

DIRECT OBSERVATION OF MUON PAIR PRODUCTION BY COSMIC RAY MUONS

V.B.Anikeev (1), S.P.Denisov (1), S.N.Gurzhev (1), S.R.Kelner (2), T.M.Kirina (2), R.P.Kokoulin (2), V.V.Lipaev (1), A.A.Petrukhin (2), A.M.Rybin (1), F.Sergiampietri (3), E.E.Yanson (2), O.S.Zolina (2)

(1) Institute for High Energy Physics, 142284 Protvino, Russia, (2) Moscow Engineering Physics Institute, 115409 Moscow, Russia, (3) Istituto Nazionale di Fisica Nucleare, Sezione di Pisa, 56010 S.Piero a Grado (PI), Italy
kokoulin@nevod.mephi.ru/Fax: 007-095-324 87 80

Experimental data collected in a long-term exposition of the big liquid-argon spectrometer BARS (IHEP, Protvino) in horizontal cosmic ray flux have been analysed to select the events corresponding to muon pair production by muons in the inner fiducial volume of the detector. A big thickness of the target (2880 g/sq.cm) and the large number of points of ionisation measurements (up to 288) along the track ensure a high efficiency and a good reliability of identification of trimuon events. Results of the present experiment provided the first direct verification of the total cross section of the process at high muon energies. Comparison with expectations based on the available theoretical formulae shows that the observed number of muon tridents (7 among 1.9 million muons passing through the setup) is in agreement with recent theoretical calculations of the cross section (Kelner e.a., 1999, 26th ICRC) but is about 7 times lower than the prediction obtained with the cross section formula widely used earlier for various estimations.