FCC Report

(NFC)

Applicant:	**S**PECTRA Technologies Holdings Co. Ltd.
Address of Applicant:	Unit 1301-09, 19-20, Tower II, Grand Century Place, 193 Prince Edward Road West, Kowloon, Hong Kong .

Equipment Under Test (EUT)

Product Name:	Wireless POS Terminal
Model No.:	T1000 WCDMA
FCC ID:	VWZT1000W
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.225: 2012
Date of sample receipt:	August 17, 2013
Date of Test:	August 17- September 9, 2013
Date of report issued:	September 9, 2013
Test Result :	PASS *

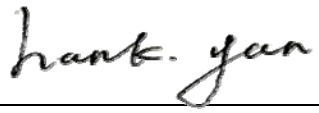
* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*September 9, 2013*	*Original*

Prepared By:  ***Date:*** *September 9, 2013*

Project Engineer

Check By:  ***Date:*** *September 9, 2013*

Reviewer

3 Contents

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Field Strength of Fundamental Emissions and Mask Measurement	15.225	Pass
Radiated Emission	15.209	Pass
20dB Emission Bandwidth	15.225	Pass
Frequency Stability Measurement	15.225	Pass

Pass: The EUT complies with the essential requirements in the standard.

5 General Information

5.1 Client Information

Applicant:	SPECTRA Technologies Holdings Co. Ltd.
Address of Applicant:	Unit 1301-09, 19-20, Tower II, Grand Century Place, 193 Prince Edward Road West, Kowloon, Hong Kong .
Manufacturer/Factory:	SPECTRA Technologies Holdings Co. Ltd.
Address of Manufacturer/ Factory:	Unit 1301-09, 19-20, Tower II, Grand Century Place, 193 Prince Edward Road West, Kowloon, Hong Kong .

5.2 General Description of E.U.T.

Product Name:	Wireless POS Terminal
Trade mark:	T1000 WCDMA
Operation Frequency:	13.56MHz
Channel Number:	1
Modulation:	ASK
Antenna type:	Integral antenna
Antenna gain:	1dBi
Power supply:	Li-Polymer Battery 7.4V 1750mAh
Adapter information :	Model:ADP036-094B Input: AC 100V~240V 1.0A 50/60Hz Output: DC 9.0V 4A

5.3 Test mode

Transmitter mode	Keep the EUT in continuously transmitting.

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS —Registration No.: CNAS L5775**

CNAS has accredited Global United Technology Services Co., Ltd. to ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fuly described in a report filed with the (FCC) Federal Communications Commission.

The acceptance letter from the FCC is maintained in out files. Registration 600491, July 20, 2010.

- **Industry Canada (IC)**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. Has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-1.

5.5 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China Tel: 0755-27798480 Fax: 0755-27798960

6 Test Instruments list

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 29 2013	Mar. 28 2014
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jul. 02 2013	Jul. 01 2014
4	Loop Antenna	ZHINAN	ZN30900A	GTS220	June 28 2013	June 27 2014
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Feb. 24 2013	Feb. 23 2014
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2013	June 27 2014
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 29 2013	Mar. 28 2014
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 30 2013	Mar. 29 2014
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 30 2013	Mar. 29 2014
11	Coaxial cable	GTS	N/A	GTS210	Mar. 30 2013	Mar. 29 2014
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 30 2013	Mar. 29 2014
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jul. 02 2013	Jul. 01 2014
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jul. 02 2013	Jul. 01 2014
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 28 2013	June 27 2014

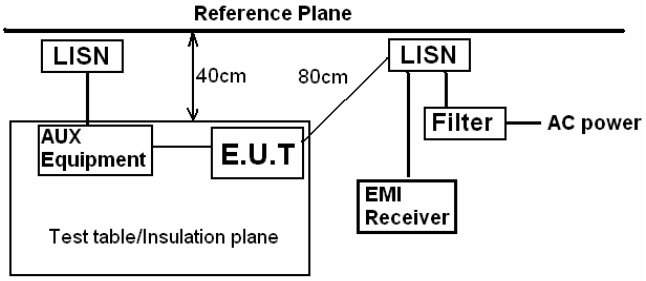
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.0(L)x3.0(W)x3.0(H)	GTS264	Sep. 08 2011	Sep. 07 2013
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jul. 02 2013	Jul. 01 2014
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	Jul. 02 2013	Jul. 01 2014
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jul. 02 2013	Jul. 01 2014
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	Jul. 02 2013	Jul. 01 2014
6	Coaxial Cable	GTS	N/A	GTS227	Jul. 02 2013	Jul. 01 2014
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

