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TEST REPORT

KCTL Inc.
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

KCTL

1. Client

- Name : Brunt. Co., Ltd
- Address : 4F, Olympia Bldg, 89 Yangjaecheon-ro, Seocho-gu, Seoul, South Korea 06748
- Date of Receipt : 2018-04-23

2. Use of Report : -

3. Name of Product and Model : Brunt Fast Wireless Charger N / WRAKR1801

4. Manufacturer and Country of Origin : Woo Young Co., Ltd. / Korea

5. FCC ID : 2AODVWRAKR1801

6. Date of Test : 2018-06-07 to 2018-06-09

7. Test Standards : FCC Part 15 Subpart C, 15.209

8. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Seonjun Yun (Signature)	Technical Manager Name : Jongha Choi (Signature)

2018-06-19

KCTL Inc.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2018-06-19	Originally issued	-

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1. Client information

Applicant:	Brunt. Co., Ltd
Address:	4F, Olympia Bldg, 89 Yangjaecheon-ro, Seocho-gu, Seoul, south Korea 06748
Telephone number:	+82 2 783 5551
Contact person:	Hyunjae Lee / j@brunt.co.kr

Manufacturer:	Woo Young Co., Ltd.
Address:	46, Bongsu-daero 501beon-gil, Seo-gu, Incheon, 22770 Korea

KCTL

2. Laboratory information

Address

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

Telephone Number: +82 31 285 0894

Facsimile Number: +82 505 299 8311

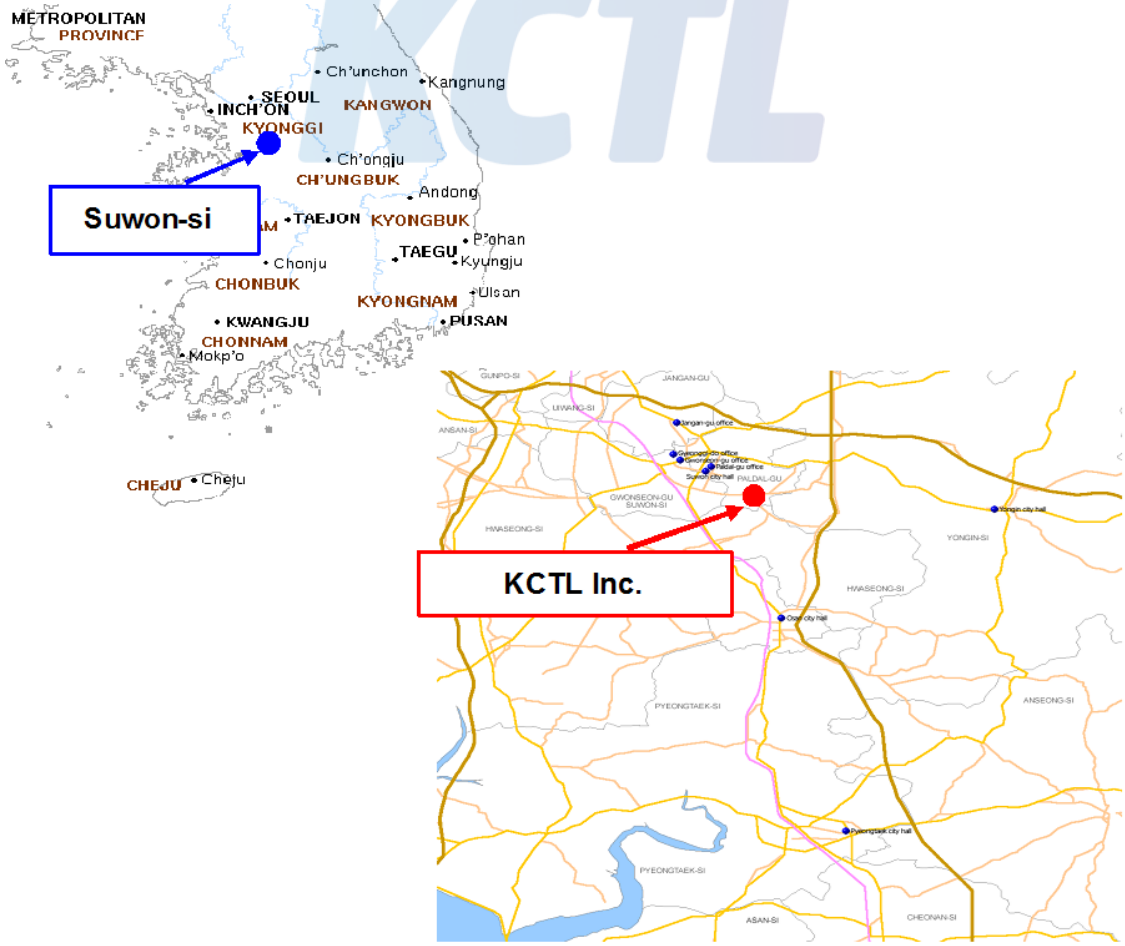
FCC Site Designation No: KR0040, FCC Site Registration No: 687132

