ENGLISH TRANSLATION

UWB (ULTRA-WIDEBAND) RADIO SYSTEMS

ARIB STANDARD

ARIB STD-T91 Ver. 2.0

Version 1.0 December 12th 2006
Version 1.1 September 25th 2008
Version 2.0 March 17th 2015

Association of Radio Industries and Businesses

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

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Foreword

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

ARIB Standards include "government technical regulations" (mandatory standard) that are set for the purpose of encouraging effective use of frequency and preventing interference with other spectrum users, and "private technical standards" (voluntary standards) that are defined in order to ensure 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 UWB (Ultra-wideband) Radio Systems. 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.

With the Radio Systems described in the Standard herein, the electrical power spreads over a wide bandwidth, and therefore it is necessary to avoid radio interference to various radio systems in the band. In order to avoid harmful radio interferences to other radio systems, "Operational Guidance for UWB Radio Systems" and "Design Guidelines for UWB Radio Equipment" were also documented and attached hereto as a reference material. 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)
(N/A)
Attachment 2 (Selection of Option 2)
(N/A)

Contents

Chapter 1 General Descriptions

1.1 Outline

The standard defines requirements of the radio equipment of the radio stations of ultra-wideband radio system (Note 1.1) stipulated in item 2 of paragraph 2, Article 4.4 of Regulations for Enforcement of Radio Law. (The radio stations mainly handle data transmissions for indoor use with the required frequency bandwidth of 450 MHz or higher and with the antenna power of 0.001 W or less (the specified power that is supplied from the transmitter to the feeder of an antenna system) using a frequency between 3.4GHz or higher and lower than 4.8 GHz, or between 7.25GHz or higher and lower than 10.25GHz.)

(Note 1.1) In this standard, the system named "UWB (Ultra-Wideband) Radio System" or "UWB Radio System".

1.2 Scope of the Standard

The radio station of a UWB Radio System consists of radio equipment and data terminal equipment (including one connected to telecommunication circuit facilities), etc. as shown in the Figure 1-1.

The standard defines the said radio equipment.

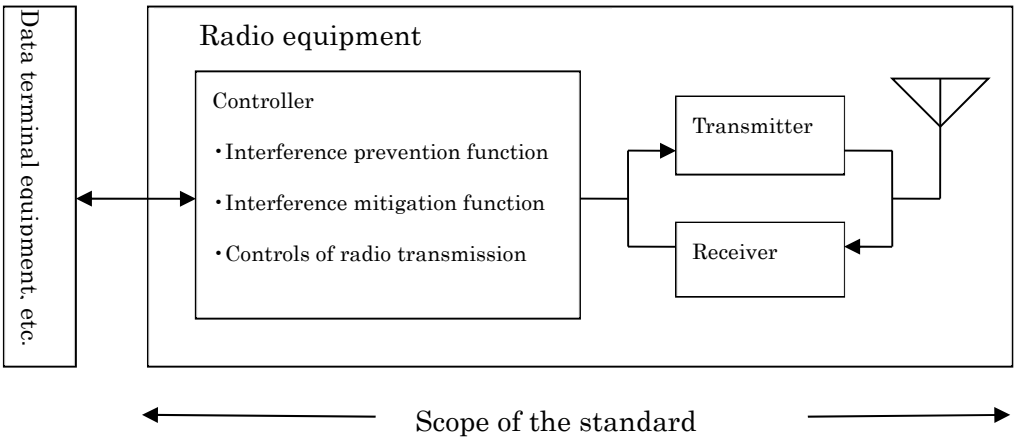


Figure 1-1 Configuration of radio station of UWB Radio System

1.3 Reference regulations

In the standard, “RL” refers to Radio Law, “RERL” refers to 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 Ordinance Concerning Terminal Facilities etc., “RTCCA” refers to 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 (MIC) if issued in 2001 or later.

Chapter 2 Standard System

2.1 System Overview

UWB Radio System is a radio system that spreads electric power over a very wide bandwidth.

On the other hand, the standard does not specify a protocol layer.

2.2 System configurations

The standard does not specify system configurations.

Chapter 3 Technical Requirements for Radio Equipment

3.1 General Conditions

(1) Contents of communications (RERL, Article 4.4)

Content of communication shall primarily be for data transmissions.

(2) Communication methods (ORE, Article 49.27)

Communication methods shall be simplex operation, full duplex operation or half duplex operation.

(3) Operating Frequency band (RERL, Article 4.4)

Operating frequency band to be used shall be between 3.4GHz or higher and lower than 4.8GHz, or between 7.25GHz or higher and lower than 10.25GHz.

(4) Usage environment condition (RERL, Article 4.4)

The radio equipment shall be used indoors.

3.2 Transmitter

(1) Modulation method

There is no specific restriction on the modulation method.

(2) Antenna power (ORE, Article 49.27, According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010) (Revised by MIC Ordinance No. 122 on December 25, 2013))

Antenna power for the operating frequency band shall satisfy respective values as follows:

- Average power per 1MHz bandwidth shall be -41.3 dBm or less.

Within the frequency band between 3.4 GHz or higher and lower than 4.2 GHz, the average power per 1 MHz bandwidth shall be -70 dBm or less. The radio equipment with use of frequency between 3.4 GHz or higher and lower than 4.8 GHz shall have the interference mitigation function as stipulated in 3.4 (2). But, this term is not applied to the equipment which has the average power per 1 MHz bandwidth of -70 dBm or less.

- Peak power per 50MHz bandwidth shall be 0 dBm or less.

Within the frequency band between 3.4 GHz or higher and lower than 4.2 GHz, the peak power per 50 MHz bandwidth shall be -30 dBm or less. The radio equipment with use of frequency between 3.4 GHz or higher and lower than 4.8 GHz shall have the interference mitigation function as stipulated in 3.4 (2). But, this term is not applied to the equipment which has the average power per 1 MHz bandwidth of -70 dBm or less.

(3) Tolerances of antenna power (ORE, Article 14)

The upper limit of the tolerance for the antenna power emitted from transmitter equipment shall be +20%.

(4) Transmission data rate (ORE, Article 49.27)

Transmission data rate with use of a frequency between 3.4GHz or higher and lower than 4.8GHz shall be higher than 50 Mbps except the case in which noise or interference from other radio stations could be avoided.

(5) Frequency bandwidth (ORE, Article 49.27)

Frequency bandwidth between the upper and lower frequencies for the radiation power points which are 10 dB below the maximum radiation power level shall be 450 MHz or more.

(6) Permissible values for occupied bandwidth (ORE, Article 6 / Table 2-49.)

Permissible values for the occupied bandwidth shall be as follows:

- For those with use of the frequency between 3.4 GHz or higher and lower than 4.8 GHz

  1.4 GHz

- For those with use of the frequency between 7.25 GHz or higher and lower than 10.25 GHz

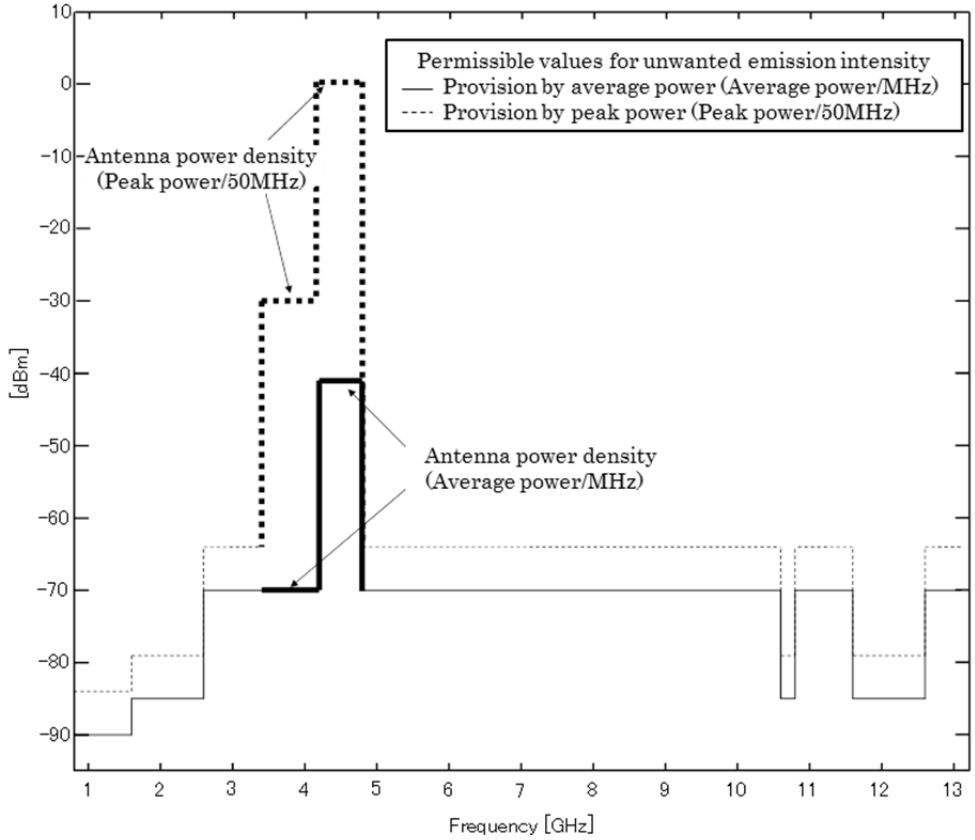
  3 GHz

(7) Permissible values for unwanted emission intensity (ORE, Article 7 / Table 3-42)

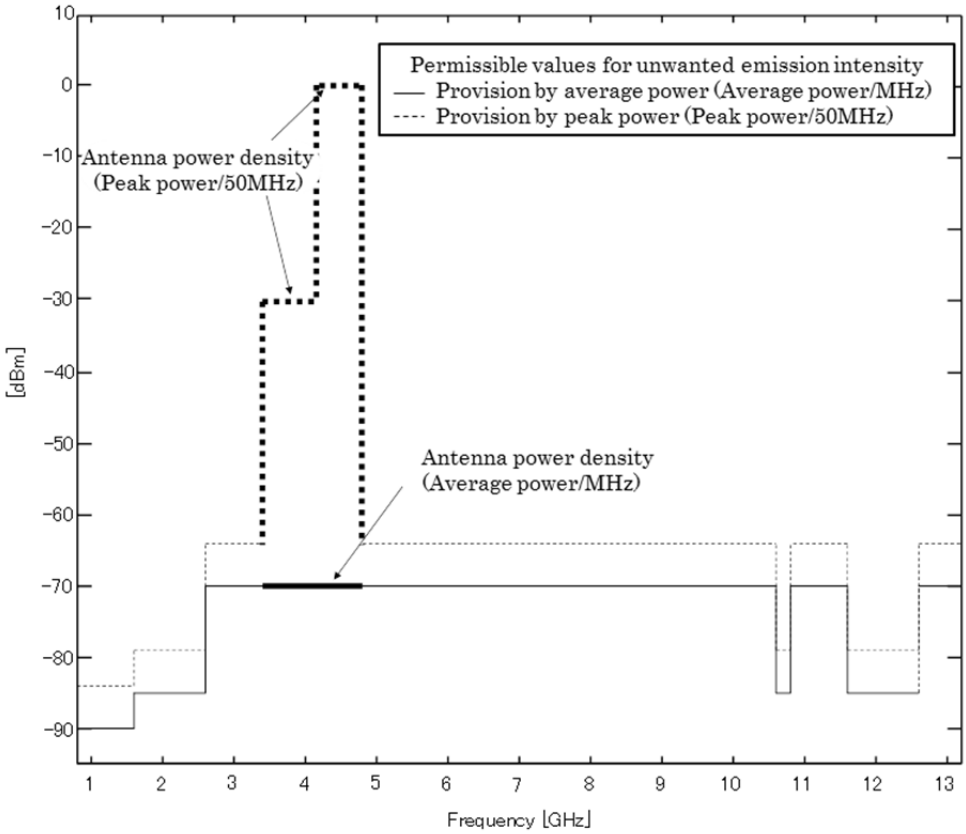
Permissible values for the unwanted emission intensity from the transmitter are as follows: (Note 3.1)

