



ARIB STD-T66

**SECOND GENERATION LOW POWER DATA  
COMMUNICATION SYSTEM/  
WIRELESS LAN SYSTEM**

**ARIB STANDARD**

VERSION 2.1

ARIB STD-T66

Version 1.0	December	14th	1999
Version 2.0	March	28th	2002
Version 2.1	March	26th	2003

Association of Radio Industries and Businesses (ARIB)

**General notes for the English version of the ARIB standard:**

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The original “Second-Generation Low-Power Data Communication System/Wireless LAN System ARIB standard Version 2.1 (ARIB STD-T66)” is written in Japanese and was approved by the 48<sup>th</sup> Standard Assembly Meeting of March 26, 2003. This document is the translation of that standard from Japanese into English. In case of discrepancy or dispute, the Japanese text shall prevail.

## Table of Standard Revisions

STD Serial Number: ARIB STD-T66

Name of Standard: Second-Generation Low-Power Data Communication System/Wireless  
LAN System

Date established: December 14, 1999

<Note>

Related ministerial ordinances, announcements, etc.:

Year 1999 ministerial ordinance No. 75 of MPT (Ministry of Posts and Telecommunications)  
(Partial revision of Radio Law Enforcement Regulations)

Year 1999 ministerial ordinance No. 76 of MPT (Partial revision of Radio Equipment  
Regulations)

Year 1999 announcement No. 757 of MPT

Revision Number	Date of Revision	Contents of Revision	Remarks
2.0	March 28, 2002	<ul style="list-style-type: none"> <li>– The phrase “and amateur radio stations” was added to the introduction.</li> <li>– In 3.2 (1) a), the phrase “and orthogonal frequency division multiplexing systems” was added; the phrase “or a hybrid system combining FH and orthogonal frequency division multiplexing systems (OFDM system)” was added to a).</li> <li>– In 3.2 (1) c), the phrase “and OFDM systems” was added.</li> <li>– In 3.2 (2) a), the phrase “or hybrid systems of FH and OFDM” was added.</li> </ul>	<p>Determined at the 42nd Standard Assembly Meeting</p> <ul style="list-style-type: none"> <li>– To broaden coverage to interference affecting amateur radio stations</li> <li>– In line with the revision of Radio Equipment Regulations (RE) (Year 2002 ministerial ordinance [MO] No. 21 of Ministry of Public Management, Home Affairs, Posts and Telecommunications [MPHPT])</li> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> </ul>

		<ul style="list-style-type: none"> <li>– In 3.2 (2) b), the phrase “and OFDM system” was added.</li> <li>– In Fig. 2.1 (1), the phrase “or a hybrid system combining FH and OFDM systems” was added.</li> <li>– In Fig. 2.1 (2), part of the previous description was revised to “An FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems using the frequency band of 2,400 to lower than 2,427 MHz or beyond 2,470.75 to 2,483.5 MHz.”</li> <li>– In Fig. 2.1 (3), the phrase “or OFDM system” was added.</li> <li>– In 3.2 (3), “Note that they represent the tolerance for the maximum rated antenna power and that no upper and lower limits of the tolerance are regulated in the case of antenna power reduction for communications reasons.” was added.</li> <li>– 3.2 (6) was revised to “Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency <math>f</math> other than frequency band used shall be as follows.”</li> <li>– In 3.2 (7), the phrase “or a hybrid system combining FH and OFDM systems” was added.</li> <li>– After 3.2 (9), (10) was added and subsequent paragraphs were renumbered accordingly.</li> </ul>	<ul style="list-style-type: none"> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT) and for clarification</li> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>– For clarification</li> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>– In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> </ul>
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		<ul style="list-style-type: none"> <li>- 3.2 (11) was revised to “When a simple FH system (except hybrid system) is used, total frequency dwell time at an arbitrary frequency within the time period obtained by multiplying 0.4 seconds by the process gain shall be 0.4 seconds or less.”</li> <li>- From 3.4.1 (2), the phrase “When the frequency band of 2,427 - 2,470.75 MHz is used,” was deleted.</li> <li>- In 3.6 (2) a), “2.14dB” was revised to “12.14dB.”</li> <li>- 3.6 (2) was revised to “The absolute gain of the transmitting antenna shall be 12.14 dB or less. However, when the equivalent isotropic radiated power (equivalent isotropic radiated power in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems) is equal to or less than the value obtained by applying an antenna power with the mean power of 10 mW with its absolute gain being 12.14 dB, the shortage shall be compensated for by the gain of the transmitting antenna (Note that mean power is 10 mW in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems; however, mean power of 3 mW in the 1 MHz bandwidth is applied if the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems is employed and the frequency band of 2,427 - 2,470.75 MHz is used.)” all</li> </ul>	<ul style="list-style-type: none"> <li>- In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>- Because there is no need to limit the frequency</li> <li>- In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>- In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> </ul>
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		<p>of 3.6 (2) is now designated as a).</p> <ul style="list-style-type: none"> <li>- In 3.6 (2), b) was added.</li> <li>- 1.1 in Annex 2 was revised to “The purpose of these guidelines is to prevent harmful interference with RFID systems (premises radio stations and specified low-power radio stations, both for RFID) operating in the frequency band of 2,427 - 2,470.75 MHz and amateur radio stations operating in the frequency band of 2,400 - 2,450 MHz, with the ultimate goals of ensuring effective use of frequencies and improving convenience for users in the operation of second-generation low-power data communications systems radio stations operating in the frequency band of 2,400 - 2,483.5 MHz. Note that “harmful interference” refers to successive and serious interference to the function of other radio equipment (RL: Article 82).”</li> <li>- In 1.2 in Annex 2, “those (called “experts” in this document) who design, manufacture, import, sell, set, or maintain the system” was revised to “those who manufacture, sell, install, operate, or maintain such systems (hereinafter experts).”</li> </ul>	<ul style="list-style-type: none"> <li>- In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> <li>- The frequency band was expanded to 2,400 - 2,483.5 MHz. Interference affecting amateur radio stations was also considered and harmful interference was defined.</li> <li>- To allow broader application</li> </ul>
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		<ul style="list-style-type: none"> <li>– After 1.3 (2) in Annex 2, the phrases “RFID equipment using the frequency hopping system for specified low-power radio stations ARIB STD-T81,” and “(5) Amateur radio stations” were added, and (3) became item (4); the frequency bands for the radio stations were added.</li> <li>– The frequency band of each radio equipment was appended to each item of 1.3 in Annex 2.</li> <li>– In 1.4 (2) in Annex 2, “continuously interfere with other radio equipment to a great extent.” was revised to “harmful interference to other radio equipment.”</li> <li>– In 1.4 (3) in Annex 2, “interference to other radio equipment” was revised to “harmful interference to other radio equipment.”</li> <li>– In 1.4 (3) in Annex 2, “premises station” was revised to “premises radio station.”</li> <li>– In the notes for 2.1 in Annex 2, the phrases “as well as amateur radio stations (radio stations requiring licenses),” “or amateur radio stations,” and “or amateur radio stations” were added.</li> <li>– In the notes for 2.1 in Annex 2, “In case that RF interference occurs” was revised to “In the event that this equipment causes harmful interference.”</li> </ul>	<ul style="list-style-type: none"> <li>– In consideration of RFID systems using specified low-power radio stations frequency hopping systems, and amateur radio stations, and for clarification</li> <li>– For clarification</li> <li>– For consistent terminology</li> <li>– For consistent terminology</li> <li>– For consistent terminology</li> <li>– To broaden coverage to interference affecting amateur radio stations</li> <li>– For consistent terminology</li> </ul>
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		<ul style="list-style-type: none"><li>- In 2.4 (2) in Annex 2, the phrases “(refer to Section 2.4.1 for details)” was added.</li><li>- In 2.4 (3) in Annex 2, the phrases “(refer to Section 2.4.2 for details)” was added.</li><li>- In 2.4 (4) in Annex 2, “(refer to Section 2.4.3 for details)” was added.</li><li>- In Table 2.1 in Annex 2, “FH – OFDM hybrid system” was added, and “In the future” was deleted.</li></ul>	<ul style="list-style-type: none"><li>- For clarification</li><li>- For clarification</li><li>- For clarification</li><li>- In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li></ul>
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		<p>– In 2.4.2 in Annex 2, “Note that all values are obtained assuming that the antenna gain of the second-generation low-power data communications system radio station is 2.14 dBi; the values are obtained by calculating radio wave propagation loss using the 3.5th power rule. On the other hand, as radio stations subject to interference, the specifications for a typical premises radio station for the RFID system (Model A in the RCR TR-1 RFID System Research and Development Report) constitute the following parameters: antenna power of 300 mW, interrogator antenna gain of 11 dBi, interrogator feeder line loss of 0 dB, responder antenna gain of 2 dBi, responder total loss of 10 dB (including antenna gain and feeder line loss), communication distance of 5 m, receiving bandwidth of 32 kHz, receiving equipment noise power of -118 dBm, and propagation margin of 10 dB. Further, it is assumed that harmful interference does not occur if interference power level is at least 10 dB below that of the standard receiving input.” was added.</p>	<p>– To specify calculation conditions</p>
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		<ul style="list-style-type: none"> <li>- In Table 2.2 in Annex 2, “OFDM” was added and under the table “Note: The interference-causing radiuses given here are estimated distances from second-generation low-power data communications systems to RFID systems (premises radio stations). This table may have different values for distances between second-generation low-power data communications systems or for distances between second-generation low-power data communications systems and amateur radio stations.” was added.</li> <li>- After 2.4.4 in Annex 2, 2.5 was added and the paragraphs renumbered.</li> <li>- In 3.1 (1) in Annex 2, “or amateur radio station” was added.</li> <li>- In 4.1 in Annex 2, the phrases “or amateur radio station” and “or the licensee of the amateur radio station” were added, and “when interference happens” was revised to “if... suffers harmful interference.”</li> <li>- In 4.2 in Annex 2, “premises station/specified station is in operation” was revised to “a premises radio station for RFID systems already operates,” and “In case the second one’s system damages the radio stations in operation with interference” was revised to “In the event that a second-generation low-power data</li> </ul>	<ul style="list-style-type: none"> <li>- In line with the revision of RE (Year 2002 MO No. 21 of MPHPT); notes are added for clarification.</li> <li>- Information related to indications for outdoor fixed installations</li> <li>- To broaden coverage to interference affecting amateur radio stations</li> <li>- To broaden coverage to interference affecting amateur radio stations and for consistent terminology</li> <li>- For clarification of licensed premises radio stations, and for consistent terminology</li> </ul>
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		<p>communications system causes harmful interference to a pre-existing premises radio station for RFID systems.”</p> <ul style="list-style-type: none"> <li>- In Annex 2, 4.3 was added.</li> <li>- In the Introduction in Annex 3, the phrase “the frequency band of 2,400 - 2,450 MHz used by amateur radio stations” was added.</li> <li>- In the operating manual for 1 (1) in Annex 3, “as well as amateur radio stations” and “or amateur radio stations” were added, and “In case that RF interference occurs” was revised to “In the event that this equipment causes harmful interference.”</li> <li>- In 1 (3) in Annex 3, the table of ii) was deleted, and the phrases “DSSS system: DS; FHSS system: FH; OFDM system: OF; Hybrid system: HY; Other: XX” was added.</li> </ul>	<ul style="list-style-type: none"> <li>- To explain restrictions placed on sector directional antennas</li> <li>- To broaden coverage to interference affecting amateur radio stations</li> <li>- To broaden coverage to interference affecting amateur radio stations and for consistent terminology</li> <li>- In line with the revision of RE (Year 2002 MO No. 21 of MPHPT)</li> </ul>
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		<ul style="list-style-type: none"> <li>- In 1 in Annex 3, (4) was added.</li> <li>- In 2 (1) in Annex 3, “or amateur radio station” was added.</li> <li>- In 3 (1) in Annex 3, the phrases “or amateur radio station” and “or the licensee of amateur radio station” were added, and “when interference happens” was revised to “if... suffers harmful interference.”</li> <li>- In 3 (2) in Annex 3, “mobile object identification system is already in operation” was revised to “a premises radio station for RFID systems already operates,” and “In case the second one’s system damages the radio station in operation with interference” was revised to “In the event that a second-generation low-power data communications system causes harmful interference to a pre-existing premises radio station for RFID systems.”</li> <li>- Corrections of other items, such as clerical, grammatical, or idiomatic errors</li> </ul>	<ul style="list-style-type: none"> <li>- Information related to indications for outdoor fixed installations</li> <li>- To broaden coverage to interference affecting amateur radio stations</li> <li>- To broaden coverage to interference affecting amateur radio stations and for consistent terminology</li> <li>- For clarification of licensed premises station, and for consistent terminology</li> </ul>
2.1	March 26, 2003	<ul style="list-style-type: none"> <li>- In 2.4 (2) in Annex 2, “Note that for radio equipment capable of emitting radio waves of multiple modulation systems, these modulation systems shall be stated by separating them with a slash as in “DS/OF.”” was added.</li> <li>- In 2.4 (3) in Annex 2, “Note that for radio equipment</li> </ul>	<p>Determined at the 48th Standard Assembly Meeting</p> <ul style="list-style-type: none"> <li>- For indication of symbols on radio equipment using multiple modulation systems</li> <li>- For indication of symbols on radio equipment using</li> </ul>

