International Telecommunication Union

Committed to connecting the world

Background

For the last 25 years, ITU has been coordinating the development of a global broadband multimedia international mobile telecommunication system, known as IMT.

Since 2000, the world has seen the introduction of the first family of standards derived from the IMT concept – IMT-2000 (commonly referred to as 3G). 3G is now widely deployed and being rapidly enhanced.

"IMT-Advanced" provides a global platform on which to build the next generations of mobile services - fast data access, unified messaging and broadband multimedia - in the form of exciting new interactive services and applications.

What is IMT-Advanced?

IMT-Advanced systems are mobile systems that include new capabilities that go beyond those of IMT-2000. They will:

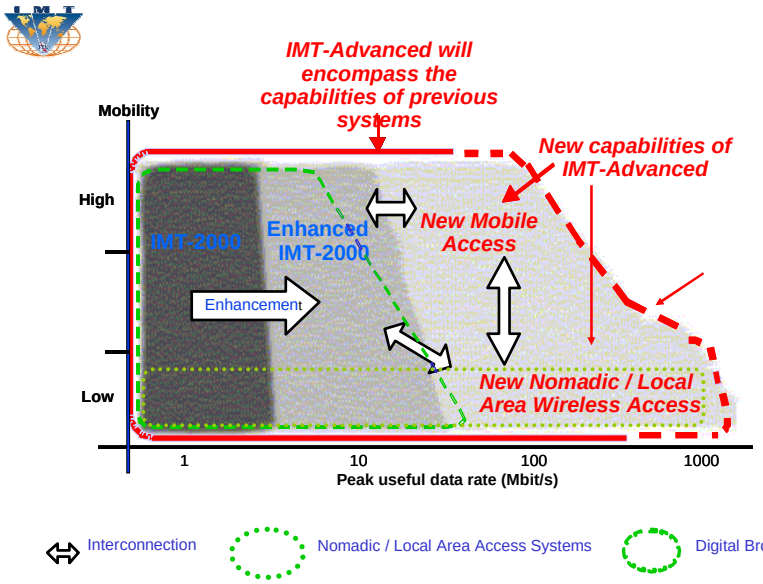
- provide access to a wide range of telecommunication services including advanced mobile services, supported by mobile and fixed networks, which are increasingly packet-based.
- support low to high mobility applications and a wide range of data rates in accordance with user and service demands in multiple user environments.
- provide for high quality multimedia applications within a wide range of services and platforms, providing a significant improvement in performance and quality of service.

Key features

- 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; and,
- 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)*.

* See Recommendation ITU-R M.1645

Capabilities

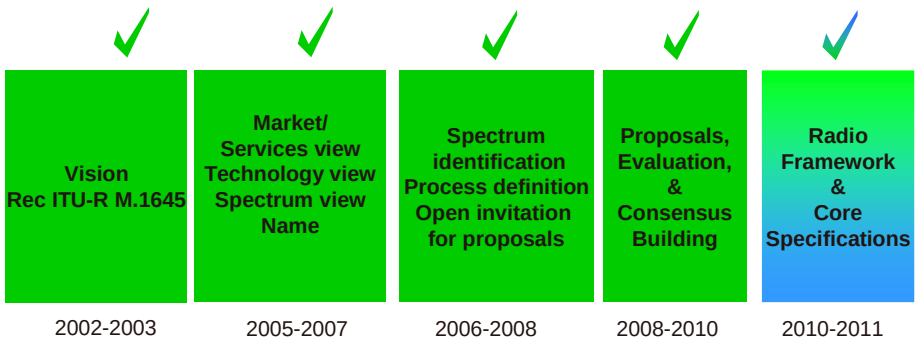


Resolution ITU-R 57

- ITU-R has commenced the process of developing ITU-R Recommendations for the terrestrial components of the IMT-Advanced radio interface(s). This work is guided by Resolution ITU-R 57, which was approved by the Radiocommunication Assembly in 2007.

