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A search for upward UHE neutrinos with SHALON atmospheric Cherenkov telescope.

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Abstract content

Problems in observation of extensive air showers generated by neutrinos are connected with an extremely small cross section of inelastic collisions of neutrinos with nuclei. However, two facts allow to search for showers generated by neutrinos: (1) a hadron cascade with the primary energy of more than 10^{13} eV leaves a mountain ridge to the atmosphere from the depth $\sim 300\text{g/cm}^2$ without an essential loss of the total energy in the hadron cascade, and (2) air Cherenkov radiation from such hadron cascades will be observed with a 7.5 km distant telescope over an area of more than $7 \times 10^5 \text{ m}^2$. This partially compensates the small cross section of inelastic neutrino collisions. The observation has been carried out since 1992 at high mountainous Tien-Shan station with SHALON Cherenkov mirror telescope with $\sim 11.2 \text{ m}^2$ mirror area and image matrix of 144 PMT with full angle $> 8^\circ$. The telescope characteristics permitted to start the search of local neutrino sources with energy $10^{13} - 10^{16}$ eV on EAS generating in mountain-range located at some 7.5 and more kilometers from gamma-telescope (in Russian the abbreviation SHALON means - the Extensive Air Showers from Neutrino). The analysis of results of observation of extensive air showers at height of 3338 m above the sea level by means of gamma-telescope SHALON at the zenith angles 72° , 76° , 84° , 97° are presented and compared with the data of detection of showers according to the direction into the zenith. The analysis of 260 hours of SHALON observation of Cherenkov bursts at angle of 97° results in 5 events from possible source that may be interpreted as Extensive Air Showers from neutrino interaction products. These cascades look like the usual extensive air showers generated in atmosphere with narrow light shape. The shower energies are in the range of 6 - 17.5 TeV. Currently, the fluxes of galactic gamma-quantum sources Cygnus X-3, Tycho's SNR, Geminga of $< 10^{-14} \text{ cm}^{-2} \text{ s}^{-1}$ are observed by SHALON. The appearing of one shower per > 100 observation hours is expected if the flux of neutrino from local sources is $10^{-15} \text{ cm}^{-2} \text{ s}^{-1}$.

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. 3 (OG part 2), pages 1201-1204

Primary author(s) : Prof. SINITSYNA, Vera Georgievna (Lebedev Physical Institute)

Co-author(s) : NIKOLSKY, Sergey (Lebedev Physical Institute); SINITSYNA, Vera Yurievna (Lebedev Physical Institute); ARSOV, Todor (Lebedev Physical Institute); MUSIN, Alexandr (Lebedev Physical Institute); PLATONOV, Gennadii (Lebedev Physical Institute)

Presenter(s) : Prof. SINITSYNA, Vera Georgievna (Lebedev Physical Institute)

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