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YAC sensitivity for measuring the light-component spectrum of primary cosmic rays at the “knee” energies

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A new air-shower core-detector array (YAC: Yangbajing Air-shower Core-detector array) has been developed to measure the primary cosmic-ray composition at the “knee” energies in Tibet, China, focusing mainly on the light components. The prototype experiment (YAC-I) consisting of 16 detectors has been constructed and operated at Yangbajing (4300 m a.s.l.) in Tibet since May 2009. YAC-I has been placed near the center of the Tibet-III AS array operating together. In this paper, we have performed a Monte Carlo simulation to check the sensitivity of YAC-I+Tibet-III array to the light-component (protons and helium nuclei) in the primary cosmic rays around the knee energies, taking account of the observation conditions of actual YAC-I+Tibet-III array. We have checked the sensitivity of YAC array to the interaction models (SIBYLL2.1, EPOS-LHC (v3400) and QGSJETII-04) and primary cosmic-ray composition models (He-poor”, He-rich” and Gaisser-fit”) around the knee using the high-energy core events observed by the YAC-I+Tibet-III array. The simulation shows that the light-component spectrum estimated by our methods can well reproduce the input ones within 10% error, and there will be about 30% systematic errors mostly induced by the primary and interaction models used.

Collaboration

– not specified –

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