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No. : 8035A-2

KOLAS NO.: KT231

SITE MAP



3. Description of E.U.T.

3.1 Basic description

Applicant	Brunt. Co., Ltd
Address of Applicant	4F, Olympia Bldg, 89 Yangjaecheon-ro, Seocho-gu, Seoul, South Korea 06748
Manufacturer	Woo Young Co., Ltd.
Address of Manufacturer	46, Bongsu-daero 501beon-gil, Seo-gu, Incheon, 22770 Korea
Type of equipment	Brunt Fast Wireless Charger N
Basic Model	WRAKR1801
Serial number	N/A

3.2 General description

Frequency Range	DC 5 V : 104 ㎑ ~ 175 ㎑, DC 9 V : 114 ㎑ ~ 162 ㎑
Type of Modulation	AM
Power supply	DC 5 V, DC 9 V
Type of Antenna	Loop coil Antenna
RF power setting	Referred the measuring instrument from manufacturer

Note : The above EUT information was declared by the manufacturer.

3.3 Test configurations

In order to check all kinds of possible configurations, EUT was evaluated with appropriate client and under each charging condition as below table.

EUT Mode	Description
5 V Charging Mode with Client device (Model : SM-G930S, FCC ID : A3LSMG930KOR)	Less than 1 % of Battery
	Less than 50 % of Battery
	100 % full charging of Battery
9 V Fast Charging Mode with Client device (Model : SM-G930S, FCC ID : A3LSMG930KOR)	Less than 1 % of Battery
	Less than 50 % of Battery
	100 % full charging of Battery

Note : The above EUT information was declared by the manufacturer.

3.4 Normal and extreme test conditions

- Ambient Conditions

	Temperature [℃]	Relative humidity [%]
Requirement for tests	15 to 35	20 to 75
Ambient Conditions	23	51

-Test Conditions

Test Condition	Temperature [°C]	Voltage [V]
NTNV	23	5, 9

Note 1 : N:Normal T:Temperature V:Voltage

4. Summary of test results

4.1 Standards & results

FCC Rule Reference	Parameter	Report Section	Test Result
15.209	Field Strength of Fundamental and Spurious Emission	5.1	C
2.1049	20 ㏈ Bandwidth	5.2	C
15.207	AC Power Line Conducted Emission	5.3	C
Note$_{1)}$: C = Complies, NC = Not Complies, NT = Not Tested, NA = Not Applicable			

Note: Measurement methods used to test this device are ANSI C63.10:2013

4.2 Uncertainty

Measurement Item	Expanded Uncertainty U = *k*Uc (*k* = 2)	
Radiated Spurious Emissions	9 ㎑ ~ 30 ㎒	+2.42 ㏈, -2.42 ㏈
	30 ㎒ ~ 300 ㎒:	+4.94 ㏈, -5.06 ㏈
		+4.93 ㏈, -5.05 ㏈
	300 ㎒ ~ 1 000 ㎒:	+4.97 ㏈, -5.08 ㏈
		+4.84 ㏈, -4.96 ㏈

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5. Test results

5.1 Field Strength of Fundamental and Spurious Emission

5.1.1 Regulation

According to §15.209(a), Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall notexceed the field strength levels specified in the following table:

Frequency (㎒)	Field strength (㎶/m)	Measurement distance (m)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

**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 permltted under other sections of this part, e.g., §15.231 and 15.241.

5.1.2 Measurement Procedure

Test Procedures for emission from 9 ㎑ to 30 ㎒

a. The EUT was placed on the top of a rotating table 0.8 meters 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.
b. 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 of the antenna are set to make the measurement.
c. 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.
d. The test-receiver system was set to Quasi Peak and Average Detect Function and Specified Bandwidth with Maximum Hold Mode.

Test Procedures for emission from above 30 ㎒

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site below 1 ㎓. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the Interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The antenna is a bi-log antenna and its height is varied from one meter to four meters 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.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Note;

RADIATED EMISSION TEST SITES FOR MEASUREMENTS FROM 9 kHz TO 30 MHz

According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. 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.

