REPORT ITU-R M.2133

Requirements, evaluation criteria and submission templates for the development of IMT-Advanced

(2008)

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Scope

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.

1 Introduction

This Report on the requirements, evaluation criteria and submission templates for the development of Recommendations and Reports on IMT-Advanced, such as the detailed specifications of IMT-Advanced, provides:

a) The service, spectrum and technical performance requirements for candidate RITs/SRITs for IMT-Advanced.

b) Evaluation guidelines including evaluation criteria and procedures to evaluate technology submissions for IMT-Advanced.

c) 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.

Additional specific details, including the process, the steps and relevant timelines may be found on the ITU-R IMT-Advanced web page (http://www.itu.int/ITU-R/go/rsg5-imt-advanced) under the link "Submission and evaluation process and consensus building" (see Document IMT-ADV/2(Rev.1) - Submission and evaluation process and consensus building).

2 IMT-Advanced requirements

The requirements established in this section relate to services, spectrum and technical performance aspects**.**

IMT-Advanced can be considered from multiple perspectives, including those of the users, manufacturers, application developers, network operators, and service and content providers as noted in § 4.2.2 in Recommendation ITU-R M.1645 – Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000. Therefore, it is recognized that the technologies for IMT-Advanced can be applied in a variety of deployment scenarios, different service capabilities, and technology options. Consideration of every variation to encompass all situations is therefore not possible; nonetheless the work of the ITU-R has been to determine a representative view of IMT-Advanced deployment scenarios in accordance with the process defined in Resolution ITU-R 57 – Principles for the process of development of IMT-Advanced.

The intent of the requirements is to ensure that IMT-Advanced technologies are able to fulfil the objectives of IMT-Advanced and to set a specific level of performance that each proposed technology need to achieve in order to be accepted within ITU-R for IMT-Advanced. The requirements are not intended to restrict the full range of capabilities or performance that candidate technologies for IMT-Advanced might achieve, nor is it intended to describe how the IMT-Advanced technologies might perform in actual deployments under operating conditions that could be different from those presented in ITU-R Recommendations and Reports on IMT-Advanced.

2.1 Services

Recommendation ITU-R M.1822 – Framework for services supported by IMT, addresses the high level requirements for services and applications to be supported by IMT. It includes service parameters and service classifications of IMT, and service examples that may be supported by IMT.

While a specific set of services is not required, the service classifications in Recommendation ITU-R M.1822 and § 7.4.4 – Support for a wide range of services of Report ITU-R M.2135 – Requirements, evaluation criteria, and submission templates for the development of IMT-Advanced should be used to ensure that a wide range of telecommunication services to mobile users can be provided by IMT.

The service capability requirements are in the compliance templates in § 4.2.4.1.

2.2 Spectrum

The following frequency bands have been identified for IMT and/or IMT-2000 by WARC-92, WRC-2000 and WRC-07:

450-470 MHz (see No. 5.286AA of the Radio Regulations (RR))

698-960 MHz (see RR No. 5.317A)

1 710-2 025 MHz (see RR No. 5.384A)

2 110-2 200 MHz (see RR No. 5.388)

2 300-2 400 MHz (see RR No. 5.384A)

2 500-2 690 MHz (see RR No. 5.384A)

3 400-3 600 MHz (see RR Nos. 5.430A, 5.432A, 5.432B, 5.433A)

ITU-R has developed frequency arrangements for the bands identified by WARC-92 and WRC-2000, which are described in Recommendation ITU-R M.1036-3. For the frequency bands that were identified at WRC-07, work on the frequency arrangements is ongoing in ITU-R.

It is anticipated that Administrations will endeavour to make spectrum available from the frequency bands listed above.

The requirements related to spectrum are in the compliance templates in § 4.2.4.2.

2.3 Technical performance

Report ITU-R M.2134 – Requirements related to technical system performance for IMT-Advanced radio interface(s) describes requirements related to technical performance for IMT-Advanced candidate radio interface technologies and also provides the necessary background information about the individual requirements and the justification for the items and values chosen.

The requirements related to technical performance are in the compliance templates in § 4.2.4.3.

3 IMT-Advanced evaluation

Candidate RITs or SRITs will be evaluated according to the guidelines in this section.

3.1 Guidelines, evaluation criteria and methodology

Report ITU-R M.2135 provides guidelines for both the procedure and the criteria (technical, spectrum and service) to be used in evaluating the candidate IMT-Advanced RITs or SRITs for a number of test environments and deployment scenarios for evaluation. The evaluation procedure is

designed in such a way that the overall performance of a candidate RIT/SRIT is fairly and consistently assessed on a technical basis.

3.2 Required number of test environments to be fulfilled

An RIT or SRIT will be accepted for inclusion in the standardization phase if, as the result of deliberation by ITU-R, it is determined that the RIT or SRIT meets the requirements of Resolution ITU-R 57, *resolves* 6 e) and f) for three of the four test environments defined in § 8 of Report ITU-R M.2135. These requirements are specified in § 2 of this Report.

4 IMT-Advanced submission guidelines and templates for details of submission[1]

4.1 Completeness of submissions

A complete submission under Step 3 of the IMT-Advanced process in Document IMT-ADV/2(Rev.1) is one that provides the three major components of the submission as referenced below. All components of the complete submission for the first invitation must be received by the final deadline specified in Document IMT-ADV/2(Rev.1). Proponents must provide all required information within each of the major components:

1 The submission of each candidate RIT or SRIT shall consist of completed templates as specified in § 4.2 together with any additional inputs which the proponent may consider relevant to the evaluation. Each proposal must also indicate the version of the minimum technical requirements and evaluation criteria of the IMT-Advanced currently in force that it is intended for and make reference to the associated requirements. In particular for a candidate SRIT, the completed templates as requested in this item should be provided for each candidate RIT within the composite SRIT and/or for the composite SRIT.

2 The entity that proposes a candidate RIT or SRIT to the ITU-R (the proponent) shall include with it either an initial self-evaluation or the proponents' endorsement of an initial evaluation submitted by another entity and based on the compliance templates in § 4.2.4. The submission will not be considered complete without an initial self-evaluation or the proponents' endorsement of an initial evaluation submitted by another entity. It is noted that the initial self-evaluation or the proponents' endorsement of an initial evaluation submitted by another entity is an evaluation performed using the same guidelines and criteria established for the evaluations under Step 4 of the process as provided in Document IMT-ADV/2(Rev.1), based on the RIT/SRIT compliance template in § 4.2.4. In particular, for a candidate SRIT, the completed initial self-evaluation or initial evaluation as requested in this item should be provided for each candidate RIT within the composite SRIT and/or for the composite SRIT.

