



FCC LISTED, REGISTRATION
 NUMBER: 2764.01

ISED LISTED REGISTRATION
 NUMBER: 23595-1

Test report No:
 4465ERM.005A1

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (2023): Radio Frequency Devices

FCC Rules and Regulations CFR 47, Part 18, Subpart C (2020): Industrial, Scientific, and Medical Equipment

&

ICES-001 Issue 5 - July (2020): Industrial, Scientific and Medical Equipment (ISM)

ICES-003 Issue 7 - October (2020): Information Technology Equipment

RSS 216 Issue 2 - January (2016): Wireless Power Transfer Devices

RSS Gen Issue 5 - April (2018): Wireless Power Transfer Devices

| | |
|---|---|
| (*) Identification of item tested | Wireless Charging Module |
| (*) Trademark | Aptiv |
| (*) Model and /or type reference tested | WCM_tx1 |
| (*) Derived model not tested | - |
| Other identification of the product | FCC: L2C0091TR IC ID: 3432A-0091TR HVIN: 1356 4197 |
| (*) Features | NFC, PLA FOD |
| Manufacturer | APTIV SERVICES US, LLC. 13085 Hamilton Crossing Blvd, Carmel, Indiana, 46032, USA |
| Test method requested, standard | FCC Rules and Regulations CFR 47, Part 15, Subpart B (2023) FCC Rules and Regulations CFR 47, Part 18, Subpart C (2020) ICES-001 Issue 5 - July (2020) ICES-003 Issue 7 - October (2020) RSS 216 Issue 2 - January (2016) RSS Gen Issue 5 - April (2018) |
| Summary | IN COMPLIANCE |
| Approved by (name / position & signature) | Domingo Galvez EMC&RF Lab Manager |
| Date of issue | 03-27-2024 |
| Report template No | FDT08_23 (* "Data provided by the client" |

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Acronyms

| Acronym ID | Acronym Description |
|------------|---------------------|
| Code | EMC Test Code |
| Freq Rng | Frequency Range |
| MP | Measurement Point |
| OM | Operation Mode |
| S/ | Sample |
| V | Verdict |

Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Certification Inc.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

| | Frequency (MHz) | U (k=2) | Units |
|--------------------|-----------------|---------|-------|
| Radiated emission | 30 - 1000 | 5.94 | dB |
| | 1000-18000 | 5.89 | dB |
| Occupied Bandwidth | 0.1 - 0.3 | 1.87 | % |

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of Wireless Charging Module version 3.1 (WCM3.1), Model A & B charges consumer electronics (CE) devices wirelessly by supplying power under the Wireless Power Consortium (WPC) Qi v1.3 charging standard. The power source to the WCM is 12V vehicle battery. CAN bus is the communication interface to the vehicle. WCM3.1 is a non-terminating CAN node with output pins provisioned for a daisy-chain connection to additional downstream CAN nodes. The WCM supports functionality for detecting foreign objects, such as coins, keys, or RFID tags; and halting or prohibiting charging while the foreign object remains present on the interface surface. The WCM is capable of delivering up to 15W to the compatible CE device.
3. Applicant's declaration letter shown below for model similarity.

• APTIV •

February 22, 2024

John Gettel
Systems Engineering Manager
~~Activ~~
5725 Innovation Drive
Troy, MI 48098

RE

To whom it may concern,

The GM Wireless Charging Module **WCM_tx1** includes four variants.

The four variants include the hardware versions / HVIN;

1356 4197
1356 4198
1356 4199
1356 4200

The functional behavior (RF, EMC, Qi, NFC) of all four hardware versions is identical.

The material of all four hardware versions, plastic resin, PCB and components, is exactly the same. The pinouts of all four hardware versions, is exactly the same.

The differences between the hardware versions is associated with the mounting location within the vehicle.

These differences are;

- 1) Housing Locating Notches
 - a. Each separate hardware version has a different housing locating notch which allows only the individual wireless chargers to be installed in a specific location within the vehicle.
- 2) Vehicle Harness Connector Keying
 - a. Each separate hardware version has a different vehicle connector key which allows only the wireless charger designed for that location to be connected to the vehicle harness at that location.

Sincerely,



John Gettel

5725 Innovation Drive | Troy | Michigan | United States

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples used for the test have been selected by The Client.

Sample S/01 is composed of the following elements, accessories and auxiliary equipment:

| Id | Control Number | Description | Manufacturer / Model | Serial N° | Date of Reception | Application |
|------|----------------|---------------------|----------------------|-----------|-------------------|--------------------|
| S/01 | 4465/08 | GM WCM PV2- model A | Aptiv / WCM_tx1 | -- | 2024-02-12 | Element Under Test |
| S/01 | 4030/04 | Harness | Aptiv | -- | 2023-11-29 | Element Under Test |

Notes referenced to samples during the project:

| Id | Type | Note |
|------|------------|--|
| S/01 | Commercial | Sample S/01 was used for: All test(s) indicated in appendix A. |

Sample S/02 is composed of the following elements, accessories and auxiliary equipment:

| Id | Control Number | Description | Manufacturer / Model | Serial N° | Date of Reception | Application |
|------|----------------|---------------------|----------------------|-----------|-------------------|--------------------|
| S/02 | 4465/10 | GM WCM PV2- model A | Aptiv / WCM_tx1 | -- | 2024-02-12 | Element Under Test |
| S/02 | 4030/04 | Harness | Aptiv | -- | 2023-11-29 | Element Under Test |
| S/02 | 4030/06 | Load | Aptiv | -- | 2023-11-29 | Accessory |
| S/02 | 4046/06 | 4mm Spacer | Aptiv | -- | 2023-11-29 | Accessory |

