

The Endless Debate about the Michelson and Morley's Tests

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Abstract

We will see that the results from Michelson and Morley's tests can be explained by the Galilean transform, without the use of time dilation. This demands an ether. If this ether has a radial motion in relation to Earth we can explain:

- gravity,
- gravity anomalies during solar eclipses,
- cosmological red shift, without Big Bang and
- the Pioneer anomaly.

Background

The tests made by Michelson, together with Morley (MMX), have had an important role in the development of the theory of special relativity (SRT). These experiments have been discussed frequently ever since they were presented in 1881. The debate still goes on, and therefore, according to common sense: something must be wrong.

MMX; longitudinal arm

Michelson analyzed the tests in the frame of the equipment, by assuming an ether wind, v , to be blowing in relation to this frame. When light is moving in the same direction as the ether wind the time for propagation between mirrors is *decreased* in proportion to $(1+\beta)^{-1}$ with $\beta=v/c$. In opposite direction of light motion, the propagation time is instead *increased* in proportion to $(1\beta)^{-1}$. By taking the sum of these 2 effects we find the round trip time to change in proportion to $(1\beta^2)^{-1}$. This implies that the 2-way speed of light is $c(1\beta^2)$.

The atoms in a crystal are controlling their separations by means of the effects that they produce on the ether. So, atoms are in an ether-based communication, by means of the disturbances they produce on the ether. This flow of information between *atoms* is affected by the ether wind in the same way as we have earlier seen regarding information flow between mirrors. The difference between these 2 cases is only regarding *how* the effects are combined.

Between mirrors the effects are *sequential* in time. So, the effects are added. Between atoms the effects are *simultaneous*. So, we take the average value of the 2 effects. However, this means the same as the sum divided by 2. Therefore, we find that the contraction of matter is equal to the reduction of 2-way light speed, namely $1\beta^2$. This contraction is 2 times the Lorentz contraction. So, we can conclude that the expected effect is **real but compensated**. We can therefore not observe the effect in the longitudinal arm.

The same effect as in the longitudinal arm, equal to 2 times the Lorentz contraction, also exists in the definition of the unit of length.

MMX; transverse arm

The *real* motion of light is a vector sum, $\mathbf{c}+\mathbf{v}$, representing beam motion. However, we also need another concept for *apparent* motion to represent the ray, for defining wave fronts inside the beam. Apparent motion is defined by the normal to the wave fronts *without* regarding the ether wind blowing inside the wave fronts. Since mirrors are transparent to the ether wind, we must use the apparent direction in relation to mirrors. This direction, or the ray concept, is also relevant when we design lenses for cameras. This follows from the fact that boundary conditions, implied by mirrors, have relevance for the moving and oscillating process, \mathbf{c} , but not for the local and constant ether property, \mathbf{v} . Therefore, in the law of reflection in a mirror, we must use \mathbf{c} , and not $\mathbf{c}+\mathbf{v}$. In relation to the MMX equipment this means that when the system is aligned the reflected light has wave fronts parallel to the distant mirror. This fact is *not* changed when the equipment is rotated. Therefore, \mathbf{c} is constant in equipment frame and only \mathbf{v} is changing. This means that we get **no effect** in the transverse arm of MMX. We can therefore conclude that we have **no observable** effect in the MMX equipment.

Potier made an important error in 1882, by stating that light in the transverse arm in MMX must take a longer way, due to the ether wind. He did not understand an important property of the MMX equipment, namely the fact that it does not matter *where* the returning light hits the equipment. Important is only *when* light hits the equipment. In the normal use of the MMX equipment the sizes of fringes are many times larger than the small shift caused by an ether wind of about 10^6 times, c or about 0.02 mm for a 10 m arm length. Potier seems to be influenced by a particle-based thinking. He thereby may have started the wave or particle paradox (not complementarity). In this article we only use the wave model for light, without photons. Potier probably assumed a 100 times too large ether wind, by assuming Earth translation instead of rotation to cause the effect from ether wind.

MMX; results

We have found a real and compensated effect in the longitudinal arm and no effect in the transverse arm. Therefore, we can explain the zero result in MMX with the Galilean transform without the use of time dilation. This means that we need a new explanation to the behavior of atomic clocks.

MMX has not contributed empirically. However, wrong interpretations have influenced theoretical physics in the wrong way.

Atomic clocks

An ether wind blowing inside the plane of orbits of bound electrons affects the electron behavior. The electrons are accelerated and decelerated during each orbit. This produces a second order effect on the orbiting frequency. The clock frequency becomes $f=f_o.(1k.\beta^2)$. By assuming $k=1$ we can derive an effect. We find this effect equal to the effect predicted by SRT after correction by a factor of $1/2$.

