

## Models for Quarks and Elementary Particles — Part IV: How Much Do We Know of This Universe?

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Essential laws and principles of the natural sciences were discovered at the high aggregation levels of matter such as molecules, metal crystals, atoms and elementary particles. These principles reappear in these models in modified form at the fundamental level of the quarks. However, the following is probably true: since the principles apply at the fundamental level of the quarks they also have a continuing effect at the higher aggregation levels. In the manner of the law of mass action, eight processes for weak interaction are formulated, which are also called Weak Processes here. Rules for quark exchange of the reacting elementary particles are named and the quasi-Euclidian or complex spaces introduced in Part I associated with the respective particles. The weak processes are the gateway to the “second” strand of this universe which we practically do not know. The particles with complex space, e.g. the neutrino, form this second strand. According to the physical model of gravitation from Part III the particles of both strands have  $\notin_T$ -fields and are thus subject to the superposition, which results in the attraction by gravity of the particles of both strands. The weak processes (7) and (8) offer a fair chance for the elimination of highly radioactive waste.

### 1 Introduction

The first parts of this series of papers have headline questions which are answered within the scope of the models [1]: I) What is a quark? II) What is mass? III) What is the nature of the gravitational field?

Which of the three questions will a physicist representing the current standard model be able to answer positively without hesitation? The standard model of physics combines huge quantities of analyses, conformities with natural laws and theories. However, too many independent quantities that can only be captured empirically still enter the standard model of physics and inconsistencies between individual theories are known. For this reason, theoreticians are looking for new physics especially in the field of the strings, loops and branes; however, they have been unable to establish any reference to reality. The standard model of cosmology has the general theory of relativity (GTR) as thread, wherein the GTR is a geometrical and not a physical theory. Despite this deficit the mainstream of cosmologists is absolutely convinced of the big bang model which is based on the GTR, wherein the big bang is a central part of the standard model of cosmology. The physical model of gravitation presented in Part III opens up a new interpretation of our universe. The perspectives of Part III render a Part V for cosmology — the utmost level of organisation — unnecessary. But there is a Part V in preparation concerning the magnetic load, which leads to the undermost level of organisation of our universe. Although many relationships are better recognizable with this model than in the past, there is certainly a lot we do not know of our universe.

### 2 The weak interaction

The equations of the weak interaction which in the following are also called “Weak Processes” are the central content of the present Part IV. Physics books present equations relating to the weak interaction. These equations are considered correct although the authors have no exact idea of what a quark is, although they are uncertain as to the mass possessed for instance by a neutrino, although they should have doubts in the uniformity of so-called “elementary particles”, although they are looking for additional particles that could be included in the equations.

An often-quoted equation in the literature is formulated thus:

$$p^+ + \bar{\nu}_e \rightarrow n^0 + e^+. \quad (1)$$

According to Table 1 of Part I, each of the four elementary particles involved is a three-quark particle (3QT). If this is used to make a quark equation — which cannot happen in the standard model of physics — according to the models to date equation (1) must read as follows:

$$\underbrace{uu}_{||} d + \underbrace{\bar{d}\bar{d}}_{\perp} \bar{u} \rightarrow \underbrace{dd}_{||} u + \underbrace{\bar{d}\bar{d}}_{\perp} \bar{d}.$$

As can be seen, the quarks on both sides do not agree in **number and type**. If the left side is correct, an  $\bar{u}$  and an  $u$  are missing on the right, instead there are a  $d$  and an  $\bar{d}$  too many on the right; the charge balance would be correct as in equation (1).

The literature equation (1) cannot be corrected because it is wrong. To get onto the right track here are some fundamental remarks concerning equations with particles.

