# A Simple Dark Matter Model

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**Abstract**

*This article proposes a new and very simple dark matter model. This article believes that the most basic particle that constitutes dark matter is called "dark particles", which is labeled in Chinese Anzi. The model assumes that there are two anzis with opposite signs and equal mass. Anzi of two different signs can be combined into dark matter atoms similar to the interaction between positive and negative electrons, and then form dark matter molecules, and finally form dark matter gas or liquid. Similar to electromagnetic interaction, the interaction between anzi is realized by exchanging dark wave quantum. By comparing the speed of light and sound, this article believes that the propagation speed of dark waves is one million times that of electromagnetic waves. This article is convinced that if dark waves can be detected and used well, humans' vision in the existing universe can be increased by one million times.*

# 1 Introduction

At present, the universe models we construct are built within the observable matter range. The universe we can observe is strongly dependent on the interaction of electromagnetic and gravitational forces.

The problem with this observable universe model is whether the universe we can observe is the entire universe? If it is, then we will always be limited to the very limited range of galaxies we are currently in, and we will not be able to exchange more adequate information with more distant galaxies. If not, what methods do we use to study the remaining unobservable universe? This article attempts to construct a model of the unobservable universe to solve the relationship between the observable universe and the unobservable universe.

## 1.1 Existing dark matter models

There are already a lot of facts that indicate the existence of dark matter. Unfortunately, many of the most influential models are still based on the laws of the observable universe. In other words, the basis of these dark matter models is still the interaction of electromagnetic and gravitation [1~3].

Constructing a dark matter model based on the interaction of electromagnetic and gravitational forces has the advantage of making it easier to design devices and equipment for detecting the existence of dark matter. Because if dark matter is caused by electromagnetic and gravitational

interaction, it will definitely produce various observable electromagnetic and gravitational interaction phenomena.

At present, some evidences have been shown in the effects of gravitational interaction, such as the drawing of galaxy speed curves, gravitational lensing effects, and so on. This proves that dark matter can affect gravitational interaction.

But in terms of electromagnetic interaction, we have not enough evidence to confirm the existence of dark matter. This shows that the interaction contained in dark matter may not have much to do with electromagnetic interaction.

So does this mean that gravitational interaction and electromagnetic interaction are two completely different ways of interaction? In other words, the dream of unifying electromagnetic interaction and gravitational interaction that Einstein expected in the past could not be realized? Perhaps the answer to this mystery is gradually emerging.

## 1.2 Enlightenment gained from the generation and propagation of sound waves and light waves

We can imagine the difference between bats and humans.

Bats mainly use ultrasound to communicate information, while humans can communicate information not only through sound but also through light. In this way, bats and humans have very different worldviews.

Since the speed of sound in the air is only more than 300 meters per second, bats will think that the world is actually very small. Because the sound it can hear is from a few kilometers away at most. Of course, it occasionally receives sounds from volcanic eruptions or asteroid impacts hundreds of kilometers away, but these sounds rarely appear after all, and most bats are unlikely to hear them in their entire lives. Therefore, bats think that the world is a few kilometers. But those bats who heard the eruption of a volcano hundreds of kilometers away think that the entire world should be hundreds of kilometers away.

Later, some of the very smart bats will calculate the speed of sound propagation, and will design more sensitive equipment to receive weaker sounds. So these bats proved theoretically that starting from the Big Bang, matter diffused out at a speed not exceeding sound, and the radius must not exceed 10,000 light-years! Because if it exceeds 10,000 light-years, the sound they hear is the sound made before the Big Bang. Of course this is impossible. In this way, the bats finally determined that the size of the universe they are in is $10^{17}$ kilometers, which is equivalent to 10,000 light-years of human measurement. Considering that the range of the bat universe is too large compared to the world that bats can perceive, physicists in bats believe that there must be signals that are faster than the speed of sound. In other words, there must be other types of interaction beyond mechanical interaction to generate supersonic signals.

