

**MEASUREMENT REPORT**
FCC Part 15C**Applicant Name:**

LG Electronics Inc.

10, Magokjungang 10-ro, Gangseo-gu,
Seoul, Korea 07796**Date of Testing:**

3/23/2018-4/11/2018

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M1803230054-02.BEJ

FCC ID:**BEJWC501M****APPLICANT:****LG Electronics Inc.****Application Type:**

Certification

EUT Type:

Vehicle Installed Wireless Charging System

Model:

WC501M

Operating Frequency:

111kHz

FCC Rule Part(s):

FCC Part 15, Subpart C (15.209)

FCC Classification:

Part 15 Low Power Transmitter Below 1705 kHz (DCD)

Test Procedure:

ANSI C63.10-2013, KDB 680106 D01 v02

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.


Randy Ortanez
President

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **LGE Vehicle Installed Wireless Charging System FCC ID: BEJWC501M**. The test data contained in this report pertains only to the emissions due to the wireless power transfer function of the EUT.

2.2 Test Configuration

The LGE Vehicle Installed Wireless Charging System FCC ID: BEJWC501M is a power transfer device (pad) that is installed in a vehicle. It was connected to a 12V DC Power Supply and turned on. One wireless power receiver block (dummy load) was used for testing with the charging pad. The block was compliant with the WPC charging protocol. Output power of the charging pad is 15W in WPC mode.

All equipment is placed on the test table top and arranged in a typical configuration in accordance with ANSI C63.10-2013. For more information, please see Section 7.0 for test data and the test setup photos document for the test setup photographs.

2.3 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of radiated and conducted emissions from the **LGE Vehicle Installed Wireless Charging System**
FCC ID: BEJWC501M.

Deviation from measurement procedure.....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband loop antenna from 9kHz up to 30MHz and broadband hybrid antenna from 30MHz up to 1GHz. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission.

3.3 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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4.0 SAMPLE CALCULATIONS

4.1 Radiated Emission Measurement Sample Calculation

@ 66.7 MHz

Class B limit	= 100 $\mu\text{V/m}$ = 40.0 dB $\mu\text{V/m}$
Reading	= - 76.0 dBm (calibrated level)
Convert to dB μV	= - 76.0 + 107 = 31.0 dB μV
Antenna Factor + Cable Loss	= 5.8 dB/m
Total	= 36.8 dB $\mu\text{V/m}$
Margin	= 36.8 - 40.0 = - 3.2 dB
	= 3.2 dB below limit

Note:

$$\text{Level [dB}\mu\text{V]} = 20 \log_{10} (\text{Level } [\mu\text{V/m}])$$

$$\text{Level [dB}\mu\text{V]} = \text{Level [dBm]} + 107$$

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	N9020A	MXA Signal Analyzer	1/24/2018	Annual	1/24/2019	US46470561
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2017	Biennial	10/10/2019	121034
Rohde & Schwarz	TS-PR8	Preamplifier-Antenna SYS; 30MHz-8GHz	5/11/2017	Annual	5/11/2018	100040
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	4/19/2017	Annual	4/19/2018	100342
Sunol Sciences	JB6	JB6 Antenna	9/27/2016	Biennial	9/27/2018	A082816

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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7.0 TEST DATA

7.1 Summary

Test Date(s): 3/23/2018-4/11/2018

Test Engineer:



FCC Part 15 Section	Description	Result
15.209	Radiated Emissions	PASS

Table 7-1. Summary of Test Results

Frequency [MHz]	Field Strength Limit [$\mu\text{V/m}$]	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
> 960	500	3

Table 7-2. Radiated Limits (Section 15.209)

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7.2 Radiated Measurement Data

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Test Procedures Used

ANSI C63.10-2013

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer frequency set to the frequency of the radiated spurious emission of interest
2. Per the CISPR 16-1-1 standard, the RBW's are as follows:
 9kHz – 150kHz (Band A): 200Hz
 150kHz – 30MHz (Band B): 9kHz
 30MHz – 1GHz (Band C): 120kHz
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

