

**Short presentation of a project proposal for the
5th call Space in FP7**

„Prevention of Electrostatic Discharge triggered issues
aboard manned and autonomous space vehicles“

**Cluster Aero-Space Technologies, Research and
Applications**

(CASTRA)

Non-profit organisation of legal entities from the Academia,
Industry and NGO fields, all active in the space sector

BULGARIA



**COSMOS Matchmaking Event
18th March 2011, Sofia, Bulgaria**

Draft Call Topic that the Proposal Aims at*

Strengthening the foundations of Space science and technology (SSF)

➤ *Research to support space science and exploration*

➤ Exploitation of space science and exploration data

➤ *Research to support space transportation and key technologies*

➤ Key technologies for in-space activities

Cross-cutting activities

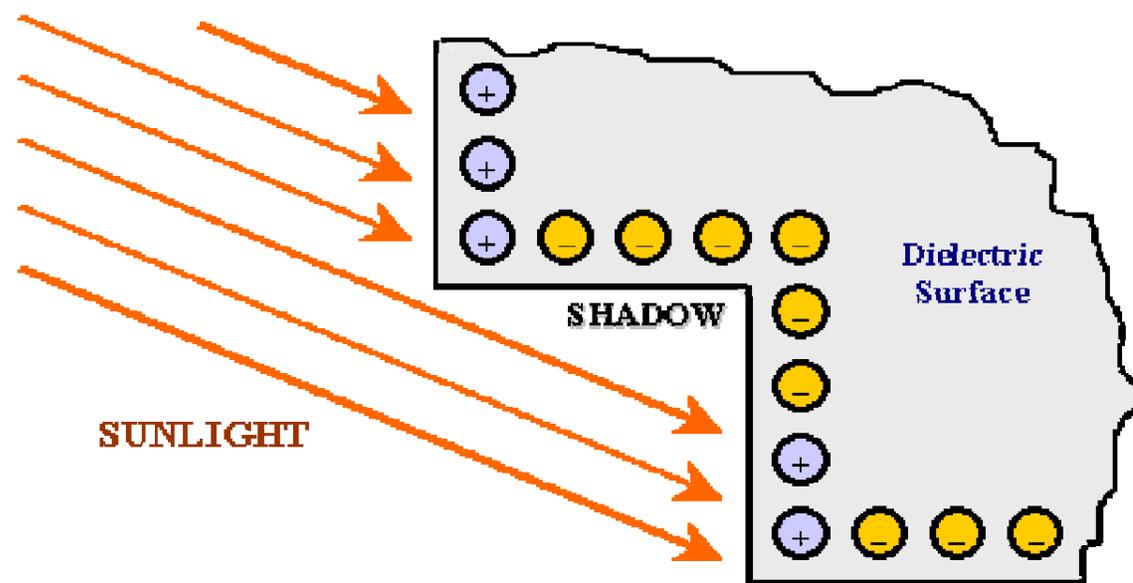
➤ *Studies and events in support of European Space Policy*

➤ New emerging research needs - reduction of vulnerability of space infrastructure

Short outline / Proposal concept I

➤ Short introduction into the state-of-the-art

Studies on the spacecraft charging began after several occasions of anomalous behavior of satellites in the early 1970s, and especially after the loss of the US military satellite DSCS-9431 in 1973 [1]. A large program was jointly conducted by NASA and the U.S. Air Force to investigate the problem. The USAF P78-2 Spacecraft Charging At High Altitudes (SCATHA) satellite operating between March 1979 and June 1980 was specially designed to obtain environmental and engineering data to allow the creation of design criteria, materials, techniques, tests and analytical methods to control charging of spacecraft surfaces



Due to self-shadowing, differential spacecraft surface charging can occur thus creating potential difference. Electric potential differences as severe as – 680V between polar-orbiting spacecraft and their high-latitude environment can occur

Docking
vehicle

In orbit Space
vehicle



Due to spacecraft charging, severe Electrical discharges can happen during different space operations leading to critical equipment failures in orbit

Short outline / Proposal concept II

- Scientific / technological aims exceeding the state-of-the-art

Develop guidelines, space born hardware design recommendations, characterisation methods , tools and solutions to mitigate the impact of the ESD events on the space-born hardware functioning. Possibly develop suitable standards.

The information about the expected range of charging will be instructive for instrument developers for applying the necessary shielding of the instruments, and for electronic elements developers for designing elements with increased stability in case of electrical discharging aboard spacecraft.

Short outline / Proposal concept III

➤ Scientific methodology

Study the mechanisms of spacecraft electrostatic charging

Develop a methodology to study the equipment charging

Develop instrumentation to quantify the electrostatic charging

Provide input to space hardware designers and space equipment manufacturers to mitigate the electrostatic charging onboard of a spacecraft during all mission stages , especially in docking events

Consortium I

- Coordinator: relevant experience, competencies
 - Fundamental understanding of ESD events;
 - experience in spaceborn hardware design
- Existing core team and responsibilities
 - Fundamental understanding of ESD events;
 - experience in spaceborn hardware design

Consortium II

➤ Wanted partners / competencies

all interested in the topic with relevant expertise in the problems,
especially these with knowledge and experience in space based
operations

Contact and further information

➤ Address data of the person to contact

CASTRA

info@castra.org

➤ Relevant links / references

www.catra.org

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- [6] L.R.Mott-Smith, I. Langmuir, The theory of collectors in gaseous discharges. Phys. Rev. 28 (4) , 1926, 727–763.
- [7] Brace, L.H. Langmuir Probe Measurements in the Ionosphere. In: Pfaff, R.F., Borovsky, J.E., Young, D.T. (Eds.), Measurement Techniques in Space Plasmas -- Particles: Geophysical Monograph 102. AGU, Washington, DC USA, pp. 23-35, 1998.
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