

FCC Test Report

FCC ID : RWO-RZ350259
Equipment : Smartphone
Brand Name : RAZER
Model Name : RZ35-0259
Applicant : Razer Inc.
201 3rd Street, Suite 900, San Francisco,
CA 94103, USA
Manufacturer : Razer Inc.
201 3rd Street, Suite 900, San Francisco,
CA 94103, USA
Standard : 47 CFR FCC Part 15.225

The product was received on Nov. 11, 2017, and testing was started from Sep. 06, 2018 and completed on Sep. 07, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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



Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



Table of Contents

HISTORY OF THIS TEST REPORT	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Information.....	5
1.2 Testing Applied Standards	7
1.3 Testing Location Information	7
1.4 Measurement Uncertainty	7
2 TEST CONFIGURATION OF EUT.....	8
2.1 The Worst Case Modulation Configuration	8
2.2 Test Channel Frequencies Configuration.....	8
2.3 The Worst Case Measurement Configuration	9
2.4 Accessories	10
2.5 Support Equipment.....	10
2.6 Test Setup Diagram	11
3 TRANSMITTER TEST RESULT	13
3.1 AC Power-line Conducted Emissions	13
3.2 Emission Bandwidth	17
3.3 Field Strength of Fundamental Emissions and Spectrum Mask	19
3.4 Transmitter Radiated Unwanted Emissions	22
3.5 Frequency Stability	31
4 TEST EQUIPMENT AND CALIBRATION DATA.....	33

Appendix A. Test Photos

Photographs of EUT V01

[illegible]

Summary of Test Result

Report Clause	Ref. Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	FCC 15.203
3.1	15.207	AC Power-line Conducted Emissions	PASS	FCC 15.207
3.2	15.215(c)	Emission Bandwidth	PASS	Fall in band $F_L \geq 13.553 \text{ MHz}$ $F_H \leq 13.567 \text{ MHz}$
3.3	15.225(a)~(d)	Field Strength of Fundamental Emissions and Spectrum Mask	PASS	124 dBuV/m at 3m
3.4	15.225(d)	Transmitter Radiated Unwanted Emissions	PASS	FCC 15.209
3.5	15.225(e)	Frequency Stability	PASS	$\pm 0.01\%$ (100ppm)

Reviewed by: Jackson Tsai

Report Producer: Michelle Tsai

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information				
Frequency Range	Modulation	Ch. Frequency (MHz)	Channel Number	Field Strength (dBuV/m)
13.553 – 13.567 MHz	ISO 18092 (ASK)	13.56	1	60.18
Note 1: Field strength performed peak level at 3m.				

1.1.2 Antenna Information

Antenna Category	
☒	Integral antenna (antenna permanently attached)
☐	Temporary RF connector provided
☒	No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
☐	External antenna (dedicated antennas)

Antenna General Information		
No.	Ant. Cat.	Ant. Type
1	Integral	Loop

1.1.3 Type of EUT

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 EUT Operational Condition

Supply Voltage	☒ AC mains	☒ DC	
Type of DC Source	☒ External AC adapter	☒ From Host System	☒ Battery
Test Voltage	☒ Vnom (3.85 V)	☒ Vmax (4.40V)	☒ Vmin (3.40 V)
Test Climatic	☒ Tnom (20°C)	☒ Tmax (55°C)	☒ Tmin (-10°C)

1.1.5 Test Signal Duty Cycle

Duty Cycle Operation Restriction	
The transmitter is used for	The transmitter is operated
☒ Inductive applications	☒ Automatically triggered
☐ Duty cycle fixed mode	☒ Duty cycle random mode
Duty cycle mode - NFC-A (ISO 14443-3A)	
Declare transmitter duty cycle / 1 hour =	100%
Duty cycle mode - NFC-B (ISO 14443-3B)	
Declare transmitter duty cycle / 1 hour =	100%
Duty cycle mode - NFC-F (ISO 18092)	
Declare transmitter duty cycle / 1 hour =	100%
Duty cycle mode - NFC-V (ISO 15693)	
Declare transmitter duty cycle / 1 hour =	100%

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
- ♦ KDB 174176 D01 v01r01

1.3 Testing Location Information

Testing Location				
☒	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL : 886-3-327-3456 FAX : 886-3-327-0973		
Test site Designation No. TW1190 with FCC.				
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Barry	24.3°C / 61%	07/Sep/2018
Radiated	03CH02-HY	Kevin	23.5°C / 59%	06/Sep/2018
AC Conduction	CO04-HY	Terry	23.5°C / 59%	06/Sep/2018

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))

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.0 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	4.3 dB	Confidence levels of 95%
Conducted Emission	1.3 dB	Confidence levels of 95%
Temperature	0.7 °C	Confidence levels of 95%
Humidity	4 %	Confidence levels of 95%

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Modulation Used for Conformance Testing	
Modulation Mode	Field Strength (dBuV/m at 3 m)
NFC	60.18

2.2 Test Channel Frequencies Configuration

Modulation Mode	Test Channel Frequencies (MHz)
NFC	13.56

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: 120Vac / 60Hz
Operating Mode	Adapter Mode

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emission Bandwidth, Frequency Stability
Test Condition	Conducted measurement

The Worst Case Mode for Following Conformance Tests			
Tests Item	Field Strength of Fundamental Emissions, Spectrum Mask, Transmitter Radiated Unwanted Emissions, Receiver Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
Pretest Mode	☒ 1. EUT Built in NFC A type		
	☒ 2. EUT Built in NFC B type		
	☒ 3. EUT Built in NFC F type		
	☒ 4. EUT Built in NFC V type		
	Mode 4 configuration was pretested and found to be the worst case and measured during the test.		
Operating Mode	☒ 1. Adapter Mode		
Modulation Mode	NFC		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT			V

2.4 Accessories

Accessories				
AC Adapter	Brand Name	Razer	Model Name	RC30-021501
	Power Rating	I/P: 100~240V,50/60Hz, 3A-5V, 2.67A-9V, 2.0A-12V		
Battery	Brand Name	Razer	Model Name	RC30-0259
	Power Rating	3.85 Vdc, 4000mAh	Type	Li-ion, Polymer
USB Cable	Brand Name	Razer	Model Name	RC30-02150705-0000
	Signal Line	1.0 meter, non-shielded cable, w/o ferrite core		
Audio Dongle	Brand Name	Razer	Model Name	RC30-02590400-0000
	Signal Line	0.10 meter, non-shielded cable, w/o ferrite core		

Reminder: Regarding to more detail and other information, please refer to user manual.

