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

Submission Title: [Interpretation and Future Modification of Japanese Regulation for UWB]

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Abstract: [A draft of Japanese regulation for UWB in 3-10GHz has been announced and called for public comments by Japanese regulator MIC during Feb.2-March 3, 2006. The draft regulation is scheduled to be approved after considering the public comments on March 27, 2006. All technical conditions are interpreted. Although various key issues such as mandatory interference suppression technology, data rate, indoor limited, etc have not been determined yet, the regulation will be updated if the remained issues are solved. The IEEE P802.15 will be able to contribute to provide some solutions for the remained problems such as reasonable interference suppression schemes such as feasible DAA and LDC, etc.

It is important for IEEE P802.15 standard to be compliant in a world as well as in USA.]

Purpose: [Suggestion to modify specifications such as a band plan, MAC and additional requirement for IEEE P802.15 in microwave band to be world-wide compliant.]

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Interpretation and Future Modification of Japanese Regulation for UWB

(update of Doc.15-06-0023-00-004a, Doc.15-05-570-02-004a,
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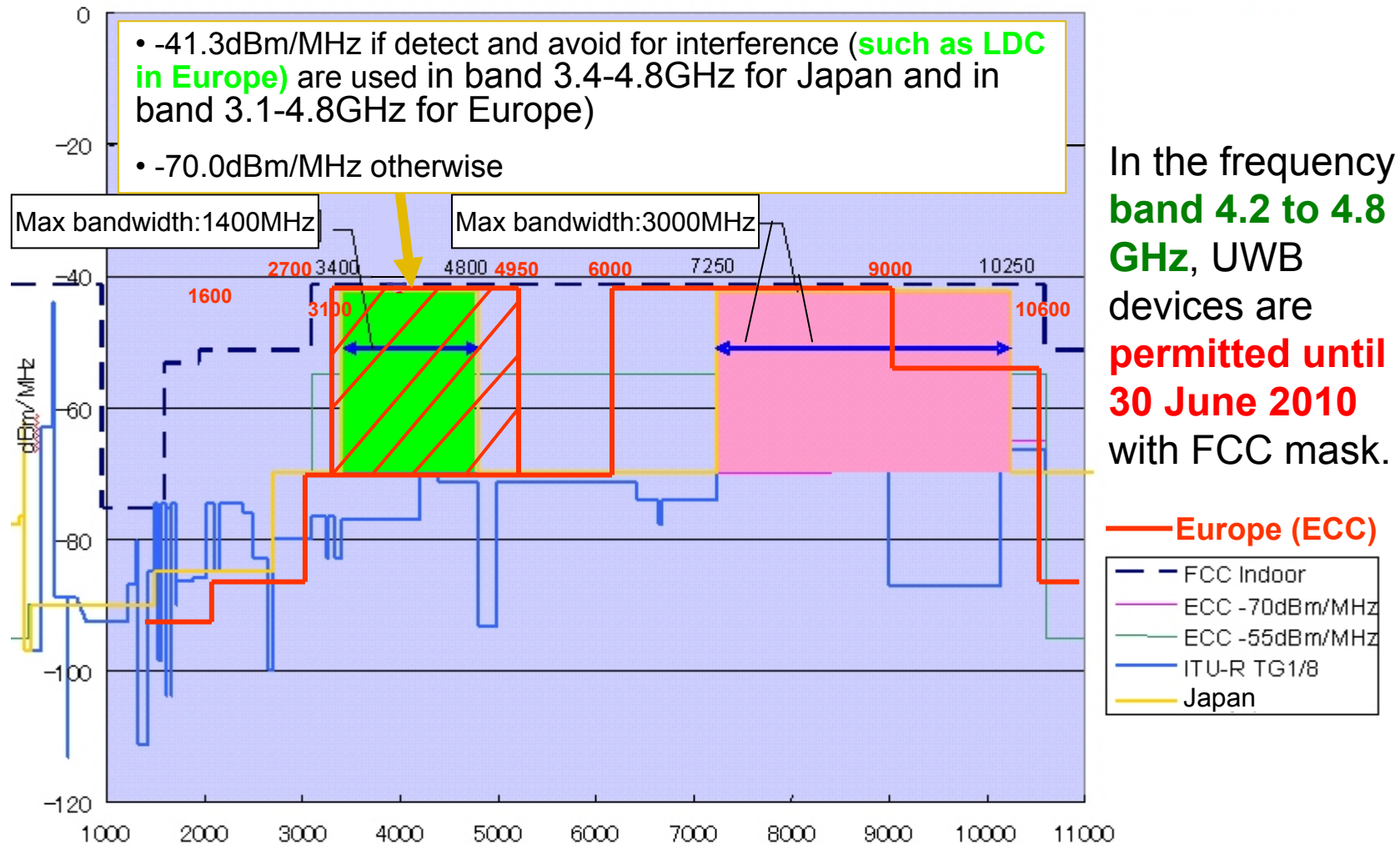
Liaison with Japanese Regulator (MIC)

