"Emission & Regeneration" Unified Field Theory.

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(This paper is an extract of [10] listed in section References.)

Abstract

This work presents a relativistic mathematical space-distributed model for electrons and positrons, model that is based on Fundamental Particles (FPs) that are continuously emitted and absorbed by the electrons and positrons and where the energy is stored as rotations at the FPs defining longitudinal and transversal angular momenta. The rays of FPs from electrons or positrons cross in space at focal points where traditionally the energies of electrons or positrons are thought to be concentrated. Electrons and positrons interact via the angular momenta of their FPs. The rules of interactions between the longitudinal and transversal angular momenta of FPs are defined in that way, that the linear momenta for all known forces can be derived as rotors from one vector field generated by the longitudinal and transversal angular momenta of the FPs.

The model allows the deduction of all experimentally proven basic laws of physics, namely, Coulomb, Ampere, Lorentz, Gravitation, Maxwell and Bragg. It also explains the coexistence of particles with same charge in nucleons without the need of gluons, and explains the flattening of galaxies' rotation curve without defining dark matter.

From the model results that the focal radius of a subatomic particle is inverse proportional to its energy and, that the incremental time to generate the force out of linear momenta is quantized.

The neutrino is defined as a pair of FPs with opposed angular momenta and the photon introduced as a sequence of neutrinos.

1 Introduction.

The methodology of today's theoretical physics [1] to [9] consists in introducing first all known forces by separate definitions independent of their origin, arriving to quantum mechanics after postulating the particle's wave, and is then followed by attempts to infer interactions of particles and fields postulating the invariance of the wave equation under gauge transformations allowing the addition of minimal substitutions. The concept is shown in Fig. 1.

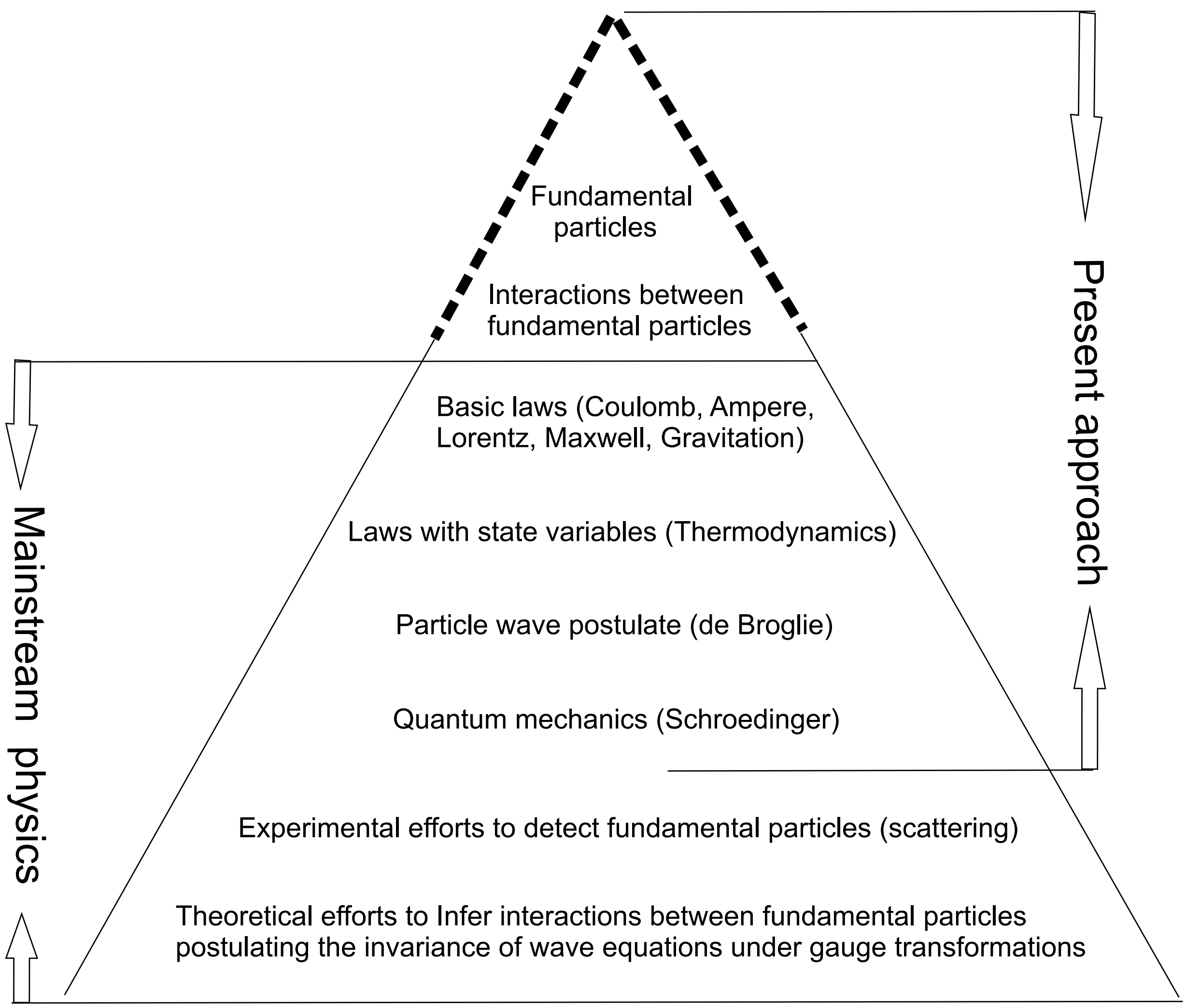

Figure 1: Methodology followed by the present approach

The present approach [10] models subatomic particles as emitting and absorbing continuously fundamental particles with longitudinal and transversal angular momenta (fields), and postulates then the interaction laws between angular momenta in that way that it is possible to deduce all known forces.

Today´s theoretical physics also postulates the particle-wave (de Broglie) to explain patterns observed in particle diffraction that look similar to patterns observed in wave diffraction experiments. The present approach shows that the patterns observed in particle diffraction are generated by quantized bending momenta that result from the quantized irradiated energy.

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.

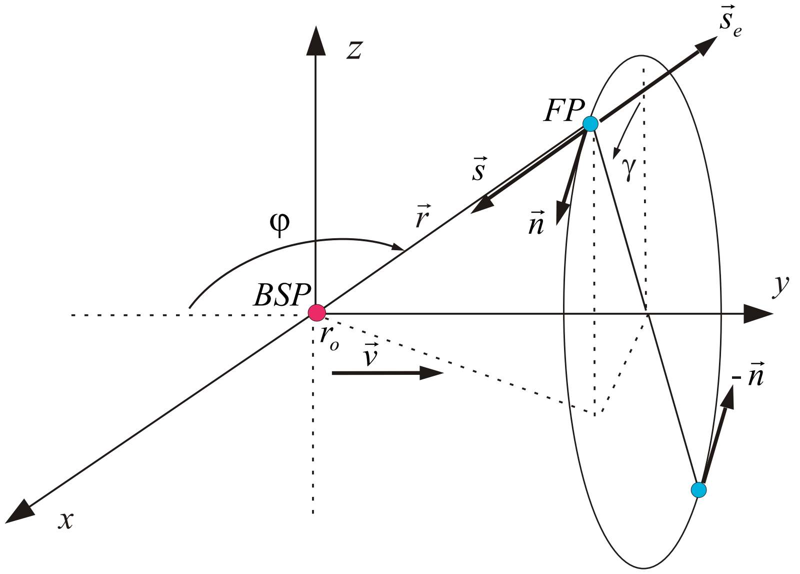

Figure 2: Unit vector $\bar{s}_e$ for an emitted FP and unit vectors $\bar{s}$ and $\bar{n}$ for a regenerating FP of a BSP moving with $v \neq c$

Electrons and positrons emit and are regenerated always by different types of FPs (see sec. 11) 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.

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 on their regenerating FPs, pairs that generate linear momenta 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.

Note: In this approach, Basic Subatomic Particles (BSPs) are the electron, the positron and the neutrino. The electron and the positron are BSPs with speeds lower than light speed and which emit and are regenerated by FPs. The neutrino is a BSP with light speed formed by two FPs with opposed angular momenta.

Complex Subatomic Particles (CSPs) are the proton, neutron and nuclei of atoms.

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

$$d\kappa = \frac{c}{2\, v} \left| \frac{\bar{v}_s}{|\bar{v}_e|} \times \frac{\bar{v}_r}{|\bar{v}_r|} \right| \frac{r_o}{r^2}\, dr\, d\varphi\, \frac{d\gamma}{2\pi} = \frac{1}{2}\, \frac{r_o}{r^2}\, dr\ \sin\varphi\, d\varphi\, \frac{d\gamma}{2\pi} \tag{4}$$

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 $dV = dr\ r d\varphi\ r \sin\varphi d\gamma$ of a FP.

The differential energies are stored in the longitudinal angular momenta $\bar{J}_e = J_e\ \bar{s}_e$ of emitted FPs and in the longitudinal $\bar{J}_s = J_s\ \bar{s}$ and transversal $\bar{J}_n = J_n\ \bar{n}$ angular momenta of regenerating FPs. The concept is shown in Fig. 3.

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

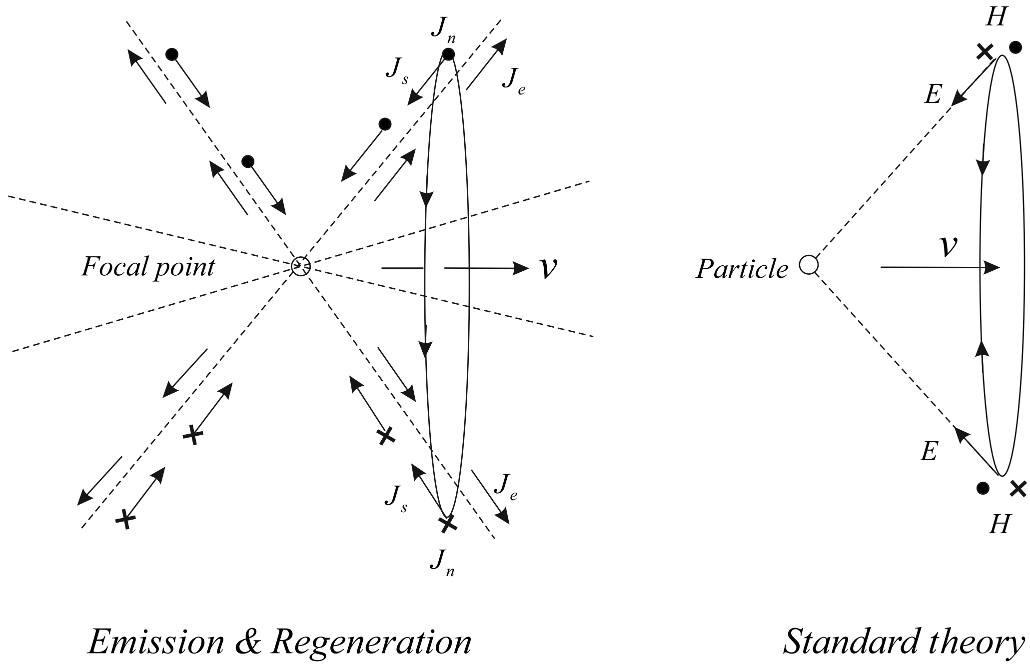

Figure 3: Particle as focal point in space

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 in today's theory is equivalent to 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 $dV = dr\ r d\varphi\ r \sin\varphi d\gamma$ of a FP (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. 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 define the sign of the charge of the BSP and the transversal angular momenta of the regenerating FPs define the mechanical and magnetic moments.

