

FCC Test Report

Equipment : Wireless Charging Power Bank
Brand Name : LUXA2
Model No. : TX-P1
FCC ID : 2AAUCPOWPCPCP1SI00
Standard : 47 CFR FCC Part 15.209
Operating Band : 110-205 kHz
FCC Classification : DCD (for 110-205kHz only)
Equipment Type : Wireless Power Transfer for Consumer Devices
Output power : 5W (from Each Primary Coil)
Applicant : Thermaltake Technology Co., Ltd.
5F., No.185, Sec. 2, Tiding Blvd., Neihu Dist.,
Taipei City 114, Taiwan
Manufacturer : Good Man Corporation
2F., No.572, Sec. 1, Minsheng N. Rd.,
Guishan Township, Taoyuan County 333,
Taiwan (R.O.C.)

The product sample received on Dec. 04, 2013 and completely tested on Feb. 12, 2014. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:


Wayne Hsu / Assistant Manager

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Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]:0.1954980MHz 52.52 (Margin 11.28dB) – QP 42.20 (Margin 11.60dB) - AV	FCC 15.207	Complied
3.2	15.209	Transmitter Radiated Emissions	[dBuV/m at 3m]:137.67MHz 35.30 (Margin 8.20dB) - PK	FCC 15.209	Complied
3.3	15.215(c)	Emission Bandwidth	20dB Bandwidth 2.7 [kHz]	N/A	Complied



SPORTON INTERNATIONAL INC.
TEL : 886-3-327-3456
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1 General Description

1.1 Information

1.1.1 General Information

Wireless Power Transfer General Information			
Frequency Range	Modulation	Charging Freq. (kHz)	Field Strength (dBuV/m)
110-205 kHz	ASK	110-205	76.92
Power Transfer Method	Output power from each primary coil	Max. coupling surface area	Charging Method
Magnetic induction and only single primary coil coupling secondary coil	5W	40 cm ²	Client directly contact
Note 1: Field strength performed peak level at 3m.			

1.1.2 Antenna Information

Antenna Category	
☐	Equipment placed on the market without antennas
☒	Integral antenna (antenna permanently attached)
☐	External antenna (dedicated antennas)

1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	☒ Production ; ☐ Pre-Production ; ☐ Prototype
Type of EUT	
☒	Stand-alone
☐	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: ...
☐	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: ...
☐	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☐	Operated normally mode for worst duty cycle
☒	Operated test mode for worst duty cycle
Test Signal Duty Cycle (x)	
☒	100%

1.1.5 EUT Operational Condition

Supply Voltage	☐ AC mains	☒ DC	
Type of DC Source	☐ Internal DC supply	☐ External DC adapter	☒ From System

1.2 Accessories

Accessories Information		
Li-on Battery	Serial No.	3373106884
	Power Rating	3.7Vdc, 5000mAh
USB Charger	Signal Line	0.5 meter, shielded cable

1.3 Support Equipment

Support Equipment				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	E5530	DoC
2	Test fixture	--	--	--

Note: The test fixture provide for customer.

1.4 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 15
- ♦ ANSI C63.10-2009

1.5 Testing Location Information

Testing Location			
☒	HWA YA	ADD : No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.	
		TEL : 886-3-327-3456 FAX : 886-3-327-0973	
Test Condition		Test Site No.	Test Engineer
AC Conduction		CO04-HY	Zeus
RF Conducted		TH01-HY	Howard
Radiated Emission		03CH03-HY	Allen
		Test Environment	
		24°C / 51%	
		24.8°C / 61%	
		22.4°C / 43%	

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty		
Test Item		Uncertainty
AC power-line conducted emissions		±2.26 dB
Emission bandwidth		±1.42 %
Unwanted emissions, conducted	9 – 150 kHz	±0.38 dB
	0.15 – 30 MHz	±0.42 dB
	30 – 1000 MHz	±0.51 dB
All emissions, radiated	9 – 150 kHz	±2.49 dB
	0.15 – 30 MHz	±2.28 dB
	30 – 1000 MHz	±2.56 dB
Temperature		±0.8 °C
Humidity		±3 %
DC and low frequency voltages		±3 %
Time		±1.42 %
Duty Cycle		±1.42 %

2 Test Configuration of EUT

2.1 The Worst Case Configuration

Modulation Mode	Field Strength (dBuV/m at 3m)
Charging	76.92
Wireless charger were performed all charging conditions including variable loading and non-charging operation, the worst mode is full charging loading.	

2.2 The Worst Charger Frequencies Configuration

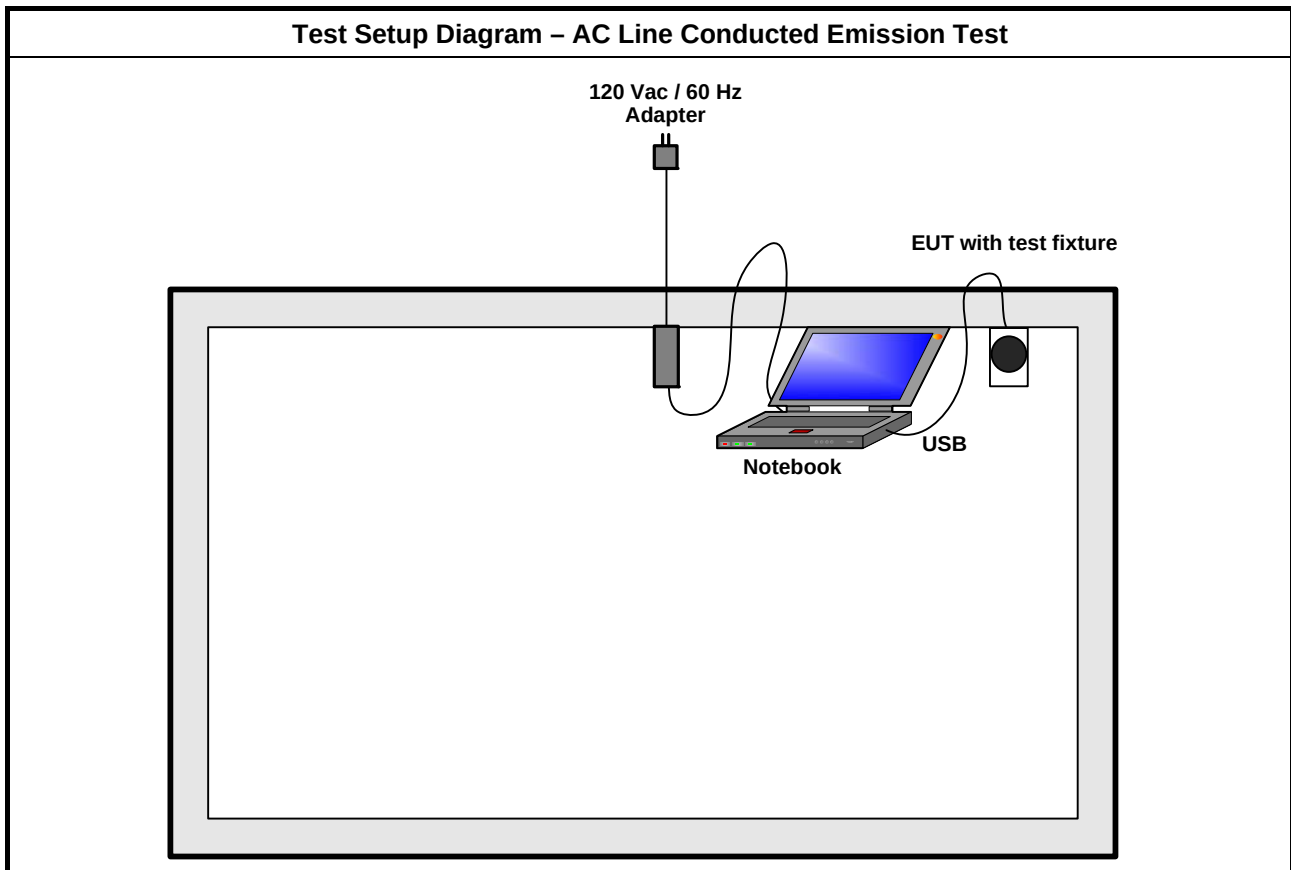
Modulation Mode	Charger Frequencies (kHz)
Charging	153.985 kHz (F1)
Wireless charger frequencies are variable frequency range (110-205 kHz) and depend on charging loading. The charging frequency is 153.985 kHz.	

