

v : 地球の I-TEL に対する速度

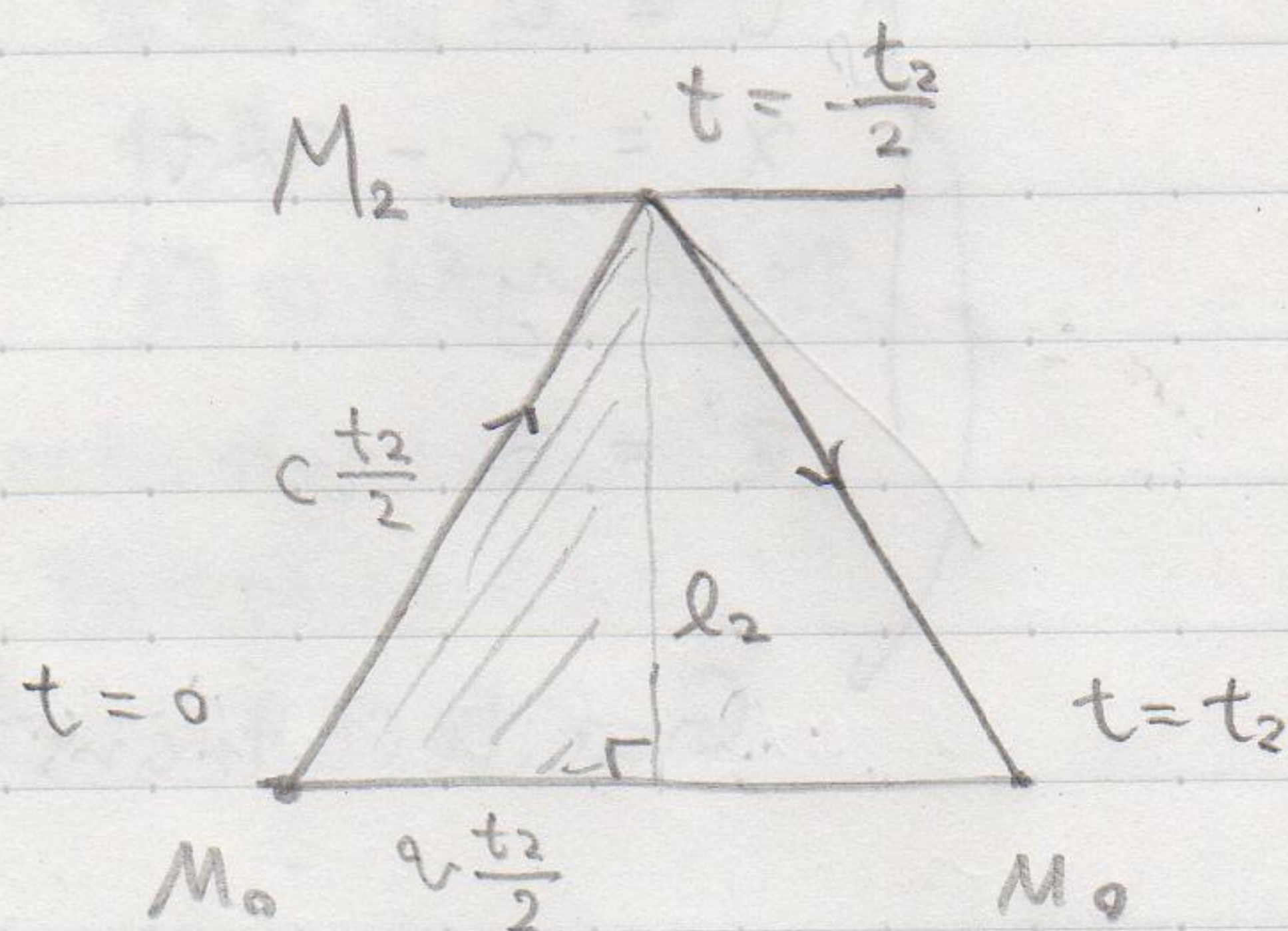
c : I-TEL の静止系での速度

$M_0 M_1 M_0$ と $M_0 M_2 M_0$ の光路差を計算

$$M_0 M_1 M_0 \quad t_1 = \frac{l_1}{c-v} + \frac{l_1}{c+v} = \frac{2l_1/c}{1-(v/c)^2}$$

$$M_0 M_2 M_0 \quad t_2: l_2^2 = -\left(v \frac{t_2}{2}\right)^2 + \left(c \frac{t_2}{2}\right)^2$$

$$t_2 = \frac{2(l_2/c)}{\sqrt{1-(v/c)^2}}$$



光路差

$$\begin{aligned} \Delta a &= c(t_1 - t_2) = 2 \left[\frac{l_1}{1-(v/c)^2} - \frac{l_2}{\sqrt{1-(v/c)^2}} \right] \\ (90^\circ \text{ 回転}) \quad \Delta b &= c(t_2 - t_1) = 2 \left[\frac{l_1}{\sqrt{1-(v/c)^2}} - \frac{l_2}{1-(v/c)^2} \right] \end{aligned}$$

$$\delta = \Delta a - \Delta b$$

$$\approx 2l_1 \left[1 + (v/c)^2 - \left(1 + \frac{1}{2}(v/c)^2\right) \right]$$

$$+ 2l_2 \left[1 + (v/c)^2 - \left(1 + \frac{1}{2}(v/c)^2\right) \right]$$

$$= (l_1 + l_2) (v/c)^2$$

干渉縞の変化を見る

$$c = 3 \times 10^8 \text{ m/s}$$

$$(v/c)^2 \sim 10^{-8}$$

$$v = 30 \text{ km/s} = 3 \times 10^4 \text{ m/s}$$

$$l_1 + l_2 \sim 3 \text{ m}$$

$$\text{光の波長 } \lambda = 400 \text{ nm} = 4 \times 10^{-7} \text{ m}$$

$\frac{1}{10} \lambda$ の干渉縞が見えるはず (X)

実験精度

$$\approx 0.03 \lambda$$

$$\text{現在 L-ザ-実験 } v/c \sim 10^{-7} \quad (v/c)^2 \sim 10^{-14}$$