

FCC Radio Test Report

FCC ID: 2AB9W-NFC001

This report concerns (check one) : ☒Original Grant ☐Class II Change

Project No. : 1505016
Equipment : NFC Module
Model Name : XYZ-NFC-001
Applicant : XYZprinting, Inc.
Address : 10F., No.99, Sec. 5, Nanjing E. Rd., Songshan Dist.,
Taipei City 10571, Taiwan (R.O.C.)

Date of Receipt : Jun. 04, 2015
Date of Test : Jun. 04, 2015~ Jun. 17, 2015
Issued Date : Jun. 18, 2015
Tested by : BTL Inc.

Testing Engineer : Josh Lin
(Josh Lin)
Technical Manager : Jeff Yang
(Jeff Yang)
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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Issue No.	Description	Issued Date
BTL-FCCP-1-1505016	Original Issue.	Jun. 18, 2015

1 CERTIFICATION

Equipment : NFC Module
Brand Name : XYZprinting
Model Name : XYZ-NFC-001
Applicant : XYZprinting, Inc.
Manufacturer : Cal-Comp Electronics (Thailand) Public Company Limited
Address : 138, Moo 4, Phechkasem Road, Sapang, Koawoyoi, Petchaburi 76140,
Thailand.
Factory : Cal-Comp Electronics (Thailand) Public Company Limited
Address : 138, Moo 4, Phechkasem Road, Sapang, Koawoyoi, Petchaburi 76140,
Thailand.
Date of Test : Jun. 04, 2015~Jun. 17, 2015
Test Sample : ENGINEERING SAMPLE
Standards : FCC Part 15, Subpart C: 2014
ANSI C63.4-2009

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1505016) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Standard Section	Test Item	Result
15.207	Conducted emission	N/A NOTE(1)
15.35/ 15.205 / 15.209 / 15.225	Radiated emission	PASS
15.225(e)	Frequency Stability	PASS
15.203	Antenna Requirement	PASS

NOTE:

1. **N/A**: denotes test is not applicable to this device.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

Radiated emission Test:

CB08: (FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty is not specified by FCC/Industry Canada rules and for reference only.

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95%**.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

A. Radiated emission test:

Test Site	Item	Measurement Frequency Range	Uncertainty	NOTE
CB08	Radiated emission at 3m	Horizontal Polarization	30 - 200MHz	3.35 dB
		Horizontal Polarization	200 - 1000MHz	3.11 dB
		Horizontal Polarization	1 - 18GHz	3.97 dB
		Horizontal Polarization	18 - 40GHz	4.01 dB
		Vertical Polarization	30 - 200MHz	3.22 dB
		Vertical Polarization	200 - 1000MHz	3.24 dB
		Vertical Polarization	1 - 18GHz	4.05 dB
		Vertical Polarization	18 - 40GHz	4.04 dB

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR} , as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB

Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR} .

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	NFC Module	
Brand Name	XYZprinting	
Model Name	XYZ-NFC-001	
OEM Brand/Model Name	N/A	
Model Difference	N/A	
Product Description	Operation Frequency	13.56 MHz
	Antenna Designation	LOOP Antenna
PowerSource	DC Voltage supplied from system.	
Power Rating	DC 3.3V	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Test Mode	Description
Mode 1	13.56MHz Transmit

