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Partie 15-7: Communications optiques sans fil à courte portée

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IEEE Std 802.15.7™-2018
(Revision of
IEEE Std 802.15.7-2011)

IEEE Standard for Local and metropolitan area networks—

Part 15.7: Short-Range Optical Wireless Communications

Sponsor

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Approved 5 December 2018

IEEE-SA Standards Board

Abstract: A physical layer (PHY) and medium access control (MAC) sublayer for short-range optical wireless communications (OWC) in optically transparent media using light wavelengths from 10 000 nm to 190 nm are defined. The standard is capable of delivering data rates sufficient to support audio and video multimedia services and also considers mobility of the optical link, compatibility with various light infrastructures, impairments due to noise and interference from sources like ambient light, and a MAC sublayer that accommodates the unique needs of visible links as well as the other targeted light wavelengths. It also accommodates optical communications for cameras where transmitting devices incorporate light-emitting sources and receivers are digital cameras with a lens and image sensor. The standard adheres to applicable eye safety regulations.

Keywords: IEEE 802.15.7™, laser diode, LD, LED, light-emitting diode, OCC, optical camera communications, OWC, short-range optical wireless communications, visible light, visible-light communication, VLC

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Introduction

This introduction is not part of IEEE Std 802.15.7-2018, IEEE Standard for Local and metropolitan area networks—Part 15.7: Short-Range Optical Wireless Communications.

This edition is a revision of IEEE Std 802.15.7-2011 and broadens the standard's scope to include more optical wireless communications (OWC) technologies. This revision adds new clauses for physical layer (PHY) types IV, V, and VI (see Clause 13, Clause 14, and Clause 15) and several related annexes (see Annex G through Annex N).

In OWC, data is transmitted by intensity modulating optical sources, such as light-emitting diodes (LEDs) and laser diodes (LDs), faster than the persistence of the human eye. OWC merges lighting and data communications in applications such as area lighting, signboards, streetlights, vehicles, traffic signals, status indicators, displays, LED panel, and digital signage. This standard describes the use of OWC for optical wireless personal area networks (OWPANs) and covers topics such as network topologies, addressing, collision avoidance, acknowledgment, performance quality indication, dimming support, visibility support, colored status indication, and color stabilization.

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Contents

1. Overview ... 16

1.1 Scope ... 16
1.2 Purpose ... 16

2. Normative references ... 17

3. Definitions, acronyms, and abbreviations ... 17

3.1 Definitions ... 17
3.2 Acronyms and abbreviations ... 18

4. General description ... 21

4.1 Introduction ... 21
4.2 Network topologies ... 21
4.2.1 Peer-to-peer topology ... 22
4.2.2 Star topology ... 22
4.2.3 Broadcast topology ... 23
4.3 Modulation-domain spectrum ... 23
4.4 Architecture ... 23
4.4.1 PHY types ... 24
4.4.2 MAC sublayer ... 26
4.4.3 Dimming and flicker-mitigation support ... 26
4.5 Functional overview ... 31
4.5.1 Superframe structure ... 32
4.5.2 Data transfer model ... 32
4.5.3 Clock-rate selection ... 34
4.5.4 Frame structure ... 34
4.5.5 Improving probability of successful delivery ... 34
4.6 Security ... 35
4.7 Concept of primitives ... 36
4.8 Some media access mechanisms by PHY types ... 37
4.9 Decoding ... 37

5. MAC protocol specifications ... 38

5.1 MAC functional description ... 38
5.1.1 Channel access ... 39
5.1.2 Starting a OWPAN ... 45
5.1.3 Maintaining OWPANs ... 51
5.1.4 Association and disassociation ... 53
5.1.5 Synchronization ... 55
5.1.6 Transaction handling ... 57
5.1.7 Transmission, reception, and acknowledgment ... 58
5.1.8 GTS allocation and management ... 65
5.1.9 Fast link recovery ... 70
5.1.10 Multiple channel resource assignment ... 73
5.1.11 OWC cell design and mobility support ... 75
5.1.12 Color function support ... 78
5.1.13 Color stabilization ... 81
5.1.14 Visibility and dimming support ... 82
5.2 MAC frame formats ... 87

