



# **FCC TEST REPORT**

**FCC ID: SY4-B01011**

**On Behalf of**

Shanghai Huace Navigation Technology LTD.

Handheld GNSS Data Collector

Model No.: LT50

Prepared for : Shanghai Huace Navigation Technology LTD.  
Address : Building C, 599 Gaojing Road, Qingpu District, Shanghai, China


Prepared By : Shenzhen Alpha Product Testing Co., Ltd.  
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an  
District, 518103, Shenzhen, Guangdong, China

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## TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology LTD.  
 Address : Building C, 599 Gaojing Road, Qingpu District, Shanghai, China  
 Manufacturer : Shanghai Huace Navigation Technology LTD.  
 Address : Building C, 599 Gaojing Road, Qingpu District, Shanghai, China  
 EUT Description : Handheld GNSS Data Collector  
 (A) Model No. : LT50  
 (B) Trademark : 

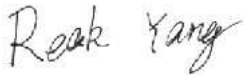
Measurement Standard Used:

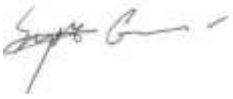
**FCC CFR Title 47 Part 15 Subpart C Section 15.225:2017**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Reak Yang  
 Project Engineer 

Approved by (name + signature).....: Simple Guan  
 Project Manager 

Date of issue.....: July 13, 2018

**Revision History**

Revision	Issue Date	Revisions	Revised By
00	July 13, 2018	Initial released Issue	Simple Guan

## 1 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.*

*Remark: Test according to ANSI C63.10 2013.*

### 1.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

## 2 General Information

### 2.1 General Description of EUT

Product Name:	Handheld GNSS Data Collector
Model No.:	LT50
Test Model No:	LT50
<i>Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are color and model name for commercial purpose.</i>	
Quantity of tested samples	1
Serial No.:	N/A
Tested Sample(s) ID:	N/A
Hardware Version:	A5503_MPCB_V4.0_0905
Software Version:	A5502_V1.01
Operation Frequency:	13.56MHz
Channel Number:	1
Modulation:	ASK
Antenna type:	Coil Antenna
Antenna gain:	20dBi
Power supply:	DC 3.8V by battery or DC 5V from adapter input AC 120V, 60Hz

## 2.2 Test mode

Transmitter mode	Keep the EUT in continuously transmitting.
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## 2.3 Test Facility

Shenzhen Alpha Product Testing Co., Ltd  
Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission  
Registration Number: 293961

July 25, 2017 Certificated by IC  
Registration Number: 12135A

### 3 Test Instruments list

#### Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEL0017	2017.09.22	1Year
Spectrum analyzer	Agilent	E4407B	MY46185649	2017.09.22	1Year
Receiver	R&S	ESCI	1166.5950K03-1011	2017.09.22	1Year
Receiver	R&S	ESCI	101202	2017.09.22	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2016.09.30	2Year
Horn Antenna	EMCO	3115	640201028-06	2016.09.30	2Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2016.09.30	2Year
Cable	Resenberger	N/A	No.1	2017.09.22	1Year
Cable	SCHWARZBECK	N/A	No.2	2017.09.22	1Year
Cable	SCHWARZBECK	N/A	No.3	2017.09.22	1Year
Pre-amplifier	Schwarzbeck	BBV9743	9743-019	2017.09.22	1Year
Pre-amplifier	R&S	AFS33-18002650-30-8P-44	SEL0080	2017.09.22	1Year
Base station	Agilent	E5515C	GB44300243	2017.09.22	1 Year
Temperature controller	Terchy	MHQ	120	2017.09.22	1Year
Power divider	Anritsu	K240C	020346	2017.09.22	1 Year
Signal Generator	HP	83732B	VS3449051	2017.09.22	1 Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2017.09.22	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2017.09.22	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2017.09.22	1 Year
18-40 Horn Antenna	18-40G antenna	Sas-574	571	2018-3-15	3 Year
Power meter	Agilent	E4419B	GB40202122	2017.09.22	1 Year
Power Sensor	Agilent	E9300A	MY41496625	2017.09.22	1 Year
Power Sensor	Agilent	E9300A	MY41496628	2017.09.22	1 Year

