



FCC RF Test Report

APPLICANT : ASUSTeK COMPUTER INC.
EQUIPMENT : ASUS Phone(Mobile Phone)
BRAND NAME : ASUS
MODEL NAME : ASUS_X01BDA
FCC ID : MSQX01BDA
STANDARD : FCC Part 15 Subpart C § 15.225
CLASSIFICATION : (DXX) Low Power Communication Device Transmitter

The product was received on Aug. 28, 2018 and testing was completed on Nov. 13, 2018. We, Sporton International (Kunshan) 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 (Kunshan) Inc., the test report shall not be reproduced except in full.

Approved by: James Huang /
Manager



Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone,
Jiangsu Province 215335, China



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR882808D	Rev. 01	Initial issue of report	Nov. 14, 2018



SUMMARY OF THE TEST RESULT

Report Section	FCC Rule	Description of Test	Result	Remark
3.1	15.207	AC Power Line Conducted Emissions	Complies	Under limit 14.42 dB at 0.156MHz
3.2	15.215(c)	20dB Spectrum Bandwidth	Complies	-
	-	99% OBW Spectrum Bandwidth	Complies	-
3.3	15.225(e)	Frequency Stability	Complies	-
3.4	15.225(a)(b)(c)	Field Strength of Fundamental Emissions	Complies	Max level 60.77 dB μ V/m at 13.560 MHz
3.5	15.225(d) & 15.209	Radiated Spurious Emissions	Complies	Under limit 15.66 dB at 34.850MHz for Quasi-Peak
3.6	15.203	Antenna Requirements	Complies	-



1. General Description

1.1 Applicant

ASUSTeK COMPUTER INC.

4F, No.150, Li-Te Rd., Peitou, Taipei 112, Taiwan

1.2 Manufacturer

ASUSTeK COMPUTER INC.

4F, No.150, Li-Te Rd., Peitou, Taipei 112, Taiwan

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	ASUS Phone(Mobile Phone)
Brand Name	ASUS
Model Name	ASUS_X01BDA
FCC ID	MSQX01BDA
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/ HSPA+ (16QAM uplink is not supported)/LTE/NFC WLAN 2.4GHz 802.11b/g/n HT20 Bluetooth BR/EDR/LE
IMEI Code	Conducted: 352384100042524/352384100042532 Conduction: 352384100041526/352384100041534 Radiation: 352384100042268
HW Version	S.TA.3.1-00742-SDM660_GEN_PACK-1
SW Version	CSC__ZB630KL_15.2016.1807.012_userdebug_20180821
EUT Stage	Identical Prototype

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 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	13.553 ~ 13.567MHz
Channel Number	1
20dBW	2.489 KHz
99%OBW	2.113 KHz
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.

1.5 Modification of EUT

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

1.6 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0) and the FCC designation No is CN5013.

Test Site	Sporton International (Kunshan) Inc.			
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone, Jiangsu Province 215335, China TEL : 86-512-57900158 FAX : 86-512-57900958			
Test Site No.	Sporton Site No.			FCC Registration No.
	TH01-KS	03CH06-KS	CO01-KS	630927
Test Engineer	Orion Li	Dream Li	Amos Zhang	
Temperature	22~24	22~23	23.8~24.3	
Relative Humidity	53~55	41~44	42~45	

1.7 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

2. Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

Investigation has been done on all the possible configurations.

The following table is a list of the test modes shown in this test report.

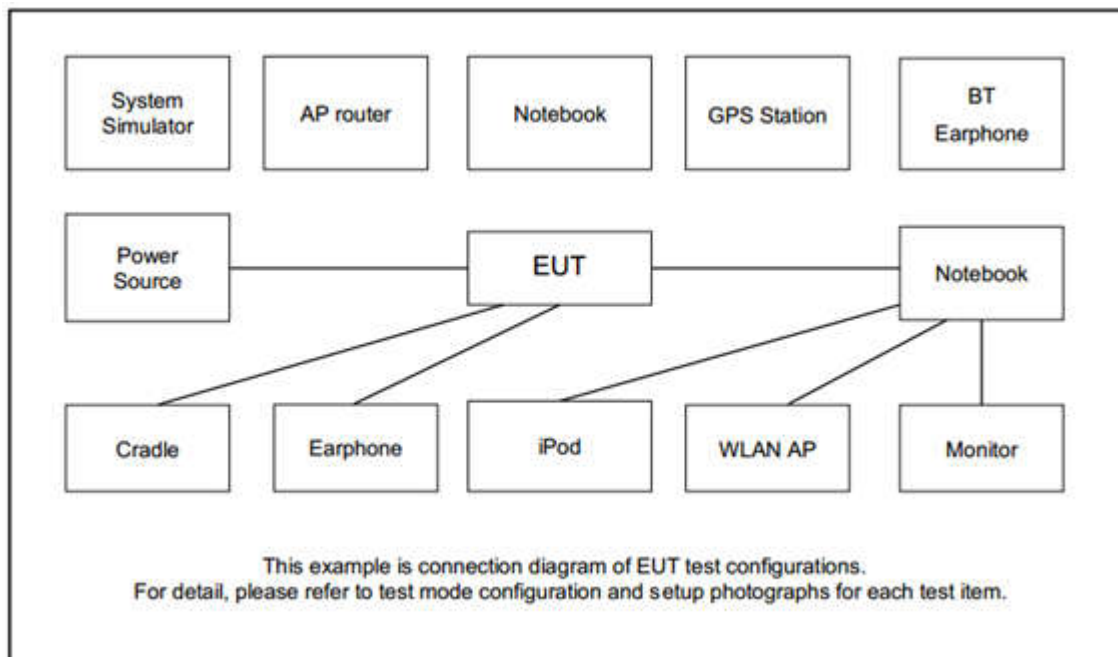
Test Items	
AC Power Line Conducted Emissions	Field Strength of Fundamental Emissions
20dB Spectrum Bandwidth	Frequency Stability
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz

The EUT pre-scanned in four NFC type, A, B, F, V. The worst type (type A) was recorded in this report.

Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (Z plane as worst plane) from all possible combinations.

Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + USB Cable 1(Charging from Adapter 3) + Earphone 1 + NFC Tx + Battery 1

2.2 Connection Diagram of Test System



2.3 Table for Supporting Units

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8m
2.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8m
3.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	BT Earphone	Lenovo	LBH308	N/A	N/A	N/A
5.	NFC Card	N/A	N/A	N/A	N/A	N/A

2.4 EUT Operation Test Setup

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.

3. Test Results

3.1 AC Power Line Conducted Emissions Measurement

3.1.1 Limit of AC Conducted Emission

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.

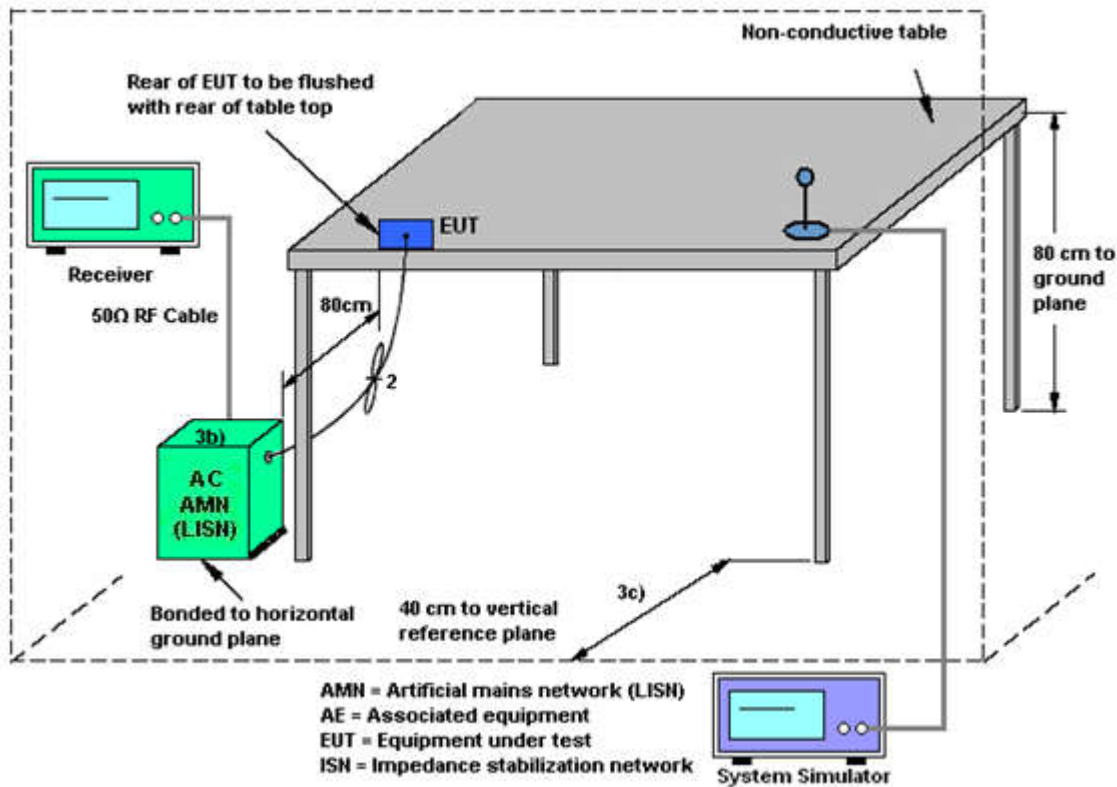
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 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.

3.1.4 Test setup



3.1.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

3.2 20dB and 99% OBW Spectrum Bandwidth Measurement

3.2.1 Limit

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

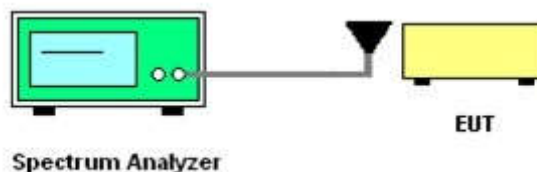
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 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.

3.2.4 Test Setup



3.2.5 Test Result of Conducted Test Items

Please refer to Appendix B.

3.3 Frequency Stability Measurement

3.3.1 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.

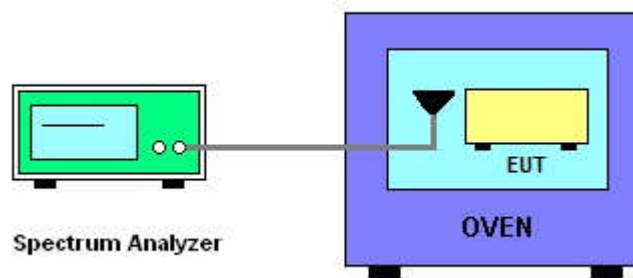
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 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.

