FCC 47 CFR PART 15 SUBPART C

125 kHz Transiver

CERTIFICATION TEST REPORT

FOR

I.ID Cluster

MODEL NUMBER : LCW05-VWE5, LCW05-VWE1, LCW05-SEE5

FCC ID: BEJLCW05-VWE5

REPORT NUMBER: 4788852919-E1V3

ISSUE DATE: MAY 28, 2019

Prepared for
LG Electronics USA, Inc.
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Prepared by
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218 Maeyeong-ro, Yeongtong-gu,
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ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	04/22/19	Initial issue	Hoonpyo Lee
V2	05/14/19	Updated to address about the TCB's question	Hoonpyo Lee
V3	05/28/19	Updated to address about the TCB's question	Hoonpyo Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LG Electronics USA, Inc.

EUT DESCRIPTION: I.ID Cluster

MODEL NUMBER: LCW05-VWE5, LCW05-VWE1, LCW05-SEE5

SERIAL NUMBER: proto-type_#7

DATE TESTED: APR 05, 2019 – APR 09, 2019

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

Changyoung Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Hoonpyo Lee
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
☐ Chamber 1
☒ Chamber 2
☐ Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at http://www.iasonline.org/PDF/TL/TL-637.pdf.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, Below 1GHz	3.86 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

Uncertainty figures are valid to a confidence level of 95%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a I.ID Cluster with 125kHz immobilizer.

The difference between the main model(LCW05-VWE5) and the additional models(LCW05-VWE1, LCW05-SEE5) is only for marketing.

5.2. MAXIMUM OUTPUT POWER

Fundamental Frequency (KHz)	Mode	E field (300m distance) FCC (dBuV/m)
125	Tx	6.58

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT is connected to the coil antenna by a unique type connector.
The antenna and product connection connector can't be removed or replaced by the user because it is located inside the vehicle when the product is installed in the vehicle.

5.4. WORST-CASE CONFIGURATION

The spurious emissions was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT & PERIPHERALS

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID/DoC
N/A	N/A	N/A	N/A	N/A

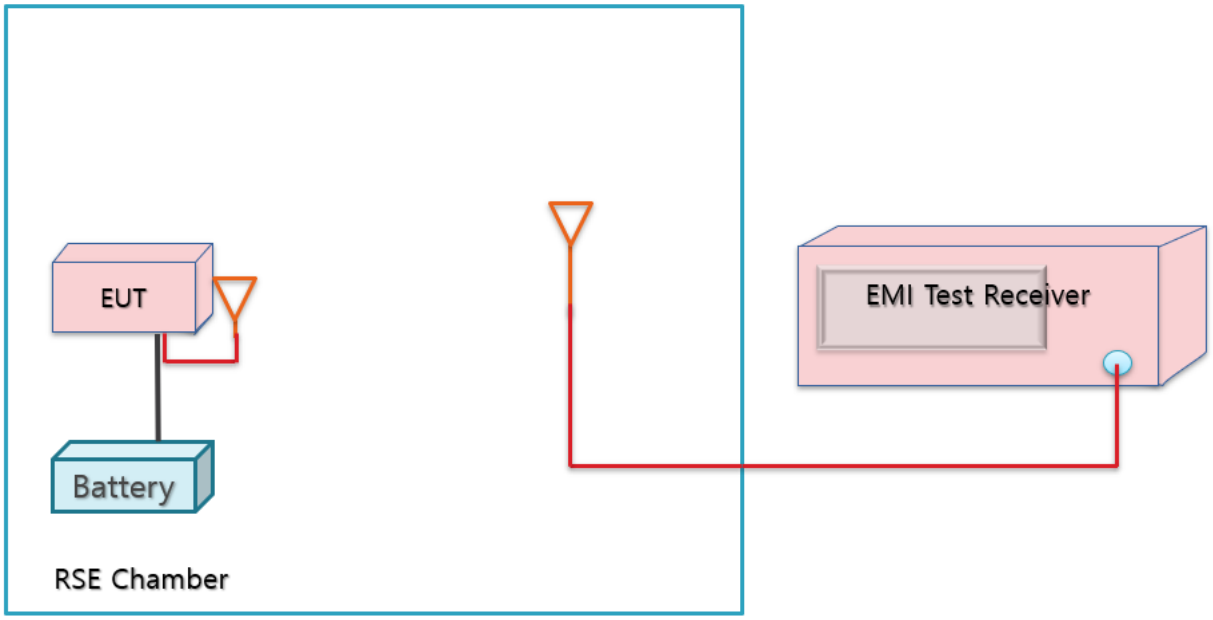
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length(m)	Remarks
1	DC Power	1	Pin	Unshielded	1.5m	From EUT to Vehicular battery

TEST SETUP

The EUT was tested in forced transmit mode using software.

TEST SETUP DIAGRAM



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-07-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-06-19
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-07-19
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Radiated software	UL	UL EMC	Ver 9.5	

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.10: 2013

The highest clock frequency generated or used in the EUT is 148 KHz therefore the frequency range was investigated from 30 MHz to 1 GHz.

