

ENERGY SPECTRUM OF PRIMARY COSMIC RAYS ABOVE 10^{17} EV
OBTAINED USING AKENO 20 KM² ARRAY

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Abstract

The Akeno 20 km² array has been in a stable operational mode since December 1934. The observation live time is 1.2×10^8 sec, and ~ 9000 showers above 10^{17} eV have been recorded. Among these showers, 60 of them are initiated by primaries with energies larger than 10^{19} eV. The energy spectrum of primary cosmic rays in the energy range between 10^{17} eV and 10^{20} eV is obtained from these data. In order to get the relation between the observable S_{600} (particle density at 600 m from core distance) and the energy of primary cosmic ray, a Monte Carlo simulation was carried out. By using the result of the simulation, the refined energy spectrum is derived. The previously reported dip becomes less significant, and the new spectrum shows no significant structure up to 10^{19} eV. Above 10^{19} eV the energy spectrum becomes flatter than at lower energies, and is consistent with other results reported so far. Our energy spectrum extends at least up to 5×10^{19} eV. This result suggests that sources of the highest energy cosmic rays are not farther than several hundred mega parsec.