law of Coulomb is deduced from eq. (22) and because of its importance is analyzed in sec. 8.

b) The equation for the calculation of linear momentum between two moving BSPs according to postulate **2**) is

$$dp_{dyn}\; \bar{s}_R = \frac{1}{c} \oint_R \left\{ \frac{\bar{dl} \cdot (\bar{n}_1 \times \bar{n}_2)}{2\pi R} \int_{r_1}^{\infty} H_{n_1}\, d\kappa_{r_1} \int_{r_2}^{\infty} H_{n_2}\, d\kappa_{r_2} \right\} \bar{s}_R \tag{23}$$

where $H_{n_1}\ d\kappa_{r_1} \bar{n}_1$ is the transversal field of the regenerating FPs of particle 1 and $H_{n_2}\ d\kappa_{r_2} \bar{n}_2$ is the transversal field of the regenerating FPs of particle 2.

The laws of Lorentz, Ampere and Bragg are deduced from equation (23).

c) The equations for the calculation of the induced linear momentum between a moving and a static probe BSP_p according to postulate **3**) are

$$dp_{ind}^{(s)}\ \bar{s}_R = \frac{1}{c} \oint_R \left\{ \frac{\bar{dl} \cdot \bar{s}}{2\pi R} \int_{r_r}^{\infty} H_s\ d\kappa_{r_r} \int_{r_p}^{\infty} H_{s_p}\ d\kappa_{r_p} \right\}\ \bar{s}_R \tag{24}$$

$$dp_{ind}^{(n)}\ \bar{s}_R = \frac{1}{c} \oint_R \left\{ \frac{\bar{dl} \cdot \bar{n}}{2\pi R} \int_{r_r}^{\infty} H_n\ d\kappa_{r_r} \int_{r_p}^{\infty} H_{s_p}\ d\kappa_{r_p} \right\}\ \bar{s}_R \tag{25}$$

The upper indexes (s) or (n) denote that the linear momentum $d'p_{ind}$ on the static probe BSP_p (subindex s_p) is induced by the longitudinal (s) or transversal (n) field component of the moving BSP.

The Maxwell, gravitation and bending laws are deduced from equations (24) and (25).

The total linear momentum for all equations is given by

$$\bar{p} = \int_{\sigma} dp\ \bar{s}_R \tag{26}$$

where $\int_\sigma$ symbolizes the integration over the whole space.

Conclusion: All forces can be expressed as rotors from the vector field $d\bar{H}$ generated by the longitudinal and transversal angular momenta of the two types of fundamental particles defined in chapter 1.

$$d\bar{F} = \frac{dp}{dt} = \frac{1}{8\ \pi} \sqrt{m}\ r_o\ rot\ \frac{d}{dt} \int_{r_r}^{\infty} d\bar{H} \tag{27}$$

7 Force quantification and the radius of a BSPs.

The relation between the force and the linear momentum for all the fundamental equations of chapter 6 is given by

$$\bar{F} = \frac{\Delta p}{\Delta t}\ \bar{s}_R \qquad with \qquad \Delta p = p - 0 = p \tag{28}$$

The force is quantized in force quanta

$$F = \Delta p\ \nu \qquad with \qquad \nu = \frac{1}{\Delta t} \tag{29}$$

and Δp the quantum of action.

The time Δt between the two BSPs is defined as

$$\Delta t = K\ r_{o_1}\ r_{o_2} \qquad where \qquad K = 5.4271 \cdot 10^4\ \left[\frac{s}{m^2}\right] \tag{30}$$

is a constant and r_{o_1} and r_{o_2} are the radii of the BSPs.

The constant K results when eqs. (22) and (23) are equalized respectively with the Coulomb and the Ampere equations

$$F_{stat} = \frac{1}{4\pi\epsilon_o} \frac{Q_1 \, Q_2}{d^{\,2}} \qquad\qquad F_{dyn} = \frac{\mu_o}{2\pi} \frac{I_1 \, I_2}{d} \tag{31}$$

The radius r_o of a particle is given by

$$r_o = \frac{\hbar \, c}{E} \qquad with \qquad E = \sqrt{E_o^2 + E_p^2} \qquad for \;\; BSPs \;\; with \;\; v \neq c \tag{32}$$

and

$$E = \hbar\omega \qquad for \;\; BSPs \;\; with \;\; v = c \tag{33}$$

and is derived from the quantified far field of the irradiated energy of an oscillating BSP [11].

8 Analysis of linear momentum between two static BSPs.

In this section the static eq.(22) is analyzed in order to explain

- why BSPs of equal sign don't repel in atomic nuclei
- how gravitation forces are generated
- why atomic nuclei radiate

Although the analysis is based only on the static eq.(22) for two BSPs, neglecting the influence of the important dynamic eq.(23) that explains for instance the magnetic moment of nuclei, it shows already the origin of the above listed phenomena.

With the integration limits shown in Fig. 6 and considering that for static BSPs it is $r_{o_1} = r_{o_2} = r_o$ and $m_1 = m_2 = m$, the integration limits are

$$\varphi_{min} = \arcsin \frac{r_o}{d} \qquad \varphi_{max} = \pi - \varphi_{min} \quad for \quad d \geq \sqrt{r_o^2 + r_o^2} \tag{34}$$

$$\varphi_{min} = \arccos \frac{d}{2 \, r_o} \qquad \varphi_{max} = \pi - \varphi_{min} \quad for \quad d < \sqrt{r_o^2 + r_o^2} \tag{35}$$

and eq.(22) transforms to

$$p_{stat} = \frac{m \; c \; r_o^2}{4 \, d^{\,2}} \int_{\varphi_{1_{min}}}^{\varphi_{1_{max}}} \int_{\varphi_{2_{min}}}^{\varphi_{2_{max}}} |\sin^3(\varphi_1 - \varphi_2)| \; d\varphi_2 \; d\varphi_1 \tag{36}$$

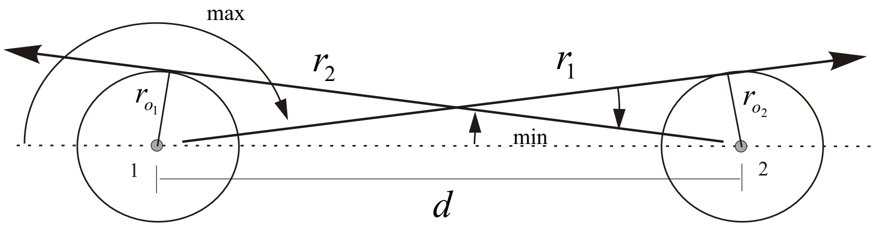


Figure 6: Integration limits for the calculation of the linear momentum between two static basic subatomic particles at the distance d

The double integral becomes zero for $d \to 0$ because the integration limits approximate each other taking the values $\varphi_{min} = \frac{\pi}{2}$ and $\varphi_{max} = \frac{\pi}{2}$. For $d \gg r_o$ the double integral becomes a constant because the integration limits tend to $\varphi_{min} = 0$ and $\varphi_{max} = \pi$.

Fig.7 shows the curve of eq.(22) where five regions can be identified with the help of $d/r_o = \gamma$ from the integration limits:

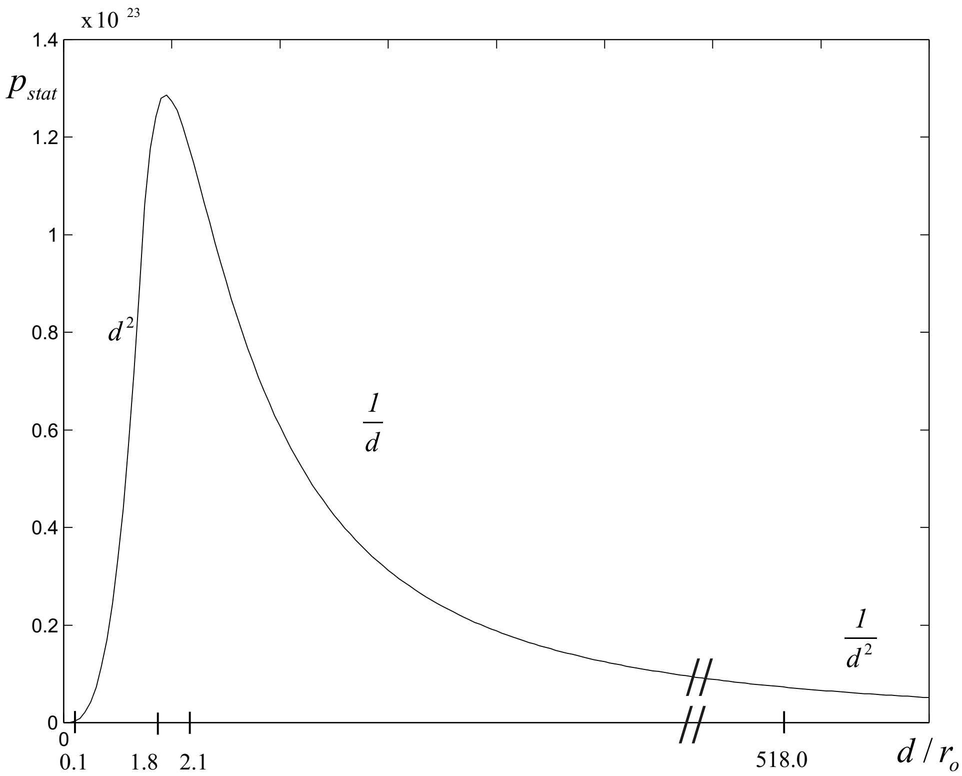


Figure 7: Linear momentum p_{stat} as function of $\gamma = d/r_o$ between two static BSPs with maximum at $\gamma = 2$

1. From $0 \ll \gamma \ll 0.1$ where $p_{stat} = 0$

2. From $0.1 \ll \gamma \ll 1.8$ where $p_{stat} \propto d^{\,2}$

3. From $1.8 \ll \gamma \ll 2.1$ where $p_{stat} \approx constant$

4. From $2.1 \ll \gamma \ll 518$ where $p_{stat} \propto \frac{1}{d}$

5. From $518 \ll \gamma \ll \infty$ where $p_{stat} \propto \frac{1}{d^{\,2}}$ (Coulomb)

See also Fig. 9.

The **first and second regions** are where the BSPs that form the atomic nucleus are confined and in a dynamic equilibrium. BSPs of different sign of charge don't mix in the nucleus because of the different signs their longitudinal angular momentum of the emitted FPs have.

For BSPs that are in the first region, the attracting or repelling forces are zero because the angle β between their longitudinal rotational momentum is $\beta = \pi + \varphi_1 - \varphi_2 = \pi$. BSPs that migrate outside the first region are reintegrated or expelled with high speed when their FPs cross with FPs of the remaining BSPs of the atomic nucleus because the angle $\beta < \pi$.

Fig.8 shows two neutrons where at neutron 1 the migrated BSP "b" is reintegrated, inducing at neutron 2 the gravitational linear momentum according postulate 3) of sec 5.

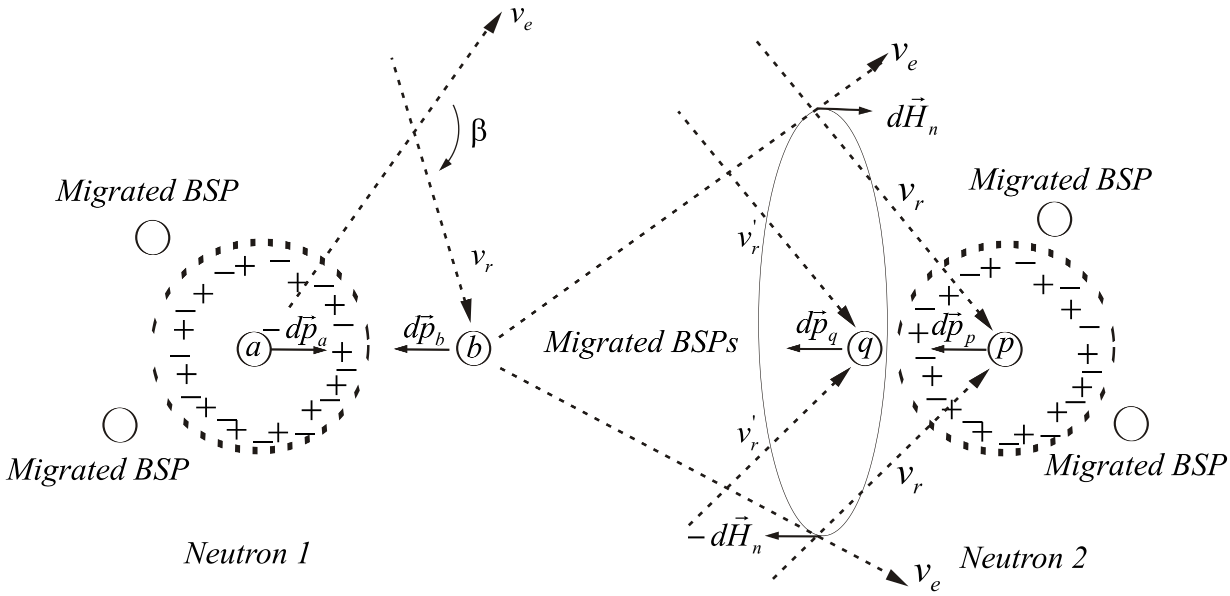


Figure 8: Transmission of momentum dp from neutron 1 to neutron 2

At stable nuclei all BSPs that migrate outside the first region are reintegrated, while at unstable nuclei some are expelled in all possible combinations (electrons, positrons, hadrons) together with neutrinos and photons maintaining the energy balance.

As the force described by eq. (25) induced on other particles during reintegration has always the direction and sense of the reintegrating particle (right screw of $\bar{J}_n$) independent of its charge, BSPs that are reintegrated induce on other atomic nuclei the gravitation force. The inverse square distance law for the gravitation force results from the inverse square distance law of the radial density of FPs that transfer their angular momentum from the moving to the static BSPs according postulate **3)** of sec. 5. Gravitation force is thus a function of the number of BSPs that migrate and are reintegrated in the time Δt (migration current), and the reintegration velocity.

The **third region** gives the width of the tunnel barrier through which the expelled particles of atomic nuclei are emitted. As the reintegration process of BSPs that migrate outside the first region depend on the special dynamic polarization of the remaining BSPs of the atomic nucleus, particles are not always reintegrated but expelled when the special dynamic polarization is not fulfilled. The emission is quantized and follows the exponential radioactive decay law.

The **fourth region** is a transition region to the Coulomb law.

The transition value $\gamma_{trans} = 518$ to the Coulomb law was determined by comparing the tangents of the Coulomb equation and the curve from Fig.7. At $\gamma_{trans} = 518$ the ratio of their tangents begin to deviate from 1.

