Why the Speed of Light Appears to be the Same in All Reference Frames and How to Find the Rest Frame

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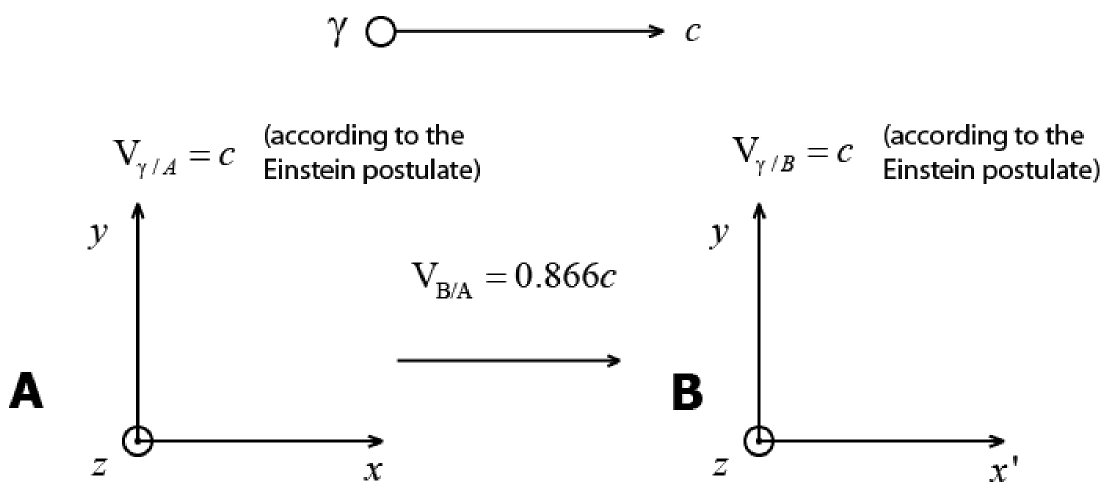
One of the postulates of Einstein's special theory of relativity is that the speed of light measured in any inertial system is the same as that measured in any other inertial system. Let the *x´yz* system move at a velocity of 0.866*c* directed to the right (where "*c*" is the speed of light) relative to the *xyz* system as shown below. Point A is fixed to the *xyz* system, and point B is fixed to the *x´yz* system. Let γ be a photon moving to the right at its velocity "*c*".



The velocity of B relative to A is 0.866*c* directed to the right. The velocity of the photon measured by an observer on the *xyz* frame, according to the Einstein postulate, is "*c*" to the right, and the velocity of the photon measured by an observer on the *x´yz* frame is "*c*" to the right. Many scientists believe this postulate of Einstein represents the truth. The following paragraphs show how this fallacious result occurs.

The universe is filled with a gas of perfectly elastic particles which is an ether defining a fixed reference system, see Brown [1]. Matter emits photons, and every one travels at velocity *c* $\left(3\times10^{8}\,m/s\right)$ relative to this fixed reference, see [1]. This speed is an invariant throughout the universe since the ether provides the mechanism for propelling the photon. Thus, no matter where a photon is observed, its absolute velocity will always be "*c*".

Consider now an assemblage of matter attached to a reference system which is at (absolute) rest. We let body A and the *xyz* system in the above figure be at rest. Let the speed of light be measured using instruments on this frame. To measure speed, a distance measure is required, and a time measure is required, since v = change in

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location divided by an increment of time. Thus, we use a measuring rod and a clock. To make our calculations simple, let the distance change of the photon be 3×10^8 meters to the right while the clock ticked one second. Thus, the speed measured is:

$$c = 3\times10^8/1 = 3\times10^8 m/s$$

Now, consider an assemblage of matter (i.e., body B) attached to a reference frame moving to the right at an absolute velocity of 0.866 times the speed of light $\left(\mathrm{v}_B = 2.598\times10^8 m/s\right)$. The observer on *B* now sees the same photon as the observer on *A* and measures the photon velocity. We know that the photon velocity relative to this frame is $c - 0.866c = 0.134c$, since the *xyz* system is at absolute rest. Observer *B* uses the same type meter stick and same type clock as observer *A*, except *B's* meter stick and clock are moving to the right with an absolute velocity of 0.866*c*. Observer *B* wants to compute the velocity of light relative to the *x´yz* frame. To understand what happens we need to know the structure of meter sticks and time clocks. We explain these in the following paragraphs.