2.3 The Worst Case Measurement Configuration

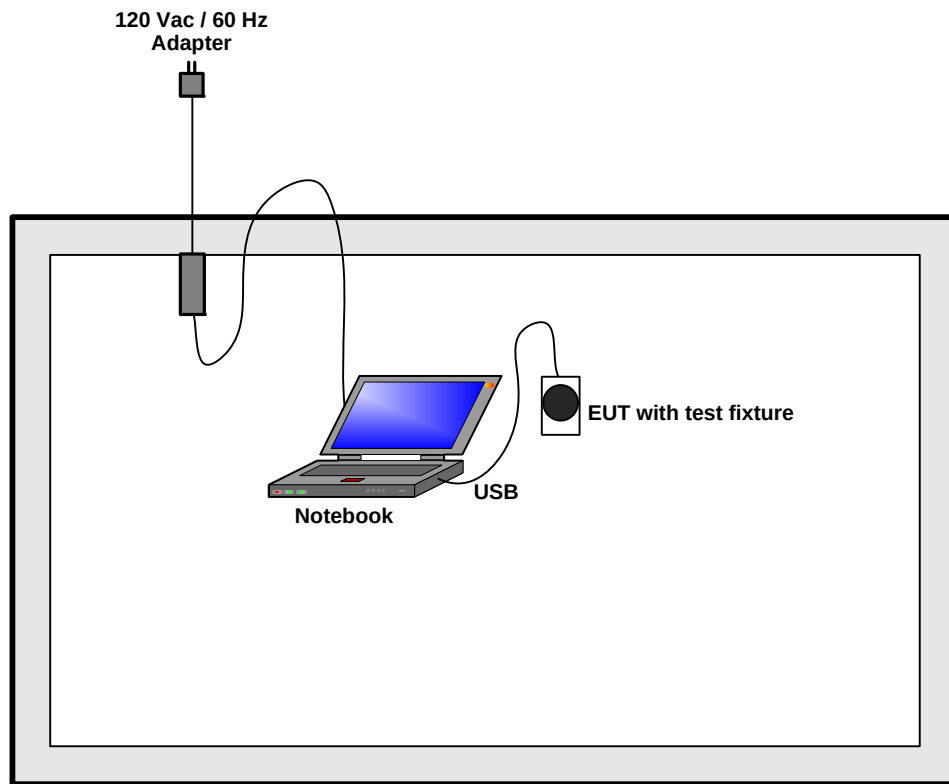
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 110Vac / 60Hz
Operating Mode	Operating Mode Description
1	EUT via USB Charging

The Worst Case Mode for Following Conformance Tests			
Tests Item		Transmitter Radiated Emissions, Emission Bandwidth	
Test Condition		Radiated measurement	
User Position		☒ EUT will be placed in fixed position at X plane.	
X Plane	Y Plane	Z Plane	☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes.
			☐ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes.
Operating Mode < 1GHz		☒ 1. EUT via USB Charging	
Modulation Mode		Charging	

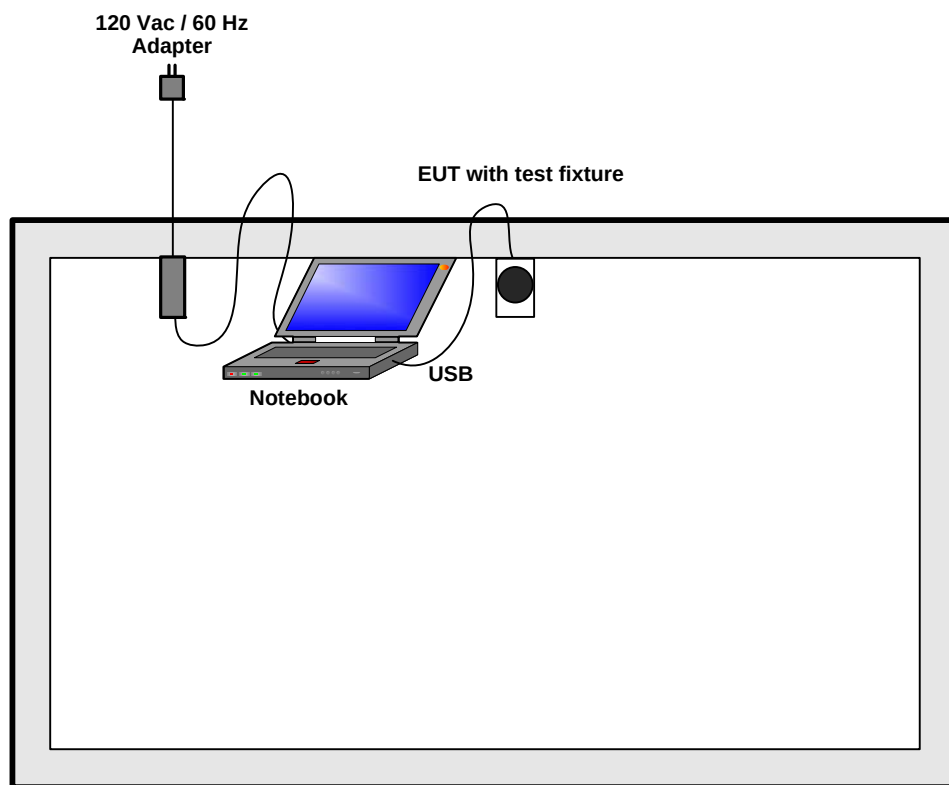
2.4 Test Setup Diagram



Test Setup Diagram - Radiated Test (9kHz~30MHz)



Test Setup Diagram - Radiated Test (30MHz~1GHz)