5.1.3 Test Result

Test Condition: Refer to the clause 3.5 Normal and extreme test conditions

- Complied

1. Measured value of the Field strength of spurious Emissions (Radiated)
2. The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
3. All radiated testing was measured in one orthogonal EUT position (X-axis)

- Field Strength of Fundamental Test data

- 5 V Charging Mode (Less than 1 % of Battery)

Frequency [MHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	3m Field Strength [dB(μV/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
0.127	77.40	H	0.56	-32.76	19.60	-12.60	64.80	-15.20	25.53	40.73
0.127	75.30	V	0.56	-32.76	19.60	-12.60	62.70	-17.30	25.53	42.83

Note1. Factor = Cable loss + Amp gain + Antenna factor
Note2. According to §15.31 (f)(2);
Result at 300 m (dBμV/m) = 3 m Field Strength Result (dBμV/m) - 40log(300/3) (dBμV/m).
Note3. The limit above was calculated based on table of §15.209 (a).

- 5 V Charging Mode (Less than 50 % of Battery)

Frequency [MHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	3m Field Strength [dB(μV/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
0.120	78.12	H	0.36	-32.76	19.60	-12.80	65.32	-14.68	26.02	40.70
0.118	76.32	V	0.36	-32.76	19.60	-12.80	63.52	-16.48	26.17	42.65

Note1. Factor = Cable loss + Amp gain + Antenna factor
Note2. According to §15.31 (f)(2);
Result at 300 m (dBμV/m) = 3 m Field Strength Result (dBμV/m) - 40log(300/3) (dBμV/m).
Note3. The limit above was calculated based on table of §15.209 (a).

- 5 V Charging Mode (100 % full charging of Battery)

Frequency [MHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	3m Field Strength [dB(μV/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
0.130	79.05	H	0.36	-32.76	19.60	-12.80	66.25	-13.75	25.33	39.08
0.130	76.55	V	0.36	-32.76	19.60	-12.80	63.75	-16.25	25.33	41.58

Note1. Factor = Cable loss + Amp gain + Antenna factor
Note2. According to §15.31 (f)(2);
Result at 300 m (dBμV/m) = 3 m Field Strength Result (dBμV/m) - 40log(300/3) (dBμV/m).
Note3. The limit above was calculated based on table of §15.209 (a).

- 9 V Charging Mode (Less than 1 % of Battery)

Frequency [MHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	3m Field Strength [dB(μV/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
0.150	79.89	H	0.65	-32.75	19.60	-12.50	67.39	-12.61	24.08	36.69
0.147	81.05	V	0.65	-32.75	19.60	-12.50	68.55	-11.45	24.26	35.71

Note1. Factor = Cable loss + Amp gain + Antenna factor
Note2. According to §15.31 (f)(2);
Result at 300 m (dBμV/m) = 3 m Field Strength Result (dBμV/m) - 40log(300/3) (dBμV/m).
Note3. The limit above was calculated based on table of §15.209 (a).

- 9 V Charging Mode (Less than 50 % of Battery)

Frequency [MHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	3m Field Strength [dB(μV/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
0.154	80.12	H	0.25	-32.75	19.60	-12.90	67.22	-12.78	23.85	36.63
0.154	81.98	V	0.25	-32.75	19.60	-12.90	69.08	-10.92	23.85	34.77

Note1. Factor = Cable loss + Amp gain + Antenna factor
Note2. According to §15.31 (f)(2);
Result at 300 m (dBμV/m) = 3 m Field Strength Result (dBμV/m) - 40log(300/3) (dBμV/m).
Note3. The limit above was calculated based on table of §15.209 (a).

- 9 V Charging Mode (100 % full charging of Battery)

Frequency [MHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	3m Field Strength [dB(μV/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
0.154	83.90	H	0.25	-32.75	19.60	-12.90	71.00	-9.00	23.85	32.85
0.154	79.90	V	0.25	-32.75	19.60	-12.90	67.00	-13.00	23.85	36.85

Note1. Factor = Cable loss + Amp gain + Antenna factor
Note2. According to §15.31 (f)(2);
Result at 300 m (dBμV/m) = 3 m Field Strength Result (dBμV/m) - 40log(300/3) (dBμV/m).
Note3. The limit above was calculated based on table of §15.209 (a).

- Spurious Emission Test data

1. According to §15.31 (f)(2)
   - 300 m Result (㏈㎶/m) = 3 m Result (㏈㎶/m) - 40log(300/3) (㏈㎶/m)
   - 30 m Result (㏈㎶/m) = 3 m Result (㏈㎶/m) - 40log(30/3) (㏈㎶/m)
2. Spurious emissions for all possible modes were investigated and almost the same below 1 ㎓.
3. According to §15.31(o), emission levels are not report much lower than the limits by over 20 ㏈.

