



FCC RF Test Report

APPLICANT : Dell Inc.
EQUIPMENT : Portable Computer
BRAND NAME : Dell
MODEL NAME : P67G
FCC ID : E2K-P67G
STANDARD : FCC Part 15 Subpart C §15.225
CLASSIFICATION : (DXX) Low Power Communication Device Transmitter

The testing was completed on Nov. 26, 2015. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in 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: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.



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D.1 Test Result of Field Strength of Fundamental Emissions
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SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	FCC Rule	Description of Test	Result	Under Limit
3.1	15.207	AC Power Line Conducted Emissions	Complies	6.50 dB at 0.158MHz
3.2	15.225(a)(b)(c)	Field Strength of Fundamental Emissions	Complies	77.24 dB at 13.560 MHz
3.3	2.1049	20dB Spectrum Bandwidth	Complies	-
3.3	-	99% OBW Spectrum Bandwidth	Complies	-
3.4	15.225(d) 15.209	Radiated Emissions	Complies	5.67 dB at 30.000 MHz
3.5	15.225(e)	Frequency Stability	Complies	-
3.6	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.26dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±4.80dB	Confidence levels of 95%



1. GENERAL INFORMATION

1.1 Applicant

Dell Inc.
One Dell Way, Round Rock, TX 78682, USA

1.2 Manufacturer

Dell Inc.
One Dell Way, Round Rock, TX 78682, USA

1.3 Product Details

Items	Description
Tx/Rx Frequency Range	13.553 ~ 13.567MHz
Channel Number	1
20dBW	2.660KHz
99%OBW	2.260KHz
Antenna Type	Loop Antenna
Type of Modulation	ASK

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Modification of EUT

No modifications are made to the EUT during all test items.



1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978		
Test Site No.	Sporton Site No.		
	TH02-HY	CO05-HY	03CH07-HY
Test Engineer	Danny Chen	Derreck Chen and Kai-Chun Chu	James Chiu
Temperature (°C)	22~24	24~25	20~22
Relative Humidity (%)	53~55	56~57	50~55

Note: The test site complies with ANSI C63.4 2009 requirement.

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855		
Test Site No.	Sporton Site No.		
	03CH10-HY		
Test Engineer	Eric Shih		
Temperature (°C)	22~23		
Relative Humidity (%)	48~50		

Note: The test site complies with ANSI C63.4 2009 requirement.

1.6 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.225
- ♦ ANSI C63.10-2009

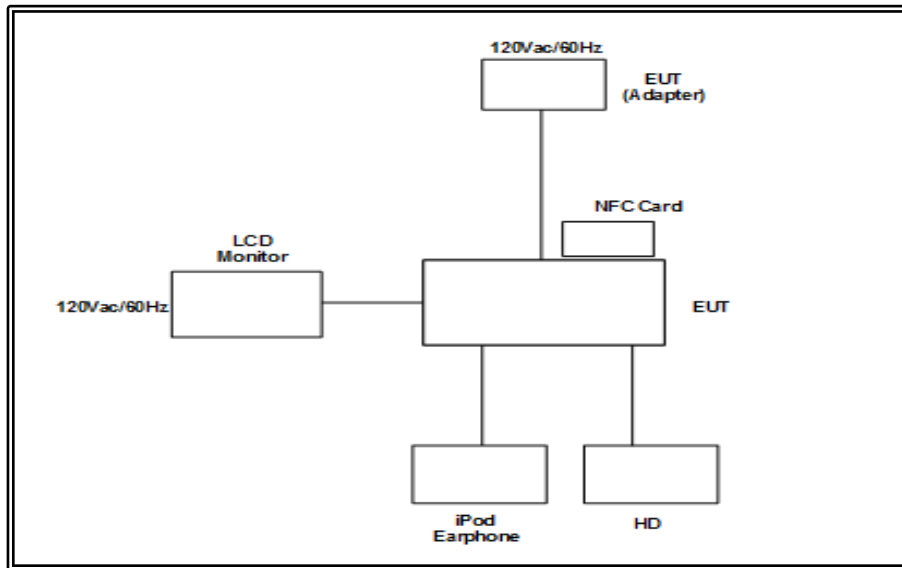
1.7 Test Modes

Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

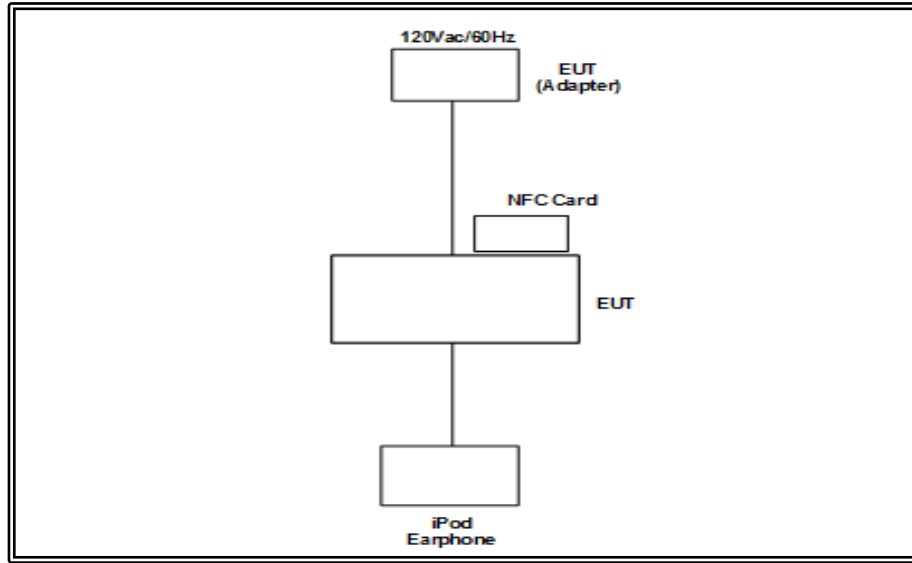
Test Items	
AC Power Line Conducted Emissions	Field Strength of Fundamental Emissions
20dB Spectrum Bandwidth	Frequency Stability
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz
Note:	
1. The EUT was programmed to be in continuously transmitting mode.	
2. The ancillary equipment, NFC card, is used to make the EUT (NFC) continuously transmit at 13.56MHz and is placed around 3 cm gap to the EUT.	

