

Optical Contacting

- Durchgeführt von T. Legero an der PTB.
- Dokumentation:

labjournal_thomas_legero

Calculation between cavity spectrum and frequency distance

Calculates the cavity spectrum and the frequency distance between TEM₀₀ and higher order modes m+n. Two curved mirrors possible. Programm made by T. Legero.

Parameter

- Radius of curvature of mirror R1: R1= 1 m
- Radius of curvature of mirror R2: R2= 1 m
- Cavity Length: L= 0.48 m
- Reflectivity of mirrors: R= 0.99998
- Speed of light: c= 299792458 m/s

Step 1: Calculate the Free-Spectral-Rang and Gouy-Phase

- Free-Spectral-Rang: FSR
- Gouy-Phase: Gouy

$$FSR = \frac{c}{2 \cdot L} \quad Gouy = \frac{FSR}{\pi} \cdot \arccos \left(\sqrt{\left(1 - \frac{L}{R1}\right) \cdot \left(1 - \frac{L}{R2}\right)} \right)$$

⇒

- FSR = 312.284 MHz
- Gouy = 101.783 MHz

Step 2: Calculate the frequency difference between TEM₀₀ and TEM_{mn}

- TEM mode number: mn
- Difference between TEM₀₀ and TEM_{mn}: Delta

$$\Delta = FSR - mn \cdot Gouy$$

- Define maximum of mn and w:
 - mn_{max} = 100
 - w_{max} = 100

- Define maximum of shown frequency difference to TEM₀₀:
 - $\text{abs}(\text{delta}(\text{mn}, \text{w})) < 10\text{E}6$
- Frequency difference von (q-w)ter höherer Mode mn zu q-ter TEM₀₀-Mode (Matrix):

$$\Delta(\text{mn}, \text{w}) = \text{w} \cdot \text{FSR} - \text{mn} \cdot \text{Gouy}$$