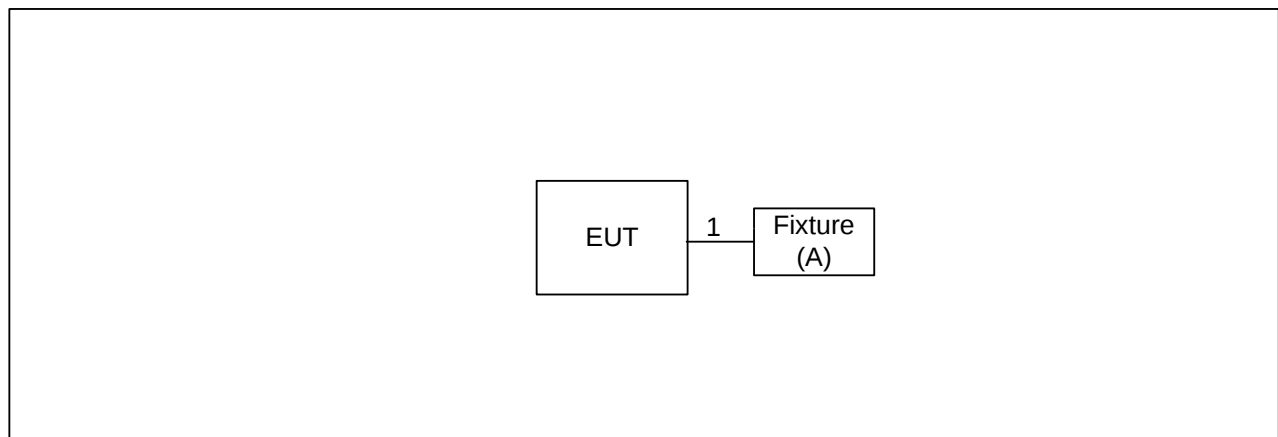
Conducted emission test	
Final Test Mode	Description
N/A	"N/A" denotes test is not applicable to this device.

Radiated emission test	
Final Test Mode	Description
Mode 1	13.56MHz Transmit

Frequency Stability test	
Final Test Mode	Description
Mode 1	13.56MHz Transmit

Antenna Requirement test	
Final Test Mode	Description
Mode 1	13.56MHz Transmit

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
A	Fixture	N/A	N/A	N/A	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	0.1m	DATA Cable

Note:

(1) The support equipment was authorized by Declaration of Conformity (DOC).

4 CONDUCTED EMISSION

4.1 LIMITS

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

NOTE:

1. The tighter limit applies at the band edges.
2. The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
3. The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value – Limit Value

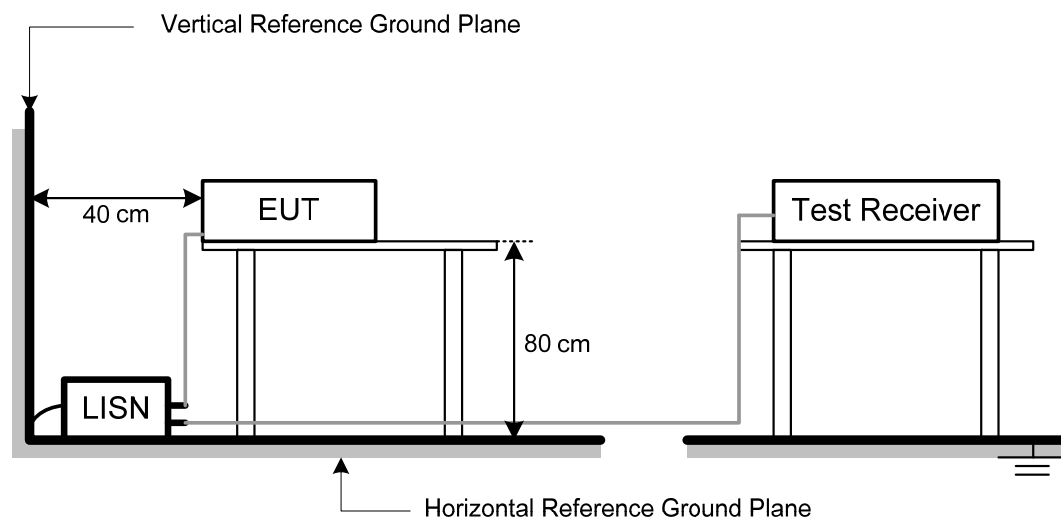
4.2 TEST PROCEDURES

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE:

- a. Reading in which marked as Peak, QP or AVG means measurements by using are Quasi-Peak or Average Mode with Detector BW=9 kHz (6 dB Bandwidth).
- b. All readings are Peak Mode value unless otherwise stated QP or AVG in column of Note. If the Peak or QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only Peak or QP Mode was measured, but AVG Mode didn't perform.

