ENGLISH TRANSLATION

SENSORS FOR DETECTING OR MEASURING MOBILE OBJECTS FOR SPECIFIED LOW POWER RADIO STATION

ARIB STANDARD

ARIB STD-T73 Ver. 2.0

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Association of Radio Industries and Businesses

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Foreword

The Association of Radio Industries and Businesses (ARIB) investigates and summarizes the basic technical requirements for various radio systems in the form of "ARIB Standards". These standards are developed with the participation of and through discussions amongst radio equipment manufacturers, telecommunication operators, broadcasting equipment manufacturers, broadcasters and users.

ARIB Standards include "government technical regulations" (mandatory standard) that are set for the purpose of encouraging effective use of frequency and preventing interference with other spectrum users, and "private technical standards" (voluntary standards) that are defined in order to ensure adequate quality and compatibility of radio equipment and broadcasting equipment as well as to offer greater convenience to radio equipment manufacturers, telecommunication operators, broadcasting equipment manufacturers, broadcasters and users.

This ARIB standard is developed for "Sensors for detecting or measuring mobile objects for specified low power radio station". In order to ensure fairness and transparency in the defining stage, the standard was set by consensus at the ARIB Standard Assembly with the participation of both domestic and foreign interested parties from radio equipment manufacturers, telecommunication operators, broadcasting equipment manufacturers, broadcasters and users.

ARIB sincerely hopes that this ARIB Standard will be widely used by radio equipment manufacturers, telecommunication operators, broadcasting equipment manufacturers, broadcasters and users.

NOTE:

Although this ARIB Standard contains no specific reference to any Essential Industrial Property Rights relating thereto, the holders of such Essential Industrial Property Rights state to the effect that the rights listed in the Appended Tables 1 and 2, which are the Industrial Property Rights relating to this standard, are held by the parties also listed therein, and that to the users of this standard, in the case of Appended Table 1, such holders shall not assert any rights and shall unconditionally grant a license to practice such Industrial Property Rights contained therein, and in the case of Appended Table 2, the holders shall grant, under reasonable terms and conditions, a non-exclusive and non-discriminatory license to practice the Industrial Property Rights contained therein. However, this does not apply to anyone who uses this ARIB Standard and also owns and lays claim to any other Essential Industrial Property Rights of which is covered in whole or part in the contents of the provisions of this ARIB Standard.

Attachment 1 (Selection of Option 1)

(N/A)

Attachment 2 (Selection of Option 2)

(N/A)

Total Contents

Preface The structure of this standard

Preface-1 Structure of this standard

This standard defines requirements for “Sensors for detecting or measuring mobile objects for specified low power radio station” and is composed of 2 Volumes (Volume 1 and Volume 2).

Preface-2 Characteristics of each standard

Characteristics (outlines) of this standard are shown in Preface table-1.

Preface table-1 Characteristics (outlines)

Items	Contents
Common items	This standard defines requirements for the radio equipment which is categorized as a Specified Low-power Radio Station stipulated in Article 6 of Regulations for Enforcement of Radio Law and used as a sensor for detecting or measuring mobile objects. The sensor is used under the category of the radio determination service for detecting information such as presence, location, roam, size and so on of roaming persons or objects with a high accuracy so that the situation of them can be recognized.
Volume 1	This section defines requirements for radio equipment using frequencies in a range of above 10.5 GHz to 10.55 GHz, or above 24.05 GHz to 24.25 GHz.
Volume 2	This section defines requirements for radio equipment which is used exclusively for sensors for detecting or measuring mobile objects in a frequency range of above 57 GHz to 64 GHz and does not require for a carrier sensing function.

Note: Radio equipment which uses frequencies of above 57 GHz to 66 GHz and requires for a carrier sensing function is not included in this Standard.

Preface-3 Method for definition

The structure of chapters in each volume is defined in accordance with the Preface table-2.

Preface table-2 Method of definition for contents of the standards

Chapter	Volume 1	Volume 2	Specifying Method
Preface	The structure of this standard		Common
Chapter1	General Descriptions	General Descriptions	Specified in each volume (Outline, Scope of the standard)
Chapter 2	Standard System	Standard System	Specified in each volume (Outline, System configuration)
Chapter 3	Technical Requirements for Radio Equipment	Technical Requirements for Radio Equipment	Specified in each volume (Frequency, modulation method, etc.)
Chapter 4	Measurement Methods	Measurement Methods	Common
Annex 1	Guidance of "Mark of operating condition"	Operational Rule	Specified in each volume
Annex 2	Group Segmentation of Radio Frequency and Group Number	(None)	Specified in each volume
Reference	Test items in relation to Technical Regulations Conformity Certification for Specified Radio Equipment		Common

Volume 1

Contents

Chapter 1 General Descriptions

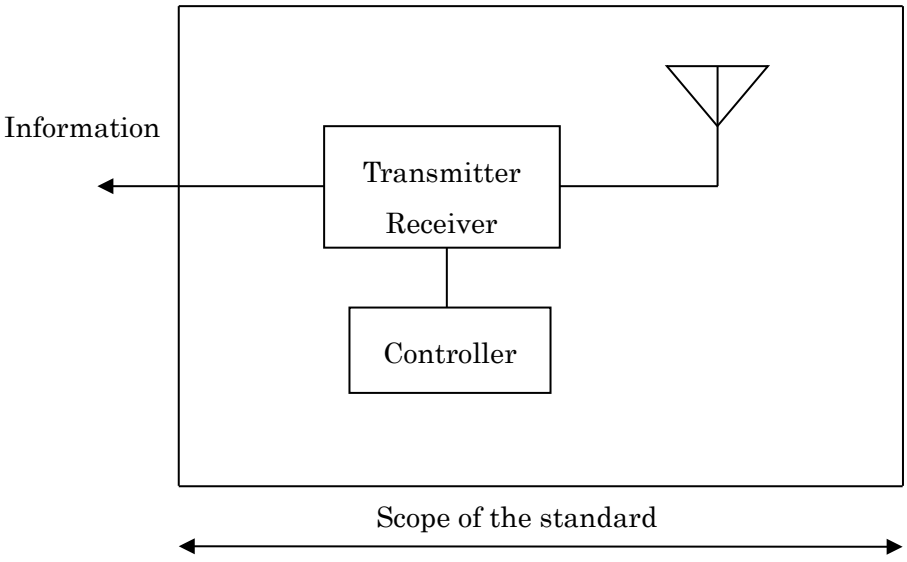
1.1 Outline

This standard defines requirements for the radio equipment using frequencies in a range of above 10.5 GHz to 10.55 GHz, or above 24.05 GHz to 24.25 GHz which is categorized as a Specified Low-power Radio Station stipulated in Article 6 of Regulations for Enforcement of Radio Law and used as a sensor for detecting or measuring mobile objects under the category of the radio determination service for detecting information such as presence, location, roam, size and so on of roaming persons or objects with high accuracy so that the situation of them can be recognized.

1.2 Scope of the Standard

Radio equipment of a radio station used for sensors for detecting or measuring mobile objects is as shown in Figure 1.1 and this standard defines the said radio equipment.