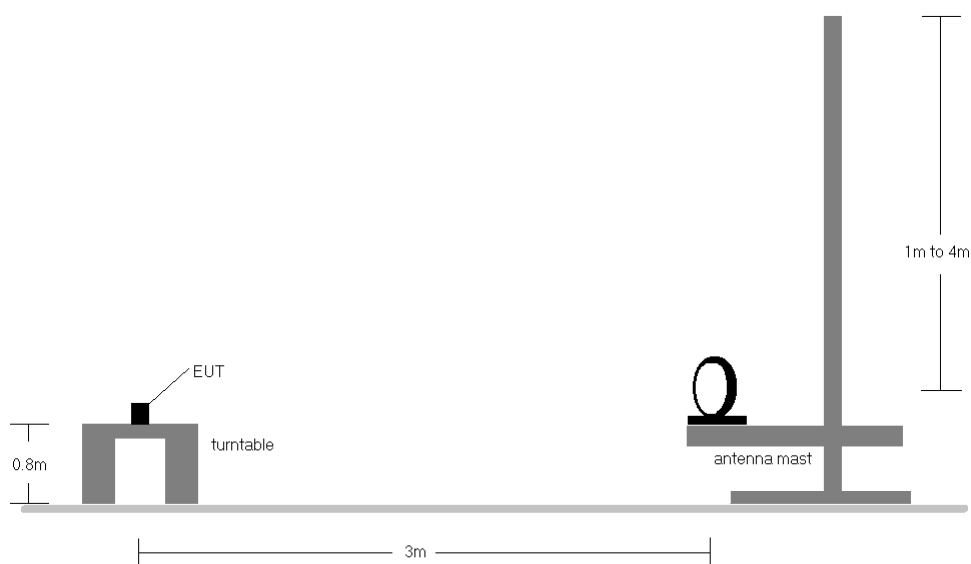


Figure 7-1. Radiated Test Setup < 30MHz

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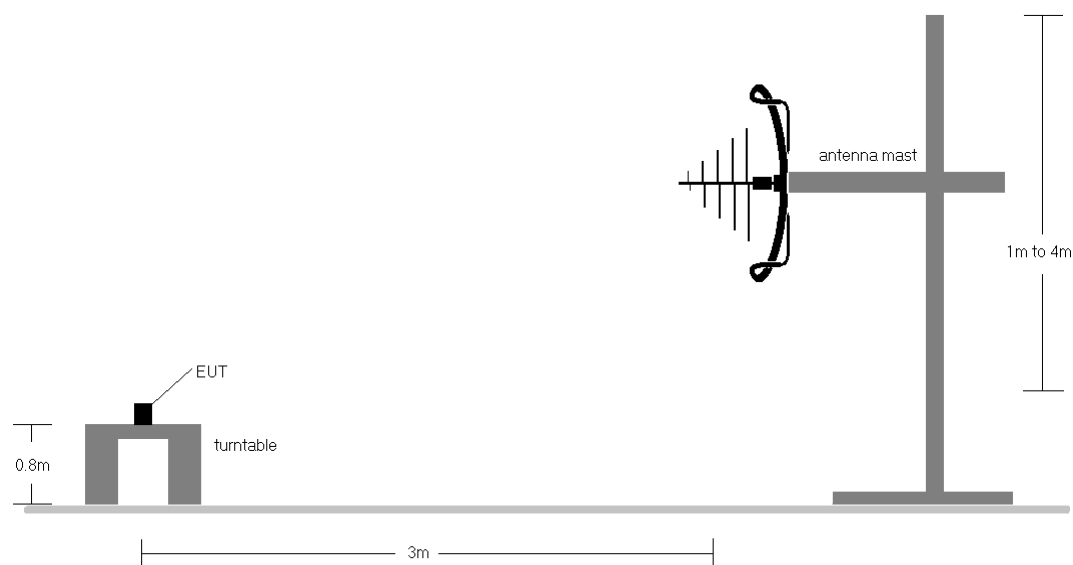


Figure 7-2. Radiated Test Setup < 1GHz

Sample Calculation:

- o Field Strength Level $[\text{dB}\mu\text{V/m}] = \text{Analyzer Level} [\text{dBm}] + 107 + \text{AFCL} [\text{dB}]$

Notes:

- o $\text{AFCL} = \text{Antenna Factor} [\text{dB}] + \text{Cable Loss} [\text{dB}]$

Notes:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. Radiated emissions were measured from 9kHz –1GHz.
3. The radiated limits for intentional radiators are shown in Table 7-2.
4. All readings are calibrated by a signal generator with accuracy traceable to the National Institute of Standards and Technology (NIST).
5. $\text{AFCL} (\text{dB/m}) = \text{Antenna Factor} (\text{dB/m}) + \text{Cable Loss} (\text{dB})$
6. $\text{Level} (\text{dB}\mu\text{V/m}) = \text{Analyzer Reading} (\text{dBm}) + \text{AFCL} (\text{dB/m}) + 107$
7. $\text{Margin} (\text{dB}) = \text{Field strength} (\text{dB}\mu\text{V/m}) - \text{Limit} (\text{dB}\mu\text{V/m})$
8. Radiated measurements below 30MHz were measured using a loop antenna. The antenna was positioned in three orthogonal planes (X front, Y side, Z top) and the position with the highest emission level is reported above.

