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| **Radiocommunication Study Groups** |  |
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| Received: 9 July 2012 | **Document 5D/74-E** |
| **9 July 2012** |
| **English only**  **SPECTRUM ASPECTS** |
| AT&T | |
| PLAN FOR DEVELOPMENT OF DRAFT NEW REPORT ITU-R M.[IMT.ADV.PARAM] AND COORDINATION WITH 3GPP AND IEEE ON IMT-ADVANCED PARAMETERS | |

# 1 Background

In support of sharing studies in Joint Task Group 4-5-6-7 and for other work in Working Party 5D, WP 5D will have to address parameters and other relevant information for the IMT technologies – both IMT-2000 and IMT-Advanced.

The obligations in this regard to the JTG have two different deadlines:

– for Agenda item 1.2 the deadline is “31 December 2012”;

– for Agenda item 1.1 the deadline is “preferably by 31 July 2013”.

In particular with regard to Inputs (liaisons) to JTG 4-5-6-7 covering the sharing, compatibility and protection criteria for IMT systems for WRC-15 sharing studies there is existing information available for IMT-2000 terrestrial technologies in Report ITU-R M.2039-2 *“Characteristics of terrestrial IMT-2000 systems for frequency sharing & interference analyses*”. However for the IMT-Advanced terrestrial technologies currently no equivalent document exists.

Consequently, Working Party 5D will need to develop the sharing, compatibility parameters for IMT-Advanced systems based on the final systems specifications for IMT-Advanced as defined in Recommendation ITU-R M.2012 which were approved in the their initial release in January 2012.

In other inputs to the 13th meeting of WP 5D, it has been suggested that the document to address such IMT-Advanced parameters should be developed. It was stated:

*– “Taking due consideration of the technical and operational characteristics as well as the understanding of how IMT systems are and will be deployed plus Reports ITU‑R M.2074 and ITU-R M.2079, and Recommendations ITU-R M.1457 and ITU‑R M.2012 and related Recommendations and Reports as well as relevant input contributions create a draft new Report ITU-R M.[IMT.ADV.PARAM] covering the sharing, compatibility and protection criteria for IMT-Advanced systems for WRC-15 studies.  
NOTE – IMT-2000 system parameters have been addressed in Report ITU-R M.2039 which might also be considered as a framework format for IMT.ADV.PARAM.”*

In order to develop draft new Report ITU-R M.[IMT.ADV.PARAM], WP 5D will need to liaise with the relevant external organizations 3GPP and IEEE who address the two technologies in Recommendation ITU-R M.2012.

# 2 Discussion

It is proposed that WP 5D manage the development of draft new Report ITU-R M.[IMT.ADV.PARAM] as follows giving due regard to the schedules and current work programs of 3GPP and IEEE:

– In the July 2012 13th meeting of WP 5D start to develop and with continuation at the October 2012 14th meeting of WP 5D, develop the framework for the data to be requested from 3GPP and IEEE looking at Report ITU-R M.2039 as a possible format model.

– Prepare liaisons to 3GPP and IEEE and dispatch then from the July and/or October meeting of WP 5D as appropriate based on the progress in WP 5D in developing the framework for the data.

– In the liaisons, emphasize that while all the data tables will need to be completed, that the data tables for the UHF frequency range particularly of concern for Agendas item 1.2 is especially needed preferably in its final version before the 31 December 2012 deadline.

– In the liaison, both 3GPP and IEEE should be directly requested to respond to WP 5D and also to copy to JTG 4-5-6-7 with their respective *preliminary responses to the liaison* before 31 December 2012 which is the deadline for inputs to JTG, thus meeting deadline for AI 1.2 and providing WP 5D with at least initial information on draft new Report ITU-R M.[IMT.ADV.PARAM].

– WP 5D will consider the preliminary responses for 3GPP and IEEE in its Jan/Feb 2013 meeting #15 and issue a suitable liaison to the JTG from the WP 5D meeting #15.

– Note: it is presumed absent at this time of a published schedule for the JTG in 2013 that the first JTG meeting in 2013 will be scheduled later in 1Q2013.

– In the same liaison, a *final response to the liaison* is requested to be provided respectively from 3GPP and IEEE before the input deadline for contribution to the July 2013 WP 5D meeting #16 (i.e., by 3 July 2013).

