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Multimuon detector for quasi horizontal EAS

Quasi horizontal showers produced by charged CR and gammas are constituted exclusively by muons, the other components being absorbed in the thick layer of the atmosphere they must cross to reach a detection system on the Earth surface. Their transverse dimensions are increased by the distance they must travel as well by the terrestrial magnetic field which tends to extend muon cloud and separate positive muons from negative ones. The extended wide transverse dimensions allow increasing the rate of detection of EAS produced by high energy CR by means of a single detector which samples the muon density in the shower. This concept has been already applied in the NEVOD-DECOR experimental complex at MEPhI in Moscow that could detect muon density of showers produced by very high energy CR up to more than 10^{18} eV. Due to the vertical orientation of DECOR planes and the presence of coordinate detector supermodules faced in two orthogonal azimuth directions, the azimuth acceptance of NEVOD-DECOR complex is nearly uniform and allows collection of near horizontal multimMuon events arriving from all azimuth angles. If several such azimuthally symmetric muon detectors could be provided, the total rate could be further increased, and muon density in several regions of each shower could be sampled, what allows in many cases to determine the position of the axis of the shower and therefore evaluate its energy event by event. An exercise based on 9 of such nearly azimuthally symmetric muon detectors is illustrated and evaluated. Furthermore, including in some of them iron magnets, the measurements of muon density could be complemented by measurements of the energy density, improving therefore the localization of the shower axis and the energy estimation of the shower.

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