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: \(5 \times 10^{-5} = 0.005\% \)

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.

\[ T_2 = \frac{L}{c_1} + \frac{V \cdot L}{c_2} + \frac{L}{c_3 \sin \theta} \]

\(c_1 + c_2 = c_3\) and \(c_1\) is the speed of the light at the source. (half beam)

\(c_2\) in the speed of the light returning after hitting the mirror 2.

We consider: \(c_2 = c_1 - V\) and we have \(c_2 \cdot t_2 = L - V \cdot t_2\)

\[ t_2 = \frac{L}{c_2 + V} = \frac{1}{c_2} \]
\[ c_3 \text{ is the speed of the light after reflecting at the splitter and before reaching the capacitor:} \]

We have: 
\[ c_3^2 = v_1^2 + c_2^2 = v_2^2 - (c_1 - v)^2 \]

so 
\[ c_3 = \sqrt{(c_1 - v)^2 + v^2} \text{ and } \cos \theta = \frac{v}{\sqrt{(c_1 - v)^2 + v^2}} \]

and 
\[ \sin \gamma = -\frac{c_3 - v}{\sqrt{(c_1 - v)^2 + v^2}} \]

\rightarrow we deduce that: 
\[ T_2 = 2 \left( \frac{L}{c_1^2} + \frac{v.L}{c_1(c_1 - v)} \right) + \frac{L}{c_1 - v} \frac{c_1.L}{c_2 + c_1(c_1 - v)} + \frac{L}{c_1 - v} \frac{c_1.L}{c_2 - c_1(v)} + \frac{L}{c_1 - v} \frac{c_1.L}{c_2 - c_1(v)} \]

\[ \Rightarrow T_2 = \frac{L}{c_1 - v} \left( 2 + \frac{v}{c_1} \right) + \frac{2L}{c_1} \]

We have also by considering \[ c_4 = c_2 + c_3 \text{: the light after reflecting at the splitter and before reaching the mirror:} \]

We consider that: 
\[ c_4^2 = v_2^2 + c_3^2 \text{ so } c_4 = \sqrt{c_2^2 + v^2} \]

and 
\[ \sin \alpha = \frac{c_4}{\sqrt{c_4^2 + v^2}} \text{ and } \cos \alpha = \frac{v}{\sqrt{c_4^2 + v^2}} \]

\rightarrow \[ c_2 \text{ is the speed of the light after reflecting at the mirror and before reaching the capacitor:} \]

We consider that: 
\[ c_3 = 2v_2^2 - c_4^2 \text{ so } c_3 = \sqrt{c_2^2 - 4v^2} \]

and 
\[ \sin \beta = \frac{c_2}{\sqrt{c_2^2 - 4v^2}} \text{ and } \cos \beta = \frac{2v}{\sqrt{c_2^2 - 4v^2}} \]

\rightarrow we deduce that: 
\[ T_2 = \frac{L}{c_1^2} + \frac{v.L}{c_1(c_1 - v)} + \frac{L}{c_1 - v} \frac{c_1.L}{c_2 + c_1(c_1 - v)} + \frac{L}{c_1 - v} \frac{c_1.L}{c_2 - c_1(v)} \]

\[ \Rightarrow T_2 = \frac{V.L}{c_1^2(c_2 - v)} + \frac{L}{c_1} \]

Finally: 
\[ T_1 - T_2 = \frac{2L}{c_1} - \frac{2L}{c_1 - v} = 2L \left( \frac{1}{c_1} - \frac{1}{c_1 - v} \right) \]
* Let's consider that the photon has a mass \( m \) and during the gravitational blueshift we have: \( m \cdot g = m \cdot v \) (\( g \) is the acceleration of the photon downwards).

* Let's consider \( v_r \) the velocity of the received photon and \( v_e \) the velocity of the emitted photon, we have then: \( g = v_r - v_e \) (\( t \) 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), then 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 then: \( v_s = v_r \) and we conclude that \( v_e = v_r - v_s \) \( \Rightarrow \) \( v_s = v_r - v_e \).

* 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.