FCC PART 74.861 TEST REPORT

for

Transmitter

Model No.: ACT-5T

FCC ID: M5X-ACT5T

of

Applicant: MIPRO Electronics Co., Ltd. Address: 814 Pei-kang Road 600 Chia-yi Taiwan, R.O.C

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.: W6M20902-9586-C-1

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Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

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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 is 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.

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Tester:

April 17, 2009		Danny	Danny
Date	WTS-Lab.	Name	Signature

Technical responsibility for area of testing:

April 17, 2009		Chang Tse-Ming	Chang Tee-ring		
Date	WTS	Name	Signature		



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1.2 Testing laboratory

1.2.1 Location

OATS

No.5-1, Shuang Sing Village, LiShuei Rd., Wanli Township, Taipei County 207, Taiwan (R.O.C.)

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.:

1 000 10 000010119 11 11 11 11 11 11 11 11 11 11 11 11	
Name:	./.
Accredited number:	./.
Street:	./.
Town:	./.
Country:	./.
Telephone:	./.
Fax:	./.

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1.3 Details of approval holder

Name: MIPRO Electronics Co., Ltd.

Street: 814 Pei-kang Road

Town: Chia-yi, 600
Country: Taiwan, R.O.C.
Telephone: +886-5-238-0809
Fax: +886-5-238-0803

1.4 Application details

Date of receipt of test sample: February 27, 2009

Date of test: From March 02, 2009 to April 15, 2009

1.5 General information of Test item

Type of test item: Transmitter

Model Number: ACT-5T

Brand Name: MIPRO

Multi-listing model number: ./.

Photos: see Appendix

Technical data

Frequency band:

Frequency(MHz)	TV Band	Used Band
26.100-26.480		
54.000-72.000		
76.000-88.000		
161.625-161.775		
174.000-216.000		
450.000-451.000		
455.000-456.000		
470.000-488.000		
488.000-494.000		
494.000-608.000		
614.000-697.000		
944.000-952.000		



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Frequency (ch A): 614.2 MHz Frequency (ch B): 655.5 MHz Frequency (ch C): 696.8 MHz

Antenna Type: $1/4 \lambda$

Antenna Gain: 0 dBi

Power supply: Battery (3 VDC, AA*2)

Operation modes: Simplex

Additional information: The EUT is the portable device. So the EUT was tested on three

different axes. The EUT uses the frequency range that are more than 10MHz, so that was tested on low, middle, and high three

different frequencies.

Manufacturer: (if different from approval holder)

 Name:
 ./.

 Street:
 ./.

 Town:
 ./.

 Country:
 ./.

1.6 Test standards

Technical standard: FCC Part 74 Subpart H, section 74.861 (2008)



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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



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2.3 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	2008/9/18	2009/9/17
ETSTW-CE 002	PREREULATOR MODE DC POWER SUPPLY	None	None	None	Functi	on Test
ETSTW-CE 003	AC POWER SOURCE	APS-9102	D161137	GW	Functi	on Test
ETSTW-CE 004	ZWEILEITER-V- NETZNACHBILDUNG TWO- LINE V-NETWORK	ESH3-Z5	840731/011	R&S	2008/9/15	2009/9/14
ETSTW-CE 005	Line-Impedance Stabilisation Network	NNBM 8126D	137	Schwarzbeck	2008/9/15	2009/9/14
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	2008/5/10	2009/5/9
ETSTW-CE 008	ABSORBING CLAMP	MDS 21	3469	Schwarzbeck	2008/9/18	2009/9/17
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2008/7/25	2009/7/24
ETSTW-CE 015	CISPR 22 TWO BALANCED TELECOM PAIRS IMPEDANCE STABILIZATION NETWORK	FCC-TLISN-T8-02	20307	FCC	2008/9/22	2009/9/21
ETSTW-CE 016	TWO-LINE V-NETWORK	ENV216	100050	R&S	2008/9/24	2009/9/23
ETSTW-RE 002	Function Generator	33220A	MY43004982	Agilent	2007/10/12	2009/10/11
ETSTW-RE 003	EMI TEST RECEIVER	ESI 26	831438/001	R&S	2008/10/8	2009/10/7
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2008/9/22	2009/9/21
ETSTW-RE 005	EMI TEST RECEIVER	ESVS10	843207/020	R&S	2008/9/18	2009/9/17
ETSTW-RE 011	PROGRAMMABLE LINEAR POWER SUPPLY	LPS-305	30503070165	МОТЕСН	Functi	on Test
ETSTW-RE 017	Log-Periodic Antenna	HL025	352886/001	R&S	2008/5/5	2009/5/4
ETSTW-RE 018	MICROWAVE HORN ANTENNA	AT4560	27212	AR	2008/10/27	2009/10/26
ETSTW-RE 020	MICROWAVE HORN ANTENNA	AT4002A	306915	AR	Function	on Test
ETSTW-RE 021	SWEEP GENERATOR	SWM05	835130/010	R&S	2008/8/27	2009/8/26
ETSTW-RE 028	Log-Periodic Dipole Array Antenna	3148	34429	EMCO	2008/4/23	2009/4/22
ETSTW-RE 029	Biconical Antenna	3109	33524	EMCO	2008/4/23	2009/4/22
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	EMCO	2009/3/23	2010/3/22
ETSTW-RE 032	Millivoltmeter	URV 55	849086/013	R&S	2008/9/1	2009/8/31
ETSTW-RE 033	WaveRunner 6000A Serise Oscilloscope	WAVERUNNER 6100A	LCRY0604P14508	LeCroy	2008/6/27	2009/6/26
ETSTW-RE 034	Power Sensor	URV5-Z4	839313/006	R&S	2008/9/1	2009/8/31
ETSTW-RE 042	Biconical Antenna	HK116	100172	R&S	2009/1/8	2011/1/7
ETSTW-RE 043	Log-Periodic Dipole Antenna	HL223	100166	R&S	2008/5/2	2009/5/1
ETSTW-RE 044	Log-Periodic Antenna	HL050	100094	R&S	2008/5/22	2009/5/21
ETSTW-RE 047	ESA-E SERIES SPECTRUM ANALYZER	E4445A	MY46181369	Agilent	2008/6/26	2009/6/25
ETSTW-RE 048	Triple Loop Antenna	HXYZ 9170	HXYZ 9170-134	Schwarzbeck	2008/9/1	2009/8/31
ETSTW-RE 049	TRILOG Super Broadband test Antenna	VULB 9160	9160-3185	Schwarzbeck	2007/5/2	2009/5/1
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2008/7/1	2009/6/30
ETSTW-RE 064	Bluetooth Test Set	MT8852B-042	6K00005709	Anritsu	2008/9/1	2009/8/31