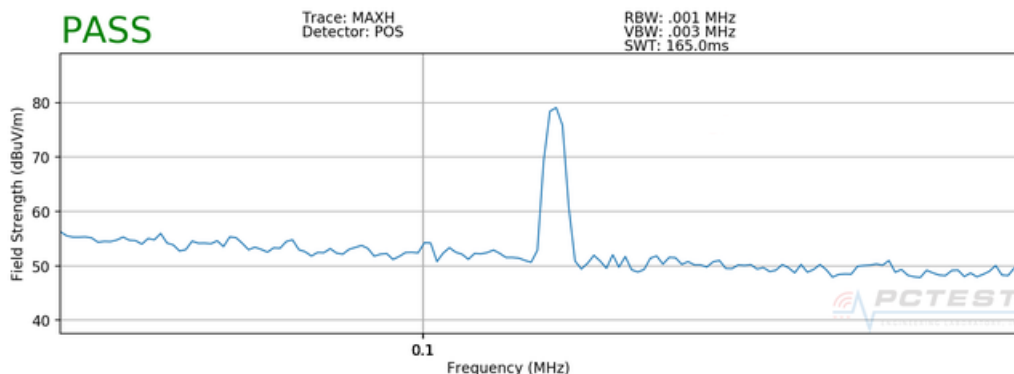
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9. For measurements made below 1GHz, the results recorded using the broadband antenna are known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antennas was found to be less than 2:1.
10. Calibrated low-loss microwaves cables are used.
11. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. These plots were taken without using any correction factors. Any emissions found to be within 20dB of the limit (after applying the correction factor) are fully investigated and the results are shown in Table 7-3.
12. The “-“ shown in the tables below are used to denote noise floor measurements.
13. No significant emissions were found in the 90 – 110kHz restricted band.

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Radiated Restricted Band Edge Measurements – 15W WPC

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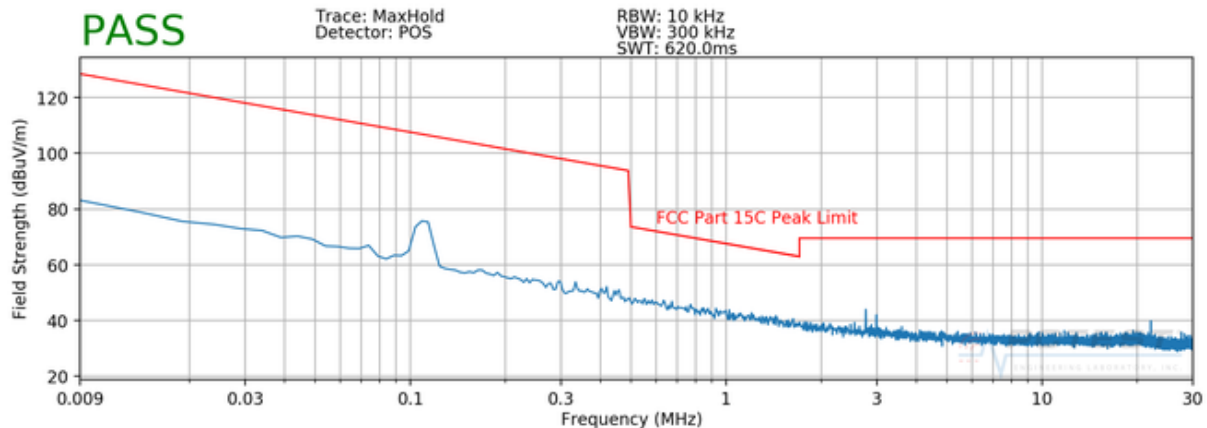


Plot 7-1. Radiated Restricted Lower Band Edge Measurement (Peak)

