FCC Test Report

Equipment	:	EFTPOS
Brand Name	:	CASTLES TECHNOLOGY
Model Name	:	VEGA5000S
FCC ID	:	WIYVEGA5000S
Standard	:	47 CFR FCC Part 15.225
Operating Band	:	13.110 – 14.010 MHz (channel freq. 13.56 MHz)
FCC Classification	:	DXX
Applicant Manufacturer	:	Castles Technology Co., Ltd. 2F, No.205, Sec. 3, Beixin Rd., Xindian District, New Taipei City 23143, Taiwan (R.O.C.)

The product sample received on May 28, 2014 and completely tested on Jul. 31, 2014. 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:

Digitally signed by Wayne Hsu
DN: cn=Wayne Hsu, c=TW, o=Sporton International INC., ou=New HY Division, email=wayne@sporton.com.tw
Date: 2014.08.25 16:57:32 +08'00'

Wayne Hsu / Assistant Manager

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]: 0.363382MHz 45.31 (Margin 3.34dB) - AV 47.20 (Margin 11.45dB) - QP	FCC 15.207	Complied
3.2	15.215(c)	Emission Bandwidth	20dB Bandwidth 2.60 [kHz] FL: 13.55686MHz FH: 13.55946MHz	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:55.78 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]: 148.34MHz 42.46 (Margin 1.04dB) - QP	FCC 15.209	Complied
3.5	15.225(e)	Frequency Stability	20.28 ppm	± 0.01% (100ppm)	Complied

Revision History

Report No.	Version	Description	Issued Date
FR452106	Rev. 01	Initial issue of report	Aug. 25, 2014

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	55.78
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

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 - ISO 14443 Type A			
Declare transmitter duty cycle / 1 hour =		100%	
Duty cycle Limit			
☐	Class 1 - < 0.1 %	☐	Class 2 - < 1.0 %
☐	Class 3 - < 10 %	☒	Class 4 - Up to 100 %
Duty cycle mode - ISO 14443 Type B			
Declare transmitter duty cycle / 1 hour =		100%	
Duty cycle Limit			
☐	Class 1 - < 0.1 %	☐	Class 2 - < 1.0 %
☐	Class 3 - < 10 %	☒	Class 4 - Up to 100 %
Remark: Type A was the worst case and it was recorded in this report.			

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 mains	☒ DC	☐ From system
Type of DC Source	☐	External USB cable	☒ External DC adapter	☒ Li-on Battery

1.2 Accessories

Accessories Information				
AC Adapter	Brand Name	CASTLES TECHNOLOGY	Model Name	AU1360903n
	Power Rating	I/P: 100-240V ~ 2A 50-60Hz ; O/P: 9V⎓4A		
Li-ion Battery	Brand Name	CASTLES TECHNOLOGY	Model Name	AE424271P4HHR-2S
	Power Rating	7.4Vdc, 1060mAh		
Docking	Brand Name	Castles Technology Co., Ltd.	Model Name	VEGA5000 B

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

1.3 Support Equipment

Support Equipment - AC Conduction & Radiated Emission			
No.	**Equipment**	**Brand Name**	**Model Name**
1	Identity Badge	-	-

1.4 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

1.5 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 Condition		**Test Site No.**	**Test Engineer**	**Test Environment**	
AC Conduction		CO04-HY	Zeus	27°C / 46%	
RF Conducted		TH01-HY	Ian	24.2°C / 61%	
Radiated Emission		03CH03-HY	Allen	23°C / 50.3%	

1.6 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)**
NFC-Read/Write	55.78

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
Modulation Mode	**Test Channel Frequencies (MHz) – FX (Frequencies Abbreviations)**
NFC-Read/Write	13.56-(F1)

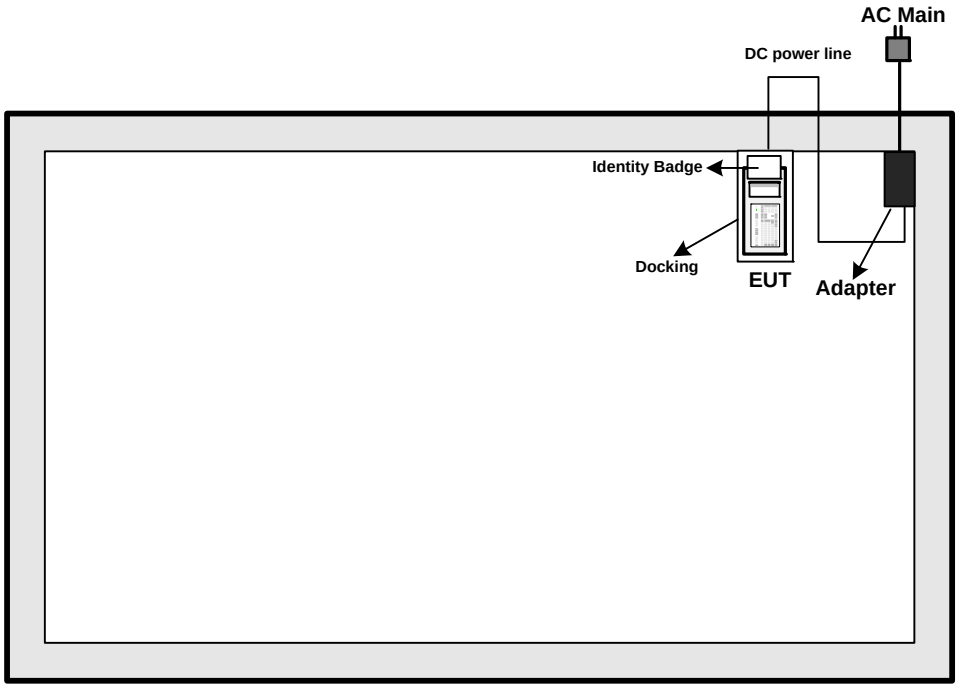
2.3 The Worst Case Measurement Configuration

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	AC Power

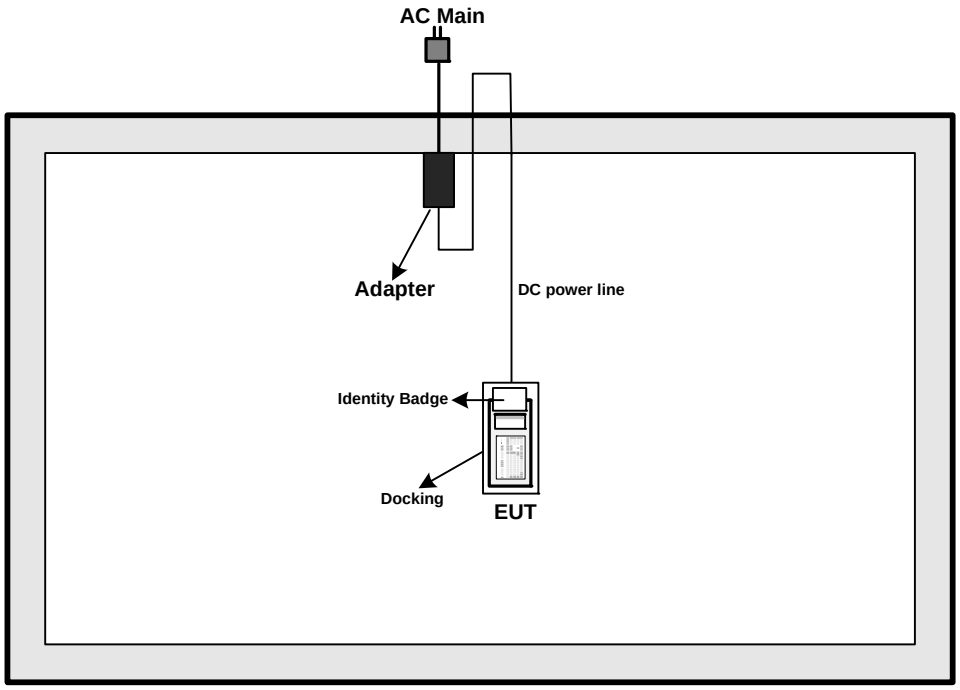
The Worst Case Mode for Following Conformance Tests			
Tests Item	Emission Bandwidth, Field Strength of Fundamental Emissions Spectrum Mask, Transmitter Radiated Unwanted Emissions Frequency Stability		
Test Condition	Radiated measurement		
User Position	☐ EUT will be placed in fixed position.		
	☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes.		
	☒ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed three orthogonal planes. The worst planes is Y.		
Operating Mode	Operating Mode Description		
1	AC Power & Transmitting		
Modulation Mode	NFC-Read/Write		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			

