

Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [Update of UWB Radio Regulation in Japan]

Date Submitted: [13 November 2018]

Source: [Ryuji Kohno^{1,2,3}] [1;Yokohama National University, 2;Centre for Wireless Communications(CWC), University of Oulu, 3;University of Oulu Research Institute Japan CWC-Nippon]

Address [1; 79-5 Tokiwadai, Hodogaya-ku, Yokohama, Japan 240-8501

2; Linnanmaa, P.O. Box 4500, FIN-90570 Oulu, Finland FI-90014

3; Yokohama Mitsui Bldg. 15F, 1-1-2 Takashima, Nishi-ku, Yokohama, Japan 220-0011]

Voice:[1; +81-45-339-4115, 2:+358-8-553-2849], FAX: [+81-45-338-1157],

Email:[1: kohno@ynu.ac.jp, 2: Ryuji.Kohno@oulu.fi, 3: ryuji.kohno@cw-nippon.co.jp] Re: []

Re: []

Abstract: [This document introduces latest change of radio regulation for Ultra Wide Band (UWB) radio use outdoor in Japan. This is not an official document of Japanese radio authority MIC but the translated part of documents by Ryuji Kohno.]

Purpose: [information]

Notice: This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release: The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

Update of UWB Radio Regulation in Japan

Ryuji Kohno

Professor, Graduate School of Engineering Science, Yokohama National University, Japan
Director, Center for Future Medical Infrastructure Based on Advanced ICT, Japan
Distinguished Professor, University of Oulu, Finland
CEO, University of Oulu Research Institute Japan - CWC-Nippon, Co. Ltd.

Introduction

Background:

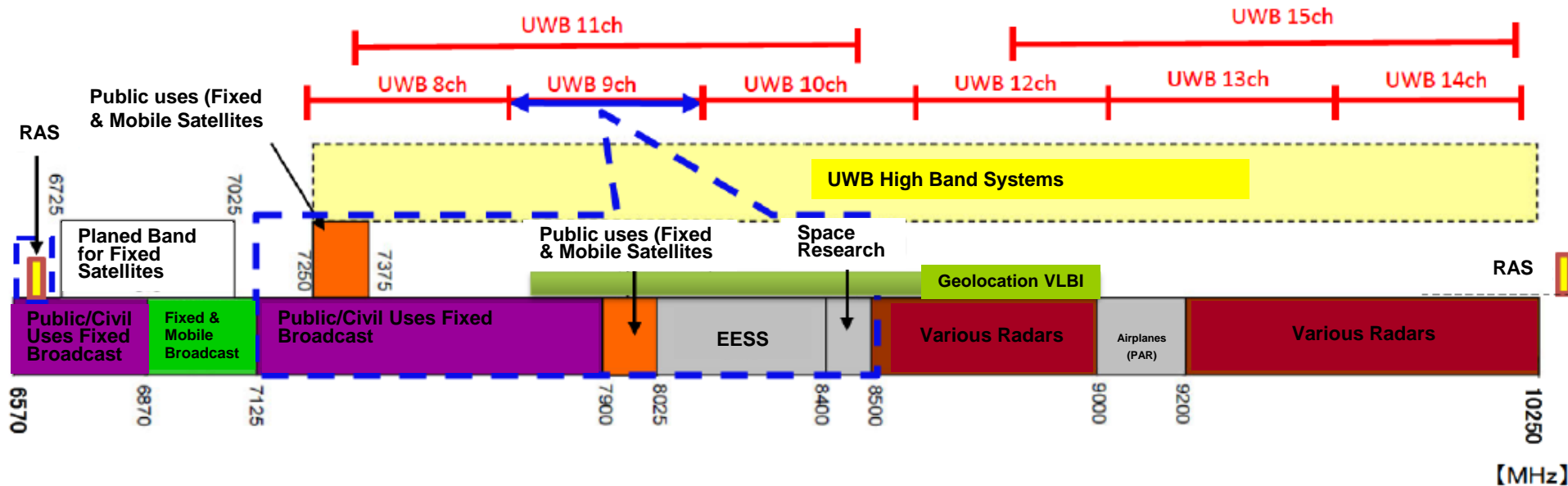
- Japanese radio regulation authority MIC (Ministry of Internal Affairs and Communications) has investigated technical requirement for ultra wide band (UWB) radio use according to UWB research, development, and business after it established regulatory requirement for communication uses for 3.4-4.8GHz, 7.25-10.25GHz in 2006, and collision avoidance radar uses for 22-29GHz in 2013. While UWB communication and sensing systems have been restricted indoor in Japan, the rest of world have been developing them to a lot of outdoor uses.
- Lately in this IoT era, wide variety of UWB radio uses have been expected in Japan as well as in a world and demand for UWB radio outdoor use has been increasing while keeping transparency with other nations.