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CELL SITE TEST SET	8921A	3339A00375	HP	2008/10/28	2009/10/27
Power Meter	N1911A	MY45100769	Agilent	2009/1/9	2011/1/8
Power Sensor	N1921A	MY45241198	Agilent	2009/1/9	2011/1/8
Match Pad	MDCS1500	None	WOKEN	2008/10/9	2009/10/8
Match Pad	MDCS1510	None	WOKEN	2008/10/9	2009/10/8
LUMPED ELEMENT POWER DIVIDER	PL2-10	146	MCLI	2009/3/6	2010/3/5
Precision Coaxial Termination	HP 909F	03941	Agilent	2008/12/19	2009/12/18
Digital Thermo-Hygro Meter	0410	01	WISEWIND	2009/3/24	2010/3/23
Universal Radio Communication Tester	CMU 200	109439	R&S	2008/9/23	2009/9/22
Power Divider	4901.19.A	None	SUHNER	2008/9/22	2009/9/21
Microwave Cable	SUCOFLEX 104	238094	HUBER+SUHNER	2008/9/22	2009/9/21
Microwave Cable	SUCOFLEX 104	238093	HUBER+SUHNER	2008/9/22	2009/9/21
Microwave Cable	SUCOFLEX 104	209953	HUBER+SUHNER	2008/9/22	2009/9/21
EMI TEST SOFTWARE	Harmonics-1000	None	EMC PARTNER		ersion 4.16 Version 2.18
EMI TEST SOFTWARE	EZ_EMC	None	Farad	Version E	ETS-03A1
EMI TEST SOFTWARE	i2	None	AUDIX	Version 3.2	2007-8-17b
	Power Meter Power Sensor Match Pad Match Pad LUMPED ELEMENT POWER DIVIDER Precision Coaxial Termination Digital Thermo-Hygro Meter Universal Radio Communication Tester Power Divider Microwave Cable Microwave Cable EMI TEST SOFTWARE EMI TEST SOFTWARE	Power Meter N1911A Power Sensor N1921A Match Pad MDCS1500 Match Pad MDCS1510 LUMPED ELEMENT PL2-10 Precision Coaxial Termination HP 909F Digital Thermo-Hygro Meter 0410 Universal Radio Communication Tester Power Divider 4901.19.A Microwave Cable SUCOFLEX 104 Microwave Cable SUCOFLEX 104 EMI TEST SOFTWARE Harmonics-1000 EMI TEST SOFTWARE EZ_EMC	Power Meter N1911A MY45100769 Power Sensor N1921A MY45241198 Match Pad MDCS1500 None Match Pad MDCS1510 None LUMPED ELEMENT POWER DIVIDER PL2-10 146 Precision Coaxial Termination HP 909F 03941 Digital Thermo-Hygro Meter 0410 01 Universal Radio Communication Tester CMU 200 109439 Power Divider 4901.19.A None Microwave Cable SUCOFLEX 104 238094 Microwave Cable SUCOFLEX 104 238093 Microwave Cable SUCOFLEX 104 209953 EMI TEST SOFTWARE Harmonics-1000 None EMI TEST SOFTWARE EZ_EMC None	Power Meter N1911A MY45100769 Agilent Power Sensor N1921A MY45241198 Agilent Match Pad MDCS1500 None WOKEN Match Pad MDCS1510 None WOKEN LUMPED ELEMENT PU2-10 146 MCLI Precision Coaxial Termination HP 909F 03941 Agilent Digital Thermo-Hygro Meter 0410 01 WISEWIND Universal Radio Communication Tester Power Divider 4901.19.A None SUHNER Microwave Cable SUCOFLEX 104 238094 HUBER+SUHNER Microwave Cable SUCOFLEX 104 238093 HUBER+SUHNER Microwave Cable SUCOFLEX 104 209953 HUBER+SUHNER EMI TEST SOFTWARE Harmonics-1000 None EMC PARTNER EMI TEST SOFTWARE EZ_EMC None Farad	Power Meter N1911A MY45100769 Agilent 2009/1/9 Power Sensor N1921A MY45241198 Agilent 2009/1/9 Match Pad MDCS1500 None WOKEN 2008/10/9 Match Pad MDCS1510 None WOKEN 2008/10/9 LUMPED ELEMENT POWER DIVIDER PL2-10 146 MCLI 2009/3/6 Precision Coaxial Termination HP 909F 03941 Agilent 2008/12/19 Digital Thermo-Hygro Meter 0410 01 WISEWIND 2009/3/24 Universal Radio Communication Tester CMU 200 109439 R&S 2008/9/23 Power Divider 4901.19.A None SUHNER 2008/9/22 Microwave Cable SUCOFLEX 104 238094 HUBER+SUHNER 2008/9/22 Microwave Cable SUCOFLEX 104 238093 HUBER+SUHNER 2008/9/22 Microwave Cable SUCOFLEX 104 209953 HUBER+SUHNER 2008/9/22 EMI TEST SOFTWARE Harmonics-1000 None EMC PARTNER HARCS V Firmware V

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2.4 General Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-2003 using a 50µH 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 C63.4-2003 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 100 kHz 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, a 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: 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.



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3 Test results (enclosure)

Test case	Para. Number	Required	Test passed	Test failed
RF Power Output	2.1046 (a);	×	×	
1	74.861 (e)(1)			
Modulation Deviation	2.1047 (b);	×	×	
Wodulation Deviation	74.861 (e)(2)			
Audio Frequency Response	2.1047 (a)	×	X	
O 1D . 1 . 14 / E M . 1	2.1049 (c)(1);	×	×	
Occupied Bandwidth / Emission Mask	74.861 (e)(5)			
Considera Essiasiona et Antonoa Tombia la	2.1051			
Spurious Emissions at Antenna Terminals	74.861(e)(6)			
D. I. e. 10	2.1053	E E		
Radiated Spurious Emission	74.861(e)(6)	×	×	
Line Conducted Emissions	15.207			
Formula Co. 1. The control of the co	2.1055 (b);	E E	E.	
Frequency Stability vs. Temperature	74.861(e)(4)	×	×	
Formula Coll Transaction Value	2.1055 (a)(1);	E E	E.	
Frequency Stability vs. Voltage	74.861 (e)(4)	×	×	

The follows is intended to leave blank.

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4 RF Power Output (conducted), FCC 2.1046 (a); 74.861 (e)

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.

4.2 Test Results

Frequency Channel	Peak Output Power (dBm)
614.2 MHz	
655.5 MHz	
696.8 MHz	

Limits:

LPAS operating in TV bands				
Frequency [MHz]	Conducted output power [mW]			
54 - 72 76 - 88 174 - 216	50 (17 dBm)			
470 – 608 614 - 806	250 (24 dBm)			

LPAS operating in other than TV bands					
Conducted power [W]	1				

Test equipment used: ETSTW-RE 055

Explanation: This test is not required.

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5 Radiated Power

5.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8mabove 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.

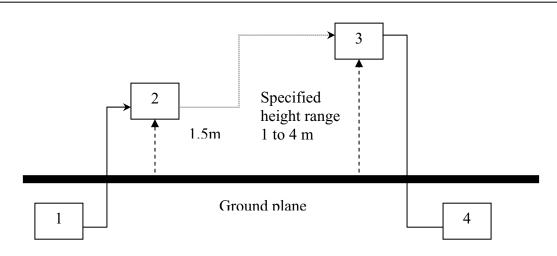
Worst case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna.

Substitution RF power Measurement at ETS Taiwan

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.



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Calibration:

In order to make this kind of measurement more effective and to avoid subjective measurement faults ETS has installed automatic computer controlled measurement procedures.

With the above described substitution method a test site is calibrated over the full frequency range which is used in suitable frequency steps. For a certain power level on the substitution antenna the received power over the whole frequency range is documented. All necessary antenna gains, cable losses, filter losses and amplifications of preamplifiers are taken in consideration. The summary of this calibration measurement performs a transducer factor that is related to the considered test site and a certain measurement distance. Differences of the radiated power levels of different test samples are determined by internal attenuation of measurement receiver. The proper function of such test site will be maintained by short term plausibility checks and periodical re-calibration.

Testing:

Now the test sample will be putted on the table at the defined position and the radiated power will be receiver and documented by the measurement receiver.

On test sites with ground plane the measurement antenna will be lowered and raised to maximum values at significant frequencies.

For peak power measurements the sample is turned by the turntable over 360 degree in order to find the direction with the maximum radiation or to document the max reading with the MAXHOLD function during the rotation.

5.2 Test results

Model: ACT-5T Date: 2009/4/15

Mode: TX power 614.2MHz Temperature: 24 °C Engineer:

Mode: TX power 614.2MHz Temperature: 24 °C Engineer: Danny

Polarization: Horizontal Humidity: 51 %

Frequency	Reading	Factor	D agult	T inair	Margin	Table	Ant.
	(dBm)	(dB)	Result	Limit		Degree	High
(MHz)	Peak	Corr.	(dBm)	(dBm)	(dB)	(Deg.)	(cm)
614.187	-35.61	32.93	-2.68	24.00	-26.68	125	150

Polarization: Vertical

Frequency	Reading	Factor	Result	Limit	Margin	Table	Ant.
	(dBm)	(dB)	(dBm)	(dBm)		Degree	High
(MHz)	Peak	Corr.	(uDIII)	(ubili)	(dB)	(Deg.)	(cm)
614.185	-20.17	30.06	9.89	24.00	-14.11	120	150

Mode: TX power 655.5MHz

Polarization: Horizontal

Frequency	Reading	Factor	Result	Limit	Margin	Table	Ant.
	(dBm)	(dB)				Degree	High
(MHz)	Peak	Corr.	(dBm)	(dBm)	(dB)	(Deg.)	(cm)
655.495	-33.54	32.65	-0.89	24.00	-24.89	120	150



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Polarization: Vertical

Frequency	Reading	Factor	Dogult	Limit	Margin	Table	Ant.
	(dBm)	(dB)	Result			Degree	High
(MHz)	Peak	Corr.	(dBm)	(dBm)	(dB)	(Deg.)	(cm)
655.487	-20.37	32.18	11.81	24.00	-12.19	130	150

Mode: TX power 696.8MHz

Polarization: Horizontal

Frequency	Reading	Factor	Result	Limit	Margin	Table	Ant.
	(dBm)	(dB)				Degree	High
(MHz)	Peak	Corr.	(dBm)	(dBm)	(dB)	(Deg.)	(cm)
696.795	-27.43	32.70	5.27	24.00	-18.73	125	150

Polarization: Vertical

Frequency	Reading	Factor	Result	Limit	Margin	Table	Ant.
	(dBm)	(dB)				Degree	High
(MHz)	Peak	Corr.	(dBm)	(dBm)	(dB)	(Deg.)	(cm)
696.787	-21.24	33.46	12.22	24.00	-11.78	120	150

Test equipment used: ETSTW-RE 003, ETSTW-RE 004, ETSTW-RE 021, ETSTW-RE 028, ETSTW-RE 029, ETSTW-RE 042, ETSTW-RE 043

Explanation: Please see attached diagrams as appendix.

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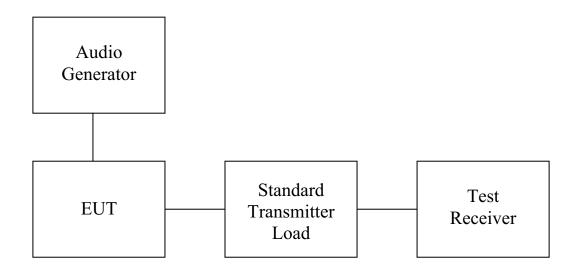
6 Modulation Deviation , FCC 2.1047 (b) ; 74.861(e)

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: Please see attached diagram as appendix.

