

IEEE Standard for

Local and metropolitan area networks—

**Part 16: Air Interface for
Broadband Wireless Access Systems**

Amendment 3: Advanced Air Interface

IEEE Computer Society

and the

IEEE Microwave Theory and Techniques Society

Sponsored by the

LAN/MAN Standards Committee

IEEE
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New York, NY 10016-5997
USA

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IEEE-SA Standards Board

Abstract: This amendment specifies the WirelessMAN-Advanced Air Interface, an enhanced air interface designated as “IMT-Advanced” by the International Telecommunication Union—Radiocommunication Sector (ITU-R). The amendment is based on the WirelessMAN-OFDMA specification and provides continuing support for legacy subscriber stations.

Keywords: IEEE 802.16m, IMT-Advanced radio interface, WirelessMAN-Advanced Air Interface, wireless metropolitan area networks

The Institute of Electrical and Electronics Engineers, Inc.
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This introduction is not part of IEEE Std 802.16m-2011, IEEE Standard for Local and metropolitan area networks—Part 16: Air Interface for Broadband Wireless Access Systems—Amendment 3: Advanced Air Interface.

This amendment specifies the WirelessMAN-Advanced Air Interface, an enhanced air interface designated as “IMT-Advanced” by the International Telecommunication Union—Radiocommunication Sector (ITU-R). The amendment is based on the WirelessMAN-OFDMA specification and provides continuing support for legacy subscriber stations. As of the publication date, the current applicable version of IEEE Std 802.16 is IEEE Std 802.16-2009, as amended by IEEE 802.16jTM-2009, IEEE 802.16hTM-2010, and IEEE 802.16m-2011.

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Anil Agiwal	Russell Chung	Lei Jin
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Jaesun Cha	Jong-Kae (JK) Fwu	Mohammad Khojastepour
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Wei-Peng Chen	Shigenori Hayase	Sangheon Kim
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Rajni Agarwal	Huiying Fang	Tsuguo Kato
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Contents

1.4	Reference models.....	2
1.4.4.2	IEEE 802.16 entity to NCMS Interface	2
2.	Normative references	3
3.	Definitions	5
4.	Abbreviations and acronyms	9
5.	Service-specific CS.....	13
5.1	ATM CS.....	13
5.2	Packet CS.....	13
5.2.1	MAC SDU format.....	13
5.2.2	Classification	13
5.2.3	Payload header suppression (PHS).....	15
5.2.3.1	PHS operation	15
5.2.3.2	PHS signaling	16
5.2.4	IEEE 802.3/Ethernet-specific part	17
5.2.5	IP specific part	18
5.2.5.1	IP CS PDU format	18
5.2.5.2	IP classification rules.....	18
5.2.6	Support for multiple protocols on the same flow	18
6.	MAC common part sublayer.....	21
6.3	Data/control plane.....	21
6.3.2	MAC PDU formats	21
6.3.2.1	MAC header formats	21
6.3.2.1.2	MAC header without payload.....	21
6.3.2.3	MAC management messages.....	21
6.3.2.3.5	RNG-REQ (ranging request) message.....	24
6.3.2.3.6	RNG-RSP (ranging response) message	24
6.3.2.3.11	DSA-RSP message.....	25
6.3.2.3.23	SBC-REQ (SS basic capability request) message.....	25
6.3.2.3.24	SBC-RSP (SS basic capability response) message	26
6.3.2.3.26	DREG-CMD (de/reregister command) message	26
6.3.2.3.37	DREG-REQ (SS deregistration request) message	27
6.3.2.3.39	MOB-SLP-REQ (sleep request) message	27
6.3.2.3.40	MOB_SLP-RSP (sleep response) message.....	28
6.3.2.3.42	MOB_NBR-ADV (neighbor advertisement) message	29
6.3.2.3.47	MOB_BSHO-REQ (BS HO request) message	30
6.3.2.3.55	OFDMA SUB-DL-UL-MAP message.....	30
6.3.5	Scheduling services.....	30
6.3.5.2	UL request/grant scheduling	30
6.3.5.2.2	Real-time polling service (rtPS).....	30
6.3.6.5	Contention-based CDMA BRs for WirelessMAN-OFDMA.....	31
6.3.6.5.1	Contention-based CDMA bandwidth requests using soft combining.....	31
6.3.9.5.1	Contention-based initial ranging and automatic adjustments	31
6.3.10.3	OFDMA-based ranging	32

6.3.10.3.1	Contention-based initial ranging and automatic adjustments	32
6.3.10.4	CDMA HO ranging and automatic adjustment	33
6.3.10.4.2	OFDMA HO ranging with soft combining	33
6.3.10.4.3	OFDMA HO ranging for soft combining without fragmentation of RNG-REQ message	35
6.3.20	Sleep mode for mobility-supporting MS	36
6.3.20.1	Introduction	36
6.3.20.1.1	Activation and transition of MS states	37
6.3.21	MAC HO procedures	37
6.3.21.1	Network topology acquisition	37
6.3.21.1.2	MS scanning of neighbor BSs	37
6.3.21.2	HO process	38
6.3.21.2.1	Drops during HO	38
6.3.23	MS idle mode (optional)	39
6.3.23.1	MS idle mode initiation	39
6.3.23.2	Cell selection	40
6.3.23.6	BS Broadcast Paging message	40
6.3.27	Emergency service	40
7.	Security sublayer	43
7.9.2	Messages	43
8.	Physical layer (PHY)	45
8.3	WirelessMAN-OFDM PHY	45
8.3.6	Map message fields and IEs	45
8.3.6.7	Reduced private maps	45
8.3.6.7.1	Reduced private DL-MAP	45
8.4	WirelessMAN-OFDMA PHY	45
8.4.4	Frame structure	45
8.4.4.6	UL transmission allocations	45
8.4.5	Map message fields and IEs	45
8.4.5.3	DL-MAP IE format	45
8.4.5.3.12	MBS MAP IE	45
8.4.5.3.25	Broadcast Control Pointer IE	46
8.4.5.3.31	Extended Broadcast Control Pointer IE	46
8.4.5.4	UL-MAP IE format	47
8.4.5.4.11	CQICH allocation IE format	47
8.4.5.6	Compressed maps	47
8.4.5.6.1	Compressed DL-MAP	47
8.4.7.3	Ranging codes	47
8.4.8	Space-time coding (STC) (optional)	48
8.4.8.3	STC for the optional zones in the DL	48
8.4.8.3.1	Symbol structure for optional AMC and optional FUSC	48
8.4.12	Channel quality measurements	48
8.4.12.3	CINR mean and standard deviation	48
10.	Parameters and constants	51
10.1	Global values	51
11.	TLV encodings	53

11.1.3	MAC version encoding	53
11.3.1	UCD channel encodings	53
11.3.2	DCD channel encodings	54
11.7.7.1	CS type Classification/PHS options and SDU encapsulation support.....	55
11.7.8	SS capabilities encodings.....	55
11.7.8.11	Extended capability	55
11.8	SBC-REQ/RSP management message encodings	56
11.8.3	Physical parameters supported.....	56
11.8.3.5	WirelessMAN-OFDMA specific parameters	56
11.8.3.5.10	OFDMA MAP capability	56
11.8.3.5.18	OFDMA parameter sets	56
11.13	Service flow management encodings	57
11.13.17	ARQ TLVs for ARQ-enabled connections	57
11.13.17.3	ARQ_RETRY_TIMEOUT TLV	57
11.13.18.1	CS Specification parameter	58
11.13.34	PDU SN Extended Subheader for HARQ Reordering TLV	58
11.16	Sleep mode management encodings	59
11.16.3	Sleep mode functions enabled in full FDD	59
16.	WirelessMAN-Advanced Air Interface	61
16.1	Introduction.....	61
16.1.1	WirelessMAN-Advanced radio interface technology specification	61
16.1.2	AMS operational states	61
16.2	Medium access control	62
16.2.1	Addressing	62
16.2.1.1	Global address.....	62
16.2.1.1.1	MAC address	62
16.2.1.2	Logical identifiers	63
16.2.1.2.1	Station identifier (STID)	63
16.2.1.2.2	Flow identifier (FID)	63
16.2.1.2.3	Deregistration identifier (DID).....	64
16.2.1.2.4	Context retention identifier (CRID)	64
16.2.1.2.5	E-MBS identifier	64
16.2.1.2.6	Multicast Group identifier	64
16.2.2	MAC PDU formats	64
16.2.2.1	MAC header formats	65
16.2.2.1.1	Advanced generic MAC header (AGMH)	65
16.2.2.1.2	Short-packet MAC header (SPMH).....	65
16.2.2.1.3	MAC signaling header	66
16.2.2.2	Extended header group formats	77
16.2.2.2.1	MAC SDU Fragmentation Extended header (FEH).....	78
16.2.2.2.2	MAC SDU Packing Extended header (PEH)	80
16.2.2.2.3	MAC Control Extended header (MCEH)	81
16.2.2.2.4	Multiplexing Extended header (MEH)	82
16.2.2.2.5	MAC Control ACK Extended header (MAEH)	83
16.2.2.2.6	Piggybacked Bandwidth Request Extended header (PBREH)....	84
16.2.2.2.7	Rearrangement Fragmentation and Packing Extended header (RFPEH)	84
16.2.2.2.8	ARQ Feedback Polling Extended header (APEH).....	86
16.2.2.2.9	Advanced Relay Forwarding Extended header (ARFEH)	86
16.2.3	MAC Control messages	86
16.2.3.1	AAI-RNG-REQ	92
16.2.3.2	AAI-RNG-RSP	99

16.2.3.3	AAI-RNG-ACK.....	110
16.2.3.4	AAI-RNG-CFM.....	114
16.2.3.5	AAI-SBC-REQ.....	115
16.2.3.6	AAI-SBC-RSP.....	118
16.2.3.7	AAI-SON-ADV message.....	122
16.2.3.8	AAI-REG-REQ.....	124
16.2.3.9	AAI-REG-RSP.....	128
16.2.3.10	AAI-HO-IND.....	133
16.2.3.11	AAI-HO-REQ.....	135
16.2.3.12	AAI-HO-CMD.....	136
16.2.3.13	AAI-NBR-ADV.....	141
16.2.3.14	AAI-SCN-REQ.....	147
16.2.3.15	AAI-SCN-RSP.....	150
16.2.3.16	AAI-SCN-REP.....	155
16.2.3.17	AAI-CLC-REQ (Co-Located Coexistence Request).....	160
16.2.3.18	AAI-CLC-RSP (Co-Located Coexistence Response).....	165
16.2.3.19	AAI-FFR-CMD (FFR Command) message.....	166
16.2.3.20	AAI-FFR-REP (FFR report) message.....	166
16.2.3.21	AAI-DREG-REQ message.....	169
16.2.3.22	AAI-DREG-RSP message.....	172
16.2.3.23	AAI-PAG-ADV (paging advertisement) message.....	176
16.2.3.24	PGID-Info (paging group information) message.....	178
16.2.3.25	AAI-SLP-REQ.....	179
16.2.3.26	AAI-SLP-RSP.....	183
16.2.3.27	AAI-TRF-IND.....	187
16.2.3.28	AAI-TRF-IND-REQ.....	190
16.2.3.29	AAI-TRF-IND-RSP.....	191
16.2.3.30	L2 Transfer message (AAI-L2-XFER).....	192
16.2.3.31	AAI-System Configuration Descriptor (SCD) message.....	194
16.2.3.32	AAI-UL Noise and Interference Level Broadcast message.....	201
16.2.3.33	AAI-UL-POWER-ADJ message.....	202
16.2.3.34	AAI-Uplink Power Status Reporting Configuration (AAI-UL-PSR-CFG) message.....	203
16.2.3.35	AAI-DL-IM message.....	204
16.2.3.36	AAI-MSG-ACK.....	206
16.2.3.37	AAI-SBS-MIMO-FBK.....	206
16.2.3.38	AAI-MBS-MIMO-FBK.....	210
16.2.3.39	AAI-MBS-MIMO-REQ.....	212
16.2.3.40	AAI-MBS-MIMO-RSP.....	214
16.2.3.41	AAI-MBS-SOUNDING-CAL.....	215
16.2.3.42	AAI-MBS-SBP.....	216
16.2.3.43	Privacy key MAC Control messages (AAI-PKM-REQ/AAI-PKM-RSP).....	216
16.2.3.43.1	PKMv3 Reauth-Request message.....	220
16.2.3.43.2	PKMv3 EAP-Transfer message.....	221
16.2.3.43.3	PKMv3 Key_Agreement-MSG#1 message.....	221
16.2.3.43.4	PKMv3 Key_Agreement-MSG#2 message.....	222
16.2.3.43.5	PKMv3 Key_Agreement-MSG#3 message.....	223
16.2.3.43.6	PKMv3 TEK-Request message.....	224
16.2.3.43.7	PKMv3 TEK-Reply message.....	225
16.2.3.43.8	PKMv3 TEK-Invalid message.....	225
16.2.3.44	AAI-ARQ-Feedback message.....	226
16.2.3.45	AAI-ARQ-Discard message.....	229
16.2.3.46	AAI-ARQ-Reset message.....	229
16.2.3.47	DSx MAC Control message.....	230

