Test Report

Report No.:	MTi230202007-04E3
Date of issue:	2023-03-10
Applicant:	Xiamen Hanin Electronic Technology Co., Ltd.
Product:	Mobile Printer
Model(s):	MT810, MT81A, MT81B, MT81C, MT81D, MT81E, MT81F, MT81G, HCD-8DT22L
FCC ID:	2AUTE-MT810

Shenzhen Microtest Co., Ltd.

http://www.mtitest.com

Address: 101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Tel: (86-755)88850135 Fax: (86-755) 88850136 Web: www.mtitest.com E-mail: mti@51mti.com

Instructions

1. This test report shall not be partially reproduced without the written consent of the laboratory.

2. The test results in this test report are only responsible for the samples submitted

3. This test report is invalid without the seal and signature of the laboratory.

4. This test report is invalid if transferred, altered, or tampered with in any form without authorization.

5. Any objection to this test report shall be submitted to the laboratory within 15 days from the date of receipt of the report.

Contents

Test Result Certification	
Applicant:	**Xiamen Hanin Electronic Technology Co., Ltd.**
Address:	Room 305A, Angye Building, Pioneering Park, Torch High-tech, Zone, Xiamen
Manufacturer:	**Xiamen Hanin Electronic Technology Co., Ltd.**
Address:	Room 305A, Angye Building, Pioneering Park, Torch High-tech, Zone, Xiamen
Product description	
Product name:	Mobile Printer
Trademark:	N/A
Model name:	MT810
Serial Model:	MT81A, MT81B, MT81C, MT81D, MT81E, MT81F, MT81G, HCD-8DT22L
Standards:	FCC 47 CFR Part 15 Subpart C
Test method:	ANSI C63.10-2013
Date of Test	
Date of test:	2022-06-10 ~ 2023-03-02
Test result:	Pass

Note: This report changes trademark, adds one battery and series model. After evaluation, new conducted emission test data, radiation emission test data were added. Other test data are based on the basis of MTi220607010-05E3. The test data is not affected, citing the original report (date 2022-08-12).

Test Engineer : Cindy Qin

(Cindy Qin)

Reviewed By: : Leon Chen

(Leon Chen)

Approved By: : Tom Xue

(Tom Xue)

1 General Description

1.1 Description of the EUT

Product name:	Mobile Printer
Model name:	MT810
Series Model:	MT81A, MT81B, MT81C, MT81D, MT81E, MT81F, MT81G, HCD-8DT22L
Model difference:	All the models are the same circuit and module, except the model name.
Electrical rating:	Input: DC 5V 2A Battery 1: DC 7.4V 2500mAh 18.5Wh Battery 2: DC 7.4V 2000mAh 14.8Wh
Software version:	V1.0
Hardware version:	V1.0
Accessories:	N/A
EUT serial number:	MTi230202007-04-S0001
RF specification:	
Operation frequency:	13.56 MHz
Modulation type:	ASK
Antenna type:	loop Antenna
Antenna gain:	0.5dBi

1.2 Description of test modes

All the test modes were carried out with the EUT in normal operation, the final test mode of the EUT was the worst test mode for emission test, which was shown in this report and defined as:

No.	test modes
Mode 1	TX-13.56MHz

1.3 Description of support units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Support equipment list			
Description	Model	Serial No.	Manufacturer
Adapter	HW-090200CH0	/	Huizhou BYD Electronics Co., Ltd.
Support cable list			
Description	Length (m)	From	To
/	/	/	/

1.4 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15ºC~35ºC
Humidity:	20 % RH ~ 75 % RH
Atmospheric pressure:	98 kPa~101 kPa

1.5 Measurement uncertainty

Measurement	Uncertainty
Conducted emission (9 kHz~30 MHz)	± 2.5 dB
Radiated emission (9 kHz ~ 30 MHz)	± 4.0dB
Radiated emission (30 MHz~1 GHz)	± 4.2 dB
Radiated emission (above 1 GHz)	± 4.3 dB
Occupied bandwidth	± 3 %
Temperature	±1 degree
Humidity	± 5 %

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2 Summary of Test Result

No.	FCC Clause	Description of test	Result
Emission			
1	§15.203	Antenna requirement	Pass
2	§15.207	AC power line Conducted emissions	Pass
3	§15.209 & §15.225	Radiated emissions	Pass
4	§15.215	Occupied bandwidth	Pass

Note: N/A means not applicable.

3 Test Facilities and accreditations

3.1 Test laboratory

Test laboratory:	Shenzhen Microtest Co., Ltd.
Test site location:	101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	(86-755)88850135
Fax:	(86-755)88850136
CNAS Registration No.:	CNAS L5868
FCC Registration No.:	448573

4 List of test equipment

No.	Equipment	Manufacturer	Model	Serial No.	Cal. date	Cal. Due
MTI-E043	EMI test receiver	R&S	ESCI7	101166	2022/05/05	2023/05/04
MTI-E044	Broadband antenna	Schwarzbeck	VULB9163	9163-1338	2021/05/30	2023/05/29
MTI-E045	Horn antenna	Schwarzbeck	BBHA9120D	9120D-2278	2021/05/30	2023/05/29
MTi-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00066	2021/05/30	2023/05/29
MTI-E047	Pre-amplifier	Hewlett-Packard	8447F	3113A06184	2022/05/05	2023/05/04
MTI-E048	Pre-amplifier	Agilent	8449B	3008A01120	2022/05/05	2023/05/04
MTi-E120	Broadband antenna	Schwarzbeck	VULB9163	9163-1419	2021/05/30	2023/05/29
MTi-E121	Pre-amplifier	Hewlett-Packard	8447D	2944A09365	2022/05/05	2023/05/04
MTi-E123	Pre-amplifier	Agilent	8449B	3008A04723	2022/05/05	2023/05/04
MTi-E122	MXA signal analyzer	Agilent	N9020A	MY54440859	2022/05/05	2023/05/04
MTi-E002	EMI Test Receiver	R&S	ESCI3	101368	2022/05/05	2023/05/04
MTi-E023	Artificial power network	Schwarzbeck	NSLK8127	NSLK8127# 841	2022/05/05	2023/05/04
MTi-E025	Artificial power network	Schwarzbeck	NSLK8127	8127183	2022/05/05	2023/05/04
MTi-A029	Loop antenna	SOLAR	7334-1	220095-2	2021/04/20	2023/04/19