Limits: $\pm 75 \text{ kHz}$

Test equipment used: ETSTW-RE 002, ETSTW-RE 055

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7 Audio frequency response, FCC 2.1047 (a)

7.1 Test procedure

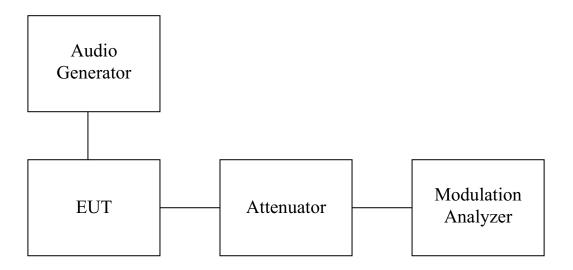
The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

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

For 1000 Hz 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 100 Hz to 5000 Hz are recorded and compared with the reference deviation as follows:

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



7.2 Test results

Explanation: Please see attached diagram as appendix.

Test equipment used: ETSTW-RE 002

FCC ID: M5X-ACT5T

8 Occupied Bandwidth/Emission Mask, FCC 2.1049 (c); 74.861 (e)(5)

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power. Near the carrier an Emission Mask is defined by the standard.

8.1 Test procedure

The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation.

Occupied Bandwidth was measured with a occupied bandwidth function of the analyzer.

The near the carrier emissions are measured by normal power measurement function of the analyzer.

8.2 Test Results

1000 Hz Modulation

Occupied Channel Bandwidth (kHz)						
Channel A	139.423076923					
Channel B	134.615384615					
Channel C	121.794871795					

2500 Hz Modulation

Occupied Channel Bandwidth (kHz)						
Channel A	144.230769231					
Channel B	145.833333333					
Channel C	136.217948718					

Test equipment used: ETSTW-RE 055

Explanation: Please see attached diagram as appendix.

FCC ID: M5X-ACT5T

9 Spurious Emissions at Antenna Terminals FCC2.1051; 74.861 (e)

9.1 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 Spurious Emissions at Antenna Terminals was measured by the spectrum analyzer with a suitable notch filter and high-pass filter.

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.

9.2 Test Results

Summary table with conducted data of the test plots for Carrier Test Frequency

Frequency Marker Indication [MHz]	Indication Power Level [dBm]	Compliance Limit [dBm	Margin	

9.3 Limit

Compliance with § 74.861 requires that any emission be attenuated below the transmitter power at least $43 + 10 \log_{10} P$ (P = transmitter power in Watts).

The compliance limit was calculated as an example per the following table:

Maximum transmitter output power	12.22 dBm
Required attenuation	$43 + 10 \log_{10} 0.01667247W = 25.22 \text{ dB}$
Maximum transmitter output power	12.22 dBm
Required attenuation	25.22 dB
Compliance limit	-13 dBm

Test equipment used: ETSTW-RE 055

Explanation: This test is not applicable.

FCC ID: M5X-ACT5T

10 Radiated Spurious Emission, FCC 2.1053; 74.861 (e)

10.1 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 have been carried out with the ESK-Software from Rode & Schwarz. The measurements below 1GHz were performed with a measurement bandwidth of 100kHz, above 1GHz with a bandwidth of 1 MHz.

Spurious emission limits near the carrier are defined by a emission mask. This measurements are done in conducted mode.

10.2 Test Results

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

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

Summary table with radiated data of the test plots for Carrier Test Frequency

Model:	ACT-5	T	Date:	2009/	3/19			
Mode:	TX 614.2	MHz Tei	mperature:	24 °C		Enginee	r: Da	ınny
Polarization: H	Horizontal	Н	lumidity:	51	%			
Frequency	Reading	Factor	Result	Lit	mit	Margin	Table	Ant.
	(dBm)	(dB)	(dBm)		3m)		Degree	High
(MHz)	Peak	Corr.	(uDiii)	(ul) 111 <i>)</i>	(dB)	(Deg.)	(cm)
285.391	-100.34	29.68	-70.66	-13	.00.	-57.66	110	150
988.778	-101.96	35.93	-66.03	-13	.00.	-53.03	125	150
1228.457	-50.42	1.50	-48.92	-13	.00	-35.92	145	150
1841.683	-40.75	3.84	-36.91	-13	.00	-23.91	135	150
2454.910	-32.10	6.58	-25.52	-13	.00	-12.52	140	150
3074.148	-45.15	10.54	-34.61	-13	.00.	-21.61	130	150
3687.375	-55.23	11.65	-43.58	-13	.00	-30.58	130	150
6140.281	-54.04	14.19	-39.85	-13	.00	-26.85	135	150



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

Polarization: Vertical

Frequency	Reading	Factor	Result	Limit	Margin	Table	Ant.
	(dBm)	(dB)	(dBm)	(dBm)		Degree	High
(MHz)	Peak	Corr.	(uDIII)	(uDili)	(dB)	(Deg.)	(cm)
78.156	-93.12	25.17	-67.95	-13.00	-54.95	105	150
932.665	-100.87	35.44	-65.43	-13.00	-52.43	120	150
1228.457	-46.68	0.84	-45.84	-13.00	-32.84	150	150
1841.683	-41.79	3.28	-38.51	-13.00	-25.51	145	150
2454.910	-39.79	4.61	-35.18	-13.00	-22.18	140	150
3074.148	-38.40	7.01	-31.39	-13.00	-18.39	135	150
3687.375	-54.27	9.92	-44.35	-13.00	-31.35	140	150
6140.281	-57.59	12.26	-45.33	-13.00	-32.33	130	150

Mode: TX 655.5MHz

Polarization: Horizontal

Frequency	Reading	Factor	Result	Limit	Margin	Table	Ant.
	(dBm)	(dB)				Degree	High
(MHz)	Peak	Corr.	(dBm)	(dBm)	(dB)	(Deg.)	(cm)
259.419	-103.70	31.93	-71.77	-13.00	-58.77	110	150
858.317	-101.13	35.75	-65.38	-13.00	-52.38	125	150
1306.613	-47.45	3.06	-44.39	-13.00	-31.39	140	150
1967.936	-41.01	4.92	-36.09	-13.00	-23.09	135	150
2623.247	-34.61	9.42	-25.19	-13.00	-12.19	145	150
3278.557	-54.97	10.98	-43.99	-13.00	-30.99	130	150
5899.800	-54.00	14.30	-39.70	-13.00	-26.70	140	150

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
298.918	-104.63	35.27	-69.36	-13.00	-56.36	105	150
988.778	-100.60	35.15	-65.45	-13.00	-52.45	120	150
1306.613	-44.60	3.18	-41.42	-13.00	-28.42	130	150
1967.936	-44.59	3.70	-40.89	-13.00	-27.89	135	150
2623.247	-40.75	6.36	-34.39	-13.00	-21.39	145	150
3278.557	-54.94	8.92	-46.02	-13.00	-33.02	140	150
5899.800	-56.39	12.27	-44.12	-13.00	-31.12	140	150



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

Mode: TX 696.8MHz

Polarization: Horizontal

Frequency	Reading	Factor	Result	Limit	Margin	Table	Ant.
	(dBm)	(dB)	(dBm)	(dBm)		Degree	High
(MHz)	Peak	Corr.	(uDIII)	(uDIII)	(dB)	(Deg.)	(cm)
296.212	-103.70	31.24	-72.46	-13.00	-59.46	115	150
865.331	-100.57	35.66	-64.91	-13.00	-51.91	120	150
1390.782	-53.91	2.59	-51.32	-13.00	-38.32	130	150
1745.491	-49.48	5.07	-44.41	-13.00	-31.41	145	150
2088.176	-48.97	4.49	-44.48	-13.00	-31.48	135	150
2785.571	-39.35	10.37	-28.98	-13.00	-15.98	140	150
6901.804	-57.76	16.09	-41.67	-13.00	-28.67	135	150

Polarization: Vertical

Frequency	Reading	Factor	Result	Limit	Margin	Table	Ant.
	(dBm)	(dB)	(dBm)	(dBm)		Degree	High
(MHz)	Peak	Corr.	(uDIII)	(uDIII)	(dB)	(Deg.)	(cm)
77.615	-89.49	25.06	-64.43	-13.00	-51.43	110	150
918.637	-101.18	35.57	-65.61	-13.00	-52.61	125	150
1390.782	-49.85	1.16	-48.69	-13.00	-35.69	140	150
2088.176	-51.11	3.26	-47.85	-13.00	-34.85	145	150
2785.571	-40.55	6.16	-34.39	-13.00	-21.39	140	150
7583.166	-55.48	11.33	-44.15	-13.00	-31.15	145	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. See the attached diagram as appendix.

10.3 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 § 74.861 (6).

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.

FCC ID: M5X-ACT5T

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

10.4 Limits

Compliance with § 74.861 requires that any emission be attenuated below the transmitter power at least $43 + 10 \log_{10} P$ (P = transmitter power in Watts).

