

2019 ITU Radiocommunication Assembly 2019 (RA-19), World Radiocommunication Conference (WRC-19) Report

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The Radiocommunication Assembly and the World Radiocommunication Conference of the International Telecommunication Union were held in Sharm El Sheikh, Egypt, from October 21 to 25, 2019, and from October 28 to November 11, respectively. This article mainly describes the matters related to International Mobile Telecommunications (IMT), discussed at these events. In particular, the article describes in detail the state of discussions on Agenda 1.13 at the World Radiocommunication Conference, which newly identifies frequencies for IMT in the 24.25 to 86 GHz frequency range with the usage of 5G in mind.

1. Introduction

The International Telecommunication Union (ITU) is a specialized agency of the United Nations. Its main mission is to set international standards and regulations on telecommunications and radio communications. As part of its activities, the organization holds the Radiocommunication Assemblies (RA) and the World Radiocommunication Conference (WRC), important meetings held every three to four years and attended by many persons involved in the telecommunications administrations

of ITU member states (193 countries in total).

Held in Sharm El Sheikh, Egypt, from October to November 2019, the Radiocommunication Assembly (hereinafter “RA-19”) was attended by approximately 500 people from the administrations, etc. of 88 countries, while the World Radiocommunication Conference (hereinafter “WRC-19”) was attended by approximately 3,300 people from the administrations, etc. of 166 countries. Both RA and WRC were held for the first time in four years since 2015, and were held for the first time outside Geneva, the location of the ITU Headquarters, since

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being held in Istanbul, Turkey, in 2000.

This article describes on the content of deliberations on International Mobile Telecommunications (IMT) at RA-19 and WRC-19, and their outcomes.

2. RA-19 Deliberations Content and Their Outcomes

The ITU Radiocommunication Sector (ITU-R) studies various types of technology and standardizes technical specifications related to international frequency usage, creates documentation about these, and functions to coordinate international frequency usage, etc. The RA is held as a general meeting concerning the overall activities of the ITU-R, approves documentation for ITU-R Resolutions, Questions and Recommendations, and appoints the chairpersons and vice chairpersons of Study Groups within the ITU-R.

2.1 Deliberations on ITU-R Resolutions, Questions and Recommendations

For resolutions that stipulate procedures, etc. for the various tasks of the ITU-R, 28 items were approved in RA-19 (2 new resolutions, 23 revisions of existing resolutions, and 3 suppressions of existing resolutions). Of these, revisions of Resolution ITU-R 1 stipulating the working method of the overall ITU-R and Resolution ITU-R 2 stipulating the working method of the Conference Preparatory Meeting (CPM)^{*1} were discussed vigorously during the session and were approved in light of the issues, etc. that had arisen in the past four years of ITU-R activities.

204 questions were submitted, and their assignments to Study Groups for the study cycle until

2023 were approved. Regarding IMT, a general term for international mobile telecommunication systems at the ITU, these include revision of a question [1] to continue studying for further advancement, and formulation of a new question [2] to study requirements that IMT must support with usage in specific industrial areas or enterprise applications in mind.

For recommendations, as items requiring approval in RA, discussions were held on recommendations referred to in the ITU Radio Regulations, and recommendations requiring further deliberations in RA considering the state of deliberations in Study Groups. As recommendations related to IMT, a proposed amendment to Recommendation ITU-R M.1036 was deliberated. This recommendation stipulates how to use frequencies identified for IMT in the ITU Radio Regulations. As a result, the deliberation reached a consensus and approved items that had not been concluded in Study Groups (such as the handling of IMT deployment with frequencies not identified for IMT) [3].

2.2 Appointment of Chairpersons and Vice Chairpersons to ITU-R Study Groups

For Study Group (SG) 3 (radiowave propagation), SG5 (terrestrial services), SG6 (broadcasting services), and SG7 (science services), currently serving chairpersons were re-appointed for a second term. For SG1 (spectrum management) and SG4 (satellite services), new chairpersons were appointed. Dr. Yukihiro Nishida (NHK) of Japan was re-appointed as the chairperson of SG6.

