EJSM EM-Sensor Study

Instrument Study Lead: **Jean-Louis Bougeret**
Co-Lead: **Baptiste Cecconi**
Instrument Study Manager: **Moustapha Dekkali**
[LESIA/France]

The **EJSM EM (ElectroMagnetic) Sensor Study** will perform a **comparative analysis of electric and magnetic sensors** and assess their relevance to the Ganymede environment in order to optimize the science return of the RPWI investigation. This study will also include an **assessment of the EMC** (ElectroMagnetic Cleanliness) **requirements** for the JGO spacecraft.

Team Composition Overview

EUROPE

FRANCE

- LESIA, Observatoire de Paris :
  scientific lead: ***B. Cecconi***
  technical lead: ***M. Dekkali***
- LPP, Ecole Polytechnique :
  scientific lead: ***T. Chust***
  technical lead: ***C. Coillot***
- LPC2E, Université d'Orléans :
  scientific lead: ***A. Marchaudon***
  technical lead: ***C. Cavoit***
- CESR, Université Paul Sabatier :
  scientific lead: ***N. André***

SWEDEN

- IRF-U, Swedish Inst. of Space Physics:
  scientific lead: ***J.-E. Wahlund***
  technical lead: ***L. Åhlén***
- KTH, Royal Institute of Technology :
  scientific lead: ***L. Blomberg***

AUSTRIA

- Graz, Austrian Academy of Sciences:
  scientific lead: ***H. Rucker***

CZECH REPUBLIC

- Instit. of Atmospheric Physics :
  scientific lead: ***O. Santolik***
  technical lead: ***J. Chum***
- Astronomical Institute :
  scientific lead: ***P. Travnicek***

UNITED KINGDOM

- Imperial College London:
  scientific lead: ***I. Müller-Wodarg***

POLAND

- Space Plasma Group SRC PAS:
  scientific lead: ***H. Rothkaehl***

ESA

- ESTEC RSSD ***J.-P. Lebreton***

OUTSIDE EUROPE

USA

- University of Iowa : scientific lead: ***B. Kurth***
  technical lead: ***D. Kirchner***
- University of California, Berkeley :
  scientific lead: ***S. Bale***
  technical lead: ***P. Turin***
- University of Colorado, Boulder :
  scientific lead: ***B. Ergun***
- University of Minnesota : technical lead: ***K. Goetz***

JAPAN

- Tohoku University: scientific/technical lead: ***Y. Kasaba***
- Kyoto University : scientific/technical lead: ***H. Kojima***
- Kanazawa University : scientific/technical lead: ***S. Yagitani***

IDENTIFIED SENSOR LIST

- E-boom (E-HF + E-BF) RPWI-PDD
  - *long dipole (~6 to 10 m)* *=> use JGO/SSR - JEO/IPR dipole ?*
  - *triad of short antennas (~1m)*
- LP (plasma + E-BF + E-DC) RPWI-PDD
- Search Coil (B-BF) RPWI-PDD
- HF Magnetic Loop (B-HF) not in PDD
- Rogowski Coil (current) not in PDD
- Mutual Impedance Probe (plasma) ⚠ EMC !

UPDATED SCOPE OF STUDY

- At the first meeting (Nov. ’09 telecon), it has been decided to restrict the scope of the study to Radio and Plasma Waves sensors.
- We thus consider that DC measurement instrumentation (E and B) is adequate as it is in the PDD.
- On the Radio/Plasma Waves point of view, the team is seriously envisaging to update the PDD.

ELECTROMAGNETIC CLEANLINESS (EMC)

- EMC requirement documents have been sent to ESA, with recommendations on grounding, common mode, radiated fields...
- Document is freely available.

