

TEST REPORT

EMI Test for FCC Certification / ISED of HLW-TNHP1 Model

APPLICANT

LG Electronics, Inc.

REPORT NO.

HCT-EM-1908-FI003

DATE OF ISSUE

August 02, 2019

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TEST REPORT

EMI Test for
FCC SDoC / ISED

REPORT NO.
HCT-EM-1908-FI003

DATE OF ISSUE
August 02, 2019

FCC ID. / IC
BEJ-HLWTNHP1 / 2703N-HLWTNHP1

Applicant LG Electronics, Inc.
170, Seongsanpaechong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do,
51533, Korea

Product Name Wireless Charger
Model Name HLW-TNHP1

Date of Test June 18, 2019

Test Standard Used FCC CFR 47 PART 15 Subpart B Class B / ICES-003 Issue 6 Class B
ANSI C63.4-2014

Test Results Refer to the present document

Manufacturer Hitachi-LG Data Storage Korea, Inc.

The result shown in this test report refer only to the sample(s) tested unless
otherwise stated.

Tested by
Kyoung-Hee Yoon

(signature)

Technical Manager
Gu-Cheol Yoon

(signature)

HCT CO., LTD.

Soo Chan Lee

SooChan Lee / CEO

Accredited by KOLAS, Republic of KOREA

This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the HCT Co., Ltd.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	August 02, 2019	Initial Release

The above testing certificate is the accredited test result by KOLAS (Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA.

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1. GENERAL INFORMATION

1.1 Description of EUT

FCC ID	BEJ-HLWTNHP1
IC	2703N-HLWTNHP1
Model Name	HLW-TNHP1
Product Name	Wireless Charger
Frequency	146.6 kHz, 147.9 kHz
Operating Voltage	12 Vdc
Manufacturer	Hitachi-LG Data Storage Korea, Inc. 189, Gasan digital 1-ro, Geumcheon-gu, Seoul, Republic of Korea
Factory's Information	Hitachi-LG Data Storage, Inc. 42nd huifeng 4 road, Zhongkai Hi-Tech Industry Development Zone Huizhou, Guangdong, CHINA

NOTE.

This product is a wireless charger module that is supplied with DC 12V from external power supply.

1.2 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Model Name	Serial Number	Manufacturer
EUT	HLW-TNHP1	-	Hitachi-LG Data Storage Korea
DC Power Supply	-	-	LG Electronics

1.3 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	DC IN	N	N/A	1.5
DC Power Supply	AC IN	N	N/A	1.5

1.4 Noise Suppression Parts on Cable (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	DC IN	N/A	N/A	Y	Both End
DC Power Supply	AC IN	Y	DC Power Supply End	Y	Both End

1.5 Test Facility

Test site is located at 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, South Korea. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1 GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014

Measurement Facilities	Designation No.
Radiated Field strength measurement facility 3 m Semi Anechoic chamber	KR0032
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #1	
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #2	
Filing the EMI Measurement Facility (3 m Semi Anechoic Chamber and Shielded Room)	IC 5944A-4
Filing the EMI Measurement Facility (10 m Semi-Anechoic Chamber)	IC 5944A-2

1.6 Calibration of Measuring Instrument

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5:2017

1.7 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty
Conducted Emission (0.15 MHz to 30 MHz)	1.8 dB
Radiated Emissions (30 MHz to 1 GHz)	4.9 dB
Radiated Emissions (1 GHz to 18 GHz)	4.8 dB
Radiated Emissions (18 GHz to 40 GHz)	5.0 dB

2. DESCRIPTION OF TEST

2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 7.3

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The frequency range from 150 kHz to 30 MHz was searched.

Conducted Emission Limits

Frequency (MHz)	Resolution Bandwidth (kHz)	Class A		Class B	
		Quasi-Peak (dBμV)	Average (dBμV)	Quasi-Peak (dBμV)	Average (dBμV)
0.15 to 0.5	9	79	66	66 to 56*	56 to 46*
0.5 to 5	9	73	60	56	46
5 to 30	9	73	60	60	50

NOTE. Decreases with the logarithm of the frequency.