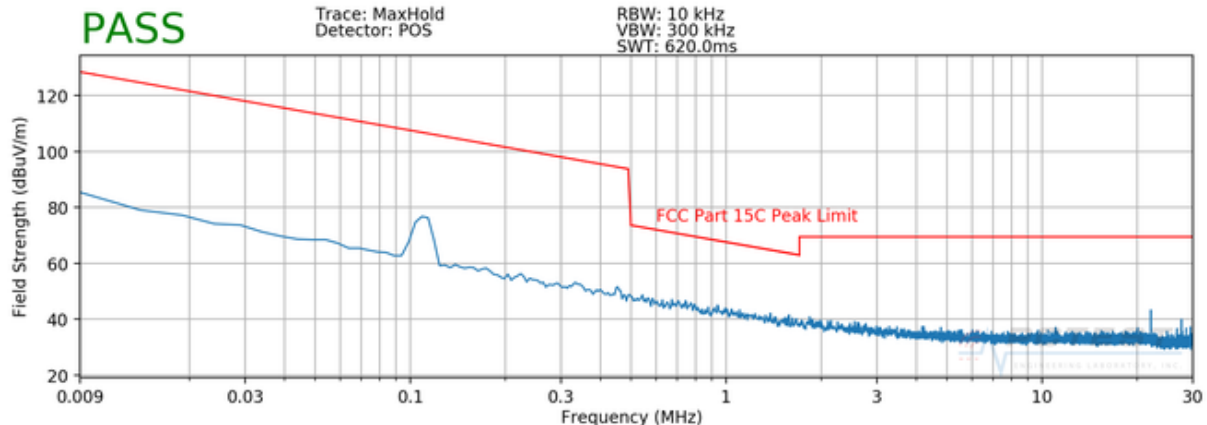
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Radiated Spurious Emissions Measurements – 15W WPC

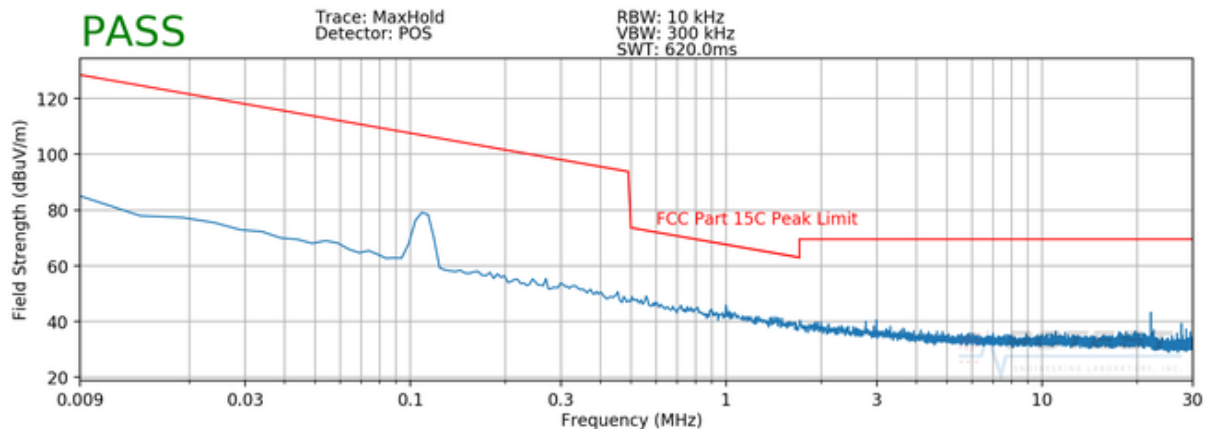
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Plot 7-1. Radiated Spurious Plot from 9kHz – 30MHz (Pol. X)



Plot 7-2. Radiated Spurious Plot from 9kHz - 30MHz (Pol. Y)

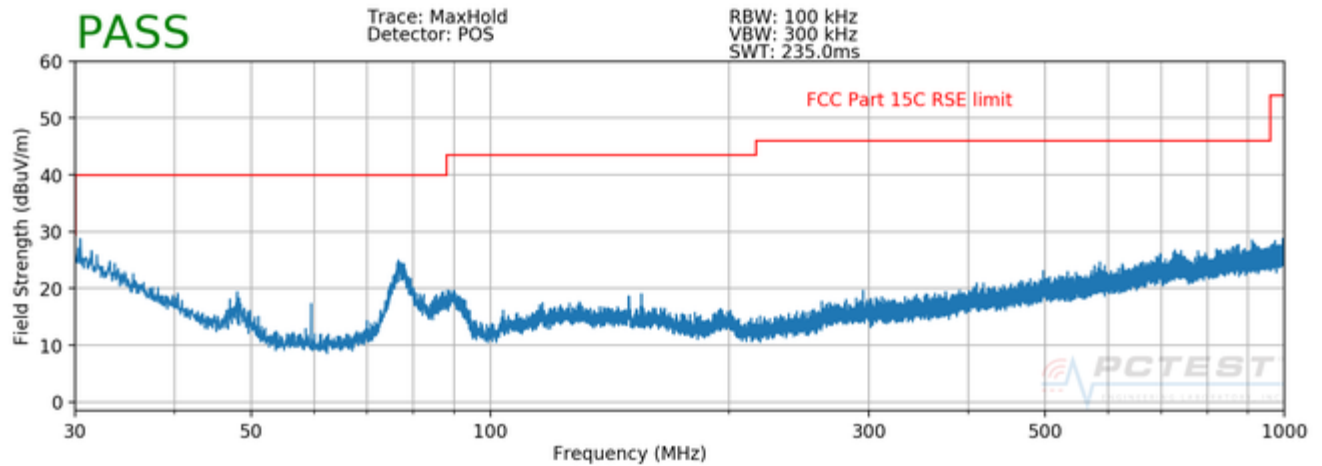


Plot 7-3. Radiated Spurious Plot from 9kHz – 30MHz (Pol. Z)

