

**MEASUREMENT REPORT**
FCC Part 15C**Manufacturer Name & Address:**LG Electronics Inc.
222 LG-ro
Jinwi-myeon, Pyeongtaek-si
Gyeonggi-do, 17709, Korea**Date of Testing:**

7/1/2016

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Test Report Serial No.:

0Y1606211103.BEJ

FCC ID: **BEJWC900A15****APPLICANT:** **LG Electronics Inc.****Application Type:**

Certification

EUT Type:

Vehicle Installed Wireless Charging System

Model:

WC900A15

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.

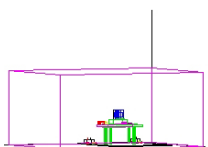

Randy Ortanez
President

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MEASUREMENT REPORT

FCC Part 15C



§ 2.1033 General Information

MANUFACTURER: LG Electronics Inc.

MANUFACTURER ADDRESS: 222 LG-ro
Jinwi-myeon, Pyeongtaek-si
Gyeonggi-do, 17709, Korea

TEST SITE: PCTEST ENGINEERING LABORATORY, INC.

TEST SITE ADDRESS: 7185 Oakland Mills Road, Columbia, MD 21046 USA

FCC RULE PART(S): Part 15 Subpart C

MODEL: WC900A15

EUT TYPE: Vehicle Installed Wireless Charging System

Test Device Serial No.: 21JUNE-3, ☐ Production ☒ Pre-Production ☐ Engineering
22MAR-4

FCC CLASSIFICATION: Part 15 Low Power Transmitter Below 1705 kHz (DCD)

DATE(S) OF TEST: 3/29 - 5/24/2016

Test Methodology

Both conducted and radiated measurements were taken using the methods and procedures described in ANSI C63.10-2013. Radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility / NVLAP Accreditation

Conducted and radiated tests were performed at PCTEST Engineering Lab in Columbia, MD 21046, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) in EMC, Telecommunication, and FCC for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. (NVLAP Lab code: 100431-0).
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.

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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.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Intern't'l (BWI) airport, the city of Baltimore and the Washington, DC area. (see Figure 1-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2014 on January 22, 2015.

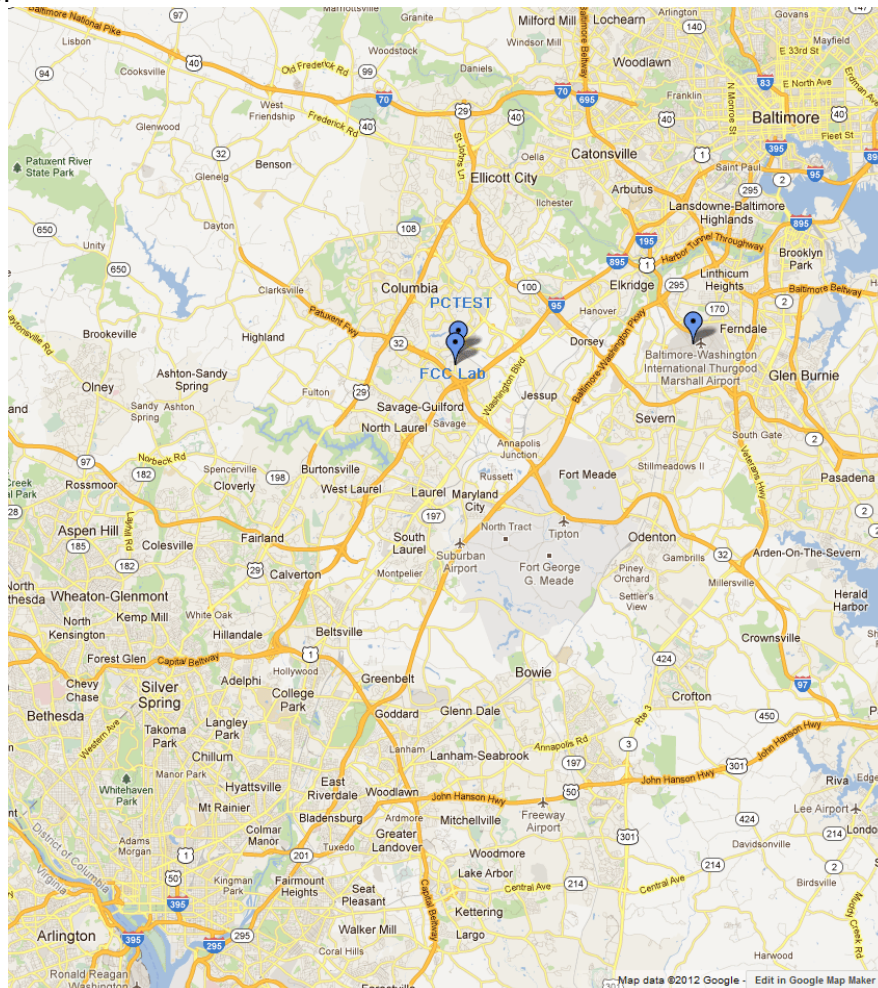


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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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: BEJWC900A15**. 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: BEJWC900A15 is a vehicle power transfer device (pad) that is installed in a vehicle. It was connected to a 12V DC Power Supply and turned on. Two wireless power receiver blocks (dummy loads) were used for testing with the charging pad. One block was compliant with the WPC charging protocol and the other block was compliant with the PMA charging protocol. Output power of the charging pad is 15W in WPC mode and 5W in PMA 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: BEJWC900A15**.

