ENGLISH TRANSLATION

150 MHz BAND ANIMAL DETECTION REPORT SYSTEM EQUIPMEMT FOR SPECIFIED LOW-POWER RADIO STATION

ARIB STANDARD

ARIB STD-T99 Version 2.1

Version 1.0 September	25th	2008
Version 1.1 December	16th	2009
Version 2.0 July	3rd	2012
Version 2.1 July	3rd	2015

Association of Radio Industries and Businesses

General Notes to the English Translation of ARIB Standards and Technical Reports

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http://www.arib.or.jp/english/index.html.

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 compatibility and adequate quality 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 "150 MHz Band Animal Detection Report System Equipment 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 Attachment 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 Attachment 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 Attachment 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)

(None)

Attachment 2 (Selection of Option 2)

(None)

Contents

Chapter 1 General Descriptions

1.1 Outline

This standard defines requirements for animal detection report system which is categorized as a Specified Low-power Radio Station designated in Article 6 of the Regulations for Enforcement of the Radio Law. The system is a radio system that makes radio communication used for mainly reporting the information about movement and status of animals in Japan with related control information.

1.2 Scope of Application

The radio station for the animal detection report system is comprised of radio equipment and associated unit including one connected through telecommunications circuit facilities as shown in Figure 1-1.

This standard defines technical requirements for the radio equipment.

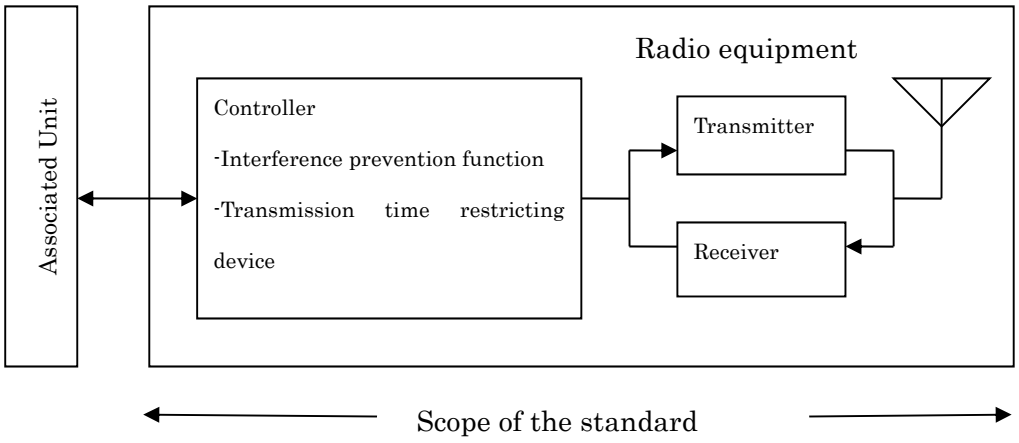


Figure 1-1 Configuration of radio station for animal detection report system

1.3 Reference Regulations

In the standard, "RERL" refers to the Regulations for Enforcement of Radio Law, "ORE" refers to Ordinance Regulating Radio Equipment, "OTRCC" refers to Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment, "OTF" refers to the Ordinance Concerning Terminal Facilities etc., "RTCCA" refers to the Rules Concerning the Technical Conditions Compliance Approval etc. for Terminal Equipment, "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 if issued in 2001 or later.

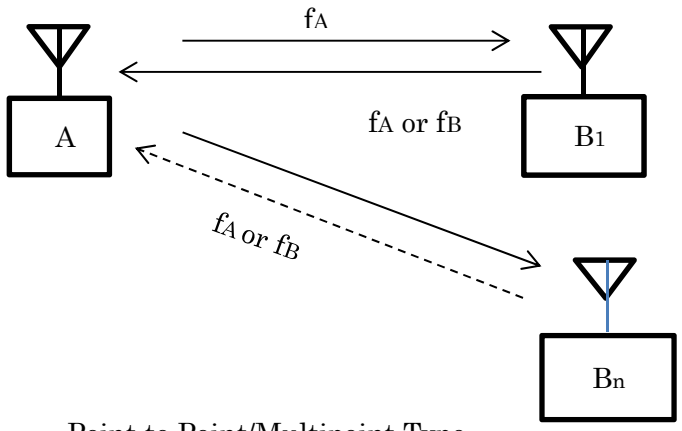
Chapter 2 Standard System

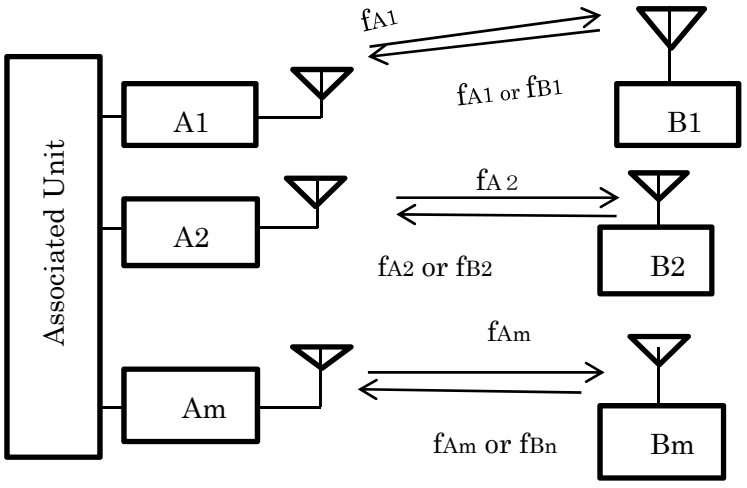
2.1 Outline of Standard System

"150 MHz Band Animal Detection Report System Equipment for Specified Low-power Radio Station" is a radio system standardized to make radio communication used for mainly reporting the information about movement and status of animals in Japan with related control information.

