The Existence Of Matter And Waves In Quantum Vacuum State Mediated By Physical Fields, Photons, And Gravitons

By Mr. Jack Campbell

Topic:

Types of waves and matter existing in Quantum Vacuum's showing the they are not matter-less, and possibility of sound waves passing through the existing matter in vacuum state.

Definitions:

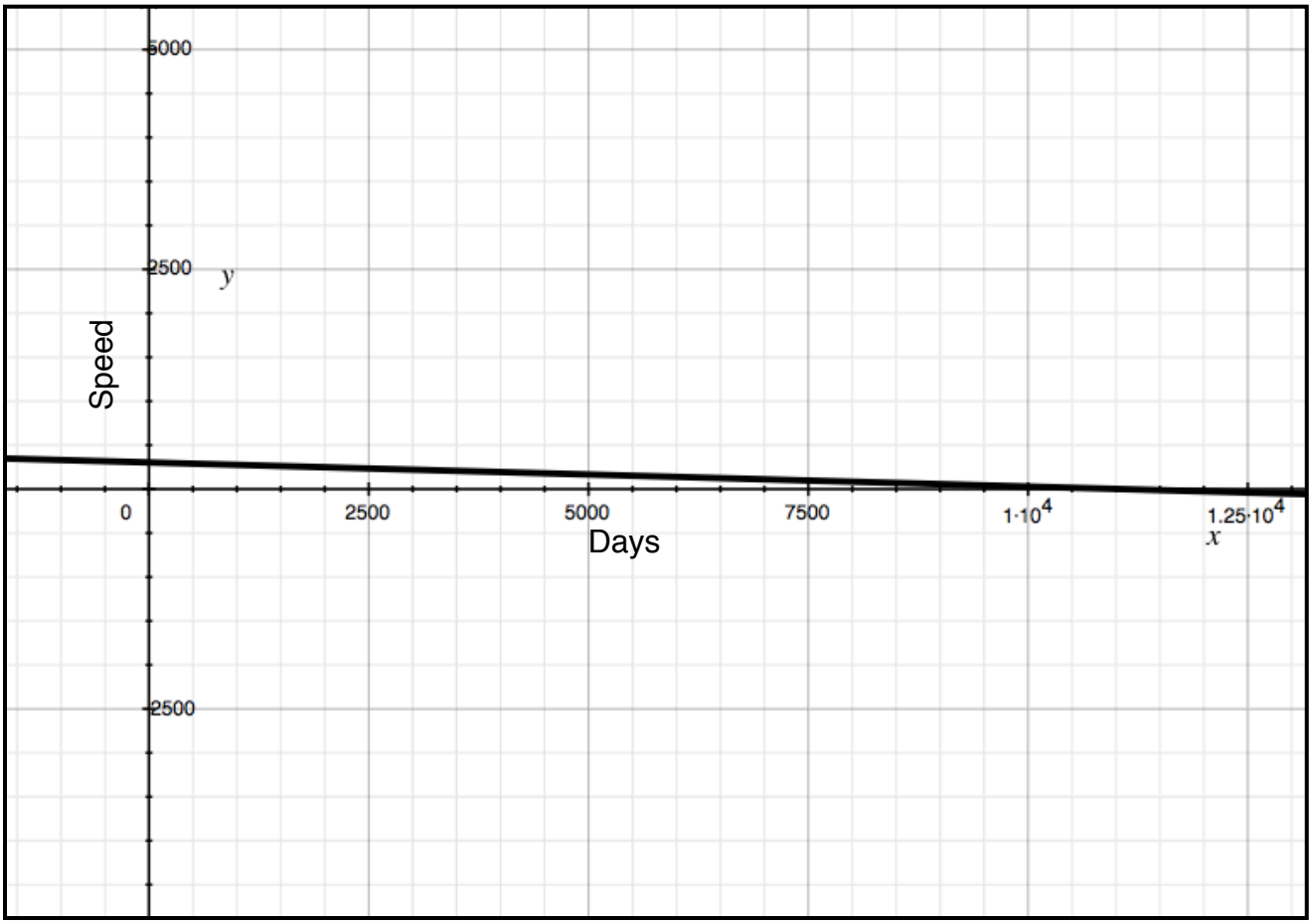
Vacuum: “A space absolutely devoid of matter”
Graviton: “A hypothetical particle postulated to be the quantum of gravitational interaction and presumed to have an indefinitely long lifetime, zero electric charge, and zero rest mass”
Photon: A) “The quantum of electromagnetic energy, regarded as a discrete particle having zero mass, no electric charge, and an indefinitely long lifetime” B) “a quantum of electromagnetic radiation, regarded as a particle with zero rest mass and charge, unit spin, and energy equal to the product of the frequency of the radiation and the Planck constant”
Force Carrier: “Any of four elementary particles that mediate one of the four fundamental forces. Force carriers are bosons.”

