



WiMAX Forum™ Mobile System Profile Specification

Release 1.5 FDD Specific Part

WMF-T23-003-R015v01

WiMAX Forum Approved

(2009-08-01)

WiMAX Forum Proprietary

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Revision History

Table 1. Change Control Revision History

Version	Date	Comment
v01	2009-08-01	WiMAX Forum Approved

1 **Abstract**

2 *This document specifies the FDD-specific aspects of WiMAX Forum Mobile System Profile Release 1.5.*
3

4 **1. Scope**

5 This document provides the FDD-specific aspects of the WiMAX Forum Mobile System Profile Release
6 1.5 specification. It serves primarily for the purpose of certification of conformant Subscriber Stations and
7 Base Stations.

8
9 This document is complementary to WiMAX Forum Mobile System Profile Release 1.5 Common Part [2]
10 and includes only the additional specifications required for FDD mode. At the beginning of each
11 subsection of Sections 4 and 5, instructions are provided for inclusion of specifications relevant to
12 WiMAX Forum Mobile System Profile Release 1.5 Common Part [2].

13
14 This specification makes use of IEEE Std 802.16 as a normative reference.
15
16

1 **2. Normative References**

2 The following documents contain provisions that, through reference in this text, constitute provisions of
3 the present document. References are either specific (identified by date of publication and/or edition
4 number or version number) or non-specific. For a specific reference, subsequent revisions do not apply.
5 For a non-specific reference, the latest version applies.

- 6
7 [1] **IEEE Std 802.16-2009**, IEEE Standard for Local and metropolitan area networks - Part 16: Air Interface
8 for Broadband Wireless Access Systems
9 [2] **WiMAX Forum WMF-T23-001-R015v01**, WiMAX Forum® Mobile System Profile, Release 1.5
10 Common Part (2009-08-01)

11

1 **3. Definitions**

2 **3.1 Abbreviations**

3 **3.2 Definitions of system profiles**

4
5 **3.3 Conventions**

6 **3.3.1 Item column**

7 The *Item* column contains a number that identifies each description in the table.

8
9 **3.3.2 Description column**

10 The *Description* column describes in free text each respective item (e.g., parameters, timers, etc.).

11
12 **3.3.3 Reference column**

13 The *Reference* column indicates the section of the referenced standard from which the requirement for the
14 item is derived.

15
16 **3.3.4 Status column**

17 The following notations are used in the *Status* column to indicate whether each item is mandatory or
18 optional in the referenced standard.

19 **Table 2. Status Column Entries**

m	Explicitly shown as mandatory in the standard. Mandatory items are automatically required in the profile for implementation.
pm	Potentially mandatory. Essential for the system to perform basic operations, although not explicitly shown as mandatory in the standard). Potentially mandatory items are required in the profile for implementation.
o	Explicitly mentioned as optional in the standard or is not explicitly optional but has capability negotiations. These items may or may not be required in the profile for implementation.
oi	Qualified option – for mutually exclusive or selectable options from a set. One or more of the options from the set shall be supported.
po	Potentially optional. Not explicitly mentioned as mandatory in the standard and not required for the system to perform basic operations.
n/a	Not applicable – in the given context, it is impossible to use the capability.

20
21 **3.3.5 BS/MS Required column**

22 The Required column indicates whether the item is required for every BS/MS to implement for
23 WiMAX™ certification purposes.

1

Table 3. Required Column Entries

Y or y	Required for compliance to this specification.
N or n	Not required for compliance to this specification.
IO-NNNN	Interoperable Options for BS: Item belongs to NNNN group of features of BS equipment. More specifically <ul style="list-style-type: none"> ▪ The item is not required for compliance to this specification and ▪ The item is required for compliance with the IO-NNNN capability.
IOMS-NNNN	Interoperable Options for MS: Item belongs to NNNN group of features for which it is requested to provide testing procedure and distinct labeling of MS equipment. More specifically <ul style="list-style-type: none"> ▪ The item is not required for compliance to this specification and ▪ The item is required for compliance with the IOMS-NNNN capability.
n/a	Not applicable

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5 **3.3.6 BS/MS Values column**

6 This column indicates the specific value or range of values for each BS/MS to implement for compliance
 7 to this specification.