2.2 Operating Type and Standard System Configurations

The operating type and standard system configuration of "150 MHz Band Animal Detection Report System Equipment for Specified Low-power Radio Station" are shown in Figure 2-1.

<table>
<tr><td>Operating Type</td><td>Standard System Configuration</td></tr>
<tr><td>1 : 1
1 : N</td><td>
<table>
<tr><td>Frequency switching method</td><td>Fix, Manual, Automatic</td></tr>
<tr><td>Communication system</td><td>Simplex. One way, Broadcast</td></tr>
</table>


Point to Point/Multipoint Type
</td></tr>
<tr><td>M : N</td><td>
<table>
<tr><td>Frequency switching method</td><td>Fix, Manual, Automatic</td></tr>
<tr><td>Communication system</td><td>Simplex</td></tr>
</table>


Centralized Base Station Type
</td></tr>
</table>

(Note) A : Base Station Radio Equipment

B: Slave Mobile Station

fA, fB: Transmitting and Receiving Frequency

Figure 2-1　Example of Standard System Configuration

(1) Basic Type 1:1

This type is used for point to point communication.

(2) Basic Type 1:N

This type is used for communication between a base radio station and multiple mobile stations.

(3) Basic Type M:N

This type is a centralized base type composed of multiple units of radio equipment that are installed at the same location and controlled by one unit of associated equipment.
It allows simultaneous communication with multiple mobile stations and also enables the mobile stations to communicate each other through the relay by the centralized base type radio equipment.

Chapter 3 Technical Requirements for Radio Equipment

3.1 General Requirements

(1) Communication System (NT: No.42 in 1989)

Communication system shall be either of one way communication system, simplex communication system or broadcast communication system.

(2) Contents of Communication (RERL: Article 6)

The contents of communication shall be related to mainly reporting the information about movement and status of animals with related control information.

(3) Emission Classes (NT: No.42 in 1989)

Not specified

(4) Operating Frequencies (NT: No.42 in 1989)

The operating frequencies shall be those designated in Table 3-1.

Table 3-1 Channel Number and Operating Frequency

Channel number	Frequency (MHz)
1	142.940
2	142.950
3	142.960
4	142.970
5	142.980

(5) Frequency- switching Method

The frequency-switching method shall be either of fixed type, manual type or automatic type

(6) Environmental Conditions

Not specified

3.2 Transmitter

(1) Antenna Power (NT: No.42 in 1989)

The antenna power shall be 1W or less.

(2) Antenna Power Tolerance (ORE: Article 14)

The tolerance of the antenna power, which is the maximum permissible tolerance from designated or rated antenna power, shall be 20% in the upper limit. Lower limit is not

specified.

(3) Oscillation Method (ORE: Article 49.14)

The oscillation method shall be either of a crystal oscillation method and a frequency synthesizer method which uses a crystal oscillator to control the oscillation frequency.

(4) Frequency Tolerance (ORE: Article 5, Appended Table 1 and NT: No.422 in 2012)

The frequency tolerance, which is the maximum permissible tolerance from the designated center frequency of the occupied frequency band of the emitted signal, shall be $\pm 12 \times 10^{-6}$.

(5) Modulation Method

Not specified.

(6) Frequency Deviation

Not specified.

(7) Modulation Rate

Not specified.

(8) Coding Type

Not specified.

(9) Leakage Power to Adjacent channel (ORE: Article 49.14)

The leakage power radiated to the adjacent channel of the bandwidth of ±8kHz separated by 20 kHz from the center frequency of the carrier shall be 1μW or less. However, when the absolute gain of a transmit antenna is 0dB or less, the leakage power shall be 1μW or less as equivalent isotropic radiation power (Note).

Note: Equivalent isotropic radiation power may be obtained by adding the transmit antenna gain (dB) to the power (dB) measured at the input to the feeder.

(10) Permissible Value for Occupied Bandwidth

(ORE: Article 6 Appended Table 2 and NT: No.659 in 2006)

The permissible value for occupied bandwidth, which is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the total mean power of a given emission, shall be 16 kHz.

(11) Permissible Levels of Spurious Emission or Unwanted Emission Intensity

(ORE: Article 7)

a) Definition (RERL: Article 2-1)

Spurious emission is defined as emission on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include

harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions. (REAL: Article 2-1-63)

Out-of- band emission is defined as emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process (REAL: Article 2-1-63.2)

Unwanted emissions consist of spurious emissions and out-of-band emissions. (REAL: Article 2-1-63.3)

Spurious domain is defined as the frequency range beyond the out-of-band domain in which spurious emissions generally predominate. (REAL: Article 2-1-63.4)

Out-of-band domain is defined as the frequency range, immediately outside the necessary bandwidth, in which out-of-band emissions generally predominate. (REAL: Article 2-1-63.5)

(ORE: Appended Table 3)

Permissible level of spurious emission is defined as a limit which is stated as mean power of spurious emissions on frequencies of waves supplied to an antenna transmission line by unmodulated signals. (ORE: Appended Table 3, 1 (1))

Permissible level of unwanted emission is defined as a limit which is stated as mean power of unwanted emissions on frequencies of waves supplied to an antenna transmission line by modulated signals. (ORE: Article 7, Appended Table 3, 1 (2))

b) Permissible Levels

(ORE: Article 7, Appended Table 3-22 and NT: No.368 in 2007)

Permissible levels of spurious emission or unwanted emission shall be as follows. The boundary frequency between out-of-band domain and spurious domain shall be ±62.5 kHz from the carrier frequency.

i) Permissible level of spurious emission in out-of-band domain

It shall be 2.5μW or less, or 40 dB or more below the average carrier power of the fundamental frequency. However, when the absolute gain of a transmit antenna is 0dB or less, it shall be 2.5μW or less as equivalent isotropic radiation power (Note), or 40 dB or more below the average carrier power of the

fundamental frequency.

ii) Permissible level of unwanted emission in spurious domain

It shall be 2.5μW or less, or 43 dB or more below the carrier power of the fundamental frequency. However, when the absolute gain of a transmit antenna is 0 dB or less, it shall be 2.5μW or less as equivalent isotropic radiation power (Note), or 43 dB or more below the carrier power of the fundamental frequency.

