

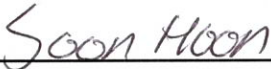
FCC EVALUATION REPORT FOR CERTIFICATION

Applicant: LG Electronics USA**1000 Sylvan Avenue Englewood Cliffs, New Jersey,
07632, United States****Attn: Mr. Jong cheul, Lee / Director****Date of Issue: July 19, 2016****Order Number: GETEC-C1-16-275****Test Report Number: GETEC-E3-16-031****Test Site: GUMI UNIVERSITY EMC CENTER
(Test firm Registration Number: 269701)****FCC ID. : BEJMR650A****Applicant : LG Electronics USA**

Rule Part(s)	: FCC Part 15 Subpart C-Intentional Radiator § 15.247
Test Method	: ANSI C63.10 (2013)
Equipment Class	: Digital Transmission System(DTS)
EUT Type	: Magic Remote
Type of Authority	: Certification
Model Name	: AN-MR650A
Trade Mark	: LG

This equipment has been shown to be in 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)

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 vest 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.

Tested by,**Reviewed by,**
**Soon-Hoon Jeong, Senior Engineer
GUMI UNIVERSITY EMC CENTER**
**Jae-Hoon Jeong, Technical Manager
GUMI UNIVERSITY EMC CENTER**



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Scope: Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.

1. General Information

Applicant: LG Electronics USA, Inc.

Applicant Address: 1000 Sylvan Avenue, Englewood Cliffs, New Jersey 07632

Manufacturer: LG Electronics Inc.

Manufacturer Address: 222 LG-ro, Jinwi-myeon, Pyeongae-gi, Gyeonggi-do 451-713, Korea

Contact Person: Mr. Jongchul Lee / Director

Telephone Number: +201-408-9181

Fax Number: +858-635-5378

- **FCC ID.** BEJMR650A
- **Equipment Class** Digital Transmission System (DTS)
- **EUT Type** Magic Remote
- **Model Name** AN-MR650A
- **Rule Part(s)** FCC Part 15 Subpart C-Intentional Radiator § 15.247
- **Test Method** ANSI C63.10 (2013)
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.10 (2013), KDB558074 D01 DTS Meas Guidance v03r05(April 8,2016)
- **Dates of Test** July 04 ~ 07, 2016
- **Place of Test** GUMI UNIVERSITY EMC CENTER (FCC Test firm Registration No.: 269701)
37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea
- **Test Report Number** GETEC-E3-16-031
- **Dates of Issue** July 19, 2016

EUT Type: Magic Remote

FCC ID.: BEJMR650A





2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **LG Electronics USA, Magic Remote. (Model name: AN-MR650A)**

These measurement tests were conducted at **GUMI UNIVERSITY EMC CENTER**.

The site address is 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Gyeongnam 641-713, Korea

This test site is one of the highest point of Gumi 1 college at about 200 kilometers away from Seoul city and 40 kilometers away from Daejeon city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.10 (2013)

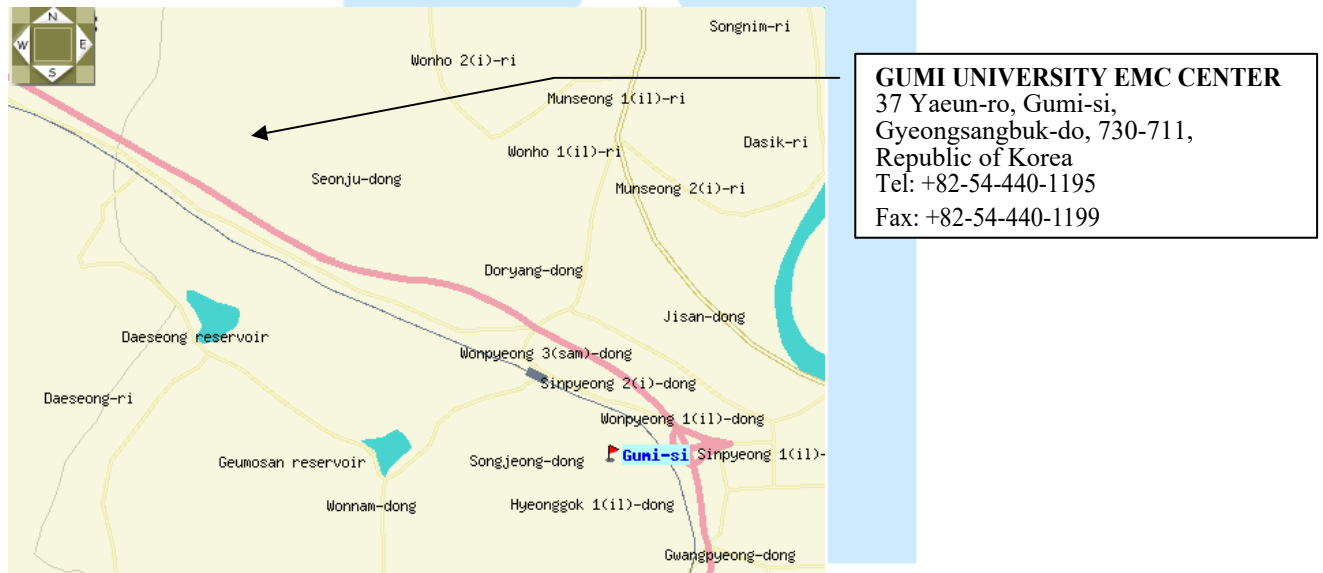


Fig 1. The map above shows the Gumi University in vicinity area.



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **LG Electronics USA Magic Remote (Model Name: AN-MR650A)**
FCC ID.: BEJMR650A

- Equipment	: Magic Remote
- Model name	: AN-MR650A
- Brand name	: LG Electronics Inc.
- Serial number	: Proto type
- Electrical Rating	: DC 3.0 V('AAA' Battery x2)
- Channel Separations	: 2 MHz
- Type of Modulation	: GFSK
- Type of Technique	: Bluetooth Low Energy
- Frequency range	: 2 402 MHz ~ 2480 MHz
- Number of channel	: 40
- Antenna Type	: PCB pattern antenna
- Type of chain	: One
- Antenna specification	: Manufacturer : RadiNa Antenna type : PCB pattern antenna Peak Gain : 2.38 dBi
- Hardware version	: PLCFA1242B/HSP-B403AB
- Software version	: Patch_1.1.0.11937
- Test Software version	: Realtek Bluetooth MP Tool v2.0.3

3.2 Definition of models

-None.



3.3 Support Equipment / Cables used

3.3.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
None.	-	-	S/N: None. FCC ID.: N/A.

See "Appendix E – Test Setup Photographs" for actual system test set-up

3.3.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
None.	-	-	S/N: - FCC ID.: -

3.3.3 Used Cable(s)

Cable Name	Condition	Description
None.	-	-

3.4 Modification Item(s)

-. None



4. Antenna Requirement - §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the applicant can be used with the device. The use of permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement.

4.1 Description of Antenna

The **LG Electronics USA RF Magic Remote**, comply with the requirement of §15.203 with a built-in PCB printed antenna permanently attached to the transmitter.

5. Description of tests

5.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used.

The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency: 3 V / DC
- Operating condition during the test(s) :
 - Continuous RF transmitting mode with maximum RF output power.
 - The RF transmitting signal is GFSK modulation signal.