Notes referenced to samples during the project:

| Id | Type | Note |
|------|------------|--|
| S/02 | Commercial | Sample S/02 was used for: All test(s) indicated in appendix B. |

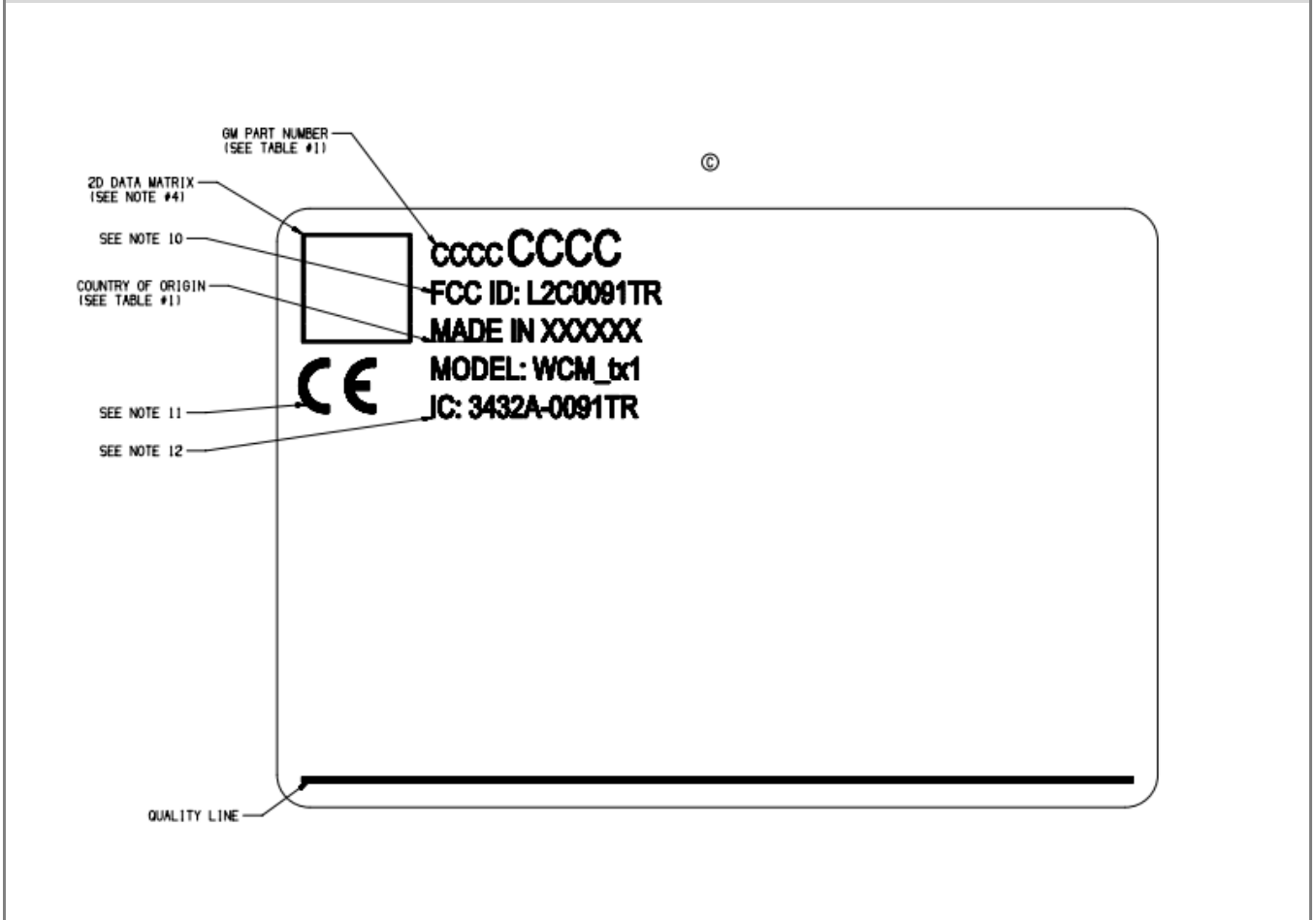
Test sample description

Test Sample description (compulsory information for EMC and RF testing services)

| | | | | | | | |
|---|-------------------------------------|---|--------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|
| Ports..... : | Port name and description | | Cable | | | | |
| | | | Specified length [m] | Attached during test | Shielded | Coupled to patient | |
| | Product connector | | 2 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| Supplementary information to the ports..... : | No Data Provided | | | | | | |
| Rated power supply | Voltage and Frequency | | Reference poles | | | | |
| | | | L1 | L2 | L3 | N | PE |
| | <input type="checkbox"/> | AC: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | <input type="checkbox"/> | AC: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | <input checked="" type="checkbox"/> | DC: 13.5Vdc, 1.5A | | | | | |
| <input type="checkbox"/> | DC: | | | | | | |
| Rated Power | 15W | | | | | | |
| Clock frequencies | 27.12 MHz; 40 MHz | | | | | | |
| Other parameters..... : | No Data Provided | | | | | | |
| Software version | WCM2_C_CERT_SW2 | | | | | | |
| Hardware version..... : | 1356 4197 | | | | | | |
| Dimensions (W x H x D)..... : | No Data Provided | | | | | | |
| Mounting position..... : | <input type="checkbox"/> | Table top equipment | | | | | |
| | <input type="checkbox"/> | Wall/Ceiling mounted equipment | | | | | |
| | <input type="checkbox"/> | Floor standing equipment | | | | | |
| | <input type="checkbox"/> | Hand-held equipment | | | | | |
| | <input checked="" type="checkbox"/> | Other: Built- in automotive vehicle console | | | | | |
| Modules/parts | Module/parts of test item | | Type | | Manufacturer | | |
| | Aptiv Test Receivers | | Receivers | | Aptiv | | |
| | Harness-2 meters long (6) | | Harness | | Aptiv | | |
| | WCM module A- (4 Qi) (4 NFC) | | WCM modules | | Aptiv | | |
| | WCM module B- (2 Qi) (2 NFC) | | WCM modules | | Aptiv | | |
| | | | | | | | |
| Accessories (not part of the test item) | Description | | Type | | Manufacturer | | |
| | No Data Provided | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Documents as provided by the applicant | Description | File name | Issue date |
|--|--|---|------------|
| | Declaration Equipment Data | PV1_FDT30_19 Declaration Equipment Data_ModelA_update | 02/21/2024 |
| | Aptiv Receiver test instruction ppt document | | 11/22/2023 |
| | | | |
| | | | |

