FCC Radio Test Report

Equipment	: Wireless Home Automation and Security
Brand Name	: CISCO
Model No.	: CLG-8202 NA; CLG-8202-WW NA
FCC ID	: VUICLG8202-NA
Standard	: 47 CFR FCC Part 15.225
Frequency Range	: 13.553 – 13.567 MHz
Equipment Class	: Part 15 Low Power Communication Device Transmitter (DXX)
Applicant	: PEGATRON CORPORATION 5F., NO. 76, LIGONG ST., BEITOU DISTRICT, TAIPEI CITY 112 Taiwan
Manufacturer	: MAINTEK COMPUTER 233 Jinfeng Rd., Suzhou, Jiangsu, PRC

The product sample received on Jul. 21, 2014 and completely tested on Aug. 08, 2014. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures and shown 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.

Sam Chen
SPORTON INTERNATIONAL INC.

Testing Laboratory
1190

Table of Contents

Summary of Test Result

Conformance Test Specifications					
Report Clause	**Ref. Std. Clause**	**Description**	**Measured**	**Limit**	**Result**
1.1.1	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]:0.4812MHz 38.18 (Margin 8.14dB) - AV 46.61 (Margin 9.71dB) - QP	FCC 15.207	Complied
3.2	15.215(c)	Emission Bandwidth	20dB Bandwidth: 2.6375 [kHz] F_L:13.5586975 MHz F_H:13.5613350 MHz	Fall in band $F_L \geq$ 13.553 MHz $F_H \leq$ 13.567 MHz	Complied
3.3	15.225(a)~(d)	Field Strength of Fundamental Emissions and Spectrum Mask	Fundamental Emissions quasi peak:46.09 dBuV/m at 3 Device complies with spectrum mask – refer to test data	124 dBuV/m at 3	Complied
3.4	15.225(d)	Transmitter Radiated Unwanted Emissions	[dBuV/m at 3m]:30.00MHz 35.98 (Margin 4.02dB) - PK	FCC 15.209(a)	Complied
3.5	15.225(e)	Frequency Stability	8.4808 ppm	± 0.01% (100ppm)	Complied

Revision History

Report No.	Version	Description	Issued Date
FR472942AF	Rev. 01	Initial issue of report	Sep. 18, 2014

1 General Description

1.1 Information

1.1.1 Product Details

Product Details	
Items	**Description**
Power Type	From Power Adapter and button cell
Frequency Range	13.553 – 13.567 MHz
Modulation	ISO 14443-2 (ASK)
Ch. Frequency (MHz)	13.56
Channel Number	1
99% Bandwidth (kHz)	2.25
Field Strength (dBuV/m)	46.09
Antenna	Antenna Type: PAB Antenna
Note 1: Field strength performed quasi peak level at 3m.	

1.2 Accessories

Accessories				
No.	**Equipment Name**	**Brand Name**	**Model Name**	**Rating**
1	Adapter	APD	WA-23A15FU	INPUT: 100-240V ~, 50-60Hz, 0.8A Max. OUTPUT: 15V, 1.5A
Other				
Cradle*1				

1.3 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Brand Name	Model Name	Description
CISCO	CLG-8202 NA	All the models are identical, the difference model for difference brand served as marketing strategy.
	CLG-8202-WW NA	

Note: Assessed as above, there is only model: CLG-8202 NA selected to test and recorded in the report as a result.

1.4 Support Equipment

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	NB	DELL	E6430	DoC

1.5 Testing Applied Standards

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

- 47 CFR FCC Part 15
- ANSI C63.4-2003
- FCC KDB 174176

1.6 Testing Location Information

Testing Location			
☐	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973	
☒	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085	
Test Condition			**Test Site No.**
AC Conducted Emission			CO02-CB
Radiated Emission			10CH01-CB
Radiated Emission			03CH01-CB
RF Conducted			TH01-CB

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Modulation Used for Conformance Testing	
Modulation Mode	**Field Strength (dBuV/m at 3 m)**
NFC	46.09

2.2 Test Channel Frequencies Configuration

Modulation Mode	Test Channel Frequencies (MHz)
NFC	13.56

2.3 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests		
Tests Item	AC Power-line Conducted Emissions	
Test Condition	AC Power-line Conducted measurement for line and neutral	
Operating Mode	CTX	
Test Mode	1	NFC On
	2	NFC Off
Modulation Mode	NFC	

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emission Bandwidth, Frequency Stability
Test Condition	Radiated measurement
Operating Mode	CTX
Modulation Mode	NFC

The Worst Case Mode for Following Conformance Tests	
Tests Item	Field Strength of Fundamental Emissions Spectrum Mask
Test Condition	Radiated measurement
Operating Mode	CTX
Modulation Mode	NFC

The Worst Case Mode for Following Conformance Tests	
Tests Item	Transmitter Radiated Unwanted Emissions
Test Condition	Radiated measurement
9kHz~30MHz	
Operating Mode	CTX
30MHz~1GHz	
Operating Mode	CTX
Modulation Mode	NFC

Note:

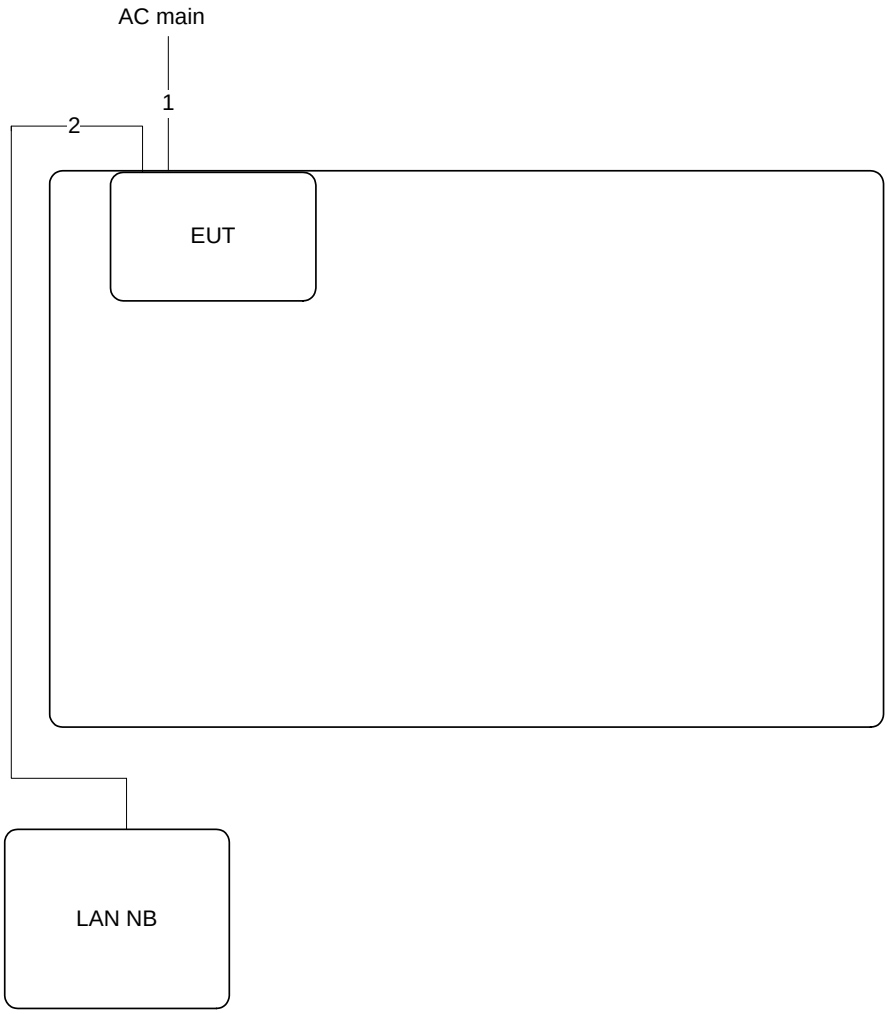
There are two Simultaneous Transmission Configurations as following:

