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| **Radiocommunication Study Groups** |  |
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| Source: Document 5D/TEMP/18 |  |
| 14 February 2024 |
| English only |
| Working Party 5D[[1]](#footnote-1) |
| OVERVIEW OF THE ITU-R TEXTS RELATING TO THE TERRESTRIAL COMPONENT OF IMT |
| *(Last update: 7 February 2024)* |

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# 1 Scope

This document describes the various topics that are relevant to the terrestrial component of International Mobile Telecommunication (IMT) and identifies the ITU-R texts (Recommendations, Reports and Handbooks) applicable to these topics. The information included in this document is based on published work only. The ongoing work on these topics is documented in the latest Working Party (WP) 5D Chair’s Report[[2]](#footnote-2).

Useful links:

|  |  |
| --- | --- |
| Free online access to ITU-R Publications, Software and Databases: | <http://www.itu.int/oth/R040200003C/en> |
| Search ITU Publications: | <http://www.itu.int/en/publications/Pages/Search.aspx> |

# 2 International Mobile Telecommunication

International Mobile Telecommunications systems are mobile systems that 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 encompasses the generations IMT-2000, IMT-Advanced, IMT-2020 and IMT-2030[[3]](#footnote-3).

IMT 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 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. Therefore, International Mobile Telecommunication can be subdivided into a number of different topics. Based on the past and ongoing work within the ITU on IMT, the following topics have been established:

|  |  |
| --- | --- |
| **Topic** | **Description** |
| IMT Objectives | Overall objectives of the future evolution of IMT |
| Telecommunication services and applications | Objectives for applications and telecommunication services supported by IMT |
| IMT Process | Requirements, evaluation and guidelines for the development of IMT |
| Architecture | Overview of the topology and architecture of IMT networks |
| Radio interfaces specifications | Standards for the detailed specifications and parameters of IMT |
| Unwanted emissions | Characteristics of unwanted emissions of base and mobile stations using IMT radio interfaces |
| Frequency spectrum needs | Methodologies and spectrum requirements for the terrestrial component of IMT |
| Frequency spectrum usage | Sharing and compatibility studies and frequency arrangements for the implementation of IMT |
| Performance/ QoS | Quality and performance objectives and requirements for IMT access networks |
| Technology  | Technical and operational aspects as well as future technology trends of IMT systems |
| Implementation | Approaches for the use/deployment and planning of IMT |

Each of these topics is largely described below, including relevant definitions and the identification of the applicable ITU-R texts available[[4]](#footnote-4).

The various terms and definitions that are considered essential to the understanding and application of the principles of IMT are included in Recommendation [ITU-R M.1224](http://www.itu.int/rec/R-REC-M.1224/en).

A complete list of relevant Recommendations, Reports and Handbooks is contained in [Annex A](#Annex) to this Guide. The abbreviations and acronyms used in this Guide are listed in [Annex B](#annex_b).

# 3 IMT objectives

In 1986, the ITU began work on developing a global future public land mobile telecommunications system (FPLMTS), which in 1994 was re-named IMT‑2000 (International Mobile Telecommunications-2000). Objectives were defined initially for IMT-2000 and subsequently for each new generation approximately every 10 years.

Report [ITU-R M.1153](http://www.itu.int/pub/R-REP-M.1153) describes the general objectives, suitable frequency bands and the degrees of compatibility of the FPLMTS.

Recommendation [ITU-R M.687](http://www.itu.int/rec/R-REC-M.687/en) defines the objectives to be met by IMT-2000 and provides the overall IMT-2000 concepts with particular consideration to achieving worldwide roaming and compatibility. Recommendation [ITU-R M.1645](http://www.itu.int/rec/R-REC-M.1645/en) defines the framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000 for the radio access network (IMT‑Advanced).

Recommendation [ITU-R M.2083](http://www.itu.int/rec/R-REC-M.2083/en) establishes the vision for IMT for 2020 and beyond, by describing potential user and application trends, growth in traffic, technological trends and spectrum implications, and by providing guidelines on the framework and the capabilities for IMT for 2020 and beyond. Envisaged three usage scenarios for IMT-2020:

– Enhanced mobile broadband (eMBB).

– Ultra-reliable and low-latency communications (URLLC).

– Massive machine-type communications (mMTC).

Recommendation [ITU-R M.2160](http://www.itu.int/rec/R-REC-M.2160/en) describes a framework and overall objectives for the development of the terrestrial component of International Mobile Telecommunications (IMT) for 2030 and beyond (IMT-2030), including a broad variety of capabilities associated with envisaged usage scenarios. Furthermore, this Recommendation addresses the objectives for the development of IMT-2030, which includes further enhancement and evolution of existing IMT. Aspects of interworking with other networks are also addressed.

# 4 Telecommunication services and applications

The original goal of IMT was to provide access to a wide range of telecommunication services for public use supported by fixed and mobile telecommunication networks. The extended capabilities of IMT technologies are also applicable to specific industrial applications in a wide range of closed environments.

## 4.1 Framework of services supported by IMT

Recommendation [ITU-R M.816](http://www.itu.int/rec/R-REC-M.816/en) forms a framework for continued development towards detailed IMT-2000 service descriptions. It includes those services supported by user bit rates up to approximately 2 Mbit/s as well as new services, some of which may require higher bit rates.

Recommendation [ITU-R M.1822](http://www.itu.int/rec/R-REC-M.1822/en) addresses high-level requirements for telecommunication services and applications to be supported by IMT, including the future development of IMT-2000 and IMT‑Advanced. The recommendation also includes service parameters and service classifications of IMT, and service examples that may be supported by IMT.

## 4.2 Specific applications

Public protection and disaster relief (PPDR) is defined in Resolution [**646 (Rev.WRC-19)**](https://www.itu.int/oth/R0A0600009E/en)and Report [ITU-R M.2291](http://www.itu.int/pub/R-REP-M.2291) addresses the current and possible future use of IMT including the use of Long Term Evolution (LTE) in support of broadband PPDR communications.

Report [ITU-R M.2373](http://www.itu.int/pub/R-REP-M.2373) “Audio-visual capabilities and applications supported by terrestrial IMT systems” examines the capabilities of IMT systems to deliver audio-visual services to consumers.

Report [ITU-R M.2440](http://www.itu.int/pub/R-REP-M.2440) addresses the technical and operational aspects of terrestrial IMT-based radio networks and systems supporting machine type communication (MTC) applications, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband MTC infrastructure and devices.

Report [ITU-R M.2441](http://www.itu.int/pub/R-REP-M.2441) “Emerging usage of the terrestrial component of International Mobile Telecommunication (IMT)” provides information on the usage of IMT systems for emerging use cases or applications such as Intelligent Transport Systems (ITS), railways or high-speed train communications, industrial automation, remote control, etc.

Report [ITU-R M.2527](http://www.itu.int/pub/R-REP-M.2527) “Applications of the terrestrial component of International Mobile Telecommunications for specific societal, industrial and other usages” addresses the usage, technical and operational aspects and capabilities of the terrestrial component of International Mobile Telecommunications (IMT) for meeting specific needs of societal, industrial and enterprise usages.

Report [ITU-R M.2528](http://www.itu.int/pub/R-REP-M.2528) “Capabilities of the terrestrial component of IMT-2020 for multimedia communications” addresses the capabilities of IMT-2020 to distribute multimedia content such as video, audio, text and graphics, including support for real-time multimedia interactive applications. This Report also addresses the capabilities of IMT-2020 user devices and base stations to support such multimedia communications with low latency and wide transmission bandwidth.

## 4.3 Performance/ QoS

This segment on performance and QoS requirements provides the requirements for speech quality, data quality, connection/session performance and the radio interface performance to be reached in IMT. Currently, there is only one publication on this topic for IMT-2000 radio access. The end-to-end QoS requirements are established by ITU-T.

Recommendation [ITU-R M.1079](http://www.itu.int/rec/R-REC-M.1079/en) defines the speech/data quality and performance requirements for IMT-2000 access networks taking into consideration the end-to-end requirements. It also defines the connection/session performance, concerning issues such as call set-up time, delay characteristics and handover probability, to be achieved in the IMT-2000 access network that the user will expect in a network of comparable performance to the fixed network.

## 4.4 Developing countries

Recognizing the disparity that exists in the telecommunication infrastructures in the world, this section points out the potential of cellular technology (and its evolution into IMT technologies) to help developing countries bridge the gap.

Recommendation [ITU-R M.819](http://www.itu.int/rec/R-REC-M.819/en) describes the objectives to be met by IMT-2000 to meet the needs of developing countries. The potential of mobile radio technologies, including IMT-2000, to help developing countries “bridge the gap” between their communication capabilities and those in developed countries.

Report [ITU-R M.1155](http://www.itu.int/pub/R-REP-M.1155) emphasizes the needs and interests of developing countries by promoting the applications of FPLMTS for fixed services (FS). It is also stressed that the use of FPLMTS for such applications is also attractive to developed countries.

Many aspects of the deployment of IMT-2000 systems for fixed wireless access (FWA) applications are covered in [Volume 1](https://www.itu.int/pub/R-HDB-25) of the Handbook on *Land Mobile (including Wireless Access)*.

# 5 IMT process

IMT standards include specifications and requirements for high-speed mobile broadband service, taking into account what technology is expected to provide in the corresponding timeframe. As a result, ITU defined the process of evaluation and the subsequent selection of mobile technologies that fulfil a number of established technical parameters (peak data rate, latency, spectrum efficiency, etc.). So, this section describes the ITU-R Recommendations and ITU-R Reports containing the requirements, evolution and guidance for the development of each generation of IMT.

## 5.1 IMT-2000

IMT-2000 are third-generation systems that started to be deployed in the year 2000. Provide access by means of one or more radio links to a wide range of telecommunications services supported by the fixed telecommunications networks (e.g. public switched telephone network (PSTN)/Internet) and other services which are specific to mobile users.

Recommendation [ITU-R M.1034](http://www.itu.int/rec/R-REC-M.1034/en) builds on the IMT-2000 concepts and to provide a high-level view of the constraints placed on the radio interface(s) particularly in terms of the system requirements, user requirements, and operational requirements.