7 Test results and Measurement Data

7.1 Antenna requirement:

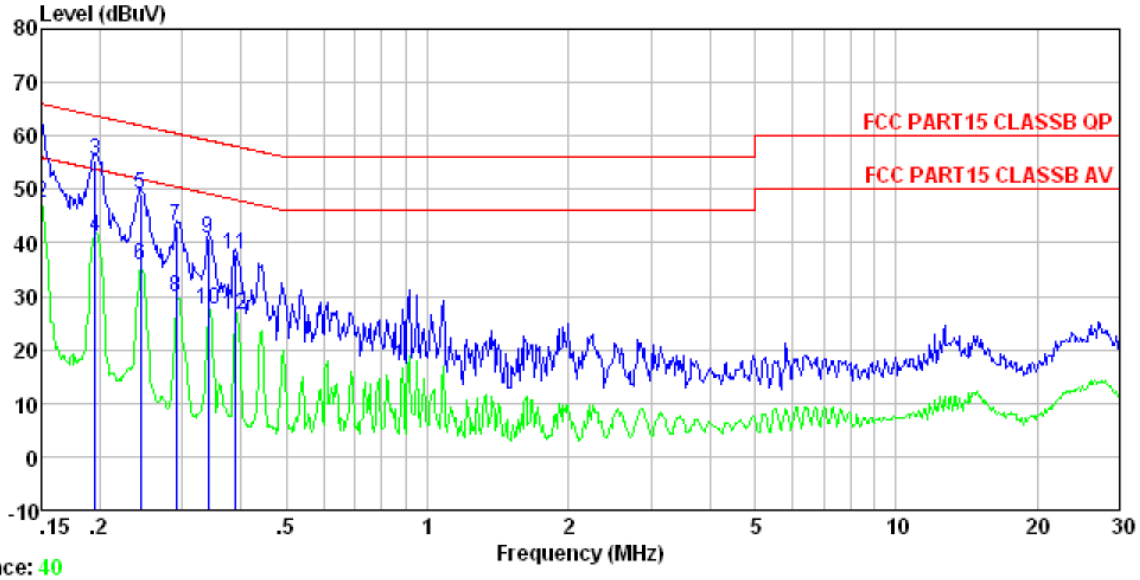
Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
E.U.T Antenna:	
The antenna is integral chip antenna.	

7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.4:2003
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	Frequency range (MHz) / Limit (dBuV): 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.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

Line:

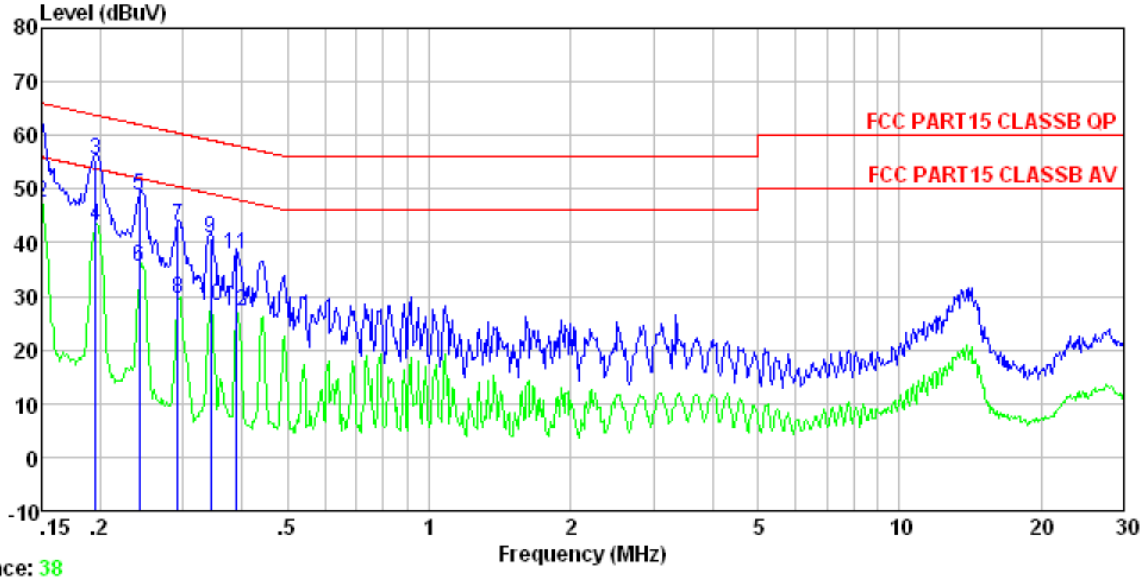


Trace: 40

Condition : FCC PART15 CLASSB QP LISN-2013 LINE
Job No. : 1287RF
Test mode : NFC Mode
Test Engineer: Ying

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	61.27	0.15	0.12	61.54	66.00	-4.46	QP
2	0.150	47.14	0.15	0.12	47.41	56.00	-8.59	Average
3	0.195	55.29	0.14	0.13	55.56	63.80	-8.24	QP
4	0.195	40.98	0.14	0.13	41.25	53.80	-12.55	Average
5	0.244	48.93	0.12	0.11	49.16	61.95	-12.79	QP
6	0.244	35.68	0.12	0.11	35.91	51.95	-16.04	Average
7	0.291	42.91	0.11	0.10	43.12	60.50	-17.38	QP
8	0.291	29.68	0.11	0.10	29.89	50.50	-20.61	Average
9	0.341	40.46	0.11	0.10	40.67	59.18	-18.51	QP
10	0.341	27.41	0.11	0.10	27.62	49.18	-21.56	Average
11	0.389	37.50	0.11	0.11	37.72	58.08	-20.36	QP
12	0.389	26.25	0.11	0.11	26.47	48.08	-21.61	Average

Neutral:



Trace: 38

Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL
Job No. : 1287RF
Test mode : NFC Mode
Test Engineer: Ying

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	61.47	0.07	0.12	61.66	66.00	-4.34	QP
2	0.150	47.14	0.07	0.12	47.33	56.00	-8.67	Average
3	0.195	55.37	0.07	0.13	55.57	63.80	-8.23	QP
4	0.195	43.02	0.07	0.13	43.22	53.80	-10.58	Average
5	0.242	48.67	0.06	0.12	48.85	62.04	-13.19	QP
6	0.242	35.36	0.06	0.12	35.54	52.04	-16.50	Average
7	0.292	43.13	0.06	0.10	43.29	60.46	-17.17	QP
8	0.292	29.47	0.06	0.10	29.63	50.46	-20.83	Average
9	0.343	40.77	0.06	0.10	40.93	59.13	-18.20	QP
10	0.343	28.08	0.06	0.10	28.24	49.13	-20.89	Average
11	0.389	37.74	0.06	0.11	37.91	58.08	-20.17	QP
12	0.389	27.02	0.06	0.11	27.19	48.08	-20.89	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

7.3 Field Strength of Fundamental Emissions and Mask Measurement

Test Requirement:	FCC Part15 C Section 15.225 and 15.209
Test Method:	ANSI C63.4:2003
Test site:	Measurement Distance: 3m
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=Auto

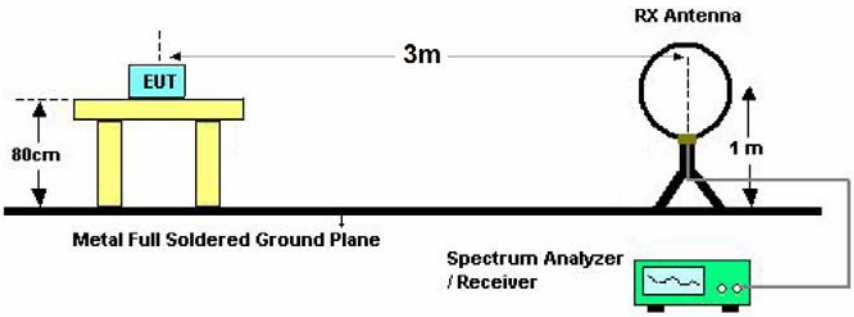
Limit:

Frequency (MHz)	Field Strength (microvolts/meter) at 30m	Field Strength (dBuV/m) at 3m
13.553~13.567	15848	124 (QP)

Mark limit:

Frequency (MHz)	Field Strength (microvolts/meter) at 30m	Field Strength (dBuV/m) at 3m
1.705~13.110	30	69.5
13.110~13.410	106	80.5
13.410~13.553	334	90.5
13.553~13.567	15848	124.0
13.567~13.710	334	90.5
13.710~14.010	106	80.5
14.010~30.000	30	69.5

Test setup:



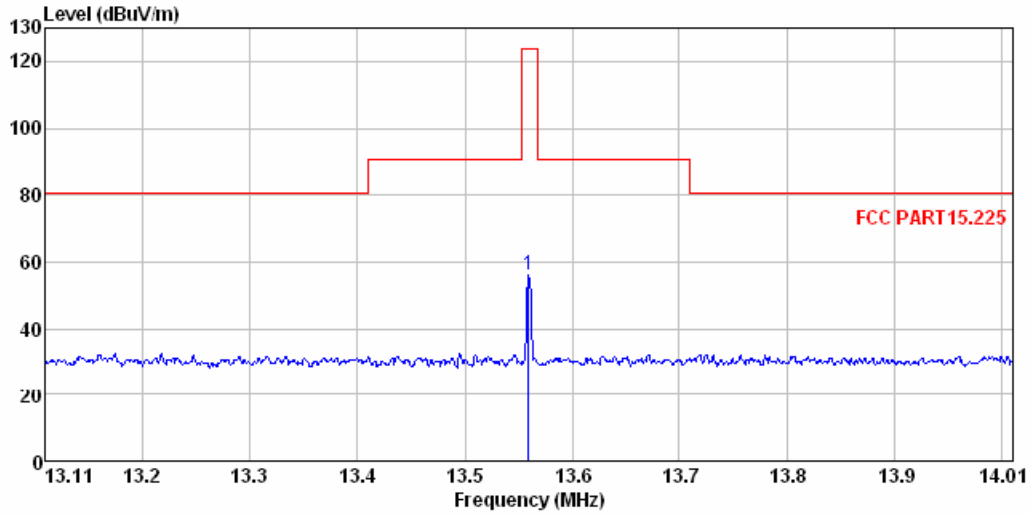
Test Procedure:

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8meter 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, 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 RB set to a 1KHz for the band 13.553~13.567MHz.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

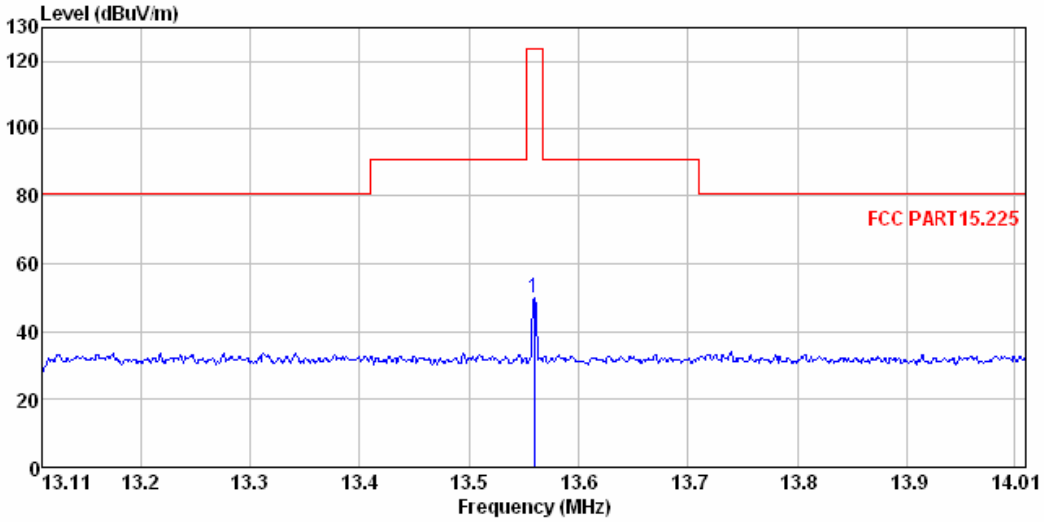
Vertical:




```
Site          : site
Condition     : FCC PART15.225 3m ZN309000A(<30M)-2013 VERTICAL
Job No.:      : 1287RF
Test mode     : Transmitting mode
Test Engineer: Hans
                 ReadAntenna  Cable Preamp         Limit   Over
           Freq  Level Factor   Loss Factor  Level   Line  Limit Remark
        ________ _____ ______ ______ ______ _____ ______ _____ __________
             MHz  dBuV   dB/m     dB     dB dBuV/m dBuV/m    dB

  1     13.560  32.67  22.86   0.51   0.00  56.04 124.00 -67.96 QP
```