2.5 Support Equipment

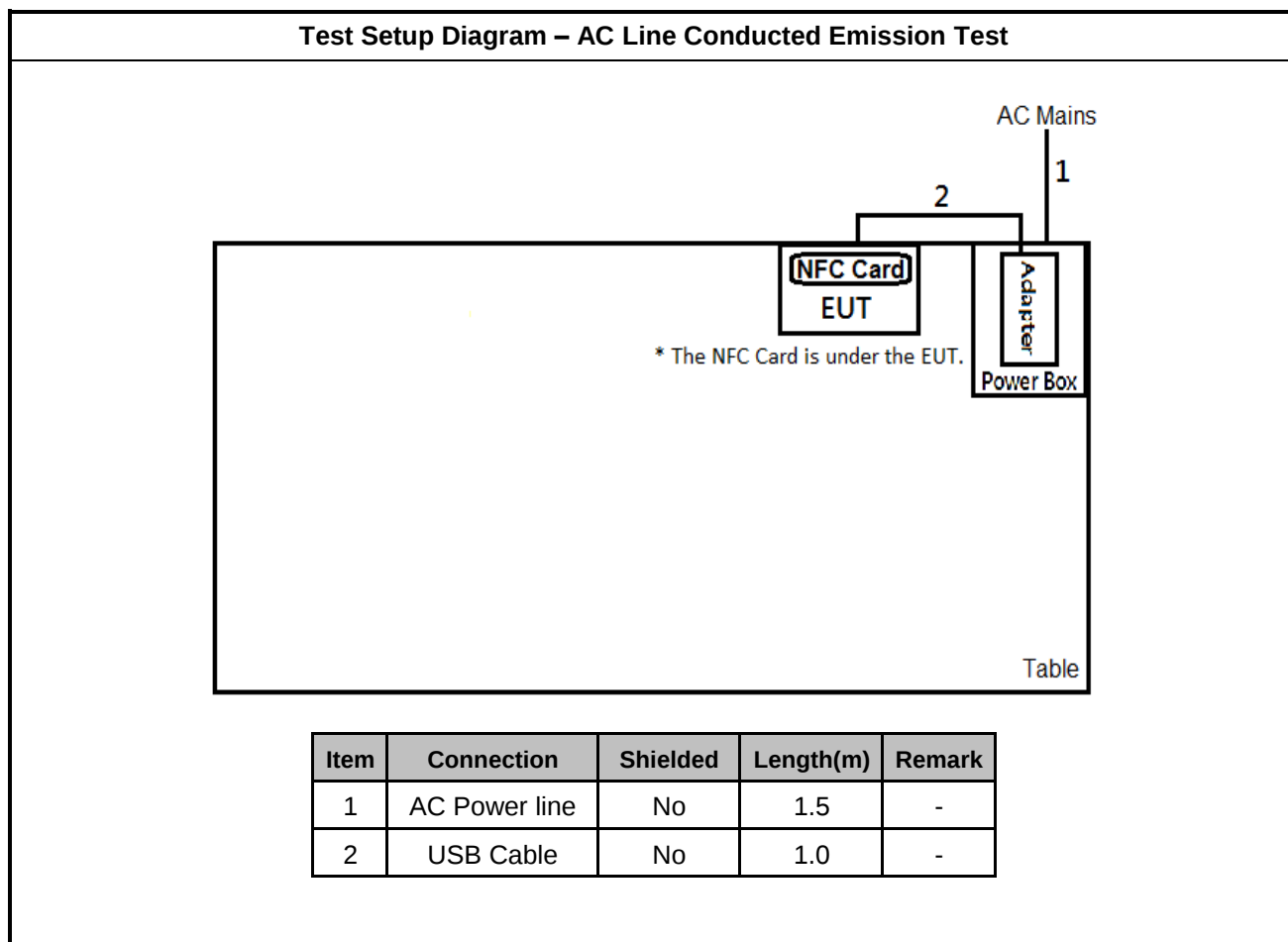
Support Equipment - RF Conducted				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NFC Card	-	-	-
2	DC Power Supply	GW	GPS-3030DD	-

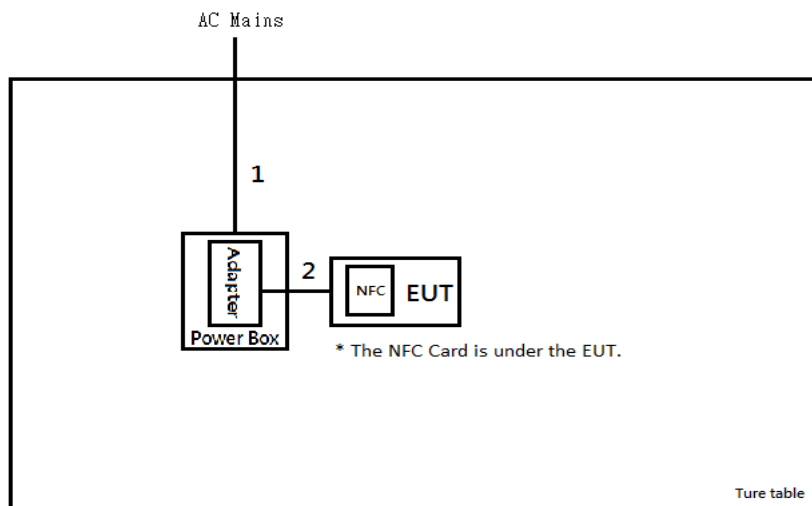
Note: Support equipment No.1 was provided by customer.

Support Equipment – AC Conduction and Radiated Emission				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NFC Card	-	-	-

Note: Support equipment No.1 was provided by customer.

2.6 Test Setup Diagram



Test Setup Diagram - Radiated Test


Item	Connection	Shielded	Length(m)	Remark
1	AC Power line	No	1.5	-
2	USB Cable	No	1.0	-

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.

