The twin Van Allen Probes were launched on or after August 30, 2012. The Electric and Magnetic Field Instrument Suite and Integrated Scintillometer (EMFISIS) investigation includes a plasma wave instrument (Waves) designed to measure three orthogonal components of the wave magnetic field and, with the supports of the Electric Fields and Waves (EFW) instrument sensors, three components of the wave electric field from 10 Hz to 12 kHz and a complement of transducers for the wave magnetic fields. Waves uses a set of orthogonal triaxial search coils. EFW utilizes two spin-plane booms with tip-to-tip lengths of 100 m and a spin axis boom with a nominal tip-to-tip length of 15 m to be detonated on orbit. Commissioning of the spacecraft and their instruments was completed within about two months of launch, at the end of October. In this paper we plan to provide initial results from Waves including an assessment of in-flight performance and early observations of plasma waves thought to play significant roles in the acceleration and loss of radiation belt. The various classes of waves we anticipate studying include whistler-mode chorus, plasma waves associated with plasmaspheric hiss and equatorial electrostatic waves. Some of the instrument’s pre-amps are housed in the cylindrical fixture which doubles as the structure holding the search coils at the end of one of the sensor booms. Performance of the system is excellent, given the severe dynamic range afforded by the three A/D converters used in the 6-channel Waveform Receiver.

The basic survey output of the EMFISIS/Waves instrument is a set of spectral matrices covering the frequency range of 10 Hz to 12 kHz utilizing six channels (1, 3, and 5 kHz) and a single-channel spectrum for the HFR, frequency range of 10 kHz to 500 kHz. While this spectrogram shows little in the way of amplitude differences between the channels, the spectral matrices capture phase differences between the various wave components and allow later determination of wave propagation parameters.

An obvious capability of the Van Allen Probes plasma waves measurements is to enable synergistic studies of the various classes of plasma wave phenomena such as whistler-mode chorus which is known to be an important precursor to magnetic storm processes. The upper panel shows data from probe A early in the mission representing the intensity of the lower-band chorus (0.1 to 0.5 kHz) as a function of MLT and radial distance. Clearly, there are instabilities in the chorus during times of enhanced activity as shown in the time history of the intensity of the lower-band chorus shown in the lower panel.