Mode 1: WiFi+Z-wave+Zigbee+NFC

Mode 2: Bluetooth+Z-wave+Zigbee+NFC

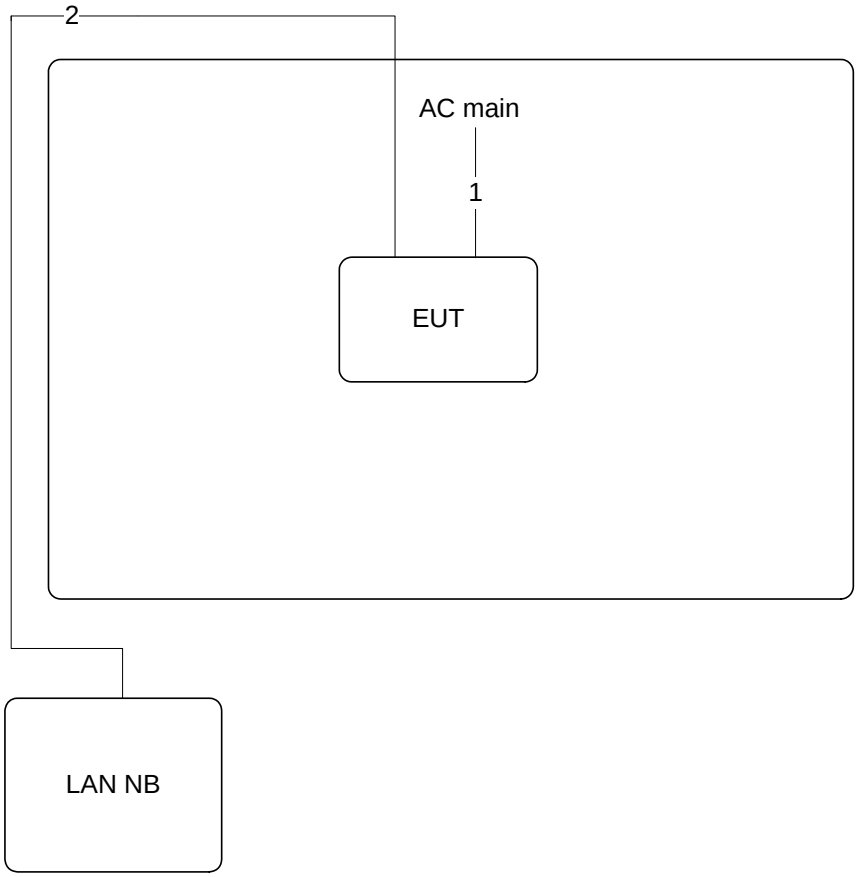
2.5 Test Setup Diagram

Test Setup Diagram - AC Power-line Conducted Emissions Test	
Test Mode	**NFC On / NFC Off**



Item	Connection	Shield	Length (m)
1	Power Cable	No	1.5
2	RJ-45 Cable	No	10

Test Setup Diagram - Radiated Test	
Test Mode	**CTX**



Item	Connection	Shield	Length (m)
1	Power Cable	No	1.5
2	RJ-45 Cable	No	10

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

For a Low-power Radio-frequency device which is designed to be connected to the 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 below limits table.

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments and Setting

Please refer to section 4 of equipment's list in this report. The following table is the setting of the receiver.

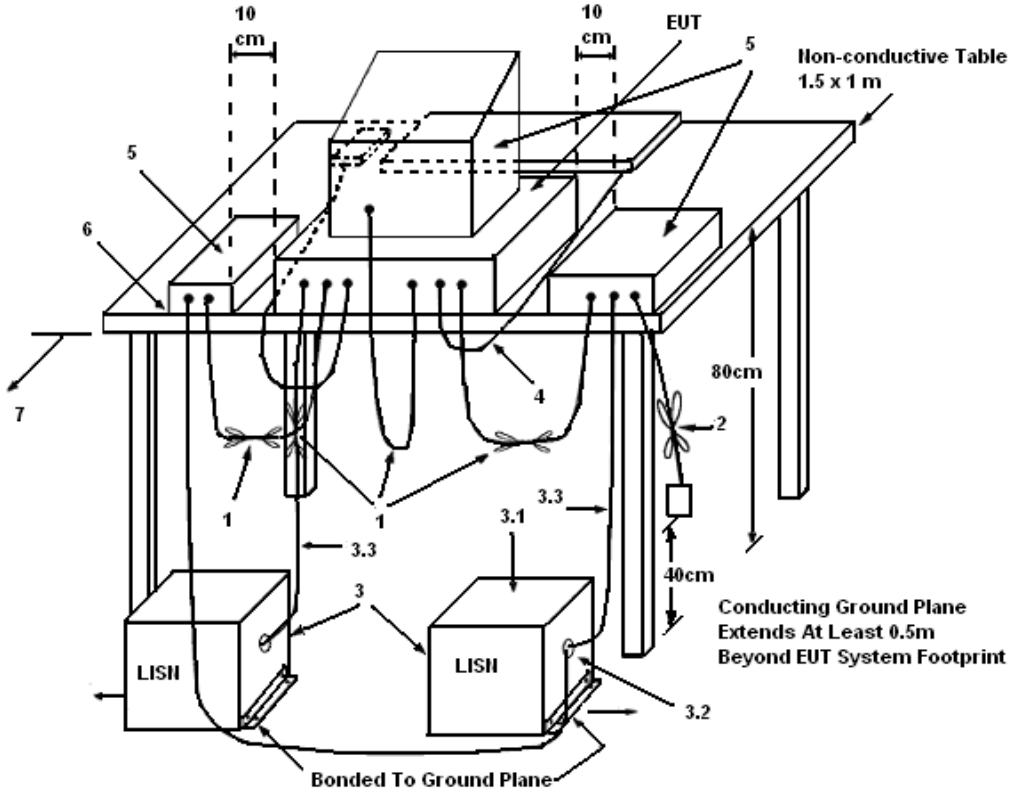
Receiver Parameters	**Setting**
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.3 Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

3.1.4 Test Setup

AC Power-line Conducted Emissions



LEGEND:

(1) 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.

(2) 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.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

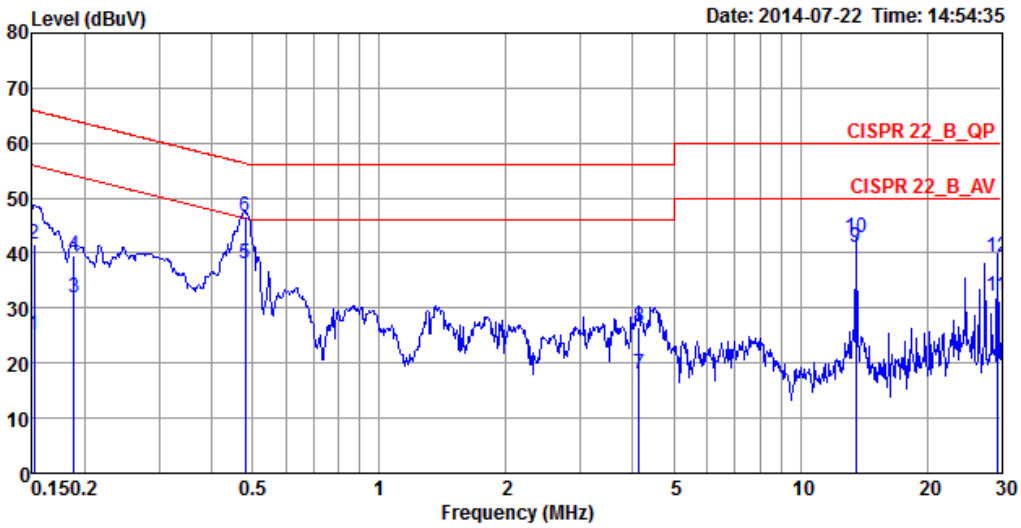
(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

