In-depth Analysis of New Weak Interaction Model

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Abstract: In this paper, I deeply analyze the weak interaction model I have established. The interaction between neutrinos and electrons, neutrinos and photons, neutrinos and neutrinos is discussed. I point out that the interaction strength of neutrinos with various other particles is also affected by the duration of an interaction. Since the interaction time of neutrinos with slower particles is shorter, the intensity of interaction is relatively small. The interaction of neutrinos with photons and neutrinos themselves, because all particles are running at the speed of light, the interaction can last for a long time, resulting in the increasing interaction strength between neutrino and photon, so that the Mössbauer effect can be used for detection. To this end, the paper gives some problems that should be paid attention to when using the Mössbauer effect to detect neutrinos.

Key words: Neutrino; Photon; Mössbauer effect; Weak interaction

1 Introductions

I analyzed the interaction of neutrinos and photons in the previous article [1~3]. It is believed that the interaction of neutrinos with photons is actually much stronger than the predictions of the theories such as the standard model. On this basis, the system error caused by using Mössbauer effect to detect the redshift of gravitational force and the phenomenon of extra redshift at the limb of the solar disk are successfully explained [2, 3].

Of course, such work can not completely rule out the existence of other mechanisms leading to these additional systematic errors and the additional spectral redshift phenomena, so it is necessary to have targeted experimental verification.

Although compared to the huge equipment such as the Super Kamioka Detector [4] and the Daya Bay Neutrino Detector [5], the Mössbauer effect can be used to achieve very small scale. However, compared with devices for detecting particles such as photons and electrons, it is still relatively large. Can devices that detect neutrinos be smaller? Of course, it is also a direction worth pursuing.

Another problem may arise in the Mössbauer effect itself. The Mössbauer effect is a very precise and sensitive effect. The operation of the Mössbauer effect instrument requires high experimental skills, and it is also susceptible to interference from other factors during the experiment, such as temperature [6], how to correctly distinguish the measured results from other interference factors. It is a very detailed job.

The last question is that the new mechanism for the interaction between photons and neutrinos is still not clear. For example, how can neutrinos collide with photons to maximize energy transfer? There is still no clear theoretical basis for which angle of collision is the most suitable. I believe that if we can get more theoretical support, there will be better mechanisms for us to design and make lighter neutrino detection equipment.

This article attempts to analyze the new model and how neutrinos interact with other particles, photons, and neutrinos.

2 Interaction between neutrinos and particles

2.1 The neutrino wave function

In the paper [1], I obtained a new wave function solution by solving the Maxwell's equations based on the virtual space-time. The wave function is characterized in that its real space-time electric field wave function is rapidly decay to zero, but the electric wave function in the virtual space-time is normally propagated at the speed of light. Or the magnetic field wave function in virtual space-time decays to zero, while the real-time magnetic field wave function propagates normally.

The electromagnetic wave that simultaneously spans two space-times as shown in Figure 1 is significantly different from the electromagnetic wave that propagates only in one space-time. For example, the electromagnetic waves of a photon are only transmitted in real space-time, and are affected by different media, and the propagation speed will also be different.

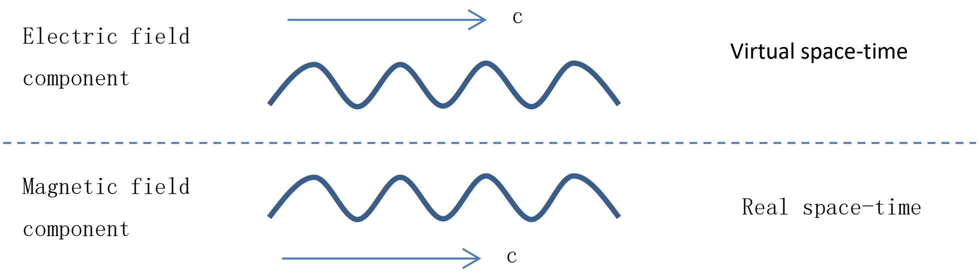

Fig. 1 The model of neutrinos' wave function

However, the electromagnetic waves that span two space-times are not affected by the medium. Whether in vacuum or in the medium, the propagation speed must always be equal to the speed of light in the vacuum.

The reason for this is that once the electromagnetic wave component velocity in real space-time is lower than c, the corresponding electromagnetic wave component velocity in the virtual space-time is necessarily greater than c (with reference to real space-time), which will affect the integrity of the electromagnetic wave, as shown in Fig. 2. Therefore, in order to ensure the integrity of these two space-times electromagnetic waves, the speed of neutrinos must be guaranteed to equal to c in any medium.

