

TEST REPORT

Applicant: Marathon Watch Company Limited

Address of Applicant: 1 - 8355 Jane Street, Vaughan, Canada, L4K 5Y3

Manufacturer: DATU ELECTRONICS MANUFACTORY LIMITED

Address of Manufacturer: TANGLI, FENGGANG TOWN, DONGGUAN CITY, GUANGDONG PROVINCE, CHINA

Equipment Under Test (EUT)

Product Name: THERMO SENSOR

Model No.: CL030066-RS

Trade Mark: MARATHON

FCC ID: 2AGNSCL030066RS

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.231

Date of sample receipt: June 24, 2022

Date of Test: June 24-29, 2022

Date of report issued: June 29, 2022

Test Result : PASS *

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

Authorized Signature:



Robinson Luo

Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	June 29, 2022	Original

Prepared By:

Tiger Chen

Date:

June 29, 2022

Project Engineer

Check By:

Robinson Lu

Date:

June 29, 2022

Reviewer

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4 Test Summary

Test Item	Section in	Result
Antenna requirement	CFR 47 15.203	Pass
Conduction Emission	CFR 47 15.207	N/A
Field strength of the fundamental signal	CFR 47 15.231(e)	Pass
Spurious emissions	CFR 47 15.231(e) &15.209	Pass
Occupy Bandwidth	CFR 47 15.231(c)	Pass
Dwell time	CFR 47 15.231(e)	Pass

Pass: The EUT complies with the essential requirements in the standard.

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)
Radiated Emission	18GHz-40GHz	3.30dB	(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:	THERMO SENSOR
Model No.:	CL030066-RS
Serial No.:	0822
Test sample(s) ID:	GTS202206000254-1
Sample(s) Status	Engineer sample
Operation Frequency:	433.92MHz
Modulation type:	OOK
Antenna Type:	Internal Antenna
Antenna gain:	5dBi(declare by applicant)
Power supply:	DC 3V(2*1.5V Size“AA” Battery)

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
Remark: New battery is used during all test.	

Per-test mode.

We have 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:

433.92MHz	Axis	X	Y	Z
	Field Strength(dBuV/m)	67.45	68.34	66.31

Final Test Mode:

According to ANSI C63.10 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.

- **IC —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 Industry Canada 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.

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.

5.6 Deviation from Standards

None.

5.7 Abnormalities from Standard Conditions

None.

5.8 Other Information Requested by the Customer

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	July. 02 2020	July. 01 2025
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	June. 23 2022	June. 22 2023
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 23 2022	June. 22 2023
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 23 2022	June. 22 2023
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 23 2022	June. 22 2023
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 23 2022	June. 22 2023
9	Coaxial Cable	GTS	N/A	GTS211	June. 23 2022	June. 22 2023
10	Coaxial cable	GTS	N/A	GTS210	June. 23 2022	June. 22 2023
11	Coaxial Cable	GTS	N/A	GTS212	June. 23 2022	June. 22 2023
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 23 2022	June. 22 2023
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 23 2022	June. 22 2023
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 23 2022	June. 22 2023
15	Band filter	Amindeon	82346	GTS219	June. 23 2022	June. 22 2023
16	Power Meter	Anritsu	ML2495A	GTS540	June. 23 2022	June. 22 2023
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 23 2022	June. 22 2023
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 23 2022	June. 22 2023
19	Splitter	Agilent	11636B	GTS237	June. 23 2022	June. 22 2023
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 23 2022	June. 22 2023
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 17 2021	Oct. 16 2022
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 17 2021	Oct. 16 2022
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 17 2021	Oct. 16 2022
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 23 2022	June. 22 2023

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 23 2022	June. 22 2023
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 23 2022	June. 22 2023
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 23 2022	June. 22 2023
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 23 2022	June. 22 2023
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 23 2022	June. 22 2023
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 23 2022	June. 22 2023
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 23 2022	June. 22 2023
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 23 2022	June. 22 2023