The compliance limit was calculated as an example per the following table:

Maximum transmitter output power	12.22 dBm
Required attenuation	$43 + 10 \log_{10} 0.01667247W = 25.22 \text{ dB}$
Maximum transmitter output power	12.22 dBm
Required attenuation	25.22 dB
Compliance limit	-13 dBm

Test equipment used: ETSTW-RE 003, ETSTW-RE 004, ETSTW-RE 017, ETSTW-RE 021,

ETSTW-RE 028, ETSTW-RE 029, ETSTW-RE 030, ETSTW-RE 042,

ETSTW-RE 043

Explanation: see attached diagrams in appendix.

FCC ID: M5X-ACT5T

11 Line Conducted Emission, FCC 15.207

11.1 Test procedure

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the table bellows with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

This measurement was transact first with instrumentation using an average and peak detector and a 10 kHz bandwidth. If the peak detector achieves a calculated level, the measurement is repeated by an instrumentation using a quasi-peak detector.

11.2 Test Results

Frequency	Max. Level (dBμV)			
requency	quasi-peak	average		
kHz				

Limits:

Frequency of Emission (MHz)	Conducted 1	Limit (dBuV)
	Quasi Peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Test equipment used: ETSTW-CE 001, ETSTW-CE 003, ETSTW-CE 004, ETSTW-CE 006

Explanation: For battery operated device, this test item is not applicable.

FCC ID: M5X-ACT5T

12 Frequency Stability vs. Temperature, FCC 2.1055, 74.861 (e)

12.1 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.

12.2 Test Results

614.2 MHz

°C	Frequency Error (kHz)	Frequency Error (ppm)
-30	-5.631	-9.168
-20	-4.381	-7.133
-10	-0.781	-1.272
0	1.127	1.834
10	-1.845	-3.003
20	-0.040	-0.066
30	-3.764	-6.129
40	-4.120	-6.708
50	-4.919	-8.008

25°C: 614.200134 MHz Limit: 30.71 kHz(±0.005%)

655.5 MHz

°C	Frequency Error (kHz)	Frequency Error (ppm)
-30	-6.346	-9.680
-20	-3.041	-4.639
-10	-2.232	-3.405
0	1.558	2.377
10	-0.567	-0.865
20	-1.591	-2.428
30	-4.014	-6.124
40	-4.179	-6.375
50	-3.871	-5.906

25°C: 655.499848 MHz Limit: 32.77 kHz(±0.005%)



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

696.8 MHz

Frequency Error (kHz)	Frequency Error (ppm)
-6.002	-8.614
-4.737	-6.798
-1.207	-1.733
0.571	0.819
-1.302	-1.868
-0.980	-1.406
-3.383	-4.855
-6.227	-8.937
-5.510	-7.907
	-6.002 -4.737 -1.207 0.571 -1.302 -0.980 -3.383 -6.227

25°C: 696.800509 MHz Limit: 34.84 kHz(±0.005%)

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

FCC ID: M5X-ACT5T

13 Frequency Stability vs. Voltage , FCC 2.1055 (d) ; 74.861 (e)

13.1 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.

13.2 Test Results

Frequency in Normal Condition	Frequency in battery operating end point	Frequency Error (kHz)	Frequency Error (ppm)
614.200134	614.195170	-4.964	-8.082
655.499848	655.494198	-5.650	-8.619
696.800509	696.795159	-5.331	-7.679

Limit: $\pm 0.005\%$

Test equipment used: ETSTW-RE 055, ETSTW-CE 003

FCC ID: M5X-ACT5T

Appendix

A Measurement diagrams

- 1. RF Power Output
- 2. Modulation Deviation and Audio frequency response
- 3. Occupied Bandwidth / Emission Mask
- 4. Spurious Emissions at Antenna Terminals (This test is not applicable)
- 5. Radiation Spurious Emission
- 6. Line Conducted Emissions (This is not required the sample is battery used.)
- 7. Frequency Stability vs. Temperature No diagrams
 Refer to point 12.2
- 8. Frequency Stability vs. Voltage No diagrams Refer to point 13.2

B Photos

- 1. External Photos
- 2. Internal Photos
- 3. Set Up Photo of Radiated Emission

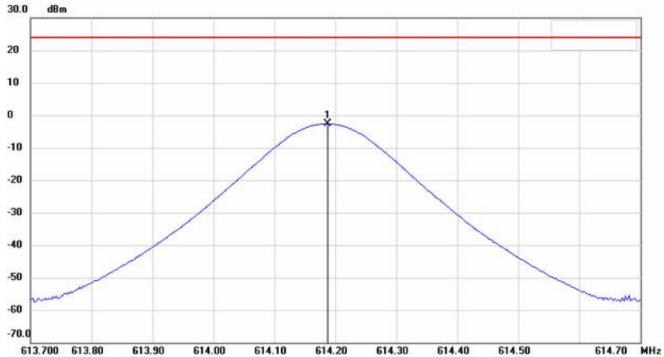


Registration number: W6M20902-9586-C-1

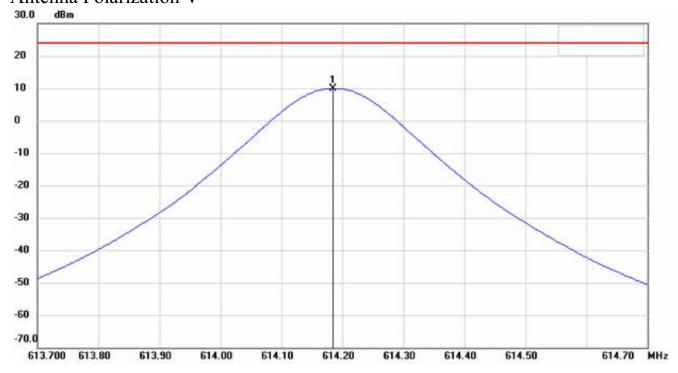
FCC ID: M5X-ACT5T

RF Power Output CH Low 614.2 MHz

Antenna Polarization H



Antenna Polarization V



Note:

- 1. The attached measurement plots are preliminarily pre-scanned with peak detector for determining the final checking frequencies and are for reference only.
- 2. The some frequencies may exceed the limit line without the specified detectors, but that cannot present the results are failed to the specification of test standard.
- 3. For corrected test results are listed in the relevant table of radiated test data of this test report.



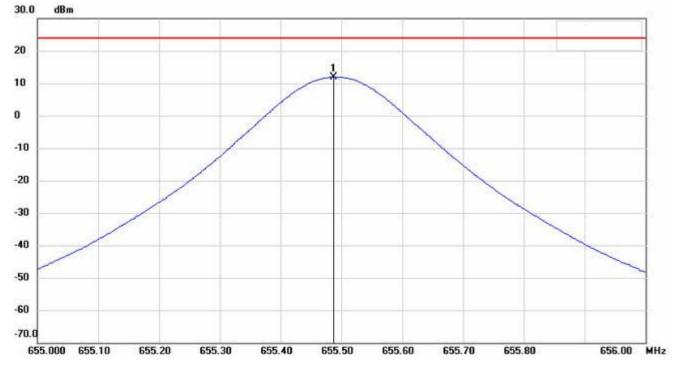
Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

CH Middle_655.5 MHz Antenna Polarization H



Antenna Polarization V



Note:

- 1. The attached measurement plots are preliminarily pre-scanned with peak detector for determining the final checking frequencies and are for reference only.
- 2. The some frequencies may exceed the limit line without the specified detectors, but that cannot present the results are failed to the specification of test standard.
- 3. For corrected test results are listed in the relevant table of radiated test data of this test report.

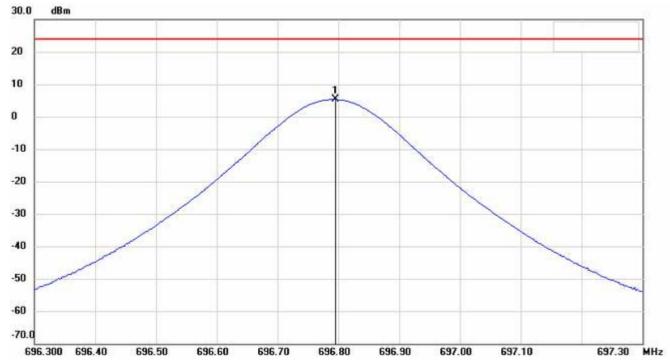


Registration number: W6M20902-9586-C-1

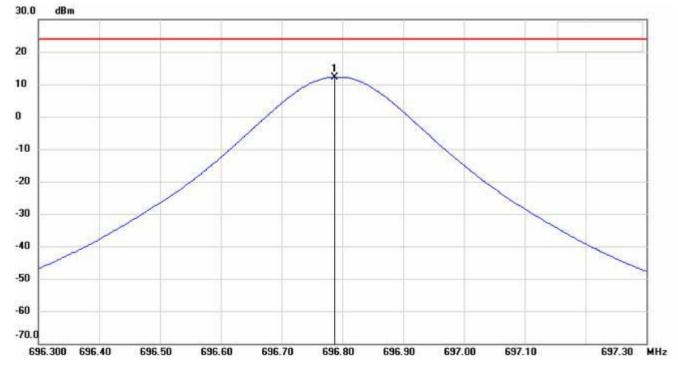
FCC ID: M5X-ACT5T

CH High 696.8 MHz

Antenna Polarization H



Antenna Polarization V



Note:

- 1. The attached measurement plots are preliminarily pre-scanned with peak detector for determining the final checking frequencies and are for reference only.
- 2. The some frequencies may exceed the limit line without the specified detectors, but that cannot present the results are failed to the specification of test standard.
- 3. For corrected test results are listed in the relevant table of radiated test data of this test report.