1.8 Test Configurations

<AC Conducted Emissions>



< For Fundamental Emissions and Mask and Radiated Emissions Measurement >



1.9 Table for Supporting Units

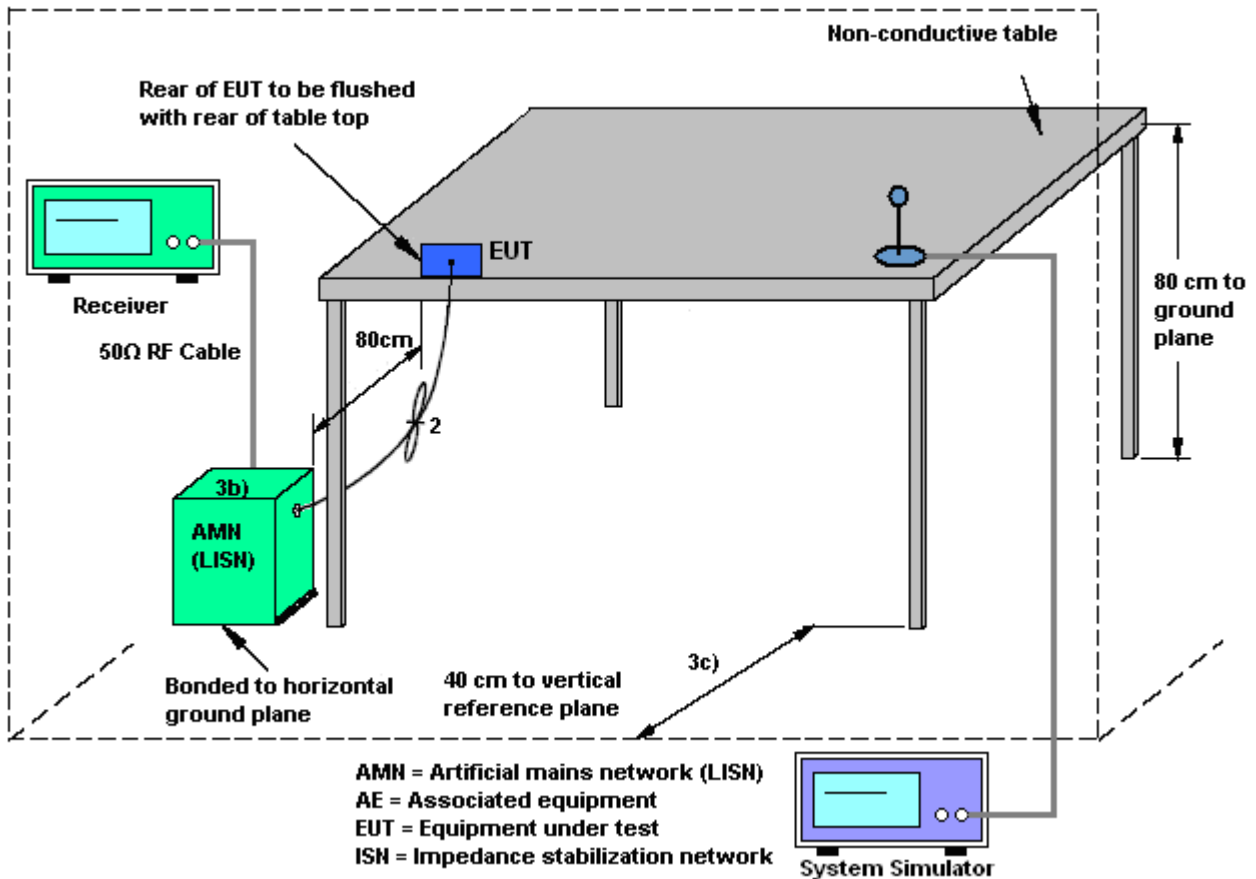
Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
2.	USB HD	PQI	H568V	FCC DoC	Shielded, 0.5m	N/A
3.	NFC Card	Metro Taipei	Easy Card	N/A	N/A	N/A
4.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
5.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2. CONDUCTED EMISSION TEST

2.1 Measuring Instruments

See list of measuring instruments of this test report.

2.2 Test setup



2.3 Test Result of Conducted Emission Test

Please refer to Appendix B.



2.4 AC Power Line Conducted Emissions Measurement

2.4.1 Limit

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

2.4.2 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

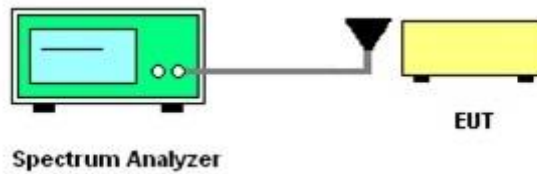
3. CONDUCTED TEST ITEMS

3.1 Measuring Instruments

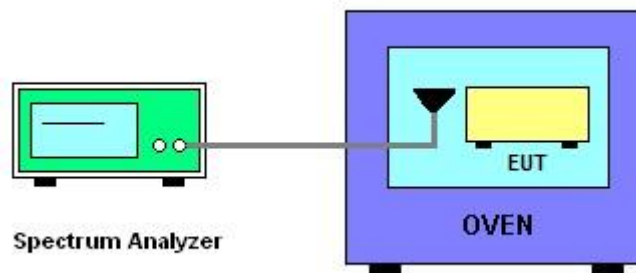
See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 20dB and 99% OBW Spectrum Bandwidth



3.2.2 Frequency Stability



3.3 Test Result of Conducted Test Items

Please refer to Appendix C.