At the transition distance d_{trans}, where $\gamma_{trans} = 518$, the inverse proportionality to the distance d_{trans} from the neighbor regions must give the same force F_{trans}

$$F_{trans} = \frac{1}{\Delta t}\,\frac{K^{'}}{d_{trans}} = \frac{1}{\Delta t}\,\frac{K_F^{'}}{d_{trans}^2} \tag{37}$$

with $K^{'}$ and $K_F^{'}$ the proportionality factors of the fourth and fifth regions.

The transition distance for BSPs (electron and positron) is:

$$d_{trans} = \gamma_{trans}\, r_o = \gamma_{trans}\,\frac{\hbar\, c}{E_o} = 518 \;\cdot\; 3.859 \cdot 10^{-13} = 2.0 \cdot 10^{-10}\; m \tag{38}$$

which is of the order of the radii of neutral isolated atoms.

The **fifth region** is where the Coulomb law is valid.

The concept is shown in Fig. 9

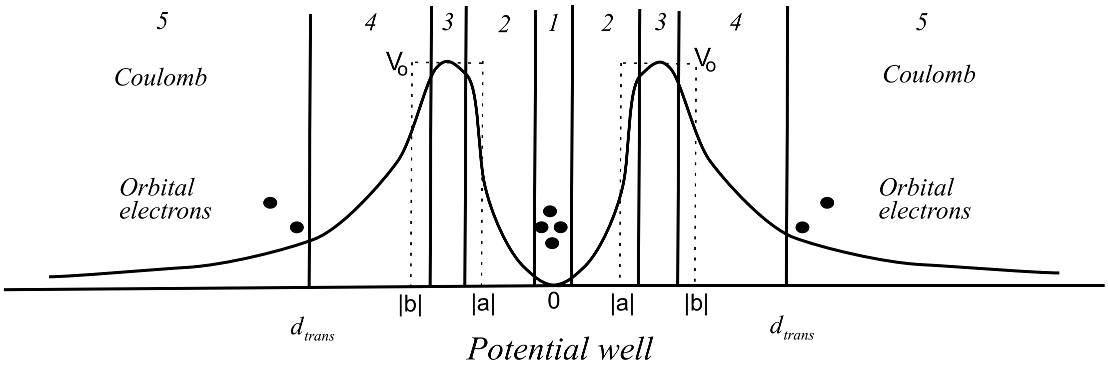


Figure 9: Potential well between BSPs

9 Induction between a moving and a probe BSP.

In the present approach the energy of a BSP is distributed in space around the radius (focal point) of the BSP. The carriers of the energy are the FPs with their angular momenta, FPs that are continuously emitted and regenerate the BSP. At a free moving BSP each angular momentum of a FP is balanced by an other angular momentum of a FP of the same BSP.

The concept is shown in Fig. 10.

Opposed transversal angular momenta $d\bar{H}_n$ and $-d\bar{H}_n$ from two FPs that regenerate the BSP produce the linear momentum $\bar{p}$ of the BSP. If a second static probe BSP_p appropriates with its regenerating angular momenta ($d\bar{H}_{s_p}$) angular momenta ($d\bar{H}_n$) from FPs of the first BSP according postulate 3) of sec. 5, angular momenta that built a rotor different from zero in the direction of the second BSP_p generating $d\bar{p}_{i_p}$, the first BSP loses energy and its linear momentum changes to $\bar{p} - d\bar{p}_{i_p}$. The angular momenta appropriated at point P by the probe BSP_p generating the linear momentum $d\bar{p}_{i_p}$ are missing now at the first BSP to compensate the angular momenta at the symmetric point $P^{\,'}$. The linear momenta at the two symmetric points are therefore equal and opposed $d^{\,'}\bar{p}_i = -d\bar{p}_{i_p}$ because of the symmetry of the energy distribution function $d\kappa(\pi - \theta) = d\kappa(\theta)$.

As the closed linear integral $\oint d\bar{H}_n \, d\bar{l}$ generates the linear momentum $\bar{p}$ of a BSP, the orientation of the field $d\bar{H}_n$ (right screw in the direction of the velocity) must be independent of the sign of the BSP, sign that is defined by $\bar{J}_e^{(\pm)}$.

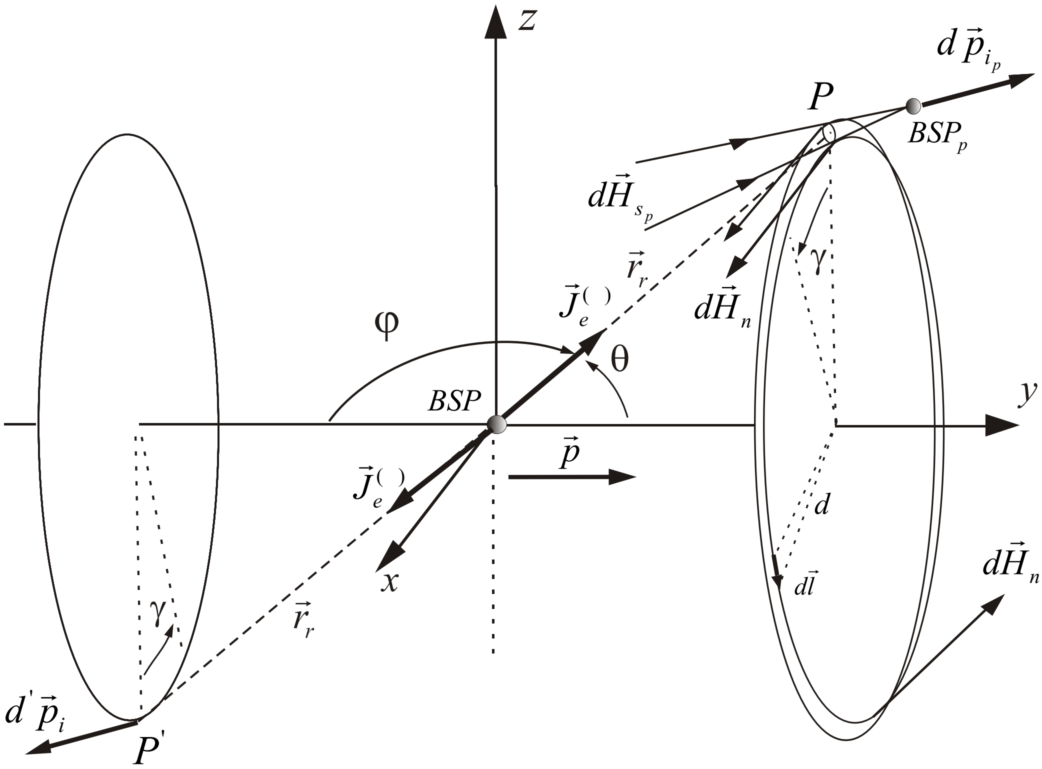


Figure 10: Linear momentum balance between static and moving BSPs

10 Newton gravitation force.

To calculate the gravitation force induced by the reintegration of migrated BSPs, we need to know the number of migrated BSPs in the time Δt for a neutral body with mass M.

The following equation was derived in [11] for the **induced gravitation** force generated by one reintegrated electron or positron

$$F_i = \frac{dp}{\Delta t} = \frac{k\, c\, \sqrt{m}\, \sqrt{m_p}}{4\, K\, d^2} \int\int_{Induction} \qquad with \qquad \int\int_{Induction} = 2.4662 \tag{39}$$

with m the mass of the reintegrating BSP, m_p the mass of the resting BSP, $k = 7.4315 \cdot 10^{-2}$. It is also

$$\Delta t = K\, r_o^2 \qquad r_o = 3.8590 \cdot 10^{-13}\ m \qquad and \qquad K = 5.4274 \cdot 10^4\ s/m^2 \tag{40}$$

The direction of the force F_i on BSP p of neutron 2 in Fig. 8 is independent of the sign of the BSPs and is always oriented in de direction of the reintegrating BSP b of neutron 1.

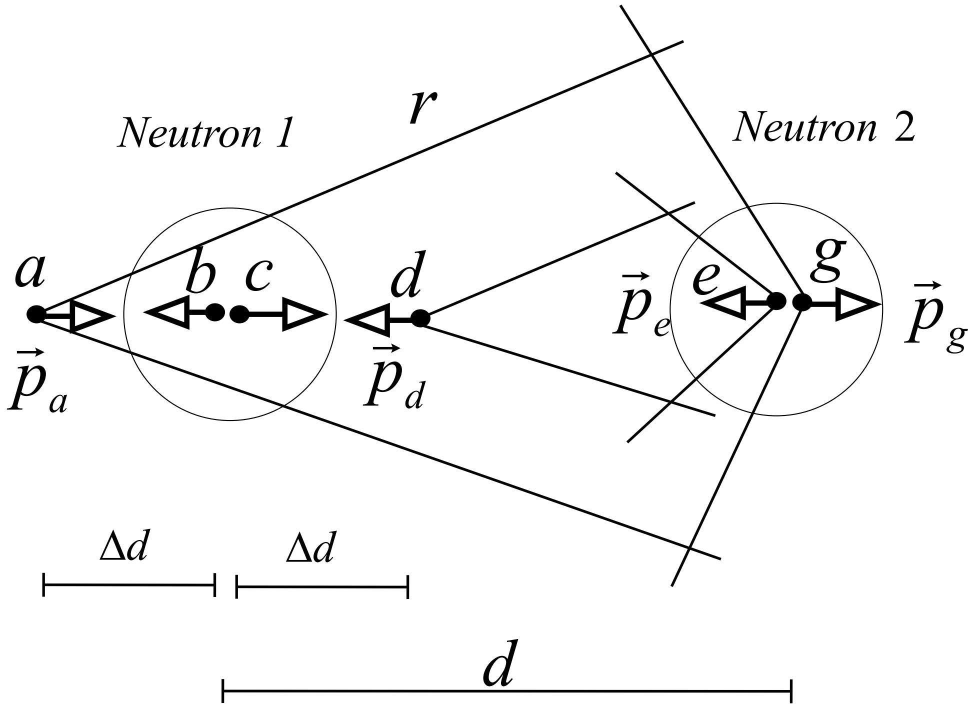


Figure 11: Net momentum transmitted from neutron 1 to neutron 2

Fig. 11 shows reintegrating BSPs a and d at Neutron 1 that transmit respectively opposed momenta p_g and p_e to neutron 2. Because of the grater distance from neutron 2 of BSP a compared with BSP d, the probability for BSP d to transmit his momentum is grater than the probability for BSP a. Momenta are quantized and have all equal absolute value independent if transmitted or not. The result computed over a mass M gives a net number of transmitted momentum to neutron 2 in the direction of neutron 1, what explains the attraction between neutral masses.

For two bodies with masses M_1 and M_2 and where the number of reintegrated BSPs in the time Δt is respectively Δ_{G_1} and Δ_{G_2} it must be

$$F_i \; \Delta_{G_1} \; \Delta_{G_2} = G \, \frac{M_1 \; M_2}{d^{\,2}} \qquad with \qquad G = 6.6726 \cdot 10^{-11} \; \frac{m^3}{kg \; s^2} \tag{41}$$

As the direction of the force F_i is the same for reintegrating electrons Δ_G^- and positrons Δ_G^+ it is

$$\Delta_G = |\Delta_G^-| + |\Delta_G^+| \tag{42}$$

We get that

$$\Delta_{G_1} \; \Delta_{G_2} = G \, \frac{4 \; K \; M_1 \; M_2}{m \; k \; c \; \int\int_{Induction}} \tag{43}$$

or

$$\Delta_{G_1}\,\Delta_{G_2} = 2.8922\cdot 10^{17}\; M_1\; M_2 = \gamma_G^2\; M_1\; M_2 \tag{44}$$

The number of migrated BSPs in the time Δt for a neutral body with mass M is thus

$$\Delta_G = \gamma_G\; M \qquad with \qquad \gamma_G = 5.3779\cdot 10^{8}\;\; kg^{-1} \tag{45}$$

Calculation example: The number of migrated BSPs that are reintegrated at the sun and the earth in the time Δt are respectively, with $M_\odot = 1.9891\cdot 10^{30}\; kg$ and $M_\dagger = 5.9736\cdot 10^{24}\; kg$

$$\Delta_{G_\odot} = 1.0697\cdot 10^{39} \qquad and \qquad \Delta_\dagger = 3.2125\cdot 10^{33} \tag{46}$$

The power exchanged between two masses due to gravitation is

$$P_G = F_i\; c = \frac{E_p}{\Delta t} = \frac{k\; m\; c^2}{4\; K\; d^{\,2}}\; \Delta_{G_1}\; \Delta_{G_2}\; \int\int_{Induktion} \tag{47}$$

The power exchanged between the sun and the earth is, with $d_{\odot\dagger} = 1.49476\cdot 10^{11}\; m$

$$P_G = F_G\; c = \; G\; \frac{M_\odot\; M_\dagger}{d_{\odot\dagger}^2}\; c = 1.0646\cdot 10^{31}\;\; J/s \tag{48}$$

11 Ampere gravitation force.

In the previous sections we have seen that the induced gravitation force is due to the reintegration of migrated BSPs in the direction d of the two gravitating bodies (longitudinal reintegration). When a BSP is reintegrated to a neutron, the two BSPs of different signs that interact, produce an equivalent current in the direction of the positive BSP as shown in Fig. 12.