Major Change:

- (1) Bandwidth, Occupied, and Impermissible Emission Available Outdoor; Channel 9 of IEEE802.15.4a™ with central frequency 7987.2GHz and bandwidth 499.2MHz out of high band 7.25-10.25GHz has been considered to be available outdoor.
- (2) EIRP(Equivalent Isotropically Radiated Power); Japanese regulatory requirement for UWB radio has been regulated by emission power, antenna gain as well as EIRP. For the sake of international compatibility, Japanese regulation for UWB radio uses could be regulated by EIRP.

Radio Uses in the Frequency Band 6.57-10.25GHz

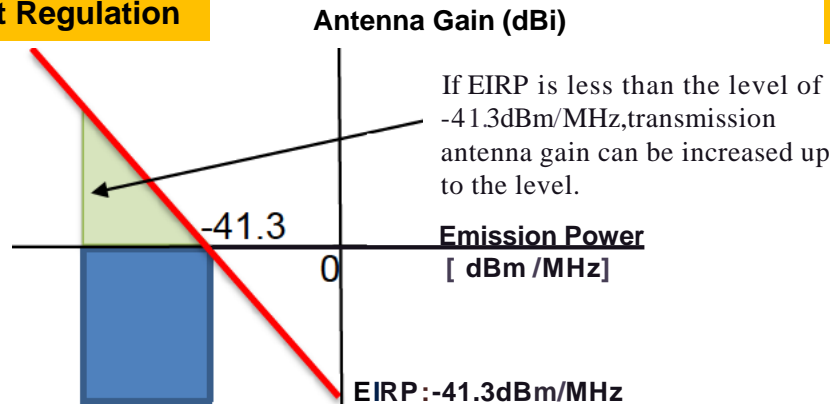
- **Red lines** indicate channels defined by **IEEE802.15.4a**.
- Available band is 7.587-8.4GHz. **Blue dotted line** systems should be protected for coexistence such as fixed micro wave communication, satellite, radio astronomy and VLBI etc.



Update of Emission Power Regulation in case of Low Gain Antenna

- Recently demand of small wireless terminals including UWB terminals drastically. A small terminal cannot perform desired covering range because antenna gain of small terminals is used not to be sufficient.
- Corresponding to the demand, it is permitted that under the range of the regulated Equivalent Isotropically Radiated Power (EIRP), antenna gain can be increased according to attenuation amount of emission power. Increase of emission power can be replaced with attenuation of transmitted antenna gain.

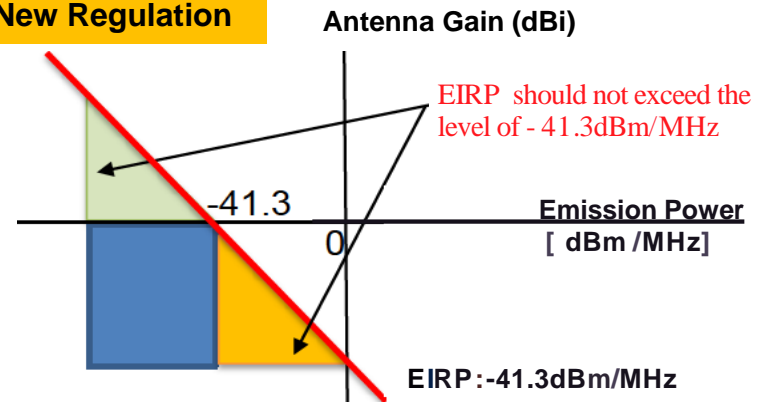
Current Regulation



Average Power -41.3 dBm/MHz
Peak Power 0 dBm/50MHz

Transmission absolute antenna gain should not exceed 0 dBi.
If and only if EIRP is lower than the level of -41.3dBm/MHz, transmission antenna gain can be increased so that EIRP can not be exceed the level.

New Regulation



Average Power -41.3 dBm/MHz (defined by EIRP)
Peak Power 0 dBm/50MHz (defined by EIRP)
EIRP should not exceed the level of -41.3dBm/MHz,.