3.4 20dB and 99% OBW Spectrum Bandwidth Measurement

3.4.1 Limit

Intentional radiators must be designed to ensure that the 20dB and 99% emission bandwidth in the specific band 13.553~13.567MHz.

3.4.2 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT in peak Max hold mode.
2. The resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.
4. Measured the 99% OBW.

3.5 Frequency Stability Measurement

3.5.1 Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% (100ppm) of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

3.5.2 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT.
2. EUT have transmitted signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire emissions bandwidth.
4. Set RBW = 1 kHz, VBW = 3 kHz with peak detector and maxhold settings.
5. The f_c is declaring of channel frequency. Then the frequency error formula is $(f_c - f) / f_c \times 10^6$ ppm and the limit is less than ± 100 ppm.
6. Extreme temperature rule is -20°C~50°C.

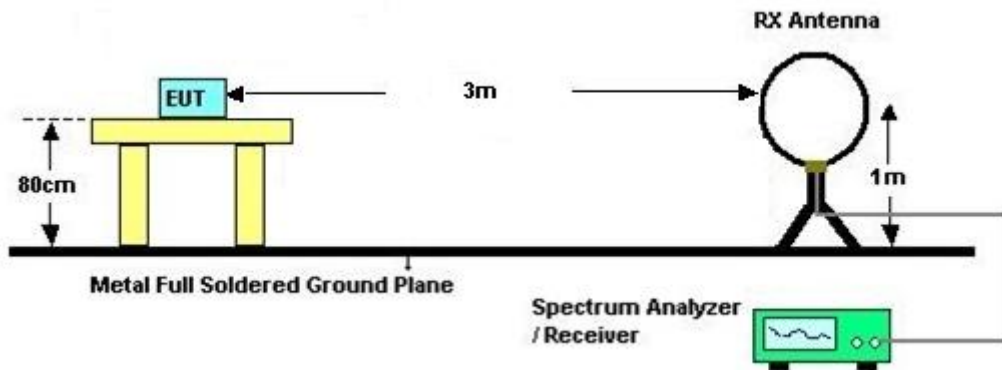
4. RADIATED TEST ITEMS

4.1 Measuring Instruments

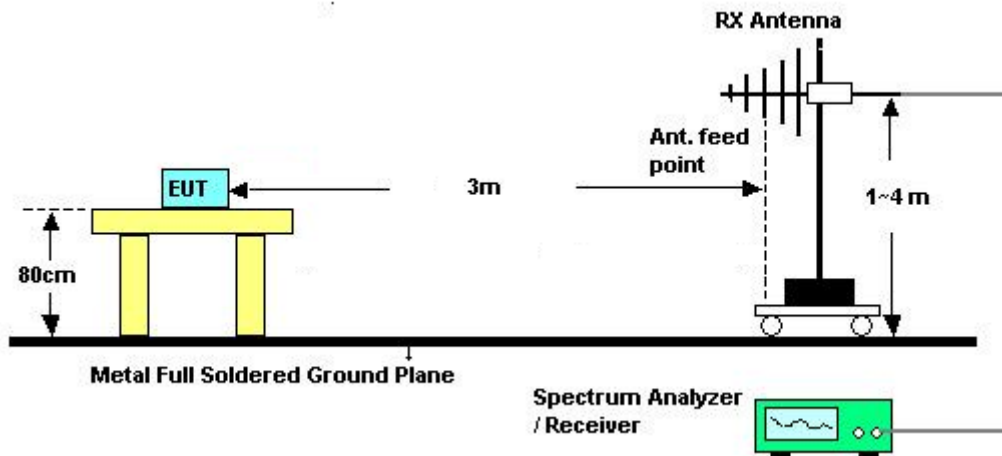
See list of measuring instruments of this test report.

4.2 Test Setup

4.2.1 For radiated emissions below 30MHz



4.2.2 For radiated emissions above 30MHz



4.3 Test Result of Radiated Test Items

Please refer to Appendix D.



4.4 Field Strength of Fundamental Emissions and Mask Measurement

4.4.1 Limit

Rules and specifications	FCC CFR 47 Part 15 section 15.225 IC RSS-210 A2.6			
	Description			
Description	Compliance with the spectrum mask is tested with RBW set to 9kHz.			
Freq. of Emission (MHz)	Field Strength (µV/m) at 30m	Field Strength (dBµV/m) at 30m	Field Strength (dBµV/m) at 10m	Field Strength (dBµV/m) at 3m
1.705~13.110	30	29.5	48.58	69.5
13.110~13.410	106	40.5	59.58	80.5
13.410~13.553	334	50.5	69.58	90.5
13.553~13.567	15848	84.0	103.08	124.0
13.567~13.710	334	50.5	69.58	90.5
13.710~14.010	106	40.5	59.58	80.5
14.010~30.000	30	29.5	48.58	69.5

4.4.2 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the loop receiving antenna mounted antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna was fixed at one meter above ground to find the maximum emissions field strength.
4. For Fundamental emissions, use the receiver to measure QP reading.
5. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
6. Compliance with the spectrum mask is tested with RBW set to 9kHz.