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

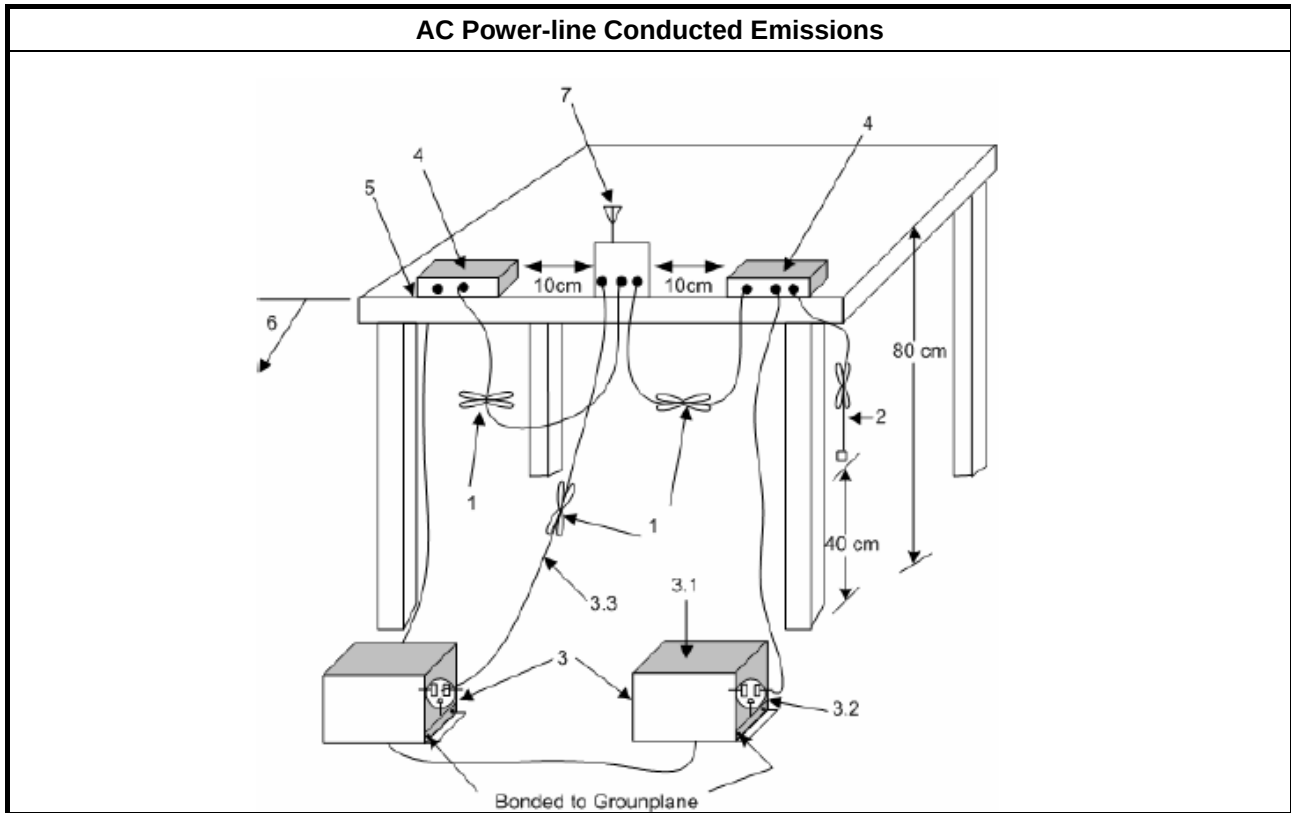
3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

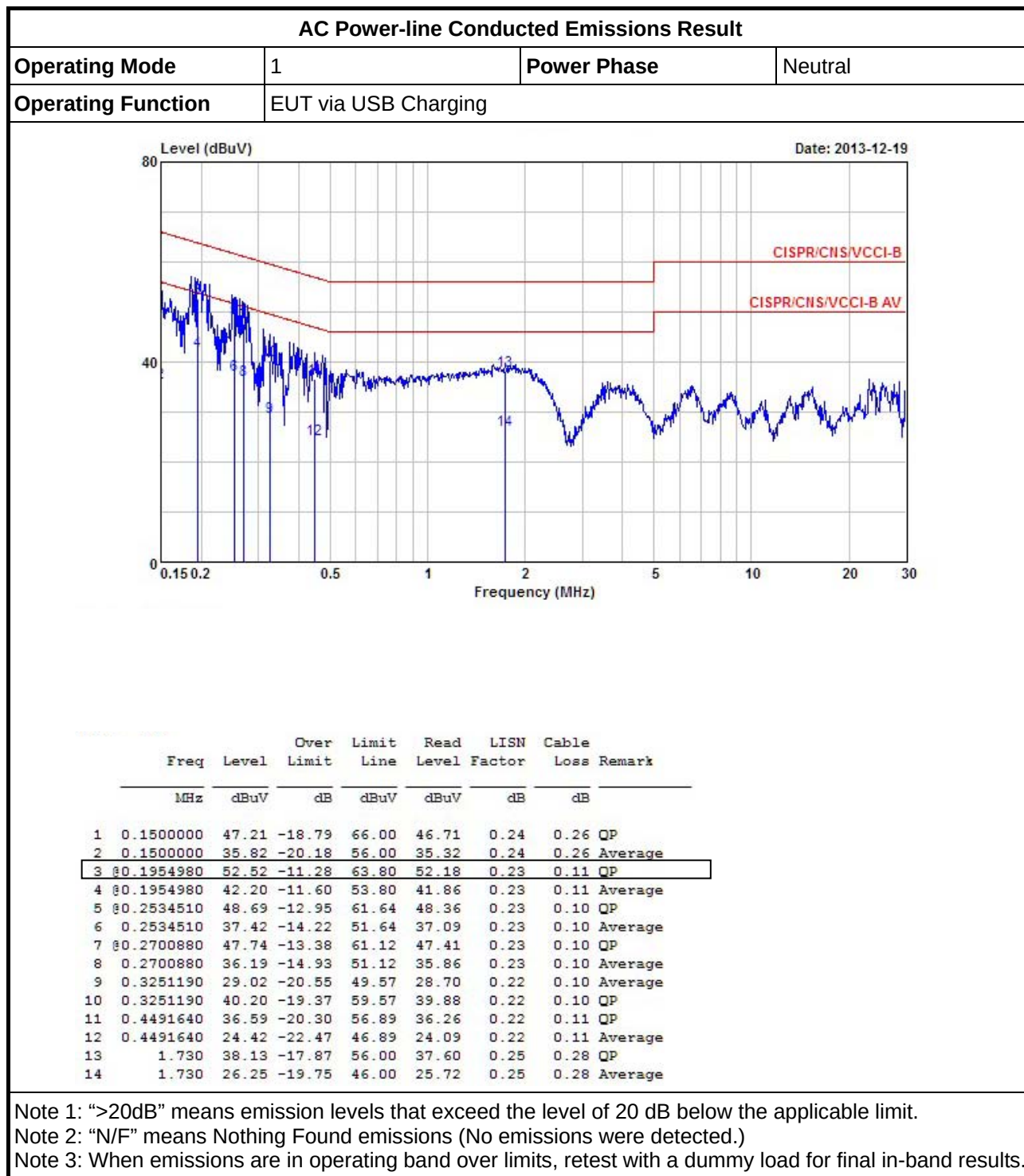
3.1.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.
☒	If AC conducted emissions fall in operating band, then following below test method confirm final result.
☐	Accept measurements done with a suitable dummy load replacing the antenna under the following conditions: (1) Perform the AC line conducted tests with the antenna connected to determine compliance with FCC 15.207 limits outside the transmitter's fundamental emission band; (2) Retest with a dummy load to determine compliance with FCC 15.207 limits within the transmitter's fundamental emission band.
☒	For a device with a permanent antenna operating at or below 30 MHz, accept measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) Perform the AC line conducted tests with the permanent antenna to determine compliance with the FCC 15.207 limits outside the transmitter's fundamental emission band; (2) Retest with a dummy load in lieu of the permanent antenna to determine compliance with the FCC 15.207 limits within the transmitter's fundamental emission band.

