

### **ENGLISH TRANSLATION**

# UWB (ULTRA-WIDEBAND) RADIO SYSTEMS

## ARIB STANDARD

### ARIB STD-T91 Ver. 2.0

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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:

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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)

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Amendment History

#### **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.

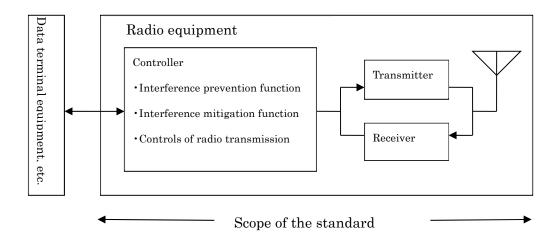


Figure 1-1 Configuration of radio station of UWB Radio System

#### 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

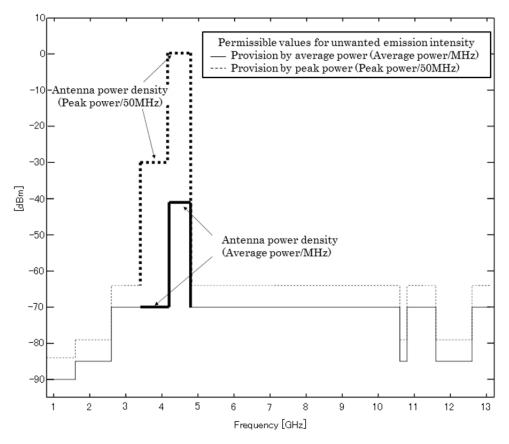
 $3~\mathrm{GHz}$ 

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

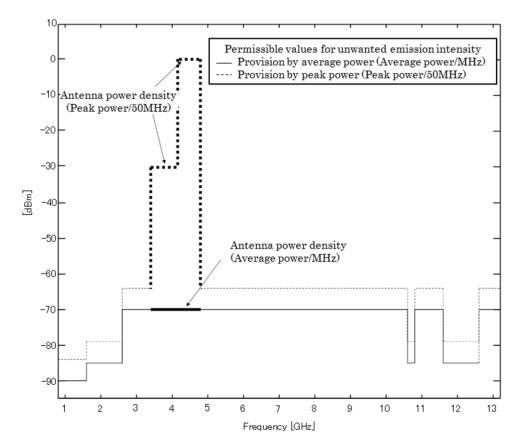
Permissible values for the unwanted emission intensity from the transmitter are as follows: (Note 3.1)

	Permissible values	
Engerson on hand	for unwanted emission intensity	
Frequency band	Average power per	Peak power per
	1 MHz bandwidth	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)

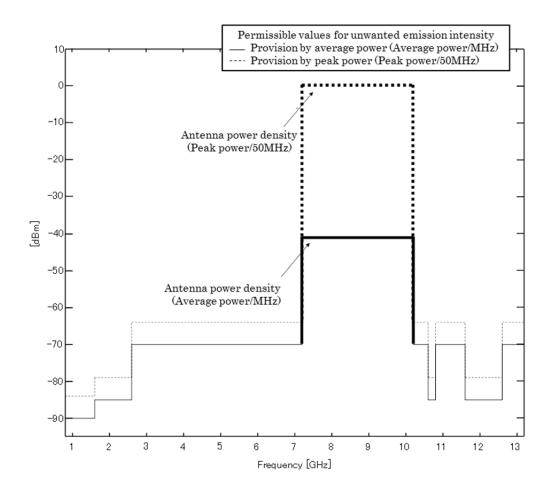


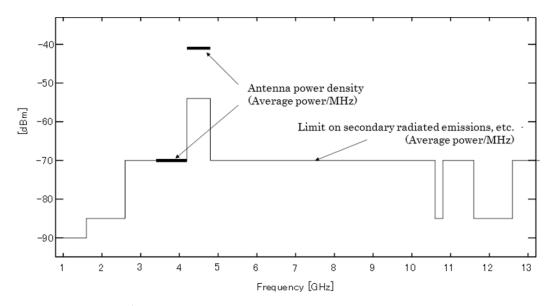
Figure 3-2 Antenna power density
and permissible values for unwanted emission intensity
(when using frequency between 7.25 GHz or higher and lower than 10.25 GHz)