2.4 Test Setup Diagram

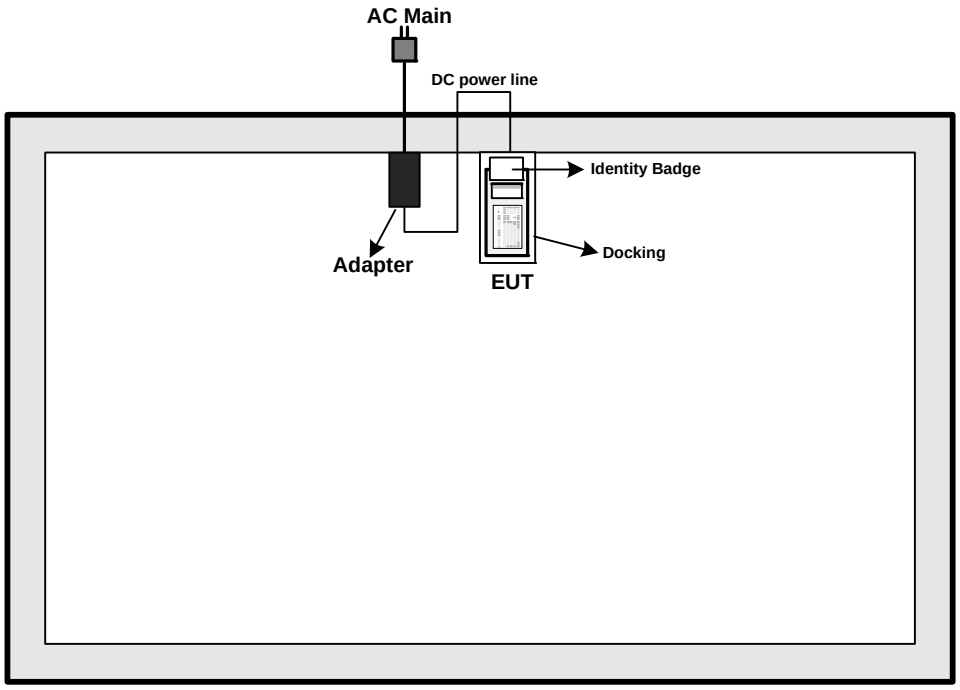
Test Setup Diagram - AC Line Conducted Emission Test



Test Setup Diagram - Radiated Below 30MHz Test



Test Setup Diagram - Radiated Above 30MHz 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

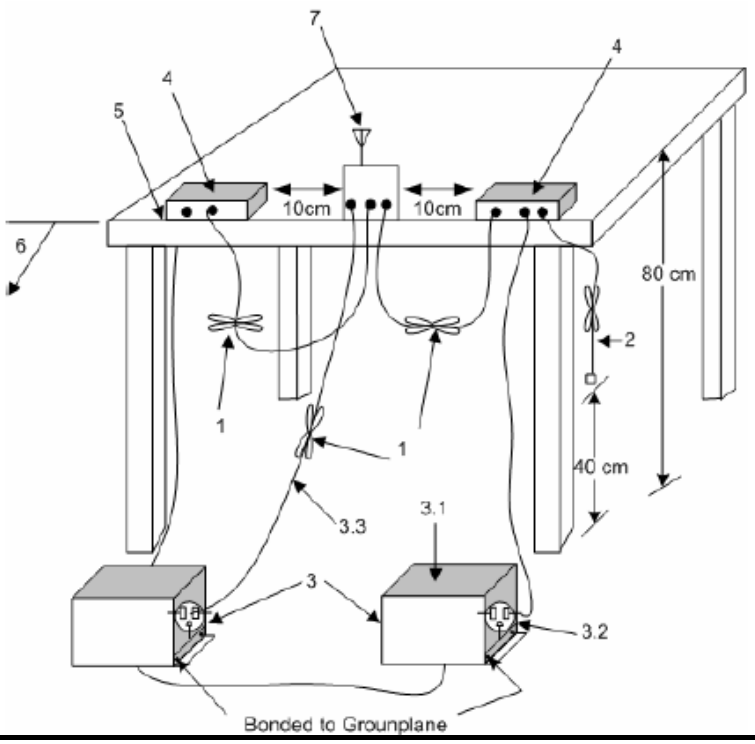
Refer a test equipment and calibration data table in this test report.

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.

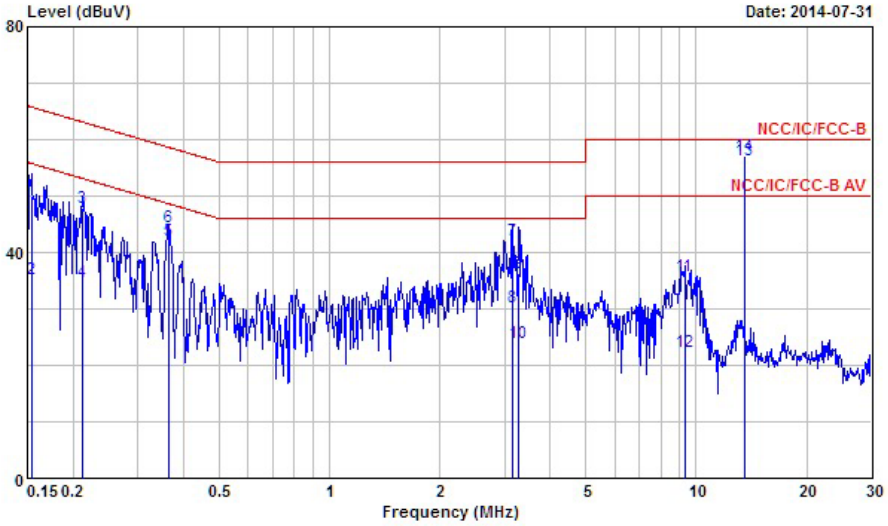
3.1.4 Test Setup

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	AC Power : NFC normal function with antenna		