5 Test Results

5.1 Antenna requirements

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Description of the EUT antenna

The antenna of EUT is loop antenna, which is no consideration of replacement.

5.2 AC power line conducted emissions

5.2.1 Limits

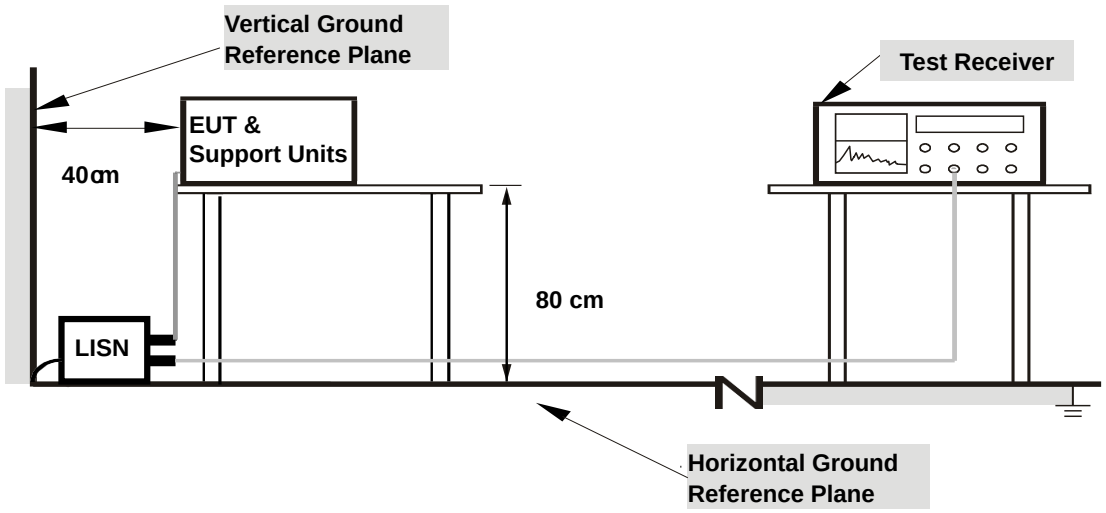
Frequency (MHz)	Detector type / Bandwidth	Limit-Quasi-peak dBµV	Limit-Average dBµV
0.15 -0.5	Average / 9 kHz	66 to 56	56 to 46
0.5 -5		56	46
5 -30		60	50

Note 1: the limit decreases with the logarithm of the frequency in the range of 0.15 MHz to 0.5 MHz.

5.2.2 Test Procedures

a) The test setup is refer to the standard ANSI C63.10-2013.
b) The EUT is connected to the main power through a line impedance stabilization network (LISN). All support equipment is powered from additional LISN(s).
c) Emissions were measured on each current carrying line of the EUT using an EMI test receiver connected to the LISN powering the EUT.
d) The test receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes described in Item 1.2.
e) The test data of the worst-case condition(s) was recorded.

5.2.3 Test setup



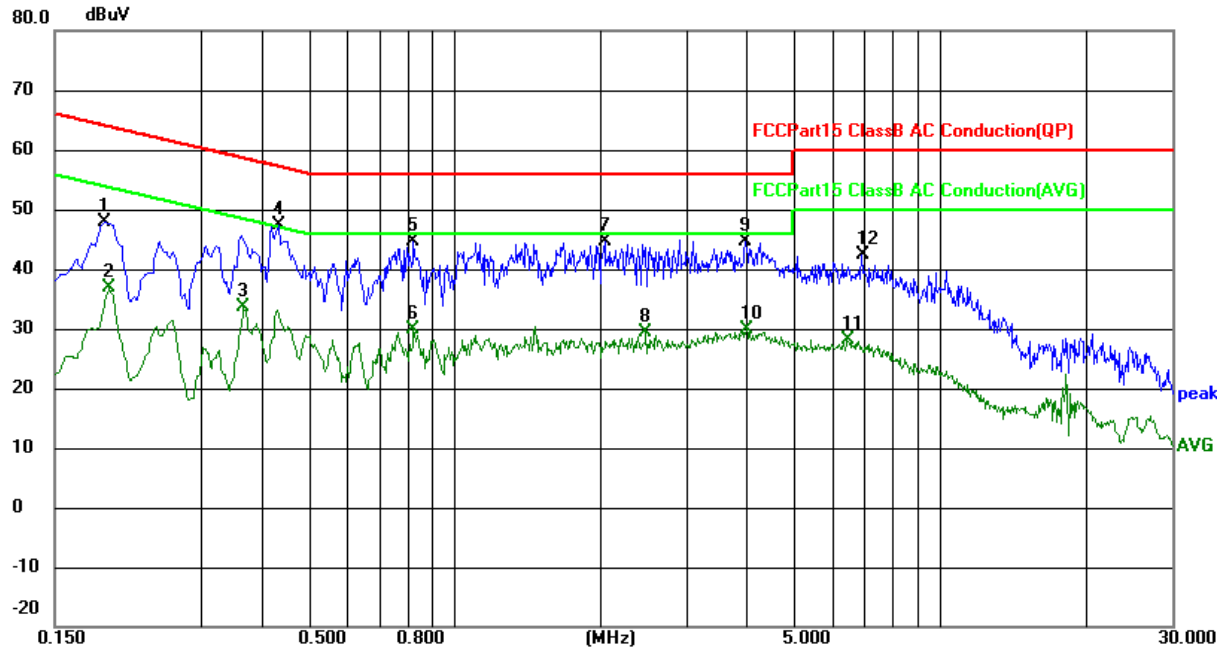
For the actual test configuration, please refer to the related item – Photographs of the test setup.