Study Group vice chairpersons were also appointed. Mr. Takahiro Kono (SKY Perfect JSAT) was newly appointed as vice chairperson of SG4,

^{*1} CPM: The Conference Preparatory Meeting. A meeting that develops reports which summarize ITU-R SG study results and other WRC-related discussions for preparation of WRC.

and Dr. Hiroyuki Atarashi (an author of this article) was re-appointed as vice chairperson of SG5.

3. WRC-19 Deliberations Content and Their Outcomes

To revise the ITU Radio Regulations, a wide range of items for deliberation (agendas) about various radio systems are set at WRC, and these agendas are deliberated based on the outcomes of studies at ITU-R over the last three to four years. At WRC-19, approximately 30 agendas were deliberated.

3.1 Agenda 1.13 (Agenda on Additional Identification of Frequency Bands for IMT)

1) Overview

Regarding frequencies used by mobile phones, harmonized international use enables procurement of devices for base stations and terminals and the enjoyment of benefits such as international roaming^{*2}. The ITU defines the name IMT as a generic term for international mobile telecommunication systems. Also, the ITU identifies the frequency bands for IMT in the ITU Radio Regulations, and

makes efforts to ensure that the use of IMT system frequencies is as common as possible in all countries of the world.

In addition, with the introduction of 5G being promoted in a range of countries around the world, one of the objectives of 5G usage is to realize high-speed communications exceeding 4G. This requires securing frequencies with wider bandwidth. For this reason, 12 candidate frequency bands from 24.25 to 86 GHz were selected at WRC-15 held in 2015. These frequencies are higher than those identified for IMT in the ITU Radio Regulations up to that point, and were deliberated as WRC-19 Agenda Item 1.13.

2) Results of Deliberations

As a result of deliberations at WRC-19, the frequency bands 24.25 to 27.5 GHz, 37 to 43.5 GHz, and 66 to 71 GHz were identified globally as frequencies for IMT for Region 1 (Europe, Russia, Africa, Arab countries), Region 2 (North and South American countries), and Region 3 (Asian and Pacific countries), as shown in **Figure 1** and **Table 1**. The 45.5 to 47 GHz and 47.2 to 48.2 GHz frequency bands were also identified as IMT frequencies for some regions or countries. For Japan, the 47.2

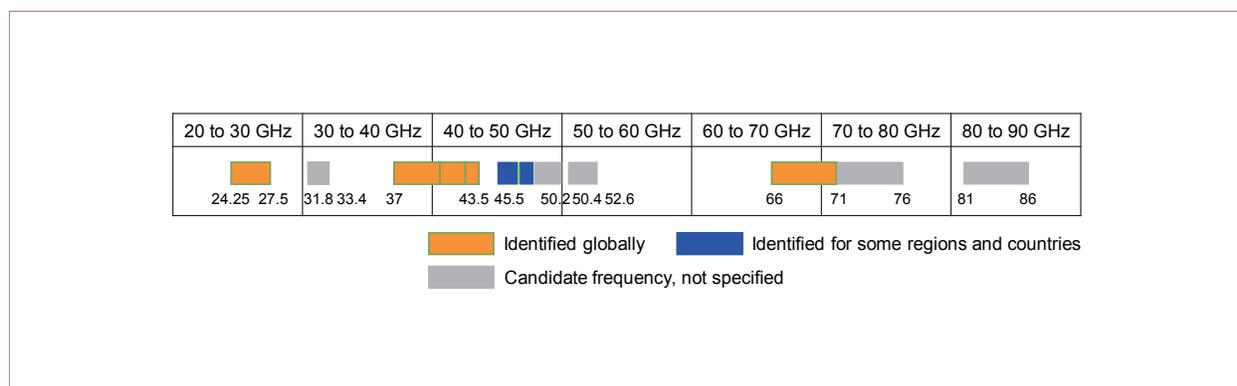


Figure 1 Candidate frequencies and frequencies identified for IMT in WRC-19 Agenda Item 1.13

^{*2} Roaming: A mechanism that enables users to use services similar to their subscribed carriers within the service areas of alliance partner telecommunication carriers, but outside the service areas of their subscribed telecommunication carriers.