16.2.3.47.1	AAI-DSA-REQ	230
16.2.3.47.2	AAI-DSA-RSP	247
16.2.3.47.3	AAI-DSA-ACK	252
16.2.3.47.4	AAI-DSC-REQ	253
16.2.3.47.5	AAI-DSC-RSP	266
16.2.3.47.6	AAI-DSC-ACK	270
16.2.3.47.7	AAI-DSD-REQ	270
16.2.3.47.8	AAI-DSD-RSP	274
16.2.3.48	Group Configuration MAC Control message (AAI-GRP-CFG)	277
16.2.3.49	AAI-RES-CMD (Reset command)	279
16.2.3.50	AAI-SII-ADV (Service Identity information)	279
16.2.3.51	AAI-MC-REQ (Multicarrier Request) message	280
16.2.3.52	AAI-MC-RSP (Multicarrier Response) message	282
16.2.3.53	Carrier Management Command (AAI-CM-CMD) MAC control message	283
16.2.3.54	Carrier Management Indication (AAI-CM-IND) MAC control message	287
16.2.3.55	AAI-MC-ADV (Multicarrier Advertisement) message	288
16.2.3.56	AAI-Global-CFG (global carrier configuration) message	292
16.2.3.57	AAI-ARS-CONFIG-CMD message format	293
16.2.3.58	AAI-ARS-ESI message	296
16.2.3.59	AAI-E-MBS-REP	297
16.2.3.60	AAI-E-MBS-RSP	298
16.2.3.61	AAI-E-MBS-CFG message	299
16.2.3.62	AAI-LBS-ADV message	303
16.2.3.63	AAI-LBS-IND message	305
16.2.4	Construction and transmission of MAC PDUs	306
16.2.4.1	Convention	309
16.2.4.2	Multiplexing	309
16.2.4.3	Concatenation	310
16.2.4.4	Fragmentation	310
16.2.4.4.1	Transport connections	311
16.2.4.4.2	Control connections	311
16.2.4.5	Packing	311
16.2.4.5.1	Packing for non-ARQ connections	312
16.2.4.5.2	Packing for ARQ connections	313
16.2.4.6	Encryption of MAC PDUs	314
16.2.4.7	Padding	315
16.2.4.8	MAC control messages with CMAC protection	315
16.2.5	AAI Security	317
16.2.5.1	Security architecture	317
16.2.5.2	Key Management protocol (PKMv3)	318
16.2.5.2.1	Key management	318
16.2.5.2.2	SA management	333
16.2.5.2.3	Cryptographic methods	335
16.2.5.2.4	AMS authentication state machine	338
16.2.5.2.5	TEK state machine	348
16.2.5.3	Privacy	352
16.2.5.3.1	AMS identity privacy	352
16.2.5.3.2	AMS location privacy	353
16.2.5.3.3	Control plane signaling protection	354
16.2.5.4	Security context	355
16.2.5.4.1	MSK context	355
16.2.5.4.2	PMK context	356
16.2.5.4.3	AK context	357
16.2.5.4.4	SA context	358

16.2.6	MAC HO procedures	360
16.2.6.1	Network topology acquisition	360
16.2.6.1.1	Network topology advertisement	360
16.2.6.1.2	AMS scanning of neighbor ABSs	360
16.2.6.2	Trigger condition definitions	361
16.2.6.3	HO procedure	364
16.2.6.3.1	HO Framework	364
16.2.6.3.2	HO decision and initiation	365
16.2.6.3.3	HO preparation	366
16.2.6.3.4	HO execution	367
16.2.6.3.5	Network reentry	368
16.2.6.3.6	HO cancellation	374
16.2.6.3.7	Drops during HO	374
16.2.6.4	Handover between WirelessMAN-Advanced Air Interface and reference systems	374
16.2.6.4.1	Handover from WirelessMAN-OFDMA R1 reference to advanced system	374
16.2.6.4.2	Handover from WirelessMAN-Advanced Air Interface System to WirelessMAN-OFDMA R1 Reference System	379
16.2.6.5	Handover between WirelessMAN-Advanced Air Interface System and other RAT systems	381
16.2.6.5.1	Inter-RAT capability negotiation	381
16.2.6.5.2	Inter-RAT handover procedure	381
16.2.7	Persistent scheduling in the Advanced Air Interface	386
16.2.7.1	Allocation mechanism	386
16.2.7.2	Deallocation mechanism	387
16.2.7.3	HARQ retransmissions	387
16.2.7.4	Error handling procedure	387
16.2.8	Multicarrier operation	388
16.2.8.1	Multicarrier types and operational modes	388
16.2.8.2	MAC operation	389
16.2.8.2.1	Addressing	389
16.2.8.2.2	Security	389
16.2.8.2.3	Network entry	389
16.2.8.2.4	Ranging	392
16.2.8.2.5	MAC PDU processing	392
16.2.8.2.6	Bandwidth request and resource allocation	393
16.2.8.2.7	QoS and connection management	393
16.2.8.2.8	DL/UL PHY level control and UL feedback channel allocation	393
16.2.8.2.9	Handover	394
16.2.8.2.10	Power management	400
16.2.8.2.11	Carrier management	402
16.2.9	Group Resource Allocation	407
16.2.9.1	Grouping mechanism	407
16.2.9.2	Group configuration	407
16.2.9.3	Group management	409
16.2.9.3.1	Addition of AMS to a group	409
16.2.9.3.2	Deletion of a flow from a group	409
16.2.9.4	Normal GRA operation	410
16.2.9.4.1	Bitmaps in group resource allocation	411
16.2.10	Connection management	414
16.2.10.1	Control connections	414
16.2.10.2	Transport connections	414

16.2.11 Bandwidth request and allocation mechanism.....	415
16.2.11.1 Bandwidth request	415
16.2.11.1.1 Contention-based random access bandwidth request.....	415
16.2.11.1.2 Standalone bandwidth request header	418
16.2.11.1.3 Piggybacked bandwidth request.....	419
16.2.11.1.4 Bandwidth request using P-FBCH	419
16.2.11.1.5 Bandwidth request message format.....	420
16.2.12 Quality of service (QoS)	421
16.2.12.1 Theory of operation	421
16.2.12.2 Service flows	421
16.2.12.3 Object model	424
16.2.12.4 Service classes	425
16.2.12.4.1 Global Service classes.....	426
16.2.12.5 Authorization.....	429
16.2.12.6 Service flow management	430
16.2.12.6.1 Dynamic service flow creation	431
16.2.12.6.2 Dynamic service flow modification and deletion.....	432
16.2.12.7 Scheduling services	432
16.2.12.7.1 Adaptive granting and polling service.....	432
16.2.12.8 Emergency and NS/EP service flows	436
16.2.12.9 Emergency and NS/EP service notification during initial ranging.....	436
16.2.12.10 Emergency and NS/EP service notification during connected state.....	437
16.2.12.11 Emergency Alert Service	437
16.2.12.12 Service flow/convergence sublayer parameters.....	437
16.2.12.12.1 FID	448
16.2.12.12.2 Uplink/Downlink indicator	448
16.2.12.12.3 Differentiated BR timer.....	448
16.2.12.12.4 Predefined BR index parameter	448
16.2.12.12.5 Coupled Group Create/Change	449
16.2.12.12.6 Group Parameter Create/Change.....	449
16.2.12.12.7 HARQ channel mapping	449
16.2.12.12.8 Vendor-specific information	449
16.2.13 ARQ mechanism.....	450
16.2.13.1 ARQ block usage.....	450
16.2.13.1.1 Initial transmission.....	450
16.2.13.1.2 Retransmission.....	451
16.2.13.2 ARQ feedback.....	452
16.2.13.2.1 ARQ feedback transmission.....	452
16.2.13.2.2 ARQ feedback poll.....	453
16.2.13.2.3 ARQ feedback triggering conditions	453
16.2.13.3 ARQ parameters and timers.....	453
16.2.13.3.1 ARQ_SN_MODULUS	453
16.2.13.3.2 ARQ_WINDOW_SIZE	453
16.2.13.3.3 ARQ_SUB_BLOCK_SIZE.....	453
16.2.13.3.4 ARQ_BLOCK_LIFETIME.....	453
16.2.13.3.5 ARQ_RX_PURGE_TIMEOUT.....	453
16.2.13.3.6 ARQ_MAX_BUFFER_SIZE	453
16.2.13.3.7 ARQ_SYNC_LOSS_TIMEOUT.....	454
16.2.13.3.8 ARQ_ERROR_DETECTION_TIMEOUT.....	454
16.2.13.3.9 ARQ_FEEDBACK_POLL_RETRY_TIMEOUT	454
16.2.13.4 ARQ state machine variables.....	454
16.2.13.4.1 ARQ_TX_WINDOW_START.....	454
16.2.13.4.2 ARQ_TX_NEXT_SN.....	454
16.2.13.4.3 ARQ_RX_WINDOW_START	454

16.2.13.4.4	ARQ_RX_HIGHEST_SN	454
16.2.13.5	ARQ operation	454
16.2.13.5.1	Sequence number comparison	454
16.2.13.5.2	Transmitter operation	455
16.2.13.5.3	Receiver operation	457
16.2.13.5.4	ARQ reset procedure	459
16.2.13.5.5	ARQ synchronization loss	462
16.2.13.5.6	ARQ buffer management	462
16.2.14	HARQ functions	462
16.2.14.1	HARQ subpacket generation and transmission	462
16.2.14.2	Generic HARQ signaling and timing	463
16.2.14.2.1	HARQ signaling	463
16.2.14.2.2	A-MAP relevance and HARQ timing	465
16.2.14.3	Group resource allocation HARQ signaling and timing	475
16.2.14.3.1	Downlink	475
16.2.14.3.2	Uplink	475
16.2.14.4	Persistent allocation HARQ signaling and timing	475
16.2.14.4.1	Downlink	475
16.2.14.4.2	Uplink	476
16.2.14.5	HARQ and ARQ interactions	476
16.2.14.6	Combined feedback scheme for ROHC and HARQ	476
16.2.15	Network entry and initialization	477
16.2.15.1	AMS DL PHY synchronization	481
16.2.15.2	AMS obtaining DL/UL parameters	481
16.2.15.3	Initial ranging and automatic adjustments	481
16.2.15.4	Basic capability negotiation	483
16.2.15.5	AMS authorization and key exchange	484
16.2.15.6	Registration	484
16.2.16	Periodic ranging	486
16.2.17	Sleep mode	487
16.2.17.1	Sleep mode initiation	488
16.2.17.2	Sleep mode operation	488
16.2.17.2.1	Sleep cycle operations	488
16.2.17.2.2	Sleep window operations	490
16.2.17.2.3	Listening window operations	490
16.2.17.2.4	Sleep mode parameter update	493
16.2.17.2.5	FFBCH operation during sleep mode	493
16.2.17.2.6	Interruptions to normal sleep cycle operation	494
16.2.17.3	Sleep mode termination	495
16.2.18	Idle mode	495
16.2.18.1	Idle mode initiation	496
16.2.18.1.1	AMS initiated	496
16.2.18.1.2	ABS initiated	498
16.2.18.2	Operation during idle mode	503
16.2.18.2.1	Operation during paging unavailable interval	503
16.2.18.2.2	Broadcast paging message	504
16.2.18.2.3	Operation during paging listening interval	505
16.2.18.3	Idle mode termination	506
16.2.18.4	Location update	506
16.2.18.4.1	Location update trigger conditions	506
16.2.18.4.2	Location update process	507
16.2.18.5	Network reentry from idle mode	508
16.2.18.6	Idle mode support for MBS	508
16.2.18.6.1	MBS location update	508

