TEST REPORT

Product	:	ePaper
Trade mark	:	Qbic
Model/Type reference	:	EP-0700, EP-07XXXXXXX (where X = 0-9, a-z, A-Z, "-", or blank for marketing purpose)
Serial Number	:	N/A
Report Number	:	EED32P80649802
FCC ID	:	2AF82-EP0700
Date of Issue	:	May 30, 2023
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

Qbic Technology Co., Ltd.
26 F.-12, No. 99, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221416, Taiwan, China

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China
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Compiled by: mark.chen. Mark Chen

Reviewed by: Tom Chen Tom Chen

Approved by: Aaron Ma Aaron Ma

Date: May 30, 2023

Check No.: 6533060523

1 Version

Version No.	Date	Description
00	May 30, 2023	Original

2 Contents

3 Test Summary

Test Item	FCC Test Requirement	Test Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203	ANSI C63.10 2013	Pass
Conducted Emission (150KHz to 30MHz)	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	N/A
Electric Field Strength of Fundamental and Outside the Allocated bands	47 CFR Part 15, Subpart C Section 15.225(a)/(b)/(c)	ANSI C63.10 2013	Pass
Radiated Emission	47 CFR Part 15, Subpart C Section 15.225(d)/15.209	ANSI C63.10 2013	Pass
Frequency Tolerance	47 CFR Part 15, Subpart C Section 15.225(e)	ANSI C63.10 2013	Pass
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.215	ANSI C63.10 2013	Pass

N/A:Only battery supply is supported and this item is not considered.
Remark:
Company Name and Address shown on Report, the sample(s) and sample Information was/ were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.
Model No.: EP-0700, EP-07XXXXXXX (where X = 0-9, a-z, A-Z, "-", or blank for marketing purpose)
Only the model EP-0700 was tested. They have same electrical, PCB and layout, only the model names are different for marketing requirements.

4 General Information

4.1 Client Information

Applicant:	Qbic Technology Co., Ltd.
Address of Applicant:	26 F.-12, No. 99, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221416, Taiwan, China
Manufacturer:	Qbic Technology Co., Ltd.
Address of Manufacturer:	26 F.-12, No. 99, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221416, Taiwan, China
Factory 1:	Jiangxi Xingtai Technology Inc.
Address of Factory 1:	Jizhou District industrial park, Ji'an, Jiangxi, China
Factory 2:	Qbic Technology Co., Ltd.
Address of Factory 2:	26 F.-10, No. 99, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221416, Taiwan, China
Factory 3:	Lih Rong Electronic Enterprise Co., Ltd.
Address of Factory 3:	No. 486, Sec. 1, Wanshou Rd., Guishan Dist., Taoyuan City 333026, Taiwan, China
Factory 4:	Lih Rong Electronic Enterprise Co., Ltd
Address of Factory 4:	No. 1, Gaoxia Rd., Zhongli Dist., Taoyuan City 320030, Taiwan, China

4.2 General Description of EUT

Product Name:	ePaper
Model No.(EUT):	EP-0700, EP-07XXXXXXX (where X = 0-9, a-z, A-Z, "-", or blank for marketing purpose)
Test Model No.:	EP-0700
Trade Mark:	Qbic
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Operation Frequency:	13.56MHz
Modulation Type:	ASK
Antenna Type:	PCB antenna
Power Supply:	Battery DC 3.0V
Test Voltage:	DC 3.0V
Sample Received Date:	May 06, 2023
Sample tested Date:	May 06, 2023 to May 15, 2023

4.3 Test Environment & Test Mode

Operating Environment:	
Radiated Emissions:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar
Conducted Emissions:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar
Test Mode:	
Mode a:	Keep EUT working in continuous transmitting mode with 100% duty cycle.

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Certification	Supplied by
/	/	/	/	/

4.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Conditions

None.

4.8 Other Information Requested by the Customer

None.

