Abstract *(paper not available)*

Simulations of the Solar Orbiter Spacecraft Interactions with the Solar Wind: Effects on the RPW Antennas & Measurements

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We will present numerical simulations of the Solar Orbiter spacecraft/plasma interactions performed with the Spacecraft Plasma Interaction System (SPIS) software (http://dev.spis.org/projects/spine/home/spis/). This toolkit aims at modelling spacecraft-plasma interactions, based on an electrostatic 3-D unstructured particle-in-cell plasma model. New powerful SPIS functionalities were recently delivered within the extension of the software: SPIS-Science (ESA contract). SPIS revolutionizes the understanding of spacecraft/plasma interactions and facilitates the configuration of plasma instrument such as Langmuir probes or particle detectors. Synthetic measurements can be generated with SPIS as a function of a large number of parameters such as the spacecraft geometry, coating materials, particle energy distributions, field of view, sampling frequencies, etc. The Solar Orbiter spacecraft (M-class ESA Cosmic Vision with NASA participation, to be launched in October 2018), is dedicated to the Sun observation with in-situ and remote sensing instruments, brought as close as 0.28 A.U. from the star. In this hot and dense environment the entire satellite will be submitted to high radiations and temperatures (up to 10 Solar constants). Material responses to environment constraints (heat, U.V. flux, photoemission, secondary electron emission) might bias the scientific instrument measurements. Among the 10 Solar orbiter Instruments, the Radio and Plasma Waves (RPW) will measure the ambient electric field fluctuation from DC to several kHz. The experiment consists in 3 conducting antennas of 6 m length which will charge independently according to local environment conditions. The potential difference between them will allow to recover the ambient electric field in the plasma, knowing the effective length of the stacers. However those 3 antennas will also emit electron clouds in their vicinity (modifying the local electrostatic pattern). They also might bend due to material expansion on their sunlit faces (at the closest distance to the Sun, temperature expected on the antennas will be about 500 – 600° C.). The perturbation effects on the RPW measurements described above will be presented with the emphasis on their influence on the effective length of the stacers and the antennas (I,V) curves.

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