
FCC Test Report

Report No.: AGC07432170502FE03

FCC ID : VWZT1000A5WCDMA
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : EFT POS
BRAND NAME : SPECTRA
MODEL NAME : T1000
CLIENT : SPECTRA Technologies Holdings Co., Ltd.
DATE OF ISSUE : July 07, 2017
STANDARD(S) : FCC Part 15 Rules
TEST PROCEDURE(S)
REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	July 07, 2017	Valid	Original Report

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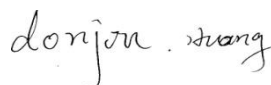
1. VERIFICATION OF CONFORMITY

Applicant	SPECTRA Technologies Holdings Co., Ltd.
Address	Unit 1301-09, 19-20, Tower II, Grand Century Place, Kowloon, Hong Kong
Manufacturer	SPECTRA Technologies Holdings Co., Ltd.
Address	Unit 1301-09, 19-20, Tower II, Grand Century Place, Kowloon, Hong Kong
Product Designation	EFT POS
Brand Name	SPECTRA
Test Model	T1000
Date of test	June 15, 2017~July 07, 2017
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-US-BR/RF

We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.225.

Tested By



Dota Zhang(Zhang Jianfeng)

July 07, 2017

Reviewed By



Bart Xie(Xie Xiaobin)

July 07, 2017

Approved By



Solger Zhang(Zhang Hongyi)
Authorized Officer

July 07, 2017

2. GENERAL INFORMATION

A major technical description of EUT is described as following

Operation Frequency	13.56MHz
Maximum field strength	76.85 dB μ V/m@3m
Modulation	ASK
Number of channels	1
Antenna Gain	0.6dBi
Antenna Designation	Fixed Antenna (Met 15.203 Antenna requirement)
Hardware Version	1
Software Version	1.2
Power Supply	DC 3.6V by battery

3. MEASUREMENT UNCERTAINTY

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 %.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 3.18\text{dB}$
2	All emissions, radiated	$\pm 3.91\text{dB}$
3	Temperature	$\pm 0.5^\circ\text{C}$
4	Humidity	$\pm 2\%$

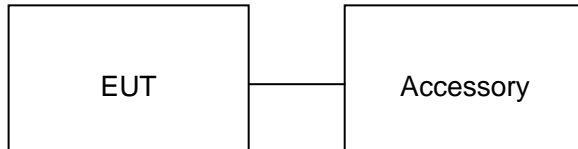
4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Transmitting
Note: 1. All the test modes can be supply by adapter, only the result of the worst case was recorded in the report, if no other cases. 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.	

5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure:



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	EFT POS	T1000	VWZT1000A5WCDMA	EUT
2	Adapter	HKA02409524-8D	DC9.5V/2.4A	Support
3	Battery	ICR18650-2600mAh	DC 3.6V 2600mAh	Support

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.229	Radiated Emission	Compliant
§15.207	Conducted Emission	Compliant
§15.229	Frequency Tolerance	Compliant
§15.215	20dB bandwidth	Compliant

6. TEST FACILITY

Site	Dongguan Precise Testing Service Co., Ltd.
Location	Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China.
FCC Registration No.	371540
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2014.

ALL TEST EQUIPMENT LIST

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 2, 2017	July 1, 2018
Trilog Broadband Antenna (25M-1GHz)	SCHWARZBECK	VULB9160	9160-3355	July 4, 2016	July 3, 2018
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 4, 2015	July 3, 2016
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 2, 2017	July 1, 2018
RF Cable	SCHWARZBECK	AK9515E	96221	July 4, 2015	July 3, 2016
RF Cable	SCHWARZBECK	AK9515E	96221	July 2, 2017	July 1, 2018
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 3, 2016	June 2, 2017
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 2, 2017	June 1, 2018
MULTI-DEVICE Positioning Controller	Max-Full	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	Schwarzbeck	FMZB1519	1519-038	June 3, 2016	June 2, 2018
Spectrum analyzer	Agilent	E4407B	MY46185649	June 2, 2017	June 1, 2018

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 4, 2015	July 3, 2016
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 2, 2017	July 1, 2018
Artificial Mains Network	Narda	L2-16B	000WX31025	July 7, 2016	July 6, 2017
Artificial Mains Network	Narda	L2-16B	000WX31025	July 2, 2017	July 1, 2018
Artificial Mains Network (AUX)	Narda	L2-16B	000WX31026	July 7, 2016	July 6, 2017
Artificial Mains Network (AUX)	Narda	L2-16B	000WX31026	July 2, 2017	July 1, 2018
RF Cable	SCHWARZBECK	AK9515E	96222	July 3, 2016	July 2, 2017

RF Cable	SCHWARZBECK	AK9515E	96222	July 2, 2017	July 1, 2018
Shielded Room	CHENGYU	843	PTS-002	July 3, 2016	July 2, 2017
Shielded Room	CHENGYU	843	PTS-002	July 2, 2017	July 1, 2018

7. RADIATED EMISSION

7.1 TEST LIMIT

Standard FCC15.225 for within the 13.110MHz-14.010MHz band

Frequencies (MHz)	Field Strength at 30m (micorvolts/meter)	Field Strength at 30m (dBuV/m)	Field Strength at 3m (dBuV/m)
13.553~13.567	15.848	84	124
13.410~13.553 13.567~13.710	334	50.5	90.5
13.110~13.410 13.710~14.010	106	40.5	80.5

According to 15.35, on any frequency or frequencies below or equal to 1000 MHz, the limits Shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test.

