

FCC RF Test Report

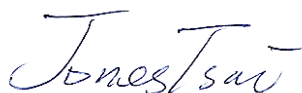
APPLICANT : Quanta Computer Inc.
EQUIPMENT : Clover Mini 3G
BRAND NAME : Clover
MODEL NAME : C301
FCC ID : HFS-C301
STANDARD : FCC Part 15 Subpart C §15.225
CLASSIFICATION : (DXX) Low Power Communication Device Transmitter

The testing was completed on Apr. 09, 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.



Table of Contents

SUMMARY OF THE TEST RESULT	4
1. GENERAL INFORMATION.....	5
1.1 Applicant	5
1.2 Manufacturer.....	5
1.3 Product Details.....	5
1.4 Modification of EUT.....	5
1.5 Testing Location	6
1.6 Applicable Standards	6
1.7 Test Modes.....	6
1.8 Test Configurations.....	7
1.9 Table for Supporting Units	8
2. CONDUCTED EMISSION TEST.....	9
2.1 Measuring Instruments	9
2.2 Test setup	9
2.3 Test Result of Conducted Emission Test.....	9
2.4 AC Power Line Conducted Emissions Measurement	10
3. CONDUCTED TEST ITEMS	11
3.1 Measuring Instruments	11
3.2 Test Setup	11
3.3 Test Result of Conducted Test Items.....	11
3.4 20dB Spectrum Bandwidth Measurement	12
3.5 Frequency Stability Measurement	12
4. RADIATED TEST ITEMS.....	13
4.1 Measuring Instruments	13
4.2 Test Setup	13
4.3 Test Result of Radiated Test Items	13
4.4 Field Strength of Fundamental Emissions and Mask Measurement	14
4.5 Radiated Emissions Measurement	15
5. LIST OF MEASURING EQUIPMENT	17
APPENDIX A. SETUP PHOTOGRAPHS OF EUT	
APPENDIX B. TEST RESULTS OF CONDUCTED EMISSION TEST	
APPENDIX C. TEST RESULTS OF CONDUCTED TEST ITEMS	
C.1. Test Result of 20dB Spectrum Bandwidth	
C.2 Test Result of Frequency Stability	
APPENDIX D. TEST RESULTS OF RADIATED TEST ITEMS	
D.1 Test Result of Field Strength of Fundamental Emissions	
D.2 Results of Radiated Emissions (9 kHz~30MHz)	
D.3 Results of Radiated Emissions (30MHz~1GHz)	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR511632D	Rev. 01	Initial issue of report	Apr. 15, 2015

**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	10.00 dB at 27.118MHz
3.2	15.225(a)(b)(c)	Field Strength of Fundamental Emissions	Complies	44.92 dB at 13.560 MHz
3.3	2.1049	20dB Spectrum Bandwidth	Complies	-
3.4	15.225(d) 15.209	Radiated Emissions	Complies	6.82 dB at 401.5 MHz for Peak
3.5	15.225(e)	Frequency Stability	Complies	-
3.6	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	$\pm 2.26\text{dB}$	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	$\pm 4.70\text{dB}$	Confidence levels of 95%

1. GENERAL INFORMATION

1.1 Applicant

Quanta Computer Inc.

No. 188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan

1.2 Manufacturer

Quanta Computer Inc.

No. 188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan

1.3 Product Details

Items	Description
Tx/Rx Frequency Range	13.553 ~ 13.567MHz
Channel Number	1
20dBW	2.640KHz
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.			IC Registration No.
	TH02-HY	CO05-HY	03CH07-HY	4086B-1
Test Engineer	Danny Chen	Eric Jeng	Nick Yu and James Chiu	
Temperature	22~24	23~25	21~23	
Relative Humidity	53~55	49~51	47~49	

