

Can string theory with supersymmetry and with tachyons explain MOND's empirical successes?

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Abstract

Why have dark matter particles not been found? Do dark matter particles exist? Assume that all gravitons have spin 2 and supersymmetry is empirically valid. Can string theory with tachyons explain the empirical successes of Milgrom's Modified Newtonian Dynamics (MOND)? An attempt is made to explain MOND using 6 tachyonic MONDons and 6 tachyonic MONDinos.

Keywords

Cosmology, General Relativity, Gravitational Theory, Quantum Gravity, Speed of Light

1. Introduction

I have suggested that Gravity Probe B's 4 ultra-precise gyroscopes worked correctly and confirmed my basic theory (i.e. string theory with the finite nature hypothesis and with various simplifying assumptions). Let us assume that the 4 ultra-precise gyroscopes really did malfunction in a surprisingly predictable way and really did disconfirm my basic theory. Consider an alternate theory based on string theory with supersymmetry and with a 5-dimensional tachyonic spacetime.

According to Witten,

"String theory is the only known generalization of relativistic quantum field theory that makes sense. ... String theory forces general relativity upon us, whereas standard quantum field theory apparently makes it impossible to incorporate general relativity. And string theory leads in a remarkably simple way to a reasonable rough draft of particle physics unified with gravity. ... string theory has proved to be remarkably rich, more so than even the enthusiasts tend to realize. It has led to penetrating insights on topics from quark confinement to quantum mechanics of black holes, to numerous problems in pure geometry." [1]

According to Milgrom,

"MOND is a paradigm that contends to account for the mass discrepancies in the Universe without invoking 'dark' components, such as 'dark matter' and 'dark energy'. It does so by supplanting Newtonian dynamics and General Relativity, departing from them at very low accelerations. " [2]

According to Einstein,

“A little reflection will show that the law of the equality of the inertial and gravitational mass is equivalent to the assertion that the acceleration imparted to a body by a gravitational field is independent of the nature of the body. For Newton's equation of motion in a gravitational field, written out in full, it is:

$(\text{Inertial mass}) \cdot (\text{Acceleration}) = (\text{Intensity of the gravitational field}) \cdot (\text{Gravitational mass}).$

It is only when there is numerical equality between the inertial and gravitational mass that the acceleration is independent of the nature of the body.” [3]

2. MOTH theory

Let us assume that Einstein's field equations are the correct mathematical formulation of the equivalence principle.

For explaining MOND there might be 3 possibilities:

1. The equivalence principle is always empirically valid.
2. The equivalence principle is true in the non-MOND regime and slightly false in the MOND regime.
3. The equivalence principle is always slightly false.

If possibility 2 happens to be true, then the best tests of the equivalence principle should involve testing both the equivalence principle and MOND's predictions.

In any theory that attempts to explain dark matter by using tachyons, one of the main problems is avoiding huge (and false) amounts of Cherenkov radiation. Thus, the best bet might be hypothesizing spin-spin interactions as the only interface between tardyonic spacetime and tachyonic spacetime.

Consider 12 hypothesis of the MOND tachyon halo (MOTH) theory.

- (1) If a fundamental particle and its superpartner are both massless, then the fundamental particle and its superpartner are both tachyons.
- (2) The only types of tachyonic bosons are 6 MONDons, each of which has a different color charge.
- (3) The only types of tachyonic fermions are 6 MONDinos, each of which has a different color charge.
- (4) Ordinary string space has 9 dimensions of space, 1 dimension of time, and 1 dimension of tardyonic MONDino spin. There are 3 dimensions of tachyonic space, 1 dimension of tachyonic time, and 1 dimension of tachyonic MONDino spin.

(5) Tachyonic/tardyonic MONDino spin is the interface between tardyonic spacetime and tachyonic spacetime.

(6) The equivalence principle is true for purely tardyonic particles (which are entirely confined to tardyonic spacetime). However, tardyonic MONDinos have zero inertial energy and positive gravitational energy.

(7) Our universe has a 5-dimensional halo of tachyonic MONDons and MONDinos.

(8) MONDons interact indirectly with quarks having the same color charge, directly with MONDinos having the same color charge, and with no other particles.

(9) MONDinos interact directly with quarks having the same color charge, directly with MONDons having the same color charge, and with no other particles.

(10) In the standard form of Einstein's field equations, the $-1/2$ is replaced with $-1/2 + \text{MOND-tachyonic-function}$. The MOND-tachyonic-function describes how MONDons and MONDinos interact with quarks.

(11) MONDinos have approximately (but not exactly) spin $1/2$. MONDinos are the only types of particles that have a mixed state of location in tardyonic spacetime and location in tachyonic spacetime. Such a hypothetical mixed state causes tardyonic spacetime to have 1 dimension of MONDino tardyonic spin and also causes tachyonic spacetime to have 1 dimension of MONDino tachyonic spin.

(12). The only transfer of energy and/or information between tachyonic spacetime and tardyonic spacetime that might occur is mediated by MONDino spin.

3. Test of the equivalence principle by Schlamminger et al., published in 2008

Schlamminger, Choi, Wagner, Gundlach, and Adelberger used a rotating torsion balance to test the equivalence principle. They claim that their result "improves limits on equivalence-principle violations with ranges from 1 m to ∞ by an order of magnitude."

[4] But is there a possible, extremely serious flaw in their reasoning? They assume that there is a huge amount of dark matter near the center of the Milky Way and that this dark matter obeys the equivalence principle. However, their assumption depends upon assuming that Einstein's field equations are 100% correct (NOT PROVED! — in view of MOND's empirical successes) and also assuming that that if the dark matter exists it does not take the form of tachyonic dark matter that actually violates the equivalence principle. Most other gravitational metrologists implicitly make the same 2 assumptions.

4. Question

Is Professor Milgrom of the Weizmann Institute the Kepler of contemporary cosmology?

References

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