FCC Test Report

FCC ID	:	**Q2GNPC300**
Equipment	:	**Tablet**
Brand Name	:	**XPLORE**
Model Name	:	**iX101L1, iX101L2**
Applicant	:	**Xplore Technologies Corp. 8601 Ranch Rd. 2222 Building 2, Austin, Texas, United States, 78730**
Manufacturer	:	**Xplore Technologies Corp. 8601 Ranch Rd. 2222 Building 2, Austin, Texas, United States, 78730**
Standard	:	**47 CFR FCC Part 15.225**

The product was received on Jul. 06, 2018, and testing was started from Jul. 12, 2018 and completed on Jul. 13, 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

Report No.	Version	Description	Issued Date
FR912915TT	01	Initial issue of report	Jan. 30, 2019

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 $F_L \geq 13.553$ MHz $F_H \leq 13.567$ 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	± 0.01% (100ppm)

Reviewed by: Sam Tsai

Report Producer: Debby Hung

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	Mode 1: 56.71
				Mode 2: 52.96
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 (110V)	☒ Vmax (126.5V)	☒ Vmin (93.5 V)
Test Climatic	☒ Tnom (20°C)	☒ Tmax (50°C)	☒ Tmin (-20°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%

1.1.6 Table for Multiple Listing

The brand/model names in the following table are all refer to the identical product.

Brand Name	Model Name	Handle	Description
XPLORE	iX101L1	V	The sample is the same one, only the CPU is different.
XPLORE	iX101L2	X	

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
- ANSI C63.4-2014

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.			
☐	JHUBEI	ADD : No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County, Taiwan (R.O.C.)	
		TEL : 886-3-656-9065	FAX : 886-3-656-9085
Test site Designation No. TW0006 with FCC.			

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	CO04-HY	Jeff	23.2°C / 51.8%	13/Jul/2018
RF Conducted	TH01-HY	Lisa	25.3°C / 61.3%	12/Jul/2018
Radiated	03CH03-HY	Jeff	23°C / 61%	12/Jul/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	Mode 1: 56.71
	Mode 2: 52.96

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	☒ 1. Adapter mode - iX101L1
	☒ 2. Adapter mode - iX101L2

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 3 configuration was pretested and found to be the worst case and measured during the test.		
Operating Mode	☒ 1. Adapter mode - iX101L1		
	☒ 2. Adapter mode - iX101L2		
Modulation Mode	NFC		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT		V	

2.4 Accessories and Support Equipment

Accessories Information				
AC Adapter	**Brand Name**	DELTA	**Model Name**	ADP-65JH
	Power Rating	I/P: 100 - 240Vac, 1.5 A, O/P: 19 Vdc, 3.42A		
	Power Cord	1.75 meter, Non-Shielded cable, with ferrite core		

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

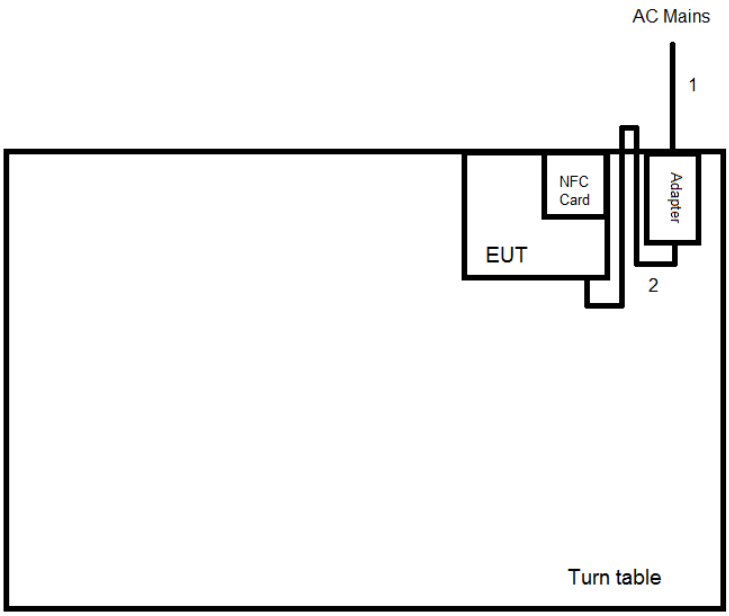
Support Equipment - AC Conduction				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NFC Card	-	-	-

Support Equipment - RF Conducted				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NFC card	-	-	-
2	AC Power Source	G.W	APS-9102	-

Support Equipment - Radiated				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NFC Card	-	-	-

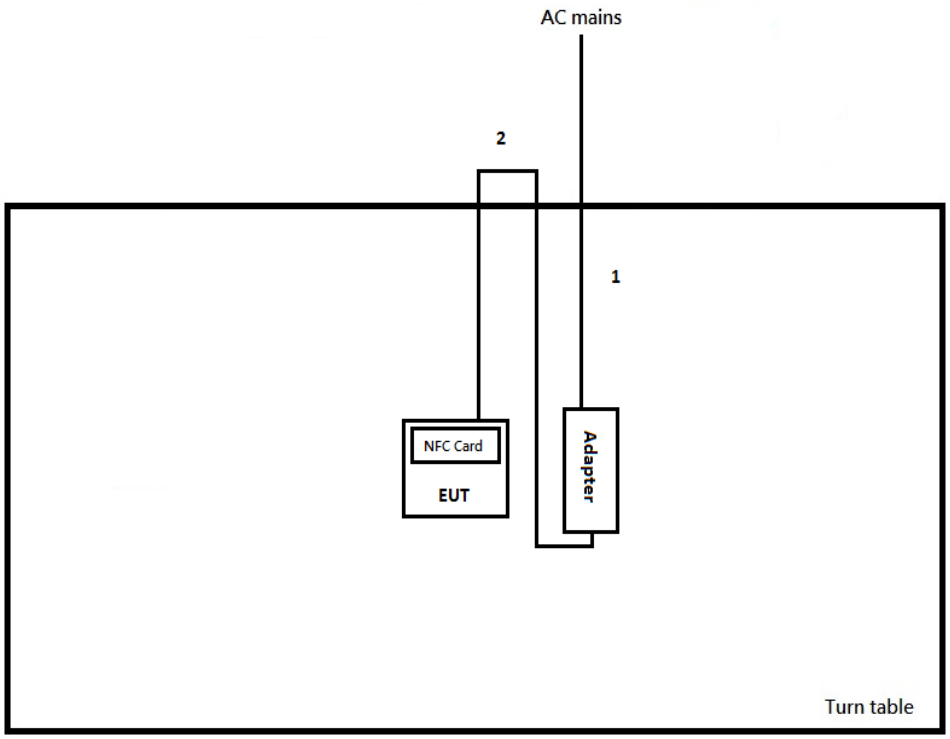
2.5 Test Setup Diagram

Test Setup Diagram - AC Conduction



Item	Connection	Shielded	Length(m)	Remark
1	AC power Cord	No	1.7	-
2	DC power Line	No	1.75	-

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1	AC power Cord	No	1.75	-
2	DC power Line	No	1.75	-