		<p>capable of emitting radio waves of multiple modulation systems, whose interference-causing radius varies depending on the modulation system, these modulation systems and interference-causing radiuses shall also be stated by separating the indications representing such modulation systems and interference-causing radiuses with a slash as in “DS2/OF1.” was added.</p> <ul style="list-style-type: none"> <li>– In 1 (3) (ii) in Annex 3, “Note that for radio equipment capable of emitting radio waves of multiple modulation systems, these modulation systems shall be stated by separating them with a slash as in “DS/OF.” was added.</li> <li>– In 1 (3) (iii) in Annex 3, “Note that for radio equipment capable of emitting radio waves of multiple modulation systems, whose interference-causing radius varies depending on the modulation system, these modulation systems and interference-causing radiuses shall also be stated by separating the indications representing such modulation systems and interference-causing radiuses with a slash as in “DS2/OF1.” was added.</li> </ul>	<p>multiple modulation systems</p> <ul style="list-style-type: none"> <li>– For indication of symbols on radio equipment using multiple modulation systems</li> <li>– For indication of symbols on radio equipment using multiple modulation systems</li> </ul>
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## Introduction

The Association of Radio Industries and Businesses (hereinafter ARIB) establishes ARIB Standards, which are standard radio equipment specifications and other basic requirements applicable to a wide range of radio systems, through a process that involves the participation of radio equipment manufacturers, carriers, broadcasters, users, and other parties.

ARIB standards constitute voluntary standards established through the compilation of government technical regulations (mandatory standards) – regulations instituted to ensure effective use of frequencies and avoid interference with other users – and voluntary standards established to improve convenience for radio equipment manufacturers and users by helping promote proper radio equipment quality and compatibility.

This ARIB standard – the standards pertaining to “Radio Equipment for Second-generation Low-power Data Communications Systems Radio Stations” and “Wireless LAN Systems’ Equipment” – was established with the consensus of interested parties (e.g., radio equipment manufacturers, users) at the Standard Assembly Meeting held by ARIB attended by representatives from a wide range of entities, both foreign and domestic, thereby ensuring fairness and transparency in the establishment of the standards.

Radio equipment as defined in this ARIB Standard uses the frequency band of 2,400 - 2,483.5 MHz. The term “the second-generation” has been added to the title of the Standard to differentiate such equipment from the radio equipment previously used for low-power data communications systems radio stations (which uses the frequency band of 2,471 - 2,497 MHz and is prescribed by RCR STD-33). The frequency band used by second-generation low-power data communications systems overlaps those of radio frequency identification systems (otherwise known as RFID systems, comprised of premises and specified low-power radio stations) and amateur radio stations, thus raising the prospect of radio-interference-induced problems. To avoid interference within the same frequency band, the “Operational Guidelines for Second-generation Low-power Data Communications Systems Radio Stations” was prepared. Attached hereto as a reference, these guidelines set out various co-frequency interference avoidance and troubleshooting procedures.

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It is our sincere hope that radio equipment manufacturers, testing organizations, users, and other parties will frequently come to refer to and rely on this ARIB Standard.

This ARIB Standard was established in a joint effort with the Telecommunication Technology Committee (TTC).

