

An Experimental Test of Photon Mass versus Special Relativity

by James Carter

The essence of Special Relativity is Einstein's assumption of $e = mc^2$ for a massless photon and the mass of kinetic energy. This is the proper equation for the energy of moving matter but the proper equation for the photon is the reciprocal equation of $cC = \sqrt{e/m}$. Where Einstein made his mistake was his symbol of c^2 . Where the photon is concerned, c^2 is not the squaring of a single velocity but the multiplying together of two separate velocities c and C that may or may not be equal to c^2 . c is the relative velocity of photon measurement and C is the absolute velocity of photon spin. This experimental test will decisively measure the difference between Einstein's idea of a massless photon of "pure energy" and the Newtonian principle of measurement of the momentum, force and energy of moving photon mass.

The Energy of Moving Mass

$E = mc^2$ has several physical meanings. It is the energy of the photons produced by the annihilation of a positron and electron. It is the energy inherent in the Lorentz transformation mass increase $m' = M\sqrt{1-v^2/c^2}$ of an accelerated observer. It is the combined kinetic and rotational energy of a photon's mass: $e = mc^2/2 + mC^2/2 = mcC$. It is the rotational kinetic energy $mC^2/2 + mC^2/2 = mCC$ contained in matter from the opposite spins at C of the rotating mass within its cyclon shaped structures. These definitions of $e = mc^2$ are principles of experimental measurement and are completely compatible with the equations of Newtonian dynamics. These principles of measurement are the same in every theory that uses them and are not unique to Special Relativity theory. Although these equations are used as part of relativity's mathematical structure, they were developed as a part of Newtonian mechanics prior to Einstein and are not used as fundamental assumptions in relativity theories.

Einstein's Massless Photon

The non-Newtonian assumption of $e = mc^2$ made by Einstein is that the mass of the entire structure of matter can be transformed into the pure energy of massless photons. This idea of pure energy is a metaphysical assumption and is not directly supported by any physical measurements. When a body of mass is accelerated, it gains kinetic energy $e = mv^2/2$. This energy is equal in quantity to the Lorentz transformation mass increase $m' = M\sqrt{1-v^2/c^2}$ of the body's increased absolute velocity. If the kinetic energy of a body's velocity has an equal quantity of mass, why is it necessary to believe that a photon's momentum and energy does not represent any mass? Why are both mass and energy conserved in all interactions of matter but not in the interactions of photons?

Relativistic Momentum

Relativity claims that a photon's momentum $p = mc$ is different in character and separate from Newtonian momentum $p = mv$. The problem with this idea is that the photon's equivalent

relativistic momentum is always measured as Newtonian momentum. When an atom emits a photon with a momentum of $p = mc$, it recoils with an equal quantity of Newtonian momentum $p = mv$. When this photon is absorbed by a second atom, this atom's recoil is measured as Newtonian momentum and is conserved with the recoil momentum of the first atom. How is it possible to believe in the conservation of momentum and still consider the photon to be massless?

When an atom emits a photon, its mass is decreased by the photon's momentum $m = p/c$. When the atom absorbs a photon, its mass and energy are increased by the photon's energy and mass. All experimental measurements of photon energy and momentum can only be quantified in terms of Newtonian momentum $p = mv$ and kinetic energy $e = mv^2/2$. What possible experimental measurements can be made in which the results require the photon to be massless? The only way an experiment can cause a photon to be measured as massless is to use non-Newtonian equations derived from Einstein's assumption of a massless photon. Measurements can produce assumptions, but assumptions do not produce measurements.

Non-Relativistic Newtonian Measurements

You cannot measure the mass of the photon using the mathematical structure of Special Relativity theory. When we measure a photon we must begin with Newton's laws of the motion of mass, space, time, and force = ma . To make these laws absolute to the speed of light, the Lorentz transformation $m' = M\sqrt{1-v^2/c^2}$ must be included. All of our instruments for measuring momentum and energy work according to these laws. The values that we get from our measuring instruments are always in terms of the Newtonian parameters of mass, space, time, and force. At the most basic level of measurement, the only three values we can determine from Newtonian dynamics are Force = Mass x Acceleration. When we measure a photon, we find, among other things, that it has a precise momentum of $p = mc$, angular momentum of $m\lambda c/2\pi$, energy of $e = mc^2$, mass of $m = e/c^2$ and a wavelength of $\lambda = h/mc$. When we measure each of these photon parameters, we need not assume photon mass because we are measuring its momentum. Photon mass is not a theory. It is just a measurement. You only need a metaphysical theory like Special Relativity to explain why the mass of the photon does not exist.