3.1.5 Test Result of AC Power-line Conducted Emissions

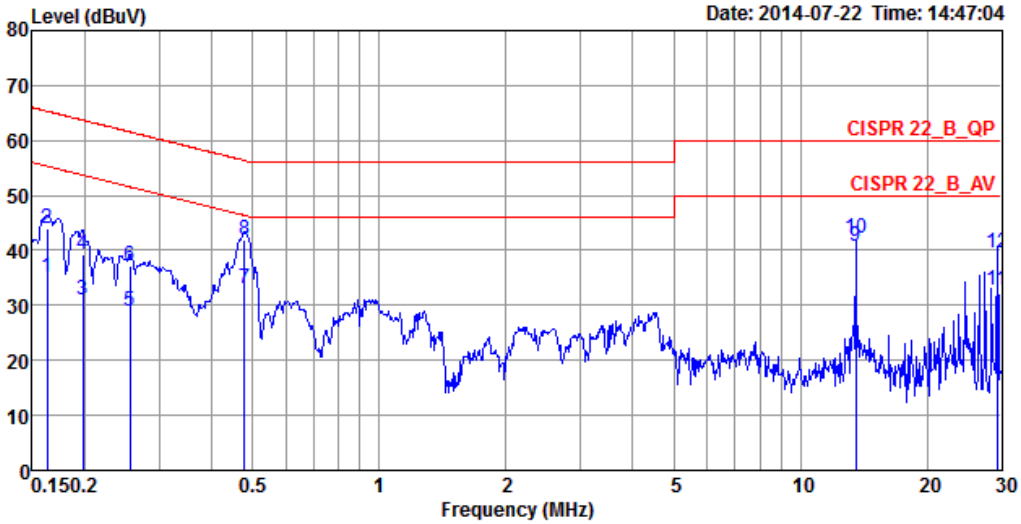
Temperature	23℃	**Humidity**	47%
Test Engineer	Ryo Fan	**Phase**	Line
Test Mode	NFC/On		



		Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
		MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1		0.1516	25.06	-30.85	55.91	0.22	24.66	0.18	LINE	Average
2		0.1516	41.59	-24.32	65.91	0.22	41.19	0.18	LINE	QP
3		0.1884	32.00	-22.11	54.11	0.21	31.59	0.20	LINE	Average
4		0.1884	39.64	-24.47	64.11	0.21	39.23	0.20	LINE	QP
5	a	0.4812	38.18	-8.14	46.32	0.22	37.76	0.20	LINE	Average
6	q	0.4812	46.61	-9.71	56.32	0.22	46.19	0.20	LINE	QP
7		4.1356	17.89	-28.11	46.00	0.30	17.29	0.30	LINE	Average
8		4.1356	26.49	-29.51	56.00	0.30	25.89	0.30	LINE	QP
9		13.5603	41.05			0.56	40.10	0.39	LINE	Average
10		13.5603	42.79			0.56	41.84	0.39	LINE	QP
11		29.3185	32.08	-17.92	50.00	0.98	30.48	0.62	LINE	Average
12		29.3185	39.18	-20.82	60.00	0.98	37.58	0.62	LINE	QP

Remark：13.56 MHz is the NFC RF fundamental signal.

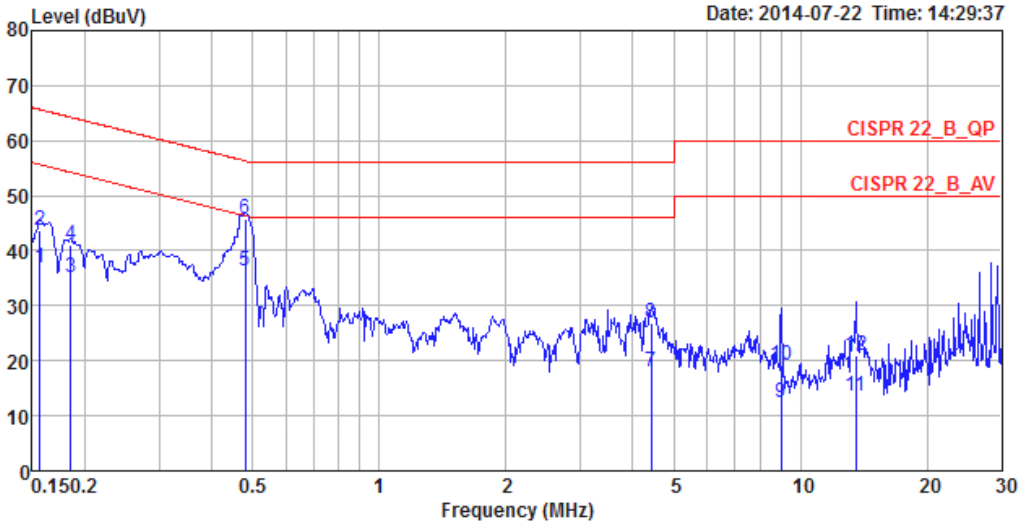
Temperature	23℃	**Humidity**	47%
Test Engineer	Ryo Fan	**Phase**	Neutral
Test Mode	NFC/On		



		Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
		MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1		0.1624	35.17	-20.17	55.34	0.08	34.90	0.19	NEUTRAL	Average
2		0.1624	44.09	-21.25	65.34	0.08	43.82	0.19	NEUTRAL	QP
3		0.1976	31.10	-22.61	53.71	0.07	30.83	0.20	NEUTRAL	Average
4		0.1976	39.41	-24.30	63.71	0.07	39.14	0.20	NEUTRAL	QP
5		0.2562	28.99	-22.57	51.56	0.07	28.72	0.20	NEUTRAL	Average
6		0.2562	37.25	-24.31	61.56	0.07	36.98	0.20	NEUTRAL	QP
7		0.4786	33.05	-13.31	46.36	0.08	32.77	0.20	NEUTRAL	Average
8	q	0.4786	41.88	-14.48	56.36	0.08	41.60	0.20	NEUTRAL	QP
9	a	13.5599	40.84			0.38	40.07	0.39	NEUTRAL	Average
10		13.5599	42.19			0.38	41.42	0.39	NEUTRAL	QP
11		29.3225	32.89	-17.11	50.00	0.75	31.52	0.62	NEUTRAL	Average
12		29.3225	39.45	-20.55	60.00	0.75	38.08	0.62	NEUTRAL	QP

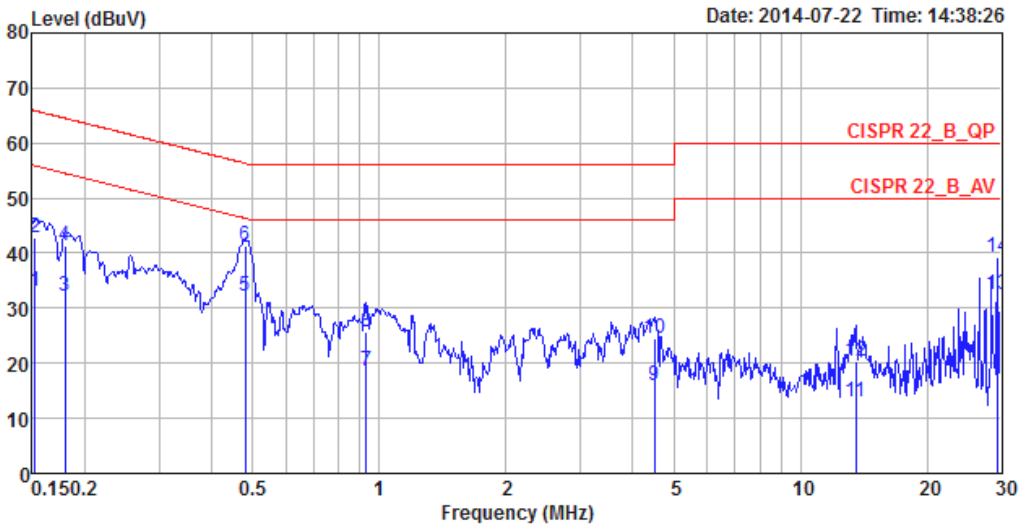
Remark：13.56 MHz is the NFC RF fundamental signal.