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

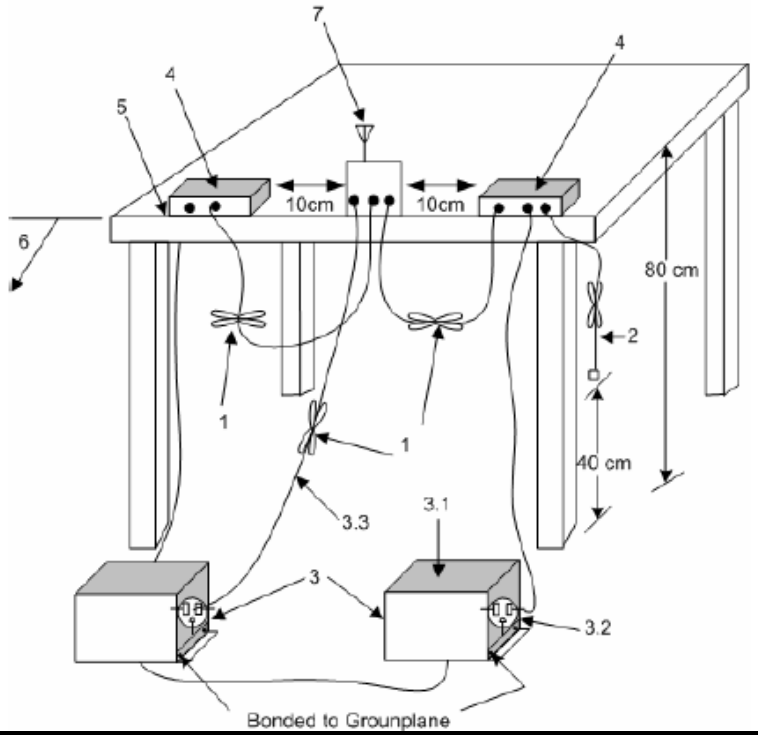
Refer a test equipment and calibration data table in this test report.

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.

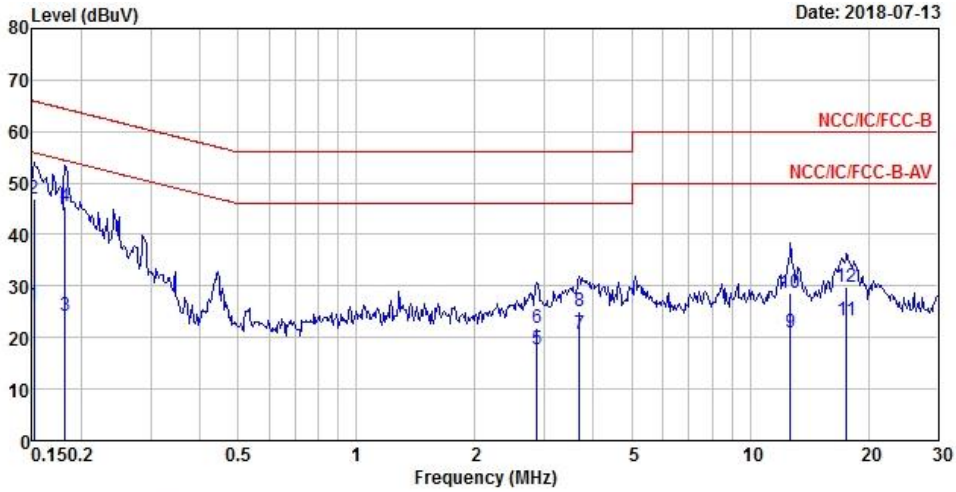
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

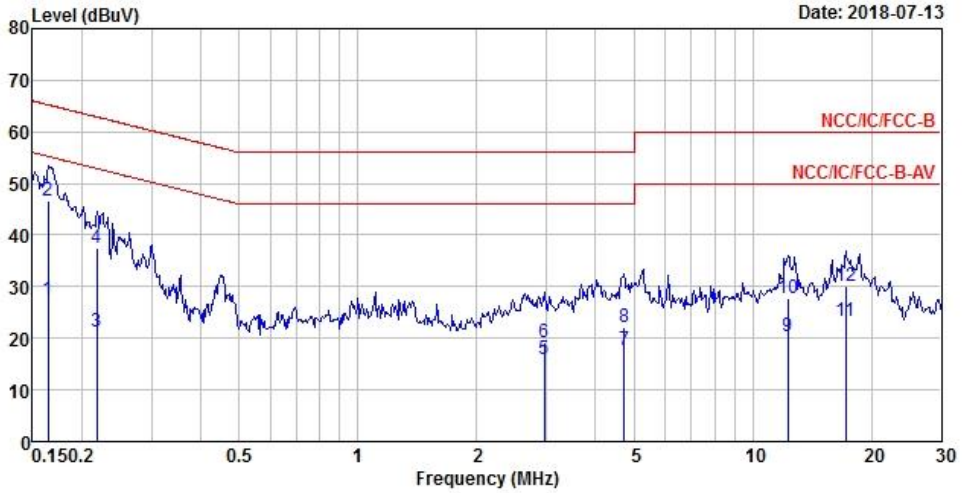
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	Adapter mode - iX101L1		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	26.23	-29.68	55.91	16.56	9.63	0.04	Average
2 MAX	0.15	46.94	-18.97	65.91	37.27	9.63	0.04	QP
3	0.18	24.23	-30.19	54.42	14.60	9.62	0.01	Average
4	0.18	45.35	-19.07	64.42	35.72	9.62	0.01	QP
5	2.87	17.64	-28.36	46.00	7.96	9.64	0.04	Average
6	2.87	21.93	-34.07	56.00	12.25	9.64	0.04	QP
7	3.68	20.81	-25.19	46.00	11.09	9.64	0.08	Average
8	3.68	25.10	-30.90	56.00	15.38	9.64	0.08	QP
9	12.65	20.90	-29.10	50.00	11.12	9.70	0.08	Average
10	12.65	28.74	-31.26	60.00	18.96	9.70	0.08	QP
11	17.57	23.20	-26.80	50.00	13.38	9.71	0.11	Average
12	17.57	29.69	-30.31	60.00	19.87	9.71	0.11	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.

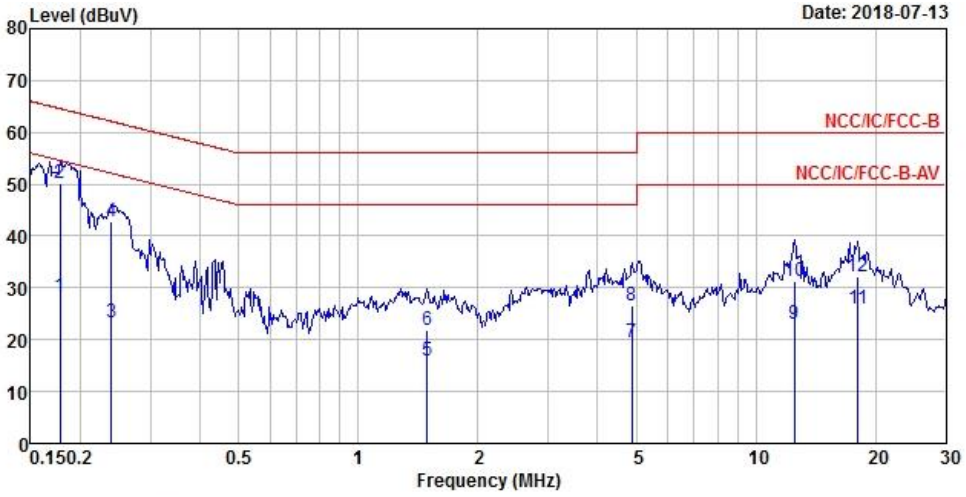
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	Adapter mode - iX101L1		



		Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16	27.46	-27.79	55.25	17.81	9.62	0.03	Average
2	MAX 0.16	46.53	-18.72	65.25	36.88	9.62	0.03	QP
3	0.22	21.19	-31.69	52.88	11.56	9.62	0.01	Average
4	0.22	37.63	-25.25	62.88	28.00	9.62	0.01	QP
5	2.96	15.82	-30.18	46.00	6.14	9.63	0.05	Average
6	2.96	19.10	-36.90	56.00	9.42	9.63	0.05	QP
7	4.72	17.57	-28.43	46.00	7.82	9.64	0.11	Average
8	4.72	22.08	-33.92	56.00	12.33	9.64	0.11	QP
9	12.25	20.48	-29.52	50.00	10.73	9.65	0.10	Average
10	12.25	27.77	-32.23	60.00	18.02	9.65	0.10	QP
11	17.20	23.26	-26.74	50.00	13.54	9.63	0.09	Average
12	17.20	30.18	-29.82	60.00	20.46	9.63	0.09	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.

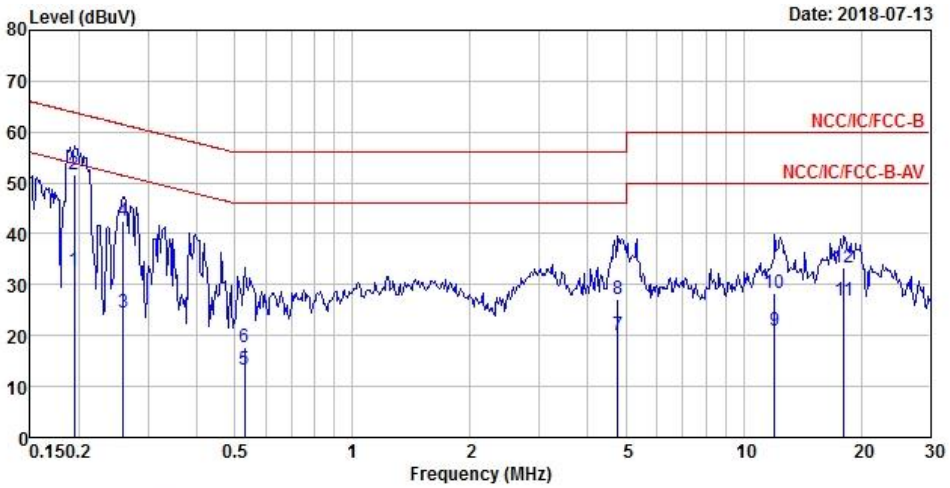
AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Neutral
Operating Function	Adapter mode - iX101L2		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.18	28.41	-26.18	54.59	18.77	9.62	0.02	Average
2 MAX	0.18	50.10	-14.49	64.59	40.46	9.62	0.02	QP
3	0.24	23.43	-28.70	52.13	13.78	9.62	0.03	Average
4	0.24	42.88	-19.25	62.13	33.23	9.62	0.03	QP
5	1.49	15.85	-30.15	46.00	6.22	9.63	0.00	Average
6	1.49	21.96	-34.04	56.00	12.33	9.63	0.00	QP
7	4.87	19.43	-26.57	46.00	9.67	9.65	0.11	Average
8	4.87	26.54	-29.46	56.00	16.78	9.65	0.11	QP
9	12.52	23.11	-26.89	50.00	13.32	9.70	0.09	Average
10	12.52	31.28	-28.72	60.00	21.49	9.70	0.09	QP
11	18.04	25.92	-24.08	50.00	16.08	9.71	0.13	Average
12	18.04	32.23	-27.77	60.00	22.39	9.71	0.13	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.

AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Line
Operating Function	Adapter mode - iX101L2		



		Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.19	32.79	-21.05	53.84	23.17	9.62	0.00	Average
2 MAX	0.19	51.55	-12.29	63.84	41.93	9.62	0.00	QP
3	0.26	24.55	-26.92	51.47	14.89	9.62	0.04	Average
4	0.26	42.42	-19.05	61.47	32.76	9.62	0.04	QP
5	0.53	13.31	-32.69	46.00	3.63	9.61	0.07	Average
6	0.53	17.58	-38.42	56.00	7.90	9.61	0.07	QP
7	4.77	20.13	-25.87	46.00	10.38	9.64	0.11	Average
8	4.77	27.15	-28.85	56.00	17.40	9.64	0.11	QP
9	12.00	21.07	-28.93	50.00	11.31	9.65	0.11	Average
10	12.00	28.40	-31.60	60.00	18.64	9.65	0.11	QP
11	18.04	26.86	-23.14	50.00	17.10	9.63	0.13	Average
12	18.04	33.30	-26.70	60.00	23.54	9.63	0.13	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

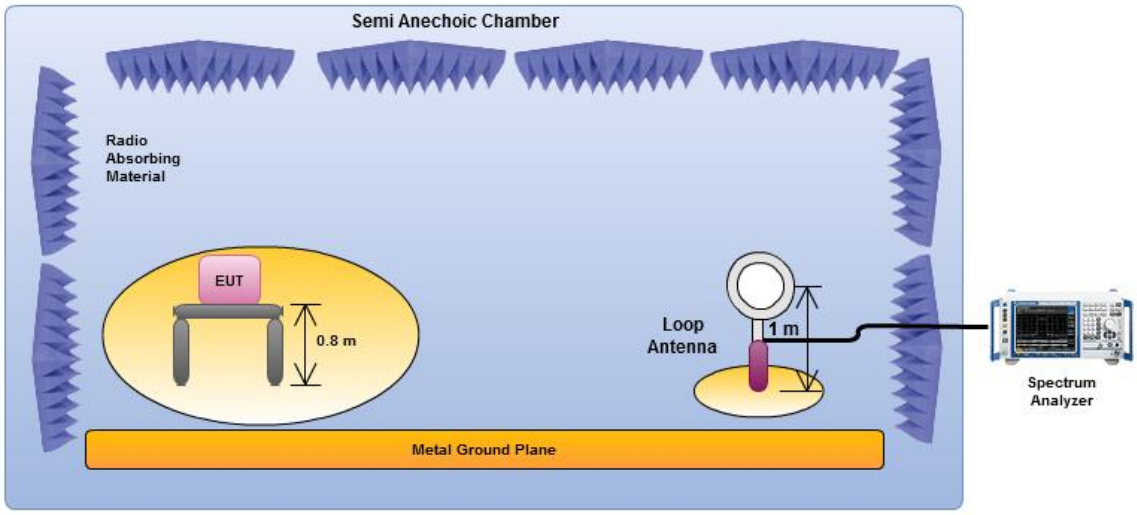
Refer a test equipment and calibration data table in this test report.