Note: Equivalent isotropic radiation power may be obtained by adding the transmit antenna gain (dB) to the power (dB) measured at the input of the feeder.

(12) Transmission Rising Time and Falling Time

Transmission rising time and falling time are not specified.

3.3 Receiver

(1) Limit of Secondary Radiated Emissions (ORE: Article 24)

The limit of secondary emissions radiated from the receiving equipment shall be, in terms of the power at a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4nW or less when measured using the circuit.

(2) Encoding Reference Sensitivity

The encoding reference sensitivity, which is defined as the necessary receiver input level affording bit error rate of 1×10^{-2} at the output of the receiver when a desired signal modulated by a standard coded test signal at the same transmission speed as that of the transmitter is applied, should be 2μV or less.

(3) Spurious Response in Effective Selectivity

The spurious response in effective selectivity, which is defined as the ratio of unmodulated interfering input signal voltage to the encoding reference sensitivity affording bit error rate of 1×10^{-2} at the output of the receiver when an unmodulated interfering signal is applied in a state in which desired signal input voltage having 3dB higher than the encoding reference sensitivity is applied, should be 40dB or more.

(4) Adjacent Channel Sensitivity in Effective Selectivity

The adjacent channel sensitivity in effective selectivity, which is defined as the ratio of the modulated interfering input signal voltage to encoding reference sensitivity affording a bit error rate of 1×10^{-2} at the output of the receiver when the interfering signal modulated by a recurring binary digit pseudo-noise signal having a code length of 32767 bits and 25 kHz distant from the desired signal in a state in which the desired signal

having 3dB higher than the encoding reference sensitivity are applied, shall be 30dB or higher.

(5) Frequency Drift of Local Oscillator

The frequency drift tolerance of a local oscillator which is defined as the maximum drift width of the oscillation frequency of a local oscillator) shall be $\pm 12 \times 10^{-6}$ or less .

3.4 Controller

The controller shall be equipped with the following units and functions, and shall conform to the respective conditions.

(1) Interference Prevention Function (RERL: Article 6.2 and ORE: Article 9.4)

i) The case where the radio equipment is connected to telecommunications circuit facilities:

In this case radio equipment is primarily used in the same premises. The radio equipment shall automatically transmit or receive an identification code which is used to identify an remote party of the communication but is different from one specified in Article 8-1-3 of the Radio Law; hereinafter.

ii) The case where the radio equipment is not connected to a telecommunication network:

In this case the either of the following functions is required.

① Function that automatically transmit or receive an identification code of the radio equipment used primarily in the same premises.

② Function that frequency switch or halt of the radio emission can be performed easily by users.

(2) Identification of the Opposite Party of Communication

In the case where the radio equipment is connected to telecommunications circuit facilities, the controller shall detect an identification code of the opposite party of communication from the received radio waves.

(3) Transmission Time Restricting Device (ORE: Article 49.14 and NT: Article 49 in 1989)

The time limit device of transmission is a device having functions that stop the radio emission within the specified transmission time after the radio emission and resume the subsequent radio emission only after the specified transmission halt time has elapsed, or restrict the duration time of the transmission within the specified transmission time and does not resume the radio emission before the specified transmission time has elapsed following the end of the communication. The limits to the duration of the transmission and the transmission halt time shall be:

i) The case where antenna power is 10mW or less:

The total time of the transmission per 5 seconds shall be 1 second or less.

ii) The case where antenna power is higher than 10mW

The maximum duration time permitting continuous transmission shall be 600 seconds and the radio emission halt time shall be 1 second. In the case where the emission is intended to be made exceeding 600 seconds, the emission shall be halted automatically when 600 seconds has elapsed after the start of the emission, and within the emission halt time of 1 second the emission shall not be resumed. In the case where the duration of the continuous emission is less than 600 seconds, the emission can be resumed immediately.

(4) Carrier Sensing (ORE: Article 49.14 and NT: Article 49 in 1989)

Function of carrier sense shall be the following.

i) The case where antenna power is 10mW or less

The function of carrier sense is not required.

ii) The case where antenna power is higher than 10mW

The function of carrier sense shall be installed. Before the radio equipment starts new emission, carrier sense shall be performed. The level of the carrier sense shall be 7μV or higher as voltage induced in an antenna with absolute gain of 2.14dB.

(5) Channel Connection Procedure

Not specified.

3.5 Antenna

(1) Antenna Structure (ORE: Article 49.14)

Not specified

(2) Antenna Gain (ORE: Article 49.14)

The absolute gain of the transmitting antenna shall be 2.14dB or less.

However, when the equivalent isotropically radiated power (e.i.r.p.) of the emitted radio wave is less than the summation of 2.14dB and antenna power of 1W, the shortage of the e.i.r.p. can be compensated by increasing the antenna gain.

3.6 Others

(1) Housing (ORE: Article 49.14 and NT: No.49 in 1989)

The radio equipment shall be housed in a single cabinet that shall not be able to be opened easily. This requirement, however, does not apply to the following:

i) Power-supply equipment

ii) Control unit

iii) Antenna

iv) Display panel indicating the operating status of transmitters and receivers

v) Volume and squelch controllers

vi) Frequency switching unit

vii) Transmission/reception switchers

viii) Associated unit and the equivalent one

(2) Mark of Technical Regulations Conformity Certification (OTRCC: Article 8)

A mark of technical regulations conformity certification shall be displayed in the specified format on a highly visible area of the radio equipment

(3) Interface with Associated Unit

Interference between radio equipment and associated unit is not specified.