- In current regulation, it is permitted that under the limit of the regulated EIRP, antenna gain can be increased according to attenuation amount of emission power.
- In new regulation, it is permitted that under the range of the regulated EIRP increase of emission power is allowed in case that antenna gain is small to reach the regulated EIRP

Major Technical Requirement for Outdoor UWB Systems(1/ 2)

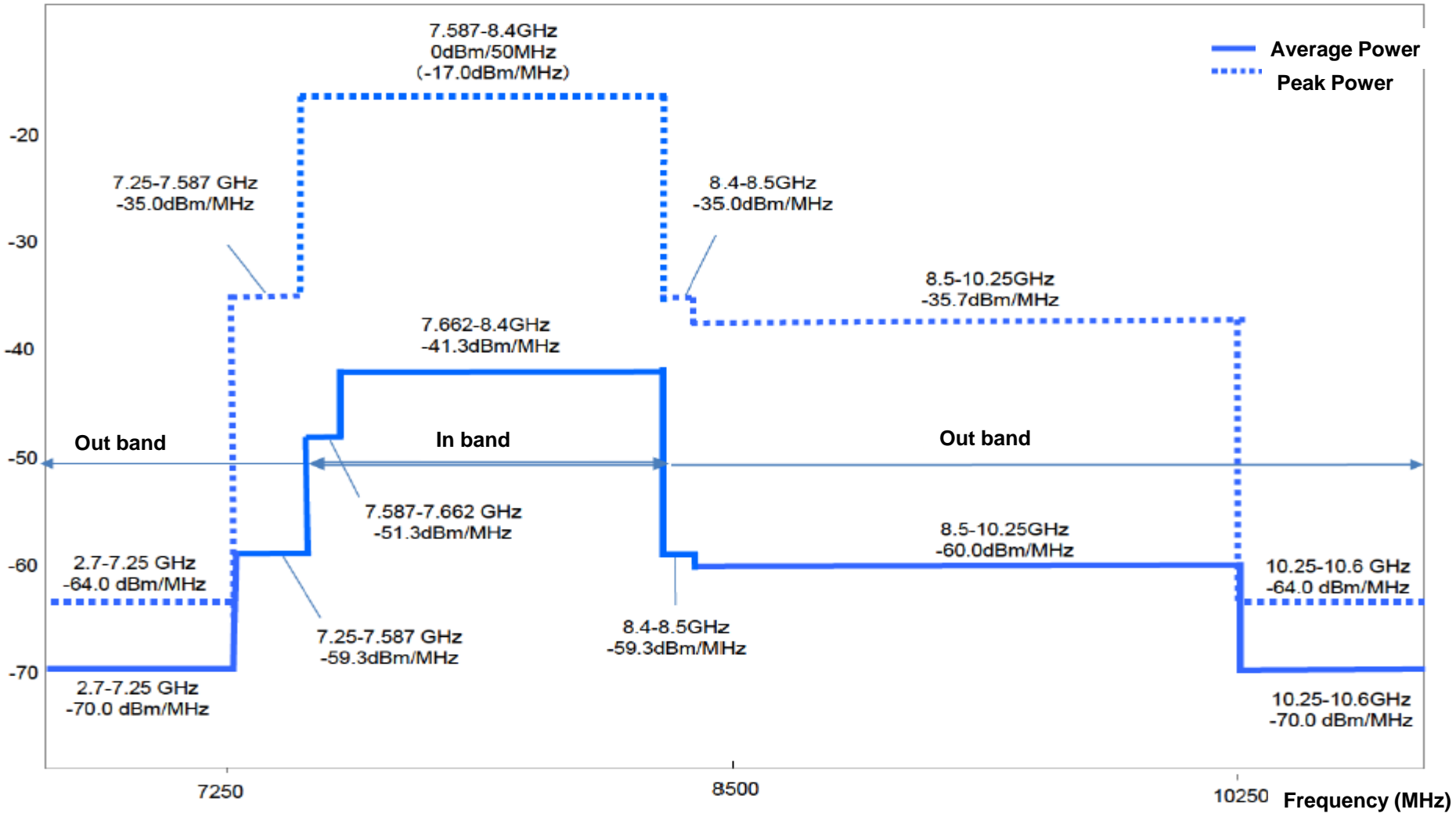
Technical Requirement of Outdoor UWB Systems				Technical Requirement of Indoor High Band UWB Systems				
Permissible Variance of Band		7.587GHz – 8.4GHz		Permissible Variance of Band		7.25GHz – 10.25GHz		
Emission Power (by EIRP)		Average Power(EIRP)		Emission Power (by EIRP)		Average Power(EIRP)		
		7,587-7662 MHz: Lower than -51.3 dBm/MHz				Lower than -41.3 dBm/MHz		
Antenna Absolute Gain		Peak Power (EIRP)		Antenna Absolute Gain		Peak Power (EIRP)		
		No Change				0 dBm		
Permissible Occupied Band width		813MHz (Specified Band)		Permissible Occupied Band width		3 GHz		
Permissible Spread Band width		No Change		Permissible Spread Band width		More than 450 MHz (10 dB Bandwidth)		
Limits of Emission Power subsidiarity (by EIRP)	Not beyond 7.25 GHz	No Change		Limits of Emission Power subsidiarity (by EIRP)	Not beyond 7.25 GHz	Less than 1,600MHz -90.0dBm/MHz		
		No Change				1,600-2,700 MHz -85.0dBm/MHz		
	No Change		2,700MHz -7.25 GHz -70.0dBm/MHz					
	Higher than 7.25 GHz	7.25 GHz -- 7.587 GHz			7.25 GHz -- 10.25 GHz		7.25GHz – 10.25GHz -54.0dBm/MHz	
		7.587 GHz -- 8.4GHz			10.25-10.6GHz		-70.0dBm/MHz	
8.4 GHz -- 8.5 GHz		10.6-10.7GHz		-85.0dBm/MHz				
Not Beyond 10.25 GHz	8.5 GHz -- 10.25 GHz		10.7-11.7GHz		-70.0dBm/MHz			
	No Change		11.7-12.56GHz		-85.0dBm/MHz			
Higher than 10.25 GHz		No Change		Beyond 12.75GHz		-64.0dBm/MHz		

