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A new approach to use LYSO scintillators for polarimetry in the storage ring EDM measurements

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One of the fundamental questions of modern particle physics is the existence of finite electric dipole moments (EDM) of the hadrons. In case of charged particles, like protons and deuterons, the proposed method is the precise determination of the precession of the beam polarization vector in a storage ring. For that purpose, the JEDI (Jülich Electric Dipole moment Investigations) collaboration is developing a precise polarimeter detector based on LYSO scintillator coupled to SiPM modules. They are capable of stopping almost 300 MeV elastically scattered deuterons and protons. Measuring the kinetic energy of the scattered projectiles ensures the accurate reaction identification leading to a precise polarization determination.
To create the long-term reliable detector system, we have performed four iterations of the detector development (three of them since last CALOR 2016). Currently, we are operating 52 LYSO modules with a dedicated dead-time less sampling ADC readout system. The modules are very compact, due to modern high pixel density SiPM readout. A summary of all test beam times and the accumulated experience will be presented and discussed.

Secondary topics

Polarimetry

Applications

Other

Primary topic

Scintillators

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