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 C63.10-2013

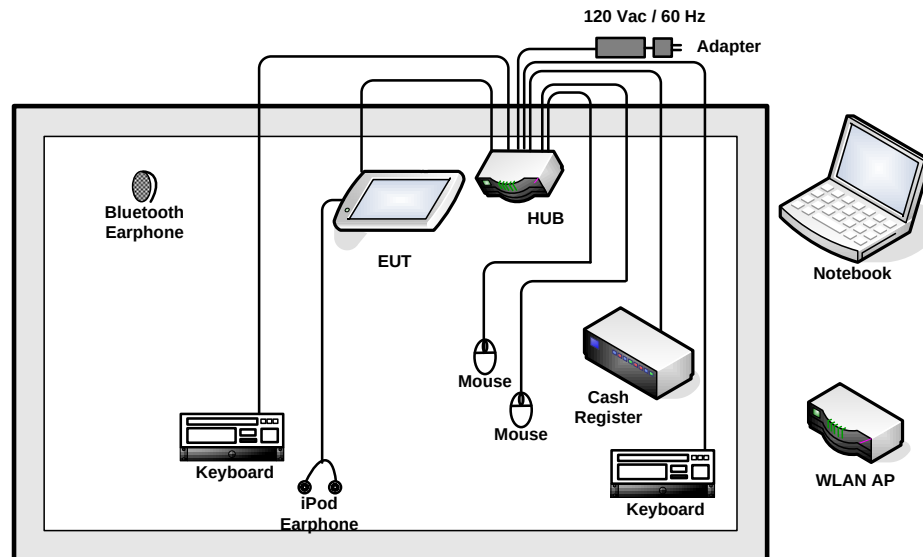
1.7 Test Modes

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.

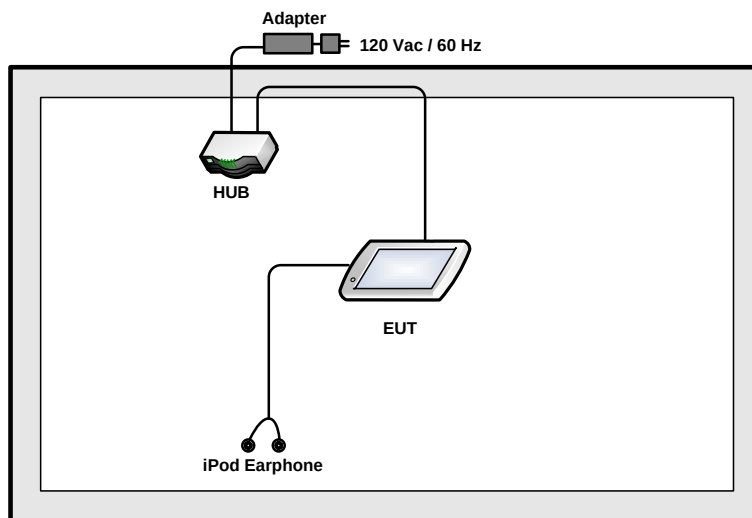
Test Items	
AC Power Line Conducted Emissions	Field Strength of Fundamental Emissions
20dB Spectrum Bandwidth	Frequency Stability
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz
Note: - The EUT was programmed to be in continuously transmitting mode. - The ancillary equipment, NFC card, is 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**