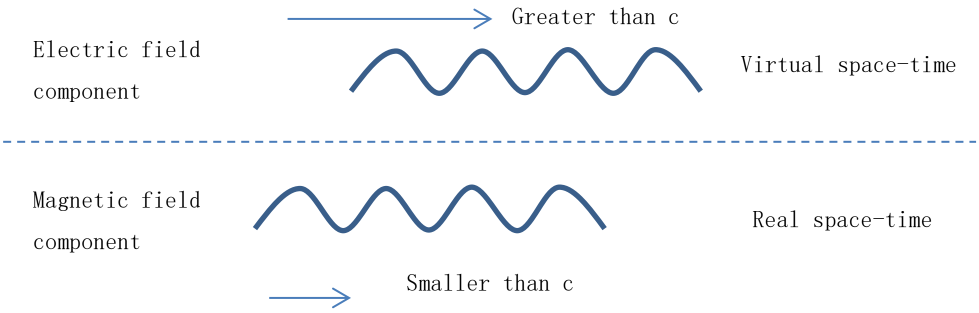

Fig. 2 The wave speed in different space-times is different due to some factors

From the data of various known particles, the closest to this property is the neutrino.

2.2 Two interactions between neutrinos and other particles

If this special electromagnetic wave spanning two space-times represents a neutrino, it may have two states when interacting with other particles. That is the elastic change and inelastic change.

For the elastic change of the neutrino, if the energy of the neutrino does not change after the interaction, the neutrino will keep the energy and motion state and continue to run at the speed of light. As shown in Fig. 3.

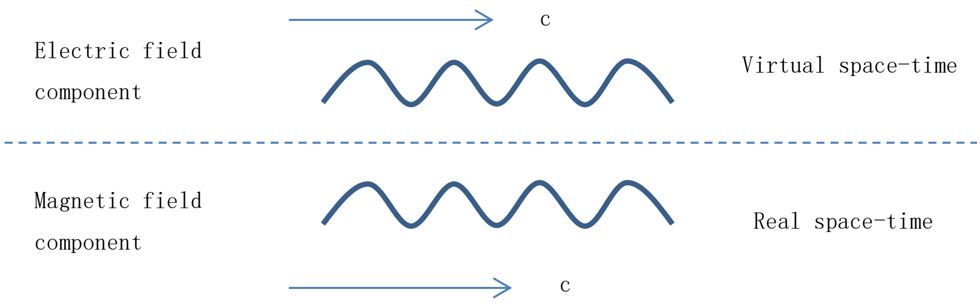

Fig. 3 The elastic change is restored.

For inelastic changes, the energy of the neutrino changes after interacting with other particles, the energy of the neutrino increases or decreases, and the state of motion may also change. As shown in Fig. 4.

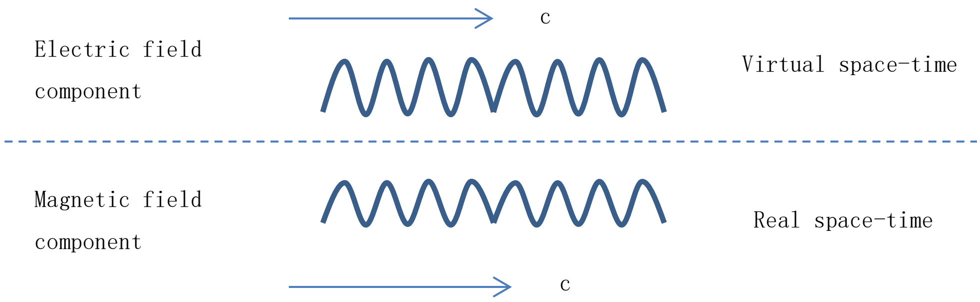

Fig. 4 Inelastic changes lead to changes in neutrino energy

Since the structure of the neutrino is very simple, if it is necessary to cause the change of the energy of the neutrino, the interaction of the neutrino with other particles must last for a sufficient time, so that the electromagnetic waves in the two space-times can have enough time to adjust its speed in order to regain the balance of speed of light.

2.3 Collisions between neutrinos and electrons

For particles whose velocity is much lower than the speed of light, the process of interaction occurs can be described by the particle decay diagram [7]. Fig. 5 shows a situation where neutrinos collide with electrons.

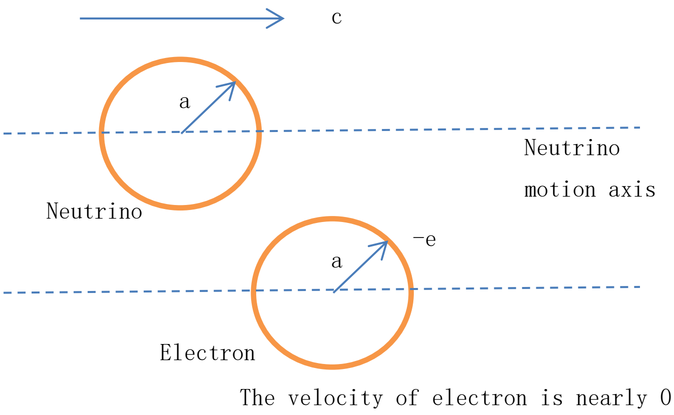

Fig. 5 Neutrinos and electrons are not on one axis

In the process shown in Fig. 5, the neutrino and electron collisions are not on one axis, the radius of the electron itself cannot block the neutrino's motion. The neutrino is very fast, and the electrons are almost stationary, which leads to the time of interaction between neutrino and the electronic electric field is very short. Although the electric field of the electron can affect the magnetic field component of the neutrino in the real space, it can only cause the elastic change of the neutrino energy at this time, after a slight disturbance. The wave function in different space-times is quickly restored to its original state. Therefore, electrons cannot cause changes in neutrino energy and motion state in this process.

