



Spacecraft charging of JUICE in the auroral zone of Ganymede

Mika Holmberg¹, Fabrice Cipriani¹, Gregoire Déprez¹, Christian Imhof², Olivier Witasse¹, Nicolas Altobelli³, and Hans Huybrighs¹

¹ESTEC, ESA, Netherlands (mika.holmberg@pm.me)

²Airbus Defence and Space, Germany

³ESAC, ESA, Spain

Ganymede is the only moon in our Solar System known to have its own global magnetic field, which generates a miniature moon magnetosphere inside the Jovian magnetosphere. Due to this unique characteristic of Ganymede, its auroral zone is also of particular scientific interest, as it is the only known example of this specific kind of interaction. The JUICE spacecraft will orbit Ganymede for almost a year, with a high inclination orbit with multiple auroral zone crossings. JUICE will study the auroral zone of Ganymede in more detail than ever before, providing both in-situ and remote sensing observations.

In this work, we use Spacecraft Plasma Interaction Software (SPIS) simulations to study the spacecraft charging of JUICE in the auroral zone. Hubble Space Telescope observations of the aurora of Ganymede show localized regions of bright spots superimposed on a continuous background emission (e.g. Feldman et al. 2000, Eviatar et al. 2001). In order to produce bright auroras, the electron population needs to be accelerated up to hundreds of eV (Eviatar et al. 2001). Preliminary simulation results, using an auroral electron population with temperature $T_e = 200$ eV and density $n_e = 300 \text{ cm}^{-3}$, shows frame charging (i.e. spacecraft ground) of around 10 V and differential charging of around 30 V. High frame and differential potentials can cause disturbances in both particle and electric field measurements and prevent accurate characterization of the environment. Since the auroral zone of Ganymede is of particular scientific interest, it is important to study and prepare for this kind of disturbances.

References

D. Feldman et al., HST/STIS ultraviolet imaging of polar aurora on Ganymede, *The Astrophysical Journal*, 535(2), 2000

A. Eviatar et al., Excitation of the Ganymede ultraviolet aurora, *The Astrophysical Journal*, 555(2), 2001