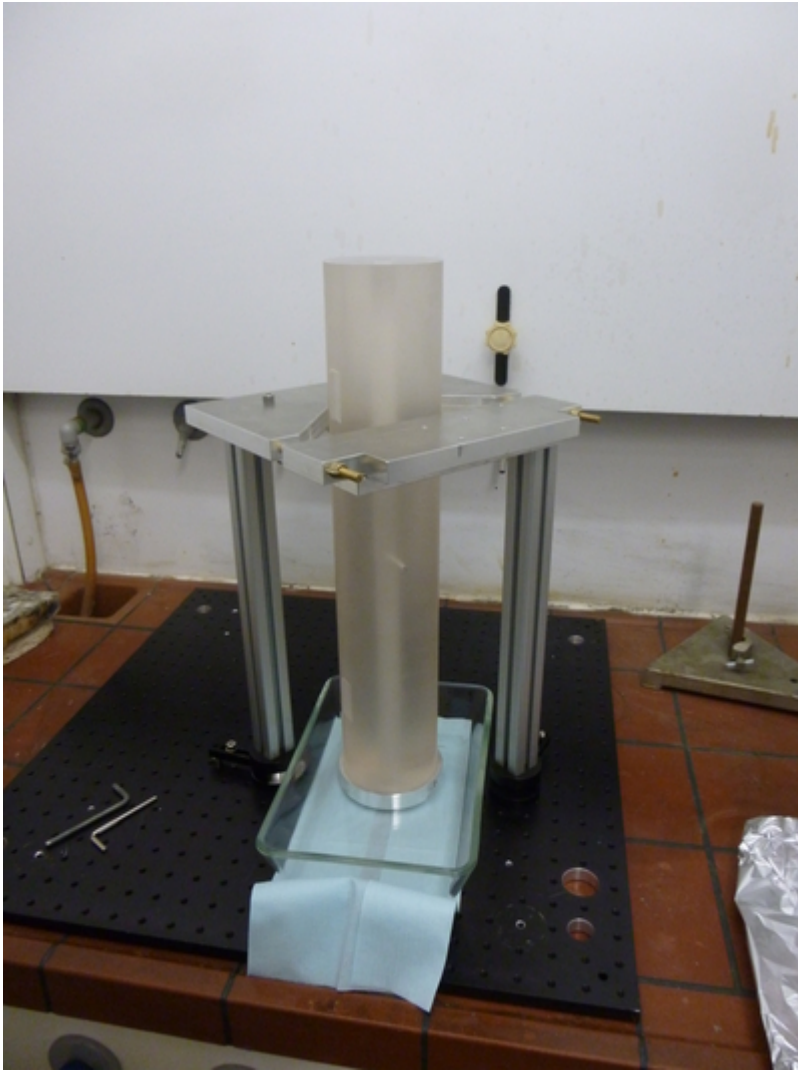
⇒

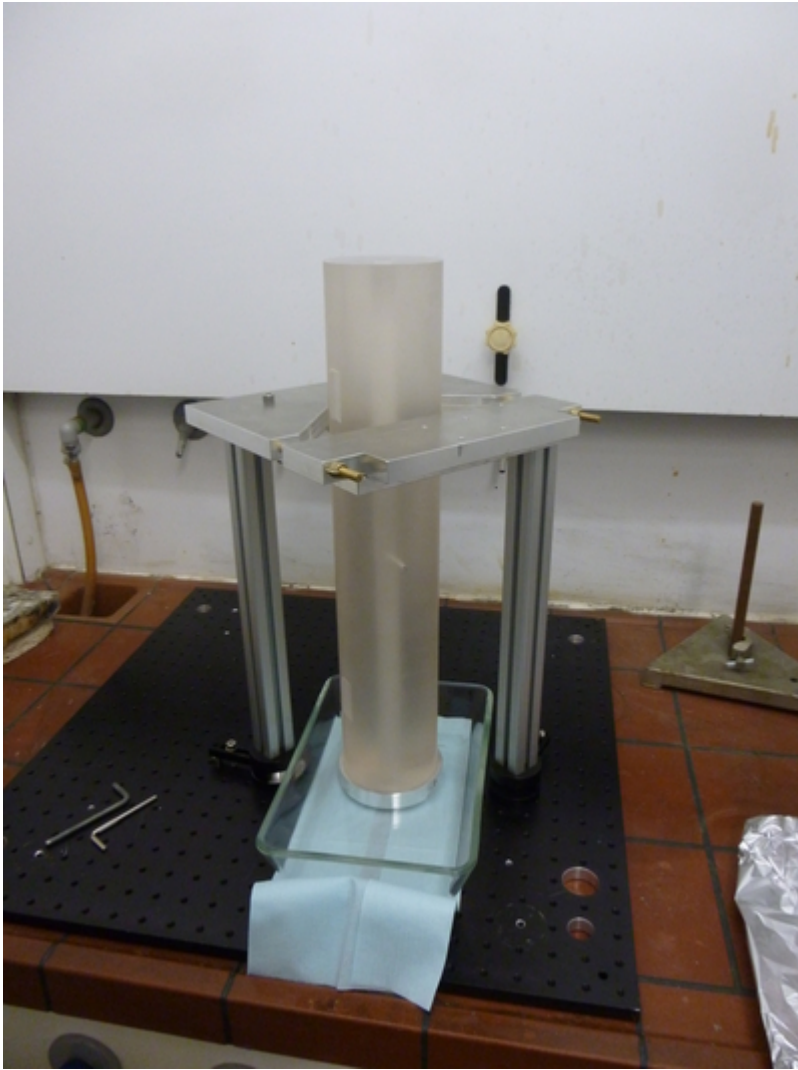
Freq. diff. of m+n = 3 higher order mode to 00-mode is 6.93401 MHz
Freq. diff. of m+n = 43 higher order mode to 00-mode is -4.70713 MHz
Freq. diff. of m+n = 46 higher order mode to 00-mode is 2.22688 MHz
Freq. diff. of m+n = 49 higher order mode to 00-mode is 9.16089 MHz
Freq. diff. of m+n = 86 higher order mode to 00-mode is -9.41427 MHz
Freq. diff. of m+n = 89 higher order mode to 00-mode is -2.48026 MHz
Freq. diff. of m+n = 92 higher order mode to 00-mode is 4.45375 MHz