① The case where a transmitting device and a receiving device are united



② The case where a transmitting device and a receiving device are separated

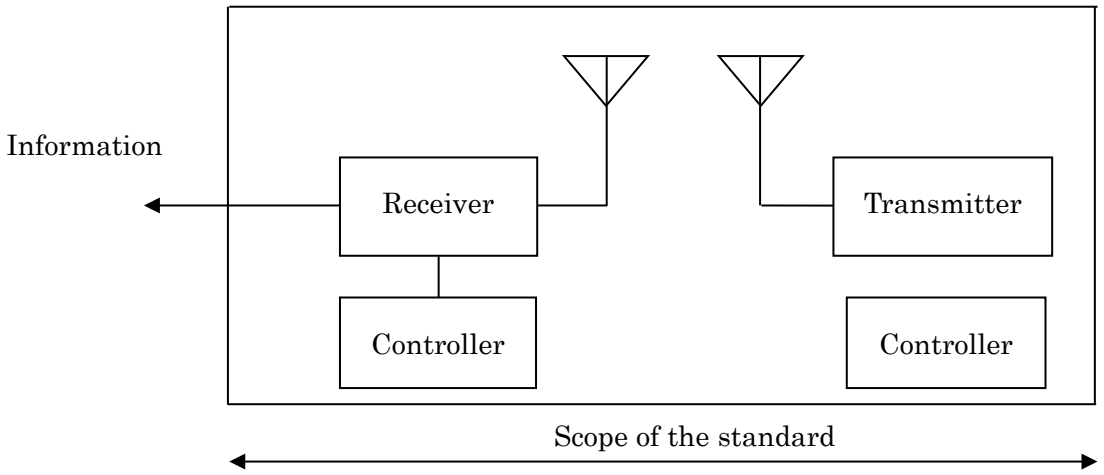


Figure 1.1 Structure of radio equipment used for sensors for detecting or measuring mobile objects

1.3 Reference document

(1) Reference regulations

In the standard, "RERL" refers to the Regulations for Enforcement of Radio Law, "ORE" refers to the Ordinance Regulating Radio Equipment, "OTRCC" refers to the Ordinance Concerning Technical Regulations Conformity Certification, etc. of Specified Radio Equipment and "NT" refers to a Notification of the Ministry of Posts and Telecommunications if issued in 2000 or earlier, and a Notification of the Ministry of Internal Affairs and Communications (MIC) if issued in 2001 or later.

Chapter 2 Standard System

The following are examples of standard system configurations.

2.1 System using reflection of radio wave

(1) System using doppler effect

A system in which the information on a mobile object is detected using doppler effect and the detected information is outputted.

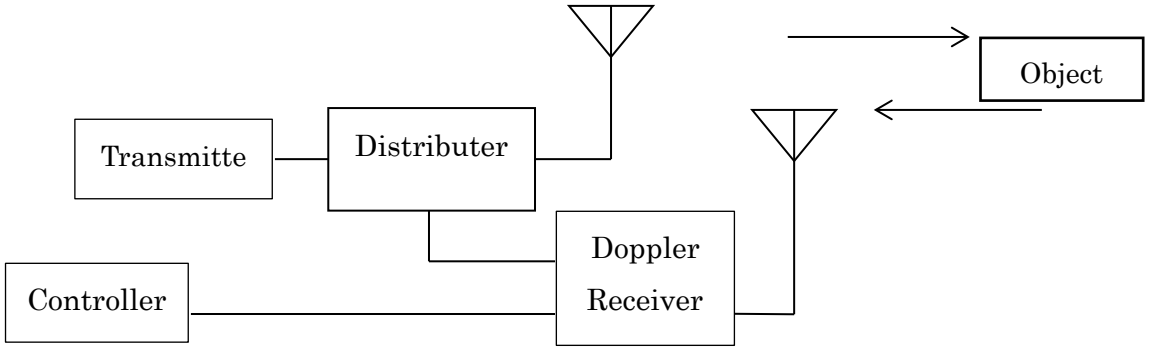


Figure 2.1 System using doppler effect

(2) System using delay of reflected wave

A system in which the information on stationary status of a mobile object and the distance to the object is detected using delay of reflected wave and the detected information is outputted.

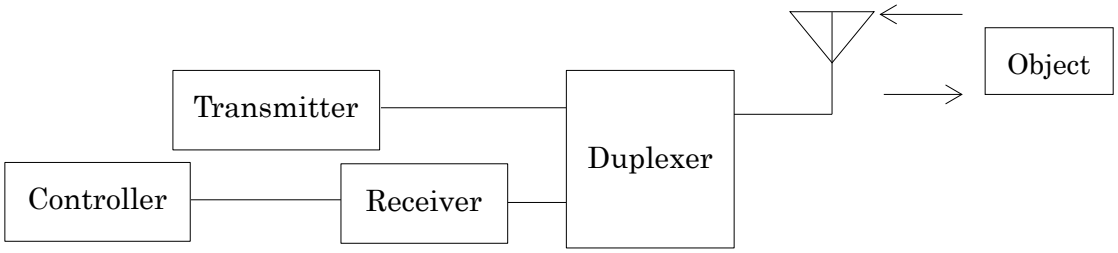


Figure 2.2 System using delay of reflected wave

2.2 System using blocking of radio wave

A system in which the information of a mobile object is obtained by receiving a radio wave that is emitted from a transmitter and interrupted by the object on the path.

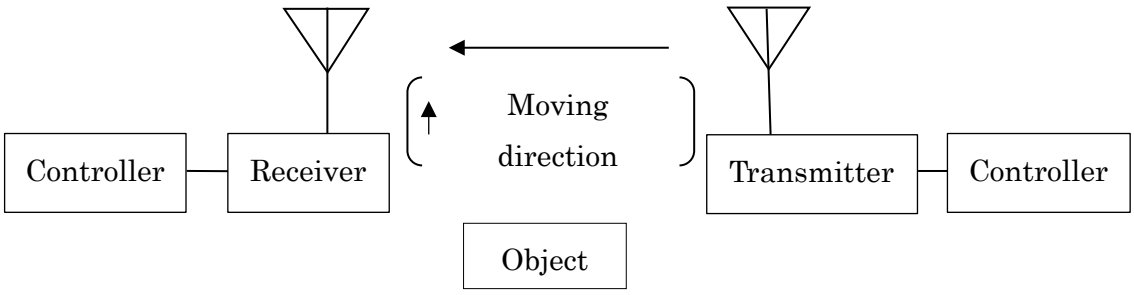


Figure 2.3 System using blocking of radio wave

Chapter 3 Technical Requirement for Radio Equipment

3.1 General condition

(1) Type of radio wave

There is no specific restriction on the type of radio wave.

(2) Operating Frequency (NT, No.42 in 1989)

The designated frequencies are shown in Table 3.1.

However, the frequency of 10.525 GHz is limited to the use of inside a building.