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. For measurements above 1GHz 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 below 1GHz, a 72.4cm high PVC support structure is placed on top of the turntable. A 3" (~7.6cm) sheet of high density polystyrene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm. For measurements above 1GHz, a high density expanded polystyrene block 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 0.8 meter high, 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
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	7/11/2016	Annual	7/11/2017	RE1
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	7/6/2016	Annual	7/6/2017	441119
PCTEST	-	EMC Switch System	7/11/2016	Annual	7/11/2017	NM1
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/15/2016	Annual	7/15/2017	100348
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

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7.0 TEST DATA

7.1 Summary

Test Date(s): 7/1/2016

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.

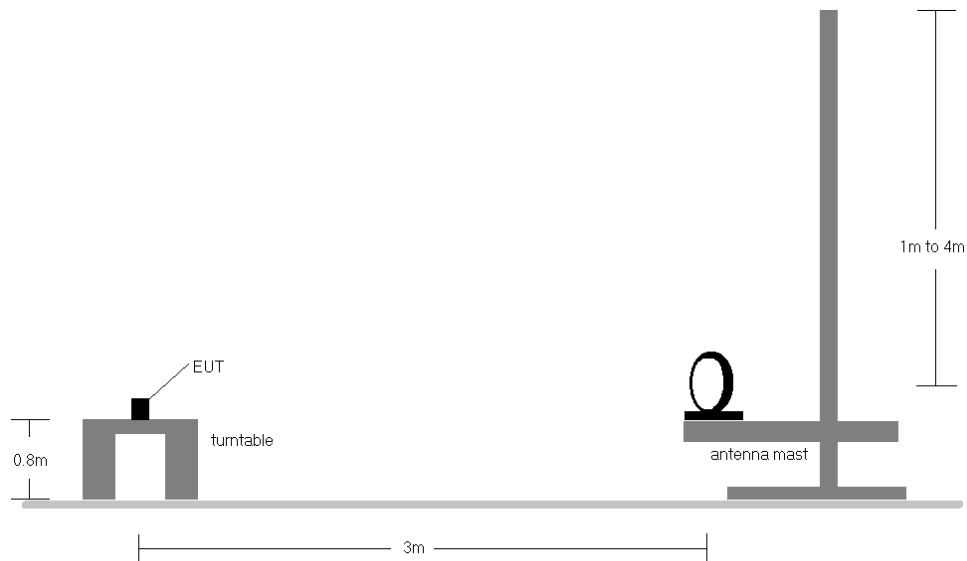


Figure 7-1. Radiated Test Setup < 30MHz

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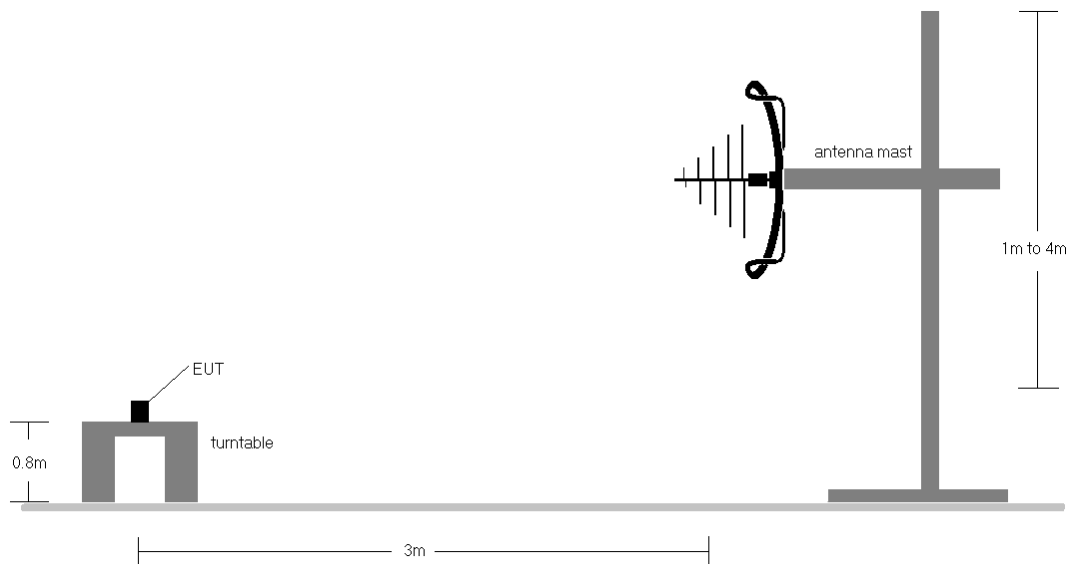


Figure 7-2. Radiated Test Setup < 1GHz

Sample Calculation:

- o Field Strength Level [dB μ V/m] = Analyzer Level [dBm] + 107 + AFCL [dB]

Notes:

- o AFCL = Antenna Factor [dB] + Cable Loss [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 at a distance of 3 meters are used in the 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. AFCL (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
6. Level (dB μ V/m) = Analyzer Reading (dBm) + AFCL (dB/m) + 107
7. Margin (dB) = Field strength (dB μ V/m) – Limit (dB μ 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.
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.