3.3.4 Test Setup



3.3.5 Test Result of Conducted Test Items

Please refer to Appendix B.

3.4 Field Strength of Fundamental Emissions and Mask Measurement

3.4.1 Limit

Rules and specifications	FCC CFR 47 Part 15 section 15.225			
Description	Compliance with the spectrum mask is tested with RBW set to 9kHz.			
Freq. of Emission (MHz)	Field Strength (μ V/m) at 30m	Field Strength (dB μ V/m) at 30m	Field Strength (dB μ V/m) at 10m	Field Strength (dB μ V/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

3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

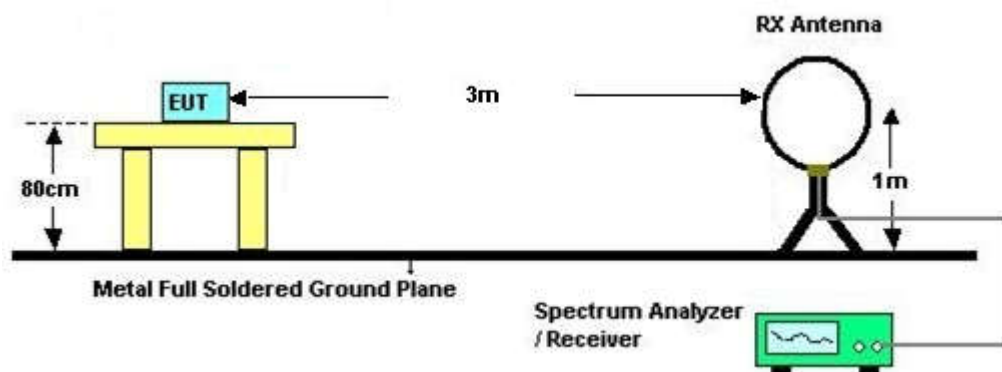
3.4.3 Test Procedures

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 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 (dB μ V/m) = 20 log Emission level (μ V/m).

3.4.4 Test Setup

For radiated emissions below 30MHz



3.4.5 Test Result of Field Strength of Fundamental Emissions and Mask

Please refer to Appendix C.

3.5 Radiated Emissions Measurement

3.5.1 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 (μ 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

3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 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

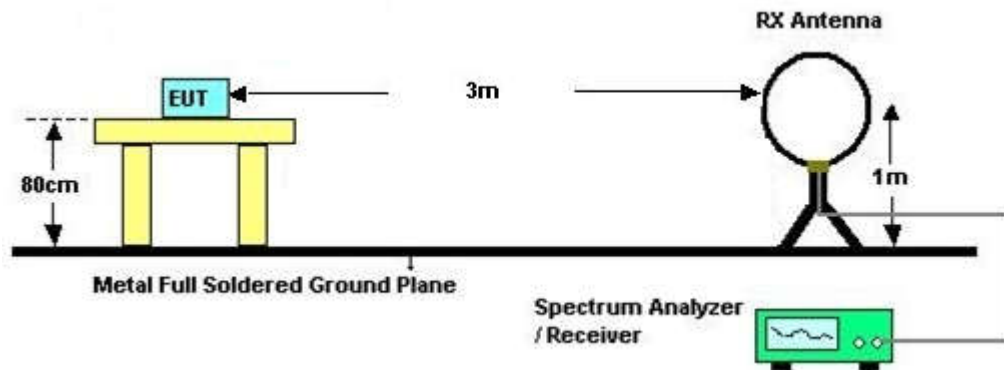
Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

3.5.4 Test Procedures

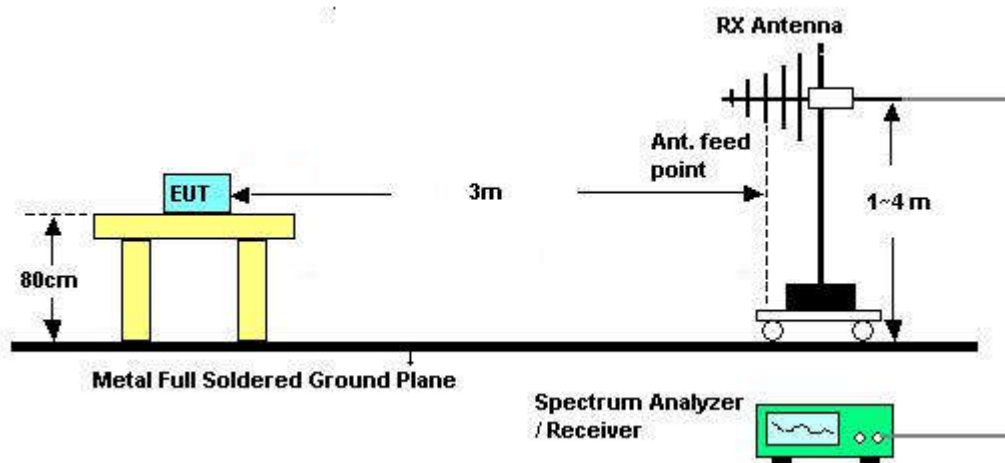
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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

3.5.5 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



3.5.6 Test Result of Radiated Emissions Measurement

Please refer to Appendix C.



3.6 Antenna Requirements

3.6.1 Standard Applicable

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.

