The Variable Speed of Light Versus the Absolute Motion of Clocks

Even though the speed of light is always constant in empty space, it is measured to have a different value in every moving inertial frame due to the time dilation of clocks. The following series of thought experiments are devised to show what natural laws and constants remain the same through changes in momentum and which laws are altered by acceleration or deceleration.

For ease in calculation, the velocity of .867 c is chosen for these experiments but Lorentz transformations are valid for any absolute velocity relative to the universal position of zero momentum photon rest. At this velocity, the linear Energy/Mass = c^2 (relativistic mass) of the ship and crew is equal to the rotational Energy/Mass = C^2 (rest mass) of their atoms. This doubling of the ship and crew's Energy/Mass has slowed the rates of onboard inertial clocks to one-half and speeded the rate of pendulum gravity clocks to 1.414

The experiment begins when the atoms contained in a group of experimental physicists and their spaceship are accelerated from rest to a velocity of 86.7% the speed of light. They use an onboard Inertial Navigation System to determine when they have reached this velocity. The technicians then assemble a number of experiments to measure the "laws of physics". These tests were performed when the ship was at rest and then again at speed in order to detect any changes in locally measured values.

Conservation of Linear and Angular Momentum

The first three laws of nature to be calculated and measured are Newton's four laws of momentum. $p = mv$, $I\omega = mvr$, $F = ma?d$, and $m = M\sqrt{1-v^2/c^2}$.

Momentum is mass times velocity and angular momentum is mass times rotational velocity times radius. These are the ultimate conserved components of all atoms and photons in the cosmos. Momentum a passive quantity that can only be detected by a linear Force that is measured on a single vector as mass times an unknown combination of absolute acceleration and deceleration. An accelerometer measures changes in momentum relative to itself but it can never separate its single reading into absolute acceleration from absolute deceleration. Angular momentum is an active absolute quantity that is the same in all reference frames that is measured by radial centripetal force. West bound automobiles must accelerate and increase their momentum to begin their journey but East bound drivers must decelerate to reduce the absolute momentum of their cars in order to move Eastward against Earth's constant angular momentum.

The Lorentz transformation is simply a combination of the laws of momentum and Force and is the mechanism used for calculating and measuring the conservation of linear momentum. The Lorentz transformation is a measure of momentum that is calculated as an increase in the Energy/Mass = c^2 of moving

bodies. Increasing mass causes inertial clocks to slow and slowed clocks make distances to appear contracted that in turn causes velocities to appear to speed up.

The technicians use three different clocks clocks to measure time. A Cesium clock and a gyroscope to measure inertial time and a pendulum clock to measure gravitational time. The gyroscope rotor is spinning at 3600 rpm and ticks off one second after each 60 revolutions. As they accelerate faster and faster they note that their Cesium clock and gyroscope clock remain synchronized even though they know that they must both be slowing down. What causes the gyroscope clock to slow is that as the Lorentz transformation increases the its rotor's mass, its rotational velocity must slow in order to conserve angular momentum $I\omega = mvr$. It is also the conservation of angular momentum that causes the Cesium clock to slow by the same rate as its atoms increase in mass.

The Astronauts use accelerometers to quantify the laws of momentum at their extreme velocity. They first measure the mass of a one kilogram bar by measuring the force needed to accelerate it to a given velocity. The then use the velocity and a clock to measure the length of a meter rod and finally they use the meter rod and velocity to determine the interval lengths of the accelerometer's clock.

All of their measurements come out exactly the same as they had back at rest on Earth. The bar still weighted one kilogram, the measuring rod was still one meter in length and the accelerometer's clock still verified both values. All measurements of mass, space, and time, appear to be the same, even though the technicians knew their intrinsic values have been changed by their absolute linear momentum.