Temperature	23℃	**Humidity**	47%
Test Engineer	Ryo Fan	**Phase**	Line
Test Mode	NFC/Off		



		Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
		MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1		0.1565	36.97	-18.68	55.65	0.22	36.57	0.18	LINE	Average
2		0.1565	43.67	-21.98	65.65	0.22	43.27	0.18	LINE	QP
3		0.1854	35.26	-18.98	54.24	0.21	34.86	0.19	LINE	Average
4		0.1854	40.94	-23.30	64.24	0.21	40.54	0.19	LINE	QP
5	a	0.4812	36.30	-10.02	46.32	0.22	35.88	0.20	LINE	Average
6	q	0.4812	45.90	-10.42	56.32	0.22	45.48	0.20	LINE	QP
7		4.4305	18.06	-27.94	46.00	0.31	17.44	0.31	LINE	Average
8		4.4305	26.83	-29.17	56.00	0.31	26.21	0.31	LINE	QP
9		9.0113	12.44	-37.56	50.00	0.41	11.69	0.34	LINE	Average
10		9.0113	19.23	-40.77	60.00	0.41	18.48	0.34	LINE	QP
11		13.5509	13.67	-36.33	50.00	0.56	12.72	0.39	LINE	Average
12		13.5509	20.83	-39.17	60.00	0.56	19.88	0.39	LINE	QP

Temperature	23℃	**Humidity**	47%
Test Engineer	Ryo Fan	**Phase**	Neutral
Test Mode	NFC/Off		



		Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
		MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1		0.1524	32.95	-22.92	55.87	0.09	32.68	0.18	NEUTRAL	Average
2		0.1524	42.78	-23.09	65.87	0.09	42.51	0.18	NEUTRAL	QP
3		0.1796	32.30	-22.20	54.50	0.08	32.03	0.19	NEUTRAL	Average
4		0.1796	41.22	-23.28	64.50	0.08	40.95	0.19	NEUTRAL	QP
5	a	0.4812	32.07	-14.25	46.32	0.08	31.79	0.20	NEUTRAL	Average
6	q	0.4812	41.47	-14.85	56.32	0.08	41.19	0.20	NEUTRAL	QP
7		0.9331	18.50	-27.50	46.00	0.09	18.21	0.20	NEUTRAL	Average
8		0.9331	25.81	-30.19	56.00	0.09	25.52	0.20	NEUTRAL	QP
9		4.5015	15.80	-30.20	46.00	0.17	15.32	0.31	NEUTRAL	Average
10		4.5015	24.51	-31.49	56.00	0.17	24.03	0.31	NEUTRAL	QP
11		13.5509	13.00	-37.00	50.00	0.38	12.23	0.39	NEUTRAL	Average
12		13.5509	20.25	-39.75	60.00	0.38	19.48	0.39	NEUTRAL	QP
13		29.3226	32.44	-17.56	50.00	0.75	31.07	0.62	NEUTRAL	Average
14		29.3226	39.35	-20.65	60.00	0.75	37.98	0.62	NEUTRAL	QP

3.2 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

20dB Bandwidth Limit
☒ Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (13.553 – 13.567 MHz).

3.2.2 Measuring Instruments and Setting

Please refer to section 4 of equipment's list in this report. The following table is the setting of the Spectrum Analyzer.

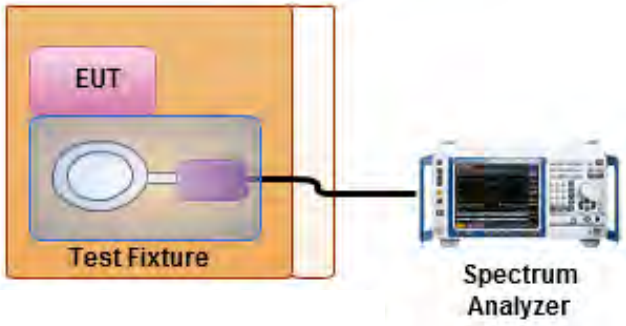
Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RBW	1 kHz
VBW	3 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.2.3 Test Procedures

1. For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.
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.

3.2.4 Test Setup

Emission Bandwidth



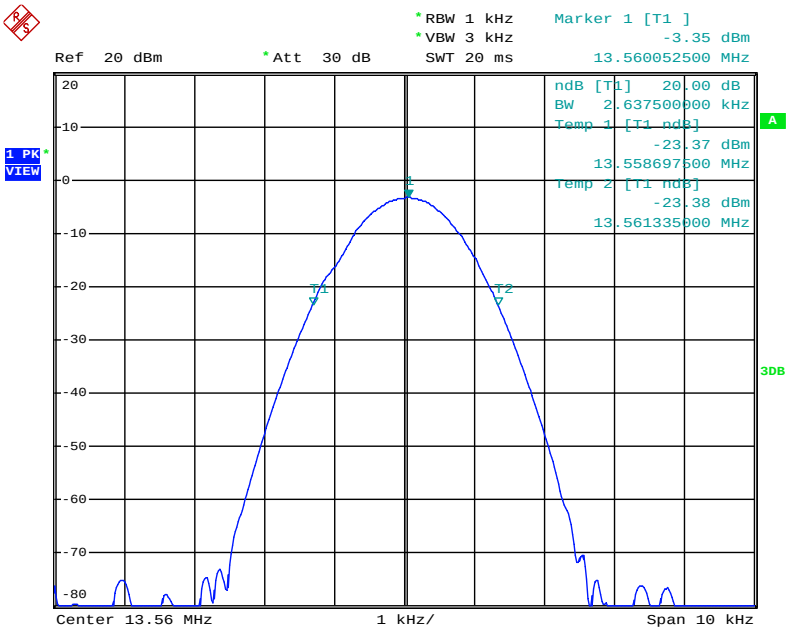
3.2.5 Test Result of Emission Bandwidth

Temperature	25℃	**Humidity**	55%
Test Engineer	Ryo Fan	**Modulation Mode**	NFC

Occupied Channel Bandwidth Result					
Modulation Mode	**Frequency (MHz)**	**20dB Bandwidth (kHz)**	**99% OBW (kHz)**	**F_L at 20dB BW (MHz)**	**F_H at 20dB BW (MHz)**
NFC	13.56	2.6375	2.25	13.5586975	13.5613350
Limit		**N/A**	**N/A**	**>13.553**	**<13.567**
Result		**Complied**			

