FCC Test Report

Equipment	:	**Computer**
Brand Name	:	**Advantech**
Model No.	:	**PWS-870,PWS-870XXXXXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character, "-" or blank.)**
FCC ID	:	**M82-TPC130**
Standard	:	**47 CFR FCC Part 15.225**
Operating Band	:	**13.110 – 14.010 MHz (channel freq. 13.56 MHz)**
FCC Classification	:	**DXX**
Applicant Manufacturer	:	**Advantech Co., Ltd.** No.1, Alley 20, Lane 26, Rueiguang Rd., Neihu District,Taipei City, Taiwan, R.O.C.

The product sample received on Dec. 04, 2014 and completely tested on Feb. 24, 2015. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

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

Reviewed by:

Vic Hsiao / Supervisor

Testing Laboratory
1190

Table of Contents

Summary of Test Result

Conformance Test Specifications					
Report Clause	**Ref. Std. Clause**	**Description**	**Measured**	**Limit**	**Result**
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]: 0.187385MHz 51.67 (Margin 12.48dB) - QP 34.61 (Margin 19.54dB) - AV	FCC 15.207	Complied
3.2	15.215(c)	Emission Bandwidth	20dB Bandwidth 2.47 [kHz] F_L:13.55926 MHz F_H:13.56174 MHz	Fall in band $F_L \geq$ 13.553 MHz $F_H \leq$ 13.567 MHz	Complied
3.3	15.225 (a)~(d)	Field Strength of Fundamental Emissions and Spectrum Mask	Fundamental Emissions peak:60.44 dBuV/m at 3m Device complies with spectrum mask – refer to test data	124 dBuV/m at 3	Complied
3.4	15.225(d)	Transmitter Radiated Unwanted Emissions	[dBuV/m at 3m]: 30MHz 32.02 (Margin 7.98dB) - Peak	FCC 15.209	Complied
3.5	15.225(e)	Frequency Stability	39.09 ppm	± 0.01% (100ppm)	Complied

Revision History

Report No.	Version	Description	Issued Date
FR470433-01	Rev. 01	Initial issue of report	Apr. 08, 2015
FR470433-01	Rev. 02	Change FCC ID	May 06, 2015

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)**
13.110 – 14.010 MHz	ISO 14443-2 (ASK)	13.56	1	60.44
Note 1: Field strength performed peak level at 3m.				

1.1.2 Antenna Information

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

1.1.3 Type of EUT

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

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☒ Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	**Voltage Duty Factor [dB] – (20 log 1/x)**
☒ 100%	0

1.1.5 EUT Operational Condition

Supply Voltage	☒ AC main	☒ DC	- -
Type of DC Source	☐ Internal DC supply	☒ External DC adapter	☒ Li-ion Battery

1.2 Accessories and Support Equipment

Accessories Information				
AC Adapter	Brand Name	FSP	Model Name	FSP065-RAB
	Power Rating	I/P: 100 - 240Vac,1.5A, 50/60Hz O/P: 19 Vdc, 3.42A		
	Power Cord	1.5meter, non-shielded cable, with ferrite core.		
Battery 1	Brand Name	JOULES MILES	Model Name	PWS870-4S2P
	Power Rating	14.8 Vdc, 4080mAh		
Battery 2	Brand Name	JOULES MILES	Model Name	PWS870
	Power Rating	14.4 Vdc, 2730mAh		
Office Cradle	Brand Name	ADVANTECH	Model Name	PWS-870 Desk Docking
	Power Rating	I/P:100 - 240Vac, 50-60HZ, O/P: 19Vdc, 3.42A		
Vehicle Cradle	Brand Name	ADVANTECH	Model Name	PWS-870 Vehicle Docking
	Power Rating	I/P:100 - 240Vac, 50/60HZ, O/P: 18.5Vdc, 4.9A		
PWS-870 Universal Cover	Brand Name	Advantech	Mode Name	PWS-870
Battery Charger	Brand Name	Advantech	Model Name	PWS-870 Multiple Battery Charger
AC Adapter (for Battery Charger)	Brand Name	FSP	Model Name	FSP150-RFBN2

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

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Identity Badge	-	-	-

1.3 Testing Applied Standards

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

- 47 CFR FCC Part 15
- ANSI C63.10-2009
- FCC KDB 174176

1.4 Testing Location Information

Testing Location								
☒	HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.				
		TEL	:	886-3-327-3456	FAX	:	886-3-327-0973	
Test Site Registration Number: FCC 636805								
Test Condition		**Test Site No.**		**Test Engineer**			**Test Environment**	
AC Conduction		CO04-HY		Zeus			22°C / 51%	
RF Conducted		TH06-HY		Leo			25.3°C / 63%	
Radiated Emission		03CH02-HY		Joe			22.1°C / 58.6%	

1.5 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	±0.3 dB
	0.15 – 30 MHz	±0.4 dB
	30 – 1000 MHz	±0.5 dB
All emissions, radiated	9 – 150 kHz	±2.4 dB
	0.15 – 30 MHz	±2.2 dB
	30 – 1000 MHz	±2.5 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)**
ASK	60.44

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
Modulation Mode	**Test Channel Frequencies (MHz)**
ASK	13.56

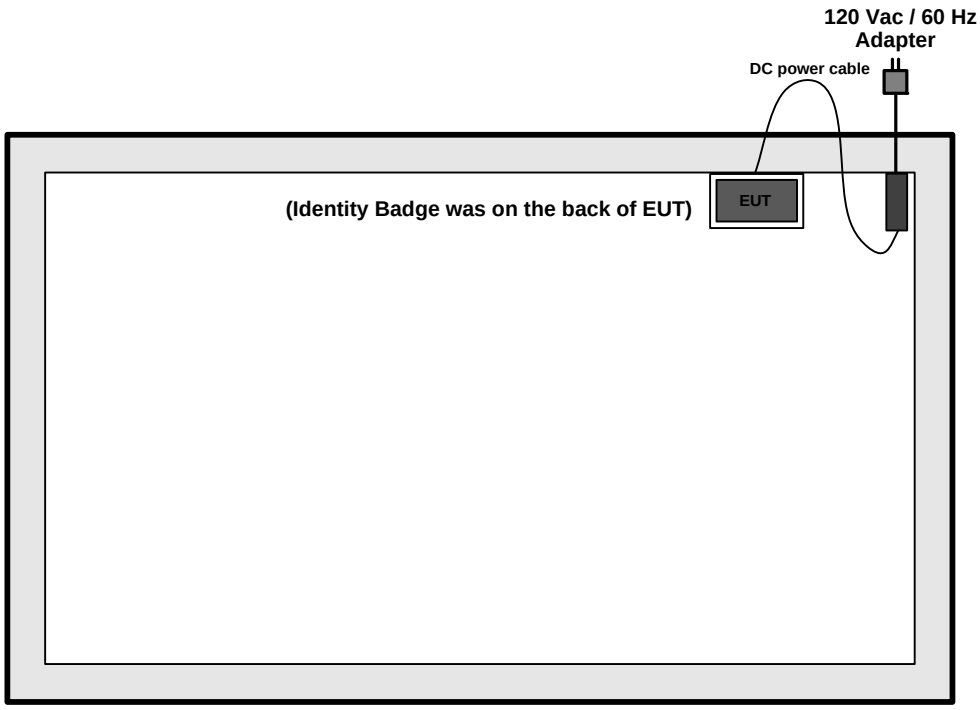
2.3 The Worst Case Measurement Configuration

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	Operating Mode Description
	1. NFC Type A, with antenna
	2. NFC Type A, with dummy load
Remark	1. NFC Type A, B, were all evaluated here. Type A was the worst case so it was recorded in this report.

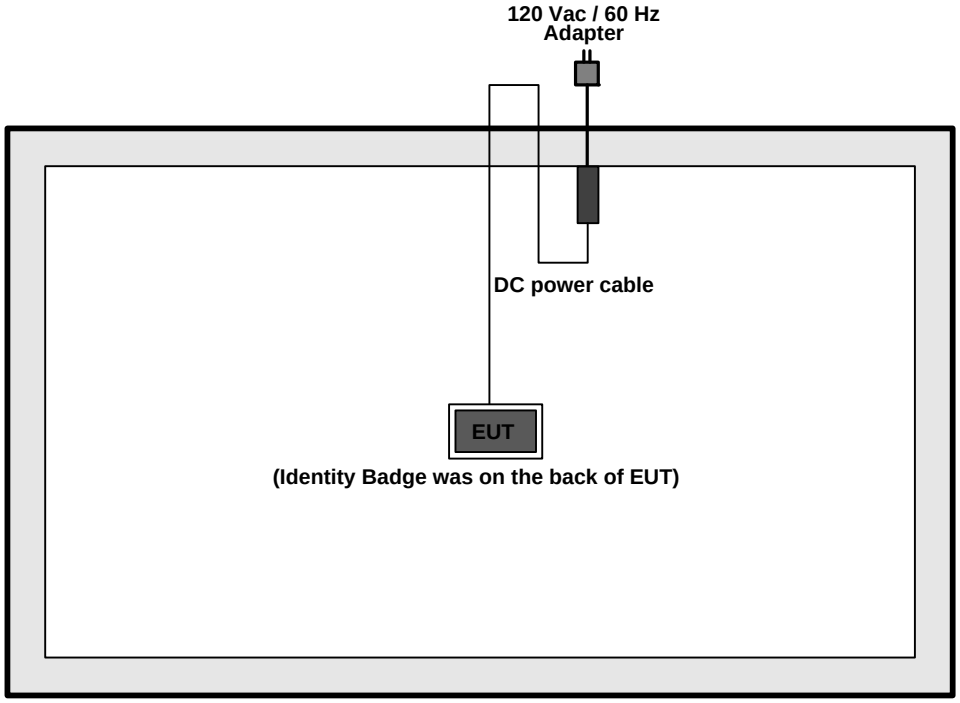
The Worst Case Mode for Following Conformance Tests			
Tests Item	Emission Bandwidth, Field Strength of Fundamental Emissions Spectrum Mask, Transmitter Radiated Unwanted Emissions Frequency Stability		
Test Condition	Radiated measurement		
User Position	☐ EUT will be placed in fixed position.		
	☐ EUT 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	Operating Mode Description		
	1. Adapter mode and Transmitter NFC Type A		
Modulation Mode	ASK		
Remark	NFC Type A, B, were all evaluated here. Type A was the worst case so it was recorded in this report.		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT		V	

2.4 Test Setup Diagram

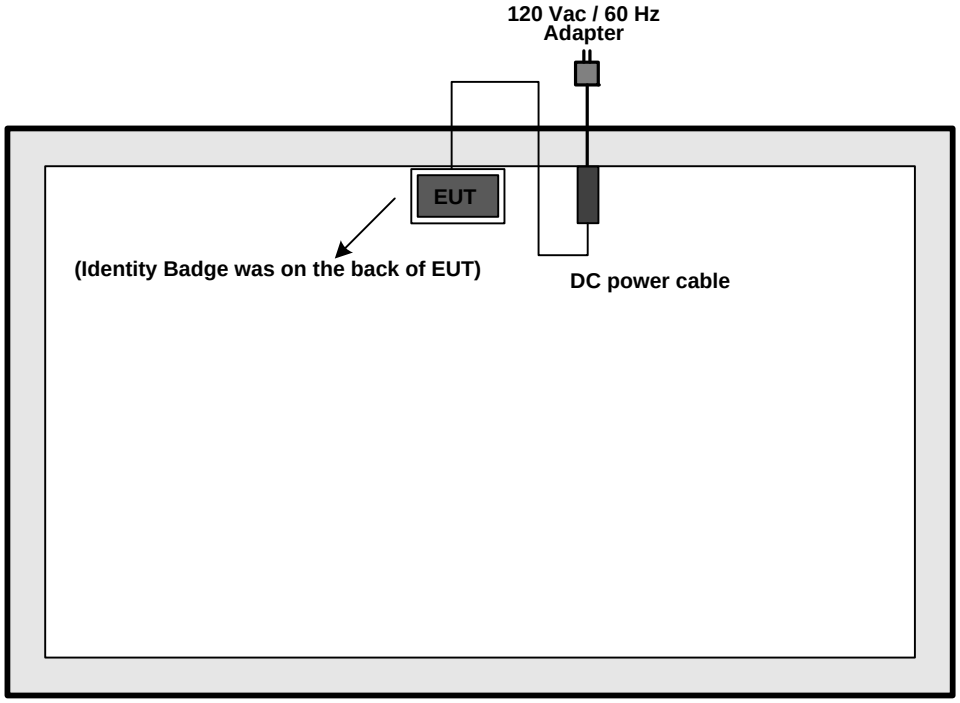
Test Setup Diagram - AC Line Conducted Emission Test



Test Setup Diagram - Radiated 9kHz~30MHz Test



Test Setup Diagram - Radiated 30MHz~1GHz Test



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments

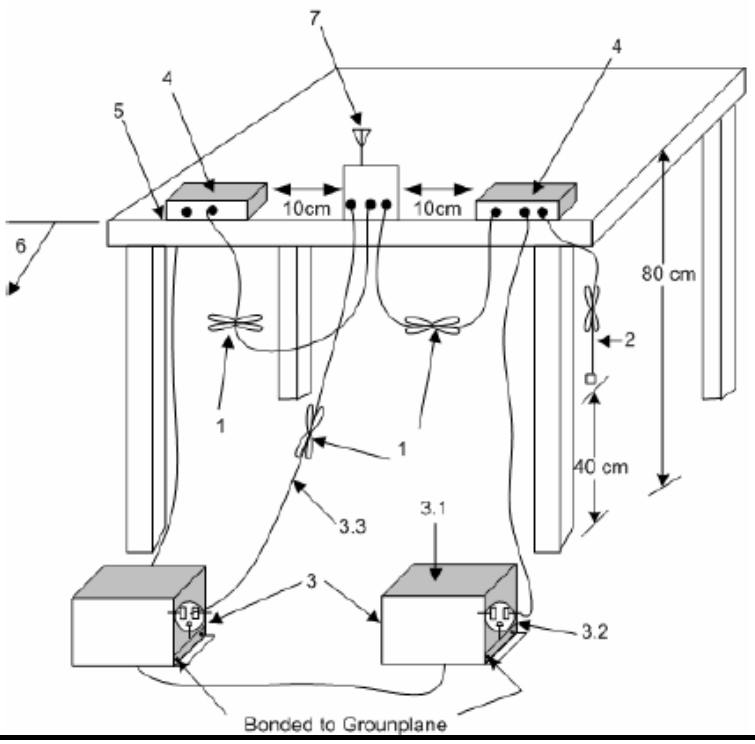
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