– WP 5D will then appropriately dispatch another liaison from WP 5D meeting #16 to the JTG on the parameters, thus both updating info for AI 1.2 (if required) and also then meeting the deadline for AI 1.1 to the JTG).

A check has been performed of the relationship of the meeting dates amongst WP 5D, 3GPP and IEEE in the relevant timeframe and it appears that this plan can coordinate across the organizations as indicated below:

TABLE 1

Meeting date relationships for WP 5D, 3GPP, & IEEE through mid-2013

| ITU-R Group | No. | Start (planned) | Stop (planned) |  | 3GPP RAN Meeting (planned) | IEEE 802.16 Meeting (planned) |
| --- | --- | --- | --- | --- | --- | --- |
| **WP 5D** | **13** | **16 July 12** | **20 July 12** |  |  | 16-19 July 12 Session #80 |
| JTG 4-5-6-7 | 1 | 23 July 12 | 27 July 12 |  |  |  |
|  |  |  |  |  | 13-17 Aug 12  *WGs* |  |
|  |  |  |  |  | 4-7 Sept 12  *Plenary #57* | 17-20 Sept 12 Session #81 |
| **WP 5D** | **14** | **3 Oct. 12** | **11 Oct. 12** |  | 8-12 Oct 12  *WGs* |  |
|  |  |  |  |  | 12-16 Nov 12  *WGs* | 12-15 Nov 12 Session #82 |
| Study Group 5 | - | 19 Nov 12 | 20 Nov 12 |  |  |  |
| JTG 4-5-6-7 | 2 | 21 Nov 12 | 28 Nov 12 |  |  |  |
|  |  |  |  |  | 4-7 Dec 12  *Plenary #58* |  |
|  |  |  |  |  |  | 14-17 Jan 13 Session #83 |
| **WP 5D** | **15** | **30 Jan 13**  **~~6 Feb. 13~~** | **6 Feb 13**  **~~13 Feb. 13~~** |  | 28 Jan – 1 Feb 13  *WGs* |  |
|  |  |  |  |  | 26 Feb – 1 Mar 13  *Plenary #59* |  |
|  |  |  |  |  |  | 18-21 Mar 13 Session #84 |
|  |  |  |  |  | 15-19 Apr 13  *WGs* |  |
|  |  |  |  |  |  | 13-16 May 13 Session #85 |
|  |  |  |  |  | 20-24 May 13  *WGs* |  |
|  |  |  |  |  | 11-14 Jun 13  *Plenary #60* |  |
|  |  |  |  |  |  | 15-18 July 13 Session #86 |
| **WP 5D** | **16** | **10 Jul. 13** | **17 Jul. 13** |  |  |  |

# 3 Proposal

It is proposed that:

1) WP 5D consider this high level workplan for developing the draft new Report ITU‑R M.[IMT.ADV.PARAM] and capture this in a detailed workplan.

2) WP 5D initiates work in the July 2012 meeting to create the framework for draft new Report ITU-R M.[IMT.ADV.PARAM] in order to send a liaison to 3GPP and IEEE from the July 2012 and October 2012 meetings.

3) That the aspects discussed above with regard to the information flows from 3GPP and IEEE and both WP 5D and the JTG be adopted as a working method on the draft new Report.

4) That Annex 1 be considered for the liaison to 3GPP and IEEE.

**Annex:** 1

ANNEX

[Draft] liaison to 3GPP and IEEE requesting characteristics for IMT-Advanced system technologies for draft new Report ITU-R N.[IMT.ADV.PARAM]  
for WRC-15 sharing studies

# 1 Background

In conjunction with the conclusion of ITU-R World Radio Conference 2012 (WRC-12), Agenda items 1.1 (AI 1.1) and 1.2 (AI 1.2) were agreed as a work topics for consideration and decisions at the World Radio Conference 2015 WRC-15 (planned for Oct/Nov 2015).

In the work structure for AI 1.1 and AI 1.2, certain studies on “sharing & compatibility” were designated to be addressed by a special purpose new entity, a Joint Task Group (JTG 4-5-6-7), created by the first Conference Preparatory Meeting (CPM 15-1) meeting which met immediately after WRC-12.