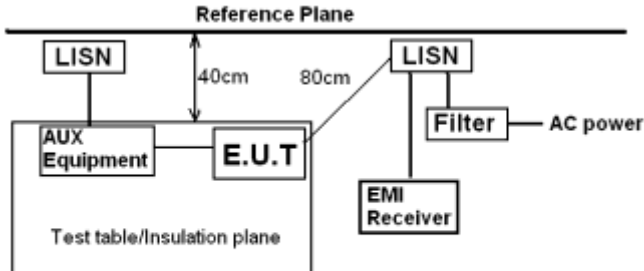


## 4 Test results and Measurement Data

### 4.1 Antenna requirement:

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<b>15.203 requirement:</b> 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.	
<b>E.U.T Antenna:</b>	
<i>The antenna is I Coil Antenna the best case gain of the antenna is 20dBi</i>	
 A photograph showing the back cover of a mobile phone, the battery, and the internal components. A ruler is placed vertically on the left and horizontally at the bottom for scale. A red arrow points to a small component on the internal board, which is labeled "NFC Antenna" in a red-bordered box. The battery is a 3000mAh Li-ion battery. The back cover has a green camera lens and a speaker grille.	

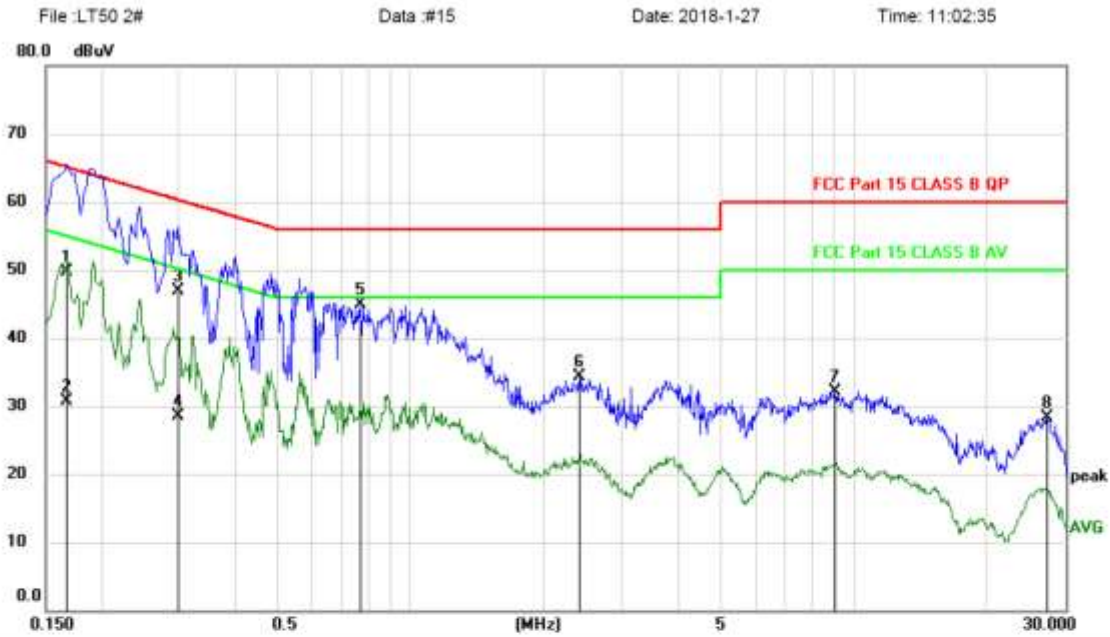
## 4.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Test Frequency Range:	150KHz to 30MHz														
Class / Severity:	Class B														
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto														
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> <p>* Decreases with the logarithm of the frequency.</p>	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
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													
Test setup:	 <p><i>Remark:</i>  E.U.T: Equipment Under Test  LISN: Line Impedance Stabilization Network  Test table height=0.6m</p>														
Test procedure:	<ol style="list-style-type: none"> <li>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.</li> <li>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).</li> <li>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 C63.10:2013 on conducted measurement.</li> </ol>														
Test Instruments:	Refer to section 6.0 for details														
Test mode:	Refer to section 5.3 for details														
Test results:	Pass														

Measurement data:

Line:

**Conducted Emission Measurement**

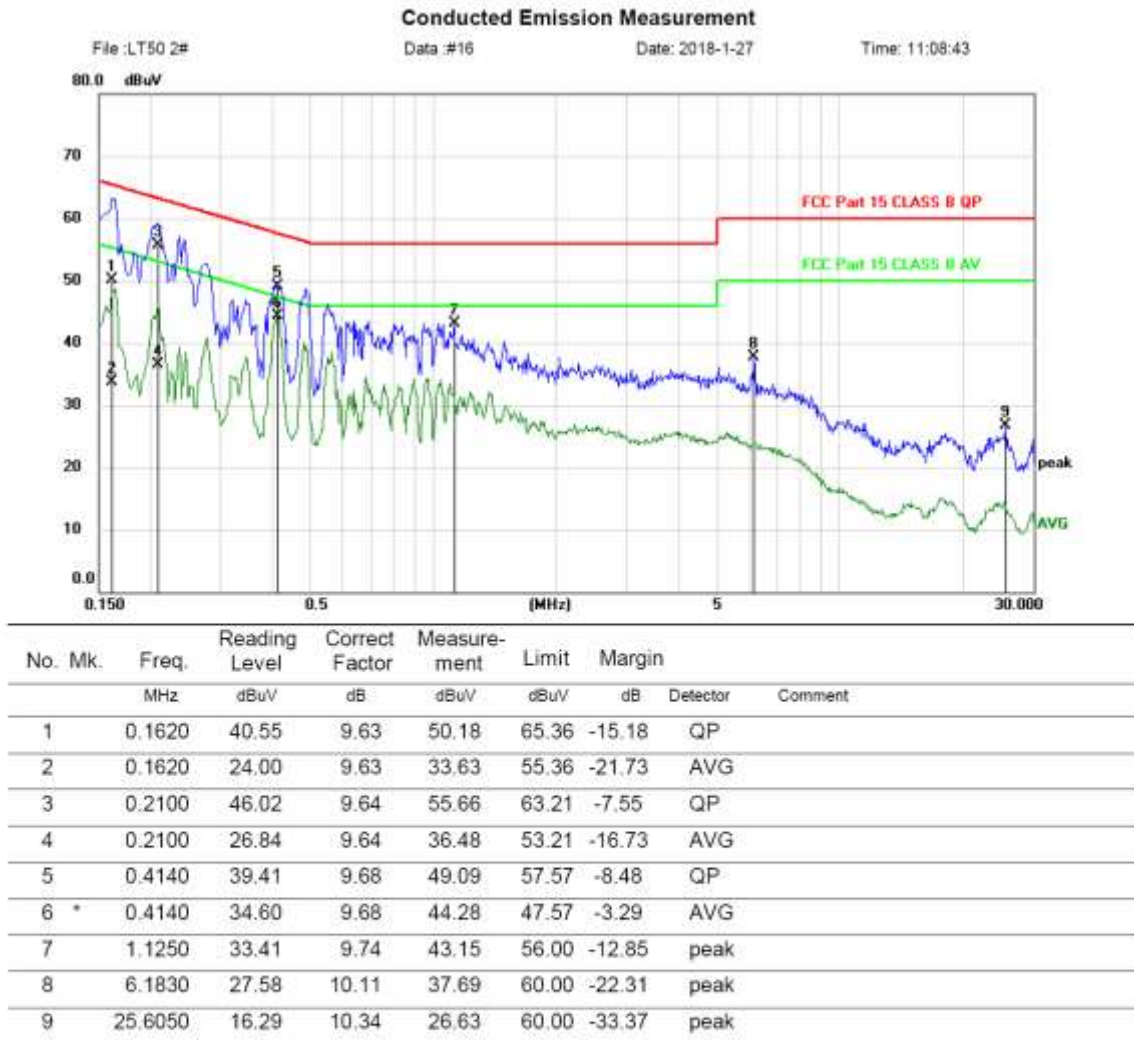


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1680	40.06	9.63	49.69	65.06	-15.37	QP	
2	0.1680	21.10	9.63	30.73	55.06	-24.33	AVG	
3	0.3000	37.27	9.66	46.93	60.24	-13.31	QP	
4	0.3000	18.90	9.66	28.56	50.24	-21.68	AVG	
5 *	0.7710	35.30	9.70	45.00	56.00	-11.00	peak	
6	2.4000	24.53	9.86	34.39	56.00	-21.61	peak	
7	9.0600	22.02	10.12	32.14	60.00	-27.86	peak	
8	27.3300	17.88	10.39	28.27	60.00	-31.73	peak	