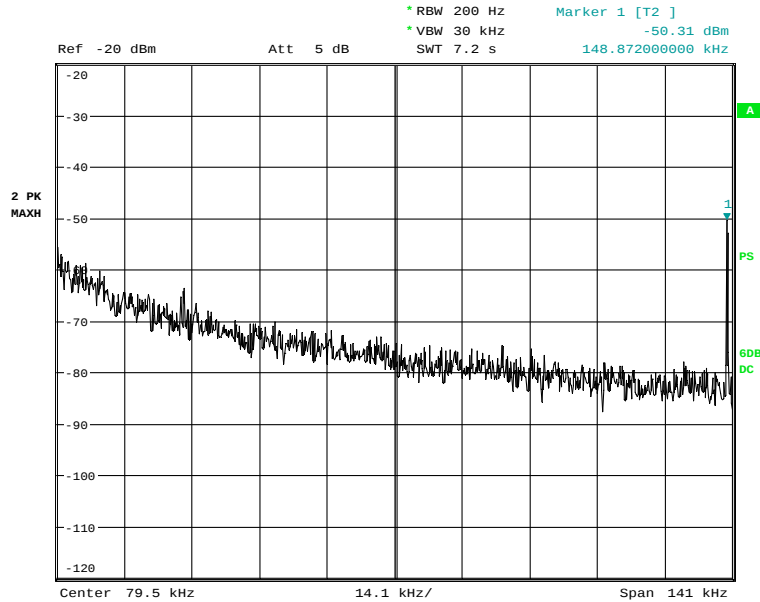
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11. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. These plots were taken without using any correction factors. Any emissions found to be within 20dB of the limit (after applying the correction factor) are fully investigated and the results are shown in Tables 7-3 and 7-4.
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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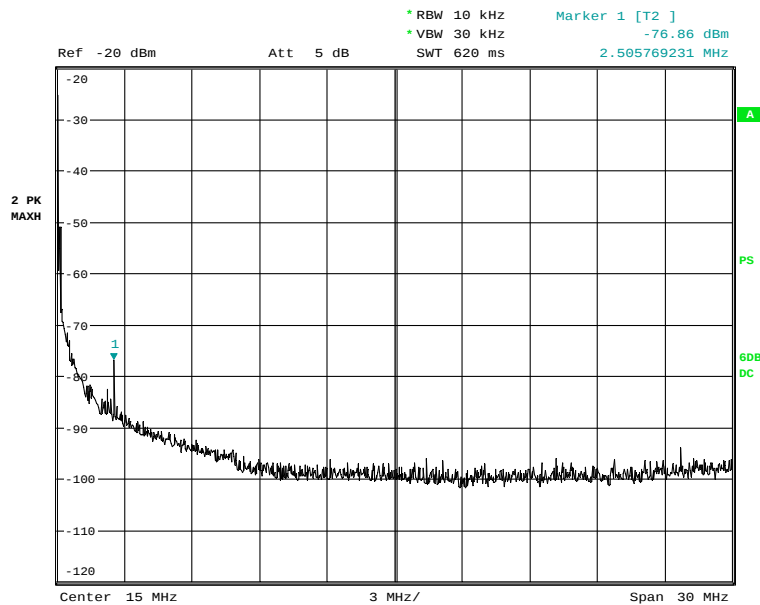
Radiated Spurious Emissions Measurements - PMA

\$15.209



Date: 1.JUL.2016 12:17:30

Plot 7-1. Radiated Spurious Plot from 9 – 150kHz (Pol. X)



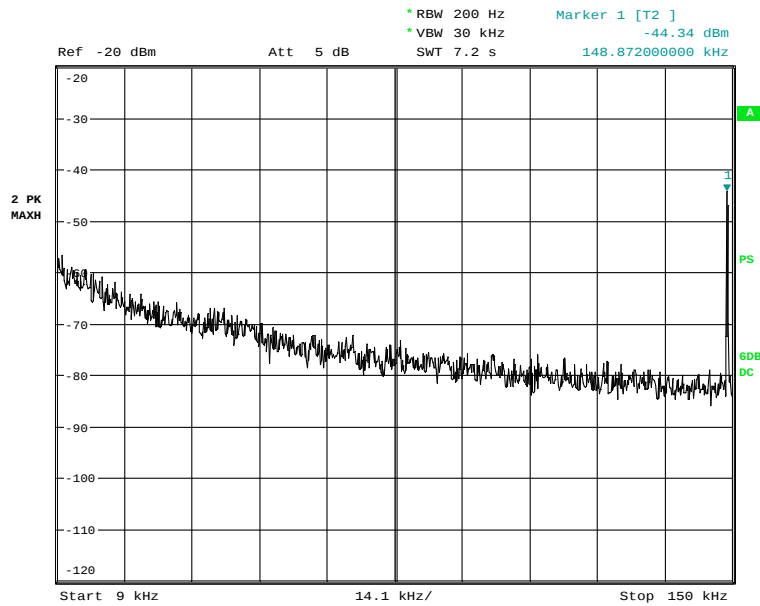
Date: 1.JUL.2016 12:43:52

Plot 7-2. Radiated Spurious Plot from 150kHz – 30MHz (Pol. X)