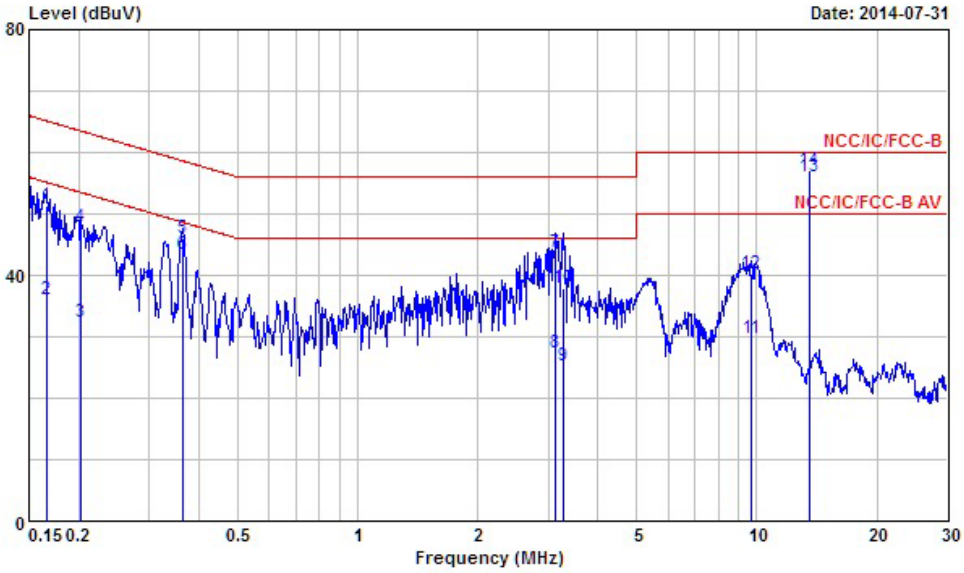


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1540270	50.02	-15.76	65.78	49.65	0.02	0.35	QP
2	0.1540270	35.37	-20.41	55.78	35.00	0.02	0.35	Average
3	0.2127940	47.83	-15.27	63.10	47.30	0.02	0.51	QP
4	0.2127940	34.68	-18.42	53.10	34.15	0.02	0.51	Average
5	0.3638820	42.03	-6.61	48.64	41.41	0.03	0.59	Average
6	0.3638820	44.44	-14.20	58.64	43.82	0.03	0.59	QP
7	3.160	42.19	-13.81	56.00	41.38	0.08	0.73	QP
8	3.160	30.30	-15.70	46.00	29.49	0.08	0.73	Average
9	3.280	36.35	-19.65	56.00	35.54	0.08	0.73	QP
10	3.280	23.97	-22.03	46.00	23.16	0.08	0.73	Average
11	9.300	35.72	-24.28	60.00	34.75	0.18	0.79	QP
12	9.300	22.41	-27.59	50.00	21.44	0.18	0.79	Average
13	13.560	56.26	-3.74	60.00	55.21	0.25	0.80	QP
14 @	13.560	57.15	7.15	50.00	56.10	0.25	0.80	Average

→ This frequency is NFC signal.

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.)

AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	AC Power : NFC normal function with antenna		

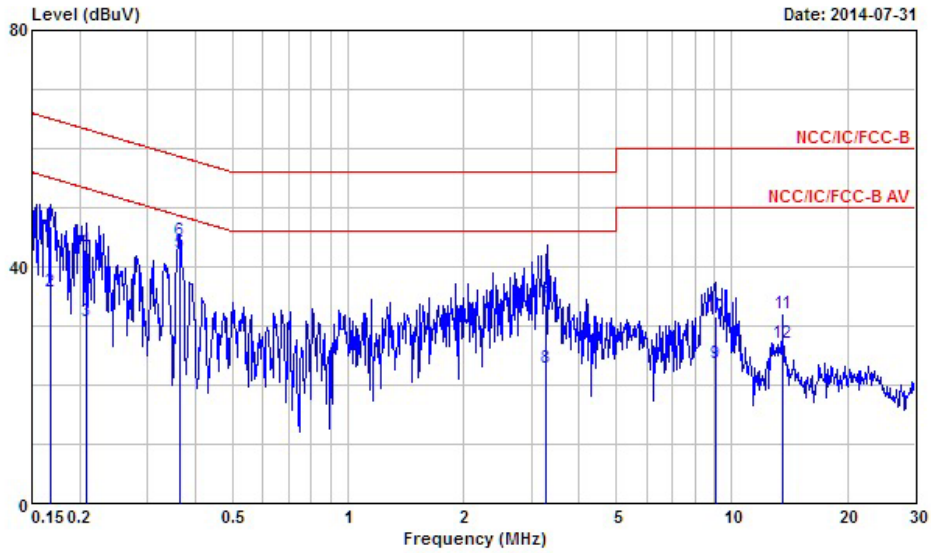


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1667680	51.36	-13.76	65.12	50.93	0.03	0.40	QP
2	0.1667680	36.16	-18.96	55.12	35.73	0.03	0.40	Average
3	0.2018130	32.32	-21.22	53.54	31.79	0.03	0.50	Average
4	0.2018130	47.91	-15.63	63.54	47.38	0.03	0.50	QP
5	0.3653120	46.12	-12.49	58.61	45.50	0.03	0.59	QP
6	0.3653120	43.40	-5.21	48.61	42.78	0.03	0.59	Average
7	3.140	43.62	-12.38	56.00	42.80	0.09	0.73	QP
8	3.140	27.40	-18.60	46.00	26.58	0.09	0.73	Average
9	3.280	25.27	-20.73	46.00	24.45	0.09	0.73	Average
10	3.280	37.92	-18.08	56.00	37.10	0.09	0.73	QP
11	9.710	29.86	-20.14	50.00	28.87	0.19	0.80	Average
12	9.710	40.27	-19.73	60.00	39.28	0.19	0.80	QP
13	13.560	56.04	-3.96	60.00	55.00	0.24	0.80	QP
14 @	13.560	57.04	7.04	50.00	56.00	0.24	0.80	Average

→This frequency is NFC signal.

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.)

AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	AC Power : the NFC is normal function with antenna terminal		