Table 3.1 Frequency

Frequency
10.525 GHz
24.15 GHz

(3) Usage environmental condition (ORE, Article No.49-14)

It is required that equipment be operated without any trouble under a normal environmental change of temperature and humidity, and vibration.

3.2 Transmitter

(1) Antenna power (NT, No.42 in 1989)

The antenna power shall be 0.02 W or less.

(2) Tolerance of antenna power (ORE, Article 14)

The tolerance of the antenna power, which is the maximum permissible tolerance from the designated or fixed antenna power, shall be +50% in the upper limit and -50% in the lower limit.

(3) Tolerance of frequency (ORE, Article 5, Attached Table 1 Note 34(2)) (NT, No.507 in 2011)

The tolerance of frequency, which is the maximum permissible departure of the center frequency of the frequency band occupied by emission from the center of the assigned frequency, shall be within the designated frequency band indicated in Table 3-2.

Table 3.2 Designated frequency band

Designated frequency band
10.5 GHz to 10.55 GHz
24.05Hz to 24.25 GHz

(4) Permissible value of occupied frequency bandwidth (ORE, Article 6, Attached Table 2, No.28)
(NT, No.659 in 2006)

Permissible value of the occupied frequency bandwidth, which is the width of a frequency band such that each mean power of the radio wave emitted below the lower frequency limit and above the upper frequency limit, are equal to 0.5% of the total mean power of a given emission, shall be shown in Table 3-3.

Table 3-3 Permissible value of occupied frequency bandwidth

Frequencies	Permissible value of occupied frequency bandwidth
Radio equipment using frequency of above 10.5 GHz and up to 10.55 GHz	40 MHz
Radio equipment using frequency of above 24.05 GHz and up to 24.25 GHz	200 MHz

(5) The permissible values for the strength of spurious emissions or unwanted emissions

a) Definition (RERL, Article 2-1)

"Spurious emissions" refer to the emissions at one or more radio frequencies outside the necessary frequency bandwidth, including harmonic emissions, subharmonic emissions, parasitic radiations, and intermodulation and excluding out-of-band emissions; it shall be possible to reduce the levels of such emissions without affecting information transmission. (RERL, Article 2-1-63)

"Out-of-band emissions" refer to the emissions at radio frequencies adjacent to the necessary frequency bandwidth, which are generated during the modulation processes for information transmission. (RERL, Article 2-1-63-2)

"Unwanted emissions" refer to the spurious emissions and out-of-band emissions.
(RERL, Article 2-1-63-3)

"Spurious band domain" refers to the frequency band where spurious emission is dominant outside of the out-of-band domain. (RERL, Article 2-1-63-4)

"Out-of-band domain" refers to the frequency band where the out-of-band emissions are dominant outside of the necessary frequency band. (RERL, Article 2-1-63-5)
(ORE, Attached Table No.3)

"The permissible values for the strength of spurious emissions" refer to the permissible values restricted by the average power of spurious emissions at each frequency which are supplied to

the feeder lines in the unmodulated condition.

(ORE, Article 7, Attached Table 3, 1 (1))

"The permissible values for the strength of unwanted emissions" refer to the permissible values restricted by the average power of unwanted emissions at each frequency which are supplied provided to the feeder lines in the modulated condition.

(ORE, Article 7, Attached Table 3, 1 (2))

b) The permissible values which have been applied and available after December 1, 2005

(ORE, Article 7, Attached Table 3)

The permissible values for the strength of spurious emissions in the out-of-band domain and for the strength of unwanted emissions in the spurious band domain shall be 2.5μW(-26.02dBm) or lower in the average power. There are transitional measures. (ORE, Supplementary provisions No.119 which is specified by the Ordinance of Ministry of Internal Affairs and Communications on August 9, 2005.)

c) The permissible values based on ORE (Ordinance Regulating Radio Equipment) before November 30, 2005.

(5) The permissible values for the strength of spurious emissions (ORE, Article 7)

The permissible values for the strength of spurious emissions (the emissions at one or more radio frequencies outside the necessary frequency bandwidth, including harmonic emissions, subharmonic emissions, parasitic radiations, and intermodulation products and excluding the emissions at radio frequencies adjacent to the necessary frequency bandwidth, which are generated during the modulation processes for information transmission; it shall be possible to reduce the levels of such emissions without affecting information transmission.) shall be 2.5μW or lower in the average power using a normal modulation method.

In the case where the equipment can transmit an unmodulated carrier, the spurious levels can be measured by using unmodulated carriers.

(ARIB STD-T73 Version 1.0)

3.3 Receiver

(1) Limit on secondary radiated emissions (ORE, Article 24)

The power limits of the secondary radiated radio waves etc. shall be 2.5 μW or lower in case of measuring with the pseudo antenna circuit which has the same electric characteristics as the receiving antenna.

3.4 Controller

The controller shall be equipped with the following devices and functions, and conform to each of the following conditions.

(1) Interference prevention function (RERL, Article 6.2)
(ORE, Article 9.4)

The controller shall have the function which specified in either of the following (i), (ii) or (iii).

i) The function that automatically transmit or receive an identification code of the radio equipment of a radio station is mainly used in the same premises.

ii) The function that frequency switch or halt of the radio wave emission can be performed easily by users.

iii) The function that can discriminate whether the receiving wave is one reflected of the transmitting wave or one transmitted from other radio station by examining characteristics such as a modulation method or other properties of the receiving wave.

3.5 Antenna

(1) Antenna structures

There is no specific provision for the antenna structure.

(2) Gain of the antenna (ORE, Article 49-14)

The absolute gain of the transmitting antenna shall be 24dB or less.

In case, the equivalent isotropically radiated power (e.i.r.p.) is not more than the value that induces 13dBm(0.02W) of antenna power into the antenna with absolute gain 24dB, the difference could be compensated by the gain of the antenna.

3.6 Others

(1) Housing (ORE, Article 49-14)

The radio equipment shall be housed in a single cabinet that cannot be opened easily. But this requirement does not apply to an antenna system.

(2) Mark of operating condition (OTR, Article 49-14)
(NT, No.657 in 2006)

Regarding a radio equipment using frequency of above 10.5 GHz and below 10.55 GHz, notification describing that the transmission from the equipment is limited to the indoor use shall be visibly displayed on the radio equipment.

Regarding the description in an instruction manual and the display of the actual product, shall be referred to Annex 1 Guidance of “Mark of operating condition”.

(3) Mark of technical regulations conformity certification (OTRCC, Article 8)

A mark of technical regulations conformity certification according to the specified format shall be visibly displayed on the radio equipment.

Chapter 4 Measurement Methods

Measurement methods shall be in accordance with the Notification of the Ministry of Internal Affairs and Communications (Note 4.1 as explained below) which is specified in item 1(3) of Appended Table 1 of OTRCC or methods equivalent to those specified in the Notification or advanced methods. For other test items which are not notified in the above methods, measurements methods generally used shall be applied.

Note 4.1: This ordinance refers to the Notification of Ministry of Internal Affairs and Communications No.88 "The testing method for the characteristics examination" (January 26, 2004) as of the date of issue of this revised standard (version 2.0 issued on September 28, 2020). However, if the MIC notification and the contents of the MIC notification are revised in future, measurement methods shall be in accordance with the latest versions of the MIC notification and the contents.