4.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	3.3dB (9kHz-30MHz)
		4.3dB (30MHz-1GHz)
		4.5dB (1GHz-12.75GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

4.10 Equipment List

Equipment	Manufacturer	Model No.	Serial Number	Cal. Date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05/22/2022	05/21/2025
Receiver	R&S	ESCI7	100938-003	09/28/2022	09/27/2023
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	9163-618	05/22/2022	05/21/2023
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04/17/2021	04/16/2024
Multi device Controller	maturo	NCD/070/10711112	---	---	---
Horn Antenna	ETS-LINGREN	BBHA 9120D	9120D-1869	04/17/2021	04/16/2024
Microwave Preamplifier	Agilent	8449B	3008A02425	06/20/2022	06/19/2023
high-low temperature test chamber	Dong Guang Qin Zhuo	LK-80GA	QZ20150611879	12-19-2022	12-28-2023
Receiver	R&S	ESCI	100009	04-25-2023	04-24-2024

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR 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.
EUT Antenna:	
The antenna is PCB antenna.	

5.2 Electric Field Strength of Fundamental and Outside the Allocated bands

Test Requirement:	47 CFR Part 15, Subpart C Section 15.225(a)/(b)/(c)
Test Method:	ANSI C63.10: 2013
Test Site:	3m (Semi-Anechoic Chamber)
Receiver Setup:	

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak

Limit:

Frequency Range(MHz)	E-field Strength Limit @ 30 m (μV/m)	E-field Strength Limit @ 3 m (dBμV/m)
13.560 ± 0.007	15848	124
13.410 to 13.553 13.567 to 13.710	334	90
13.110 to 13.410 13.710 to 14.010	106	81

Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula:

Extrapolation(dB)=40log$_{10}$(Measurement Distance/Specification Distance)

Test Setup:

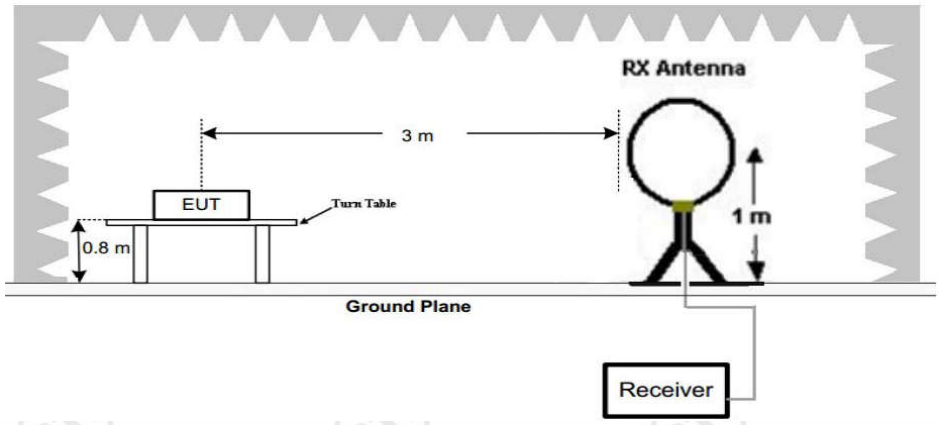


Figure 1. Below 30MHz

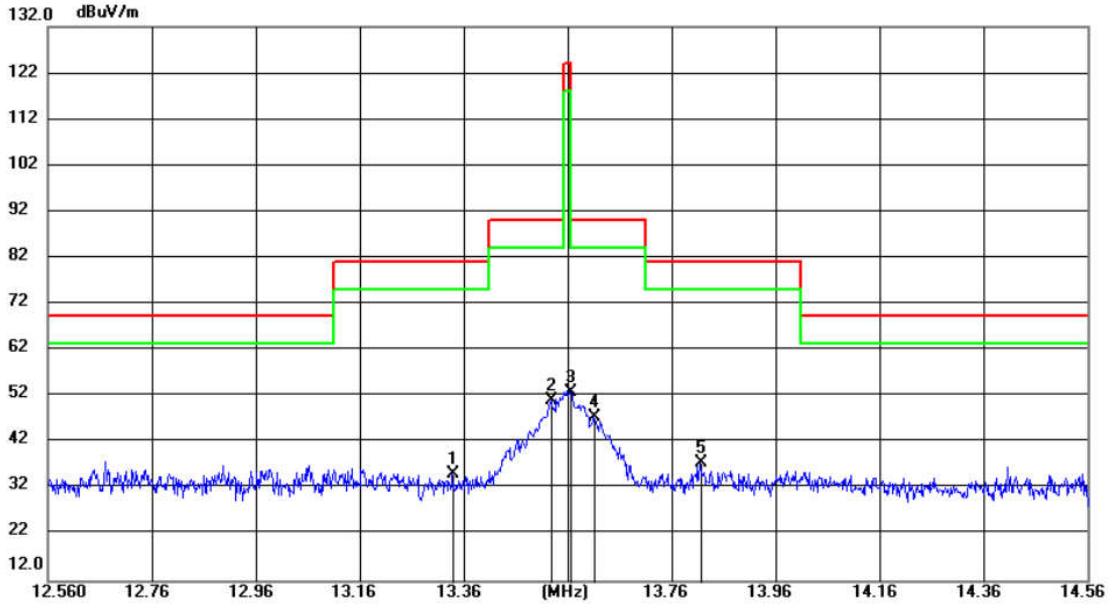
Test Procedure:

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the

	ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test Mode:	Transmitting with ASK modulation.
Test Result:	Pass

Measurement Data

X axis positioning



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		13.3398	14.96	20.35	35.31	81.00	-45.69	peak	100	47	
2	*	13.5295	30.76	20.35	51.11	90.00	-38.89	peak	100	52	
3		13.5647	32.62	20.35	52.97	124.00	-71.03	peak	100	111	
4		13.6105	27.13	20.35	47.48	90.00	-42.52	peak	100	120	
5		13.8155	17.45	20.35	37.80	81.00	-43.20	peak	100	222	

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier.

The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

5.3 Radiated Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.225(d),
Test Method:	ANSI C63.10: 2013
Test Site:	3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Peak	100 kHz	300kHz	Peak

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m) @ 3 m	Remark
0.009MHz-0.490MHz	2400/F(kHz) @300m	128.5-93.8	Quasi-peak
0.490MHz-1.705MHz	24000/F(kHz) @30m	73.8-63	Quasi-peak
1.705MHz-30MHz	30 @30m	70	Quasi-peak
30MHz-88MHz	100 @3m	40.0	Quasi-peak
88MHz-216MHz	150 @3m	43.5	Quasi-peak
216MHz-960MHz	200 @3m	46.0	Quasi-peak
960MHz-1GHz	500 @3m	54.0	Quasi-peak

Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula:

Extrapolation(dB)=40log$_{10}$(Measurement Distance/Specification Distance)

Test Setup:

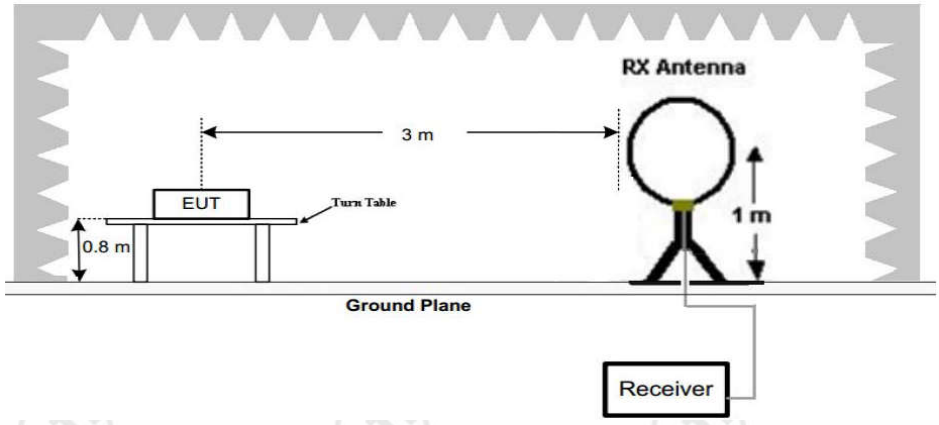


Figure 1. Below 30MHz

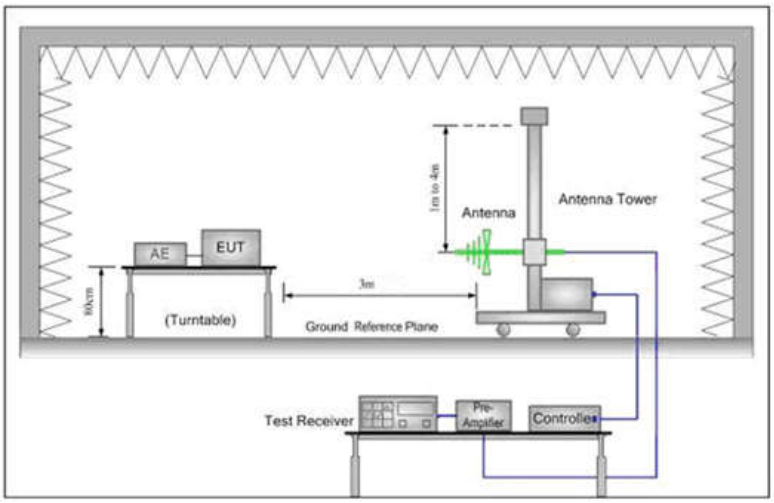


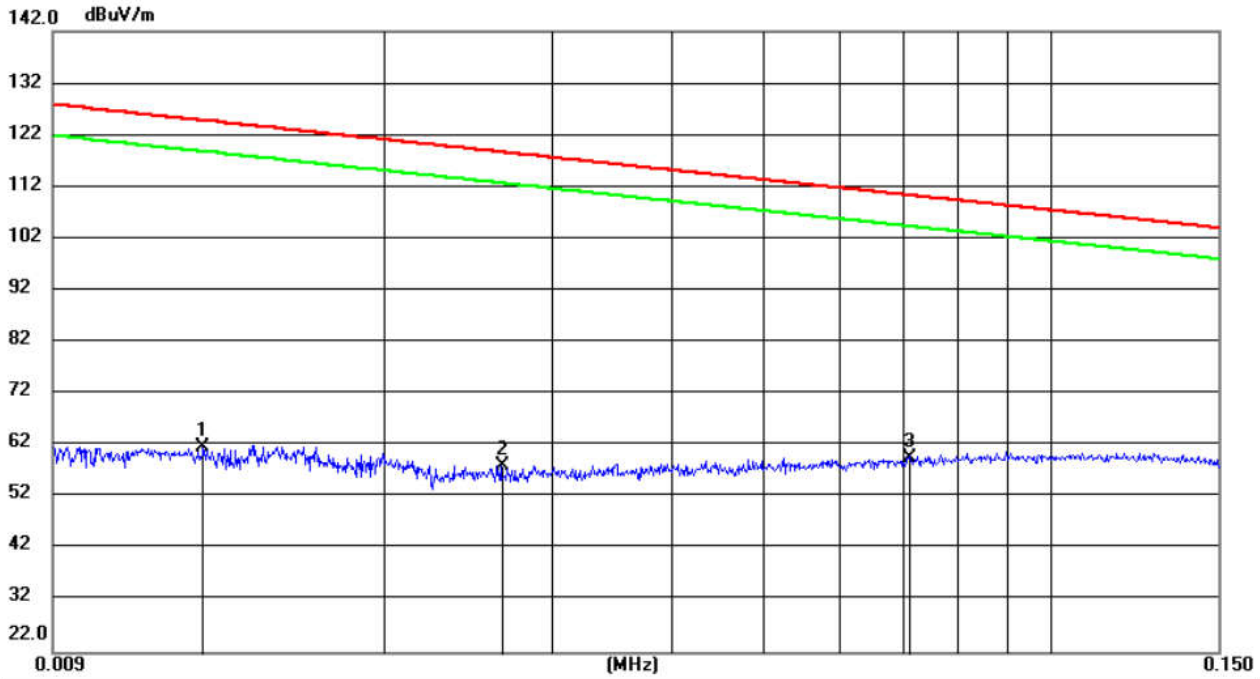
Figure 2. 30MHz to 1GHz

Test Procedure:	5. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 6. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 7. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 8. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test Mode:	Transmitting with ASK modulation.
Test Result:	Pass

Measurement Data

X axis positioning

9kHz – 150KHz:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		0.0129	40.74	21.11	61.85	124.77	-62.92	peak	100	52	
2		0.0266	37.52	20.78	58.30	118.67	-60.37	peak	100	120	
3	*	0.0710	39.13	20.64	59.77	110.39	-50.62	peak	100	111	