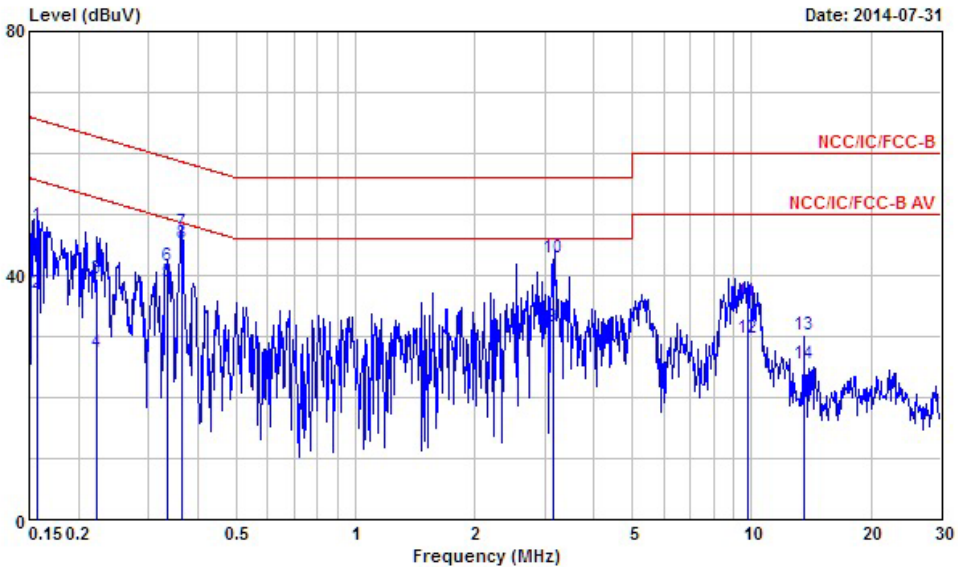


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1676540	46.95	-18.13	65.08	46.53	0.02	0.40	QP
2	0.1676540	35.76	-19.32	55.08	35.34	0.02	0.40	Average
3	0.2072310	30.72	-22.60	53.32	30.19	0.02	0.51	Average
4	0.2072310	42.92	-20.40	63.32	42.39	0.02	0.51	QP
5	0.3633820	42.40	-6.25	48.65	41.78	0.03	0.59	Average
6	0.3633820	44.60	-14.05	58.65	43.98	0.03	0.59	QP
7	3.290	33.81	-22.19	56.00	33.00	0.08	0.73	QP
8	3.290	23.00	-23.00	46.00	22.19	0.08	0.73	Average
9	9.060	23.67	-26.33	50.00	22.70	0.18	0.79	Average
10	9.060	31.70	-28.30	60.00	30.73	0.18	0.79	QP
11	13.560	32.12	-27.88	60.00	31.07	0.25	0.80	QP
12	13.560	27.15	-22.85	50.00	26.10	0.25	0.80	Average

→This frequency is NFC signal.

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.)

AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	AC Power : the NFC is normal function with antenna terminal		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1564950	48.07	-17.58	65.65	47.68	0.03	0.36	QP
2	0.1564950	37.15	-18.50	55.65	36.76	0.03	0.36	Average
3	0.2220070	39.43	-23.31	62.74	38.88	0.03	0.52	QP
4	0.2220070	27.30	-25.44	52.74	26.75	0.03	0.52	Average
5	0.3356200	38.82	-10.49	49.31	38.22	0.03	0.57	Average
6	0.3356200	41.63	-17.68	59.31	41.03	0.03	0.57	QP
7	0.3633820	47.20	-11.45	58.65	46.58	0.03	0.59	QP
8	@0.3633820	45.31	-3.34	48.65	44.69	0.03	0.59	Average
9	3.170	31.68	-14.32	46.00	30.86	0.09	0.73	Average
10	3.170	42.78	-13.22	56.00	41.96	0.09	0.73	QP
11	9.760	35.69	-24.31	60.00	34.70	0.19	0.80	QP
12	9.760	29.62	-20.38	50.00	28.63	0.19	0.80	Average
13	13.560	30.25	-29.75	60.00	29.21	0.24	0.80	QP
14	13.560	25.50	-24.50	50.00	24.46	0.24	0.80	Average

→This frequency is NFC signal.

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.)

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

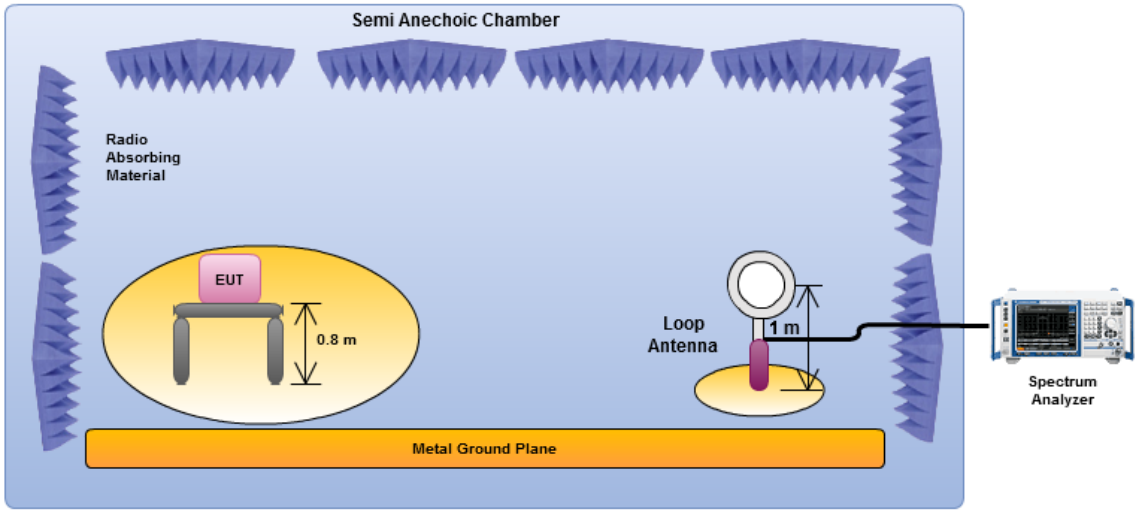
Refer a test equipment and calibration data table in this test report.

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

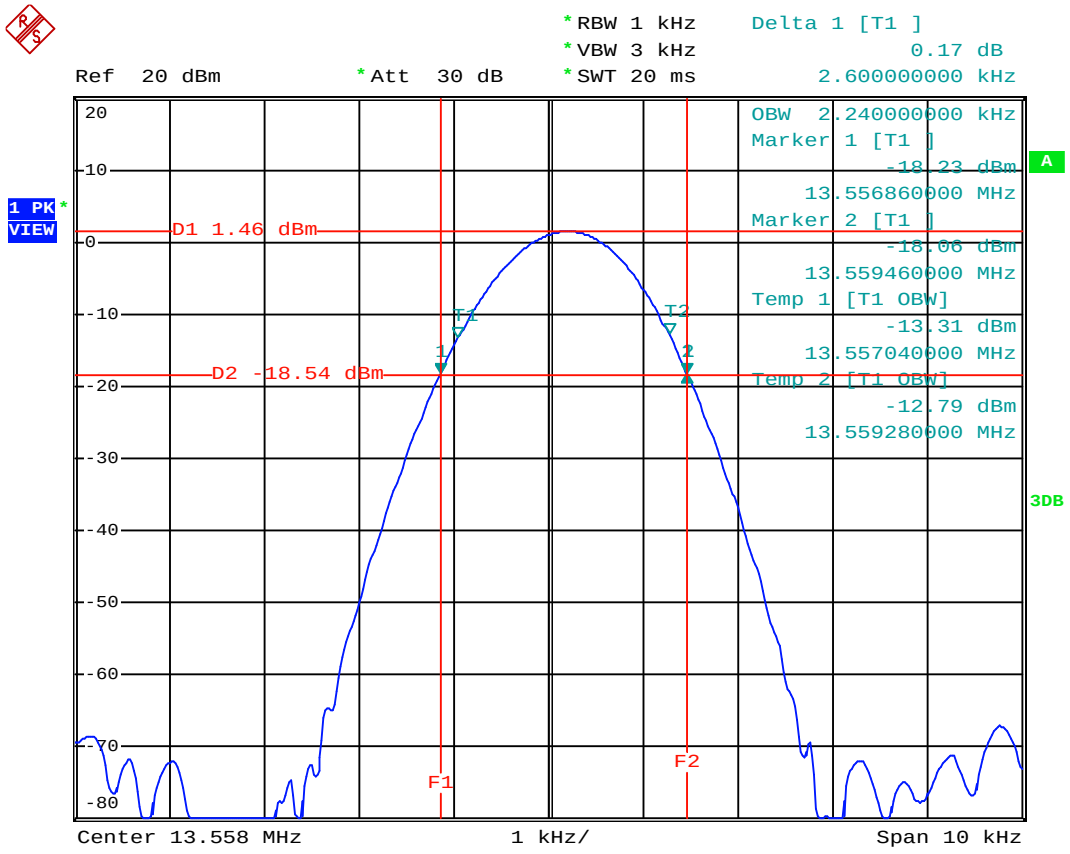
Emission Bandwidth



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)
NFC-Read/Write	13.56	2.60	13.55686	13.55946	2.24
Limit		**N/A**	**13.553**	**13.567**	**N/A**
Result		**Complied**			

