3.7 Unification of the four fundamental forces

Result for space-time:

Space-time follows the characteristic inertial motion of electromagnetic oscillations. It is a form of moving energy.

Results from the electric potential:

According to classical physics, the four fundamental forces are gravity, electromagnetic interaction, the strong nuclear force and the weak nuclear force. Formulas (3.27) and (3.28) allow for a unification of the four fundamental forces. The cause of electromagnetic interaction, the strong and weak nuclear forces lies in the electric potential of the universe, which forms the permanently applied photon field in field-space. With the help of the physical quantity of frequency, it is possible to describe the mechanical causes from the electric potential and assign any field to a specific coupling frequency. In order to achieve these frequencies, very specific space-structure-related conditions are necessary during an interaction, as explained in the previous chapter. The reference field for the cause of the electromagnetic field exchange remains the wave-field F_{4-6}, while the emitted forces are registered in the particle-field F_{1-3} as a specific field from a point source (point of contact with the dimension plane D_{56}). In the particle-field F_{1-3}, the fields are perceived as abstract field lines and, in macroscopic superposition, as discrete objects.

The minimum coupling frequency corresponds to the mass of the smallest exchange fion with the lowest excitation:

It should be noted that a single exchange fion has a multiple of the momentum for the electric forces, corresponding to that of an electron. At the moment of field exchange, it can be ~ 137 times heavier than in the composition of its three active electron-internal fions. This confirms previous observations in nuclear physics that quarks in atoms contribute only a small fraction of the total mass. The majority of the mass is caused in the FSM by exchange fions with their characteristic coupling frequencies.

The exchange fion was found in its lowest excitation for the 4th dimensional family with the following mass:

$$\boldsymbol{M_{fion}} = [\,\frac{4}{3}\,(\frac{3}{2})^3\,]^4\,\frac{1}{3}\,M_e = \mathbf{136{,}6875}\,\boldsymbol{M_e} \tag{3.32}$$

The electrical exchange of a fion with an electron begins with the **minimum coupling frequency**. Above this frequency, fions become capable of forming a partial charge that is generated in the wave-field F_{4-6} of the field-space:

$$\boldsymbol{f_{fion}} = [\,\frac{4}{3}\,(\frac{3}{2})^3\,]^4\,\frac{1}{3}\,f_e = 136{,}6875 \cdot 1{,}2356\ 10^{20}\ \text{Hz} = \mathbf{1{,}688911\ 10^{22}\ Hz} \tag{3.33}$$

$\lambda_{fion\_fine\ struktur}$ = 1,775 10^{-14} m

It is striking that the reciprocal factor of ~ 137 appears in Arnold Sommerfeld's determination of the fine structure constant under precisely these minimal conditions. There could be a formal connection between Sommerfeld's reciprocal factor and the minimal coupling frequency.

Sommerfeld's definition of **the fine structure constant** from Quantum Mechanics is that it represents the threshold at which exchange particles of electromagnetic interaction (the photon) begin to couple to an electrically charged elementary particle, such as the electron. The value is given in the literature as ~ 1/137. This definition is similar to the state of an invisible photon from the FSM, which begins to interact electrically with its environment at this factor for the minimum coupling frequency.

The stability in a particle can thus be evaluated by how well the electric impulse with $\boldsymbol{P = 136{,}6875\, M_e\, c}$ is absorbed into a quark-exchange-fion-quark-coupling. Only when there is a stable exchange of exchange fions do permanent electric interaction forces develop. A particle with too low a total mass fluctuates immediately.

