

# **Irradiation testbeam in PSI**

(Goal & Preparation)

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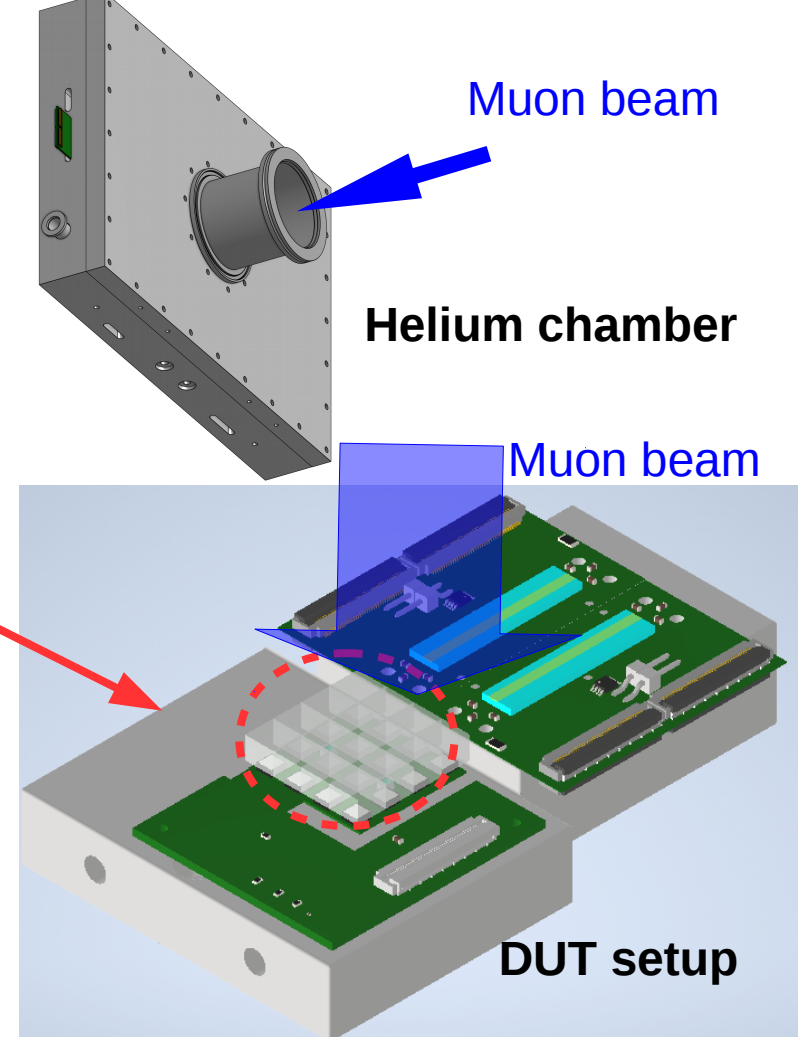
# Motivation & Goals

- **Mu3e Phase I run**
  - Tile SiPM Dose (expected): up to  $5 \times 10^{10} n_{eq}/cm^2$  (0 to  $10^\circ C$  )
- **Previous study**: timing resolution will be effected by irradiation damage
  - MEG-II:  $7 \times 10^9 n_{eq}/cm^2$ 
    - timing resolution deteriorates by  $\sim 29\%$  (  $30^\circ C$  )
    - timing resolution deteriorates by  $\sim 6\%$  (  $10^\circ C$  )
  - SiPM test in KIP by Maximilian Proll (2014): Sr-90:  $\sim 10^{13} e/cm^2$ 
    - Dark count rate increases by 10 times ( $\sim 25^\circ C$ )
- **To Check** whether the matrix fulfills the requirement for full phase I run

# Setup information

- Start from July 27<sup>th</sup> @piE5 (3 weeks)
- Helium chamber:
  - Helium gas
  - Target mounted inside (polyethylene)
- DUT: SiFi SiPM + Tile Matrix
  - Adapter board
    - Will be tested this week
  - Water cooled (about 10)
    - designed and now reviewing
    - Monitored by temperature sensors