Copy of marking plate:



Identification of the client

APTIV SERVICES US, LLC.
 13085 Hamilton Crossing Blvd,
 Carmel, Indiana, 46032,
 USA

Testing period and place

| | |
|----------------------|--------------------------|
| Test Location | DEKRA Certification Inc. |
| Date (start) | 02-16-2024 |
| Date (finish) | 03-20-2024 |

Document history

| Report number | Date | Description |
|---------------|------------|--|
| 4465ERM.005 | 03-13-2024 | First release |
| 4465ERM.005A1 | 03-27-2024 | Second Release. Occupied bandwidth (or 99% emission bandwidth) test case is added in this report. This modification of test report cancels and replaces the test report 4465ERM.005. |

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

| | |
|--------------------------|-------------------------------------|
| Temperature | Min. = 15 °C Max. = 35 °C |
| Relative humidity | Min. = 30 % Max. = 75 % |
| Air pressure | Min. = 860 mbar Max. = 1060 mbar |

In the semi-anechoic chamber, the following limits were not exceeded during the test.

| | |
|--------------------------|-------------------------------------|
| Temperature | Min. = 15 °C Max. = 35 °C |
| Relative humidity | Min. = 30 % Max. = 75 % |
| Air pressure | Min. = 860 mbar Max. = 1060 mbar |

In the chamber for conducted measurements, the following limits were not exceeded during the test:

| | |
|--------------------------|-------------------------------------|
| Temperature | Min. = 15 °C Max. = 35 °C |
| Relative humidity | Min. = 30 % Max. = 60 % |
| Air pressure | Min. = 860 mbar Max. = 1060 mbar |

Remarks and comments

- The tests have been performed by the technical personnel: Qi Zhang, Koji Nishimoto, and Prudhvi Kothapalli.

Testing verdicts

| | |
|----------------|-----|
| Fail | F |
| Inconclusive | I |
| Not applicable | N/A |
| Not measured | N/M |
| Pass | P |
| Partial Passed | P* |

Summary

| Emission Test - Unintentional Radiators FCC Rules and Regulations CFR 47, Part 15, Subpart B / ICES 003 | | | |
|--|--|---------|------------|
| Report Section | Requirement – Test case | Verdict | Remark |
| A.1 | Radiated Emission Electromagnetic Field (30 MHz – 1000 MHz) | P | N/A |
| - | Radiated Emission Electromagnetic Field (1 GHz – 18 GHz) | N/A | Refer 1 |
| - | Radiated Emission Electromagnetic Field (18 GHz – 40 GHz) | N/A | Refer 1 |
| - | Continuous Conducted Emission on Power Leads (150 kHz to 30 MHz) | N/A | Refer 2, 3 |
| Supplementary information and remarks: | | | |
| <p>1) According with the requirements of FCC Rules and Regulations, title 47, Chapter I, Subchapter A, Part 15, Subpart A, §15.33 Frequency range of radiated measurements, (b) for unintentional radiators, (1) due to The Highest frequency generated or used in the device in the range of 1.705 -108MHz, The Upper frequency of measurement range is up to 1000MHz.</p> <p>2) According with the requirements of FCC Rules and Regulations, title 47, Chapter I, Subchapter A, Part 15, Subpart B, §15.107 Conducted limits, (d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation, and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.</p> <p>3) Exemptions from the scope of ICES-003, clause 1.5.1 ICES-003 does not apply to the following types of equipment (a) ITE or digital apparatus factory-installed in vehicles, boats or devices equipped with internal combustion engines, traction batteries or both (subject to ICES-002). ITE or digital apparatus not factory-installed in vehicles, boats or devices equipped with internal combustion engines, traction batteries or both do not qualify for this exemption.</p> | | | |

| Emission Test - Intentional Radiators FCC Rules and Regulations CFR 47, Part 18, Subpart C / ICES 001 | | | |
|--|--|---------|---------|
| Report Section | Requirement – Test case | Verdict | Remark |
| B.1 | Radiated Emission Electromagnetic Field (0.009-30 MHz) | P | N/A |
| B.1 | Radiated Emission Electromagnetic Field (30 MHz – 1000 MHz) | P | N/A |
| - | Radiated Emission Electromagnetic Field (1 GHz – 18 GHz) | N/A | Refer 1 |
| - | Continuous Conducted Emission on Power Leads (150 kHz to 30 MHz) | N/A | Refer 2 |
| B.2 | Occupied bandwidth (or 99% emission bandwidth) | P | N/A |
| Supplementary information and remarks: | | | |
| <p>1) According with the requirements of FCC Rules and Regulations, title 47, Chapter I, Subchapter A, Part 18, Subpart C, §18.309 Frequency range of measurements, (a) For field strength measurements, due to the frequency band in which device operates below 500 MHz, the highest frequency of measurement range is 10th harmonic or 1,000 MHz, whichever is higher.</p> <p>2) According with the requirements of FCC Rules and Regulations, title 47, Chapter I, Subchapter A, Part 18, Subpart C, §18.307 Conduction limits, for the equipment designed to be connected to the public utility (AC) power line the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies shall not exceed the limits in the tables (a) All Induction cooking ranges and ultrasonic equipment, (b) All other part 18 consumer devices, (c) RF lighting devices. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal using a 50 µH/50 ohms line impedance stabilization network (LISN).</p> | | | |