5.2.4 Test Result

Calculation formula:
Measurement (dBµV) = Reading Level (dBµV) + Correct Factor (dB)
Over (dB) = Measurement (dBµV) – Limit (dBµV)

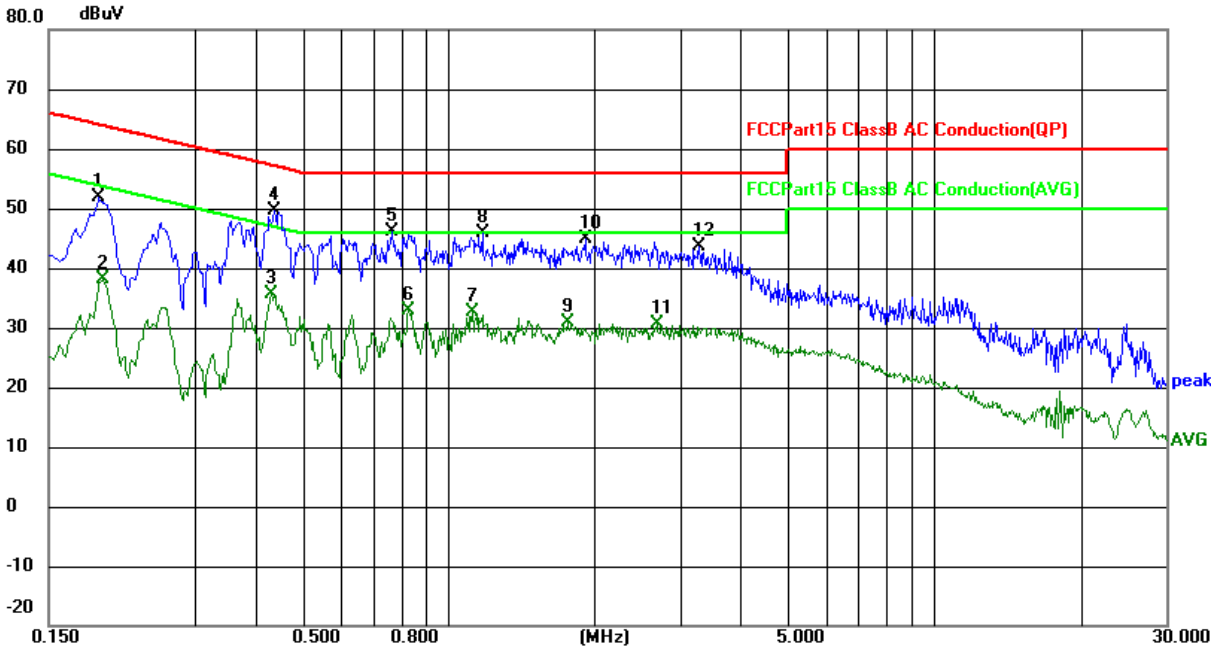
New test:

Test mode:	TX-13.56MHz	Phase:	L
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1900	37.23	10.66	47.89	64.04	-16.15	peak
2	0.1940	26.24	10.66	36.90	53.86	-16.96	AVG
3	0.3660	22.55	11.03	33.58	48.59	-15.01	AVG
4 *	0.4340	36.16	11.17	47.33	57.18	-9.85	peak
5	0.8260	32.57	12.05	44.62	56.00	-11.38	peak
6	0.8260	17.90	12.05	29.95	46.00	-16.05	AVG
7	2.0340	34.59	10.01	44.60	56.00	-11.40	peak
8	2.4739	19.21	10.13	29.34	46.00	-16.66	AVG
9	3.9740	34.28	10.27	44.55	56.00	-11.45	peak
10	4.0020	19.60	10.27	29.87	46.00	-16.13	AVG
11	6.4340	17.94	10.28	28.22	50.00	-21.78	AVG
12	6.9020	31.98	10.28	42.26	60.00	-17.74	peak

Test mode:	TX-13.56MHz	Phase:	N
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1900	41.17	10.60	51.77	64.04	-12.27	peak
2	0.1940	27.54	10.59	38.13	53.86	-15.73	AVG
3	0.4300	24.59	11.13	35.72	47.25	-11.53	AVG
4 *	0.4380	38.39	11.16	49.55	57.10	-7.55	peak
5	0.7660	34.25	11.91	46.16	56.00	-9.84	peak
6	0.8300	20.96	12.03	32.99	46.00	-13.01	AVG
7	1.1220	19.95	12.59	32.54	46.00	-13.46	AVG
8	1.1780	33.26	12.71	45.97	56.00	-10.03	peak
9	1.7580	16.81	13.96	30.77	46.00	-15.23	AVG
10	1.9140	34.39	10.45	44.84	56.00	-11.16	peak
11	2.6860	20.28	10.35	30.63	46.00	-15.37	AVG
12	3.2860	33.36	10.29	43.65	56.00	-12.35	peak

5.3 Radiated emissions

5.3.1 Limits

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

§ 15.209 Radiated emission limits:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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