4.3 TEST SETUP LAYOUT



4.4 DEVIATION FROM TEST STANDARD

No deviation

4.5 EUT OPERATING CONDITIONS

The EUT used during radiated and/or conducted emission measurement was designed to exercise in a manner similar to a typical use.

4.6 EUT TEST CONDITIONS

Temperature: N/A°C

Relative Humidity: N/A%

Test Voltage: N/A

4.7 TEST RESULTS

Please refer to the Attachment A.

Remark

- (1) All readings are QP Mode value unless otherwise stated AVG in column of 『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform in this case, a "*" marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150KHz to 30MHz.

5 RADIATED EMISSION

5.1 LIMITS

FCC Part 15.209				
Frequency (MHz)	Field Strength Limitation		Field Strength Limitation at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
0.009 – 0.490	2400 / F(KHz)	300m	10000* 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 – 1.705	24000 / F(KHz)	30m	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40
1.705 – 30.00	30	30m	100* 30	20log 30 + 40
30.0 – 88.0	100	3m	100	20log 100
88.0 – 216.0	150	3m	150	20log 150
216.0 – 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500
FCC Part 15.225(a)/(b)/(c)				
Frequency (MHz)	Field Strength Limitation		Field Strength Limitation at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
13.553 – 13.567	15,848	30 m	15,848*100	124
13.567 – 13.710	334	30 m	334*100	90.5
13.110 – 13.410 13.710 – 14.010	106	30 m	106*100	80.5

NOTE:

- (1) The tighter limit shall apply at the boundary between two frequency range.
- (2) Limitation expressed in dBuV/m is calculated by 20log Emission Level (uV/m).
- (3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d_2/d_1)^2$.
Example:
F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 3m distance is adjusted as $L_{d1} = L_1 = 30uV/m * (10)^2 = 100 * 30 uV/m$
- (4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
Margin Level = Measurement Value – Limit Value

5.2 TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3mmeter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- d. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE: (FCC PART 15.209)

- a. Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode with Detector BW=120 kHz.
- b. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.

NOTE: (FCC PART 15.225)

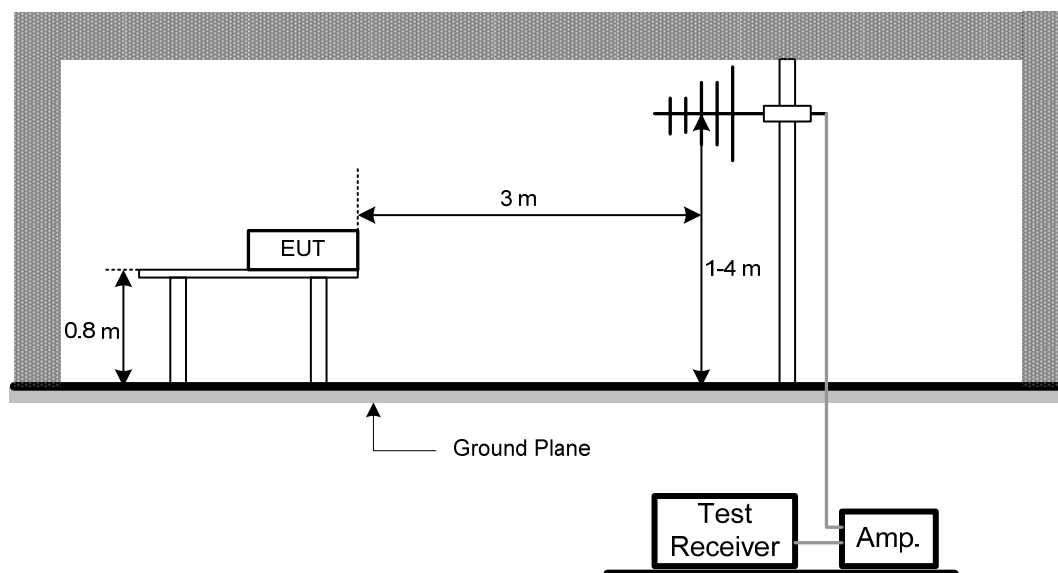
- a. Spectrum Setting:
 - 9 KHz – 150 KHz, RBW= 200Hz, VBW=200Hz, Sweep time = 200 ms.
 - 150 K Hz – 30 MHz, RBW= 10 KHz, VBW=10 KHz, Sweep time = 200 ms.
 - 30 MHz – 1000 MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
- b. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- c. The Log-Bicon Antenna will use to test frequency range from 30MHz to 1000MHz and the Loop Antenna will use to test frequency below 30MHz.