Recommendation [ITU-R M.1225](http://www.itu.int/rec/R-REC-M.1225/en) provides guidelines for both the procedure and the criteria to be used in evaluating radio transmission technologies (RTTs) for a number of test environments. These test environments, defined in the recommendation, are chosen to simulate closely the more stringent radio operating environments.

## 5.2 IMT-Advanced

IMT-Advanced is a mobile system that includes the new capabilities of IMT that go far beyond those of IMT-2000 and 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 the current services.

Resolution [ITU-R 57](https://www.itu.int/pub/R-RES-R.57) contains the principles for the process of development of IMT-Advanced.

Report [ITU-R M.2133](http://www.itu.int/pub/R-REP-M.2133) 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.

Report [ITU-R M.2134](http://www.itu.int/pub/R-REP-M.2134) “ Requirements related to technical system performance for IMT-Advanced radio interface(s)” describes requirements related to technical performance for IMT-Advanced candidate RITs and also provides the necessary background information about the individual requirements and the justification for the items and values chosen.

Report [ITU-R M.2135](http://www.itu.int/pub/R-REP-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.

Report [ITU-R M.2198](http://www.itu.int/pub/R-REP-M.2198) 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.

## 5.3 IMT-2020

As defined in Resolution [ITU-R 56](https://www.itu.int/pub/R-RES-R.56), IMT-2020 systems are mobile systems that include new radio interface(s) which support the new capabilities of systems beyond IMT-2000 and IMT-Advanced. The intention is to make IMT-2020 more flexible, reliable and secure than previous IMT when providing diverse services in the intended three usage scenarios, including eMBB, URLLC, and mMTC.

Resolution [ITU-R 65](https://www.itu.int/pub/R-RES-R.65) provides the principles for the process of future development of IMT for 2020 and beyond.

Report [ITU-R M.2410](http://www.itu.int/pub/R-REP-M.2410) describes key requirements related to the minimum technical performance of IMT-2020 candidate RITs. It also provides the necessary background information about the individual requirements and the justification for the items and values chosen.

Report [ITU-R M.2411](http://www.itu.int/pub/R-REP-M.2411) addresses the requirements, evaluation criteria, as well as submission templates required for a complete submission of RITs and SRITs for IMT-2020.

Report [ITU-R M.2412](http://www.itu.int/pub/R-REP-M.2412) provides guidelines for the procedure, the methodology and the criteria (technical, spectrum and service) to be used in evaluating the candidate IMT-2020 RITs or SRITs for a number of test environments. 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 RITs/SRITs may be fairly and equally assessed on a technical basis.

Report [ITU-R M.2483](http://www.itu.int/pub/R-REP-M.2483) is the results record of the work performed after reception of the RIT and SRIT proposals for IMT-2020, including the evaluation activity, the consensus building, the outcome and the conclusions. Report [ITU-R M.2498](http://www.itu.int/pub/R-REP-M.2498) is the record of the work performed after receipt of complete proposals for IMT-2020 candidate “DECT-2020 NR” component RIT and “3GPP 5G NR” component RIT.

## 5.4 IMT-2030

As defined in Resolution [ITU-R 56](https://www.itu.int/pub/R-RES-R.56), IMT-2030 refers to those systems, system components and related aspects that include radio interface(s) which support(s) the additional capabilities of systems beyond IMT-2000, IMT-Advanced and IMT-2020, and the procedures and processes in Resolution [ITU-R 65](https://www.itu.int/pub/R-RES-R.65) apply for the future development of IMT-2030.

The Usage scenarios and overarching aspects of IMT-2030, the new and enhanced capabilities of IMT-2030, and the anticipated perspective of the timelines for IMT-2030 are described in Recommendation [ITU-R M.2160](http://www.itu.int/rec/R-REC-M.2160/en).

## 5.5 Summary

The detailed information about the IMT-family is available online at <https://www.itu.int/imt>. The ITU-R Recommendations and Reports that have been published in support of the IMT process for the various generations of IMT are summarized in Table 1:

TABLE 1

ITU-R Recommendations and Reports in support of the IMT process

|  | IMT-2000 | IMT-Advanced | IMT-2020 | IMT-2030 |
| --- | --- | --- | --- | --- |
| **Vision/Objectives** | [*M.687*](https://www.itu.int/rec/R-REC-M.687/en) (1990-1992-1997) | [*M.1645*](https://www.itu.int/rec/R-REC-M.1645/en) (2003) | [*M.2083*](https://www.itu.int/rec/R-REC-M.2083/en) (2015) | [*M.2160*](http://www.itu.int/rec/R-REC-M.2160/en) (2023) |
| **Requirements** | [*M.1034*](https://www.itu.int/rec/R-REC-M.1034/en)(1994-1997) | [M.2134](https://www.itu.int/pub/R-REP-M.2134) (2008)[M.2133](https://www.itu.int/pub/R-REP-M.2133) (2008) | [M.2410](http://www.itu.int/pub/R-REP-M.2410) (2017) [M.2411](https://www.itu.int/pub/R-REP-M.2411) (2017) |  |
| **Submission C.L.** | [8/LCCE/47](https://www.itu.int/itudoc/itu-r/archives/rsg/lcce/rsg8/) (1997) | [5/LCCE/2](https://www.itu.int/md/R00-SG05-CIR-0002/en) (2008) | [5/LCCE/59](https://www.itu.int/md/R00-SG05-CIR-0059/en) (2016) |  |
| **Evaluation** | [*M.1225*](https://www.itu.int/rec/R-REC-M.1225/en) (1997) | [M.2135](https://www.itu.int/pub/R-REP-M.2135) (2008-2009) | [M.2412](https://www.itu.int/pub/R-REP-M.2412) (2017) |  |
| **Outcome** | [*M.1455*](https://www.itu.int/rec/R-REC-M.1455/en) (suppressed) | [M.2198](https://www.itu.int/pub/R-REP-M.2198) (2010) | [M.2483](https://www.itu.int/pub/R-REP-M.2483) (2020)[M.2498](https://www.itu.int/pub/R-REP-M.2498) (2021) |  |
| **Specifications** | [*M.1457*](https://www.itu.int/rec/R-REC-M.1457/en) (2000-…-2020) | [*M.2012*](https://www.itu.int/rec/R-REC-M.2012/en)(2012-…-2023) | [*M.2150*](https://www.itu.int/rec/R-REC-M.2150/en) (2023) |  |
| *Notes:* – Italic font indicates that it is a recommendation.– The years in brackets indicate the approval of the various revisions.– C.L.: Circular Letter inviting the submission of candidate technologies. |  |

# 6 Architecture

IMT is intended to provide telecommunication services to mobile and fixed users via a wireless link, covering a wide range of user sectors and accommodating a wide range of user equipment. The network architecture model developed for IMT must therefore be flexible enough to cover all these application scenarios. This overview describes the existing texts about the topology and architecture of IMT networks.

Recommendation [ITU-R M.817](http://www.itu.int/rec/R-REC-M.817/en) presents the functional network architectures and some of the resulting network configurations which are possible for IMT-2000.

Report [ITU-R M.2375](http://www.itu.int/pub/R-REP-M.2375) describes an overview of the architecture, topology/configuration, and transport requirements of IMT networks.

In order to specify the radio interface(s) of IMT-2000, Recommendation [ITU-R M.1035](http://www.itu.int/rec/R-REC-M.1035/en) presents an overview of the radio subsystem for IMT-2000 and give guidelines for the development of the structure of the radio sub-system. The radio sub-system includes the functionalities needed to provide IMT-2000 services over a radio interface(s) to mobile terminals in all IMT-2000 operating environments. Recommendation [ITU-R M.1311](http://www.itu.int/rec/R-REC-M.1311/en) identifies and describes the modularity and radio commonality principles which should be adopted in the development of the radio-related aspects of IMT-2000.

Recommendation [ITU-R M.1182](http://www.itu.int/rec/R-REC-M.1182/en) provides five levels of different architecture for the integration of mobile-satellite service (MSS) systems with terrestrial PSTN or cellular network.

# 7 Radio interface specifications

This section identifies the Recommendations that provide the detailed specifications of the radio interfaces for the terrestrial component of each generation of IMT, including the features and parameters. It also includes the capability to ensure worldwide compatibility, international roaming, and access to high-speed data services.

Table 2 below contains the ITU-R Recommendations that have been published with the specifications of each generation of IMT:

TABLE 2

|  |  |
| --- | --- |
| IMT Generation | Specifications |
| IMT-2000 | Recommendation ITU-R [M.1457](http://www.itu.int/rec/R-REC-M.1457/en) |
| IMT-Advanced | Recommendation ITU-R [M.2012](http://www.itu.int/rec/R-REC-M.2012/en) |
| IMT-2020 | Recommendation ITU-R [M.2150](http://www.itu.int/rec/R-REC-M.2150/en) |

# 8 Unwanted emissions

Unwanted emissions consist of spurious emissions and out-of-band emissions according to No. **1.146** defined in the RR, ITU-R work on the characteristics of unwanted emissions of base and mobile stations using IMT radio interfaces to protect other radio systems and services from interference and to enable coexistence between different technologies.

Recommendation [ITU-R M.1580](http://www.itu.int/rec/R-REC-M.1580/en) provides the generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-2000.

Recommendation [ITU-R M.1581](http://www.itu.int/rec/R-REC-M.1581/en) provides the generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-2000, suitable for establishing the technical basis for global circulation of IMT-2000 terminals.

Recommendation [ITU-R M.2070](http://www.itu.int/rec/R-REC-M.2070/en) provides the generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-Advanced.

Recommendation [ITU-R M.2071](http://www.itu.int/rec/R-REC-M.2071/en) provides the generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-Advanced, suitable for establishing the technical basis for global circulation of IMT-Advanced terminals.

TABLE 3

|  |  |
| --- | --- |
|  | Generic unwanted emission characteristics |
| IMT radio interface | Base station | Mobile station |
| IMT-2000 | [M.1580](http://www.itu.int/rec/R-REC-M.1580/en) | [M.1581](http://www.itu.int/rec/R-REC-M.1581/en) |
| IMT-Advanced | [M.2070](http://www.itu.int/rec/R-REC-M.2070/en) | [M.2071](http://www.itu.int/rec/R-REC-M.2071/en) |

Table 3 contains the ITU-R Recommendations that have been published with the generic unwanted emissions characteristics of each IMT radio interface generation for base and mobile stations.