Humans are different from bats. Humans can not only hear sounds, but also see light. The propagation speed of light is much faster than sound. The speed of light is 300,000 kilometers per second, which is one million times the speed of sound. Therefore, according to the same calculation method, humans believe that the scope of the universe should be 14 billion light-years away. It can be seen from this that the scope of the universe far exceeds the scope of the world in which humans live, so is there a signal that exceeds the speed of light and is formed by other interactions? This should be a question that humans need to think about.

Why is there such a big difference in the scope of the universe in the worldview of bats and humans? The reason is of course that the signals used to explore the world are different. Bats use slow-spreading sounds, while humans use fast-spreading light.

Now let us suppose that there is a creature in this universe that can communicate using a signal system that travels far faster than the speed of light. It can be predicted that in this creature's world view, the universe will be larger.

# 2 Ocean model of the universe

Let's build a marine model first. In this ocean, all living things can communicate and communicate only through sound. Therefore, their universe is only tens of thousands of light-years away. However, in the ocean, there do exist measures that can communicate through light, that is to say, supersonic speed exists. But these creatures do not know the existence of light.

Now we regard the universe in which humans live as a cosmic ocean, in which communication is mainly carried out through light and gravitational waves. In this way, two different types of "oceans" can be compared. Table 1 shows the relationship between the two.

Table 1. Comparison of the ocean and the universe

| Types | Ocean | Universe |
|---|---|---|
| **Signal of information exchange** | Sonar | Light, gravitational wave |
| **Signal speed** | $1500m/s$ | $3 \times 10^8 m/s$ |
| **Faster signal** | Light | Unknown |
| **Energy** | Mechanical vibration | Electromagnetic energy |
| **Sensory organ** | Hearing | Visual |
| **Correlation effect** | Accelerated electric charges generate electromagnetic waves | Unknown |
| **Transmission medium** | Matter formed by electromagnetic interaction | Vacuum etc. |
| **Distribution** | Different temperatures in different locations | Uneven distribution of dark matter |

As can be seen from Table 1, is there a signal faster than the speed of light in the universe? This is a question worth exploring. Judging from the universe we have observed so far, it is very difficult

to maintain such a large-scale universe only by electromagnetic interaction and gravitational interaction. After all, the signal propagation speed generated by these two known interactions is too slow.

The accelerated movement of electric charges can generate electromagnetic waves, which can convert mechanical energy into electromagnetic energy. For example, when a mechanical wave propagates through an electron, it can excite electromagnetic waves. The mechanical wave will lose a certain amount of energy.

Correspondingly, if the electromagnetic wave passes through a certain form of dark matter, it can also excite a higher speed dark matter signal, and the electromagnetic wave will lose a certain amount of energy. From this, perhaps the existence of dark matter interaction can be detected.

In addition, mechanical vibration requires media, and the composition of these media is formed by electromagnetic interaction.

The oscillation of electromagnetic waves can propagate in vacuum. Like sound, the propagation speed of electromagnetic waves in different media is different. This means that vacuum can actually be regarded as a medium, which has a corresponding dielectric constant.

The inability of sound to propagate in a vacuum indicates that the vacuum should not be made of matter formed by electromagnetic interaction. Electromagnetic waves are fine. Therefore, the composition of the vacuum may be a material formed by a new type of dark matter structure that we cannot detect through electromagnetic interaction.

# 3 New dark matter model

## 3.1 Vacuum model

### 3.1.1 The old vacuum model

There are many vacuum models, the most famous of which is the Ether model. The vacuum model of quantum mechanics occupies a dominant position in modern physics.

However, the Ether model is based on a mechanical structure. The vacuum model of quantum mechanics is based on electromagnetic interaction. Neither model is directly related to dark matter, nor does it propose a new form of interaction.

### 3.1.2 Dark matter vacuum model

It can be seen from the analysis in this article that vacuum is an electromagnetic wave propagation

medium similar to water, air and other sound propagation media. Enlightenment is obtained from the propagation medium of sound. The propagation medium of electromagnetic waves may belong to the kind of substance that can be composed by a new interaction.

