TOSHIBA

電波利用環境委員会
ワイヤレス電力伝送作業班第2回会合資料

# 米国および欧州におけるWPT関連の制度の状況

2013.7.30

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# 米国（FCC）

◆現行制度において、WPT機器に対する明確なカテゴリーは存在しないが、認証を受けている例があり、以下のような解釈で利用されている。

①9kHz以上で動作するワイヤレス充電器や給電用パッドなどは“intentional radiators”に分類される。

②どのルールが適用されるかは、機器がどのような動作をするか、特に送電器と受電器の間での通信の有無による。

- 電力伝送（Charging）機能： Part 18（Industrial, scientific, and medical equipment）
- 通信（Communication）機能： 利用する通信方式によりPart 15B（Radio frequency devices）、Part 15 C（Bluetoothなど）
- ただし、同一周波数で電力伝送と通信を行う場合には、Part 15Bが適用される。

※FCC KDB 680106（2013年5月30日）参照

◆電波暴露に関するガイドライン値を考慮する必要あり

※KDB 680106の添付資料（680106 D01 RF Exposure Wireless Charging Apps v02）参照

**Publication**
**Number:** 680106 **Rule Parts:** 18, 15B **Publication Date:** 05/30/2013
**Keyword:** Part 15B, Part 18, Wireless Chargers, Inductive Chargers, Wireless Charging Pads
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**First Category:** Equipment Authorization Process *
**Second Category:** General [Equipment Authorization Process]03/19/2013
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**Question:** What rules regulate short distance wireless inductive coupled charging pads or charging devices?
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**Answer:**
Wireless power transfer devices operating at frequencies above 9 kHz are intentional radiators and are subject to either Part 15 and/or Part 18 of the FCC rules. The specific applicable rule part depends on how the device operates, and if there is communication between the charger and device being charged.

Devices specifically intended for use for wireless power transfer, or inductive charging, require FCC guidance for frequency exposure review. This includes Part 18 devices. The responsible party or manufacturer must seek guidance from the FCC by submitting a wireless charging application inquiry at http://www.fcc.gov/labhelp.

The initial inquiry shall include the following:

1. In the "Subject" line, fill the field as follows: Seeking guidance for wireless chargers;
2. complete product description, including coil diameters , number of turns and current;
3. the rule part(s) the device will operate in and the reasoning for rule part(s);
4. planned equipment authorization procedure;
5. drawings, illustrations;
6. frequencies;
7. radiated power;
8. operating configurations
9. conditions for human exposure [1], and

Intentional radiators transmitting information must be certified under the appropriate Part 15 rules and will generally require an equipment certification, except for special types of devices meeting requirements under Section 15.201 which are subject to verification. A charger may operate in two different modes: charging and communications. It is possible for the device to be approved under Part 18 for the charging mode and Part 15 for the communications mode, if it can be shown that (1) the device complies with the relevant rule parts and (2) the functions are independent. Part 18 consumer devices can be either certified or approved under DoC, only after the required SAR guidance has been given (as noted above ". . . by submitting an inquiry at www.fcc.gov/labhelp" . . ) and the necessary test requirements have been completed.

Finally, it is possible that the power charging function could be approved under Part 15 rather than Part 18 if the device meets all of the requirements of the appropriate Part 15 rule.

Attachment 680106 D01 RF Exposure Wireless Charging Apps v02 provides general guidance on the information necessary to determine RF exposure evaluation and compliance requirements when submitting a wireless charging application inquiry.

Attachment List:

680106 D01 RF Exposure Wireless Charging Apps v02

# Part 18における試験項目と条件値

| Standard | Test item | Test procedure | Limit |
|---|---|---|---|
| FCC part 18 | Conducted Emission | FCC Measurement Procedure MP–5, “Methods of Measurements of Radio Noise Emissions from ISM equipment”. | 18.307 |
| | Radiated Emission | | 18.305 |

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# 18.305 Field strength limits

| Equipment | Operating frequency | RF Power generated by equipment (watts) | Field strength limit (uV/m) | Distance (meters) |
|---|---|---|---|---|
| Any type unless otherwise specified (miscellaneous). | Any ISM frequency | Below 500 | 25 | 300 |
| | | 500 or more | 25×SQRT(power/500) | [1]300 |
| | Any non-ISM frequency | Below 500 | 15 | 300 |
| | | 500 or more | 15×SQRT(power/500) | [1]300 |
| Industrial heaters and RF stabilized arc welders. | On or below 5,725 MHz | Any | 10 | 1,600 |
| | Above 5,725 MHz | Any | ([2]) | ([2]) |
| Medical diathermy | Any ISM frequency | Any | 25 | 300 |
| | Any non-ISM frequency | Any | 15 | 300 |
| Ultrasonic | Below 490 kHz | Below 500 | 2,400/F(kHz) | 300 |
| | | 500 or more | 2,400/F(kHz)× SQRT(power/500). | [3]300 |
| | 490 to 1,600 kHz | Any | 24,000/F(kHz) | 30 |
| | Above 1,600 kHz | Any | 15 | 30 |
| Induction cooking ranges | Below 90 kHz | Any | 1,500 | [4]30 |
| | On or above 90 kHz | Any | 300 | [4]30 |