# 9 Frequency spectrum needs

Spectrum requirements for the terrestrial component of IMT-2000 were estimated prior to World Administrative Radio Conference in 1992 (WARC‑92). These spectrum calculations are documented in Recommendation [ITU-R M.687](http://www.itu.int/rec/R-REC-M.687/en). As technology advances, customers will demand more and more capabilities from wireless services. As a result, this section contains all the studies on estimated spectrum and traffic requirements for the future development of IMT.

## 9.1 Estimation methodologies

ITU-R has developed methodologies for the estimation of required terrestrial spectrum which are defined in:

– Recommendation [ITU-R M.1390](http://www.itu.int/rec/R-REC-M.1390/en) contains a methodology for the calculation of terrestrial spectrum requirement estimates for IMT-2000. This methodology could also be used for other public land mobile radio systems. It provides a systematic approach that incorporates geographic influences, market and traffic impacts, technical and system aspects and consolidation of spectrum requirement results.

– Recommendation [ITU-R M.1768](http://www.itu.int/rec/R-REC-M.1768/en) describes a methodology for the calculation of terrestrial spectrum requirement estimation for IMT. It provides a systematic approach that incorporates service categories (a combination of service type and traffic class), service environments (a combination of service usage pattern and teledensity), radio environments, market data analysis and traffic estimation by using these categories and environments, traffic distribution among radio access technique groups (RATGs), required system capacity calculation and resultant spectrum requirement determination. Report [ITU-R M.2289](http://www.itu.int/pub/R-REP-M.2289) presents the future radio aspect parameters for use with the terrestrial IMT spectrum estimate methodology of Recommendation ITU-R M.1768 in conjunction with developing the future spectrum requirement estimate for terrestrial IMT systems, principally focused towards the years 2020 and beyond.

## 9.2 Frequency spectrum needs

Report [ITU-R M.2023](http://www.itu.int/pub/R-REP-M.2023) determines the amount of spectrum needed to support IMT-2000 services by both the terrestrial and satellite components of IMT-2000. It also describes the forecast demand estimates for such services.

Report [ITU-R M.2078](http://www.itu.int/pub/R-REP-M.2078) provides results of technical studies on estimated spectrum requirements for the future development of IMT-2000 and for IMT-Advanced.

Since the approval of the previous Report in 2006, there have been significant advances in IMT technologies and the deployment of IMT networks.

Report [ITU-R M.2072](http://www.itu.int/pub/R-REP-M.2072) provides a summary of the market analysis and forecast of evolution of mobile market and services for the future development of IMT-2000, systems beyond IMT-2000 and other systems. This Report has derived market related parameters and provided forecasts for 2010, 2015, and 2020 for the mobile market, as estimated in the year 2006.

Report [ITU-R M.2079](http://www.itu.int/pub/R-REP-M.2079) provides useful information for administrations to consider when processing spectrum selection for the future development of IMT-2000 and IMT-Advanced.

ITU-R has developed two documents on traffic, as well as spectrum requirements to 2020, namely:

– Report [ITU-R M.2243](http://www.itu.int/pub/R-REP-M.2243) reviews both the market and traffic forecasts for IMT that were developed in previous study periods (2000-2007) and assesses the perspectives and future needs of MBB that would be supported by IMT until 2020. In addition, it provides traffic forecasts up to 2015, and in some cases up to 2020, taking into account new market trends and market drivers.

– Report [ITU-R M.2290](http://www.itu.int/pub/R-REP-M.2290) provides a global perspective on the future spectrum requirements estimate for terrestrial IMT. In order to estimate the spectrum requirements for 2020, this Report predicts future traffic growth up to 2020 and derived input parameters representing a possible set of global scenarios of the future mobile traffic growth.

Building on the Reports described above, Report [ITU-R M.2370](http://www.itu.int/pub/R-REP-M.2370) analyses trends impacting future IMT traffic growth beyond the year 2020 and estimates the traffic demands for the period 2020 to 2030. There are many drivers impacting future IMT traffic growth and the characteristics of the traffic that are envisaged to generate this growth are also described in this Report.

# 10 Frequency spectrum usage

Frequency bands and associated footnotes identifying the band for IMT in Table 4 are extracted from the [Edition 2020 of the RR](https://www.itu.int/pub/R-REG-RR-2020), Article **5** for ease of reference.

*[Editor’s Note: The footnotes highlighted in yellow in the following table are from the WRC-23* [*Provisional Final Acts*](https://www.itu.int/dms_pub/itu-r/opb/act/R-ACT-WRC.15-2023-PDF-E.pdf) *and will need to be updated when the final numbers are defined for the new edition of the RR].*

TABLE 4

| Band | Footnotes identifying the band for IMT |
| --- | --- |
| Region 1 | Region 2 | Region 3 |
| 450-470 MHz | **5.286AA** |
| 470-694/698 MHz | **5.15B** | **5.295**, **5.308A** | **5.296A** |
| 694/698-960 MHz | **5.317A** | **5.317A** | **5.313A**, **5.317A** |
| 1 427-1 518 MHz | **5.341A**, **5.346** | **5.341B** | **5.341C**, **5.346A** |
| 1 710-2 025 MHz | **5.384A**, **5.388** |
| 2 110-2 200 MHz | **5.388** |
| 2 300-2 400 MHz | **5.384A** |
| 2 500-2 690 MHz | **5.384A** |
| 3 300-3 400 MHz | **5.429B** | **5.429D** | **5.429F** |
| 3 400-3 600 MHz | **5.430A** | **5.431B** | **5.432A**, **5.432B**, **5.433A** |
| 3 600-3 700 MHz | **5.A13C, 5.A13D** | **5.434** | – |
| 3 700-3 800 MHz | **5.A13D** | **5.36A12** | **5.36A12** |
| 4 800-4 990 MHz | **5.441B** | **5.441A**, **5.441B** | **5.441B** |
| 6 425-7 025 MHz | **5.6A12** | **5.6C12** | **5.6B12** |
| 7 025-7 125 MHz | **5.6A12** | **5.6C12** | **5.6A12** |
| 10-10.5 GHz |  | **5.10B12** |  |
| 24.25-27.5 GHz | **5.532AB** |
| 37-43.5 GHz | **5.550B** |
| 45.5-47 GHz | **5.553A** | **5.553A** | **5.553A** |
| 47.2-48.2 GHz | **5.553B** | **5.553B** | **5.553B** |
| 66-71 GHz | **5.559AA** |

## 10.1 Sharing and compatibility studies

All the frequencies bands listed in the Table 4 were identified at World Radiocommunication Conferences (WRC) as harmonized spectrum bands that administrations may choose to make available for terrestrial component of IMT. Consequently, ITU-R has undertaken sharing and compatibility studies in these bands between IMT systems and other services together with the characteristics and methodologies to carry out these studies.

In applying these ITU-R Recommendations and ITU-R Reports, the pertinent World Radiocommunication Conferences decisions and the Radio Regulations in force prevail.

### 10.1.1 Characteristics for sharing studies

To perform the necessary sharing and compatibility studies between IMT systems and systems in other services, characteristics of the terrestrial component of IMT systems are needed. These characteristics can be found in:

– For IMT-2000, Report [ITU-R M.2039](http://www.itu.int/pub/R-REP-M.2039) provides the baseline characteristics of terrestrial IMT-2000 systems only for use in frequency sharing and interference analysis studies involving IMT-2000 systems and between IMT-2000 systems and other systems.

– Parameters of IMT-Advanced interface for frequency sharing and interference analysis studies are addressed in Report [ITU-R M.2292](http://www.itu.int/pub/R-REP-M.2292).

### 10.1.2 Methodologies

Methodologies to perform the necessary sharing and compatibility studies between IMT systems and systems in other services can be found in:

– Recommendation [ITU-R M.1545](http://www.itu.int/rec/R-REC-M.1545/en) describes the application of measurement uncertainty to test limits when devices for terrestrial component of IMT-2000 are tested for conformance.

– Recommendation [ITU-R M.1635](http://www.itu.int/rec/R-REC-M.1635/en) provides recommendations for administrations for a methodology for assessing the potential for interference between IMT-2000 and systems beyond and other services under co-frequency as well as adjacent band conditions.

– Recommendation [ITU-R M.1641](http://www.itu.int/rec/R-REC-M.1641/en) contains a methodology for evaluating co-channel interference and a separation distance between a high-altitude platform stations (HAPS) system as a base station for IMT-2000 and a terrestrial tower-based cellular system providing IMT-2000 service.

– Recommendation [ITU-R M.1654](http://www.itu.int/rec/R-REC-M.1654/en) contains methodology to assess the interference from broadcasting-satellite service (BSS) (sound) into terrestrial IMT-2000 systems intending to use the band 2 630‑2 655 MHz and that could be used to determine the impact of BSS (sound) on terrestrial IMT-2000 in the context of co-frequency sharing through the development of power flux-density (pfd) masks, where applicable.

– Recommendation [ITU-R M.2101](http://www.itu.int/rec/R-REC-M.2101/en) describes the methodology for modelling and simulation of IMT networks for use in sharing and compatibility studies between IMT and other systems and/or applications.

### 10.1.3 Sharing studies

In this section, all frequency sharing studies and interference analyses involving IMT systems and other systems and services operating in bands identified for IMT are listed. The following ones are in force:

– Recommendation [ITU-R M.1646](http://www.itu.int/rec/R-REC-M.1646/en) contains the parameters to be used in co-frequency sharing and pfd threshold studies between terrestrial IMT-2000 and broadcasting-satellite service (sound) in the 2 630-2 655 MHz band.

– Report [ITU-R M.2030](http://www.itu.int/pub/R-REP-M.2030) addresses the coexistence between IMT-2000 time division duplex and frequency division duplex terrestrial RITs around 2 600 MHz operating in adjacent bands and in the same geographical area.

– Report [ITU-R M.2041](http://www.itu.int/pub/R-REP-M.2041) identifies sharing and adjacent band compatibility in the 2.5 GHz band between the terrestrial and satellite components of IMT-2000.

