International Journal of Scientific Reports
Oakley WS. Int J Sci Rep. 2015 Oct;1(6):250-252
http://www.sci-rep.com

pISSN 2454-2156 | eISSN 2454-2164

DOI: http://dx.doi.org/10.18203/issn.2454-2156.IntJSciRep20150954

Research Article

Resolving the electron-positron mass annihilation mystery

William S. Oakley*

Nano-Scale Storage Systems, Inc. (aka NS3), San Jose, CA 95129, USA

Received: 04 September 2015
Accepted: 28 September 2015

***Correspondence:**
William S. Oakley
E-mail: willoakley@earthlink.net

ABSTRACT

Mutual annihilation of low energy electrons and positrons results in two photons of equal energy. The annihilation is consistent with charge conservation but both particles have positive mass, so how do two positive masses annihilate? The issue is resolved by considering particles electromagnetic (EM) energy localized by curvature of the space-time metric. The curvature extends into the surrounding metric forming the particle's gravitational field, usually attributed as due to mass by the observer, but only the curved space-time metric exists. In principle both positive and negative metric curvatures could exist and display positive and negative masses respectively, but both would possess positive energy. For the electron EM energy circulates in the observer domain and outside but close to an event horizon (EH), the positive metric curvature results in the impression of positive mass. Symmetry suggests positron energy circulates inside an EH and should have negative curvature. It is posited metric field curvature reverses on passage through an event horizon, thus the positron positive mass apparent to the observer arises from negative metric curvature inside the particle EH. The opposite metric curvatures of the electron and positron cancel on annihilation, eliminating their gravitational effects and thereby their apparent masses.

Keywords: Electron-positron mass annihilation, Metric curvature, Event horizon, Curvature reversal

INTRODUCTION

Circa 1925 Dirac stated "all matter is no more than localized electromagnetic (EM) energy", as now well established and empirically validated. The mutual annihilation of low energy electrons and positrons, (the electron anti-particle), results in only two photons, each of about 0.511 MeV. The electron and positron have equal but opposite electric charges, so charge annihilation does not present a conservation issue. But both particles exhibit positive mass, so how is mass annihilation to be explained? Basic principles of energy conservation and symmetry suggest the positron mass should be negative, but negative mass is not plausible in observer space-time and a more complex symmetry must therefore exist.

The electron mass energy has long been considered in balance with its electric potential energy and the net energy in the observer domain is thereby zero, i.e. $m_ec^2 - \alpha\hbar c/r_e = 0$. The total observer domain energy of the positron is also zero, so how does the positron exhibit positive mass when in principle having positive charge its mass should be negative?

DISCUSSION

Mass is a notional property invented by Newton to 'explain' how gravity acts independent of all observable properties of matter and provide a parameter to quantify gravitational attraction. Einstein's General Relativity (GR) theory shows gravity acts via curved space-time, and as described in [2], highly curved space-time of closed geometry at the particle scale enables electron formation by localization of EM energy. By virtue of continuity the convex space-time curvature extends into the surrounding metric creating the effect of gravity with

the observer thereby forming the notion of mass, and the positron should be similar

EM energy propagates rectilinearly at velocity c in matter free space and will follow a curved path relative to the observer only if the spacetime in which it is propagating is similarly curved. From Special Relativity (SR) theory only energy propagating at a velocity less than c in observer space can exhibit the property of mass in observer space. It logically follows an electron is EM energy localized in observer spacetime by propagating close to but just outside an event horizon at a velocity below c. Symmetry indicates another state can exist with energy propagation similar to the electron but just inside the event horizon where both mass and charge effects are effectively reversed and thus are in equilibrium.

The mass effect is due to metric curvature where convex curvature implies positive mass and concave curvature implies negative mass, i.e. the net radial gravitational strains are opposite for opposite curvatures, even though both curvature strains have positive energy.

In such circumstances energy propagating inside an event horizon (EH), with effectively negative curvature exhibits positive curvature, gravity and mass in the observer domain. Two strained metrics of equal but opposite curvature in adjacent space-time domains, individually exhibiting gravity and thus positive mass to an observer, would annihilate to zero curvature and mass if combined at the event horizon.

