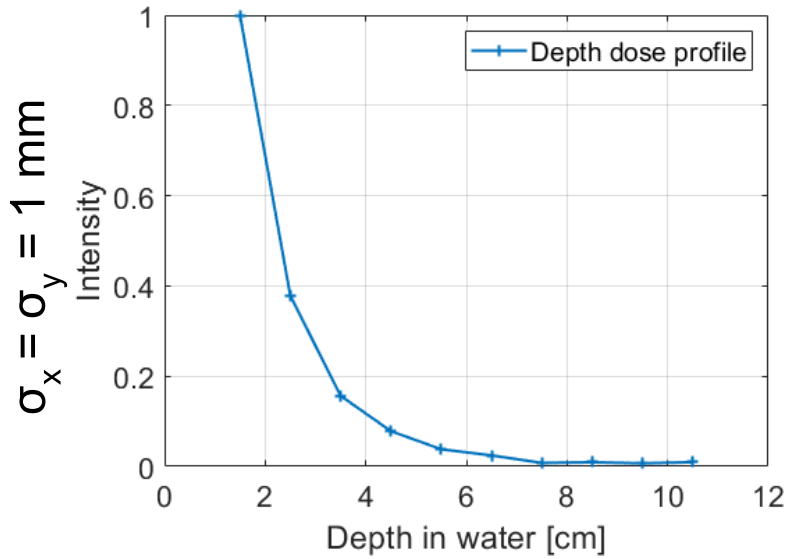


# Report about water phantom experiments, HZDR preparations and in air calibration of films

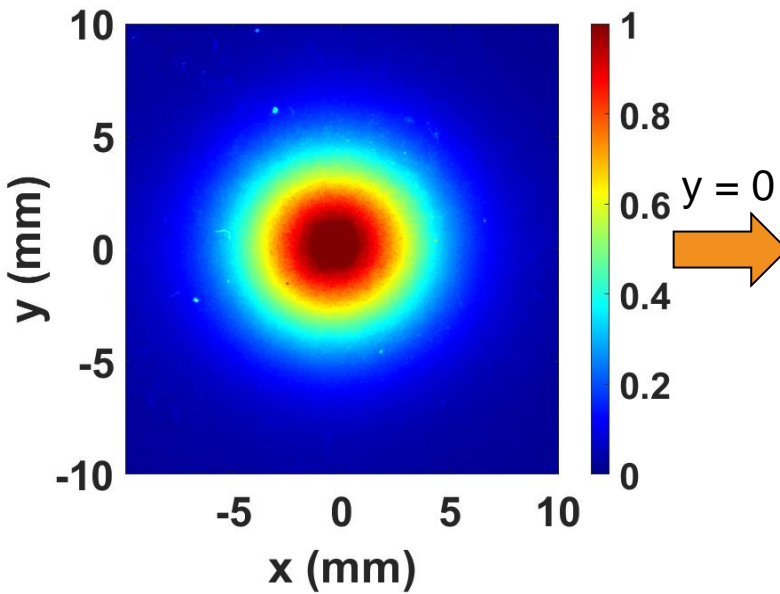
Felix Riemer

PPS, 23.02.2023

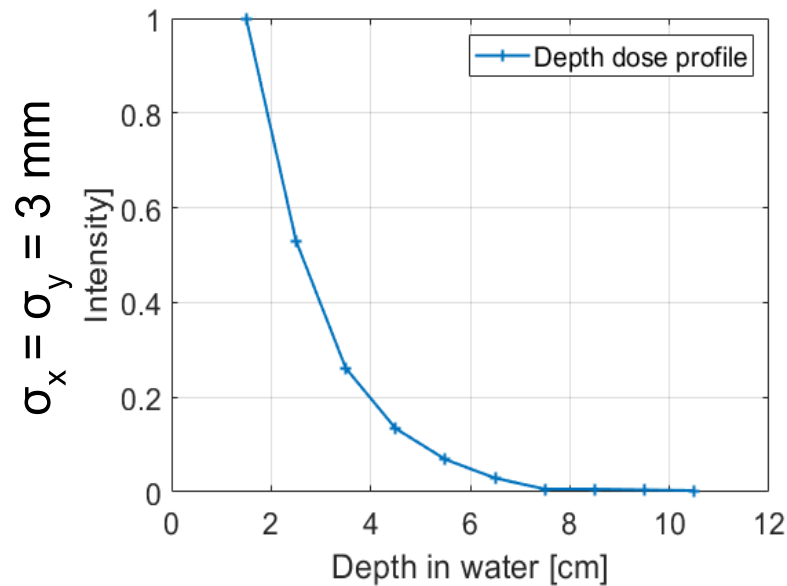
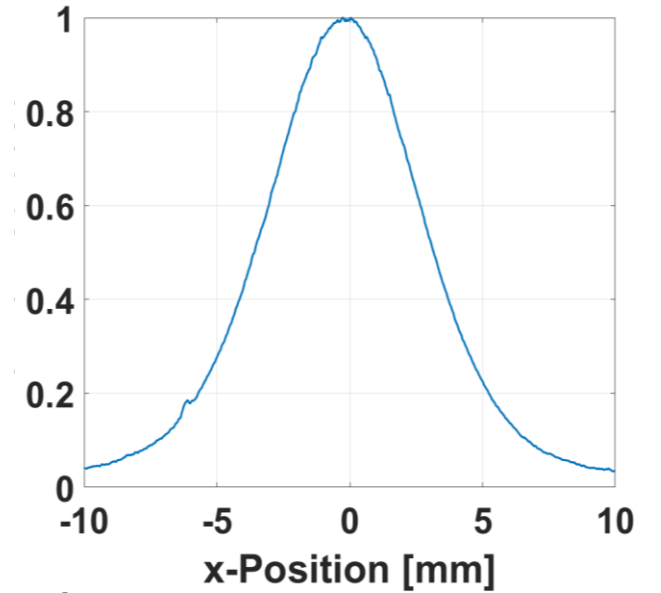
# Water phantom: Depth dose curve & beam profile



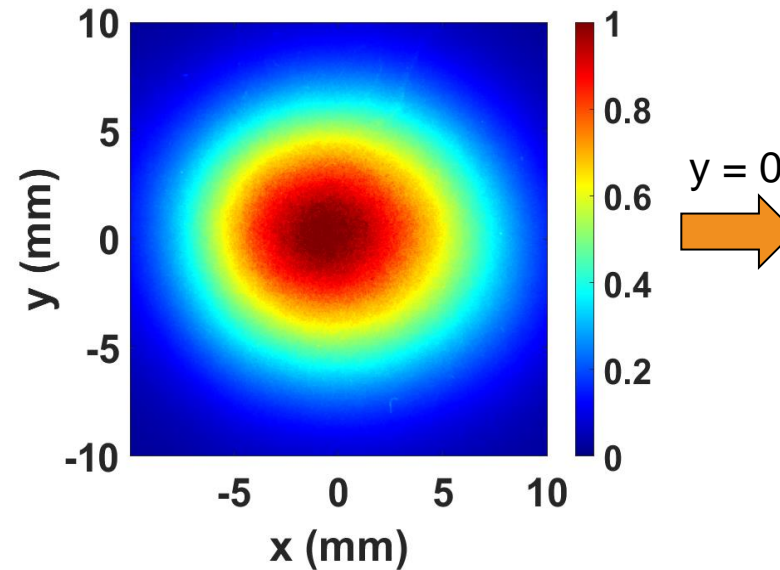