Table 1 Details of frequencies identified for IMT at WRC-19

	Region 1 (Europe, Russia, Arabia, Africa) 122 countries	Region 2 (North and South America) 35 countries	Region 3 (Asia, Pacific) 36 countries
24.25 to 27.5 GHz	Identified globally		
37 to 43.5 GHz	Identified globally		
45.5 to 47 GHz	Identified for 50 countries (Europe (some countries), Russia, Arabia, Africa)	Identified for 1 country (Brazil)	Identified for 2 countries (Iran, Korea)
47.2 to 48.2 GHz	Identified for 62 countries (Europe (some countries), Russia, Arabia, Africa)	Identified for all regions	Identified for 7 countries (Australia, Korea, India, Iran, Japan, Malaysia, Singapore)
66 to 71 GHz	Identified globally		

to 48.2 GHz frequency band was identified for IMT. Adding these frequency bands together, a total of 17.25 GHz of bandwidth was identified for IMT at WRC-19, a significant increase on the total bandwidth of approximately 1.9 GHz of frequencies previously identified by the ITU Radio Regulations.

3) Issues Deliberated

Conditions for frequency sharing with existing radio systems were a major issue in identifying frequencies for IMT. In deliberations on 24.25 to 27.5 GHz and 37 to 43.5 GHz, conditions to prevent radio interference from IMT to nearby Earth exploration satellite services (passive) operating at frequencies 23.6 to 24 GHz and 36 to 37 GHz were discussed. As specific conditions, it was shown that the intensity of unwanted emissions^{*3} of IMT radio stations (base stations and terminals) at the reception frequency of Earth exploration satellite were limited, but resulted in a major debate because there were significant differences between the required limits on the intensity of unwanted emissions between the regions and countries making proposals due to differences in prerequisites

for technical studies, etc. In addition, conditions for preventing radio interference to inter-satellite services and fixed satellite services operating within 24.25 to 27.5 GHz and 42.5 to 43.5 GHz were also discussed. Specifically, proposals such as provisions for IMT base station output power restrictions, transmission directionality and mechanical tilting^{*4} for outdoor IMT base station were discussed.

About the issues regarding frequency sharing conditions with the Earth exploration satellite services (passive), inter-satellite services, and fixed-satellite services, it was assumed that agreement would be difficult through deliberations at the meeting. Therefore, in the latter half of the WRC-19 meeting, considerations were continued on agreeable compromises through the holding of many small, informal meetings with small numbers of people mainly representative of various regions and representatives of countries making specific proposals. Finally, these compromises were submitted to the WRC-19 plenary session and agreement was reached.

^{*3} Unwanted emissions: Unneeded radio emissions outside the desired band that can cause interference on neighboring frequencies.

^{*4} Tilting: Inclination of an antenna's main beam direction in the vertical plane. There are mechanical tilt systems that physically tilt the antenna and electrical tilt systems that control the amplitude and phase of antenna array elements to tilt the main beam.

3.2 Other IMT-related Agendas

As 1,427 to 1,518 MHz were identified as frequencies for IMT at WRC-15, considerations were addressed in Agenda 9.1, Issue 9.1.2 regarding compatibility between the 1,452 to 1,492 MHz broadcasting satellite services (voice) and IMT for Regions 1 and 3. Mobile communication systems have been operating in this frequency band in Japan since before WRC-15, and Japan has taken actions to prevent restrictions on future domestic operations. This issue also entailed a difficult debate until the final week of WRC-19, but ultimately a solution that struck a balance between broadcast satellite services (voice) and IMT regulations was reached.