4 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

$$\bar{J}^{(s)}_{n_1} = -\,\mathrm{sign}(\bar{J}_{s_1})\,\mathrm{sign}(\bar{J}_{s_2})\,(\sqrt{J_{s_1}}\;\bar{s}_1\;\times\;\sqrt{J_{s_2}}\;\bar{s}_2) \tag{10}$$

If both sides of eq. (10) 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

$$dE^{(s)}_{n_1} = \left|\;\sqrt{\nu_{s_1}\;J_{s_1}\;d\kappa_1}\;\bar{s}_1 \times \sqrt{\nu_{s_2}\;J_{s_2}\;d\kappa_2}\;\bar{s}_2\;\right| \tag{11}$$

or

$$dE^{(s)}_{n_1} = |\;dH_{s_1}\;\bar{s}_1 \times dH_{s_2}\;\bar{s}_2\;| \qquad with \qquad dH_{s_i}\;\bar{s}_i = \sqrt{\nu_{s_i}\;J_{s_i}\;d\kappa_i}\;\bar{s}_i \tag{12}$$

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

$$dp = \frac{1}{c}\;dE^{(s)}_p \qquad with \qquad dE^{(s)}_p = \left|\int_{r_{r_1}}^{\infty} dH_{s_1}\;\bar{s}_1 \times \int_{r_{r_2}}^{\infty} dH_{s_2}\;\bar{s}_2\right| \tag{13}$$

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

$$\bar{J}^{(n)}_1 = -\,\mathrm{sign}(\bar{J}_{s_1})\,\mathrm{sign}(\bar{J}_{s_2})\,(\sqrt{J_{n_1}}\;\bar{n}_1\;\times\;\sqrt{J_{n_2}}\;\bar{n}_2) \tag{14}$$

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

$$dE^{(n)}_1 = |\;dH_{n_1}\;\bar{n}_1 \times dH_{n_2}\;\bar{n}_2\;| \qquad with \qquad dH_{n_i}\;\bar{n}_i = \sqrt{\nu_{n_i}\;J_{n_i}\;d\kappa_i}\;\bar{n}_i \tag{15}$$

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 $-\bar{J}'^{(n)}_1$, so that the components of the pair are equal and opposed, the generated linear momentum on the two BSPs is

$$dp = \frac{1}{c}\;dE^{(n)}_p \qquad with \qquad dE^{(n)}_p = \left|\int_{r_{r_1}}^{\infty} dH_{n_1}\;\bar{n}_1 \times \int_{r_{r_2}}^{\infty} dH_{n_2}\;\bar{n}_2\right| \tag{16}$$

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. 15)

5 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

$$dp_{stat}\ \bar{s}_R = \frac{1}{c}\oint_R \left\{ \frac{\bar{dl}\cdot(\bar{s}_{e_1}\times\bar{s}_{s_2})}{2\pi R} \int_{r_1}^{\infty} H_{e_1}\ d\kappa_{r_1} \int_{r_2}^{\infty} H_{s_2}\ d\kappa_{r_2} \right\} \bar{s}_R \tag{17}$$

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. (17) and because of its importance is analyzed in chapter 6.

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

$$dp_{dyn}\ \bar{s}_R = \frac{1}{c}\oint_R \left\{ \frac{\bar{dl}\cdot(\bar{n}_1\times\bar{n}_2)}{2\pi R} \int_{r_1}^{\infty} H_{n_1}\ d\kappa_{r_1} \int_{r_2}^{\infty} H_{n_2}\ d\kappa_{r_2} \right\} \bar{s}_R \tag{18}$$

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 (18).

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

$$dp_{ind}^{(s)}\ \bar{s}_R = \frac{1}{c}\oint_R \left\{ \frac{\bar{dl}\cdot\bar{s}}{2\pi R} \int_{r_r}^{\infty} H_s\ d\kappa_{r_r} \int_{r_p}^{\infty} H_{s_p}\ d\kappa_{r_p} \right\} \bar{s}_R \tag{19}$$

$$dp_{ind}^{(n)}\ \bar{s}_R = \frac{1}{c}\oint_R \left\{ \frac{\bar{dl}\cdot\bar{n}}{2\pi R} \int_{r_r}^{\infty} H_n\ d\kappa_{r_r} \int_{r_p}^{\infty} H_{s_p}\ d\kappa_{r_p} \right\} \bar{s}_R \tag{20}$$

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 and the gravitation laws are deduced from equations (19) and (20).

The total linear momentum for all equations is given by

$$\bar{p} = \int_\sigma dp\ \bar{s}_R \tag{21}$$

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.

$$d\bar{F} = \frac{dp}{dt} = \frac{1}{8\ \pi}\ \sqrt{m}\ r_o\ rot\ \frac{d}{dt} \int_{r_r}^{\infty} d\bar{H} \tag{22}$$

6 Analysis of linear momentum between two static BSPs.

In this section the static eq.(17) 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.(17) for two BSPs, neglecting the influence of the important dynamic eq.(18) 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. 4 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

$$\varphi_{min} = \arcsin \frac{r_o}{d} \qquad \varphi_{max} = \pi - \varphi_{min} \quad for \quad d \geq \sqrt{r_o^2 + r_o^2} \tag{23}$$

$$\varphi_{min} = \arccos \frac{d}{2\ r_o} \qquad \varphi_{max} = \pi - \varphi_{min} \quad for \quad d < \sqrt{r_o^2 + r_o^2} \tag{24}$$

and eq.(17) transforms to

$$p_{stat} = \frac{m\ c\ r_o^2}{4\ d^2} \int_{\varphi_{1_{min}}}^{\varphi_{1max}} \int_{\varphi_{2_{min}}}^{\varphi_{2max}} |\sin^3(\varphi_1 - \varphi_2)|\ d\varphi_2\ d\varphi_1 \tag{25}$$

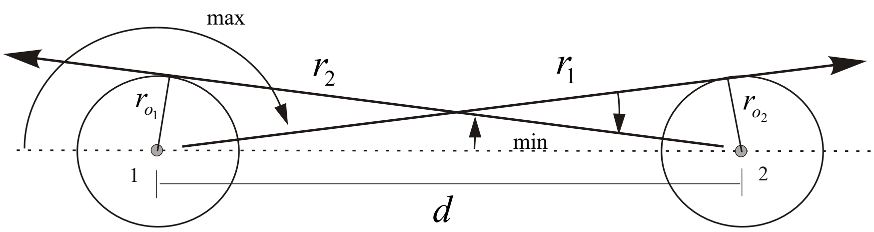

Figure 4: Integration limits for the calculation of the linear momentum between two static basic subatomic particles at the distance d

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.5 shows the curve of eq.(17) where five regions can be identified with the help of $d/r_o = \gamma$ from the integration limits:

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)

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.6 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 4.

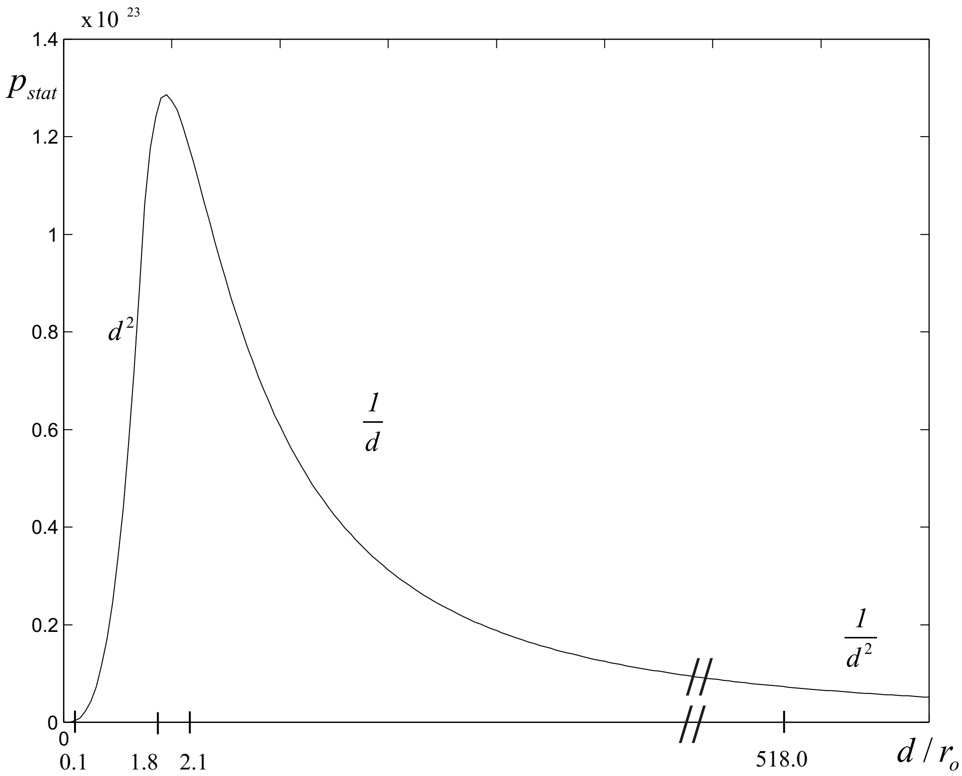

Figure 5: Linear momentum p_{stat} as function of $\gamma = d/r_o$ between two static BSPs with maximum at $\gamma = 2$

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. (20) 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. 4. 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

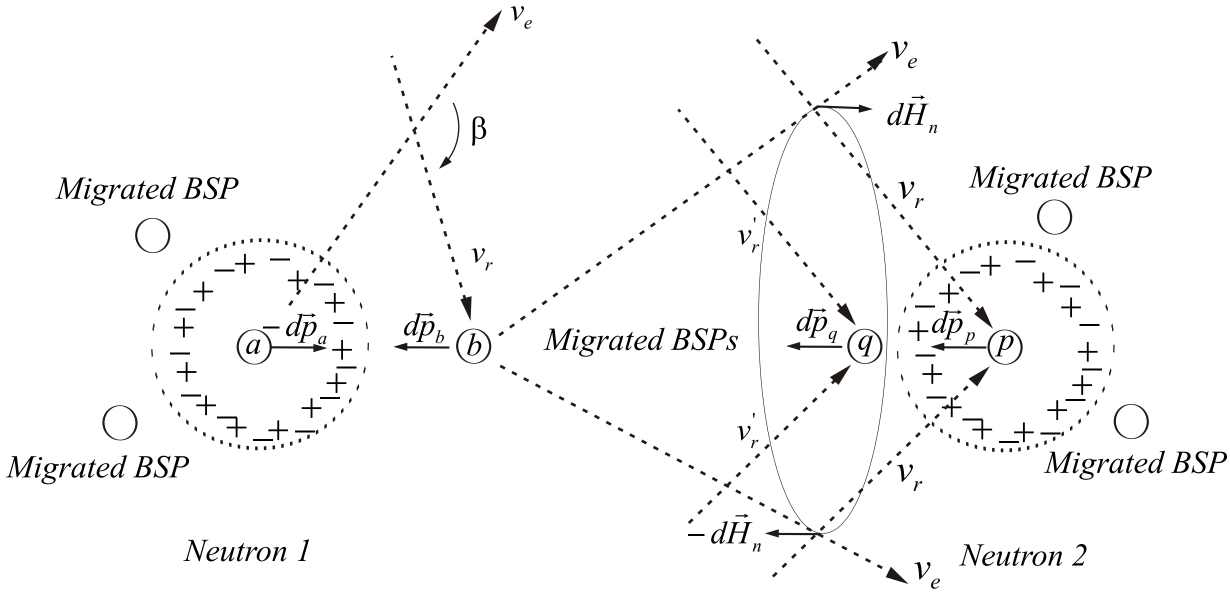

Figure 6: Transmission of momentum dp from neutron 1 to neutron 2

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.5. 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}

$$F_{trans} = \frac{1}{\Delta t} \frac{K^{'}}{d_{trans}} = \frac{1}{\Delta t} \frac{K_F^{'}}{d_{trans}^2} \tag{26}$$