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 rule.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Aug. 07, 2018	Oct. 27, 2018	Aug. 06, 2019	Conducted (TH01-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Oct. 27, 2018	NCR	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jun. 27, 2018	Oct. 27, 2018	Jun. 26, 2019	Conducted (TH01-KS)
EMI Receiver	R&S	ESC17	100768	9kHz~7GHz;	Apr. 19, 2018	Oct. 24, 2018	Apr. 18, 2019	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 12, 2018	Oct. 24, 2018	Oct. 11, 2019	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Nov. 23, 2017	Oct. 24, 2018	Nov. 22, 2018	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2018	Oct. 24, 2018	Oct. 11, 2019	Conduction (CO01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400023	3Hz~8.5GHz;Max 30dBm	Oct. 12, 2018	Nov. 13, 2018	Oct. 11, 2019	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471084	10Hz~44GHz	Jun. 25, 2018	Nov. 13, 2018	Jun. 24, 2019	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 19, 2018	Nov. 13, 2018	Oct. 18, 2019	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz~1GHz	Jan. 29, 2018	Nov. 13, 2018	Jan. 28, 2019	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	187289	9KHz ~1GHZ	Aug. 06, 2018	Nov. 13, 2018	Aug. 05, 2019	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Nov. 13, 2018	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Nov. 13, 2018	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Nov. 13, 2018	NCR	Radiation (03CH06-KS)

NCR: No Calibration Required

5. Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.9 dB
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Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

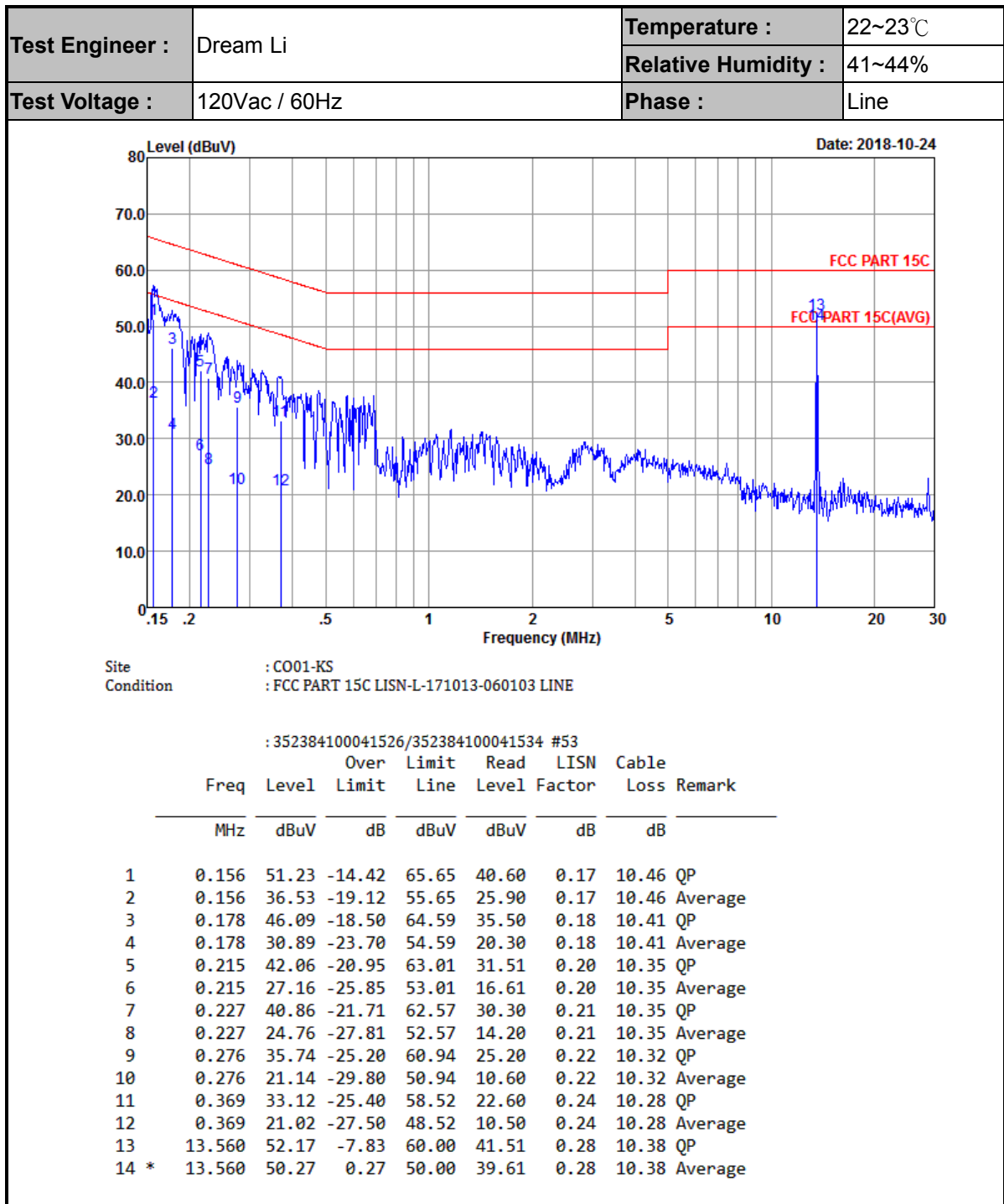
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.0 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.0 dB
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Appendix A. Test Results of Conducted Emission Test