#### 3.3 Receiver

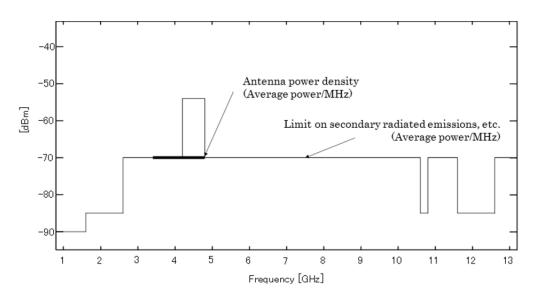
(1) Limit on secondary radiated emissions, etc. (ORE, Article 24, According to ORE, Supplementary provision (MIC Ordinance No. 105 on August 1, 2006) (Revised by MIC Ordinance No. 98 on August 29, 2008) (Revised by MIC Ordinance No. 89 on October 14, 2010) (Revised by MIC Ordinance No. 122 on December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

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

	Average power at any 1 MHz bandwidth		
Enggyon ov hand	When using frequency	When using frequency	
Frequency band	between 3.4 GHz or higher	between 7.25 GHz or higher	
	and lower than 4.8 GHz	and lower than 10.25 GHz	
lower than 1,600 MHz	-90 dI	Bm or less	
1,600 MHz or higher	-0E JI	Bm or less	
to lower than 2,700 MHz	-65 di	om or less	
2,700 MHz or higher	-70 di	Bm or less	
to lower than 4.2 GHz	-70 di	om or less	
4.2 GHz or higher	-54 dBm or less	-70 dBm or less	
to lower than 4.8 GHz	54 adm or less	70 adm or less	
4.8 GHz or higher	-70 dBm or less		
to lower than 7.25 GHz			
7.25 GHz or higher	-70 dBm or less -54 dBm or less		
to lower than 10.25 GHz	70 ubili of less	54 dDin or less	
10.25 GHz or higher	-70 dI	Bm or less	
to lower than 10.6 GHz	70 til	on iess	
10.6 GHz or higher	-85 dBm or less		
to lower than 10.7 GHz	-89 ubm or less		
10.7 GHz or higher	-70 dBm or less		
to lower than 11.7 GHz	- 70 abm or iess		
11.7 GHz or higher	-85 dBm or less		
to lower than 12.75 GHz	TOO UDIN OF IESS		
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)

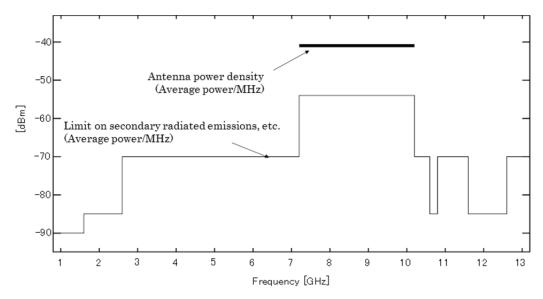


Figure 3-4 Antenna power density and limit on secondary radiated emissions, etc.

(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:	
•	

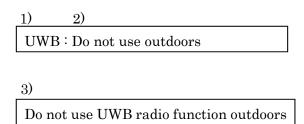
Note: The "UWB radio function" stated in the operation manual refers to the wireless communication function of the UWB radio systems,

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

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.

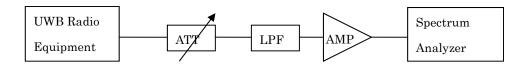


Figure A3-1 A measurement schematic diagram used for the measurement example

#### (2) Equipment for an experiment

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

Manufacturer Model Remarks Equipment name Qtty 1 UWB radio equipment DC-18GHzATT HP 8495B1 8494B 1dB, 10dB step LPF Mini-Circuits **BPF-750** 750MHz LPF 1 **AMP** R&K A-528-LN 1 0.01-1GHz, 32dB MS8901A 1 9kHz-3GHz Spectrum analyzer Anritsu