Notes:

The tighter limit applies at the band edges.
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

§ 15.35 (b) requirements:

When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

According to ANSI C63.10, the tests shall be performed in the frequency range shown in the following table:

Frequency range of measurements for unlicensed wireless device

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

Frequency range of measurements for unlicensed wireless device with digital device

Highest frequency generated or used in the device or on which the device operates or tunes	Upper frequency range of measurement
Below 1.705 MHz	30 MHz
1.705 MHz to 108 MHz	1000 MHz
108 MHz to 500 MHz	2000 MHz
500 MHz to 1000 MHz	5000 MHz
Above 1000 MHz	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Test instrument setup

Frequency	Test receiver / Spectrum analyzer setting
9 kHz ~ 150 kHz	Quasi Peak / 200 Hz
150 kHz ~ 30 MHz	Quasi Peak / 9 kHz
30 MHz ~ 1 GHz	Quasi Peak / 120 kHz

5.3.2 Test Procedures

The EUT is placed on a non-conducting table 80cm above the ground plane for measurement blew 1 GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10-2013.

For measurement blew 1 GHz, the resolution bandwidth is set as item 5.4.2.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned form 1 to 4m meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and horizontal positions.

Special requirements for 9 kHz to 30 MHz:

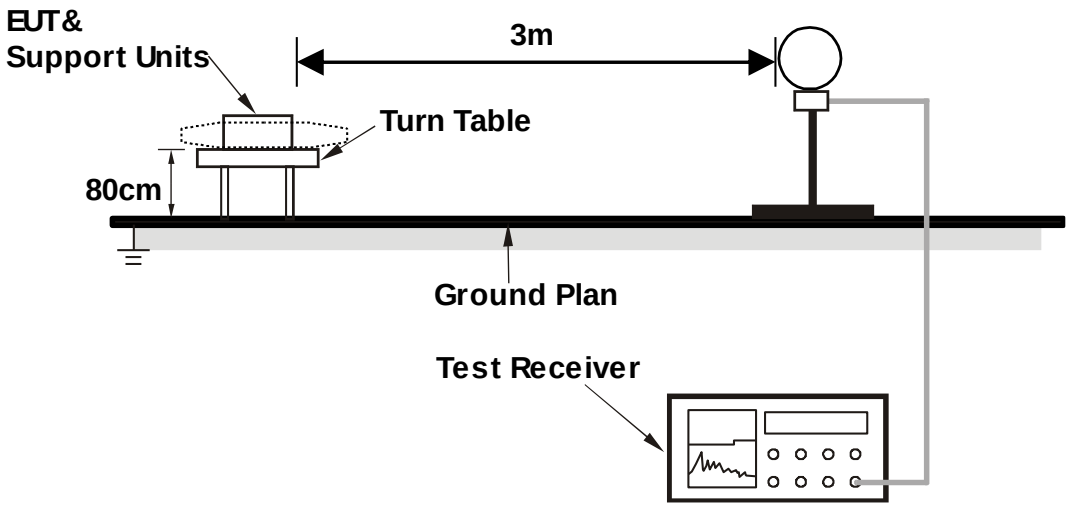
The lowest height of the magnetic antenna shall be 1 m above the ground

When the EUT contains a loop antenna that can only be placed in a vertical axis, normal measurements shall be made aligning the measurement antenna along the site axis, and then orthogonal to the axis. For each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable.

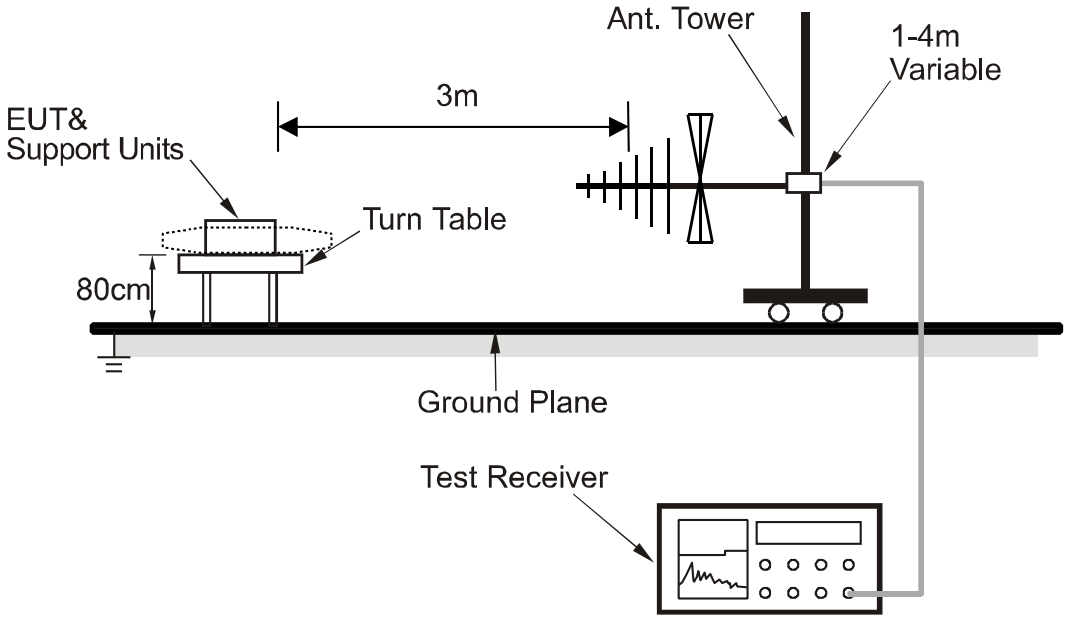
When the EUT contains a loop antenna that can be placed in a horizontal or vertical axis, normal measurements shall be made aligning the measurement antenna along the site axis, orthogonal to the axis, and then with the measurement antenna horizontal. For each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable.

