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A STANDARD INTERCONNECT BENCHMARK FOR A EUROPEAN IN-ORBIT SERVICES, MANUFACTURING AND ASSEMBLY (ISMA) DEMONSTRATOR

Abstract

Growing space debris is an issue for which solutions are being sought, especially with the usage of space robotics. The topic ranges from disposal to sustainability. In this context, modular robotics plays a major role. Here, different modules with different payloads can be combined with each other to create, for example, a satellite and in the event of malfunction, modules can be replaced without having to abandon the whole satellite. This reduces space debris. To connect the modules, standard interconnects (SIs) with multifunctional features, like to connect mechanically and transit power and data, are required. In the operational grant (OG) PERIOD of the EU Horizon 2020 project PERASPERA, three existing Sis have been evaluated with the help of a benchmarking concept to give a recommendation on the most suited one to be used in the orbital demonstration mission of PERIOD. Two of these SIs were developed in the previous OGs. These are SIROM, developed in the first phase and HOTDOCK developed during the second phase of PERASPERA. The third SI is the iSSI by iBOSS GmbH.

The SI benchmark methodology was developed using typical steps of a TRA of a component at TRL

5 as documented in Section 5.3.5 of the ECSS-E-HB-11A - guideline:

- 1. Define element to be assessed.
- 2. Define relevant environment and performance requirements.
- 3. Identify and analyse critical functions of an element.
- 4. Define a test plan to validate and verify the element.

The goal of the activity is to identify and verify in a relevant environment the critical functions of an element on non-full-scale breadboard(s) with a limitation that the benchmark shall not perform the TRA of SIs under test but merely use the above-mentioned steps as a guide for the benchmark method while complying with the constraints of the PERIOD project.

Tests are implemented by the German Research Center for Artificial Intelligence GmbH (DFKI) as an independent body to evaluate the performance of the SIs in relevant demonstration scenarios and in full transparency to the Consortium members. This will lead to a recommendation of a preferred interface to be considered during the B2 phase of the project. This paper describes the benchmark concept, methodology, test setup and execution, and the path of the recommendation. The approach can be extended and applied to future deployments of SIs in European as well as international space projects.