FCC ID: BEJWC900A15	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15C MEASUREMENT TEST REPORT	LG	Reviewed by: Quality Manager
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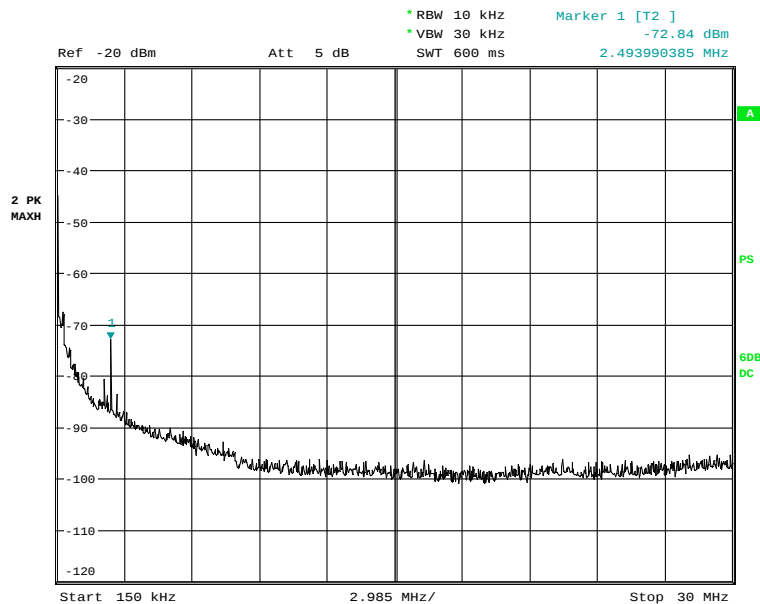
Radiated Spurious Emissions Measurements - PMA

\$15.209



Date: 1.JUL.2016 13:12:01

Plot 7-3. Radiated Spurious Plot from 9 – 150kHz (Pol. Y)



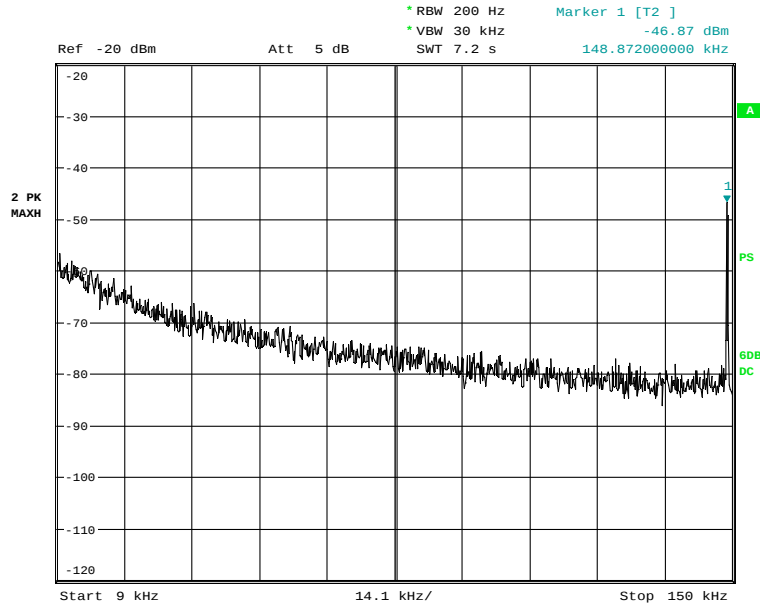
Date: 1.JUL.2016 13:13:36

Plot 7-4. Radiated Spurious Plot from 150kHz - 30MHz (Pol. Y)

FCC ID: BEJWC900A15	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15C MEASUREMENT TEST REPORT	LG	Reviewed by: Quality Manager
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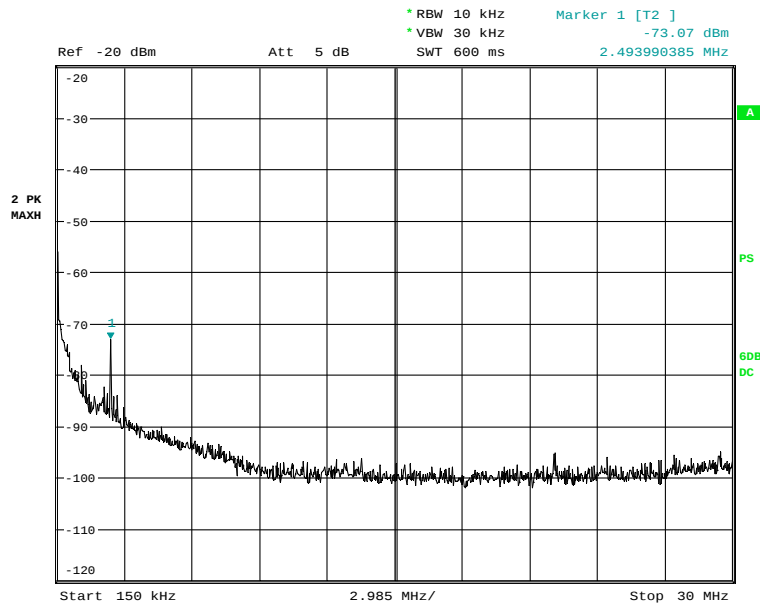
Radiated Spurious Emissions Measurements - PMA