Standard FCC 15.209 for outside of the 13.110MHz-14.010MHz band

Frequency (MHz)	Distance Meters	Field Strengths Limit	
		μ V/m	dB(μ V)/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 ~ 1.705	30	24000/F(kHz)	---
1.705 ~ 30	30	30	---
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	Other:74.0 dB(μ V)/m (Peak) 54.0 dB(μ V)/m (Average)	

Remark: (1) Emission level dB μ V = 20 log Emission level μ V/m
(2) The smaller limit shall apply at the cross point between two frequency bands.
(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

7.2. MEASUREMENT PROCEDURE

1. 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. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. 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 values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. 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.

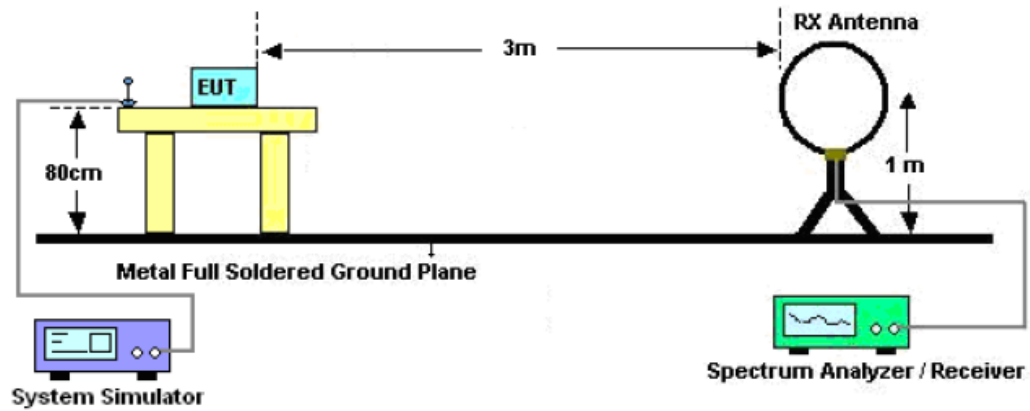
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/1MHz for Peak, 1MHz/10Hz for Average

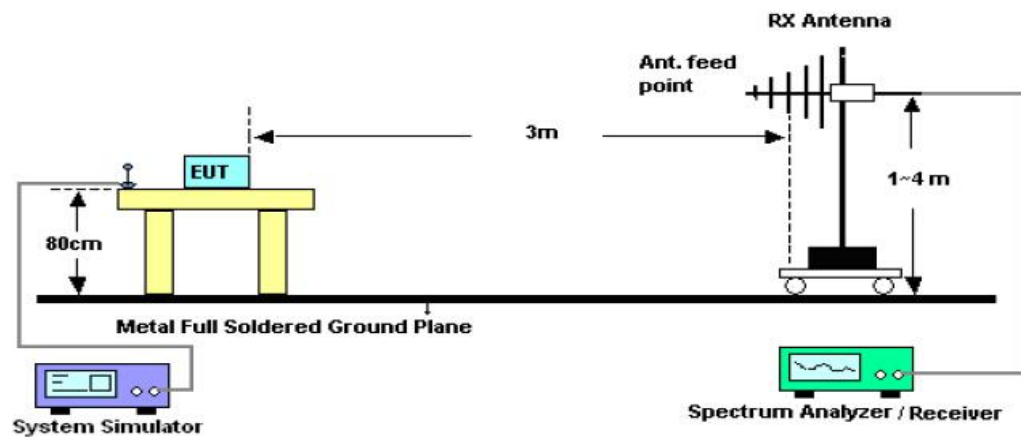
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

7.3. TEST SETUP

Radiated Emission Test-Setup Frequency Below 30MHz



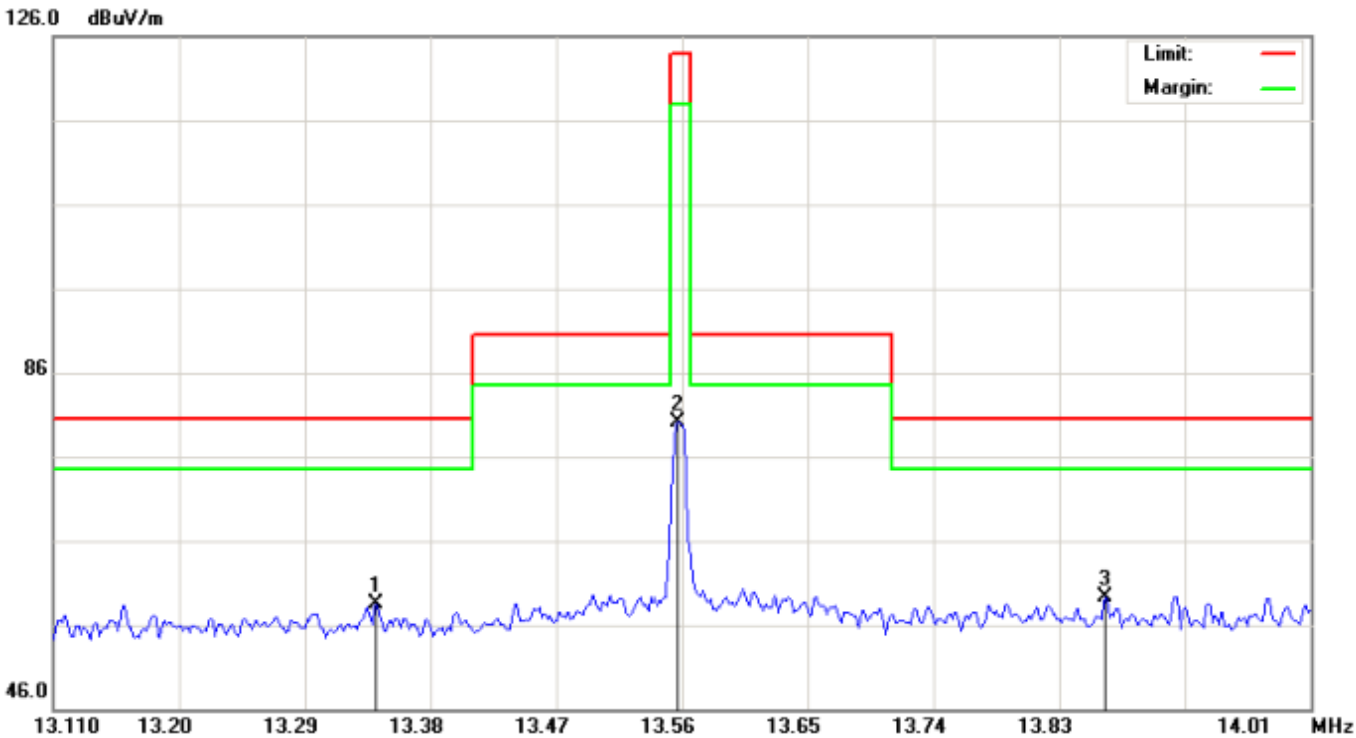
RADIATED EMISSION TEST SETUP 30MHz-1000MHz