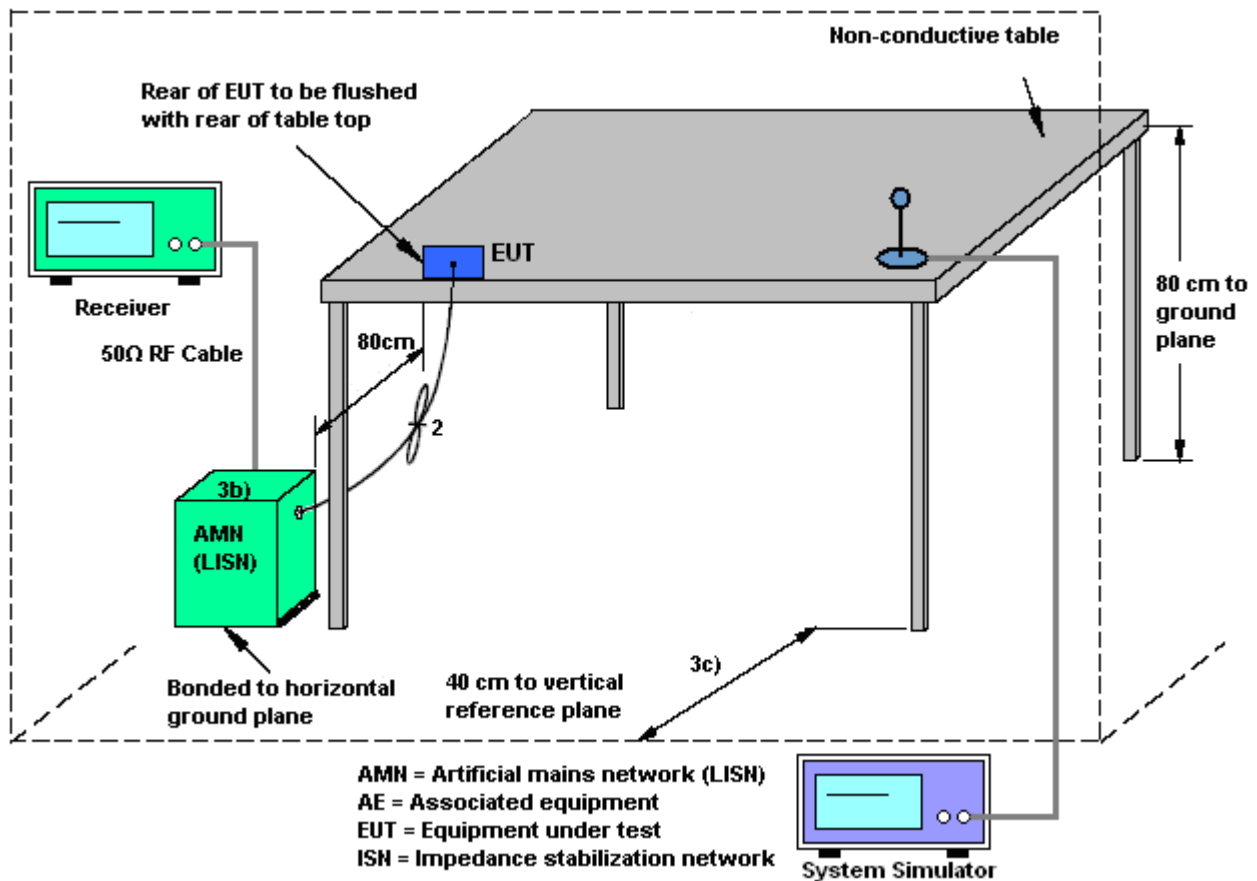
Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8m
WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8m
iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
Keyboard	Logitech	K200	FCC DoC	Shielded, 1.3 m	N/A
Keyboard	Logitech	K120	FCC DoC	Shielded, 1.3 m	N/A
(USB) Mouse	DELL	MOC5UO	FCC DoC	Shielded, 1.8 m	N/A
Mouse	SAMPO	VC-Y120L(B)	FCC DoC	Shielded, 1.4 m	N/A
IC Card	N/A	N/A	N/A	N/A	N/A
NFC Card	N/A	N/A	N/A	N/A	N/A
Magnetic Card	N/A	N/A	N/A	N/A	N/A
RJ-45 Load	N/A	N/A	N/A	N/A	N/A
Cash Drawer	Clover	D100	NA	Unshielded, 1.0 m	NA

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 (dBμV)	
	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.

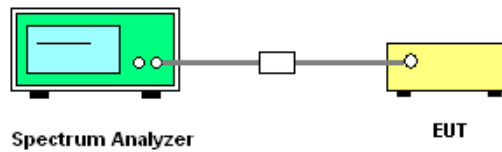
3. CONDUCTED TEST ITEMS

3.1 Measuring Instruments

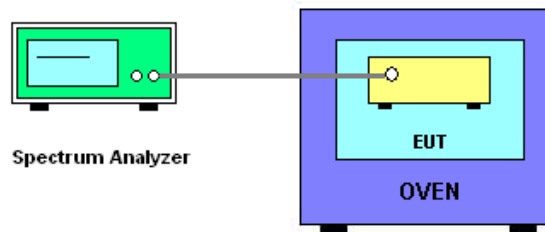
See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 20dB Spectrum Bandwidth



3.2.2 Frequency Stability



3.3 Test Result of Conducted Test Items

Please refer to Appendix C.

3.4 20dB Spectrum Bandwidth Measurement

3.4.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band 13.553~13.567MHz

3.4.2 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer 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.

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 transmitter output (antenna port) was connected to the spectrum analyzer.
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.

