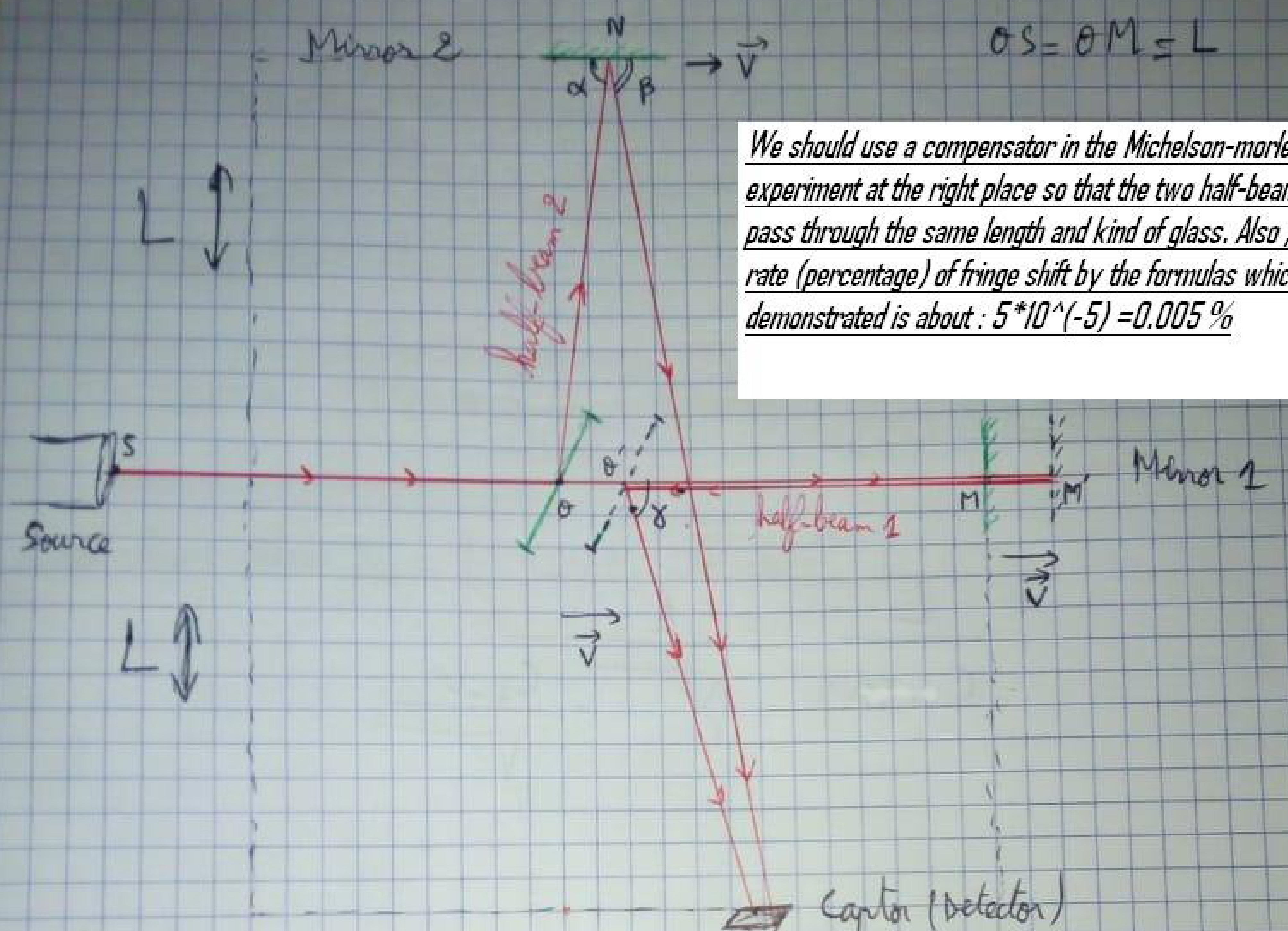
Michelson-Morley experiment (The effects were considered)



We should use a compensator in the Michelson-morley experiment at the right place so that the two half-beams pass through the same length and kind of glass. Also ,the rate (percentage) of fringe shift by the formulas which I demonstrated is about : 5*10^(-5) =0.005 %

*We consider T_1 and T_2 the times needed for the two half-beams to reach the captor starting from the source, but we consider also that the splitter doesn't influence the light when it passes through it. We consider also the ping-pong effect at the reflection of light.

$$T_1 = 2\left(\frac{L}{c_1} + \frac{V.t_1}{c_1}\right) + \frac{L}{c_2} - \frac{V.t_2}{c_2} + \frac{L}{c_3 \cdot |\sin\gamma|}$$

$c_1 \neq c_2 \neq c_3$ and c_1 is the speed of the light at the source: (half-beam 1)

→ we have $c_1 . t_1 = L + V . t_1 \iff t_1 = \frac{L}{c_1 - V}$

→ c_2 is the speed of the light returning after hitting the mirror 1.