Tile Matrix



# Plan for test

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- Test everything in KIP (cooling plate, adapter board...)
- Ship Tile Matrix setup to PSI
- Irradiation (with HV on) until reach Phase I dose  $5 \times 10^{10} n_{eq}/cm^2$
- Storage in low temperature
  - CMS lab in ETH until able to transport back to HD
  - Store in fridge in Heidelberg (**to confirm**)
- Further testbeam in DESY (maybe in October)
  - Transportation: box with dry ice
- If “No” after irradiation:
  - Further more detail study will be done

Dry ice box  
(borrow from PI)



# Preparation

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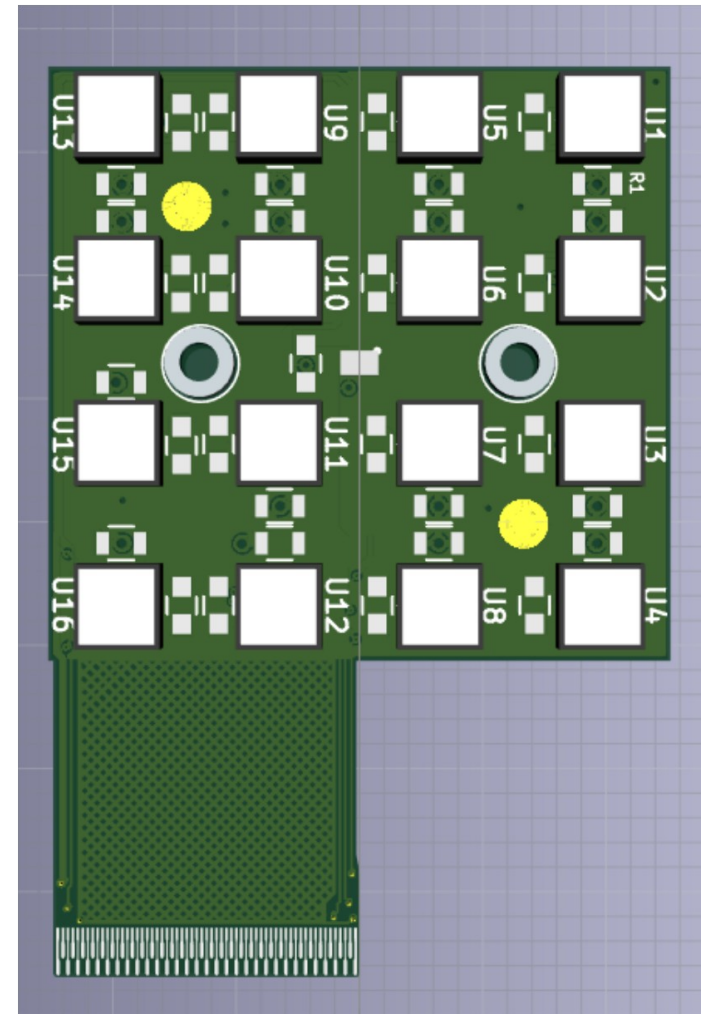
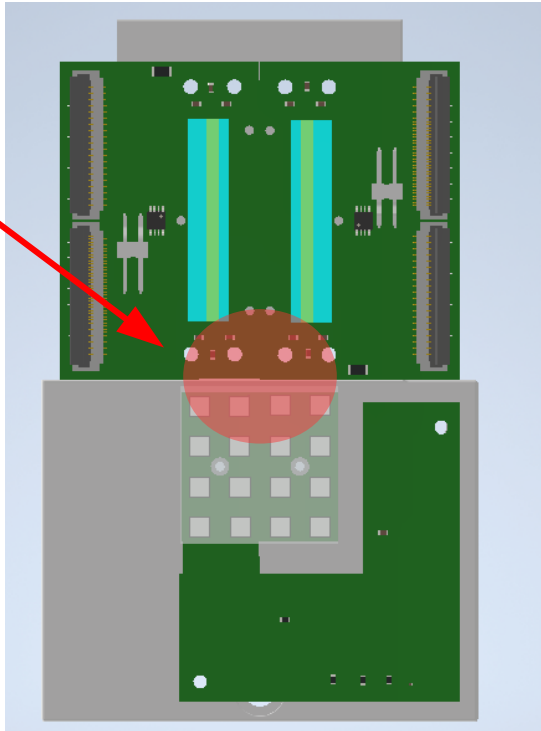
- Tile Matrix ✓
- Adapter boards: Already got and will be test this week ✓✓
- Cooling plate: reviewing with full setup (Dose estimation) ✓✓
- Storage
  - Right after test: CMS lab in ETH (confirmed with Lukas) ✓✓
  - Transportation: Box with dry ice ✓
  - In HD: fridge in lab (more information needed) ✓✓