3.1.4 Test Setup

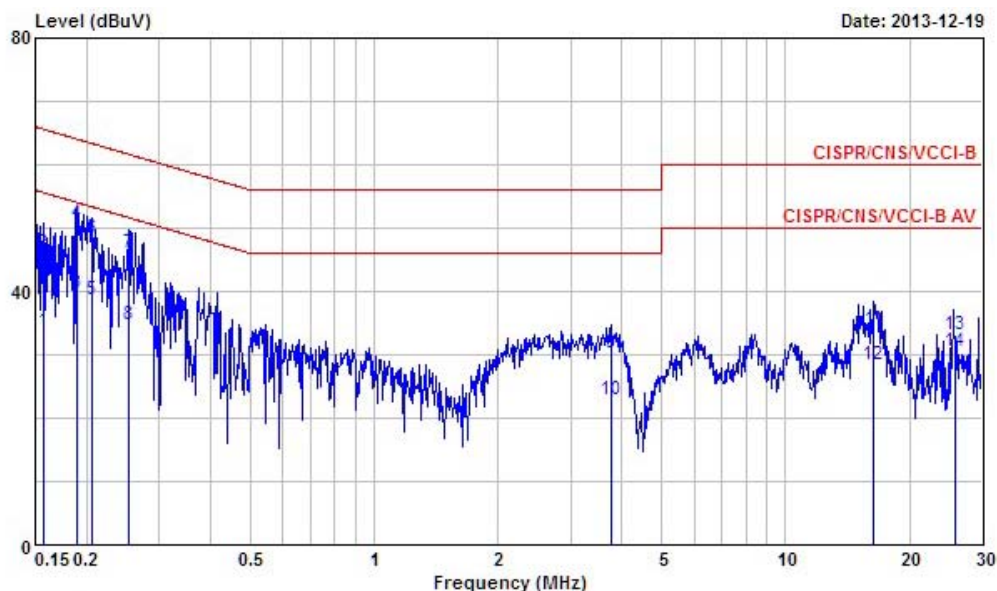


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	EUT via USB Charging		



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1564950	33.60	-22.05	55.65	33.25	0.11	0.24	Average
2	0.1564950	45.95	-19.70	65.65	45.60	0.11	0.24	QP
3	0.1893810	39.87	-14.19	54.06	39.63	0.11	0.13	Average
4	0.1893810	50.66	-13.40	64.06	50.42	0.11	0.13	QP
5	0.2061360	38.72	-14.64	53.36	38.51	0.11	0.10	Average
6	0.2061360	48.51	-14.85	63.36	48.30	0.11	0.10	QP
7	0.2521110	45.95	-15.74	61.69	45.74	0.11	0.10	QP
8	0.2521110	34.64	-17.05	51.69	34.43	0.11	0.10	Average
9	3.760	30.32	-25.68	56.00	29.96	0.15	0.21	QP
10	3.760	22.97	-23.03	46.00	22.61	0.15	0.21	Average
11	16.400	33.97	-26.03	60.00	33.48	0.29	0.20	QP
12	16.400	28.35	-21.65	50.00	27.86	0.29	0.20	Average
13	25.870	33.07	-26.93	60.00	32.70	0.35	0.02	QP
14	25.870	30.65	-19.35	50.00	30.28	0.35	0.02	Average

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

Note 3: When emissions are in operating band over limits, retest with a dummy load for final in-band results.

3.2 Transmitter Radiated Emissions

3.2.1 Transmitter Radiated Emissions Limit

Transmitter Radiated Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: the frequency bands 9-90 kHz, 110-490 kHz measurements employing an average detector and other below 1GHz measurements employing a CISPR quasi-peak detector.

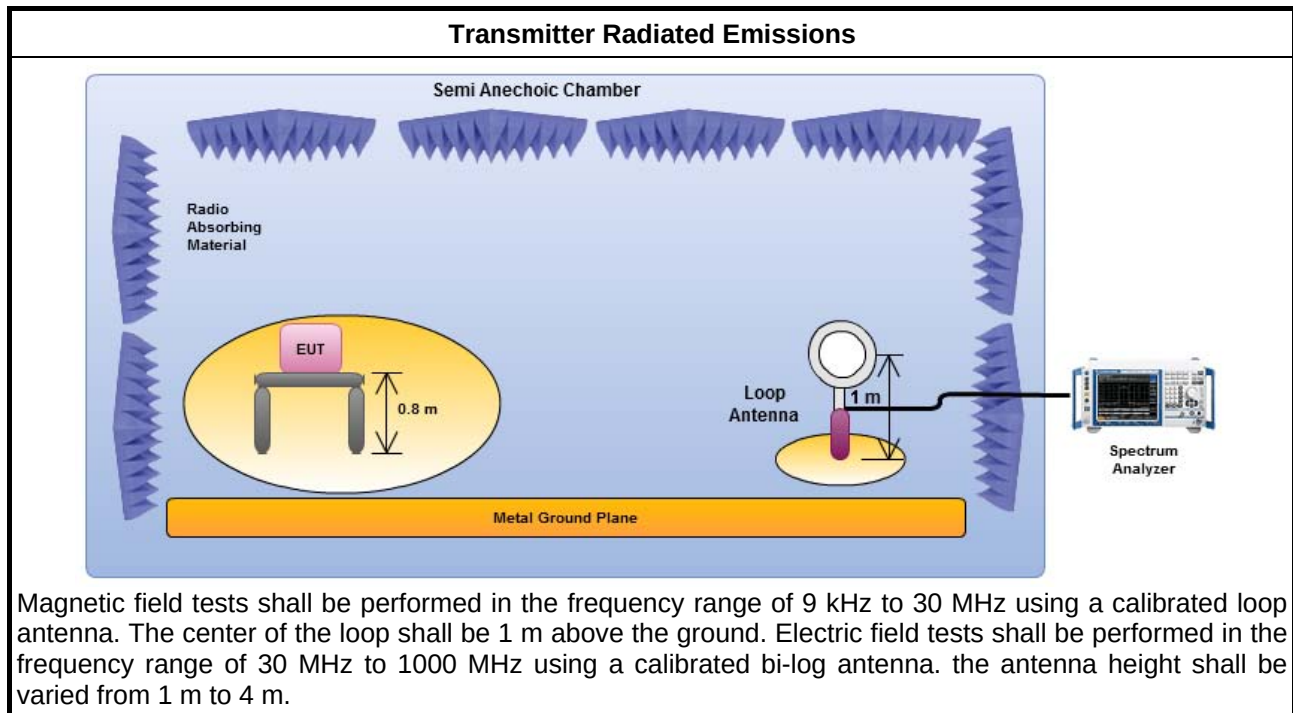
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

