FCC RF Test Report

APPLICANT	**:**	**Getac Technology Corporation.**
EQUIPMENT	**:**	**RFID Module**
BRAND NAME	**:**	**Jogtek**
MODEL NAME	**:**	**TRF7970A**
FCC ID	**:**	**QYLS410N**
STANDARD	**:**	**FCC Part 15 Subpart C §15.225**
CLASSIFICATION	**:**	**(DXX) Low Power Communication Device Transmitter**

The testing was completed on Jan. 20, 2016. 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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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR5N3002-01	Rev. 01	Initial issue of report	Feb. 02, 2016

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	3.00 dB at 13.558MHz
3.2	15.225(a)(b)(c)	Field Strength of Fundamental Emissions	Complies	55.90 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	30.78 dB at 25.280 MHz for Quasi-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	±2.26dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±4.80dB	Confidence levels of 95%

1. GENERAL INFORMATION

1.1 Applicant

Getac Technology Corporation.

5F., Building A, No. 209, Sec.1, Nangang Rd.,Nangang Dist., Taipei City 11568, Taiwan, R.O.C.

1.2 Manufacturer

Getac Technology (Kunshan) Co., LTD.

No. 269, No. 2 Avenue, Kunshan Comprehensive Free Trade Zone, Jiangsu Province, P.R.C

1.3 Product Details

Items	Description
Sample 1	EUT with SKU B
Sample 2	EUT with SKU C
Installed into Notebook	Brand Name: Getac Model Name: S410
Tx/Rx Frequency Range	13.553 ~ 13.567MHz
Channel Number	1
20dBW	2.64 KHz
99%OBW	2.24 KHz
Antenna Type	PCB Antenna
Type of Modulation	ASK

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. All tests were performed with sample 2.

Sample Information		
	SKU B	SKU C
CPU	i5-6200U non Vpro	i7-6600U, VPRO
TPM	Discrete	Intel
Memory	4GB x 2 323712900001 DDR3 / 4GB ; 512*8 (1600Mhz,1.35V)	8GB x 1 323712900002 DDR3L / 8GB ; 512*8 (1600Mhz , 1.35V)
Display Resolution	HD (AUO) 413000022007	FHD (AUO) 413000022028
Discrete Graphics	N/A	N/A
Touch	Yes	Yes
Sunlight Readable	Yes	Yes
Main Storage	1TB 5400 RPM HTS541010A7E630	256GB SSD 523481763002 PX-256G7LeV (Vlite)
Battery	Brand Name: Getac Model Name: BP-S410-Main-32/2040 S	Brand Name: Getac Model Name: BP-S410-Main-32/2040 S
Battery 2 (2nd)	NA	Brand Name: Getac Model Name:BP-S410-2nd-32/2040 S
Backlit Keyboard	Yes	Yes
AC Adapter	Chicony 65W 442768000001	Chicony 65W 442768000001
Options		
OS (Win7/Win10)	Win10	Win10
2nd Storage	256GB SSD 523481763011 Liteon PX-256G7Ne	128GB SSD 523481763010 Liteon PX-128G7Ne
ODD/2nd Battery/ PCMCIA/Express	ODD Samsung SU-208HB	2nd Battery
Bridge Battery	Brand Name: Getac Model Name: BP-S410-Bridge-21/1950 S	Brand Name: Getac Model Name:BP-S410-Bridge-21/1950 S
Webcam	Foxlink FN20FF-EVE312 2 MP, Fix Focus, 1080P 412876800004	Foxlink FN20FF-EVE312 2 MP, Fix Focus, 1080P 412876800004
Smart Card	Yes	Yes
VGA Port	N/A	Yes
RS232	Yes *2	Yes
Option Ports (Power USB/2nd LAN/Fischer USB/Fischer LAN)	2nd LAN	2nd LAN
Discrete GPS	Yes	Yes
Finger Print	N/A	Yes
wifi bt combo 8260 (V pro version)	Intel 8260 wifi ac/a/b/g/n	Intel 8260 wifi ac/a/b/g/n
Contactless Smart Card	Yes	Yes
LTE	Sierra 4G module EM7355	Sierra 4G module EM7355
RF Passthrough	Yes	Yes

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 1st 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.		
	TH03-HY	CO05-HY	03CH07-HY
Test Engineer	Danny Chen	Kai Chun Chu	James Chiu and Nick Yu
Temperature	22~24℃	24~25℃	21~23℃
Relative Humidity	53~55%	52~53%	55~58%

Note: The test site complies with ANSI C63.4 2014 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.