### Topics addressed in this standard

- ◆ Regulations and the standard are described from Chapters 1 through 4.
- ◆ Measurement methods appropriate for the standard are described in Chapter 5.
- ◆ Annex 1 describes test items associated with specified radio equipment.
- ◆ Annex 2 describes methods of preventing and troubleshooting co-frequency interference with RFID systems.
- ◆ Annex 3 outlines Annex 2.
- ◆ For technical and other requirements pertaining to radio equipment described in this ARIB Standard, relevant regulations are attached.

Law- and ordinance-related abbreviations in brackets represent the following:

RL:	Radio Law
OM:	Ordinance of the Ministry of Posts and Telecommunications if issued in 2000 or earlier, and Ordinance of the Ministry of Public Management, Home Affairs and Posts and Telecommunications if issued in 2001 or later.
AM:	Announcement of the Ministry of Posts and Telecommunications if issued in 2000 or earlier, and Notification of the Ministry of Public Management, Home Affairs and Posts and Telecommunications if issued in 2001 or later.
RLE:	Radio Law Enforcement Regulations
RE:	Radio Equipment Regulations
RTCSR:	Regulations Pertaining to Technical Regulations Conformity Certification for Specified Radio Equipment
TR:	Terminal and Other Equipment Regulations
RTADT:	Regulations Pertaining to Technical Regulations Conformity Approval and Design Authentication for Terminal Equipment



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## Chapter 1 General

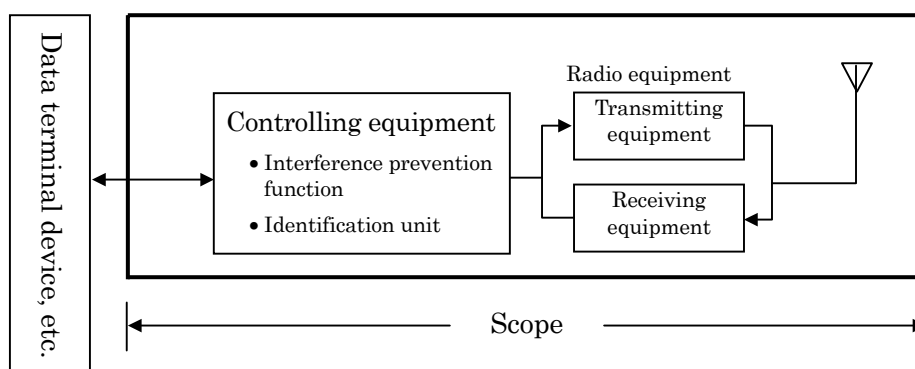
### 1.1 Outline

This ARIB Standard prescribes “Radio Equipment for Second-generation Low-power Data Communications Systems Radio Stations” and “Wireless LAN Systems’ Equipment” performing radio communications primarily for data communication (including equipment connected to other facilities through telecommunications circuit) that use the frequency band of 2,400 - 2,483.5 MHz among radio stations for low-power data communications systems regulated in Article 6 paragraph 4 item 4 of the Radio Law Enforcement Regulations.

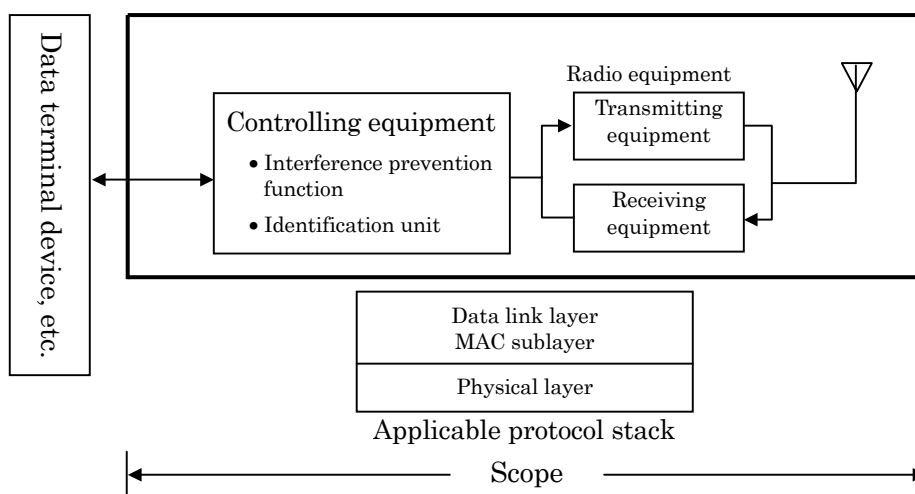
### 1.2 Scope

Second-generation low-power data communications systems radio stations and wireless LAN systems are comprised of radio or infrared equipment, data terminal devices, and other devices (including equipment connected to other facilities through telecommunications circuit) as shown in Fig. 1.1.

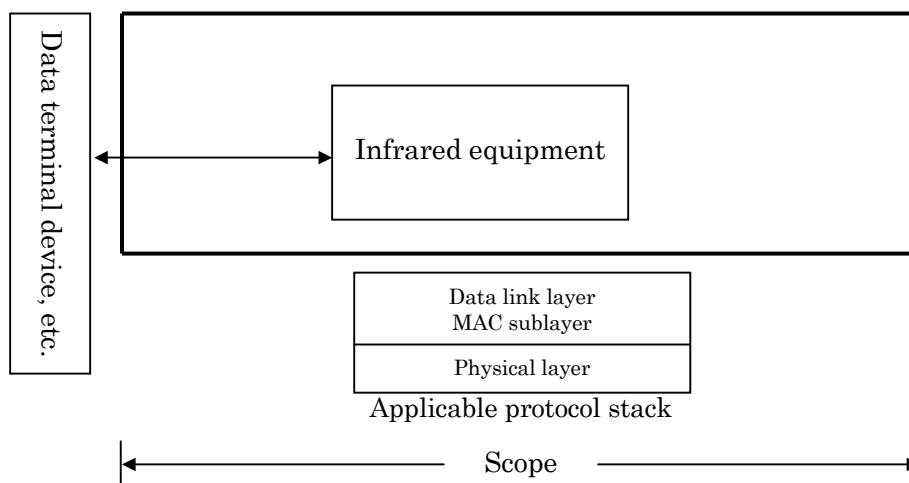
This ARIB Standard prescribes these particular radio and infrared equipment.



(1) Second-generation low-power data communications system radio station



(2) Wireless LAN system's radio equipment



(3) Wireless LAN system's infrared equipment

Fig. 1.1 Structure of second generation low-power data communication system radio station and wireless LAN system

### 1.3 Normative Documents

The following document is used as a normative document in this ARIB Standard:

- (1) Information technology – Telecommunications and Information Exchange Between Systems – LAN/MAN Specific Requirements – Specific requirements – Part 11: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications (ISO/IEC 8802-11)

## Chapter 2 Standard System

### 2.1 System outline

Second-generation low-power data communications systems and wireless LAN systems are designed to perform radio or infrared transmission of digitized information signals.

Note that requirements of the protocol are not prescribed. However, requirements of the protocol prescribed in ISO/IEC 8802-11 shall be used for interconnected systems (hereinafter interconnected systems).

### 2.2 System configuration

Not particularly regulated.

## Chapter 3 Technical Requirements of Radio Equipment

### 3.1 General conditions

- (1) Communication method (RE: Article 49-20)  
Communication method (including a spread spectrum system) that transmits digital signals and that is one-way communication, simplex operation, semi-duplex operation, or duplex operation shall be used.
- (2) Contents of communication  
Digitized data signals shall be mainly transmitted.
- (3) Frequency band (RLE: Article 6)  
Frequency band of 2,400 - 2,483.5 MHz shall be used.
- (4) Environmental operating conditions  
Not particularly regulated.

