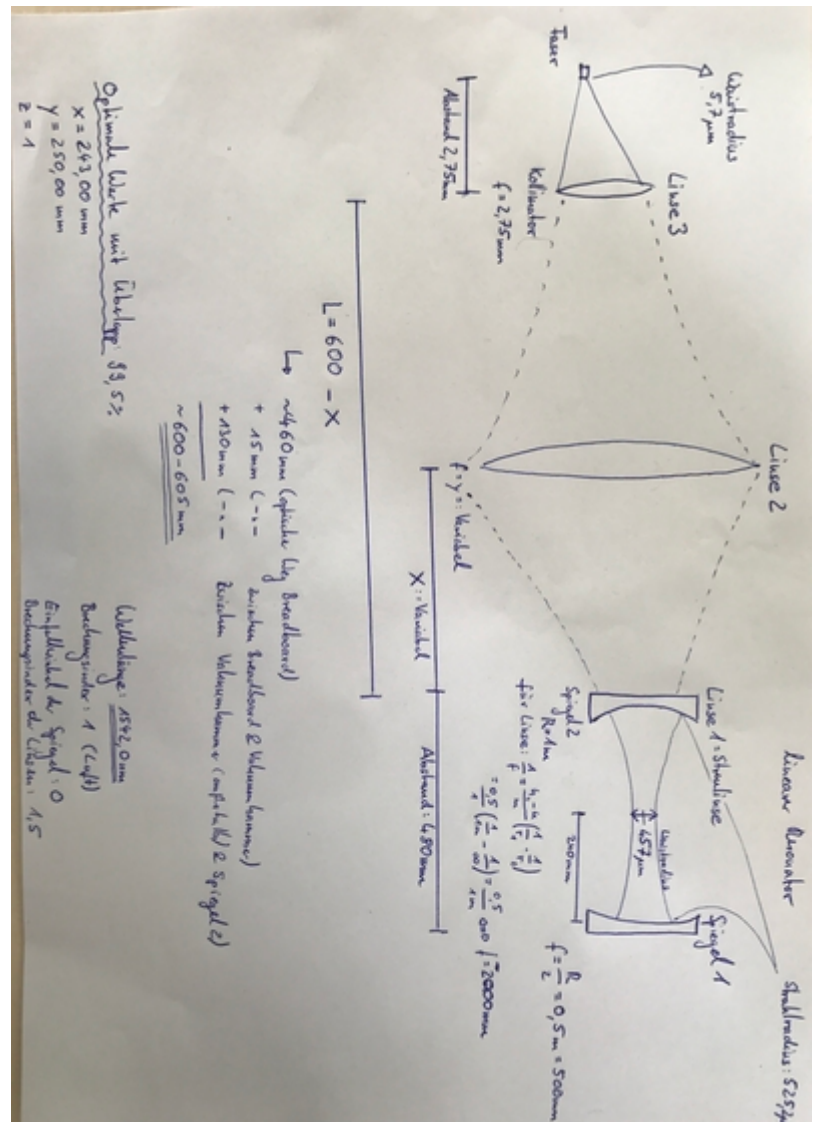


Mode Matching - two curve mirrors

Mirror configuration



Parameter

- Radius of curvature of mirror R1: $R_1 = 1 \text{ m}$
- Radius of curvature of mirror R2: $R_2 = 1 \text{ m}$ (Incoupling side)
- Wavelength: $\lambda = 1542.0 \text{ nm}$
- Length between the resonator mirrors: $L = 480 \text{ mm}$
- Beam radius at cavity-waist: w_0
- Beam radius at mirror: w_1, w_2
- Distance between:
 - mirror R1 and mirror R2: L
 - mirror R2/lense 1 and lense 2: X

- mirror R2/lense 1 and collimatorlense: 600mm - X
 - 600mm (+15mm) = optical way of the incoupling breadboard (450mm) + thickness breadboard (10mm) + distance between breadboard and vacuumchamber (30mm) + distance between vacuumchamber and cavity mirror R2 (130mm)
- collimatorlense and fiber: 2.75 mm

We used the programm *Strahl.exe* (@IQ) or *STRAHLFP.EXE* (@PTB) (same software, but different names).

Step 0: Choose parameter

- Wellenlänge: 1542 nm
- Brechungsindex: 1 (Air)
- Welcher Resonatortyp: linearer Resonator

Step 1: Beam waist calculation from resonator

- Nr. 1: Spiegel 1 with Brennweite 500 mm; Einfallwinkel: 0
- Nr. 2: Abstand 480 mm
- Nr. 3: Spiegel 2 with Brennweite 500 mm; Einfallwinkel: 0

→ Waistradius: 457 μm ; Strahlradius on the mirrors: 525.2 μm

Step 2:

- Change Spiegel 2 to Linse 1
 - Brechungsindex: 1.5
 - Brennweite: -2000 mm



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

Step 3:

- Nr. 4: Abstand with Variable X
- Nr. 5: Linse 2 with Variable Y
- Nr. 6: Abstand 600 - X
- Nr. 7: Linse 3 with Brennweite 2.75 mm
- Nr. 8: Abstand 2.75 mm
- Zielwaist: 5.2 μm

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

Case: Mirror R2/lense 1 and collimatorlense: 600mm - X

Lense focal length Y [mm]	400	300	250	200	175
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Distance between mirror R2 and lense 2 X [mm]	179	208	243	316	357
Überlapp [%]	83.1	97.6	99.5	87.9	77.4

Case: Mirror R2/lense 1 and collimatorlense: 615mm - X

Lense focal length Y [mm]	400	300	250	200	175
Distance between mirror R2 and lense 2 X [mm]	170	215	265	332	357
Überlapp [%]	83.2	97.9	99.2	87.0	76.3

Step 5: Check what is happend for the wavelength 1560 nm

No effect!

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