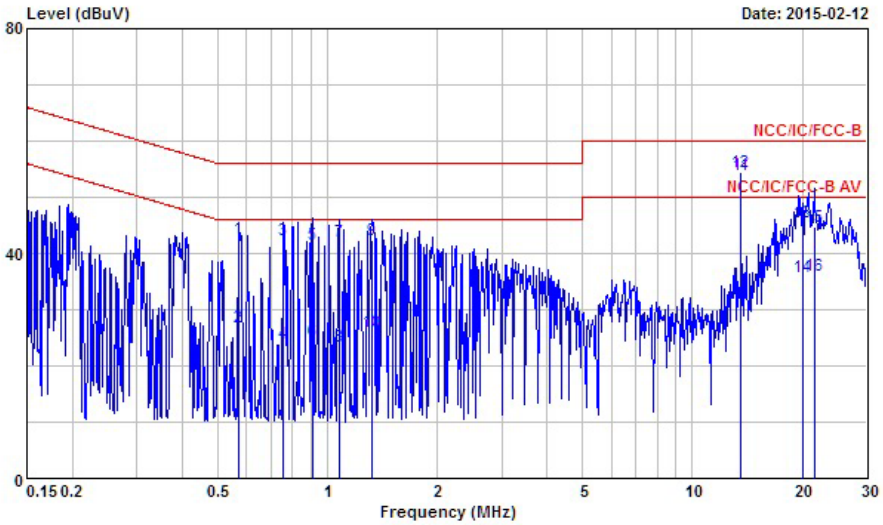
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

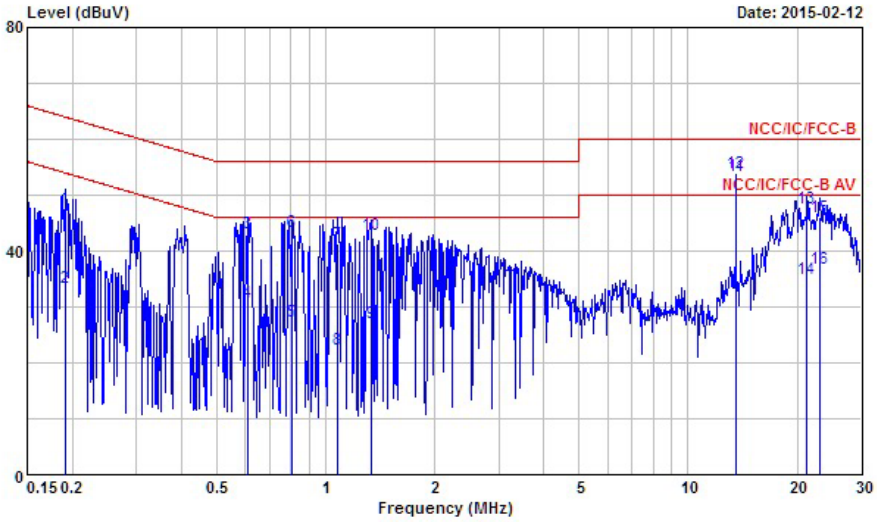
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	NFC Type A, with antenna		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	@0.5731280	42.51	-13.49	56.00	41.75	0.08	0.68	QP
2	0.5731280	26.93	-19.07	46.00	26.17	0.08	0.68	Average
3	@0.7549280	42.24	-13.76	56.00	41.42	0.08	0.74	QP
4	0.7549280	23.93	-22.07	46.00	23.11	0.08	0.74	Average
5	0.9135710	41.57	-14.43	56.00	40.70	0.09	0.78	QP
6	0.9135710	24.37	-21.63	46.00	23.50	0.09	0.78	Average
7	@ 1.080	42.20	-13.80	56.00	41.31	0.09	0.80	QP
8	1.080	23.42	-22.58	46.00	22.53	0.09	0.80	Average
9	@ 1.320	42.42	-13.58	56.00	41.53	0.09	0.80	QP
10	1.320	26.04	-19.96	46.00	25.15	0.09	0.80	Average
11	@ 13.560	53.92	-6.08	60.00	52.81	0.31	0.80	QP
12	@ 13.560	54.38	4.38	50.00	53.27	0.31	0.80	Average
13	20.060	45.44	-14.56	60.00	44.34	0.40	0.70	QP
14	20.060	35.89	-14.11	50.00	34.79	0.40	0.70	Average
15	21.600	44.73	-15.27	60.00	43.65	0.42	0.66	QP
16	@ 21.600	36.10	-13.90	50.00	35.02	0.42	0.66	Average

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)
Note 3: Frequency 13.56 MHz is NFC signal.

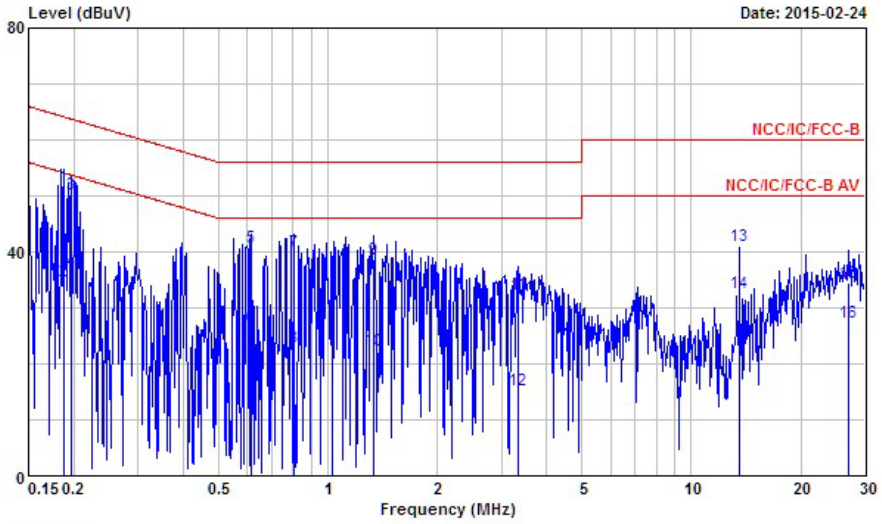
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	NFC Type A, with antenna		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1903870	47.50	-16.52	64.02	46.97	0.06	0.47	QP
2	0.1903870	33.41	-20.61	54.02	32.88	0.06	0.47	Average
3	@0.6107510	43.14	-12.86	56.00	42.38	0.07	0.69	QP
4	0.6107510	30.91	-15.09	46.00	30.15	0.07	0.69	Average
5	0.8087580	27.26	-18.74	46.00	26.43	0.08	0.75	Average
6	@0.8087580	43.29	-12.71	56.00	42.46	0.08	0.75	QP
7	1.080	41.33	-14.67	56.00	40.45	0.08	0.80	QP
8	1.080	22.25	-23.75	46.00	21.37	0.08	0.80	Average
9	1.330	27.06	-18.94	46.00	26.17	0.09	0.80	Average
10	@ 1.330	42.84	-13.16	56.00	41.95	0.09	0.80	QP
11	@ 13.560	53.53	-6.47	60.00	52.44	0.29	0.80	QP
12	@ 13.560	53.96	3.96	50.00	52.87	0.29	0.80	Average
13	@ 21.260	47.59	-12.41	60.00	46.55	0.37	0.67	QP
14	21.260	34.92	-15.08	50.00	33.88	0.37	0.67	Average
15	@ 23.020	45.96	-14.04	60.00	44.94	0.38	0.64	QP
16	@ 23.020	36.78	-13.22	50.00	35.76	0.38	0.64	Average

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)
Note 3: Frequency 13.56 MHz is NFC signal.