Annex 1 Guidance of “Mark of operating condition”

1 Purpose

Since the use of frequencies of 10.5 GHz band may cause interference to a licensed radio equipment which is operated in outdoors, the use of mobile detection sensor in 10.5 GHz band is permitted only to indoor use, i.e. the use in houses, condominiums and buildings.

In the case where radio equipment uses frequencies of above 10.5 GHz to 10. 55 GHz, it is required to display in an easy-to-watch place a warning that the transmission from this equipment is allowed only in a room. The radio equipment used for sensors for detecting or measuring mobile objects in 10.5 GHz band shall be subject to this requirement. (NT, No.657 in 2006)

This guidance specifies mark of operating conditions.

2 Scope of instruction

This instruction applies to users and business operators of manufacturing and selling radio equipment (hereinafter referred to as “vendors”) for sensors for detecting or measuring mobile objects using a frequency of above 10.5 GHz to 10. 55 GHz. A company which manufactures and sells this equipment as parts or incorporates this equipment in a product as parts is also included in vendors.

3 Description of subject

3.1 Operation manual

In an operation manual the specialty contractor shall describe a notice which is outlined in the following box.

Notice for the use of this equipment

There is a case where licensed radio equipment using a frequency in the band (above 10.5 GHz to 10 55 GHz) is in operation in outdoors. In order to avoid interference with the equipment, this equipment is permitted only to indoor use, i.e. the use in houses, condominiums and buildings.

It should be noted that in the case where a sensor for detecting or measuring mobile objects using a frequency in the 10.5 GHz band is used in outdoors, not only the performance of the sensor would be hindered, but also the users are punished for the violation of Radio Law.

3.2 Catalogs, brochures and websites

The content similar to the notice mentioned in section 3.1 shall be described in catalogs, brochures or websites of vendors.

4 Indication by labels

In the case where radio equipment used for sensors for detecting or measuring mobile objects uses a frequency of above 10.5 GHz to 10. 55 GHz, it is required to be visibly displayed a warning that the transmission from the equipment is allowed only in a room.

Vendors shall indicate the following message which is visibly displayed on the cabinet and the cabinet of a product in which the radio equipment is installed.

Radio equipment used for sensor for detecting or measuring mobile objects

No outdoor use

Figure Annex 1-1 Indication by labels

4.1 Method of indication and so on

(1) Method of indication

The method of indication is not specified.

(2) Size, Aspect ratio, Color and the use of a frame of the label

Size, aspect ratio, color and the use of a frame of the label are not specified.

(3) Material

The label shall not be easily peeled off and get dirty.

(4) Font, Color of letter and symbol

The label characters should be clear and easy-to-read.

4.2 Package

Vendors shall indicate the content which is similar the indication by labels in section 4 in an easy-to-watch place of the package of the radio equipment. However, if the package is used for the only purpose of delivering, this is not the case.

Annex 2 Group Segmentation of Radio Frequency and Group Number

Radio equipment used for sensors for detecting or measuring mobile objects is expected to have a wide range of applications depending on the type of object and detection categories (presence, distance, speed, condition and so on).

In the application which requires multiple channels at the same place, there is a usage method in which a frequency is segmented depending on the usage frequency range.
In this annex recommended group segmentation of radio frequency and the numbering of its segment which are specified.

1 Group segmentation of frequency and group number

Table Annex 2-1 Group segmentation for 10.5 GHz to 10.55 GHz band

Group number	Usage frequency range (GHz)
A1	10.500 – 10.505
A2	10.505 – 10.510
A3	10.510 – 10.515
A4	10.515 – 10.520
A5	10.520 – 10.525
A6	10.525 – 10.530
A7	10.530– 10.535
A8	10.535 – 10.540
A9	10.540 – 10.545
A10	10.545 – 10.550

Table Annex 2-2 Group segmentation for 24.05 GHz to 24.25 GHz band

Group number	Usage frequency range (GHz)
B1	24.050 – 24.055
B2	24.055 – 24.060
B3	24.060 – 24.065
B4	24.065 – 24.070
B5	24.070 – 24.075
B6	24.075 – 24.080
B7	24.080 – 24.085
B8	24.085 – 24.090
B9	24.090 – 24.095
B10	24.095 – 24.100
B11	24.100 – 24.105
B12	24.105 – 24.110
B13	24.110 – 24.115
B14	24.115 – 24.120
B15	24.120 – 24.125
B16	24.125 – 24.130
B17	24.130 – 24.135
B18	24.135 – 24.140
B19	24.140 – 24.145
B20	24.145 – 24.150
B21	24.150 – 24.155
B22	24.155 – 24.160
B23	24.160 – 24.165
B24	24.165 – 24.170
B25	24.170 – 24.175
B26	24.175 – 24.180
B27	24.180 – 24.185
B28	24.185 – 24.190
B29	24.190 – 24.195
B30	24.195 – 24.200
B31	24.200 – 24.205

B32	24.205– 24.210
B33	24.210 – 24.215
B34	24.215 – 24.220
B35	24.220 – 24.225
B36	24.225 – 24.230
B37	24.230 – 24.235
B38	24.235 – 24.240
B39	24.240 – 24.245
B40	24.245– 24.250

2 Example of indication

(1) The case where the range of usage frequency is 10.520 GHz to 10.525 GHz:
A5

(2) The case where the range of usage frequency is 10.515 GHz to 10.530 GHz:
A4-6

(3) The case where the range of usage frequency is 24.160 GHz to 24.230 GHz:
B23-36

Reference Test Items in relation to Technical Regulations Conformity Certification for Specified Radio Equipment

(OTRCC, Appendix 1)

Test items in relation to the Technical Regulations Conformity Certification for the radio equipment used for sensors for detecting or measuring mobile objects, should be referred to the Appendix 1, in the Ordinance concerning Technical Regulations Conformity Certification for Specified Radio Equipment.