– Report [ITU-R M.2045](http://www.itu.int/pub/R-REP-M.2045) considers techniques to improve compatibility between IMT‑2000 time division duplex (TDD) and frequency division duplex (FDD) RITs operating in adjacent frequency bands and in the same geographic area within the 2 500-2 690 MHz frequency band.

– Recommendation [ITU-R M.2090](http://www.itu.int/rec/R-REC-M.2090/en) provides guidance to administrations on specific unwanted emission levels of IMT mobile stations operating in the frequency band 694‑790 MHz in order to facilitate protection of existing services in the frequency band 470-694 MHz in Region 1.

– Report [ITU-R M.2109](http://www.itu.int/pub/R-REP-M.2109) provides a summary of the sharing studies between IMT‑Advanced systems and geostationary satellite networks in the fixed-satellite service (FSS) in the 3 400-4 200 and 4 500-4 800 MHz frequency bands.

– Report [ITU-R M.2110](http://www.itu.int/pub/R-REP-M.2110) assesses the feasibility of sharing between IMT systems operating in the 450-470 MHz band and the radiocommunication services having a primary allocation.

– Report [ITU-R M.2111](http://www.itu.int/pub/R-REP-M.2111) provides sharing studies between radar systems and IMT‑Advanced systems in the bands 3 400-3 700 MHz, and potential interference mitigation techniques.

– Report [ITU-R M.2112](http://www.itu.int/pub/R-REP-M.2112) provides compatibility analysis between air surveillance radars (ASR) and meteorological radars and IMT systems operating in the 2 700-2 900 MHz band with new assumptions and systems characteristics.

– Report [ITU-R M.2113](http://www.itu.int/pub/R-REP-M.2113) focuses on sharing studies in the 2 500-2 690 MHz band between IMT-2000 and fixed broadband wireless access systems including nomadic applications in the same geographical area.

– Report [ITU-R M.2146](http://www.itu.int/pub/R-REP-M.2146) studies the coexistence between IMT-2000 CDMA-DS and IMT‑2000 OFDMA-TDD-WMAN in the 2 500-2 690 MHz band operating in adjacent bands in the same area.

– Recommendation [ITU-R M.2159](http://www.itu.int/rec/R-REC-M.2159/en) provides technical and regulatory measures for adjacent band compatibility between satellite systems in the mobile-satellite service (MSS) operating in the band 1 518‑1 525 MHz and terrestrial international mobile telecommunications (IMT) systems operating in the band 1 492-1 518 MHz as invited by Resolution **223 (Rev.WRC-19)**.

– Report [ITU-R M.2241](http://www.itu.int/pub/R-REP-M.2241) provides sharing study results in relation with Resolution **224 (Rev.WRC-19)**. It assesses the degree of compatibility between IMT systems operating in the frequency bands 790-862 MHz or 698-806 MHz and systems of other services operating in the same or adjacent band.

– Report [ITU-R M.2324](http://www.itu.int/pub/R-REP-M.2324) provides sharing studies between potential IMT systems and aeronautical mobile telemetry (AMT) systems in the frequency band 1 429-1 535 MHz.

– Report [ITU-R SA.2325](http://www.itu.int/pub/R-REP-SA.2325) considers the feasibility of LTE type of IMT systems sharing the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz with incumbent primary services of the space research, Earth exploration-satellite and space operation services in the space-to-space direction.

– Report [ITU-R F.2326](http://www.itu.int/pub/R-REP-F.2326) addresses the sharing and compatibility study between indoor IMT small cells and FS stations in the 5 925-6 425 MHz frequency band.

– Report [ITU-R F.2327](http://www.itu.int/pub/R-REP-F.2327) provides the results of compatibility studies between IMT system and point-to-point fixed wireless systems in the frequency band 4 400-4 990 MHz.

– Report [ITU-R F.2328](http://www.itu.int/pub/R-REP-F.2328) examines the compatibility of proposed IMT systems and FS systems operating in the 3 400-4 200 MHz frequency range.

– Report [ITU-R SA.2329](http://www.itu.int/pub/R-REP-SA.2329) provides an assessment of the separation distance that would be required between IMT stations (base stations and user equipment (UE)) and meteorological-satellite service (MetSat) receiving earth stations in the 1 695‑1 710 MHz frequency band.

– Report [ITU-R F.2331](http://www.itu.int/pub/R-REP-F.2331) examines the compatibility of proposed IMT systems and FS systems operating in the 470‑694/698 MHz frequency range.

– Report [ITU-R F.2333](http://www.itu.int/pub/R-REP-F.2333) presents an analysis of the feasibility of co-channel compatibility/sharing between IMT systems and FS point-to-point links currently operating in the frequency band 1 350-1 527 MHz.

– Report [ITU-R RS.2336](http://www.itu.int/pub/R-REP-RS.2336) provides analyses based on both static scenario and dynamic methodology to address the compatibility between IMT systems in the frequency bands 1 375-1 400 MHz and 1 427-1 452 MHz and Earth exploration-satellite service (EESS) (passive) systems in the 1 400‑1 427 MHz frequency band.

– Report [ITU-R BT.2337](http://www.itu.int/pub/R-REP-BT.2337) provides sharing and compatibility studies were conducted between terrestrial mobile broadband applications, including IMT, and digital terrestrial television broadcasting (DTTB) in the frequency band 470-694 MHz in the GE06 planning area.

– Report [ITU-R BT.2338](http://www.itu.int/pub/R-REP-BT.2338) provides relevant information on audio SAB/SAP, including technical characteristics, quality requirements, current spectrum use, and the impact of the loss of the 694-790 MHz band.

– Report [ITU-R BT.2339](http://www.itu.int/pub/R-REP-BT.2339) describes co-channel sharing and compatibility studies between digital terrestrial television broadcasting and IMT in the frequency band 694-790 MHz in the GE06 planning area.

– Report [ITU-R BS.2340](http://www.itu.int/pub/R-REP-BS.2340) provides a sharing study between potential IMT systems and the broadcasting service (BS) in the frequency band 1 452-1 492 MHz.

– Report [ITU-R S.2367](http://www.itu.int/pub/R-REP-S.2367) describes sharing studies between IMT-Advanced systems and satellite networks in the fixed-satellite service in the 5 850-6 425 MHz frequency band.

– Report [ITU-R S.2368](http://www.itu.int/pub/R-REP-S.2368) describes sharing studies between IMT-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands.

– Report [ITU-R M.2374](http://www.itu.int/pub/R-REP-M.2374) provides an un-paired arrangement, time division duplex (TDD) for the band 2 300-2 400 MHz. This band is used or is planned to be used for mobile broadband wireless access (BWA) including IMT technologies in a number of countries and there is a need for a study on coexistence of BWA systems, deployed in the same geographical area, using TDD mode in adjacent spectrum blocks in 2 300-2 400 MHz band in order to maximize the additional benefit from harmonized use of the band.

– Report [ITU-R M.2481](http://www.itu.int/pub/R-REP-M.2481) contains studies on operational measures to enable coexistence of IMT and radiolocation service in the frequency band 3 300-3 400 MHz, and compatibility studies in adjacent bands between IMT systems operating in the frequency band 3 300‑3 400 MHz and radiolocation systems operating below 3 300 MHz.

– Report [ITU-R M.2499](http://www.itu.int/pub/R-REP-M.2499) addresses the study on the aspects of synchronization operations of multiple IMT-2020 TDD networks in close proximity using the same frequency band, including analyses of coexistence issues when IMT operators utilize different synchronization modes, performance evaluation under different synchronization modes, and coexistence mitigation strategies.

– Report [ITU-R F.2529](http://www.itu.int/pub/R-REP-F.2529) provides adjacent band compatibility studies of IMT systems in the mobile service in the band 1 492-1 518 MHz with respect to systems in the mobile-satellite service in the frequency band 1 518-1 525 MHz.

As observations made by the radio astronomy service (RAS) are highly susceptible to detrimental interference from unwanted emissions by active services, it is necessary to determine the conditions under which they can be protected in accordance with the relevant ITU-R Recommendations. In particular, these studies should determine the separation distances between RAS antennas and IMT systems necessary to protect the RAS. As a result, Report [ITU-R RA.2332](http://www.itu.int/pub/R-REP-RA.2332) describes compatibility and sharing studies between the radio astronomy service and IMT systems in the frequency bands 608-614 MHz, 1 330-1 400 MHz, 1 400-1 427 MHz, 1 610.6-1 613.8 MHz, 1 660-1 670 MHz, 2 690‑2 700 MHz, 4 800-4 990 MHz and 4 990-5 000 MHz.

To summarize, all sharing and compatibility studies mentioned are referenced in Table 5, sorted by the service they are sharing the frequency spectrum with, in each identified IMT band.

