TEST REPORT

FCC Part 15C

Equipment under test	Wireless Charging Cradle
Model name	HC-D112
FCC ID	2AUG3-HCD112
Applicant	Cellreturn Co., Ltd.
Manufacturer	Cellreturn Co., Ltd.
Date of test(s)	2019.12.09~2019.12.20
Date of issue	2020.01.30

Issued to

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Issued by

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Test and report completed by :	**Report approval by :**
	
Yeong-Jun Cho Test engineer	Hyeon-Su Jang Technical manager

Revision history

Revision	Date of issue	Test report No.	Description
-	2020.01.30	KES-RF-20T0018	Initial

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1. General information

Applicant	Cellreturn Co., Ltd.
Applicant address	237, Namdongseo-ro, Namdong-gu, Inchon, Republic of Korea
Test site	KES Co., Ltd.
Test site address	3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea 473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Test Facility	FCC Accreditation Designation No.: KR0100, Registration No.: 444148
FCC rule part(s):	Part 15C
FCC ID:	2AUG3-HCD112
Test device serial No.	☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	Wireless Charging Cradle
Frequency	0.189 ㎒
Inductive charging technique	Magnetic Induction
Model:	HC-D112
Antenna specification	Internal type(Coil antenna)
Power source	AC 120 V(Adapter DC output 5 V)
S/W version	1.0.0
H/W version	REV 1.1

1.2. Test configuration

The **Cellreturn Co., Ltd. Wireless Charging Cradle FCC ID: 2AUG3-HDC112** was tested according to the specification of EUT, the EUT must comply with following standards.

FCC Part 15C
ANSI C63.10-2013

1.3. Test frequency

		Frequency Range
Power source	AC 120 V (Adapter DC output 5 V)	0.189 ㎒

1.4. Test mode

Mode	Charging current	Description
Charging mode With load	90%	Using Max load
	50%	Using Mid load
	10%	Using Min load

1.5. Information about derivative model

N/A

1.6. Device modifications

N/A

1.7. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
AC/DC Adapter	Apower	APS-0530A	-	Output : DC 5 V, 3A
Hair Alpha-RAY(load)	Cellreturn Co., Ltd.	HA-M2192	-	-

1.8. Measurement Uncertainty`

Test Item		Uncertainty
Uncertainty for Conduction emission test		2.62 dB
Uncertainty for Radiation emission test (include Fundamental emission)	9㎑ - 30㎒	4.54 dB
	30㎒ - 1㎓	4.36 dB
	Above 1㎓	5.00 dB
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

2. Summary of tests

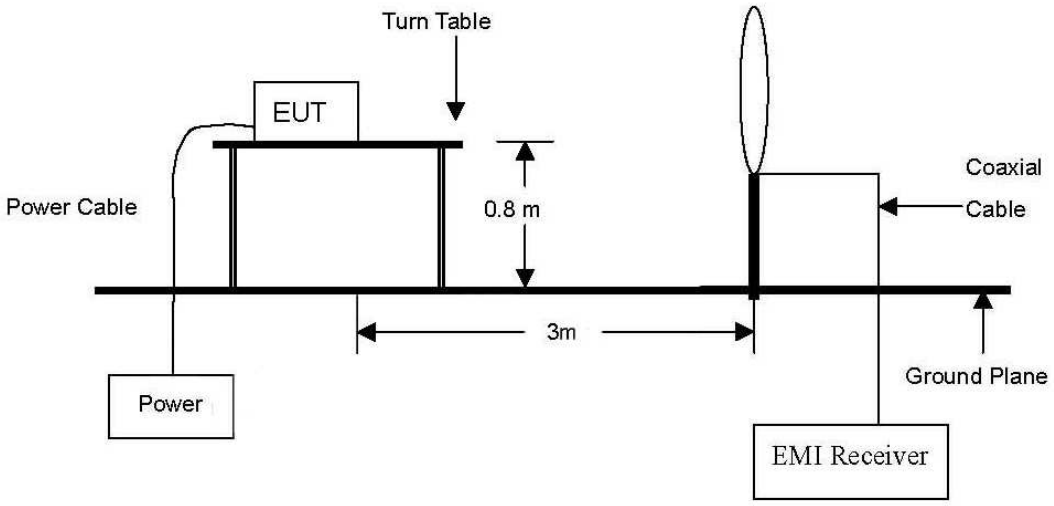
FCC Part Sections	Parameter	Test results
15.209	Radiated spurious emission	Pass
2.1049	20dB Bandwidth	Pass
15.207	AC conducted emissions	Pass