- Below 1 ㎓ data

- 9 V Charging Mode (100 % full charging of Battery)

Frequency [㎒]	Receiver Bandwidth [㎑]	Pol. [V/H]	Reading [dB(μV)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Average DATA. Emissions below 1 ㎓										
Not detected										
Quasi-Peak DATA. Emissions below 1 ㎓										
58.74	120	V	44.80	1.58	-28.69	12.51	-14.60	30.20	40.00	9.80
120.09	120	V	37.60	2.36	-36.56	18.30	-15.90	21.70	43.50	21.80
177.08	120	V	36.90	2.91	-32.64	15.33	-14.40	22.50	43.50	21.00
193.08	120	V	44.80	3.06	-34.33	15.27	-16.00	28.80	43.50	14.70
300.51	120	H	26.90	3.88	-34.69	19.21	-11.60	15.30	46.00	30.70
399.57	120	H	27.60	4.56	-34.95	21.69	-8.70	18.90	46.00	27.10

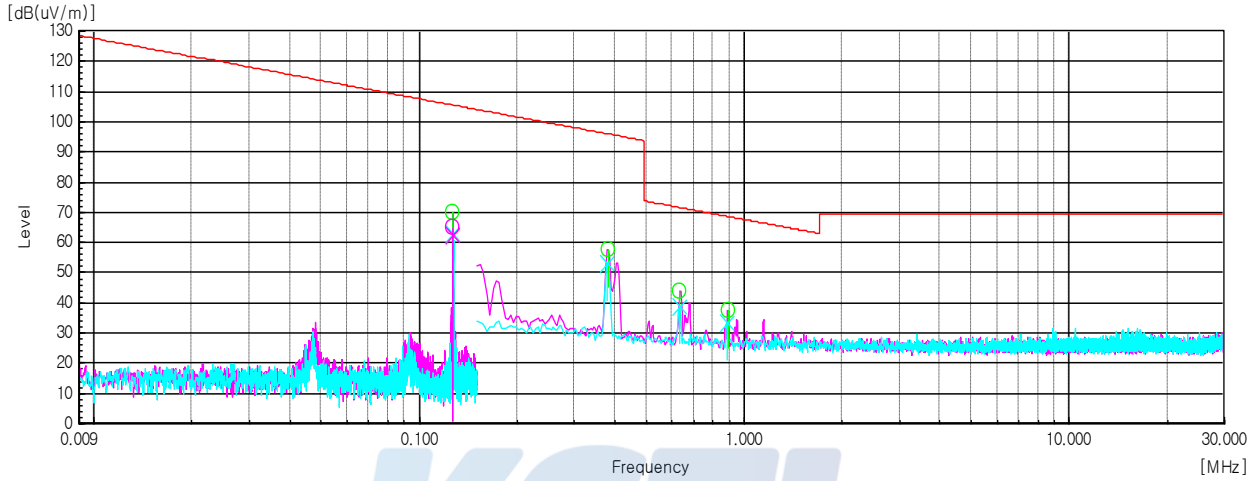
Note1. Factor = Cable loss + Amp. Gain + Antenna factor

5.1.4 Test Plot

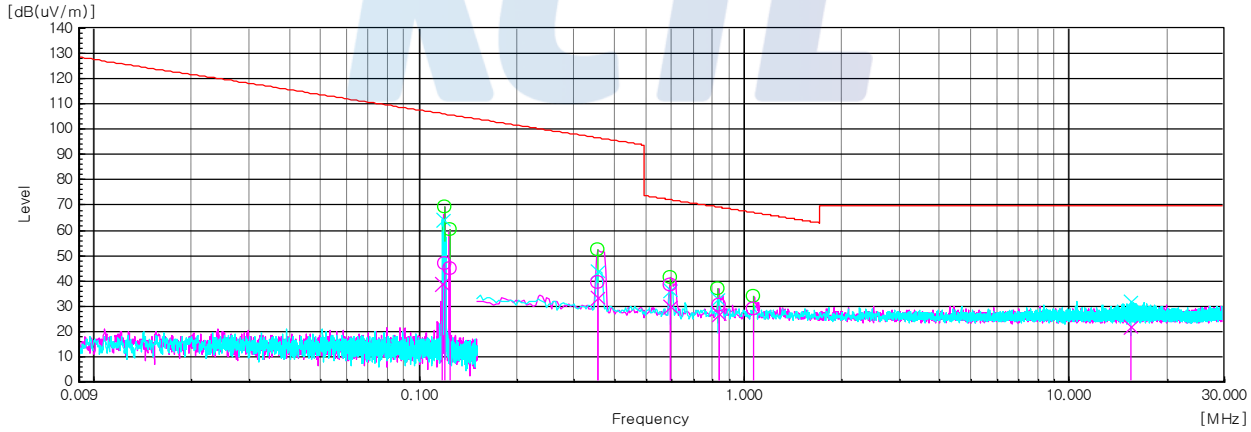
Plot of Field Strength of Fundamental and Spurious Emission (Radiated)

