

The POKER calorimeter

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The POKER (POsitron resonant annihilation into dark mattER) project aims to perform a missing-energy measurement employing a ~ 100 -GeV positron beam impinging on an active thick target. The beam interaction with this detector could produce feebly interacting massive particles, exiting from it undetected and carrying away a significant fraction of the primary positron energy. The crucial element of the POKER project is a high-resolution electromagnetic calorimeter used as the target, composed of lead tungstate crystals with a silicon photomultiplier-based readout system.

In this context, the POKERINO detector is a prototype for this new high-resolution electromagnetic calorimeter that served as a test bench to validate the POKER project's technical choices. It consists of a 3×3 matrix of PbWO_4 crystals, each with dimensions $2 \times 2 \times 22\text{-cm}^3$ read by four SiPMs. The POKERINO response to high-energy particles was measured at the H6 beamline of the Super Proton Synchrotron (SPS) at CERN in 2024. This facility provides electron, positron, muon or hadron beams with energies ranging from 10-GeV to over 100-GeV, allowing testing POKERINO with various particle types over a wide energy range. In my contribution, I will present the POKERINO energy-resolution and linearity studies achieved through the test beam at CERN, highlighting how this analysis influenced the design of the detector. I will also report the latest achievements in the final POKER calorimeter R&D effort, whose construction and preliminary characterization with cosmic rays were completed in Genova in early 2025.

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