3. Test results

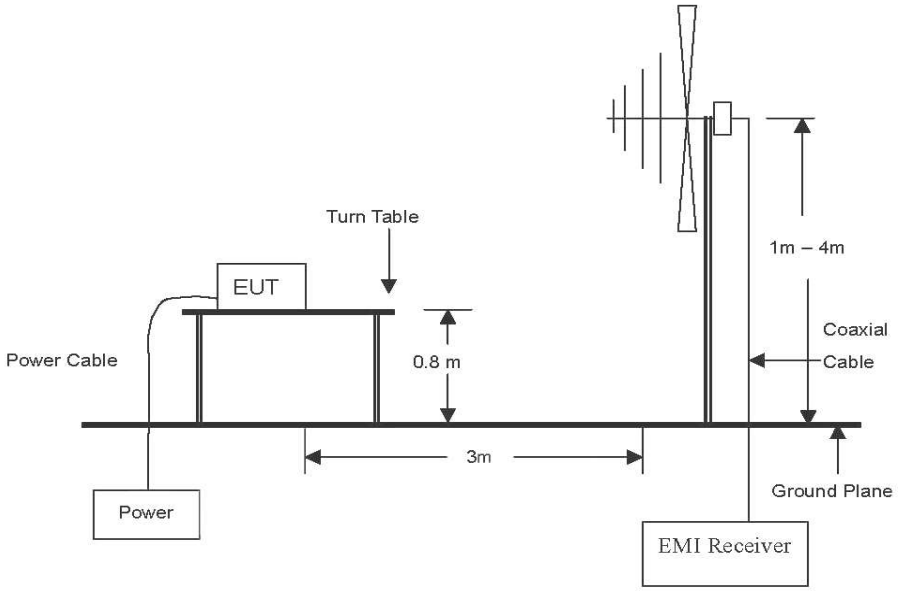
3.1. Radiated spurious emission

Test setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



Test procedure

[9 ㎑ to 30 ㎒]

The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular and ground parallel of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Quasi-peak function and specified bandwidth with maximum hold mode.

[30 ㎒ to 1 ㎓]

The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

Note:

1. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
2. Measurement distance : 3 m.
3. Field strength = Level + Correction factor + F_d
4. $F_d = 40\log(D_m / D_s)$
   Where:
   F_d = Distance factor in dB
   D_m = Measurement distance in meters
   D_s = Specification distance in meters
   For 300m: 40log(300/3) = 80 dB for frequency band 0.009 ㎒ to 0.490 ㎒
   For 30m: 40log(30/3) = 40 dB for frequency band 0.490 ㎒ to 30 ㎒
5. No significant emissions were found in the 90 - 110㎑ restricted band.

Limit

According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (㎒)	Distance (Meters)	Radiated (㎶/m)
0.009 ~ 0.490	300	2400 / F(㎑)
0.490 ~ 1.705	30	24000 / F(㎑)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

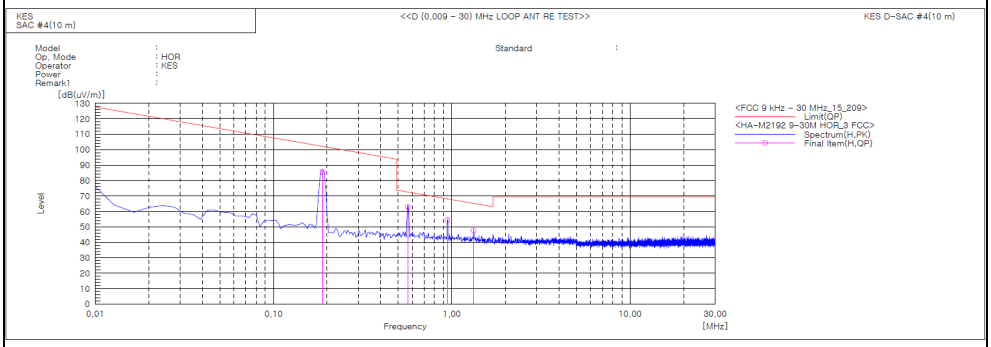
**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 ㎒, 76 ~ 88 ㎒, 174 ~ 216 ㎒ or 470 ~ 806 ㎒. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

Test results (Below 30 ㎒)