3 Proponents and IPR holders should indicate their compliance with the ITU policy on intellectual property rights (see Annex 1 of Resolution ITU-R 1), as specified in the Common Patent Policy for ITUT/ITU-R/ISO/IEC available at http://www.itu.int/ITU-T/dbase/patent/patent-policy.html.

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[1] Additional specific details, including the process, the steps and relevant timelines may be found on the ITU-R IMT-Advanced web page (http://www.itu.int/ITU-R/go/rsg5-imt-advanced) under the link "Submission and evaluation process and consensus building".

4.2 Submission guidelines and templates

4.2.1 Submission guidelines

Submission of the ITU-R requested information and voluntary supplementary information addressing the description template and compliance template on the candidate RITs or SRITs by proponents in the form of completed templates shown in § 4.2.2 can be made electronically or by other means to the ITU-R.

4.2.2 Templates for submission

Templates required for submission of IMT-Advanced candidate RITs or SRITs are divided into two categories: **an RIT/SRIT description template** and **RIT /SRIT compliance templates**. Each set of responses:

a) must complete the RIT/SRIT description template and RIT/SRIT compliance templates – this is information developed in a template format in order to provide a common base of information across the submissions and therefore follows a defined format, asks certain questions, and proposes the responses be provided in a suggested format to the questions determined by ITU-R; and

b) may include voluntary supplementary information – this is additional information deemed relevant by the proponent to provide for further understanding of the submission. This information may be formatted as desired by the proponent.

4.2.3 RIT/SRIT description template

This section provides a template for the description of the characteristics of a candidate RIT or SRIT.

Information should be provided for each test environment for which the candidate RIT or SRIT is proposed to operate. This can be done by preparing:

– a separate template submission for each test environment; or

– a single submission that includes multiple answers for those technical parameters impacted by a test environment.

4.2.3.1 Description template background

The Description Template is a template for the description of the characteristics of a candidate RIT or SRIT. It shall be used by the proponents to describe their proposal for a radio interface for IMT-Advanced to a level of detail that will facilitate a sufficient understanding of the proposed technology to enable an independent technical assessment of compliance with the IMT-Advanced requirements as specified in this Report.

The inclusion of an item in this template shall not imply that it is a minimum requirement of IMT-Advanced. Proponents are encouraged to extend beyond the template if additional information would assist in the assessment.

Furthermore, where an item is not relevant to or for a proposal, it should be answered N/A (Not Applicable); optionally with an explanation of why the item is not applicable. However, the proponents should be aware that providing sufficient information relevant to the assessment will assist in the evaluation of their proposal by avoiding requests for additional information.

4.2.3.2 Description template – characteristics template

Item	Item to be described
4.2.3.2.1	**Test environment(s)**
4.2.3.2.1.1	What test environments (described in Report ITU-R M.2135) does this technology description template address?
4.2.3.2.2	**Radio interface functional aspects**
4.2.3.2.2.1	*Multiple access schemes* Which access scheme(s) does the proposal use: TDMA, FDMA, CDMA, OFDMA, IDMA, SDMA, hybrid, or another? Describe in detail the multiple access schemes employed with their main parameters.
4.2.3.2.2.2	*Modulation scheme*
4.2.3.2.2.2.1	What is the baseband modulation scheme? If both data modulation and spreading modulation are required, describe in detail. Describe the modulation scheme employed for data and control information. What is the symbol rate after modulation?
4.2.3.2.2.2.2	*PAPR* What is the RF peak to average power ratio after baseband filtering (dB)? Describe the PAPR (peak-to-average power ratio) reduction algorithms if they are used in the proposed RIT.
4.2.3.2.2.3	*Error control coding scheme and interleaving*
4.2.3.2.2.3.1	Provide details of error control coding scheme for both downlink and uplink? For example, – FEC or other schemes? – Unequal error protection? Explain the decoding mechanism employed.
4.2.3.2.2.3.2	Describe the bit interleaving scheme for both uplink and downlink.
4.2.3.2.3	**Describe channel tracking capabilities (e.g. channel tracking algorithm, pilot symbol configuration, etc.) to accommodate rapidly changing delay spread profile.**
4.2.3.2.4	**Physical channel structure and multiplexing**
4.2.3.2.4.1	What is the physical channel bit rate (Mbit/s) for supported bandwidths? i.e., the product of the modulation symbol rate (in symbols per second), bits per modulation symbol, and the number of streams supported by the antenna system.
4.2.3.2.4.2	*Layer 1 and Layer 2 overhead estimation.* Describe how the RIT accounts for all layer 1 (PHY) and layer 2 (MAC) overhead and provide an accurate estimate that includes static and dynamic overheads.
4.2.3.2.4.3	*Variable bit rate capabilities*: Describe how the proposal supports different applications and services with various bit rate requirements.

Item	Item to be described
4.2.3.2.4.4	*Variable payload capabilities:* Describe how the RIT supports IP-based application layer protocols/services (e.g., VoIP, video-streaming, interactive gaming, etc.) with variable-size payloads.
4.2.3.2.4.5	*Signalling transmission scheme*: Describe how transmission schemes are different for signalling/control from that of user data.
4.2.3.2.5	**Mobility management (Handover)**
4.2.3.2.5.1	Describe the handover mechanisms and procedures which are associated with – Inter-System handover – Intra-System handover o Intra-frequency and Inter-frequency o Within the RIT or between RITs within one SRIT (if applicable) Characterize the type of handover strategy or strategies (for example, MS or BS assisted handover, type of handover measurements).
4.2.3.2.5.2	What are the handover interruption times for: • Within the RIT (intra- and inter-frequency) • Between various RITs within a SRIT • Between the RIT and another IMT system.
4.2.3.2.6	**Radio resource management**
4.2.3.2.6.1	Describe the radio resource management, support of, – centralised and/or distributed RRM – dynamic and flexible radio resource management – efficient load balancing.
4.2.3.2.6.2	*Inter-RIT interworking* Describe the functional blocks and mechanisms for interworking (such as a network architecture model) between heterogeneous RITs within a SRIT, if supported.
4.2.3.2.6.3	*Connection/session management* The mechanisms for connection/session management over the air-interface should be described. For example: – the support of multiple protocol states with fast and dynamic transitions. – The signalling schemes for allocating and releasing resources.
4.2.3.2.7	**Frame structure**
4.2.3.2.7.1	Describe the frame structure for downlink and uplink by providing sufficient information such as: – frame length, – the number of time slots per frame, – the number and position of switch points per frame for TDD – guard time or the number of guard bits, – user payload information per time slot, – control channel structure and multiplexing, – power control bit rate.