16.2.19	Deregistration with context retention (DCR) mode.....	508
16.2.19.1	DCR initiation in connected state	509
16.2.19.2	DCR mode initiation from idle mode	509
16.2.19.3	DCR mode extension	509
16.2.19.4	Network reentry from DCR mode	509
16.2.19.5	DCR mode termination.....	509
16.2.20	Co-located coexistence (CLC)	510
16.2.20.1	Type I CLC class	514
16.2.20.2	Type II CLC class.....	515
16.2.20.2.1	Type II CLC class—Subtype 1	516
16.2.20.2.2	Type II CLC class—Subtype 2	516
16.2.20.2.3	Type II CLC class—Subtype 3	517
16.2.20.3	Type III CLC class	517
16.2.21	Interference mitigation mechanism	518
16.2.21.1	DL FFR	518
16.2.21.1.1	DL/UL signaling.....	519
16.2.21.1.2	Operation procedure	521
16.2.21.2	UL FFR	523
16.2.21.3	FFR partition configuration	525
16.2.22	MAC control reliability	525
16.2.23	Power management for the active mode.....	525
16.2.24	Update of S-SFH IEs	526
16.2.25	Short message service	529
16.2.26	Coverage loss detection and recovery from coverage loss	530
16.2.26.1	Coverage loss detection at ABS and ABS's behavior	530
16.2.26.2	Coverage loss detection at AMS and AMS's behavior.....	531
16.2.26.3	Coverage loss recovery procedure	531
16.2.26.4	Recovery from coverage loss due to the ABS restart	531
16.2.27	AMS deregistration.....	532
16.2.28	Support for multicast service	532
16.2.28.1	Multicast operation.....	532
16.2.28.2	Multicast connection establishment	532
16.2.28.3	Multicast operation in connected state	533
16.3	Physical layer	535
16.3.1	Introduction.....	535
16.3.2	OFDMA symbol description, symbol parameters, and transmitted signal.....	535
16.3.2.1	Time domain description	535
16.3.2.2	Frequency domain description	535
16.3.2.3	Primitive parameters	535
16.3.2.4	Derived parameters	536
16.3.2.5	Transmitted signal.....	537
16.3.2.6	Definition of basic terms on the transmission chain	539
16.3.3	Frame structure	539
16.3.3.1	Basic frame structure	539
16.3.3.2	Frame structure for CP = 1/8 Tb.....	542
16.3.3.2.1	FDD frame structure	542
16.3.3.2.2	TDD frame structure	544
16.3.3.3	Frame structure for CP = 1/16 Tb.....	546
16.3.3.4	Frame structure for CP = 1/4 Tb.....	549
16.3.3.5	Frame structure supporting WirelessMAN-OFDMA	552
16.3.3.5.1	TDD frame structure.....	552
16.3.3.5.2	FDD frame structure.....	555
16.3.3.6	Frame structure supporting wider bandwidth	556
16.3.3.6.1	Support for WirelessMAN-OFDMA with multicarrier	

	operation	557
	16.3.3.6.2 Subcarrier alignment for multicarrier operation	558
	16.3.3.6.3 Data transmission over guard subcarriers in multicarrier operation	560
	16.3.3.7 Set of frame configurations.....	560
16.3.4	Downlink physical structure	563
	16.3.4.1 Physical and logical resource unit	564
	16.3.4.1.1 Distributed logical resource unit.....	564
	16.3.4.1.2 Contiguous logical resource unit	564
	16.3.4.2 Multi-cell resource mapping	564
	16.3.4.2.1 Subband partitioning.....	564
	16.3.4.2.2 Miniband permutation.....	568
	16.3.4.2.3 Frequency partitioning	570
	16.3.4.3 Cell-specific resource mapping	574
	16.3.4.3.1 CRU/DRU allocation	575
	16.3.4.3.2 Subcarrier permutation.....	580
	16.3.4.3.3 Random sequence generation	583
	16.3.4.3.4 A-MAP symbols to subcarrier pair mapping	583
	16.3.4.3.5 Logical resource unit mapping.....	583
	16.3.4.4 Pilot structure.....	584
	16.3.4.4.1 Pilot patterns.....	584
	16.3.4.4.2 MIMO midamble.....	592
	16.3.4.4.3 Usage of downlink pilots.....	594
	16.3.4.4.4 E-MBS zone-specific pilot patterns	595
	16.3.4.5 Downlink physical structure for multicarrier support.....	597
	16.3.4.6 Downlink physical structure for E-MBS support	598
16.3.5	Downlink control structure	599
	16.3.5.1 Advanced Preamble	599
	16.3.5.1.1 Primary Advanced Preamble (PA-Preamble).....	600
	16.3.5.1.2 Secondary advanced preamble (SA-Preamble)	602
	16.3.5.2 DL control channels.....	624
	16.3.5.2.1 Superframe header.....	624
	16.3.5.2.2 Advanced MAP (A-MAP).....	627
	16.3.5.2.3 Enhanced multicast broadcast service MAP (E-MBS MAP)....	630
	16.3.5.3 Resource mapping of DL control channels.....	631
	16.3.5.3.1 Superframe header	631
	16.3.5.3.2 Advanced MAP (A-MAP)	632
	16.3.5.3.3 Enhanced-Multicast Broadcast Services MAP (E-MBS MAP).	636
	16.3.5.4 Downlink power control	636
	16.3.5.4.1 Power control for A-MAP	636
	16.3.5.5 DL control information elements.....	637
	16.3.5.5.1 SFH control information elements.....	637
	16.3.5.5.2 A-MAP control information elements	648
	16.3.5.5.3 E-MBS Control Information elements.....	710
16.3.6	Downlink MIMO	711
	16.3.6.1 Downlink MIMO architecture and data processing.....	711
	16.3.6.1.1 MIMO layer to MIMO stream mapping	712
	16.3.6.1.2 MIMO stream to antenna mapping	714
	16.3.6.1.3 Downlink MIMO modes.....	717
	16.3.6.2 Transmission schemes for data channels	719
	16.3.6.2.1 Encoding and precoding of SU-MIMO	719
	16.3.6.2.2 Encoding and precoding of MU-MIMO	720
	16.3.6.2.3 Mapping of data and pilot subcarriers	721
	16.3.6.2.4 Usage of MIMO modes	721

16.3.6.2.5	Feedback mechanisms and operation	722
16.3.6.3	Transmission schemes for control channels	761
16.3.6.4	MIMO transmission schemes for E-MBS	761
16.3.7	Uplink physical structure	761
16.3.7.1	Physical and logical resource unit	761
16.3.7.1.1	Distributed logical resource unit	762
16.3.7.1.2	Contiguous logical resource unit.....	762
16.3.7.2	Multi-cell resource mapping	762
16.3.7.2.1	Subband partitioning	762
16.3.7.2.2	Miniband permutation.....	766
16.3.7.2.3	Frequency partitioning	767
16.3.7.3	Cell-specific resource mapping	771
16.3.7.3.1	CRU/DRU allocation.....	772
16.3.7.3.2	Tile permutation	777
16.3.7.3.3	Resource allocation and tile permutation for control channels	779
16.3.7.3.4	Logical resource unit mapping	782
16.3.7.3.5	WirelessMAN-OFDMA systems support	782
16.3.7.4	Pilot structure.....	784
16.3.7.5	Uplink physical structure for multicarrier support	790
16.3.8	Uplink control channel.....	791
16.3.8.1	Physical uplink control channel.....	791
16.3.8.1.1	Fast feedback control channel.....	791
16.3.8.1.2	HARQ feedback control channel	791
16.3.8.1.3	Sounding channel.....	792
16.3.8.1.4	Ranging channel.....	792
16.3.8.1.5	Bandwidth request channel	797
16.3.8.2	Uplink control channels physical resource mapping	797
16.3.8.2.1	Fast feedback control channel (FFBCH).....	797
16.3.8.2.2	HARQ feedback control channel	800
16.3.8.2.3	Sounding channel	801
16.3.8.2.4	Ranging channel.....	804
16.3.8.2.5	Bandwidth request channel	811
16.3.8.3	Uplink control information content	814
16.3.8.3.1	Fast feedback control channel	814
16.3.8.3.2	Bandwidth request channel	833
16.3.8.4	Uplink power control.....	833
16.3.8.4.1	Power control for data channel.....	834
16.3.8.4.2	Power control for control channels.....	834
16.3.8.4.3	Power correction using PC-A-MAP	835
16.3.8.4.4	Initial ranging channel power control.....	835
16.3.8.4.5	Sounding channel power control	837
16.3.8.4.6	Concurrent transmission of uplink control channel and data ...	837
16.3.8.4.7	Uplink power status reporting	838
16.3.8.4.8	Uplink power control in initial network entry and reentry	839
16.3.8.4.9	Uplink power control in handover.....	840
16.3.8.4.10	Uplink power control in multicarrier operation.....	840
16.3.8.5	Uplink physical structure for multicarrier support	840
16.3.9	Uplink MIMO	841
16.3.9.1	Uplink MIMO architecture and data processing.....	841
16.3.9.1.1	MIMO layer to MIMO stream mapping	841
16.3.9.1.2	MIMO stream to antenna mapping	842
16.3.9.1.3	Uplink MIMO transmission modes	843
16.3.9.2	Transmission schemes for data channels	845
16.3.9.2.1	Encoding and precoding of SU-MIMO modes.....	845

16.3.9.2.2	Encoding and precoding of collaborative spatial multiplexing (MU-MIMO).....	845
16.3.9.2.3	Mapping of data subcarriers.....	845
16.3.9.2.4	Usage of MIMO modes.....	845
16.3.9.2.5	Downlink signaling support of UL-MIMO modes	846
16.3.9.3	Codebook for closed-loop transmit precoding.....	846
16.3.9.3.1	Base codebook for two transmit antenna	846
16.3.9.3.2	Base codebook for four transmit antennas	846
16.3.9.4	Codebook subsets for open-loop transmit precoding	847
16.3.9.4.1	OL SU-MIMO subset.....	847
16.3.9.4.2	OL MU-MIMO subset	848
16.3.10	Channel coding and HARQ	855
16.3.10.1	Channel coding for the data channel.....	855
16.3.10.1.1	Burst CRC encoding	855
16.3.10.1.2	Burst partition	855
16.3.10.1.3	Randomization	858
16.3.10.1.4	FEC block CRC encoding	859
16.3.10.1.5	FEC encoding.....	859
16.3.10.1.6	Bit selection and repetition	863
16.3.10.1.7	Bit collection	864
16.3.10.1.8	Modulation	864
16.3.10.2	Channel coding for control channel.....	864
16.3.10.2.1	TBCC encoder	865
16.3.10.2.2	Bit separation	865
16.3.10.2.3	Subblock interleaver	865
16.3.10.2.4	Bit grouping	866
16.3.10.2.5	Bit selection	866
16.3.10.3	Subcarrier randomization.....	866
16.3.10.3.1	PRBS for subcarrier randomization	866
16.3.10.3.2	Data subcarrier randomization	867
16.3.10.3.3	Pilot subcarrier randomization	867
16.3.10.4	HARQ	869
16.3.10.4.1	IR HARQ	869
16.3.10.4.2	Constellation rearrangement	870
16.3.11	Link adaptation	871
16.3.11.1	DL link adaptation.....	871
16.3.11.2	UL link adaptation.....	871
16.3.12	Error vector magnitude (EVM) and requirements	872
16.3.12.1	EVM definition.....	872
16.3.12.2	EVM requirements.....	872
16.3.13	Channel quality measurements	872
16.3.13.1	Introduction.....	872
16.3.13.2	RSSI mean and standard deviation	873
16.3.13.3	CINR mean and variance	873
16.3.13.4	SIR mean	874
16.3.13.5	Downlink noise and interference level mean and variance	875
16.3.14	Receiver requirements	876
16.4	Support for Femto ABS	877
16.4.1	General description	877
16.4.2	Femto base station subscription types	877
16.4.3	Femto ABS state diagram	877
16.4.4	PHY and MAC level identifier.....	878
16.4.4.1	PHY level cell identifier	878
16.4.4.2	CSG white list.....	878