# 18.307 Conduction limits

All induction cooking ranges and Ultrasonic equipment:

| Frequency of emission (MHz) | Conducted limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.009–0.05 | 110 | — |
| 0.05–0.15 | 90–80* | — |
| 0.15–0.5 | 66 to 56* | 56 to 46* |
| 0.5–5 | 56 | 46 |
| 5–30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

All other part 18 consumer devices:

| Frequency of emission (MHz) | Conducted limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15–0.5 | 66 to 56* | 56 to 46* |
| 0.5–5 | 56 | 46 |
| 5–30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

# 欧州（ETSI・CENELEC）

（欧州の現状）

◆ワイヤレス電力伝送に明確な制度はまだない。ETSI・CENELECなどで検討している。

- 2012年6月4日付公式発表でワイヤレス電力伝送に対して、ETSI TC ERMとCENELEC TC210への適合を推奨。

◆現状、ISM帯の利用提案が多く見られる。一方で、ISM帯より低い周波数帯の利用も検討されている。

◆国別の制度はなく、関係するEN規格（IEC規格）が参考になる。

（製品化について）

◆「自己宣言」で製品化は可能。手続きとしては、認証機関に試験を依頼し、「適合証明書」、「Test Report」を出してもらう。
「自己宣言書」によりCEマーク取得可能。

◆EMC/EMI規格の他に安全性に関する規格にも準拠する必要あり。
例えば、IEC 60950（IT機器）、IEC 60335（家電機器）など。

# 欧州（ETSI・CENELEC）続き

（一般論として）

◆R&TTE指令（Radio and Telecommunications Terminal　Equipment Directive）1999/5/ECが強制適用される。無線機器・電気通信端末およびその付属機器が対象。R&TTE指令への適合判定にはR&TTE指令用の欧州規格を用いる。

◆R&TTE指令では下記の4つの要求事項が決められている。

・Article 3.2 Spectrum Requirement
・RF特性の要求（キャリアレベル・スプリアス周波数マスクなど）
・Article 3.1b EMC Requirement: 電磁的両立性(EMI/EMS)の要求
・Article 3.1a Safety Requirement: 電気安全の要求
・Article 3.1a Health Requirement: 人体に対する高周波暴露の安全要求

# 2012年6月4日のETSI TC ERM、CENELEC TC 210によるワイヤレス充電器適合に関する公式発表。

| ケース | 該当指令 | 周波数範囲 | 主要要求事項 | | |
|---|---|---|---|---|---|
| | | | EMF | EMC | 無線 |
| 1 | EMC-D 及び LVD/GPS D | ISM及び非ISM周波数帯 > 9kHz | OJ LVD 一覧表から選定した適用規格 | EN 55011 Group 2 （又は該当する場合、より適切なCENELEC規格） | 該当無し |
| 2 | R&TTE-D | 9kHz<周波数帯<30MHz | EN 62311 (EN 62479) | EN 301 489-1/3 | EN 300 330 |
| | | 30MHz<周波数帯<1GHz | | | EN 300 220 |
| | | 1GHz<周波数帯<40GHz | | | EN 300 440 |
| 3 | EMC-D (ワイヤレス充電器部分) | ケース1のルールが適用 | | | |
| | R&TTE-D (通信部分) | 通信技術による | (例えば： Bluetooth -> EN 301 489-1/17 ; EN 300 328) | | |

# ケース1

| ケース | 該当指令 | 周波数範囲 | 主要要求事項 | | |
|---|---|---|---|---|---|
| | | | EMF | EMC | 無線 |
| 1 | EMC-D 及び LVD/GPSD | ISM及び非ISM周波数帯 > 9kHz | OJ LVD 一覧表から選定した適用規格 | EN 55011 Group 2（又は該当する場合、より適切なCENELEC規格） | 該当無し |

- 充電器と充電受信機器の間にデータ通信がない場合は、適切なEMC規格にて適合評価を行う。

# CISPR 11での区分

- ワイヤレス充電器はCISPR 11(EN 55011) Group 2に区分される：
- *Group 2機器*：Group 2 には意図的放射される9 kHz～400 GHz周波数帯で電磁放射、 誘導及び/または静電結合の形の電磁エネルギーを伝送し、素材処理の目的、検査・分析、もしくは使用されるすべてのISM RF機器が含まれる。