These unchanged measured values of mass, space and time would seem to verify Einstein's 1st postulate that stated the laws of physics are the same in all inertial frames. This all depends on what he considered to be "laws of physics". The technicians knew from their inertial navigation system that they were traveling at .867 c and also calculated that at this velocity the Lorentz transformation would double their mass, slow their inertial clocks to one/half, speed up their gravity clocks by 1.414 times, and cause their meter rods to be measured at 500 mm.

Einstein's second postulate was a new law of nature that stated that photons always moved through empty space at c = 299,792,458 m/s. When the scientists use their clocks and meter rods to test this law and measure the speed of light, they find to their surprise that the two-way speed has increased to nearly 600,000,000 m/s. There are two possible explanations for this doubling of c. Either their clocks have slowed to one-half or their meter rods have contracted to one-half but not both. Either way the actual intrinsic speed of light has not changed. Only the parameters of the astronaut's measuring instruments have changed.

The True Speed of Light is 299,417,717.4 m/s

We measure the speed of light c here on Earth to be exactly 299,792,458 m/s. This value is exact because it is used to define the length of the meter and the duration of a second. This is not the true value of c because it is measured to have a different value in every other inertial reference frame.

We can determine from the 2.7 K cosmic blackbody photons that Earth's inertial frame is moving towards Leo at about 375 km/s. This momentum has increased the mass of Earth and the duration of its rotation as well as its other clocks by .00125 (Mass = 1.00125 kg, clock seconds = 1.00125 s and the length of the day has increased to 1.00125 day due to the conservation of Earth's angular momentum $I\omega = mvr$). The time interval of the second for pendulum gravity clocks has increased to .707 second.

When c is measured at the zero momentum rest frame of all photons where mass = 1.0 and the second = 1.0, it is measured to be 299,417,717.4 m/s. This is the true velocity at which all photons move through empty space. When experimental physicists attempt to measure this intrinsic velocity in any other moving reference frames they find that its velocity increases in direct proportion to the momentum of their frame. The actual speed of photons does not change but just appears to increase due to the observer's slowed inertial clocks and appears to slow down when measured with a gravity clock.

Earth's daly rotation is an inertial clock and the moon's monthly orbit is a gravity clock.

However, these increases in the measured speed of light do contradict a conclusion of Einstein's first postulate that states it is impossible for observers to locally determine their motion through empty space. By measuring that the two-way speed of light has doubled in all directions inside their spaceship, the researchers are able to determine their ship's velocity through absolute space to be .867 c. However, there is still no way to determine the direction of their momentum vector without looking at the stars or the 2.7 K cosmic blackbody radiation.

In another test, a spectrometer is used is used to measure individual photons of the Hydrogen spectrum. They know that the mass of the electron has been doubled by their momentum and that this will double the length of the Bohr radius which in turn doubles the wavelengths and halves the momentum of Hydrogen spectral photons. This is the so called transverse Doppler effect. While this double red shift in the Hydrogen spectrum can be measured by observers at rest, it cannot be measured in the spaceship because the spectrometer has undergone the same transverse shifts in its atoms. Even though the wavelengths of Hydrogen spectrum photons have actually doubled, the slowed clocks will measure them at their original momentum, energy and wavelengths.

