

# SPINE MEETING INTRODUCTION

*A. Hilgers*

European Space Agency (ESTEC/TEC-EES)

- 1. Welcome
- 2. New scientific missions coming soon
- 3. Electrostatic cleanliness is an issue
- 4. Development of tools to assess it foreseen
- 5. Objectives of the meeting
- 6. Programme of the meeting

SPINE Meeting – 13-14 Nov 2008, ESTEC



## Background

- Cross-scale, Laplace, Tandem and other Cosmic Vision mission are planned to include plasma payloads.
- Electrostatic cleanliness of such scientific spacecraft requires limiting electrostatic potential perturbations and interference from spacecraft- generated charged particles (e.g. secondary/photo electrons and sputtered ions).
- This leads to a requirement for low spacecraft potential (typically  $\sim 1V$ ), well below the energy of particles being detected, and for spacecraft- induced fluxes well below ambient levels.
- Control and mitigation of spacecraft perturbation of plasma/field sensors is possible through charge alleviation devices, grounding, material selection and siting of detectors.
- The open source spacecraft-plasma interaction simulation tool, SPIS, currently has a resolution about one order of magnitude above the required accuracy.
- Increasing the accuracy to the required level requires significant physics, algorithm and software developments, possibly including better modelling of secondary/photo/sputter emission, better shadowing, control of convergence and increased number of particles per cell and trajectory accuracy.
- SPIS simulation toolkit has been conceived with a modular approach such that extension of the capabilities and functionalities can be performed without reengineering the whole software.

SPINE Meeting – 13-14 Nov 2008, ESTEC

## Foreseen R&D activity in the TRP plan 2009

### Objectives:

- To develop models and tools, and measure surface properties where necessary, for accurate quantitative evaluation of low-level surface electrostatic charging of science missions.

### Description:

- More information on: <http://emits.esa.int>
- Look for: COMPUTATIONAL TOOLS FOR SPACECRAFT ELECTROSTATIC CLEANLINESS AND PAYLOAD ANALYSIS ESA Intended Invitation To Tender 09.1EE.03

SPINE Meeting – 13-14 Nov 2008, ESTEC

## Objectives of the meeting

- Review existing and foreseen problems related to electrostatic cleanliness of scientific mission.
- Review state of the art in analysis methods, modelling and prediction.
- Provide inputs on modelling requirements.

SPINE Meeting – 13-14 Nov 2008, ESTEC

## 13-11-2008 AM

Speaker	Title	min	Time
A. Hilgers	Welcome and objectives of the meeting	15	09:30
	Future Cosmic Vision missions	0	09:45
A. Wielders	Overview of Cross-scale mission	10	09:45
C. Erd	Overview of Tandem mission	10	09:55
A. Stankov	Overview of Laplace mission	10	10:05
	Coffee Break	10	10:15
	Session: Observations	0	10:25
A. Hilgers (ESA)	A review of spacecraft plasma interactions effects on plasma measurements	20	10:25
A. Masson (ESA)	Electron density measurements in the magnetotail with different instruments	20	10:45
M. Capacci (Laben)	Observation of SMART-1 plume plasma environment with the EPDP plasma diagnostic package and future activities	20	11:05
M. Capacci (Laben)	Charging active control: PLEGPAY experiment onboard ISS results; activities on future systems	20	11:25
D. Rodgers (ESA)	Plasma measurements onboard CHAMP spacecraft	20	11:45
H. Laakso (ESA)	Observation of spacecraft plasma interactions with Cluster	20	12:05
D. Kataria (MSSL)	Spacecraft-plasma interactions: an MSSL perspective	20	12:25
A. Eriksson (IRFU)	Cold plasma and electric field measurements in the Jovian system: possibilities and challenges	20	12:45
	Session Wrap-up	10	13:05
	Lunch Break	75	13:15

## 13-11-2008 PM

	Session: Modelling and analysis	0	14:30
A. Hilgers (ESA)	Modelling of plasma environment of Cluster electrostatic sensors	20	14:30
A. Eriksson (IRFU)	Wakes in cold tenuous plasmas: nuisance and blessing	20	14:50
S. Ciucas (ESA)	MMS electrostatic environment simulation	20	15:10
D. Rodgers (ESA)	Champ and Swarm plasma environment modelling	20	15:30
	Coffee Break	15	15:50
A. Yilmaz (IKU)	Dynamical Modeling of Hall Thruster Plume	20	16:05
J.-F. Roussel (ONERA)	Microscope plasma environment modelling	20	16:25
J.-F. Roussel (ONERA)	Modelling of plasma tank and related langmuir probe calibration	20	16:45
S. Ciucas (ESA)	Study of plasma plume induced contamination on Lisa Path Finder	20	17:05
J.-F. Roussel (ONERA)	High level charging simulation	20	17:25
	Session Wrap-up	20	17:45

## Thank you all for your contribution!

- Hamelin
- Eriksson
- Kataria
- Capacci
- Roussel
- Yilmaz
- Lapenta
- Forest
- Payan
- Hill
- Genot
- Berthelie
- Marchand
- Rodgers
- Erd
- Stankov
- Wielders
- Laakso
- Clucas
- Santin
- Masson
- Hilgers
- Asnes

SPINE Meeting – 13-14 Nov 2008, ESTEC

## 14-11-2008

Speaker	Title	min	Time
	Session: Development of numerical tools	0	09:30
D. Rodgers (ESA)	A review of computational tools available at ESA	30	09:30
J.-F. Roussel (ONERA)	SPIS Numerical Solvers Status	30	10:00
G. Lapenta (KU Leuven)	DEMOCRITUS: A tool for simulating objects immersed in a plasma	30	10:30
G. Santin (ESA)	Geant4 low energy particle transport calculation for space applications	20	11:00
	Coffee Break	15	11:20
	Round Table on Modelling Requirements	60	11:35
	Closing	15	12:35
	Lunch Break	60	12:50

SPINE Meeting – 13-14 Nov 2008, ESTEC