

FCC Test Report

Equipment : B-pillar Endpoint
Brand Name : Tesla
Model No. : 1089773E
FCC ID : 2AEIM-1089773E
Standard : 47 CFR FCC Part 15.225
Operating Band : 13.553 – 13.567 MHz
Applicant / Manufacturer : Tesla Motors, Inc.
3500 Deer Creek Road Palo Alto, California
US 94304 United States Of America

The product sample received on Feb. 08, 2018 and completely tested on Feb. 24, 2018. 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.

Reviewed by:


Phoenix Chen / Assistant Manager



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APPENDIX A. TEST PHOTOS

PHOTOGRAPHS OF EUT V01

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	15.215(c)	Emission Bandwidth	20dB Bandwidth 2.62 [kHz] F_L : 13.558533 MHz F_H : 13.560767 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: 77.17 dBuV/m at 3m Device complies with spectrum mask – refer to test data	124 dBuV/m at 3m	Complied
3.4	15.225(d)	Transmitter Radiated Unwanted Emissions	[dBuV/m at 3m]: 270.56MHz 42.94 (Margin 3.06dB) - QP	FCC 15.209	Complied
3.5	15.225(e)	Frequency Stability	-32.82 ppm	$\pm 0.01\%$ (100ppm)	Complied

Revision History

[illegible]

1 General Description

1.1 Information

1.1.1 RF General Information

NFC Chip	Brand Name	Model Name
	ST25R3915	1089773

RF General Information				
Frequency Range	Modulation	Ch. Frequency (MHz)	Channel Number	Field Strength (dBuV/m)
13.553 – 13.567 MHz	NFC-A (ISO 14443-3A)	13.56	1	77.17
Note 1: Field strength performed peak level at 3m.				

1.1.2 Antenna Information

Antenna Category	
<input checked="" type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	Temporary RF connector provided
<input checked="" type="checkbox"/>	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.
<input type="checkbox"/>	External antenna (dedicated antennas)

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

1.1.3 Type of EUT

Type of EUT	
<input checked="" type="checkbox"/>	Stand-alone
<input type="checkbox"/>	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.:
<input type="checkbox"/>	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.:
<input type="checkbox"/>	Other:

1.1.4 Test Signal Duty Cycle

Duty Cycle Operation Restriction			
The transmitter is used for		The transmitter is operated	
<input checked="" type="checkbox"/>	Inductive applications	<input checked="" type="checkbox"/>	Automatically triggered
<input type="checkbox"/>	Duty cycle fixed mode	<input checked="" type="checkbox"/>	Duty cycle random mode
Duty cycle mode - NFC-A (ISO 14443-3A)			
Declare transmitter duty cycle / 1 hour =		100%	
Duty cycle Limit			
<input type="checkbox"/>	Class 1 - < 0.1 %	<input type="checkbox"/>	Class 2 - < 1.0 %
<input type="checkbox"/>	Class 3 - < 10 %	<input checked="" type="checkbox"/>	Class 4 - Up to 100 %

1.1.5 EUT Operational Condition

Supply Voltage	<input type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC	
Type of DC Source	<input checked="" type="checkbox"/> Internal DC supply	<input type="checkbox"/> External AC adapter	<input type="checkbox"/> Battery
Test Voltage	<input checked="" type="checkbox"/> Vnom (12 V)	<input checked="" type="checkbox"/> Vmax (13.2 V)	<input checked="" type="checkbox"/> Vmin (10.8 V)
Test Climatic	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (85°C)	<input checked="" type="checkbox"/> Tmin (-40°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
- ♦ KDB 174176 D01 v01r01

1.3 Testing Location Information

Testing Location				
<input checked="" type="checkbox"/>	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 Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH06-HY	Tim	22.5°C / 63%	23/Feb/2018
Radiated	03CH03-HY	Jeff	23.8°C / 65%	24/Feb/2018

Test site Designation No. TW1190 with FCC.

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

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

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration



Modulation Used for Conformance Testing	
Modulation Mode	Field Strength (dBuV/m at 3 m)
NFC-Read/Write	77.17

2.2 Test Channel Frequencies Configuration

Modulation Mode	Test Channel Frequencies (MHz)
NFC-Read/Write	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	<input type="checkbox"/> EUT will be placed in fixed position.	
	<input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions.	
	<input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.	
Pretest Mode	<input checked="" type="checkbox"/> 1. EUT Built in NFC A type	
Operating Mode < 1GHz	<input checked="" type="checkbox"/> 1. DC Power Supply	
Modulation Mode	NFC-Read/Write	
Orthogonal Planes of EUT	Y Plane	Z Plane
		