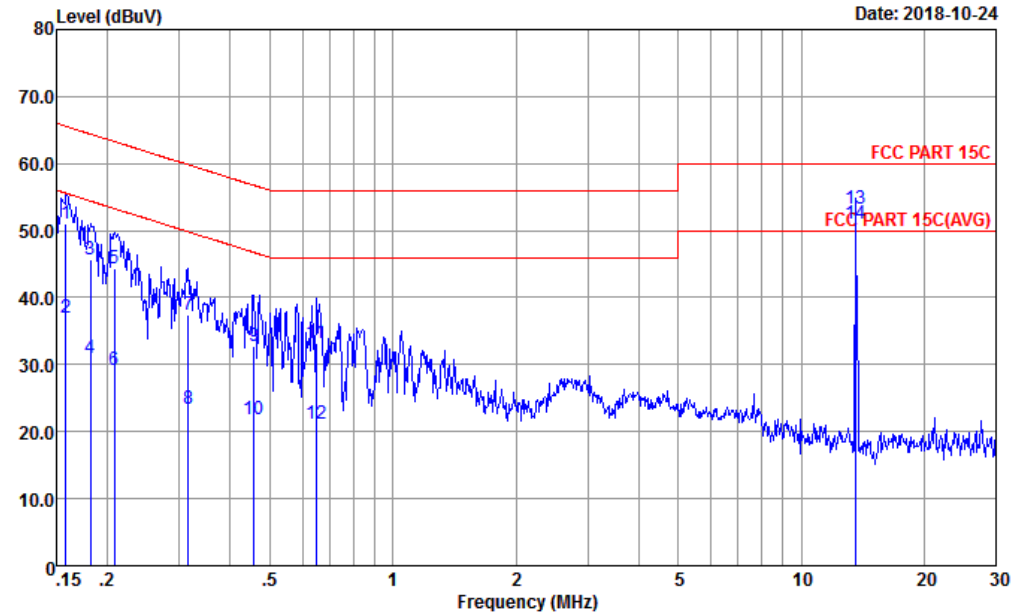


(1) with antenna

Remark: 13.56MHz is the NFC RF fundamental signal.



Test Engineer :	Dream Li	Temperature :	22~23°C
		Relative Humidity :	41~44%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



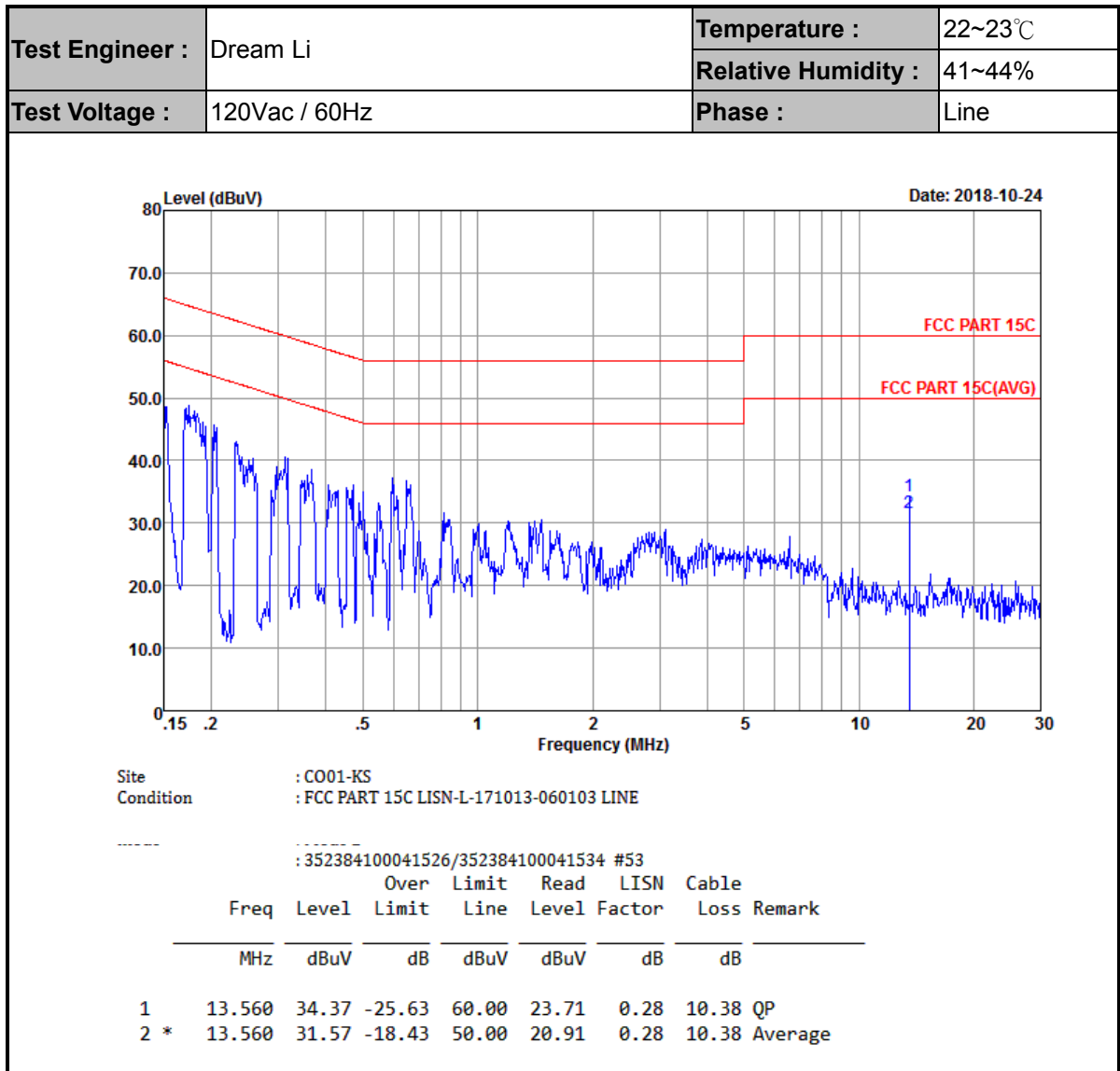
Site : CO01-KS
Condition : FCC PART 15C LISN-N-171013-060103 NEUTRAL