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5.2.1 General MAC frame formats ... 88
5.2.2 Format of individual frame types ... 96
5.3 MAC command frames ... 103
5.3.1 Association request command ... 104
5.3.2 Association response command ... 105
5.3.3 Disassociation notification command ... 107
5.3.4 Data request command ... 108
5.3.5 OWPAN ID conflict notification command ... 109
5.3.6 Beacon request command ... 109
5.3.7 Coordinator realignment command ... 110
5.3.8 GTS request command ... 111
5.3.9 Blinking notification command ... 112
5.3.10 Dimming notification command ... 113
5.3.11 Fast link recovery command ... 113
5.3.12 Mobility notification command ... 114
5.3.13 GTS response command ... 114
5.3.14 Clock rate change notification command ... 115
5.3.15 Multiple channel assignment command ... 115
5.3.16 Color stabilization timer notification command ... 116
5.3.17 Color stabilization information command ... 116
5.3.18 CVD disable command ... 116
5.3.19 Information element command ... 117

6. MAC sublayer service specification ... 124

6.1 Overview ... 124
6.2 MAC data service ... 124
6.2.1 MCPS-DATA.request ... 125
6.2.2 MCPS-DATA.confirm ... 128
6.2.3 MCPS-DATA.indication ... 130
6.2.4 MCPS-PURGE.request ... 132
6.2.5 MCPS-PURGE.confirm ... 133
6.2.6 Data service message sequence chart ... 134
6.3 MAC management service ... 134
6.3.1 Association primitives ... 135
6.3.2 Disassociation primitives ... 143
6.3.3 Beacon notification primitive ... 149
6.3.4 Primitives for reading PIB attributes ... 151
6.3.5 GTS management primitives ... 153
6.3.6 Primitives for resetting the MAC sublayer ... 160
6.3.7 Primitives for specifying the receiver enable time ... 161
6.3.8 Primitives for channel scanning ... 165
6.3.9 Communication status primitive ... 168
6.3.10 Primitives for writing PIB attributes ... 172
6.3.11 Primitives for updating the superframe configuration ... 174
6.3.12 Primitive for synchronizing with a coordinator ... 179
6.3.13 Primitive for synchronization loss with a coordinator ... 180
6.3.14 Primitives for requesting data from a coordinator ... 183
6.4 MAC constants and PIB attributes ... 186
6.4.1 MAC constants ... 186
6.4.2 MAC PIB attributes ... 188
6.5 Optical clock-rate selection ... 199
6.5.1 Optical-clock-rate selection for peer-to-peer topology ... 199
6.5.2 Optical-clock-rate selection for star topology ... 202

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6.5.3 Clock-rate selection for multicast topology 204
6.6 Message sequence charts illustrating MAC-PHY interaction 206

7. Security suite specifications 214

7.1 Overview 214
7.2 Functional description 214
7.2.1 Outgoing frame security procedure 214
7.2.2 Outgoing frame key retrieval procedure 215
7.2.3 Incoming frame security procedure 216
7.2.4 Incoming frame security material retrieval procedure 218
7.2.5 Key descriptor lookup procedure 219
7.2.6 Blacklist checking procedure 219
7.2.7 Device descriptor lookup procedure 220
7.2.8 Incoming security level checking procedure 220
7.2.9 Incoming key usage policy checking procedure 220
7.3 Security operations 221
7.3.1 Integer and octet representation 221
7.3.2 CCM* nonce 221
7.3.3 CCM* prerequisites 221
7.3.4 CCM* transformation data representation 222
7.3.5 CCM* inverse transformation data representation 223
7.4 Auxiliary Security header 224
7.4.1 Integer and octet representation 224
7.4.2 Security Control field 224
7.4.3 Frame Counter field 226
7.4.4 Key Identifier field 226
7.5 Security-related MAC PIB attributes 227
7.5.1 PIB security material 227
7.5.2 Key table 230
7.5.3 Device table 231
7.5.4 Minimum security level table 231
7.5.5 Frame counter 231
7.5.6 Automatic request attributes 231
7.5.7 Default key source 231
7.5.8 Coordinator address 231