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

The transition distance for a Carbon nucleus C^{12} is, with m_p and m_n the mass of the proton and neutron respectively,

$$d_{trans} = \gamma \; r_o = \gamma \; \frac{\hbar \; c}{E_o} = 518 \; \frac{\hbar \; c}{6 \; (m_p + m_n) \; c^2} = 9.0724 \; fm \tag{27}$$

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

7 Time quantification and the radius of a BSPs.

The relation between the total force and the linear momentum for all the fundamental equations of chapter 5 is given by

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

with the momentum time Δt between the two BSPs defined as

$$\Delta t = K\; r_{o_1}\; r_{o_2} \qquad where \qquad K = 5.4271 \cdot 10^4 \;\left[\frac{s}{m^2}\right] \tag{29}$$

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

The constant K results when eqs. (17) and (18) are equalized respectively with the Coulomb and the Ampere equations

$$F_{stat} = \frac{1}{4\pi\epsilon_o}\,\frac{Q_1\,Q_2}{d^{\,2}} \qquad\qquad F_{dyn} = \frac{\mu_o}{2\pi}\,\frac{I_1\,I_2}{d} \tag{30}$$

The radius r_o of a particle is given by

$$r_o = \frac{\hbar\, c}{E} \qquad with \qquad E = \sqrt{E_o^2 + E_p^2} \qquad for\;\; BSPs\;\; with\;\; v \neq c \tag{31}$$

and

$$E = \hbar\omega \qquad for\;\; BSPs\;\; with\;\; v = c \tag{32}$$

and is derived from the quantified far field of the irradiated energy of an oscillating BSP [10].

8 Quantification of irradiated energy.

To express the energy irradiated by a BSP as quantified irradiation we start with

$$E = E_e = E_s + E_n = \sqrt{E_o^2 + E_p^2} \qquad \Delta t = K r_o r_{o_p} \qquad r_o = \frac{\hbar\, c}{E_e} \qquad r_{o_p} = \frac{\hbar\, c}{E_o} \tag{33}$$

with r_o the radius of the moving particle and r_{o_p} the radius of the probe particle and

$$\Delta_o t = \Delta t_{(v=0)} = K\,\frac{\hbar^2\, c^2}{E_o^2} = 8.082097 \cdot 10^{-21}\;\; s \quad with \quad K = 5.4274 \cdot 10^4\; s/m^2 \tag{34}$$

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

$$E_e \, \Delta t = K \, \frac{\hbar^2 \, c^2}{E_o} = K \, \frac{h^2}{4 \, \pi^2 \, m} = h \qquad E_e = h \, \nu_e \qquad \nu_e = \frac{1}{\Delta t} \tag{35}$$

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

$$E_e \, \Delta t = E_o \, \Delta_o t = h \qquad E_o = h \, \nu_o \qquad \nu_o = \frac{1}{\Delta_o t} = 1.2373 \cdot 10^{20} \;\; s^{-1} \tag{36}$$

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.

For the expression of the energy $E = J \, \nu$ two different assumptions are possible:

- That the angular momentum J is variable and that an universal frequency ν_g exists.
- That an universal angular momentum h exists and that the frequency ν is variable. This assumption will be followed now.

We define the quantized emission of energy at a BSP defining the power as

$$P_e = \frac{E_e}{\Delta_o t} = E_e \, \nu_o \tag{37}$$

With the equation (36) which states that $E_e \, \Delta t = E_o \, \Delta_o t = h$ we get

$$P_e = \frac{E_e}{\Delta_o t} = E_e \, \nu_o = \frac{E_o}{\Delta t} = E_o \, \nu_e = E_o \, (\nu_s^{''} + \nu_n^{''}) = P_s^{''} + P_n^{''} = \frac{(E_s + E_n)}{\Delta_o t} \tag{38}$$

or

$$P_e = E_o \, \nu_e = E_e \, \nu_o \qquad P_s^{''} = E_o \, \nu_s^{''} = E_s \, \nu_o \qquad P_n^{''} = E_o \, \nu_n^{''} = E_n \, \nu_o \tag{39}$$

Note: The emitted and regenerating powers have different frequencies ν_e, $\nu_s^{''}$ and $\nu_n^{''}$ but a common energy quanta E_o.

We also get

$$\nu_s^{''} = \frac{E_s}{E_o \, \Delta_o t} = \frac{E_s}{E_o} \, \nu_o = \frac{E_s}{h} \qquad \textit{and} \qquad \nu_n^{''} = \frac{E_n}{E_o \, \Delta_o t} = \frac{E_n}{E_o} \, \nu_o = \frac{E_n}{h} \tag{40}$$

and conclude that

$$E_e = h\,\nu_e \qquad E_s = h\,\nu_s^{''} \qquad E_n = h\,\nu_n^{''} \qquad with \qquad \nu_e = \nu_s^{''} + \nu_n^{''} \tag{41}$$

With

$$dE = E\,d\kappa \qquad dH = \sqrt{E}\,d\kappa = H\,d\kappa \tag{42}$$

and

$$\frac{H}{\sqrt{\Delta t}} = \sqrt{E\,\nu} = \sqrt{P} \tag{43}$$

the equations for the Coulomb, Ampere and induction forces of sec. 5 can be transformed to

$$d^{'}F\,\bar{s}_R = \frac{d^{'}p}{\Delta_o t}\,\bar{s}_R \;\propto\; \frac{1}{c}\oint_R \left\{ \int_{r_1}^{\infty} \frac{H_1}{\sqrt{\Delta_o t}}\,d\kappa_{r_1} \int_{r_2}^{\infty} \frac{H_2}{\sqrt{\Delta_o t}}\,d\kappa_{r_2} \right\}\,\bar{s}_R \tag{44}$$

and expressed as a function of the powers of the interacting BSPs

$$d^{'}F\,\bar{s}_R = \frac{d^{'}p}{\Delta_o t}\,\bar{s}_R \;\propto\; \frac{1}{c}\oint_R \left\{ \int_{r_1}^{\infty} \sqrt{P_1}\,d\kappa_{r_1} \int_{r_2}^{\infty} \sqrt{P_2}\,d\kappa_{r_2} \right\}\,\bar{s}_R \tag{45}$$

with

$$P_1 = E_1\,\nu_o = E_o\,\nu_1 \qquad and \qquad P_2 = E_2\,\nu_o = E_o\,\nu_2 \tag{46}$$

The differential energy fluxes are given with

$$dP_e = \nu_e\,E_o\,d\kappa \qquad dP_s = \nu_s\,E_o\,d\kappa \qquad dP_n = \nu_n\,E_o\,d\kappa \tag{47}$$

and with

$$d\kappa = \frac{1}{2}\,\frac{r_o}{r^2}\,dr\,\sin\varphi\,d\varphi\,\frac{d\gamma}{2\pi} \qquad and \quad dA = r^2\,\sin\varphi\,d\varphi\,d\gamma \tag{48}$$

The concept is shown in Fig. 7.
we define the differential energy flux density as

$$dS = \frac{dP}{dA} = \frac{1}{4\pi}\,\nu\,E_o\,\frac{r_o}{r^4}\,dr \qquad \frac{J}{m^2\,s} \tag{49}$$

The cumulated differential energy flux density is

$$\int_r^{\infty} dS = \frac{1}{dA}\int_r^{\infty} dP = -\,\frac{1}{12\pi}\,\nu\,E_o\,\frac{r_o}{r^3} \qquad \frac{J}{m^2\,s} \tag{50}$$

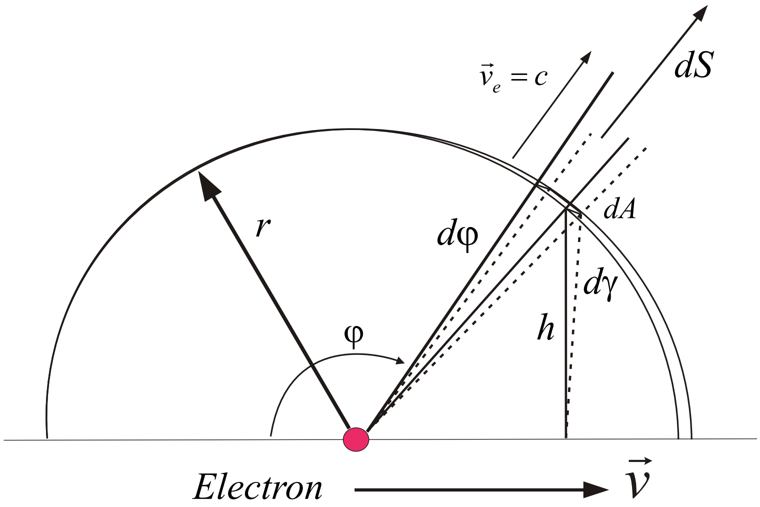

Figure 7: Emitted Energy flux density dS of a moving electron

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 doesn´t define who is moving relative to whom.

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

The emitted differential energy is

$$dE_e = E_e\, d\kappa = \frac{h}{\Delta t}\ \frac{1}{2}\, \frac{r_o}{r^2}\, dr\ \sin\varphi\, d\varphi\, \frac{d\gamma}{2\pi} \tag{51}$$

With the help of Fig. 7 we see that the area of the sphere is $A = 4\pi r^2$, and we get

$$dE_e = \frac{h}{\Delta t\ A}\ \ r_o\, dr\ \sin\varphi\, d\varphi\, d\gamma \tag{52}$$

We now define

$$dE_e = \sigma_h\ \ r_o\, dr\ \sin\varphi\, d\varphi\, d\gamma \quad with \quad \sigma_h = \frac{h}{\Delta t\ A} \tag{53}$$

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

We can also write

$$dE_e = \sigma_h\ \ dA \quad with \quad dA = r_o\, dr\ \sin\varphi\, d\varphi\, d\gamma \tag{54}$$

9 Ampere bending (Bragg law).

From sec. 4 we have that the momentum $d\bar{p}$ generated between two moving BSPs due to the interaction of their transversal angular momentum is

$$d\bar{p} = \frac{1}{c} \left| \int_{r_{r_1}}^{\infty} dH_{n_1}\, \bar{n}_1 \times \int_{r_{r_2}}^{\infty} dH_{n_2}\, \bar{n}_2 \right| \tag{55}$$

The Bragg equation is deduced from the equation of the force density between two parallel conductors [6]

$$\frac{F}{dl} = \frac{b}{c\,\Delta_o t}\,\frac{r_o^2}{64\,m}\,\frac{I_{m_1}\,I_{m_2}}{d} \int_{\gamma_{2min}}^{\gamma_{2max}} \int_{\gamma_{1min}}^{\gamma_{1max}} \frac{\sin^2(\gamma_1-\gamma_2)}{\sqrt{\sin\gamma_1\,\sin\gamma_2}}\, d\gamma_1\, d\gamma_2 \tag{56}$$

with $\int\int = 5.8731$ and $b = 0.25$.

