International Telecommunication Union

ITU-R

Radiocommunication Sector of ITU

Report ITU-R M.2198

(11/2010)

The outcome of the evaluation, consensus building and decision of the IMT-Advanced process (Steps 4 to 7), including characteristics of IMT-Advanced radio interfaces

M Series

Mobile, radiodetermination, amateur and related satellites services

International Telecommunication Union

Foreword

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***Note**: This ITU-R Report was approved in English by the Study Group under the procedure detailed in Resolution ITU-R 1.*

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(2010)

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1 Introduction

International Mobile Telecommunications-Advanced (IMT-Advanced) systems are mobile systems that include the new capabilities of IMT that go beyond those of IMT-2000. Such systems provide access to a wide range of telecommunication services including advanced mobile services, supported by mobile and fixed networks that are increasingly packet-based.

IMT-Advanced systems support low to high mobility applications and a wide range of data rates in accordance with user and service demands in multiple user environments. IMT-Advanced also has capabilities for high-quality multimedia applications on a wide range of services and platforms providing a significant improvement in performance and quality of service.

The key features of IMT-Advanced are:

– a high degree of commonality of functionality worldwide while retaining the flexibility to support a wide range of services and applications in a cost efficient manner;
– compatibility of services within IMT and with fixed networks;
– capability of interworking with other radio access systems;
– high-quality mobile services;
– user equipment suitable for worldwide use;
– user-friendly applications, services and equipment;
– worldwide roaming capability;
– enhanced peak data rates to support advanced services and applications (100 Mbit/s for high and 1 Gbit/s for low mobility were established as targets for research)[1].

These features enable IMT-Advanced to address evolving user needs. The capabilities of IMT-Advanced systems are being continuously enhanced in line with user trends and technology developments.

[1] Data rates sourced from Recommendation ITU-R M.1645.

The first invitation for the submission of proposals for candidate radio interface technologies (RITs) or a set of RITs (SRITs) for the terrestrial components of IMT-Advanced was announced by Circular Letter 5/LCCE/2 on 7 March 2008. The Circular Letter and its addenda, initiated an ongoing process to evaluate the candidate RITs or SRITs for IMT-Advanced, inviting the formation of independent evaluation groups and the subsequent submission of evaluation reports on these candidate RITs or SRITs.

The submission and evaluation process for IMT-Advanced development is included in the Revision 1 to Document IMT-ADV/2 and is illustrated in Fig. A2-2, reproduced here for reference in understanding the steps of the IMT-Advanced process. The requirements, evaluation criteria and submission templates for the development of IMT-Advanced are included in Report ITU-R M.2133. The requirements related to technical performance for IMT-Advanced radio interface(s) are included in Report ITU-R M.2134. The guidelines for evaluation of radio interface technologies for IMT-Advanced are included in Report ITU-R M.2135-1.

2 Scope

This Report is the record of the work performed after receipt of the proposals for IMT-Advanced candidate RITs and SRITs, including the evaluation activity and the consensus building. This text contains the outcome and conclusions of Steps 4-7 of the IMT-Advanced process. These steps correspond to:

– Step 4: Evaluation of candidate RITs or SRITs by Evaluation Groups.

– Step 5: Review and coordination of outside evaluation activities.

– Step 6: Review to assess compliance with minimum requirements.

– Step 7: Consideration of evaluation results, consensus building and decision.

The details of these steps are provided in Document IMT-ADV/2 Rev.1[2].

This Report also states the decisions reached by ITU-R on each of the candidate proposals and provides the technical characteristics of the RITs and SRITs for IMT-Advanced.

Note that the actual specifications of the agreed IMT-Advanced radio interfaces will be contained in a future Recommendation which is being developed[3].

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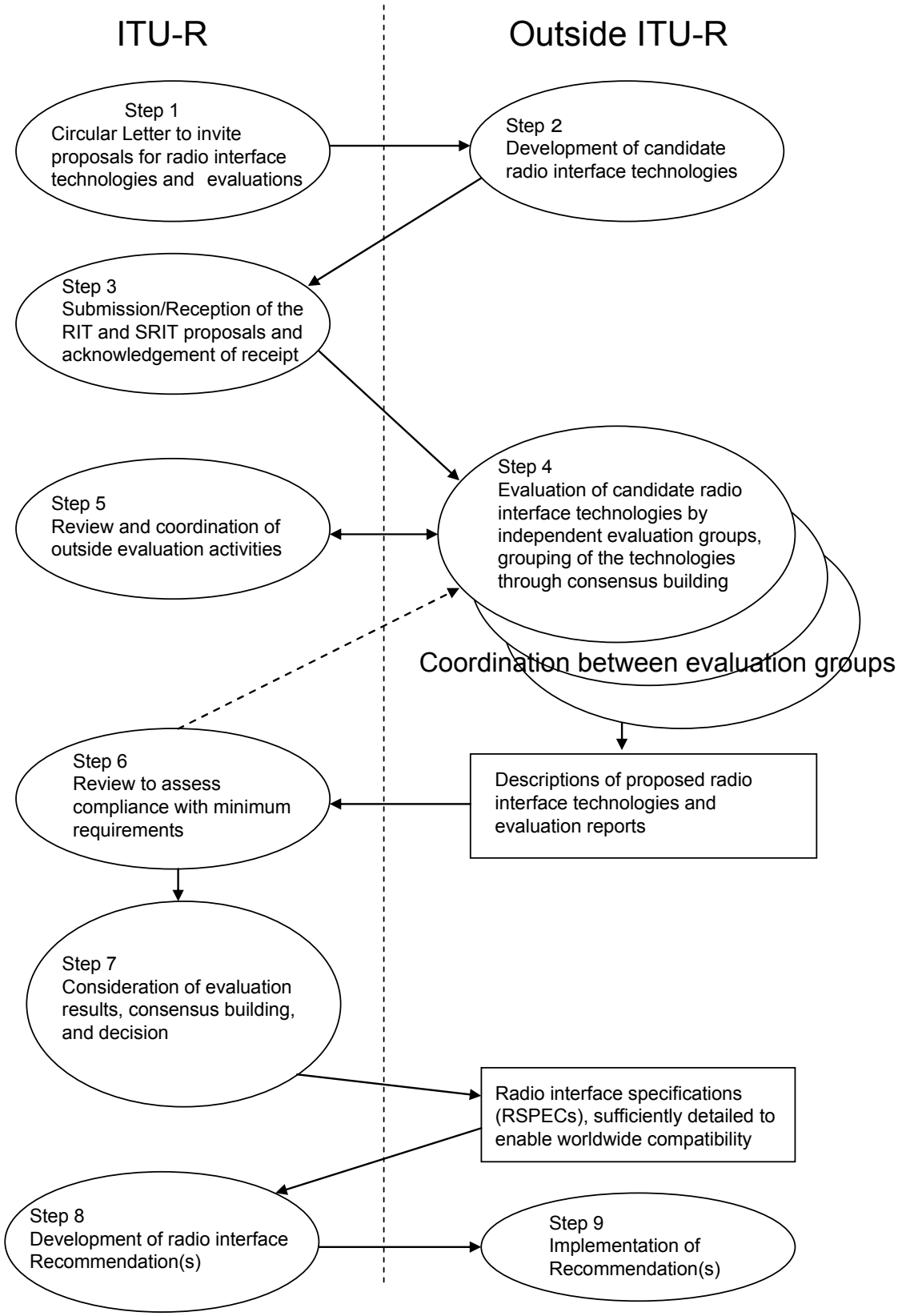
[2] IMT-ADV documents referred to in this Report are found on the ITU-R web page: "IMT-Advanced submission and evaluation process (http://www.itu.int/ITU-R/go/rsg5-imt-advanced)".