Working Party 5D as the lead group for IMT in ITU-R also has responsibility for certain work on AI 1.1 and AI 1.2.

Information on Agenda items 1.1 and 1.2 is provided in Attachment 1.

# 2 Information needed to be developed for sharing studies under AIs 1.1 and 1.2

The deliverables in Working Party 5D includes supporting the JTG’s designated studies by providing to the JTG information on IMT technologies (both IMT-2000 and IMT-Advanced) which includes compatibility and protection parameters and criteria that would be utilized in sharing studies.

For Agenda item 1.1 there was a deadline established for WP 5D to provide the relevant parameters to JTG 4-5-6-7 by 31 July 2013.

For Agenda item 1.2 there was a deadline established for WP 5D to provide the relevant parameters to JTG 4-5-6-7 by 31 December 2012.

In meeting this obligation it was noted in Working Party 5D in its first meeting in the new ITU-R Study Period that:

– For the IMT-2000 technologies, existing Report ITU-R M.2039-2 (published 2010) *“Characteristics of terrestrial IMT-2000 systems for frequency sharing and interference analyses”* addresses these type requested parameters and 3GPP and IEEE contributed to the development/updating of this Report.

– For the IMT-Advanced technologies, no equivalent document to Report ITU-R M.2039 current exists in ITU-R as the final approval of the IMT-Advanced technologies defined in Recommendation ITU-R M.2012 was just approved in ITU-R in January 2012.

Consequently, while WP 5D can point to Report ITU-R M.2039 for the relevant parameters for IMT-2000, it will need to develop a similar Report for the IMT-Advanced parameters working in conjunction with the external organizations of 3GPP and IEEE.

Working Party 5D has started work on the relevant document which is identified as draft new Report ITU-R M.[IMT.ADV.PARAM] covering the sharing, compatibility and protection criteria for IMT-Advanced systems for WRC-15 studies and intends to finalize this deliverable in 2103, as well as a revision of Report ITU-R M.2039-2 to include the latest developments of IMT-2000 technologies.

# 3) Request to 3GPP and IEEE

The information to be compiled in Report ITU-R M.[IMT.ADV.PARAM] will serve both the studies for AIs 1.1 and 1.2. However, due to the deadlines established by the JTG for receipt of information, WP 5D will be developing this document in two Parts.

– **Part 1 (bands below 1 GHz):** WP 5D is seeking the information relevant to the bands below 1 GHz (and for AI 1.2 particularly the band range of roughly 690 to 960 MHz) by its October 2012 meeting No. 14 in order to review and submit it to the JTG by the requisite 31 December 2012 deadline for AI 1.2.

– **Part 2 (bands below 1 GHz and bands above 1 GHz but below 6 GHz ):** WP 5D is seeking the information relevant to other potential IMT bands under AI 1.1 which includes both bands below 1 GHz and bands above 1 GHz but below 6 GHz. This information along with any updated information on the bands below 1 GHz is needed by WP 5D by its July 2013 meeting No. 16 in order to review and submit a complete package covering all relevant frequency ranges to the JTG by the requisite 31 July 2013 deadline for AI 1.1.

Working Party 5D therefore has the following specific requests:

– For Part 1 (bands below 1 GHz):

i) Utilizing the enclosed template in Attachment 2, please provide to Working Party 5D the information on IMT-Advanced system parameters corresponding to the respective technologies in Recommendation ITU-R M.2012 in support of sharing and compatibility studies in the frequency range below 1 GHz.

ii) Given the requested delivery of this Part 1 information to JTG 4-5-6-7 by 31 December 2012, WP 5D kindly asks for the Part 1 information in time for its October 2012 meeting (deadline for document submissions is 26 September 2012 at 16:00 hours UTC).

iii) While the preference is to receive Part 1 parameters for its October 2012 meeting, it is recognized by WP 5D that because of the short interval for the request in this liaison that the 26 September 2012 deadline might pose some difficulties for either 3GPP or IEEE and as a remedy for this, WP 5D would like to offer an alternative approach (Part 1 Alternative) which could optionally be utilized (if necessary):

a) For Part 1 Alternative, should meeting the 26 September 2012 date for the parameters below 1GHz, 3GPP and IEEE are alternatively requested to reply to WP 5D and to also copy the reply to JTG 4-5-6-7 with their respective preliminary responses to the liaison before 31 December 2012 which is the deadline for inputs to JTG, thus effectively meeting deadline for AI 1.2 and providing WP 5D with at least initial information on draft new Report ITU-R M.[IMT.ADV.PARAM]. WP 5D will consider the preliminary responses from 3GPP and IEEE in its Jan/Feb 2013 meeting #15 and issue a suitable liaison to the JTG from the WP 5D meeting #15 confirming and/or commenting upon the information.