1.5 cm



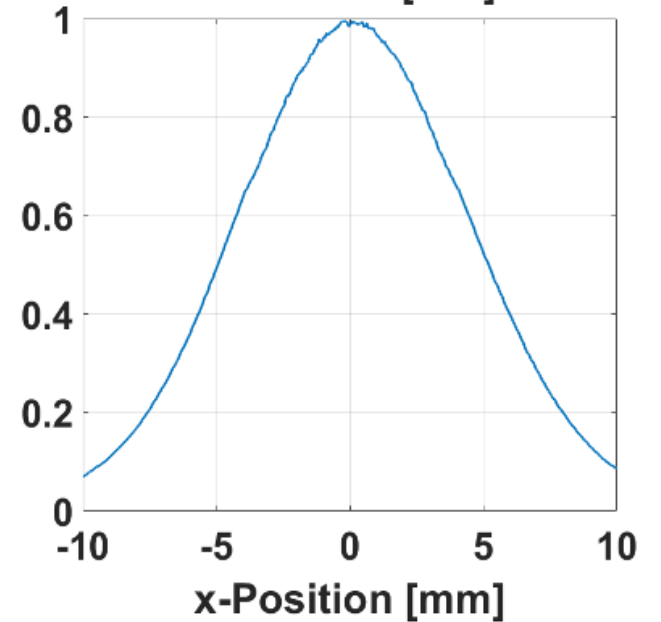
Relative dose



1.5 cm



Relative dose



# Water phantom: Other planned measurements / improvements

## Planned measurements

- Measurement plan was discussed with Xiangkun
- 4 different beam optics planned
  - Charité high dose rate beam optics
  - Charité low dose rate beam optics
  - High/low charge focused as good as possible