[3] Once the Recommendation has been developed the exact reference to the Recommendation will be added as an editorial action.

FIGURE A2-2

IMT-Advanced terrestrial component radio interface development process



[IMT-Advanced A2-02]

3 Related text references

–	Recommendation ITU-R M.1036	– Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications-2000 (IMT 2000) in the bands 806-960 MHz, 1 710-2 025 MHz, 2 110-2 200 MHz and 2 500-2 690 MHz
–	Recommendation ITU-R M.1645	– Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000
–	Recommendation ITU-R M.1768	– Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000
–	Recommendation ITU-R M.1822	– Framework for services supported by IMT
–	Recommendation ITU-R M. …	– Detailed specifications of the radio interfaces of IMT-Advanced[4]
–	Report ITU-R M.2038	– Technology trends
–	Report ITU-R M.2072	– World mobile telecommunication market forecast
–	Report ITU-R M.2074	– Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000
–	Report ITU-R M.2078	– Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced
–	Report ITU-R M.2079	– Technical and operational information for identifying Spectrum for the terrestrial component of future development of IMT-2000 and IMT-Advanced
–	Report ITU-R M.2133	– Requirements, evaluation criteria and submission templates for the development of IMT-Advanced
–	Report ITU-R M.2134	– Requirements related to technical performance for IMT-Advanced radio interface(s)
–	Report ITU-R M.2135-1	– Guidelines for evaluation of radio interface technologies for IMT-Advanced
–	Resolution ITU-R 56	– Naming for International Mobile Telecommunications
–	Resolution ITU-R 57	– Principles for the process of development of IMT Advanced
–	IMT-ADV/1	– Background on IMT-Advanced
–	IMT-ADV/2 (Rev.1)	– Submission and evaluation process and consensus building
–	IMT-ADV/24	– Process and the use of Global Core Specification (GCS), references, and related certifications in conjunction with Recommendation ITU-R M.[IMT.RSPEC]

[4] Once the Recommendation has been developed the exact reference to the Recommendation will be added as an editorial action.

3.1 List of acronyms and abbreviations

IMT International Mobile Telecommunications

RIT Radio interface technology

SRIT Set of radio interface technologies

TDD Time division duplex

FDD Frequency division duplex

4 Summary of submissions

Following the guidelines of the IMT-Advanced process, the candidate technology submissions provided to the ITU-R in October 2009 were reviewed and the following were acknowledged as "complete" candidate technology submissions as per § 4 of Report ITU-R M.2133:

– IMT-ADV/4 – Acknowledgement of candidate submission from IEEE under Step 3 of the IMT-Advanced process (IEEE technology).

– IMT-ADV/5 – Acknowledgement of candidate submission from Japan under Step 3 of the IMT-Advanced process (IEEE technology).

– IMT-ADV/6 – Acknowledgement of candidate submission from Japan under Step 3 of the IMT-Advanced process (3GPP technology).

– IMT-ADV/7 – Acknowledgement of candidate submission from TTA under Step 3 of the IMT-Advanced process (IEEE technology).

– IMT-ADV/8 – Acknowledgement of candidate submission from 3GPP proponent (3GPP organization partners of ARIB, ATIS, CCSA, ETSI, TTA AND TTC) under Step 3 of the IMT-Advanced process (3GPP technology).

– IMT-ADV/9 – Acknowledgement of candidate submission from China (People's Republic of) under Step 3 of the IMT-Advanced process (3GPP technology).

For convenience, these submissions are attached to Annex 1 of this Report.

5 Conclusion for Steps 4 to 7

5.1 Results of Steps 4, "Evaluation of candidate RITs or SRITs by Evaluation Groups" and Step 5, "Review and coordination of outside evaluation activities"

Under Step 4 of IMT-Advanced process, candidate RITs or SRITs were evaluated by Independent Evaluation Groups that were registered in the ITU-R. In this step the candidate RITs or SRITs were assessed based on Reports ITU-R M.2133 and ITU-R M.2135-1.

In Step 5, the ITU-R monitored the progress of the evaluation activities, and provided appropriate responses to problems or requests for guidance to facilitate consensus building. To this end, ITU-R convened correspondence activities between the sixth and eighth meetings of Working Party 5D (i.e., from October 2009 to June 2010) and coordinated discussion between proponents and Independent Evaluation Groups, and among Independent Evaluation Groups.

A total of fourteen Independent Evaluation Groups registered with ITU-R. Thirteen evaluation reports and two additional reports from the Independent Evaluation Groups were submitted and discussed in ITU-R under Steps 4 and 5. These evaluation reports from the respective Independent Evaluation Groups are included in Annex 2 of this Report. Some of these reports addressed more than one technology proposal.