Table A3-2 Equipment for experiment

#### (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.

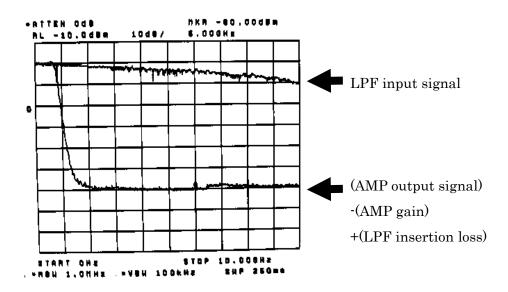


Figure A3-2 Transmission characteristics of signals when combining LPF and AMP

(A display example from a spectrum analyzer)

#### (4) Characteristics of AMP

Gain and noise figure (NF) of AMP at  $600 \mathrm{MHz}$  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)  $\alpha$ , ATT thermal noise and AMP thermal noise, and can be expressed in the Equation (1).

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

M: AMP output signal level

α: ATT input signal level (unwanted emission intensity)

L: ATT attenuation

k: Boltzamann constant

T<sub>a</sub>: Ambient temperature (K)

T<sub>1</sub>: Equivalent noise temperature (obtained by converting AMP noise into AMP input.) (K)

G: AMP gain

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

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

F: AMP noise figure (antilog)

To: Temperature 290 K

From Equation (1) and (2),  $\alpha$  can be obtained by making  $T_{a=}T_0$  as in the Equation (3).

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

As shown in the Equation (3),  $\alpha$  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  $\alpha$  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	600 MHz
	[dB]	
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.

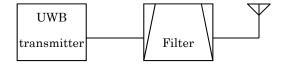


Figure A3-3 A configuration of UWB radio equipment using a filter

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.  $\alpha$  [dBm/MHz] is obtained as a measured result.

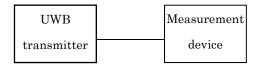


Figure A3-4 A connection example for characteristics measurement of UWB transmitter

#### (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.

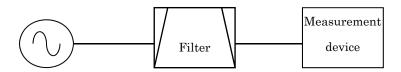


Figure A3-5 A connection example for characteristics measurement of a filter

#### (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.

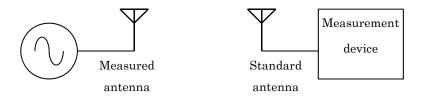


Figure A3-6 A connection example for characteristics measurement of an antenna

#### (4) Estimation of unwanted emission intensity

It can be estimated that the unwanted emission intensity is  $\alpha$ -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	As an interim measure until	As an interim measure until	
	(2)	December 31, <u>2010</u> , the following	December 31, <del>2008</del> , the	
		condition shall apply: Of radio	following condition shall apply:	Change
		equipment with use of frequency	Of radio equipment with use of	related
		from 3.4 GHz to 4.8 GHz, those	frequency from 3.4 GHz to 4.8	to
		without an interference	GHz, those without an	Ordinan
		mitigation function stipulated in	interference mitigation function	ce
		3.4 (2) shall have the average	stipulated in 3.4 (2) shall have	
		power of -70 dBm or less per 1	the average power of -70 dBm or	
		MHz bandwidth within the	less per 1 MHz bandwidth	
		frequency band from 3.4 GHz to	within the frequency band from	
		4.2 GHz, and the average power of	3.4 GHz to 4.2 GHz, and the	
		-41.3 dBm or less per 1 MHz	average power of -41.3 dBm or	
		bandwidth within the frequency	less per 1 MHz bandwidth	
		band from 4.2 GHz to 4.8 GHz.	within the frequency band from	
		(According to ORE,	4.2 GHz to 4.8 GHz. (According	
		Supplementary provision (MIC	to ORE, Supplementary	
		Ordinance No. 105 on August 1,	provision (MIC Ordinance No.	
		2006) (Revised by MIC Ordinance	105 on August 1, 2006).)	
		No. 98 on August 29, 2008).)		
6	3.2 (7)	Without an interference	Without an interference	Change
	Fig. 3-1	mitigation function (until	mitigation function (until	related
		December 31, <u>2010</u> )	December 31, <del>2008</del> )	to
				Ordinan
				ce