\$15.209



Date: 1.JUL.2016 13:46:07

Plot 7-5. Radiated Spurious Plot from 9 – 150kHz (Pol. Z)



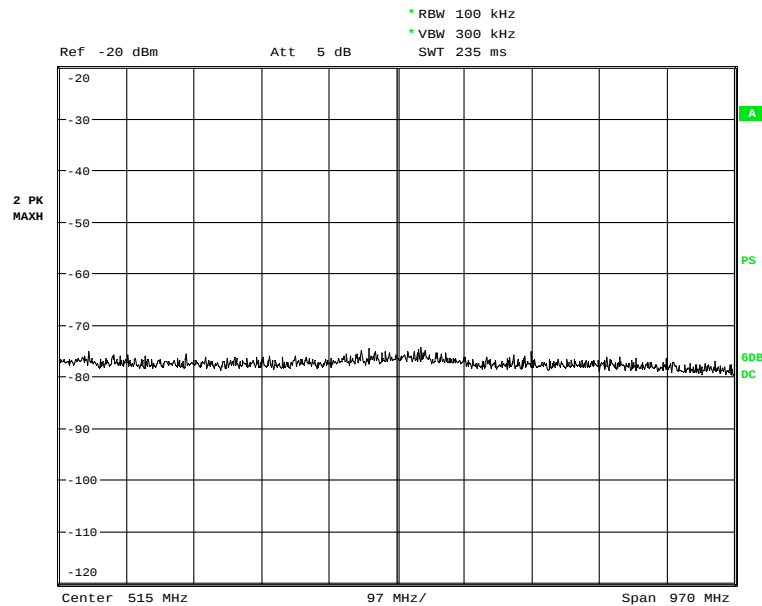
Date: 1.JUL.2016 13:55:17

Plot 7-6. Radiated Spurious Plot from 150kHz - 30MHz (Pol. Z)

FCC ID: BEJWC900A15	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15C MEASUREMENT TEST REPORT	LG	Reviewed by: Quality Manager
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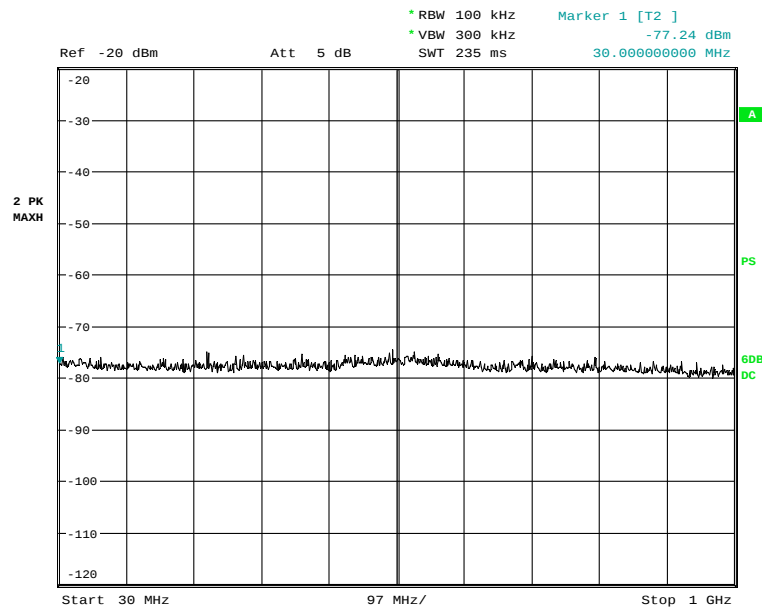
Radiated Spurious Emissions Measurements - PMA

\$15.209



Date: 1.JUL.2016 15:54:32

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



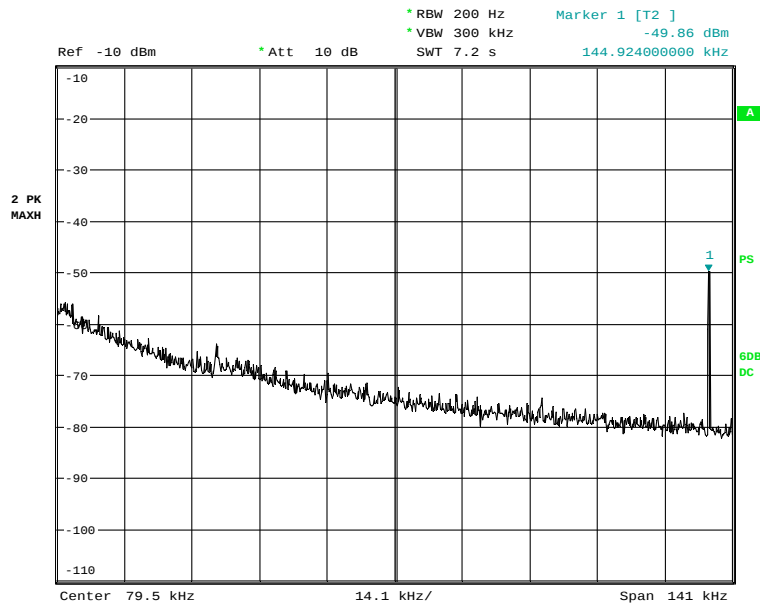
Date: 1.JUL.2016 14:32:08

Plot 7-8. Radiated Spurious Plot above 30MHz (Pol. V)