5.1.1 Summary of the evaluations received for the 3GPP technology candidate

It was concluded by ITU-R that the IMT-ADV/6 and IMT-ADV/9 candidate technology proposals were technically identical to the IMT-ADV/8 candidate technology proposal and that a single evaluation would be applicable to all three proposals[5].

Under Steps 4 and 5 of the IMT-Advanced process, ITU-R coordinated the activities of fourteen Evaluation Groups and received seven full and one partial evaluation reports on the 3GPP FDD Technology, and six full and two partial evaluation reports for the 3GPP TDD technology, plus two additional reports. The independent evaluation groups utilized the defined ITU-R evaluation methodology and criteria established in the relevant ITU-R Reports covering IMT-Advanced. Some Independent Evaluation Groups developed additional assessment aspects as provided for in the IMT-Advanced process. ITU-R concluded that the independent evaluation groups had fulfilled their role in the process and that the inclusion of views from organizations external to the ITU-R working by invitation under the guidelines of Resolution ITU-R 9-3 had been useful to the work on IMT-Advanced and had contributed to the success of the IMT-Advanced process.

The received evaluation reports indicated that the evaluation groups were of the opinion that the candidate RIT/SRIT proposals in IMT-ADV/6, IMT-ADV/8 and IMT-ADV/9 met the minimum requirements of all required test environments.

The ITU-R views of the relevant evaluation reports from the Independent Evaluation Groups and the individual Independent Evaluation Group analyses for the 3GPP technology are included in Annex 2 of this Report are as follows:

– IMT-ADV/11 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/6, IMT-ADV/8 and IMT-ADV/9 by ATIS WTSC
– IMT-ADV/12 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 (as well as IMT-ADV/5 and IMT-ADV/7) and IMT-ADV/8 (as well as IMT-ADV/6 and IMT ADV/9) by Canadian Evaluation Group
– IMT-ADV/13 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/6, IMT-ADV/8 and IMT-ADV/9 by Chinese Evaluation Group
– IMT-ADV/15 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by Russian Evaluation Group
– IMT-ADV/16 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by TCOE India
– IMT-ADV/17 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by TR-45 Independent Evaluation Group
– IMT-ADV/18 – Evaluation of IMT-Advanced candidate technology submissions in Document IMT-ADV/8 by TTA PG707
– IMT-ADV/22 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/6, IMT-ADV/8 and IMT-ADV/9 by WINNER+ Evaluation Group
– IMT-ADV/23 – Additional reports from registered Independent Evaluation Groups

5.1.2 Summary of the evaluations received for the IEEE technology candidate

It was concluded by ITU-R that the IMT-ADV/5 and IMT-ADV/7 candidate technology proposals were technically identical to the IMT-ADV/4 candidate technology proposal and that a single evaluation would be applicable to all three proposals.

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[5] For Document IMT-ADV/9 the technically identical submission (except for the name) is specifically for the TDD RIT component.

Under Steps 4 and 5 of the IMT-Advanced process, ITU-R coordinated the activities of fourteen Evaluation Groups and received seven full and two partial evaluations reports for the IEEE technology, plus one additional Report. The independent evaluation groups utilized the defined ITU-R evaluation methodology and criteria established in the relevant ITU-R Reports covering IMT-Advanced. Some Independent Evaluation Groups developed additional assessment aspects as provided for in the IMT-Advanced process. ITU-R concluded that the independent evaluation groups had fulfilled their role in the process and that the inclusion of views from organizations external to the ITU-R working by invitation under the guidelines of Resolution ITU-R 9-3 had been useful to the work on IMT-Advanced and had contributed to the success of the IMT-Advanced process.

The received evaluation reports indicated that the evaluation groups were of the opinion that the candidate RIT proposals in IMT-ADV/4, IMT-ADV/5 and IMT-ADV/7 met the minimum requirements of all required test environments.

The ITU-R views of the relevant evaluation reports from the Independent Evaluation Groups and the individual Independent Evaluation Group analyses for the IEEE technology included in Annex 2 of this Report are as follows:

– IMT-ADV/10 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4, IMT-ADV/5 and IMT-ADV/7 by ATIS WTSC
– IMT-ADV/12 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 (as well as IMT-ADV/5 and IMT-ADV/7) and IMT-ADV/8 (as well as IMT-ADV/6 and IMT ADV/9) by Canadian Evaluation Group
– IMT-ADV/14 – Evaluation of IMT-Advanced candidate technology submission in Document IMT-ADV/4 by Israeli Evaluation Group
– IMT-ADV/15 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by Russian Evaluation Group
– IMT-ADV/16 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by TCOE India
– IMT-ADV/17 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by TR-45 Independent Evaluation Group
– IMT-ADV/19 – Evaluation of IMT-Advanced candidate technology submissions in Document IMT-ADV/4 by TTA PG707
– IMT-ADV/20 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4, IMT-ADV/5 and IMT-ADV/7 by WiMAX Forum Evaluation Group
– IMT-ADV/21 – Evaluation of IMT-Advanced candidate technology submission in Document IMT-ADV/4 by WCAI Evaluation Group
– IMT-ADV/23 – Additional reports from registered Independent Evaluation Groups

5.2 Results of Step 6, “Review to assess compliance with minimum requirements”

Under Step 6 of the IMT-Advanced process and guidelines, an assessment of each proposal was made as to whether it met a version of the minimum technical requirements and evaluation criteria of the IMT-Advanced process in force as described in Report ITU-R M.2134. The evaluation methodology is described in Report ITU-R M.2135-1. The version of the minimum technical requirements used is described in Report ITU-R M.2134.

In this step, the evaluated proposal for an RIT/SRIT is assessed as a qualifying RIT/SRIT, if any one of the following is met:

– an RIT meets the minimum requirements of at least one test environment;
– an RIT may meet the minimum requirements of all required test environments;
– an SRIT meets the minimum requirements of more than one test environment;
– an SRIT may meet the minimum requirements of all required test environments.

Such a qualified RIT/SRIT will go forward for further consideration in Step 7.