From [1], Chapter 8.5, page 202: The (A) law of mass action, the (B) Pauli principle, the (C) superconductivity and the (D) uncertainty principle were found at higher aggregation levels of the particle world and applied to (A) molecules, (B) atoms, (C) metal crystals and (D) elementary particles. All four can be found again in these models in modified form at the fundamental level of the quarks, e.g. in the following (A) weak processes or with the (B) configurations of the nuclei in [1], Chapter 7.5 or in the (C) “fountain”, Fig. 1 in Part I, or in the definition of the natural constant of the (D) inertia quantum  $^N\Theta$ , see penultimate paragraph of Part III. Probably the effect of such laws and principles has to be seen differently: **Since they apply at the fundamental level they continue to have an effect also at the higher aggregation levels.**

The following is an example using the (B) Pauli’s principle. The Pauli principle states for a complete atom — i.e. for a higher aggregation level — that a shell (K, L, M etc. with the sub-shells s, p, d etc.) of the atomic shell cannot be occupied by two electrons.

In Part I, Table 1 in line A shows the particles  $\underbrace{dd}_{\parallel} d \equiv e_e$  and  $\underbrace{uu}_{\parallel} u \equiv \Delta_{\Delta}$  for the fundamental level of the quarks. In addition, Fig. 12 in Part I shows the loci for a  $\underbrace{dd}_{\perp} - Zk$ . (A definition of the “dual-coordination” or briefly “Zk” is given in Part I, page 74, paragraph 5.) If the locus of a third d-quark were to be placed in the level of this Zk, either space I or space III would be occupied with two loci. Such double occupancy is demanded for the particles  $e_e$  and  $\Delta_{\Delta}$  by the  $\parallel$  symbol. According to the Pauli principle this means at the fundamental level of the quarks that the particles  $e_e$  and  $\Delta_{\Delta}$  are prohibited, see Table 2! Allowed are only the electron  $\underbrace{dd}_{\perp} d \equiv e^-$  and the deldopon  $\underbrace{uu}_{\perp} u \equiv (\Delta^{++})$ , where each quark assumes a different position.

Another example relates to the (A) law of mass action. This law primarily applies to the fundamental quark equations, but was initially discovered by us by means of the chemical reactions at the high aggregation level. The equation of a chemical reaction is formulated in the same manner as a fundamental quark equation. All constituents entering a fundamental reaction again come out of the reaction in a changed composition. Nothing disappears or is added. In this regard, some of the equations for the weak interaction offered in physics books are totally unsatisfactory, since the particles on both sides of the equations lack a common basis. This is also evident from the above equation (1): for the nucleons there is the quark representation in the standard model, not for the leptons.

### 3 The eight weak processes

Reading the following is not easy, the subject however highly interesting for the understanding of our universe. The comments regarding the equations are intended to facilitate this understanding.

Eight processes with the construction

Starting particle  $\rightarrow$  (Quarkpool)  $\rightarrow$  Reaction products

$$p^+ + e^- \rightarrow \rightarrow \rightarrow \rightarrow n^0 + \nu_e \quad (2)$$

$$\underbrace{uu}_{\parallel} d + \underbrace{dd}_{\perp} d \rightarrow \left( \begin{array}{c} uu_{\parallel} d: dd_{\perp} d \\ \uparrow \text{-----} \uparrow \end{array} \right) \rightarrow \underbrace{dd}_{\parallel} u + \underbrace{dd}_{\perp} u \quad (2a)$$

Space type **qeR** **qeR**  $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$  **qeR** **koR**

$$n^0 + \nu_e \rightarrow \rightarrow \rightarrow \rightarrow p^+ + e^- \quad (3)$$

$$\underbrace{dd}_{\parallel} u + \underbrace{dd}_{\perp} u \rightarrow \left( \begin{array}{c} dd_{\parallel} u: dd_{\perp} u \\ \uparrow \text{-----} \uparrow \end{array} \right) \rightarrow \underbrace{uu}_{\parallel} d + \underbrace{dd}_{\perp} d \quad (3a)$$

Space type **qeR** **koR**  $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$  **qeR** **qeR**

The equations (2) and (3) count among the best known of the weak interaction. For the formulations according to the standard model the common basis of the particles mentioned above is absent. As quark equation (2a) and (3a), they correspond to the characteristics of the law of mass action. Details for a “quark pool” are included in the quark equations. This quark pool stands for the physical process of the reaction of the particles involved which requires a finite time and during which exchange processes take place. The signs within the brackets explain this exchange. During both the above processes a quark from the Zk of the baryon/nucleon involved is exchanged for the singular quark of the lepton, while the quark from the Zk of the baryon does not belong to the  $u_{\parallel}d$ -group.

