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TEST REPORT

EMI Test for FCC Certification of MR22GA Model

APPLICANT
LG Electronics Inc.

REPORT NO.
HCT-EM-2106-FC004

DATE OF ISSUE
June 22, 2021

Tested by
Hyun-Jin Lim

(signature)

Technical Manager
Kyoung-Hee Yoon

(signature)

Accredited by KOLAS, Republic of KOREA

HCT CO., LTD.

Bongjai Huh

BongJai Huh / CEO

HCT Co., Ltd.

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA

Tel. +82 31 645 6300 Fax. +82 31 645 6401

Page 1 of 18



HCT Co., Ltd.

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 645 6300 Fax. +82 31 645 6401



<h1 style="margin: 0;">TEST REPORT</h1> <p style="margin: 0;">EMI Test for FCC Certification</p>	<p>REPORT NO. HCT-EM-2106-FC004</p> <p>DATE OF ISSUE June 22, 2021</p> <p>FCC ID. BEJMR22GA</p>
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Applicant	<p>LG Electronics Inc. 222, LG-ro, Jinwi-myeon, Pyeontaek-si, Gyeonggi-do, 17709, KOREA</p>
Product Name Model Name	<p>Magic Remote MR22GA</p>
Date of Test	<p>June 08, 2021 to June 09, 2021</p>
Test Standard Used	<p>FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014</p>
Test Results	<p>Refer to the present document</p>
Manufacturer	<p>LG Electronics Inc.</p>

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
 This test results were applied only to the test methods required by the standard.
 This laboratory is not accredited for the test results marked *.
 The contents marked ** is information provided by the customer.



REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	June 22, 2021	Initial Release

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (KOLAS Accreditation No. KT197)

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr



CONTENTS

1. GENERAL INFORMATION	5
1.1 Description of EUT	5
1.2 Tested System Details	5
1.3 Cable Description	6
1.4 Noise Suppression Parts on Cable. (I/O Cable)	6
1.5 Test Facility	7
1.6 Calibration of Measuring Instrument	7
1.7 Measurement Uncertainty	7
2. DESCRIPTION OF TEST	8
2.1 Measurement of Conducted Emission	8
2.2 Measurement of Radiated Emission	9
2.3 Configuration of Tested System	10
3. PRELIMINARY TEST	11
3.1 Conducted Emission	11
3.2 Radiated Emission	11
4. EMISSION TEST SUMMARY	12
4.1 Conducted Emission	12
4.2 Radiated Emission Below 1 GHz	13
4.3 Radiated Emission Above 1 GHz	15
5. CONCLUSION	17
6. APPENDIX A. TEST SETUP PHOTOGRAPHS	18



1. GENERAL INFORMATION

1.1 Description of EUT

The EUT is Magic Remote.

FCC ID	BEJMR22GA
Model Name	MR22GA
Product Name	Magic Remote
Frequency Range	Bluetooth: 2 402 MHz to 2 480 MHz
Power Supply	Normal voltage: DC 3.0 V Extreme lower voltage: DC 2.4 V Extreme upper voltage: DC 3.2 V
Manufacturer	LG Electronics Inc.
Factory	Hansung Electronics Co., LTD 1) 49-29, Cheomdangieop 4-ro, Sandong-myeon, Gumi-si, Gyeongsangbuk-do, Korea 2) Kawasan Industri Batik Lippo Cikarang Jl.Palemn 1Block Ds-6, Cibatu, Cikarang Selatan, Bekasi, Jawa Barat, Indonesia
	OHSUNG Electronics CO., LTD. 1) 335-4, Sanho-daero, Gumi-si, Gyeongsangbuk-do, KOREA 2) No.188 Tunpu South Road, Qiushe Economic Development Zone, Tongli Town, Wujiang City, Jiangsu Province, China 3) Jl. Selayar Blok D7 Kawasan Industri MM 2100, Mekarwangi, Cikarang Barat 17845 Jawa Barat, Indonesia 4) CERRADA CENTINELA 1719, PARQUE INDUSTRIAL CACHANILLA, MEXICALI, BAJA CALIFORNIA, MEXICO 21394

NOTE. This product is a wireless remote controller, it does not have a port to connect peripherals and has a built-in battery. (DC 3.0 V)

1.2 Tested System Details

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

Device Type	Model Name	Serial Number	Manufacturer
Magic Remote	MR22GA	-	LG Electronics



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	N/A

"(D)" Data Cable, "(P)" Power Cable.

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	



1.5 Test Facility

Test site is located at 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Rep. of 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. This testing laboratories are accredited and accordance with the recognized international Standard ISO/IEC 17025:2017. (KOLAS, Accreditation No. KT197)

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 C63.5:2017

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.