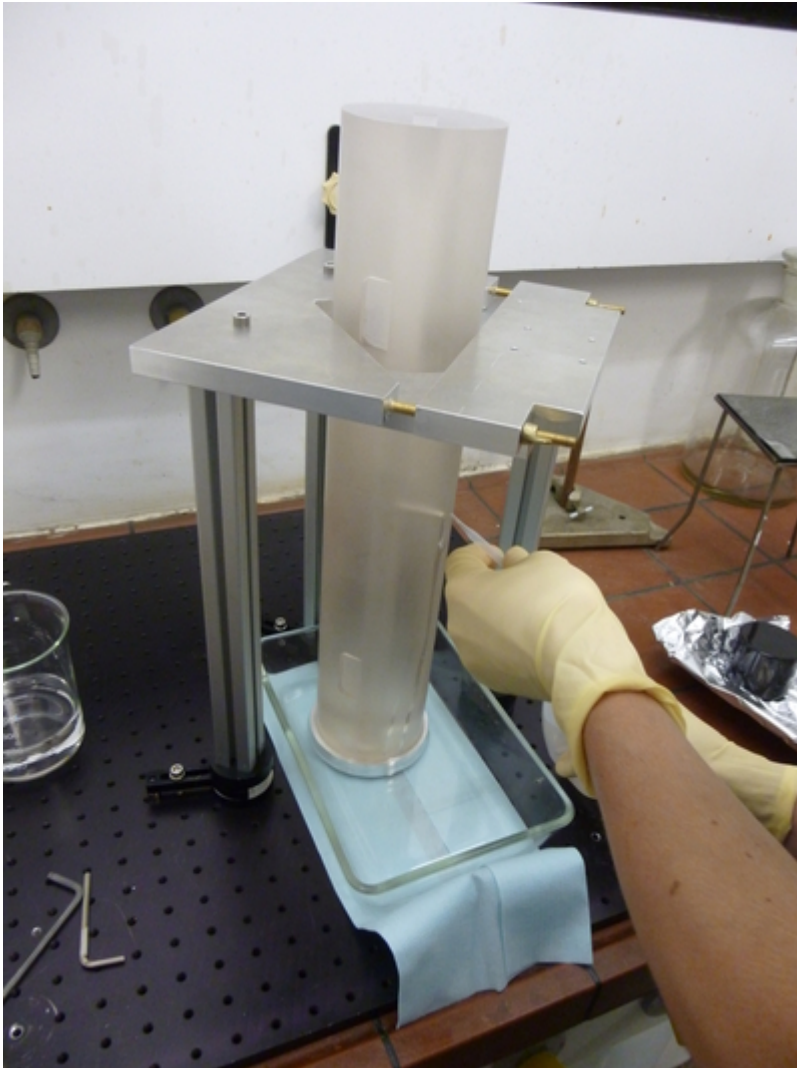
Photos

Spacerreinigung

Durchgeführt am 10.07.2017