Schedule of Japanese UWB radio regulation

- **Oct. 27, 2005: Technical Group meeting of UWB Radio Systems Regulatory Committee** of Japanese regulator MIC was held to report results of ITU-R TG1/8 and to decide action plan. The Japanese draft spectrum mask was involved in ITU-R recommendation DNR ITU-R SM.
- **Nov. 25, 2005: TG meeting of UWB Radio Systems Regulatory Committee** was held to report evaluation results of the draft spectrum mask for coexistence and to discuss on remained problems etc.
- **Dec. 22, 2005: TG meeting of UWB Radio Systems Regulatory Committee** was held to summarize evaluation results and solution for the remained problems.
- **Jan. 24, 2006: TG meeting of UWB Radio Systems Regulatory Committee** will be held to make the final draft of regulation with spectrum mask for indoor.
- **Jan. 31, 2006: UWB Radio Systems Regulatory Committee** will be held to approve the final draft of regulation with spectrum mask for indoor.
- **Feb. 2- March 3, 2006: MIC** will request public comments for the final draft from any sector in Japan. http://www.soumu.go.jp/s-news/2006/060202_2.html#sa
- **March 20, 2006: UWB Radio Systems Regulatory Committee** will be held to modify the final draft considering the public comments.
- **March 27, 2006: MIC** will authorize it as the official regulation for indoor.
- **Since April, 2006: MIC** will keep investigating the remained issues to update the regulation.

Draft Spectrum Masks in Japan and Europe

still under consideration



In the frequency band 4.2 to 4.8 GHz, UWB devices are permitted until 30 June 2010 with FCC mask.

Report of Draft Regulation for UWB

http://www.soumu.go.jp/s-news/2006/060327_3.html (in Japanese)

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5. Technical Requirements on UWB Radio (1/6)

5-1 General requirements

(1) UWB definition

The recommendation given by ITU-R SG1 (DNR ITU-R SM.[UWB.CHAR]) is used for UWB definition.

At the maximum radiation frequency (FM), the 10dB-down bandwidth (B-10) must be larger than 500MHz or the fractional bandwidth must be larger than 20%.

Moreover, systems using frequency hopping or chirping are regarded as UWB systems as long as their instantaneous bandwidth meet the above UWB bandwidth definition.

(2) UWB frequency bands

The frequency bands of 3400MHz through 4800MHz and 7250MHz through 10250MHz are assigned for UWB operation. For 3400MHz through 4800MHz, interference mitigation techniques are required. However, for 4200MHz through 4800MHz, interference mitigation techniques are not required until the end of December, 2008.

UWB systems shall not interrupt other radio systems operated in the same band. UWB systems shall not defer the operation of other radio systems.

5. Technical Requirements on UWB Radio (2/6)

(3) Transmission Power

Average power and peak power are defined in Table 5-1

Table 5-1 Radiation Power (not e.i.r.p)

| Frequency band (MHz) | Average Power | Peak Power |
|----------------------|-----------------|--------------|
| 3400 – 4800 (#) | < -41.3 dBm/MHz | < 0dBm/50MHz |
| 7250 - 10250 | < -41.3 dBm/MHz | < 0dBm/50MHz |

(#) Average power and peak power must be -70dBm/MHz and -30dBm/50MHz if interference techniques are not installed. However, this is not applied for 4200MHz through 4800MHz until the end of December 2008.

(4) Antenna Gain

Antenna gain must be smaller than 0dBi. However, if the e.i.r.p. is below the power limit given in Table 5-1 is not reached, a large antenna gain can be applied to reach the limit.

5. Technical Requirements on UWB Radio (3/6)

(5) Transceiver and Modulation

Transceiver can be simplex, full-duplex, or semi-duplex.

There is no limitation on modulation types.

(6) Spread Bandwidth

10-dB bandwidth must be equal to or larger than 500MHz.

(7) Data Rate

The data rate must be equal to or higher than 50Mbps. However, a lower data rate is permitted in case where the purpose of using the lower data rate is for interference avoidance from noise and noise-like so as to maintain QoS.