– For Part 2 (bands below 1 GHz and bands above 1 GHz but below 6 GHz):

i) Utilizing the enclosed template in Attachment 2, please provide to Working Party 5D the information on IMT-Advanced system parameters corresponding to the respective technologies in Recommendation ITU-R M.2012 in support of sharing and compatibility studies in the frequency range that encompasses both bands below 1 GHz and bands above 1 GHz.

ii) Given the requested delivery of Part 2 information to JTG 4-5-6-7 by 31 July 2103, WP 5D kindly asks for Part 2 information in time for its July 2013 meeting (deadline for document submissions is 3 July 2013 at 16:00 hours UTC).

iii)Part 2 necessarily includes the final responses to the liaison for all relevant frequency ranges including any updates to the preliminary response received for Part 1.

iv) WP 5D also requests as a Part 2 response any relevant information towards a revision of Report ITU-R M.2039-2 to include the latest developments of IMT-2000 technologies and the inclusion of any new frequency ranges that have been developed in the relevant frequency band tables maintained by the Partnership Projects or SDO organizations. Report ITU-R M.2039 in its current published form is available at <http://www.itu.int/pub/R-REP-M.2039-2-2010>.

# 4 Administrative information

The planned dates of the relevant WP 5D meetings are:

| ITU-R Group | No. | Start  (planned) | Stop  (planned) |  | Deadline for Inputs | Requested from 3GPP and IEEE |
| --- | --- | --- | --- | --- | --- | --- |
| WP 5D | 13 | 16 July 12 | 20 July 12 |  |  |  |
| **WP 5D** | **14** | **3 Oct. 12** | **11 Oct. 12** |  | **26 September 2012  @ 16:00 hours UTC** | **Part 1 Information** |
| WP 5D | 15 | 30 Jan 13  ~~6 Feb. 13~~ | 6 Feb 13  ~~13 Feb. 13~~ |  | 23 January 2013  @ 16:00 hours UTC |  |
| **WP 5D** | **16** | **10 Jul. 13** | **17 Jul. 13** |  | **3 July 2013  @ 16:00 hours UTC** | **Part 1 Information (updated if needed)**  **&**  **Part 2 Information** |

The contact for this liaison is:

Mr. Alan JAMIESON E-mail: [ajamieson@ava.co.nz](mailto:ajamieson@ava.co.nz)

Reply liaisons should be addressed to WP 5D and (if necessary for Part 1 alternate approach the JTG-4-5-6-7) and dispatched to:

WP 5D: Mr. Sergio BUONOMO, Counsellor for Study Group 5 and Working Party 5D  
 E-mail: [sergio.buonomo@itu.int](mailto:Sergio.buonomo@itu.int)

JTG 4-5-6-7: Mr. David BOTHA, Counsellor for Joint Task Group 4-5-6-7  
 E-mail: [david.botha@itu.int](mailto:david.botha@itu.int)

ATTACHMENT 1

Information on WRC-15 Agenda items 1.1 and 1.2

(Extracted from Annex 8 to Circular Letter CA/201, “Results of the first session of the Conference Preparatory Meeting for WRC‑15 (CPM15‑1)”)