- 30 ㎒ ~ 1 ㎓ data

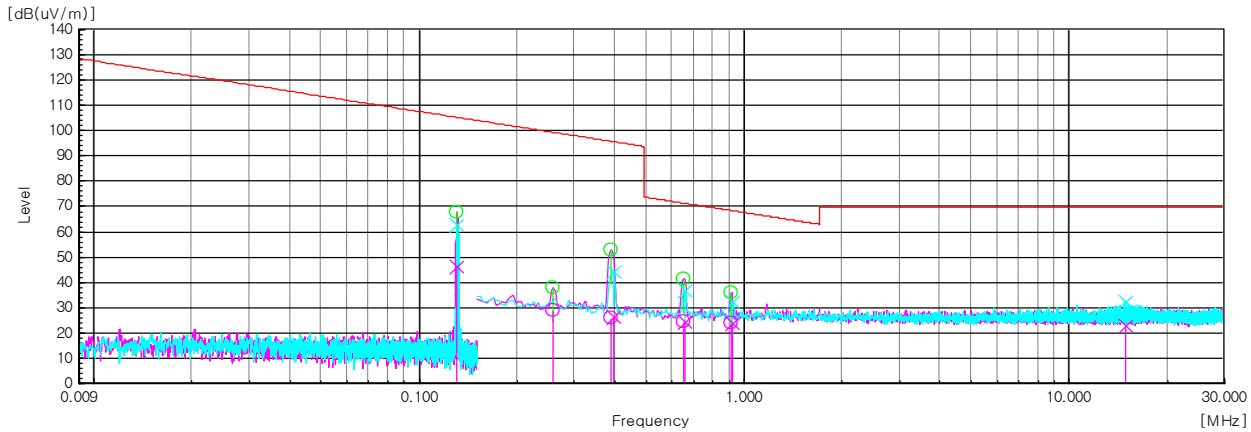
- 5 V Charging Mode (Less than 1 % of Battery)



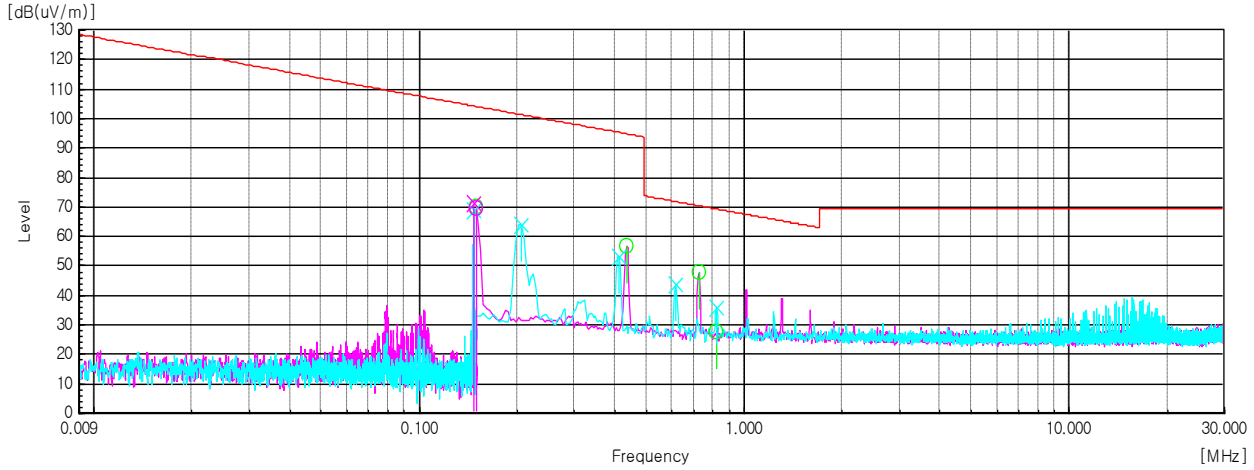
- 5 V Charging Mode (Less than 50 % of Battery)



