

**FCC PART 95 TEST REPORT**

**for**

**GPS dog tracking collar**

**Model No.: DC50 Series**

of

Applicant: **Garmin International Inc**

Address: 1200 E. 151st Street Olathe, Kansas 66062 United States

Tested and Prepared

by

**Worldwide Testing Services (Taiwan) Co., Ltd.**

**FCC Registration No.: 930600**

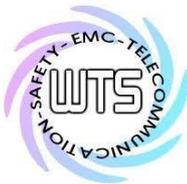
**Industry Canada filed test laboratory Reg. No. IC 5679A-1**

**A2LA Accredited No.: 2732.01**



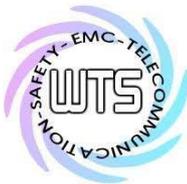
**Report No.: W6M21303-13066-C-95**

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.  
TEL: 886-2-66068877 FAX: 886-2-66068879 E-mail: [wts@wts-lab.com](mailto:wts@wts-lab.com)



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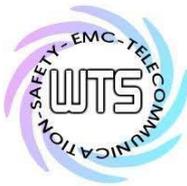
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## 1. General Information

### 1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.

The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.

Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.

Neither is there any guarantee that such a test sample will interwork with other genuinely open systems. The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that its performance generally conforms to representative cases of communications equipment.

The test results of this test report relate exclusively to the item tested as specified in 1.5.

The test report may only be reproduced or published in full.

Reproduction or publication of extracts from the report requires the prior written approval of the Worldwide Testing Services(Taiwan) Co., Ltd.

### Tester:

June 03, 2013

Robert Ren

Date

WTS-Lab.

Name

Signature

### Technical responsibility for area of testing:

June 03, 2013

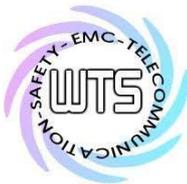
Danny Sung

Date

WTS

Name

Signature



# Worldwide Testing Services(Taiwan) Co., Ltd.

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## 1.2 Testing laboratory

### 1.2.1 Location

OATS

No.5-1, Lishui, Shuang Sing Village,  
Wanli Dist., New Taipei City 207,  
Taiwan (R.O.C.)

3 meter semi-anechoic chamber

No.35, Aly. 21, Ln. 228, Ankang Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

TEL:886-2-6613-0228

FAX:886-2-2791-5046

Company

Worldwide Testing Services(Taiwan) Co., Ltd.

6F, NO. 58, LANE 188, RUEY-KUANG RD.

NEIHU, TAIPEI 114, TAIWAN R.O.C.

Tel : 886-2-66068877

Fax : 886-2-66068879

### 1.2.2 Details of accreditation status

Accredited testing laboratory

A2LA accredited number: 2732.01

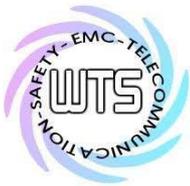
FCC filed test laboratory Reg. No. 930600

Industry Canada filed test laboratory Reg. No. IC 5679A-1



**Test location, where different from Worldwide Testing Services (Taiwan) Co., Ltd. :**

Name:	./.
Accredited number:	./.
Street:	./.
Town:	./.
Country:	./.
Telephone:	./.
Fax:	./.



Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

**1.3 Details of approval holder**

Name: Garmin International Inc  
Street: 1200 E. 151st Street  
City: Olathe, Kansas 66062  
Country: United States  
Telephone: (913) 397-8448  
Fax: (913) 397-8282

**1.4 Application details**

Date of receipt of test item: April 26, 2013  
Date of test: from April 29, 2013 to May 31, 2013

**1.5 General information of Test item**

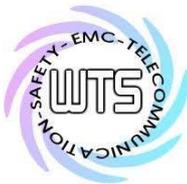
Type of test item: GPS dog tracking collar  
Model Number: DC50 Series  
Brand Name: Garmin  
Multi-listing model number: ./.  
Photos: See appendix

**Technical data**

Operating frequency band:

Frequency(MHz)	Used Band
151.820 MHz	<input checked="" type="checkbox"/>
151.880 MHz	<input checked="" type="checkbox"/>
151.940 MHz	<input checked="" type="checkbox"/>
154.570 MHz	<input checked="" type="checkbox"/>
154.600 MHz	<input checked="" type="checkbox"/>

Sample tested frequency: 151.820 MHz - 154.600 MHz  
Number of RF-channels: 5  
Type of modulation: GFSK  
Designation of emission: 10K2F1D



# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21303-13066-C-95  
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Antenna Type: braided antenna / gain: -0.09 dBi

Connection of Antenna:  detachable  not detachable

Power supply: Adaptor 1 (P/N: 362-00072-00):  
(I/P: 100-240V / 50-60Hz / 0.3A / 10-20VA;  
O/P: 5V / 1.0A MAX)  
Adaptor 2 (P/N: 362-00087-00):  
(I/P: 100-240V / 50-60Hz / 200mA; O/P: 5V / 1A)  
Battery: 3.7V / 2300mAh / 8.6Wh  
DC 12V

End point of Battery voltage: 3.145V / 4.255V

Operation modes: Simplex

Part number information:  
AC adaptor-GPN: 362-00072-00 for Adaptor 1  
362-00087-00 for Adaptor 2

CLA- GPN: 013-00434-00

DC50-GPN: 011-03142-0x

Charger cable assembly-GPN: 320-00788-00

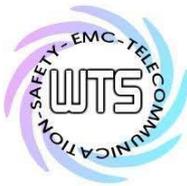
Antenna-GPN: 700-00034-51 for short antenna  
700-00034-52 for long antenna

**Manufacturer:** (if applicable)

Name: Garmin Corporation  
Street: No.68, Zhangshu 2nd Rd., Xizhi Dist.,  
Town: New Taipei City 221,  
Country: Taiwan (R.O.C.)

## 1.6 Test standards

Technical standard:  
FCC RULES PART 95 - Personal Radio Service  
(2011-10) Subpart J - Multi-Use Radio Service (MURS)  
Subpart E - Technical Regulations  
FCC RULES PART 2 - Frequency Allocations General Rules and Regulations  
(2011-10)



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**2. Technical test**

**2.1 Summary of test results**

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

**or**

The deviations as specified in 3 were ascertained in the course of the tests performed.

**2.2 Test environment**

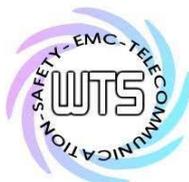
Temperature: 23 °C  
Relative humidity content: 20 ... 75 %  
Air pressure: 86-103 KPa

**2.3 Description of Tested System**

The EUT was tested with the Accessories or Peripherals Listed below:

Equipment	Model No.	Series No.	Software	Cable information	Note
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--

Explanation: The EUT was configured as stand alone device, and there are no accessories or peripherals during the test.

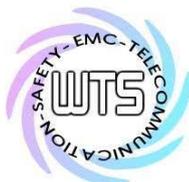


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## 2.4 Test Equipment List

No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-CE 001	EMI TEST RECEIVER	ESHS10	842121/013	R&S	2012/9/5	2013/9/4
ETSTW-CE 003	AC POWER SOURCE	APS-9102	D161137	GW	Function Test	
ETSTW-CE 004	ZWEILEITER-V-NETZNACHBILDUNG TWO-LINE V-NETWORK	ESH3-Z5	840731/011	R&S	2012/12/21	2013/12/20
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	2013/3/4	2014/3/3
ETSTW-CE 007	SPECTRUM ANALYZER 5GHz	FSB	849670/001	R&S	Pre-test Use	
ETSTW-CE 008	HF-EICHLEITUNG RF STEP ATTENUATOR 139dB DPSP	334.6010.02	844581/024	R&S	Function Test	
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2012/7/3	2013/7/2
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2012/9/5	2013/9/4
ETSTW-RE 005	EMI TEST RECEIVER	ESVS10	843207/020	R&S	2012/9/5	2013/9/4
ETSTW-RE 012	TUNABLE BANDREJECT FILTER	D.C 0309	146	K&L	Function Test	
ETSTW-RE 013	TUNABLE BANDREJECT FILTER	D.C 0336	397	K&L	Function Test	
ETSTW-RE 018	MICROWAVE HORN ANTENNA	AT4560	27212	AR	2012/10/12	2013/10/11
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	ETS-Lindgren	2012/8/01	2013/7/31
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	EMCO	2013/3/4	2014/3/3
ETSTW-RE 045	ESA-E SERIES SPECTRUM ANALYZER	E4404B	MY45111242	Agilent	Pre-test Use	
ETSTW-RE 049	TRILOG Super Broadband test Antenna	VULB 9160	9160-3185	Schwarzbeck	2013/3/21	2014/3/20
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2013/3/4	2014/3/3
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2013/3/4	2014/3/3
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2013/3/4	2014/3/3
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2013/5/28	2014/5/27
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2013/3/4	2014/3/3
ETSTW-RE 062	Amplifier Module	CHC 2	None	KMIC	2012/11/28	2013/11/27
ETSTW-RE 064	Bluetooth Test Set	MT8852B-042	6K00005709	Anritsu	Function Test	
ETSTW-RE 069	Double-Ridged Guide Horn Antenna	3117	00069377	EMCO	Function Test	
ETSTW-RE 072	CELL SITE TEST SET	8921A	3339A00375	HP	2012/10/5	2013/10/4
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2012/10/12	2013/10/11
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2013/3/4	2014/3/3
ETSTW-RE 106	Humidity Temperature Meter	TES-1366	091011113	TES	2012/12/4	2013/12/3
ETSTW-RE 111	TRILOG Super Broadband test Antenna	VULB 9160	9160-3309	Schwarz beck	2012/12/13	2013/12/12
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	None	T-Power	Function test	
ETSTW-RE 115	2.4GHz Notch Filter	N0124411	473874	MICROWAVE CIRCUITS	2013/1/11	2014/1/10
ETSTW-RE 120	RF Player	MP9200	MP9210-111022	ADIVIC	Function test	



# Worldwide Testing Services(Taiwan) Co., Ltd.

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ETSTW-RE 122	SIGNAL GENERATOR	SMF100A	102149	R&S	2012/7/3	2013/7/2
ETSTW-RE 125	5GHz Notch filter	5NSL11-5200/E221.3-O/O	1	K&L Microwave	2012/8/18	2013/8/17
ETSTW-RE 126	5GHz Notch filter	5NSL11-5800/E221.3-O/O	1	K&L Microwave	2012/8/18	2013/8/17
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2013/3/4	2014/3/3
ETSTW-GSM 002	Universal Radio Communication Tester	CMU 200	109439	R&S	2012/10/5	2013/10/4
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40 /12+9SS	3	WI	2013/1/11	2014/1/10
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2013/1/11	2014/1/10
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2013/1/11	2014/1/10
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2013/1/11	2014/1/10
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2012/9/18	2013/9/17
ETSTW-Cable 010	BNC Cable	5 M BNC Cable	None	JYE BAO CO.,LTD.	2013/3/4	2014/3/3
ETSTW-Cable 011	BNC Cable	BNC Cable 1	None	JYE BAO CO.,LTD.	Pre-test Use NCR	
ETSTW-Cable 012	N TYPE To SMA Cable	Cable 012	None	JYE BAO CO.,LTD.	2013/3/4	2014/3/3
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2013/3/4	2014/3/3
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2013/3/4	2014/3/3
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2013/3/4	2014/3/3
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2013/3/4	2014/3/3
ETSTW-Cable 022	N TYPE Cable	5006	0002	JYE BAO CO.,LTD.	2013/3/26	2014/3/25
ETSTW-Cable 026	Microwave Cable	SUCOFLEX 104	279075	HUBER+SUHNER	2013/3/4	2014/3/3
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2013/3/4	2014/3/3
ETSTW-Cable 028	Microwave Cable	FA147A0015M2020	30064-2	UTIFLEX	2012/10/12	2013/10/11
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2012/10/12	2013/10/11
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 (S_Cable 9)	279067	HUBER+SUHNER	2013/3/4	2014/3/3
ETSTW-Cable 031	Microwave Cable	SUCOFLEX 104 (S_Cable 10)	238092	HUBER+SUHNER	2012/11/28	2013/11/27
ETSTW-Cable 043	Microwave Cable	SUCOFLEX 104	317576	HUBER+SUHNER	2012/11/28	2013/11/27
ETSTW-Cable 047	Microwave Cable	SUCOFLEX 104	325518	HUBER+SUHNER	2012/11/28	2013/11/27
ETSTW-Cable 053	N TYPE To SMA Cable	RG142	None	JYE BAO CO.,LTD.	2013/3/26	2014/3/25
ETSTW-Cable 054	BNC To SMA Cable	RG142	None	JYE BAO CO.,LTD.	2013/3/26	2014/3/25
WTSTW-SW 002	EMI TEST SOFTWARE	EZ_EMCC	None	Farad	Version ETS-03A1	



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## **2.5 General Test Procedure**

**POWER LINE CONDUCTED INTERFERENCE:** The procedure used was ANSI STANDARD C63.4-2009 5.2 using a 50 $\mu$ H LISN (if necessary). Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

**RADIATION INTERFERENCE:** The test procedure used was according to ANSI STANDARD C63.4-2009 6.4 employing a spectrum analyzer. For investigated frequency is equal to or below 1GHz, the RBW and VBW of the spectrum analyzer was 100 kHz and 100kHz respectively with an appropriate sweep speed. For investigated frequency is above 1GHz, both of RBW and VBW of the spectrum analyzer were 1 MHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 23°C with a humidity of 40 %.

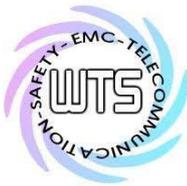
The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to the frequency specified as follows:

- (1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
- (2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
- (3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
- (4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1)-(a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this Section, whichever is the higher frequency range of investigation.

For hand-held devices, an exploratory test was performed with three (3) orthogonal planes to determine the highest emissions.

Measurements were made by at the registered open field test site located at The Registration Number: 930600. When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

ANSI STANDARD C63.4-2009 10.2.7: Any measurements that utilize special test software shall be indicated and referenced in the test report. During testing, test software 'EZ EMC' was used for setting up different operation modes.

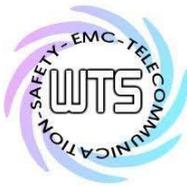


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**3. Test results (enclosure)**

TEST CASE	Para. Number	Required	Test passed	Test failed
RF Power Output	2.1046; 95.639 (h)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Modulation Deviation	2.1047 (b) 95.631 (j)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Audio Frequency Response	2.1047 (a) 95.631 (j)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occupied Bandwidth / Emission Mask	2.1049 (c)(1); 95.633 (f) 95.635 (e)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Radiated Spurious Emission Transmitter	2.1053 95.635 (e)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Radiated Spurious Emission Receiver	Part 15B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Frequency Stability vs. Temperature	2.1055 (b); 95.632(c)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Frequency Stability vs. Voltage	2.1055 (a)(1); 95.632(c)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

The following is intentionally left blank.



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FCC ID: IPH-02228

## 4. RF Power Output (conducted), FCC 2.1046; 95.639

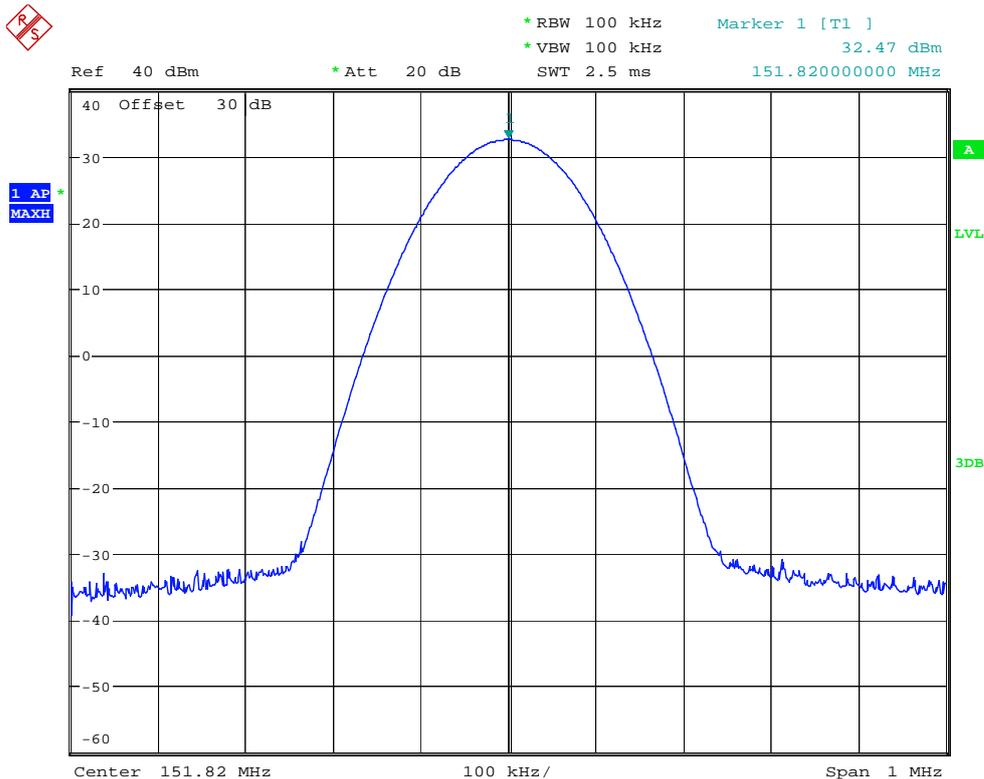
### 4.1 Test procedure

This transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a spectrum analyzer. Transmitter output was derived with the spectrum analyzer in dBm. The power output at the transmitter antenna port was determined by assign the value of the attenuator to the spectrum analyzer reading.

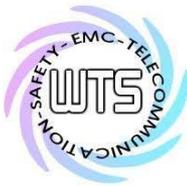
An HP power meter was also used to measure the RF power.

Tests were performed with an un-modulated carrier at three frequencies (low, middle and high channels) and on all power levels, which can be set-up on the transmitters, if applicable.

### 4.2 Test Results

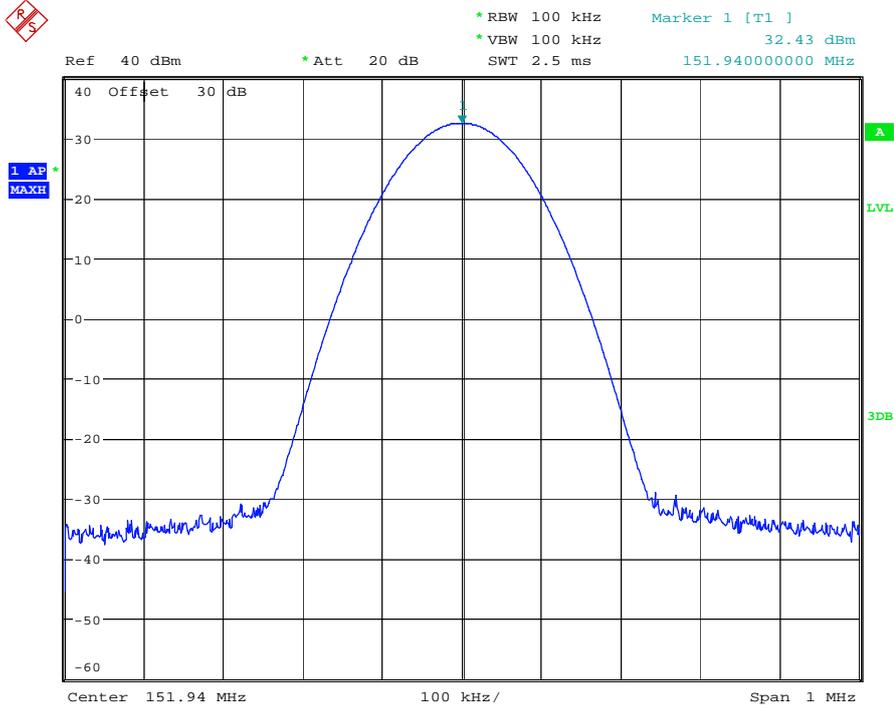


MAX OUTPUT POWER 151.82MHz  
Date: 27.MAY.2013 16:30:09

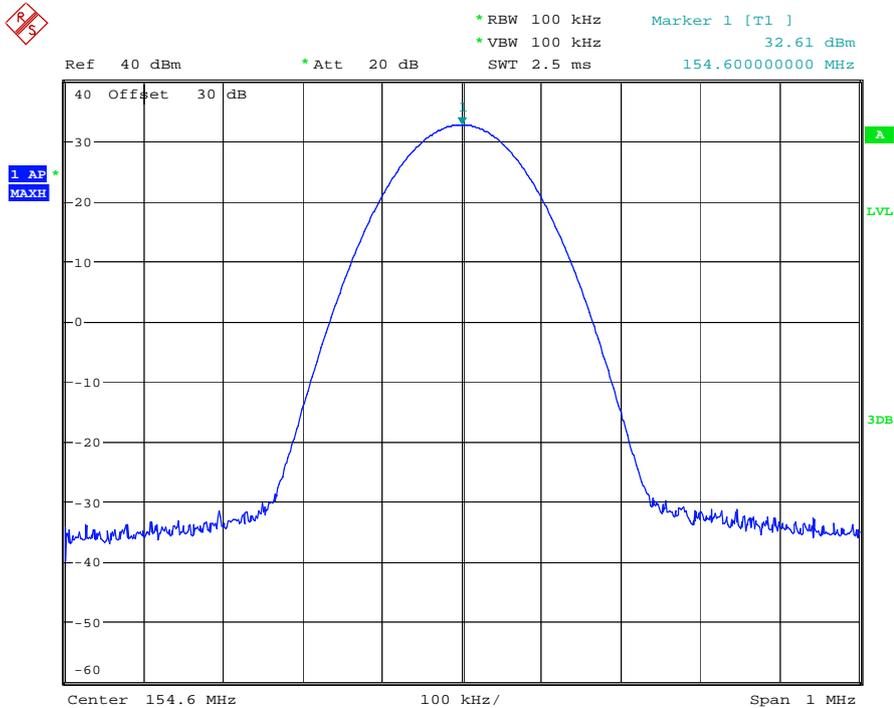


# Worldwide Testing Services(Taiwan) Co., Ltd.

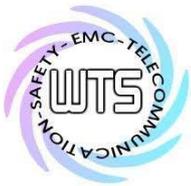
Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228



MAX OUTPUT POWER 151.94MHz  
Date: 27.MAY.2013 16:30:36



MAX OUTPUT POWER 154.60MHz  
Date: 27.MAY.2013 16:31:05



Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

**4.3 Limits:**

No MURS unit, under any condition of modulation, shall exceed 2 Watts transmitter power output.

Test equipment used: ETSTW-RE 060, ETSTW-RE 055

Registration number: W6M21303-13066-C-95  
 FCC ID: IPH-02228

## 5. Radiated Power

### 5.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground on an open test site. The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer.

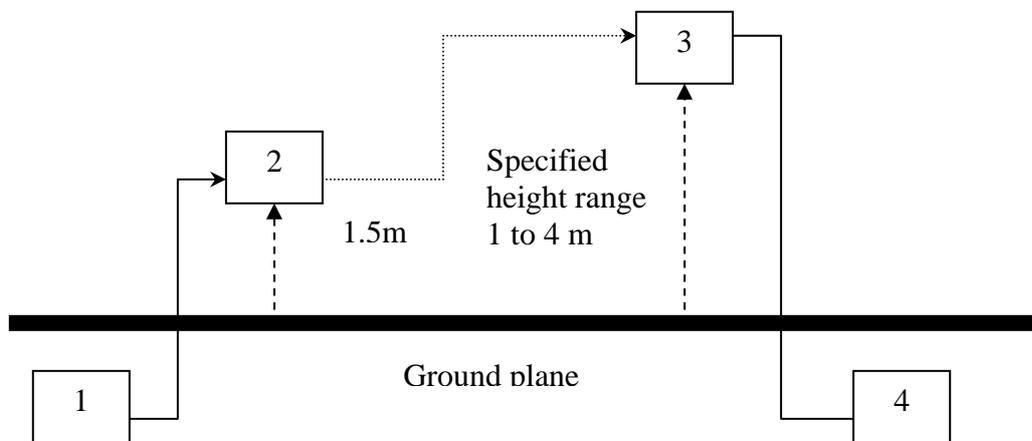
Worst case emission was recorded with the rotation of the turntable and the rising and lowering of the test antenna.

### Substitution RF power Measurement at WTS

General:

The applied substitution method follows ANSI/TIA/EIA-603, ANSI/TIA/EIA-102.CAAA or the appropriate ETSI rules respectively.

The actual signal generated by the EUT can be determined by means of a substitution measurement in which a known signal source replaces the device to be measured.

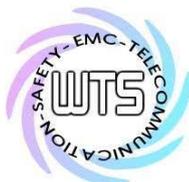


- 1) Signal generator ;
- 2) Substitution antenna ;
- 3) Test antenna ;
- 4) Spectrum analyzer or selective voltmeter.

The substitution antenna replaces the transmitter antenna at the same position and in vertical polarization. The frequency of the signal generator shall be adjusted to the measurement frequency. The test antenna shall be raised or lowered, if necessary, to ensure that the maximum signal is still received. The input signal to the substitution antenna shall be adjusted in level until an equal or a known related level to that detected from the transmitter is obtained in the measurement receiver. If a fully anechoic chamber is used as test site in order to provide free space conditions there is no need to change the height of the antenna.

The measurement will be repeated in horizontal position.





# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21303-13066-C-95

FCC ID: IPH-02228

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
151.9330	-1.31	24.58	23.27	33.00	-9.73	100	150

Mode: TX Power CH5

Polarization: Horizontal

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
154.5970	-18.57	24.22	5.65	33.00	-27.35	20	150

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
154.5930	-0.65	24.80	24.15	33.00	-8.85	100	150

## Antenna (P/N: 700-00034-52)

Model: DC50 Series

Date: 2013/4/30

Mode: TX Power CH1

Temperature: 24 °C

Engineer: Danny

Polarization: Horizontal

Humidity: 60 %

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
151.8150	-11.99	24.03	12.04	33.00	-20.96	20	150

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
151.8150	5.43	24.57	30.00	33.00	-3.00	100	150

Mode: TX Power CH3

Polarization: Horizontal

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
151.9350	-11.74	24.03	12.29	33.00	-20.71	20	150



# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21303-13066-C-95

FCC ID: IPH-02228

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
151.9330	3.98	24.58	28.56	33.00	-4.44	100	150

Mode: TX Power CH5

Polarization: Horizontal

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
154.5930	-11.81	24.22	12.41	33.00	-20.59	20	150

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
154.5950	5.86	24.80	30.66	33.00	-2.34	100	150

Test equipment used: ETSTW-RE 003, ETSTW-RE 004, ETSTW-RE 122, ETSTW-RE 030, ETSTW-RE 042, ETSTW-RE 043, ETSTW-RE 044

Explanation: Please see attached diagram as appendix.

### 5.3 Limits:

No MURS unit, under any condition of modulation, shall exceed 2 Watts transmitter power output.

Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

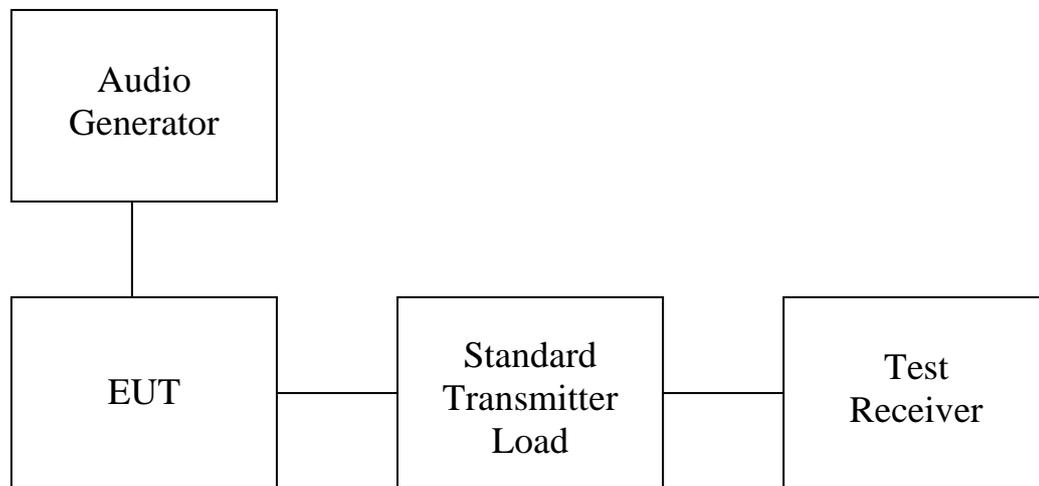
## **6. Modulation Deviation, FCC 2.1047 (b), 95.631(j)**

### **6.1 Test procedure**

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of rated system deviation.

The audio signal generator is connected to the audio input of the EUT with its full rating.

The modulation response is measured at certain modulation frequencies, related to 1000Hz reference signal. Tests are performed for positive and negative modulation.



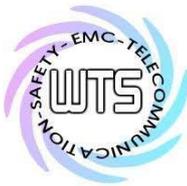
### **6.2 Test results:**

Explanation: This test is not required because the EUT belongs to digital modulation.

### **6.3 Limits:**

A MURS transmitter must transmit only emission types A1D, A2B, A2D, A3E, F2B, F1D, F2D, F3E, G3E. Emission types A3E, F3E and G3E include selective calling or tone-operated squelch tones to establish or continue voice communications. MURS transmitters are prohibited from transmitting in the continuous carrier mode.

Test equipment used: ETSTW-RE 055, ETSTW-RE 060



Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

## **7. Audio frequency response, FCC 2.1047 (a)**

### **7.1 Test procedure**

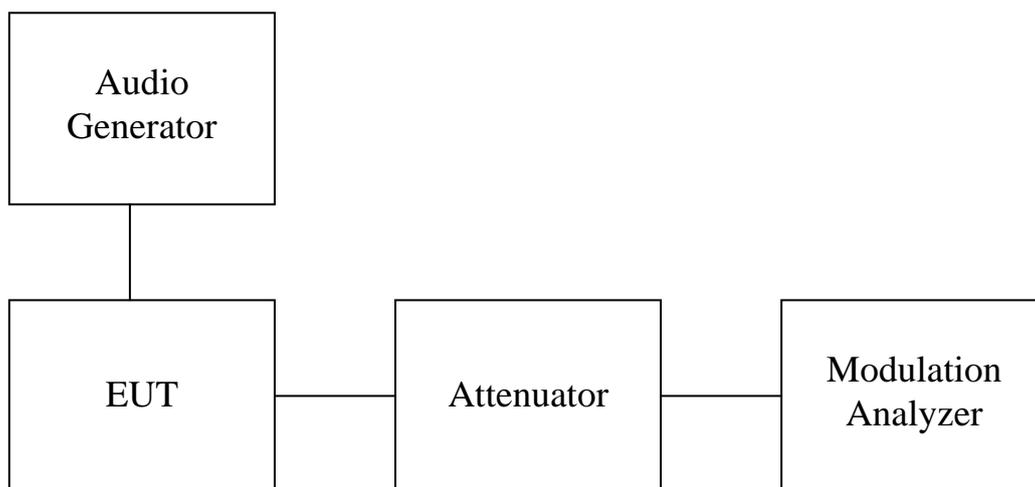
The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The frequency response of the audio modulation part is measured over a frequency range of 100 Hz to 5000Hz.

For 1000Hz tone reference signal the audio generator level is adjusted to get 20% of the rated system deviation.

The deviations obtained over the frequency range from 100Hz to 5000Hz are recorded and compared with the reference deviation as follows:

$$\text{Audio Frequency Response} = 20 \log [ \text{DEV}_{\text{Freq}} / \text{DEV}_{\text{ref}} ].$$



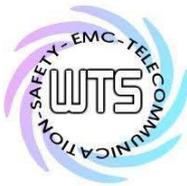
### **7.2 Test results:**

Explanation: This test is not required because the EUT belongs to digital modulation.

### **7.3 Limits:**

A MURS transmitter must transmit only emission types A1D, A2B, A2D, A3E, F2B, F1D, F2D, F3E, G3E. Emission types A3E, F3E and G3E include selective calling or tone-operated squelch tones to establish or continue voice communications. MURS transmitters are prohibited from transmitting in the continuous carrier mode.

Test equipment used: ETSTW-RE 072, ETSTW-RE 055



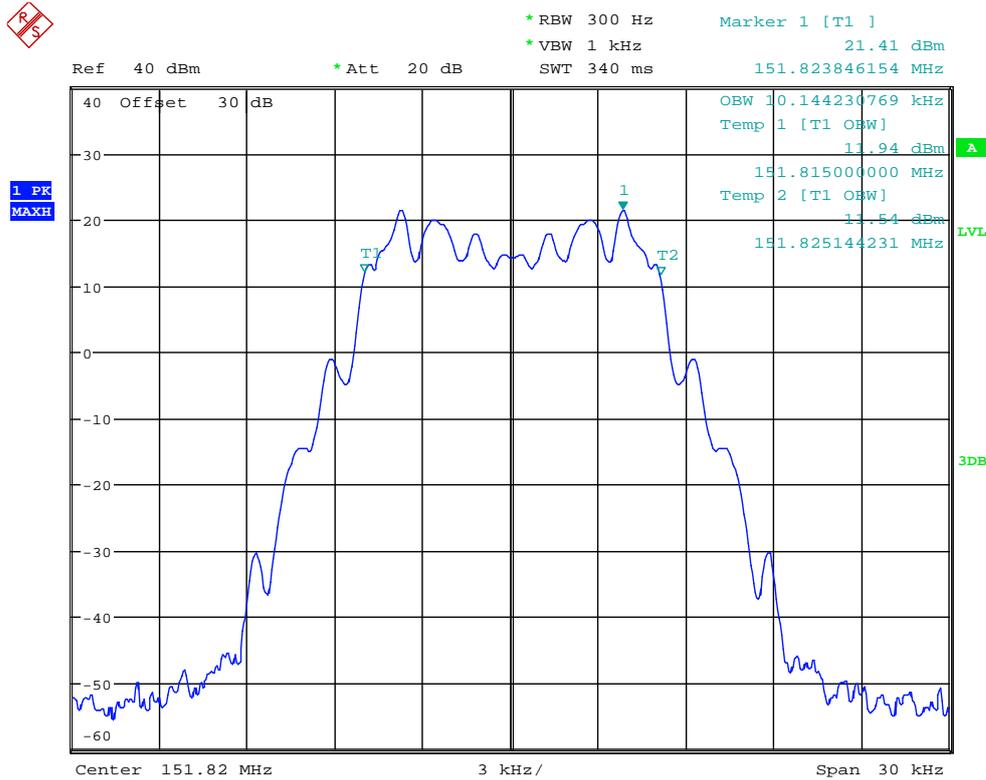
Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

## 8. Occupied Bandwidth/Emission Mask, FCC 2.1049 (c) ; 95.632

The authorized bandwidth is 11.25 kHz on frequencies 151.820 MHz, 151.880 MHz and 151.940 MHz.  
The authorized bandwidth is 20.0 kHz on frequencies 154.570 and 154.600 MHz.

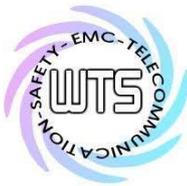
### 8.1 Test Results

#### Occupied Bandwidth



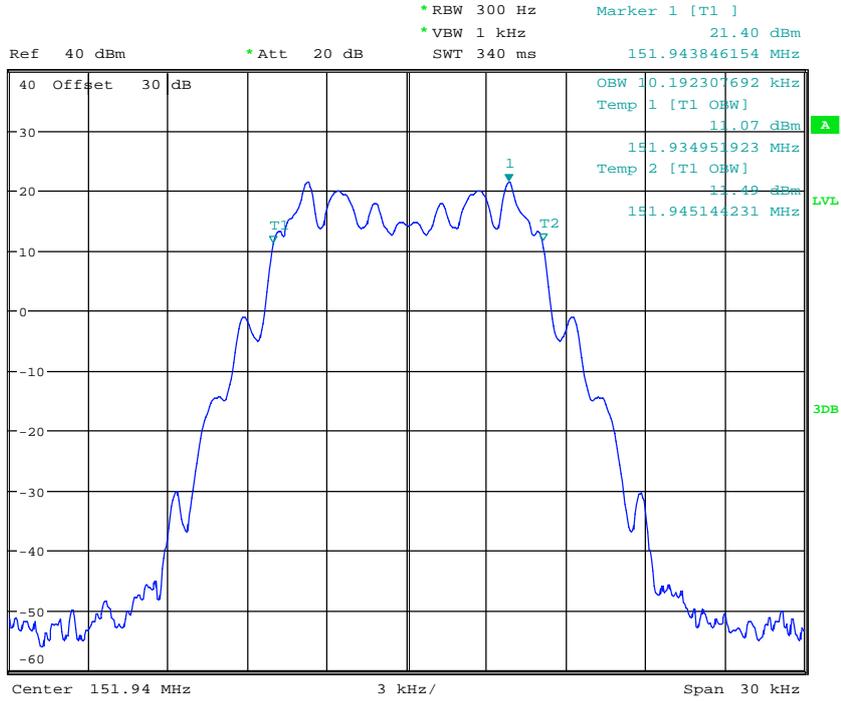
OCCUPIED BANDWIDTH 151.82MHz

Date: 2.MAY.2013 15:08:15



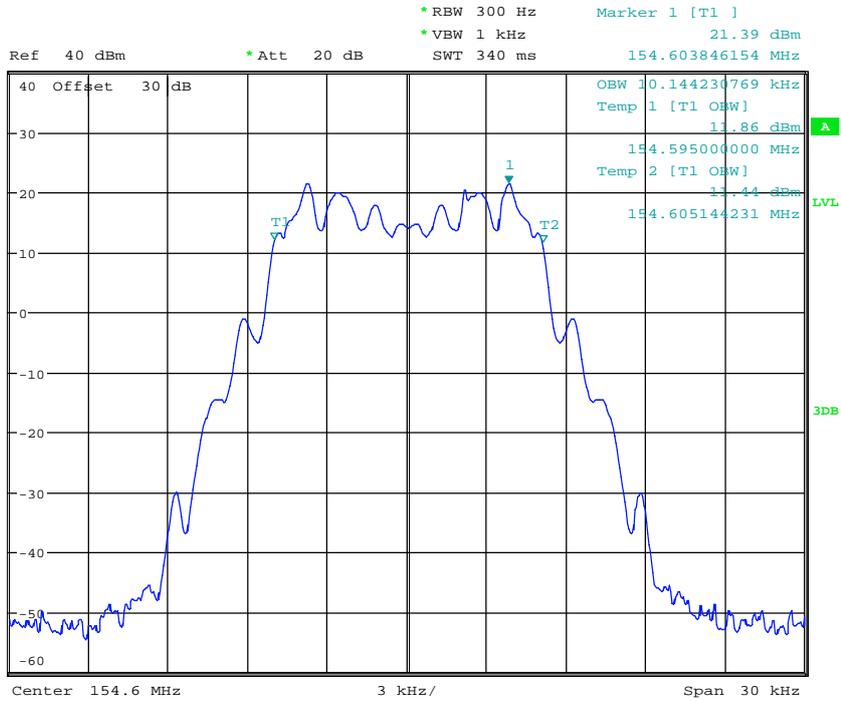
# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228



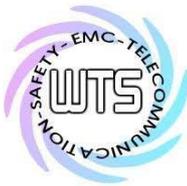
OCCUPIED BANDWIDTH 151.94MHz

Date: 2.MAY.2013 15:07:47



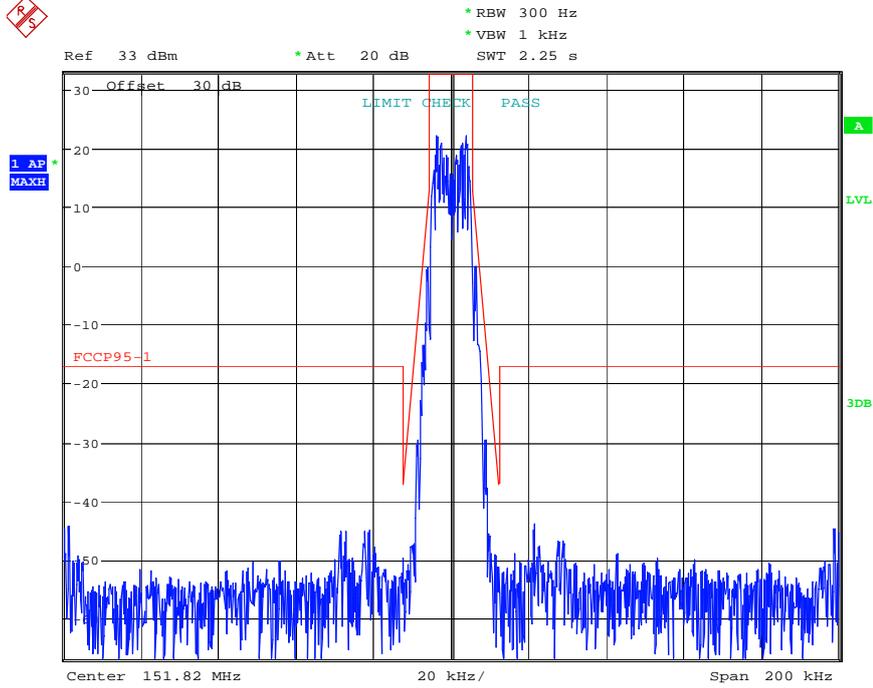
OCCUPIED BANDWIDTH 154.6MHz

Date: 2.MAY.2013 15:07:16

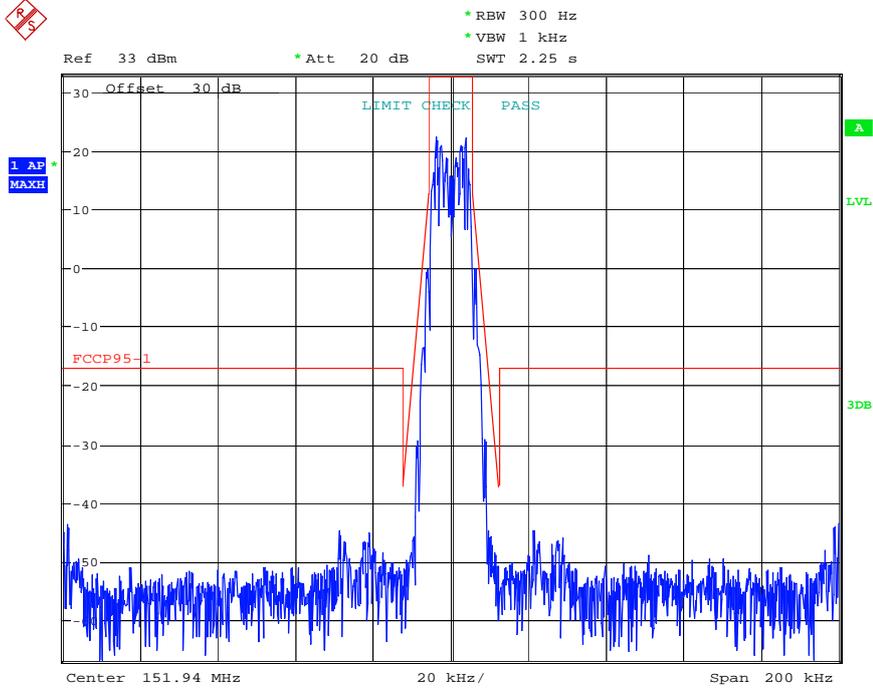


Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

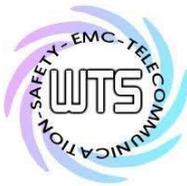
## Emission Mask



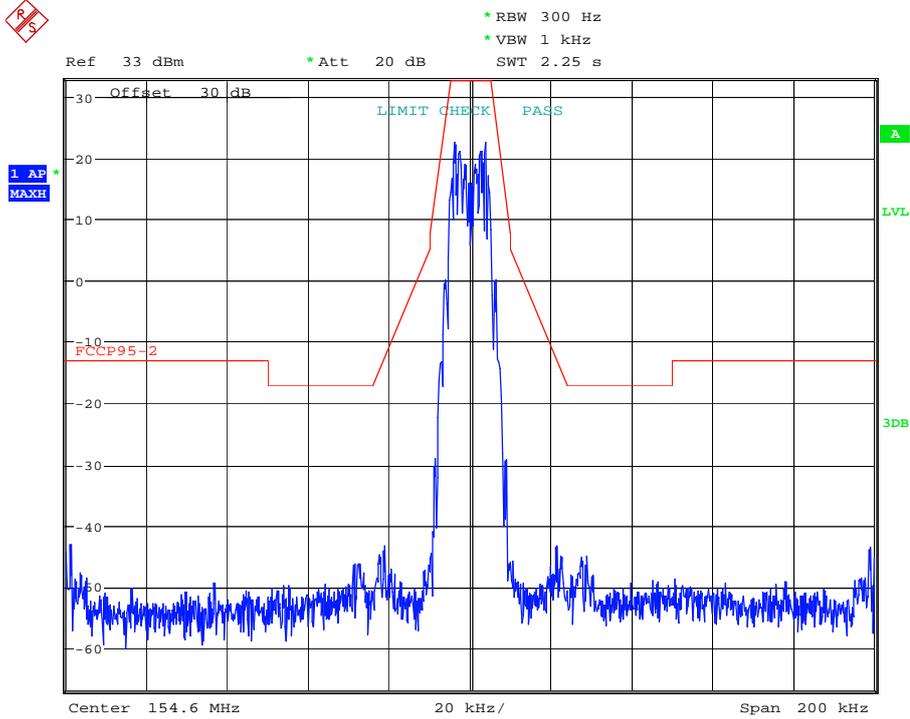
EMISSION MASK 151.82MHz  
Date: 27.MAY.2013 14:46:49



EMISSION MASK 151.94MHz  
Date: 27.MAY.2013 14:46:19



Registration number: W6M21303-13066-C-95  
 FCC ID: IPH-02228

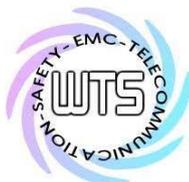


EMISSION MASK 154.60MHz  
 Date: 27.MAY.2013 14:45:41

## 8.2 Limit

Frequencies	Authorized bandwidth
151.820 MHz 151.880 MHz 151.940 MHz	11.25 kHz
154.570 and 154.60 MHz	20.0 kHz

Test equipment used: ETSTW-RE 055, ETSTW-RE 060



Registration number: W6M21303-13066-C-95

FCC ID: IPH-02228

## 9. Radiated Spurious Emission, FCC 2.1053; 95.635

### 9.1 Test procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane.

The radiated emission at the fundamental frequency was measured at 3 m distance with a test antenna and spectrum analyzer.

Worst case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna.

ERP was measured using a substitution method. The EUT was replaced by reference antenna connected to a signal generator.

The test of spurious radiated emission has been carried out with the validated test software. The measurements below 1GHz were performed with a measurement bandwidth of 100 kHz, above 1GHz with a bandwidth of 1MHz.

Spurious emission limits near the carrier are defined by a emission mask.

### 9.2 Test Results

The measurements of the spurious emission at the upper, center and lower channel, if applicable.

The measurement diagrams show that all significant spurious emissions are well below the limit line.