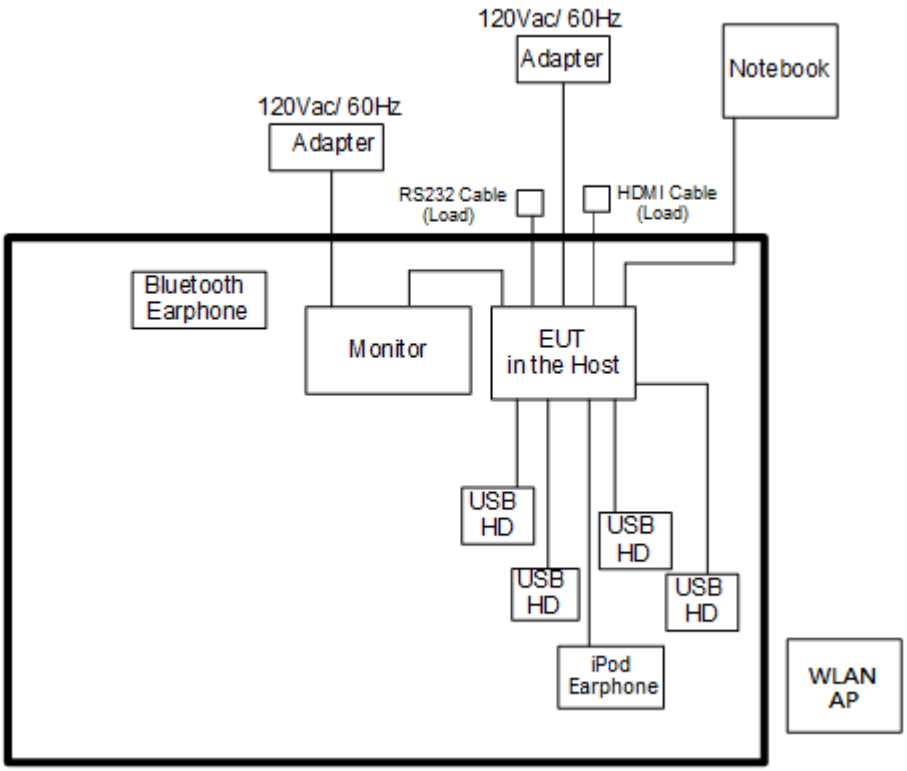
Test Items	
AC Power Line Conducted Emissions	Field Strength of Fundamental Emissions
20dB Spectrum Bandwidth	Frequency Stability
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz

Note:

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

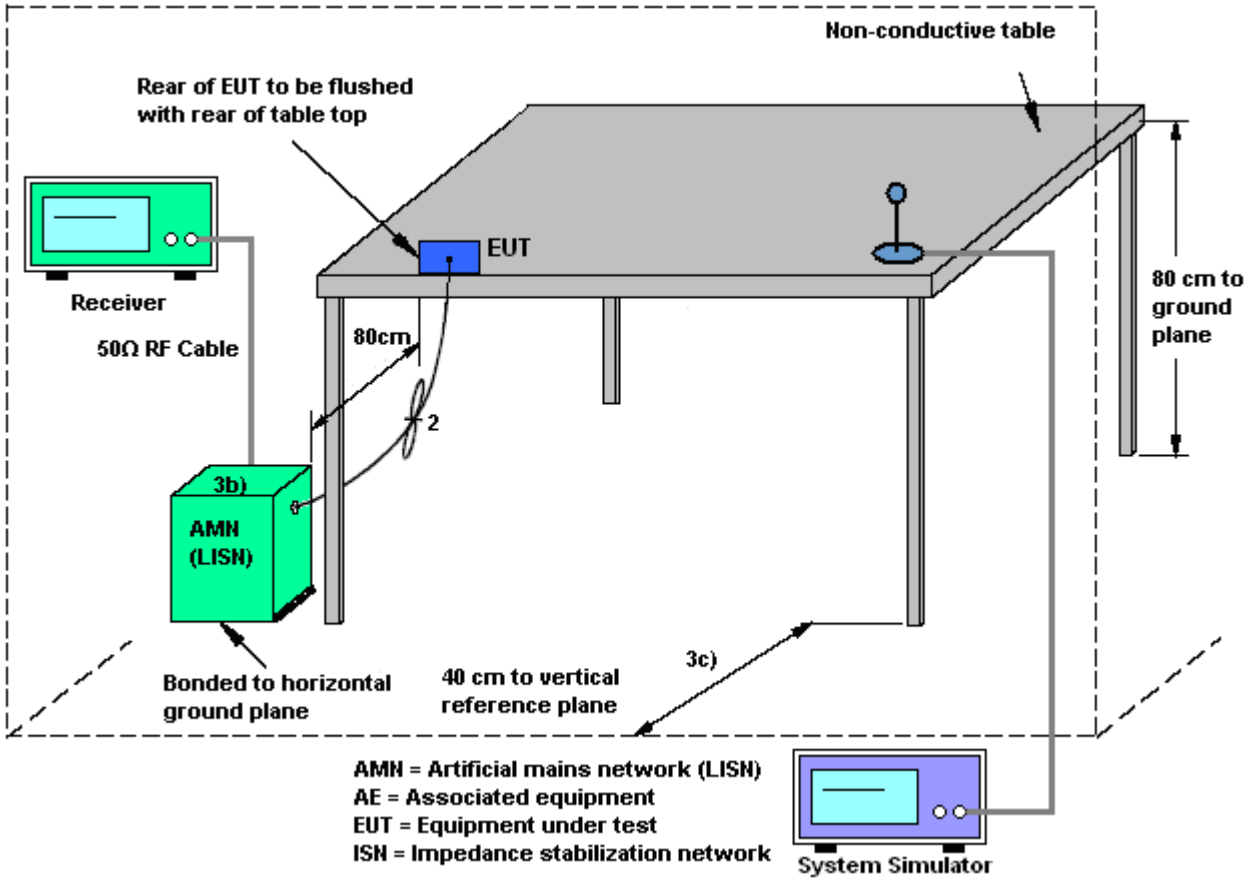
Support Unit	Manufacturer	Model	FCC ID
System Simulator	Anritsu	MT8820C	N/A
GPS Station	Pendulum	GSG-54	N/A
WLAN AP	D-Link	DIR-628	KA2DIR628A2
Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054
iPod Earphone	Apple	N/A	Verification
Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029
USB HD	PQI	H568V	FCC DoC
SD Card	SanDisk	MicroSD HC	FCC DoC
NFC Card	Metro Taipei	Easy Card	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 (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.

