

Entanglement between matter and anti-matter particles

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Abstract

In our previous paper [1] we show a paradox that leads to the conclusion that anti-matter must have "anti-gravity". Based on this conclusion we claim that matter and anti-matter preserve two new conservation laws: 1. Conservation of gravity, 2. Conservation of time.

In this article, based on these new conservation laws, we claim that the number of all matter particles in the universe must be equal exactly to the number of all antimatter particles. Moreover, each matter particle must be entangled to a "partner" antimatter particle since entanglement is the only mechanism that can synchronize between matter and antimatter particles in order to preserve the new conservation laws mentioned above.

This phenomena can be examined at the LHC and if proven to be correct it is another proof that entanglement is truly a "spooky action at a distance" (EPR paradox) and has nothing to do with hidden variables. It also opens the possibility that if anti matter particles remain and exist from the "big bang" somewhere in the universe they are still entangled to the matter particles although the drastic annihilation during the big bang.

Entanglement of matter and anti-matter particles

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1. Entanglement of matter and anti-matter particles

Matter and anti-matter were originally produced, based on the "big bang" theory, by pure energy ($E = mc^2$). In our previous paper [1] we show a paradox that leads us to the conclusion that anti-matter must have "anti-gravity".

Since pure energy don't influence time and apply no gravity, we claim that matter and anti-matter must preserve two new conservation laws: 1. The "Conservation of gravity", 2. The "Conservation of time".

In this article, based on these new conservation laws, we claim that the number of all matter particles in the universe must be equal exactly to the number of all antimatter particles. Moreover, each matter particle must be entangled to a "partner" antimatter particle so all the universe is build up from matter and antimatter entangled pairs.

According to general relativity theory, the gravity of matter particles is caused by the curvature of space-time. The effect of this curving is expressed by accumulation of matter particles into chunks of mass that grows gradually up to the size of stars, galaxies, galaxy clusters, etc. We claim, that anti-gravity tends to stretch space-time. The effect of this stretching is expressed by spreading the anti-matter particles in space far away from each other so that finally they are spread equally in space [1].

Our first new law of "conservation of gravity" states that if matter applies gravity, its "partner" anti-matter applies anti-gravity so that the total gravity of both particles sum up to zero as it was originally the zero gravity of the pure energy that created them in the first place. Our second new law of conservation of time states that if matter impose gravitational time dilation, its partner anti-matter impose anti-gravitational time anti-dilation (time "floats" faster) so that the total effect on time sum up to zero as it was originally true for the pure energy that produced originally these matter and anti-matter particles.

This theory requires that both the matter particle and its antimatter "partner" particle will be synchronized in some way. For example, when a matter particle approaches a bulk of mass (e.g. star) that impose on the matter particle a gravitational time dilation. That information must be transferred instantaneously to its "partner" anti-matter

particle in order to impose anti-gravitational time anti-dilation (time “floats” faster) so that the total effect on time will sum up to zero.

We claim that such synchronization can be done only if these matter and antimatter pair particles are entangled.

But what if the annihilation during the big bang phase was an outcome of a matter and anti-matter interaction from two separate entangled matter & anti-matter pairs? We claim that in such case the two remaining particles (each from different set of matter & anti-matter pairs) must become entangled together in order to satisfy time and gravity conservation laws so, if this pair will annihilate each other back to pure energy the total effect on gravity and time will cancel each other since pure energy has no effect on time and gravity (Fig. 1).

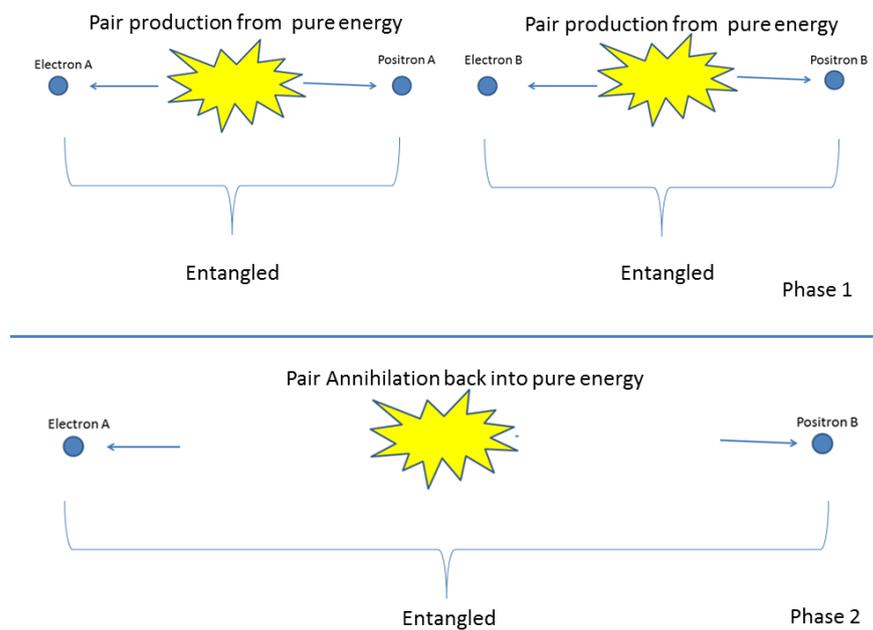


Figure 1: Two separate electron and positron pairs (A and B) are produced from pure energy during the big bang.

Phase 1: from gravity and time conservation consideration, pair A is entangled and pair B is entangled while pair A is not entangled in any way to pair B.

Phase 2: positron A and electron B annihilate each other and from gravity and time conservation consideration electron A and positron B become immediately entangled between them.

This phenomenon detailed in the figure 1, can be also expected through entanglement of the quantum spin at a specific direction of measurement, from angular momentum consideration.

This phenomenon can be examined at the LHC and if proven to be correct it is another proof that entanglement is truly a “spooky action at a distance” (EPR paradox) and has nothing to do with hidden variables, since no hidden variables can predict which half pair will annihilate each other and which half pair will re entangle together . It should be tested at a large enough distance in order to make sure that no signal travelling at the speed of light could have traveled with a hidden variable and re entangled the remaining half pairs (e.g. electron A and positron B in figure 1).

2. Conclusion

Based on gravity and time conservation considerations we conclude that each matter particle must be entangled to a "partner" antimatter particle. This leads to the conclusion that all the universe is build up from matter and antimatter entangled pairs. We conclude that each matter particle is still entangled to an antimatter particle although the drastic annihilation of the big bang.

The entanglement non locality mechanism is a mystery. In our previous article [2], on quantization of photonic energy and photonic wave length, we claim that space time is quantized into Planck length and Planck time cells, and the non-locality is due to grid like dimensions between the quantized space time “cells”.

3. References

- [1] Yoav Weinstein¹, Eran Sinbar^{2,*}, and Gabriel Sinbar³,

Antimatter's gravity paradox,

<http://www.slideshare.net/eransinbar1/anti-matters-gravity-paradox>

- [2] Yoav Weinstein¹, Eran Sinbar^{2,*}, and Gabriel Sinbar³,

Quantization of photonic energy and photonic wave length,

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Figure legends:

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