Frequency Reorganization Action Plan (FY2024 Version)

December 2024

Ministry of Internal Affairs and Communications

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Chapter 1 Background and Objectives

To promote the effective utilization of finite and scarce radio wave resources and to cope with the introduction of new radio spectrum utilization systems and increasing frequency demand, the Ministry of Internal Affairs and Communications (MIC) formulatinged and announcinged a Frequency Reorganization Action Plan sincein August 2004. The plan has been reviewed and announced annually since 2004.

The MIC has formulated a Frequency Reorganization Action Plan up to FY2022 based on the results of the Survey on Actual Radio Spectrum Usage and evaluation of them, etc., conducted by the MIC. The Frequency Reorganization Action Plan from FY2023 onwards has been formulated based on the results of Survey on Actual Radio Spectrum Usage conducted by the MIC and the Evaluation of the Degree of Effective Utilization of Radio Spectrum conducted by the Radio Regulatory Council based on the survey results, following the transfer of the evaluation authority from the MIC to the Council due to the amendment of the Radio Act in FY2022. This helps to ensure transparency and predictability and to promote the smooth and steady transition and reorganization of frequencies.

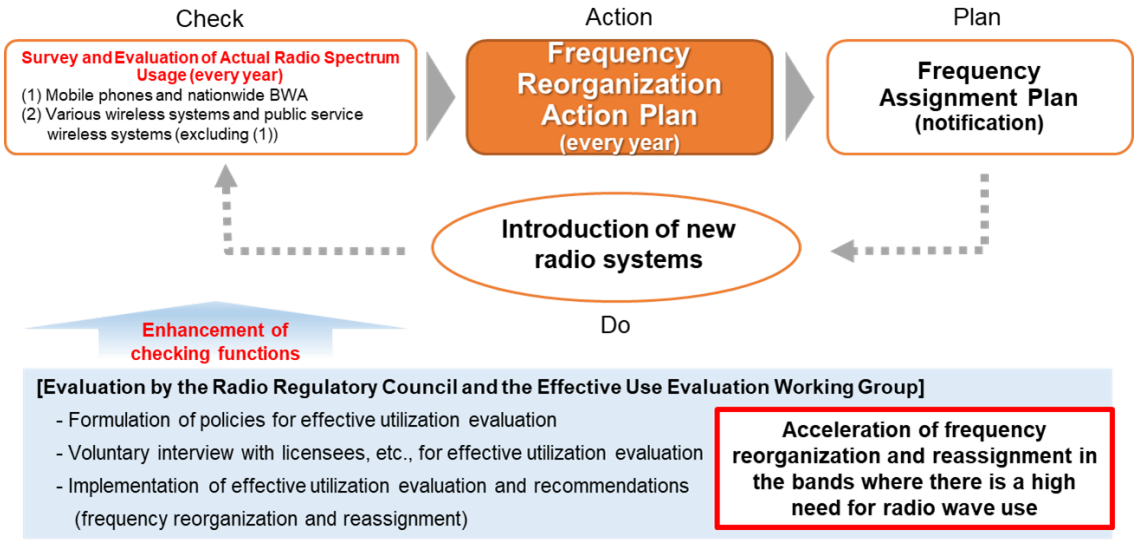

Fig. 1 Frequency reorganization PDCA cycle

Through the development and growth of radio spectrum utilization up to now, there has been a drastic expansion in both network connection opportunities and connection types. Various kinds of new services that use the radio spectrum, such as smartphones, digital home appliances, e-books, electronic money, and online distribution of broadcasting content, have been developed. On the other hand, thanks to the advancement of broadband services, there have been developments in a range of delivered services that use large-capacity content, and mobile communication traffic has continued to increase year by year. Moreover, radio spectrum utilization has been mobilized across various sectors, including regional revitalization, healthcare, environment, etc., and its importance as a social infrastructure has been also increasing. In particular, in the event of a disaster like the Great East Japan Earthquake, radio spectrum utilization systems, such as satellite mobile phones, have played an essential role as a communication method during emergencies. In addition, when the 2024 Noto Peninsula Earthquake occurred, ship-based base stations and tethered drones were utilized for the emergency restoration of mobile phone networks, and enhancements of Non-terrestrial Networks (NTNs) are expected to further contribute to diversification of communication methods during disasters.

As given in the following table, discussions have taken place concerning radio spectrum policies to deal with the development of radio spectrum utilization.

Table 1 : Discussions on radio spectrum policies

Study Group on Promotion of Effective Use of the Radio Spectrum	April to December 2012
Radio Policy Vision Panel	January to December 2014
Round-Table Conference on Radio Policies 2020	January to July 2016
Round-Table Conference on Growth Strategies for the Effective Use of Radio Spectrum	November 2017 to August 2018
Digital Transformation Era's Radio Spectrum Policy Council	November 2020 to July 2023
Radio Policy Roundtable for Expanding Digital Business	November 2023 to August 2024

It is moreover understood that 5G is expected to contribute to solving social issues and economic growth as the foundation of Japan's industrial and social activities. At the same time, it is also important to practically use 5G in society as a business. Based on this understanding, the Digital Transformation Era's Radio Spectrum Policy Council 5G Business Design Working Group had held meetings since January 2023 to examine measures to expand 5G business utilizing high-frequency bands, including the millimeter wave band, which will play a central part in the assignment of 5G in the future. The Working Group also discussed the institutional design for “conditional auctions” as a new assignment scheme and compiled a report in July 2023.

Furthermore, based on the importance of using radio waves as a foundation for the growth

of the digital society and expanding business opportunities, a meeting of the “Radio Policy Roundtable for Expanding Digital Business” had held since November 2023 to discuss the future vision for radio wave utilization, the setting of targets for securing new frequencies, and measures for the effective use of radio waves. The WX (Wireless Transformation) Promotion Strategy was introduced in the report compiled in August 2024, setting a goal of securing bandwidth by the end of 2040.

Furthermore, based on the fact that the development of digital infrastructure such as 5G is essential for embodying the “Vision for a Digital Garden City Nation Realization” that enables the country to connect to the world by promoting digitalization in rural areas to create a new wave of transformation and narrowing the gap between rural and urban areas, the MIC formulated the Infrastructure Development Plan for a Digital Garden City Nation and announced a revised version in April 2023.

Since the radio spectrum utilization system continues to be an important cornerstone in the daily lives of Japanese citizens and Japanese socioeconomic activities, both today and in the future, it is essential to secure new radio frequencies that can be assigned to address growing radio wave use needs and new technological trends. In addition, it is increasingly important to promote more effective use of radio waves, which are finite and scarce shared public resources, as well as their sharing among different wireless systems.

This Frequency Reorganization Action Plan (FY2024 version) is based on the progress of the policies and studies established so far, as shown above. It is also based on the review of efforts to secure frequencies for new radio spectrum utilization systems, and to consider frequency migration policies and timing.

In this review, from the viewpoint of ensuring transparency and fairness, the results of the Survey on Actual Radio Spectrum Usage and the Evaluation of the Degree of Effective

Utilization of Radio Spectrum have been taken into account. At the same time, research and development initiatives implemented by the Japanese government for effective use of the radio frequencies were clearly itemized and formulated based on opinions submitted as public comments.

The MIC has the goal of overcoming the various problems facing Japan today, such as the declining birth rate and population, which is accompanying a shrinking workforce as well as rural depopulation, while also contributing to the revitalization of Japan’s economy through the steady implementation of measures in line with this Frequency Reorganization Action Plan. This goal will be achieved by stepping up the thorough utilization and application of wireless communication technologies and by strengthening Japan's international competitiveness, while at the same time further promoting effective use of the radio spectrum.

Chapter 2. Goals for Securing Frequency Bandwidth

Goals for securing frequency bandwidth by the end of 2040

According to the “Radio Policy Roundtable for Expanding Digital Business Report” compiled in August 2024, it has been estimated that a total bandwidth of approximately 70 GHz (73.1 GHz) will be required to accommodate the wireless traffic in 2040 using mobile phone networks, NTN, and Wi-Fi, categorized by region, etc.

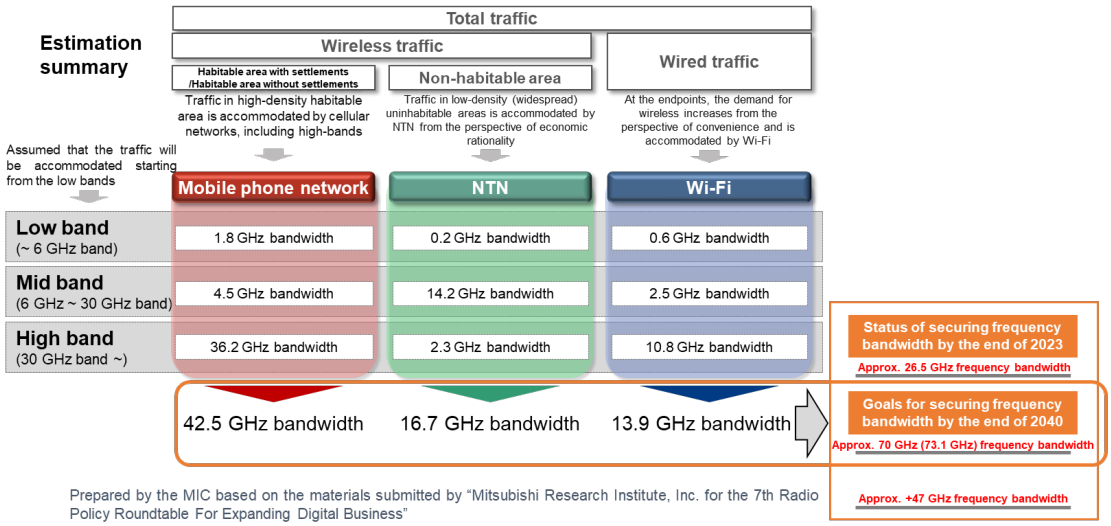

Fig. 2 Illustration of goals for securing bandwidth by the end of 2040

For the mobile phone network system, the goal is to secure a bandwidth of approximately 42.5 GHz. The goal is to secure approximately 1.8 GHz bandwidth in the low band below 6 GHz, approximately 4.5 GHz bandwidth in the mid-band between 6 GHz and 30 GHz, and approximately 36.2 GHz bandwidth in the high band above 30 GHz. Specifically, to secure frequencies for cell phones of the 2030s, including Beyond 5G, it is appropriate to examine the possibility of assigning the IMT-identified millimeter wave band and to actively contribute to discussions on the shared use of the centimeter-wave bands at the ITU-R

such as the 7125 to 8400 MHz and 14.8 to 15.35 GHz, which are IMT candidate bands of WRC-27, while fully considering international standardization and practical social implementation.

For NTN, the goal is to secure a bandwidth of approximately 16.7 GHz. The aim is to have approximately 0.2 GHz bandwidth in the low band, 14.2 GHz bandwidth in the mid-band, and 2.3 GHz bandwidth in the high band.