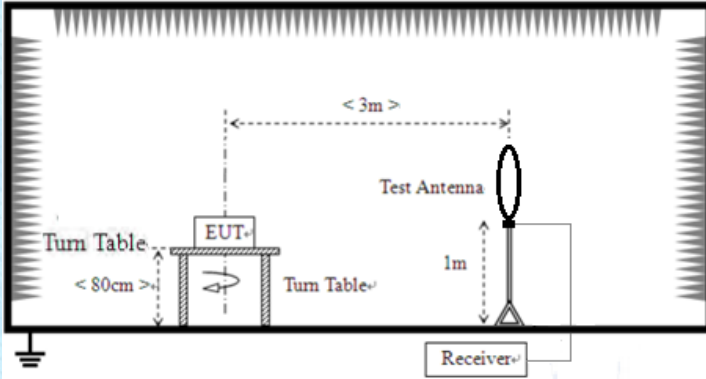
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 23 2022	June. 22 2023
2	Barometer	ChangChun	DYM3	GTS255	June. 23 2022	June. 22 2023

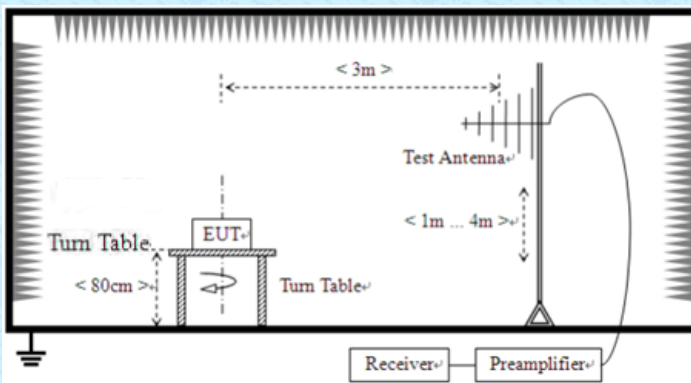
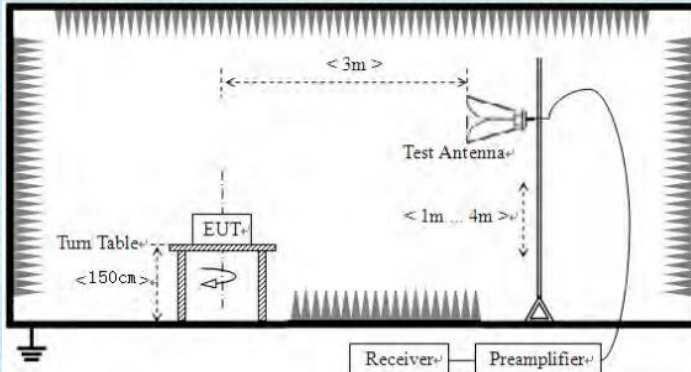
7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC 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 internal antenna, reference to the appendix II for details.	

7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 6000MHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
Peak		1MHz	10Hz	Average	
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	433.92MHz	72.87		Average Value	
		92.87		Peak Value	
Limit: (Spurious Emissions)	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	30m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
		5000	Peak		
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.					
Test setup:	Below 30MHz				
					
Below 1GHz					

	 Above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter 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 and the rota 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.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test environment:	Temp.: 25 °C Humid.: 50% Press.: 1 010mbar
Test voltage:	DC 3.0V

Test results:	Pass
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Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:

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
433.92	84.40	15.58	3.02	37.52	65.48	92.87	-27.39	Vertical
433.92	87.26	15.58	3.02	37.52	68.34	92.87	-24.53	Horizontal

Remarks:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. PK Value under PK limit more than 20db, then pass for AV value.