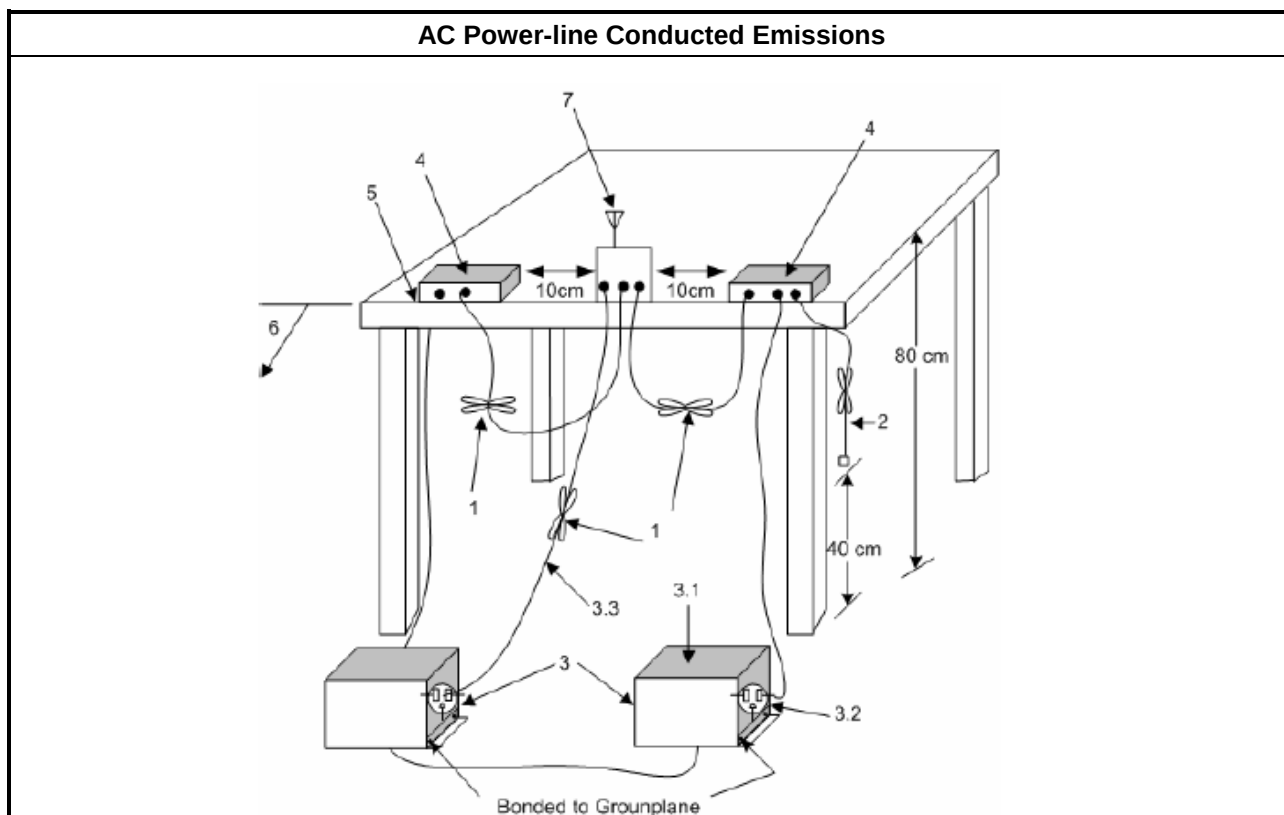
3.1.2 Measuring Instruments

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

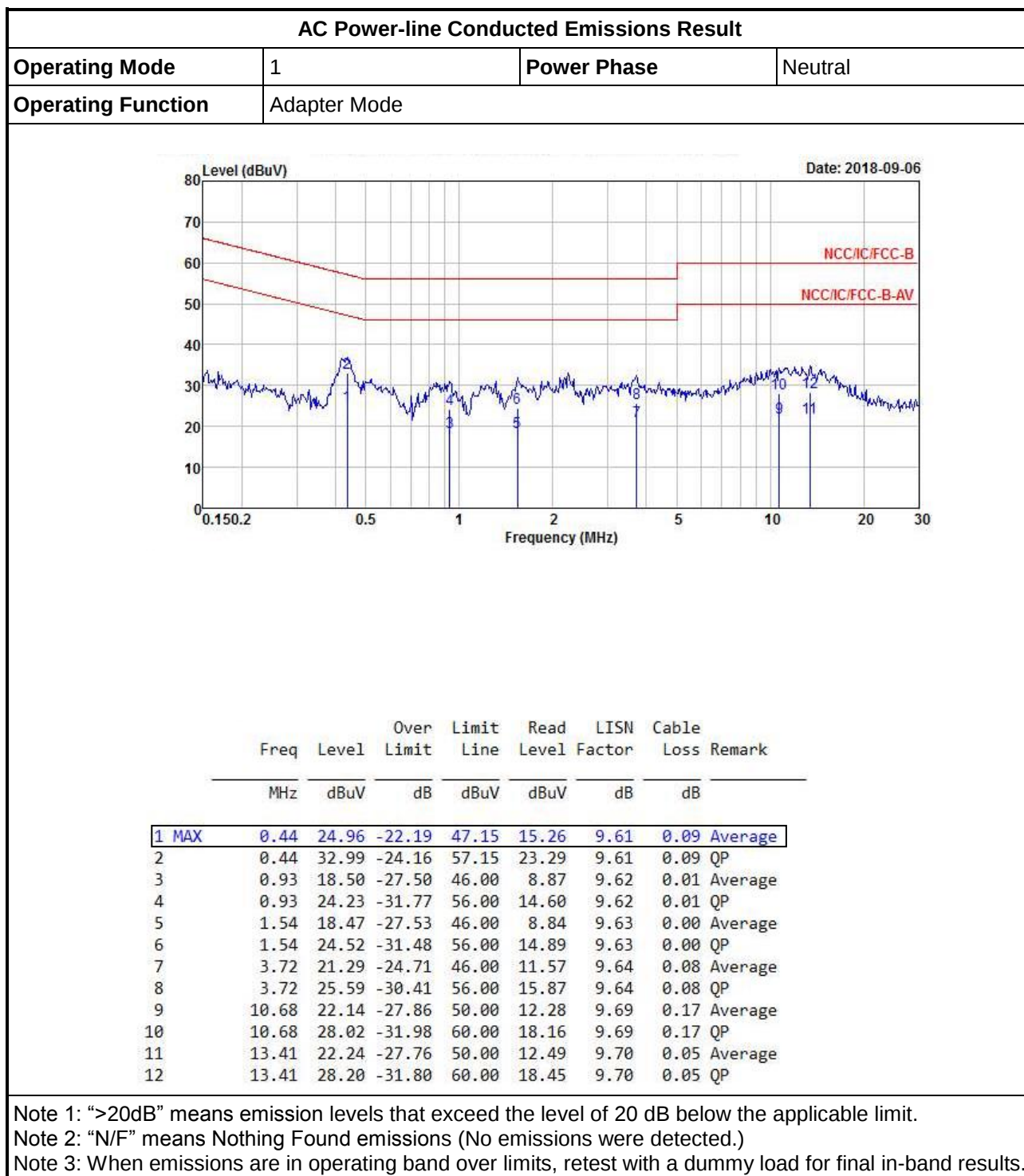
3.1.3 Test Procedures

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

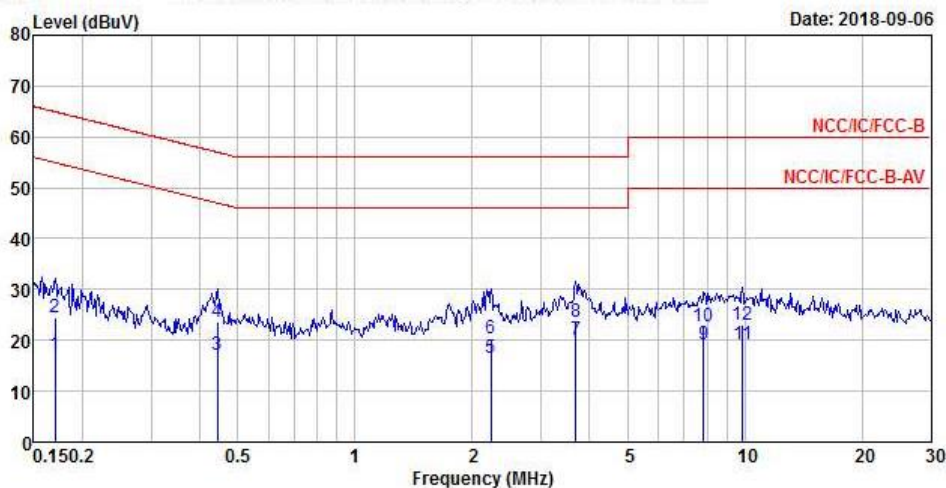


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Adapter Mode		



		Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.17	17.20	-37.74	54.94	7.56	9.62	0.02	Average
2	0.17	24.52	-40.42	64.94	14.88	9.62	0.02	QP
3	0.44	17.15	-29.83	46.98	7.45	9.61	0.09	Average
4	0.44	23.72	-33.26	56.98	14.02	9.61	0.09	QP
5	2.24	16.42	-29.58	46.00	6.79	9.62	0.01	Average
6	2.24	20.45	-35.55	56.00	10.82	9.62	0.01	QP
7 MAX	3.68	20.09	-25.91	46.00	10.38	9.63	0.08	Average
8	3.68	23.76	-32.24	56.00	14.05	9.63	0.08	QP
9	7.85	19.33	-30.67	50.00	9.51	9.65	0.17	Average
10	7.85	22.65	-37.35	60.00	12.83	9.65	0.17	QP
11	9.86	19.14	-30.86	50.00	9.28	9.66	0.20	Average
12	9.86	23.03	-36.97	60.00	13.17	9.66	0.20	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 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

20dB Bandwidth Limit	
☒	Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (13.553 – 13.567 MHz).