Test Item	Test Site (Chamber)	Expanded Uncertainty
Radiated Emission (30 MHz to 1 GHz)	3 m Semi Anechoic Chamber #1	4.9 dB
Radiated Emission (1 GHz to 18 GHz)	3 m Semi Anechoic Chamber #1	4.6 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 $50 \Omega / 50 \mu\text{H}$ 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]

FCC Part15 Subpart B

Frequency (MHz)	Class A		Class B	
	Quasi-Peak (dB μV)	Average (dB μV)	Quasi-Peak (dB μV)	Average (dB μV)
0.15 to 0.5	79	66	66 to 56*	56 to 46*
0.5 to 5	73	60	56	46
5 to 30	73	60	60	50

[*] 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]

FCC Part15 Subpart B

Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength ($\mu\text{V}/\text{m}$)	Quasi-Peak (dB $\mu\text{V}/\text{m}$)	Antenna Distance (m)	Field Strength ($\mu\text{V}/\text{m}$)	Quasi-Peak (dB $\mu\text{V}/\text{m}$)
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 (dB $\mu\text{V}/\text{m}$)	Average (dB $\mu\text{V}/\text{m}$)	Peak (dB $\mu\text{V}/\text{m}$)	Average (dB $\mu\text{V}/\text{m}$)	
Above 1 000	3	80	60	74	54	



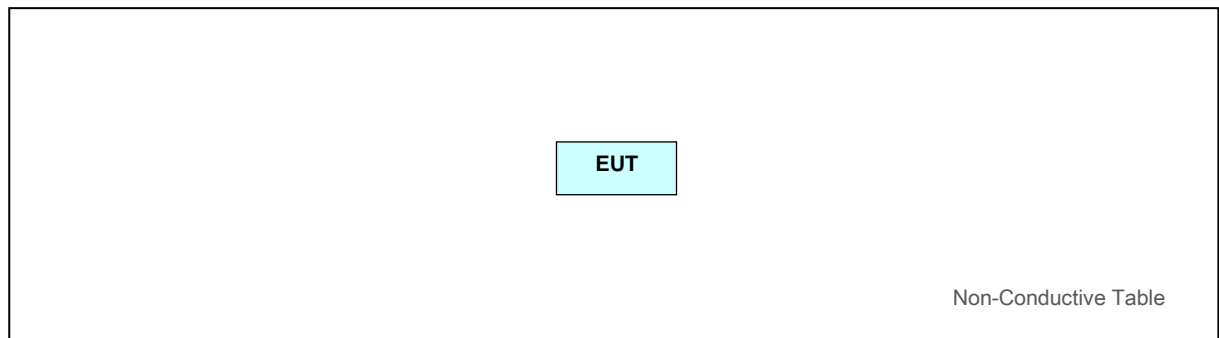
2.2.1 Frequency Range of Radiated Measurements

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

FCC Part15 Subpart B

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

2.3 Configuration of Tested System



3. PRELIMINARY TEST

3.1 Conducted Emission (Not Applicable)

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

Operating Modes: Not applicable

NOTE. This product is a wireless remote controller, it does not have a port to connect peripherals and has a built-in battery.
(DC 3.0 V)

3.2 Radiated Emission

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

Operating Modes: IDLE mode



4. CONDUCTED EMISSION AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission (Not Applicable)

4.1.1 Measuring instruments

Type	Model Name	Manufacturer	Serial Number	Calibration Cycle	Calibration Date
<input type="checkbox"/> EMI test receiver	ESR7	Rohde & Schwarz	101910	1 year	09.16.2020
<input type="checkbox"/> LISN	ENV216	Rohde & Schwarz	102245	1 year	09.04.2020
<input type="checkbox"/> LISN	ENV216	Rohde & Schwarz	100073	1 year	04.07.2021
<input type="checkbox"/> Software	EMC32	Rohde & Schwarz	-	-	-

4.1.2 Operating Condition

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

Test Standard Used	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Frequency Range	0.15 MHz to 30 MHz
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Test Site	EMI Shield Room
Temperature	- °C
Relative Humidity	- %
Test Date	-

- Calculation Formula:**
1. Conductor L1 = Hot, Conductor N = Neutral
 2. Corr. = LISN Factor + Cable Loss
 3. QuasiPeak or CAverage= Receiver Reading + Corr.
 4. Margin = Limit – QuasiPeak or CAverage

