

FCC TEST REPORT
for
Wireless Speaker Amplifier
Model No.: TVee Model Two

of

Applicant: MEILOON INDUSTRIAL CO., LTD.
Address: No.77, Lane 1775, Chuen-Ryh Road , Taoyuan City, Taiwan

Tested and Prepared
by



ETS Product Service (Taiwan) Co., Ltd.

FCC Registration No.: 930600

Industry Canada filed test laboratory Reg. No. IC 5679

A2LA Accredited No.: 2300.01

PTCRB Accredited Type Certification Test House

FCC ID: R48TVEE21TX

Report No.: W6M20707-8271-P-15-T

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Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX

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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.

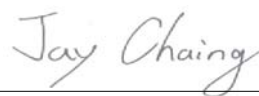
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Tester:

Aug 20, 2007

Jay Chaing



Date

ETS-Lab.

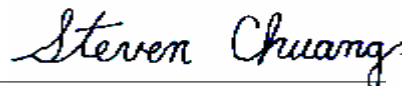
Name

Signature

Technical responsibility for area of testing:

Aug 20, 2007

Steven Chuang



Date

ETS

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
ETS Product Service (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: 2300.01

FCC filed test laboratory Reg. No. 930600

Industry Canada filed test laboratory Reg. No. IC 5679

PCTRB Accredited Type Certification Test House

1.3 Details of approval holder

Name	: MEILOON INDUSTRIAL CO., LTD.
Street	: No.77, Lane 1775, Chuen-Ryh Road,
Town	: Taoyuan City
Country	: Taiwan
Telephone	: +886-3-326-1611
Fax	: +886-3-326-3884

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1.4 Application details

Date of receipt of test item : July 018, 2007
Date of test : from July 19, 2007 to Aug 20, 2007

1.5 General information of Test item

Type of test item : Wireless Speaker Amplifier
Model Number : TVee Model Two
Hardware : V3.4
Software : V1.0
Multi-listing model number : without
Photos : see Annex

Technical data

Frequency band : 2402 - 2479 MHz
Frequency (ch A) : 2.403 GHz
Frequency (ch B) : 2.442 GHz
Frequency (ch C) : 2.479 GHz

Transmitter

Unom

Normal Mode
Power (ch A) : Conducted: 15.07 dBm
Power (ch B) : Conducted: 15.17 dBm
Power (ch C) : Conducted: 15.48 dBm

Power supply adaptor Input : 100-240 VAC, 50-60 Hz
 Output : 18-24 VDC, 3.61-2.7 A
Operation modes : duplex
Modulation Type : FHSS
Antenna Type : Dipole antenna
Antenna gain : 2 dBi

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Host device : none

Classification :

Fixed Device	☒
Mobile Device (Human Body distance > 20cm)	☐
Portable Device (Human Body distance < 20cm)	☐

Manufacturer:
(if applicable)

Name : ./.
Street : ./.
Town : ./.
Country : ./.

Additional information : ./.

1.6 Test standards

Technical standard : FCC RULES PART 15 Subpart B / SUBPART C § 15.247 (2007-05)

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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

Details of power supply	Input	: 100-240 VAC, 50-60 Hz
	Output	: 18-24 VDC, 3.61-2.7 A