Note: Emission level (dBµV/m) = 20 log Emission level (µV/m).



4.5 Radiated Emissions Measurement

4.5.1 Limit

The field strength of any emissions which appear outside of 13.110 ~14.010MHz band shall not exceed the general radiated emissions limits.

Frequencies (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.5.2 Measuring Instrument Setting

The following table is the setting of receiver.

Receiver Parameter	Setting
Attenuation	Auto
Frequency Range: 9kHz~150kHz	RBW 200Hz for QP
Frequency Range: 150kHz~30MHz	RBW 9kHz for QP
Frequency Range: 30MHz~1000MHz	RBW 120kHz for Peak

Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.



4.5.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
1. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
2. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
3. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
4. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
5. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
6. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. Antenna Requirements

4.5.4 Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

4.5.5 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.



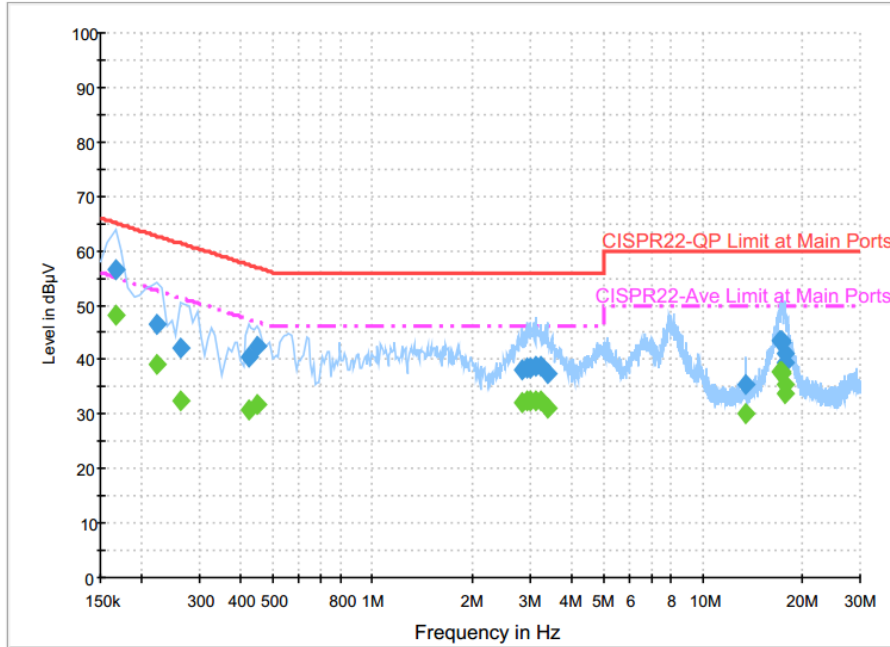
5. LIST OF MEASURING EQUIPMENT

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSP30	101329	9kHz~30GHz	Jun. 24, 2015	Oct. 26, 2015	Jun. 23, 2016	Conducted (TH03-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL883644	Voltage:0~20V; Current:0~5A	Dec. 01, 2014	Oct. 26, 2015	Nov. 30, 2015	Conducted (TH03-HY)
Hygrometer	Testo	608-H1	34893241	N/A	May 04, 2015	Oct. 26, 2015	May 03, 2016	Conduction (TH03-HY)
Temperature Chamber	ESPEC	SU-641	92013721	-30~70°	Dec. 01, 2014	Oct. 26, 2015	Nov. 30, 2015	Conducted (TH03-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz – 2.75GHz	Dec. 01, 2014	Oct. 23, 2015	Nov. 30, 2015	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 08, 2014	Oct. 23, 2015	Dec. 07, 2015	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Oct. 23, 2015	N/A	Conduction (CO05-HY)
Bilog Antenna	Schaffner	CBL 6111D	40103	30MHz ~ 1GHz	Jul. 27, 2015	Oct. 27, 2015~ Oct. 28, 2015	Jul. 26, 2016	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz-1000MHz	Mar. 12, 2015	Oct. 27, 2015~ Oct. 28, 2015	Mar. 11, 2016	Radiation (03CH07-HY)
Signal Analyzer	Rohde & Schwarz	FSV 30	101749	10Hz~30GHz	Mar. 10, 2015	Oct. 27, 2015~ Oct. 28, 2015	Mar. 09, 2016	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Oct. 27, 2015~ Oct. 28, 2015	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 degree	N/A	Oct. 27, 2015~ Oct. 28, 2015	N/A	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Nov. 26, 2015	Sep. 01, 2016	Radiation (03CH10-HY)
EMI Test Receiver	Keysight	N9038A	MY54130085	20Hz ~ 8.4GHz	Nov. 04, 2015	Nov. 26, 2015	Nov. 03, 2016	Radiation (03CH10-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Nov. 26, 2015	N/A	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Nov. 26, 2015	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0-360 degree	N/A	Nov. 26, 2015	N/A	Radiation (03CH10-HY)



Appendix B. Test Results of Conducted Emission Test

Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	NFC Tx + H-Pattern + HDMI + USB HD + SD Card + Adapter for Sample 2		