5.3.3 Test Setup

Blew 30 MHz:



Blew 1 GHz:



For the actual test configuration, please refer to the related item – Photographs of the test setup.

5.3.4 Test result

Calculation formula:
Measurement (dBμV/m) = Reading Level (dBμV) + Correct Factor (dB/m)
Over (dB) = Measurement (dBμV/m) – Limit (dBμV/m)

Notes:

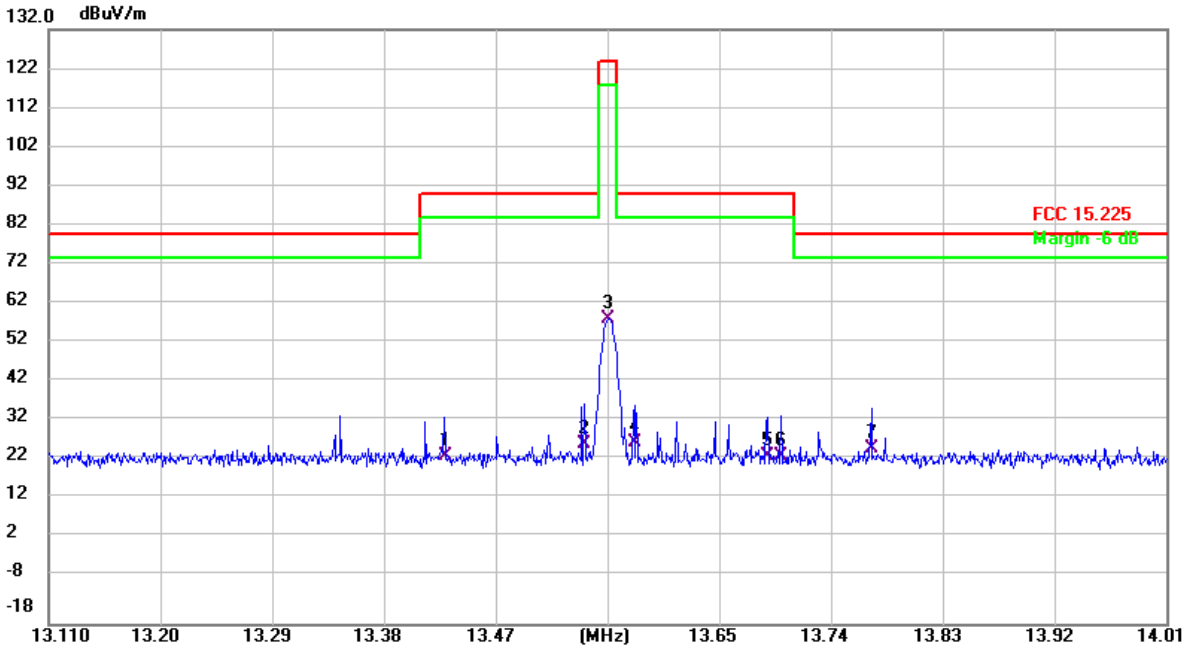
The amplitude of spurious emissions which are attenuated more than 20 dB below the limits are not reported.

For 9 kHz - 30 MHz testing, all the required orthogonal orientations of the measurement loop antenna were performed for pre-scan, the maximum radiated transmissions (Site axis) were recorded.

Limit (dBμV/m) = 20*log(μV/m).
Limit (dBuV/m) @ 3m = Limit (dBμV/m) @ 10m + 40*log(30/3)

Fundamental & spurious emissions in 13.110 ~ 14.010 MHz

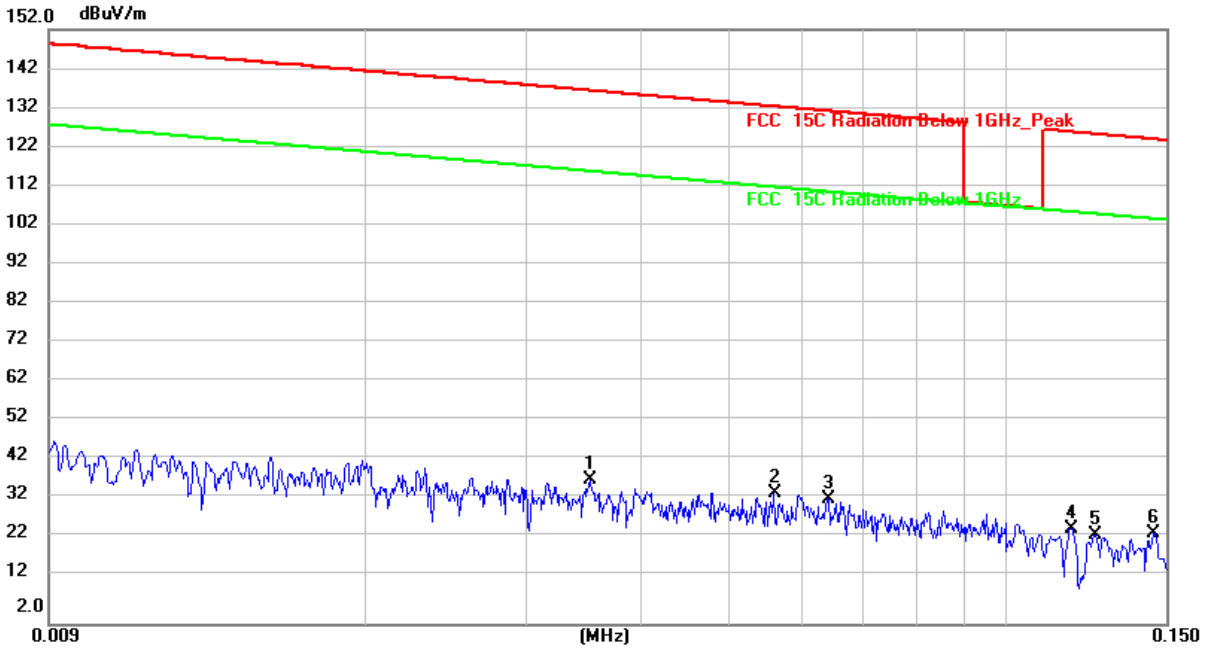
Test mode:	TX-13.56MHz	Polarization:	Site axis
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	RE chamber 2