For Wi-Fi, the goal is to secure a bandwidth of approximately 13.9 GHz. The aim is to have approximately 0.6 GHz bandwidth in the low band, 2.5 GHz bandwidth in the mid-band, and 10.8 GHz bandwidth in the high band.

As mentioned above, the goal is to secure a total bandwidth of 73.1 GHz. Since approximately 26.5 GHz of bandwidth had already been secured as of the end of 2023, the aim is to secure an additional 47 GHz of frequency bands by the end of 2040.

To realize the goal of securing bandwidth, efforts to promote the effective use of frequencies in existing wireless systems are underway, and further promotion of frequency reorganization and sharing is necessary, considering international trends and advancements in applied technologies. Since addressing such frequency demand, as well as the migration and reorganization of the frequencies, requires a huge amount of time and cost, it is important to advance discussions with a medium- to long-term perspective to secure frequencies, thereby enhancing predictability for carriers from a business perspective.

Chapter 3. Priority Initiatives

I. Securing of frequencies toward widespread adoption of 5G

In order to secure internationally harmonized frequencies in cooperation with other countries, such as European countries and the United States, examinations will be conducted on additional frequency assignment for mobile communication systems in the bands of 2.6 GHz, 4.9 GHz, 26 GHz, 40 GHz, etc., including the adoption of dynamic frequency sharing, while taking account of any possible impact on existing wireless systems on the same or adjacent bands.

For the 2.6 GHz band (2645 to 2665 MHz), in light of progress in migrating existing satellite mobile communication systems to an upgraded system, the possibility of introducing mobile communication systems, including the application of dynamic frequency sharing at ordinary times and during disasters, will be further examined, while taking account of its impact on existing wireless systems.

Regarding the 4.9 GHz band (4.9 to 5.0 GHz), regulatory revisions were made by the MIC based on the 5G technical conditions compiled in March 2024 for the introduction of 5G in September 2024. In the future, necessary procedures will be carried out to facilitate the early assignment to 5G.

For the 4.9 GHz band, in preparation for the assignment of frequencies to 5G systems, regulatory revisions were made by the MIC to set the deadline of the establishment of new 5 GHz band wireless access systems (registered stations) by the end of FY2025, based on the assumption that termination promotion measures will be introduced to facilitate the migration of existing systems. Furthermore, the usage period for frequencies of these systems has been set to expire by the end of FY2035. In addition, MIC will promote measures such as informing registrants about the transition of the this system.

For the 26 GHz band (25.25 to 27 GHz) and 40 GHz band (37.0 to 43.5 GHz), surveys on specific utilization needs will be conducted, taking into account the existing wireless systems in these bands and the utilization status of the 28 GHz band. A conditional auction is planned to be held by the end of FY2025 with the aim of assigning frequencies to 5G systems. Therefore, while appropriately reflecting the status of engineering tests related to the sharing conditions with existing wireless systems, the requirements for the band applied to dynamic frequency sharing and the requirements of the sharing management systems, the technical conditions will be complied by around spring 2025, and the technical standards will be formulated by around autumn 2025. In addition, the engineering test for advancing the 22 GHz band fixed wireless access system (FWA), which is a candidate for migration of the existing wireless system in 26GHz and 40GHz, will be promoted. While appropriately reflecting the status of the test, the technical conditions will be compiled by around spring 2026, and regulatory revisions will be implemented by around summer 2026.

With regard to frequency bands (7025 to 7125 MHz, 24.25 to 27.5 GHz, 37 to 43.5 GHz, 47.2 to 48.2 GHz, and 66 to 71 GHz) already identified for IMT in past WRC with an eye on their use for 5G systems, even if they do not come under the 26 GHz and 40 GHz bands mentioned above, the possibility of frequency assignment to 5G systems will also be examined while taking account of examinations by the ITU, 3GPP, etc., and trends in other countries. With regard to the 27.0 to 27.5 GHz band, frequency assignment was implemented in April 2019, along with the 27.5 to 29.5 GHz band.

With regard to the frequency bands (4400 to 4800 MHz, 7125 to 8400 MHz, and 14.8 to 15.35 GHz) considered for possible IMT-identified assignments in preparation, policies in WRC-27 will be considered at an appropriate time during WRC-27, taking into account international trends, specific usage needs, and the potential for sharing with existing

wireless systems.

For local 5G (4.6 to 4.9 GHz and 28.2 to 29.1 GHz), regulatory revisions will be completed by the end of FY2024 based on the compilation of some responses by the Information and Communications Council in July 2024 concerning the technical conditions for marine usage (limited to 4.8 to 4.9 GHz) and the refinement of radio propagation parameters. In addition, the goal is to introduce an experimental test station system with simplified procedures within FY2025 and examine the introduction of a system to simplify and expedite licensing procedures using operational adjustment organizations by the end of FY2025 based on future demand trends.

II. Further enhancement and frequency extension of wireless LANs

Regarding the frequencies used by wireless LANs in the 5 GHz band (mainly in the 5.2 GHz band), measures to further expand their use in airspace while preventing interference with other wireless systems, etc., will be examined, and regulatory revisions will be completed by the end of FY2024.

With regard to the use of narrowband devices in the 6 GHz band (5925 to 6425 MHz), frequency sharing will be examined with attention to trends in other countries.

The technical conditions for the frequency sharing related to the outdoor use of the 6 GHz band wireless LAN and the extension of its band to 6.5 GHz band (6425 to 7125 MHz), including the outdoor use will be compiled by the end of FY2025. In the compilation process, attention will be paid to the frequency band (7025 to 7125 MHz) identified for IMT at WRC-23. Studies will be conducted on the structure and operational methods of the Automated Frequency Coordination (AFC) system necessary to prevent harmful interference with existing radio stations, etc. The conclusion will be based on these considerations.

III. Frequency use by drones in airspace

As the use of drones is becoming popular in various sectors, such as logistics, disaster response, agriculture, infrastructure inspection and entertainment, the extension of frequencies for drones to mobile phones and wireless LANs will be further examined.

Toward further expansion of frequency use in airspace, technical conditions are being studied for enabling the use of 4G (3.4 and 3.5 GHz band), 5G (3.4, 3.5, 3.7, 4.5, 4.9, and 28 GHz band), local 5G (4.6 to 4.9 GHz and 28.2 to 29.1 GHz band), and broadband mobile wireless access (BWA) systems of 2.5 GHz band (2545 to 2645 MHz) by drones, etc., in airspace, while preventing interference with other wireless systems, etc. These studies commenced in July 2024, and efforts will be made to compile within the same year any conclusions that reached early.

Regarding the frequencies used by wireless LANs in the 5 GHz band (mainly in the 5.2 GHz band), measures to further expand their use in airspace while preventing interference with other wireless systems, etc., will be examined, and regulatory revisions will be completed by the end of FY2024.

From the viewpoint of economic rationality, it is required to achieve international harmonization with the frequencies used by overseas drones (e.g., the 5.8 GHz band). To enable experimental operation in the 5.8 GHz band through simplified procedures, the MIC compiled frequencies and locations that can be operated without affecting existing wireless systems and announced the range of frequencies available for use as specific experimental test stations in November 2024.

IV. Promotion of examinations on V2X

In light of the development and importance of autonomous driving systems (including safe driving assistance), additional assignment to the 5.9 GHz band (5850 to 5925 MHz) has been examined internationally, in addition to the existing frequency bands for ITS (such as 760 MHz band). To that end, the “Study Group on ‘Next-Generation ITS Communications’ in the Autonomous Driving Era” complied an interim report in August 2023, stating that the “assignment of frequencies for V2X communications with a maximum bandwidth of 30 MHz (5895 to 5925 MHz) should be considered, taking into account international frequency harmonization, and avoiding interference with existing radio stations.” Specific examinations will proceed based on the interim report.

Specifically, with regard to a part of the 5.9 GHz band (5888 to 5925 MHz), measures will be taken to secure alternative frequencies for existing wireless systems and support their migration, and frequency sharing with systems adjacent to 5.9 GHz band V2X systems will be examined. Based on government strategies, the pathway for the introduction and widespread adoption of 5.9 GHz band V2X systems will be clarified through the establishment of experimental environments and technical demonstrations on platforms such as the Shin-Tomei Expressway, as well as studies on new frequency migration and reorganization schemes for their introduction and practical use. Based on these efforts, frequency assignment for V2X communications will be implemented by FY2026.

V. Advanced use of Non-Terrestrial Networks (NTNs)

For the purpose of introducing High-Altitude Platform Stations (HAPS) in Japan, which are expected to serve as an approach for realizing ultra-wide-area communications for

smartphones, drones, and IoT devices, engineering tests are being conducted for wireless systems related to fixed links, mobile links, and Command and Control (C2) links, including considerations of frequency sharing with other wireless systems, to develop the necessary technical standards. Additionally, flight demonstrations and tests will be carried out at the Osaka-Kansai Expo in 2025, and the technical conditions for HAPS communication systems will be compiled by FY2025. Additionally, research and development will be promoted for technologies to utilize frequencies for HAPS efficiently.

With regard to non-geostationary satellite communication systems, for the early realization of direct connectivity with mobile phones, etc., using the frequency bands identified for IMT, studies on technical conditions including frequency sharing, and licensing procedures for radio stations, will be carried out on the basis of the WRC-23 resolution, and regulatory developments for the 2 GHz band will be completed by the end of 2024 while ensuring harmonization with studies in the ITU-R.

For the introduction of the non-geostationary satellite communication systems in the Ka-band, which operates in orbit at an altitude of approximately 600 km, studies on the technical conditions for frequency sharing with existing radiocommunication systems will be conducted, and regulatory developments are expected to be completed by around FY2024.

VI. Effective use of frequencies for public services

In order to achieve the effective use of publicly-owned frequencies, the Working Group for Publicly-owned Frequencies of the Digital Transformation Era's Radio Spectrum Policy Council interviewed the relevant ministries and agencies, targeting "systems using frequencies for which demand has apparently arisen for other purposes," and "systems

using an analog format" among national public service radio stations (which are exempt from spectrum user fees, hereinafter the same applies) used by the national government. In August 2021, the Working Group formulated the direction for termination, frequency migration, frequency sharing, digitalization, etc. Based on the above council's report stating that a follow-up should be made every year for the time being to complement the Survey of Actual Radio Spectrum Utilization.

With the enforcement of the Radio Amendment Act 2022, the Radio Regulatory Council became the evaluation body of the Survey of Actual Radio Spectrum Utilization. Based on this, starting from 2023, the Council will carry out the Survey of Actual Radio Spectrum Utilization on national public service radio stations every year for the time being. (See Tables 2 and 3 below)

Table 2 : Progress of initiatives implemented by relevant ministries and agencies (FY2023) (systems using frequencies for which demand has apparently arisen for other purposes)

System name	Frequency band	Demand for other purposes	Directionality of initiatives	Progress status
(1) 5 GHz wireless access system	5 GHz band	5G	Termination or migration to another wireless system	Migration to alternative means is under consideration
(2) Weather radar (C-band)	5.3 GHz band	Wireless LAN	Frequency sharing	In FY2022, studies on sharing the frequency with wireless LAN were completed, and progress was made on updating to more efficient technologies
(3) 6.5 GHz band telecommunication,	6.5 GHz band	Wireless LAN	Frequency sharing	Studies on frequency sharing with wireless LAN systems have advanced, and technical

public and general services				condition studies are scheduled to commence by FY2024
(4) 40 GHz band image transmission (For public service)	37 GHz band	5G, satellite	Termination or migration to another wireless system	(Initiative completed)
(5) 40 GHz band public and general services (Relay Systems)	40 GHz band	5G, satellite	Migration to another wireless system	(Initiative completed)
(6) 38 GHz band FWA	38 GHz band	5G, satellite	Frequency sharing	Studies on frequency sharing with 5G have progressed

Table 3 : Progress of initiatives implemented by relevant ministries and agencies (FY2023) (systems using analog format)

System name	Frequency band	Directionality of initiatives	Progress status
(1) Roadside communication	1620 kHz band	Digitalization, termination or migration to another wireless system	Other wireless systems have replaced some systems, and the future direction is scheduled to be reviewed by the end of FY2024
(2) Public service telemetry (excluding disaster response and flood control operations)	60 MHz band	Migration to another wireless system	Termination due to replacement with other wireless systems is progressing
(3) Public service telemetry (disaster response and flood control operations)	60/400 MHz band	Digitalization	Technical studies on digitalization will be steadily carried out up to FY2024, and usage conditions will be surveyed
(4) Flood prevention	60/150 MHz band	Digitalization	
(5) Mobile radio communication for disaster response and flood control	60 MHz band	Digitalization	
(6) Central anti-disaster mobile radio	150/400 MHz band	Digitalization, etc.	(Initiative completed)
(7) Intra-departmental communication (for communications during disasters)	150 MHz band	Digitalization, etc.	The possibility of substitution with public safety mobile systems is being evaluated
(8) Oil reserves	150 MHz band	Digitalization, etc.	Digitalization is being planned
(9) Disaster prevention intercommunication radio	150/400 MHz band	Digitalization, etc.	The possibility of substitution with public safety mobile systems is

			being evaluated, and partial substitution with other wireless systems is being planned
(10) Helicopter television (heli-tele) communication for public services	400 MHz band	Digitalization	Technical studies are being conducted on digital systems, and the replacement with heli-sat systems is progressing
(11) Meteorological assistance radio	400 MHz band	Digitalization	Technical studies are being conducted on digital systems, with some systems planned to be replaced by other wireless systems Digitalization and substitution with heli-sat systems are progressing
(12) 15 GHz band helicopter television (heli-tele) video transmission	15 GHz band	Digitalization, etc.	

VII. Promotion of Beyond 5G

To realize Beyond 5G, which is expected to serve as the next-generation information and communications platform supporting an AI society, the MIC, based on the “Strategy for Realizing Next-Generation Information and Communication Infrastructure to Support AI Society - Beyond 5G Promotion Strategy 2.0,” published in August 2024, has identified (i) All-Photonics Network (APN), (ii) Non-Terrestrial Network (NTN), and (iii) Radio Access Network (RAN) as Japan’s primary strategic sectors and is promoting necessary initiatives.

Specifically, (i) in the APN sector, the MIC aims for the full-scale introduction of APN services that seamlessly connect multiple service providers in Japan by around 2030, and the overseas expansion of APN-related products and services. Toward this end, MIC will promote the research and development of common platform technology to connect multiple service providers seamlessly and establish its platform by around 2028. In addition, MIC will promote the development of experimental infrastructure to implement research and development results and, starting in 2027 will provide support for private-sector

standardization activities to reflect these results in international forum standards gradually. Furthermore, to expand the footprint of Japanese companies, MIC will proactively support the overseas expansion of already commercialized products from the current stage.

(ii) In the NTN sector, to facilitate the introduction of HAPS in Japan by 2026, MIC will conduct flight demonstrations and tests, including those at the Osaka-Kansai Expo in 2025. The technical conditions for HAPS communication systems will be compiled by FY2025, along with support for research and development of advanced technologies and their overseas expansion. In addition to regulatory revisions needed to smoothly introduce globally provided satellite communication services in Japan, MIC will also support research and development.

(iii) In the RAN sector, in addition to expanding the use of sub-6 and millimeter waves and stand-alone (SA), MIC is working to secure frequencies to address future traffic demand. Regarding the frequency bands (4400 to 4800 MHz, 7125 to 8400 MHz, and 14.8 to 15.35 GHz) under consideration by the ITU for possible IMT-specific allocations in preparation for WRC-27, policies will be considered at an appropriate time during WRC-27, taking into account international trends, specific usage needs, and the potential for sharing with existing wireless systems. In addition, promote research and development, etc., for the advancement of RAN and further utilization of high frequencies.

The opportunity provided by Expo 2025 Osaka, Kansai, to be held in FY2025, will be utilized for the above initiatives. Efforts to promote Beyond 5G will be accelerated by setting up an exhibition booth as a 'Beyond 5G Ready Showcase' to provide an experience of cutting-edge technologies.

Regarding industry-academia-government collaboration, starting in FY2024, the 5G Mobile Promotion Forum (5GMF), which has contributed to the promotion of 5G, and the

Beyond 5G Promotion Consortium, which has worked on Beyond 5G promotion, will be integrated to form the newly established XG Mobile Promotion Forum (XGMF), which will promote efforts toward the social implementation of next-generation mobile communications and international collaboration.

Chapter 4. Reorganization Policy for Each Frequency Band

I. 222 MHz and below

1 Overview of bandwidth

This frequency band is primarily allocated to maritime mobile services, broadcasting services, aeronautical mobile services, amateur services, mobile services, fixed services, aeronautical radio navigation satellite services, etc.

2 Basic policy

Promote the digitalization of current analog wireless systems from the viewpoint of effective use of the radio spectrum. In addition, MIC will examine new application potential and sharing of the radio spectrum.

3 Initiatives for regulatory revisions

(1) Global maritime distress and safety system (GMDSS) [medium wave band, short wave band, 150/160 MHz band]

(i) Toward the introduction of autonomous maritime radio devices (AMRD) using automatic identification system (AIS) technology, which will be used as devices for transmitting the location data of fishing nets, icebergs and large drifting objects, engineering tests will be carried out from FY2023 to FY2024, and MIC will begin studies to formulate the technical standards in the first half of FY2025 and regulatory revisions will be implemented by the end of FY2025. [See Appendix 2 (6) (iii)]

(ii) The introduction of automatic connection systems (ACS) and digital navigation data systems (NAVDAT) using the 500 kHz band and the 4, 6, 8, 12, 16, and 22 MHz bands, and VHF band data exchange systems (VDES) that exchange data between ocean

vessels, as well as between land and ship, is being discussed in the ITU and IMO. Engineering tests will be carried out from FY2024 to FY2025, and technical standards will be formulated sequentially from FY2026 onwards based on the progress of discussions in the international community to achieve this. [See Appendix 2 (6) (iii)]

(iii) Regarding marine radio systems using the VHF band (156 to 162 MHz), discussions on the future shift to band narrowing of analog voice communications at the ITU will be encouraged.

(2) Short-wave digital communications [3 to 30 MHz]

(i) Based on the progress of introducing short-wave digital systems in other countries, technical conditions for the introduction of a digital system for short-wave international communications (fixed stations) will be summarized during FY2024.

(3) Utilization measures for V-Low band etc. [95 to 108 MHz etc.]

(i) With regard to the V-Low band (95 to 108 MHz band), based on the “Summary Report on Measures to Utilize Broadcasting Frequencies (regarding the former terrestrial broadcasting site of the Open University of Japan and V-Low Band)” compiled by the Study Subcommittee on Utilization Measures for Broadcast Frequencies in March 2022, the necessary bandwidth will be examined along with the conversion from AM broadcasting to FM broadcasting which is expected to become feasible nationwide from 2028 for expanding FM broadcasting frequencies.

In addition, surveys will be conducted to understand the status of examinations carried out by relevant ministries and agencies regarding migration to FM roadside communication systems or other wireless systems. Based on the findings of these examinations and tests, a specific assignment policy will be formulated by the end of FY2024.

(4) Utilization measures for the V-High band [170 to 222 MHz]

(i) With regard to the V-High band (170 to 222 MHz), based on the “Summary of the Results of a Demonstration Experiment in the V-High Band” compiled by the Study Subcommittee on Utilization Measures for Broadcast Frequencies (June 2022) and the report of the Digital Transformation Era's Radio Spectrum Policy Council (August 2021), technical conditions will be examined to extend the frequency for the 200 MHz band public broadband mobile communications system (public BB), and to introduce narrowband IoT communication systems, which enable several public safety agencies and other organizations to share information at multiple locations in the event of a disaster, into guard bands between the public BB and other systems. Technical conditions for these systems will be examined, and regulatory revisions will be completed by the end of FY2025.

(5) Systems using an analog format among national public service radio stations [60 MHz/150 MHz band]

(i) Regarding public service telemetry (excluding disaster response and flood control operations) (60 MHz band), flood control operations (60 and 150 MHz bands), and mobile wireless for disaster response and flood control operations (60 MHz band), MIC conducted engineering tests from FY2022 to FY2024 and compiled the technical conditions required for the introduction of digital systems. [See Appendix 2 (6) (i)]

4 Progress of frequency reorganization, etc.

(1) Municipal disaster prevention administrative radio [60 MHz band]

(i) With regard to municipal disaster prevention administrative radio (60 MHz band (only for the broadcast system)), early migration to a digital format will be promoted. As part

of the promotion measures, initiatives will be undertaken to confirm and understand the background circumstances, including issues related to digitalization, based on the results of the FY2024 Survey on Actual Radio Spectrum Usage.

(2) VHF band for aeronautical mobile (R) service radio [117.975 to 137 MHz]

(i) The spectrum shortage in the VHF band for aeronautical mobile (R) service radio is expected to become more severe in the future due to increasing communication demand driven by the growing use of flying vehicles and other factors. For this reason, taking account of the introduction of and renewal plans for wireless communication devices by licensees based on the Evaluation of the Degree of Effective Utilization of the Radio Spectrum in the Survey on Actual Radio Spectrum Usage (714 MHz or below) in FY2022, channel assignment (channel plan) for band narrowing will be examined in the Tokyo metropolitan area and Kinki region, where communication demand is expected to be too high.

Based on the channel plan, frequencies will be assigned by FY2024 after coordination with the concerned carriers for flying cars (aircraft stations) scheduled to operate at Expo 2025 Osaka, Kansai, and ground-based air stations that facilitate communication.

(3) Municipal and prefectural disaster prevention administrative radios [150 MHz band]

(i) Regarding prefectural disaster prevention administrative radio (150 MHz band), the direction of frequency migration by licensees will be appropriately assessed through the FY2024 Survey on Actual Radio Spectrum Usage and migration to an appropriate system, including a digital format (260 MHz band), will be promoted concurrently with the replacement of equipment.

