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Development of a Floating Strip Micromegas Detector for a Clinical Proton Computed Tomography System

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A high-performing clinical proton computed tomography (pCT) system requires single particle tracking detectors with good spatial resolution, high rate capability, and a minimal material budget, along with a residual energy detector. Large-area floating strip Micromegas detectors are particularly well suited for this purpose, as they provide a very low material budget, while achieving the detector dimensions up to 40 cm required for clinical imaging. The design principle focuses on minimizing the material budget to reduce scattering within the detector, especially important for the low energy protons, encountered in pCT.
At the chair for medical physics of the Ludwig-Maximilians-Universität-München (LMU Munich), a floating strip Micromegas with an active area of 200x200 mm^2 was developed and manufactured in-house as a study for constructing a detector with an active area of 400x400 mm^2 for future use in a clinical pCT. The design of the detector as well as the development of the in-house manufacturing processes, including photolithographic techniques to produce readout structures from 125µm thick FR4 material with 35µm copper cladding and 25µm Kapton foil with 17µm copper cladding, will be presented. To ensure a planar surface for the readout structure, the FR4 material is glued to an aramide honeycomb structure using a vacuum setup. The gluing process will be described in detail. First characterization measurements using a Fe-55 source will also be shown.

Primary experiment

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