8

Table 4. Value Column Entries

xx	Set to value xx
aa - bb	Set to range aa - bb
n/a	Not applicable

9

10 **3.3.7 Comment column**

11 This column provides additional clarification and explanation.

12

13

4. PHY Profile

4.1 Profiles of BS and MS

4.1.1 System Parameters

[Add the following text and table as the content of Section 4.1.1 of Reference [2].]

The supported uplink-downlink duplexing mode alternatives are specified in the following.

Table 5. Duplexing Mode Alternatives

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	Full Duplex FDD support	8.4.4.2	oi	Y	IOMS-FFDD	All FDD devices shall support HFDD operation.
2	Half Duplex FDD support	8.4.4.2	oi	Y	Y	BS shall support Full Duplex FDD MS.

4.1.1.1 PHY Mode

4.1.1.2 Channel bandwidths and corresponding FFT sizes

4.1.1.3 Sampling Factor

4.1.1.4 Cyclic Prefix

4.1.1.5 Frame Configuration

[Add Table 6 to the end of Section 4.1.1.5 of Reference [2].]

Table 6. FDD Frame Configuration

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	5 ms frame with two standalone group specific MAPs	8.4.4.2, 6.3.20.9, 11.16.2	o	Y	Y	
2	Resource allocation methods for Full Duplex FDD MS: Use existing DL-MAP and UL-MAP to allocate resources in both Group 1 and Group 2	8.4.4.2	o	Y	IOMS-FFDD	
3	Resource allocation methods for Full Duplex	8.4.4.2.3.2	o	N	N	

	FDD MS: Full Duplex Support with aggregated HARQ channels					
4	Resource allocation methods for Full Duplex FDD MS: Full Duplex Support with FDD paired allocation IE	8.4.4.2.3.1	o	N	N	
5	MAP based signaling for group boundaries and group partitioning	8.4.4.2.2	m	Y	Y	
6	Group Switching: H-FDD Group Switch IE	8.4.4.2.1, 8.4.5.3.28	oi	Y	Y	
7	Group Switching: Group Indicator field in HARQ Sub-burst IEs	8.4.4.2.1, 8.4.5.3.21, 8.4.5.3.29, 8.4.5.4.30	oi	Y	Y	
8	DCD and UCD alignment for both groups	8.4.4.2.4, 11.4.1, 8.4.4.2.5, 11.3.1	m	Y	Y	The option of setting DCD and UCD aligned for both groups are done through DCD TLV 155 bit#0 and UCD TLV 218 bit#0.

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4.1.1.6 TTG/RTG

Table 7. TTG/RTG

Item	Description	Reference	Status	BS Required	BS Values	MS Required	Comment
1	TTG1	8.4.4.2	m	Y	432 PS for 10 MHz, 432 PS for 8.75 MHz, 432 PS for 7 MHz, 216 PS for 5 MHz and 216 PS for 3.5 MHz	n/a	
2	RTG1	8.4.4.2	m	Y	320 PS for 10 MHz, 260 PS for 8.75 MHz, 352 PS for 7 MHz, 160 PS for 5 MHz and 176 PS for 3.5 MHz	n/a	
3	TTG2	8.4.4.2	m	Y	432 PS for 10 MHz, 432 PS for 8.75 MHz, 432 PS for 7	n/a	

					MHz, 216 PS for 5 MHz and 216 PS for 3.5 MHz		
4	RTG2	8.4.4.2	m	Y	432 PS for 10 MHz, 432 PS for 8.75 MHz, 432 PS for 7 MHz, 216 PS for 5 MHz and 216 PS for 3.5 MHz	n/a	

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4.1.1.7 Frame and Subframe Parameters

[Add Table 8 to the end of Section 4.1.1.7 of Reference [2].]