List of equipment used during the test

Radiated Emission Equipment

| Control No. | Equipment | Model | Manufacturer | Next Calibration |
|-------------|---|---------------|-----------------|------------------|
| 1039 | Signal analyser 40GHz | FSV40 | Rhode & Schwarz | 2024-11-01 |
| 1062 | Active loop antenna | 6502 | ETS Lindgren | 2026-07-25 |
| 1064 | Biconilog antenna | 3142E | ETS Lindgren | 2024-12-13 |
| 1108 | Ethernet SNMP thermometer | HWg-STE Plain | HW Group | 2024-10-17 |
| 1110 | Ethernet SNMP thermometer | HWg-STE Plain | HW Group | 2024-10-17 |
| 1111 | Ethernet SNMP thermometer | HWg-STE Plain | HW Group | 2024-10-18 |
| 1150 | Near field probe | -- | Dekra | -- |
| 1179 | Semi-anechoic chamber | SAC 3plus 'L' | Frankonia | -- |
| 1217 | Frankonia transparent test table 1 | FFT-Square | Frankonia | -- |
| 1314 | Wireless Measurement Software R&S EMC32 | -- | Rhode & Schwarz | -- |
| 1374 | EMI Test receiver | ESR7 | Rhode & Schwarz | 2024-05-26 |

Appendix A:

Test results FCC Part 15 / ICES-003

Appendix A Content

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Description of the operation modes

The operation modes described in this paragraph constitute a functionality of the sample under test for itself. The operation modes used by the samples to which the present report refers, are shown in the following table:

| Id | Description |
|-------|---|
| OM/01 | DUT ON. WPT charger and NFC in standby mode. Powered by 13.5Vdc |

* **Worst configuration detected**

Test Conditions

RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30-1000 MHz (Bilog antenna).

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

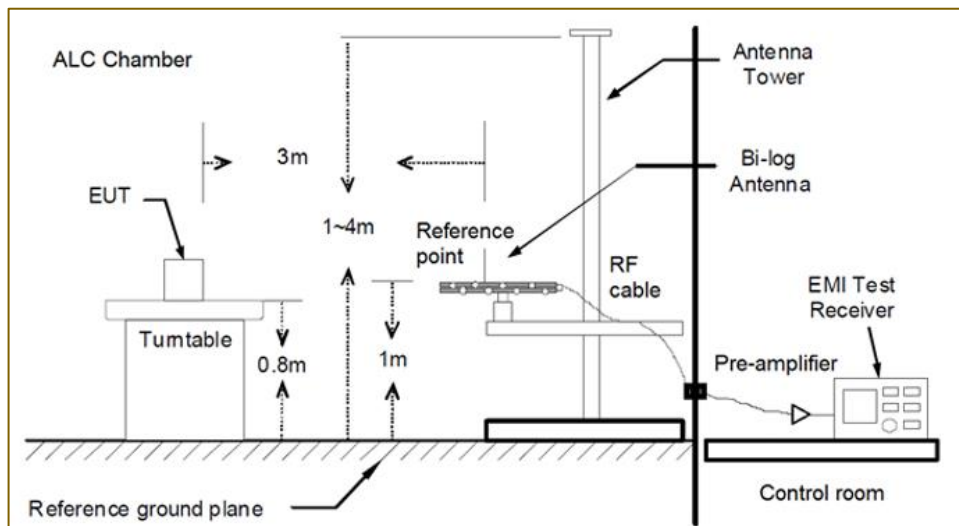


Fig A1: Generic setup for measurements from 30 to 1000 MHz

Test Cases Details

Radiated Emission Electromagnetic Field

Limits

Limits of interference Class B

The applied limit for radiated emissions, according to the requirements of:

- a) **FCC Rules and Regulations 47 CFR Part 15: Radio Frequency Devices, Subpart B: Unintentional Radiators, Secs. 15.109 (a):** [54 FR 17714, Apr. 25, 1989, as amended at 56 FR 373, Jan. 4, 1991; 58 FR 51249, Oct. 1, 1993; 66 FR 19098, Apr. 13, 2001; 67 FR 48993, July 29, 2002; 69 FR 2849, Jan. 21, 2004; 80 FR 33447, June 12, 2015].
- b) **ICES-003 Issue 7, Secs 3.2.2, table 2 & 4 (October 2020).**

| Frequency range (MHz) | FCC Part 15B | | ICES-003 Issue 7 | | FCC Part 15B & ICES-003 Issue 7 | |
|-----------------------|------------------|----------------|------------------|----------------|---------------------------------|-------------------|
| | QP Limit for 3 m | | QP Limit for 3 m | | PK Limit for 3 m | AVG Limit for 3 m |
| | (μ V/m) | (dB μ V/m) | (μ V/m) | (dB μ V/m) | (dB μ V/m) | (dB μ V/m) |
| 30 to 88 | 100 | 40 | 100 | 40 | --- | --- |
| 88 to 216 | 150 | 43.5 | 150 | 43.5 | --- | --- |
| 216 to 230 | 200 | 46 | 200 | 46 | --- | --- |
| 230 to 960 | 200 | 46 | 224 | 47 | | |
| 960 to 1000 | 500 | 54 | 500 | 54 | --- | --- |
| Above 1000 | --- | --- | --- | --- | 74 | 54 |

Limits according to FCC Part 15B, are equal or more stringent than those of ICES-003 Issue 7.