Major Technical Requirement for Outdoor UWB Systems(2/ 2)

Technical Requirement of Outdoor UWB Systems				Technical Requirement of Indoor UWB Systems					
Limits of Permitted Emission (by Average Power, EIRP)	Not beyond 7.25 GHz	No Change		Limits of Permitted Emission (by Average Power, EIRP)	Not beyond 7.25 GHz	Less than 1,600MHz	-90dBm/MHz		
	7.25 GHz -- 10.25 GHz	7.25 GHz -- 7.587 GHz	-59.3 dBm/MHz			1,600-- 2,700MHz	-85.0dBm/MHz		
		7.587 GHz -- 8.4GHz	non			2,700MHz--7.25GHz	-70dBm/MHz		
		8.4 GHz -- 8.5 GHz	-59.3dBm/MHz		7.25 GHz -- 10.25 GHz Non				
		8.5 GHz -- 10.25GHz	-60.0dBm/MHz						
over 10.25GHz	No Change		Limits of Permitted Emission (by Peak Power, EIRP)	Not beyond 7.25 GHz	10.25--10.6GHz	-70.0dBm/MHz			
Limits of Permitted Emission (by Peak Power, EIRP)	Not beyond 7.25 GHz	No Change			10.6G--10.7GHz	-85.0dBm/MHz			
		7.25 GHz -- 7.587 GHz			-35.0 dBm/MHz	10.7--11.7GHz	-70.0dBm/MHz		
		7.587 GHz -- 8.4GHz			Non	11.7--12.75GHz	-85.0dBm/MHz		
		8.4 GHz -- 8.5 GHz			-35.0dBm/MHz	Beyond 12.75GHz	-70.0dBm/MHz		
8.5 GHz -- 10.25 GHz	-35.7dBm/MHz	Limits of Permitted Emission (by Peak Power, EIRP)	Not beyond 7.25 GHz	Less than 1,600MHz	-84.0dBm/MHz				
Higher than 10.25 GHz	No Change			No Change		1,600--2,700MHz	-79.0dBm/MHz		
						7.25 GHz -- 10.25 GHz	Non	2,700MHz--7.25GHz	-64.0dBm/MHz
						Higher than 10.25 GHz	10.25--10.6GHz 10.6G--10.7GHz 10.7--11.7GHz 11.7--12.75GHz Beyond 12.75GHz		-64.0dBm/MHz
						Higher than 10.25 GHz			-79.0dBm/MHz
Higher than 10.25 GHz	-64.0dBm/MHz								
Higher than 10.25 GHz	-79.0dBm/MHz								
Package is not easily opened.				Package is not easily opened.					

Updated UWB PSD Mask for Outdoor Uses in Japan

Power(dBm/MHz)



Remark

- MIC said that this change of regulation for UWB radio outdoor use is only for CH9 but will be more reasonable extension to other channels.
- These slides are translated from MICT documents by Ryuji Kohno, so it means these are not official MIC documents.