7.4. TEST RESULT

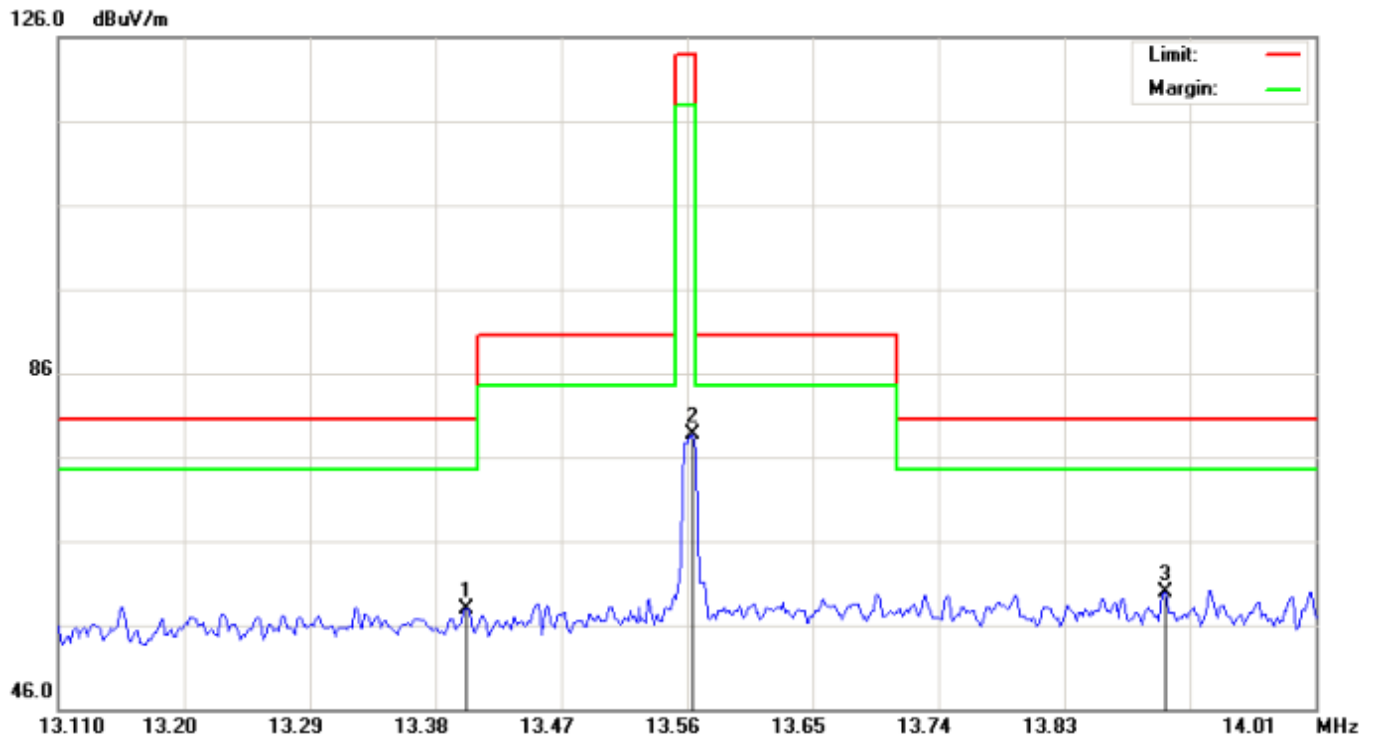
RADIATED EMISSION BELOW 30MHZ

EUT :	EFT POS	Model Name	T1000
Temperature :	20 °C	Relative Humiditytity :	48%
Pressure :	1010 hPa	Test Voltage :	DC3.6V
Test Mode :	Mode 1	Polarization :	Face



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		13.3410	58.45	0.00	58.45	80.50	-22.05	peak			
2		13.5570	80.17	0.00	80.17	124.00	-43.83	peak			
3	*	13.8630	59.27	0.00	59.27	80.50	-21.23	peak			

EUT :	EFT POS	Model Name	T1000
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC3.6V
Test Mode :	Mode 1	Polarization :	Side