Worst Planes of EUT	V	

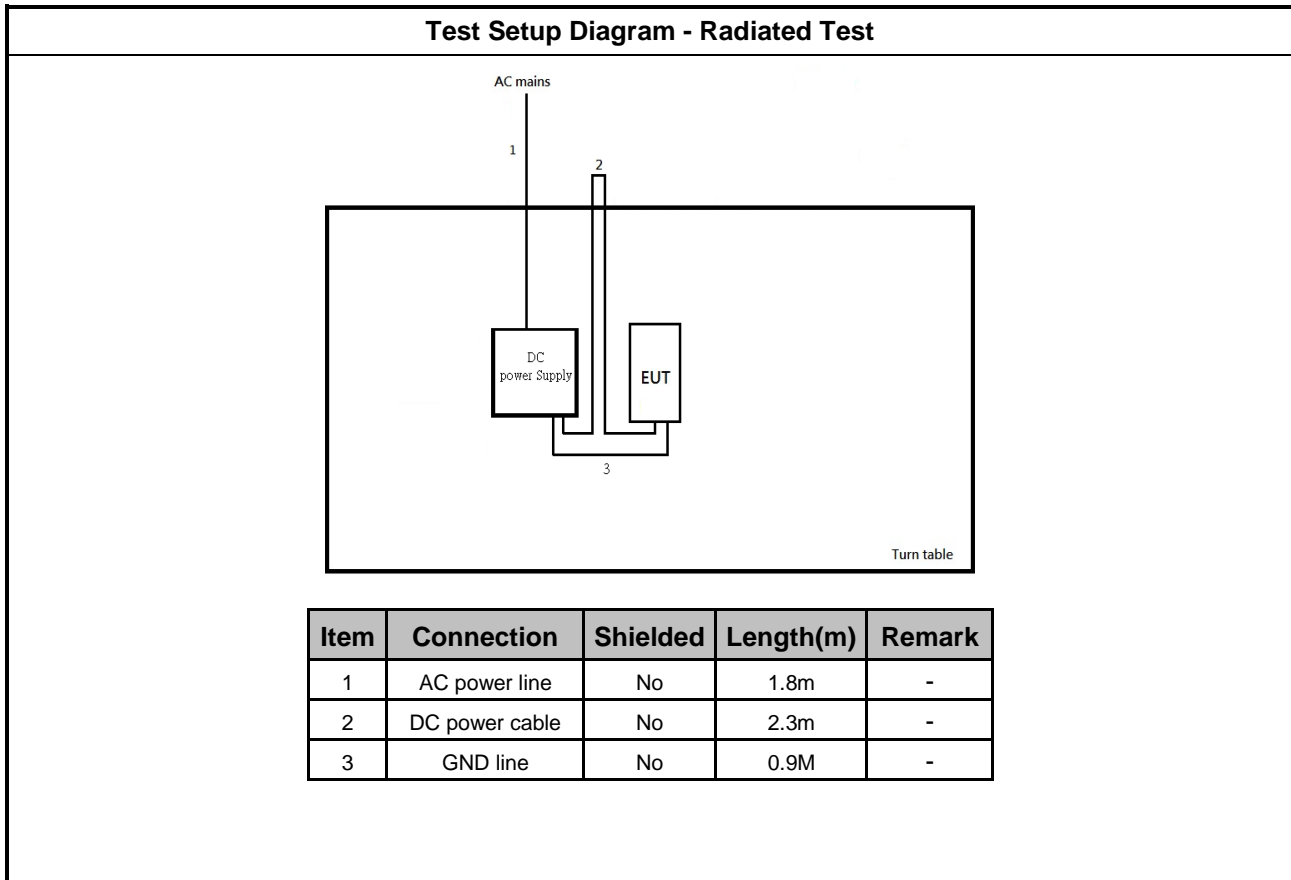
2.4 Support Equipment

Support Equipment - Radiated			
No.	Equipment	Brand Name	Model Name
1	DC Source	GW	GPS-3030DD

Support Equipment- RF Conducted			
No.	Equipment	Brand Name	Model Name
1	Notebook	-	-
2	DC Source	GW	GPS-3030DD

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

2.5 Test Setup Diagram



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.

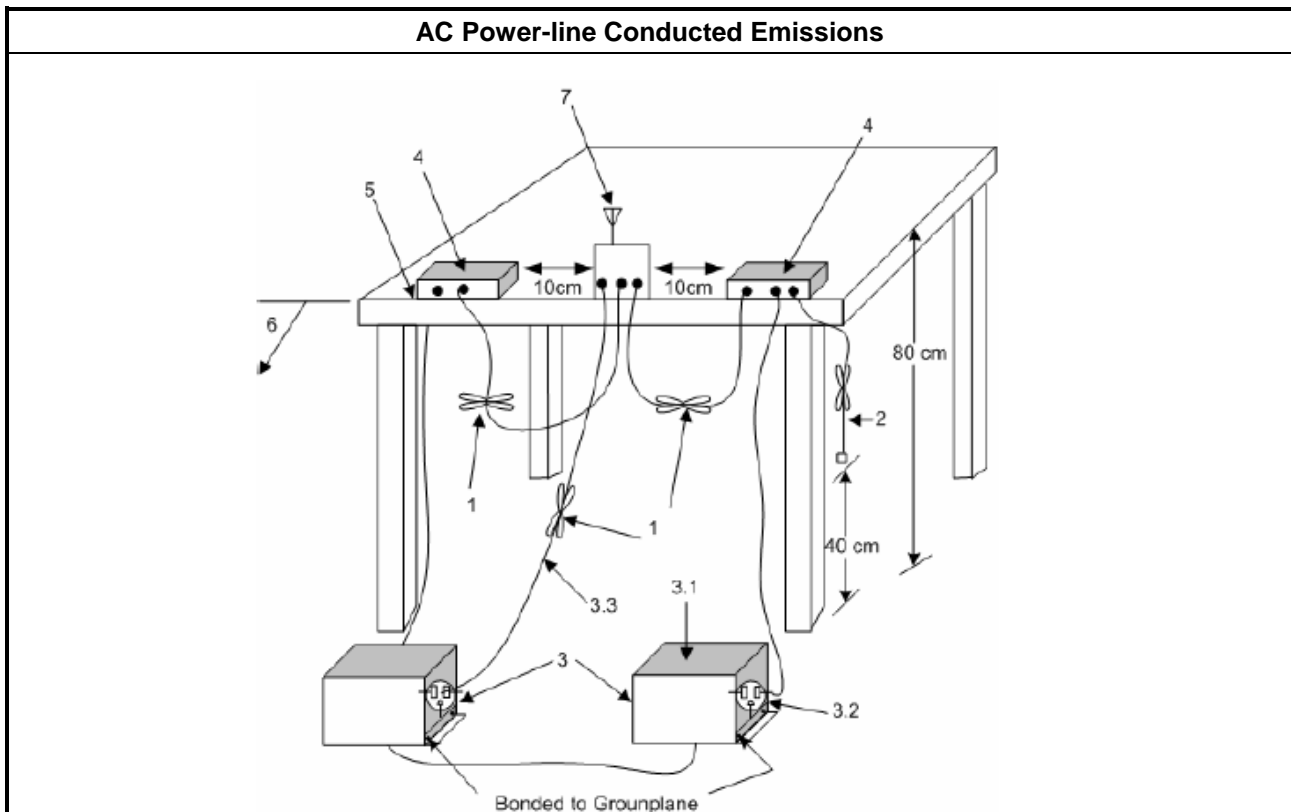
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.
<input checked="" type="checkbox"/>	If AC conducted emissions fall in operating band, then following below test method confirm final result.
<input type="checkbox"/>	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.
<input checked="" type="checkbox"/>	For a device with a permanent antenna operating at or below 30 MHz, accept measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) Perform the AC line conducted tests with the permanent antenna to determine compliance with the FCC 15.207 limits outside the transmitter's fundamental emission band; (2) Retest with a dummy load in lieu of the permanent antenna to determine compliance with the FCC 15.207 limits within the transmitter's fundamental emission band.

