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RIPTIDE: a proton-recoil track imaging detector for fast neutrons

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Neutron detectors are crucial for various research fields, including nuclear, particle, and astroparticle physics, as well as hadrontherapy and radiation protection. Not ionizing directly, neutrons are detected via nuclear interactions producing charged particles or electromagnetic radiation. As a result, the detection efficiency depends on the probability of neutron interaction in the detector and on the escape probability of the reaction products.
Nowadays, proton-recoil track imaging remains a challenging task due to the need of a high photon sensitivity, among several reasons.
To overcome these limitations the RIPTIDE (RecoIl Proton Track Imaging DEtector) project was proposed: a monolithic plastic scintillator coupled to an optical system and to CMOS technology imaging devices can act as a recoil-proton track detector, enabling the possibility of a real-time analysis of the energy loss along the charged particle track. The capability of measuring both single and double neutron-proton scattering makes the detector suitable for a wide range of applications.
In this contribution we report on the status of the project, both on a software and hardware standpoint. A GEANT4 optical simulation to explore the possibility of accurately reconstructing the tracks and vertices of neutron interactions within the scintillator volume was developed together with track reconstruction algorithms to provide a reasonable starting setting for the experimental setup. Moreover, the progress on the construction of the first RIPTIDE prototype, from the detector design to ongoing tests of optics system and sensors will be reported.

Collaboration

Role of Submitter

I am the presenter

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