Spectrum Monitoring Plan
For the
Olympic and Paralympic Games
Tokyo 2020

20 September 2018
# Spectrum Monitoring Plan For the Olympic and Paralympic Games Tokyo 2020

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1. Introduction and Purpose
The Games of the XXXII Olympiad and the Tokyo 2020 Paralympic Games ("the Tokyo 2020 Games") will be held from 24 July to 9 August 2020 and from 25 August to 6 September 2020 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 radio spectrum monitoring-related activities with the close cooperation of the Ministry of Internal Affairs and Communications ("the MIC"), which is the competent radio regulatory authority of Japan, and together will ensure that the use of the radio spectrum at the Tokyo 2020 Games will have no harmful interferences and will not be used inappropriately.

The purpose of this document is to notify all concerned parties of the implementation of reliable radio spectrum monitoring at the Tokyo 2020 Games to ensure a reliable spectrum use environment free from harmful interferences, which in turn will contribute to the success of the Tokyo 2020 Games.

1.1 The status quo of radio use in Tokyo
The status quo of radio use in Japan is found on the following website of the MIC.


Spectrum is allocated to ensure its effective use without causing harmful interference between wireless stations, and to abide by international rules.

In Japan, many radio stations are already in operation, especially in the Tokyo area where population and industrial activities are concentrated. The Tokyo area is located in the Kanto Plain and faces the Tokyo Bay where radio waves propagate in a wide range. Accordingly, precise spectrum allocation has been implemented in this area, and spectrum allocation with an extremely high level of precision will be required for the Tokyo 2020 Games.

Precise spectrum allocation will be carried out for each venue taking into account the location, topography and physical environment surrounding the venue. In
addition, the same spectrum may be shared with two or more radio stations by separating the time or using mutual idle time.

For the above reasons, use of the spectrum which neglects or fails to take into account the existing spectrum allocation may cause severe disruption to usage of the spectrum.

It is vital that Tokyo 2020 and the MIC secure this precisely allocated spectrum use environment to ensure the success of the Tokyo 2020 Games.
1.2 The organisation of radio spectrum monitoring

Radio spectrum monitoring in Japan is implemented by the MIC under the provisions of Article 4, Paragraph 1, Item 64 of the MIC establishment law.

Effective radio spectrum monitoring will ensure adequate spectrums for use for competitions and operations including the Wi-Fi band (2.4 GHz band / 5 GHz band) and for international broadcast relay stations, public service radio stations around the competition venues during the Tokyo 2020 Games.

The task of radio spectrum monitoring during the Tokyo 2020 Games is to confirm that the radio transmissions by the radio stations listed above are officially allocated spectrum, to check whether the radio stations are operated in an authorised competition venue, to confirm the occurrence of radio interference, to identify and remove radio interference sources.

Should radio interference occur during the Tokyo 2020 Games, the MIC will promptly identify the location of radio interference sources by utilising the radio spectrum monitoring system (DEURAS: DEtect Unlicensed RAdio Stations) and remove interference sources.

With the cooperation of the MIC, Tokyo 2020 will endeavour to ensure that spectrum use during the Tokyo 2020 Games can be reliably handled without harmful interference, and in full compliance with the Radio Act.

<table>
<thead>
<tr>
<th>Table 1 Appointment of the MIC and Tokyo 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokyo 2020</td>
</tr>
<tr>
<td>Securing rooms for monitoring radio spectrum at venues</td>
</tr>
<tr>
<td>Installation and operation of radio spectrum monitoring system</td>
</tr>
<tr>
<td>Identification of radio emission sources</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Enforced termination of radio transmitter emissions</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
2. Radio spectrum monitoring system in Japan

Radio spectrum monitoring in Japan is carried out by the radio spectrum monitoring department of ten Regional Bureaus of Telecommunications. The competition venues of the Tokyo 2020 Games: Tokyo, and Chiba, Saitama, Kanagawa and Ibaraki prefectures fall under the jurisdiction of the Kanto Bureau of Telecommunications. Shizuoka Prefecture is under the Tokai Bureau, Miyagi and Fukushima prefectures are under the Tohoku Bureau, and Hokkaido comes under the Hokkaido Bureau.

The MIC operates the following radio spectrum monitoring system to crack down on illegal radio stations, and to protect important radio communications such as police and fire department radio, aviation and maritime radio, mobile phone and broadcasting communications.

