FCC Test Report

Equipment	:	**ECU**
Brand Name	:	**Gogoro**
Model No.	:	**38700-BA2**
FCC ID	:	**2AGYWGOGORO2**
Standard	:	**47 CFR FCC Part 15.247**
Operating Band	:	**13.553 – 13.567 MHz**
Applicant / Manufacturer	:	**gogoro taiwan limited** 33, Dinghu Rd., Guishan, Taoyuan, Taiwan 33378

The product sample received on Mar. 28, 2017 and completely tested on Apr. 11, 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.

Phoenix Chen/ Assistant Manager
SPORTON INTERNATIONAL INC.

Testing Laboratory
1190

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APPENDIX A. TEST PHOTOS

PHOTOGRAPHS OF EUT v02

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	N/A	FCC 15.207	N/A
3.2	15.247(a)	Emission Bandwidth	20dB Bandwidth 5.38000 [kHz] F_L: 13.55760 MHz F_H: 13.56260 MHz	Fall in band $F_L \geq$ 13.553 MHz $F_H \leq$ 13.567 MHz	Complied
3.3	15.247(b)	Field Strength of Fundamental Emissions and Spectrum Mask	Fundamental Emissions peak: 71.70 dBuV/m at 3m Device complies with spectrum mask – refer to test data	124 dBuV/m at 3m	Complied
3.4	3.2.1.2	Transmitter Radiated Unwanted Emissions	[dBuV/m at 3m]: 99.840MHz 39.78 (Margin 3.72 dB) - PK	FCC 15.209	Complied
3.5	3.2.1.3	Frequency Stability	5.90 ppm	± 0.01% (100ppm)	Complied

Revision History

Report No.	Version	Description	Issued Date
FR732463TW	Rev. 01	Initial issue of report	Dec. 06, 2017
FR732463TW	Rev. 02	Revise typo and PHOTOGRAPHS OF EUT	Dec. 15, 2017

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	ASK	13.56	1	71.70
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	External	Chip Antenna

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 (13.8 V)	☒ Vmax (15.87V)	☒ Vmin (11.73 V)
Test Climatic	☒ Tnom (20°C)	☒ Tmax (50°C)	☒ Tmin (-30°C)

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
- FCC KDB 174176 D01

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	TH07-HY	Candy	21.4°C / 62.8%	11/Apr/2017	
Radiated	03CH03-HY	Ryan	23.8°C / 61%	11/Apr/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**
AC power-line conducted emissions		±2.2 dB
Emission bandwidth		±1.4 %
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		±1.4 %
Duty Cycle		±1.4 %

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	71.70

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	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		
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 Chip 1		
	☒ 2.USB Mode Chip 2		
Operating Mode < 1GHz	☒ 1.USB Mode Chip 1		
	☒ 2.USB Mode Chip 2		
Modulation Mode	NFC		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT	V		

2.4 Accessories and Support Equipment

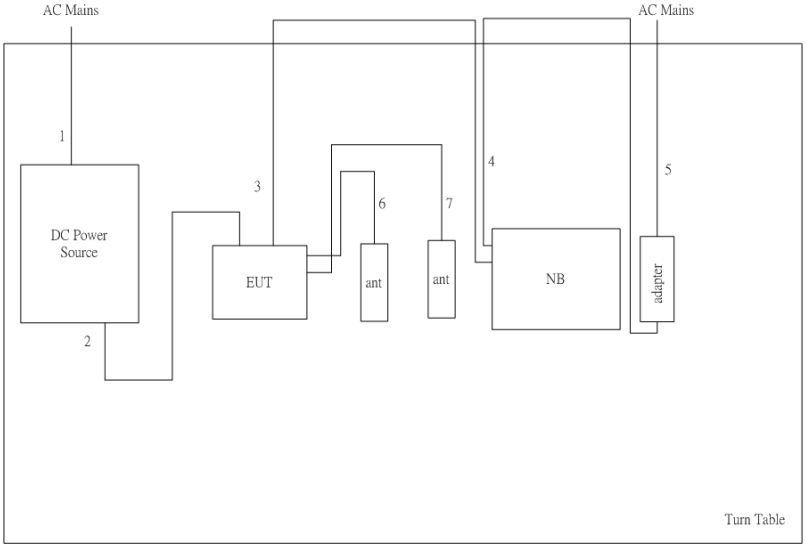
Accessories Information		
-	-	-

Support Equipment - Radiated				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	DoC
2	Adapter for NB	DELL	LA65NS2-01	DoC

Support Equipment- RF Conducted				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	DoC
2	Adapter for NB	DELL	HA65NM130	DoC

2.5 Test Setup Diagram

Test Setup Diagram - Radiated Test_TX mode



Item	Connection	Shielded	Length(m)	Remark
1	AC power line	No	2.0m	-
2	DC power line	No	1.5m	-
3	USB cable	No	2.0m	-
4	DC power line	No	1.8m	-
5	AC power line	No	1.8m	-
6	Ant cable	No	0.5m	-
7	Ant cable	No	0.6m	-