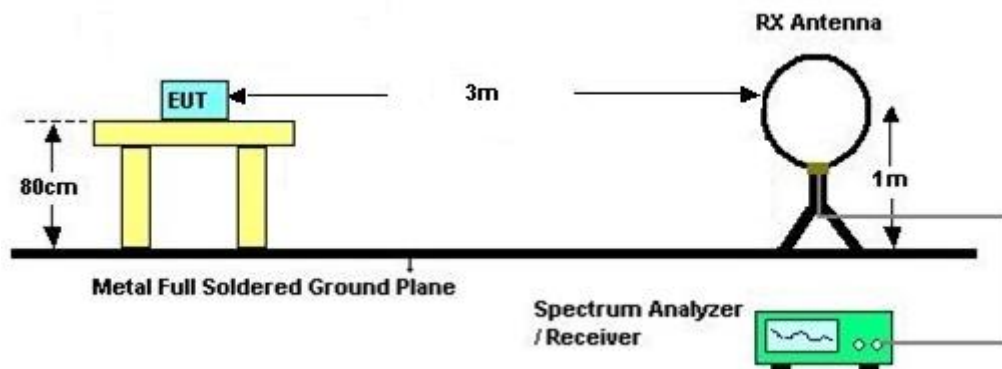
4. RADIATED TEST ITEMS

4.1 Measuring Instruments

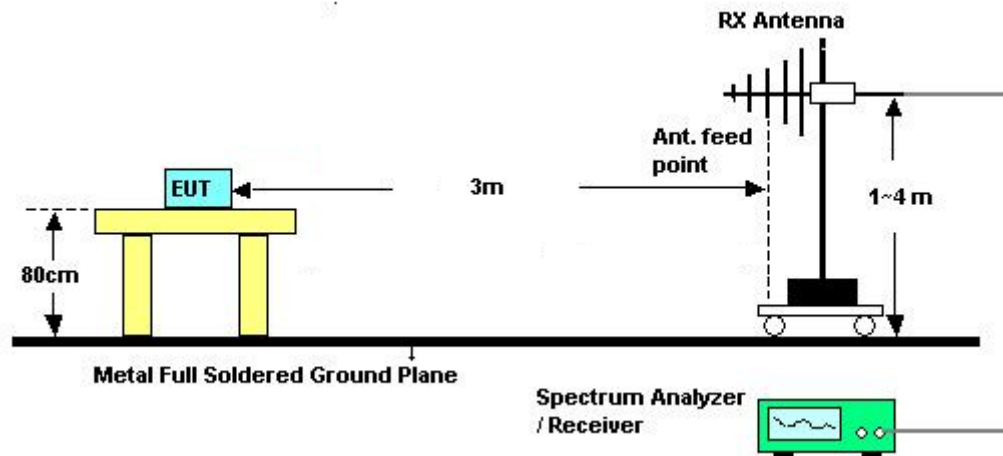
See list of measuring instruments of this test report.

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	CFR 47 Part 15 section 15.225(a)-(d)			
Description	Compliance with the spectrum mask is tested using a spectrum analyzer with RBW set to a 9kHz for the band 13.553~13.567MHz			
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 C63.4. 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 using a spectrum analyzer with RBW set to a 9kHz for the band 13.553~13.567MHz.

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 13.553~13.567MHz 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 C63.4. 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.
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 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.
4. 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.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. 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.
7. 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.



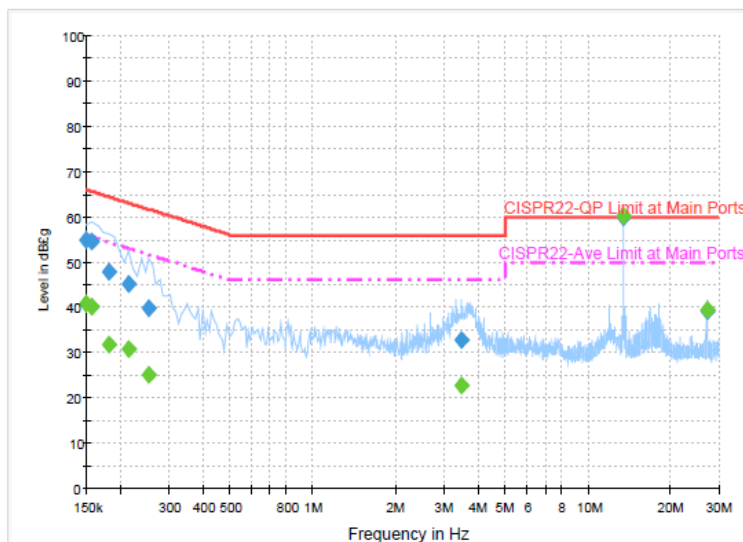
5. LIST OF MEASURING EQUIPMENT

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Apr. 01, 2015	Jun. 08, 2015	Conducted (TH02-HY)
Thermal Chamber	Ten Billion	TTH-D3SP	TBN-930701	N/A	Jul. 17, 2014	Apr. 01, 2015	Jul. 16, 2015	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Dec. 01, 2014	Apr. 08, 2015	Nov. 30, 2015	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 08, 2014	Apr. 08, 2015	Dec. 07, 2015	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 02, 2014	Apr. 08, 2015	Dec. 01, 2015	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Apr. 08, 2015	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9 kHz~7 GHz	Aug. 30, 2014	Apr. 07, 2015~ Apr. 09, 2015	Aug. 29, 2015	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	100315	9 kHz~30 MHz	Jul. 28, 2014	Apr. 07, 2015~ Apr. 09, 2015	Jul. 27, 2015	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz ~ 1GHz	Sep. 27, 2014	Apr. 07, 2015~ Apr. 09, 2015	Sep. 26, 2015	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10 MHz ~ 1000MHz 32dB GAIN	Mar. 17, 2014	Apr. 07, 2015~ Apr. 09, 2015	Mar. 16, 2015	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Apr. 07, 2015~ Apr. 09, 2015	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Apr. 07, 2015~ Apr. 09, 2015	N/A	Radiation (03CH07-HY)