Code: REmmnnRR_PP

- RE: Radiated Emission,
- mm: Sample number,
- nn: Operation mode,
- RR: Frequency range Low Range = LR: [30, 1000];

Results

| S/ | OM | Code | Freq Rng (MHz) | V |
|----|-------|----------|----------------|---|
| 01 | OM/01 | RE0101LR | [30, 1000] | P |

Verdict

Pass

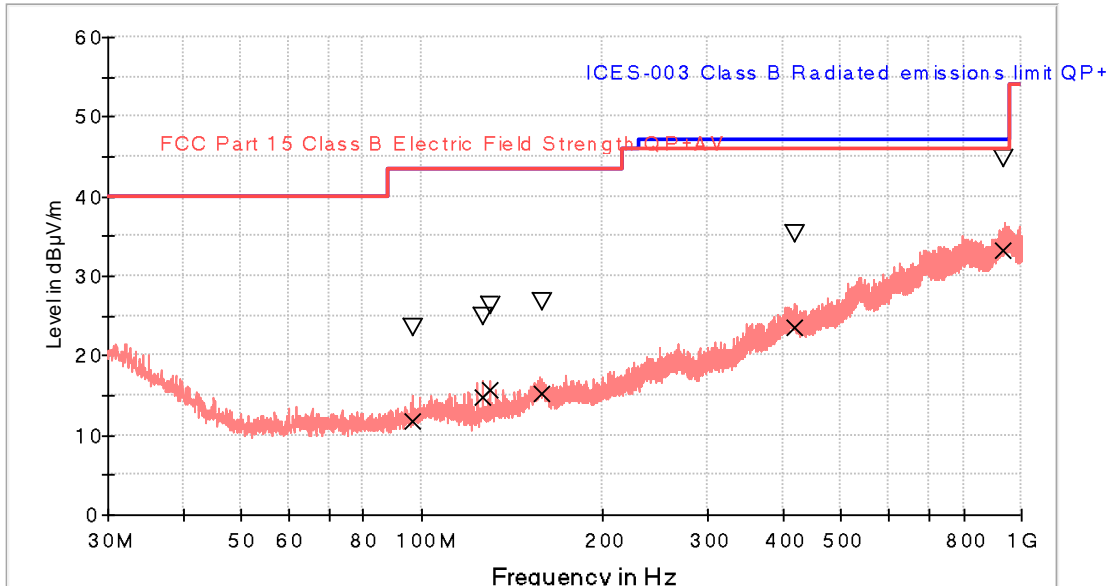
Attachments

EMC Test Code = RE0101LR Frequency Range MHz = [30, 1000]

Sample ID: S/01

Operation Mode: OM/01. DUT ON. WPT charger and NFC in standby mode. Powered by 13.5Vdc

Images:



- Preview Result 1-PK+
- ICES-003 Class B Radiated emissions limit QP+AV
- X Final Result QPK
- ∇ Final Result PK+
- FCC Part 15 Class B Electric Field Strength QP+AV

Tables:

| Frequency (MHz) | QuasiPeak (dBµV/m) | MaxPeak (dBµV/m) | Limit (dBµV/) | Margin (dB) | Pol |
|-----------------|--------------------|------------------|---------------|-------------|-----|
| 96.880875 | 11.76 | 23.45 | 43.50 | 31.74 | H |
| 126.114390 | 14.75 | 24.82 | 43.50 | 28.75 | H |
| 130.363150 | 15.66 | 26.28 | 43.50 | 27.84 | H |
| 158.113100 | 15.16 | 26.88 | 43.50 | 28.34 | H |
| 417.179300 | 23.54 | 35.29 | 46.00 | 22.46 | H |
| 933.259340 | 33.15 | 44.72 | 46.00 | 12.85 | H |

Spectrum Analyzer Parameters

| Subrange | Step Size | Detectors | Bandwidth | Sweep Time |
|----------------|-----------|-----------|-----------|------------|
| 30 MHz - 1 GHz | 48.5 kHz | PK+ | 100 kHz | 1 s |

Appendix B:

Test results FCC Part 18 / ICES-001 / RSS-216

Appendix B Content

| | |
|---|----|
| Description of the operation modes..... | 19 |
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Description of the operation modes

The operation modes described in this paragraph constitute a functionality of the sample under test for itself. The operation modes used by the samples to which the present report refers, are shown in the following table:

| Id | Description |
|-------|---|
| OM/01 | DUT ON. WPT charging mode. Powered by 13.5Vdc |

* **Worst configuration detected**

Test Conditions

RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency ranges of 9kHz to 30MHz (loop Antenna) and 30-1000 MHz (Bilog antenna).

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. EUT was also rotated 360°.

For Bilog antenna; the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Measurements were made in both horizontal and vertical planes of polarization.