TABLE 5

|  |  |
| --- | --- |
| Band (MHz) | IMT frequency spectrum sharing studies |
| Terrestrial services | Satellite services | Science services |
| FS | BS (sound) | BS (television) | LMS | RDS | FSS | BSS | MSS | EESS | SRS | SOS | RAS |
| 450-470 | [M.2110](http://www.itu.int/pub/R-REP-M.2110) | [M.2110](http://www.itu.int/pub/R-REP-M.2110)\* | [M.2110](http://www.itu.int/pub/R-REP-M.2110)\* | [M.2110](http://www.itu.int/pub/R-REP-M.2110) | [M.2110](http://www.itu.int/pub/R-REP-M.2110) (RLS) |  |  | [M.2110](http://www.itu.int/pub/R-REP-M.2110) |  |  |  |  |
| 470-698 | [F.2331](http://www.itu.int/pub/R-REP-F.2331) |  | [BT.2337](http://www.itu.int/pub/R-REP-BT.2337) |  |  |  |  |  |  |  |  | [RA.2332](http://www.itu.int/pub/R-REP-RA.2332) |
| 694/698-960 | [M.2241](http://www.itu.int/pub/R-REP-M.2241) | [M.2241](http://www.itu.int/pub/R-REP-M.2241)[*M.2090*](http://www.itu.int/rec/R-REC-M.2090/en)\* | [M.2241](http://www.itu.int/pub/R-REP-M.2241) [*M.2090*](http://www.itu.int/rec/R-REC-M.2090/en)\*[BT.2339](http://www.itu.int/pub/R-REP-BT.2339)[BT.2338](http://www.itu.int/pub/R-REP-BT.2338) |  | [M.2241](http://www.itu.int/pub/R-REP-M.2241) (ARNS) |  |  |  |  |  |  |  |
| 1 427-1 518 | [F.2333](http://www.itu.int/pub/R-REP-F.2333) | [BS.2340](http://www.itu.int/pub/R-REP-BS.2340) |  |  | [M.2324](http://www.itu.int/pub/R-REP-M.2324)(AMS/AMT) |  |  | [*M.2159*](http://www.itu.int/rec/R-REC-M.2159/en)[M.2529](https://www.itu.int/pub/R-REP-M.2529-2023) | [RS.2336](http://www.itu.int/pub/R-REP-RS.2336) |  |  | [RA.2332](http://www.itu.int/pub/R-REP-RA.2332)\* |
| 1 710-2 025 |  |  |  |  |  |  |  |  | [SA.2329](http://www.itu.int/pub/R-REP-SA.2329)\*(MetSat) |  |  | [RA.2332](http://www.itu.int/pub/R-REP-RA.2332)\* |
| 2 110-2 200 |  |  |  |  |  |  |  |  | [SA.2325](http://www.itu.int/pub/R-REP-SA.2325) | [SA.2325](http://www.itu.int/pub/R-REP-SA.2325) | [SA.2325](http://www.itu.int/pub/R-REP-SA.2325) |  |
| 2 300-2 400 |  |  |  | [M.2374](http://www.itu.int/pub/R-REP-M.2374) |  |  |  |  |  |  |  |  |
| 2 500-2 690 | [M.2030](http://www.itu.int/pub/R-REP-M.2030)[M.2045](http://www.itu.int/pub/R-REP-M.2045)[M.2113](http://www.itu.int/pub/R-REP-M.2113) |  |  | [M.2030](http://www.itu.int/pub/R-REP-M.2030) [M.2045](http://www.itu.int/pub/R-REP-M.2045) [M.2146](http://www.itu.int/pub/R-REP-M.2146) | [M.2112](http://www.itu.int/pub/R-REP-M.2112)\* (RLS) |  | [*M.1646*](http://www.itu.int/rec/R-REC-M.1646/en) | [M.2041](http://www.itu.int/pub/R-REP-M.2041) |  |  |  | [RA.2332](http://www.itu.int/pub/R-REP-RA.2332)\* |
| 3 300-3 400 |  |  |  |  | [M.2481](http://www.itu.int/pub/R-REP-M.2481) (RLS) |  |  |  |  |  |  |  |
| 3 400-3 600 | [F.2328](http://www.itu.int/pub/R-REP-F.2328) |  |  |  | [M.2111](http://www.itu.int/pub/R-REP-M.2111) (RLS) | [M.2109](http://www.itu.int/pub/R-REP-M.2109) [S.2368](http://www.itu.int/pub/R-REP-S.2368) |  |  |  |  |  |  |
| 3 600-3 700 | [F.2328](http://www.itu.int/pub/R-REP-F.2328) |  |  |  | [M.2111](http://www.itu.int/pub/R-REP-M.2111) (RLS) | [M.2109](http://www.itu.int/pub/R-REP-M.2109) [S.2368](http://www.itu.int/pub/R-REP-S.2368) |  |  |  |  |  |  |
| 4 800-4 990 | [F.2327](http://www.itu.int/pub/R-REP-F.2327)[F.2326](http://www.itu.int/pub/R-REP-F.2326)\* |  |  |  |  | [M.2109](http://www.itu.int/pub/R-REP-M.2109)\*[S.2368](http://www.itu.int/pub/R-REP-S.2368)\* [S.2367](http://www.itu.int/pub/R-REP-S.2367)\* |  |  |  |  |  | [RA.2332](http://www.itu.int/pub/R-REP-RA.2332) |
| *Notes:* – Italic font indicates that it is a Recommendation.**\*** These sharing studies includes adjacent bands of IMT. |

## 10.2 Frequency implementation

Recommendation [ITU-R M.1036](http://www.itu.int/rec/R-REC-M.1036/en) provides guidance on the selection of transmitting and receiving frequency arrangements for the terrestrial component of IMT systems as well as the arrangements themselves, with a view to assisting administrations on spectrum-related technical issues relevant to the implementation and use of the terrestrial component of IMT in the bands identified in the Radio Regulations (RR).

Recommendation [ITU-R M.1456](http://www.itu.int/rec/R-REC-M.1456/en) addresses minimum performance characteristics and operational conditions for HAPS operating as IMT-2000 base stations in frequency bands around 2 GHz.

Report [ITU-R M.2024](http://www.itu.int/pub/R-REP-M.2024) “Summary of spectrum usage survey results” contains the views of a number of administrations that have indicated their current and planned spectrum usage of the bands which are considered potentially suitable for IMT-2000.

# 11 Technology

One of the most challenging aspects of designing future wireless telecommunications systems is accurately anticipating what the future trends and technological drivers will be. This is made even more difficult by the rapid advances in technology over the last few years and the increasingly sophisticated demands. Therefore, this section contains the existing ITU-R texts about technology in different applications and the future technology trends.

*Cognitive radio systems (CRS):* Report [ITU-R M.2242](http://www.itu.int/pub/R-REP-M.2242) addresses aspects of cognitive radio systems specific to IMT systems. It includes results of studies to determine the impact of adding cognitive radio capabilities to existing IMT systems, and analyses the benefits, challenges and impacts of CRSs in IMT, including a description of how the systems would be used in IMT system deployments and their possible impact on the use of IMT frequency spectrum.

*Antennas:* Report [ITU-R M.2244](http://www.itu.int/pub/R-REP-M.2244) contains methods to estimate the required isolation between IMT base station antennas in the land mobile service that are co-located or located in close proximity and possible antenna orientations to achieve the required isolation.

Report [ITU-R M.2334](http://www.itu.int/pub/R-REP-M.2334) addresses several aspects of active and passive antenna systems for base stations of IMT systems, including:

– the definitions of antenna systems, associated components and terminology;

– definitions for common performance parameters and tolerances;

– guidelines on performance parameters and tolerances;

– and considerations of advanced concepts.

*Implementation technologies:* Report [ITU-R M.2038](http://www.itu.int/pub/R-REP-M.2038) “Technology trends” addresses technology topics that appear relevant to some lesser or greater degree to the future development of IMT-2000 and systems beyond IMT‑2000. Specifically, it considers these topics in three broad categories:

– technologies which have an impact on spectrum, its utilization and/or efficiency in this context;

– technologies which relate to access networks and radio interfaces;

– technologies which relate to mobile terminals.

Report [ITU-R M.2074](http://www.itu.int/pub/R-REP-M.2074) describes technical matters related to radio aspects such as requirement for technical characteristics that are needed for the spectrum requirements calculations, values of the required radio parameters, spectrum efficiency values, and suitable spectrum range preference from a technical aspect. These matters are reflected in the process to calculate the required spectrum and to determine suitable frequency ranges for the future development of IMT-2000 and systems beyond IMT-2000 from 2010 onwards.

Considering the timeframe 2015-2020 and beyond, Report [ITU-R M.2320](http://www.itu.int/pub/R-REP-M.2320) provides a broad view of future technical aspects of terrestrial IMT systems. It includes information on technical and operational characteristics of IMT systems, including the evolution of IMT through advances in technology and spectrally efficient techniques, and their deployment.

Report [ITU-R M.2376](http://www.itu.int/pub/R-REP-M.2376) provides information on the technical feasibility of IMT in the bands between 6 GHz and 100 GHz. It includes information on how current IMT systems, their evolution, and/or potentially new IMT RITs and system approaches could be appropriate for operation in the bands between 6 GHz and 100 GHz, taking into account the impact of the propagation characteristics related to the possible future operation of IMT in those bands.

More information on this topic can be found in Handbook “[Global Trends in IMT](http://www.itu.int/pub/R-HDB-62)”, which provides the general information such as service requirements, application trends, system characteristics, and substantive information on spectrum, regulatory issues, guideline for the evolution and migration, and core network evolution on IMT.

# 12 Implementation

This section provides information on various aspects that need to be considered when planning to use or deploy an IMT. A number of considerations have been identified for the implementation of IMT:

Recommendations and guidance for the evolution of pre-IMT-2000 systems towards IMT-2000 are provided in Recommendation [ITU-R M.1308](https://www.itu.int/rec/R-REC-M.1308/e) and [Volume 2](https://www.itu.int/pub/R-HDB-30) of the Land Mobile Handbook.

Recommendation [ITU-R M.1168](http://www.itu.int/rec/R-REC-M.1168/en) present the conceptual and methodological framework for the definition of the management of IMT-2000. The methodology described in Recommendation ITU-T M.3020 is used to define management requirements, management services, management functions, information models, and management protocols related to the management of IMT-2000.

Handbook “[Deployment of IMT-2000 Systems](http://www.itu.int/pub/R-HDB-60)” addresses a variety of issues related to the deployment of IMT-2000 systems, to inform and guide key decision-makers on critical aspects concerning third-generation mobile communication systems, to facilitate decisions on the selection of options and strategies for the introduction of their IMT-2000 networks. Revised Supplement “[Migration to IMT‑2000 Systems](http://www.itu.int/pub/R-HDB-46)” to the previous Handbook offers additional information and guidance on the radio aspects of IMT-2000 systems based on further studies and the experience gained since the Handbook was first published. In particular, it deals with evolution and migration aspects.

In October 2000, the BR published a CD-ROM “[IMT-2000: Special Edition](https://www.itu.int/itudoc/gs/subscirc/itu-r/%28297-00%29.html)” containing a complete set of ITU texts on IMT-2000 and other related topics on personal mobile communications in force at the time, which is now of historical interest only. It includes relevant ITU Recommendations, Reports, Handbooks, Resolutions, extracts of the provisional Final Acts of the World Radiocommunication Conference 2000 (WRC-2000), as well as general information documents, conference, seminar and workshop presentations. In particular, it contains the first version of Recommendation ITU-R M.1457, which describes the detailed specifications of the radio interfaces of IMT-2000, including the full contents of the core global specifications for the different radio interfaces recommended by ITU.