Item	Item to be described
4.2.3.2.8	**Spectrum capabilities and duplex technologies** NOTE 1 – Parameters for both downlink and uplink should be described separately, if necessary.
4.2.3.2.8.1	*Spectrum sharing and flexible spectrum use* Does the RIT/SRIT support flexible spectrum use and/or spectrum sharing for the bands for IMT? Provide details.
4.2.3.2.8.2	*Channel bandwidth scalability* Describe how the proposal supports channel bandwidth scalability, including the supported bandwidths. Describe whether the proposed RIT supports extensions for scalable bandwidths wider than 40 MHz. Consider, for example: – The scalability of operating bandwidths. – The scalability using single and/or multiple RF carriers. Describe multiple contiguous (or non-contiguous) band aggregation capabilities, if any. Consider for example the aggregation of multiple channels to support higher user bit rates.
4.2.3.2.8.3	What are the frequency bands supported by the RIT? Please list.
4.2.3.2.8.4	What is the minimum amount of spectrum required to deploy a contiguous network, including guardbands (MHz)?
4.2.3.2.8.5	What are the minimum and maximum transmission bandwidth (MHz) measured at the 3 dB down points?
4.2.3.2.8.6	What duplexing scheme(s) is (are) described in this template? (e.g. TDD, FDD or half-duplex FDD). Describe details such as: – What is the minimum (up/down) frequency separation in case of full- and half-duplex FDD? – What is the requirement of transmit/receive isolation in case of full- an half-duplex FDD? Does the RIT require a duplexer in either the mobile station (MS) or BS? – What is the minimum (up/down) time separation in case of TDD? – Whether the DL/UL Ratio variable for TDD? What is the DL/UL ratio supported? If the DL/UL ratio for TDD is variable, what would be the coexistence criteria for adjacent cells?
4.2.3.2.9	**Support of advanced antenna capabilities**
4.2.3.2.9.1	Fully describe the multi-antenna systems supported in the MS, BS, or both that can be used and/or must be used; characterize their impacts on systems performance; e.g., does the RIT have the capability for the use of: – spatial multiplexing techniques, – space-time coding (STC) techniques, – beam-forming techniques (e.g., adaptive or switched).
4.2.3.2.9.2	How many antennas are supported by the BS and MS for transmission and reception? Specify if correlated or uncorrelated antennas in copolar or cross-polar configurations are used. What is the antenna spacing (in wavelengths)?
4.2.3.2.9.3	Provide details on the antenna configuration that is used in the self-evaluation.

Item	Item to be described
4.2.3.2.9.4	If spatial multiplexing (MIMO) is supported, does the proposal support (provide details if supported) – Single codeword (SCW) and/or multi-codeword (MCW) – Open and/or closed loop MIMO – Cooperative MIMO – Single-user MIMO and/or multi-user MIMO.
4.2.3.2.9.5	*Other antenna technologies* Does the RIT/SRIT support other antenna technologies, for example: – remote antennas, – distributed antennas. If so, please describe.
4.2.3.2.9.6	Provide the antenna tilt angle used in the self-evaluation.
4.2.3.2.10	**Link adaptation and power control**
4.2.3.2.10.1	Describe link adaptation techniques employed by RIT/SRIT, including: – the supported modulation and coding schemes, – the supporting channel quality measurements, the reporting of these measurements, their frequency and granularity. Provide details of any adaptive modulation and coding schemes, including: – Hybrid ARQ or other retransmission mechanisms? – Algorithms for adaptive modulation and coding, which are used in the self-evaluation. – Other schemes?
4.2.3.2.10.2	Provide details of any power control scheme included in the proposal, for example: – Power control step size (dB) – Power control cycles per second – Power control dynamic range (dB) – Minimum transmit power level with power control – Associated signalling and control messages.
4.2.3.2.11	**Power classes**
4.2.3.2.11.1	*Mobile station emitted power*
4.2.3.2.11.1.1	What is the radiated antenna power measured at the antenna (dBm)?
4.2.3.2.11.1.2	What is the maximum peak power transmitted while in active or busy state?
4.2.3.2.11.1.3	What is the time averaged power transmitted while in active or busy state? Provide a detailed explanation used to calculate this time average power.
4.2.3.2.11.2	*Base station emitted power*
4.2.3.2.11.2.1	What is the base station transmit power per RF carrier?
4.2.3.2.11.2.2	What is the maximum peak transmitted power per RF carrier radiated from antenna?
4.2.3.2.11.2.3	What is the average transmitted power per RF carrier radiated from antenna?

Item	Item to be described
4.2.3.2.12	**Scheduler, QoS support and management, data services**
4.2.3.2.12.1	*QoS support* – What QoS classes are supported? – How QoS classes associated with each service flow can be negotiated. – QoS attributes, for example: • data rate (ranging from the lowest supported data rate to maximum data rate supported by the MAC/PHY); • control plane and user plane latency (delivery delay); • packet error rate (after all corrections provided by the MAC/PHY layers), and delay variation (jitter). – Is QoS supported when handing off between radio access networks? Please describe. – How users may utilize several applications with differing QoS requirements at the same time.
4.2.3.2.12.2	*Scheduling mechanisms* – Exemplify scheduling algorithm(s) that may be used for full buffer and VoIP traffic in the technology proposal for evaluation purposes. Describe any measurements and/or reporting required for scheduling.
4.2.3.2.13	**Radio interface architecture and protocol stack**
4.2.3.2.13.1	Describe details of the radio interface architecture and protocol stack such as, Logical channels – Control channels – Traffic channels Transport channels and/or physical channels.
4.2.3.2.13.2	What is the bit rate required for transmitting feedback information?
4.2.3.2.13.3	*Channel access*: Describe in details how RIT/SRIT accomplishes initial channel access, (e.g. contention or non-contention based).
4.2.3.2.14	**Cell selection**
4.2.3.2.14.1	Describe in detail how the RIT/SRIT accomplishes cell selection to determine the serving cell for the users.
4.2.3.2.15	**Location determination mechanisms**
4.2.3.2.15.1	Describe any location determination mechanisms that may be used, e.g., to support location based services.
4.2.3.2.16	**Priority access mechanisms**
4.2.3.2.16.1	Describe techniques employed to support prioritization of access to radio or network resources for specific services or specific users (e.g., to allow access by emergency services).

