SLOVENSKI STANDARD
oSIST prEN 16603-50-11:2018

01-oktober-2018

Vesoljska tehnika - SpaceFibre - Zelo hitri serijski vmesnik

Space engineernig - SpaceFibre - Very high-speed serial link

Raumfahrttechnik - SpaceFibre - Serielle Verbindung mit sehr hoher Geschwindigkeit

Ingénierie spatiale - SpaceFibre - Liaison série très haut débit

Ta slovenski standard je istoveten z: prEN 16603-50-11

ICS:

49.140	Vesoljski sistemi in operacije	Space systems and operations

oSIST prEN 16603-50-11:2018 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 16603-50-11

July 2018

ICS 49.140

English version

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Ingénierie spatiale - SpaceFibre - Liaison série très haut débit

Raumfahrttechnik - SpaceFibre - Serielle Verbindung mit sehr hoher Geschwindigkeit

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/CLC/JTC 5.

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Document type: European Standard
Document subtype:
Document stage: ENQUIRY
Document language: E

Y:\STD_MGT\STDDEL\PRODUCTION\Standards\JT005\128\41_e_stf.docx

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European Foreword

This document (prEN 16603-50-11:2018) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN (Germany).

This document (prEN 16603-50-11:2018) originates from ECSS-E-ST-50-11C DIR1.

This document is currently submitted to the CEN ENQUIRY.

This document has been developed to cover specifically space systems and will the-refore have precedence over any EN covering the same scope but with a wider do-main of applicability (e.g.: aerospace).

1 Scope

SpaceFibre is a very high-speed serial link and network technology, designed specifically for use on board spacecraft. SpaceFibre is able to operate over fibre-optic and electrical cable and supports data rates of up to 5 Gbps (6,25 Gbps data signalling rate). It complements the capabilities of the widely used SpaceWire on-board networking standard: improving the data rate by a factor of 10, reducing the cable mass and providing galvanic isolation. Multi-laning improves the data-rate further to well over 20 Gbps.

SpaceFibre provides a coherent quality of service mechanism able to support bandwidth reserved, scheduled and priority based qualities of service. It substantially improves the fault detection, isolation and recovery (FDIR) capability compared to SpaceWire.

SpaceFibre aims to support high data-rate payloads, for example synthetic aperture radar and hyper-spectral optical instruments. It provides robust, long distance communications for launcher applications and supports avionics applications with deterministic delivery constraints through the use of virtual channels. SpaceFibre enables a common on-board infrastructure to be used across many different mission applications resulting in cost reduction and design reusability. SpaceFibre uses a packet format which is the same as SpaceWire enabling simple connection between existing SpaceWire equipment and high-speed SpaceFibre links and networks. Applications developed for SpaceWire can be readily transferred to SpaceFibre.

The SpaceFibre standard specifies the interfaces to the user application and to the physical medium. Intermediate interfaces between protocol layers are also specified. The functions that a SpaceFibre interface has to implement are specified. Connector and cable characteristics for SpaceFibre optical and copper implementations are also specified.

This standard may be tailored for the specific characteristic and constraints of a space project in conformance with ECSS-S-ST-00.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this specification. For dated references, subsequent amendments to, or revision of any of these publications do not apply. However, parties to agreements based on this specification are encouraged to investigate the possibility of applying the more recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system - Glossary of terms
EN 16603-50-12	ECSS-E-ST-50-12	Space engineering - SpaceWire - Links, nodes, routers and networks
EN 16603-50-52	ECSS-E-ST-50-52	Space engineering - SpaceWire – Remote Memory Access Protocol
EN 16602-70-02	ECSS-Q-ST-70-02	Space product assurance - Thermal vacuum outgassing test for the screening of space materials
EN 16602-70-21	ECSS-Q-ST-70-21	Space product assurance - Flammability testing for the screening of space materials
EN 16602-70-29	ECSS-Q-ST-70-29	Space product assurance - Determination of offgassing products from materials and assembled articles to be used in a manned space vehicle crew compartment
	ESCC 3420:2017	Optical Fibre Cable Assemblies with Single Fibre Ferrules, ESCC Generic specification, issue 1, June 2017
	ESCC 2263420:2017	Evaluation Test programme for optical fibre cable assemblies, ESCC Basic Specification, issue 1, June 2017
	ESCC 3401/088:2018	High Data Rate Connectors Savers, Plugs based on type AxoMach, ESCC Detailed specification, issue 1, 2018
	ESCC 3401/089:2018	Connectors, Electrical, Rectangular, High Data Rate PCB Connectors based on type AxoMach, ESCC Detailed specification, issue 1, 2018
	ESCC 3409:2018	High Data Rate Cable Assemblies, Generic specification, issue 1, 2018

EN reference	Reference in text	Title
	ESCC 3409/001:2018	High Data Rate Harnesses based on type AxoMach, ESCC Detailed specification, issue 1, 2018
	ESCC 3420/001:2017	Optical Fibre Cable Assemblies with Single Fibre Ferrules, ESCC Detail specification, issue 1, June 2017
	IEC 60793-2-10:2015	Optical fibres - Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres, IEC, 2015
	IEC 61754-5:2005	Fibre optic connector interfaces - Part 5: Type MT connector family, IEC, 2005
	IEC 61755-3-31:2015	Fibre optic interconnecting devices and passive components - Connector optical interfaces - Part 3-31: Connector parameters of non-dispersion shifted single mode physically contacting fibres - Angled polyphenylene sulphide rectangular ferrules
	IEC 61755-3-32:2015	Fibre optic interconnecting devices and passive components - Connector optical interfaces - Part 3-32: Connector parameters of non-dispersion shifted single mode physically contacting fibres - Angled thermoset epoxy rectangular ferrules
	IEEE 802.3:2012	IEEE Standard for Ethernet, IEEE Standards Association, 28 December 2012
	MIL-PRF-49291, Revision D, Amendment 1, 20 November 2014	Performance Specification, Fiber, Optical, (Metric) General Specification
	MIL-PRF-85045, Revision G, 17 June 2014	Performance Specification, Cables, Fiber Optic, General Specification
	Serial ATA Revision 3.0:2009	Serial ATA Revision 3.0, clause 6.6.1, Serial ATA International Organization, June 2, 2009, Gold Revision

3 Terms, definitions and abbreviated terms

3.1 Terms defined in other standards

a. For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply.

3.2 Terms specific to the present standard

3.2.1 active lane

unidirectional lane or **bi-directional lane** which is in the Active state

3.2.2 asymmetric link

multi-lane link that includes one or more **unidirectional lanes**

3.2.3 available bandwidth

number of **data words** or **control words** sent since the **bandwidth credit** was last updated

3.2.4 bandwidth credit

amount of **link bandwidth** that a **virtual channel** has accumulated

3.2.5 bandwidth credit limit

maximum amount of positive or negative **bandwidth credit** that a **virtual channel** is allowed to accumulate

3.2.6 bandwidth utilisation

measure of how much bandwidth allocated to a **virtual channel** has been used recently, allowing for loss of measured use of bandwidth when either the positive or negative **bandwidth credit limit** is reached

3.2.7 bi-directional lane

active lane or **inactive lane** which has the TX_EN and RX_EN configuration bits asserted at both ends of the **link**, so that when active it can send information in both directions of the **link**