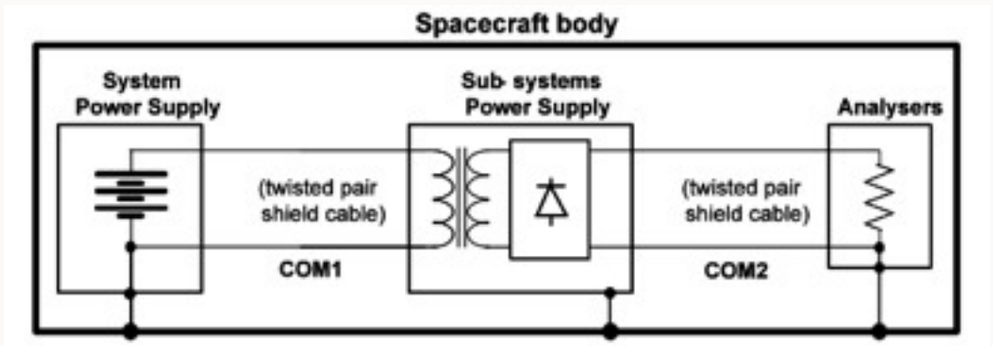

Figure 1 : Grounding diagram

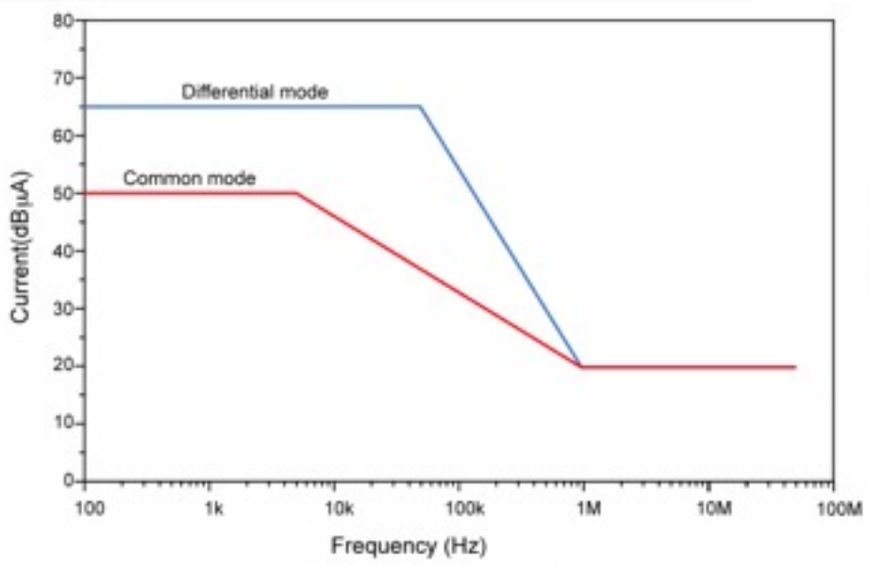

Figure 2 : Differential/common mode limits

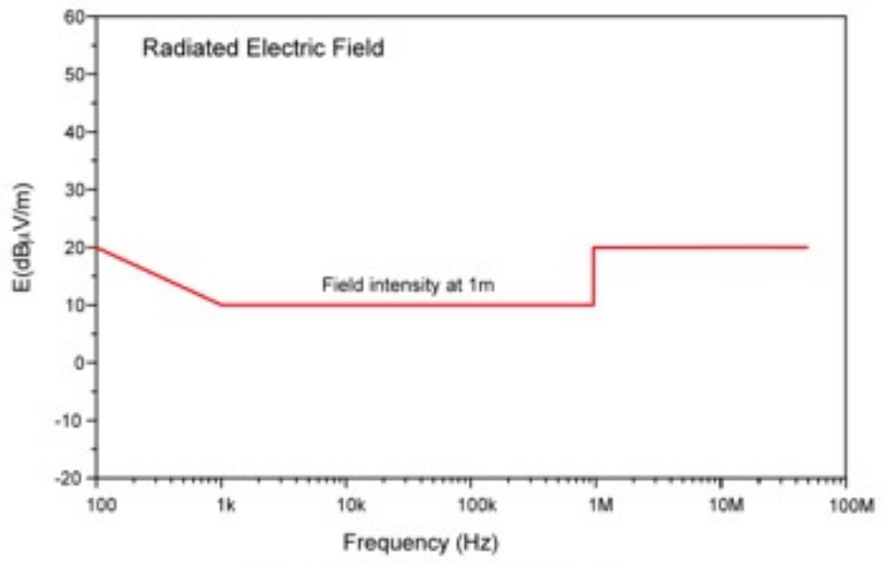

Figure 3 : Radiated electric field at 1m

SCIENCE OPTIMIZED SENSOR SELECTION

- Mass *(sensor, deployment mechanism, boom?)*
- Power *(preamplifier, active sensors)*
- Deployment mechanism and sensor robustness
- Gain, sensitivity & dynamic range *(size, preamplifiers, receiver noise)*
- Shape, location and orientation *(sensor adapted to specific analyses, influence of spacecraft body, boom, interference with other instruments FoV)*
- Accommodation, risks *(momentum, oscillations, planetary protection)*
- Radiation tolerance *(shielding, instrument design)*
- Electromagnetic cleanliness *(e.g. prefer passive instrumentation)*
- ...

STATUS REPORT

- Next meeting should be in February or March.
  Preliminary report should be available at this time

- Study covers both JGO and JEO.
  Contact with Jupiter WG and Magnetosphere WG (especially to promote minimal necessary JEO measurements)

- Antenna response simulations are underway.

- Technology Developments:
  CNES R&T projects submitted.
  Selection known at the end this month.