Based on a review of the evaluations carried out by the Independent Evaluation Groups as well as the self-evaluations from the proponents, the conclusions of the ITU-R for Step 6 are presented in the following sub-sections. Each candidate technology submission is separately addressed for compliance with regard to services, spectrum and technical performance and for confirmation as a qualifying RIT/SRIT:

– Section 5.2.1 Candidate submission from IEEE (IMT-ADV/4).
– Section 5.2.2 Candidate submission from Japan (IMT-ADV/5).
– Section 5.2.3 Candidate submission from Japan (IMT-ADV/6).
– Section 5.2.4 Candidate submission from TTA (IMT-ADV/7).
– Section 5.2.5 Candidate submission from 3GPP Proponent (IMT-ADV/8).
– Section 5.2.6 Candidate submission from China (People's Republic of) (IMT-ADV/9).

5.2.1 Candidate submission from IEEE (IMT-ADV/4)

The ITU-R summary view of the candidate technology submission from the IEEE is presented below. The individual detailed analysis of compliance for each of the defined items in Report ITU-R M.2133 is included in the tables in Annex 3.

Compliance related to services

The IEEE technology proposed by IEEE (IMT-ADV/4) meets the minimum requirements for services.

Compliance related to spectrum

The IEEE technology proposed by IEEE (IMT-ADV/4) meets the minimum requirements for spectrum.

Compliance related to technical performance

The IEEE technology proposed by IEEE (IMT-ADV/4) meets the minimum requirements for technical performance.

Assessment of the candidate technology proposal as a qualifying RIT/SRIT

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/4 meets the minimum requirements of the indoor test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/4 meets the minimum requirements of the microcellular test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/4 meets the minimum requirements of the base coverage urban test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/4 meets the minimum requirements of the high speed test environment.

Therefore, the IEEE technology proposed by IEEE (IMT-ADV/4) meets the requirements of a qualifying RIT and moves forward for consideration in Step 7.

5.2.2 Candidate submission from Japan (IMT-ADV/5)

The ITU-R summary view of the candidate technology submission from Japan is presented below. The individual detailed analysis of compliance for each of the defined items in Report ITU-R M.2133 is included in the tables in Annex 3.

Compliance related to services

The IEEE technology proposed by Japan (IMT-ADV/5) meets the minimum requirements for services.

Compliance related to spectrum

The IEEE technology proposed by Japan (IMT-ADV/5) meets the minimum requirements for spectrum.

Compliance related to technical performance

The IEEE technology proposed by Japan (IMT-ADV/5) meets the minimum requirements for technical performance.

Assessment of the candidate technology proposal as a qualifying RIT/SRIT

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/5 meets the minimum requirements of the indoor test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/5 meets the minimum requirements of the microcellular test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/5 meets the minimum requirements of the base coverage urban test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/5 meets the minimum requirements of the high speed test environment.

Therefore, the IEEE technology proposed by Japan (IMT-ADV/5) meets the requirements of a qualifying RIT and moves forward for consideration in Step 7.

5.2.3 Candidate submission from Japan (IMT-ADV/6)

The ITU-R summary view of the candidate technology submission from Japan is presented below. The individual detailed analysis of compliance for each of the defined items in Report ITU-R M.2133 is included in the tables in Annex 3.

Compliance related to services

The 3GPP technology proposed by Japan (IMT-ADV/6) meets the minimum requirements for services.

Compliance related to spectrum

The 3GPP technology proposed by Japan (IMT-ADV/6) meets the minimum requirements for spectrum.

Compliance related to technical performance

The 3GPP technology proposed by Japan (IMT-ADV/6) meets the minimum requirements for technical performance.

Assessment of the candidate technology proposal as a qualifying RIT/SRIT

ITU-R confirms that both the TDD RIT component and the FDD RIT component in IMT-ADV/6 individually meet the minimum requirement of the indoor test environment. Therefore, the candidate SRIT submission in IMT-ADV/6 meets the minimum requirements for this environment.

ITU-R confirms that both the TDD RIT component and the FDD RIT component in IMT-ADV/6 individually meet the minimum requirement of the microcellular test environment. Therefore, the candidate SRIT submission in IMT-ADV/6 meets the minimum requirements for this environment.

ITU-R confirms that both the TDD RIT component and the FDD RIT component in IMT-ADV/6 individually meet the minimum requirement of the base coverage urban test environment. Therefore, the candidate SRIT submission in IMT-ADV/6 meets the minimum requirements for this environment.

ITU-R confirms that both the TDD RIT component and the FDD RIT component in IMT-ADV/6 individually meet the minimum requirement of the high speed test environment. Therefore, the candidate SRIT submission in IMT-ADV/6 meets the minimum requirements for this environment.

Therefore, both the TDD RIT component and the FDD RIT component in IMT-ADV/6 individually meet the requirements of a qualifying RIT and move forward for consideration in Step 7 and the SRIT in IMT-ADV/6 meets the requirements of a qualifying SRIT and moves forward for consideration in Step 7.

5.2.4 Candidate submission from TTA (IMT-ADV/7)

The ITU-R summary view of the candidate technology submission from TTA is presented below. The individual detailed analysis of compliance for each of the defined items in Report ITU-R M.2133 is included in the tables in Annex 3.

Compliance related to services

The IEEE technology proposed by TTA (IMT-ADV/7) meets the minimum requirements for services.

Compliance related to spectrum

The IEEE technology proposed by TTA (IMT-ADV/7) meets the minimum requirements for spectrum.

Compliance related to technical performance

The IEEE technology proposed by TTA (IMT-ADV/7) meets the minimum requirements for technical performance.

Assessment of the candidate technology proposal as a qualifying RIT/SRIT

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/7 meets the minimum requirements of the indoor test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/7 meets the minimum requirements of the microcellular test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/7 meets the minimum requirements of the base coverage urban test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/7 meets the minimum requirements of the high speed test environment.

Therefore, the IEEE technology proposed by TTA (IMT-ADV/7) meets the requirements of a qualifying RIT and moves forward for consideration in Step 7.

5.2.5 Candidate submission from 3GPP Proponent (IMT-ADV/8)

The ITU-R summary view of the candidate technology submission from 3GPP Proponent (3GPP organization partners of ARIB, ATIS, CCSA, ETSI, TTA AND TTC) (IMT-ADV/8) is presented below. The individual detailed analysis of compliance for each of the defined items in Report ITU-R M.2133 is included in the tables in Annex 3.