Introduction:

Quantum vacuums, areas devoid of matter, are not entirely empty. There are many particles existing inside vacuums, some of these particles are photons, gravitons, physical fields, and in partial vacuums atoms of gasses such as hydrogen. When vacuums are created and matter is removed, a physical field is formed in its place. This field is believed to have minute amounts of mass, and contribute to the minuscule amount of friction that effects objects in vacuums. Gravitons are believed to have no mass, however behave and propagate as a wave to mediate the interaction of gravity. Photons are force carriers for the electromagnetic force with zero rest mass, and exhibit the property of wave-particle duality where a photon may be reflected or refracted by a lens, but also act as a particle by giving a definite position when it is measured. A partial vacuum containing atoms of gas, had a mass that allows for minuscule transfer of energy.

Physical Fields:

Physical fields are fields that are created when matter is removed from an area. When this occurs the field causes any matter in contact with it to behave similar to as if it was affected by centripetal force and move inward towards itself too fill to area occupied by the existing physical field. This interaction can be seen as an implosion of the structure until the area is occupied. This field is believed to have minute amounts of mass due to its energy, and affect objects. With there being minute amounts of mass existing among this field, it shows that the vacuum contains mass and is improbable to rid all matter from the vacuum, as well as gives a possible median for the transfer of waves that require particles.
A 100-nanometre-wide grain of graphite, is approximated to take 10 years to slow to one-third of its initial speed. (Graph and Equation Below)



The graph above demonstrates the decrease in speed of the graphite due to the friction. This graph matches the equation: $S_1 \times \left(\frac{y}{10} \times \frac{1}{3} \right) = S_2$ S sub 1: initial speed y: years moving S sub 2: final speed

Photons:

Photons are thought of as strictly massless and having the property of wave partial duality, meaning that the photon behaves as both a particle and a wave. This is due to its behavior in certain situations. The photon is mediated through electromagnetic energy, which can exist in a vacuum. This is because unlike mechanical waves that require the presence of a material medium in order to transport their energy from one location to another, such as sound waves, electromagnetic waves are created by the vibration of an electric charge, this vibration creates a wave which has both an electric and a magnetic component. When this happens it is able to propagate itself, allowing it to move through a vacuum. When the photon travels through a vacuum it travels with a speed of 3.00×10^8 represented by c, the speed of light. While through a median is less than c. Therefor, showing that the existence of photons in vacuums is preeminent and adds both waves and particles existing in the vacuum.

Gravitons:

Gravitons are believed to have zero rest mass. But they behave and propagate as a wave to mediate the interaction of gravity and gravitational waves. With this the vacuum contains waves produced from the gravitational waves and gravitons.

Sound wave possibility:

Sound waves are propagated through a median of matter such as molecules by vibrating them and generating waves. In a vacuum there are very limited molecules. However in partial vacuums there are atoms spread apart, but not enough to propagate a wave. The same situation applies to the physical field, there is not matter to propagate the mechanical wave through the median. A minute amount of propagation is possible, however would be very weak.

Conclusions:

In conclusion, the existence of both particles and waves is preeminent in vacuums, from photons traveling through electromagnetic waves, gravitons propagating as waves, and the effects of the physical field generated in a vacuum. Due to all these, there is mass and matter in existence, even in the most perfect vacuum. Because there is matter, this generates friction and counteract the thought of “frictionless vacuum” use widely in the field of physics. Over all and in conclusion the vacuum is indeed not matter-less, nor frictionless, however even in the most perfect vacuum matter and waves will be in existence and effecting other matter inside, however not enough to propagate mechanical waves.