3.1.4 Test Setup





3.1.5 Test Result of AC Power-line Conducted Emissions

Please refer to FCC 15.207 which states, "Measurements to demonstrate compliance with the conducted limits are not required for devices 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	
<input checked="" type="checkbox"/>	Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (13.553 – 13.567 MHz).

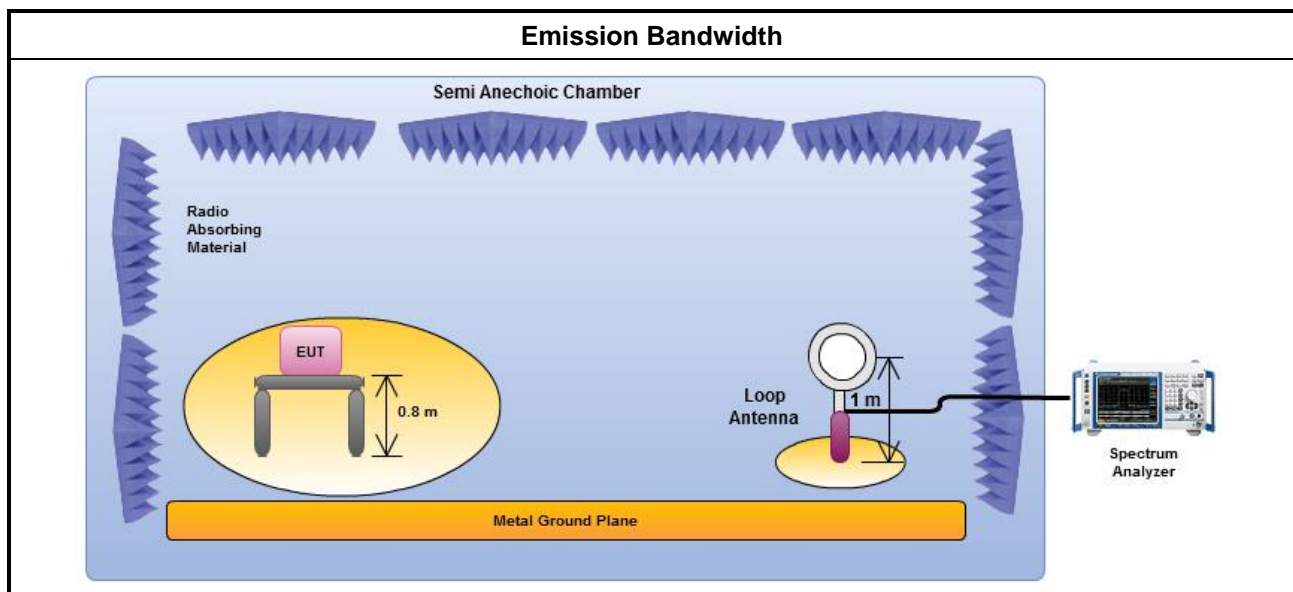
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

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

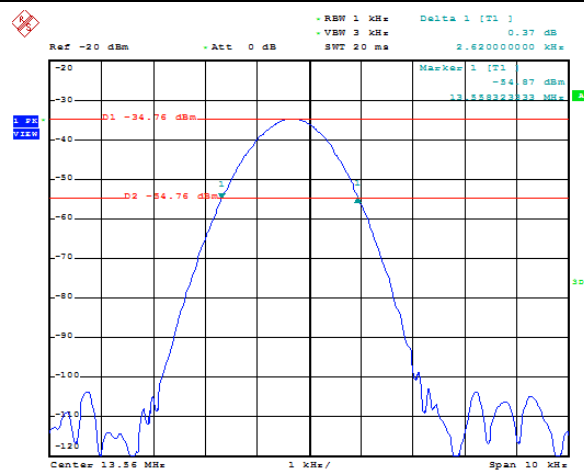
3.2.4 Test Setup



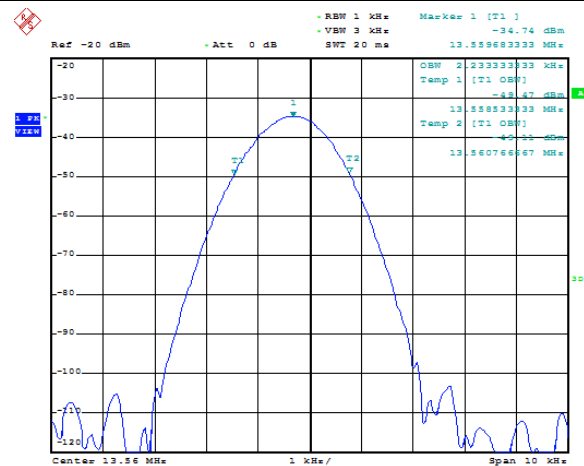
3.2.5 Test Result of Emission Bandwidth

Occupied Channel Bandwidth Result					
Modulation Mode	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	F _L at 20dB BW (MHz)	F _H at 20dB BW (MHz)
NFC-Read/Write	13.56	2.62000	2.23333	13.558533	13.560767
Limit		N/A	N/A	13.553	13.567
Result		Complied			