Mode: 15W // 10 % charger

Distance of measurement: 3 meter

Parallel



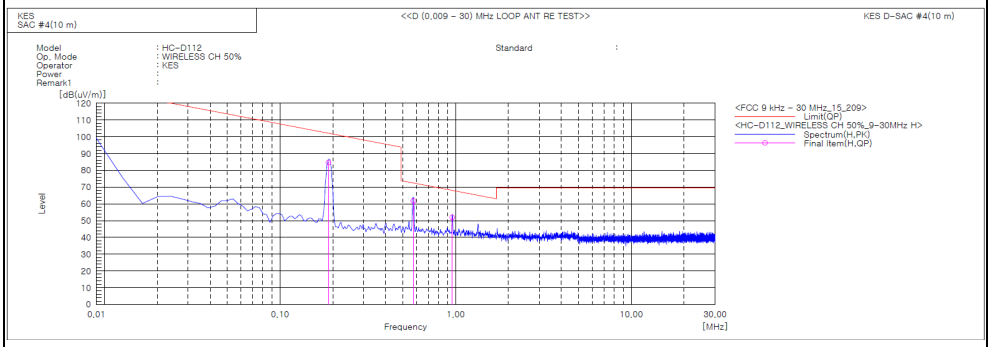
Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	0.189	H	66.5	19.2	85.7	102.1	16.4	100.0	185.0	
2	0.568	H	43.0	20.0	63.0	72.5	9.5	100.0	185.0	
3	0.946	H	34.0	20.5	54.5	68.1	13.6	100.0	162.0	
4	1.325	H	27.4	20.1	47.5	65.2	17.7	100.0	185.0	

Mode: 15W // 50 % charger

Distance of measurement: 3 meter

Parallel



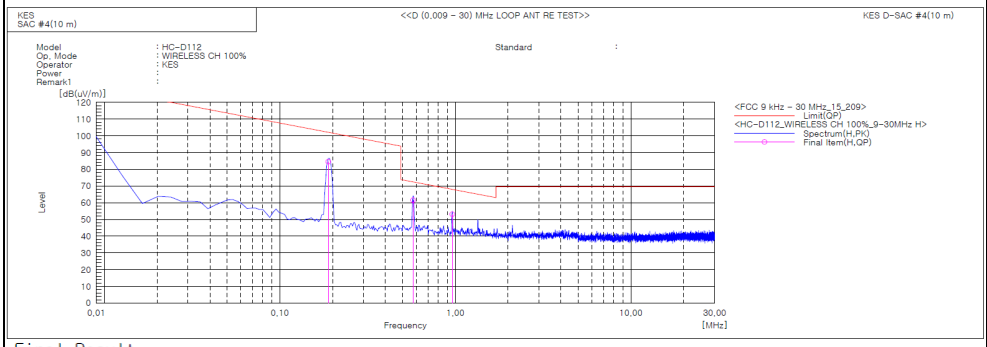
Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	0.189	H	65.4	19.2	84.6	102.1	17.5	100.0	169.0	
2	0.575	H	41.7	20.1	61.8	72.4	10.6	100.0	162.0	
3	0.957	H	31.4	20.5	51.9	68.0	16.1	100.0	169.0	

Mode: 15W // 90 % charge

Distance of measurement: 3 meter

Parallel



Final Result

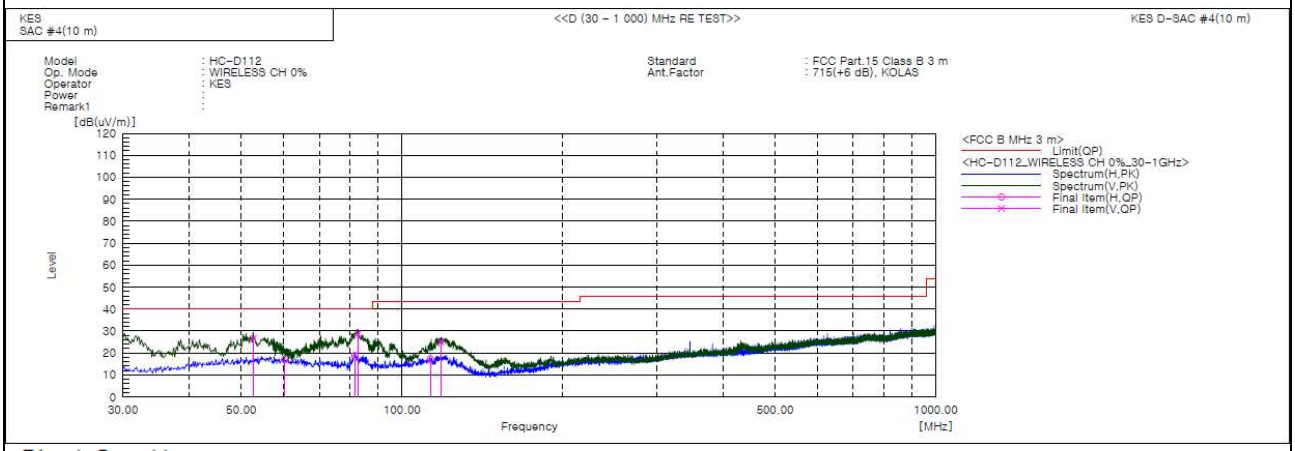
No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	0.189	H	65.3	19.2	84.5	102.1	17.6	100.0	191.0	
2	0.575	H	41.4	20.1	61.5	72.4	10.9	100.0	191.0	
3	0.961	H	32.6	20.5	53.1	68.0	14.9	100.0	198.0	