FCC ID: BEJWC900A15	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15C MEASUREMENT TEST REPORT	LG	Reviewed by: Quality Manager
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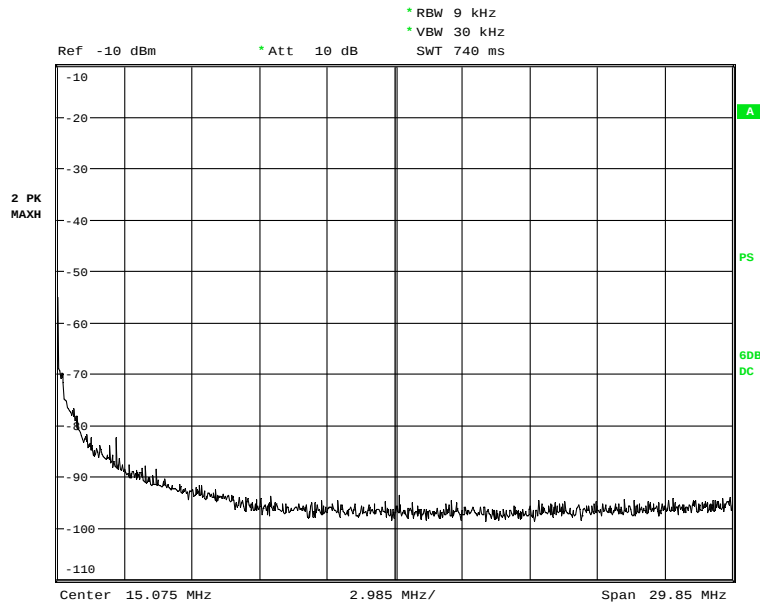
Radiated Spurious Emissions Measurements - WPC

\$15.209



Date: 1.JUL.2016 11:06:46

Plot 7-9. Radiated Spurious Plot from 9 – 150kHz (Pol. X)



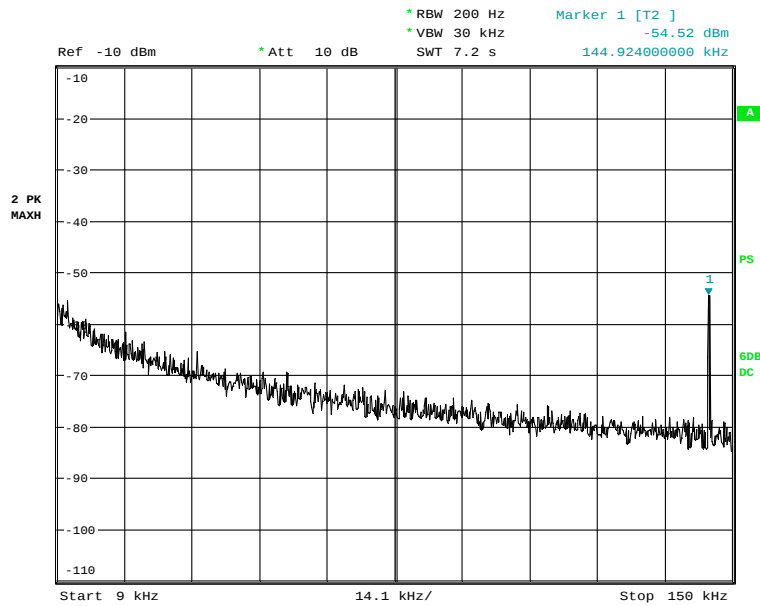
Date: 1.JUL.2016 11:09:27

Plot 7-10. Radiated Spurious Plot from 150kHz - 30MHz (Pol. X)

FCC ID: BEJWC900A15	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15C MEASUREMENT TEST REPORT	LG	Reviewed by: Quality Manager
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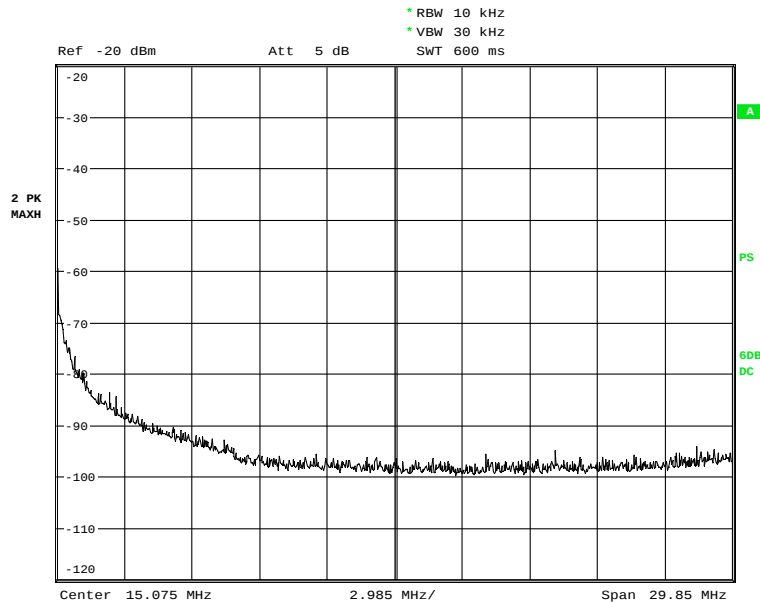
Radiated Spurious Emissions Measurements - WPC