# ケース2

| ケース | 該当指令 | 周波数範囲 | 主要要求事項 | | |
|---|---|---|---|---|---|
| | | | EMF | EMC | 無線 |
| 2 | R&TTE-D | 9kHz<周波数帯<30MHz | EN 62311 (EN 62479) | EN 301 489-1/3 | EN 300 330 |
| | | 30MHz<周波数帯<1GHz | | | EN 300 220 |
| | | 1GHz<周波数帯<40GHz | | | EN 300 440 |

- 充電器と充電受信機器の間にデータ通信があり、同じ周波数で電力伝送エネルギーを行う場合は、R&TTE (SRD)に基づき適切なEN規格にて適合評価を行う。

# ケース3

| ケース | 該当指令 | 周波数範囲 | 主要要求事項 | | |
|---|---|---|---|---|---|
| | | | EMF | EMC | 無線 |
| 3 | EMC-D（ワイヤレス充電器部分） | ケース1のルールを適用 | | | |
| | R&TTE-D（通信部分） | 通信技術による　（例えば：　Bluetooth -> EN 301 489-1/17 ; EN 300 328） | | | |

- 充電器と充電受信機器の間にデータ通信があり、それとは別の周波数で電力伝送エネルギーを行う場合は、データ通信についてはR&TTE (SRD)に基づき評価を行い、充電機能についてはケース１に従いEMC規格で適合評価を行う。

# (CISPR 11)　ISM機器に使用される無線周波数 (RF)帯（ITU指定）

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| Centre frequency MHz | Frequency range MHz | Maximum radiation limit [b] | Number of appropriate footnote to the table of frequency allocation of the ITU Radio Regulations[a] |
|---|---|---|---|
| 6,780 | 6,765 – 6,795 | Under consideration | 5.138 |
| 13,560 | 13,553 – 13,567 | Unrestricted | 5.150 |
| 27,120 | 26,957 – 27,283 | Unrestricted | 5.150 |
| 40,680 | 40,66 – 40,70 | Unrestricted | 5.150 |
| 433,920 | 433,05 – 434,79 | Under consideration | 5.138 in Region 1, except countries mentioned in 5.280 |
| 915,000 | 902 – 928 | Unrestricted | 5.150 in Region 2 only |
| 2 450 | 2 400 – 2 500 | Unrestricted | 5.150 |
| 5 800 | 5 725 – 5 875 | Unrestricted | 5.150 |
| 24 125 | 24 000 – 24 250 | Unrestricted | 5.150 |
| 61 250 | 61 000 – 61 500 | Under consideration | 5.138 |
| 122 500 | 122 000 – 123 000 | Under consideration | 5.138 |
| 245 000 | 244 000 – 246 000 | Under consideration | 5.138 |

[a] Resolution No. 63 of the ITU Radio Regulations applies.

[b] The term “unrestricted” applies to the fundamental and all other frequency components falling within the designated band. Outside of ITU designated ISM bands, the limits for the disturbance voltage and radiation disturbance in this standard apply.

# (CISPR 11, Group 2 Class A)　磁界強度のリミット値

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| Frequency range MHz | Limits for a measuring distance *D* in m | | | | | |
|---|---|---|---|---|---|---|
| | On a test site *D* = 30 m from the equipment | | On a test site *D* = 10 m from the equipment | | On a test site *D* = 3 m from the equipment [a] | |
| | Electric field | Magnetic field | Electric field | Magnetic field | Electric field | Magnetic field |
| | Quasi-peak dB(μV/m) | Quasi-peak dB(μA/m) | Quasi-peak dB(μV/m) | Quasi-peak dB(μA/m) | Quasi-peak dB(μV/m) | Quasi-peak dB(μA/m) |
| 0,15 – 0,49 | – | 33,5 | – | 57,5 | – | 57,5 |
| 0,49 – 1,705 | – | 23,5 | – | 47,5 | – | 47,5 |
| 1,705 – 2,194 | – | 28,5 | – | 52,5 | – | 52,5 |
| 2,194 – 3,95 | – | 23,5 | – | 43,5 | – | 43,5 |
| 3,95 – 20 | – | 8,5 | – | 18,5 | – | 18,5 |
| 20 – 30 | – | –1,5 | – | 8,5 | – | 8,5 |
| 30 – 47 | 58 | – | 68 | – | 78 | – |
| 47 – 53,91 | 40 | – | 50 | – | 60 | – |
| 53,91 – 54,56 | 40 | – | 50 | – | 60 | – |
| 54,56 – 68 | 40 | – | 50 | – | 60 | – |
| 68 – 80,872 | 53 | – | 63 | – | 73 | – |
| 80,872 – 81,848 | 68 | – | 78 | – | 88 | – |
| 81,848 – 87 | 53 | – | 63 | – | 73 | – |
| 87 – 134,786 | 50 | – | 60 | – | 70 | – |
| 134,786 – 136,414 | 60 | – | 70 | – | 80 | – |
| 136,414 – 156 | 50 | – | 60 | – | 70 | – |
| 156 – 174 | 64 | – | 74 | – | 84 | – |
| 174 – 188,7 | 40 | – | 50 | – | 60 | – |
| 188,7 – 190,979 | 50 | – | 60 | – | 70 | – |
| 190,979 – 230 | 40 | – | 50 | – | 60 | – |
| 230 – 400 | 50 | – | 60 | – | 70 | – |
| 400 – 470 | 53 | – | 63 | – | 73 | – |
| 470 – 1 000 | 50 | – | 60 | – | 70 | – |