#### 9.2.1 Spurious emission near the carrier:

The Results of Emission Mask:  PASSED  NOT PASSED

#### 9.2.2 Spurious emission not near the carrier:

##### Antenna (P/N: 700-00034-51)

Model: DC50 Series

Date: 2013/4/30

Mode: TX CH1

Temperature: 24 °C

Engineer: Danny

Polarization: Horizontal

Humidity: 60 %

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
91.6633	-102.39	22.96	-79.43	-20.00	-59.43	160	150
454.9098	-31.46	-6.96	-38.42	-20.00	-18.42	100	150
607.2144	-37.02	-3.70	-40.72	-20.00	-20.72	250	150
759.5190	-37.77	-2.74	-40.51	-20.00	-20.51	190	150
911.8236	-51.89	0.16	-51.73	-20.00	-31.73	100	150
2274.5490	-58.41	7.21	-51.20	-20.00	-31.20	200	150



# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21303-13066-C-95

FCC ID: IPH-02228

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
92.0040	-102.14	23.66	-78.48	-20.00	-58.48	200	150
302.6052	-35.36	-7.51	-42.87	-20.00	-22.87	200	150
454.9098	-32.73	-7.27	-40.00	-20.00	-20.00	190	150
607.2144	-32.28	-3.66	-35.94	-20.00	-15.94	210	150
759.5190	-31.29	-1.37	-32.66	-20.00	-12.66	140	150
1210.4210	-44.86	2.47	-42.39	-20.00	-22.39	200	150

Mode: TX CH3

Polarization: Horizontal

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
97.7956	-102.28	23.28	-79.00	-20.00	-59.00	250	150
454.9098	-30.92	-6.96	-37.88	-20.00	-17.88	190	150
607.2144	-36.00	-3.70	-39.70	-20.00	-19.70	240	150
759.5190	-37.35	-2.74	-40.09	-20.00	-20.09	190	150
911.8236	-51.81	0.16	-51.65	-20.00	-31.65	200	150
1210.4210	-49.18	1.09	-48.09	-20.00	-28.09	240	150

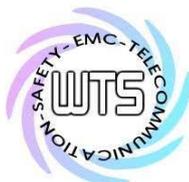
Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
91.6633	-101.77	23.62	-78.15	-20.00	-58.15	20	150
302.6051	-34.98	-7.51	-42.49	-20.00	-22.49	250	150
454.9098	-32.37	-7.27	-39.64	-20.00	-19.64	170	150
607.2144	-31.36	-3.66	-35.02	-20.00	-15.02	160	150
759.5190	-30.92	-1.37	-32.29	-20.00	-12.29	200	150
1210.4210	-40.97	2.47	-38.50	-20.00	-18.50	130	150

Mode: TX CH5

Polarization: Horizontal

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
78.7174	-103.19	24.08	-79.11	-13.00	-66.11	100	150
462.9260	-32.92	-6.84	-39.76	-13.00	-26.76	260	150
618.4370	-32.90	-2.87	-35.77	-13.00	-22.77	140	150
773.9480	-33.00	-2.61	-35.61	-13.00	-22.61	280	150
927.8557	-53.83	0.17	-53.66	-13.00	-40.66	140	150
1078.1560	-49.44	1.78	-47.66	-13.00	-34.66	130	150



# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21303-13066-C-95

FCC ID: IPH-02228

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
101.8838	-102.92	24.44	-78.48	-13.00	-65.48	160	150
309.0180	-40.75	-7.70	-48.45	-13.00	-35.45	190	150
462.9260	-32.97	-6.74	-39.71	-13.00	-26.71	210	150
618.4370	-29.09	-3.50	-32.59	-13.00	-19.59	280	150
773.9480	-29.95	-1.25	-31.20	-13.00	-18.20	140	150
1234.4690	-43.01	2.06	-40.95	-13.00	-27.95	140	150

## Antenna (P/N: 700-00034-52)

Model: DC50 Series

Date: 2013/4/30

Mode: TX CH1

Temperature: 24 °C

Engineer: Danny

Polarization: Horizontal

Humidity: 60 %

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
92.0040	-94.25	22.98	-71.27	-20.00	-51.27	140	150
454.9098	-39.68	-6.96	-46.64	-20.00	-26.64	240	150
607.2144	-37.96	-3.70	-41.66	-20.00	-21.66	190	150
759.5190	-32.05	-2.74	-34.79	-20.00	-14.79	200	150
911.8236	-48.49	0.16	-48.33	-20.00	-28.33	180	150
1060.1200	-50.32	1.54	-48.78	-20.00	-28.78	290	150

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
125.3908	-93.33	23.42	-69.91	-20.00	-49.91	200	150
454.9098	-32.69	-7.27	-39.96	-20.00	-19.96	280	150
607.2144	-26.24	-3.66	-29.90	-20.00	-9.90	100	150
759.5190	-27.08	-1.37	-28.45	-20.00	-8.45	170	150
911.8236	-41.88	-1.32	-43.20	-20.00	-23.20	140	150
1210.4210	-44.98	2.47	-42.51	-20.00	-22.51	250	150

Mode: TX CH3

Polarization: Horizontal

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
92.0040	-95.35	22.98	-72.37	-20.00	-52.37	240	150
454.9098	-36.92	-6.96	-43.88	-20.00	-23.88	180	150
607.2144	-36.80	-3.70	-40.50	-20.00	-20.50	140	150
759.5190	-33.33	-2.74	-36.07	-20.00	-16.07	210	150
911.8236	-49.59	0.16	-49.43	-20.00	-29.43	160	150
3969.9400	-61.88	11.97	-49.91	-20.00	-29.91	10	150



# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21303-13066-C-95

FCC ID: IPH-02228

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
125.3908	-93.73	23.42	-70.31	-20.00	-50.31	170	150
454.9098	-44.59	-7.27	-51.86	-20.00	-31.86	150	150
607.2144	-26.25	-3.66	-29.91	-20.00	-9.91	190	150
759.5190	-27.23	-1.37	-28.60	-20.00	-8.60	200	150
911.8236	-41.31	-1.32	-42.63	-20.00	-22.63	210	150
1973.9480	-47.51	4.91	-42.60	-20.00	-22.60	20	150

Mode: TX CH5

Polarization: Horizontal

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
160.1402	-97.73	24.59	-73.14	-13.00	-60.14	290	150
462.9260	-40.89	-6.84	-47.73	-13.00	-34.73	240	150
618.4370	-33.49	-2.87	-36.36	-13.00	-23.36	190	150
773.9480	-34.22	-2.61	-36.83	-13.00	-23.83	200	150
927.8557	-49.51	0.17	-49.34	-13.00	-36.34	100	150
1078.1560	-49.93	1.78	-48.15	-13.00	-35.15	180	150

Polarization: Vertical

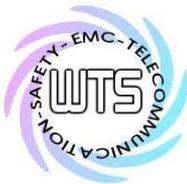
Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
92.0040	-96.73	23.66	-73.07	-13.00	-60.07	240	150
462.9260	-37.31	-6.74	-44.05	-13.00	-31.05	180	150
618.4370	-25.57	-3.50	-29.07	-13.00	-16.07	240	150
773.9480	-27.20	-1.25	-28.45	-13.00	-15.45	100	150
927.8557	-42.50	-1.45	-43.95	-13.00	-30.95	210	150
2010.0200	-46.69	5.42	-41.27	-13.00	-28.27	260	150

**Note:**

1. Correction Factor = Antenna Gain + Cable Loss + Amplifier Gain
2. The formula of measured value as: Test Result = Reading + Correction Factor
3. Detector function in the form : PK = Peak, AV = Average
4. All not in the table noted test results are more than 20 dB below the relevant limits.
5. Measurement uncertainty: 30-200MHz : ±2.11 dB, 200-1000MHz : ±2.11 dB, 1-18GHz : ±2.71 dB  
Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.
6. See the attached diagram as appendix.

Test equipment used: ETSTW-RE 003, ETSTW-RE 004, ETSTW-RE 122, ETSTW-RE 030,

ETSTW-RE 042, ETSTW-RE 043, ETSTW-RE 044



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**9.3 Explanation of test result**

The measurements of the spurious emissions at the equipment output terminals were performed pursuant to the test procedure above in order to verify that any emissions are below the limits given by § 95.635(e).

Calculation of test results:

Such factors like antenna correction, cable loss, external attenuation etc. are already included in the provided measurement results. This is done by using validated test software and calibrated test system according the accreditation requirements.

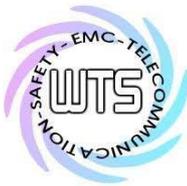
In the Table being listed the critical peak and average value an exhibit the compliance with the above calculated Limits.

**9.4 Limits**

For transmitters designed to operate in the MURS, transmitters shall comply with the following:

Frequency	Mask with audio low pass filter	Mask without audio low pass filter
151.820 MHz, 151.880 MHz and 151.940 MHz.....	(1)	(1)
154.570 MHz and 154.600 MHz	(2)	(3)

(1) Emission Mask 1—For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows: (i) On any frequency from the center of the authorized bandwidth  $f_0$  to 5.625 kHz removed from  $f_0$ : Zero dB. (ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.625 kHz but no more than 12.5 kHz: at least  $7.27(f_d - 2.88)$  dB. (iii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: at least  $50 + 10 \log(P)$  dB or 70 dB, whichever is the lesser attenuation. (2) Emission Mask 2—For transmitters designed to operate with a 25 kHz channel bandwidth that are equipped with an audio low-pass filter, the power of any emission must be below the unmodulated carrier power (P) as follows: (i) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: at least 25 dB. (ii) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: at least 35 dB. (iii) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: at least  $43 + 10 \log(P)$  dB. (3) Emission Mask 3—For transmitters designed to operate with a 25 kHz channel bandwidth that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows: (i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5 kHz, but not more than 10 kHz: at least  $83 \log(f_d/5)$  dB. (ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 10 kHz, but not more than 250 percent of the authorized band-width: at least  $29 \log(f_d^2/11)$  dB or 50 dB, whichever is the lesser attenuation. (iii) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: at least  $43 + 10 \log(P)$  dB.



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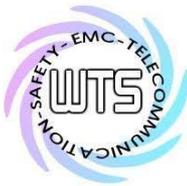
The compliance limit was calculated as the following table:

151.820 MHz, 151.880 MHz and 151.940 MHz

Maximum transmitter output power	30.00 dBm
Required attenuation	$50 + 10 \times \text{Log}( 1.00000000 ) = 50.00 \text{ dBm}$
Maximum transmitter output power	30.00 dBm
Required attenuation	50.00 dBm
Compliance limit	-20 dBm

154.570 MHz and 154.600 MHz

Maximum transmitter output power	30.66 dBm
Required attenuation	$43 + 10 \times \text{Log}( 1.16412603 ) = 43.66 \text{ dBm}$
Maximum transmitter output power	30.66 dBm
Required attenuation	43.66 dBm
Compliance limit	-13 dBm



**10. Frequency Stability vs. Temperature, FCC 2.1055, 95.632**

**10.1 Test procedure**

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable, exited the chamber through an opening made for that purpose.

After the temperature stabilized the frequency output was recorded from the counter.

**10.2 Test Results**

**151.82 MHz**

Temperature(°C)	Frequency(MHz)	Error(kHz)	Error(ppm)
-30	151.820048	-0.019	-0.127
-20	151.820048	-0.019	-0.127
-10	151.820048	-0.019	-0.127
0	151.820048	-0.019	-0.127
+10	151.820048	-0.019	-0.127
+20	151.820067	0.000	0.000
+30	151.820005	-0.063	-0.412
+40	151.820058	-0.010	-0.063
+50	151.820048	-0.019	-0.127

**151.94 MHz**

Temperature(°C)	Frequency(MHz)	Error(kHz)	Error(ppm)
-30	151.940048	-0.010	-0.063
-20	151.940048	-0.010	-0.063
-10	151.940048	-0.010	-0.063
0	151.940048	-0.010	-0.063
+10	151.940038	-0.019	-0.127
+20	151.940058	0.000	0.000
+30	151.940067	0.010	0.063
+40	151.940058	0.000	0.000
+50	151.940048	-0.010	-0.063



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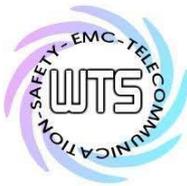
**154.60 MHz**

Temperature(°C)	Frequency(MHz)	Error(kHz)	Error(ppm)
-30	154.600048	-0.010	-0.062
-20	154.600048	-0.010	-0.062
-10	154.600048	-0.010	-0.062
0	154.600038	-0.019	-0.124
+10	154.600038	-0.019	-0.124
+20	154.600058	0.000	0.000
+30	154.600077	0.019	0.124
+40	154.600058	0.000	0.000
+50	154.600048	-0.010	-0.062

**10.3 Limits:**

According to FCC 95.632(c), MURS transmitters must maintain a frequency stability of 5.0 ppm, or 2.0 ppm if designed to operate with a 6.25 kHz bandwidth.

Test equipment used: ETSTW-RE 055, ETSTW-CE 009



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**11. Frequency Stability vs. Voltage, FCC 2.1055 (d) ; 95.632**

**11.1 Test procedure**

An external variable DC power supply was connected to the battery terminals of the equipment under test.

For hand carried, battery powered equipment primary supply voltage was reduced to the battery operating end point as specified by the manufacturer. The output frequency was recorded for each battery voltage.

**11.2 Test Results**

**151.82 MHz**

Voltage	Frequency(MHz)	Error(kHz)	Error(ppm)
Norm	151.820067	--	--
3.145V	151.820067	0.000	0.000
4.255V	151.820067	0.000	0.000

**151.94 MHz**

Voltage	Frequency(MHz)	Error(kHz)	Error(ppm)
Norm	151.940058	--	--
3.145V	151.940058	0.000	0.000
4.255V	151.940058	0.000	0.000

**154.60 MHz**

Voltage	Frequency(MHz)	Error(kHz)	Error(ppm)
Norm	154.600058	--	--
3.145V	154.600058	0.000	0.000
4.255V	154.600058	0.000	0.000

**11.3 Limits:**

According to FCC 95.632(c), MURS transmitters must maintain a frequency stability of 5.0 ppm, or 2.0 ppm if designed to operate with a 6.25 kHz bandwidth.

Test equipment used: ETSTW-RE 055

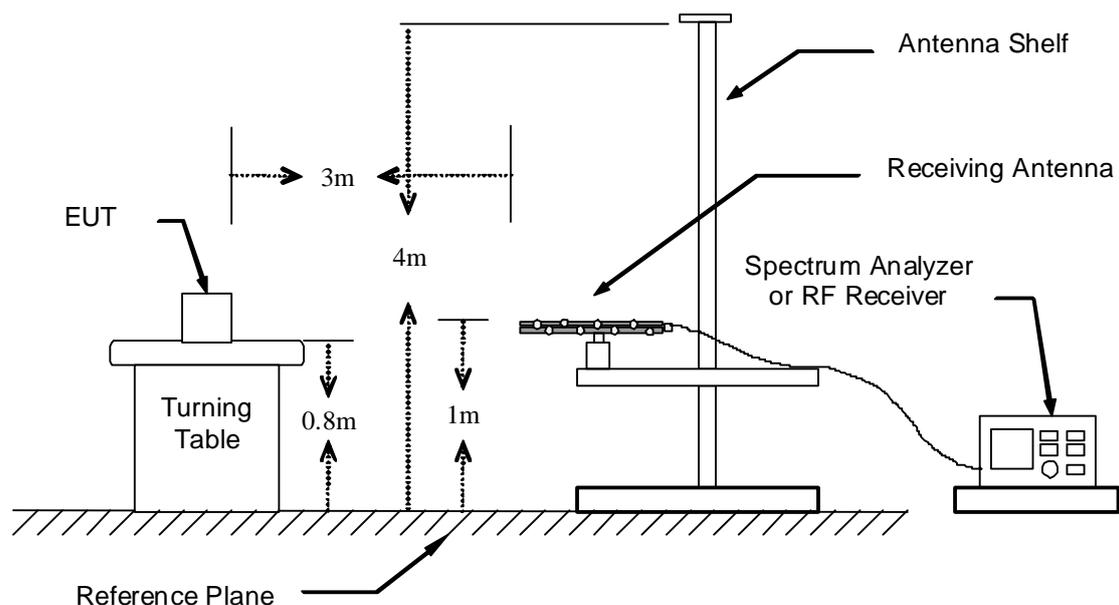
Registration number: W6M21303-13066-C-95  
 FCC ID: IPH-02228

## 12. Receiver Radiated Spurious Emission

### 12.1 Test Procedures

1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on the top of the turn table 0.8 meter above ground.
3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turn table.
4. Power on the EUT and all the supporting units.
5. The turn table was rotated 360 degrees to determine the position of the highest radiation.
6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
7. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.
8. Adjust the spectrum analyzer for the following settings:
  - Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz and 1 MHz for spurious emissions above 1GHz.
  - Video Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.
  - Sweep Speed slow enough to maintain measurement calibration.
  - Detector Mode = Positive Peak.

### 12.2 Test Setup







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## 13. Maximum Permissible Exposure

### 13.1 Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.3 m normally can be maintained between the user and the device.

### 13.2 MPE Calculation Method

#### (A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

#### (B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz

\*Plane-wave equivalent power density

$$E \text{ (V/m)} \cdot \frac{\sqrt{30 \times P \times G}}{d}$$

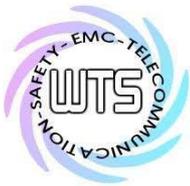
$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} \cdot \frac{E^2}{377}$$

E = Electric field (V/m) P = output power (W) G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd \cdot \frac{30 \times P \times G}{377 \times d^2}$$

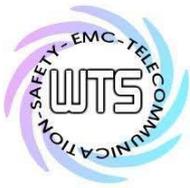


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Max output power (W)	Antenna Gain	Power Density(S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
1.8238957	-0.09	0.16	0.2	Complies

From the peak EUT RF output power, the minimum mobile separation distance,  $d=0.3$  m, as well as the gain of the used antenna, the RF power density can be obtained.

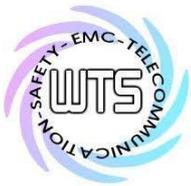


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## **Appendix**

### **Measurement diagrams**

1. RF Power Output
2. Radiation Spurious Emission



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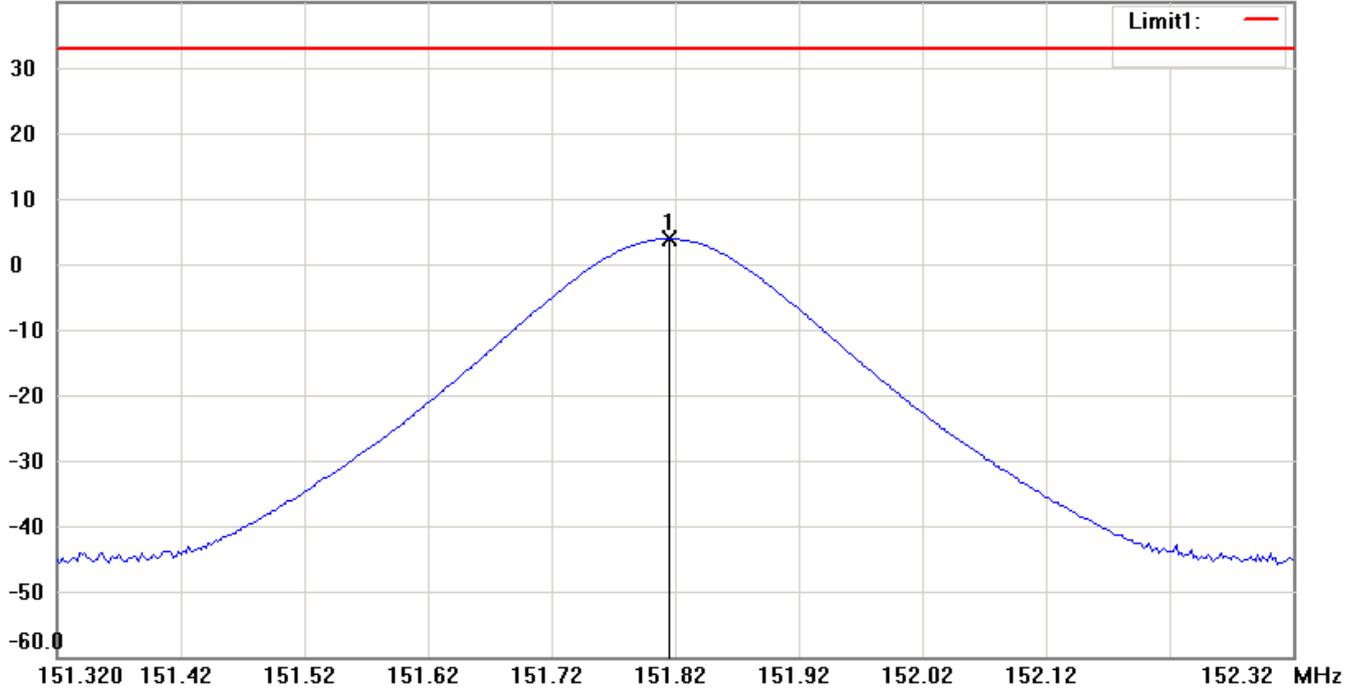
## RF Power Output Radiated

Antenna (short)

TX Power CH1

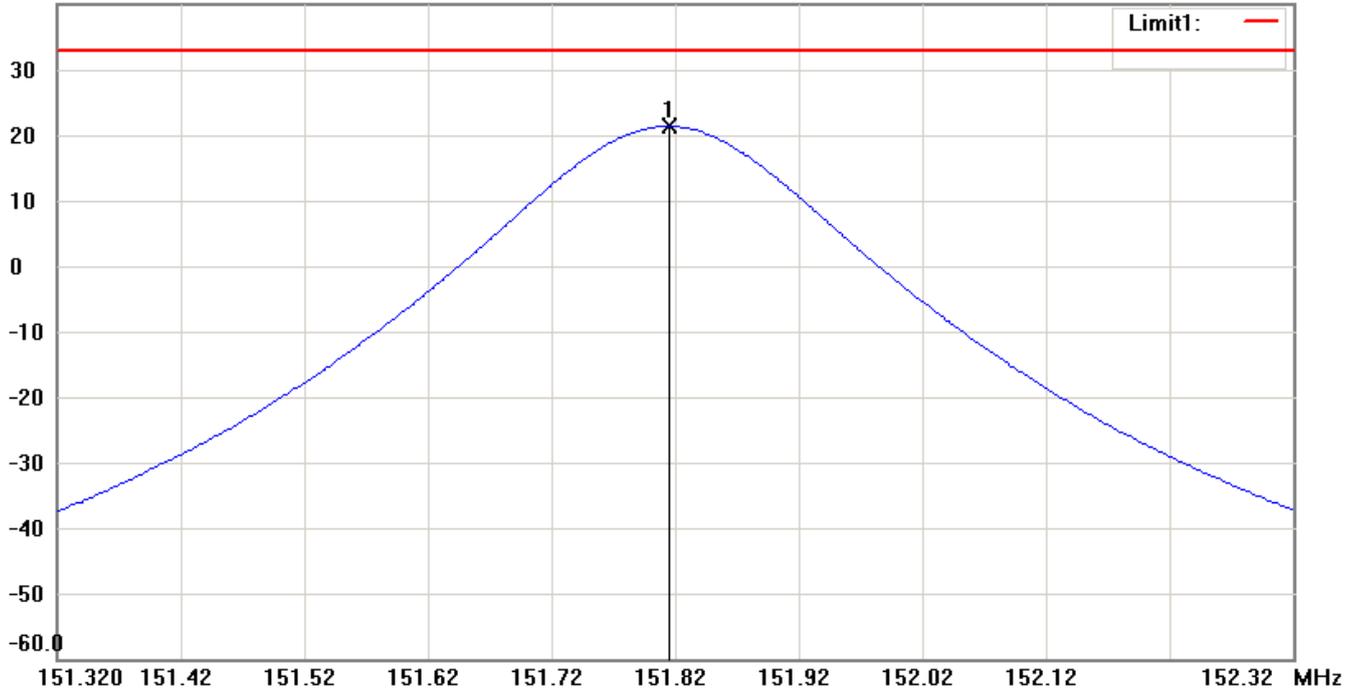
Polarization H

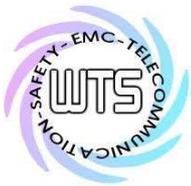
40.0 dBm



Polarization V

40.0 dBm

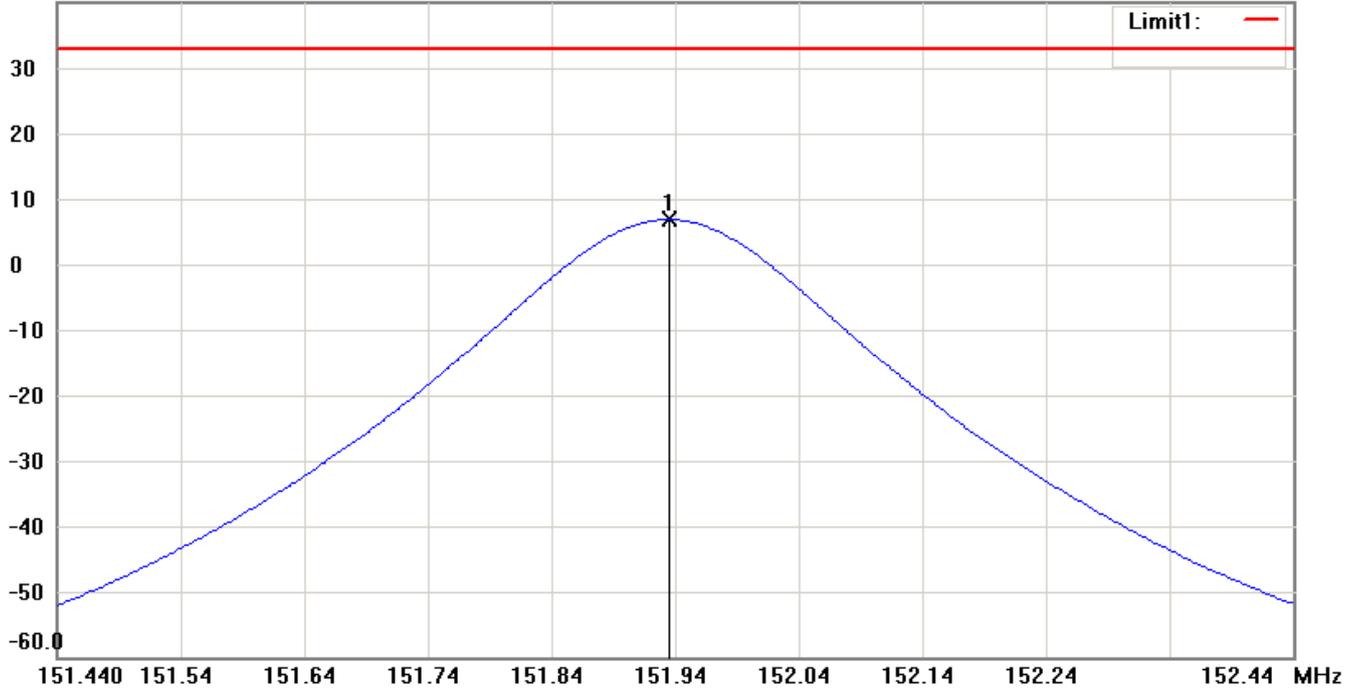




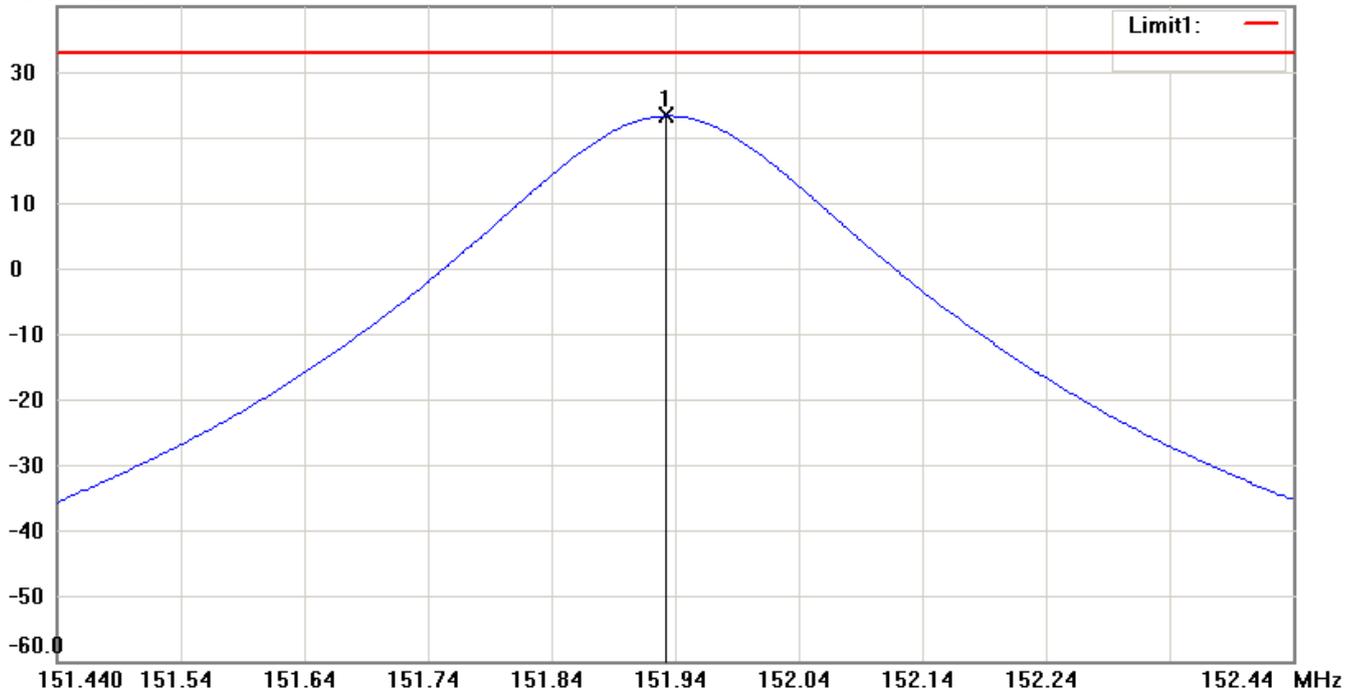
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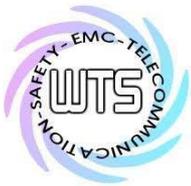
Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