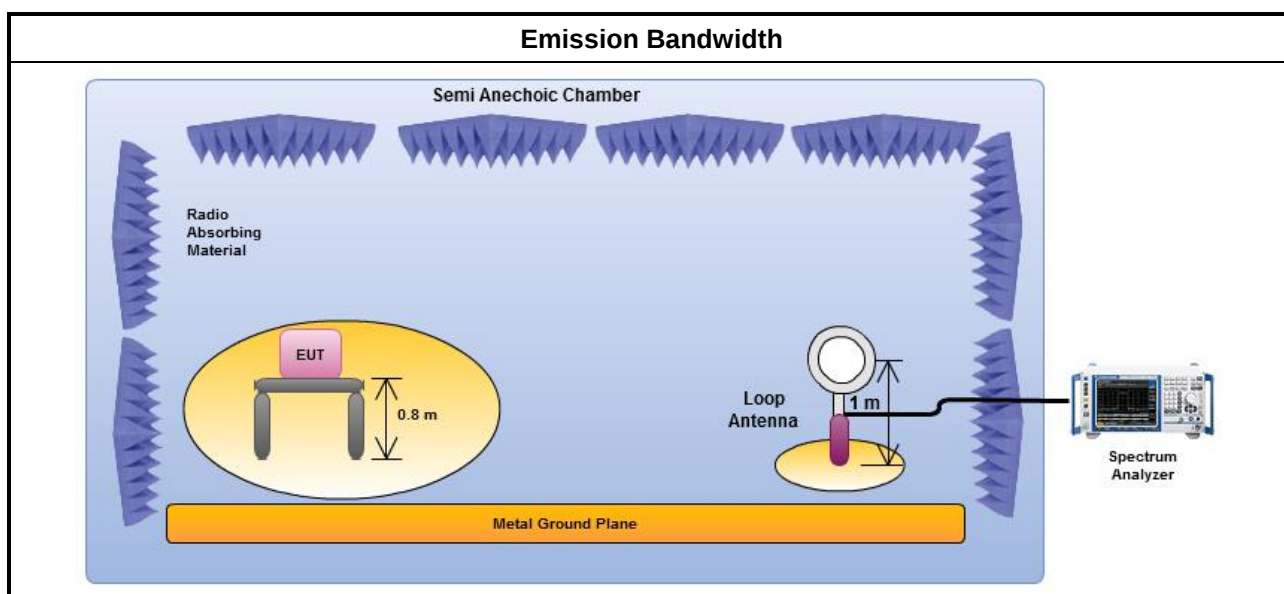
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

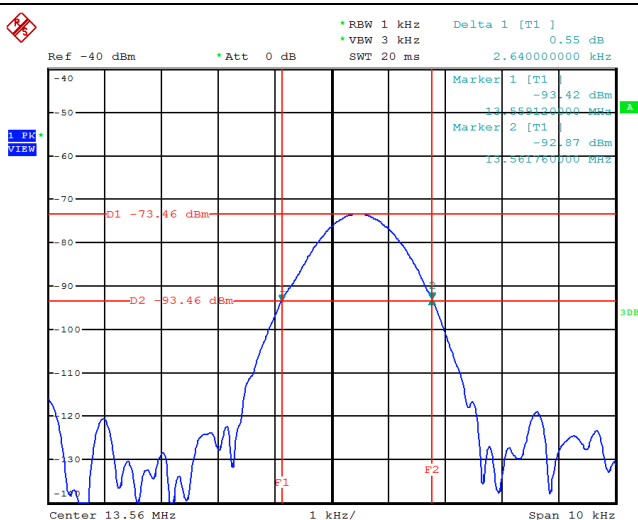
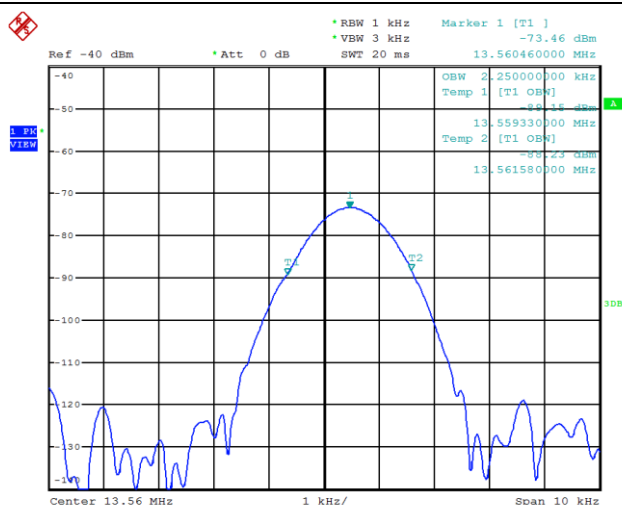
Test Method	
☒	For the emission bandwidth refer ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
☒	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field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

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Occupied Channel Bandwidth Result					
Modulation Mode	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	F _L at 20dB BW (MHz)	F _H at 20dB BW (MHz)
NFC	13.56	2.64000	2.25000	13.55912	13.56176
Limit		N/A	N/A	13.553	13.567
Result		Complied			

Emission Bandwidth Plot - 20dB Bandwidth

Emission Bandwidth Plot - 99% Bandwidth


3.3 Field Strength of Fundamental Emissions and Spectrum Mask

3.3.1 Field Strength of Fundamental Emissions and Spectrum Mask Limit

Field Strength of Fundamental Emissions					
Emissions	(uV/m)@30m	(dBuV/m)@30m	(dBuV/m)@10m	(dBuV/m)@3m	(dBuV/m)@1m
fundamental	15848	84.0	103.1	124.0	143.1
Quasi peak measurement of the fundamental.					