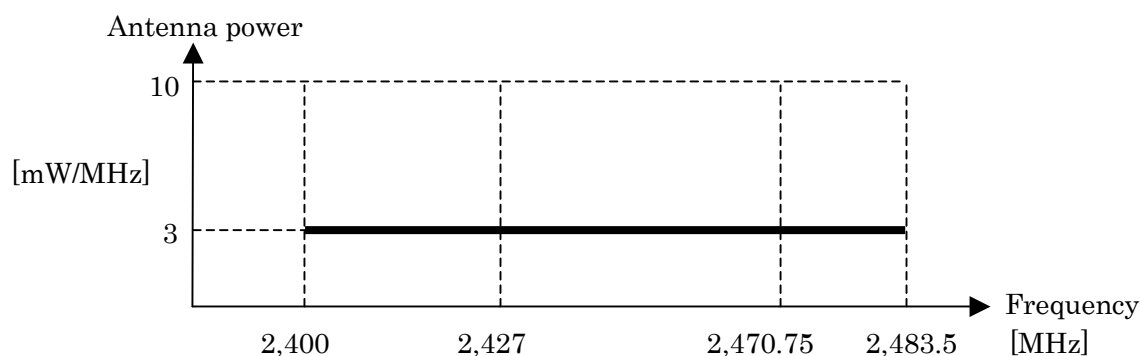
### 3.2 Transmitting equipment

- (1) Modulation system (RE: Article 49-20)
  - a. Spread spectrum and orthogonal frequency division multiplexing systems  
For spread spectrum systems, a Direct Sequence system (DS system), a Frequency Hopping system (FH system), a hybrid system combining these systems, or a hybrid system combining FH and orthogonal frequency division multiplexing systems (OFDM system) shall be used.  
DS: A pseudo-random spreading code is combined with the information sequence to implement spreading function. The resulting signal modulates a carrier signal and consequently, the information signal is spread to a wide band signal.  
FH: The transmitting signal is a sequence of pulses at different frequencies over a large bandwidth. This sequence is called as frequency hopping pattern.
  - b. Modulation type for information signal  
Information modulation types for information transmission in spread spectrum systems are not particularly regulated.
  - c. Modulation techniques for systems other than spread spectrum and OFDM systems  
Amplitude modulation, frequency modulation, phase modulation, or a digital modulation technique combining these modulation techniques shall be used.
- (2) Antenna power (RE: Article 49-20)
  - a. The antenna power of a transmitting equipment (with a frequency band of 2,427 - 2,470.75 MHz, for spread spectrum systems using FH systems, hybrid systems of DS and FH, or hybrid systems of FH and OFDM) shall be such that the mean power within a bandwidth of 1 MHz is 3 mW or less in the case of modulation using a standard coding test signal with the same transmission rate as that of the modulation signal.
  - b. The antenna power of a transmitting equipment using a spread spectrum system other than any of those in “a” and the OFDM system shall be such that the mean

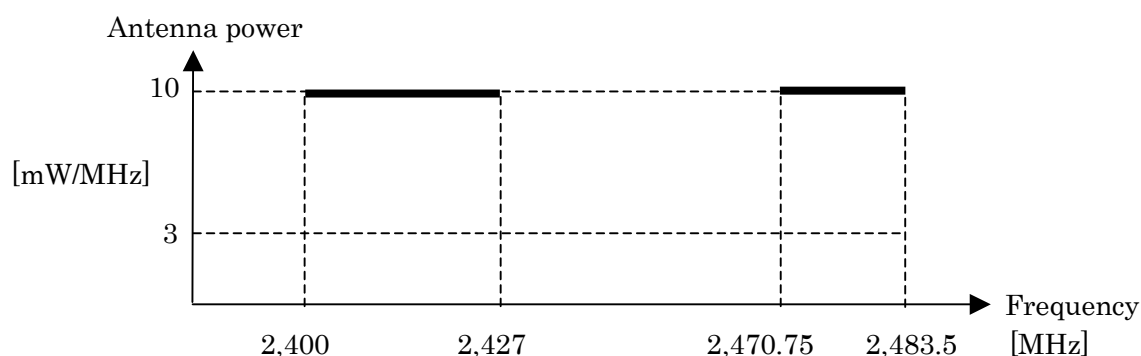


power within a bandwidth of 1 MHz is 10 mW or less in the case of modulation using a standard coding test signal with the same transmission rate as that of the modulation signal.

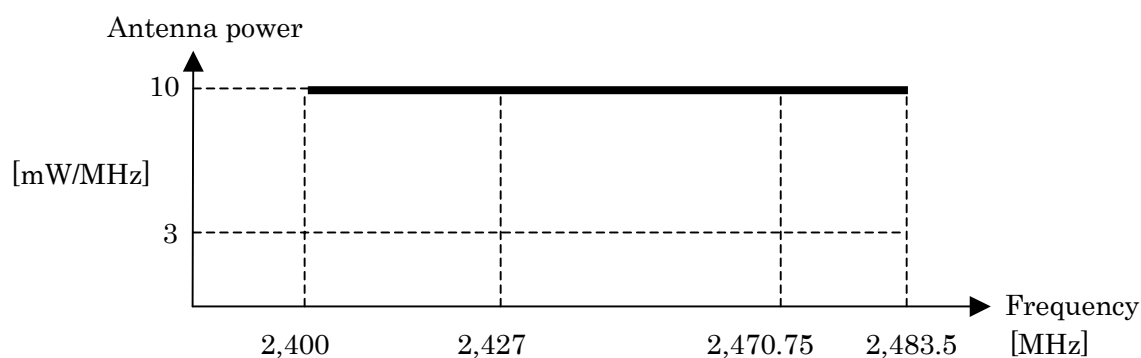
- c. The antenna power of a transmitting equipment using systems other than any of those in “a” or “b” shall be 10 mW or less.



- (1) An FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems using the frequency band of 2,427 - 2,470.75 MHz or using 2,427 MHz or lower or 2,470.75 MHz or higher, including 2,427 - 2,470.75 MHz



- (2) An FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems using the frequency band of 2,400 to lower than 2,427 MHz or beyond 2,470.75 to 2,483.5 MHz



- (3) DS or OFDM system

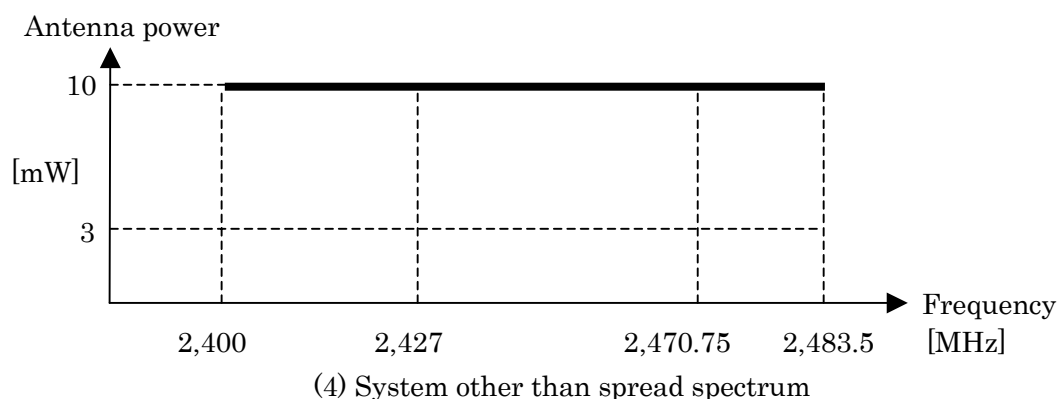


Fig. 2.1 Antenna Power

- (3) Tolerances for antenna power

Upper and lower limits of the tolerance for antenna power shall be 20% and 80%, respectively. Note that they represent the tolerance for the maximum rated antenna power and that no upper and lower limits of the tolerance are regulated in the case of antenna power reduction for communications reasons.

(RE: Article 14)
- (4) Frequency tolerance

Tolerance of frequency shall be  $\pm 50 \times 10^{-6}$ .

(RE: Article 5, Attached Table No. 1)
- (5) Transmission rate

No signal transmission rate is regulated.
- (6) Spurious emission intensity

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency  $f$  other than frequency band used shall be as follows:

  - a.  $2,387 \text{ MHz} \leq f \leq 2,400 \text{ MHz}$  and  $2,483.5 \text{ MHz} < f \leq 2,496.5 \text{ MHz}$        $25 \mu\text{W}$  or less
  - b.  $2,387 \text{ MHz} > f$  and  $2,496.5 \text{ MHz} < f$        $2.5 \mu\text{W}$  or less

(RE: Article 7)
- (7) Permissible value for occupied bandwidth

Permissible value for occupied bandwidth using the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems shall be 83.5 MHz or less, while necessary bandwidth (minimum occupied bandwidth sufficient to ensure information transmission of required quality at a required transmission rate for the system used under specified conditions for a given emission type) using a system other than any of the above shall be 26 MHz or less.

(RE: Article 6, Attached Table No. 2)
- (8) Spread bandwidth

In spread spectrum systems, spread bandwidth (which refers to a frequency bandwidth with an upper limit and lower limit such that each of the mean powers radiated above the upper frequency limit and below the lower frequency limit is equal to 5 % of the total mean power radiated; this also applies hereafter) shall be 500 kHz or more.

