

# SPACE AND COSMIC RAY PHYSICS SEMINAR

University of Maryland  
Computer & Space Sciences Building, Rm 2400  
4:30 PM Monday, December 1, 2003  
Tea & cookies 4:00-4:30 PM

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## **Cosmic Ray Measurements with BESS**

The Balloon-borne Experiment with a Superconducting Spectrometer (BESS) has been carried out since 1993, in order to investigate elementary particle phenomena in the early Universe through observations of low energy antiprotons and searches for primordial antimatter in the cosmic radiation. The seven successful flights from 1993 to 2000 have confirmed that the origin of cosmic antiprotons is predominantly due to collisions of high-energy primary cosmic rays with interstellar matter. Nonetheless, we still cannot rule out the possible existence of some novel processes of antiproton production such as evaporation of primordial black holes or annihilation of supersymmetric dark matter in the Universe since the spectrum below 1 GeV seems to be softer than that predicted by the secondary production models. For antinuclei searches, a most stringent upper limit has been placed on the ratio of the antihelium nuclei to the helium nuclei. BESS has also measured primary cosmic-ray spectra, solar modulation effects, and cosmic-ray development in the atmosphere, improving its detector performance flight by flight.

For further studies of the low-energy antiprotons and extensive searches for antinuclei in cosmic rays, a new superconducting spectrometer for long duration balloon flights, BESS-Polar, is being prepared. To extend the detectable energy range of the antiprotons, a new ultra-thin superconducting spectrometer was developed. With further efforts to minimize materials along the trajectory of the incident particles, the detector material thickness in an upper-half wall becomes half of that in the current BESS detector. The new BESS-Polar detector was also designed to meet requirements for long duration balloon flights in Antarctica. We carried out a successful engineering flight at Fort Sumner, NM, in October 1, 2003, and expect to have a first scientific flight in Antarctica in December 2004.

Sponsored by: Department of Physics, University of Maryland, and the Institute for Physical Science and Technology, University of Maryland. For information call Matthew Hill at (301) 405-6209 or go to the following website: [http://space.umd.edu/seminars/Fall\\_2003\\_Seminar.html](http://space.umd.edu/seminars/Fall_2003_Seminar.html) (A PDF file of this abstract is available for download at this URL.)

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