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

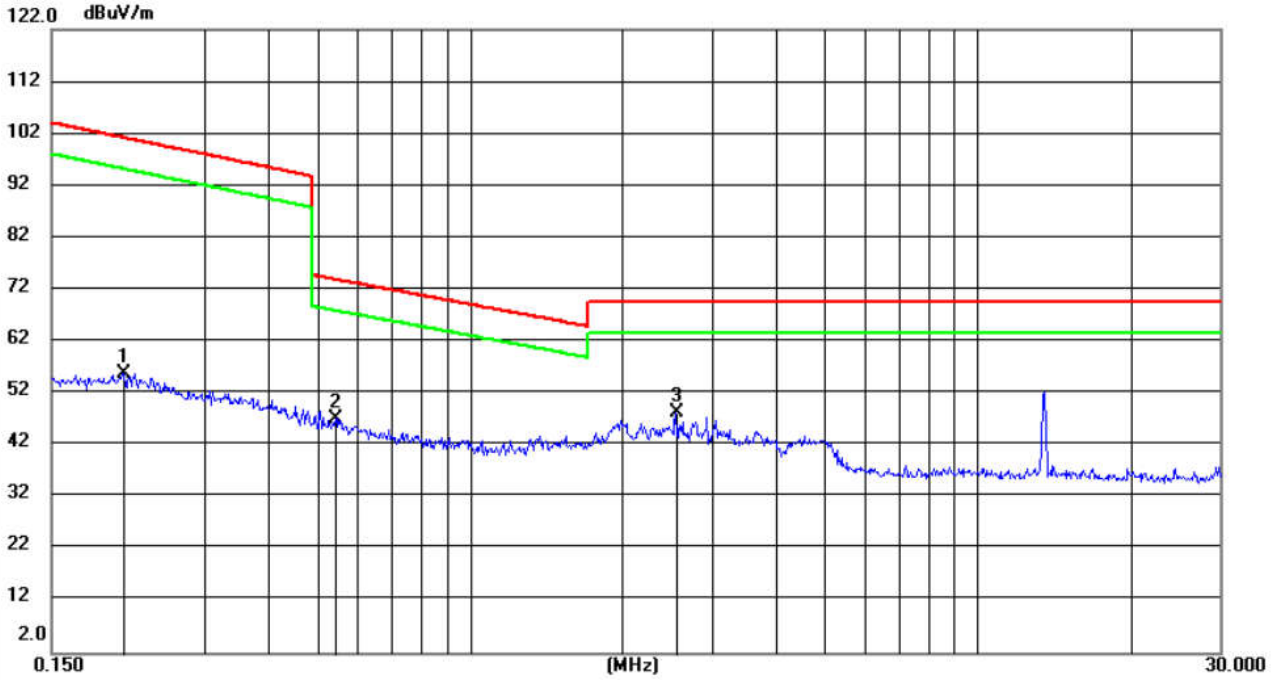
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

X axis positioning

150KHz-30MHz:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		0.2082	35.18	20.54	55.72	101.23	-45.51	peak	100	78	
2		0.5435	26.61	20.45	47.06	73.98	-26.92	peak	100	111	
3	*	2.5521	27.89	20.37	48.26	69.54	-21.28	peak	100	245	

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

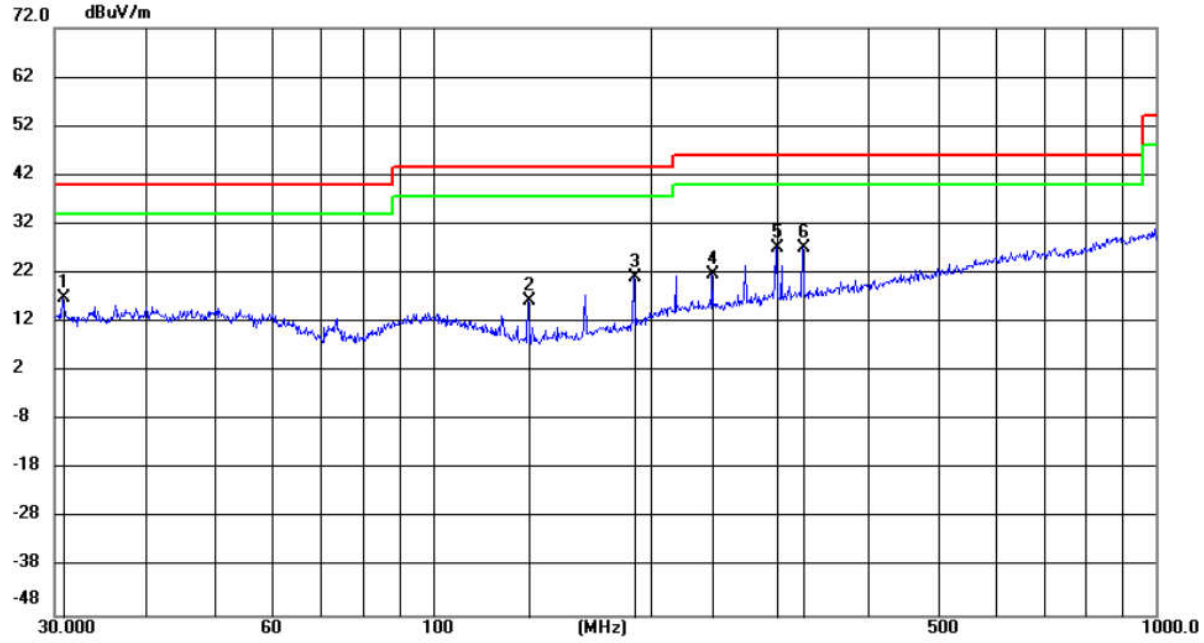
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

