

RF TEST REPORT

Test Equipment : Wireless Charger
Model Name : WMC-1100
FCC ID : 2AHHUWMC-1100
Date of receipt : 2017.01.04
Test duration : 2017.01.04 ~ 2017.01.06
Date of issue : 2017.01.09

Applicant : ERANG Info tech Co., Ltd.
1012 ho, 201 dong Chunui Technopark2,18, bucheon-ro, 198 beon-gil
Wonmi-gu,Bucheon-si, Gyeonggi-do, 14557 Korea

Test Laboratory : Lab-T, Inc.
2182-42, 2182-40 Baegok-daero, Mohyeon-myeon, Cheoin-gu, Yongin-si
Gyeonggi-do 17036, Korea

Test specification : FCC CFR Title 47 Part 15 Subpart C 15.203
FCC CFR Title 47 Part 15 Subpart C 15.207
FCC CFR Title 47 Part 15 Subpart C 15.209
Test result : Pass

The above equipment was tested by Lab-T Testing Laboratory for compliance
with the requirements of FCC Rules and Regulations.

The test results presented in this test report are limited only to the sample supplied by applicant
and the use of this test report is inhibited other than its purpose.
This test report shall not be reproduced except in full, without the written approval of Lab-T, Inc

Tested by:



Engineer
SungSin Kim

Reviewed by:



Technical Manager
SangHoon Yu

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1. Client Information

Applicant : ERANG Info tech Co., Ltd.
Address : 1012 ho, 201 dong Chunui Technopark2,18, bucheon-ro, 198 beon-gil
Wonmi-gu,Bucheon-si, Gyeonggi-do, 14557 Korea
Telephone No. : +82 70-4445-7131
Person in charge : LuRee Park / erang.infotech@gmail.com

Manufacturer : ERANG Info tech Co., Ltd.
Address : 1012 ho, 201 dong Chunui Technopark2,18, bucheon-ro, 198 beon-gil
Wonmi-gu,Bucheon-si, Gyeonggi-do, 14557 Korea

2. Laboratory Information

Test Laboratory : Lab-T, Inc.
Address : 2182-42, 2182-40 Baegok-daero, Mohyeon-myeon, Cheoin-gu, Yongin-si
Gyeonggi-do 17036, Korea
Telephone No. : +82 31-322-6767
Facsimile No. : +82 31-322-6768

Certificate

Designation No. : KR0159

Registration No. : 133186

3. Information About Test Equipment

3.1 Equipment Information

Equipment type	Wireless Charger
Equipment model name	WMC-1100
Equipment add model name	-
Frequency range	110 kHz ~ 205 kHz
Modulation type	Backscatter modulation
Power supply	DC 5.00 V

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

3.2 Antenna Information

type	Inductive Loop Coil Antenna
------	-----------------------------

3.3 Test Frequency

Test frequency (kHz)		
Lowest frequency	Middle frequency	Highest frequency
114	148	180

3.4 Tested Companion Device Information

Type	Manufacturer	Model	Note
-	-	-	-
	-	-	-

4. Test Report

4.1 Summary

FCC Part 15			
Reference	Parameter	Clause	Status
Transmitter Requirements			
2.1049	20 dB Bandwidth	4.4.5	C
15.209(a)	Radiated Emission	4.4.6	C
15.207(a)	Conducted Emissions	4.4.7	N/A ^(NOTE2)
15.203	Antenna Requirements	4.4.8	C

NOTE 1 : C = Comply N/C = Not Comply N/T = Not Tested N/A = Not Applicable

NOTE 2 : This product is powered solely by battery. Therefore, this test item was not performed.

* The general test methods used to test this device is ANSI C63.10:2013

4.2 Measurement Uncertainty

Mesurement items	Expanded Uncertainty
Radiated Spurious Emissions (1 GHz under)	±4.560 dB (The confidence level is about 95 %, k=2)
Conducted emission	±4.080 dB (The confidence level is about 95 %, k=2)

