Illustrate the unified of electromagnetic, weak, and strong interactions

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Abstract: The electromagnetic, weak, and strong interactions can be well unified by standard models. However, this unified approach is more abstract. Here we try to describe the nature of these three interactions by way of illustration, and can intuitively point out that these three interactions are actually electromagnetic interactions.

Keywords: interaction; electromagnetic interaction; unity of interaction

1 Introduction

At present, electromagnetic interaction, weak interaction, and strong interaction have been unified through standard models. This means that these three interactions are actually one kind of interaction. However, the unified model of the standard model is more abstract and difficult to understand. Here we try to use the knowledge of virtual space-time physics to use graphic form to describe the unified process of these three interactions. Make it easier to understand, and the physical meaning becomes more obvious.

2 The nature of the three interactions

First we need to assume the existence of virtual space-time. Virtual space-time exists symmetrically with the real space-time in which we live. In both spacetimes, there are electromagnetic wave signals. Different from the propagation of electromagnetic wave signals in a single space-time, electromagnetic waves propagating in two space-times will have three different propagation modes. These three different modes of propagation can be described as:

1. Electromagnetic waves propagate completely in real space-time. This is photon. Corresponding to electromagnetic interaction.

2. Electromagnetic waves propagate across both real space-time and virtual space-time, such as W or Z bosons, neutrinos, etc. This is closely linked to weak interactions.

3. Electromagnetic waves propagate completely in virtual spacetime. This is another possible intermediary particle, perhaps gluon. Corresponds to strong interactions.

It can be represented by Figure 1.

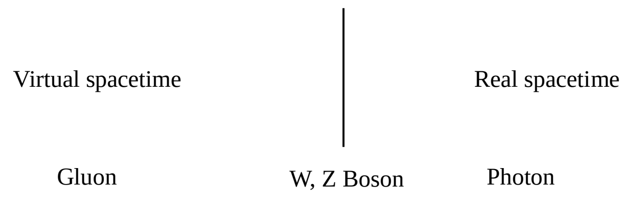

Figure 1. Propagation of particles in three space-times

3 Illustrate three interactions

In order to understand the three types of interactions more intuitively, here we use a graphical approach to explore the three types of interactions. In the figures, the electromagnetic radius of the proton is relatively large, so it is represented by a large circle. The radial direction is outward, indicating positive mass particles. The electron radius is small and is represented by small circles. Of course, a particle is composed of two space-time energies of virtual space-time and real space-time, so there is a large point mass in the center of the proton. It is not drawn in the figure.

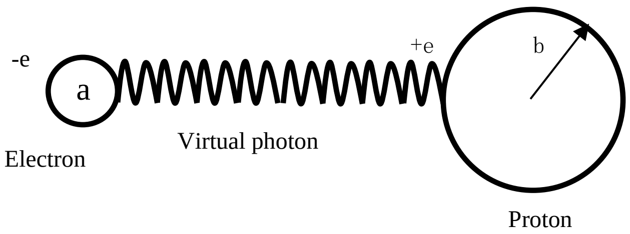

Figure 2. Electromagnetic interaction

For electromagnetic interactions, energy is transferred in the form of photons between two particles in real time. As shown in Figure 2.

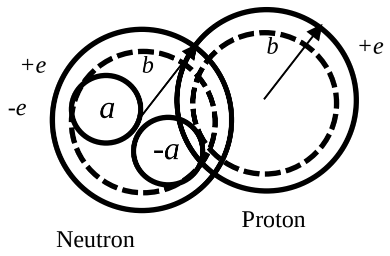

Figure 3. Strong interaction

Figure 3 shows the case where a neutron and a proton are in close proximity, resulting in a strong interaction.

The inner of dotted circles inside proton and neutron are virtual space-time. This means that when the distance between the proton and the neutron reaches a certain level, the virtual space-time inside the proton and the neutron will coincide. In this way, the electrons inside the neutron and the anti-electron neutrinos can flow to the inside of the proton, thereby generating energy from the neutron to the proton, forming a strong interaction. If in quark model, a neutron is converted into protons, it involves quark flavor change and the entire strong interaction process becomes very complex.

Because the entire strong interaction occurs in virtual space-time, even if there are intermediate particles such as gluons, it cannot be detected in real space-time. This may solve the mystery of quark confinement.