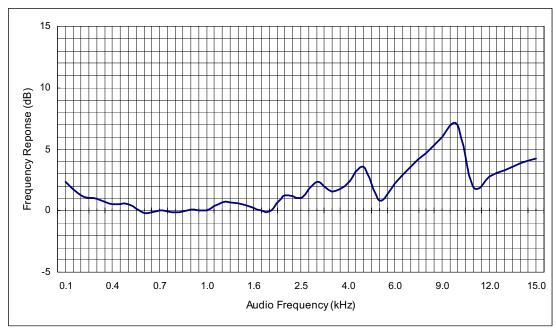
Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

Modulation Deviation and Audio frequency response

614.2MHz

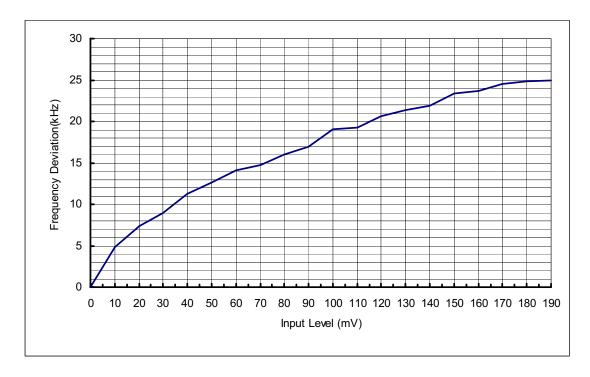


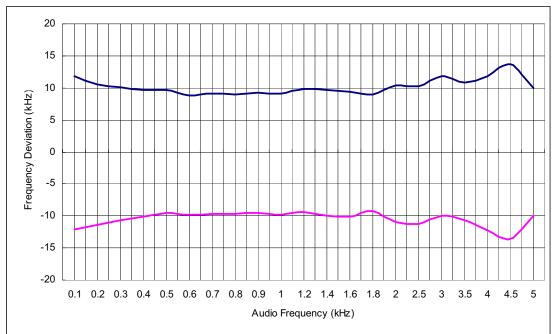




Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T





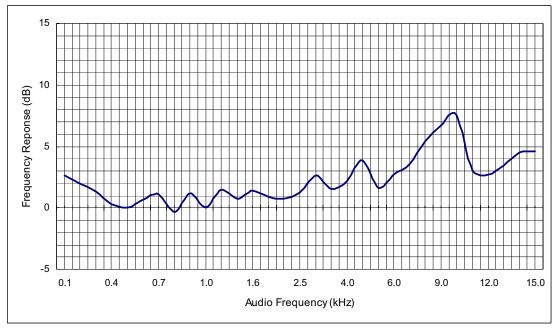


Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

655.5MHz

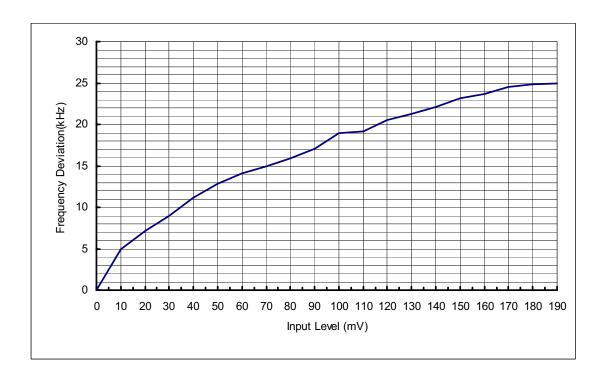


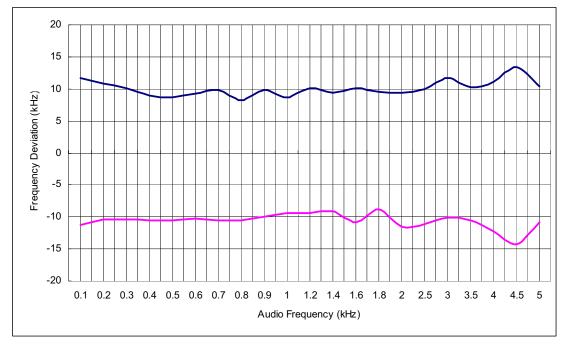




Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



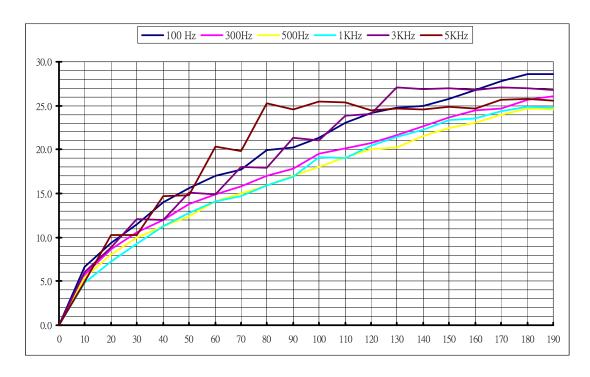


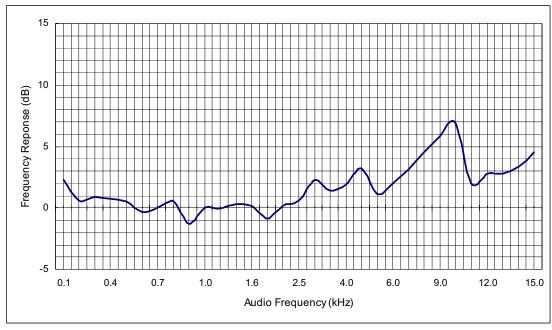


Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

696.8MHz

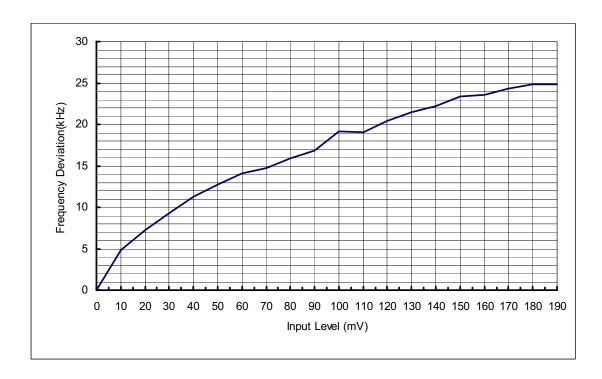


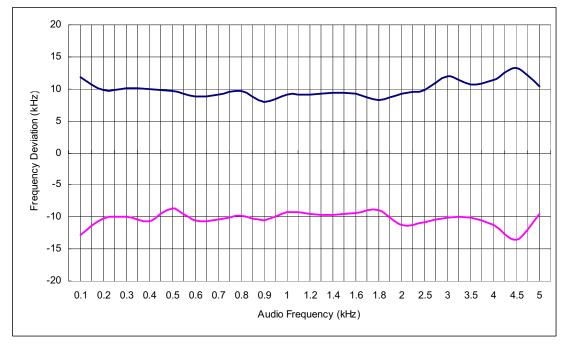




Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



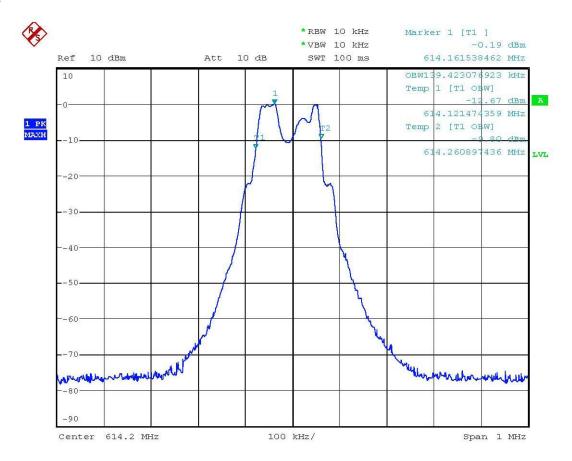




Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

Occupied Bandwidth / Emission Mask



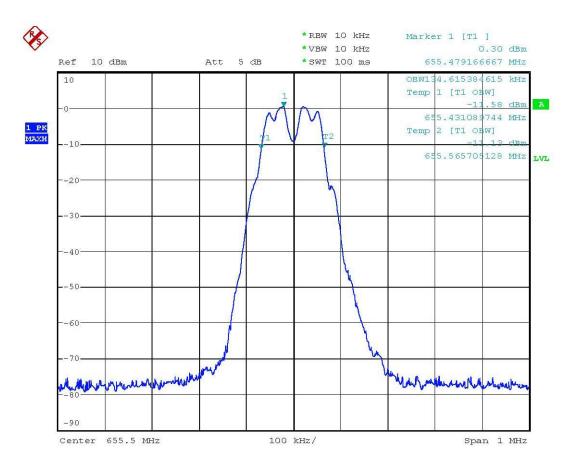
OCCUPIED BANDWIDTH 1000Hz MODULATION 614.2MHz