| Topic | Responsible group | Action to be taken by the group | Concerned group[[1]](#footnote-1)(1) |
| --- | --- | --- | --- |
| **1.1** to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **233 [COM6/8] (WRC‑12)**; | | | |
| Resolution **233 [COM6/8] (WRC‑12)**  Studies on frequency-related matters on International Mobile  Telecommunications and other terrestrial mobile broadband applications | **JTG 4-5-6-7[[2]](#footnote-2)(2)** | resolves to invite ITU‑R  1 to study additional spectrum requirements, taking into account:  – technical and operational characteristics of IMT systems, including the evolution of IMT through advances in technology and spectrally-efficient techniques, and their deployment;  – the bands currently identified for IMT, the technical conditions of their use, and the possibility of optimizing the use of these bands with a view to increasing spectrum efficiency;  – the evolving needs, including user demand for IMT and other terrestrial mobile broadband applications;  – the needs of developing countries;  – the time-frame in which spectrum would be needed;  2 to study potential candidate frequency bands, taking into account the results of the studies under *resolves to invite ITU‑R* 1, protection of existing services and the need for harmonization,  further resolves  1 that the studies referred to in *resolves to invite ITU‑R* 2 include sharing and compatibility studies with services already having allocations in the potential candidate bands and in adjacent bands, as appropriate, taking into account the current and planned use of these bands by the existing services, as well as the applicable studies already performed in ITU‑R;  2 to invite WRC‑15 to consider the results of the above studies and take appropriate actions, | **WP 4A WP 4B WP 4C WP 5A WP 5B WP 5C WP 5D WP 6A WP 7B WP 7C WP 7D**  (WP 1A WP 3K WP 3M)  **(2)** |

| Topic | Responsible group | Action to be taken by the group | Concerned group |
| --- | --- | --- | --- |
| **1.2** to examine the results of ITU‑R studies, in accordance with Resolution **232 [COM5/10] (WRC‑12)**, on the use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service in Region 1 and take the appropriate measures; | | | |
| Resolution **232 [COM5/10] (WRC‑12)**  Use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service in Region 1 and related studies | **JTG 4-5-6-7**(2) | resolves  1 to allocate the frequency band 694-790 MHz in Region 1 to the mobile, except aeronautical mobile, service on a co-primary basis with other services to which this band is allocated on a primary basis and to identify it for IMT;  2 that the allocation in resolves 1 is effective immediately after WRC‑15;  3 that use of the allocation in resolves 1 is subject to agreement obtained under No. 9.21 with respect to the aeronautical radionavigation service in countries listed in No. 5.312;  4 that the lower edge of the allocation is subject to refinement at WRC‑15, taking into account the ITU-R studies referred to in invites ITU-R below and the needs of countries in Region 1, in particular developing countries;  5 that WRC‑15 will specify the technical and regulatory conditions applicable to the mobile service allocation referred to in resolves 1, taking into account the ITU-R studies referred to in invites ITU-R below,  invites ITU-R  1 to study the spectrum requirement for the mobile service and for the broadcasting service in this frequency band, in order to determine as early as possible the options for the lower edge referred to in *resolves* 4;  2 to study the channelling arrangements for the mobile service, adapted to the frequency band below 790 MHz, taking into account:  – the existing arrangements in Region 1 in the bands between 790 and 862 MHz and defined in the last version of Recommendation ITU-R M.1036, in order to ensure coexistence with the networks operated in the new allocation and the operational networks in the band 790‑862 MHz,  – the desire for harmonization with arrangements across all Regions,  – the compatibility with other primary services to which the band is allocated, including in adjacent bands;  3 to study coexistence between the different channelling arrangements which have been implemented in Region 1 above 790 MHz, as well as the possibility of further harmonization;  4 to study the compatibility between the mobile service and other services currently allocated in the frequency band 694-790 MHz and develop ITU-R Recommendations or Reports;  5 to study solutions for accommodating applications ancillary to broadcasting requirements;  6 to report, in time for WRC‑15, the results of these studies, | **WP 4A WP 5A WP 5B WP 5D WP 6A**  (WP 3K WP 3M)  (2) |

ATTACHMENT 2

Draft template for parameters for draft new Report  
ITU-R M.[IMT.ADV.PARAM]

**(Editor’s Note: WP 5D will need to create this at the July 2012 meeting.**

Characteristics of IMT-Advanced systems in the [450-960] MHz band  
for use in sharing studies[[3]](#footnote-3)

