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**HCT**

# TEST REPORT

EMI Test for FCC Certification / ISED of MR20GA

**APPLICANT**

LG Electronics, Inc.

**REPORT NO.**

HCT-EM-1905-FI010

**DATE OF ISSUE**

May 27, 2019

**HCT Co., Ltd.**

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FCC Certification  
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REPORT NO.  
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May 27, 2019

FCC ID / IC  
BEJMR20GA / 2703H-MR20GA

Applicant **LG Electronics, Inc.**  
222. LG-ro. Jinwi-mveon. Pveongtaek-si. Gyeonggi-do. 451-713 South Korea

Product Name **Magic Remote**  
Model Name **MR20GA**

Date of Test **May 20, 2019 to May 21, 2019**

Test Standard Used **FCC CFR 47 PART 15 Subpart B Class B / ICES-003 Issue 6 Class B  
ANSI C63.4-2014**

Test Results **Refer to the present document**

Manufacturer **LG Electronics Inc.**

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

Tested by  
Kyoung-Hee Yoon

(signature)

Technical Manager  
Jeong-Hyun Choi

(signature)

## REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	May 27, 2019	Initial Release

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. (See Test Report if any modifications were made for compliance)

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.

HCT certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

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## 1. GENERAL INFORMATION

### 1.1 Description of EUT

Its basic purpose is used for communications.

<b>FCC ID</b>	BEJMR20GA
<b>IC</b>	2703H-MR20GA
<b>Model</b>	MR20GA
<b>EUT Type</b>	Magic Remote
<b>Frequency Range</b>	2 402 MHz to 2 480 MHz (Bluetooth)
<b>Power Source</b>	AA 1.5 V, 2 alkaline batteries are used
<b>Manufacturer</b>	LG Electronics, Inc.
<b>Factory's Information</b>	<p>Hansung Electronics Co., LTD</p> <p>1. 49-29, Cheomdangieop 4-ro, Sandong-myeon, Gumi-si, Gyeongsangbuk-do, Korea</p> <p>2. Kawasan Industri Batik Lippo Cikarang Jl.Palemn 1Block Ds-6, Cibatu, Cikarang Selatan, Bekasi, Jawa Barat, Indonesia</p> <p>OHSUNG Electronics CO., LTD.</p> <p>1. 335-4, Sanho-daero, Gumi-si, Gyeongsangbuk-do, KOREA</p> <p>2. No.188 Tunpu South Road, Qiushe Economic Development Zone, Tongli Town, Wujiang City, Jiangsu Province</p> <p>3. Jl. Selayar Blok D7 Kawasan Industri MM 2100, Mekarwangi, Cikarang Barat 17845 Jawa Barat, Indonesia</p> <p>4. CERRADA CENTINELA 1719, PARQUE INDUSTRIAL CACHANILLA, MEXICALI, BAJA CALIFORNIA, MEXICO 21394</p>

### 1.2 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Model Name	Serial Number	Manufacturer
EUT	MR20GA	-	LG

### 1.3 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	-	N/A	N/A	-

### 1.4 Noise Suppression Parts on Cable (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	-	N/A	N/A	N/A	-

NOTE. This product is a wireless remote controller, it does not have a port to connect peripherals and has a built-in battery (DC 3 V).

### 1.5 Test Facility

Test site is located at 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, South Korea. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1 GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014

Measurement Facilities	Designation No.
Radiated Field strength measurement facility 3 m Semi Anechoic chamber	KR0032
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #1	
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #2	

### 1.6 Calibration of Measuring Instrument

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).

### 1.7 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. 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.

Parameter	Expanded Uncertainty
Conducted Emission (0.15 MHz to 30 MHz)	1.82 dB
Radiated Emissions (30 MHz to 1 GHz)	5.20 dB
Radiated Emissions (1 GHz to 18 GHz)	5.24 dB
Radiated Emissions (18 GHz to 40 GHz)	5.40 dB

## 2. DESCRIPTION OF TEST

### 2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 7.3

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).

If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).

Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.

c. The frequency range from 150 kHz to 30 MHz was searched.