Spectrum Mask					
Freq. of Emission (MHz)	(uV/m)@30m	(dBuV/m)@30m	(dBuV/m)@10m	(dBuV/m)@3m	(dBuV/m)@1m
1.705~13.110	30	29.5	48.6	69.5	88.6
13.110~13.410	106	40.5	59.6	80.5	99.6
13.410~13.553	334	50.5	69.6	90.5	109.6
13.553~13.567	15848	84.0	103.1	124.0	143.1
13.567~13.710	334	50.5	69.6	90.5	109.6
13.710~14.010	106	40.5	59.6	80.5	99.6
14.010~30.000	30	29.5	48.6	69.5	88.6

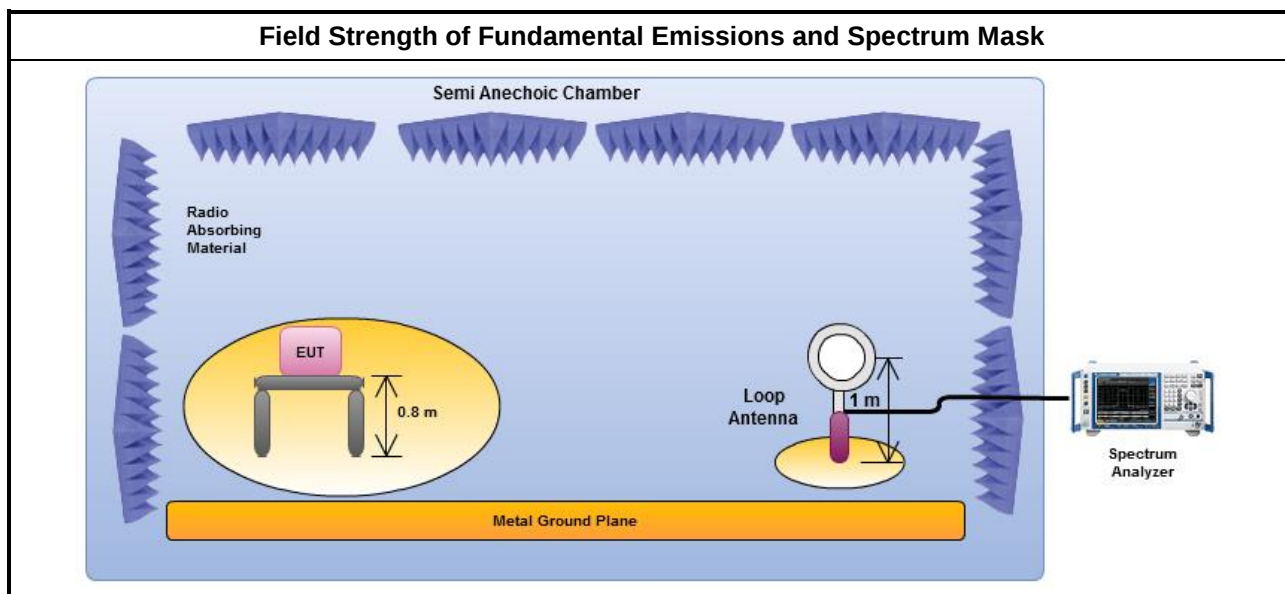
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

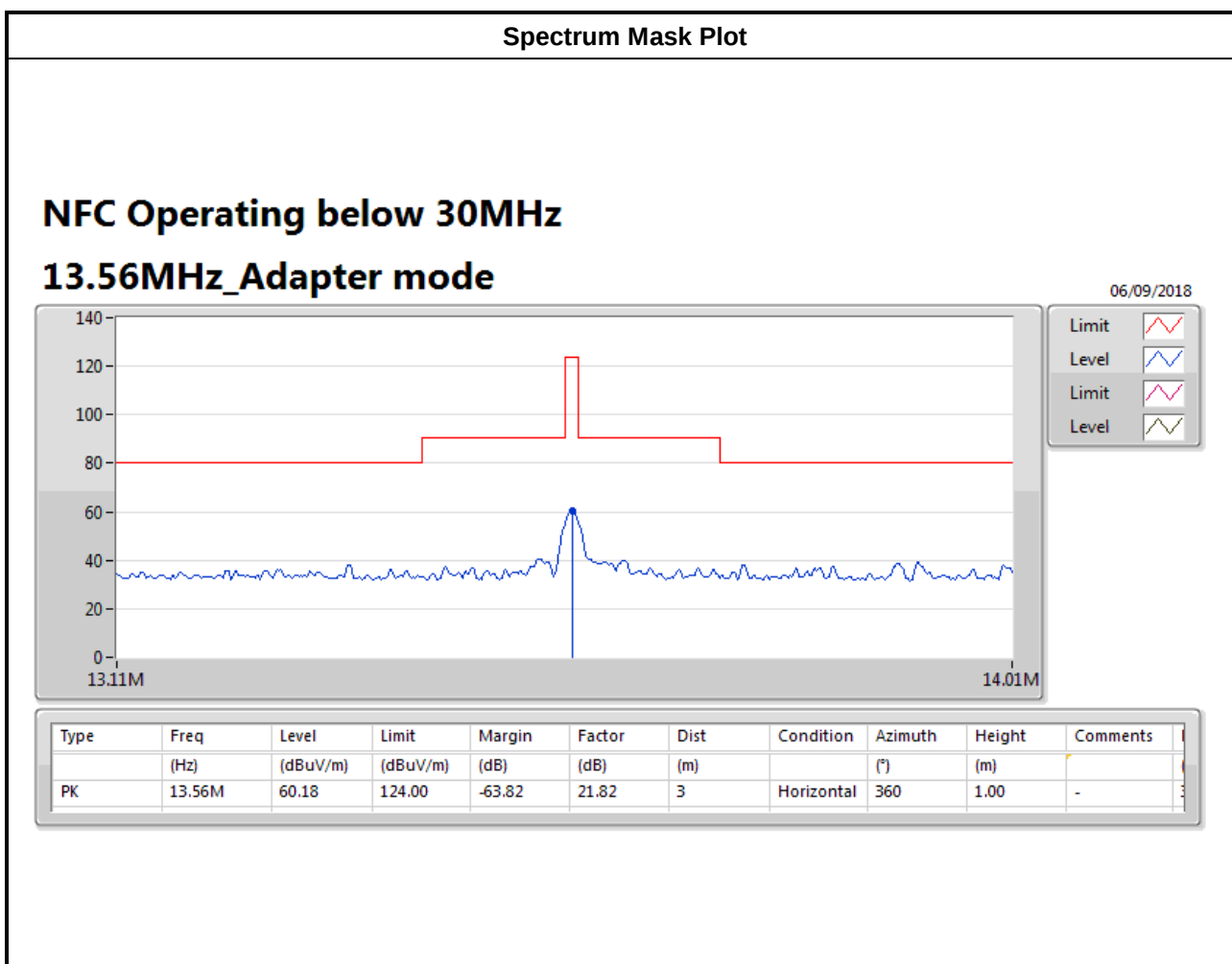
Test Method	
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
☒	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements 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.

3.3.4 Test Setup



3.3.5 Test Result of Field Strength of Fundamental Emissions and Spectrum Mask

Field Strength of Fundamental Emissions Result					
Modulation Mode	Frequency (MHz)	Fundamental (dBuV/m)@3m	Polarization	Margin (dB)	Limit (dBuV/m)@3m
NFC	13.56	60.18	H	63.82	124.00
Result		Complied			
Note 1: Measurement worst emissions of receive antenna polarization: H(Horizontal).					



3.4 Transmitter Radiated Unwanted Emissions

3.4.1 Transmitter Radiated Unwanted Emissions Limit

Transmitter Radiated Unwanted 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.