Inertial Time versus Gravitational Time

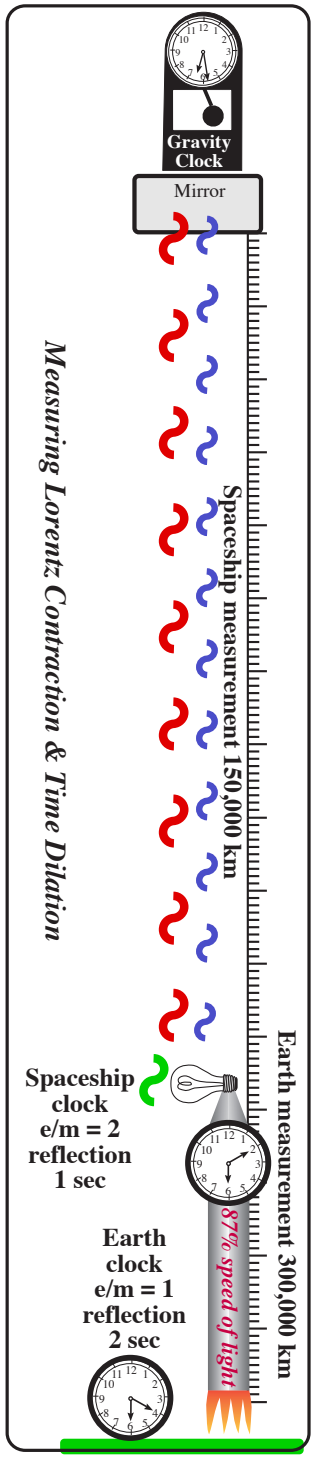
Lorentz transformations caused by increased linear momentum cause all inertial clocks to slow and pendulum gravity clocks to speed up. This divergence between inertial time and gravitational time indicates that they flow in opposite directions and meet in the middle as metaphysical time.

An additional test is performed to measure the gravitational force constant with accelerometers and pendulum clocks attached at the bow and stern of the ship. The astronauts first performed this test in a high Earth orbit to measure the amount of gravitational acceleration produced by the ship's Energy/Mass = c^2 at rest m =1. The pendulum clocks are then synchronized with the craft's Cesium clocks.

The same measurements are made again when the ship reaches its final momentum. Because of the craft's doubled mass, the doubled gravitational acceleration on the clock's pendulum would increase its rate by 1.414 times its Earth rate and 2.828 times the slowed local Cesium clock's rate ($t = 2\pi \sqrt{L/g} = 1$ $t' = 2\pi \sqrt{L/2g} = .707$). The doubled mass of the clock's pendulum would not effect its rate of ticking but it is found that if the length of its pendulum is doubled, it will run at the same rate as the local Cesium clock. This is another example of an apparent Fitzgerald contraction.

The Fitzgerald Length "Contraction"

In their measurements of light speed, the scientists detect a .5 contraction in the length of their meter rods when using their local clock. This is also true when they change the length of a gravity clock's pendulum to adjust its time intervals, This is the so called Fitzgerald contraction but as we can see here, it is a non-physical length effect that is an artifact of the measurement process using slowed or speeded up clocks.



At absolute rest, atoms have only rotational Energy/Mass = C^2 (angular momentum) and zero momentum. When they are accelerated, they acquire linear Energy/Mass = c^2 (momentum). At .867 c, their E/M = C^2 is equal to their E/M = c^2.

The only thing that really changes in a Lorentz transformation is an increase or decrease in the clocks' linear Energy/Mass = c^2 (momentum) while their rotational Energy/Mass = C^2 (angular momentum) remains constant. The faster the observers go, the more divergence they measure between the speed of light and their clocks. Observers can then use these measured changes in light speed or rod length to calculate their true velocity relative to the zero momentum photon rest frame of the cosmos.