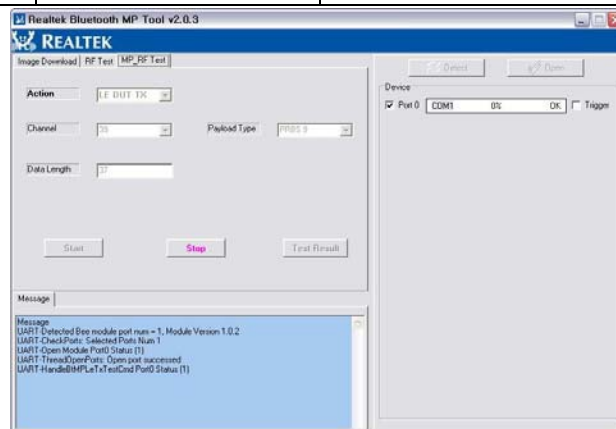
Operating channel frequency and moderation technology

Mode	Available channel	Type of Modulation
BT LE	0 ~ 39	GFSK

- Test condition (description of RF setting)

Following photograph with the specific test software “Realtek Bluetooth MP Tool v2.0.3” are used to set the product

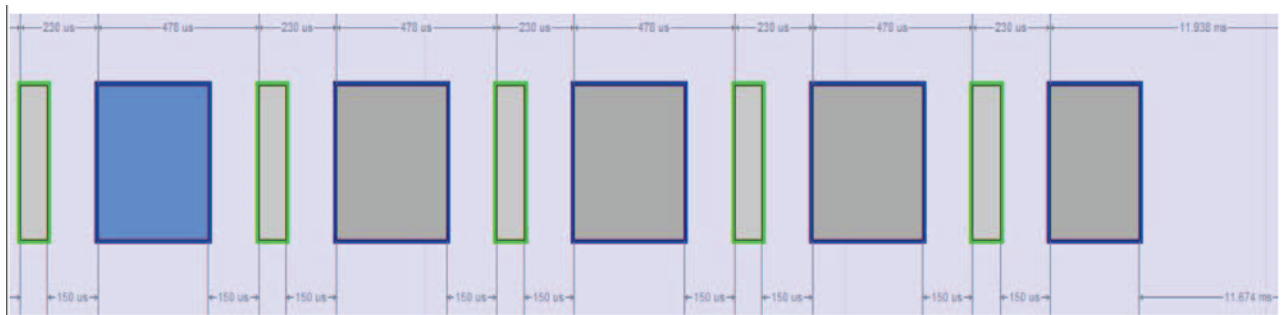
Test Software version	Realtek Bluetooth MP Tool v2.0.3 RF power setting value		
Frequency	2 402 MHz	2 440 MHz	2 480 MHz
BT LE	0 dBm	0 dBm	0 dBm





6. Duty Cycle Correction

6.1 A cycle pulse Train



6.2 Calculation of duty cycle

- Total width of pulse on time: 1.976 ms
- A cycle time (On & OFF time): 15.00 ms
- Duty Cycle (%): $1.976 \text{ ms} / 15.00 \text{ ms} = 0.131733 \times 100 = 13.1733 \%$
- Duty Cycle Collection Factor (dB): $20\log(1.976/15.00) = -17.60 \text{ dB}$

Total width of ON-Time	Total width of Cycle time	Duty Cycle (%)	Duty Cycle Collection Factor (dB)
1.976 ms	15.00 ms	13.1733 %	-17.60 dB



7. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Result
§15.247(a)(2)	6 dB Bandwidth	Pass
§15.247(b)(3)	Conducted Maximum Peak Output Power	Pass
§15.247(e)	Power Spectral Density	Pass
§15.247(d)	Conducted Out of Band Emission Emissions	Pass
§15.207(a)	AC Power line Conducted Emissions	N/A ¹⁾
§15.205, 15.209	Radiated Spurious Emissions	Pass
§15.247(d), 15.205, 15.209	Radiated Restricted Band Edge	Pass

Note)

1) The EUT is supplied power from battery. Therefore the test was not applicable.

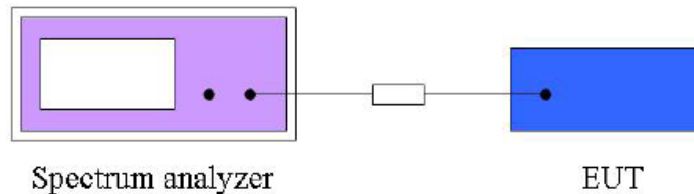


8. 6 dB Bandwidth Measurement

8.1 Operating environment

Temperature : 27.0 °C
Relative Humidity : 50.5 % R.H.

8.2 Test Set-up (Layout)



8.3 Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

8.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Jan. 04, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20, 2017

8.5 Test Procedure

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

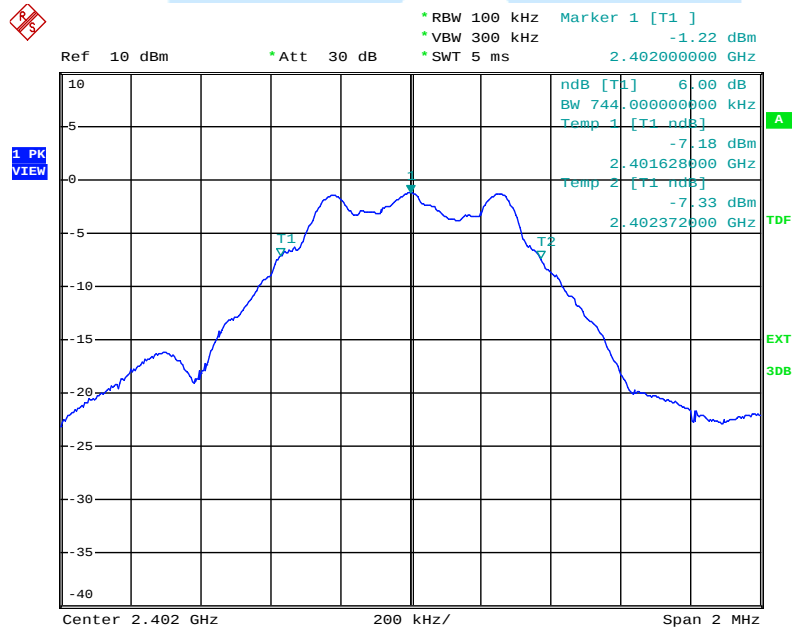


8.6 Test result

- Test Date : July 06, 2016
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(2)
- Test Procedure(s) : ANSI C63.10 (2013), KDB558074 D01 DTS Meas Guidance v03r05(April 8,2016)
- Operating Condition : RF transmitting mode (Low: 2 402 MHz, Middle: 2 440 MHz, High: 2 480 MHz)
- Power Source : DC 3 V

Frequency (MHz)	6 dB Bandwidth (MHz)	Min. Limit (kHz)	Result
2 402	0.744	500	Complies
2 440	0.716	500	Complies
2 480	0.744	500	Complies

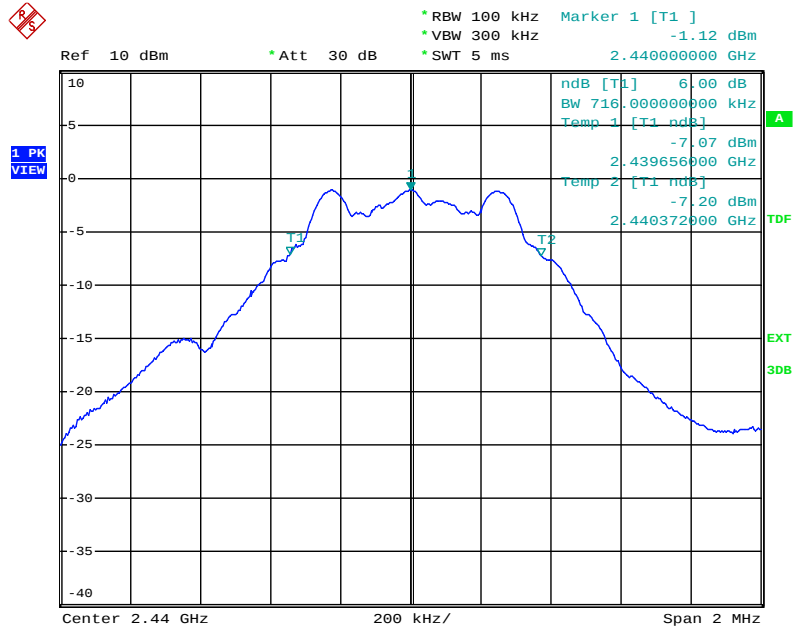
6 dB Bandwidth Plot on Configuration : Lowest channel (2 402 MHz)



