

The energy spectrum of all-particle cosmic rays around the knee region observed with the Tibet air shower array The Tibet AS γ Collaboration

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Abstract.

We will present the energy spectrum of all-particle cosmic rays in the energy region between 10^{14} eV and 10^{16} eV using the data obtained with the Tibet-III air-shower array operating at Yangbajing (4300m above sea level) from the late fall of 2000 at the conference. It is known that the atmospheric depth at Yangbajing altitude (4300 m above sea level at Yangbajing) is close to the maximum development of air showers with energies around 10^{14} - 10^{17} eV, including the “knee” energy region (10^{15} - 10^{16} eV). This enables us to estimate the energy of primary particle with very small ambiguity.

The Tibet-III array, starting operation in 2000, consists of 533 scintillation detectors of 0.5 m² each which are placed at a 7.5 m or 15 m square grid in the area of 250 m \times 250 m. Using this array, we can observe cosmic ray showers in a wide energy range between several times 10^{12} eV and about 10^{17} eV with a good accuracy. In the multi-TeV energies, this array is the most sensitive in searching for gamma rays

from point sources. Among 533 detectors of the the Tibet-III array, 221 detectors each equipping with a wide dynamic range PMT together with a fast-timing one are placed at a 15 m square grid. The covering area of these detectors is 36,900m². This air shower array enables us to measure the number of shower particles per detector up to about 8000 m², so that the lateral distribution of shower particles can be measured for very high energy air showers in excess of 100 TeV with a good accuracy.

The result will be compared with that obtained with the Tibet-I array in 1996. We also examine how our result would change, when a simulation code to be used was changed. Three simulation codes, GENAS, COSMOS, and CORSIKA are examined in this work.