3.7 Safety and Reliability

i) In designing data signal format, redundancy of the data and error correction function shall be considered.

ii) In designing and operating the system, thorough consideration shall be given to possible crosstalk and interference.

Chapter 4 Connection to Telecommunications Circuit Facilities

In the case where the radio equipment intends to connect to a telecommunications circuit facilities, in addition to the conditions specified in Chapter 3 the following conditions shall be met.

(1) Identification Code

Identification code, which is used to identify a transmitting station at an opposite site by checking the code before establishing a communication line and is generally included in a control signal, shall be comprised of 48 bits or more.

(2) Interference Conditions with Telecommunications Circuit Facilities

Interference condition with telecommunication facility shall be in accordance with technical standards specified in OTF and technical standards specified by a Type I telecommunication carrier.

(3) Housing (OTF: Article 9 and NT: No.424 in 1994)

The radio equipment shall be housed in a single cabinet that cannot be opened readily. This requirement, however, does not apply to the following:

i) Power equipment

ii) Control panel, display panel and volume controller or equivalent one

iii) Squelch controller, frequency switching device, associated unit for data signal or the equivalent one

(4) Mark of Technical Conditions Compliance Approval of Terminal Equipment

(RTCCA: Article 10)

A mark of technical conditions compliance approval of terminal equipment shall be displayed in the specified format on a highly visible area of the radio equipment.

Chapter 5 Measurement Methods

Measurement methods shall be in accordance with the Notification of the Ministry of Internal Affairs and Communications (Note 1), which are specified in item 1(3) of Appended Table 1 of OTRCC.

For other test items which are not notified in the above methods, measurements methods generally used shall be applied.

Note 1: This ordinance refers to 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 2.1 issued at July 3, 2015). However, the latest version of the Notification shall be applied if the Notification or contents of the Notification are revised.

Reference 1 Test Items in relation to Technical Regulations Conformity Certification for Specific Radio Equipment

(OTRCC: Appended Table No.1, and Examination for Technical Regulations Conformity Certification: Articles 6 and 25)

The test items in relation to the technical regulations conformity certification for the specific low-power radio equipment are as follows:

(1) Transmitter

-Frequency tolerance,

-Occupied frequency bandwidth,

-Intensity of spurious emission or unwanted emission,

-Tolerance of antenna power,

-Power leakage to adjacent channels

(2) Receiver

-Limit of Secondary Radiated Emissions

(3) Other Equipment

-Interference Prevention Function

-Transmission time restricting device

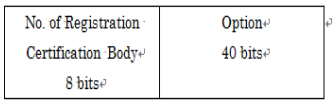
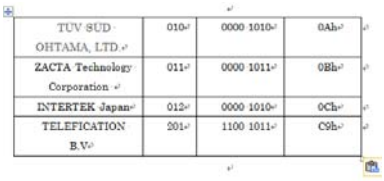
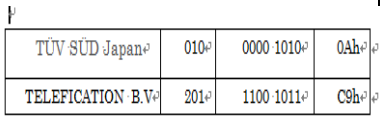
Amendment History of Standard

150 MHz Band Animal Detection Report System Equipment
for Specified Low-Power Radio Station
(ARIB STD-T99)

The 1.1th edition amendment history

Page	Para.no.	Content of amendment	Old edition	Reason
16	Reference 2 2.2 (7)	(7) Identification code (i) The case where EIRP is 100μW or less and the equipment is not connected to a telecommunication network: 6 bits or more are recommended. (ii)The case other than the case (i): Shall be 48 bits. Identification code is managed by the following organization. 1. Registration Certification Body registered according to a business type specified in the Radio Law No.38, 2-1-1 2. Approval Certification Body approved according to a business type specified in the Radio Law No.38, 2-1-1 3. Registered Foreign Conformity Assessment Body registered according to a business type specified in the Radio Law No.38, 2-1-1	(7) Identification code (i)~~The case where the equipment is connected to a telecommunication circuit and EIRP is 0.1mW or more: Shall be 48 bits.~~ ~~- The first 8 bits of the 48 bits shall be used for the number of the Registration Certification Body.~~ ~~The number of the Registration Certification Body is related to the classification registered based on the Radio Raw 38-2.1-1 among Registration Certification Bodies registered in the NT No.460 of July 1 in 2003 and Registered Foreign Conformity Assessment Bodies registered in the NT No.638 of November 20 in~~	-In line with the revision of NT No.481 in 2008)

		(NT: No.481 in 2008) As a reference, an example of a format of identification code is shown below. The number of the Registration Certification Body is related to the classification registered based on the Radio Raw 38-2.1-1 among Registration Certification Bodies registered in the NT No.460 of July 1 in 2003 and Registered Foreign Conformity Assessment Bodies registered in the NT No.638 of November 20 in 2007. However, when these NT's or the contents of the NT are revised, the number shall be in accordance with the revisions. As a reference, the numbers of the bodies are shown in the following Table Reference 2-1.	~~2007. However, when these NT's or the contents of the NT are revised, the number shall be in accordance with the revisions.~~ ~~As a reference, the numbers of the registered bodies effective on September 25, 2008 are shown in the Table Reference 2-1.~~ ~~- (ii) The case where the equipment is not connected to a telecommunication circuit and EIRP is 100μW or less: 6 bits or more are recommended.~~	

		 Figure Ref. 2-4 Example of Format of Identification Code (48 bits)	 Figure Ref. 2-4 Format of Identification Code (48 bits)	
		Table Reference 2-1 The number of the Conformity Assessment Bodies and 8 bits expression (a list of the excerpts)  ZACTA Technology Corporation and Intertek Japan, Ltd are added.	Table Reference 2-1 The number of the Conformity Assessment Bodies and 8 bits expression (a list of the excerpts) 	-In line with the NT No.105 in 2009 and the revisions of the NT No.406 in 2003)

