

ALS Photodetector Power

532 laser wavelength, m	$\lambda_{532} := 0.532 \cdot 10^{-6}$
1064 laser wavelength, m	$\lambda_{1064} := 1.064 \cdot 10^{-6}$
IFO waist size, m	$w_{ifo} := 0.012$
Gaussian beam radius 1064 beam at ITM, m	$w_{1064} := 0.055$
Gaussian beam radius 532 beam at ITM, m	$w_{532} := 0.055 \cdot \sqrt{\frac{\lambda_{532}}{\lambda_{1064}}}$
IFO arm length, m	$L := 4000$
PSL laser power, W	$P_{psl} := 125$
transmissivity of PRM	$T_{prm} := 0.03$
transmissivity of ITM	$T_{itm} := 0.014$
radius of photodetector ring, m	$r_{pdbc} := 0.196$
Photoconductor radius, m	$r_{pd} := \frac{0.0114}{2}$
photoconductor area, m ²	$A_{pd} := \pi \cdot r_{pd}^2$
1064 nm Beam	
1064 laser power, W	$P_{1064} := P_{psl} \cdot T_{prm} \cdot T_{itm}$ $P_{1064} = 0.053$
1064 irradiance function at ACB, W/m ²	$I_{1064pd}(r) := 2 \cdot \frac{P_{1064}}{\pi \cdot w_{1064}^2} \cdot e^{-2 \cdot \left(\frac{r^2}{w_{1064}^2} \right)}$

Irradiance at photodetector, W/m²

$$I_{1064pd}(0) = 11.049$$

Power hitting each PD, W

$$P_{1064pd} := I_{1064pd}(0) \cdot A_{pd}$$

$$P_{1064pd} = 1.128 \times 10^{-3}$$

1064 nm Beam

532 laser power, W

$$P_{532} := 0.1$$

532 irradiance function
at ACB, W/m²

$$I_{532pd}(r) := 2 \cdot \frac{P_{532}}{\pi \cdot w_{532}^2} \cdot e^{-2 \cdot \left(\frac{r^2}{w_{532}^2} \right)}$$

check total beam
power, W

$$P_0 := \int_0^{10w_{532}} 2 \cdot \pi \cdot r \cdot I_{532pd}(r) \, dr$$

$$P_0 = 0.1$$

Irradiance at photodetector, W/m²

$$I_{532pd}(0) = 42.091$$

Power hitting each PD, W

$$P_{532pd} := I_{532pd}(0) \cdot A_{pd}$$

$$P_{532pd} = 4.296 \times 10^{-3}$$