Item	Item to be described
4.2.3.2.17	**Unicast, multicast and broadcast**
4.2.3.2.17.1	Describe how the RIT enables: – broadcast capabilities, – multicast capabilities, – unicast capabilities, using both dedicated carriers and/or shared carriers. Please describe how all three capabilities can exist simultaneously.
4.2.3.2.17.2	Describe whether the proposal is capable of providing multiple user services simultaneously to any user with appropriate channel capacity assignments?
4.2.3.2.17.3	Provide details of the codec used for VoIP capacity in the self evaluation. Does the RIT support multiple voice and/or video codecs? Provide details.
4.2.3.2.17.4	If a codec is used that differs from the one specified in Annex 2 of Report ITU-R M.2135, specify the voice quality (e.g., PSQM, PESQ, CCR, E-Model, MOS) for the corresponding VoIP capacity in the self-evaluation.
4.2.3.2.18	**Privacy, authorization, encryption, authentication and legal intercept schemes**
4.2.3.2.18.1	Any privacy, authorization, encryption, authentication and legal intercept schemes that are enabled in the radio interface technology should be described. Describe whether any synchronisation is needed for privacy and encryptions mechanisms used in the RIT. Describe how the RIT may be protected against attacks, for example: − man in the middle, − replay, − denial of service.
4.2.3.2.19	**Frequency planning**
4.2.3.2.19.1	How does the RIT support adding new cells or new RF carriers? Provide details.
4.2.3.2.20	**Interference mitigation within radio interface**
4.2.3.2.20.1	Does the proposal support Interference mitigation? If so, describe the corresponding mechanism.
4.2.3.2.20.2	What is the signalling, if any, which can be used for intercell interference mitigation?
4.2.3.2.20.3	*Link level interference mitigation* Describe the feature or features used to mitigate intersymbol interference.
4.2.3.2.20.4	Describe the approach taken to cope with multipath propagation effects (e.g. via equalizer, rake receiver, cyclic prefix, etc.).

Item	Item to be described
4.2.3.2.20.5	*Diversity techniques* Describe the diversity techniques supported in the MS and at the BS, including micro diversity and macro diversity, characterizing the type of diversity used, for example: – Time diversity: repetition, Rake-receiver, etc. – Space diversity:multiple sectors, , etc. – Frequency diversity: frequency hopping (FH), wideband transmission, etc. – Code diversity: multiple PN codes, multiple FH code, etc. – Multi-user diversity: proportional fairness (PF), etc. – Other schemes. Characterize the diversity combining algorithm, for example, switched diversity, maximal ratio combining, equal gain combining. Provide information on the receiver/transmitter RF configurations, for example: • number of RF receivers • number of RF transmitters.
4.2.3.2.21	**Synchronization requirements**
4.2.3.2.21.1	Describe RIT's timing requirements, e.g. – Is BS-to-BS synchronization required? Provide precise information, the type of synchronization, i.e., synchronization of carrier frequency, bit clock, spreading code or frame, and their accuracy. – Is BS-to-network synchronization required? State short-term frequency and timing accuracy of BS transmit signal.
4.2.3.2.21.2	Describe the synchronization mechanisms used in the proposal, including synchronization between a user terminal and a site.
4.2.3.2.22	**Link budget template** Proponents should complete the link budget template in **§ 4.2.3.3** to this description template for the environments supported in the RIT.
4.2.3.2.23	**Other items**
4.2.3.2.23.1	*Coverage extension schemes* Describe the capability to support/ coverage extension schemes, such as relays or repeaters.
4.2.3.2.23.2	*Self-organisation* Describe any self-organizing aspects that are enabled by the RIT/SRIT.
4.2.3.2.23.3	Describe the frequency reuse schemes (including reuse factor and pattern) for the assessment of cell spectrum efficiency, cell edge user spectral efficiency and VoIP capacity.
4.2.3.2.23.4	Is the RIT an evolution of an existing IMT-2000 technology? Provide details.
4.2.3.2.23.5	Does the proposal satisfy a specific spectrum mask? Provide details. (This information is not intended to be used for sharing studies.)
4.2.3.2.23.6	Describe any MS power saving mechanisms used in the RIT.

Item	Item to be described
4.2.3.2.23.7	*Simulation process issues* Describe the methodology used in the analytical approach. Proponent should provide information on the width of confidence intervals of user and system performance metrics of corresponding mean values, and evaluation groups are encouraged to provide this information as requested in § 7.1 of Report ITU-R M.2135.
4.2.3.2.24	**Other information** Please provide any additional information that the proponent believes may be useful to the evaluation process.

4.2.3.3 Description template – link budget template

Proponents of IMT-Advanced RIT/SRITs technology proposals should provide information on the link budget according to this template when they submit the proposals for each test environment in the target set of test environments. The test environments and deployment scenario are specified in § 8 of Report ITU-R M.2135.

For a given deployment scenario many of the parameter values called out in the tables below are given in, or are given constraints in Report ITU-R M.2135, § 8. The corresponding parameter entries in the below template follow those sets of values or constraints. The parameter entries for which there is no guidance in the template should be provided by the proponent.

In the use of these tables, the convention utilized is that the relevant values or formulas to be employed in a given part of the calculation are represented by (*X*) where *X* refers to the cell or formula of that corresponding number.

For example, formula (9a) which is Control channel EIRP = (3) + (4) + (5) + (6) - (8) (dBm) is to be taken as:

> "Control channel EIRP equals the value in cell (3) plus the value in cell (4) plus the value in cell (5) plus the value in cell (6) minus the value in cell (8) expressed in dBm".

Link budget templates for the five deployment scenarios which are defined in Report ITU-R M.2135, § 8 are shown in the following tables.

TABLE 1

Link budget template for indoor test environment (indoor hotspot deployment scenario)

Item	Downlink	Uplink
System configuration		
Carrier frequency (GHz)	3.4	3.4
BS antenna heights (m)	6	6
UT antenna heights (m)		
Cell area reliability(1) (%) (Please specify how it is calculated.)		
Transmission bit rate for control channel (bit/s)		
Transmission bit rate for data channel (bit/s)		
Target packet error rate for the required SNR in item (19a) for control channel		
Target packet error rate for the required SNR in item (19b) for data channel		
Spectral efficiency(2) (bit/s/Hz)		
Pathloss model(3) (select from LoS or NLoS)		
Mobile speed (km/h)	3	3
Feeder loss (dB)	0	0
Transmitter		
(1) Number of transmit antennas. (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(2) Maximal transmit power per antenna (dBm)		
(3) Total transmit power = function of (1) and (2) (dBm) (The value shall not exceed the indicated value in Table 6 of Report ITU-R M.2135)		
(4) Transmitter antenna gain (dBi)	0	0
(5) Transmitter array gain (depends on transmitter array configurations and technologies such as adaptive beam forming, CDD (cyclic delay diversity), etc.) (dB)		
(6) Control channel power boosting gain (dB)		
(7) Data channel power loss due to pilot/control boosting (dB)		
(8) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (feeder loss must be included for and only for downlink)		
(9a) Control channel EIRP = (3) + (4) + (5) + (6) – (8) dBm		
(9b) Data channel EIRP = (3) + (4) + (5) – (7) – (8) dBm		
Receiver		
(10) Number of receive antennas (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(11) Receiver antenna gain (dBi)	0	0
(12) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (feeder loss must be included for and only for uplink)		
(13) Receiver noise figure (dB)	7	5

