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METHODS FOR EXPERIMENTAL VERIFICATION OF ISODUAL LIGHT

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Abstract

In this paper, we review the mathematical and physical foundation of the 1997 R. M. Santilli's paper on the hypothesis that light emitted by antimatter is an anti-Hermitean image of ordinary light, called by the author "isodual light," thus having all characteristics opposite to those of ordinary light, including negative energy and expected repulsion by a matter gravitational field; we review evidence obtained via Santilli telescopes with concave lenses of film traces that appear to be caused by galactic light with negative energy; and we propose a new method for producing isodual light in laboratory for subsequent measurements of the effects of isodual light on targets.

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1 Introduction

Since the time of Dirac's prediction of antiparticles and their detection, the theory of antimatter has been essentially developed at the level of second quantization.

This occurrence has created an unbalance between the theories of matter and antimatter at the classical and first quantization levels, as well as a number of shortcomings, such as the inability for the classical theory of antimatter to have a quantized formulation which is the correct charge (or PTC) conjugate of that of matter.

In order to resolve these shortcomings, in 1995 Santilli proposed a new anti-isomorphic image of conventional mathematics [2] characterized by the map of the conventional unit called isodual map, or isoduality:

$$+1 \to 1^d = -1^{\dagger} = -1 \tag{1}$$

It should be noted that the change of the basic unit implies a simple, yet unique and non-trivial change of the totality of conventional mathematics, including numbers, angles, functions transforms, vector and metric spaces, algebras and geometries, etc.

This new map and isodual mathematics provide a novel classical representation of anti-matter not just on the charge conjugation level but also at gravitational level with the prediction of anti-gravity defined as the reversal of the sign of the curvature tensor for massive antiparticles in the field of matter with subsequent predictions of relevance in a number of fields [1]:

Prediction 1: Massive stable isodual particles (anti-matter made of positrons and anti-protons, such as the anti-hydrogen) experience anti-gravity (repulsive gravity) in the field of matter and ordinary gravity in the field of anti-matter.

The implications at cosmological level are profounds since this prediction suggests that galaxies made of matter naturally repel and isolate themselves from galaxies made of anti-matter except from rare instances where anti-matter objects possess too high kinetic energy to be effectively swerved away from each other and they subsequently impact against each other.

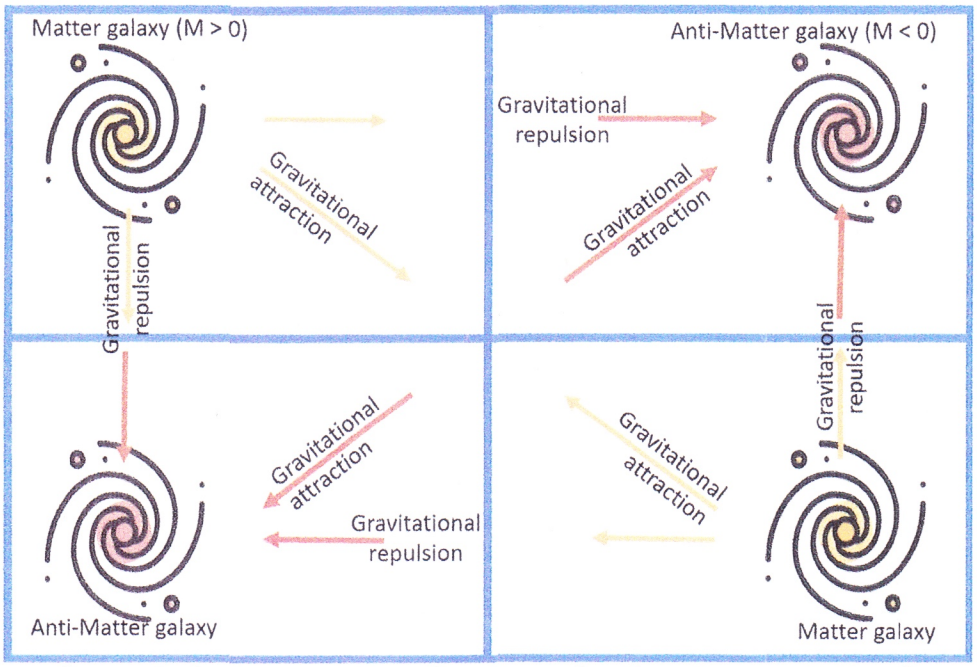

Image 1: An interpretation of matter and anti-matter gravitational interactions showing how it is possible for the two to remain gravitationally segregated.