Frequency band	Permissible values for unwanted emission intensity	
	Average power per 1 MHz bandwidth	Peak power per 1 MHz bandwidth
lower than 1,600 MHz	-90 dBm or less	-84 dBm or less
1,600 MHz or higher to lower than 2,700 MHz	-85 dBm or less	-79 dBm or less
2,700 MHz or higher to lower than 10.6 GHz	-70 dBm or less	-64 dBm or less
10.6 GHz or higher to lower than 10.7 GHz	-85 dBm or less	-79 dBm or less
10.7 GHz or higher to lower than 11.7 GHz	-70 dBm or less	-64 dBm or less
11.7 GHz or higher to lower than 12.75 GHz	-85 dBm or less	-79 dBm or less
12.75 GHz or higher	-70 dBm or less	-64 dBm or less

(Note 3.1): In case that the frequency is used within a range between 3.4 GHz or higher and lower than 4.8 GHz, the antenna power for its frequency band shall comply with Article 3.2 (2) instead of 3.2 (7). Similarly, in case that the frequency is used within a range between 7.25 GHz or higher and lower than 10.25 GHz, the antenna power for its frequency band shall comply with the Article 3.2 (2) instead of 3.2 (7).



1) With an interference mitigation function



2) Without an interference mitigation function

Figure 3-1 Antenna power density
and permissible values for unwanted emission intensity
(when using frequency between 3.4 GHz or higher and lower than 4.8 GHz)

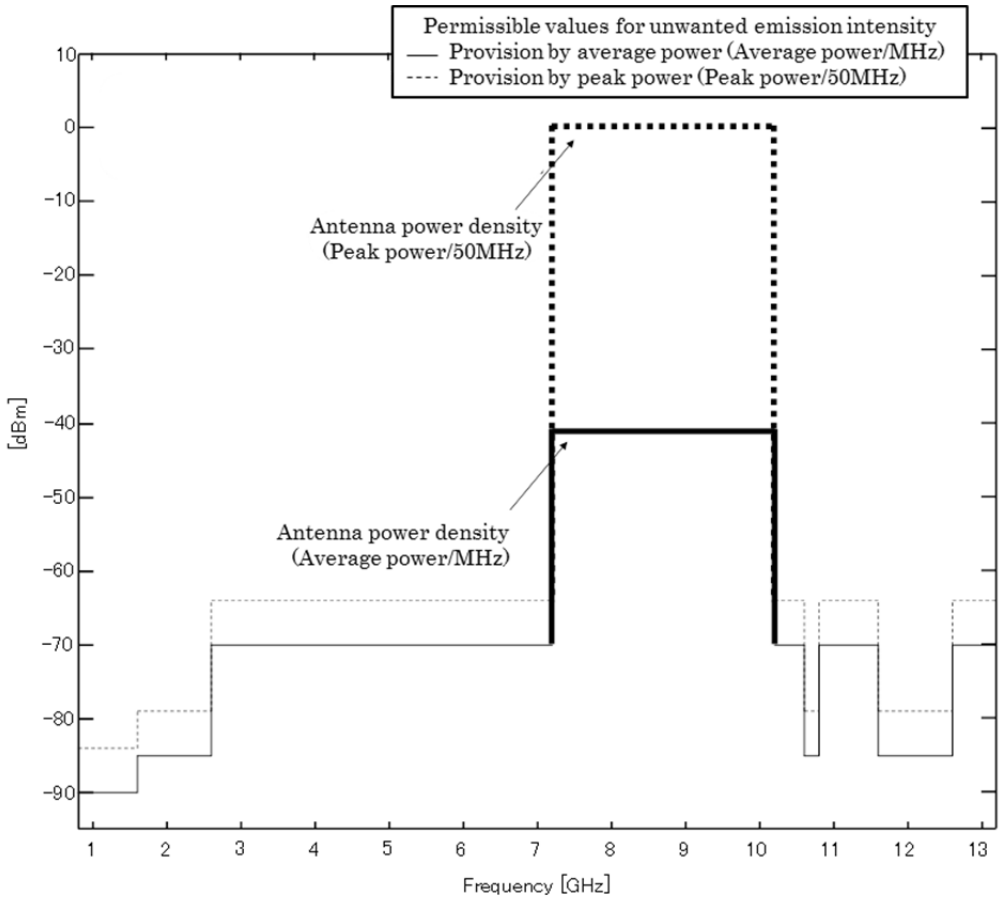


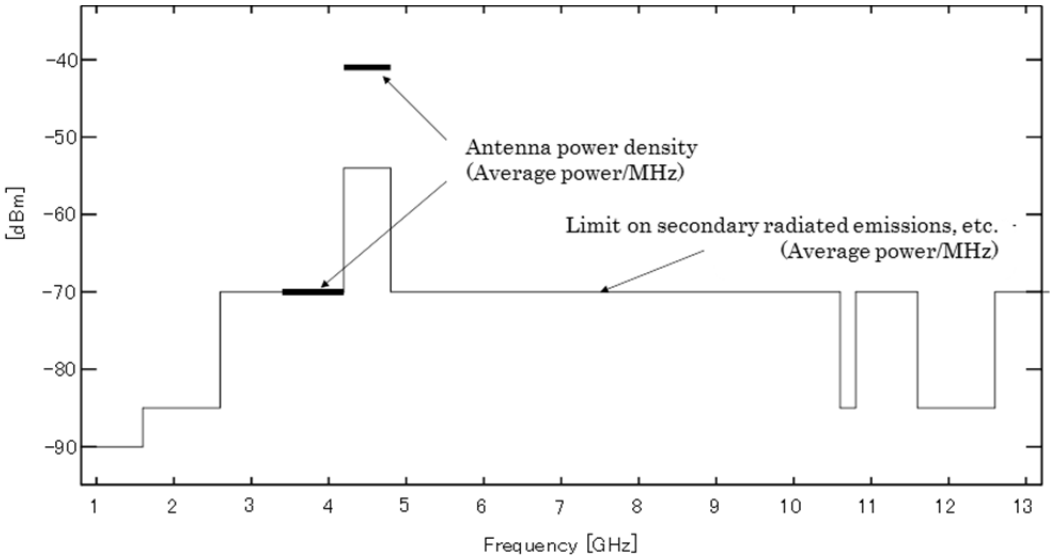
Figure 3-2 Antenna power density
and permissible values for unwanted emission intensity
(when using frequency between 7.25 GHz or higher and lower than 10.25 GHz)

3.3 Receiver

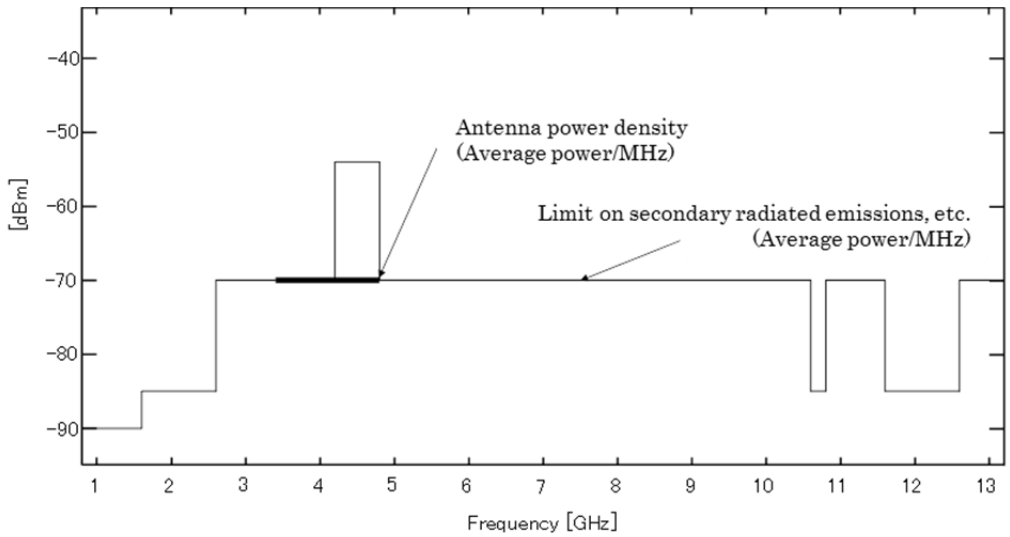
(1) Limit on secondary radiated emissions, etc. (ORE, Article 24, According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010) (Revised by MIC Ordinance No. 122 on December 25, 2013))

Limit on secondary radiated emissions, etc. from the receiver shall be as follows:

Frequency band	Average power at any 1 MHz bandwidth	
	When using frequency between 3.4 GHz or higher and lower than 4.8 GHz	When using frequency between 7.25 GHz or higher and lower than 10.25 GHz
lower than 1,600 MHz	-90 dBm or less	
1,600 MHz or higher to lower than 2,700 MHz	-85 dBm or less	
2,700 MHz or higher to lower than 4.2 GHz	-70 dBm or less	
4.2 GHz or higher to lower than 4.8 GHz	-54 dBm or less	-70 dBm or less
4.8 GHz or higher to lower than 7.25 GHz	-70 dBm or less	
7.25 GHz or higher to lower than 10.25 GHz	-70 dBm or less	-54 dBm or less
10.25 GHz or higher to lower than 10.6 GHz	-70 dBm or less	
10.6 GHz or higher to lower than 10.7 GHz	-85 dBm or less	
10.7 GHz or higher to lower than 11.7 GHz	-70 dBm or less	
11.7 GHz or higher to lower than 12.75 GHz	-85 dBm or less	
12.75 GHz or higher	-70 dBm or less	



1) With an interference mitigation function



2) Without an interference mitigation function

Figure 3-3 Antenna power density
and limit on secondary radiated emissions, etc.
(when using frequency between 3.4 GHz or higher and lower than 4.8 GHz)

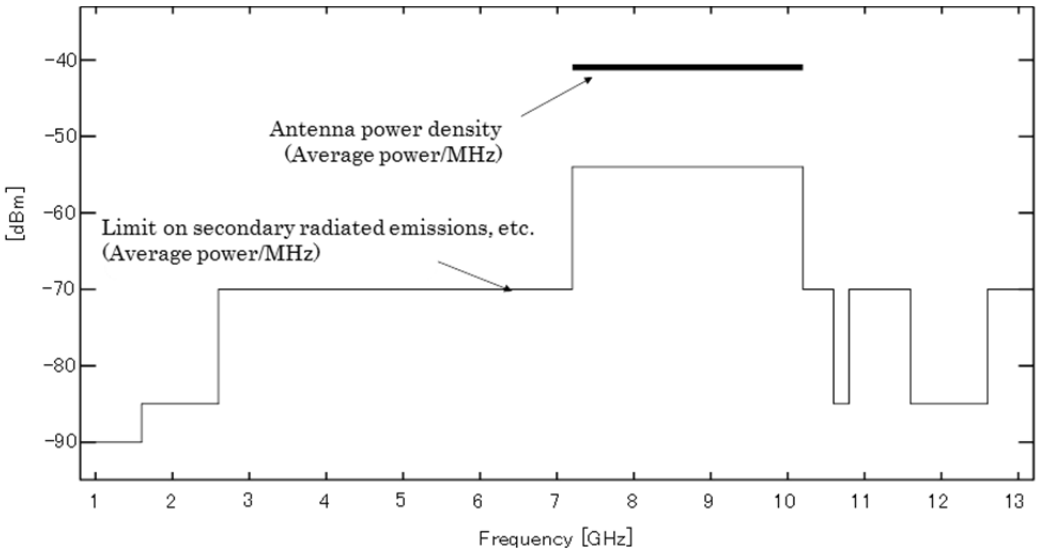


Figure 3-4 Antenna power density

and limit on secondary radiated emissions, etc.