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

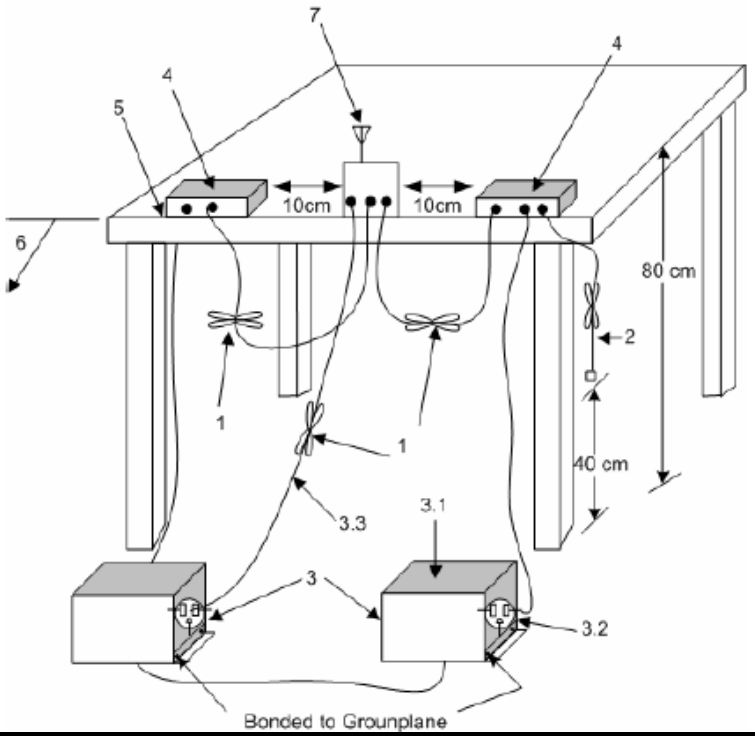
Refer a test equipment and calibration data table in this test report.

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

Please refer to Part 15.207(c) which states, “Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ DC power source for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines”. Therefore, for this device, AC Power Line Conducted Emissions investigation is not required.

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

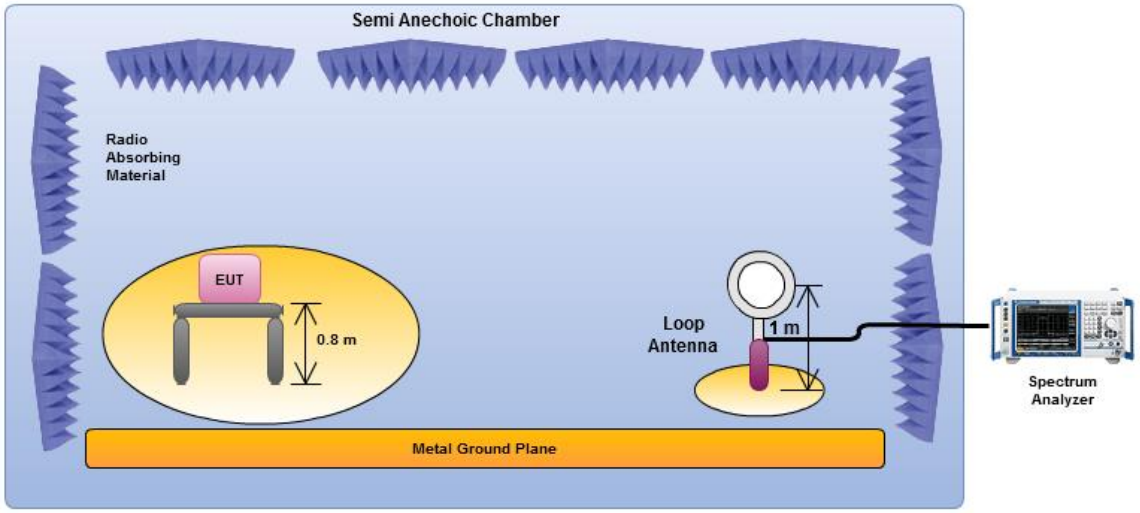
Refer a test equipment and calibration data table in this test report.

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

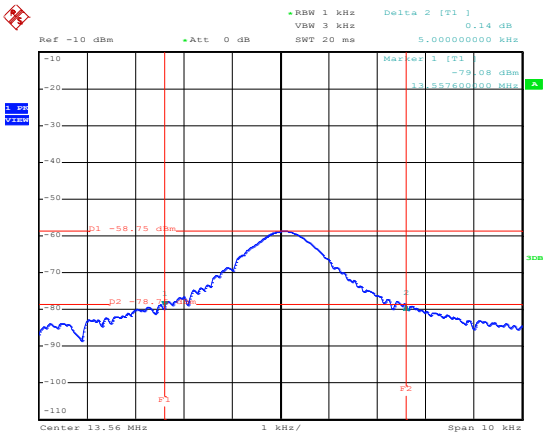
Emission Bandwidth



3.2.5 Test Result of Emission Bandwidth

Occupied Channel Bandwidth Result – Chip 1					
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	5.38000	6.42000	13.55760	13.56260
Limit		**N/A**	**N/A**	**13.553**	**13.567**
Result		**Complied**			

Emission Bandwidth Plot - 20dB Bandwidth



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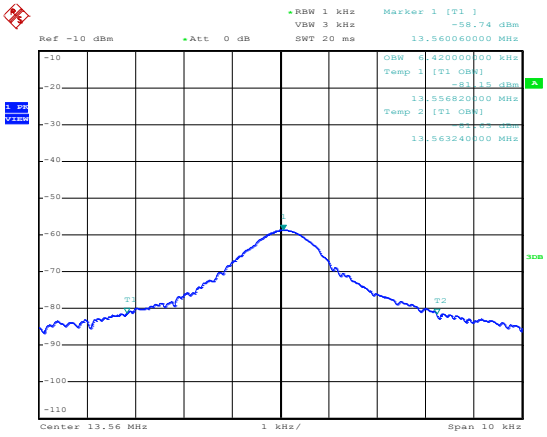
Emission Bandwidth Plot - 99% Bandwidth