16.4.5	Femto ABS initialization and de-attachment	879
16.4.5.1	Femto ABS attachment to the Macro ABS	879
16.4.5.2	Femto ABS deattachment from network	879
16.4.6	Network synchronization	879
16.4.7	Network entry	879
16.4.7.1	Femto ABS detection, identification, and selection	879
16.4.7.2	Manual femto ABS selection	882
16.4.7.3	Femto ABS access restrictions	882
16.4.7.4	Ranging	882
16.4.7.4.1	Ranging channel configuration	882
16.4.7.4.2	Ranging channel transmission	882
16.4.7.5	Femto ABS reselection by AMS	883
16.4.8	Handover (HO)	884
16.4.8.1	Network topology acquisition	884
16.4.8.1.1	Network topology advertisement	884
16.4.8.1.2	AMS scanning neighbor Femto ABSs	884
16.4.8.2	Trigger condition definitions	885
16.4.8.3	HO decision	885
16.4.8.4	HO from Macro ABS to Femto ABS	886
16.4.8.5	HO from Femto ABS to Macro ABS or other Femto ABS	886
16.4.8.6	HO between Femto ABS and legacy system BS	886
16.4.9	Idle mode	886
16.4.10	Low-duty operation mode	886
16.4.10.1	General description	886
16.4.10.2	Default LDM pattern(s)	887
16.4.11	Interference avoidance and interference mitigation	887
16.4.11.1	Interference mitigation trigger condition definitions	889
16.4.12	Power control	890
16.4.12.1	Downlink power control	890
16.4.13	Femto ABS reliability	890
16.5	Multi-BS MIMO	891
16.5.1	DL Multi-BS MIMO	891
16.5.1.1	DL/UL signaling	891
16.5.1.2	Single-BS precoding with multi-BS coordination	892
16.5.1.2.1	Operation procedure	892
16.5.1.3	DL multi-BS joint MIMO processing	894
16.5.1.3.1	Operation procedure	894
16.5.1.4	Multi-BS MIMO trigger mechanism	896
16.5.2	UL multi-BS MIMO	897
16.5.2.1	Single-BS precoding with multi-BS coordination	897
16.5.2.1.1	DL signaling	897
16.5.2.1.2	Operation procedure	897
16.5.2.2	UL multi-BS joint MIMO processing	898
16.6	Support for relay	899
16.6.1	Relay modes and general description	899
16.6.2	Medium access control	899
16.6.2.1	Addressing	899
16.6.2.1.1	Station identifier (STID)	899
16.6.2.1.2	Flow identifier (FID)	899
16.6.2.2	MAC PDU formats	899
16.6.2.3	Construction and transmission of MPDUs	900
16.6.2.3.1	Data forwarding scheme	900
16.6.2.3.2	Forwarding control messages between the ARS and the ASN ..	900
16.6.2.4	Security	900

16.6.2.5	Handover.....	902
16.6.2.5.1	Network topology advertisement.....	902
16.6.2.5.2	AMS scanning of neighbor ABSs/ARs.....	903
16.6.2.5.3	AMS handover process.....	903
16.6.2.6	Scheduling and QoS.....	903
16.6.2.6.1	Connection management.....	903
16.6.2.7	Bandwidth request and grant management.....	903
16.6.2.8	ARQ.....	903
16.6.2.9	HARQ.....	904
16.6.2.9.1	Generic HARQ signaling and timing.....	904
16.6.2.9.2	Group resource allocation HARQ signaling and timing at ARS.....	912
16.6.2.9.3	Persistent allocation HARQ signaling and timing at ARS.....	912
16.6.2.10	Network entry.....	912
16.6.2.10.1	AMS network entry.....	912
16.6.2.10.2	ARS network entry.....	912
16.6.2.11	Ranging.....	914
16.6.2.11.1	ARS initial ranging.....	914
16.6.2.11.2	Handling of AMS and ARS periodic ranging.....	914
16.6.2.12	Sleep mode.....	914
16.6.2.13	Idle mode.....	914
16.6.2.14	ARS configuration.....	914
16.6.2.14.1	Parameter configuration during TTR ARS network entry.....	914
16.6.2.14.2	Parameter configuration update for TTR ARS operational mode.....	915
16.6.2.15	ARS deregistration.....	915
16.6.2.16	Update of SFH.....	915
16.6.2.16.1	Update of SFH information during ARS network entry.....	915
16.6.2.16.2	Update of SFH information during ARS operational mode.....	915
16.6.3	Physical layer for TTR relay mode.....	915
16.6.3.1	Basic frame structure supporting ARS.....	915
16.6.3.2	Frame structure.....	917
16.6.3.2.1	FDD frame structure.....	917
16.6.3.2.2	TDD frame structure.....	919
16.6.3.2.3	Set of frame configurations for ARS operation.....	920
16.6.3.3	Relay downlink PHY structure.....	921
16.6.3.3.1	MIMO midamble.....	921
16.6.3.3.2	Cell-specific resource mapping.....	922
16.6.3.3.3	Downlink data subcarrier mapping.....	922
16.6.3.4	Downlink control structure.....	922
16.6.3.4.1	Advanced preamble for relay.....	923
16.6.3.5	Relay uplink physical structure.....	923
16.6.3.5.1	Cell-specific resource mapping.....	923
16.6.3.5.2	Uplink data subcarrier mapping.....	923
16.6.3.6	Uplink control structure.....	923
16.6.4	Physical layer for STR relay mode.....	924
16.7	Support for self-organization.....	925
16.7.1	Self organization.....	925
16.7.2	Self configuration.....	925
16.7.2.1	Femto ABS neighbor discovery.....	925
16.7.2.2	Macro ABS neighbor list self-discovery.....	925
16.7.2.3	Femto ABS self configuration.....	925
16.7.3	Self optimization.....	926
16.7.3.1	Support of interference mitigation.....	926

16.7.3.2	Support of multi-BS MIMO	926
16.7.4	Support of reconfigurations and restart	926
16.7.5	AMS assisted Femto ABS neighbor list update.....	926
16.8	Support for location-based services (LBS)	929
16.8.1	Location determination capability negotiation	929
16.8.2	Basic LBS support	929
16.8.2.1	Basic functions supported using AAI-LBS-ADV message.....	929
16.8.2.2	Measurements and reporting for location determination	929
16.8.2.3	Assistance for satellite-based location determination.....	930
16.8.2.4	LBS message formats	930
16.8.3	Enhanced LBS support	933
16.8.3.1	Enhanced LBS support in downlink	933
16.8.3.1.1	Basic description of downlink LBS zone	933
16.8.3.1.2	Allocation of D-LBS zone in frame structure	933
16.8.3.2	D-LBS zone location beacon signals	934
16.8.3.3	Predefined D-LBS zone transmission plan	935
16.8.3.4	D-LBS zone measurement and report.....	935
16.9	Support for Enhanced Multicast Broadcast Service	937
16.9.1	E-MBS transmission modes.....	937
16.9.1.1	Non-macro-diversity mode	937
16.9.1.2	Macro-diversity mode.....	938
16.9.2	E-MBS operation	938
16.9.2.1	E-MBS connection establishment.....	939
16.9.2.2	E-MBS operation in connected state	940
16.9.2.3	E-MBS operation in Idle state	941
16.9.2.4	E-MBS Operation on the multicarrier deployment.....	941
16.9.3	E-MBS protocol features and functions.....	942
16.9.3.1	E-MBS configuration indicators.....	942
16.9.3.2	E-MBS zone configuration	942
16.9.3.3	E-MBS scheduling interval (MSI).....	943
16.10	Support for Advanced Air Interface in LZone.....	945
16.10.1	Support for network topology advertisement	945
16.10.1.1	DL frame prefix	945
16.10.2	Support for zone switch operation	945
16.10.2.1	RNG-RSP management message encodings	945
16.10.2.2	RNG-REQ management message encodings	946
16.10.3	Migrating to AAI without impacting the deployed legacy network	947
16.11	Global values	949
Annex D (informative) Messages sequence charts (MSCs)		957
Annex R (normative) Definition of AAI MAC control messages.....		961
Annex S (informative) Test vectors		1053
Annex T (informative) Supported frequency bands		1057
Annex U (normative) Radio specifications for WirelessMAN-Advanced Air Interface.....		1059
Annex V (normative) Default capability class and parameters for an IEEE 802.16m system.....		1063

List of figures

Figure 8—MAC SDU format	13
Figure 9—Classification and CID mapping (BS to SS)	14
Figure 10—Classification and CID mapping (SS to BS)	14
Figure 13—PHS signaling example	17
Figure 18a—Multi-protocol flow PDU format without PHS	18
Figure 18b—Multi-protocol flow PDU format with PHS	18
Figure 100—Message flows during Initial network entry with ranging code from the Initial Ranging Code set 1	33
Figure 101a—Message flows during Network Reentry during HO, Network Reentry from Idle Mode, or Location Update with a ranging code from the HO Ranging Code set 1	35
Figure 430—AMS state transition diagram	61
Figure 431—MAC PDU formats	64
Figure 432—Zone_Allocation Bit-MAP for 10 MHz	302
Figure 433—Data path functional blocks involved in construction of MAC PDUs	307
Figure 434—Example Construction of a MAC PDU for transport connections	308
Figure 435—Multiplexing of connection payload associated with same SA	309
Figure 436—Usage of FEH/PEH/RFPEH/MCEH and MEH in MAC PDU	310
Figure 437—MAC PDU concatenation showing example FIDs	310
Figure 438—Packing variable length MAC SDUs into a single MAC PDU	312
Figure 439—Packing with fragmentation	313
Figure 440—MAC PDU with transport connection payload	314
Figure 441—MAC PDU with multiple transport connection payload	315
Figure 442—MPDU construction with/without CMAC protection	316
Figure 443—MPDU construction of fragmented MAC control message with CMAC protection	317
Figure 444—Security functions	318
Figure 445—AK_COUNT management	323
Figure 446—AK from PMK	325
Figure 447—CMAC key and TEK derivation from AK	325
Figure 448—Key agreement procedure	328
Figure 449—MS TEKULE update procedure	330
Figure 450—Construction of initial CCM Block B0	336
Figure 451—Construction of counter blocks Ctrj	336
Figure 452—System relationships in security-related FSM	339
Figure 453—Authentication state machine for PKMv3	340
Figure 454—TEK state machine for PKMv3	349
Figure 455—Network entry procedure to support AMS location privacy	354
Figure 456—Flow of AAI selective control message protection	355
Figure 457—Generic HO procedure	365
Figure 458—AMS network reentry procedure flow diagram	369
Figure 459—Network reentry procedure with HO_Reentry_Mode set to 0	371
Figure 460—Network reentry procedure with HO_Reentry_Mode set to 1	372
Figure 461—Handover procedure from legacy BS to ABS	376
Figure 462—Handover procedure from R1 BS to ABS	377
Figure 463—Generic target RAT discovery and selection procedure	383
Figure 464—Control signaling through MAC container	385
Figure 465—AMS initialization overview to support multicarrier transmission	391
Figure 466—Neighbor ABS advertisement and scanning of serving and neighbor ABSs	396
Figure 467—Scanning while maintaining communication with S-ABS	397
Figure 468—Multicarrier HO with network reentry on the T-ABS	398
Figure 469—A call flow for multicarrier HO in which the AMS performs network reentry on the target primary carrier that is different from the serving primary carrier	399

