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Compact forward e.m. calorimeter based on oriented crystals

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Progress in high-energy physics has been closely tied to the development of high-performance electromagnetic calorimeters. Recent experiments have demonstrated the possibility to significantly accelerate the electromagnetic shower development inside the scintillating crystals, typically used to build homogeneous calorimeters, when the incident beam is aligned with a crystallographic axis. In particular, an effective reduction of the radiation length was measured when a ultrarelativistic electron or photon beam is oriented with an high-Z scintillator crystal along one of its main axes.
Here we propose a new type of ultra-compact ultra-fast e.m. calorimeter, based on oriented ultrafast PWO (PWO-UF) crystals. An oriented crystal calorimeter will open the way for applications at the maximum energies achievable in current and future experiments. Such applications span from forward calorimeters to compact beam dumps for the search for light dark matter, to source-pointing space-borne γ-ray telescopes to decrease the size and the cost of the calorimeter needed to fully contain e.m. showers initiated by GeV to TeV particles.

Collaboration / Activity

OREO (INFN CSN5)

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