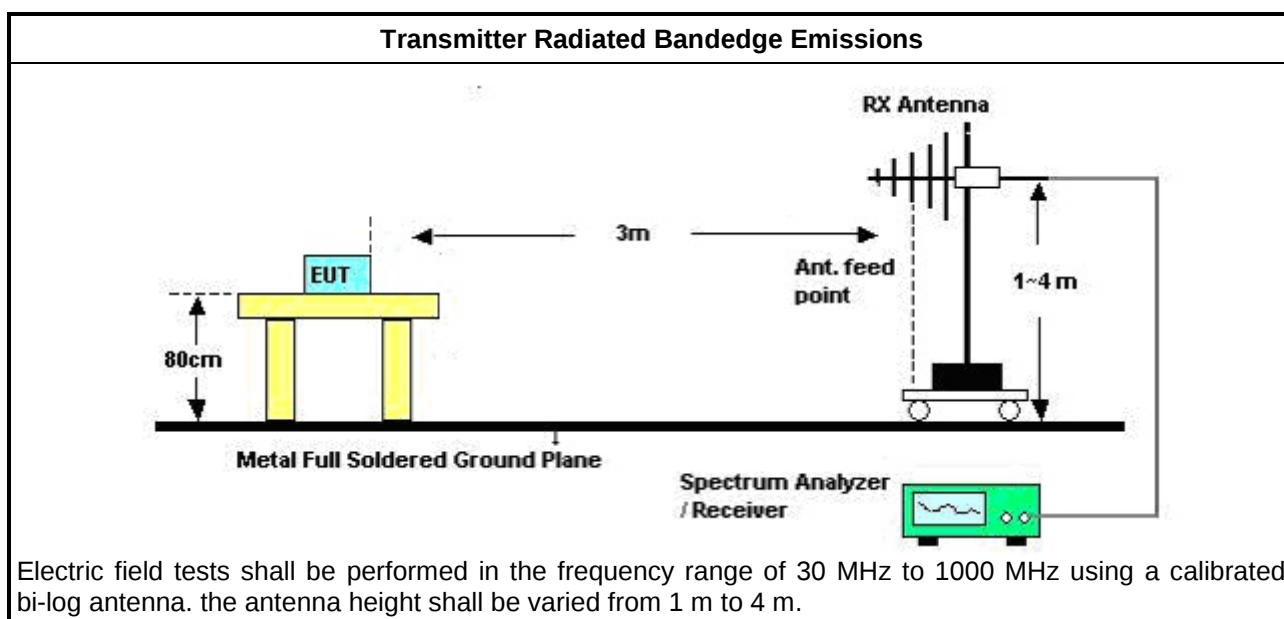
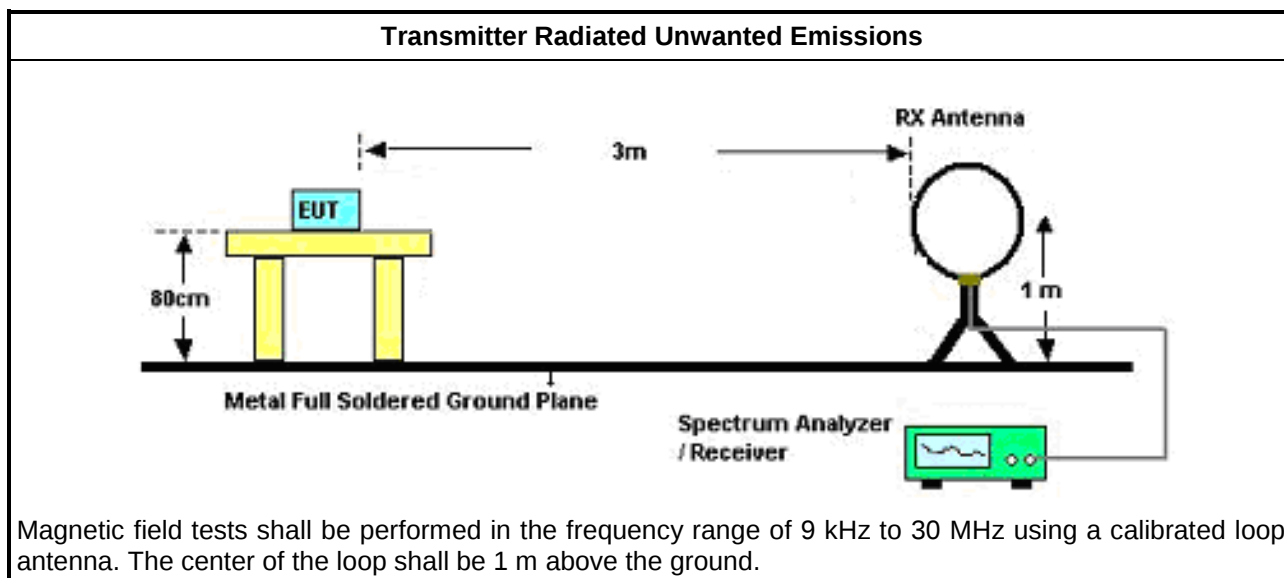
3.4.2 Measuring Instruments

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

3.4.3 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 and 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.

3.4.4 Test Setup



3.4.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
13.553-13.567MHz	-	-	-	-	-	-	-	-	-	-	-
NFC	Pass	QP	2.8962M	50.15	69.50	-19.35	17.37	3	125	1.00	-

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_Adapter mode	Pass	PK	13.56M	60.18	124.00	-63.82	21.82	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	33.534k	44.58	117.09	-72.51	13.26	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	90.78k	47.91	108.43	-60.52	13.50	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	144.36k	50.20	104.41	-54.21	13.99	3	360	1.00	-
13.56MHz_Adapter mode	Pass	QP	2.8962M	50.15	69.50	-19.35	17.37	3	125	1.00	-
13.56MHz_Adapter mode	Pass	QP	3.2544M	49.32	69.50	-20.18	17.58	3	94	1.00	-
13.56MHz_Adapter mode	Pass	PK	5.5827M	49.66	69.50	-19.84	19.08	3	0	1.00	-

NFC Operating below 30MHz

13.56MHz_Adapter mode

06/09/2018

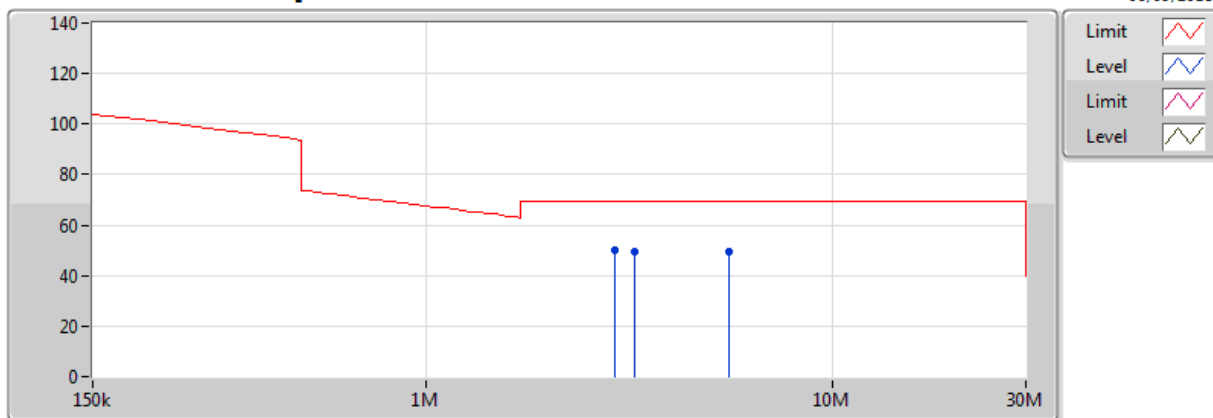


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	33.534k	44.58	117.09	-72.51	13.26	3	Horizontal	360	1.00	-
PK	90.78k	47.91	108.43	-60.52	13.50	3	Horizontal	360	1.00	-
PK	144.36k	50.20	104.41	-54.21	13.99	3	Horizontal	360	1.00	-