Volume 2

Contents

Chapter 1 General Descriptions

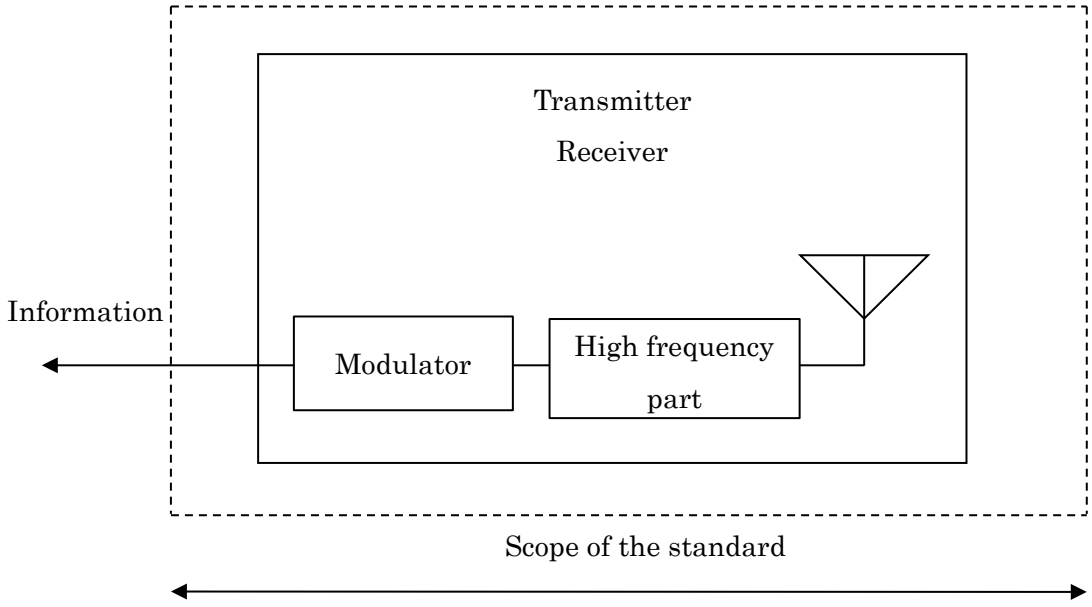
1.1 Outline

The Volume 2 of this standard defines requirements for radio equipment with no carrier cense requirement using frequency in a range of above 57 GHz to 64 GHz which is categorized as a Specified Low-power Radio Station stipulated in Article 6 of the Regulations for Enforcement of the Radio Law and used as sensors for detecting or measuring mobile objects under the category of the radio determination service for mainly detecting information of roaming persons or objects such as presence, location, roam, size and so on, so that the situation of them can be recognized with high accuracy.

1.2 Scope of the standard

Radio equipment of a radio station used for sensors for detecting or measuring mobile objects is as shown in Figure 1.1. This standard defines the said radio equipment.

① The case where high frequency part and modulator of transmitter and receiver are installed in the same cabinet



② The case where high frequency and modulator of transmitter and receiver are installed in a different cabinet

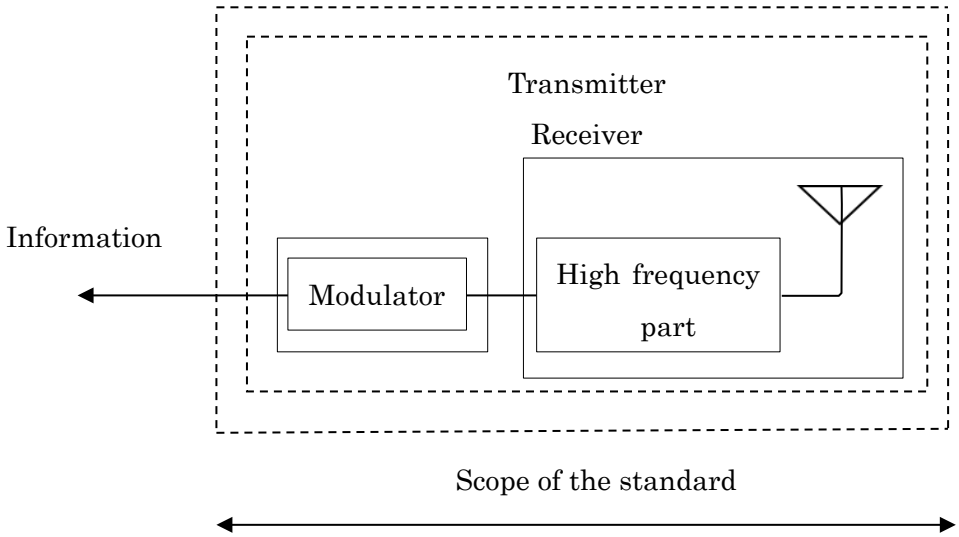


Figure 1.1 Structure of radio equipment used for sensors for detecting or measuring mobile objects

1.3 Reference documents

(1) Reference regulations

In the standard, "RERL" refers to the Regulations for Enforcement of Radio Law, "ORE" refers to the Ordinance Regulating Radio Equipment, "OTRCC" refers to Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment, and "NT" refers to a Notification of the Ministry of Posts and Telecommunications if issued in 2000 or earlier, and a Notification of the Ministry of Internal Affairs and Communications (MIC) if issued in 2001 or later.

Chapter 2 Standard System

2.1 System overview and configurations

A standard system is as shown in the following.

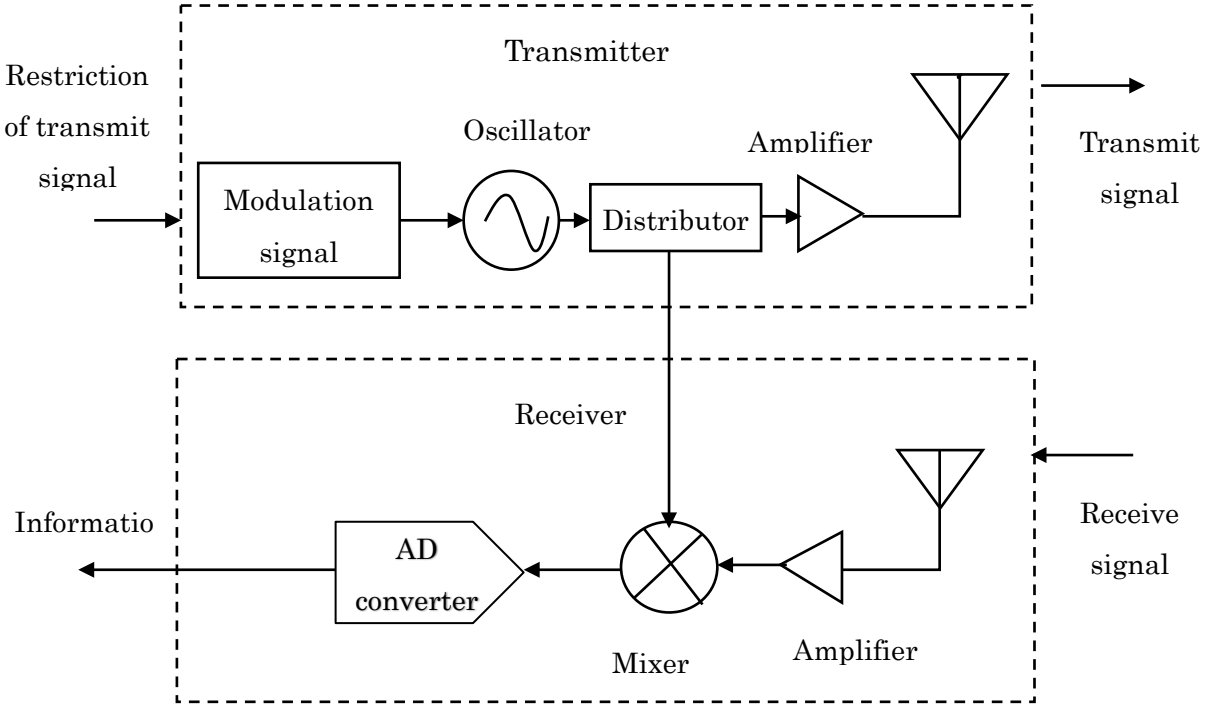


Figure 2.1 Structure of standard system

A transmit signal is frequency modulated with the frequency deviation of about 4 GHz to 7 GHz in the frequency range of 57.0 to 64.0 GHz. Usually, a chirp wave which is formed by sweeping the carrier frequency in a time of several 10 μ sec is transmitted at several tens to several 100 cycles. A mixer applies frequency conversion to a difference between the transmitted signal and the received signal. An AD converter converts that signal to a digital signal. Then the distance information of the object can be obtained by converting the signal which is detected as a frequency difference generated by the time delay proportional to the distance to the object.

