

# TEST REPORT

**Applicant:** On Track Innovations Ltd  
**Address of Applicant:** Post Office Box 32, Rosh – Pina, 12000, Israel  
**Manufacturer:** On Track Innovations Ltd  
**Address of Manufacturer:** Post Office Box 32, Rosh – Pina, 12000, Israel  
**Equipment Under Test (EUT)**  
Product Name: MRFN (Mini RFN)  
Model No.: MRFN900  
Trade Mark: MRFN  
**FCC ID:** JNX-OTI-MRFN900  
**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.225  
**Date of sample receipt:** July 31, 2023  
**Date of Test:** August 01, 2023-September 07, 2023  
**Date of report issued:** September 08, 2023  
**Test Result :** PASS

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

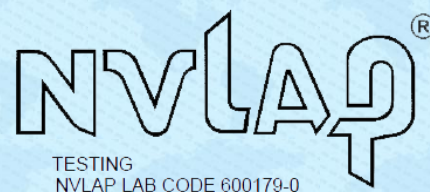
Authorized Signature:



Robinson Luo

Laboratory Manager

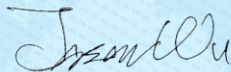
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## 2 Version

Version No.	Date	Description
00	September 07, 2023	Original

Prepared By:

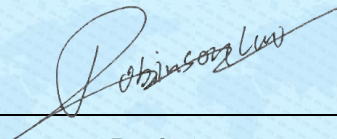


Date:

September 07, 2023

Project Engineer

Check By:



Date:

September 07, 2023

Reviewer

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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	N/A
Field Strength of Fundamental Emissions and Mask Measurement	15.225(a)(b)(c)	Pass
Radiated Emission	15.225(d)&15.209	Pass
20dB Emission Bandwidth	15.225&15.215	Pass
Frequency Stability Measurement	15.225(e)	Pass

Remark:

1. Pass: The EUT complies with the essential requirements in the standard.
2. N/A: Not applicable.

### 4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)

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

## 5 General Information

### 5.1 General Description of EUT

Product Name:	MRFN (Mini RFN)
Model No.:	MRFN400
Serial No.:	N/A
Test sample(s) ID:	GTS2023070332-1
Sample(s) Status	Engineered sample
Operation Frequency:	13.56MHz
Channel Number:	1
Modulation:	ASK
Antenna type:	Integral antenna
Antenna gain:	0dBi
Power supply:	DC 3.6V 4000mAh Battery

Remark:

1. Antenna gain information provided by the customer
2. The relevant information of the sample is provided by the entrusting company, and the laboratory is not responsible for its authenticity.

## 5.2 Test mode

Transmitter mode	Keep the EUT in continuously transmitting.		
<b>Pre-test mode.</b>			
GTS has verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:			
Axis	X	Y	Z
Field Strength(dBuV/m)	61.34	64.29	61.34
<b>Final Test Mode:</b>			
According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup”: Y axis (see the test setup photo)			

### 5.3 Test Facility

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

- **FCC —Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

- **ISED —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of ISED for radio equipment testing.

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

### 5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

### 5.5 Description of Support Units

None.