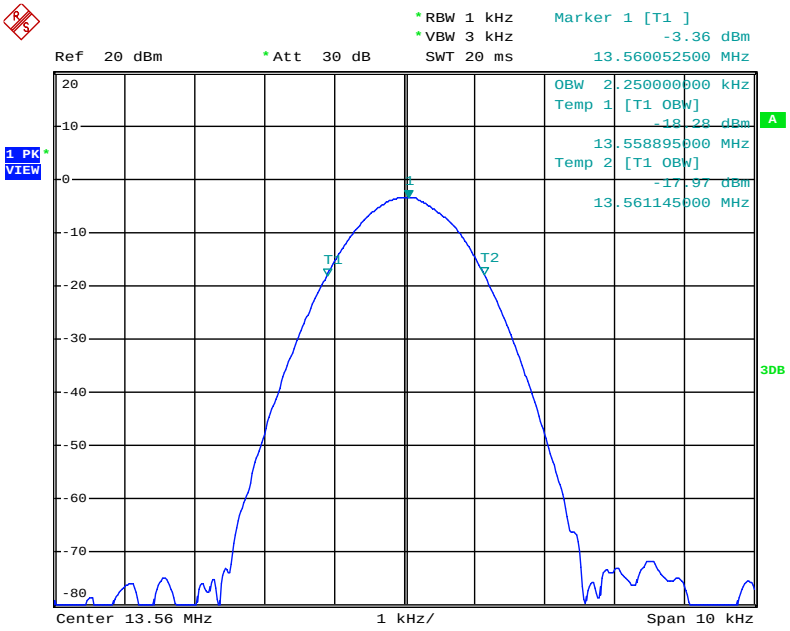
Emission Bandwidth Plot

20dB Bandwidth



Date: 2.AUG.2014 11:39:20

99% OBW



Date: 2.AUG.2014 11:37:30

3.3 Field Strength of Fundamental Emissions and Spectrum Mask

3.3.1 Field Strength of Fundamental Emissions and Spectrum Mask Limit

Field Strength of Fundamental Emissions			
Frequencies (MHz)	**Field Strength (microvolts/meter) at 30m**	**Field Strength (dBµV/m) at 10m**	**Field Strength (dBµV/m) at 3m**
13.553 – 13.567 MHz	15848	103.08 (QP)	124 (QP)
Quasi peak measurement of the fundamental.			

Spectrum Mask					
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 – 13.567 MHz.				
Limit	**Freq. of Emission (MHz)**	**Field Strength**			
		(uV/m)@30m	**(dBuV/m)@30m**	**(dBuV/m)@10m**	**(dBuV/m)@3m**
	1.705~13.110	30	29.5	48.6	69.5
	13.110~13.410	106	40.5	59.6	80.5
	13.410~13.553	334	50.5	69.6	90.5
	13.553~13.567	15848	84.0	103.1	124.0
	13.567~13.710	334	50.5	69.6	90.5
	13.710~14.010	106	40.5	59.6	80.5
	14.010~30.000	30	29.5	48.6	69.5

3.3.2 Measuring Instruments and Setting

Please refer to section 4 of equipment's list in this report. The following table is the setting of the receiver.

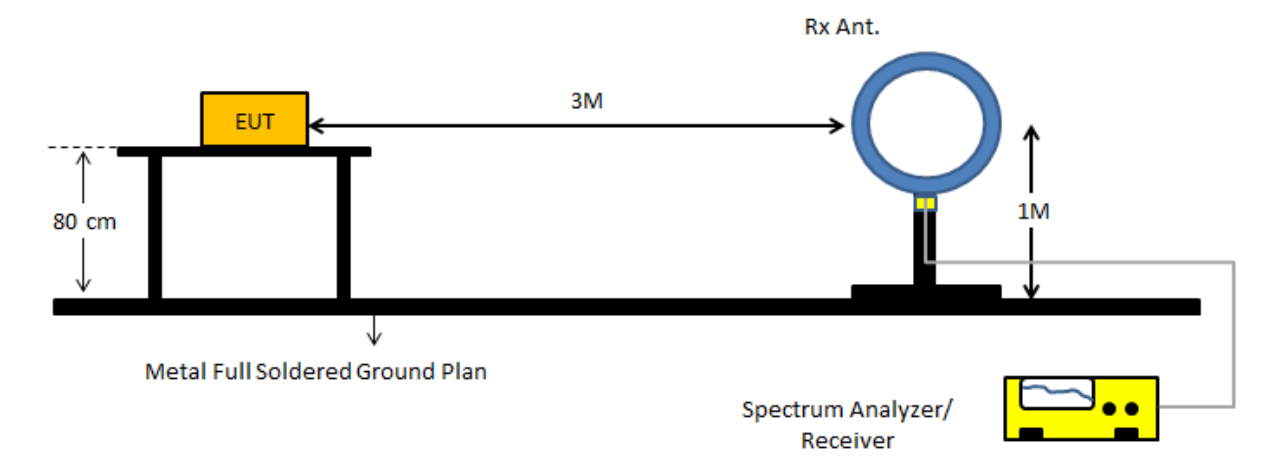
Receiver Parameter	**Setting**
Attenuation	Auto
Center Frequency	Fundamental Frequency
RBW	9 kHz
Detector	QP

3.3.3 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 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 – 13.567 MHz.

3.3.4 Test Setup

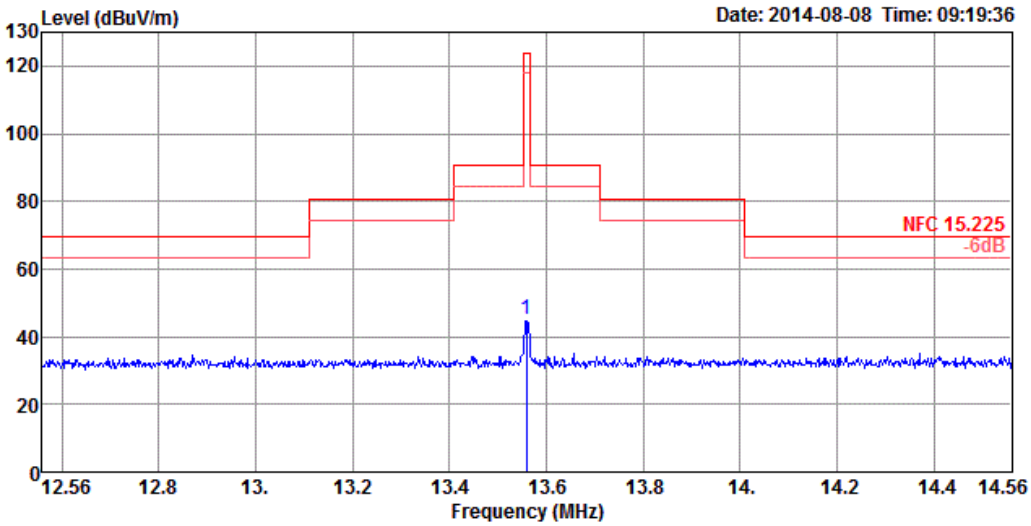
Field Strength of Fundamental Emissions and Spectrum Mask