#### Conducted Emission Limits

Frequency (MHz)	Resolution Bandwidth (kHz)	Class A		Class B	
		Quasi-Peak (dBµV)	Average (dBµV)	Quasi-Peak (dBµV)	Average (dBµV)
0.15 to 0.5	9	79	66	66 to 56*	56 to 46*
0.5 to 5	9	73	60	56	46
5 to 30	9	73	60	60	50

NOTE. Decreases with the logarithm of the frequency.



## 2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 8.3

- a. The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- g. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. (1 GHz to 40 GHz)

### Radiated Emission Limits

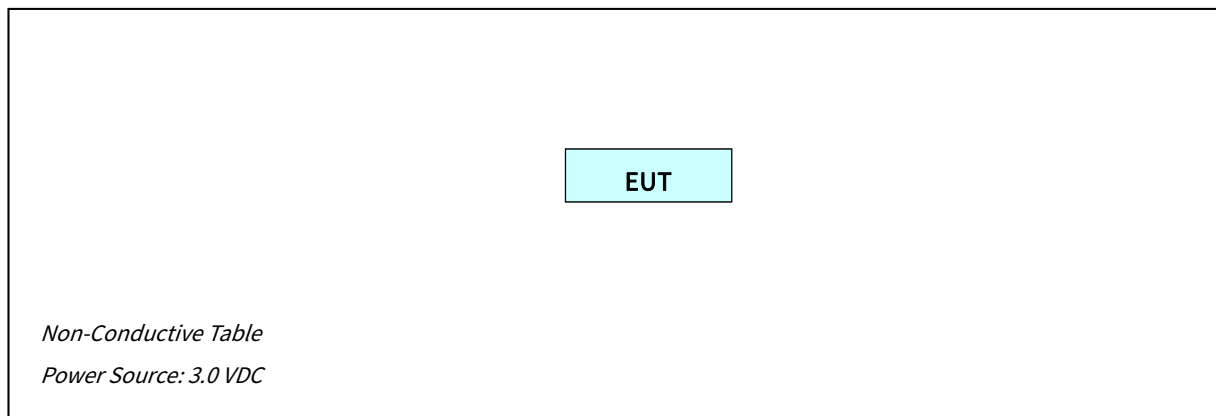
Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)	
Above 1 000	3	80	60	74	54	

### 2.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower
Below 1.705	30

### 2.3 Configuration of Tested System



### 3. PRELIMINARY TEST

#### 3.1 Conducted Emission

It was tested the following operating mode, after connecting all peripheral devices.

**Operating Modes:** Not applicable

#### 3.2 Radiated Emission

It was tested the following operating mode, after connecting all peripheral devices.

**Operating Mode:** Bluetooth Idle mode

## 4. CONDUCTED EMISSION AND RADIATED EMISSION TEST SUMMARY

### 4.1 Conducted Emission (Not applicable)

#### 4.1.1 Measuring instruments

Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
<input type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.25.2018
<input type="checkbox"/> LISN	Rohde & Schwarz	ENV216	102245	1 year	12.12.2018
<input type="checkbox"/> LISN	Rohde & Schwarz	ENV216	100073	1 year	04.30.2019
<input type="checkbox"/> Software	Rohde & Schwarz	EMC32 VER8.54.0	-	-	-

#### 4.1.2 Operating Condition

The test results of conducted emission at mains ports provide the following information:

<b>Test Standard Used</b>	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
<b>Detector</b>	Quasi-Peak, CISPR-Average
<b>Bandwidth</b>	9 kHz (6 dB)
<b>Operating Mode</b>	-
<b>Kind of Test Site</b>	Shielded Room
<b>Temperature</b>	- °C
<b>Relative Humidity</b>	- %
<b>Test Date</b>	-

## 4.2 Radiated Emission Below 1 GHz

### 4.2.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
<input checked="" type="checkbox"/>	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	07.27.2018
<input checked="" type="checkbox"/>	Trilog antenna	Schwarzbeck	VULB 9168	255	2 year	03.26.2019
<input checked="" type="checkbox"/>	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
<input checked="" type="checkbox"/>	Antenna master controller	INNCO Systems	CO 3000	CO3000/870/ 35990515/L	N/A	-
<input checked="" type="checkbox"/>	Turn Table	INNCO Systems	1060	-	N/A	-
<input checked="" type="checkbox"/>	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
<input checked="" type="checkbox"/>	Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-