2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 8.3

- The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber.
The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
(1 GHz to 40 GHz)

Radiated Emission Limits

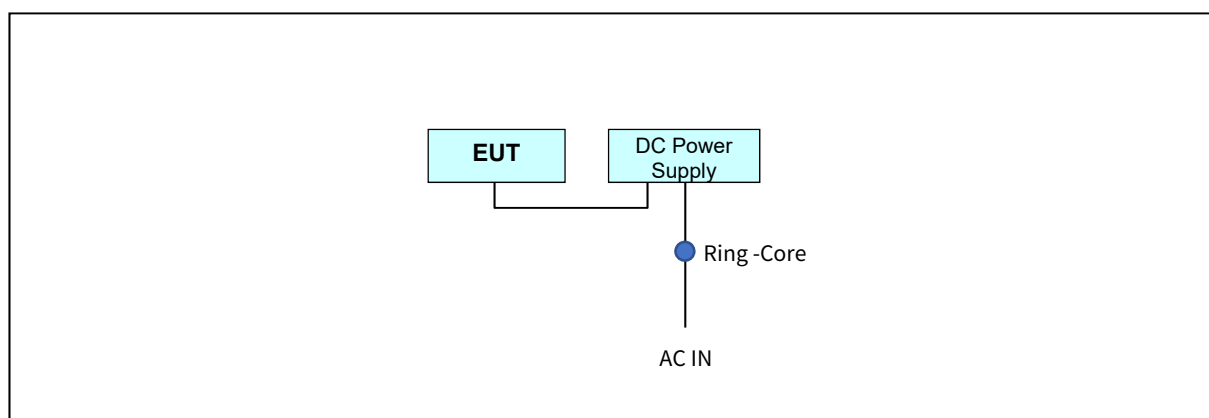
Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	
Above 1 000	3	80	60	74	54	

2.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

2.3 Configuration of Tested System



Non-Conductive Table

Power Line: 120 VAC, 60 Hz

3. PRELIMINARY TEST

3.1 Conducted Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Modes: Idle mode

3.2 Radiated Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Modes: Idle mode

4. CONDUCTED EMISSION AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission

4.1.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.18.2019
☒	LISN	Rohde & Schwarz	ENV216	102245	1 year	12.12.2018
☐	LISN	Rohde & Schwarz	ENV216	100073	1 year	04.30.2019
☒	Software	Rohde & Schwarz	EMC32	-	-	-

