

FCC Test Report

Equipment : Wireless Power
Brand Name : INPAQ
Model No. : WPC-W-A-TX-CF-001
FCC ID : 2ALND-WPCWATXCF01
Standard : 47 CFR FCC Part 15.209
Operating Band : 370-398 kHz
Equipment Type : Wireless Power Transfer for Consumer Devices
Applicant / Manufacturer : INPAQ Technology Co., Ltd.
No. 11, Ke-Yi St., Chunan, Miaoli 350 Taiwan R.O.C.

The product sample received on Mar. 13, 2017 and completely tested on Mar. 24, 2017. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 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:



Phoenix Chen / Assistant Manager



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APPENDIX A. TEST PHOTOS

PHOTOGRAPHS OF EUT v01

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]:0.19MHz 53.25 (Margin 10.77dB) - QP 39.86 (Margin 14.16dB) - AV	FCC 15.207	Complied
3.2	15.209	Transmitter Radiated Emissions	[dBuV/m at 1m]:598.420MHz 36.77 (Margin 9.23dB) - QP	FCC 15.209	Complied
3.3	15.215(c)	Emission Bandwidth	20dB Bandwidth 2.79 [kHz]	N/A	Complied



SPORTON INTERNATIONAL INC.
TEL : 886-3-327-3456
FAX : 886-3-327-0973

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)
370-398 kHz	FSK	394	64.31
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	19.6 cm ²	Client directly contact
Note 1: Field strength performed peak level at 1m.			

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: The EUT place with the platform.

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 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 C63.10-2013
- ♦ KDB680106 D01 RF Exposure Wireless Charging Apps v02

1.3 Testing Location Information

Testing Location				
☒	HWA YA	ADD	: No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.	
		TEL	: 886-3-327-3456	FAX : 886-3-327-0973
Test Site Registration Number:553509				
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Ryan	24.5°C / 64.5%	23/Mar/2017
AC Conduction	CO04-HY	Bear	20.2°C/65%	24/Mar/2017
Radiated Emission	03CH03-HY	Morrison	23.8°C /61%	23/Mar/2017

1.4 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	Limit
Radio Frequency		$\pm 6.7 \times 10^{-8}$	$\pm 1 \times 10^{-7}$
All emissions, radiated	9 – 150 kHz	± 2.5 dB	± 6 dB
	0.15 – 30 MHz	± 2.3 dB	± 6 dB
	30 – 1000 MHz	± 2.6 dB	± 6 dB
Temperature		± 0.8 °C	± 1 °C
Humidity		± 5 %	± 5 %
DC and low frequency voltages		± 0.9 %	± 3 %

2 Test Configuration of EUT

2.1 The Worst Case Configuration

Modulation Mode	Field Strength (dBuV/m at 1m)
WPC	64.31
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)
WPC	394 kHz
Wireless charger frequencies are variable frequency range (370-398 kHz) and depend on charging loading. The charging frequency is 394 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	USB Mode

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.		
	☒ EUT will be placed in mobile position and operating multiple positions.		
	☐ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.		
Operating Mode < 1GHz	☒ 1. USB Mode		
Modulation Mode	WPC		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT			V

2.4 Accessories and Support Equipment

Accessories Information				
-	-	-	-	-

Support Equipment – AC Conduction				
No.	Equipment	Brand Name	Model Name	FCC ID
1	USB cable	-	-	-
2	Notebook	DELL	E5540	DOC
3	AC Adapter for NB	DELL	LA65NS2-01	DOC
4	Mouse	DELL	MS111-L	DOC
5	IPod	Apple	A1199	DOC
6	Load*3	-	-	-

Note.Support equipment No.6 was provided by customer.

Support Equipment –Conducted				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E5410	DOC
2	Adapter for NB	DELL	HA65NM130	DOC
3	Load*3	-	-	-

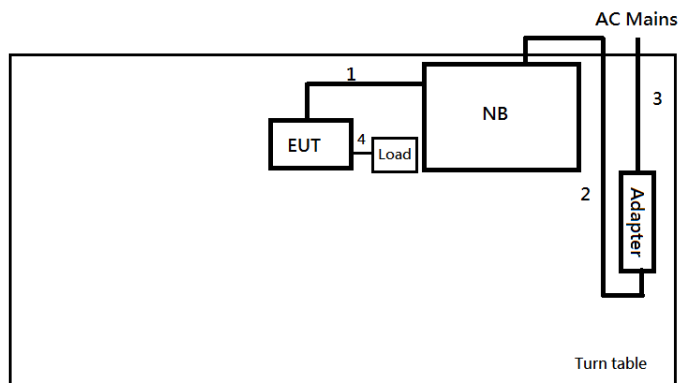
Note.Support equipment No.3 was provided by customer.

Support Equipment –Radiated				
No.	Equipment	Brand Name	Model Name	FCC ID
1	USB cable	-	-	DOC
2	Notebook	DELL	E5540	DOC
3	Mouse	DELL	MS111-L	-
4	IPod	Apple	A1199	-
5	Load*3	-	-	-

Note.Support equipment No.3 was provided by customer.

