



MEO-GEO Tool Development

SPINE Meeting
28-29 September 2009
ESTEC



Electromagnetics & Space
Environment Division – TEC-EES

Background

- GEO charging common engineering problem
- New SPIS capabilities aimed at better GEO charging simulation
 - Current through back-tracking
 - Implicit capacitance calculation
- SPIS flexibility means
 - Choice of physics methods
 - User control of the simulation process
- Steep learning curve for SPIS users



Spacecraft Plasma Interaction System

File Edit GEOM Mesh Properties Groups Fields Solvers PostProcessing Tasks Data Bus Reporting Tools Options Help

GLOBAL PARAM V 100 SETTING 56 SAT UI NUM SOLVER $f(x, y, z, t) = 0$ JSynoptic JYCONSOLE

Pre-Processing Simulation Post-Processing

Global Parameters Editor

MultiZone		Volume Interactions		Surface Interactions		Outputs		Plasma		Simulation control	
B Field			Spacecraft			Poisson equation			Scenario		
Name	Description	Type	Unit	Value							
avPartNbPerCell	average number of super-par...	float	None	5.0							
electronDensity	Electron density (1st population)	float	[m ⁻³]	1.0E7							
electronDensity2	Electron density (2nd populati...	float	[#/m ³]	0.0							
electronDistrib	Name of the VolDistrib class t...	string	None	BacktrackingPICCompositeVolDistrib							
electronDistrib2	Name of the VolDistrib class t...	string	None	PICVolDistrib							
electronDt	Maximum integration time ste...	float	[s]	-1.0							
electronDt2	Maximum integration time ste...	float	[s]	-1.0							
electronSpeedUp	Numerical times speed-up fa...	float	[-]	1.0							
electronSpeedUp2	Numerical times speed-up fa...	float	[-]	1.0							
electronTemperature	Electron temperature(1st pop...	float	[eV]	1.0							
electronTemperature2	Electron temperature(2nd po...	float	[eV]	1000.0							
environmentType	Name of the Environment clas...	string	None	BIMaxwellianEnvironment							
ionDensity	Ion density (1st population)	float	[m ⁻³]	1.0E7							
ionDensity2	Ion density (2nd population)	float	[#/m ³]	0.0							
ionDistrib	Name of the VolDistrib class t...	string	None	BacktrackingPICCompositeVolDistrib							
ionDistrib2	Name of the VolDistrib class t...	string	None	PICVolDistrib							
ionDt	Maximum integration time ste...	float	[s]	-1.0							
ionDt2	Maximum integration time ste...	float	[s]	-1.0							
ionSpeedUp	Numerical times speed-up fa...	float	[-]	1.0							
ionSpeedUp2	Numerical times speed-up fa...	float	[-]	1.0							
ionTemperature	Ion temperature (1st populati...	float	[eV]	1.0							
ionTemperature2	Ion temperature (2nd populat...	float	[eV]	1000.0							
ionType	First ion population	string	None	H+							
ionType2	Second ion population	string	None	H+							

Add Remove save and quit

Jython Log
Standard Log Number of particles reflected on symmetry boundaries : 0



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SIMPLIFIED STANDARD MEO/GEO TOOLS FOR SPACECRAFT CHARGING

- TRP (100-200kEuro)
- Initiated
- Objectives: To develop a tool for the evaluation of surface electrostatic charging that can be used without specialized training and which guides user in making appropriate choices for GEO/MEO application
- Description: A user-friendly tool will be developed using software components from the SPIS. It will include standard plasma environment, material property lists, and will allow 3-d geometrical models to be created. The tool will allow for a high degree of automisation of parameters needed to make the code run but which do not reflect real physical inputs, e.g. mesh resolution, particle weights, time-steps. The code will be extensively verified using available data. User and data interfaces will also be produced.



THE END



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