As the numbers of positive and negative BSPs that migrate in one direction at one neutron are equal, no average current should exists in that direction in the time Δt. It is

$$\Delta_R = \Delta_R^+ + \Delta_R^- = 0 \tag{49}$$

We now assume that because of the power exchange (47) between the two neutrons, a synchronization between the reintegration of BSPs of equal sign in the direction orthogonal to the axis defined by the two neutrons is generated, resulting in parallel currents of equal sign that generate an attracting force between the neutrons. The

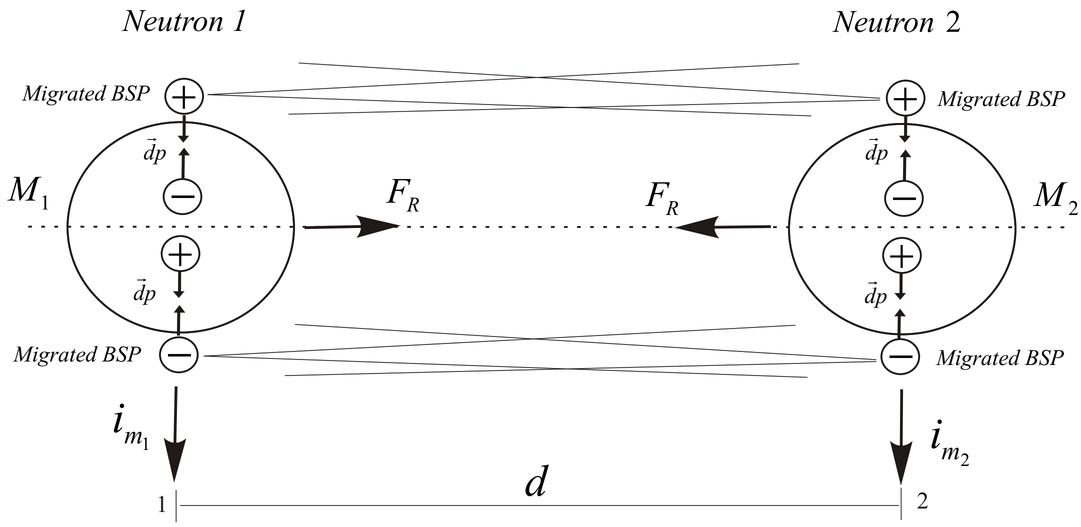


Figure 12: Resulting current due to reintegration of migrated BSPs

synchronization is generated by the relative movements between the gravitating bodies and is zero between static bodies. Thus the total attracting force between the two neutrons is produced first by the induced (Newton) force and second by the currents of reintegrating BSPs (Ampere).

$$F_T = F_G + F_R \qquad with \qquad F_G = G\,\frac{M_1\;M_2}{d^2} \qquad and \qquad F_R = R\,\frac{M_1\;M_2}{d} \tag{50}$$

To derive an equation we start with the following equation from [11] derived for the total force density due to Ampere interaction.

$$\frac{F}{\Delta l} = \frac{b}{c\;\Delta_o t}\;\frac{r_o^2}{64\;m}\;\frac{I_{m_1}\;I_{m_2}}{d}\int_{\gamma_{2_{min}}}^{\gamma_{2max}}\int_{\gamma_{1_{min}}}^{\gamma_{1max}}\frac{\sin^2(\gamma_1-\gamma_2)}{\sqrt{\sin\gamma_1\;\sin\gamma_2}}\;d\gamma_1\;d\gamma_2 \tag{51}$$

with $\int\int_{Ampere} = 5.8731$.
It is also for $v \ll c$

$$\rho_x = \frac{N_x}{\Delta x} = \frac{1}{2\;r_o} \qquad I_m = \rho\;m\;v \qquad \Delta_o t = K\;r_o^2 \qquad I_m = \frac{m}{q}\;I_q \tag{52}$$

We have defined a density ρ_x of BSPs for the current so that one BSP follows immediately the next without space between them. As we want the force between one pair of BSPs of the two parallel currents we take $\Delta l = 2\;r_o$.

For one reintegrating BSP it is $\rho = 1$. The current generated by one reintegrating

BSP is

$$I_{m_1} = i_m = \rho\, m\, v_m = \rho\, m\, k\, c \qquad with \qquad v_m = k\, c \qquad k = 7.4315 \cdot 10^{-2} \tag{53}$$

We get for the force between one transversal reintegrating BSP at the body with mass M_1 and one longitudinal reintegrating BSP at M_2 moving parallel with the speed v_2

$$dF_R = \ 5.8731\, \frac{b}{\Delta_o t}\, \frac{2\, r_o^3}{64}\, \rho^2\, m\, k\, \frac{v_2}{d} = 2.2086 \cdot 10^{-50}\, \frac{v_2}{d}\ \ N \tag{54}$$

with $I_{m_2} = i_2 = \rho\, m\, v_2$.

The concept is shown in Fig. 13.

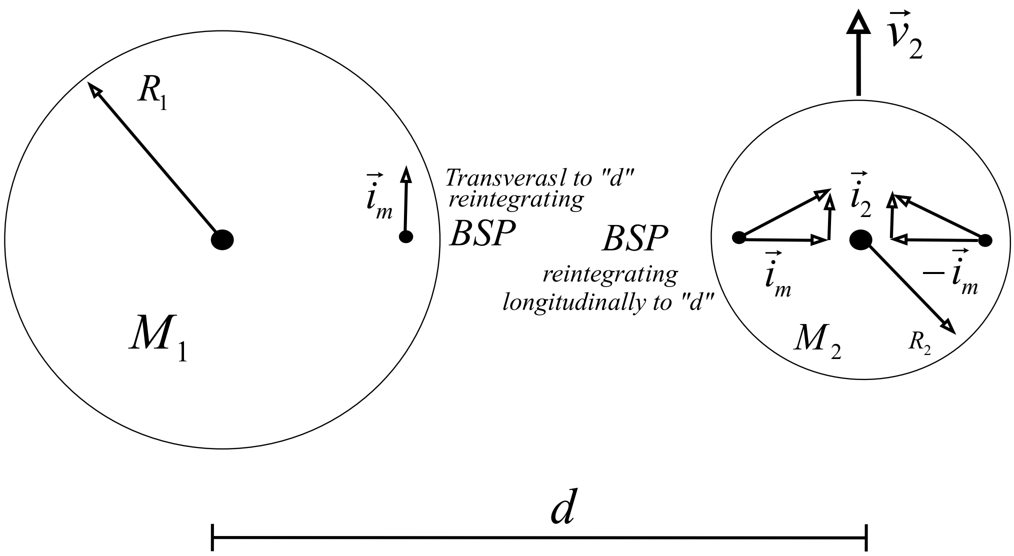


Figure 13: Ampere gravitation

Note: The sign that takes the current i_m of the reintegrating BSP at the body with mass M_1 which interacts with the current i_2, is a function of the direction of the magnetic poles of M_1. The Ampere gravitation force F_R is therefore an attraction or a repulsion force depending on the relative directions of the magnetic poles of M_1 and the speed v_2.

In sec. 10 we have derived the mass density γ_G of reintegrating BSPs. At Fig. 11 we have seen that half of the longotudinal reintegrating BSPs of a neutron 1 induce momenta on neutron 2 in one direction while the other half of longitudinal reintegrating BSPs induce momenta in the opposed direction on neutron 2. In Fig. 13 we see, that all longitudinal reintegrating BSPs at M_2 generate a current component i_2 in the direction of the speed v_2. This means that we have to take for the density γ_A of reintegrating BSPs for the Ampere gravitation force approximately twice the value of the density γ_G of the Newton gravitation force

$$\gamma_A \approx 2\,\gamma_G = 2 \cdot 5.3779 \cdot 10^8 = 1.07558 \cdot 10^9 \;\; kg^{-1} \tag{55}$$

resulting for the total Ampere gravitation force between M_1 and M_2

$$F_R = \; 5.8731 \, \frac{b}{\Delta_o t} \, \frac{2\, r_o^3}{64} \, \rho^2 \, m \, k \, v_2 \, \gamma_A^2 \, \frac{M_1 \, M_2}{d} = 2.5551 \cdot 10^{-32} \, v_2 \, \frac{M_1 \, M_2}{d} \;\; N \tag{56}$$

where

$$F_R = R \, \frac{M_1 \, M_2}{d} \qquad with \qquad R = 2.5551 \cdot 10^{-32} \; v_2 = R(v_2) \tag{57}$$

The total gravitation force gives

$$F_T = F_G + F_R = \left[\frac{G}{d^2} + \frac{R}{d} \right] \; M_1 \, M_2 \tag{58}$$

The concept is shown in Fig. 14.

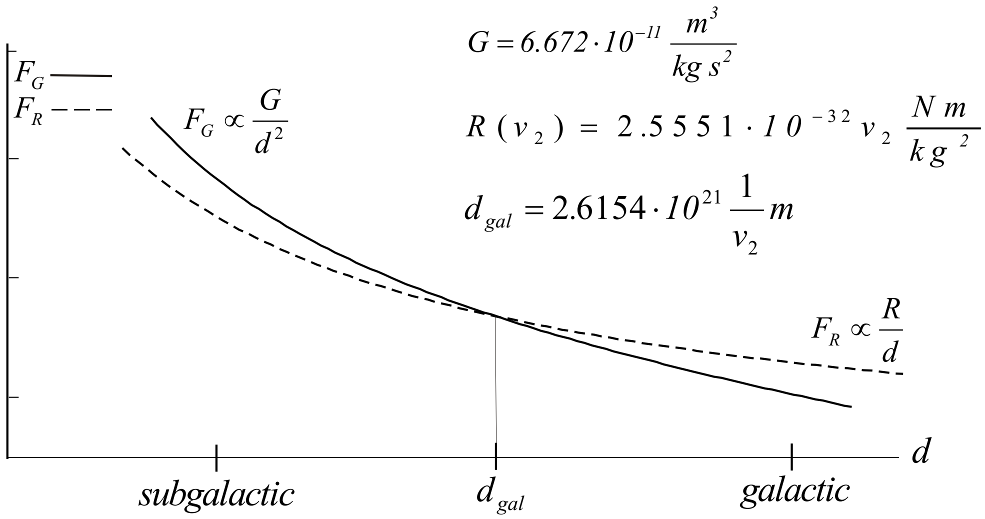


Figure 14: Gravitation forces at sub-galactic and galactic distances.

Calculation example

To verify that the Newton component predominates over the Ampere component for the case of the earth and the sun, we calculate now d_{gal} for this case and compare it with the distance $d_{\odot,+} = 1.5 \cdot 10^{11}$ m between the earth and sun. It is for the sun

$M_\odot = 2 \cdot 10^{30}$ kg, and for the earth $M_+ = 5.97 \cdot 10^{24}$ kg, and $v_2 = 29.78 \cdot 10^3$ m/s.

$$d_{gal} = \frac{G}{R(v_2)} = 8.733 \cdot 10^{16} \;\; m >> d_{\odot,+} \tag{59}$$

The Ampere component of the force is $F_A = 6.056 \cdot 10^{16}$ N and the Newton component is $F_G = 3.54 \cdot 10^{22}$ N. It is $F_G >> F_A$ what explains why we only can measure the Newton component of the gravitation force.

11.1 Flattening of galaxies' rotation curve.

For galactic distances the Ampere gravitation force F_R predominates over the induced gravitation force F_G and we can write eq. (58) as

$$F_T \approx F_R = \frac{R}{d} \, M_1 \, M_2 \tag{60}$$

The equation for the centrifugal force of a body with mass M_2 is

$$F_c = M_2 \, \frac{v_{orb}^2}{d} \qquad\qquad \textit{with } v_{orb} \textit{ the tangential speed} \tag{61}$$

For steady state mode the centrifugal force F_c must equal the gravitation force F_T. For our case it is

$$F_c = M_2 \, \frac{v_{orb}^2}{d} = F_T \approx F_R = \frac{R}{d} \, M_1 \, M_2 \tag{62}$$

We get for the tangential speed

$$v_{orb} \approx \sqrt{R \, M_1} \qquad \textit{constant} \tag{63}$$

The tangential speed v_{orb} is independent of the distance d what explains the flattening of galaxies' rotation curves.

Calculation example

In the following calculation example we assume that the transition distance d_{gal} is much smaller than the distance between the gravitating bodies and that the Newton force can be neglected compared with the Ampere force.

For the Sun with $v_2 = v_{orb} = 220 \; km/s$ and $M_2 = M_\odot = 2 \cdot 10^{30} \; kg$ and a distance to the core of the Milky Way of $d = 25 \cdot 10^{19} \; m$ we get a centrifugal force of

$$F_c = M_2 \, \frac{v_{orb}^2}{d} = 3.872 \cdot 10^{20} \;\; N \tag{64}$$

With

$$R(v_2) = 2.5551 \cdot 10^{-32} \; v_2 = 5.6212 \cdot 10^{-27} \;\; Nm/kg^2 \tag{65}$$

and

$$F_c \approx R \; \frac{M_1 \; M_2}{d} \tag{66}$$

we get a Mass for the Milky Way of

$$M_1 = F_c \; d \; \frac{1}{R \; M\odot} = 4.3 \cdot 10^6 \; M\odot \tag{67}$$

and with

$$F_G = F_R \qquad we \; get \qquad d_{gal} = \frac{G}{R(v_2)} = 1.1870 \cdot 10^{16} \;\; m \tag{68}$$

justifying our assumption for $F_T \approx F_R$ because the distance between the Sun and the core of the Milky Way is $d \gg d_{gal}$.

Note: The mass of the Milky Way calculated with the Newton gravitation law gives $M_1 \approx 1.5 \cdot 10^{12} \; M\odot$ which is huge more than the bright matter and therefore called dark matter. The mass calculated with the present approach corresponds to the bright matter and there is no need to introduce virtual masses in space.

For sub-galactic distances the induced force F_G is predominant, while for galactic distances the Ampere force F_R predominates, as shown in Fig. 14.

$$d_{gal} = \frac{G}{R(v_2)} \tag{69}$$

Note: The flattening of galaxies' rotation curve was derived based on the assumption that the gravitation force is composed of an induced component and a component due to parallel currents generated by reintegrating BSPs and, that for galactic distances the induced component can be neglected.

12 Quantification of irradiated energy and movement.

12.1 Quantification of irradiated energy.

To express the energy irradiated by a BSP as quantified in angular momenta over time we start with

$$E = E_e = E_s + E_n = \sqrt{E_o^2 + E_p^2} \qquad \Delta t = K r_o r_{o_p} \qquad r_o = \frac{\hbar\, c}{E_e} \qquad r_{o_p} = \frac{\hbar\, c}{E_o} \tag{70}$$

with r_o the radius of the moving particle and r_{o_p} the radius of the resting probe particle. It is

$$\Delta t = K r_o r_{o_p} \frac{r_{o_p}}{r_{o_p}} = K r_{o_p}^2 \frac{r_o}{r_{o_p}} = \Delta_o t \frac{r_o}{r_{o_p}} \tag{71}$$

with

$$\Delta_o t = \Delta t_{(v=0)} = K \frac{\hbar^2\, c^2}{E_o^2} = 8.082097 \cdot 10^{-21} \;\; s \quad with \quad K = 5.4274 \cdot 10^4 \; s/m^2 \tag{72}$$

We now define $E_e\, \Delta t$ and get

$$E_e\, \Delta t = K \frac{\hbar^2\, c^2}{E_o} = K \frac{h^2}{4\, \pi^2\, m} = h \tag{73}$$

equation that is valid for every speed $0 \le v \le c$ of the BSP giving

$$E_e\, \Delta t = E_o\, \Delta_o t = h \tag{74}$$

where h is the Planck constant.

Note: In the equation $E_e\, \Delta t = h$ the energy E_e is the total energy of the moving particle and the differential time Δt is the time the differential momentum Δp is active to give the force $F = \Delta p / \Delta t$ between the moving and the probe particle.

In connection with the quantification of the energy $E = J\, \nu$ the following cases are possible:

- A common frequency ν_g exists and the angular momentum J is variable.
- A common angular momentum J_g exists and the frequency ν is variable.

The concept is shown in Fig. 15.