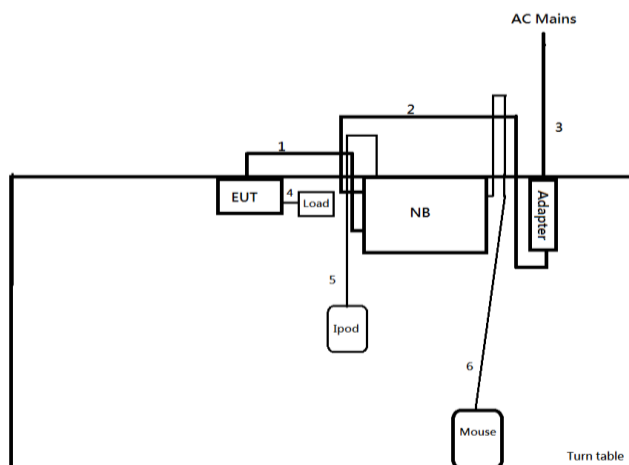
2.5 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)	Remark
1	USB cable	No	1m	-
2	DC power line	No	1m	
3	AC power line	No	1m	
4	DC power line	No	0.1m	-

Test Setup Diagram - Radiated Test 9kHz~30MHz



Item	Connection	Shielded	Length(m)	Remark
1	USB cable	No	1m	-
2	DC power line	No	1m	
3	AC power line	No	1m	
4	DC power line	No	0.1m	-
5	USB cable	No	1.2m	-
6	USB cable	No	1.8m	-

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.