In order to suppress the interference with other systems, the transmitter shall have a mechanism to limit the transmission time of 10% or less per 33 msec. It also shall have a mechanism to stop a transmit signal in a specific situation.

2.2 Operational form of system

The operational form of system is not specified. The following are examples of operational forms.

(1) Operation of electronic device by gesture

An operational form in which an electronic device is operated with non-contact by shading the device with a hand or moving a hand near the device.

(2) Motion sensor

An operational form in which entering of a person into a detecting area is recognized.

(3) Home monitoring services, health checks, monitoring at nursing homes, etc.

An operational form in which monitoring is made to see if a normal activity is done or not by detecting the movement of persons at the place where privacy might be violated by installing monitoring cameras.

(4) Highly precise facial recognition

An operational form in which a three-dimensional face authentication is performed by detecting the three-dimensional shape of the face, etc.

Chapter 3 Technical Requirement for Radio Equipment

3.1 General conditions

(1) Type of radio waves (ORE, Article No.49-14)

Type of radio waves shall be F3N.

(2) Operating frequency (NT, No.18 in 2020)

The designated frequency and frequency range are shown in Table 3.1.

Table 3.1 Designated frequency and frequency range

Designated frequency	Designated frequency range
60.5 GHz	57.0 GHz to 64.0 GHz

(3) Usage environmental conditions (ORE, Article No.49-14)

Environment conditions to be used are not stipulated.

3.2 Transmitter

(1) Modulation method (ORE, Article No.49-14)

The modulation method shall be frequency modulation and the modulated wave shall be transmitted by the continuous wave method (excluding the intermittent continuous wave method).

(2) Antenna power (ORE, Article No.49-14)

(NT, No.15 in 2020)

The antenna power shall be 0.01 W (10 dBm) or less.

The equivalent isotropic radiated power shall be 13 dBm or less.

(3) Tolerance of antenna power (ORE, Article No.49-14)

The tolerance of the antenna power, which is the maximum permissible tolerance from designated or fixed antenna power, shall be +50% in the upper limit and -70% in the lower limit.

(4) Tolerance of frequency (ORE, Article 5, Attached Table 1 Note 34(2))

(NT, No.18 in 2020)

The frequency tolerance, which is the maximum permissible departure of the center frequency of the frequency band occupied by emission from the center of assigned frequency, shall be within the designated frequency range indicated in Table 3-2.

Table 3.2 Designated frequency range

Designated frequency range
57.0 GHz to 64.0 GHz

(5) The permissible value of occupied frequency bandwidth

(ORE, Article 6, Attached Table 2, No.28)

(NT, No.19 in 2020)

The permissible value of occupied frequency bandwidth (When the average power which is radiated over the upper frequency limit of the spectrum and the average power below the lower frequency limit of the spectrum are equal to 0.5% of total average power respectively, the bandwidth between the upper limit frequency and the lower limit frequency is called as occupied frequency bandwidth), shall be specified in Table 3-3.

Table 3-3 Permissible value of occupied frequency bandwidth

Frequency band	Permissible value of occupied frequency bandwidth
Radio equipment using frequency of above 57.0 GHz and up to 64.0 GHz	7 GHz

(Note 3.1) In the case where the occupied frequency bandwidth is 4.32 GHz or less, refer to Section 4 of Operation rules in Annex.

(6) The permissible values for the strength of spurious emissions of unwanted emissions

a) Definition (RERL, Article 2-1)

"Spurious emissions" refer to the emissions at one or more radio frequencies outside the necessary frequency bandwidth, including harmonic emissions, subharmonic emissions, parasitic radiations, and intermodulation and excluding out-of-band emissions; it shall be possible to reduce the levels of such emissions without affecting information transmission.

(RERL, Article 2-1-63)

"Out-of-band emissions" refer to the emissions at radio frequencies adjacent to the necessary frequency bandwidth, which are generated during the modulation processes for information transmission. (RERL, Article 2-1-63-2)

"Unwanted emissions" refer to the spurious emissions and the out-of-band emissions.

(RERL, Article 2-1-63-3)

"Spurious band domain" refers to the frequency band where spurious emission is dominant outside of the out-of-band domain. (RERL, Article 2-1-63-4)

"Out-of-band domain" refers to the frequency band where the out-of-band emissions are dominant outside of the necessary frequency band. (RERL, Article 2-1-63-5)

(ORE, Attached Table 3)

"The permissible values for the strength of spurious emissions" refer to the permissible values restricted by the average power of spurious emissions at each frequency which are supplied to the feeder lines in the unmodulated condition. (ORE, Article 7, Attached Table 3, 1 (1))

"The permissible values for the strength of unwanted emissions" refer to the permissible values restricted by the average power of unwanted emissions at each frequency which are supplied to the feeder lines in the modulated condition.

(ORE, Article 7, Attached Table 3, 1 (2))

b) The permissible values for the strength of unwanted emissions (ORE, Article 7, Attached Table 3) The permissible values for the strength of unwanted emissions is shown in Table 3.4.

Table 3.4 The permissible values for the strength of unwanted emissions

Frequency	The permissible values for the strength of unwanted emissions	Note
55.62 GHz or less	-30 dBm/MHz	Spurious domain
Above 55.62 GHz to 57 GHz or less	-26 dBm/MHz	Out-of-band domain
Above 64 GHz to 67.5 GHz or less	-26 dBm/MHz	Out-of-band domain
Above 67.5 GHz	-30 dBm/MHz	Spurious domain

3.3 Receiver

(1) Limit on secondary radiated emissions (ORE, Article 24-2)

The power limit of secondary emission, which does not cause any adverse effect to the functions of other equipment, in case of measuring with the pseudo antenna circuit which has the same electric characteristics as the receiving antenna , shall be shown in Table 3.5.

Table 3.5 Limit on secondary radiated emissions

Frequency band	Limit on secondary radiated emissions
Specified low-power radio station used for sensors for detecting or measuring mobile objects	20 nW

3.4 Controller

A controller shall be equipped with the following devices and functions, and shall conform to each of the following conditions.

(1) Interference prevention function (REAL, Article 6.2-5)

(ORE, Article 9.4-7)

The function shall be able to identify whether the receiving wave is reflected of the transmitting wave or transmitted from other radio station by examining characteristics which is a modulation method or other properties of the receiving wave.