(ii) Regarding municipal disaster prevention administrative radio (150 MHz band), the

frequency migration status will be checked periodically, and migration to an appropriate system, including a digital format (260 MHz band), will be promoted concurrently with the replacement of equipment.

(4) Systems using an analog format among national public service radio stations [1620 kHz, 60 MHz, and 150 MHz band]

(i) For roadside communication systems (1620 kHz), progress is being made in replacing some systems with other wireless systems. The future direction will be steadily reviewed by the end of FY2024, and surveys will be conducted to assess the progress of these reviews.

(ii) Regarding public service telemetry (excluding disaster response and flood control operations) (60 MHz band), termination through replacement with other wireless systems is progressing, and the progress of termination will continue to be monitored.

(iii) For intra-departmental communication (for communications during disasters) (150 MHz band), the possibility of substitution with public safety mobile systems will be examined.

(iv) For radio communication systems for oil reserves (150 MHz band), digitalization is being planned, and progress will continue to be monitored.

(v) For the disaster prevention intercom radio system (150 MHz band) used for communications between disaster prevention organizations, some systems are planned to be replaced with other wireless systems. The Emergency Communications Council, consisting of disaster prevention organizations, will conduct surveys on usage conditions, including the possibility of substitution with public safety mobile systems.

5 Future themes to be addressed

(1) With regard to public BB, which is expected to see increased demand as a means of transmitting images during disasters, research and development will be carried out from FY2025 to FY2028 to establish the next-generation public BB technology with the aim of achieving a faster, longer-distance network that can be set up more flexibly and quickly, even in disaster situations. [See Appendix 2 (6) (iv)]

II. 222 ~ 714 MHz

1 Overview of bandwidth

This frequency band is primarily allocated to fixed services, mobile services, broadcasting services, etc.

2 Basic policy

Promote digitalization and frequency migration, and consider the use of post-migration frequencies for systems of land-based sectors, including self-operated radio systems for public and general services.

3 Initiatives for regulatory revisions

(1) Terrestrial broadcasting [UHF band]

(i) With regard to terrestrial broadcasting, engineering tests on technologies for expanding transmission capacity and improving high compression and transmission efficiency were completed in FY2022, aiming at more effective use of broadcasting frequencies and realization of new broadcasting services (e.g., ultra-high-definition broadcasting) in the future. Based on the results of those tests, regulatory revisions of technical conditions for new broadcasting systems were established in May 2024.

(2) National public service radio stations using an analog system [400 MHz band]

(i) Regarding public service telemetry (disaster response and flood control operations) (400 MHz band), MIC conducted engineering tests from FY2022 to FY2024 and compiled the technical conditions required for the introduction of digital systems. [See Appendix 2 (6) (i)]

(ii) For helicopter television (heli-tele) communication for public services (400 MHz band),

technical studies on digital systems have been underway from FY2022 to FY2024, and progress is also being made in replacing them with heli-stats. While steadily conducting this technical study, progress on alternatives such as heli-sats will also be examined. [See Appendix 2 (6) (i)]

(iii) For meteorological assistance radio (400 MHz band), technical studies on digital systems have been underway from FY2022 to FY2024, and partial replacement with other wireless systems is being planned. While steadily conducting this technical study, the usage status will also be examined. [See Appendix 2 (6) (i)]

(3) Specified radio microphone [470 to 714 MHz]

(i) For specified digital radio microphones, in view of the results of engineering tests and by collaboration with relevant organizations, a channel list for those with low antenna power will be added by the end of FY2024 to enable more flexible operation in the TV white space band.

4 Progress of frequency reorganization, etc.

(1) Convenience radio [350 MHz and 400 MHz bands]

(i) Since the frequency usage deadline for analog convenience radio stations is November 30, 2024 (as stipulated in the Frequency Assignment Plan, September 2021), efforts will be promoted to raise awareness and provide education through relevant organizations to ensure a smooth transition to digital systems.

(2) Municipal and prefectural disaster prevention administrative radios [400 MHz band]

(i) Regarding prefectural disaster prevention administrative radio (400 MHz band), the direction of frequency migration by licensees will be appropriately assessed through the FY2024 survey, and migration to an appropriate system, including a digital format

(260 MHz band), will be promoted concurrently with equipment replacement.

(ii) Regarding municipal disaster prevention administrative radio (400 MHz band), the frequency migration status will be checked periodically, and migration to an appropriate system, including a digital format (260 MHz band), will be promoted concurrently with the replacement of equipment.

(3) Taxi radio [400 MHz band]

(i) With regard to analog taxi radio, early migration from an analog format to a digital one or another system will be promoted in order to upgrade communication systems, and to use frequencies more effectively.

(4) MCA for regional development [400 MHz band]

(i) With regard to analog MCA for regional development, early migration from an analog format to a digital one or another system will be promoted in order to upgrade communication systems, and to use frequencies more effectively.

(5) Disaster prevention intercom radio system [400 MHz band]

(i) For the disaster prevention intercom radio system (400 MHz band) used for communications between disaster prevention organizations, the Emergency Communications Council, consisting of disaster prevention organizations, will conduct surveys on usage conditions, including the possibility of substitution with public safety mobile systems.

5 Future themes to be addressed

There are no applicable cases in FY2024.

III. 714 MHz to 1.4 GHz

1 Overview of bandwidth

This frequency band is primarily allocated to mobile services, aeronautical radio navigation satellite services, amateur services, etc.

Individual radio spectrum utilization systems are used in mobile phones, MCA, 1.2 GHz band video FPU, specific radio microphones, air traffic control systems, amateur radio, and license-exempt radio spectrum utilization systems such as telemetry and RFID.

2 Basic policy

Promote further dissemination and promotion of radio spectrum utilization system, particularly for mobile services.

3 Initiatives for regulatory revisions

(1) Study on effective frequency utilization measures after the transition to digital MCA and advanced MCA [800/900 MHz band]

(i) With regard to digital MCA land mobile communication systems, in light of the announcement that the service would be terminated at the end of May 2029, migration to alternative systems will be promoted. Technical conditions for the new wireless systems will be compiled by FY2024, including the possibility of phased introduction through frequency sharing initiated during ongoing migration to ensure that new wireless systems can be introduced early in the frequency band opened by the migration.

(ii) Regarding advanced MCA wireless communication systems, in light of the announcement that services will be terminated by the end of March 2028, migration

to alternative systems will be promoted, and studies will be conducted on the frequency utilization measures after the termination of the services.

(2) Wireless communication system using HAPS [694 to 960 MHz]

(i) To introduce High-Altitude Platform Stations (HAPS) in Japan, engineering tests are being conducted for wireless systems related to fixed links, mobile links, and Command and Control (C2) links, including considerations of frequency sharing with other wireless systems, to develop the necessary technical standards. Additionally, flight demonstrations and tests will be carried out at the Osaka-Kansai Expo in 2025, and the technical conditions for HAPS communication systems will be compiled by FY2025.

In particular, based on the study status of the 2 GHz band, the potential for future use as mobile system links will be examined as necessary. [See Appendix 2 (2) (ii)]

4 Progress of frequency reorganization, etc.

(1) Image transmission systems [1.2 GHz band]

(i) Regulatory revisions were implemented in FY2016 in relation to radio stations for unmanned mobile image transmission systems that can transmit images digitally from the airspace using radio waves in the frequency bands of 2.4 and 5.7 GHz, etc. In response to this, the deadline set for the acquisition of new licenses for analog image transmission systems using the 1.2 GHz band will be the end of FY2027, with the aim of promoting early migration to the frequency bands of 2.4 GHz band, 5.7 GHz band, etc.

5 Future themes to be addressed

(1) To address issues such as interference caused by the relative position and density of interrogators and terminals, which are inherent in the backscatter communication system used in 920 MHz band passive RFID systems, and to enhance frequency utilization efficiency, research and development will be promoted to establish technologies, including distributed antenna coordination control that forms communication zones in multiple specific areas through synchronized coordination control technology of distributed interrogators and spatial division multiplexing technology that improves the quality of received signals by coordinating between interrogators. [See Appendix 2 (3) (i)]

IV. 1.4 ~ 3.4 GHz

1 Overview of bandwidth

This frequency band is primarily allocated to mobile services, mobile satellite services, radio navigation satellite services, amateur services, radiolocation services, etc.

Individual radio spectrum utilization systems are used in license-exempt radio spectrum utilization systems such as mobile phones, broadband mobile wireless access (BWA) systems, mobile satellite communications for telecommunications services, Quasi-Zenith Satellite System, 2.3 GHz band video FPU, wireless LAN, and Airport Surveillance Radar (ASR), ship radars, etc.

2 Basic policy

Promote further dissemination and promotion of mobile communication systems, including upgrades to 5G, and advance studies on measures for effective use of frequencies to address the growing demand for 5G and non-geostationary satellite systems for mobile phones, etc.

3 Initiatives for regulatory revisions

(1) Mobile communication systems [2.6 GHz band]

(i) For the 2.6 GHz band (2645 to 2665 MHz), in light of progress in migrating existing satellite mobile communication systems to an upgraded system, the possibility of introducing mobile communication systems, including the application of dynamic frequency sharing at ordinary times and during disasters, will be further examined, while taking account of its impact on existing wireless systems.

(2) Non-geostationary satellite communication systems for mobile phones [Frequency

bands identified for IMT (2 GHz band, etc.)]

(i) With regard to non-geostationary satellite communication systems, for the early realization of direct connectivity with mobile phones, etc., using the frequency bands identified for IMT, studies on technical conditions including frequency sharing, and licensing procedures for radio stations, will be carried out on basis of the WRC-23 resolution, and regulatory developments for the 2 GHz band will be completed by the end of 2024 while ensuring harmonization with studies in the ITU-R.

(3) Wireless communication system using HAPS [2 GHz band]

(i) To introduce High-Altitude Platform Stations (HAPS) in Japan, engineering tests are being conducted for wireless systems related to fixed links, mobile links, and Command and Control (C2) links, including considerations of frequency sharing with other wireless systems, to develop the necessary technical standards. Additionally, flight demonstrations and tests will be carried out at the Osaka-Kansai Expo in 2025, and the technical conditions for HAPS communication systems will be compiled by FY2025.

In particular, the technical conditions will be studied for mobile system links using the 2 GHz band (1920 to 1980 MHz and 2110 to 2170 MHz), which are expected to be utilized in the near future. [See Appendix 2 (2) (ii)]

(4) Broadband mobile wireless access (BWA) systems [2.5 GHz band]

(i) With regard to broadband mobile wireless access (BWA) systems using the 2.5 GHz band (2545 to 2645 MHz), examinations will be conducted to assess the necessity of allowing voice as an additional feature alongside data transmission based on specific needs.

