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The TRACER Project: Instrument Concept, Balloon Flights, and Analysis Procedures

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Abstract content

Accurate measurements of the composition and energy spectra of cosmic rays beyond the TeV energy region have been an experimental challenge for years. TRACER ("Transition Radiation Array for Cosmic Energetic Radiation"), is currently the largest cosmic-ray detector for direct measurements, and has been developed for long-duration balloon flights. The instrument is unconventional in that it uses only electromagnetic processes, such as measurements of ionization energy loss, Cherenkov light, and transition radiation, to make precision measurements that span more than four decades in energy, from 1 GeV/nucleon to energies beyond 10 TeV/nucleon. In its first long-duration balloon flight from Antarctica in December 2003, TRACER has measured the energy spectra of the primary galactic cosmic-ray nuclei from oxygen (Z = 8) to iron (Z = 26). For a second LDB flight from Sweden in July 2006, the instrument was modified and upgraded in order to include the important light nuclei from boron (Z = 5) to nitrogen (Z = 7).

We shall discuss the performance of TRACER in these two flights, review the response of the individual detector components, and the techniques employed in the data analysis. We will discuss the resolution of TRACER both in charge and in energy, and review the statistical and systematic uncertainties of the measurements.

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 83-86

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