8. PHY specification 232

8.1 Overview 232
8.2 Operating modes 232
8.3 General requirements 235
8.3.1 Wavelength band plan 235
8.3.2 Optical mapping 235
8.3.3 Maximum error tolerance for multiple optical sources 236
8.3.4 Minimum LIFS, SIFS, and RIFS periods 237
8.3.5 TX-to-RX turnaround time 237
8.3.6 RX-to-TX turnaround time 237
8.3.7 Transmit data clock frequency tolerance 237
8.3.8 Wavelength quality indicator (WQI) 238
8.3.9 Clear channel assessment (CCA) 238
8.4 Data modes 239
8.5 Dimming and flicker mitigation 239
8.5.1 Dimming during idle time 240
8.5.2 Dimming during data transmission time 241

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8.5.3 Flicker mitigation 245
8.5.4 CSK color stabilization at the transmitter 246
8.6 PPDU format 247
8.6.1 Preamble field 247
8.6.2 PHY Header field 252
8.6.3 HCS field 256
8.6.4 Optional fields 256
8.6.5 PSDU field 259

9. PHY service specifications 265

9.1 Overview 265
9.2 PHY management service 265
9.2.1 PLME-CCA.request 266
9.2.2 PLME-CCA.confirm 266
9.2.3 PLME-GET.request 267
9.2.4 PLME-GET.confirm 267
9.2.5 PLME-SET.request 268
9.2.6 PLME-SET.confirm 269
9.2.7 PLME-SET-TRX-STATE.request 270
9.2.8 PLME-SET-TRX-STATE.confirm 270
9.2.9 PLME-SWITCH.request 271
9.2.10 PLME-SWITCH.confirm 272
9.3 PHY data service 272
9.3.1 PD-DATA.request 273
9.3.2 PD-DATA.confirm 273
9.3.3 PD-DATA.indication 274
9.4 PHY enumeration description 275
9.5 PHY constants and PIB attributes 275
9.5.1 PHY constants 275
9.5.2 PHY PIB attributes 276

10. PHY I specifications 290

10.1 Reference modulator diagram 290
10.2 Outer FEC encoder 290
10.3 Interleaving and puncturing block 291
10.4 Inner FEC encoder 292
10.4.1 Rate-1/4 code 293
10.4.2 Rate-1/3 code 293
10.4.3 Rate-2/3 code 293
10.5 RLL encoder 294
10.5.1 4B6B encoding for VPPM modes 294
10.5.2 Manchester encoding for OOK mode 295
10.6 Data mapping for VPPM 295

11. PHY II specifications 296

11.1 Reference modulator diagram 296
11.2 FEC encoder 296
11.3 RLL encoder 297
11.4 Data mapping for VPPM 297

12. PHY III specifications 298

12.1 Reference modulator diagram 298

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12.2 Scrambler 298
12.3 Channel encoder 299
12.4 CSK constellation overview 300
12.5 CSK constellation design rules 301
12.5.1 Design rule for 4-CSK 301
12.5.2 Design rule for 8-CSK 301
12.5.3 Design rule for 16-CSK 302
12.6 Data mapping for CSK 303
12.7 Valid color band combinations 304
12.8 CSK color mapping 306
12.9 CSK calibration at the receiver 307