For Loop antenna; The antenna orientation was varied along X, Y and Z axes to find maximum radiated emissions.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

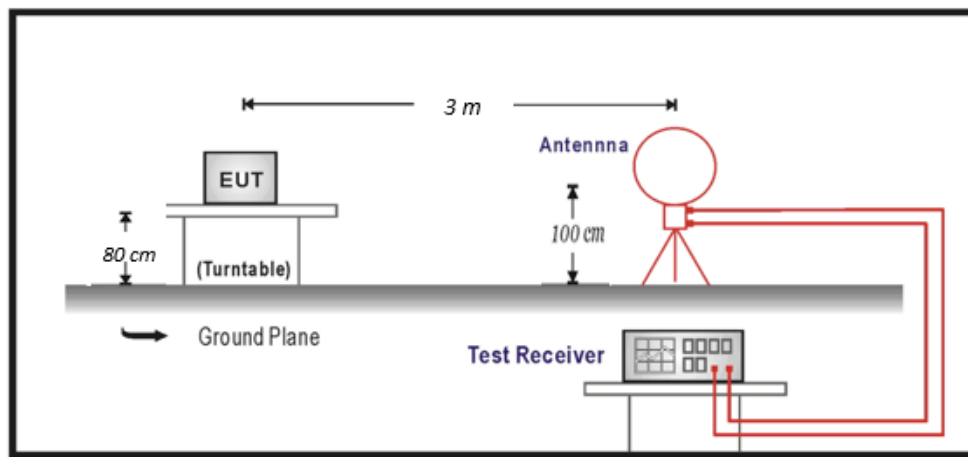


Fig B1: Generic setup for measurements from 9kHz to 30 MHz

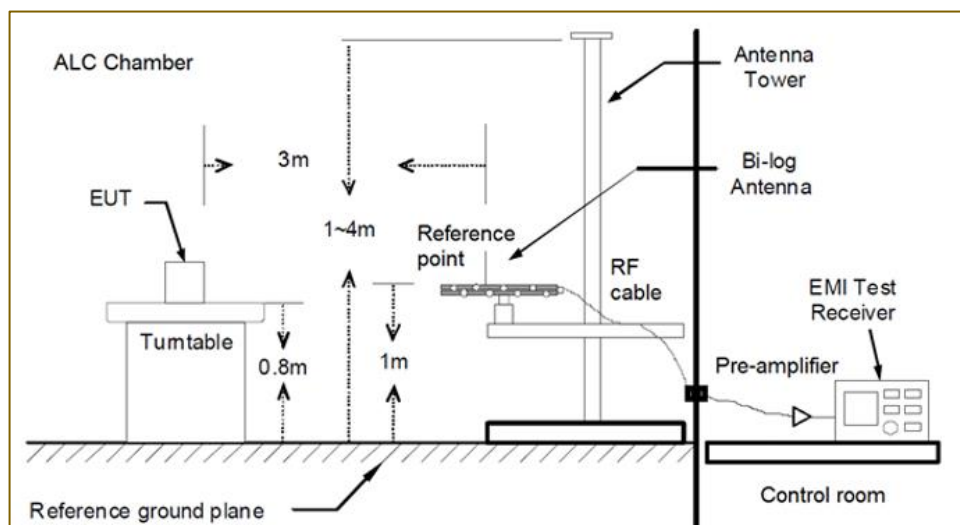


Fig B2: Generic setup for measurements from 30 to 1000 MHz

Test Cases Details

Radiated Emission Electromagnetic Field

Limits

Limits of interference

The applied limit for radiated emissions, according to the requirements of:

- a) **FCC Rules and Regulations 47 CFR Part 18: Industrial, Scientific, and Medical Equipment, Subpart C: Technical Standards, Secs. 18.305 (b):** [50 FR 36070, Sept. 5, 1985, as amended at 51 FR 17970, May 16, 1986; 52 FR 43197, Nov. 10, 1987].

| Equipment | Operating frequency | RF Power generated by equipment (Watts) | Field strength limit ($\mu\text{V/m}$) | Distance (meters) |
|---|--|---|---|---------------------------|
| Any type unless otherwise specified (miscellaneous) | Any ISM frequency | Below 500 500 or more | 25 $25 \times \text{SQRT}(\text{power}/500)$ | 300 300 ⁽¹⁾ |
| | Any non-ISM frequency | Below 500 500 or more | 15 $15 \times \text{SQRT}(\text{power}/500)$ | 300 300 ⁽¹⁾ |
| Industrial heaters and RF stabilized arc welders | On or below 5,725 MHz Above 5,725 MHz | Any Any | 10 ⁽²⁾ | 1,600 ⁽²⁾ |
| Medical diathermy | Any ISM frequency Any non-ISM frequency | Any Any | 25 15 | 300 300 |
| Ultrasonic | Below 490 kHz | Below 500 500 or more | $2,400/F(\text{kHz})$ $2,400/F(\text{kHz}) \times \text{SQRT}(\text{power}/500)$ | 300 300 ⁽³⁾ |
| | 490 to 1,600 kHz Above 1,600 kHz | Any Any | $24,000/F(\text{kHz})$ 15 | 30 30 |
| Induction cooking ranges | Below 90 kHz | Any | 1500 | 30 ⁽⁴⁾ |
| | On or above 90 kHz | Any | 300 | 30 ⁽⁴⁾ |

1: Field strength may not exceed 10 $\mu\text{V/m}$ at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.
2: Reduced to the greatest extent possible.
3: Field strength may not exceed 10 $\mu\text{V/m}$ at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.
4: Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment

Note 1: Limit 3m (dB $\mu\text{V/m}$) = Limit 300m (dB $\mu\text{V/m}$) + 40log(300m/3m) (Below 30MHz) according to 15.31

Note 2: Limit 3m (dB $\mu\text{V/m}$) = Limit 300m (dB $\mu\text{V/m}$) + 20log(300m/3m) (Above 30MHz) according to 15.31

Note 3: This product is a wireless charger which operates at (105 kHz - 115kHz, 110kHz nominal). So, the limit of miscellaneous with non-ISM frequency is applied.