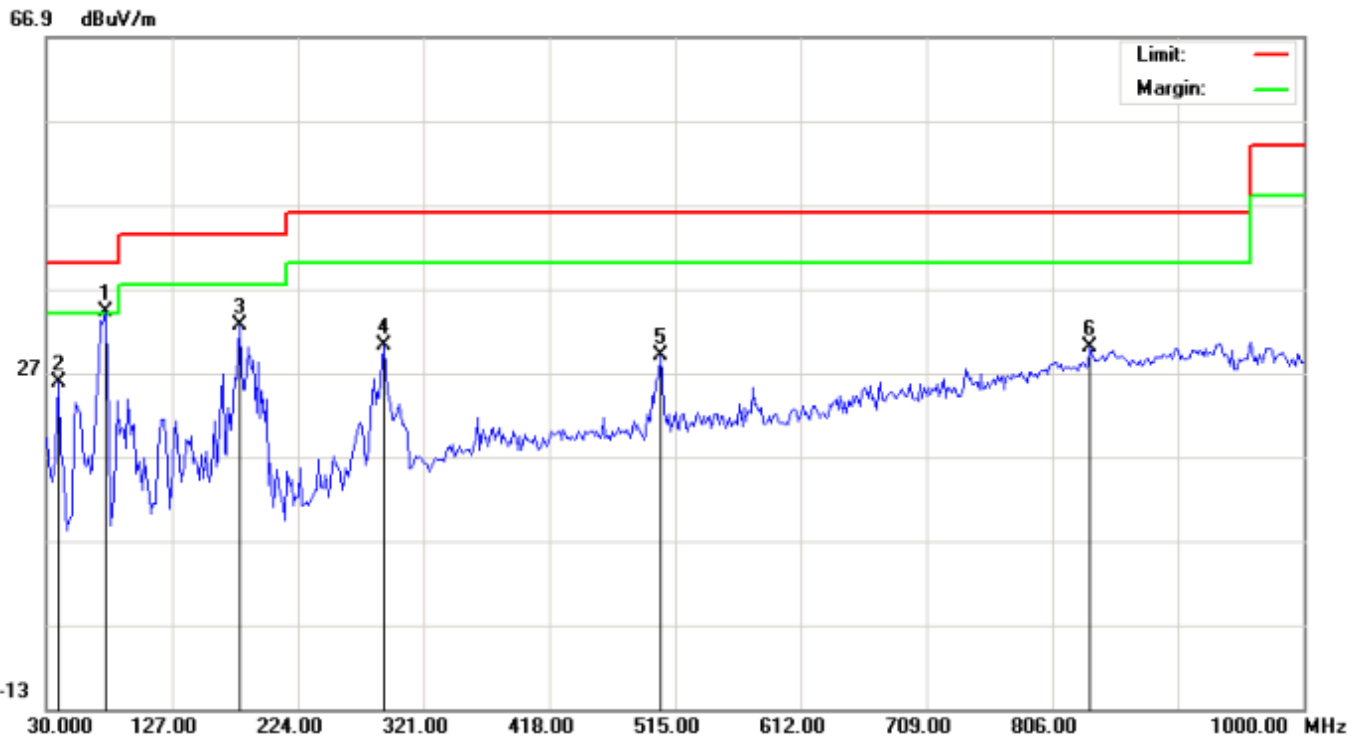


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		13.4025	57.89	0.00	57.89	80.50	-22.61	peak			
2		13.5645	78.65	0.00	78.65	124.00	-45.35	peak			
3	*	13.9020	59.83	0.00	59.83	80.50	-20.67	peak			

Note: Other emissions from 9 kHz to 30 MHz are considered as ambient noise. No recording in the test report.

RADIATED EMISSION 30MHz- 1GHZ

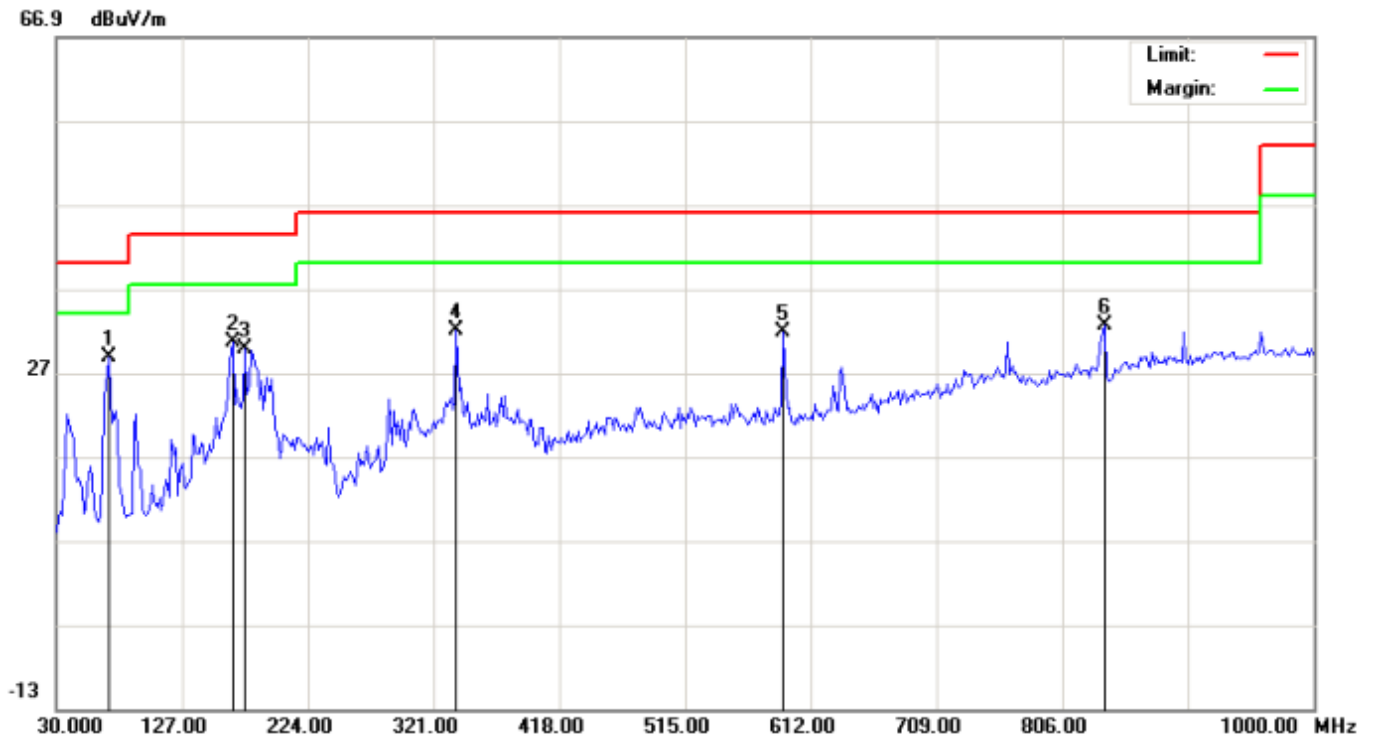
EUT :	EFT POS	Model Name	T1000
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC3.6V
Test Mode :	Mode 1	Polarization :	Horizontal