It can also be seen that the structure symbols in the equations are retained. A  $\parallel$  and a  $\perp$  symbol each are present on the left and on the right side of the equation. This is to be correlated with the retention of the baryon and lepton number of the standard model. This means there are fixed rules for the reactions during the weak processes.

In each third line for each reaction the space type **qeR** or **koR**, see [5], Part I, page 72/73, of the elementary particle is noted. If two particles from “our” quasi-Euclidian space (qeR) react with each other the probability of the reaction substantially depends on a resonance possibility, i.e. the size of the particles MAGINPARs. In addition to this probability for a reaction there is obviously also a second one. This depends on the space type. This means, two particles with the same space type react with each other with far greater probability than particles with different space type.

We are aware of this in the case of the hugely plentiful neutrinos with the complex space type qeR which hit the particles of earth with the space type qeR with only an extremely

3QT	dd d	dd u	uu d	uu u
Locus level of singular quark parallel (  ) to the locus level of the Zk †	e <sub>e</sub> †	n <sup>0</sup>	p <sup>+</sup>	Δ <sub>Δ</sub> †
Space type of particle	koR1 †	<b>qeR1</b>	<b>qeR1</b>	koR1 †
Locus level of singular quark vertically (⊥) on locus level of Zk	e <sup>-</sup>	ν <sub>e</sub>	? <sup>+</sup>	(Δ <sup>++</sup> )
Space type of particle	<b>qeR2</b>	koR2	koR2	<b>qeR2</b>

koR ≡ “complex” space, qeR ≡ quasi-Euclidian space.

The number 1 or 2 designates the number of the ρ-rotation levels per particle.

†Elementary particles prohibited by the Pauli principle.

Table 2: Space structures of the elementary particles

low probability. The probabilities for a reaction are called MAGINPAR and space type probability. All eight weak processes are characterized in that at least one particle of a process has the space type koR. Thus the space type probability applies to the eight here treated processes which is why we talk about the “weak” interaction.

$$p^+ + ?^+ \rightarrow \rightarrow \rightarrow \rightarrow n^0 + (\Delta^{++}) \quad (4)$$

$$\underbrace{uu}_{||} d + \underbrace{uu}_{\perp} d \rightarrow \left( \begin{array}{c} uu_{||} d : uu_{\perp} d \\ \uparrow \text{-----} \uparrow \\ \underbrace{uu}_{\perp} u \end{array} \right) \rightarrow \underbrace{dd}_{||} u + \quad (4a)$$

Space type **qeR koR** → → → → **qeR qeR**

$$n^0 + (\Delta^{++}) \rightarrow \rightarrow \rightarrow \rightarrow p^+ + ?^+ \quad (5)$$

$$\underbrace{dd}_{||} u + \underbrace{uu}_{\perp} u \rightarrow \left( \begin{array}{c} dd_{||} u : uu_{\perp} u \\ \uparrow \text{-----} \uparrow \\ \underbrace{uu}_{\perp} d \end{array} \right) \rightarrow \underbrace{uu}_{||} d + \quad (5a)$$

Space type **qeR qeR** → → → → **qeR koR**

A hypothesis (here the models under consideration) establishes new predictions/expansions unknown to date for the (physical) teaching applicable to that point, which have to be verified. Such predictions are made by Table 1 and the still to follow Table 2 with some of the particles noted there, which also occur in the equations (4) and (5). For the sake of brevity the particles of the Tables that have not been found yet will not be further commented upon at this point. Reference is only made to the respective exchange of the quarks in the quark pool, which corresponds to the fixed rules for the reactions mentioned above.