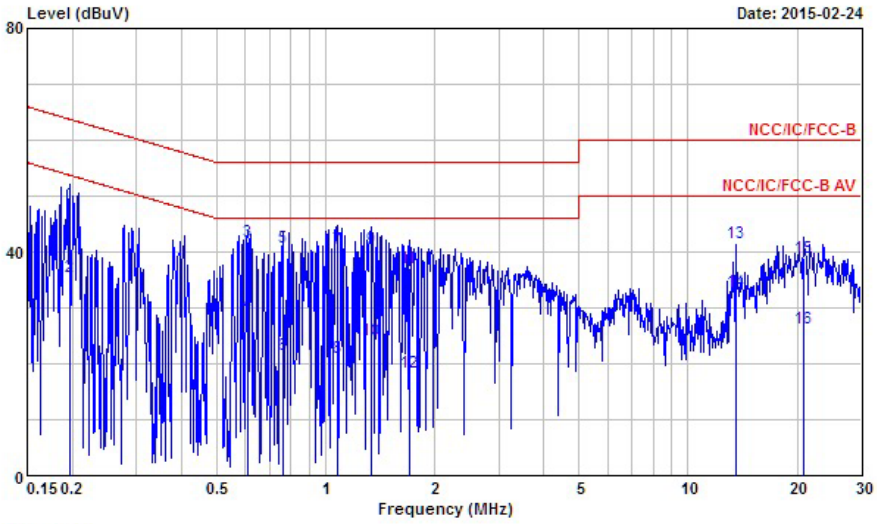
AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Neutral
Operating Function	NFC Type A, with dummy load		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	@0.1873850	51.67	-12.48	64.15	51.14	0.07	0.46	QP
2	0.1873850	34.61	-19.54	54.15	34.08	0.07	0.46	Average
3	@0.1965370	50.37	-13.39	63.76	49.81	0.07	0.49	QP
4	0.1965370	36.47	-17.29	53.76	35.91	0.07	0.49	Average
5	0.6172570	40.89	-15.11	56.00	40.12	0.08	0.69	QP
6	0.6172570	26.68	-19.32	46.00	25.91	0.08	0.69	Average
7	0.8044850	40.10	-15.90	56.00	39.26	0.09	0.75	QP
8	0.8044850	22.78	-23.22	46.00	21.94	0.09	0.75	Average
9	1.330	38.72	-17.28	56.00	37.83	0.09	0.80	QP
10	1.330	22.40	-23.60	46.00	21.51	0.09	0.80	Average
11	3.350	32.44	-23.56	56.00	31.59	0.12	0.73	QP
12	3.350	15.33	-30.67	46.00	14.48	0.12	0.73	Average
13	13.560	41.13	-18.87	60.00	40.02	0.31	0.80	QP
14	13.560	32.67	-17.33	50.00	31.56	0.31	0.80	Average
15	26.980	34.45	-25.55	60.00	33.42	0.47	0.56	QP
16	26.980	27.38	-22.62	50.00	26.35	0.47	0.56	Average

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)
Note 3: Frequency 13.56 MHz is NFC signal.

AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Line
Operating Function	NFC Type A, with dummy load		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1965370	48.67	-15.09	63.76	48.12	0.06	0.49	QP
2	0.1965370	35.61	-18.15	53.76	35.06	0.06	0.49	Average
3	@0.6107510	41.96	-14.04	56.00	41.20	0.07	0.69	QP
4	0.6107510	28.95	-17.05	46.00	28.19	0.07	0.69	Average
5	0.7589380	40.71	-15.29	56.00	39.89	0.08	0.74	QP
6	0.7589380	21.61	-24.39	46.00	20.79	0.08	0.74	Average
7	1.080	40.43	-15.57	56.00	39.55	0.08	0.80	QP
8	1.080	20.93	-25.07	46.00	20.05	0.08	0.80	Average
9	1.330	40.43	-15.57	56.00	39.54	0.09	0.80	QP
10	1.330	24.27	-21.73	46.00	23.38	0.09	0.80	Average
11	1.700	37.19	-18.81	56.00	36.29	0.10	0.80	QP
12	1.700	18.32	-27.68	46.00	17.42	0.10	0.80	Average
13	13.560	41.69	-18.31	60.00	40.60	0.29	0.80	QP
14	13.560	32.93	-17.07	50.00	31.84	0.29	0.80	Average
15	20.810	38.93	-21.07	60.00	37.88	0.37	0.68	QP
16	20.810	26.36	-23.64	50.00	25.31	0.37	0.68	Average

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)
Note 3: Frequency 13.56 MHz is NFC signal.

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 (13.110 – 14.010 MHz).

3.2.2 Measuring Instruments

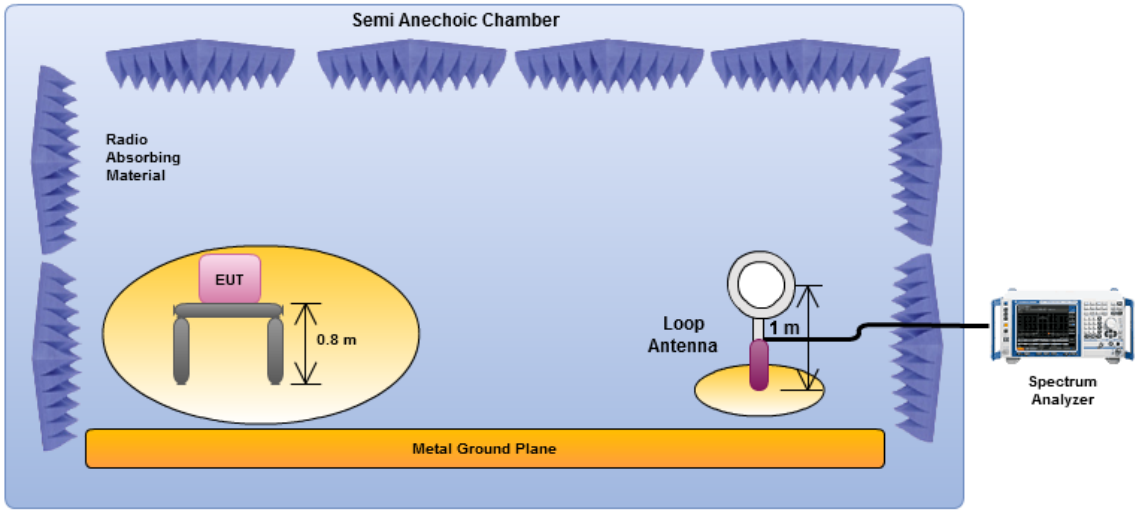
Refer a test equipment and calibration data table in this test report.