Emission Bandwidth Plot



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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

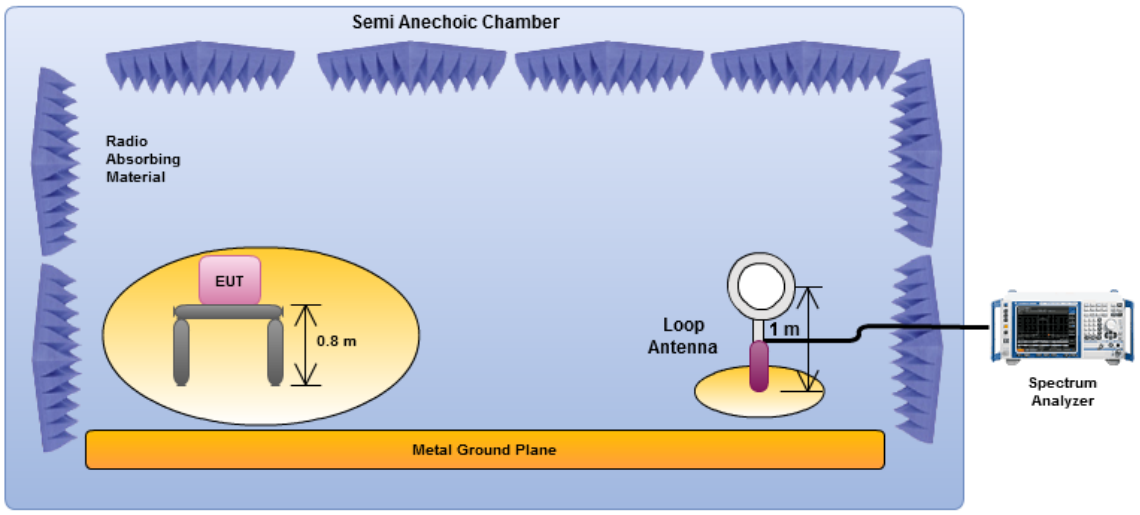
Refer a test equipment and calibration data table in this test report.

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

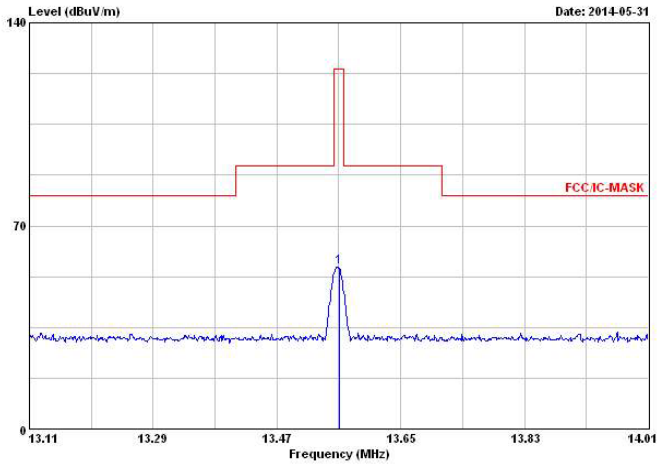
Field Strength of Fundamental Emissions and Spectrum Mask



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

Field Strength of Fundamental Emissions Result					
Modulation Mode	**Frequency (MHz)**	**Fundamental (dBuV/m)@3m**	**Polarization**	**Margin (dB)**	**Limit (dBuV/m)@3m**
NFC-Read/Write	13.56	55.78	H	68.22	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

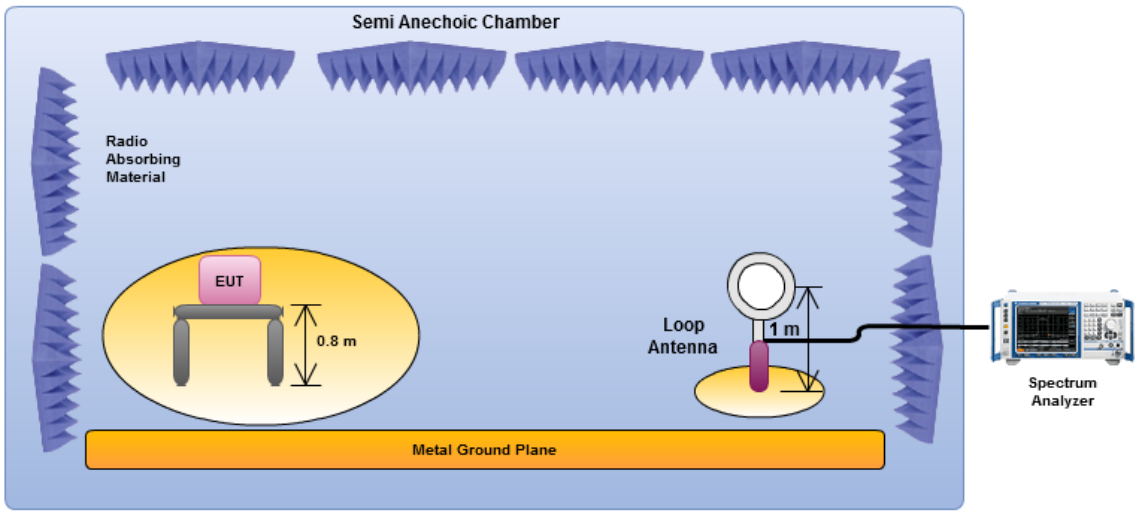
Refer a test equipment and calibration data table in this test report.

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.

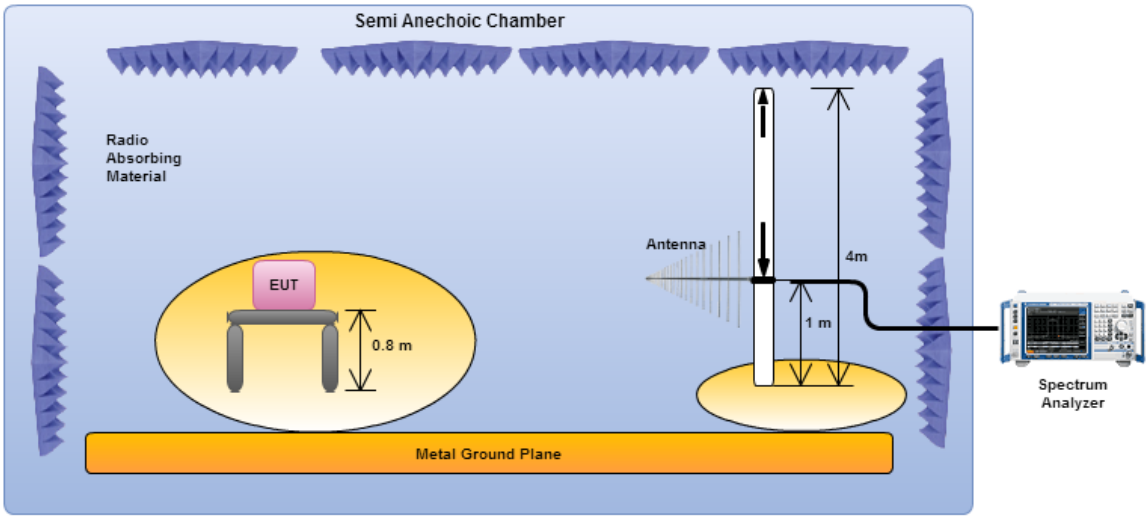
3.4.4 Test Setup

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.

