SPACE DEBRIS SYMPOSIUM (A6)
Hypervelocity Impacts and Protection (3)

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DEBRIS DETECTOR VERIFICATION BY HVI-TESTS

Abstract

Information regarding Space Debris (SD) or Micrometeoroids (MM) impacting on spacecraft (S/C) or payloads (P/L) can be obtained by using environmental models e.g. MASTER (ESA) or ORDEM (NASA). The validation of such models is performed by comparison of simulated results with measured data or orbital observation. The latter is utilised for large particles and can be obtained from ground based or space based radars or telescopes. Data regarding very small but abundant particles can also be gained by analysis of retrieved hardware (e.g. Hubble Space Telescope, Space Shuttle Windows), which are brought from orbit back to Earth. Furthermore, in-situ impact detectors are an essential source for information on small size meteoroids and space debris. These kind of detectors are placed inorbit and collect impact data regarding SD and MM, sending data near real time via telemetry. Compared to the impact data which is gained by analysis of retrieved surfaces, the detected data comprise additional information regarding exact impact time and, depending on the type of detector, on the orbit and particles composition. Nevertheless, existing detectors have limitations. Since the detection area is small, statistically meaningful number of impacts are obtained for very small particles only. Measurements of particles in the size range of hundreds of microns to mm which are potentially damaging to S/C require larger sensor areas. To make use of the advantages of in-situ impact detectors and to increase the amount of impact data an innovative impact detector concept is currently under development at DLR in Bremen. Different to all previous impact detectors the Solar Generator based Impact Detector (SOLID) is not an add-on component on the S/C. SOLID makes use of existing subsystems of the S/C and adopts them for impact detection purposes. Since the number of impacts on a target in space dependends linearly on the exposed area, the S/C solar panels offer a unique opportunity to use them for impact detection. Considering that the SOLID method could be applied to several S/Cs in different orbits, the spatial coverage in space concerning SD and MM can be significantly increased. In this way the method allows to generate large amount of impact data, which can be used for environmental model validation. This paper focuses on the verification of the SOLID method by Hypervelocity Impact (HVI) tests performed at Fraunhofer EMI. The test set-up as well as achieved results are presented and discussed.