Date: 6.JUL.2016 14:12:05

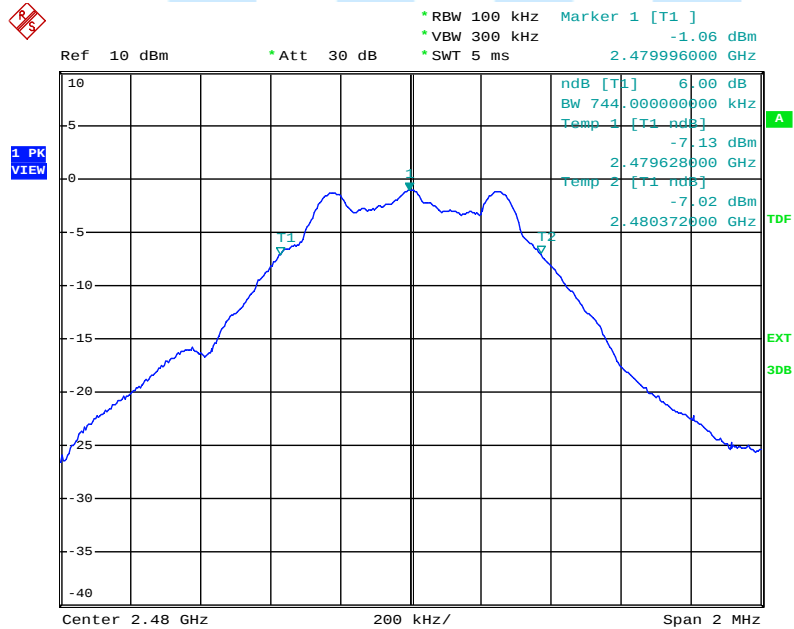


6 dB Bandwidth Plot on Configuration : Middle channel (2 440 MHz)



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6 dB Bandwidth Plot on Configuration : Highest channel (2 480 MHz)



Date: 6.JUL.2016 14:13:39



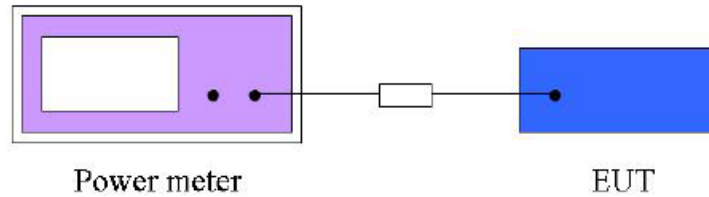


9. Conducted Maximum Peak Output Power Measurement

9.1 Operating environment

Temperature : 26.0 °C
Relative Humidity : 60.0 % R.H.

9.2 Test Set-up (Layout)



9.3 Limit

For systems using digital modulation in the (2 400~2 483.5) MHz, the limit for peak output power is 30 dBm. The limit has to be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

9.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - NRV-Z32	Rohde & Schwarz	Peak Power sensor	100049	Jan. 05, 2017
■ - NRVD	Rohde & Schwarz	Dual Channel Power Meter	837794/048	Apr. 19, 2017
■ - NRP-Z51	Rohde & Schwarz	Power sensor	1138.0005.02	Jan. 05, 2017

9.5 Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

9.6 Test Result

- Test Date : July 06, 2016
- Reference Standard : Part 15 Subpart C, Sec. 15.247(a)(2)
- Test Procedure(s) : ANSI C63.10 (2013), KDB558074 D01 DTS Meas Guidance v03r05(April 8,2016)
- Operating Condition : RF transmitting mode (Low: 2 402 MHz, Middle: 2 440 MHz, High: 2 480 MHz)
- Power Source : DC 3 V

Frequency (MHz)	Average Conducted Power ¹⁾ (dBm)	Peak Conducted Power (dBm)	Max. Limit (dBm)	Result
2 405	-0.69	-0.19	30.00	Complies
2 440	-0.61	-0.13	30.00	Complies
2 480	-0.53	-0.10	30.00	Complies

Note: 1) The Average output power is reference data for RF Exposure.

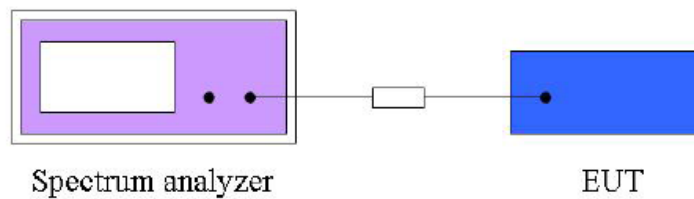


10. Power Spectral Density Measurement

10.1 Operating Environment

Temperature : 27.0 °C
Relative Humidity : 50.5 % R.H.

10.2 Test Set-up (Layout)



10.3 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

10.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Jan. 04, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20, 2017

10.5 Test Procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to 3 kHz
- Set the VBW to 10 kHz
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

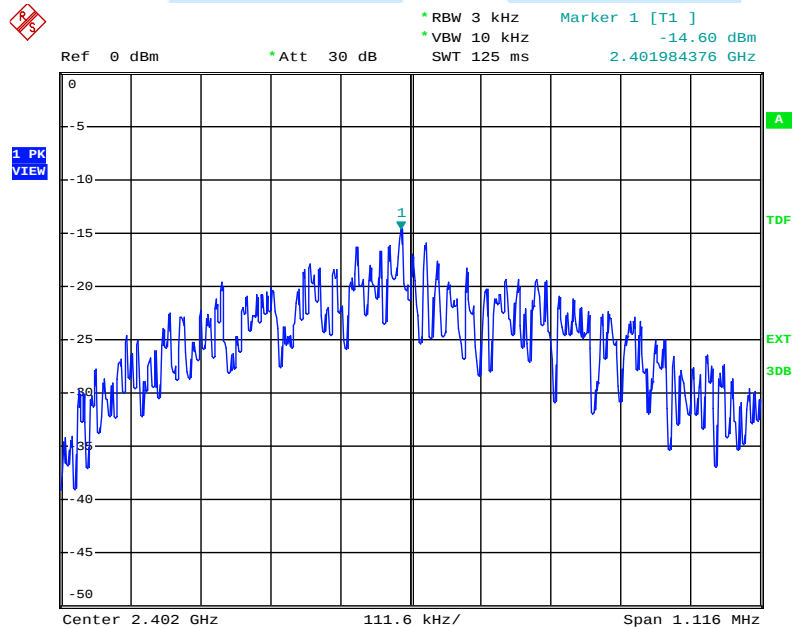


10.6 Test Result

- Test Date : July 06, 2016
- Reference Standard : Part 15 Subpart C, Sec. 15.247(e)
- Test Procedure(s) : ANSI C63.10 (2013), KDB558074 D01 DTS Meas Guidance v03r05(April 8,2016)
- Operating Condition : RF transmitting mode (Low: 2 402 MHz, Middle: 2 440 MHz, High: 2 480 MHz)
- Power Source : DC 3 V

Frequency	PSD (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
2 402 MHz	-14.60	8.00	Complies
2 440 MHz	-15.45	8.00	Complies
2 480 MHz	-15.61	8.00	Complies