Compliance related to services

The 3GPP technology proposed by 3GPP Proponent (3GPP organizational partners of ARIB, ATIS, CCSA, ETSI, TTA and TTC) (IMT-ADV/8) meets the minimum requirements for services.

Compliance related to spectrum

The 3GPP technology proposed by 3GPP Proponent (3GPP organizational partners of ARIB, ATIS, CCSA, ETSI, TTA AND TTC) (IMT-ADV/8) meets the minimum requirements for spectrum.

Compliance related to technical performance

The 3GPP technology proposed by 3GPP Proponent (3GPP organizational partners of ARIB, ATIS, CCSA, ETSI, TTA AND TTC) (IMT-ADV/8) meets the minimum requirements for technical performance.

Assessment of the candidate technology proposal as a qualifying RIT/SRIT

ITU-R confirms that both the TDD RIT component and the FDD RIT component in IMT-ADV/8 individually meet the minimum requirement of the indoor test environment. Therefore, the candidate SRIT submission in IMT-ADV/8 meets the minimum requirements for this environment.

ITU-R confirms that both the TDD RIT component and the FDD RIT component in IMT-ADV/8 individually meet the minimum requirement of the microcellular test environment. Therefore, the candidate SRIT submission in IMT-ADV/8 meets the minimum requirements for this environment.

ITU-R confirms that both the TDD RIT component and the FDD RIT component in IMT-ADV/8 individually meet the minimum requirement of the base coverage urban test environment. Therefore, the candidate SRIT submission in IMT-ADV/8 meets the minimum requirements for this environment.

ITU-R confirms that both the TDD RIT component and the FDD RIT component in IMT-ADV/8 individually meet the minimum requirement of the high speed test environment. Therefore, the candidate SRIT submission in IMT-ADV/8 meets the minimum requirements for this environment.

Therefore, both the TDD RIT component and the FDD RIT component in IMT-ADV/8 individually meet the requirements of a qualifying RIT and move forward for consideration in Step 7 and the SRIT in IMT-ADV/8 meets the requirements of a qualifying SRIT and moves forward for consideration in Step 7.

5.2.6 Candidate submission from China (People's Republic of) (IMT-ADV/9)

The ITU-R summary view of the candidate technology submission from China (People's Republic of) is presented below. The individual detailed analysis of compliance for each of the defined items in Report ITU-R M.2133 is included in the tables in Annex 3.

Compliance related to services

The 3GPP technology TDD RIT component proposed by China, (People's Republic of) (IMT-ADV/9) meets the minimum requirements for services.

Compliance related to spectrum

The 3GPP technology TDD RIT component proposed by China, (People's Republic of) (IMT-ADV/9) meets the minimum requirements for spectrum.

Compliance related to technical performance

The 3GPP technology TDD RIT component proposed by China, (People's Republic of) (IMT-ADV/9) meets the minimum requirements for technical performance.

Assessment of the candidate technology proposal as a qualifying RIT/SRIT

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/9 meets the minimum requirements of the indoor test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/9 meets the minimum requirements of the microcellular test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/9 meets the minimum requirements of the base coverage urban test environment.

ITU-R confirms that the RIT of the candidate technology submission in IMT-ADV/9 meets the minimum requirements of the high speed test environment.

The 3GPP technology TDD RIT component proposed by China (People's Republic of) (IMT-ADV/9) meets the requirements of a qualifying RIT and moves forward for consideration in Step 7.

5.3 Result of Step 7, "Consideration of evaluation results, consensus building and decision"

5.3.1 Consideration of evaluation results

Each of the six candidate technology submissions is acknowledged and listed below (and their respective SRIT or RITs) has individually satisfied in four test environments the requirements of Step 7 of the IMT-Advanced process. Therefore, each of these IMT-Advanced candidate technology submissions has the opportunity to proceed to Step 8.

– IMT-ADV/4 – Acknowledgement of candidate submission from IEEE under Step 3 of the IMT-Advanced process (IEEE technology).
– IMT-ADV/5 – Acknowledgement of candidate submission from Japan under Step 3 of the IMT-Advanced process (IEEE technology).
– IMT-ADV/6 – Acknowledgement of candidate submission from Japan under Step 3 of the IMT-Advanced process (3GPP technology).
– IMT-ADV/7 – Acknowledgement of candidate submission from TTA under Step 3 of the IMT-Advanced process (IEEE technology).
– IMT-ADV/8 – Acknowledgement of candidate submission from 3GPP proponent (3GPP organization partners of ARIB, ATIS, CCSA, ETSI, TTA and TTC) under Step 3 of the IMT-Advanced process (3GPP technology).
– IMT-ADV/9 – Acknowledgement of candidate submission from China (People's Republic of) under Step 3 of the IMT-Advanced process (3GPP technology).

5.3.2 Consensus building and decision

As concluded in §§ 5.1.1 and 5.1.2 above:

– the IMT-ADV/6 and IMT-ADV/9 candidate technology proposals are technically identical to the IMT-ADV/8 candidate technology proposal[6];

– the IMT-ADV/5 and IMT-ADV/7 candidate technology proposals are technically identical to the IMT-ADV/4 candidate technology proposal.

Additionally, consensus building has been performed with the objective of achieving global harmonization and having the potential for wide industry support for the radio interfaces that are developed for IMT-Advanced.

As a result of the consensus building in ITU-R among the six technology proposals, the following two groupings are agreed by ITU-R:

– The RITs and SRITs proposed in IMT-ADV/6, IMT-ADV/8 and IMT-ADV/9 are grouped into the technology identified in ITU as ***"LTE-Advanced"***[7], developed by the Third Generation Partnership Project (3GPP) , for Step 7 and subsequent IMT-Advanced development.

– The RITs proposed in IMT-ADV/4, IMT-ADV/5 and IMT-ADV/7 are grouped into the technology identified in ITU as ***"WirelessMAN-Advanced"***[8], developed by IEEE, for Step 7 and subsequent IMT-Advanced development.

Based on the above consensus views, the following table summarizes the candidate submissions and the conclusions.