## 6 Test Instruments list

Radiated Emission:						
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	June 23, 2021	June 22, 2024
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	April 14, 2023	April 13, 2024
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 14, 2023	April 13, 2024
8	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023
9	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 14, 2023	April 13, 2024
10	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 14, 2023	April 13, 2024
11	Horn Antenna (18-26.5GHz)	/	UG-598A/U	GTS664	Oct. 30, 2022	Oct. 29, 2023
12	Horn Antenna (26.5-40GHz)	A.H Systems	SAS-573	GTS665	Oct. 30, 2022	Oct. 29, 2023
13	FSV-Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	March 13, 2023	March 12, 2024
14	Amplifier	/	LNA-1000-30S	GTS650	April 14, 2023	April 13, 2024
15	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS668	Dec. 20, 2022	Dec.19, 2023
16	Wideband Amplifier	/	WDA-01004000-15P35	GTS602	April 14, 2023	April 13, 2024
17	Thermo meter	JINCHUANG	GSP-8A	GTS643	April 19, 2023	April 18, 2024
18	RE cable 1	GTS	N/A	GTS675	July 31. 2023	July 30, 2024
19	RE cable 2	GTS	N/A	GTS676	July 31. 2023	July 30, 2024
20	RE cable 3	GTS	N/A	GTS677	July 31. 2023	July 30, 2024
21	RE cable 4	GTS	N/A	GTS678	July 31. 2023	July 30, 2024
22	RE cable 5	GTS	N/A	GTS679	July 31. 2023	July 30, 2024
23	RE cable 6	GTS	N/A	GTS680	July 31. 2023	July 30, 2024
24	RE cable 7	GTS	N/A	GTS681	July 31. 2023	July 30, 2024
25	RE cable 8	GTS	N/A	GTS682	July 31. 2023	July 30, 2024



<b>RF Conducted Test:</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal.Date (mm-dd-yy)</b>	<b>Cal.Due date (mm-dd-yy)</b>
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 14, 2023	April 13, 2024
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 14, 2023	April 13, 2024
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 14, 2023	April 13, 2024
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 14, 2023	April 13, 2024
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 14, 2023	April 13, 2024
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 14, 2023	April 13, 2024
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 14, 2023	April 13, 2024
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	April 19, 2023	April 18, 2024

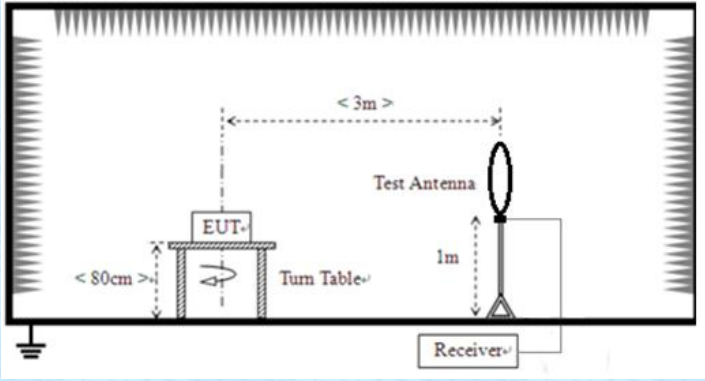
<b>General used equipment:</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Inventory No.</b>	<b>Cal.Date (mm-dd-yy)</b>	<b>Cal.Due date (mm-dd-yy)</b>
1	Barometer	KUMAO	SF132	GTS647	April 19, 2023	April 18, 2024

## 7 Test results and Measurement Data

### 7.1 Antenna requirement:

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<p><b>15.203 requirement:</b></p> <p>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.</p>	
<b>EUT Antenna:</b>	
The are antennas integral antenna, reference to the appendix II for details	

**7.2 Field Strength of Fundamental Emissions and Mask Measurement**

Test Requirement:	FCC Part15 C Section 15.225(a)(b)(c)
Test Method:	ANSI C63.10:2013 & ANSI C63.4: 2014
Test site:	Measurement Distance: 3m
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=Auto
limit:	FCC Part 15.225 & 15.209
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