Power Density Plot on configuration : Lowest channel (2 402 MHz)



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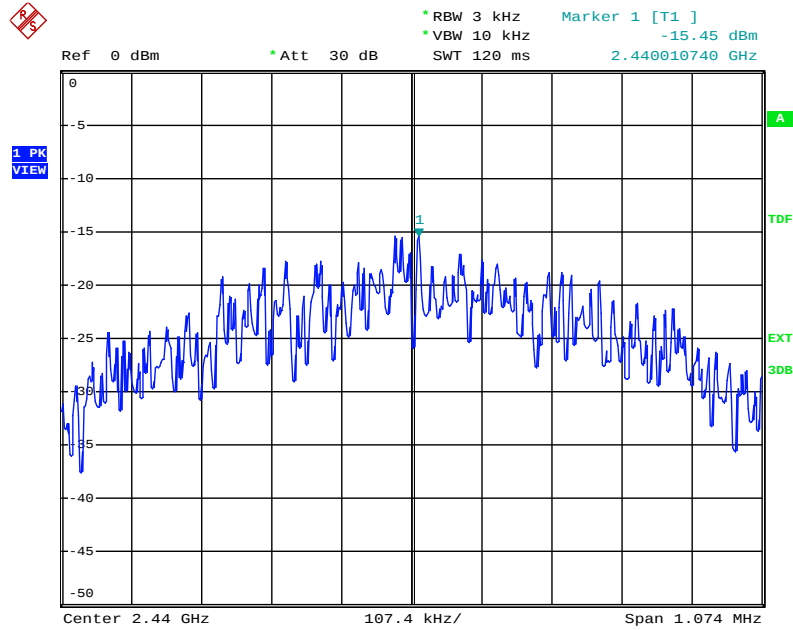
EUT Type: Magic Remote

FCC ID.: BEJMR650A



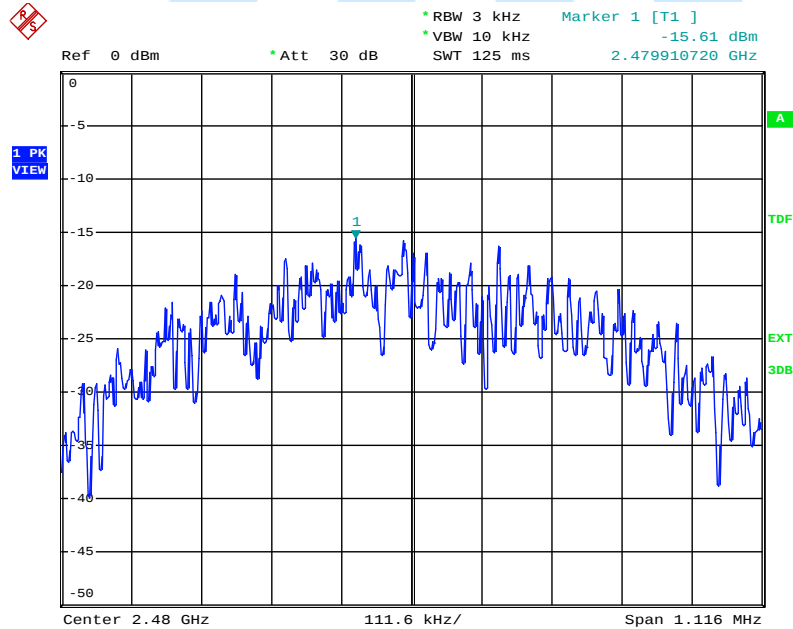


Power Density Plot on configuration : Middle channel (2 440 MHz)



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Power Density Plot on configuration : Highest channel (2 480 MHz)



Date: 6.JUL.2016 14:15:14

EUT Type: Magic Remote

FCC ID.: BEJMR650A



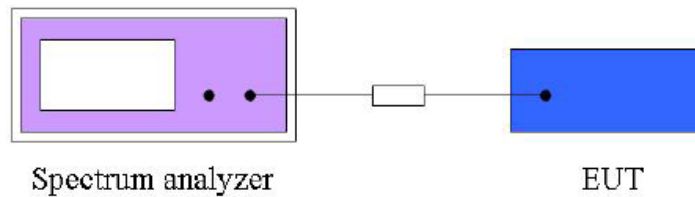


11. Conducted Spurious Emission & Out of Band Emission

11.1 Operating environment

Temperature : 26.8 °C
Relative Humidity : 50.7 % R.H.

11.2 Test set-up (Lay-out)



11.3 Limit

Below -20 dB of the highest emission level of operating band (in 100 kHz resolution band width)

11.4 Test equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSP	Rohde & Schwarz	Spectrum Analyzer	101431	Jan. 30, 2017
■ - 56-10	Weinschel	10 dB Attenuator	53184	Apr. 20, 2017

11.5 Test Procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to 3 kHz
- Set the VBW to 10 kHz
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.



11.6 Test Result

- Test Date : July 05, 2016
- Reference standard : Part 15 Subpart C, Sec. 15.247(e)
- Test Procedure(s) : ANSI C63.10 (2013), KDB558074 D01 DTS Meas Guidance v03r05(April 8,2016)
- Operating condition : RF transmitting mode (Low: 2 402 MHz, Middle: 2 440 MHz, High: 2 480 MHz)
- Power Source : DC 3 V

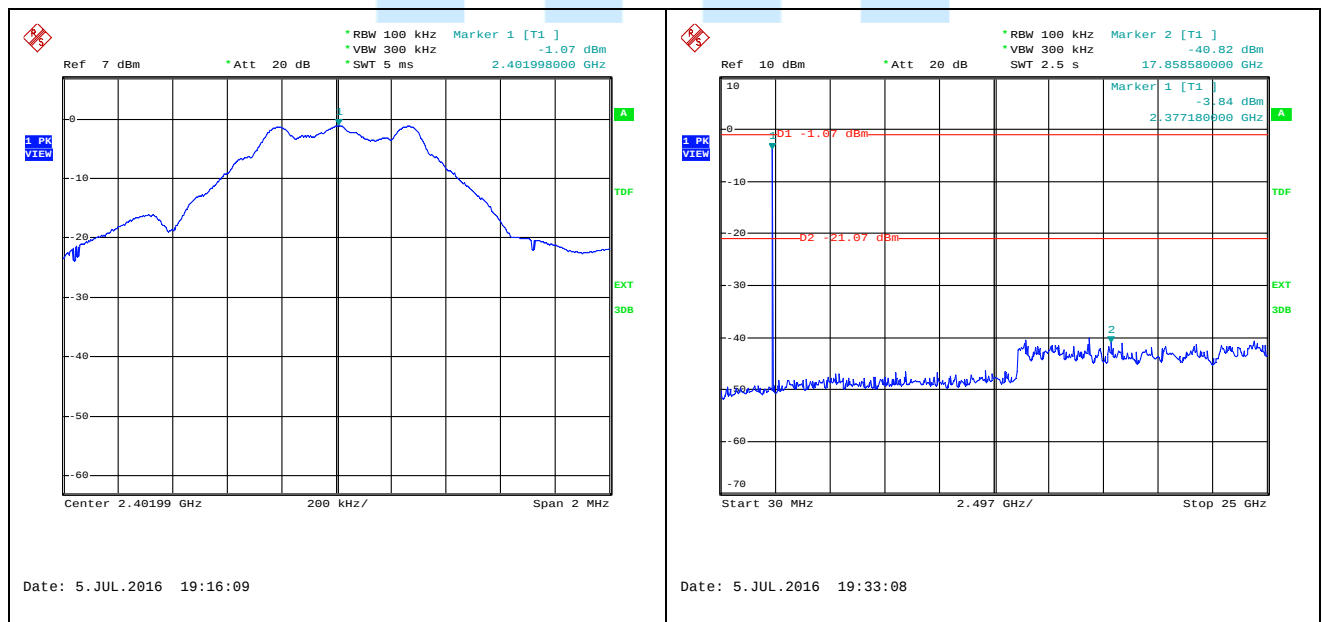
Conducted Spurious Emission

Operating Frequency	100 kHz PSD (dBm)	Spurious Level (dBm)	Deviation (dBc)	Limits (dBc)	Result
2 402 MHz	-1.07	-40.82	-39.75	-20.00	Complies
2 440 MHz	-1.00	-40.46	-39.46		Complies
2 480 MHz	-0.94	-40.86	-39.92		Complies