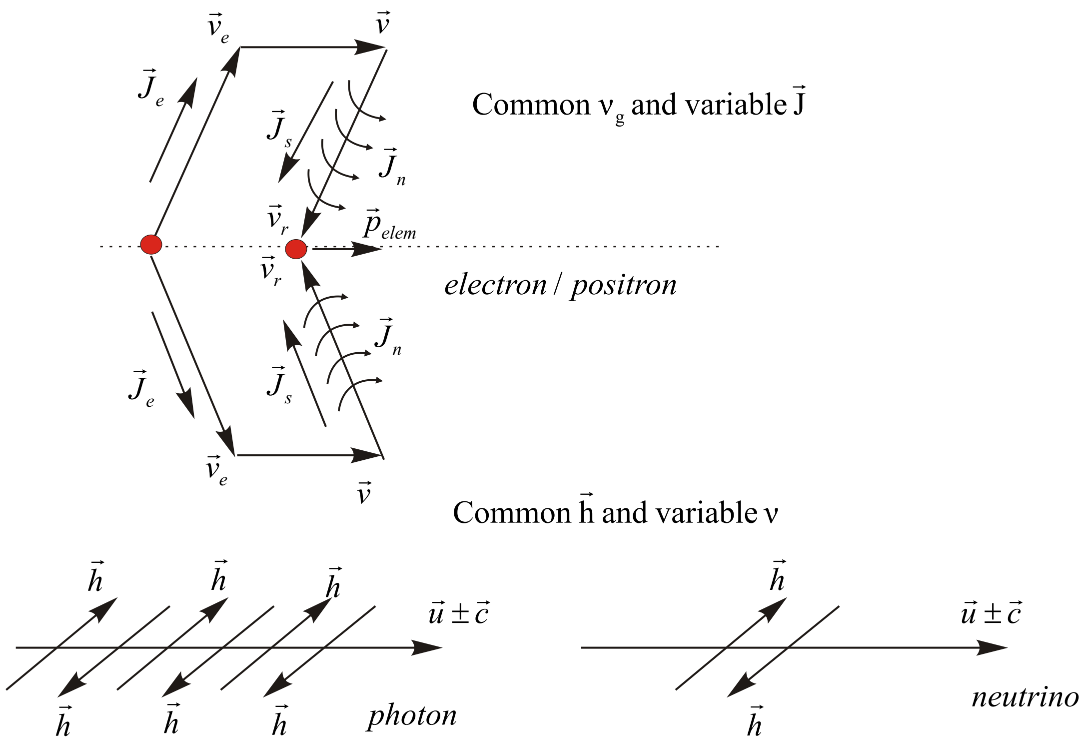


Figure 15: Quantification of linear momentum

We define for a common angular momentum $J_g = h$ the equivalent angular frequencies ν, ν_o and ν_p with the following equations

$$E = E_e = h\,\nu \qquad \nu = \frac{1}{\Delta t} \qquad and \qquad E_p = p\,c = h\,\nu_p \tag{75}$$

and

$$E_o = m\,c^2 = h\,\nu_o \qquad \nu_o = \frac{1}{\Delta_o t} = 1.2373 \cdot 10^{20} \;\; s^{-1} \tag{76}$$

We have already defined the angular frequencies ν_e, ν_s and ν_n for the FPs with the following equations

$$E_e = E_s \;+\; E_n \qquad and \qquad dE_e = dE_s \;+\; dE_n \tag{77}$$

With a common angular momentum $J_g = h$ it is

$$dE_e = E_e\,d\kappa = h\,\nu_e \qquad dE_s = E_s\,d\kappa = h\,\nu_s \qquad dE_n = E_n\,d\kappa = h\,\nu_n \tag{78}$$

The relation between the angular frequencies of FPs and the equivalent angular frequencies is

$$\nu = \sum_i \nu_{e_i} = \sum_i \nu_{s_i} \ + \ \sum_i \nu_{n_i} = \sqrt{\nu_o^2 \ + \ \nu_p^2} \tag{79}$$

If all FPs have the same angular frequency $\nu_{e_i} = \nu_{s_i} = \nu_{n_i} = \nu_{FP}$ we get

$$\nu = N_e \, \nu_{FP} = N_s \, \nu_{FP} \ + \ N_n \, \nu_{FP} = \sqrt{\nu_o^2 \ + \ \nu_p^2} \tag{80}$$

with N the corresponding total number of FPs of the BSP. If we multiply the equation with h we get

$$h \, \nu = N_e \, h \, \nu_{FP} = N_s \, h \, \nu_{FP} \ + \ N_n \, h \, \nu_{FP} = h \, \sqrt{\nu_o^2 \ + \ \nu_p^2} \tag{81}$$

or

$$E = E_e = E_s \ + \ E_n = \sqrt{E_o^2 \ + \ E_p^2} \tag{82}$$

with $E_{FP} = h \, \nu_{FP}$ the energy of one FP.

12.1.1 Fundamental equations expressed as functions of the powers exchanged by the BSPs.

We define the quantized emission of energy for a BSP with $v \neq c$ defining the power as

$$P_e = \frac{E_e}{\Delta t} = E_e \, \nu \qquad \nu = \frac{1}{\Delta t} \tag{83}$$

$$P_e = \frac{E_e}{\Delta t} = \frac{1}{\Delta t} \, \sqrt{E_o^2 + E_p^2} = \sqrt{{P_o}^2 + {P_p}^2} = E_s \, \nu \ + \ E_n \, \nu = P_s \ + \ P_n \tag{84}$$

where

$$P_o = E_o \, \nu \qquad P_p = E_p \, \nu \qquad P_s = E_s \, \nu \qquad P_n = E_n \, \nu \tag{85}$$

For the differential powers we get

$$dP_e = \nu \, E_e \, d\kappa \qquad dP_s = \nu \, E_s \, d\kappa \qquad dP_n = \nu \, E_n \, d\kappa \tag{86}$$

Now we show that the fundamental equations of sec 6 for the generation of linear momentum can be expressed as functions of the powers of their interacting BSPs.

With

$$dE = E\, d\kappa \qquad dH = \sqrt{E}\, d\kappa = H\, d\kappa \qquad and \qquad \frac{H}{\sqrt{\Delta t}} = \sqrt{E\, \nu} = \sqrt{P} \tag{87}$$

the equations for the Coulomb, Ampere and induction forces of sec. 6 can be transformed to

$$d^{'}F\; \bar{s}_R = \frac{d^{'}p}{\Delta t}\; \bar{s}_R \;\propto\; \frac{1}{c} \oint_R \left\{ \int_{r_1}^{\infty} \frac{H_1}{\sqrt{\Delta_1 t}}\, d\kappa_{r_1} \int_{r_2}^{\infty} \frac{H_2}{\sqrt{\Delta_2 t}}\, d\kappa_{r_2} \right\} \bar{s}_R \tag{88}$$

with

$$\sqrt{\Delta_1 t}\, \sqrt{\Delta_2 t} = \sqrt{K} r_{o_1}\, \sqrt{K} r_{o_2} = K r_{o_1} r_{o_2} = \Delta t \tag{89}$$

and

$$\frac{H_1}{\sqrt{\Delta_1 t}} = \frac{\sqrt{E_1}}{\sqrt{\Delta_1 t}} = \sqrt{\frac{E_1}{\Delta_1 t}} = \sqrt{P_1} \qquad\qquad P = \frac{E^3}{K\, \hbar^2\, c^2} \approx \frac{E^3}{K \cdot 10^{-51}} \tag{90}$$

Finally we get the general formulation for the fundamental equations of sec 6 for the generation of linear momentum expressed as functions of the powers of their interacting BSPs.

$$d^{'}F\; \bar{s}_R = \frac{d^{'}p}{\Delta t}\; \bar{s}_R \;\propto\; \frac{1}{c} \oint_R \left\{ \int_{r_1}^{\infty} \sqrt{P_1}\, d\kappa_{r_1} \int_{r_2}^{\infty} \sqrt{P_2}\, d\kappa_{r_2} \right\} \bar{s}_R \tag{91}$$

It is also possible to define differential energy fluxes for BSPs. We start with

$$dP_e = \nu\, E_e\, d\kappa \qquad dP_s = \nu\, E_s\, d\kappa \qquad dP_n = \nu\, E_n\, d\kappa \tag{92}$$

and with

$$d\kappa = \frac{1}{2}\, \frac{r_o}{r^2}\, dr\; \sin\varphi\, d\varphi\, \frac{d\gamma}{2\pi} \qquad and \quad dA = r^2\; \sin\varphi\, d\varphi\, d\gamma \tag{93}$$

The concept is shown in Fig. 16.

The cumulated differential energy flux is

$$\int_r^{\infty} dP_e = \nu\, E \int_r^{\infty} d\kappa = \nu\, E\, \frac{1}{2}\, \frac{r_o}{r}\; \sin\varphi\, d\varphi\, \frac{d\gamma}{2\pi} \quad J\; s^{-1} \tag{94}$$

The cumulated differential energy flux density is

$$\int_r^{\infty} dS_e = \frac{1}{dA} \int_r^{\infty} dP_e = \nu\, E_e\, \frac{1}{4\pi}\, \frac{r_o}{r^3} \quad \frac{J}{m^2\; s} \tag{95}$$

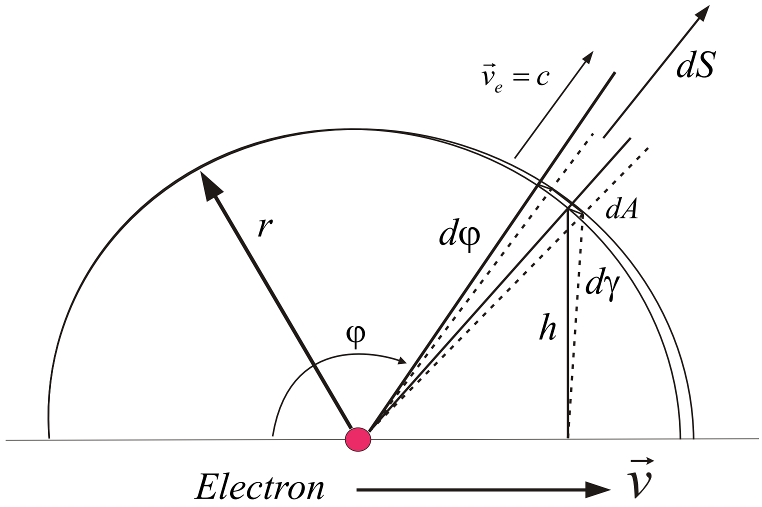


Figure 16: Emitted Energy flux density dS of a moving electron

To get the total cumulated energy flux through a sphere with a radius r we make $r_o = r$ and integrate over the whole surface $A = 4\pi\, r^2$ of the sphere and get

$$4\pi\, r^2 \int_r^\infty dS_e = \nu\, E_e \quad \frac{J}{m^2\, s} \tag{96}$$

Note: The differential energy flux density is independent of φ and γ and therefore independent of the direction of the speed v. This is because of the relativity of the speed v that does not define who is moving relative to whom.

12.1.2 Physical interpretation of an electron and positron as radiating and absorbing FPs:

The emitted differential energy is

$$dE_e = E_e\, d\kappa = \frac{h}{\Delta t}\ \frac{1}{2}\ \frac{r_o}{r^2}\, dr\ \sin\varphi\, d\varphi\, \frac{d\gamma}{2\pi} \tag{97}$$

With the help of Fig. 16 we see that the area of the sphere is $A = 4\pi r^2$, and we get

$$dE_e = \frac{h}{\Delta t\ A}\ \ r_o\, dr\ \sin\varphi\, d\varphi\, d\gamma \tag{98}$$

We now define

$$dE_e = \sigma_h\ \ r_o\, dr\ \sin\varphi\, d\varphi\, d\gamma \quad with \quad \sigma_h = \frac{h}{\Delta t\ A} \tag{99}$$

where σ_h is the *current density of fundamental angular momentum h.*

We can also write

$$dE_e = \sigma_h \; dA \quad with \quad dA = r_o \, dr \; \sin\varphi \, d\varphi \, d\gamma \tag{100}$$

12.2 Energy and density of Fundamental Particles.

12.2.1 Energy of Fundamental Particles.

The emission time of photons from **isolated** atoms is approximately $\tau = 10^{-8}\ s$ what gives a length for the train of waves of $L = c\ \tau = 3\ m$. The total energy of the emitted photon is $E_t = h\ \nu_t$ and the wavelength is $\lambda_t = c/\nu_t$. We have defined (see Fig. 15), that the photon is composed of a train of FPs with alternated opposed angular momenta where the distance between two consecutive FPs is equal $\lambda_t/2$. The number of FPs that build the photon is therefore $N_{\mathbf{FP}} = L/(\lambda_t/2)$ and we get for the energy of one FP

The concept is shown in Fig. 17

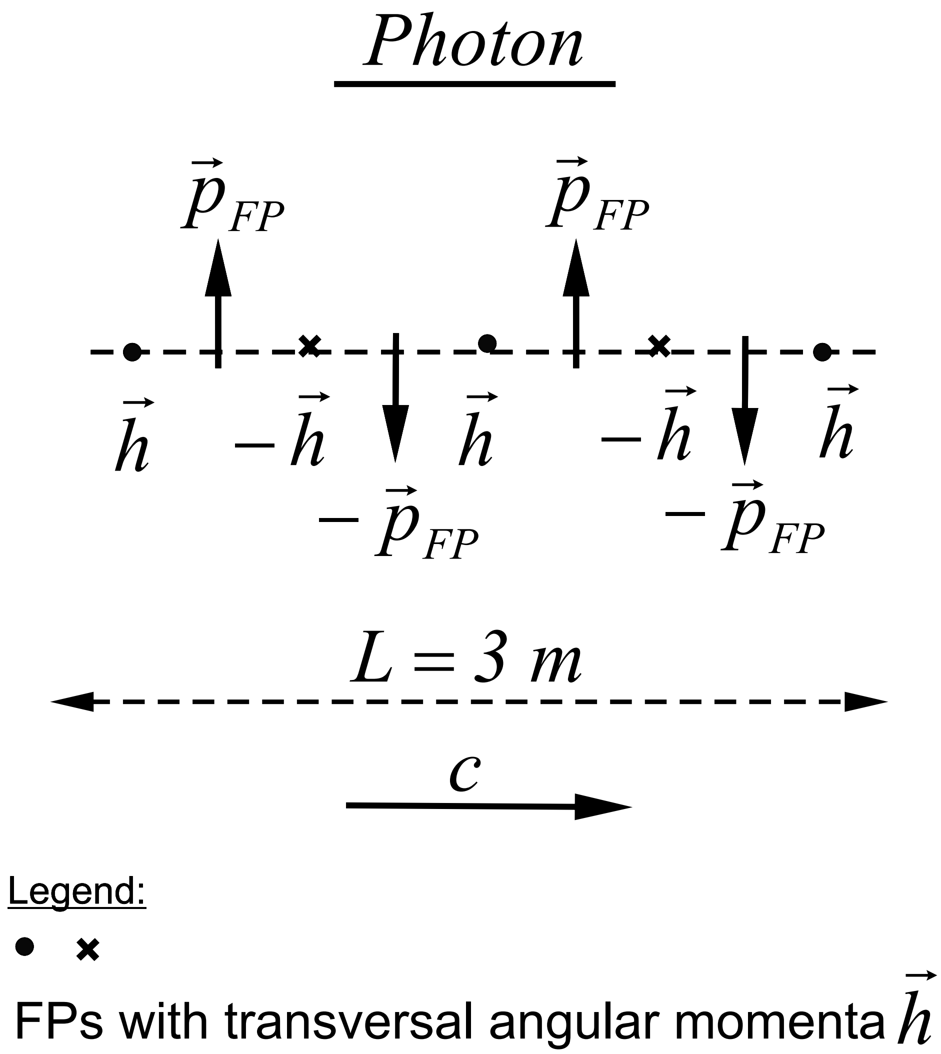


Figure 17: Photon as sequence of opposed angular momenta

$$E_{\mathbf{FP}} = \frac{E_t}{N_{\mathbf{FP}}} = \frac{E_t\ \lambda_t}{2\ L} = \frac{h}{2\ \tau} = 3.313 \cdot 10^{-26}\ J = 2.068 \cdot 10^{-7}\ eV \tag{101}$$

and for the angular frequency of the angular momentum h

$$\nu_{\mathbf{FP}} = \frac{E_{\mathbf{FP}}}{h} = \frac{1}{2\ \tau} = 5 \cdot 10^{7}\ s^{-1} \tag{102}$$

Finally we get

$$\nu_t = N_{\mathbf{FP}}\ \nu_{\mathbf{FP}} = \ 5 \cdot 10^{7}\ N_{\mathbf{FP}}\ s^{-1} \qquad with \qquad N_{\mathbf{FP}} = \frac{c\ \tau}{\lambda_t/2} \tag{103}$$

Note: The frequency ν_t represents a linear frequency where the relation with the velocity v and the wavelength λ_t is given by $v = \lambda_t\ \nu_t$. The frequency $\nu_{\mathbf{FP}}$ represents the angular frequency of the angular momentum h.