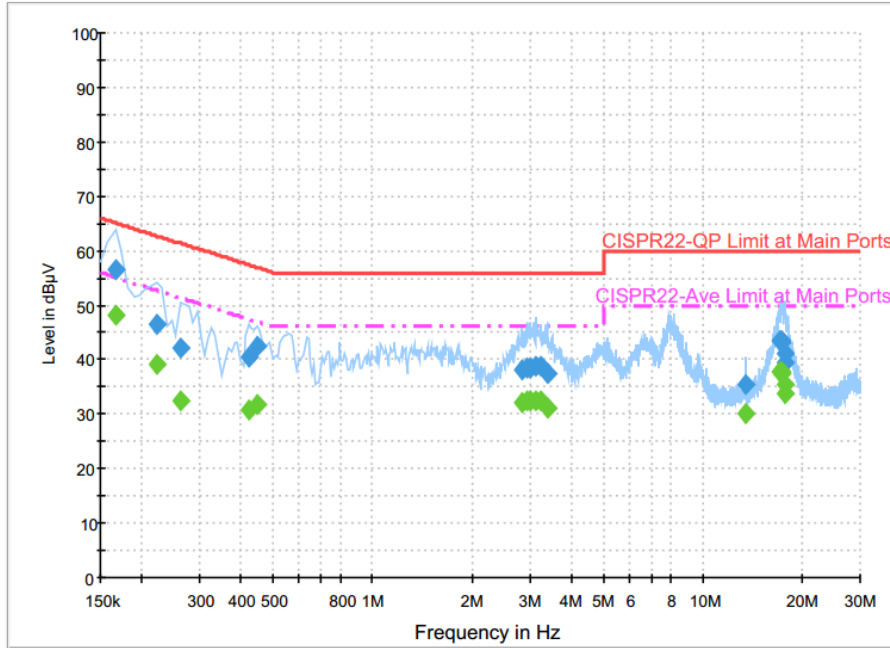


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	56.4	Off	L1	19.5	8.8	65.2
0.222000	46.4	Off	L1	19.4	16.3	62.7
0.262000	42.3	Off	L1	19.5	19.1	61.4
0.422000	40.5	Off	L1	19.5	16.9	57.4
0.446000	42.3	Off	L1	19.5	14.6	56.9
2.846000	38.1	Off	L1	19.6	17.9	56.0
2.958000	38.5	Off	L1	19.6	17.5	56.0
2.998000	38.5	Off	L1	19.6	17.5	56.0
3.126000	38.8	Off	L1	19.7	17.2	56.0
3.230000	38.7	Off	L1	19.7	17.3	56.0
3.382000	37.6	Off	L1	19.6	18.4	56.0
13.558000	35.4	Off	L1	19.9	24.6	60.0
17.174000	43.6	Off	L1	19.9	16.4	60.0
17.278000	43.5	Off	L1	19.9	16.5	60.0
17.414000	43.0	Off	L1	19.9	17.0	60.0
17.662000	41.1	Off	L1	19.9	18.9	60.0
17.830000	39.5	Off	L1	19.9	20.5	60.0



Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	NFC Tx + H-Pattern + HDMI + USB HD + SD Card + Adapter for Sample 2		

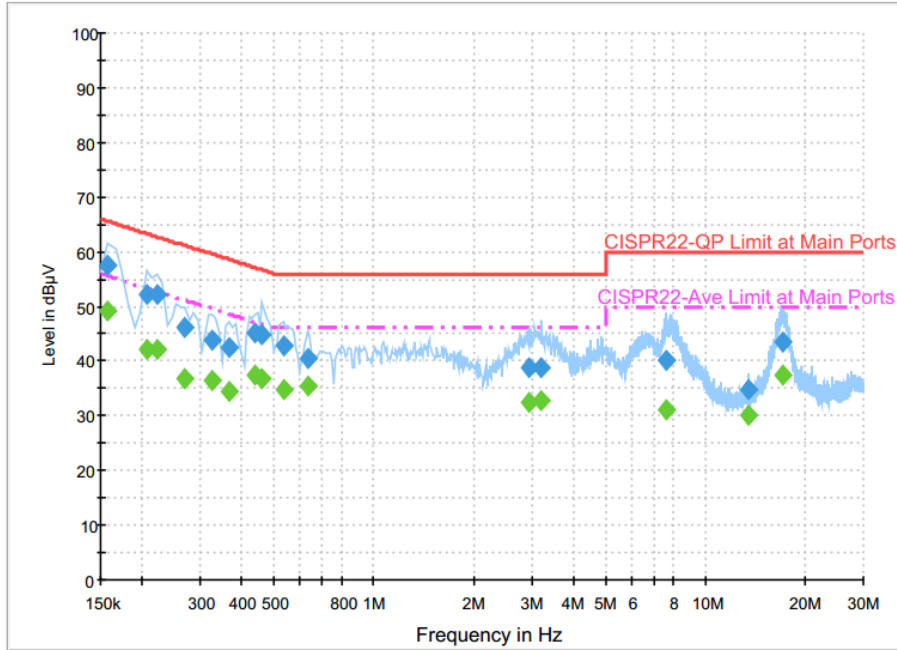


Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	48.0	Off	L1	19.5	7.2	55.2
0.222000	39.1	Off	L1	19.4	13.6	52.7
0.262000	32.4	Off	L1	19.5	19.0	51.4
0.422000	30.8	Off	L1	19.5	16.6	47.4
0.446000	31.8	Off	L1	19.5	15.1	46.9
2.846000	32.1	Off	L1	19.6	13.9	46.0
2.958000	32.4	Off	L1	19.6	13.6	46.0
2.998000	32.4	Off	L1	19.6	13.6	46.0
3.126000	32.5	Off	L1	19.7	13.5	46.0
3.230000	32.3	Off	L1	19.7	13.7	46.0
3.382000	31.1	Off	L1	19.6	14.9	46.0
13.558000	30.0	Off	L1	19.9	20.0	50.0
17.174000	37.7	Off	L1	19.9	12.3	50.0
17.278000	37.9	Off	L1	19.9	12.1	50.0
17.414000	37.6	Off	L1	19.9	12.4	50.0
17.662000	35.5	Off	L1	19.9	14.5	50.0
17.830000	33.7	Off	L1	19.9	16.3	50.0



Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	NFC Tx + H-Pattern + HDMI + USB HD + SD Card + Adapter for Sample 2		

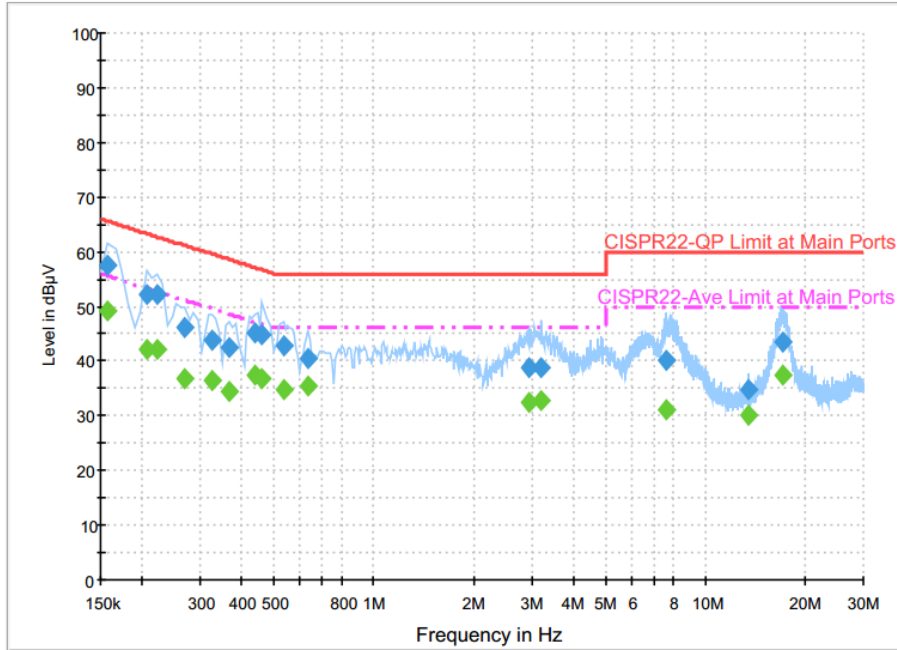


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	57.6	Off	N	19.5	8.0	65.6
0.206000	52.3	Off	N	19.4	11.1	63.4
0.222000	52.1	Off	N	19.4	10.6	62.7
0.270000	46.2	Off	N	19.5	14.9	61.1
0.326000	43.8	Off	N	19.6	15.8	59.6
0.366000	42.6	Off	N	19.5	16.0	58.6
0.438000	45.3	Off	N	19.5	11.8	57.1
0.462000	44.8	Off	N	19.5	11.9	56.7
0.534000	42.9	Off	N	19.5	13.1	56.0
0.630000	40.4	Off	N	19.6	15.6	56.0
2.942000	38.6	Off	N	19.6	17.4	56.0
3.190000	38.9	Off	N	19.7	17.1	56.0
7.614000	40.2	Off	N	19.6	19.8	60.0
13.558000	34.9	Off	N	19.9	25.1	60.0
17.134000	43.3	Off	N	19.9	16.7	60.0



Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	NFC Tx + H-Pattern + HDMI + USB HD + SD Card + Adapter for Sample 2		



Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	49.1	Off	N	19.5	6.5	55.6
0.206000	42.2	Off	N	19.4	11.2	53.4
0.222000	42.1	Off	N	19.4	10.6	52.7
0.270000	36.8	Off	N	19.5	14.3	51.1
0.326000	36.5	Off	N	19.6	13.1	49.6
0.366000	34.3	Off	N	19.5	14.3	48.6
0.438000	37.4	Off	N	19.5	9.7	47.1
0.462000	36.8	Off	N	19.5	9.9	46.7
0.534000	34.8	Off	N	19.5	11.2	46.0
0.630000	35.3	Off	N	19.6	10.7	46.0
2.942000	32.5	Off	N	19.6	13.5	46.0
3.190000	32.8	Off	N	19.7	13.2	46.0
7.614000	31.2	Off	N	19.6	18.8	50.0
13.558000	30.2	Off	N	19.9	19.8	50.0
17.134000	37.5	Off	N	19.9	12.5	50.0

(1) with antenna

Remark: 13.558MHz is the NFC RF fundamental signal.

(2) with dummy load

Remark: Only the fundamental NFC signal needs to be retested per C63.4.



Appendix C. Test Results of Conducted Test Items

C.1 Test Result of 20dB Spectrum Bandwidth

<For Sample 1>

Test mode	NFC Tx	Test Frequency (MHz)	13.56
20dB Bandwidth (kHz)	2.660	99% OccupiedBW(kHz)	2.260
Frequency range (MHz)	$f_L > 13.553$	13.55872	Test Result
	$f_H < 13.567$	13.56138	Complies