All matter is comprised of mass moving at the speed of light in an orbital path, again see [1]. For matter at absolute rest the mass travels in a circular path. In order for matter to translate, a photon must impact the matter and cause it to take a spiral path, as viewed from a rest frame. The path viewed from a frame moving with the matter particle is an ellipse with a minor axis which is $\sqrt{1-\beta^2}\ (\beta = \mathrm{v}/c)$ as large as the circular radius when at rest. Thus all matter shortens by this factor when moving. Further, the time for an orbit increases by the factor $1/\sqrt{1-\beta^2}$. In this case $\sqrt{1-\beta^2} = \sqrt{1-(.866)^2} = 0.5$ and while the photon passes, the measure stick would measure a distance of $3\times10^8/\sqrt{1-\beta^2} = 3\times10^8/0.5 = 6\times10^8$ meters while the clock ticked $1/\sqrt{1-\beta^2} = 1/0.5 = 2$ seconds. Thus, the observer on *B* computes the velocity as

$$c = 6\times10^8/2 = 3\times10^8 m/s$$

which is exactly the same as the rest observer's results. However, the photon absolute velocity relative to B is $(1.000 - 0.866)c = 0.134c$. Sometimes the truth is hard to find.

However, we do have a problem embedded within the above analysis. What we have shown is that the velocity of light measured using a rest frame is the same as that for another frame moving at any given velocity. Thus, all inertial frame gives the same result. So how do we find a rest frame??? Knowing the structure of matter and of photons may provide a method for determining the absolute velocity of a body.

For an understanding of the structure of matter and photons we again return to Brown [1]. Consider matter as typified by a proton. A proton at absolute rest is a small "ball" of mass orbiting in a circular path with a large radius compared to the radius of the "ball" representing the proton. This "ball" produces a spherical wave in the ether which oscillates outwardly and inwardly and produces the proton electrostatic field. In order for the proton to translate, a photon must interact with the proton's electromagnetic field, and as a result of the interaction, part of the photon mass becomes a part of the electromagnetic field (thus increasing the proton's mass), and the proton begins translating. To decrease the proton speed, mass in the field must be emitted. The mass of the proton, as a function of its velocity, is given by $M_v = M_o / \sqrt{1-(v/c)^2}$, where v is the proton absolute velocity, and M_o is the proton's mass when at absolute rest. Now, how can we find v???

Consider the following experiment. Let B be a body on the surface of the earth. B has an absolute velocity $v = \beta c$ which we wish to determine. Let us accelerate electrons, from point B in two opposite directions, say to the left and to the right, at the same velocity $\beta_1 (= v_1/c)$ relative to B. The direction of v_1 is to be parallel to v which is taken to be directed to the right. Now, the masses of the electrons are

$$M_e = M_o / \sqrt{1-(\beta_1-\beta)^2}, \qquad M_r = M_o / \sqrt{1-(\beta_1+\beta)^2}$$

where M_e is the left electron mass, and M_r is the right electron mass. From these

$$\left(\frac{M_e}{M_r}\right)^2 = \frac{1-(\beta_1+\beta)^2}{1-(\beta_1-\beta)} = \delta$$

where δ is defined by the above equation. We can measure δ easily.

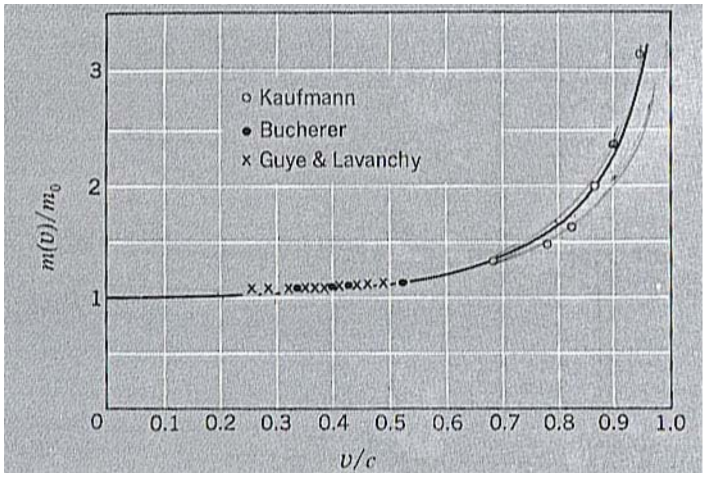
We will accelerate the electrons to a speed close to "*c*", and we anticipate that the velocity of point B on the earth is much less than "*c*". Thus, we can eliminate β^2 terms. Now, solving the above equation for β results in

$$\beta = \frac{(1-\delta)(1-\beta_1^2)}{2(1+\delta)\beta_1}$$

Knowing δ as a function of β_1 gives β, the sought-for absolute velocity.