5.3 DEVIATION FROM TEST STANDARD

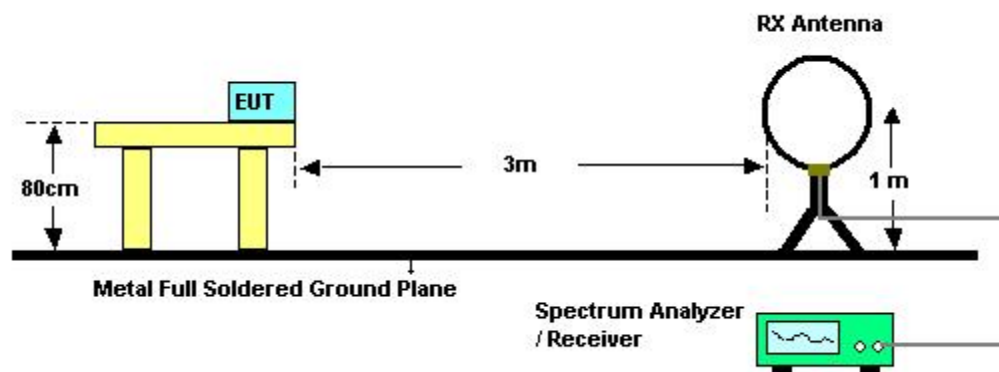
No deviation

5.4 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) For radiated emissions below



30MHz

5.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.6** Unless otherwise a special operating condition is specified in the follows during the testing.

5.6 EUT TEST CONDITIONS

Temperature: 24°C
Relative Humidity: 60%
Test Voltage: DC 3.3V

5.7 TEST RESULTS (BELOW 30MHZ) - FCC PART 15.209

Please refer to the Attachment B.

5.8 TEST RESULTS -(30-1000MHZ) - FCC PART 15.209

Please refer to the Attachment C.

5.9 TEST RESULTS- FCC PART 15.225

Please refer to the Attachment D.

6 FREQUENCY STABILITY

6.1 LIMITS

FCC Part 15.225(e)
The frequency tolerance of the carrier signal shall be maintained within +/-0.01% 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.

6.2 TEST PROCEDURE

- a. The equipment under test was connected to an external AC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber.
After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.
- b. At room temperature (25±5°C), an external variable AC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

6.3 DEVIATION FROM TEST STANDARD

No deviation

6.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.5. Unless otherwise a special operating condition is specified in the follows during the testing.

6.5 EUT TEST CONDITIONS

Temperature: 23°C
Relative Humidity: 62%
Test Voltage: DC 3.3V

6.6 TEST RESULTS

Please refer to the Attachment E.