Table 8. FDD Frame Parameters

Item	Description	Reference	Status	BS Required	BS Values	MS Required	MS Values	Comment
1	Number of symbols in HFDD Groups	8.4.4.2	oi	Y	Minimum number of symbols in DL SubFrame1 or DL SubFrame2 = 16 for 5/8.75/10 MHz, 12 for 3.5/7 MHz	n/a	n/a	
2	Minimum size for Group 2 Zone 1	8.4.4.2	o	Y	4 OFDM symbols	n/a	n/a	
3	Integer DL gap	8.4.4.2	o	Y	0 OFDM symbols	Y	0 OFDM symbols	

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4.1.2 Subcarrier Allocation

4.1.2.1 DL Subcarrier Allocation

4.1.2.2 UL Subcarrier Allocation

4.1.2.3 Common SYNC Symbol

4.1.2.4 UL Sounding

[Add Table 9 to the end of Section 4.1.2.4 of Reference [2].]

Table 9. UL Sounding 3

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	Two Antenna UL	8.4.6.2.7	o	N	N	

	Sounding: Multi-Antenna Flag enabled for Cyclic Shift Separation					
2	Two Antenna UL Sounding: Multi-Antenna Flag enabled for Decimation Separation	8.4.6.2.7	o	N	N	

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4.1.3 UL Control Channels

4.1.3.1 Initial Ranging

4.1.3.2 HO Ranging

4.1.3.3 Periodic Ranging

4.1.3.4 BW Request

4.1.3.5 Fast-Feedback/CQI Channel Encoding

4.1.3.6 Fast-Feedback/CQI Channel Allocation Method

[Append the table in Section 4.1.3.6 of Reference [2] with Table 10.]

Table 10. Fast-Feedback/CQI Channel Allocation Method

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	Fast feedback channel allocation using CQICH Enhanced Allocation IE	8.4.5.4.7, 11.3.1, 11.8.3.5.14	o	IO-MIM3	IOMS-MIM3	

4.1.4 Channel Coding

4.1.4.1 Repetition

4.1.4.2 Randomization

4.1.4.3 Convolutional Code

4.1.4.4 Convolutional Turbo Code

4.1.4.5 BTC

4.1.4.6 LDPC

4.1.4.7 Interleaving

1 **4.1.5 H-ARQ Support**

2
3 **4.1.5.1 Chase Combining**

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5 **4.1.5.2 Incremental Redundancy**

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7 **4.1.5.3 ACK Channel**

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9 **4.1.6 Control Mechanism**

10
11 **4.1.6.1 Synchronization**

12
13 **4.1.6.2 Closed-loop Power Control**

14 [Append the the table in Section 4.1.6.2 of Reference [2] with Table 11.]

15 **Table 11. Closed-loop Power Control**

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	Additional Power Control Support for FDD: CL Power control using UL PC bitmap IE	8.4.5.4.27	o	Y	Y	

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18 **4.1.6.3 Open-loop Power Control**

19
20 **4.1.6.4 MS Maximum Transmission Power Limitation Control Using UCD TLV**

21
22 **4.1.7 Channel Measurement**

23
24 **4.1.7.1 CINR Measurement**

25 [Append the table in Section 4.1.7.1 of Reference [2] with Table 12.]

