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Measurement of the cosmic ray muon charge ratio with the OPERA Detector

The OPERA detector at the Gran Sasso underground laboratory (LNGS) was used to measure the cosmic ray muon charge ratio Rμ = Nμ+/Nμ− in the TeV energy region. We updated the muon cosmic ray analysis including data of 2008 and 2009 physics runs. We computed separately the muon charge ratio for single and for multiple muon events in order to select different energy regions of the primary cosmic ray spectrum and to test the Rμ dependence on the primary composition. Rμ is also shown as a function of the "vertical surface energy"Eμ cos(theta). A fit to a simplified model of muon production in atmosphere allowed the determination of the pion and kaon charge ratios weighted by the cosmic ray energy spectrum.

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