MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Dr. ROBERTO PALAZZETTI
University of Strathclyde, United Kingdom

Dr. Karen Donaldson
University of Strathclyde, United Kingdom
Mrs. Wiebke Wenzel
DFKI GmbH, Robotics Innovation Center, Germany
Dr. Sebastian Bartsch
DFKI GmbH, Germany
Prof. Xiu-Tian Yan
University of Strathclyde, United Kingdom

TOWARD A MULTIFUNCTIONAL INTERFACE FOR FUTURE PLANETARY AND ORBITAL MISSIONS

Abstract

The growing interest for extra-terrestrial missions makes the robotic handling of payload in space missions and planetary explorations a topic of great interest. The SIROM (Standard Interface for Robotic Manipulation of Payloads in Future Space Missions) project, funded by the European Union's Horizon 2020 research and innovation programme which aims to design, develop and manufacture a new standard multifunctional interface for handling active payload modules (APMs) in space. A modular, scalable interface (IF) has been designed for transferring mechanical loads, data information, electrical power and heat flux from one module to another in two different scenarios: space mission, and extra-terrestrial planetary exploration. The IF here presented targets orbital missions, and illustrates some unique features compared with existing designs and prototypes.

This paper shows part of the preliminary results achieved to date for said project. In particular, the design of the structure is presented in detail, as well as the operations necessary for docking with a counterpart. A thermo-mechanical simulation of the IF has been performed, and a prototype has been built to test and validate the design.

The final aim of the prototype is to validate the new ideas and the unique features of the proposed design, and to lay down the basis for further development, targeting an increase of the TRL of the solution. It is expected that the preliminary design will develop into a functional ready-to-fly interface by the beginning of 2019.

The challenge of mechatronic design has been undertaken by using multiple layered hierarchical models, to enable a multiple perspective view of such a complex system. Initial design inputs were: mass of the IF: 1.5 Kg, mechanical payload: 5.5 Kg, data rate to be ensured: $\geq$100 Mbits/s, electrical power to be transmitted: 300 W and thermal load to be transferred: 50 W. The design of the mechanical and thermal functionalities is scalable, as their performances strongly depend on the size and type of the payload. Contrary to this, the electrical and power connectors will be much less affected by the size of module they will be installed to, and their configuration will not change significantly among different sizes of IF.