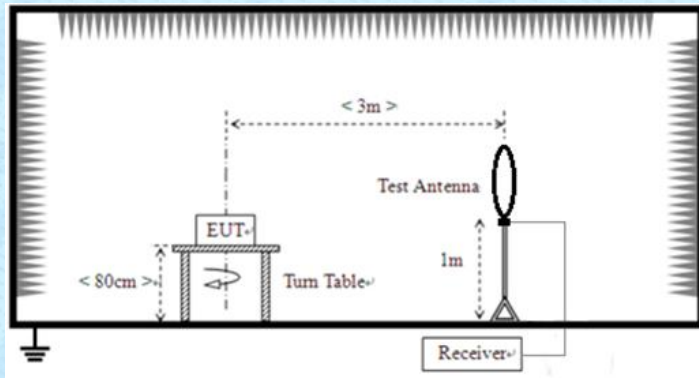
**Measurement data:**

**Test data combines x, y, z-axis**

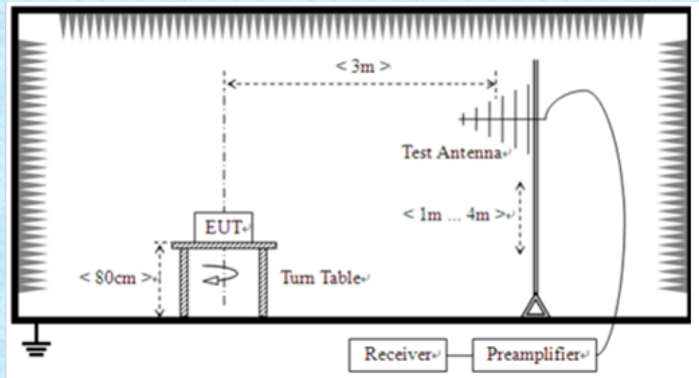
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
13.56	43.21	20.57	0.51	64.29	70.47	-6.18	QP

### 7.3 Radiated Emission

Test Requirement:	FCC Part15 C Section 15.225(d) and 15.209					
Test Method:	ANSI C63.10: 2013 & ANSI C63.4: 2014					
Test Frequency Range:	9KHz to 1000MHz					
Test site:	Measurement Distance: 3m					
Receiver setup:	Frequency	Detector	RBW	VBW	Remark	
	9kHz-150kHz	Quasi-peak	200Hz	300Hz	Quasi-peak Value	
	150kHz-30MHz	Quasi-peak	9kHz	10kHz	Quasi-peak Value	
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value	
FCC Limit:	<b>Frequency (MHz)</b>		<b>Field strength (microvolts/meter)</b>		<b>Measurement distance (meters)</b>	
	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	
	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 and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.					
	IC Limit:	<b>Table 5 – General field strength limits at frequencies above 30 MHz</b>				
<b>Frequency (MHz)</b>		<b>Field strength (µV/m at 3 m)</b>				
30 – 88		100				
88 – 216		150				
216 – 960		200				
Above 960		500				
<b>Table 6 – General field strength limits at frequencies below 30 MHz</b>						
<b>Frequency</b>		<b>Magnetic field strength (H-Field) (µA/m)</b>	<b>Measurement distance (m)</b>			
9 - 490 kHz <sup>1</sup>		6.37/F (F in kHz)	300			
490 - 1705 kHz		63.7/F (F in kHz)	30			
1.705 - 30 MHz	0.08	30				
<b>Note 1:</b> The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.						
Test setup:	Below 30MHz					