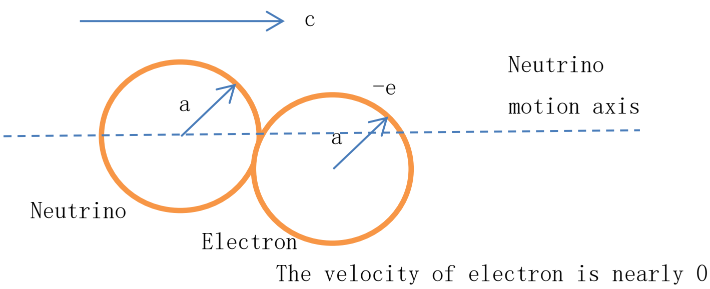

Fig. 6 Neutrinos and electrons are on one axis

Fig. 6 shows that the neutrinos and electrons are on the same axis, so that the neutrinos are blocked by electrons, and the interaction can be long enough, and the neutrino energy will produce inelastic changes. Energy can be transferred to the electrons.

Since the collision to change the neutrino energy must occur on the axis where neutrino and electron located, the probability of collision is very low. However, it is still not clear which angle neutrino collides with electron can cause the neutrino energy change. The theoretical uncertainty is still relatively large. Therefore, it is still difficult to calculate the scattering cross section. Perhaps it can be explored in further research.

3 Interactions between neutrino and photon

The interactions between neutrino and photon has a remarkable feature, that is, the speed of photon is basically the same as that of neutrinos, so that if they interact, they can last for a long time, thus making this interaction effect becomes more apparent.

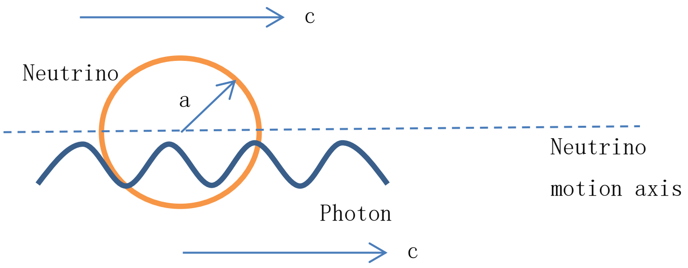

Fig. 7 Interaction between neutrino and photon

Fig. 7 shows an illustration of the interaction between neutrino and photon. Since both neutrino and photon are at speed c, the electromagnetic field components of neutrino and photon can interact for a long time. Even though the neutrino's inertia is relatively large due to the special structure of the neutrino itself, a long enough interaction will cause a change in the neutrino energy, which in turn leads to a change in photon energy.

If such an analysis is correct, it is indicated that when photon neutrino interaction effects are used to detect neutrinos, photons ray and neutrinos beam should be placed in the same direction of motion as much as possible. That is, the collision angle between the neutrino and the photon should be as small as possible.

However, the energy exchange between the neutrino and the photon will eventually reach an equilibrium state. Therefore, if the motion direction of the neutrino and the photon are completely in a straight line, the energy of the neutrino and the photon will eventually reach equilibrium, and the energy will no longer be exchanged after enough time. Therefore, it is necessary to consider how a photon can continue to interact with other neutrinos once a single neutrino and photon reach an energy balance, so that a more pronounced photon frequency shift effect can be produced.

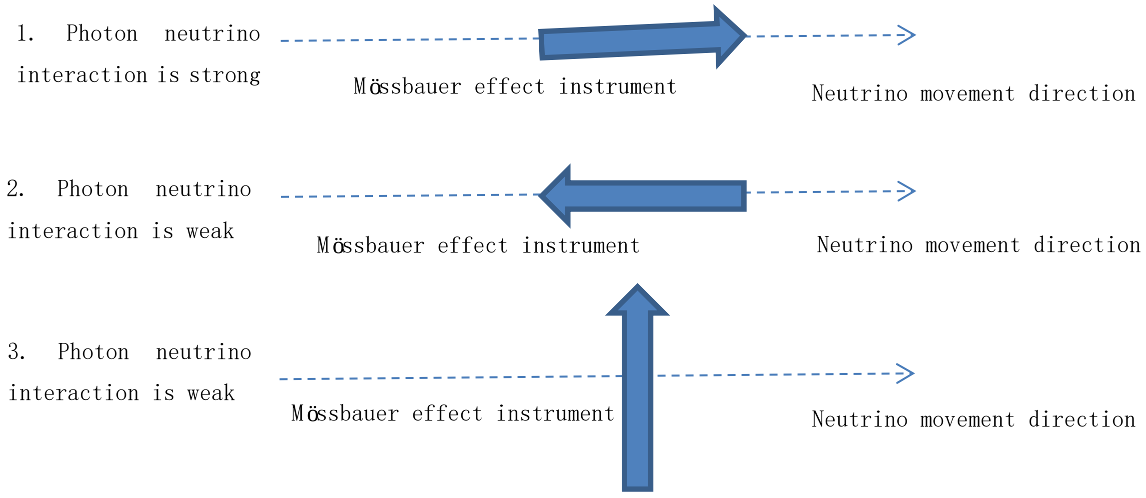

Fig. 8 Effect of the direction of the Mössbauer effect instrument on the detection (The direction of the large arrow of the Mossbauer effect instrument in the figure indicates the direction of the gamma ray emission from the source)