26 **Table 12. CINR Measurement**

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	Physical CINR measurement from the midamble	6.3.17, 11.11, 11.12	o	IO-MIM3	IOMS-MIM3	

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28
29 **4.1.7.2 RSSI Measurement**

30
31 **4.1.8 Modulation**

32
33 **4.1.8.1 PRBS (Subcarrier Randomization)**

34
35 **4.1.8.2 Downlink**

36
37 **4.1.8.3 Uplink**

1	4.1.8.4	<i>Pilot Modulation</i>
2		
3	4.1.8.5	<i>Preamble Modulation</i>
4		
5	4.1.8.6	<i>Ranging Modulation</i>
6		
7	4.1.9	MAP Support
8		
9	4.1.9.1	<i>Normal MAP</i>
10		
11	4.1.9.2	<i>Compressed MAP</i>
12		
13	4.1.9.3	<i>Sub-DL-UL MAP</i>
14		
15	4.1.9.4	<i>H-ARQ MAP Message</i>
16		
17	4.1.9.5	<i>Extended HARQ IE in the Normal MAP</i>
18		
19	4.1.9.6	<i>DL Region Definition</i>
20		
21		
22	4.1.10	AAS
23		
24	4.1.10.1	<i>AAS Zone Support</i>
25		
26	4.1.10.2	<i>Supported Permutation in DL</i>
27		
28	4.1.10.3	<i>Supported Permutation in UL</i>
29		
30	4.1.10.4	<i>AAS DL Preamble</i>
31		
32	4.1.10.5	<i>AAS UL Preamble</i>
33		
34	4.1.10.6	<i>Diversity MAP Scan</i>
35		
36	4.1.10.7	<i>DL AAS-SDMA Pilots</i>
37		
38	4.1.10.8	<i>UL AAS-SDMA Pilots</i>
39		
40	4.1.10.9	<i>AAS Private MAP</i>
41		
42	4.1.10.10	<i>AAS-FBCK-REQ/RSP support</i>
43		
44	4.1.11	STC/MIMO
45		
46	4.1.11.1	<i>Supported Features for DL PUSC</i>
47		
48	4.1.11.2	<i>Supported Features for DL FUSC</i>
49		
50	4.1.11.3	<i>Supported Features for DL Optional FUSC</i>
51		

- 1 **4.1.11.4 Supported Features for DL Optional AMC**
- 2
- 3
- 4
- 5 **4.1.11.5 Supported Features for DL PUSC-ASCA**
- 6
- 7 **4.1.11.6 Supported Features in UL PUSC**
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- 10 **4.1.11.7 Supported Features in UL Optional PUSC**
- 11
- 12 **4.1.11.8 Supported Features in UL Optional AMC**
- 13
- 14 **4.1.11.9 Closed-Loop MIMO**
- 15 [Add Table 13 to the end of Section 4.1.11.9 of Reference [2].]

Table 13. Closed Loop MIMO for DL Optional AMC with Dedicated Pilot

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	Codebook based pre-coding	8.4.8.3.6 6.3.2.3.56 8.4.11.15 11.8.3.5.5	o	IO-MIM3	IOMS-MIM3	
2	(Tx antennas) x (Streams) = 2x1, 4x1, 2x2, 4x2 <ul style="list-style-type: none"> • Number of Tx antennas = {2, 4} • Number of streams = {1, 2} 	8.4.11.15	o	IO-MIM3	IOMS-MIM3	
3	Codebooks for 2 Tx: 3-bit feedback	8.4.11.15	o	IO-MIM3	IOMS-MIM3	
4	Codebooks for 4 Tx: 3-bit feedback	8.4.11.15	o	N	N	
5	Codebooks for 4 Tx: 6-bit feedback	8.4.11.15	o	IO-MIM3	IOMS-MIM3	
6	MIMO AMC Triggering: Triggering MIMO AMC operation using REP-RSP based on CINR measurement on Midamble	6.3.17.2	o	IO-MIM3	IOMS-MIM3	
7	MIMO AMC Triggering: Triggering MIMO AMC operation using 6-bit CQICH based on CINR measurement on Midamble	6.3.17.2	o	N	N	
8	Feedback Mechanism: Feedback header type 1101 for CL-MIMO PMI and Differential CQI feedback – (3 PMI for 3 best bands (3X6 bits), 2 bit differential CQI for 3 best bands (3X2 bits))	6.3.2.1.2.2.1 8.4.5.4.26 11.3.1 11.7.21	o	IO-MIM3	IOMS-MIM3	
9	Feedback Mechanism:	8.4.5.4.11	o	N	N	

