

TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: BEJIGCJ2PHE

Equipment Under Test : Car AVN
Model Name : IGCJ1PHE
Variant Model Name : IGCJ2PHE
Applicant : LG Electronics USA
Manufacturer : LG Electronics Inc.
Date of Receipt : 2022.12.07
Date of Test(s) : 2022.12.23 ~ 2023.02.16
Date of Issue : 2023.02.23

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:



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Report Number: F690501-RF-RTL003847

Page: 2 of 10

INDEX

Table of Contents

Page

1. General Information -----	3
2. RF Exposure Evaluation -----	6

1. General Information

1.1. Testing Laboratory

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1.2. Details of Applicant

Applicant : LG Electronics USA

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 : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796

1.4. Description of EUT

Kind of Product		Car AVN
Brand Name		JAGUAR LAND ROVER
Model Name		IGCJ1PHE
Variant Model Name		IGCJ2PHE
Serial Number		211VIYKC97034
Power Supply		DC 12 V
Rated Power		GSM 850: 33 dBm GSM 1 900: 30 dBm WCDMA V: 23 dBm LTE Band 5, 7, 26: 23 dBm
Frequency Range		GSM 850: 824 MHz ~ 849 MHz GSM 1 900: 1 850 MHz ~ 1 910 MHz WCDMA V: 824 MHz ~ 849 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2 500 MHz ~ 2 570 MHz LTE Band 26(Part 90): 814 MHz ~ 824 MHz LTE Band 26(Part 22): 824 MHz ~ 849 MHz 2 402 MHz ~ 2 480 MHz (Bluetooth) 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		QPSK, 16QAM, GMSK, 8PSK, DSSS, OFDM, GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels		79 channels (Bluetooth) 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		External Antenna
Antenna Gain*	Port 1	2 400 MHz ~ 2 483.5 MHz: 3 dB i (Bluetooth) 5 150 MHz ~ 5 250 MHz: 5 dB i (WLAN 5 G) 5 725 MHz ~ 5 850 MHz: 5 dB i (WLAN 5 G)
	Port 2	2 400 MHz ~ 2 483.5 MHz: 3 dB i (WLAN 2.4 G) 5 150 MHz ~ 5 250 MHz: 5 dB i (WLAN 5 G) 5 725 MHz ~ 5 850 MHz: 5 dB i (WLAN 5 G)
	Port 3	814 MHz ~ 824 MHz: -1.79 dB i 824 MHz ~ 849 MHz: -0.69 dB i 1 850 MHz ~ 1 910 MHz: 0.85 dB i 2 500 MHz ~ 2 570 MHz: 0.99 dB i
H/W Version		V9.0
S/W Version		IP36

1.5. Declaration by the Manufacturer

- Bluetooth transmits only on Port 1.
- WLAN 2.4G transmits only on Port 2.
- WLAN 5G transmits on both Port 1 and Port 2.
- WWAN transmits on Port 3.

1.6. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL003847	2023.02.23	Initial

2. RF Exposure Evaluation

2.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1 500	-	-	f/300	6
1 500-100 000	-	-	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
<u>300-1 500</u>	-	-	<u>f/1500</u>	<u>30</u>
<u>1 500-100 000</u>	-	-	<u>1.0</u>	<u>30</u>

2.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

2.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data
 Test Mode : Normal Operation

2.1.3. Test information of Cable Loss and Antenna Gain

Test Item	Frequency Range (MHz)	Cable Loss (dB)	Antenna Gain of EUT (dB i)	Final Antenna Gain (dB i)
Bluetooth	2 400 ~ 2 483.5	-1.94	3	1.06
WLAN 2.4G	2 400 ~ 2 483.5	-1.94	3	1.06
WLAN 5G	5 150 ~ 5 250	-2.08	5	2.92
WLAN 5G	5 725 ~ 5 850	-2.08	5	2.92
GSM 850	824 ~ 849	-1.12	-0.69	-1.81
GSM 1900	1 850 ~ 1 910	-1.12	0.85	-0.27
WCDMA 5	824 ~ 849	-1.12	-0.69	-1.81
LTE 26/5	824 ~ 849	-1.12	-0.69	-1.81
LTE 7	2 500 ~ 2 570	-1.94	0.99	-0.95
LTE 26	814 ~ 849	-1.12	-1.79	-2.91

Note;

-Final Antenna Gain (dB i) = Cable Loss (dB) + Antenna Gain of EUT (dB i)

2.1.4. Output Power into Antenna & RF Exposure Evaluation Distance

Bluetooth_Ant.1

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 400 ~ 2 483.5	0	2	2	1.06	0.000 402	1

WLAN (2.4G)_Ant.2

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 400 ~ 2 483.5	12	3	15	1.06	0.008 030	1

WLAN (5G)_Ant.1

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
5 150 ~ 5 250	-0.5	3	2.5	2.92	0.000 693	1
5 725 ~ 5 850	-0.5	3	2.5	2.92	0.000 693	1

WLAN (5G)_Ant.2

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
5 150 ~ 5 250	0.5	3	3.5	2.92	0.000 872	1
5 725 ~ 5 850	0.5	3	3.5	2.92	0.000 872	1

WLAN (5G)_Ant.1+Ant.2

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
5 150 ~ 5 250	3	3	6	5.93	0.003 103	1
5 725 ~ 5 850	3	3	6	5.93	0.003 103	1

GSM 850

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Duty Cycle (%)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
824 ~ 849	33	2	25	28.98	-1.81	0.103 674	0.549

GSM 1 900

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Duty Cycle (%)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
1 850 ~ 1 910	30	2	25	25.98	-0.27	0.093 255	1

WCDMA Band 5

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
824 ~ 849	23	2	25	-1.81	0.041 470	0.549

LTE Band 7

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 500 ~ 2 570	23	2	25	-0.95	0.050 551	1

LTE Band 26/5_Part 22

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
824 ~ 849	23	2	25	-1.81	0.041 470	0.549

LTE Band 26_Part 90

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Maximum Average Output Power (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
814 ~ 824	23	2	25	-2.91	0.032 191	0.543

Note;

- The power density Pd (5th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum 20 cm between the radiator and your body.
- The antenna gain of this transmitter is less than 6 dBi and must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.
- According to KDB 447498 D01 RF Exposure Guidance 4.1.
- Maximum average target power is the manufacturer's declared rated power.
- Maximum average output power = Maximum average target power (dBm) + Maximum tune up (dB).
- Antenna gain: $10 \log \left[\left\{ 10^{(\text{Ant. 1 gain} / 20)} + 10^{(\text{Ant. 2 gain} / 20)} \right\}^2 / 2 \right]$

Simultaneous transmission of RF Exposure test exclusion for worst case configuration.

Confirm the sum result of individual MPEs ratio is ≤ 1.0 ;

Bluetooth_Ant.1 + WLAN2_Ant.2 + GSM 850_Ant.3 : $(0.000402 / 1) + (0.008030 / 1) + (0.103674 / 0.549)$
 $= 0.197274 \leq 1.0$

WLAN5_(Ant.1+Ant.2) + GSM 850_Ant.3 : $(0.003103 / 1) + (0.103674 / 0.549)$
 $= 0.191945 \leq 1.0$