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	75.2667	31.16	2.96	34.12	40.00	-5.88	peak			
2		39.7000	17.32	8.51	25.83	40.00	-14.17	peak			
3		178.7333	18.40	14.15	32.55	43.50	-10.95	peak			
4		290.2833	15.13	15.12	30.25	46.00	-15.75	peak			
5		503.6833	7.69	21.23	28.92	46.00	-17.08	peak			
6		835.1000	2.65	27.31	29.96	46.00	-16.04	peak			

RESULT: PASS

EUT :	EFT POS	Model Name	T1000
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC3.6V
Test Mode :	Mode 1	Polarization :	Vertical



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	70.4167	24.68	4.16	28.84	40.00	-11.16	peak			
2		165.8000	15.70	14.96	30.66	43.50	-12.84	peak			
3		175.5000	15.43	14.35	29.78	43.50	-13.72	peak			
4		338.7833	14.05	17.99	32.04	46.00	-13.96	peak			
5		590.9833	9.04	22.68	31.72	46.00	-14.28	peak			
6		838.3333	5.28	27.31	32.59	46.00	-13.41	peak			

RESULT: PASS

Note:

Factor=Antenna Factor + Cable loss, Margin=Result-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

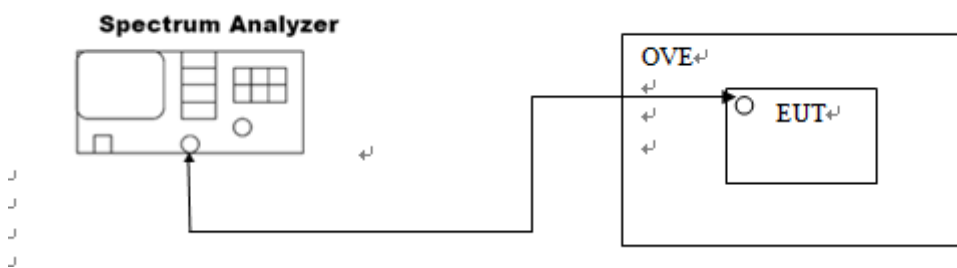
The mode 1 is the worst case, and only the data of the worst case recorded in this test report.

8. FREQUENCY TOLERANCE

8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the operation frequency.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 1 KHz, VBW $\geq 3 \times$ RBW.
4. Set SPA Trace 1 Max hold, then View.
5. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
6. Extreme temperature rule is -20°C~50°C.

8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



8.3. MEASUREMENT RESULTS

Operating frequency: 13.56MHz

Voltage vs. Frequency Stability (Test Temperature: 20°C)

Voltage(V)	Measurement Frequency (MHz)	Max. Deviation (MHz)	Limit(MHz)	Conclusion
3.60	13.56038	0.00049	0.001356	PASS
3.24	13.56049			
3.96	13.56046			

Temperature vs. Frequency Stability (Test Voltage: 3.6V)

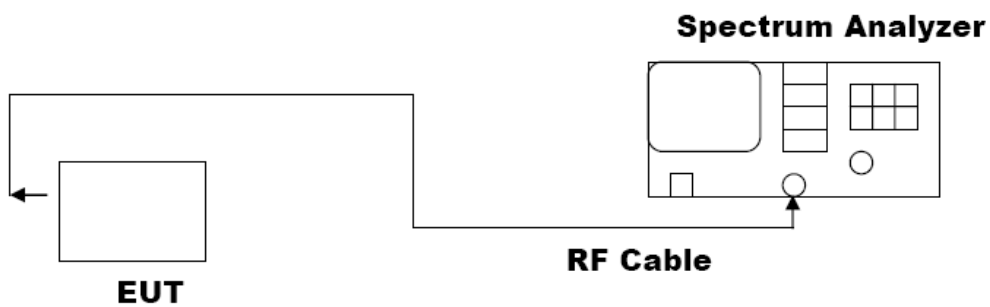
Temperature (°C)	Measurement Frequency (MHz)	Max. Deviation (MHz)	Limit(MHz)	Conclusion
- 20°C	13.56042	0.00044	0.001356	PASS
-10°C	13.56037			
0°C	13.56039			
10°C	13.56041			
20°C	13.56038			
30°C	13.56037			
40°C	13.56042			
50°C	13.56044			

9. 20DB BANDWIDTH

9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the operation frequency.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 1 KHz, VBW $\geq 3 \times$ RBW.
4. Set SPA Trace 1 Max hold, then View.