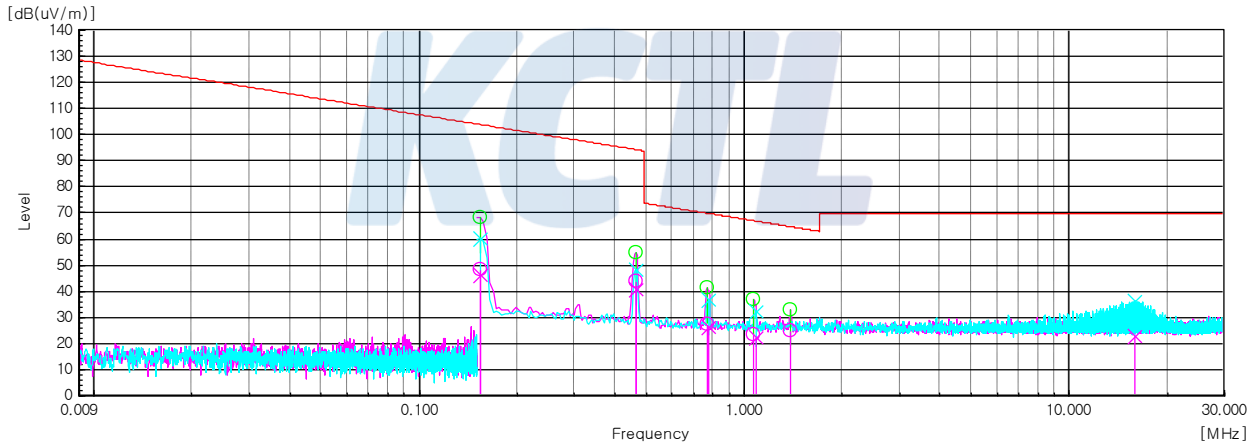
- 5 V Charging Mode (100 % full charging of Battery)



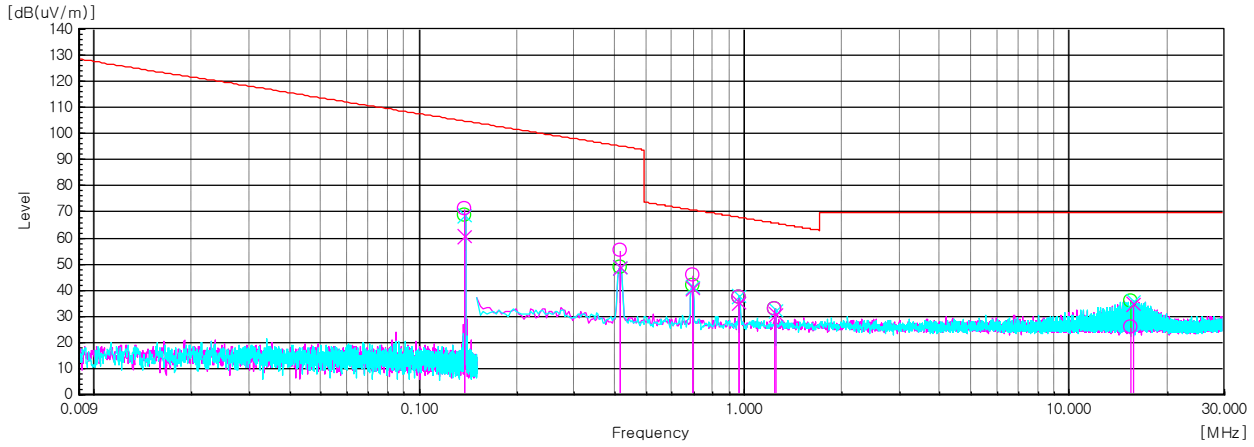
- 9 V Charging Mode (Less than 1 % of Battery)



- 9 V Charging Mode (Less than 50 % of Battery)



- 9 V Charging Mode (100 % full charging of Battery)



5.2 20 ㏈ Bandwidth

5.2.1 Regulation

For reporting purpose only

5.2.2 Measurement Procedure

a. Span = set to capture all products of the modulation process, including the emission skirts. RBW = 1 ~ 5 % of the OBW, VBW = RBW, Sweep = auto, Detector = peak, Trace = max hold.
b. The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 ㏈ down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 ㏈ bandwidth of the emission.

