

THE PRIMARY ENERGY SPECTRUM OF COSMIC RAYS OBTAINED BY MUON DENSITY MEASUREMENTS AT KASCADE

A. Haungs and the KASCADE Collaboration

Institut für Kernphysik, Forschungszentrum Karlsruhe, 76021 Karlsruhe, Germany.

haungs@ik3.fzk.de/Fax: +49/7247/82-4075

Spectra of local muon densities in high-energy extensive air-showers (EAS) are presented as signature of the primary cosmic ray energy spectrum in the knee region. The KASCADE central detector, with its two layers of multiwire proportional chambers and with a layer of scintillation counters, enables the measurements of muon densities at two different threshold energies. The spectra have been reconstructed for various core distances, as well as for particular subsamples, classified on the basis of the shower size ratio N_μ/N_e . The measured density spectra of the total sample exhibit clear kinks reflecting the knee of the primary energy spectrum. While relatively sharp changes of the slopes are observed in the spectrum of EAS with small values of the shower size ratio, no such feature is detected at EAS of large N_μ/N_e ratio in the energy range of 1–10 PeV. In addition to these findings the validity of EAS simulations is studied by comparing the spectra for different muon energy detection thresholds and core distances with detailed Monte Carlo simulations. No consistent energy spectrum can be derived from the data for the two muon thresholds, irrespective of assumptions on elemental composition.