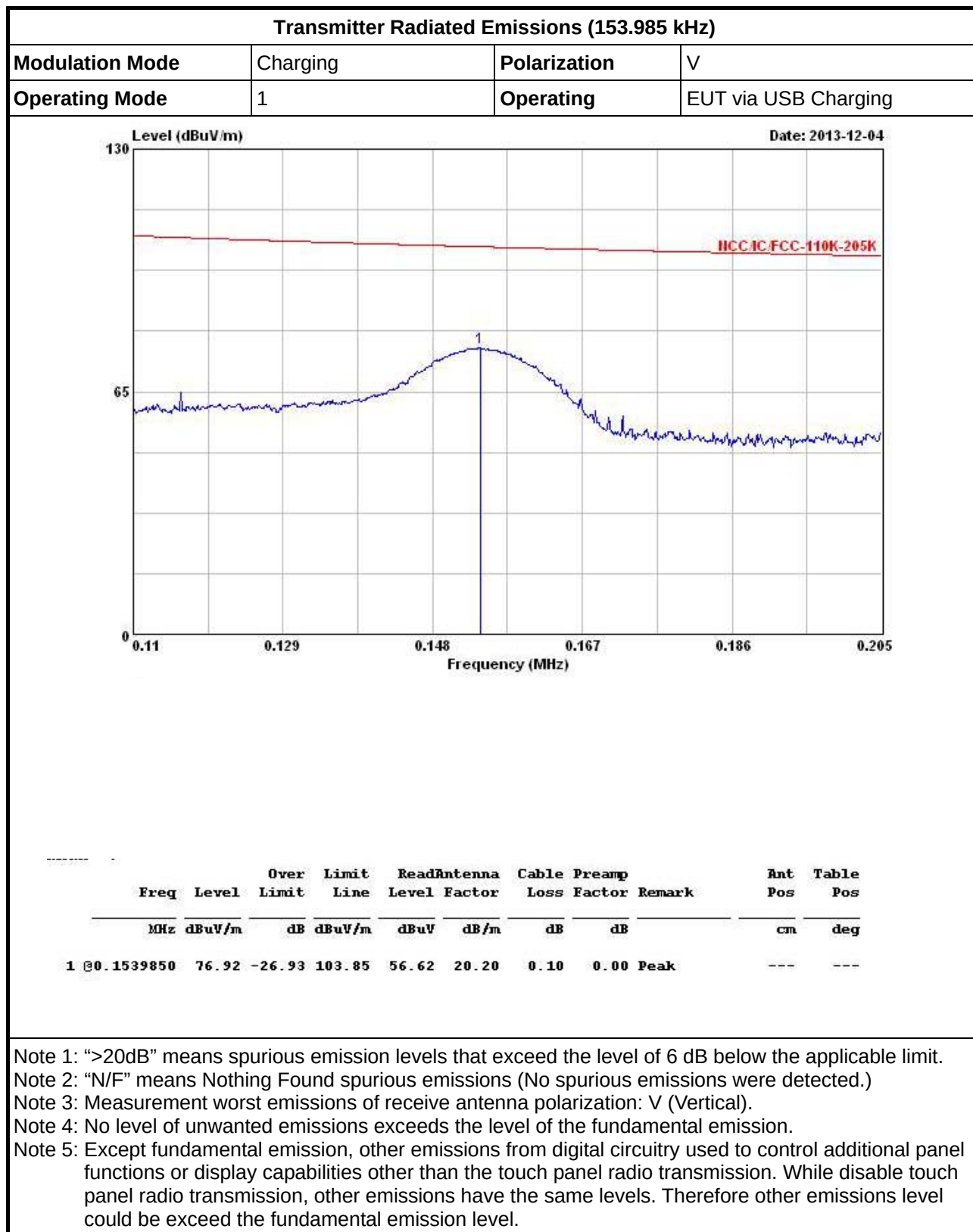
3.2.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 3m.
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz the frequency bands 9-90 kHz, 110-490 kHz measurements employing an average detector and other below 30MHz measurements employing a CISPR quasi-peak detector. Test distance is 3m.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be following below methods.
☐	The results shall be extrapolated to the specified distance by making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor.
☒	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
☒	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.
☒	The any unwanted emissions level shall not exceed the fundamental emission level.
☒	All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.2.4 Test Setup

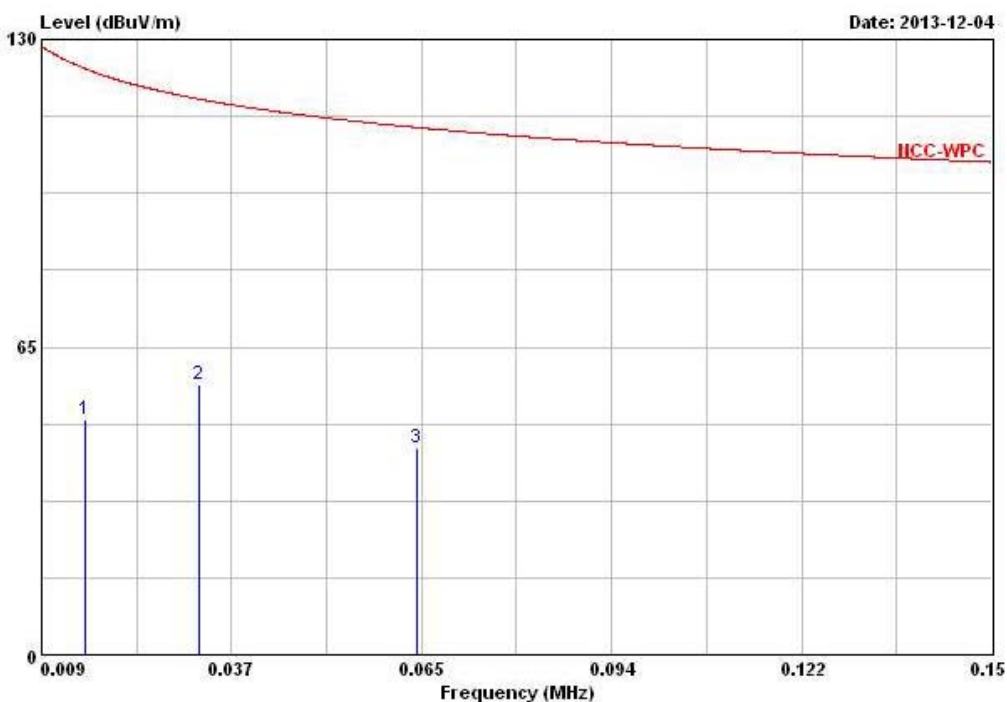


3.2.5 Transmitter Radiated Emissions (Below 30MHz)



Transmitter Radiated Emissions (9 kHz – 150 kHz)

Modulation Mode	Charging	Polarization	V
Operating Mode	1	Operating Function	EUT via USB Charging