Emission Bandwidth Plot – 20db



Emission Bandwidth Plot – 99%



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 For FCC					
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 For FCC					
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

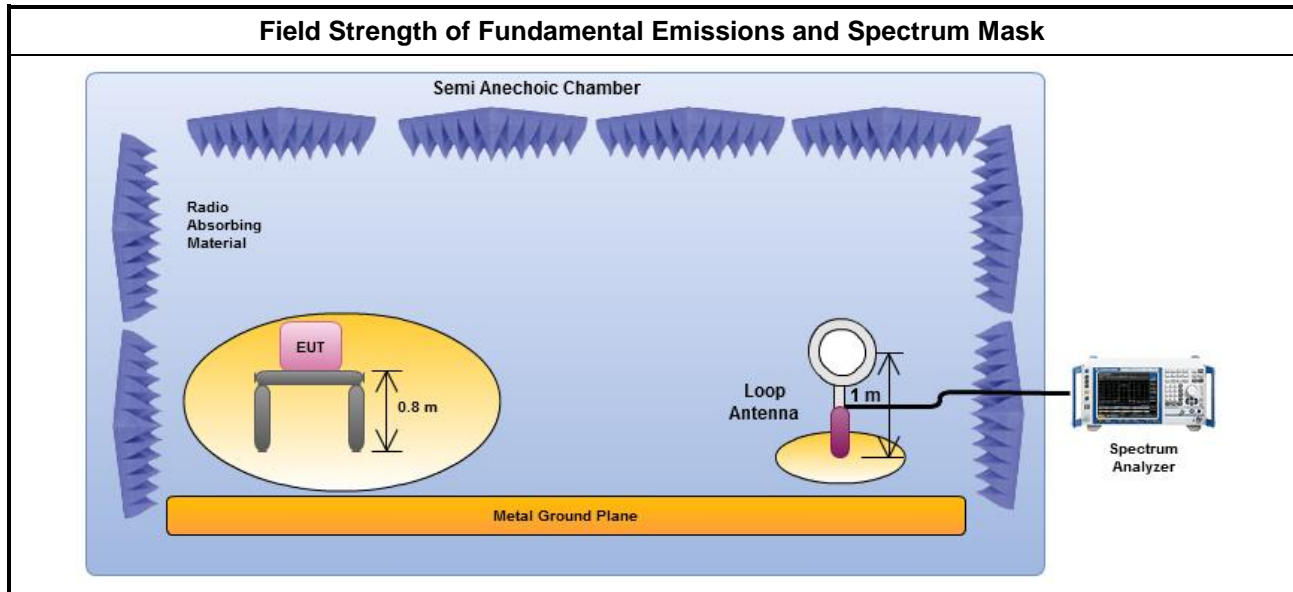
3.3.2 Measuring Instruments

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

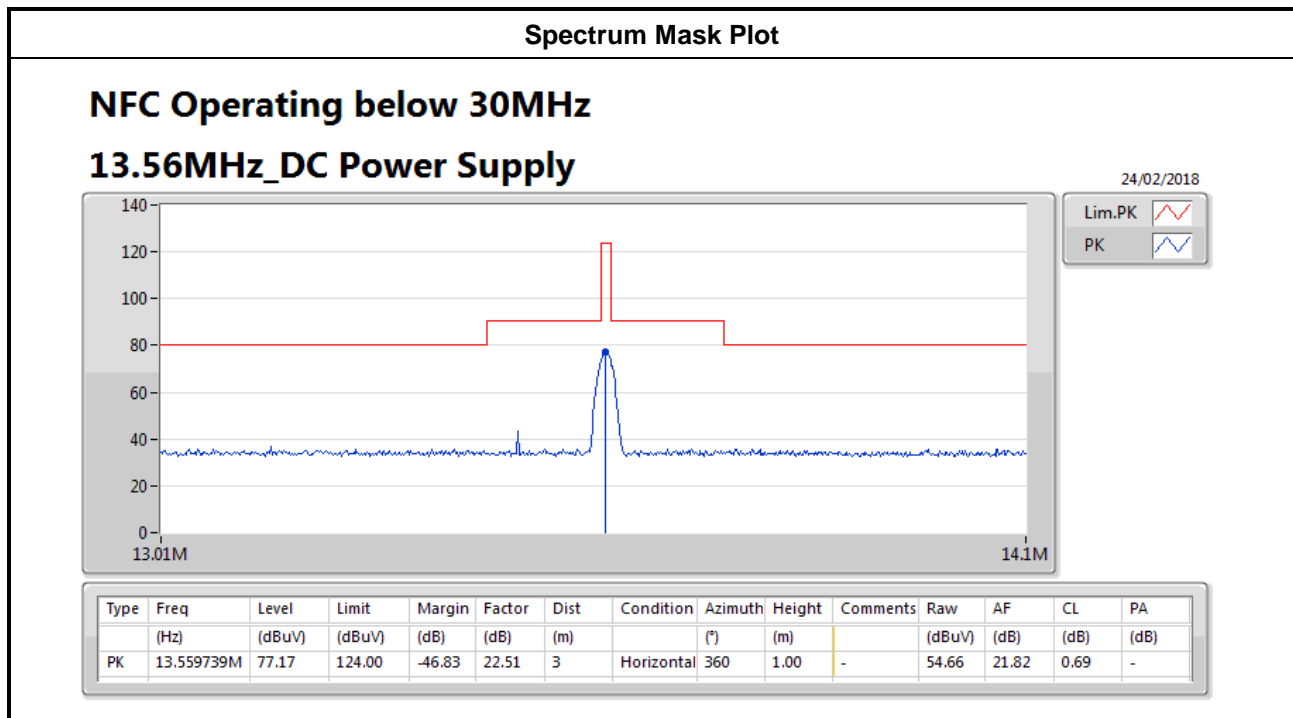
3.3.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/>	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.
<input type="checkbox"/>	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.
<input checked="" type="checkbox"/>	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
<input checked="" type="checkbox"/>	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.

