



TOKYO 2020

# **Spectrum Management Plan for the Olympic and Paralympic Games Tokyo 2020**

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## 1. Introduction

### 1.1 The Olympic and Paralympic Games Tokyo 2020

Based on the decision on 24 March 2020 to postpone the Tokyo 2020 Games, the Games of the XXXII Olympiad and the Tokyo 2020 Paralympic Games (“the Tokyo 2020 Games”) will be held from 23 July to 8 August 2021 and from 24 August to 5 September 2021 respectively.

The competitions will be held mainly in Tokyo, which is the host city of the Tokyo 2020 Games and the capital of Japan, while some competitions will be staged at competition venues located in vicinity prefectures of Tokyo such as Saitama, Chiba, Ibaraki and Kanagawa. There will also be competition venues located in Hokkaido, Miyagi, Fukushima and Shizuoka Prefectures.

The Tokyo Organising Committee of the Olympic and Paralympic Games (“Tokyo 2020”) is responsible for the coordination, tentative assignment and authorisation of radio spectrum for the Tokyo 2020 Games and will handle its task with the cooperation of the Ministry of Internal Affairs and Communications (“the MIC”), which is the authority for spectrum assignment in Japan.

In addition, the MIC will monitor the radio spectrum during the Tokyo 2020 Games to ensure a safe and reliable spectrum environment without interference.

### 1.2 Objectives

This document defines the spectrum management plan for the Tokyo 2020 Games based on the data from the past Olympic and Paralympic Games as well as other major international sport events and the status of currently assigned spectrum in Japan.

As to the spectrum assignment for the Tokyo 2020 Games, Tokyo 2020 should ensure to avoid harmful interference not only among the radio systems operated by the stakeholders, but also between the systems operated by the stakeholders and other radio systems already in operation nationwide.

To avoid such harmful interference, Tokyo 2020 should also conform to the applicable Japanese Radio Act and work in cooperation with the MIC for the appropriate spectrum management for the Tokyo 2020 Games.

This document is to clarify the condition of assignable spectrum by detailing the basic spectrum plan published in November 2017. It also aims to promote the orderly spectrum usage by notifying stakeholders the spectrum application procedure, test & tagging implementation and the implementation of radio spectrum monitoring.

### 1.3 Spectrum usage status in the host city

Tokyo, the host city, is the centre of the Japanese economy where industrial activities are concentrated and there is already a high use of radio spectrum. Difficulties in the spectrum assignment are envisaged in the Tokyo area because Tokyo is located in the Kanto Plain and faces Tokyo Bay. Furthermore, since the major competition venues are located within 10km of the Athletes’ Village, the re-use of spectrum will be limited.

The number of stations in operation is about 4 million (as of the end of September 2017, excluding land mobile stations such as mobile phone terminals). About 40% of the above stations are operated in the Kanto region including Tokyo. Also, the use of radio spectrum has been accelerating with the advent of IoT and the proliferation of mobile phones.

For the above reasons, Tokyo 2020 strongly requests the stakeholders to use a wired communication system wherever possible, in particular for wireless microphones and wireless cameras, and the radio spectrum should be used only when the wired communication system could not be used at the Tokyo 2020 Games.

#### **1.4 Subject of spectrum coordination and radio station license**

A license is necessary to operate radio stations in Japan unless otherwise permitted. At the Tokyo 2020 Games, Tokyo 2020 will obtain the radio station license from the MIC on behalf of the stakeholders.

In order to avoid harmful interference, the MIC will undertake spectrum coordination between wireless devices used by stakeholders and existing radio stations in Japan, in cooperation with Tokyo 2020 and from the standpoint of domestic frequency management, will administer the wireless devices to which the MIC, as the competent authority, issues licenses to Tokyo 2020 as a licensee. In contrast Tokyo 2020 will undertake spectrum coordination among stakeholders' wireless devices, and give approval to permit stakeholders to use wireless devices in venues and necessary places from the standpoint of frequency management of the approved wireless devices.

#### **1.5 Equipment subject to spectrum coordination and authorisation**

All radio equipment must follow the spectrum coordination and authorisation in order to avoid harmful interferences. Prior authorisation of Tokyo 2020 is required for the equipment to be brought into the venues.

Under the Japanese Radio Act, radio stations that conform to the prescribed technical standards and use the specified spectrum that is designated by the Act as free from licenses ("license-exempt radio") will also be required to obtain prior authorisation from Tokyo 2020 to use them in the venue and its vicinity.

Tokyo 2020 recognises that there would be radio equipment that would be excluded from authorisation.

##### **1.5.1 Radio equipment requiring authorisation**

Regardless of licenses obtained in Japan or outside Japan, all radio equipment require authorisation from Tokyo 2020 unless otherwise specified. Wireless camera, point-to-point link, video link, wireless microphones/IEMs, talkback system (intercom), personal mobile radio, telemetry/telecommand and small-capacity data transmission, digital still camera, wireless LAN and data transmission and satellite communication are subject to authorisation. All radio equipment cannot be used within and around the venue without the authorisation of Tokyo 2020 unless otherwise specified.

### 1.5.2 Radio equipment that does not require authorisation

Regardless of licenses obtained in Japan or outside Japan, all radio equipment requires authorisation from Tokyo 2020 unless otherwise specified.

However, the following radio equipment does not require authorisation.

- Mobile phones whose services are provided by Japanese telecommunication operators
- Mobile phones brought from overseas conforming to the technical standard (international standard) equivalent to the technical standard prescribed in the Japanese Radio Act and used for international roaming service or using SIM cards of Japanese telecommunications operators
- The slave unit of a low power data communication system with the approval seal marked by  to show that it conforms to the technical standard prescribed in the Japanese Radio Act (using spectrum bands 2.4GHz, 5.2GHz, 5.3GHz and 5.6GHz). Wi-Fi and Bluetooth are examples.

However, even for this radio equipment, the authorisation procedure of Tokyo 2020 would be required for some specific areas such as competition venues, broadcast areas, the MPC, the IBC and the Athletes' Village.

Since the wireless file transmitter described in Section 2.6.2 is excluded from license-exempt radio, authorisation procedures should be applied.

- The slave unit of a low power data communication system conforming to the technical standard (international standard) equivalent to the technical standard specified by the Japanese Radio Act that uses spectrum bands of 2.4GHz, 5.2GHz, 5.3GHz and 5.6GHz and used within 90 days after entering Japan. (Equipment with FCC certification, CE mark and a logo of Wi-Fi Alliance or Bluetooth SIG is included.)

However, even for this radio equipment, the approval of Tokyo 2020 is required for some specific areas such as competition venues, broadcast areas, the MPC, the IBC and the Athletes' Village.

The wireless file transmitter described in Section 2.6.2 must be authorised regardless of the operation area.

## 2. Frequency map

The spectrum plan with detailed information added to the basic spectrum plan published in November 2017 is presented below by applications.

The second edition presents some in-depth updates of the frequency map based on results of an examination of assignable frequencies in cooperation with the MIC. It also presents conditions of the use of radio equipment given possible adverse effects on the fifth-generation mobile communication system (5G) for which the new frequencies have already been assigned in Japan.

Tokyo 2020 and the MIC will continue to study the possibility of expanding the spectrum that would be available.

### 2.1 Video link

#### 2.1.1 Wireless cameras

A wireless camera is used for broadcasting purposes. About 200 Rights-holding Broadcasters (RHBs) will be working at the Tokyo 2020 Games, and many of them will use wireless cameras. Tokyo 2020 foresees that at least 100 channels for wireless cameras would be required and 150 channels should be prepared for a stable assignment.

Tokyo 2020 also foresees that many broadcasters including the Olympic Broadcasting Services (OBS) will request assignment of channels below 4GHz because of the propagation characteristic of radio waves and the equipment used. Because the majority of requests will be for wireless cameras and high-definition equipment, the use of bands over 4GHz such as 5GHz, 6GHz, 7GHz, 10GHz or 16GHz should be considered by broadcasters especially for short-range transmission.