Appendix B. Test Results of Conducted Emission Test

<For Normal Mode>

Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	GSM850 Idle + Bluetooth Idle + WLAN On + Adapter + NFC Tx + RJ45 Link + H-Pattern + Print + TF + TC		



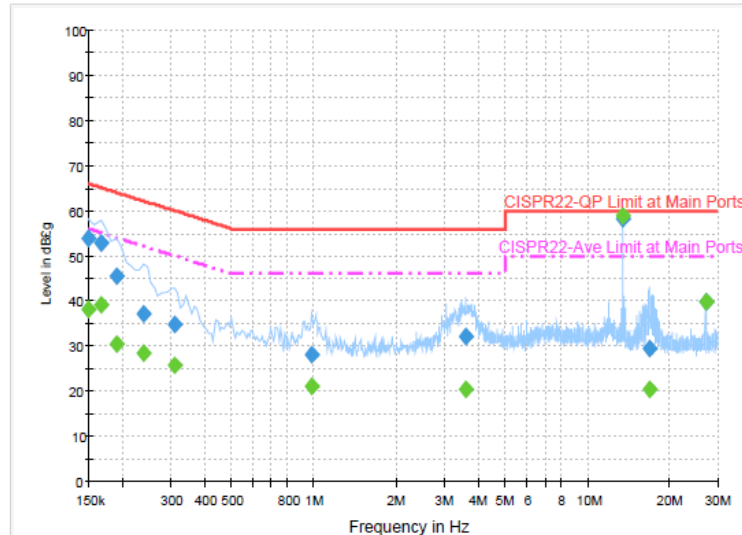
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	55.0	Off	L1	19.5	11.0	66.0
0.158000	54.4	Off	L1	19.4	11.2	65.6
0.182000	47.7	Off	L1	19.5	16.7	64.4
0.214000	45.1	Off	L1	19.4	17.9	63.0
0.254000	39.7	Off	L1	19.5	21.9	61.6
3.470000	32.7	Off	L1	19.7	23.3	56.0
13.558000	59.8	Off	L1	19.9	0.2	60.0
27.118000	39.3	Off	L1	20.0	20.7	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	40.8	Off	L1	19.5	15.2	56.0
0.158000	40.1	Off	L1	19.4	15.5	55.6
0.182000	31.8	Off	L1	19.5	22.6	54.4
0.214000	30.6	Off	L1	19.4	22.4	53.0
0.254000	24.9	Off	L1	19.5	26.7	51.6
3.470000	22.8	Off	L1	19.7	23.2	46.0
13.558000	60.2	Off	L1	19.9	-10.2	50.0
27.118000	39.5	Off	L1	20.0	10.5	50.0

Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	GSM850 Idle + Bluetooth Idle + WLAN On + Adapter + NFC Tx + RJ45 Link + H-Pattern + Print + TF + TC		


