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Gamma-Rays Produced in Cosmic-Ray Interactions and the TeV-band Spectrum of RX J1713-3946

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Abstract content

In this work we study the individual contribution to diffuse γ -ray emission from the secondary products in hadronic interactions generated by cosmic rays (CRs), in addition to the contribution of neutral-pions via the decay into two gamma rays. For that purpose we employ the Monte Carlo particle collision code DPMJET3.04 to determine the multiplicity spectra of various secondary particles with gamma rays as the final decay state, that result from inelastic collisions between cosmic-ray protons and Helium nuclei and the interstellar medium with standard composition. We thus derive an easy-to-use gamma-ray production matrix for cosmic ray with energies up to about 10 PeV. The production matrices are used to interpret the gamma ray spectra of diffuse galactic emission and supernova remnants (SNR) and also to the GeV excess in diffuse galactic gamma rays that was seen with EGRET. We also test the hypothesis that the TeV-band gamma-ray emission of the shell-type SNR RX J1713-3946 observed with HESS is caused by shock-accelerated hadronic cosmic rays. Using the chi-square statistics we find that a continuously softening spectrum is strongly preferred, in contrast to expectations. A hardening spectrum has about 1% probability to explain the HESS data, but then only if a hard cut-off at 50-100 TeV is imposed on the particle spectrum.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olive, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 2 (OG part 1), pages 739-742

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