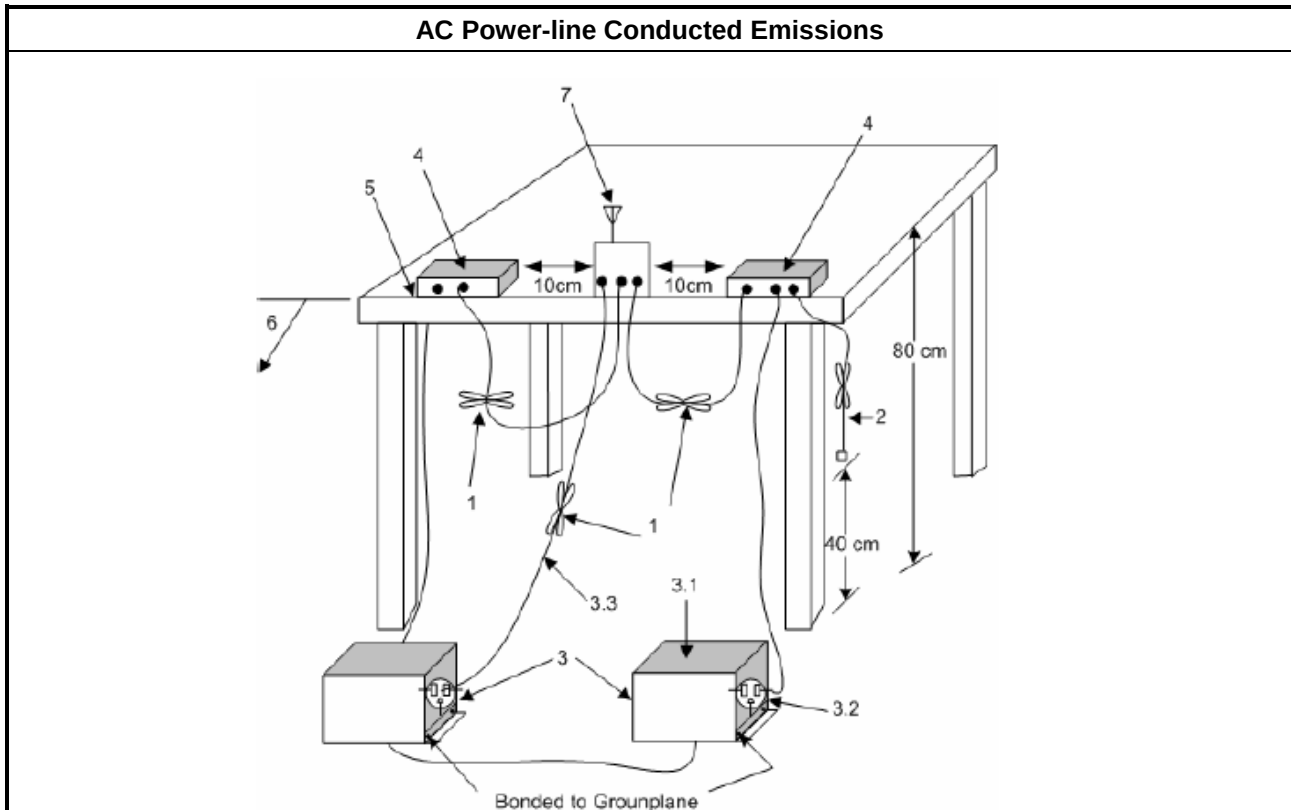
3.1.2 Measuring Instruments

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

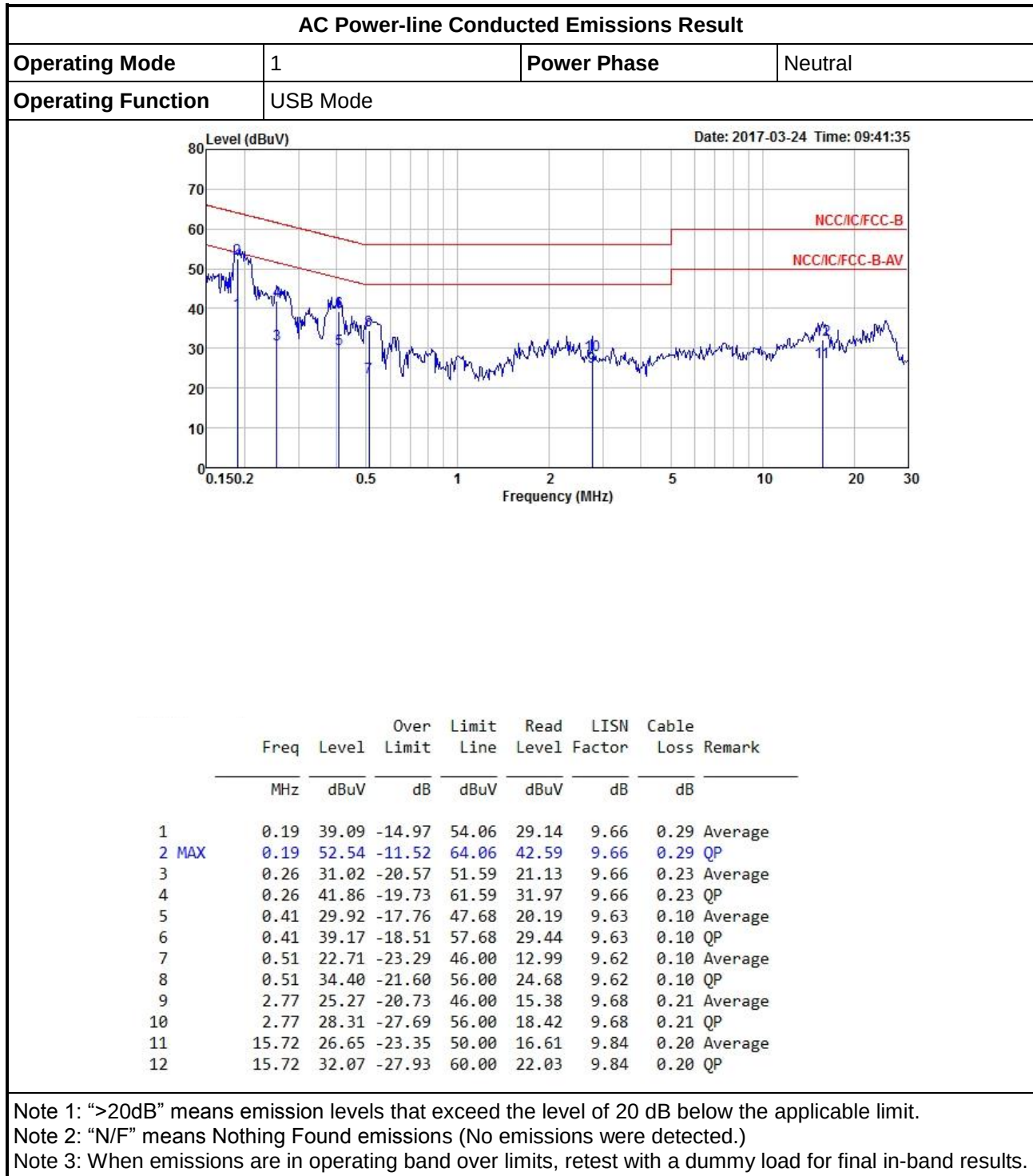
3.1.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10-2013, 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

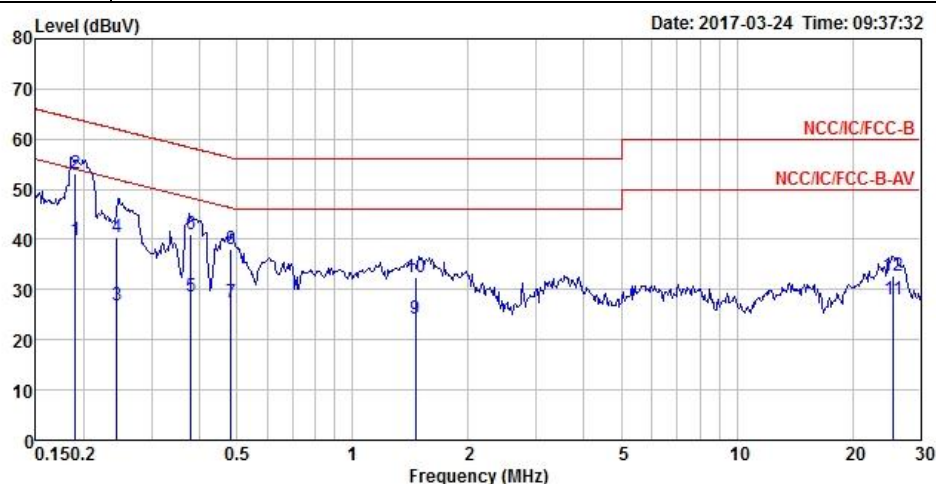


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	USB Mode		



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.19	39.86	-14.16	54.02	29.92	9.65	0.29	Average
2 MAX	0.19	53.25	-10.77	64.02	43.31	9.65	0.29	QP
3	0.24	26.76	-25.20	51.96	16.86	9.66	0.24	Average
4	0.24	40.33	-21.63	61.96	30.43	9.66	0.24	QP
5	0.38	28.52	-19.78	48.30	18.72	9.68	0.12	Average
6	0.38	41.02	-17.28	58.30	31.22	9.68	0.12	QP
7	0.48	27.46	-18.82	46.28	17.69	9.67	0.10	Average
8	0.48	38.18	-18.10	56.28	28.41	9.67	0.10	QP
9	1.46	24.08	-21.92	46.00	14.15	9.72	0.21	Average
10	1.46	32.38	-23.62	56.00	22.45	9.72	0.21	QP
11	25.58	28.04	-21.96	50.00	17.91	9.92	0.21	Average
12	25.58	32.76	-27.24	60.00	22.63	9.92	0.21	QP

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.