Conducted Out of Band(Band Edge) Emission

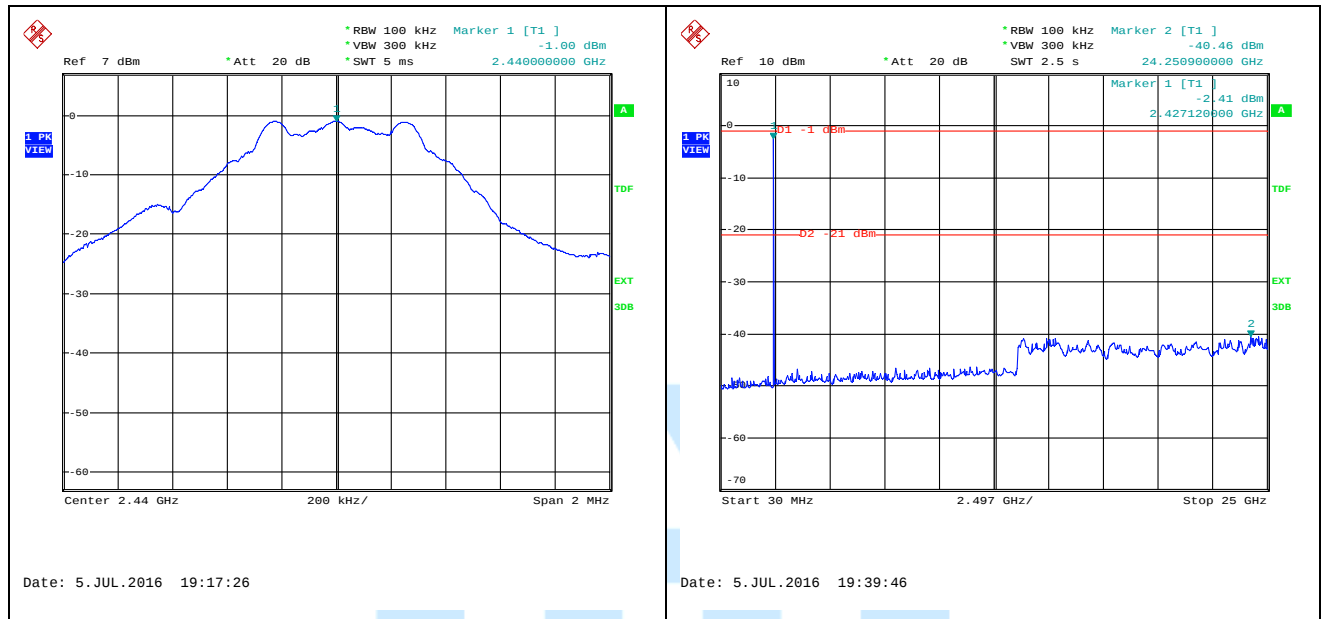
Operating Frequency	100 kHz PSD (dBm)	Bandedge Level (dBm)	Deviation (dBc)	Limits (dBc)	Result
2 402 MHz	-1.07	-48.14	-47.07	-20.00	Complies
2 480 MHz	-0.94	-43.46	-42.52		Complies

Conducted spurious Emission Plot on Configuration : Lowest channel (2 402 MHz)

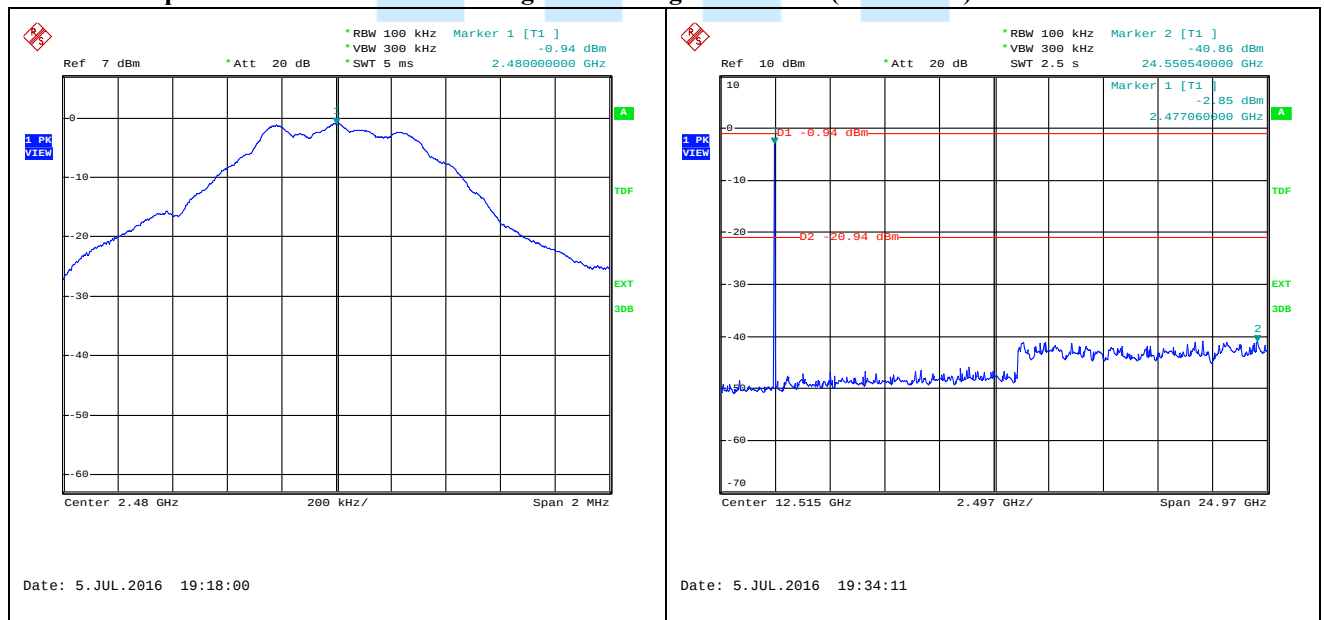




Conducted spurious Emission Plot on Configuration : Middle channel (2 440 MHz)