- Resolution ITU-R 57 on the “Principles for the process of development of IMT-Advanced” outlines the essential criteria and principles which will be used in the process of developing the Recommendations and Reports for IMT-Advanced, including Recommendation(s) for the radio interface specification.

The IMT-Advanced Process

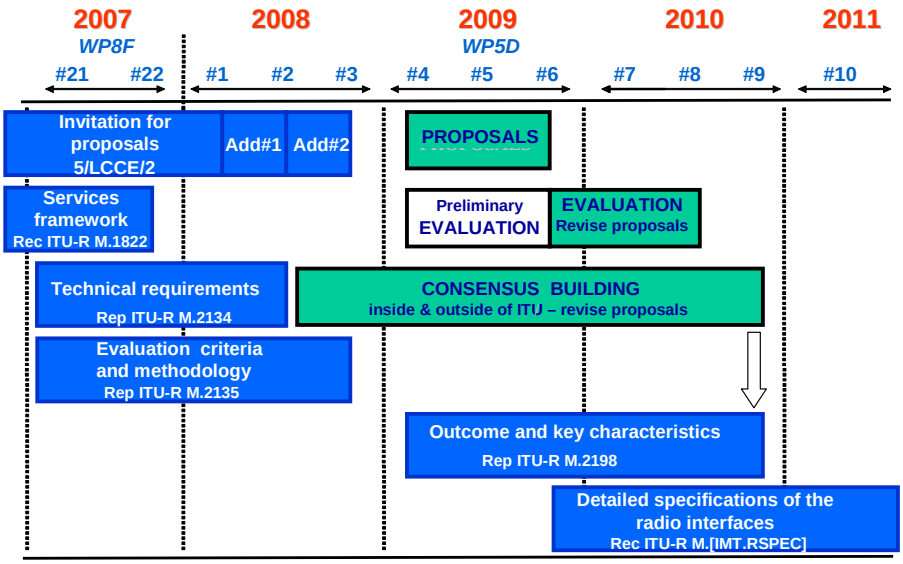


Q. 229-2/5
2000-2003-2008

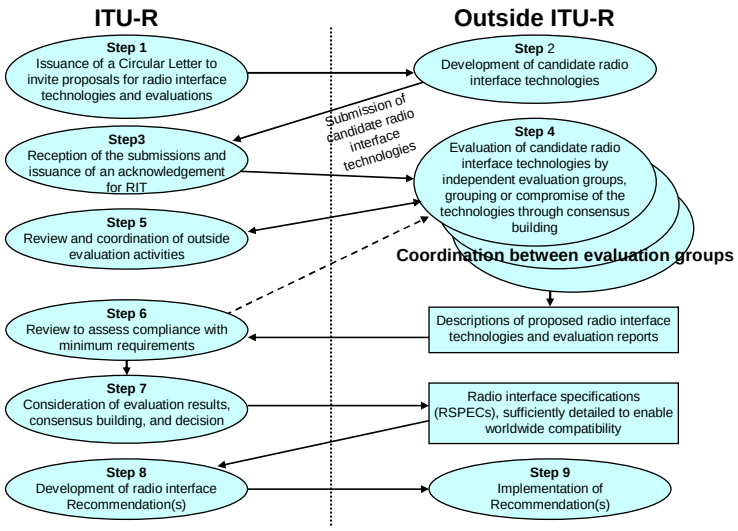
Setting the stage for the future:
Vision, spectrum, and technology views

Defining the technology

Schedule



IMT-Advanced development process



Key documents

Circular Letter 5/LCCE/2 and addenda 7 Mar 2008 & 12 Aug 2008
INVITATION FOR SUBMISSION OF PROPOSALS FOR CANDIDATE RADIO TECHNOLOGIES FOR THE TERRESTRIAL COMPONENT OF IMT-ADVANCED

Doc. IMT-ADV/1 30 May 2008
BACKGROUND ON IMT-ADVANCED

Doc IMT-ADV/2 Rev 1 7 Aug 2008
TIMELINES, SUBMISSION AND EVALUATION PROCESS, AND CONSENSUS BUILDING

REPORT ITU-R M.2133 11 Nov 2008
REQUIREMENTS, EVALUATION CRITERIA, and SUBMISSION TEMPLATES FOR THE DEVELOPMENT OF IMT-ADVANCED