Date: 26.MAR.2009 07:49:43



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



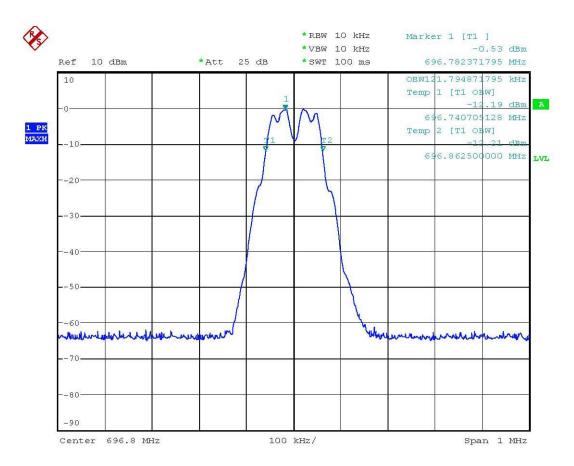
OCCUPIED BANDWIDTH 1000Hz MODULATION 655.5MHz

Date: 26.MAR.2009 08:16:56



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



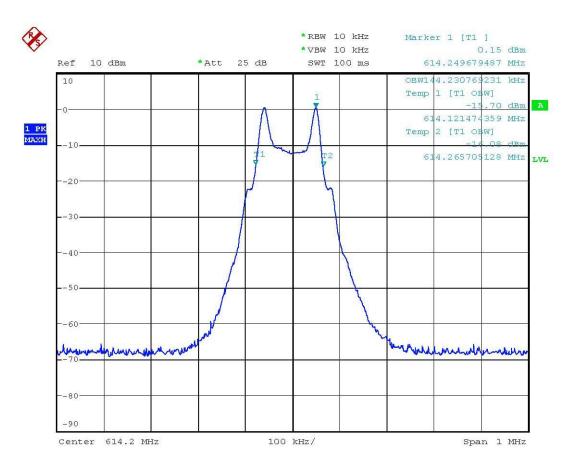
OCCUPIED BANDWIDTH 1000Hz MODULATION 696.8MHz

Date: 26.MAR.2009 08:31:32



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



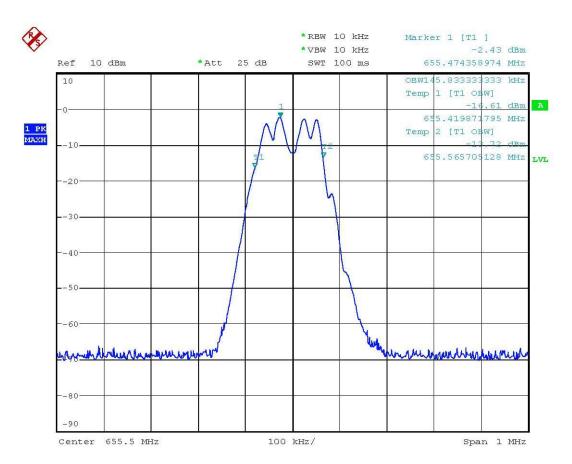
OCCUPIED BANDWIDTH 2500Hz MODULATION 614.2MHz

Date: 2.APR.2009 15:43:31



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



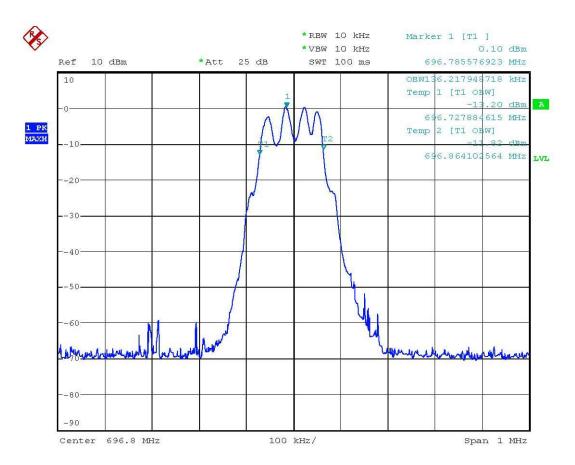
OCCUPIED BANDWIDTH 2500Hz MODULATION 655.5MHz

Date: 2.APR.2009 15:54:38



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



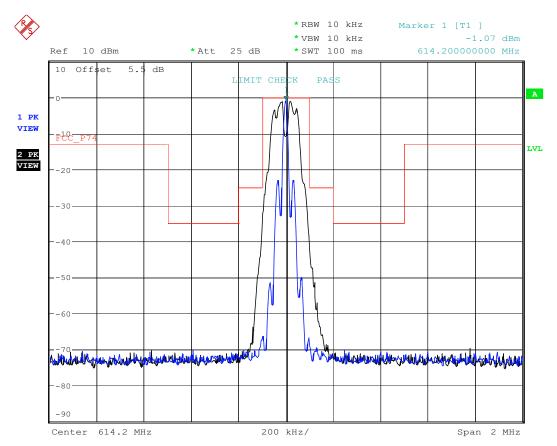
OCCUPIED BANDWIDTH 2500Hz MODULATION 696.8MHz

