

SPACEWIRE CABLING IN AN OPERATIONALLY RESPONSIVE SPACE ENVIRONMENT

Session: SpaceWire Test and Verification

Long Paper

Derek Schierlmann and Paul Jaffe

*Naval Center for Space Technology, Naval Research Laboratory Code 8243,
4555 Overlook Ave SW, Washington, DC 20375, USA*

E-mail: derek.schierlmann@nrl.navy.mil, paul.jaffe@nrl.navy.mil

ABSTRACT

The rapid integration, launch, and deployment of satellites in response to emerging needs has been a focus of various organizations. This concept has been termed “Operationally Responsive Space” (ORS) by the United States Department of Defense. One vision of ORS calls for the positioning in a depot of interchangeable satellite payloads and spacecraft buses with a common interface. Upon direction to deploy a particular mission, the appropriate payload would be selected and integrated with a bus, and the space vehicle would be launched. To support such a system, standardized hardware and software interfaces are needed between the payload and bus. For the development of ORS Bus Standards, SpaceWire has been specified as part of such a payload-bus interface for high rate data. Data interfaces can be modelled in a number of ways, such as with the OSI layer model. SpaceWire offers the appeal of standardization of physical, data, and network layers. However, the physical standards specified in the SpaceWire standard (ECSS-E-50-12A) regarding connectors are not ideal for the depot environment. The needs for quick connection, use by minimally trained personnel, and few or no required tools combine with the usual mission considerations of cost, availability, signal integrity maintenance, and space worthiness in driving connector selection. The preliminary investigation and testing described in this paper details our recent efforts at the Naval Center for Space Technology concerning possible SpaceWire connectors for ORS. Proposed ORS test and flight cables were fabricated, tested, and analyzed using oscilloscope and time-domain reflectometry techniques and compared with existing SpaceWire standard cabling.