Equation (56) results from eq. (18) of sec. 4 when applied to two parallel conductors with mass currents I_{m_1} and I_{m_2} where for $v \ll c$

$$I_m = \rho_x\, m\, v \qquad \rho_x = \frac{N_x}{\Delta x} \qquad \Delta_o t = K\, r_o^2 \tag{57}$$

The linear density ρ_x is defined as the number N_x of BSPs per length Δx of the conductor. The relation between the mass current I_m and the electric current I_c is given by

$$I_m = \frac{m}{q}\, I_c = 5,685631378 \cdot 10^{-12}\, I_c \left[\frac{kg}{s}\right] \tag{58}$$

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

The BSPs that interact now trough their transversal angular momentum are the moving BSP and the parallel reintegrating BSP of a nucleon described in sec. 6. The concept is shown in Fig. 8

We get with

$$I_m = \rho_x\, m\, v \qquad \rho_x = \frac{N_x}{\Delta x} = \frac{1}{2\, r_o} \qquad p = F\, \Delta_o t \tag{59}$$

the bending momentum p

$$p = \frac{b}{4}\,\frac{5.8731}{64\,c}\,\frac{\sqrt{m}\,v_1\,\sqrt{m}\,v_2}{d}\,\Delta l \tag{60}$$

and with $\sqrt{E_n} = \sqrt{h\,\nu_n} = H_n = \sqrt{m\,v^2} = \sqrt{m}\,v$ we get

$$p = \frac{b}{4}\,\frac{5.8731}{64\,c}\,\frac{h\,\sqrt{\nu_{n_1}\,\nu_{n_2}}}{d}\,\Delta l \tag{61}$$

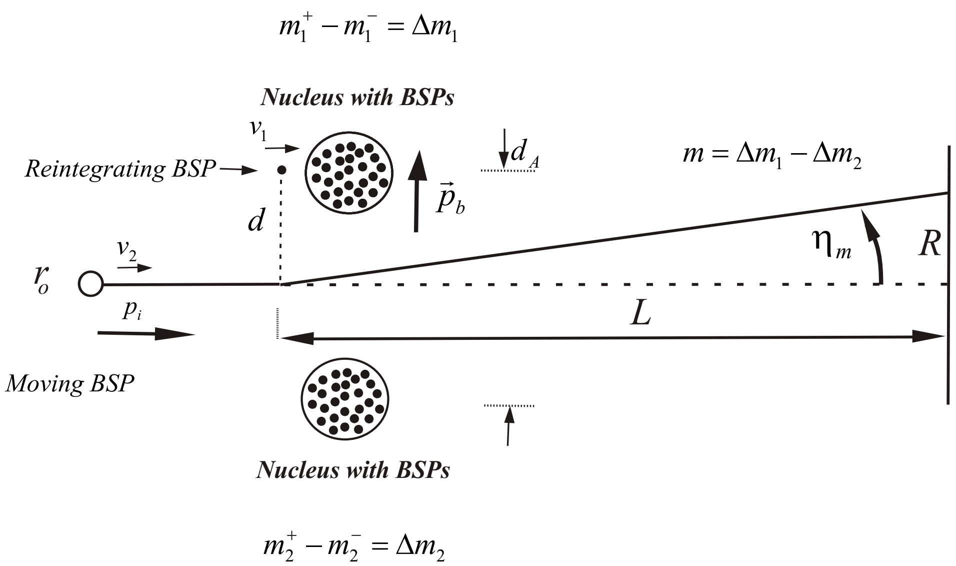

Figure 8: Bending of BSPs

The concept is shown in Fig. 9

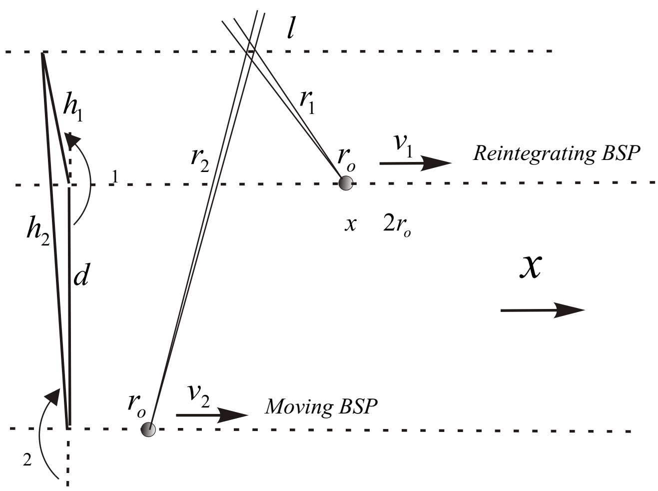

Figure 9: Geometric relations for single moving BSPs.

From sec. 8 we have that

$$P_n = \frac{E_n}{\Delta_o t} = E_n \, \nu_o = E_o \, \nu_n \qquad or \qquad \nu_n = \frac{E_n}{E_o} \, \nu_o \tag{62}$$

and we get

$$p = \frac{b}{4} \, \frac{5.8731}{64 \, c} \, \frac{h \, \sqrt{E_{n_1} \, E_{n_2}} \, \nu_o}{E_o \, d} \, \Delta l \tag{63}$$

For the moving BSP we have, that $\Delta l = v_1 \; \Delta'' t$ and the product $\sqrt{E_{n_1}} \; \Delta'' t = H_{n_1} \; \Delta'' t = \sqrt{m} \; \Delta l$ is independent of the velocity v_1 for a given Δl. The increase of H_{n_1} with the speed v_1 is compensated by the reduction of the time $\Delta'' t$ the moving BSP remains in Δl, reducing proportionally the number of fundamental particles emitted by the moving BSP that can interact with fundamental particles of the reintegrating BSP, while moving through Δl .

We know that the bending is quantized and we introduce in the equation the quantization of the energy making $E_{n_1} = E_{n_2} = E_o$ and we get

$$p_b = \frac{b}{4} \, \frac{5.8731}{64 \, c} \, \frac{h \, \nu_o}{d} \, \Delta l \; n \tag{64}$$

where n gives the number of energy quanta of E_o interchanged between the two BSPs.

If we now write the bending equation with the help of $\tan \eta = 2 \sin \theta$ for small η we get

$$\sin \theta = \frac{p_b}{2 \, p_i} = \frac{b}{4} \, \frac{5.8731}{64} \, \frac{\nu_o}{c} \, \Delta l \, \frac{h}{2 \, p_i \, d} \; n \tag{65}$$

and with $2 \; d = d_A$, where d_A is the interatomic distance and we get

$$\sin \theta = \frac{p_b}{2 \, p_i} = \left(\frac{b}{2} \, \frac{5.8731}{64} \, \frac{\nu_o}{c} \, \Delta l \right) \, \frac{h}{2 \, p_i \, d_A} \; n \tag{66}$$

which is the Bragg equation except for the proportionality factor which can be adapted to the Bragg equation through the distance Δl that we assume is constant.

The Bragg equation is

$$\sin \theta = \frac{h}{2 \, p_i \, d_A} \; n \tag{67}$$

resulting for Δl with $\nu_o = 1.2373 \cdot 10^{20} \;\; s^{-1}$ and $b = 0.25$

$$\Delta l = 2 \, \frac{64 \, c}{5.8731 \, \nu_o} = 2.1137 \cdot 10^{-10} \;\; m \tag{68}$$

which is in the order of interatomic distances that are constant for each electron diffraction experiment.

Conclusion: We have derived the Bragg equation without the concept of particle-wave introduced by de Broglie. Numerical results obtained using the quantized irradiated energy instead of the particle-wave are equivalent, different is the physical interpretation of the underlying phenomenon.

10 BSP with light speed.

BSPs with speeds $v \neq c$ emit and are regenerated continuously by fundamental particles that have longitudinal and transversal angular momenta. With $v \to c$, eq. (7) becomes zero and so the longitudinal field $d\bar{H}_s$ and the corresponding angular momentum $\bar{J}_s$. According eq. (8) only the transversal field $d\bar{H}_n$ and the corresponding angular momentum $\bar{J}_n$ remain. With $v \to c$, the BSP reduces to a pair of FPs with opposed transversal angular momenta $\bar{J}_n$, with no emission (no charge) nor regeneration.

The concept is shown in Fig. 10

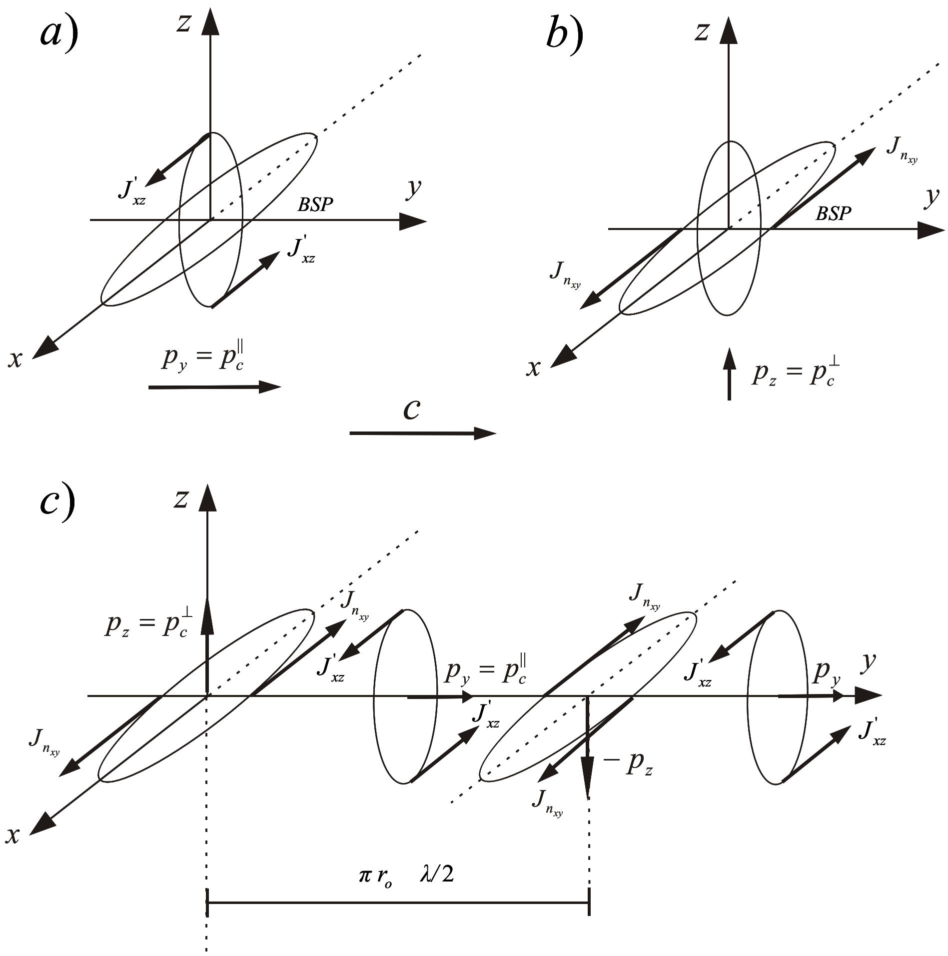

Figure 10: Different forms of BSP with light speed

Fig. 10 shows at **a)** a BSP with parallel $\bar{p}_c^{\parallel}$ linear momentum and at **b)** with transversal $\bar{p}_c^{\perp}$ linear momentum. At **c)** a possible configuration of a photon is shown as a sequence of BSPs with light speed with alternated transversal linear momentums $\bar{p}_c^{\perp}$, which gives the wave character, and intercalated BSPs with longitudinal momentums $\bar{p}_c^{\parallel}$ that gives the particle character to the photon.