Date: 2.APR.2009 15:47:46



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



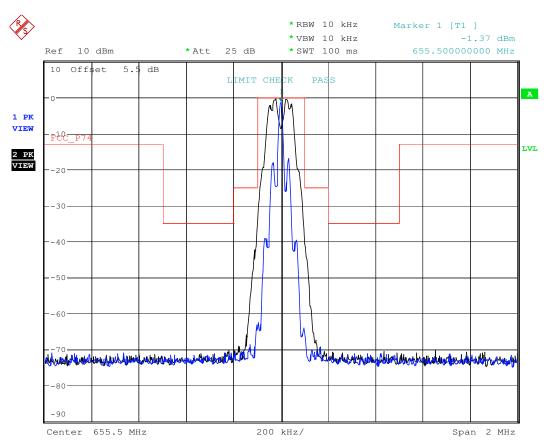
EMISSION MASK 614.2MHz

Date: 26.MAR.2009 09:05:17



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



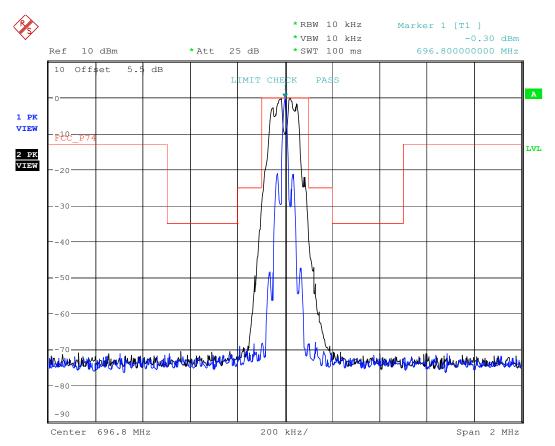
EMISSION MASK 655.5MHz

Date: 26.MAR.2009 09:31:50



Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T



EMISSION MASK 696.8MHz

Date: 26.MAR.2009 09:44:47



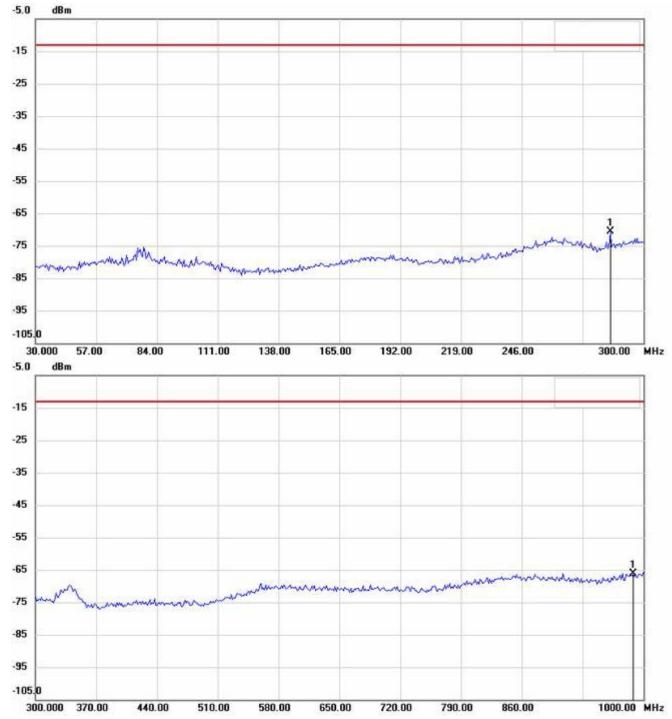
Registration number: W6M20902-9586-C-1

FCC ID: M5X-ACT5T

Radiation Spurious Emission

CH Low 614.2 MHz

Antenna Polarization H

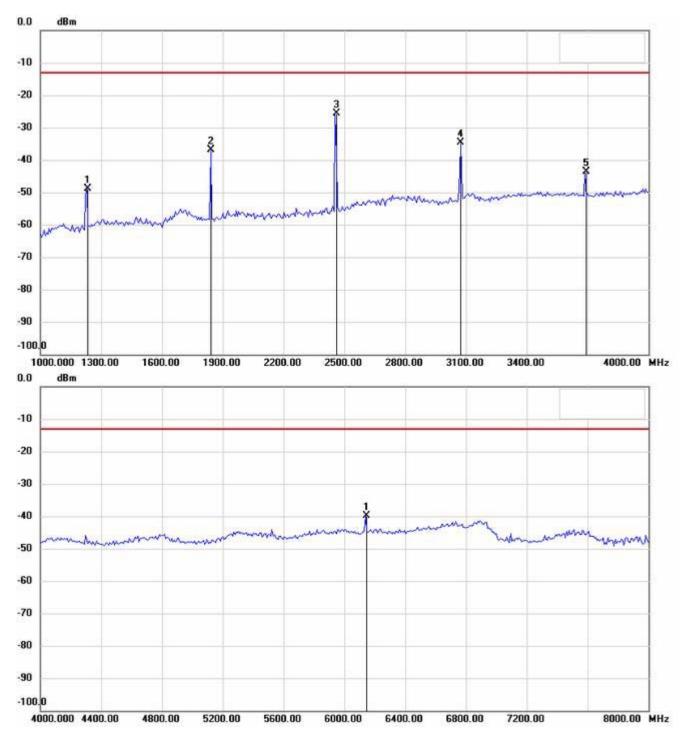


- 1. The attached measurement plots are preliminarily pre-scanned with peak detector for determining the final checking frequencies and are for reference only.
- 2. The some frequencies may exceed the limit line without the specified detectors, but that cannot present the results are failed to the specification of test standard.
- 3. For corrected test results are listed in the relevant table of radiated test data of this test report.



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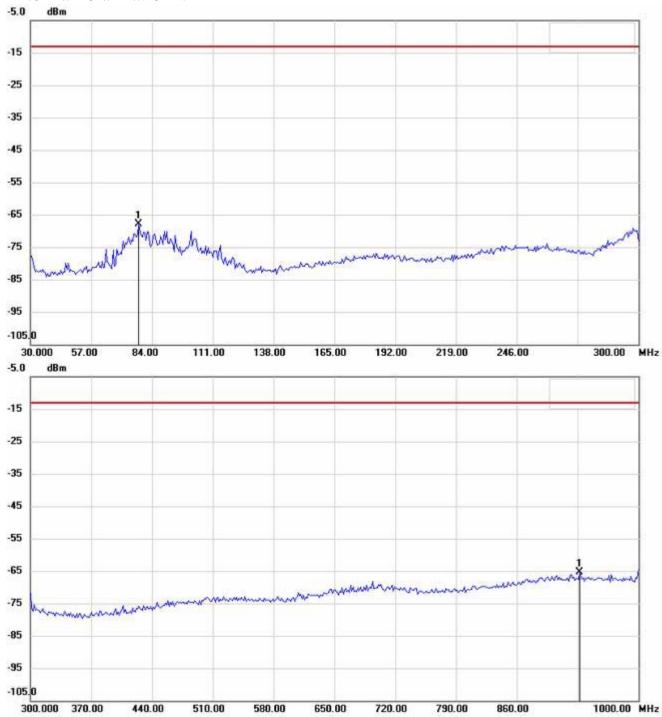
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Antenna Polarization V

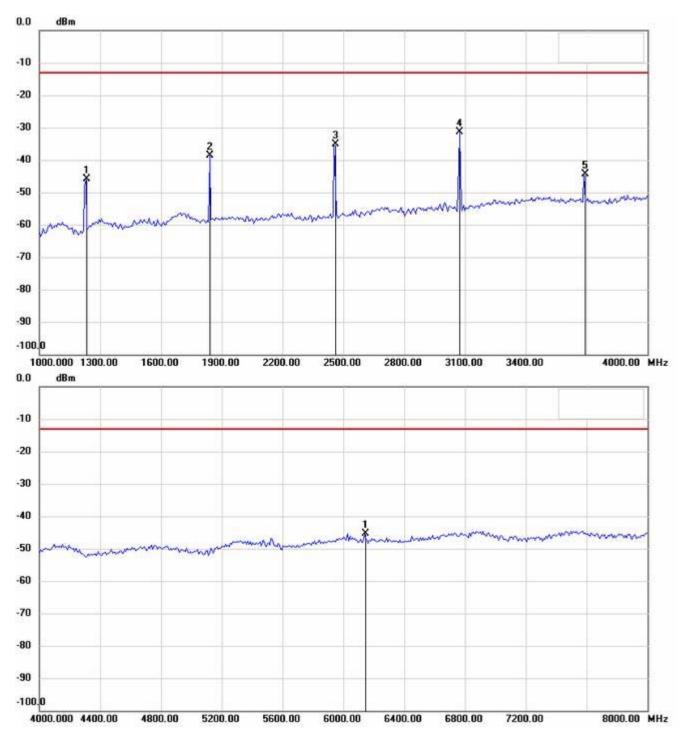


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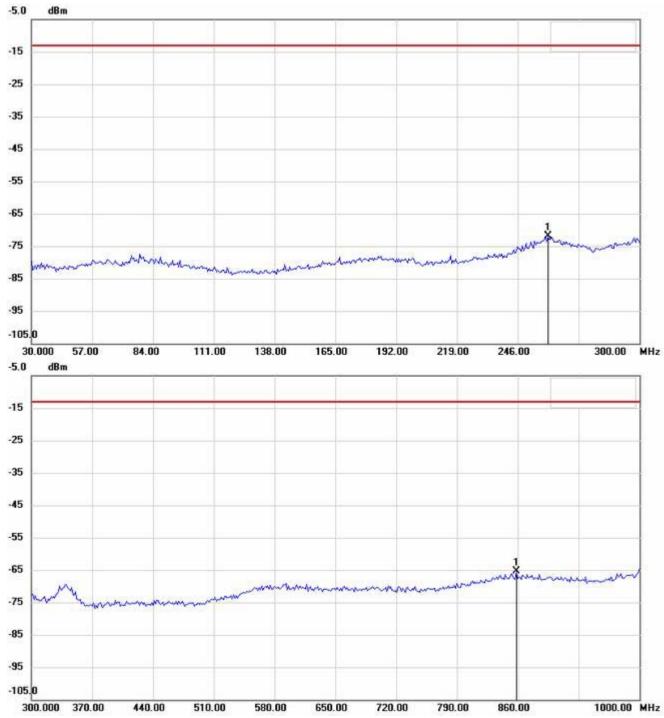
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CH Middle_655.5 MHz Antenna Polarization H

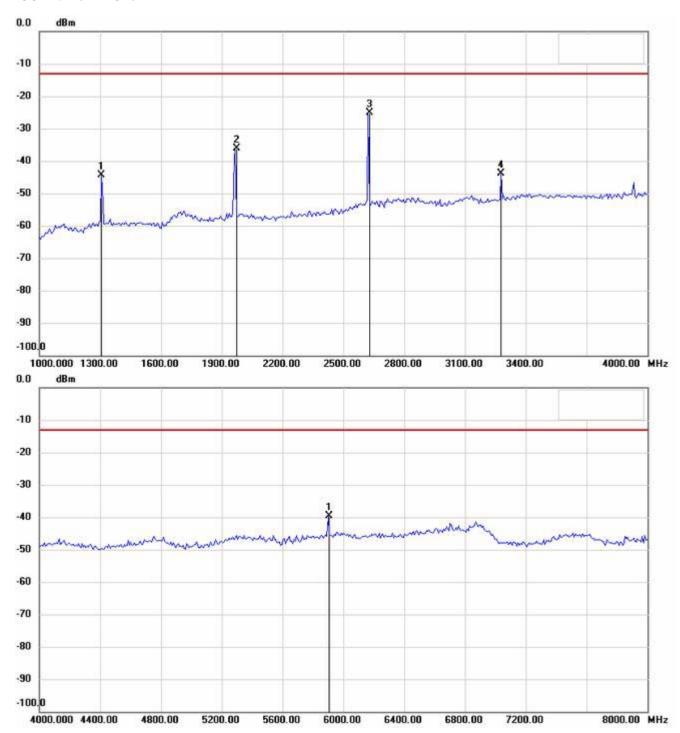


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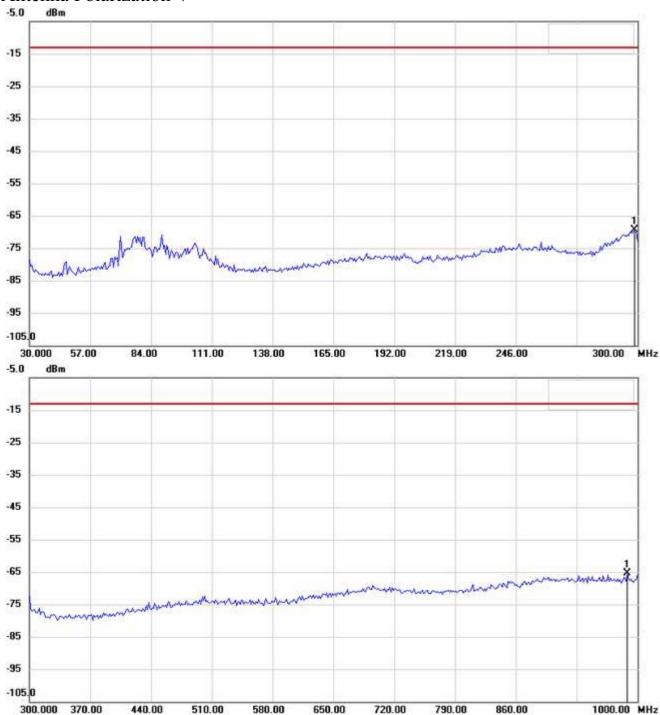
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Antenna Polarization V