Based on the premise above, Tokyo 2020 will make every effort to assign channels for all requests between 2GHz and 4GHz bands, and at the same time will also continue to work closely with broadcasters and manufacturers to encourage the use of higher spectrum bands as there is more spectrum available for use.

Table 2.1.1 shows details of the usage conditions for frequency bands indicated in the basic spectrum plan that may be assigned to the wireless cameras.

The 3600-4100MHz and 4500-4600MHz bands shall not be permitted as a rule as they may interfere with 5G. Limitation of geographical areas and transmitting power may be imposed on the adjacent bands to them.

The number of channels shown in Table 2.1.1 is based on the premise of a maximum bandwidth of 10MHz or 20MHz. However, the wireless camera is more susceptible to interference compared to other devices, and actual wireless cameras have a rather large side lobe level that affect adjacent channels, so it is foreseen that the actual frequency allocation will be very difficult. Therefore, Tokyo 2020 proposes the following:

- Use wired cameras as much as possible, and limit wireless camera use only when it is not possible to use a wired camera.
- Use high performance filters when using frequencies below 4GHz, which is highly demanded.
- To reduce interference as much as possible, operate with the minimum transmission power necessary by properly arranging the transmitter/receiver of the wireless camera.
- Secure proper distance from mobile base stations and spectators' seats when using frequencies of 2GHz to 4GHz as mobile phone systems are often operated on adjacent frequencies.

Table 2.1.1 Candidate frequency bands to be assigned to wireless cameras

Spectrum [MHz]		Bandwidth [MHz]	Expected number of channels	Technical specification / Operating conditions
From	To			
1260	1300	40	- 20	<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz / 20MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
1300	1400	100		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> </ul>
1462.9	1475.9	13		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: below 50mW</li> </ul>
1510.9	1525	14.1		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: below 50mW</li> </ul>
1525	1559	34		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> </ul>
1613.8	1700	86.2		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> </ul>
1980	2110	130	15 - 25	<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz / 20MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
2170	2300	130		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz / 20MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
2300	2330	30		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
2330	2370	40		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz / 20MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
2370	2400	30		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
2483.5	2497	13.5	30 - 40	<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
2500	2545	45		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> <li>• 2500-2530MHz are unassignable.</li> </ul>
2575	2595	20		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
2645	2660	15		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: below 50mW</li> <li>• Indoor use only</li> </ul>
2660	2690	30		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> </ul>
2700	3100	400		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> </ul>

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Spectrum [MHz]		Bandwidth [MHz]	Expected number of channels	Technical specification / Operating conditions
From	To			
3100	3400	300	40 - 60	<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> </ul>
3600	4200	600		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> <li>• The 3600-4100MHz and 4500-4600MHz bands shall not be permitted as a rule as they may interfere with 5G.</li> </ul>
4400	4900	500		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> <li>• The 4500-4600MHz and 4500-4600MHz bands shall not be permitted as a rule as they may interfere with 5G.</li> </ul>
4900	4990	90		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
5000	5150	150	20 - 30	<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> </ul>
5710	6425	715		<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> <li>• Indoor use only</li> </ul>
6425	7900	1475	30 - 60	<ul style="list-style-type: none"> <li>• Channel bandwidth: 10MHz</li> <li>• Transmission power: 100-250mW</li> </ul>

[NOTE]

1. Channel bandwidth and transmission power are standard models.
2. For compatibility with radar and satellite communication systems, use location of use is indoors only.
3. Channels for airborne use is to be studied.

### 2.1.2 Point-to-point (P-P) link

A point-to-point (P-P) link would be used to connect outdoor studios or remote cameras to the IBC, or outdoor remote cameras to a broadcast van. Though the need for P-P links has decreased over the years with the emergence of optical fibre, the optical fibre connection may not always be available.

For P-P links, Tokyo 2020 has selected spectrum used for fixed links or for fixed wireless access (FWA). Stakeholders should apply for assignments for the P-P link using the pre-arranged application method.

For P-P links, Tokyo 2020 recommends the use of the less congested bands of 10GHz or higher to reduce coordination with wireless cameras.

Table 2.1.2 shows detailed information regarding possible frequency bands to be assigned to P-P links indicated in the basic spectrum plan.

Table 2.1.2 Candidate frequency bands to be assigned to point-to-point links

Band	Spectrum [GHz]		Bandwidth [MHz]	Technical specification / Operating conditions Band
	From	To		
6GHz(a)	5.92	6.17	250	Channel bandwidth and transmission power vary depending on the mode of use of each radio. Frequency allocation will be determined from the frequency range that meet the requirements of each individual application.
6GHz(b)	6.18	6.43	250	
11/12GHz(a)	10.7	11.7	1000	
11/12GHz(b)	12.2	12.5	300	
18GHz(a)	17.7	18.72	1020	
18GHz(b)	19.22	19.7	480	
40GHz(a)	38	38.5	500	
40GHz(b)	39	39.5	500	
50GHz	50.4	51.2	800	
80GHz(a)	71	76	5000	
80GHz(b)	81	86	5000	

### 2.1.3 License-exempt radio for video links

Radio equipment with the approval seal showing that it conforms to the technical standards stipulated in the Japanese Radio Act and operated within the spectrum in Table 2.1.3 does not require a license. However, authorisation from Tokyo 2020 to use these devices in/around the venues must still be obtained in order to avoid the risk of potential interference.

It should be noted that the license-exempt radio could be subject to interference from other stations unrelated to the Games operation that are located outside of the Games venue which Tokyo 2020 and the MIC have no control over.

It is highly recommended to refrain from transmitting video by radio equipment (Wi-Fi<sup>※</sup>) in the band of 2.4GHz and 5GHz because the traffic would be highly congested.

<sup>※</sup>Applications and authorisation of Tokyo 2020 are necessary even for Wi-Fi equipment.

Table 2.1.3 Frequency bands of license-exempt radio for video links

Band	Spectrum [GHz]		Bandwidth [MHz]	Technical specification / Operating conditions
	From	To		
26GHz (a)	24.77	25.23	460	<ul style="list-style-type: none"> <li>•Channel spacing: –</li> <li>•Channel bandwidth: –</li> <li>•Transmission power: below 10mW/MHz, below 10mW</li> </ul>
26GHz (b)	27.02	27.46	440	<ul style="list-style-type: none"> <li>•Channel spacing: –</li> <li>•Channel bandwidth: –</li> <li>•Transmission power: below 10mW, above 10mW - below 250mW</li> </ul>
60GHz*	57	66	9000	<ul style="list-style-type: none"> <li>•Channel spacing: [IEEE802.11ad] 2.16GHz</li> <li>•Channel bandwidth: below 9GHz</li> <li>•Transmission power: below 10mW, above 10mW - below 250mW</li> </ul>

(\*)e.g. IEEE 802.11ad

## 2.2 Wireless microphones/IEMs

### 2.2.1 Wireless microphones/IEMs

At the Tokyo 2020 Games, wireless microphones with high quality sound and in-ear monitors (IEMs) with similar audio quality will require substantial bandwidth. These wireless microphones/IEMs would be used for:

- ceremonies of the Games;
- sports presentation;
- sports coverage requiring wireless microphones (e.g. Sailing, Rowing, Golf, etc.)
- interviews or coverage for broadcasting;

Wireless microphones/IEMs require a channel with a bandwidth of 100-300 kHz, which is wider than other sound transmission, and therefore the spectrum bands to be assigned for those purposes would be limited.

The spectrum bands usually assigned for wireless microphones/IEMs in Japan are WS-1 to WS-7, 710-714MHz, 806-810MHz and 1.2GHz bands as shown in Table 2.2.1 below. Basically, Tokyo 2020 will assign these same spectrum bands for microphones/IEMs to avoid harmful interference. Also, the spectrum which are currently regarded as the guard band of mobile phones will be assigned to wireless microphones/IEMs at the Tokyo 2020 Games as long as it does not cause any harmful interference.