Regarding frequencies from 27.5 to 29.5 GHz, studies on the technical and operational characteristics of Earth Stations In Motion (ESIM)^{*5} operated as fixed satellite services and their frequency sharing with other radio systems were handled as Agenda 1.5. Some of these frequencies are already allocated for 5G in Japan. The discussions focused on how to prevent the effects of radio interference on existing systems deployed on the ground when ESIMs onboard aircraft (hereinafter “aeronautical ESIMs”) transmit to satellites. There was a major debate between Europe, etc. who are considering the deployment of ESIMs in the 27.5 to 29.5 GHz frequency range and Japan, Korea and the United States who are considering these frequencies for the use of 5G. Ultimately, restrictions on the Power Flux Density (PFD)^{*6} on the ground surface of aeronautical ESIMs were stipulated for operations. Also, it was agreed that the ITU-R Radiocommunication Bureau would strictly inspect aeronautical ESIMs and liability provisions for PFD compliance with restrictions outside borders, to be specified in

a WRC resolution.

3.3 Agendas to be Deliberated at WRC-23

At each WRC, agendas for deliberation at the future WRC are decided. Therefore, agendas for WRC-23 to be held in four years were deliberated and agreed upon at WRC-19. **Figure 2** shows the frequency bands of agendas related to IMT.

Continuing from WRC-19 Agenda 1.13, a number of countries and regions made proposals to establish new agendas to study further identification of frequencies for IMT. In the proposed 3.3 to 24 GHz frequency range, as a result of coordination among members representing various regions, agreement was reached to study the frequency bands shown in Fig. 2 as WRC-23 Agenda 1.2.

Also, regarding the 4,800 to 4,990 MHz frequency band identified for some countries as frequencies for IMT in WRC-15, discussions were held to review the handling of PFD limit values for IMT radio stations to protect radio stations for aeronautical mobile services but did not reach a conclusion, although agreement was reached to continue deliberations as WRC-23 Agenda 1.1.

In addition, agreement was reached for Japan’s proposal to establish a new agenda to study the use of IMT base stations installed on High Altitude Platform Stations (HAPS)^{*7} with 2.7 GHz and below specified for IMT after narrowing down target frequencies and regions, as WRC-23 Agenda 1.4.

Furthermore, agreements were reached to study primary allocation^{*8} for mobile services in the 3,600 to 3,800 MHz band in Region 1 (Agenda 1.3), and frequency usage of existing services and future handling in the 470 to 694 MHz band in Region 1 (Agenda 1.5). These agendas may also become

^{*5} ESIM: A name for earth stations in motion that communicate with satellite stations operating under the fixed-satellite service.

^{*6} PFD: The power intensity of a radio wave passing through a unit area.

^{*7} HAPS: A general term for a system that provides communication services from the sky by mounting communication equipment on an unmanned vehicle such as an aircraft that stays in a fixed location in the stratosphere at an altitude of approximately 20 km.