The electric force :

The **electron–exchange fion–electron-coupling** between two electrons is the **electric force**. The exchange takes place electromagnetically in the wave-field $F_{4\text{-}6}$, while the observer in the particle-field $F_{1\text{-}3}$ registers an electric force at these coupling frequencies. An electron with the particle configuration PC = $\frac{3}{3}$ couples to a surrounding fion with a frequency above the minimum coupling frequency and thus exchanges its field with another electron PC = $\frac{3}{3}$. The momentum of an electrical interaction is recorded per unit of time in the particle-field.

$$\boldsymbol{f_{el.force}} = [\frac{4}{3}(\frac{3}{2})^3]^4 \frac{1}{3} f_e = \boldsymbol{136{,}6875\ f_e} \qquad (3.34)$$

$$\boldsymbol{M_{el.force}} = [\frac{4}{3}(\frac{3}{2})^3]^4 \frac{1}{3} f_e = \boldsymbol{136{,}6875\ M_e} \qquad (3.35)$$

$$f_{muon/electron,4.} = \frac{1}{2}[\frac{4}{3}(\frac{3}{2})^3]^4 \boldsymbol{\frac{3}{3}} f_e = 205{,}031\ f_e \qquad (3.36)$$

$$f_{electron,5.} = \frac{1}{2}[\frac{4}{3}(\frac{3}{2})^3]^5 \boldsymbol{\frac{3}{3}} f_e = 922{,}640625\ f_e \qquad (3.37)$$

$$f_{tauon/electron,6.} = \frac{1}{2}[\frac{4}{3}(\frac{3}{2})^3]^6 \frac{5}{6} \boldsymbol{\frac{3}{3}} f_e = 3459{,}9\ f_e \qquad (3.38)$$

Nuclear force – strong interaction:

The **quark–fission–quark–coupling** in a particle structure such as that of a baryon or a meson belongs to **the nuclear force.** The field exchange of the strong interaction follows the same mechanism as that between the electron–exchange fion–electron-coupling. The interaction field of the strong interaction is formed by electromagnetic coupling with an exchange fion, which exchanges its field with a particle from the coupling configuration up to PC = $\frac{4}{3}$. The momentum of a strong interaction is recorded per unit of time in the particle-field.

$$f_{pion/meson\text{-}boson,4.} = \frac{1}{2} [\frac{4}{3} (\frac{3}{2})^3]^4 \mathbf{\frac{4}{3}} f_e = 273{,}375 f_e \tag{3.39}$$

$$f_{meson\text{-}boson,5.} = \frac{1}{2} [\frac{4}{3} (\frac{3}{2})^3]^5 \mathbf{\frac{4}{3}} f_e = 1230{,}1875 f_e \tag{3.40}$$

$$f_{proton/baryon,5.} = \frac{1}{2} [\frac{4}{3} (\frac{3}{2})^3]^5 \mathbf{\frac{6}{3}} f_e = 1845{,}28125 f_e \tag{3.41}$$

$$f_{meson\text{-}boson,6.} = \frac{1}{2} [\frac{4}{3} (\frac{3}{2})^3]^6 \frac{5}{6} \mathbf{\frac{4}{3}} f_e = 4613{,}203125 f_e \tag{3.42}$$

$$f_{meson/baryon,6.} = \frac{1}{2} [\frac{4}{3} (\frac{3}{2})^3]^6 \frac{5}{6} \mathbf{\frac{6}{3}} f_e = 6919{,}804688 f_e \tag{3.43}$$

Nuclear force – weak interaction:

If the **quark–exchange fion–quark-coupling** is not transmitted exactly in the dimension plane D_{56} but is slightly shifted in the wave-field $F_{4\text{-}6}$, only part of the field exchange can take place at the point of contact with the particle-field $F_{1\text{-}3}$. This produces only a **weak interaction**. A good example of such a particle structure with weak interaction is shown in **Figure 3.26**.

The mediation for the field force effect was derived in **Chapter 2** according to formula (2.20), which only reaches its maximum for the particle-field through parallel mediation of a field to the dimension plane D_{56}.