3.3.4 Test Setup



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



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

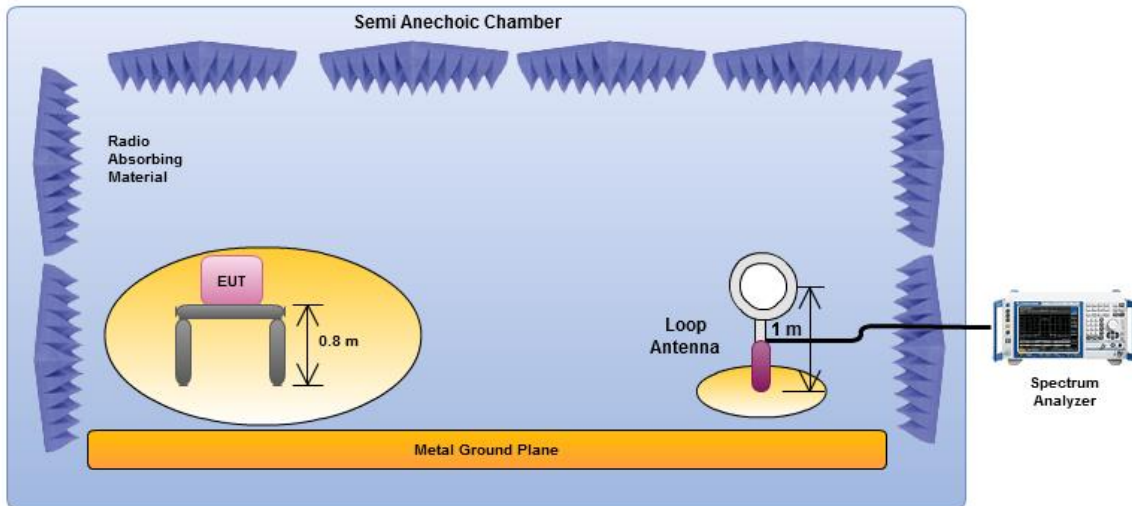
Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/>	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.
<input type="checkbox"/>	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.
<input checked="" type="checkbox"/>	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
<input checked="" type="checkbox"/>	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.
<input checked="" type="checkbox"/>	The any unwanted emissions level shall not exceed the fundamental emission level.
<input checked="" type="checkbox"/>	All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

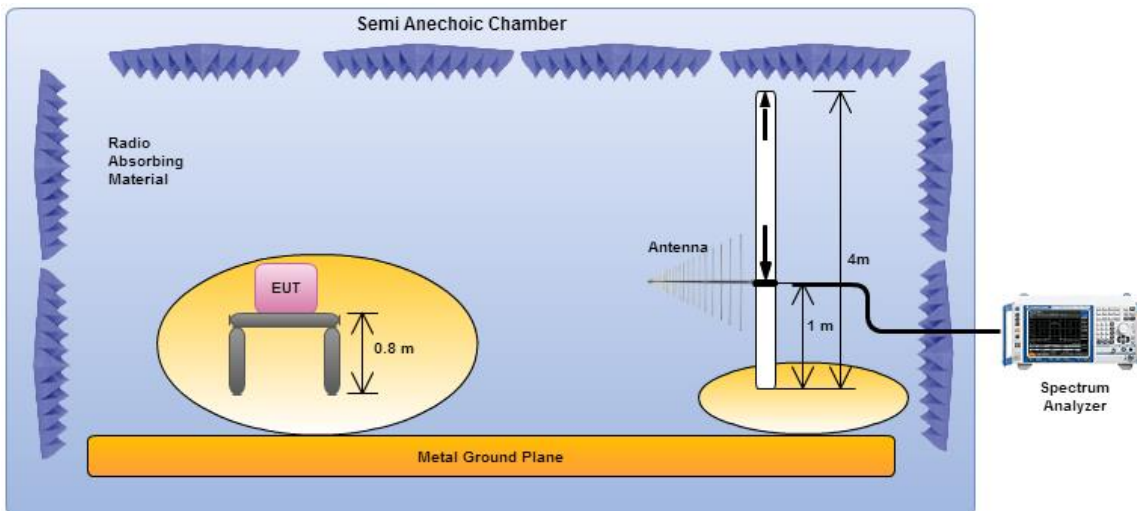
3.4.4 Test Setup

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)****Summary**

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
13.553-13.567MHz	-	-	-	-	-	-	-	-	-	-	-	-
NFC	Pass	PK	4.8066M	43.58	69.50	-25.92	21.10	3	Horizontal	0	1.00	-

