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6.1 Instruments overview

As previously described in section 1 the mission scientific goals are quite numerous and diverse. Thus, to achieve all of them the payload consists of several instruments, 9 to be precise, covering a wide spectrum of experimentations. Here we have a brief overview of all the singular instruments, unless otherwise specified only the sensors are mounted on the exterior of the spacecraft while all the relevant electronics are located inside the radiation vault.

- **Magnetometer (MAG):** As the name implies its objective is to accurately measure Jupiter's magnetic field, achieved by employing a fluxgate magnetometer, a scalar helium magnetometer and star cameras. All the sensors are mounted on the magnetometer boom located at the end of one of the solar array wings to reduce the interference from the spacecraft itself. Even then the presence of two magnetometers allows to subtract this contribution from the measurement.
- **Microwave Radiometer (MWR):** It consists of six antennas which measure six different frequencies (600 MHz, 1.2 GHz, 2.4 GHz, 4.8 GHz, 9.6 GHz and 22 GHz) in order to investigate the Jovian atmosphere below the visible external layer. A key objective of this analysis is also the determination of the abundance of water inside the planet. The antennas are mounted on two sides of the exagonal prism that constitutes the main body of the spacecraft.
- **Gravity science:** It's quite a unique instrument as it's composed both by a space and a ground elements. The space segment is tasked with amplifying and sending back radio signals which are instead generated and received by the ground station. By measuring the doppler shift in the returning signal from Juno is possible to characterize Jupiter's gravitational field. Thus the instrument hardware mainly consists in the high gain antenna mounted on top of the radiation vault on the main deck pointing in the same direction as the solar arrays.
- **Jupiter Energetic-particle Detector Instrument (JEDI):** It detects high energy electrons and ions present in the Jovian magnetosphere which are discriminated by composition. Each sensor is characterized by six electron and six ion viewing directions that together cover a $12^\circ \times 160^\circ$ field of view. In total three sensors are present on Juno, two arranged to obtain an almost complete 360° view perpendicular to the spacecraft spin axis while the third one is instead aligned with it to achieve a full scan of the sky over one spin period. As the JEDI sensors are self-contained no electronic hardware is present in the radiation vault.

7 Mission analysis