FCC EVALUATION REPORT FOR CERTIFICATION

FCC Part 18 (Class II Permissive Change)

Applicant: LG Electronics USA.
1000 Sylvan Avenue,
Englewood Cliffs New Jersey United States 07632,
Attn: Kyung-Su Han / Director

Date of Issue: Sep. 08, 2017
Order Number: GETEC-C1-17-442
Test Report Number: GETEC-E3-17-047
Test Site: GUMI UNIVERSITY EMC CENTER
(FCC Test Firm Registration No.: 269701)

FCC ID. : BEJE09MFE07

Applicant : LG Electronics USA.

Rule Part(s)	**: FCC Part 18**
Test Method	**: FCC/OET MP-5**
EUT Type	**: Refrigerator**
Equipment Class	**: Part 18 Consumer Device(8CC)**
Type of Authority	**: Certification**
Model Name	**: SKSCF1801P**
Trade Mark	**: LG**

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC/OET MP-5 (1986)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the vest of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,

Sang Hyun Park, Associate Engineer
GUMI UNIVERSITY EMC CENTER

Reviewed by,

Hyoung Seop Kim, Technical Manager
GUMI UNIVERSITY EMC CENTER

This test report only contains the result of a specific sample supplied for the examination.
It is not allowed to copy this report even partly without the approval of EMC center

GUMI UNIVERSITY
EMC CENTER

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Scope: *Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.*

1. General Information

Applicant: LG Electronics USA.
Applicant Address: 1000 Sylvan Avenue,
Englewood Cliffs New Jersey United States 07632
Manufacturer: LG Electronics Inc.
Manufacturer Address: 170, Sungsanpaechong-ro, Seongsan-gu, Changwon-si,
Gyeongsangnam-do, 642-711, Korea
Contact Person: Bogeun Lee / Research Engineer
Telephone Number: +82-55-260-3966

- **FCC ID.** BEJE09MFE07
- **EUT Type** Refrigerator
- **Model Name** SKSCF1801P
- **Rule Part(s)** FCC Part 18
- **Test Method** FCC/OET MP-5
- **Type of Authority** Certification
- **Test Procedure(s)** FCC/OET MP-5
- **Dates of Test** Sep. 01, 2017 ~ Sep. 02, 2017
- **Place of Test** **GUMI UNIVERSITY EMC CENTER** (FCC Test Firm Registration Number: 269701) 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea.
- **Test Report Number** GETEC-E3-17-047
- **Dates of Issue** Sep. 08, 2017

2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014) was used in determining radiated and conducted emissions emanating from **LG Electronics USA. Refrigerator (Model name: SKSCF1801P).**

These measurement tests were conducted at **GUMI UNIVERSITY EMC CENTER**.
The site address is 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Gyeongnam 641-713, Korea
This test site is one of the highest point of GUMI UNIVERSITY at about 200 kilometers away from Seoul city and 40 kilometers away from Daegu city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.4 (2014)

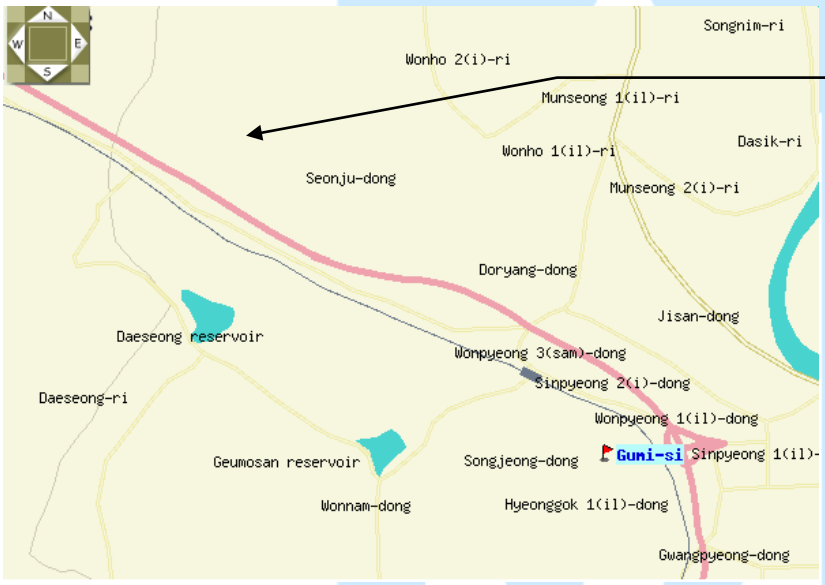

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Fig 1. The map above shows the GUMI UNIVERSITY in vicinity area.