	Freq	Level	Over	Limit	ReadAntenna	Cable Preamp			Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	0.0154860	49.79	-74.02	123.81	29.19	20.50	0.10	0.00	Peak	---
2	0.0324060	57.23	-60.16	117.39	36.83	20.30	0.10	0.00	Peak	---
3	0.0646950	43.73	-67.66	111.39	23.43	20.20	0.10	0.00	Peak	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

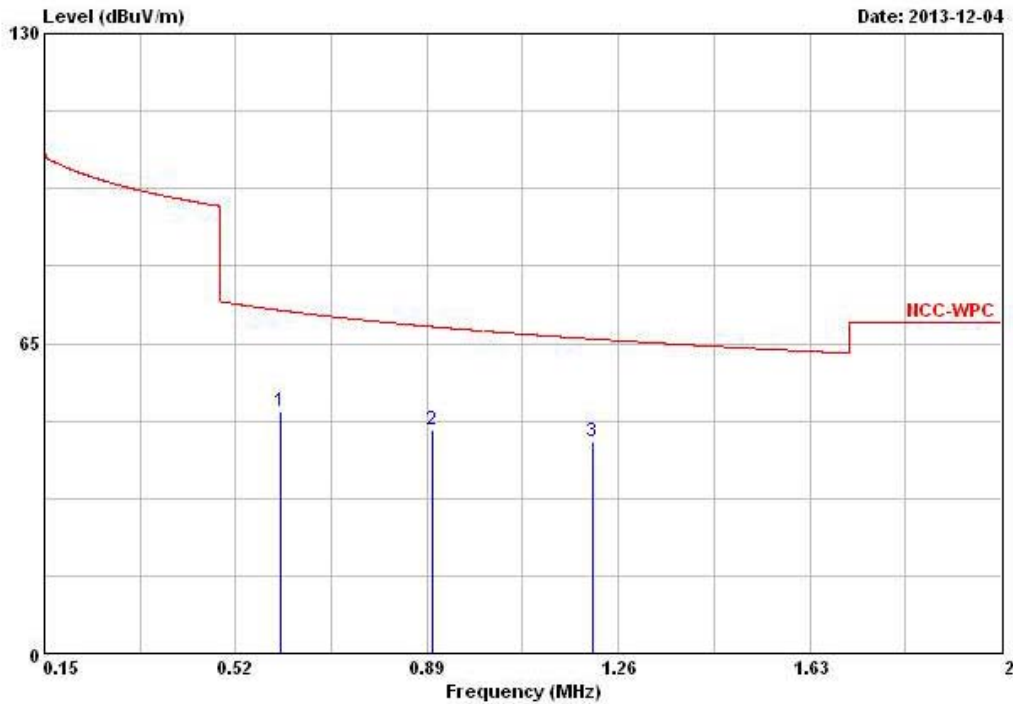
Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level could be exceed the fundamental emission level.

Transmitter Radiated Emissions (150 kHz – 2 MHz)

Modulation Mode	Charging	Polarization	V
Operating Mode	1	Operating Function	EUT via USB Charging



Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Remark	Ant	Table
MHz	dBuV/m	dB	dBuV/m	Level	Factor	Loss	Factor		Pos	Pos
				dBuV	dB/m	dB	dB		cm	deg
1 @ 0.6069500	50.71	-21.24	71.95	30.57	20.04	0.10	0.00	Peak	---	---
2 @ 0.9011000	46.77	-21.75	68.52	26.74	19.93	0.10	0.00	Peak	---	---
3 @ 1.210	44.32	-21.63	65.95	24.28	19.94	0.10	0.00	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

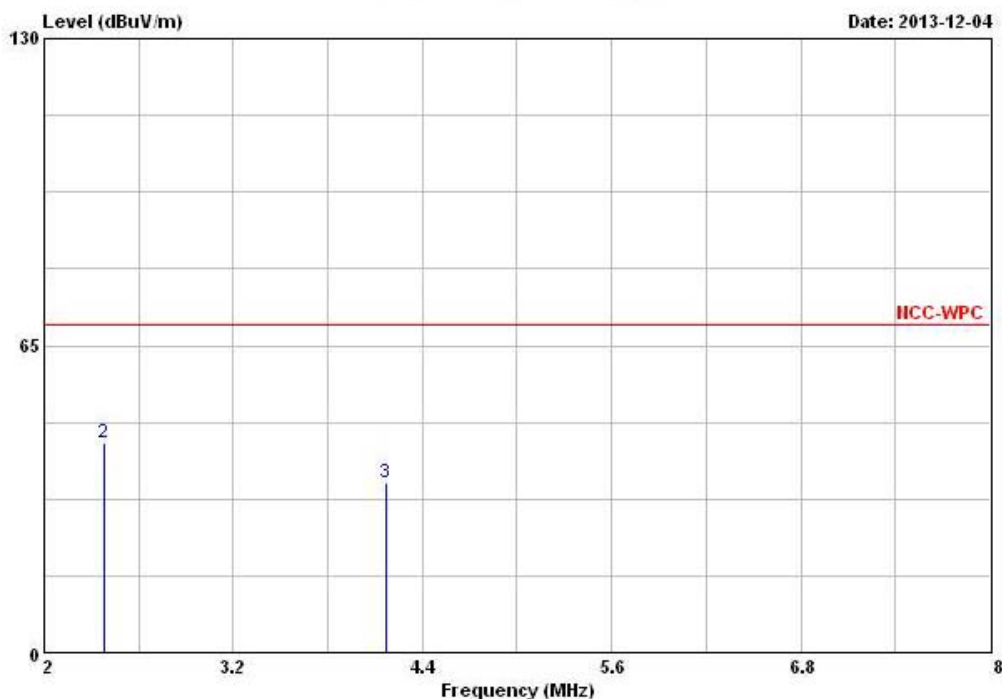
Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level could be exceed the fundamental emission level.

Transmitter Radiated Emissions (2 MHz – 8 MHz)

Modulation Mode	Charging	Polarization	V
Operating Mode	1	Operating Function	EUT via USB Charging



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	2.000	44.26	-25.28	69.54	24.06	20.00	0.20	0.00	Peak	---	---
2	2.380	44.51	-25.03	69.54	24.31	20.00	0.20	0.00	Peak	---	---
3	4.170	35.78	-33.76	69.54	15.47	20.00	0.31	0.00	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