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

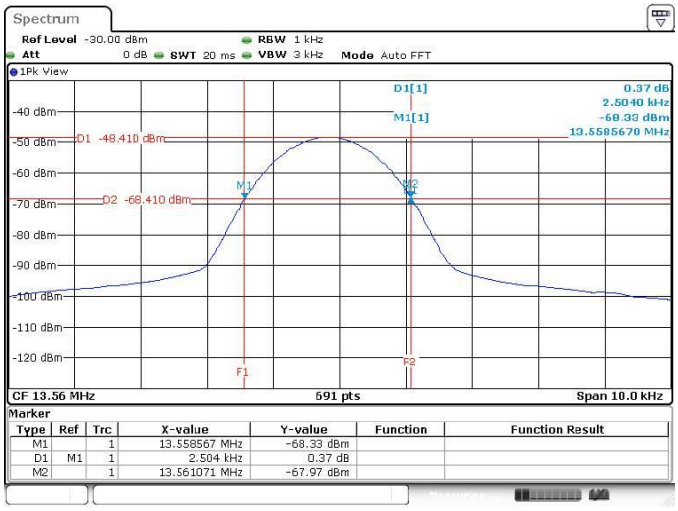
Emission Bandwidth



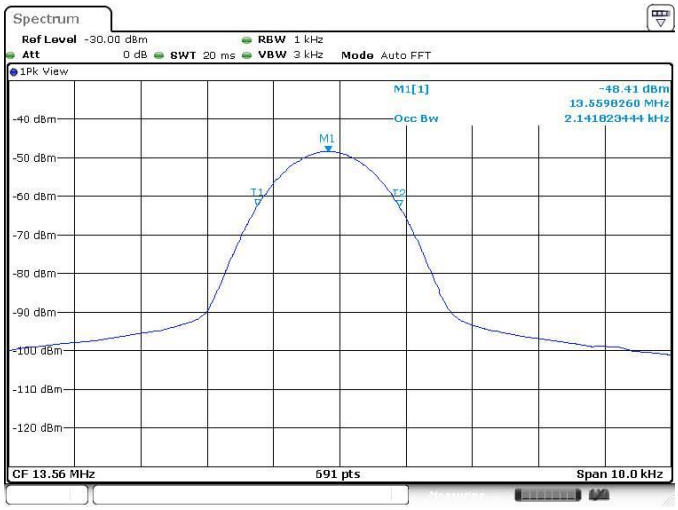
3.2.5 Test Result of Emission Bandwidth

Occupied Channel Bandwidth Result <Mode1>					
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	2.50400	2.14182	13.55856	13.56107
Limit		**N/A**	**N/A**	**13.553**	**13.567**
Result		**Complied**			

Emission Bandwidth Plot - 20dB Bandwidth

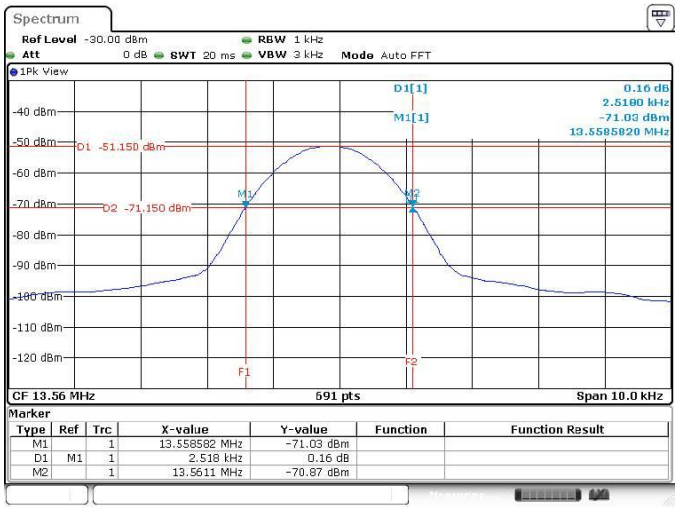


Emission Bandwidth Plot - 99% Bandwidth

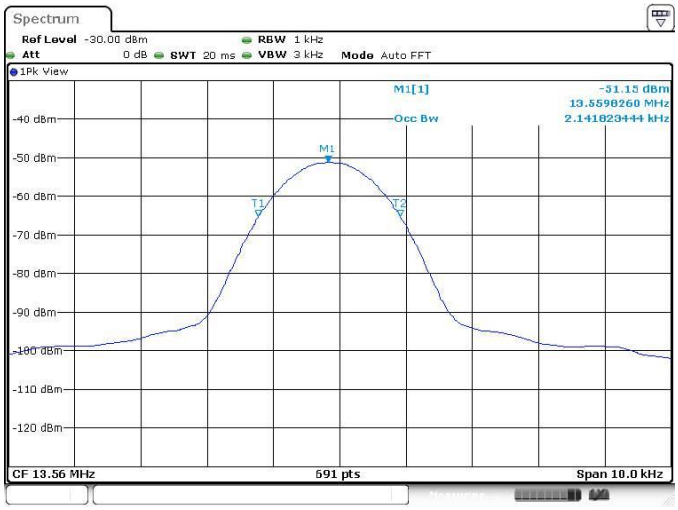


Occupied Channel Bandwidth Result <Mode2>					
Modulation Mode	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	F_L at 20dB BW (MHz)	F_H at 20dB BW (MHz)
NFC	13.56	2.51800	2.14182	13.55858	13.56110
Limit		**N/A**	**N/A**	**13.553**	**13.567**
Result		**Complied**			

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

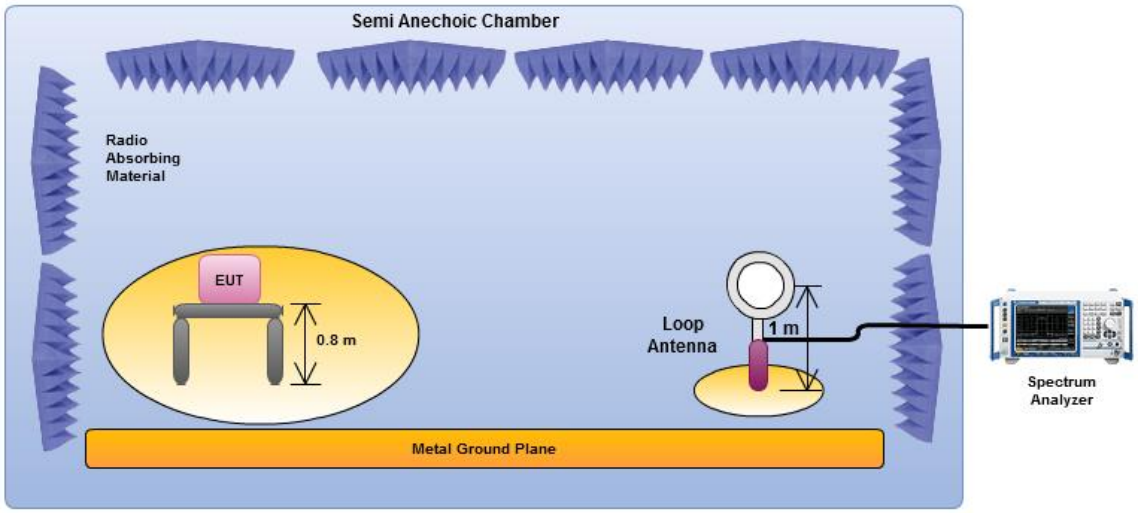
Refer a test equipment and calibration data table in this test report.

