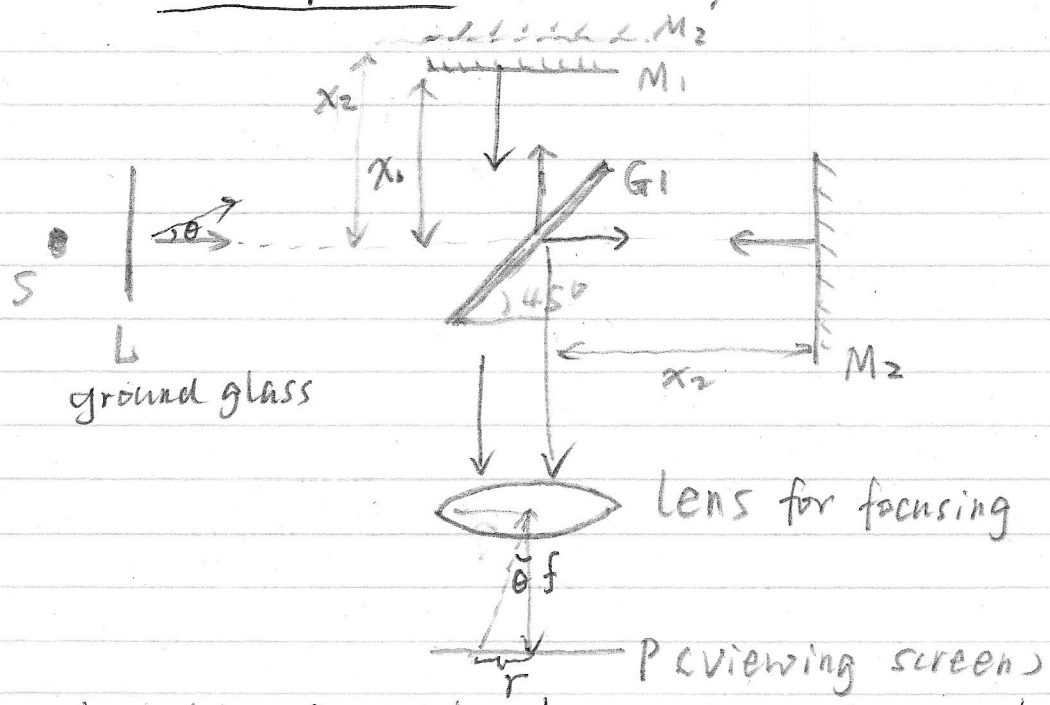
Michelson Interferometer (CH15.11)

→ Accurately measure the change of distance

two beams come from two mirrors that perpendicular to each other. The two mirrors receive light beams from the same source, thus coherent, through a beam splitter.



The light reflected by the splitter G_1 toward the viewing screen has an abrupt phase change of π

Optical path difference $\Delta = 2(x_2 - x_1)\cos\theta = 2d\cos\theta$

constructive $\Delta = (m + \frac{1}{2})\lambda$, $m = 0, 1, 2$

Destructive $\Delta = m\lambda$, $m = 0, 1, 2$.

d: the distance between mirror M_1 and M_1'

θ: the angle the rays make with the axis

Interference fringe patter: concentric dark and bright rings

Eg. $\lambda = 6 \times 10^{-5}$ cm, $d = 0.3$ mm.

the angles of the dark ring: $2d\cos\theta = m\lambda$

$$\theta = \cos^{-1}\left(\frac{m\lambda}{2d}\right) = \cos^{-1}\left(\frac{m}{1000}\right)$$

$\theta = 0$. the center, $m = 1000$, the 1000th dark ring