: 352384100041526/352384100041534 #53

	Freq	Level	Over Limit	Limit	Read	LISN	Cable	
	MHz	dBuV		dB	Level	Factor	Loss	Remark
					dBuV	dB	dB	
1	0.158	51.04	-14.52	65.56	40.30	0.28	10.46	QP
2	0.158	37.04	-18.52	55.56	26.30	0.28	10.46	Average
3	0.182	45.58	-18.84	64.42	34.90	0.28	10.40	QP
4	0.182	30.88	-23.54	54.42	20.20	0.28	10.40	Average
5	0.208	44.24	-19.03	63.27	33.60	0.28	10.36	QP
6	0.208	29.24	-24.03	53.27	18.60	0.28	10.36	Average
7	0.315	37.49	-22.35	59.84	26.91	0.28	10.30	QP
8	0.315	23.49	-26.35	49.84	12.91	0.28	10.30	Average
9	0.456	32.74	-24.02	56.76	22.20	0.29	10.25	QP
10	0.456	21.84	-24.92	46.76	11.30	0.29	10.25	Average
11	0.647	33.13	-22.87	56.00	22.59	0.30	10.24	QP
12	0.647	21.13	-24.87	46.00	10.59	0.30	10.24	Average
13	13.560	53.22	-6.78	60.00	42.61	0.23	10.38	QP
14 *	13.560	51.12	1.12	50.00	40.51	0.23	10.38	Average

(1) with antenna

Remark: 13.56MHz is the NFC RF fundamental signal.

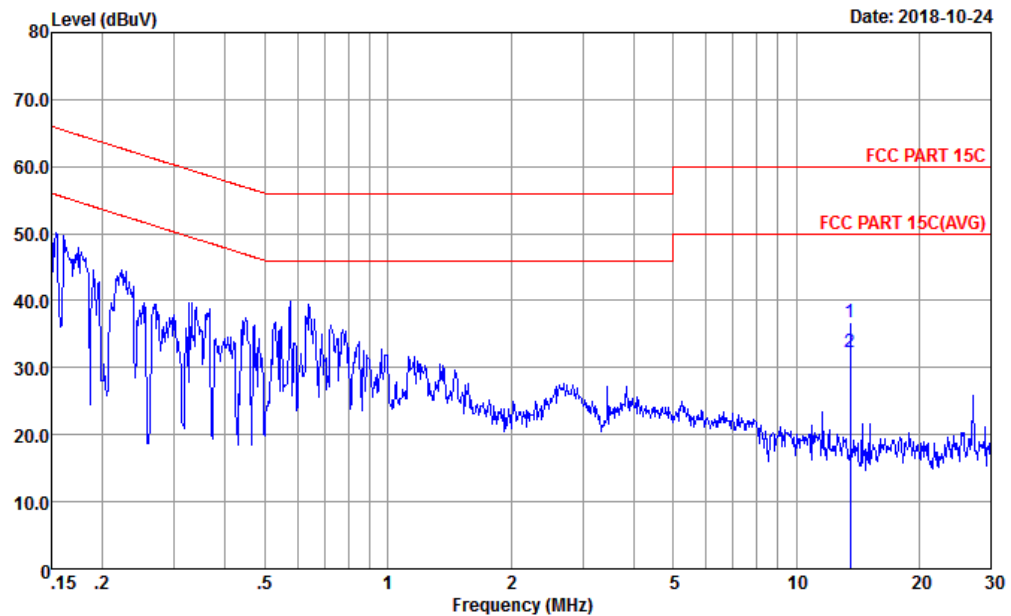


(2) With dummy load

Remark: Only the fundamental NFC signal needs to be retested per KDB 174176



Test Engineer :	Dream Li	Temperature :	22~23°C
		Relative Humidity :	41~44%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : CO01-KS
Condition : FCC PART 15C LISN-N-171013-060103 NEUTRAL

: 352384100041526/352384100041534 #53

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	13.560	36.82	-23.18	60.00	26.21	0.23	10.38	QP
2 *	13.560	32.25	-17.75	50.00	21.64	0.23	10.38	Average