5.2.3 Test Result

Test Condition: Refer to the clause 3.5 Normal and extreme test conditions

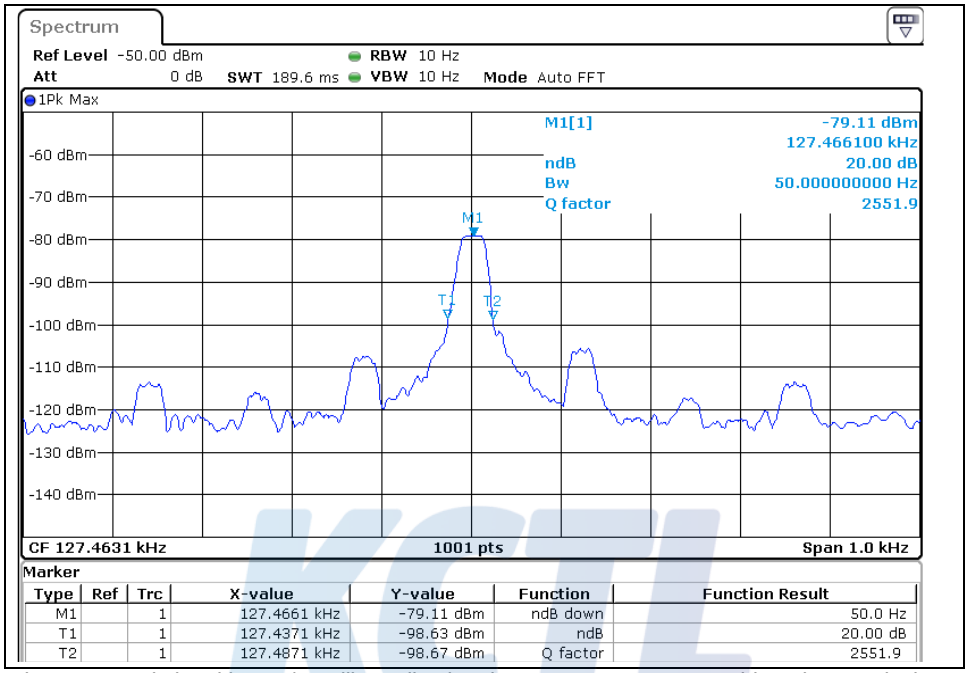
- Complied

Test Mode	20 ㏈ Bandwidth [㎐]	Results
5 V Charging Mode	50.00	reporting purpose
9 V Charging Mode	64.90	reporting purpose

5.2.4 Test Plot

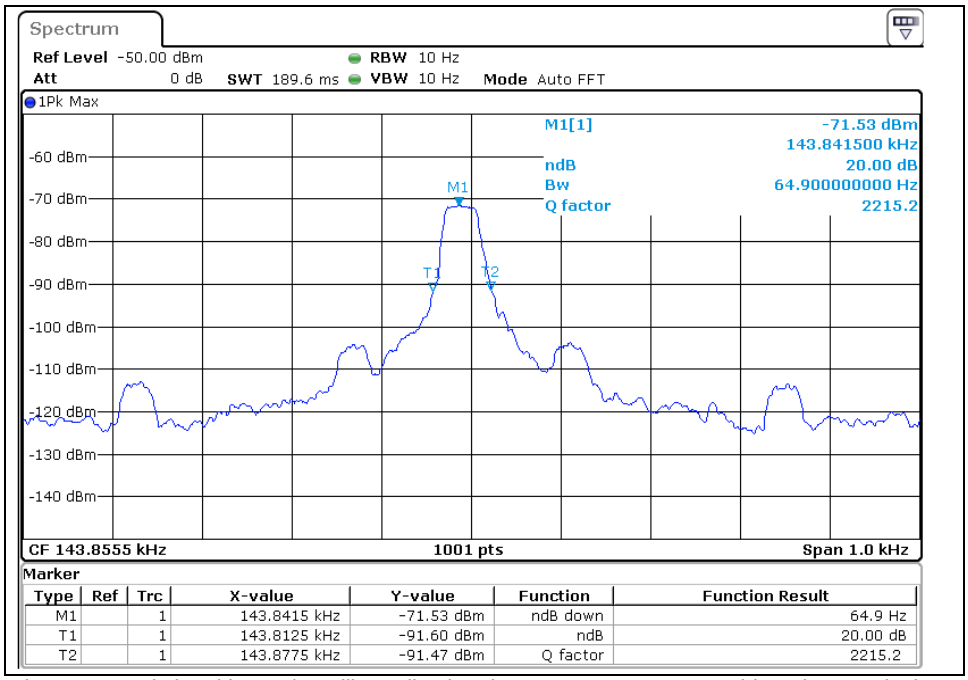
Plot of 20 dB Bandwidth

- 5 V Charging Mode



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.

- 9 V Charging Mode



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.

