

Overview of Radiation Belt Storm Probes (RBSP)

The Radiation Belt Storm Probes mission is part of NASA's [Living With a Star](#) Geospace program to explore fundamental processes that operate throughout the solar system, in particular those that generate hazardous space weather effects near the Earth and phenomena that could affect solar system exploration.

The [instruments](#) on the two RBSP spacecraft will provide the measurements needed to characterize and quantify the processes that produce [relativistic](#) ions and electrons. They will measure the properties of charged particles that comprise the Earth's radiation belts and the plasma waves that interact with them, the large-scale electric fields that transport them, and the magnetic field that guides them.

Current mission status:

Launch date: 4:00 AM on August 23

Fully ready for joint science, two months later.

<http://www.athena.jhuapl.edu/> > RBSP web site including ephemerides

Check site for RBSP Orbit Position Calculator,

- begins at Oct 6, 08:24 UT
- ASCII format

Scientific aims:

The mission is to gain scientific understanding of how populations of relativistic electrons and ions in space form or change in response to changes in [solar activity](#) and the [solar wind](#).

The mission's *general scientific objectives* are to:

Discover which processes - singly or in combination - accelerate and transport the particles in the radiation belt, and under what conditions.

Understand and quantify the loss of electrons from the radiation belts.

Determine the balance between the processes that cause electron acceleration and those that cause losses.

Understand how the radiation belts change in the context of geomagnetic storms.

Spacecraft

RBSP consists of two spin-stabilized spacecraft to be launched with a single Atlas V rocket.

Instruments

Each probe will carry the following:

Energetic Particle, Composition, and Thermal Plasma (ECT) Instrument Suite [\[1\]](#); The Principal Investigator is Harlan Spence [\[2\]](#) from [University of New Hampshire](#). Key partners in this investigation are [LANL](#), [Southwest Research Institute](#), [Aerospace Corporation](#) and [LASP](#)

Electric and Magnetic Field Instrument Suite and Integrated Science (EMFISIS); The Principal Investigator is Craig Kletzing from the [University of Iowa](#).

Electric Field and Waves Instrument (EFW); The Principal Investigator is John Wygant from the [University of Minnesota](#). Key partners in this investigation include the University of California at Berkeley and the University of Colorado at Boulder.

Radiation Belt Storm Probes Ion Composition Experiment (RBSPICE); The Principal Investigator is Lou Lanzerotti [\[3\]](#) from the New Jersey Institute of Technology. Key partners include the [Applied Physics Laboratory](#) and Fundamental Technologies, LLC [\[4\]](#).

Relativistic Particle Spectrometer (RPS) from the [National Reconnaissance Office](#)

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Scientific aims – maximize the value of observations obtained during storm-times with RBSP, especially during conjunctions

Proposed focii for SD-RBSP Science

- 1) The dynamics of large-scale ionospheric electric fields during storm periods
- 2) The role of ULF waves in stimulating wave-particle interactions that affect the dynamics of the outer zone electron belt.

(Note also sustained RBSP interest in VLF/ULF waves and EMIC waves.)

Proposed SuperDARN mode in support of RBSP (see Tim's call for a decision):

- Full-scan + 3 camping beams to combine large-scale coverage with the capability to observe ULF pulsations and to measure their azimuthal wave numbers
- simultaneous coverage of large-scale convection
- triggered during storm-time conditions

Example of RBSP footprint tracings:

24 hours of RBSP footprints using dummy data (1st July 2012, 00-24 UT)

RBSP-A, RBSP-B

AAGCM Magnetic longitude/Magnetic latitude

