Gravity and Light Speed

Testing a Gravitationally dragged Aether on Stellar Aberration and Sagnac Effect

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Abstract

In history it was claimed that dragged aether theories do not comply with stellar aberration nor with many of the experiments, particularly the Sagnac interferometer [4]. This paper will describe a new concept for explaining and properly calculating stellar aberration that allows for aberration within fully dragged aether. Apart of this it will be shown that all applicable experiments comply with a gravitationally dragged aether, taking into account the new concept for aberration and disclosing a series of fateful and fundamental misinterpretations. Invariance of light speed, time dilation and Lorentz contraction [2] will become obsolete.

Content

1. Introduction

The historic dispute about aether theories was circling around the experimental evidence, most importantly the Sagnac and Michelson/Gale/Pearson experiment versus the Michelson/Morley experiment. The Sagnac effect [4] as well as the Michelson/Gale/Pearson [5] experiment were esteemed to be disproving dragged aether but being in accordance with static aether, the Michelson/Morley [3] experiment attested the opposite. A similar picture was given by the problem of stellar and terrestrial aberration. Generally spoken, static aether concepts [2] were explaining stellar aberration but failed on terrestrial aberration, dragged aether concepts [6] [7] vice versa. Special Relativity [1] solved all the contradictions by postulating invariance of light speed, but at the expense of logical reason, and understanding of the nature of light was never brought to an end, when Special Relativity [1] prematurely terminated any further investigation on this topic. This paper is aiming to positively test a gravitationally dragged aether - whereby light is fully dragged by gravity - on aberration and on most of the applicable experiments. In the gravitationally dragged aether, the following framework is given:

- Source's velocity relative to gravitational field does not affect speed of light propagation
- Observer's velocity relative to gravitational field adds up to speed of light propagation

2. Terrestrial and stellar aberration -novel concept-

Stellar aberration is the most crucial aspect on dragged aether theories, therefor this will be our first step to be clarified.

The classic explanation of stellar aberration [10] was, that similar to a falling rain drop, the telescope would have to be twisted in order to follow the light ray since the telescope itself was moving sideways by earth rotation or earth orbiting respectively. If the aether on the other side was fully dragged by earth, no such aberration could occur at all, because the light ray would always follow earth's movement. On the other hand it was found difficult to explain aberration at all assuming a pure wave nature of light. Additionally the explanation was tacitly based on the idea that light is always coming as a directed beam rather than an undirected series of concentric spheres.

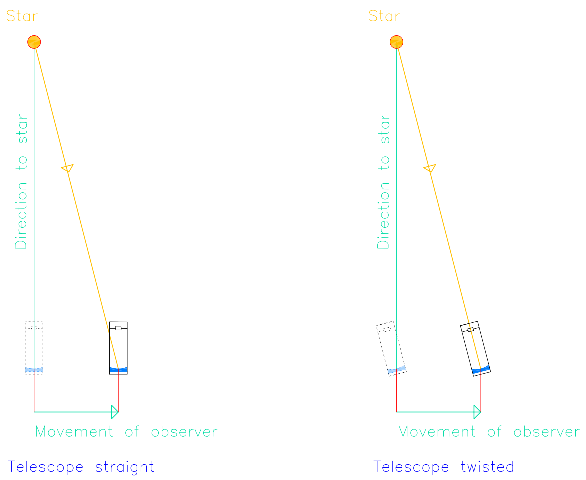


Fig. 1: Stellar aberration by classic explanation

The aberration angle was then calculated upon the distance that the telescope would move whilst the light ray is traveling from the telescope's lens to its mirror. The great misunderstanding is, that stellar aberration in truth does not have anything to do with the telescope having to follow the light path within the short distance inside the telescope nor the still short distance within earth's atmosphere nor even the short distance within the gravitational influence of earth or even the solar system, but the whole distance that light travels from its source, i.e. the distance from stars being billions of lightyears away.

The following images show, how a spherical wave of light will be emitted by its source arbitrarily far away, whereby the observer is travelling by any speed, and the task will be to find the point, where the sphere (not the beam) meets the observer. From above we also must realize that the true position of the star is unknown and we have to start from a hypothetical middling angle of all observed angles, though this middling angle would show a position of the star that is never visible, because observation angles are always circling and ellipsing around this point. We will see later, that this interpretation makes up an important difference. For convenience the following model values were chosen:

- Light speed c: 1,5 km/s
- Earth movement speed v: 0,6 km/s (on a range of 0,4 to 0,6 km/s) against static aether on orbital path
- Distance of earth path to light source: 1,5 km
- Middling angle of observation at 0,5 km/s towards source: 60° degree (the angle between the true position of star and observer at the time of observation, 46,10° in this case, is actually unknown)

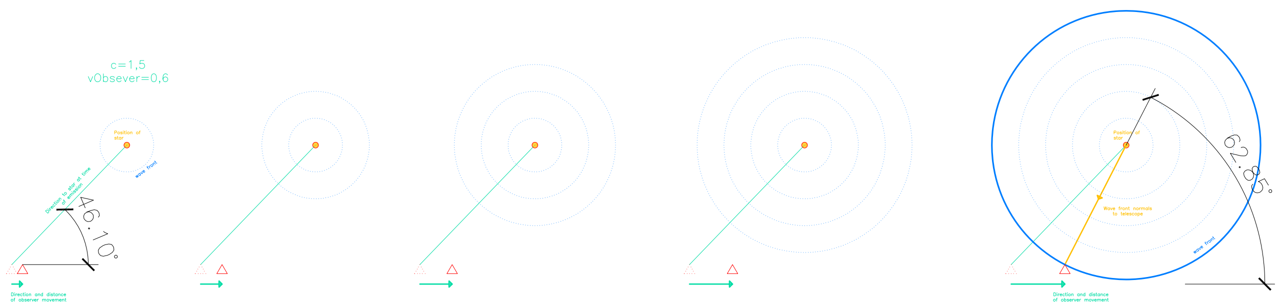


Fig. 2: Light propagation from source with 0,3 seconds steps, earth's speed 0,6 km/s

It can be seen, that the observer is moving sidewise during the complete period that the light wave front travels from the source to meet the observer. It is important to mention that at this instant the light wave front hits the observer as a wave normal, and all subsequent wave fronts do as well. Only now we have established the angle, under which the light ray meets the observer, and we add a telescope for better understanding:

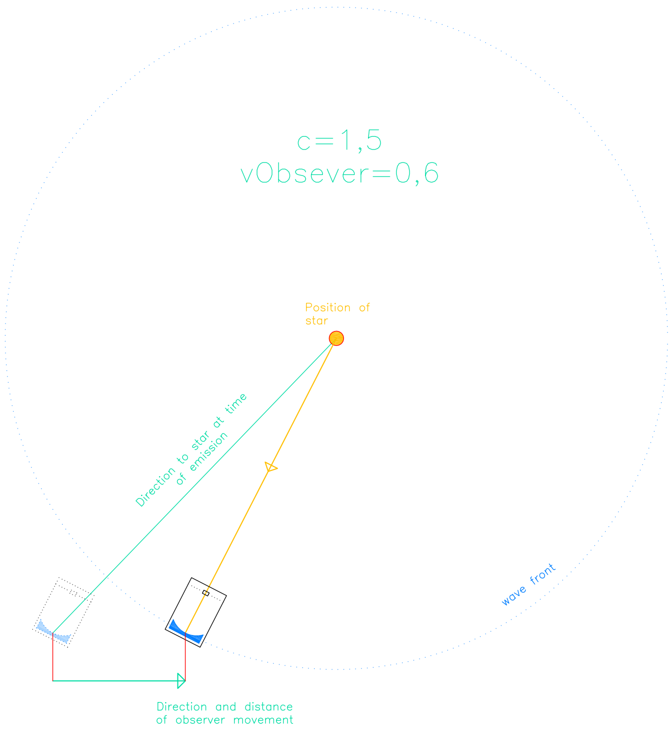


Fig. 3: Telescope directed to source.