(when using frequency between 7.25 GHz or higher and lower than 10.25 GHz)

3.4 Controller

A controller shall have the following devices and functions, and meet each of the following conditions.

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

The radio equipment of the radio station shall mainly be used in the same premises. It shall automatically transmit identification signs or receive them.

(2) Interference mitigation function (ORE, Article 49.27)

The radio equipment using the frequency between 3.4 GHz or higher and lower than 4.8 GHz shall have the interference mitigation function that meets the technical conditions [3.2] notified separately by Minister of Internal Affairs and Communications. But, this article may not be applied to the equipment which has the average emission power of -70dBm or less per 1 MHz.

[Note 3.2] The interference mitigation function (NT, No.475 in 2013)

In case of the preparation stage of emission or emission stage of radio frequency for the equipment of UWB Radio systems, the technical conditions of the interference mitigation function shall comply with the articles as follows.

(a) In case of receiving the same frequency as the UWB Radio system and receiving the input level more than -136dBm at random 15kHz bandwidth, the average antenna power at random 1 MHz bandwidth shall be -70dBm.

(b) The signal detection time shall be 5 seconds or more.

(c) The signal detection probability shall be 99% or more.

(d) The signal detection interval shall be within 60 seconds.

3.5 Connections with telecommunication circuit equipment

A radio equipment that is connected to the telecommunication circuit equipment shall meet the following conditions:

(1) Terminal equipment (NT, No.72 in 1994)

The terminal equipment is a kind of radio station stipulated in Article 4.3 of "RL" and the equipment which use the radio equipment in the radio station of ultra-wideband radio system stipulated in item 2 of paragraph 2, Article 4.4 of "RERL".

(2) Identification devices (OTF, Article 9)

An identification device shall have a unique identification sign (sign designed to identify the radio equipment used for the terminal equipment and to be collated when configuring a communication channel).

(3) Identification signs (NT, No. 424 in 1994)

The coding length of the identification sign shall be 48 bits or more.

(4) Method to judge the availability of the operating frequency band (NT, No. 424 in 1994)

Judgment of the availability of the operating frequency band shall be made by detecting a radio wave emitted from another radio station, or by calculating the received signal and detecting the signal level. However, for the equipment that has a function to disconnect the channel when the communication quality is degraded, the judgment may be replaced by checking the normal operating condition of the channel.

3.6 Antenna

(1) Antenna structures

There is no specific provision for the antenna structure.

(2) Gain of the transmitting antenna (ORE, Article 49.27)

Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in case that the e.i.r.p. (Equivalent Isotropic Radiated Power) falls below the value which is added to the transmitting antenna of absolute gain 0dBi with the antenna power stipulated in 3.2(2). The difference may be complemented by adjusting the gain of the transmitting antenna.

(3) Gain of the receiving antenna

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

3.7 Others

(1) Cabinet (ORE, Article 49.27)

The cabinet shall be constructed so as not to be easily tampered with.

(2) Mark of usage restrictions (ORE, Article 49.27)

A mark of the usage restriction that radio waves can be emitted only indoor shall be visibly shown on the cabinet.

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

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

(4) Mark in relation to technical conditions compliance approval for terminal equipment (RTCCA, Article 10)

In case a radio equipment connects to the telecommunication circuit equipment, a mark in relation to technical conditions compliance approval for terminal equipment in the specified format shall be visibly displayed on it.

Chapter 4 Measurement Methods

Measurement methods shall be in accordance with MIC Ordinance related with OTRCC, Item 1 (3) in Appendix 1 [Note 4.1]. Items that are not specified in the MIC Ordinance, however, shall be based on conventionally practiced methods.

[Note 4.1] At the release date of ARIB STD-T91 Ver. 2.0 on March 17, 2015, it means MIC Ordinance No, 88 on January 26, 2004. However if the MIC Ordinance and the contents of the MIC Ordinance are revised in near future, measurement methods shall be in accordance with latest versions of the MIC Ordinance and the contents.

In addition, TELEC-T406 (“Characteristics Test Methods for Radio Equipment Used for Radio Station of Ultra-Wideband Radio System”) that is issued by Telecom Engineering Center (TELEC) Foundation based on the MIC Ordinance No. 88 on January 26, 2004, may be referred as the measurement methods as of the revised time of the Standard Ver. 2.0 (on March 17, 2015).

Annex 1 Test Items in relation to Technical Regulations Conformity Certification for Specified Radio Equipment

(OTRCC, Appendix 1)

Test items in relation to the technical regulation conformity certification for radio equipment of radio stations of UWB (Ultra-Wideband) radio system are as follows:

See ARIB STD-T91 Chapter 4 for details.

(1) Transmitter

Frequency

Occupied bandwidth

Intensity of spurious emission or unwanted emission

Antenna power

Gain of transmitting antenna

Frequency Bandwidth

(2) Receiver

Limit on secondary radiated emissions

(3) Others

Interference mitigation function (When using radio frequency between 3.4 GHz or higher and lower than 4.8 GHz)

Annex 2 Operational Guidance for UWB Radio Systems

1 Summary

1.1 Objectives

The Operational Guidance is aimed at avoiding harmful radio interference to other radio equipment, and ensuring users' convenience as well as achieving effective spectrum utilization, for operating UWB (Ultra-wideband) radio systems.

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

1.2 General scope

The Operational Guidance is applied to users of UWB radio systems and vendors (hereinafter referred to as "vendors") who manufacture, sell and install the radio equipment of radio stations of UWB radio systems (hereinafter referred to as "UWB radio equipment").

1.3 Target Systems

The Operational Guidance is intended for the following system.

- UWB (Ultra-Wideband) Radio Systems ARIB STD-T91

1.4 Basic agreements

(1) Clarification of problems

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

(2) Preliminary survey

In case users or vendors intend to introduce UWB radio equipment, preliminary survey on interference shall be practiced, and it shall be confirmed prior to the introduction that the said radio equipment will not cause radio interference which is harmful to other radio equipment.

(3) Cooperate responses

In the event that a UWB radio system has caused radio interference which is harmful to other radio equipment, the users and/or vendors shall cooperate in good faith for avoidance and reduction of the radio interference.

2 Clarification of problems

(1) Operation manuals

Vendors shall include the intended meanings of the following messages in operation manuals of UWB radio equipment.

The frequency band used for the UWB radio function is also used for radio equipment of other radio systems.

1. The use of equipment with UWB radio function shall be limited to indoors, i.e. within environments such as houses, apartments, buildings, etc. Not approved for outdoor use.

Even if it will be used indoors, in case of use at the event place which will be broadcasted by relay, please confirm with the event organizer about the use of UWB radio function as it might cause interference to broadcasting operations.

2. The use of equipment with UWB radio function may cause influence on radio astronomy operations, etc. When the equipment is used near a radio astronomy observatory, please contact the following address.

3. In case that harmful interference to other non-UWB radio equipment (satellite earth stations, 5GHz band wireless LAN, mobile phones, etc.) is caused due to the emission from the UWB radio function of the equipment, please take discretionary actions such as to remove the UWB radio equipment from the interfering area. If interference remains, promptly stop the radio emission and contact the following address:

Contact us at :_____

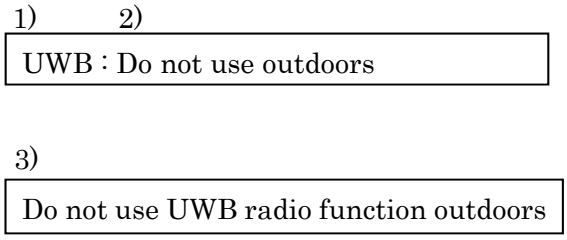
Note: The "UWB radio function" stated in the operation manual refers to the wireless communication function of the UWB radio systems,

(2) Catalogs, brochures, websites

Vendors shall include similar warning message as shown in the operational manuals in catalogs, brochures, websites, etc.

(3) Indication by labels

Vendors shall indicate one of the following messages visibly displayed on the UWB radio equipment.



Notes:

1) shows that the equipment is UWB radio equipment.
2) shows that the equipment shall only be used indoors.
3) shows that the equipment is UWB radio equipment, and that UWB radio function shall only be used indoors .

The method of indication, size, horizontal to vertical ratio, color and the use of a frame of the label are not specified. The quality of the label material is not specified but the label shall not be easily removed nor scratched. The font type and color of the label characters are not specified either, but should be clear and easy-to-read.

3 Preliminary survey

3.1 Method of preliminary survey

(1) Survey of existing radio astronomy observatories

Users who intend to operate UWB radio system shall check whether there is a radio astronomy operation currently in use or planed in the neighborhood.

If a radio astronomy observatory is found or assumed to be in operation in the neighborhood, UWB radio system shall not be operated, unless the user receives consent from an authorized person of the radio astronomy observatory.

(2) Preliminary survey at an event site, etc.

Users who intend to operate a UWB radio system at an event site, etc. shall confirm its use with the event organizer. If broadcast radio relay equipment is used on site, the user of the UWB radio system shall notify its use to the authorized person of the broadcast service, perform a prior test before the operation of the system if necessary,, and then obtain permission from the event organizer.

A UWB radio system shall not be operated at an event site, etc. unless permission from the event organizer can be obtained.

3.2 Response by Vendors

When installing a UWB radio system, vendors shall execute a preliminary survey upon request by the user. Vendors should voluntarily execute a preliminary survey even if such a

request is not issued.

4 Cooperation

4.1 Cooperation for interference avoidance

In case that harmful radio interference is caused to radio equipment other than UWB radio systems, by the use of a UWB radio system manufactured, sold and installed by a vendor, and that it is needed to discuss a radio interference avoidance measure between the user of the UWB radio system and the management representative of the interfered radio equipment, the vendor shall, in good faith, extend cooperation to avoid the radio interference.

In case that the harmful interference to radio equipment other than UWB radio systems is caused after a UWB radio system had started its operation, the radio emission shall be promptly stopped, and an interference avoidance measure shall be taken.

4.2 Cooperation for interference avoidance from January 1, 2014 or later for radio equipment using radio frequency between 4.2 GHz or higher and lower than 4.8 GHz without interference mitigation functions

With respect to the trend of future new mobile communications systems, etc., and development of domestic radio ordinances, vendors shall refrain from manufacturing, selling and installing UWB radio equipment using the frequency between 4.2 GHz or higher and lower than 4.8 GHz without interference mitigation functions (hereinafter referred to as “radio equipment not supporting interference mitigation”) from January 1, 2014 or later.