The 2.0th edition amendment history

Page	Paragraph No.	Content of amendment	Old edition	Reason
	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 compatibility and adequate quality 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.	The Association of Radio Industries and Businesses (ARIB), an incorporated association, investigates and summarizes the basic technical requirements for various radio systems in the form of "ARIB Standards" with the participation of and through discussions amongst radio communication equipment manufacturers, broadcasting equipment manufacturers, telecommunication operators, broadcasters and users. ARIB Standards include "private technical standards" (voluntary standards) that are defined in order to ensure compatibility and adequate quality 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 in conjunction with "government technical regulations" (mandatory standard) that are set for the purpose of encouraging effective use of frequency and preventing interference with other spectrum users.	Review of description

		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 Attachment 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 Attachment 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 Attachment 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		Addition

		any other Essential Industrial Property Rights of which is covered in whole or part in the contents of the provisions of this ARIB Standard.		
1	1.1	This standard defines requirements for radio equipment to send information or information processed for the purpose of establishing animal detection report system which is categorized as a Specified Low-power Radio Station designated in Article 6 of the Regulations for Enforcement of the Radio Law. The system is a radio system that makes radio communication used for mainly reporting the information about movement and status of animals in Japan and control information.	This standard defines requirements for radio equipment for data transmission to send information or information processed for the purpose of establishing animal detection report system which is categorized as a Specified Low- power Radio Station designated in Article 6 of the Regulations for Enforcement of the Radio Law. This system is a radio system that makes radio communication used for mainly reporting the information about movement and status of animals moving in Japan, to which some equipment is attached, and control information.	Reviewed in line with the NT
2	2.1	"150 MHz Band Animal Detection Report System Equipment for Specified Low-power Radio Station" is a radio system standardized to make radio communication used for	"150 MHz Band Animal Detection Report System Equipment for Specified Low-power Radio Station" is a radio system standardized to make radio communication used for mainly reporting the	Reviewed in line with the NT

		mainly reporting the information about movement, status of animals and control information.	information about movement and status of animals moving in Japan to which some equipment is attached, and control information.	
4	3.1(1)	Communication system shall be either of one way communication system, simplex communication system or broadcast communication system.	Communication system is specified in Table 3-2. Table 3-2 Antenna Power, Communication system Antenna Power / Communication System 0.01W or less / One way system, Simplex system or Broadcasting system 100μW (e.i.r.p.) or less / One way system or Broadcasting system (Note) e.i.r.p.: equivalent isotropic radiation power	In line with the NT No.87 in 2012
4	3.1(2)	The contents of communication shall be related to mainly reporting the information about movement, status of animals and control information.	The contents of communication shall be related to mainly reporting the information about movement and status of animals moving in Japan to which some equipment is attached and control information	Reviewed in line with the NT
4	3.1(3)	Emission Classes Not specified	Emission classes and frequencies: Emission classes and frequencies shall be as specified in Table 3-1. Table 3-1 Emission Classes and frequency Emission Classes / Channel Number / Frequency F1D, F2D, A1D or M1D / 1 / 142.940 2 / 142.950 3 / 142.960 4 / 142.970 5 / 142.980	In accordance with the NT No.87 in 2012
4	3.1(4)	Frequencies Frequencies shall be as specified in Table 3-1.		Section 3.1(4) is added to reflect the revision of 3.1(3) and the

<table>
<tr>
<td></td>
<td></td>
<td>Table 3-1 Channel number and frequency
<table><tr><th>Channel Number</th><th>Frequency</th></tr><tr><td>1</td><td>142.940</td></tr><tr><td>2</td><td>142.950</td></tr><tr><td>3</td><td>142.960</td></tr><tr><td>4</td><td>142.970</td></tr><tr><td>5</td><td>142.980</td></tr></table></td>
<td>Table 3-1 Type of radio wave and frequency
<table><tr><th>Type of Radio Wave</th><th>Channel Number</th><th>Frequency</th></tr><tr><td rowspan="5">F1D
F2D
A1D
or
M1D</td><td>1</td><td>142.940</td></tr><tr><td>2</td><td>142.950</td></tr><tr><td>3</td><td>142.960</td></tr><tr><td>4</td><td>142.970</td></tr><tr><td>5</td><td>142.980</td></tr></table></td>
<td>subsequent sections were renumbered in order.</td>
</tr>
<tr>
<td>4</td>
<td>3.2(1)</td>
<td>Antenna power shall be 1W or less.</td>
<td>Antenna power shall be as specified in Table 3-2.
Table 3-2 Antenna Power, Communication System
<table><tr><th>Antenna Power</th><th>Communication System</th></tr><tr><td>0.01W or less</td><td>One way system, Simplex system or Broadcasting system</td></tr><tr><td>100μW (e.i.r.p.) or less</td><td>One way system or Broadcasting system</td></tr></table>(Note) e.i.r.p.: equivalent isotropic radiation power</td>
<td>In accordance with the NT No.87 in 2012</td>
</tr>
<tr>
<td>5</td>
<td>3.2(4)</td>
<td>(NT: No.50 in 1989)
The frequency tolerance, which is the maximum permissible tolerance from the designated center frequency of the occupied frequency band of the emitted signal, shall be ± 12×10^{−6}.</td>
<td>The frequency tolerance, which is the maximum permissible tolerance from the designated center frequency of the occupied frequency band of the emitted signal, shall be the following. In the case where the frequency of the carrier modulated by a standard test signal, which is a recurring binary digit pseudo- noise signal having a code length of 511 bits, is measured, the average frequency deviation shall be ±12×10^{−6} as maximum. If the equipment can generate an unmodulated carrier, the frequency can be measured</td>
<td>The addition of the No. of NT,