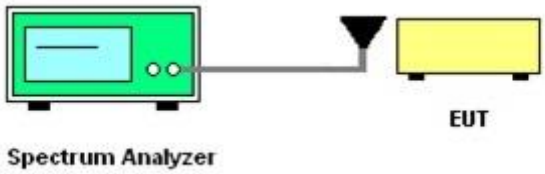
3. CONDUCTED TEST ITEMS

3.1 Measuring Instruments

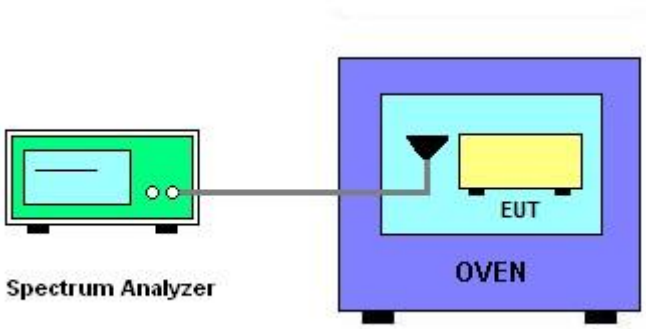
See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 20dB 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 fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±100ppm.
6. Extreme temperature rule is -20°C~50°C.

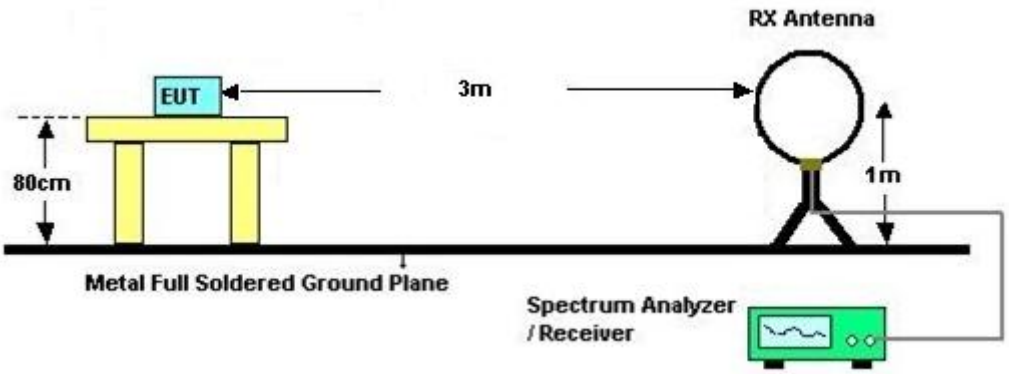
4. RADIATED TEST ITEMS

4.1 Measuring Instruments

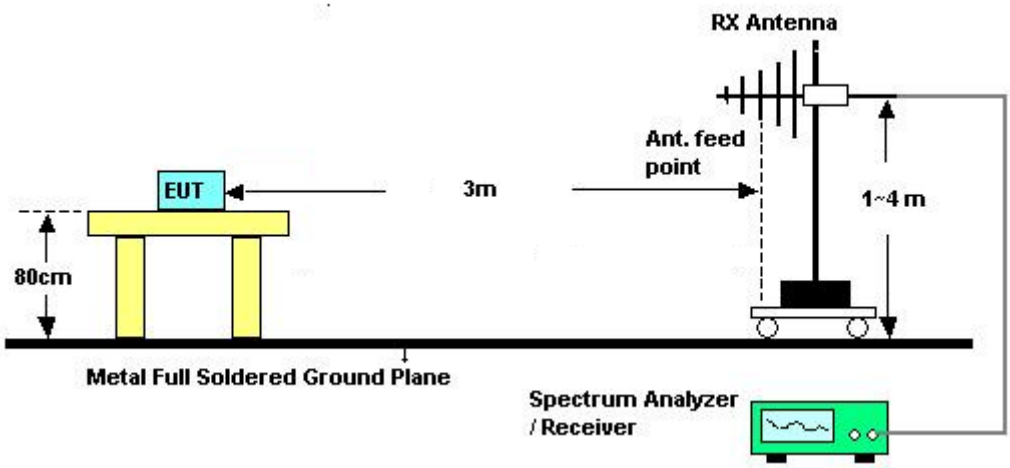
See list of measuring instruments of this test report.