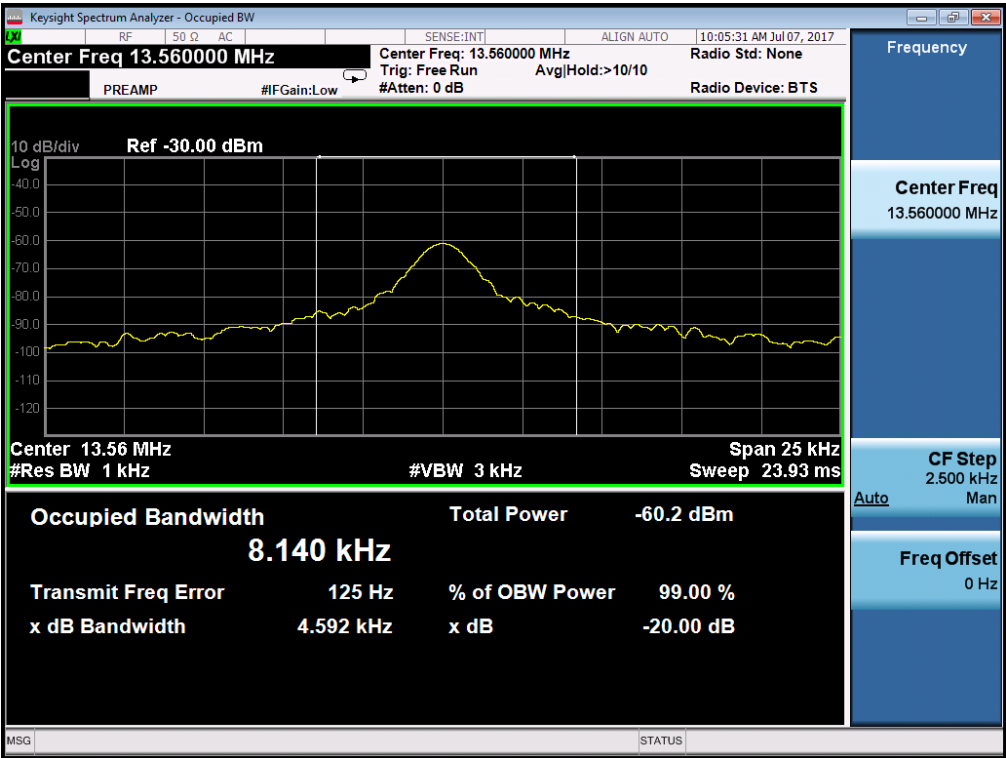
9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



9.3. MEASUREMENT RESULTS

TEST ITEM	20DB BANDWIDTH
TEST MODE	Mode1

Test Data (kHz)		Criteria
Operate channel	4.592	PASS



10. FCC LINE CONDUCTED EMISSION TEST

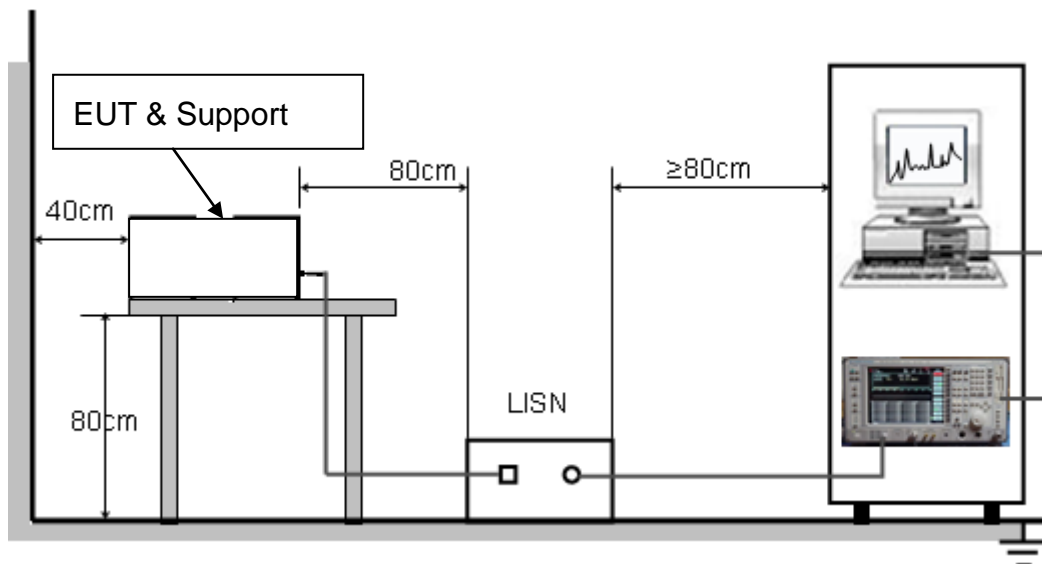
10.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

10.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



10.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received charging voltage by adapter which received 120V/60Hz power by a LISN..
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

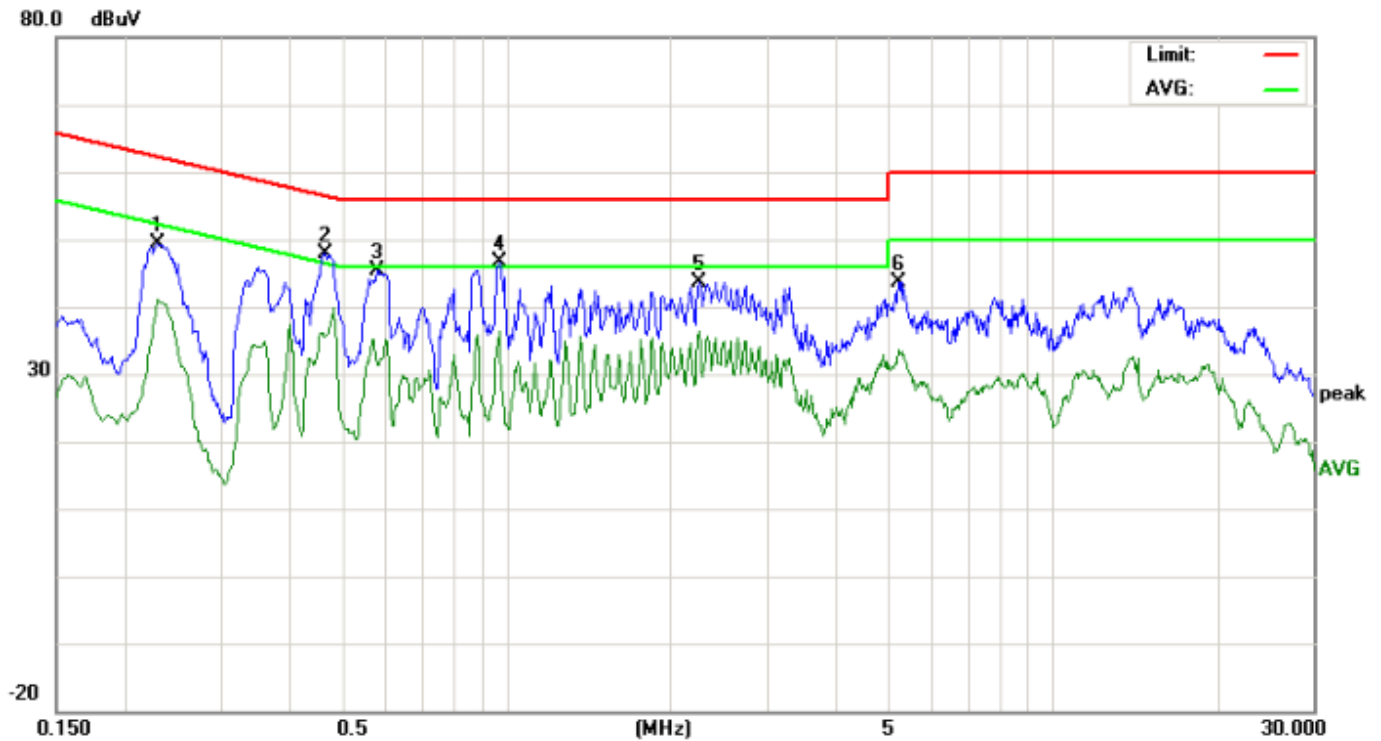
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