(ii) Regarding broadband mobile wireless access (BWA) systems that use the 2.5 GHz

band (2545 to 2645 MHz), a study began in July 2024 to examine the technical conditions for enabling the use of airspace by drones while preventing interference with other wireless systems. Efforts will be made to compile within the same year any conclusions that reached early ..

4 Progress of frequency reorganization, etc.

(1) National public service radio stations [1.7 GHz band]

(i) The cessation of all 1.7 GHz band radio stations for national public services was completed by using temporary alternative lines utilizing termination promotion measures. Wireless facilities will continue to be improved, and frequency migration to the 4.5 GHz band, etc., will be advanced.

(2) Rural subscriber radio [2 GHz band]

(i) According to the 2023 Survey on Actual Radio Spectrum Usage, demand for 2 GHz band rural subscriber radio has been decreasing, except in remote islands and mountainous areas, due to migration to other wireless systems and other factors. In light of the steady progress observed, migration to other systems, such as the VHF band subscriber digital wireless systems upgraded in July 2020, will continue to be promoted, aiming for completion by FY2030.

5 Future themes to be addressed

(1) To introduce HAPS in Japan, which is expected to serve as an approach to realize ultra-wide-area communication for smartphones, drones and IoT devices, research and development will be advanced for technologies to utilize frequencies for the service and feeder links efficiently. [See Appendix 2 (2) (iii)]

(2) To avoid bursts of interference due to increased traffic in wireless LAN systems, etc., research and development will be pursued regarding intelligent propagation path control technologies that coordinate active array antenna technology and Intelligent Reflecting Surface (IRS) technology, as well as interlayer access control technology that allows grasping of the wireless environment and efficiently managing wireless resources. [See Appendix 2 (3) (ii)]

V 3.4 ~ 8.5 GHz

1 Overview of bandwidth

This frequency band is primarily allocated to fixed services, mobile services, fixed satellite services, aeronautical radio navigation satellite services, amateur services, radiolocation services, etc.

Individual radio spectrum utilization systems are used in license-exempt radio spectrum utilization systems such as fixed stations for telecommunications and broadcasting services, mobile phones, local 5G, Dedicated Short-Range Communication (DSRC), Microwave Band Video Field Pick-Up Unit (FPU), satellite communication system for telecommunications services, radio altimeters, amateur radios, weather radars, wireless LAN, etc.

2 Basic policy

To disseminate and promote 5G and local 5G, which have already been assigned, secure the necessary frequencies to meet further demand for 5G, etc., examine effective frequency utilization measures to expand the use of wireless LANs that can meet diverse usage needs, and secure frequency bands that can respond to internationally harmonized ITS communications, measures for frequency sharing with existing wireless systems will be further examined.

3 Initiatives for regulatory revisions

(1) Mobile communication systems [3.4/3.5/3.7/4.5/4.6 ~ 5.0 GHz bands]

(i) Regarding the 4.9 GHz band (4.9 to 5.0 GHz), regulatory revisions were made by MIC based on the 5G technical conditions compiled in March 2024 to enable the

introduction of 5G in September 2024. In the future, necessary procedures will be carried out to facilitate the early assignment to 5G.

(ii) For the 4.9 GHz band, in preparation for the assignment of frequencies to 5G systems, regulatory revisions were made by MIC to allow the establishment of new 5 GHz band wireless access systems (registered stations) by the end of FY2025, based on the assumption that termination promotion measures will be introduced to facilitate the migration of existing systems. Furthermore, the usage period for these systems' frequencies has been set to expire by the end of FY2035. In addition, MIC will promote measures such as informing registrants about the transition of the relevant system.

(iii) Technical conditions are being studied for enabling the use of 4G (3.4/3.5 GHz band), 5G (3.4/3.5/3.7/4.5/4.9 GHz band) and local 5G (4.6 to 4.9 GHz) by drones, etc., in airspace, while preventing interference with other wireless systems, etc. These studies commenced in July 2024, and efforts will be made to compile within the same year any conclusions that reached early.

(iv) For local 5G (4.6 to 4.9 GHz), regulatory revisions will be completed by the end of FY2024 based on the compilation of some responses by the Information and Communications Council in July 2024 concerning the technical conditions for marine usage (limited to 4.8 to 4.9 GHz) and the refinement of radio propagation parameters. Additionally, the goal is to introduce an experimental test station system with simplified procedures within FY2025.

(2) Wireless LAN systems [5, 6, 6.5 GHz band, etc.]

(i) Regarding the frequencies used by wireless LANs in the 5 GHz band (mainly in the 5.2 GHz band), measures to further expand their use in airspace while preventing interference with other wireless systems, etc., will be examined, and regulatory

revisions will be completed by the end of FY2024.

(ii) With regard to the use of narrowband devices in the 6 GHz band (5925 to 6425 MHz), frequency sharing will be examined with attention to trends in other countries.

(iii) The technical conditions for the frequency sharing related to the extension of the frequency range, including the outdoor use of the 6 GHz band wireless LAN and the outdoor use of the 6.5 GHz band (6425 ~ 7125 MHz), will be compiled by the end of FY2025. In the compilation process, attention will be paid to the frequency band (7025 to 7125 MHz) identified for IMT at WRC-23. Studies will be conducted on the structure and operational methods of the Automated Frequency Coordination (AFC) system necessary to prevent harmful interference with existing radio stations, etc. The conclusion will be based on these considerations.

(3) Drones, etc., flying in airspace [5.8 GHz band]

(i) From the viewpoint of economic rationality, it is required to achieve international harmonization with the frequencies used by overseas drones (e.g., 5.8 GHz band). To enable experimental operation in the 5.8 GHz band through simplified procedures, MIC compiled frequencies and locations that can be operated without affecting existing wireless systems and announced the range of frequencies available for use as specific experimental test stations in November 2024.

(4) V2X [5.9 GHz band]

(i) In light of the development and importance of autonomous driving systems (including safe driving assistance), additional assignment to the 5.9 GHz band (5850 to 5925 MHz) has been examined internationally, in addition to the existing frequency bands for ITS (such as 760 MHz band). To that end, the “Study Group on ‘Next-Generation ITS Communications’ in the Autonomous Driving Era” complied an interim report in

August 2023, stating that the “assignment of frequencies for V2X communications with a maximum bandwidth of 30 MHz (5895 to 5925 MHz) should be considered, taking into account international frequency harmonization, and avoiding interference with existing radio stations”. Specific examinations will proceed based on the interim report.

Specifically, with regard to a part of the 5.9 GHz band (5888 to 5925 MHz), measures will be taken to secure alternative frequencies for existing wireless systems and support their migration, and frequency sharing with systems adjacent to 5.9 GHz band V2X systems will be examined. Based on government strategies, the pathway for the introduction and widespread adoption of 5.9 GHz band V2X systems will be clarified through the establishment of experimental environments and technical demonstrations on platforms such as the Shin-Tomei Expressway, as well as studies on new frequency migration and reorganization schemes for their introduction and practical use. Based on these efforts, frequency assignment for V2X communications will be implemented by FY2026. [See Appendix 2 (1) (v)]

(5) Fixed wireless communication systems [6 GHz, 6.5 GHz, and 7.5 GHz band]

(i) Fixed wireless communication systems using the radio spectrum in the 6 GHz, 6.5 GHz, and 7.5 GHz bands have been used as a means of providing telecommunications services to island areas, etc., where it is difficult to lay optical fiber networks or ensure communications in the event of a disaster. Technological studies to realize further upgrades of those communication systems and improvement of communication quality through frequency sharing with wireless LAN systems, etc., will be carried out, and the technical conditions will be finalized during FY2024. Based on these technical conditions, regulatory revisions will be completed by the end of FY2025.

(6) Relay system for broadcasting business [6.5 GHz and 7.5 GHz bands]

(i) For fixed and mobile systems used in broadcasting business, engineering studies are being advanced to expand the transmission capacity of wireless systems and improve compression technologies. These efforts are based on the findings from studies on new broadcasting services conducted up to the end of FY2022, with the aim of compiling technical conditions by the end of FY2026. [See Appendix 2 (5) (i)]

4 Progress of frequency reorganization, etc.

(1) Systems for public service radio stations using frequencies for which demand has apparently arisen in other applications [5 GHz, 5.3 GHz, and 6.5 GHz bands]

(i) For 5 GHz wireless access systems, examinations of migration to an alternative means are being carried out, and the status of examinations will be surveyed.

(ii) For weather radar (C-band, 5.3 GHz band), progress is being made in updating to solid-state devices, which are more efficient than traditional electron tube-based systems. Surveys will be conducted on the status of this transition to solid-state devices.

(iii) For 6.5 GHz band telecommunication, public and general services, surveys on usage status will be conducted while considering the status of examinations on frequency sharing with wireless LAN systems.

5 Future themes to be addressed

(1) With the aim of securing communications effectively using high-frequency bands, research and development on cooperative control of Intelligent Reflection Surface (IRS) and relay communication terminals will be carried out in order to construct an optimal

propagation path that avoids radio wave obstructions lying between base stations and mobile terminals, and to use spatial resources in the high-frequency bands effectively. [See Appendix 2 (1) (ii)]

(2) To avoid bursts of interference due to increased traffic in wireless LAN systems, etc., research and development will be pursued regarding intelligent propagation path control technologies that coordinate active array antenna technology and Intelligent Reflecting Surface (IRS) technology, as well as interlayer access control technology that allows grasping of the wireless environment and efficiently managing wireless resources. [See Appendix 2 (3) (ii)]

(3) The DSRC system, which is mainly used for electronic toll collection (ETC) on toll roads, has several channels that can be utilized, but there is a bias in the channels that are actually used. Surveys on how the frequency is used and the status of that use will continue to be carried out, and the possibility of sharing with other wireless systems will be examined based on the usage status.

(4) Regarding the 7025 to 7125 MHz band, which was identified for IMT at WRC-23, the possibility of assigning it to 5G will be examined, taking into account the progress of studies by the ITU, 3GPP, etc., and the trends in other nations.

(5) With regard to the frequency bands (4400 to 4800 MHz and 7125 to 8400 MHz) considered for possible IMT-specific allocations in preparation for WRC-27, policies will be considered at an appropriate time during WRC-27, taking into account international trends, specific usage needs, and the potential for sharing with existing wireless systems.

(6) Regarding local 5G (4.6 to 4.9 GHz), the introduction of a system to simplify and expedite licensing procedures using operational adjustment organizations will be examined based on future demand trends by FY2025.

VI. 8.5 ~ 15.35 GHz

1 Overview of bandwidth

This frequency band is primarily allocated to radiolocation services, fixed services, broadcasting satellite services, fixed satellite services, mobile satellite services, amateur services, etc.

Individual radio spectrum utilization systems are used in various radars for public and general services, fixed stations for telecommunication and broadcasting services, satellite communication systems for telecommunications services, BS/CS broadcasting, amateur radios, etc.

2 Basic policy

Regulatory revisions will be implemented to enable the enhancement of various radars and video encoding systems for satellite broadcasting.