NFC Operating below 30MHz

13.56MHz_Adapter mode

06/09/2018



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
QP	2.8962M	50.15	69.50	-19.35	17.37	3	Horizontal	125	1.00	-
QP	3.2544M	49.32	69.50	-20.18	17.58	3	Horizontal	94	1.00	-
PK	5.5827M	49.66	69.50	-19.84	19.08	3	Horizontal	0	1.00	-

3.4.6 Transmitter Radiated Unwanted Emissions (Above 30MHz)

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
13.553-13.567MHz	-	-	-	-	-	-	-	-	-	-	-
NFC	Pass	PK	30M	25.72	40.00	-14.28	-4.17	3	360	1.00	-

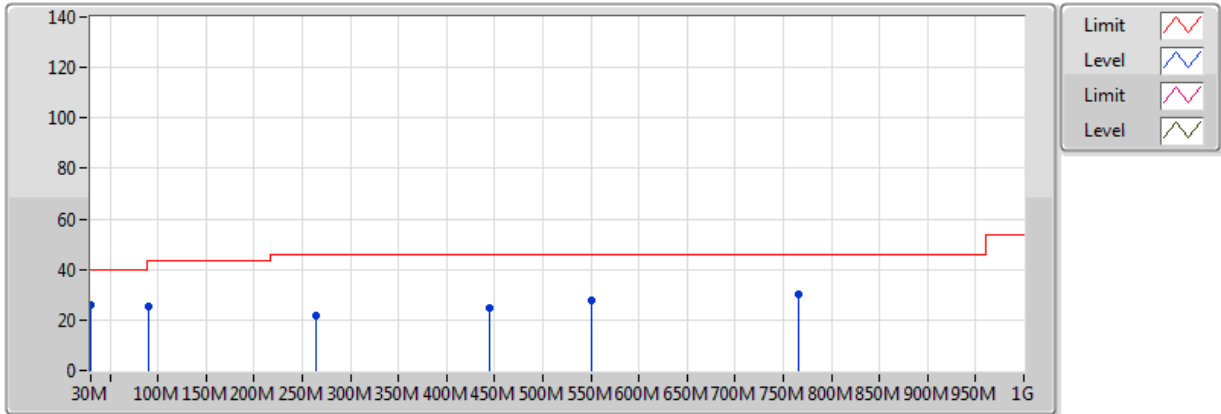
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_Adapter mode	Pass	PK	30M	25.72	40.00	-14.28	-4.17	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	90.14M	25.26	43.50	-18.24	-11.98	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	264.74M	21.49	46.00	-24.51	-5.41	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	445.16M	25.04	46.00	-20.96	-2.34	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	549.92M	27.77	46.00	-18.23	-0.20	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	765.26M	29.99	46.00	-16.01	1.46	3	360	1.00	-
13.56MHz_Adapter mode	Pass	PK	31.94M	24.35	40.00	-15.65	-5.09	3	0	1.00	-
13.56MHz_Adapter mode	Pass	PK	90.14M	21.82	43.50	-21.68	-11.98	3	0	1.00	-
13.56MHz_Adapter mode	Pass	PK	260.86M	21.47	46.00	-24.53	-5.12	3	0	1.00	-
13.56MHz_Adapter mode	Pass	PK	363.68M	25.25	46.00	-20.75	-3.93	3	0	1.00	-
13.56MHz_Adapter mode	Pass	PK	549.92M	27.99	46.00	-18.01	-0.20	3	0	1.00	-
13.56MHz_Adapter mode	Pass	PK	751.68M	29.43	46.00	-16.57	1.37	3	0	1.00	-

NFC Operating above 30MHz

13.56MHz_Adapter mode

06/09/2018

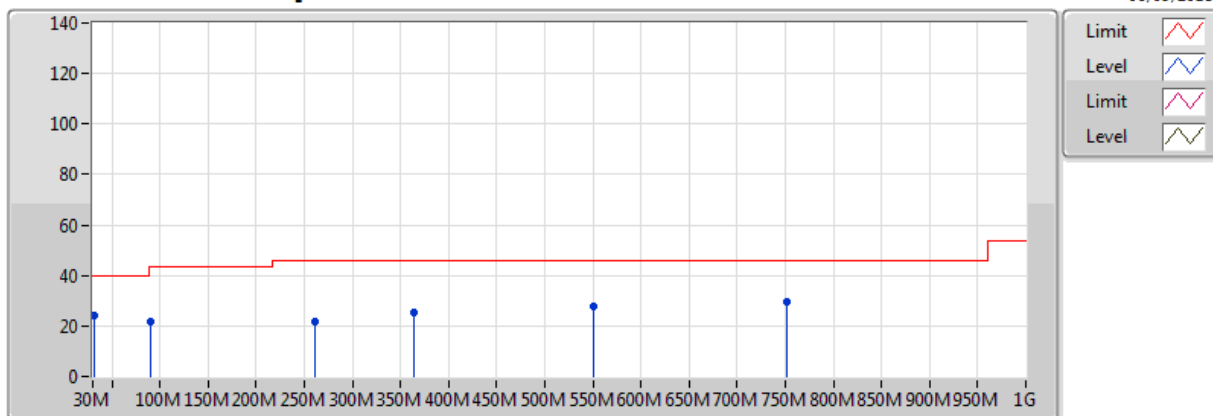


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	30M	25.72	40.00	-14.28	-4.17	3	Vertical	360	1.00	-
PK	90.14M	25.26	43.50	-18.24	-11.98	3	Vertical	360	1.00	-
PK	264.74M	21.49	46.00	-24.51	-5.41	3	Vertical	360	1.00	-
PK	445.16M	25.04	46.00	-20.96	-2.34	3	Vertical	360	1.00	-
PK	549.92M	27.77	46.00	-18.23	-0.20	3	Vertical	360	1.00	-
PK	765.26M	29.99	46.00	-16.01	1.46	3	Vertical	360	1.00	-