Fig. 8 shows the effect of the placement of the Mössbauer effect instrument on the intensity of the photon neutrino interaction. It can be seen from the figure that the effect of photon neutrino interaction is most obvious when the direction of neutrino movement is consistent with the direction of the gamma ray emitted by the source in the Mössbauer effect instrument. Under other conditions, the effects of these interactions will be weaker.

If such an effect exists, the experiment used to verify the interaction of the photon with the neutrino can be facilitated by measuring the angle of the vertical direction of the Mössbauer effect instrument when measures the gravitational redshift. The specific effect of the neutrino photon interaction can be obtained by the changes of the red shift of the gamma ray in different angles and then subtracting the red shift of the gravitational force.

Such a scheme can effectively eliminate systematic errors caused by various factors such as temperature since it is measured at the same place and at the same time. Fig. 9 shows such a measurement process. When the gamma photon’s travel direction is consistent with the solar neutrino, the measured red shift is larger. In the second case in the figure, the gamma photon’s direction has a larger angle with the sun neutrino’s movement direction, the redshift will be smaller.

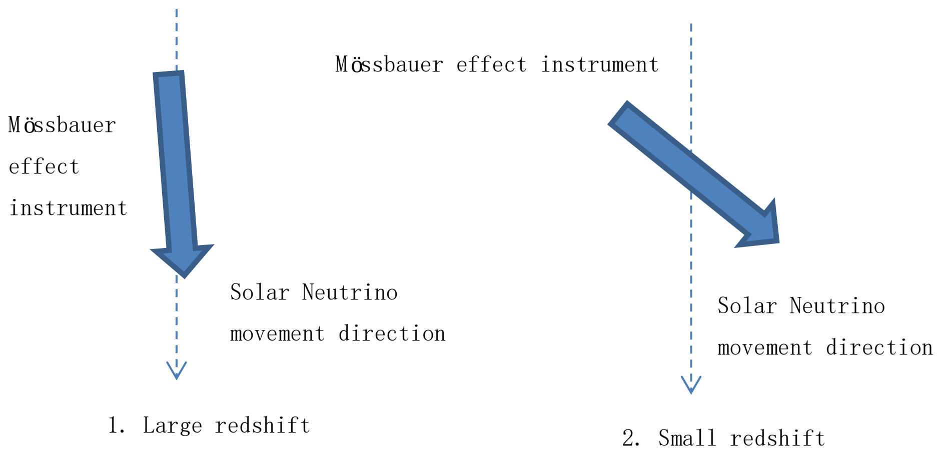

Fig. 9 Detecting the effect of solar neutrinos on photon frequency shift (The direction of the large arrow of the Mossbauer effect instrument in the figure indicates the direction of the gamma ray emission from the source)

4 Interaction between neutrinos

Since all neutrinos are at the same speed, the interaction between neutrinos is stronger, which may also reflect that neutrinos may be a less stable particle. It may also be the reason why one type of neutrino can be changed into another type of neutrino in the propagation process.

The interaction between neutrinos can refer to the interaction between photon and neutrino. The interaction between neutrinos will lead to multi-effects such as neutrino dispersion and frequency shift and etc. However, due to the lack of efficient and sensitive neutrino detection devices, more experimental data and theoretical support are needed to understand more details of the interaction between neutrinos. Perhaps after we have a deeper understanding of photon neutrino interactions, the interaction between neutrinos will lead to a more complete solution.

5 Conclusions

In this paper, I make an in-depth analysis and discussion on the new neutrino theory. Based on the special wave function of neutrinos given in the previous paper[1], the interaction between neutrinos and various particles, photons and neutrinos is analyzed, and various conditions that can cause the changes of neutrino wave function.

I point out that the scattering cross section of neutrinos and electrons is relatively small because of the short-time contact. The electric field of electron or other particles cannot affect the energy of neutrinos. Only when the neutrino and the electron's body are in contact with each other can there be enough time to change the energy of the neutrinos.

The neutrinos and photons run at the same speed. Therefore, when the neutrinos and the photons are basically propagating in the same direction, the interaction between the two is the strongest. At this time, the neutrinos will probably maximize change the photon frequency, to be red shift or blue shift.

This also provides us with a simpler method to detect the interaction between neutrino and photon and obtain some specific interaction parameters.

If we have a deeper understanding of the interaction between neutrino and photon, it will help us better analyze the interaction between neutrinos, thus perfecting our neutrinos knowledge.