Photon Spin

Both Special Relativity and quantum mechanics identify the photon as a spin one particle. That is as far as these theories go with a physical description before launching into non-intuitive equations about a field continuum. This is because, without mass, they cannot identify just what it is that is spinning. They believe that the photon has neither a mass nor structure that is analogous to the mass and structure of matter. They believe that this spin occurs in an imagined non-Euclidian dimension. In quantum field mechanics, the photon's unit of spin one has energy but it cannot be divided into the Newtonian parameters of mass, velocity, and radius. This energy is believed to be the result of etherial motion rather than the motion of mass.

The Rest Mass and Energy of Matter

The photon is a matter/antimatter particle that gets equal quantities of negative electric mass and positive magnetic mass from an atom's electron and proton respectively. Relativists believe that when an atom emits a photon, part of that atom's mass is completely converted into a formless point of "pure" energy with no mass or shape. This would require that the photon was no longer matter and now existed as part of a spacetime continuum aether.

By contrast, if you allow the photon to have mass, you don't need an otherwise incomprehensible aether continuum to carry its momentum and energy across the universe. The photon just moves through the void with the pure Newtonian mechanics of inertial motion. Also, a photon with mass gives substance to the wave/particle duality, and with a mass structure the photon can act mechanically and no longer needs a quantum field to interact with an atom.

Doppler Shift of Photon Energy

A photon has the absolute parameter of masslength $m\lambda$ as it travels through space at c . This relationship is called Planck's constant $h = m\lambda c$. (Planck's constant simply quantifies mass, space, and time into a single equation.) When a photon is measured at an observer's absolute velocity of $v \pm c$, it is Doppler shifted to a different momentum $p = mv$, wavelength $\lambda = h/mv \pm c$, and energy $e = mv^2/2 + mC^2/2$. (If you believe in relativity, then its energy is Doppler shifted according to $e = mv^2$.) The Doppler shifts of momentum and wavelength are directly proportional to the observer's velocity but Doppler shifts of energy are proportional to the square of that velocity. The angular momentum $I\omega = m\lambda c/2\pi$ is the same for all photons and is never Doppler shifted. The photon's rotational kinetic energy is also the same in all reference frames and cannot be Doppler shifted. It is only the photon's linear kinetic energy $e = mv^2/2$ relative to c that can be Doppler shifted.

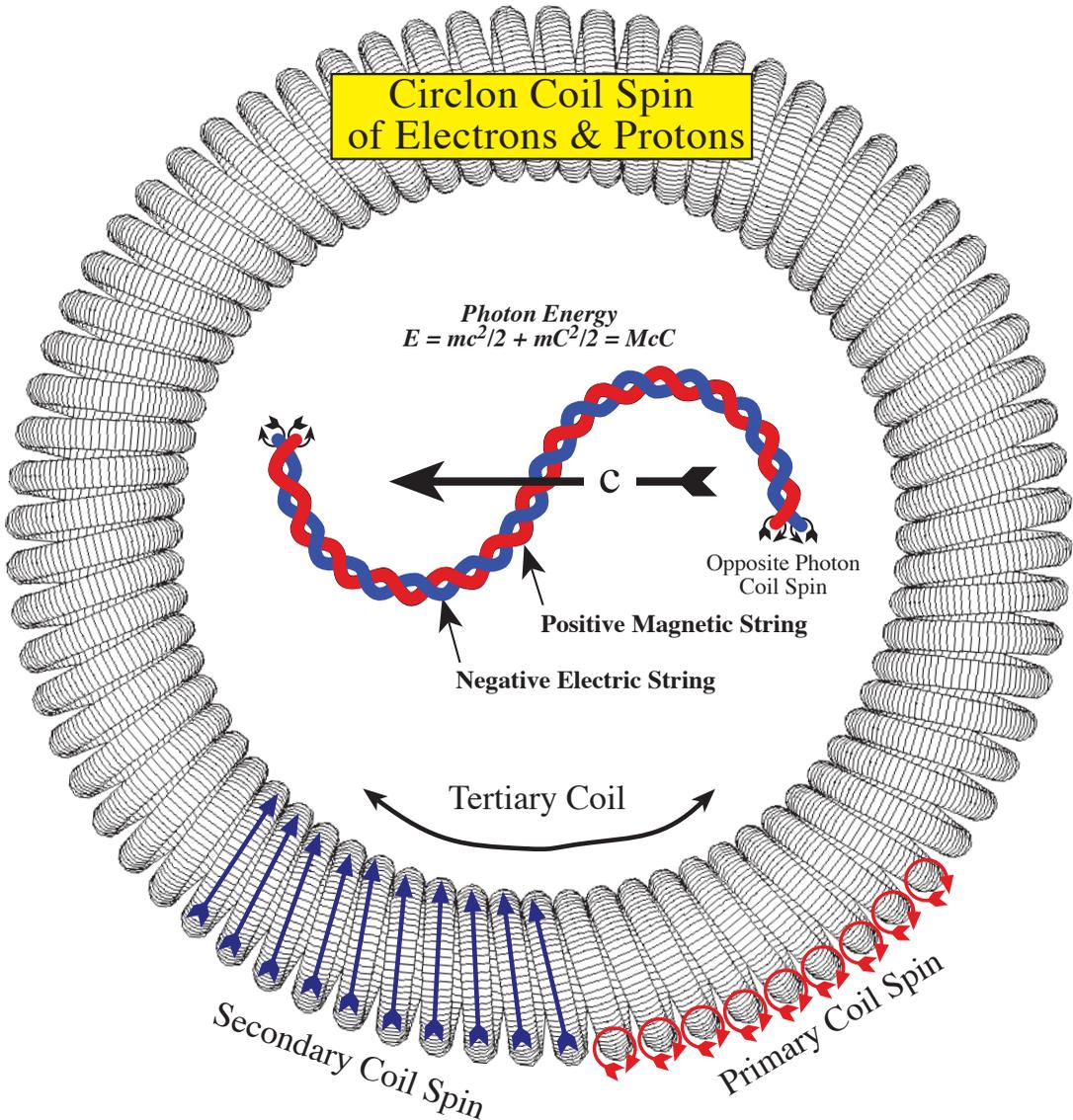
For example, when a photon is measured at $1/2c$, its momentum and wavelength are Doppler shifted to $1/2$ and 2 depending on direction. When the photon's shift in energy is measured, its rotational energy $e = mC^2/2$ stays the same and the kinetic energy $e = mv^2/2$ of its velocity is either $1/4$ or 4 . Photon energy at $1/2c$ is Doppler shifted to either $(1/8 + 1/2 = 5/8)$ or $(1/8 - 1/2 = -3/8)$. Without rotating mass, relativity's photon energy $e = mv^2$ would be Doppler shifted to either 2.25 or $1/4$.