The frequency for the weak interaction has a deviation angle α for the optimal geometric shape of the particles involved. This deviation angle α between the point of contact on the dimension plane D_{56} and a raised point of contact reduces the frequency and thus the effect of the strong interaction to:

$$\boldsymbol{f_{weak\ interaction}} = \boldsymbol{f_{strong\ interaction}}\ \mathbf{sin(0° < \alpha < 90°)} \tag{3.44}$$

Results from the gravitational potential:

Gravitational force:

In the FSM, the **gravitational force** of an object with a mass M is the counterforce to the inertial force that acts with its propagation as an electromagnetic wave through space-time. This quantity depends on the **object's mass**, its **distance** from other objects and its **gravitational potential**. At the location of the inertial system for the minimal length contraction of the universe, the field propagation velocities apply with $V_5 = c;\ V_4 = 0$. At this location, the minimal deformation in space-time prevails for an object mass m_{obj}, and thus also the lowest gravitational force for the given gravitational potential.

The gravitational force of an object in field-space relative to its geometric shape to the dimensional plane D_{56}:

$$F_{gravity} = m_{obj}\, Rk^2 \sin(kt) \qquad (2.28)$$

The gravitational force between two objects:

$$F_{gravity} = \frac{G\, m_{obj1}\, m_{obj2}}{R^2} \sin(kt) \qquad (2.20)$$

Addendum to the definition of mass from Chapter 1.2:

The normalised masses of objects are determined on the basis of their **electromagnetic properties** of a **particle–exchange ion–particle-coupling** from the wave-field $F_{4\text{-}6}$. The masses of complex particles such as the proton differ only in the variation of their electrical exchange particles.

Magnetism in the proton:

The proton moves partially in all dimensional planes by means of quarks rotating periodically in $3T$. In the third period, the proton rotates, among other things, with its axis of rotation on the dimensional plane D_{56} around its overall structure. Within this structure, three charged quarks rotate around a binding neutrino without spin. Similar to a bicycle dynamo, a magnetic field parallel to the axis of rotation is induced at the location of this neutrino and thus at the centre of the angular momentum of a proton. **Figure 3.27** shows the mechanism.