	"Multiple CQICH's with the same CQICH-ID (CQICH_NUM > 0)"	8.4.5.4.14 6.3.17.2				
10	Feedback Mechanism: CQICH Report single PMI for all 3 reported AMC subbands	8.4.5.4.11 8.4.5.4.11 6.3.17.2	o	IO-MIM3	IOMS-MIM3	
11	Feedback Mechanism: CQICH Report 3 separate PMIs for 3 best bands	8.4.5.4.11 8.4.5.4.14 6.3.17.2	o	N	N	
12	Feedback Mechanism: CQICH MS Capability of feedback items in Table 523 through CQICH in precoding operation (e.g. matrix A or B indication, number of precoding streams) through CQICH allocation IE	8.4.5.4.11 8.4.5.4.14 6.3.17.2	o	N	N	
13	Feedback Mechanism: CQICH MS Capability of feedback items in Table 523 through CQICH in precoding operation (e.g. matrix A or B indication, number of precoding streams) through CQICH Enhanced allocation IE	8.4.5.4.11 8.4.5.4.14 6.3.17.2	o	N	N	
14	Feedback Mechanism: CQICH MS Capability of reporting rank, PMI, differential CINR information through Enhanced allocation IE	8.4.5.4.11 8.4.5.4.14 6.3.17.2	o	N	N	
15	Feedback Mechanism: CQICH Report PMI through 6 bit CQICH using 6 bit codebook	8.4.5.4.11 8.4.5.4.14 6.3.17.2	o	IO-MIM3	IOMS-MIM3	CQICH Type = 0b000
16	Feedback Mechanism: CQICH "10-bit CQICH conveying 3-bit or 6-bit codebook and 3-bit differential CINR"	8.4.5.4.11 8.4.5.4.14 6.3.17.2	o	IO-MIM3	IOMS-MIM3	
17	Feedback Mechanism: CQICH Report single PMI per band AMC allocation	8.4.5.4.11 8.4.5.4.14 6.3.17.2	o	N	N	

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4.1.11.10 MIMO Feedback

4.1.11.11 MIMO Midamble

[Append the table in Section 4.1.11.11 of Reference [2] with Table 14.]

1

Table 14. MIMO Midamble

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	MIMO Midamble with 2 antennas: MIMO midamble support in STC zone with optional AMC permutation	6.3.2.3.38.6.7 , 8.4.8.5, 11.8.3.5.5 11.11 11.12	o	IO-MIM3	IOMS-MIM3	
2	MIMO Midamble with 2 antennas: MIMO Midamble support STC zone with PUSC permutation	6.3.2.3.38.6.7, 8.4.8.5, 11.8.3.5.5 11.11 11.12	o	N	N	
3	MIMO Midamble with 4 antennas: MIMO midamble support in STC zone with optional AMC permutation	6.3.2.3.38.6.7, 8.4.8.5, 11.8.3.5.5 11.11 11.12	o	IO-MIM3	IOMS-MIM3	
4	MIMO Midamble with 4 antennas: MIMO Midamble support STC zone with PUSC permutation	6.3.2.3.38.6.7, 8.4.8.5, 11.8.3.5.5 11.11 11.12	o	N	N	

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4.1.11.12 MIMO Soft-Handover Based Macro-diversity

4.1.11.13 H-ARQ Downlink Support for MIMO

4.1.11.14 H-ARQ Uplink Support for MIMO

4.1.12 HO Support in PHY

4.1.12.1 FBSS

4.1.12.2 MIMO Soft-handover based macro-diversity transmission

4.1.12.3 UL Macro diversity

1 **4.2 Performance/Fidelity Requirements**

2 **4.2.1 MS Minimum Performance**

3 **4.2.1.1 SSTG/SSRTG**

4 **Table 15. SSTG/SSRTG for HFDD**

Item	Description	Reference	Status	MS Required	MS Values	Comment
1	SSTG (H-FDD)	8.4.4.3	m	Y	100 μs	
2	SSRTG (H-FDD)	8.4.4.3	m	Y	100 μs	