Recommendation [ITU-R M.1579](http://www.itu.int/rec/R-REC-M.1579/en) establishes the technical basis for global circulation of IMT terrestrial terminals based on terminals not causing harmful interference in any country where they circulate:

– by conforming to IMT-2000 and IMT-Advanced terrestrial radio interface specifications; and

– by complying with unwanted emission limits for IMT-2000 and IMT-Advanced terrestrial radio interfaces.

Report [ITU-R M.2480](http://www.itu.int/pub/R-REP-M.2480) provides national approaches taken and/or knowledge gained by certain countries wishing to share their approaches, in the use/deployment or planning of terrestrial component of IMT in certain frequency bands that are allocated to the mobile service and identified for IMT, which includes regulatory, technical and operational aspects.

Due to the particular nature of wireless communications, IMT needs to incorporate security measures to prevent unauthorized reception. The IMT radio specifications include the necessary security measures.

Recommendation [ITU-R M.1078](http://www.itu.int/rec/R-REC-M.1078/en) provides the principles and framework for the security provided by IMT-2000. The Recommendation covers all aspects of security for IMT-2000 and is intended as a basis for more detailed aspects of IMT-2000 security to be integrated in various ITU-R or ITU-T Recommendations including IMT-2000 requirements at a later stage.

Recommendation [ITU-R M.1223](http://www.itu.int/rec/R-REC-M.1223/en) identifies classes of security mechanisms appropriate for implementing the IMT-2000 security features defined in the previous Recommendation on security principles for IMT-2000, and thus for satisfying the IMT-2000 security requirements identified in the same Recommendation.

Annex A

All documents sorted by topic[[5]](#footnote-5)

| Type | Series | Number | Rev. | Title | Year | Relevant topic(s) |
| --- | --- | --- | --- | --- | --- | --- |
| Rec. | M. | [817](http://www.itu.int/rec/R-REC-M.817/en) | 0 | International Mobile Telecommunications-2000 (IMT‑2000) – Network architectures | 1992 | ArchitectureIMT-2000 |
| Rec. | M. | [1035](http://www.itu.int/rec/R-REC-M.1035/en) | 0 | Framework for the radio interface(s) and radio sub-system functionality for International Mobile Telecommunications-2000 (IMT-2000) | 1994 | ArchitectureIMT-2000 |
| Rec. | M. | [1182](http://www.itu.int/rec/R-REC-M.1182/en) | 1 | Integration of terrestrial and satellite mobile communication systems | 2003 | Architecture |
| Rec. | M. | [1311](http://www.itu.int/rec/R-REC-M.1311/en) | 0 | Framework for modularity and radio commonality within IMT-2000 | 1997 | ArchitectureIMT-2000 |
| Rep. | M. | [2375](http://www.itu.int/pub/R-REP-M.2375) | 0 | Architecture and topology of IMT networks | 2015 | Architecture |
| Rec. | M. | [819](http://www.itu.int/rec/R-REC-M.819/en) | 2 | International Mobile Telecommunications-2000 (IMT‑2000) for developing countries | 1997 | Developing countriesIMT-2000 |
| Rep. | M. | [1155](http://www.itu.int/pub/R-REP-M.1155) | 0 | Adaptation of mobile radiocommunication technology to the needs of developing countries | 1990 | Developing countries |
| Rec. | M. | [1224](http://www.itu.int/rec/R-REC-M.1224/en) | 1 | Vocabulary of terms for International Mobile Telecommunications (IMT) | 2012 | Vocabulary |
| Rec. | M. | [1034](http://www.itu.int/rec/R-REC-M.1034/en) | 1 | Requirements for the radio interface(s) for International Mobile Telecommunications-2000 (IMT-2000) | 1997 | IMT ProcessIMT-2000 |
| Rec. | M. | [1225](http://www.itu.int/rec/R-REC-M.1225/en) | 0 | Guidelines for evaluation of radio transmission technologies for IMT‑2000 | 1997 | IMT ProcessIMT-2000 |
| Rep. | M. | [2133](http://www.itu.int/pub/R-REP-M.2133) | 0 | Requirements, evaluation criteria and submission templates for the development of IMT-Advanced | 2008 | IMT ProcessIMT-Advanced |
| Rep. | M. | [2134](http://www.itu.int/pub/R-REP-M.2134) | 0 | Requirements related to technical performance for IMT-Advanced radio interface(s) | 2008 | IMT ProcessIMT-Advanced |
| Rep. | M. | [2135](http://www.itu.int/pub/R-REP-M.2135) | 1 | Guidelines for evaluation of radio interface technologies for IMT-Advanced | 2009 | IMT ProcessIMT-Advanced |
| Rep. | M. | [2198](http://www.itu.int/pub/R-REP-M.2198) | 0 | The outcome of the evaluation, consensus building and decision of the IMT‑Advanced process (steps 4-7), including characteristics of IMT-Advanced radio interfaces | 2010 | IMT ProcessIMT-Advanced |
| Rep. | M. | [2410](http://www.itu.int/pub/R-REP-M.2410) | 0 | Minimum requirements related to technical performance for IMT-2020 radio interface(s) | 2017 | IMT ProcessIMT-2020 |
| Rep. | M. | [2411](http://www.itu.int/pub/R-REP-M.2411) | 0 | Requirements, evaluation criteria and submission templates for the development of IMT-2020 | 2017 | IMT ProcessIMT-2020 |
| Rep. | M. | [2412](http://www.itu.int/pub/R-REP-M.2412) | 0 | Guidelines for evaluation of radio interface technologies for IMT-2020 | 2017 | IMT ProcessIMT-2020 |
| Rep. | M. | [2483](http://www.itu.int/pub/R-REP-M.2483) | 0 | The outcome of the evaluation, consensus building and decision of the IMT-2020 process (Steps 4 to 7), including characteristics of IMT-2020 radio interfaces | 2020 | IMT ProcessIMT-2020 |
| Rep. | M. | [2498](http://www.itu.int/pub/R-REP-M.2498) | 0 | The outcome of 'Way Forward Option 2 for "ETSI (TC DECT) and DECT Forum Proponent" of the evaluation, consensus building and decision of the IMT-2020 process (Steps 4 to 7), including characteristics of IMT-2020 radio interfaces | 2021 | IMT ProcessIMT-2020 |
| Rec. | M. | [1168](http://www.itu.int/rec/R-REC-M.1168/en) | 0 | Framework of International Mobile Telecommunications-2000 (IMT‑2000) | 1995 | ImplementationIMT-2000 |
| Rec. | M. | [1308](https://www.itu.int/rec/R-REC-M.1308/e) | 0 | Evolution of land mobile systems towards IMT‑2000*Note: Responsibility WP 5A* | 1997 | ImplementationIMT-2000 |
| Rec. | M. | [1579](http://www.itu.int/rec/R-REC-M.1579/en) | 2 | Global circulation of IMT terrestrial terminals | 2015 | Implementation |
| Rep. | M. | [2480](http://www.itu.int/pub/R-REP-M.2480) | 1 | National approaches of some countries on the implementation of terrestrial IMT systems in bands identified for IMT | 2021 | Implementation |
| Handbook | [30](http://www.itu.int/pub/R-HDB-30) | 0 | Land Mobile (including Wireless Access) – Volume 2: Principles and Approaches on Evolution to IMT‑2000/FPLMTS | 1997 | ImplementationIMT-2000 |
| Handbook | [37](http://www.itu.int/pub/R-HDB-37) | 0 | IMT-2000: Special Edition | 2000 | ImplementationIMT-2000 |
| Handbook | [46](http://www.itu.int/pub/R-HDB-46) | 1 | Migration to IMT-2000 Systems – Supplement 1 (Revision 1) of the Handbook on Deployment of IMT-2000 Systems | 2011 | Implementation |
| Handbook | [60](http://www.itu.int/pub/R-HDB-60) | 0 | Deployment of IMT-2000 Systems | 2003 | ImplementationIMT-2000 |
| Rec. | M. | [1078](http://www.itu.int/rec/R-REC-M.1078/en) | 0 | Security principles for International Mobile Telecommunications-2000 (IMT-2000) | 1994 | ImplementationIMT-2000 |
| Rec. | M. | [1223](http://www.itu.int/rec/R-REC-M.1223/en) | 0 | Evaluation of security mechanisms for IMT-2000 | 1997 | ImplementationIMT-2000 |
| Rec. | M. | [687](http://www.itu.int/rec/R-REC-M.687/en) | 2 | International Mobile Telecommunications-2000 (IMT‑2000) | 1997 | ObjectivesIMT-2000 |
| Rep. | M. | [1153](http://www.itu.int/pub/R-REP-M.1153) | 0 | Future public land mobile telecommunication systems | 1990 | Objectives |
| Rec. | M. | [1645](http://www.itu.int/rec/R-REC-M.1645/en) | 0 | Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000 | 2003 | ObjectivesIMT-2000 |
| Rec. | M. | [2083](http://www.itu.int/rec/R-REC-M.2083/en) | 0 | IMT Vision – "Framework and overall objectives of the future development of IMT for 2020 and beyond" | 2015 | ObjectivesIMT-2020 |
| Rec. | M. | 2160 | 0 | Framework and overall objectives of the future development of IMT for 2030 and beyond | 2023 | ObjectivesIMT-2030 |
| Rec. | M. | [1457](http://www.itu.int/rec/R-REC-M.1457/en) | 15 | Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT‑2000) | 2020 | Radio interface specificationsIMT-2000 |
| Rec. | M. | [2012](http://www.itu.int/rec/R-REC-M.2012/en) | 6 | Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced) | 2023 | Radio interface specificationsIMT-Advanced |
| Rec. | M. | [2150](http://www.itu.int/rec/R-REC-M.2150/en) | 2 | Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2020 (IMT-2020) | 2023 | Radio interface specificationsIMT-2020 |
| Rec. | M. | [1390](http://www.itu.int/rec/R-REC-M.1390/en) | 0 | Methodology for the calculation of IMT-2000 terrestrial spectrum requirements | 1999 | Spectrum needsIMT-2000 |
| Rec. | M. | [1768](http://www.itu.int/rec/R-REC-M.1768/en) | 1 | Methodology for calculation of spectrum requirements for the terrestrial component of International Mobile Telecommunications | 2013 | Spectrum needs |
| Rep. | M. | [2023](http://www.itu.int/pub/R-REP-M.2023) | 0 | Spectrum requirements for International Mobile Telecommunications-2000 (IMT-2000) | 2000 | Spectrum needsIMT-2000 |
| Rep. | M. | [2072](http://www.itu.int/pub/R-REP-M.2072) | 0 | World mobile telecommunication market forecast | 2005 | Spectrum needs |
| Rep. | M. | [2078](http://www.itu.int/pub/R-REP-M.2078) | 0 | Estimated spectrum bandwidth requirements for the future development of IMT‑2000 and IMT-Advanced | 2006 | Spectrum needsIMT-2000 / IMT‑Advanced |
| Rep. | M. | [2079](http://www.itu.int/pub/R-REP-M.2079) | 0 | Technical and operational information for identifying spectrum for the terrestrial component of future development of IMT-2000 and IMT‑Advanced | 2006 | Spectrum needsIMT-2000 / IMT‑Advanced |
| Rep. | M. | [2243](http://www.itu.int/pub/R-REP-M.2243) | 0 | Assessment of the global mobile broadband deployments and forecasts for International Mobile Telecommunications | 2011 | Spectrum needs |
| Rep. | M. | [2289](http://www.itu.int/pub/R-REP-M.2289) | 0 | Future radio aspect parameters for use with the terrestrial IMT spectrum estimate methodology of Recommendation ITU-R M.1768-1 | 2013 | Spectrum needs |
| Rep. | M. | [2290](http://www.itu.int/pub/R-REP-M.2290) | 0 | Future spectrum requirements estimate for terrestrial IMT | 2013 | Spectrum needs |
| Rep. | M. | [2370](http://www.itu.int/pub/R-REP-M.2370) | 0 | IMT Traffic estimates for the years 2020 to 2030 | 2015 | Spectrum needs |
| Rec. | M. | [1036](http://www.itu.int/rec/R-REC-M.1036/en) | 6 | Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations | 2019 | Spectrum usageImplementation |
| Rec. | M. | [1456](http://www.itu.int/rec/R-REC-M.1456/en) | 0 | Minimum performance characteristics and operational conditions for high altitude platform stations providing IMT-2000 in the bands 1 885‑1 980 MHz, 2 010‑2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2 | 2000 | Spectrum usageHAPSIMT-2000 |
| Rec. | M. | [1545](http://www.itu.int/rec/R-REC-M.1545/en) | 0 | Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000 | 2001 | Spectrum usageIMT-2000 |
| Rec. | M. | [1635](http://www.itu.int/rec/R-REC-M.1635/en) | 0 | General methodology for assessing the potential for interference between IMT-2000 or systems beyond IMT-2000 and other services | 2003 | Spectrum usage |
| Rec. | M. | [1641](http://www.itu.int/rec/R-REC-M.1641/en) | 1 | A methodology for co-channel interference evaluation to determine separation distance from a system using HAPS to a cellular system to provide IMT-2000 service  | 2006 | Spectrum usageIMT-2000 |
| Rec. | M. | [1646](http://www.itu.int/rec/R-REC-M.1646/en) | 0 | Parameters to be used in co-frequency sharing and pfd threshold studies between terrestrial IMT-2000 and BSS (sound) in the 2 630‑2 655 MHz band | 2003 | Spectrum usageIMT-2000 |
| Rec. | M. | [1654](http://www.itu.int/rec/R-REC-M.1654/en) | 0 | A methodology to assess interference from broadcasting satellite service (sound) into terrestrial IMT‑2000 systems intending to use the band 2 630‑2 655 MHz | 2003 | Spectrum usageIMT-2000 |
| Rec. | M. | [2159](https://www.itu.int/rec/R-REC-M.2159/en) | 0 | Technical and regulatory measures to provide compatibility between IMT and MSS, with respect to MSS operations in the frequency band 1 518-1 525 MHz for administrations wishing to implement IMT in the frequency band 1 492-1 518 MHz | 2023 | Spectrum usage |
| Rep. | M. | [2529](https://www.itu.int/pub/R-REP-M.2529-2023) | 0 | Adjacent band compatibility studies of IMT systems in the mobile service in the band 1 492-1 518 MHz with respect to systems in the mobile-satellite service in the frequency band 1 518-1 525 MHz | 2023 | Spectrum usage |
| Rep. | M. | [2024](http://www.itu.int/pub/R-REP-M.2024) | 0 | Summary of spectrum usage survey results | 2000 | Spectrum usage |
| Rep. | M. | [2030](http://www.itu.int/pub/R-REP-M.2030) | 0 | Coexistence between IMT-2000 time division duplex and frequency division duplex radio interface technologies around 2 600 MHz operating in adjacent bands and in the same geographical area | 2003 | Spectrum usageIMT-2000 |
| Rep. | M. | [2031](http://www.itu.int/pub/R-REP-M.2031) | 0 | Compatibility between WCDMA 1800 downlink and GSM 1900 uplink | 2003 | Spectrum usage |
| Rep. | M. | [2039](http://www.itu.int/pub/R-REP-M.2039) | 3 | Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analyses | 2014 | Spectrum usage |
| Rep. | M. | [2041](http://www.itu.int/pub/R-REP-M.2041) | 0 | Sharing and adjacent band compatibility in the 2.5 GHz band between the terrestrial and satellite components of IMT-2000 | 2003 | Spectrum usageIMT-2000 |
| Rep. | M. | [2045](http://www.itu.int/pub/R-REP-M.2045) | 0 | Mitigating techniques to address coexistence between IMT-2000 time division duplex and frequency division duplex radio interface technologies within the frequency range 2 500‑2 690 MHz operating in adjacent bands and in the same geographical area | 2004 | Spectrum usage |
| Rec. | M. | [2090](http://www.itu.int/rec/R-REC-M.2090/en) | 0 | Specific unwanted emission limit of IMT mobile stations operating in the frequency band 694-790 MHz to facilitate protection of existing services in Region 1 in the frequency band 470-694 MHz | 2015 | Spectrum usage |
| Rec. | M. | [2101](http://www.itu.int/rec/R-REC-M.2101/en) | 0 | Modelling and simulation of IMT networks and systems for use in sharing and compatibility studies | 2017 | Spectrum usage |
| Rep. | M. | [2109](http://www.itu.int/pub/R-REP-M.2109) | 0 | Sharing studies between IMT-Advanced systems and geostationary satellite networks in the fixed satellite service in the 3 400-4 200 MHz and 4 500‑4 800 MHz frequency bands | 2007 | Spectrum usageIMT-Advanced |
| Rep. | M. | [2110](http://www.itu.int/pub/R-REP-M.2110) | 0 | Sharing studies between radiocommunication services and IMT systems operating in the 450-470 MHz band | 2007 | Spectrum usage |
| Rep. | M. | [2111](http://www.itu.int/pub/R-REP-M.2111) | 0 | Sharing studies between IMT-Advanced and radiolocation service in the 3 400‑3 700 MHz bands | 2007 | Spectrum usageIMT-Advanced |
| Rep. | M. | [2112](http://www.itu.int/pub/R-REP-M.2112) | 0 | Compatibility/sharing of airport surveillance radars and meteorological radar with IMT systems within the 2 700-2 900 MHz band | 2007 | Spectrum usage |
| Rep. | M. | [2113](http://www.itu.int/pub/R-REP-M.2113) | 1 | Sharing studies in the 2 500-2 690 MHz band between IMT-2000 and fixed broadband wireless access systems including nomadic applications in the same geographical area | 2008 | Spectrum usageIMT-2000 |
| Rep. | M. | [2146](http://www.itu.int/pub/R-REP-M.2146) | 0 | Coexistence between IMT-2000 CDMA DS and IMT-2000 OFDMA TDD WMAN in the 2 500-2 690 MHz band operating in adjacent bands in the same area | 2009 | Spectrum usage |
| Rep. | M. | [2241](http://www.itu.int/pub/R-REP-M.2241) | 0 | Compatibility studies in relation to Resolution **224** in the bands 698-806 MHz and 790‑862 MHz | 2011 | Spectrum usage |
| Rep. | M. | [2292](http://www.itu.int/pub/R-REP-M.2292) | 0 | Characteristics of terrestrial IMT-Advanced systems for frequency sharing/interference analyses | 2013 | Spectrum usage |
| Rep. | M. | [2324](http://www.itu.int/pub/R-REP-M.2324) | 0 | Sharing studies between potential International Mobile Telecommunication systems and aeronautical mobile telemetry systems in the frequency band 1 429-1 535 MHz | 2014 | Spectrum usage |
| Rep. | SA. | [2325](http://www.itu.int/pub/R-REP-SA.2325) | 0 | Sharing between space-to-space links in space research, space operation and Earth exploration-satellite services and IMT systems in the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz | 2014 | Spectrum usage |
| Rep. | F. | [2326](http://www.itu.int/pub/R-REP-F.2326) | 0 | Sharing and compatibility study between indoor International Mobile Telecommunication small cells and fixed service station in the 5 925‑6 425 MHz frequency band | 2014 | Spectrum usage |
| Rep. | F. | [2327](http://www.itu.int/pub/R-REP-F.2327) | 0 | Sharing and compatibility study between International Mobile Telecommunication systems and point-to-point fixed wireless systems in the frequency band 4 400‑4 990 MHz | 2014 | Spectrum usage |
| Rep. | F. | [2328](http://www.itu.int/pub/R-REP-F.2328) | 0 | Sharing and compatibility between International Mobile Telecommunication systems and fixed service systems in the 3 400-4 200 MHz frequency range | 2014 | Spectrum usage |
| Rep. | SA. | [2329](http://www.itu.int/pub/R-REP-SA.2329) | 0 | Sharing assessment between meteorological-satellite systems and IMT stations in the 1 695-1 710 MHz frequency band | 2014 | Spectrum usage |
| Rep. | F. | [2331](http://www.itu.int/pub/R-REP-F.2331) | 0 | Sharing and compatibility between International Mobile Telecommunication systems and fixed service systems in the 470-694/698 MHz frequency range | 2014 | Spectrum usage |
| Rep. | RA. | [2332](http://www.itu.int/pub/R-REP-RA.2332) | 0 | Compatibility and sharing studies between the radio astronomy service and IMT systems in the frequency bands 608-614 MHz, 1 330-1 400 MHz, 1 400-1 427 MHz, 1 610.6‑1 613.8 MHz, 1 660-1 670 MHz, 2 690-2 700 MHz, 4 800-4 990 MHz and 4 990‑5 000 MHz | 2014 | Spectrum usage |
| Rep. | F. | [2333](http://www.itu.int/pub/R-REP-F.2333) | 0 | Sharing and compatibility study between International Mobile Telecommunication and the fixed service in the frequency band 1 350-1 527 MHz | 2014 | Spectrum usage |
| Rep. | RS. | [2336](http://www.itu.int/pub/R-REP-RS.2336) | 0 | Consideration of the frequency bands 1 375-1 400 MHz and 1 427-1 452 MHz for the mobile service - Compatibility with systems of the Earth exploration-satellite service within the 1 400-1 427 MHz frequency band | 2014 | Spectrum usage |
| Rep. | BT. | [2337](http://www.itu.int/pub/R-REP-BT.2337) | 1 | Sharing and compatibility studies between digital terrestrial television broadcasting and terrestrial mobile broadband applications, including IMT, in the frequency band 470‑694/698 MHz | 2017 | Spectrum usage |
| Rep. | BT. | [2338](http://www.itu.int/pub/R-REP-BT.2338) | 0 | Services ancillary to broadcasting/services ancillary to programme making spectrum use in Region 1 and the implication of a co-primary allocation for the mobile service in the frequency band 694-790 MHz | 2014 | Spectrum usage |
| Rep. | BT. | [2339](http://www.itu.int/pub/R-REP-BT.2339) | 0 | Co-channel sharing and compatibility studies between digital terrestrial television broadcasting and International Mobile Telecommunication in the frequency band 694‑790 MHz in the GE06 planning area | 2014 | Spectrum usage |
| Rep. | BS. | [2340](http://www.itu.int/pub/R-REP-BS.2340) | 0 | Sharing between the mobile service and the broadcasting service in the 1 452‑1 492 MHz frequency band | 2014 | Spectrum usage |
| Rep. | S. | [2367](http://www.itu.int/pub/R-REP-S.2367) | 0 | Sharing and compatibility between International Mobile Telecommunication systems and fixed-satellite service networks in 5 850-6 425 MHz frequency range | 2015 | Spectrum usage |
| Rep. | S. | [2368](http://www.itu.int/pub/R-REP-S.2368) | 0 | Sharing studies between International Mobile Telecommunication-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands in the WRC study cycle leading to WRC-15  | 2015 | Spectrum usage |
| Rep. | M. | [2374](http://www.itu.int/pub/R-REP-M.2374) | 0 | Coexistence of two TDD networks in the 2 300-2 400 MHz band | 2015 | Spectrum usage |
| Rep. | M. | [2481](http://www.itu.int/pub/R-REP-M.2481) | 0 | In-band and adjacent band coexistence and compatibility studies between IMT systems in 3 300-3 400 MHz and radiolocation systems in 3 100-3 400 MHz | 2019 | Spectrum usage |
| Rep. | M. | [2499](http://www.itu.int/pub/R-REP-M.2499) | 0 | Synchronization of IMT-2020 Time Division Duplex networks | 2021 | Spectrum usage |
| Rep. | M. | [2242](http://www.itu.int/pub/R-REP-M.2242) | 0 | Cognitive radio systems specific for IMT systems | 2011 | TechnologySpectrum usage |
| Rep. | M. | [2244](http://www.itu.int/pub/R-REP-M.2244) | 0 | Isolation between antennas of IMT base stations in the land mobile service | 2011 | Technology |
| Rep. | M. | [2334](http://www.itu.int/pub/R-REP-M.2334) | 0 | Passive and active antenna systems for base stations of IMT systems | 2014 | Technology |
| Rep. | M. | [2376](http://www.itu.int/pub/R-REP-M.2376) | 0 | Technical feasibility of IMT in bands above 6 GHz | 2015 | TechnologySpecifications and characteristics |
| Rep. | M. | [2038](http://www.itu.int/pub/R-REP-M.2038) | 0 | Technology trends  | 2003 | Technology trends |
| Rep. | M. | [2074](http://www.itu.int/pub/R-REP-M.2074) | 0 | Radio aspects for the terrestrial component of IMT‑2000 and systems beyond IMT‑2000 | 2006 | Technology trends |
| Rep. | M. | [2320](http://www.itu.int/pub/R-REP-M.2320) | 0 | Future technology trends of terrestrial IMT systems | 2014 | Technology trends |
| Handbook | [62](http://www.itu.int/pub/R-HDB-62) | 0 | Global Trends in International Mobile Telecommunications | 2015 | Technology trends |
| Rec. | M. | [816](http://www.itu.int/rec/R-REC-M.816/en) | 1 | Framework for services supported on International Mobile Telecommunications-2000 (IMT-2000) | 1997 | Telecommunication services and applicationsIMT-2000 |
| Rec. | M. | [1079](http://www.itu.int/rec/R-REC-M.1079/en) | 2 | Performance and quality of service requirements for International Mobile Telecommunications-2000 (IMT‑2000) access networks | 2003 | Telecommunication services and applicationsIMT-2000 |
| Rec. | M. | [1822](http://www.itu.int/rec/R-REC-M.1822/en) | 0 | Framework for services supported by IMT | 2007 | Telecommunication services and applications |
| Rep. | M. | [2291](http://www.itu.int/pub/R-REP-M.2291) | 2 | The use of International Mobile Telecommunications for broadband public protection and disaster relief applications | 2021 | Telecommunication services and applications |
| Rep. | M. | [2373](http://www.itu.int/pub/R-REP-M.2373) | 1 | Audio-visual capabilities and applications supported by terrestrial IMT systems | 2018 | Telecommunication services and applications |
| Rep. | M. | [2440](http://www.itu.int/pub/R-REP-M.2440) | 0 | The use of the terrestrial component of International Mobile Telecommunications (IMT) for narrowband and broadband machine-type communications | 2018 | Telecommunication services and applications |
| Rep. | M. | [2441](http://www.itu.int/pub/R-REP-M.2441) | 0 | Emerging usage of the terrestrial component of International Mobile Telecommunication (IMT) | 2018 | Telecommunication services and applications |
| Rep. | M. | [2527](https://www.itu.int/pub/R-REP-M.2527) | 0 | Applications of the terrestrial component of International Mobile Telecommunications for specific societal, industrial and other usages | 2023 | Telecommunication services and applications |
| Rep. | M. | [2538](https://www.itu.int/pub/R-REP-M.2528) | 0 | Capabilities of the terrestrial component of IMT-2020 for multimedia communications | 2023 | Telecommunication services and applications |
| Rec. | M. | [1580](http://www.itu.int/rec/R-REC-M.1580/en) | 5 | Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT‑2000 | 2014 | Unwanted emissionsIMT-2000 |
| Rec. | M. | [1581](http://www.itu.int/rec/R-REC-M.1581/en) | 5 | Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT‑2000 | 2014 | Unwanted emissionsIMT-2000 |
| Rec. | M. | [2070](http://www.itu.int/rec/R-REC-M.2070/en) | 1 | Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-Advanced | 2017 | Unwanted emissionsIMT-Advanced |
| Rec. | M. | [2071](http://www.itu.int/rec/R-REC-M.2071/en) | 1 | Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-Advanced | 2017 | Unwanted emissionsIMT-Advanced |