We do not know the direction of v (the absolute velocity of B), but with our experimental apparatus we can determine the direction. All that is required is to direct the electron paths in every direction over 4π sterradians, i.e., every direction over a sphere. For any given value of velocity relative to the earth, the difference in mass will be a maximum when the relative velocity of the accelerated particles is parallel to the absolute velocity of B.

The following figure, taken from French [2], shows data on electrons of mass at velocity divided by the mass at rest versus velocity. The data were obtained over a period of six years (1909 to 1915) and were from experiments performed on the surface of the earth (i.e., point B). The directions of the velocities were probably, all tangent to the earth (i.e., horizontal) and, probably, at somewhat random orientations to the absolute velocity of B. First we note that at low velocities there is very little scatter which indicates that the absolute velocity of B is small. At high velocities we note some scatter of the data, from the nominal curve. The scatter could be an artifact of the experiment, but we will assume, for illustrating our scheme for finding the absolute velocity of B, that all the scatter is due to accelerating the electrons with components opposite or the same as the direction of the absolute velocity of B. Furthermore assume, for our purposes here, that the maximum deviation from the nominal curve has been obtained and presented in the figure.



Using the data at $v/c = 0.9$ we have $M_r / M_l = 2.35/2.00 = 1.175,$ since we have taken the absolute velocity to be directed to the right. Thus the right electron will be more massive than the left electron.

Now

$$\delta = \left(\frac{M_l}{M_r}\right)^2 = \left(\frac{1}{1.175}\right)^2 = 0.72$$

and

$$\beta = \frac{(1-.72)\left(1-\overline{0.9}^2\right)}{2(1+.72)(0.9)} = 0.017$$

which is our desired result.

Point B on the surface of the earth is traveling at 1.7 percent of the speed of light, or the absolute velocity of B is

$$v_B = 0.017 \times 3 \times 10^8 = 5.2 \times 10^6 m/s$$

In a way of comparison, other velocity components of point B follow. Due to rotation of the earth that velocity is (if B were on the equator)

$$\mathrm{v}_r = \frac{2\pi r}{\text{seconds in a day}} = \frac{2\pi\left(4000\times5280/3.3\right)}{24\times3600}$$
$$= 466\, m/s \quad \text{or} \quad \mathrm{v}/c = 1.6\times10^{-6}$$

which is very small. The orbital velocity of the earth is

$$\mathrm{v}_o = \frac{2\pi r}{\text{seconds in a year}} = \frac{2\pi\left(93\times10^{6}\times5280/3.3\right)}{365\times24\times3600}$$
$$= 30,000\, m/s \quad \text{or} \quad \mathrm{v}/c = 1.0\times10^{-4}$$

There also is a component of velocity for the solar system rotation in the Milky Way galaxy, and there could be an additional component due to translation of the complete galaxy. Nonetheless, the estimate of the absolute velocity of a point on the earth may be reasonable. The lack of scatter at low velocities indicates that the absolute velocity must be less than a few percent of the speed of light.

The experiments for the above analysis were used only to illustrate the technique for finding absolute velocities and may give results quite different than those based on tests covering the full range of direction (i.e., directions over 4π sterradians). It is hoped that the analysis here will lead to realistic 4π sterradian tests. Such tests not only would give the magnitude of the absolute velocity but also would give its direction.

Another observation indicating an absolute velocity (i.e., velocity relative to the ether) is the eccentricity of the planetary orbits. Every individual nuclear matter particle must take a spiral path in order to move relative to the ether, and this spiral path viewed from a frame moving at the speed of the particle is an elliptic path. The minor axis of the ellipse is parallel to the absolute velocity of the particle. Further, the eccentricity of the path is equal to the particle's speed in velocity of light units, see [1]. It is expected that massive bodies in orbit would exhibit the same spiral path as the individual nuclear particles. If so, then a planet with its orbital plane parallel to the average "smoothed-out" absolute velocity would have an elliptic orbit, and its eccentricity would be equal to its speed (in speed of light units).