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	13.4286	3.44	20.96	24.40	90.50	-66.10	QP
2	13.5411	6.64	20.96	27.60	90.50	-62.90	QP
3	13.5600	38.29	20.95	59.24	124.00	-64.76	QP
4	13.5816	6.85	20.95	27.80	90.50	-62.70	QP
5	13.6887	3.46	20.94	24.40	90.50	-66.10	QP
6	13.6995	3.66	20.94	24.60	90.50	-65.90	QP
7 *	13.7724	5.57	20.93	26.50	80.50	-54.00	QP

Spurious emissions (9 kHz ~ 150 kHz)

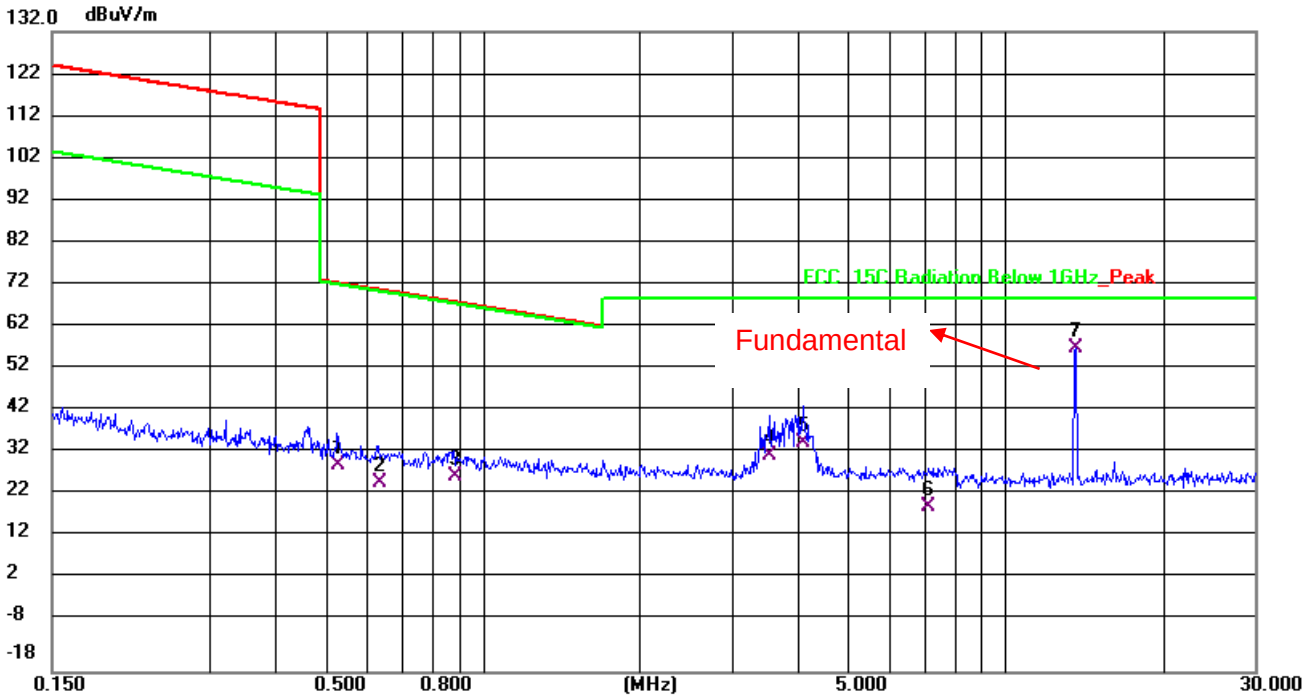
Test mode:	TX-13.56MHz	Polarization:	Site axis
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	RE chamber 2



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.0351	17.59	21.15	38.74	116.60	-77.86	peak
2 *	0.0559	14.18	20.94	35.12	112.60	-77.48	peak
3	0.0641	12.92	20.86	33.78	121.42	-77.64	peak
4	0.1177	5.86	20.46	26.32	106.21	-79.89	peak
5	0.1253	4.27	20.42	24.69	105.67	-80.98	peak
6	0.1454	4.65	20.48	25.13	104.37	-79.24	peak

Spurious emissions (150 kHz ~ 30 MHz)