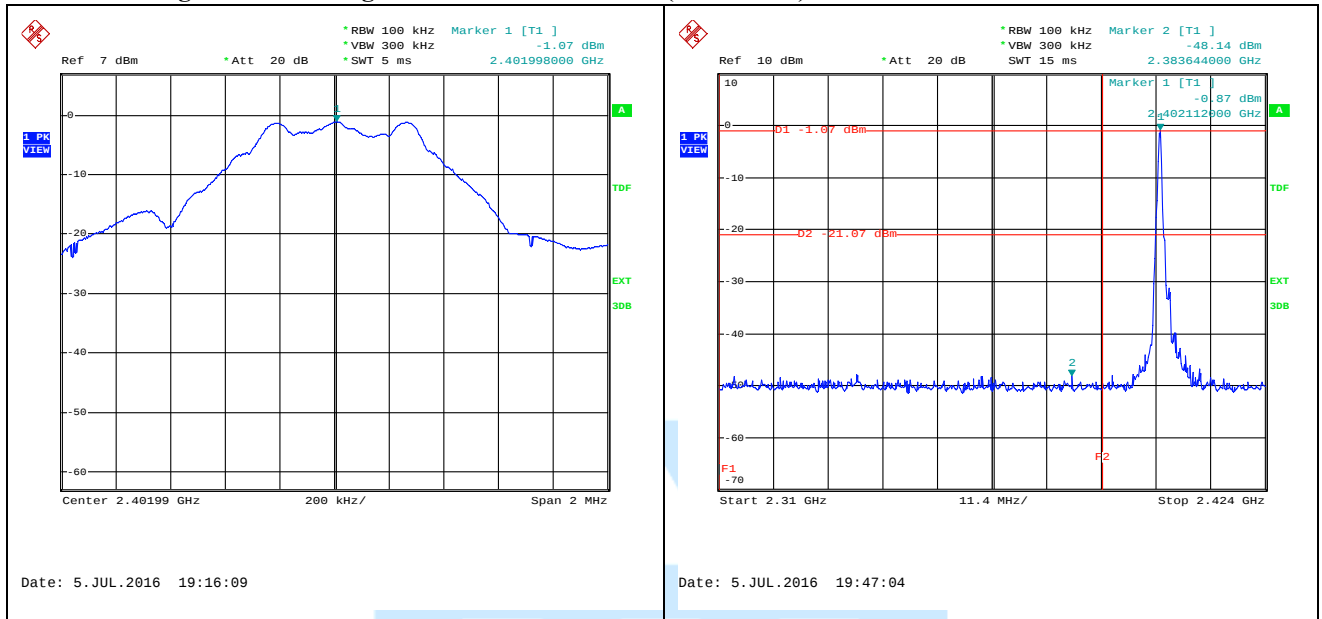


Conducted spurious Emission Plot on Configuration : Highest channel (2 480 MHz)

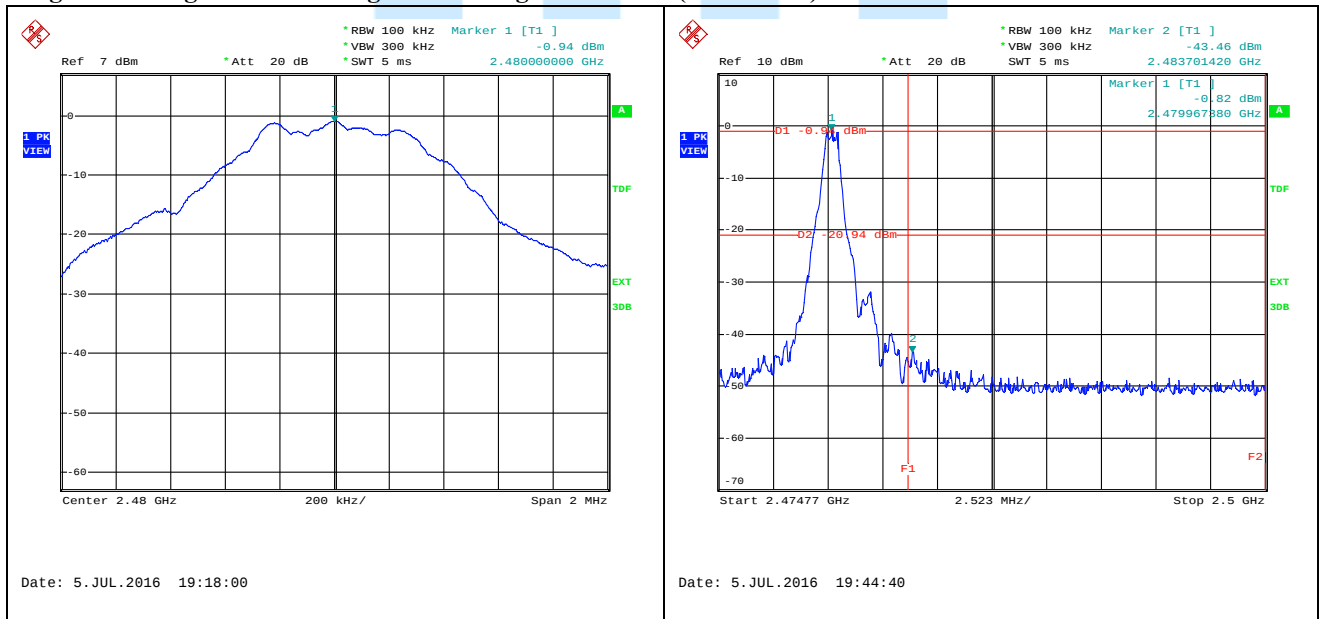




Low Band Edge Plot on Configuration : Lowest channel (2 402 MHz)



High Band Edge Plot on Configuration : Highest channel (2 480 MHz)





12. AC Power line Conducted emission

-Test Description

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (Test firm Registration Number: 269701)

The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.8 m in height and 0.4 m away from the vertical wall of the shielded enclosure.

The EUT is powered from the Rohde & Schwarz LISN (ENV216) and the support equipment is powered from the Rohde & Schwarz LISN (ENV216). Powers to the LISN are filtered by high-current high insertion loss power line filter.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCI).

Exploratory measurements were conducted to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Exploratory measurements were scanned using Peak mode of EMI Test receiver from 150 kHz to 30 MHz with 20 ms sweep time. The final measurements were measured with Quasi-Peak and Average mode.

The bandwidth of EMI Test Receiver was set to 9 kHz. Interface cables were connected to the available interface ports of the test unit. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

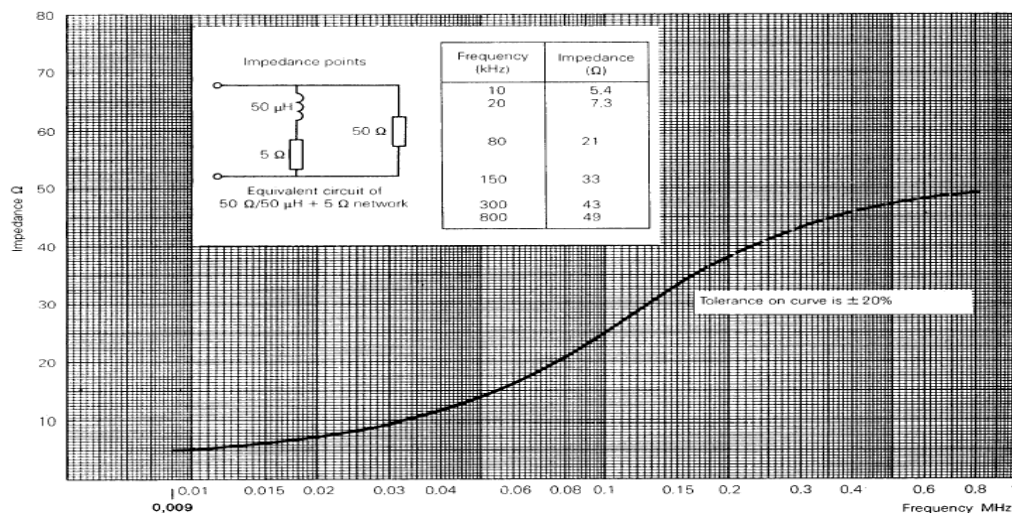


Fig 2. Impedance of LISN



12.1 Operating Environment

Temperature : - °C
Relative Humidity : - % R.H.

12.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.8 m heights above the floor, 0.4 m from the reference ground plane (GRP) wall and 0.8 m from AMN & ISN.

AMN is bonded on horizontal reference ground plane.

The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, were filtered.

12.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO "Guide to the expression of uncertainty in measurement."

The measurement uncertainty was given with a confidence of 95 %.