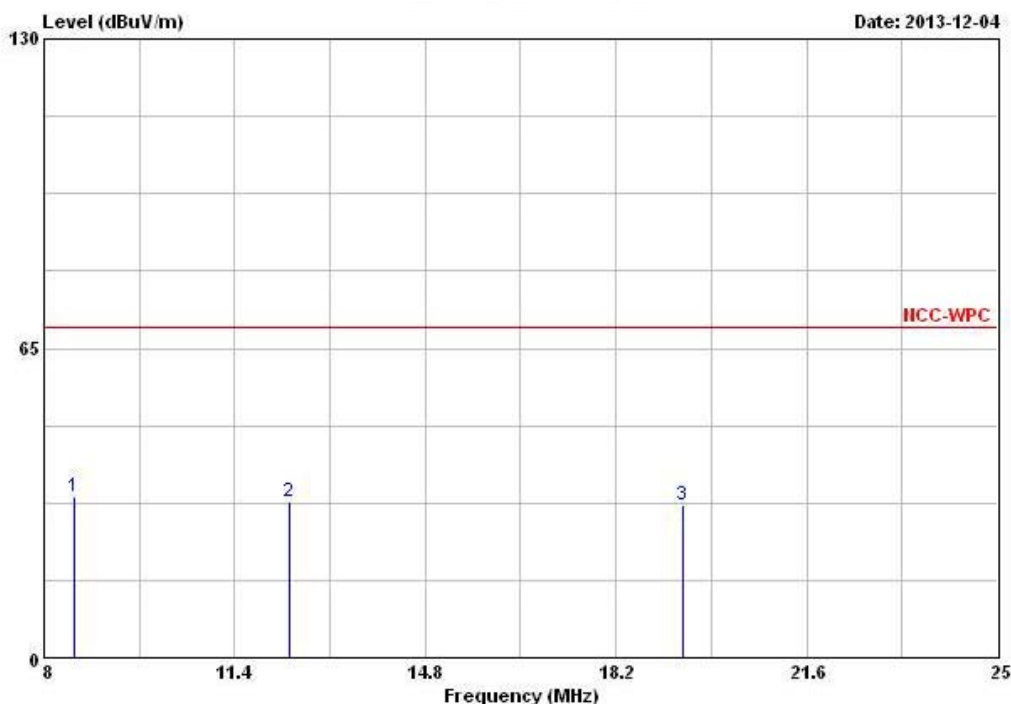
Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level could be exceed the fundamental emission level.

Transmitter Radiated Emissions (8 MHz – 25 MHz)

Modulation Mode	Charging	Polarization	V
Operating Mode	1	Operating Function	EUT via USB Charging



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8.530	33.77	-35.77	69.54	13.20	20.10	0.47	0.00	Peak	---	---
2	12.390	32.89	-36.65	69.54	12.25	20.10	0.54	0.00	Peak	---	---
3	19.390	31.94	-37.60	69.54	11.05	20.19	0.70	0.00	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

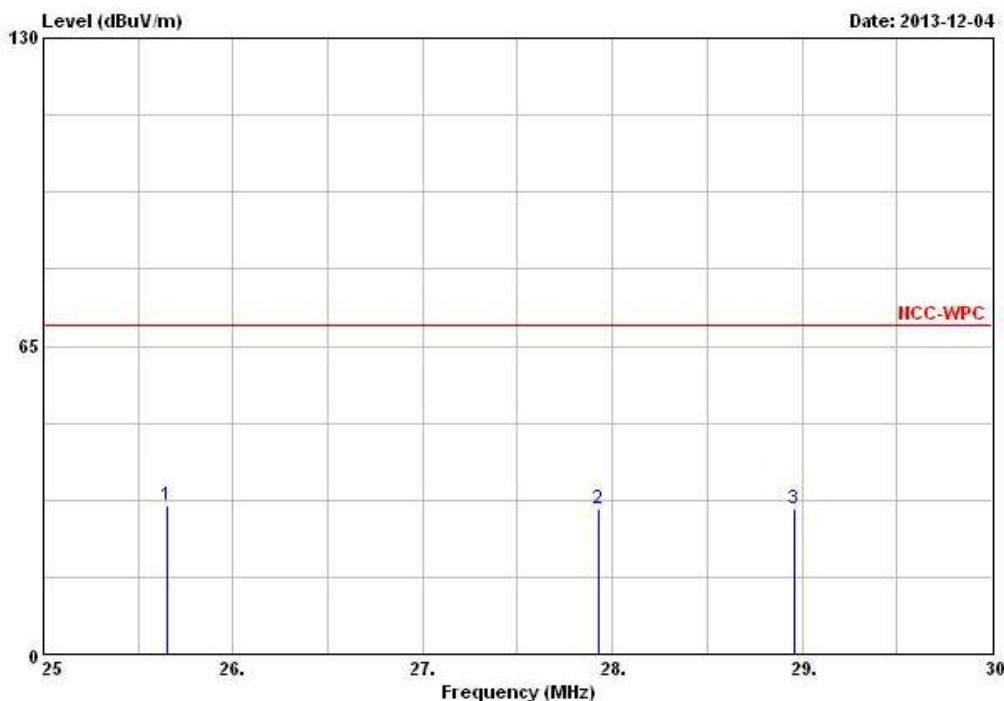
Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level could be exceed the fundamental emission level.

Transmitter Radiated Emissions (250 MHz – 30 MHz)

Modulation Mode	Charging	Polarization	V
Operating Mode	1	Operating Function	EUT via USB Charging



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	25.650	31.44	-38.10	69.54	10.54	20.10	0.80	0.00	Peak	---
2	27.930	30.52	-39.02	69.54	9.61	20.10	0.81	0.00	Peak	---
3	28.960	30.48	-39.06	69.54	9.56	20.10	0.82	0.00	Peak	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

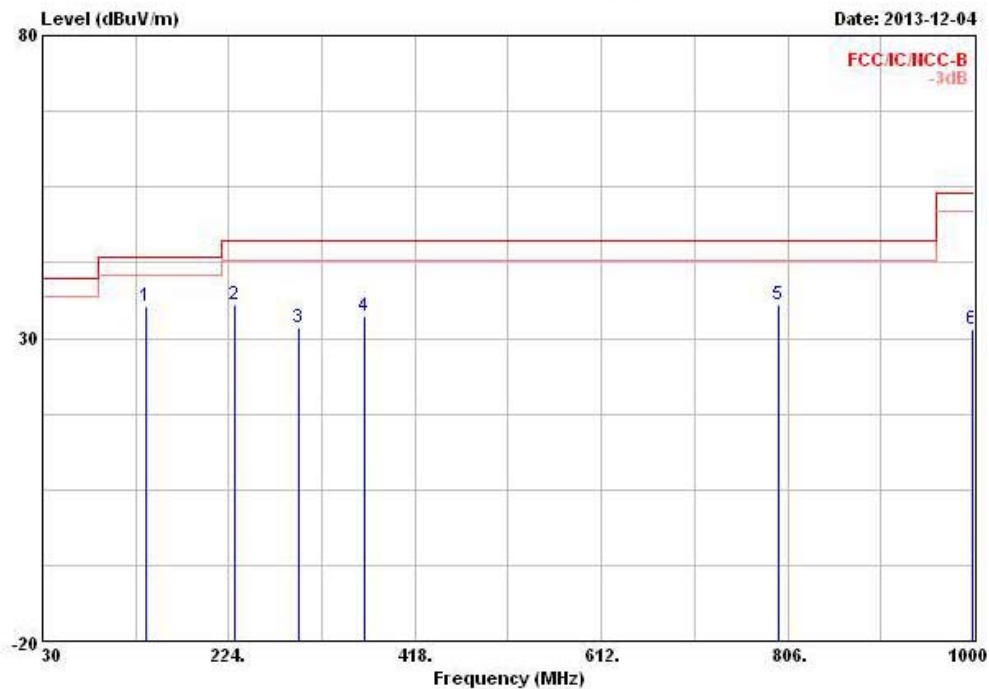
Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level could be exceed the fundamental emission level.

