LIGHT INERTIA

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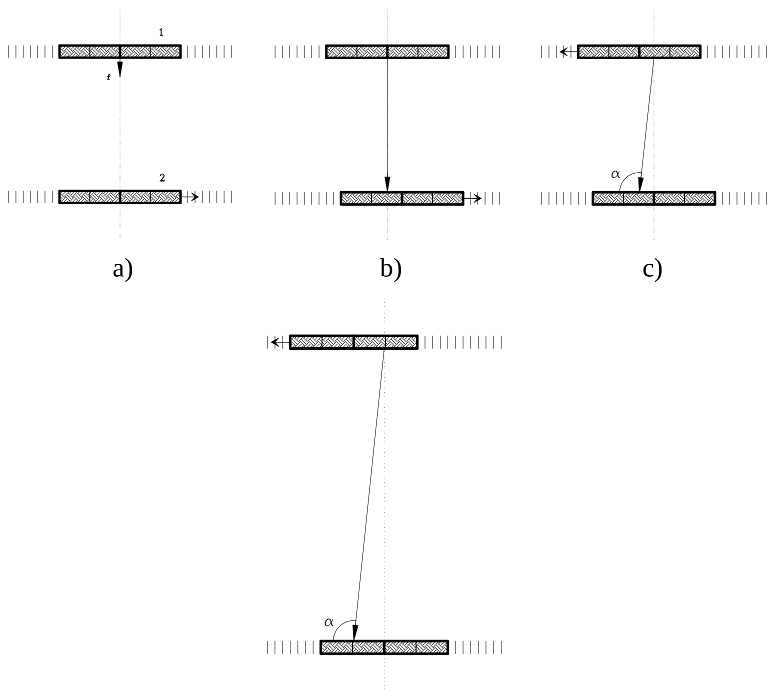
Abstract: A new experiment for registration of variable speed of light.

Examination

Light has inertia and variable speed, which follows from the experiments of Bradley, Michelson and Sagnac. Consequently, the effect of Bradley should also depend on the distance, and this can be verified experimentally.

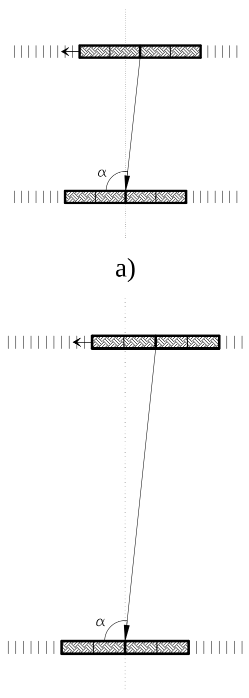
According to Newton[1], Bradley's effect depends on the relative velocity and on the distance (Fig.1). I.e. the photon f lags sideways equally, regardless of which of the trains 1 or 2 moves, and on doubling the distance between them, doubles also the lateral displacement of the ray, so angle α remains the same.

Einstein speculates[2] that the speed of light is constant and the space-time is displaced, so the source is laterally displaced, not the photon (Fig.2). I.e. Bradley's effect should not depend on the distance.



a) b) c) d)

Fig. 1



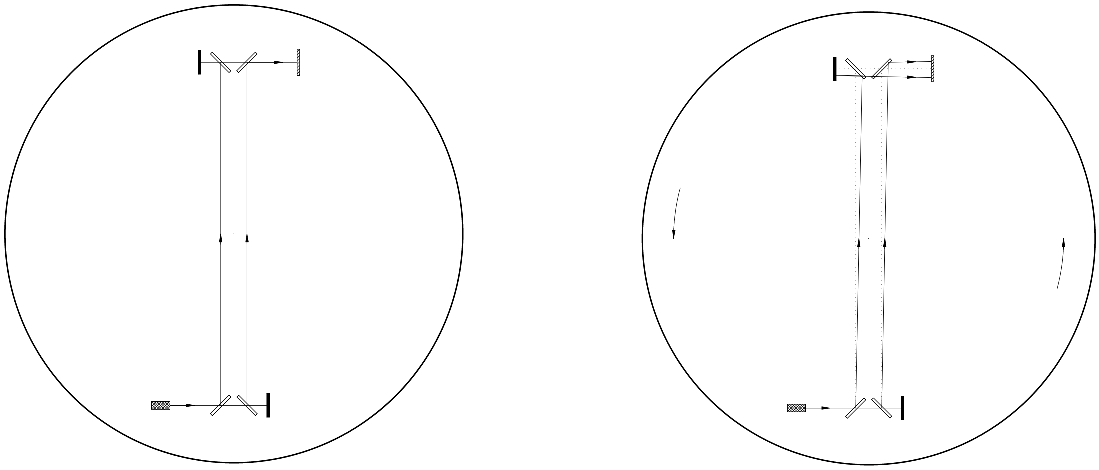
a) b)

