

# Test Report

**Applicant:** Unit Connection Technology Co., Ltd

**Address of Applicant:** 5/F., Block J, Shifeng Technology Park, Loucun, Guangming New District, Shenzhen ,China

**Manufacturer/Factory:** Unit Connection Technology Co., Ltd

**Address of Manufacturer/Factory:** 5/F., Block J, Shifeng Technology Park, Loucun, Guangming New District, Shenzhen ,China

**Equipment Under Test (EUT)**

Product Name: Wireless Weather Station Transmitter

Model No.: WS020, WS020T, WS019,WS019T,WS021,WS021T

**FCC ID:** 2ALHJ-WS020T

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

**Date of sample receipt:** January 08, 2020

**Date of Test:** January 08-14, 2020

**Date of report issued:** January 14, 2020

**Test Result :** PASS \*

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

Authorized Signature:



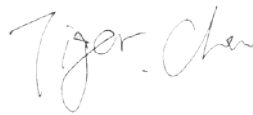
**Robinson Lo**  
**Laboratory Manager**

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
01	January 14, 2020	Original

**Prepared By:**

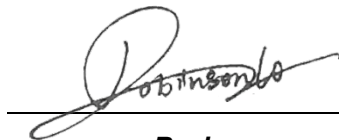


**Date:**

January 14, 2020

**Project Engineer**

**Check By:**



**Date:**

January 14, 2020

**Reviewer**

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## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203	Pass
Conduction Emission	15.207	N/A
Field strength of the Fundamental Signal	15.231 (e)	Pass
Spurious Emissions	15.231 (e)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Dwell Time	15.231 (e)	Pass

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

*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)
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:	Wireless Weather Station Transmitter
Model No.:	WS020, WS020T, WS019,WS019T,WS021,WS021T
Test Model No.:	WS020
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The difference is model name for commercial purpose	
Serial No.:	NA
Hardware Version:	V01
Software Version:	V1.1.0
Test sample(s) ID:	GTS202001000030-1
Sample(s) Status:	Engineer sample
Operation Frequency:	433.91MHz
Modulation technology:	ASK
Antenna Type:	Integral Antenna
Antenna gain:	0dBi(declare by applicant)
Power supply:	3*DC 1.5V size "AA" LR6

## 5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
Note: 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 only the worst case was shown in this test report and defined as follows, only worse case is reported:

Axis	X	Y	Z
Field Strength(dBuV/m)	70.53	70.98	69.87

## 5.3 Description of Support Units

None.

## 5.4 Test Facility

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

- **FCC —Registration No.: 381383**

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. Registration 381383.

- **IC —Registration No.: 9079A**

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 with Registration No.: 9079A.

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

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

## 5.5 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  
 Tel: 0755-27798480  
 Fax: 0755-27798960

## 5.6 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. 03 2015	July. 02 2020
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. 26 2019	June. 25 2020
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 26 2019	June. 25 2020
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 26 2019	June. 25 2020
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 26 2019	June. 25 2020
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 26 2019	June. 25 2020
9	Coaxial Cable	GTS	N/A	GTS211	June. 26 2019	June. 25 2020
10	Coaxial cable	GTS	N/A	GTS210	June. 26 2019	June. 25 2020
11	Coaxial Cable	GTS	N/A	GTS212	June. 26 2019	June. 25 2020
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 26 2019	June. 25 2020
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 26 2019	June. 25 2020
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 26 2019	June. 25 2020
15	Band filter	Amindeon	82346	GTS219	June. 26 2019	June. 25 2020
16	Power Meter	Anritsu	ML2495A	GTS540	June. 26 2019	June. 25 2020
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 26 2019	June. 25 2020
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 26 2019	June. 25 2020
19	Splitter	Agilent	11636B	GTS237	June. 26 2019	June. 25 2020
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 26 2019	June. 25 2020
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 19 2019	Oct. 18 2020
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 19 2019	Oct. 18 2020
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 19 2019	Oct. 18 2020
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 26 2019	June. 25 2020

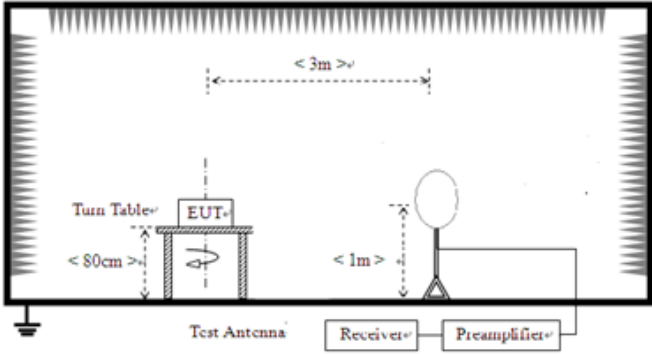
<b>RF Conducted Test:</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal.Date (mm-dd-yy)</b>	<b>Cal.Due date (mm-dd-yy)</b>
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 26 2019	June. 25 2020
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 26 2019	June. 25 2020
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 26 2019	June. 25 2020
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 26 2019	June. 25 2020
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 26 2019	June. 25 2020
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 26 2019	June. 25 2020
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 26 2019	June. 25 2020

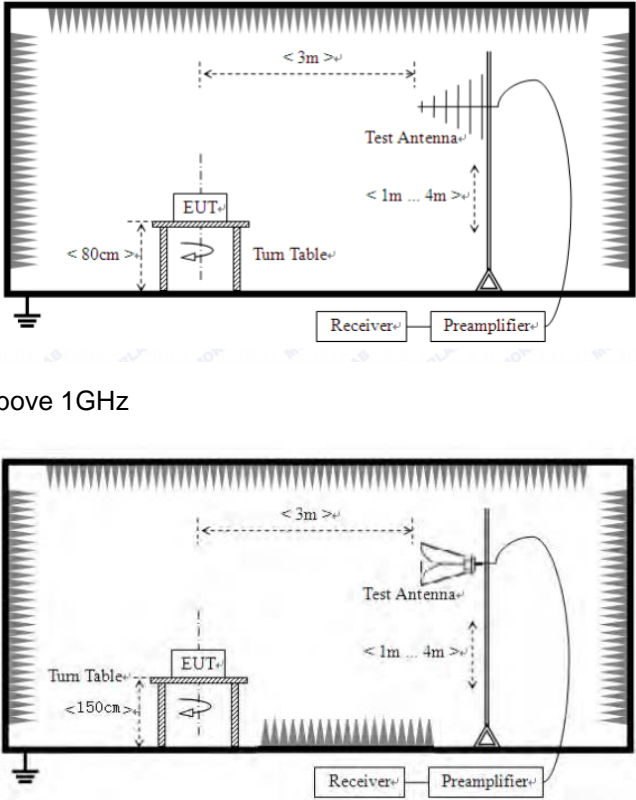
<b>General used equipment:</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Inventory No.</b>	<b>Cal.Date (mm-dd-yy)</b>	<b>Cal.Due date (mm-dd-yy)</b>
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 26 2019	June. 25 2020
2	Barometer	ChangChun	DYM3	GTS255	June. 26 2019	June. 25 2020



## 7 Test results and Measurement Data

### 7.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.231 (e)& 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		
	433.91MHz	92.87		Peak Value		
		72.87		Average Value		
Limit: (Spurious Emissions)	Fundamental Frequency (MHz)	Field Strength of fundamental (microvolts/meter)		Field Strength of Unwanted Emissions (microvolts/meter)		
	40.66-40.70	1,000		100		
	70-130	500		50		
	130-174	500 to 1,500**		50 to 1,50**		
	174-260	1,500		1,50		
	260-470	1,500 to 5,000**		1,50 to 5,00**		
	Above 470	5,000		5,00		
	Frequency (MHz)	Class B(dBuV/m @3m)				
		Above 1000	Peak		Average	
			74		54	
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.						
Test setup:	<p>Below 30MHz</p>  <p>Below 1GHz</p>					

	 <p>Above 1GHz</p>						
Test Instruments:	Refer to section 6.0 for details						
Test mode:	Refer to section 5.2 for details						
Test environment:	<table border="1"> <tr> <td>Temp.:</td> <td>25 °C</td> <td>Humid.:</td> <td>50%</td> <td>Press.:</td> <td>1 010mbar</td> </tr> </table>	Temp.:	25 °C	Humid.:	50%	Press.:	1 010mbar
Temp.:	25 °C	Humid.:	50%	Press.:	1 010mbar		
Test results:	Pass						

**Measurement data:****7.1.1 Field Strength of The Fundamental Signal****Peak value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
433.91	89.45	16.03	3.02	37.52	70.98	72.87	-1.89	Horizontal
433.91	87.97	16.03	3.02	37.52	69.5	72.87	-3.37	Vertical

*Remarks:*

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *PK value under the average limit, so, compliance.*

## 7.1.2 Spurious Emissions

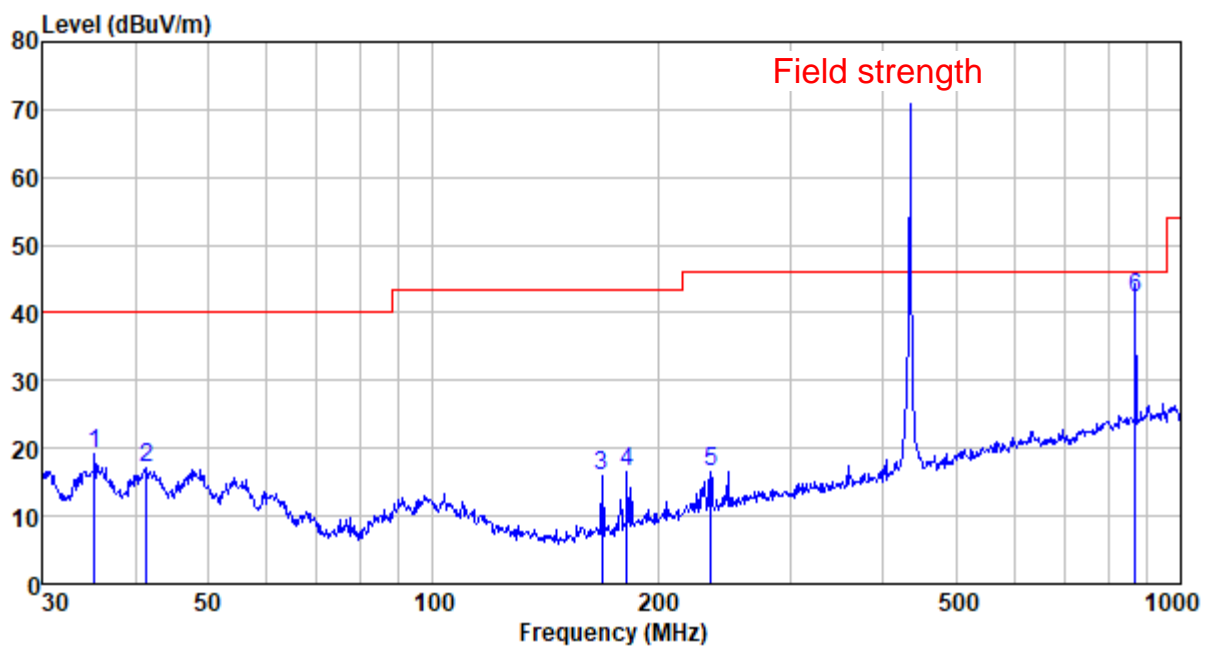
### Measurement data:

#### 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.

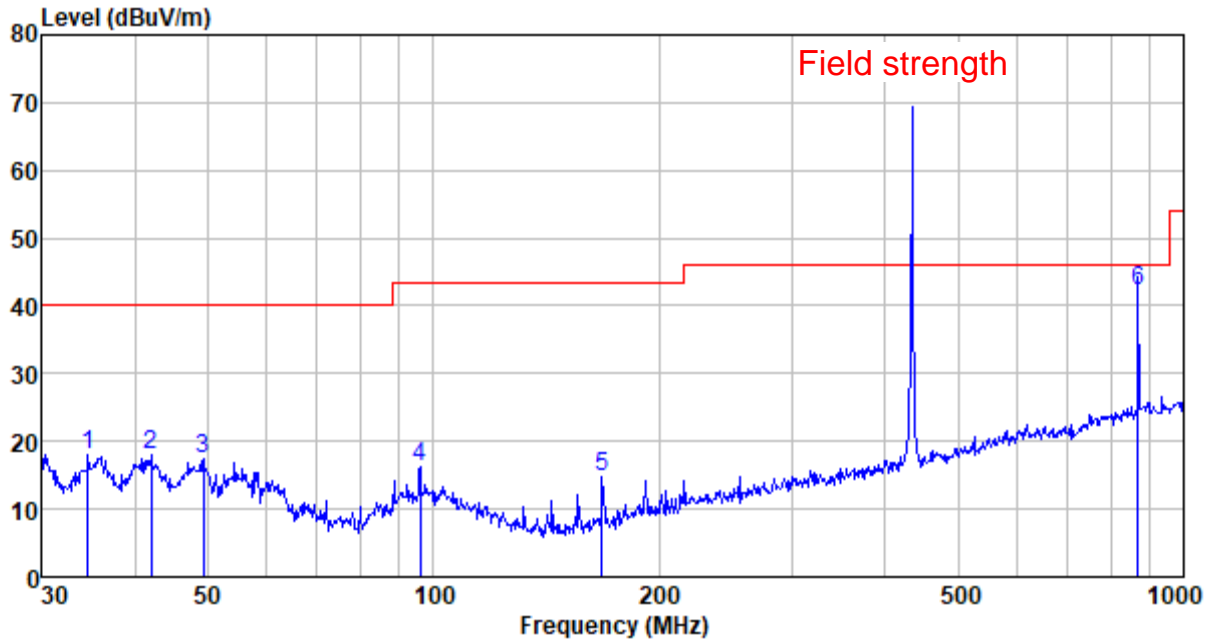
#### Below 1GHz:

<b>Mode:</b>	<b>Transmitting mode</b>	<b>Polarization:</b>	<b>Horizontal</b>
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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
35.251	42.47	11.36	0.61	35.37	19.07	40.00	-20.93	QP
41.422	39.89	12.22	0.68	35.75	17.04	40.00	-22.96	QP
168.414	42.86	8.47	1.68	37.18	15.83	43.50	-27.67	QP
181.920	43.08	9.07	1.75	37.25	16.65	43.50	-26.85	QP
234.991	40.09	11.67	2.05	37.37	16.44	46.00	-29.56	QP
869.130	53.14	22.02	4.74	37.61	42.29	46.00	-3.71	QP

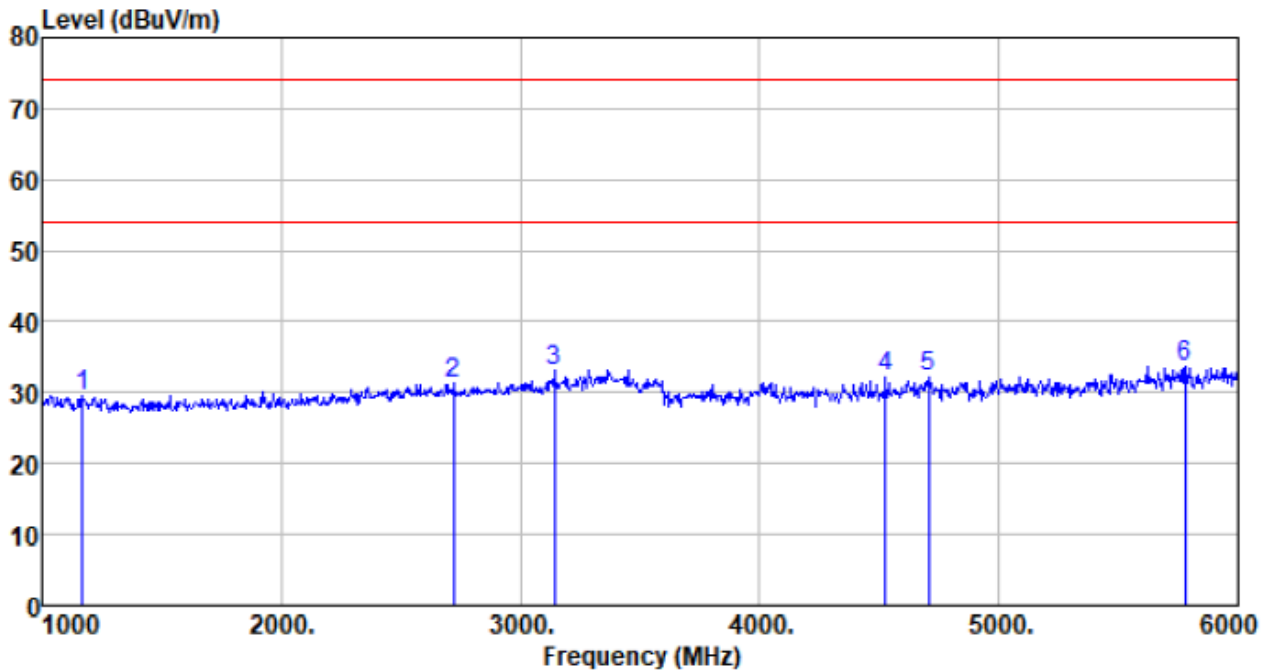
<b>Mode:</b>	<b>Transmitting mode</b>	<b>Polarization:</b>	<b>Vertical</b>
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Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
34.639	41.58	11.29	0.61	35.33	18.15	40.00	-21.85	QP
42.007	40.86	12.22	0.69	35.78	17.99	40.00	-22.01	QP
49.359	40.42	12.29	0.77	36.15	17.33	40.00	-22.67	QP
96.099	40.24	11.65	1.16	36.69	16.36	43.50	-27.14	QP
167.824	41.87	8.46	1.67	37.18	14.82	43.50	-28.68	QP
869.130	53.00	22.02	4.74	37.61	42.15	46.00	-3.85	QP

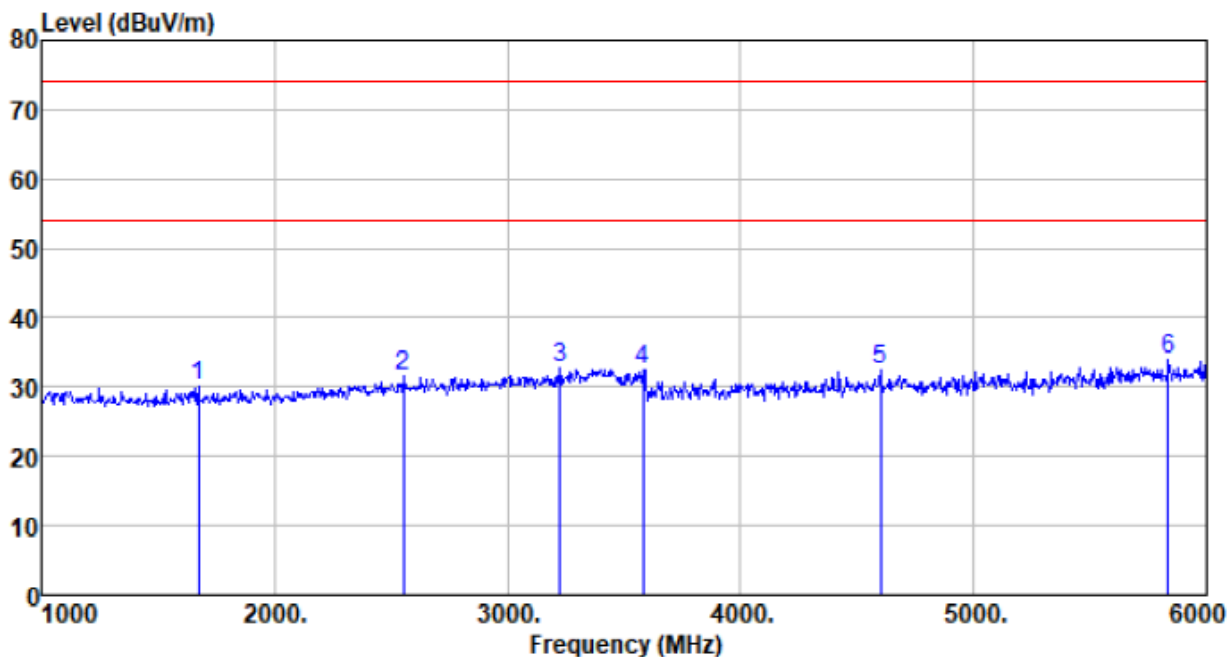
Above 1G:

<b>Mode:</b>	<b>Transmitting mode</b>	<b>Polarization:</b>	<b>Horizontal</b>
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Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
1170.000	38.65	24.75	2.12	35.88	29.64	74.00	-44.36	Peak
2720.000	37.17	28.02	3.17	37.11	31.25	74.00	-42.75	Peak
3140.000	38.54	28.40	3.56	37.32	33.18	74.00	-40.82	Peak
4525.000	34.51	30.74	4.44	37.62	32.07	74.00	-41.93	Peak
4705.000	34.21	31.05	4.56	37.69	32.13	74.00	-41.87	Peak
5780.000	32.58	32.21	5.44	36.69	33.54	74.00	-40.46	Peak

<b>Mode:</b>	<b>Transmitting mode</b>	<b>Polarization:</b>	<b>Vertical</b>
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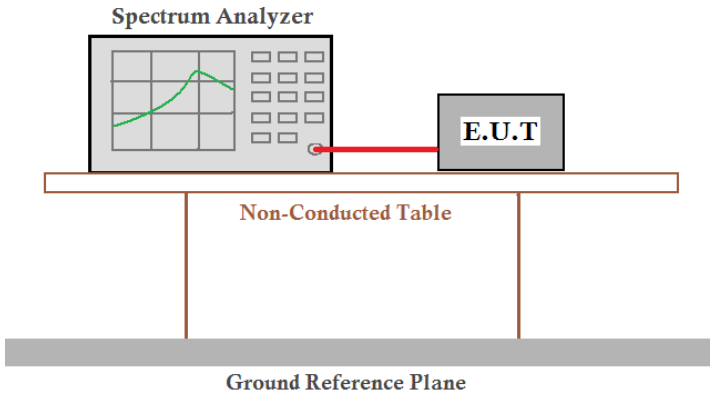


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
1675.000	38.30	25.60	2.39	36.29	30.00	74.00	-44.00	Peak
2555.000	37.77	27.79	3.06	36.99	31.63	74.00	-42.37	Peak
3225.000	38.09	28.40	3.62	37.33	32.78	74.00	-41.22	Peak
3580.000	37.46	28.64	3.82	37.36	32.56	74.00	-41.44	Peak
4600.000	34.60	30.87	4.51	37.65	32.33	74.00	-41.67	Peak
5835.000	32.72	32.30	5.48	36.62	33.88	74.00	-40.12	Peak

**Remarks:**

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

## 7.2 20dB Occupy Bandwidth

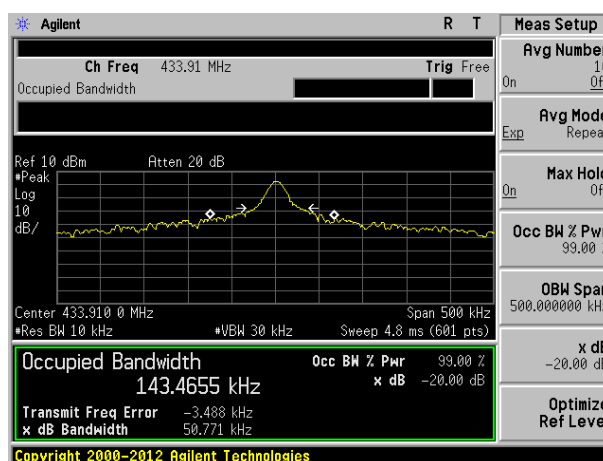
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test setup:	
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)	20dB bandwidth (kHz)	Limit (MHz)	Result
433.91	50.771	1.085	Pass

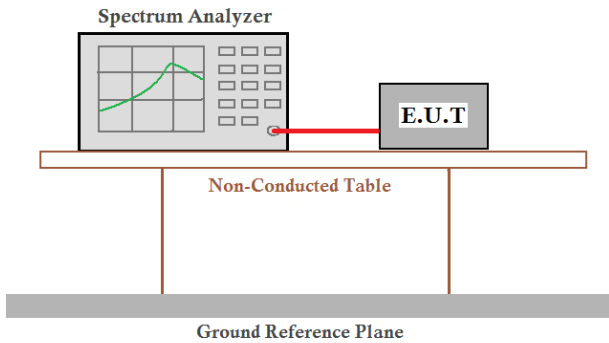
Note: Limit= Fundamental frequency×0.25%  
 $433.91 \times 0.25\% = 1.085\text{MHz}$

Test plot as follows:





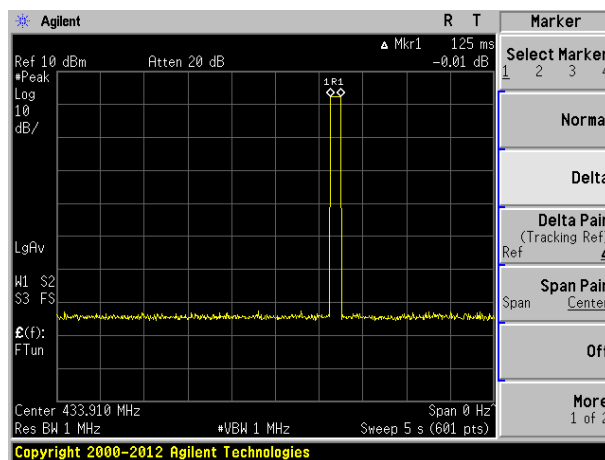
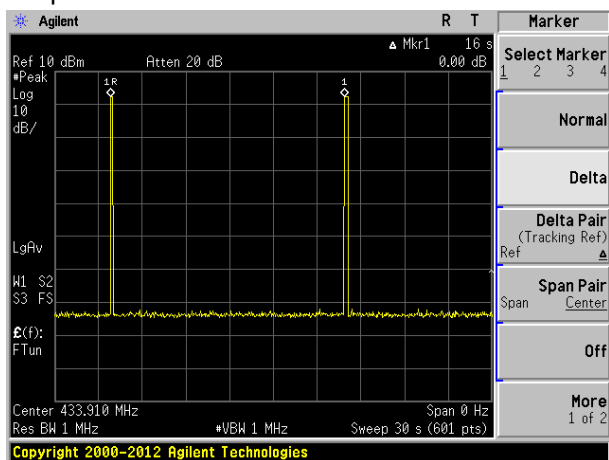
### 7.3 Dwell Time

Test Requirement:	FCC Part15 C Section 15.231 (e)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1000KHz, VBW=1000KHz, 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:

Frequency (MHz)	Duration of each TX (second)	Limit (second)	Result
433.91	0.125	<1.0	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 -----