- Remote azimuth measurement system (DEURAS-D)
- Illegal radio station search vehicle (DEURAS-M)
- Short wave monitoring system (DEURAS-H)
- Space radio monitoring facility (DEURAS-S)

In addition to the existing radio spectrum monitoring system, a monitoring system dedicated to the competition venues and its vicinities will be introduced for the Tokyo 2020 Games.
2.1 Remote azimuth measurement system (DEURAS-D)
Remote azimuth measurement system (DEURAS-D) remotely controls sensor stations from 11 centre stations located in major cities nationwide (generally installed in the Regional Bureau of Telecommunications). It also monitors radio transmissions received at each station, measures the direction of received radio transmissions, and specifies the position of the radio spectrum emission source. The spectrum of the monitoring of all sensor stations around the venues of Tokyo 2020 Games will be renewed by the end of FY 2018.

![Figure 1 Configuration of DEURAS-D](image)

**Table 2 DEURAS-D functions and Deployment locations**

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Main functions</th>
<th>Deployment locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHF band / UHF band / S band</td>
<td>· Direction measurement · Receiving – direction finder sound received</td>
<td>· 11 center stations Sapporo · Sendai · Tokyo · Nagano · Kanazawa · Nagoya · Osaka · Hiroshima · Matsuyama · Kumamoto · Naha · About 350 sensor stations Major cities nationwide</td>
</tr>
</tbody>
</table>
2.2 Illegal radio station search vehicle (DEURAS-M)
An illegal radio station search vehicle (DEURAS-M) is a radio spectrum monitoring system equipped with a DEURAS-D function. In order to flexibly search and identify radio transmissions sources of illegal radio stations, the MIC has deployed several vehicles in 11 Regional Bureaus of Telecommunications throughout the country.

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Main functions</th>
<th>Deployment location</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHF band / UHF band / S band</td>
<td>· Direction measurement · Receiving sounds</td>
<td>Sapporo · Sendai · Tokyo · Nagano · Kanazawa · Nagoya · Osaka · Hiroshima · Matsuyama · Kumamoto · Naha</td>
</tr>
</tbody>
</table>

In addition to DEURAS-M, the MIC has deployed Radio Spectrum Surveillance Vehicles equipped with radio spectrum monitoring devices such as spectrum analyzers and direction measuring devices in 11 Regional Bureaus of Telecommunications throughout the country. As a result, it is possible to quickly and flexibly monitor radio transmissions even if multiple radio interference incidents occur simultaneously.
2.3 Short wave spectrum monitoring system (DEURAS-H)

The short wave monitoring system (DEURAS-H) is a radio spectrum monitoring system used to ensure a good radio spectrum environment in the high frequency (HF) band which is used for international broadcasting, aviation and maritime purposes.

By remotely operating the sensor stations installed at five locations nationwide from the centre station installed at the Miura Radio Monitoring Center (Miura City, Kanagawa Prefecture), monitoring of the HF band radio spectrum, and direction measurement of received radio transmissions received at each sensor station are conducted, and the location of the source of radio transmissions is specified.

### Table 5 DEURAS-H functions · Deployment locations

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Main functions</th>
<th>Deployment locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF band / HF band</td>
<td>· Direction measurement</td>
<td>· Center station 1 (Miura)</td>
</tr>
<tr>
<td></td>
<td>· Receiving sounds</td>
<td>· Sensor Bureau 5 (Chitose, Togane, Suzu, Aso, Ishigaki)</td>
</tr>
</tbody>
</table>

![Figure 4 Configuration of DEURAS-H](image)
2.4 Space radio spectrum monitoring facility (DEURAS-S)
The space radio observation facility (DEURAS-S) surveys and analyzes the usage of spectrums used by communication satellites, broadcasting satellites and other observation satellites, to monitor their orbit location and operational conditions. The DEURAS-S facility is located at the Miura Radio Monitoring Center in the Kanto Bureau of Telecommunications (Miura City, Kanagawa Prefecture), and is equipped with a geostationary satellite surveillance facility (L / S / C / Ku / Ka band) and a non-stationary satellite surveillance facility (VHF band / UHF band / X band).
The geostationary satellite monitoring facility is equipped with a function that is able to pinpoint the location of uplink radio interference sources.

<table>
<thead>
<tr>
<th>Type</th>
<th>Spectrum</th>
<th>Antenna equipment</th>
<th>Deployment location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geostationary satellite monitoring facility</td>
<td>L / S / C / Ku / Ka band</td>
<td>13 m parabolic antennas</td>
<td>Miura City, Kanagawa Prefecture</td>
</tr>
<tr>
<td>Non-stationary satellite monitoring facility</td>
<td>VHF band / UHF band / X band</td>
<td>VHF band / UHF band / X band</td>
<td></td>
</tr>
</tbody>
</table>

Table 6 DEURAS-S functions and Deployment location

Figure 5 Configuration of DEURAS-S
2.5 Radio spectrum monitoring equipment to be placed at and around the competition venues

In addition to the radio spectrum monitoring facilities described in 2.1 to 2.4 above, the following radio spectrum monitoring equipment will be placed in and around the Tokyo 2020 Games competition venues, and the MIC will make every effort to monitor the radio spectrum during the events.

