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Laboratory and test beam characterization of ARCADIA MAPS

The ARCADIA INFN collaboration developed a fully Depleted Monolithic Active Pixel Sensor (DMAPS) as technology demonstrator, using LFoundry 110nm technology node. The whole high-resistivity substrate can be depleted thanks to a custom backside process, that allows a very good electric field uniformity inside the sensing volume.

Technology demonstrators have been developed with an overall active thickness of 50, 100 and 200 μm which makes them suitable not only for charged particles detection, but also for X-ray detection, as well as near-UV imaging. The readout architecture is capable to handle a rate up to 100 MHz cm^{-2} , and it has been optimized for low power consumption, including a “space mode” for very low power consumption. All these features make it suitable for application at next-generation experiments, space experiments and medical imaging.

Characterization on the ARCADIA Main Demonstrator (MD3) with 200 μm thickness has been carried out with table-top experimental setups, including ^{55}Fe radioactive source and X-ray tube. A custom-made three planes telescope has also been tested with a proton beam of 120 GeV between June and July 2024 at Fermilab, to estimate tracking capabilities with Minimum Ionizing Particles. Results on laboratory characterization and preliminary results on tracking resolution and efficiency from in-beam measurements are presented in this poster, together with future developments and applications.

Primary authors: ZINGARETTI, Alessandra (Istituto Nazionale di Fisica Nucleare); PANTOUVAKIS, Caterina (Istituto Nazionale di Fisica Nucleare); BONINI, Chiara (Istituto Nazionale di Fisica Nucleare); CHIAPPARA, Davide (Istituto Nazionale di Fisica Nucleare); PANTANO, Devis (Istituto Nazionale di Fisica Nucleare); WYSS, Jeffery (Istituto Nazionale di Fisica Nucleare); DA ROCHA ROLO, Manuel Dionisio (Istituto Nazionale di Fisica Nucleare); RIGNANESE, Michele (Istituto Nazionale di Fisica Nucleare); GIUBILATO, Piero (Istituto Nazionale di Fisica Nucleare); CIARLANTINI, Sabrina (Istituto Nazionale di Fisica Nucleare); MATTIAZZO, Serena (Università di Padova)

Presenter: RIGNANESE, Michele (Istituto Nazionale di Fisica Nucleare)