For weak interactions, it mainly involves neutrino radiation.

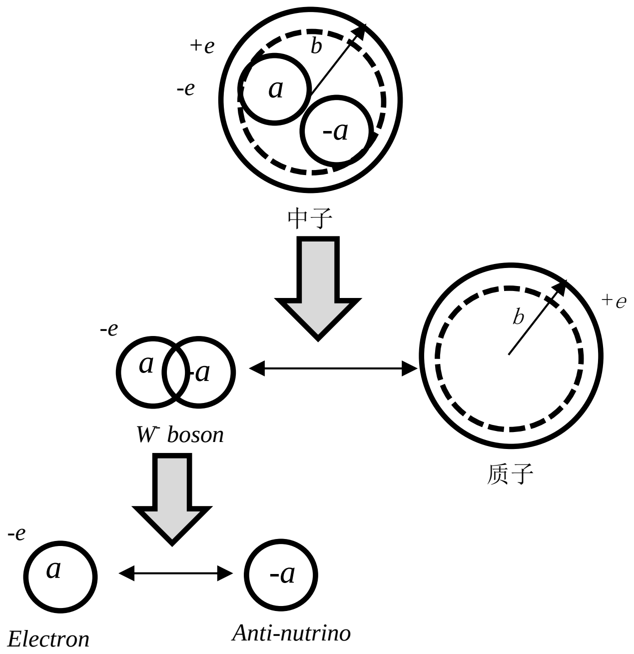

Figure 4. Weak interaction

In the weak interaction process shown in Figure 4, composite particles such as neutrons decay into leptons, leading to changes in particle properties.

From the comparison of Fig. 3 and Fig. 4, the processes of strong interactions all occur in the virtual space-time, so their interaction intensity is greater and the probability of interactions is also very high. The strength of strong interactions may be related to the combination of protons and neutrons. Although the neutron is not charged, considering that there is still a certain charge distribution on the surface of the neutron, this causes the protons to be affected by certain electromagnetic interactions in the process of approaching the neutron.

The weak interaction involves the process of the W or Z boson from virtual space-time to real space-time. The energy of the W of Z boson is very large, so the intensity of the interaction is relatively small. The probability of occurrence is very small.

Reference

[1] Cheng, Z. Foundations of Virtual Spacetime Physics. LAP LAMBERT Academic Publishing. Brivibas gatve 197, LV-1039, Riga. Latvia, European Union

Chinese Version

图解电磁、弱、强相互作用统一的物理基础

Zhi Cheng

摘要：通过标准模型可以很好地将电磁、弱相互作用、强相互作用三种相互作用统一在一起。然而这种统一的方法比较抽象。这里尝试通过图解的方式来描述这三种相互作用的本质，并能够很直观地指出这三种相互作用实际上都是电磁相互作用。

关键词：相互作用；电磁相互作用；相互作用统一

1 导言

目前通过标准模型已经能够将电磁相互作用、弱相互作用和强相互作用统一在一起。意味着这三种相互作用其实都是属于一种相互作用。不过标准模型的统一方式比较抽象，不容易理解。这里尝试通过虚时空物理学的知识，使用图解的形式来描述三种相互作用的统一方式。使之变得更容易理解，物理意义也变得更加明显。

2 三种相互作用的本质

首先我们需要假设存在虚时空。虚时空与我们所处的实时空是对称存在的。在虚实两个时空中，都存在电磁波信号的传播。与单一时空的电磁波信号传播不同，在两个时空中进行传播的电磁波将具备三种不同的传播方式。这三种不同的传播方式可以描述为：

1、电磁波完全在实时空中传播。这就是光子。因而对应了电磁相互作用。

2、电磁波同时跨越实时空和虚时空两个时空传播，比如 W 玻色子、中微子等。这跟弱相互作用紧密联系在一起。

3、电磁波完全在虚时空中传播。这就是另一种可能存在的中介粒子，或许就是胶子。对应了强相互作用。

可以用图 1 来表示。

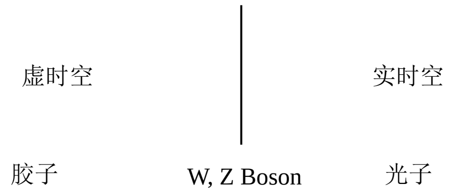

图 1 三种粒子的传播

3 图解三种相互作用

为了更直观理解三种相互作用方式，这里使用图解的方式来探讨三种相互作用。在图中，质子的电磁半径比较大，因此用一个大圆来表示。半径方向向外，表示正质量粒子。电子半径小，用小圆表示。当然一个粒子都是由虚时空和实时空两个时空的能量组合在一起的，因此在质子中心存在一个较大的点质量。图中并没有绘制出来。