7. MEASUREMENT INSTRUMENTS LIST

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Oct. 26, 2015
2	Microflex Cable	Harbour industries	27478LL142	1m	May 11, 2016
3	Test Cable	LMR	LMR-400	12m	May 12, 2016
4	Test Cable	LMR	LMR-400	3m	May 12, 2016
5	Pre-Amplifier	Anritsu	MH648A	M92649	Jun. 16, 2016
6	Log-Bicon Antenna	Schwarzbeck	VULB9168-35 2	9168-352	July. 10, 2015
7	Loop Antenna	EMCO	6502	00042960	Nov. 06. 2015

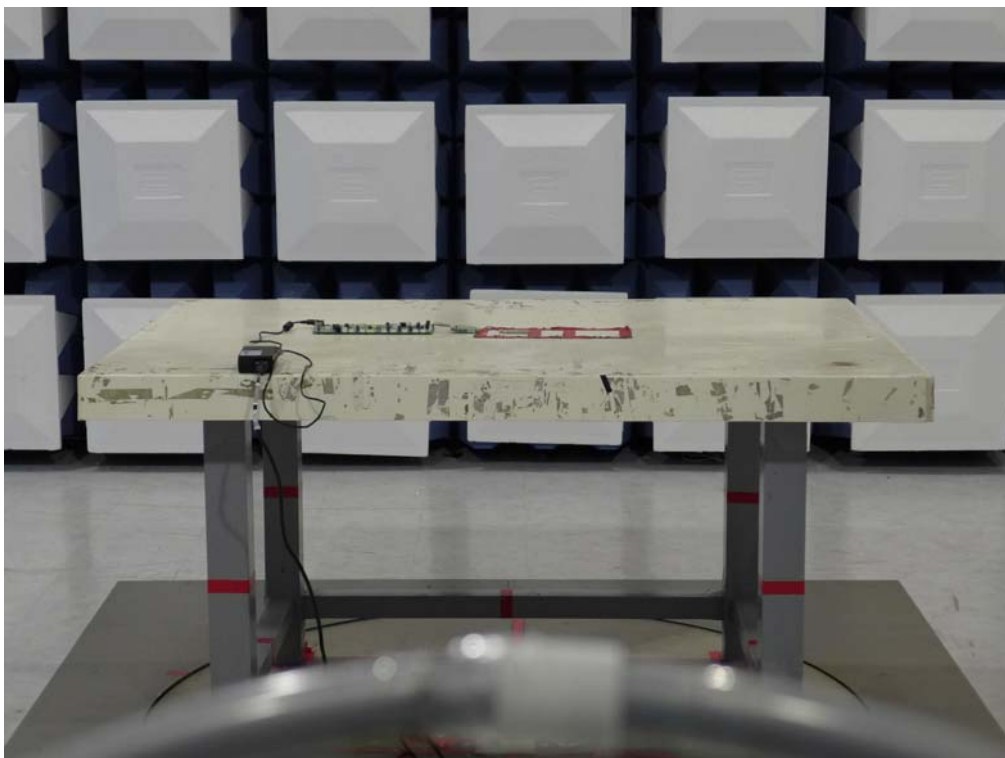
Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-30	100854	Oct. 26, 2015

Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

8 EUT TEST PHOTO

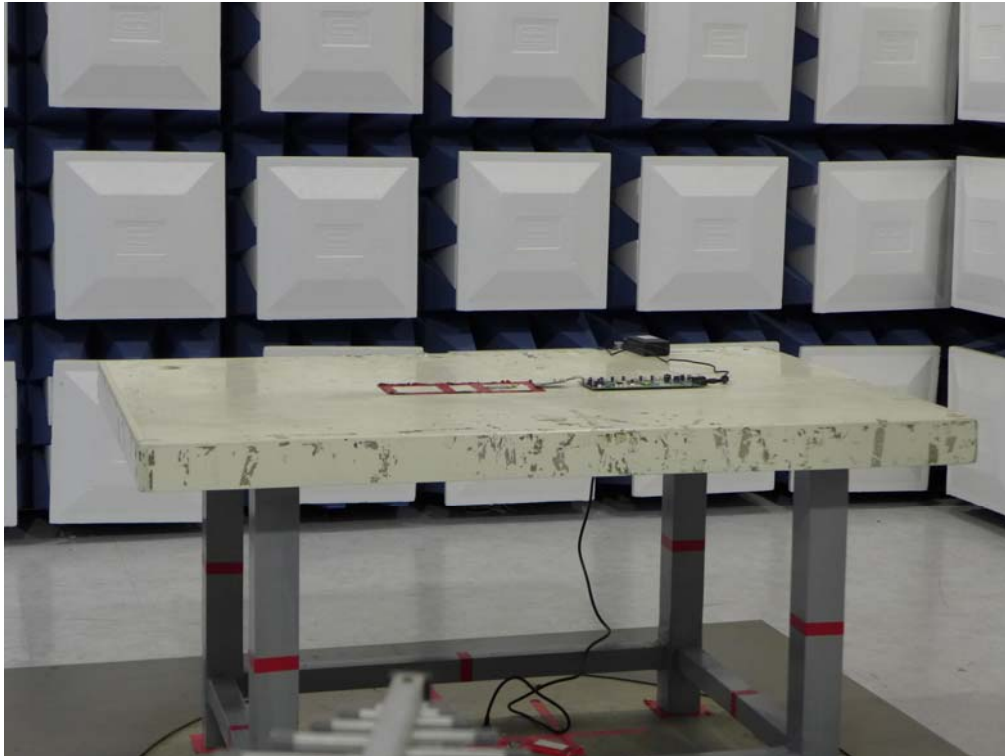
Radiated emission test photos

9KHz to 30MHz



Radiated emission test photos

30MHz to 1000MHz



ATTACHMENT A - CONDUCTED EMISSION

Test Mode: N/A

Note: "N/A" denotes test is not applicable to this device.

ATTACHMENT B - RADIATED EMISSION (9KHZ-30MHZ)

Test Mode: 13.56MHz Transmit

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Note
0.1200	0°	42.53	11.99	54.52	86.02	-31.50	AVG
0.1200	0°	51.15	11.99	63.14	106.02	-42.88	PK
0.2910	0°	38.37	11.93	50.30	78.33	-28.02	AVG
0.2910	0°	46.74	11.93	58.67	98.33	-39.65	PK
0.4410	0°	38.36	11.95	50.31	74.72	-24.40	AVG
0.4410	0°	47.47	11.95	59.42	94.72	-35.29	PK
0.7410	0°	43.53	12.01	55.54	70.21	-14.66	AVG
0.7680	0°	41.42	12.01	53.43	90.21	-36.77	QP
1.3470	0°	38.98	11.94	50.92	65.02	-14.10	QP

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Note
0.1190	90°	41.49	11.99	53.48	86.09	-32.61	AVG
0.1190	90°	53.39	11.99	65.38	106.09	-40.71	PK
0.2930	90°	38.52	11.93	50.45	78.27	-27.81	AVG
0.2930	90°	45.50	11.93	57.43	98.27	-40.83	PK
0.4440	90°	39.30	11.95	51.25	74.66	-23.40	AVG
0.4440	90°	48.29	11.95	60.24	94.66	-34.41	PK
0.7470	90°	42.21	12.01	54.22	70.14	-15.91	QP
0.7720	90°	40.00	12.01	52.01	90.14	-38.12	QP
1.3510	90°	38.33	11.94	50.27	64.99	-14.72	QP