(RE: Article 49-20)

- (9) Process gain (RE: Article 49-20)

Process gain (value obtained by dividing the spread bandwidth by a frequency equal to the transmission rate of the modulation signal; this also applies hereafter) in the spread spectrum system shall be 5 or more.

- (10) Number of carriers (RE: Article 49-20)

The OFDM system shall have one or more carriers per 1 MHz bandwidth.

- (11) Dwell time (RE: Article 49-20)

Frequency dwell time (time during which radio waves continue to be emitted at a specified frequency) of a transmitting equipment using the FH system shall be 0.4 seconds or less. When a simple FH system (except hybrid system) is used, total frequency dwell time at an arbitrary frequency within the time period obtained by multiplying 0.4 seconds by the process gain shall be 0.4 seconds or less.

### 3.3 Receiving equipment

- (1) Limit on secondary radiated emissions (RE: Article 24)

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4 nW or less at a frequency below 1 GHz and 20 nW or less at a frequency of 1 GHz or higher as measured using the circuit

- (2) Other

Neither adjacent channel selectivity, intermodulation characteristic, nor spurious response are regulated.

### 3.4 Controlling equipment

Controlling equipment shall be equipped with the following devices and functionality and comply with the respective requirements:

#### 3.4.1 Interference prevention function

- (1) Identification code transmission/reception (RLE: Article 6-2)

(RE: Article 9-4)

Radio equipment used mainly on the same premises and automatically transmits or receives identification code

- (2) Frequency switching and other functions

Users shall be able to choose operating frequencies and halt emission.

#### 3.4.2 Channel connection procedure

Not particularly regulated.

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### 3.5 Telecommunications circuit connection

Radio equipment connected to telecommunications circuit facilities shall comply with the following requirements:

- (1) Identification unit (TR: Article 9)  
An identification unit shall have an identification code (code designed to identify the radio equipment used in terminal equipment and verify that the equipment at the time of communication channel establishment).
- (2) Identification code (AM: No. 424 of 1994)  
The identification code shall be 48 bits long.
- (3) Judgment as to whether radio frequency to be used is available (TR: Article 9)  
(AM: No. 424 of 1994)  
(AM: No. 757 of 1999)

Judgment is performed by detecting radio waves emitted by other radio stations or calculating received signals and signals for spreading and detecting signal levels. Note, however, that if the radio equipment is capable of disconnecting the communication channel (its own communication link) in the event of deterioration of communication quality, such determination is carried out by verifying the communication channel (its own communication link) for proper operation.

- (4) Requirements for interfacing with telecommunications circuit facilities  
Requirements for interfacing with telecommunications circuit facilities shall comply with technical regulations (including technical requirements prescribed by Type I telecommunications carriers) as specified in Terminal and Other Equipment Regulations.

### 3.6 Antenna

- (1) Antenna structure  
Not particularly regulated.
- (2) Antenna gain (RE: Article 49-20)
  - a: The absolute gain of the transmitting antenna shall be 12.14 dB or less. However, when the equivalent isotropic radiated power (equivalent isotropic radiated power in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems) is equal to or less than the value obtained by applying an antenna power with the mean power of 10 mW with its absolute gain being 12.14 dB, the shortage shall be compensated for by the gain of the transmitting antenna (Note that mean power is 10 mW in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems; however, mean power of 3 mW in the 1 MHz bandwidth is applied if the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems is employed and the frequency band of 2,427 - 2,470.75 MHz is used.).
  - b: The half-power beam width (angle between two points at which radiated power becomes 1/2) of the transmitting antenna's horizontal and vertical planes shall not exceed the value as determined by the following formula:

$$360 / A \text{ [degrees]},$$

where constant A is equal to the value obtained by dividing the equivalent isotropic radiated power (equivalent isotropic radiated power in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems) by the value obtained by applying an antenna power with the mean power of 10 mW with its absolute gain being 2.14 dB, and shall be assumed to be 1 if it is less than 1 (Note that mean power is 10 mW in the 1 MHz bandwidth in the case of spread spectrum and OFDM systems; however, mean power of 3 mW in the 1 MHz bandwidth is applied if the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining the FH and OFDM systems is employed and the frequency band of 2,427 - 2,470.75 MHz is used.).

### 3.7 Others

#### (1) Cabinet

(RE: Article 49-20)

(TR: Article 9)

(AM: No. 424 of 1994)

The radio equipment used shall be housed in a single cabinet that cannot be readily opened. Note, however, that radio equipment meeting the followings need not be housed in a single cabinet:

- a. Radio equipment meeting the following requirements
  - i) Radio frequency and modulation sections other than antenna system are difficult to open.
  - ii) Identification unit resists removal.
- b. Radio equipment devices listed below
  - i) Power supply unit, microphone, and earphone
  - ii) Receive-only antenna
  - iii) Control unit, indicators, volume controller, and their equivalents

#### (2) Indication of information associated with Technical Regulations Conformity Certification

(RTCSR: Article 6)

Information associated with Technical Regulations Conformity Certification shall be indicated in the specified format at visible location on radio equipment.

#### (3) Indication of information associated with Technical Conditions Compliance Certification for Terminal Equipment

(RTADT: Article 7)

For radio equipment connected to telecommunications circuit facilities, information associated with Technical Conditions Compliance Certification for Terminal Equipment shall be indicated in the specified format at a visible location on radio equipment.

## Chapter 4 Requirements for Interconnected System

### 4.1 System outline, etc.

Pursuant to regulations in Chapters 1 through 5 in ISO/IEC 8802-11

### 4.2 Communication protocol, etc.

#### 4.2.1 MAC service definition

Pursuant to regulations in Chapter 6 in ISO/IEC 8802-11

#### 4.2.2 MAC frame format

Pursuant to regulations in Chapter 7 in ISO/IEC 8802-11

#### 4.2.3 Authentication and privacy

Pursuant to regulations in Chapter 8 in ISO/IEC 8802-11

#### 4.2.4 MAC sublayer functional description

Pursuant to regulations in Chapter 9 in ISO/IEC 8802-11

#### 4.2.5 Layer management

Pursuant to regulations in Chapter 10 in ISO/IEC 8802-11

#### 4.2.6 MAC sublayer management entity

Pursuant to regulations in Chapter 11 in ISO/IEC 8802-11

#### 4.2.7 Physical service specification

Pursuant to regulations in Chapter 12 in ISO/IEC 8802-11

#### 4.2.8 Physical layer management

Pursuant to regulations in Chapter 13 in ISO/IEC 8802-11

### 4.3 Radio equipment requirements

Radio equipment is required to comply with Chapter 3 technical requirements and the requirements given below. Note, however, that in the event of inconsistencies in the treatment and particulars of a standard described in both Chapter 3 and the following, the regulations set forth in Chapter 3 shall take precedence.

#### 4.3.1 Frequency Hopping system

Pursuant to regulations in Chapter 14 in ISO/IEC 8802-11

#### 4.3.2 Direct Sequence system

Pursuant to regulations in Chapter 15 in ISO/IEC 8802-11

### 4.4 Infrared equipment requirements

Pursuant to regulations in Chapter 16 in ISO/IEC 8802-11

### 4.5 Supplementary provision

Pursuant to regulations in Annexes A through E in ISO/IEC 8802-11

## **Chapter 5 Measurement Method**

Measurements shall be conducted pursuant to “Technical Regulations Conformity Certification; Radio Equipment Characteristics Testing Method” (established by the Telecom Engineering Center). Note, however, that measurement of items other than those prescribed herein shall be conducted pursuant to methods accepted as common practice.

**Annex 1 Test Items Associated with Specified Radio Equipment**

The test items associated with radio equipment for second-generation low-power data communications systems and wireless LAN systems radio stations are as follows:

- (1) Transmitting equipment (RTCSR: Article 4, Attached Table No.3)
  - Frequency
  - Occupied bandwidth
  - Spurious emission intensity
  - Antenna power
- (2) Receiving equipment (RTCSR: Article 4, Attached Table No.3)
  - Limit on secondary radiated emissions
- (3) Others (RE: Article 49-20)
  - Dwell time
  - Spread bandwidth



## Annex 2 Operational Guidelines for Second-generation Low-power Data Communications Systems Radio Stations

### 1. Outline

#### 1.1 Objective

The purpose of these guidelines is to prevent harmful interference with RFID systems (premises radio stations and specified low-power radio stations, both for RFID) operating in the frequency band of 2,427 - 2,470.75 MHz and amateur radio stations operating in the frequency band of 2,400 - 2,450 MHz, with the ultimate goals of ensuring effective use of frequencies and improving convenience for users in the operation of second-generation low-power data communications systems radio stations operating in the frequency band of 2,400 - 2,483.5 MHz. Note that “harmful interference” refers to successive and serious interference to the function of other radio equipment (RL: Article 82).

