space enuironment monitoring workshop

SPACEMON 2017

DISCUSSION SESSION SUMMARY

1. Missing environmental knowledge

- It is remarked that the topic of missing environmental knowledge should also entail missing effect knowledge.
- Electrostatic discharge (ESD) monitors are necessary to study spacecraft anomalies, in this sense ESA is looking for industrial partners to fly them and are therefore also useful to industry. A study called TWIST is being carried out by ONERA, also JPL is working on a prototype ESD monitor which is still a low TRL proof of concept. Since a spacecraft should be ESD free, the monitor itself should not affect the spacecraft itself. It is clarified that ESDs is not the same as the effects of internal charging and that ESDs can be measured in an indirect way by monitoring the transient in electrical potential on the spacecraft.
- A lot of science missions will be orbiting L2 which will require specific environmental knowledge. In particular the 10 keV to 1 MeV energy particle populations are poorly studied. The same goes for the microparticle environment where there seem to be very large uncertainties, the perturbations and effects of interplanetary space need to be understood better.
- The variation in environment will become important when spacecraft will use electrical orbit raising and traverse the radiation belts.
- The knowledge on the anisotropy of the SAA and LEO environment is something that requires attention. It is remarked that this can be done using detectors with several sensor heads on cubesat platforms. These cubesats will then also need to be attitude controlled so they exactly know where they are pointed to.
- Questions are raised on how the downlink from small sat and cubesat platforms should be organized (speed, how to distribute data, …)
- A lack of data on space environment in general is a recurring theme, questions are being raised on how the current models and predictive tools (SEPEM,…) can cope with this lack of data.
- An ESA ARTES activity is ongoing concerning the development of a solar array charging detector.

2. Collaborations

- In terms of collaborations it is important to establish what the needs of the industry vs. the needs of the customers are. After all, the needs of environment monitoring for housekeeping for the operators is not the same as the specifications required for e.g. the scientific community.
- At this point environment monitors are only flown on spacecraft when absolutely necessary. Operators and industry don't want to pay for this: if ESA's Space Situational Awareness programme wants environment monitors they will need to be the ones who pay. However this picture is changing since project managers start to be scared of failures. For example there were almost no monitors flying on the Galileo spacecraft but the second generation of Galileo spacecraft should fly a lot more since the team is open to the idea.
- It would be good if ESA could define a standard interface for modular monitors or detectors, not only electronically but also mechanically. There is a GSTP compendium activity on this point.
- It is remarked by JPL that Europe is more mature in terms of environment monitoring instruments and also flying them. This is due to imposed decisions from the ESA management where a directive was installed to fly radiation monitors on spacecraft (e.g. batch of 10 manufactured SREM monitors).
- It is proposed that perhaps it should be included in the ECSS that flying space environment monitors is mandatory. An incentive for industry could be that what is seen in the instruments is useful for life extension of the spacecraft.

3. Testing

- ESA has a collaboration agreement with CERN to use their testing facilities (also in collaboration with CNES and Fraunhofer). Of specific interest for the near future is the testing of batches of COTS materials to be used in space applications.
- The sharing of data is very important. The establishment of a standard data set requires a standard way of doing ground testing. In light of this it would be useful if there is also an intercalibration between test facilities happening (i. e. testing the same component in different test centers) or having test facility guidelines. ESA must take initiative to keep and improve the quality for testing and dosimetry.
- There is a big difference between the expertise in radiation testing and microparticle damage testing, more facilities and moitors are needed to update the damage equations that have been used since the '70s.
- A very difficult but necessary task lies in the testing and characterisation of material properties to estimate surface charging.

4. Flight opportunities

- Only looking at science missions there are science instruments that are capable of sampling the environment, however in this case the requirement is also such that the goal is to actually measure the environment.
- Industry has trouble getting access to platforms on which they can fly their radiation monitors. Companies like e.g. SSTL fly their monitors themselves. There is a demand for a technology demonstrator platform provided by ESA giving this opportunity like Proba. Missions to be launched in the forseeable future like Jason and Sentinel 6 don't fly monitors.
- The question about which people to lobby when wanting to fly monitors is being raised, e.g. in light of Galileo 2nd Generation. ESA should be consulted for the design but the European Commission is the customer. In general the more people insist on it the better.