LIMIT

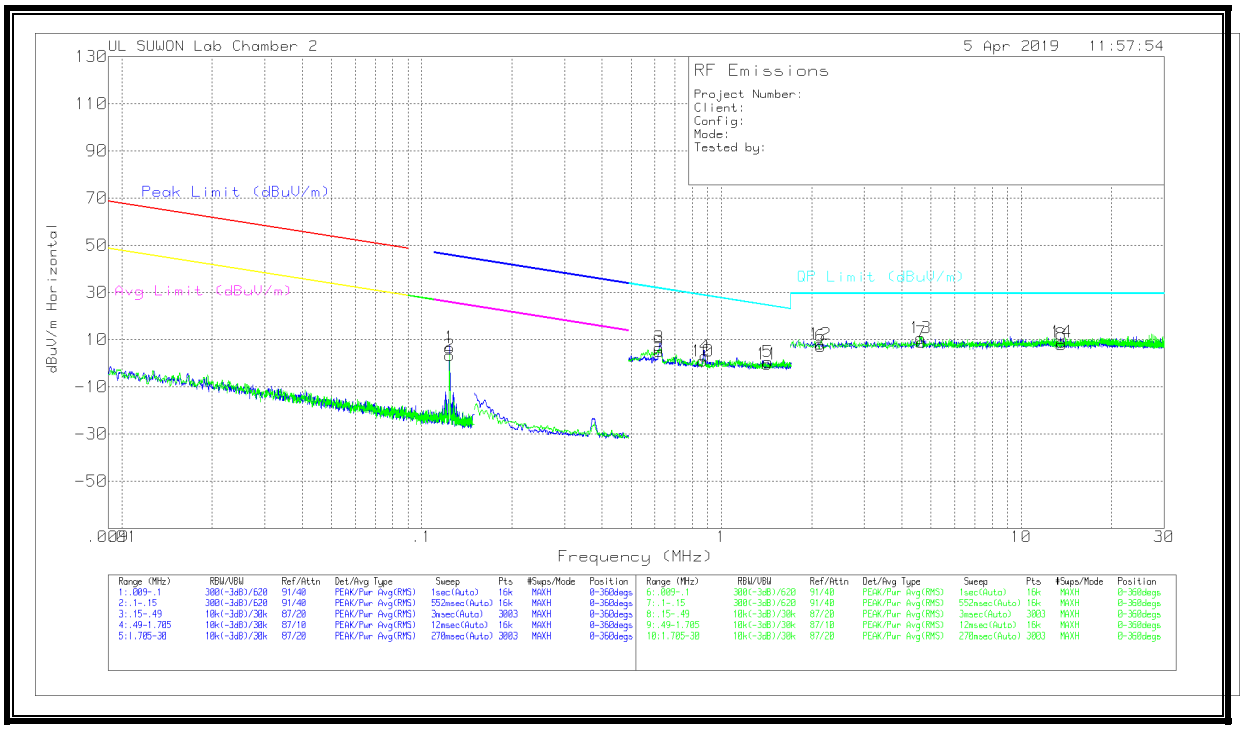
FCC §15.209 (a)
ICES-001 Section 6.2, IC RSS-216 6.2.2, and IC RSS-GEN Sections 8.9 and 8.10.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960 MHz	500	3
Note: The lower limit shall apply at the transition frequency.		

RESULTS

See the following pages.

RADIATED EMISSIONS FUNDAMENTAL & 9 KHz to 30 MHz



TEST DATA

Trace Markers

[Face-On]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading dBuV/m	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
**1	.12411	66.78	Pk	19.7	.1	-80	6.58	45.75	-39.17	25.75	-19.17	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.62011	26.73	Pk	19.7	.1	-40	6.53	31.76	-25.23	0-360
4	.88125	23.07	Pk	19.7	.2	-40	2.97	28.72	-25.75	0-360
5	1.4308	20.61	Pk	19.7	.2	-40	.51	24.52	-24.01	0-360
6	2.14798	27.18	Pk	19.8	.2	-40	7.18	29.5	-22.32	0-360
7	4.6456	28.78	Pk	19.8	.3	-40	8.88	29.5	-20.62	0-360
8	13.60878	27.4	Pk	19.9	.6	-40	7.9	29.5	-21.6	0-360

Pk - Peak detector

** Fundamental

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[Face-Off]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading dBuV/m	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
**2	.12404	63.49	Pk	19.7	.1	-80	3.29	45.75	-42.46	25.75	-22.46	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.62011	26.73	Pk	19.7	.1	-40	6.53	31.76	-25.23	0-360
4	.88125	23.07	Pk	19.7	.2	-40	2.97	28.72	-25.75	0-360
5	1.4308	20.61	Pk	19.7	.2	-40	.51	24.52	-24.01	0-360
6	2.14798	27.18	Pk	19.8	.2	-40	7.18	29.5	-22.32	0-360
7	4.6456	28.78	Pk	19.8	.3	-40	8.88	29.5	-20.62	0-360
8	13.60878	27.4	Pk	19.9	.6	-40	7.9	29.5	-21.6	0-360
9	.61882	25.05	Pk	19.7	.1	-40	4.85	31.78	-26.93	0-360
10	.86666	20.93	Pk	19.7	.2	-40	.83	28.86	-28.03	0-360
11	1.42336	19.68	Pk	19.7	.2	-40	-.42	24.56	-24.98	0-360
12	2.13855	28.03	Pk	19.8	.2	-40	8.03	29.5	-21.47	0-360
13	4.62675	30.55	Pk	19.8	.3	-40	10.65	29.5	-18.85	0-360
14	13.62763	28.4	Pk	19.9	.6	-40	8.9	29.5	-20.6	0-360

Pk - Peak detector

** Fundamental

[Remark]
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 10m open field test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlated with the one of tests made in an open field site based on KDB 414788.

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7.1. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.10: 2013

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

LIMIT

FCC §15.207 (a)

Frequency range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
*Decreases with the logarithm of the frequency.		

RESULTS (N/A)

This EUT is only supplied by vehicular battery.