Fig. 2

This can be tested easily by a new type of rotating radial interferometer (Fig.3). The circular motion is practically rectilinear for the short time needed of photons. If the photons have inertia

(Coriolis effect), then the rays will be dephased proportionally to the peripheral speed and to the diameter of the device.

The two rays are equal and thin or convergent, and the distance between them is minimal, to reduce the effect of Sagnac. Upon rotation of the device, the rays will displace themselves laterally (Fig.3b). So the interference pattern will be reduced, without dephasing.



a) b)

Fig. 3

In the interferometer of Fig.4, the lateral displacement of the rays is converted into dephasing by prisms of Michelson, which increases accuracy. Further it can be added a square prism at the center of the disk, that swaps the rays.

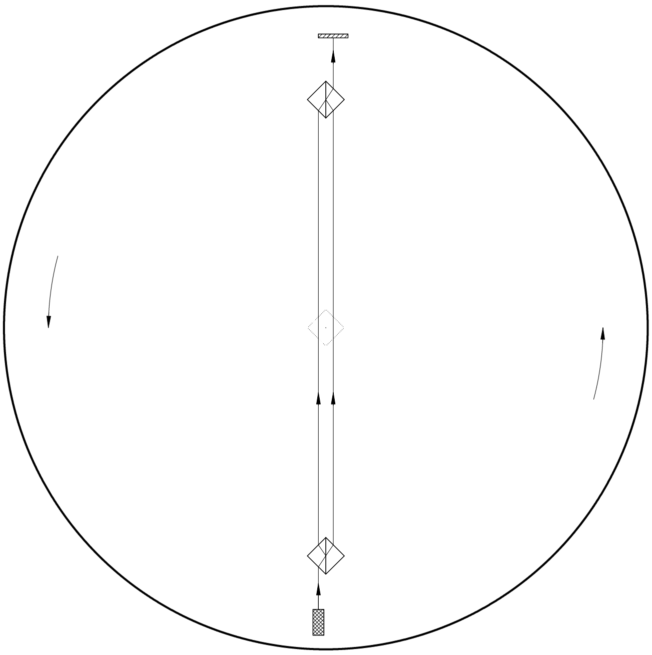


Fig. 4

Dephasing of the rays in the device is two types, rotational and translational. Rotational dephasing is insignificant because the angle β is almost zero, and the formula is:

$$Dr = \frac{4 . l . v . sin\beta}{c . \lambda} \quad (1)$$

D - dephasing
l - lengths of rays
c - speed of light
v - peripheral velocity
β - angle of displacement
λ - wavelength of light

Only the translational dephasing is important in this case and is described by the formula:

$$D = \frac{4 . l . v . cos\beta}{c . \lambda} \quad (2)$$

So for example, if l = 1m, v = 10m/s, c = 3.10^8m/s, $cos\beta \approx 1$, λ = 500nm, then $D \approx 0,25$ of λ. And if l = 2m, then $D \approx 0,5$. I.e. dephasing depends on the lengths of the rays, at the same peripheral velocities. Similar results should be expected also in practice.

References

[1] Newton, *“Opticks”*, 1704.
[2] Einstein, *“On the Electrodynamics of Moving Bodies”*, 1905.