Suppose the matter that constitutes a vacuum is called "dark matter". When electromagnetic waves pass through the dark matter, it will cause the dark matter to vibrate and excite dark matter waves. The energy of electromagnetic waves will be attenuated.

Corresponding to such a vacuum structure, we believe that the composition of dark matter is similar to the structure of matter that we can observe. The bottom layer is the elementary dark matter particles, here we use Chinese word “Anzi” to represent it. Anzi is divided into two types, positive anzi and negative anzi. The signs of the two are opposite, and the mass is equal.

Positive anzi and negative anzi can combine to form dark matter atoms. Dark matter atoms can be combined to form dark matter molecules.

Dark matter molecules gather together to form dark matter gas or liquid.

This hierarchical structure can be represented in Figure 1.

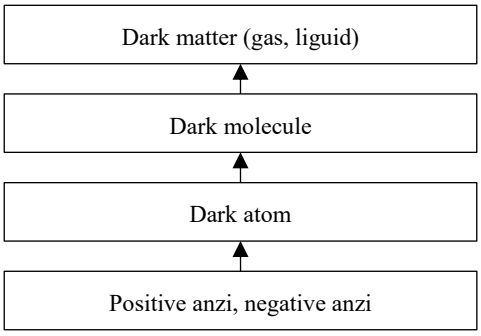


Figure 1. The layer structure of dark matter

## 3.1.3 Dark matter waves

Like electric charge, anzi can also form a dark field. When the dark field accelerates, it will form a dark wave. To construct the wave equation of dark wave, we can be inspired by the wave equation of sound wave and electromagnetic wave.

The wave equation forms of acoustic waves and electromagnetic waves are basically the same, usually:

$$\frac{\partial^2 u}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 u}{\partial t^2}$$

Now we use the same method to construct a dark wave's wave equation

$$\frac{\partial^2 u}{\partial x^2} = \frac{1}{{v_d}^2}\frac{\partial^2 u}{\partial t^2}$$

## 3.2 The speed of dark matter waves

The main difference between sound waves and electromagnetic waves is the difference in wave speed. For sound, its propagation speed is:

$$v_s = 340 m/s$$

And the propagation speed of electromagnetic waves is

$$c = 3 \times 10^8 m/s$$

There is a very simple way to estimate the speed of dark waves. Since the speed of light is about one million times faster than the speed of sound, it can be guessed that the speed of dark waves should also be one million times the speed of light.

which is

$$\frac{v_d}{c} = \frac{c}{v_s} \approx 10^6$$

It can be guessed that the propagation speed of the Dark wave is approximately

$$v_d \approx 3 \times 10^{14} m/s$$

It is about 0.03 light-years away in one second.

This speed seems to be quite large, but compared to the entire universe, it is not very large. For example, based on the diameter of 100,000 light-years, it takes 925 hours for the dark wave to traverse the entire galaxy, which is about 2.5 years. This is also a long time. By Comparing to the 14 billion light-years of the universe we know now, it will take 14,000 years to travel through the universe for dark waves. Perhaps in addition to the dark wave, there will be higher-speed waves traveling through the universe, so that the integrity of the entire universe can be better maintained.

From the above analysis, we can get some important characteristics of dark wave, including the following aspects:

1. Super speed of light. Just like sound waves propagate in the medium, electromagnetic waves are excited. The speed of electromagnetic waves is far supersonic. Therefore, the dark wave radiation excited by electromagnetic waves in dark matter will inevitably exceed the speed of light.

2. The propagation hypothesis of dark wave is also quantized, so dark wave is actually the propagation of dark wave quantum. The dark wave quantum is the intermediary particle of the interaction between dark matter.

3. To form a complete structure, dark matter needs to interact. This interaction allows static dark matter to gather together. Taking into account the super-luminous nature of the dark wave quantum, it means that two resolvable dark matter at extremely long distances can interact with each other.