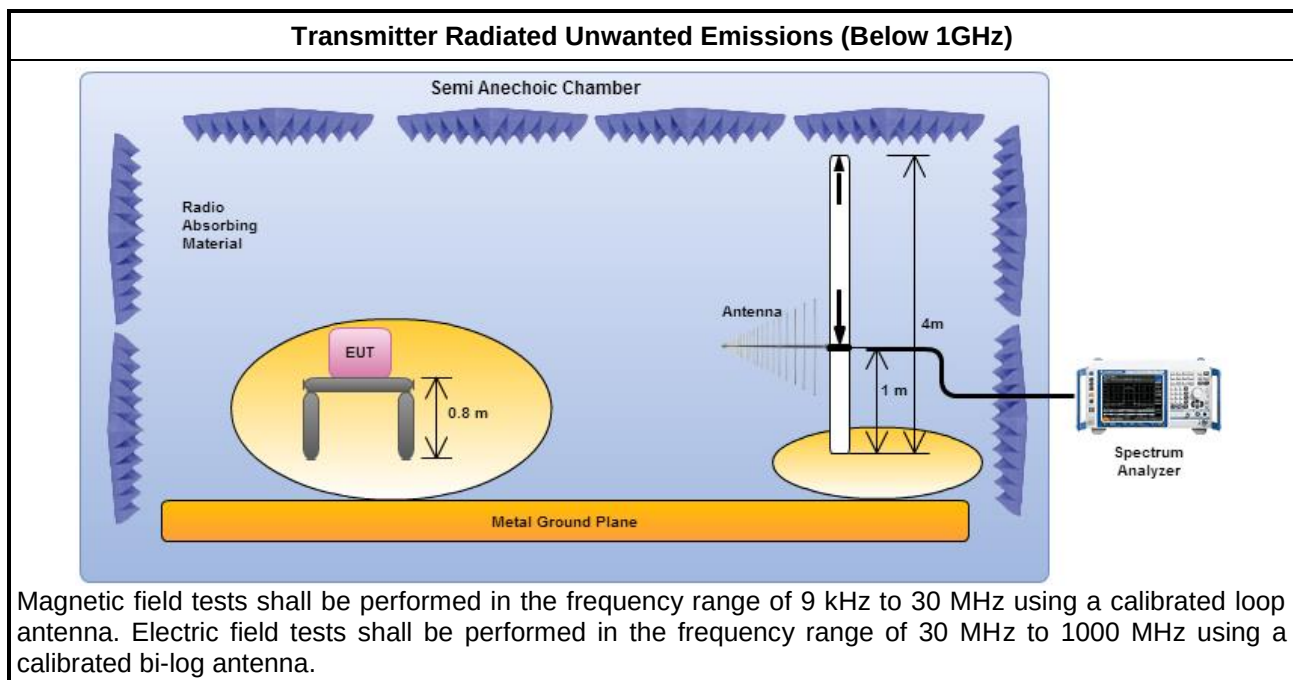
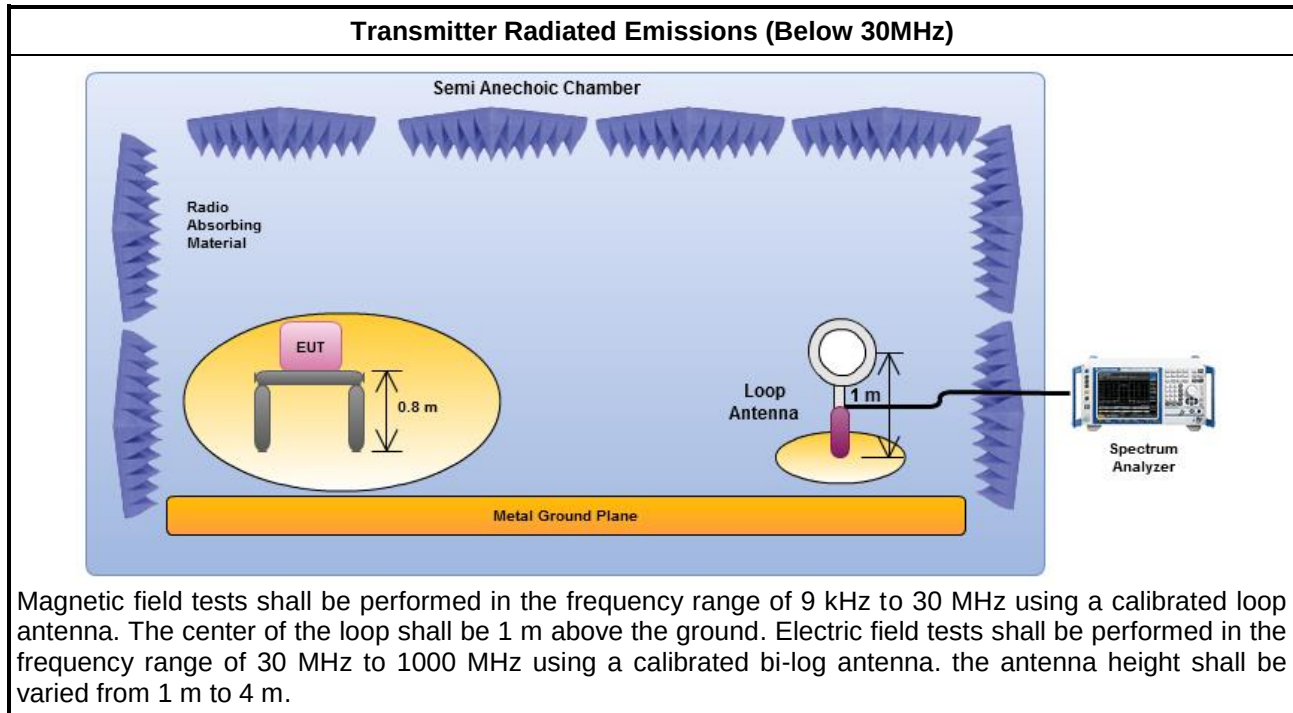
3.2.2 Measuring Instruments