In this model the observation angle will amount to 62,8542°, as shown per calculation later. All distances, angles and relations of speeds are on scale at the model, verified by means of cad.

Now the same procedure with 0,4 km/s earth's movement speed:

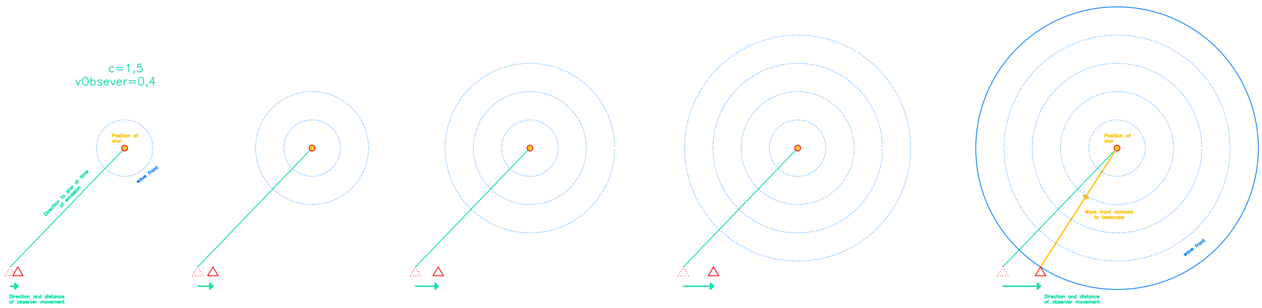


Fig. 4: Light propagation from source with 0,3 seconds steps, earth's speed 0,4 km/s

Of course, as before, again the meeting point represents a series of wave normals. But as can be seen by adding the telescope, the observation angle this time is 57,1806°. Now the two images of both earth's movement speeds will be overlayed:

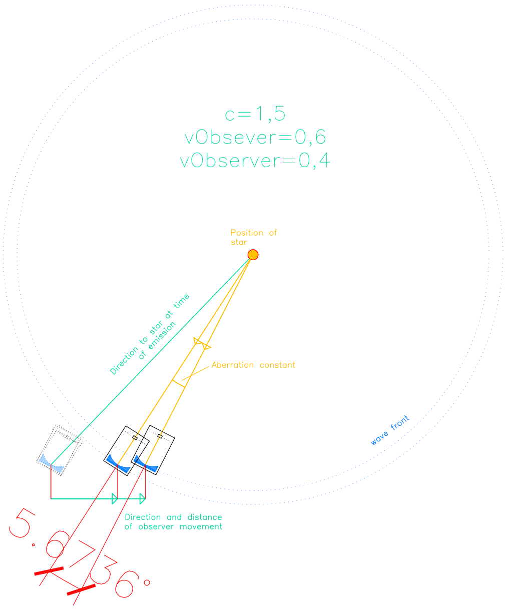


Fig. 5: Overlay both situations 0,6 and 0,4 km/s

The angle between the two light rays now, in this case 5,6736° is deemed to be the common aberration angle. It is most important that this angle is deriving from the difference of the total earth's speed against the static aether e.g. CMB (Cosmic Microwave Background), but not necessarily the earth's speed on the orbit (being 0,2 km/s in this model).

From the overlay it can be seen also, that both rays do not meet at the same time, since wave fronts do not have equal diameters.

Now the task will be done to show what happens if the middling observation angle is 90°, i.e. the object's / source's position is on the zenith. Only the final overlay is being shown, again the ray turns out to be defined by consecutive wave front normals:

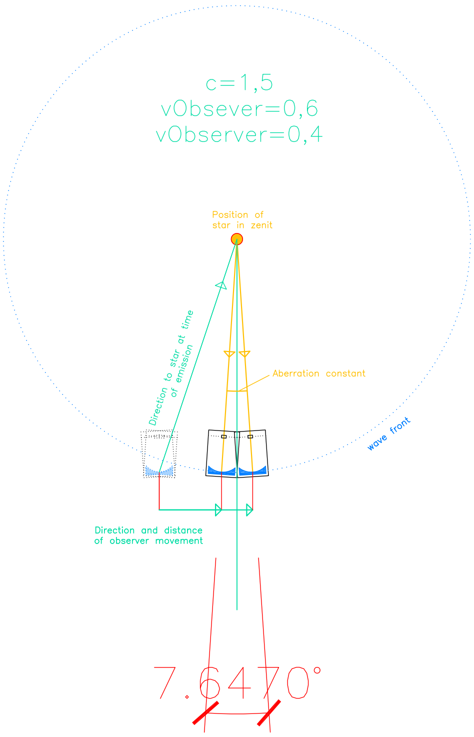


Fig. 6: Overlay 0,6 and 0,4 km/s but on 90° middling observation angle

Obviously even with the unrealistic relation of values for c and v, the diameters of both wave fronts are very close together and no more visible on this scale image.

Now it might be also interesting, how the concept behaves when the light source is moving:

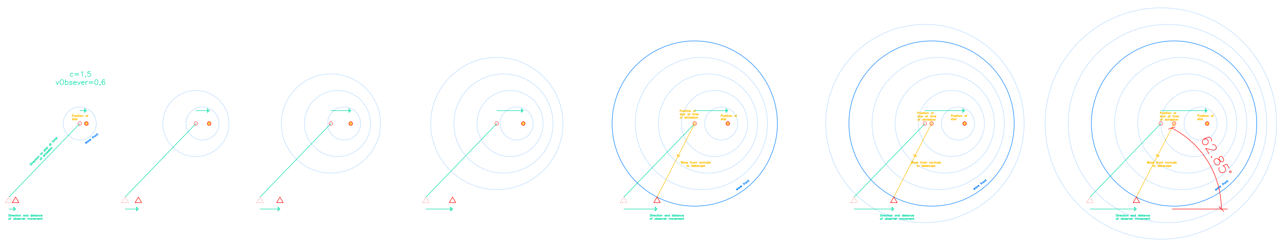


Fig. 7: Light propagation from source speed 0,6 km/s with 0,3 seconds steps, earth's speed 0,6 km/s

It becomes clear that the aberration produces the same angle as if the source was not moving. The observer still receives only wave normals, but in this case from ever different source's position. The Doppler effect [11] behaves strictly in the classical way. Movement of source is irrelevant for aberration, and behavior of binary stars is fully plausible.