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

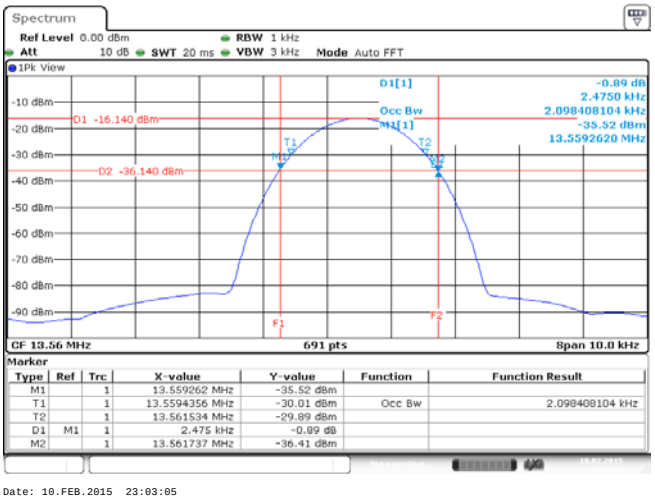
Emission Bandwidth



3.2.5 Test Result of Emission Bandwidth

Occupied Channel Bandwidth Result					
Modulation Mode	Frequency (MHz)	20dB Bandwidth (kHz)	F_L at 20dB BW (MHz)	F_H at 20dB BW (MHz)	99% Bandwidth (kHz)
ASK	13.56	2.47	13.55926	13.56174	2.09
Limit		**N/A**	**13.553**	**13.567**	**N/A**
Result		**Complied**			

Emission Bandwidth Plot



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

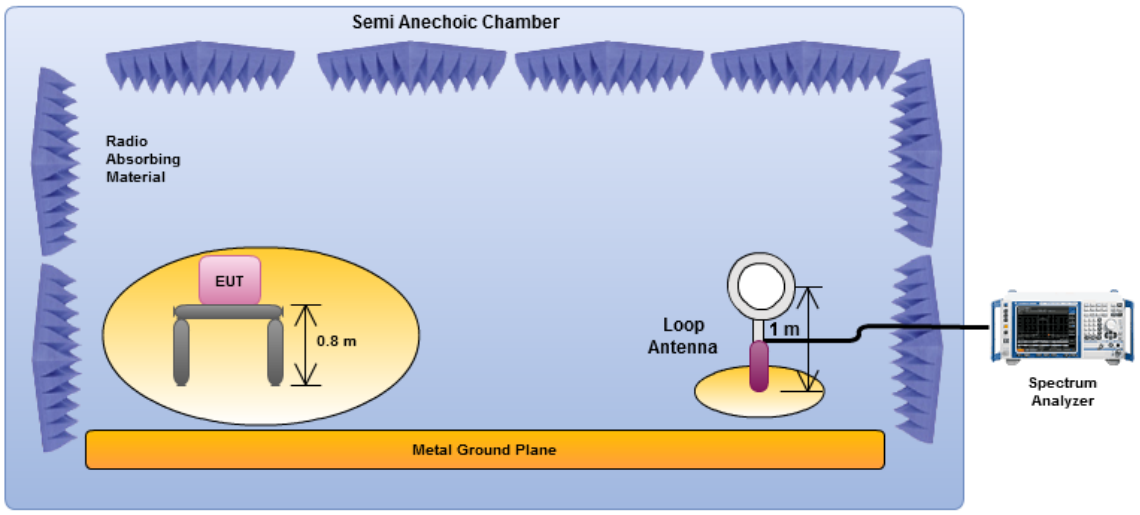
Refer a test equipment and calibration data table in this test report.

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

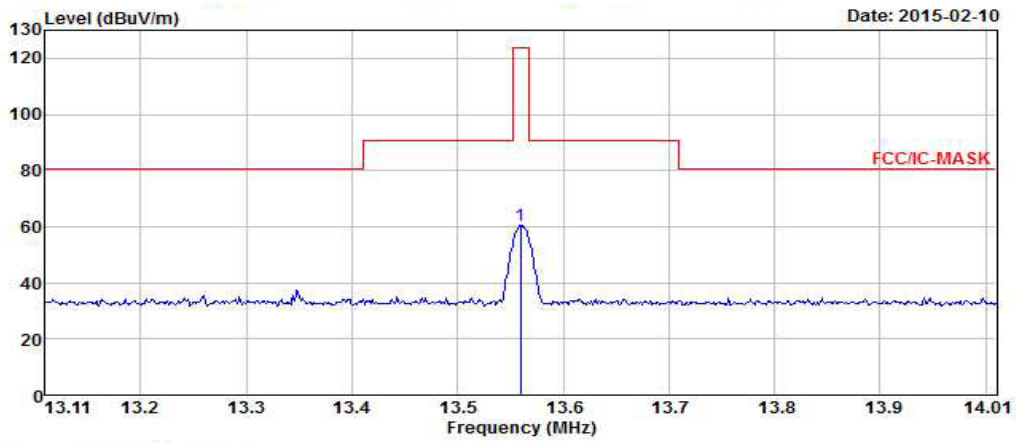
Field Strength of Fundamental Emissions and Spectrum Mask



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

Field Strength of Fundamental Emissions Result					
Modulation Mode	**Frequency (MHz)**	**Fundamental (dBuV/m)@3m**	**Polarization**	**Margin (dB)**	**Limit (dBuV/m)@3m**
ASK	13.56	60.44	H	-63.56	124.00
Result		**Complied**			
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal).					

Spectrum Mask Plot



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

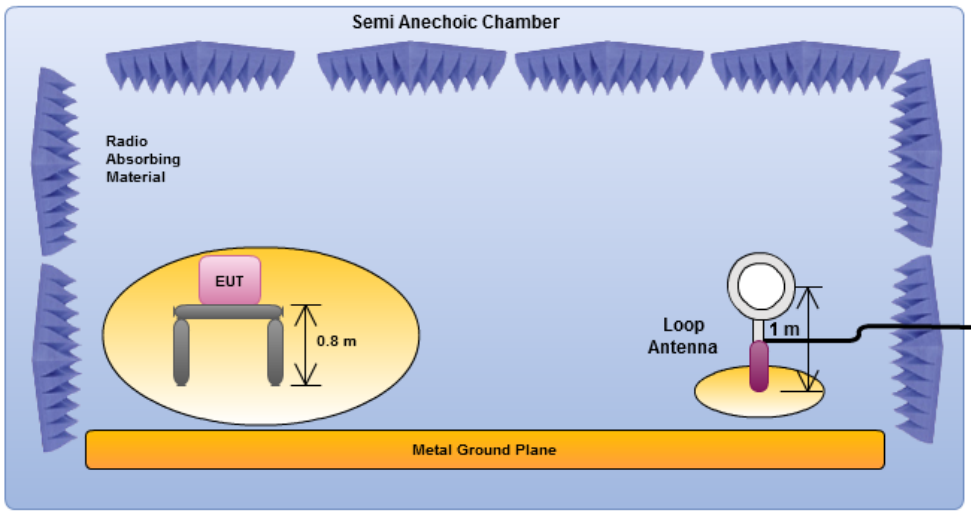
Refer a test equipment and calibration data table in this test report.