TABLE 1 (*cont.*)

Item	Downlink	Uplink
Receiver (*cont.*)		
(14) Thermal noise density (dBm/Hz)	–174	–174
(15) Receiver interference density (dBm/Hz)		
(16) Total noise plus interference density = 10 log (10^(((13) + (14))/10) + 10^((15)/10)) dBm/Hz		
(17) Occupied channel bandwidth (for meeting the requirements of the traffic type) (Hz)		
(18) Effective noise power = (16) + 10 log((17)) dBm		
(19a) Required SNR for the control channel (dB)		
(19b) Required SNR for the data channel (dB)		
(20) Receiver implementation margin (dB)		
(21a) H-ARQ gain for control channel (dB)		
(21b) H-ARQ gain for data channel (dB)		
(22a) Receiver sensitivity for control channel = (18) + (19a) + (20) – (21a) dBm		
(22b) Receiver sensitivity for data channel = (18) + (19b) + (20) – (21b) dBm		
(23a) Hardware link budget for control channel = (9a) + (11) − (22a) dB		
(23b) Hardware link budget for data channel = (9b) + (11) − (22b) dB		
Calculation of available pathloss		
(24) Lognormal shadow fading std deviation (dB)		
(25) Shadow fading margin (function of the cell area reliability and (24)) (dB)		
(26) BS selection/macro-diversity gain (dB)		
(27) Penetration margin (dB)		
(28) Other gains (dB) (if any please specify)		
(29a) Available path loss for control channel = (23a) – (25) + (26) – (27) + (28) – (12) dB		
(29b) Available path loss for data channel = (23b) – (25) + (26) – (27) + (28) – (12) dB		

TABLE 1 (*end*)

Item	Downlink	Uplink
Range/coverage efficiency calculation		
(30a) Maximum range for control channel (based on (29a) and according to the system configuration section of the link budget) (m)		
(30b) Maximum range for data channel (based on (29b) and according to the system configuration section of the link budget) (m)		
(31a) Coverage Area for control channel = (π (30a)^2) (m^2/site)		
(31b) Coverage Area for data channel = (π (30b)^2) (m^2/site)		

(1) Cell area reliability is defined as the percentage of the cell area over which coverage can be guaranteed. It is obtained from the cell edge reliability, shadow fading standard deviation and the path loss exponent. The latter two values are used to calculate a fade margin. Macro diversity gain may be considered explicitly and improve the system margin or implicitly by reducing the fade margin.

(2) The spectral efficiency of the chosen modulation scheme.

(3) The pathloss models are summarized in Table 9 of Report ITU-R M.2135.

TABLE 2

Link budget template for microcellular test environment (urban micro-cell deployment scenario)

Item	Downlink	Uplink
System configuration		
Carrier frequency (GHz)	2.5	2.5
BS antenna heights (m)	10	10
UT antenna heights (m)		
Cell area reliability(1) (%) (Please specify how it is calculated.)		
Transmission bit rate for control channel (bit/s)		
Transmission bit rate for data channel (bit/s)		
Target packet error rate for the required SNR in item (19a) for control channel		
Target packet error rate for the required SNR in item (19b) for data channel		
Spectral efficiency(2) (bit/s/Hz)		
Pathloss model(3) (select from LoS, NLoS or O-to-I)		
Mobile speed (km/h)	3	3
Feeder loss (dB)	2	2
Transmitter		
(1) Number of transmit antennas. (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(2) Maximal transmit power per antenna (dBm)		
(3) Total transmit power = function of (1) and (2) (dBm) (The value shall not exceed the indicated value in Table 6 of Report ITU-R M.2135)		
(4) Transmitter antenna gain (dBi)	17	0

TABLE 2 (*cont.*)

Item	Downlink	Uplink
Transmitter (*cont.*)		
(5) Transmitter array gain (depends on transmitter array configurations and technologies such as adaptive beam forming, CDD (Cyclic delay diversity), etc.) (dB)		
(6) Control channel power boosting gain (dB)		
(7) Data channel power loss due to pilot/control boosting (dB)		
(8) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (Feeder loss must be included for and only for downlink)		
(9a) Control channel EIRP = (3) + (4) + (5) + (6) – (8) dBm		
(9b) Data channel EIRP = (3) + (4) + (5) – (7) – (8) dBm		
Receiver		
(10) Number of receive antennas. (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(11) Receiver antenna gain (dBi)	0	17
(12) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (feeder loss must be included for and only for uplink)		
(13) Receiver noise figure (dB)	7	5
(14) Thermal noise density (dBm/Hz)	–174	–174
(15) Receiver interference density (dBm/Hz)		
(16) Total noise plus interference density = 10 log (10^(((13) + (14))/10) + 10^((15)/10)) dBm/Hz		
(17) Occupied channel bandwidth (for meeting the requirements of the traffic type) (Hz)		
(18) Effective noise power = (16) + 10 log((17)) dBm		
(19a) Required SNR for the control channel (dB)		
(19b) Required SNR for the data channel (dB)		
(20) Receiver implementation margin (dB)		
(21a) H-ARQ gain for control channel (dB)		
(21b) H-ARQ gain for data channel (dB)		
(22a) Receiver sensitivity for control channel = (18) + (19a) + (20) – (21a) dBm		
(22b) Receiver sensitivity for data channel = (18) + (19b) + (20) – (21b) dBm		
(23a) Hardware link budget for control channel = (9a) + (11) – (22a) dB		
(23b) Hardware link budget for data channel = (9b) + (11) – (22b) (dB)		

TABLE 2 (*end*)

Item	Downlink	Uplink
Calculation of available pathloss		
(24) Lognormal shadow fading std deviation (dB)		
(25) Shadow fading margin (function of the cell area reliability and (24)) (dB)		
(26) BS selection/macro-diversity gain (dB)		
(27) Penetration margin (dB)		
(28) Other gains (dB) (if any please specify)		
(29a) Available path loss for control channel = (23a) – (25) + (26) – (27) + (28) – (12) dB		
(29b) Available path loss for data channel = (23b) – (25) + (26) – (27) + (28) – (12) dB		
Range/coverage efficiency calculation		
(30a) Maximum range for control channel (based on (29a) and according to the system configuration section of the link budget) (m)		
(30b) Maximum range for data channel (based on (29b) and according to the system configuration section of the link budget) (m)		
(31a) Coverage Area for control channel = (π (30a)^2) (m^2/site)		
(31b) Coverage Area for data channel = (π (30b)^2) (m^2/site)		

(1) Cell area reliability is defined as the percentage of the cell area over which coverage can be guaranteed. It is obtained from the cell edge reliability, shadow fading standard deviation and the path loss exponent. The latter two values are used to calculate a fade margin. Macro diversity gain may be considered explicitly and improve the system margin or implicitly by reducing the fade margin.

