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Tests of the Electromagnetic Calorimeter for HADES Experiment at GSI

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Measurements of mass spectra of dilepton pairs in the HADES experiment in the energy domain of SIS18 and SIS100 (GSI, Germany) are very important to study the excitation function of the virtual photon radiation from dense nuclear matter. A large excess of the dilepton yield in the intermediate (0.14 < M < 0.6 GeV/c2) mass region points to a strong source generated from the high-density zone of HI collisions. A detail study of this phenomenon demands a precise knowledge of the hadronic cocktail, which is dominated by the η Dalitz decay. Precise measurements of dielectron spectra given by $\pi 0$ decay are also necessary for normalization. It is proposed to perform precise measurements of inclusive cross sections of $\pi 0$ and η-meson production by electromagnetic calorimeter (ECAL) based on lead-glass Cherenkov detector modules. The ECAL will replace the currently existing the HADES Pre-Shower detector, located at forward angles (18 < θ < 45 grad). An additional advantage of ECAL would be the improvement of the electron/pion separation at larger momenta (p > 400 MeV/c) as compared to the present situation. The total area of the proposed HADES calorimeter amounts to about 8 m2 and covers polar angles between 12 and 45 grad. with almost full azimuthal coverage. It was shown in beam tests that the ECAL energy resolution is (5-6)% · E - 1/2. Detailed simulations show that this enables the η-meson reconstruction in the forthcoming experiment on Ag+Ag collisions at 1.65 A GeV and in future measurements on SIS100 with Ni+Ni collisions at energy range 2 - 8 A GeV. In this report, we briefly present the main details of the detector layout, construction of the lead-glass Cherenkov detector modules, the support structure and the electronic readout. The Stand for test measurements of ECAL detector modules on cosmic rays is described in detail and main results of cosmic test measurements are presented.

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