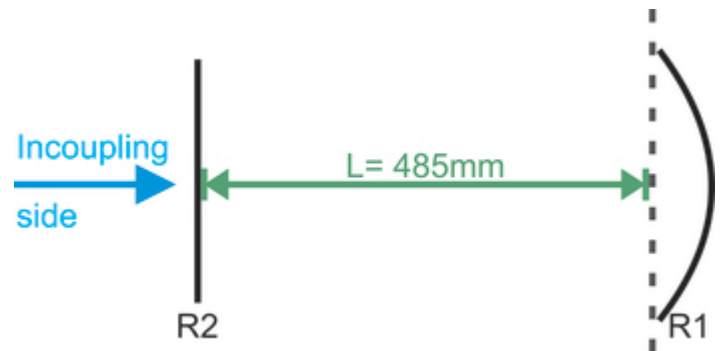


Mode matching

Literature



- Laser Beams and Resonators

H. Kogelnik et al., Applied Optics **5**, 1550 (1966)

Mirror configuration

Parameter

- Radius of curvature of mirror R1: $R_1 = 1 \text{ m}$
- Radius of curvature of mirror R2: $R_2 = 1 \times 10^6 \text{ m}$ (Incoupling side)
- Wavelength: $\lambda = 1.55 \times 10^{-6} \text{ nm}$
- Length between the resonator mirrors: $L = 485 \text{ mm}$
- Beam radius at waist: w_0
- Beam radius at mirror: w_1, w_2
- Stability parameter of the resonator: g_1, g_2
- Distance between mirror and the waist: t_1, t_2

Beam waist calculation

$$g_1 = 1 - \frac{L}{R_1} \quad ; \quad g_2 = 1 - \frac{L}{R_2}$$

From thesis of Sana:

- Beam Radii, $1/e^2$ of the intensity

$$w_1 = \sqrt{L \cdot \frac{\lambda}{\pi}} \cdot \left(\frac{g_2}{g_1 \cdot (1 - g_1 \cdot g_2)} \right)^{1/4}$$

$$w_2 = \sqrt{L \cdot \frac{\lambda}{\pi}} \cdot \left(\frac{g_1}{g_2 \cdot (1 - g_1 \cdot g_2)} \right)^{1/4}$$

From Appl. Opt. 5, 1550 (1966):

$$w_1 = \sqrt{\frac{\lambda \cdot R_1}{\pi}} \cdot \left(\frac{(R_2 - L) \cdot L}{(R_1 - L) \cdot (R_1 + R_2 - L)} \right)^{1/4}$$

$$w_2 = \sqrt{\frac{\lambda \cdot R_2}{\pi}} \cdot \left(\frac{(R_1 - L) \cdot L}{(R_2 - L) \cdot (R_1 + R_2 - L)} \right)^{1/4}$$

$$w_0 = \sqrt{\frac{\lambda}{\pi}} \cdot \left(\frac{L \cdot (R_1 - L) \cdot (R_2 - L)}{(R_1 + R_2 - L)^2} \right)^{1/4}$$

In our case:

$$w_2 = w_0$$

Position of the beam waist from the two mirrors:

$$s_{t_1} = L \cdot \frac{R_2 - L}{R_1 + R_2 - 2L} \quad s_{t_2} = L \cdot \frac{R_1 - L}{R_1 + R_2 - 2L}$$

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