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.

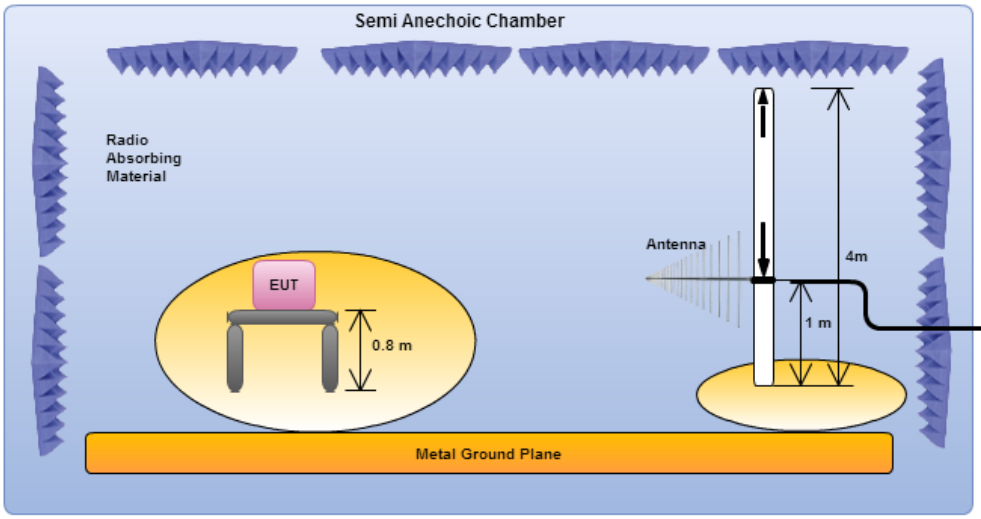
3.4.4 Test Setup

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.

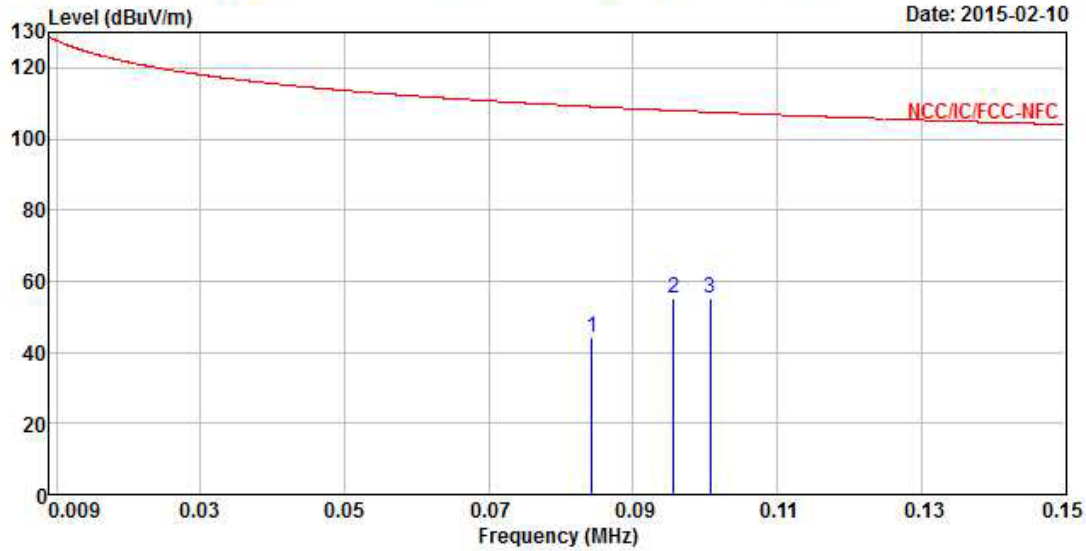
Transmitter Radiated Unwanted Emissions



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)

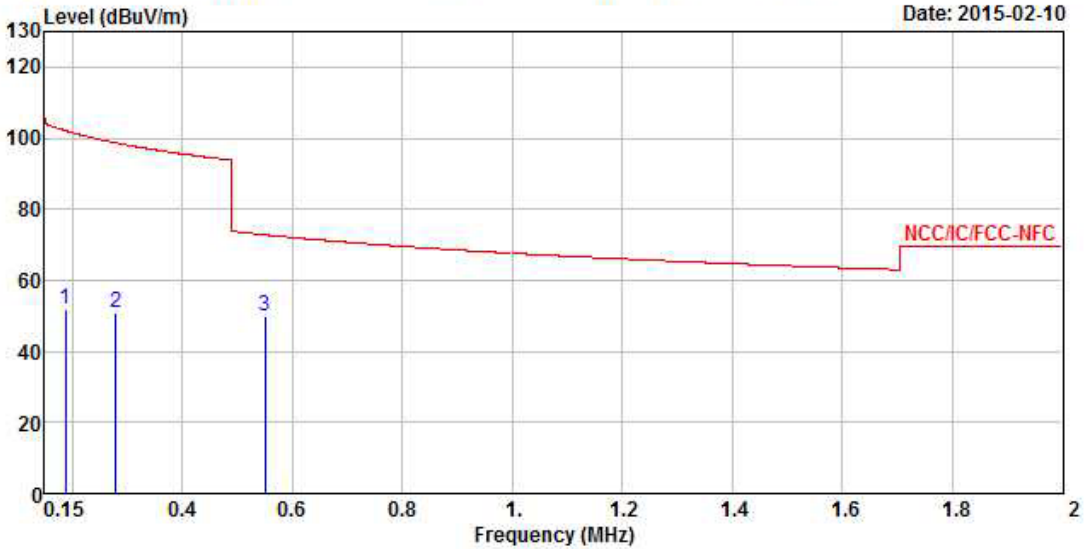
Transmitter Radiated Unwanted Emissions (9 kHz – 150 kHz)			
Modulation Mode	ASK	**Polarization**	H
Operating Mode	1		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	A/Pos	T/Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	0.08	44.31	-64.78	109.09	24.15	20.10	0.06	0.00	Peak	---	---
2	0.10	55.17	-52.83	108.00	35.01	20.10	0.06	0.00	Peak	---	---
3	0.10	55.26	-52.29	107.55	35.10	20.10	0.06	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.

