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Space engineering - Radio frequency and modulation

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This European Standard was approved by CEN on 1 March 2014.

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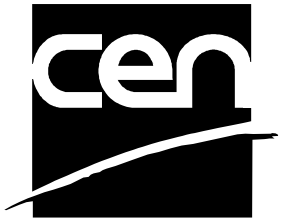

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Table of contents

Foreword **6**

Introduction **7**

1 Scope **8**

2 Normative references **9**

3 Terms, definitions and abbreviated terms **10**

3.1 Terms from other standards 10

3.2 Terms specific to the present standard 10

3.3 Abbreviated terms 12

4 Frequency allocations, assignment and use **15**

4.1 Frequency allocations to the Space Operation, Space Research and Earth Exploration-Satellite services 15

4.1.1 Overview 15

4.1.2 Frequency bands allocated to the Space Radiocommunications services 15

4.2 Specific conditions for the use of certain frequency bands 17

4.2.1 2 025 MHz – 2 120 MHz and 2 200 MHz – 2 300 MHz bands 17

4.2.2 8 025 MHz – 8 400 MHz band 18

4.2.3 8 400 MHz - 8 450 MHz band 19

4.2.4 8 450 MHz – 8 500 MHz band 19

4.2.5 25,5 GHz – 27,0 GHz, 37,0 GHz – 38 GHz and 40,0 GHz – 40,5 GHz bands 19

4.3 Frequency assignment procedure 20

4.3.1 Choice of frequencies 20

4.3.2 Advance publication, coordination and notification of frequencies 21

5 Transmitted signals **22**

5.1 Turnaround frequency ratio for coherent transponders 22

5.1.1 Generation of the transmitted carrier 22

5.1.2 Band pairs 22

5.2 Carrier frequency stability 24

5.2.1 Spacecraft transmitter 24

5.2.2 Spacecraft receiver 25
5.2.3 Ground station equipment 25
5.3 Polarization 26
5.4 Occupied bandwidth considerations 26
5.5 Emissions 28
5.5.1 Unwanted emission power level 28
5.5.2 Cessation of emissions 32
5.5.3 Power flux density limits at the Earth's surface 32
5.5.4 Power flux density limits at the GSO in the 25,5 GHz - 27,0 GHz band 33
5.5.5 Power limits for Earth station emissions 34
5.5.6 Time limitations on transmissions 35

6 Modulation 36
6.1 Phase modulation with residual carriers 36
6.1.1 Application 36
6.1.2 Modulating waveforms 36
6.1.3 PCM waveforms and data rates 37
6.1.4 Use of subcarriers 39
6.1.5 Data transition density 41
6.1.6 Carrier modulation index 42
6.1.7 Sense of modulation 42
6.1.8 Modulation linearity 42
6.1.9 Residual amplitude modulation 42
6.1.10 Carrier phase noise 43
6.1.11 Residual carrier, out-of-band emission and discrete spectral lines 43
6.2 Suppressed carrier modulation 44
6.2.1 Application and modulation schemes 44
6.2.2 Modulating waveforms 45
6.2.3 Carrier modulation 45
6.2.4 Data transition density 51
6.2.5 Symbol rate stability 51
6.2.6 Carrier phase noise 51
6.2.7 Carrier suppression, out-of-band emission and discrete spectral lines 51
6.3 Spectral roll-off 52

7 Link acquisition procedures 53
7.1 Space-Earth 53
7.1.1 Normal operation 53

7.1.2 Alternative mode of operation 53
7.1.3 Coherent mode 53
7.2 Earth-space 54
7.2.1 2 025 MHz - 2 110 MHz category A 54
7.2.2 2 110 MHz - 2 120 MHz category B 55
7.2.3 7 145 MHz - 7 190 MHz category B 55
7.2.4 7 190 MHz – 7 235 MHz category A....55

8 RF interface control....57
8.1 RF interface control documents 57
8.2 Spacecraft-Earth station interface control document....57
8.2.1 Overview....57
8.2.2 Process....57
8.3 Link budget tables....58
8.3.1 General....58
8.3.2 Parameters 58
8.4 Spacecraft-ground network compatibility test....61

9 GMSK and 8PSK TCM modulation formats 63
9.1 GMSK modulation format....63
9.2 8PSK TCM modulation format 64
9.2.1 General principles 64
9.2.2 4 dimensional 8PSK-TCM encoder 64
9.2.3 Differential encoders for SEF = 2 and 2,5....65
9.2.4 Trellis encoder structure....66
9.2.5 Constellation mapper for 4 dimensional 8PSK-TCM....66
9.2.6 Channel filtering 68