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

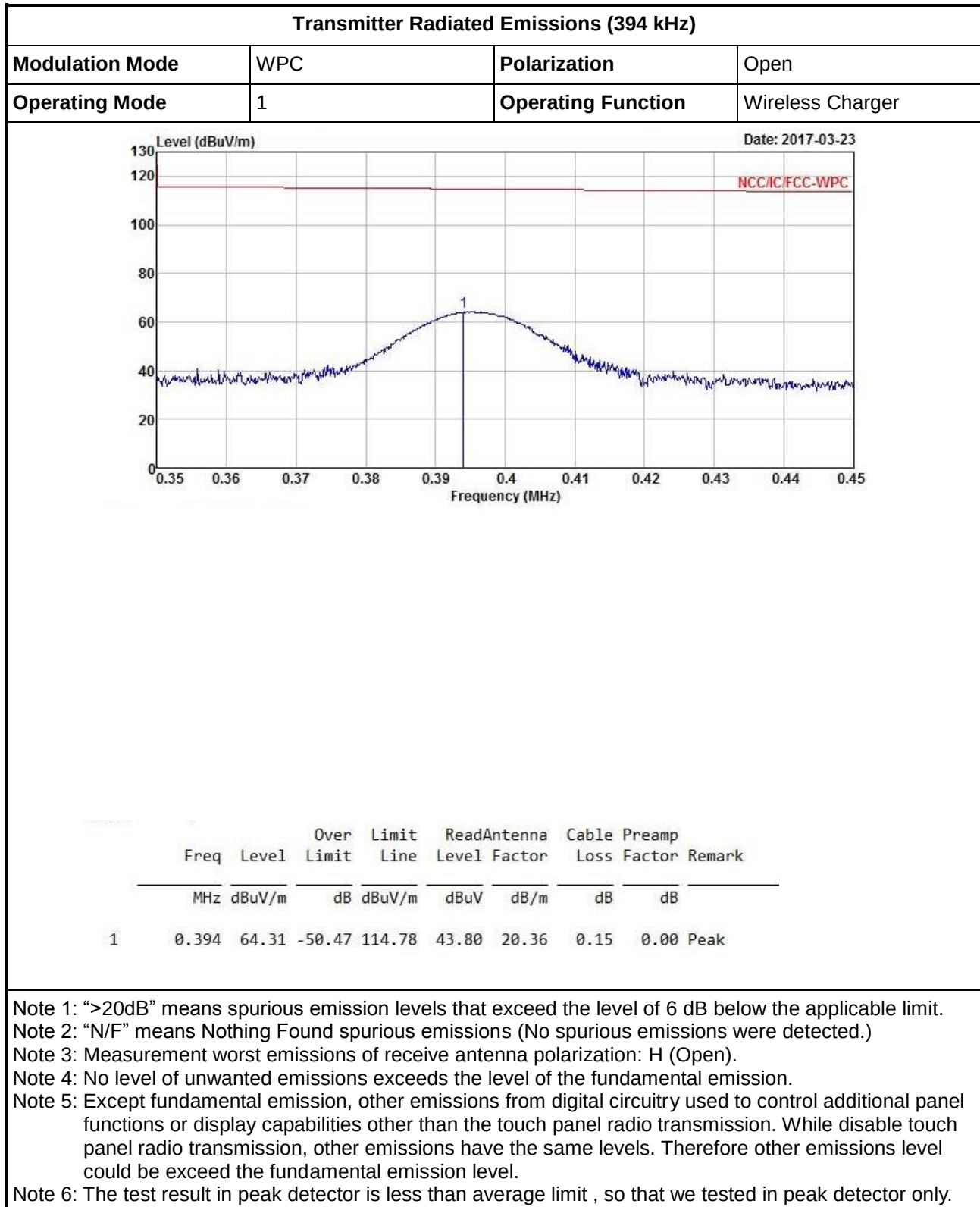
3.2.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 1m.
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz the frequency bands 394 kHz, 370-398kHz measurements employing an average detector and other below 30MHz measurements employing a CISPR quasi-peak detector. Test distance is 1m.
☒	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

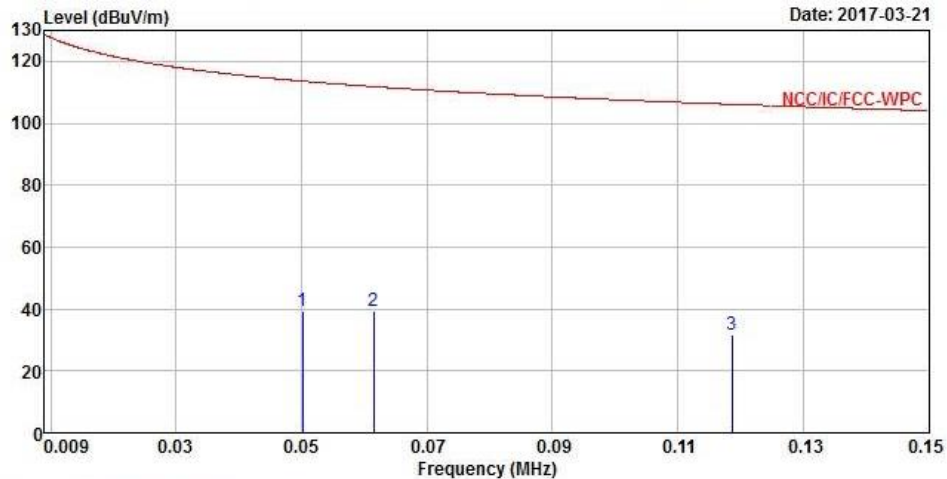


3.2.5 Transmitter Radiated Emissions (Below 30MHz)



Transmitter Radiated Emissions (9 kHz – 150 kHz)