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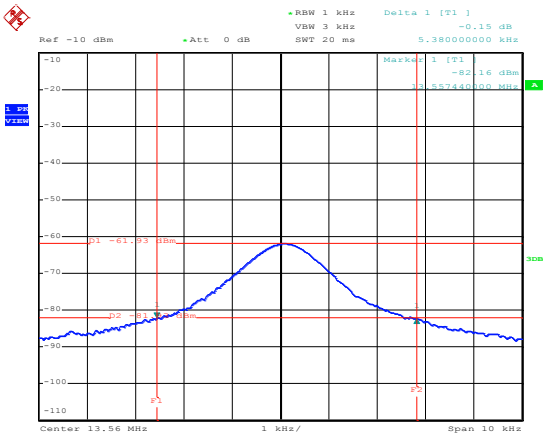
Occupied Channel Bandwidth Result – Chip 2					
Modulation Mode	**Frequency (MHz)**	**20dB Bandwidth (kHz)**	**99% Bandwidth (kHz)**	**F_L at 20dB BW (MHz)**	**F_H at 20dB BW (MHz)**
NFC	13.56	5.38000	6.60000	13.55744	13.56282
Limit		**N/A**	**N/A**	**13.553**	**13.567**
Result		**Complied**			

Emission Bandwidth Plot - 20dB Bandwidth



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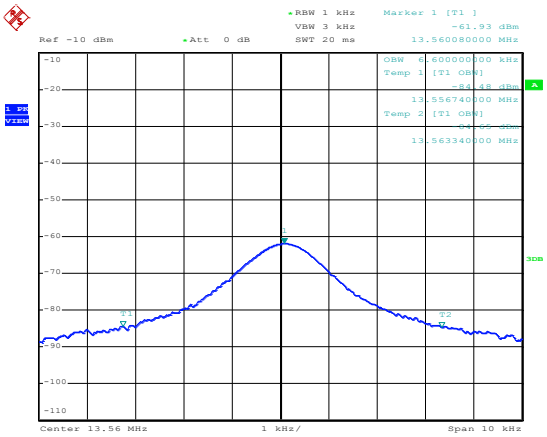
Emission Bandwidth Plot - 99% Bandwidth



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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

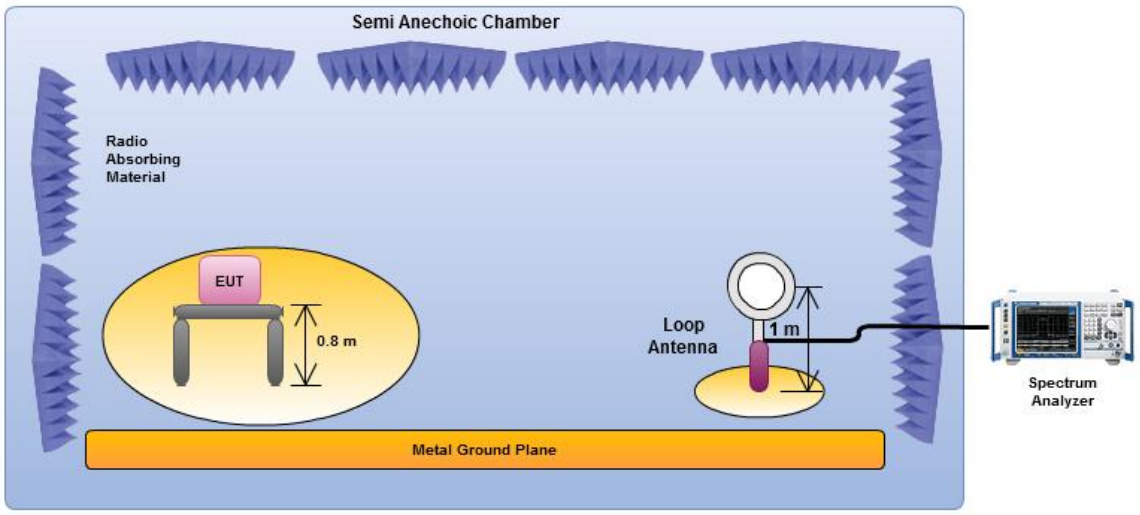
Refer a test equipment and calibration data table in this test report.

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

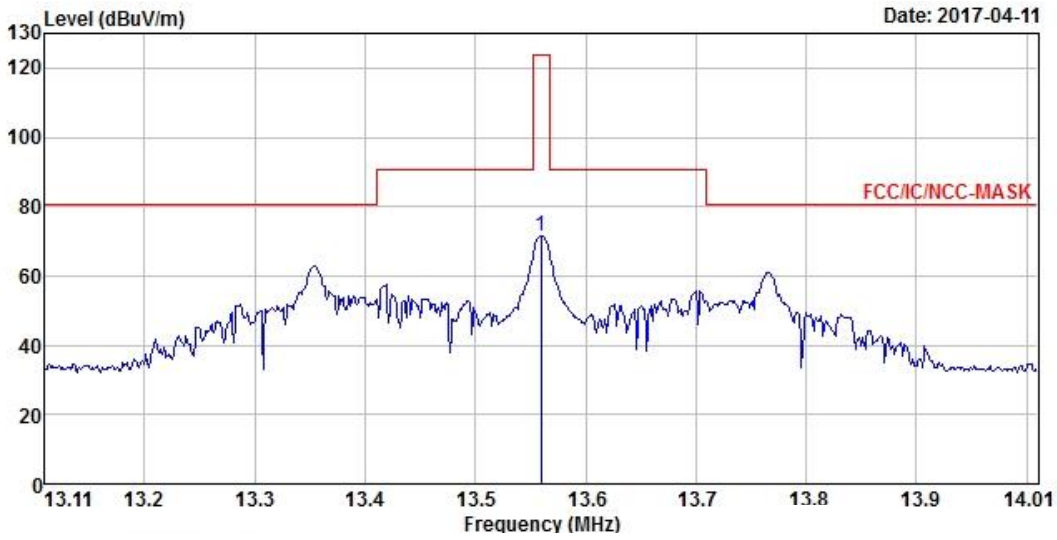
Field Strength of Fundamental Emissions and Spectrum Mask