Since the satellites do not have stability in relation to the direction of motion, we find that the ether wind due to motion is not always inside the orbiting plane of the electron. So, we must do a correction. Therefore, we take the average value of a squared cosine function and find the value $1/2$. The ether winds used are: 7.91 km/s near Earth and 3.87 km/s in a GPS satellite. After this correction we get agreement to SRT.

In the same way we can describe the effect predicted by GRT, if we assume a radial ether wind of the same magnitude as the tangential ether wind, earlier used. Since we assume the clocks to be oriented transverse to radius of satellite orbits, we do not need the earlier correction with $1/2$. However, this model is in agreement to GRT only for light moving in radial direction to Earth. The ether model described here explains gravity. GRT is only a description of gravity, without a cause.

We can conclude that only *one* model, based on the ether wind, can describe the *combined* effects of SRT and GRT.

The ether wind

The radial ether wind we have described in relation to Earth must also exist in relation to the Sun. So, we get for the Sun:

437 km/s near surface, 29.8 km/s at 1 AU (astronomical units) and 6.7 km/s at 20 AU.

The radial ether wind near the Sun causes a red shift of about 0.15 %. This effect is perhaps detected. The same effect on other celestial bodies can perhaps explain the cosmological red shift, without the use of the Big Bang model.

The radial ether wind described here can be united with the 300 years old model described by Fatio and Le Sage. The radial ether wind can also be united with observations on tidal water and gravity anomalies during solar eclipses.

Pioneer anomaly

A radial ether wind of 6.7 km/s at 20 AU changes 2-way light speed as $0.5 \cdot 10^9$ times c . Which is 15 cm/s. So, *increasing* 2-way light speed can look like a *decrease* in space station motion. Therefore, Pioneer anomaly can be a measurement error caused by changes in 2-way speed of light.

The global positioning system

The high precision in the GPS system can be explained by a so-called entrained ether. This means an ether that is translated, but not rotated, by our planet. However, we cannot assume our planet to entrain the ether in all Universe. Instead, this problem can be solved by a radial ether wind, that approaches zero speed far away from our planet. Such an ether wind can also be united with the high precision in the GPS system. We can see this by regarding the fact that GPS transmitters and receivers are localized on 2 concentric spheres. This symmetry is all that is needed in the GPS system. This kind of symmetry is of interest also by the fact that gravity can be explained.

The so-called entrained ether is also an *entraining* ether, since this ether is moving a free-falling body in such a way that gravity from *distant* bodies add up to zero by the principle of equivalence. Small deviations from this rule are observed in gravity from Sun and Moon. These anomalies are explained by the fact that these 2 bodies are very near our planet. This means that the mass point approximation is not really valid. These effects are observed in tidal water and in gravity anomalies during solar eclipses. The remaining gravity is just the gravity that is produced by our own planet.

MMX; not needed?

The only way to find a numerical value on the speed of light, c , seems to be by 2-way measurements. However, this fact does not exclude the possibility that 1-way measurements can detect *changes* in light speed due to the ether wind. Dr C C Su has suggested a scaled down version of the method by de Witte from microwave to laser wavelength. 2 HeNe lasers are connected by an optical fiber with the length of a few meters. The signals are compared in an interferometer and phase is registered. The equipment is rotated with constant speed. We get a linear function of time, due to a very small frequency difference. We also get a cosine function of time, due to rotation. The magnitude of this component can reveal horizontal or vertical ether winds. However, demands on lasers are high?

Fortunately, there is a much easier method that can discriminate between GRT theory and radial ether wind. We can use an atomic clock and change its orientation from horizontal to vertical direction. The theory presented here predicts that clock frequency will increase by $60 \mu\text{s}/\text{day}$. The reason to this fact is that radial ether wind will become orthogonal to electron orbits. So, the effect of the ether wind will disappear. According to GRT nothing will happen.

The Sagnac effect

The Sagnac effect can be described by integrating motion along a line. If the line is closed a mathematical rule states that we can have the same result if we integrate a rotation over the enclosed area. It is however important to observe that it is only the first description that has relevance in physics. We also can conclude that the line in question does *not* have to be closed. A closed line was demanded by the experimental method and not by physics. So, we have now ended up with the suggestion that was done by Dr C C Su, as described earlier.

Result

The difference between the two concepts beam and ray is only about 10^6 . A normally ignorable difference. However, important in the explanation of the MMX tests.

We have seen a possible solution to the mysteries around MMX and dilation of time. If we can confirm these ideas, we can have a theory without time dilation and based on the Galilean transform. Gravity can also be explained. All that is needed to do this confirmation is an atomic clock.

A positive result would end a very long debate.

Remark

Enormous amounts of money are spent on the detection of gravity waves with LIGO, to perhaps find a *possibility* for these waves. However, these tests can never prove *necessity*. To do that we have to *disprove* something, perhaps by tilting a clock 90 degrees.