3 Initiatives for regulatory revisions

(1) X-band coastal surveillance radars, etc. [9 GHz band]

(i) To address the increasing demand for coastal surveillance radars, examining frequency band expansion and advancing technology, including multi-band compatibility, will be implemented. The technical standards will be formulated by the end of FY2024.

(2) Ultra-high-definition television broadcasting (4K/8K broadcasting) [12 GHz band]

(i) In satellite broadcasting, to upgrade video encoding systems for 2K satellite broadcasting and enable their integration in the same transponders as 4K broadcasting, the satellite Broadcasting WG of the Study Group on the Ideal

Broadcasting System in the Digital Age has initiated studies based on the findings of the engineering tests from FY2023. The group aims to compile the examination results by December 2024 and complete regulatory revisions by the end of FY2024.

4 Progress of frequency reorganization, etc.

(1) Systems for national public service radio stations using frequencies for which demand has apparently arisen in other applications [15 GHz band]

(i) Digitalization and substitution with heli-sat systems are progressing for 15 GHz band helicopter television (heli-tele) image transmission. Studies will be conducted on the progress of these developments.

5 Future themes to be addressed

(1) With regard to the frequency bands (14.8 to 15.35 GHz) considered for possible IMT-specific allocations in preparation for WRC-27, policies will be considered at an appropriate time during WRC-27, taking into account international trends, specific usage needs, and the potential for sharing with existing wireless systems.

VII 15.35 ~ 36 GHz

1 Overview of bandwidth

This frequency band is primarily allocated to fixed satellite services, mobile satellite services, fixed services, radiolocation services, mobile services, etc.

Individual radio spectrum utilization systems are used in satellite communication systems for telecommunications services, fixed stations for telecommunication and public services, fixed radio access systems (FWA), various radars for public services, mobile phones, local 5G, etc.

2 Basic policy

To disseminate and promote 5G and local 5G, which have already been assigned, and to examine measures for the effective use of frequencies to secure the necessary spectrum for addressing the growing demand for 5G and satellite communication systems.

3 Initiatives for regulatory revisions

(1) Mobile communication systems [26 GHz band, etc.]

(i) For the 26 GHz band (25.25 to 27 GHz), surveys on specific utilization needs will be conducted, taking into account the existing wireless systems in these bands and the usage status of the 28 GHz band. A conditional auction is planned to be held by the end of FY2025 with the aim of assigning frequencies to 5G systems. Therefore, while appropriately reflecting the status of engineering tests related to the sharing conditions with existing wireless systems, the requirements for the band applied to dynamic frequency sharing and the requirements of the sharing management systems, the

technical conditions will be complied by around spring 2025, and the technical standards will be formulated by around autumn 2025. [See Appendix 2 (1) (i)]

(ii) With regard to frequency bands (24.25 to 27.5 GHz) already specified for IMT in past meetings with an eye on their use for 5G systems, even if they do not come under 26 GHz, the possibility of frequency assignment to 5G systems will also be examined while taking account of examinations by the ITU, 3GPP, etc., and trends in other countries. With regard to the 27.0 to 27.5 GHz band, frequency assignment were implemented in April 2019, along with the 27.5 to 29.5 GHz band.

(iii) Technical conditions are being studied for enabling the use of 5G (28 GHz band) and local 5G (28.2 to 29.1 GHz) by drones, etc., in airspace, while preventing interference with other wireless systems, etc. These studies commenced in July 2024, and efforts will be made to compile within the same year any conclusions that reached early.

(iv) For local 5G (28.2 to 29.1 GHz), regulatory revisions will be completed by the end of FY2024 based on the compilation of some responses by the Information and Communications Council in July 2024 concerning the refinement of radio propagation parameters. Additionally, the goal is to introduce an experimental test station system with simplified procedures within FY2025.

(2) 22 GHz band radio access system (FWA) [22.0 to 23.6 GHz band]

To facilitate the assignment of the 26 GHz and 40 GHz bands to 5G, engineering tests for advancing the 22 GHz band wireless access system (FWA), which is a candidate for migration of the existing wireless system in this frequency band, will be promoted. While appropriately reflecting the status of these tests, the technical conditions will be compiled by around spring 2026, and regulatory revisions will be implemented by

around summer 2026. [See Appendix 2 (1) (i)]

(3) Non-geostationary satellite communication system [Ka band]

(i) For the introduction of the non-geostationary satellite communication system in the Ka-band, which operates in orbit at an altitude of approximately 600 km, studies on the technical conditions for frequency sharing with existing radiocommunication systems will be conducted, and regulatory development are expected to be completed by around FY2024.

4 Progress of frequency reorganization, etc.

There are no applicable cases in FY2024.

5 Future themes to be addressed

(1) To address various satellite communications needs, such as Internet use onboard aircraft and communications during disasters, research and development will be promoted for technologies that enable flexible control of satellite (Ka-band) resources (frequency bandwidth, location and shape of irradiation beams). From FY2025 onward, demonstrations will be conducted to improve frequency utilization efficiency and practical applications in real-world environments. [See Appendix 2 (2) (i)]

(2) With the aim of securing communications effectively using high-frequency bands, research and development on cooperative control of Intelligent Reflection Surface (IRS) and relay communication terminals will be carried out in order to construct an optimal propagation path that avoids radio wave obstructions lying between base stations and mobile terminals, and to use spatial resources in the high-frequency bands effectively. [See Appendix 2 (1) (ii)]

(3) Regarding local 5G (28.2 to 29.1 GHz), the introduction of a system to simplify and expedite licensing procedures using operational adjustment organizations will be examined based on future demand trends by FY2025.

VIII. Above 36 GHz

1 Overview of bandwidth

This frequency band is primarily allocated to mobile services, fixed services, radio astronomy, etc.

Individual radio spectrum utilization systems are used in license-exempt radio spectrum utilization systems such as image transmission systems, 40 and 55 GHz band video FPU, 50 GHz convenience radio, fixed radio access systems (FWA), 60 GHz band low power data communication systems, vehicle radars, etc.

2 Basic policy

Promote the development of basic technologies and new radio spectrum utilization systems in order to carry out examinations of effective frequencies utilization measures for securing the necessary frequencies that meet the further demand for 5G and to facilitate the use of unused frequency bands, including terahertz bands.

3 Initiatives for regulatory revisions

(1) Mobile communication systems [40 GHz band, etc.]

(i) For the 40 GHz band (37.0 to 43.5 GHz), surveys on specific utilization needs will be conducted, taking into account the existing wireless systems in these bands and the usage status of the 28 GHz band. A conditional auction is planned to be held by the end of FY2025 with the aim of assigning frequencies to 5G systems. Therefore, while appropriately reflecting the status of engineering tests related to the sharing conditions with existing wireless systems, the requirements for the band applied to dynamic frequency sharing and the requirements of the sharing management systems, the

technical conditions will be complied by around spring 2025, and the technical standards will be formulated by around autumn 2025. [See Appendix 2 (1) (i)]

(ii) With regard to frequency bands (37 to 43.5 GHz, 47.2 to 48.2 GHz, 66 to 71 GHz) already specified for IMT in past meetings with an eye on their use for 5G systems, even if they do not come under 40 GHz, the possibility of frequency assignment to 5G systems will also be examined while taking account of examinations by the ITU, 3GPP, etc., and trends in other countries.

(2) Millimeter wave train radio systems [40 GHz band]

(i) To respond to the increasing demand for video image transmission that enables the command room to grasp the situation in train cars and provides the image of a platform to support one-person train operations, technical conditions will be compiled by the end of FY2024, and regulatory revisions will be put in place by the end of FY2025 based on the results of examinations made in preparation for the introduction of millimeter wave train radio systems in FY2023.

(3) Security surveillance radars [75 to 110 GHz]

(i) To ensure the safety and security of public spaces, etc., it is required to install high-speed and high-precision millimeter wave security surveillance radars using multi-bands that can quickly detect various dangerous materials. To that end, engineering tests for their institutional framework will be carried out, and the possibility of sharing with other wireless systems will be examined by FY2024. Based on the results of the test, the technical conditions will be examined by the end of FY2025. [See Appendix 2 (6) (ii)]

(4) Foreign object debris detection radars [92 to 100 GHz]

(i) To ensure the availability and safety of critical infrastructure such as airport runway

surveillance, etc., it is required to introduce foreign object debris detection radars (92 to 100 GHz) using high-speed, high-precision imaging technologies. To that end, regulatory revisions will be performed by the end of FY2024 based on the technical conditions report from the Information and Communications Council compiled in April 2024.

(5) Wireless communication system using HAPS [38 to 39.5 GHz]

(i) To introduce High-Altitude Platform Stations (HAPS) in Japan, engineering tests are being conducted for wireless systems related to fixed links, mobile links, and Command and Control (C2) links, including considerations of frequency sharing with other wireless systems, to develop the necessary technical standards. Additionally, flight demonstrations and tests will be carried out at the Osaka-Kansai Expo in 2025, and the technical conditions for HAPS communication systems will be compiled by FY2025.

In particular, study the technical conditions for fixed system links using the 38 to 39.5 GHz, which are expected to be utilized in the near future. [See Appendix 2 (2) (ii)]

4 Progress of frequency reorganization, etc.

(1) Systems for national public service radio stations using frequencies for which demand has apparently arisen in other applications [38 GHz band]

(i) For 38 GHz band FWA, the frequency sharing with 5G will be studied steadily, and surveys will continue to be conducted on its utilization status.

5 Future themes to be addressed

(1) To introduce HAPS in Japan, which is expected to serve as an approach to realize ultra-

wide-area communication for smartphones, drones and IoT devices, research and development will be advanced for technologies to utilize frequencies for the service and feeder links efficiently. [See Appendix 2 (2) (iii)]

(ii) To realize fixed wireless communication lines that respond to the rapid increase in communication volume due to the development of 5G, etc., research and development will be carried out on wireless technology in the ultra-high frequency band (350 to 600 GHz), and mutual conversion technology with optical fiber signals. The aim is to develop wireless communication technology exceeding 200 Gbps that is highly compatible with optical communication using ultra-high-frequency bands by the end of FY2024. [See Appendix 2 (4) (i)]

(iii) To establish fixed wireless communication technology exceeding 100 Gbps in the high millimeter wave band, where fixed wireless communication has not yet been utilized, research and development of multiplex transmission methods for ultra-high capacity and beam control technology will be conducted to ensure stability and flexibility, with the goal to develop wireless communication technology capable of replacing optical lines. [See Appendix 2 (4) (ii)]

(4) To realize high-capacity fixed wireless systems, technical studies will be carried out toward the introduction of Orbital Angular Momentum (OAM) mode multiplexing transmission technology (a technology that increases the number of signals transmitted simultaneously by transmitting signals on radio waves which have different OAM modes (radio vortex rotation speeds)) in the millimeter wave band. [See Appendix 2 (4) (iii)]

(5) To realize Society 5.0, high-capacity, simultaneous multi-connection technology for transmission of high-definition video and sensing information, etc., is required for upgrading communication tools such as AR and VR and mobility in the fields of education,

medical care, etc. For that purpose, research and development will be carried out on wireless LAN transmission technologies using terahertz-band MIMO, which can transmit an enormous amount of information. [See Appendix 2 (3) (iii)]

IX. Initiatives related to the reorganization of other frequencies and radio wave usage

(1) Promotion of Beyond 5G

To realize Beyond 5G, which is expected to serve as the next-generation information and communications platform supporting an AI society, MIC, based on the “Strategy for Realizing Next-Generation Information and Communication Infrastructure to Support AI Society - Beyond 5G Promotion Strategy 2.0,” published in August 2024, has identified (i) All-Photonics Network (APN), (ii) Non-Terrestrial Network (NTN), and (iii) Radio Access Network (RAN) as Japan’s primary strategic sectors and is promoting necessary initiatives.