13. PHY IV specifications 309

13.1 UFSOOK 309
13.1.1 Reference modulator diagram 309
13.1.2 UFSOOK encoder 309
13.1.3 UFSOOK spatial FEC 309
13.1.4 UFSOOK temporal FEC 310
13.1.5 UFSOOK MIMO protocol 311
13.2 Twinkle VPPM 316
13.2.1 Reference modulator diagram 316
13.2.2 VPPM encoder 316
13.2.3 Twinkle generation 317
13.3 S2-PSK 318
13.3.1 Reference architecture 318
13.3.2 S2-PSK bit-to-symbol mapping 318
13.3.3 S2-PSK 1/2-rate line coding 319
13.3.4 S2-PSK FEC encoder 319
13.4 HS-PSK 319
13.4.1 Reference architecture 319
13.4.2 DS8-PSK modulator 320
13.4.3 HS-PSK encoder 321
13.4.4 HS-PSK FEC encoder 322
13.5 Offset-VPWM 322
13.5.1 Reference architecture 322
13.5.2 Offset-VPWM PHY encoder 322

14. PHY V specifications 325

14.1 RS-FSK 325
14.1.1 Transmitted signal frequency 325
14.1.2 Symbol duration 325
14.2 CM-FSK modulation 325
14.2.1 Reference architecture 325
14.2.2 Asynchronous bit(s) insertion 325
14.2.3 CM-FSK encoder 326
14.3 C-OOK 328
14.3.1 Reference architecture 328
14.3.2 C-OOK encoder 328
14.3.3 Packet structure specification modes 330
14.4 MPM 330
14.4.1 Sequence Number subfield 331
14.4.2 Last Sequence Flag subfield 331
14.4.3 PLCP Header/Center/Footer subfields 331

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14.4.4 Front Payload subfield and Back Payload subfield 332
14.4.5 MPWM/MPPM waveform 332

15. PHY VI specifications 334

15.1 A-QL 334
15.1.1 Reference architecture 334
15.1.2 Channel encoder 335
15.1.3 Bits-to-intensity mapping 337
15.1.4 Channel estimation and color calibration 337
15.2 VTASC specifications 338
15.2.1 VTASC reference architecture 338
15.2.2 Synchronization sequence 339
15.2.3 VTASC code design 340
15.2.4 VTASC encoder 342
15.2.5 Asynchronous communication mode 345
15.2.6 Scalable bitrate controller 346
15.3 SS2DC specification 347
15.3.1 SS2DC reference architecture 347
15.3.2 SS2DC code design 347
15.3.3 SS2DC encoder 348
15.4 IDE specification 349
15.4.1 IDE reference architecture 349
15.4.2 Synchronization sequence 350
15.4.3 IDE encoder 350
15.5 Hidden A-QL (HA-QL) 353
15.5.1 Reference architecture 353
15.5.2 Channel encoder 354
15.5.3 Bits-to-intensity mapping 355

Annex A (informative) Bibliography 356

A.1 General 356
A.2 Regulatory documents 357

Annex B (normative) Service-specific convergence sublayer (SSCS) 360

B.1 IEEE 802.2 convergence sublayer 360

Annex C (normative) Cyclic redundancy check (CRC) 364

Annex D (normative) Channel assignment 365

Annex E (informative) Considerations for OWC using LED displays 371

E.1 Introduction—Dynamic displays vs. addressed displays 371
E.2 Dynamic displays 371
E.3 Addressed displays 375

Annex F (informative) Receiver performance variation on multi-color channels 376

Annex G (informative) RS-FSK tutorial 380

G.1 RS-FSK transmitted waveform 380
G.2 Transmitted signal frequency 380
G.3 Symbol duration 381

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G.4 Relation between signal frequency and the observed strip width in the captured image 381
G.5 Survey of parameters of commercially available image sensors 382