The following points should be considered for usage of these bands:

- Many of the bands mentioned above are also assigned to terrestrial TV broadcast. (In Japan, a channel for terrestrial TV broadcast that can be used for other purposes without affecting terrestrial TV broadcast is often called a "white space".) In the Tokyo area, the lower spectrum of UHF band is assigned to terrestrial digital TV broadcast service and millions of homes receive the signal. Therefore, it would be extremely difficult to assign frequency that actually overlap frequencies used for terrestrial digital TV broadcast services to wireless microphones/IEMs.
- It is anticipated that the demand for spectrum for wireless microphones/IEMs at music concerts or theatres in and around the Tokyo area will increase during the Tokyo 2020 Games.

Considering the above, Tokyo 2020 proposes the following to avoid the difficulty of assigning frequencies for wireless microphones/IEMs as much as possible.

- Use wired microphones as much as possible. Wireless microphones should be used only when wired microphones cannot be used.
- Avoid using wireless microphones/IEMs where possible, especially in outdoor areas.
- Use digital wireless microphones/IEMs systems that are usually more tolerant to interference.
- Secure proper distance from mobile base stations and spectators' seats as mobile phone systems are often operated on adjacent frequencies.
- Adopt systems that confirm to Japanese standards for the smooth coordination and assignment of spectrums.

In Japan, spectrum bands other than 60MHz, 70MHz, WS-1 to WS-7, 710-714MHz, 806-810MHz and 1.2GHz bands shown in Table 2.2.1 are assigned to a guard band to protect adjacent systems. When assigning frequencies, care should be taken to avoid interference to/from other stations that use co-channels or adjacent channels.

In the broadcast area covered by main or relay transmitting stations, the frequencies for those stations would be extremely difficult to assign to the wireless microphones/IEMs.

Table 2.2.1 Candidate Frequency bands to be assigned to wireless microphones/IEMs

Band	Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions					
	From	To		Zone division					
				Zone I	Zone II	Zone III	Zone IV	Zone V	
60MHz	54	68	14			△			<ul style="list-style-type: none"> <li>•Frequency: Desired frequency (If the desired frequency is not available, an alternate frequency will be assigned from the frequency range tunable with the radio.)</li> <li>•Channel bandwidth : below 200kHz</li> <li>•Transmission power: 10-50mW</li> <li>•Certain frequencies may have to coexist with other domestic users or Tokyo 2020 stakeholders.</li> </ul>
70MHz	68	74.8	6.8			△			Same as above
	75.2	76	0.8			△			Same as above
WS-1※	470	488	18	✓	△	✓	△	△	<ul style="list-style-type: none"> <li>•Channel bandwidth: below 200kHz/ below 300kHz</li> <li>•Transmission power: 10-50mW</li> <li>•Subject to compatibility with DTV (13-15ch)</li> </ul>
WS-2※	488	506	18	△	×	△	△	△	<ul style="list-style-type: none"> <li>•Channel bandwidth: below 200kHz/ below 300kHz</li> <li>•Transmission power: 10-50mW</li> <li>•Subject to compatibility with DTV (16-18ch)</li> </ul>
WS-3※	506	518	12	✓	✓	✓	×	△	<ul style="list-style-type: none"> <li>•Channel bandwidth: below 200kHz/ below 300kHz</li> <li>•Transmission power: 10-50mW</li> <li>•Subject to compatibility with DTV (19-20ch)</li> </ul>
WS-4※	518	566	48	×	×	×	×	△	<ul style="list-style-type: none"> <li>•Channel bandwidth: below 200kHz/ below 300kHz</li> <li>•Transmission power: 10-50mW</li> <li>•Subject to compatibility with DTV (21-28ch)</li> </ul>

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Band	Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions					
	From	To		Zone division					
				Zone I	Zone II	Zone III	Zone IV	Zone V	
WS-5※	566	590	24	△	△	△	✓	△	<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> <li>• Subject to compatibility with DTV (29-32ch)</li> </ul>
WS-6※	590	662	72	✓	△	✓	✓	✓	<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> <li>• Subject to compatibility with DTV (33-44ch)</li> </ul>
WS-7※	662	710	48	✓	✓	×	✓	✓	<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> <li>• Subject to compatibility with DTV (45-52ch)</li> </ul>
700MHz	710	714	4	✓	✓	△	✓	✓	<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	714	718	4	✓					<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	748	755	7	✓					<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	765	773	8	✓					<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>

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Band	Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions					
	From	To		Zone division					
				Zone I	Zone II	Zone III	Zone IV	Zone V	
800MHz	803	806	3			✓			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	806	810	4			△			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	810	815	5			✓			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	845	850	5			✓			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	890	900	10	△	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	940	945	5	×	✓	✓	✓	✓	<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>

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Band	Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions					
	From	To		Zone division					
				Zone I	Zone II	Zone III	Zone IV	Zone V	
1.2GHz	1215	1240	25			△			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	1240	1252	12			✓			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	1252	1253	1			△			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	1253	1260	7			✓			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	1260	1400	140			△			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
1.5GHz	1462.9	1475.9	13			✓			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>
	1510.9	1525	14.1			✓			<ul style="list-style-type: none"> <li>• Channel bandwidth: below 200kHz/ below 300kHz</li> <li>• Transmission power: 10-50mW</li> </ul>

[NOTE]