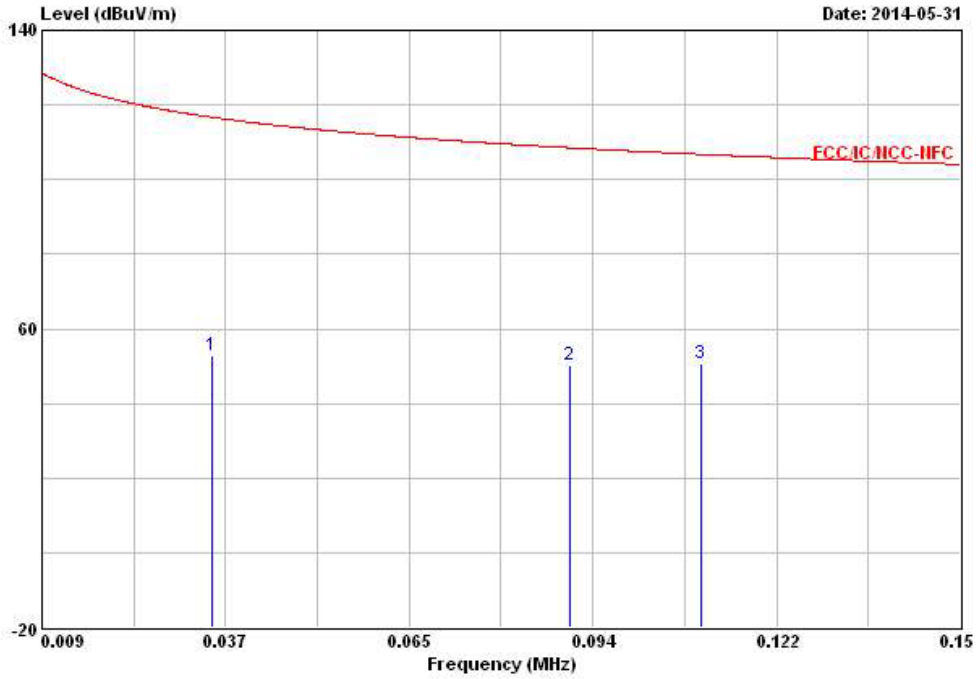
Transmitter Radiated Bandedge Emissions



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)

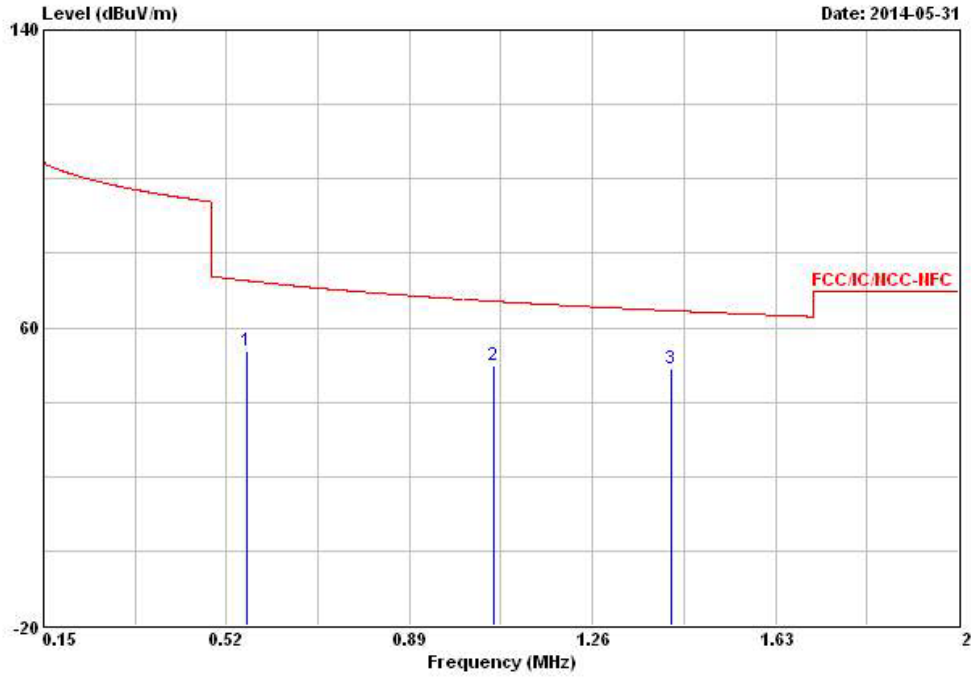
Transmitter Radiated Unwanted Emissions (9 kHz –150 kHz)			
Modulation Mode	NFC-Read/Write	**Polarization**	H
Operating Mode	1	**Operating Function**	AC Power & Transmitting



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	@0.0352260	52.89	-63.78	116.67	32.49	20.30	0.10	0.00	Peak	---	---
2	@0.0900750	50.38	-58.14	108.52	30.18	20.10	0.10	0.00	Peak	---	---
3	@0.1102380	50.86	-55.90	106.76	30.66	20.10	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.

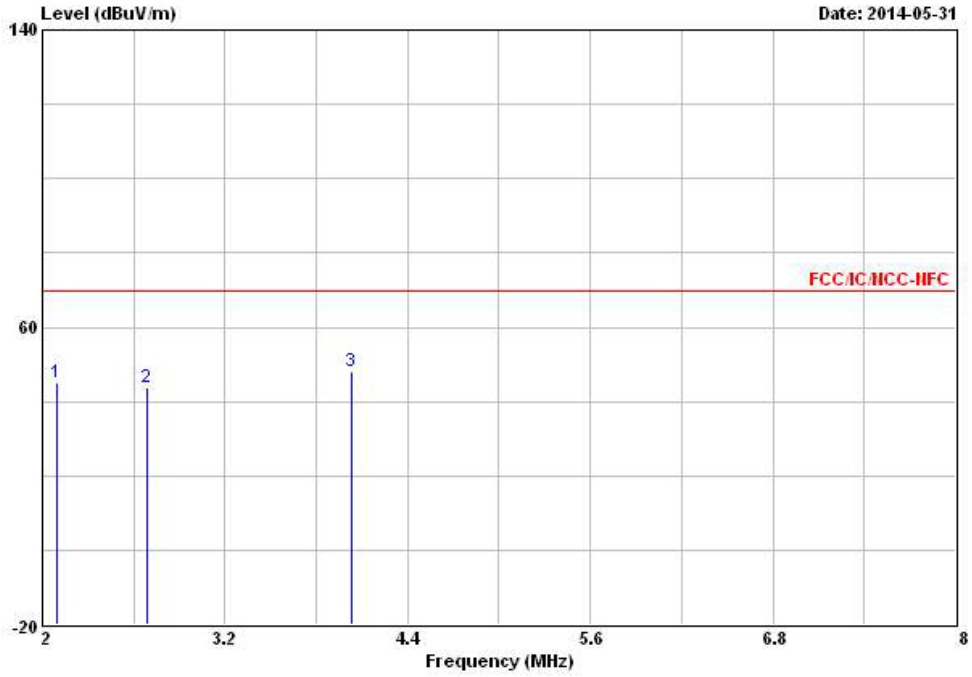
Transmitter Radiated Unwanted Emissions (150 kHz – 2 MHz)			
Modulation Mode	NFC-Read/Write	**Polarization**	H
Operating Mode	1	**Operating Function**	AC Power & Transmitting



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	@0.5625500	53.89	-18.72	72.61	33.72	20.07	0.10	0.00	Peak	---	---
2	@ 1.060	49.95	-17.15	67.10	29.94	19.91	0.10	0.00	Peak	---	---
3	@ 1.420	48.93	-15.63	64.56	28.85	19.98	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.