Figure 1 shows two particle scale quantum black holes each with a EH at v = c. In one the energy circulates just outside the event horizon, in the other energy circulates just inside the event horizon. In both the radial strain is in equilibrium with a circumferential strain, but the one system, the positron, appears unbalanced to an observer as the metric curvature inside the EH appears reversed from negative to positive.

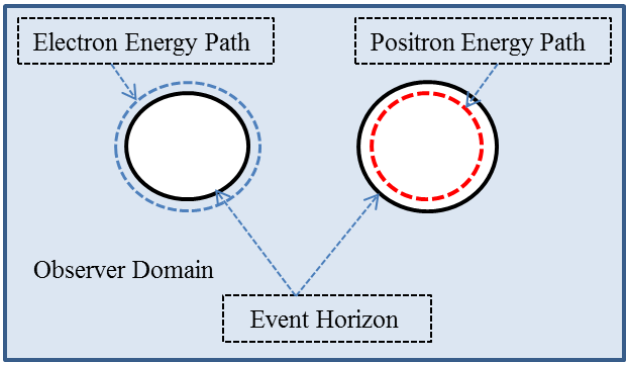

Figure 1: Electron and Positron energy paths with respective event horizons.

Note the observer is located in the same space-time domain as the electron energy, but is separated from the positron energy by an EH, so his viewpoint is asymmetric. The Universe has no such bias and treats each particle the same. Symmetry suggests we are not in a privileged location and an observer in the positron energy domain would note a similar circumstance, with both particle energy paths convex to him, and his local energy would appear outside his EH as an electron. Thus the convex circulation in positron space should logically seem concave in the electron space but instead appears convex to an electron space observer. It must be concluded: *space-time metric curvature reverses on passage through an event horizon*.

On annihilation the oppositely curved metric strains of electrons and positrons cancel and with no remaining space-time curvature the effect of mass (i.e. gravity), disappears.

THE PROTON

As with the positron, the proton also evidences positive charge and mass. This indicates a similar energy configuration where the proton consists of EM energy propagating in a closed metric path on the far side of an EH relative to the observer. I.e. in a space-time domain separated from observer space such that the metric curvature inside the proton is reversed to the observer and appears as positive mass, but the radial electric field is not reversed, enabling the particle to maintain dynamic equilibrium in its energy domain.

CONCLUSION

Expanding conservation principles to include two space-time domains separated by an event horizon allows resolution of an apparent violation of energy conservation that arises if only one domain is considered. This resolves the mass annihilation mystery for electron-positron mutual annihilation. The reversal of metric curvature by passage through an event horizon should be mathematically provable.

The reversal of space-time curvature on passage through an EH is one symmetry, but another must exist as electrons/positrons and protons/anti-protons all exhibit unit charge and identical classical gravitational constants.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Sodickson L, Bowman W, Stephenson J, Weinstein R. Single-quantum annihilation of positrons. Physical Rev. 1970;124:1851.
2. Oakley WS. Analyzing the large number problem and Newton's G via a relativistic quantum loop model of the electron. Int J Sci Rep. 2015 Aug;1(4):201.

3. Atwood WB, Michelson PF, Ritz S. Una Ventana Abierta a los Confines del Universo. Investigación y Ciencia (in Spanish). 2008;377:24-31.
4. Griffiths DJ. Introduction to elementary particles. In: Griffiths DJ, eds. A Book. US: Wiley; 1987.
5. Weinberg Steve. The quantum theory of fields. In: Weinberg Steve, eds. A Book. 1st ed. Cambridge: Foundations; 2005: 14.
6. Dirac Paul. A theory of electrons and protons. Proceedings Royal Soc A. 1930;126(801):360-5.
7. Villata M. CPT symmetry and antimatter gravity in general relativity. EPL (Europhysics Letters). 2011;94:20001.

Cite this article as: Oakley WS. Resolving the electron-positron mass annihilation mystery. Int J Sci Rep 2015;1(6):250-2.