

Characterization of ParTI Phoswiches with the Use of Charged Pion Beams

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ABSTRACT

The Partial Truncated Icosahedron (ParTI) detector array consists of 15 phoswiches. Each phoswich is made of two scintillating components – a thallium-doped cesium iodide (CsI(Tl)) crystal and an EJ-212 scintillating plastic – coupled to a photomultiplier tube. Both materials have different scintillation times and are sensitive to both charged and neutral particles. The type of particle and amount of energy deposited determine the shape of the scintillation pulse as a function of time. By integrating the fast and slow signals of the scintillation pulses, a “Fast vs. Slow Integration” plot can be created that produces particle identification lines based on the energy deposited in the scintillating materials. Four of these phoswiches were taken to the Paul Scherrer Institute (PSI) in Switzerland where π^+ , π^- , and proton beams were scattered onto the phoswiches to demonstrate their particle identification (PID) capabilities. Using digitizers to record the detector response waveforms, pions can also be identified by the characteristic decay pulse of the muon daughters.