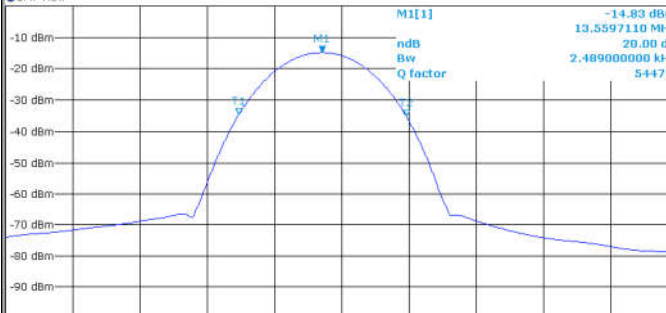
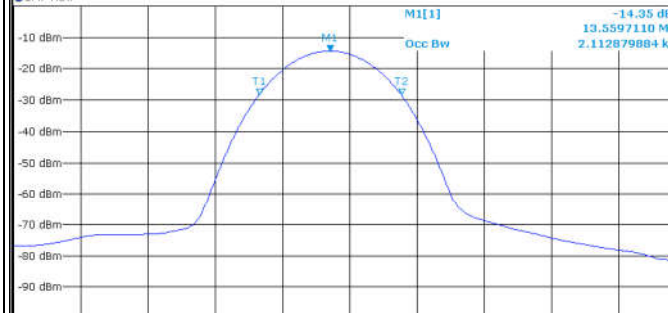
(2) With dummy load

Remark: Only the fundamental NFC signal needs to be retested per KDB 174176



Appendix B. Test Results of Conducted Test Items

B1. Test Result of 20dB Spectrum Bandwidth

Test mode		NFC Tx		Test Frequency (MHz)		13.56																																																																	
Spectrum Ref Level 0.00 dBm Att 30 dB RBW 1 kHz SWT 20 ms VBW 3 kHz Mode Auto FFT 1Pk View  CF 13.56 MHz 691 pts Span 10.0 kHz <table><tr><th>Marker</th><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td></td><td></td><td>1</td><td>13.559711 MHz</td><td>-14.83 dBm</td><td>ndB down</td><td>2.489 kHz</td></tr><tr><td>T1</td><td></td><td></td><td>1</td><td>13.558466 MHz</td><td>-34.72 dBm</td><td>ndB</td><td>20.00 dB</td></tr><tr><td>T2</td><td></td><td></td><td>1</td><td>13.560955 MHz</td><td>-35.04 dBm</td><td>Q factor</td><td>5447.5</td></tr></table>				Marker	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1			1	13.559711 MHz	-14.83 dBm	ndB down	2.489 kHz	T1			1	13.558466 MHz	-34.72 dBm	ndB	20.00 dB	T2			1	13.560955 MHz	-35.04 dBm	Q factor	5447.5	Spectrum Ref Level 0.00 dBm Att 30 dB RBW 1 kHz SWT 20 ms VBW 3 kHz Mode Auto FFT 1Pk View  CF 13.56 MHz 691 pts Span 10.0 kHz <table><tr><th>Marker</th><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td></td><td></td><td>1</td><td>13.559711 MHz</td><td>-14.35 dBm</td><td></td><td></td></tr><tr><td>T1</td><td></td><td></td><td>1</td><td>13.5586541 MHz</td><td>-28.22 dBm</td><td>Occ Bw</td><td>2.112879884 kHz</td></tr><tr><td>T2</td><td></td><td></td><td>1</td><td>13.560767 MHz</td><td>-28.46 dBm</td><td></td><td></td></tr></table>				Marker	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1			1	13.559711 MHz	-14.35 dBm			T1			1	13.5586541 MHz	-28.22 dBm	Occ Bw	2.112879884 kHz	T2			1	13.560767 MHz	-28.46 dBm		
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20dB Bandwidth (kHz)		2.489		99% Occupied BW(kHz)		2.113																																																																	
Frequency range (MHz)		$f_L > 13.553$		13.558466		Test Result																																																																	
		$f_H < 13.567$		13.560955		Complies																																																																	

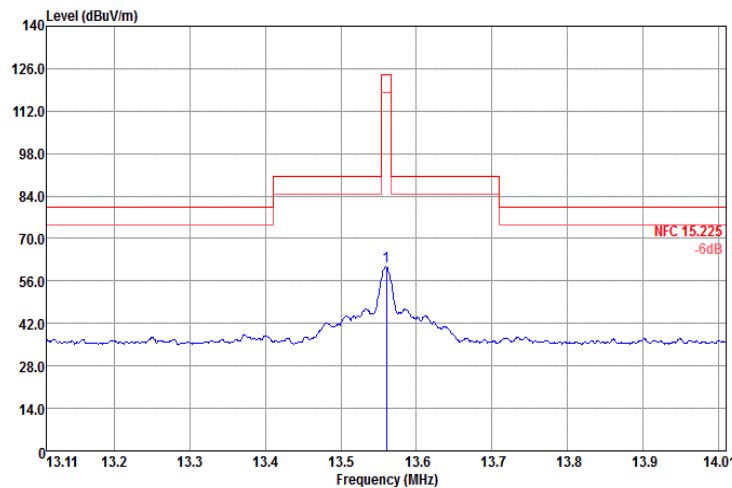
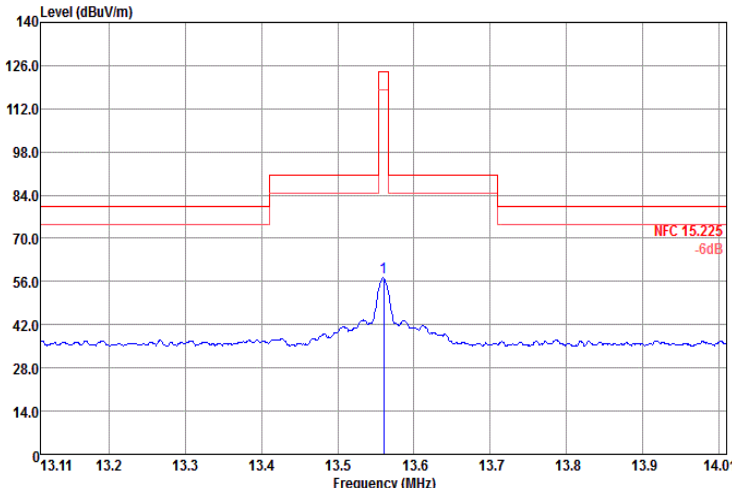
B2. Test Result of Frequency Stability