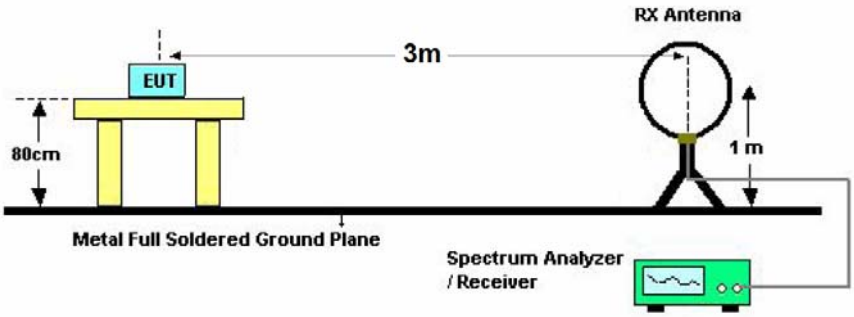
Horizontal:



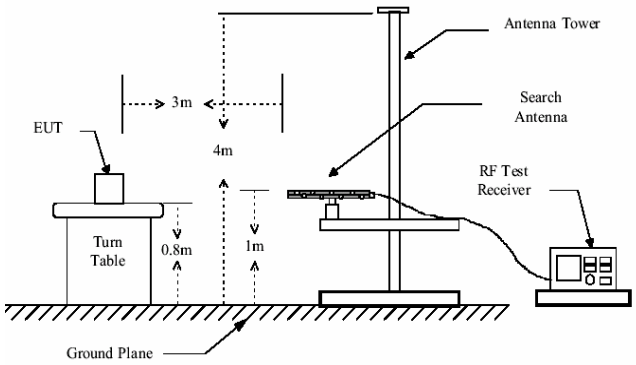
Site : 3m chamber
Condition : FCC PART15.225 3m ZN309000A(<30M)-2013 HORIZONTAL
Job No.: : 1287RF
Test mode : Transmitting mode
Test Engineer: Hans

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	13.560	26.67	22.86	0.51	0.00	50.04	124.00	-73.96	QP

7.4 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4: 2003</td></tr>
<tr><td>Test Frequency Range:</td><td>9KHz to 1000MHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency (MHz)</th><th>RBW(KHz)</th><th>Detector</th></tr>
<tr><td>0.009~0.15</td><td>0.2</td><td>QP</td></tr>
<tr><td>0.15~30</td><td>9</td><td>QP</td></tr>
<tr><td>30~1000</td><td>120</td><td>QP</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>The Field strength of any emissions which appear outside of 13.553~13.567MHz band shall not exceed the general radiated emissions limits
<table>
<tr><th>Frequency (MHz)</th><th>Field strength (micorvolts/meter)</th><th>Measurement distance (meters)</th></tr>
<tr><td>0.009~0.490</td><td>2400/F(KHz)</td><td>300</td></tr>
<tr><td>0.490~1.705</td><td>24000/F(KHz)</td><td>30</td></tr>
<tr><td>1.705~30</td><td>30</td><td>30</td></tr>
<tr><td>30~88</td><td>100</td><td>3</td></tr>
<tr><td>88~216</td><td>150</td><td>3</td></tr>
<tr><td>216~960</td><td>200</td><td>3</td></tr>
<tr><td>960~1000</td><td>500</td><td>3</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>Below 30MHz
 