(8) Communication Control

i) A UWB transceiver must detect the identification signals from other UWB equipments before start communication.

ii) Before detection of identification signal, a UWB transceiver can send its own identification signal.

(9) Intervention Avoidance

Functions of sending and receiving identification signal are required. No intervention to other radio systems are allowed.

5. Technical Requirements on UWB Radio (4/6)

(10) Communications between equipments within a same terminal

- i) Equipments using radios must have an identification code with a length larger than 48 bits.
- ii) Generally, it must detect channel and the link can be established only when the channel is free.

(11) Operation Limitation

Operation is limited to indoor. This should be guaranteed by

- i) A 'host' equipment must be connected to an AC power supply. Other 'client' equipments are controlled by the 'host' and are not necessary to be connected to AC supplies.
- ii) There must be a clear and easy-to-look note attached to a UWB equipment to remind the indoor operation limitation.

(12) Measures for anti-illegal re-build

The devices must be built robust and be difficult to dismantle.

(13) EMC to Medical Equipments

The impact EMC interference among UWB equipments and electronic medical equipments must be soundly taken into consideration.

5. Technical Requirements on UWB Radio (5/6)

5-2 Technical Requirements for Radio Equipments

5-2-1 Transmitters

(1) Occupied Bandwidth

To be compatible with the existing lab, occupied bandwidth is limited instead of UWB transmission bandwidth.

As to the UWB transmitter, it is decided as follows.

- i) To be smaller than 1400MHz at 3400MHz through 4800MHz.
- ii) To be smaller than 3000MHz at 7250MHz through 10250MHz.

Interference mitigation techniques are required. However, this requirement is not applied for 4200MHz through 4800MHz until the end of December, 2008. The permitted bandwidth occupancy is smaller than 600MHz.

(2) Unwanted Emission Level

The unwanted emission level is given in Table 5-2.

Table 5-2 Permitted Level of Unwanted Emission

| Frequency (MHz) | Average power (dBm/MHz) | Peak power (dBm/MHz) |
|-----------------|-------------------------|----------------------|
| <1600 | -90.0 | -84.0 |
| 1600 - 2700 | -85.0 | -79.0 |
| >2700 | -70.0 | -64.0 |
| 10600 - 10700 | -85.0 | -79.0 |
| 11700 - 12750 | -85.0 | -79.0 |

5. Technical Requirements on UWB Radio (6/6)

(3) Reference bandwidth

The reference bandwidth for permissible un-intentioned emission is 1 MHz.

(4) The permissible deviation of emission power

It must be in the scope of smaller than 20%.