Annex A (normative) Spacecraft-Earth station interface control document - DRD 71

Annex B (informative) Cross-support from other networks 72

Annex C (informative) Protection of Ariane-5 RF system....73

Annex D (informative) Differences from CCSDS recommendations....76

Annex E (informative) Tailoring guidelines....78

Bibliography....79

Figures

Figure 4-1: Maximum allowable bandwidth in the band 8 400 MHz - 8 450 MHz 20
Figure 6-1: PCM waveforms and symbol duration definition 38
Figure 6-2: Symbol rate reference point 39
Figure 6-3: QPSK/OQPSK constellation mapping 46
Figure 6-4: OQPSK post-amplifier filter transfer function 49
Figure 6-5: Spectral emission masks for telemetry transmission at symbol rates above 60 ksps 52
Figure 8-1: Parameter distributions and their equations.....60
Figure 9-1: General principle of the 4D-8PSK TCM modulator 65
Figure 9-2: Codes to eliminate 22,5° phase ambiguity on carrier synchronization 66
Figure 9-3: Representation of a 64 state L=7, rate 3/4 systematic trellis encoder 66
Figure 9-4: Constellation mapper for SEF = 2.....67
Figure 9-5: Constellation mapper for SEF = 2,5.....67
Figure 9-6: Transmit structure for baseband, square root raised-cosine shaping.....69
Figure 9-7: Transfer function for a 4 poles/2 zeros elliptic filter 69
Figure 9-8: Transmit structure for post-amplifier shaping.....70

Tables

Table 4-1: Frequency allocations to the Space Operation, Space Research and Earth Exploration-Satellite services 16
Table 5-1: Turnaround frequency ratios for coherent transponder operation 23
Table 5-2 Alternative turnaround frequency ratios for coherent transponder operation.....24
Table 5-3: Frequency stability for spacecraft transmitters.....24
Table 5-4: Frequency stability for spacecraft receivers 25
Table 5-5: Occupied bandwidth 27
Table 5-6: Maximum level of spurious emissions.....28
Table 5-7: Threshold levels of interference detrimental to radio astronomy spectral line (i.e. narrow bandwidth) observations at the surface of the Earth due to terrestrial interference sources (Recommendation ITU-R RA.769-2).....30
Table 5-8: Threshold levels of interference detrimental to radio astronomy continuum (i.e. wide bandwidth) observations at the surface of the Earth due to terrestrial interference sources (Recommendation ITU-R RA.769-2).....31
Table 5-9: Harmful interference levels at deep space antenna sites 32
Table 5-10: Power flux density limits at the Earth’s surface 33
Table 6-1: PCM waveforms and rates for residual carrier modulation.....37
Table 6-2: Subcarriers used with phase-modulated carriers 39
Table 6-3: Limits of the peak modulation index.....42
Table 6-4: PCM waveforms 45
Table 8-1: Probability density functions for link budgets 60

Foreword

This document (EN 16603-50-05:2014) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16603-50-05:2014) originates from ECSS-E-ST-50-05C Rev. 2.

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 2015, and conflicting national standards shall be withdrawn at the latest by March 2015.

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 mandate 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This Standard contains requirements to ensure the following:

- Compatibility of frequency usage and modulation schemes between space agencies' spacecraft and Earth stations for the Space Operation, Space Research and Earth Exploration-Satellite services.
- Compatibility between the spacecraft and the networks that they interact with, as far as possible.
- Standardization of frequency usage and modulation schemes within the space projects.
- Conformity of spacecraft and Earth station parameters to international radio regulatory provisions (Radio Regulations of the International Telecommunication Union (ITU)) and with national regulatory provisions (e.g. national frequency plans).
- Selection of the appropriate parameters of spacecraft and Earth stations that are listed in advance of their use, thus enabling coordination with other interested parties.
- Optimization of the frequency usage and modulation schemes within the above limitation.

1
Scope

This Standard defines the radio communication techniques used for the transfer of information between spacecraft and Earth stations in both directions, and for the tracking systems used for orbit determination. It includes the following:

- frequency allocation, assignment and use;
- requirements on transmitted signals concerning, for example, spectral occupation, RF power levels, protection of other radio services;
- definition of the permissible modulation methods and parameters;
- specification of the major technical requirements relevant for the interface between spacecraft and Earth stations;
- operational aspects, such as acquisition;
- cross-support.

This Standard is applicable to all spacecraft supported by Earth stations[1] and to all controlled Earth stations operating in the Space Operation, Space Research and Earth Exploration-Satellite services as defined in the ITU Radio Regulations.[2]

Other space telecommunication services are not covered in this issue.

All requirements in this Standard are equally applicable to both the customer and the supplier with exception of clauses 4.3.1 and 4.3.2 which are applicable to the customer only.

Further provisions and guidance on the application of this Standard can be found, respectively, in ECSS-E-ST-50 "Communications", and in the handbook ECSS-E-HB-50A "Communications guidelines".

ECSS-E-ST-50 defines the principle characteristics of communication protocols and related services for all communication layers relevant for space communication (physical- to application-layer), and their basic relationship to each other. The handbook ECSS-E-HB-50 provides information on specific implementation characteristics of these protocols in order to support the choice of a certain communications profile for the specific requirements of a space mission. Users of the present standard are invited to consult these documents before taking decisions on the implementation of the present one.

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

[1] This Standard is not applicable to spacecraft supported by data relay satellites.

[2] Under the term Earth Exploration-Satellite service, the Meteorological Satellite service is also included.

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 revisions 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 most 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 16603-10-03	ECSS-E-ST-10-03	Space engineering – Testing
EN 16603-50	ECSS-E-ST-50	Space engineering – Communications
EN 16603-50-01	ECSS-E-ST-50-01	Space engineering – Space data links - Telemetry synchronization and channel coding
	ITU/RR:2004 [3,4]	ITU Radio Regulations

[3] In this Standard the relevant articles are specified after the reference name. For example, ITU/RR/1.23 refers to Article 1.23.

[4] For possible changes to the ITU/RR, contact the responsible frequency coordinator.