

ISO/IEC 29157:2010-06 (E)

Information technology - Telecommunications and information exchange between systems - PHY/MAC specifications for short-range wireless low-rate applications in the ISM band

Contents		Page
Foreword		viii
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Abbreviated terms	2
5	Overview	3
6	Interlayer service specification	5
6.1	Overview	5
6.2	General format of management primitives	6
6.2.1	MLME-GET.request and PLME-GET.request	7
6.2.2	MLME-GET.confirm and PLME-GET.confirm	7
6.2.3	MLME-SET.request and PLME-SET.request	8
6.2.4	MLME-SET.confirm and MLME-SET.confirm	8
6.3	MLME-SAP	9
6.3.1	MLME-GET.request	10
6.3.2	MLME-GET.confirm	10
6.3.3	MLME-MASTER-START.request	10
6.3.4	MLME-MASTER-START.confirm	11
6.3.5	MLME-RESET.request	11
6.3.6	MLME-RESET.confirm	12
6.3.7	MLME-SCAN.request	12
6.3.8	MLME-SCAN.confirm	13
6.3.9	MLME-SET.request	13
6.3.10	MLME-SET.confirm	14
6.4	MAC-SAP	14
6.4.1	MAC-DATA.request	15
6.4.2	MAC-DATA.confirm	15
6.4.3	MAC-DATA.indication	16
6.5	PLME-SAP	16
6.5.1	PLME-GET.request	17
6.5.2	PLME-GET.confirm	17
6.5.3	PLME-SET.request	18
6.5.4	PLME-SET.confirm	18
6.5.5	PLME-RESET.request	19
6.5.6	PLME-RESET.confirm	19
6.6	PD-SAP	19
6.6.1	PD-DATA.request	20
6.6.2	PD-DATA.confirm	20
6.6.3	PD-DATA.indication	21
7	MAC PDU format	21
7.1	MPDU of beacon frame (BF)	22
7.1.1	Open flag (OF, 2 bits)	22

7.1.2	MAC version (6 bits)	22
7.1.3	Address mode (ADDM, 2 bits)	22
7.1.4	PHY version (6 bits)	22
7.1.5	Frame type (8 bits)	22
7.1.6	Superframe mode control (SFMC, 2 bits)	23
7.1.7	Upper layer frame size (ULFS, 6 bits)	23
7.1.8	Source MAC address (64 bits)	23
7.1.9	Superframe counter (SFC, 4 bits)	23
7.1.10	Middleframe counter (FC, 4 bits)	23
7.1.11	Hopping sequence (32 bits)	24
7.1.12	BF frequency table (BFFT, 16 bytes)	24
7.1.13	Upper layer data (16 bytes)	24
7.2	MPDU of fast beacon frame (FBF)	24
7.2.1	Open flag (OF, 2 bits)	24
7.2.2	MAC version (6 bits)	24
7.2.3	Address mode (ADDM, 2 bits)	24
7.2.4	PHY version (6 bits)	24
7.2.5	Frame type (8 bits)	24
7.2.6	Superframe mode control (SFMC, 2 bits)	24
7.2.7	Upper layer frame size (ULFS, 6 bits)	24
7.2.8	Source MAC address (64 bits)	25
7.2.9	Superframe counter (SFC, 4 bits)	25
7.2.10	Middleframe counter (SC, 4 bits)	25
7.2.11	Hopping sequence (32 bits)	25
7.2.12	BF frequency table (BFFT, 16 bytes)	25
7.2.13	Upper layer data (16 Bytes)	25
7.3	MPDU of request control frame (RCF)	26
7.3.1	Open flag (OF, 2 bits)	26
7.3.2	MAC version (6 bits)	26
7.3.3	Address mode (ADDM, 2 bits)	26
7.3.4	PHY version (6 bits)	26
7.3.5	Frame type (8 bits)	26
7.3.6	Upper layer frame size (ULFS, 6 bits)	26
7.3.7	Source MAC address (64 bits)	26
7.3.8	Destination MAC address (64 bits)	26
7.3.9	Upper layer data	26
7.4	MPDU of master control frame (MCF)	27
7.4.1	Open flag (OF, 2 bits)	27
7.4.2	MAC version (6 bits)	27
7.4.3	Address mode (ADDM, 2 bits)	28
7.4.4	PHY version (6 bits)	28
7.4.5	Frame type (8 bits)	28
7.4.6	Upper layer frame size (ULFS, 6 bits)	28
7.4.7	Source MAC address (64 bits)	28
7.4.8	Destination MAC address (64 bits)	28
7.4.9	Upper layer data	29
7.5	MPDU of RCF acknowledge control frame (RACF)	29
7.6	MPDU of MCF acknowledge control frame (MACF)	29
7.7	MPDU of payload frame (PF)	29
7.7.1	Open flag (OF, 2 bits)	29
7.7.2	MAC version (6 bits)	29
7.7.3	Address mode (ADDM, 2 bits)	29
7.7.4	PHY version (6 bits)	29
7.7.5	Frame type (8 bits)	29
7.7.6	Upper layer frame size (ULFS, 6 bits)	30
7.7.7	Source MAC address (64 bits)	30
7.7.8	Destination MAC address (64 bits)	30
7.7.9	Upper layer data	30
8	MAC functional description	31
8.1	General description	31
8.2	System state diagram	31