The momentum generated by a pair of FPs with opposed angular momenta is

$$p_{\mathbf{FP}} = \frac{2\ E_{\mathbf{FP}}}{c} = 2.20866 \cdot 10^{-34}\ kg\ m\ s^{-1} \tag{104}$$

Note: Isolated FPs have only angular momenta, they have no linear momenta and therefore cannot generate a force through the change of linear momenta . Linear momentum is generated only out of pairs of FPs with opposed angular momentum as defined in sec. 4. It makes no sense to define a dynamic mass for FPs because they have no linear inertia, which is a product of the energy stored in FPs with opposed angular momenta. FPs that meet in space interact changing the orientation of their angular momenta but conserving each its energy $E_{FP} = 3.313 \cdot 10^{-26}\ J$.

The number N_{FP_o} of FPs of an resting BSP (electron or positron) is

$$N_{FP_o} = \frac{E_o}{E_{FP}} = 2.4746 \cdot 10^{12} \tag{105}$$

12.2.2 Density of Fundamental Particles.

We have defined that

$$dE = E\ d\kappa = E\ \frac{1}{2}\ \frac{r_o}{r^2}\ dr\ \sin\varphi\ d\varphi\ \frac{d\gamma}{2\pi} \qquad and \qquad dV = r^2\ dr\ \sin\varphi\ d\varphi\ d\gamma \tag{106}$$

resulting for the energy density

$$\omega = \frac{dE}{dV} = \frac{E}{4\pi}\ \frac{r_o}{r^4} \qquad J\ m^{-3} \tag{107}$$

The density of FPs we define as

$$\omega_{FP} = \frac{\omega}{E_{FP}} = \frac{1}{4\pi}\ \frac{E}{E_{FP}}\ \frac{r_o}{r^4} \qquad m^{-3} \tag{108}$$

with $E_{FP} = h\ \nu_{FP} = 3.313 \cdot 10^{-26}\ J$.

The concept is shown in Fig. 3

The energy emitted by a BSP is equal to the sum of the energies of the regenerating FPs with longitudinal (s) and transversal (n) angular momenta. The corresponding densities are

$$\omega_{FP}^{(s)} = \frac{1}{4\pi}\ \frac{E_s}{E_{FP}}\ \frac{r_o}{r^4} \qquad \omega_{FP}^{(n)} = \frac{1}{4\pi}\ \frac{E_n}{E_{FP}}\ \frac{r_o}{r^4} \qquad m^{-3} \tag{109}$$

As $E_e = E_s + E_n$ we get

$$\omega_{FP}^{(e)} = \omega_{FP}^{(s)} + \omega_{FP}^{(n)} \qquad m^{-3} \tag{110}$$

The number dN_{FP} of FPs in a volume dV is given with

$$dN_{FP} = \omega_{FP}\, dV \qquad and\ \ with \qquad dV = r^2\, dr\ \sin\varphi\, d\varphi\, d\gamma \tag{111}$$

we get

$$dN_{FP} = \frac{1}{2\pi}\,\frac{E}{E_{FP}}\, d\kappa \tag{112}$$

With the definition of $\mu_{FP} = E_{FP}/c^2$, where μ_{FP} is the dynamic mass of a FP, we get for the density of the mass

$$\omega_\mu = \frac{\mu_{FP}\, dN_{FP}}{dV} = \mu_{FP}\, \omega_{FP} \qquad kg\ m^{-3} \tag{113}$$

The rest mass m of a BSP expressed as a function of the dynamic mass μ_{FP} of its FPs is

$$m = N_{FP_o}\, \mu_{FP} = \frac{\nu_o}{\nu_{FP}}\, \mu_{FP} \tag{114}$$

Note: In the present theory all BSPs are expressed through FPs with the Energy E_{FP}, the angular frequency ν_{FP} and the dynamic mass μ_{FP}.

12.3 Quantification of movement.

An isolated moving BSP has a potential energy

$$E = E_s\ +\ E_n \tag{115}$$

which is a function of the relative speed v to the selected reference coordinate. The potential energy will manifest when the isolated moving BSP interacts with a BSP which is static in the selected coordinate system.

The time variation Δt derived for the variation dp of the momentum for the Coulomb, Ampere and Induction forces between two BSPs, we use also as time variation to describe the movement of a BSP that moves with constant speed $v = \Delta x/\Delta t$ where $dp = 0$.

The energy E_n is responsible for the movement of the BSP and the number of FPs that generate the movement during the time Δt is

$$N_{FP}^{(n)} = \frac{E_n}{E_{FP}} \tag{116}$$

The total momentum of a BSP moving with constant speed v is therefore

$$p = m\, v = N_{FP}^{(n)}\, p_{FP} = m\, \frac{\Delta x}{\Delta t} \tag{117}$$

with p_{FP} defined in eq. (104). For Δx we get

$$\Delta x = N_{FP}^{(n)}\, p_{FP}\, \frac{\Delta t}{m} \tag{118}$$

For $v = 0$ we get

$$v = 0 \qquad E_n = 0 \qquad N_{FP}^{(n)} = 0 \qquad \Delta x = 0 \tag{119}$$

For $v \to c$ we get with $\Delta t = K\, r_o^2$ with r_o the radius of the moving BSP

$$v \to c \qquad E_p \to \infty \qquad E_n \to \infty \qquad N_{FP}^{(n)} \to \infty \qquad \Delta t \to 0 \tag{120}$$

$$\lim_{v \to c} \Delta x = \lim_{v \to c} \frac{2\, K\, \hbar^2\, c}{m\, E_p} = 0 \qquad for \qquad v \to c \tag{121}$$

$$\lim_{v \to c} \frac{\Delta x}{\Delta t} = v \tag{122}$$

Note: For the isolated BSP moving with constant speed v we have no static probe BSP with radius r_{o_p} that measures the force between them, force that is zero because $dp = 0$. There is no difference between the two BSPs and the equation $\Delta t = K\, r_o\, r_{o_p}$ becomes $\Delta t = K\, r_o^2$ with r_o the radius of the moving BSP.

13 Electromagnetic and Gravitation emissions.

Fig. 18 shows the generation of the electromagnetic emission and the gravitation emission.

At **a)** a Subatomic Particle (SP), electron or positron, shows transversal angular momenta J_n of its Fundamental particles (FPs) when moving with constant moment p relative to a second SP (not shown). The transversal angular momenta of its FPs follow the right screw law in moving direction independent of the charge. FPs with opposed angular momenta are entangled and are fixed to the SP. No FPs are emitted when moving with constant speed.

When the moving SP approaches a second SP (not in the drawing), the opposed transversal angular momenta are passed to the second SP via their regenerating FPs so that the first SP looses moment while the second SPs gains moment.

At **b**) a oscillating SP is shown with the pairs of emitted FPs with opposed angular momenta at the closed circles changing ciclically their directions. At far distances from the SP trains of FPs with opposed angular momenta become independent from the SP and move with light speed (photons) relative to its source. According to which combination of opposed entangled FPs become independent we have a train with potentially transversal momenta p (shown) or potentially longitudinal momenta p (not shown).

At **c**) a SP is shown that migrates slowly to the right outside the atomic nucleus and is than reintegrated to the left with high speed to its nucleus . The migration is so slow that no transversal angular momenta are generated at their FPs. When reintegrated, FPs with opposed transversal angular momenta become independent and move until absorbed by regenerating FPs of a second SP (not shown). As the transversal angular momenta of a moving SP follow the right screw law in moving direction independent of the charge of the SP, the reintegration will generate always potential longitudinal momenta p in the direction of the nucleus. The emitted pairs of opposed angular momenta with potential longitudinal momenta p have all the same direction, and when passed to a second SP generate the gravitation force.

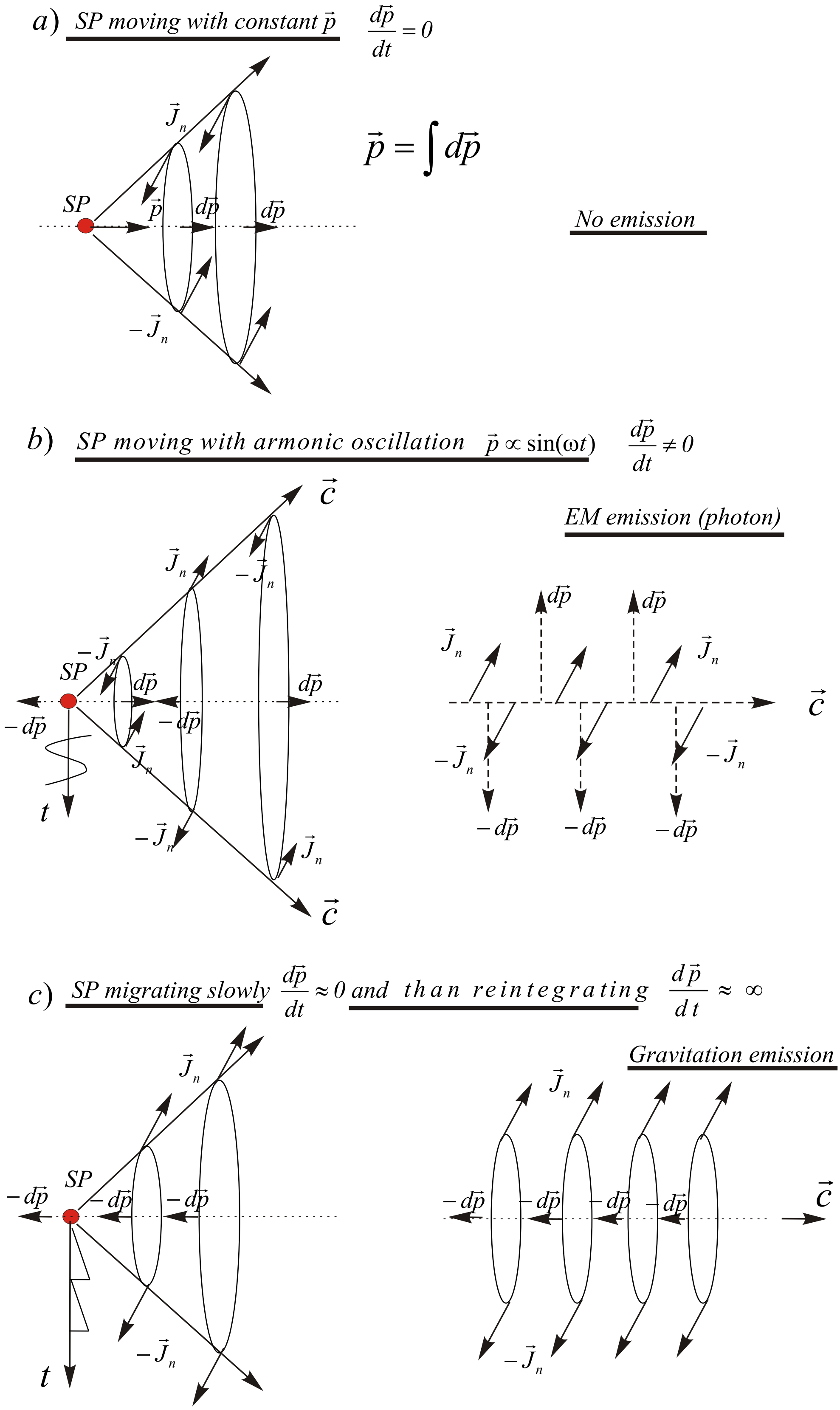


Figure 18: Electromagnetic and Gravitation emissions

14 Conventions introduced for BSPs.

Fig. 19 shows the convention used for the two types of electrons and positrons introduced.

The accelerating positron emits FPs with high speed $v_e = \infty$ and positive longitudinal angular momentum $\bar{J}_s^+$ $(\infty+)$ and is regenerated by FPs with low speed $v_r = c$ and negative longitudinal angular momentum $\bar{J}_s^-$ $(c-)$.

The decelerating electron emits FPs with low speed $v_e = c$ and negative longitudinal angular momentum $\bar{J}_s^-$ $(c-)$ and is regenerated by FPs with high speed $v_r = \infty$ and positive longitudinal angular momentum $\bar{J}_s^+$ $(\infty+)$.

The emitted FPs of the accelerating positron regenerate the decelerating electron and the emitted FPs of the decelerating electron regenerate the accelerating positron.