4.3 Test Report Version

Test Report No.	Date	Description
TRRFCC17-0001	17.01.09	Initial issue

4.4.5 20 dB Bandwidth

4.4.5.1 Measurement Procedure

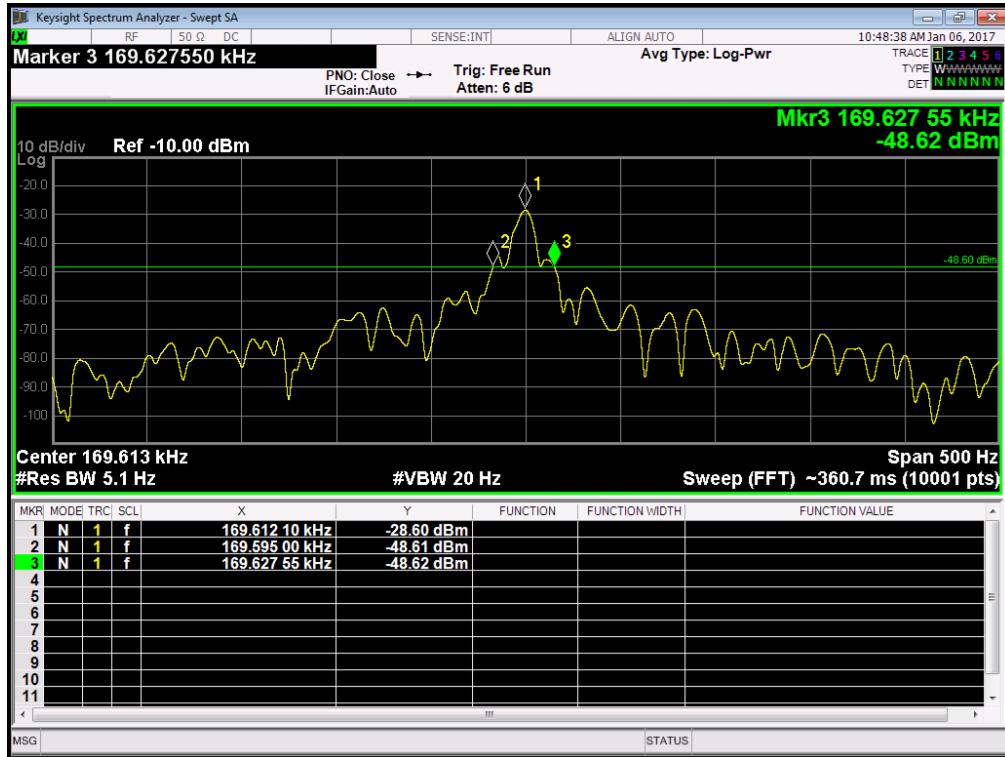
The 20 dB Bandwidth is measured with a spectrum analyzer connected via a receiving antenna placed near the EUT while the EUT is operating.

4.4.5.3 Result

Comply (measurement data : refer to below)

4.4.5.4 Measurement data

Tested Frequency(kHz)	Test Results(kHz)
169.61	0.032



4.4.6 Radiated Emission

4.4.6.1 Regulation

According to §15.209(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009 - 0.490	$2\ 400/F(\text{kHz})$	300
0.490 - 1.705	$24\ 000/F(\text{kHz})$	30
1.705 - 30.0	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 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

4.4.6.2 Measurement Procedure

- 1) The EUT was placed on a turn table which is 0.8m above ground plane.
- 2) Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
- 3) And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4) Repeat above procedures until all frequency measurements have been completed.

4.4.6.3 Result

Comply (measurement data : refer to the next page)

4.4.6.4 Measurement data_Radiated Spurious Emissions

Test mode : Lowest Frequency (9 kHz ~ 30 MHz)

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dB μ V)	Ant Factor (dB)	Loss (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
0.114	QP	H	64.5	11.3	0.1	75.9	106.5	30.6
0.114	QP	V	58.9	11.3	0.1	70.3	106.5	36.2
0.226	QP	H	41.3	11.2	0.1	52.6	100.5	47.9
0.230	QP	V	36.4	11.2	0.1	47.7	100.4	52.7
0.343	QP	H	44.8	11.2	0.1	56.1	96.9	40.8
0.343	QP	V	39.8	11.2	0.1	51.1	96.9	45.8
0.571	QP	H	41.7	11.2	0.1	53.0	72.5	19.5
0.575	QP	V	37.4	11.2	0.1	48.7	72.4	23.7
0.804	QP	H	43.7	11.2	0.1	55.0	69.5	14.5
0.804	QP	V	39.3	11.2	0.1	50.6	69.5	18.9
1.029	QP	H	39.2	11.2	0.1	50.5	67.4	16.9
1.032	QP	V	33.2	11.2	0.1	44.5	67.3	22.8

Note 1 : Loss : Cable loss - Amp gain

Note 2 : Result : Reading + Ant Factor + Loss

Note 3 : The radiation measurements are performed in X, Y, Z axis positioning. And worst case mode is recorded in the report.