Final Result : Quasi-Peak

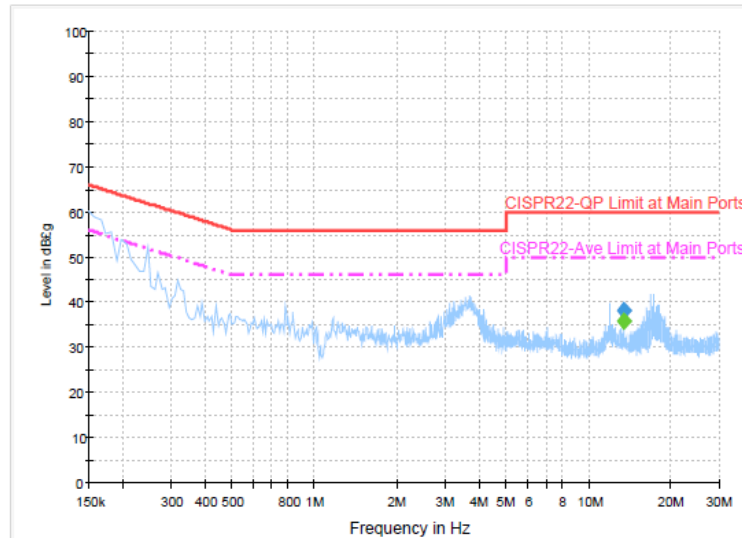
Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	54.0	Off	N	19.5	12.0	66.0
0.166000	52.9	Off	N	19.4	12.3	65.2
0.190000	45.5	Off	N	19.5	18.5	64.0
0.238000	37.2	Off	N	19.5	25.0	62.2
0.310000	34.8	Off	N	19.5	25.2	60.0
0.990000	28.2	Off	N	19.6	27.8	56.0
3.606000	32.2	Off	N	19.7	23.8	56.0
13.558000	58.3	Off	N	20.0	1.7	60.0
17.014000	29.5	Off	N	20.0	30.5	60.0
27.118000	39.7	Off	N	20.2	20.3	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	38.0	Off	N	19.5	18.0	56.0
0.166000	39.1	Off	N	19.4	16.1	55.2
0.190000	30.4	Off	N	19.5	23.6	54.0
0.238000	28.5	Off	N	19.5	23.7	52.2
0.310000	25.6	Off	N	19.5	24.4	50.0
0.990000	20.9	Off	N	19.6	25.1	46.0
3.606000	20.3	Off	N	19.7	25.7	46.0
13.558000	58.9	Off	N	20.0	-8.9	50.0
17.014000	20.4	Off	N	20.0	29.6	50.0
27.118000	40.0	Off	N	20.2	10.0	50.0

<For Terminal Mode>

Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	GSM850 Idle + Bluetooth Idle + WLAN On + Adapter + NFC Tx + RJ45 Link + H-Pattern + Print + TF + TC		

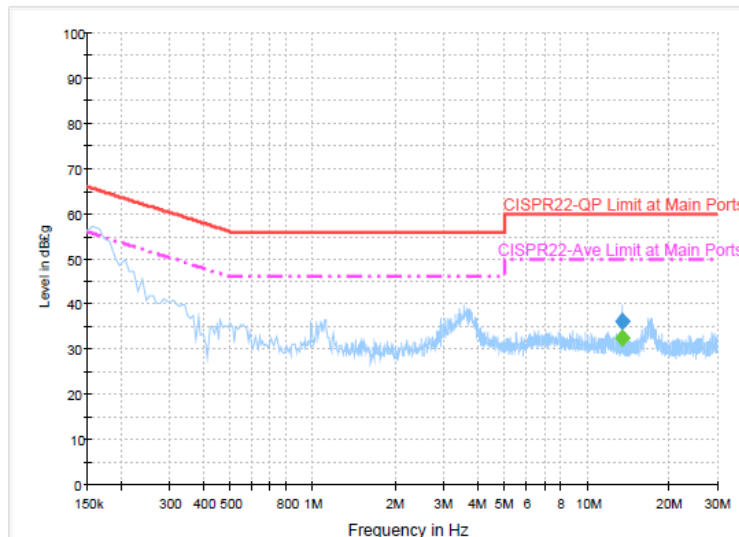

Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
13.558000	38.0	Off	L1	19.9	22.0	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
13.558000	35.7	Off	L1	19.9	14.3	50.0

Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	GSM850 Idle + Bluetooth Idle + WLAN On + Adapter + NFC Tx + RJ45 Link + H-Pattern + Print + TF + TC		


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
13.558000	36.0	Off	N	20.0	24.0	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
13.558000	32.5	Off	N	20.0	17.5	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.

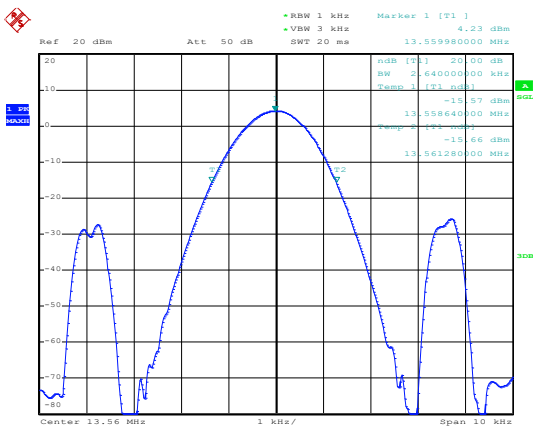
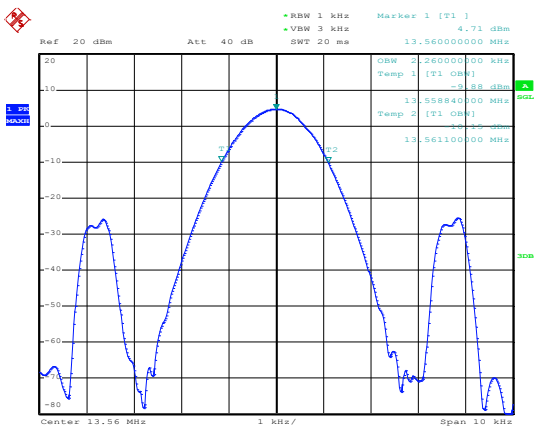
(3) TC stands for Test Configuration, and consists of Earphone, HUB, Mouse (Load), Keyboard (Load), RJ11 (Load with Cash Register, USB Cable (Load with Notebook).