Also, vendors shall cooperate with public organizations to estimate the remaining number of UWB radio equipment not supporting interference mitigation, by tracking the number of shipped radio equipment not supporting interference mitigation functions as well as the UWB radio equipment using the same bandwidth with an interference mitigation functions (hereinafter referred to as “radio equipment supporting interference mitigation”), in order to avoid the harmful influence by the interference on introduce new mobile communication systems etc. in future..

As an appropriate measure to reduce the number of remaining UWB radio equipment not supporting interference mitigation to below an allowed its limit, in 2014 or later, the vendors shall cooperate with operators for future mobile communications systems in order to realize the smooth migration and acceleration of replacement for radio equipment supporting interference mitigation.

5 Ban on the use of UWB Radio Equipment for Toys

UWB radio equipment shall not be included in toys. This reason is that a child may not be able to properly judge on the usage for the UWB radio system, outdoors, in airplane, or at an event site, etc. The terminology of toy is not strictly defined in this Annex, but manufacturers, etc. of UWB radio equipment should properly decide by themselves with due consideration of the intent of this standard.

In this regard, toys which do not permit embedded UWB radio equipment shall include at least game machines.

Annex 3 Design Guidelines for UWB Radio Equipment

1 Design Guideline for the Protection of Broadcast Receiver

1.1 Permissible Levels of Unwanted Emission Intensity lowered for the Protection of Broadcast Receivers

Permissible values for unwanted emission intensity provided in ARIB STD-T91 are set lower than those for unwanted emission intensity for other popular radio equipment such as a land mobile station for mobile wireless communications (mobile phone), low power data communications radio equipment (wireless LAN) and radio frequency identification (RFID). Therefore, UWB (ultra-wideband) radio systems may not immediately cause interference with other radio equipment such as broadcast receivers. However, if the radio equipment of the radio station of UWB radio systems (hereinafter referred to as "UWB radio equipment") is used in a very close neighborhood of a broadcast receiver, and the input level of the broadcast wave is near the receiver sensitivity limit, it may be necessary to set the permissible level for unwanted emission intensity at the specific frequency bands less than the value specified in ARIB STD-T91 so as not to cause interference with broadcast receivers. For this reason, the UWB radio equipment should be designed with due consideration of permissible values for unwanted emission intensity that protect broadcast receivers as shown in Table A3-1. Regarding permissible values for unwanted emission intensity out of the frequency bands shown in Table A3-1, those specified in ARIB STD-T91 shall be applied.

Table A3-1 Permissible values for unwanted emission intensity for protecting broadcast receiver

Frequency band		Permissible values for unwanted emission intensity
	Interfered system	Average power at any 1 MHz bandwidth (e.i.r.p.)
Higher than 170 MHz to 222 MHz or lower	Terrestrial broadcasting (VHF 4-12 ch)	-114.7 dBm or less
Higher than 470 MHz to 710 MHz or lower	Terrestrial broadcasting (UHF 13-52 ch)	-106.1 dBm or less

Note: e.i.r.p.: Effective Isotropic Radiated Power

In addition, although table A3-1 shows permissible values for terrestrial analog broadcast receiver, revises of the design guideline are subject to the usage situation of terrestrial digital broadcasting and the spread situation of UWB equipment.

1.2 Indirect Measurement Method for Unwanted Emission Intensity

1.2.1 Use of an indirect measurement method for unwanted emission intensity

The permissible values for unwanted emission intensity shown in Table A3-1 are at the lower limitation point of measurement as same as thermal noise at the room temperature. It is thus extremely difficult to measure immediately the unwanted emission intensity for not only products embedded with UWB radio equipments but also those at the design stage or on the process of manufacture. Therefore, it is, if possible, allowed to estimate the unwanted emission intensity of UWB radio equipment in the frequency bandwidth shown in Table A3-1 (hereinafter referred to as "interference bandwidth") with the indirect values in accordance with the measurement method described hereinafter, after separating signals generated by the UWB radio equipment and noise generated by non-UWB portion of the equipment.

1.2.2 An example of Indirect Measurement of Unwanted Emission Intensity

An example of indirect measurement of unwanted emission intensity for UWB radio equipment at 600 MHz is shown below. The same method can be applied to measurements for other frequencies.

(1) A measurement schematic diagram

A measurement schematic diagram used in the measurement example is shown in Figure A3-1. The signal generated by the UWB radio equipment is inputted into a spectrum analyzer via an attenuator (ATT), a low-pass filter (LPF) and a high-frequency amplifier (AMP) for the measurement. In the measurement example, the signal that the UWB radio equipment generates in the frequency band is suppressed by the use of LPF and AMP, to prevent intermodulation of the spectrum analyzer due to overloading by the input signal, and to enable measurement of the unwanted emission intensity at the frequency bandwidth. Also, regarding reflections to UWB radio equipment due to LPF, an attenuator (ATT) of 6 dB is added, to attain voltage standing wave ratio (VSWR) <1.67, which is a realistic value, in case of any load changes.

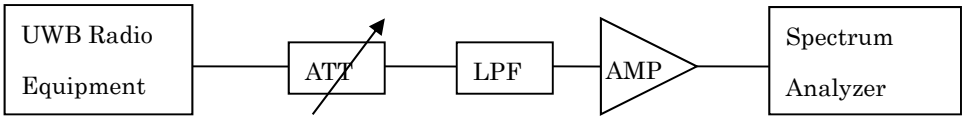


Figure A3-1 A measurement schematic diagram used for the measurement example

(2) Equipment for an experiment

A list of equipment used for the measurement experiment is shown in Table A3-2:

Table A3-2 Equipment for experiment

Equipment name	Manufacturer	Model	Qtty	Remarks
UWB radio equipment			1	
ATT	HP	8495B 8494B	1	DC-18GHz 1dB, 10dB step
LPF	Mini-Circuits	BPF-750	1	750MHz LPF
AMP	R&K	A-528-LN	1	0.01-1GHz, 32dB
Spectrum analyzer	Anritsu	MS8901A	1	9kHz-3GHz

(3) Characteristics of LPF and AMP

The transmission characteristics when combining LPF and AMP in the measurement example are shown in Figure A3-2. Frequency characteristics for "LPF input signal" and "(AMP output signal) – (AMP gain) + (LPF insertion loss)" are also shown here. In the measurement example, attenuation of 50 dB or more was obtained in the frequency band between 1.5GHz or higher and less than 10GHz by combining LPF and AMP.

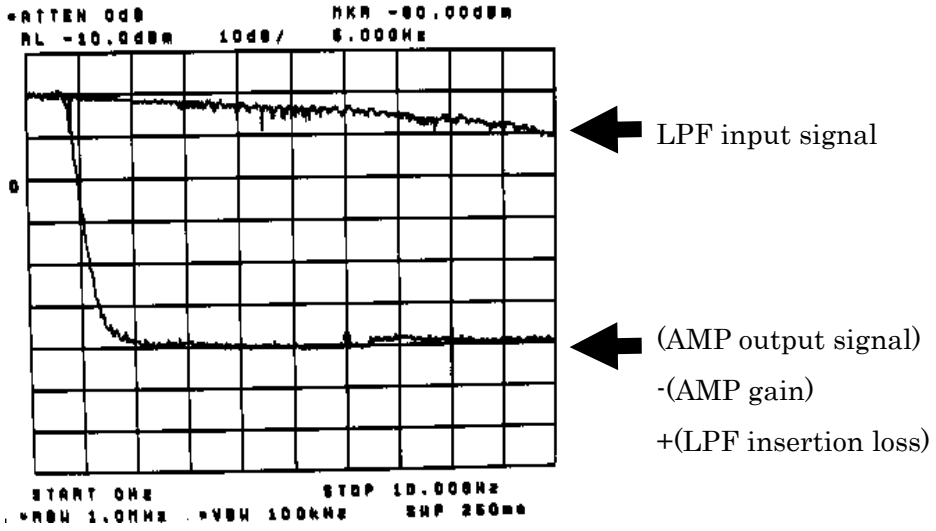


Figure A3-2 Transmission characteristics of signals when combining LPF and AMP (A display example from a spectrum analyzer)

(4) Characteristics of AMP

Gain and noise figure (NF) of AMP at 600MHz in the measurement example are shown in Table A3-3.

Table A3-3 Characteristics of AMP

Frequency	600MHz
Gain	36.0dB
NF	3.9dB

(5) Setting of spectrum analyzer

Parameters of the spectrum analyzer used in the measurement example are shown in Table A3-4.

Table A3-4 Measurement parameters of a spectrum analyzer

Item	Setting value
Resolution bandwidth (RBW)	1MHz
Video bandwidth(VBW)	Auto
Sweep time (SWP)	1s
Attenuation (ATT)	0dB
Number of data points (Point)	1001
Detection (Detect)	RMS
Average count(Average)	100
Frequency span(SPAN)	10MHz
Preamplifier (Pre AMP)	ON

(6) Estimation equations for unwanted emission intensity

The signal level M of AMP output observed by the spectrum analyzer is a combined value of ATT input signal level (unwanted emission intensity) α , ATT thermal noise and AMP thermal noise, and can be expressed in the Equation (1).

$$M = \left\{ \frac{\alpha}{L} + kT_a \left(1 - \frac{1}{L} \right) + kT_1 \right\} \cdot G \qquad \cdots \quad (1)$$

M: AMP output signal level

α: ATT input signal level (unwanted emission intensity)

L: ATT attenuation

k: Boltzamann constant

T_a: Ambient temperature (K)

T_1: Equivalent noise temperature (obtained by converting AMP noise into AMP input.) (K)

G: AMP gain

Here, T1 can be expressed as Equation (2).

$$T_1 = (F - 1)T_0 \qquad \cdots \quad (2)$$

F: AMP noise figure (antilog)

T_0: Temperature 290 K

From Equation (1) and (2), α can be obtained by making T_a=T_0 as in the Equation (3).

$$\alpha = L\left\{ \frac{M}{G} - kT_0 \left(F - \frac{1}{L} \right) \right\} \qquad \cdots \quad (3)$$

As shown in the Equation (3), α can be calculated when AMP gain (G) and noise figure (F) are obtained.

(7) Measured results of the measurement example

Parameters set in the measurement example are shown in Table A3-5, and the measured results in Table A3-6, respectively. The estimated value for unwanted emission intensity at 600 MHz has become -111.3 dBm / MHz by making a band conversion upon obtaining α from the measured values.

Table A3-5 Parameters for the measurement example

Item	Unit	600 MHz	
		log	antilog
L		6+1.3dB	5.37
k	J/K (W・s)		1.38E-23
T_0	K		290
G		36-0.4dB	3631
F		3.9dB	2.45

L : ATT+(Cable loss + ATT insertion loss + LPF insertion loss)

G : AMP gain - cable loss

Table A3-6 Measured results

Item	ATT [dB]	600 MHz
M	6	-134.2 dBm / Hz
α		-111.3 dBm / MHz

1.2.3 A design example for UWB radio equipment

A configuration of UWB radio equipment using a filter is shown in Figure A3-3. In the figure, the transmitter of the UWB radio equipment (hereinafter referred to as "UWB transmitter"), a filter and an antenna are connected. The receiver as well as the controller of the UWB radio equipment are omitted in the Figure A3-3.

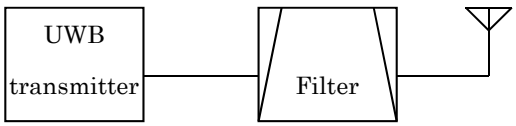


Figure A3-3 A configuration of UWB radio equipment using a filter

The following descriptions are design examples of indirect measurements for unwanted emission intensity of UWB radio equipment, based on the Figure A3-3.

