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Investigation of the measured signal of protons in pixelated semiconductor detectors

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List of contents

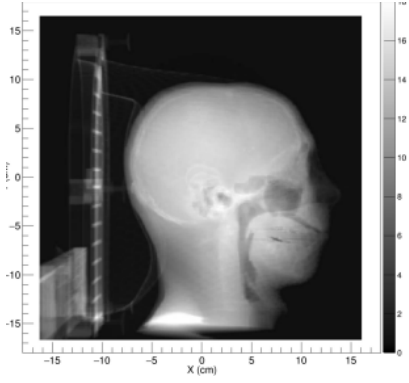
- About me
- Proton imaging
- Motivation for the bachelor thesis
- Experimental setup
- FE-I4
- What to do next?

About me

- Name: Felix Gläsemann
- Age: 27
- Intended degree: Bachelor in medical physics
- Hobbies:
  - → Running, swimming
  - → Reading
  - → Going out with friends

Proton imaging

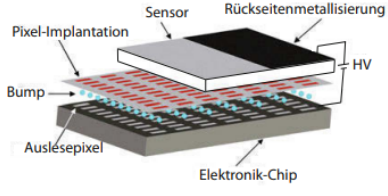
- Proton beams to create images of tissue
  - → Protons interact with tissue
  - → Signals from the interaction get detected
  - → Images are reconstructed
- Advantages:
  - → Reduced radiation dose
- Application in medical imaging and materials science



Reconstructed proton radiograph (RPR) [1, p. 99]

Motivation for the bachelor thesis

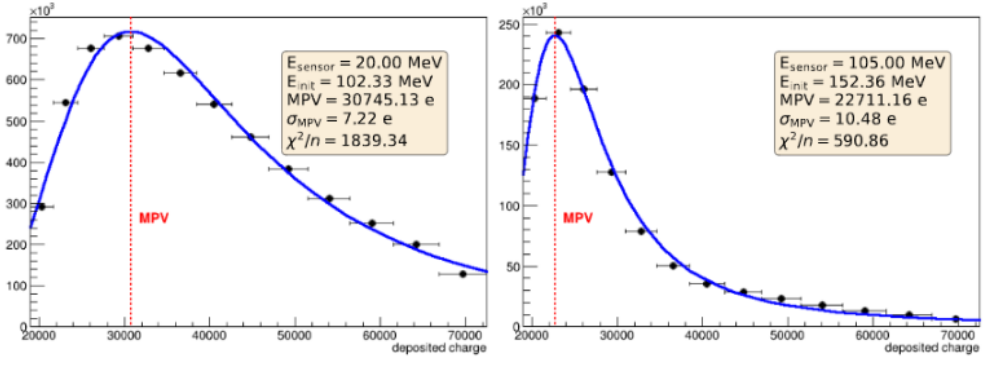
- Physical and medical application
  - → Improving diagnostics through **proton imaging** and **therapy**
  - → Better understanding of proton detection for different tunings of the detector
  - → Influence of tuning on clustering and measured charge



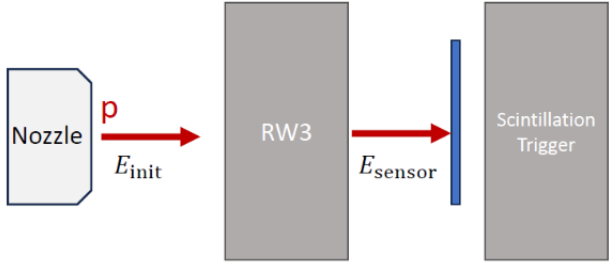
Schematic structure of a pixelated silicon detector [2, p. 334]

Motivation for the bachelor thesis

- Comparison between experiment and simulation



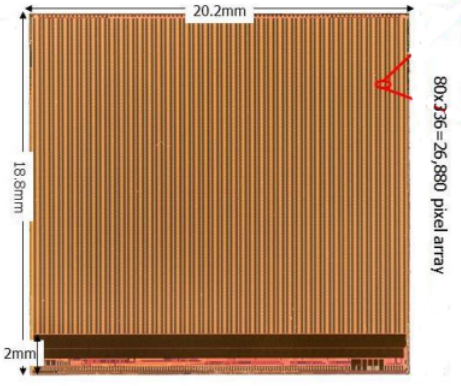
Experimental setup



- RW3 phantom used to lower the energy of the protons
- FE-I4 used for detection

FE-I4 module

- FE-I4
  - → Developed for ATLAS Experiment
  - → High-speed data readout
  - → Identify and process relevant data from particle collisions
- RW3 phantom
  - → Variable measuring depth (0 to 300 mm)
  - → Made of water-equivalent RW3 material



FE-I4 module [3, p. 3]

What's next?

- Building the experimental setup using Allpix Squared
- Start the simulation and get first results
  → Compare results from experiment and simulation

Questions?

Literature

[1] Chelsea Miller et al. *Journal of Radiation Oncology*. 2019. URL: https://doi.org/10.1007/s13566-019-00376-0.

[2] Hermann Kolanoski and Norbert Wermes. *Teilchendetektoren*. 2016.

[3] Marlon Barbero et al. *The FE-I4 Pixel Readout Chip and the IBL Module*. 2012. URL: https://cds.cern.ch/record/1415701/files/ATL-UPGRADE-PROC-2012-001.pdf.