Figure 470—Call flow for multicarrier HO with secondary carrier pre-assignment.....	400
Figure 473—Example of bitmaps with Group MIMO Mode Set: DL (0b00, 0b10), UL(0b00, 0b10).....	413
Figure 474—Example of bitmaps for Group MIMO Mode Set: DL (0b01), UL(0b01)	413
Figure 475—Example of bitmaps for Group MIMO Mode Set: UL(0b11)	413
Figure 476—Three-step random access BR procedure	417
Figure 477—Example of five-step random access BR procedure.....	418
Figure 478—Provisioned authorization model “envelopes”	423
Figure 479—Dynamic authorization model “envelopes”	424
Figure 480—Theory of operation object model	425
Figure 481—Service flow state transition overview	430
Figure 482—ABS-initiated AAI-DSA message flow	431
Figure 483—AMS-initiated AAI-DSA message flow.....	432
Figure 484—ABS-initiated adaptation	433
Figure 485—AMS-initiated adaptation	434
Figure 486—ARQ block initial transmission and retransmission	452
Figure 487—ARQ Tx block states	455
Figure 488—ARQ Tx subblock states.....	456
Figure 489—Transmitter-initiated ARQ reset	460
Figure 490—Receiver-initiated ARQ reset	461
Figure 491—Example of FDD DL HARQ timing for 5 MHz, 10 MHz, and 20 MHz channel bandwidths.....	466
Figure 492—Example of FDD UL HARQ timing for 5 MHz, 10 MHz, and 20 MHz channel bandwidths.....	468
Figure 493—Example of TDD DL HARQ timing for 5 MHz, 10 MHz, and 20 MHz channel bandwidths.....	470
Figure 494—Example of TDD UL HARQ timing for 5 MHz, 10 MHz, and 20 MHz channel bandwidths.....	472
Figure 495— Example of AAI subframe indexing	473
Figure 496— Example of TDD DL HARQ timing	474
Figure 497— Example of TDD UL HARQ timing	475
Figure 498—AMS initialization overview	477
Figure 499—State machine for the AMS for initial network entry process.....	479
Figure 500—State machine of the ABS for the initial NW entry process.....	480
Figure 501—Relationship between capability classes.....	484
Figure 502—Call flow for AMS-initiated idle mode entry	497
Figure 503—Procedures during AMS-initiated idle mode entry.....	498
Figure 504—Call flow for ABS-initiated idle mode entry	499
Figure 505—ABS procedures during Type 1 ABS-initiated idle mode entry.....	500
Figure 506—AMS procedures during Type 1 ABS-initiated idle mode entry	501
Figure 507—AMS procedures during Type 2 ABS-initiated idle mode entry	502
Figure 508—ABS Procedures during Type 2 ABS-initiated idle mode entry	503
Figure 509—Transmission of PGID-Info.....	505
Figure 510—Skipping for synchronous HARQ due to collision with CLC Active Interval.....	512
Figure 511—CLC Request/Response exchange.....	513
Figure 512—Type I CLC class example (a1= 8, b1= 102400)	515
Figure 513—Example of Type II CLC class subtype 1 (a2=2).....	516
Figure 514—Example of Type II CLC class subtype 2 (a2 = 48, b2 = 20).....	517
Figure 515—Example of Type II CLC class subtype 3 (a2=4, b2=3).....	517
Figure 516—Basic concept of fractional frequency reuse for reuse-3 scenario.....	518
Figure 517—Basic concept of fractional frequency reuse for reuse-2 scenario.....	519
Figure 518—Example where AMS sends PFPI and ABS agrees to change FFR partition.....	521
Figure 519—Example where AMS sends PFPI and ABS refuses to change FFR partition	522
Figure 520—Basic concept of UL FFR for the reuse-3 scenario	524
Figure 521—Basic concept of fractional frequency reuse for reuse-2 scenario.....	524

Figure 522—Illustrations of S-SFH update procedure	529
Figure 523—OFDMA symbol time structure	535
Figure 524—Definition of basic terms on the transmission chain	539
Figure 525—Basic frame structure for 5 MHz, 10 MHz, and 20 MHz channel bandwidths	542
Figure 526—Frame structure with Type-1 FDD AAI subframe	543
Figure 527—Frame structure for 7 MHz FDD mode ($G=1/8$)	543
Figure 528—Frame structure for 8.75 MHz FDD mode ($G = 1/8$)	544
Figure 529—Frame structure for 5/10/20 MHz mode	545
Figure 530—Frame structure for 7 MHz TDD mode	545
Figure 531—Frame structure for 8.75 MHz TDD mode	546
Figure 532—Frame structures for 5 MHz, 10 MHz, and 20 MHz of TDD and FDD mode ($G = 1/16$)	547
Figure 533—Frame structures for 7 MHz TDD and FDD modes ($G = 1/16$)	548
Figure 534—Frame structures for 8.75 MHz TDD and FDD modes ($G = 1/16$)	549
Figure 535—Frame structures for 5 MHz, 10 MHz, and 20 MHz of TDD and FDD modes ($G = 1/4$)	550
Figure 536—Frame structures for 7 MHz TDD and FDD modes ($G = 1/4$)	551
Figure 537—Frame structures for 8.75 MHz TDD and FDD modes ($G = 1/4$)	552
Figure 538—TDD frame configuration to support WirelessMAN-OFDMA UL FDM operation	554
Figure 539—TDD frame configuration to support WirelessMAN-OFDMA UL TDM operation	555
Figure 540—FDD frame configuration to support WirelessMAN-OFDMA FDD/H-FDD operation (e.g., 5 MHz, 10 MHz, and 20 MHz with 1/8 Tb CP)	556
Figure 541—Example of the frame structure to support multicarrier operation	557
Figure 542—Example of the frame structure to support WirelessMAN-OFDMA with multicarrier operation	558
Figure 543—Example of subcarrier alignment of adjacent carriers	559
Figure 544—Example of downlink physical structure	564
Figure 545—PRU to PRUSB and PRUMB mapping for BW = 10 MHz, KSB = 7	568
Figure 546—Mapping from PRUs to PRUSB and PPRUMB mapping for BW=10 MHz, KSB=7	570
Figure 547—Frequency partition for BW=10 MHz, KSB=7, FPCT=4, FPS0=FPSi=12, DFPSC=2	574
Figure 548—Frequency partition for BW = 10 MHz	579
Figure 549—Subcarrier permutation for BW = 10 MHz	582
Figure 550—Pilot patterns used for one DL data stream outside the open-loop region	584
Figure 551—Pilot patterns used for two DL data streams	585
Figure 552—CoFIP pattern for AAI subframes with six OFDM symbols	585
Figure 553—CoFIP pattern for AAI subframes with five OFDM symbols	586
Figure 554—Interlaced pilot patterns for 1 data stream outside the open-loop region	587
Figure 555—Interlaced pilot patterns on stream 0 for 2 data streams	588
Figure 556—Interlaced pilot patterns on stream 1 for 2 data streams	588
Figure 557—Pilot patterns on stream 0 for 4 data streams	589
Figure 558—Pilot patterns on stream 1 for 4 data streams	590
Figure 559—Pilot patterns on stream 2 for 4 data streams	590
Figure 560—Pilot patterns on stream 3 for 4 data streams	591
Figure 561—Pilot patterns for 8 data streams	592
Figure 562—MIMO midamble physical structure for 4TX antennas and IDcell = 0	593
Figure 563—E-MBS zone specific pilot patterns for 1 and 2 stream transmission in Type-1 subframe	596
Figure 564—E-MBS zone specific pilot patterns for 1 and 2 stream transmission in Type-2 subframe	596
Figure 565—E-MBS zone specific pilot patterns for 1 and 2 stream transmission in Type-3 subframe	597
Figure 566—Location of the A-Preamble	599
Figure 567—PA-Preamble symbol structure	600
Figure 568—A-Preamble transmission structure supporting WirelessMAN-OFDMA	602
Figure 569—Allocation of sequence subblocks for each FFT	615
Figure 570—SA-Preamble symbol structure for 512-FFT	616
Figure 571—Multi-antenna example for 512-FFT	617
Figure 572—Multi-antenna example for 1024-FFT	617
Figure 573—Multi-antenna example for 2048-FFT	618

Figure 574—Proposed allocation of SA-Preamble at $11.25 \leq x < 12.5$	622
Figure 575—Illustration of periodic transmission of S-SFH SPs with example transmission periodicity of 40 ms, 80 ms, and 160 ms for SP1, SP2, and SP3, respectively	626
Figure 576—Illustration of additional transmission of S-SFH SP2	627
Figure 577—Example of locations of A-MAP regions in a TDD system with a 4:4 DL/UL ratio	627
Figure 578—Structure of an A-MAP region	628
Figure 579—Structure of an assignment A-MAP for non-FFR configuration	629
Figure 580—Physical processing block diagram for the P-SFH	631
Figure 581—Physical processing block diagram for the S-SFH	631
Figure 582—Chain of non-user-specific A-MAP IE to non-user-specific A-MAP symbols	632
Figure 583—Chain of HF-A-MAP IE to HF-A-MAP symbols	633
Figure 584—Chain of PC-A-MAP IE to PC-A-MAP symbols	634
Figure 585—Chain of A-A-MAP IE to A-A-MAP symbols	635
Figure 586—Interpretation of the ERA field when $Y_{SB} \leq 4$, illustrated for $Y_{SB} = 4$	668
Figure 587—Interpretation of the RA field when $5 \leq Y_{SB} \leq 10$ and RA MSB = 0b0	669
Figure 588—Interpretation of the RA field when $5 \leq Y_{SB} \leq 10$ and ModeIndicator = 0b1	670
Figure 589—Interpretation of the CRA field when $11 \leq Y_{SB} \leq 21$ and ModeIndicator = 0b1	671
Figure 590—Definitions of subband pairs in the $Y_{SB} > 10$, single IE case	672
Figure 591—Partitioning and usage of the RA field in the $Y_{SB} > 10$, single IE case	672
Figure 592—DL MIMO architecture	711
Figure 593—Example of uplink physical structure	761
Figure 594—PRU to PRUSB and PRUMB mapping for BW = 10 MHz, KSB = 7	765
Figure 595—Mapping from PRUs to PRUSB and PPRUMB mapping for BW=10 MHz, KSB=7	767
Figure 596—Frequency partition for BW=10 MHz, KSB = 7, FPCT = 4, FPS0 = FPSi = 12, UFPSC = 2771	771
Figure 597—Frequency partition for BW = 10 MHz	776
Figure 598—Tile partition for BW = 10 MHz	778
Figure 599—Allocation order of UL channels in the FDM-based UL PUSC zone	779
Figure 600—Allocation of channels in the UL frequency partition	779
Figure 601—Resource block for FDM based UL PUSC zone support	783
Figure 602—Example of subchannelization for FDM base UL PUSC zone support	784
Figure 603—Pilot patterns of 1-Tx stream for distributed LRUs	785
Figure 604—Pilot patterns of 2-Tx streams for distributed LRUs	785
Figure 605—Pilot pattern of 1-Tx stream for distributed PUSC LRUs	785
Figure 606—Pilot pattern of 2-Tx stream for distributed PUSC LRUs	786
Figure 607—Pilot patterns for contiguous LRUs for 1-Tx stream	786
Figure 608—Pilot patterns for contiguous LRUs for 2-Tx streams	787
Figure 609—Pilot patterns for contiguous LRUs for 3 Tx streams	787
Figure 610—Pilot patterns for contiguous LRUs for 4-Tx streams	788
Figure 611—Pilot patterns for contiguous LRUs for 8 Tx streams	789
Figure 612—Pilot patterns of 1-Tx stream for type-4 AAI subframe distributed PUSC LRUs	790
Figure 613—Pilot patterns of 2-Tx stream for type-4 AAI subframe distributed PUSC LRUs	790
Figure 614—Sounding PHY structures for (a) 6-symbol PRU and (b) 7-symbol PRU cases	792
Figure 615—NS-RCH allocation in AAI subframe(s)	794
Figure 616—S-RCH structure in the time domain	795
Figure 617—RCH structures for FDM-based UL PUSC zone support	796
Figure 618—RCH structures and allocations for FDM based UL PUSC zone support	797
Figure 619—PFBCH comprised of three distributed 2x6 UL FMTs	798
Figure 620—Mapping of information in the PFBCH	798
Figure 621—SFBCB comprising of three distributed 2x6 UL FMTs	800
Figure 622—2x2 HMT structure	801
Figure 623—PRBS generator for ranging code generation	809
Figure 624—6x6 BR tile structure in the advance air interface	811
Figure 625—4x6 BR tile structure	814
Figure 626—UL MIMO architecture	841