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	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 (μV/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

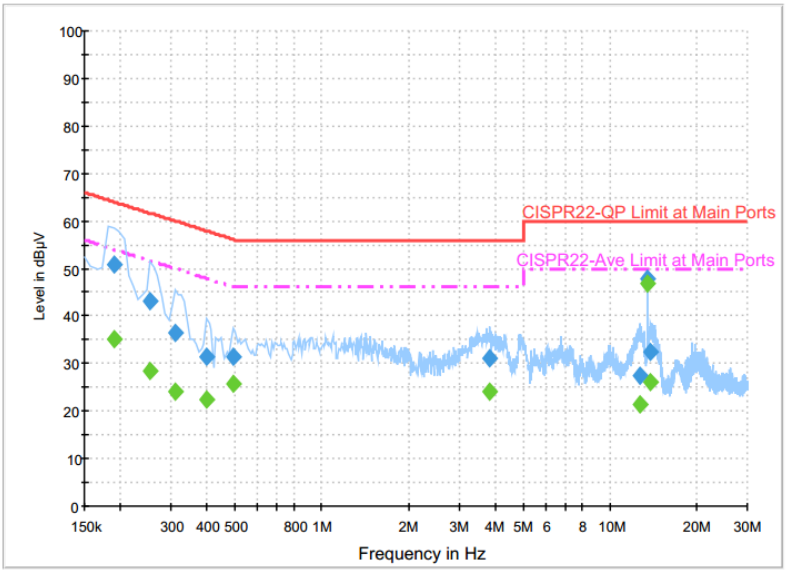
An embedded-in antenna design is used.

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	Jan. 08, 2016	Jun. 23, 2016	Conducted (TH03-HY)
Temperature Chamber	ESPEC	SU-641	92013721	-30℃ ~70℃	Nov. 20, 2015	Jan. 08, 2016	Nov. 19, 2016	Conducted (TH03-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jan. 20, 2016	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 26, 2015	Jan. 20, 2016	Aug. 25, 2016	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 02, 2015	Jan. 20, 2016	Dec. 01, 2016	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 14, 2015	Jan. 20, 2016	Dec. 13, 2016	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 08, 2016	Jan. 20, 2016	Jan. 07, 2017	Conduction (CO05-HY)
Bilog Antenna	Schaffner	CBL6111C	2725	30MHz~1GHz	Nov. 17, 2015	Jan. 09, 2016	Nov. 16, 2016	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Jan. 09, 2016	Sep. 01, 2016	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz-1000MHz	Mar. 12, 2015	Jan. 09, 2016	Mar. 11, 2016	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9010A	MY53470118	10Hz~44GHz	Mar. 03, 2015	Jan. 09, 2016	Mar. 02, 2016	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Jan. 09, 2016	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 degree	N/A	Jan. 09, 2016	N/A	Radiation (03CH07-HY)

Appendix B. Test Results of Conducted Emission Test

Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	WCDMA Band II Idle + TC + TF + NFC Tx		