REPORT ITU-R M.2134 11 Nov 2008
REQUIREMENTS RELATED TO TECHNICAL PERFORMANCE FOR IMT-ADVANCED RADIO INTERFACE(S)

REPORT ITU-R M.2135 11 Nov 2008
GUIDELINES FOR EVALUATION OF RADIO INTERFACE TECHNOLOGIES FOR IMT-ADVANCED

Circular Letter 5/LCCE/2 and addenda

Step 1 – Issue the Circular Letter

- The purpose of this Circular Letter was to invite the submission of proposals for candidate radio interface technologies (RITs) or a set of RITs (SRITs) for the terrestrial components of IMT−Advanced.
- This Circular Letter also initiated an ongoing process to evaluate the candidate RITs or SRITs for IMT−Advanced, and invited the formation of independent evaluation groups and the subsequent submission of evaluation reports on these candidate RITs or SRITs.

IMT-Advanced submissions

Step 2 – development of candidate radio technologies

- Six proposals based on the IEEE 802.16m or 3GPP LTE-Advanced technology were submitted for candidate radio interface technologies for IMT-Advanced at the 6th meeting of ITU-R WP5D in October 2009.

Step 3 – acknowledgement

- WP5D determined that each submission was “complete”, and issued an acknowledgement to all proponents.

Step 4 – evaluation

WP5D initiated evaluation of the six candidate technology submissions.

- Correspondence Groups were established as a tool to augment communication and to facilitate the evaluation work.
- The 3rd workshop on IMT-Advanced was held on 15th October 2009.
  - Proponents of IMT-Advanced candidate radio interface technologies and external evaluation groups were invited to join and make presentations.

Evaluation Groups

14 Groups were established:

- **ARIB Evaluation Group**
- **ATIS WTSC**
- **Canadian Evaluation Group (CEG)**
- **Chinese Evaluation Group (ChEG)**
- **ETSI**
- **Israeli Evaluation Group (IEG)**
- **Russian Evaluation Group (REG)**
- **TCOE India**
- **TR-45**
- **TTA PG707**
- **UADE, Instituto de Tecnología (Argentina)**
- **Wireless Communications Association International (WCAI)**
- **WiMAX Forum Evaluation Group**
- **WINNER+**

Evaluation

Step 5 – review and coordination of evaluations

- final evaluation reports and relevant contributions on the candidate technologies were received at the 8th meeting of WP5D in June 2010.

Step 6 – review to assess compliance with the minimum requirements

- WP 5D commenced this review at the 8th meeting of WP5D in June 2010.

Step 7 – consideration of evaluation results, consensus-building and decision

- This activity will be completed at the October 2010 meeting

Step 8 – development of radio interface specifications

- Preliminary draft new Recommendation ITU-R M.[IMT.RSPEC] started, completion expected mid 2011.
- The update procedure for M.[IMT.RSPEC] was also addressed.

Step 9 – implementation of the Recommendations

Decision

LTE-Advanced and **WirelessMAN-Advanced** technologies were each determined to have successfully met all of the criteria established by ITU-R for the first release of IMT-Advanced.

LTE-Advanced is developed by 3GPP as LTE Release 10 and Beyond (LTE-Advanced).

WirelessMAN-Advanced is developed by IEEE as the WirelessMAN-Advanced specification incorporated in IEEE Std 802.16 beginning with approval of IEEE Std 802.16m.

Full details of the submissions and evaluation process are contained in the recently approved Report ITU-R M.2198

The detailed technical specifications of these radio interfaces will be contained in Recommendation ITU-R M.[RSPEC] to be finalized in early 2012.

