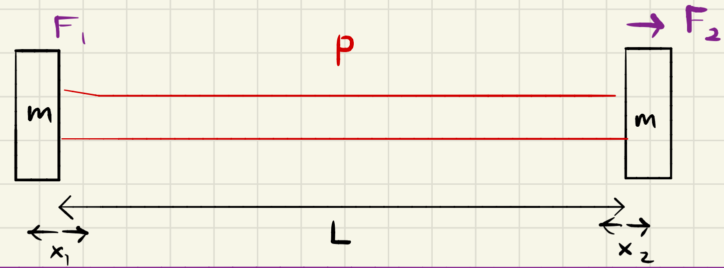
Radiation Pressure for reflected light in FP



$$F = \frac{2P}{c}$$

$$x_i = -\frac{F_i}{m\omega^2}$$

$$\Delta L = x_1 - x_2 \approx 2\Delta x$$

$$= -\frac{2\Delta F}{m\omega^2}$$

$$\boxed{\Delta L = -\frac{4\,\Delta P}{mc\omega^2}}$$

Now, $L_{DARM} = L_X - L_Y$, so

$$\Delta L_D = -\frac{4}{mc\omega^2}\left(\Delta P_x - \Delta P_Y\right)$$

For an intensity noise injection, the change in the power in each arm can be written as

$$\Delta P_x = RIN_a(f)\, P_x \quad , \quad \Delta P_Y = RIN_a(f)\, P_Y$$

$$\Rightarrow \boxed{\frac{L_{DARM}(f)}{RIN_a(f)} = -\frac{4}{mc\omega^2}\left(P_x - P_Y\right) = -\frac{4}{mc\omega^2}\,\Delta P_{arms}}$$

Finally, $RIN_a(f)$ is the RIN of the arms, and is cleaned relative to the input RIN via the CARM pole: $\frac{RIN_{arms}}{RIN_{Input}} = \frac{1}{1+i\frac{\omega}{\omega_{cc}}}$

$$\boxed{\frac{L_{DARM}(f)}{RIN_{Input}(f)} = -\frac{4}{mc\omega^2}\,\frac{1}{1+i\frac{\omega}{\omega_{cc}}}\,\Delta P_{arms}}$$