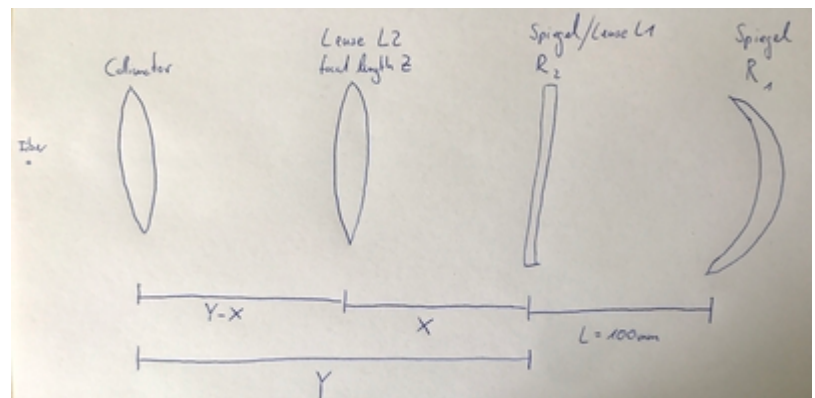


Mode Matching Resonator 2 - plan and curve mirror



Mirror configuration

Parameter

- Radius of curvature of mirror R1: $R_1 = 500 \text{ mm}$
- Radius of curvature of mirror R2: $R_2 = \text{infinity}$ (Incoupling side)
- Wavelength: $\lambda = 916.0 \text{ nm}$
- Length between the resonator mirrors: $L = 100 \text{ mm}$
- Beam radius at cavity-waist: $w_0 = w_2$
- Beam radius at mirror: w_1, w_2
- Distance between:
 - mirror R1 and mirror R2: L
 - mirror R2/lense 1 and lense 2: X
 - lense 2 focal length: Z
 - mirror R2/lense 1 and collimatorlense: Y
 - collimatorlense and fiber: 4 mm

We used the programm *Strahl.exe* (@IQ)

Step 0: Choose parameter

- Wellenlänge: 916 nm
- Brechungsindex: 1 (Air)
- Welcher Resonatortyp: linearer Resonator

Step 1: Beam waist calculation from resonator

- Insert
- Nr. 1: Spiegel 1 with Krümmungsradius $500 \text{ mm} \rightarrow$ Brennweite: 250 mm ; Einfallswinkel: 0

- Nr. 2: Abstand 100 mm
- Nr. 3: Spiegel 2 with Brennweite 10000000000000 mm (so groß es ging)
 - Alternative: **Planspiegel**; Einfallswinkel: 0

→ Waistradius: $w_2 = 270 \mu\text{m}$, $w_1 = 241.5 \mu\text{m}$

→ FSR = 1.499 GHz

Step 2:

- Change with “**C**hange” Spiegel 2 to Linse 1 - Radius Spiegel verw?=ja **y**
 - Brechungsindex: 1.5
 - Brennweite: -40000000000000 mm



The values of the Waistradius and Strahlradius must not change!!!

<fc #ff00ff>**Fenster?**</fc>

- Abstand S2 zu “**G**renzfläche” Fenster
- Grenzfläche: Brechungsindex 1.5 Einfallsw=0 Radius=0 bei unendl
- Abstand dicke Fenster: 6.35mm
- Grenzfläche: Brechungsindex 0 Einfallsw=0 Radius=0 bei unendl
- Programm berechnet hieraus Strahlrad.-1ym (Nicht realistisch)

2. Ansatz

- Berechnung der opt.Dichte → Weglängenänderung → Korrektur Abstand Spiegel zu Linse (wird größer) $D(\lambda) = \log[1 - e^{-(\alpha\lambda)}] = 9,45\text{mm}$ → neuer Abstand $X + 3,15\text{mm}$

Step 3:

- Nr. 4: Abstand with Variable X <fc #ff00ff>ausgemessen 530mm</fc>
- Nr. 5: Linse 2 with Variable Z (<fc #ff00ff>500mm=f</fc>)
- Nr. 6: Abstand Y - X
- Nr. 7: Linse 3 with Brennweite 4 mm (?)
- Nr. 8: Abstand 4 mm
- “**Z**ielwaist” (Strahlrad.an Faserausgang): $5.2 \mu\text{m}$

Step 4: Playing with the parameters X, Y and Z for the best Überlapp

- with “**V**ariable”

Lense focal length of Linse 2 Z [mm]	400	300	250	200	175	150	100	50
Distance between mirror R2 and lense 2 X [mm]	86	100	65	100	100	104	124	99
Distance between mirror R2 and collimator Y [mm]	210	272	230	250	245	240	216	141

Überlapp [%]	98.1	99.6	99.8	98.3	95.8	91.5	73.3	41.3
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