#### 1.2 Abstract

These guidelines apply to users of second-generation low-power data communications systems and to those who manufacture, sell, install, operate, or maintain such systems (hereinafter experts).

#### 1.3 Target systems

The following systems using the same frequency bands as second-generation low-power data communications systems radio stations are treated as target systems:

- (1) RFID systems (premises radio stations): 2,427 - 2,470.75 MHz RCR STD – 1
- (2) RFID equipment for specified low-power radio stations: 2,427 - 2,470.75 MHz RCR STD – 29
- (3) RFID equipment using the frequency hopping system for specified low-power radio stations: 2,400 - 2,483.5 MHz ARIB STD – T81
- (4) Second-generation low-power data communications systems radio stations: 2,400 - 2,483.5 MHz ARIB STD – T66
- (5) Amateur radio stations: 2,400 - 2,450 MHz

#### 1.4 Basic concepts

##### (1) Clarification of problems

Experts must act in good faith, taking appropriate measures to prevent interference. This can be done by providing notes in instruction manuals and other materials and through public relations efforts.

##### (2) Preliminary survey

When a user or an expert intends to introduce a radio equipment for a second-generation low-power data communications system, the user or expert must perform an interference survey prior to the introduction to ensure that the radio equipment does not cause harmful interference to other radio equipment.

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### (3) Coordinated response

The user and the expert must coordinate their efforts in good faith to resolve interference in the event that harmful interference to other radio equipment occurs for reasons attributable to the second-generation low-power data communications system. At this time, utmost consideration must be given to protection of the “premises radio station” already in operation.

## 2. Clarification of problems

### 2.1 Instruction manuals

Notes to the following effect and the meanings of equipment-indicated symbols described further below shall be provided in instruction manuals for second-generation low-power data communications systems:

この機器の使用周波数帯では、電子レンジ等の産業・科学・医療用機器のほか工場の製造ライン等で使用されている移動体識別用の構内無線局（免許を要する無線局）及び特定小電力無線局（免許を要しない無線局）並びにアマチュア無線局（免許を要する無線局）が運用されています。

- 1 この機器を使用する前に、近くで移動体識別用の構内無線局及び特定小電力無線局並びにアマチュア無線局が運用されていないことを確認して下さい。
- 2 万一、この機器から移動体識別用の構内無線局に対して有害な電波干渉の事例が発生した場合には、速やかに使用周波数を変更するか又は電波の発射を停止した上、下記連絡先にご連絡頂き、混信回避のための処置等(例えば、パーティションの設置など)についてご相談して下さい。
- 3 その他、この機器から移動体識別用の特定小電力無線局あるいはアマチュア無線局に対して有害な電波干渉の事例が発生した場合など何かお困りのことが起きたときは、次の連絡先へお問い合わせ下さい。

連絡先 : \_\_\_\_\_

This equipment shares a frequency band with a wide range of equipment: e.g. industrial, scientific, and medical equipment such as microwave ovens, premises radio stations (radio stations requiring licenses), and specified low-power radio stations (radio stations not requiring licenses) for RFID used for factory production lines as well as amateur radio stations (radio stations requiring licenses).

1. Before use, confirm that no premises radio stations and specified low-power radio stations for RFID or amateur radio stations operate in your vicinity.
2. In the event that this equipment causes harmful interference to any premises radio station for RFID, immediately change frequencies or halt radio wave emission and contact us at the information indicated below for consultation on interference avoidance measures (e.g., partition installation).
3. Contact us at the information indicated below if this equipment causes harmful interference to any specified low-power radio stations for RFID or amateur radio stations or if other problems arise.

Contact us at : \_\_\_\_\_

## 2.2 Sticker

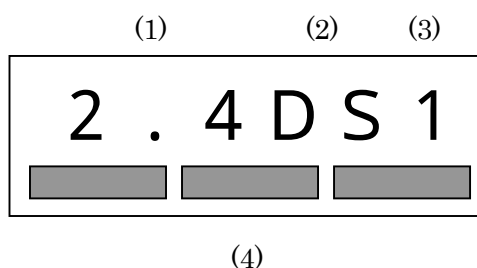
A sticker bearing the same notes as provided in instruction manuals shall be attached. The material, size, shape, and other characteristics of the sticker are not specified.

## 2.3 Catalogs, pamphlets, and Web pages

The same information provided in instruction manuals, including definitions of equipment-indicated symbols (described further below), shall be provided in catalogs, pamphlets, Web pages, and other media related to second-generation low-power data communications systems.

## 2.4 Indication of symbols on equipment

Indication (representing “2.4 GHz band equipment, modulation system, estimated interference distance, and frequency-changing capability”) shall be provided on the main unit of the radio equipment for the second-generation low-power data communications system. Note, however, that a sticker bearing the same indication may be used instead if no indication can be provided on the main unit of radio equipment for reasons related to the radio equipment’s physical size, installation type, design restrictions, or other factors.



- (1) “2.4”: Represents radio equipment using the 2.4 GHz band.
- (2) “DS”: Represents modulation system (refer to Section 2.4.1 for details). Note that for radio equipment capable of emitting radio waves of multiple modulation systems, these modulation systems shall be stated by separating them with a slash as in “DS/OF.”
- (3) “1”: Represents estimated interference-causing radius to premises radio stations for RFID (refer to Section 2.4.2 for details). Note that for radio equipment capable of emitting radio waves of multiple modulation systems, whose interference-causing radius varies depending on the modulation system, these modulation systems and interference-causing radiuses shall also be stated by separating the indications representing such modulation systems and interference-causing radiuses with a slash as in “DS2/OF1.”
- (4) “ ”: Indicates that the equipment can use the entire band and is capable of avoiding the band used by RFID systems (refer to Section 2.4.3 for details).

### 2.4.1 Modulation system

The modulation system shall be indicated by one of the symbols listed in Table 2.1.

Table 2.1 Modulation Systems

Symbol	Modulation system	Remarks
DS	DS – SS system	
FH	FH – SS system	
HY	DS – FH or FH – OFDM hybrid system	
OF	OFDM system	
XX	Other system	Narrow-band modulation, etc.

2.4.2 Indication of interference-causing radius

Table 2.2 shows the estimated interference-causing distances to a premises radio station for the RFID system, and antenna power values. Note that all values are obtained assuming that the antenna gain of second-generation low-power data communications system radio station is 2.14 dBi; the values are obtained by calculating radio wave propagation loss using the 3.5th power rule. On the other hand, as radio stations subject to interference, the specifications for a typical premises radio station for the RFID system (Model A in the RCR TR-1 RFID System Research and Development Report) constitute the following parameters; antenna power of 300 mW, interrogator antenna gain of 11 dBi, interrogator feeder line loss of 0 dB, responder antenna gain of 2 dBi, responder total loss of 10 dB (including antenna gain and feeder line loss), communication distance of 5 m, receiving bandwidth of 32 kHz, receiving equipment noise power of -118 dBm, and propagation margin of 10 dB. Further, it is assumed that harmful interference does not occur if interference power level is at least 10 dB below that of the standard receiving input.

If the antenna gain is not 2.14 dBi or if the antenna power is different, estimated interference-causing radius may change with such differences in antenna gain or power, and this results in a change of symbols. Note that although four symbols – 1, 2, 4, 8 – are used in Table 2.2, other symbols may also be used. 1/10 of the estimated interference-causing radius shall be used as the symbol.