3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **LG Electronics USA. Refrigerator (Model Name: SKSCF1801P) FCC ID.: BEJE09MFE07.**

Type of Equipment	Refrigerator
Model Name	SKSCF1801P
Serial Number	Prototype
RF Frequency	330 kHz ~ 370 kHz
External connector	DC input 1 EA
Rated Voltage	Input : AC 115 V, 60 Hz (Wireless Power Transmitter input voltage: DC 12 V)
Output Electricity Power	Less than 3W
Size(W x H x T)	17 $^{1/2}$(W) x23 $^{3/4}$(D) x83$^{1/2}$(H) inch (Wireless Power Transmitter module :50 (mm) x 35 (mm) x 1.0 (mm))

3.2 Definition of models

- None.

3.3 Support Equipment / Cables used

3.3.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
None	-	-	S/N: - FCC ID.: -

See "Appendix C – Test Setup Photographs" for actual system test set-up

3.3.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
None.	-	-	S/N: -. FCC ID.: -.

3.3.3 Used Cable(s)

Cable Name	Condition	Description
Power cable	Connected to the EUT and AC power	2.20 m Unshielded.

3.4 Modification Item(s)

-. None

4. Description of tests

4.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used. The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency: AC 115 V, 60 Hz (Wireless Power Transfer Device supplied DC 12 V)

- Operating condition during the test(s) :
  This device has been tested in the configurations of Power transmitting mode

Transmitting Current	Support Equipment	Comment
1 000 mA	Refrigerator Shelf RX module	

4.2 General Test Procedures

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 (2014) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which Fixed at 2 m above the ground plane to find out the highest emission.

And also, each emission was to be maximized by the table was turned from 0 degrees to 360 degrees. In order to find out the max emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4 (2014).

5. Conducted Emission

-Test Description

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure.
(FCC Test Firm Registration No.: 269701)
The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.8 m in height and 0.4 m away from the vertical wall of the shielded enclosure.
The EUT is powered from the Rohde & Schwarz LISN (ENV216) and the support equipment is powered from the Rohde & Schwarz LISN (ENV216). Powers to the LISN are filtered by high-current high insertion loss power line filter.
Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCI).
Exploratory measurements were conducted to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.
Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Exploratory measurements were scanned using Peak mode of EMI Test receiver from 150 kHz to 30 MHz with 20 ms sweep time. The final measurements were measured with Quasi-Peak and Average mode.
The bandwidth of EMI Test Receiver was set to 9 kHz. Interface cables were connected to the available interface ports of the test unit. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