Figure 627—Channel coding procedure for data channel	855
Figure 628—Data randomization with a PRBS generator	858
Figure 629—CTC encoder	860
Figure 630—Block diagram of interleaving scheme	863
Figure 631—Block diagram of TBCC structure	864
Figure 632—TBCC encoder of rate 1/5	865
Figure 633—PRBS generator for subcarrier randomization	866
Figure 634—Mapping of pilot modulation sequence to pilot subcarriers of CoFIP	869
Figure 675—Functional overview of Femto ABS states and operational modes	878
Figure 676—Procedure for Femto ABS discovery and association	881
Figure 677—Femto ABS reselection procedure	884
Figure 678—Example of operation in low-duty mode	887
Figure 679—Relay MAC PDU format	900
Figure 680—Key agreement procedure	902
Figure 681—Example of FDD DL HARQ timing of ARS-AMS link	905
Figure 682—Example of FDD UL HARQ timing of ARS-AMS link	906
Figure 683—Example of TDD DL HARQ timing between ARS and AMS stations	907
Figure 684—Example of TDD UL HARQ timing between ARS and AMS stations	908
Figure 685—Example of FDD DL HARQ timing of ABS-ARS link	909
Figure 686—Example of FDD UL HARQ timing of ABS-ARS link	910
Figure 687—Example of TDD DL HARQ timing between ABS and ARS stations	911
Figure 688—Example of TDD UL HARQ timing between ABS and ARS stations	912
Figure 689—ARS initialization overview	913
Figure 690—Superframe structure for system with ARS support	917
Figure 691—Example of ARS FDD frame structure with $G = 1/8$ in 5/10/20 MHz	919
Figure 692—Example of ARS TDD frame structure with $G = 1/8$ in 5/10/20 MHz	920
Figure 693—Femto ABS neighbor list update control flow	927
Figure 694—Operation description on AAI for general U-TDOA	931
Figure 695—Operation description on AAI for special U-TDOA	932
Figure 696—D-LBS zone allocation	934
Figure 697—Example of scan for D-LBS Zone	936
Figure 698—Procedure of E-MBS connection establishment to start E-MBS service	940

List of tables

Table 2a—Type ID for Multi-protocol flow.....	19
Table 8—BR header fields	21
Table 38—MAC management messages.....	21
Table 96—Action codes and actions	26
Table 109—DREG-REQ message format.....	27
Table 144—MOB_NBR-ADV message format.....	29
Table 201a—State transitions of an MS with active PSC/PSCs	37
Table 201b—State transitions of an MS with active scanning pattern.....	38
Table 302—Reduced private DL-MAP message format.....	45
Table 339—MBS MAP IE	46
Table 362—Broadcast Control Pointer IE format	46
Table 375—Extended Broadcast Control Pointer IE.....	46
Table 554—Parameters and constants	51
Table 571—UCD PHY-specific channel encodings-WirelessMAN-OFDMA	53
Table 575—DCD channel encodings	54
Table 578—Emergency Alert Sservice description.....	54
Table 658—Flow identifiers	63
Table 659—AGMH format	65
Table 660—SPMH format.....	66
Table 661—MAC signaling header format	66
Table 662—Type field encodings for MAC signaling header type.....	67
Table 663—BR with STID header format.....	67
Table 664—BR without STID header format.....	68
Table 665—Service specific scheduling control header format.....	68
Table 666—Sleep Control header format.....	71
Table 667—AMS Battery Report Header format.....	72
Table 668—Uplink Power Status Report header format	73
Table 669—Correlation Matrix Feedback header format.....	74
Table 670—MIMO feedback header format	75
Table 671—Extended header group format.....	77
Table 672—Description of Extended header types	78
Table 673—Fragmentation Extended header format.....	79
Table 674—Packing Extended header format	80
Table 675—Encoding of FC field	81
Table 676—MAC Control Extended header format.....	81
Table 677—Multiplexing Extended header format	82
Table 678—MAC Control ACK Extended header format	83
Table 679—Piggybacked Bandwidth Request Extended header format.....	84
Table 680—Rearrangement Fragmentation and Packing Extended header format.....	84
Table 681—ARQ Feedback Polling Extended header format.....	86
Table 682—Advanced Relay Forwarding Extended header format.....	86
Table 683—MAC Control messages.....	87
Table 684—AAI-RNG-REQ message field description	92
Table 685—AAI-RNG-RSP message field description	100
Table 686—AAI-RNG-ACK message field description	110
Table 687—AAI-RNG-CFM message field description	114
Table 688—AAI-SBC-REQ message field description	115
Table 689—AAI-SBC-RSP message field description	119
Table 690—Parameters for AAI-SON-ADV message.....	122
Table 691—AAI-REG-REQ message field description.....	124
Table 692—AAI-REG-RSP message field description.....	129

Table 693—AAI-HO-IND message field description	134
Table 694—AAI-HO-REQ message field description	135
Table 695—AAI-HO-CMD message field description	136
Table 696—AAI-NBR-ADV message field description	143
Table 697—AAI-SCN-REQ message field description	147
Table 698—AAI-SCN-RSP message field description	151
Table 699—AAI-SCN-REP message field description	156
Table 700—AAI-CLC-REQ message field description	160
Table 701—AAI-CLC-RSP message field description	165
Table 702—AAI-FFR-CMD message field description	166
Table 703—AAI-FFR-REP message field description	167
Table 704—AAI-DREG-REQ message field description	169
Table 705—AAI-DREG-RSP message format	172
Table 706—AAI-PAG-ADV message field description	176
Table 707—PGID-Info message field description	178
Table 708—AAI-SLP-REQ message field description	179
Table 709—AAI-SLP-RSP message field description	183
Table 710—AAI-TRF-IND message field description	188
Table 711—AAI-TRF-IND-REQ message field description	190
Table 712—AAI-TRF-IND-RSP message field description	191
Table 713—AAI-L2-XFER message field description	192
Table 714—AAI-SCD message field description	194
Table 715—AAI-ULPC-NI Field description	201
Table 716—AAI-UL-POWER-ADJ message field description	202
Table 717—AAI-UL-PSR-CFG message field description	203
Table 718—AAI-DL-IM message field description	204
Table 719—AAI-MSG-ACK message format	206
Table 720—AAI-SBS-MIMO-FBK message format	207
Table 721—AAI-MBS-MIMO-FBK message field description	211
Table 722—AAI-MBS-MIMO-REQ message field description	213
Table 723—AAI-MBS-MIMO-RSP message field description	214
Table 724—AAI-MBS-SOUNDING-CAL message field description	215
Table 725—AAI-MBS-MIMO-SBP message field description	216
Table 726—AAI-PKM-REQ message field description	216
Table 727—AAI-PKM-RSP message field description	218
Table 728—PKM v3 message types	220
Table 729—PKMv3 Reauth Request message attributes	221
Table 730—PKMv3 EAP-Transfer message attributes	221
Table 731—PKMv3 Key_Agreement-MSG#1 message attributes	222
Table 732—PKMv3 Key_Agreement-MSG#2 message attributes	223
Table 733—PKMv3 Key_Agreement-MSG#3 message attributes	224
Table 734—PKMv3 TEK-Request message attributes	225
Table 735—PKMv3 TEK-Reply message attributes	225
Table 736—PKMv3 TEK-Invalid message attributes	226
Table 737—AAI-ARQ-Feedback message field description	226
Table 738—AAI-ARQ-Discard message field description	229
Table 739—AAI-ARQ-Reset message field description	229
Table 740—AAI-DSA-REQ Message Field description	231
Table 741—AAI-DSA-RSP message field description	248
Table 742—AAI-DSA-ACK message field description	252
Table 743—AAI-DSC-REQ message field description	254
Table 744—AAI-DSC-RSP message field description	267
Table 745—AAI-DSC-ACK message field description	270
Table 746—AAI-DSD-REQ message field description	271

Table 747—AAI-DSD-RSP message field description	274
Table 748—AAI-GRP-CFG message field description	277
Table 749—AAI-RES-CMD	279
Table 750—AAI-SII-ADV message field description	279
Table 751—AAI-MC-REQ message format	281
Table 752—AAI-MC-RSP message field description	283
Table 753—AAI-CM-CMD message field description	284
Table 754—AAI-CM-IND message field description	288
Table 755—AAI-MC-ADV message field description	288
Table 756—AAI-Global-CFG message field description	292
Table 757—AAI-ARS-CONFIG-CMD message field description	293
Table 758—AAI-ARS-ESI message field description	296
Table 759—AAI-E-MBS-REP message field description	298
Table 760—AAI-E-MBS-RSP message field description	299
Table 761—AAI-E-MBS-CFG message field description	300
Table 762—AAI-LBS-ADV message field description	303
Table 763—AAI-LBS-IND message field description	306
Table 764—SA mapping with protection level	333
Table 765—LZone CID to MZone SA mapping during LZone to MZone zone switch	334
Table 766—MZone FID to LZone SA mapping during MZone to LZone zone switch	334
Table 767—Nonce construction	336
Table 768—Authentication FSM state transition matrix for PKMv3	341
Table 769—TEK FSM state transition matrix for PKMv3	349
Table 770—MSK context	356
Table 771—PMK context	357
Table 772—AK context	358
Table 773—TEK context	359
Table 774—SA context	359
Table 775—Trigger description	361
Table 776—Description of the trigger type/function/action	363
Table 777—CA-specific trigger description	403
Table 778—CA-specific Trigger; Type/Function/Action description	404
Table 779—DL MIMO mode set candidates	407
Table 780—UL MIMO mode set candidates	408
Table 781—Burst sizes supported in GRA and corresponding codes	408
Table 782—MIMO bitmap Information for DL	411
Table 783—MIMO Bitmap Information for UL	412
Table 784—Quick access message format	420
Table 785—Global Service Class Name Information Field parameters	427
Table 786—SF QoS parameters for aGP service scheduling service	435
Table 787—Mapping from aGP service to ertPS/rtPS	436
Table 788—Service flow/convergence sublayer parameters	437
Table 789—ROHC parameter payload	447
Table 790—Parameters for default service flow setting	447
Table 791—Predefined BR index parameters	448
Table 792—FDD DL HARQ timing	465
Table 793—FDD UL HARQ timing	467
Table 794—TDD DL HARQ timing	469
Table 795—TDD UL HARQ timing	470
Table 796—Time unit of CLC class parameters	510
Table 797—Default value of CLC limits	511
Table 798—Type II CLC class subtype	515
Table 799—Resource metric information	520
Table 800—Short message service	530