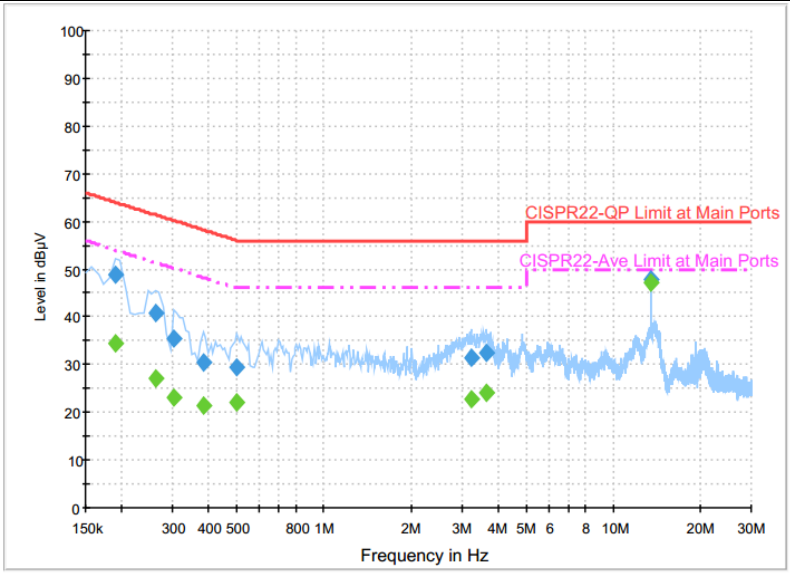
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	50.8	Off	L1	19.6	13.2	64.0
0.254000	43.0	Off	L1	19.6	18.6	61.6
0.310000	36.4	Off	L1	19.6	23.6	60.0
0.398000	31.3	Off	L1	19.6	26.6	57.9
0.494000	31.5	Off	L1	19.6	24.6	56.1
3.814000	31.0	Off	L1	19.7	25.0	56.0
12.750000	27.3	Off	L1	19.8	32.7	60.0
13.558000	47.7	Off	L1	19.8	12.3	60.0
13.918000	32.5	Off	L1	19.8	27.5	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	35.2	Off	L1	19.6	18.8	54.0
0.254000	28.3	Off	L1	19.6	23.3	51.6
0.310000	24.0	Off	L1	19.6	26.0	50.0
0.398000	22.4	Off	L1	19.6	25.5	47.9
0.494000	25.7	Off	L1	19.6	20.4	46.1
3.814000	23.9	Off	L1	19.7	22.1	46.0
12.750000	21.4	Off	L1	19.8	28.6	50.0
13.558000	46.8	Off	L1	19.8	3.2	50.0
13.918000	26.0	Off	L1	19.8	24.0	50.0

Test Mode :	NFC Tx	Test Voltage :	120Vac / 60Hz
Function Type :	WCDMA Band II Idle + TC + TF + NFC Tx		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	48.9	Off	N	19.6	15.1	64.0
0.262000	40.8	Off	N	19.6	20.6	61.4
0.302000	35.4	Off	N	19.6	24.8	60.2
0.382000	30.4	Off	N	19.6	27.8	58.2
0.502000	29.4	Off	N	19.6	26.6	56.0
3.222000	31.3	Off	N	19.6	24.7	56.0
3.654000	32.3	Off	N	19.6	23.7	56.0
13.558000	48.0	Off	N	19.8	12.0	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	34.5	Off	N	19.6	19.5	54.0
0.262000	27.1	Off	N	19.6	24.3	51.4
0.302000	23.2	Off	N	19.6	27.0	50.2
0.382000	21.5	Off	N	19.6	26.7	48.2
0.502000	22.0	Off	N	19.6	24.0	46.0
3.222000	22.7	Off	N	19.6	23.3	46.0
3.654000	24.0	Off	N	19.6	22.0	46.0
13.558000	47.0	Off	N	19.8	3.0	50.0

Note:

1. (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

2. TC stands for Test Configuration, and consists of Adapter, SD Card, USB HD, Earphone, HDMI

Cable (Load), RJ-45, D-sub, RS232 Cable (Load), and Smart Card (Load).

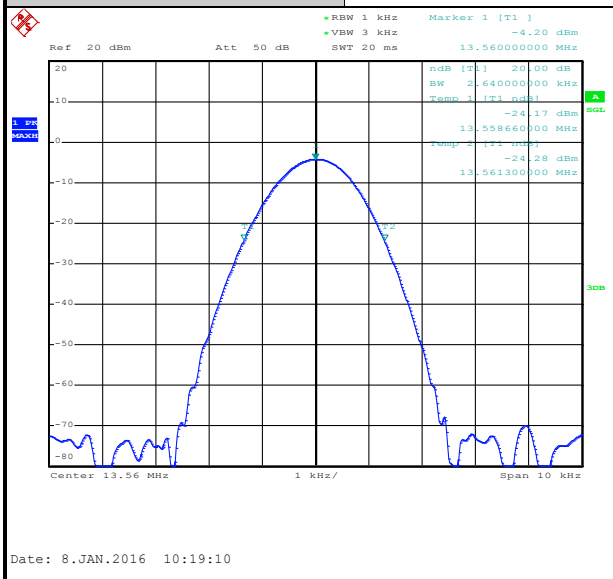
3. TF stands for Test Function, and consists of MPEG4, Camera, GPS Rx, H-Pattern, Bluetooth Idle, WLAN Idle, and RFID Idle.