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6 **4.2.1.2 Max DL Concurrent Bursts**

7 **4.2.1.3 Max Bursts in DL Subframe**

8 **4.2.1.4 Max Number of Zones in DL/UL Subframe**

9 **4.2.1.5 Measurement Processes and CQI Channels**

10 **4.2.1.6 Max H-ARQ Bursts in DL/UL Subframe**

11 **4.2.2 Transmit Requirements**

12

13 **4.2.3 Receiver Requirements**

14

15 **4.2.4 Frequency and Time Synchronization Requirements**

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1 **5. MAC Profile**

2 **5.1 Profiles of BS and MS**

3 **5.1.1 PHS**

4 **5.1.2 CS Options**

6 **5.1.3 MAC PDU formats**

8 **5.1.4 MAC Support of PHY layer**

10 **5.1.4.1 *Feedback Mechanism***

12 **5.1.5 Multicast connection**

14 **5.1.6 Network Entry**

16 **5.1.7 ARQ**

18 **5.1.8 MAC support for H-ARQ**

20 **5.1.9 QoS**

22 **5.1.10 Data delivery services for mobile network**

24 **5.1.11 Request-Grant mechanism**

26 **5.1.12 Neighbor Advertisement**

28 **5.1.13 Scanning and Association**

30 **5.1.13.1 *Scanning***

32 **5.1.13.2 *Scan Reporting Type Support***

34 **5.1.13.3 *Association***

36 **5.1.13.4 *Association Type Support***

38 **5.1.13.5 *HO/Scan/Report Trigger Metrics***

40 **5.1.14 MAC layer HO procedures**

42 **5.1.15 HO Optimization**

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- 1 **5.1.16 CID and SAID Update**
- 2
- 3 **5.1.17 Fast BS Switching**
- 4
- 5 **5.1.18 Macro Diversity Handover**
- 6
- 7 **5.1.19 Sleep Mode**

8 [Append the table in Section 5.1.19 of Reference [2] with Table 16.

9 **Table 16. FDD Frame Configuration**

Item	Description	Reference	Status	BS Required	MS Required	Comment
1	Sleep mode following MAP relevance for H-FDD	6.3.20.9, 11.16.2	o	IO-MR	IOMS-MR	

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- 11 **5.1.20 Idle Mode**
- 12
- 13 **5.1.21 Expedited Network Re-entry from Idle Mode**
- 14
- 15 **5.1.22 MBS**
- 16
- 17 **5.1.23 AAS**
- 18
- 19 **5.1.24 MS's Network Entry issued by BS restart**
- 20
- 21 **5.1.25 NSP Selection**
- 22
- 23 **5.1.26 Load Balancing**
- 24
- 25 **5.1.27 Location Based Services**
- 26 **5.1.28 Coexistence Among WiMAX™, Wi-Fi® and Bluetooth® Networks**
- 27
- 28 **5.1.29 Capacity Improvements for Feedbacks**
- 29
- 30 **5.1.30 Persistent Allocation**
- 31
- 32 **5.1.31 Alternative RAT Advertisement**
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1 **5.2 Parameters**

2 **6. Security**

3 **6.1 Authorization Policy Support**

4 **6.2 PKM Version Support**

5 **6.3 PKMv2 Authorization policy support – initial network entry**

6 **6.4 PKMv2 Authorization policy support – network re-entry**

7 **6.5 Supported cryptographic suites**

8 **6.6 Message Authentication Code Mode**

9 **6.7 Security Association**

10 **6.8 SA Service Type**

11 **6.9 EAP Authentication methods**

12 **6.10 Certificate profile**

13 **6.11 Multicast Broadcast Re-keying Algorithm (MBRA)**

14 **7. Radio Profile**

15 **8. Power Class Profile**

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