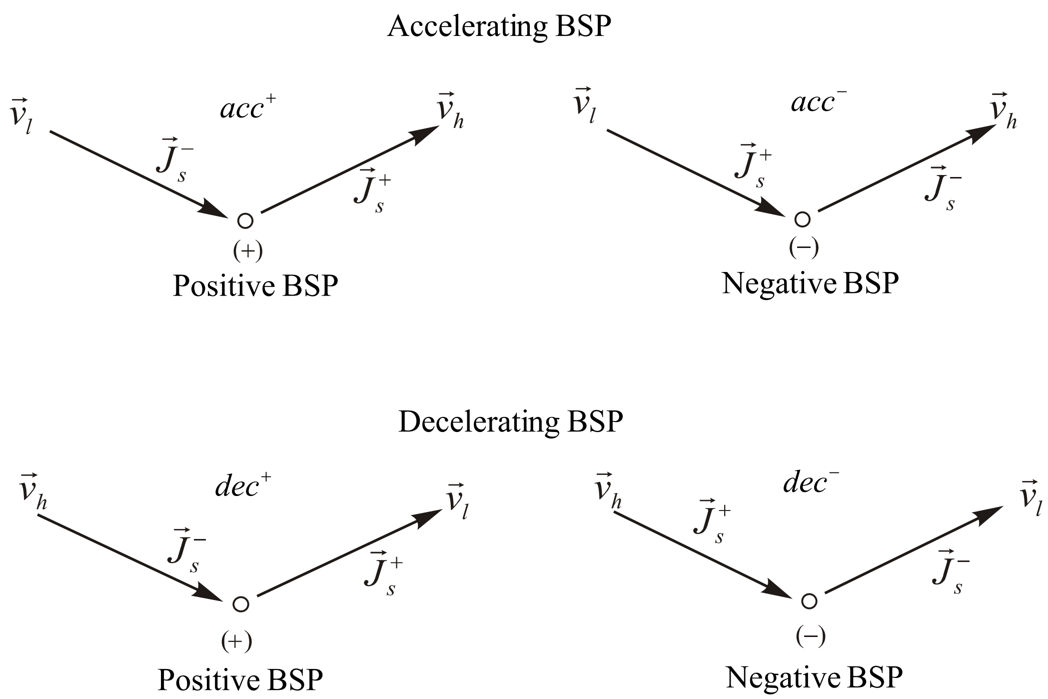


Figure 19: Conventions for BSPs

Fig. 20 a) shows a neutron with the internal and external rays for emitted and regenerating FPs. The complex SP is formed by accelerating positrons and decelerating electrons.

Fig. 20 b) shows a proton with the net external rays for emitted and regenerating FPs. The complex SPs is formed by accelerating positrons and decelerating electrons.

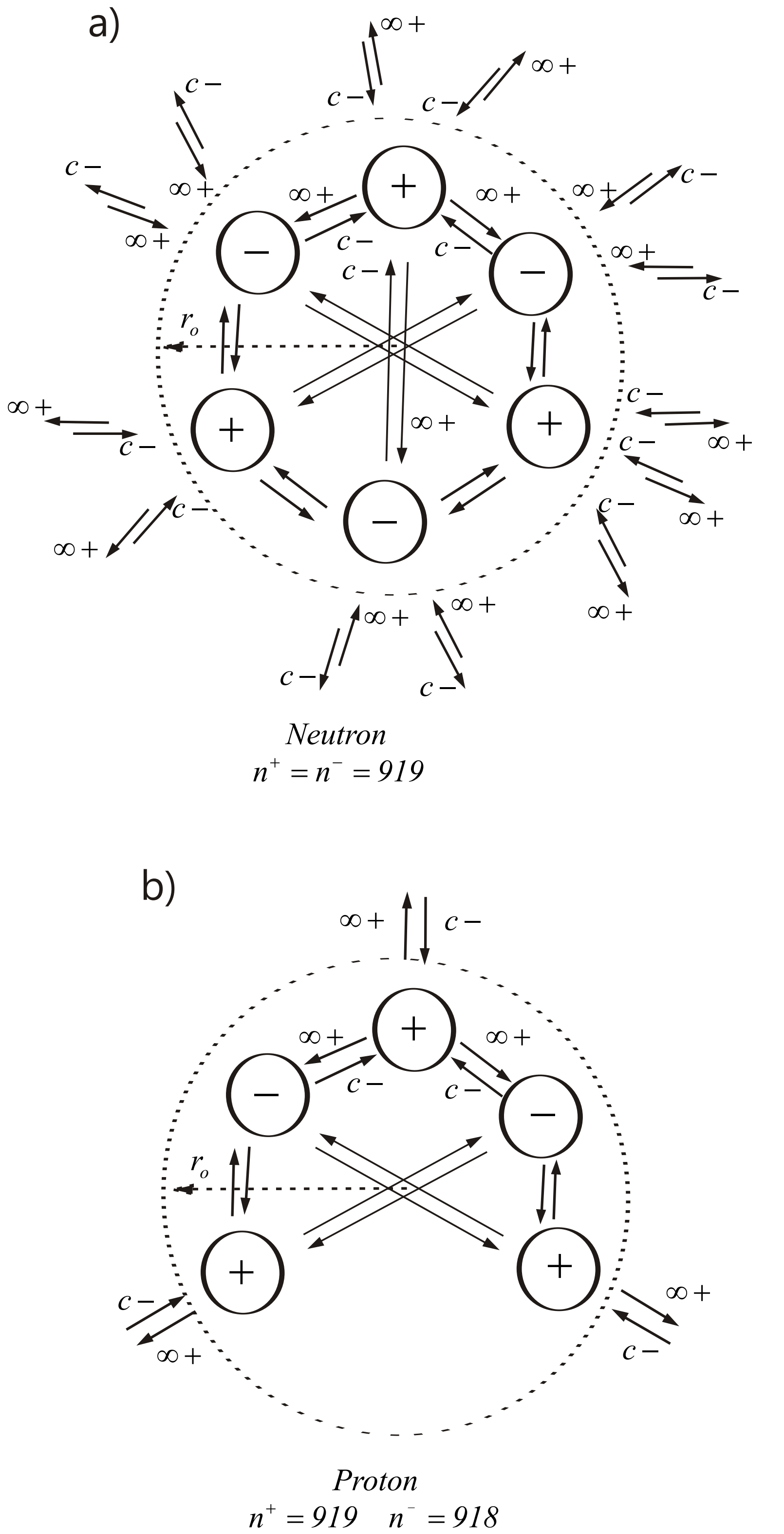


Figure 20: Neutron and proton
composed of accelerating positrons and decelerating electrons

Fig. 21 shows a neutron with one migrated BSP and the net external field.

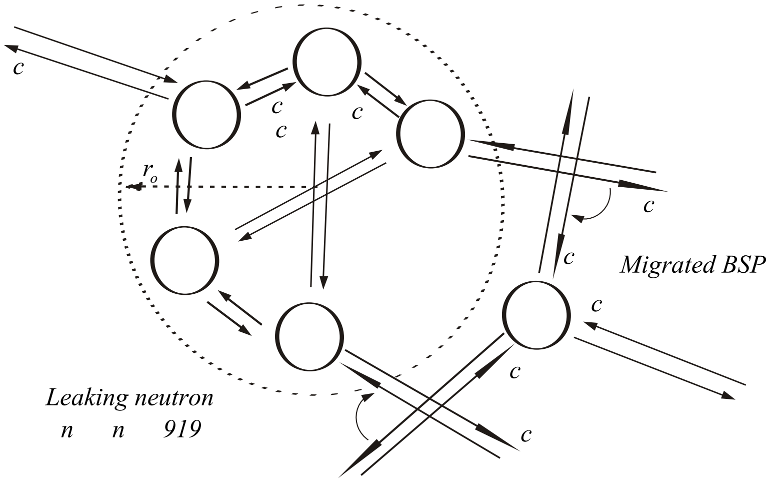


Figure 21: Neutron with migrated BSP

15 Corner-pillars of the "E & R" UFT model

The corner-pillars of the proposed model are:

1. Nucleons are composed of electrons and positrons

2. A space with Fundamental Particle (FPs) with angular momenta is postulated.

3. Electrons and positrons are represented as focal points of rays of FPs where the energy of the electrons and positrons is stored as rotation.

4. FPs are emited with c or ∞ from the focus. The focus is regenerated by FPs that move with c or ∞ relative to the focus.

5. Regenerating FPs are those that are emited by other focuses. A focus is stable when emission and regeneration is energetically balanced.

6. Pairs of FPs with opposed angular momenta generate linear momenta on focuses.

7. Interactions between subatomic particles are the product of the interactions of their FPs when they cross in space. The probability that they cross follows the radiation law.

8. The interactions between FPs are so defined, that the fundamental equations (Coulomb, Ampere, Lorentz, Newton, Maxwell, etc.) can be mathematically derived.

9. Neutrinos are parallel moving pairs of FPs with opposed angular momenta.

10. Photons are a sequence of neutrinos with their potential linear momenta oriented alternatelly oposed.

11. Photons that move with $c \pm v$ are reflected and refracted by optical lenses and electric antenas with c.

All experiments that can be explained with the SM must also be at least explained with the E & R model. The explanations must not be equal to those of the SM.

Note: The fundamental laws (Coulomb, Ampere, Lorentz, Newton, Maxwell, etc.) were deduced with measurements that took place under conditions where the nucleons involved were adequatelly regenerated to be stable. At relativistic speeds and at heavy atomic nuclei the regeneration can become deficient and produce instability. They decay in configurations that can be adequtely regenerated by the enviroment, in other words, in stable configurations.

The interactions between subatomic particles take place at the regenerating FPs that move along the rays with the speed c or ∞. The laws that were deduced for stable configurations (Coulomb, Ampere, Lorentz, Newton, Maxwell, etc.) not necessarilly must work for unstable particles where emission and regeneration are not in balance.

The model "E & R" only takes into consideration stable partikles, in other words, electrons, neutrons, protons, neutrinos, photons and their antiparticles. Positrons are only stable in configurations like the nucleons. The many short-lived configurations are not taken into account because they not necessarilly follow the known fundamental laws.

16 Quantum mechanics and the "E & R" UFT.

We have seen in sec. 8 that all known interactions (weak, strong, electromagnetic and gravitation) can be explained as interactions between the longitudinal and transversal dH fields of subatomic particles.

For distances between subatomic particles that fall in region 5 of the curve of Fig. 7, the basic interactions Coulomb, Ampere, Lorentz, Maxwell, etc. are valid. Not so for distances of the other regions, where the individual interactions between the dH fields are still valid but doesn't result in the basic laws of Coulomb, Ampere, Lorentz, etc.

The Standard Model (SM) introduces the gauge theory of QED to describe interactions (electromagnetic) between subatomic particles that take place at distances that fall in region 5 of the curve of Fig. 7. For interactions (weak, strong) that take place in the regions 1 and 2 of the curve of Fig. 7, the SM introduces the gauge theory of QCD. For the gravitation interaction, which also falls in the region 5 of the curve of Fig. 7, Einstein‘s general relativity approach is not compatible with QM and efforts are made (gravity/duality) to overcome the problem.

16.1 The strong and the weak interactions.

The denomination Strong interaction comes from the idea that a very strong force must hold protons in atomic nuclei together. The denomination weak interaction comes from the short interaction distance compared with electrodynamic interactions.

For the following analysis nucleons (protons and neutrons) are composed of electrons and positrons.

From the curve of Fig. 7 we see that in the region 1 electrons and positrons neither attract nor repel each other. The force required to hold them together is zero and no special carriers (gluons) or strong forces are required.

Electrons and positrons that migrate slowly from region 1 to region 2 of a nucleon are reintegrated to region 1 or expulsed to region 3 according with which of the remaining positrons and electrons of the nucleon they interact.

Quantum-mechanically the two interactions can be described with the time independent Schroedinger equation as an electron or positron moving in a potential well $V(x)$ where

$$V(x) = \begin{cases} 0 & \text{for} \quad |x| < a \\ 0 & \text{for} \quad |x| > b \\ V_o > 0 & \text{for} \quad a < |x| < b \end{cases}$$

The concept is shown in Fig. 9.

At stable atoms all electrons and positrons of the nucleons are reflected at the potential well V_o while at unstable atoms part of them tunnel through it, resulting radioactivity.

The transmitted (tunneled) electrons are of short range because the acceleration from region 2 to 3 is weak due to the small cross product between the dH fields of the regenerating FPs of the interacting electrons and positrons.

16.2 The electromagnetic interaction.

Interactions of subatomic particles at distances defined by the region 5 are described by the basic interaction laws of Coulomb, Ampere, Lorentz, Maxwell, etc. These interactions are Quantum-mechanically described by QED.

16.3 The gravitation interaction.

Electrons and positrons that migrate slowly from region 1 to region 2 in a nucleon of an atom, are reintegrated to region 1 when they interact respectively with the remaining positrons and electrons of the nucleon. The transversal dH fields generated on the FPs of the electrons and positrons during reintegration are transmitted to regenerating FPs of electrons and positrons of nucleons of an other atom (see Fig. 11). The reintegration moment is so passed from the first to the second atom remaining a the first atom only the opposed reaction moment. The final result is that the two neutral atoms attract each other.

16.3.1 Compatibility of gravitation with Quantum mechanics.

The potential in which an orbital electron in an Hidrogen atom with $Z = 1$ moves is

$$U(r)_{Coul} = -\left(\frac{Z\,e^2}{4\pi\epsilon_o}\right)\frac{1}{r} = 2.3072 \cdot 10^{-28}\,\frac{1}{r}\,J \qquad with \quad Z = 1 \tag{123}$$

We know from [5] page 178 that the discrete energy levels for the orbital electron of the H-atom is

$$E_{n_{Coul}} = -\frac{m}{2\hbar^2}\left(\frac{Z\,e^2}{4\pi\epsilon_o}\right)^2\frac{1}{n^2} = 2.1819 \cdot 10^{-18}\,\frac{1}{n^2}\,J \tag{124}$$

The difference between the energy levels is

$$\Delta E_{n_{Coul}} = 2.1819 \cdot 10^{-18}\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] J \tag{125}$$

16.3.2 Quantized gravitation.

In the present approach of "Emission & Regeneration" UFT gravitation is presented based on the reintegration of migrated electrons and positrons to their nuclei. According to that model the force on one electron/positron of a mass M_1 due to the reintegration of an electron/positron to an atomic nucleus of a mass M_2 is given by (39)

$$F_i = \frac{dp}{\Delta t} = \frac{k\ c\ \sqrt{m}\ \sqrt{m_p}}{4\ K\ d^{\,2}} \int\int_{Induction} \qquad with \qquad \int\int_{Induction} = 2.4662 \tag{126}$$

and the corresponding potential is

$$U(r)_{Grav} = \left(2.4662\ \frac{k\ c\ \sqrt{m}\ \sqrt{m_p}}{4\ K}\right)\ \frac{1}{r} = 2.3071 \cdot 10^{-28}\ \frac{1}{r}\ J \tag{127}$$

If we write the Schroedinger equation with the gravitation potential instead of the Coulomb potential for the H-atom, we get discrete energy levels simply in replacing the expression in brackets of eq.(124) with the expression in brackets of eq. (127)

$$E_{n_{Grav}} = -\ \frac{m}{2\hbar^2}\ \left(2.4662\ \frac{k\ c\ \sqrt{m}\ \sqrt{m_p}}{4\ K}\right)\ \frac{1}{n^2} = 2.1816 \cdot 10^{-18}\ \frac{1}{n^2}\ J \tag{128}$$

In the same model of gravitation the number of reintegrating electrons/positrons for a mass M is derived as $\Delta G = \gamma_G\ M$ with $\gamma_G = 5.3779 \cdot 10^8\ kg^{-1}$. The resulting energy level due to all reintegrating electrons/positrons of M_1 and M_2 is

$$E_{n_{Grav\ tot}} = 2.1816 \cdot 10^{-18}\ \Delta G_1\ \Delta G_2\ \frac{1}{n^2}\ J \tag{129}$$

For the H-Atom M_2 is formed by one proton composed of 918 electrons and 919 positrons and M_1 is the mass of the electron. The mass of a proton is $M_2 = m_{prot} = 1.6726 \cdot 10^{-27}\ kg$ and the mass of the electron $M_1 = m_{elec} = 9.1094 \cdot 10^{-31}\ kg$. We get $\Delta G_2 = 8.9951 \cdot 10^{-19}$ and $\Delta G_1 = 4.8989 \cdot 10^{-22}$. We get for the energy difference for orbital electrons at the H-Atom due to gravitation potential

$$\Delta E_{n_{Proton}} = 9.6134 \cdot 10^{-58}\ \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]\ J \tag{130}$$

If we compare the factors of the brackets for the energy difference due to the Coulomb potential of eq. (125) and the gravitational potential of eq. (130), we see that even between very different energy levels n_1 and n_2 of the gravitational levels the energy differences of the gravitation are neglectible compared with the Coulomb.