Conclusion: BSPs with light speed are composed of pairs of FPs with opposed angular momenta $\bar{J}_n$, they don't emit and are not regenerated by FPs. They are not bound to en environment that supplies continuously FPs to regenerate them. The potential linear momentum $\bar{p}_c$ of each pair of opposed angular momenta can have any orientation relative to the speed $\bar{c}$. BSPs with light speed can be identified with the neutrinos.

10.1 Redshift of the energy of a complex BSP with light speed (photon) in the presence of matter.

Fig. 11 shows a sequence of BSPs with light speed (photon) with their potential linear momenta p before and after the interaction with the ray of regenerating FPs of the BSPs of matter. When the regenerating rays are approximately perpendicular to the trajectory of the opposed dH_n (dots and crosses) fields of the photon, part of the energy of the dH_n field is absorbed by the regenerating FPs of the ray and carried to the BSPs of the matter. The photon doesn't change its direction and loses energy to the BSPs of the matter shifting its frequency to the red. The inverse process is not possible because the BSPs of the photon (opposed dH_n fields) have no regenerating rays of FPs that can carry energy from the BSPs of matter and shift the frequency to the violet.

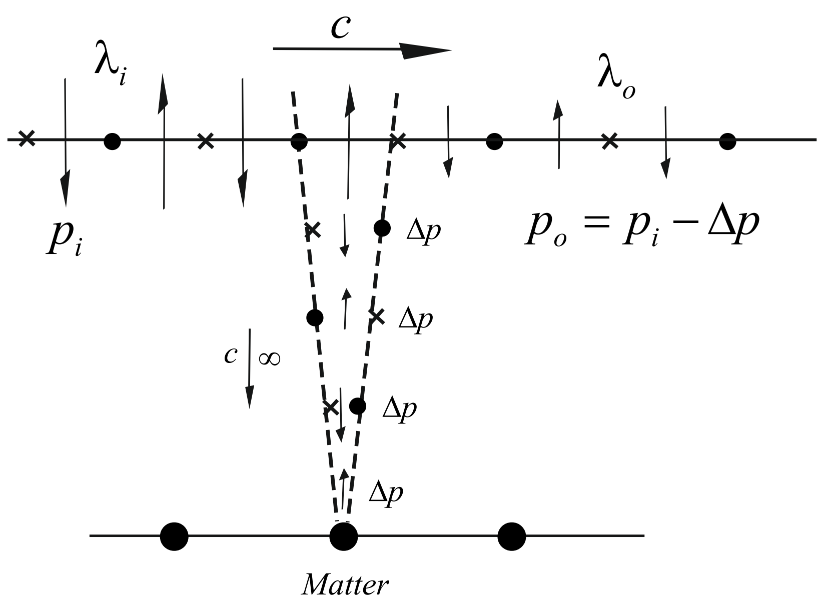

Figure 11: Loss of energy of a BSP with $v = c$

The process of loss of energy is according the interaction law **3)** of sec. 4 which postulates that pairs of regenerating FPs with longitudinal angular momenta from a BSP can adopt opposed pairs of transversal angular momentum from another BSP (see

Fig. 15). As photons have no regenerating FPs they can only leave pairs of transversal angular momentum to other BSPs and lose energy. During the red shift, two adjacent opposed potential linear momenta of the photon compensate partially by passing part of their opposed linear momenta to the BSP of matter.

The energy exchanged between a photon and an electron is

$$E_i = \frac{h\ c}{\lambda_i} \qquad\qquad E_b = \frac{p_b^2}{2\ m_p} \tag{69}$$

The frequency shift of the photon is with $E_i = E_o + E_b$

$$\Delta\nu = \nu_i - \nu_o = \frac{1}{h}(E_i - E_o) = \frac{E_b}{h} \qquad z = \frac{\Delta\nu}{\nu_i} \tag{70}$$

where $E_i = h\ c/\lambda_i$ is the energy before the interaction, $E_o = h\ c/\lambda_o$ the energy after the interaction and E_b the energy carried to the BSP of matter.

Light that comes from far galaxies loses energy to cosmic matter resulting in a red shift approximately proportional to the distance between galaxy and earth (Big Bang).

Light is not bent by gravitation nor by a bending target, it is reflected and refracted by a target.

11 Conventions introduced for BSPs.

Fig. 12 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.

Fig. 13 shows a neutron and a proton with the rays for emitted and regenerating FPs. The complex BSPs are formed of accelerating positrons and decelerating electrons.

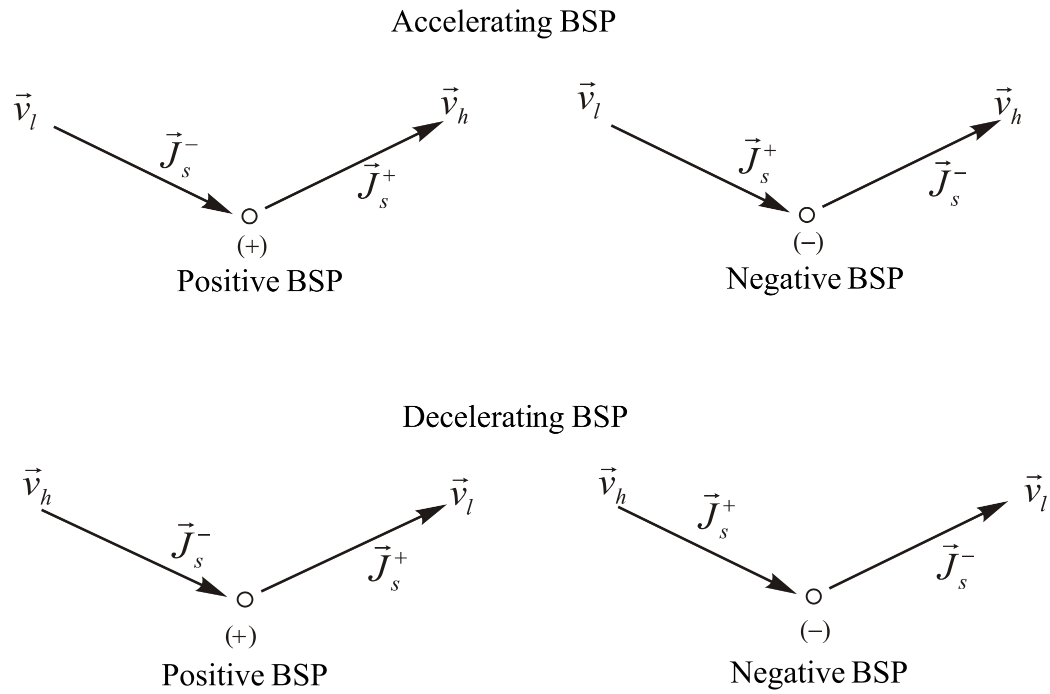

Figure 12: Conventions for BSPs

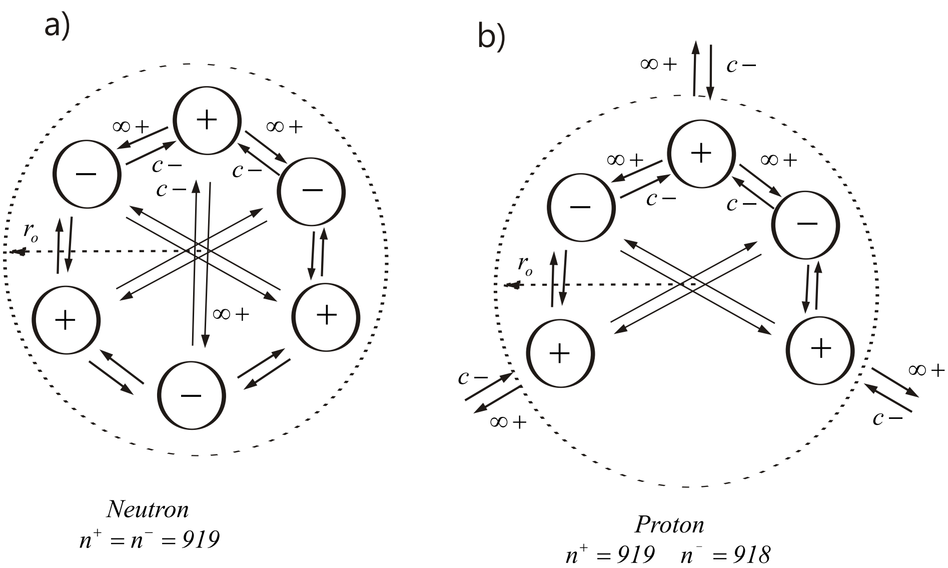

Figure 13: Neutron and proton
composed of accelerating positrons and decelerating electrons

Fig. 14 shows a neutron with one migrated BSP and the corresponding leaking fields.

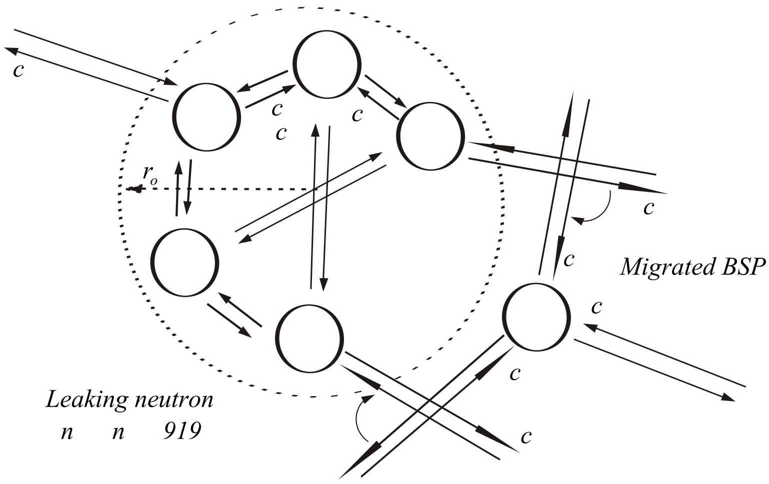

Figure 14: Neutron with migrated BSP

12 Mechanism of elastic and destructive scattering of particles.

In the present approach the energy of a BSP is distributed in space around the radius 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. 15.