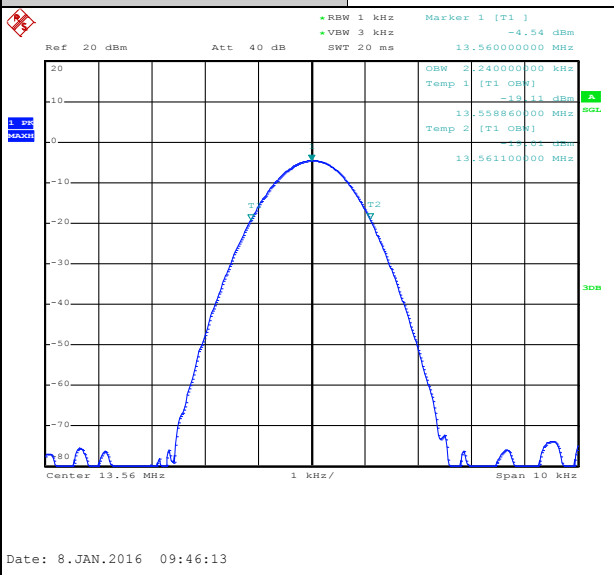
Appendix C. Test Results of Conducted Test Items

C.1 Test Result of 20dB Spectrum Bandwidth

<Type A>

Test mode	NFC Tx	Test Frequency (MHz)	13.56

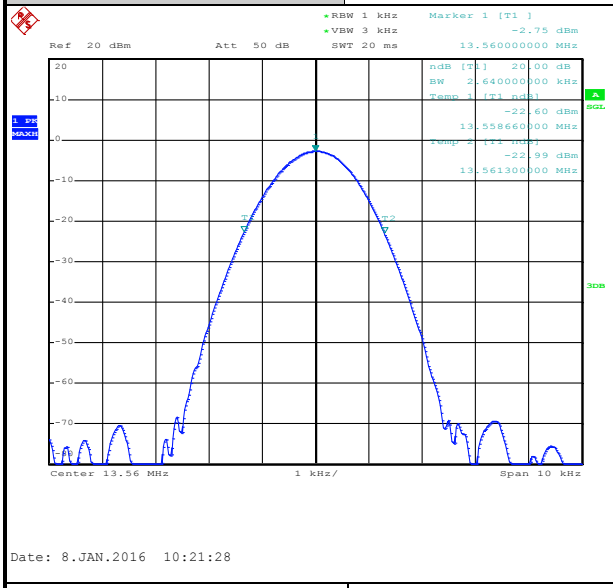


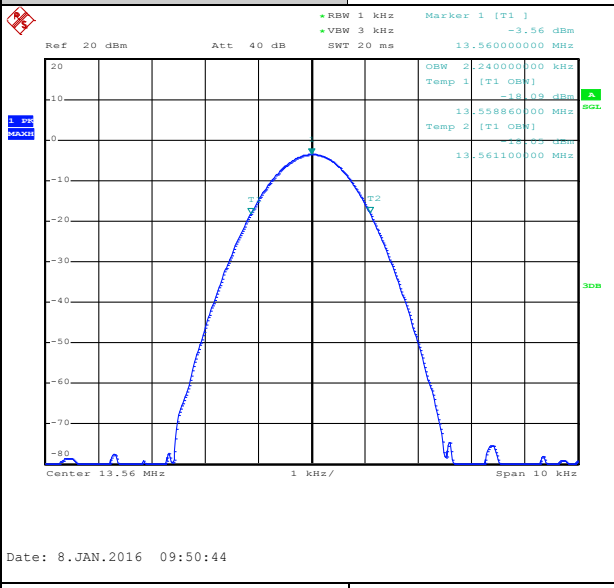


20dB Bandwidth (kHz)	2.640	**99% OccupiedBW(kHz)**	2.240
Frequency range (MHz)	**f_L > 13.553**	13.55866	**Test Result**
	f_H < 13.567	13.56130	**Complies**