The photon's red and blue energy Doppler shifts are just the mechanics of linear motion and the spin of mass. The dynamics of a photon's momentum and energy have three components that must be calculated and measured separately. The energy of a photon's spin is constant and is the same in all frames, the linear momentum is directly proportional to the photon's Doppler velocity and its linear kinetic energy is proportional to $1/2$ the square of the observer's motion.

Photon Energy and Planck's Constant

Special Relativity's theory of a massless photon is circular in nature. It first adopts the metaphysical assumption for a massless photon $e = mc^2$ and then tries to confirm this quantity of energy $e = hf$ with Planck's constant which is just another metaphysical assumption for a massless photon. If you do not assume a massless photon then the value of the constant is $h = m\lambda c$.

Planck's constant is equal to the mass times the wavelength of any photon times the speed of light and photon energy is $e = hc/\lambda = m\lambda c^2/\lambda = mc^2$. The argument for a massless photon is based on unmeasured equations rather than experimental parameters. You cannot measure the mass of the photon with a theory that begins with a postulate that the photon is massless. Einstein's whole idea of the massless photon stemmed from his failure to arrange his favorite equation of $e = mc^2$ into its proper form to show the relationship between photon mass and energy $cC = e/m$. In this equation, photon energy and mass remain on the same side as complementary units within each



photon.

The Newtonian Photon Mass Principle

The only experimental difference between Newtonian mechanics and Special Relativity's dynamics is in their mathematical relationships between mass and energy. In Newtonian mechanics, kinetic energy and mass maintain equal quantities within each photon and within the motions of each body of matter.

In relativity theory, the kinetic energy of a body's motion is coupled to what is called "relativistic" mass and the photon's "relativistic energy" has no actual mass. Even without mass, the photon is calculated to interact with matter in the same measurable way that it would if it did have Newtonian mass. In the Newtonian mass principle, energy and mass are always constant and equal in all interactions of matter and photons. In relativity theory, mass and energy are sometimes conserved but at other times they are allowed to come and go, and transform into one another, and even appear from or disappear into the zero point energy continuum. For example, in Big Bang theory, the energy and momentum of CBR photons are constantly disappearing into the imagined parameter of the expanding spacetime continuum.

