

OFI Glint into IFO
6/7/10

laser wavelength, m		$\lambda := 1.064 \times 10^{-6}$
IFO waist size, m	$w_{ifo} := 0.0115$	
OFI waist size, m	$w_{ofi} := 0.002$	
IFO solid angle, sr ⁻¹	$\Delta\Omega_{ifo} := \frac{\lambda^2}{\pi \cdot w_{ifo}^2}$	$\Delta\Omega_{ifo} = 2.725 \times 10^{-9}$
OFI solid angle, sr ⁻¹	$\Delta\Omega_{ofi} := \frac{w_{ifo}^2}{w_{ofi}^2} \cdot \Delta\Omega_{ifo}$	$\Delta\Omega_{ofi} = 9.009 \times 10^{-8}$
divergence angle at OFI, rad	$\theta_{dofi} := \sqrt{\frac{\Delta\Omega_{ofi}}{\pi}}$	$\theta_{dofi} = 1.693 \times 10^{-4}$
divergence angle at OFI, deg	$\theta_{dofideg} := \theta_{dofi} \cdot \frac{180}{\pi}$	$\theta_{dofideg} = 9.703 \times 10^{-3}$
wedge angle of TGG Crystal, deg	$x_w := 0.5$	
tilt angle of glint surface, rad	$x_t := 2 \cdot x_w \cdot \frac{\pi}{180}$	$x_t = 0.017$
power in signal recycling cavity, W	$P_0 := 0.135$	
transmissivity of TGG Crystal	$T := \sqrt{0.995}$	$T = 0.997$
reflectivity of TGG Crystal	$R := 1 - T$	$R = 2.503 \times 10^{-3}$

Gaussian beam equation
in recycling cavity, radial
coords

$$I_{\text{rcmax}}(\theta) := 2 \cdot \frac{P_0}{0.865 \cdot \pi \cdot \theta_{\text{dofi}}^2} \cdot e^{-2 \cdot \left(\frac{\theta^2}{\theta_{\text{dofi}}^2} \right)}$$

$$P_{\text{max}} := \int_0^{\theta_{\text{dofi}}} I_{\text{rcmax}}(\theta) \cdot 2 \cdot \pi \cdot \theta \, d\theta$$

$$P_{\text{max}} = 0.135$$

Gaussian beam equation
in recycling cavity, x,y
coords

$$I_{\text{rc}}(x, y) := 2 \cdot \frac{P_0}{0.865 \cdot \pi \cdot \theta_{\text{dofi}}^2} \cdot e^{-2 \cdot \left(\frac{x^2 + y^2}{\theta_{\text{dofi}}^2} \right)}$$

integrated glint power in recycling
cavity, W

$$P_{\text{rc}}(x_t) := R \cdot 2 \cdot \int_{-x_t - \theta_{\text{dofi}}}^{-x_t + \theta_{\text{dofi}}} \int_0^{\sqrt{\theta_{\text{dofi}}^2 - (x+x_t)^2}} I_{\text{rc}}(x, y) \, dy \, dx$$

$$P_{\text{rc}}(.0006) = 3.644 \times 10^{-11}$$

$$P_{\text{rc}}(0) = 3.378 \times 10^{-4}$$

$x_t := 0, 0.00001 \dots 0.0006$