## Improvements

- Lead shielding on side of beam pipe (done)
- Grounding of water (done)
- Measurement at water depth = 0 (outside of phantom)

# Preparation for HZDR

**Goal: 90% homogeneity in 5x8 mm rectangle, max dose 30 Gy**

## Analysis dose (High dose rate)

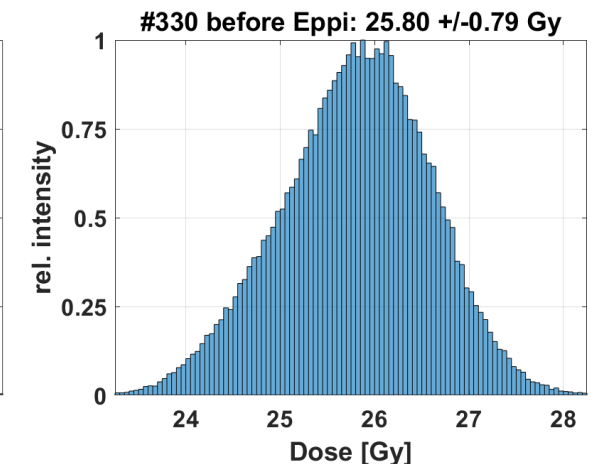
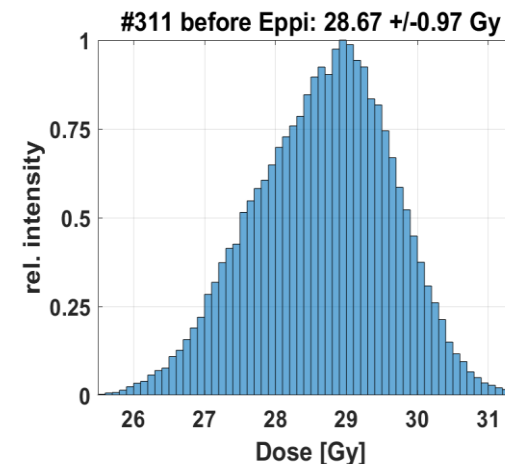
- 12 films irradiated
- **5mm plate:**  
2x doubled dose
- **10mm plate:**  
5x doubled dose, 1x quadruple dose  
(plate thickness not changed in  
FLUKA/Python???)

## Homogeneity:

- Very good for 5mm & 10 mm plate (>90%)
- no mayor difference between both cases

## Analysis dose (low dose rate)

- 12 films irradiated
- **5mm plate:**  
dose a little too low
- **10mm plate:**  
dose a little to high



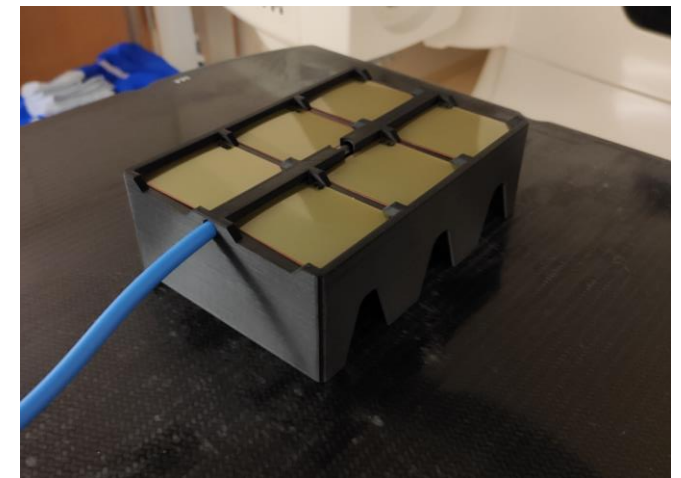
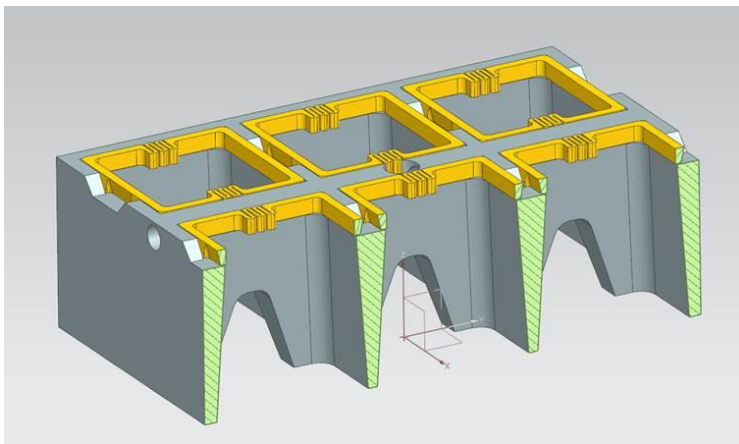
# In air calibration of films

