

A Digital Tracking Calorimeter based on Silicon Pixel Detectors for Proton Computed Tomography

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Proton computed tomography is an actively developing method [1,2] for planning patient treatment in hadron therapy. An important part of this method is to measure the energy of the protons passing through patient in order to determine the relative stopping power of his tissues. For this purpose, a digital track calorimeter based on modern detector technologies using silicon pixel sensors [3] can be used. In this report the results of experimental work (proton beams) on the creation of digital track calorimeter will be presented, together with the results of silicon pixel sensors properties and characteristics studies. The results of high accuracy charged particle tracks reconstruction will be presented. This reconstruction allows to imagine phantom by the deflection of protons in the tissue (Figure 1).

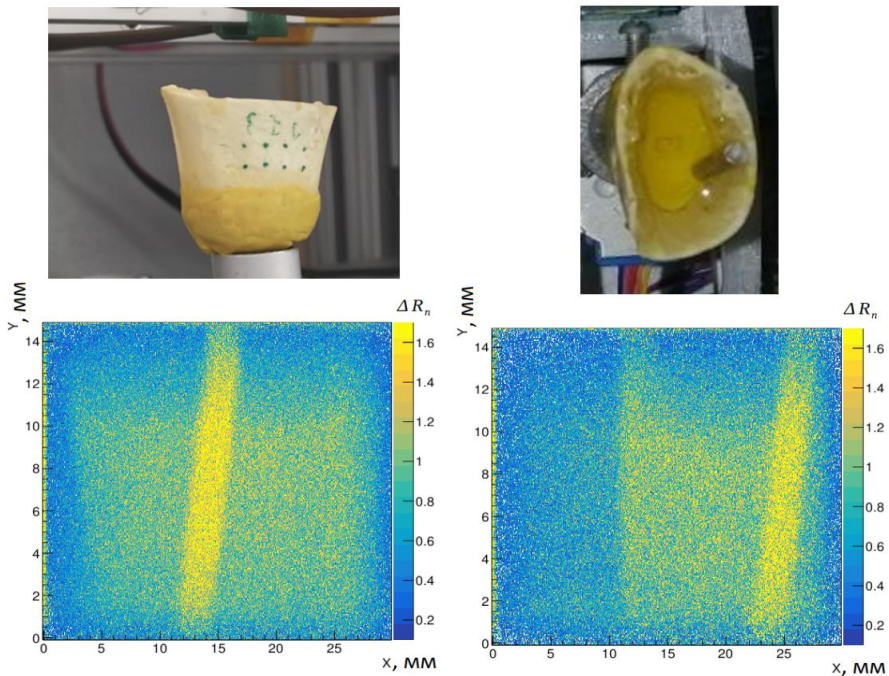


Fig.1. The images of phantom (bone with water and tin wire, up), collected according to the deflections of protons in tissues.

- [1] J.T. Taylor et al., Proton tracking for medical imaging and dosimetry, *Journal of Instrumentation*, 10 C02015 (2015).
- [2] Johan Alme et al., A High-Granularity Digital Tracking Calorimeter Optimized for Proton CT, *Journal Name, Phys Sec Med Phys and Imag*, 8, 20 (2020).
- [3] V. I. Zhrebchevsky et al., Silicon Detector Systems for Investigating Superdense Nuclear Matter at the NICA Accelerator Complex, *Bull. Russ. Acad. Sci.: Phys.*, 88, 1235–1248 (2024).