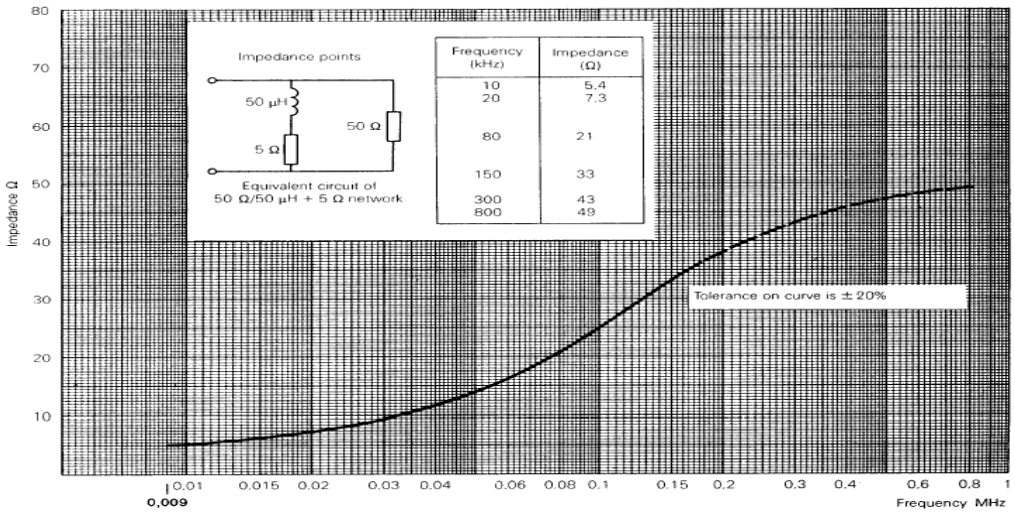


Fig 2. Impedance of LISN

5.1 Operating Environment

Temperature	:	24.3 ℃
Relative Humidity	:	52.9 % R.H.
Air pressure	:	100.5 kPa

5.2 Test Set-up

The conducted emission measurements were performed in the shielded room.
The EUT was placed on wooden table, 0.8 m heights above the floor, 0.4 m from the reference ground plane (GRP) wall and 0.8 m from AMN & ISN.
AMN is bonded on horizontal reference ground plane.
The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, were filtered.

5.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO "Guide to the expression of uncertainty in measurement."
The measurement uncertainty was given with a confidence of 95 %.

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	3.85 dB	Confidence level of approximately 95 % (k = 2)
Conducted emission (150 kHz ~ 30 MHz)	3.32 dB	Confidence level of approximately 95 % (k = 2)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.
The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results

5.4 Limit

RFI Conducted	FCC Limit(dBμV/m)	
Freq. Range	Quasi-Peak	Average
150 kHz ~ 0.5 MHz	66 ~ 56*	56 ~ 46*
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50
*Limits decreases linearly with the logarithm of frequency.		

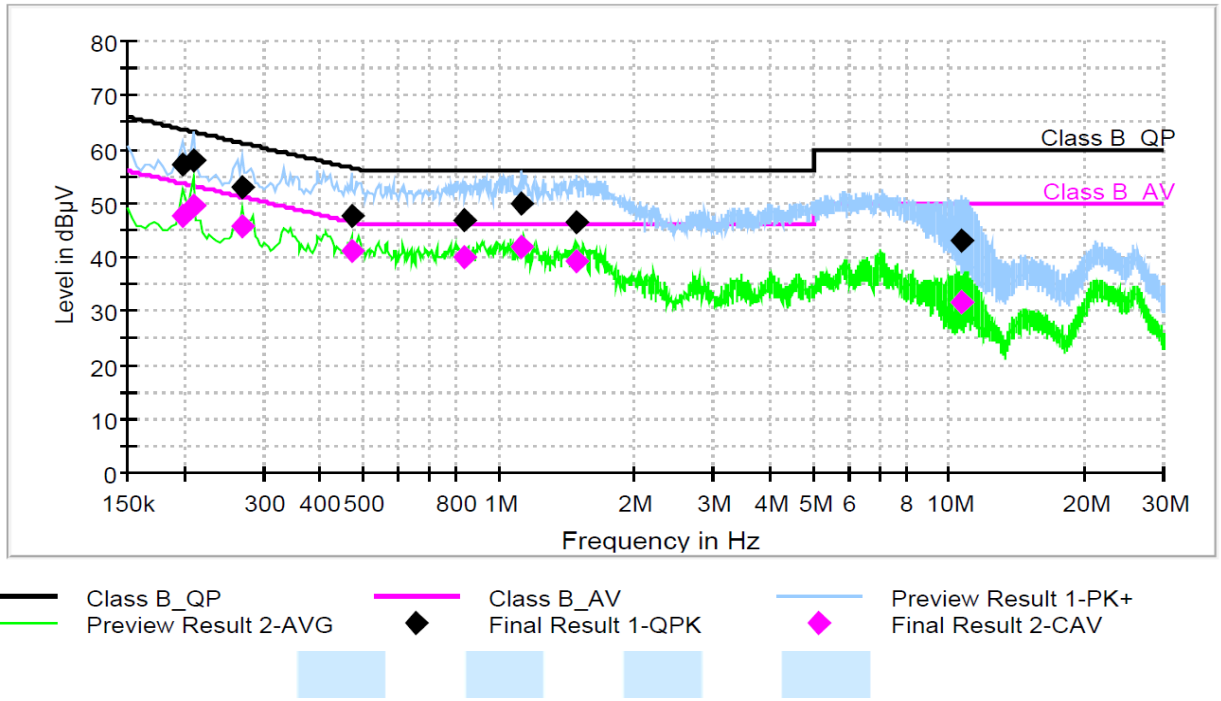
5.5 Test Equipment used

	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESCI	Rohde & Schwarz	EMI Test Receiver	100237	Apr. 18, 2018
☐ -	ENV216	Rohde & Schwarz	LISN	100172	Apr. 19, 2018
■ -	ENV216	Rohde & Schwarz	LISN	100173	Apr. 19, 2018
☐ -	ISN T8	TESEQ.GmbH	ISN	24568	Apr. 21, 2018
■ -	EMC 32	Rohde & Schwarz	Software	Ver.8.53	N/A