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

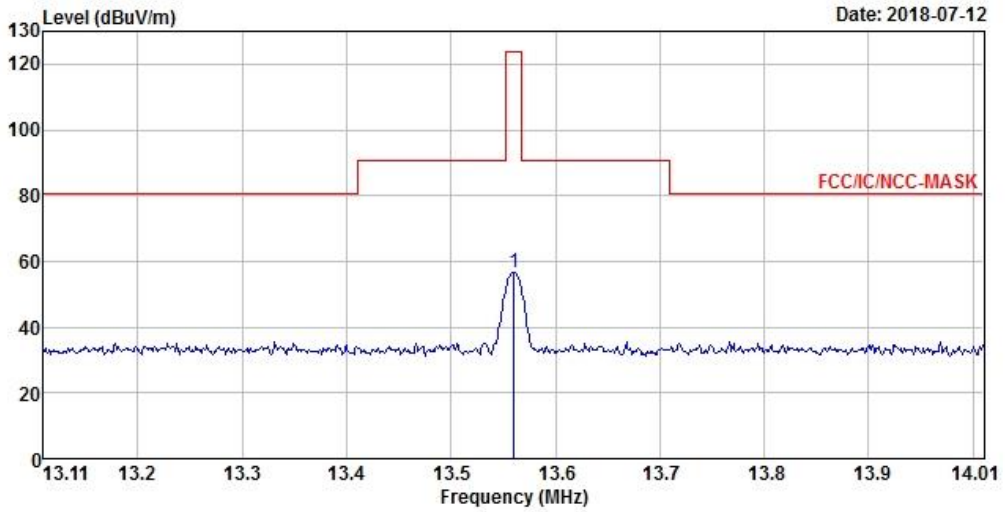
Field Strength of Fundamental Emissions and Spectrum Mask



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

Field Strength of Fundamental Emissions Result <Mode1>					
Modulation Mode	**Frequency (MHz)**	**Fundamental (dBuV/m)@3m**	**Polarization**	**Margin (dB)**	**Limit (dBuV/m)@3m**
NFC	13.56	56.71	H	67.29	124.00
Result		**Complied**			
Note 1: Measurement worst emissions of receive antenna polarization: H(Horizontal).					

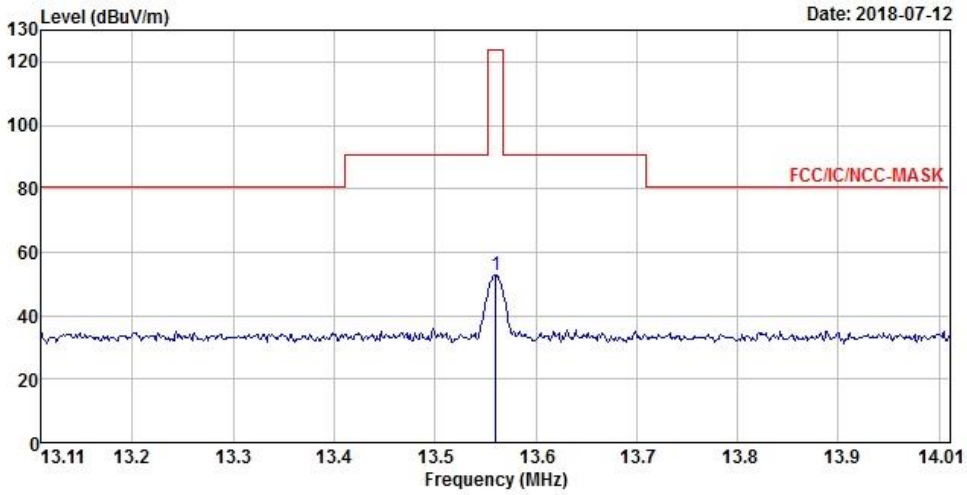
Spectrum Mask Plot



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	13.56000	56.71	-67.29	124.00	34.20	21.82	0.69	0.00	Peak

Field Strength of Fundamental Emissions Result <Mode2>					
Modulation Mode	Frequency (MHz)	Fundamental (dBuV/m)@3m	Polarization	Margin (dB)	Limit (dBuV/m)@3m
NFC	13.56	52.96	H	71.04	124.00
Result		Complied			
Note 1: Measurement worst emissions of receive antenna polarization: H(Horizontal).					

Spectrum Mask Plot



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	13.56000	52.96	-71.04	124.00	30.45	21.82	0.69	0.00	Peak

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

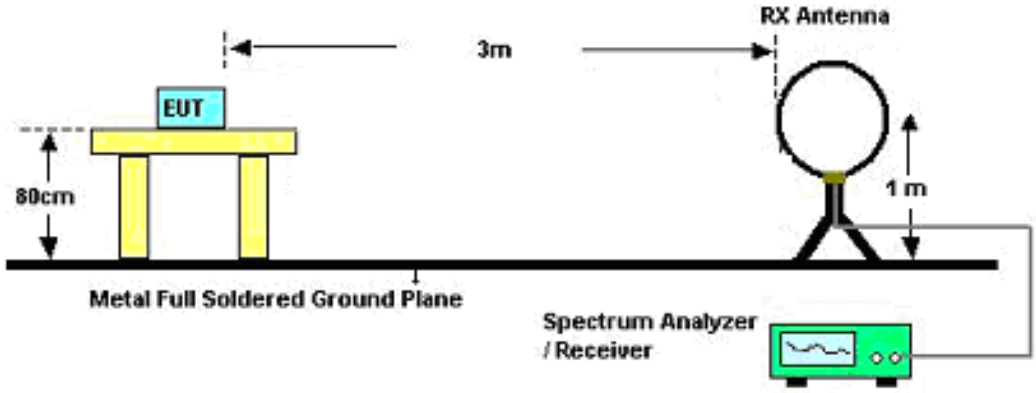
Refer a test equipment and calibration data table in this test report.

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.

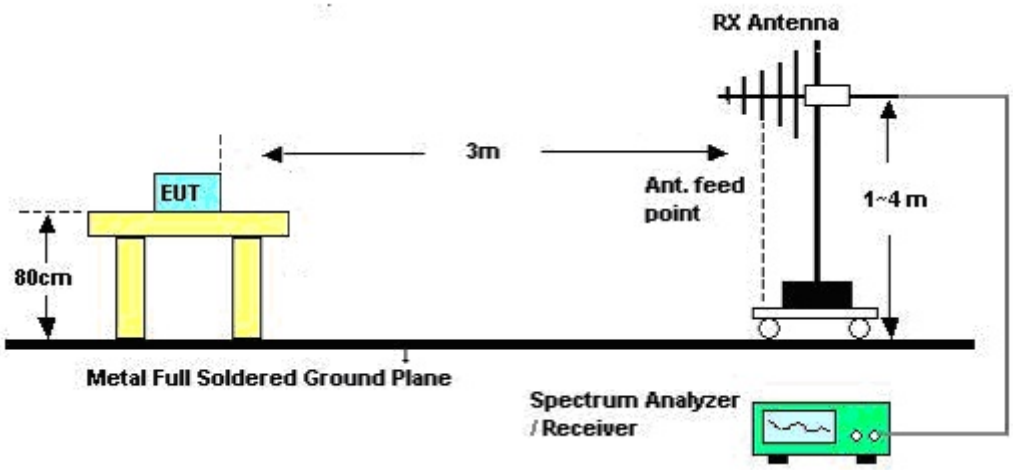
3.4.4 Test Setup

Transmitter Radiated Unwanted Emissions



Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. The center of the loop shall be 1 m above the ground.