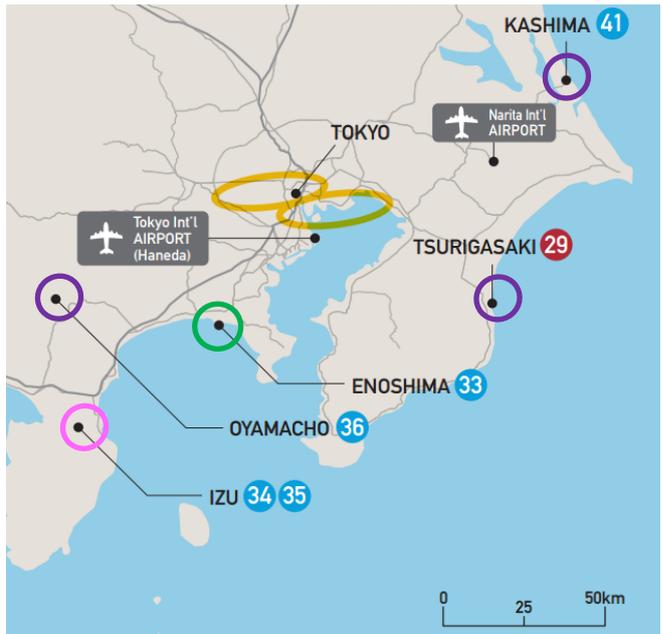
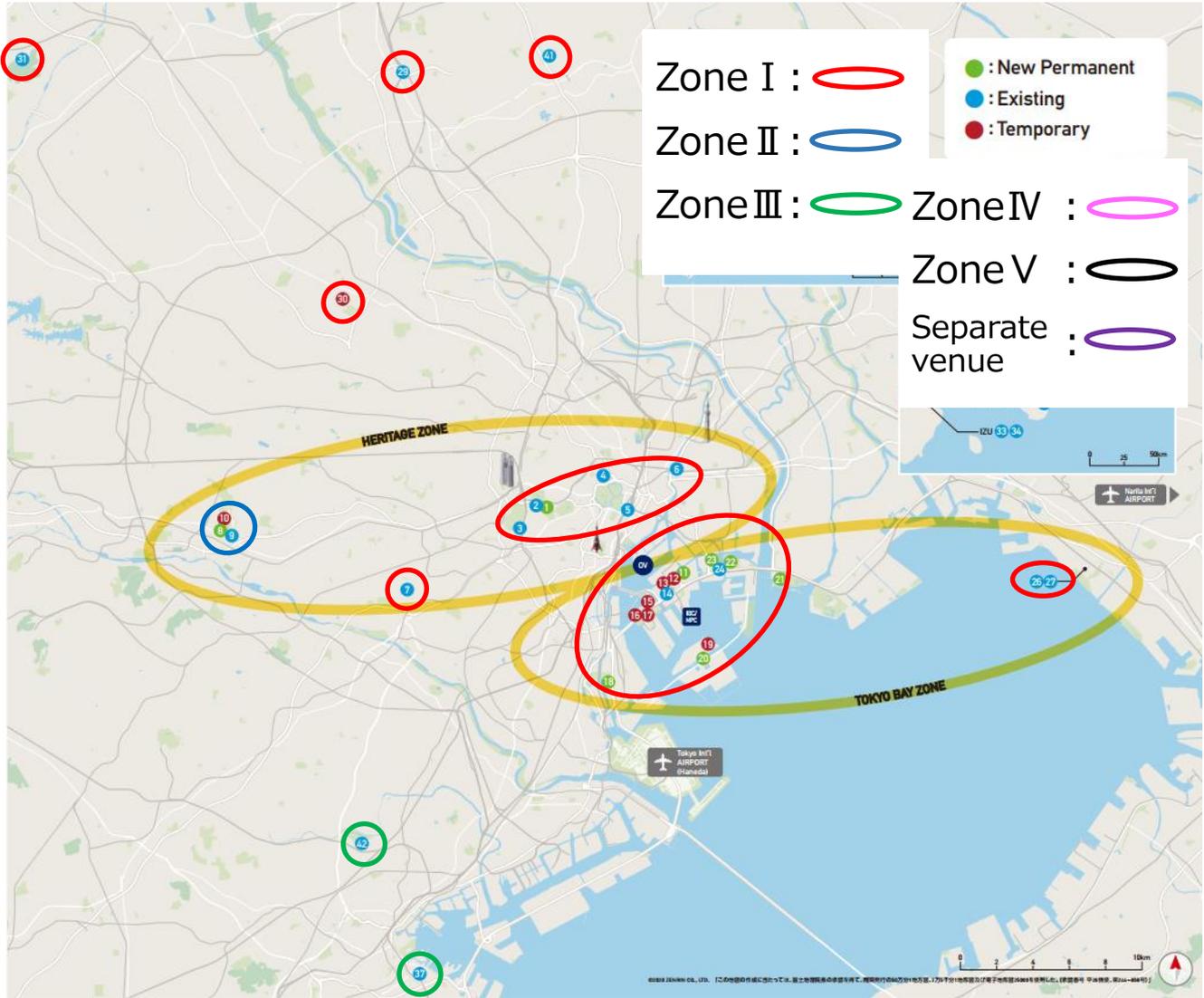
- Channel bandwidth and transmission power shown in the table are standard models.
- Zone divisions (use limitation: in and around the venue only)
  - Tokyo area, Saitama area, Makuhari (Except for II – V and 4)
  - Tokyo west area (Tokyo Stadium, Musashino Forest Sport Plaza, Musashinonomori Park)
  - Yokohama area (Yokohama Stadium, International Stadium Yokohama and Enoshima)
  - Izu area (Izu Velodrome, Izu Mountain Bike Course)
  - Outside of Tokyo (Sapporo Dome, Miyagi Stadium, Fukushima Azuma Baseball Stadium)
- Mark
  - ✓ : Available, △ : Available for some spectrum (subject to the technical specifications/operating conditions (under study)), × : Unavailable
- Special notes on separate venue
  - Ibaraki Kashima Stadium : Available for WS 1 to WS3, and WS5 to WS7 (Partially subject to limited power) and unavailable for WS4.
  - Tsurigasaki : Available for WS 1 to WS3, WS5 and WS6. Unavailable for WS4 and the part of WS5 and WS6.

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Fuji International Speedway: Available for WS2 and WS4 to WS7. Unavailable for WS1, WS3 and the part of WS5 to WS7.

5. The zoning is to show in which venues the same frequency would be available, because the available frequencies vary by region. However, approval of frequencies is granted on a venue basis, NOT on a zone basis.

[Zoning Map]



## [List of Venues]

No.	Venue	Zone
1	Olympic Stadium	Zone I
2	Tokyo Metropolitan Gymnasium	Zone I
3	Yoyogi National Stadium	Zone I
4	Nippon Budokan	Zone I
5	Tokyo International Forum	Zone I
6	Kokugikan Arena	Zone I
7	Equestrian Park	Zone I
8	Musashino Forest Sport Plaza	Zone II
9	Tokyo Stadium	Zone II
10	Musashinonomori Park	Zone II
11	Ariake Arena	Zone I
12	Olympic Gymnastic Centre	Zone I
13	Olympic BMX Course	Zone I
14	Ariake Tennis Park	Zone I
15	Odaiba Marine Park	Zone I
16	Shiokaze Park	Zone I
17	Aomi Urban Sports Venue	Zone I
18	Seaside Park Hockey Stadium	Zone I
19	Sea Forest Cross-Country Course	Zone I
20	Sea Forest Waterway	Zone I
21	Canoe Slalom Course	Zone I
22	Dream Island Archery Field	Zone I
23	Olympic Aquatics Centre	Zone I
24	Tatsumi International Swimming Centre	Zone I
25	Sapporo Odori Park	Zone V

No.	Venue	Zone
26	Makuhari Messe Hall A	Zone I
27	Makuhari Messe Hall B	Zone I
28	Makuhari Messe Hall C	Zone I
29	Tsurigasaki Beach Surfing Venue	Separate venue
30	Saitama Super Arena	Zone I
31	Asaka Shooting Range	Zone I
32	Kasumigaseki Country Club	Zone I
33	Enoshima Yacht Harbour	Zone III
34	Izu Velodrome	Zone IV
35	Izu Mountain Bike Course	Zone IV
36	Fuji International Speedway	Separate venue
37	Fukushima Azuma Baseball Stadium	Zone V
38	Yokohama Stadium	Zone III
39	Sapporo Dome	Zone V
40	Miyagi Stadium	Zone V
41	Ibaraki Kashima Stadium	Separate venue
42	Saitama Stadium	Zone I
43	International Stadium Yokohama	Zone III
-	Athletes' Village	Zone I
-	IBC/MPC Tokyo International Exhibition Centre (Tokyo Big Sight)	Zone I

### 2.2.2 License-exempt radio for wireless microphones/IEMs

Radio equipment with the approval seal showing that it conforms to the technical standards stipulated in the Japanese Radio Act and operated in the spectrum in Table 2.2.2 does not require a license. However, authorisation from Tokyo 2020 to use these devices in/around the venues must still be obtained in order to avoid the risk of potential interference.

It should be noted that the license-exempt radio could suffer interference from other stations unrelated to the Games operation that are located outside of the Games venue which Tokyo 2020 and the MIC have no control over.

Table 2.2.2 Frequency bands of license-exempt radio for wireless microphones/IEMs

Band	Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions
	From	To		
74MHz	74.5	74.8	0.3	<ul style="list-style-type: none"> <li>•Channel bandwidth 60KHz</li> <li>•Transmission power below 10mW</li> </ul>
75MHz	75.2	76	0.8	<ul style="list-style-type: none"> <li>•Channel bandwidth 20kHz / 30kHz / 80kHz</li> <li>•Transmission power below 10mW</li> </ul>
320MHz	322	322.42	0.42	<ul style="list-style-type: none"> <li>•Channel bandwidth 30KHz</li> <li>•Transmission power below 1mW</li> </ul>
806MHz	806	810	4	<ul style="list-style-type: none"> <li>•Channel bandwidth 110kHz / 192kHz</li> <li>•Transmission power below 10mW</li> </ul>

## 2.3 Talk back system (intercom)

### 2.3.1 Talk back system (intercom)

The talk back system (intercom) is used primarily by broadcasters for communication between the director of activities and the members of the production team such as presenters, interviewers, cameramen, sound operators, lighting operators and engineers.

Talk back provides two-way simultaneous communications and as such requires spectrum for two channels as a duplex or semi-duplex pair. The voice delay is small compared with that of a one-way personal mobile radio (PMR).

Table 2.3.1 shows detailed information regarding possible frequency bands assigned to the talk back system (intercom) indicated in the basic spectrum plan. Some spectrum and/or bands might be shared with PMRs or telemetry and small-capacity data transmissions.