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

Field Strength of Fundamental Emissions Result – Chip 1					
Modulation Mode	**Frequency (MHz)**	**Fundamental (dBuV/m)@3m**	**Polarization**	**Margin (dB)**	**Limit (dBuV/m)@3m**
NFC	13.56	71.70	H	-52.30	124.00
Result		**Complied**			
Note 1: Measurement worst emissions of receive antenna polarization: H(Horizontal).					

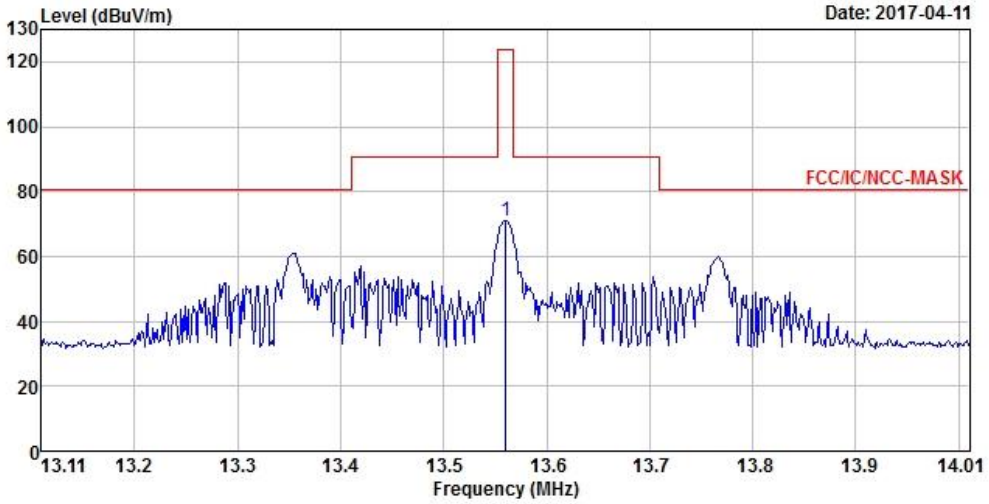
Spectrum Mask Plot



	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	13.560	71.70	-52.30	124.00	49.19	21.82	0.69	0.00	Peak

Field Strength of Fundamental Emissions Result – Chip 2					
Modulation Mode	**Frequency (MHz)**	**Fundamental (dBuV/m)@3m**	**Polarization**	**Margin (dB)**	**Limit (dBuV/m)@3m**
NFC	13.56	71.01	H	-52.99	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	13.560	71.01	-52.99	124.00	48.50	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

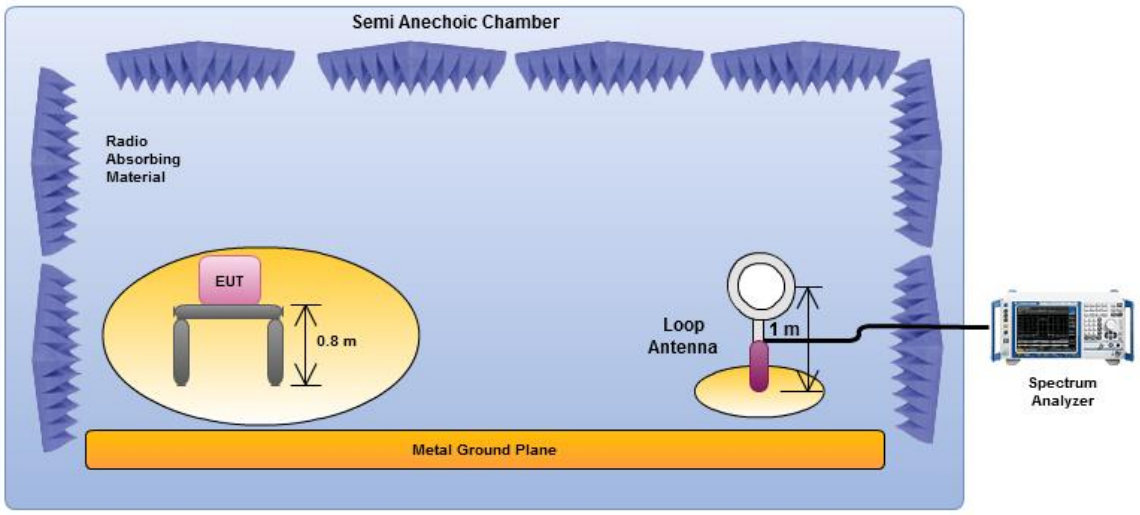
Refer a test equipment and calibration data table in this test report.

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.