The shortcomings of this article are also very obvious. Due to the limitations of various conditions, both theoretical and experimental aspects are still at a preliminary stage of discussion. There are many problems that are still very unclear. What is even more frustrating is that there are no experiments specifically designed for detecting photon neutrino interaction, so it can only be explored in theory recently. This process may encounter various problems and even draw some wrong conclusions. For example, last year I overestimated the interaction strength of neutrinos and muons [8]. Of course, I believe that after continuous thinking and hard work, the possibility of getting close to the truth will be greater and greater.

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Appendix: Chinese Version

新弱相互作用模型的深入分析

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摘要：本文深入分析了我所建立的弱相互作用模型。重点探讨了中微子与电子等粒子、中微子与光子、中微子与中微子之间的相互作用。本文指出中微子与其他各种粒子相互作用强度还受到一个相互作用持续时间的影响。由于中微子与速度较慢的粒子相互作用时间比较短，导致相互作用的强度比较小。而中微子与光子以及中微子本身的相互作用，则由于所有粒子都是以光速运行，相互作用可以持续较长的时间，导致中微子与这些光子等粒子的相互作用强度变得足够大，以至于可以通过穆斯堡尔效应来进行探测。为此本文给出了在利用穆斯堡尔效应探测中微子的时候应该注意的一些问题。

关键词：中微子；光子；穆斯堡尔效应；弱相互作用

1 引言

我在前面的文章中分析了中微子与光子的相互作用【1~3】。认为中微子与光子的相互作用实际上比标准模型等理论的预测要强很多。在此基础上成功解释了利用穆斯堡尔效应测量引力红移所产生的系统误差问题以及太阳光面边沿额外红移的现象【2，3】。

当然这样的工作还不能够完全排除可能存在其他的机制导致这些额外的系统误差以及额外的光谱红移现象的出现，因此还需要有针对性的实验验证。

虽然相比于超级神冈探测器【4】、大亚湾中微子探测器【5】等庞大的设备，利用穆斯堡尔效应，其仪器设备已经可以做到非常小规模了，但相对于光子、电子等粒子探测的设备而言，还是比较庞大的。探测中微子的设备还能不能更小规模一些？当然也是一个值得追求的方向。

另一个问题则可能出现在穆斯堡尔效应本身。穆斯堡尔效应是一个非常精密和灵敏的效应。操作穆斯堡尔效应仪器进行探测需要很高的实验技巧，且在实验过程中也很容易受到其他因素的干扰，比如温度等【6】，如何正确区分所测结果与其他干扰因素所引起的误差是一个非常细致的工作。

最后一个问题就是目前对光子与中微子相互作用的新机制还不是很明确，比如究竟中微子与光子如何进行碰撞才能够最大限度地实现能量转移？碰撞角度如何等，还缺乏明确的理论依据。相信如果能够获得更多的理论方面的支持，会有更好的机制提供给我们设计制作出更轻便的中微子探测设备。

本文尝试就新的模型，深入分析一下中微子是如何与其他粒子、光子以及中微子产生相互作用的。

2 中微子与粒子的相互作用

2.1 中微子的波函数

在文献【1】中，通过对基于虚时空的麦克斯韦方程组的求解，我获得了一个新的波函数解。该波函数的特点在于其实时空的电场波函数迅速衰减为零，但虚时空的电场波函数则正常地以光速进行传播。或者其虚时空的磁场波函

数衰减为零，而实时空的磁场波函数则正常传播。

图 1 所示的同时跨越两个时空的电磁波与只在一个时空中传播的电磁波有着明显的区别。比如光子的电磁波只在实时空中传播，则受到不同介质的影响，其传播速度也会有所不同。

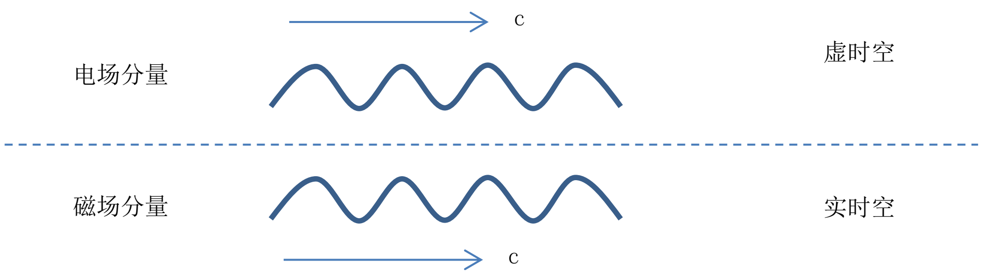

图 1 中微子的波函数模型

然而跨越两个时空的电磁波则不会受到介质的影响，无论是在真空中还是在介质中，其传播速度始终都必须恒等于真空中的光速 c

这其中的原因在于一旦在实时空中电磁波分量速度低于 c，则虚时空中的对应的电磁波分量速度必然大于 c（以实时空为参照系），这将影响到电磁波的完整性。如图 2 所示。因此为了确保这种跨越两个时空电磁波的完整性，无论在何种介质中，其速度都必须保证是 c.