(1) Measurements of characteristics of UWB transmitter equipment

Connect the UWB transmitter to measurement device as shown in FigureA3-4, and measure the unwanted emission intensity of the UWB transmitter equipment emitted by itself in the interference band. The measurement should be conducted as described in 1.2.2 for example, paying enough attention to the noise level of the measurement device.

α [dBm / MHz] is obtained as a measured result.

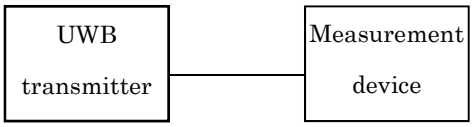


Figure A3-4 A connection example for characteristics measurement of UWB transmitter

(2) Measurement of characteristics of a filter

Connect a filter to a signal source as well as a measurement device as shown in Figure A3-5, and measure the attenuation level of the filter itself in the interference band. In general, a filter shows identical linear characteristics irrespective of different input levels. In the measurement, therefore, it is easy to eliminate influence of measurement device's noise, as a signal sufficiently larger than the noise level can be used.

Attenuation Lf [dB] is obtained as a measured result.

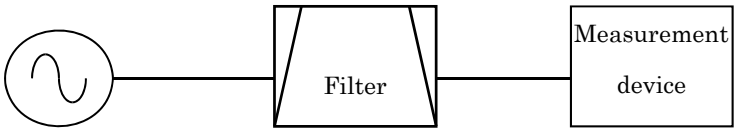


Figure A3-5 A connection example for characteristics measurement of a filter

(3) Measurement of characteristics of an antenna

Connect a signal source and a measured antenna as well as a measurement device and a standard antenna as shown in Figure A3-6 in an environment such as a radio anechoic chamber, and measure the absolute gain of the antenna. The absolute gain of the antenna is likely to be a negative value in most cases because the frequency in the interference band deviates from the frequency used for UWB radio system.

Absolute gain of an antenna Ga [dBi] is obtained as a measured result.

Figure A3-6 A connection example for characteristics measurement of an antenna

(4) Estimation of unwanted emission intensity

It can be estimated that the unwanted emission intensity is

α-Lf+Ga [dBm/MHz e.i.r.p.] .

(5) Design of UWB radio equipment

Based on the unwanted emission intensity estimated by (1) - (4), it is possible to design UWB radio equipment to meet the conditions of Table A3-1.

Amendment History

UWB(Ultra-wideband) Radio Systems

ARIB STANDARD

(ARIB STD-T91)

The 1.1th edition amendment history

Page	Para.no	Content of Amendment	Present	Reason
4	3.2 (2)	As an interim measure until December 31, 2010, the following condition shall apply: Of radio equipment with use of frequency from 3.4 GHz to 4.8 GHz, those without an interference mitigation function stipulated in 3.4 (2) shall have the average power of -70 dBm or less per 1 MHz bandwidth within the frequency band from 3.4 GHz to 4.2 GHz, and the average power of -41.3 dBm or less per 1 MHz bandwidth within the frequency band from 4.2 GHz to 4.8 GHz. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008).)	As an interim measure until December 31, ~~2008~~, the following condition shall apply: Of radio equipment with use of frequency from 3.4 GHz to 4.8 GHz, those without an interference mitigation function stipulated in 3.4 (2) shall have the average power of -70 dBm or less per 1 MHz bandwidth within the frequency band from 3.4 GHz to 4.2 GHz, and the average power of -41.3 dBm or less per 1 MHz bandwidth within the frequency band from 4.2 GHz to 4.8 GHz. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006).)	Change related to Ordinance
6	3.2 (7) Fig. 3-1	Without an interference mitigation function (until December 31, 2010)	Without an interference mitigation function (until December 31, ~~2008~~)	Change related to Ordinance

11	3.3 (1) Fig. 3-3	Without an interference mitigation function (until December 31, 2010)	Without an interference mitigation function (until December 31, ~~2008~~)	Change related to Ordinance
12	3.3 (2)	As an interim measure until December 31, 2010, the following conditions shall apply: For radio equipment using radio with frequency from 3.4 GHz to 4.8 GHz, those without an interference mitigation function stipulated in 3.4 (2) shall have the limit on secondary emissions, etc. as in the table below. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008).)	As an interim measure until December 31, ~~2008~~, the following conditions shall apply: For radio equipment using radio with frequency from 3.4 GHz to 4.8 GHz, those without an interference mitigation function stipulated in 3.4 (2) shall have the limit on secondary emissions, etc. as in the table below. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006)	Change related to Ordinance
13	3.4 (2)	As an interim measure until December 31, 2010, it is not mandatory to install an interference mitigation function. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008))	As an interim measure until December 31, ~~2008~~, it is not mandatory to install an interference mitigation function. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006))	Change related to Ordinance
16	4	Measurement methods shall be in accordance with MIC Ordinance related with OTRCC, Item 1 (3) in Appendix 1 [1]. Items	Measurement methods shall be in accordance with ~~TELEC-T406 ("Characteristics Test Methods for Radio~~	Change related to Ordinan

		that are not specified in the MIC Ordinance, however, shall be based on conventionally practiced methods. [1] At the release date of ARIB STD-T91 Ver. 1,1 on September 25, 2008, it means MIC Ordinance No, 88 on January 26, 2004. However if the MIC Ordinance and the contents of the MIC Ordinance are revised in near future, measurement methods shall be in accordance with latest versions of the MIC Ordinance and the contents. In addition, TELEC-T406 ("Characteristics Test Methods for Radio Equipment Used for Radio Station of Ultra-Wideband Radio System") what is issued by Telecom Engineering Center (TELEC) Foundation commissioned by the paragraph 2 of MIC Ordinance No. 88 on January 26, 2004, may be referred as the measurement method.	~~Equipment Used for Radio Station of Ultra-Wideband Radio System") issued by Telecom Engineering Center (TELEC) Foundation commissioned by the paragraph 2 of MIC Ordinance No. 88 on January 26, 2004. Items that are not specified in the report, however, shall be based on conventionally practiced methods.~~ ~~In case the measurement methods are separately specified by Notification, etc., such Notification shall override the method cited above.~~	ce
17	Annex 1 (3)	As an interim measure until December 31, 2010, the interference mitigation function is not mandatory (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29,	As an interim measure until December 31, ~~2008~~, the interference mitigation function is not mandatory (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006)).	Change related to Ordinance

		2008)).		
21	Annex 2 4.2	With respect to future new mobile communications systems, etc., and development of domestic radio ordinances, vendors shall refrain from manufacturing, selling and installing UWB radio equipment using the frequency from 3.4 GHz to 4.8 GHz without an interference mitigation function (hereinafter referred to "radio equipment not supporting mitigation") from January 1, 2011 and later.	With respect to future new mobile communications systems, etc., and development of domestic radio ordinances, vendors shall refrain from manufacturing, selling and installing UWB radio equipment using the frequency from 3.4 GHz to 4.8 GHz without an interference mitigation function (hereinafter referred to "radio equipment not supporting mitigation") from January 1, ~~2009~~ and later.	Change related to Ordinance
21	Annex 2 4.2	As an appropriate measure to limit the number of remaining UWB radio equipment not supporting interference mitigation to below an allowed limit in 2011, the vendors shall cooperate with future mobile communications system operators for an early shift to and replacement with radio equipment supporting interference mitigation.	As an appropriate measure to limit the number of remaining UWB radio equipment not supporting interference mitigation to below an allowed limit in ~~2009~~, the vendors shall cooperate with future mobile communications system operators for an early shift to and replacement with radio equipment supporting interference mitigation.	Change related to Ordinance

The 1.2th edition amendment history

Page	Para.no	Content of Amendment	Present	Reason
4	3.2(2)	As an interim measure until December 31, 2013	As an interim measure until ~~December 31, 2010~~	Change related to Ordinance
		(According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010).)	(According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008).)	
6	3.2(7) Figure 3-1	2) Without an interference mitigation function (until December 31, 2013)	2) Without an interference mitigation function (until ~~December 31, 2010~~)	
11	3.3(1) Figure 3-3	2) Without an interference mitigation function (until December 31, 2013)	2) Without an interference mitigation function (until ~~December 31, 2010~~)	
10	3.3(1)	As an interim measure until December 31, 2013	As an interim measure until ~~December 31, 2010~~	
		(According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010).)	(According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008).)	
13	3.4(2)	As an interim measure until December 31, 2013, it is not mandatory to install an interference mitigation function. For the radio equipment	As an interim measure until ~~December 31, 2010~~, it is not mandatory to install an interference mitigation function. (According to ORE,	

		without this function, which has actually received Technical Regulations Conformity Certification until December 31, 2013 or is based on the construction design with Construction Design Certification, it is not mandatory to install an interference mitigation function. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010))	Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008))	
16	4	[1] At the release date of ARIB STD-T91 Ver. 1,2 on November 5, 2010,	[1] At the release date of ARIB STD-T91 Ver. ~~1,1~~ on ~~September 25, 2008~~,	Change related to Ordinance
17	Annex 1 (3)	As an interim measure until December 31, 2013	As an interim measure until ~~December 31, 2010~~	Change related to Ordinance
21	Annex 2 4.2	January 1, 2014 and later the number of remaining UWB radio equipment not supporting interference mitigation to below an allowed limit in 2014,	~~January 1, 2011~~ and later the number of remaining UWB radio equipment not supporting interference mitigation to below an allowed limit in ~~2011~~,	

The 2.0th edition amendment history

Page	Para.no	Content of Amendment	Present	Reason
	General Notes	1. Notes on Copyright - The copyright of this document is ascribed to the Association of Radio Industries and Businesses (ARIB). - All rights reserved. No part of this document may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, without the prior written permission of ARIB. 2. Notes on English Translation - ARIB Standards and Technical Reports are usually written in Japanese. This document is a translation into English of the original document for the purpose of convenience of users. If there are any discrepancies in the content, expressions, etc. between the original document and this translated document, the original document shall prevail. - ARIB Standards and Technical Reports, in the original language, are made publicly available through web posting. The original document of this translation may have been further revised and therefore	~~1.~~ The copyright of this document is ascribed to the Association of Radio Industries and Businesses (ARIB). ~~2.~~ All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior written permission of ARIB. ~~3.~~ The ARIB Standards and ARIB Technical Reports are usually written in Japanese ~~and approved by the ARIB Standard Assembly~~. This document is a translation into English of the approved document for the purpose of convenience of users. If there are any discrepancies in the content, expressions, etc., between the ~~Japanese~~ original and this translated document, the ~~Japanese~~ original shall prevail. ~~4. The establishment, revision and abolishment of~~ ARIB Standards and Technical Reports ~~are approved at the ARIB Standard Assembly,~~	Unify expression

		users are encouraged to check the latest version at an appropriate page under the following URL: http://www.arib.or.jp/english/index.html.	~~which meets several times a year. Approved ARIB Standards and Technical Reports, in their original language,~~ are made publicly available ~~in hard copy, CDs or~~ through web posting~~, generally in about one month after the date of approval~~. The original document of this translation may have been further revised and therefore users are encouraged to check the latest version at an appropriate page under the following URL: http://www.arib.or.jp/english/index.html	
		Foreword	~~Introduction~~	Unify expression
	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	~~With participation of radio communication equipment manufacturers, broadcasting equipment manufacturers, telecommunication operators, broadcasters and general equipment users, Association of Radio Industries and Businesses (ARIB) defines basic technical requirements for standard specifications of radio equipment, etc. as an "ARIB STANDARD" in the field of various radio systems.~~	Unify expression