To facilitate the association of the space types with the individual elementary particles Table 2 is inserted.

The best known equation to describe the “β-decay” is the following:

$$n^0 \rightarrow p^+ + e^- + \bar{\nu}_e \quad (6)$$

Under the aspect of the standard theories such an equation is possible because four totally independent particles are present, the electric charges involved are correct and the n<sup>0</sup> has the greatest mass/energy so that it can decay into the three other particles of lower energy. Under the aspect of the models developed here the two sides of this process cannot be brought into line even from the number of the quarks involved. The right side of the equation comprises nine quarks, the left side three quarks. In other words six quarks have to be added to the left side, while a 6QT or boson is obvious.

The following arguments speak for the photon-like ν-gamma (ν - γ) as trigger of the process — incompletely — described with the above non-equation:

1. The particle is not yet known which is why it is not named so far on the left side of the process;
2. Because of its space type koR the particle — based on ν<sub>e</sub> (Table 2) — is difficult to discover;
3. ν-gamma brings with it the necessary number and type of quarks and of structure signs || respectively ⊥.

The almost known “β-decay” according to the standard model as fully formulated weak process according to these models then becomes the following as particle and quark equation:

$$n^0 + \nu - \gamma \rightarrow \rightarrow \rightarrow \rightarrow p^+ + e^- + \bar{\nu}_e \quad (8)$$

$$\underbrace{dd}_{||} u + \underbrace{dd}_{\perp} \underline{u\bar{u}}_{\perp} \underline{d\bar{d}} \rightarrow \left( \begin{array}{c} d \text{ from } n^0 \Leftrightarrow \\ u \text{ from } Bk \end{array} \right) \rightarrow \rightarrow \underbrace{uu}_{||} d + d_{\perp} \underbrace{dd}_{\perp} + \bar{u}_{\perp} \underline{d\bar{d}} \quad (8a)$$

Space type **qeR koR** → → → → **qeR qeR koR**

The central part  $\underline{u\bar{u}}$  of the  $\nu - \gamma$  within the quark-equation (8a) is called a “binding coordination”, briefly “Bk”.

The fixed rules for the quark reactions need only be modified slightly for the reaction type (8) relative to the reaction type (2) and (3) or (4) and (5):

- A baryon each reacts with a photon-like 6QT (instead of 3QT lepton).
- From the original particles, a formally singular quark each (not anti-quark) of a lepton and now part of a Bk in the photon-like is exchanged for a Zk-quark (not from the u||d-group) of the baryon.
- In addition to the type and number of the quarks involved the type and number of the structure signs || and  $\perp$  now agree on both sides of equation (8) as well.

Since equation (8) relative to the non-equation (6) has been explained, equation (7) is now added where  $e-\gamma$  (our “normal” photon) has to be additionally considered compared with the standard version.

$$p^+ + e - \gamma \rightarrow \rightarrow \rightarrow \rightarrow n^0 + e^+ + \nu_e \quad (7)$$

$$\underbrace{uu}_{||} d + \underbrace{dd}_{\perp} \underbrace{d\bar{d}}_{\perp} \underbrace{d\bar{d}}_{\perp} \rightarrow \left( \begin{array}{l} u \text{ from } p^+ \Leftrightarrow \\ d \text{ from } Bk \end{array} \right) \rightarrow$$

$$\rightarrow \underbrace{dd}_{||} u + \underbrace{d\bar{d}}_{\perp} \bar{d} + \underbrace{dd}_{\perp} u \quad (7a)$$

$$\text{Space type } \text{qeR} \quad \text{qeR} \rightarrow \rightarrow \rightarrow$$

$$\rightarrow \text{qeR} \quad \text{qeR} \quad \text{koR}$$

Since the following equations (9) and (10) contain particles not yet found from the systematic of Table 1 and 2 here they will not be further commented upon. In structure they correspond to the type of the equations (7) and (8) and complete the set of the weak processes according to these models:

$$p^+ + ? - \gamma \rightarrow \rightarrow \rightarrow \rightarrow n^0 + (\Delta^{2+}) + ?^+ \quad (9)$$

$$\underbrace{uu}_{||} d + \underbrace{uu}_{\perp} \underbrace{d\bar{d}}_{\perp} \underbrace{u\bar{u}}_{\perp} \rightarrow \left( \begin{array}{l} u \text{ from } p^+ \Leftrightarrow \\ d \text{ from } Bk \end{array} \right) \rightarrow$$

$$\rightarrow \underbrace{dd}_{||} u + \underbrace{uu}_{\perp} u + \underbrace{u\bar{u}}_{\perp} \bar{d} \quad (9a)$$

$$n^0 + (\Delta) - \gamma \rightarrow \rightarrow \rightarrow \rightarrow p^+ + ?^+ + (\Delta^{2-}) \quad (10)$$

$$\underbrace{dd}_{||} u + \underbrace{uu}_{\perp} \underbrace{u\bar{u}}_{\perp} \underbrace{u\bar{u}}_{\perp} \rightarrow \left( \begin{array}{l} d \text{ from } n^0 \Leftrightarrow \\ u \text{ from } Bk \end{array} \right) \rightarrow$$

$$\rightarrow \underbrace{uu}_{||} d + d_{\perp} \underbrace{uu}_{\perp} + \bar{u}_{\perp} \underbrace{u\bar{u}}_{\perp} \quad (10a)$$

The weak processes are the gateway to the “second” strand of this universe. The particles having a complex space (koR) form this second strand. “Our” particles with quasi-Euclidian space (qeR) from the “first” strand overlap those from the second strand without problems, which is why the spaces also overlap without problems. (What is a “space” being created in our imagination?) The “spaces” do not interact with each other.

In contrast with this, the physical = electric  $\notin$ -fields from qeR and koR interact very well with each other so that their superposition results in the mutual attraction, see [1], page 186, line 18. Measured by the undiscovered particles of Tables 1 and 2 there is much to be discovered behind the gate to the “second” strand of this universe. Judging by the ratio of the gravitational effects of the visible matter and the dark matter what can be discovered behind the gate is a multiple of what we already know.

#### 4 The Meaning of the Weak Processes (7) and (8)

Equations (7) and (8) contain some fascinating technical potential. H. Stumpf deals with nuclear reaction rates of the electroweak interaction [2] and at the end of his paper he refers to L. I. Urutskoev and other Russian authors, who perform experiments regarding this item. The potential of those works includes finding new routes for the elimination of highly radioactive waste. In a few years this waste from hundreds of disused nuclear reactors will pile up in many states of our earth. The final storage of this waste is not clarified and costs for a long time storage with e. g. sarcophagus as in Tschernobyl would be enormous. The duration of storage follows from natural  $\beta$ -decay half-life periods of different elements or their isotopes which can last for up to  $1.5 \times 10^{24}$  years for  $^{128}_{52}\text{Te}$ , [4], page 34, which mankind cannot live to see.

Equation (7) respectively (7a) demonstrates, that the protons of radioactive elements can have resonance and can react with very short waved photons ( $e-\gamma$ ) into neutrons, positrons and neutrinos. Thereby the structure and the therewith combined beat of the photon shown in Part II, page 77, left column, point (2) and the storage of the photon in an electron (resonance), Part II, page 77, right column, penultimate paragraph are called to mind.