4.1.3 Measuring Data

Not applicable

4.2 Radiated Emission Below 1 GHz

4.2.1 Measuring instruments

Type	Model Name	Manufacturer	Serial Number	Calibration Cycle	Calibration Date
<input checked="" type="checkbox"/> EMI test receiver	ESU40	Rohde & Schwarz	100524	1 year	05.10.2021
<input checked="" type="checkbox"/> Bilog antenna	VULB9168	Schwarzbeck	255	2 year	03.15.2021
<input checked="" type="checkbox"/> Antenna master	MA4640-XP-ET	INNCO SYSTEM	-	-	-
<input checked="" type="checkbox"/> Antenna master controller	CO3000	INNCO SYSTEM	CO3000/870 /35990515/L	-	-
<input checked="" type="checkbox"/> Turn Table	1060	INNCO SYSTEM	-	-	-
<input checked="" type="checkbox"/> Turn Table controller	CO2000	INNCO SYSTEM	CO2000/095 /7590304/L	-	-
<input checked="" type="checkbox"/> Software	EMC32	Rohde & Schwarz	-	-	-

4.2.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Frequency Range	30 MHz to 1 000 MHz
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Test Site	3 m Semi Anechoic Chamber #1
Temperature	24.2 °C
Relative Humidity	47.0 %
Test Date	June 08, 2021

-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



4.2.3 Measuring Data

IDLE mode

Frequency (MHz)	Quasi Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
46.6396	17.5	125.2	V	39.0	19.8	22.5	40.0
166.5973	23.0	100.0	V	243.0	19.2	20.5	43.5
199.1519	28.2	116.8	V	237.0	16.9	15.3	43.5
215.4419	26.5	100.0	V	325.0	17.4	17.0	43.5
266.4886	26.0	100.0	V	194.0	19.3	20.0	46.0
950.9152	32.0	100.0	H	251.0	32.0	14.0	46.0

4.3 Radiated Emission Above 1 GHz

4.3.1 Measuring instruments

	Type	Model Name	Manufacturer	Serial Number	Calibration Cycle	Calibration Date
<input checked="" type="checkbox"/>	EMI test receiver	ESU40	Rohde & Schwarz	100524	1 year	05.10.2021
<input checked="" type="checkbox"/>	Antenna master	MA4640-XP-ET	INNCO SYSTEM	-	-	-
<input checked="" type="checkbox"/>	Antenna master controller	CO3000	INNCO SYSTEM	CO3000/870/ 35990515/L	-	-
<input checked="" type="checkbox"/>	Turn table	1060	INNCO SYSTEM	-	-	-
<input checked="" type="checkbox"/>	Turn table controller	CO2000	INNCO SYSTEM	CO2000/095/ 7590304/L	-	-
<input checked="" type="checkbox"/>	Horn antenna	BBHA 9120D	Schwarzbeck	01836	1 year	07.23.2020
<input checked="" type="checkbox"/>	Low noise amplifier	TK-PA18H	TESTEK	170034-L	1 year	03.02.2021
<input type="checkbox"/>	Horn Antenna	BBHA 9170	Schwarzbeck	BBHA 9170 #786	1 year	11.18.2020
<input type="checkbox"/>	Power Amplifier	TK-PA1840H	TESTEK	170030-L	1 year	03.09.2021
<input checked="" type="checkbox"/>	Software	EMC32	Rohde & Schwarz	-	-	-

4.3.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Frequency	2 480 MHz
Tested Frequency Range	1 GHz to 18 GHz
Test Site	3 m Semi Anechoic Chamber #1
Temperature	23.1 °C
Relative Humidity	45.8 %
Test Date	June 09, 2021

- 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



4.3.3 Measuring Data

IDLE mode

Frequency (MHz)	Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1593.0400	41.2	100.0	V	268.0	-26.3	32.8	74.0
5011.2300	37.2	349.8	H	351.0	-16.6	36.8	74.0
7324.7800	41.9	150.0	H	224.0	-11.1	32.1	74.0
9873.6900	44.9	100.0	H	182.0	-7.6	29.1	74.0
14183.7600	48.2	187.6	H	202.0	-0.3	25.8	74.0
17986.6690	55.5	249.9	V	74.0	9.6	18.5	74.0

Frequency (MHz)	CAverage (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1593.0400	20.6	100.0	V	268.0	-26.3	33.4	54.0
5011.2300	24.5	349.8	H	351.0	-16.6	29.5	54.0
7324.7800	29.1	150.0	H	224.0	-11.1	24.9	54.0
9873.6900	32.0	100.0	H	182.0	-7.6	22.0	54.0
14183.7600	35.4	187.6	H	202.0	-0.3	18.6	54.0
17986.6690	42.7	249.9	V	74.0	9.6	11.3	54.0



5. CONCLUSION

The data collected shows that the **Product Name: Magic Remote, Model Name: MR2GA** complies with §15.107 and §15.109 of the FCC rules



6. APPENDIX A. TEST SETUP PHOTO

Please refer to Appendix. A and test setup photo file no. as follows;

File No.	Date of Issue	Description
HCT-EM-2106-FC004-P	June 22, 2021	Initial Release

End of report