Table 2.3.1 Candidate frequency bands to be assigned to the talk back system (intercom)

Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions
From	To		
138	170	32	<ul style="list-style-type: none"> <li>•Frequency: Desired frequency (If the desired frequency is not available, an alternate frequency will be assigned from the frequency range tunable with the radio.)</li> <li>•Channel bandwidth: below 12.5kHz (channel width 20kHz)</li> <li>•Transmission power: 1-5W</li> <li>•A part of frequencies may be subject to compatibility with other domestic users or the Tokyo 2020 users.</li> </ul>
170	225	45	Same as above
335.4	380.2	44.8	Same as above
381.4	402	20.6	Same as above
406.1	420	13.9	Same as above
420	470	50	Same as above
1893.5	1906.1	12.6	<ul style="list-style-type: none"> <li>•Frequency: Desired frequency (If the desired frequency is not available, an alternate frequency will be assigned from the frequency range tunable with the radio.)</li> <li>•Channel bandwidth: below 12.5kHz</li> <li>•Transmission power: 0.05W</li> <li>•A part of frequencies may be subject to compatibility with other domestic users or the Tokyo 2020 users.</li> </ul>

[NOTE] Channel bandwidth and transmission power are standard models.

### 2.3.2 License-exempt radio for the talk back system (intercom)

Radio equipment with the approval seal to conform to the technical standards stipulated in the Japanese Radio Act and operated in the spectrum in Table 2.5.2 does not require a license.

However, authorisation from Tokyo 2020 to use these devices in/around the venues must still be obtained in order to avoid the risk of potential interference.

It should be noted that the license-exempt radio could suffer a possibility of interference from other stations unrelated to the Games operation that are located outside of the Games venue which Tokyo 2020 and the MIC have no control over.

Table 2.3.2 Frequency bands of license exempt radio for the talk back system (intercom)

Type	Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions
	From	To		
Pair1-L	421.5	421.9	0.4	<ul style="list-style-type: none"> <li>•Analogue</li> <li>•Channel bandwidth: 5.8kHz / 8.5kHz</li> <li>•Transmission power: below 10mW</li> </ul>
Pair1-H	440.2	440.37	0.17	<ul style="list-style-type: none"> <li>•Analogue</li> <li>•Channel bandwidth: 5.8kHz / 8.5kHz</li> <li>•Transmission power: below 10mW</li> </ul>
Pair2-L	413.6	414.2	0.6	<ul style="list-style-type: none"> <li>•Analogue</li> <li>•Channel bandwidth: 8.5kHz</li> <li>•Transmission power: below 1mW</li> </ul>
Pair2-H	454.0	454.3	0.3	<ul style="list-style-type: none"> <li>•Analogue</li> <li>•Channel bandwidth: 8.5kHz</li> <li>•Transmission power: below 1mW</li> </ul>
-	1893.5	1906.1	12.6	<ul style="list-style-type: none"> <li>•Digital (TDD: Time Division Duplex)</li> <li>•Channel bandwidth: 1.728MHz</li> <li>•Transmission power: below 240mW</li> </ul>

## 2.4 Personal mobile radio (PMR)

### 2.4.1 Personal mobile radio (PMR)

The personal mobile radio (PMR), which is a radio called a Private Mobile Radio in the past tournament, is a mobile communication tool used for broadcast relay, news gathering, operation of competitions and ceremonies. Except for the talk back application, the mainly voice-based PMR is expected to use a press-to-talk system.

The VHF and UHF bands suitable for PMR already have a considerably high number of users in and around the Tokyo area. These bands are expected to be assigned to the talk back system, telemetry and telecommand, and small-capacity data transmissions at the Tokyo 2020 Games.

A digital system is recommended to facilitate the spectrum assignment and to avoid interference. However, the digital system generates an audio delay of about 100ms to 500ms (in rare cases, up to 1000ms). Tokyo 2020 recognises that frequencies for an analogue system would be required if such a delay is unacceptable for the user's operations.

Table 2.4.1.1 shows detailed information regarding the possible frequency bands assigned to PMR indicated in the basic spectrum plan. Tokyo 2020 would take appropriate action to ensure that licenses are issued to the applicants and exclusive spectrum for the Tokyo 2020 Games are prepared to avoid interference.

The transmission power may vary by usage, but high power should be avoided from the viewpoint of effective spectrum usage. Transmission power should be preferably no more than 1W or maximum 5W in special cases.

Table 2.4.1.1 Candidate frequency bands to be assigned to PMR

Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions
From	To		
138	154.44	16.44	<ul style="list-style-type: none"> <li>• Frequency: Desired frequency (If the desired frequency is not available, an alternate frequency will be assigned from the frequency range tunable with the radio.)</li> <li>• Channel bandwidth: below 16kHz (or 20kHz)</li> <li>• Transmission power: generally below 1W</li> <li>• Certain frequencies are subject to compatibility with other domestic users or Tokyo 2020 stakeholders.</li> </ul>
154.44	225	70.56	<ul style="list-style-type: none"> <li>• Frequency: Desired frequency (If the desired frequency is not available, an alternate frequency will be assigned from the frequency range tunable with the radio.)</li> <li>• Channel bandwidth: below 16/8.5kHz (or 25/12.5kHz)</li> <li>• Transmission power: generally below 1W</li> <li>• Certain frequencies are subject to compatibility with other domestic users or Tokyo 2020 stakeholders.</li> </ul>
335.4	380.2	44.8	Same as above
381.4	402	20.6	Same as above
406.1	420	13.9	Same as above
420	470	50	Same as above

[NOTE] Channel bandwidth and transmission power are standard models.

For the following reasons, Tokyo 2020 proposes the use of the mobile phone or the PMR service provided by Tokyo 2020.

- A high demand is assumed for the spectrum bands shown in Table 2.4.1.1
- Stakeholders using the Tokyo 2020 mobile phone or PMR service will not be required to follow the standard spectrum application process as this is covered by Tokyo 2020's services.

As a reference, the outline of the PMR service that Tokyo 2020 would provide is shown in Table 2.4.1.2.

Table 2.4.1.2 Outline of the PMR services (provided by Tokyo 2020)

Type	Band	Service area		備考
Type1	900MHz	Specified area in Tokyo	Anywhere in the service area	Press-to-Talk
Type2	350MHz	Nationwide	Within 1km distances	Press-to-Talk
Type3	900MHz	Nationwide	Anywhere in the service area	Press-to-Talk service with mobile network

## 2.4.2 License-exempt radio for PMR

Radio equipment with the approval seal showing that it conforms to the technical standards stipulated in the Japanese Radio Act and operated in the spectrum in Table 2.4.2.1 does not require a license. Radio equipment with the approval seal that shows it conforms to the technical standards stipulated in the Japanese Radio Act and operated in the spectrum in Table 2.4.2.2 does not require a license but requires registration. However, authorisation from Tokyo 2020 to use these devices in/around the venues must still be obtained in order to avoid the risk of potential interference.

It should be noted that the license-exempt radio could suffer interference from other stations unrelated to the Games operation that are located outside of the Games venue which Tokyo 2020 and the MIC have no control over.

Table 2.4.2.1 Frequency band of license-exempt systems similar to PMR

Type	Spectrum [MHz]		Bandwidth [kHz]	Technical specification / Operating conditions
	From	To		
License exempt	422.04	422.35	310	<ul style="list-style-type: none"> <li>•Analogue</li> <li>•Channel bandwidth: 8.5kHz</li> <li>•Transmission power: below 10mW</li> </ul>

Table 2.4.2.2 Frequency band of registered systems with functions similar to PMR

Type	Spectrum [MHz]		Bandwidth [kHz]	Technical specification / Operating conditions
	From	To		
By registration (CR*)	351.16	351.2	40	<ul style="list-style-type: none"> <li>•Digital</li> <li>•Channel bandwidth: 5.8kHz</li> <li>•Transmission power: below 1W</li> </ul>
	351.2	351.38	180	<ul style="list-style-type: none"> <li>•Digital</li> <li>•Channel bandwidth: 5.8kHz</li> <li>•Transmission power: below 5W</li> </ul>

(\*)CR: Convenience Radio

## 2.5 Telemetry/telecommand and small-capacity data transmission

### 2.5.1 Telemetry/telecommand and small-capacity data transmission

Telemetry and telecommand are used to control equipment from a remote site and to transmit measurement results. Most of the small-capacity data transmission systems, including telemetry and telecommand, are expected to be used for such purposes as:

- to control wireless cameras, cable cameras and track cameras;
- to control aerial cameras;
- to measure and record competitions;
- to control equipment for ceremonies;

Systems for these services employ a variety of radio spectrum and bandwidths. They generally transmit small-capacity data using a narrow bandwidth. Systems that require a wide bandwidth transmit signals in a very short time using low transmission power.

