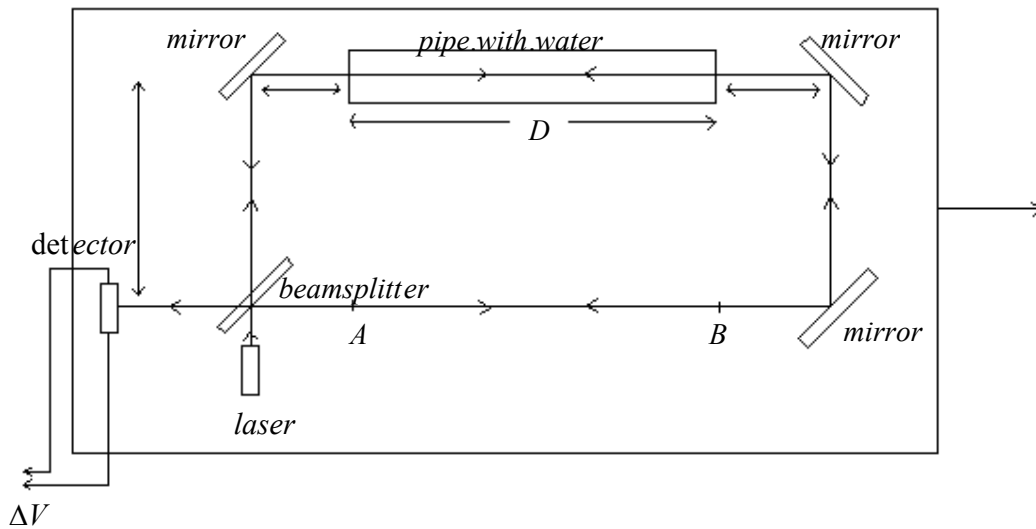


Linear Sagnac Experiment – II

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This experiment is a version of the Sagnac experiment made with linear speed. So, the system is an inertial referential. It will prove if light speed has or not relative speed.



The device has a laser diode ($\lambda = 6.5 \times 10^{-7} \text{ m}$, $P = 3.5 \text{ mW}$), a 50% - 50% beam splitter, three mirrors, a pipe filled of water with two glass windows and a light detector

The laser beam is divided on the splitter and travels in two directions in the mirrors circuit. Then they are joined again and went to the detector where the variable interference pattern generates the voltage ΔV .

The device moves in the exterior of a car so, the movement relative to the rest air will sum and subtract to light speed. According to relativity theory this is impossible. It's important to note that the medium, the air, is at rest what is moving is the effective detector and the emitter that there are the points A and B.

Times of the light rays:

$$\begin{cases} t_1 = k + \frac{D}{w} + \frac{D}{c-v} \\ t_2 = k + \frac{D}{w} + \frac{D}{c+v} \end{cases} \quad \text{and} \quad t = t_1 - t_2$$

$$t = \frac{2Dv}{c^2} \quad ; \quad D = 0.33m \quad ; \quad t = 7.34 \times 10^{-18} v$$

Space phase shift:

$$\Delta t = 7.34 \times 10^{-18} \Delta v \quad \text{and} \quad \Delta x = c \Delta t \quad \Leftrightarrow \quad \Delta x = 2.2 \times 10^{-9} \Delta v$$

Voltage variation on the detector:

$$\Delta V = V \frac{\Delta x}{\lambda/2} \quad \text{with} \quad \lambda = 6.5 \times 10^{-7} m \quad \Leftrightarrow$$

$$\Leftrightarrow \quad \Delta V = V \times 6.8 \times 10^{-3} \Delta v$$

In our device $V = 60mV$, so for a $\Delta v = 100km/h = 27.8m/s$:

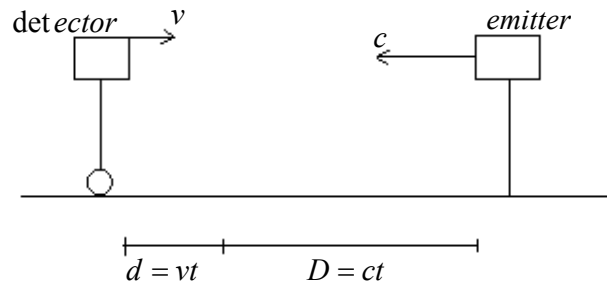
$$\underline{\Delta V = 11.3mV} \quad ; \quad \frac{\Delta V}{V} = 19\%$$

We have made the experiment (2008-06-02), made 20 measures and found always a voltage variation of 10 mV.

So, we have proved that light speed is not constant and that it sums to the speed of the receptor.

Further explanations

The points A and B work as emitter-detector and detector-emitter. We can see how light speed is additive in this experiment:



$$d + D = (c + v)t$$

This experiment is very different from the Fizeau experiment where what is moving is the medium. For instance we can not do the experiment with the device at rest and the air moving with a fan. In this case the formula we must use is:

$$w = c^2 \frac{w_0 + v}{c^2 + vw_0} \approx c$$

And the speed variation is very little.