\$15.209



Date: 1.JUL.2016 11:22:59

Plot 7-11. Radiated Spurious Plot from 9 – 150kHz (Pol. Y)



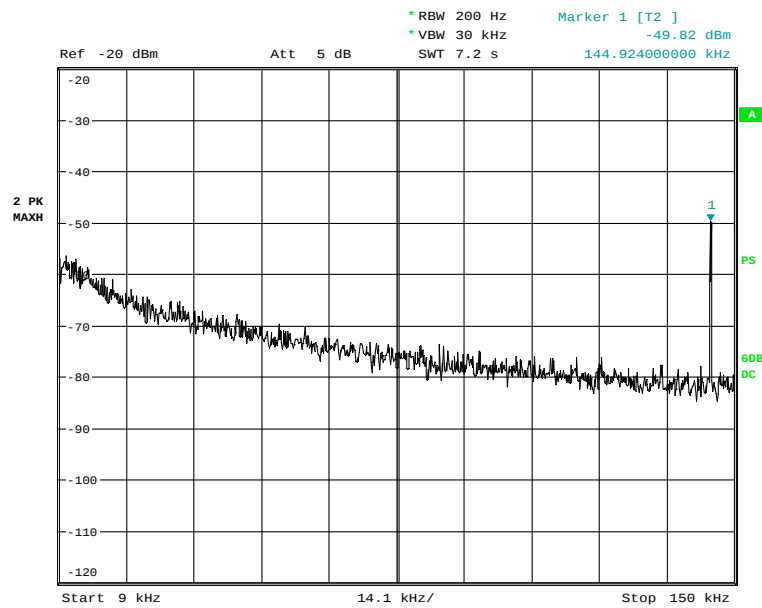
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Plot 7-12. Radiated Spurious Plot from 150kHz - 30MHz (Pol. Y)

FCC ID: BEJWC900A15	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15C MEASUREMENT TEST REPORT	LG	Reviewed by: Quality Manager
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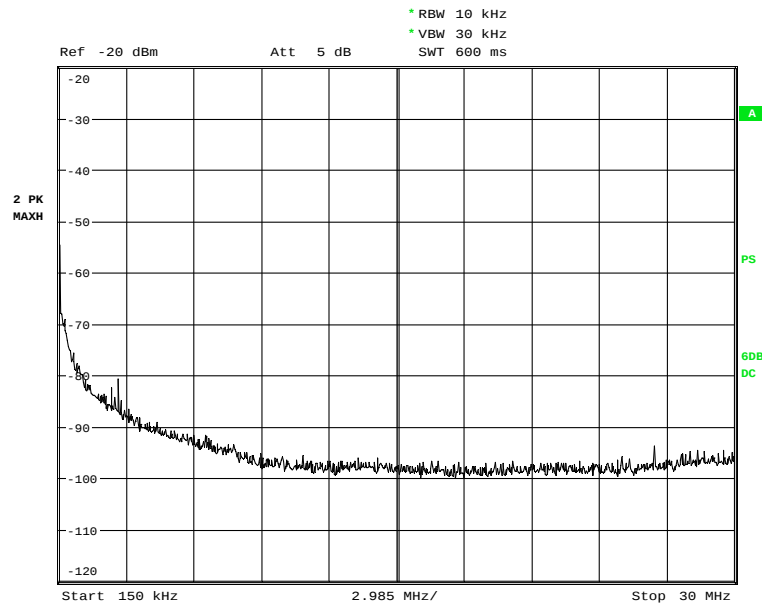
Radiated Spurious Emissions Measurements - WPC

\$15.209



Date: 1.JUL.2016 11:33:19

Plot 7-13. Radiated Spurious Plot from 9 – 150kHz (Pol. Z)