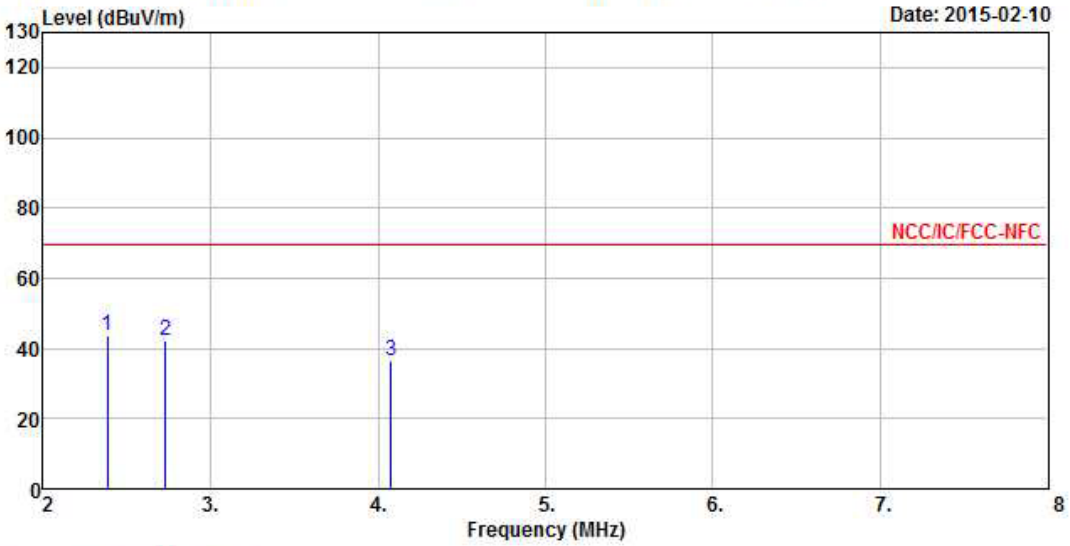
Transmitter Radiated Unwanted Emissions (150 kHz – 2 MHz)			
Modulation Mode	ASK	**Polarization**	H
Operating Mode	1		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	A/Pos	T/Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	0.19	51.97	-50.20	102.17	31.81	20.10	0.06	0.00	Peak	---	---
2	0.28	50.66	-48.02	98.68	30.50	20.10	0.06	0.00	Peak	---	---
3	0.55	49.94	-22.87	72.81	29.77	20.07	0.10	0.00	Peak	---	---

Note 1: “>20dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement worst emissions of receive antenna polarization: H (Horizontal).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

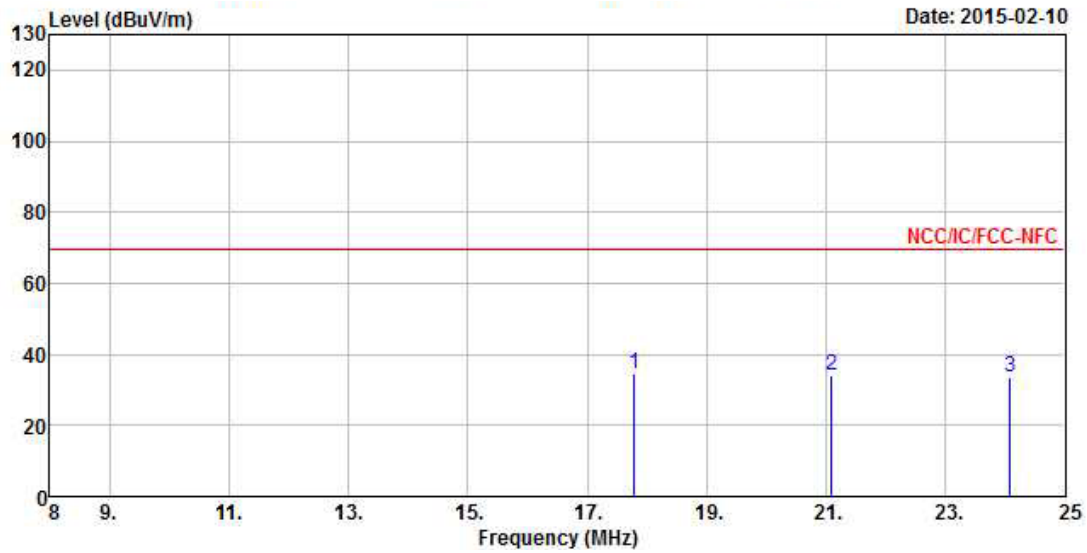
Transmitter Radiated Unwanted Emissions (2 MHz – 8 MHz)			
Modulation Mode	ASK	**Polarization**	H
Operating Mode	1		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	A/Pos	T/Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	2.38	43.74	-25.80	69.54	23.59	20.00	0.15	0.00	Peak	---	---
2	2.73	42.33	-27.21	69.54	22.14	20.00	0.19	0.00	Peak	---	---
3	4.08	36.41	-33.13	69.54	16.14	20.03	0.24	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.

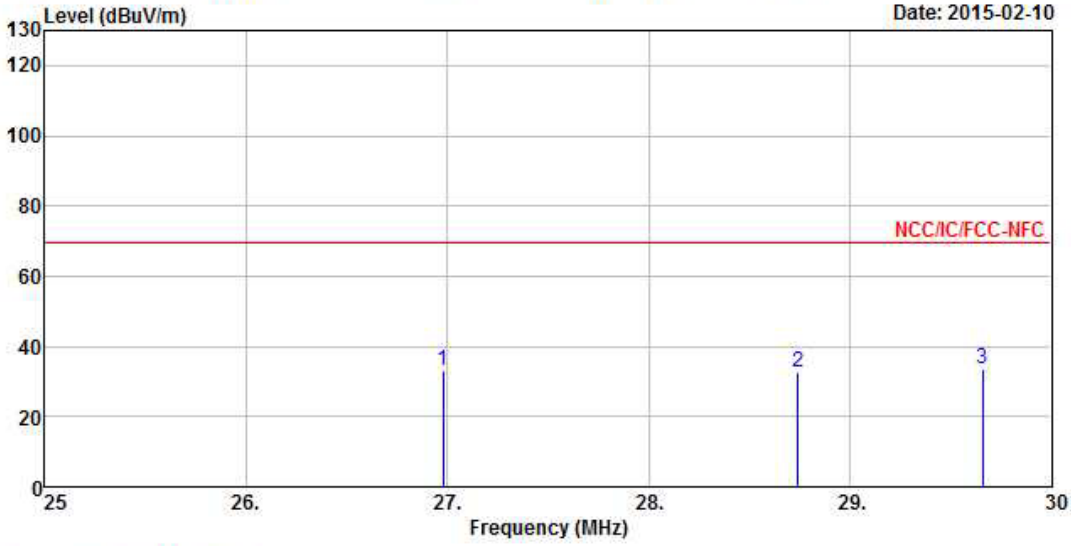
Transmitter Radiated Unwanted Emissions (8 MHz – 25 MHz)			
Modulation Mode	ASK	**Polarization**	H
Operating Mode	1		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	A/Pos	T/Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	17.79	34.54	-35.00	69.54	13.81	20.16	0.57	0.00	Peak	---	---
2	21.09	34.04	-35.50	69.54	13.24	20.18	0.62	0.00	Peak	---	---
3	24.08	33.76	-35.78	69.54	12.98	20.12	0.66	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 (25 MHz – 30 MHz)			
Modulation Mode	ASK	**Polarization**	H
Operating Mode	1		