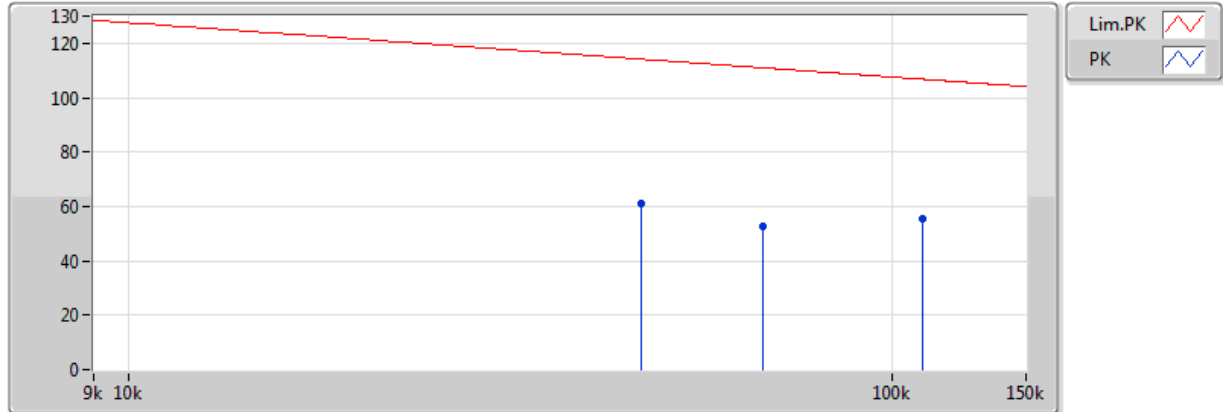
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_DC Power Supply	Pass	PK	47.07k	61.00	114.13	-53.13	21.29	3	Horizontal	360	1.00	-
13.56MHz_DC Power Supply	Pass	PK	67.938k	52.41	110.95	-58.54	21.03	3	Horizontal	360	1.00	-
13.56MHz_DC Power Supply	Pass	PK	109.956k	55.67	106.77	-51.10	20.77	3	Horizontal	360	1.00	-
13.56MHz_DC Power Supply	Pass	PK	3.4932M	40.27	69.50	-29.23	20.86	3	Horizontal	0	1.00	-
13.56MHz_DC Power Supply	Pass	PK	4.8066M	43.58	69.50	-25.92	21.10	3	Horizontal	0	1.00	-
13.56MHz_DC Power Supply	Pass	PK	8.1498M	39.65	69.50	-29.85	21.74	3	Horizontal	0	1.00	-

NFC Operating below 30MHz

13.56MHz_DC Power Supply

24/02/2018

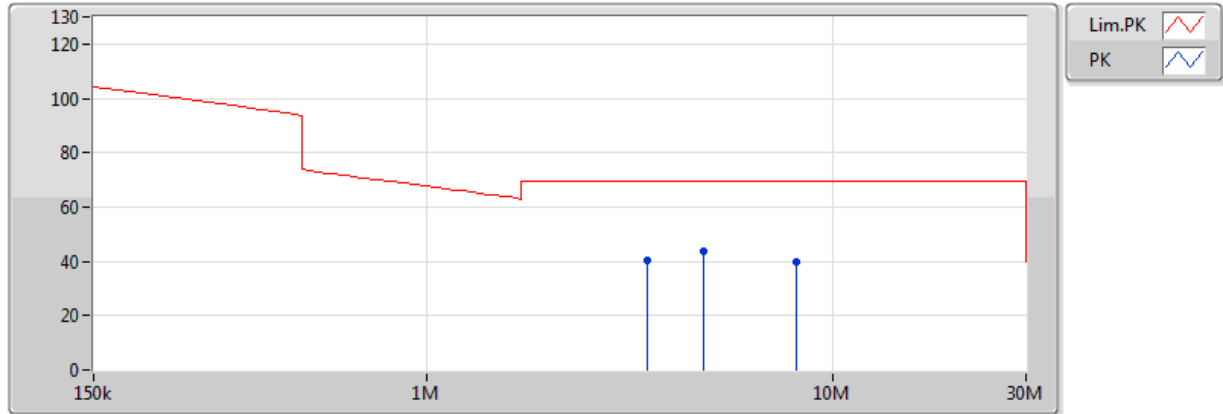


Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	47.07k	61.00	114.13	-53.13	21.29	3	Horizontal	360	1.00	-	39.71	21.22	0.07	-
PK	67.938k	52.41	110.95	-58.54	21.03	3	Horizontal	360	1.00	-	31.38	20.96	0.07	-
PK	109.956k	55.67	106.77	-51.10	20.77	3	Horizontal	360	1.00	-	34.90	20.69	0.08	-

NFC Operating below 30MHz

13.56MHz_DC Power Supply

24/02/2018



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments	Raw	AF	CL	PA
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	3.4932M	40.27	69.50	-29.23	20.86	3	Horizontal	0	1.00	-	19.41	20.47	0.39	-
PK	4.8066M	43.58	69.50	-25.92	21.10	3	Horizontal	0	1.00	-	22.48	20.67	0.43	-
PK	8.1498M	39.65	69.50	-29.85	21.74	3	Horizontal	0	1.00	-	17.91	21.20	0.53	-

**3.4.6 Transmitter Radiated Unwanted Emissions (Above 30MHz)****Summary**

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
13.553-13.567MHz	-	-	-	-	-	-	-	-	-	-	-	-
NFC	Pass	QP	270.56M	42.94	46.00	-3.06	-6.22	3	Horizontal	307	1.00	-