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	3.85 dB	Confidence level of approximately 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	3.32 dB	Confidence level of approximately 95 % ($k = 2$)



12.4 Limit

RFI Conducted	FCC Limit(dBμV/m) Class B	
Freq. Range	Quasi-Peak	Average
150 kHz ~ 0.5 MHz	66 ~ 56*	56 ~ 46*
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50
*Limits decreases linearly with the logarithm of frequency.		

12.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
☐ - ESCI	Rohde & Schwarz	EMI test receiver	100237	Apr 23. 2016
☐ - ENV216	Rohde & Schwarz	LISN	100172	Apr 23. 2016
☐ - ENV216	Rohde & Schwarz	LISN	100173	Apr 23. 2016
☐ - ISN T8	TESEQ. GmbH	ISN	24568	Apr 27. 2016

12.6 Test data for Conducted Emission

- Test Date :
- Reference Standard :
- Test Procedure(s) :
- Operating Condition :
- Frequency range :
- Comment : Not applicable
※ The EUT is supplied power from battery. Therefore this test was not applicable.

13. Radiated Spurious & Restricted Band Edge Emission

Exploratory Radiated measurements were conducted at the 3m semi anechoic chamber in order to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Final measurements of below 1GHz were made at 3m or 10 m Chamber that complies with CISPR 16/ANSI C63.10. Above 1GHz final measurements were conducted at the 3m Chamber only.

For measurements above 1GHz, the bottom side of 3m chamber was installed with absorbers in order to meet SVSWR Limit.

Exploratory measurements were scanned using Peak mode of EMI Test receiver and final measurements were measured with Quasi-Peak mode (Below 1GHz) and Peak & Average mode (Above 1GHz).

The measurements were performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity.

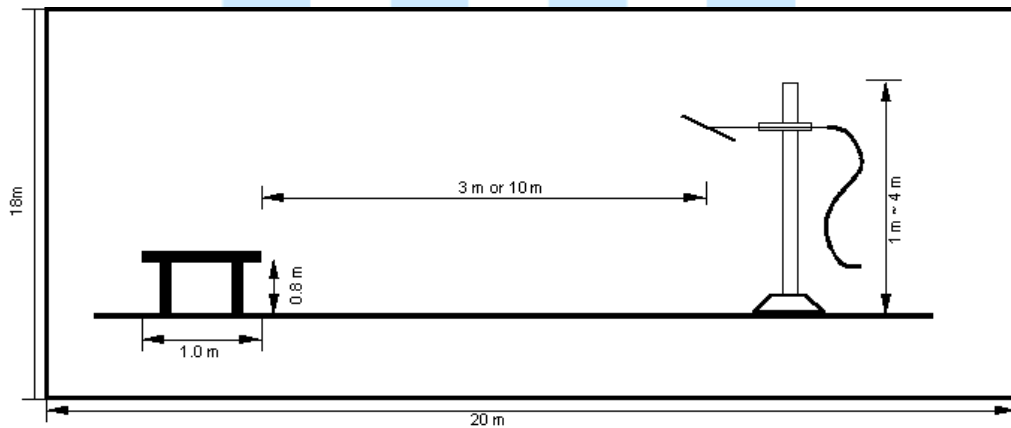


Fig 3. Dimensions of test site (Below 1GHz)

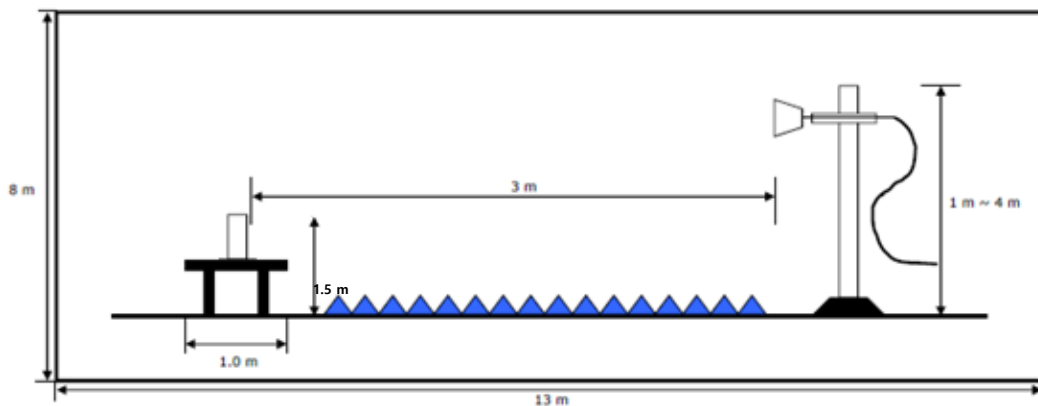


Fig 4. Dimensions of test site (Above 1GHz)



13.1 Operating environment

Temperature : 21.5 °C
Relative humidity : 50.9 % R.H.

13.2 Test set-up

A preliminary and final measurement was at 3 m anechoic chamber.

The EUT was placed on a non-conducting table.

For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane.

For emission measurements above 1 GHz, the table height is 1.5 m above the reference ground plane.

The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels.

This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

13.3 Measurement uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.

The measurement uncertainty was given with a confidence of 95 %.

Test items(Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	4.78 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	4.77 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	5.06 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	5.03 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m, V/H)	5.42 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (6 000 MHz ~ 18 000 MHz, 3 m, V/H)	5.64 dB	Confidence level of approximately 95 % ($k = 2$)



13.4 Limit

20 dB in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2 400/F (kHz)	300
0.490 ~ 1.705	2 400/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

13.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	Apr. 18, 2017
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	100041	Dec. 21, 2017
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3099	Aug. 03. 2017
■ - BBHA9120D	Schwarzbeck	Horn Antenna	207	Mar. 15. 2018
■ - 3160-09	Schwarzbeck	Horn Antenna	LM3981	Nov. 29. 2017
■ - MCU066	maturo GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ - AM 4.0	maturo GmbH	Antenna Mast	1390308	N/A
■ - AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258943	Jan. 05. 2017
■ - SCU-F1826-G47-BZ42-CSS	BONN Elektronik	Preamplifier	10003	Jan. 12. 2017



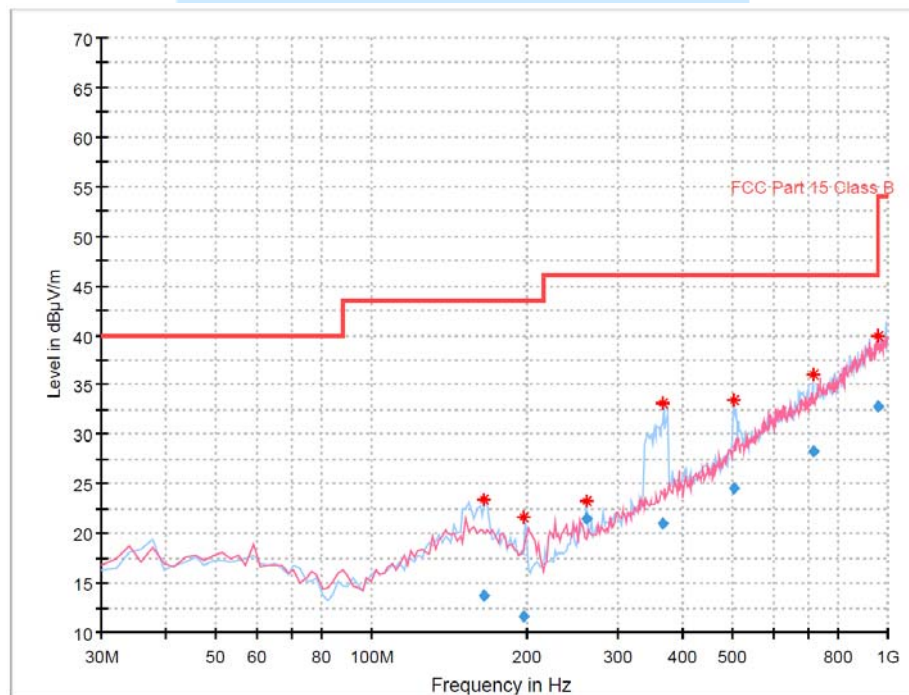
13.6 Test data for Radiated Spurious Emission

- Test Date : July 04, ~ 07, 2016
- Reference Standard : Part 15 Subpart C, Sec. 15.247(d)
- Measuring Distance : 3 m
- Spectrum Resolution : 200 Hz / 9 kHz / 120 kHz / 1 MHz
Bandwidth(6 dB)
- Detector mode : Quasi Peak detector mode / Peak detector mode
- Power Source : DC 3.0 V
- Note : Through three orthogonal axes were investigated and the worst case is report

Radiated Spurious Emission (9 kHz to 30 MHz): Lowest channel (2 480 MHz)

※ The emission level was not found.