TX Power CH3  
Polarization H  
40.0 dBm



Polarization V  
40.0 dBm

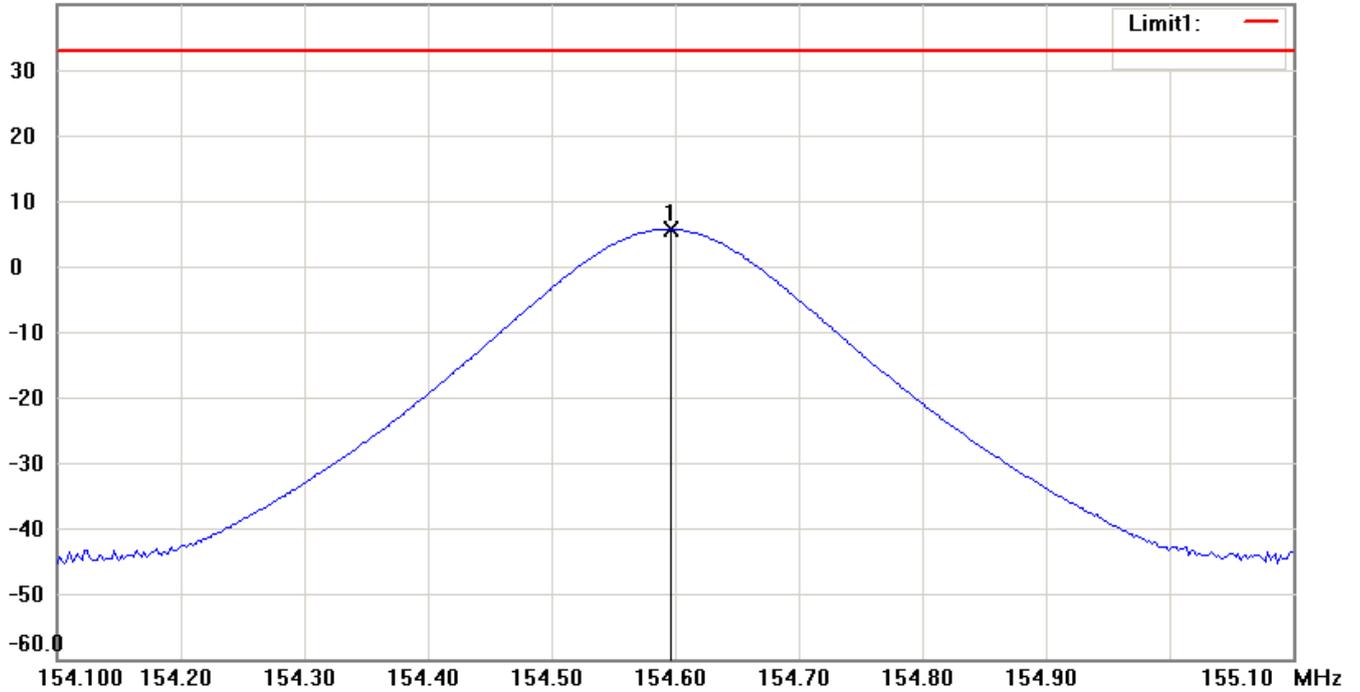




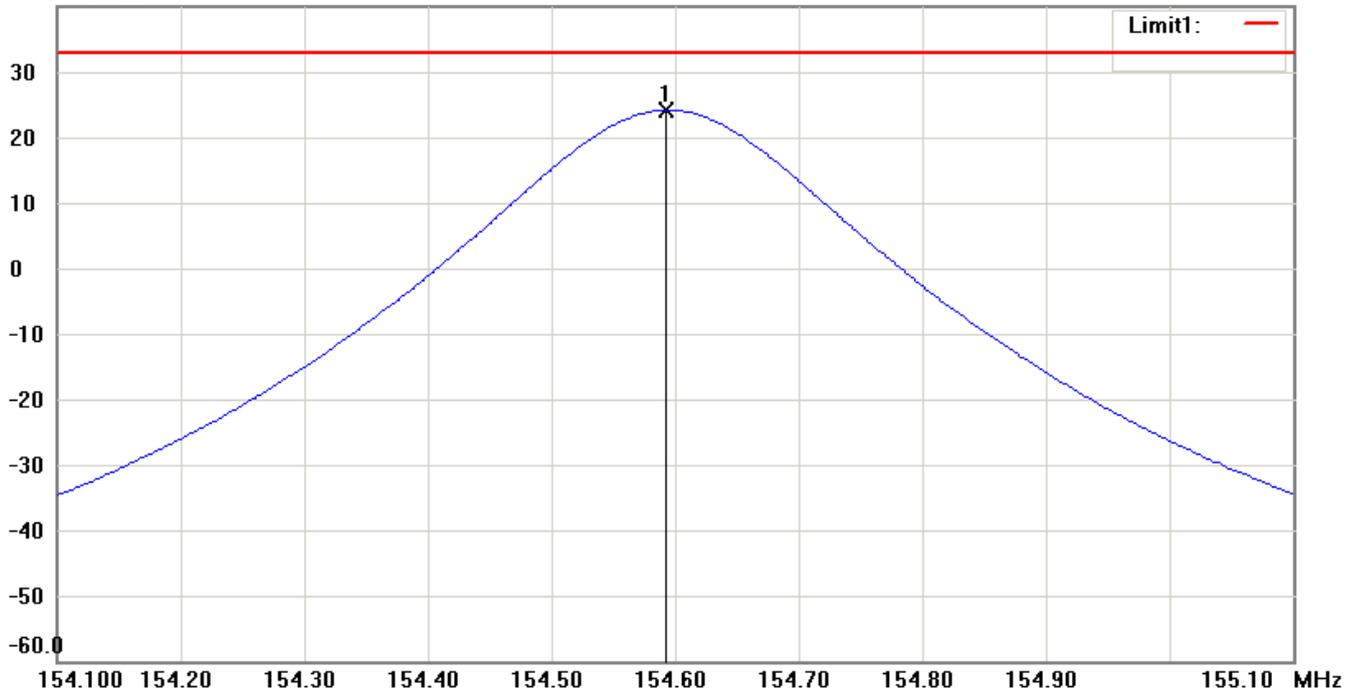
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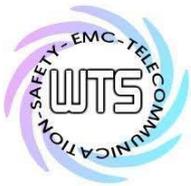
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FCC ID: IPH-02228

TX Power CH5  
Polarization H  
40.0 dBm



Polarization V  
40.0 dBm





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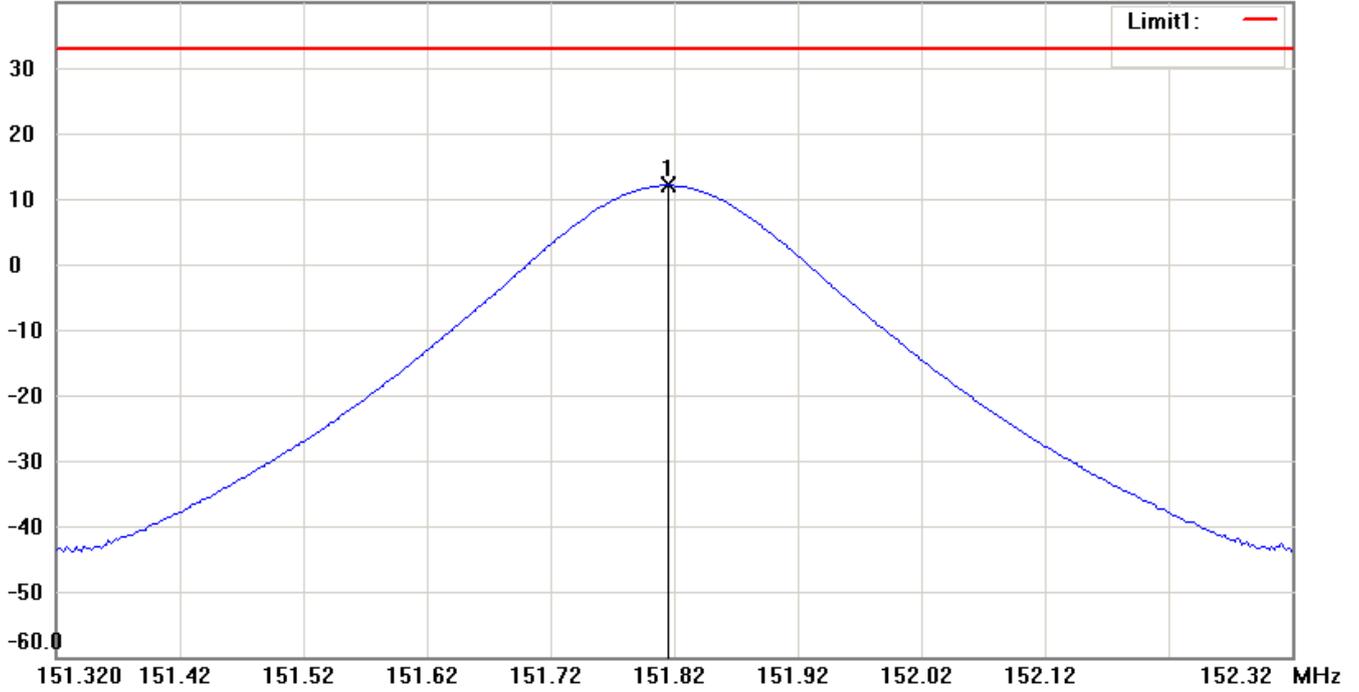
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FCC ID: IPH-02228

## Antenna (long)

TX Power CH1

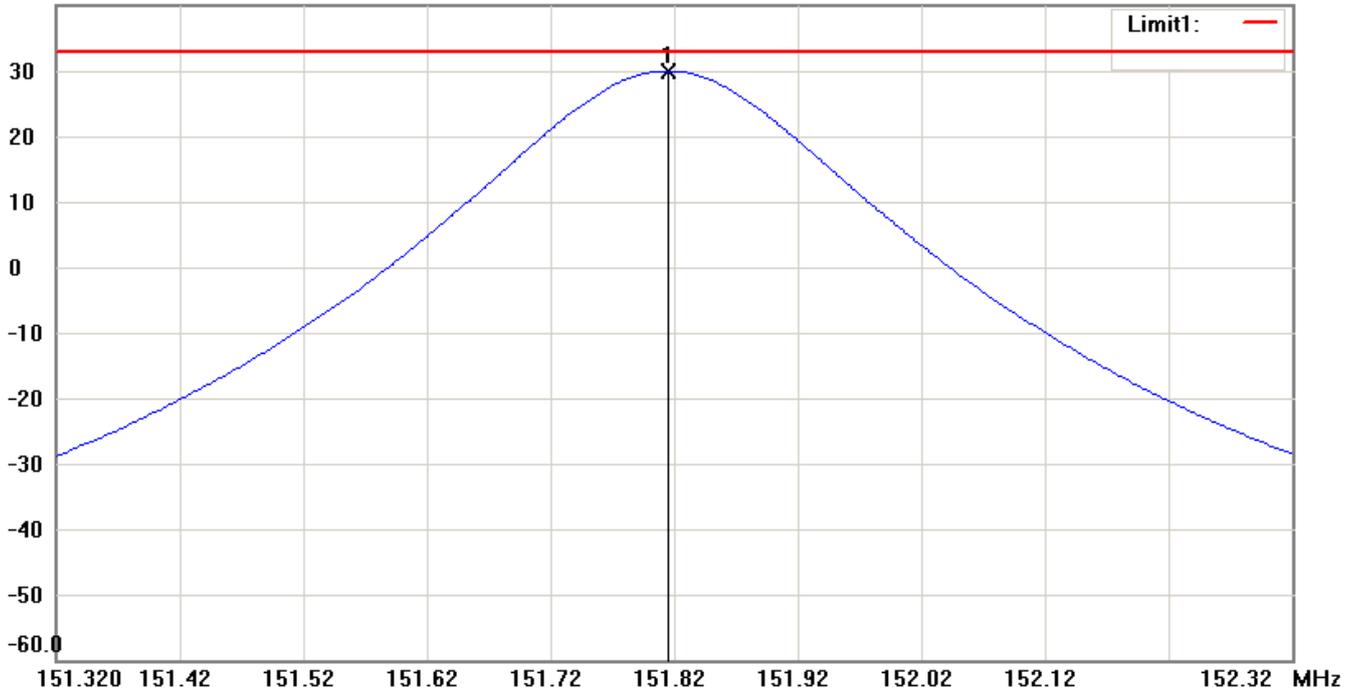
Polarization H

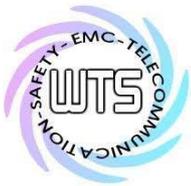
40.0 dBm



## Polarization V

40.0 dBm

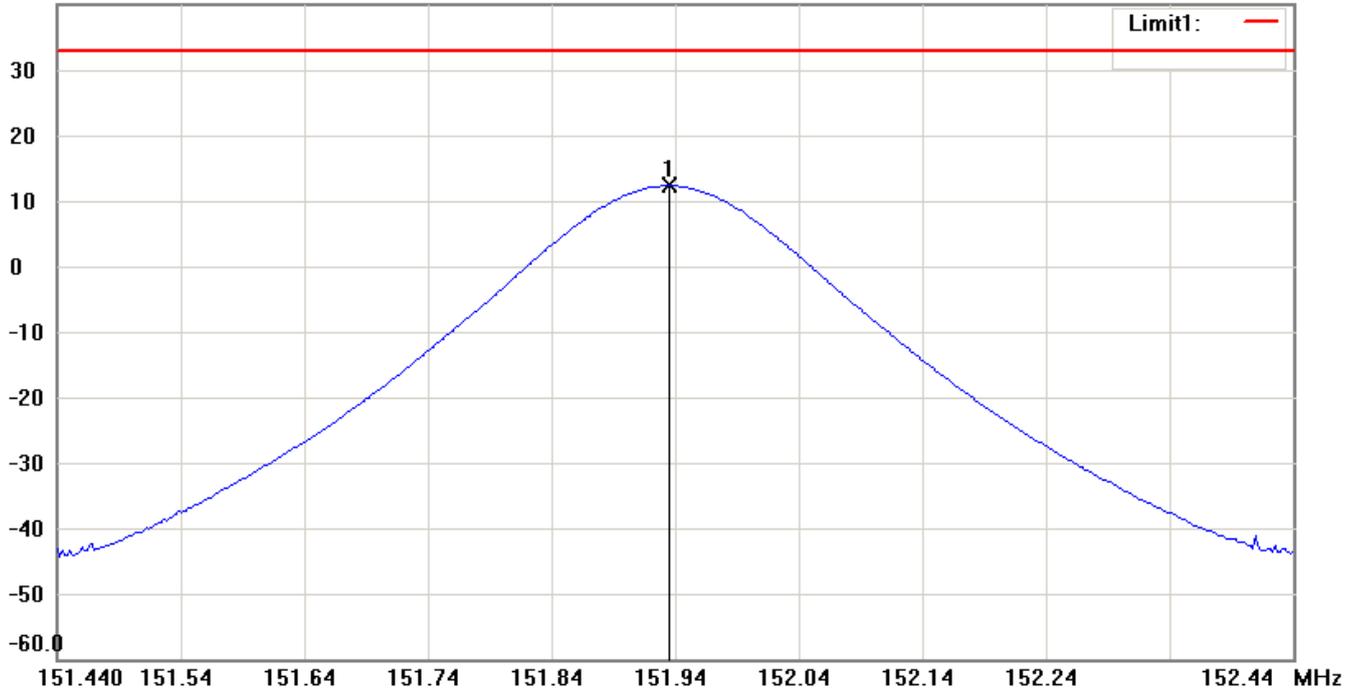




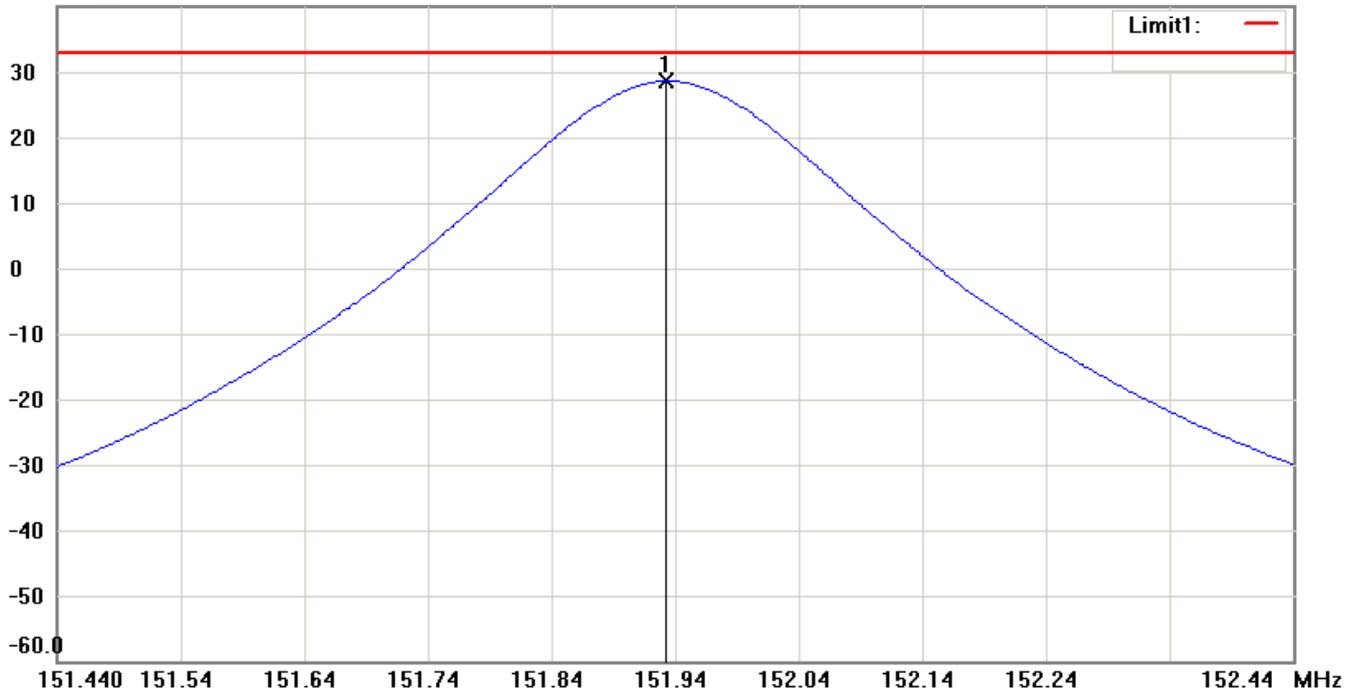
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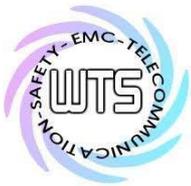
Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

TX Power CH3  
Polarization H  
40.0 dBm



Polarization V  
40.0 dBm

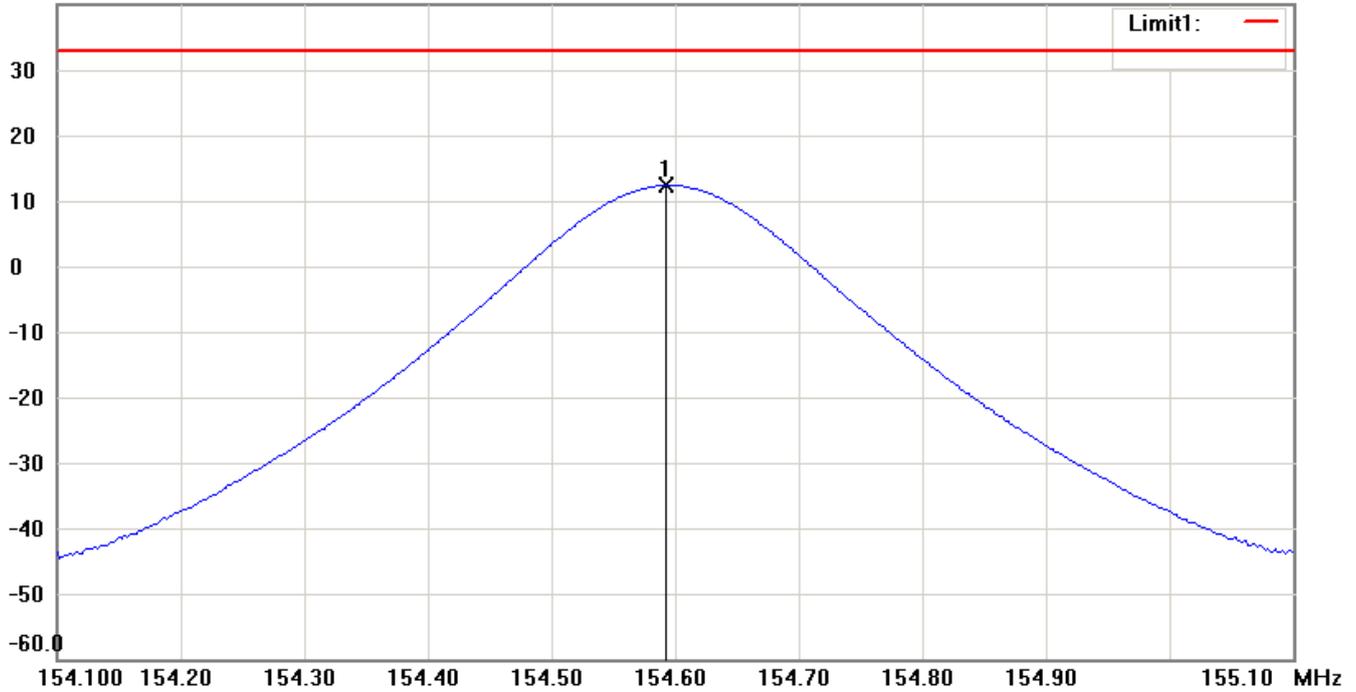




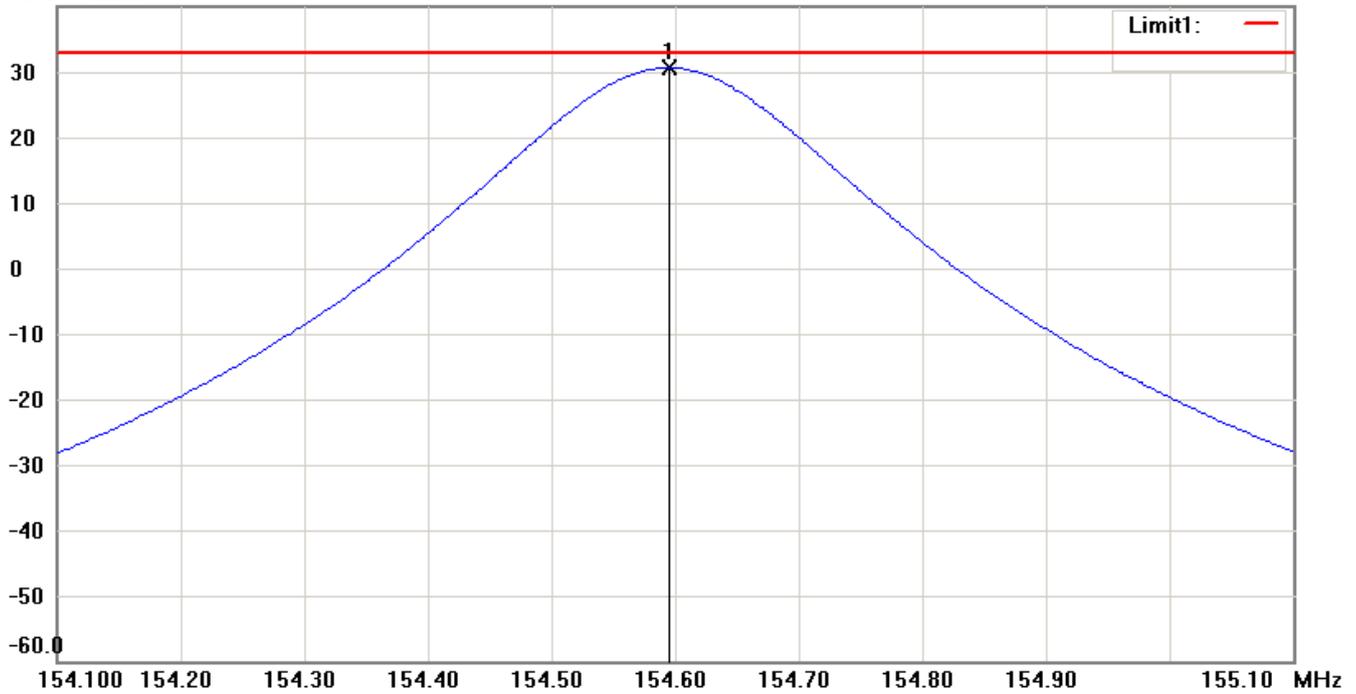
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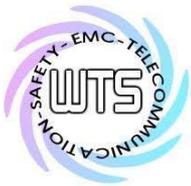
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FCC ID: IPH-02228