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

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

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

The 1.2th edition amendment history

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

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

The 2.0th edition amendment history

Page	Para.no	Content of Amendment	Present	Reason
	General	1. Notes on Copyright	+ The copyright of this	Unify
	Notes	- The copyright of this	document is ascribed to the	expression
		document is ascribed to the	Association of Radio Industries	
		Association of Radio Industries	and Businesses (ARIB).	
		and Businesses (ARIB).	2. All rights reserved. No	
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		form or by any means, without	any means, without the prior	
		the prior written permission of	written permission of	
		ARIB.	ARIB.	
		2. Notes on English Translation	<del>3.</del> The ARIB Standards	
		- ARIB Standards and Technical	and ARIB Technical Reports	
		Reports are usually written in	are usually written in Japanese	
		Japanese. This document is a	and approved by the ARIB	
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		If there are any discrepancies in	document for the purpose of	
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		between the <u>original</u> document	are any discrepancies in the	
		and this translated document,	content, expressions, etc.,	
		the original <u>document</u> shall	between the <del>Japanese</del> original	
		prevail.	and this translated document,	
		- ARIB Standards and Technical	the <del>Japanese</del> original shall	
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		language, are made publicly	4. The establishment,	
		available through web posting.	revision and abolishment of	
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		the latest version at an	<del>year. Approved ARIB</del>	
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			in about one month after the	
			<del>date of approval</del> . The original	
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			and therefore users are	
			encouraged to check the latest	
			version at an appropriate page	
			under the following URL:	
			http://www.arib.or.jp/english/in	
			dex.html	
		Foreword	<del>Introduction</del>	Unify
				expression
Fo	orewo	The Association of Radio	With participation of radio	Unify
rd	ł	<u>Industries and Businesses</u>	communication equipment	expression
		(ARIB) investigates and	manufacturers, broadcasting	
		summarizes the basic technical	equipment manufacturers,	
		requirements for various radio	telecommunication operators,	
		systems in the form of "ARIB	broadcasters and general	
		Standards". These standards	equipment users, Association of	
		are developed with the	Radio Industries and	
		participation of and through	Businesses (ARIB) defines	
		discussions amongst radio	basic technical requirements	
		equipment manufacturers,	for standard specifications of	
		telecommunication operators,	radio equipment, etc. as an	
		broadcasting equipment	"ARIB STANDARD" in the field	
		manufacturers, broadcasters	<del>of various radio systems.</del>	

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

2	1.3	In the standard, <u>"RL" refers</u>	In the standard, "RERL"	Insert
		to Radio Law, "RERL" refers to	refers to Regulations for	
		Regulations for Enforcement of	Enforcement of Radio Law,	parenthes
		Radio Law, "ORE" refers to	"ORE" refers to Ordinance	is
		Ordinance Regulating Radio	Regulating Radio Equipment,	
		Equipment, "OTRCC" refers to	"OTRCC" refers to Ordinance	
		Ordinance Concerning	Concerning Technical	
		Technical Regulations	Regulations Conformity	
		Conformity Certification etc. of	Certification etc. of Specified	
		Specified Radio Equipment,	Radio Equipment, "OTF" refers	
		"OTF" refers to Ordinance	to Ordinance Concerning	
		Concerning Terminal Facilities	Terminal Facilities etc.,	
		etc., "RTCCA" refers to Rules	"RTCCA" refers to Rules	
		Concerning the Technical	Concerning the Technical	
		Conditions Compliance	Conditions Compliance	
		Approval etc. for Terminal	Approval etc. for Terminal	
		Equipment, "NT" refers to a	Equipment, "NT" refers to a	
		Notification of the Ministry of	Notification of the Ministry of	
		Posts and Telecommunications	Posts and Telecommunications	
		if issued in 2000 or earlier, and	if issued in 2000 or earlier, and	
		a Notification of the Ministry of	a Notification of the Ministry of	
		Internal Affairs and	Internal Affairs and	
		Communications (MIC) if	Communications (MIC) if	
		issued in 2001 or later.	issued in 2001 or later.	
3	2.2	The standard does not specify	In the radio equipment of the	Change
		system configurations.	radio station of a UWB Radio-	related to
			System, a radio equipment not-	Ordinance
			connected to the AC mains	
			<del>power supply shall be</del>	
			permitted to emit radio waves	
			only after it receives a signal	
			from another radio equipment	