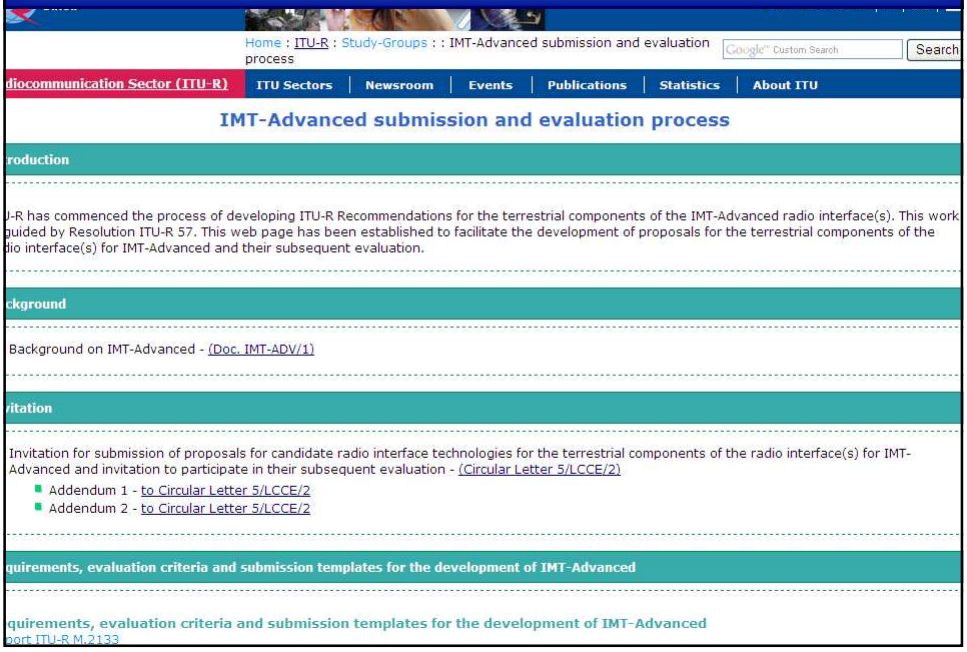
Future standardization of IMT

Just as 3G is currently continuing to be enhanced, IMT-Advanced will also evolve over time and these updated Recommendations will be developed in WP 5D

WP5D has also commenced studying future requirements and has commenced an “Analysis and assessment of global broadband wireless services and marketplace for IMT” based on input contributions at the July 2010 meeting of WP5D.

- a workshop to further this work is planned in 2011
- This study is expected to be finalized around the end of 2011

http://www.itu.int/ITU-R/go/rsg5-imt-advanced



Thank you

Colin Langtry
Counsellor for ITU Radiocommunication Study Group 5

References

- **Circular Letter 5/LCCE/2 -** Invitation for proposals and evaluation groups
- **Doc. IMT-ADV/1 -** Background on IMT-Advanced
- **Doc. IMT-ADV/2 Rev.1 -** Submission and evaluation process and consensus building
- **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** - Guidelines for evaluation of radio interface technologies for IMT-Advanced
- **Spectrum Aspects Documents**
- **Marketplace and User Needs Aspects Documents**
- **Regulatory Aspects Documents**
- **Technology Aspects Documents**

Circular Letter 5/LCCE/2 and addenda
Invitation for proposals and evaluation groups

- The purpose of this Circular Letter is to invite the submission of proposals for candidate radio interface technologies (RITs) or a set of RITs (SRITs) for the terrestrial components of IMT−Advanced.
- This Circular Letter also initiates an ongoing process to evaluate the candidate RITs or SRITs for IMT−Advanced, and invites the formation of independent evaluation groups and the subsequent submission of evaluation reports on these candidate RITs or SRITs.

DOCUMENT IMT-ADV/1
Background on IMT-Advanced

This document provides summary and background information on IMT-Advanced.