5.6 Test data for Conducted Emission

-. Test Date : Sep. 01,2017
-.Resolution Bandwidth : 9 kHz
-. Frequency Range : 0.15 MHz ~ 30 MHz
-. Line : L1: Live, N: Neutral
-. Comment : None

▪ Operating condition: Continuous Power transmitting mode



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.198506	57.1	1000.0	9.000	Off	N	9.6	6.6	63.7	
0.209700	57.9	1000.0	9.000	Off	N	9.6	5.3	63.2	
0.269400	53.1	1000.0	9.000	Off	N	9.7	8.0	61.1	
0.470888	47.5	1000.0	9.000	Off	N	9.7	9.0	56.5	
0.836550	46.7	1000.0	9.000	Off	N	9.7	9.3	56.0	
1.127588	49.9	1000.0	9.000	Off	N	9.7	6.1	56.0	
1.485788	46.4	1000.0	9.000	Off	L1	9.7	9.6	56.0	
10.619888	42.9	1000.0	9.000	Off	L1	9.9	17.1	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.198506	47.7	1000.0	9.000	Off	N	9.6	5.9	53.7	
0.209700	49.5	1000.0	9.000	Off	N	9.6	3.7	53.2	
0.269400	45.7	1000.0	9.000	Off	N	9.7	5.5	51.1	
0.470888	41.2	1000.0	9.000	Off	N	9.7	5.3	46.5	
0.836550	39.9	1000.0	9.000	Off	N	9.7	6.1	46.0	
1.127588	42.0	1000.0	9.000	Off	N	9.7	4.0	46.0	
1.485788	39.2	1000.0	9.000	Off	L1	9.7	6.8	46.0	
10.619888	31.7	1000.0	9.000	Off	L1	9.9	18.3	50.0	

6. Radiated Emission

6.1 Operating Environment

Temperature	:	22.3 ℃
Relative Humidity	:	58.6 % R.H.
Air pressure	:	100.4 kPa

6.2 Test Set-up

The Radiated emission measurements were conducted at the worst test conditions.

The measurements of below 1 GHz were made at 3 m Semi Anechoic Chamber or 10 m Semi Anechoic Chamber (FCC Test Firm Registration No.: 269701) that complies with CISPR 16/ANSI C63.4.

The frequency range of 9 kHz to 30 MHz, The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane. The turntable with EUT was rotated 360° and the receive antenna was fixed 2.0 m on the ground plane.

The frequency range of 30 MHz to 1 000 MHz, The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane. The turntable with EUT was rotated 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity.