		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 UWB (Ultra-wideband) Radio Systems. 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,	~~In conjunction with national technical standards which are intended for effective spectrum utilization and avoidance of interference with other spectrum users, an ARIB STANDARD is intended as a standard for use by the private sector by compiling various voluntary standards regarding the adequate quality of radio and broadcasting service, compatibility issues, etc. It aims to enhance convenience for radio equipment manufacturers, telecommunication operators, broadcasting equipment manufacturers, broadcasters and general users.~~ ~~An ARIB STANDARD herein is published as "UWB (Ultra-Wideband) Radio Systems". In order to ensure fairness and transparency in the defining stage, the standard was decided by consensus of the standard council with participation of interested parties including radio equipment manufacturers, telecommunication operators, broadcasters, testing organizations, general users,~~	

		broadcasting equipment manufacturers, broadcasters and users. With the Radio Systems described in the Standard herein, the electrical power spreads over a wide bandwidth, and therefore it is necessary to avoid radio interference to various radio systems in the band. In order to avoid harmful radio interferences to other radio systems, "Operational Guidance for UWB Radio Systems" and "Design Guidelines for UWB Radio Equipment" were also documented and attached hereto as a reference material. 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	~~etc. with impartiality.~~ ~~With the radio system described in the ARIB STANDARD herein, the electrical power spreads over a wide bandwidth, and therefore it is necessary to avoid radio interference to various radio systems in the band. In order to avoid harmful radio interferences to other radio systems, "Operational Guidelines for UWB Radio Systems" and "Design Guidelines for UWB Radio Systems" were also documented and attached hereto as a reference material.~~ ~~It is our sincere hope that the standard would be widely used by radio equipment manufacturers, testing organizations, general users, etc.~~	

		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) (N/A)		

		Attachment 2 (Selection of Option 2) (N/A)		
	Contents	Annex2 Operational Guidance for UWB Radio Systems	~~Annex 2 Operational Guidelines for UWB Radio Systems~~	Unify expression
1	1.1	The standard defines requirements of the radio equipment of the radio stations of ultra-wideband radio system (Note 1.1) stipulated in item 2 of paragraph 2, Article 4.4 of Regulations for Enforcement of Radio Law. (The radio stations mainly handle data transmissions for indoor use with the required frequency bandwidth of 450 MHz or higher and with the antenna power of 0.001 W or less (the specified power that is supplied from the transmitter to the feeder of an antenna system) using a frequency between 3.4GHz or higher and lower than 4.8 GHz, or between 7.25GHz or higher and lower than 10.25GHz.) (Note 1.1) In this standard, the system named "UWB (Ultra-Wideband) Radio System" or "UWB Radio System".	~~The standard defines requirements of the radio equipment of ultra-wideband radio stations stipulated in item 2 of paragraph 2, Article 4.4 of Regulations for Enforcement of Radio Law (This refers to the radio stations that mainly handle data transmissions with the required frequency bandwidth of 450 MHz or more and uses 0.001 W or less for the antenna input power (hereinafter referred to as "antenna power") with use of frequency from 3.4GHz to 4.8 GHz or from 7.25GHz to 10.25GHz for indoor use), and also the radio equipment of the radio stations of "UWB (Ultra-Wideband) Radio System" for the communication application~~	Unify expression

2	1.3	In the standard, "RL" refers to Radio Law, "RERL" refers to 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 Ordinance Concerning Terminal Facilities etc., "RTCCA" refers to 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 (MIC) if issued in 2001 or later.	In the standard, "RERL" refers to 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 Ordinance Concerning Terminal Facilities etc., "RTCCA" refers to 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 (MIC) if issued in 2001 or later.	Insert parenthesis
3	2.2	The standard does not specify system configurations.	~~In the radio equipment of the radio station of a UWB Radio System, a radio equipment not connected to the AC mains power supply shall be permitted to emit radio waves only after it receives a signal from another radio equipment~~	Change related to Ordinance

			~~connected to the AC mains power supply. (ORE, Article 49.27)~~ ~~Examples of a compliant system configuration are shown in Figure 2-1, 2-2 and 2-3.~~ ~~(1) The case of radio equipment connected to the AC mains power supply which transmits signals to another radio equipment:~~ ~~If a radio equipment is connected to the AC mains power supply, it can start transmission at any time~~ ~~Figure 2-1 Example of standard system configuration (1)~~ ~~(2) The case of radio equipment not connected to the AC mains power supply which transmits signals to another radio equipment connected to the AC mains power supply:~~ ~~If a radio equipment is not connected to the AC mains power supply, it can emit radio waves only after it detects a signal from another radio equipment which is connected to the AC mains power supply.~~ ~~Figure 2-2 Example of standard system configuration (2)~~ ~~(3) The case of radio~~	

			~~equipment not connected to the AC mains power supply which transmits signals to another radio equipment not connected to the AC mains power supply:~~ ~~If a radio equipment is not connected to the AC mains power supply and transmits signal to another radio equipment not connected to the AC mains power supply, it can emit radio waves after it receives signal from another radio equipment that is connected to the AC mains power supply.~~ ~~Figure 2-3 Example of standard system configuration (3)~~	
4	3.1(2)	Communication methods shall be simplex operation, full duplex operation or half duplex operation.	Communication methods shall be ~~either~~ simplex operation, full duplex operation or half duplex operation.	Correction
4	3.1(3)	Operating frequency band to be used shall be between 3.4GHz or higher and lower than 4.8GHz, or between 7.25GHz or higher and lower than 10.25GHz.	Operating frequency band to be used shall be ~~from 3.4 GHz to 4.8 GHz or from 7.25 GHz to 10.25 GHz.~~	Unify expression
4	3.2(2)	(2)Antenna power (ORE, Article 49.27, According to ORE, Supplementary provision (MIC Ordinance No. 105 on	~~(2) Antenna power (ORE, Article 49.27)~~ ~~Antenna power for the operating frequency band shall~~	Change Related to Ordinance

		August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010) (Revised by MIC Ordinance No. 122 on December 25, 2013).)	~~satisfy respective values as follows:~~	
4	3.2(2)	Within the frequency band between 3.4 GHz or higher and lower than 4.2 GHz, the average power per 1 MHz bandwidth shall be -70 dBm or less. The radio equipment with use of frequency between 3.4 GHz or higher and lower than 4.8 GHz shall have the interference mitigation function as stipulated in 3.4 (2). But, this term is not applied to the equipment which has the average power per 1 MHz bandwidth of -70 dBm or less.	~~As an interim measure until December 31, 2013, the following condition shall apply: Of radio equipment with use of frequency from 3.4 GHz to 4.8 GHz, those without an interference mitigation function stipulated in 3.4 (2) shall have the average power of -70 dBm or less per 1 MHz bandwidth within the frequency band from 3.4 GHz to 4.2 GHz, and the average power of -41.3 dBm or less per 1 MHz bandwidth within the frequency band from 4.2 GHz to 4.8 GHz. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010).)~~	Change related to Ordinance
5	3.2(2)	Within the frequency band between 3.4 GHz or higher and lower than 4.2 GHz, the peak	~~As an interim measure until December 31, 2013, the following condition shall apply:~~	Change related to Ordinance

		power per 50 MHz bandwidth shall be -30 dBm or less. The radio equipment with use of frequency between 3.4 GHz or higher and lower than 4.8 GHz shall have the interference mitigation function as stipulated in 3.4 (2). But, this term is not applied to the equipment which has the average power per 1 MHz bandwidth of -70 dBm or less.	~~Of radio equipment with use of frequency from 3.4 GHz to 4.8 GHz, those without an interference mitigation function stipulated in 3.4 (2) shall have a peak power of -30 dBm or less per 50 MHz bandwidth within the frequency band from 3.4 GHz to 4.2 GHz, and the peak power of 0 dBm or less per 50 MHz bandwidth within the frequency band from 4.2 GHz to 4.8 GHz. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010).)~~	
5	3.2(3)	(3) Tolerances of antenna power (ORE, Article 14) The upper limit of the tolerance for the antenna power emitted from transmitter equipment shall be +20%.	~~(3) Tolerances for antenna power (ORE, Article 14)~~ ~~The tolerance of the antenna power from shall be less than the allowed maximum value + 20%.~~	Change for explanation
5	3.2(4)	Transmission data rate with use of a frequency between 3.4GHz or higher and lower than 4.8GHz shall be higher than 50 Mbps except the case in which noise or interference from other radio stations could	~~Transmission data rate shall be higher than 50 Mbps excepting for such cases as noise or interference from other radio stations need be avoided.~~	Change related to Ordinance

		be avoided.		
5	3.2(5)	Frequency bandwidth between the upper and lower frequencies for the radiation power points which are 10 dB below the maximum radiation power level shall be 450 MHz or more.	~~Frequency bandwidth between the upper and lower frequencies for which the radiation power drops 10 dB below the maximum radiation power shall be 450 MHz or more.~~	Change for explanation
5	3.2(6)	□ For those with use of the frequency between 3.4 GHz or higher and lower than 4.8 GHz 1.4 GHz □ For those with use of the frequency between 7.25 GHz or higher and lower than 10.25 GHz 3 GHz	~~□ For those with use of the frequency from 3.4 GHz to 4.8 GHz 1.4 GHz~~ ~~□ For those with use of the frequency from 7.25 GHz to 10.25 GHz 3 GHz~~	Unify expression
6	3.2(7)	(ORE, Article 7 / Table 3-42)	(ORE, Article 7 / ~~Table 3-41~~)	Correction
6	3.2(7)	lower than 1,600 MHz A MHz or higher to lower than B MHz C GHz or higher to lower than D GHz 12.75 GHz or higher	~~Less than 1,600 MHz~~ ~~From A MHz to B MHz~~ ~~From C GHz to D GHz~~ ~~More than 12.75 GHz~~	Unify expression
6	3.2(7)	(Note 3.1): In case that the frequency is used within a range between 3.4 GHz or higher and lower than 4.8 GHz, the antenna power for its frequency band shall comply with Article 3.2 (2) instead of 3.2 (7). Similarly, in case that the frequency is used within a range between 7.25 GHz or higher and lower than 10.25	Note: In the case that the use of the frequency is within a range ~~from 3.4 GHz to 4.8 GHz~~, the antenna power for ~~the~~ frequency band ~~from 3.4 GHz to 4.8 GHz~~ shall comply with Article 3.2 (2) instead of 3.2 (7). Similarly, in ~~the~~ case that ~~the use of~~ the frequency is within a range ~~from 7.25 GHz to 10.25~~	Unify expression

		GHz, the antenna power for its frequency band shall comply with the Article 3.2 (2) instead of 3.2 (7).	~~GHz~~, the antenna power for ~~the~~ frequency band ~~from 7.25 GHz to 10.25 GHz~~ shall comply with the Article 3.2 (2) instead of 3.2 (7).	
7-8	3.2(7) Figure 3-1	Figure 3-1 Antenna power density and permissible values for unwanted emission intensity (when using frequency between 3.4 GHz or higher and lower than 4.8 GHz) 1) With an interference mitigation function 2) Without an interference mitigation function	~~Figure 3-1 Permissible values for unwanted emission intensity~~ ~~(when using frequency from 3.4 GHz to 4.8 GHz)~~ ~~1) With an interference mitigation function~~ ~~2) Without an interference mitigation function (until December 31, 2013)~~	Change related to Ordinance
9	3.2(7) Figure 3-2	Figure 3-2 Antenna power density and permissible values for unwanted emission intensity (when using frequency between 7.25 GHz or higher and lower than 10.25 GHz)	~~Figure 3-2 Permissible values for unwanted emission intensity~~ ~~(when using frequency from 7.25 GHz to 10.25 GHz)~~	Change related to Ordinance
10	3.3(1)	(ORE, Article 24, ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006), Revised by MIC Ordinance No. 98 on August 29, 2008, Revised by MIC Ordinance No. 89 on October 14, 2010, Revised by MIC Ordinance No. 122 on December 25, 2013)	~~(ORE, Article 24)~~	Change related to Ordinance

