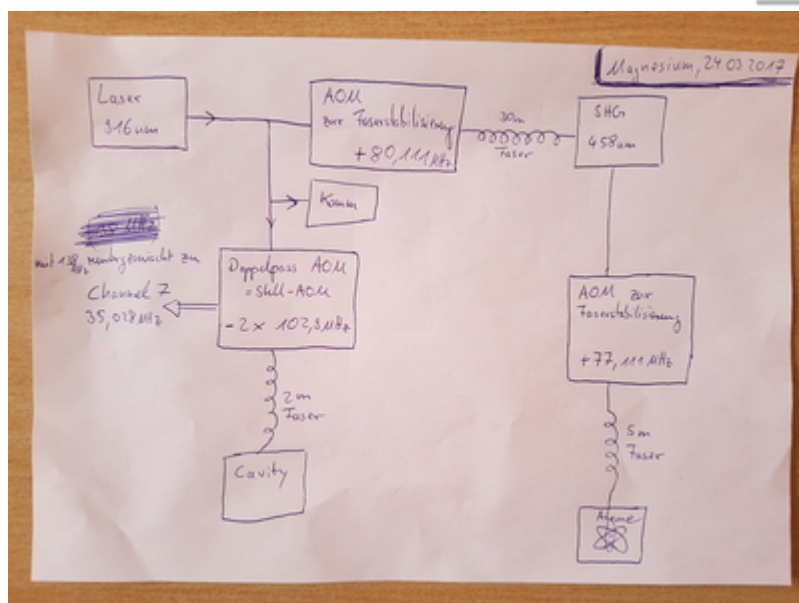
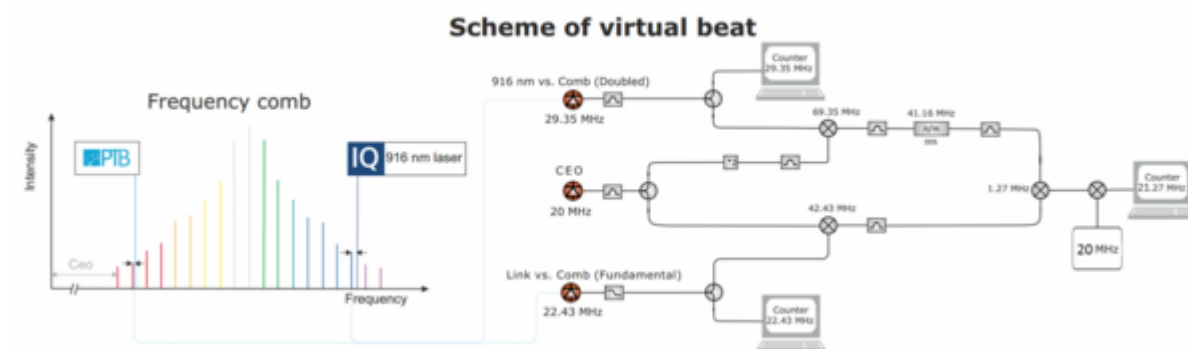


# Notes/Informations

## Frequency-Comb Hannover

| Channel | Measured                           | Frequency    | Sign | Interval       | Max outliers (Alarm) | F(x)    |
|---------|------------------------------------|--------------|------|----------------|----------------------|---------|
| CH1     | IQ-Resonator (R1) vs. Comb         | 29.347 MHz   | -    | $\pm 1$ kHz    |                      | -fx     |
| CH2     | CEO                                | 20 MHz       | -    | $\pm 2$ Hz     |                      | -fceo   |
| CH3     | Reprate                            | 6.250001 MHz |      | $\pm 0.002$ Hz |                      | frep    |
| CH4     | Link vs. Comb                      | 22.432 MHz   | -    | $\pm 300$ Hz   |                      | -fy     |
| CH5     | Virtualer Beat (Link vs. IQ-Laser) | 21,27143 MHz |      | $\pm 20$ Hz    |                      | fv      |
| CH6     | Manypoint-AOM                      | 36 MHz       |      | $\pm 5$ Hz     |                      |         |
| CH7     | Stell-AOM vom IQ-Laser             | 35.02865 MHz |      | $\pm 100$ kHz  |                      | f_Stell |
| CH8     | Rubidiumuhr referenziert auf GPS   | 10 MHz       |      | $\pm 0.002$ Hz |                      |         |

- Modenverhältnis: 1944000/3275292
- Repetitionsrate: 100,0000226 MHz



- AOM (+77.111 MHz) used for atom-lock + fiber stabilization(5m)
- AOM (+80.111 MHz) used for fiber stabilization(30m)
- Double-pass AOM (-2\*102,XX MHz) used for spectroscopy (frequency shift), feedback-loop!!!

- Channel 7 = 138 MHz (Synthesizer, referenced by 10 MHz GPS) - Double-pass AOM
- Atom frequency:  $\text{nu\_opt}(\text{Mg}) = (3275292 \cdot \text{col}(\text{e}) \cdot 16 - 2 \cdot \text{col}(\text{d}) - \text{col}(\text{c}) + 80,111\text{e}6) \cdot 2 + 77,111\text{e}6$
- Laserfrequency:  $f_{\text{laser}} = 3275292 \cdot \text{frep} \cdot 16 - 2 \cdot \text{fceo} - f_x$
- Resonator 1 frequency:  $f_{\text{R1}} = 3275292 \cdot \text{frep} \cdot 16 - 2 \cdot \text{fceo} - f_x + (-2 \cdot f_{\text{AOM\_R1}})$
- Double-pass AOM:  $f_{\text{AOM\_R1}} = 138 \text{ MHz} - f_{\text{Stell}}$

## Virtuel-Beat

- $f_v = (f_y + \text{fceo}) - (f_x + 2 \cdot \text{fceo}) \cdot (1944000/3275292) + (2 \cdot 10 \text{ MHz})$

## Evaluation (PTB)

- $f_x = \text{col}(\text{c})$  (#1, negatives  $f_x$ )
- $\text{fceo} = \text{col}(\text{d})$  (#2) (negatives  $\text{fceo}$ )
- $\text{frep} = \text{col}(\text{e})$  (#3,  $\text{frep}/16$ )

## Test analysis

- $\text{nu\_opt}(\text{Mg}) - \text{nu}(\text{Mg2015})[\text{Hz}] = \text{nu\_opt}(\text{Mg}) - 655058646691000$

→  $\text{nu\_opt}(\text{Mg}) - \text{nu}(\text{Mg2015})[\text{Hz}] = (f_{\text{laser}} + 80,111\text{e}6) \cdot 2 + 77,111\text{e}6 - 655058646691000$

## Frequency-Comb Braunschweig

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