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Method to Determine Neutrino Cross-Section using ANITA

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Abstract content

The balloon-borne ANITA high energy neutrino telescope successfully launched on December 15, 2006 and flew for a little less than 35 days. Its primary mission is to detect astrophysical neutrinos with energies in excess of 10^{19} eV. Neutrino interactions in Antarctic ice produce short, intense radio pulses that are detected by ANITA at distances as large as 600 km. The usual detection scenario involves nearly horizontal neutrinos interacting in the bulk ice of the Antarctic ice sheet to produce detectable radio signatures. In this paper, we describe an alternative detection channel from interactions within the coastal Ice Shelves. Recent studies of the Ross Ice Shelf confirm earlier studies that indicate that most of the ice-water boundary beneath the shelf behaves like a very good mirror at radio frequencies. This property and the remarkably good attenuation length creates the opportunity to observe reflected radio pulses from the bottom. The interaction rate from the relatively thin ice shelves is more sensitive to neutrino cross-section than the rate from the bulk ice. With sufficient statistics, the cross-section can be determined by comparing the rate of neutrino interactions in the ice sheet to ice shelf. This paper describes the method, its advantages and limitations, and possible systematic contributions to the uncertainty.

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

ANITA

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. 5 (HE part 2), pages 1445-1448

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