Description on the method of measurement is deleted.</td>
</tr>
</table>

			by using the unmodulated carrier. However, if a frequency offset occurs when the unmodulated carrier is transmitted continuously, the center frequency is obtained according to the equation (upper limit frequency corresponding to the maximum level modulation signal + lower limit frequency corresponding to the minimum level modulation signal)/2.	
5	3.2(5)	Modulation method is not specified.	Modulation method shall be in accordance with the emission classes specified in section 3.1(3)	In accordance with the NT No.87 in 2012
5	3.2(9)	The leakage power emitted to the adjacent channel of the bandwidth of ±8kHz separated by 20 kHz from the center frequency of the carrier shall be 1μW or less. However, regarding the radio equipment having the transmit absolute antenna gain of 0dB or less, the leakage power shall be 1μW or less as equivalent isotropic radiation power (Note). Note: Equivalent isotropic radiation power may be	The leakage power emitted to the adjacent channel of the bandwidth of ±8kHz separated by 20 kHz from the center frequency of the carrier shall be 1μW or less. regarding to the radio equipment having the absolute gain of a transmit antenna is 0dB or less, However, regarding the radio equipment having the equivalent isotropic radiation power of 100μW or less, the leakage power shall be 1μW or less as equivalent isotropic	In accordance with the partial revisions of ORE

		obtained by adding the transmit antenna gain (dB) to the power (dB) measured at the input to the feeder.	radiation power. Table 3-3 Leakage power emitted to adjacent channels Antenna Power: 100pW (eirp) or less; Measurement Condition: the adjacent channel of the bandwidth of ±8kHz separated by 20 kHz from the center frequency of the carrier; Allowable Leakage Power: 1pW (eirp) or less Antenna Power: Other than the above; Measurement Condition: the adjacent channel of the bandwidth of ±8kHz separated by 20 kHz from the center frequency of the carrier; Allowable Leakage Power: 1pW or less (Note) e.i.r.p.: equivalent isotropic radiation power	
5	3.2(10)	(NT: No.659 in 2006)	(NT: No.51 in 1989)	Correction to NT number
5	3.2(11) a) Definition	Spurious domain is defined as the frequency range beyond the out-of-band domain in which spurious emissions generally predominate. (REAL: Article 2-1-63.4) Out-of-band domain is defined as the frequency range, immediately outside the necessary bandwidth, in which out-of-band emissions generally predominate. (REAL: Article 2-1-63.5)		Addition of the definition of the terminologies
6	3.2(11) a) Definition	(ORE: Appended Table 3) "Permissible level of spurious emission" is defined as a limit which is stated as mean power of spurious emissions on frequencies of unmodulated signals supplied to an antenna transmission line. (ORE: Appended Table 3, 1 (1))	"Permissible level of spurious emission or unwanted emission" is defined as a limit which is stated as power of unwanted emissions on frequencies of modulated signals supplied to an antenna transmission line or mean power of equivalent isotropic radiation power of the signals.	Correction to the definition of the terminologies

<table>
<tr><td></td><td></td><td>“Permissible level of unwanted emission” is defined as a limit which is stated as mean power of unwanted emissions on frequencies of unmodulated signals supplied to an antenna transmission line.
(ORE: Appended Table 3, 1 (2))</td><td>((ORE: Appended Table 3, 1 (2))</td><td></td></tr>
<tr><td>6</td><td>3.2(11)
b)
Permissible Levels</td><td>(ORE: Article 7 Appended Table 3-22)
(NT: No.368 in 2007)</td><td>(ORE: Article 7 Appended Table 3-23)</td><td>Addition of NT numbers, et al.</td></tr>
<tr><td>6</td><td>3.2(11)
b)
Permissible Levels</td><td>Permissible levels of spurious emission or unwanted emission shall be as follows. The boundary frequency between out-of-band domain and spurious domain shall be ±62.5 kHz from the carrier frequency.
i) Permissible level of spurious emission in out-of-band domain:
It shall be 2.5μW or less, or 40 dB or more below the average carrier power of the fundamental frequency. However, when the absolute gain of a transmit antenna is 0dB or less, it shall be 2.5μW or less as equivalent</td><td>Permissible levels of spurious emission or unwanted emission shall be as specified in Table 3-4.
Table 3-4 Permissible level of spurious emission or unwanted emission
<table><tr><th>Antenna Power</th><th>Unwanted Emission Definition</th><th>Permissible level</th></tr><tr><td rowspan="2">100μW (e.i.r.p.) or less</td><td>out-of-band domain (inside of ±62.5 kHz from the carrier frequency)</td><td>2.5μW (e.i.r.p.) or less</td></tr><tr><td>spurious domain (outside of ±62.5 kHz from the carrier frequency)</td><td>2.5μW (e.i.r.p.) or less</td></tr><tr><td rowspan="2">Other than the above</td><td>out-of-band domain (inside of ±62.5 kHz from the carrier frequency)</td><td>2.5μW or less</td></tr><tr><td>spurious domain (outside of ±62.5 kHz from the carrier frequency)</td><td>2.5μW or less</td></tr></table>(Note) e.i.r.p.: equivalent isotropic radiation power</td><td>In accordance with NT No.89 in 2012</td></tr>
</table>

		isotropic radiation power (Note), or 40dB or more below the average carrier power of the fundamental frequency. ii)Permissible level of unwanted emission in spurious domain It shall be 2.5μW or less, or 43 dB or more below the carrier power of the fundamental frequency. However, when the absolute gain of a transmit antenna is 0 dB or less, it shall be 2.5μW or less as equivalent isotropic radiation power (Note), or 43 dB or more below the carrier power of the fundamental frequency. Note: Equivalent isotropic radiation power may be obtained by adding the transmit antenna gain (dB) to the power (dB) measured at the input to the feeder.		
6	3.3(1)	The limit of secondary emissions radiated from the receiving equipment shall be, in terms of the power at a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4nW or less when	The limit of secondary emissions shall be as specified in Table 3-5. Table 3-5 Limit of secondary radiated emissions Antenna Power / Frequency Range / Limit / Reference Bandwidth 100μW (e.i.r.p.) or less / 1 GHz or less / 4nW (e.i.r.p.) or less / 100 kHz Above 1 GHz / 4nW (e.i.r.p.) or less / 1 MHz Other than the above / / 4nW or less / (Note) eirp: equivalent isotropic radiation power	In accordance with the partial revision to the ORE

		measured using the circuit.		
7	3.3(4)	when the interfering signal modulated by a recurring binary digit pseudo-noise signal having a code length of 32767 bits 25 kHz distant from the desired signal	when the interfering signal modulated by a recurring binary digit pseudo-noise signal having a code length of 32767 bits respectively from the desired signal is added,	Clarification of condition
7	3.4(1)	i) The case where the radio equipment is not connected to telecommunications circuit facilities: In this case the either of the following functions is required. ① Function that automatically transmit or receive an identification code of the radio equipment used primarily in the same premises. ② Function that frequency switch or halt of the radio emission can be performed easily by users.	The case where the radio equipment is not connected to a telecommunications circuit: Function that automatically transmit or receive an identification code of the radio equipment used primarily in the same premises.	In accordance with the partial revision to the ORE
8	3.4(3)	The transmission time restricting device is a device having functions that stop the radio emission within the specified transmission time after the radio emission and resume the subsequent radio emission only after the specified transmission halt time has	The transmission time restricting device is a device having functions that stop the radio emission within the following transmission time after the radio emission and resume the subsequent radio emission only after the transmission halt time has elapsed, or restrict the	In accordance with NT No.88 in 2012

		elapsed, or restrict the duration time of the transmission within the specified duration time and does not resume the radio emission before the specified transmission time has elapsed following the end of the communication. The limits to the duration of the transmission and the transmission halt time shall be: i) The case where antenna power is 10mW or less: The total time of the transmission per 5 seconds shall be 1 second or less. ii) The case where antenna power is higher than 10mW The maximum duration time permitting continuous transmission shall be 600 seconds and the radio emission halt time shall be 1 second. In the case where the emission is intended to be made exceeding 600 seconds, the emission shall be halted automatically when 600 seconds has elapsed after the start of the emission, and within the emission halt time of 1 second the emission shall	duration of the emission within the following duration time and does not resume the radio emission before the specified radio emission halt time has elapsed. The limits to the duration of the emission shall be the following: The total time of the transmission per 5 seconds shall be 1 second or less.	

		not be resumed.		
8	3.4(4)	(ORE: Article 49.14 and NT: Article 49 in 1989) Function of carrier sense shall be the following. i) The case where antenna power is 10mW or less: The function of carrier sense is not required. ii) The case where antenna power is higher than10mW: Function of carrier sense shall be installed. Before the radio equipment starts new emission, carrier sense shall be performed. The level of the carrier sense shall be 7μV or higher as voltage induced in an antenna with absolute antenna gain of 2.14dB.	The function of carrier sense is not required in radio equipment.	In accordance with NT No.88 in 2012
8	3.5(1)	Not specified.	The structure of an antenna has no feeder and grounding device.	In accordance with the partial revision to ORE
8	3.5(2)	The absolute gain of the transmitting antenna shall be 2.14dB or less. However, when the equivalent isotropically radiated power (e.i.r.p.) of the emitted radio wave is less than the summation of	The absolute gain of the transmitting antenna shall be 2.14dB or less. When the equivalent isotropically radiated power (e.i.r.p.) of the emitted radio wave is less than the summation of 2.14dB and	In accordance with the partial revision to ORE

		2.14dB and antenna power of 1W, the shortage of the e.i.r.p. can be compensated by increasing the antenna gain.	antenna power of 0.01W, the shortage of the eirp can be compensated by increasing the antenna gain.	
9	3.6(1)	The radio equipment shall be housed in a single cabinet that shall not be able to be opened easily. This requirement, however, does not apply to the following: i) Power-supply equipment ii) Control unit iii) Antenna iv) Display panel indicating the operating status of transmitters and receivers v) Volume and squelch controllers vi) Frequency switching unit vii) Transmission/reception switchers viii) Associated unit and the equivalent one	The radio equipment including an antenna duplexer used in a centralized base station shall be housed in a single cabinet that has no antenna connector and hall not be able to be opened easily. This requirement, however, does not apply to the following: i) Power-supply equipment ii) Control unit iii) Display panel indicating the operating status of transmitters and receivers iv) Volume and squelch controllers v) Frequency switching unit vi) Transmission and reception switchers vii) Associated unit and the equivalent one	In accordance with the partial revision to ORE
9	3.6(2)	(OTRCC: Article 8)	(OTRCC: Article 6)	Correction of error
11	Chapter 5	Measurement methods shall be in accordance with the Notification (Note 1) of the Ministry of Internal Affairs and	Measurement methods shall be in accordance with the "TELEC-T246 the measurement method of radio equipment used for	Review of the description

		Communications, which are specified in item 1(3) of Appended Table 1 of OTRCC. For other test items which are not notified in the above methods, measurements methods generally used shall be applied. Note 1: This ordinance refers to Notification of Ministry of Internal Affairs and Communications No.88 "Testing method for the characteristics examination" (January 26, 2004) as of the date of issue of this revised standard (version 2.0 issued on July 4, 2012). However, the latest version of the Notification shall be applied if the Notification or contents of the Notification is revised.	Animal Detection Report System Equipment for Specified Low-power Radio Station", which was established according to NT No.88-2 issued on January 26, 2004, shall be applied. For other test items which are not notified in the above methods, measurements methods generally used shall be applied. In the case where measurement methods are specified in NT et al. the methods shall be applied. Note: For the measurement there are two cases: with a measurement port or without a measurement port. To enable prompt measurement it is recommended to use the measurement port.	
13	Reference 1	(OTRCC: Appended Table No.1, and Examination for Conformity Certification of Technical Conditions Compliance: Articles 6 and 25)	(OTRCC: Appended Table No.3, and Methods of Examination Articles 4 and 11)	In accordance with the partial revisions to OTRCC
13	(1)	Intensity of spurious	Intensity of unwanted	Correction of

		emission or unwanted emission	emission	error
14	Reference 2 Guideline of operation	Delete	Reference 2 Guideline of operation	According to the upgrade of the system in MIC, the guideline of operation was not needed.