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 whichtransmits 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 <del>(1)</del> (2) The case of radio equipment not connected to the AC mains power supply whichtransmits 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 radiowaves 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 <del>(2)</del> (3) The case of radio

				1
			equipment not connected to the	
			AC mains power supply which	
			transmits signals to another	
			radio equipment not connected	
			to the AC mains power supply:	
			<del>If a radio equipment is not</del>	
			connected to the AC mains	
			power supply and transmits	
			<del>signal to another radio</del>	
			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	
			<del>power supply.</del>	
			Figure 2-3 Example of	
			standard system configuration	
			( <del>3)</del>	
4	3.1(2)	Communication methods	Communication methods	Correction
		shall be simplex operation, full	shall be <del>either-</del> simplex	
		duplex operation or half duplex	operation, full duplex operation	
		operation.	or half duplex operation.	
4	3.1(3)	Operating frequency band to	Operating frequency band to	Unify
		be used shall be <u>between</u>	be used shall be <del>from 3.4 GHz</del>	expression
		3.4GHz or higher and lower	to 4.8 GHz or from 7.25 GHz to	
		than 4.8GHz, or between	10.25 GHz.	
		7.25GHz or higher and lower		
		than 10.25GHz.		
4	3.2(2)	(2)Antenna power (ORE,	(2) Antenna power (ORE,	Change
		Article 49.27, According to	Article 49.27)	Related to
		ORE, Supplementary provision	Antenna power for the	Ordinance
		(MIC Ordinance No. 105 on	operating frequency band shall	
1		<u>2.22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</u>	opolating modulity band bhan-	

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

		power per 50 MHz bandwidth	Of radio equipment with use	
		shall be -30 dBm or less.	of frequency from 3.4 GHz to	
		The radio equipment with use	4.8 GHz, those without an	
		of frequency between 3.4 GHz	interference mitigation	
		or higher and lower than 4.8	function stipulated in 3.4 (2)	
		GHz shall have the interference	shall have a peak power of -30	
		mitigation function as	dBm or less per 50 MHz	
		stipulated in 3.4 (2). But, this	bandwidth within the	
		term is not applied to the	frequency band from 3.4 GHz to	
		equipment which has the	4.2 GHz, and the peak power of	
		average power per 1 MHz	0 dBm or less per 50 MHz	
		bandwidth of -70 dBm or less.	bandwidth within the	
		bandwidth of 70 dbin of less.	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	
			<del>14, 2010).)</del>	
5	3.2(3)	(3) Tolerances of antenna	(3) Tolerances for antenna	Change
		power (ORE, Article 14)	power (ORE, Article 14)	for
		The upper limit of the	The tolerance of the antenna	explanatio
		tolerance for the antenna power	power from shall be less than	n
		emitted from transmitter	the allowed maximum value +	
		equipment shall be +20%.	<del>20%.</del>	
5	3.2(4)	Transmission data rate with	Transmission data rate shall	Change
		use of a frequency between	be higher than 50 Mbps	related to
		3.4GHz or higher and lower	excepting for such cases as	Ordinance
		than 4.8GHz shall be higher	noise or interference from other	
		than 50 Mbps except the case in	radio stations need be avoided.	
		which noise or interference		
		from other radio stations could		
		irom other radio stations could		

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

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

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

		T		
			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 radio equipment using	Change
		the frequency between 3.4 GHz	radio with frequency from 3.4	related to
		or higher and lower than 4.8	GHz to 4.8 GHz shall have the	Ordinance
		GHz shall have the interference	interference mitigation	
		mitigation function that meets	function that meets the	
		the technical conditions [3.2]	technical conditions notified	
		notified separately by Minister	separately by Minister of	
		of Internal Affairs and	Internal Affairs and	
		Communications. But, this	Communications	
		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		
<u> </u>	I			

		6 1 11	
		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	
		<u>be -70dBm.</u>	
		(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
			<del>function.</del>
			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
			accading received compensation