## Calibration in stack of plates

- Film calibration was done at medical irradiation facility at Charité
- Films and reference dosimeter were placed in stack of plates
- Is calibration valid for our in air setup? -> Needs to be checked!

## In air setup

- 3D printed holder: films and dosimeter float in the air

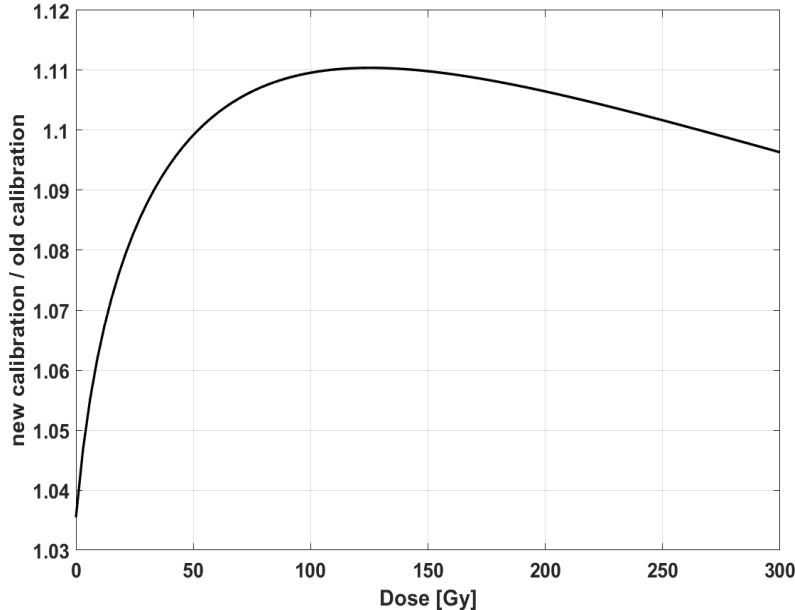


# Results of new calibration

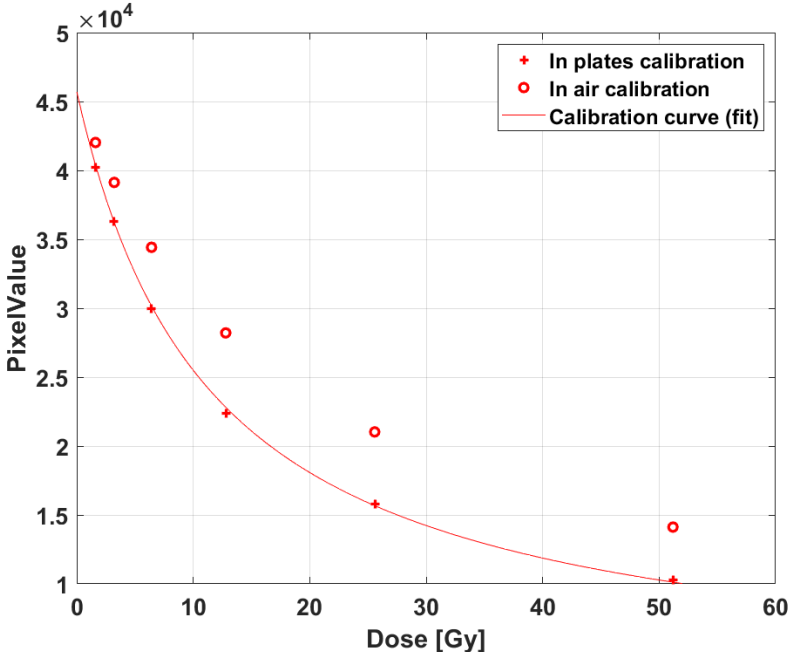
## Analysis of films

- Films in plates were irradiated from 0.1 Gy up to 300 Gy (15 films)
- Films in air were irradiated from 1.6 Gy up to 51.2 Gy (6 films)
- Inner 3x3 cm<sup>2</sup> square (films are 5x5 cm<sup>2</sup>) was defined as area of interest