8.3	Protocol structure	33
8.3.1	Middleframe structure	34
8.3.2	Superframe structure	34
8.4	Frequency operation	36
8.4.1	Frequency hopping control	36
8.4.2	Frame frequency mapping	36
8.4.3	Frequency diversity and time diversity	37
8.4.4	Orthogonal frequency offset	37
8.4.5	Frequency selection	37
9	PHY specification	40
9.1	General requirements	40
9.1.1	Operating frequency range	40
9.1.2	Frequency assignment	40
9.1.3	Frequency synthesizer stabilisation time	40
9.1.4	Frequency synthesizer turn off time	41
9.2	PHY protocol data unit (PPDU) format	41
9.2.1	Lock time	41
9.2.2	Preamble (128 bits)	41
9.2.3	Header (48 bits)	42
9.2.4	Message	42
9.2.5	EoF delimiter	42
9.3	Modulation and codes	42
9.3.1	Modulation	42
9.3.2	Codes	43
9.4	Transmitter specification	44
9.4.1	Pulse shaping filter	44
9.4.2	Transmitter power spectrum mask	44
	Bibliography	45
	Figures Figure 1 -- A group communication example	4
	Figure 2 -- Data formats: a frame, a middleframe, and a superframe	5
	Figure 3 -- The protocol model used in this International Standard	6
	Figure 4 -- MPDU in Frame structure	22
	Figure 5 -- MPDU format of Beacon Frame	23
	Figure 6 -- MPDU format of Fast Beacon Frame (FBF)	25
	Figure 7 -- MPDU format of RCF	27
	Figure 8 -- MPDU format of MCF	28
	Figure 9 -- MPDU format of PF	30
	Figure 10 -- A pico-net with only two devices	31
	Figure 11 -- A pico-net with more than two terminals	31
	Figure 12 -- State transition diagram	33
	Figure 13 -- The protocol structure	34
	Figure 14 -- Middleframe structure	34
	Figure 15 -- Structure of a normal superframe	35
	Figure 16 -- Structure of a fast synchronisation superframe	35

Figure 17 -- Superframe mode alternation	35
Figure 18 -- Middleframe counter	36
Figure 19 -- Superframe counter	36
Figure 20 -- The hopping sequence generator	36
Figure 21 -- Frame frequency mapping scheme	37
Figure 22 -- Middleframe structure of passive sounding	38
Figure 23 -- One cycle of passive sounding frames	38
Figure 24 -- Illustration of static sounding	39
Figure 25 -- Middleframe structure of static sounding	39
Figure 26 -- Static sounding value	39
Figure 27 -- The structure of the static sounding superframe	40
Figure 28 -- PHY Protocol Data Unit (PPDU) format	41
Figure 29 -- An example of Gold code generators	42
Figure 30 -- Scan code	43
Figure 31 -- Security code	43
Figure 32 -- Group code	43
Tables Table 1 -- General management primitive overview	6
Table 2 -- MLME/PLME general management primitive parameters	7
Table 3 -- MLME primitive summary	9
Table 4 -- MLME-SAP parameters	9
Table 5 -- MAC-SAP primitive summary	14
Table 6 -- MAC-SAP parameters	14
Table 7 -- PLME-SAP primitive summary	16
Table 8 -- PLME-SAP parameters	17
Table 9 -- PD-SAP primitives	19
Table 10 -- PD-SAP parameters	20
Table 11 -- Description of states	32
Table 12 -- The use of the fields in a frame	41