Table 2.2 Indication of Interference-causing Radius

Indicated symbol		1	2	4	8	
Estimated interference-causing radius		10m	20m	40m	80m	
Example of radio equipment	Narrow-band modulation	0.01 mW	0.1 mW	1 mW	10 mW	
	DS, OFDM	1 mW	1 mW/MHz	10 mW/MHz	–	
	F Antenna power	1 mW	0.1mW/MHz	1 mW/MHz	10mW/MHz	3mW/MHz
	H Spread bandwidth	83.5 MHz	26 MHz	26 MHz	26 MHz	83.5 MHz

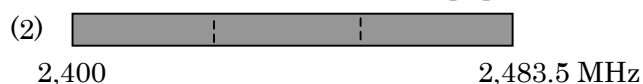
Note:

The interference-causing radiuses given here are estimated distances from second-generation low-power data communications systems to RFID systems (premises radio stations). This table may have different values for distances between second-generation low-power data communications systems or for distances between second-generation low-power data communications systems and amateur radio stations.

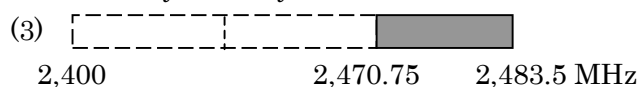
## 2.4.3 Indication of frequency-changing capability



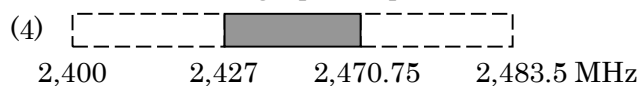
The above graph indicates that the equipment can use the entire band and is capable of avoiding the band used by RFID systems. Although the above indicates three parts, this does not mean that the equipment uses three channels, i.e., the graph has three parts regardless of the number of channels that the equipment uses.



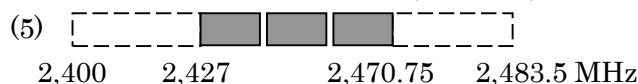
The above graph indicates that the equipment uses the entire band and is unable to avoid the band used by RFID systems.



The above graph indicates that the equipment uses only the higher region (e.g., 2,471 - 2,483.5 MHz) of the band. According to this standard, no graphs are required for radio equipment using frequencies 2,470.75 MHz or higher or 2,427 MHz or lower. Nevertheless, it is recommended that graphs be provided for clarification.



The above graph indicates that the equipment uses only the middle region of the band and is unable to avoid the band used by RFID systems.



The above graph indicates that the equipment uses only the middle region of the band and is capable of changing frequencies within that region. Although the above indicates three parts, the graph indicates that the equipment can change frequencies within the band used by RFID systems. The graph has three parts regardless of the number of channels that the equipment uses.

## 2.4.4 Indication method and others

## (1) Indication method

Not particularly regulated. Stickers, printing on equipment's nameplate, embossing on cabinet, or other methods may be used.

## (2) Size, aspect ratio, background color, and presence/absence of border

Not particularly regulated.

## (3) Material

Although not particularly regulated, the material shall resist peeling, removal, and discoloration.

## (4) Font, character, and symbol color

Although not particularly regulated, the font and its color shall be easily visible and clear.

## (5) Used frequency display graph

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Although size, aspect ratio, division ratio, and others are not particularly regulated, the graph shape and color shall allow easy verification of the frequency used.

### 2.5 Indication of information on fixed, outdoor-installed equipment

A second-generation low-power data communications system radio station operating as a fixed outdoor station shall indicate the name of its owner or operator and contact information in addition to indications on the equipment, as described in the previous section. An example is given below:

2.4GHz 帯小電力データ通信システムの無線局	(1)
運用者 通信株式会社	(2)
I P 事業部お客様相談室	(3)
連絡先 TEL 03-       -	(3)
URL http://www.       .co.jp	

2.4 GHz band low-power data communications system radio station	(1)
Operator XX Communication Co., Ltd.	(2)
IP Division Customer Service Center	
To contact : TEL : 03- XXXX - XXXX	(3)
: URL: http://www.XX.co.jp	

#### 2.5.1 Indicated information

##### (1) Indication of radio station

The equipment shall be clearly labeled as “2.4 GHz band low-power data communications system radio station.”

##### (2) Name of owner or operator

The name of the individual shall be indicated if the radio station is owned or operated by that individual. The names of the relevant entity and section or person in charge shall be indicated if the radio station is owned or operated by that entity.

##### (3) Contact information

Telephone number, e-mail address, or URL shall be indicated.

##### (4) Others

Useful information on interference avoidance may be indicated, as necessary.

#### 2.5.2 Indication method and others

##### (1) Indication method

Not particularly regulated. Stickers, printing on equipment’s nameplate, embossing on cabinet, or other methods may be used.

##### (2) Size, aspect ratio, background color, and presence/absence of border

Not particularly regulated.

##### (3) Material

Although not particularly regulated, the material shall resist peeling, removal, and

discoloration even when left outside for an extended period.

(4) Font, character and symbol color

Although not particularly regulated, the font and its color shall be easily visible and clear.

(5) Location of indication

Information shall be indicated in prominent, easily visible locations that do not require additional steps to view the information. Such locations include the radio equipment's main unit, antenna, or casing.

## 2.6 Package

"2.4 GHz band equipment, modulation system, estimated interference distance, and frequency-changing capability" shall be indicated in a prominent position on the package of the radio equipment in the same format as the symbols indicated on equipment. This does not apply if the package is designed solely for transport purposes.

## 3. Preliminary survey

### 3.1 Preliminary survey method

- (1) Those intending to operate a second-generation low-power data communications system radio station shall conduct a preliminary survey to determine whether any RFID system or amateur radio station operate, or have finalized preparations for operating within the estimated interference-causing radius shown in Table 2.2.
- (2) If any premises radio station for RFID system is found to exist or is expected to begin operating within this area, the second-generation low-power data communications system may not operate within the same frequency band. However, through consultation with the user of the station, if it is confirmed that no interference occurs by test operations and / or by measurement using a spectrum analyzer for example or dedicated testing instruments, this does not apply.

### 3.2 Expert's response

#### (1) Consulting

Before delivering a second-generation low-power data communications system, experts shall conduct the preliminary survey if requested to do so by its users. Ideally, preliminary surveys should be undertaken voluntarily, even if not specifically requested by users.

#### (2) Testing functions

Ideally, experts should ensure that the radio equipment has a function of, for example, continuous wave transmission, bit error rate measurement, and other testing functions required for preliminary surveys. If the radio equipment does not have such functions, testing equipment, measuring instruments, or other equipment should ideally be made available to enable such tests.

## 4. Coordinated response

### 4.1 Cooperation to avoid interference

Experts shall cooperate with users in good faith to resolve interference occurrence if an RFID system or an amateur radio station suffers harmful interference attributable to a second-generation low-power data communications system manufactured, sold, installed or maintained by the expert; and if the user of the system concerned and the user of the RFID system or the licensee of the amateur radio station need to consider interference avoidance measures.

4.2 Higher priority to pre-existing radio station

Those intending to operate a second-generation low-power data communications system radio station in an area in which a premises radio station for RFID systems already operates, using the same frequency band, or introduction of such system has been finalized, are responsible for conducting preliminary surveys and for taking interference avoidance measures.

In the event that a second-generation low-power data communications system causes harmful interference to a pre-existing premises radio station for RFID systems, the operator shall immediately change frequencies or halt radio wave emissions in order to resolve interference issues. Users of both systems have to cooperate and work together to resolve the interference if the station-to-station distance is greater than the estimated interference-causing radius shown in Table 2.2.

4.3 Limitations of sector directive antenna

The half-power beam width of antennas is limited so that interference-causing area will not increase with increasing EIRP. However, the area in which interference occurs will eventually increase if multiple radio stations are installed at a single location and their antenna beams are pointed in multiple directions. For this reason, only one radio station may operate at any one location (within the estimated interference-causing radius shown in Table 2.2) if antennas with gain in excess of 2.14 dBi are used and if EIRP exceeds the corresponding value under “Omnidirectional” in Table 4.1.

Table 4.1 Upper Limit of EIRP for Modulation Systems

Modulation system	Frequency band used	Antenna power (max.)	EIRP (max.)	
			Omnidirectional case	Directional case
DS, OFDM	2,400 - 2,483.5 MHz	10 mW/MHz	12.14 dBm/MHz	22.14 dBm/MHz
FH, DS-FH FH-OFDM	2,400 - 2,483.5 MHz	3 mW/MHz	6.91 dBm/MHz	16.91 dBm/MHz
	Excluding 2,427 - 2,470.75 MHz	10 mW/MHz	12.14 dBm/MHz	22.14 dBm/MHz
Other than the above	2,400 - 2,483.5 MHz	10 mW	12.14 dBm	22.14 dBm

Note:

The half-power beam width for directional antenna shall be 360/A degrees or less, where A is a ratio which causes the EIRP concerned to exceed the omnidirectional EIRP upper limit.