Table 2.5.1 shows detailed information regarding possible frequency bands assigned to telemetry/telecommand and small-capacity data transmission indicated in the basic spectrum plan.

When assigning frequencies in Table 2.4.1.1, it should be noted that those frequencies could also be assigned to PMR and other audio transmissions.

Table 2.5.1 Candidate frequency band for telemetry/telecommand

Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions
From	To		
138	170	32	Channel bandwidth and transmission power vary depending on the mode of use of each radio. Frequency allocation will be determined from the frequency range that meet the requirements of each individual application.
170	225	55	
335.4	380.2	44.8	
381.4	402	20.6	
406.1	420	13.9	
420	470	50	
915	930	15	
2483.5	2497	13.5	

### 2.5.2 License-exempt radio for telemetry/telecommand

Radio equipment with the approval seal that shows it conforms to the technical standards stipulated in the Japanese Radio Act and operated in the spectrum in Table 2.5.2 does not require a license. (For Wi-Fi, refer to the "Wireless LAN" chapter.)

However, authorisation from Tokyo 2020 to use these devices in/around the venues must still be obtained in order to avoid the risk of potential interference.

It should be noted that the license-exempt radio could suffer a possibility of interference from other stations unrelated to the Games operation that are located outside of the Games venue which Tokyo 2020 and the MIC have no control over.

Table 2.5.2 Frequency of license-exempt radio for telemetry/telecommand

Band	Spectrum [MHz]		Bandwidth [MHz]	Technical specification / Operating conditions
	From	To		
312MHz	312.6	314.7	2.1	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: 1MHz</li> <li>• Transmission power: below 250<math>\mu</math>W (e.i.r.p)</li> </ul>
426MHz	426	426.15	0.15	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: 5.8kHz /8.5kHz /16kHz</li> <li>• Transmission power: below 100mW</li> </ul>
429MHz	429	430	1	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: 5.8kHz / 8.5kHz</li> <li>• Transmission power: below 1W</li> </ul>
449MHz	449.7	449.9	0.2	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: 5.8kHz / 8.5kHz</li> <li>• Transmission power: below 1W</li> </ul>
469MHz	469.4	469.5	0.1	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: 5.8kHz / 8.5kHz</li> <li>• Transmission power: below 1W</li> </ul>
920MHz	915.9	928.1	12.2	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: below 200kHz/ below 400 kHz/ below 600 kHz/ below 800 kHz/ below 1000 kHz</li> <li>• Transmission power: below 1mW</li> </ul>
	920.5	928.1	7.6	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: below 200kHz/ below 400kHz/ below 600kHz/ below 800 kHz/ below 1000kHz</li> <li>• Transmission power: above 1mW – below 20mW</li> </ul>
1.2GHz(a)	1216	1217	1	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: 8.5kHz /16 kHz /32kHz</li> <li>• Transmission power: below 1W</li> </ul>
1.2GHz(b)	1252	1253	1	<ul style="list-style-type: none"> <li>• Digital</li> <li>• Channel bandwidth: 8.5kHz /16 kHz /32kHz</li> <li>• Transmission power: below 1W</li> </ul>

## 2.6 Control and data transmission of digital still camera

A digital still camera is an equipment with a release trigger (shutter control) function or an image transmission function including a release trigger.

### 2.6.1 Wireless release trigger

A device described in Section 3.5 “telemetry/telecommand and small-capacity data transmission” of the basic spectrum plan published on 8 November 2017 as “to press the shutter of a still camera” is re-named as a “wireless release trigger” for clarification and is described as such in this section.

The wireless release trigger is a device with the function of transmitting a control signal to turn on/off the release of the digital still camera (including a still camera). Setting data for the release (exposure control setting, aperture value, etc.) and strobe synchronisation are all included in the control signal to turn on/off the release.

Devices with data transmission functions other than the control signal to work/stop the release (for example, thumbnail and finder image), regardless of usage of these functions, are excluded from the wireless release trigger and would be treated as a wireless file transmitter described in 2.6.2.

The use of the wireless release trigger in designated areas requires application for approval by Tokyo 2020.

When applying for frequencies for the wireless release trigger, all frequencies that can be transmitted from the equipment must be included. It should be noted that, even if the equipment is authorised for use, channel assignment in the venue may be coordinated by Tokyo 2020.

Table 2.6.1 shows the candidate frequency bands for the wireless release trigger.

Since some frequency bands overlap with Type 2 PMR shown in Table 2.4.1.2 or existing radio stations, it will be noted that they may be subject to limited use within venues and interference from other radio stations. Further study should be conducted to improve the usage conditions.

Table 2.6.1 Candidate frequency band for wireless release triggers

Spectrum [MHz]		Bandwidth [MHz]	Classification and condition to be noted
From	To		
315.5	317	1.5	<ul style="list-style-type: none"> <li>• Subject to compatibility with public/general services.</li> <li>• Subject to compatibility with designated small power stations (license exempt).</li> </ul>
340	354	14	<ul style="list-style-type: none"> <li>• Subject to compatibility with public/general services.</li> <li>• Subject to compatibility with designated convenience radio station (see 2.4.2) service.</li> </ul>
433.44	434.42	0.98	<ul style="list-style-type: none"> <li>• Subject to compatibility with amateur radio, public services.</li> <li>• Subject to compatibility with designated small power stations (license exempt).</li> </ul>

### **2.6.2 Wireless file transmitter**

A wireless file transmitter works with a digital still camera and transmits images and other data.

The wireless file transmitter can be a function built in to the digital still camera or it can be an accessory device. The digital still camera with a built-in wireless file transmitter should be regarded as a wireless file transmitter, and is subject to authorisation from Tokyo 2020.

The wireless file transmitter employs the standard established by Wi-Fi Alliance and Bluetooth SIG. The wireless transmitter operates as an access point and a client of the wireless LAN. With the access point function, it is possible to connect the wireless transmitter and the smartphone/PC and transmit the image data of the digital still camera to the smartphone/PC.

With the client function, it is possible to connect the digital still camera to the wireless LAN network constructed by a third party and transmit the image data of the digital still camera to the smartphone/PC connected to it. In this way, the wireless transmitter can be used as a wireless LAN access point or as a wireless LAN client. All wireless transmitters that use either of the functions above must receive authorisation from Tokyo 2020.

Furthermore, the wireless file transmitter approved by Tokyo 2020 must correspond to the wireless LAN data transmission standard in 2.7. A device that does not match this standard is not approved even if it uses the same band.

## 2.7 Wireless LAN and data transmission

Wireless LAN is a license-exempt small-scale, large-capacity wireless system used to access the Internet. Wireless LAN standardised by the Wi-Fi Alliance is widespread.

ZigBee and Bluetooth are widely used as well. Furthermore, there are many other data transmission systems with unique standards that are different from these standards.

Wireless LAN devices are internationally recognised as license-exempt. In Japan, radio equipment with the approval seal that shows it conforms to the technical standards stipulated in the Japanese Radio Act and operated in the spectrum in Table 2.7 is not required to have a license. However, at the Tokyo 2020 Games, whether or not a license is required, authorisation from Tokyo 2020 is required for the master unit (the base station side having the access point). Even for the slave unit, authorisation from Tokyo 2020 may be required for some specific areas such as the competition venues, broadcast-related areas, the MPC, the IBC and the Athletes' Village.

It is strongly recommended that the number of approvals for frequencies of wireless LAN bands be kept to a bare minimum in order to avoid congestion and the reduction in the speed of communication transmissions caused by too many users. The wireless LAN service offered by Tokyo 2020 should be used as an alternative means.