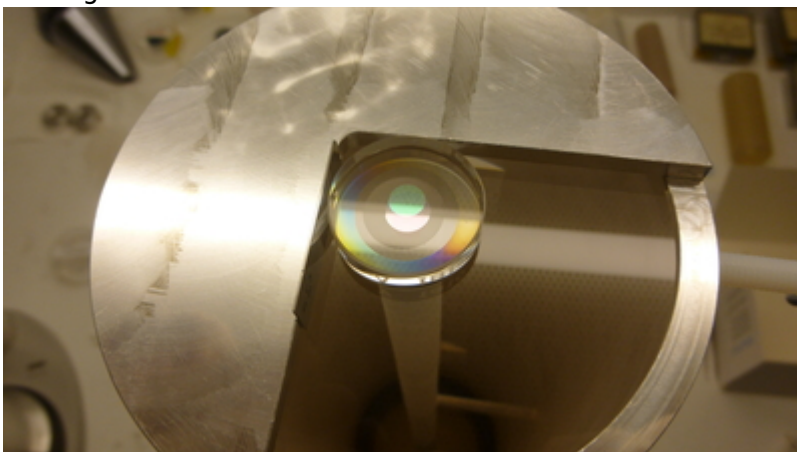


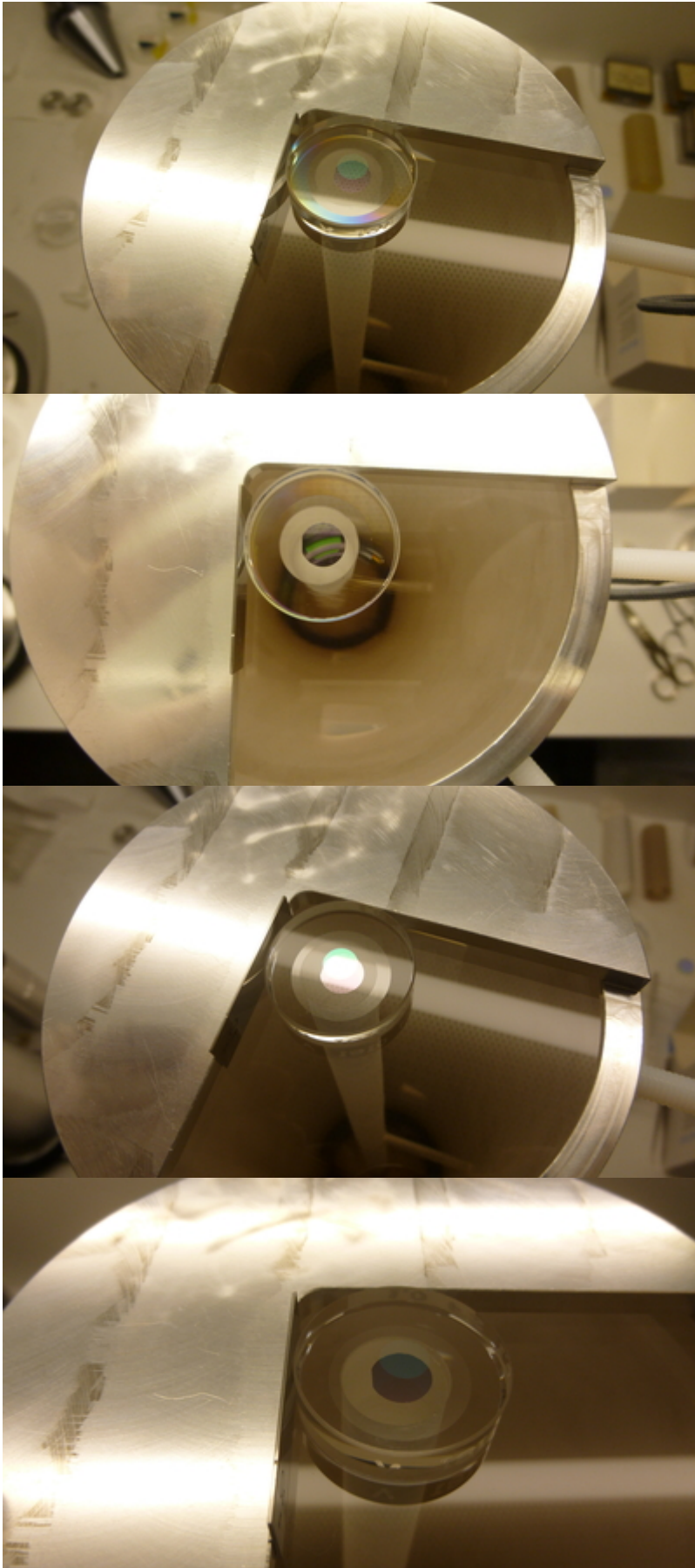




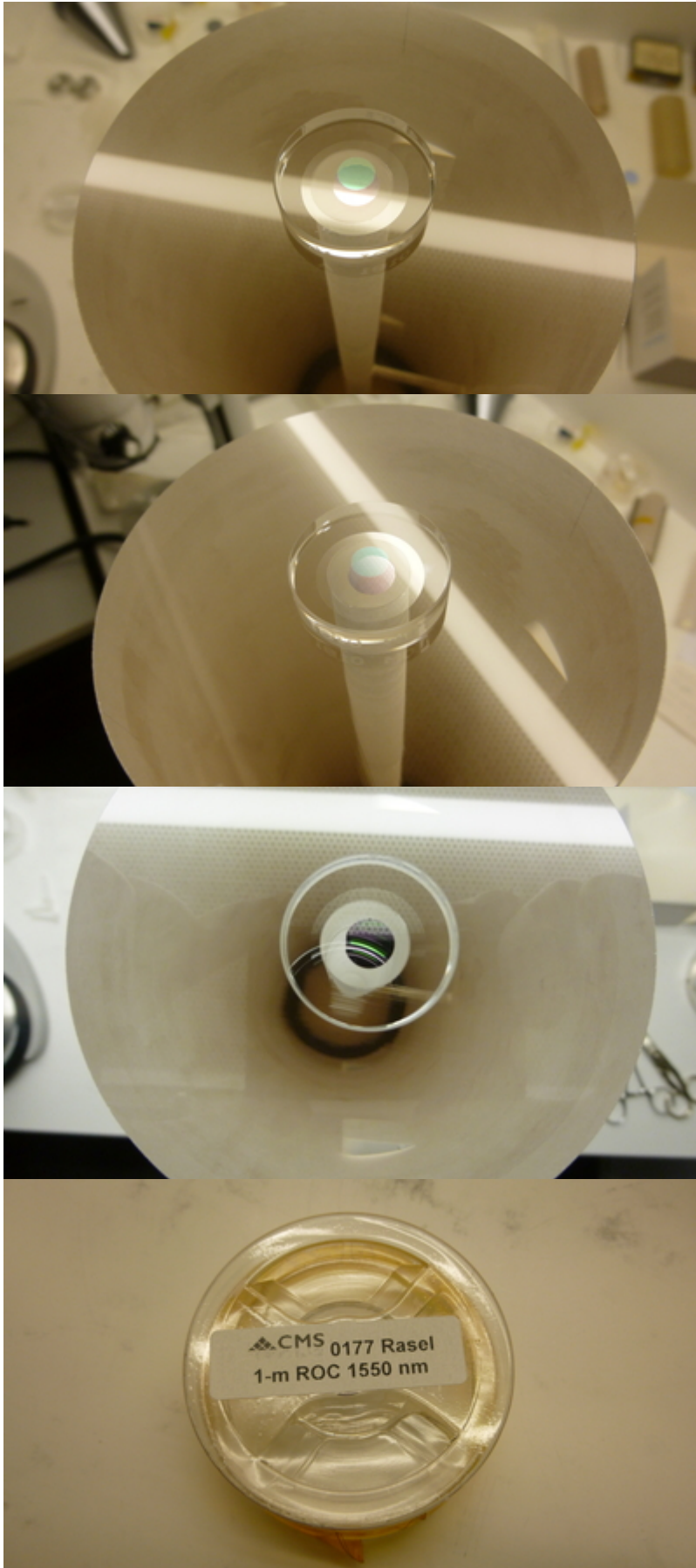