Experimentally, most equations defining a measurement show equal results for both the Newtonian principle and relativity theory. Whether or not someone believes that the photon has mass boils down to their choice in equations. Most of the so called tests of relativity's massless photon can equally confirm the Newtonian mass principle simply by rearranging Einstein's photon energy equations of $e = mc^2$ and $h = e\lambda/c$ to the Newtonian photon equation of $cC = e/m$. In Newtonian physics, the equation for a photon's parameters requires that photon energy and mass are always equal in quantity and must not be placed on opposite sides of the equation except for the purpose of their individual calculation.

It would seem that all measurements of electrodynamics would be calculated the same with both relativistic and Newtonian equations. However, the Doppler effect of photon energy provides an experimental test that will produce different results for photons with Newtonian mass and energy than with relativity theory's massless energy photons. A photon's relativistic massless energy $e = mc^2$ is a single homogeneous unit, whereas a photon's Newtonian energy $e = mc^2/2 + mC^2/2 = mcC$ is divided into two equal quantities of relative and absolute kinetic energies. The photon's kinetic energy from the linear motion of its mass is proportional to the relative velocity of the observer, but the rotational energy of the photon's spinning mass remains constant in all observer frames. Both a photon's rotational kinetic energy and its angular momentum are constant and are not shifted by a Doppler effect.

The Definitive Test of Relativity's Massless Photon

It is claimed by many that Special Relativity has "passed every experimental test ever conceived". This is only true if you begin with equations requiring the assumption of a massless photon. The only real difference between Newtonian mechanics and the dynamics of relativity is the assumption of the massless photon. Most of the mathematical calculations for "every ex-

The Definitive Measurement of the Absolute Motion of Both Inertial Mass and Photon Mass

This experimental measurement could easily be performed in a small laboratory. All that would be required is four lasers and sensors capable of accurately measuring photon wavelength and energy.

Transverse Doppler Shift

$$\lambda \text{ motion} = \frac{\lambda \text{ rest}}{\sqrt{1-v^2/c^2}}$$

$\sqrt{1-v^2/c^2}$ @ 375 km/s = .999999217

Doppler shift of Momentum @ 375 km/s

$$\frac{375.000}{299,792,458} = .001250865353$$

$$p = \frac{c - v}{\sqrt{1-v^2/c^2}} = .998749916 \text{ red}$$

$$c - v = .998749134$$

$$p = \frac{c + v}{\sqrt{1-v^2/c^2}} = 1.00125165 \text{ blue}$$

$$c + v = 1.001250865353$$

Newtonian Energy Doppler shift @ 375 km/s

$$Ne = mc^2/2 + mv^2/2\sqrt{1-v^2/c^2} = .998749135 \text{ red}$$

$$c^2/2 + v^2/2 = .998749917 \quad e = c^2/2 + v^2/2 = .997501395$$

$$Ne = mc^2/2 + mv^2/2\sqrt{1-v^2/c^2} = 1.00125086 \text{ blue}$$

$$c^2/2 + v^2/2 = 1.001251648 \quad e = c^2/2 + v^2/2 = 1.002503544$$

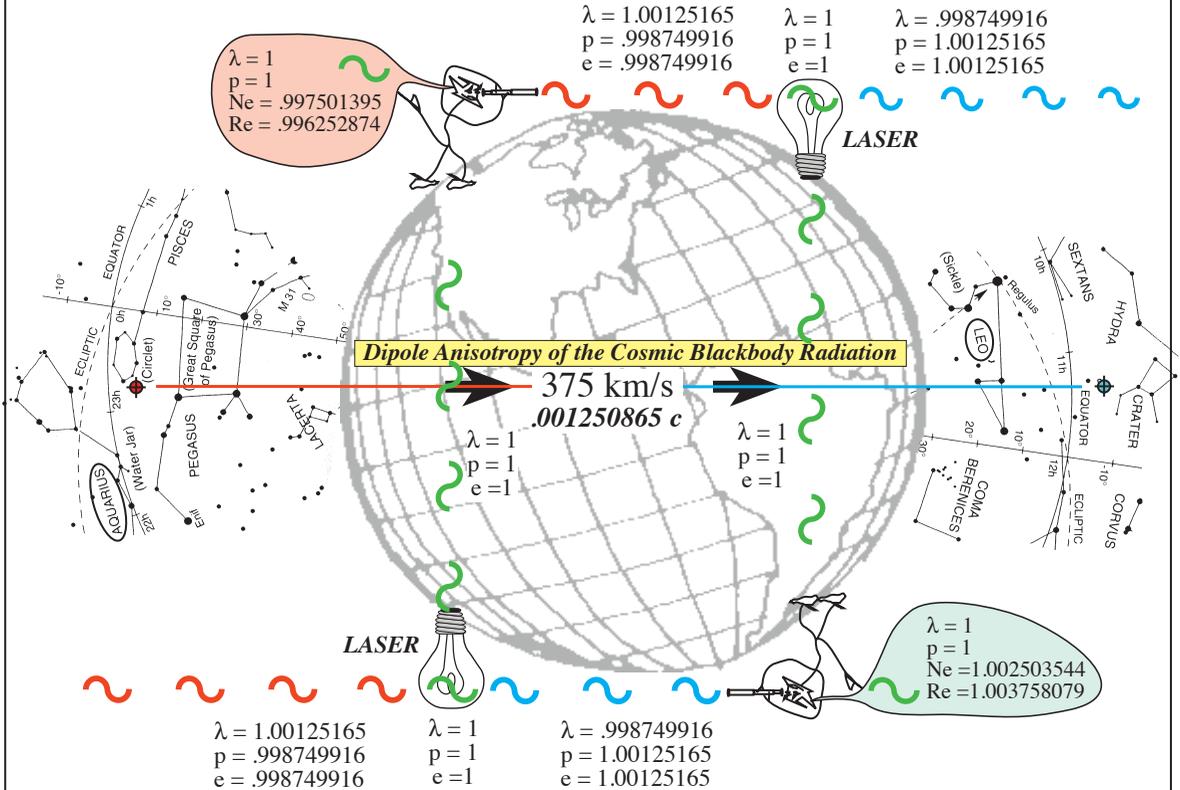
Relativity's Energy Doppler shift @ 375 km/s