For this reason, applications for wireless LAN frequencies may be rejected even when they conform to the wireless LAN channel policy. Other data transmission systems are referred to in the "video link" and the "telemetry/telecommand" sections..

Table 2.7 Frequency bands for license-exempt wireless LAN

Band	Spectrum [GHz]		Bandwidth [MHz]	Technical specification / Operating conditions
	From	To		
2.4GHz	2.400	2.497	97	Use restricted to Games operation only •Channel spacing: [IEEE802.11b] 22MHz [IEEE802.11g] 20MHz [IEEE802.11n] 20/40MHz [IEEE802.11ax] 20/40MHz each channel offset by 5 MHz •Channel bandwidth: 26/38MHz •Transmission power: below 10mW/MHz / below 5mW/MHz / below 10mW
5GHz	5.150	5.250	100	Use restricted to Games operation only •Channel spacing: [IEEE802.11a] 20MHz [IEEE802.11n] 20/40MHz [IEEE802.11ac] 80/160MHz [IEEE802.11ax] 20/40/80/160MHz •Channel bandwidth: 20MHz system:19MHz (OFDM) / 18MHz (Other OFDM) 40MHz system:38MHz 80MHz system:78MHz 160MHz system:158MHz (combined with the band 5.25-5.35GHz) •Transmission power: (OFDM) 20MHz system: below 10mW/MHz 40MHz system: below 5mW/MHz 80MHz system: below 2.5mW/MHz 160MHz system: below 1.25mW/MHz (Other OFDM) below 10mW/MHz / below 10mW •Indoor use only*

(\* ) Registered systems (access point only) can be used outdoors (EIRP below 1W)

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Band	Spectrum [GHz]		Bandwidth [MHz]	Technical specification / Operating conditions
	From	To		
	5.250	5.350	100	<ul style="list-style-type: none"> <li>• Channel spacing:                [IEEE802.11a] 20MHz                [IEEE802.11n] 20/40MHz                [IEEE802.11ac] 80/160MHz                [IEEE802.11ax] 20/40/80/160MHz</li> <li>• Channel bandwidth:                20MHz system:19MHz (OFDM) / 18MHz (Other OFDM)                40MHz system:38MHz                80MHz system:78MHz                160MHz system:158MHz (combined with the band 5.15-5.25GHz)</li> <li>• Transmission power:                (OFDM) 20MHz system: below 10mW/MHz                40MHz system: below 5mW/MHz                80MHz system: below 2.5mW/MHz                160MHz system: below 1.25mW/MHz                (Other OFDM) below 10mW/MHz / below 10mW</li> <li>• Indoor use only</li> <li>• Dynamic Frequency Selection(DFS) required</li> </ul>
5GHz	5.470	5.725	250	5630MHz-5725MHz: Use restricted to Games operation only <ul style="list-style-type: none"> <li>• Channel spacing:                [IEEE802.11a] 20MHz                [IEEE802.11n] 20/40MHz                [IEEE802.11ac] 80/160MHz                [IEEE802.11ax] 20/40/80/160MHz</li> <li>• Channel bandwidth:                20MHz system: 19.7MHz                40MHz system: 38MHz                80MHz system: 78MHz                160MHz system: 158MHz</li> <li>• Transmission power:                (OFDM) 20MHz system: below 10mW/MHz                40MHz system: below 5mW/MHz                80MHz system: below 2.5mW/MHz                160MHz system: below 1.25mW/MHz                (Other OFDM) below 10mW/MHz / below 10mW</li> <li>• Dynamic Frequency Selection(DFS) required</li> </ul>
26GHz	24.77	25.23	460	<ul style="list-style-type: none"> <li>• Channel spacing: –</li> <li>• Channel bandwidth: –</li> <li>• Transmission power: below 10mW/MHz / below 10mW</li> </ul>
	27.02	27.46	440	<ul style="list-style-type: none"> <li>• Channel spacing: –</li> <li>• Channel bandwidth: –</li> <li>• Transmission power: below 10mW /above 10mW – below 250mW</li> </ul>
60GHz	57	66	9000	<ul style="list-style-type: none"> <li>• Channel spacing:                [IEEE802.11ad] 2.16GHz</li> <li>• Channel bandwidth: below 9GHz</li> <li>• Transmission power: below 10mW /above 10mW – below 250mW</li> </ul>

## 2.8 Satellite communication

Tokyo 2020 anticipates that satellite communication would be used to transmit video, audio and data during the Tokyo 2020 Games, both domestically (between venues and the IBC) and internationally. Satellite communication faces the following situations:

- Recent terrestrial communication including fibre optics and mobile phones can replace the above-mentioned satellite communication. Several competition venues for the Tokyo 2020 Games are expected to be equipped with fibre optics facilities.
- Even for international communication, fibre optics could cover part of the transmission path in case a country to which signals are to be delivered is not covered by satellite.
- Satellite operation requires international coordination. The coordination procedure of spectrum, the direction of radiated radio wave, the density of radio wave strength, the orbital slot, etc., are regulated under the International Telecommunication Union (ITU). Difficulty could be foreseen to use a satellite with specific conditions, because many satellites are in operation under the international rules in the East Asia region including Japan.

Considering the facts mentioned above, the usage of satellite communication at the Tokyo 2020 Games should be as follows:

- If there are no options other than satellite communication, the existing services provided by domestic operators should be utilised to the maximum extent for both domestic and international communication. In this case, it is highly recommended to accept the satellite and the frequencies in operation provided by domestic communication operators.
- Tokyo 2020 protects downlink frequency bands (1215-1240MHz, 1559-1610MHz) for satellite navigation received on the ground because these bands would be used for measurements during the Games.
- Installation of fixed TX satellite communications stations may be permitted only when it is confirmed that they will not interfere with a lot of local radio stations for fixed communications, which are in use of the 5850-7075MHz band in Japan.
- In the 3600-4200 MHz band, interference with 5G should be kept in mind. Distance of several kilometres or several 10's of kilometres is required to avoid interference from 5G, resulting in quite difficult situation in installing fixed Rx satellite communications stations in/around Tokyo. For this reason, the use of this band shall not be permitted as a rule.

Table 2.8 shows the frequencies available for satellite communication in Japan.

Table 2.8 Frequency bands for the satellite communication

Band	Uplink [MHz]		Downlink [MHz]		Notes
	From	To	From	To	
L Band	1610	1618.75	2483.5	2500	For mobile communications.
	1670	1675	1518	1525	
	1626.5	1660.5	1525	1559	
	1621.35	1626.5	1621.35	1626.5	
S Band	2660	2690	2500	2545	
C Band	5850	7075	3600	4200	Installation of fixed TX satellite communications stations may be permitted only when it is confirmed that they will not interfere with a lot of local radio stations for fixed communications, which are in use of the 5850-7075MHz band in Japan.
Ku Band	13750	14500	12200	12750	For fixed communications.
Ka Band	27500	30000	17700	20200	For fixed communications. (The use of the 27500-28200 MHz band and the 29100-29500 band may be permitted subject to compatibility with mobile phone services.)

### 3. Spectrum application procedure

#### 3.1 Spectrum application

Spectrum application must be submitted using the Spectrum Order Portal via the rate card system.

Tokyo 2020 has revised the “Spectrum Application Guide” on 21 December 2020 to give guidance on the spectrum application process.

As shown in Table 3.1, the spectrum applications already received by Tokyo 2020 have been processed after the due date of each application period. From the viewpoint of securing a spectrum, early application is highly recommended once the Extraordinary Application reopens on 1 February 2021.

The overall flow from the frequency application until the entry of radio equipment into the venue is shown in Figure 3-1 and 3-2.