Modulation Mode	WPC	Polarization	Open
Operating Mode	1	Operating Function	Wireless Charger



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	0.050	39.13	-74.47	113.60	17.96	21.10	0.07	0.00 Peak
2	0.061	39.28	-72.56	111.84	18.20	21.01	0.07	0.00 Peak
3	0.119	31.45	-74.67	106.12	10.68	20.68	0.09	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.)

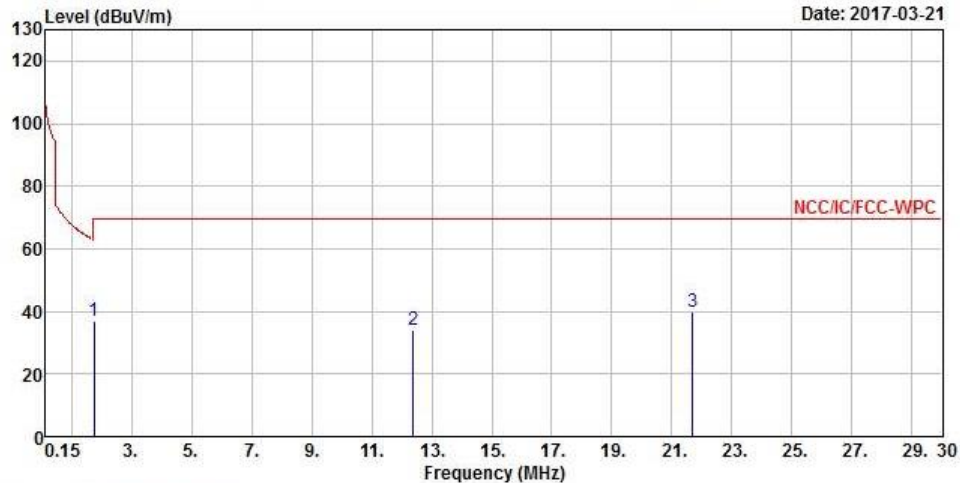
Note 3: Measurement worst emissions of receive antenna polarization: H (Open).

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 – 30 MHz)

Modulation Mode	WPC	Polarization	Open
Operating Mode	1	Operating Function	Wireless Charger



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	1.762	37.17	-32.37	69.54	16.22	20.59	0.36	0.00 Peak
2	12.389	34.19	-35.35	69.54	11.82	21.71	0.66	0.00 Peak
3	21.702	40.00	-29.54	69.54	16.68	22.45	0.87	0.00 Peak

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

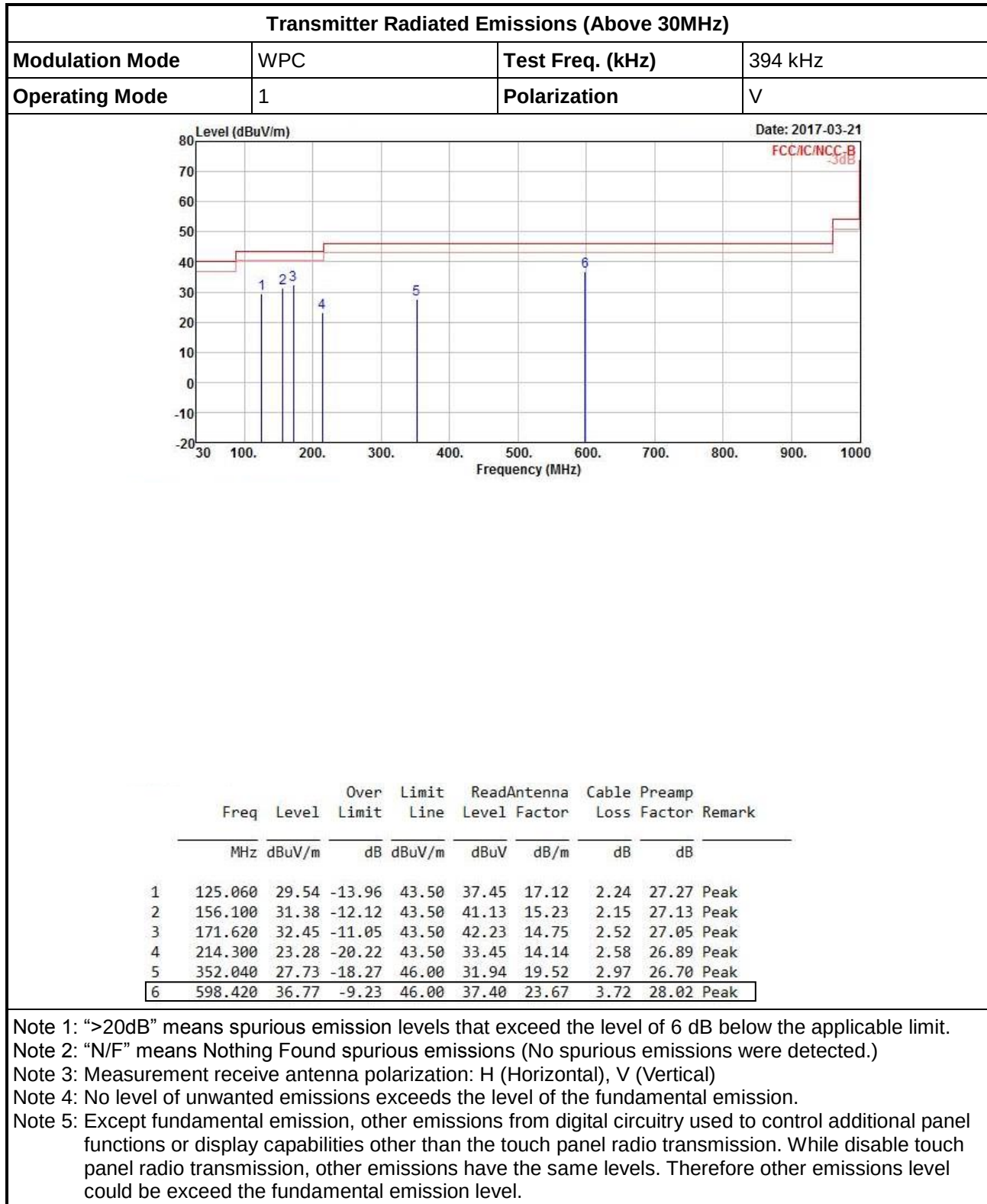
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement worst emissions of receive antenna polarization: H (Open).

