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The Submillimetre Wave Instrument on JUICE

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Abstract

The Submillimetre Wave Instrument (SWI) is part of the JUICE (Jupiter ICy moon Explorer) payload. SWI's primary scientific objectives are the investigation of the middle atmosphere of Jupiter and the atmospheres and exospheres of the Galilean satellites. SWI will contribute to the understanding of the circulation regime in the atmosphere of Jupiter as a function of latitude and altitude, how the various atmospheric regions are dynamically coupled, and how the energy originating in Jupiter's interior vertically propagates to the upper layers to be radiated in space. In this sense SWI complements the Juno mission. Furthermore SWI will determine important isotopic radios, monitor and trace known gases and search for new molecules. SWI will – for the first time – investigate the density, structure and distribution of the water atmospheres of Ganymede, Callisto and Europa from ground up to a few hundred km, determine its isotopic composition and general circulation. Io's volcanic atmosphere will be studied through lines of SO_2, SO, NaCl, and perhaps other species.. The secondary scientific objectives concerns the determination of thermophysical properties of the Galilean satellite surfaces by radiometric observations.

In the proposed configuration SWI will operate in two submm wave bands around 600 GHz and 1200 GHz. Basline however at the present time are two 600 GHz receivers. Both receivers will be tunable within a bandwidth of approximately 20 % around the centre frequency. The antenna has a diameter of 30 cm and will be movable in two dimensions. Two high resolution Chirp Transform Spectrometers with 1 GHz bandwidth and two 5 GHz wide low resolution autocorrelator spectrometer are used for determining the spectral line shapes and for line surveys. The observations geometry includes limb and nadir sounding. The total mass of the instrument is aimed at below 10 kg and the power consumption below 50 W.

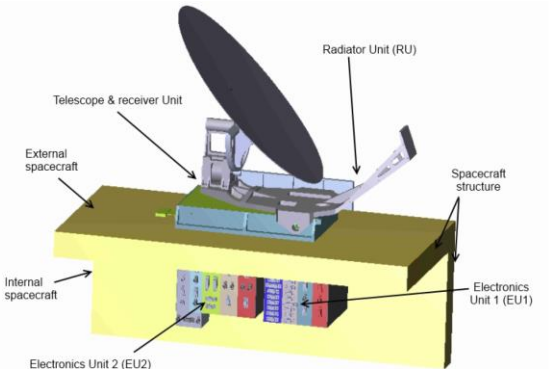

Figure 1: SWI instrument