

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advanced Technologies (5)

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SPACEFIBRE: GBIT/S LINKS FOR USE ON BOARD SPACECRAFT

Abstract

SpaceFibre is a very high-speed serial data-link standard being developed by ESA which is intended for use in data-handling networks for high data-rate payloads. SpaceFibre is able to operate over fibre optic and copper cable and support data rates of 2.5 Gbit/s in the near future and up to 6 Gbit/s long-term. It aims to complement the capabilities of the widely used SpaceWire onboard networking standard: improving the data rate by a factor of 10, reducing the cable mass by a factor of four and providing galvanic isolation.

SpaceFibre will support high data-rate payloads, for example synthetic aperture radar and hyperspectral optical instruments. It will provide robust communications over distances of up to 100m for launcher applications and will support avionics applications with deterministic delivery constraints through its inbuilt quality of service mechanisms. SpaceFibre will enable a common onboard infrastructure to be used across many different mission applications resulting in cost reduction and design reusability.

The principal requirements for SpaceFibre are listed below:

- Symmetrical, bi-directional, point-to-point link connection
- High speed (1-10 Gbits/s) with a target of at least 2.5 Gbits/s
- Fibre cable lengths of up to 100 m
- Copper cable over shorter length of 5 m
- Fibre optic cable mass of less than 20 g/m for a full-duplex link
- Galvanic isolation
- Quality of service support
- Support arbitrary network architectures
- Support mixed SpaceWire-SpaceFibre networks using a SpaceWire-SpaceFibre multiplexer/de-multiplexer

A prototype SpaceFibre interface has been designed by the Space Technology Centre at the University of Dundee, a demonstration system built and an initial draft of a standard document written. This work was funded by ESA under contract number 17938/03/NL/LvH. A prototype has also been built by NASA Goddard Space Flight Centre and will shortly fly on a test vehicle.

The full paper will provide an introduction to SpaceFibre and describe the work done by University of Dundee in developing the SpaceFibre prototype. The paper is aimed at spacecraft system engineers and product managers and will show how SpaceFibre fills a growing gap in onboard communications links for spacecraft, which is being widened by the high data-rate demands of new instruments. It will conclude with an overview of the current state of the SpaceFibre standard and its supporting technologies.