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The Introduction of Additional Spacetime Distortion(ASD) and A new interpretation of dark matter by it

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Abstract

This paper proposes a new interpretation for Essence of Dark matter with Additional Spacetime Distortions(the non-linear superposition of spacetime distortions driven by configurations of physical matters, ASD) and advocates dark matter is, by definition, ASD itself. phenomena related to dark matter are be explained consistently by ASD. The limitations of current dark matter interpretation candidate theories are also overcome and this framework will provide a lot of explanation for ASD & Dark matter

Keywords: astronomy — astrophysics — physics — galaxies — gravitation — spacetime

1. Introduction

A concept: Additional Spacetime Distortions (ASD), defined as the non-linear superposition of spacetime distortions driven by configurations of physical matter. When the space-time distortion fields overlap, the space-time distortion fields does not overlap by the sum of simple linearity. when the superpositions actually occur, it has a nonlinear combination. In other words, as an example 1+1 = 5 appears, not 1+1 = 2. The form of distortion has a complexity that is almost impossible to calculate. and then Because of the distortions of space-time, the gravitational lens(4) appears. it seems that there was an invisible material, but in fact, there was only distortions of space-time made of nonlinear superposition, not actual material. so this framework asserts dark matter(2) is ASD itself.
(Density refers to Celestial Density and Naturally it includes particulate elements such as gas, molecular clouds, nebulae, interstellar matter, plasma etc.)

2. Nonlinear Structure of EFE

We begin with Einstein's Field Equations (EFE), which describe the fundamental relationship between spacetime geometry and the distribution of matter and energy:

$$G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

Here, the terms are defined as follows:

- $G_{\mu\nu}$: The Einstein tensor, which encapsulates the curvature of spacetime. It is a complex, nonlinear function of the metric tensor ($g_{\mu\nu}$) and its derivatives.
- $T_{\mu\nu}$: The energy-momentum tensor, representing the density and flux of energy and momentum (including mass, pressure, and stress) that act as the source of spacetime curvature.
- G: The gravitational constant.
- c: The speed of light in vacuum.

It is crucial to emphasize that the EFE themselves are inherently nonlinear. This nonlinearity stems from two primary aspects:

- The Einstein tensor $G_{\mu\nu}$ is a nonlinear function of the metric tensor $g_{\mu\nu}$. When fully expressed, $G_{\mu\nu}$ contains terms involving products of $g_{\mu\nu}$ and its derivatives (e.g., Christoffel symbols (Γ) appearing quadratically in the Ricci tensor, $R_{\mu\nu} \propto \Gamma\Gamma$). This means that the geometry of spacetime affects itself in a non-linear way.
- The gravitational field itself carries energy and momentum, and this energy-momentum contributes to the overall $T_{\mu\nu}$ that sources spacetime curvature.This self-interaction of gravity means the gravitational field not only dictates the motion of matter but also influences its own evolution, leading to a complex, nonlinear feedback loop.

3. The exact same characteristics of Dark matter and ASD

ASD and Dark Matter don't interact with light. This is because, unlike matter, ASD is an Additional distorted spacetime itself. The same goes for dark matter. they do not interact with light.

non-linear superposition of spacetime distortions, ASD cannot also exist and move completely independently By definition. This, too, is Exactly the same as dark matter existing theories assume that dark matter is an virtual particle, But absolutely alone or independent motion like matter or particles has never been observed.

ASD, Dark matter exerts gravity but It is not subject to gravity. (There is only indirect speculation that dark matter will probably be affected by gravity)

4. Interpretation of ASD Perspectives on Dark Matter-Related Phenomena

4.1. Rotation Curve Reinterpretation

(In the present model, it is assumed that ASD formation is better achieved when density is low. Except for dramatically dense or low density situations)

Central = High density area, → Low ASD formation, a small amount of dark matter
Exterior = Low density area, → High ASD formation, relatively a lot of dark matter

(1) Galaxy rotation Velocity v(r) increases to some distance from the center of the galaxy
But it's not really a constant in the mathematical sense. Usually, there is a change of less than 10% to 20%. Milky Way Approximately 220 to 240 km/s from the solar position from 200 to 250 km/s on the outskirts Naturally, due to the low density, there must have been much ASD formed.

The gravitational force (F_g) acting on an object in a circular orbit equals the centripetal force (F_c).

$$F_g = F_c$$

$$G\frac{M(r)m}{r^2} = \frac{mv(r)^2}{r}$$

Where G is the gravitational constant, $M(r)$ is the total mass within the radius r, m is the mass of an object in orbit, and $v(r)$ is the orbital velocity. If you clear one m and r from both sides:

$$G\frac{M(r)}{r} = v(r)^2$$

So to summarize for $v(r)$:

$$v(r) = \sqrt{\frac{GM(r)}{r}}$$

Since G is a constant here, the proportional relationship is as follows.

$$v(r) \propto \sqrt{\frac{M(r)}{r}}$$

Numerical examples (based on our galaxy):
0 kpc: 0 km/s (it's center)
1 to 2 kpc: rapidly increasing above 100 km/s
3-5 kpc: Increase to around 200 km/s,
8.5 kpc (the Sun's position): approximately 220 km/s (our Sun's orbital velocity).
10 to 20 kpc (optical outskirts): little change before and after 220 km/s (must be reduced in theory, but retained thanks to dark matter)
20-50 kpc (dark matter halo area): still constant around 220 km/s

4.2. Halo Distribution

The halo covers the galaxy cluster itself. And the area contains all the substances we can see and touch, such as stars, gases, dust, planets, and so on. In Halo, the density of unidentified dark matter also decreases as the density of ordinary matter decreases as it moves away from the center. ASD also has exactly the same properties as dark matter, as the reduction of ordinary matter inevitably leads to fewer nonlinear superposition of spacetime distortion fields.