Test results (Below 1 000 ㎒)

Mode: 15W // 10 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



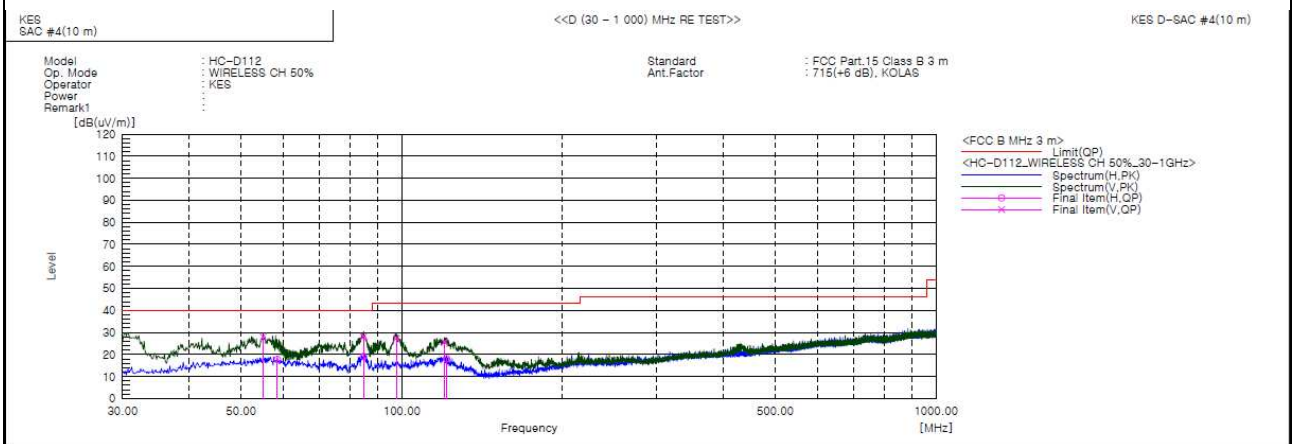
Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	52.674	V	48.7	-22.0	26.7	40.0	13.3	119.0	253.0	
2	60.313	H	40.2	-23.1	17.1	40.0	22.9	324.0	154.0	
3	81.653	H	46.9	-28.1	18.8	40.0	21.2	359.0	67.0	
4	82.744	V	56.4	-27.8	28.6	40.0	11.4	100.0	55.0	
5	113.056	H	41.1	-23.8	17.3	43.5	26.2	244.0	269.0	
6	118.270	V	49.7	-24.6	25.1	43.5	18.4	126.0	83.0	