(2) The spectral efficiency of the chosen modulation scheme.

(3) The pathloss models are summarized in Table 9 of Report ITU-R M.2135.

TABLE 3

Link budget template for base coverage urban test environment (urban macro-cell deployment scenario)

Item	Downlink	Uplink
System configuration		
Carrier frequency (GHz)	2.0	2.0
BS antenna heights (m)	25	25
UT antenna heights (m)		
Cell area reliability(1) (%) (Please specify how it is calculated.)		
Transmission bit rate for control channel (bit/s)		
Transmission bit rate for data channel (bit/s)		
Target packet error rate for the required SNR in item (19a) for control channel		
Target packet error rate for the required SNR in item (19b) for data channel		
Spectral efficiency(2) (bit/s/Hz)		
Pathloss model(3) (Select from LoS or NLoS)		
Mobile speed (km/h)	30	30
Feeder loss (dB)	2	2
Transmitter		
(1) Number of transmit antennas (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(2) Maximal transmit power per antenna (dBm)		
(3) Total transmit power = function of (1) and (2) (dBm) (The value shall not exceed the indicated value in Table 6 of Report ITU-R M.2135)		
(4) Transmitter antenna gain (dBi)	17	0
(5) Transmitter array gain (depends on transmitter array configurations and technologies such as adaptive beam forming, CDD (Cyclic delay diversity), etc.) (dB)		
(6) Control channel power boosting gain (dB)		
(7) Data channel power loss due to pilot/control boosting (dB)		
(8) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (Feeder loss must be included for and only for downlink)		
(9a) Control channel EIRP = (3) + (4) + (5) + (6) - (8) dBm		
(9b) Data channel EIRP = (3) + (4) + (5) - (7) - (8) dBm		
Receiver		
(10) Number of receive antennas. (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(11) Receiver antenna gain (dBi)	0	17

TABLE 3 (*cont.*)

Item	Downlink	Uplink
Receiver (*cont.*)		
(12) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (feeder loss must be included for and only for uplink)		
(13) Receiver noise figure (dB)	7	5
(14) Thermal noise density (dBm/Hz)	–174	–174
(15) Receiver interference density (dBm/Hz)		
(16) Total noise plus interference density = 10 log (10^(((13) + (14))/10) + 10^((15)/10)) dBm/Hz		
(17) Occupied channel bandwidth (for meeting the requirements of the traffic type) (Hz)		
(18) Effective noise power = (16) + 10log((17)) dBm		
(19a) Required SNR for the control channel (dB)		
(19b) Required SNR for the data channel (dB)		
(20) Receiver implementation margin (dB)		
(21a) H-ARQ gain for control channel (dB)		
(21b) H-ARQ gain for data channel (dB)		
(22a) Receiver sensitivity for control channel = (18) + (19a) + (20) – (21a) dBm		
(22b) Receiver sensitivity for data channel = (18) + (19b) + (20) – (21b) dBm		
(23a) Hardware link budget for control channel = (9a) + (11) – (22a) dB		
(23b) Hardware link budget for data channel = (9b) + (11) – (22b) dB		
Calculation of available pathloss		
(24) Lognormal shadow fading std deviation (dB)		
(25) Shadow fading margin (function of the cell area reliability and (24)) (dB)		
(26) BS selection/macro-diversity gain (dB)		
(27) Penetration margin (dB)		
(28) Other gains (dB) (if any please specify)		
(29a) Available path loss for control channel = (23a) – (25) + (26) – (27) + (28) – (12) dB		
(29b) Available path loss for data channel = (23b) – (25) + (26) – (27) + (28) – (12) dB		

TABLE 3 (*end*)

Item	Downlink	Uplink
Range/coverage efficiency calculation		
(30a) Maximum range for control channel (based on (29a) and according to the system configuration section of the link budget) (m)		
(30b) Maximum range for data channel (based on (29b) and according to the system configuration section of the link budget) (m)		
(31a) Coverage Area for control channel = (π (30a)^2) (m^2/site)		
(31b) Coverage Area for data channel = (π (30b)^2) (m^2/site)		

(1) Cell area reliability is defined as the percentage of the cell area over which coverage can be guaranteed. It is obtained from the cell edge reliability, shadow fading standard deviation and the path loss exponent. The latter two values are used to calculate a fade margin. Macro diversity gain may be considered explicitly and improve the system margin or implicitly by reducing the fade margin.

(2) The spectral efficiency of the chosen modulation scheme.

(3) The pathloss models are summarized in Table 9 of Report ITU-R M.2135.

TABLE 4

Link budget template for high speed test environment (rural macro-cell deployment scenario)

Item	Downlink	Uplink
System configuration		
Carrier frequency (GHz)	0.8	0.8
BS antenna heights (m)	35	35
UT antenna heights (m)		
Cell area reliability(1) (%) (Please specify how it is calculated.)		
Transmission bit rate for control channel (bit/s)		
Transmission bit rate for data channel (bit/s)		
Target packet error rate for the required SNR in item (19a) for control channel		
Target packet error rate for the required SNR in item (19b) for data channel		
Spectral efficiency(2) (bit/s/Hz)		
Pathloss model(3) (Select from LoS or NLoS)		
Mobile speed (km/h)	120	120
Feeder loss (dB)	2	2
Transmitter		
(1) Number of transmit antennas (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(2) Maximal transmit power per antenna (dBm)		
(3) Total transmit power = function of (1) and (2) (dBm) (The value shall not exceed the indicated value in Table 6 of Report ITU-R M.2135)		

TABLE 4 (*cont.*)