Optisches Kontaktieren

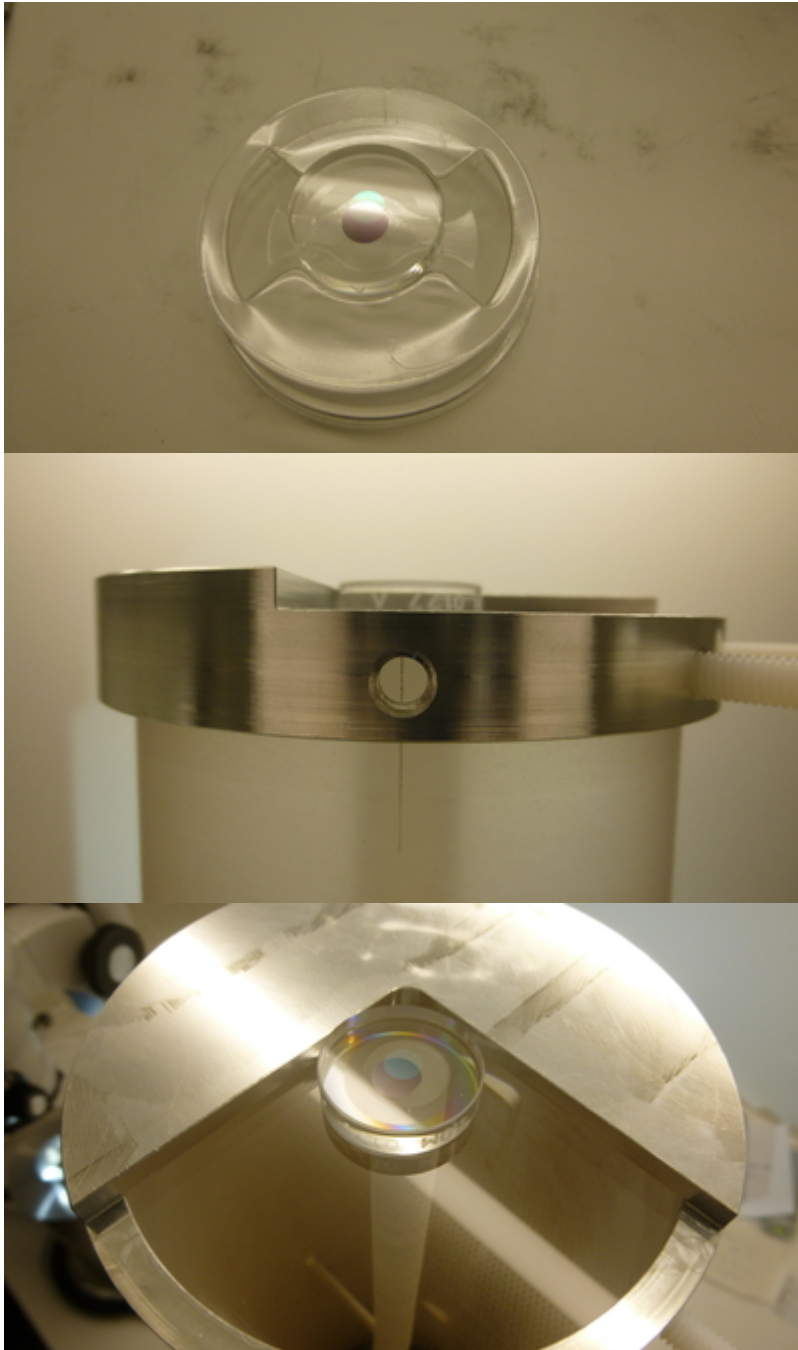
Durchgeföhrt am 27.07.2017