4.3. Bullet Cluster Event

One of the most important events suggesting the existence of dark matter is the bullet galaxy cluster event.(5) (Collision at speeds between 4500 and 6000 km/s) First of all, hot gas strongly collides with galaxies due to the action of electromagnetic force in the center. while stars do not collide because the empty space is too huge. after the collision, the hot gas remained in around the center. but the center of mass was laid out by galaxies and stars. This means that a gravitational source, which cannot be explained by visible matter has traveled with the star and galaxies. This suggests that invisible dark matter exists. The same goes for ASD. In the event of a collision, ASD goes through everything. That is, distorted spacetime itself, and distorted spacetime has no interaction with electromagnetic force at all. From ASD's point of view, the stars and galaxies passed without impact, so ASD just continued to goes with the stars and galaxies without affected. There can be no impingement by definition. In other words, ASD has never collided.

4.4. ASD Post–Big Bang

Right after the Big Bang(6) from ASD's perspective, the superposition of spacetime distortion fields would have covered all the space at that time. and the same superposition may exist, but it never continues to occur consistent ASD, that is additional gravitational forces. Irregular generation and disappearance of ASD with different spacetime distortions due to nonlinearity superpositions would have been repeated so many times

Ordinary Matter's Situation: Until about 380,000 years after the Big Bang, the universe was in a state of 'soup' filled with hot light (photon). Ordinary matter (proton, electrons) was under tremendous pressure as they violently interacted with the light. Because of the pressure of this light, ordinary matter could not aggregate no matter how much gravity pulled them. It was like trying to build a sandcastle in a strong storm.

The situation of ASD: On the other hand, ASD by definition does not interact with light at all. Therefore, it was not disturbed by the 'storm' of the pressure of light. ASD, calmly begin to clump together from the very beginning.

5. Gravitational Lensing and its Observational Challenges

Table 1. Detectability of lensing signatures by mass and distance

Mass $M(M_\odot)$	**Distance** D_L **(Mpc)**	**Expected** θ_E
10^{11} (Galactic Scale)	100	$\sim$ 1 UltraVisual
3×10^{10}	3×100	$\sim$ 0.3 First-second
10^9	100	$\sim$ 0.1 Ultra-angle
10^8	10	$\sim$ 0.01 Ultra-angle
10^7	1	$\sim$ 0.003 Ultra-angle

The basic lensing equation relates the observed image position $\vec{\theta}$, the true source position $\vec{\beta}$, and the deflection angle $\vec{\alpha}(\vec{\theta})$ as:

$$\vec{\beta} = \vec{\theta} - \vec{\alpha}(\vec{\theta}) \cdot \frac{D_{LS}}{D_S} \quad (1)$$

Here, D_{LS} is the angular diameter distance between the lens and the source, and D_S is the angular diameter distance between the observer and the source. For weak lensing by dark matter halos, the deflection angle $\vec{\alpha}(\vec{\theta})$ becomes exceedingly small. Consequently, the observed image position $\vec{\theta}$ is only minutely displaced from the true source position $\vec{\beta}$, leading to $\vec{\theta} \approx \vec{\beta}$. This tiny difference, often referred to as a subtle distortion, frequently falls below the detection limits of current instrumental resolution, making the direct measurement of weak lensing effects particularly challenging.

Interpretation of Observational Challenges As illustrated in Table 1, small or distant masses significantly reduce the Einstein radius (θ_E), making the detection of lensing signatures extremely challenging. For instance, even a $10^9 M_\odot$ dark matter halo acting as a lens at a distance of 100 Mpc would produce an Einstein radius of approximately 0.1 arcsecond. This value is critically close to, or often below, the typical angular resolution limit of the Hubble Space Telescope (around 0.05 arcseconds), making it profoundly difficult to observe such a faint distortion as a distinct entity. For even smaller mass or more distant lenses, the deflection angles (and thus θ_E) diminish further into the milliarcsecond (mas) range. Such minute bending angles render them undetectable by optical telescopes like HST, often requiring specialized instruments such as very high-resolution radio telescopes (e.g., VLBI) for any potential detection, or making them undetectable altogether.

6. Obeservation of dynamic changes in the inside of a black hole

From the ASD perspective, when black holes(7) interact, ASD will appear in Somewhere because of irregular superposition of each other's gravitational fields. it's likely to happen in a very short time. but it can be measured with the current technology. The information can measure changes inside the black hole during interaction.

7. Conclusion

After all, the most important point of this paper is to suggest that ASD is the dark matter itself. Currently, attempts to interpret dark matter by assuming virtual particles are ongoing, but not a single virtual particle has been found or detected. This implies that another interpretation, concept, or experiment is needed for it. Therefore, we proposed the ASD framework as a new persuasive alternative, and this concept will serve as an opportunity to match and successfully know the identity of dark matter.

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