(2) Transmission time restricting device (ORE, Article 49-14)
(NT, No.17 in 2020)

Total transmission time per unit time shall be 3.3 ms or less. The unit time is 33 ms or more.

(3) Function to halt a radio wave emission (ORE, Article 49-14)

In the case where radio equipment used for sensors for detecting or measuring mobile objects and other kinds of equipment are installed in a same cabinet and simultaneous multiple emissions of radio waves are possible, shall be equipped the function which halt emission only frequency range above 57.0 to 64.0 GHz or multiple radio waves including a radio wave of using frequency. Here, the other kinds of radio equipment are listed in Tables of ORE, Article 14-2-1-1 and Article 14-2-2-1.

Furthermore, in the case where radio equipment used for sensors for detecting or measuring mobile objects has a function to emit a radio wave only for the purpose, the function to halt a radio wave emission shall be equipped.

3.5 Antenna

(1) Antenna structures

There is no specific provision for the antenna structure.

(2) Gain of the antenna

There is no specific provision for the gain of the antenna.

3.6 Others

(1) Housing (ORE, Article 49-14)

The high frequency part and the modulator except an antenna system cannot be easily opened. Further, in the case where the high frequency part and the modulator are housed in different cabinets, take measures to maintain the similarity as the transmitting device and each cabinet cannot be easily opened.

(2) Mark in relation to operating condition

There is no specific provision for the mark in relation to operating condition.

(3) Mark in relation to technical regulations conformity certification (OTRCC, Article 8)

A mark in relation to technical regulations conformity certification in the specified format shall be visibly displayed on the radio equipment.

3.7 The permissible values for the strength exposed a human body to a radio wave

(ORE: Article 14-2)

(NT: No. 20 and No.21 in 2020)

In the case where radio equipment used for sensors for detecting or measuring mobile objects and other kinds of equipment are installed in a same cabinet and simultaneous multiple emissions of radio waves are possible, the strength of a radio wave which is exposed a human body shall be one (1) or less as the total radiation ratio which is calculated by the method described in the notification. Here, the other kinds of radio equipment are listed in Tables of ORE Article 14-2-1-1 and Article 14-2-2-1. The method described in the notification means the method specified in NT No.21 of 2020.

In the case where a radio equipment used for sensors for detecting or measuring mobile objects transmits a radio wave alone, the strength of a radio wave which is exposed a human body shall be 2 mW/cm^2 or less per $1cm^2$ of arbitrary body surface.

Chapter 4 Measurement Methods

Measurement methods shall be in accordance with the Notification of the Ministry of Internal Affairs and Communications (Note 4.1 as explained below) which is specified in item 1(3) of Appended Table 1 of OTRCC or methods equivalent to those specified in the Notification or advanced methods. For other test items which are not notified in the above methods, measurements methods generally used shall be applied.

Note 4.1: This ordinance refers to the Notification of Ministry of Internal Affairs and Communications No.88 "The testing method for the characteristics examination" (January 26, 2004) as of the date of issue of this revised standard (version 2.0 issued on September 28, 2020). However if the MIC notification and the contents of the MIC notification are revised in future, measurement methods shall be in accordance with the latest versions of the MIC notification and the contents.

Annex Operational Rule

1 Outline

For the introduction of a specified low-power radio station used for sensors for detecting or measuring mobile objects that uses a radio wave of a frequency above 57 GHz to 64 GHz (hereinafter referred to as "radio equipment for mobile detection sensors") (Revision of related ministerial ordinance and notification on 30 January, 2020), the 60 GHz Band Radio Equipment Working Group of Land Radio Communication Committee in Information and Communication Technology Subcommittee of Information and Communications Council examined radio coexistence with other radio equipment. Based on the results of this radio coexistence study, this operational rule has been established.

Even if the specifications and other requirements of this standard (ARIB STD-T73 Volume 2) including this operation rules are met, if problems such as interference with other radio equipment occur, the operational rules will be reviewed.

1.1 Purposes

The purpose of this operational rule is to avoid harmful radio interference with other radio equipment, to make effective use of frequencies and to ensure convenience for users in operating radio equipment used for sensors for detecting or measuring mobile objects.

Here, harmful radio interference means causing continuous and serious failure to functions of other radio equipment (Article 82 of the Radio law).

1.2 Scope of application

This operational rule applies to users, manufactures and sellers (hereafter referred to as “vendors”). A company which manufacture and sell as parts or incorporate products into radio equipment used for sensors for detecting or measuring mobile objects are also included in vendors.

1.3 Target system

This operational rule covers the following system.

(1) Radio equipment used for sensors for detecting or measuring mobile objects: ARIB STD-T73 Volume 2

1.4 Basic agreements

(1) Clarification of problems

Vendors shall take in good faith preventive measures including warning messages in operation manuals and PR activities for prevention of radio interference, etc.

(2) Cooperate responses

In the case that a radio equipment used for sensors for detecting or measuring mobile objects, has caused radio interference which is harmful to other radio equipment, the users and/or vendors shall cooperate in good faith for avoidance and reduction of the radio interference.

2 Consideration of radio coexistence with other radio equipment

Table Annex-1 shows the results of the study of radio coexistence with other radio equipment. This table is based on the Report of "Land Radio Communication Committee" of "Information and Communication Technology Subcommittee" of "Information and Communications Council" dated 8 October 2019.

Table Annex-1 Consideration of radio coexistence with other radio equipment

Frequency (GHz)	Other radio equipment (interfered) [Application]	Result of radio coexistence study
50.3 – 63.57	Earth exploration satellite [low orbit satellite]	Studies were made on receiving frequencies of 57.29 GHz and 60 GHz. No harmful interference.
54.25 – 66.78	Broadcasting [FPU in 55 GHz band]	Although harmful radio wave interference may occur under a specific facing conditions of interfered equipment and the interfering equipment, radio coexistence is feasible by operation.
55.78 – 59.0	Telecommunication, Public communication, General service [Entrance radio circuit in 58 GHz band]	Out of scope for study (no assignment of license)

57.0 – 66.0	Low-Power Data Transmission System (60 GHz Radio system)	
	[Data and image transmission (Wi-Gig, etc.)]	Although there is interference to the carrier sense of the interfered system and harmful radio wave interference during operation of the interfered system, it is considered that radio coexistence is possible.
	[Millimeter-wave image transmission system]	The separation distance to avoid harmful radio wave interference is small, therefore it is deemed that sharing is possible.
60.0 – 61.0	Millimeter-Wave radar equipment for specified low power radio station	
	[Car radar]	It seems that radio coexistence is possible according to desktop simulations. However, after commercializing an interfered device, it is desirable that the technical conditions are reviewed and the act of evaluation by experiments.
	[Obstruction detecting device]	It seems that radio coexistence is possible based on the result which was obtained by experiments. However, there is a difference between results obtained by desktop simulation and by experiments. It is considered that the difference is due to the distance measuring method (signal processing

		method) of the obstruction detecting device, therefore, if there is a change in the distance measuring method, re-verification is desirable.
58.2 – 59.0 64.0 – 65.0 76.0 – 77.5 79.0 – 94.0 94.1 – 116.0	Radio astronomy	There is harmful radio wave interference due to unwanted emission from the radio equipment for the sensor for detecting or measuring mobile objects. It may be necessary to reduce unnecessary emission as much as possible and to limit the area of the use of the equipment.