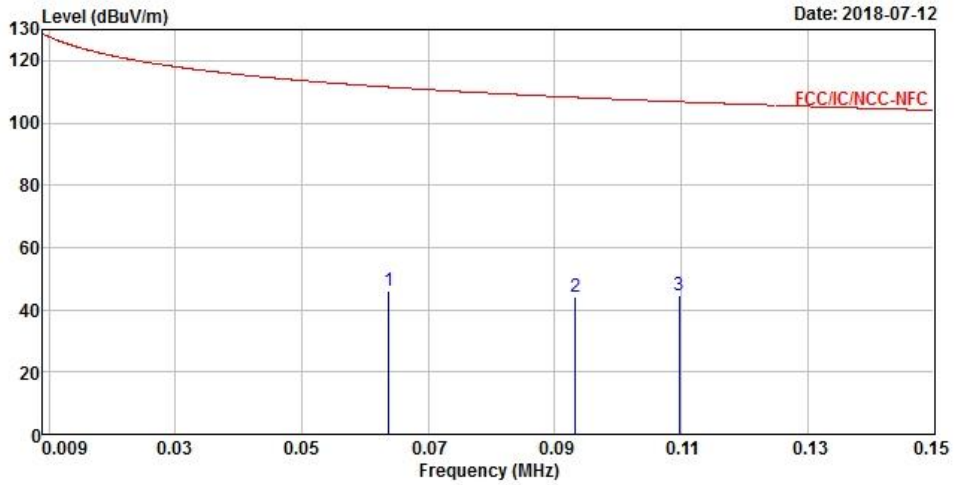
Transmitter Radiated Bandedge Emissions



Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna. the antenna height shall be varied from 1 m to 4 m.

3.4.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

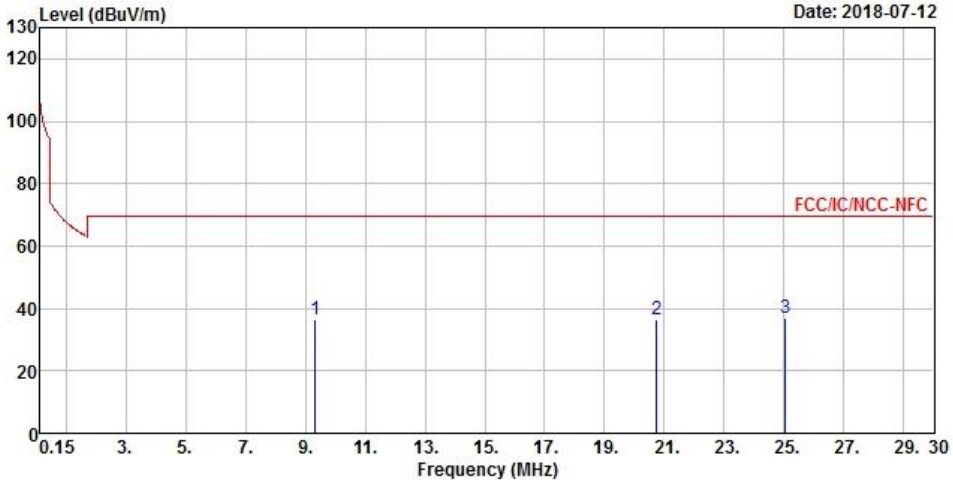
Transmitter Radiated Unwanted Emissions (9 kHz – 150 kHz)			
Modulation Mode	NFC	**Polarization**	H
Operating Mode	1		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	0.06371	46.13	-65.39	111.52	25.07	20.99	0.07	0.00	Peak
2	0.09332	43.93	-64.28	108.21	23.10	20.75	0.08	0.00	Peak
3	0.10967	44.53	-62.28	106.81	23.76	20.69	0.08	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 (Horizontal).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (150 kHz – 30 MHz)			
Modulation Mode	NFC	**Polarization**	H
Operating Mode	1		

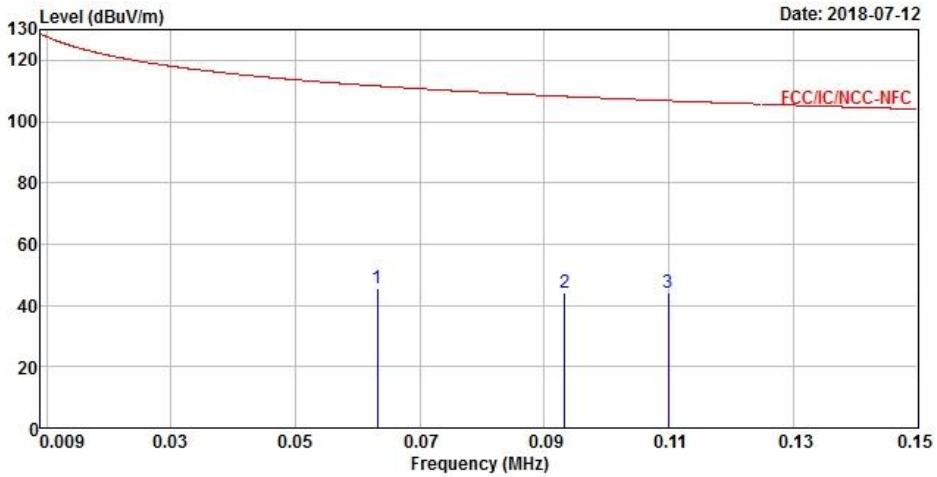


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	9.34380	36.39	-33.15	69.54	14.42	21.40	0.57	0.00	Peak
2	20.74650	36.43	-33.11	69.54	13.17	22.42	0.84	0.00	Peak
3	25.04490	36.87	-32.67	69.54	13.33	22.55	0.99	0.00	Peak

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

3.4.6

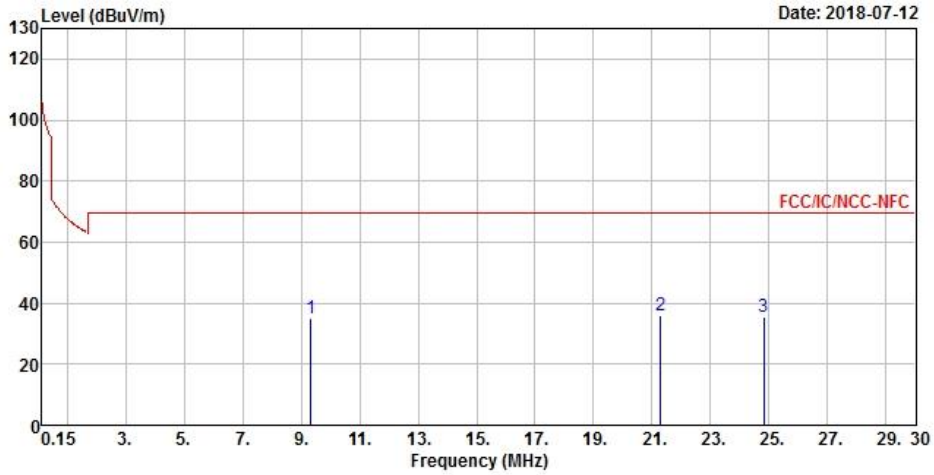
Transmitter Radiated Unwanted Emissions (9 kHz – 150 kHz)			
Modulation Mode	NFC	**Polarization**	H
Operating Mode	2		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	0.06314	45.49	-66.11	111.60	24.43	20.99	0.07	0.00	Peak
2	0.09332	44.00	-64.21	108.21	23.17	20.75	0.08	0.00	Peak
3	0.10996	44.22	-62.56	106.78	23.45	20.69	0.08	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 (Horizontal).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (150 kHz – 30 MHz)			
Modulation Mode	NFC	**Polarization**	H
Operating Mode	2		