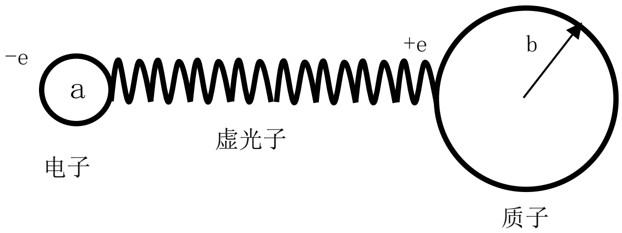

图 2 电磁相互作用

对于电磁相互作用，实时空中两个粒子之间传递光子的方式来传递能量。

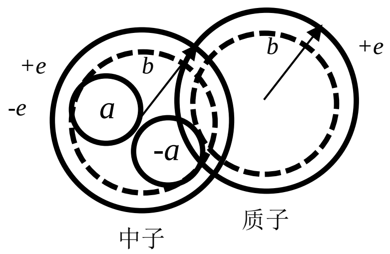

图 3 强作用

图 3 显示了一个中子和一个质子之间距离非常近的情况下，产生强相互作用的情况。

质子和中子内部的虚线圆圈为虚时空。这意味着当质子和中子之间的距离达到一定程度之后，质子和中子内部的虚时空将重合。这样中子内部的电子和反电子中微子将可以流向质子内部，从而产生能量从中子传递到质子，形成强相互作用。

对于弱相互作用，主要涉及到中微子的辐射。

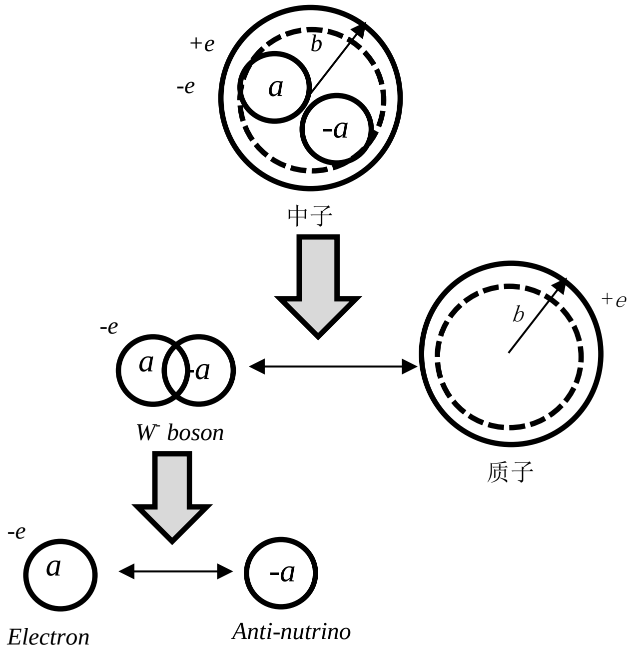

Figure 4. Weak interaction

图 4 显示的弱相互作用过程中，中子等复合粒子衰变成轻子，导致粒子性质的改变。

从图3和图4的对比来看，强相互作用的过程全部发生在虚时空，因此其相互作用强度更大，发生相互作用的概率也非常高。强相互作用的强度主要可能跟质子与中子的结合有关。虽然中子不带电，但是考虑到中子表面还是有一定的电荷分布，这导致质子在靠近中子的过程中，会受到一定的电磁相互作用的影响。

而弱相互作用涉及到 W 玻色子从虚时空进入实时空的过程，W 玻色子的能量非常大，故相互作用强度也就比较小。发生的概率也就非常小。

参考文献：

[1] Cheng, Z. Foundations of Virtual Spacetime Physics. LAP LAMBERT Academic Publishing. Brivibas gatve 197, LV-1039, Riga. Latvia, European Union