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Beam test characterization of oriented crystals in strong field conditions

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It is well known that the lattice structure of a scintillating crystal can influence the development of the electromagnetic processes inside it. For electron and photon beams aligned with the symmetry axis of a crystal, if the strong field condition is satisfied, a reduction of the radiation length X_0 is expected. However, these effects have been experimentally observed only in the last few years, with crystal samples limited in number, composition and length. The lack of experimental data for these phenomena makes it harder to properly account for them in the design and simulation of innovative radiation detectors and equipment, such as active beam dumps or compact electromagnetic calorimeters. Recent experiments, performed by the STORM and KLEVER collaborations at the CERN SPS extracted beam lines, demonstrated a significant reduction of X_0 for electron and photon beams impinging on a crystal within $\sim 0.1^\circ$ from one of its symmetry axes. This contribution will describe such experiments, reporting preliminary results for a variety of scintillating crystals (a 1 X_0 $PbWO_4$, a 2 X_0 $PbWO_4$ and a 1 X_0 pure W) and also, for the first time, for an oriented Cherenkov crystal (a 1 X_0 PbF_2).

In-person participation

Yes

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