Search for fractionally charged particles in cosmic rays with the BESS spectrometer

BESS Collaboration:
H. Fuke (1), Y. Tasaki (1), K. Abe (2), S. Haino (3), Y. Makida (3), S. Matsuda (4), J. W. Mitchell (5), A. A. Moiseev (5), J. Nishimura (4), M. Nozaki (2), S. Orito (4), J. F. Ormes (5), M. Sasaki (5), E. S. Seo (6), Y. Shikaze (2), R. E. Streitmatter (5), J. Suzuki (3), K. Tanaka (3), T. Yamagami (1), A. Yamamoto (3), T. Yoshida (3), and K. Yoshimura (3)

(1) Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency (JAXA), Sagamihara, Kanagawa 229-8510, Japan,
(2) Kobe University, Kobe, Hyogo 657-8501, Japan,
(3) High Energy Accelerator Research Organization (KEK), Tsukuba, Ibaraki 305-0801, Japan,
(4) The University of Tokyo, Tokyo 113-0033, Japan,
(5) NASA, Goddard Space Flight Center, Greenbelt, Maryland 20771, USA,
(6) University of Maryland, College Park, Maryland 20742, USA
(fuke@balloon.isas.jaxa.jp / Phone:+81-42-759-8237)

The origin of the electric charge quantization is a fundamental question for elementaly particle physics, but it remains unexplained within the Standard Model. Since the proposal of the quark model in 1964, many searches for fractionally charged particles have been carried out in the cosmic radiation without any evidence for their existence. However, most of these searches were performed on or under ground on the assumption that the objective particles are able to penetrate large amount of material. Therefore, it is worthwhile to do the search near top of the atmosphere by flying vehicles.

We performed a search for relativistic 2/3 e charged particles in cosmic rays using data collected during four BESS balloon flights from 1997 to 2000 carried out in northern Canada. The data were analyzed by looking at the energy deposition measurements by the time-of-flight scintillator hodoscopes. No candidate was found. The resultant upper limit on the flux of 2/3 e charged particles and the analysis in detail will be presented at the conference.