Annex H (informative) PHY modes TX and RX profile 383

H.1 PHY modes TX profiles 383
H.2 PHY modes RX profile 384

Annex I (informative) PHY IV, PHY V, and PHY VI OCC waveforms decoding guide 386

I.1 S2-PSK decoding method 386
I.2 DS8-PSK decoding method 386
I.3 HS-PSK decoding method 388
I.4 C-OOK decoding method 388
I.5 A-QL decoding method 392
I.6 HA-QL decoding method 393
I.7 Offset-VPWM decoding method 394
I.8 VTASC decoding method 395
I.9 SS2DC decoder 396
I.10 IDE decoder 396

Annex J (normative) Hamming code and majority bit voting 398

J.1 Generation of Hamming code 398
J.2 Temporal error correction using majority bit voting 400

Annex K (informative) PHY mode-specific characteristics 401

K.1 VTASC 401
K.2 SS2DC 401
K.3 IDE 401

Annex L (normative) Frequency-based invisible watermarking 402

Annex M (informative) UFSOOK MIMO decoder protocol 403

Annex N (informative) Receiver details on Twinkle VPPM processing 405

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IEEE Standard for
Local and metropolitan area networks—

Part 15.7: Short-Range
Optical Wireless Communications

1. Overview

1.1 Scope

This standard defines a physical layer (PHY) and medium access control (MAC) sublayer for short-range optical wireless communications (OWC) in optically transparent media using light wavelengths from 10 000 nm to 190 nm. The standard is capable of delivering data rates sufficient to support audio and video multimedia services and also considers mobility of the optical link, compatibility with various light infrastructures, impairments due to noise and interference from sources like ambient light, and a MAC sublayer that accommodates the unique needs of visible links as well as the other targeted light wavelengths. It also accommodates optical communications for cameras where transmitting devices incorporate light-emitting sources and receivers are digital cameras with a lens and image sensor. The standard adheres to applicable eye safety regulations.

1.2 Purpose

This standard provides a global standard for short-range OWC. The standard provides the following:

— Access to several hundred terahertz of unlicensed spectrum.
— Immunity to electromagnetic interference and noninterference with radio frequency systems.
— For visible light systems, additional security by allowing the user to see the communication channel.
— Communication augmenting and complementing existing services (e.g., illumination, display, indication, decoration).

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2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used; therefore, each referenced document is cited in text, and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ANSI/INCITS 373: Fiber Channel Framing and Signaling Interface (FC-FS).[1]

IEEE Std 802.15.4™-2015, IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LR-WPANs).[2,3]

ITU-T I.432.1, Series I: Integrated Services Digital Network, ISDN user-network interfaces—Layer 1RecommendationsB-ISDN user-network interface—Physical layer specification: General characteristics, http://www.itu.int/rec/T-REC-I.432.1-199902-I/en.[4]

3. Definitions, acronyms, and abbreviations

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.[5]

3.1 Definitions

blending: The disproportional merging of two different images as a single image.

color function: A function that provides information, such as device status and channel quality, to the human eye via color.

color stabilization: A control loop for the stabilization of the color emitted by color-shift keying (CSK) transmitters.

color visibility dimming (CVD) frame: A frame used for color, visibility, and dimming support.

compensation time: The idle time inserted in the idle pattern or in the data frame, where the light is turned ON or OFF with the appropriate ratio to meet dimming requirements.

dimming: Reducing the radiant power of a transmitting light.

idle pattern: A pattern whose duty cycle variation results in a change of brightness for dimming support.

image sensor: A sensor that captures an image and translates it into a light-coded output signal.

macro cell: An aggregate cell formed using all the cells available at the optical media.

[1] ANSI publications are available from the American National Standards Institute (http://www.ansi.org/).
[2] IEEE publications are available from The Institute of Electrical and Electronics Engineers, Inc. (http://standards.ieee.org/).
[3] The IEEE standards or products referred to in this clause are trademarks of The Institute of Electrical and Electronics Engineers, Inc.
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[5] *IEEE Standards Dictionary Online* is available at http://dictionary.ieee.org.

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