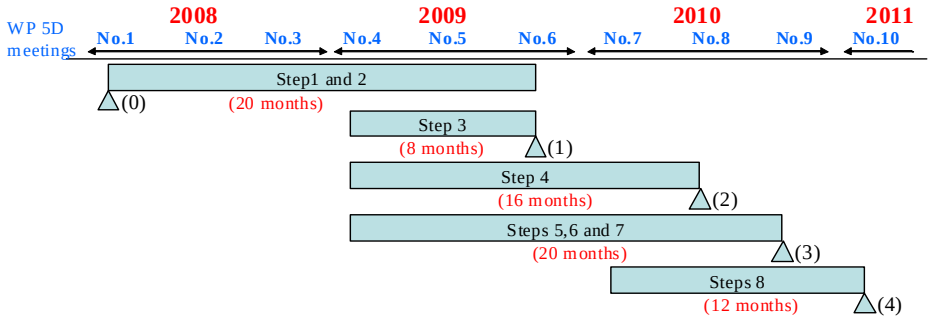
International Mobile Telecommunications-Advanced (IMT-Advanced) systems are mobile systems that include the new capabilities of IMT that go beyond those of IMT-2000. Such systems provide access to a wide range of telecommunication services including advanced mobile services, supported by mobile and fixed networks, which 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 within a wide range of services and platforms, providing a significant improvement in performance and quality of service.

DOCUMENT IMT-ADV/2 Rev 1
Submission and evaluation process and consensus building

- This document describes the process and activities identified for the development of the IMT−Advanced terrestrial components radio interface Recommendations:
- **1 Time schedule**
- The time schedule described below applies to the first invitation for candidate RITs or SRITs. Subsequent time schedules will be decided according to the submissions of proposals.
- Submission of proposals may begin at any time subsequent to the release of Circular Letter 5/LCCE/2, dated 7 March 2008.The final deadline for submissions is 16:00 hours UTC, 7 calendar days prior to the start of the 6th meeting of Working Party 5D (WP 5D) in the latter part of 2009. The evaluation of the proposed radio interface technologies by the evaluation groups and the consensus-building process will be performed throughout this time period and thereafter. The detailed schedule can be found in Figure A2-1.

FIGURE A2-1
Schedule for the development of IMT-Advanced radio interface Recommendations



Steps in radio interface development process:

Step 1: Issuance of the circular letter
Step 2: Development of candidate RITs and SRITs
Step 3: Submission/Reception of the RIT and SRIT proposals and acknowledgement of receipt
Step 4: Evaluation of candidate RITs and 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
Step 8: Development of radio interface Recommendation(s)

Critical milestones in radio interface development process:

(0): Issue an invitation to propose RITs	March 2008	(2): Cut off for evaluation report to ITU	June 2010
(1): ITU proposed cut off for submission of candidate RIT and SRIT proposals	October 2009	(3): WP 5D decides framework and key characteristics of IMT-Advanced RITs and SRITs	October 2010
		(4): WP 5D completes development of radio interface specification Recommendations	February 2011

IMT-Advanced A2-01

REPORT ITU-R M.2133
Requirements, evaluation criteria and submission templates for the development of IMT-Advanced

This Report supports the process for IMT-Advanced initiated by Circular Letter 5/LCCE/2 and its' Addenda. It addresses the requirements, evaluation criteria, as well as submission templates required for a *complete submission* of candidate radio interface technologies (RITs) and candidate sets of radio interface technologies (SRITs) for IMT-Advanced.

It provides:

- 1)The service, spectrum and technical performance requirements for candidate RITs/SRITs for IMT-Advanced.
- 2)Evaluation guidelines including evaluation criteria and procedures to evaluate technology submissions for IMT-Advanced.
- 3)Submission templates that proponents must utilize to organize the information that is required in a submission of a candidate technology for evaluation. Proponents must provide the required information.

