

THE CHARGE RATIO OF ATMOSPHERIC MUONS BELOW 1.0 GeV/c: STATUS AND PERSPECTIVE

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The compact WILLI device built in Bucharest (44° 26' N latitude and 26° 04' E longitude) at a vertical cut-off rigidity of 5.6 GV has been used for measurements of the charge ratio in the vertical atmospheric flux at momenta below 1 GeV/c. In this low energy range the studies of muon charge ratio provide information useful for the discussion of the so-called atmospheric neutrino anomaly and for studies of atmospheric neutrino and antineutrino fluxes. The experimental method is based on the observation of the reduced effective lifetime of the negative muons, stopped in matter, as compared to the lifetime of positive muons. Avoiding the difficulties and the systematic errors of magnetic spectrometers, results are obtained with high accuracy, indicating a decrease of the muon charge ratio from 1.30 (at 0.87 GeV/c) to 1.15 (at 0.24 GeV/c). The detector WILLI has been transformed in a rotating device for measuring muon charge ratio for different angles of incidence in azimuthal and zenithal range. With such perspective a systematic “muon charge ratio spectroscopy” may provide interesting geophysical observation.