

PEP-HI: ENERGETIC ELECTRON, ION, AND NEUTRAL PARTICLE INSTRUMENTATION FOR THE JUICE MISSION. C. W. Parker¹, ¹Johns Hopkins University Applied Physics Laboratory

The Particle Environment Package (PEP) is an instrument suite comprising six sensors that is being developed for the European Space Agency's JUptier ICy moon Explorer (JUICE) mission. The Johns Hopkins University Applied Physics Laboratory is developing two sensors for this package, the Jovian Energetic Neutrals and Ions (JENI) sensor and the Jovian Energetic Electron (JoEE) sensor, which are responsible for measurements of the middle to high energy portions of the Jovian particle environment.

The JENI sensor is an ion and neutral particle camera based on the Cassini/INCA and IMAGE/HENA sensors, that will measure energetic (500 eV – 5 MeV) H, He, CNO, and S ions and neutral particles with an energy resolution $\Delta E/E < 14\%$. The $90^\circ \times 120^\circ$ FOV is resolved into $2^\circ \times 2^\circ$ pixels (≥ 10 keV H) and has a geometrical factor that can be adjusted between $0.013 \text{ cm}^2 \text{ sr}$ and $1.8 \text{ cm}^2 \text{ sr}$ by a rotating shutter mechanism. An electrostatic deflection system can be enabled to sweep ions $< 300\text{-}400 \text{ keV}/q$ out of the aperture so that neutral particles can be imaged.

Neutral particle images from JENI are observations of the remote particle environment and compliment the in-situ charged particle measurements of the other PEP instruments. Remote events can be detected and tracked as they evolve prior to reaching the in-situ instruments allowing local measurements to be understood within the context of the Jovian magnetosphere.

The JoEE sensor is an energetic electron (25 keV – 1 MeV) detector with an FOV of $202.5^\circ \times 12^\circ$ divided into nine 22.5° degree sectors. A magnetic spectrometer wheel is employed to bend incoming electron (25 keV – 300 keV) trajectories into a pixelated solid state detector perpendicular to the plane of the aperture. Three sectors (0° , 90° , and 180°) have an SSD detector stack parallel to the aperture plane that will observe electrons energetic enough to traverse the magnetic spectrometer section (≥ 400 keV). A dExE measurement in these detectors will be used to separate electrons from high-energy ions.

JoEE will measure the electron pitch angle distributions to assist in determining magnetic field topology. Distributions on field lines connected to Ganymede, for example, will have much larger loss cones than those on field lines connected to the Jovian magnetosphere.