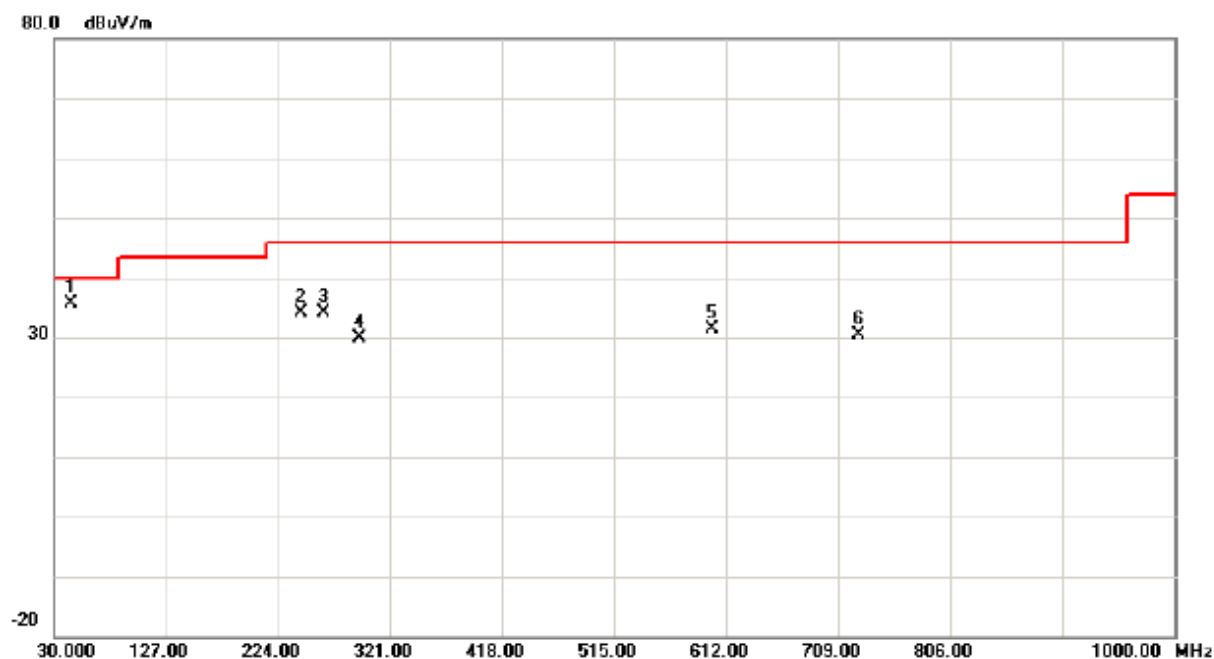
Remark:

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB 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 (dBuV) + distance extrapolation factor. ◦

ATTACHMENT C - RADIATED EMISSION (30MHZ TO 1000MHZ)

Test Mode: 13.56MHz Transmit

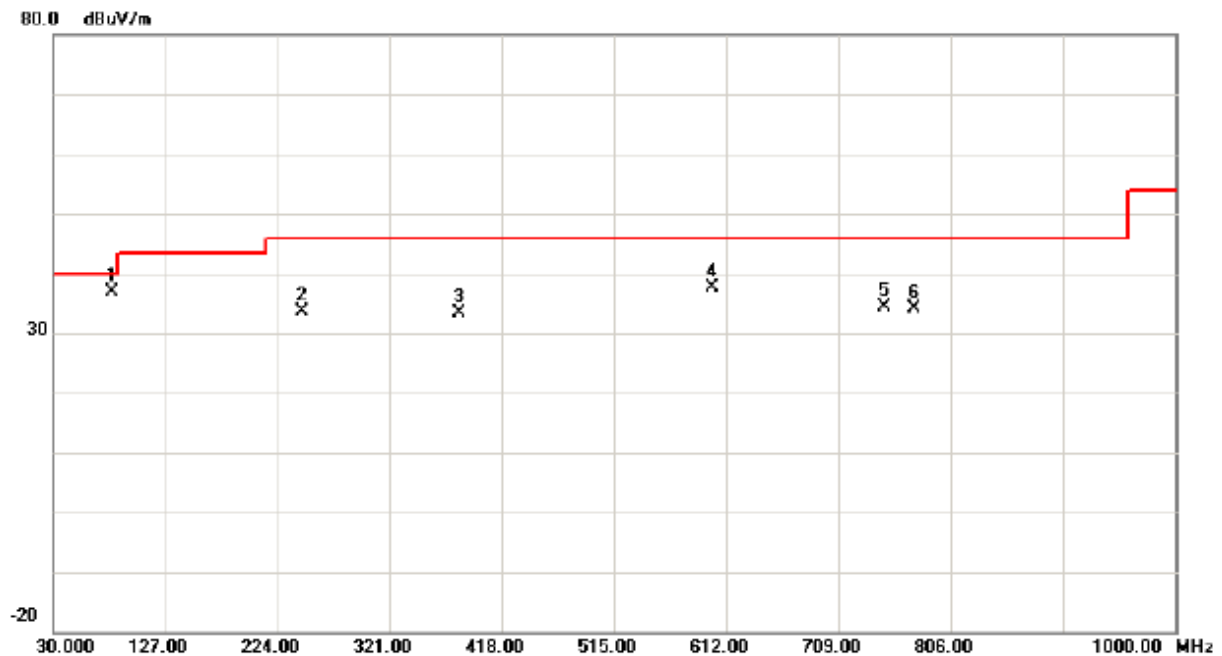
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	44.5500	49.56	-13.89	35.67	40.00	-4.33	peak	
2		243.4000	49.38	-15.21	34.17	46.00	-11.83	peak	
3		262.8000	48.77	-14.54	34.23	46.00	-11.77	peak	
4		294.3250	43.62	-13.74	29.88	46.00	-16.12	peak	
5		599.8750	38.90	-7.43	31.47	46.00	-14.53	peak	
6		725.9750	35.45	-5.18	30.27	46.00	-15.73	peak	