Item	Downlink	Uplink
Transmitter (*cont.*)		
(4) Transmitter antenna gain (dBi)	17	0
(5) Transmitter array gain (depends on transmitter array configurations and technologies such as adaptive beam forming, CDD (Cyclic delay diversity), etc.) (dB)		
(6) Control channel power boosting gain (dB)		
(7) Data channel power loss due to pilot/control boosting (dB)		
(8) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (feeder loss must be included for and only for downlink)		
(9a) Control channel EIRP = (3) + (4) + (5) + (6) – (8) dBm		
(9b) Data channel EIRP = (3) + (4) + (5) – (7) – (8) dBm		
Receiver		
(10) Number of receive antennas. (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(11) Receiver antenna gain (dBi)	0	17
(12) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (feeder loss must be included for and only for uplink)		
(13) Receiver noise figure (dB)	7	5
(14) Thermal noise density (dBm/Hz)	–174	–174
(15) Receiver interference density (dBm/Hz)		
(16) Total noise plus interference density = 10 log (10^(((13)+(14))/10) + 10^((15)/10)) dBm/Hz		
(17) Occupied channel bandwidth (for meeting the requirements of the traffic type) (Hz)		
(18) Effective noise power = (16) + 10 log((17)) dBm		
(19a) Required SNR for the control channel (dB)		
(19b) Required SNR for the data channel (dB)		
(20) Receiver implementation margin (dB)		
(21a) H-ARQ gain for control channel (dB)		
(21b) H-ARQ gain for data channel (dB)		
(22a) Receiver sensitivity for control channel = (18) + (19a) + (20) – (21a) dBm		
(22b) Receiver sensitivity for data channel = (18) + (19b) + (20) – (21b) dBm		
(23a) Hardware link budget for control channel = (9a) + (11) - (22a) dB		
(23b) Hardware link budget for data channel = (9b) + (11) - (22b) dB		

TABLE 4 (*end*)

Item	Downlink	Uplink
Calculation of available pathloss		
(24) Lognormal shadow fading std deviation (dB)		
(25) Shadow fading margin (function of the cell area reliability and (24)) (dB)		
(26) BS selection/macro-diversity gain (dB)		
(27) Penetration margin (dB)		
(28) Other gains (dB) (if any please specify)		
(29a) Available path loss for control channel = (23a) – (25) + (26) – (27) + (28) – (12) dB		
(29b) Available path loss for data channel = (23b) – (25) + (26) – (27) + (28) – (12) dB		
Range/coverage efficiency calculation		
(30a) Maximum range for control channel (based on (29a) and according to the system configuration section of the link budget) (m)		
(30b) Maximum range for data channel (based on (29b) and according to the system configuration section of the link budget) (m)		
(31a) Coverage Area for control channel = (π (30a)^2) (m^2/site)		
(31b) Coverage Area for data channel = (π (30b)^2) (m^2/site)		

(1) Cell area reliability is defined as the percentage of the cell area over which coverage can be guaranteed. It is obtained from the cell edge reliability, shadow fading standard deviation and the path loss exponent. The latter two values are used to calculate a fade margin. Macro diversity gain may be considered explicitly and improve the system margin or implicitly by reducing the fade margin.

(2) The spectral efficiency of the chosen modulation scheme.

(3) The pathloss models are summarized in Table 9 of Report ITU-R M.2135.

TABLE 5

Link budget template for base coverage urban test environment (suburban macro-cell deployment scenario)

Item	Downlink	Uplink
System configuration		
Carrier frequency (GHz)	2.0	2.0
BS antenna heights (m)	35	35
UT antenna heights (m)		
Cell area reliability(1) (%) (Please specify how it is calculated.)		
Transmission bit rate for control channel (bit/s)		
Transmission bit rate for data channel (bit/s)		
Target packet error rate for the required SNR in item (19a) for control channel		

TABLE 5 (*cont.*)

Item	Downlink	Uplink
System configuration (*cont.*)		
Target packet error rate for the required SNR in item (19b) for data channel		
Spectral efficiency(2) (bit/s/Hz)		
Pathloss model(3) (Select from LoS or NLoS)		
Mobile speed (km/h)	3 or 90	3 or 90
Feeder loss (dB)	2	2
Transmitter		
(1) Number of transmit antennas (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(2) Maximal transmit power per antenna (dBm)		
(3) Total transmit power = function of (1) and (2) (dBm) (The value shall not exceed the indicated value in Table 6 of Report ITU-R M.2135)		
(4) Transmitter antenna gain (dBi)	17	0
(5) Transmitter array gain (depends on transmitter array configurations and technologies such as adaptive beam forming, CDD (cyclic delay diversity), etc.) (dB)		
(6) Control channel power boosting gain (dB)		
(7) Data channel power loss due to pilot/control boosting (dB)		
(8) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (Feeder loss must be included for and only for downlink)		
(9a) Control channel EIRP = (3) + (4) + (5) + (6) - (8) dBm		
(9b) Data channel EIRP = (3) + (4) + (5) - (7) - (8) dBm		
Receiver		
(10) Number of receive antennas (The number shall be within the indicated range in Table 6 of Report ITU-R M.2135)		
(11) Receiver antenna gain (dBi)	0	17
(12) Cable, connector, combiner, body losses, etc. (enumerate sources) (dB) (Feeder loss must be included for and only for uplink)		
(13) Receiver noise figure (dB)	7	5
(14) Thermal noise density (dBm/Hz)	–174	–174
(15) Receiver interference density (dBm/Hz)		
(16) Total noise plus interference density = 10 log (10^(((13) + (14))/10) + 10^((15)/10)) dBm/Hz		
(17) Occupied channel bandwidth (for meeting the requirements of the traffic type) (Hz)		

TABLE 5 (*end*)

Item	Downlink	Uplink
Receiver (*cont.*)		
(18) Effective noise power = (16) + 10log((17)) dBm		
(19a) Required SNR for the control channel (dB)		
(19b) Required SNR for the data channel (dB)		
(20) Receiver implementation margin (dB)		
(21a) H-ARQ gain for control channel (dB)		
(21b) H-ARQ gain for data channel (dB)		
(22a) Receiver sensitivity for control channel = (18) + (19a) + (20) – (21a) dBm		
(22b) Receiver sensitivity for data channel = (18) + (19b) + (20) – (21b) dBm		
(23a) Hardware link budget for control channel = (9a) + (11) - (22a) dB		
(23b) Hardware link budget for data channel = (9b) + (11) - (22b) dB		
Calculation of available pathloss		
(24) Lognormal shadow fading std deviation (dB)		
(25) Shadow fading margin (function of the cell area reliability and (24)) (dB)		
(26) BS selection/macro-diversity gain (dB)		
(27) Penetration margin (dB)		
(28) Other gains (dB) (if any please specify)		
(29a) Available path loss for control channel = (23a) – (25) + (26) – (27) + (28) – (12) dB		
(29b) Available path loss for data channel = (23b) – (25) + (26) – (27) + (28) – (12) dB		
Range/coverage efficiency calculation		
(30a) Maximum range for control channel (based on (29a) and according to the system configuration section of the link budget) (m)		
(30b) Maximum range for data channel (based on (29b) and according to the system configuration section of the link budget) (m)		
(31a) Coverage Area for control channel = (π (30a)^2) (m^2/site)		
(31b) Coverage Area for data channel = (π (30b)^2) (m^2/site)		

(1) Cell area reliability is defined as the percentage of the cell area over which coverage can be guaranteed. It is obtained from the cell edge reliability, shadow fading standard deviation and the path loss exponent. The latter two values are used to calculate a fade margin. Macro diversity gain may be considered explicitly and improve the system margin or implicitly by reducing the fade margin.

