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Compton reconstruction of the Crab under the atmospheric background for GRAMS balloon experiment

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The GRAMS (Gamma-Ray and AntiMatter Survey) project that aims to observe MeV gamma rays and to search for dark matter at the same time started in 2021 on full scale. The MeV gamma-ray region is important for understanding phenomena in the universe such as nucleosynthesis and high-energy particle acceleration. The detector for the project is a large LArTPC (Liquid Argon Time Projection Chamber) with a size of 140 $\times$ 140 $\times$ 20 cm^3, which works as a Compton camera. A balloon experiment using this detector is planned in the middle of the 2020s. There are a lot of background gamma rays in the atmosphere, so in the present work, the effect of the background in reconstruction of the Crab was evaluated. A Monte Carlo simulation to reproduce the detector response in the atmosphere was performed with ComptonSoft. Because of the computational limitations, the actual observation time corresponding to this simulation is only 100 seconds, but a clear reconstructed image of the Crab was obtained. The results demonstrated the feasibility to reconstruct MeV gamma ray images under atmospheric background and built the foundation for future data analysis.

Experimental nuclear physics

Theoretical nuclear physics

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