Test Mode: 13.56MHz Transmit

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	80.9250	55.25	-18.46	36.79	40.00	-3.21	peak	
2		245.8250	48.70	-15.16	33.54	46.00	-12.46	peak	
3		381.6250	45.07	-11.70	33.37	46.00	-12.63	peak	
4		599.8750	44.96	-7.43	37.53	46.00	-8.47	peak	
5		747.8000	39.31	-5.01	34.30	46.00	-11.70	peak	
6		774.4750	39.09	-4.89	34.20	46.00	-11.80	peak	

ATTACHMENT D - RADIATED EMISSION (FCC PART 15.225)

Test Mode	13.56MHz Transmit
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Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)
13.560	0°	36.05	11.44	47.49	124.00	-76.51
27.122	0°	16.25	10.01	26.26	69.54	-43.28

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)
13.561	90°	32.55	11.44	43.99	124.00	-80.01
27.560	90°	16.15	9.91	26.06	69.54	-43.48

ATTACHMENT E - FREQUENCY STABILITY MEASUREMENT

Test Mode:	13.56MHz Transmit
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Frequency Stability Versus Environmental Temperature						
	Temperature (°C)	Voltage (DC)	Frequency (MHz)	Frequency Error (kHz)	Limit (kHz)	Result
	20	3.30V	13.5601	-	-	-
0 min	50	3.30V	13.5601	0.0001	+/- 1.356	PASS
	-20	3.30V	13.5601	0.0001	+/- 1.356	PASS
2 min	50	3.30V	13.5600	0.0000	+/- 1.356	PASS
	-20	3.30V	13.5601	0.0001	+/- 1.356	PASS
5 min	50	3.30V	13.5600	0.0000	+/- 1.356	PASS
	-20	3.30V	13.5601	0.0001	+/- 1.356	PASS
10 min	50	3.30V	13.5601	0.0001	+/- 1.356	PASS
	-20	3.30V	13.5601	0.0001	+/- 1.356	PASS

Frequency Stability Versus Input Voltage						
Temperature (°C)	Voltage (DC)		Frequency (MHz)	Frequency Error (kHz)	Limit (kHz)	Result
20	V-nom	3.30	13.5601	-	-	-
20	V-min	2.97	13.5601	0.0001	+/- 1.356	PASS
20	V-max	3.63	13.5601	0.0001	+/- 1.356	PASS