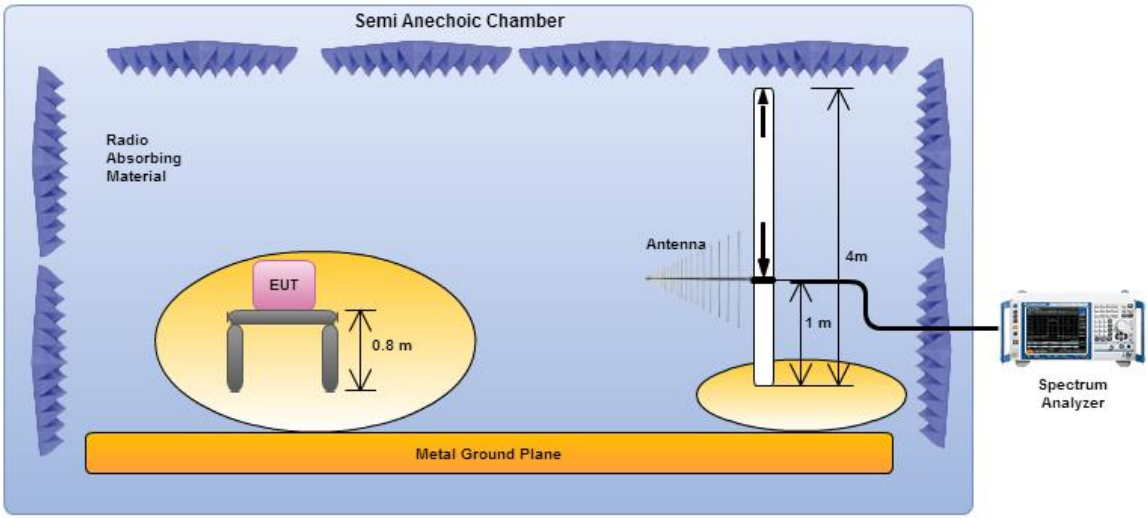
3.4.4 Test Setup

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.

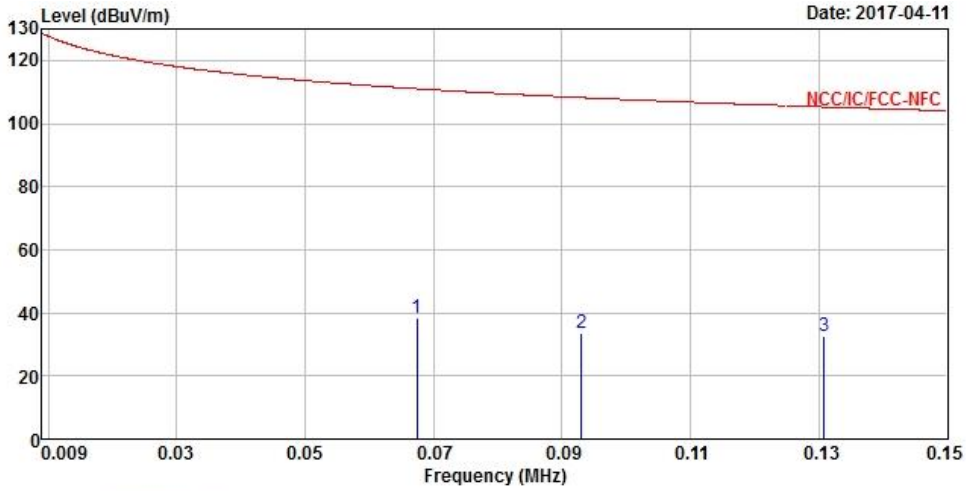
Transmitter Radiated Bandedge Emissions



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)

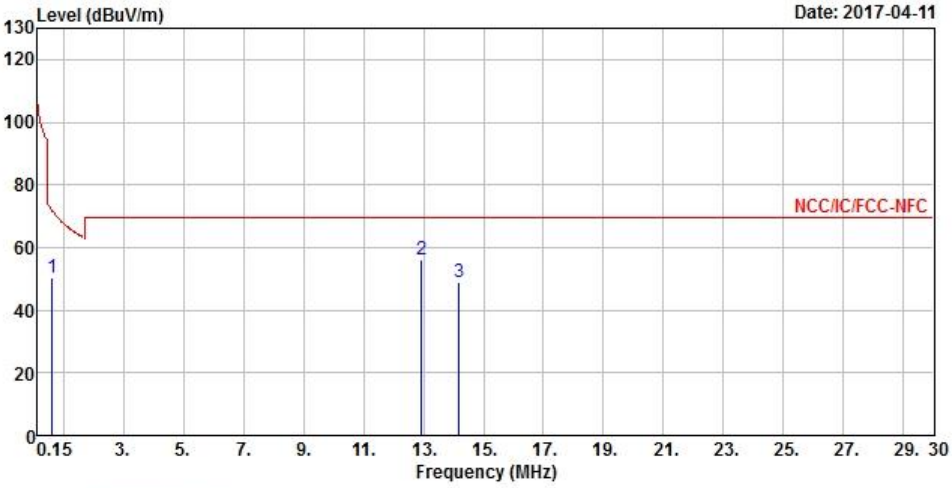
Transmitter Radiated Unwanted Emissions (9 kHz – 150 kHz)			
Modulation Mode	NFC	**Polarization**	H
Operating Mode	1		



	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	0.067	38.17	-72.87	111.04	17.14	20.96	0.07	0.00	Peak
2	0.093	33.56	-74.67	108.23	12.72	20.76	0.08	0.00	Peak
3	0.131	32.59	-72.68	105.27	11.83	20.67	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 (Horizontal).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