C.2 Test Result of Frequency Stability

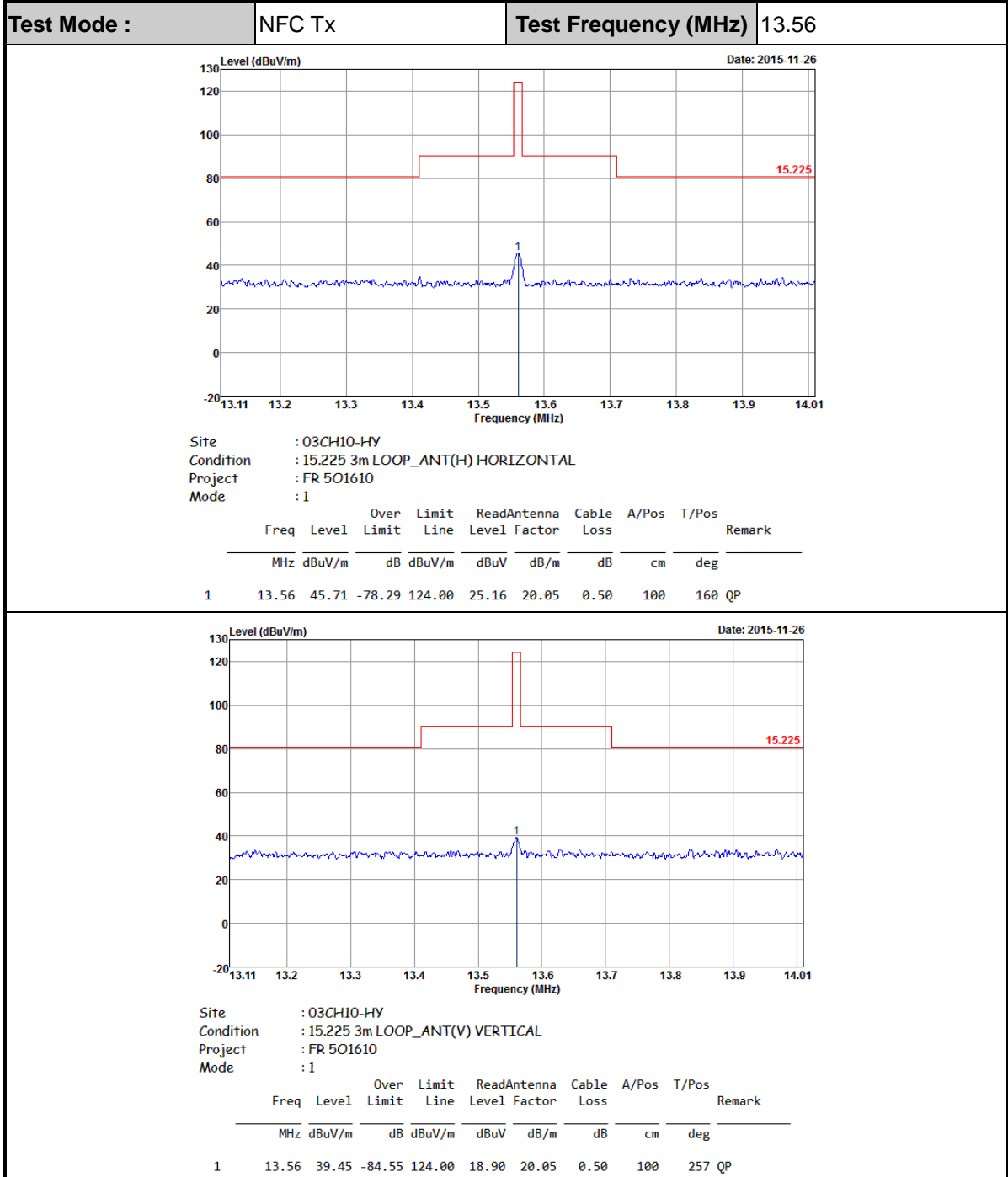
Voltage vs. Frequency Stability		Temperature vs. Frequency Stability	
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (°C)	Measurement Frequency (MHz)
120	13.560040	-20	13.560140
102	13.560040	-10	13.560120
138	13.560040	0	13.560120
		10	13.560080
		20	13.560080
		30	13.560040
		40	13.560030
		50	13.560020
Max.Deviation (MHz)	0.000040	Max.Deviation (MHz)	0.000140
Max.Deviation (ppm)	2.9499	Max.Deviation (ppm)	10.3245
Limit	FS < ±100 ppm	Limit	FS < ±100 ppm
Test Result	PASS	Test Result	PASS



Appendix D. Test Results of Radiated Test Items

D.1 Test Result of Field Strength of Fundamental Emissions

<For Sample 1>



Note: All NFC's spurious emissions are below 20dB of limits.



<For Sample 2>

Test Mode :	NFC Tx	Test Frequency (MHz)	13.56
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Date: 2015-11-26

Site : 03CH10-HY
 Condition : 15.225 3m LOOP_ANT(H) HORIZONTAL
 Project : FR 501610
 Mode : 2

1	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	
1	13.56	46.76	-77.24	124.00	26.21	20.05	0.50	100	148	QP

Date: 2015-11-26

Site : 03CH10-HY
 Condition : 15.225 3m LOOP_ANT(V) VERTICAL
 Project : FR 501610
 Mode : 2

1	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	
1	13.56	40.39	-83.61	124.00	19.84	20.05	0.50	100	228	QP

Note: All NFC's spurious emissions are below 20dB of limits.



D.2 Results of Radiated Emissions (9 kHz~30MHz)

<For Sample 1>

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.05388	37.19	-75.79	112.98	16.94	20.09	0.16			Average
0.08067	33.37	-76.1	109.47	13.17	20.04	0.16			Average
0.09808	29.85	-77.92	107.77	9.71	19.99	0.15			QP
0.13772	33.43	-71.39	104.82	13.31	19.97	0.15			Average
0.15306	43.36	-60.55	103.91	23.25	19.95	0.16			Average
0.97815	35.7	-32.1	67.8	15.64	19.91	0.15	100	48	QP
11.28	31.28	-38.72	70	10.77	20.05	0.46			QP
13.56	45.49	-24.51	70	24.94	20.05	0.5			QP
19.825	31.28	-38.72	70	10.25	20.4	0.63			QP
25.795	33.53	-36.47	70	12.22	20.61	0.7			QP