3.3.5 Test Result of Field Strength of Fundamental Emissions

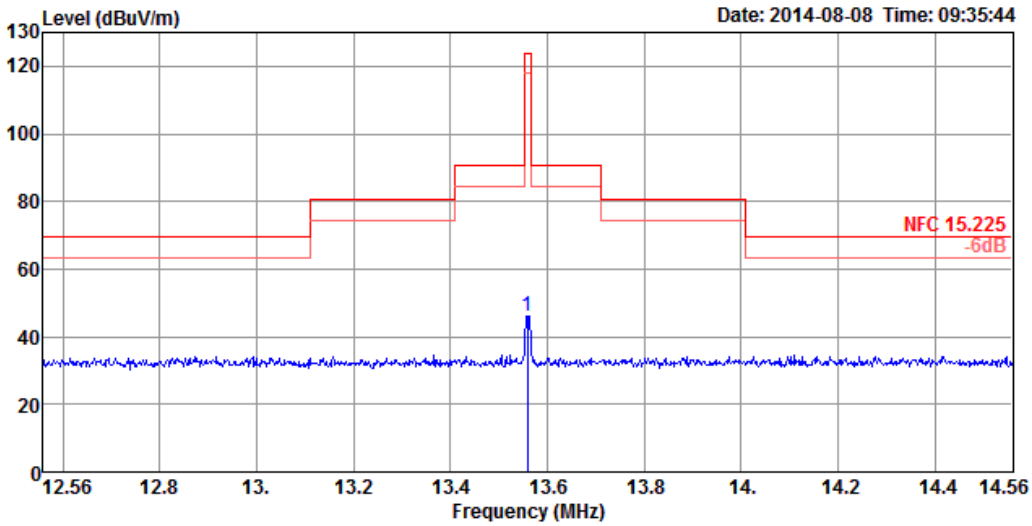
Temperature	23℃	**Humidity**	47%
Test Engineer	Ryo Fan	**Modulation Mode**	NFC
Frequency (MHz)	13.56		

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1 q	13.56	45.22	124.00	-78.78	22.70	0.00	21.13	1.39	QP	---	---	VERTICAL

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1 q	13.56	46.09	124.00	-77.91	23.57	0.00	21.13	1.39	QP	---	---	HORIZONTAL

Note:
1. Emission level (dBμV/m) = 20 log Emission level (μV/m).
2. Measured distance is 3m.
3. All emissions emit form non-NFC function of digital unintentional emissions. All NFC's spurious emissions are below 20dB of limits.

3.4 Transmitter Radiated Unwanted Emissions

3.4.1 Transmitter Radiated Unwanted Emissions Limit

The field strength of any emissions which appear outside of 13.553 ~ 13.567MHz band shall not exceed the general radiated emissions limits.

Transmitter Radiated Unwanted Emissions Limit		
Frequency (MHz)	**Field Strength (uV/m)**	**Measure Distance (m)**
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

3.4.2 Measuring Instruments and Setting

Please refer to section 4 of equipment's list in this report. The following table is the setting of the receiver.

Receiver Parameter	**Setting**
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	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.

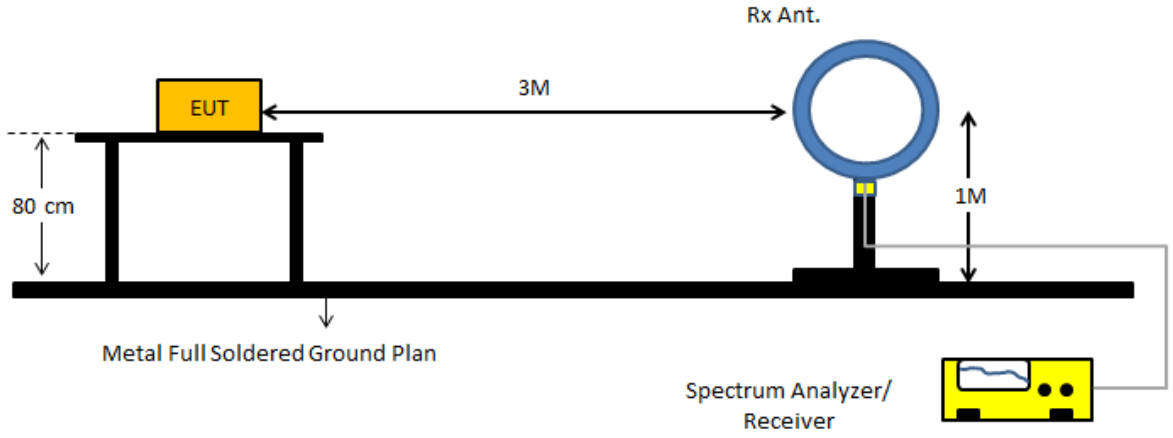
3.4.3 Test Procedures

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. High – Low scan is not required in this case.