Specifically, (i) in the APN sector, MIC aims for the full-scale introduction of APN services that seamlessly connect multiple service providers in Japan by around 2030, and the overseas expansion of APN-related products and services. Toward this end, MIC will promote the research and development of common platform technology to connect multiple service providers seamlessly and establish its platform by around 2028. In addition, MIC will promote the development of experimental infrastructure to implement research and development results and, starting in 2027 will provide support for private-sector standardization activities to reflect these results in international forum standards gradually. Furthermore, to expand the footprint of Japanese companies, MIC will proactively support the overseas expansion of already commercialized products from the current stage.

(ii) Regarding the field of NTNs, to facilitate the introduction of HAPS in Japan by 2026, MIC will conduct flight demonstrations and tests, including those at the Osaka-Kansai Expo in 2025. The technical conditions for HAPS communication systems will be compiled by FY2025, along with support for research and development of advanced

technologies and their overseas expansion. In addition, the MIC will undertake the necessary regulatory development for the smooth introduction of globally provided satellite communication services in Japan, and will also support related research and development.

(iii) In the RAN sector, in addition to expanding the use of sub-6 and millimeter waves and stand-alone (SA), MIC is working to secure frequencies to address future traffic demand. Regarding the frequency bands (4400 to 4800 MHz, 7125 to 8400 MHz, and 14.8 to 15.35 GHz) under consideration by the ITU for possible IMT-specific allocations in preparation for WRC-27, policies will be considered at an appropriate time during WRC-27, taking into account international trends, specific usage needs, and the potential for sharing with existing wireless systems. In addition, promote research and development, etc., for the advancement of RAN and further utilization of high frequencies.

The opportunity provided by Expo 2025 Osaka, Kansai, to be held in FY2025, will be utilized for the above initiatives. Efforts to promote Beyond 5G will be accelerated by setting up an exhibition booth as a “Beyond 5G Ready Showcase” to provide an experience of cutting-edge technologies.

Regarding industry-academia-government collaboration, starting in FY2024, the 5G Mobile Promotion Forum (5GMF), which has contributed to the promotion of 5G, and the Beyond 5G Promotion Consortium, which has worked on Beyond 5G promotion, will be integrated to form the newly established XG Mobile Promotion Forum (XGMF), which will promote efforts toward the social implementation of next-generation mobile communications and international collaboration.

(2) Response based on the Evaluation of the Degree of Effective Utilization of the Radio

Spectrum

Based on the Evaluation of the Degree of Effective Utilization of the Radio Spectrum, which was conducted by the Radio Regulatory Council, initiatives for reviewing the content of the actual usage survey in the next fiscal year will be implemented as necessary, and frequency reorganization in bands where there is a high need for radio usage will be accelerated.

(3) New assignment methods for mobile phone frequencies

The Study Group on New Assignment Methods for Mobile Phone Frequencies decided to hold meetings from October 2021, and the basic direction of examinations on new assignment methods for mobile phone frequencies in Japan was formulated in November 2022. According to this, it would be appropriate to examine methods that enable us to choose "conditional auction" in addition to the conventional comprehensive evaluation method (specified base station establishment fee system).

Based on this direction, the 5G Business Design Working Group has held meetings since January 2023 to examine the measures to expand the 5G business using high-frequency bands, including the millimeter wave band, which will be the main band assigned to 5G in the future. The Working Group also discussed the institutional design of “conditional auctions” as a new assignment method contributing to those measures, and compiled a report in July of the same year. Furthermore, the “Radio Policy Roundtable for Expanding Digital Business Report” states that it is appropriate to conduct a “conditional auction” in the high-frequency band, which is expected to be newly assigned for 5G by the end of FY2025, and to assign the revenue to measures for strengthening the infrastructure and technology of information and communications, including the effective use of radio waves, such as facilitating the migration of existing

licensees. In light of this report, the necessary regulatory revisions will be completed by the end of FY2025 to enable the conditional auction.

(4) Promotion of effective use of publicly-owned frequencies (promoting the introduction of a public safety mobile system)

With regard to public safety mobile systems, which aim to facilitate smooth information sharing among public safety agencies in the event of a disaster, etc., by utilizing existing mobile phone technologies, the services were launched in April 2024 based on the technology demonstrations conducted in cooperation with relevant ministries and agencies. In addition to being deployed as mobile communications equipment for disaster response by MIC, efforts will be made to promote its use by public institutions to contribute to the more effective utilization of publicly-owned frequencies.

(5) Examination of technology to construct a millimeter wave band area in a virtual space and technology for sharing frequencies between various systems

Little traffic is carried on 5G in the millimeter wave band, and it is essential to facilitate area construction in this band. In addition, it is necessary to promote frequency sharing with other systems further in order to use the high microwave band, in which area construction is considered to be easier than in the millimeter wave band. For this reason, area construction technology in the millimeter wave band and frequency sharing technology between different systems will be established by using frequency management methods in virtual space. [See Appendix 2 (1) (iii)]

(6) Promotion of safe radio wave utilization at medical institutions

To promote safe and secure radio wave utilization in medical institutions, surveys on the impact of radio waves on medical devices etc., will be conducted, and various initiatives, including public awareness activities through regional councils, will be

promoted.

(7) Examinations of regulatory revisions concerning wireless power transmission systems

For 920 MHz band, 2.4 GHz band, 5.7 GHz band and 24 GHz band spatial wireless power transmission, to realize the expansion of future use requirements, research and development will be pursued on technologies for suppressing interference to other wireless systems that may occur with spatial wireless power transmission to mobile devices and large numbers of IoT connected devices, as well as technologies for upgrade that meet needs for higher capacity and multiplication of power transmission. [See Appendix 2 (7) (ii)]

With regard to 6.78 MHz band non-beam wireless power transfer, it is preferable to expand the type designation for Equipment Utilizing High Frequency Current. Therefore, technical conditions were further considered to ensure that unwanted emission do not affect other wireless communications, and the report of the Information and Communications Council was compiled in June 2024. Based on this report, regulatory revisions are planned for completion by 2024.

(8) Study of practical and efficient test methods

In light of advanced measurement equipment and international consistency, engineering tests will be conducted to establish highly practical and efficient test methods. [See Appendix 2 (7) (iii)]

(9) Examination of in situ measurement methods for large electronic equipment, etc., to maintain a good radio environment

Unwanted emission from equipment that uses high frequencies, including large electronic equipment in factories and large diagnostic equipment in hospitals, may interfere with other communications. In recent years, the above equipment has become

larger, increases output power and uses high-frequency waves while it is on the move without staying at a fixed position. Therefore, the establishment of measurement methods suitable for these equipments has become indispensable. To that end, engineering tests on such in situ measurement methods, including moving equipment were carried out. The “Guidance on In Situ Measurement of Equipment Utilizing High Frequency Current” was compiled and published in September 2024.

(10) Coordination with international organizations regarding Equipment Utilizing High Frequency Current, etc., to maintain the radio wave usage environment

To maintain a good radio environment, Japan will lead the development of standards at the international organization, International Special Committee on Radio Interference (CISPR), regarding the limit and measurement methods for unwanted emission from Equipment Utilizing High Frequency Current and electronic devices and also promote the incorporation of these international standards into laws and regulations of Japan.

(11) Overseas expansion of radio wave systems

In order to promote the international diffusion and deployment of radio wave systems utilizing Japanese technologies, the public and private sectors will work together to demonstrate the technology overseas and coordinate with related organizations at home and abroad. Through these efforts, Japan will promote international standardization of the technologies used in these systems and coordinated international use of frequencies.

(12) Consideration of frequency assignment and sharing in the amateur radio frequency band

With regard to amateur radio, the number of users has decreased to nearly one-quarter of its peak level. Based on the results of the Evaluation of the Degree of Effective Utilization of the Radio Spectrum by the Radio Regulatory Council, MIC will continue to

promote initiatives to broaden the base of wireless human resource development. At the same time, MIC will consider reviewing the overall frequency assignment for amateur radio and promoting further sharing, etc., based on international trends in the use of radio waves, demand for other new radio wave systems, and the nature of amateur radio.

The following issues will be considered and reviewed as immediate tasks.

- In the 10.1 to 10.15 MHz band, the possibility of sharing with fixed services will be examined in light of new international demand for radio wave use and international allocations, etc.
- In the 1260 to 1300 MHz band, in light of the WRC-23 resolution, the Frequency Assignment Plan will include the condition that amateur services and amateur satellite services must not cause harmful interference to receivers for radio navigation satellite services (space-to-earth) that share the same frequency.
- In the 2400 to 2450 MHz band, 5650 to 5850 MHz band, and 10.0 to 10.25 GHz band, an examination will be conducted in light of the distinction between frequencies in use that are underutilized or unused for radio stations relaying amateur services in the so-called Band Plan (Operational Rules Notification). In addition, based on international trends in the use of radio waves, demand for other new radio wave systems, and the nature of amateur radio, MIC will promote studies for the future review of the entire so-called band plan (Operational Rules Notification), including the frequency band concerned, and for the further promotion of shared use.

  The 10.45 to 10.5 GHz band, 24 to 24.05 GHz band, and 47 to 47.2 GHz band will be considered as potential target frequencies for specified experimental test stations.

(13) Examination of technical conditions related to the introduction of drone detection radar

The demand for drone detection radar is increasing amid growing concerns about safety, such as the discovery of suspicious drones at critical facilities like airports. To facilitate the radar's operational deployment, engineering tests related to the possibility of sharing frequencies with existing wireless systems and the efficient operation of radar systems will begin in FY2025, along with the examination of technical conditions, including the frequencies to be used. [See Appendix 2 (4) (iv)]

Appendix: Research and Development for the Realization of New Radio Spectrum Applications

1 Overview

As radio spectrum usage continues to develop and grow across a wide range of sectors in society and frequency bands become congested, research and development must be steadily pursued in three particular fields while taking into account Japan's crowded frequency use. These three fields are (1) technologies for the efficient use of frequencies, (2) technologies to promote the shared use of frequencies, and (3) technologies that promote migration to higher frequencies. Chapter 4 of the Frequency Reorganization Action Plan clarifies which research and development themes Japan must address depending on frequency classifications from the perspective of frequency migration and reorganization.

