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Simulation of the total MPD/ECAL setup for cosmic ray calibration

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The Multi-Purpose Detector (MPD) has a main goal to investigate the hot and dense baryonic matter produced in heavy-ion collisions at the NICA collider [1]. An important subsystem of the MPD detector is the barrel electromagnetic calorimeter (ECal), which allows the high-precision measurement of the spatial coordinates and energy of photons and electrons. ECal consists of 50th half-sectors containing 768 trapezoidal "shashlyk" type towers in a projective geometry orientation [2]. Currently, the half-sectors undergo calibration on cosmic rays in two modes using inclined and longitudinal muon tracks relative to the tower axis. In simulation cosmic muons are produced on the vertical cylinder surface using a fast cosmic muon generator [3]. For inclined tracks, when at least three adjacent towers are triggered in line, the energy deposition distribution shows a clear characteristic peak and its position determines the calibartion factor. This method depends on tower position in the total ECal setup. The next one is based on the fact of signal absence in the neighboring towers in relation to the investigated one and makes it possible to identify a peak with an average energy release in the higher region. Using both methods provides a good cross-check of the calibration procedure. A self-triggering capability of the readout system gives an opportunity to calibrate the calorimeter without using external detectors. For the inclined mode, energy depositions for calibration were obtained and parametrized for all towers. The longitudinal mode is also applicable, except for towers with a nearly horizontal orientation.

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