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

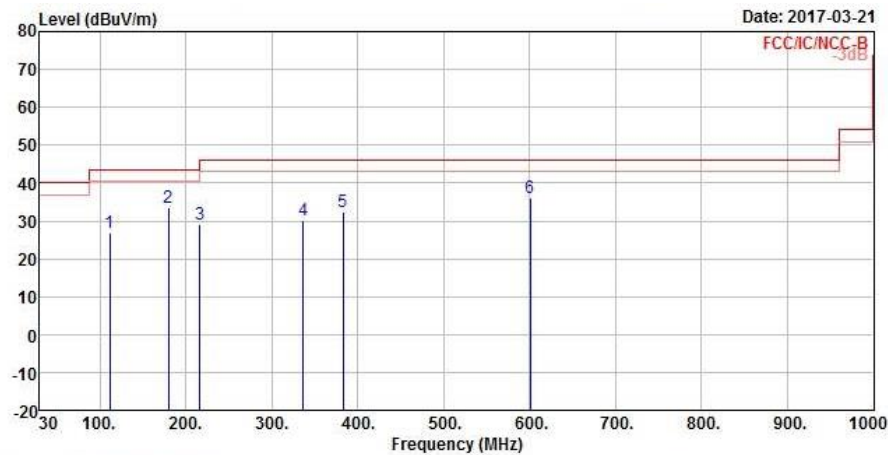
Note 5: Except fundamental emission, other emissions from digital circuitry used to control additional panel functions or display capabilities other than the touch panel radio transmission. While disable touch panel radio transmission, other emissions have the same levels. Therefore other emissions level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

3.2.6 Transmitter Radiated Emissions (Above 30MHz)



Transmitter Radiated Emissions (Above 30MHz)

Modulation Mode	WPC	Test Freq. (kHz)	394 kHz
Operating Mode	1	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	111.480	26.82	-16.68	43.50	35.09	17.09	1.98	27.34 Peak
2	179.380	33.46	-10.04	43.50	43.85	14.39	2.24	27.02 Peak
3	216.240	28.90	-17.10	46.00	39.04	14.16	2.58	26.88 Peak
4	336.520	30.06	-15.94	46.00	35.01	18.93	2.82	26.70 Peak
5	383.080	32.51	-13.49	46.00	35.76	20.42	3.03	26.70 Peak
6	600.360	36.07	-9.93	46.00	36.70	23.67	3.72	28.02 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

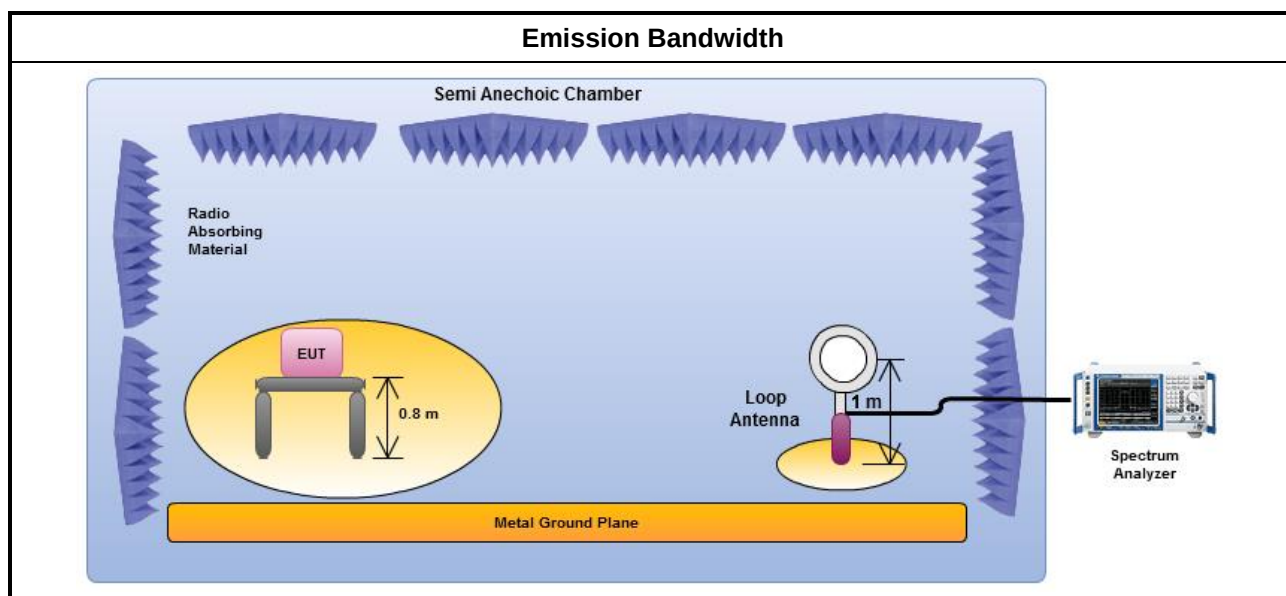
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