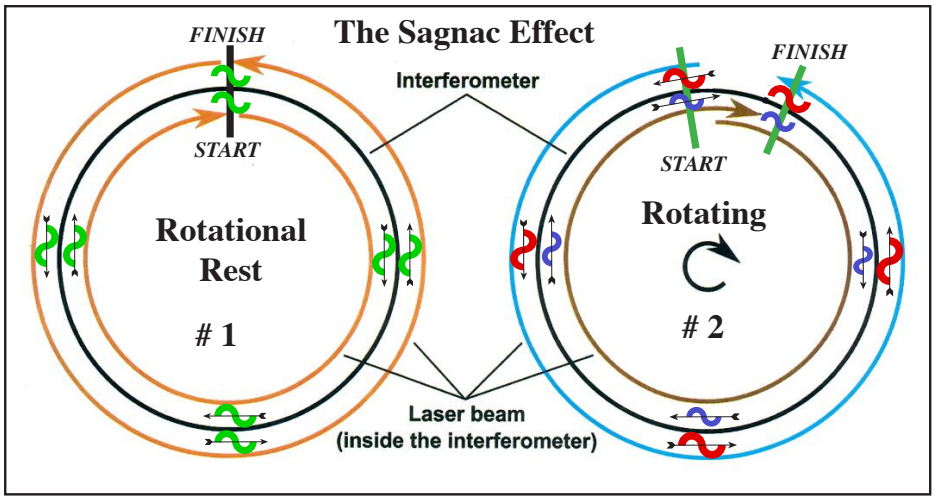
The three parameters of mass, space and time involved in the Lorentz transformation are just the components of changing linear momentum. Linear Energy/Mass = c^2 is the only changing reality and space and time are merely metaphysical ideas used to quantify linear momentum as the absolute motion of Energy/Mass. Of the three Lorentz transformation calculations of mass, space and time, mass is the only parameter that actually changes. Changes in the mass of any clock's moving parts changes the lengths of its recorded intervals and changes in clock intervals will change length measurements when the two-way speed of light is used as a constant for space and time in the measured values.

The following thought experiment demonstrates why length contraction is not a physical effect and how the idea arises from the experimenter's choice of constants and physical parameters in the measurement process.

In the experiment, a 300,000 km ruler with a mirror at the end is attached to a space ship. Photons are blue shifted to double their momentum when emitted toward the mirror and then red shifted to half their original momentum when they are reflected back to the ship. The clock timing of the photons' return is used to determine the length of the ruler. The intrinsic velocity of both the blue and red photons is exactly c relative to the empty space of zero momentum rest.

Before the ship takes off, it is measured that it takes two seconds for the photons to return to the ship. However, when the ship and ruler are moving at 87% c, it only takes one second for the photon to travel to the mirror and back. This is because the observer's inertial clocks have slowed to one half their Earth rate due to the doubling of its mass. If the observers don't realize their clocks have slowed and assume the speed of light to be constant, they will incorrectly assume that the ruler has contracted to one half its Earth length.

If the aether people try to use a Michaelson Interferometer to measure their absolute motion they will get a zero fringe shift. The small fringe shifts measured by interferometers back on Earth result from the Sagnac effect detecting Earth's daly rotation.



In drawing #1, green un-shifted photons travel in opposite directions on a circular path around the interferometer. They meet at the point where they started.

In drawing #2, the circular path is rotating to the right. The photons emitted in the direction of the motion are blue shifted and take momentum from the apparatus and the photons emitted against the motion are red shifted and add to its momentum. Both sets of photons move at exactly c in opposite directions. Because their paths are rotating, they do not meet until the blue photons have made more than one revolution and the red photons have made less than a revolution. The exact rotation of the interferometer can be measured as red and blue fringe shifts. They both move at exactly c and travel the same distance in the same time but the blue photons are perceived to move faster than the red photons relative to the Sagnac apparatus.

The Sagnac effect is somewhat unique among scientific experiments because it has been claimed at one time or another to both verify and falsify Special Relativity, General Relativity, and aether theories. These theories offer different and somewhat contradictory explanations of this effect. However, none of these metaphysical assumptions are necessary because the Sagnac effect is based on a simple principle of measurement that requires no theory to explain. The constant speed of light is a measurement and not a theory.

All photons are measured to move at exactly c through the same zero momentum rest frame of empty space. Their velocity relative to an observer is always plus or minus c and is precisely measured as red and blue Doppler shifts in photon momentum.

In linear measurements, Doppler shifts cannot be physically separated from a photon's actual dimensions but with the circular motion of the Sagnac interferometer, the complementary absolute red and blue shifts are equal and can be precisely measured as fringe shifts to quantify rotary motion and conserve angular momentum.