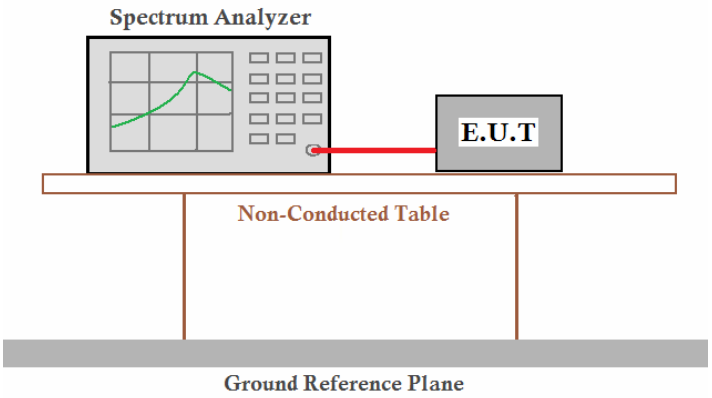
Above 30MHz</td></tr>
</table>

	
Test Procedure:	1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8meter 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, 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 1M to 4M) 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.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1.583	13.67	20.80	0.36	0.00	34.83	63.64	-28.81	Vertical
8.926	15.76	23.17	0.48	0.00	39.41	69.54	-30.13	Vertical
15.493	14.47	23.32	0.51	0.00	38.30	69.54	-31.24	Vertical
34.880	43.85	15.82	0.61	32.06	28.22	40.00	-11.78	Vertical
54.070	42.41	16.15	0.81	31.95	27.42	40.00	-12.58	Vertical
113.320	45.30	14.15	1.31	31.83	28.93	43.50	-14.57	Vertical
234.170	44.50	14.88	2.04	32.16	29.26	46.00	-16.74	Vertical
742.260	36.23	22.34	4.24	31.25	31.56	46.00	-14.44	Vertical
4.269	8.16	21.80	0.43	0.00	30.39	69.54	-39.15	Horizontal
17.821	11.52	25.94	0.52	0.00	37.98	69.54	-31.56	Horizontal
25.284	16.35	26.21	0.55	0.00	43.11	69.54	-26.43	Horizontal
34.280	38.66	15.80	0.60	32.06	23.00	40.00	-17.00	Horizontal
72.590	39.56	12.53	0.96	31.84	21.21	40.00	-18.79	Horizontal
96.440	37.85	16.02	1.16	31.75	23.28	43.50	-20.22	Horizontal
147.400	43.02	11.27	1.55	31.97	23.87	43.50	-19.63	Horizontal
239.150	40.95	15.06	2.06	32.16	25.91	46.00	-20.09	Horizontal

7.5 20dB Emission Bandwidth

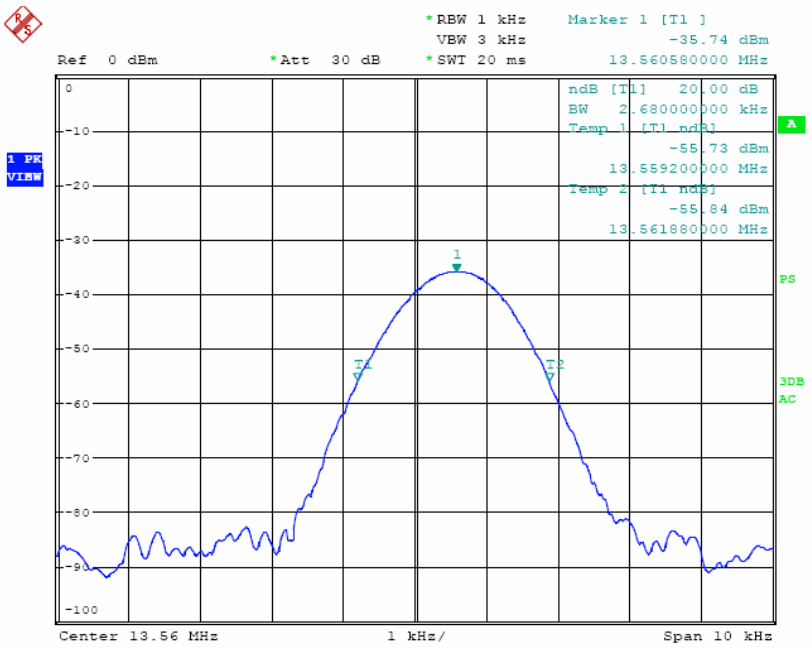
Test Requirement:	FCC Part15 C Section 15.225 and 15.215
Test Method:	ANSI C63.4:2003
Limit:	N/A
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