(4) TF stands for Test Function, and consists of Magnetic Stripe Card Reading and Chip Card Reading.



Appendix C. Test Results of Conducted Test Items

C.1 Test Result of 20dB Spectrum Bandwidth

Test mode		NFC Tx		Test Frequency (MHz)	13.56
 Date: 1.APR.2015 15:42:48		 Date: 1.APR.2015 15:36:45			
20dB Bandwidth (kHz)		2.640		99% OccupiedBW(kHz)	2.260
Frequency range (MHz)		$f_L > 13.553$		13.55864	Test Result
		$f_H < 13.567$		13.56128	Complies

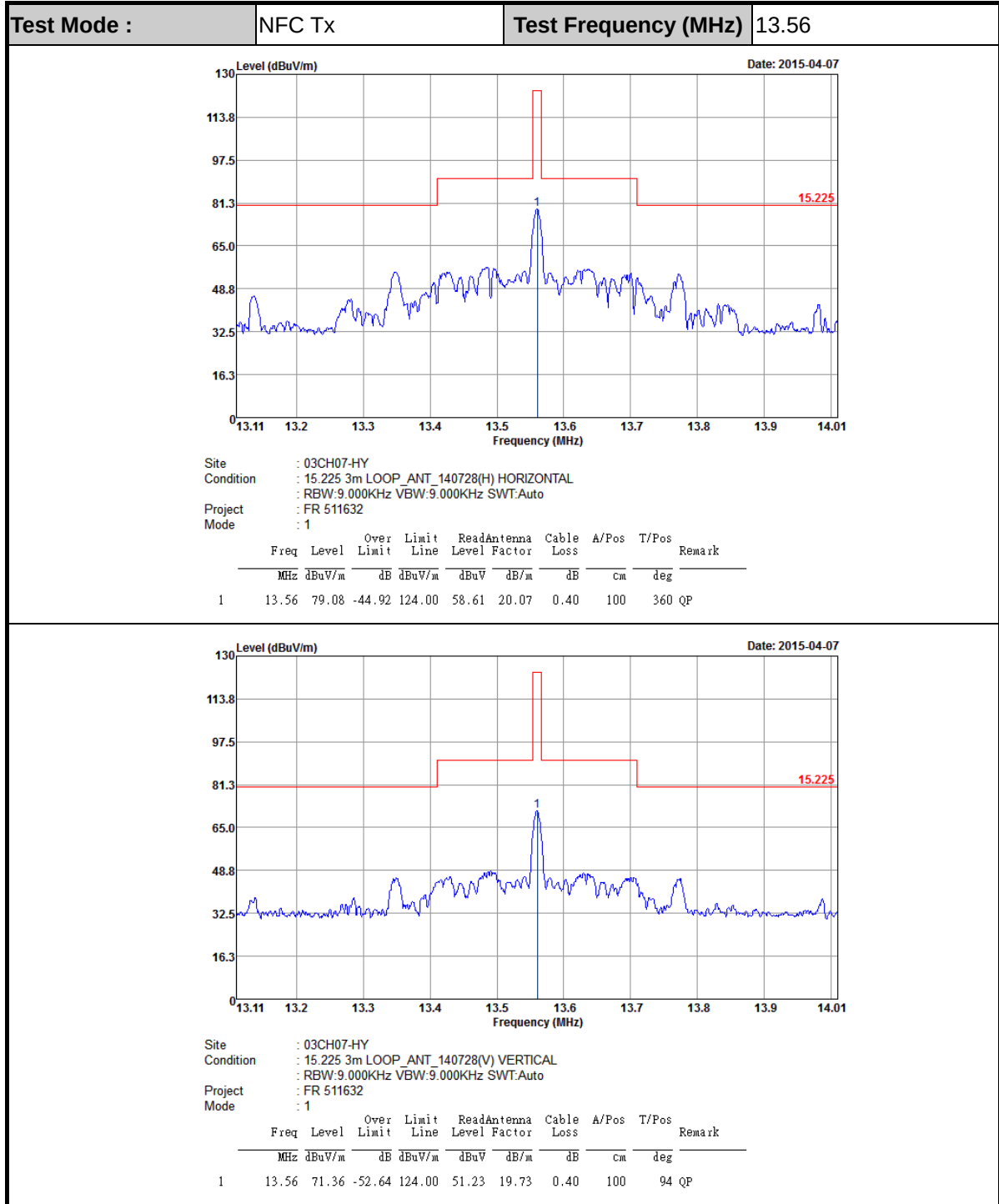
**C.2 Test Result of Frequency Stability**