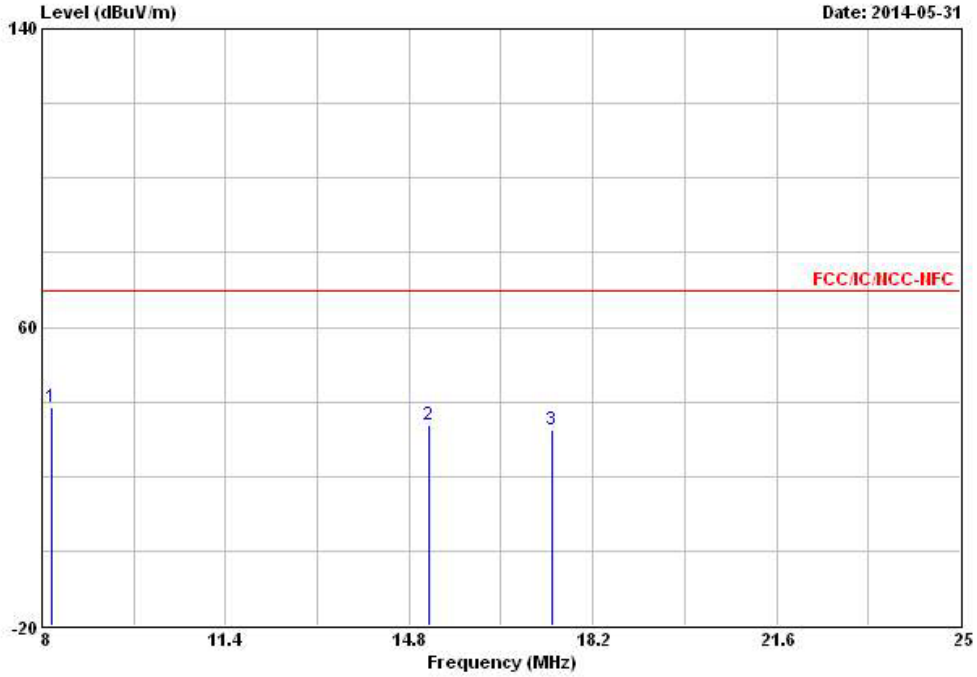
Transmitter Radiated Unwanted Emissions (2 MHz – 8 MHz)			
Modulation Mode	NFC-Read/Write	**Polarization**	H
Operating Mode	1	**Operating Function**	AC Power & Transmitting



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	2.090	45.05	-24.49	69.54	24.85	20.00	0.20	0.00	Peak	---	---
2 @	2.690	43.87	-25.67	69.54	23.61	20.00	0.26	0.00	Peak	---	---
3 @	4.030	47.89	-21.65	69.54	27.58	20.00	0.31	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.

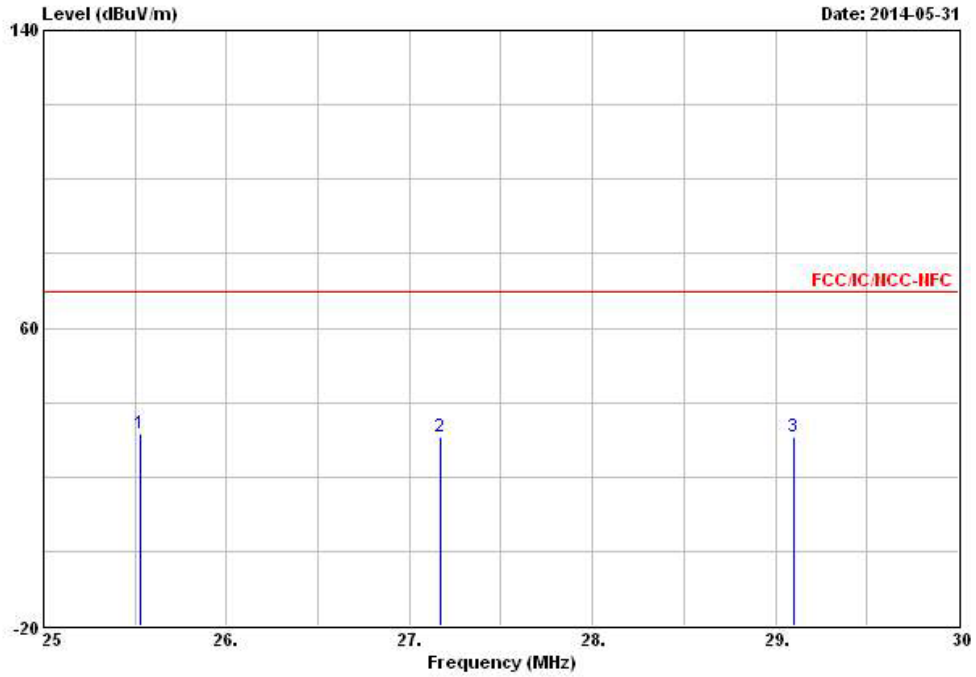
Transmitter Radiated Unwanted Emissions (8 MHz – 25 MHz)			
Modulation Mode	NFC-Read/Write	**Polarization**	H
Operating Mode	1	**Operating Function**	AC Power & Transmitting



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	8.170	38.60	-30.94	69.54	18.06	20.10	0.44	0.00	Peak	---	---
2 @	15.170	33.98	-35.56	69.54	13.27	20.10	0.61	0.00	Peak	---	---
3 @	17.440	32.28	-37.26	69.54	11.48	20.15	0.65	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	NFC-Read/Write	**Polarization**	H
Operating Mode	1	**Operating Function**	AC Power & Transmitting