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. 4, 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

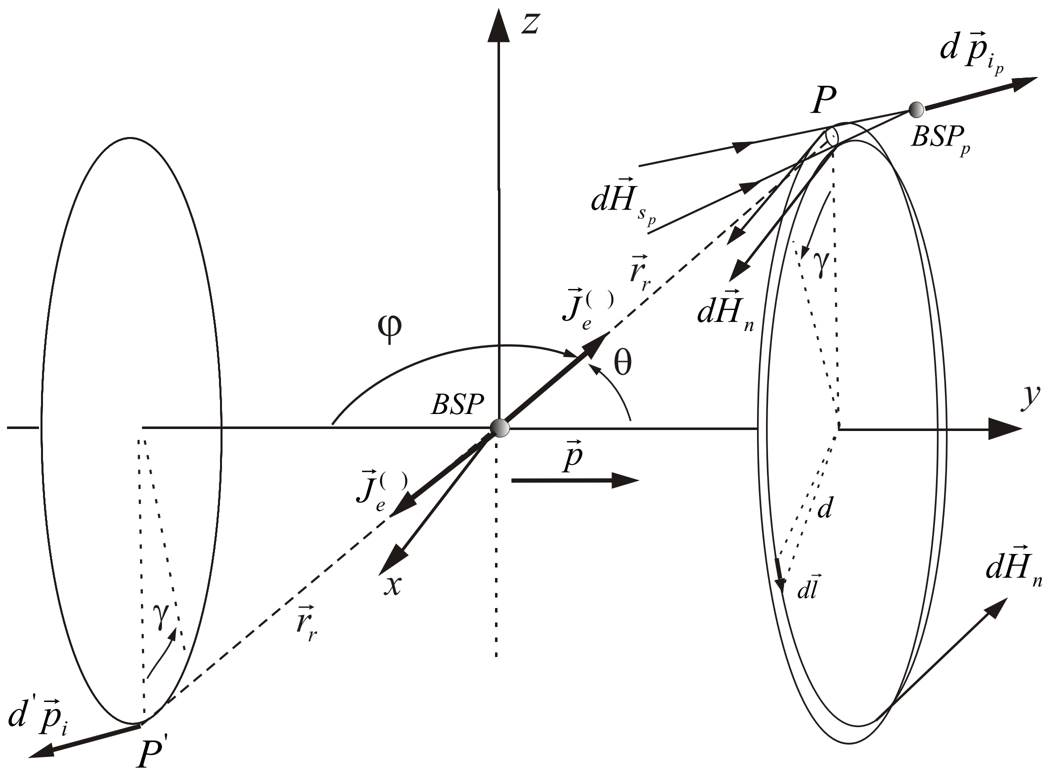

Figure 15: Linear momentum balance between static and moving BSPs

$d\kappa(\pi - \theta) = d\kappa(\theta)$.

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 $\bar{J}_e^{(\pm)}$.

In a complex SP formed by more than one BSP, a mutual regeneration between the BSPs exists. The emitted positive $\bar{J}_e^{(+)}$ of the positive BSPs regenerate the negative BSPs, and the emitted negative $\bar{J}_e^{(-)}$ of the negative BSPs regenerate the positive BSPs. BSPs that have no opposed pair inside the nucleus emit their FPs with the longitudinal angular momenta $\bar{J}_e^{(+)}$ generating $d\bar{H}$ fields beyond the radius of the nucleus. Opposed angular momenta of the $d\bar{H}$ field beyond the radius are responsible for the "electromagnetic" interactions.

Elastic scattering.

Elastic scattering occurs "electromagnetically" beyond the radius r_o of the nucleus, and "mechanically" at the radius r_o.

Elastic electromagnetic scattering occurs when charged (difference between the constituent numbers of BSPs with different sign) complex SPs interact without entering in mechanical contact. Interactions are limited to the interactions of their fields beyond the radius r_o of the particles. The complex particles maintain the internal distribution of their BSPs and, because of the weak accelerations, the internal mutual regeneration between the BSPs that form the complex particles is not disturbed.

Elastic mechanic scattering occurs when neutral complex particles enter in mechanical contact maintaining the internal distribution of their BSPs, but the acceleration is already strong enough to disturb the internal mutual regeneration between the BSPs. The angular momenta of the pairs of BSPs are not more compensated inside the nucleus and each BSP of the complex SP interchanges opposed angular momenta with the scattering partner (mass).

Plastic or destructive scattering.

Plastic or destructive scattering we have when distances between the scattering partners are smaller than r_o. 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 postulates defined in chapter 4 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.

13 Dark matter.

In sec. 6 we have seen that the origin of the gravitation force is the induced force due to the reintegration of migrated BSPs in the direction of the two gravitating bodies. 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. 16.

As the numbers of positive (Δ_R^+) and negative (Δ_R^-) BSPs that migrate in one

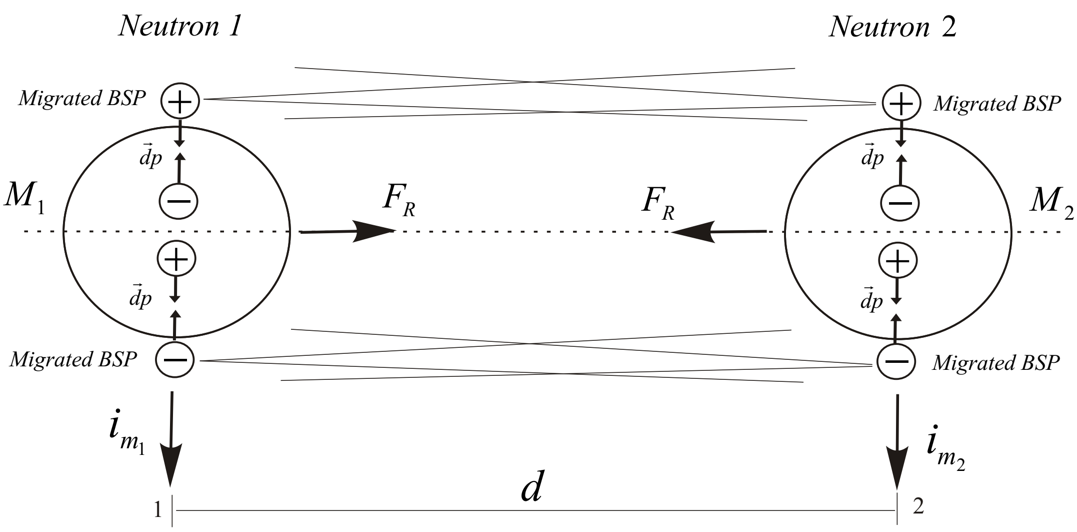

Figure 16: Resulting current due to reintegration of migrated BSPs

direction at one neutron are equal, no average current should exists in that direction in the time Δt. It is

$$\Delta_R = \Delta_R^+ + \Delta_R^- = 0 \tag{71}$$

We now assume, that because of the energy interchange between the two neutrons, a synchronization exists between the reintegration of BSPs of equal sign in the orthogonal direction of the two neutrons, resulting in parallel currents of equal signs that generate an attracting force between the neutrons. Thus the resulting attractive force between the two neutrons is produced by two components; the induced force F_G due to the reintegration of migrated BSPs in the direction of the two gravitating bodies and the force F_R due to parallel currents of reintegrating BSPs.

$$F_T = F_G + F_R \qquad with \qquad F_G = G\,\frac{M_1\;M_2}{d^2} \qquad and \qquad F_R = R\,\frac{M_1\;M_2}{d} \tag{72}$$

To obtain an equation for the force F_R we start with eq. (64) from sec. 9 which was calculated for one pair of parallel moving BSPs

$$p_b = \frac{1}{4}\,\frac{5.8731}{64\;c}\,\frac{h\;\nu_o}{d}\,\Delta l\;n \tag{73}$$

with

$$\nu_o = 1.2373 \cdot 10^{\,20} \;\; s^{-1} \qquad \Delta l = 5.2843 \cdot 10^{-11} \;\; m \qquad \Delta_o \, t = 8.0821 \cdot 10^{-21} \;\; s^{-1} \tag{74}$$

and

$$dF_R = \frac{p_b}{\Delta_o t} \qquad n = 1 \tag{75}$$

The force for one pair of BSPs is given by

$$dF_R = \frac{p_b}{\Delta_o t} = \frac{K_{Dark}}{d} \qquad with \qquad K_{Dark} = \frac{1}{2}\,\frac{h}{\Delta_o t} = 4.09924 \cdot 10^{-14} \;\; m \tag{76}$$

The total force is

$$F_R = \frac{K_{Dark}}{d}\;\Delta_{R_1}\;\Delta_{R_2} = R\;\frac{M_1\;M_2}{d} \tag{77}$$

We get

$$\Delta_{R_1}\;\Delta_{R_2} = \frac{R}{K_{Dark}}\;M_1\;M_2 \tag{78}$$

or

$$\Delta_{R_1}\;\Delta_{R_2} = \gamma_R^2\;M_1\;M_2 \qquad with \qquad \gamma_R^2 = \frac{R}{K_{Dark}} \tag{79}$$

and

$$\Delta_R = \gamma_R\;M \tag{80}$$

The total attraction force gives

$$F_T = F_G + F_R = \left[\frac{G}{d^2} + \frac{R}{d}\right]\;M_1\;M_2 \tag{81}$$

For sub-galactic distances the induced force F_G is predominant, while for galactic distances the force of parallel reintegrating BSPs F_R predominates, as shown in Fig. 17.

Calculation example:

For the sun with $v_{orb} = 220\;km/s$ and $M_2 = M_\odot = 2 \cdot 10^{30}\;kg$ and a distance to

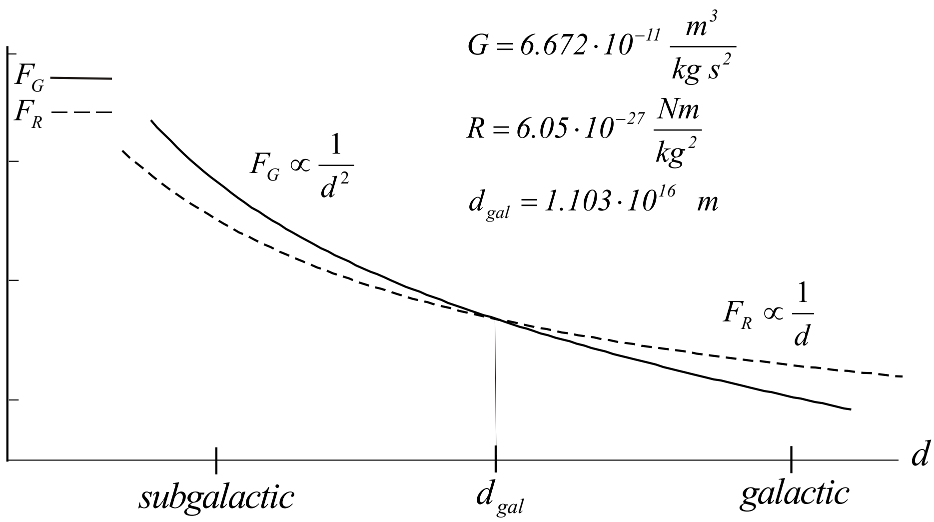

Figure 17: Gravitation forces at sub-galactic and galactic distances.

the core of the Milky Way of $d = 25 \cdot 10^{19}\ m$ we get a centrifugal force of

$$F_c = M_2 \frac{v_{orb}^2}{d} = 3.872 \cdot 10^{20} \ \ N \tag{82}$$

With the mass of the core of the Milky Way of $M_1 = 4 \cdot 10^6\ M_\odot$ and

$$F_c = F_T \approx F_R = R \frac{M_1\ M_2}{d} \qquad we\ get \qquad R = 6.05 \cdot 10^{-27} \ \ Nm/kg^2 \tag{83}$$

and with

$$F_G = F_R \qquad we\ get \qquad d_{gal} = \frac{G}{R} = 1.103 \cdot 10^{16} \ \ m \tag{84}$$

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

We also have that

$$\gamma_R = \sqrt{\frac{R}{K_{Dark}}} = 3.842 \cdot 10^{-7} \ \ kg^{-1} \tag{85}$$

If we compare with $\gamma_G = 6.061 \cdot 10^7 \ \ kg^{-1}$ for the induced force we see that γ_R is very small.