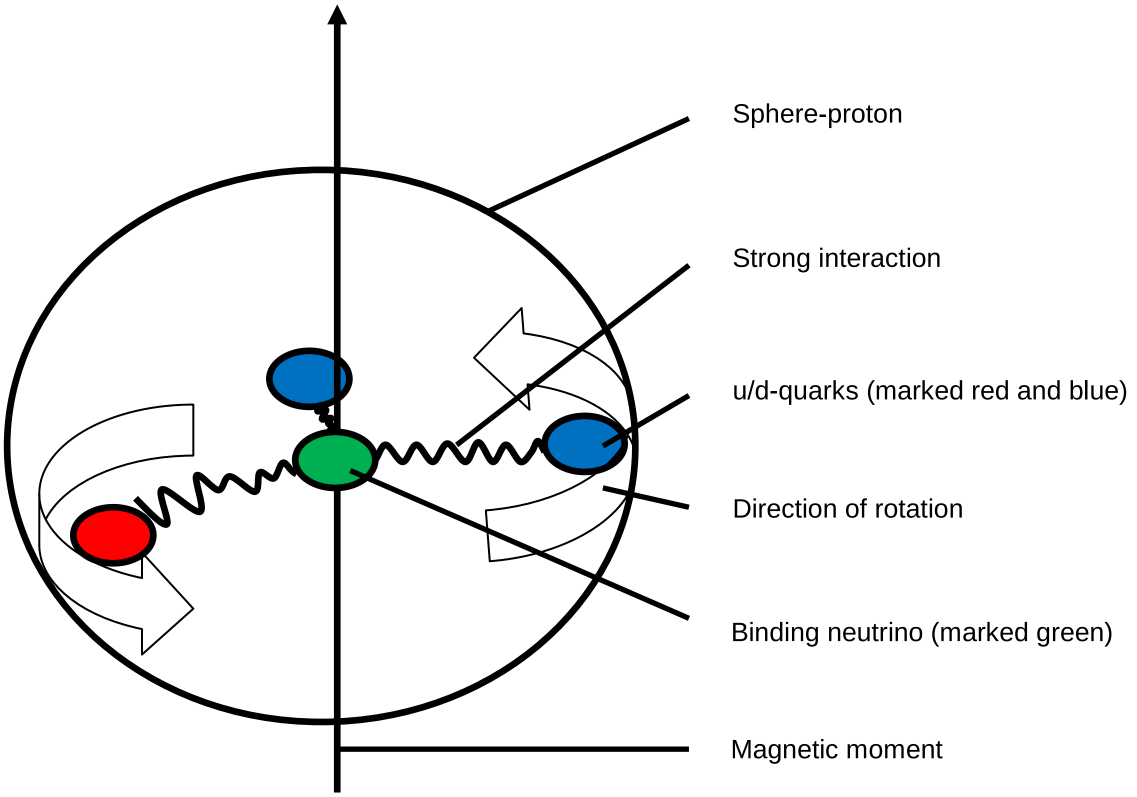

Figure 3.27: Magnetic moment in a proton

Matter pulse and thermodynamics :

In the following chapters, the matter pulse will be used for technical applications, for example to successfully increase the energy in particles. With the effective increase in energy achieved by finding the appropriate coupling frequency for matter, a plasma can be generated in a limited space with a high efficiency of around 100%, which is particularly interesting for energy technology or for manipulating space-time. In technical applications, the resulting pressure and temperature with a limited volume will be decisive.

Thermodynamics is a branch of physics that models the technical implementation of the coupling frequencies of matter for FSM. A space-time segment such as a proton, for example, has a defined limited space with its sphere S. As the energy increases, the elementary particles within it oscillate periodically faster. The increased kinetic energy inevitably leads to increased repetitions of interaction events, which are interpreted macroscopically as friction with other particles. The sum of the interactions between the particles of a system or a space-time segment is used as a measure of temperature. According to the law of conservation of energy, the exchange between two systems corresponds to the heat flow that continues until the temperature gradient is tangent to zero. The time required for complete temperature equalisation between particles or systems can be calculated. The coupling frequency for matter (3.33) can be used to specifically control thermodynamic processes. This paper continues to focus on the coupling frequency for matter in order to establish the prerequisites for a thermodynamic description of the processes.

The agreement of the four basic forces in one theory:

The four basic forces are summarised below, as they result from the FSM model.

The basic effect is identified as the **electromagnetic interaction**, which combines the electric force with a possible magnetic induction, the strong nuclear force, the weak nuclear force and the gravitational force. All forces are geometry-dependent and based on the characteristic coupling frequency of an object f_{obj} within the electromagnetic photon field in question. PR stands for process response, which explains what happens between the elements.