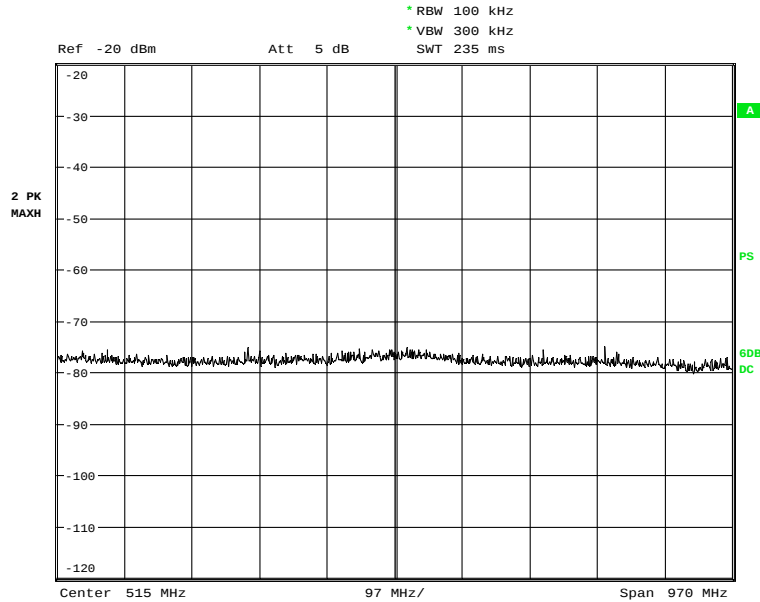
Date: 1.JUL.2016 11:44:53

Plot 7-14. Radiated Spurious Plot from 150kHz - 30MHz (Pol. Z)

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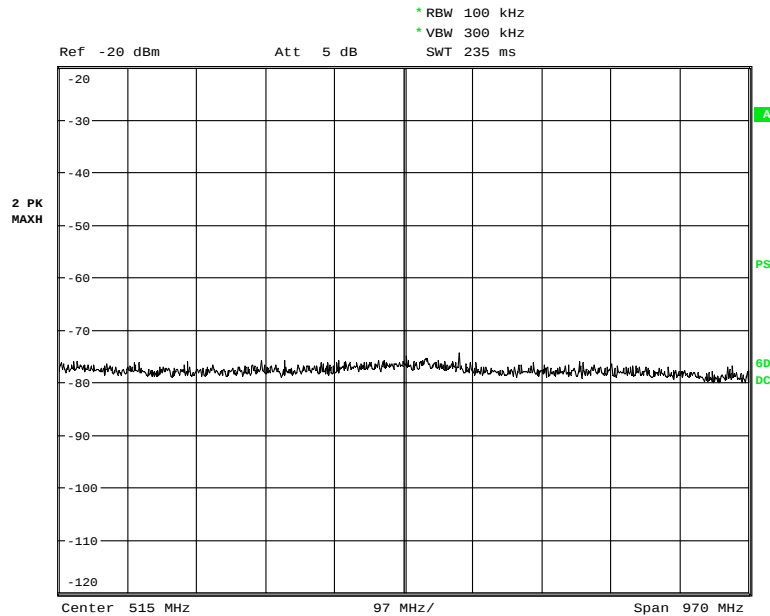
Radiated Spurious Emissions Measurements - WPC

§15.209



Date: 1.JUL.2016 15:44:48

Plot 7-15. Radiated Spurious Plot above 30 MHz (Pol. H)



Date: 1.JUL.2016 15:38:55

Plot 7-16. Radiated Spurious Plot above 30MHz (Pol. V)

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Frequency [MHz]	Antenna Position	Antenna Height [cm]	Turntable Azimuth [degree]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBμV/m]	Distance Correction Factor [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
0.149	Y	100	285	-42.23	14.30	79.07	-80.00	-0.93	24.14	-25.07
2.230	Y	100	261	-78.85	14.69	42.84	-40.00	2.84	29.54	-26.70
2.531	Y	100	72	-72.91	14.70	48.79	-40.00	8.79	29.54	-20.75
72.690	H	-	-	-75.10	-8.70	23.20	0.00	23.20	40.00	-16.80
212.590	H	-	-	-75.55	-17.41	14.04	0.00	14.04	43.52	-29.49
549.920	H	-	-	-74.37	-8.48	24.15	0.00	24.15	46.02	-21.87
738.000	H	-	-	-76.19	-4.42	26.39	0.00	26.39	46.02	-19.63

Table 7-3. Radiated Measurements at 3-meters (with PMA Block)

Frequency [MHz]	Antenna Position	Antenna Height [cm]	Turntable Azimuth [degree]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBμV/m]	Distance Correction Factor [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
0.145	Z	100	360	-48.82	14.30	72.48	-80.00	-7.52	24.38	-31.90
2.750	Z	100	8	-81.40	14.70	40.30	-40.00	0.30	29.54	-29.24
199.070	H	-	-	-75.64	-5.55	25.81	0.00	25.81	43.52	-17.71
384.050	H	-	-	-74.66	-12.08	20.26	0.00	20.26	46.02	-25.76
530.170	H	-	-	-74.17	-8.92	23.91	0.00	23.91	46.02	-22.11
705.300	H	100	212	-64.89	-5.36	36.75	0.00	36.75	46.02	-9.27
712.000	H	-	-	-77.56	-5.07	24.37	0.00	24.37	46.02	-21.66

Table 7-4. Radiated Measurements at 3-meters (with 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: BEJWC900A15** has been verified to comply with the requirements specified in Part 15 (§15.209) of the FCC Rules.

FCC ID: BEJWC900A15		FCC Pt. 15C MEASUREMENT TEST REPORT		Reviewed by: Quality Manager
Test Report S/N: 0Y1606211103.BEJ	Test Dates: 7/1/2016	EUT Type: Vehicle Installed Wireless Charging System		Page 23 of 23