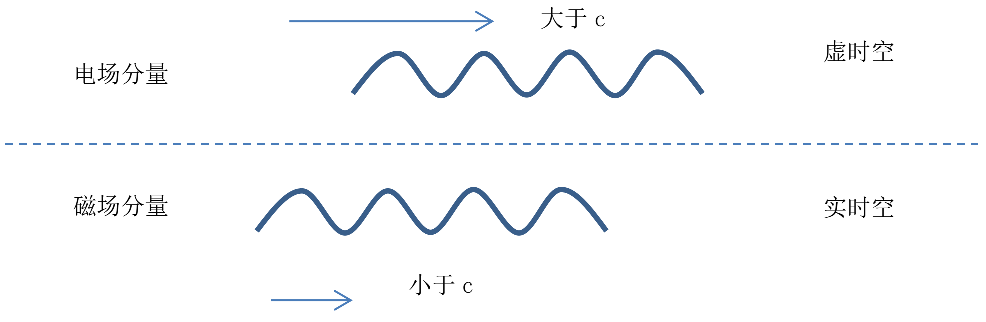

图 2 因为某种因素导致两个时空波函数速度不同

从已知的各种粒子的数据来看，与这种特性最接近的就是中微子。

2.2 中微子与其它粒子的两种相互作用

如果这种特殊的、跨越两个时空的电磁波表示的就是中微子，则它在与其他粒子进行相互作用的时候就可能存在两种状态：弹性变化和非弹性变化

对于中微子的弹性变化，则如果相互作用之后，中微子的能量不会产生变化，则中微子将保持能量和运动状态不变继续以光速运行。如图 3 所示。

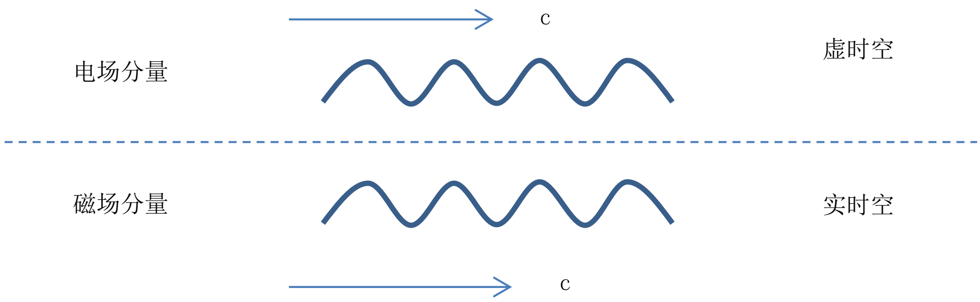

图 3 弹性变化恢复原状

而对于非弹性变化，则中微子的能量在与其它粒子相互作用之后会产生变化，中微子能量会增加或减少，而其运动状态也可能会出现变化。如图 4 所示。

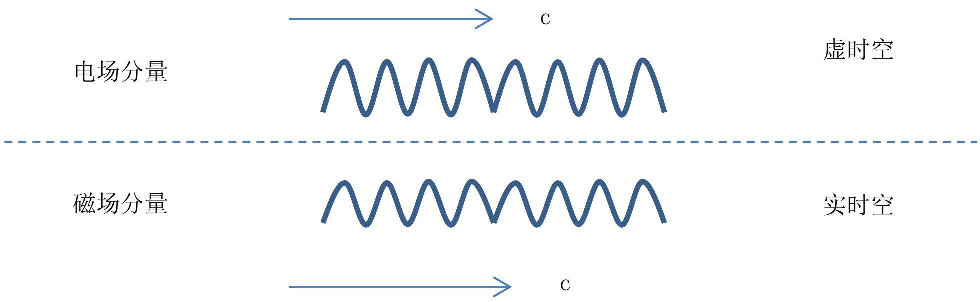

图 4 非弹性变化导致中微子能量产生变化

鉴于中微子的结构非常简单，因此要引起中微子能量的改变，意味着中微子与其他粒子产生相互作用必须持续足够的时间，这样才能够让两个时空中的电磁波有足够的时间进行调整，重新达到光速运动的平衡。

2.3 中微子与电子的碰撞

对于速度远低于光速的粒子，这里以粒子衰变图【7】来描述发生相互作用的过程。图 5 显示了中微子与电子相互碰撞的一种情况。

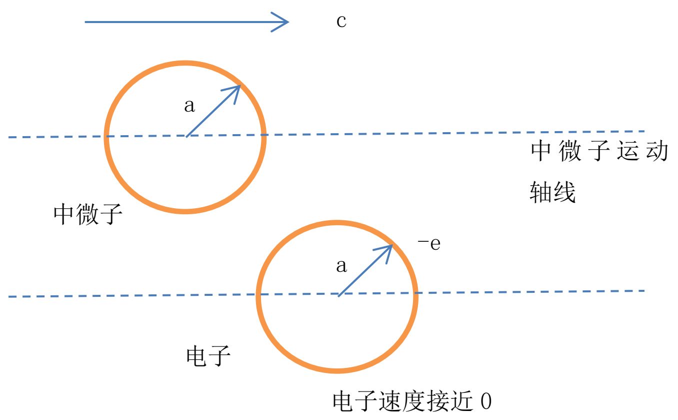

图 5 中微子与电子不在一条轴线上

图 5 显示的过程中，中微子和电子碰撞不在一条轴线上，电子本身的半径无法阻挡中微子运行，加上中微子速度非常快，而电子几乎静止不动，这导致中微子与电子电磁场相互影响的时间非常短，尽管电子的电场能够影响中微子实空间中的磁场分量，但此时中微子能量出现的弹性变化，一点微小扰动之后，其虚实两个时空的波函数又恢复到原来的状态。因此电子无法引起中微子能量和运动状态的变化。