Above 30MHz

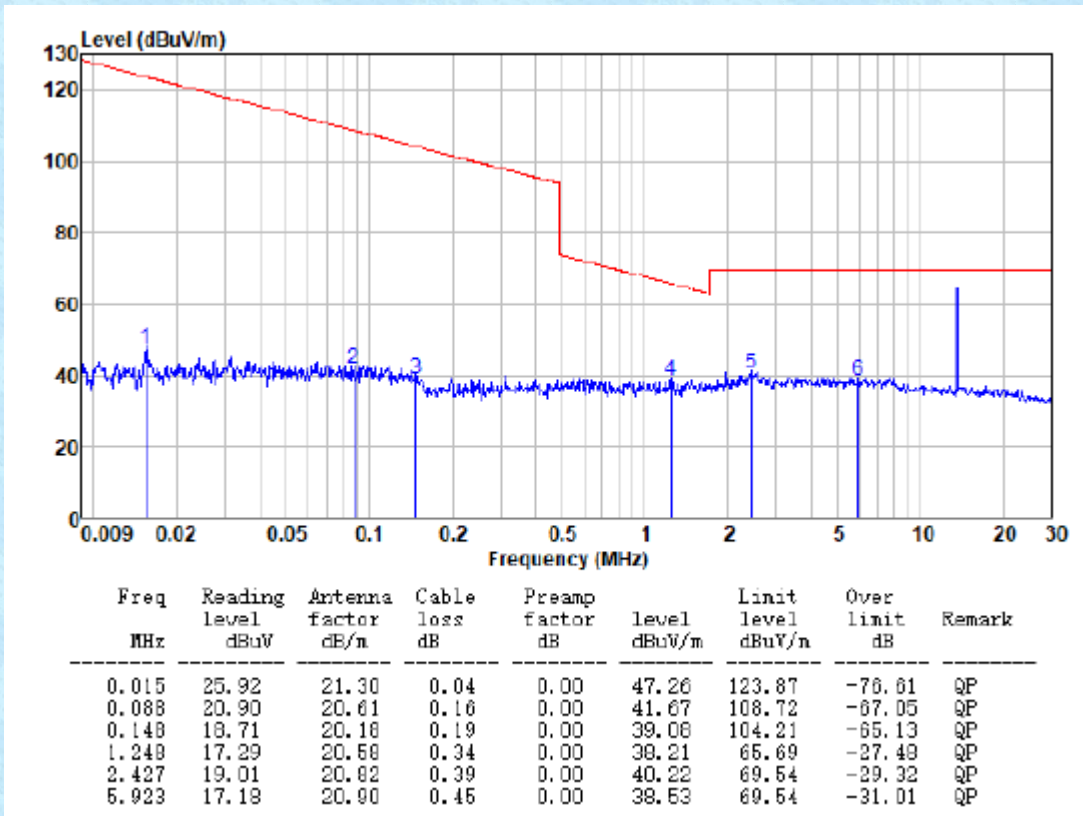


Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	DC 3.6V					
Test results:	Pass					

Measurement data:

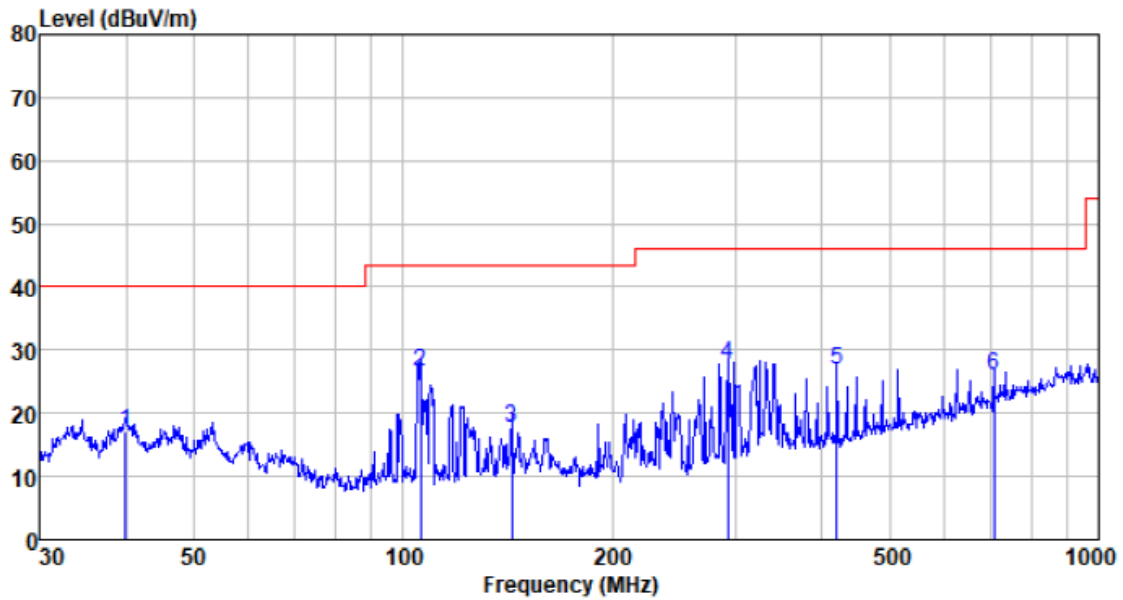
■ 9kHz~30MHz

Test data combines x, y, z-axis; the radiation emission more than 20dB below the limit