For the energy difference between two levels n_1 and n_2 of an atom we can write:

$$\Delta E_{n_{Coul}} \pm \Delta E_{n_{Grav}} = h(\nu \pm \Delta\nu) = 2.1819 \cdot 10^{-18}\ [1 \pm \Delta G_1\ \Delta G_2] \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]\ J \quad (131)$$

with $\Delta G = \gamma_G\ M$ where $\gamma_G = 5.3779 \cdot 10^8\ kg^{-1}$.

Now we make the same calculations for the difference between the energy levels due to the gravitation potential of the sun with $M_2 = M_\odot = 1.9891 \cdot 10^{30}\ kg$ and the earth with $M_1 = M_\dagger = 5.9736 \cdot 10^{24}\ kg$. We we get $\Delta_{G_\odot} = 1.0697 \cdot 10^{39}$ and $\Delta_{G_\dagger} = 3.2125 \cdot 10^{33}$ resulting

$$\Delta E_{n_{\odot,\dagger}} = 7.4968 \cdot 10^{54} \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]\ J \quad (132)$$

As the earth shows no quantization in its orbit around the sun, two adjacent levels n_1 and n_2 must be very large outer levels so that $\Delta E_{n_{\odot,\dagger}} \approx 0$, similar to the large outer levels of the conducting electrons of conducting materials. Mathematically we can write with $n_2 = n_1 + 1$

$$\lim_{n_1 \Rightarrow \infty} \Delta E_{n_{\odot,\dagger}} = 7.4968 \cdot 10^{54} \left[\frac{1}{n_1^2} - \frac{1}{(n_1+1)^2}\right] = 0\ \ J \quad (133)$$

16.3.3 Relation between energy levels and space.

The compatibility of gravitation as the reintegration of migrated electrons/positrons to their nuclei is also shown by the following calculations. From eq. (129) we get the energy difference between two gravitation levels

$$\Delta E_{n_{Grav}} = 2.1816 \cdot 10^{-18}\ \Delta G_1\ \Delta G_2 \left[\frac{1}{n_1^2}\ -\ \frac{1}{n_2^2}\right]\ \ J \quad (134)$$

and with the difference between two gravitation potentials at different distances

$$\Delta U_{Grav} = G\ M_1\ M_2 \left[\frac{1}{r_1}\ -\ \frac{1}{r_2}\right]\ \ J \quad (135)$$

we can write that $\Delta E_{n_{Grav}} = \Delta U_{Grav}$ what gives with $r_1\ r_2 \approx r^2$

$$\frac{\Delta r}{r^2} = \frac{2.1816 \cdot 10^{-18}\ \gamma_G^2}{G} \left[\frac{1}{n_1^2}\ -\ \frac{1}{n_2^2}\right] \quad (136)$$

For the H-atom with $r \approx 10^{-13}\ m$ we get for the difference between the two first energy levels $n_1 = 1$ and $n_2 = 2$

$$\Delta r = \frac{2.1816 \cdot 10^{-18}\ \gamma_G^2}{G}\ r^2 \left[\frac{3}{4}\right] = 7.0926 \cdot 10^{-17}\ m \quad (137)$$

what is a reasonable result because $\Delta r << r$.

Now we make the same calculations for the earth and the sun with $r_{\odot,\dagger} \approx 150.00 \cdot 10^9\ m$. We get

$$\Delta r_{\odot,\dagger} = 2.1164 \cdot 10^{32} \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] \tag{138}$$

As the earth shows no quantization in its orbit around the sun, two adjacent levels n_1 and n_2 must be very large outer levels so that $\Delta r_{\odot,\dagger} \approx 0$, similar to the large outer levels of the conducting electrons of conducting materials.

16.4 Superposition of gravitation and Coulomb forces.

The "Emission & Regeneration" UFT shows that the Coulomb and the Ampere forces tend to zero for the distance between electrons/positrons tending to zero. The behaviour is explained with the cross product of the angular momenta of the regenerating rays of FPs that tends to zero.

The induction force is not a function of the cross product but simply the product between angular momenta of the regenerating rays of FPs. The result is that the induction force does not tend to zero with the distance between inducing particles tending to zero. As the gravitation was defined as the reintegration of migrated electrons/positrons to their nuclei and as a induction force, the gravitation force prevails over the Coulomb or Ampere forces for the distance tending to zero.

Fig. 22 shows qualitatively the resulting momentum due to Coulomb/Ampere and Gravitation momenta between an atomic nucleus of a target and a He nucleus.

Note: The gravitation model of "Emission & Regeneration" UFT is based on a physical approach of reintegration of migrated electrons/positrons to their nuclei and compatible with quantum mechanics, while General Relativity, the gravitation model of the SM, based on a mathematical-geometric approach is not compatible with quantum mechanics.

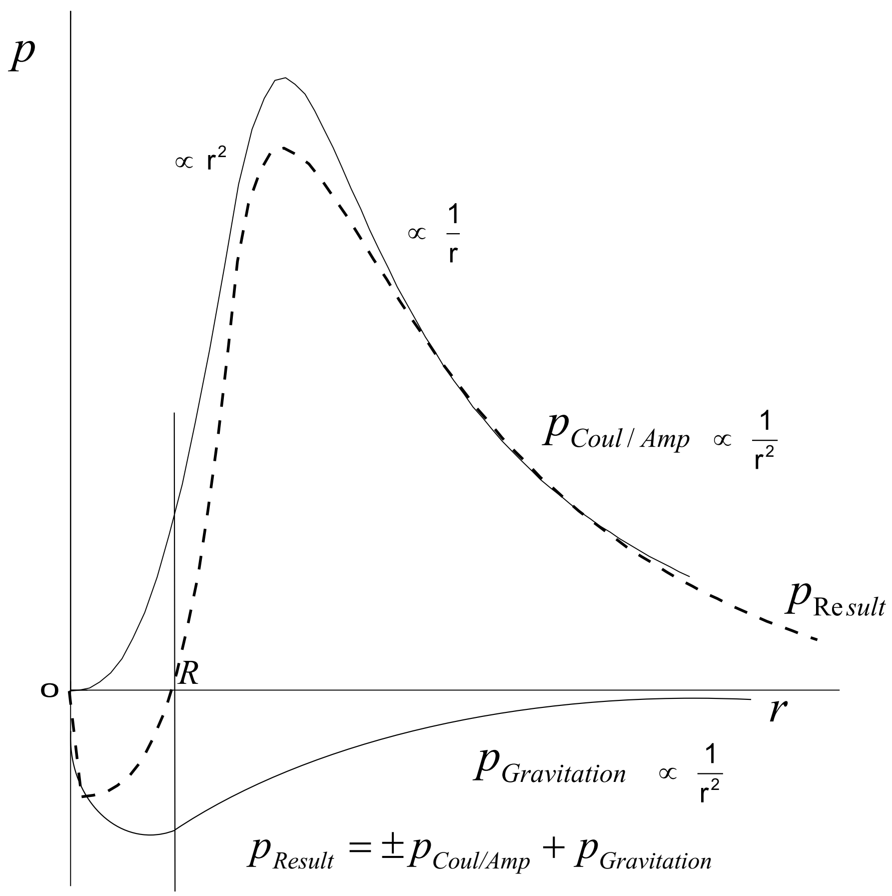


Figure 22: Resulting linear momentum p due to Coulomb/Ampere and Gravitation momenta.

16.5 Table comparing the SM and the 'E & R' model.

Model	Sub-division	Particle representation	Force Carriers	Fields	Interactions	Gauges	Comment
SM (Poly-particle)	Classic	Point-like	Gluons W-Boson Photons Gravitons	Strong Weak Electromagnetic Gravitation	Strong Weak Electromagnetic Gravitation		Four fields, one for each type of force
	QM	Wave Packet				QCD Electroweak QED Gravity Duality	
E & R (Mono-particle)	Classic	***Focal-point*** of rays of Fundamental Particles	***Fundamental Particle*** with Longitudinal and Transversal angular momenta	***dH*** field with Longitudinal and Transversal components	Electromagnetic (Long x Long, Trans x Trans, Trans - Long)		One field for all forces
	QM	Wave Packet				QED	

Figure 23: Table comparing the SM and the 'E & R' model.

Fig. 23 shows the SM and the 'E & R' model subdivided in classical physics and QM. The classic part of the SM with its point-like representation of particles has four force-carriers, four fields and four interactions. QM based on the classical physics of the SM has correspondingly four gauge theories.

The classic part of the 'E & R' model with its focal-point representation of particles has only one type of force-carrier, only one field and only one type of interaction. QM based on the classical physics of the 'E & R' model has correspondingly only one type of gauge theory, namely QED.

The SM has four fields one for each type of force while the 'E & R' model has only one field for all forces and is therfore a UFT.

The SM is a poly-particle model while the 'E & R' model is a mono-particle model.

17 Miscellaneous.

17.1 Flux density of FPs.

At each BSP the flux density of emitted FPs is equal to the flux density of regenerating FPs although the different speeds of the FPs.

In a complex SP formed by more than one BSP (Fig.20), a mutual internal regeneration between the BSPs of the complex SP exists. Part of the emitted positive rays of FPs with $\bar{J}_e^{(+)}$ of the positive BSPs of the complex SP regenerate the negative BSPs of the complex SP, and part of the emitted negative rays of FPs with $\bar{J}_e^{(-)}$ of the negative BSPs regenerate the positive BSPs. The other part of the emitted and regenerating rays of FPs respectivelly radiate into space and regenerate from space.

At a complex SP with equal number of positive and negative BSPs Fig.20 a) the flux density of FPs radiated into space with positive angular momenta is equal to the flux density of FPs radiated into space with negative angular momenta. The same is valid for the flux density of regenerating FPs.

At a complex SP with different number of positive and negative BSPs Fig.20 b) the flux density of FPs radiated into space with positive angular momenta is not equal to the flux density of FPs radiated into space with negative angular momenta. If the complex SP has more positive BSPs in the nucleous, the flux density of FPs radiated into space with positive angular momenta is bigger than the flux density of FPs radiated into space with negative angular momenta and vice versa.

17.2 Scattering of particles.

Elastic scattering.

Elastic scattering we have when the scattering partners conserve their identity. No photons, neutrinos, electrons, positrons, protons, neutrons are emitted.

There are two types of elastic scatterings according the smallest scattering distance d_s that is reached between the scattering partners.

"**Electromagnetic**" scatering we have when the smallest scattering distance d_s is in the fifth region of the linear momentum curve p_{stat} of Fig.7 where the Coulomb force is valid. Electromagnetic scattering is characterized by the inverse square distance force between particles.

"**Mechanical**" scatering we have when the smallest scattering distance d_s is in the fourth region of Fig.7. Mechanical scattering is characterized by the combination of inverse square distance and inverse distance forces between particles.

Plastic or destructive scattering.

Plastic scattering we have when the identity of the scattering partners is modified and photons, neutrinos, electrons, positrons, protons or neutrons are emitted.

In plastic or destructive scattering the smallest scattering distance d_s enters the third and second region of the linear momentum curve p_{stat} of Fig.7.

The internal distribution of the BSPs is modified and the acceleration disturbs the internal mutual regeneration between the BSPs. The angular momenta of each BSP of the scattering partners interact heavily, and new basic configurations of angular momenta are generated, configurations that are balanced or unbalanced (stable or unstable).

In today's point-like representation the energy of a BSP is concentrated at a point and scattering with a second BSP requires the emission of a particle (gauge boson) to overcome the distance to the second BSP which then absorbs the particle. The energy violation that results in the rest frame is restricted in time through the uncertainty principle and the maximum distance is calculated assigning a mass to the interchanged particle (Feynman diagrams).

Conclusion: In the present approach the emission of FPs by BSPs is continuous and not restricted to the instant particles are scattered. In the rest frame of the scattering partners no energy violation occurs. When particles are destructively scattered, during a transition time the angular momenta of all their FPs interact heavily according to the three interaction from sec. 5 and new basic arrangements of angular momenta are produced, resulting in balanced and unbalanced configurations of angular momenta that are stable or unstable, configurations of quarks, hadrons, leptons and photons. The interacting particles (force carriers) for all types of interactions (electromagnetic, strong, weak, gravitation) are the FPs with their longitudinal and transversal angular momenta.

The concept is shown in Fig. 24

Note: The proposed theory considers **elementary particles** those which are stable as free particles or as part of composed particles like the electron, positron, neutron, proton, neutrino, photon, nuclei of atoms. All particles with a short life time (transitory particles) are not elementary particles and are produced at collisions. With increasing collision energies more and more transitory particles of higher energies can be produced without adding new substantial information to the theory.