In this appendix, research and development tackled by MIC will be classified by field and shown in a list from the perspective of enabling improved efficiency and growth in diverse industrial sectors through further growth and development of radio spectrum usage.

2. Research and development themes, etc.

(1) Mobile communication systems

(i) With the aim of assigning the 26 GHz and 40 GHz bands to 5G for the effective use of the radio spectrum in the 22 GHz, 26 GHz, and 40 GHz bands as a whole, engineering tests will be carried out for examining the conditions for sharing with existing radio systems, applicable bandwidths for dynamic frequency sharing, and requirements for the sharing management system. At the same time, engineering tests for upgrading the

22 GHz band radio access system will be conducted as a candidate for migrating existing radio systems in this frequency band. [See also Chapter 4, VII 3 (1) (i), (2) (i), VIII 3 (1) (i)]

(ii) With the aim of securing communications effectively using high-frequency bands, research and development on cooperative control of Intelligent Reflection Surface (IRS) and relay communication terminals will be carried out in order to construct an optimal propagation path that avoids radio wave obstructions lying between base stations and mobile terminals, and to use spatial resources in the high-frequency bands effectively. [See also Chapter 4, V5 (1), VII 5 (2)]

(iii) Little traffic is carried on 5G in the millimeter wave band, and it is essential to facilitate area construction in this band. In addition, it is necessary to promote frequency sharing with other systems further in order to use the high microwave band, in which area construction is considered to be easier than in the millimeter wave band. For this reason, area construction technology in the millimeter wave band and frequency sharing technology between different systems will be established by using frequency management methods in virtual space. [See also Chapter 4, IX (5)]

(iv) In order to ensure early recovery from communication failure due to natural disasters, etc., and to cover areas where it is difficult to build an existing mobile network, such as mountains, remote islands and the sea, technological studies for non-terrestrial networks (NTN) through High Altitude Platform Station (HAPS) will be carried out. The technical conditions will be compiled and connected to the societal implementation of HAPS mobile communication base stations by the end of FY2025.

(v) With regard to V2X communications, whose demand is expected to increase due to the increased use of autonomous driving, technological studies will be conducted

concerning the introduction of next-generation V2X communications (5G-V2X) utilizing 5G technology into the 5.9 GHz band and verification of 5G-V2X and V2N combined use systems. The goal is to achieve robust V2X communications with high-frequency utilization efficiency. [See also Chapter 4, V3 (4) (i)]

(vi) To promote price and technology competition in the mobile phone base station market and establish a highly continuous mobile phone carrier network environment even in the event of an emergency, advanced test methods for open base station equipment specifications based on Open RAN will be devised, and wireless system operating conditions required for inter-carrier roaming in an emergency will be formulated technologically. The goal is to promote generalization of low-cost, high-efficiency frequency communication devices by ensuring that various vendors can enter the base station market, and the development of a foundation for building a robust network to support it.

(vii) To promote the effective use of frequencies for drone radio stations toward the further expansion of drone usage, engineering tests will be carried out concerning the advancement of the operational coordination technology necessary to quickly and efficiently accommodate and share a large number of radio stations on limited frequencies.

(2) Satellite communications HAPS

(i) Research and development will be promoted for technologies that enable flexible control of frequency bandwidth and the location and shape of irradiation beams of communication satellites (Ka-band). The aim is to meet recent needs for diverse satellite communications by various users, such as marine communication demand for an aircraft

broadband environment and ocean resource development, and securing communication means in the event of a disaster. From FY2025 onward, demonstrations will be conducted to improve frequency utilization efficiency and practical applications in real-world environments. [See also Chapter 4, VII 5 (1)]

(ii) With the aim of formulating technical standards necessary for the early introduction of HAPS, engineering tests on wireless systems related to fixed links, mobile links and C2 links will be carried out from FY2023, including examination of sharing with other radio stations. [See also Chapter 4, III 3 (2) (i), IV 3 (3) (i), VIII 3 (5) (i)]

(iii) To introduce High-Altitude Platform Stations (HAPS) in Japan, which is expected to serve as an approach to realize ultra-wide-area communication for smartphones, drones and IoT devices, research and development will be advanced for technologies to utilize frequencies for the service and feeder links efficiently. [See also Chapter 4, IV 5 (1), VIII 5 (1)]

(iv) In direct connectivity between satellites and between ground terminals such as smartphones, a technology that enables frequency sharing between terrestrial and satellite networks will be established by constructing a large-diameter phased-array antenna clustered with multiple nano-satellites and making the beam emitted from the antenna a narrow beam.

(3) IoT Wireless LAN

(i) To address issues such as interference caused by the relative position and density of interrogators and terminals, which are inherent in the backscatter communication system used in 920 MHz band passive RFID systems, and to enhance frequency utilization efficiency, research and development will be promoted to establish technologies,

including distributed antenna coordination control technology that forms communication zones in multiple specific areas through synchronized coordination control of distributed interrogators and spatial division multiplexing technology that improves the quality of received signals by coordinating between interrogators. [See also Chapter 4, III 5 (1)]

(ii) To avoid bursts of interference due to increased traffic in wireless LAN systems, etc., research and development will be pursued regarding intelligent propagation path control technologies that coordinate active array antenna technology and Intelligent Reflecting Surface (IRS) technology, as well as interlayer access control technology that allows grasping of the wireless environment and efficiently managing wireless resources. [See also Chapter 4, IV 5 (2), V5 (2)]

(iii) To realize Society 5.0, high-capacity, simultaneous multi-connection technology for transmission of high-definition video and sensing information, etc., is required for upgrading communication tools such as AR and VR and mobility in the fields of education, medical care, etc. For that purpose, research and development will be carried out on wireless LAN transmission technologies using terahertz-band MIMO, which can transmit an enormous amount of information. [See also Chapter 4, VIII 5 (5)]

(iv) Research and development will be promoted to miniaturize atomic clocks so that they can be installed on small terminals and to synchronize and manage time information at each terminal with approximately 100 times higher precision than before, thereby improving the accuracy of time and position, increasing the efficiency of radio wave utilization on the time and spatial axes, and promoting the effective use of frequency resources.

(4) Fixed communication systems and radar

(i) To realize fixed wireless communication lines that respond to the rapid increase in communication volume due to the development of 5G, etc., research and development will be carried out on wireless technology in the ultra-high frequency band (350 to 600 GHz), and mutual conversion technology with optical fiber signals. The aim is to develop wireless communication technology exceeding 200 Gbps that is highly compatible with optical communication using ultra-high-frequency bands by the end of FY2024. [See also Chapter 4, VIII 2 (5)]

(ii) To establish fixed wireless communication technology exceeding 100 Gbps in the high millimeter wave band, where fixed wireless communication has not yet been utilized, research and development of multiplex transmission methods for ultra-high capacity and beam control technology will be conducted to ensure stability and flexibility, with the goal to develop wireless communication technology capable of replacing optical lines. [See also Chapter 4, VIII 3 (5)]

(iii) To realize high-capacity fixed wireless systems, engineering tests will be carried out toward the introduction of Orbital Angular Momentum (OAM) mode multiplexing transmission technology (a technology that increases the number of signals transmitted simultaneously by transmitting signals on radio waves which have different OAM modes (radio vortex rotation speeds)) in the millimeter wave band. [See also Chapter 4, VIII 5 (4)]

(iv) The demand for drone detection radar is increasing amid growing concerns about safety, such as the discovery of suspicious drones at critical facilities like airports. To facilitate the radar’s operational deployment, engineering tests related to the possibility of sharing frequencies with existing wireless systems and the efficient operation of radar

systems will begin in FY2025, along with the examination of technical conditions, including the frequencies to be used. [See also Chapter 4, IX. (13)]

(5) Broadcast

(i) With regard to new broadcasting services (ultra-high-definition broadcasting, etc.), which had been examined until FY2022, it is necessary to set technical conditions for efficient placement of stations in limited frequency bands and relays toward the construction of broadcasting networks. Surveys and examinations on what conditions should be set will be carried out. [See also Chapter 4, V3 (6) (i)]

(ii) In order to realize the efficient and stable provision of IP broadcasting content over wireless (local 5G), the technology for implementing a transceiver function for IP broadcasting will be established, and the frequency utilization efficiency of the entire network will be improved by more than double. Those efforts will contribute to the effective use of the spectrum.

(6) Public

(i) With regard to “systems using analog formats” in national public service radio stations used by the national government, it is necessary to clarify the requirements and conditions for each system and introduce digital formats. For that purpose, engineering tests will be carried out along with examinations of the possibility of substitution in shared-use systems that utilize public networks (e.g., public safety mobile systems) and other existing systems. [See also Chapter 4, I3 (5) (i), II 3 (2) (i), (ii), (iii)]

(ii) In order to achieve practical use of active radars and hybrid imagers that use the millimeter-wave band, which is a component of a suspicious object recognition system

that can highly accurately detect suspicious persons and suspicious objects that are hidden by combining acquired data from multiple radars etc., demonstrations of the operability of the entire system and examinations of the conditions for sharing frequencies with existing systems will be carried out. [See also Chapter 4, VIII3 (3) (i)]

(iii) Given the fact that the International Maritime Organization, the International Telecommunication Union and other organizations examined and revised the rules and technical standards for next-generation GMDSS marine radio equipment and GMDSS-derived equipment such as autonomous marine radio equipment, technological studies will be carried out to establish technical conditions with the aim of formulating technical standards for marine radio equipment, etc., and certification standards for flexible model conformity inspection that are consistent with international trends.[See also Chapter 4, I3 (1) (i), (ii)]

(iv) With regard to public BB, which is expected to see increased demand as a means of transmitting images during disasters, research and development will be promoted from 2025 to 2028 to establish the next-generation public BB technology with the aim of achieving a faster, longer-distance network that can be set up more flexibly and quickly, even in disaster situations. [See also Chapter 4, I 5 (1)]

(7) Radio wave usage environment

(i) As the use of robots and other devices is expected to expand in various fields in the future, efforts to improve the radio wave environment and efficiently use frequencies will be made. Specifically, a technology to analyze and evaluate the radio wave environment will be established to stabilize wireless communications that control autonomous mobile objects and noise suppressors will be developed to suppress unwanted radio waves that

can be installed on autonomous mobile objects.

(ii) Research and development will be pursued on technologies for suppressing interference to other wireless systems that may occur with spatial wireless power transmission to mobile devices and large numbers of IoT-connected devices, as well as technologies for upgrades that meet needs for higher capacity and multiplication of power transmission. [See also Chapter 4, IX. (7)]

(iii) In light of advanced measurement equipment and international consistency, engineering tests will be conducted to establish highly practical and efficient test methods. [See also Chapter 4, IX. (8)]

(8) Cybersecurity

(i) Research and development will be carried out on new-generation cryptographic technologies that do not compromise the characteristics of wireless communications (e.g., 5G), including ultra-high speed, high capacity and multiple connections while ensuring security for large-scale quantum computers.