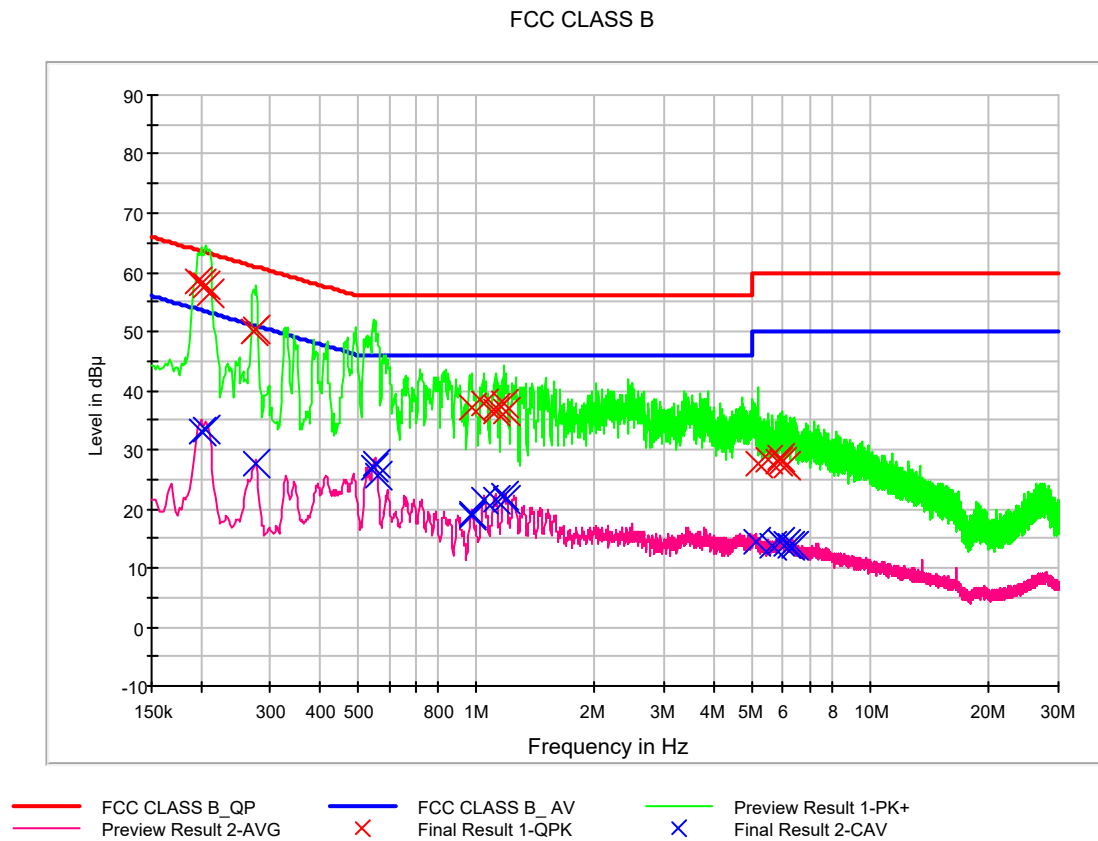
4.1.2 Operating Condition

The test results of conducted emission at mains ports provide the following information:

Test Standard Used	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operating Mode	Idle mode
Kind of Test Site	EMI Shielded Room
Temperature	24.8 °C
Relative Humidity	45.4 %
Test Date	June 18, 2019

4.1.3 Measuring Data

Figure 1: Conducted Emission, AC Main Port, Line (L1)



QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.196000	58.5	9.000	L1	9.7	5.3	63.8
0.200000	58.1	9.000	L1	9.7	5.6	63.6
0.206000	57.7	9.000	L1	9.7	5.6	63.4
0.210000	56.4	9.000	L1	9.7	6.8	63.2
0.272000	49.9	9.000	L1	9.6	11.2	61.1
0.276000	50.5	9.000	L1	9.6	10.4	60.9
0.972000	37.2	9.000	L1	9.7	18.8	56.0
1.044000	37.9	9.000	L1	9.7	18.1	56.0
1.116000	36.3	9.000	L1	9.7	19.7	56.0
1.128000	37.0	9.000	L1	9.7	19.0	56.0
1.172000	38.0	9.000	L1	9.7	18.0	56.0
1.186000	36.5	9.000	L1	9.7	19.5	56.0
5.214000	27.5	9.000	L1	9.8	32.5	60.0
5.478000	28.2	9.000	L1	9.9	31.8	60.0
5.868000	27.8	9.000	L1	9.9	32.2	60.0
5.912000	28.6	9.000	L1	9.9	31.4	60.0
5.994000	27.8	9.000	L1	9.9	32.2	60.0
6.124000	27.4	9.000	L1	9.9	32.6	60.0

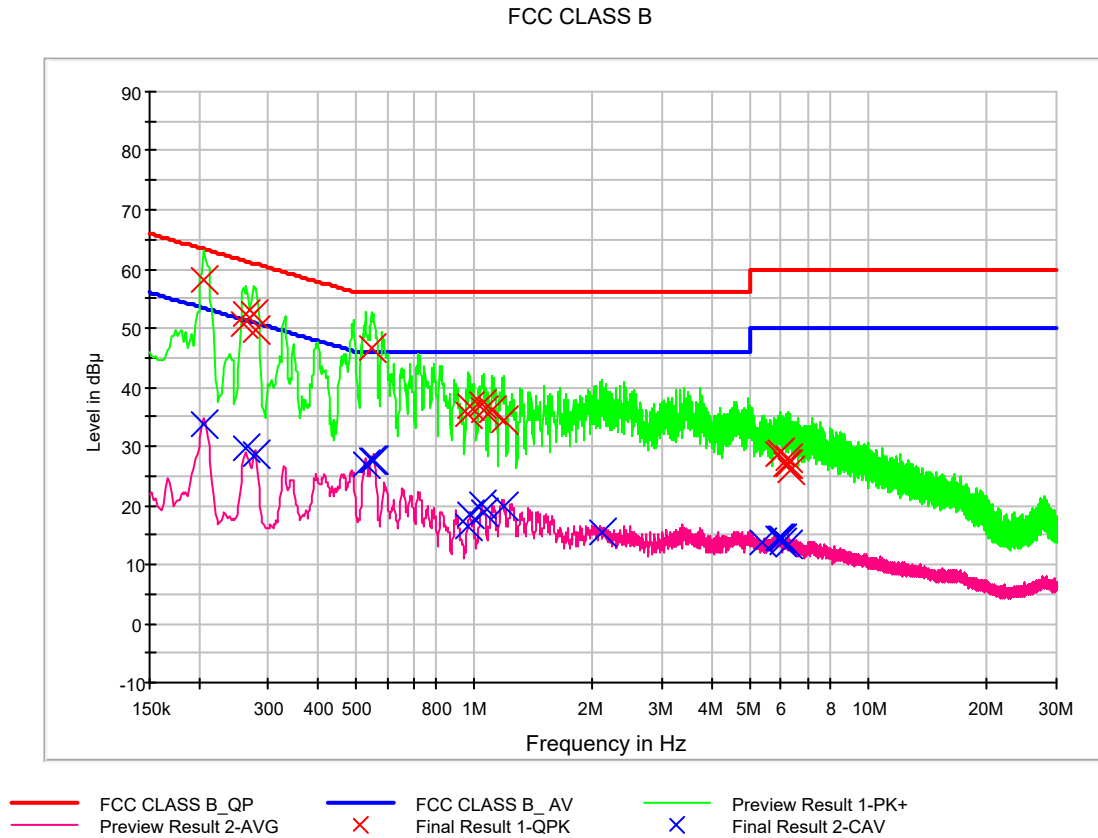
Calculation Formula:

1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage

CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.200000	33.0	9.000	L1	9.7	20.6	53.6
0.206000	33.2	9.000	L1	9.7	20.1	53.4
0.276000	27.6	9.000	L1	9.6	23.3	50.9
0.548000	27.1	9.000	L1	9.7	18.9	46.0
0.554000	27.7	9.000	L1	9.7	18.3	46.0
0.560000	25.6	9.000	L1	9.7	20.4	46.0
0.974000	19.3	9.000	L1	9.7	26.7	46.0
0.978000	19.0	9.000	L1	9.7	27.0	46.0
1.044000	21.6	9.000	L1	9.7	24.4	46.0
1.116000	21.4	9.000	L1	9.7	24.6	46.0
1.172000	22.2	9.000	L1	9.7	23.8	46.0
1.186000	21.7	9.000	L1	9.7	24.3	46.0
5.150000	14.3	9.000	L1	9.8	35.7	50.0
5.640000	13.6	9.000	L1	9.9	36.4	50.0
5.912000	14.3	9.000	L1	9.9	35.7	50.0
6.124000	14.0	9.000	L1	9.9	36.0	50.0
6.266000	13.7	9.000	L1	9.9	36.3	50.0
6.394000	13.8	9.000	L1	9.9	36.2	50.0

Figure 2: Conducted Emission, AC Main Port, Line (N)



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.206000	58.2	9.000	N	9.6	5.2	63.4
0.260000	50.7	9.000	N	9.6	10.7	61.4
0.264000	52.5	9.000	N	9.6	8.8	61.3
0.276000	52.3	9.000	N	9.6	8.6	60.9
0.280000	49.6	9.000	N	9.6	11.2	60.8
0.548000	46.6	9.000	N	9.7	9.4	56.0
0.968000	35.3	9.000	N	9.7	20.7	56.0
0.974000	36.7	9.000	N	9.7	19.3	56.0
1.046000	37.0	9.000	N	9.7	19.0	56.0
1.060000	36.0	9.000	N	9.7	20.0	56.0
1.112000	35.9	9.000	N	9.7	20.1	56.0
1.190000	34.5	9.000	N	9.7	21.5	56.0
5.934000	28.8	9.000	N	9.9	31.2	60.0
5.970000	28.9	9.000	N	9.9	31.1	60.0
6.182000	26.8	9.000	N	9.9	33.2	60.0
6.258000	28.0	9.000	N	9.9	32.0	60.0
6.284000	27.0	9.000	N	9.9	33.0	60.0
6.356000	25.9	9.000	N	9.9	34.1	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.206000	33.6	9.000	N	9.6	19.7	53.4
0.264000	29.8	9.000	N	9.6	21.5	51.3
0.278000	28.5	9.000	N	9.6	22.4	50.9
0.530000	26.9	9.000	N	9.7	19.1	46.0
0.550000	27.7	9.000	N	9.7	18.3	46.0
0.556000	27.5	9.000	N	9.7	18.5	46.0
0.960000	16.3	9.000	N	9.7	29.7	46.0
0.974000	18.6	9.000	N	9.7	27.4	46.0
1.044000	20.0	9.000	N	9.7	26.0	46.0
1.060000	18.7	9.000	N	9.7	27.3	46.0
1.188000	19.9	9.000	N	9.7	26.1	46.0
2.114000	15.5	9.000	N	9.7	30.5	46.0
5.392000	13.7	9.000	N	9.8	36.3	50.0
5.934000	14.2	9.000	N	9.9	35.8	50.0
5.998000	14.3	9.000	N	9.9	35.7	50.0
6.036000	14.3	9.000	N	9.9	35.7	50.0
6.056000	13.7	9.000	N	9.9	36.3	50.0
6.284000	13.4	9.000	N	9.9	36.6	50.0

