SLOVENSKI STANDARD
SIST EN 16603-50-11:2020

01-november-2020

Vesoljska tehnika - SpaceFibre - Zelo hiter 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

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49.140	Vesoljski sistemi in operacije	Space systems and operations

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English version

Space engineernig - SpaceFibre - Very high-speed serial link

Ingénierie spatiale - SpaceFibre - Liaison série très haut débit

Raumfahrttechnik - SpaceFibre - Teil 50-11: Sehr schnelle serielle Schnittstelle

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European Foreword

This document (EN 16603-50-11:2020) has been prepared by Technical Committee CEN-CENELEC/TC 5 “Space”, the secretariat of which is held by DIN.

This document (EN 16603-50-11:2020) originates from ECSS-E-ST-50-11C.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2021, and conflicting national standards shall be withdrawn at the latest by March 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association.

This document has been developed to cover specifically space systems and has therefore precedence over any EN covering the same scope but with a wider domain of applicability (e.g. aerospace).

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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 Gbit/s (6,25 Gbit/s 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 Gbit/s.

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 characteristics 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 ECSS Standard. For dated references, subsequent amendments to, or revision of any of these publications do not apply. However, parties to agreements based on this ECSS Standard 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 16603-50-52	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 2263420:2017	Evaluation Test programme for optical fibre cable assemblies, ESCC Basic Specification, issue 1, June 2017
	ESCC 3401/090:2018	High Data Rate Connectors Savers, Plugs based on type AxoMach, ESCC Detail Specification, issue 1, 2018
	ESCC 3409:2018	High Data Rate Cable Assemblies, ESCC Generic Specification, issue 1, 2018
	ESCC 3409/001:2018	High Data Rate Harnesses based on type AxoMach, ESCC Detail Specification, issue 1, 2018
	ESCC 3420:2017	Optical Fibre Cable Assemblies with Single Fibre Ferrules, ESCC Generic Specification, issue 1, June 2017
	ESCC 3420/001:2017	Optical Fibre Cable Assemblies with Single Fibre Ferrules, ESCC Detail Specification, issue 1, June 2017

EN reference	Reference in text	Title
	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
	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**