GAMMA-HADRON SEPARATION USING ČERENKOV PHOTON DENSITY FLUCTUATIONS

P. N. Bhat and V. R. Chitnis
Tata Institute of Fundamental Research, Homi Bhabha Road, Colaba, Mumbai 400 005, India..
pnbhat@tifr.res.in/Fax: 091-22-215 2110

In atmospheric Čerenkov technique $\gamma-$ rays are detected against abundant background produced by hadronic showers. In order to improve signal to noise ratio of the experiment, it is necessary to reject a significant fraction of hadronic showers. The temporal and spectral differences, the lateral distributions and density fluctuations of Čerenkov photons generated by $\gamma-$ ray and hadron primaries are often used for this purpose. Here we study the differences in Čerenkov photon density fluctuations at the observation level based on Monte Carlo simulations. Various types of density fluctuations like the short range (or local), medium range fluctuations and flatness parameter are studied. The estimated quality factors reflect the efficiencies with which the hadrons can be rejected from the data. It has been found that we can reject around 80% of proton showers while retaining about 70% of $\gamma-$ ray showers in the data, based only on the differences in the flatness parameter. Density fluctuations particularly suited for wavefront sampling observations seem to be a good technique to improve the signal to noise ratio.