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability	
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (°C)	Measurement Frequency (MHz)
120	13.559970	-20	13.560060
102	13.559950	-10	13.560080
138	13.559960	0	13.560070
		10	13.560050
		20	13.560020
		30	13.560000
		40	13.559960
		50	13.559950
Max.Deviation (MHz)	-0.000050	Max.Deviation (MHz)	0.000080
Max.Deviation (ppm)	-3.6873	Max.Deviation (ppm)	5.8997
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



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

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

Test Mode :		NFC Tx			Polarization :		Horizontal		
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
0.01798	32.95	-89.56	122.51	12.42	20.24	0.29	-	-	Average
0.08109	25.32	-84.1	109.42	5.07	19.96	0.29	-	-	Average
0.09952	25.68	-81.97	107.65	5.43	19.96	0.29	-	-	QP
0.13056	26.15	-79.14	105.29	5.92	19.94	0.29	-	-	Average
0.44988	54.63	-39.91	94.54	34.46	19.88	0.29	-	-	Average
0.51253	54.72	-18.69	73.41	34.53	19.88	0.31	100	133	QP
12.712	37.23	-32.77	70	16.75	20.08	0.4	-	-	QP
13.56	78.91	8.91	70	58.44	20.07	0.4	-	-	QP
19.285	37.17	-32.83	70	16.39	20.35	0.43	-	-	QP
27.12	38.27	-31.73	70	17.11	20.68	0.48	-	-	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
0.04164	33.09	-82.12	115.21	12.68	20.12	0.29	-	-	Average
0.08151	22.84	-86.54	109.38	2.56	19.99	0.29	-	-	Average
0.09856	25.14	-82.59	107.73	4.86	19.99	0.29	-	-	QP
0.12988	23.26	-82.07	105.33	3.01	19.96	0.29	-	-	Average
0.44818	53.27	-41.3	94.57	33.08	19.9	0.29	-	-	Average
0.51253	52.92	-20.49	73.41	32.71	19.9	0.31	100	246	QP
8.36	40.11	-29.89	70	19.91	19.82	0.38	-	-	QP
13.56	69.96	-0.04	70	49.83	19.73	0.4	-	-	QP
20.248	37.85	-32.15	70	17.47	19.95	0.43	-	-	QP
27.12	39.75	-30.25	70	19.18	20.09	0.48	-	-	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 = $40 \log (\text{specific distance} / \text{test distance})$ (dB);
4. Limit line = specific limits (dBμV) + distance extrapolation factor.

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

Test Mode :		NFC Tx				Polarization :		Horizontal		
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
40.53	22.31	-17.69	40	38.44	13.3	1.77	31.2	-	-	Peak
81.3	30.83	-9.17	40	52.72	7.22	2.06	31.17	-	-	Peak
131.25	17.84	-25.66	43.5	34.66	11.9	2.38	31.1	-	-	Peak
401.5	39.18	-6.82	46	50.61	15.95	3.52	30.9	122	57	Peak
556.2	28.19	-17.81	46	35.03	19.92	4.01	30.77	-	-	Peak
647.9	39.16	-6.84	46	45.04	20.4	4.22	30.5	-	-	Peak

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)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
54.03	32.58	-7.42	40	55.21	6.8	1.77	31.2	122	89	Peak
81.3	26.02	-13.98	40	47.91	7.22	2.06	31.17	-	-	Peak
143.94	22.8	-20.7	43.5	39.79	11.5	2.61	31.1	-	-	Peak
388.2	34.06	-11.94	46	46.08	15.42	3.52	30.96	-	-	Peak
594	32.25	-13.75	46	39.25	19.54	4.08	30.62	-	-	Peak
780.2	35.02	-10.98	46	38.74	22	4.62	30.34	-	-	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.