**Note 1: A separate table should be completed using this template for each relevant frequency band and/or range.**

**Note 2: If additional rows are required in the table for certain parameters , please add as appropriate and note through “track change mode” or by other suitable means.**

|  | Radio interface | “LTE-Advanced”[[4]](#footnote-4) | | | | | “WirelessMAN-Advanced”[[5]](#footnote-5) | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Duplex mode | FDD | | TDD | | | FDD | | TDD | |
| No. | Parameter | Base station | Mobile station | Base station | | Mobile station | Base station | Mobile station | Base station | Mobile station |
| 1 | **Channel bandwidth (MHz)** |  |  |  | |  |  |  |  |  |
|  | | | | | | | | | | |
| 2 | **Signal bandwidth (MHZ)** |  |  |  | |  |  |  |  |  |
|  | | | | | | | | | | |
| 3 | **Transmitter characteristics** |  |  |  | |  |  |  |  |  |
| 3.1 | Maximum e.i.r.p (dBm) |  |  |  | |  |  |  |  |  |
| 3.2 | Average e.i.r.p (dBm) |  |  |  | |  |  |  |  |  |
| 3.3 | Power dynamic range (dB) |  |  |  | |  |  |  |  |  |
| 3.4 | Spectral mask |  |  |  | |  |  |  |  |  |
| 3.5 | ACLR |  |  |  | |  |  |  |  |  |
| 3.6 | Maximum spectral power |  |  |  | |  |  |  |  |  |
|  | | | | | | | | | | |
| 4 | **Receiver characteristics** |  |  | |  |  |  |  |  |  |
| 4.1 | Thermal noise |  |  | |  |  |  |  |  |  |
| 4.2 | Sensitivity |  |  | |  |  |  |  |  |  |
| 4.3 | Blocking response |  |  | |  |  |  |  |  |  |
| 4.4 | ACS |  |  | |  |  |  |  |  |  |
|  | | | | | | | | | | |
| 5 | **Antenna characteristics** |  |  | |  |  |  |  |  |  |
| 5.1 | Gain (dBi) |  |  | |  |  |  |  |  |  |
| 5.2 | Height (m) |  |  | |  |  |  |  |  |  |
| 5.3 | Type |  |  | |  |  |  |  |  |  |
| 5.4 | Pattern |  |  | |  |  |  |  |  |  |
| 5.4.1 | Width in horizontal plane (°) |  |  | |  |  |  |  |  |  |
| 5.4.2 | Width in vertical plane (°) |  |  | |  |  |  |  |  |  |
| 5.4.3 | Downtilt (°) |  |  | |  |  |  |  |  |  |
| 5.4.4 | Relative side-lobe level (dB) |  |  | |  |  |  |  |  |  |
| 5.5 | Polarization discrimination (dB) |  |  | |  |  |  |  |  |  |
| 5.6 | Feeder loss (dB) |  |  | |  |  |  |  |  |  |
|  | | | | | | | | | | |
| 6 | **Operational factors** |  |  | |  |  |  |  |  |  |
| 6.1 | Frequency reuse factor |  |  | |  |  |  |  |  |  |
| 6.2 | Equipment density (number.km²) |  | | |  |  |  |  |  |  |
| 6.3 | Equipment density (number/km²) operating  co-frequency |  |  | |  |  |  |  |  |  |
| 6.4 | Capacity criteria |  | | |  |  |  |  |  |  |
| 6.5 | Coverage radius (km) |  |  | |  |  |  |  |  |  |

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. (1) A concerned ITU-R group may be either a contributing group on a specific item (indicated in bold), or an interested group (indicated between round brackets) that will follow the work on a specific issue and act as appropriate. [↑](#footnote-ref-1)
2. (2) See the CPM15-1 Decision on the establishment and Terms of Reference of Joint Task Group 4-5-6-7 (Annex 10 to this Administrative Circular). [↑](#footnote-ref-2)
3. A table should be appropriately created for specific band or frequency ranges (e.g. “below 1 GHz”). Rows may be added for other appropriate characteristics. Report ITU-R M.2039 may be consulted for examples/guidance. [↑](#footnote-ref-3)
4. Developed by 3GPP as LTE Release 10 and Beyond (*LTE-Advanced*). [↑](#footnote-ref-4)
5. Developed by IEEE as the WirelessMAN-Advanced specification incorporated in IEEE Std 802.16 beginning with approval of IEEE Std 802.16m. [↑](#footnote-ref-5)