7.2.2 Spurious emissions

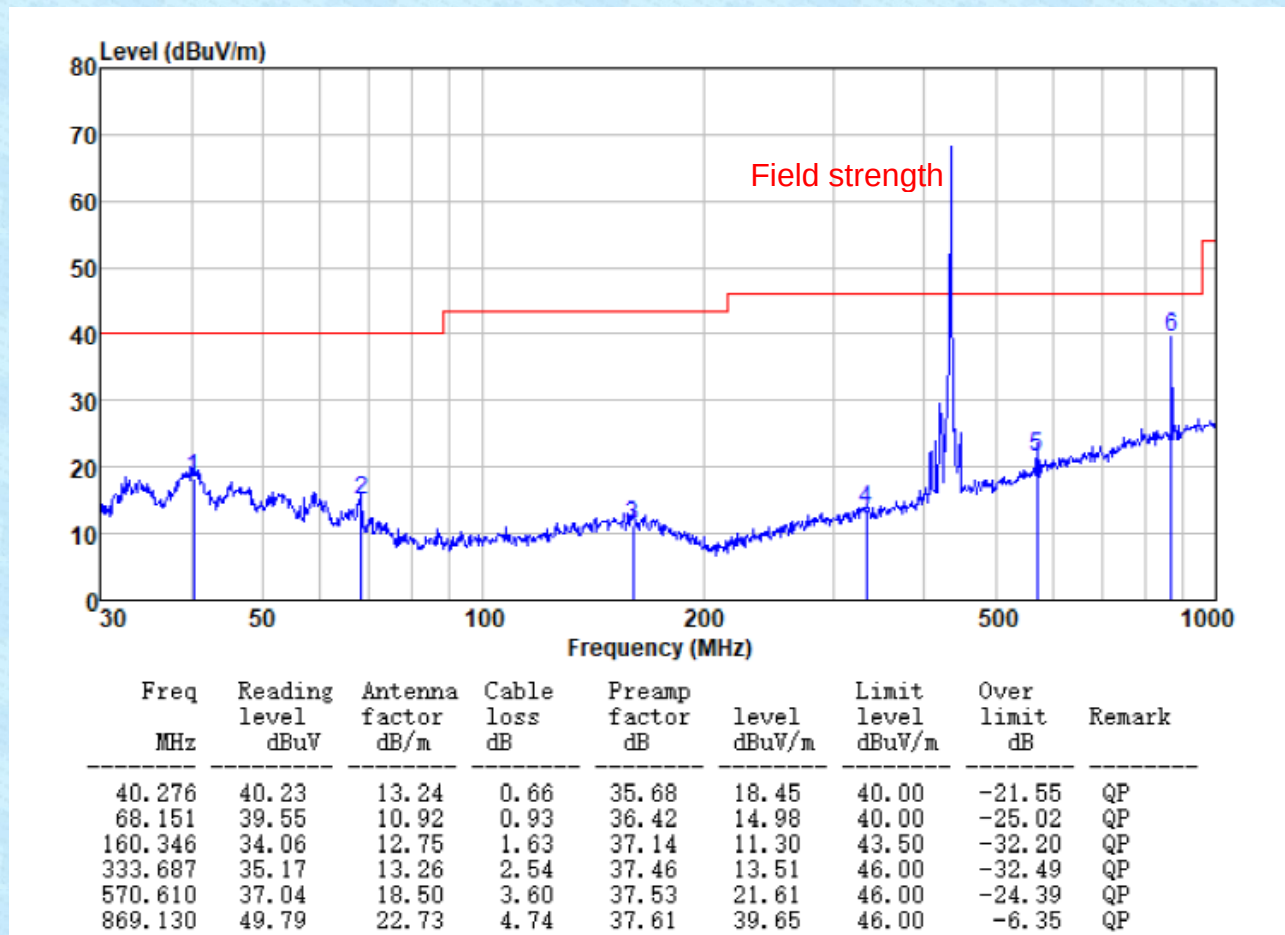
Measurement data:

9 kHz ~ 30 MHz

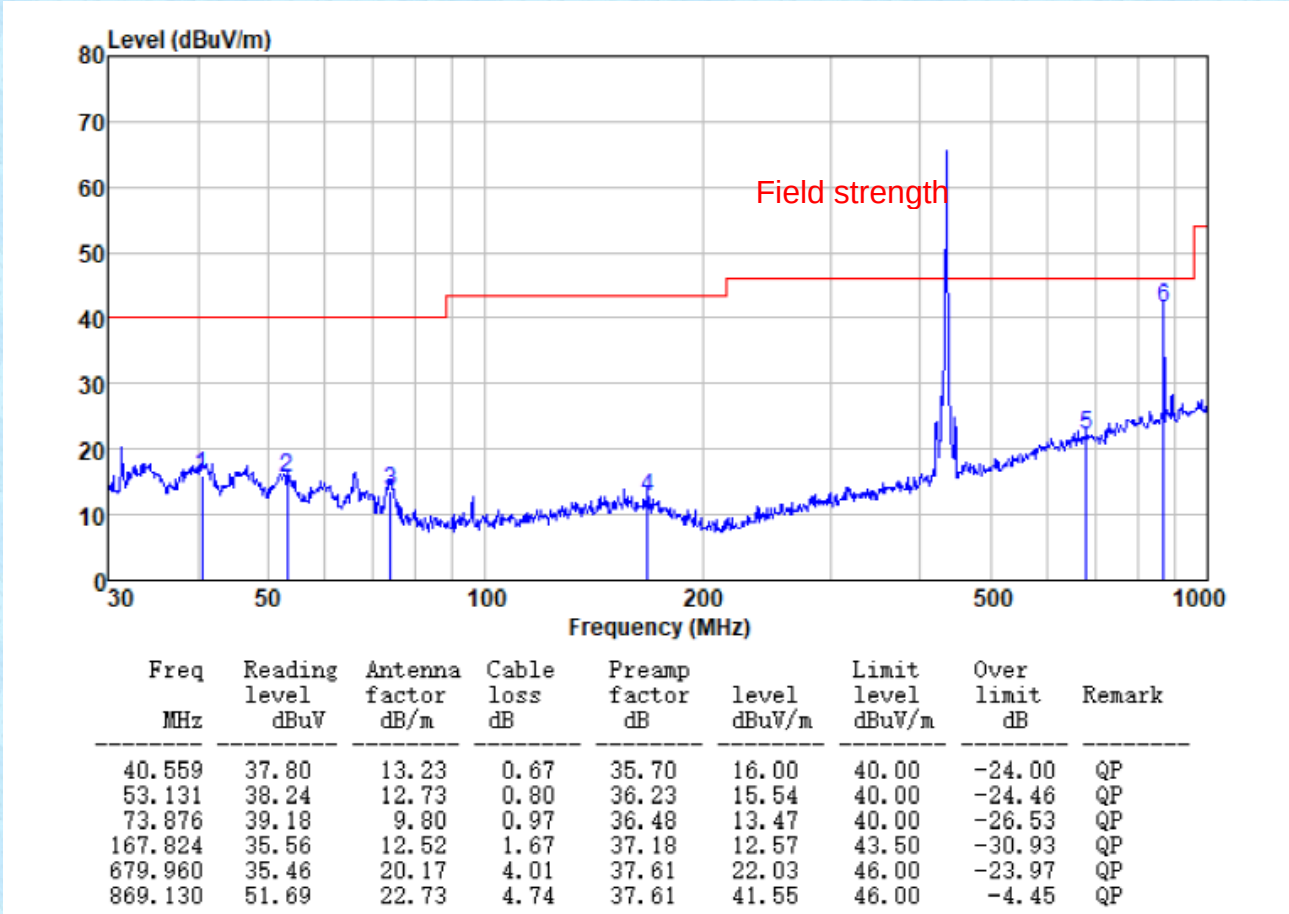
The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Below 1GHz:

Test channel:	433.92MHz	Polarization:	Horizontal
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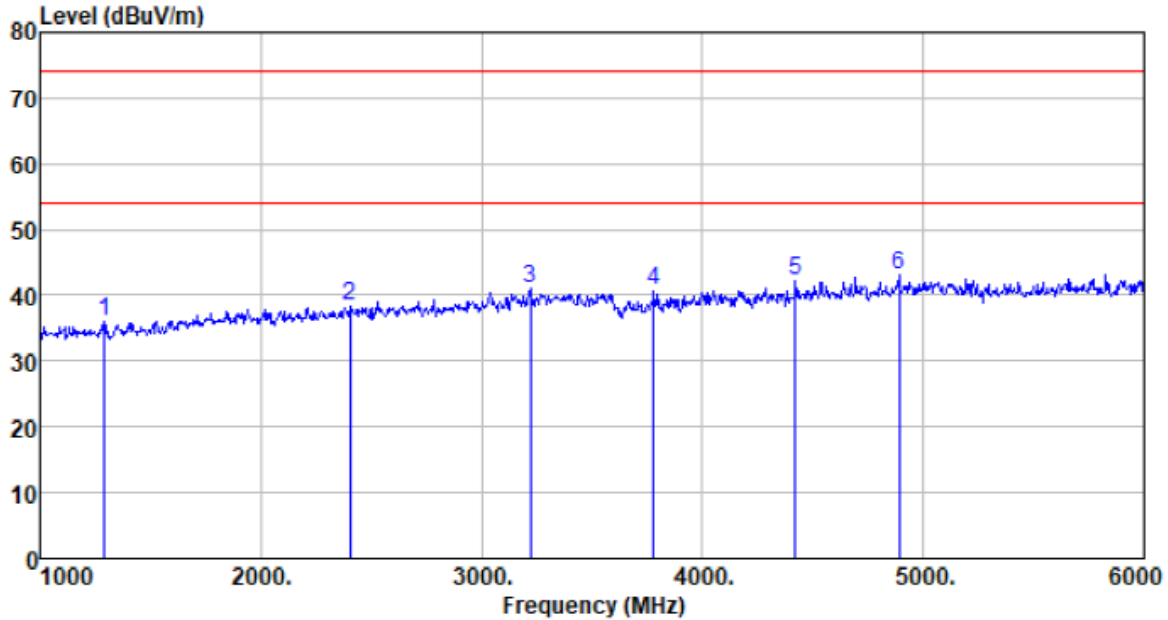


Test channel:	433.92MHz	Polarization:	Vertical
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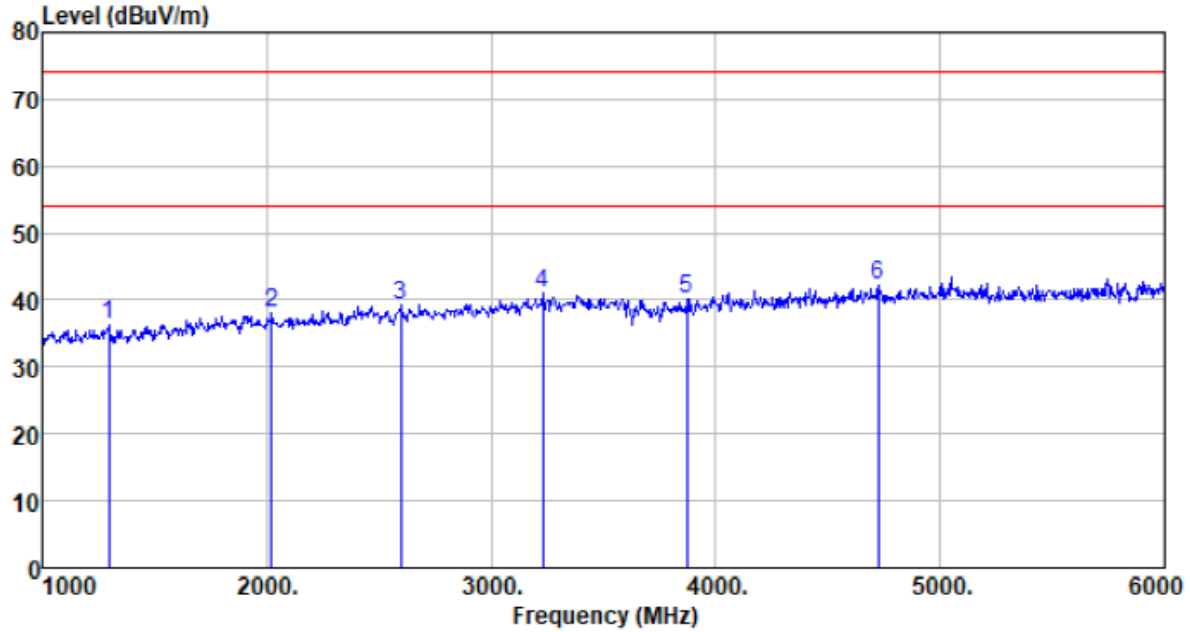
Above 1G:

Test channel:	433.92MHz	Polarization:	Horizontal
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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
1290.000	48.40	24.97	2.19	39.58	35.98	74.00	-38.02	Peak
2405.000	46.88	27.43	2.93	38.87	38.37	74.00	-35.63	Peak
3220.000	47.53	28.40	3.62	38.58	40.97	74.00	-33.03	Peak
3780.000	45.41	29.20	3.91	37.91	40.61	74.00	-33.39	Peak
4420.000	45.10	30.57	4.35	37.94	42.08	74.00	-31.92	Peak
4890.000	44.71	31.33	4.71	37.61	43.14	74.00	-30.86	Peak

Test channel:	433.92MHz	Polarization:	Vertical
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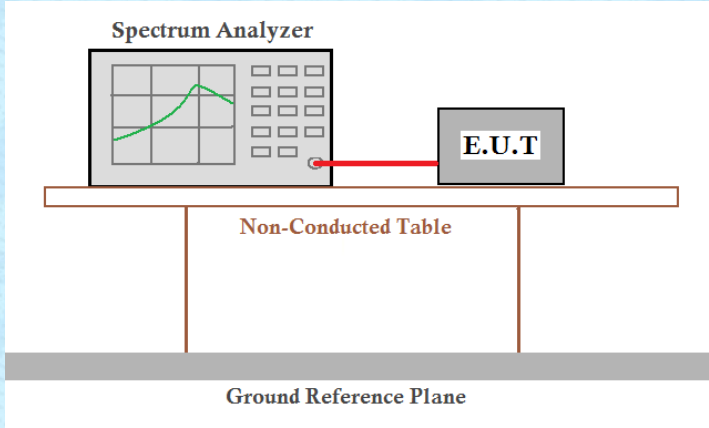


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
1295.000	48.73	24.97	2.19	39.57	36.32	74.00	-37.68	Peak
2020.000	47.34	26.16	2.55	37.95	38.10	74.00	-35.90	Peak
2595.000	47.26	27.84	3.11	39.04	39.17	74.00	-34.83	Peak
3230.000	47.72	28.40	3.62	38.57	41.17	74.00	-32.83	Peak
3870.000	44.44	29.44	3.92	37.78	40.02	74.00	-33.98	Peak
4725.000	44.38	31.07	4.57	37.78	42.24	74.00	-31.76	Peak

Remarks:

Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

7.3 Occupy Bandwidth

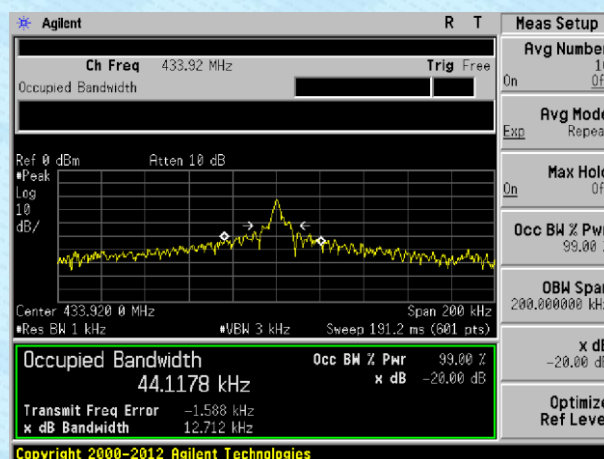
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