Radio Interference Technologies:	***"WirelessMAN-Advanced"***	***"LTE-Advanced"***
Proponents (submission in):	IEEE (IMT-ADV/4) Japan (IMT-ADV/5) TTA (IMT-ADV/7)	Japan (IMT-ADV/6) 3GPP Proponent (IMT-ADV/8) China (People's Republic of) (IMT-ADV/9)
Determination whether the RIT or SRIT meets the requirements of Res. ITU-R 57, *resolves* 6 e) and f), for at least three of the four test environments, based on Report ITU-R M.2133 § 3.2:	YES (Requirements met for four test environments)	YES (Requirements met for four test environments)

Therefore in consideration of IMT-Advanced process for Steps 4 through 7, the following conclusions have been reached in ITU-R:

– Both ***"LTE-Advanced" and "WirelessMAN-Advanced"*** are acknowledged to individually satisfy the requirements of Resolution ITU-R 57, *resolves* 6 e) and f) for the required number of the test environments. These requirements are specified in Report ITU-R M.2133.

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[6] For Document IMT-ADV/9 the technically identical submission (except for the name) is specifically for the TDD RIT component.

[7] Developed by 3GPP as *LTE Release 10 and Beyond (LTE-Advanced)*.

[8] Developed by IEEE as the *WirelessMAN-Advanced* specification incorporated in IEEE Std 802.16 beginning with approval of IEEE Std 802.16m.

– Consequently both ***"LTE-Advanced" and "WirelessMAN-Advanced"*** are accepted for inclusion in the standardization phase of the IMT-Advanced process and should proceed to Step 8.

6 Characteristics of the IMT-Advanced technologies and basis of the specifications for Step 8

In Step 8, a (set of) IMT-Advanced terrestrial component radio interface Recommendation(s) is developed within the ITU-R on the basis of the results of Step 7, sufficiently detailed to enable worldwide compatibility of operation and equipment, including roaming.

6.1 Characteristics of radio interface technologies for IMT-Advanced

The ***"LTE-Advanced"*** in IMT-Advanced is based on the technology specified in Document IMT-ADV/8, which is technically identical to IMT-ADV/6 and IMT-ADV/9 (except that IMT-ADV/9 contains only the TDD RIT component).

The ***"WirelessMAN-Advanced"*** in IMT-Advanced is based on the technology specified in Document IMT-ADV/4, which is technically identical to IMT-ADV/5 and IMT-ADV/7.

6.2 Detailed specifications for the radio interface technologies for IMT-Advanced in Step 8

Under Step 8 of the IMT-Advanced process the detailed technical specifications for the Radio Interface Technologies in IMT-Advanced will be provided in a Recommendation to be developed[9] ("Detailed specifications of the radio interfaces of IMT-Advanced").

6.2.1 For "LTE-Advanced"

Based on the consensus views in § 5.3, ***"LTE-Advanced"*** is accepted for Step 8. The basis for specifying the ***"LTE-Advanced"*** technology in Step 8 is Document IMT-ADV/8, which is technically identical to IMT-ADV/6 and IMT-ADV/9 (except that IMT-ADV/9 contains only the TDD RIT component).

As provided for in IMT-ADV/24 Process and the use of Global Core Specification (GCS), References, and Related Certifications in Conjunction with Recommendation ITU-R M.[IMT.RSPEC]), the ***GCS Proponent*** for the ***"LTE-Advanced"*** in Step 8 is "*ARIB, ATIS, CCSA, ETSI, TTA, and TTC on behalf of 3GPP*".

6.2.2 For "WirelessMAN-Advanced"

Based on the consensus views in Section 5.3, ***"WirelessMAN-Advanced"*** is accepted for Step 8. The basis for specifying the ***"WirelessMAN-Advanced"*** technology in Step 8 is Document IMT-ADV/4, which is technically identical to IMT-ADV/5 and IMT-ADV/7.

As provided for in IMT-ADV/24 (Process and the use of Global Core Specification (GCS), References, and Related Certifications in Conjunction with Recommendation ITU-R M.[IMT.RSPEC]), the ***GCS Proponent*** for the ***"WirelessMAN-Advanced"*** in Step 8 is *"IEEE"*.

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[9] Once the Recommendation has been developed the exact reference to the Recommendation will be added as an editorial action.

Annex 1

Submission of candidate technologies

IMT-ADV/4 – Acknowledgement of candidate submission from IEEE under Step 3 of the IMT-Advanced process (IEEE technology).

IMT-ADV4.doc

IMT-ADV/5 – Acknowledgement of candidate submission from Japan under Step 3 of the IMT-Advanced process (IEEE technology).

IMT-ADV5.doc

IMT-ADV/6 – Acknowledgement of candidate submission from Japan under Step 3 of the IMT-Advanced process (3GPP technology).

IMT-ADV6.doc

IMT-ADV/7 – Acknowledgement of candidate submission from TTA under Step 3 of the IMT-Advanced process (IEEE technology).

IMT-ADV7.doc

IMT-ADV/8 – Acknowledgement of candidate submission from 3GPP proponent (3GPP organization partners of ARIB, ATIS, CCSA, ETSI, TTA AND TTC) under Step 3 of the IMT-Advanced process (3GPP technology).

IMT-ADV8.doc

IMT-ADV/9 – Acknowledgement of candidate submission from China (People's Republic of) under Step 3 of the IMT-Advanced process (3GPP technology).

IMT-ADV9.doc

Annex 2

Summary and details of Evaluation Reports from Independent Evaluation Groups

IMT-ADV/10 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4, IMT-ADV/5 and IMT-ADV/7 by ATIS WTSC.

IMT-ADV10.doc

IMT-ADV/11 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/6, IMT-ADV/8 and IMT-ADV/9 by ATIS WTSC.

IMT-ADV11.doc

IMT-ADV/12 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 (as well as IMT-ADV/5 and IMT-ADV/7) and IMT-ADV/8 (as well as IMT-ADV/6 and IMT-ADV/9) by Canadian Evaluation Group.

IMT-ADV/13 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/6, IMT-ADV/8 and IMT-ADV/9 by Chinese Evaluation Group.

IMT-ADV/14 – Evaluation of IMT-Advanced candidate technology submission in Document IMT-ADV/4 by Israeli Evaluation Group.

IMT-ADV/15 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by Russian Evaluation Group.

IMT-ADV12.doc

IMT-ADV/16 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by TCOE India.