The 2.1th edition amendment history

Page	Paragraph No.	Content of Amendment	Old edition	Reason
	Foreword	This ARIB Standard is developed for "150 MHz Band Animal Detection Report System Equipment 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.	This ARIB Standard is developed for "150 MHz Band Animal Detection Report System Equipment 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, users and so on.	Based on the review of description
	Foreword	Attachment 1 (None) (Selection of Option 1) Attachment 2 (None) (Selection of Option 2)		addition

1	1.1	This standard defines requirements for animal detection report system which is categorized as a Specified Low-power Radio Station designated in Article 6 of the Regulations for Enforcement of the Radio Law. The system is a radio system that makes radio communication used for mainly reporting the information about movement and status of animals in Japan with related control information.	This standard defines requirements for radio equipment to send information or information processed for the purpose of establishing animal detection report system which is categorized as a Specified Low-power Radio Station designated in Article 6 of the Regulations for Enforcement of the Radio Law. The system is a radio system that makes radio communication used for mainly reporting the information about movement and status of animals in Japan and control information.	Reviewed in line with RERL
1	1.2	The radio station for the animal detection report system ----radio equipment--- as shown in Figure 1.1.	The radio station for the detection report system of animals----radio equipment--- as shown in Figure 1.1.	Review of description
1	1.2	Figure 1.1 Configuration of radio station for animal detection report system	Figure 1.1 Configuration of radio station for detection report system of animals	Review of description
4	3.1(2)	Contents of communication (RERL: Article 6) The content of communication shall be related to mainly reporting the information about movement and status of	Contents of communication (NT: No.42 in 1989) The content of communication shall be related to mainly reporting the information about movement, status of animals	Reviewed in line with REAL

		animals with related control information.	and control information.	
5	3.2(4)	(4) Frequency Tolerance (ORE: Article 5, Appended Table 1 and NT: No.422 in 2012) The frequency tolerance, which is the maximum permissible tolerance from the designated center frequency of the occupied frequency band of the emitted signal, shall be $\pm 12 \times 10^{-6}$.	(4) Frequency Tolerance (ORE: Article 5, Appended Table 1 and NT: No.50 in 1989) The frequency tolerance, which is the maximum permissible tolerance from the designated center frequency of the occupied frequency band of the emitted signal, shall be $\pm 12 \times 10^{-6}$.	In line with NT No.422 in 2012) (NT No.50 in 1989 was deleted.)
5	3.2(9)	(9) Leakage Power to Adjacent channel (ORE: Article 49.14) The leakage power radiated to the adjacent channel of the bandwidth of ±8kHz separated by 20 kHz from the center frequency of the carrier shall be 1μW or less. However, when the absolute gain of a transmit antenna is 0dB or less, the leakage power shall be 1μW or less as equivalent isotropic radiation power (Note). Note: Equivalent isotropic radiation power may be obtained by adding the transmit antenna gain (dB) to the power (dB) measured at the input to the feeder.	(9) Leakage Power to Adjacent channel (ORE: Article 49.14, NT:No.49 in 1989) The leakage power radiated to the adjacent channel of the bandwidth of ±8kHz separated by 20 kHz from the center frequency of the carrier shall be 1μW or less. . However, regarding the radio equipment having the absolute transmit antenna gain of 0dB or less, the leakage power shall be 1μW or less as equivalent isotropic radiation power (Note). Note: Equivalent isotropic radiation power may be obtained by adding the transmit antenna gain (dB)	Correction of error and reviewed in accordance with the revision to ORE Article No.49.14

			to the power (dB) measured at the input to the feeder.	
8	3.4(3)	ii) The case where antenna power is higher than 10mW The maximum duration time permitting continuous emission shall be 600 seconds and the radio emission halt time shall be 1 second. In the case where the emission is intended to be made exceeding 600 seconds, the emission shall be halted automatically at 600 seconds after the start of the emission, and within the emission halt time of 1 second the emission shall not be resumed. In the case where the duration of the continuous emission is less than 600 seconds, the emission can be resumed immediately.	ii) The case where antenna power is higher than 10mW The maximum duration time permitting continuous emission shall be 600 seconds and the radio emission halt time shall be 1 second. In the case where the emission is intended to be made exceeding 600 seconds, the emission shall be halted automatically at 600 seconds after the start of the emission, and within the emission halt time of 1 second the emission shall not be resumed.	In accordance with NT No.281 in 2014
	Chapter 4 (1)	(1) Identification Code Identification code, which is used to identify a transmitting station at an opposite site by checking the code before establishing a communication line and is generally included in a control signal, shall be comprised of 48 bits or more.	(1) Identification Code Identification code, which is used to identify a transmitting station at an opposite site by checking the code before establishing a communication line and is generally included in a control signal, shall be comprised of 48 bits.	Correction of error

11	Chapter 5	Note 1: This ordinance refers to 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 2.1 issued on July 3, 2015). However, the latest version of the Notification shall be applied if the Notification or contents of the Notification is revised.	Note 1: This ordinance refers to Notification of Ministry of Internal Affairs and Communications No.88 “Testing method for the characteristics examination” (January 26, 2004) as of the date of issue of this revised standard (version 2.0 issued on July 3, 2012). However, the latest version of the Notification shall be applied if the Notification or contents of the Notification is revised.	Issue of Version 2.1

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Communication Note of ARIB Standard-related Proposals, etc.

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150 MHz Band Animal Detection Report System Equipment

for Specified Low-power Radio Station

ARIB STANDARD

ARIB STD-T99 Version 2.1

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