3 Clarification of problems

(1) Operation manuals

Vendors shall describe the note of the following messages in operation manuals of the radio equipment for the sensor for detecting or measuring mobile objects.

The frequency band used for the radio function of the sensor for detecting or measuring mobile objects is also used for radio equipment of other radio systems.

1. The use of the radio function which is the sensor for detecting or measuring mobile objects may cause influence on radio astronomy operations. When the equipment is used near a radio astronomy observatory, please contact the following address.
2. If the radio wave emitted from this equipment causes a harmful interference to other radio equipment which is indicated in the below table, please take actions such as to remove this equipment from the interfering area. If radio interference remains, promptly stop the radio emission and contact the following address.

List of other radio equipment

Frequency (GHz)	Other radio equipment (interfered) [Application]
54.25 – 66.78	Broadcasting [FPU in 5 GHz band]
57.0 – 66.0	Low-Power Data Transmission System (60 GHz Radio system) [Data and image transmission (Wi-Gig, etc.)] [Millimeter-wave image transmission system]
60.0 – 61.0	Millimeter-Wave radar equipment for specified low power radio station [Obstruction detecting device]
58.2 – 59.0 64.0 – 65.0 76.0 – 77.5 79.0 – 94.0 94.1 – 116.0	Radio astronomy

Contact us at: _____

Note: The "wireless function of the sensor for detecting or measuring mobile objects" described in the operation manual refers to the function of performing a radiolocation service by radio equipment for sensor for detecting or measuring mobile objects.

(2) Catalogs, brochures and websites

Vendors shall write similar warning message as shown in the operation manual in catalogs, brochures, websites, etc. of radio equipment for a sensor for detecting or measuring mobile objects.

4 Cooperation

4.1 Cooperation for interference avoidance

In case that harmful radio interference is caused to radio equipment other than the radio equipment for sensor for detecting or measuring mobile objects, by the use of a radio equipment for sensor for detecting or measuring mobile objects which is manufactured, sold and installed by a vendor, and that it is needed to discuss a radio interference avoidance measure between the user of the radio equipment for sensor for detecting or measuring mobile objects and the management representative of the interfered radio equipment, the vendor shall, in good faith, extend cooperation to avoid the radio interference.

In case that the harmful interference to radio equipment other than the radio equipment for sensor for detecting or measuring mobile objects is caused after a radio equipment for sensor for detecting or measuring mobile objects had started its operation, the radio emission shall be promptly stopped, and an interference avoidance measure shall be taken.

4.2 Channel plan (A radio equipment for sensor for detecting or measuring mobile objects)

The frequency band used by the radio equipment for sensor for detecting or measuring mobile objects enables a wide bandwidth communication and setting of the wide occupied bandwidth is allowed generally. In order to reduce harmful radio wave interference to other radio equipment, the following channel plans are established, and the recommended frequency bands to be used are set for each occupied frequency bandwidth.

4.2.1 Channel number and operating frequency

Table Annex-2 Segment of group in 57.0 GHz to 64. GHz frequency band

Channel number	Usage frequency range (GHz)	Note
C1	57.00 – 57.24	
C2	57.24 – 59.40	IEEE802.11ad Ch1
C3	59.40 – 60.00	IEEE802.11ad Ch2 (partial)
C4	60.00 – 61.00	IEEE802.11ad Ch2 (partial), Millimeter-wave radar
C5	61.00 – 61.56	IEEE802.11ad Ch2 (partial)
C6	61.56 – 63.72	IEEE802.11ad Ch3
C7	63.72 – 64.00	IEEE802.11ad Ch4 (Partial)

4.2.2 Example of indication

(1) The case where the usage frequency range is 60.10 GHz to 60.9 GHz

C4

(2) The case where the usage frequency range is 59.95 GHz to 60.95 GHz

C3 – C4

(3) The case where the usage frequency range is 57.00 GHz to 64.0 GHz

C1 – C7

4.2.3 Occupied frequency bandwidth and recommendable channel number

Table Annex-3 Occupied frequency bandwidth and recommendable channel number

Occupied frequency bandwidth	Recommendable channel number	Wi-Gig channel number
1.0 GHz or less	C4	Ch2
Above 1.0 GHz to 2.16 GHz	C3 – C5 (C2: non-recommendable) (C6: non-recommendable)	Ch2 (Ch1) (Ch3)
Above 2.16 GHz to 4.32 GHz	C2 – C5 (C3 – C6: non-recommendable)	Ch1, Ch2 (Ch2, Ch3)
Above 4.32 GHz to 4.56 GHz	C1 – C5	Ch1, Ch2
Above 4.56 GHz to 6.72 GHz	C1 – C6	Ch1, Ch2, Ch3
Above 6.72 GHz and 7.0 GHz	C1 – C7	Ch1, Ch2, Ch3, Ch4

4.2.4 Occupied frequency bandwidth, transmitting time, recommendable antenna power and equivalent isotropically radiated power

In a system which has narrow occupied frequency bandwidth, a concern that the opportunity of causing interference to other systems will increase, because the power density per frequency increases even if the peak power is the same. Therefore, the recommendable antenna power and equivalent isotropically radiated power in the occupied frequency bandwidth are defined below. However, this does not apply if the system is guaranteed to be used in a specific area where interference does not happen because of sufficient separation distance from other systems and so on.

Table Annex-4 Occupied frequency bandwidth, transmitting time, recommendable antenna power and equivalent isotropically radiated power

Occupied frequency bandwidth	Antenna power	Equivalent isotropically radiated power
1.0 GHz or less	10 mW x k1 or less	13 dBm + $10\log_{10}$(k1) or less
Above 1.0 GHz to 4.32 GHz	10 mW x k2 or less	13 dBm + $10\log_{10}$(k2) or less
Above 4.32 GHz to 7.0 GHz	10 mW or less	13 dBm or less

However, k1 and k2 are defined as follows when fw is the occupied frequency bandwidth (GHz) and Tt is the maximum value (msec) of the total transmission time in an arbitrary 33 msec time.

$k1 = \mathrm{Min}((1/4.32) \times (3.3/Tt), 1)$

$k2 = \mathrm{Min}((fw/4.32) \times (3.3/Tt), 1)$

Here, Tt shall be 3.3 msec or less.

Appendix Test Items in relation to Technical Regulations Conformity Certification for Specific Radio Equipment

(OTRCC, Appendix 1)

Test items in relation to the Technical Regulations Conformity Certification for the radio equipment used for sensors for detecting or measuring mobile objects, should be referred to the Appendix 1, in the Ordinance concerning Technical Regulations Conformity Certification for Specified Radio Equipment.

SENSORS FOR DETECTING OR MEASURING
MOBILE OBJECTS
FOR SPECIFIED LOW POWER RADIO STATION

ARIB STANDARD

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