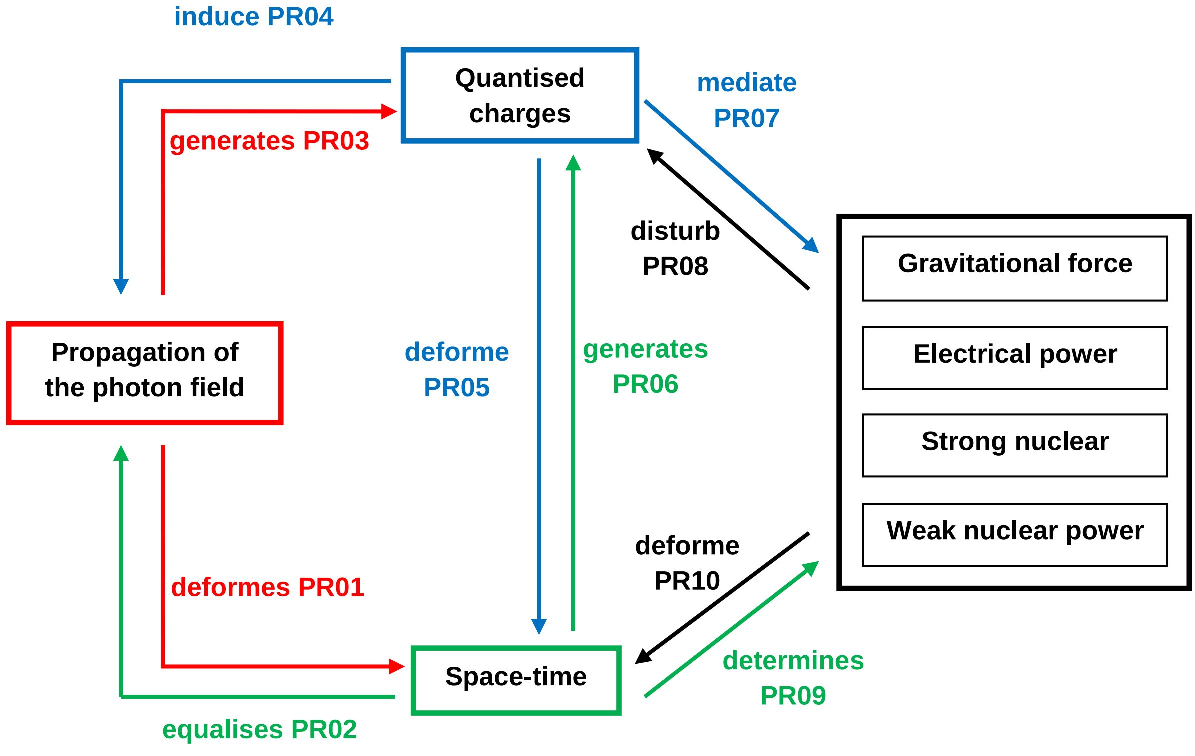

Figure 3.28: Schematic of the electromagnetic interaction

Figure 3.28 explanations:

PR01: The photon field of the Universe propagates as a universal electromagnetic wave. Space-time causes an inertial force against this propagation. The gravitational force was defined as the counterforce to this inertial force. The strength of the gravitational force depends on the deformation of space-time. The gravitational potential describes the space-time tension for an object between the inertial system and any space-time distorted location.

PR02: Space-time reacts to the space-time deformation in the photon field with equalising forces. These space-time mechanical effects correspond to Lorentz transformations (time dilation, length contraction, relativistic energy increase).

PR03: The photon field is able to divide its total momentum depending on its expansion. This results in a certain number of quanta from the photon field until the expansion is complete.

During the expansion, an electric potential prevails in the photon field due to a displacement current. The dimensional planes $D_{45/46}$ offer the possibility for a space-time quantum along the fourth spatial dimension D_4 to generate a charge through its rotational movement in this voltage potential. The dimensional plane D_{56} is used for the electrostatic separation of these charges.

PR04: An electric charge carrier can generate an alternating magnetic field through its periodic rotational movement. Conversely, a moving magnetic field induces an electric field.

PR05: The sum of all interactions of quantised charge carriers and the propagation of their mediated fields in the field-space results in the periodic contribution to the deformation of space-time. These fields deform their surrounding space depending on the frequency of their interaction with each other.

PR06: As long as there is a space-time deformation with a certain gravitational potential, the proportionally applied electric potential in the photon field remains above its minimum and positively and negatively charged particles continue to be produced.

PA07: Quantised charge carriers can mediate a certain gravitational force, electric force, strong nuclear force and the weak nuclear force depending on the geometric procurement of their particle structure with the aid of particle-exchange fion-particle-coupling.

PR08: Interaction fields from the particle-field can disturb the synchronisation of the exchange fions in the wave-field with a particle. This disturbance deforms the rotation paths of the individual active fions that interact with the particle-field. A possible disturbance on the rotation paths along the dimensional planes $D_{14/24/34}$ increases the necessary coupling frequency and the rest mass of particles. This perturbation has a similar effect to the relativistic energy increase without a vectorial object velocity V_3, which increases the matter pulse of matter.

PR09: The existing space-time deformation of the universe determines the state of the gravitational potential d$M(\alpha)$ of matter. The measurable gravitational forces are the result between two objects with their object masses m_{obj}, a certain distance from each other and the existing gravitational potential d$M(\alpha)$. The deformed space-time also ensures shorter paths for the exchange of fields. This increases the density of all matter and therefore all other interaction fields.

PR10: Interacting objects from the particle-field can cause an additional spatiotemporal deformation at the point where they meet.