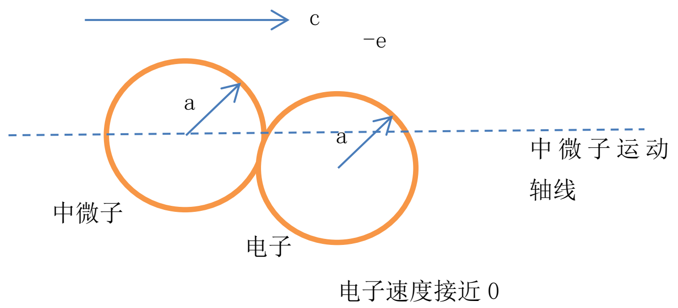

图 6 中微子与电子在一条轴线上

图 6 显示的则是中微子和电子位于同一轴线上，这样由于中微子受到电子的阻挡，相互作用可以获得足够长的时间，此时中微子能量将产生非弹性变化，所失去的能量会转移给电子。

由于改变中微子能量的碰撞必须发生在电子位于中微子运行的轴线上，因此发生概率是非常低的。不过由于还不太清楚究竟偏离中微子运行轴线多少角度才能够引起中微子能量变化，理论上的不确定性还比较大，因此要具体计算散射截面还是有一定的难度的。或许可以在进一步的研究中进行探讨。

3 中微子与光子的相互作用

中微子与光子的相互作用有一个很显著的特点，就是光子运行的速度与中微子基本相同，这样二者如果产生相互作用则可以持续比较长的时间，从而使得这种相互作用产生的效应变得更加明显。

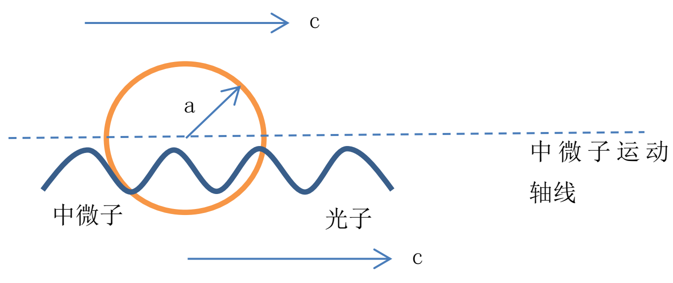

图 7 中微子与光子产生相互作用

图 7 显示中微子与光子产生相互作用的图解。由于中微子与光子都是以速度 c 运行，因此中微子和光子的电磁场分量可以在很长时间中产生相互作用。即便由于中微子本身的特殊结构导致中微子的惰性比较大，但足够长时间的相互作用将能够引起中微子能量的变化，进而导致光子能量的变化。

如果这样的分析是正确的，则说明在利用光子中微子相互作用效应来检测中微子的时候，应该尽可能地让光子与中微子处于相同的运动方向上。即中微子与光子的碰撞角度要尽量小一些。

然而中微子与光子的能量交换最终都会达到一个平衡状态的，因此如果中微子与光子完全处于一条直线上，则中微子与光子的能量最终达到平衡，就不再交换能量了。因此还要考虑到一旦单个中微子与光子达到能量平衡之后，光子如何继续与其他的中微子产生相互作用，这样才能够产生比较明显的光子频率移动效应。

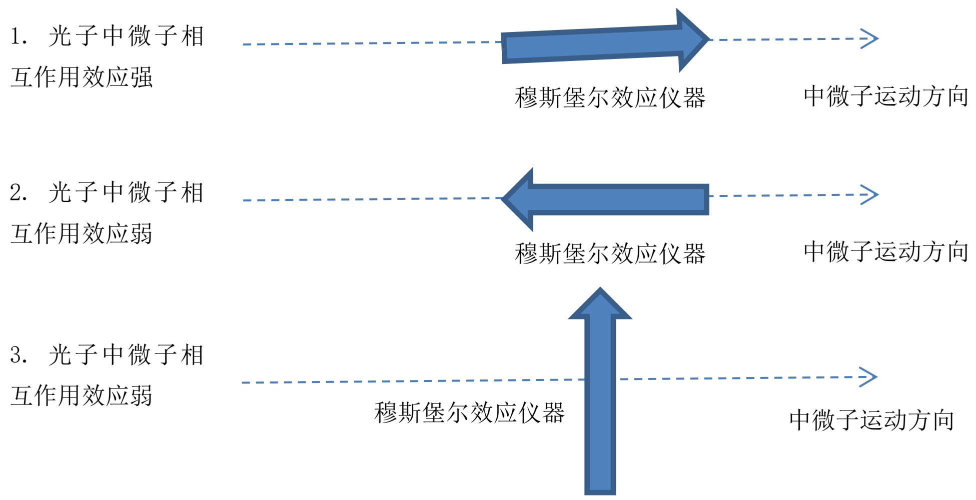

图 8 穆斯堡尔效应仪器的方向对探测的影响（图中穆斯堡尔效应仪器的大箭头方向表示放射源伽马射线发射方向）

图 8 显示了穆斯堡尔效应仪器放置的位置对探测光子中微子相互作用效应强度的影响。从图中可以看出，当中微子运行的方向与穆斯堡尔效应仪器中的放射源发出的伽马射线方向一致时，光子中微子相互作用的效应最明显。而其他的条件下则这些相互作用的效应就会比较弱。