We consider : $c_2 = c_1 - V$ and we have $c_2 . t_2 = L - V . t_2$

so $t_2 = \frac{L}{c_2 + V} = \frac{L}{c_1}$

→ C_3 is the speed of the light after reflecting at the splitter and before reaching the captor :

We have : $\vec{C_3} = V\vec{i} + C_2\vec{j} = V\vec{i} - (C_1 - V)\vec{j}$

so $C_3 = \sqrt{(C_1-V)^2+V^2}$ and $\cos\gamma = \dfrac{V}{\sqrt{(C_1-V)^2+V^2}}$

and $\sin\gamma = -\dfrac{C_1 - V}{\sqrt{(C_1-V)^2+V^2}}$

→ we deduce that : $T_1 = 2\left(\dfrac{L}{C_1} + \dfrac{V.L}{C_1(C_1-V)}\right) + \dfrac{L}{C_1-V} - \dfrac{V.L}{C_1.(C_1-V)} + \dfrac{L}{C_1-V}$

$\iff$ $T_1 = \dfrac{L}{C_1-V}\left(2 + \dfrac{V}{C_1}\right) + \dfrac{2L}{C_1}$

We have also by considering $C_1 \neq C_2' \neq C_3'$: half-beam 2

$T_2 = \dfrac{L}{C_1} + \dfrac{V.t_1}{C_1} + \dfrac{L}{C_2'|\sin\alpha|} + \dfrac{2.L}{C_3'.|\sin\beta|}$

→ C_2' is the speed of the light after reflecting at the splitter and before reaching the mirror 2 :

We consider that : $\vec{C_2'} = V\vec{i} + C_1\vec{j}$ so $C_2' = \sqrt{C_1^2+V^2}$

and $\sin\alpha = \dfrac{C_1}{\sqrt{C^2+V^2}}$ and $\cos\alpha = \dfrac{V}{\sqrt{C_1^2+V^2}}$

→ C_3' is the speed of the light after reflecting at the mirror 2 and before reaching the captor:

We consider that $C_3' = 2V\vec{i} - C_1\vec{j}$ so $C_3' = \sqrt{C_1^2+4V^2}$

and $\sin\beta = \dfrac{-C_1}{\sqrt{C_1^2+4V^2}}$ and $\cos\beta = \dfrac{2V}{\sqrt{C_1^2+4V^2}}$

We deduce that : $T_2 = \dfrac{L}{C_1} + \dfrac{V.L}{C_1(C_1-V)} + \dfrac{L}{C_1} + \dfrac{2.L}{C_1}$

$\iff$ $T_2 = \dfrac{V.L}{C_1(C_1-V)} + \dfrac{4L}{C_1}$

Finally : $T_1 - T_2 = \dfrac{2L}{C_1-V} - \dfrac{2L}{C_1} = 2L\left(\dfrac{1}{C_1-V} - \dfrac{1}{C_1}\right)$

Formulas demonstrated for Pound-Rebka experiment

* Let's consider that the photon has a mass m than during the gravitational blueshift we have: $m \cdot g = m \cdot \gamma$
(γ is the acceleration of the photon downwards)
Let's consider V_r the velocity of the recieved photon and V_e the velocity of the emitted photon, we have than: $\boxed{g = \frac{V_r - V_e}{t}}$
(t is the time between the emission and the reception of the photon)
* Let's consider V_S the velocity of the photon when its source S doesn't move (fixed), than during a doppler effect we have:
$V_e = V_S - v_S$ with v_S: the velocity of the source (upwards)
* Let's consider that the gravitational effect and the doppler effect abolish each other than: $V_S = V_r$
and we conclude that $V_e = V_r - v_S \iff \boxed{v_S = V_r - V_e}$
* We conclude finally that: $v_S = g \cdot t$ which is the formula found for the experiment.

---

* I suggested during this demonstration that the photon has a mass m and that the velocity of the photon changes.
* I also suggested that the gravitational effect is because of a mass m of the photon.

---

* I suggest also that the mass m of the photon can be found by making a gravitational blueshift or redshift in a vacuum and using the famous formula.

$\Delta E = \frac{1}{2} m \, \Delta V^2$ with: $\Delta E = E_r - E_e$
and: $\Delta V = V_r - V_e$

E: stands for the energy of the photon.