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# TeV gamma-rays from Galactic sources: Tycho's SNR, Geminga and Crab Nebula

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## Abstract content

The gamma-quantum spectra produced by the electronic and hadronic components of cosmic rays have similar shapes at the energies from 1GeV to 1 TeV due to the synchrotron losses of the electrons. So, the only observational possibility to discriminate between leptonic and hadronic contributions is to measure the gamma-quantum spectrum at energies higher than 1 TeV, where these two spectra are expected to be essentially different. The gamma-quantum emitting objects in our Galaxy are the supernova remnants and binary. According to the theoretical prediction about 20 Supernova Remnants should be visible in the TeV gamma-rays whereas only two were detected up to now by SHALON in northern hemisphere, namely Tycho's SNR and Geminga. The observation results of gamma-quantum sources Tycho Brage and Geminga by SHALON gamma-telescope are presented. The energy spectra of Geminga supernova remnants and Tycho's SNR F(E_O > 0.8TeV ) \propto Eˆk are found to be harder than Crab Nebula spectrum. The integral energy spectrum of Crab Nebula is well described by the single power law I(> Eγ)\propto Eγˆ{-1.44\pm0.07}. Geminga is one of the brightest sources of MeV – GeV gamma-ray. The value Geminga flux obtained by SHALON is lower than the upper limits published before. Its integral gamma-ray flux is found to be (0.48 \pm0.17)\times10ˆ{-12} at energies of > 0.8 TeV. Within the range 0.8 - 5 TeV, the integral energy spectrum is well described by the single power law I(> Eγ) \proptoEγˆ{-0.58\pm0.11}. The integral gamma-ray flux of Tycho.s SNR above 0.8 TeV by SHALON was estimated as (0.52 \pm0.09)\times10ˆ{-12}. The energy spectrum of Tycho's SNR at 0.8 - 20 TeV can be approximated by the power law I(>Eγ)\proptoEˆ{k_γ}, with kγ = -1.00 \pm 0.06. The expected {\pi}ˆO-decay gamma-quantum flux F_γ \propto E_γˆ{-1} extends up to ˜ 30 TeV, whereas the Inverse Compton gamma-ray flux has a cutoff above the few TeV. So, the detection of gamma-rays at energies of ˜ 10 - 40 TeV by SHALON is the evidence of hadron origin.

## 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'Olivo, 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 543-546

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