Test mode : Middle Frequency (9 kHz ~ 30 MHz)

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dB μ V)	Ant Factor (dB)	Loss (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
0.148	QP	H	61.6	11.3	0.1	73.0	104.2	31.2
0.148	QP	V	58.2	11.3	0.1	69.6	104.2	34.6
0.451	QP	H	44.8	11.2	0.1	56.1	94.5	38.4
0.451	QP	V	40.8	11.2	0.1	52.1	94.5	42.4
0.751	QP	H	41.0	11.2	0.1	52.3	70.1	17.8
0.755	QP	V	36.2	11.2	0.1	47.5	70.0	22.5
1.055	QP	H	36.0	11.2	0.1	47.3	67.1	19.8
1.055	QP	V	30.3	11.2	0.1	41.6	47.1	25.5

Note 1 : Loss : Cable loss - Amp gain

Note 2 : Result : Reading + Ant Factor + Loss

Note 3 : The radiation measurements are performed in X, Y, Z axis positioning. And worst case mode is recorded in the report.

Test mode : Highest Frequency (9 kHz ~ 30 MHz)

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dB μ V)	Ant Factor (dB)	Loss (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
0.180	QP	H	56.1	11.3	0.1	67.5	101.7	34.2
0.180	QP	V	51.2	11.3	0.1	62.6	101.7	39.1
0.541	QP	H	43.1	11.2	0.1	54.4	72.9	18.5
0.541	QP	V	38.4	11.2	0.1	49.7	72.9	23.2
0.897	QP	H	37.2	11.2	0.1	48.5	68.5	20.0
0.901	QP	V	33.5	11.2	0.1	44.8	68.5	23.7

Note 1 : Loss : Cable loss - Amp gain

Note 2 : Result : Reading + Ant Factor + Loss

Note 3 : The radiation measurements are performed in X, Y, Z axis positioning. And worst case mode is recorded in the report.

Test mode : 30 MHz ~ 1 GHz (Worst Case : Lowest Frequency)

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dB μ V)	Ant Factor (dB)	Loss (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
53.048	QP	V	47.0	12.3	-29.3	30.0	40.0	10.0
116.928	QP	V	44.8	12.0	-28.3	28.5	43.5	15.0

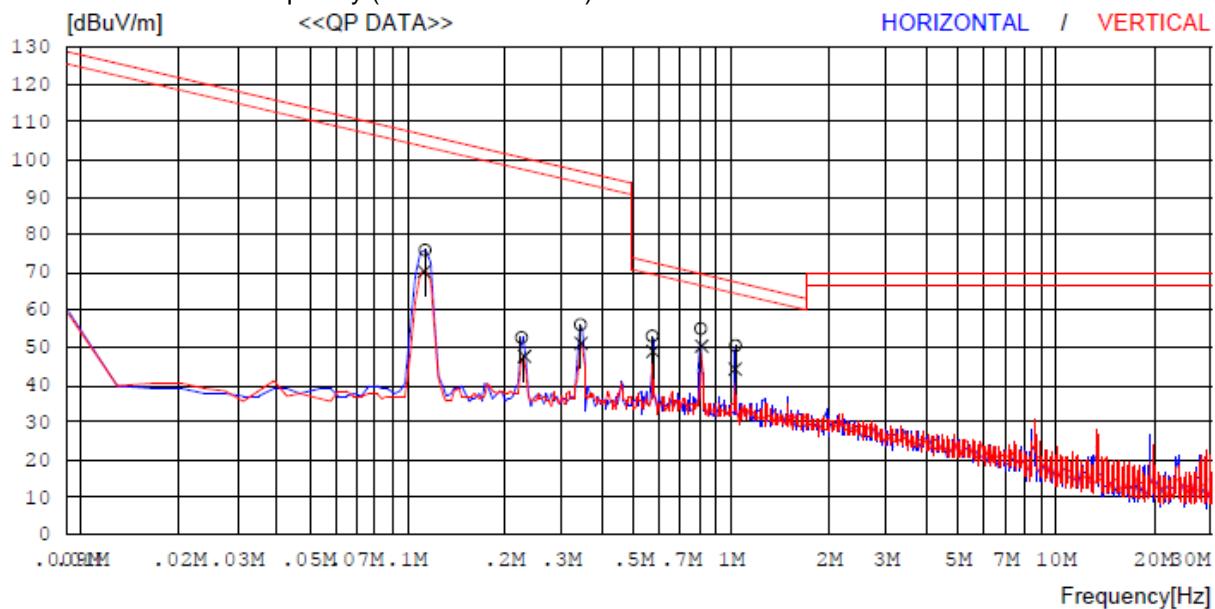
Note 1 : Loss : Cable loss - Amp gain

Note 2 : Result : Reading + Ant Factor + Loss

Note 3 : The radiation measurements are performed in X, Y, Z axis positioning. And worst case mode is recorded in the report.