$$Re = mv^2\sqrt{1-v^2/c^2} = .997499052 \text{ red}$$

$$v^2 = .997499834 \quad e = mv^2 = .996252874$$

$$Re = mv^2\sqrt{1-v^2/c^2} = 1.00250251 \text{ blue}$$

$$v^2 = 1.002503295 \quad e = mv^2 = 1.003758079$$



Earth has an Absolute Motion of 375 km/s Relative to the Photon Rest of the 2.7° K CBR.

This motion can be detected independently of the CBR by measuring the difference in Doppler shifts between a photon's energy and its wavelength and momentum. This measurement can also be used to show the photon has a mass structure and that it is not just "pure energy".

perimental test” come out the same whether you are quantifying Newtonian mass or relativistic momentum and energy.

Most of the experimental measurements of relativistic momentum, energy and wavelengths can be calculated to the same degree of accuracy using the equations of Newton’s laws of force and motion and a photon with measured Newtonian mass, energy, momentum, and angular momentum. The only difference between the dynamics of Newtonian mechanics and Special Relativity is the massless photon. All the so called tests of Special Relativity are made with Newtonian measuring instruments that are incapable of detecting massless momentum and energy.

The Doppler effect provides the ability to experimentally test Special Relativity’s theory of the massless photon against the opposite principle of Newtonian photon mass. The “pure” energy $e = mc^2$ of the relativity theory is Doppler shifted more than the combined kinetic energies $e = I\omega^2/2 + mc^2/2 = mc^2$ of the photon mass principle. Careful measurements of photons will show that the Doppler shifts in a photon’s momentum are not proportional to shifts in its energy. This is because momentum is shifted directly by velocity, and energy is shifted by one half of the square of velocity. Careful and precise measurement of a photon’s relationship between Doppler shifted momentum and energy should be able to falsify either relativity theory or the Newtonian photon mass principle. For example, relativity’s energy red shift for $1/2 c$ would be $1/4$ while the Newtonian red energy shift would only be $5/8$.

This Doppler shift discrepancy between momentum and energy can only be measured by rapidly moving observers. This is a relativity large effect that could possibly be measured in the dipole anisotropy of the CBR. Such a test would provide the opportunity to measure uniform photons from all directions that are undergoing large (375 km/s) red and blue Doppler shifts in their wavelengths, momentum, and energy.

It is very likely that this effect could be detected with lasers aligned to the 375 km/s velocity vector of the CBR. Such an experiment could easily be performed in a small underground laboratory. Four lasers would be aligned with, against, and at right angles to the CBR dipole anisotropy. Sensitive detectors would measure changes in the photon’s wavelength, momentum, and energy as Earth’s rotation moved the lasers into and out of alignment with the vector of CBR motion.

The different Doppler shifts in photon energy predicted by Special Relativity and the Newtonian laws of motion provides an ideal experimental way to determine which of these theories is valid. In Special Relativity, total photon energy is Doppler shifted and with Newtonian force and motion only the linear half of a photon’s energy is shifted and the rotational half the its energy remains constant.