10	3.3(1)	2,700 MHz or higher to lower than 4.2 GHz	~~From 2,700 MHz to 3.4 GHz~~	Change related to Ordinance
10	3.3(1)	4.2 GHz or higher to lower than 4.8 GHz	~~From 3.4 GHz to 4.8 GHz~~	
10	3.3(1)	lower than 1,600 MHz A MHz or higher to lower than B MHz C GHz or higher to lower than D GHz 12.75 GHz or higher	~~Less than 1,600 MHz~~ ~~From A MHz to B MHz~~ ~~From C GHz to D GHz~~ ~~More than 12.75 GHz~~	
11	3.3(1) Figure 3-3	Figure 3-3 Antenna power density and limit on secondary radiated emissions, etc. (when using frequency between 3.4 GHz or higher and lower than 4.8 GHz) 1) With an interference mitigation function 2) Without an interference mitigation function	~~Figure 3-3 Limit on Secondary Radiated Emissions~~ ~~(when using frequency from 3.4 GHz to 4.8 GHz)~~ ~~1) With an interference mitigation function~~ ~~2) Without an interference mitigation function (until December 31, 2013)~~	
12	3.3(1) Figure 3-4	Figure 3-4 Antenna power density and limit on secondary radiated emissions, etc. (when using frequency between 7.25 GHz or higher and lower than 10.25 GHz)	~~Figure 3-4 Limit on Secondary Radiated Emissions~~ ~~(when using frequency from 7.25 GHz to 10.25 GHz)~~	Change related to Ordinance
12	3.3(1)	(Delete)	~~As an interim measure until December 31, 2013, the following conditions shall apply:~~ ~~For radio equipment using radio with frequency from 3.4 GHz to 4.8 GHz, those without an interference mitigation~~	Change related to Ordinance

			~~function stipulated in 3.4 (2) shall have the limit on secondary emissions, etc. as in the table below. (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010).)~~ ~~The table of limit on secondary emissions~~	
13	3.4(2)	The radio equipment using the frequency between 3.4 GHz or higher and lower than 4.8 GHz shall have the interference mitigation function that meets the technical conditions [3.2] notified separately by Minister of Internal Affairs and Communications. But, this article may not be applied to the equipment which has the average emission power of -70dBm or less per 1 MHz. [Note 3.2] The interference mitigation function (NT, No.475, in 2013) In case of the preparation stage of emission or emission stage of radio frequency for the equipment of UWB Radio systems, the technical conditions of the interference	~~The radio equipment using radio with frequency from 3.4 GHz to 4.8 GHz shall have the interference mitigation function that meets the technical conditions notified separately by Minister of Internal Affairs and Communications~~	Change related to Ordinance

		mitigation function shall comply with the articles as follows. (Ⅰ) In case of receiving the same frequency as the UWB Radio system and receiving the input level more than -136dBm at random 15kHz bandwidth, the average antenna power at random 1 MHz bandwidth shall be -70dBm. (Ⅱ) The signal detection time shall be 5 seconds or more. (Ⅲ) The signal detection probability shall be 99% or more. (Ⅳ) The signal detection interval shall be within 60 seconds.		
13	3.4(2)	(Delete)	~~As an interim measure until December 31, 2013, it is not mandatory to install an interference mitigation function.~~ ~~Also, it is radio equipment that does not have this interference mitigation function, in December 31, 2013, the radio equipment has actually received Technical Regulations Conformity Certification, and the radio equipment is based on the construction design has actually received Construction~~	

			~~Design Certification, is not mandatory to install an interference mitigation function.~~ ~~(According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 98 on October 14, 2010))~~ ~~When the interim measure is applied, the description of 3.2 (2) shall be noted for the antenna power, the description of 3.2 (7) for permissible values for unwanted emission intensity and the description of 3.3 (1) for the limit on secondary radiated emissions, etc.~~	
13	3.4(3)	(Delete)	~~(3) Controls of radio emission (ORE, Article 49.27)~~ ~~A radio equipment not connected to the AC mains power supply shall be permitted to emit radio waves only after it receives a signal from another radio equipment connected to the AC mains power supply.~~	Change related to Ordinance
14	3.5	(1) Terminal equipment (NT No.72 in 1994)		

		The terminal equipment is a kind of radio station stipulated in Article 4.3 of "RL" and the equipment which use the radio equipment in the radio station of ultra-wideband radio system stipulated in item 2 of paragraph 2, Article 4.4 of "RERL".		Change related to Notification
14	3.5	(2) Identification devices (OTF, Article 9)	~~(1) Identification devices (OTF, Article 9)~~	Change the paragraph number
14	3.5	(3) Identification signs (NT No. 424 in 1994)	~~(2) Identification signs (NT No. 424 in 1994)~~	Change the paragraph number
14	3.5	(4) Method to judge the availability of the operating frequency band (NT No. 424 in 1994)	~~(3) Method to judge the availability of the operating frequency band (NT No. 424 in 1994)~~	Change the paragraph number
14	3.6(2)	Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in case that the e.i.r.p. (Equivalent Isotropic Radiated Power) falls below the value which is added to the transmitting antenna of absolute gain 0dBi with the antenna power stipulated in 3.2(2), the difference may be complemented by adjusting the gain of the transmitting antenna.	Absolute gain of the transmitting antenna shall be 0 dBi or less. ~~However, in the case that the e.i.r.p. (Equivalent Isotropic Radiated Power) falls short of the antenna power provided in 3.2 (2) added with the transmitting antenna gain of 0 dBi absolute gain,~~ the difference may be complemented by adjusting the gain of the transmitting antenna.	Change for explanation

15	3.7	The cabinet shall be constructed so as not to be easily tampered with.	The cabinet shall be constructed ~~so as to be not~~ be easily tampered with.	Correction
16	4	Measurement methods shall be in accordance with MIC Ordinance related with OTRCC, Item 1 (3) in Appendix 1 [Note 4.1]. Items that are not specified in the MIC Ordinance, however, shall be based on conventionally practiced methods. [Note 4.1] At the release date of ARIB STD-T91 Ver. 2.0 on March 17, 2015, it means MIC Ordinance No, 88 on January 26, 2004. However if the MIC Ordinance and the contents of the MIC Ordinance are revised in near future, measurement methods shall be in accordance with latest versions of the MIC Ordinance and the contents. In addition, TELEC-T406 ("Characteristics Test Methods for Radio Equipment Used for Radio Station of Ultra-Wideband Radio System") that is issued by Telecom Engineering Center (TELEC) Foundation based on the MIC Ordinance No. 88 on January 26, 2004, may be referred as the	Measurement methods shall be in accordance with MIC Ordinance related with OTRCC, Item 1 (3) in Appendix 1 ~~[1].~~ Items that are not specified in the MIC Ordinance, however, shall be based on conventionally practiced methods. ~~[1]~~ At the release date of ARIB STD-T91 ~~Ver. 1,2 on November 5, 2010,~~ it means MIC Ordinance No, 88 on January 26, 2004. However if the MIC Ordinance and the contents of the MIC Ordinance are revised in near future, measurement methods shall be in accordance with latest versions of the MIC Ordinance and the contents~~,~~ ~~In addition, TELEC-T406 ("Characteristics Test Methods for Radio Equipment Used for Radio Station of Ultra-Wideband Radio System") what is issued by Telecom Engineering Center (TELEC) Foundation commissioned by the paragraph 2 of MIC Ordinance~~	Change related to Ordinance

		measurement methods as of the revised time of the Standard Ver. 2.0 (on March 17, 2015).	~~No. 88 on January 26, 2004, may be referred as the measurement method.~~	
17	Annex 1 (3)	Interference mitigation function (When using radio frequency between 3.4 GHz or higher and lower than 4.8 GHz)	~~Interference mitigation function (When using radio wave within the frequency from 3.4 GHz to 4.8 GHz)~~	Unify expression
17	Annex 1 (3)	(Delete)	~~As an interim measure until December 31, 2013, the interference mitigation function is not mandatory (According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010)).~~ ~~Therefore, the test item of interference mitigation function is not required for the radio equipment without the interference mitigation function. (According to OTRCC, Supplementary provision (MIC Ordinance No. 106 on August 1, 2006)~~	Change related to Ordinance
18	Annex2	Annex 2 Operational Guidance for UWB Radio Systems	~~Annex 2 Operational Guidelines for UWB Radio Systems~~	Unify expression
18	Annex2	1.1 Objectives The Operational Guidance is	~~1.1 Objectives~~ ~~The Operational Guidelines~~	

		aimed at avoiding harmful radio interference to other radio equipment, and ensuring users' convenience as well as achieving effective spectrum utilization, for operating UWB (Ultra-wideband) radio systems. The harmful radio interference means causing continuous and serious failure to the functions of other radio equipment (Radio Law Article 82). 1.2 General scope The Operational Guidance is applied to users of UWB radio systems and vendors (hereinafter referred to as "vendors") who manufacture, sell and install the radio equipment of radio stations of UWB radio systems (hereinafter referred to as "UWB radio equipment"). 1.3 Target Systems The Operational Guidance is intended for the following system. □ UWB (Ultra-Wideband) Radio Systems ARIB STD-T91 1.4 Basic agreements (1) Clarification of problems	~~are aimed at avoiding harmful radio interference to other radio equipment, and ensuring users' convenience as well as achieving effective spectrum utilization, for operating UWB (Ultra-wideband) radio systems.~~ ~~The harmful radio interference is meant to refer to continuous and serious interference to other radio equipment (Radio Law Article 82).~~ ~~1.2 General scope~~ ~~The Operational Guidelines apply to users of UWB radio systems and vendors (hereinafter referred to as "vendors") who manufacture, sell and install the radio equipment of radio stations of UWB radio systems (hereinafter referred to as "UWB radio equipment").~~ ~~1.3 Target Systems~~ ~~The Operational Guideline is intended for the following system.~~ ~~□ UWB (Ultra-Wideband) Radio Systems ARIB STD-T91~~ ~~1.4 Basic agreements~~ ~~(1) Clarification of problems~~	Change for explanation