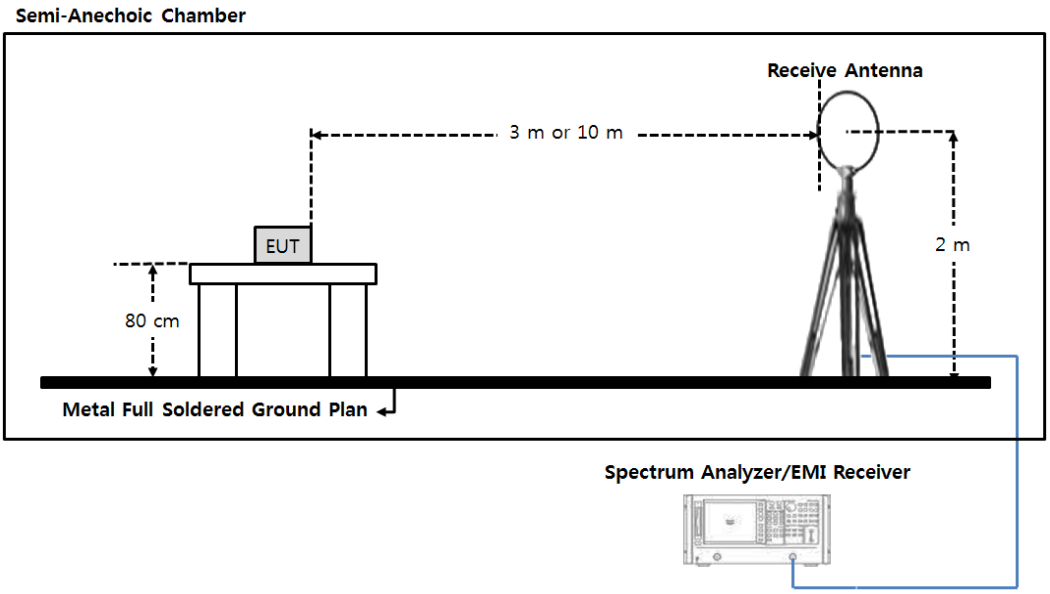


Fig 3. Configurations of Radiated emission test (9 kHz to 30 MHz)

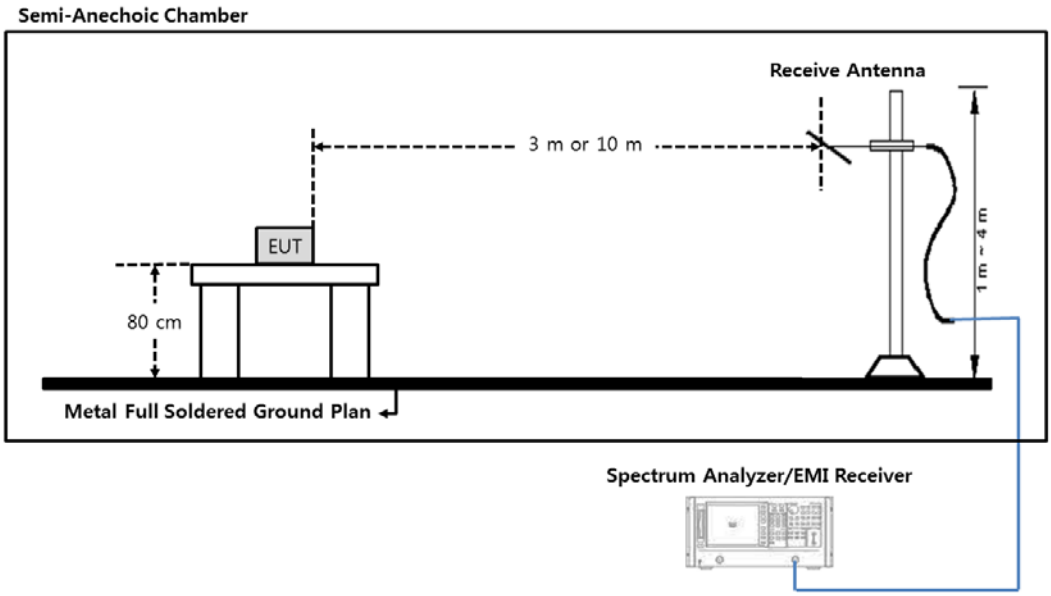


Fig 4. Configurations of Radiated emission test (30 MHz to 1 000 MHz)

6.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO "Guide to the expression of uncertainty in measurement".

The measurement uncertainty was given with a confidence of 95 %.

Test items (10 m Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 10 m, Vertical)	3.50 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (30 MHz ~ 300 MHz, 10 m, Horizontal)	3.73 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Vertical)	3.67 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Horizontal)	3.64 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (1 GHz ~ 6 GHz, 3 m)	4.39 dB	Confidence level of approximately 95 % (k = 2)

Test items (3 m Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	5.01 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	5.01 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	5.10 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	5.10 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (1 GHz ~ 6 GHz, 3 m)	4.53 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (6 GHz ~ 18 GHz, 3 m)	4.55 dB	Confidence level of approximately 95 % (k = 2)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.
The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results

6.4 Limit

Equipment	Operating frequency	RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500 500 or more	25 25×SQRT(power/500)	300 [1]300
	Any non-ISM frequency	**Below 500** 500 or more	**15** 15×SQRT(power/500)	**300** [1]300
Industrial heaters and RF stabilized arc welders	On or below 5,725 MHz Above 5,725 MHz	Any Any	10 (2)	1,600 (2)
Medical diathermy	Any ISM frequency Any non-ISM frequency	Any Any	25 15	300 300
Ultrasonic	Below 490 kHz	Below 500 500 or more	2,400/F(kHz) 2,400/F(kHz)× SQRT(power/500)	300 [3]300
	490 to 1,600 kHz Above 1,600 kHz	Any Any	24,000/F(kHz) 15	30 30
Induction cooking ranges	Below 90 kHz On or above 90 kHz	Any Any	1,500 300	[4]30 [4]30

Note.