3.2.6 Transmitter Radiated Emissions (Above 30MHz)



Transmitter Radiated Emissions (Above 30MHz)

Modulation Mode	Charging	Test Freq. (FX)	F1
Operating Function	Transmit	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	137.670	35.30	-8.20	43.50	49.07	11.53	1.94	27.24	Peak	---	---
2	230.790	35.44	-10.56	46.00	49.24	10.60	2.50	26.90	Peak	---	---
3	296.750	31.75	-14.25	46.00	42.35	13.18	2.88	26.66	Peak	---	---
4	365.620	33.71	-12.29	46.00	42.90	14.72	3.19	27.10	Peak	---	---
5	797.270	35.69	-10.31	46.00	38.94	19.65	4.90	27.80	Peak	---	---
6	998.060	31.50	-22.50	54.00	32.02	21.25	5.50	27.27	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level could be exceed the fundamental emission level.

3.3 Emission Bandwidth

3.3.1 Emission Bandwidth Limit

Emission Bandwidth Limit
N/A

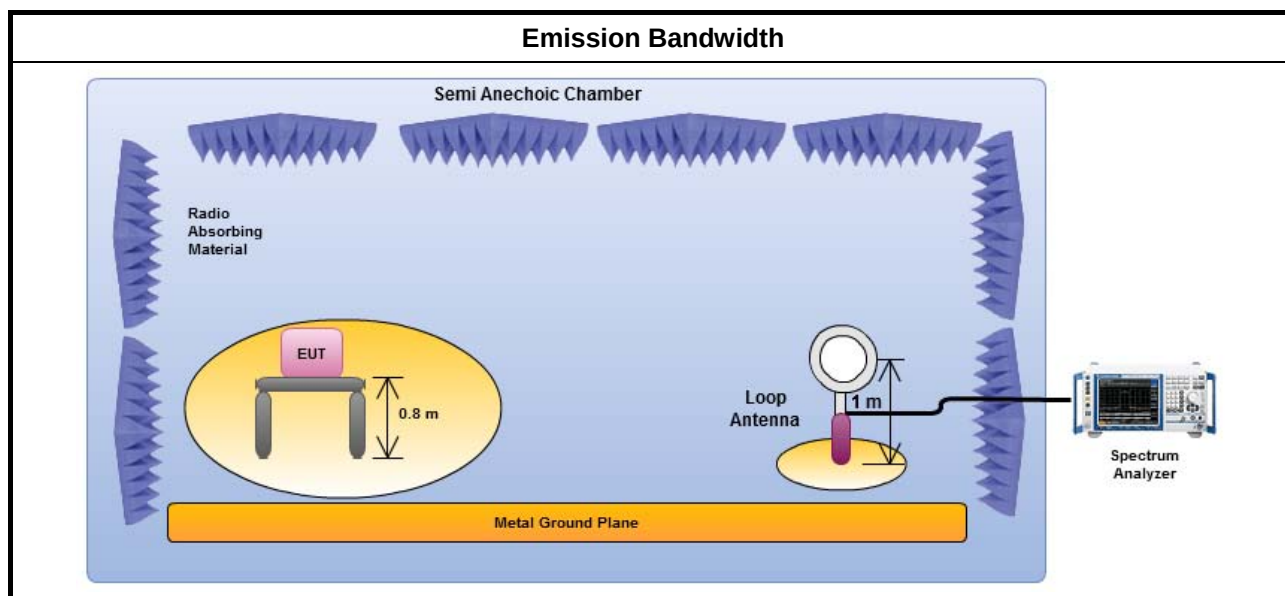
3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

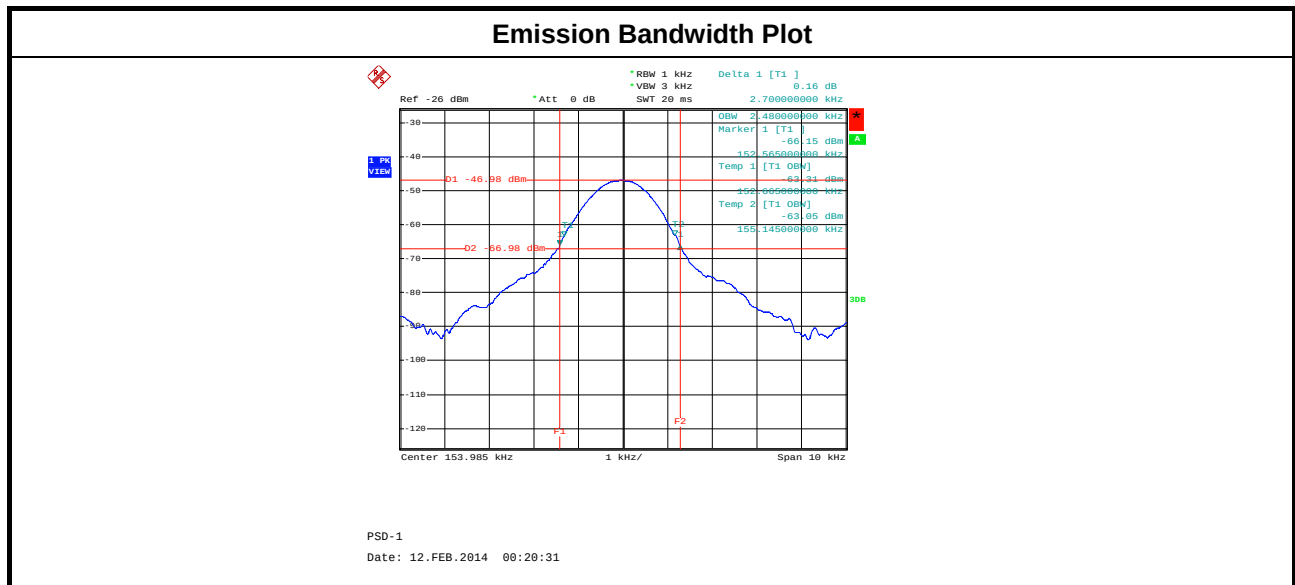
Test Method
☒ For the emission bandwidth refer ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
☒ For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.

3.3.4 Test Setup



3.3.5 Test Result of Emission Bandwidth

Occupied Channel Bandwidth Result					
Modulation Mode	Frequency (kHz)	20dB Bandwidth (kHz)	F _L at 20dB BW (kHz)	F _H at 20dB BW (kHz)	99% Bandwidth (kHz)
Charging	100-205	2.7	152.56	155.26	2.48
Limit		N/A	N/A	N/A	N/A
Result		Complied			



4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Mar. 26, 2013	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 21, 2013	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	7.61183201e+012	9kHz ~ 30MHz	Oct. 30, 2013	Conduction (CO04-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101013	9KHz~40GHz	Jan. 25, 2014	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is two year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 11, 2013	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May. 03, 2013	Radiation (03CH03-HY)
Spectrum	R&S	FSP30	100023	9kHz ~ 30GHz	Jul. 20, 2013	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 21, 2013	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Jan. 17, 2013	Radiation (03CH03-HY)
Turn Table	EM Electronics	EM Electronics	060615	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation (03CH03-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	TESEQ	HLA 6120	31244	9kHz ~ 30MHz	Dec. 02, 2012	Radiation (03CH03-HY)

Note: Calibration Interval of instruments listed above is two year.