Review of ESA flight opportunities for plasma instruments & experiments

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Introduction

- Plasma sensors: Langmuir probe, retarding grid analyser, faraday cup, etc…[excluding > 100 keV detectors, and remote sensors in this presentation].
- Plasma emitters: particle gun, plasma contactor, EP system.
- Plasma effects experiments: charge detector, ESD monitor.
- Other devices: Tether, artificial magnetosphere, electric sail.
- Where do they fit in ESA programmes?

Scientific programme

- In development:
  - Lisa PF (EP)
  - Bepi Colombo (plasma on MMO)
- New science programme Cosmic Vision
- Several missions with plasma objectives:
  - EJSM/Laplace
  - Cross-scale
  - Solar orbiter
  - Marco-Polo
- Some plasma equipments may fly with a platform/payload support objective (EP, charge alleviation and/or monitoring).
- Payload instruments are nationally funded.

Earth Observation programme

- Sentinels missions
  - Most on polar LEO but no plasma instruments
- Explorer missions
  - SWARM (has plasma payload)
- Meteorological spacecraft
  - METOP (has plasma+rad monitor, SEM-2, in NOAA provided payload)
  - MTG (foresee radiation monitor-energy range?).

Application programmes

- Telecom
  - Alphasat (ARTES 8) – Includes EP and rad monitor.
  - Small geo (ARTES 11) -
  - Technology for platforms (ARTES 5)
- Navigation
  - Giove-A, B (had >300keV electron detectors but no plasma)
  - IOV + FOC: no plasma instruments planned.
  - Future?
- SSA
  - Solar wind and magnetosphere plasma detectors are foreseen.

Technology experiments

- General Support Technology Programme (Optional programme).
  - Proba-2 with plasma sensors.
  - Proba-3 could have plasma sensors.
- GSTP -5 expanded compared to previous GSTPs
- Establishment of several elements:
  - General activities (as now) –permanently open AO
  - Building blocks (equipment prepared to be available “off the shelf”);
    - Multi-application miniaturised EQM Hall Effect Thruster System
    - Radiation monitor
  - Security-related
    - Development of 3-D solar wind plasma monitor – Phase A/B
  - In-Orbit Demonstration (IOD):
    flight experiments; technology missions; Under discussion.
- Actions needed from ESA side and at national delegation and formal decision taken at IPC.

- Other:
  - Ellipse

Conclusion

- Several flight opportunities for plasma sensors (sci+app), plasma effects experiments (techno), plasma devices (especially EP).
- On the short term, good opportunity via:
  - EP propulsion
  - Considering extension of radiation monitor requirements to low energy range.
  - SSA plasma sensors
  - ESD experiments
- Possibility of harmonisation through SEENoTC (B, E, F, G, SE, UK).