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Particle Identification and Energy Measurementswith the TRACER Cosmic-Ray Detector D. MULLER, M. AVE, P. BOYLE, F. GAHBAUER, C. HOEPPNER, J. HOERANDEL, M. ICHIMURA, A. ROMERO-WOLF[1], S. WAKELY, University of Chicago — TRACER is currently the largest cosmic-ray detector for balloon-borne measurements of cosmic-ray nuclei at very high energies, exhibiting a geometric factor of $\sim$ 5 m^2 ster. For particle identification and energy measurements it employs a combination of plastic scintillators, acrylic Cherenkov counter, and arrays of gas-proportional tubes.Eight layers of tubes measure the specific ionization and its relativistic rise, and another eight layers are combined with radiator material to function as a transition radiation detector. This detector system provides measurements of heavy nuclei ($8 \leq Z \leq 26$) over the energy range $\sim$ 500 MeV/nucleon to $\sim$ 10 TeV/nucleon. Optimum response is achieved if the signal characteristics of the detector elements are well calibrated, and the correlations between signals are well understood. To accomplish this we employ calibrations in the laboratory and at accelerators, analytical studies and a complete simulation of the detector using GEANT, and the balloon flight data themselves. Subtle effects such as δ-ray contributions and nuclear interactions in the detector material are taken into account in the analysis of the data. We describe our procedures and discuss how well the response characteristics of TRACER match the requirements of a cosmic-ray measurement.

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