Conclusion: 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 remaining the component generated by parallel currents which is responsible for the flattening of galaxies´ rotation curves.

Note: We also may assume that the synchronization of the reintegrating BSPs in the orthogonal direction of the two neutrons results in parallel currents of opposed signs, generating a repulsive force between the two neutrons.

14 Quantification of forces between BSPs and CSPs.

In the section " Induction between an accelerated and a probe BSP expressed as closed path integration over the whole space" from [10] we have that the maximum speed a reintegrating BSP gets is $v_{max} = k\,c$ with $k = 7.4115 \cdot 10^{-2}$. We define the elementary linear momentum p_{elem} as follows:

$$p_{elem} = m\,c\,k = \frac{h}{c\,\Delta_o t}\,k = 2.0309 \cdot 10^{-23}\ \ kg\ m\ s^{-1} \tag{86}$$

with $\Delta t(v=0) = \Delta_o t = 8.082110^{-21}\ \ s.$

In the following subsections we ill express all known forces quantized in elementary linear momenta p_{elem}

14.1 Quantification of the Coulomb force.

In Sec. 5 we have presented eq. (17) which for the Coulomb force between two BSPs gives the following equation

$$F_2 = \frac{a\,m\,c\,r_o^2}{4\,\Delta t\,d^{\,2}} \int\!\!\int_{Coulomb} \qquad with \qquad \int\!\!\int_{Coulomb} = 2.0887 \tag{87}$$

where $a =$ is a tuning constant.

With $v = 0$ we write the equation as follows

$$F_2 = N_C(d)\,\frac{1}{\Delta_o t}\,p_{elem} = N_C(d)\,\nu_o\,p_{elem} \tag{88}$$

with

$$N_C(d) = \frac{a\,r_o^2}{4\,k\,d^{\,2}} \int\!\!\int_{Coulomb} = 9.18124 \cdot 10^{-26}\,\frac{1}{d^2} \tag{89}$$

$N_C(d)$ gives the number of FPs of the two BSPs that cross and interact in space during the time $\Delta_o t$ and which generate elementary linear momentum p_{elem} resulting in the force F_2.

For an inter-atomic distance of $d = 10^{-10}\ m$ we get $N_C = 9.18124 \cdot 10^{-6}$ resulting a frequency of crossings of FPs of

$$\nu_C(d) = N_C(d)\,\nu_o = 1.13599 \cdot 10^{15}\ \ s^{-1} \qquad for \qquad d = 10^{-10}\ m \tag{90}$$

14.2 Quantification of the Ampere force between straight infinite parallel conductors.

In Sec. 5 we have presented eq. (18) which for the Ampere force between two parallel conductors gives the following equation

$$\frac{F}{dl} = \frac{1}{c\,\Delta t}\,\frac{r_o^2}{64\,m}\,\frac{I_{m_1}\,I_{m_2}}{d}\int\!\!\int_{Ampere} \qquad with \qquad \int\!\!\int_{Ampere} = 5.8731 \tag{91}$$

We now write the equation in the following form assuming that the velocity of the electrons is $v << c$ so that $\Delta t \approx \Delta_o t$ and the currents are $I_m \approx \rho_x\ m\ v$, where $\rho_x = N_x/\Delta x$ is the linear density of electrons that move with speed v in the conductors.

$$F = N_A(d, I_{m_1}, I_{m_2},\ \Delta l)\ \nu_o\ p_{elem} \qquad p_{elem} = m\ c\ k \qquad \nu_o = \frac{1}{\Delta_o t} \tag{92}$$

with

$$N_A(d, I_{m_1}, I_{m_2},\ \Delta l) = \frac{r_o^2}{64\ k\ m^2\ c^2}\,\frac{I_{m_1}\ I_{m_2}}{d}\int\!\!\int_{Ampere}\Delta l \tag{93}$$

or

$$N_A(d, I_{m_1}, I_{m_2},\ \Delta l) = 2.46222\cdot 10^{18}\ \frac{I_{m_1}\ I_{m_2}}{d}\ \Delta l \tag{94}$$

For a distance of $1m$ between parallel conductors with a length of $1m$ and currents of $1A$ we get $N_A = 2.46222\cdot 10^{18}$ elementary linear momentum during the time $\Delta_o t$ that generate the force F. The frequency of the crossing of FPs is for this particular case

$$\nu_A = N_A(d, I_{m_1}, I_{m_2},\ \Delta l)\ \nu_o = 3.0465\cdot 10^{38}\ \ s^{-1} \tag{95}$$

14.3 Quantification of the induced force between aligned reintegrating BSPs.

In sec. 5 we have presented eq. (20) which for the force between two aligned reintegrating BSPs and with $h\ \nu_n = h\ \nu_o = E_o = m\ c^2$ gives the following equation

$$F_i = \frac{\sqrt{h\ \nu_o}\ \sqrt{m_p}}{4\ K\ d^{\,2}}\int\!\!\int_{Induction} \qquad with \qquad \int\!\!\int_{Induction} = 2.4662 \tag{96}$$

which we can write with $\Delta_o t = K\, r_o^2$ and $p_{elem} = m\, c\, k$ as

$$F_i = N_i\, \nu_o\, p_{elem} \qquad with \qquad N_i = \frac{r_o^2}{4\, k\, d^{\,2}} \int\int_{Induction} \tag{97}$$

Considering that $\Delta G_1\, \Delta G_2 = \gamma_G^2\, M_1\, M_2$ we can write

$$F_G = F_i\, \Delta G_1\, \Delta G_2 = N_G\, \nu_o\, p_{elem} \qquad with \qquad N_G = N_i\, \Delta G_1\, \Delta G_2 \tag{98}$$

Finally we get

$$F_G = N_G(M_1, M_2, d)\, \nu_o\, p_{elem} \qquad with \qquad N_G = 2.65558 \cdot 10^{-8}\, \frac{M_1\, M_2}{d^2} \tag{99}$$

The frequency with which FPs cross in space is

$$\nu_G = N_G(M_1, M_2, d)\, \nu_o = 3.28575 \cdot 10^{12}\, \frac{M_1\, M_2}{d^2} \tag{100}$$

For the earth with a mass of $M_\oplus = 5.974 \cdot 10^{24}\ kg$ and the sun with a mass of $M_\odot = 1.9889 \cdot 10^{30}\ kg$ and a distance of $d = 147.1 \cdot 10^9\ m$ we get a frequency of $\nu_G = 1.8043 \cdot 10^{46}\ s^{-1}$ for aligned reintegrating BSPs.

14.4 Quantification of Ampere force between parallel reintegrating BSPs.

From sec. 13 we get with eq. (73) and eq. (75) the following equation for the force between a pair of parallel reintegrating BSPs.

$$dF_R = \frac{p_b}{\Delta_o t} = \frac{1}{4}\, \frac{5.8731}{64\, c}\, \frac{h\, \nu_o}{\Delta_o t}\, \frac{\Delta l}{d} \tag{101}$$

which we can write as

$$dF_R = N\, \nu_o\, p_{elem} \qquad with \qquad p_{elem} = m\, c\, k \qquad and \qquad N = \frac{1}{4}\, \frac{5.8731}{64\, k}\, \frac{\Delta l}{d} \tag{102}$$

For Δ_{R_1} and Δ_{R_2} BSPs we get for the total force

$$F_R = dF_R\, \Delta_{R_1}\, \Delta_{R_2} = N_R\, \nu_o\, p_{elem} \qquad with \qquad N_R = N\, \Delta_{R_1}\, \Delta_{R_2} \tag{103}$$

and with $\Delta_{R_1}\, \Delta_{R_2} = \gamma_R^2\, M_1\, M_2$ we get

$$F_R = N_R(M_1, M_2, d, \Delta l)\ \nu_o\, p_{elem} \qquad with \qquad N_R = 4.55686 \cdot 10^{-14}\ \frac{M_1\, M_2}{d} \Delta l \tag{104}$$

The frequency with which FPs cross in space is

$$\nu_R = N_R(M_1, M_2, d, \Delta l)\ \nu_o = 5.6382 \cdot 10^6\ \frac{M_1\, M_2}{d} \Delta l\ \ s^{-1} \tag{105}$$

For the earth with a mass of $M_\oplus = 5.974 \cdot 10^{24}\ kg$ and the sun with a mass of $M_\odot = 1.9889 \cdot 10^{30}\ kg$ and a distance of $d = 147.1 \cdot 10^9\ m$ we get a frequency of $\nu_R = 2.4065 \cdot 10^{40}\ s^{-1}$ for parallel reintegrating BSPs. The frequency ν_G for aligned BSPs is nearly 10^6 times grater than the frequency for parallel reintegrating BSPs an so the corresponding forces.

14.5 Quantification of the total gravitation force.

The total gravitation force is given by the sum of the induced force between aligned reintegrating BSPs and the force between parallel reintegrating BSPs.

$$F_T = F_G + F_R = [N_G(M_1, M_2, d)\ +\ N_R(M_1, M_2, d, \Delta l)]\ p_{elem}\, \nu_o \tag{106}$$

or with $\Delta l = 5.2843 \cdot 10^{-11}\ m$

$$F_T = F_G + F_R =\ p_{elem}\ \nu_o\ \left[\frac{1.9735 \cdot 10^{-9}}{d^2} + \frac{1.7895 \cdot 10^{-25}}{d} \right]\ M_1\, M_2 \tag{107}$$

We define the distance d_{gal} as the distance for which $F_G = F_R$ and get

$$d_{gal} = \frac{1.9735 \cdot 10^{-9}}{1.7895 \cdot 10^{-25}} = 1.103 \cdot 10^{16}\ \ m \tag{108}$$

15 Spin of level electrons and the formation of elements

In sec. 11 two types of electrons and positrons were identified according the velocities of their regenerating and emitting fundamental particles; they were named accelerating and decelerating BSPs.

We know, that the two electrons in any individual orbit must have opposed spins. This is interpreted in the present model that two electrons of any individual orbit must be of opposed type, namely accelerating and decelerating electrons.

For each type of level electron, a corresponding opposed type of positron must exist in the atomic nucleus, to allow that the emitted fundamental particles of one can regenerate the other. This leads to the conclusion, that protons and neutrons are also composed of BSPs of different types.