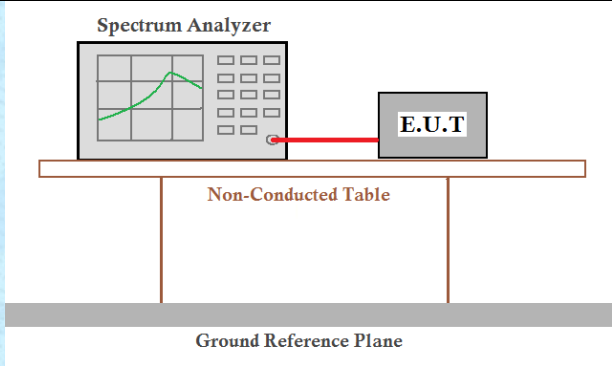
Test Frequency (MHz)	20dB bandwidth (kHz)	99% bandwidth(kHz)	Limit (MHz)	Result
433.92	12.712	44.1178	1.0848	Pass

Note: Limit= Fundamental frequency×0.25%

Test plot as follows:



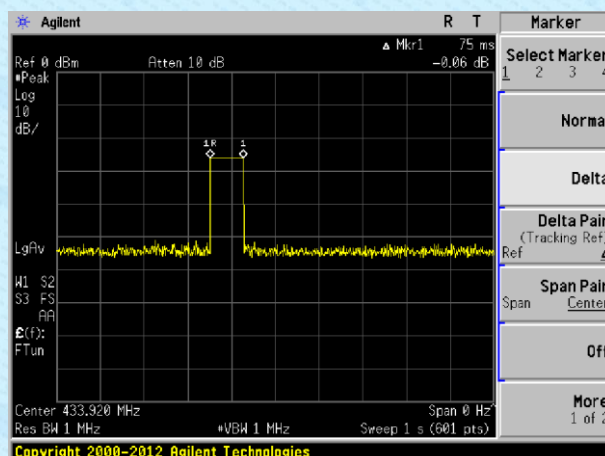
7.4 Dwell time

Test Requirement:	FCC Part15 C Section 15.231 (e)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, span=0Hz, detector: Peak
Limit:	Not more than 1 seconds
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

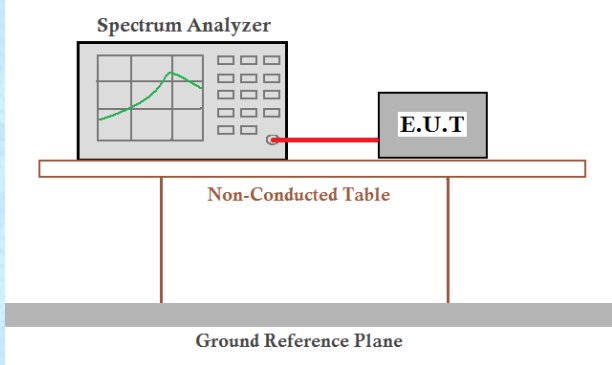
Measurement data:

Test Frequency (MHz)	Duration of each TX (second)	Limit (second)	Result
433.92	0.075	<1.0	Pass

Test plot as follows:



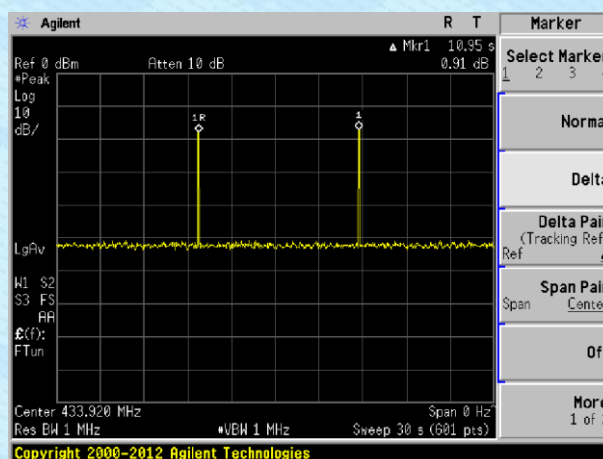
7.5 Silent period

Test Requirement:	FCC Part15 C Section 15.231 (e)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, span=0Hz, detector: Peak
Limit:	at least 30 times the duration of the transmission or more than 10 seconds
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Single scan the transmit, and read the transmission time.
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 Frequency (MHz)	Silent period (second)	Limit (second)	Result
433.92	10.95	>10	Pass

Test plot as follows:



8 Test Setup Photo

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

9 EUT Constructional Details

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

-----End-----