

ISO 21214:2015-08 (E)

Intelligent transport systems - Communications access for land mobiles (CALM) - Infra-red systems

Contents	Page
Foreword	vii
Introduction	viii
1 Scope	1
2 Conformance	1
3 Normative references	2
4 Terms and definitions	2
4.1 General terms and definitions	2
4.2 Terms and definitions of the optical parameters	4
5 Symbols (and abbreviated terms)	7
6 Requirements: Transmitter and receiver parameters	10
6.1 Transmitter wavelengths and bandwidths	10
6.2 Radiated power	11
6.2.1 Radiated power limits	11
6.2.2 Transmitter classes	11
6.3 Receiver wavelengths and bandwidths	11
6.4 Receiver class	12
7 Modulation and coding	12
7.1 Wake-up modes	12
7.1.1 85 kHz coded WU	12
7.1.2 Transmitter generic modulation parameters	13
7.1.3 Receiver generic modulation parameters	13
7.2 Communications profiles	13
7.3 Profile 0 (base profile) and profile 1 (default profile) modulation	14
7.4 Profile 2 to profile 6	14
8 Directivity and communication zones	15
8.1 Directivity parameters	15
8.2 Communication zones	16
8.2.1 Basic beam	16
8.2.2 Communication zone construction	16
8.2.3 Communication zones shortcuts	16
9 Frames and windows	17
9.1 General structure	17
9.2 Frame	18
9.2.1 Frame structure	18
9.2.2 Frame synchronisation signal (F-Sync)	19
9.3 Windows	19
9.3.1 Window structure and types	19
9.3.2 Window synchronisation (W-Sync)	19
9.3.3 Management window	20
9.3.4 Private window	22
9.3.5 Broadcast window	23

9.3.6	Multicast window	24
9.3.7	Spare window	25
9.3.8	Compatibility window	25
9.3.9	Wake-up window	25
9.4	Command alert (CA)	26
9.5	Frame and window parameters, summary	26
10	MAC commands	28
10.1	General	28
10.2	MAC commands related to the frame and window organization	29
10.2.1	Frame organization table (MC-FOT)	29
10.2.2	When generated	30
10.2.3	Effect on receipt	30
10.2.4	Frame organization table update (MC-FOTU)	30
10.2.5	Frame organization table steady (MC-FOTS)	31
10.2.6	Submaster organization table (MC-SOT)	32
10.2.7	Get submaster area (MC-GSA)	33
10.2.8	Submaster status (MC-SST)	33
10.2.9	Submaster area confirmed (MC-SAC)	34
10.2.10	Submaster area denied (MC-RESA)	34
10.2.11	Broadcast (MC-BRC)	34
10.2.12	Re-establish session (MC-REST)	35
10.2.13	Session re-establishment confirmed (MC-RESC)	36
10.2.14	Session re-establishment denied (MC-RESA)	36
10.2.15	Change master identifier (MC-CMI)	36
10.2.16	Kill all (MC-KIA)	37
10.2.17	Kill slave (MC-KIS)	37
10.2.18	De-register (MC-DREG)	38
10.2.19	Suspend all (MC-SUA)	39
10.2.20	Suspend slave (MC-SUS)	39
10.2.21	Free air time (MC-FAT)	40
10.2.22	Free air time (MC-FAT)	40
10.2.23	Spare window (MC-SPW)	41
10.2.24	Wakeup (MC-WU)	41
10.3	MAC commands related to flow control	42
10.3.1	Busy (MC-BSY)	42
10.3.2	Command not supported (MC-CNS)	42
10.3.3	Token (MC-TKN)	43
10.3.4	Block start (MC-BLS)	43
10.3.5	Control channel block start (MC-CCBS)	44
10.3.6	IEEE frame block start (MC-FBS)	44
10.3.7	Start of MAC control block (MC-SMC)	45
10.3.8	Packet start (MC-PAS)	45
10.3.9	Block start CRC16 (MC-BLS16)	46
10.3.10	Packet start CRC16 (MC-PAS16)	46
10.3.11	Packet end (MC-PAE)	47
10.3.12	Block end (MC-BLE)	47
10.3.13	Transmission acknowledged (MC-TAck)	48
10.3.14	Transmission acknowledged and (MC-TAck&)	48
10.3.15	Transmission NOT acknowledged (MC-TNAck)	49
10.3.16	Transmission NOT acknowledged and (MC-TNAck&)	49
10.3.17	Retransmission request (MC-RTQ)	49
10.3.18	Block acknowledge (MC-BAck)	50
10.4	MAC commands related to the registration process	50
10.4.1	Registration enable (MC-REN)	50
10.4.2	Registration request (MC-RRQ)	51
10.4.3	Identifier request (MC-IDQ)	52
10.4.4	Identifier response (MC-IDP)	52
10.4.5	Registration confirmation (MC-REC)	53
10.5	MAC commands related to the PHY layer parameters	53
10.5.1	Profiles request (MC-PRQ)	53