\*:Maximum data    x:Over limit    !:over margin

Note: Measurement=Reading Level+Correc Factor.    Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Neutral:



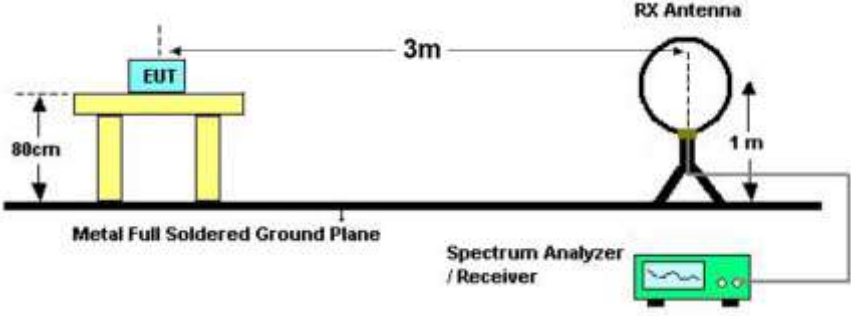
\*:Maximum data    x:Over limit    !:over margin

Note: Measurement=Reading Level+Correc Factor.    Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Notes:

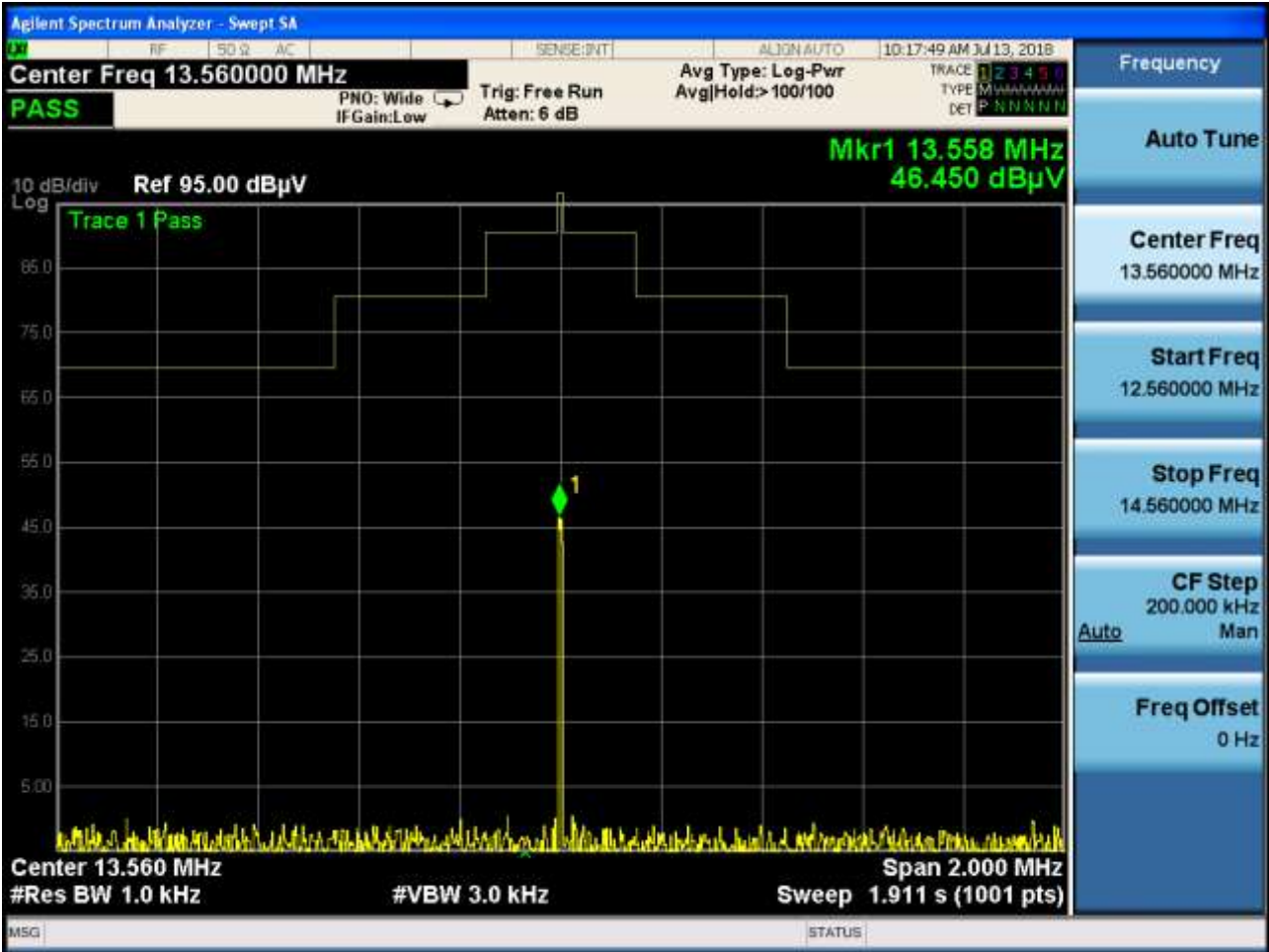
1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