Annex B

List of acronyms and abbreviations

AMS Aeronautical mobile service

AMT Aeronautical mobile telemetry

ARNS Aeronautical radionavigation service

ASR Air surveillance radars

BAS Broadcast auxiliary service

BS Broadcasting service

BSS Broadcasting-satellite service

BWA Broadband wireless access

CRS Cognitive radio systems

DTTB Digital terrestrial television broadcasting

EES Earth exploration-satellite

EESS Earth exploration-satellite service

eMBB Enhanced mobile broadband

FDD Frequency division duplex

FPLMTS Future public land mobile telecommunication system

FS Fixed service

FSS Fixed-satellite service

FWA Fixed wireless access

HAPS High-altitude platforms station

IMT International Mobile Telecommunications

ITS Intelligent Transport Systems

LMS Land Mobile Service

LTE Long Term Evolution

MetSat Meteorological-satellite service

mMTC Massive machine-type communications

MS Mobile service

MSS Mobile-satellite service

MTC Machine-type communications

MWA Mobile wireless access

pfd power flux-density

PPDR Public protection and disaster relief

PSTN Public switched telephone network

QoS Quality of service

RAS Radio astronomy service

RATGs Radio access technique groups

RDS Radiodetermination service

RIT Radio interface technology

RLS Radiolocation service

RTTs Radio transmission technologies

RR Radio Regulations

SAB Services ancillary to broadcasting

SAP Services ancillary to programme

SRIT Sets of radio interface technology

SOS Space operation service

SRS Space research service

TDD Time division duplex

UE User equipment

URLLC Ultra-reliable and low-latency communications

WARC World Administrative Radio Conference

WRC World Radiocommunication Conferences

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1. *Contact:* [Chair, ITU-R Working Party 5D](https://www.itu.int/online/compass/cvc.v2.sh?topic=WP5D&head_title=List%20of%20Working%20Parties%20and%20Joint%20Task%20Group%20Chairmen%20and%20Vice-Chairmen). [↑](#footnote-ref-1)
2. Chair’s Report [ITU-R WP 5D, IMT Systems](https://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/Pages/default.aspx). [↑](#footnote-ref-2)
3. Resolution [ITU-R 56](https://www.itu.int/pub/R-RES-R.56) defines the relationship between the terms “IMT-2000”, “IMT-Advanced”, “IMT-2020” and IMT-2030. [↑](#footnote-ref-3)
4. A full list of official ITU terms and definitions can be found: [Online ITU Terms and Definitions](https://www.itu.int/net/ITU-R/index.asp?redirect=true&category=information&link=terminology-database&lang=en&adsearch=&SearchTerminology=&sector=&language=all&part=abbreviationterm&kind=anywhere). [↑](#footnote-ref-4)
5. The electronic version of this table can be sorted by columns as required. [↑](#footnote-ref-5)