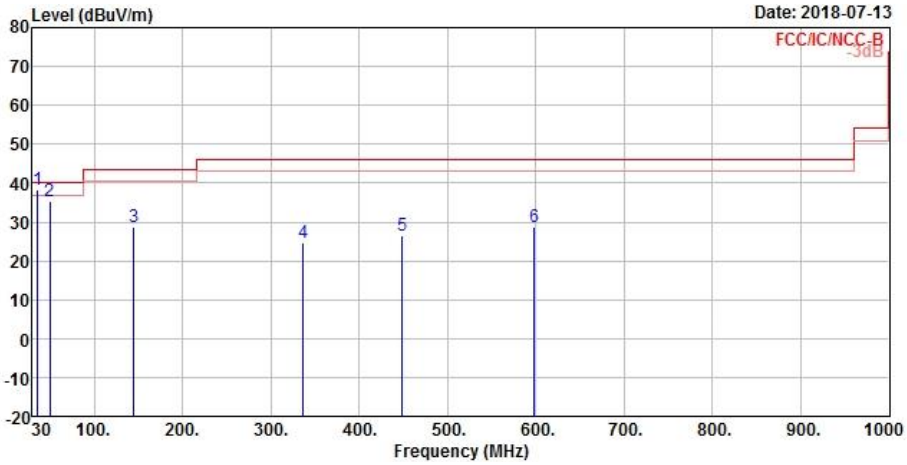


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	9.34380	35.17	-34.37	69.54	13.20	21.40	0.57	0.00	Peak
2	21.28380	35.96	-33.58	69.54	12.66	22.44	0.86	0.00	Peak
3	24.80610	35.34	-34.20	69.54	11.83	22.54	0.97	0.00	Peak

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

3.4.7 Transmitter Radiated Unwanted Emissions (Above 30MHz)

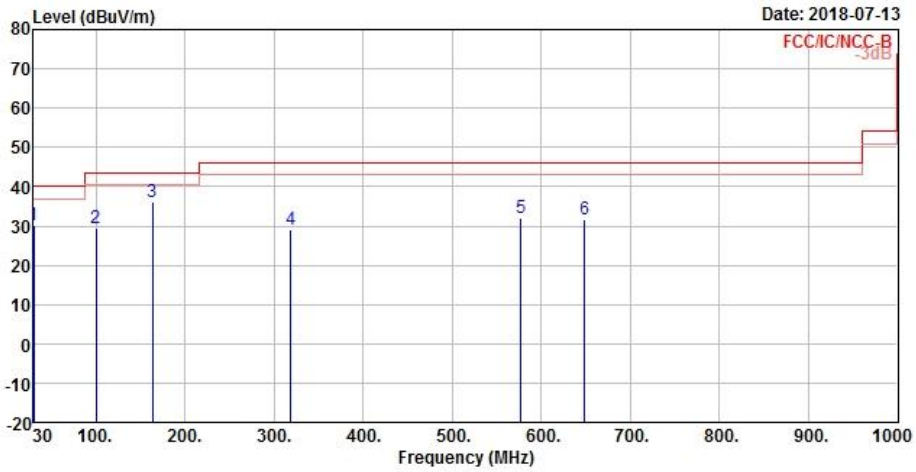
Transmitter Radiated Spurious Emissions (Above 30MHz)			
Modulation Mode	NFC	**Test Freq. (MHz)**	13.56
Operating Mode	1	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 !	35.82000	38.46	-1.54	40.00	44.29	19.92	1.80	27.55	QP
2	49.40000	35.26	-4.74	40.00	47.79	13.22	1.76	27.51	Peak
3	144.46000	28.53	-14.97	43.50	37.68	15.86	2.15	27.16	Peak
4	336.52000	24.73	-21.27	46.00	29.82	18.96	2.82	26.87	Peak
5	449.04000	26.61	-19.39	46.00	29.02	21.71	3.42	27.54	Peak
6	598.42000	28.66	-17.34	46.00	29.22	23.67	3.72	27.95	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.

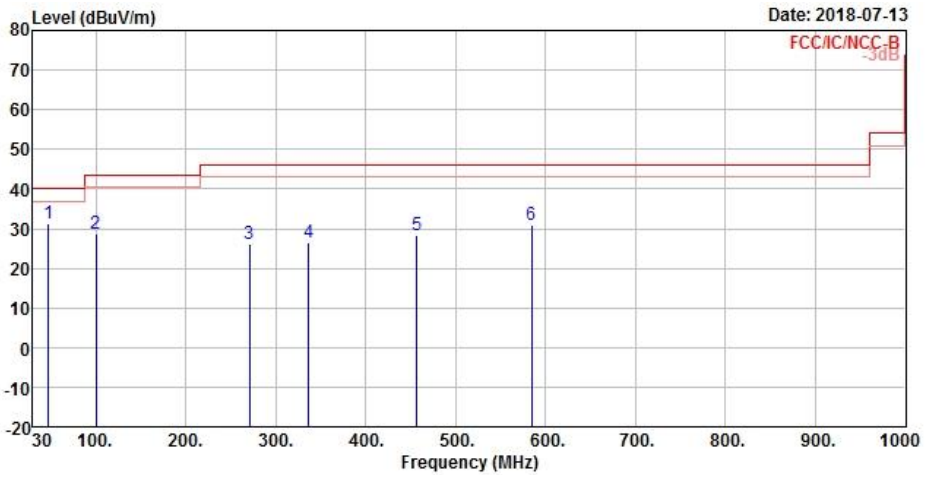
Transmitter Radiated Spurious Emissions (Above 30MHz)			
Modulation Mode	NFC	**Test Freq. (MHz)**	13.56
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	30.00000	30.19	-9.81	40.00	32.57	23.48	1.71	27.57	Peak
2	99.84000	29.43	-14.07	43.50	38.76	16.05	1.98	27.36	Peak
3	163.86000	36.06	-7.44	43.50	45.95	14.85	2.33	27.07	Peak
4	319.06000	29.14	-16.86	46.00	34.56	18.72	2.62	26.76	Peak
5	577.08000	32.02	-13.98	46.00	32.74	23.51	3.69	27.92	Peak
6	648.86000	31.75	-14.25	46.00	31.45	24.05	4.17	27.92	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.