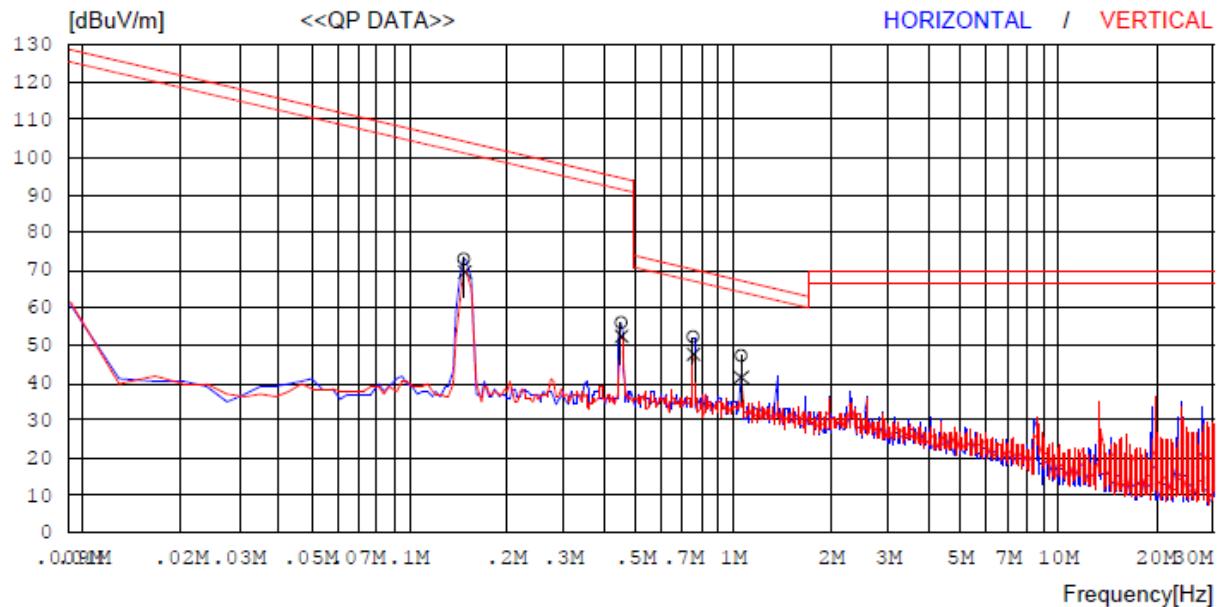
4.4.6.5 Measurement Plot

Test mode : Lowest Frequency (9 kHz ~ 30 MHz)



