

SYMPOSIUM ON NEW TECHNOLOGIES FOR FUTURE SPACE ASTRONOMY MISSIONS (A7)
Lessons Learned (5)

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HIGH TEMPERATURE AND IRRADIANCE TECHNOLOGIES FOR BEPICOLOMBO AND SOLAR
ORBITER MISSIONS

Abstract

The ESA missions BepiColombo, dedicated to Mercury exploration, and Solar Orbiter, dedicated to Sun and heliosphere observations, will fly at Sun distances close to or even below 0.3 AU. Both spacecraft will be submitted to quasi-permanent direct solar fluxes above 15 kW/m², further worsened for BepiColombo by the intense planet infrared thermal flux. Any item of the spacecraft exposed to such an extremely severe environment will implement dedicated technology, to ensure that its function can be delivered according to the needs. This is particularly critical for: • Solar array and solar cells: power delivery under very high temperature and high light intensity conditions, with cycling effects on BepiColombo; • High gain antenna with pointing mechanism, required to ensure beam directivity, RF performance and pointing accuracy under very hot environment as well; • External thermal control hardware (radiators, MLI, coatings, Sunshield of Solar orbiter); • Payload instruments, especially those in charge of Sun remote sensing on Solar orbiter. Beside these critical hardware technologies, system technologies must also be implemented. These relate to attitude safing, with autonomous failure detection, isolation and recovery. An optimum association of hardware technologies and system technologies is crucial for both missions. Since the initial study phases of both missions, in 2001, ESA has undertaken a significant Technology Development Activity (TDA) programme. BepiColombo implementation phase (B2 - C/D) was started in 2006, with Astrium Germany as prime contractor. All BepiColombo TDA initiated by ESA are managed by Astrium as normal project work. BepiColombo is the pathfinder for the technologies related to high solar irradiances that are common with Solar Orbiter. On the other hand, Solar Orbiter is expected to enter the implementation phase by end of 2011. The project prime contractor is Astrium UK. A key aspect for both projects is the management of commonalities to minimize development risks and costs, at all levels: critical technology, equipments, system. The paper will present first the critical technologies stemming from the BepiColombo and Solar orbiter missions, give a status on their acquired readiness level, and highlight the difficulties encountered during their development. A first set of lessons learnt will be proposed. Secondly, the paper will discuss about the technologies commonality management between both projects, and derive another set of lessons learnt