### 4.2.2 Operating Condition

The test results of radiated emission provide the following information:

<b>Used Test Standard</b>	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
<b>Detector</b>	Quasi-Peak
<b>Bandwidth</b>	120 kHz (6 dB)
<b>Operating Mode</b>	Bluetooth Idle mode
<b>Kind of Test Site</b>	3 m semi anechoic chamber
<b>Temperature</b>	22.5 °C
<b>Relative Humidity</b>	44.6 %
<b>Test Date</b>	May 20, 2019

#### 4.2.3 Measuring Data

Frequency (MHz)	Quasi Peak (dB $\mu$ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
30.630835	16.1	193.9	V	214.0	18.4	23.9	40.0
45.357600	16.7	292.8	V	106.0	19.4	23.3	40.0
65.482400	16.3	125.0	V	130.0	18.7	23.7	40.0
114.547200	13.9	225.0	V	145.0	16.8	29.6	43.5
416.928800	21.0	117.8	V	343.0	23.3	25.0	46.0
690.557600	27.7	225.0	V	92.0	28.7	18.3	46.0

#### - Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak

### 4.3 Radiated Emission Above 1 GHz

#### 4.3.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
<input checked="" type="checkbox"/>	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	07.27.2018
<input checked="" type="checkbox"/>	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
<input checked="" type="checkbox"/>	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
<input checked="" type="checkbox"/>	Turn table	INNCO Systems	1060	-	N/A	-
<input checked="" type="checkbox"/>	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
<input checked="" type="checkbox"/>	Horn antenna	Schwarzbeck	BBHA 9120D	01836	2 year	07.20.2018
<input checked="" type="checkbox"/>	Low Noise amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
<input checked="" type="checkbox"/>	Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-

#### 4.3.2 Operating Condition

The test results of radiated emission provide the following information:

<b>Used Test Standard</b>	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
<b>Detector</b>	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Average (RBW: 1 MHz, VBW: 10 Hz)
<b>Highest Frequency</b>	2 480 MHz
<b>Tested Frequency Range</b>	1 GHz to 18 GHz
<b>Operation Mode</b>	Bluetooth Idle mode
<b>Kind of Test Site</b>	3 m semi anechoic chamber
<b>Temperature</b>	22.6 °C
<b>Relative Humidity</b>	43.8 %
<b>Test Date</b>	May 21, 2019

### 4.3.3 Measuring Data

Frequency (MHz)	Peak (dB $\mu$ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
1782.890000	32.2	150.0	H	236.0	-25.4	41.8	74.0
2679.875000	38.8	306.5	H	43.0	-22.5	35.2	74.0
4598.490000	44.5	307.4	V	288.0	-17.1	29.5	74.0
6483.635000	42.0	299.4	V	177.0	-11.9	32.0	74.0
8442.900000	46.3	322.6	H	301.0	-8.3	27.7	74.0
11268.100000	48.3	150.0	V	239.0	-2.4	25.7	74.0

Frequency (MHz)	CAverage (dB $\mu$ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
1782.890000	19.9	150.0	H	236.0	-25.4	34.1	54.0
2679.875000	26.9	306.5	H	43.0	-22.5	27.1	54.0
4598.490000	25.3	307.4	V	288.0	-17.1	28.7	54.0
6483.635000	29.5	299.4	V	177.0	-11.9	24.5	54.0
8442.900000	33.6	322.6	H	301.0	-8.3	20.4	54.0
11268.100000	35.6	150.0	V	239.0	-2.4	18.4	54.0

#### - Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. Peak or CAverage = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
4. Margin = Limit - Peak or CAverage



## 5. CONCLUSION

The data collected shows that the **EUT Type: Magic Remote, Model: MR20GA** complies with § 15.107 and § 15.109 of the FCC rules and ICES-003 Issue 6 of the IC rules.

## 6. APPENDIX A. TEST SETUP PHOTO

Please refer to Appendix. A

File No.	Date of Issue	Description
HCT-EM-1905-FI010-P	May 27, 2019	Initial Release

End of report