Table 801—OFDMA parameters	536
Table 802—Additional OFDMA parameters	537
Table 803—OFDMA parameters for 2048 FFT when tone dropping is applied	538
Table 804—OFDMA parameters for 1024 FFT when tone dropping is applied	538
Table 805—Multicarrier configuration index	560
Table 806—Frame configuration and indexing (5/10/20 MHz channel bandwidth)	561
Table 807—Frame configuration and indexing (8.75 MHz channel bandwidth)	562
Table 808—Frame configuration and indexing (7 MHz channel bandwidth)	563
Table 809—Mapping between DSAC and KSB for 2048 FFT size	565
Table 810—Mapping between DSAC and KSB for 1024 FFT size	566
Table 811—Mapping between DSAC and KSB for 512 FFT size	566
Table 812—Mapping between DFPC and frequency partitioning for 2048 FFT size	571
Table 813—Mapping between DFPC and frequency partitioning for 1024 FFT size	572
Table 814—Mapping between DFPC and frequency partitioning for 512 FFT size	572
Table 815—Mapping between DCASMB,0 and number of miniband-based CRUs for FP0 for 2048 FFT size	575
Table 816—Mapping between DCASMB,0 and number of miniband-based CRUs for FP0 for 1024 FFT size	576
Table 817—Mapping between DCASMB,0 and number of miniband-based CRUs for FP0 for 512 FFT size	576
Table 818—DL PHY structure—Summary of parameters	578
Table 819—Golay sequence of length 2048 bits	594
Table 820—Offsets in the Golay sequence	594
Table 821—Number of guard PRUs	597
Table 822—PA-Preamble series	600
Table 823—PA-Preamble boosting levels	601
Table 824—IDcell partitioning for public ABS and CSG-femto ABS	603
Table 825—IDcell partitioning	604
Table 826—SA Preamble for n = 0 (Segment 0)	605
Table 827—SA Preamble for n = 1 (Segment 1)	609
Table 828—SA Preamble for n = 2 (Segment 2)	612
Table 829—SA-Preamble boosting levels	619
Table 830—SA-Preamble block cover sequence	620
Table 831—Allocation of sequence subblocks for tone dropping support	620
Table 832—SA-Preamble boosting levels for tone dropping support	623
Table 833—SA-Preamble block cover sequence based on subblock dropping	623
Table 834—Parameters and values for resource allocation of SFH	625
Table 835—Transmission periodicity of S-SFH SPs	626
Table 836—E-MBS MAP structure	630
Table 837—P-SFH IE format	637
Table 839—S-SFH SP1 IE format	639
Table 838—S-SFH IE format	639
Table 840—S-SFH SP2 IE format	644
Table 841—S-SFH SP3 IE format	646
Table 842—Power boosting/deboosting values	648
Table 843—Non-user specific A-MAP IE	649
Table 844—HF-A-MAP-IE	652
Table 845—PC-A-MAP IE format	652
Table 846—Number of HARQ regions in each UL AAI subframe	653
Table 847—PC-A-MAP IE location	653
Table 848—Assignment A-MAP IE types	654
Table 849—Description of CRC mask	655
Table 850—Description of the masking code for type indicator 001	655
Table 851—Description of the masking code for type indicator 010	655

Table 852—DL Basic Assignment A-MAP IE	656
Table 853—UL Basic Assignment A-MAP IE	662
Table 854—ERA bit to SLRU index mapping when $Y_{SB} \leq 4$	667
Table 855—Interpretation of the ITF from 0110 through 1101 (decimal 6 through 13)	674
Table 856—RA bit to SLRU index mapping when $Y_{SB} \leq 3$	675
Table 857—Feedback Allocation A-MAP IE	676
Table 858—UL Sounding Command A-MAP IE	683
Table 859—CDMA Allocation A-MAP IE	685
Table 860—DL persistent allocation A-MAP IE	687
Table 861—UL persistent allocation A-MAP IE	690
Table 862—Group Resource Allocation A-MAP IE	693
Table 863—Feedback Polling A-MAP IE	695
Table 864—Polling deallocation bitmap	703
Table 865—BR-ACK A-MAP IE	705
Table 866—Broadcast Assignment A-MAP IE	707
Table 867—Extended Assignment A-MAP IE	709
Table 868—E-MBS DATA information elements	710
Table 869—Codebook subsets used for non-adaptive precoding in DL DLRU and NLRU	715
Table 870—Codebook subsets used for non-adaptive precoding in DL SLRU	715
Table 871—Values of N_w for non-adaptive precoding in DL DLRU and NLRU	716
Table 872—Values of N_w for non-adaptive precoding in DL SLRU	717
Table 873—Downlink MIMO modes	717
Table 874—DL MIMO parameters	718
Table 875—Supported permutation for each DL MIMO mode outside the OL region	721
Table 876—Supported permutation for each DL MIMO mode in the OL region	722
Table 877—Types of open-loop regions	723
Table 878—MIMO feedback modes	724
Table 879—DL MIMO control parameters	727
Table 880—C(2,1,3)	730
Table 881—C(2,2,3)	731
Table 882—C(4,1,6)	731
Table 883—C(4,2,6)	734
Table 884—C(4,3,6)	737
Table 885—C(4,4,6)	739
Table 886—C(8, 1, 4)	740
Table 887—Ranks 2 to 8 of SU MIMO 4 bit 8Tx base codebook	743
Table 888—CDL,OL,SU(2,1,2) and CDL,OL,SU(2,2,1)	744
Table 889—CDL,OL,SU(4,1,4), CDL,OL,SU(4,2,4), CDL,OL,SU(4,3,2) and CDL,OL,SU(4,4,1)	744
Table 890—CDL,OL,SU(8,1,8), CDL,OL,SU(8,2,4), CDL,OL,SU(8,3,4) and CDL,OL,SU(8,4,2)	745
Table 891—CDL,OL,SU(8,5,2), CDL,OL,SU(8,6,2), CDL,OL,SU(8,7,2) and CDL,OL,SU(8,8,1)	745
Table 892—Subset selection of the base codebook for four transmit antennas	745
Table 893—Quantization parameters for diagonal entries of R	747
Table 894—Quantization parameters for non-diagonal entries of R	748
Table 895—D(2,1,4) codebook	751
Table 896—D(2,2,4) codebook	751
Table 897—D(4,1,16) codebook	752
Table 898—D(4,2,16) codebook	752
Table 899—D(8,1,16) codebook	753
Table 900—D(8,2,16) codebook	754
Table 901—D(8,3,16) codebook	756
Table 902—D(8,4,16) codebook	758
Table 903—Mapping between USAC and KSB for 2048 FFT size	763
Table 904—Mapping between USAC and KSB for 1024 FFT size	763
Table 905—Mapping between USAC and KSB for 512 FFT size	764

Table 906—Mapping between UFPC and frequency partitioning for 2048 FFT size	768
Table 907—Mapping between UFPC and frequency partitioning for 1024 FFT size	769
Table 908—Mapping between UFPC and frequency partitioning for 512 FFT size	769
Table 909—Mapping between UCASMB,0 and number of miniband-based CRUs for FP0 for 2048 FFT size	772
Table 910—Mapping between UCASMB,0 and number of miniband-based CRUs for FP0 for 1024 FFT size	773
Table 911—Mapping between UCASMB,0 and number of miniband-based CRUs for FP0 for 512 FFT size	773
Table 912—UL PHY structure—Summary of parameters.....	775
Table 913—512 FFT OFDMA UL subcarrier allocations for DRU	782
Table 914—1024 FFT OFDMA UL subcarrier allocations for DRU	783
Table 915—2048 FFT OFDMA UL subcarrier allocations for DRU	783
Table 916—Number of guard PRUs	790
Table 917—Formats and parameters for the NS-RCH.....	793
Table 918—Sequences for PFBCH	799
Table 919—Orthogonal sequences for UL HARQ feedback channel.....	801
Table 920—Golay sequence of length 2048 bits.....	803
Table 921—Sounding sequence offset values	803
Table 922—Number of cyclic shifted codes per ZC root index, M_{ns} , for the NS-RCH	805
Table 923—RP code partition information table, N_{IN} and N_{HO} , for the NS-RCH.....	805
Table 924—Periodicity of the NS-RCH allocations by S-SFH.....	806
Table 925—Ranging preamble code information table, N_{PE} , for the S-RCH.....	807
Table 926—The RP code partition information table	808
Table 927—Periodicity of the S-RCH allocations	809
Table 928—RP code partition information table for FDM-based UL PUSC zone support, N_{IN} , N_{HO} , and N_{PE}	810
Table 929—BR channel preamble sequences	812
Table 930—PFBCH feedback content	815
Table 931—Contents encoding type 0 in PFBCH.....	815
Table 932—Contents encoding type 1 in PFBCH.....	819
Table 933—Contents encoding type 3 in PFBCH.....	820
Table 934—SFBCH feedback content	821
Table 935—MCS table for CQI.....	822
Table 936—Feedback formats for MFM 0, 4, and 7(outside OL region)	824
Table 937—Feedback formats for MFM 0 and 1 (inside OL region)	825
Table 938—Feedback formats for MFM 2 (outside OL region)	826
Table 939—Feedback formats for MFM 2 (inside OL region)	827
Table 940—Feedback formats for MFM 3	828
Table 941—Feedback formats for MFM 3 for differential codebook.....	829
Table 942—Feedback formats for MFM 5	830
Table 943—Feedback formats for MFM 6	831
Table 944—Feedback formats for MFM 6 for differential codebook.....	832
Table 945—SINRTarget parameters for control channels	835
Table 946—Priority of uplink transmit channels	838
Table 947—Default ULPC parameters.....	839
Table 948—Codebook subsets used for non-adaptive precoding in UL DLRU and NLRU.....	842
Table 949—Codebook subsets used for non-adaptive precoding in UL SLRU.....	842
Table 950—Values of N_w for non-adaptive precoding in UL DLRU and NLRU.....	843
Table 951—Values of N_w for non-adaptive precoding in UL SLRU	843
Table 952—Uplink MIMO modes	843
Table 953—UL MIMO parameters	844
Table 954—Supported permutation for each UL MIMO mode	846
Table 955—UL MIMO control parameters.....	847

Table 956— $C_{\text{base,UL}}(2,1,4)$	848
Table 957— $C_{\text{base,UL}}(4,4,6)$	849
Table 958— $C_{\text{UL,CL,CSM}}(4,1,4)$, $C_{\text{UL,CL,CSM}}(4,2,4)$, $C_{\text{UL,CL,CSM}}(4,3,4)$	854
Table 959— $C_{\text{UL,OL,SU}}(4,1,4)$, $C_{\text{UL,OL,SU}}(4,2,4)$, $C_{\text{UL,OL,SU}}(4,3,4)$, and $C_{\text{UL,OL,SU}}(4,4,4)$	854
Table 960—Burst size	856
Table 962—Rules for modulation order	857
Table 961—Minimal size index as a function of the allocation size	857
Table 963—Interleaver parameters	861
Table 964—Parameters for the subblock interleavers	862
Table 965—Downlink data and pilot subcarriers power	867
Table 966—Uplink data and pilot subcarriers power	867
Table 967—Pilot modulation sequences for CoFIP	868
Table 968—Starting position determination for downlink HARQ	869
Table 969—Constellation rearrangement version (MIMO stream = 1)	870
Table 970—Constellation rearrangement version (MIMO stream > 1)	870
Table 971—EVM requirements	872
Table 972—IM-termination trigger; type/function/action description	889
Table 973—IM-termination trigger; type/function/action description	889
Table 974—Control parameters for DL Multi-BS MIMO	891
Table 975—Feedback information for DL Multi-BS MIMO supported by codebook-based feedback	892
Table 976— $\text{pmiCoordinationSubset}$	894
Table 977—Quantization parameters for b	895
Table 978—Control parameters for UL multi-BS MIMO	897
Table 979—Frame configuration for ARS operation	921
Table 980—Predefined D-LBS zone transmission plan	935
Table 981—OFDMA DL Frame Prefix format	945
Table 982—OFDMA-specific RNG-RSP message encodings	946
Table 983—OFDMA-specific RNG-REQ message encodings	947
Table 982—Parameters and constants	949
Table V.1—Default capability class and parameters for the AAI PHY	1063
Table V.2—Default capability class and parameters for AAI MAC	1063

IEEE Standard for
Local and metropolitan area networks

Part 16: Air Interface for
Broadband Wireless Access Systems
Amendment 3: Advanced Air Interface

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NOTE—The editing instructions contained in this amendment define how to merge the material contained herein into the existing base standard and its amendments to form a comprehensive standard.