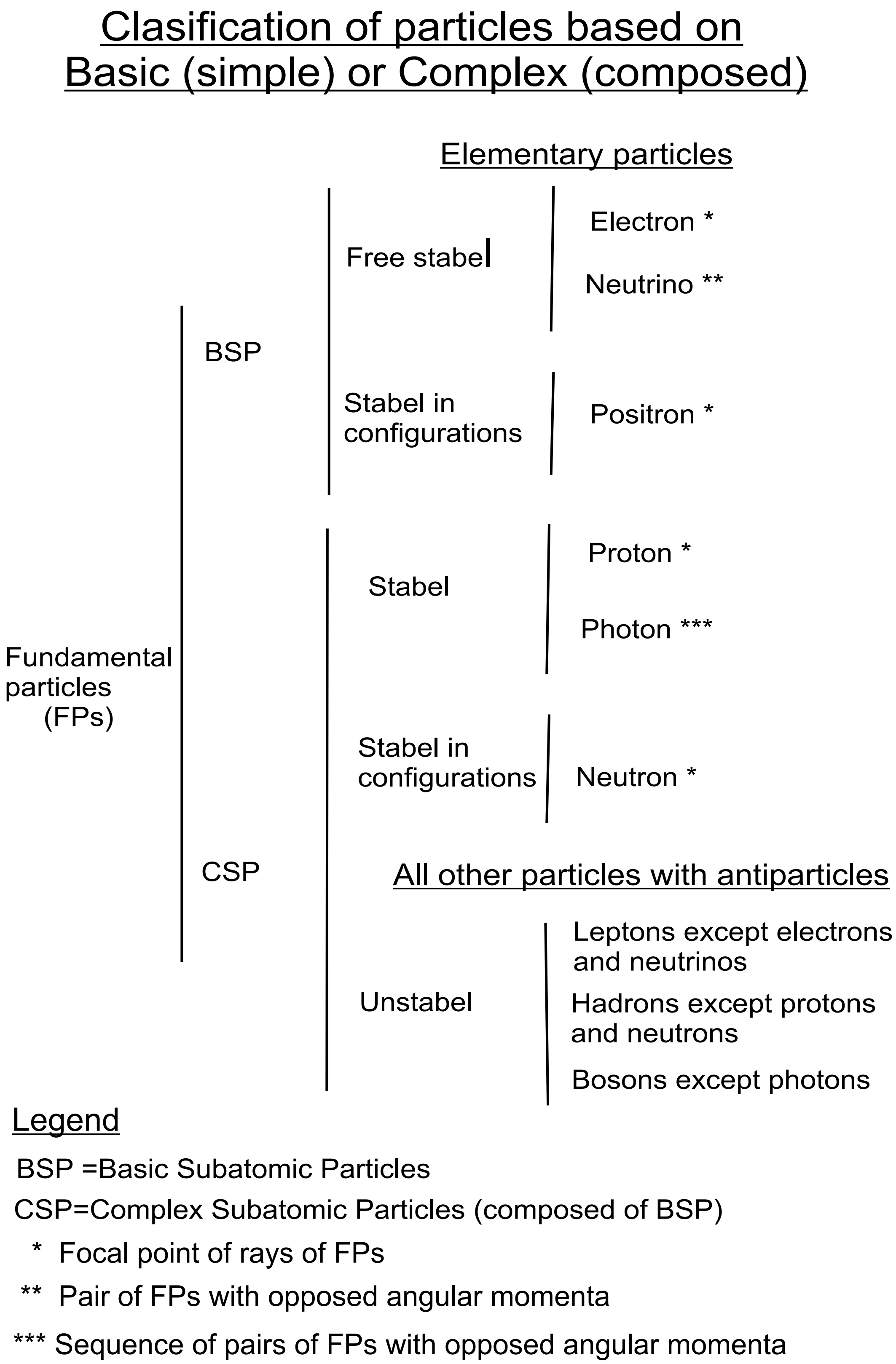


Figure 24: Clasification of particles

17.3 Feynman diagram.

The proposed approach postulates that the force carriers between the focal points, which replace the subatomic particles, are the FPs with their dH fields. The forces between the subatomic particles are generated by the interactions of the angular momenta of their FPs or dH fields, and not by the exchanges of particles as the standard model teaches.

A flawless analysis of the disintegration of radioactive nuclei shows that there is no violation of conservation of energy, contrary to Feynmans conclusions.

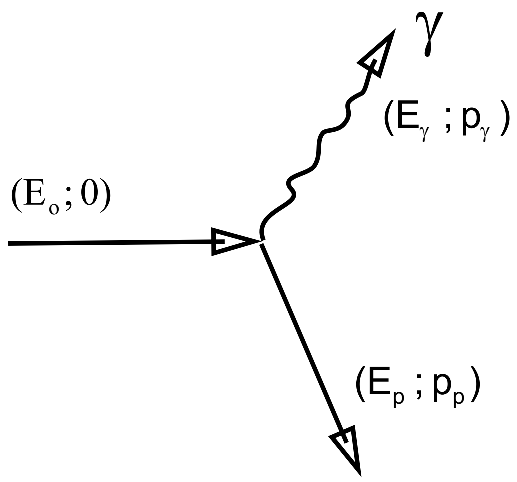


Figure 25: Feynman diagram

The concept is shown in Fig. 25

$$(E_o\ ;\ 0) \rightarrow (E_p\ ;\ p_p)\ +\ (E_\gamma\ ;\ p_\gamma) \tag{139}$$

$$E_k = \sqrt{E_o^{'\,2} + E_p^2} \qquad E_p = p_p\ c \qquad E_\gamma = p_\gamma\ c \tag{140}$$

with

$$\bar{p}_p = -\bar{p}_\gamma \qquad E_p = E_\gamma \tag{141}$$

$$\Delta E = E_k + E_\gamma - E_o = \sqrt{E_o^{'\,2} + E_p^2} + E_\gamma - E_o \tag{142}$$

For $\Delta E = 0$ we get

$$E_o^{'} = \sqrt{E_o^2 - 2\ E_o\ E_p} = \sqrt{E_o^2 - 2\ E_o\ E_\gamma} \tag{143}$$

For stable BSPs like the electron and the positron which don't disintegrate by radiation $E_p = E_\gamma = 0$ and $E_o^{'} = E_o$.

For CSPs like heavy nuclei that disintegrate by radiation $E_p > 0$ and $E_o^{'} < E_o$.

The same analysis is valid for nuclei that radiate α, β and γ particles. The radiated energy goes always in detriment of the rest mass E_o of the nuclei. No violation of conservation of energy occurs.

18 Interpretation of Data in a theoretical frame.

A theory like our Standard Model was improved over time to match with experimental data introducing fictious entities (particle wave, gluons, gravitons, dark matter, dark energy, time dilation, length contraction, Higgs particle, Quarks, Axions, etc.) and helpmates (duality principle, equivalent principle, uncertainty principle, violation of energy conservation, etc.) taking care that the theory is as consistent and free of paradoxes as possible. The concept is shown in Fig. 26. These improvements were integrated to the existing model trying to modify it as less as possible what led, with the time, to a model that resembles a monumental patchwork. To return to a mathematical consistent theory without paradoxes (contradictions) a completely new approach is required that starts from the basic picture we have from a particle. “E & R” UFT is such an approach representing particles as focal points in space of rays of FPs. This representation contains from the start the possibility to describe interactions between particles through their FPs, interactions that the SM with its particle representation attempts to explain with fictious entities.

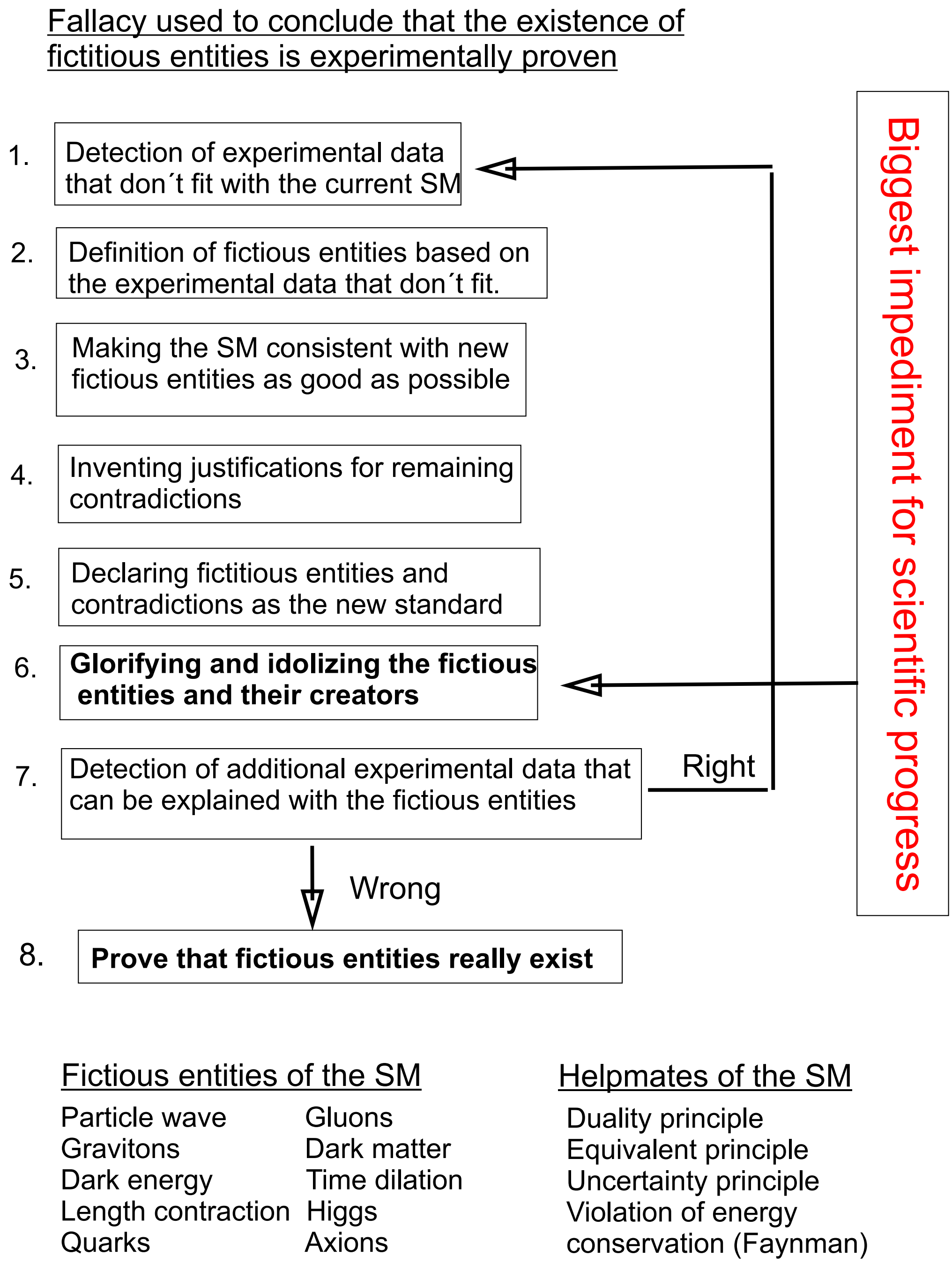


Figure 26: Fallacy used to conclude that fictious entities really exist

Fig. 26 is an organigram where the main steps of the integration of fictious entities to the SM are shown. All experiments where the previously defined fictious entities are indirectly detected (point 7. of Fig. 26) are not a confirmation of the existence of the fictious entities (point 8. of Fig. 26), they are simply the confirmation that the model was made consistent with the fictious entities (point 3. of Fig. 26).

All experiments where time dilation or length contraction are apparently measured are indirect measurements and where the experimental results are explained with time dilation or length contraction, which stand for the interactions between light and the measuring instruments, interactions that were omited.

In the case of the increase of the life time of moving muons the increase is because of the interactions between the FPs of the muons with the FPs of the matter that constitute the real frame relative to which the muons move. To explain it with time dilation only avoids that scientists search for the real physical origin of the increase of the life time.

19 Findings of the proposed approach.

The main findings of the proposed model [11], from which the present paper is an extract, are:

- The energy of a BSP is stored as rotations in FPs defining the longitudinal angular momenta of the emitted fundamental particles. The rotation sense of the longitudinal angular momenta of emitted fundamental particles defines the sign of the charge of the BSP.
- All the basic laws of physics (Coulomb, Ampere, Lorentz, Maxwell, Gravitation, bending of particles and interference of photons, Bragg) are derived from one vector field generated by the longitudinal and transversal angular momenta of fundamental particles, laws that in today's theoretical physics are introduced by separate definitions.
- The interacting particles (force carriers) for all types of interactions (electromagnetic, strong, weak, gravitation) are the FPs with their longitudinal and transversal angular momenta.
- Quantification and probability are inherent to the approach.
- The incremental time to generate the force out of linear momenta is quantized.
- Gravitation has its origin in the induced momenta when BSPs that have migrated outside their nuclei are reintegrated.
- The gravitation force is composed of an induced component and a component due to parallel currents of reintegrating BSPs. For galactic distances the induced component can be neglected, what explains the flattening of galaxies?rotation curve. (dark matter).
- The photon is a sequence of BSPs with potentially opposed transversal linear momenta, which are generated by transversal angular momenta of FPs that comply with specific symmetry conditions (pairs of opposed angular momenta).

- Permanent magnets are explained through closed energy flows at static BSPs stored in transversal angular momenta of FPs.
- All forces are the product of electronagnetic interactions described by QED. Interactions like QCD and Gauge/Gravity Duality are simply the product of the insufficiencies of the SM and not required.

Bibliography

Note: The present approach is based on the concept that fundamental particles are constantly emitted by electrons and positrons and constantly regenerate them. As the concept is not found in mainstream theory, no existing paper can be used as reference.

1. Günter Lehner. **Elektromagnetische Feldtheorie.** 7. bearbeitete Auflage 2010. Springer Verlag.

2. Hering · Martin · Stohrer. **Physik für Ingenieure.** Vierte, verbesserte Auflage 1992. VDI Verlag.

3. Albrecht Lindner. **Grundkurs Theoretische Physik.** Teubner Verlag, Stuttgart 1994.

4. Georg Joos. **Lehrbuch der Theoretischen Physik.** 15., völlig neu bearbeitete Auflage 1989. AULA-Verlag Wiesbaden.

5. Max Schubert / Gerhard Weber. **Quantentheorie, Grundlagen und Anwendungen.** Spektrum, Akad. Verlag 1993.

6. Harald Klingbeil. **Electromagnetische Feldtheorie.** 2. überarbeitete Auflage 2011, Vieweg + Teubner Verlag.

7. Martin Ammon / Johanna Erdmenger. **Gauge/Gravity Duality.** Cambridge University Press 2015.

8. Benenson · Harris · Stocker · Lutz. **Handbook of Physics.** Springer Verlag 2001.

9. B.R. Martin & G. Shaw. **Particle Physics.** John Wiley & Sons 2003.

10. Stephen G. Lipson. **Optik.** Springer Verlag 1997.

11. Osvaldo Domann. **"Emission & Regeneration" Field Theory.** June 2003. www.odomann.com.