## 3.3 The interaction between dark matter and matter

As the universe expands, dark matter will continue to cool, and eventually dark matter may condense into a liquid form. Therefore, according to the dark matter model proposed in this article, dark matter is just like hydrogen gas or liquid. In any case, dark matter will not condense into heavy atoms. This is because the masses of two anzis with different signs are equal.

Regardless of its form, dark matter can be used as a medium to transmit electromagnetic waves. Dark matter can not only absorb the energy of matter, but also release energy to matter. Considering that dark matter is always at a stable energy level, therefore, if energy is released from matter into dark matter, there is a greater possibility that it will return from dark matter to matter, thereby ensuring energy conservation. It's just that the returned energy may change in form.

This can be used to explain why high-energy photons hit the vacuum, which can produce positive and negative electron pairs. The fluctuation of quantum vacuum can also be better explained by dark matter. From this we can draw a conclusion that the elementary particles we currently understand are actually energy quantum produced in dark matter. Only due to the different boundary conditions, the form of the elementary particles formed will be very different. This is just like the sound propagating in the medium can excite phonons of different vibration modes.

Of course, the interaction between electromagnetic waves and dark matter may also be inelastic. In this case, the energy of electromagnetic waves or gravitational waves will be lost and transformed into dark waves for emission. This may require very high energy.

Two situations can be shown in Figure 2. The left side of the figure is elastic scattering, the right side is inelastic scattering。

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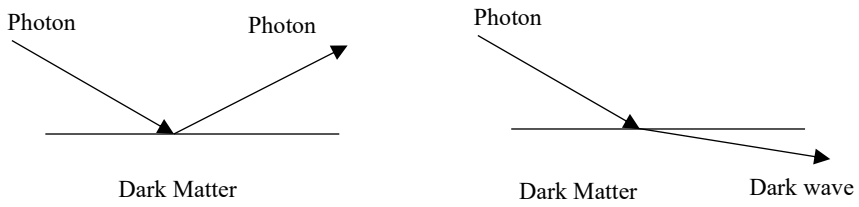


Figure 2. Elastic and inelastic dark matter scattering

# 4. Summary

This article attempts to establish a new dark matter model. The characteristic of this model is that it uses a relatively simple positive and negative particles to construct dark matter. This article calls this kind of particle anzi. Unlike previous dark matter models, the anzi constructed in this article does not belong to the standard model of elementary particles. Nor is it beyond the standard model, that is, an extension of the standard model. Rather, it points out that anzi belongs to a completely new form of interaction. In the new dark matter model, there is a charge-like interaction between the two anzi. Anzis of the same symbol repel each other, and anzis of different symbols attract each other. But unlike electrons and protons, the masses of the two anzi are equal. Therefore, dark matter composed of anzi does not form heavy atoms. In this way, dark matter always exists in the form of gas or liquid in the universe. This is somewhat similar to the Cooper electron pair in metal.

Once two anzis form dark matter atoms, the dark matter atoms can be further combined to form molecules. In turn, a gas or liquid is formed.

If this model is correct, then we can expect the universe to look like an ocean of dark matter. The dark matter ocean is composed of dark matter molecules and atoms.

In addition, this article believes that the interaction between anzi is mainly completed by exchanging Dark waves. Dark wave is a new high-speed dark matter wave different from electromagnetic waves. The propagation speed of the dark wave can reach one million times the speed of light. This can well solve the current problem that the universe is too large and the interaction between electromagnetic and gravitational forces is very limited in space and time. It can also explain why our current universe is stable.

Although this article has established a simple dark matter model, this article does not propose a specific method for detecting dark matter. Therefore, the next step is how to find a feasible method to detect dark matter, especially the existence of dark waves. In order to verify whether the theory is correct. Especially if this kind of Dark wave can be detected, it also means that humans' vision in this universe will be expanded by several million times.

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