IMT-ADV/17 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4 and IMT-ADV/8 by TR-45 Independent Evaluation Group.

IMT-ADV/18 – Evaluation of IMT-Advanced candidate technology submission in Document IMT-ADV/8 by TTA PG707.

IMT-ADV/19 – Evaluation of IMT-Advanced candidate technology submission in Document IMT-ADV/4 by TTA PG707.

IMT-ADV/20 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/4, IMT-ADV/5 and IMT-ADV/7 by WiMAX Forum Evaluation Group.

IMT-ADV16.doc

IMT-ADV/21 – Evaluation of IMT-Advanced candidate technology submission in Document IMT-ADV/4 by WCAI Evaluation Group.

IMT-ADV/22 – Evaluation of IMT-Advanced candidate technology submissions in Documents IMT-ADV/6, IMT-ADV/8 and IMT-ADV/9 by WINNER+ Evaluation Group.

IMT-ADV21.doc

IMT-ADV/23 – Additional reports from registered Independent Evaluation Groups.

IMT-ADV23.doc

Annex 3

Detailed compliance template summaries[10]

A Candidate submission from IEEE (IMT-ADV/4)

Reference Section of Report ITU-R M.2133	Summary of Assessment of compliance for services	ITU-R confirmation that the requirement is met by the candidate technology proposal
4.2.4.1.1	Support of a wide range of services	Yes
4.2.4.1.1.1	Ability to support basic conversational service class	
4.2.4.1.1.2	Support of rich conversational service class	
4.2.4.1.1.3	Support of conversational low delay service class	

Reference Section of Report ITU-R M.2133	Summary of Assessment of compliance for spectrum	ITU-R confirmation that the requirement is met by the candidate technology proposal
4.2.4.2.1	Spectrum bands – Is the proposal able to utilize at least one band identified for IMT?	Yes

[10] Reference Report ITU-R M.2133, § 4.2.4.

Reference Section of Report ITU-R M.2134	Summary of Assessment of compliance for technical performance				ITU-R confirmation that the requirement is met by the candidate technology proposal
		Category		ITU-R required value	
		Test environment	Downlink or uplink		
4.1	Cell spectral efficiency (bit/s/Hz/cell)	Indoor	Downlink	3	Yes
			Uplink	2.25	
		Microcellular	Downlink	2.6	
			Uplink	1.8	
		Base coverage urban	Downlink	2.2	
			Uplink	1.4	
		High speed	Downlink	1.1	
			Uplink	0.7	
4.2	Peak spectral efficiency (bit/s/Hz)	Not applicable	Downlink	15	
			Uplink	6.75	
4.3	Bandwidth	Not applicable	Up to and including (MHz)	40	
			Scalability	Support of at least three bandwidth values	
4.4	Cell edge user spectral efficiency (bit/s/Hz)	Indoor	Downlink	0.1	
			Uplink	0.07	
		Microcellular	Downlink	0.075	
			Uplink	0.05	
		Base coverage urban	Downlink	0.06	
			Uplink	0.03	
		High speed	Downlink	0.04	
			Uplink	0.015	
4.5.1	Control plane latency (ms)	Not applicable	Not applicable	Less than 100 ms	
4.5.2	User plane latency (ms)	Not applicable	Not applicable	Less than 10 ms	
4.6	Mobility classes	Indoor	Uplink	Stationary, pedestrian	
		Microcellular	Uplink	Stationary, pedestrian, vehicular up to 30 km/h	
		Base coverage urban	Uplink	Stationary, pedestrian, vehicular	
		High speed	Uplink	High speed vehicular, vehicular	

Reference Section of Report ITU-R M.2134	Summary of Assessment of compliance for technical performance				ITU-R confirmation that the requirement is met by the candidate technology proposal
		Category		ITU-R required value	
		Test environment	Downlink or uplink		
4.6	Mobility traffic channel link data rates (bit/s/Hz)	Indoor	Uplink	1	Yes
		Microcellular	Uplink	0.75	
		Base coverage urban	Uplink	0.55	
		High speed	Uplink	0.25	
4.7	Intra-frequency hand-over interruption time (ms)	Not applicable	Not applicable	27.5	
	Inter-frequency handover interruption time within a spectrum band (ms)	Not applicable	Not applicable	40	
	Inter-frequency handover interruption time between spectrum bands (ms)	Not applicable	Not applicable	60	
	Inter-system handover	Not applicable	Not applicable	Not applicable	
4.8	Number of supported VoIP users (active users/sector/MHz)	Indoor	As defined in Report ITU-R M.2134	50	
		Microcellular	As defined in Report ITU-R M.2134	40	
		Base coverage urban	As defined in Report ITU-R M.2134	40	
		High speed	As defined in Report ITU-R M.2134	30	

B Candidate submission from Japan (IMT-ADV/5)

The table for this submission is identical to that in Section A of this Annex (IMT-ADV/4).

C Candidate submission from Japan (IMT-ADV/6)

The tables for this submission are identical to that in Section E.1 and E.2 of this Annex (IMT-ADV/8).

D Candidate submission from TTA (IMT-ADV/7)

The table for this submission is identical to that in Section A of this Annex (IMT-ADV/4).

E Candidate submission from 3GPP Proponent (IMT-ADV/8)

E.1 FDD RIT

Reference Section of Report ITU-R M.2133	Summary of Assessment of compliance or services	ITU-R confirmation that the requirement is met by the candidate technology proposal
4.2.4.1.1	Support of a wide range of services	Yes
4.2.4.1.1.1	Ability to support basic conversational service class	
4.2.4.1.1.2	Support of rich conversational service class	
4.2.4.1.1.3	Support of conversational low delay service class	

Reference Section of Report ITU-R M.2133	Summary of Assessment of compliance for spectrum	ITU-R confirmation that the requirement is met by the candidate technology proposal
4.2.4.2.1	Spectrum bands – Is the proposal able to utilize at least one band identified for IMT?	Yes

