ISO 17854:2013-06 (E)

Space data and information transfer systems - Flexible advanced coding and modulation scheme for high rate telemetry applications

Contents

Page

1 INTRODUCTION 1-1

1.1 PURPOSE 1-1
1.2 SCOPE 1-1
1.3 APPLICABILITY 1-2
1.4 DOCUMENT STRUCTURE 1-2
1.5 CONVENTIONS AND DEFINITIONS 1-3
1.6 PATENTED TECHNOLOGIES 1-4
1.7 REFERENCES 1-5

2 OVERVIEW 2-1

2.1 ARCHITECTURE 2-1
2.2 SUMMARY OF FUNCTIONS 2-1
2.3 INTERNAL ORGANIZATION 2-3

3 MODE ADAPTATION 3-1

3.1 OVERVIEW 3-1
3.2 SCCC SYSTEM INPUT AND INITIAL OPERATIONS 3-1

4 SCCC ENCODING 4-1

4.1 GENERAL 4-1
4.2 CONVOLUTIONAL ENCODING 4-2
4.3 INTERLEAVER 4-3
4.4 CODING RATE ADJUSTMENT 4-4
4.5 ROW-COLUMN INTERLEAVER 4-8

5 PHYSICAL LAYER FRAMING 5-1

5.1 GENERAL 5-1
5.2 CONSTELLATION MAPPING 5-1
5.3 PL SIGNALLING INSERTION 5-6
5.4 FRAME HEADER MODULATION 5-10
5.5 PHYSICAL LAYER *I*/*Q* PSEUDO-RANDOMIZATION 5-11

6 BASEBAND FILTERING 6-1

7 FRAME SYNCHRONIZATION 7-1

7.1 OVERVIEW 7-1
7.2 THE ATTACHED SYNC MARKER 7-1
7.3 ASM BIT PATTERNS 7-1
7.4 LOCATION OF ASM 7-1
7.5 ASM FOR EMBEDDED DATA STREAM 7-2

8 PSEUDO-RANDOMIZER 8-1

8.1 OVERVIEW 8-1
8.2 PSEUDO-RANDOMIZER DESCRIPTION 8-1
8.3 SYNCHRONIZATION AND APPLICATION OF PSEUDO-RANDOMIZER 8-1
8.4 SEQUENCE SPECIFICATION 8-2
8.5 LOGIC DIAGRAM 8-2

9 MANAGED PARAMETERS 9-1

9.1 OVERVIEW 9-1
9.2 PERMANENT MANAGED PARAMETERS 9-1
9.3 VARIABLE MANAGED PARAMETERS 9-2

ANNEX A SERVICE (NORMATIVE) A-1
ANNEX B PARALLELIZED INTERLEAVER (NORMATIVE) B-1
ANNEX C PHYSICAL LAYER PSEUDO-RANDOMIZATION (NORMATIVE) C-1
ANNEX D SECURITY, SANA, AND PATENT CONSIDERATIONS (INFORMATIVE) D-1
ANNEX E ACRONYMS AND TERMS (INFORMATIVE) E-1
ANNEX F INFORMATIVE REFERENCES (INFORMATIVE) F-1

Figure

1-1 Bit Numbering Convention 1-3
2-1 Relationship with OSI Layers 2-1
2-2 Functional Diagrams at Sending End 2-3
2-3 Stream Format at Different Stages of Processing 2-4
4-1 Block Diagram of the SCC Turbo Coding Scheme 4-2
4-2 The Convolutional Encoder Block Diagram for CC1 and CC2 4-3
4-3 Outer Code Puncturing Scheme 4-3
4-4 Row-Column Bit-Interleaving Scheme 4-9

Figure Page

5-1 Bit Mapping into Constellations 5-4
5-2 Physical Layer Frame Structure 5-6
5-3 Frame Marker Sequence Generator 5-7
5-4 Frame Descriptor Code Structure 5-8
5-5 Generator Matrix for (32,6) Code 5-9
5-6 Distributed Pilot Pattern 5-10
7-1 Embedded ASM Bit Pattern 7-2
8-1 Pseudo-Randomizer Configuration 8-1
8-2 Pseudo-Randomizer Logic Diagram 8-3
B-1 Interpretation of Interleaver Algorithm B-1
C-1 Possible Block Diagram for Pseudo-Randomization Sequence Generation C-2

Table

3-1 Information Block Sizes for Different ACM Formats 3-2
4-1 Interleaver Sizes for Different ACM Formats 4-4
4-2 Best Incremental Puncturing Positions 4-6
4-3 Main Encoder Parameters for 27 Selected ACM Formats 4-8
5-1 Constellation Radius Ratios for 16APSK and 32APSK 5-3
5-2 ACM Formats of the SCCC Encoder 5-5
5-3 Frame Descriptor Input Bits Content 5-8
5-4 Frame Parameters Related to Pilot Distribution 5-10
7-1 ASM Bit Patterns 7-1
9-1 Managed Parameters for Frame Synchronization 9-1
9-2 Managed Parameters for Coding and Modulation 9-2
9-3 Managed Parameters for Supported ACM Formats 9-2
9-4 Managed Parameters for ACM Format 9-3
9-5 Variable Managed Parameters for 27 Selected ACM Formats 9-3
B-1 Interleaver Parameters (1-10) B-2
B-2 Interleaver Parameters (11 to 19) B-7
C-1 Scrambling Sequences C-2