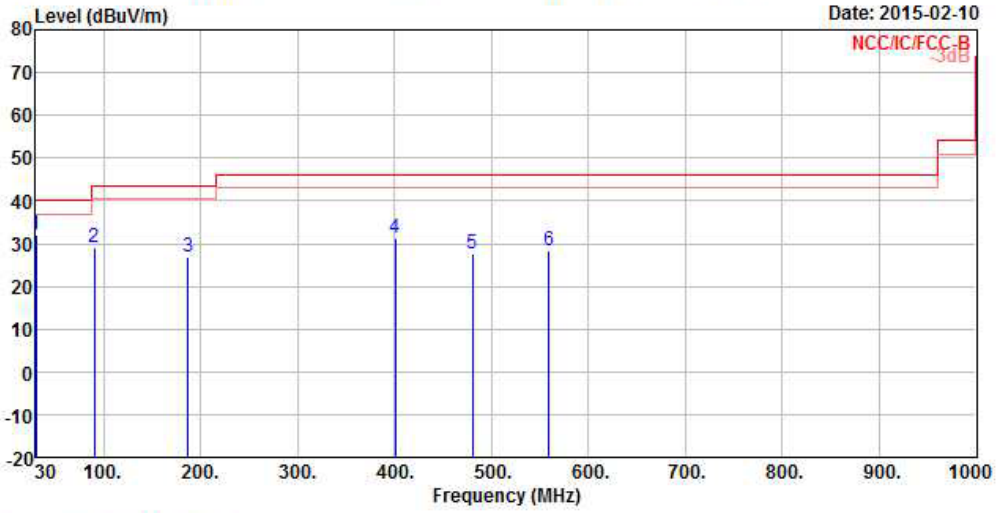


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	A/Pos	T/Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	26.98	32.87	-36.67	69.54	12.06	20.10	0.71	0.00	Peak	---	---
2	28.74	32.67	-36.87	69.54	11.85	20.10	0.72	0.00	Peak	---	---
3	29.66	33.69	-35.85	69.54	12.86	20.10	0.73	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)

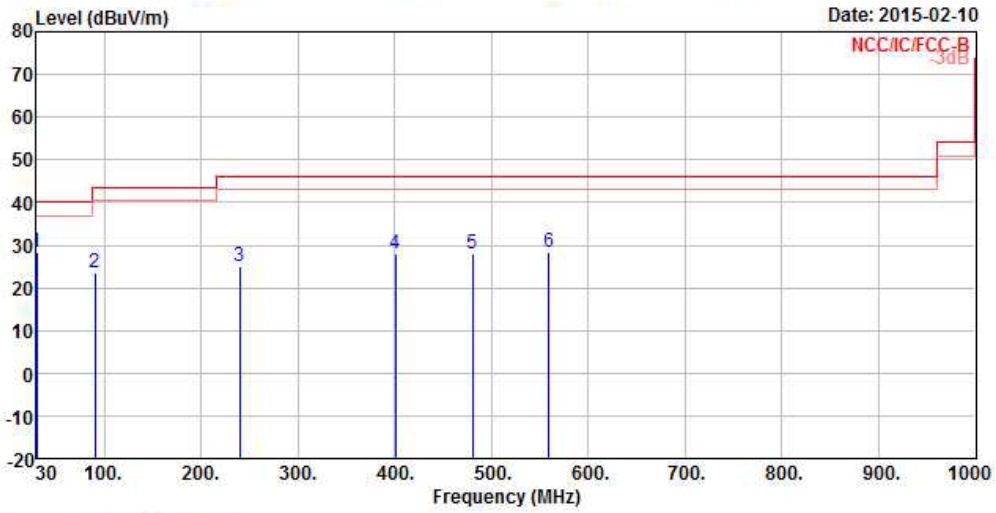
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Modulation Mode	ASK	**Polarization**	V
Operating Mode	1		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	A/Pos	T/Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	30.00	32.02	-7.98	40.00	41.41	17.67	0.75	27.81	Peak	---	---
2	90.14	29.02	-14.48	43.50	46.80	8.59	1.34	27.71	Peak	---	---
3	187.14	26.68	-16.82	43.50	43.39	8.79	1.97	27.47	Peak	---	---
4	400.54	31.19	-14.81	46.00	40.74	15.45	2.91	27.91	Peak	---	---
5	480.08	27.58	-18.42	46.00	35.56	17.16	3.19	28.33	Peak	---	---
6	559.62	28.19	-17.81	46.00	34.72	18.39	3.56	28.48	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Modulation Mode	ASK	**Polarization**	H
Operating Mode	1		



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	A/Pos	T/Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	30.00	28.34	-11.66	40.00	37.73	17.67	0.75	27.81	Peak	---	---
2	90.14	23.45	-20.05	43.50	41.23	8.59	1.34	27.71	Peak	---	---
3	239.52	25.03	-20.97	46.00	38.96	11.12	2.27	27.32	Peak	---	---
4	400.54	27.81	-18.19	46.00	37.36	15.45	2.91	27.91	Peak	---	---
5	480.08	27.91	-18.09	46.00	35.89	17.16	3.19	28.33	Peak	---	---
6	559.62	28.22	-17.78	46.00	34.75	18.39	3.56	28.48	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.

3.5 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

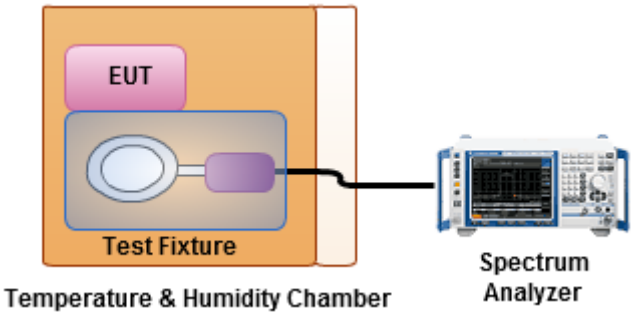
Refer a test equipment and calibration data table in this test report.

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

Test date: Feb. 11, 2015		Frequency Stability Result
Power Level	**1**	**Frequency Stability Max. Deviation Limit < 100 ppm**
Condition	**Freq. (MHz)**	**10 min**
$T_{20°C}$Vmax	13.56046	33.92
$T_{20°C}$Vmin	13.56047	34.66
$T_{50°C}$Vnom	13.56046	33.92
$T_{40°C}$Vnom	13.56047	34.66
$T_{30°C}$Vnom	13.56050	36.87
$T_{20°C}$Vnom	13.56047	34.66
$T_{10°C}$Vnom	13.56043	31.71
$T_{0°C}$Vnom	13.56043	31.71
$T_{-10°C}$Vnom	13.56048	35.40
$T_{-20°C}$Vnom	13.56053	39.09
Result		**Complied**

Note 1: Measure at 85 % [Vmin] and 115 % [Vmax] of the nominal voltage [Vnom]. The nominal voltage refer test report clause 1.1.2 for EUT operational condition.

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Apr. 14. 2014	AC Conduction
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 22, 2015	AC Conduction
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	Oct. 31, 2014	AC Conduction
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	AC Conduction

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101515	9kHz ~ 40GHz	Jun. 01, 2014	RF Conducted
Temp. and Humidity Chamber	Giant Force	GTH-225-20-S	MAB0103-001	-20 ~ 100℃	Nov. 25, 2014	RF Conducted

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP40	100593	9kHz ~ 40GHz	Oct. 02, 2014	Radiation
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 11, 2014	Radiation
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	Jul. 22, 2014	Radiation
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Sep 20, 2014	Radiation
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 08, 2014	Radiation
Turn Table	Chaintek Instruments	3000	MF7802058	0~ 360 degree	N/A	Radiation
Antenna Mast	MF	MF7802	MF780208205	1 ~ 4 m	N/A	Radiation

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jul. 28, 2014	Radiation

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