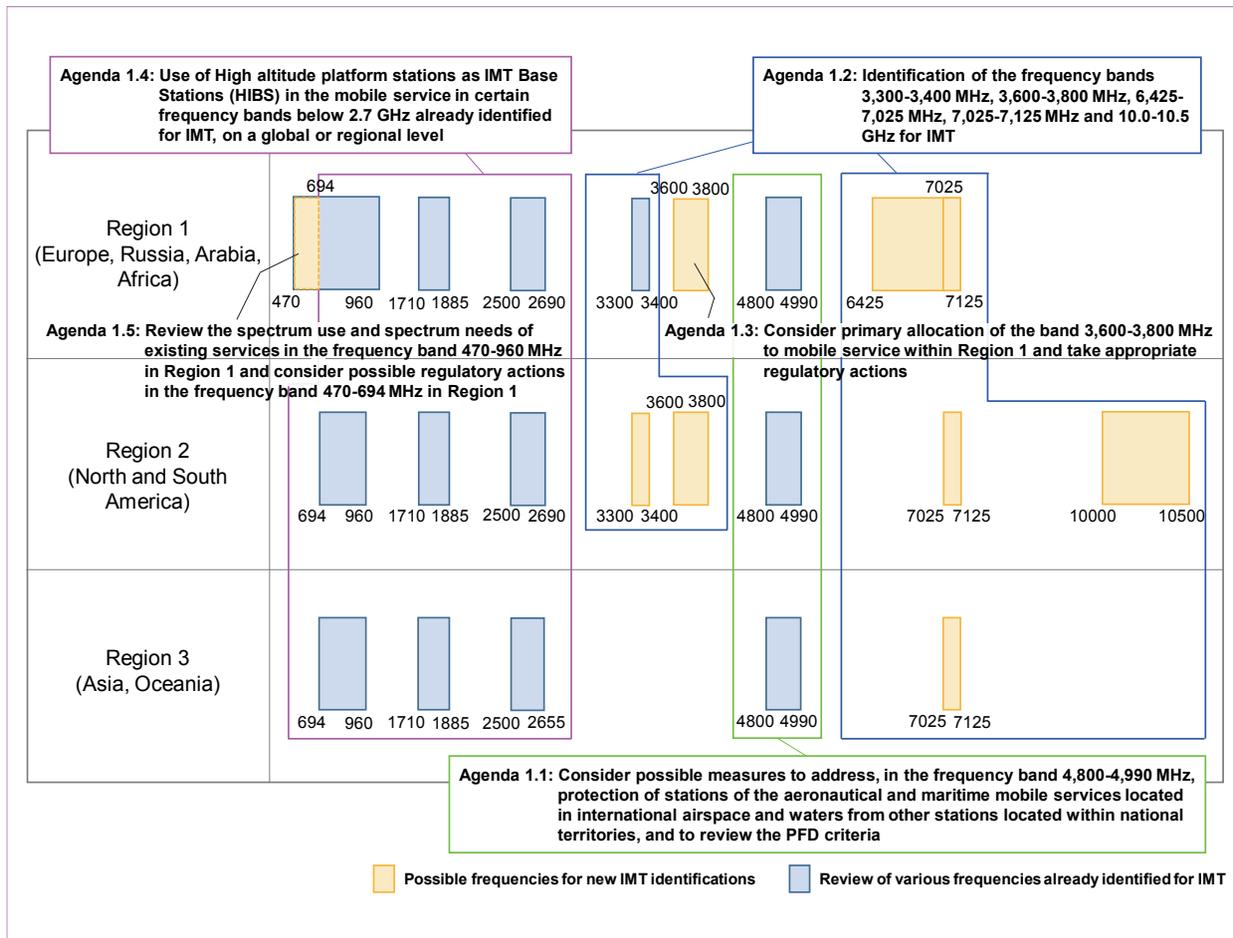


Figure 2 Frequency bands of IMT-related agendas at WRC-23

relevant to discussion on identification of frequencies for IMT, depending on future discussions.

4. Conclusion

This article has described an overview of the outcomes of deliberations at RA-19 and WRC-19. In deliberations on Agenda 1.13 at WRC-19, agreement was reached to identify very wide bandwidth of frequencies for IMT. This is a considerably significant result for further IMT development going forward compared to the results of past WRCs. In

contrast, as there are large conceptual differences for the conditions for frequency sharing with existing radio systems in each region and country, much time and effort were also spent on consensus building in deliberations at WRC-19.

Additional identification of frequencies for IMT will also be studied at WRC-23, and it's likely that frequency sharing conditions for existing systems operating on any frequency band will be discussed intensely. At the end of the WRC-19 conference period, informal meetings were held by representatives, etc. from each region and compromises were

*8 Primary allocation: Allocation of frequencies to a primary service in the ITU Radio Regulations. Services to which frequencies are allocated are classified as primary or secondary services. Primary services are services that can be protected from harmful interference from other primary services or secondary services. Conversely, secondary services cannot

cause harmful interference to the operation of primary services, nor claim protection from primary service interference.

found, so it's possible that similar methods of coordination will be adopted for difficult cases at WRC-23. To respond appropriately to such discussions, it will be necessary to unify the views of all regions in advance and for representatives of each region to be recognized. Thus, presence at ITU-R Study Group meetings and preparatory meetings in each region will be even more important. NTT DOCOMO will continue to proactively participate in these meetings.

REFERENCES

- [1] Question ITU-R 229-5/5: "Further development of the terrestrial component of IMT," Nov. 2019.
- [2] Question ITU-R 262/5: "Usage of the terrestrial component of IMT systems for specific applications," Nov. 2019.
- [3] Recommendation ITU-R M.1036-6: "Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations," Oct. 2019.