<Type F>

Test mode	NFC Tx for Type F	Test Frequency (MHz)	13.56

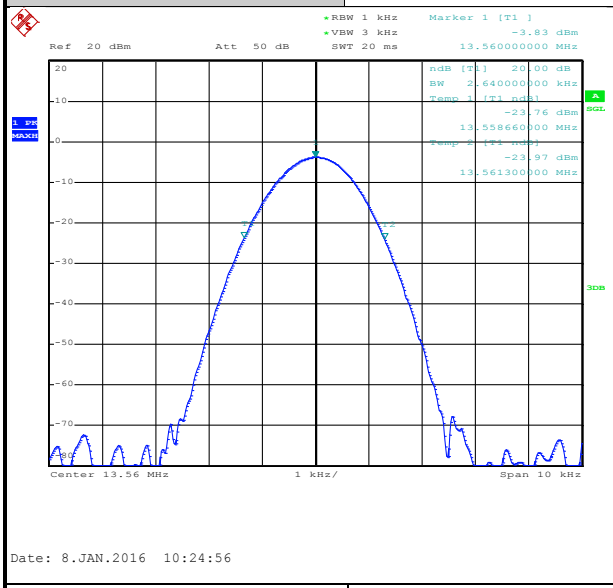


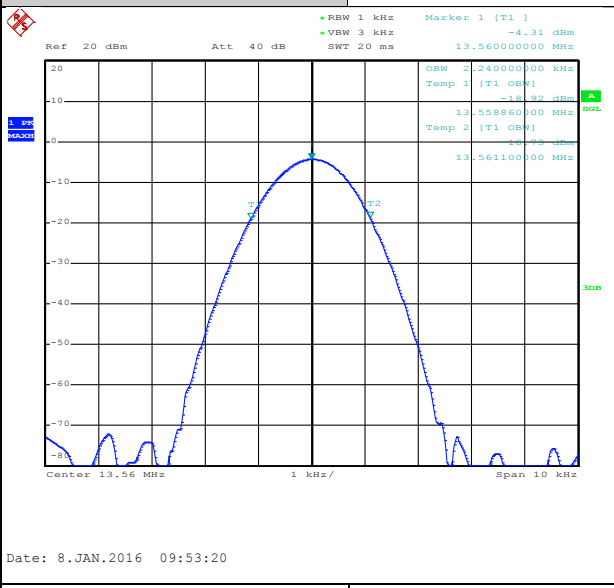


20dB Bandwidth (kHz)	2.640	99% OccupiedBW(kHz)	2.240
Frequency range (MHz)	$f_L > 13.553$	13.55866	Test Result
	$f_H < 13.567$	13.56130	Complies

<Type V>

Test mode	NFC Tx for Type V	Test Frequency (MHz)	13.56





20dB Bandwidth (kHz)	2.640	99% OccupiedBW(kHz)	2.240
Frequency range (MHz)	$f_L > 13.553$	13.55866	Test Result
	$f_H < 13.567$	13.56130	Complies

C.2 Test Result of Frequency Stability

<Type A>

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability	
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (℃)	Measurement Frequency (MHz)
120	13.559980	**-20**	13.560000
102	13.559980	**-10**	13.560010
138	13.559980	**0**	13.560000
		10	13.560000
		20	13.559980
		30	13.559980
		40	13.559960
		50	13.559960
Max.Deviation (MHz)	-0.000020	**Max.Deviation (MHz)**	-0.000040
Max.Deviation (ppm)	-1.4749	**Max.Deviation (ppm)**	-2.9499
Limit	**FS < ±100 ppm**	**Limit**	**FS < ±100 ppm**
Test Result	**PASS**	**Test Result**	**PASS**

<Type F>

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability	
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (℃)	Measurement Frequency (MHz)
120	13.559980	**-20**	13.560000
102	13.559980	**-10**	13.560020
138	13.559980	**0**	13.560000
		10	13.560000
		20	13.559980
		30	13.559980
		40	13.559960
		50	13.559960
Max.Deviation (MHz)	-0.000020	**Max.Deviation (MHz)**	-0.000040
Max.Deviation (ppm)	-1.4749	**Max.Deviation (ppm)**	-2.9499
Limit	**FS < ±100 ppm**	**Limit**	**FS < ±100 ppm**
Test Result	**PASS**	**Test Result**	**PASS**

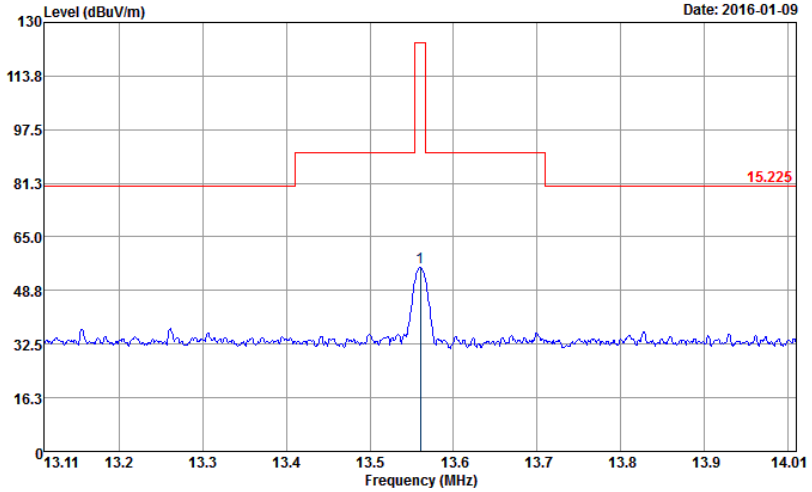
<Type V>

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability	
Voltage (Vac)	**Measurement Frequency (MHz)**	**Temperature (℃)**	**Measurement Frequency (MHz)**
120	13.559980	**-20**	13.560000
102	13.559980	**-10**	13.560020
138	13.559980	**0**	13.560000
		10	13.559980
		20	13.559980
		30	13.559980
		40	13.559970
		50	13.559960
Max.Deviation (MHz)	-0.000020	**Max.Deviation (MHz)**	-0.000040
Max.Deviation (ppm)	-1.4749	**Max.Deviation (ppm)**	-2.9499
Limit	**FS < ±100 ppm**	**Limit**	**FS < ±100 ppm**
Test Result	**PASS**	**Test Result**	**PASS**