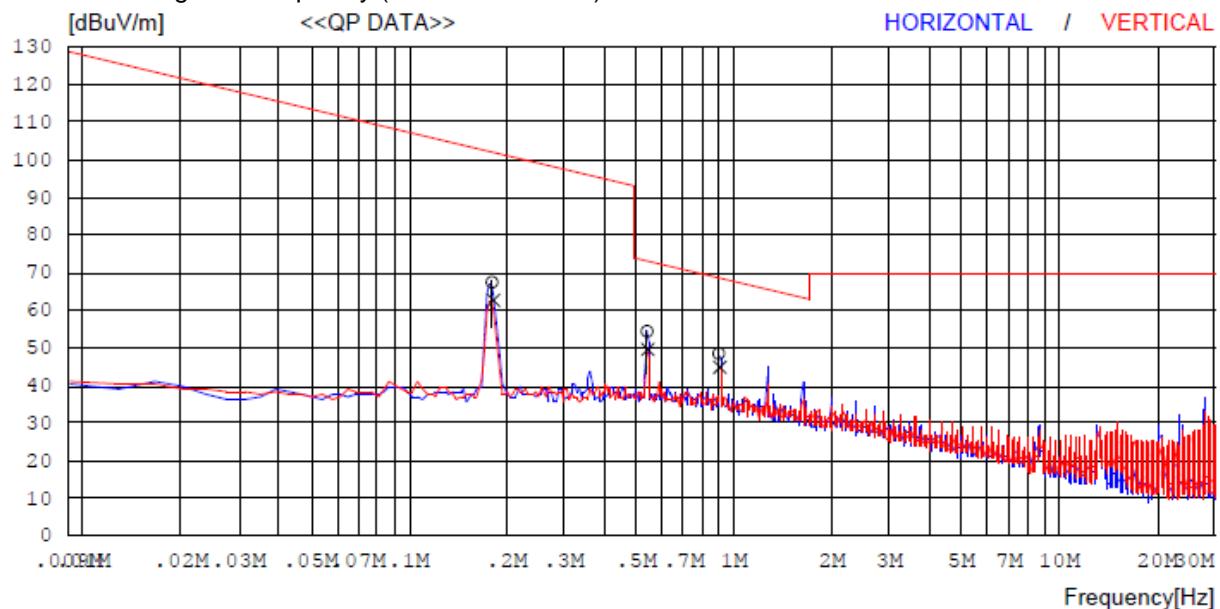
No.	FREQ [MHz]	READING [dBuV]	QP FACTOR	ANT [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----											
1	0.114	64.5	11.3	0.1	0.0	75.9	106.5	30.6	100	129	
2	0.226	41.3	11.2	0.1	0.0	52.6	100.5	47.9	100	346	
3	0.343	44.8	11.2	0.1	0.0	56.1	96.9	40.8	100	91	
4	0.571	41.7	11.2	0.1	0.0	53.0	72.5	19.5	100	129	
5	0.804	43.7	11.2	0.1	0.0	55.0	69.5	14.5	100	110	
6	1.029	39.2	11.2	0.1	0.0	50.5	67.4	16.9	100	129	
----- Vertical -----											
7	0.114	58.9	11.3	0.1	0.0	70.3	106.5	36.2	400	38	
8	0.230	36.4	11.2	0.1	0.0	47.7	100.4	52.7	400	249	
9	0.343	39.8	11.2	0.1	0.0	51.1	96.9	45.8	400	16	
10	0.575	37.4	11.2	0.1	0.0	48.7	72.4	23.7	400	57	
11	0.804	39.3	11.2	0.1	0.0	50.6	69.5	18.9	400	35	
12	1.032	33.2	11.2	0.1	0.0	44.5	67.3	22.8	400	57	

Test mode : Middle Frequency (9 kHz ~ 30 MHz)



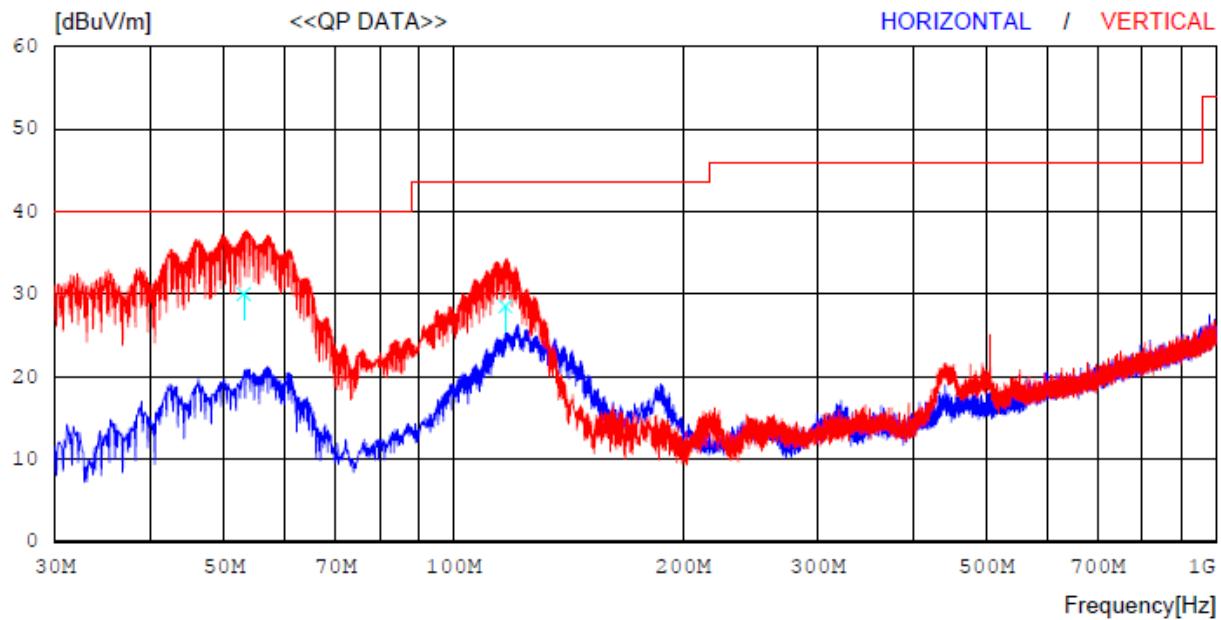
No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	0.148	61.6	11.3	0.1	0.0	73.0	104.2	31.2	100	65
2	0.451	44.8	11.2	0.1	0.0	56.1	94.5	38.4	100	27
3	0.751	41.0	11.2	0.1	0.0	52.3	70.1	17.8	100	65
4	1.055	36.0	11.2	0.1	0.0	47.3	67.1	19.8	100	45
----- Vertical -----										
5	0.148	58.2	11.3	0.1	0.0	69.6	104.2	34.6	400	150
6	0.451	40.8	11.2	0.1	0.0	52.1	94.5	42.4	400	150
7	0.755	36.2	11.2	0.1	0.0	47.5	70.0	22.5	400	172
8	1.055	30.3	11.2	0.1	0.0	41.6	67.1	25.5	400	150