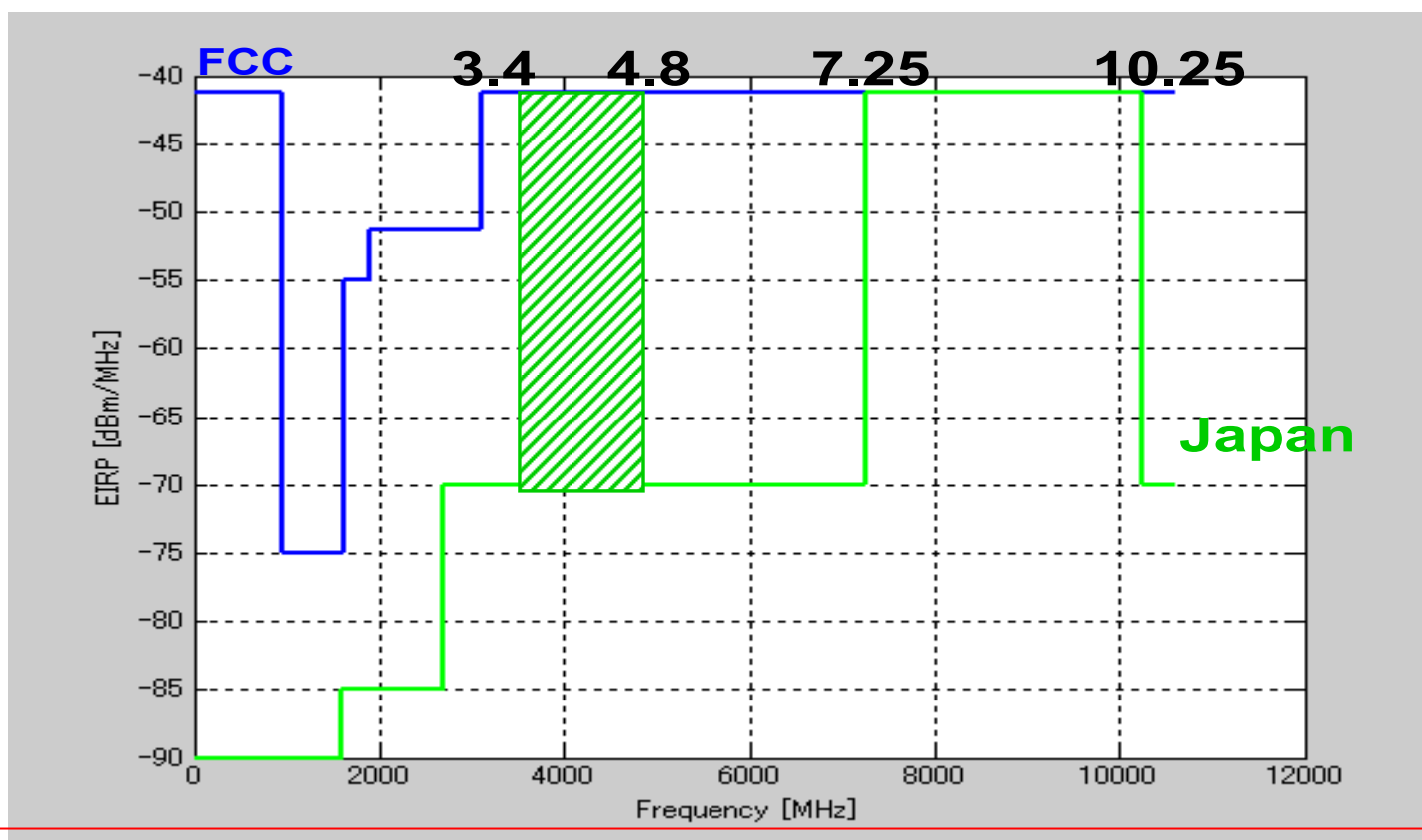
(5) Emission from Chassis

e.i.r.p must be smaller than the permitted unwanted emission.

5-2-2 Receive equipments

For 3400MHz through 4800MHz and 7250MHz through 10250MHz, the permitted unwanted emission must be smaller than 4nw per MHz (-54dBm/MHz). For other frequency band must be below the level determined in Table 5-2.

Draft Mask Issued by MIC



- In the frequency band 3.4-4.8GHz, efficient mitigation techniques are required.
- This mask is only for indoor high-speed communications.
- Chirp or CS waveform is applicable.

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http://www.soumu.go.jp/s-news/2006/pdf/060327_3.html (in Japanese)

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5-4 Future Modification of Technical Requirements

- In the above-mentioned technical requirements for coexistence with other wireless systems, **some existing systems may be seriously interfered according to distribution of UWB systems in future.** Therefore, **interference to other wireless systems may be examined and investigated in practical environment.**
- **The technical requirements will be examined and modified around three years later considering spread situation of UWB systems, evaluation results of influence to other systems, and an international trend.**
- In case that a UWB system may make a trouble in operation of other wireless systems, it is necessary that **a manufacture of UWB systems should actively contribute in avoiding its interference.**
- **Corresponding to future change of international frequency allocation in WRC etc., the technical requirements may be modified.**

6. Future Examination Subjects

6-1 Continuous Examination Subjects

(1) Outdoor Usage

>Since **outdoor usage** of UWB systems may be demanded, technical requirement for coexistence in outdoor applications may be examined considering spread distribution, international trend and so on.

>**Usage inside an automobile** may be also examined.

(2) Interference Suppression Technologies

>In particular, the band of 3400MHz-4800MHz is scheduled to apply for the 4th Generation of Mobile Communication Systems in future.

Appropriate interference suppression technologies to avoid interference to current and future coexisting systems should be examined carefully with consensus of operators or users of the coexisting systems and manufactures of UWB systems.

6-2 New Applications

(1) Sensor Network

(2) Collision-Avoidance Vehicular Radar in Quasi-Millimeter and Millimeter wave Band

Concluding Remarks

1. The low data-rate UWB system is not compliant in current Japanese regulation without appropriate interference suppression technologies such as feasible DAA and LDC. This is simply due to a lack of investigation of low data-rate UWB system.
2. However, it will be able to be compliant if the reasonable interference suppression technologies as the same as high data-rate UWB systems will be provided.
3. High data-rate system is not compliant in a lower band (3.4-4.8GHz) without appropriate interference suppression technologies, neither.
4. If IEEE802.15 TG4a should provide an reasonable interference suppression schemes to MIC in Japan, then MIC will speed up the procedure to approve both high and low data-rate UWB systems as well as European and other nations' regulators.