- b) **RSS-216 Issue 2, clause 6.2.2.2 (January 2016), Radiated Emissions limits mentioned as below:**
The magnetic field radiated emissions within 9 kHz – 30 MHz from the WPT subassembly of WPT source and client devices and WPT systems shall comply with the limits applicable to induction cooking equipment, asset out in ICES-001.
- c) **ICES-001 Issue 5, clause 3.3.4.1, table 2 (July 2020).**

Table 2: Magnetic field strength radiated emission limits for induction cooking appliances

| Frequency range (MHz) | QP Limit at 3 m | |
|-----------------------|-----------------------|-----------------------|
| | (dB $\mu\text{A/m}$) | (dB $\mu\text{V/m}$) |
| 0.009 - 0.07 | 69 | 120.5 |
| 0.07 - 0.15 | 69 - 39* | 120 - 90.5* |
| 0.15 - 30 | 39 - 7* | 90.5 - 58.5* |

The limit level decreases linearly with the logarithm of frequency.

- According to ICES-001 Issue 5 - July (2020), clause 3.3.2, Instrumentation, test methods and test facilities, The instrumentation, test methods and test facilities used to demonstrate compliance with the limits defined in sections 3.3.3 and 3.3.4 shall be in accordance with the requirements set out in CSA CISPR 11:19 and in its normative references, as listed therein (specifically CISPR 16-1-1, CISPR 16-1-2, **CISPR 16-1-4**, CISPR 16-2-1 and CISPR 16-2-3 of editions as listed in CSA CISPR 11:19).
- According to **CISPR 16-1-4**, clause C.6.3, NOTE 2: For disturbance level calculations, CISPR uses the magnetic field strength H in dB(μA/m) instead of electric field strength E in dB(μV/m). In this context, the relation between H and E is given by Equation (C.4): $E = H + 51,5$

$$\text{dB}\mu\text{V/m} = \text{dB}\mu\text{A/m} + 51.5$$

d) ICES-001 Issue 5, clause 3.3.4.1, table 4 (July 2020).

Table 4: Electric field strength radiated emission limits for induction cooking appliances

| Frequency range (MHz) | QP Limit at 3 m | Note: |
|-----------------------|-----------------|------------------------------|
| | (dBμV/m) | Limits for OATS or SAC* |
| 30 - 230 | 40 | *OATS = open-area test site |
| 230 - 1000 | 47 | *SAC = semi-anechoic chamber |

Limits according to ICES-001 Issue 5, are equal or more stringent than those of FCC Part 18 Part C.

Code: REmmnnRR_PP

- RE: Radiated Emission,
 - mm: Sample number,
 - nn: Operation mode,
 - RR: Frequency range
- Low Range = LR1: [0.009, 30];
Low Range = LR2: [30, 1000];

Results

| S/ | OM | Code | Freq Rng (MHz) | V |
|----|-------|-----------|----------------|---|
| 02 | OM/01 | RE0201LR1 | [0.009, 30] | P |
| 02 | OM/01 | RE0201LR2 | [30, 1000] | P |

***Worst case Y orientation observed for LR1, and the plot is shown below**

Verdict

Pass

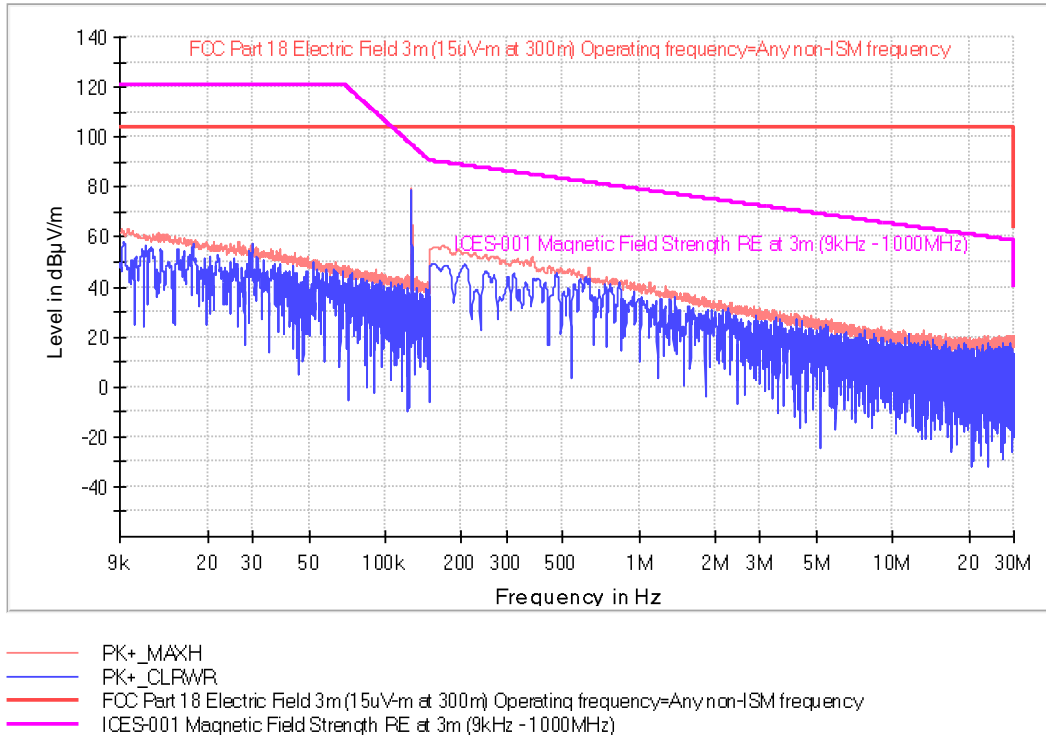
Attachments

EMC Test Code = RE0201LR1 Frequency Range MHz = [0.009, 1000]

Sample ID: S/02

Operation Mode: OM/01. DUT ON. WPT charging mode. Powered by 13.5Vdc.