### 4.3 Field Strength of Fundamental Emissions and Mask Measurement

Test Requirement:	FCC Part15 C Section 15.225 and 15.209		
Test Method:	ANSI C63.10:2013		
Test site:	Measurement Distance: 3m		
Receiver setup:	RBW=1KHz, VBW=3KHz, 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:	<ol style="list-style-type: none"> <li>1. Configure the EUT according to ANSI C63.10. 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.</li> <li>2. Power on the EUT, the turntable was rotated by 360 degrees to determine the position of the highest radiation.</li> <li>3. The height of the receiving antenna was fixed at one meter above ground to find the maximum emissions field strength.</li> <li>4. For Fundamental emissions, use the receiver to measure QP reading.</li> <li>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.</li> <li>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.</li> </ol>		

Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:



### 4.4 Radiated Emission

Test Requirement:	FCC Part15 C Section 15.209		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	9KHz to 1000MHz		
Test site:	Measurement Distance: 3m		
Receiver setup:	Frequency (MHz)	RBW(KHz)	Detector
	0.009~0.15	0.2	QP
	0.15~30	9	QP
	30~1000	120	QP
Limit:	The Field strength of any emissions which appear outside of 13.553~13.567MHz band shall not exceed the general radiated emissions limits		
	Frequency (MHz)	Field strength (micorvolts/meter)	Measurement distance (meters)
	0.009~0.490	2400/F(KHz)	300
	0.490~1.705	24000/F(KHz)	30
	1.705~30	30	30
	30~88	100	3
	88~216	150	3
	216~960	200	3
	960~1000	500	3
Test setup:	Below 30MHz		
Test setup:	Above 30MHz		



Test Procedure:	<ol style="list-style-type: none"> <li>1. Configure the EUT according to ANSI C63.10. 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.</li> <li>2. Power on the EUT, the turntable was rotated by 360 degrees to determine the position of the highest radiation.</li> <li>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.</li> <li>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.</li> <li>5. Set the test-receiver system to Peak or CISPR quasi-peak detect function with specified bandwidth under maximum hold mode.</li> <li>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.</li> <li>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.</li> </ol>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