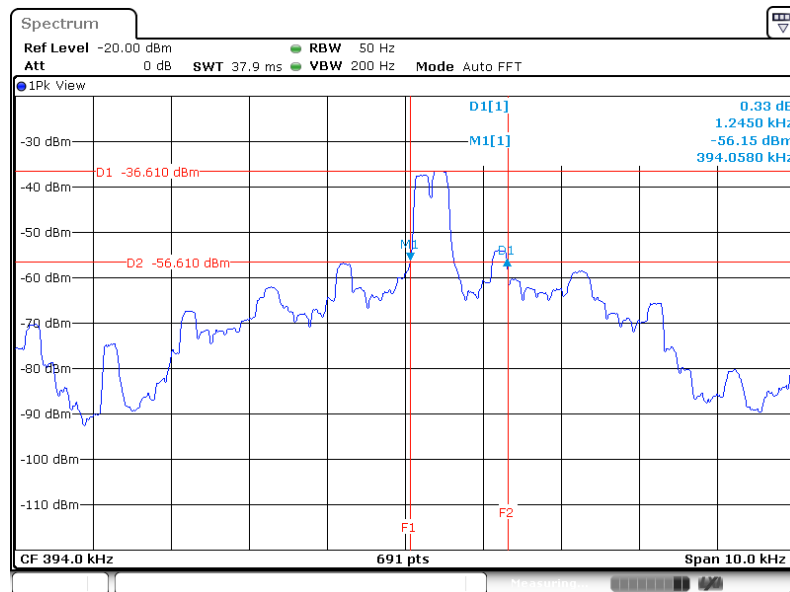
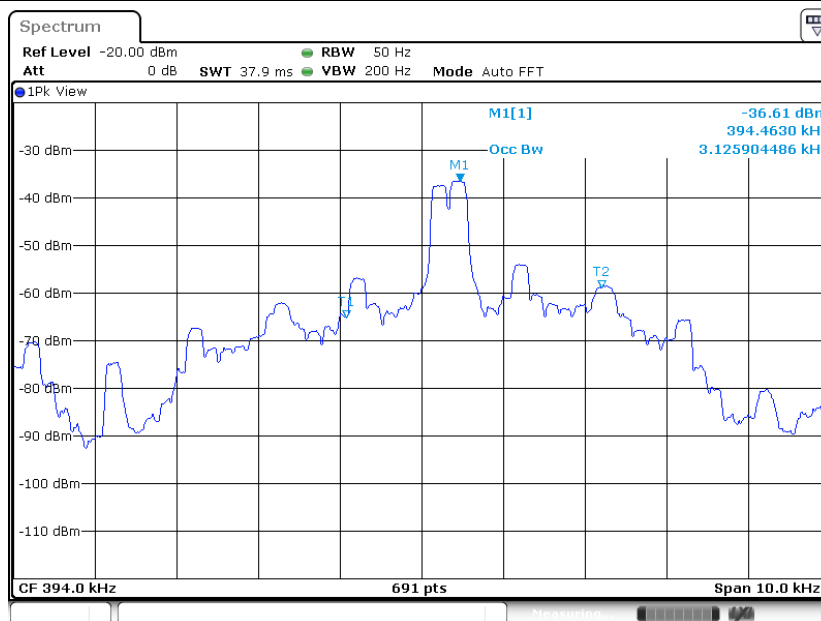
Test Method
☒ For the emission bandwidth refer ANSI C63.10, clause 6.9.3 for occupied bandwidth testing.
☒ For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field 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)	99% Bandwidth (kHz)
WPC	394	1.24	3.12
Limit		N/A	N/A
Result		Complied	

Emission Bandwidth Plot 20dB Bandwidth (394 kHz)

Emission Bandwidth Plot 99% Bandwidth (394 kHz)


4 Test Equipment and Calibration Data

< AC Conduction >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
EMC Receiver	R&S	ESR-3	102051	9kHz ~ 3.6GHz	19/Apr/2016	18/Apr/2017
LISN	R&S	ENV216	101295	9kHz ~ 30MHz	15/Nov/2016	14/Nov/2017
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	24/Oct/2016	23/Oct/2017
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	NCR	NCR

NCR : Non-Calibration Require

< RF Conducted >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101013	9KHz~40GHz	30/Dec/2016	29/Dec/2017
Loop Antenna	TESEQ	HLA 6120	24155	9kHz~30MHz	02/Mar/2017	01/Mar/2018

< Radiated Emission >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	9kHz ~ 1GHz 3m	28/Nov/2016	27/Nov/2017
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	23/Jul/2016	22/Jul/2017
Spectrum	R&S	FSV40	101013	9kHz ~ 40GHz	30/Dec/2016	29/Dec/2017
Bilog Antenna	SCHAFFNER	CBL 6112B	2723	30MHz ~ 1GHz	01/Oct/2016	30/Sep/2017
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	10/May/2016	09/May/2017
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	02/Mar/2017	01/Mar/2018