Mode: 15W // 50 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



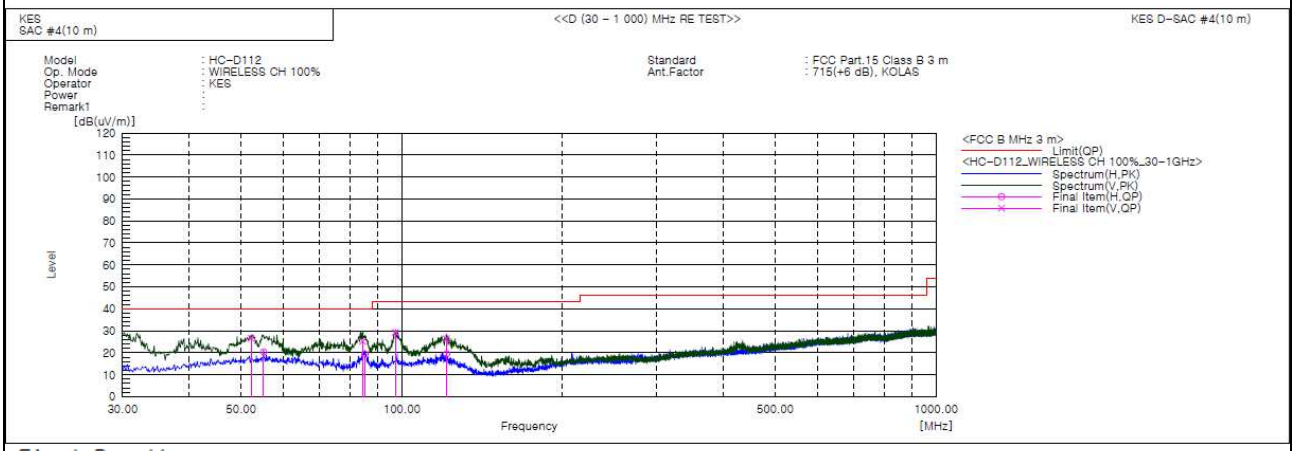
Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	54.978	V	50.4	-22.3	28.1	40.0	11.9	115.0	236.0	
2	58.494	H	40.6	-22.8	17.8	40.0	22.2	368.0	146.0	
3	84.805	V	55.2	-27.1	28.1	40.0	11.9	141.0	37.0	
4	84.805	H	46.2	-27.1	19.1	40.0	20.9	393.0	35.0	
5	97.658	V	50.8	-23.5	27.3	43.5	16.2	100.0	173.0	
6	120.210	V	50.6	-24.9	25.7	43.5	17.8	100.0	45.0	
7	121.301	H	43.1	-25.0	18.1	43.5	25.4	387.0	110.0	

Mode: 15W // 90 % charge

Distance of measurement: 3 meter

Horizontal // Vertical

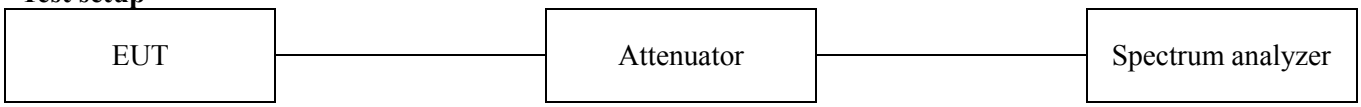


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	52.189	V	48.6	-22.0	26.6	40.0	13.4	100.0	280.0	
2	55.099	H	42.7	-22.3	20.4	40.0	19.6	319.0	211.0	
3	84.441	V	52.4	-27.2	25.2	40.0	14.8	105.0	117.0	
4	85.290	H	46.3	-26.9	19.4	40.0	20.6	345.0	59.0	
5	97.173	V	52.9	-23.6	29.3	43.5	14.2	100.0	236.0	
6	121.059	V	51.4	-25.0	26.4	43.5	17.1	160.0	133.0	
7	121.301	H	44.5	-25.0	19.5	43.5	24.0	400.0	107.0	

3.2. 20dB Bandwidth

Test setup



Test procedures

The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the emission bandwidth. The VBW is set to ≥RBW. The sweep time is coupled.

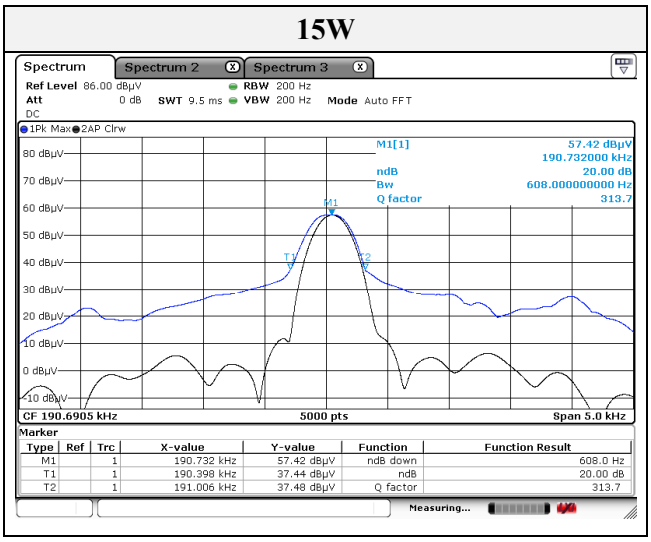
Limit

None; for reporting purposes only.