Report ITU-R M.2133 - contents

IMT-ADVANCED REQUIREMENTS

- Services
- Spectrum
- Technical Performance → **Report ITU-R M.2134**

IMT-ADVANCED EVALUATION

- Guidelines, evaluation criteria → **Report ITU-R M.2135**
- Required number of test environments

IMT-ADVANCED SUBMISSION GUIDELINES & TEMPLATES

- Completeness of Submissions
- Submission Guidelines and Templates
- Submission Guidelines
- Templates for Submission
- RIT/SRIT description template
- RIT/SRIT compliance templates

Report ITU-R M.2134

Requirements related to technical performance for IMT-Advanced radio interface(s)

- This Report describes requirements related to technical performance for IMT-Advanced candidate radio interfaces. These requirements were used in the development of Report ITU-R M.2135 – “Guidelines for evaluation of radio interface technologies for IMT-Advanced”
- It also provides the necessary background information about the individual requirements and the justification for the items and values chosen. This information is needed for a broader understanding of the requirements.
- It is based on the ongoing development activities from external research and technology organizations.

Report ITU-R M.2135

Guidelines for evaluation of radio interface technologies for IMT-Advanced

- This Report provides guidelines for both the procedure and the criteria (technical, spectrum and service) to be used in evaluating the proposed IMT-Advanced radio interface technologies (RITs) or Sets of RITs (SRITs) for a number of test environments and deployment scenarios for evaluation. These test environments are chosen to simulate closely the more stringent radio operating environments. The evaluation procedure is designed in such a way that the overall performance of the candidate RIT/SRITs may be fairly and equally assessed on a technical basis. It ensures that the overall IMT-Advanced objectives are met.
- It provides, for proponents, developers of candidate RIT/SRITs and evaluation groups, the common methodology and evaluation configurations to evaluate the proposed candidate RIT/SRITs and system aspects impacting the radio performance.
- It allows a degree of freedom so as to encompass new technologies. The actual selection of the candidate RIT/SRITs for IMT-Advanced is outside the scope of this Report.
- The candidate RIT/SRITs will be assessed based on these evaluation guidelines. If necessary, additional evaluation methodologies may be developed by each independent evaluation group to complement the evaluation guidelines. Any such additional methodology should be shared between evaluation groups and sent to the Radiocommunication Bureau as information in the consideration of the evaluation results by ITU-R and for posting under additional information relevant to the evaluation group section of the ITU-R IMT-Advanced web page (http://www.itu.int/ITU-R/go/rsg5-imt-advanced).

Spectrum Aspects Documents

- **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*
  (completed 2006 ITU-R deliverable)
- **Report ITU-R M.2078** *Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced*
  (completed 2006 ITU-R deliverable)
- **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*
  (completed 2006 ITU-R deliverable)

Marketplace and User Needs Aspects Documents

- ***Recommendation ITU-R M.1645*** *Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000*
  (completed 2002/2003 ITU-R deliverable)
- **Report ITU-R M.2072** *World mobile telecommunication market forecast*
  (completed 2005 ITU-R deliverable)
- **Recommendation ITU-R M.1822** *Framework for Services delivered by IMT*
  (completed 2007 ITU-R deliverable)

Regulatory Aspects Documents

- **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* *(completed 1994-1999-2003-2007 ITU-R deliverable – update currently in progress)*
- **Resolution ITU-R 56** *Naming for International Mobile Telecommunications*
  (completed 2005 ITU-R deliverable)
- **Reports ITU-R M.2109, M.2110, M.2111, & M.2112** *(IMT related sharing studies covering various bands and technologies)*
  (completed 2005 ITU-R deliverable)

Technology Aspects Documents

- **Resolution ITU-R 57** *Principles for the process of development of IMT-Advanced (Question ITU-R 229/8)*
  (completed 2006ITU-R deliverable)
- **Report ITU-R M.2038** *Technology Trends*
  (completed 2005 ITU-R deliverable)
- **Report ITU-R M.2074** *Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000*
  (completed 2005 ITU-R deliverable)
- **Report ITU-R M.2133** *Requirements, evaluation criteria, and submission templates for the development of IMT-Advanced*
  (completed 2008 ITU-R deliverable)
- **Report ITU-R M.2134** *Requirements related to technical system performance for IMT-Advanced Radio interface(s)*
  (completed 2008 ITU-R deliverable)
- **Report ITU-R M.2135** *Guidelines for evaluation of radio interface technologies for IMT-Advanced*
  (completed 2008 ITU-R deliverable)