Test Mode :		NFC Tx			Polarization :		Vertical		
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.05551	38.65	-74.07	112.72	18.45	20.04	0.16			Average
0.08154	32.4	-76.98	109.38	12.2	20.04	0.16			Average
0.10938	31.51	-75.32	106.83	11.37	19.99	0.15			QP
0.14356	30.19	-74.27	104.46	10.07	19.97	0.15			Average
0.31014	38.18	-59.59	97.77	18.11	19.91	0.16			Average
0.67775	36.54	-34.44	70.98	16.49	19.9	0.15	100	218	QP
13.56	39.94	-30.06	70	19.39	20.05	0.5			QP
14.536	30.23	-39.77	70	9.66	20.05	0.52			QP
23.137	31.25	-38.75	70	10.02	20.56	0.67			QP
29.29	34.96	-35.04	70	13.78	20.44	0.74			QP

Note:

- 13.56 MHz is fundamental signal which can be ignored.
- The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
- Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
- Limit line = specific limits (dBµV) + distance extrapolation factor.



<For Sample 2>

Test Mode :	NFC Tx	Polarization :	Horizontal
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Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.04475	35.95	-78.64	114.59	15.7	20.09	0.16			Average
0.06717	32.06	-79	111.06	11.86	20.04	0.16			Average
0.09898	29.51	-78.18	107.69	9.37	19.99	0.15			QP
0.12084	31.69	-74.27	105.96	11.57	19.97	0.15			Average
0.18502	40.58	-61.68	102.26	20.49	19.93	0.16			Average
1.549	30.09	-33.71	63.8	9.98	19.92	0.19	100	127	QP
13.56	45.81	-24.19	70	25.26	20.05	0.5			QP
14.776	29.06	-40.94	70	8.49	20.05	0.52			QP
20.131	31.37	-38.63	70	10.31	20.43	0.63			QP
29.23	33.26	-36.74	70	12.06	20.46	0.74			QP



Test Mode :		NFC Tx			Polarization :		Vertical		
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.0575	35.57	-76.84	112.41	15.37	20.04	0.16			Average
0.06714	39.01	-72.05	111.06	18.81	20.04	0.16			Average
0.10604	29.63	-77.46	107.09	9.49	19.99	0.15			QP
0.1212	30.9	-75.03	105.93	10.78	19.97	0.15			Average
0.21188	40.52	-60.56	101.08	20.44	19.92	0.16			Average
0.6402	37.21	-34.27	71.48	17.16	19.9	0.15	100	208	QP
13.56	40.87	-29.13	70	20.32	20.05	0.5			QP
15.16	30.94	-39.06	70	10.36	20.05	0.53			QP
20.464	31.87	-38.13	70	10.77	20.46	0.64			QP
28.735	35.11	-34.89	70	13.85	20.53	0.73			QP

Note:

1. 13.56 MHz is fundamental signal which can be ignored.
2. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
4. Limit line = specific limits (dBμV) + distance extrapolation factor.



D.3 Results of Radiated Emissions (30MHz~1GHz)

<For Sample 1>

Test Mode :	NFC Tx	Polarization :	Horizontal
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Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
67.53	26.15	-13.85	40	49.11	6.24	2.06	31.26			Peak
109.92	35.12	-8.38	43.5	53.14	10.8	2.38	31.2	100	0	Peak
264.09	24.16	-21.84	46	38.44	13.56	3.16	31			Peak
407.8	32.67	-13.33	46	43.89	16.12	3.52	30.86			Peak
456.1	27.32	-18.68	46	37.11	17.36	3.63	30.78			Peak
750.8	29.36	-16.64	46	33.18	22.1	4.48	30.4			Peak

Test Mode :	NFC Tx	Polarization :	Vertical
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Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30	34.33	-5.67	40	45.26	18.8	1.77	31.5	100	0	Peak
109.92	35.02	-8.48	43.5	53.04	10.8	2.38	31.2			Peak
160.68	32.36	-11.14	43.5	50.58	10.36	2.61	31.19			Peak
456.1	26.62	-19.38	46	36.41	17.36	3.63	30.78			Peak
552.7	26.86	-19.14	46	33.78	19.86	4.01	30.79			Peak
761.3	31.65	-14.35	46	35.45	22.1	4.48	30.38			Peak

Note:

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.



<For Sample 2>

Test Mode :	NFC Tx	Polarization :	Horizontal
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Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
110.73	30.8	-12.7	43.5	48.76	10.85	2.38	31.19			Peak
179.04	36.81	-6.69	43.5	56.15	8.97	2.61	30.92	100	0	Peak
238.98	37.4	-8.6	46	54.26	11.18	2.96	31			Peak
318.2	38.95	-7.05	46	53.29	13.38	3.28	31			Peak
750.1	37.8	-8.2	46	41.62	22.1	4.48	30.4			Peak
900.6	33.93	-12.07	46	36.2	23.23	4.8	30.3			Peak

Test Mode :	NFC Tx	Polarization :	Vertical
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Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30	32.5	-7.5	40	43.43	18.8	1.77	31.5	100	0	Peak
179.31	32.07	-11.43	43.5	51.41	8.97	2.61	30.92			Peak
238.98	30.7	-15.3	46	47.56	11.18	2.96	31			Peak
300	32.87	-13.13	46	47.51	13.2	3.16	31			Peak
639.5	32.28	-13.72	46	38.18	20.4	4.22	30.52			Peak
750.1	38.23	-7.77	46	42.05	22.1	4.48	30.4			Peak

Note:

- The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
- Emission level (dBµV/m) = 20 log Emission level (µV/m).
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.