4.2 Radiated Emission Below 1 GHz

4.2.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI test receiver	Rohde & Schwarz	ESi40	831564103	1 year	10.31.2018
☒	Trilog antenna	Schwarzbeck	VULB 9168	255	2 year	03.26.2019
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn Table	INNCO Systems	1060	-	N/A	-
☒	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	Software	Rohde & Schwarz	EMC32	-	-	-

4.2.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Operating Mode	Idle mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	24.8 °C
Relative Humidity	43.9 %
Test Date	June 18, 2019

4.2.3 Measuring Data

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.970406	19.1	225.0	V	105.0	18.4	20.9	40.0
119.680800	23.6	274.8	H	218.0	17.4	19.9	43.5
126.958400	25.5	274.7	H	44.0	18.0	18.0	43.5
153.952800	20.0	274.8	H	252.0	19.6	23.5	43.5
465.494400	23.5	274.9	H	353.0	24.4	22.5	46.0
789.975200	30.6	325.3	V	239.0	30.2	15.4	46.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak

4.3 Radiated Emission Above 1 GHz

4.3.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☐	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒	EMI test receiver	Rohde & Schwarz	ESI40	831564103	1 year	10.31.2018
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn table	INNCO Systems	1060	-	N/A	-
☒	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	Horn antenna	Schwarzbeck	BBHA 9120D	01836	1 year	07.20.2018
☒	Low Noise amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
☐	Power Amplifier	TK-PA1840H	TESTEK	170030-L	1 year	12.17.2018
☐	Horn Antenna	BBHA 9170	Schwarzbeck	BBHA 9170 #786	2 year	12.05.2017
☒	Software	Rohde & Schwarz	EMC32	-	-	-

4.3.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Frequency	147.9 kHz
Tested Frequency Range	1 GHz to 18 GHz
Operation Mode	Idle mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	24.8 °C
Relative Humidity	43.9 %
Test Date	June 18, 2019

4.3.3 Measuring Data

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
5546.900000	39.0	249.8	V	104.0	-15.1	35.0	74.0
7536.450000	44.5	125.7	V	317.0	-9.2	29.5	74.0
9191.815000	48.0	100.0	V	76.0	-6.0	26.0	74.0
9642.055000	48.1	99.9	V	303.0	-5.1	25.9	74.0
12235.240000	45.5	99.9	H	340.0	-3.3	28.5	74.0
14627.185000	48.9	99.7	H	29.0	0.9	25.1	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
5546.900000	26.4	249.8	V	104.0	-15.1	27.6	54.0
7536.450000	31.7	125.7	V	317.0	-9.2	22.3	54.0
9191.815000	35.2	100.0	V	76.0	-6.0	18.8	54.0
9642.055000	35.4	99.9	V	303.0	-5.1	18.6	54.0
12235.240000	33.0	99.9	H	340.0	-3.3	21.0	54.0
14627.185000	36.1	99.7	H	29.0	0.9	17.9	54.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. Peak or CAverage = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
4. Margin = Limit - Peak or CAverage

5. CONCLUSION

The data collected shows that the **Product Name: Wireless Charger, Model Name: HLW-TNHP1** complies with § 15.107 and § 15.109 of the FCC rules and ICES-003 Issue 6 of the IC rules.

6. APPENDIX A. TEST SETUP PHOTO

Please refer to Appendix. A and test setup photo file no. as follows;

File No.	Date of Issue	Description
HCT-EM-1908-FI003-P	August 02, 2019	Initial Release

End of report