Radio Receiver Instrument, RRI

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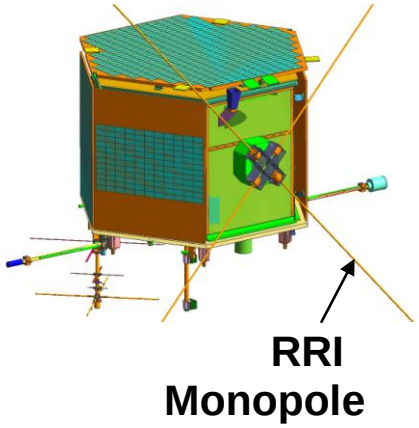
Scientific objectives	• Morphology and dynamics of F-region density structures • Auroral wave-particle interactions • Plasma nonlinear processes created by intense HF waves • Mechanism of coherent backscatter
Observation objectives	• Parameters of refracted, diffracted, scattered waves from collaborating ground transmitters. • Propagation directions, spectral power distributions of spontaneously generated waves. • Spectra of waves and particles created nonlinearly in the beam of ionospheric heaters. • In-situ capture of angular and power distributions of back- and forward-scattered waves.
Instrument architecture	RRI has four 3-m STEM dipoles, each with its deployment system, feeding four high-impedance preamplifiers (SPM). Each preamplifier line connects to one channel of a four-channel digital radio receiver module (DRRM). In each DRRM channel, the signal is first digitized then recorded in baseband after digital down conversion.
Measurements	• Wave electric field magnitude from 1 μV/m to 1V/m. • Frequencies from 10 Hz to 18 MHz. • Sampling rate of 60000/s permits bandwidths up to 30 kHz. • Four monopoles sampled separately or combined differentially as classic dipoles.
Principle of instrument operation	• High-impedance preamplifiers make the input voltage the same as the open-circuit voltage, whence incident wave electric field can be determined. • Crossed dipoles give polarization information, hence wave direction of arrival.
Statistics	• Mass: SPM 4.92, DRRM 3.67, total 8.59 kg • Power: SPM 2.2, DRRM 5.3, total 7.5 W • Size: SPM 30×30×18, DRRM 20×16×5 mm^3
Operation modes	12 Experiment Modes combine the following in various ways: Record I and/or Q baseband signals on any combination of four channels; use one of three bandwidths 1, 5 or 30 kHz; record monopole or dipole signal; fix or sweep frequency (linear or log.);
Data format	(To be added)
References	(To be added)

Four RRI monopoles connected to preamplifier enclosure on +x face of CASSIOPE spacecraft.



Functional high-level block diagram of digital radio receiver.