10.5.2	Profiles response (MC-PRP)	54
10.5.3	Request new profile (MC-RNP)	55
10.5.4	Set profile (MC-SPR)	55
10.5.5	Set profile confirmation (MC-SPC)	56
10.5.6	Set multicast profile (MC-SMP)	56
10.6	MAC commands related to test and services	57
10.6.1	Ping (MC-PING)	57
10.6.2	Pong (MC-PONG)	57
10.6.3	Status request1 (MC-SRQ1)	57
10.6.4	Status request2 (MC-SRQ2)	58
10.6.5	Status request3 (MC-SRQ3)	59
10.6.6	Status request4 (MC-SRQ4)	60
10.6.7	Status response1 (MC-SR1)	61
10.6.8	Status response2 (MC-SR2)	62
10.6.9	Status response3 (MC-SR3)	62
10.6.10	Status response4 (MC-SR4)	63
10.6.11	Echo alert (MC-EA)	64
10.6.12	Echo request (MC-ERQ)	65
10.6.13	Echo (MC-ECH)	65
10.6.14	Service table (MC-ST)	66
10.6.15	Service table request (MC-STQ)	67
10.6.16	Service subscribe (MC-SVS)	67
10.6.17	Service (MC-SVC)	68
10.6.18	Service unsubscribe (MC-SVU)	68
10.7	MAC command set overview	69
11	Registration procedure	71
11.1	General	71
11.2	Normal registration procedure	72
11.2.1	Temporary identifier	72
11.2.2	TempID codes	72
11.3	Sequence of the registration procedure without collision	72
11.4	Sequence of the registration procedure with collision	73
11.4.1	Both signals appear with equal signal strength	73
11.4.2	Both signals appear with different signal strength	74
11.4.3	Identical TempIDs	74
11.5	Handover and re-registration	75
11.5.1	Cancel TempID	75
11.5.2	Advise adjacent masters	75
11.6	Registration process timers	75
12	Window management	75
12.1	General	75
12.2	Window allocation by frame organization tables	76
12.3	Spare windows	76
12.4	Windows for isochronous services	76
13	IR Management entity	77
13.1	General	77
13.2	MAC command not supported	77
13.3	Communication profiles	77
13.4	Equipment status	77
13.5	Testing	77
13.6	Registration	77
13.7	Session management	78
13.8	Communication	79
13.8.1	Organization of IR communication	79
13.8.2	Unique block number reference	79
13.9	Window management	80
13.10	MAC Tunnel	80
14	Adaptation	80

14.1	Architecture	80
14.2	IR-CAL	81
14.2.1	Communication SAP	81
14.2.2	Communication types	81
14.2.3	WLAN functionality	82
14.2.4	MAC addresses	84
14.2.5	Fragmentation and defragmentation	85
14.3	IR-MAE	85
15	Adoption of other standards and internationally accepted practices	86
16	Marking and labelling	86
17	Declaration of patents and Intellectual Property	86
Annex A (normative)	Coding and error correction of profiles 0 and 1 and of commands	89
Annex B (normative)	Coding and modulation of profile 2 to profile 6	91
Annex C (informative)	Link power budget	98
Annex D (informative)	Link directivity considerations	103
Annex E (informative)	Compatibility of CALM and non-CALM infrared systems	105
Annex F (normative)	Specification of MR-IR communication protocol for compatibility with previously published version	133
Bibliography	135