TX Power CH5  
Polarization H  
40.0 dBm



Polarization V  
40.0 dBm





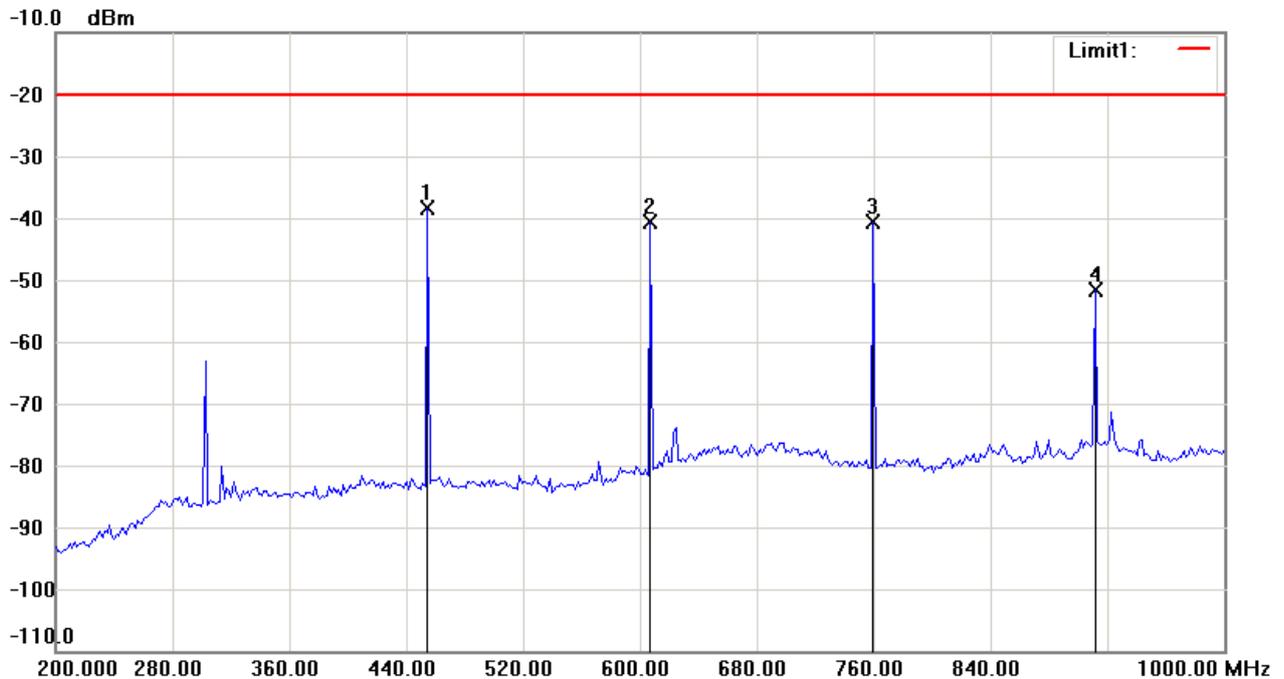
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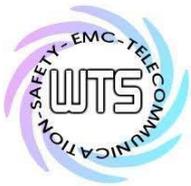
Radiation Spurious Emission\_Transmitter

Antenna (short)

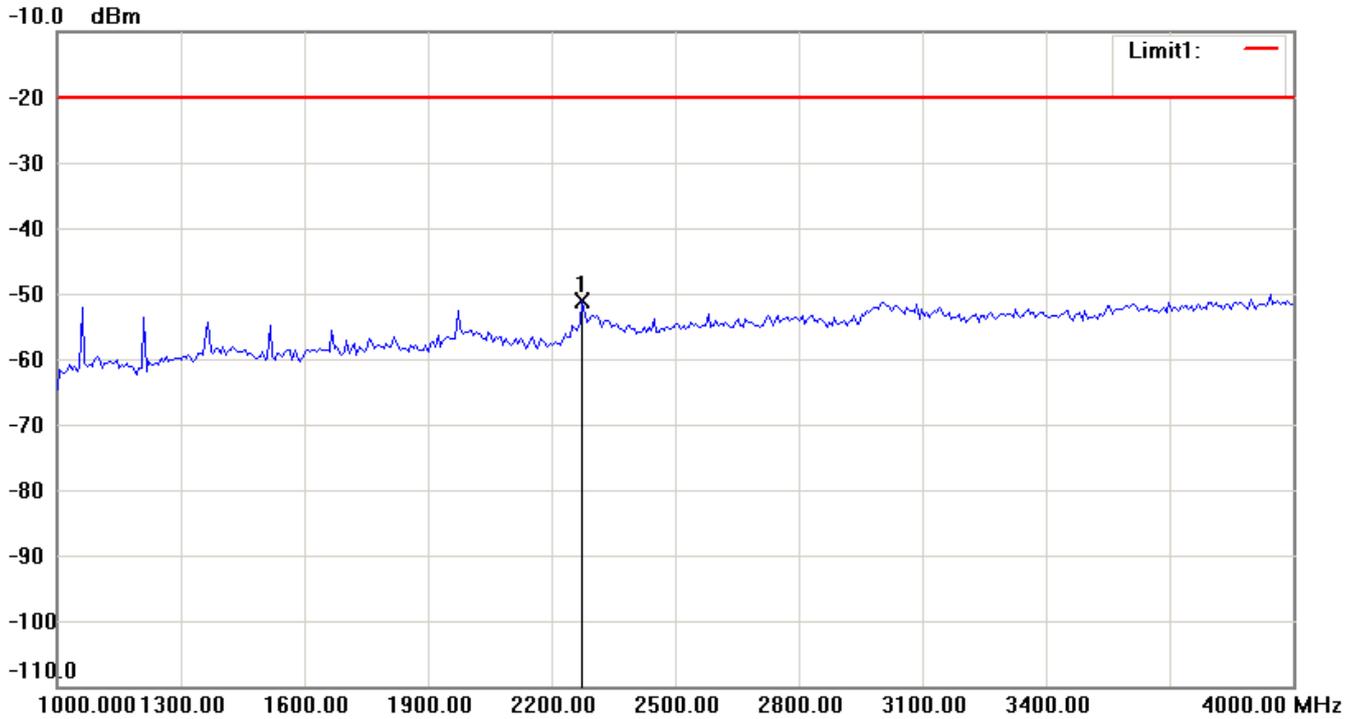
TX CH1

Antenna Polarization H



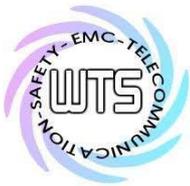


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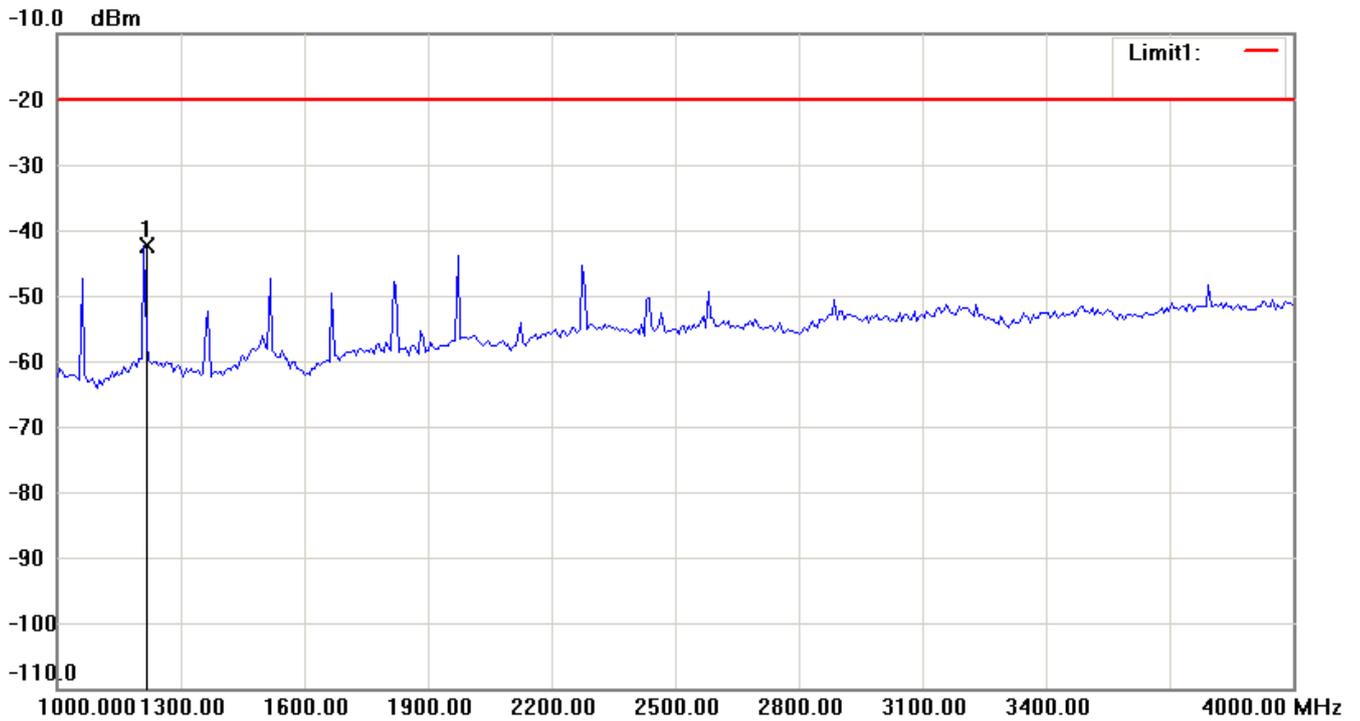
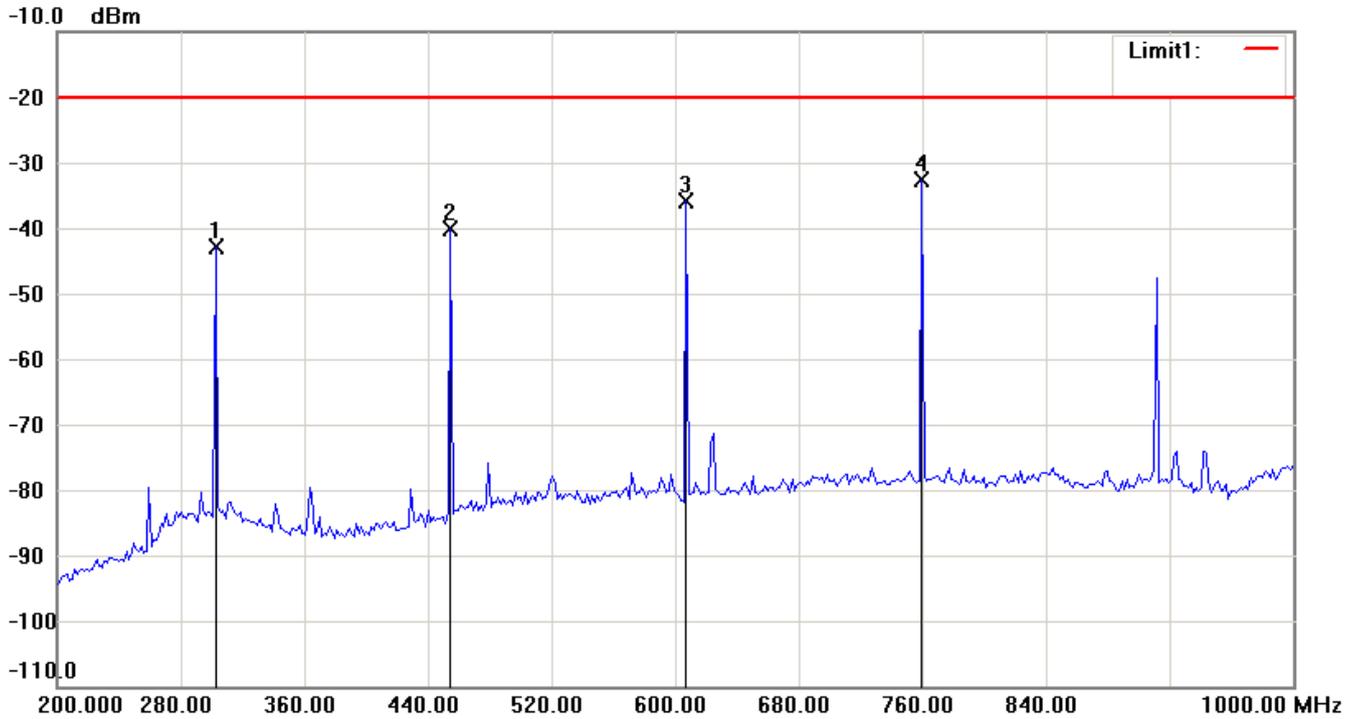
## Antenna Polarization V

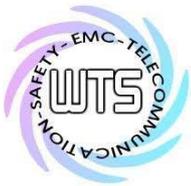




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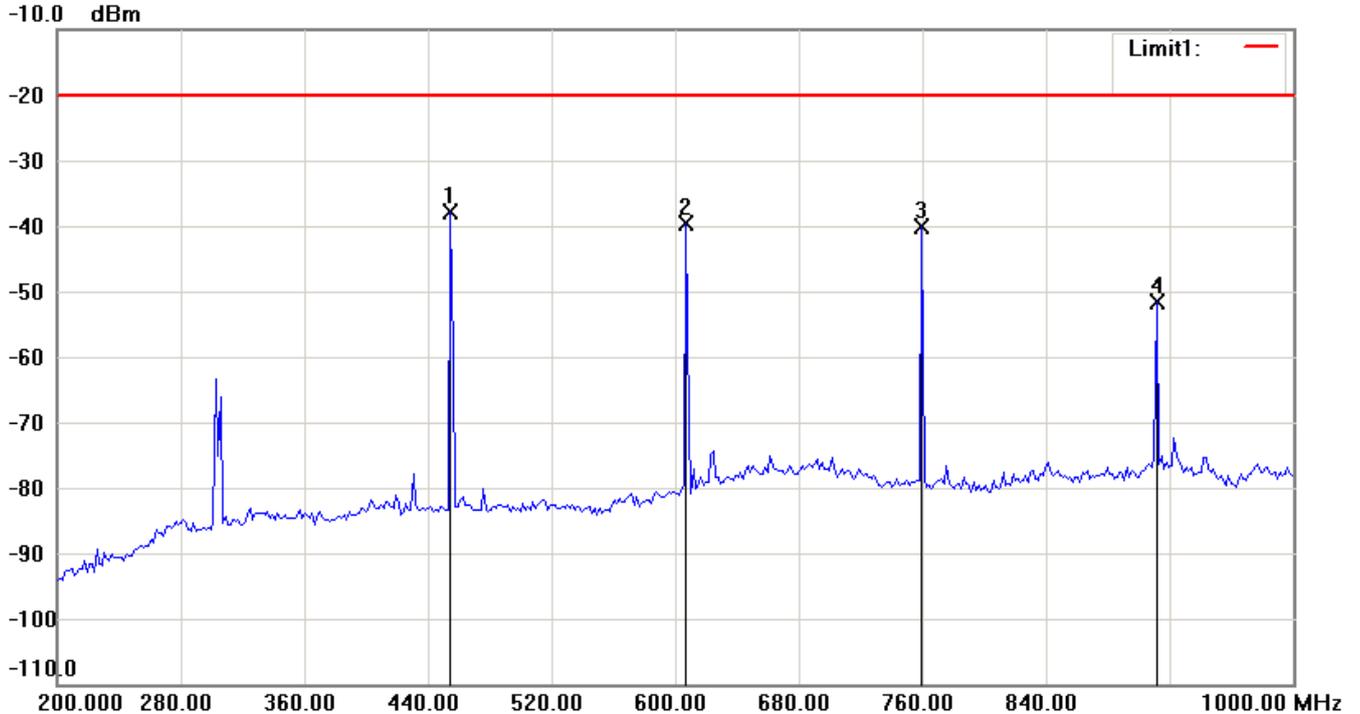
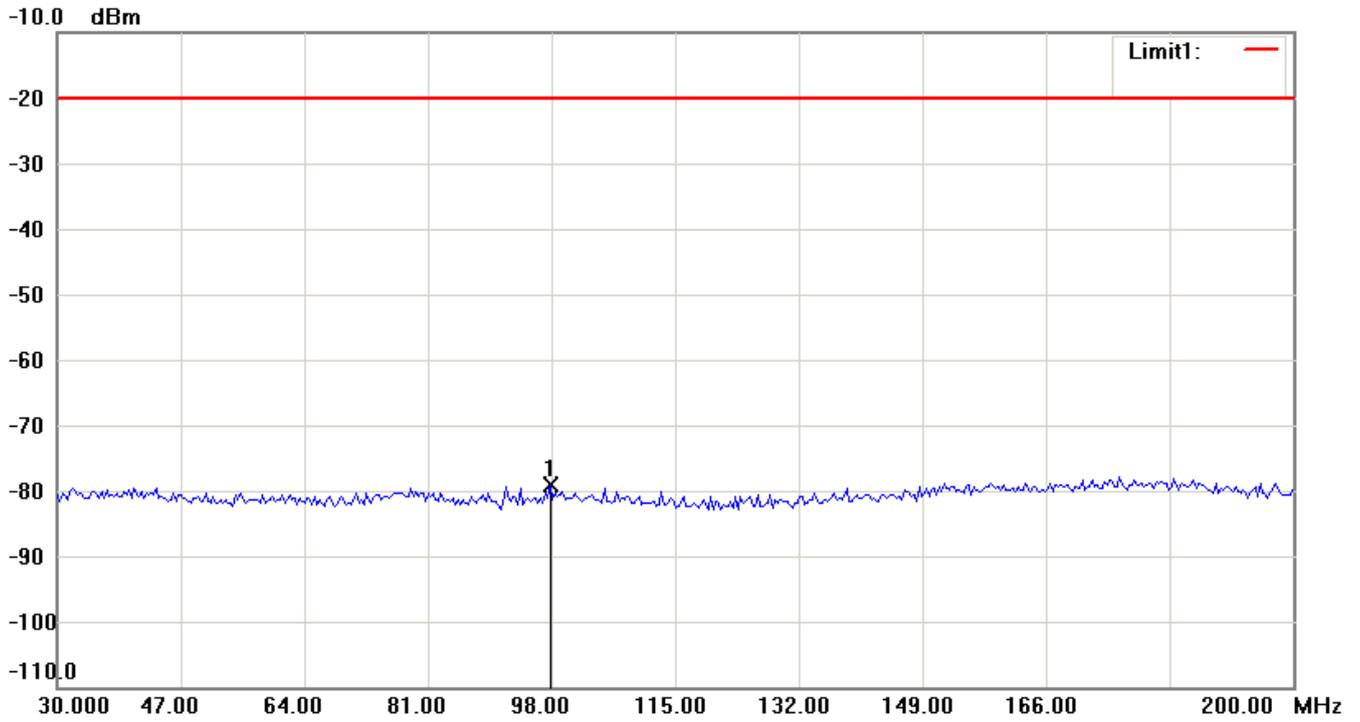




Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

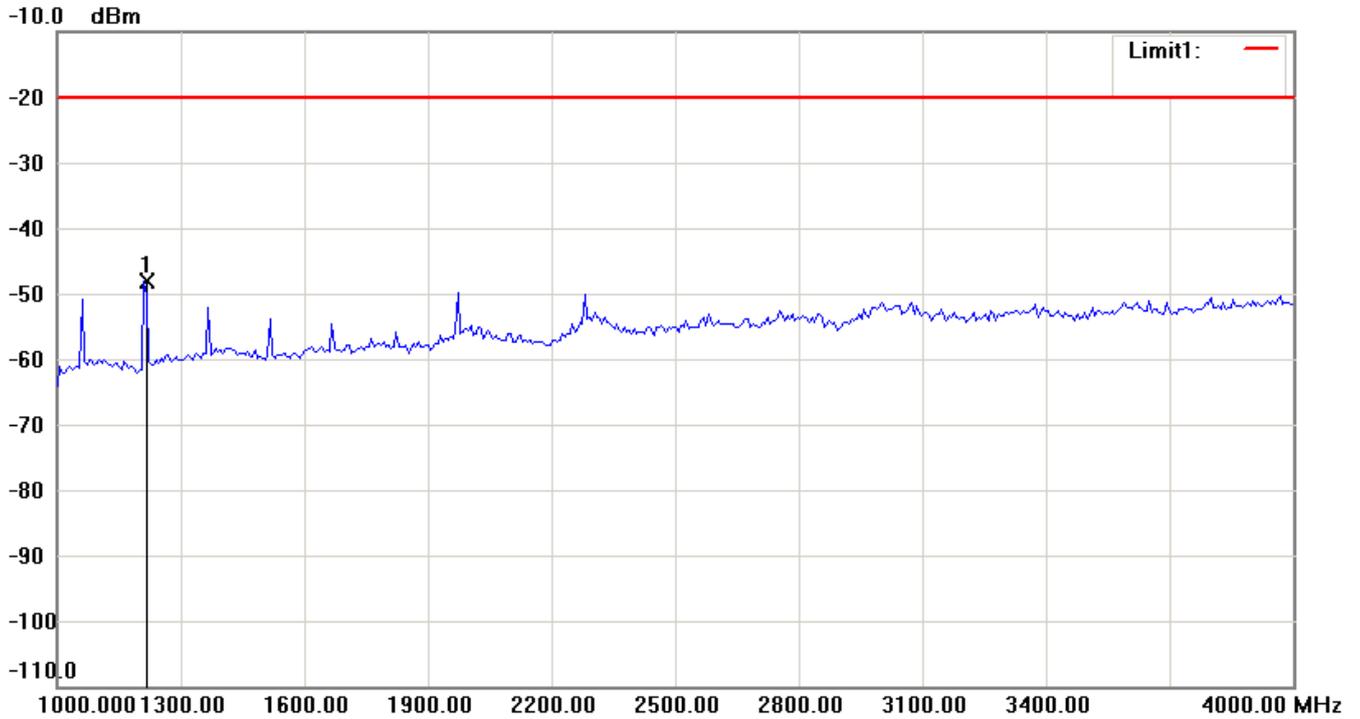
TX CH3

Antenna Polarization H

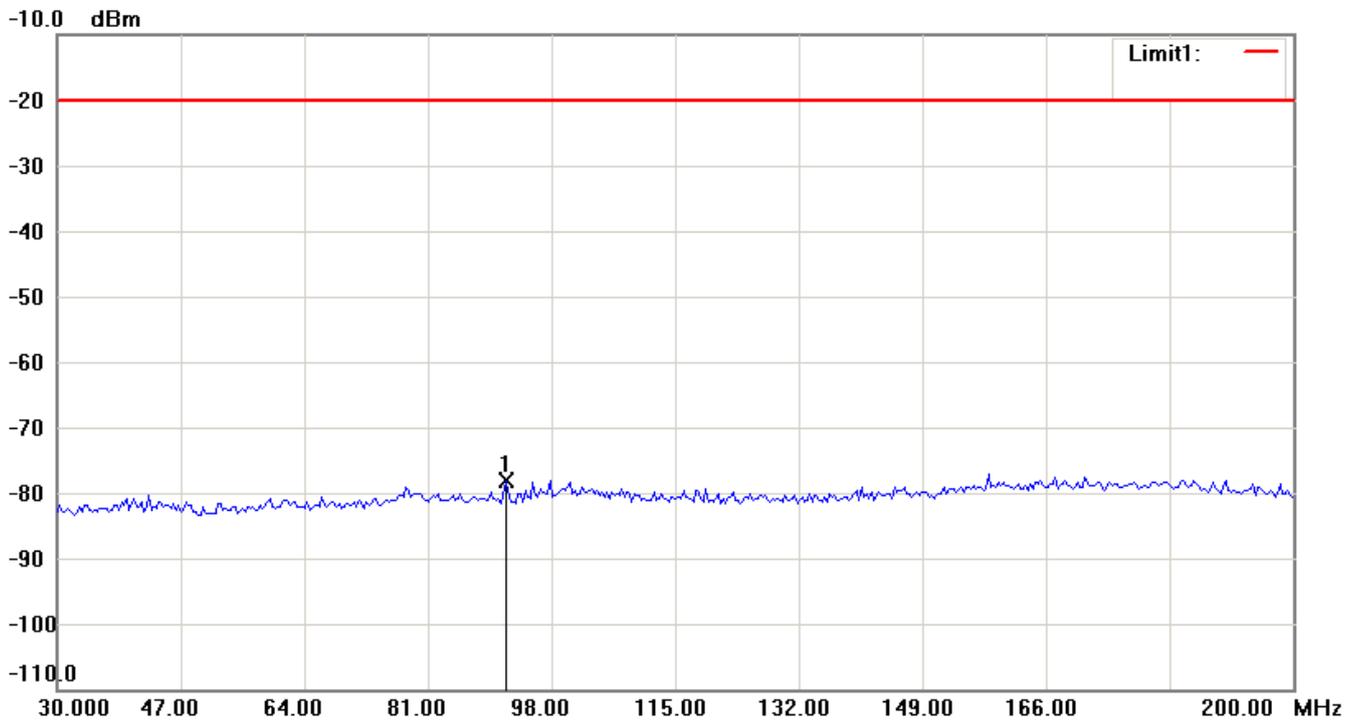


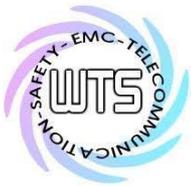


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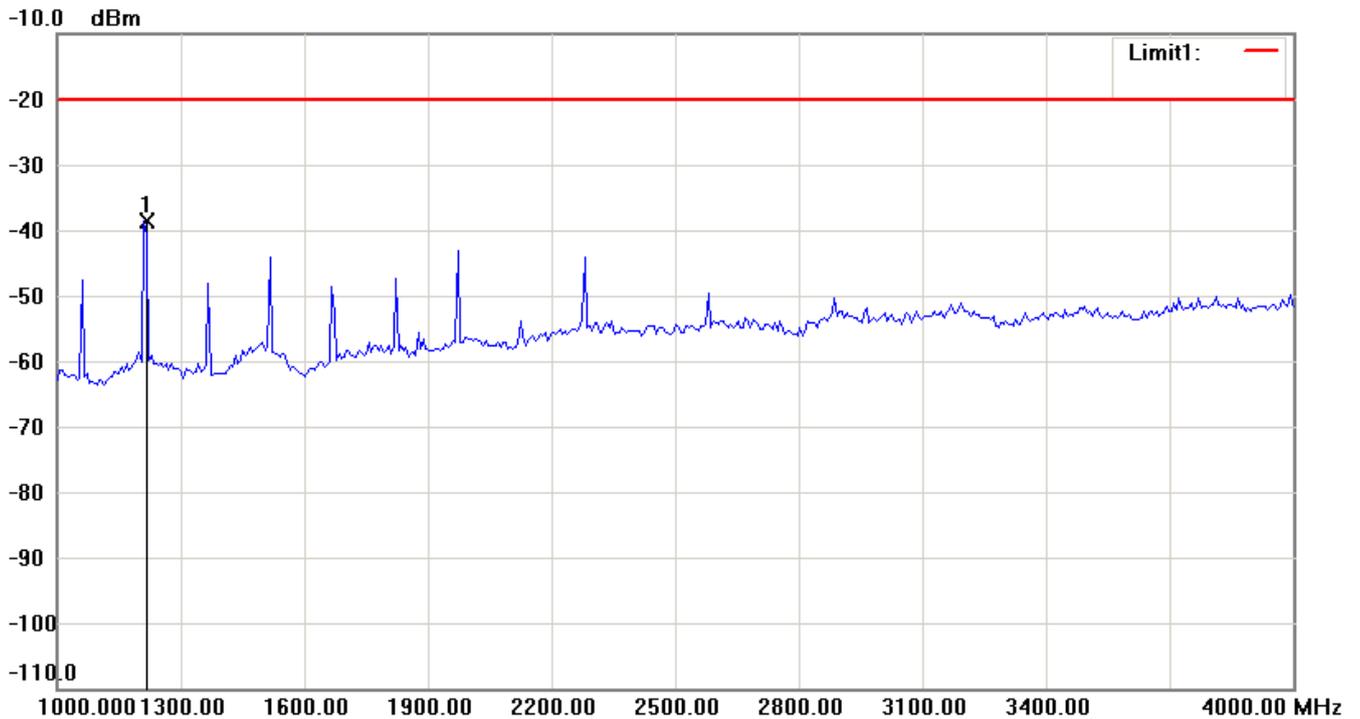
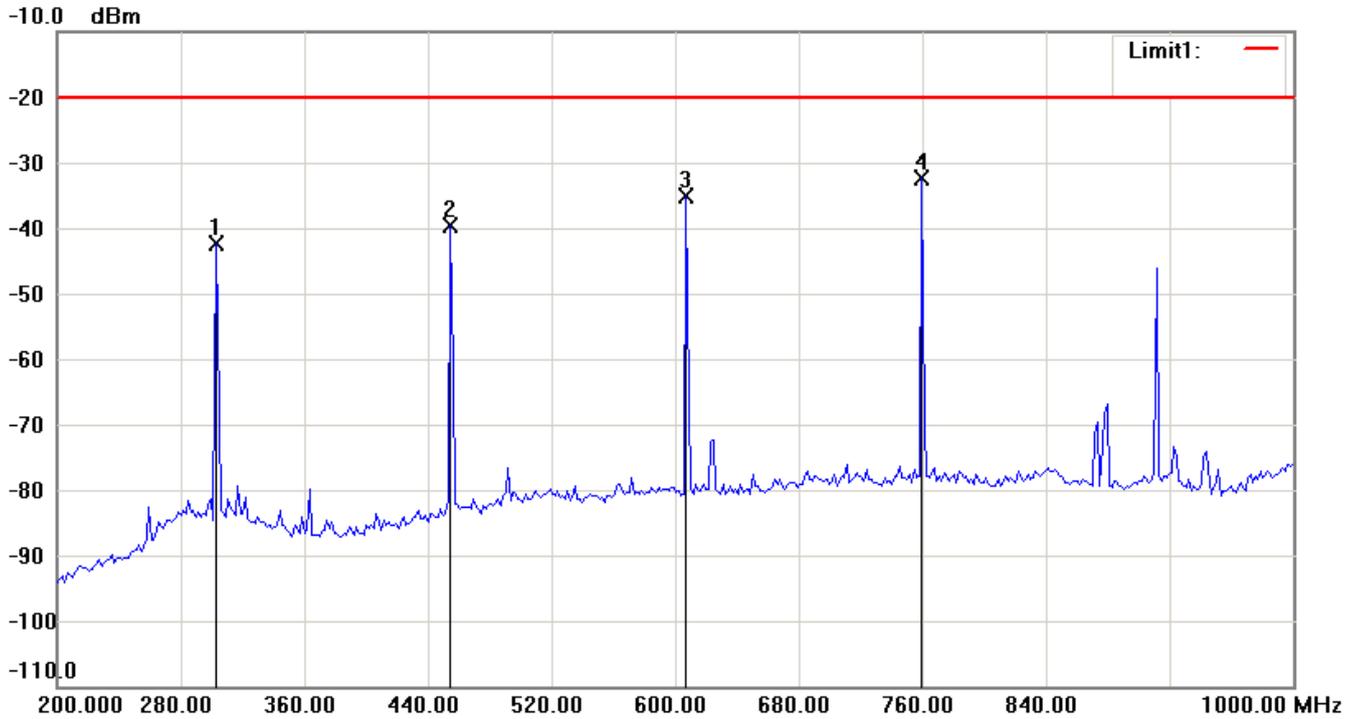
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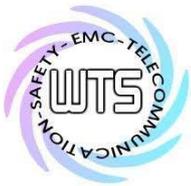




# Worldwide Testing Services(Taiwan) Co., Ltd.

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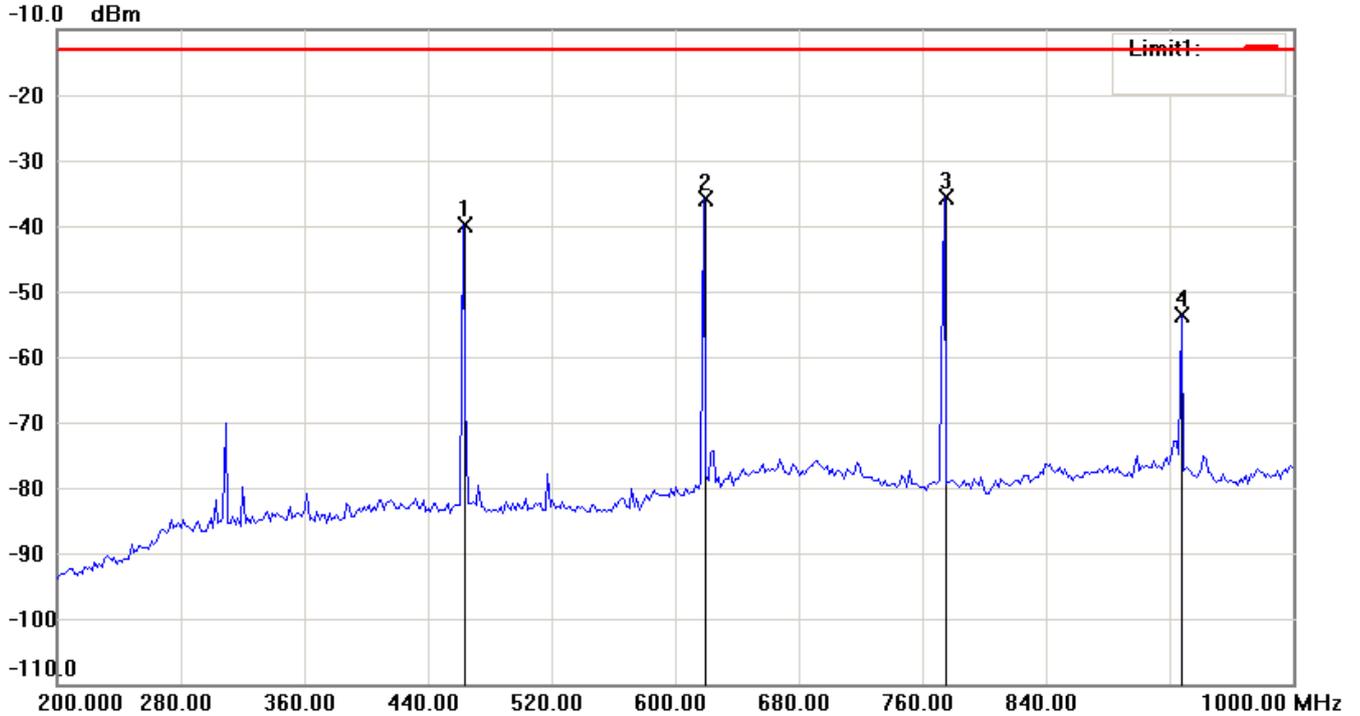
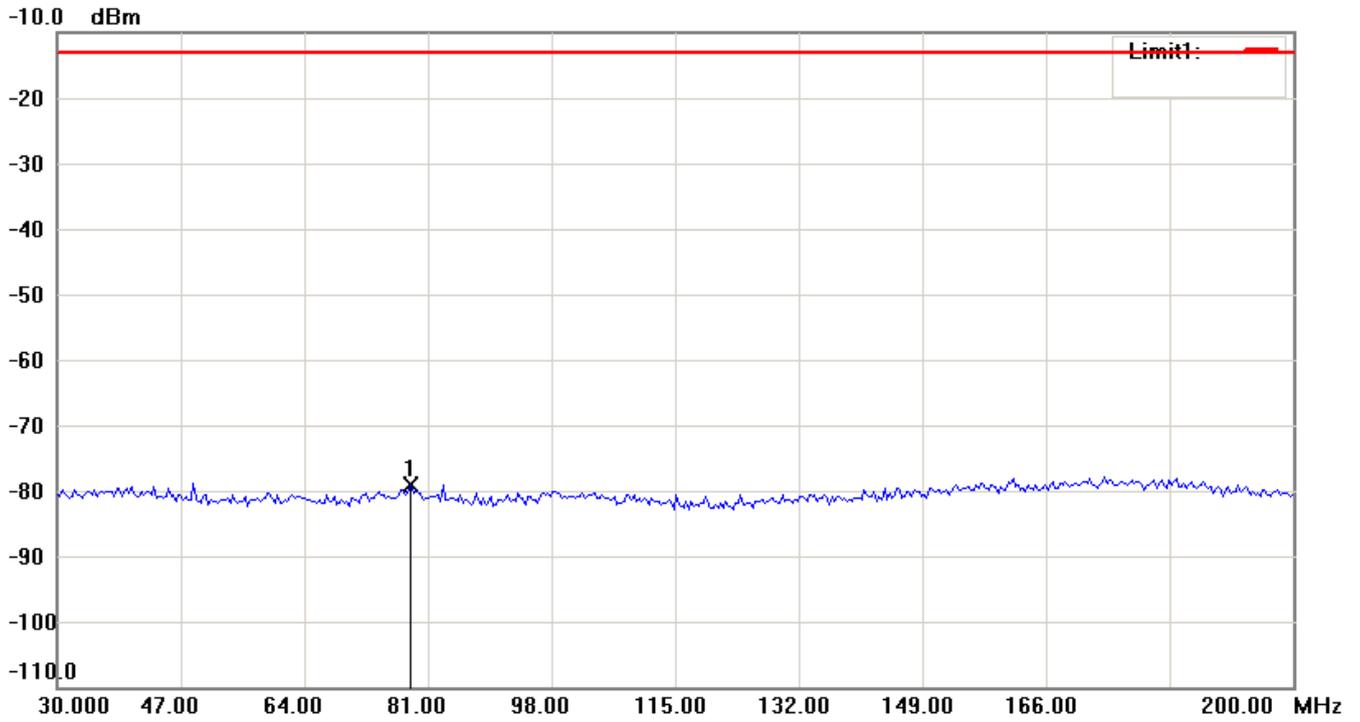


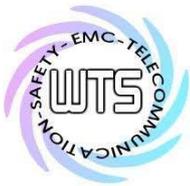


Registration number: W6M21303-13066-C-95  
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TX CH5

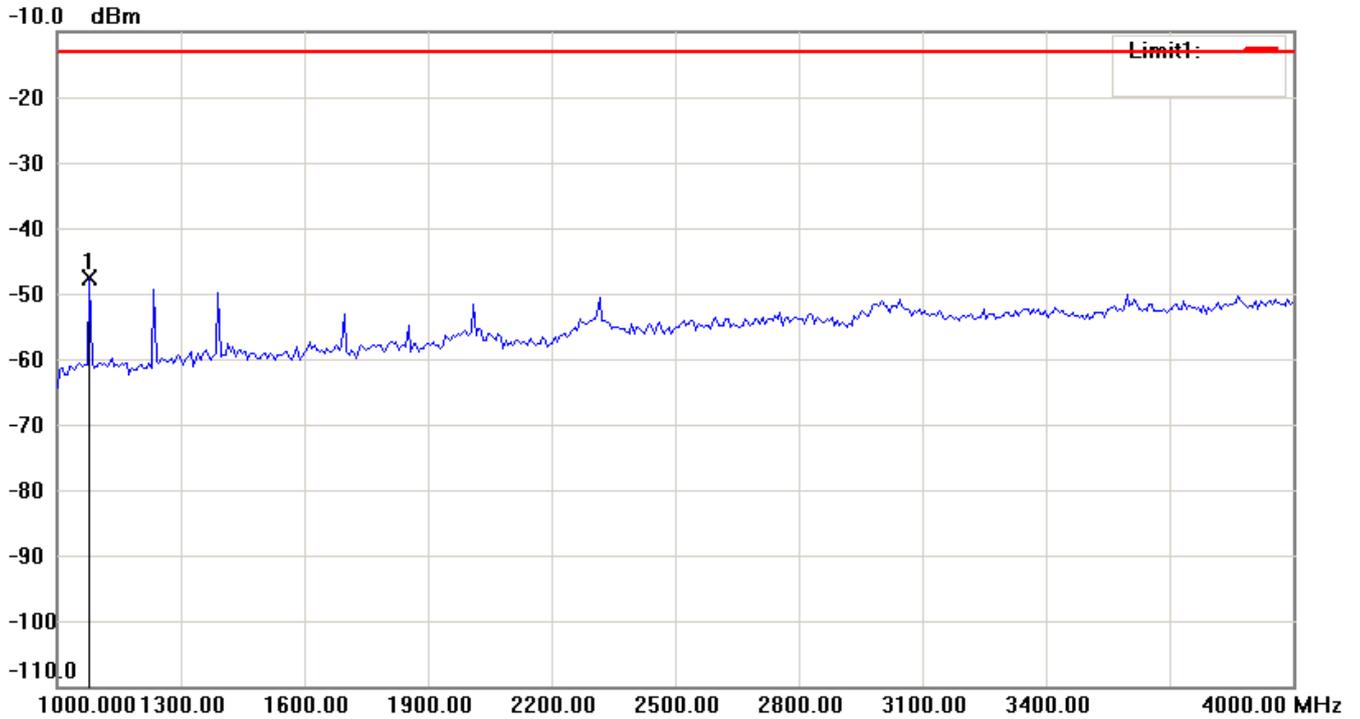
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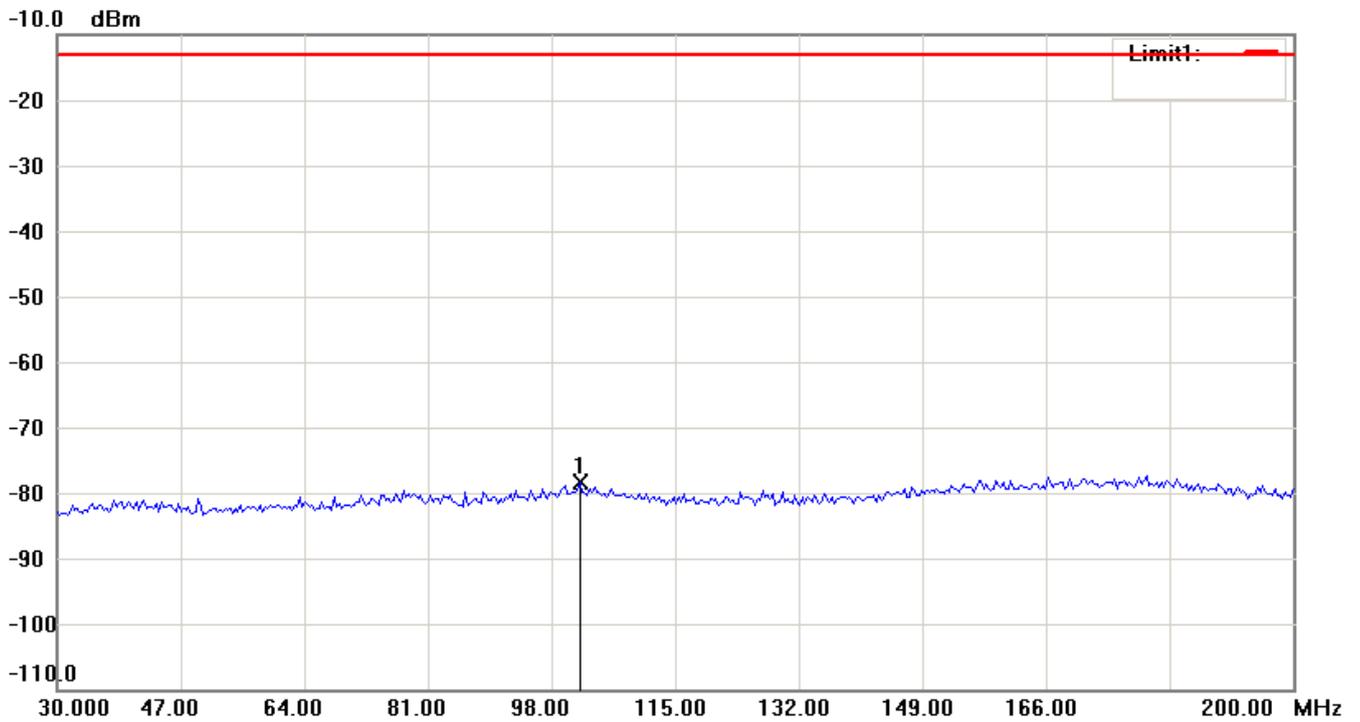


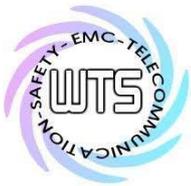
# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228



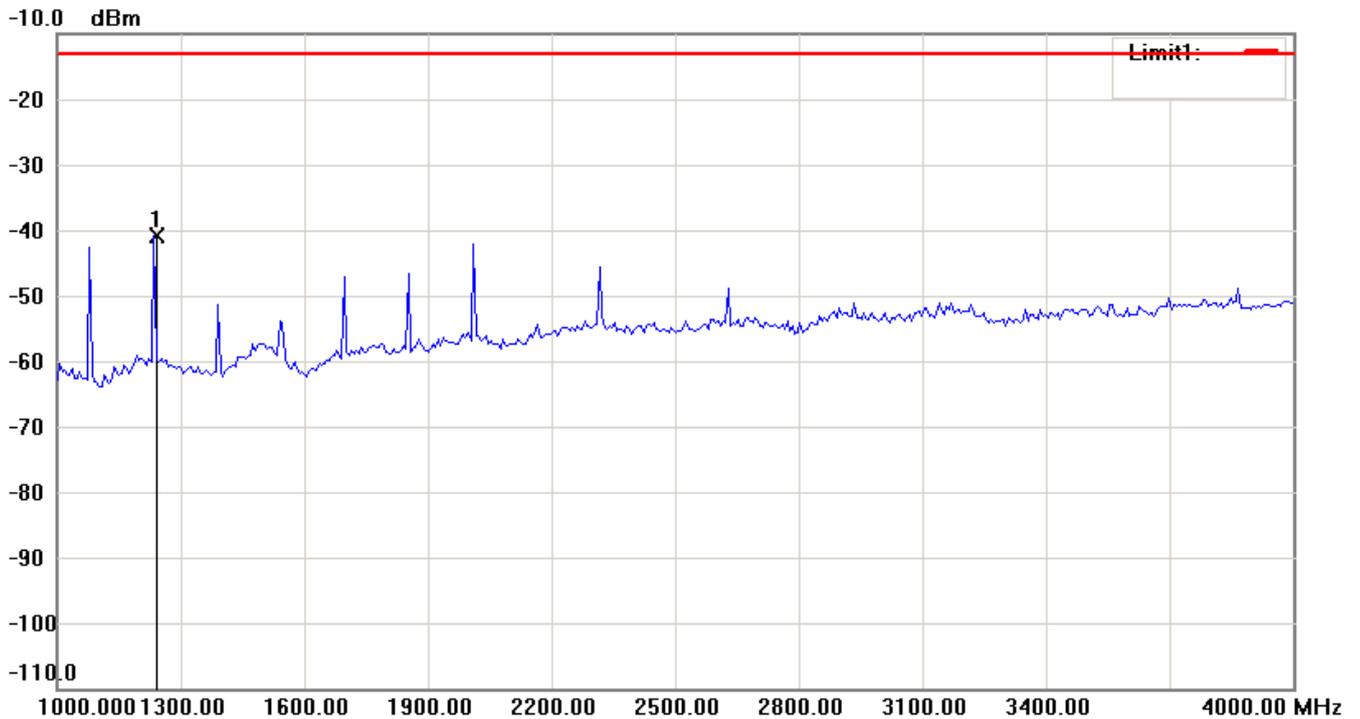
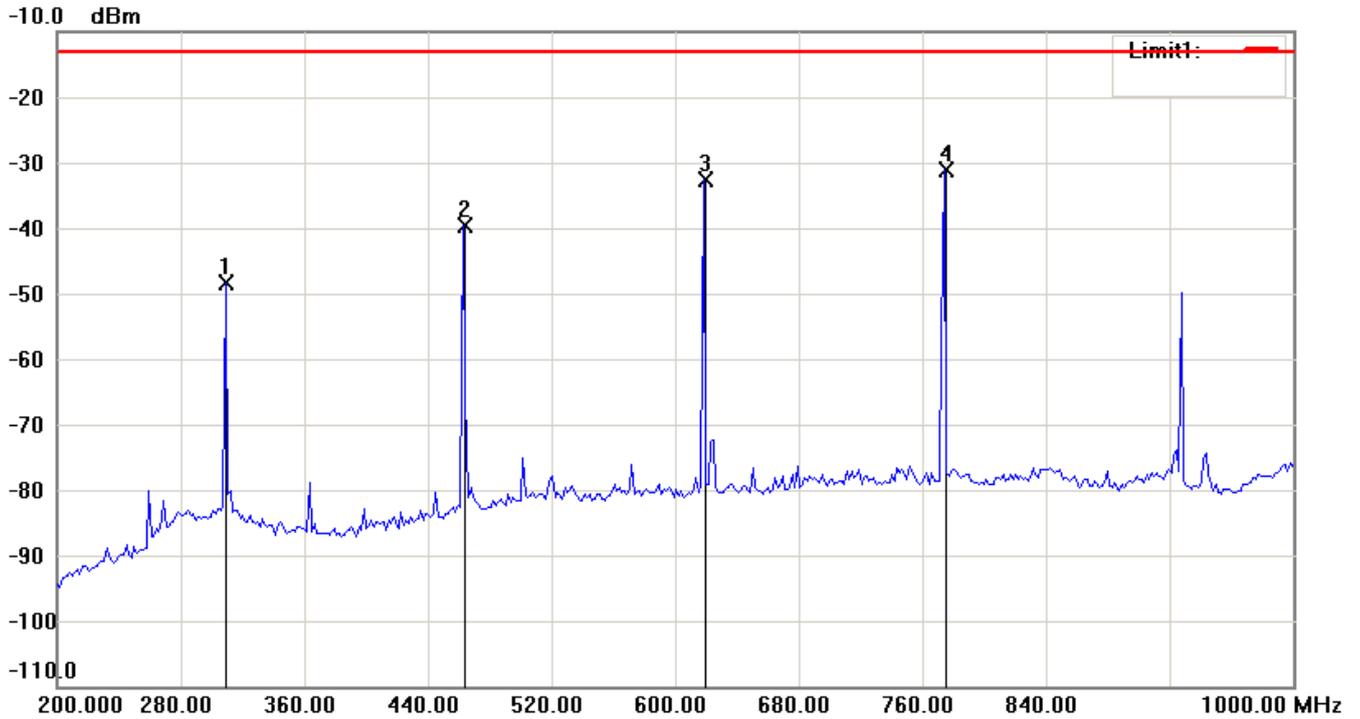
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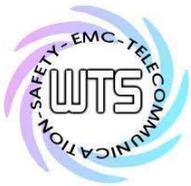




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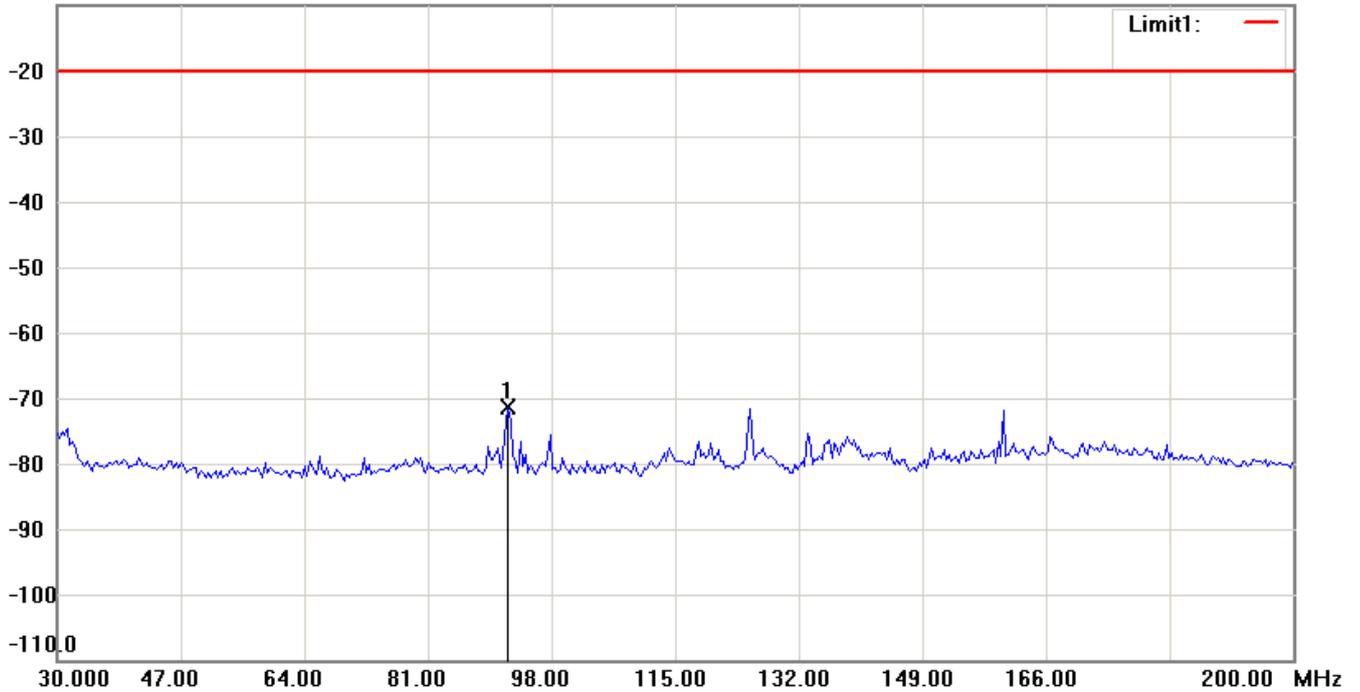
Registration number: W6M21303-13066-C-95  
FCC ID: IPH-02228

**Antenna (long)**

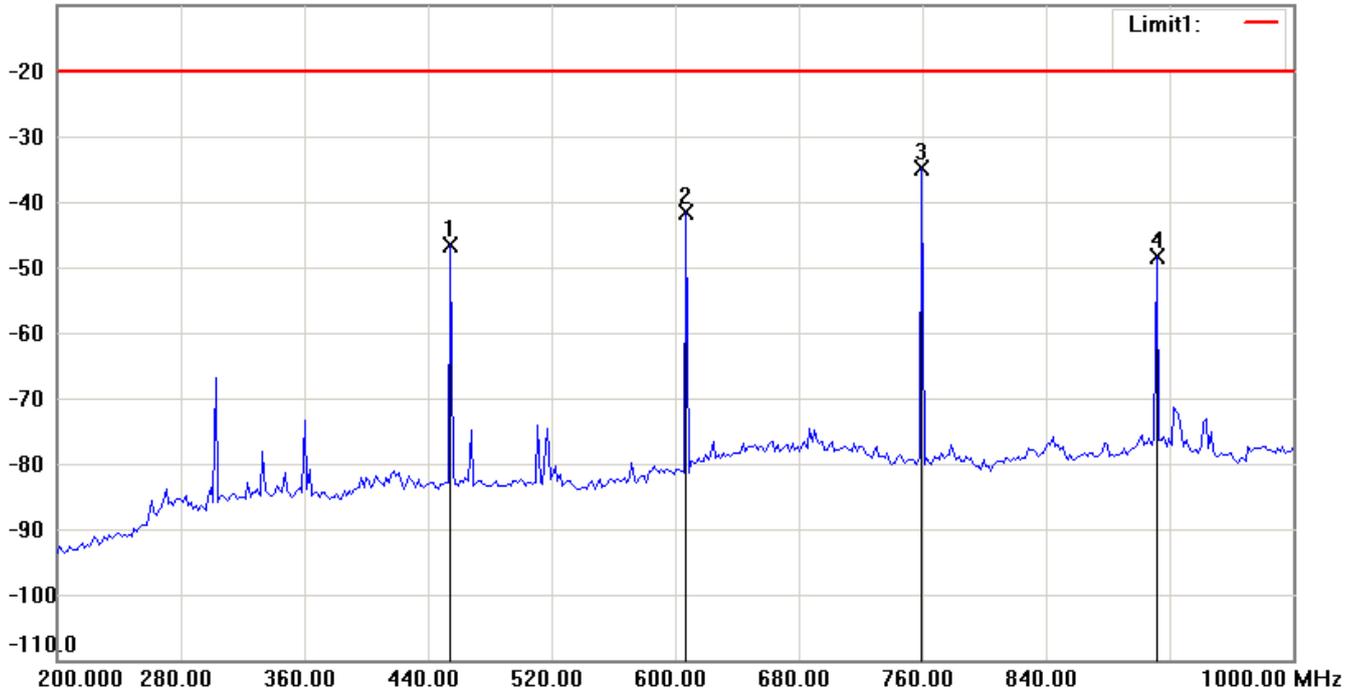
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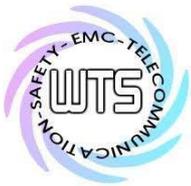
Antenna Polarization H

-10.0 dBm

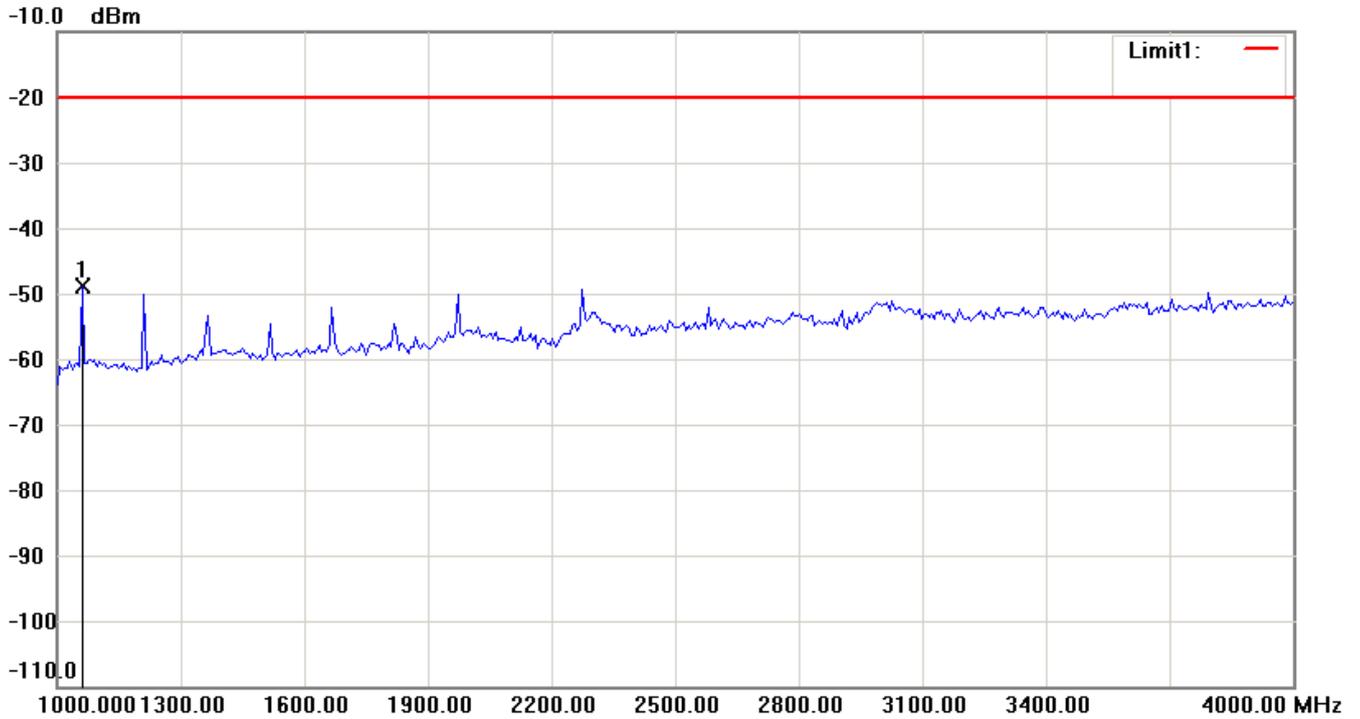


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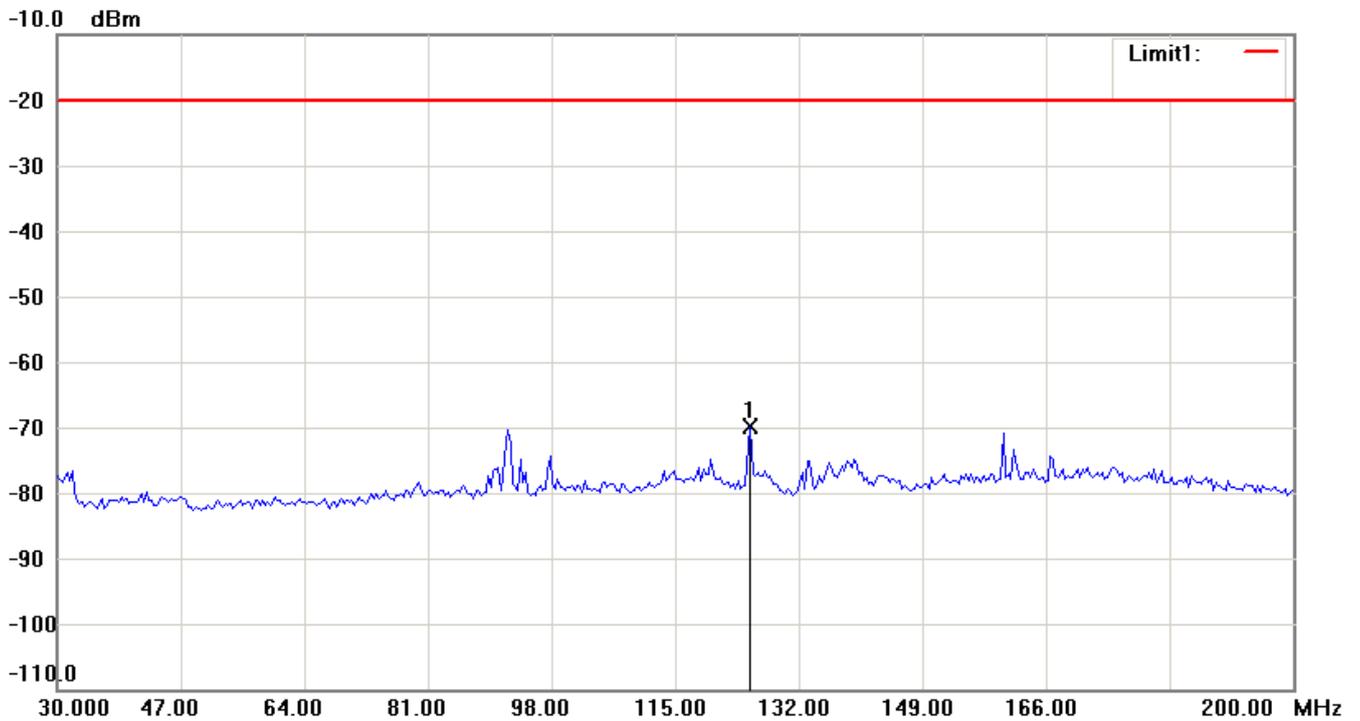


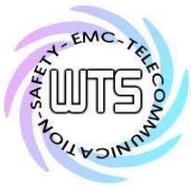


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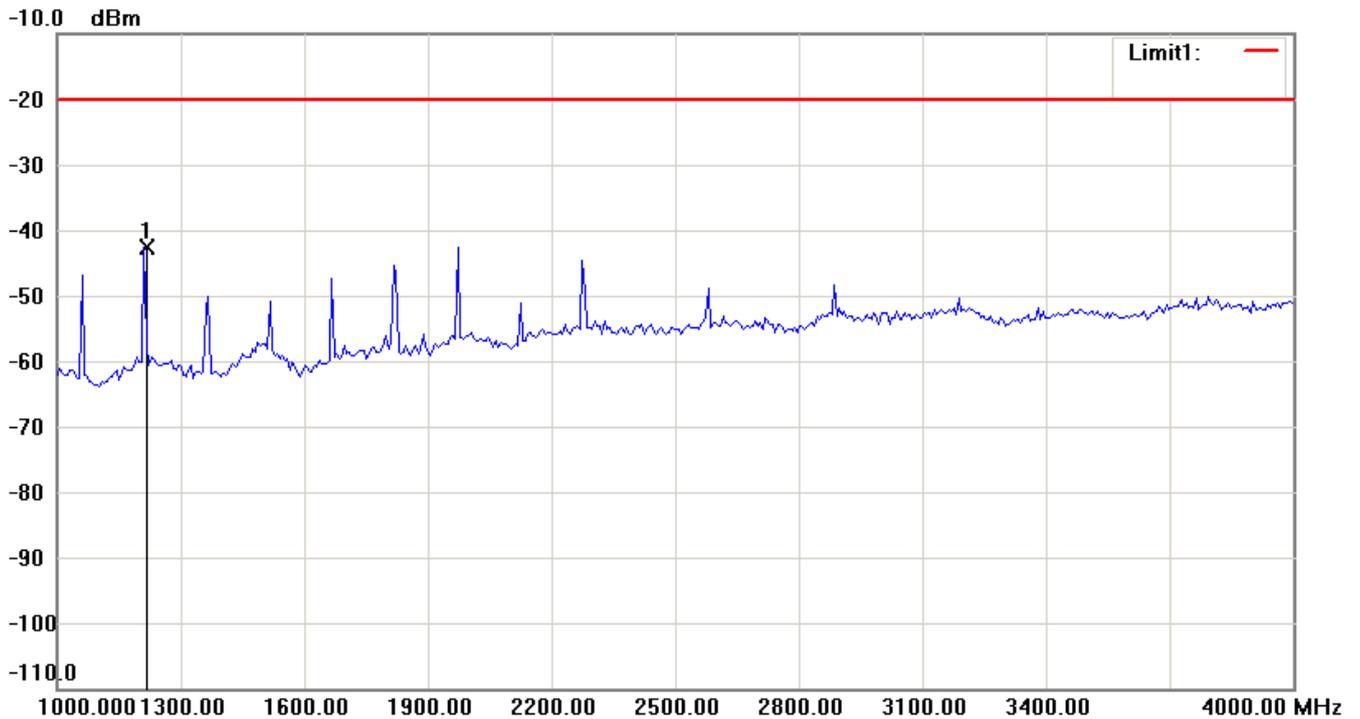
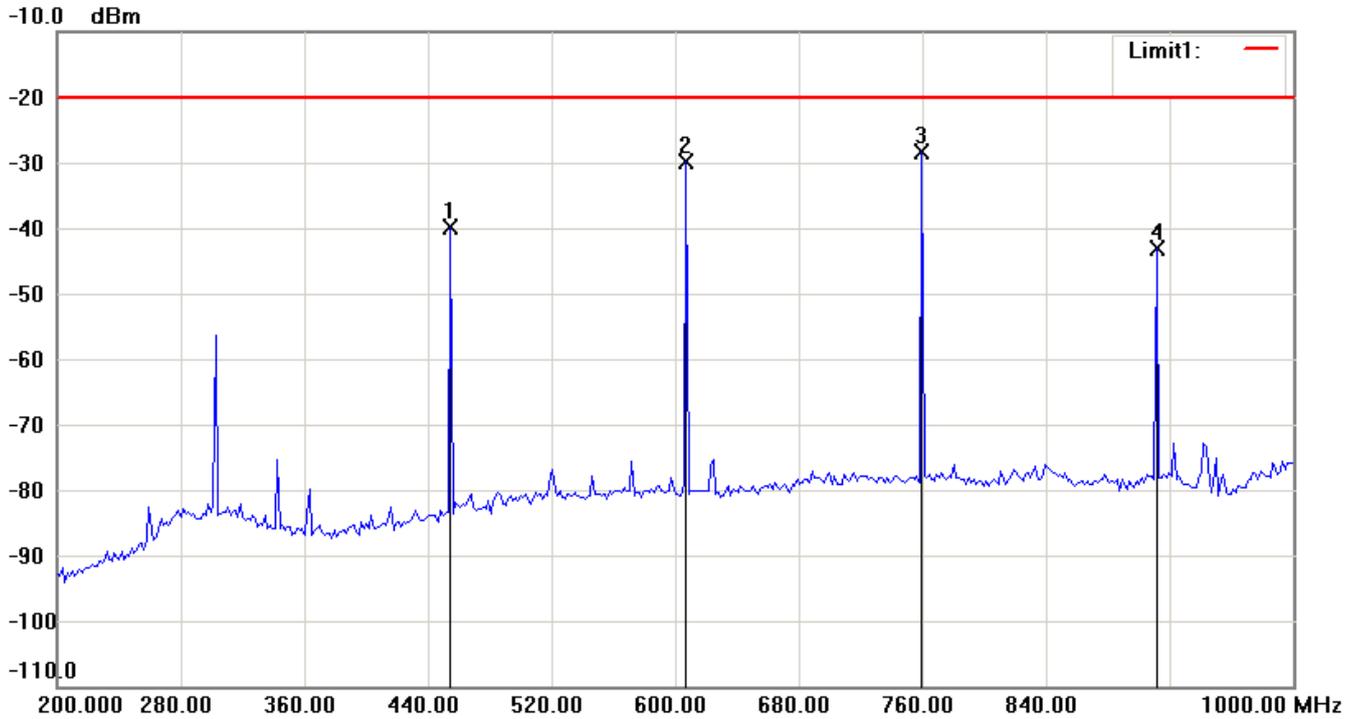
## Antenna Polarization V

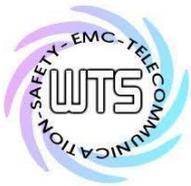




# Worldwide Testing Services(Taiwan) Co., Ltd.

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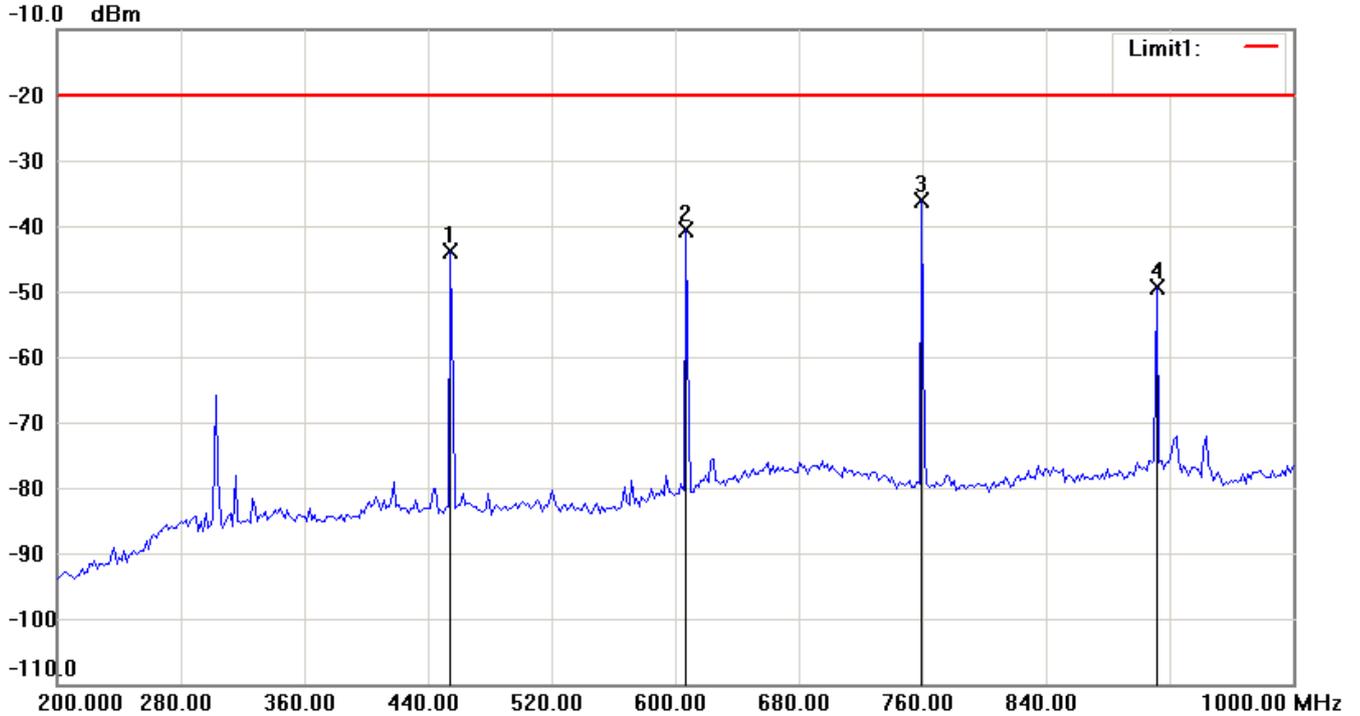
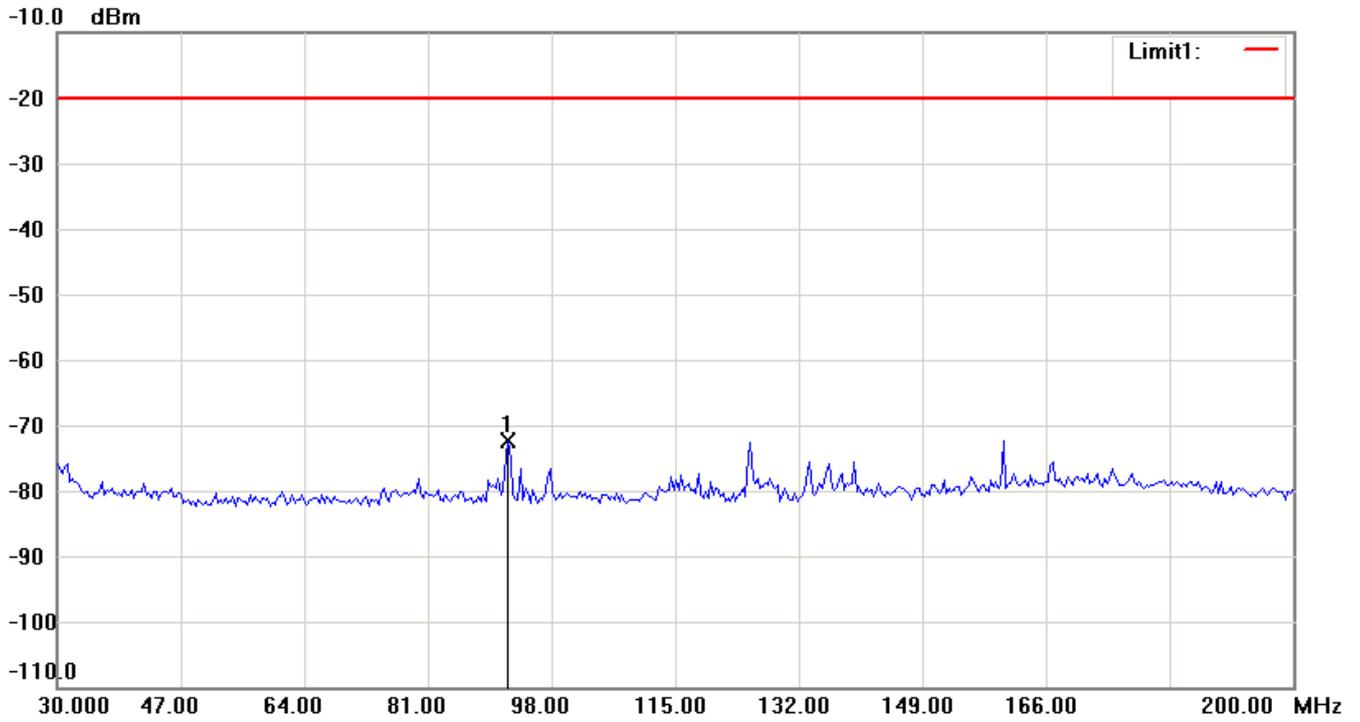


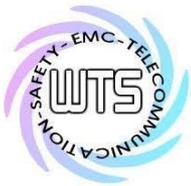


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TX CH3

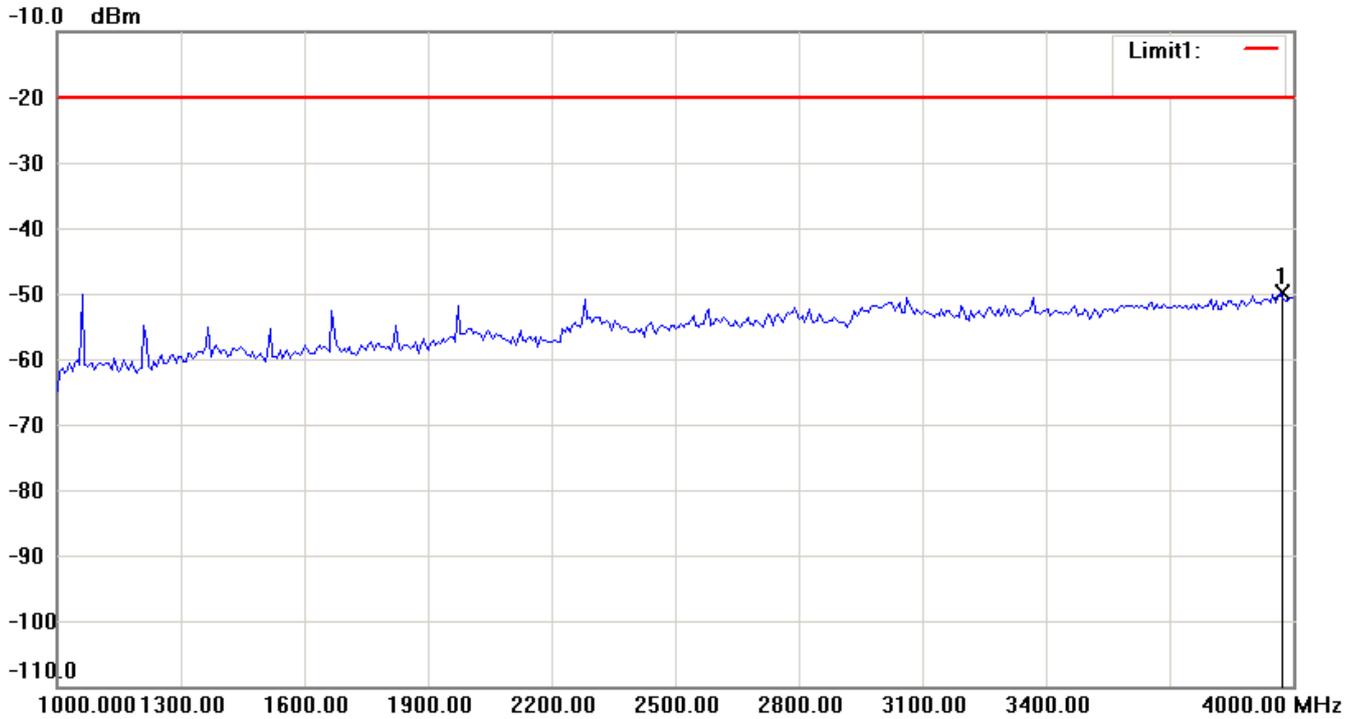
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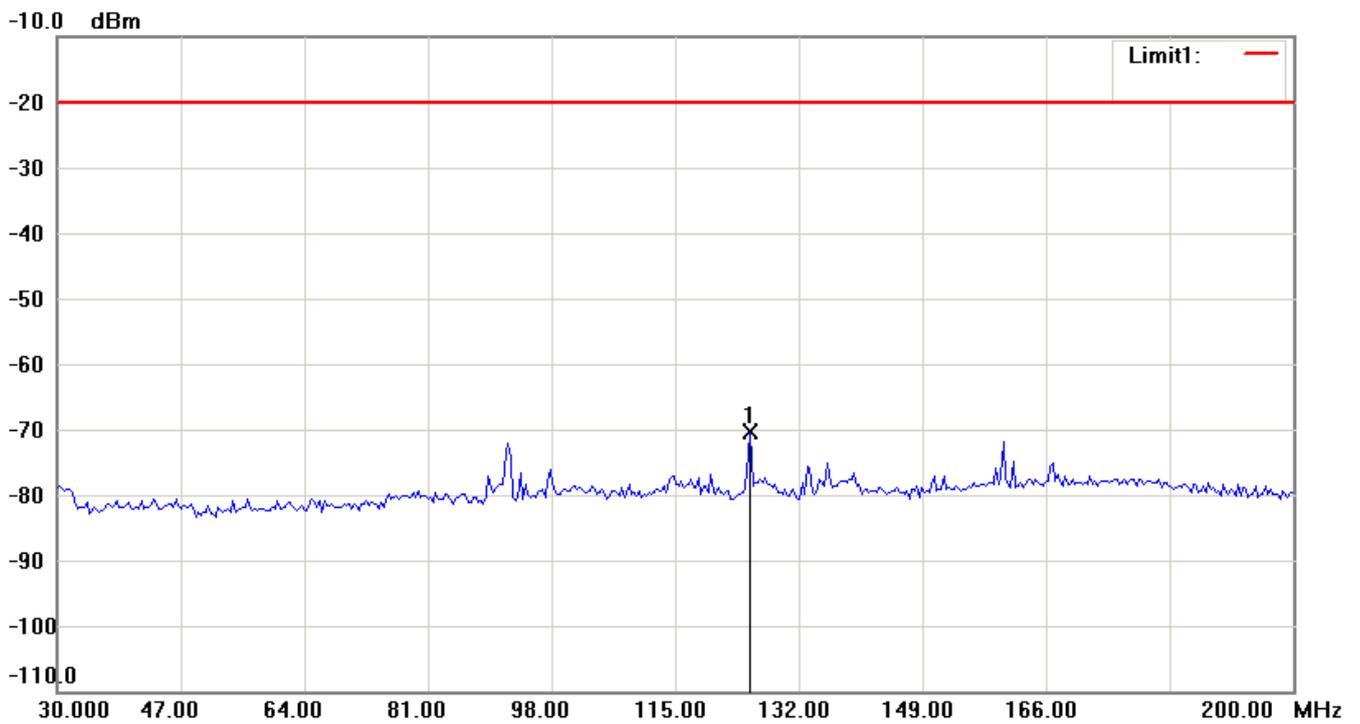


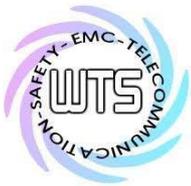
# Worldwide Testing Services(Taiwan) Co., Ltd.

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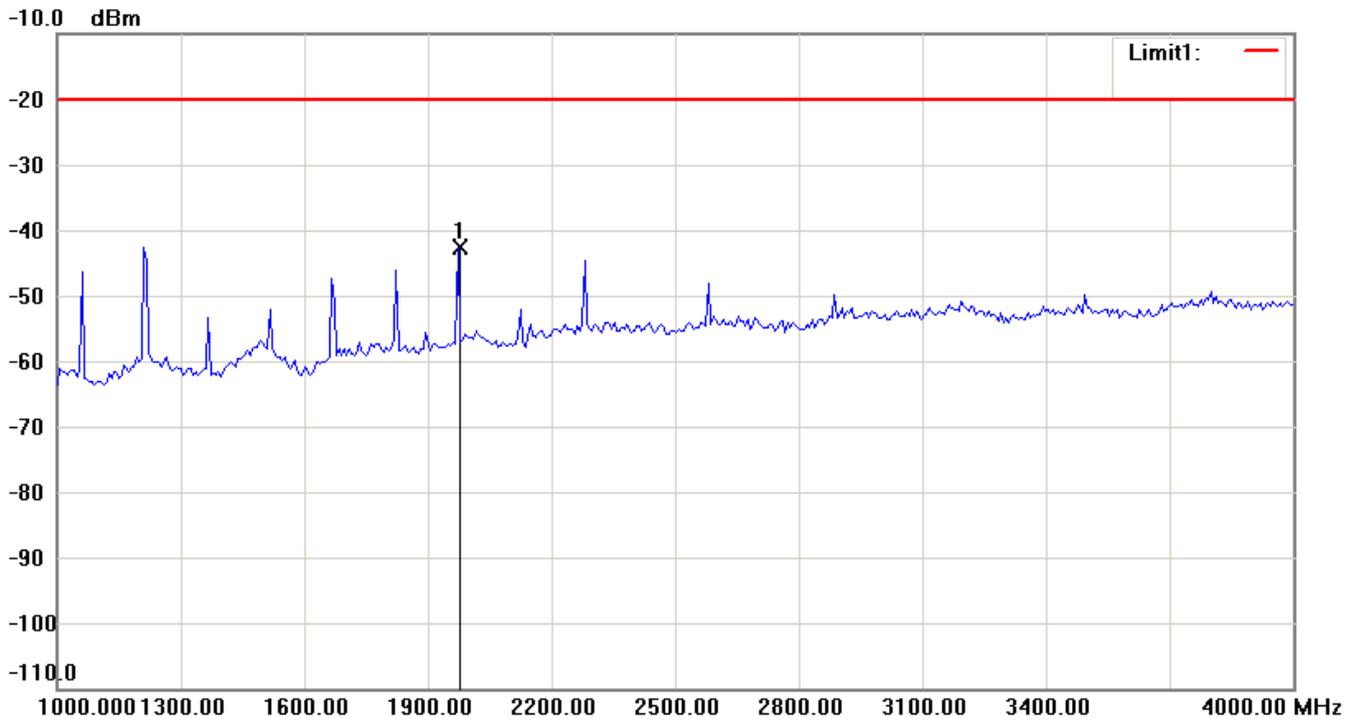
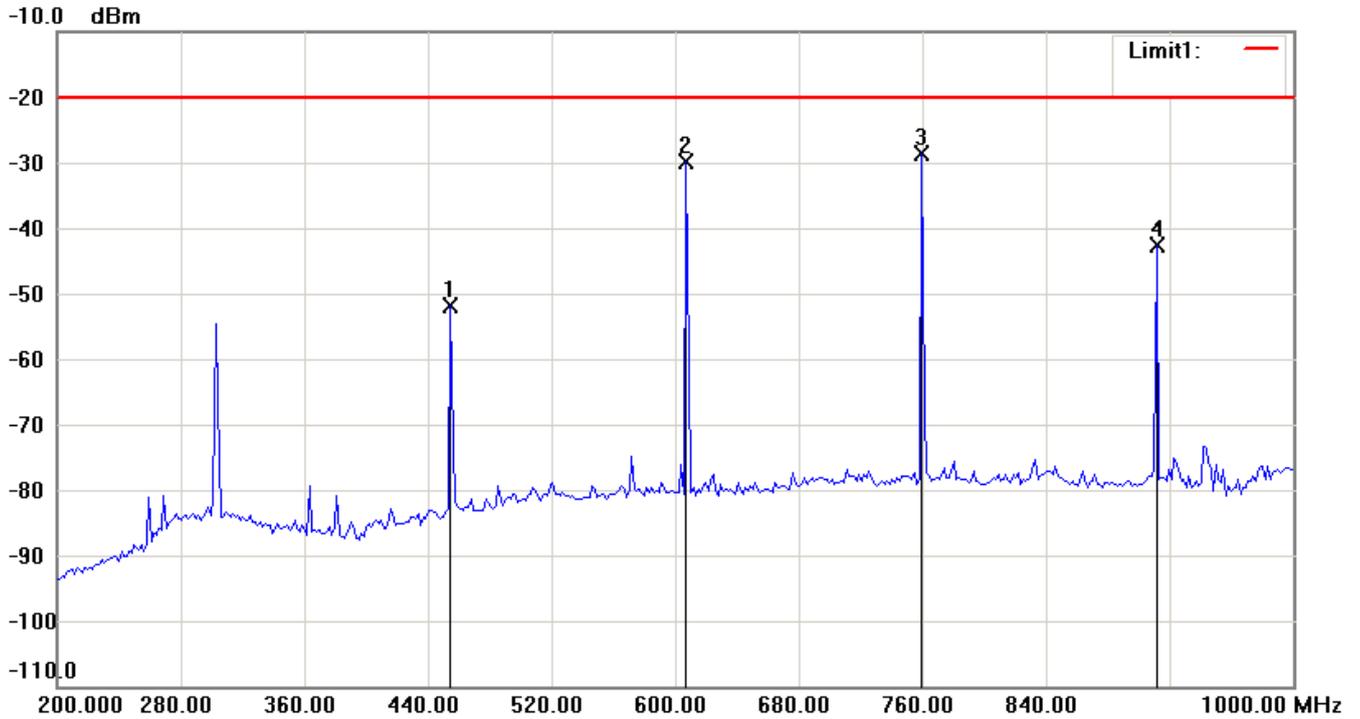
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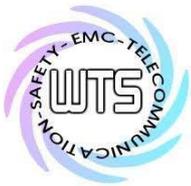




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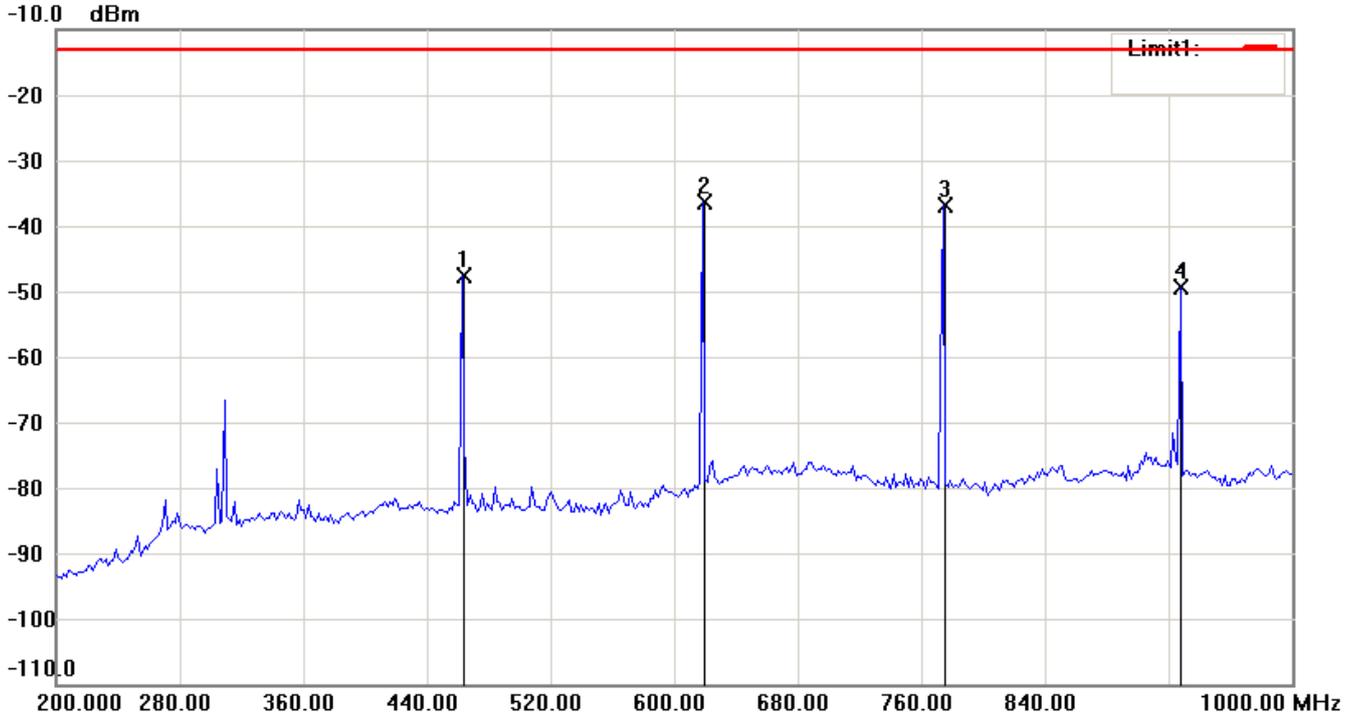
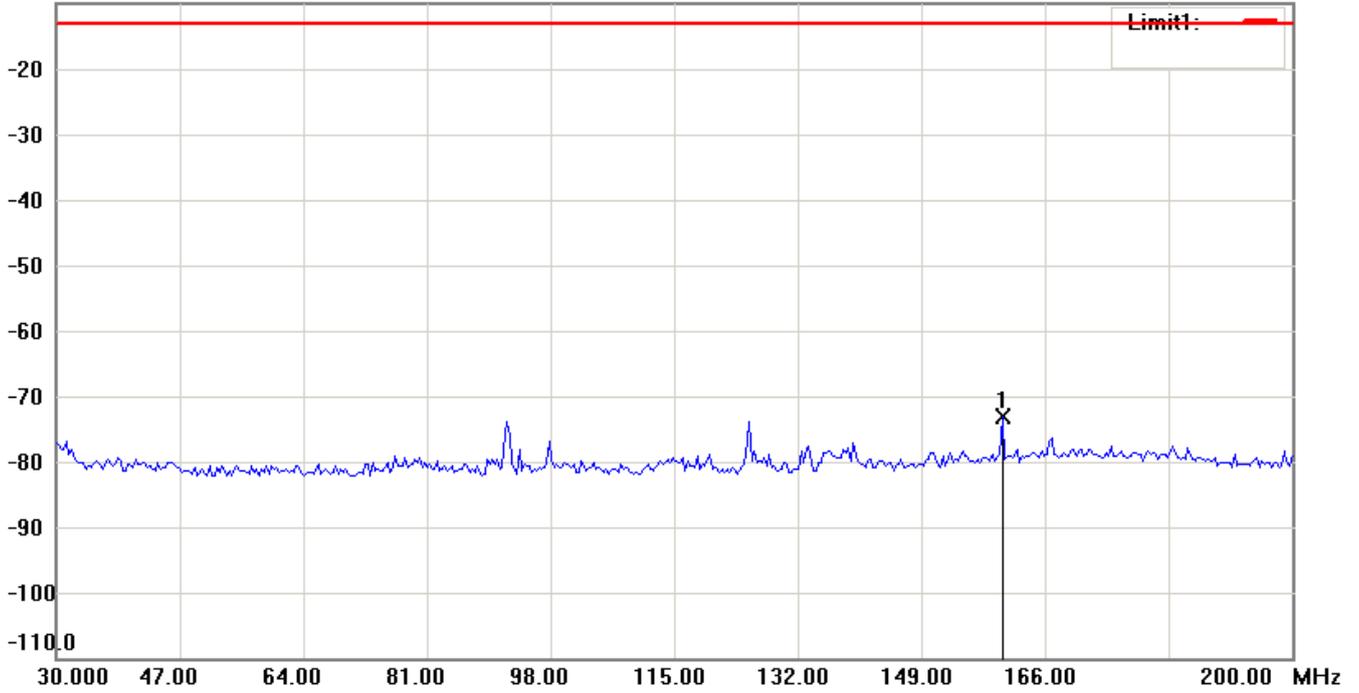


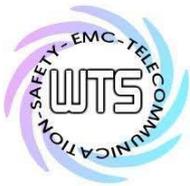
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TX CH5

Antenna Polarization H

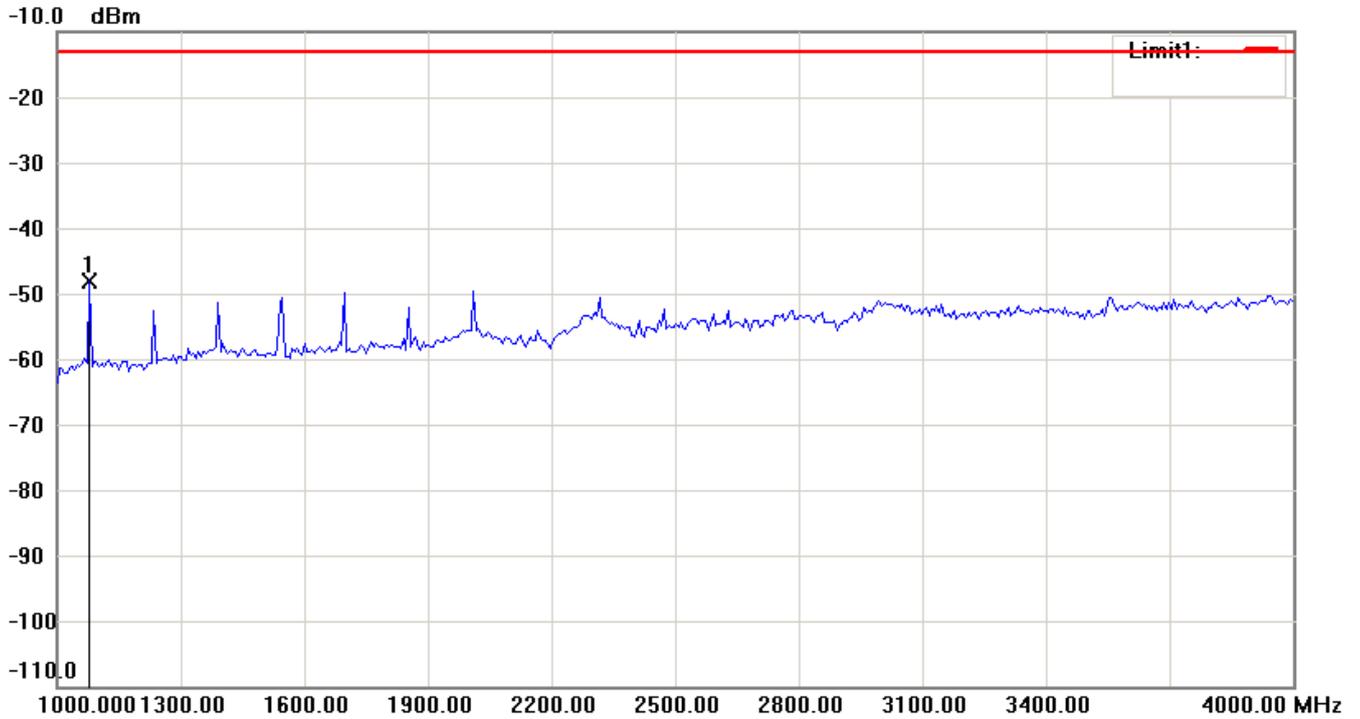
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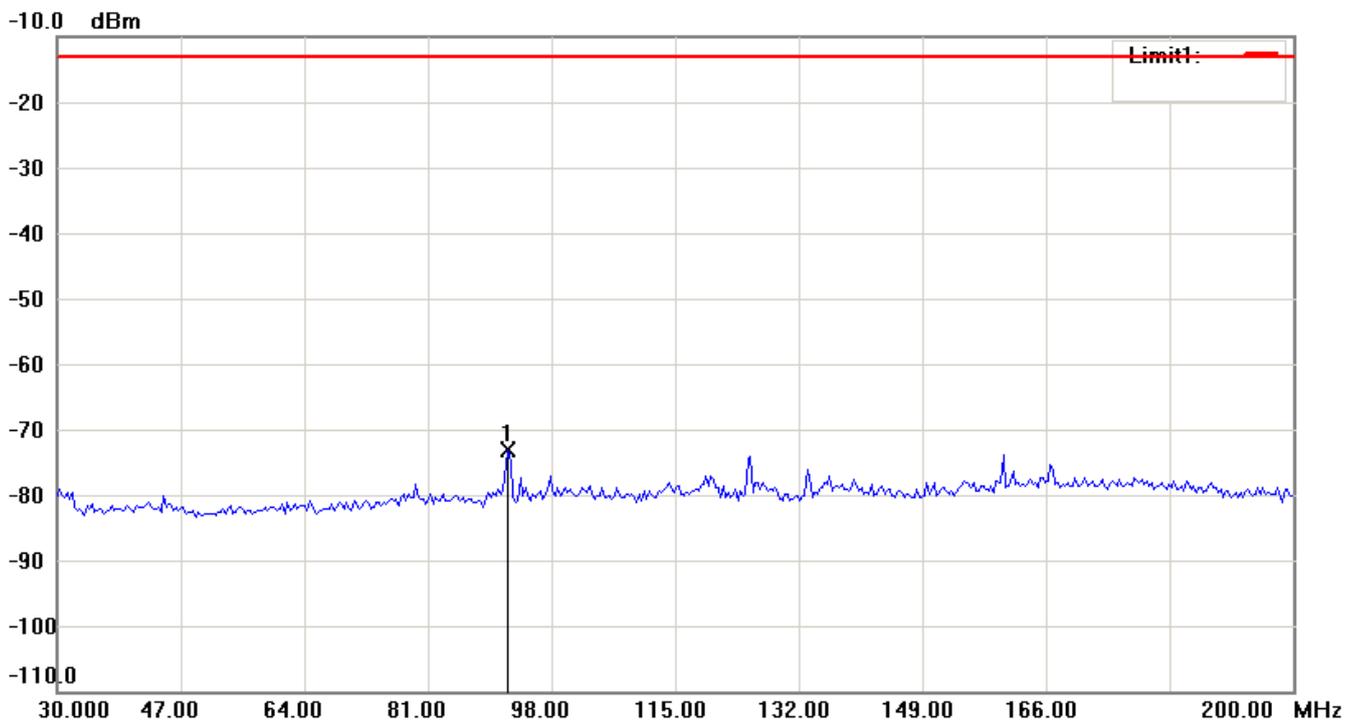


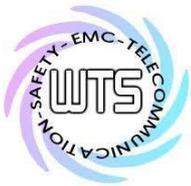
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Antenna Polarization V





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