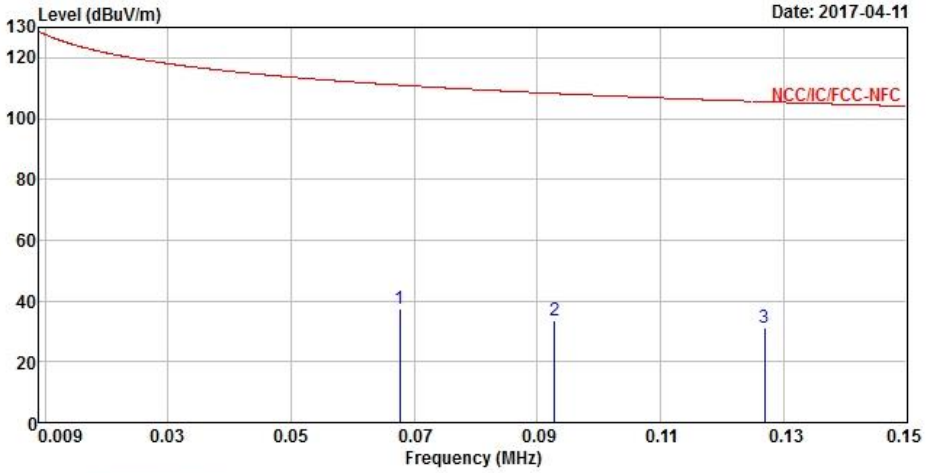
Transmitter Radiated Unwanted Emissions (150 kHz – 30 MHz)			
Modulation Mode	NFC	**Polarization**	H
Operating Mode	1		



	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	0.628	50.54	-21.12	71.66	30.00	20.33	0.21	0.00	Peak
2	12.926	56.07	-13.47	69.54	33.64	21.76	0.67	0.00	Peak
3	14.180	49.13	-20.41	69.54	26.54	21.88	0.71	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.

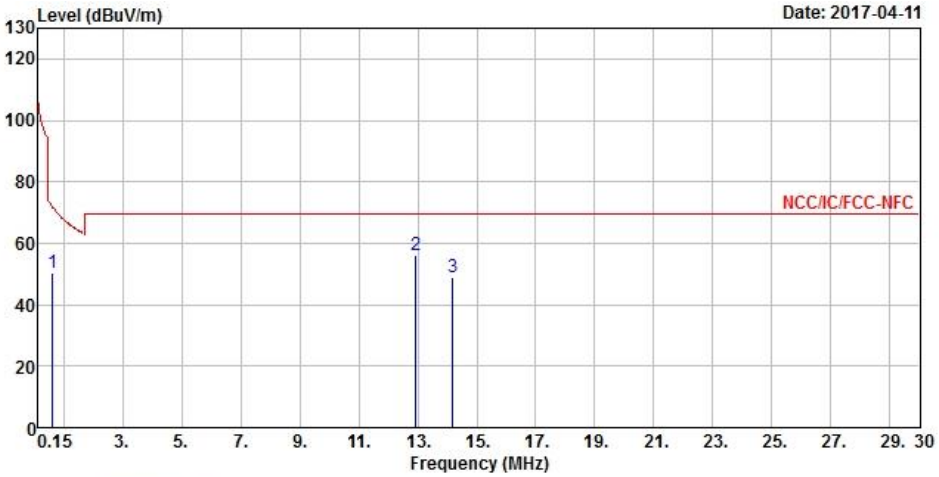
Transmitter Radiated Unwanted Emissions (9 kHz – 150 kHz)			
Modulation Mode	NFC	**Polarization**	H
Operating Mode	2		



	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	0.068	37.51	-73.49	111.00	16.48	20.96	0.07	0.00	Peak
2	0.093	33.52	-74.74	108.26	12.68	20.76	0.08	0.00	Peak
3	0.127	31.00	-74.54	105.54	10.24	20.67	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 (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		

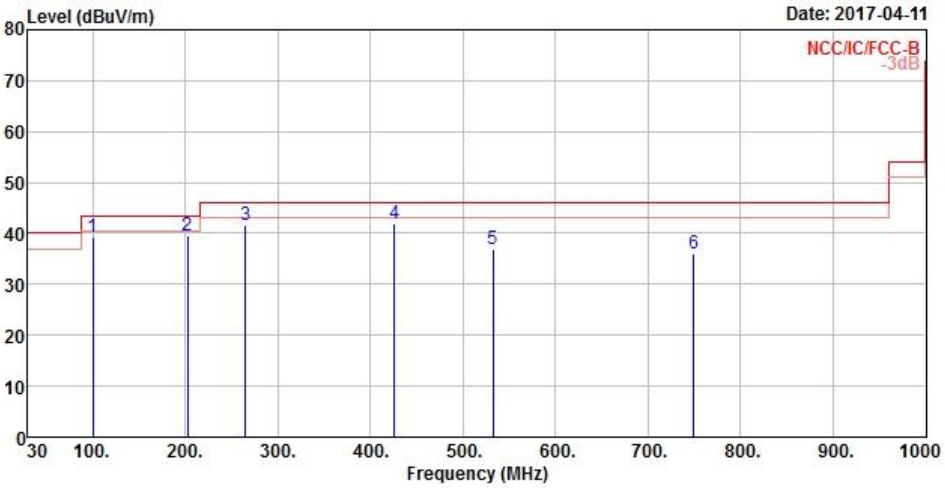


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	0.628	50.56	-21.10	71.66	30.02	20.33	0.21	0.00	Peak
2	12.926	56.18	-13.36	69.54	33.75	21.76	0.67	0.00	Peak
3	14.180	48.90	-20.64	69.54	26.31	21.88	0.71	0.00	Peak