**New vs. Old calibration (in plates)**



**New vs. in air calibration (red channel)**

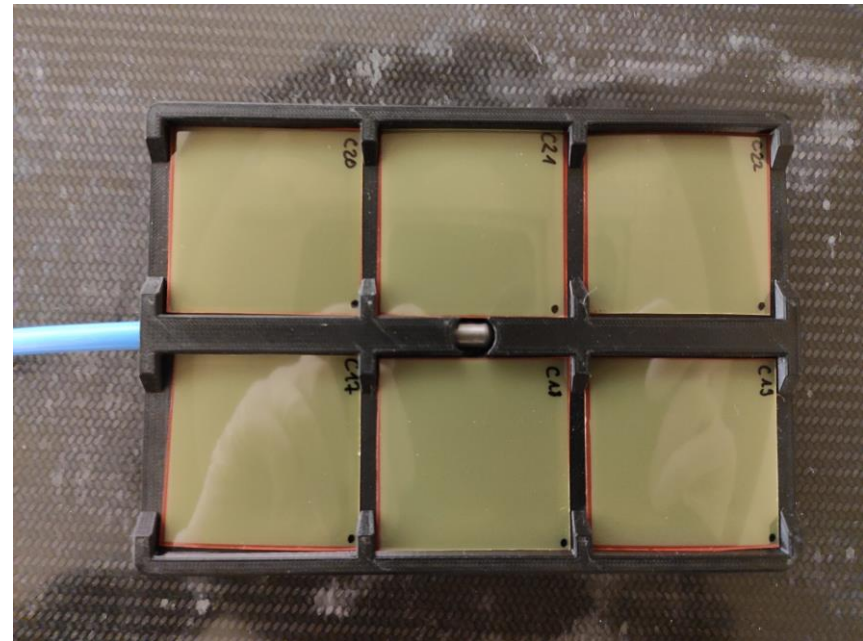
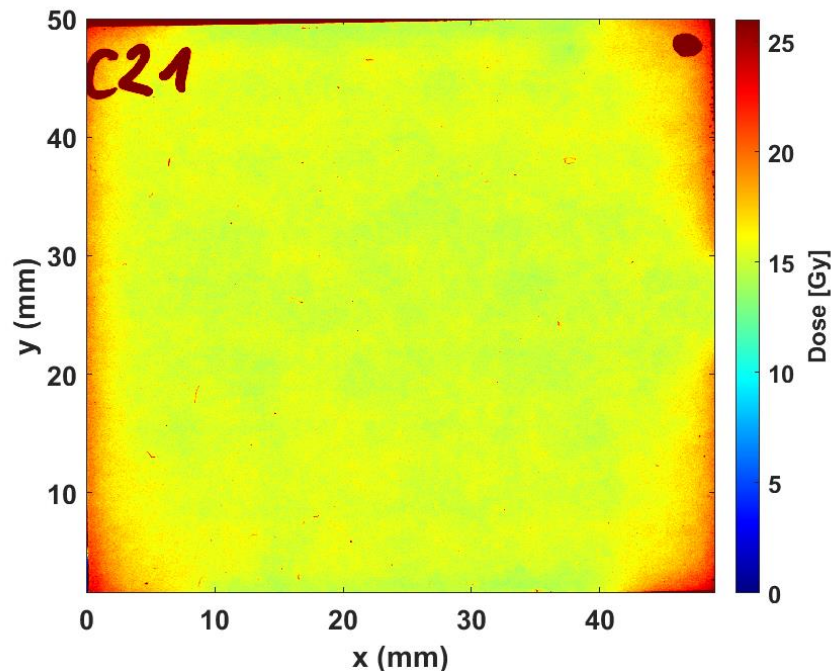


In air measurements are way off -> possible explanation on next slide

# Difficulties of in air calibration

## Scattering....

- There was still some scattering from the holder.
- Did not affect inner area of films -> BUT (most probably) the dosimeter
- Dose value on edges corresponds to measured dose with dosimeter
- Holder needs to be improved (larger hole for dosimeter) -> Redo experiment





# Summary

- **First results for water phantom experiments were shown -> more are planned**
- **Homogeneity is fine, but absolute dose needs to be adjusted/handled carefully**
- **Difficulties for in air calibration -> Holder needs to be improved and experiments redone**