

Modifications of method for low energy gamma incident angle reconstruction in GAMMA-400 gamma-ray telescope

Thursday, 13 October 2016 16:30 (15)

Modifying a method of incident angle reconstruction for low-energy gamma rays in the GAMMA-400 gamma-ray telescope.

The GAMMA-400 gamma-ray telescope is designed to measure the gamma-ray fluxes in the energy range from 20 MeV to 1 TeV, performing a sensitive search in high-energy gamma-ray emission when annihilating or decaying dark matter particles. Such measurements also will concern the following scientific goals: searching for new and studying known Galactic and extragalactic discrete high-energy gamma-ray sources: supernova remnants, pulsars, accreting objects, microquasars, active galactic nuclei, blazars, quasars; studying their structure with high angular resolution and measuring their energy spectra and luminosity with high-energy resolution; identifying discrete gamma-ray sources with known sources in other energy ranges. The major advantage of the GAMMA-400 instrument is excellent angular and energy resolutions for gamma rays above 10 GeV. The gamma-ray telescope angular and energy resolutions for the main aperture at 100-GeV gamma rays are $\sim 0.01^\circ$ and $\sim 1\%$, respectively. The motivation of presented results is to improve physical characteristics of the GAMMA-400 gamma-ray telescope in the energy range of ~ 10 -100 MeV, most unexplored range today. Such observations are crucial today for a number of first-rank problems faced by modern astrophysics and fundamental physics, including the origin of chemical elements and cosmic rays, the nature of dark matter, and the applicability range of the fundamental laws of physics. To improve incident angle reconstruction accuracy for low-energy gamma rays the special analysis of topology of pair-conversion events in thin layers of converter was performed. Choosing the pair-conversion events with more precise vertical localization allows us to obtain significantly better angular resolution in comparison with previous and current space and ground-based experiments. For 50-MeV gamma rays the GAMMA-400 gamma-ray telescope angular resolution is better than 5° .

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Session Classification : Cosmic rays - parallel VI

Track Classification : Cosmic rays