ESTIMATION OF VITAL SHOWER PARAMETERS IN WAVE-FRONT SAMPLING TECHNIQUE

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Wavefront sampling experiments record arrival times of Čerenkov photons with high precision at various locations in Čerenkov pool using a distributed array of telescopes. It was shown earlier that this photon front can be fitted with a spherical surface traveling at a speed of light and originating from a single point on the shower axis. Radius of curvature of the spherical shower front (R) is approximately equal to the height of shower maximum from observation level. For a given primary species, it is also found that R varies with the primary energy (E) and this provides a method of estimating the primary energy. In general, one can estimate the arrival times at each telescope using the radius of curvature, arrival direction of the primary and the core location. This, when compared with the data enables us to estimate the above parameters for each shower. This method of obtaining the arrival direction alleviates the difficulty in the form of systematics arising out of the plane wavefront approximation for the Čerenkov front. Another outstanding problem in the field of atmospheric Čerenkov technique is the difficulty in locating the shower core. This method seems to solve both these problems and provides an elegant method to determine the arrival direction as well as the core location from timing information alone. In addition, using the Čerenkov photon density information and the core position we can estimate the energy of the primary if the nature of the primary is known. Combining these two independent estimates of the primary energy, the energy resolution can be further improved. Application of this methodology to simulated data and the results will be presented. The intrinsic uncertainties on the various estimated parameters also will be discussed.