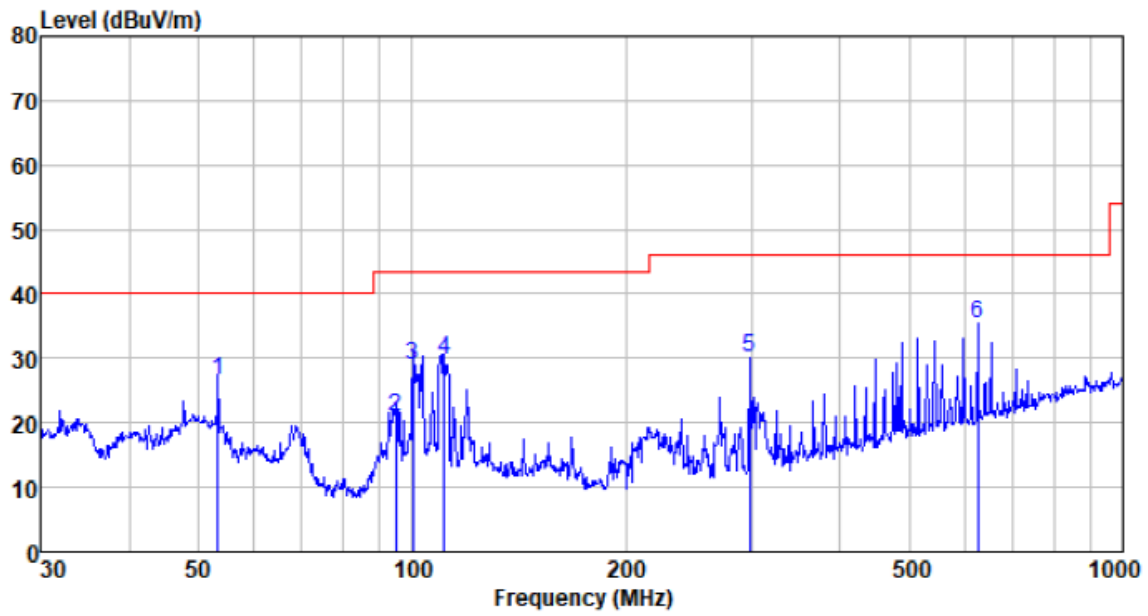
■ 30MHz~1GHz

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
39.854	38.36	13.48	0.66	35.29	17.21	40.00	-22.79	QP
106.013	51.33	10.18	1.25	36.14	26.62	43.50	-16.88	QP
143.326	40.17	12.44	1.53	36.36	17.78	43.50	-25.72	QP
293.084	49.75	12.57	2.32	36.88	27.76	46.00	-18.24	QP
420.580	44.87	16.13	2.95	37.03	26.92	46.00	-19.08	QP
706.700	38.23	20.94	4.12	37.25	26.04	46.00	-19.96	QP

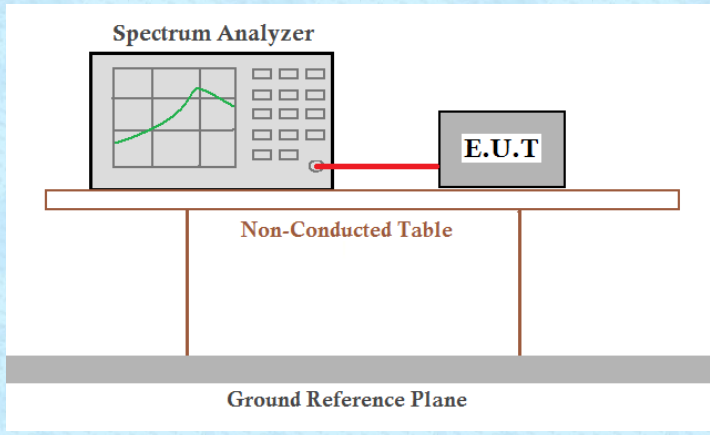
Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
53.318	48.32	12.99	0.80	35.65	26.46	40.00	-13.54	QP
94.760	46.87	9.14	1.15	36.06	21.10	43.50	-22.40	QP
100.229	54.22	9.72	1.19	36.10	29.03	43.50	-14.47	QP
110.957	54.01	10.56	1.29	36.18	29.68	43.50	-13.82	QP
298.268	52.20	12.44	2.35	36.90	30.09	46.00	-15.91	QP
625.078	49.02	19.70	3.82	37.20	35.34	46.00	-10.66	QP