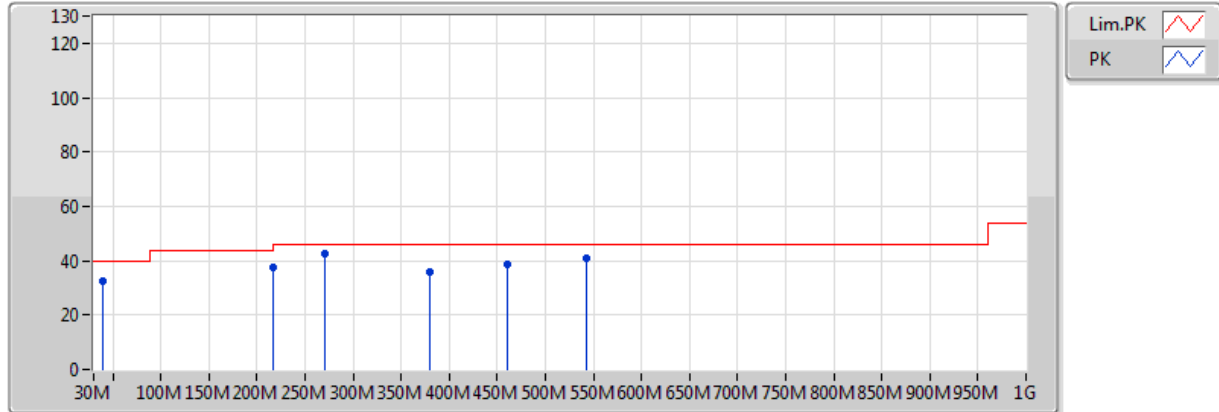
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
NFC	-	-	-	-	-	-	-	-	-	-	-	-
13.56MHz_DC Power Supply	Pass	PK	39.7M	32.62	40.00	-7.38	-7.84	3	Vertical	360	1.00	-
13.56MHz_DC Power Supply	Pass	PK	216.24M	37.57	46.00	-8.43	-9.98	3	Vertical	360	1.00	-
13.56MHz_DC Power Supply	Pass	PK	379.2M	36.13	46.00	-9.87	-4.20	3	Vertical	360	1.00	-
13.56MHz_DC Power Supply	Pass	PK	460.68M	38.61	46.00	-7.39	-2.12	3	Vertical	360	1.00	-
13.56MHz_DC Power Supply	Pass	PK	542.16M	40.92	46.00	-5.08	-0.30	3	Vertical	360	1.00	-
13.56MHz_DC Power Supply	Pass	QP	270.56M	42.75	46.00	-3.25	-6.22	3	Vertical	121	1.58	-
13.56MHz_DC Power Supply	Pass	PK	161.92M	35.21	43.50	-8.29	-9.93	3	Horizontal	0	1.00	-
13.56MHz_DC Power Supply	Pass	PK	243.4M	40.30	46.00	-5.70	-7.26	3	Horizontal	0	1.00	-
13.56MHz_DC Power Supply	Pass	PK	324.88M	37.08	46.00	-8.92	-5.36	3	Horizontal	0	1.00	-
13.56MHz_DC Power Supply	Pass	PK	542.16M	36.71	46.00	-9.29	-0.30	3	Horizontal	0	1.00	-
13.56MHz_DC Power Supply	Pass	PK	813.76M	34.64	46.00	-11.36	2.03	3	Horizontal	0	1.00	-
13.56MHz_DC Power Supply	Pass	QP	270.56M	42.94	46.00	-3.06	-6.22	3	Horizontal	307	1.00	-

NFC Operating above 30MHz

13.56MHz_DC Power Supply

24/02/2018

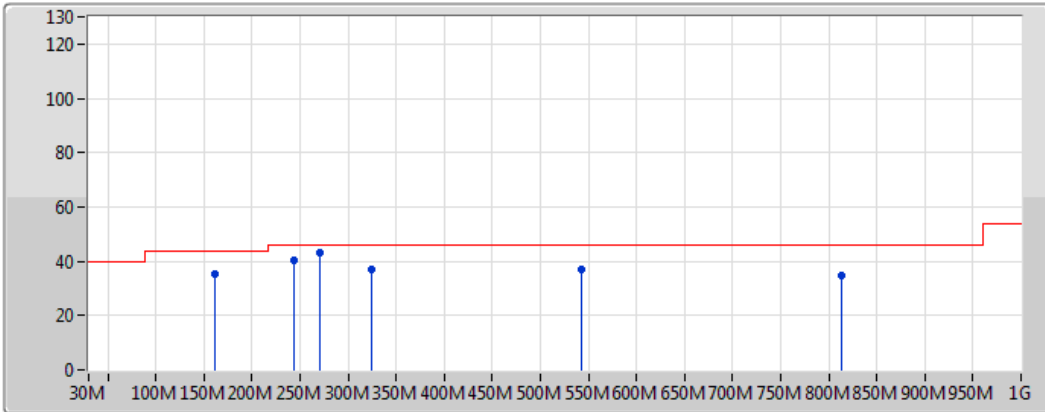




Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	39.7M	32.62	40.00	-7.38	-7.84	3	Vertical	360	1.00	-	40.46	17.86	1.86	27.56
PK	216.24M	37.57	46.00	-8.43	-9.98	3	Vertical	360	1.00	-	47.55	14.32	2.58	26.87
PK	379.2M	36.13	46.00	-9.87	-4.20	3	Vertical	360	1.00	-	40.33	19.95	3.02	27.17
PK	460.68M	38.61	46.00	-7.39	-2.12	3	Vertical	360	1.00	-	40.73	22.04	3.45	27.61
PK	542.16M	40.92	46.00	-5.08	-0.30	3	Vertical	360	1.00	-	41.22	23.95	3.64	27.89
QP	270.56M	42.75	46.00	-3.25	-6.22	3	Vertical	121	1.58	-	48.97	18.02	2.51	26.75

NFC Operating above 30MHz

13.56MHz_DC Power Supply

24/02/2018



Lim.PK 
PK 

Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	161.92M	35.21	43.50	-8.29	-9.93	3	Horizontal	0	1.00	-	45.14	14.89	2.26	27.08
PK	243.4M	40.30	46.00	-5.70	-7.26	3	Horizontal	0	1.00	-	47.56	16.96	2.59	26.81
PK	324.88M	37.08	46.00	-8.92	-5.36	3	Horizontal	0	1.00	-	42.44	18.78	2.68	26.83
PK	542.16M	36.71	46.00	-9.29	-0.30	3	Horizontal	0	1.00	-	37.01	23.95	3.64	27.89
PK	813.76M	34.64	46.00	-11.36	2.03	3	Horizontal	0	1.00	-	32.61	25.07	4.66	27.71
QP	270.56M	42.94	46.00	-3.06	-6.22	3	Horizontal	307	1.00	-	49.16	18.02	2.51	26.75