		Vendors shall take in good faith preventive measures including warning messages in operation manuals and PR activities for prevention of radio interference., etc.. (2) Preliminary survey In case users or vendors intend to introduce UWB radio equipment, preliminary survey on interference shall be practiced, and it shall be confirmed prior to the introduction that the said radio equipment will not cause radio interference which is harmful to other radio equipment. (3) Cooperate responses In the event that a UWB radio system has caused radio interference which is harmful to other radio equipment, the users and/or vendors shall cooperate in good faith for avoidance and reduction of the radio interference.	~~Vendors shall in good faith take preventive measures including warning messages in operation manuals, etc. and to pursue PR activities for prevention of radio interference.~~ ~~(2) Preliminary survey~~ ~~In case users or vendors intend to introduce UWB radio equipment, it shall be confirmed prior to the introduction that the said radio equipment will not cause radio interference which is harmful to other radio equipment.~~ ~~(3) Coordinated responses~~ ~~In the event that a UWB radio system has caused radio interference which is harmful to other radio equipment, the users and/or vendors shall, in good faith, help for reduction of radio interference.~~	
19	Annex22	The frequency band used for the UWB radio function is also used for radio equipment of other radio systems. 1. The use of equipment with UWB radio function shall be limited to indoors, i.e. within environments such as houses, apartments, buildings, etc. Not	~~The frequency band used for the UWB radio function is also used for radio equipment of other radio systems.~~ ~~1. The use of equipment with UWB radio function shall be limited to indoors, i.e. within environments such as houses, apartments, buildings, etc. Not~~	Change for explanation

		approved for outdoor use. Even if it will be used indoors, in case of use at the event place which will be broadcasted by relay, please confirm with the event organizer about the use of UWB radio function as it might cause interference to broadcasting operations. 2. The use of equipment with UWB radio function may cause influence on radio astronomy operations, etc. When the equipment is used near a radio astronomy observatory, please contact the following address. 3. In case that harmful interference to other non-UWB radio equipment (satellite earth stations, 5GHz band wireless LAN, mobile phones, etc.) is caused due to the emission from the UWB radio function of the equipment, please take discretionary actions, such as to remove the UWB radio equipment from the interfering area. If interference remains, promptly stop the radio emission and contact the following address:	~~approved for outdoor use.~~ ~~Even when used indoors, such as at broadcast events , please confirm with the event organizer about the use of UWB radio function as it might cause interference to broadcasting operations.~~ ~~2. The use of equipment with UWB radio function may cause influence to radio astronomy operations, etc. When the equipment is used near a radio astronomy observatory, contact the following address.~~ ~~3. In case that harmful interference to other non-UWB radio equipment (satellite earth station antennas, 5GHz band wireless LAN, mobile phones, etc.) is caused due to the emission from the UWB radio function of the equipment, take discretionary actions, such as to remove the UWB radio equipment from the interfering area. If interference remains, promptly stop the radio emission and contact the following address:~~	
21	Annex 2	In case that harmful radio interference is caused to radio	~~In the case that harmful radio interference is caused to~~	

	4.1	equipment other than UWB radio systems, by the use of a UWB radio system manufactured, sold and installed by a vendor, and that it is needed to discuss a radio interference avoidance measure between the user of the UWB radio system and the management representative of the interfered radio equipment , the vendor shall, in good faith, extend cooperation to avoid the radio interference. In case that the harmful interference to radio equipment other than UWB radio systems is caused, after a UWB radio system had started its operation, the radio emission shall be promptly stopped, and an interference avoidance measure shall be taken.	~~radio equipment other than UWB radio systems, by the use of a UWB radio system manufactured, sold and installed by a vendor, and that there is a need to discuss a radio interference avoidance measure between the user of the UWB radio system and the management representative of the interfered radio equipment , the vendor shall, in good faith, extend cooperation to avoid the radio interference.~~ ~~In the case that radio emission was found to cause harmful interference to radio equipment other than UWB radio systems, after a UWB radio system had started operation, the radio emission shall be promptly stopped, and an interference avoidance measure shall be taken.~~	Change for explanation
21	Annex 2 4.2	4.2 Cooperation for interference avoidance from January 1, 2014 or later for radio equipment using radio frequency between 4.2 GHz or higher and lower than 4.8 GHz without interference mitigation functions With respect to the trend of future new mobile communications systems, etc.,	~~4.2 Cooperation for interference avoidance from January 1, 2011 and later for radio equipment using radio frequency from 3.4 GHz to 4.8 GHz without interference mitigation function~~ ~~With respect to future new mobile communications systems, etc., and development of domestic radio ordinances,~~	Change related to Ordinance

		and development of domestic radio ordinances, vendors shall refrain from manufacturing, selling and installing UWB radio equipment using the frequency between 4.2 GHz or higher and lower than 4.8 GHz without interference mitigation functions (hereinafter referred to as "radio equipment not supporting interference mitigation") from January 1, 2014 or later. Also, vendors shall cooperate with assist public organizations to estimate the remaining number of UWB radio equipment not supporting interference mitigation, by tracking the number of shipped radio equipment not supporting interference mitigation functions as well as the UWB radio equipment using the same bandwidth with an interference mitigation functions (hereinafter referred to as "radio equipment supporting interference mitigation"), in order to avoid the harmful influence by the interference on introduce new mobile communication systems etc. in future.. As an appropriate measure to	~~vendors shall refrain from manufacturing, selling and installing UWB radio equipment using the frequency from 3.4 GHz to 4.8 GHz without an interference mitigation function (hereinafter referred to "radio equipment not supporting mitigation") from January 1, 2011 and later.~~ ~~Also, vendors shall cooperate to assist public organizations to estimate the remaining number of UWB radio equipment not supporting mitigation, by tracking the number of shipped radio equipment not supporting a mitigation function as well as the UWB radio equipment using the same bandwidth with an interference mitigation function (hereinafter referred to "radio equipment supporting interference mitigation").~~ ~~As an appropriate measure to limit the number of remaining UWB radio equipment not supporting interference mitigation to below an allowed limit in 2011, the vendors shall cooperate with future mobile communications system~~	

		reduce the number of remaining UWB radio equipment not supporting interference mitigation to below an allowed its limit, in 2014 or later, the vendors shall cooperate with operators for future mobile communications systems in order to realize the smooth migration and acceleration of replacement for radio equipment supporting interference mitigation.	~~operators for an early shift to and replacement with radio equipment supporting interference mitigation.~~	
22	Annex 2 5	5 Ban on the use of UWB Radio Equipment for Toys UWB radio equipment shall not be included in toys. This reason is that a child may not be able to properly judge on the usage for the UWB radio system, outdoors, in airplane, or at an event site, etc. The terminology of toy is not strictly defined in this Annex, but manufacturers, etc. of UWB radio equipment should properly decide by themselves with due consideration of the intent of this standard. In this regard, toys which do not permit embedded UWB radio equipment shall include at least game machines.		Change related to Ordinance
23	Annex3	1.1 Permissible Levels of	~~1.1 Lowered Permissible~~	

	1.1	Unwanted Emission Intensity lowered for the Protection of Broadcast Receivers Permissible values for unwanted emission intensity provided in ARIB STD-T91 are set lower than those for unwanted emission intensity for other popular radio equipment such as a land mobile station for mobile wireless communications (mobile phone), low power data communications radio equipment (wireless LAN) and radio frequency identification (RFID). Therefore, UWB (ultra-wideband) radio systems may not immediately cause interference with other radio equipment such as broadcast receivers. However, if the radio equipment of the radio station of UWB radio systems (hereinafter referred to as "UWB radio equipment") is used in a very close neighborhood of a broadcast receiver, and the input level of the broadcast wave is near the receiver sensitivity limit, it may be is necessary to set the permissible level for unwanted emission intensity at the specific frequency bands less	~~Levels of Unwanted Emission Intensity for the Protection of Broadcast Receivers~~ ~~Permissible values for unwanted emission intensity provided in ARIB STD-T91 are set lower than those for unwanted emission intensity for other popular radio equipment such as a land mobile station for mobile wireless communications (mobile phone), low power data communications radio equipment (wireless LAN) and radio frequency identification (RFID). Therefore, UWB (ultra-wideband) radio systems may not immediately cause interference with other radio equipment such as broadcast receivers. However, if the radio equipment of the radio station of UWB radio systems (hereinafter referred to as "UWB radio equipment") is used in a very close neighborhood of a broadcast receiver, and the level of broadcast emission is near the receiver sensitivity limit , it is necessary to further lower the unwanted emission intensity of the specified frequency below those specified in ARIB~~	Change for explanation

		than the value specified in ARIB STD-T91 so as not to cause interference with broadcast receivers. For this reason, the UWB radio equipment should be designed with due consideration of permissible values for unwanted emission intensity that protects broadcast receivers as shown in Table A3-1. Regarding permissible values for unwanted emission intensity out of the frequency bands shown in Table A3-1, those specified in then ARIB STD-T91 shall be applied.	~~STD-T91 so as not to cause interference with broadcast receivers. For this reason, the UWB radio equipment should be designed with due consideration of permissible values for unwanted emission intensity that protects broadcast receivers as shown in Table A3-1.In case permissible values for unwanted emission intensity of the frequency band are not shown in Table A3-1, then ARIB STD-T91 shall apply.~~	
23	Annex 3 Table A3-1	Higher than 470 MHz to 710 MHz or lower	~~From 470 MHz to 770 MHz~~	Change Related to Ordinance
		Higher than A MHz to B MHz or lower	~~From A MHz to B MHz~~	
		(UHF 13-52 ch)	(UHF 13-~~62 ch~~)	
		(Delete)	~~From 2630 MHz to 2655 MHz Mobile broadcasting -111.7 dBm or less~~	
23	Annex 3 1.1	In addition, although table A3-1 shows permissible values for terrestrial analog broadcast receiver, revises of the design guideline are subject to the usage situation of terrestrial digital broadcasting and the spread situation of UWB equipment.	~~The design guideline is subject to change depending on the VHF and UHF bands usage scenarios for the future planned termination of terrestrial analog broadcasting on July 24, 2011.~~	

24	Annex3 1.2.1	The permissible values for unwanted emission intensity shown in Table A3-1 are at the lower limitation point of measurement as same as thermal noise at the room temperature. It is thus extremely difficult to measure immediately the unwanted emission intensity for not only products embedded with UWB radio equipments but also those at the design stage or on the process of manufacture. Therefore, it is, if possible, allowed to estimate the unwanted emission intensity of UWB radio equipment in the frequency bandwidth shown in Table A3-1 (hereinafter referred to as "interference bandwidth") with the indirect values in accordance with the measurement method described hereinafter, after separating signals generated by the UWB radio equipment and noise generated by non-UWB portion of the equipment.	~~The permissible values for unwanted emission intensity shown in Table A3-1 are at the measuring limit comparable with thermal noise at an ordinary temperature. It is thus extremely difficult to measure the unwanted emission intensity of the final products incorporating UWB radio equipment and to measure products at the design and manufacturing stage. It is, therefore, allowed to estimate the unwanted emission intensity of UWB radio equipment in the frequency bandwidth shown in Table A3-1 (hereinafter referred to as "interference bandwidth") in accordance with the measurement method hereinafter described, after separating signals generated by the UWB radio equipment and noise generated by non-UWB portion of the equipment.~~	Change for explanation
25	Annex3 1.2.2(3)	In the measurement example, attenuation of 50 dB or more was obtained in the frequency band between 1.5GHz or higher and less than 10GHz by combining LPF and AMP.	In the measurement example, attenuation of 50 dB or more was obtained in the frequency band between ~~1.5GHz and 10GHz~~ by combining LPF and AMP.	Unify expression

26	Annex3 1.2.2(5) TableA 3-4	Setting value Number of data points (Point)	~~Set value~~ ~~Data points(Point)~~	Clarificati on

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Communication Note of ARIB Standard-related Proposals, etc.

ARIB Standard Name (No.)	UWB(Ultra-Wideband) Radio Systems (ARIB STD-T91)

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UWB(Ultra-wideband) Radio Systems

ARIB STANDARD

ARIB STD-T91 Version 2.0

Version 1.0	December	2006
Version 1.1	September	2008
Version 1.2	November	2010
Version 2.0	March	2015

Published by

Association of Radio Industries and Businesses

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