The determination of the aberration angle is done geometrically upon the aforementioned scale model. First the angle between observer at time of emission and the source will be calculated:

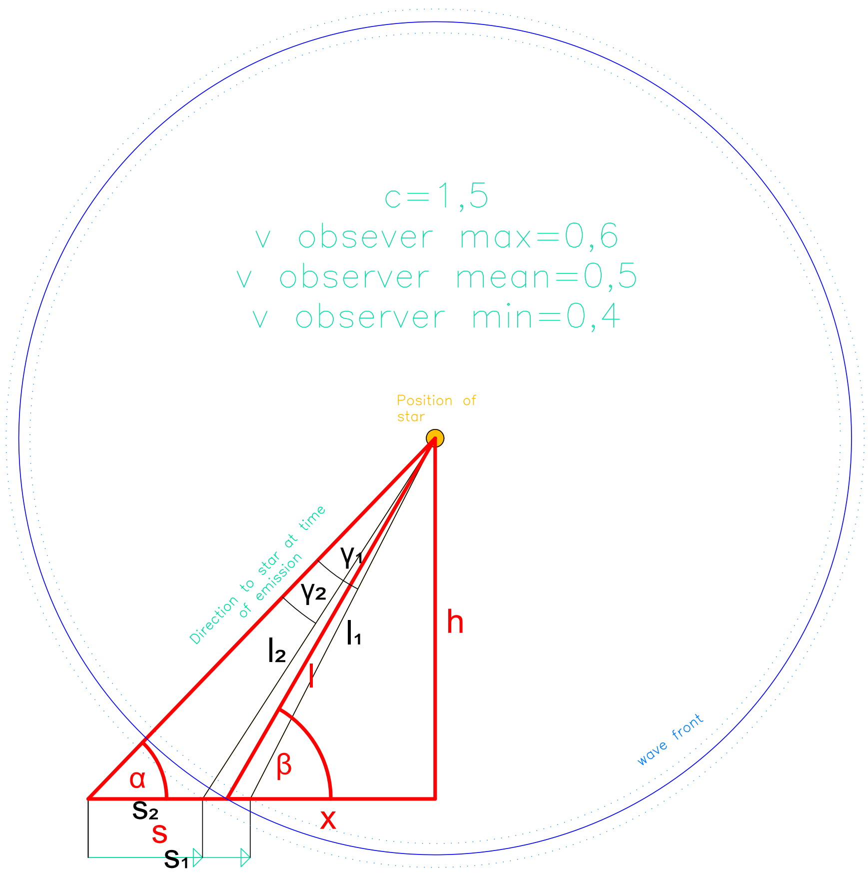


Fig. 8: Geometric model of 60° observation angle at mean speed

(1) $\tan(\alpha) = \frac{h}{s+x}$

(2) $\tan(\beta) = \frac{h}{x} \Rightarrow h = \tan(\beta) \bullet x$

(3) $\cos(\beta) = \frac{x}{l} \Rightarrow x = \cos(\beta) \bullet c$

Now insert (3) in (2)

(4) $h = \tan(\beta) \bullet \cos(\beta) \bullet c = \sin(\beta) \bullet c$

Now insert (4) and (3) in one:

$$\tan(\alpha) = \frac{\tan(\beta)\bullet\cos(\beta)\bullet c}{s+\cos(\beta)\bullet c} \Rightarrow \tan(\alpha) = \frac{\sin(\beta)\bullet l}{s+\cos(\beta)\bullet l} \Rightarrow \tan(\alpha) = \frac{\sin(\beta)}{\frac{s}{l}+\cos(\beta)} \Rightarrow \boxed{\tan(\alpha) = \frac{\sin(\beta)}{\frac{v}{c}+\cos(\beta)}}$$

Now it is important to acknowledge that the angle of aberration at maximum speed against the mean speed is different form the angle at minimum speed against mean speed, i.e. the full aberration angle is not simply double of one of the angles:

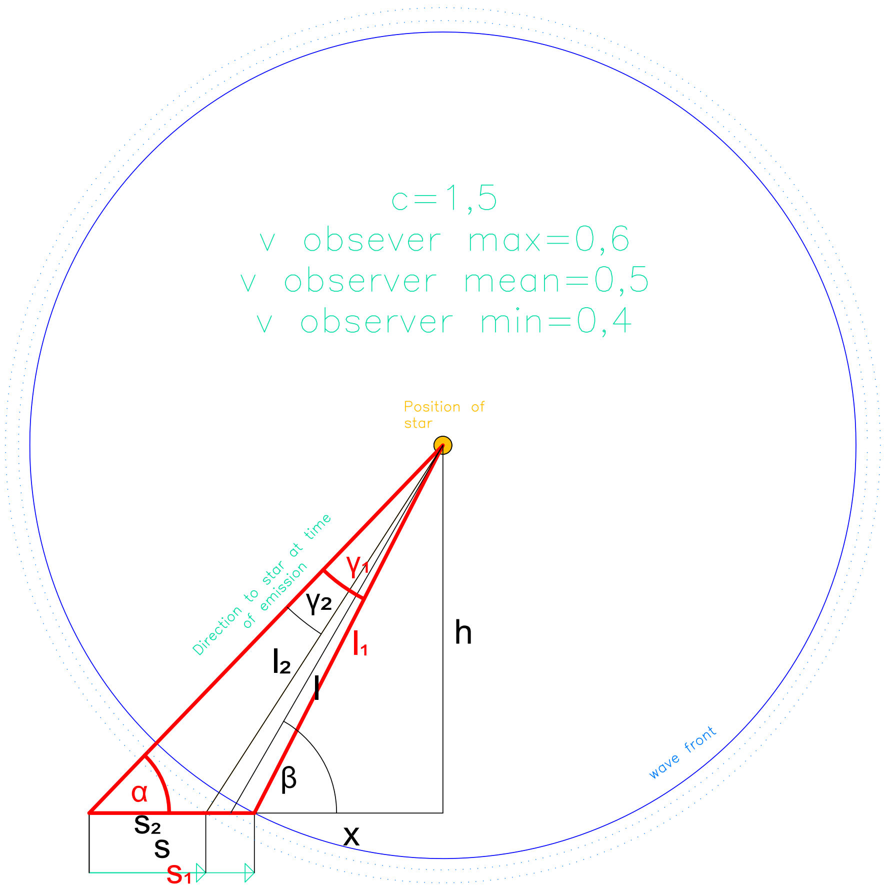


Fig. 9: Geometric model of 60° observation angle at maximum speed

(1) $\sin(\gamma_1) = \frac{s_1}{l_1} \cdot \sin(\alpha) = \frac{v_1}{c} \cdot \sin(\alpha)$

(2) $\tan(\alpha) = \frac{\sin(\beta)}{v/c + \cos(\beta)} \Rightarrow \alpha = \arctan\left(\frac{\sin(\beta)}{v/c + \cos(\beta)}\right)$ (from above)

Now insert (2) in (1):

arbitrary observation angle β at speed v1

$$\sin(\gamma_1) = \frac{v_1}{c} \cdot \sin\left(\arctan\left(\frac{\sin(\beta)}{v/c + \cos(\beta)}\right)\right)$$

arbitrary observation angle β at speed v2

$$\sin(\gamma_2) = \frac{v_2}{c} \cdot \sin\left(\arctan\left(\frac{\sin(\beta)}{v/c + \cos(\beta)}\right)\right)$$

For 90° observation angle sin(β)=1 und cos(β)=0

$$\sin(\gamma_1) = \frac{v_1}{c} \cdot \sin\left(\arctan\left(\frac{c}{v}\right)\right)$$

$$\sin(\gamma_1) = \frac{v_1}{c} \cdot \frac{\frac{c}{v}}{\sqrt{1 + c^2/v^2}} = \frac{v_1}{c} \cdot \frac{\frac{c}{v}}{\sqrt{1 + c^2/v^2}}$$

90° observation angle at speed v_1

$$\sin(\gamma_1) = \frac{v_1}{v} \cdot \frac{1}{\sqrt{1 + c^2/v^2}}$$

90° observation angle at speed v_2

$$\sin(\gamma_2) = \frac{v_2}{v} \cdot \frac{1}{\sqrt{1 + c^2/v^2}}$$

And the full aberration angle is the difference of the above angles.