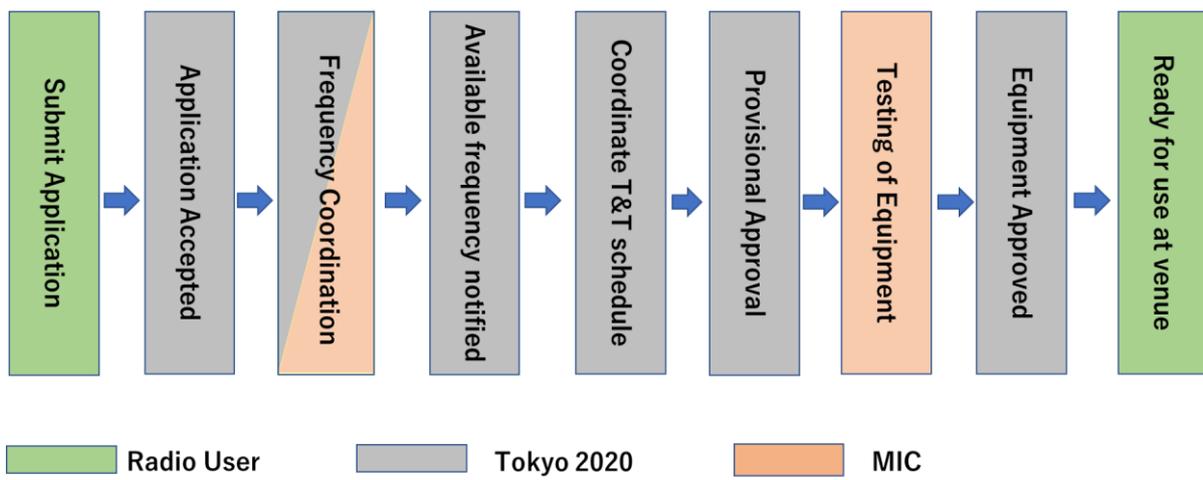


Figure 3-1 Flow from frequency application until the entry of radio equipment into the venue

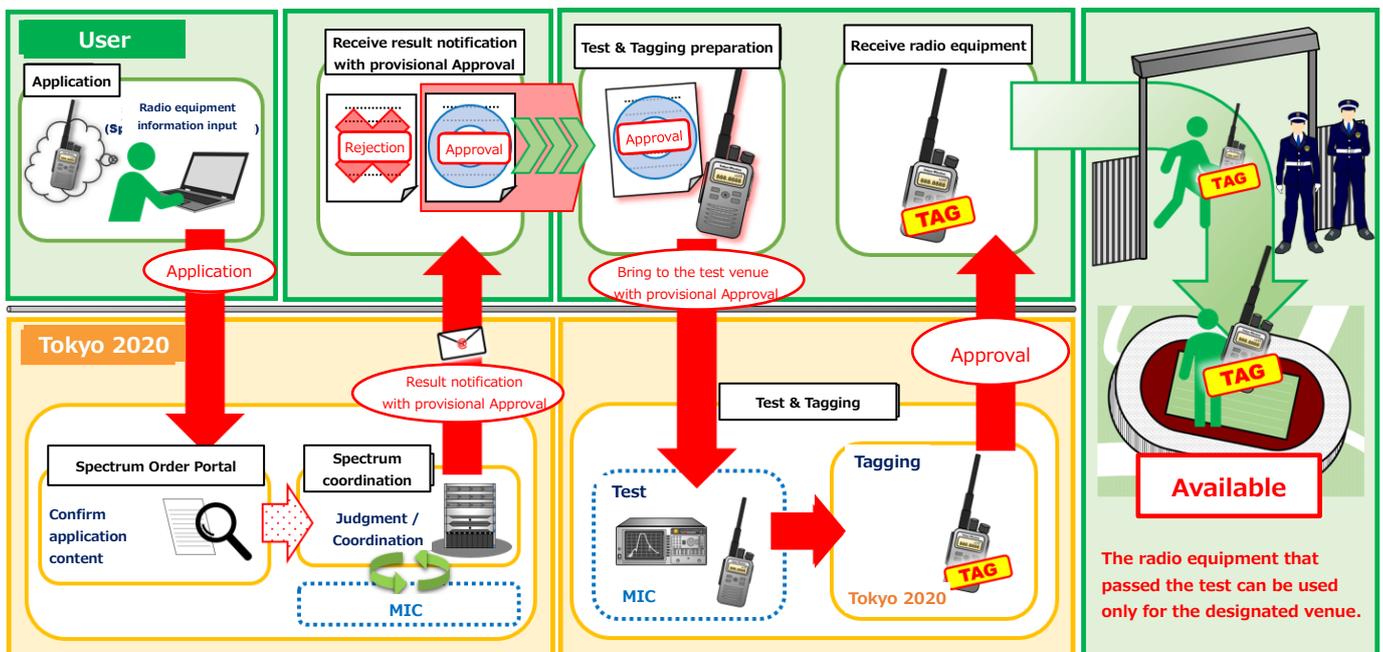


Figure 3-2 Flow from frequency application until the entry of radio equipment into the venue (details)

### 3.1.1 Application item

Some important parameters must be specified in the Spectrum Order Portal form, such as:

- Usage periods
- Spectrum usage location
- Spectrum service
- Desired centre spectrum
- Adjustable spectrum bands
- Channel bandwidth
- Transmit power

### 3.1.2 Web registration, submission by spreadsheet

The users can make multiple applications by submitting a spreadsheet via email. The spreadsheet can be downloaded from the Spectrum Order Portal.

## 3.2 Notice of approval

After accepting the spectrum application, Tokyo 2020 and the MIC will examine the possibility of interference between equipment applied by stakeholders and existing radio stations in Japan.

Then, based on the schedule in Table 3-1, Tokyo 2020 will notify the applicant of the result of examination through the Spectrum Order Portal.

Table 3-1 Application Schedule

	Application Period	Notification Schedule
<del>Normal Application</del>	<del>1 Feb. 2019 ~ 31 Aug. 2019</del>	<del>10 Jan. 2020 ~</del>
<del>Late Application</del>	<del>9 Sep. 2019 ~ 24 Jan. 2020</del>	<del>1 Apr. 2020 ~</del>
<del>Extraordinary Application</del>	<del>1 Feb. 2020 ~ 2 Apr. 2020</del>	<del>1 May 2020 ~</del>
Extraordinary Application	Resuming from 1 Feb. 2021 - 5 Sep. 2021	1 May 2021 -

## **4. Test & Tagging (T&T)**

### **4.1 Conducting the test**

After obtaining notification of spectrum application approval from Tokyo 2020, the applicant is required to have the radio equipment tested before using it in the venue. In accordance with the Radio Act, the test is conducted to confirm if its performance matches the spectrum application.

As a measure against COVID-19, it is strictly required to make a reservation for the test in advance and adhering to it to keep the test environment safe. Details of the test will be announced in the Test & Tagging Guide.

### **4.2 Test location / period**

A Spectrum Desk will be set up at 19 venues such as the IBC, the MPC, the UAC, the Athletes' Village and the OLS for efficient and swift testing. Details will be announced in the Test & Tagging Guide.

### **4.3 Tagging (attaching of the tag)**

A tag issued by Tokyo 2020 will be visibly applied on the radio equipment that passed the test. All radio equipment must have the tag to be allowed into the venue. Permission is venue specific, and equipment will be managed by the number on the tag. Details will be announced in the Test & Tagging Guide.

## **5. Radio spectrum monitoring**

Tokyo 2020 will conduct radio spectrum monitoring with the cooperation of the MIC, which is the competent authority of radio spectrum supervision in Japan, in order to secure that radio spectrum for the radio system used for the Tokyo 2020 Games are not interfered and appropriately used. Tokyo 2020 posted the “Spectrum Monitoring Plan” on 20 September 2018 to outline the radio spectrum monitoring.

Tokyo 2020 requests stakeholders who use radio spectrum to cooperate in securing an interference-free spectrum environment at the time of the Games.

## **6. Update information**

### **6.1 Spectrum-related information**

Further details and updated information about the spectrum management plan will be announced in a news release as they become available. The news release will be published on the official website of Tokyo 2020.

### **6.2 Test & Tagging information**

Further details and updated information on Test & Tagging will be announced in the Test & Tagging Guide which will be published on the official website of Tokyo 2020.