Radiated Spurious Emission (30 MHz to 1 000 MHz): Highest channel (2 480 MHz)



Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
164.844689	13.76	43.50	29.74	1000.0	120.000	308.0	H	297.0	15.1
196.698397	11.63	43.50	31.87	1000.0	120.000	207.0	H	137.0	12.4
260.175350	21.43	46.00	24.57	1000.0	120.000	120.0	H	131.0	15.5
367.039078	20.98	46.00	25.02	1000.0	120.000	107.0	H	245.0	19.2
502.219439	24.50	46.00	21.50	1000.0	120.000	203.0	H	317.0	22.9
715.946894	28.29	46.00	17.71	1000.0	120.000	109.0	H	232.0	28.1
957.389780	32.77	46.00	13.23	1000.0	120.000	112.0	V	210.0	32.5



Radiated Spurious Emission (1 GHz to 25 GHz): Lowest channel (2402 MHz)

Frequency [MHz]	Pol.	Reading [dBuV]	Transducer Factor [dB]	DCCF [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
2280.72	V	54.05	-11.30	-	42.75	74.00	31.25	PK
2353.75	V	58.39	-11.00	-	47.39	74.00	26.61	PK
2488.24	H	55.61	-10.50	-	45.11	74.00	28.89	PK
4804.52	H	66.42	-5.30	-	61.12	74.00	12.88	PK
4804.52	H	-	-	-17.6	43.52	54.00	10.48	AV
7205.34	H	58.72	3.80	-	62.52	74.00	11.48	PK
7205.34	H	-	-	-17.6	44.92	54.00	9.08	AV
9607.14	V	44.34	10.70	-	55.04	74.00	18.96	PK
9607.14	V	-	-	-17.6	37.80	54.00	16.20	AV

Radiated Spurious Emission (1 GHz to 25 GHz): Middle Channel (2440 MHz)

Frequency [MHz]	Pol.	Reading [dBuV]	Transducer Factor [dB]	DCCF [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
2389.72	H	58.16	-10.80	-	47.36	74.00	26.64	PK
2485.71	V	58.53	-10.50	-	48.03	74.00	25.97	PK
2529.78	H	54.48	-10.50	-	43.98	74.00	30.02	PK
4880.54	H	65.26	-5.10	-	60.16	74.00	13.84	PK
4880.54	H	-	-	-17.6	42.56	54.00	11.44	AV
7320.71	H	57.30	4.50	-	61.80	74.00	12.20	PK
7320.71	H	-	-	-17.6	44.20	54.00	9.80	AV
9759.21	H	44.66	11.00	-	55.66	74.00	18.34	PK
9759.21	H	-	-	-17.6	38.06	54.00	15.94	AV



Radiated Spurious Emission (1 GHz to 25 GHz): Highest channel (2480 MHz)

Frequency [MHz]	Pol.	Reading [dBuV]	Transducer Factor [dB]	DCCF [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
1113.08	V	54.74	-14.30	-	40.44	74.00	33.56	PK
2389.31	H	54.84	-10.80	-	44.04	74.00	29.96	PK
2524.08	H	58.08	-10.50	-	47.58	74.00	26.42	PK
4960.54	H	63.22	-4.80	-	58.42	74.00	15.58	PK
4960.54	H	-	-	-17.60	40.82	54.00	13.18	AV
7439.35	V	58.68	5.10	-	63.78	74.00	10.22	PK
7439.35	V	-	-	-17.60	46.18	54.00	7.82	AV
9920.87	H	44.19	11.30	-	55.49	74.00	18.51	PK
9920.87	H	-	-	-17.60	37.89	54.00	16.11	AV

Note:

If the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

Emission level (dBuV/m) = 20 log × Emission level (μV/m).

Test Result = Antenna factor + Cable loss + Preamplifier gain + High Pass Filter + Reading value

Average calculation = Peak – D.C.C.F(dB)

D.C.C.F (Duty Cycle Collection Factor) : $20\log(1.976/12.500) = -16.02$ dB

Pol.: H(Horizontal), V(Vertical)



13.7 Test data for Radiated Restricted Band Edge Emission

- Test Date : July 04, ~ 05, 2016
- Reference Standard : Part 15 Subpart C, Sec. 15.247(d)
- Measuring Distance : 3 m
- Spectrum Resolution : RBW (1 MHz), VBW (3 MHz)
Bandwidth(3dB)
- Detector mode : Peak detector mode
- Power Source : DC 3.0 V
- Note : Through three orthogonal axes were investigated and the worst case is report

Lowest channel (2402 MHz)

Frequency [MHz]	Pol.	Reading [dBuV]	Transducer Factor [dB]	DCCF [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
2390.00	H	66.02	-10.8	-	55.22	74.00	18.78	Peak
2390.00	H	37.62	-	-17.60	37.62	54.00	16.38	AV

Highest channel (2480 MHz)

Frequency [MHz]	Pol.	Reading [dBuV]	Transducer Factor [dB]	DCCF [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
2483.50	V	75.15	-10.6	-	64.55	74.00	9.45	PK
2483.50	V	46.95	-	-17.60	46.95	54.00	7.05	AV

Note:

Emission level (dBμV/m) = 20 log × Emission level (μV/m).

Test Result = Antenna factor + Cable loss + Preamplifier gain + Reading value

Average calculation = Peak – D.C.C.F(dB)

D.C.C.F (Duty Cycle Collection Factor) : 20log (1.976/12.500) = - 16.02 dB

Pol.: H(Horizontal), V(Vertical)



14. Sample Calculations

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \text{ Log}_{10}(\mu\text{V}/\text{m}) \\ \text{dB}\mu\text{V} &= \text{dBm} + 107 \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

14.1 Example 1 :

■ 20.3 MHz

Class B Limit	= 250 μV = 48 dB μV
Reading	= 39.2 dB μV
$10^{(39.2\text{dB}\mu\text{V}/20)}$	= 91.2 μV
Margin	= 48 dB μV - 39.2 dB μV = 8.8 dB

14.2 Example 2 :

■ 66.7 MHz

Class B Limit	= 100 $\mu\text{V}/\text{m}$ = 40.0 dB $\mu\text{V}/\text{m}$
Reading	= 31.0 dB μV
Antenna Factor + Cable Loss	= 5.8 dB
Total	= 36.8 dB $\mu\text{V}/\text{m}$
Margin	= 40.0 dB $\mu\text{V}/\text{m}$ – 36.8 dB $\mu\text{V}/\text{m}$ = 3.2 dB



15. Recommendation & Conclusion

The data collected shows that the **LG Electronics USA. RF Magic Remote (Model Name: AN-MR650A)** was complies with §15.247 of the FCC Rules.

- The end -

