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TEST REPORT

of

RF Exposure Evaluation

FCC ID: BEJCCRCRUS

Equipment Under Test	:	Rear Seat Entertainment
Model Name	:	CCRC R
Variant Model Name(s)	:	-
Applicant	:	LG Electronics USA, Inc.
Manufacturer	:	LG Electronics Inc.
Date of Receipt	:	2023.09.08
Date of Test(s)	:	2023.09.08 ~ 2023.10.18
Date of Issue	:	2023.10.18

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

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Tested by: Murphy Kim

Technical Manager: Inho Park

SGS Korea Co., Ltd. Gunpo Laboratory

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- CAB Identifier: KR0150

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1.2. Details of Applicant

Applicant : LG Electronics USA, Inc.
Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States, 07632
Contact Person : Cho, Hee-jae
Phone No. : +1 201 470 2696

1.3. Details of Manufacturer

Company : LG Electronics Inc.
Address : 128, Yeoui-daero, Yeongdeungpo-gu, Seoul, Republic of Korea, 07336

1.4. Description of EUT

Kind of Product		Rear Seat Entertainment
Model Name		CCRC R
Variant Model Name		-
Serial Number		Conducted Sample: C01 Radiated Sample: R01
Power Supply		DC 12 V
Frequency Range		2 402 ㎒ ~ 2 480 ㎒ (Bluetooth) 2 402 ㎒ ~ 2 480 ㎒ (Bluetooth Low Energy) 2 412 ㎒ ~ 2 462 ㎒ (11b/g/n_HT20) 5 180 ㎒ ~ 5 240 ㎒ (Band 1: 11a/n_HT20, 11ac_VHT20) 5 190 ㎒ ~ 5 230 ㎒ (Band 1: 11n_HT40, 11ac_VHT40) 5 210 ㎒ (Band 1: 11ac_VHT80) 5 745 ㎒ ~ 5 825 ㎒ (Band 3: 11a/n_HT20, 11ac_VHT20) 5 755 ㎒ ~ 5 795 ㎒ (Band 3: 11n_HT40, 11ac_VHT40) 5 775 ㎒ (Band 3: 11ac_VHT80)
Modulation Technique		DSSS, OFDM, GFSK, π/4DQPSK, 8DPSK
Number of Channels		79 channels (Bluetooth) 40 channels (Bluetooth Low Energy) 11 channels (11b/g/n_HT20) 4 channels (Band 1: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 1: 11n_HT40, 11ac_VHT40) 1 channel (Band 1: 11ac_VHT80) 5 channels (Band 3: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 3: 11n_HT40, 11ac_VHT40) 1 channel (Band 3: 11ac_VHT80)
Antenna Type	**Core 0&1**	Dielectric Chip Antenna
	BT	Multilayer Chip Antenna
Antenna Gain※	**Core 0**	2 400 ㎒ ~ 2 483.5 ㎒: 3.61 ㏈i (Bluetooth Low Energy) 5 150 ㎒ ~ 5 250 ㎒: 3.10 ㏈i (WLAN 5 G) 5 725 ㎒ ~ 5 850 ㎒: 3.10 ㏈i (WLAN 5 G)
	Core 1	2 400 ㎒ ~ 2 483.5 ㎒: 3.61 ㏈i (WLAN 2.4 G) 5 150 ㎒ ~ 5 250 ㎒: 3.10 ㏈i (WLAN 5 G) 5 725 ㎒ ~ 5 850 ㎒: 3.10 ㏈i (WLAN 5 G)
	BT	2 400 ㎒ ~ 2 483.5 ㎒: 2.36 ㏈i (Bluetooth)
H/W Version		1.0
S/W Version		1.0

1.5. Declarations by the manufacturer

- The EUT has three ports (Core 0, Core 1, BT).

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 2		
Section	**Test Item(s)**	**Result**
2.1091	RF Exposure Evaluation	Complied

1.7. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL004453	2023.10.18	Initial

1.8. Device Capabilities

Frequency	Mode	SISO			MIMO
		BT port	Core 0	Core 1	Core 0 + Core 1
2.4 ㎓	Bluetooth	O	X	X	X
	Bluetooth Low Energy	X	O	X	X
	802.11b/g/n	X	X	O	X
5 ㎓	802.11a	X	O	O	X
	802.11n/ac	X	O	O	O

2. RF Exposure Evaluation

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

2.1. Blanket 1 ㎽ Blanket Exemption

The 1 ㎽ Blanket Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 ㎽, regardless of separation distance.
The 1 ㎽ blanket exemption applies at separation distances less than 0.5 ㎝, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph § 1.1307(b)(3)(ii)(A).
The 1 ㎽ exemption is independent of service type and covers the full range of 100 ㎑ to 100 ㎓, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