			Design Continue	
			Design Certification, is not	
			mandatory to install an	
			interference mitigation	
			<del>function.</del>	
			(According to ORE,	
			Supplementary provision (MIC-	
			Ordinance No. 105 on August 1,	
			<del>2006) (Revised by MIC</del>	
			Ordinance No. 98 on August 29,	
			<del>2008) (Revised by MIC</del>	
			Ordinance No. 98 on October	
			<del>14, 2010))</del>	
			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	Change
			(ORE, Article 49.27)	related to
			A radio equipment not	Ordinance
			connected to the AC mains	
			<del>power supply shall be</del>	
			permitted to emit radio waves	
			only after it receives a signal	
			from another radio equipment	
			connected to the AC mains	
			power supply.	
14	3.5	(1) Terminal equipment (NT	pon or outpry.	
14	0.0			
		No.72 in 1994)		

		The terminal equipment is a		Change
		kind of radio station stipulated		related to
		in Article 4.3 of "RL" and the		Notificatio
		equipment which use the radio		n
		equipment in the radio station		
		of ultra-wideband radio system		
		stipulated in item 2 of		
		paragraph 2, Article 4.4 of		
		<u>"RERL".</u>		
14	3.5	(2) Identification devices	(1) Identification devices	Change
		(OTF, Article 9)	(OTF, Article 9)	the
				paragraph
				number
14	3.5	(3) Identification signs (NT	(2) Identification signs (NT	Change
		No. 424 in 1994)	No. 424 in 1994)	the
				paragraph
				number
14	3.5	(4) Method to judge the	(3) Method to judge the	Change
14	3.5	(4) Method to judge the availability of the operating	(3) Method to judge the availability of the operating	Change the
14	3.5			C
14	3.5	availability of the operating	availability of the operating	the
14	3.5	availability of the operating frequency band (NT No. 424 in	availability of the operating frequency band (NT No. 424 in	the paragraph
		availability of the operating frequency band (NT No. 424 in 1994)	availability of the operating frequency band (NT No. 424 in 1994)	the paragraph number
		availability of the operating frequency band (NT No. 424 in 1994) Absolute gain of the	availability of the operating frequency band (NT No. 424 in- 1994) Absolute gain of the	the paragraph number Change
		availability of the operating frequency band (NT No. 424 in 1994)  Absolute gain of the transmitting antenna shall be 0	availability of the operating frequency band (NT No. 424 in 1994)  Absolute gain of the transmitting antenna shall be 0	the paragraph number Change for
		availability of the operating frequency band (NT No. 424 in 1994)  Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in case	availability of the operating frequency band (NT No. 424 in 1994)  Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in the	the paragraph number Change for explanatio
		availability of the operating frequency band (NT No. 424 in 1994)  Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in case that the e.i.r.p. (Equivalent	availability of the operating frequency band (NT No. 424 in- 1994)  Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in the case that the e.i.r.p.	the paragraph number Change for explanatio
		availability of the operating frequency band (NT No. 424 in 1994)  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	availability of the operating frequency band (NT No. 424 in 1994)  Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in the case that the c.i.r.p. (Equivalent Isotropic Radiated	the paragraph number Change for explanatio
		availability of the operating frequency band (NT No. 424 in 1994)  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	availability of the operating frequency band (NT No. 424 in 1994)  Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in the case that the c.i.r.p. (Equivalent Isotropic Radiated Power) falls short of the	the paragraph number Change for explanatio
		availability of the operating frequency band (NT No. 424 in 1994)  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	availability of the operating frequency band (NT No. 424 in 1994)  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	the paragraph number Change for explanatio
		availability of the operating frequency band (NT No. 424 in 1994)  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	availability of the operating frequency band (NT No. 424 in- 1994)  Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in the case that the c.i.r.p. (Equivalent Isotropic Radiated- Power) falls short of the antenna power provided in 3.2 (2) added with the transmitting	the paragraph number Change for explanatio
		availability of the operating frequency band (NT No. 424 in 1994)  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	availability of the operating frequency band (NT No. 424 in- 1994)  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	the paragraph number Change for explanatio
		availability of the operating frequency band (NT No. 424 in 1994)  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	availability of the operating frequency band (NT No. 424 in 1994)  Absolute gain of the transmitting antenna shall be 0 dBi or less. However, in the ease 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	the paragraph number Change for explanatio