Neutron: Composed of 919 electrons and 919 positrons. The 919 electrons are composed of 459 accelerating, 459 decelerating and 1 acc/dec electrons. The 919 positrons are composed of 459 accelerating, 459 decelerating and 1 dec/acc positrons.

Proton; Composed of 918 electrons and 919 positrons. The 918 electrons are composed of 459 accelerating and 459 decelerating electrons. The 919 positrons are composed of 459 accelerating, 459 decelerating and 1 acc/dec positrons.

The definition of two types of electrons and positrons has let to protons that are formed of BSPs that complement each other and which are of two types:

- Protons formed of accelerating positrons and decelerating electrons and
- Protons formed of decelerating positrons and accelerating electrons

The level electron associated to a proton is of the same type as the electrons of the proton. Elements in the Periodic Table are classified according to the growing number of protons in their nuclei and with level electrons that alternate their spin. In the present approach the elements of the periodic table are built with alternating types of protons and the two types of electrons with opposed spin from our standard theory are replaced by the accelerating and decelerating electrons.

The concept is shown in Fig. 18.

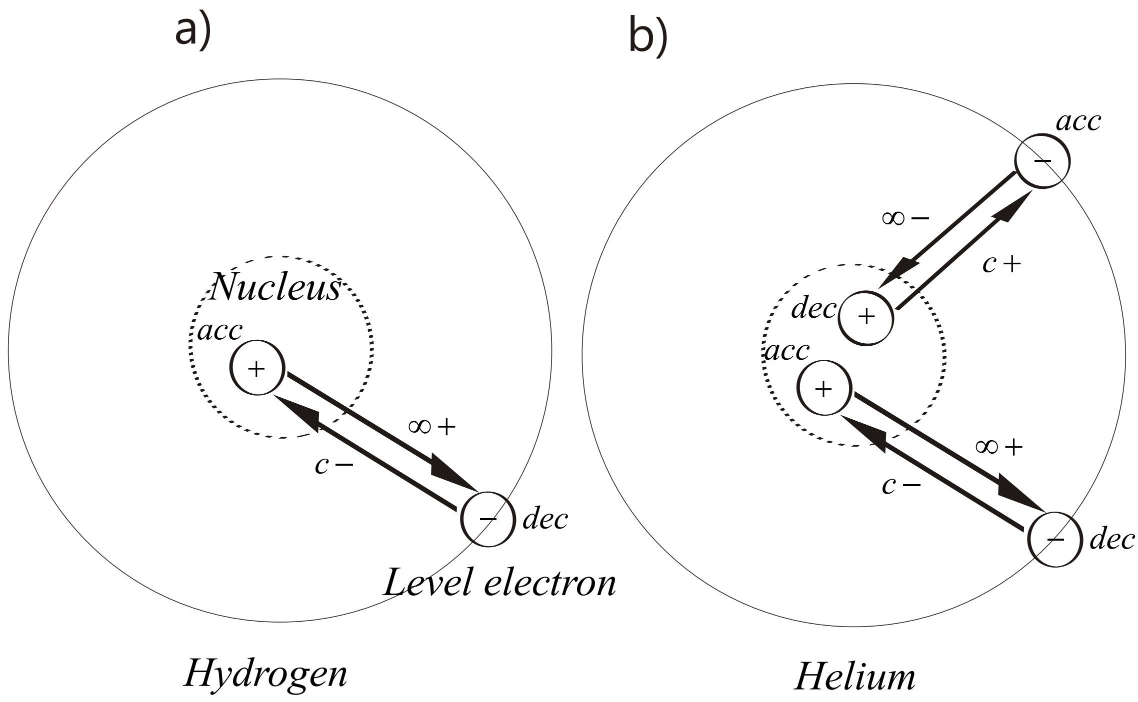

Figure 18: Level electrons of Hydrogen and Helium Atoms

15.1 Stern-Gerlach experiment and the spin of the electron.

In the Stern-Gerlach experiment neutral particles are shot through a strong inhomogeneous magnetic field and observed deflections are attributed in standard theory to the magnetic angular momentum of the external unpaired electron. Stern-Gerlach experiments with charged particles are not possible because of the strong Lorentz force that makes impossible to verify the spin and associated magnetic momentum of an isolated electron.

In the present approach there are two types of electrons and positrons that explain the two different states electrons take in energy levels of atoms, states that in standard theory are attributed to the spin of the electron. It remains the question how to explain the deflections of neutral particles in the Stern-Gerlach experiment.

In the present approach the deflections are attributed to the interactions between the two parallel currents of BSPs, namely, the currents that generate the magnetic inhomogeneous field and the currents due to reintegration of BSPs at the nuclei of the neutral particles of the atomic ray. The interactions between parallel currents of BSPs are quantized in energy quanta equal to the rest energy of an electron, what explains the quantization of the deflection of the atoms of the ray.

To obtain an equation for the force F_R we start with eq. (64) from sec. 9 which was calculated for one pair of parallel BSPs

$$p_b = \frac{1}{4}\,\frac{5.8731}{64\;c}\,\frac{h\;\nu_o}{d}\,\Delta l\;n \tag{109}$$

and with

$$\nu_o = 1.2373\cdot 10^{\,20}\;\;s^{-1} \qquad \Delta l = 5.2843\cdot 10^{-11}\;\;m \qquad \Delta_o\,t = 8.0821\cdot 10^{-21}\;\;s \tag{110}$$

and

$$dF_b = \frac{p_b}{\Delta_o t} \qquad n = 1 \tag{111}$$

the force for one pair of BSPs is given by

$$dF_b = \frac{p_b}{\Delta_o t} = \frac{K_b}{d} \qquad with \qquad K_b = \frac{1}{2}\,\frac{h}{\Delta_o t} = 4.09924\cdot 10^{-14}\;\;Nm \tag{112}$$

The resulting forces are given by the different possible combinations of the currents I_1 and the reintegrating currents i_m.

The concept is shown in Fig. 19.

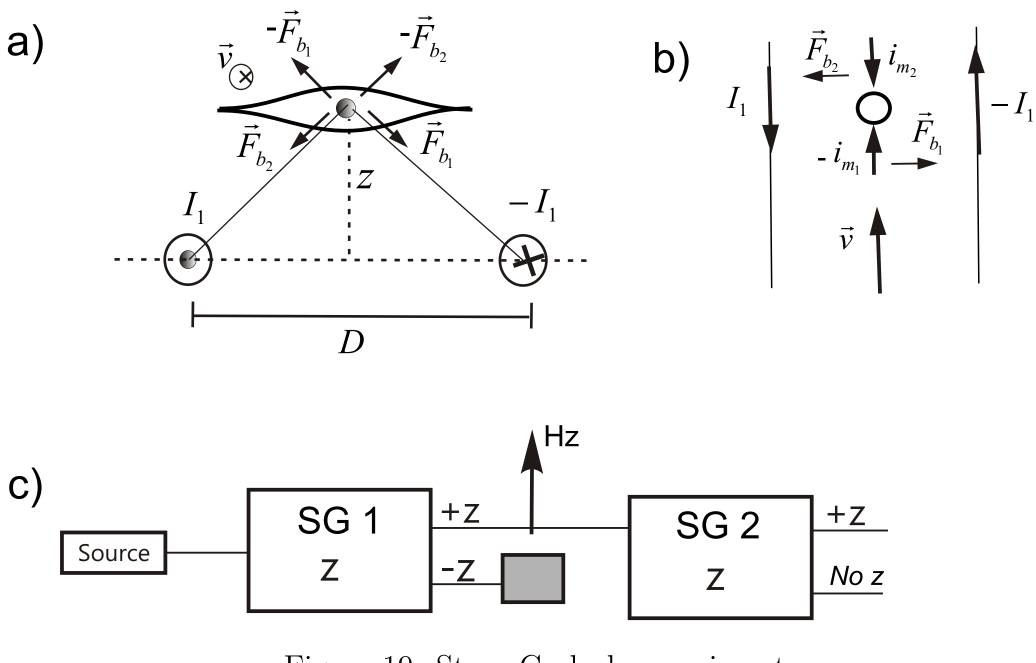

Figure 19: Stern-Gerlach experiment

At **a)** the forces are shown which can appear individually or combined depending of how many regenerating BSPs interact simultaneously with the currents I_1.

At **b)** a top view of **a)** is shown with the regenerating currents i_m of the atomic nucleus and the resulting forces F_b.

At **c)** a sequential Stern-Gerlach experiment is shown where the particles $+Z$ from $SG1$ are passed through $SG2$ and where only particles $+Z$ are obtained if a homogeneous magnetic field H_z is applied between $SG1$ and $SG2$. The explanation given by standard theory is that the magnetic momentum of the valence electron must hold unchanged during the pass from $SG1$ to $SG2$.

The present approach explains the up or down deflections with the special combinations of interacting currents I_1 and i_m which are defined by the special configurations the orbital electrons and reintegrating BSPs of the atom take when entering the external inhomogeneous magnetic field. To have the same combination of interacting currents with the same deflection at $SG2$ it is necessary to hold the configuration of the orbital electrons and reintegrating BSPs of the atoms applying the homogeneous magnetic field H_z between the two SG devices.

The approach concludes that the deflections are a characteristic only of complex particles like the neutrons, protons, and atoms and not a characteristic of BSPs like electrons, positrons and neutrinos.

To introduce in standard theory the spin of an electron the assumption is made, that at the Ag atom for instance, 46 of the electrons form together with the nucleus a close inner core of total angular momentum zero and that the one remaining electron has no orbital angular momentum. This would mean that the remaining level electron is static without the possibility to compensate with its centrifugal force the attracting force of the nucleus and collapse. Another argument against the spin of an electron is that all theoretical efforts made to explain the magnetic moment of an electron as a rotating charge have let to not acceptable conclusions.

16 Findings of the proposed approach.

The main findings of the proposed model [10], from which the present paper is an extract, are:

- The energy of a BSP is stored in 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.
- The emitted and regenerating energies of a BSP are quantized in energy quanta E_o.
- 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.
- Permanent magnets are explained through closed energy flows at static BSPs stored in transversal angular momenta of FPs.
- The addition of a wave to a particle (de Broglie) is effectively replaced by a relation between the particles radius and its energy. Deflection of particles such as the electron is now a result of the quantified bending linear momenta between BSPs.
- The uncertainty relation of quantum mechanics form pairs of canonical conjugated variables between "energy and space" and "momentum and time". The Schrödinger equation results as the particular time independent case of a more general wave differential equation where the wave function is differentiated two times towards time and one towards space.
- The new quantum mechanics theory, based on wave function derived from the radius-energy relation, is in accordance with the quantum mechanics theory based on the correspondence principle.

- The present approach has no energy violation in a virtual process at a vertex of a Fynmann diagram.
- As the model relies on BSPs permitting the transmission of linear momenta at infinite speed via FPs, it is possible to explain that entangled photons show no time delay when they change their state.
- The two possible states of the electron spin are replaced by the two types of electrons defined by the present theory, namely the accelerating and decelerating electrons.
- The splitting of the atomic beam in the Stern-Gerlach experiment is explained with the interaction of parallel moving BSPs, interaction that is quantized in energy quanta of one resting electron.

17 References.

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.

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