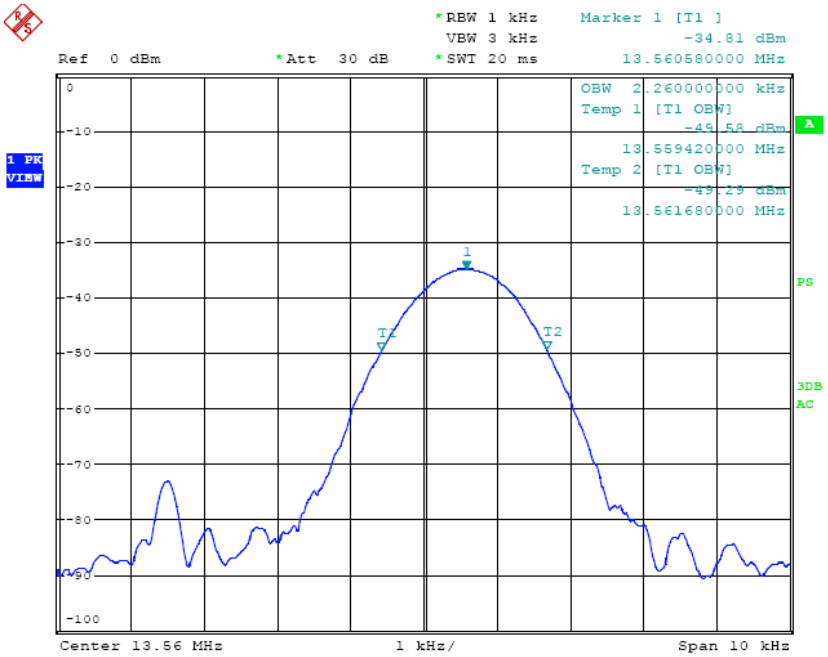
Frequency (MHz)	20dB Bandwidth (KHz)	99% OBW (KHz)	Frequency range (MHz) fL>13.553MHz	Frequency range (MHz) fH>13.567MHz	Result
13.56MHz	2.68	2.26	13.5592	13.56188	Pass

Test plot as follows:

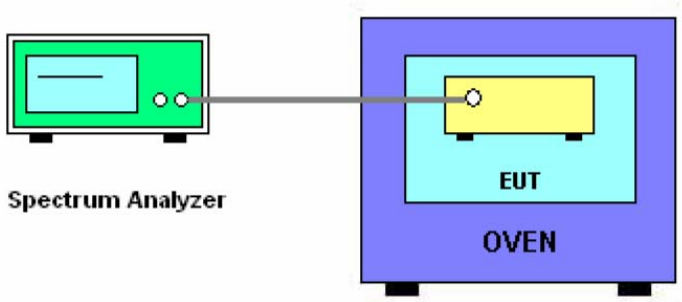
Test mode:	20dB bandwidth



Test mode:	99% OBW



7.6 Frequency Stability Measurement

Test Requirement:	FCC Part15 C Section 15.225
Test Method:	ANSI C63.4: 2003
Receiver setup:	RBW=1KHz, VBW=1KHz, Sweep time=Auto
Limit:	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, 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.
Test setup:	
Test Procedure:	1. The transmitter output (antenna port) was connected to the spectrum analyzer. 2. EUT have transmitted absence of modulation signal and fixed channelize 3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth. 4. Set RBW=1KHz, VBW=1KHz with peak detector and maxhold settings. 5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc x10^6 ppm and the limit is less than ±100ppm. 6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value 7. Extreme temperature rule is -20℃ ~50℃
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

Reference Frequency: 13.56MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit	Result
		Hz	%		
7.40	-20	49	0.00036%	+/- 0.01%	Pass
	-10	53	0.00039%		
	0	57	0.00042%		
	10	55	0.00041%		
	20	58	0.00043%		
	30	61	0.00045%		
	40	67	0.00049%		
	50	63	0.00046%		

Reference Frequency: 13.56MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit	Result
		Hz	ppm		
20	6.29	46	0.00034%	+/- 0.01%	Pass
	7.40	58	0.00043%		
	8.51	72	0.00053%		

------End------