5.3 Conducted Emission

5.3.1 Regulation

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 50 μH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (㎒)	Conducted limit (㏈㎶)	
	Qausi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

5.3.2 Measurement Procedure

1) The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 ㎝ in which is located 40 ㎝ away from the vertical wall and 1.5m away from the side wall of the shielded room.

2) Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.

3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.

4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.

5) The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 ㎑ or to QUASI-PEAK and AVERAGE within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

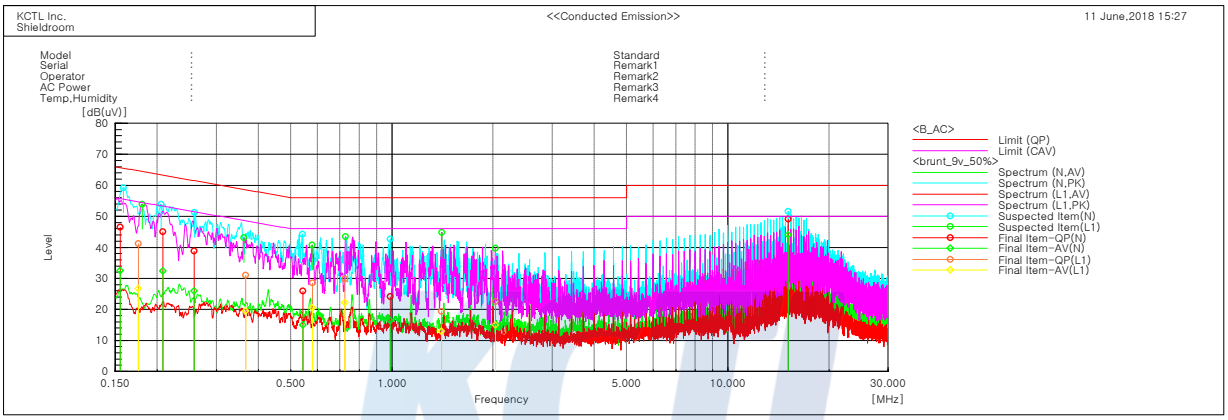
5.6.3 Test Result

Test Condition: Refer to the clause 3.5 Normal and extreme test conditions

- Complied

Figure 6. plot of Conducted Emission

- 9 V Charging Mode (Less than 50 % of Battery)



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.15536	36.7	22.7	9.8	46.5	32.5	65.7	55.7	19.2	23.2
2	0.25765	29.3	16.4	9.5	38.8	25.9	61.5	51.5	22.7	25.6
3	0.54225	16.2	5.2	9.8	26.0	15.0	56.0	46.0	30.0	31.0
4	0.98784	14.4	6.7	9.7	24.1	16.4	56.0	46.0	31.9	29.6
5	15.11734	39.0	33.9	10.1	49.1	44.0	60.0	50.0	10.9	6.0
6	0.20812	35.3	22.7	9.7	45.0	32.4	63.3	53.3	18.3	20.9

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	1.40486	9.7	3.4	9.6	19.3	13.0	56.0	46.0	36.7	33.0
2	0.72342	20.1	12.5	9.7	29.8	22.2	56.0	46.0	26.2	23.8
3	0.17581	31.2	16.7	10.0	41.2	26.7	64.7	54.7	23.5	28.0
4	2.03409	13.0	5.4	9.6	22.6	15.0	56.0	46.0	33.4	31.0
5	0.57919	18.7	10.6	9.8	28.5	20.4	56.0	46.0	27.5	25.6
6	0.36633	21.4	9.8	9.7	31.1	19.5	58.6	48.6	27.5	29.1

6. Test equipment used for test

	Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
■	SIGNAL GENERATOR	R&S	SMB100A	176206	19.01.31
■	VECTOR SIGNAL GENERATOR	R&S	SMBV100A	257566	19.01.05
■	DC Power Supply	AGILENT	E3632A	MY40004399	19.01.05
■	Spectrum Analyzer	R & S	FSV30	101437	18.08.01
■	Bilog Antenna	SCHWARZBECK	VULB 9168	440	18.08.05
■	COAXIAL FIXED ATTENUATOR	AGILENT	8491A	MY52461848	18.08.05
■	EMI TEST RECEIVER	R & S	ESCI	100732	18.08.24
■	LOOP Antenna	R & S	HFH2-Z2	892665/035	19.01.25
■	AMPLIFIER	SONOMA INSTRUMENT	310N	284608	18.08.24
■	Antenna Mast	MATURO	EAS 1.5	042/8941211	-
■	Antenna Mast	MATURO	EAS 1.5	043/8941211	-
■	Turn Table	MATURO	TT 0.8 PF	041/8941211	-
■	Cable Assembly	gigalane	RG-400	-	-

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