3.5 Frequency Stability

3.5.1 Frequency Stability Limit

Frequency Stability Limit	
<input checked="" type="checkbox"/>	Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

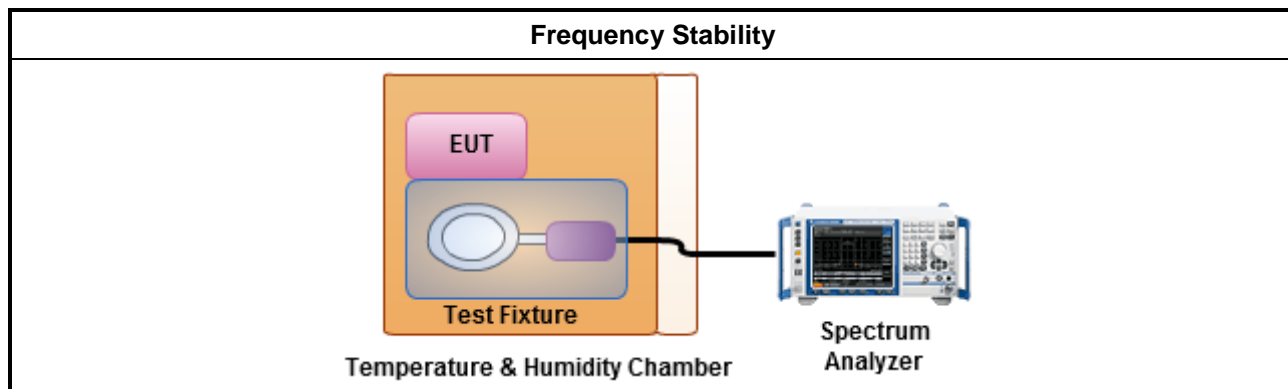
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

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

3.5.4 Test Setup



3.5.5 Test Result of Frequency Stability

Frequency Stability Result									
Condition	Ch. Freq. (MHz)	Frequency Stability (ppm)							
		Test Frequency (MHz)				Frequency Stability (ppm)			
		0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min
T _{20°C} V _{max}	13.56	13.559697	13.559697	13.559696	13.559696	-22.35	-22.35	-22.42	-22.42
T _{20°C} V _{min}	13.56	13.559695	13.559695	13.559694	13.559694	-22.49	-22.49	-22.57	-22.57
T _{85°C} V _{nom}	13.56	13.559555	13.559556	13.559557	13.559557	-32.82	-32.74	-32.67	-32.67
T _{80°C} V _{nom}	13.56	13.559557	13.559558	13.559558	13.559558	-32.67	-32.60	-32.60	-32.60
T _{70°C} V _{nom}	13.56	13.559585	13.559587	13.559588	13.559588	-30.60	-30.46	-30.38	-30.38
T _{60°C} V _{nom}	13.56	13.559598	13.559598	13.559560	13.559561	-29.65	-29.65	-32.45	-32.37
T _{50°C} V _{nom}	13.56	13.559626	13.559629	13.559631	13.559631	-27.58	-27.36	-27.21	-27.21
T _{40°C} V _{nom}	13.56	13.559642	13.559643	13.559643	13.559644	-26.40	-26.33	-26.33	-26.25
T _{30°C} V _{nom}	13.56	13.559660	13.559662	13.559663	13.559663	-25.07	-24.93	-24.85	-24.85
T _{20°C} V _{nom}	13.56	13.559691	13.559693	13.559693	13.559693	-22.79	-22.64	-22.64	-22.64
T _{10°C} V _{nom}	13.56	13.559688	13.559689	13.559691	13.559692	-23.01	-22.94	-22.79	-22.71
T _{0°C} V _{nom}	13.56	13.559696	13.559698	13.559697	13.559697	-22.42	-22.27	-22.35	-22.35
T _{-10°C} V _{nom}	13.56	13.559950	13.559949	13.559948	13.559948	-3.69	-3.76	-3.83	-3.83
T _{-20°C} V _{nom}	13.56	13.559976	13.559974	13.559974	13.559973	-1.77	-1.92	-1.92	-1.99
T _{-30°C} V _{nom}	13.56	13.560040	13.560038	13.560037	13.560037	2.95	2.80	2.73	2.73
T _{-40°C} V _{nom}	13.56	13.560052	13.560055	13.560055	13.560055	3.83	4.06	4.06	4.06
Limit (ppm)		-				100			
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.									
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	FSP 40	100305	9kHz~40GHz	04/Jan/2018	03/Jan/2019
Temp. and Humidity Chamber	Giant Force	GTH-225-40-CP-AR	MAA1611-005	-40 ~ 100℃	21/Nov/2016	20/Nov/2018
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	02/Mar/2017	01/Mar/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	30MHz ~ 1GHz 3m	31/Oct/2017	30/Oct/2018
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	19/Apr/2017	18/Apr/2018
Spectrum	R&S	FSV40	101500	9kHz ~ 40GHz	28/Jun/2017	27/Jun/2018
Receiver	R&S	ESR3	102052	9KHz ~ 3.6GHz	29/Apr/2017	28/Apr/2018
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	26/Jan/2018	25/Jan/2019
Bilog Antenna	SCHAFFNER	CBL 6112B	22237	30MHz ~ 1GHz	08/Jul/2017	07/Jul/2018
Loop Antenna	TESEQ	HLA 6120	24155	9 kHz~30 MHz	16/Mar/2017	15/Mar/2018