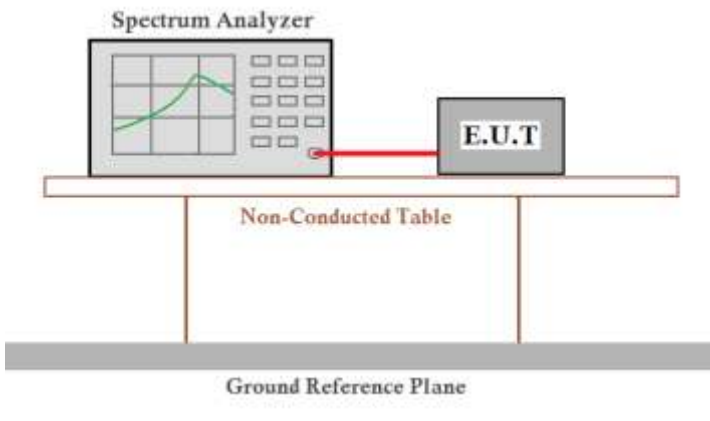


## Measurement data:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
35.62	36.29	11.20	0.62	30.07	18.04	40.00	-21.96	Vertical
51.84	31.79	12.20	0.79	29.98	14.80	40.00	-25.20	Vertical
98.14	26.95	11.73	1.18	29.71	10.15	43.50	-33.35	Vertical
219.85	24.98	10.88	1.96	29.39	8.43	46.00	-37.57	Vertical
382.59	25.02	15.15	2.77	29.58	13.36	46.00	-32.64	Vertical
793.40	23.86	21.21	4.43	29.20	20.30	46.00	-25.70	Vertical
39.72	33.68	12.30	0.66	30.04	16.60	40.00	-23.40	Horizontal
89.59	29.68	10.60	1.11	29.75	11.64	43.50	-31.86	Horizontal
147.92	30.09	7.50	1.56	29.42	9.73	43.50	-33.77	Horizontal
302.48	24.06	13.56	2.37	29.98	10.01	46.00	-35.99	Horizontal
485.61	25.10	17.20	3.24	29.33	16.21	46.00	-29.79	Horizontal
897.00	23.56	22.17	4.83	29.10	21.46	46.00	-24.54	Horizontal

NOTE: The test data below 30MHz is too lower than the limit, so not show in this report.

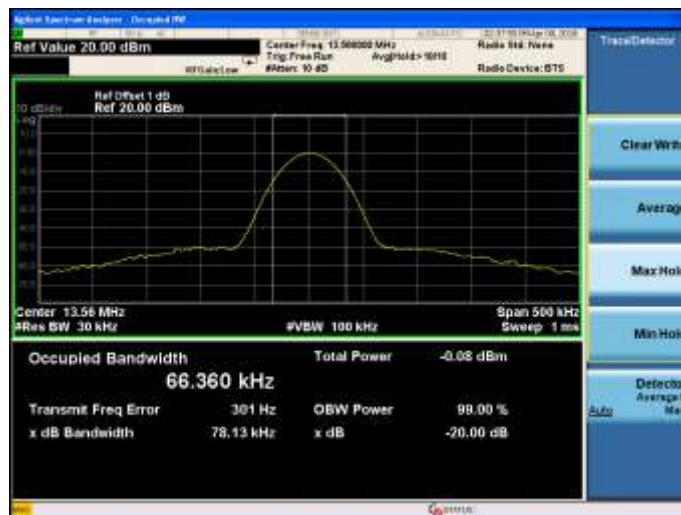
### 4.5 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.225 and 15.215
Test Method:	ANSI C63.10:2013
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

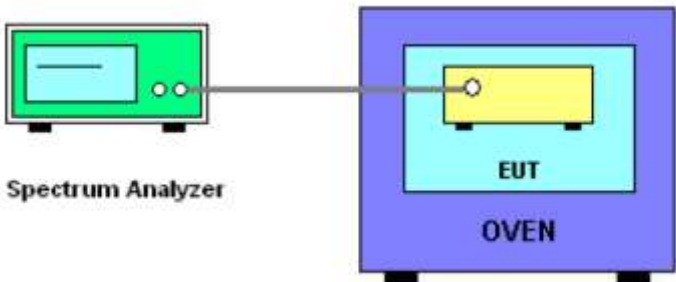
### Measurement Data

Frequency (MHz)	20dB Bandwidth (KHz)	99% OBW (KHz)	Frequency range (MHz) fL>13.553MHz	Frequency range (MHz) fH<13.567MHz	Result
13.56MHz	78.13	66.360	13.559	13.561	Pass

Test plot as follows:



#### 4.6 Frequency Stability Measurement

Test Requirement:	FCC Part15 C Section 15.225
Test Method:	ANSI C63.10: 2013
Receiver setup:	RBW=1KHz, VBW=1KHz, Sweep time=Auto
Limit:	<p>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,</p> <p>for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.</p> <p>For battery operated equipment, the equipment tests shall be performed using a new battery.</p>
Test setup:	 <p>The diagram illustrates the test setup. On the left is a green Spectrum Analyzer. A cable connects its antenna port to the antenna port of a yellow Equipment Under Test (EUT). The EUT is housed inside a blue Oven. Labels 'Spectrum Analyzer', 'EUT', and 'OVEN' are placed below their respective components.</p>
Test Procedure:	<ol style="list-style-type: none"> <li>1. The transmitter output (antenna port) was connected to the spectrum analyzer.</li> <li>2. EUT have transmitted absence of modulation signal and fixed channelize</li> <li>3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.</li> <li>4. Set RBW=1KHz, VBW=1KHz with peak detector and maxhold settings.</li> <li>5. <math>f_c</math> is declaring of channel frequency. Then the frequency error formula is <math>(f_c - f) / f_c \times 10^6</math> ppm and the limit is less than <math>\pm 100</math>ppm.</li> <li>6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value</li> <li>7. Extreme temperature rule is -20°C ~50°C</li> </ol>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

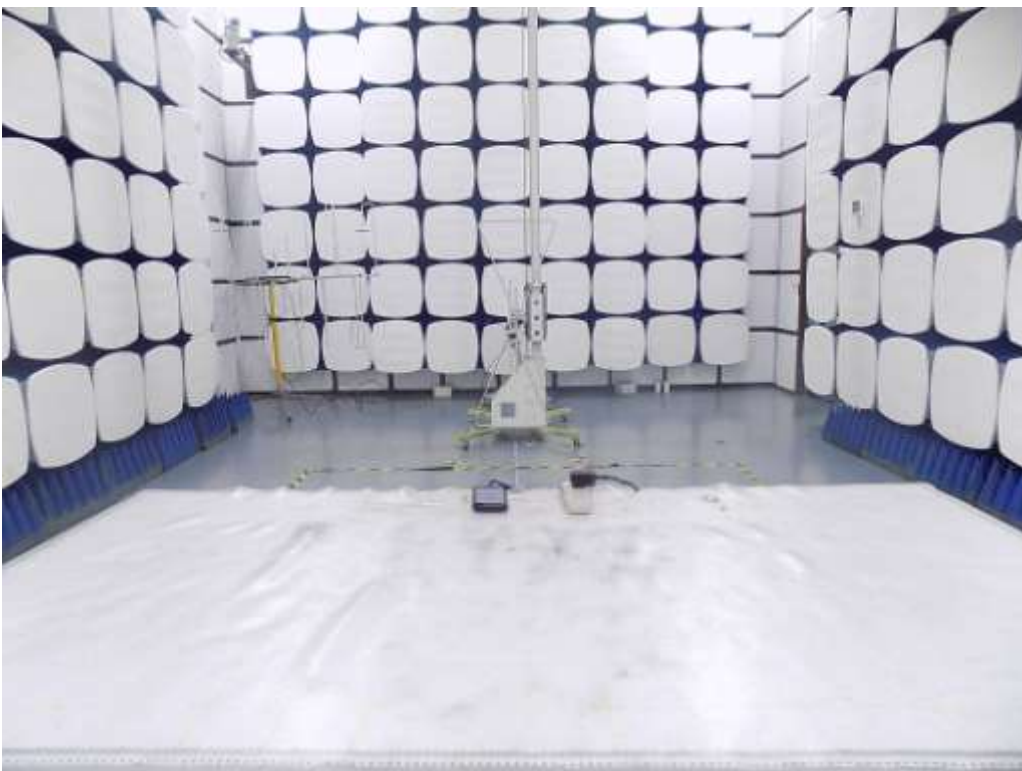
## Measurement data:

Reference Frequency: 13.56MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit	Result
		Hz	ppm (%)		
3.8	-20	41	0.00030	+/- 0.01%	Pass
	-10	53	0.00039		
	0	68	0.00050		
	10	49	0.00036		
	20	54	0.00040		
	30	63	0.00046		
	40	61	0.00045		
	50	68	0.00050		

Reference Frequency: 13.56MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit	Result
		Hz	ppm (%)		
20	3.23	42	0.00031	+/- 0.01%	Pass
	3.8	52	0.00038		
	4.38	71	0.00052		

## 5 Test Setup Photo

Radiated Emission



Conducted Emission



## 6 EUT Constructional Details

Reference to the test report No. T1880174 01

----- End -----