Test mode : Highest Frequency (9 kHz ~ 30 MHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dB]	MARGIN [cm]	ANTENNA [DEG]	TABLE
----- Horizontal -----										
1	0.180	56.1	11.3	0.1	0.0	67.5	101.7	34.2	100	189
2	0.541	43.1	11.2	0.1	0.0	54.4	72.9	18.5	100	189
3	0.897	37.2	11.2	0.1	0.0	48.5	68.5	20.0	100	8
----- Vertical -----										
4	0.181	51.2	11.3	0.1	0.0	62.6	101.7	39.1	100	261
5	0.541	38.4	11.2	0.1	0.0	49.7	72.9	23.2	100	261
6	0.901	33.5	11.2	0.1	0.0	44.8	68.5	23.7	100	242

Test mode : 30 MHz ~ 1 GHz (Worst Case : Lowest Frequency)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Vertical -----										
1	53.048	47.0	12.3	-29.3	0.0	30.0	40.0	10.0	100	332
2	116.928	44.8	12.0	-28.3	0.0	28.5	43.5	15.0	100	93

4.4.7 Conducted Emission

4.4.7.1 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 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/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 (MHz)	Conducted limit (dB μ V)	
	Quasi-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.

4.4.7.2 Measurement Procedure

- 1) The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5 m away from the side wall of the shielded room.
- 2) Each current-carrying conductor of the EUT power cord was individually connected through a 50 Ω /50 μ H 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 in the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
- 5) The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASIPEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

4.4.7.3 Result

Not Applicable (This product is powered solely by battery. Therefore, this test item was not performed.)

4.4.8 Antenna Requirements

4.4.8.1 Regulation

According to §15.203, An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

4.4.8.2 Result

Comply

(The antenna of this EUT is Coil Antenna Type. Therefore the antenna is permanently attached. Please refer to the internal photo. Therefore this EUT Complies with the requirement of §15.203)

APPENDIX I

TEST EQUIPMENT USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

Equipment	Manufacturer	Model	Serial No.	Cal. Date (yy.mm.dd)	Next Cal.Date (yy.mm.dd)
Dynamic Mesurement DC Source	HP	66332A	US37471465	16.01.14	17.01.14
HUMIDITY/TEMP DATA RECORDER	LUTRON	MHB-382SD	79735	16.04.28	17.04.28
Digital MultiMeter	HP	34401A	US36025428	16.01.14	17.01.14
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	261413	16.10.18	17.10.18
EMI Test Receiver	ROHDE&SCHWARZ	ESU40	100445	16.12.16	17.12.16
BiLog Antenna	Schwarzbeck	VULB9160	3381	15.06.15	17.06.15
Preamplifier	TSJ	MLA-10k01-b01-27	1870369	16.04.25	17.04.25
Antenna Mast(10 m)	TOKIN	5977	-	-	-
Controller(10 m)	TOKIN	5909L	141909L-1	-	-
Turn Table(10 m)	TOKIN	5983-1.5	-	-	-
10 m Semi-Anechoic Chamber	SY CORPORATION	-	-	-	-
Active Loop H-Field	ETS	6502	00150598	15.06.05	17.06.05