2.2. MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 ㎑ through 100 ㎓.

Table 1: THRESHOLDS FOR SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			Minimum Distance			Threshold ERP
f_L (㎒)		f_H (㎒)	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	-	1.34	159 m	-	35.6 m	1 920 R2
1.34	-	30	35.6 m	-	1.6 m	3 450 R^2/f^2
30	-	300	1.6 m	-	159 mm	3.83 R^2
300	-	1 500	159 mm	-	31.8 mm	0.012 8 R^2f
1 500	-	100 000	31.8 mm	-	0.5 mm	19.2 R^2
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

The table applies to any RF source (i.e., single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least λ/2π. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.
For mobile devices that are not exempt per Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] at distances from 20 ㎝ to 40 ㎝ and in 0.3 ㎓ to 6 ㎓, evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP 20 ㎝ in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

$$P_{\text{th}}\,(\text{mW}) = ERP_{20\,\text{cm}}\,(\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \qquad \text{(B.1)}$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole.
SAR-based exemptions are constant at separation distances between 20 ㎝ and 40 ㎝ to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 ㎝, considering the importance of reflections.

2.3. SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.
If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of λ/4.
As for devices with antennas of length greater than λ/4 where the gain is not well defined, but always less than that of a half-wave dipole (length λ/2), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.
The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.
The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (㎽).
This method shall only be used at separation distances from 0.5 ㎝ to 40 ㎝ and at frequencies from 0.3 ㎓ to 6 ㎓ (inclusive). P_{th} is given by Formula (B.2).

$$P_{\text{th}}\,(\text{mW}) = \begin{cases} ERP_{20\text{ cm}}(d/20\text{ cm})^{x} & d \le 20\text{ cm} \\ ERP_{20\text{ cm}} & 20\text{ cm} < d \le 40\text{ cm} \end{cases} \qquad \text{(B. 2)}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\text{ cm}}\sqrt{f}}\right)$$

and f is in ㎓, d is the separation distance (㎝), and ERP 20 ㎝ is per Formula (B.1).

2.4. Simultaneous Transmission SAR Test Exemption with Respect to Multiple Exemption Criteria

Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR ($Evaluated_k$ term) shall be used to determine exemption for simultaneous transmission according to Formula (C.1) [repeated from § 1.1307(b)(3)(ii)(B)].

$$\sum_{i=1}^{a}\frac{P_i}{P_{th,i}} + \sum_{j=1}^{b}\frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c}\frac{Evaluated_k}{Exposure\ Limit_k} \le 1$$

3. Test Result

3.1. RF Exposure Test Exemptions for Single Source

Mode	Frequency Range (㎒)	Minimum Separation Distance (㎝)	Maximum Average Target Power (㏈m)	Maximum Tune up (㏈)	Maximum Average Power (㏈m)	Antenna Gain (㏈i)	ERP		Threshold ERP	Ratio	Result
							(㏈m)	(㎽)	(㎽)		
Bluetooth	2 400 ~ 2 483.5	20	1	2	3	2.36	3.21	2.09	768	0.003	Pass
Bluetooth BLE_Core 0	2 400 ~ 2 483.5	20	-2	2	0	3.61	1.46	1.40	768	0.002	Pass
WLAN (2.4G)_Core 1	2 400 ~ 2483.5	20	12	2	14	3.61	15.46	35.16	768	0.046	Pass
SISO_WLAN (5G)_Core 0	5 150 ~ 5 250	20	7	2	9	3.10	9.95	9.89	768	0.013	Pass
SISO_WLAN (5G)_Core 0	5 725 ~ 5 850	20	7	2	9	3.10	9.95	9.89	768	0.013	Pass
SISO_WLAN (5G)_Core 1	5 150 ~ 5 250	20	7	2	9	3.10	9.95	9.89	768	0.013	Pass
SISO_WLAN (5G)_Core 1	5 725 ~ 5 850	20	8	2	10	3.10	10.95	12.45	768	0.016	Pass
MIMO_WLAN (5G)	5 150 ~ 5 250	20	6	2	8	6.11	11.96	15.70	768	0.020	Pass
MIMO_WLAN (5G)	5 725 ~ 5 850	20	8	2	10	6.11	13.96	24.89	768	0.032	Pass

Note ;

- Maximum average target power is the manufacturer's declared rated power.
- Maximum average power = Maximum average target power (㏈m) + Maximum tune up (㏈).
- ERP (㏈m) = Maximum average Power (㏈m) + Antenna Gain (㏈i) -2.15

3.2. RF Exposure Test Exemptions for Simultaneous Transmission

Mode	P_i/P_{th} Ratio Mode A	P_i/P_{th} Ratio Mode B	P_i/P_{th} Ratio Mode C	$\Sigma P_i/P_{th}$ Ratio Mode A+B+C	Result
Bluetooth + Bluetooth_BLE_Core 0 + WLAN (2.4G)_Core 1	0.003	0.002	0.046	0.051	Pass

Conclusion: No SAR is required.

- End of the Test Report -