Reference Section of Report ITU-R M.2134	Summary of Assessment of compliance for technical performance				ITU-R confirmation that the requirement is met by the candidate technology proposal
		Category		ITU-R required value	
		Test environment	Downlink or uplink		
4.1	Cell spectral efficiency (bit/s/Hz/cell)	Indoor	Downlink	3	Yes
			Uplink	2.25	
		Microcellular	Downlink	2.6	
			Uplink	1.8	
		Base coverage urban	Downlink	2.2	
			Uplink	1.4	
		High speed	Downlink	1.1	
			Uplink	0.7	
4.2	Peak spectral efficiency (bit/s/Hz)	Not applicable	Downlink	1.5	
			Uplink	6.75	
4.3	Bandwidth	Not applicable	Up to and including (MHz)	40	
			Scalability	Support of at least three bandwidth values	
4.4	Cell edge user spectral efficiency (bit/s/Hz)	Indoor	Downlink	0.1	
			Uplink	0.07	
		Microcellular	Downlink	0.075	
			Uplink	0.05	
		Base coverage urban	Downlink	0.06	
			Uplink	0.03	
		High speed	Downlink	0.04	
			Uplink	0.015	

Reference Section of Report ITU-R M.2134	Summary of Assessment of compliance for technical performance				ITU-R confirmation that the requirement is met by the candidate technology proposal
		Category		ITU-R required value	
		Test environment	Downlink or uplink		
4.5.1	Control plane latency (ms)	Not applicable	Not applicable	Less than 100 ms	Yes
4.5.2	User plane latency (ms)	Not applicable	Not applicable	Less than 10 ms	
4.6	Mobility classes	Indoor	Uplink	Stationary, pedestrian	
		Microcellular	Uplink	Stationary, pedestrian, vehicular up to 30 km/h	
		Base coverage urban	Uplink	Stationary, pedestrian, vehicular	
		High speed	Uplink	High speed vehicular, vehicular	
	Mobility traffic channel link data rates (bit/s/Hz)	Indoor	Uplink	1	
		Microcellular	Uplink	0.75	
		Base coverage urban	Uplink	0.55	
		High speed	Uplink	0.25	
4.7	Intra-frequency hand-over interruption time (ms)	Not applicable	Not applicable	27.5	
	Inter-frequency handover interruption time within a spectrum band (ms)	Not applicable	Not applicable	40	
	Inter-frequency handover interruption time between spectrum bands (ms)	Not applicable	Not applicable	60	
	Inter-system handover	Not applicable	Not applicable	Not applicable	
4.8	Number of supported VoIP users (active users/sector/MHz)	Indoor	As defined in Report ITU-R M.2134	50	
		Microcellular	As defined in Report ITU-R M.2134	40	
		Base coverage urban	As defined in Report ITU-R M.2134	40	
		High speed	As defined in Report ITU-R M.2134	30	

E.2 TDD RIT

Reference Section of Report ITU-R M.2133	Summary of Assessment of compliance for services	ITU-R confirmation that the requirement is met by the candidate technology proposal
4.2.4.1.1	Support of a wide range of services	Yes
4.2.4.1.1.1	Ability to support basic conversational service class	
4.2.4.1.1.2	Support of rich conversational service class	
4.2.4.1.1.3	Support of conversational low delay service class	

Reference Section of Report ITU-R M.2133	Summary of Assessment of compliance for spectrum	ITU-R confirmation that the requirement is met by the candidate technology proposal
4.2.4.2.1	Spectrum bands – Is the proposal able to utilize at least one band identified for IMT?	Yes

Reference Section of Report ITU-R M.2134	Summary of Assessment of compliance for technical performance				ITU-R confirmation that the requirement is met by the candidate technology proposal
		Category		ITU-R required value	
		Test environment	Downlink or uplink		
4.1	Cell spectral efficiency (bit/s/Hz/cell)	Indoor	Downlink	3	Yes
			Uplink	2.25	
		Microcellular	Downlink	2.6	
			Uplink	1.8	
		Base coverage urban	Downlink	2.2	
			Uplink	1.4	
		High speed	Downlink	1.1	
			Uplink	0.7	
4.2	Peak spectral efficiency (bit/s/Hz)	Not applicable	Downlink	15	
			Uplink	6.75	
4.3	Bandwidth	Not applicable	Up to and including (MHz)	40	
			Scalability	Support of at least three bandwidth values	
4.4	Cell edge user spectral efficiency (bit/s/Hz)	Indoor	Downlink	0.1	
			Uplink	0.07	
		Microcellular	Downlink	0.075	
			Uplink	0.05	
		Base coverage urban	Downlink	0.06	
			Uplink	0.03	
		High speed	Downlink	0.04	
			Uplink	0.015	

Reference Section of Report ITU-R M.2134	Summary of Assessment of compliance for technical performance				ITU-R confirmation that the requirement is met by the candidate technology proposal
		Category		ITU-R required value	
		Test environment	Downlink or uplink		
4.5.1	Control plane latency (ms)	Not applicable	Not applicable	Less than 100 ms	Yes
4.5.2	User plane latency (ms)	Not applicable	Not applicable	Less than 10 ms	
4.6	Mobility classes	Indoor	Uplink	Stationary, pedestrian	
		Microcellular	Uplink	Stationary, pedestrian, vehicular up to 30 km/h	
		Base coverage urban	Uplink	Stationary, pedestrian, vehicular	
		High speed	Uplink	High speed vehicular, vehicular	
	Mobility traffic channel link data rates (bit/s/Hz)	Indoor	Uplink	1	
		Microcellular	Uplink	0.75	
		Base coverage urban	Uplink	0.55	
		High speed	Uplink	0.25	
4.7	Intra-frequency hand-over interruption time (ms)	Not applicable	Not applicable	27.5	
	Inter-frequency handover interruption time within a spectrum band (ms)	Not applicable	Not applicable	40	
	Inter-frequency handover interruption time between spectrum bands (ms)	Not applicable	Not applicable	60	
	Inter-system handover	Not applicable	Not applicable	Not applicable	
4.8	Number of supported VoIP users (active users/sector/MHz)	Indoor	As defined in Report ITU-R M.2134	50	
		Microcellular	As defined in Report ITU-R M.2134	40	
		Base coverage urban	As defined in Report ITU-R M.2134	40	
		High speed	As defined in Report ITU-R M.2134	30	

F Candidate submission from China (People's Republic of) (IMT-ADV/9)

The table for this submission is identical to that in Section E.2 of this Annex (IMT-ADV/8).