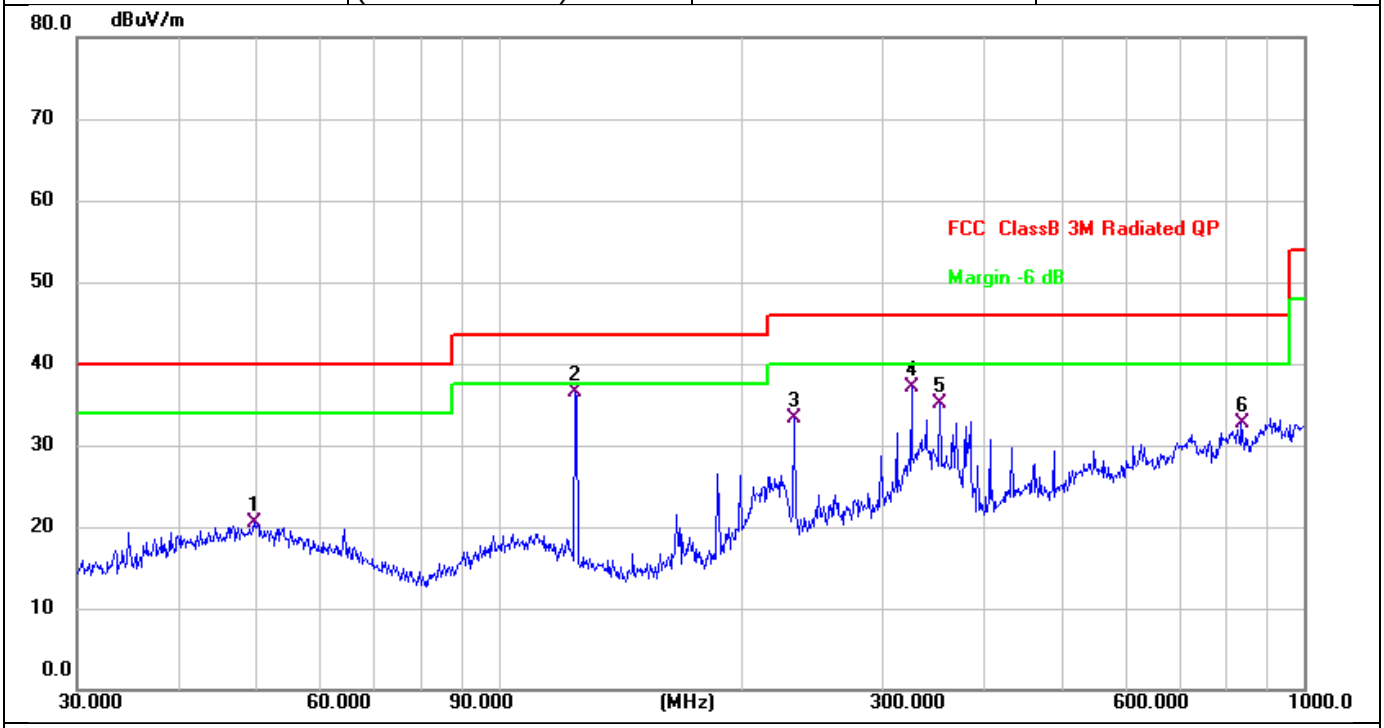
Test mode:	TX-13.56MHz	Polarization:	Site axis
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	RE chamber 2



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.5265	9.79	20.61	30.40	73.18	-42.78	QP
2	0.6305	5.95	20.65	26.60	71.62	-45.02	QP
3	0.8803	7.05	20.75	27.80	68.73	-40.93	QP
4	3.5278	4.87	28.03	32.90	69.50	-36.60	QP
5	4.0920	6.59	29.21	35.80	69.50	-33.70	QP
6	7.1374	-14.14	35.04	20.90	69.50	-48.60	QP
7 *	13.5627	36.81	20.95	57.76	69.50	-11.74	QP

Spurious emissions (30 MHz ~ 1 GHz) New test:

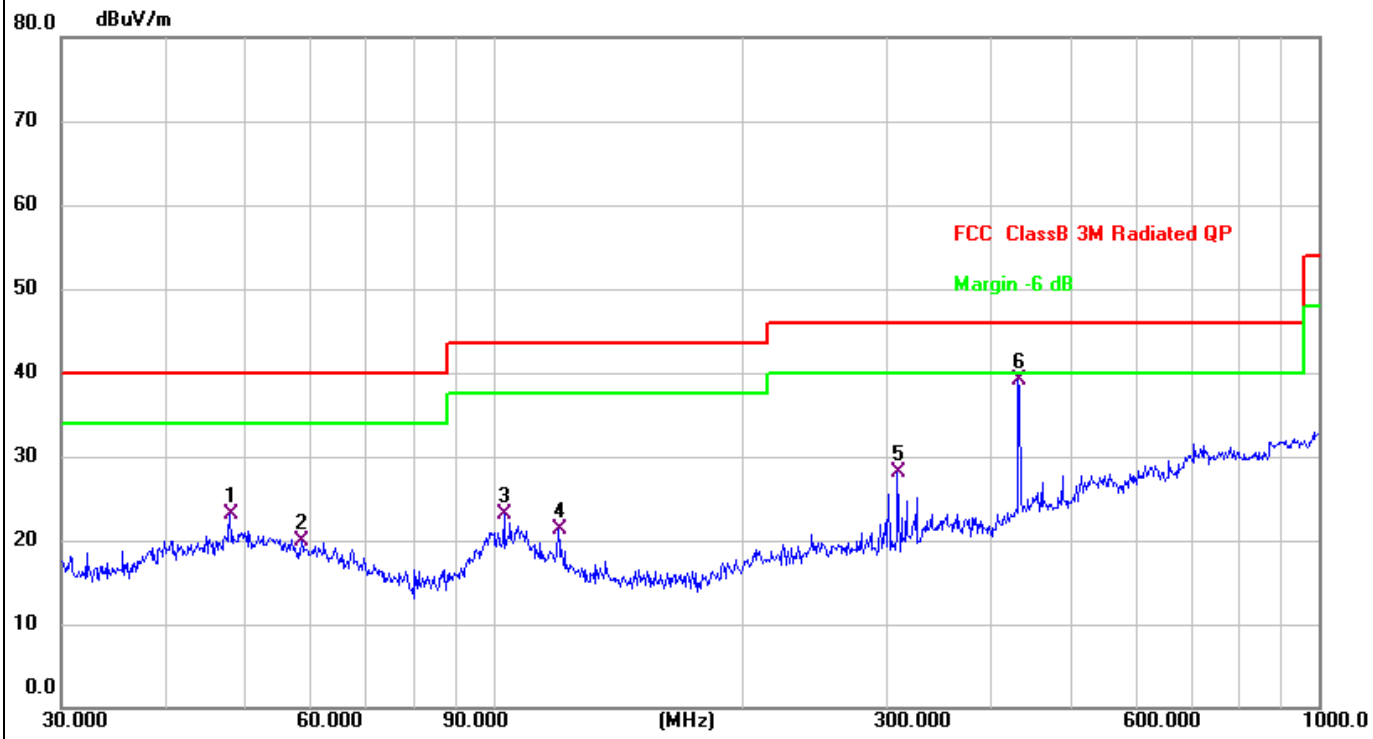
Test mode:	TX-13.56MHz	Polarization:	Horizontal
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		49.7068	26.39	-5.91	20.48	40.00	-19.52	QP
2	*	124.5690	45.76	-9.32	36.44	43.50	-7.06	QP
3		232.5318	38.93	-5.69	33.24	46.00	-12.76	QP
4		325.5958	40.94	-3.85	37.09	46.00	-8.91	QP
5		352.9433	38.43	-3.39	35.04	46.00	-10.96	QP
6		836.2443	25.80	6.81	32.61	46.00	-13.39	QP