10.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

13.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

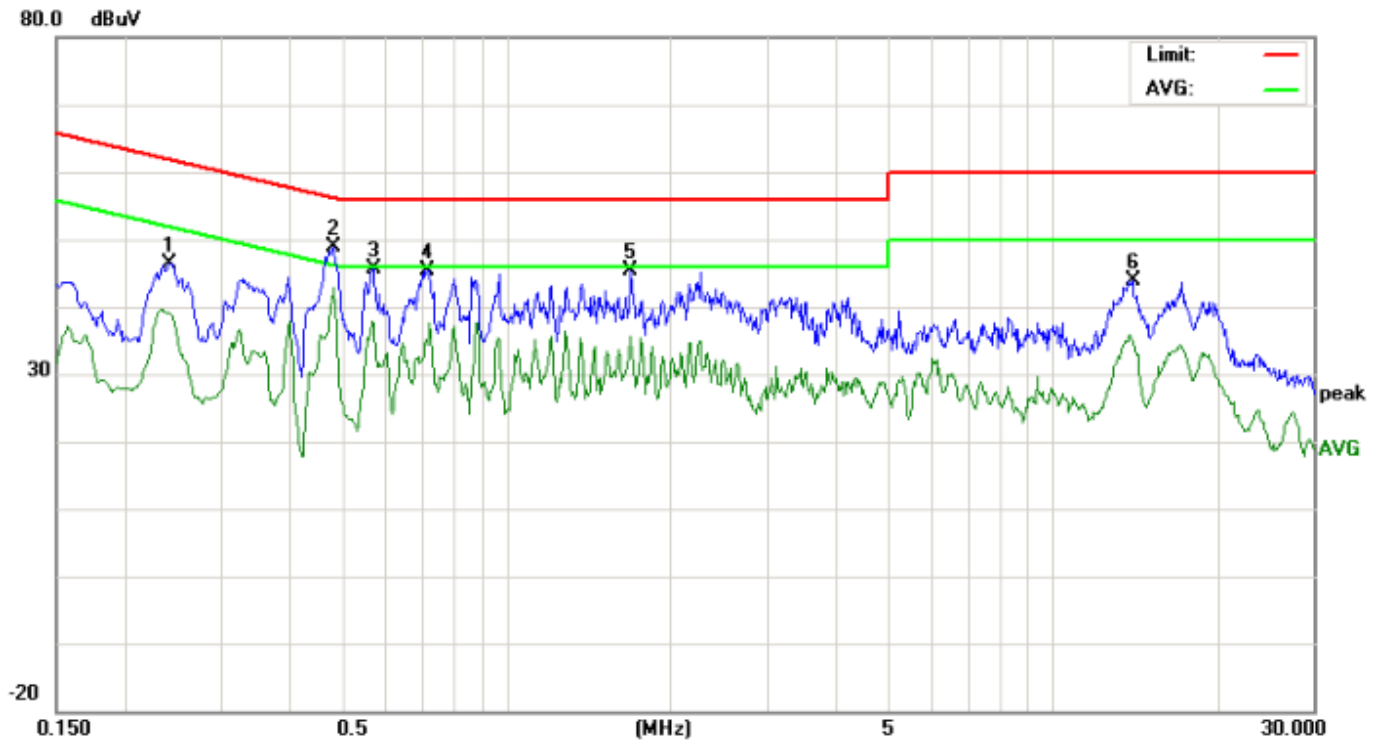
LINE CONDUCTED EMISSION TEST LINE 1-L



No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor (dB)	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.2300	39.25		30.78	10.25	49.50		41.03	62.45	52.45	-12.95	-11.42	P	
2	0.4661	37.61		25.18	10.38	47.99		35.56	56.58	46.58	-8.59	-11.02	P	
3	0.5820	35.04		20.95	10.33	45.37		31.28	56.00	46.00	-10.63	-14.72	P	
4	0.9740	36.29		23.28	10.38	46.67		33.66	56.00	46.00	-9.33	-12.34	P	
5	2.2540	33.41		26.05	10.33	43.74		36.38	56.00	46.00	-12.26	-9.62	P	
6	5.2419	33.42		23.35	10.24	43.66		33.59	60.00	50.00	-16.34	-16.41	P	