2.5.1 Small monitoring system

Small Monitoring Sensors will be placed in and around competition venues by FY 2019.

Compact monitoring sensors are capable of measuring direction by POA method or TDOA method, and by arranging them closely in the vicinity of the competition venues, they are able to quickly identify and eliminate low-power interference sources.

Table 7 Functions and deployment location of compact monitoring sensors

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Main function</th>
<th>Direction measurement method</th>
<th>Deployment location</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHF band / UHF band / S band / C band</td>
<td>Direction measurement</td>
<td>POA or TDOA method</td>
<td>In and around the competition venue</td>
</tr>
</tbody>
</table>

Figure 6 Sample image of configuration/installation of a compact monitoring sensor
2.5.2 Radio spectrum monitoring equipment in competition venues
At each competition venue, radio spectrum monitoring will be carried out with equipment such as a radio spectrum monitoring receiver, a spectrum analyzer, a handheld analyzer, and a radio transmission source visualization device. Antenna facilities and other facilities required for radio spectrum monitoring will be installed in each competition venue in advance.

2.5.3 Closed space radio spectrum monitoring systems
For major stadium competition venues, the MIC will introduce closed space radio monitoring systems using a linear array antenna that is robust against multipath. This makes it possible to quickly identify and eliminate interference sources even within a stadium where radio transmissions are reflected by the stand seating.

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Main function</th>
<th>Direction measurement method</th>
<th>Deployment location</th>
</tr>
</thead>
</table>
| VHF band / UHF band / S band | - Direction measurement   
- Receiving sounds | AOA(DBF) method              | Major competition venues    |

Table 8 Functions and deployment location of closed space radio spectrum monitoring systems

Sample image of installation of antenna

Figure 7 Configuration image of closed space radio spectrum monitoring system
3. **Equipment entry regulations**

   Approval by Tokyo 2020 is required to bring wireless devices into the venues. Some devices such as mobile phones, may be excluded.

   For wireless devices to be brought into the venues, it is necessary to conduct a spectrum application and obtain spectrum approval from Tokyo 2020. In addition, testing and tagging of devices is required before they can be taken into the venues. The tests are conducted by the MIC. Items of equipment that have successfully passed testing are then required to affix approval tags which are issued by Tokyo 2020.

   At the entrance of the venue, wireless devices with the appropriate tag(s) will be permitted to be taken into the venue. Please note, however, that attempting to bring such devices into the venue without the correct tags affixes will result in measures being taken to prevent radio transmission or confiscation of the device(s). If Tokyo 2020 personnel discover a wireless device without a tag or without the correct tag inside the venue, the same measures will be taken.

   Wireless device operations within a competition venue must comply with the regulations established by Tokyo 2020, even if such wireless device is legal under the Radio Act or a valid license is held.
4. Legal regulations

4.1 Penal Provisions

In such case a person causes interference with any wireless communications, the person will be ordered to stop using the offending wireless device. If the person refuses to comply with such order he/she shall be subject to the statutory punishment under Japanese Act.

【Legal restrictions】 (excerpts from the Radio Act)

- **Article 108-2**
  Any person causing interference to police, fire department and other important radio communications, shall be subject to imprisonment for a period of up to five years, or the payment of a fine not exceeding JPY2,500,000.

- **Article 110 (1) and (2)**
  Any person who establishes or operates a radio station without obtaining a valid license from the Minister of Internal Affairs and Communications shall be subject to imprisonment for a period of up to one year, or the payment of a fine not exceeding JPY1,000,000.

- **Article 110 (5)**
  Any person found to be in violation of the terms and conditions set forth in the license shall be subject to imprisonment for a period of up to one year, or the payment of a fine not exceeding JPY1,000,000.

- **Article 110 (8)**
  Any person failing to comply with an order from the Minister of Internal Affairs and Communications to cease radio operations shall be subject to imprisonment for a period of up to one year, or the payment of a fine not exceeding JPY1,000,000.

- **Article 114 (1) and (2)**
  Any business enterprise found to be complicit in such unlawful actions shall be subject to the payment of a fine not exceeding JPY1,000,000.
5. Information update

5.1 Spectrum monitoring-related information
This document will be updated as and when required and made publicly available in news releases and other means through the official Tokyo 2020 website.