Planet	Orbital inclination (degrees)	Orbital eccentricity
	(with respect to the ecliptic)	
Mercury	7.00	0.206
Venus	3.39	0.007
Earth	0	0.017
Mars	1.85	0.093
Jupiter	1.31	0.048
Saturn	2.49	0.056
Uranus	0.77	0.046
Neptune	1.77	0.010
Pluto	17.15	0.248

Table 1

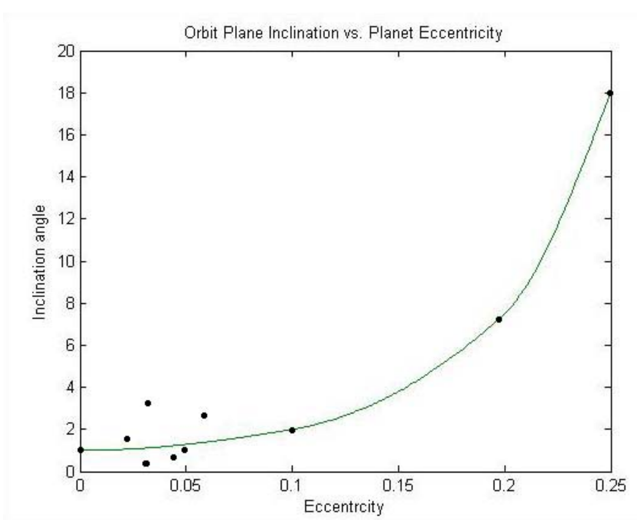
Table 1, constructed using data from Chaisson [3], gives orbital inclination and the eccentricities for the nine planets. The orbital inclination for the earth, of course, is zero. The direction of the absolute velocity of the planets is not known. If an orbital plane is not parallel to the absolute velocity then it is expected that a larger eccentricity would be required for the same absolute velocity than the orbit parallel to the absolute velocity. However, the exact relation between inclination angle and eccentricity has not been developed. Nonetheless an inspection of the Table 1 eccentricities shows that Venus has the smallest eccentricity. The variations in eccentricities from 0.248 (for Pluto) to 0.007 (for Venus) are presumed to be the result of the variation in inclinations of the orbit planes to the planet absolute velocities. Additionally there may be some effect due to other causes. Since the rotational and revolving velocities are assumed small relative to the solar system's absolute velocity, it is expected that the planet with the smallest eccentricity has its plane nearest parallel to the absolute velocity. Based upon this we expect that the eccentricity of Venus (i.e., 0.007) to be an upper limit to the solar system velocity (in speed of light units). We assume the absolute speed of Venus is at this limit. Thus,

$$\left(\mathrm{V}_{abs}\right)_{\substack{\text{solar system}\\ \text{(Eccentrities)}}} = 0.007 \times 3 \times 10^{8}$$
$$= 2.1 \times 10^{6} \, m/s$$

This compares, somewhat favorably, with our estimate from the electron acceleration tests of

$$\left(\mathrm{V}_{abs}\right)_{\substack{\text{solar system}\\ \text{(Electron accel)}}} = 5.2 \times 10^{6} \, m/s$$

It is noted coincidentally that the earth's eccentricity of 0.017 has the same magnitude as the earth velocity of 0.017 (in speed of light units) obtained from the electron experiments. We emphasize that this estimate based on the planetary motions is subject to much question. The principal objection is the lack or correlation of the eccentricity with the angle of inclination, see the following figure.



Further analysis of the effect on eccentricity of orbit inclination might provide improved prediction of the absolute velocity of the solar system, and thus, identify the absolute rest frame.

Reference

1. Brown, Joseph M., *The Grand Unified Theory of Physics*, Chapter 3. ISBN: 0-9712944-6-1, Basic Research Press, Starkville, MS 39759.
2. French, A.P., Page 23, *Special Relativity*, W.W. Norton, Inc., New York, 1968.
3. Chaisson, Eric and McMillan, Steve, *Astronomy Today*. Page 39, ISBN: 0-13-080199-3, Prentice-Hall, Inc. Upper Saddle River, NJ 07458, 1999.