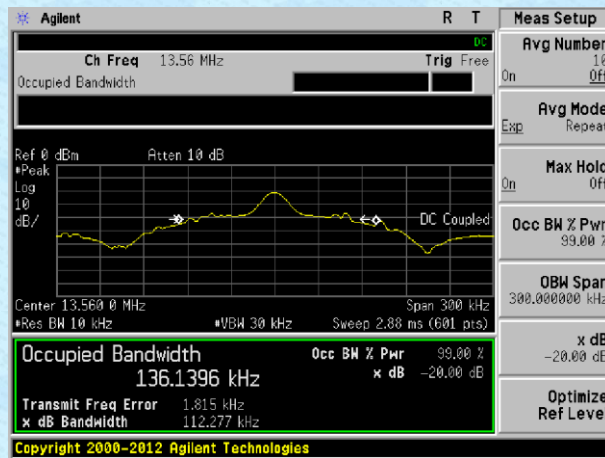
### 7.4 Channel Bandwidth

Test Requirement:	FCC Part15 C Section 15.225 and 15.215
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test Procedure:	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set the EUT to proper test channel.</li> <li>3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points.</li> <li>4. Read 20dB bandwidth &amp; 99%bandwidth.</li> </ol>
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are positioned on a Non-Conducted Table. This table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

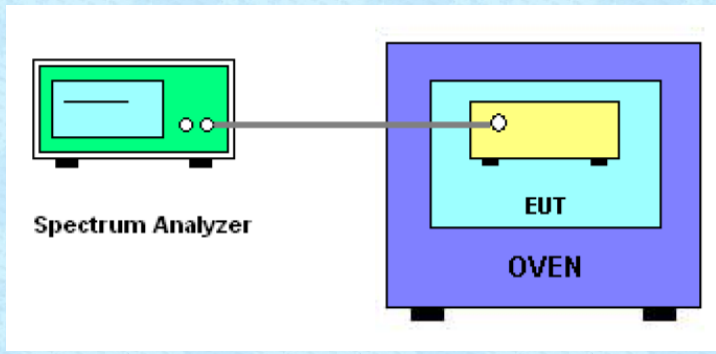
Measurement Data

Test ANT	Test frequency (MHz)	20dB bandwidth(KHz)	Result
1	13.56	112.277	Pass

Test plot as follows:



### 7.5 Frequency Stability Measurement

Test Requirement:	FCC Part15 C Section 15.225 (e)
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 output to the input of a yellow EUT (Equipment Under Test) which is housed inside a blue Oven. The labels 'Spectrum Analyzer', 'EUT', and 'OVEN' are placed below their respective components.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

Reference Frequency: 13.56MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit	Result
		Hz	%		
3.6	-20	90	0.0007	+/- 0.01%	Pass
	-10	80	0.0006		
	0	79	0.0006		
	10	58	0.0004		
	20	48	0.0004		
	30	55	0.0004		
	40	46	0.0004		
	50	79	0.0006		

Reference Frequency: 13.56MHz					
Temperature (°C)	Power supplied (Vac)	Frequency error		Limit	Result
		Hz	ppm		
20	90	185	0.0013	+/- 0.01%	Pass
	110	120	0.0009		

## **8 Test Setup Photo**

Reference to the **appendix I** for details.

## **9 EUT Constructional Details**

Reference to the **appendix II** for details.

----- End -----