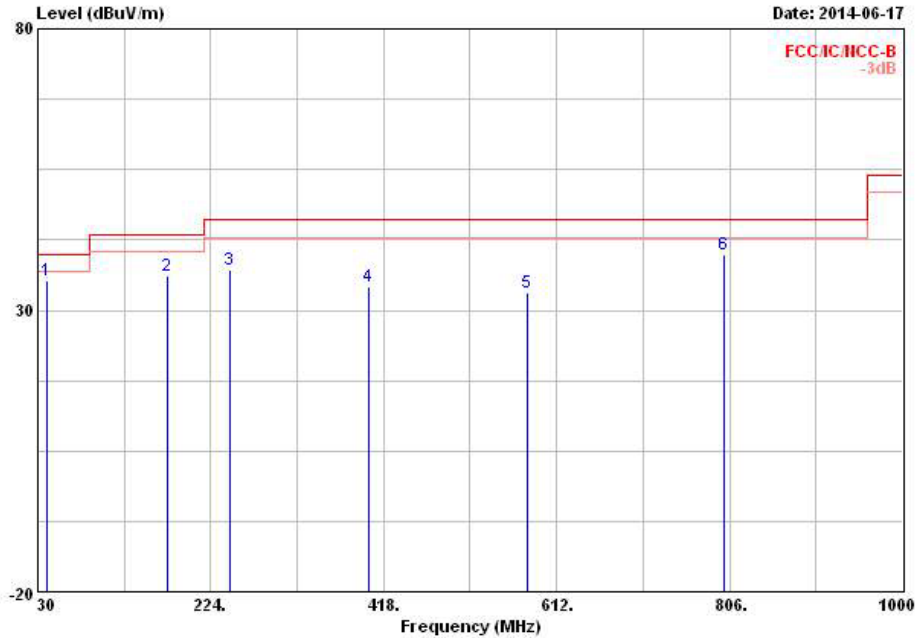


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	25.530	31.56	-37.98	69.54	10.66	20.10	0.80	0.00	Peak	---	---
2 @	27.170	30.76	-38.78	69.54	9.85	20.10	0.81	0.00	Peak	---	---
3 @	29.100	30.70	-38.84	69.54	9.78	20.10	0.82	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)

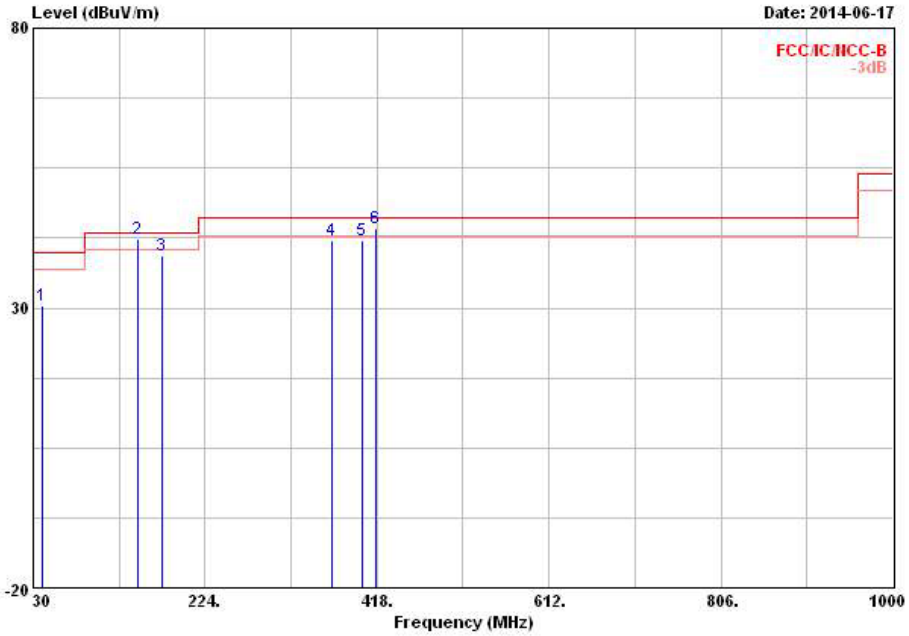
Transmitter Radiated Unwanted Emissions			
Modulation Mode	NFC-Read/Write	**Polarization**	V
Operating Mode	1	**Operating Function**	AC Power & Transmitting



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	39.700	35.18	-4.82	40.00	48.38	13.08	1.02	27.30	Peak	---	---
2 @	175.500	36.06	-7.44	43.50	51.45	9.58	2.17	27.14	Peak	---	---
3 @	246.310	37.06	-8.94	46.00	49.03	12.37	2.59	26.93	Peak	---	---
4 @	400.540	34.32	-11.68	46.00	42.60	15.70	3.34	27.32	Peak	---	---
5 @	579.990	33.13	-12.87	46.00	38.70	18.17	4.06	27.80	Peak	---	---
6 @	800.180	39.94	-6.06	46.00	43.01	19.64	4.92	27.63	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			
Modulation Mode	NFC-Read/Write	**Polarization**	H
Operating Mode	1	**Operating Function**	AC Power & Transmitting



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	39.700	30.28	-9.72	40.00	43.48	13.08	1.02	27.30	Peak	---	---
2 @	148.340	42.46	-1.04	43.50	56.93	10.68	2.01	27.16	QP	---	---
3 @	175.500	39.26	-4.24	43.50	54.65	9.58	2.17	27.14	Peak	---	---
4 @	366.590	41.96	-4.04	46.00	51.15	14.72	3.19	27.10	Peak	---	---
5 @	400.540	42.14	-3.86	46.00	50.42	15.70	3.34	27.32	Peak	---	---
6 @	416.060	44.32	-1.68	46.00	51.96	16.39	3.39	27.42	QP	---	---

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

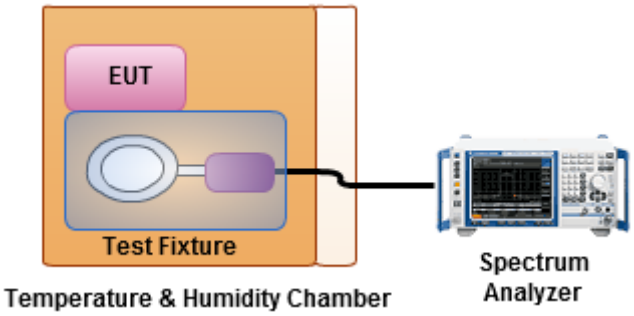
Refer a test equipment and calibration data table in this test report.

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: May 28, 2014		Frequency Stability Result
Power Level	**1**	**Frequency Stability Max. Deviation Limit < 100 ppm**
Condition	**Freq. (MHz)**	**10 min**
$T_{20°C}$Vmax	13.558203	14.97
$T_{20°C}$Vmin	13.558203	14.97
$T_{50°C}$Vnom	13.558275	20.28
$T_{40°C}$Vnom	13.558217	16.01
$T_{30°C}$Vnom	13.558188	13.87
$T_{20°C}$Vnom	13.558203	14.97
$T_{10°C}$Vnom	13.558232	17.11
$T_{0°C}$Vnom	13.558246	18.14
$T_{-10°C}$Vnom	13.558260	19.18
$T_{-20°C}$Vnom	13.558275	20.28
Result		**Complied**

Note 1: Measure at 85 % [Vmin] and 115 % [Vmax] of the nominal voltage [Vnom]. The nominal voltage refer test report clause 1.1.5 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	Mar. 26, 2014	AC Conduction
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 21, 2014	AC Conduction
RF Cable-CON	HUBER+SUHNER	RG213/U	0-7611832020001	9kHz ~ 30MHz	Oct. 30, 2013	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	101013	9KHz~40GHz	Jan. 25, 2014	RF Conducted
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Nov. 20, 2013	RF Conducted
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 21, 2013	RF Conducted

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Nov. 30, 2013	Radiated Emission
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 05, 2014	Radiated Emission
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Mar. 27, 2014	Radiated Emission
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 21, 2013	Radiated Emission
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 16, 2013	Radiated Emission
Turn Table	EM Electronics	EM Electronics	060615	0 ~ 360 degree	N/A	Radiated Emission
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiated Emission

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	TESEQ	HLA 6120	31244	9kHz ~ 30MHz	Dec. 02, 2012	Radiated Emission

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