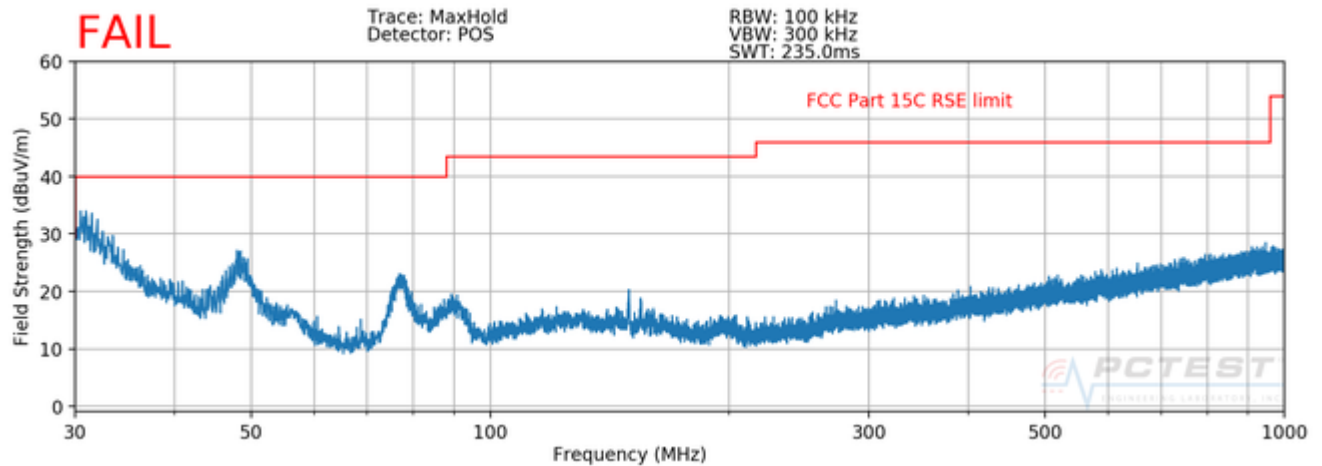
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Radiated Spurious Emissions Measurements – 15W WPC

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Plot 7-4. Radiated Spurious Plot above 30MHz (Pol. H)



Plot 7-5. Radiated Spurious Plot above 30MHz (Pol. V)

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Radiated Spurious Emissions Measurements

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Frequency [MHz]	Detector	Antenna Position	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	3m Field Strength [dBμV/m]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
0.01	Quasi-Peak	Z	-	-	-52.48	14.20	68.72	-11.28	47.60	-58.88
0.07	Quasi-Peak	Z	-	-	-56.91	13.80	63.89	-16.11	30.70	-46.81
0.11	Quasi-Peak	Z	147	139	-42.71	13.80	78.09	-1.91	26.70	-28.60
5.54	Quasi-Peak	Z	-	-	-90.81	14.45	30.64	-9.36	29.54	-38.91
14.38	Quasi-Peak	Z	-	-	-94.85	14.58	26.73	-13.27	29.54	-42.81
25.06	Quasi-Peak	Z	-	-	-93.88	13.18	26.30	-13.70	29.54	-43.25
47.90	Quasi-Peak	V	-	-	-56.60	-21.69	28.71	28.71	40.00	-11.29
77.40	Quasi-Peak	V	110	233	-63.46	-22.74	20.80	20.80	40.00	-19.20
89.90	Quasi-Peak	V	125	326	-61.83	-21.21	23.96	23.96	43.52	-19.56
143.90	Quasi-Peak	V	2	211	-71.30	-16.55	19.15	19.15	43.52	-24.37
149.20	Quasi-Peak	V	139	242	-65.58	-16.39	25.03	25.03	43.52	-18.49

Table 7-3. Radiated Measurements at 3-meters (with 15W WPC Block)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LGE Vehicle Installed Wireless Charging System FCC ID: BEJWC501M** has been verified to comply with the requirements specified in Part 15 (§15.209) of the FCC Rules.

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