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability	
Voltage (Vdc)	Measurement Frequency (MHz)	Temperature (°C)	Measurement Frequency (MHz)
120	13.559711	-20	13.559711
102	13.559711	-10	13.559711
138	13.559711	0	13.559711
		10	13.559711
		20	13.559711
		30	13.559711
		40	13.559711
		50	13.559711
Max.Deviation (MHz)	-0.000289	Max.Deviation (MHz)	-0.000289
Max.Deviation (ppm)	-21.3127	Max.Deviation (ppm)	-21.3127
Limit	FS < ±100 ppm	Limit	FS < ±100 ppm
Test Result	PASS	Test Result	PASS



Appendix C. Test Results of Radiated Test Items

C1. Test Result of Field Strength of Fundamental Emissions

Test Mode :		NFC Tx				Test Frequency (MHz)		13.56																														
 Site : 03CH06-KS Condition : NFC 15.225 3m LOOP NFC HORIZONTAL <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB/m</th><th>dB</th><th>cm</th><th>deg</th></tr><tr><td>1</td><td>13.56</td><td>60.77</td><td>-63.23</td><td>124.00</td><td>40.71</td><td>19.90</td><td>0.16</td><td>---</td><td>---</td><td>QP</td></tr></table>										Freq	Level	Over	Limit	ReadAntenna	Cable	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	1	13.56	60.77	-63.23	124.00	40.71	19.90	0.16	---	---	QP
Freq	Level	Over	Limit	ReadAntenna	Cable	A/Pos	T/Pos	Remark																														
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg																														
1	13.56	60.77	-63.23	124.00	40.71	19.90	0.16	---	---	QP																												
 Site : 03CH06-KS Condition : NFC 15.225 3m LOOP NFC VERTICAL <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB/m</th><th>dB</th><th>cm</th><th>deg</th></tr><tr><td>1</td><td>13.56</td><td>57.15</td><td>-66.85</td><td>124.00</td><td>37.09</td><td>19.90</td><td>0.16</td><td>---</td><td>---</td><td>QP</td></tr></table>										Freq	Level	Over	Limit	ReadAntenna	Cable	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	1	13.56	57.15	-66.85	124.00	37.09	19.90	0.16	---	---	QP
Freq	Level	Over	Limit	ReadAntenna	Cable	A/Pos	T/Pos	Remark																														
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg																														
1	13.56	57.15	-66.85	124.00	37.09	19.90	0.16	---	---	QP																												

C2. Results of Radiated Spurious 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
0.01915	50.59	-71.37	121.96	29.98	20.6	0.01	-	-	Average
0.04989	39.21	-74.43	113.64	18.8	20.4	0.01	-	-	Average
0.07174	43.97	-66.51	110.48	23.61	20.35	0.01	-	-	Average
0.8308	48.87	-20.33	69.2	29.2	19.65	0.02	-	-	QP
1.756	48.48	-21.06	69.54	28.67	19.78	0.03	-	-	QP
2.9	48.72	-20.82	69.54	28.88	19.8	0.04	-	-	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
0.01915	49.97	-71.99	121.96	29.36	20.6	0.01	-	-	Average
0.07174	43.47	-67.01	110.48	23.11	20.35	0.01	-	-	Average
0.85485	46.85	-22.1	68.95	27.17	19.66	0.02	-	-	QP
1.787	46.1	-23.44	69.54	26.29	19.78	0.03	-	-	QP
2.9	46.39	-23.15	69.54	26.55	19.8	0.04	-	-	QP
21.772	34.81	-34.73	69.54	14.65	19.91	0.25	-	-	QP

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. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);
3. Limit line = specific limits (dBμV) + distance extrapolation factor.

C3. Results of Radiated Spurious 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
34.85	24.34	-15.66	40	35.11	21.2	0.63	32.6	100	0	QP
43.58	20.49	-19.51	40	35.58	16.7	0.63	32.42	-	-	Peak
121.18	20.43	-23.07	43.5	33.31	18.16	1.12	32.16	-	-	Peak
175.5	23.12	-20.38	43.5	38.37	15.42	1.38	32.05	-	-	Peak
311.3	24.02	-21.98	46	34.51	19.49	1.87	31.85	-	-	Peak
778.84	27.23	-18.77	46	30.1	25.84	3.03	31.74	-	-	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
40.67	27.06	-12.94	40	41.03	17.9	0.61	32.48	100	0	Peak
67.83	19.28	-20.72	40	38.04	12.66	0.82	32.24	-	-	Peak
175.5	21.57	-21.93	43.5	36.82	15.42	1.38	32.05	-	-	Peak
564.47	24.16	-21.84	46	29.16	24.2	2.53	31.73	-	-	Peak
830.25	25.39	-20.61	46	27.78	26.22	3.09	31.7	-	-	Peak
932.1	27.03	-18.97	46	28.44	26.82	3.31	31.54	-	-	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.