### Annex 3 Summary of Operational Guidelines for Second-generation Low-power Data Communications Systems Radio Stations

#### Introduction

Second-generation low-power data communications systems radio stations use the frequency band of 2,400 - 2,483.5 MHz, which overlaps both the frequency band of 2,427 - 2,470.75 MHz used by RFID systems (premises radio stations for RFID and specified low-power radio stations for RFID), and the frequency band of 2,400 - 2,450 MHz used by amateur radio stations. The Operational Guidelines have been prepared to prevent harmful interference within these overlapping frequency bands in order to ensure effective use of frequencies, and to improve convenience for all users.

Those who manufacture, sell, install, operate, or maintain second-generation low-power data communications systems (hereinafter experts) are requested to clarify any potential interference to users, to guide them in taking interference avoidance measures, and to work with them to implement such measures in the event that interference occurs.

#### 1. Clarification of problems

##### (1) Instruction manuals

Notes to the following effect and the meanings of equipment-indicated symbols shall be described in instruction manuals. Note that a sticker bearing the same information shall be supplied with the product.

この機器の使用周波数帯では、電子レンジ等の産業・科学・医療用機器のほか工場の製造ライン等で使用されている移動体識別用の構内無線局（免許を要する無線局）及び特定小電力無線局（免許を要しない無線局）並びにアマチュア無線局（免許を要する無線局）が運用されています。

- 1 この機器を使用する前に、近くで移動体識別用の構内無線局及び特定小電力無線局並びにアマチュア無線局が運用されていないことを確認して下さい。
- 2 万一、この機器から移動体識別用の構内無線局に対して有害な電波干渉の事例が発生した場合には、速やかに使用周波数を変更するか又は電波の発射を停止した上、下記連絡先にご連絡頂き、混信回避のための処置等(例えば、パーティションの設置など)についてご相談して下さい。
- 3 その他、この機器から移動体識別用の特定小電力無線局あるいはアマチュア無線局に対して有害な電波干渉の事例が発生した場合など何かお困りのことが起きたときは、次の連絡先へお問い合わせ下さい。

連絡先： \_\_\_\_\_

This equipment shares a frequency band with a wide range of equipment: e.g. industrial, scientific, and medical equipment such as microwave ovens, premises radio stations (radio stations requiring licenses) and specified low-power radio stations (radio stations not requiring licenses) for RFID used for factory production lines as well as amateur radio stations (radio stations requiring licenses).

1. Before use, confirm that no premises radio stations and specified low-power radio stations for RFID or amateur radio stations operate in your vicinity.
2. In the event that this equipment causes harmful interference to any premises radio station for RFID, immediately change frequencies or halt radio wave emission and contact us at the information indicated below for consultation on interference avoidance measures (e.g., partition installation).
3. Contact us at the information indicated below if this equipment causes harmful interference to any specified low-power radio stations for RFID or amateur radio stations or if other problems arise.

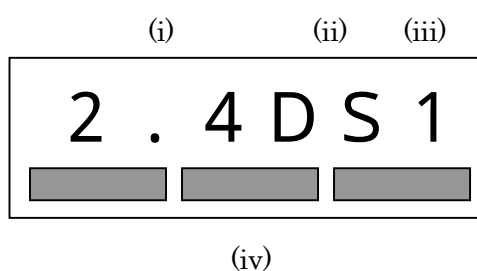
Contact us at : \_\_\_\_\_

(2) Catalogs, pamphlets, and Web pages

The same information provided in instruction manuals, including definitions of equipment-indicated symbols, shall be provided in catalogs, pamphlets, Web pages, and other media.

(3) Indication of symbols on equipment

The symbols listed below (representing “2.4 GHz band equipment, modulation system, estimated interference distance, and frequency-changing capability”) shall be indicated on the main unit of the radio equipment. The symbols in the same format shall be indicated also on the package. The following figure is intended to serve as an example. Refer to ARIB STD-T66 for details.



- (i) “2.4”: Represents radio equipment using the 2.4 GHz band.
- (ii) “DS”: Represents modulation system. Note that for radio equipment capable of emitting radio waves of multiple modulation systems, these modulation systems shall be stated by separating them with a slash as in “DS/OF.”  
DSSS system: DS, FHSS system: FH, OFDM system: OF, hybrid system: HY, others: XX
- (iii) “1”: Represents estimated interference-causing radius. This example represents estimated interference distance (1 x 10) m or less. Note that for radio equipment

capable of emitting radio waves of multiple modulation systems, whose interference-causing radius varies depending on the modulation system, these modulation systems and interference-causing radiuses shall also be stated by separating the indications representing such modulation systems and interference-causing radiuses with a slash as in “DS2/OF1.”

- (iv) “**■ ■ ■**”: Indicates that the equipment can use the entire band and is capable of avoiding the band used by RFID systems.

(4) Indication of information on fixed, outdoor-installed equipment

A second-generation low-power data communications system radio station operating as a fixed outdoor station shall indicate the following information at a prominent location on the radio equipment’s main unit, antenna, or casing.

2.4GHz 帯小電力データ通信システムの無線局	(i)
運用者 <b>通信株式会社</b>	(ii)
I P 事業部お客様相談室	(iii)
連絡先 TEL 03-       -	
URL http://www.       .co.jp	

2.4 GHz band low-power data communications system radio station	(i)
Operator <b>XX Communication Co., Ltd.</b>	(ii)
IP Division Customer Service Center	
To contact : TEL : 03- XXXX - XXXX	(iii)
: URL: http://www.XX.co.jp	

- (i) Indicate that the equipment is a 2.4 GHz band low-power data communications system radio station.
- (ii) Indicate the owner’s or operator’s name.
- (iii) Indicate the owner’s or operator’s telephone number, e-mail address, or URL.

## 2. Preliminary survey

- (1) Those intending to operate a second-generation low-power data communications system radio station shall conduct a preliminary survey to determine whether any RFID system or amateur radio station operate within the estimated interference-causing radius.
- (2) If any premises radio station for RFID system is found, the second-generation low-power data communications system may not operate within the same frequency band. However, through consultation with the user of the station, if it is confirmed that no interference occurs by test operations and / or by measurement using a spectrum analyzer for example or dedicated testing instruments, this does not apply.
- (3) Experts shall conduct a preliminary survey if requested to do so by their users. It is recommended that experts conduct preliminary surveys on a voluntary basis, even if not specifically requested by their users.

### 3. Coordinated response

#### (1) Cooperation to avoid interference

Experts shall cooperate with users in good faith to resolve interference occurrence if an RFID system or amateur radio station suffers harmful interference attributable to a second-generation low-power data communications system; and if the user of the system concerned and the user of the RFID system or the licensee of the amateur radio station need to consider interference avoidance measures.

#### (2) Higher priority to pre-existing radio station

Those intending to operate a second-generation low-power data communications system radio station in an area in which a premises radio station for RFID systems already operates, using the same frequency band, or introduction of such system has been finalized, are responsible for conducting a preliminary survey and for taking interference avoidance measures.

In the event that a second-generation low-power data communications system causes harmful interference to a pre-existing premises radio station for RFID systems, the operator shall immediately change frequencies or halt radio wave emissions in order to resolve interference issues.

#### Notes:

1. This Summary of Operational Guidelines constitutes voluntary standards. For the details, consult the Operational Guidelines attached to “ARIB STD-T66.”
2. For more information, contact  
Secretariat of Wireless LAN Working Group, Standard Assembly Meeting of the Association of Radio Industries and Businesses  
Tel: +81 3 5510 8590, Fax: +81 3 3592 1103, E-mail: info@arib.or.jp  
Nittochi Bld. 14<sup>th</sup> floor, 1-4-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-0013, Japan

To: Secretariat of Wireless LAN Working Group,  
 Standard Assembly Meeting of the Association of Radio Industries and Businesses  
 Fax: 03-3592-1103  
 Nittochi Bld. 14<sup>th</sup> floor, 1-4-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-0013, Japan

Communication Note of ARIB Standard-related Proposals, etc.		
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Page/section	(Please describe your proposal or present your questions or comments in concrete terms.)	
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SECOND GENERATION LOW POWER DATA  
COMMUNICATION SYSTEM/  
WIRELESS LAN SYSTEM

ARIB STANDARD

ARIB STD-T66 VERSION 2.1

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