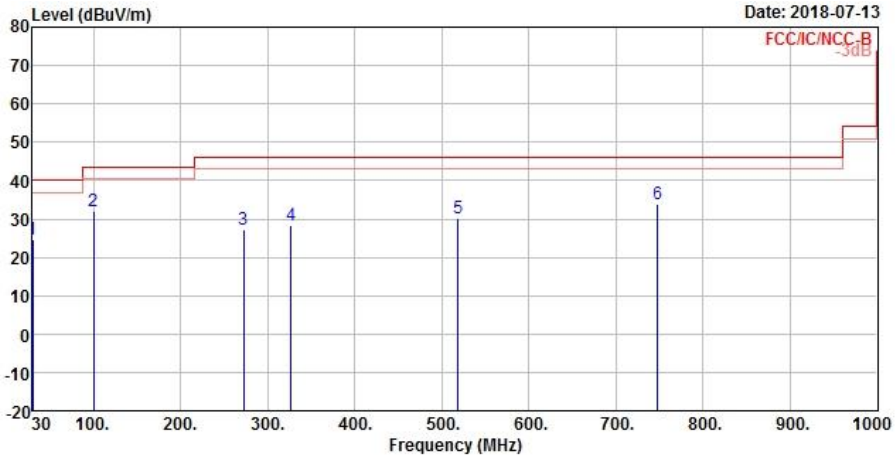
Transmitter Radiated Spurious Emissions (Above 30MHz)			
Modulation Mode	NFC	**Test Freq. (MHz)**	13.56
Operating Mode	2	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	47.46000	31.17	-8.83	40.00	42.87	14.04	1.78	27.52	Peak
2	99.84000	28.75	-14.75	43.50	38.08	16.05	1.98	27.36	Peak
3	270.56000	26.13	-19.87	46.00	32.32	18.02	2.51	26.72	Peak
4	336.52000	26.59	-19.41	46.00	31.68	18.96	2.82	26.87	Peak
5	456.80000	28.36	-17.64	46.00	30.57	21.93	3.44	27.58	Peak
6	584.84000	31.06	-14.94	46.00	31.75	23.54	3.70	27.93	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.

Transmitter Radiated Spurious Emissions (Above 30MHz)			
Modulation Mode	NFC	**Test Freq. (MHz)**	13.56
Operating Mode	2	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	30.00000	24.79	-15.21	40.00	27.17	23.48	1.71	27.57	Peak
2	99.84000	31.86	-11.64	43.50	41.19	16.05	1.98	27.36	Peak
3	272.50000	27.30	-18.70	46.00	33.44	18.01	2.56	26.71	Peak
4	326.82000	28.39	-17.61	46.00	33.68	18.81	2.71	26.81	Peak
5	518.88000	30.21	-15.79	46.00	31.85	22.61	3.59	27.84	Peak
6	747.80000	33.97	-12.03	46.00	32.46	24.96	4.36	27.81	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.

3.5 Frequency Stability

3.5.1 Frequency Stability Limit

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

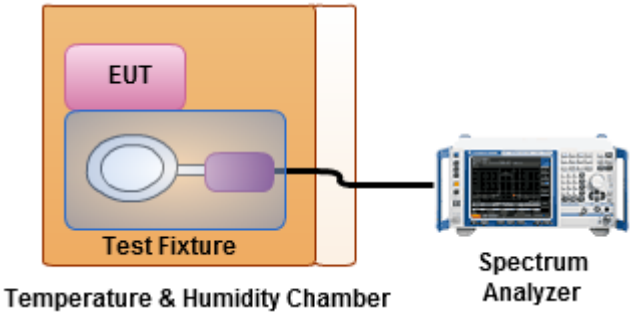
3.5.2 Measuring Instruments

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

Frequency Stability


3.5.5 Test Result of Frequency Stability

Frequency Stability Result <Mode 1>									
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	13.55981	13.55981	13.55981	13.55981	-14.01	-14.09	-13.94	-14.01
$T_{20°C}$Vmin	13.56	13.55981	13.55981	13.55981	13.55982	-14.09	-14.01	-13.94	-13.50
$T_{50°C}$Vnom	13.56	13.55987	13.55986	13.55986	13.55987	-9.88	-10.25	-10.03	-9.66
$T_{40°C}$Vnom	13.56	13.55982	13.55986	13.55987	13.55986	-13.64	-10.25	-9.96	-10.18
$T_{30°C}$Vnom	13.56	13.55981	13.55981	13.55981	13.55972	-13.86	-13.72	-13.94	-21.02
$T_{20°C}$Vnom	13.56	13.55981	13.55981	13.55981	13.55981	-14.01	-13.86	-13.79	-13.79
$T_{10°C}$Vnom	13.56	13.55976	13.55976	13.55976	13.55971	-17.48	-17.40	-17.63	-21.53
$T_{0°C}$Vnom	13.56	13.55972	13.55971	13.55971	13.55972	-21.02	-21.09	-21.17	-20.94
$T_{-10°C}$Vnom	13.56	13.55962	13.55962	13.55962	13.55962	-28.24	-28.39	-28.24	-27.95
$T_{-20°C}$Vnom	13.56	13.55962	13.55962	13.55962	13.55962	-28.17	-28.13	-28.12	-28.15
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.

Frequency Stability Result <Mode 2>									
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	13.55981	13.55981	13.55981	13.55981	-13.86	-14.16	-14.01	-14.01
$T_{20°C}$Vmin	13.56	13.55981	13.55982	13.55981	13.56014	-14.16	-13.64	-14.09	10.18
$T_{50°C}$Vnom	13.56	13.55981	13.55981	13.55981	13.55980	-14.23	-13.86	-13.72	-14.53
$T_{40°C}$vnom	13.56	13.55981	13.55981	13.55981	13.55981	-14.38	-14.16	-14.31	-13.79
$T_{30°C}$Vnom	13.56	13.55981	13.55981	13.55981	13.55981	-14.16	-13.79	-14.31	-14.38
$T_{20°C}$Vnom	13.56	13.55983	13.55981	13.55982	13.55981	-12.54	-13.86	-13.57	-13.72
$T_{10°C}$Vnom	13.56	13.55971	13.55971	13.55971	13.55971	-21.76	-21.68	-21.53	-21.39
$T_{0°C}$Vnom	13.56	13.55971	13.55971	13.55971	13.55971	-21.53	-21.68	-21.68	-21.61
$T_{-10°C}$Vnom	13.56	13.55970	13.55972	13.55971	13.55971	-21.98	-20.87	-21.68	-21.61
$T_{-20°C}$Vnom	13.56	13.55969	13.55969	13.55969	13.55970	-22.71	-22.71	-22.64	-22.17
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.	Characteristics	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

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101013	10Hz~40GHz	05/Feb/2018	04/Feb/2019
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	22/May/2018	21/May/2019
Loop Antenna	TESEQ	HLA 6120	31244	9k-30MHz	29/Mar/2018	28/Mar/2019

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	31/Oct/2017	30/Oct/2018
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	23/Apr/2018	22/Apr/2019
Spectrum	R&S	FSP40	100593	9kHz ~ 40GHz	12/Dec/2017	13/Dec/2018
Receiver	R&S	ESCS 30	100354	9kHz ~ 2.75GHz	08/Dec/2017	07/Dec/2018
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	26/Jan/2018	25/Jan/2019
Bilog Antenna	SCHAFFNER	CBL 6112B	2723	30MHz ~ 1GHz	09/Sep/2017	08/Sep/2018
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	16/Mar/2018	15/Mar/2019