Contribution ID: **161** Type: **Poster**

Pixel chamber: a solid-state active-target for 3D imaging of charm and beauty

Tuesday, 24 May 2022 08:46 (1 minute)

A silicon-based modern detector, which acts as an active-target capable of imaging particles in 3D, similar to a bubble chamber, does not exist. Ideas for a silicon active target providing continuous tracking were put forward already almost 40 years ago, but the required technology did not exist until recently.
In this talk, a project to construct the first silicon active target based on silicon pixel sensors, called Pixel Chamber, will be described. The aim is to create a bubble chamber-like high-granularity stack of hundreds of very thin monolithic active pixel sensors glued together, capable of performing continuous, high resolution (O(μm)) 3D tracking, including open charm and beauty particles. For the stack, the ALPIDE sensor, designed for the ALICE experiment at the CERN LHC, will be used.
The power consumption of a stack consisting of hundreds of sensors could result in very high temperatures, affecting the performance of the detector, thus requiring a cooling scheme. Simulations were carried out to evaluate different options and converge on a cooling solution. Preliminary results of laboratory cooling tests will be presented.
High-efficiency tracking and vertexing algorithms were developed to reconstruct tracks and vertices inside Pixel Chamber. They were tested on Monte Carlo simulations of proton-silicon interactions occurring inside the detector. The vertex resolution can be up to one order of magnitude better than state-of-the-art detectors like those of LHC experiments. The tracking algorithm has been also tested with real data, using tracks produced in a single ALPIDE sensor exposed to electrons and hadrons beams with very good results.
Finally, the first results obtained for the development of prototypes of stacks of few ALPIDE sensors will be presented. Future perspectives of the project will be illustrated at the end of the talk.

Collaboration

Primary authors: MASONI, Alberto (CA); DE FALCO, Alessandro (Department of Physics –University of Cagliari, Italy); MULLIRI, Alice (Department of Physics-University of Cagliari and INFN Cagliari); CICALO', Corrado (Istituto Nazionale di Fisica Nucleare); MARRAS, Davide (CA); CASULA, Ester Anna Rita (Department of Physics –University of Cagliari, Italy); USAI, Gianluca (Department of Physics –University of Cagliari, Italy); MUSA, Luciano (CERN); MAGER, Magnus (CERN); TUVERI, Marcellino (Istituto Nazionale di Fisica Nucleare); ARBA, Mauro (Istituto Nazionale di Fisica Nucleare); BHATTACHARYA, Purba (School of Physical Sciences, National Institute of Science Education and Research, India); SIDDHANTA, Sabyasachi (Istituto Nazionale di Fisica Nucleare)

Presenter: MULLIRI, Alice (Department of Physics-University of Cagliari and INFN Cagliari)

Session Classification: Solid State Detectors - Poster session