The editing instructions are shown ***bold italic***. Four editing instructions are used: ***change***, ***delete***, ***insert***, and ***replace***. ***Change*** is used to make small corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by either using ~~striketrough~~ (to remove old material) or underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make large changes in existing text, subclauses, tables, or figures by removing existing material and replacing it with new material. Editorial notes will not be carried over into future editions because the changes will be incorporated into the base standard.

1.4 Reference models

Change the paragraph as follows:

The MAC comprises three sublayers. The service-specific convergence sublayer (CS) provides any transformation or mapping of external network data, received through the CS service access point (SAP), into MAC service data units (SDUs) received by the MAC common part sublayer (CPS) through the MAC SAP. This includes classifying external network SDUs and associating them to the proper MAC service flow identifier (SFID) and connection identifier (CID), or, for an ABS or AMS, to a Station Identifier + Flow Identifier (STID+FID) combination. It may also include such functions as payload header suppression (PHS). Multiple CS specifications are provided for interfacing with various protocols. The internal format of the CS payload is unique to the CS, and the MAC CPS is not required to understand the format of or parse any information from the CS payload.

1.4.4.2 IEEE 802.16 entity to NCMS Interface

Change 1.4.4.2 as follows:

This interface is a set of SAP between an IEEE 802.16 entity and NCMS and is represented in Figure 3. It is decomposed into two parts: the M-SAP is used for less time sensitive Management plane primitives and the C-SAP is used for more time sensitive Control plane primitives that support handovers, security context management, radio resource management, and low power operations (such as idle mode and paging functions).

Architecturally, the base stations and their backbone connections form the Access Service Network (ASN), defined as a complete set of network functions, are needed to provide radio access to the mobile stations. The ASN is outside the scope of this standard.

2. Normative references

Insert the following text in alphanumerical order:

IETF RFC 2132, “DHCP Options and BOOTP Vendor Extensions,” S. Alexander, R. Droms, March 1997.

IETF RFC 3315, “Dynamic Host Configuration Protocol for IPv6 (DHCPv6),” R. Droms, et al., July 2003.

Internet Assigned Numbers Authority (IANA), “Dynamic Host Configuration Protocol (DHCP) and Bootstrap Protocol (BOOTP) Parameters.”

Internet Assigned Numbers Authority (IANA), “Dynamic Host Configuration Protocol for IPv6 (DHCPv6).”

NIST Special Publication 800-38C-Recommendation for Block Cipher Modes of Operation: The CCM Mode for Authentication and Confidentiality, May 2004.

3. Definitions

Insert the following new definitions:

3.97 AAI (DL/UL) Access Zone: An integer multiple of subframes located in the MZone of the ABS frame or ARS frame, where an ABS or ARS transmit to the AMSs or receive from AMSs.

3.98 AAI (DL/UL) Relay Zone: An integer multiple of subframes located in the MZone of the ABS frame, where an ABS transmit to the ARSs and/or AMSs or receive from ARSs and AMSs, or ARS frame, where an ARS transmit to the ABS or receive from ABS.

3.99 AAI subframe: A structured data sequence of predefined duration used by the Advanced Air Interface specification.

3.100 ARS receive/transmit transition gap (ARSRTG): The minimum receive-to-transmit turnaround gap required at an ARS. ARS-RTG is measured from the time of the last sample of the received burst to the first sample of the transmitted burst at the antenna port of the ARS.

3.101 ARS transmit/receive transition gap (ARSTTG): The minimum transmit-to-receive turnaround gap required at an ARS. ARS-TTG is measured from the time of the last sample of the transmitted burst to the first sample of the received burst at the antenna port of the ARS.

3.102 advanced base station (ABS): A base station that supports the WirelessMAN-Advanced Air Interface.

3.103 advanced mobile station (AMS): A subscriber station capable of performing the Wireless-MAN-OFDMA TDD Release 1 subset of mobile station (MS) features and functions and additionally implementing the WirelessMAN-Advanced Air Interface.

3.104 advanced relay station (ARS): A relay station that supports the WirelessMAN-Advanced Air Interface.

3.105 CSG Femto ABS: CSG-Closed or CSG-Open Femto ABS.

3.106 CSG-Closed Femto ABS: A Femto ABS accessible only to the AMSs, which are in its CSG(s), except for emergency services. AMSs that are not the members of the CSG(s) should not try to access CSG-Closed Femto ABSs.

3.107 CSG-Open Femto ABS: A Femto ABS primarily accessible to the AMSs that belong to its CSG(s), while other AMSs, outside CSG(s), may also access such Femto ABS, and will be served at lower priority. CSG-Open Femto ABS will provide service to such AMSs as long as the QoS of AMSs in its CSG(s) is not compromised.

3.108 closed subscriber group (CSG): A set of subscribers authorized by the Femto ABS owner or the network service provider, for accessing CSG Femto ABS.

3.109 contiguous resource unit (CRU): The resource allocation unit of the same size as the PRU that has undergone the subband partitioning and miniband permutation, assigned to contiguous allocation and will bypass subcarrier permutation in DL and tile permutation in UL. *Syn:* **localized resource unit.**

3.110 default service flow: A service flow that is established automatically without DSA procedure after successful registration procedure. QoS parameters for the default service flow are predefined.

3.111 distributed resource unit (DRU): The resource allocation unit of the same size as the PRU that has undergone the subband partitioning and miniband permutation, assigned to distributed allocation and will be submitted to the subcarrier permutation in DL and tile permutation in UL.

3.112 dual radio MS: A multimode MS/AMS that can have both radios (transmitting and receiving) active at the same time. A dual radio MS/AMS can simultaneous transmit and receive on both radios. A dual radio MS/AMS may behave as a single radio MS by operating in single radio mode.

3.113 Femto ABS: An ABS with low transmit power, typically installed by a subscriber in the home, SOHO, or enterprise to provide the access to closed or open group of users as configured by the subscriber and/or the access provider. A Femto ABS is typically connected to the service providers network via a broadband connection.

3.114 frame index: The frame order within a superframe (i.e., the 1st, 2nd, 3rd, or 4th frame of superframe).

3.115 frame number: In WirelessMAN-OFDMA, the frame number is a 24-bit number transmitted in every frame. Frame numbers are not necessarily synchronized across base stations. In WirelessMAN-Advanced Air Interface, the frame number is obtained by concatenating the 12-bit superframe number (transmitted in every superframe) and the 2-bit frame index. Superframe numbers are synchronized across base stations.

3.116 horizontal encoding: Indicates transmitting multiple MIMO layers over multiple antennas. The number of MIMO layers is more than 1. The number of MIMO streams is same as the number of MIMO layers in this case.

3.117 logical resource unit (LRU): The generic name of logical units for distributed and localized resource allocations.

3.118 LZone: A positive integer number of consecutive subframes during which an ABS communicates with RSs or R1 MSs, and where an ARS or an RS communicates with one or more R1 MSs.

3.119 Macro ABS: An ABS with high transmit power. A Macro ABS is directly connected to the service providers network.

3.120 Macro hot-zone ABS: An ABS with smaller transmission power/cell size than that of macro ABSs, typically deployed by service provider and operated on service provider backhaul.

3.121 MIMO layer: An information path fed to the MIMO encoder as an input. A MIMO layer represents one channel coding block.

3.122 MIMO stream: Each information path encoded by the MIMO encoder that is passed to the precoder.

3.123 mixed-mode ABS: An ABS with an operating LZone and operating Mzone.

3.124 multi-layer encoding: The number of MIMO streams is same as the number of MIMO layers in this case.

3.125 multi radio MS: A multimode MS/AMS that can have multiple radios (transmitting and receiving) active at the same time. A multi radio MS/AMS can simultaneous transmit and receive on multiple radios. A Multi Radio MS/AMS may behave as a Single Radio MS by operating in Single Radio Mode.

3.126 multi-user MIMO (MU-MIMO): A MIMO transmission scheme in which multiple MSs are scheduled in one RU, by virtue of spatial separation of the transmitted signals.

3.127 MZone: A positive integer number of consecutive subframes during which an ABS communicates with one or more ARSs or AMSs, and where an ARS communicates with one or more ARSs or AMSs.

3.128 OSG Femto ABS: A Femto ABS accessible to any AMS.

3.129 partially configured carrier: A downlink only carrier configured with control channels to support downlink transmission.

3.130 physical resource unit (PRU): The basic resource allocation unit that consists of 18 adjacent subcarriers in consecutive symbols in the same AAI subframe.

3.131 primary carrier: An OFDMA carrier on which an ABS and an AMS/MS exchange traffic and full PHY/MAC control information defined in the Advanced Air Interface specification. Further, the primary carrier is used for control functions for proper AMS/MS operation, such as network entry. Each AMS shall have only one carrier it considers to be its primary carrier in a cell.

3.132 R1 BS: A base station compliant with the WirelessMAN-OFDMA R1 Reference System.

3.133 R1 MS: A mobile station compliant with the WirelessMAN-OFDMA R1 Reference System.

3.134 relative delay (RD): The delay of neighbor DL signals relative to the serving/attached BS.

3.135 resource unit: A granular unit in frequency and time, described by the number of OFDMA subcarriers and OFDMA symbols

3.136 round trip delay (RTD): The time required for a signal or packet to transfer from a MS to a BS and back again.

3.137 secondary carrier: An OFDMA carrier that an AMS may use to exchange traffic with an ABS, based on allocation commands and rules received over the primary carrier of that ABS. The secondary carrier may also include control signaling to support multicarrier operation.

3.138 simultaneous transmit and receive (STR) relaying: A relay mechanism where transmission to subordinate station(s) and reception from the superordinate station, and transmission to the superordinate station and reception from subordinate station(s) are performed simultaneously.

3.139 single radio MS: A multimode MS/AMS that operates with only a single transmitting radio and with one or more receiving radios at any given time.

3.140 single user MIMO (SU-MIMO): A MIMO transmission scheme in which a single MS is scheduled in one RU.

3.141 superframe: A structured data sequence of fixed duration used by the Advanced Air Interface specifications. A superframe is comprised of four frames.

3.142 time-division transmit and receive (TTR) relaying: A relay mechanism where transmission to subordinate station(s) and reception from the superordinate station, or transmission to the superordinate station and reception from subordinate station(s) is separated in time.

3.143 transmission time interval (TTI): The duration of the transmission of the physical layer encoded packet over the radio air interface and is equal to an integer number of AAI subframes. The default TTI is 1 AAI subframe.

3.144 vertical encoding: Indicates transmitting a single MIMO layer over multiple antennas. The number of MIMO layers is always 1.

3.145 WirelessMAN-OFDMA Advanced Co-existing System: An ABS and/or AMS that also implements LZone functionality compliant with WirelessMAN-OFDMA TDD Release 1.

3.146 WirelessMAN-OFDMA R1 Reference System: A network compliant with the WirelessMAN-OFDMA capabilities as specified in WirelessMAN-OFDMA TDD Release 1.