NFC Operating above 30MHz

13.56MHz_Adapter mode

06/09/2018



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	31.94M	24.35	40.00	-15.65	-5.09	3	Horizontal	0	1.00	-
PK	90.14M	21.82	43.50	-21.68	-11.98	3	Horizontal	0	1.00	-
PK	260.86M	21.47	46.00	-24.53	-5.12	3	Horizontal	0	1.00	-
PK	363.68M	25.25	46.00	-20.75	-3.93	3	Horizontal	0	1.00	-
PK	549.92M	27.99	46.00	-18.01	-0.20	3	Horizontal	0	1.00	-
PK	751.68M	29.43	46.00	-16.57	1.37	3	Horizontal	0	1.00	-

3.5 Frequency Stability

3.5.1 Frequency Stability Limit

Frequency Stability Limit	
☒	Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

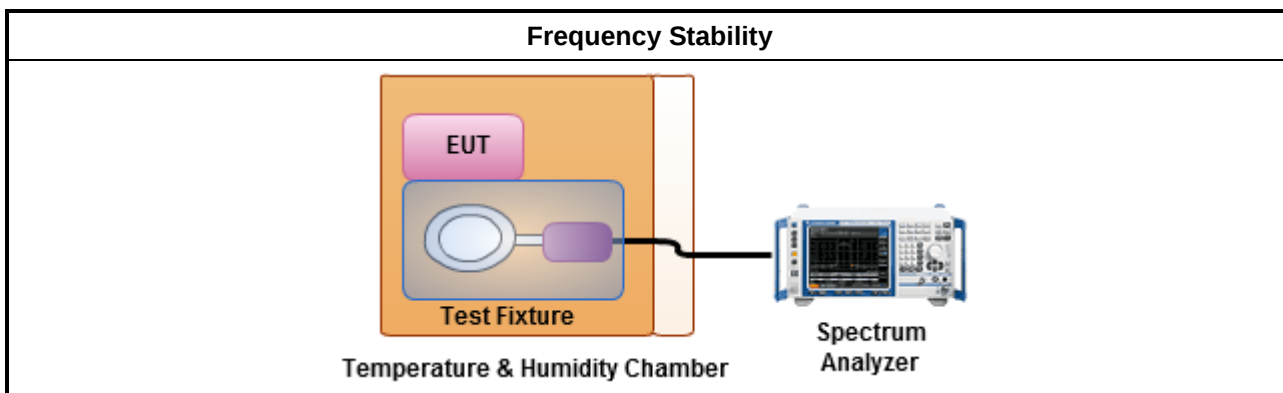
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.8 for frequency stability tests
☒	Frequency stability with respect to ambient temperature
☒	Frequency stability when varying supply voltage
☐	For conducted measurement.
☒	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

3.5.4 Test Setup



3.5.5 Test Result of Frequency Stability

Frequency Stability Result									
Condition	Ch. Freq. (MHz)	Frequency Stability (ppm)							
		Test Frequency (MHz)				Frequency Stability (ppm)			
		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min
T _{20°C} Vmax	13.56	13.55997	13.55997	13.56001	13.55994	-2.36	-2.43	0.81	-4.35
T _{20°C} Vmin	13.56	13.55992	13.56003	13.55997	13.56000	-6.12	2.21	-2.29	0.00
T _{50°C} Vnom	13.56	13.55987	13.55997	13.55987	13.55979	-9.29	-2.21	-9.29	-15.41
T _{40°C} Vnom	13.56	13.55995	13.56001	13.56005	13.55992	-3.76	0.74	3.47	-5.75
T _{30°C} Vnom	13.56	13.56014	13.55997	13.56004	13.56002	10.62	-2.06	3.24	1.33
T _{20°C} Vnom	13.56	13.55983	13.56007	13.56018	13.56001	-12.39	5.01	13.57	0.81
T _{10°C} Vnom	13.56	13.55981	13.56011	13.56000	13.55990	-13.72	8.26	-0.29	-7.74
T _{0°C} Vnom	13.56	13.55978	13.56006	13.55992	13.55994	-16.15	4.06	-5.90	-4.35
T _{-10°C} Vnom	13.56	13.55989	13.55997	13.56010	13.55992	-8.33	-2.36	7.52	-5.90
T _{-20°C} Vnom	13.56	13.56000	13.56001	13.56000	13.55999	0.29	0.59	0.15	-1.11
Limit (ppm)		-				100			
Result		Pass							
Note 1: Measure at 85 % [Vmin] and 115 % [Vmax] of the nominal voltage [Vnom]. The nominal voltage refer test report clause 1.1.4 for EUT operational condition.									
Note 2: Measure maximum deviation frequency at operating frequency at startup and two, five, and ten min.									

4 Test Equipment and Calibration Data

Instrument for AC Conduction

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
EMC Receiver	R&S	ESR	102051	9KHz ~ 3.6GHz	03/May/2018	02/May/2019
LISN	R&S	ENV216	101295	9kHz ~ 30MHz	17/Nov/2017	16/Nov/2018
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	06/Oct/2017	05/Oct/2018
AC POWER	APC	AFC-11005G	F310050055	47Hz~63Hz 5~300V	NCR	NCR
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9 kHz ~ 30 MHz	12/Oct/2017	11/Oct/2018

NCR : Non-Calibration Require.

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	20/Oct/2017	19/Oct/2018
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz ~ 18GHz 3m	27/Oct/2017	26/Oct/2018
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	27Jul/2018	02/Jul/2019
Microwave Preamplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	28/Sep/2017	27/Sep/2018
Spectrum Analyzer	Rohde & Schwarz	FSP40	100593	9KHz - 40GHz	12/Dec/2017	11/Dec/2018
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100354	9kHz ~ 2.75GHz	08/Dec/2017	07/Dec/2018
RF Cable-R03m	Jye Bao	RG142	CB017	9kHz ~ 1GHz	19/Jan/2018	18/Jan/2019
RF Cable-high	SUHNER	SUCOFLEX104	MY34918/4	1GHz ~ 40GHz	19/Jan/2018	18/Jan/2019
Bilog Antenna	SCHAFFNER	CBL 6112B	2723	30MHz ~ 1GHz	09/Sep/2017	08/Sep/2018
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170154	18GHz ~ 40GHz	06/Feb/2018	05/Feb/2019
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA 9120 D 1531	1GHz ~ 18GHz	18/Apr/ 2018	17/Apr/2019
Preamplifier	MITEQ	TTA1840-35-HG	1864481	18GHz ~ 40GHz	24/Aug/2018	23/Aug/2019
Loop Antenna	TESEQ	HLA 6120	31244	9k-30MHz	29/Mar/2018	28/Mar/2019
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170221	15GHz ~ 40GHz	12/Mar/2018	11/Mar/2019
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 01543	1GHz ~ 18GHz	11/May/2018	10/May/2019

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101013	9kHz~40GHz	04/Jan/2018	03/Jan/2019
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	05/Feb/2018	04/Feb/2019
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	10/Feb/2017	09/Feb/2018
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10710/4	30MHz ~ 26.5GHz	23/Aug/2018	22/Aug/2019
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10709/4	30MHz ~ 26.5GHz	23/Aug/2018	22/Aug/2019
RF Cable-0.5m	HUBER+SUHNER	SUCOFLEX_104	MY10713/4	30MHz ~ 26.5GHz	23/Aug/2018	22/Aug/2019
Signal Generator	R&S	SMR100A	175727	10kHz ~ 40GHz	26/Oct/2017	25/Oct/2018