1) Field strength may not exceed 10 μV/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.
2) Reduced to the greatest extent possible.
3) Field strength may not exceed 10 μV/m at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.
4) Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.

6.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESR7	Rohde & Schwarz	EMI Test Receiver	101382	Apr. 18, 2018
■ - HFH2-Z2	Rohde & Schwarz	Loop ANT	100041	Dec. 21, 2017
■ - CO3000	Innco system GmbH	Position Controller	CO03000/779/ 33050314/L	N/A
■ - DT3000	Innco system GmbH	Turntable	1280314	N/A
□ - MA4000-EP	Innco system GmbH	Antenna Mast	4420314	N/A

All test equipment used is calibrated on a regular basis.

6.6 Test data for Radiated Emission

-. Test Date : Sep. 02, 2017
-. Measurement Distance : 3 m
-. Note : frequency range to be scanned up to 30 MHz, because the frequency band in which the EUT operates less than 1.705 MHz

-. Measurement setting

Frequency range	9 kHz ~ 150 kHz	0.15 MHz ~ 30 MHz
Detector mode	Peak	Peak
Resolution bandwidth	200 Hz	9 kHz

-. Measurement Data: Continuous Power transmitting mode(1.2W)

Note.2	Frequency [MHz]	Detector mode	ANT Pol.	Field Strength Reading [dBuV/m] at 3 m	D.C.F	Field Strength [dBuV/m] at 300 m	Limits [dBuV/m]	Margin [dB]
F	0.348	Peak	V1	59.84	80	-20.16	23.52	43.68
S	0.069	Peak	V1	46.22	80	-33.78	23.52	57.3
S	0.135	Peak	V1	31.64	80	-48.36	23.52	71.88
S	0.344	Peak	V1	55.24	80	-24.76	23.52	48.28
S	4.016	Peak	V1	37.75	80	-42.25	23.52	65.77
<<	<<	<<	<<	<<	<<	<<	<<	<<

Note.1 The worst case data were reported
And no other spurious and harmonic emissions were reported greater than listed emission above table
Note.2 “F”=Fundamental / “S”=Spurious / “*” = Noise Floor
Note.3 All measurements were recorded using a spectrum analyzer employing a peak detector for below 30 MHz
Note.4 Distance Correction Factor (D.C.F.)
For 300 m: 40log(300/3) = 80 dB
Note.5 Sample calculation
Field Strength = Reading – D.C.F
Margin = Limit – Field Strength
Where, D.C.F = Distance Correction Factor
Note.6 “V1”= Vertical and perpendicular to the centerline / “V2”=vertical and parallel to the centerline
“H” = horizontal (parallel to the ground)
None.7 << The margin is More than 20 dB

7. Sample Calculations

$dB\mu V = 20 \text{ Log}_{10}(\mu V/m)$
$dB\mu V = dBm + 107$
$\mu V = 10^{(dB\mu V/20)}$

7.1 Example 1 :

■ **20.3 MHz**

Class B Limit	**= 250 µV = 48 dBµV**
Reading	**= 39.2 dBµV**
$10^{(39.2dB\mu V/20)}$	**= 91.2 µV**
Margin	**= 48 dBµV - 39.2 dBµV**
	= 8.8 dB

7.2 Example 2 :

■ **66.7 MHz**

Class B Limit	**= 100 µV/m = 40.0 dBµV/m**
Reading	**= 31.0 dBµV**
Antenna Factor + Cable Loss	**= 5.8 dB**
Total	**= 36.8 dBµV/m**
Margin	**= 40.0 dBµV/m – 36.8 dBµV/m**
	= 3.2 dB

8. Recommendation & Conclusion

The data collected shows that the **LG Electronics USA. Refrigerator (Model Name: SKSCF1801P)** was complies with §18.305 and 18.307 of the FCC Rules.

- The end -