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The investigation of the hadronic interaction models using WILLI detector

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The WILLI detector, built in IFIN-HH Bucharest, in collaboration with KIT Karlsruhe, is a rotatable modular detector for measuring charge ratio for cosmic muons with energy < 1 GeV. It is under construction a mini-array for measuring the muon charge ratio in Extensive Air Showers. The EAS simulations have been performed with CORSIKA code.

The values of the muon flux, calculated with semi-analytical formula, and simulated with CORSIKA code, based on DPMJET and QGSJET models for the hadronic interactions, are compared with the experimental data determined with WILLI detector. No significant differences between the two models and experimental data are observed.

The measurements of the muon charge ratio for different angles-of-incidence, (performed with WILLI detector) shows an asymmetry due to the influence of magnetic field on muons trajectory; the values are in agreement with the simulations based on DPMJET hadronic interaction model. The simulations of muon charge ratio in EAS performed with CORSIKA code based on three hadronic interaction models (QGSJET2, EPOS and SYBILL) show relative small difference between models for H and for the Fe showers; the effect is more pronounced at higher inclination of WILLI detector. The future measurements should indicate which model is suitable.

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