RESULT: PASS

Line Conducted Emission Test Line 2-N

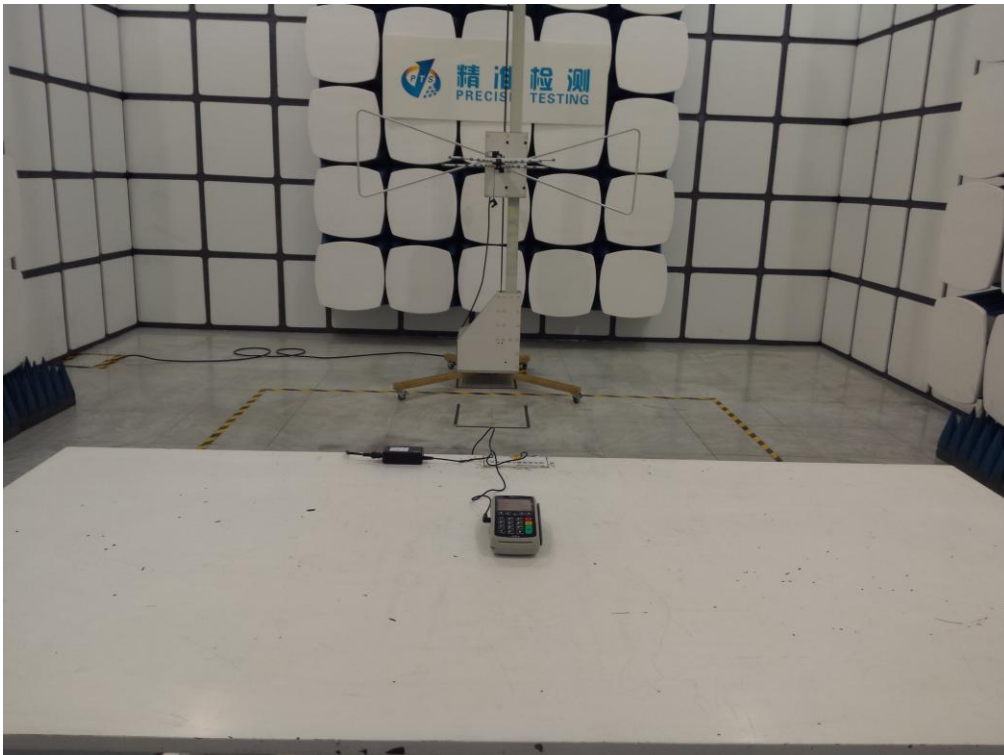
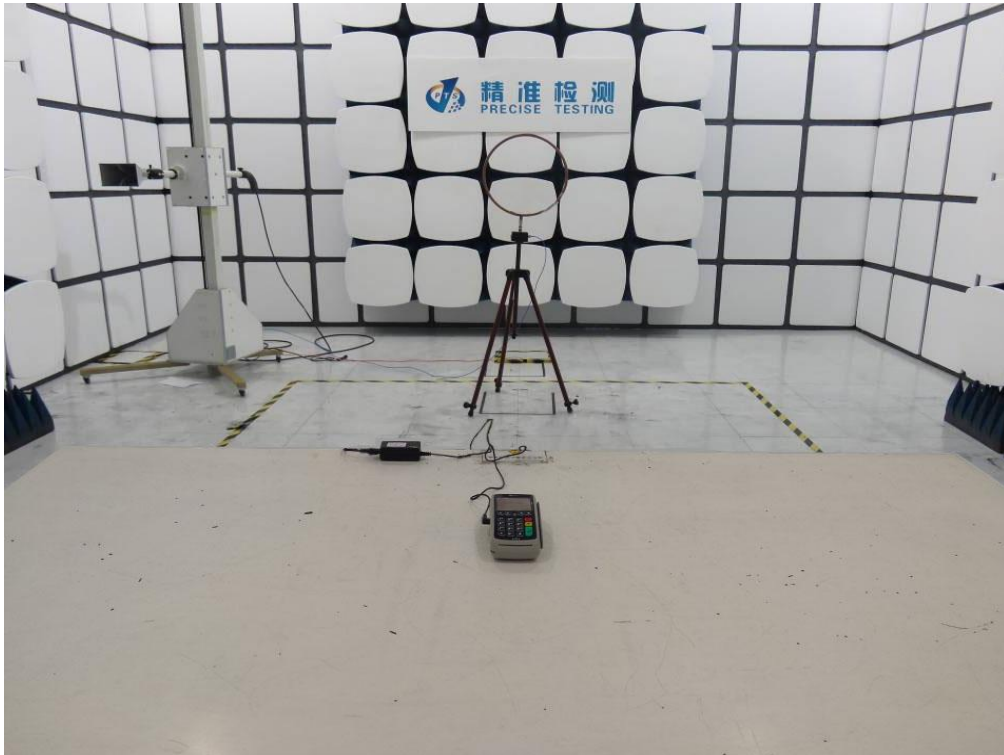


No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor (dB)	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.2420	36.08		28.84	10.26	46.34		39.10	62.02	52.02	-15.68	-12.92	P	
2	0.4820	38.41		32.40	10.39	48.80		42.79	56.30	46.30	-7.50	-3.51	P	
3	0.5701	35.32		27.40	10.34	45.66		37.74	56.00	46.00	-10.34	-8.26	P	
4	0.7180	35.11		24.11	10.34	45.45		34.45	56.00	46.00	-10.55	-11.55	P	
5	1.6900	35.17		25.03	10.32	45.49		35.35	56.00	46.00	-10.51	-10.65	P	
6	14.0219	33.77		24.69	10.12	43.89		34.81	60.00	50.00	-16.11	-15.19	P	

RESULT: PASS

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 1GHz



FCC LINE CONDUCTED EMISSION TEST SETUP