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 (Above 30MHz)

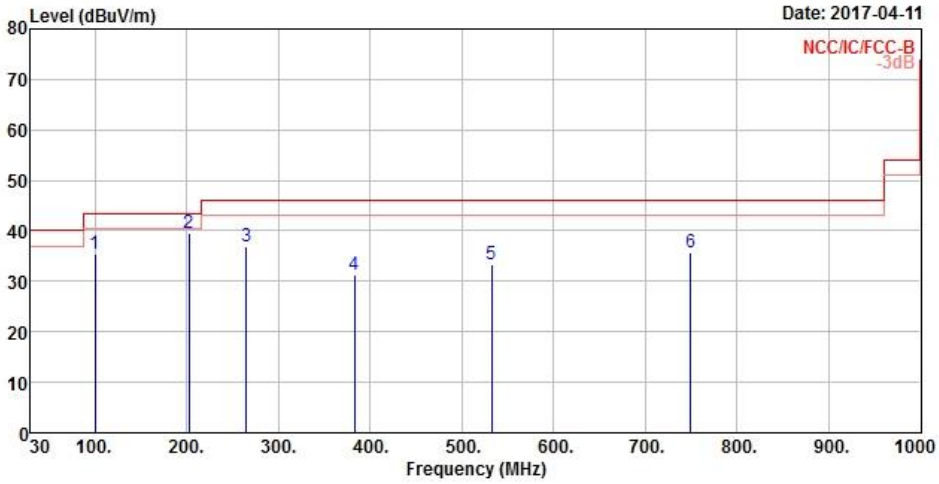
Transmitter Radiated Spurious Emissions (Above 30MHz)			
Modulation Mode	NFC	**Test Freq. (MHz)**	13.56
Operating Mode	1	**Polarization**	V



	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	99.840	39.19	-4.31	43.50	48.60	16.00	1.98	27.39	Peak
2	202.660	39.69	-3.81	43.50	49.76	14.31	2.53	26.91	Peak
3	264.740	41.58	-4.42	46.00	47.64	18.32	2.40	26.78	Peak
4	425.760	42.05	-3.95	46.00	44.40	21.38	3.25	26.98	Peak
5	532.460	36.93	-9.07	46.00	37.81	23.37	3.62	27.87	Peak
6	749.740	36.03	-9.97	46.00	34.77	24.75	4.37	27.86	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.

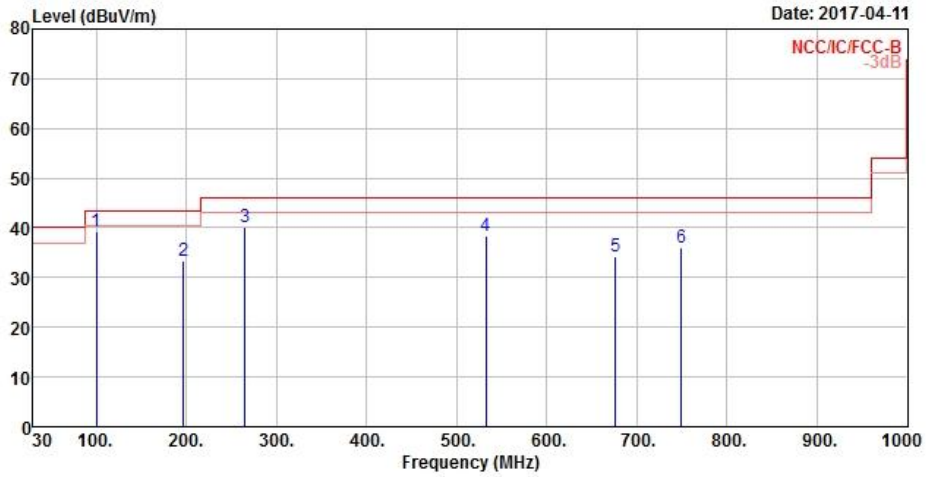
Transmitter Radiated Spurious Emissions (Above 30MHz)			
Modulation Mode	NFC	**Test Freq. (MHz)**	13.56
Operating Mode	1	**Polarization**	H



	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	99.840	35.42	-8.08	43.50	44.83	16.00	1.98	27.39	Peak
2	202.660	39.47	-4.03	43.50	49.54	14.31	2.53	26.91	Peak
3	264.740	36.84	-9.16	46.00	42.90	18.32	2.40	26.78	Peak
4	383.080	31.30	-14.70	46.00	34.55	20.42	3.03	26.70	Peak
5	532.460	33.25	-12.75	46.00	34.13	23.37	3.62	27.87	Peak
6	749.740	35.80	-10.20	46.00	34.54	24.75	4.37	27.86	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.