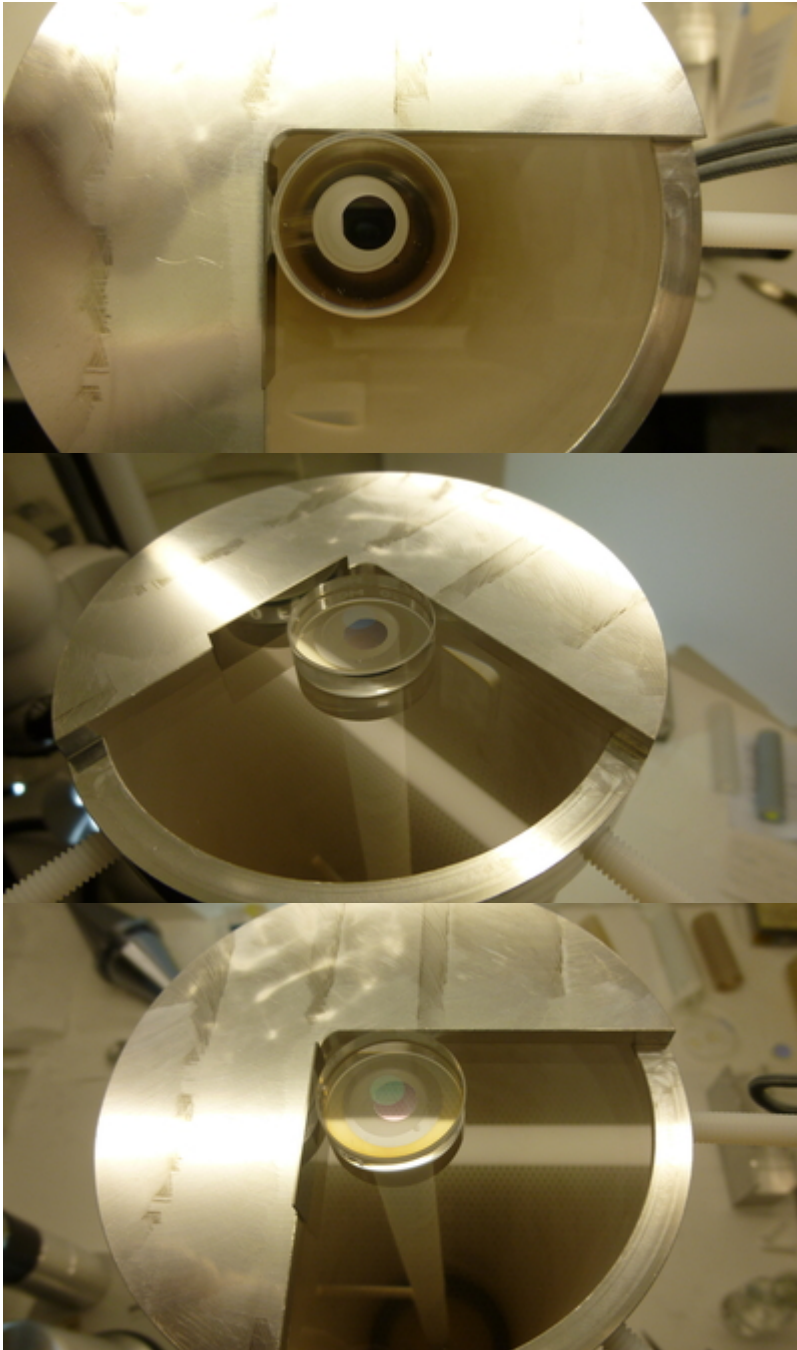






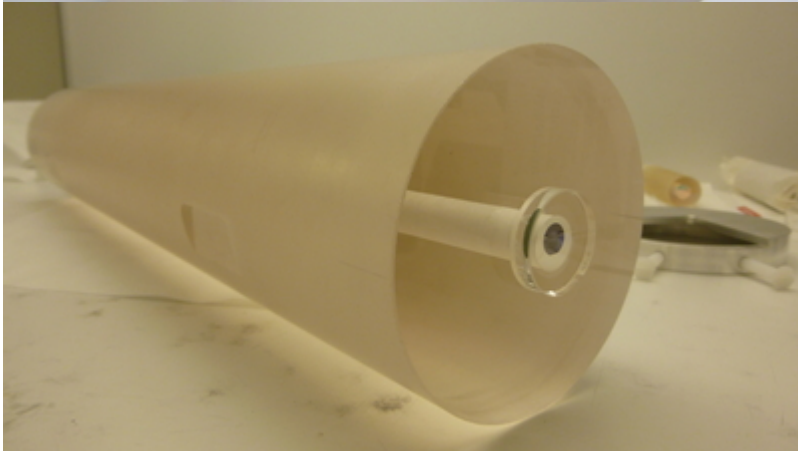
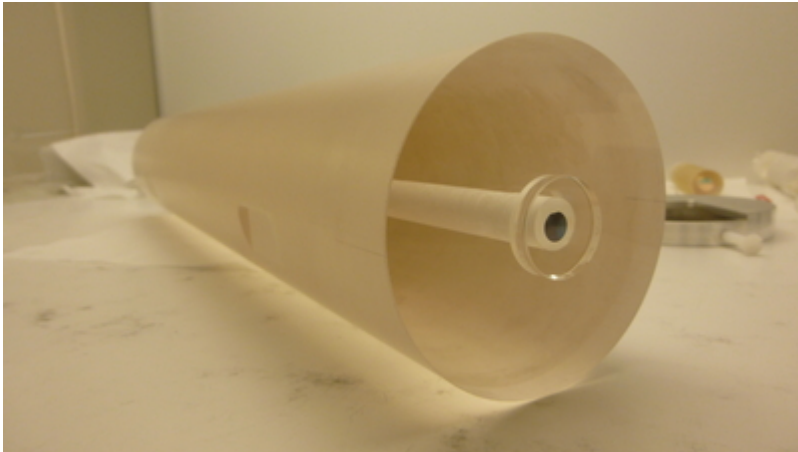












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Last update: **2017/08/08 13:02**