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

		measurement methods as of	No. 88 on January 26, 2004,	
		the revised time of the	may be referred as the	
		Standard Ver. 2.0 (on March 17,	measurement method.	
		<u>2015).</u>		
17	Annex	Interference mitigation	Interference mitigation	Unify
	1	function (When using radio	function (When using radio-	expression
	(3)	frequency between 3.4 GHz or	wave within the frequency from	
		higher and lower than 4.8 GHz)	3.4 GHz to 4.8 GHz)	
17	Annex	(Delete)	As an interim measure until	Change
	1		December 31, 2013, the	related to
	(3)		interference mitigation	Ordinance
			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	
			<del>14, 2010)).</del>	
			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,	
			<del>2006)</del>	
18	Annex2	Annex 2 Operational	Annex 2 Operational	Unify
		Guidance for UWB Radio	Guidelines for UWB Radio	expression
		Systems	<del>Systems</del>	
18	Annex2	1.1 Objectives	1.1 Objectives	
		The Operational Guidance is	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

UWB

(Ultra-Wideband) Radio

intended for the following

Systems

system.

ARIB STD-T91

1.4 Basic agreements

(1) Clarification of problems

are aimed at avoiding harmfulradio interference to other
radio equipment, and ensuringusers' convenience as well asachieving effective spectrumutilization, for operating UWB(Ultra-wideband) radiosystems.

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 systems.

UWB

(<del>Ultra-Wideband) Radio</del>

Systems

ARIB STD-T91

1.4 Basic agreements

(1) Clarification of problems

Change for explanatio

		Vendors shall take in good	Vendors shall in good faith	
		<u>faith preventive measures</u>	take preventive measures	
		including warning messages in	including warning messages in	
		operation manuals and PR	operation manuals, etc. and to	
		activities for prevention of radio	pursue PR activities for	
		interference., etc	<del>prevention of radio</del>	
		(2) Preliminary survey	interference.	
		In case users or vendors	(2) Preliminary survey	
		intend to introduce UWB radio	<del>In case users or vendors</del>	
		equipment, preliminary survey	intend to introduce UWB radio	
		on interference shall be	equipment, it shall be-	
		practiced, and it shall be	confirmed prior to the	
		confirmed prior to the	introduction that the said radio	
		introduction that the said radio	equipment will not cause radio	
		equipment will not cause radio	interference which is harmful	
		interference which is harmful to	to other radio equipment.	
		other radio equipment.	(3) Coordinated responses	
		(3) Cooperate responses	In the event that a UWB	
		In the event that a UWB	radio system has caused radio	
		radio system has caused radio	interference which is harmful	
		interference which is harmful to	to other radio equipment, the	
		other radio equipment, the	users and/or vendors shall, in-	
		users and/or vendors shall	good faith, help for reduction of	
		cooperate in good faith for	radio interference.	
		avoidance and reduction of the		
		radio interference.		
19	Annex2	The frequency band used for	The frequency band used for	Change
	2	the UWB radio function is also	the UWB radio function is also	for
		used for radio equipment of	used for radio equipment of	explanatio
		other radio systems.	<del>other radio systems.</del>	n
		1. The use of equipment	1. The use of equipment	
		with UWB radio function shall	with UWB radio function shall	
		be limited to indoors, i.e. within	be limited to indoors, i.e. within	
		environments such as houses,	environments such as houses,	
		apartments, buildings, etc. Not	apartments, buildings, etc. Not	

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

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

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	operators for an early shift to	
		UWB radio equipment not	and replacement with radio	
		supporting interference	equipment supporting	
		mitigation to below an allowed	interference mitigation.	
		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.		
22	Annex	5 Ban on the use of UWB		Change
	2	Radio Equipment for Toys		related to
	5	UWB radio equipment shall		Ordinance
		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.		
23	Annex3	1.1 Permissible Levels of	1.1 Lowered Permissible	

n

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 stationof 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 belowthese specified in ARIB

Change for explanatio

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

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

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

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#### UWB(Ultra-wideband) Radio Systems

#### ARIB STANDARD

#### ARIB STD-T91 Version 2.0

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