Spurious emissions (30 MHz ~ 1 GHz)

Test mode:	TX-13.56MHz	Polarization:	Vertical
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		47.9940	29.05	-6.04	23.01	40.00	-16.99	QP
2		58.6126	27.06	-7.15	19.91	40.00	-20.09	QP
3		103.0800	30.16	-6.98	23.18	43.50	-20.32	QP
4		119.8556	29.68	-8.44	21.24	43.50	-22.26	QP
5		308.9126	32.27	-4.20	28.07	46.00	-17.93	QP
6	*	432.5457	40.20	-1.15	39.05	46.00	-6.95	QP

5.4 Occupied bandwidth test

5.4.1 Limits

None, for reporting purposes only.

5.4.2 Test Procedures

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation.

d) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement

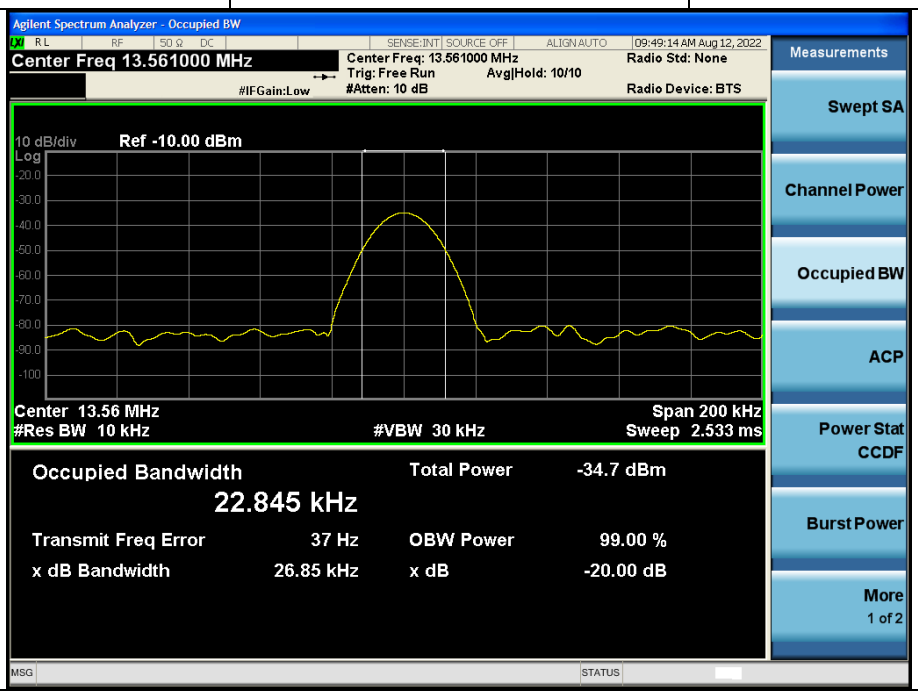
e) Set detection mode to peak and trace mode to max hold.

f) Determine the "−xx dB down amplitude" using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.

5.4.3 Test Result

Note: Because the measured signal is CW-like, adjusting the RBW per C63.10 would not be practical since measurement bandwidth will always follow the RBW. The RBW is set to 10 kHz to perform the occupied bandwidth test.

Frequency MHz	20 dB occupied bandwidth kHz	99% occupied bandwidth kHz
13.56	26.85	22.845



5.5 Frequency stability

5.5.1 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, 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.

5.5.2 Test Procedure

ANSI C63.10-2013 Clause 6.8.

5.5.3 Test result

Power Supply (VDC)	Temperature (℃)	Measured Frequency (MHz)	Frequency Deviation	Limit
7.4	-20	13.560439	0.0032%	+/-0.01%
	-10	13.560350	0.0026%	
	0	13.560433	0.0032%	
	10	13.560401	0.0030%	
	20	13.560361	0.0027%	
	30	13.560372	0.0027%	
	40	13.560430	0.0032%	
	50	13.560357	0.0026%	
6.29	20	13.560427	0.0031%	
8.51	20	13.560443	0.0033%	

Photographs of the Test Setup

Radiated emission

Conducted emission


Photographs of the EUT

See the Appendix – EUT Photos.

----End of Report----