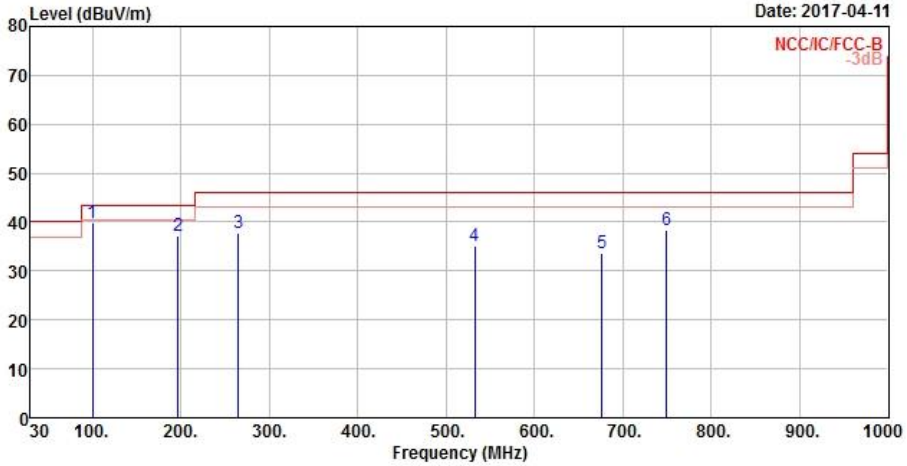
Transmitter Radiated Spurious Emissions (Above 30MHz)			
Modulation Mode	NFC	**Test Freq. (MHz)**	13.56
Operating Mode	2	**Polarization**	V



	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	99.840	39.21	-4.29	43.50	48.62	16.00	1.98	27.39	Peak
2	196.840	33.34	-10.16	43.50	43.51	14.30	2.46	26.93	Peak
3	264.740	40.05	-5.95	46.00	46.11	18.32	2.40	26.78	Peak
4	532.460	38.35	-7.65	46.00	39.23	23.37	3.62	27.87	Peak
5	676.020	34.34	-11.66	46.00	34.16	23.98	4.15	27.95	Peak
6	749.740	36.02	-9.98	46.00	34.76	24.75	4.37	27.86	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	99.840	39.78	-3.72	43.50	49.19	16.00	1.98	27.39	Peak
2	196.840	37.27	-6.23	43.50	47.44	14.30	2.46	26.93	Peak
3	264.740	37.65	-8.35	46.00	43.71	18.32	2.40	26.78	Peak
4	532.460	35.07	-10.93	46.00	35.95	23.37	3.62	27.87	Peak
5	676.020	33.76	-12.24	46.00	33.58	23.98	4.15	27.95	Peak
6	749.740	38.35	-7.65	46.00	37.09	24.75	4.37	27.86	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

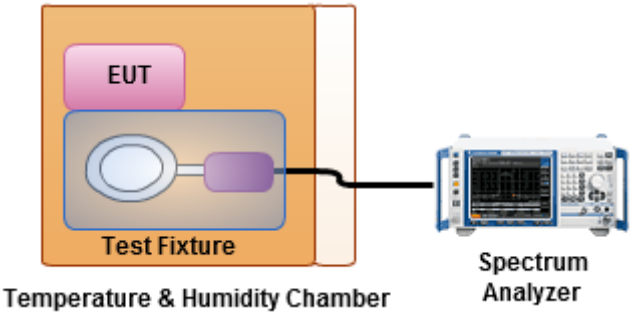
Refer a test equipment and calibration data table in this test report.

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 – Chip 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	13.55996	13.55996	13.55996	13.55996	-2.95	-2.95	-2.95	-2.95
$T_{20°C}$Vmin	13.56	13.55996	13.55996	13.55996	13.55996	-2.95	-2.95	-2.95	-2.95
$T_{40°C}$Vnom	13.56	13.55994	13.55992	13.55994	13.55992	-4.42	-5.90	-4.42	-5.90
$T_{30°C}$Vnom	13.56	13.55998	13.55998	13.55998	13.55998	-1.47	-1.47	-1.47	-1.47
$T_{20°C}$Vnom	13.56	13.55994	13.55996	13.55996	13.55998	-4.42	-2.95	-2.95	-1.47
$T_{10°C}$Vnom	13.56	13.56006	13.56006	13.56006	13.56006	4.42	4.42	4.42	4.42
$T_{0°C}$Vnom	13.56	13.56006	13.56006	13.56006	13.56006	4.42	4.42	4.42	4.42
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 – Chip 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	13.55996	13.55996	13.55996	13.55996	-2.95	-2.95	-2.95	-2.95
$T_{20°C}$Vmin	13.56	13.55996	13.55996	13.55996	13.55996	-2.95	-2.95	-2.95	-2.95
$T_{40°C}$Vnom	13.56	13.55998	13.55998	13.55998	13.55998	-1.47	-1.47	-1.47	-1.47
$T_{30°C}$Vnom	13.56	13.55994	13.55996	13.55996	13.55998	-4.42	-2.95	-2.95	-1.47
$T_{20°C}$Vnom	13.56	13.55996	13.55996	13.55996	13.55998	-2.95	-2.95	-2.95	-1.47
$T_{10°C}$Vnom	13.56	13.56006	13.56006	13.56006	13.56006	4.42	4.42	4.42	4.42
$T_{0°C}$Vnom	13.56	13.56008	13.56008	13.56008	13.56008	5.90	5.90	5.90	5.90
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 Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101013	9kHz~40GHz	08/Feb/2017	07/Feb/2018
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	25/Apr/2016	24/Apr/2017
Temp. and Humidity Chamber	Giant Force	GTH-225-40-CP-AR	MAA1611-005	-40 ~ 100℃	21/Nov/2016	20/Nov/2018

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	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
DC power supply	GWINSTEK	GPS-3030DD	GEN865896	DV 0V~30V	09/Feb/2017	08/Feb/2018
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	02/Mar/2017	01/Mar/2018