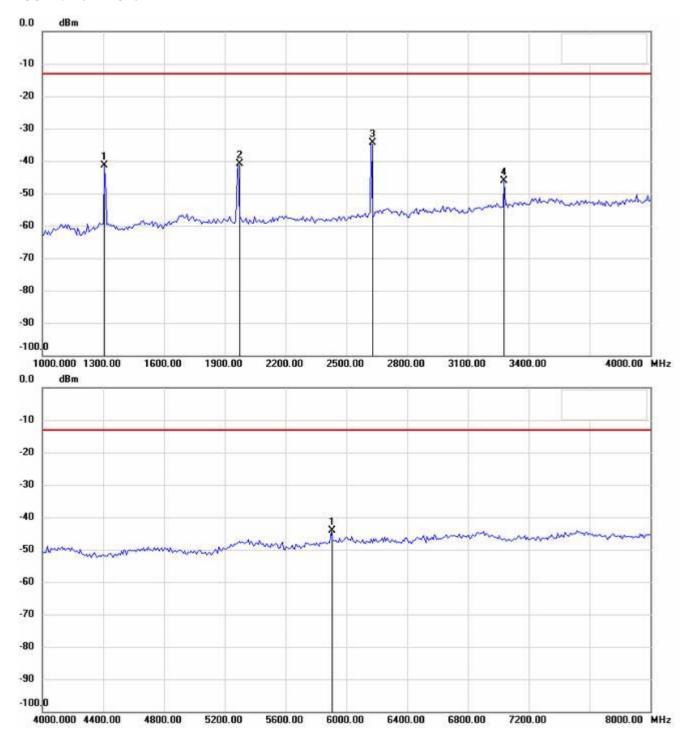


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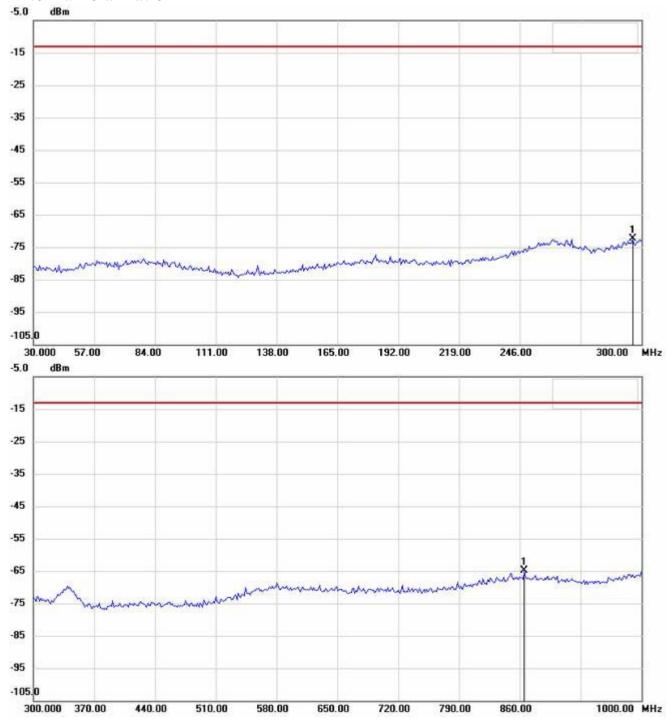


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CH High 696.8 MHz

Antenna Polarization H

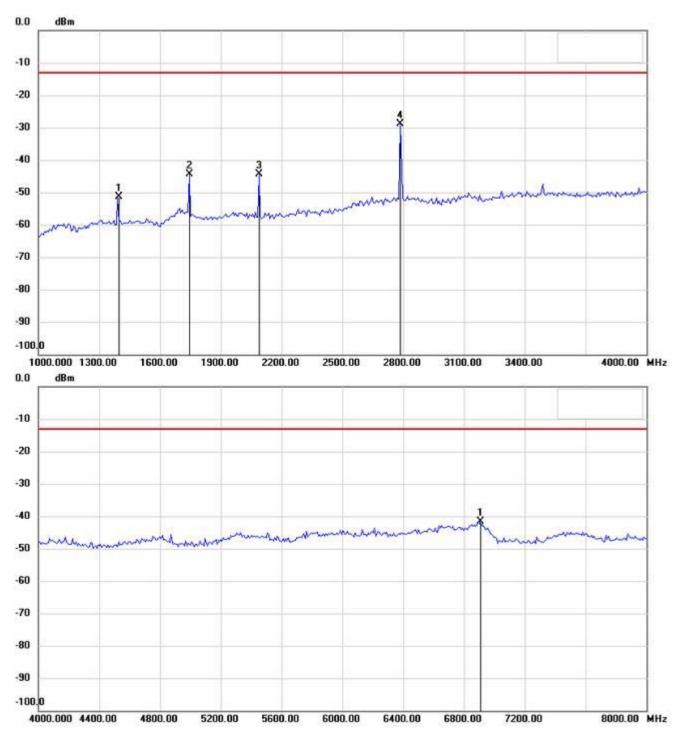


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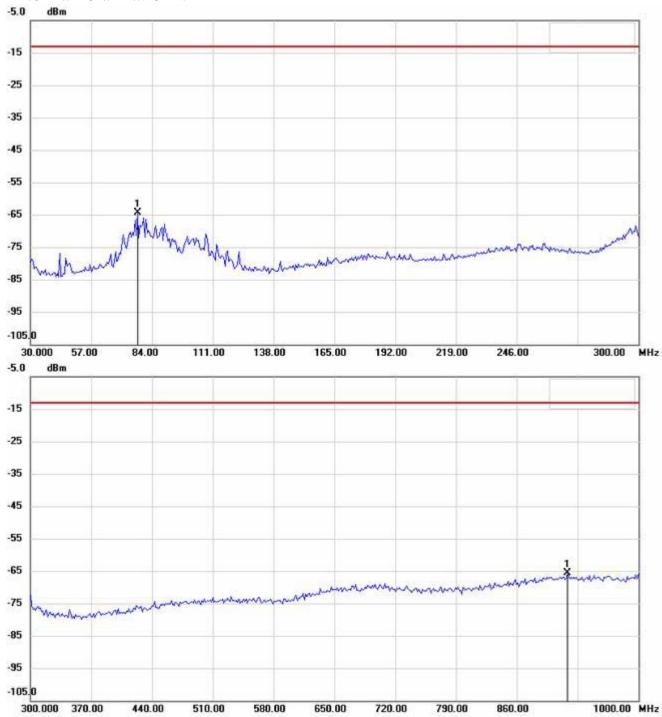
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Antenna Polarization V

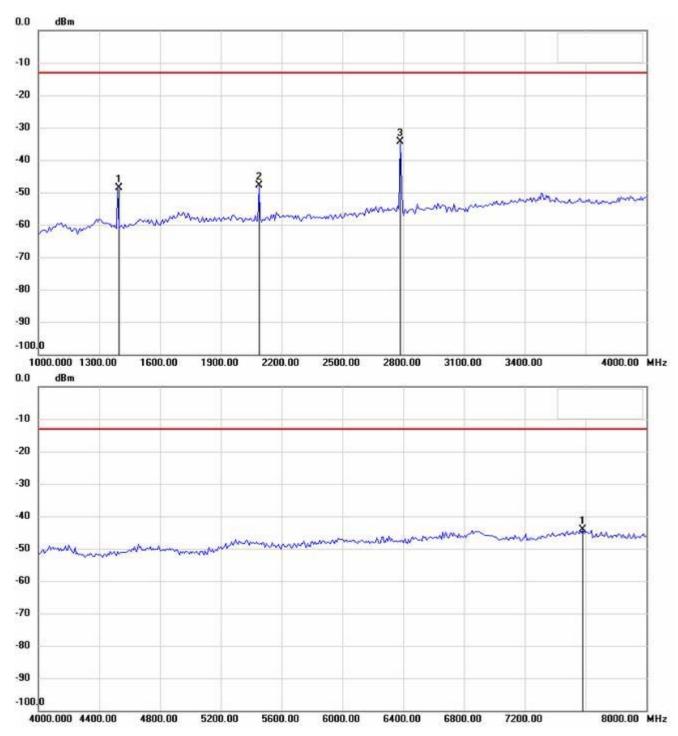


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