Equation (7) is confirmed by two aspects of the above mentioned experiments of L. I. Urutskoev et al. [3]. First aspect: The central incidents of the experiments are electric discharges between metallic foils in vessels filled with various fluids, [2], page 455. My interpretation is, that by the discharges those short waved  $e-\gamma$  of process (7) are generated, which can have resonance and reaction with the protons of the (radioactive) elements. Second aspect: The possibility of “low-energy nuclear transformation” is reported in [3]. If an electron and a visible photon have a comparable COMPTON-wavelength and therefore have resonance, then the photon has an energy of multiplier  $10^5$  less than the electron, [1], Chapter 8.2.3, page 163. With weak interaction nuclei emit short waved  $e-\gamma$  in the range of a few keV up to a few MeV. That means nuclei are in the position to have resonance with those short waved  $e-\gamma$ . If such short waved  $e-\gamma$  arrives at a nucleus and hit (a neutron or) a proton then there is the possibility for the “low-energy” exchange of quarks in a quark-pool according to the rules of page 72, middle of right column, and page 74, upper part left column. By the exchange of quarks

in accordance with equation (7) the proton transforms into a neutron and by this a new element respectively a new isotope takes shape. New elements respectively isotopes were detected by the authors of [3].

Following are comments on the peculiarities of the weak process (7):

1. The Standard Model of Physics treats the  $\beta$ -“decay” as statistical phenomenon or as happening by chance. The model under consideration especially the weak process (7) presents a dosed bombardment of protons by  $e-\gamma$ . The transformation of the protons into products of reaction happens not by chance instead the reaction is determined by the efficiency of the law of mass action.
2. Without the knowledge of the weak process (7) Urutskoev et al. with exotic experiments strive for the realisation of reactions according to this process. With knowledge of equation (7) different experiments are possible:

Possibly one could observe the weak process cease when the bombardment of protons by photons, which can have resonance, is prevented completely. Nevertheless the “radioactive decay” of a specimen with an outer screening could continue because a radiation could be released “from the interior” of this specimen. The latter could stem from the less probable but possible opposite reaction of equation (7):  $n^0 + e^+ + \nu_e \rightarrow p^+ + e-\gamma$ . The  $e-\gamma$  originating in the interior of the atomic nucleus would be absorbed after flying a very short distance in the specimen because of a high probability of resonance. By this the weak process (7) would be caused “from the interior”.

3. The weak process (7) cannot be observed in nature, [4], S. 38.

Following are comments on the peculiarities of the weak process (8):

1. The very common but not applicable non-equation (6) claims that the neutrons of radioactive elements would “decay” into protons, electrons and anti-neutrinos. As with equation (7) the law of mass action is valid with equation (8);
2. By the exchange of quarks according equation (8) a new element respectively a new isotope takes shape. The problem is, until now we still do not know the  $\nu - \gamma$  because of its complex space koR and beyond this we cannot shield it from the outside or handle it at all. From that point of view we would be dependent on the sun, on space or on nuclear reactors as generators for  $\nu - \gamma$  of whatever intensity and wavelength to shorten half-life periods by chance.

Eventually a possibility on the basis of the opposite reaction of the weak process (8) will be revealed. Those  $\nu - \gamma$  originating from  $p^+ + e^- + \bar{\nu}_e \rightarrow n^0 + \nu - \gamma$  would be absorbed

after flying the shortest distance because of a high probability of resonance. By this the weak process (8) would be released “from the interior”. The opposite reaction of the weak process (8) should be reinforced by proper conditions in such a way that the reaction rates are of sufficient size.

In summary: Though till now we do not know the  $\nu - \gamma$  radiation so far and, much less, we can control it, there is hope to transform the neutrons of radioactive elements by  $\nu - \gamma$  via the opposite reaction of equation (8). The construction of some technical apparatus for short waved  $e-\gamma$ -radiation as e.g. X-rays of  $10^3$  to  $10^6$  eV is feasible. By the reaction of proton and  $e-\gamma$  (photon) according to the weak process (7) natural, partly very long time half-life periods can be shortened down to seconds using a technical apparatus! The use of both types of radiation,  $\nu - \gamma$  and  $e-\gamma$ , would be decisive steps for the elimination of highly radioactive waste.

Submitted on April 05, 2008 / Accepted on June 19, 2008

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