Appendix D. Test Results of Radiated Test Items

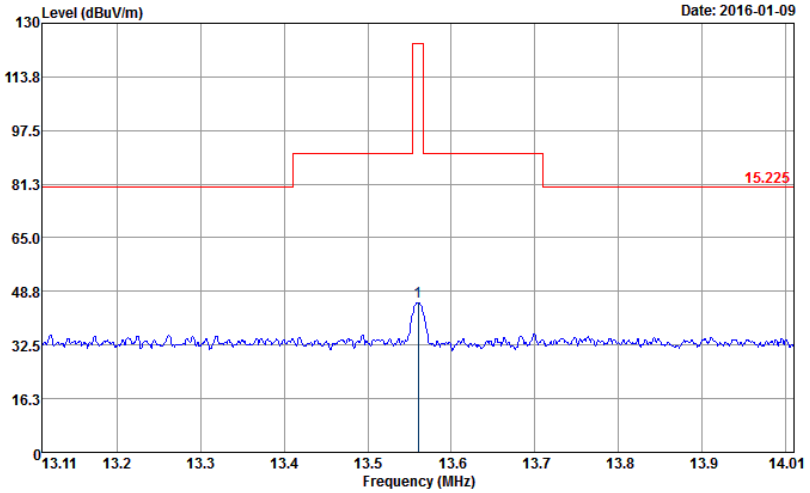
D.1 Test Result of Field Strength of Fundamental Emissions

Test Mode :	NFC Tx	Test Frequency (MHz)	13.56



Site : 03CH07-HY
Condition : 15.225 3m LOOP_ANT(H) HORIZONTAL
: RBW:9.000KHz VBW:9.000KHz SWT:Auto

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	
1	13.56	55.90	-68.10	124.00	34.83	20.05	1.02	100	0	Peak



Site : 03CH07-HY
Condition : 15.225 3m LOOP_ANT(V) VERTICAL
: RBW:9.000KHz VBW:9.000KHz SWT:Auto

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	
1	13.56	45.80	-78.20	124.00	24.73	20.05	1.02	100	286	Peak

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
0.01405	38.59	-86.06	124.65	17.32	20.25	1.02	-	-	Average
0.06471	47.43	-63.95	111.38	26.37	20.04	1.02	-	-	Average
0.10872	23.47	-83.41	106.88	2.46	19.99	1.02	-	-	QP
0.1294	42.35	-63.02	105.37	21.36	19.97	1.02	-	-	Average
0.30572	23.56	-74.34	97.9	2.63	19.91	1.02	-	-	Average
0.49	28.99	-44.81	73.8	8.07	19.9	1.02	-	-	QP
13.56	55.39	-	-	34.32	20.05	1.02	-	-	QP
14.448	37.97	-31.53	69.5	16.9	20.05	1.02	-	-	QP
23.65	38.24	-31.26	69.5	15.9	20.57	1.77	-	-	QP
25.28	38.72	-30.78	69.5	16.36	20.59	1.77	100	321	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
0.01323	36.37	-88.8	125.17	15.1	20.25	1.02	-	-	Average
0.0738	42.02	-68.22	110.24	20.96	20.04	1.02	-	-	Average
0.0987	22.24	-85.48	107.72	1.23	19.99	1.02	-	-	QP
0.1294	35.85	-69.52	105.37	14.86	19.97	1.02	-	-	Average
0.30436	27.26	-70.68	97.94	6.33	19.91	1.02	-	-	Average
0.50502	29.74	-43.8	73.54	8.82	19.9	1.02	-	-	QP
13.56	45.59	-	-	24.52	20.05	1.02	-	-	QP
14.264	38.47	-31.03	69.5	17.4	20.05	1.02	100	215	QP
23.803	38.46	-31.04	69.5	16.12	20.57	1.77	-	-	QP
28.6	38.36	-31.14	69.5	16.04	20.55	1.77	-	-	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)

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
30	28.14	-11.86	40	32.17	25.7	1.77	31.5	-	-	Peak
216.03	35.97	-10.03	46	48.28	16.04	2.69	31.04	100	231	Peak
264.09	31.05	-14.95	46	39.43	19.46	3.16	31	-	-	Peak
311.9	29.44	-16.56	46	37.26	19.9	3.28	31	-	-	Peak
528.9	31.05	-14.95	46	33.27	24.61	3.89	30.72	-	-	Peak
969.2	35.66	-18.34	54	30.35	30.7	4.94	30.33	-	-	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
30	28.68	-11.32	40	32.71	25.7	1.77	31.5	105	157	Peak
216.03	34.05	-11.95	46	46.36	16.04	2.69	31.04	-	-	Peak
264.09	31.25	-14.75	46	39.63	19.46	3.16	31	-	-	Peak
400.1	28.6	-17.4	46	33.66	22.32	3.52	30.9	-	-	Peak
503.7	29.58	-16.42	46	32.16	24.15	3.89	30.62	-	-	Peak
969.9	34.95	-19.05	54	29.63	30.7	4.94	30.32	-	-	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.