# Backup slides

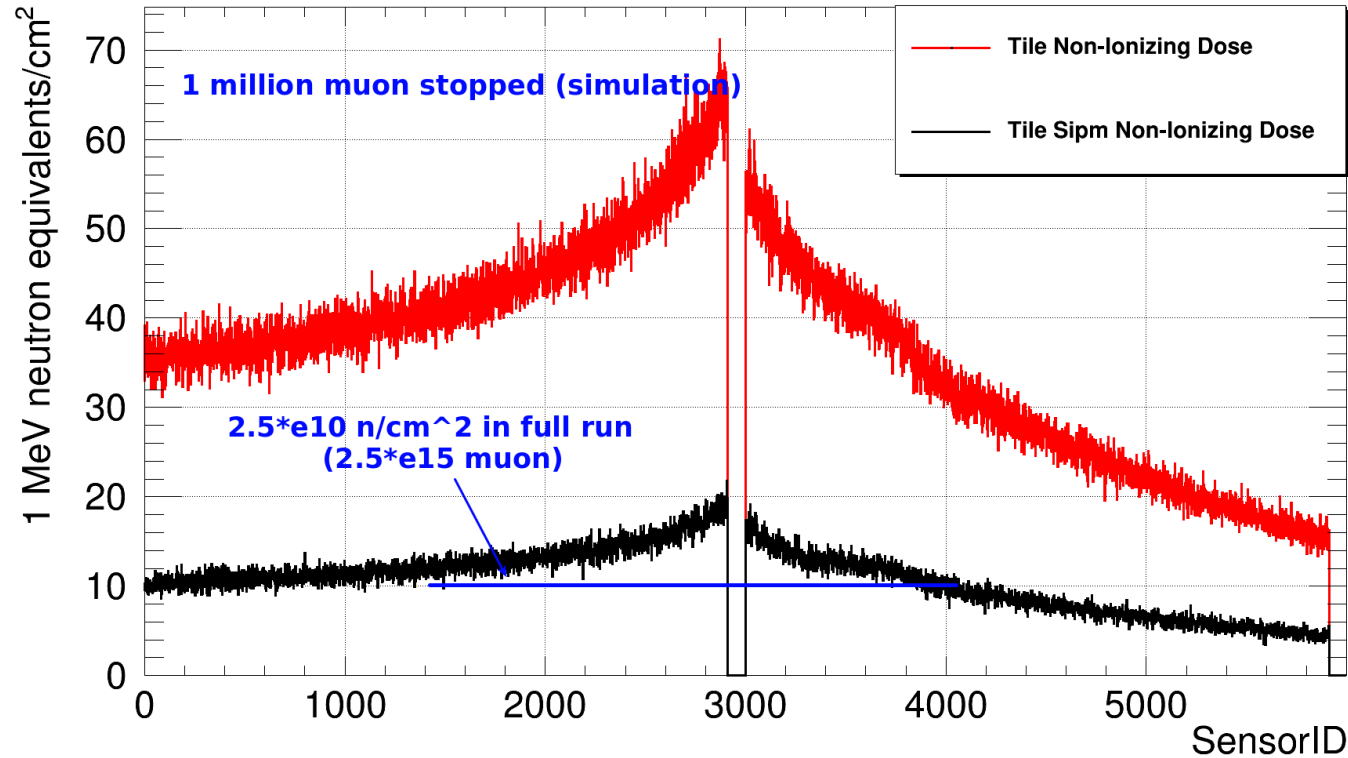
# BK slides

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Beam profile



# Simulation for mu3e tile





# Simulation position vs dose