(2) The spectral efficiency of the chosen modulation scheme.

(3) The pathloss models are summarized in Table 9 of Report ITU-R M.2135.

4.2.4 RIT/SRIT compliance templates

This section provides templates for the responses that are needed to assess the compliance of a candidate RIT or SRIT with the requirements of IMT-Advanced.

The compliance templates are:

– Compliance template for services;

– Compliance template for spectrum; and,

– Compliance template for technical performance.

4.2.4.1 Compliance template for services[2]

	Service related minimum capabilities within the RIT/SRIT	Evaluator's comments
4.2.4.1.1	**Support of a wide range of services** Does the proposal support a wide range of services?: If bullets 4.2.4.1.1.1 - 4.2.4.1.1.3 are marked as "yes" then 4.2.4.1.1 is a "yes". □YES / □NO	
4.2.4.1.1.1	**Ability to support basic conversational service class** Is the proposal able to support basic conversational service class?: □YES / □NO	
4.2.4.1.1.2	**Support of rich conversational service class** Is the proposal able to support rich conversational service class?: □YES / □NO	
4.2.4.1.1.3	**Support of conversational low delay service class** Is the proposal able to support conversational low-delay service class?: □YES / □NO	

[2] If a proponent determines that a specific question does not apply, the proponent should indicate that this is the case and provide a rationale for why it does not apply.

4.2.4.2 Compliance template for spectrum[2]

	Spectrum capability requirements
4.2.4.2.1	**Spectrum bands** Is the proposal able to utilize at least one band identified for IMT?: □YES / □NO Specify in which band(s) the candidate RIT or candidate SRIT can be deployed.

4.2.4.3 Compliance template for technical performance[2]

Minimum technical requirements item (4.2.4.3.x), units, and Report ITU-R M.2134 section reference[(1)]	**Category**		**Required value**	**Value[(2), (3)]**	**Require-ment met?**	**Comments**
	Test environment	**Downlink or uplink**				
4.2.4.3.1 Cell spectral efficiency (bit/s/Hz/cell) *(4.1)*	Indoor	Downlink	3		□ Yes □ No	
		Uplink	2.25		□ Yes □ No	
	Microcellular	Downlink	2.6		□ Yes □ No	
		Uplink	1.8		□ Yes □ No	
	Base coverage urban	Downlink	2.2		□ Yes □ No	
		Uplink	1.4		□ Yes □ No	
	High speed	Downlink	1.1		□ Yes □ No	
		Uplink	0.7		□ Yes □ No	
4.2.4.3.2 Peak spectral efficiency (bit/s/Hz) *(4.2)*	Not applicable	Downlink	15		□ Yes □ No	
		Uplink	6.75		□ Yes □ No	
4.2.4.3.3 Bandwidth *(4.3)*	Not applicable	Up to and including (MHz)	40		□ Yes □ No	
		Scalability	Support of at least three band-width values[(4)]		□ Yes □ No	

Minimum technical requirements item (4.2.4.3.x), units, and Report ITU-R M.2134 section reference[1]	Category		Required value	Value[2], [3]	Require-ment met?	Comments
	Test environment	Downlink or uplink				
4.2.4.3.4 Cell edge user spectral efficiency (bit/s/Hz) *(4.4)*	Indoor	Downlink	0.1		☐ Yes ☐ No	
		Uplink	0.07		☐ Yes ☐ No	
	Microcellular	Downlink	0.075		☐ Yes ☐ No	
		Uplink	0.05		☐ Yes ☐ No	
	Base coverage urban	Downlink	0.06		☐ Yes ☐ No	
		Uplink	0.03		☐ Yes ☐ No	
	High speed	Downlink	0.04		☐ Yes ☐ No	
		Uplink	0.015		☐ Yes ☐ No	
4.2.4.3.5 Control plane latency (ms) *(4.5.1)*	Not applicable	Not applicable	Less than 100 ms		☐ Yes ☐ No	
4.2.4.3.6 User plane latency (ms) *(4.5.2)*	Not applicable	Not applicable	Less than 10 ms		☐ Yes ☐ No	
4.2.4.3.7 Mobility classes *(4.6)*	Indoor	Uplink	Stationary, pedestrian		☐ Yes ☐ No	
	Microcellular	Uplink	Stationary, pedestrian, vehicular up to 30 km/h		☐ Yes ☐ No	
	Base coverage urban	Uplink	Stationary, pedestrian, vehicular		☐ Yes ☐ No	
	High speed	Uplink	High speed vehicular, vehicular		☐ Yes ☐ No	
4.2.4.3.8 Mobility Traffic channel link data rates (bit/s/Hz) *(4.6)*	Indoor	Uplink	1.0		☐ Yes ☐ No	
	Microcellular	Uplink	0.75		☐ Yes ☐ No	
	Base coverage urban	Uplink	0.55		☐ Yes ☐ No	
	High speed	Uplink	0.25		☐ Yes ☐ No	

Minimum technical requirements item (4.2.4.3.x), units, and Report ITU-R M.2134 section reference[1]	Category		Required value	Value[2], [3]	Require-ment met?	Comments
	Test environment	Downlink or uplink				
4.2.4.3.9 Intra-frequency hand-over interruption time (ms) *(4.7)*	Not applicable	Not applicable	27.5		☐ Yes ☐ No	
4.2.4.3.10 Inter-frequency handover interruption time within a spectrum band (ms) *(4.7)*	Not applicable	Not applicable	40		☐ Yes ☐ No	
4.2.4.3.11 Inter-frequency handover interruption time between spectrum bands (ms) *(4.7)*	Not applicable	Not applicable	60		☐ Yes ☐ No	
4.2.4.3.12 Inter-system handover *(4.7)*	Not applicable	Not applicable	Not applicable	Not applicable	☐ Yes ☐ No	
4.2.4.3.13 Number of supported VoIP users (active users/ sector/MHz) *(4.8)*	Indoor	As defined in Report ITU-R M.2134	50		☐ Yes ☐ No	
	Microcellular	As defined in Report ITU-R M.2134	40		☐ Yes ☐ No	
	Base coverage urban	As defined in Report ITU-R M.2134	40		☐ Yes ☐ No	
	High speed	As defined in Report ITU-R M.2134	30		☐ Yes ☐ No	

[1] As defined in Report ITU-R M.2134.

[2] According to the evaluation methodology specified in Report ITU-R M.2135.

[3] Mandatory when “no” is checked, optional when “yes” is checked.

[4] Refer to Report ITU-R M.2135, § 7.4.1.