30MHz-1GHz

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		30.7616	4.04	12.89	16.93	40.00	-23.07	peak	100	290	
2		135.6012	7.02	9.34	16.36	43.50	-27.14	peak	199	219	
3		189.8383	9.50	11.73	21.23	43.50	-22.27	peak	100	188	
4		244.1036	6.33	15.31	21.64	46.00	-24.36	peak	100	310	
5	*	298.3204	10.04	17.19	27.23	46.00	-18.77	peak	100	198	
6		325.4816	9.37	17.80	27.17	46.00	-18.83	peak	100	310	

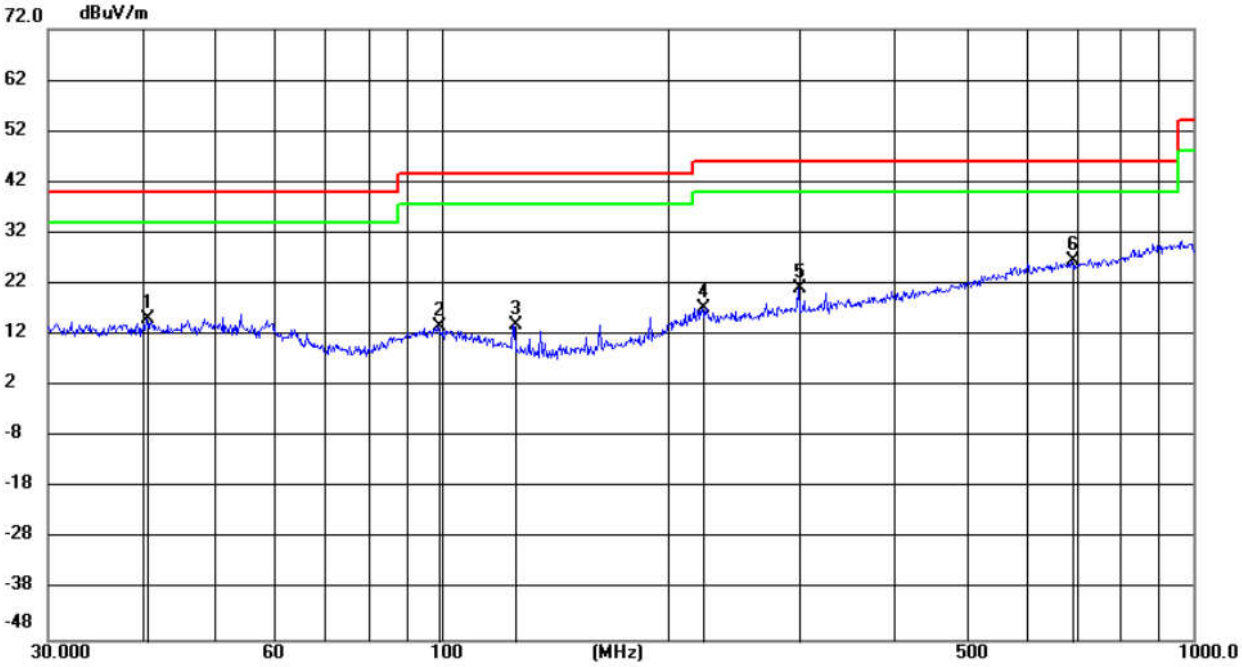
Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,
Over Limit=Level-Limit Line.