On the basis of above formulae it is convenient to produce an excel sheet to play with different speeds, distances and angles. The following values were set:

Light speed c: 299.792 km/s

Earth movement speed v: 368 km/s +/- 29,78 km/s on orbital path

Distance of earth path to light source: 20 million lightyears

Middling angle of observation at 368 km/s towards source: 90° degree

	higher speed km/s, Grad	mean speed km/s, Grad	lower speed km/s, Grad	
c	299.792,00000	299.792,00000	299.792,00000	
v Earth 368 km/s (+/- 29,78 km/s on orbit)	397,78000	368,0000000000000	338,22000	
Incident angle light ray degree	90,00569	90,00000	89,99431	0,011383014335 Difference low/high values is aberration angle x 2
Radian	1,57090	1,57080	1,57070	0,005691507167320 aberration angle
				20,4894258024 Aberration angle arcsec
Distance earth path to source km	1,8908481E+20	1,8908481E+20	1,8908481E+20	
lightyears		20.000.000,00000		
angle difference observer-star to incident angle	0,07602305829156	0,07033155077724	0,06464004395692	0,0113830143346
Angle observer to star at emission degree	89,92967	89,92967	89,92967	
Radian	1,56957	1,56957	1,56957	
pathlength earth	2,508878E+17	2,321050E+17	2,133221E+17	3,756568E+16 Difference low/high values
pathlength light	1,890848E+20	1,890848E+20	1,890848E+20	3,080192E+06 Difference low/high values
part				1,629000E-14

Fig. 10: Calculation sheet with realistic values

The resulting aberration angle is 20,4894”, properly matching the observations. Interestingly there is still a time lack between both wave front spheres of approx. one part of a trillion at 90°, amounting to a distance deviation of approx. 35.000 km in this case that could be responsible for observed irregularities of planet’s orbits. **The deviation is progressively increasing on flat observation angles**.

Now for checkup the distance is set to 1.000 km and again 90°, resulting in again 20,4894”

	higher speed km/s, Grad	mean speed km/s, Grad	lower speed km/s, Grad	
c	299.792,00000	299.792,00000	299.792,00000	
v Earth 368 km/s (+/- 29,78 km/s on orbit)	397,78000	368,0000000000000	338,22000	
Incident angle light ray degree	90,00569	90,00000	89,99431	0,011383014335 Difference low/high values is aberration angle x 2
Radian	1,57090	1,57080	1,57070	0,005691507167320 aberration angle
				20,4894258024 Aberration angle arcsec
Distance earth path to source km	1,0000000E+03	1,0000000E+03	1,0000000E+03	
lightyears		0,00000		
angle difference observer-star to incident angle	0,07602305829156	0,07033155077724	0,06464004395692	0,0113830143346
Angle observer to star at emission degree	89,92967	89,92967	89,92967	
Radian	1,56957	1,56957	1,56957	
pathlength earth	1,32685329149042	1,22751774563691	1,12818221189572	0,198671079594692000 Difference low/high values
pathlength light	1.000,00000493362000	999,99999999995000	1.000,00000493360000	0,0000000000162572178 Difference low/high values
part				0,0000000000000162572

Fig. 11: Calculation sheet with realistic values but unrealistic short distance

Obviously distance is irrelevant for the aberration angle, as it should be.

The fact that it has been herewith proved that the aberration is resulting from the whole distance between source and observer alone, makes it almost irrelevant if the light ray is dragged in the short part in close distance of source or observer. Since the influencing distance is vanishingly short against the distance between observer and source, the aberration must have already happened on its way. Also experiments with water filled telescopes (by George Bidell Airy, [12]) or the like therefore cannot but have a null result.

The same applies for the source. As for any wave, movement of source is irrelevant for the wave front that was emitted at one time. If emitted waves are dragged by gravity of the source star, the influence would be again vanishingly because of the comparably very short distance that light might be dragged by the gravity of source. The reverse argument though is, that light dragged by gravity still causes stellar aberration as usual and therefore

the gravitationally dragged aether is fully suitable to explain stellar aberration.

As well the lack of any observable terrestrial aberration is explainable. It was shown by the author that due to reflection on moving mirrors and refraction on moving lenses terrestrial aberration is prevailingly cancelled out [8]. With the involved speeds (light speed and solely rotational speed of earth), the terrestrial aberration angle to be expected would have to be, if existing at all, below 10^{-5} arcseconds, according to the formulae being obtained in the afore- mentioned paper [8]. Therefore

The gravitationally dragged aether is fully suitable to explain terrestrial aberration.

	higher speed	mean speed	lower speed		
	km/s, Grad	km/s, Grad	km/s, Grad		
c	299.792,00000	299.792,00000	299.792,00000		
v Earth 368 km/s (+/- 29,78 km/s on orbit)	397,78000	368,0000000000000	338,22000		
Incident angle light ray degree	90,00569	90,00000	89,99431	0,011383014335	Difference low/high values is aberration angle x 2
Radian	1,57090	1,57080	1,57070	0,005691507167320	aberration angle
				20,4894258024	**Aberration angle arcsec**
Distance earth path to source km	1,0000000E+03	1,0000000E+03	1,0000000E+03		
lightyears		0,00000			
angle difference observer-star to incident angle	0,07602305829156	0,07033155077724	0,06464004395692	0,0113830143346	
Angle observer to star at emission degree	89,92967	89,92967	89,92967		
Radian	1,56957	1,56957	1,56957		
pathlength earth	1,32685329149042	1,22751774563691	1,12818221189572	0,198671079594692000	Difference low/high values
pathlength light	1.000,00000493362000	999,99999999995000	1.000,00000493360000	0,000000000016257217 8	Difference low/high values
part				0,0000000000000162572	

3. Tests on gravitationally dragged aether

3.1. The Sagnac effect, Michelson/Gale/Pearson Experiment

First we will test the Sagnac experiment on both aether theories, starting with static aether. To paint a sharp picture, we assume that only the velocity v_{CMB} against the CMB (cosmic microwave background) and the rotational speed v_R of the disc around its own axix are relevant. Orbital velocities around sun and galaxy just add up to v_{CMB} the one or the other way. We will see later why the rotational speed, though being the smallest, embodies some special features and therefore must be taken into consideration. In order to fully understand the effects by the Sagnac effect in comparison with the Michelson Morley experiment we will simplify the setup:

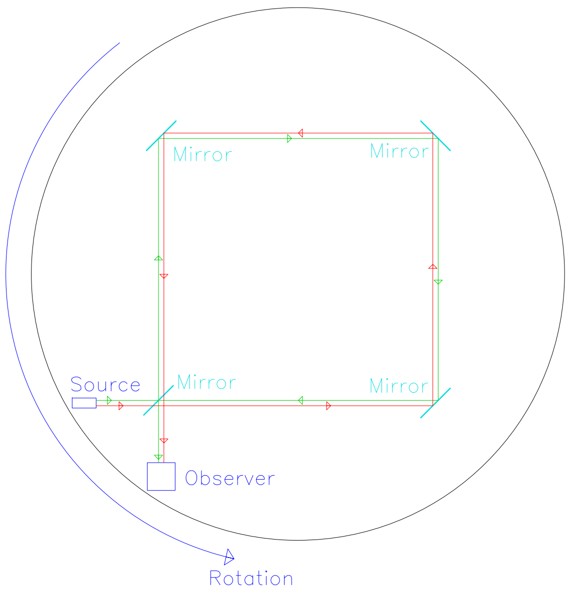


Fig. 12: Schematic setup of the Sagnac experiment

Two lightrays in reverse motion are forced into a complete roundtrip, and propagation time of both rays will be compared.

Rather than considering the full circle we will go a new approach. In analogy to the Michelson Morley experiment we only look at the part of the rays that will be affected by the movements against v_{CMB} and v_R , i.e. the horizontal, and will investigate on all effects of first (v/c) and second order (v^2/c^2). We assume all speeds to be in one line:

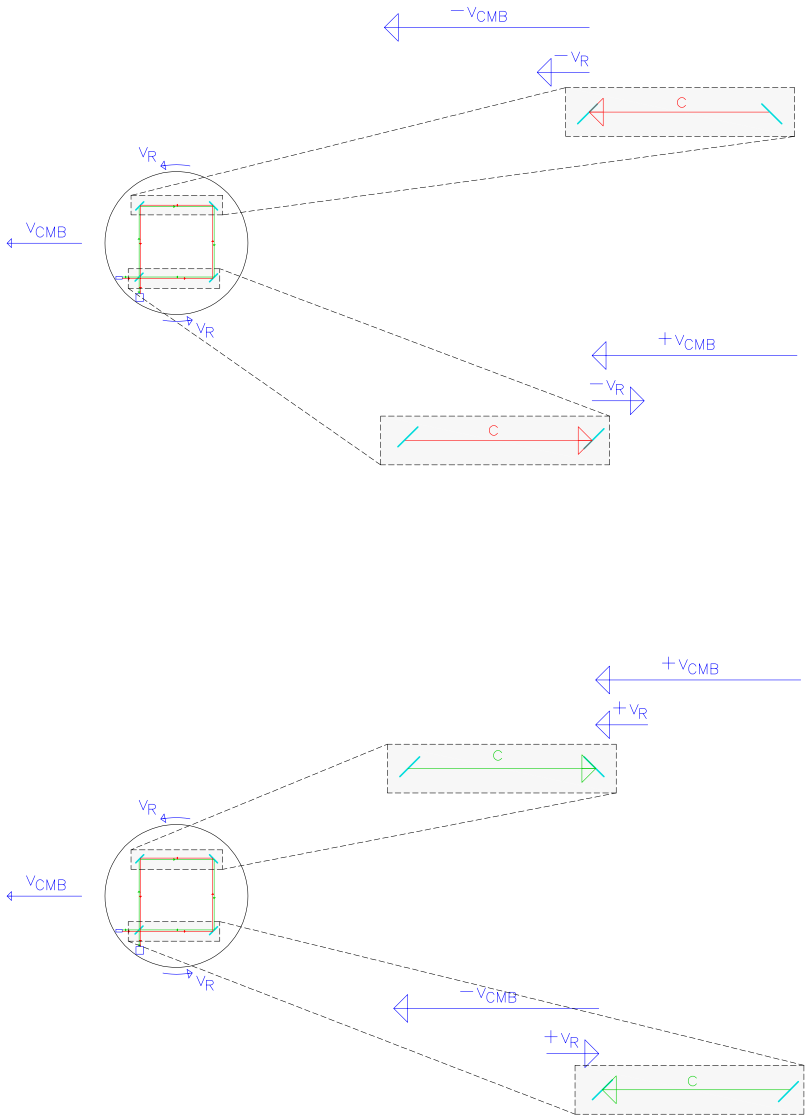


Fig. 13: Velocities on Sagnac experiment in static aether

- v_R is the rotational velocity of disc on disc's rim
- v_{CMB} is the total velocity of earth against CMB

For the red ray, we obtain:

$$t_1 = \frac{l}{(c - v_R - v_{CMB})} + \frac{l}{(c - v_R + v_{CMB})} = \frac{l(c - v_R + v_{CMB})}{(c - v_R - v_{CMB})(c - v_R + v_{CMB})} + \frac{l(c - v_R - v_{CMB})}{(c - v_R + v_{CMB})(c - v_R - v_{CMB})} = \frac{2l(c - v_R)}{c^2 - 2v_R c + v_R{}^2 - v_{CMB}{}^2}$$

At this point we can see that **the first order effect of v_{CMB} is cancelled out.** The only reason for this is the fact, that within one roundtrip, v_{CMB} acts both with and against the lightray, but not so v_R. Simplifying the algebra, we obtain:

$$t_1 = 2l\frac{(c-v_R)}{(c-v_R)^2 - v_{CMB}^{\;2}} \qquad (1)$$

For the counterclockwise green ray, we obtain:

$$t_2 = \frac{l}{(c+v_R+v_{CMB})} + \frac{l}{(c+v_R-v_{CMB})} = \frac{l(c+v_R-v_{CMB})}{(c+v_R+v_{CMB})(c+v_R-v_{CMB})} + \frac{l(c+v_R+v_{CMB})}{(c+v_R-v_{CMB})(c+v_R+v_{CMB})} = \frac{2l(c+v_R)}{c^2+2v_Rc+v_R^{\;2}-v_{CMB}^{\;2}}$$

$$t_2 = 2l\frac{(c+v_R)}{(c+v_R)^2 - v_{CMB}^{\;2}} \qquad (2)$$

And finally for the difference of both rays (1) - (2):

$$\Delta t = 2l\left(\frac{(c-v_R)}{(c-v_R)^2 - v_{CMB}^{\;2}} - \frac{(c+v_R)}{(c+v_R)^2 - v_{CMB}^{\;2}}\right) \qquad \text{(static aether unapproximated)}$$

It has to be emphasized at this point that there is still a second order effect of v_R and v_{CMB} respectively.

The second order effect of v_{CMB} is very small, so for convenience we can erase v_{CMB}^2:

$$\approx 2l\left(\frac{(c-v_R)}{(c-v_R)^2} - \frac{(c+v_R)}{(c+v_R)^2}\right) = 2l\left(\frac{1}{(c-v_R)} - \frac{1}{(c+v_R)}\right) = 2l\left(\frac{(c+v_R)-(c-v_R)}{(c-v_R)(c+v_R)}\right) = 2l\left(\frac{2v_R}{c^2-v_R^{\;2}}\right)$$

Now we can erase v_R^2:

$$\boxed{\Delta t \approx 4l\frac{v_R}{c^2}} \qquad \text{(static aether approximated)}$$

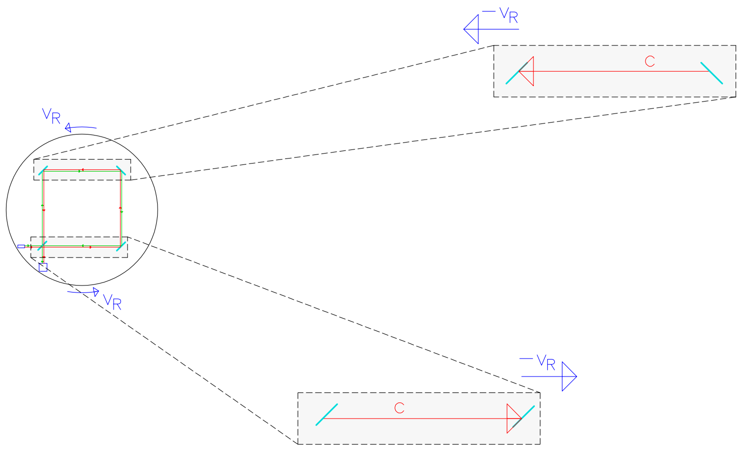
And this looks quite familiar, comparing Sagnac's well known formula:

$$\Delta t = 4 \cdot r \cdot \pi \cdot \frac{v}{c^2}$$

Indeed the Sagnac experiment gave a positive result with the expected difference.

The Sagnac effect's positive result therefore is in accordance with the static aether.

Now we draw the equivalent picture based on the assumption that light is being fully dragged by gravity. v_{CMB} does not count in this consideration:



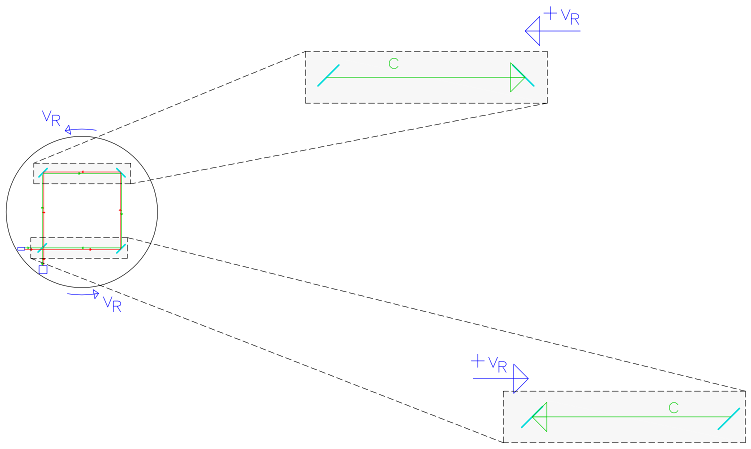


Fig. 14: Velocities on Sagnac experiment in dragged aether

For the green ray, we obtain:

$$t_1 = \frac{l}{(c - v_R)} + \frac{l}{(c - v_R)} = 2l \frac{1}{(c - v_R)}$$

For the red ray, we obtain:

$$t_2 = \frac{l}{(c + v_R)} + \frac{l}{(c + v_R)} = 2l \frac{1}{(c + v_R)}$$

And finally for the difference of both rays:

$$\Delta t = 2l\frac{1}{(c-v_R)} - 2l\frac{1}{(c+v_R)} = 2l\left(\frac{(c+v_R)}{(c-v_R)(c+v_R)} - \frac{(c-v_R)}{(c+v)v_R(c-v_R)}\right) = 2l\frac{(c+v_R)-(c-v_R)}{(c-v_R)(c+v_R)}$$

$$\Delta t = 4l\frac{v_R}{c^2 - {v_R}^2}$$ (dragged aether unapproximated)

Again we can erase v_R^2:

$$\boxed{\Delta t \approx 4l\frac{v_R}{c^2}}$$ (dragged aether approximated)

Being equivalent with the result from static aether.

Contrarily to the above speculation we obtain the same situation as per static aether, but for different reason. Total speed against CMB (v_{CMB}) is not cancelling out, but does not count at all since light is fully dragged by earth's gravity. **But gravity is not dragged along rotation!** Therefore the speed of the observer on the disc's rim is still relevant, i.e the movement speed of the observer relative to the gravitational field.

One might say now that centrifugal force on the rotating disc could become easily stronger than gravity, both light rays would be accelerated and glued towards the disc's rim, and the Sagnac experiment would have to give a null result. We will pinpoint this argument later on the Michelson/Gale/Pearson Experiment, but for now: There is no reason why light should be accelerated by a rotating disc unless having a physical bonding to it, which is not the case. It can be summarized, that according to the gravitationally dragged aether a positive result and identic to the static aether has to be expected, as being obtained by the experiment.

The Sagnac effect's positive result therefore is in accordance with the gravitationally dragged aether.

Finally we have to look at the Michelson/Gale/Pearson experiment:

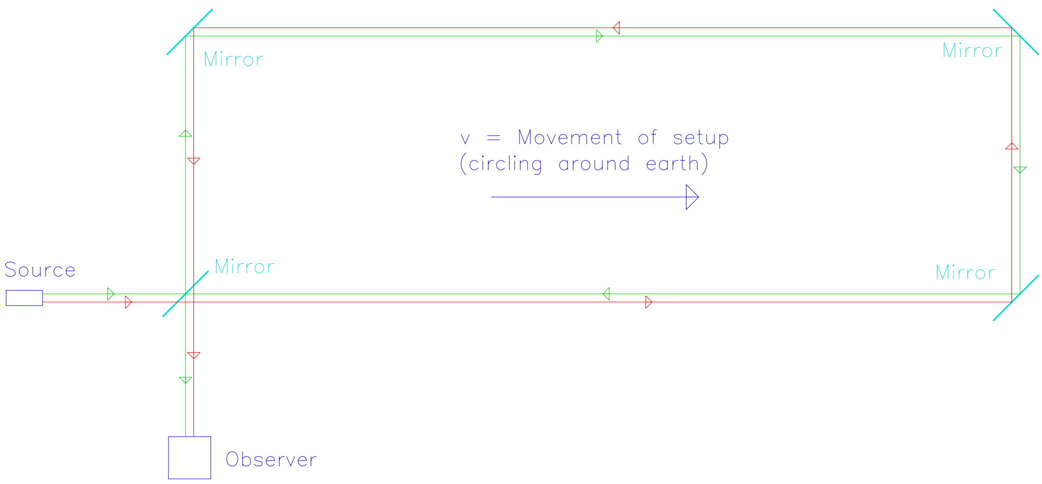


Fig. 15: Schematic setup of the Michelson/Gale/Pearson experiment

The difference to the Sagnac effect is none but the following:

- Size of the setup is in the range of a kilometer
- The rotating disc is earth itself
- The lengths of the horizontally and vertically interferometer arms vary decisively in order to obtain as much of a result as possible.

Nonetheless this setup, taking earth itself as a rotating disc, gives rise to some crucial misinterpretations:

One might say, why of all is the lowest velocity relevant, the earth's rotational speed? And if light is fully dragged by earth, should not no speed at all be relevant? And for both cases, would not actually centrifugal force partly or fully cancel out the gravitational effects? And even further, would then light not have been accelerated to earth's rotational speed already?

At this point it is necessary to put right a couple of fundamental misunderstandings on the whole issue and to do a brief Gedankenexperiment:

If one person is standing on earth, of course he/she will be already accelerated to the earth's rotational speed on surface, indeed we all become born already accelerated. But nevertheless there would be no such acceleration if there was no physical bonding of the body to be accelerated (person) to the rotating body (earth). If someone would be hovering on top of a rotating carousel, he would under no circumstance acquire the carousel's angular speed, though he would still fall down to earth due to gravity! And of course it must be the same with light, travelling in or against earth's rotation, earth would just move away under its feet! And even centrifugal force, being an apparent force, may cancel out gravity only if again a physical bonding is there for centrifugal force to become effective. Gravity obviously does not need such bonding. Therefore - assuming light being fully dragged by gravity - light will be dragged along with earth's movement around the sun, around the galaxy and also the CMB, **but not along earth's rotation!** Insofar the assumption that only the rotational speed remains relevant is plausible.

The Michelson/Gale/Pearson experiment's positive result is in accordance with both static and gravitationally dragged aether.

3.2. The Michelson/Morley Experiment

Differently from Sagnac experiments in this case the light rays were forced into a back and forth route. First we will take a look under static aether conditions.

The setup of this experiment simplified was as follows:

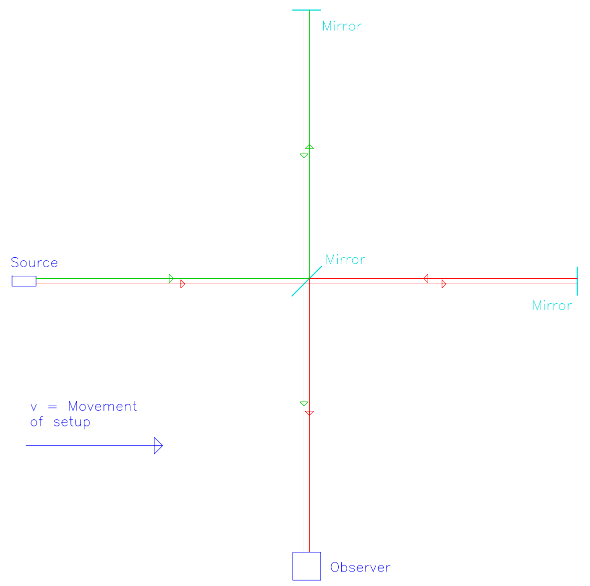


Fig. 16: Schematic setup of the Michelson/Morley experiment

Again we assume that only the velocity v_{CMB} against the CMB (cosmic microwave background) and the rotational speed v_R of the earth are relevant. All movements are in line. Again we will investigate on all effects of first order (v/c) and second order (v^2/c^2). We assume all speeds to be in one line:

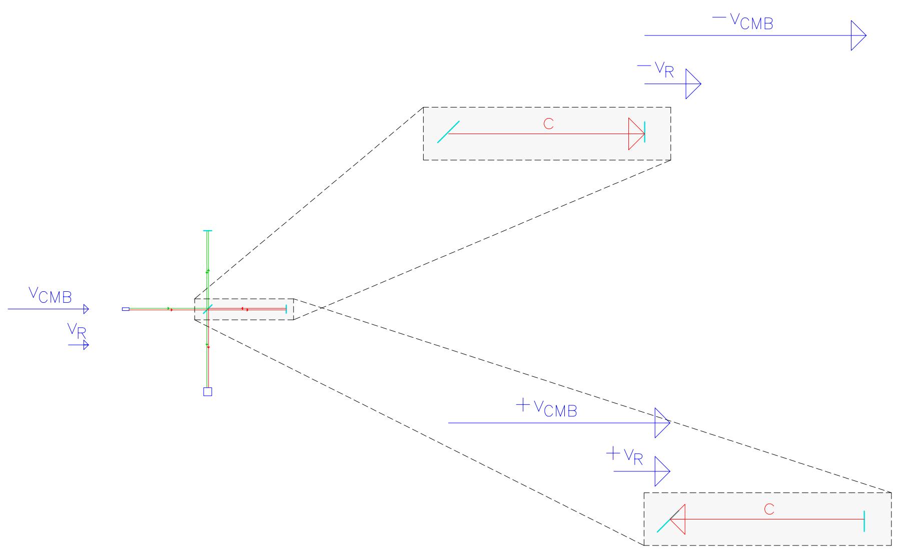


Fig. 17: Velocities on Michelson Morley experiment in static aether

- v_R is the rotational speed of earth
- v_{CMB} is the total velocity of earth against CMB

For the horizontal green ray, we obtain:

$$t_1 = \frac{l}{(c - v_R - v_{CMB})} + \frac{l}{(c + v_R + v_{CMB})} = l \cdot \frac{(c + v_R + v_{CMB}) + (c - v_R - v_{CMB})}{(c - v_R - v_{CMB})(c + v_R + v_{CMB})} = l \cdot \frac{2c}{(c^2 - v_R{}^2 - 2v_R v_{CMB} - v_{CMB}{}^2)}$$

At this point we can see that **the first order effects of v_R and v_{CMB} are cancelled out.**

$$t_1 = 2l \frac{c}{\left(c^2 - (v_R + v_{CMB})^2\right)} \qquad (1)$$

For the vertical red ray, we obtain:

$$t_2 = \frac{2l}{c} \qquad (2)$$

And finally for the difference of both rays (1)-(2):

$$\Delta t = 2l \frac{c}{\left(c^2 - (v_R + v_{CMB})^2\right)} - 2l \frac{1}{c} = 2l \left(\frac{c}{\left(c^2 - (v_R + v_{CMB})^2\right)} - \frac{1}{c} \right) = 2l \left(\frac{c^2 - \left(c^2 - (v_R + v_{CMB})^2\right)}{\left(c^2 - (v_R + v_{CMB})^2\right) c} \right)$$

$$\Delta t = \frac{2l}{c} \cdot \frac{(v_R + v_{CMB})^2}{\left(c^2 - (v_R + v_{CMB})^2\right)}$$ (static aether unapproximated)

Again we delete $v_R{}^2$ and $v_{CMB}{}^2$:

$$\boxed{\Delta t \approx \frac{2l}{c} \cdot \frac{(v_R + v_{CMB})^2}{c^2}}$$ (static aether approximated)

And this looks quite familiar, comparing Michelson's well known formula:

$$\Delta t = \frac{2l}{c} \cdot \frac{v^2}{c^2}$$

Taking 29,78 km/s for v (thus orbital speed of earth), the resulting difference in running length would be $2x10^{-8}$ m, equivalent to 0,04 times a wavelength (assuming 500nm as a wavelength), **hence 0,04 fringes** on the interference screen (all basically according to Michelson). The experiment result was well below this number and thus interpreted favoring the light speed to be invariant from the observer's movement.

It was never quite discussed to the end whether earth's orbital speed, earth's rotational speed, the solar system's speed around the galaxy or the total speed against CMB has to be called upon for calculation. Michelson obviously decided for the first. If Michelson had opted (if he had known of) for the total speed against CMB, the difference to be expected would have been **4 fringes**, and the null result becomes even more distinct.

Therefore the result of the experiment, using v_{CMB} would have to be expected to be **4,013 times a fringe shift**. experimentally obtained null result therefore is evidence that

The Michelson Morley experiment's null result is in contradiction with the static aether.

Now we draw the equivalent picture based on the assumption that light is being fully dragged by gravity. v_{CMB} does not count in this consideration:

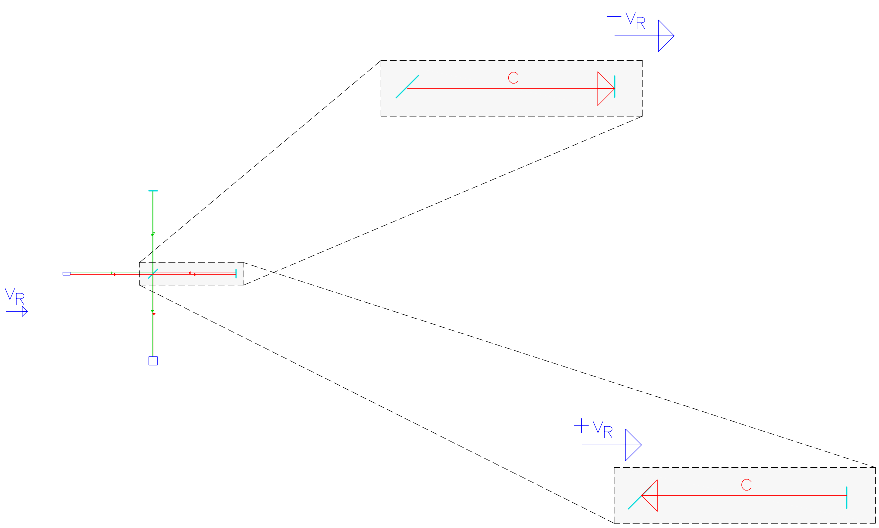


Fig. 18: Velocities on Michelson Morley experiment in dragged aether

For the green ray:

$$t_1 = \frac{l}{(c-v_R)} + \frac{l}{(c+v_R)} = \frac{l\cdot(c+v_R)}{(c-v_R)\cdot(c+v_R)} + \frac{l\cdot(c-v_R)}{(c+v_R)\cdot(c-v_R)} = l\cdot\frac{(c+v_R)+(c-v_R)}{(c-v_R)\cdot(c+v_R)} = 2l\frac{c}{c^2-v_R{}^2}$$

For the red ray:

$$t_2 = \frac{2l}{c}$$

For the difference of both rays:

$$\Delta t = 2l\frac{c}{c^2-v_R{}^2} - 2l\frac{1}{c} = 2l\left(\frac{c}{c^2-v_R{}^2} - \frac{1}{c}\right) = 2l\left(\frac{c^2-(c^2-v_R{}^2)}{(c^2-v_R{}^2)c}\right)$$

$$\Delta t = \frac{2l}{c}\cdot\frac{v_R{}^2}{(c^2-v_R{}^2)}$$ (dragged aether unapproximated)

Again we delete v_R^2 below:

$$\Delta t \approx \frac{2l}{c} \cdot \frac{v_R^2}{c^2}$$ (dragged aether approximated)

And this looks even more familiar, comparing Michelson's well known formula (only that he used the earth's orbital instead of rotational speed):

$$\Delta t = \frac{2l}{c} \cdot \frac{v^2}{c^2}$$

We have to emphasize that only earth's rotational speed is relevant. And then the Michelson/Morley experiment has to deal solely with the tiny rotational speed of earth, and also only on the second order effect thereof, giving an even tinier result. The difference then should be only $1x10^{-5}$ of a fringe shift, and the most accurate interferometer experiments ever done give no less than $4x10^{-2}$ of a fringe!

The Michelson Morley experiment's null result is in accordance with the gravitationally dragged aether.

Until today no attempt was ever done for an interferometer experiment that could reveal this tiny fringe shift. Unfortunately even gravitational wave telescopes would show a plain null result, since the interferometer maintains the same position against earth's rotation at any time.

3.3. Hammar Experiment

The Hammar [13] experiment, with a setup similar to the Michelson Morley experiment but consisting of differing length interferometer arms partially cladded with heavy lead blocks, also gave a null result, although, under the terms of dragged aether, a positive result was expected due to gravitational attraction of light by the lead blocks. The obtained null result is everything but significant. The assumptive 500kg weighing lead blocks could only achieve an additional gravitational acceleration in the negligible range of 10^{-7} of earth's gravitational acceleration on the one interferometer limb directly cladded, but also have an influence of 10^{-9} on the other limb 1m apart.

But even if gravitation of the lead block would be relevant, it would drag the light along the limb being in line with earth's rotation and cancel out even the second order effect. We would have to expect a true zero result. Otherwise if the perpendicular limb was cladded, no more than the second order effect of the standard Michelson Morley experiment would be attained, i.e. non- detectable 10^{-5} of a fringe shift.

The Hammar experiment's null result is not suitable to make any proposition and therefore in accordance with the gravitationally dragged aether.

3.4. Lodge Experiment

The Lodge experiment uses a similar setup as the Michelson/Gale/Pearson Experiment, but laboratory size. The roundtrip of two light rays in opposite motion was fixed in the laboratory, and a heavy rotating lead disc in the middle was implied to drag each ray in one or the other direction. Once again this conclusion is subject to the misconception that the disc's gravitation would be rotating with the disc.

The Lodge experiment's null result therefore is not suitable to make any proposition and therefore in accordance with the gravitationally dragged aether.

3.5. Water filled telescope by George Bidell Airy

In chapter 2 it has been proved that stellar aberration is resulting from the whole distance between source and observer alone. It is irrelevant if the light ray is dragged in the short part in close distance of source or observer. Since the influencing distance is vanishingly short against the distance between observer and source, the aberration must have already happened on its way. All experiments with water filled telescopes (by George Bidell Airy, [12]) or the like therefore cannot but have a null result.

The water filled telescope experiment's null result is in accordance with the gravitationally dragged aether.

3.6. Laser gyroscopes

Experiments with glass fiber laser gyroscopes plausibly show the Sagnac effect on the basis of classic physics. GPS technology is functioning only with earth as the inertial reference frame. If sun was used as the reference frame, computations based upon Relativity fail to produce correct results.

GPS technology is in accordance with the gravitationally dragged aether.

3.7. Laser resonators

Laser resonator setups that allegedly result in much smaller possible light speed anisotropy exclusively deal with frequency changes. But in the gravitationally dragged aether the Doppler Effect behaves strictly classical, i.e. the effect caused by the source moving against the gravitational field is fully cancelled out by the effect caused by the observer moving with the same speed against the gravitational field. Further on there is no loss or gain of energy. Frequency changes therefore are fundamentally not to be expected.

The laser resonator experiment's null results are not suitable and therefore in accordance with the gravitationally dragged aether.

4. Conclusion and Perspective

We have seen that understanding of the nature of light propagation is until today underlying some fundamental misinterpretations that we brought into order with this paper. We have shown that stellar and terrestrial aberration, and all applicable experiments fully comply with the gravitationally dragged aether. In fact there is no reason why light should not be fully dragged by gravity in general, at least on the foundation of the above discussed experiments.

It is but logically obvious, that the interpretation of one experiment that deals with first order effects (Sagnac), and of another experiment that deals with second order effects (Michelson/Morley) should give a consistent statement about the same applicable velocity, earth's rotational speed in this case.

Based on the finding that electromagnetic waves and probably also electromagnetic fields are being influenced and dragged by gravity, it could be fertile to further investigate into the question, if simply electromagnetic fields are bent by gravity rather than spacetime.

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