On a test site, class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m. A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.10.

At the transition frequency, the more stringent limit shall apply.

[a] The limits specified for the 3 m separation distance apply only to small equipment meeting the size criterion defined in 3.10.

# (CISPR 11, Group 2 Class B)　磁界強度のリミット値

TOSHIBA

| Frequency range MHz | Limits for a measuring distance *D* in m | | | | |
|---|---|---|---|---|---|
| | Electric field | | | | Magnetic field |
| | *D* = 10 m | | *D* = 3 m [b] | | *D* = 3 m |
| | Quasi-peak | Average [a] | Quasi-peak | Average [a] | Quasi-peak |
| | dB(μV/m) | | dB(μV/m) | | dB(μA/m) |
| 0,15 – 30 | – | – | – | – | 39<br>Decreasing linearly with the logarithm of frequency to<br>3 |
| 30 – 80,872 | 30 | 25 | 40 | 35 | – |
| 80,872 – 81,848 | 50 | 45 | 60 | 55 | – |
| 81,848 – 134,786 | 30 | 25 | 40 | 35 | – |
| 134,786 – 136,414 | 50 | 45 | 60 | 55 | – |
| 136,414 – 230 | 30 | 25 | 40 | 35 | – |
| 230 – 1 000 | 37 | 32 | 47 | 42 | – |

On a test site, class B equipment can be measured at a nominal distance of 3 m or 10 m. A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.10.

At the transition frequency, the more stringent limit should apply.

[a] The average limits apply to magnetron driven equipment only. If magnetron driven equipment exceeds the quasi-peak limit at certain frequencies, then the measurement shall be repeated at these frequencies with the average detector, and the average limits specified in this table apply.

[b] The limits specified for the 3 m separation distance apply only to small equipment meeting the size criterion defined in 3.10.

# (CISPR 11, Group 2 Class A)　伝導性試験リミット値

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| Frequency range MHz | Rated input power of ≤ 75 kVA | | Rated input power of > 75 kVA [a] | |
|---|---|---|---|---|
| | Quasi-peak dB(μV) | Average dB(μV) | Quasi-peak dB(μV) | Average dB(μV) |
| 0,15 – 0,50 | 100 | 90 | 130 | 120 |
| 0,50 – 5 | 86 | 76 | 125 | 115 |
| 5 – 30 | 90 decreasing linearly with logarithm of frequency to 73 | 80 decreasing linearly with logarithm of frequency to 60 | 115 | 105 |

At the transition frequency, the more stringent limit shall apply.

NOTE 1　Limits only apply to Low Voltage (LV) a.c. mains input ports.

NOTE 2　For class A equipment with a rated power ≤ 75 kVA intended to be connected solely to isolated neutral or high impedance earthed (IT) industrial power distribution networks (see IEC 60364-1), the limits defined for group 2 equipment with a rated input power > 75 kVA can be applied.

a　The manufacturer and/or supplier shall provide information on installation measures that can be used to reduce emissions from the installed equipment.

# (CISPR 11, Group 2 Class B)　伝導性試験リミット値

TOSHIBA

| **Frequency range**<br>MHz | **Quasi-peak**<br>dB(μV) | **Average**<br>dB(μV) |
|---|---|---|
| 0,15 – 0,50 | 66<br>Decreasing linearly with logarithm of frequency to<br>56 | 56<br>Decreasing linearly with logarithm of frequency to<br>46 |
| 0,50 – 5 | 56 | 46 |
| 5 – 30 | 60 | 50 |
| At the transition frequency, the more stringent limit shall apply. | | |