Images:



Tables:

| Frequency (MHz) | PK+_CLRWR (dBµV/m) | PK+_MAXH (dBµV/m) | Pol | Margin - PK+ (dB) | Limit - PK+ (dBµV/m) | Comment |
|-----------------|--------------------|-------------------|-----|-------------------|----------------------|-----------------|
| 0.009686 | 47.6 | 62.8 | H | 40.7 | 103.5 | |
| 0.026362 | 47.2 | 58.2 | H | 45.3 | 103.5 | |
| 0.127252 | 78.9 | 79.5 | H | 24.0 | 103.5 | WPT Fundamental |
| 0.379845 | 37.9 | 51.8 | H | 51.7 | 103.5 | |

Spectrum Analyzer Parameters

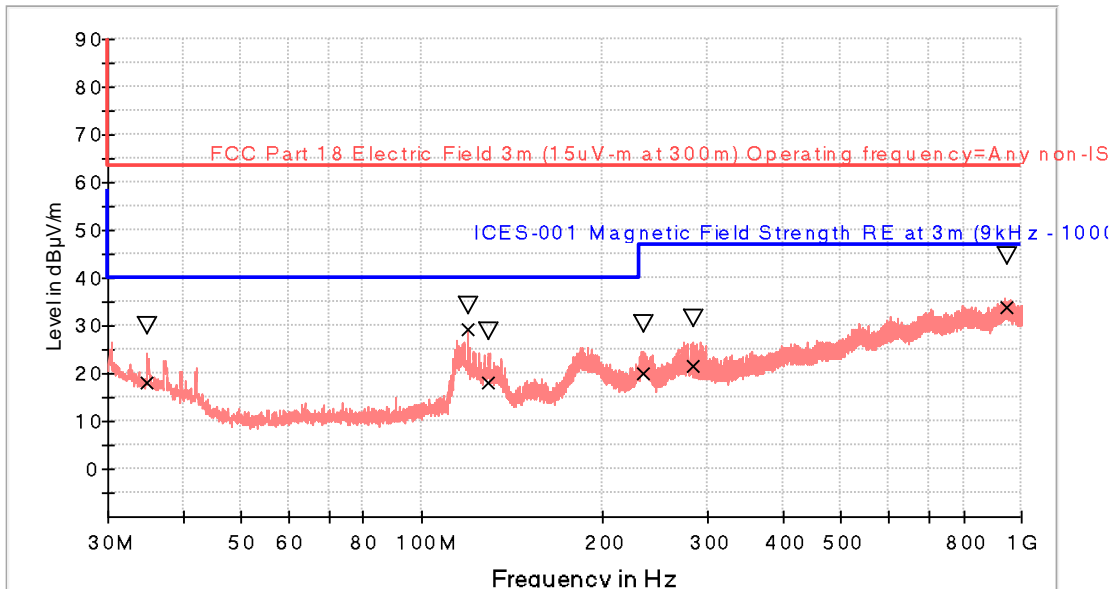
| Subrange | Step Size | Detectors | Bandwidth | Sweep Time |
|------------------|-----------|-----------|-----------|------------|
| 9 kHz - 150 kHz | 4.7 Hz | PK+ | 200 kHz | Coupled |
| 150 kHz - 30 MHz | 995 Hz | PK+ | 10 kHz | Coupled |

EMC Test Code = RE0201LR2 Frequency Range MHz = [30, 1000]

Sample ID: S/02

Operation Mode: OM/01. DUT ON. WPT charging mode. Powered by 13.5Vdc

Images:



- Preview Result 1-PK+
- ICES-001 Magnetic Field Strength RE at 3m (9kHz - 1000MHz)
- FCC Part 18 Electric Field 3m (15uV-m at 300m) Operating frequency=Any non-ISM frequer
- X Final Result QPK
- ▽ Final Result PK+

Tables:

| Frequency (MHz) | QuasiPeak (dBµV/m) | MaxPeak (dBµV/m) | Limit (dBµV/) | Margin (dB) | Pol |
|-----------------|--------------------|------------------|---------------|-------------|-----|
| 34.910000 | 18.11 | 30.07 | 63.52 | 45.42 | H |
| 119.560000 | 29.16 | 34.32 | 63.52 | 34.36 | H |
| 129.090000 | 18.09 | 28.83 | 63.52 | 45.44 | H |
| 233.890000 | 20.05 | 30.49 | 63.52 | 43.47 | V |
| 283.530000 | 21.38 | 31.45 | 63.52 | 42.15 | V |
| 941.610000 | 33.66 | 44.47 | 63.52 | 29.86 | V |

Spectrum Analyzer Parameters

| Subrange | Step Size | Detectors | Bandwidth | Sweep Time |
|----------------|-----------|-----------|-----------|------------|
| 30 MHz - 1 GHz | 48.5 kHz | PK+ | 100 kHz | 1 s |

Occupied bandwidth (or 99% emission bandwidth)

Limits

RSS Gen Issue 5 – April, clause 6.7 (2018).

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Compliance with RSS-Gen and the limits set out in the applicable RSS shall be demonstrated using the methods of measurement specified in section 3 of the Std. RSS-Gen Issue 5 (April 2018).

Verdict

Pass

Attachments

Operation mode: DUT ON. WPT charger and NFC in standby mode. Powered by 13.5Vdc
***Worst case**

| Freq (kHz) | Bandwidth (kHz) | Occ Ch BW (Hz) |
|------------|-----------------|----------------|
| 127.8 | 1 | 661.32 |

