

TEST REPORT

of

RF Exposure Evaluation

FCC ID: BEJCCRCRUS

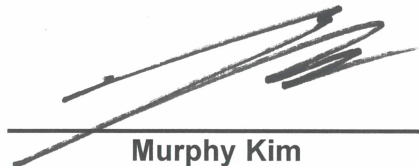
Equipment Under Test : Rear Seat Entertainment
Model Name : CCRC R
Variant Model Name(s) : -
Applicant : LG Electronics USA, Inc.
Manufacturer : LG Electronics Inc.
Date of Receipt : 2023.09.08
Date of Test(s) : 2023.09.08 ~ 2023.10.18
Date of Issue : 2023.10.18

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

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Report Number: F690501-RF-RTL004453

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1. General Information

1.1. Testing Laboratory

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- 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 MHz ~ 2 480 MHz (Bluetooth) 2 402 MHz ~ 2 480 MHz (Bluetooth Low Energy) 2 412 MHz ~ 2 462 MHz (11b/g/n_HT20) 5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20, 11ac_VHT20) 5 190 MHz ~ 5 230 MHz (Band 1: 11n_HT40, 11ac_VHT40) 5 210 MHz (Band 1: 11ac_VHT80) 5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20, 11ac_VHT20) 5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40, 11ac_VHT40) 5 775 MHz (Band 3: 11ac_VHT80)	
Modulation Technique	DSSS, OFDM, GFSK, $\pi/4$ DQPSK, 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 MHz ~ 2 483.5 MHz: 3.61 dB i (Bluetooth Low Energy) 5 150 MHz ~ 5 250 MHz: 3.10 dB i (WLAN 5 G) 5 725 MHz ~ 5 850 MHz: 3.10 dB i (WLAN 5 G)
	Core 1	2 400 MHz ~ 2 483.5 MHz: 3.61 dB i (WLAN 2.4 G) 5 150 MHz ~ 5 250 MHz: 3.10 dB i (WLAN 5 G) 5 725 MHz ~ 5 850 MHz: 3.10 dB i (WLAN 5 G)
	BT	2 400 MHz ~ 2 483.5 MHz: 2.36 dB 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 GHz	Bluetooth	O	X	X	X
	Bluetooth Low Energy	X	O	X	X
	802.11b/g/n	X	X	O	X
5 GHz	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 mW Blanket Exemption

The 1 mW 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 mW, regardless of separation distance.

The 1 mW blanket exemption applies at separation distances less than 0.5 cm, 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 mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, 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 kHz through 100 GHz.

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

RF Source Frequency			Minimum Distance			Threshold ERP
f_L (MHz)		f_H (MHz)	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	-	1.34	159 m	-	35.6 m	1 920 R ²
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 ² f
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 $\lambda/2\pi$. 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 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP_{20 cm} in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

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

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 $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, 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 $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), 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} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

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

where

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

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ 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)].

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

3. Test Result

3.1. RF Exposure Test Exemptions for Single Source

Mode	Frequency Range (MHz)	Minimum Separation Distance (cm)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Power (dB m)	Antenna Gain (dB i)	ERP		Threshold ERP (mW)	Ratio	Result
							(dB m)	(mW)			
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 (dB m) + Maximum tune up (dB).
- ERP (dB m) = Maximum average Power (dB m) + Antenna Gain (dB 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	$\sum P_i/P_{th}$ 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 -