Test results

Power source(W)	Frequency(㎒)	Measured bandwidth(㎑)
15.0	0.190	0.608

15W



Note.

Because the measured signal is CW/CW-like, adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

3.3. AC conducted emissions

Limit

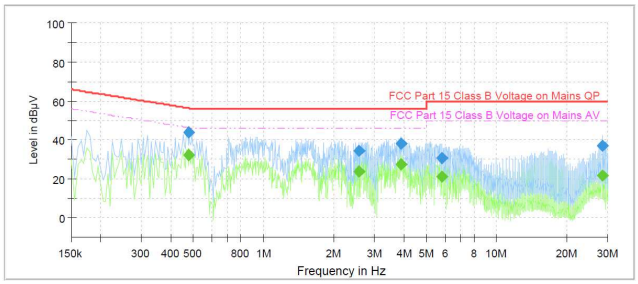
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (㎒)	Conducted limit (dB㎶/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Test results

Mode: 15W // 90 % charge

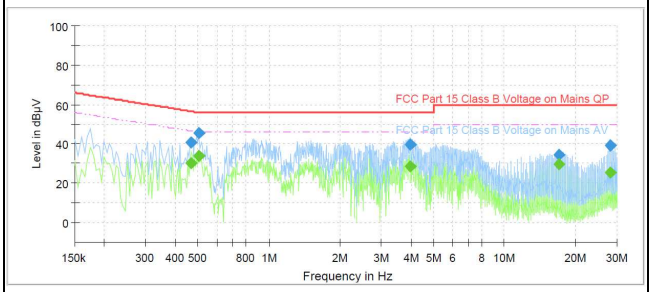
Hot Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.480000	---	32.40	46.34	13.94	1000.0	9.000	L1	10.9
0.480000	44.06	---	56.34	12.28	1000.0	9.000	L1	10.9
2.570000	---	23.97	46.00	22.03	1000.0	9.000	L1	10.0
2.570000	34.17	---	56.00	21.83	1000.0	9.000	L1	10.0
3.890000	---	27.48	46.00	18.52	1000.0	9.000	L1	10.1
3.890000	38.31	---	56.00	17.69	1000.0	9.000	L1	10.1
5.845000	---	21.12	50.00	28.88	1000.0	9.000	L1	10.3
5.845000	30.98	---	60.00	29.02	1000.0	9.000	L1	10.3
28.490000	---	21.95	50.00	28.05	1000.0	9.000	L1	11.1
28.490000	36.88	---	60.00	23.12	1000.0	9.000	L1	11.1

Neutral Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.465000	---	30.36	46.60	16.24	1000.0	9.000	N	10.9
0.465000	40.97	---	56.60	15.63	1000.0	9.000	N	10.9
0.505000	---	33.97	46.00	12.03	1000.0	9.000	N	11.0
0.505000	45.37	---	56.00	10.63	1000.0	9.000	N	11.0
3.985000	---	28.68	46.00	17.32	1000.0	9.000	N	10.1
3.985000	39.90	---	56.00	16.10	1000.0	9.000	N	10.1
16.990000	---	29.76	50.00	20.24	1000.0	9.000	N	10.6
16.990000	34.55	---	60.00	25.45	1000.0	9.000	N	10.6
28.140000	---	25.19	50.00	24.81	1000.0	9.000	N	11.0
28.140000	39.37	---	60.00	20.63	1000.0	9.000	N	11.0

Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Cal. Day to next Cal. day
Spectrum Analyzer	R&S	FSV40	101002	2019.06.24 ~ 2020.06.24
Loop Antenna	Schwarzbeck	FMZB1513	225	2019.02.15 ~ 2021.02.15
Trilog-broadband antenna	SCHWARZBECK	VULB 9163	715	2018.11.29 ~ 2020.11.29
AC POWER SOURCE	HP	6813A	3729A00754	2019.01.15 ~ 2020.01.15
				2020.01.15 ~ 2021.01.15
EMI Test Receiver	R&S	ESR3	101781	2019.04.22 ~ 2020.04.22
EMI Test Receiver	R&S	ESU26	100551	2019.04.09 ~ 2020.04.09
LISN	R&S	ENV216	101786	2019.01.25 ~ 2020.01.25
				2020.01.20 ~ 2021.01.20

Peripheral device

Device	Manufacturer	Model No.	S/N	Note
Hair Alpha-RAY	Cellreturn Co., Ltd.	HA-M2192	-	-