如果这样的影响是存在的，则用来验证光子与中微子相互作用的实验可以变得很方便，即只需要通过改变测量引力红移的穆斯堡尔效应仪器垂直方向的角度，测量伽马射线红移量的变化，然后减去引力红移，就可以获得中微子对光子频率红移的具体影响。

这样的方案因为是在同一时间同一地点等进行的测量，还可以有效排除温度等因素引起的系统误差。图 9 显示了这样的测量过程。当伽马光子运行方向与太阳中微子一致时，测得的红移数量较大。而图中的第二种情况，伽马光子运行方向与太阳中微子运行方向有较大的夹角，红移数量较小。

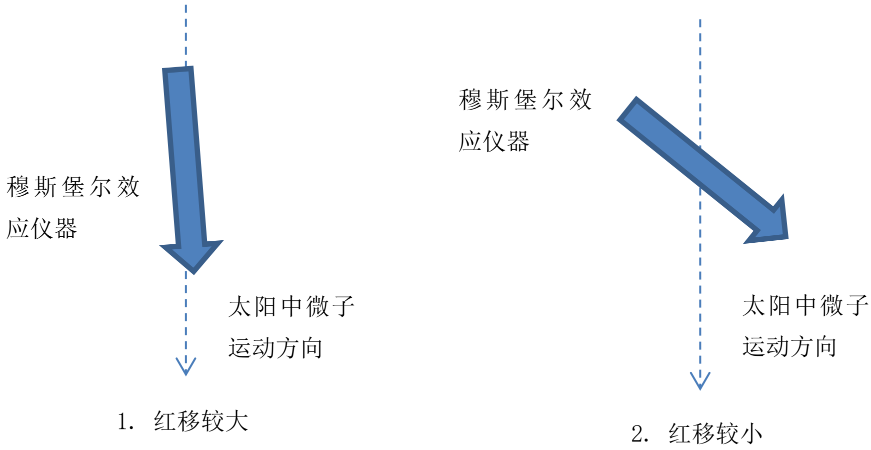

图 9 探测太阳中微子对光子频移的影响（图中穆斯堡尔效应仪器的大箭头方向表示放射源伽马射线发射方向）

4 中微子与中微子的相互作用

由于所有中微子的速度都是一样的，因此中微子之间的相互作用更强烈，这也可能反映出中微子可能是一种不太稳定的粒子，这也可能是中微子在运行的过程中，会转变成另一种中微子的原因。

中微子之间的相互作用可以参照光子与中微子之间的相互作用。中微子之间的相互作用将能够导致出现中微子色散、频移等多种效应。但是由于目前缺少高效、灵敏度很高的中微子探测装置，要了解中微子之间相互作用的更多的细节问题，尚需更多的实验数据以及理论的支持。也许在我们对光子中微子相互作用有了更深入的了解之后，中微子之间的相互作用将能够获得更完善的解决方案。

5 结论

本文对新的中微子理论进行了深入的分析和探讨。在前述文献给出的中微子比较特殊的波函数的基础上【1】，分析了中微子与各种粒子、光子以及中微子之间的相互作用，以及可能导致中微子波函数的变化情况。

本文指出中微子与电子等粒子的散射截面比较小的原因主要在于太短时间的接触，电子等粒子的电场无法影响中微子的能量。只有中微子和电子实体相互接触，才能够有足够的时间来改变中微子的能量。

而中微子与光子的运行速度基本相等，因此当中微子与光子的运行方向基本一致的时候，二者之间的相互作用强度最大，这时候中微子将有可能最大限度地引起光子频率的红移或者蓝移。

这也为我们提供了一种比较简单的方法来检验中微子与光子相互作用的效应，并获得一些具体的相互作用参数。

如果我们对中微子和光子之间的相互作用有了比较深入的了解之后，将有助于我们更好地分析中微子与中微子之间的相互作用，从而完善我们有关中微子的知识。

本文不足之处也非常明显。由于受到各种条件的限制，无论是理论还是实验方面都还处于一个初步探讨的阶段，有很多的问题现在还非常不清楚。更让人沮丧的是还没有直接针对光子中微子相互作用原理而专门设计的实验，因此只能够在理论上不断摸索。这一过程可能会遇到各种问题，甚至得出一些错误的结论，比如去年我就曾经高估了中微子与渺子的相互作用强度【8】。当然相信经过不断的思考和努力，接近真相的可能性也将会越来越大。

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