One candidate particle for testing this prediction in a laboratory setting would be to measure the gravitational deflection of a horizontal positron beam with low enough kinetic energy so that the deflection upward or downward caused by earth gravity would be apparent at the end of the flight tube [10].

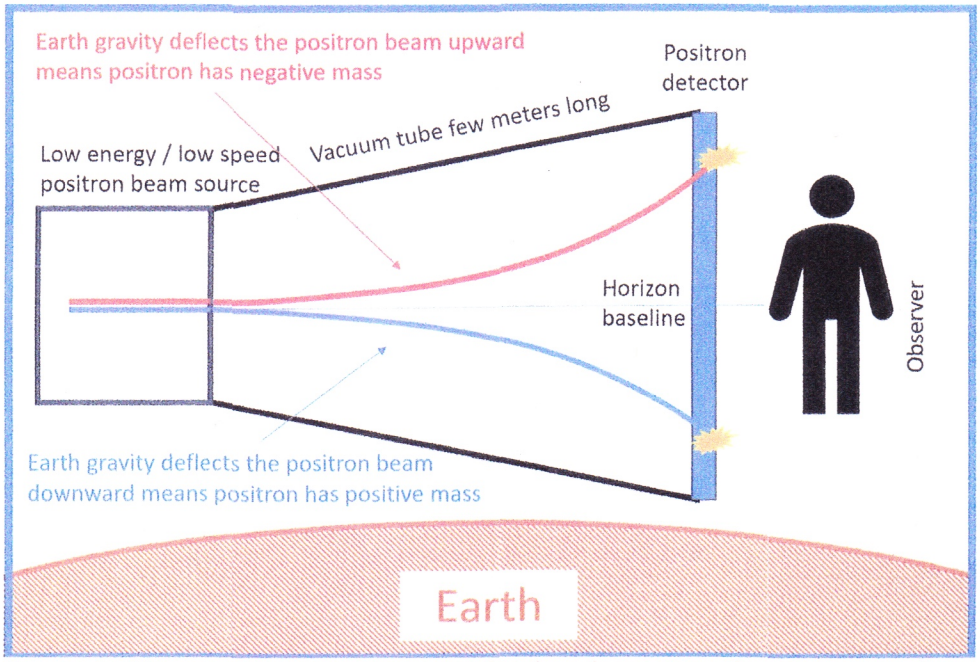

Image 2: Testing the negative mass of isolated positrons by measuring their gravitational deflection on a horizontal flight within a sufficiently shielded vacuum tube.

Prediction 2: Bound states of massive stable particles and their isoduals (such as the positronium) experience ordinary gravity in both fields of matter and anti-matter.

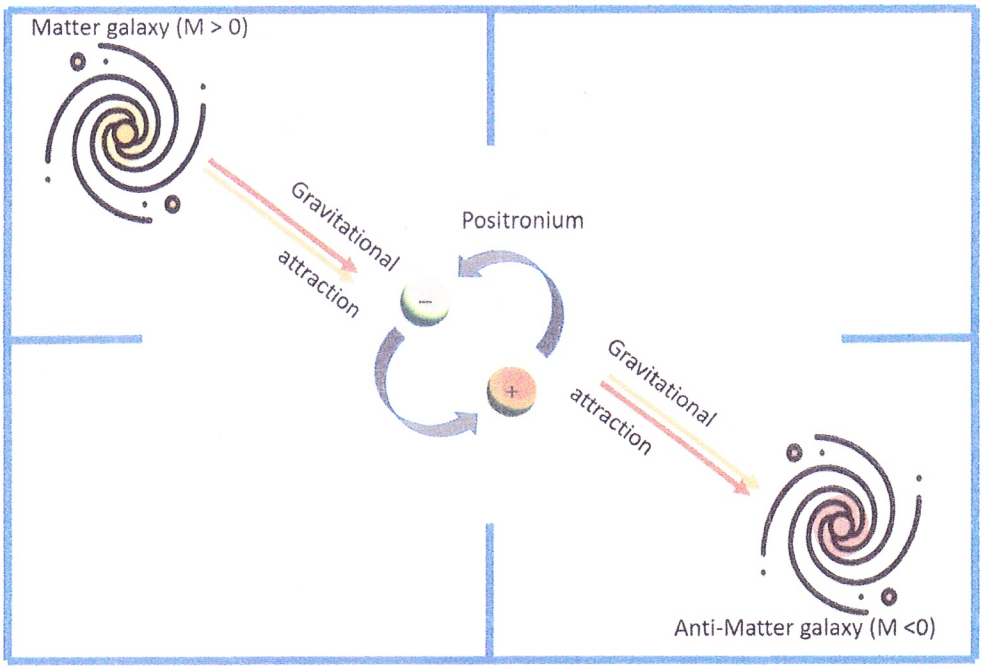

Image 3: Graphical interpretation of the positronium and the effects of gravity and anti-gravity fields being both attractive