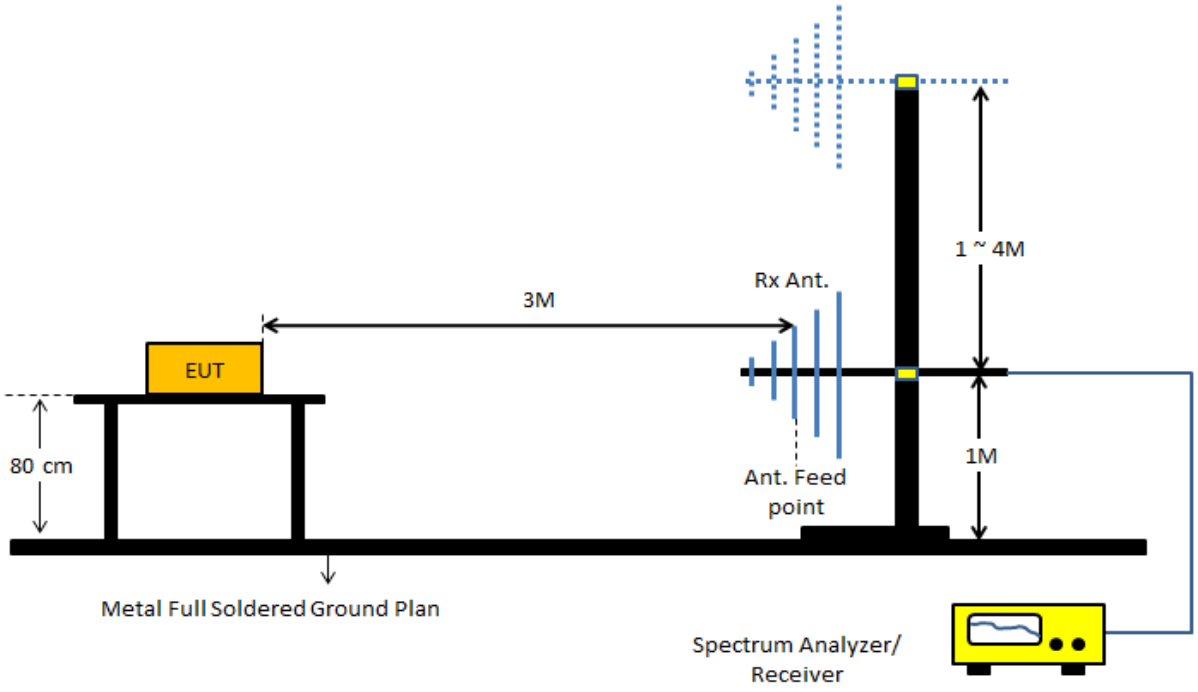
3.4.4 Test Setup

Transmitter Radiated Unwanted Emissions

For radiated emissions below 30 MHz



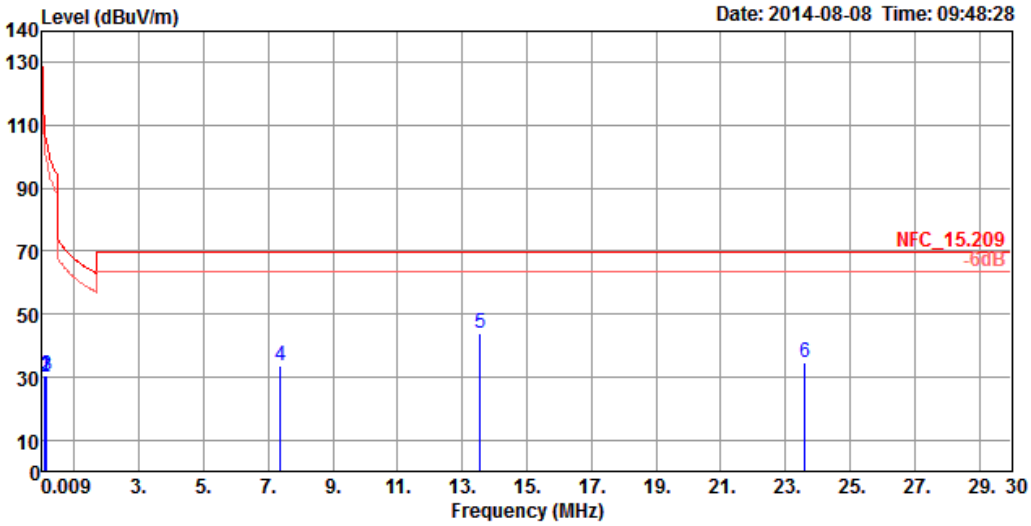
For radiated emissions above 30 MHz



3.4.5 Transmitter Radiated Unwanted Emissions (9 kHz ~ 30 MHz)

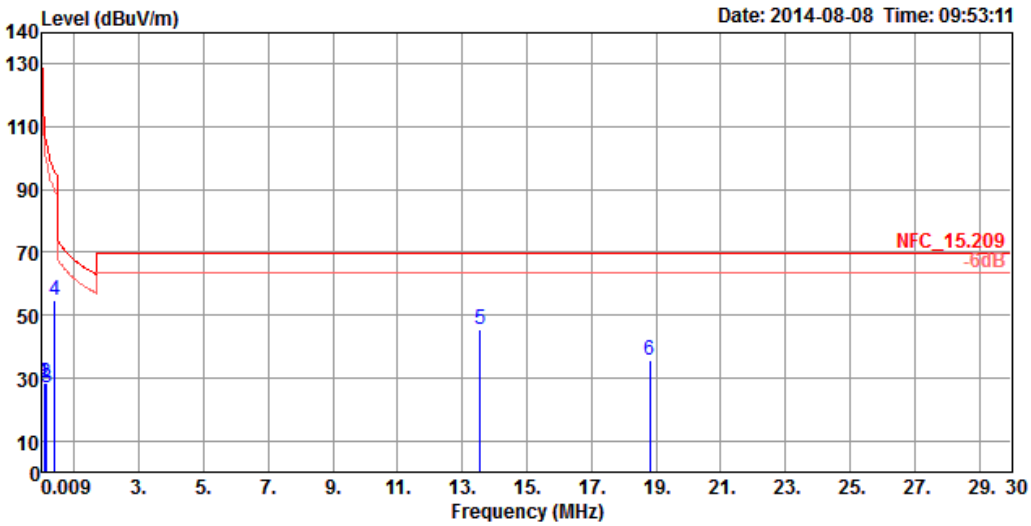
Temperature	23℃	**Humidity**	47%
Test Engineer	Ryo Fan	**Modulation Mode**	NFC
Frequency Range	9 kHz ~ 30 MHz	**Frequency (MHz)**	13.56

Vertical



		Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1		0.08	30.45	109.52	-79.07	9.55	0.00	19.90	1.00	QP	---	---	VERTICAL
2		0.11	30.14	106.73	-76.59	9.14	0.00	20.00	1.00	QP	---	---	VERTICAL
3		0.13	30.60	105.24	-74.64	9.60	0.00	20.00	1.00	QP	---	---	VERTICAL
4		7.37	33.58	69.54	-35.96	11.99	0.00	20.40	1.19	QP	---	---	VERTICAL
5	q	13.55	43.98			21.46	0.00	21.13	1.39	QP	---	---	VERTICAL
6		23.61	34.64	69.54	-34.90	10.74	0.00	22.24	1.66	QP	---	---	VERTICAL

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	0.08	28.47	109.62	-81.15	7.57	0.00	19.90	1.00	QP	---	---	HORIZONTAL
2	0.11	28.65	107.16	-78.51	7.65	0.00	20.00	1.00	QP	---	---	HORIZONTAL
3	0.13	27.11	105.27	-78.16	6.11	0.00	20.00	1.00	QP	---	---	HORIZONTAL
4	0.39	54.59	95.81	-41.22	33.99	0.00	19.60	1.00	QP	---	---	HORIZONTAL
5 q	13.55	45.47			22.95	0.00	21.13	1.39	QP	---	---	HORIZONTAL
6	18.81	35.64	69.54	-33.90	12.20	0.00	21.91	1.53	QP	---	---	HORIZONTAL

Note:

1. 13.56 MHz is transmitter's fundamental signal.
2. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

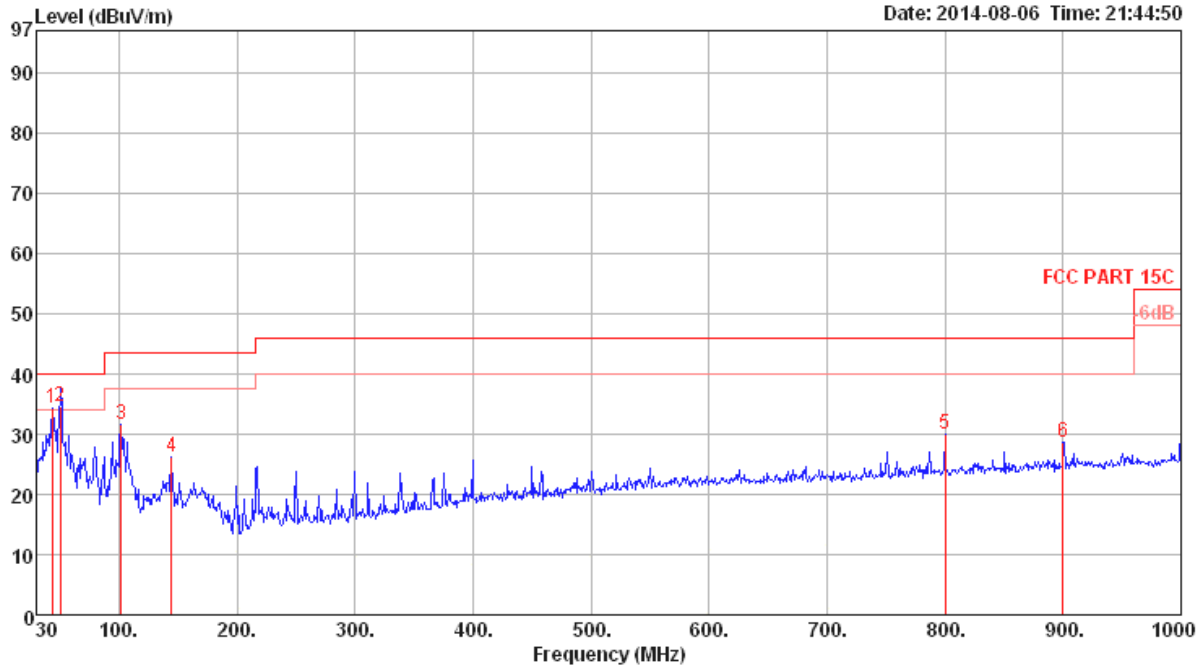
   Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

   Limit line = specific limits (dBμV) + distance extrapolation factor.