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		40.6588	0.59	14.51	15.10	40.00	-24.90	peak	200	189	
2		99.4235	-0.25	13.97	13.72	43.50	-29.78	peak	100	352	
3		125.0066	3.63	10.43	14.06	43.50	-29.44	peak	200	189	
4		222.6377	2.71	14.56	17.27	46.00	-28.73	peak	100	147	
5		298.3204	3.89	17.19	21.08	46.00	-24.92	peak	200	250	
6	*	690.5323	1.76	24.68	26.44	46.00	-19.56	peak	100	352	

Remark:

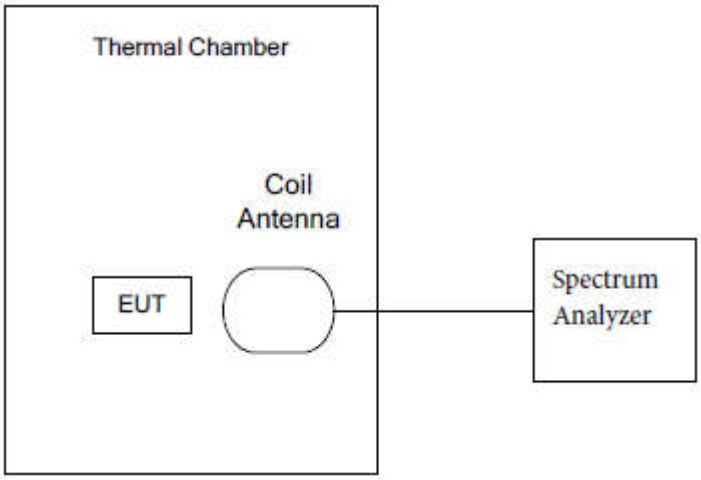
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

5.4 Frequency Stability

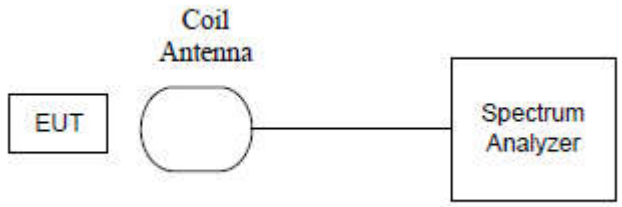
Test Requirement:	47 CFR Part 15 C Section 15.225(e)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Frequency Range:	Operation within the band 13.110-14.010 MHz
Requirements:	The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and 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.
Method of Measurement:	The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output.
Test Result:	The unit does meet the FCC Part 15 C Section 15.225(e) requirements.

Test Frequency: 13.56MHz			Temperature:20℃	
Supply Voltage （V）DC	Test Result (MHz)	Deviation (kHz)	Limit ±0.01% (kHz)	Result
3.00	13.55976	-0.24	1.3560	Pass
3.45	13.55976	-0.24	1.3560	Pass
2.55	13.55970	-0.30	1.3560	Pass

Test Frequency: 13.56MHz			Normal Voltage:3.0Vdc	
Temperature （℃）	Test Result (MHz)	Deviation (kHz)	Limit ±0.01% (kHz)	Result
-20	13.55976	-0.24	1.3560	Pass
-10	13.55970	-0.30	1.3560	
0	13.55970	-0.30	1.3560	
10	13.55971	-0.29	1.3560	
20	13.55978	-0.22	1.3560	
30	13.55973	-0.27	1.3560	
40	13.55970	-0.30	1.3560	
50	13.55970	-0.30	1.3560	

Note: Deviation (KHz) = (Test Result-13.56MHz)*1000

5.5 20dB Occupied Bandwidth

Test Requirement:	47 CFR Part 15 C Section 15.215 (C)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Frequency Range:	Operation within the band 13.110 – 14.010 MHz
Requirements:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through §15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.
Limit:	For 13.56 MHz the permitted frequency band is 14kHz, so the limit is 11.2 kHz.

Test Data:

20dB bandwidth (Hz)	FL (MHz)	FH (MHz)	Limit(MHz)	Result
333.0	**13.559913**	**13.560246**	**13.110 – 14.010**	**Pass**

Test plot as follows: