

Spacecraft Plasma Interaction System

Course and Practical Work

Part I: Introduction

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The inputs parameters

- Define a complete geometrical model
 - S/C = the inner sphere, with $R_{s/c} = 1\text{ m}$
 - Outside boundary, shape as you wish, with $R_{\text{ext}} = 10\text{ m}$ at least
 - Set the properties groups
 - Mesh and refine properly
 - Plasma parameters
 - $n_e = n_i = 100/cc$
 - $T_e = 1.7\text{ eV}$
 - S/C with floating potential
 - Plasma and S/C model
 - S/C with floating potential
 - Maxwellian plasma model for electron and non-linear Poisson solver.
 - Passive surface (no secondary emission)
- Start with the CAD file
genericSphere.geo

Start with the CAD file
genericSphere.geo

Compute the equilibrium potential

Make a cutting plane of the final plasma potential

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Possible Extensions

- Define several surface groups for the S/C with:
 - Different materials properties or;
 - Different potentials and electric nodes.
- Add a source of secondary particles on one of the hemispheres.
- Play with the S/C capacitance (C_{sat}) to study the charging dynamic.
- Switch the Maxwellian plasma model into a full PIC model (CAUTION: this can be lead to long simulations runs).
- Switch the S/C potential into fixed mode at a positively potential.
- Change the plasma parameters (density, temperature).
- Define a new geometrical model “from scratch” with Gmsh.

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Questions ?

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