3.4.6 Transmitter Radiated Unwanted Emissions (30 MHz ~ 1,000 MHz)

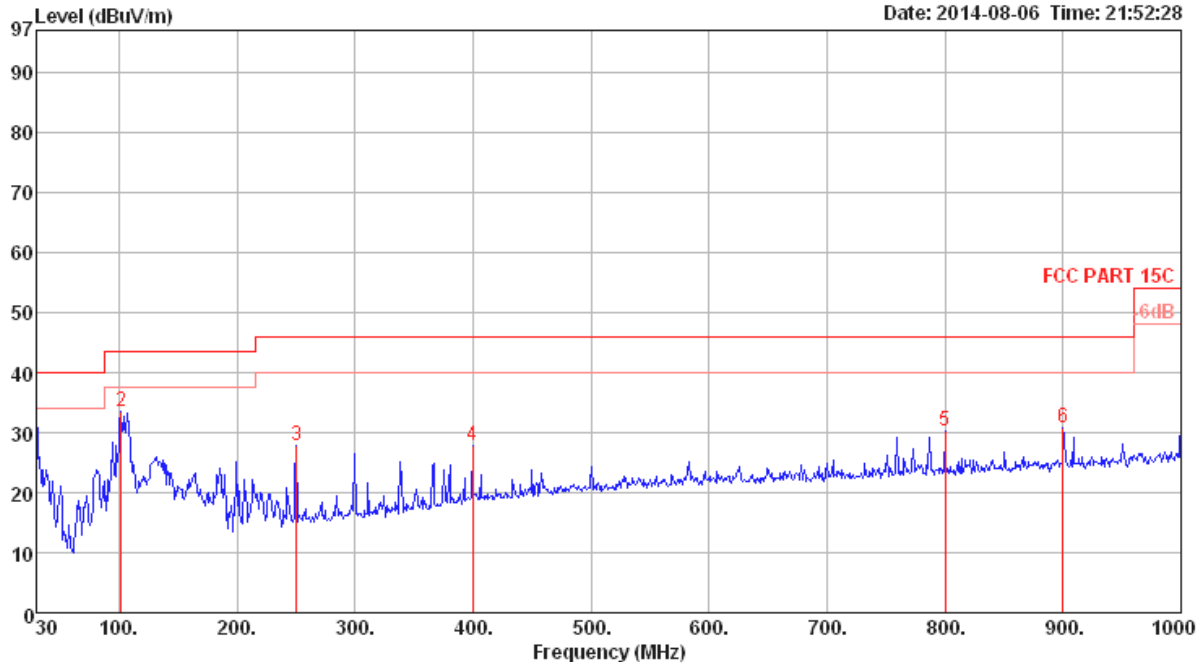
Temperature	23℃	**Humidity**	47%
Test Engineer	Ryo Fan	**Modulation Mode**	NFC
Frequency Range	30 MHz ~ 1,000 MHz	**Frequency (MHz)**	13.56

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	43.58	34.39	40.00	-5.61	50.59	0.72	10.88	27.80	Peak	400	0	VERTICAL
2	50.37	34.56	40.00	-5.44	52.96	0.87	8.53	27.80	QP	100	16	VERTICAL
3	101.78	31.52	43.50	-11.98	46.79	1.18	11.14	27.59	Peak	400	0	VERTICAL
4	144.46	26.33	43.50	-17.17	40.17	1.42	12.12	27.38	Peak	400	0	VERTICAL
5	800.18	30.07	46.00	-15.93	34.68	3.22	19.77	27.60	Peak	400	0	VERTICAL
6	900.09	28.76	46.00	-17.24	32.08	3.55	20.53	27.40	Peak	400	0	VERTICAL

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	30.00	35.98	40.00	-4.02	44.41	0.61	18.76	27.80	Peak	100	0	HORIZONTAL
2	101.78	33.49	43.50	-10.01	48.76	1.18	11.14	27.59	Peak	100	0	HORIZONTAL
3	250.19	27.87	46.00	-18.13	40.32	1.78	12.77	27.00	Peak	100	0	HORIZONTAL
4	399.57	27.81	46.00	-18.19	37.05	2.30	16.06	27.60	Peak	100	0	HORIZONTAL
5	800.18	30.18	46.00	-15.82	34.79	3.22	19.77	27.60	Peak	100	0	HORIZONTAL
6	900.09	30.74	46.00	-15.26	34.06	3.55	20.53	27.40	Peak	100	0	HORIZONTAL

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.

3.5 Frequency Stability

3.5.1 Frequency Stability Limit

Frequency Stability Limit
☒ Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

3.5.2 Measuring Instruments

Please refer to section 4 of equipment's list in this report. The following table is the setting of the spectrum analyzer.

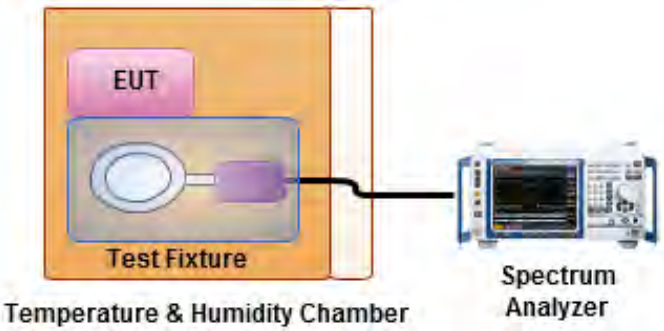
Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RBW	1 kHz
VBW	3 kHz
Sweep Time	Auto

3.5.3 Test Procedures

1. For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.
2. EUT have transmitted modulation 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.

3.5.4 Test Setup

Frequency Stability



3.5.5 Test Result of Frequency Stability

Temperature	25℃	**Humidity**	55%
Test Engineer	Ryo Fan	**Modulation Mode**	NFC
Frequency (MHz)	13.56	**Test Date**	Aug. 07. 2014

Voltage vs. Frequency Stability

Voltage(V)	Measurement Frequency (MHz)
102	13.5600325
120	13.5600325
138	13.5600324
Max. Deviation (MHz)	0.0000325
Max. Deviation (ppm)	2.3968

Temperature vs. Frequency Stability

Temperature (℃)	Measurement Frequency (MHz)
-20	13.5600950
-10	13.5601150
0	13.5601150
10	13.5600950
20	13.5600325
30	13.5600325
40	13.5599670
50	13.5599275
Max. Deviation (MHz)	0.000115
Max. Deviation (ppm)	8.4808

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Nov. 23, 2013	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 11, 2013	Conduction (CO02-CB)
MXE EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 30MHz	Jan. 22, 2014	Conduction (CO02-CB)
COND Cable	Woken	Cable	01	0.15MHz~30MHz	Dec. 04, 2013	Conduction (CO02-CB)
Software	Audix	E3	5.410e	-	N.C.R.	Conduction (CO02-CB)
10m Semi Anechoic Chamber	TDK	SAC-10M	10CH01-CB	30MHz~6GHz 10m	Jun. 23, 2014	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10783	9kHz ~ 1.3GHz	Mar. 28, 2014	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10784	9kHz ~ 1.3GHz	Feb. 11, 2014	Radiation (10CH01-CB)
EMI Test Receiver	Rohde&Schwarz	ESCI	100186	9kHz ~ 3GHz	Jun. 25, 2014	Radiation (10CH01-CB)
Spectrum Analyzer	Rohde&Schwarz	FSV30	101026	9kHz ~ 30GHz	Nov. 15, 2013	Radiation (10CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Nov. 05, 2012*	Radiation (10CH01-CB)
Software	Audix	E3	6.120210d	-	N.C.R.	Radiation (10CH01-CB)
BILOG ANTENNA	Schaffner	CBL6112B	2928	30MHz ~ 2GHz	Dec. 27, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 12, 2013	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100019	9kHz~40GHz	Dec. 02, 2013	Radiation (03CH01-CB)
EMI Test Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8GHz	Dec. 12, 2013	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R.	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N.C.R.	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 17, 2013	Radiation (03CH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Nov. 29, 2013	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2014	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

"*" Calibration Interval of instruments listed above is two years.

NCR means Non-Calibration required.

5 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.4 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%
Occupied Channel Bandwidth	$6.6*10^{-8}$ MHz	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%