We should hereby clarify the nature of the positronium as an isoself dual particle since it is evidently invariant under the isodual map interchanges $e \rightarrow e^d, e^d \rightarrow e$.

As such it possesses a positive spectrum E_n as referred to our spacetime, as well as exhibiting a negative spectrum when studied in the isodual spacetime.

The total state of positronium in our spacetime ($\hbar = 1$) is given by $I\,Pos\,> = I\,e\,> \times I\,e\,>^d$ and subsequent Schrodinger equation: [3]

$$i\frac{\partial}{\partial t} IPos> = (p_k \times p^k/2m)\, Ie> \times Ie>^d + Ie> (p_k \times p^k/2m)^d \times^d Ie>^d + V(r) \times Ie> \times Ie>^d = E_n\, IPos>,\ E_n > 0 \quad (2)$$

With a conjugate expression in isodual space-time here omitted for brevity.

This isodual interpretation of the positronium recovers the available information on electromagnetic and weak interactions of antiparticles.

When annihilating the positronium will yield one iso photon and one isodual counterpart:

$$Pos. = (e\,, e^d)_{IQM} \rightarrow \gamma + \gamma^d \qquad (3)$$

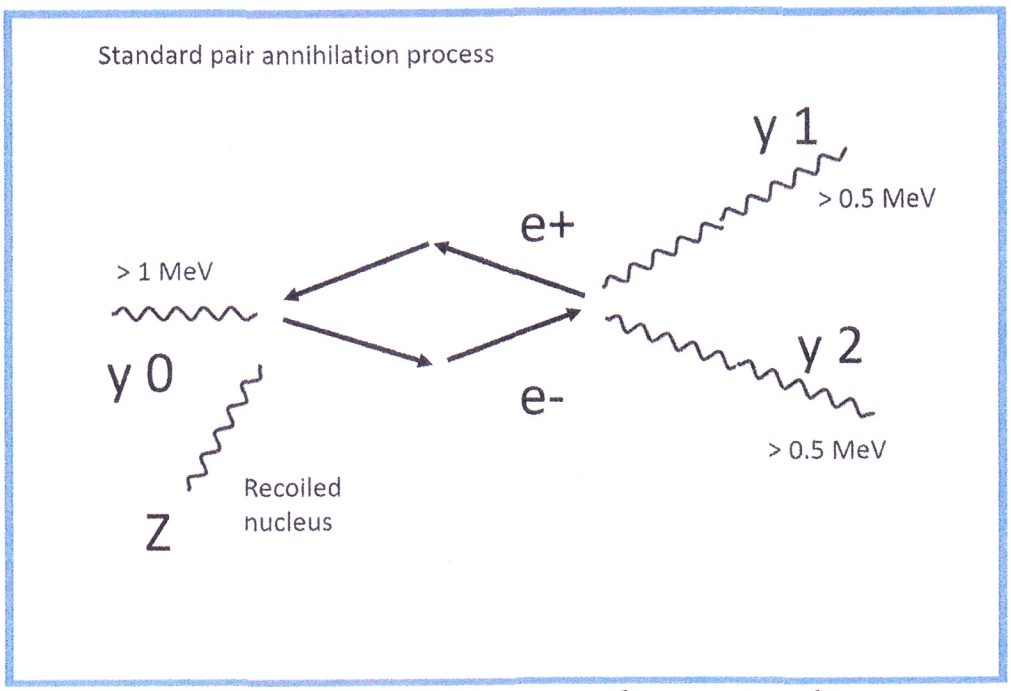

Image 4: Standard pair annihilation process with generation of 2 gamma rays both with positive energy

Prediction 3: Antimatter produces isodual photons who experience antigravity in the field of matter and anti-gravity in the field of anti-gravity.