Extreme conditions parameters : test voltage : -- extreme
min :-- V
max :-- V

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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	2006/10/16	2007/10/15
ETSTW-CE 002	PREREULATOR MODE DC POWER SUPPLY	None	None		Function Test	
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	2006/10/16	2007/10/15
ETSTW-CE 005	Line-Impedance Stabilisation Network	NNBM 8126D	137	Schwarzbeck	2006/10/16	2007/10/15
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	In House Certificate	
ETSTW-CE 008	ABSORBING CLAMP	MDS 21	3469	Schwarzbeck	2005/10/24	2007/10/23
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2007/8/2	2008/8/1
ETSTW-CE 013	CISPR 22 TWO BALANCED TELECOM PAIRS IMPEDANCE STABILIZATION NETWORK	FCC-TLISN-T4-02	20242	FCC	2005/12/8	2007/12/7
ETSTW-CE 014	CISPR 22 TWO BALANCED TELECOM PAIRS IMPEDANCE STABILIZATION NETWORK	FCC-TLISN-T2-02	20241	FCC	2005/12/7	2007/12/6
ETSTW-CE 015	CISPR 22 TWO BALANCED TELECOM PAIRS IMPEDANCE STABILIZATION NETWORK	FCC-TLISN-T8-02	20307	FCC	2006/11/7	2008/11/6
ETSTW-CE 016	TWO-LINE V-NETWORK	ENV216	100050	R&S	2006/11/21	2007/11/20
ETSTW-RE 002	Function Generator	33220A	MY43004982	Agilent	2005/10/14	2007/10/13
ETSTW-RE 003	EMI TEST RECEIVER	ESI 26	831438/001	R&S	2006/10/20	2007/10/19
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2006/10/30	2007/10/29
ETSTW-RE 005	EMI TEST RECEIVER	ESVS10	843207/020	R&S	2006/10/12	2007/10/11
ETSTW-RE 010	PROGRAMMABLE LINEAR POWER SUPPLY	LPS-305	30503070181	MOTECH	Function Test	
ETSTW-RE 011	PROGRAMMABLE LINEAR POWER SUPPLY	LPS-305	30503070165	MOTECH	Function Test	
ETSTW-RE 017	Log-Periodic Antenna	HL025	352886/001	R&S	2006/5/4	2008/5/3
ETSTW-RE 018	MICROWAVE HORN ANTENNA	AT4560	27212	AR	2004/11/8	2007/11/7
ETSTW-RE 020	MICROWAVE HORN ANTENNA	AT4002A	306915	AR	Function Test	
ETSTW-RE 021	SWEEP GENERATOR	SWM05	835130/010	R&S	2006/10/11	2007/10/10
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	EMCO	In House Certificate	
ETSTW-RE 028	Log-Periodic Dipole Array Antenna	3148	34429	EMCO	2006/5/26	2008/5/25
ETSTW-RE 029	Biconical Antenna	3109	33524	EMCO	2006/5/26	2008/5/25
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	EMCO	2006/5/3	2008/5/2
ETSTW-RE 032	Millivoltmeter	URV 55	849086/013	R&S	2006/10/11	2007/10/10
ETSTW-RE 034	Power Sensor	URV5-Z4	839313/006	R&S	2005/10/17	2007/10/16
ETSTW-RE 042	Biconical Antenna	HK116	100172	R&S	2007/1/11	2009/1/10
ETSTW-RE 043	Log-Periodic Dipole Antenna	HL223	100166	R&S	2006/5/8	2008/5/7

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ETSTW-RE 044	Log-Periodic Antenna	HL050	100094	R&S	2006/5/29	2008/5/28
ETSTW-RE 048	Triple Loop Antenna	HXYZ 9170	HXYZ 9170-134	Schwarzbeck	2005/3/22	2008/3/21
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	2007/7/16	2008/7/15
ETSTW-RE 064	Bluetooth Test Set	MT8852B-042	6K00005709	Anritsu	Function Test	
ETSTW-RE 072	CELL SITE TEST SET	8921A	3339A00375	HP	2007/7/2	2009/7/1

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2.4 General Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-2003 using a 50 μ 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 C63.4-2003 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 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 %.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dB μ V) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB.

Example:

Freq (MHz)	METER READING + ACF + CABLE LOSS (to the receiver) = FS
33	20 dB μ V + 10.36 dB + 6 dB = 36.36 dB μ V/m @3m

The UUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m (non metallic table) and arranged according to ANSI C63.4-2003 Section 13.1.2. 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 ETS Product Service (Taiwan) Co., Ltd. at the registered open field test site located No.5-1, Shuang Sing Village, LiShuei Rd., Wanli Township, Taipei County 207, Taiwan (R.O.C.). The Registration Number: **930600**.

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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.

When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

The formula is as follows:

Average = Peak + Duty Factor

Duty Factor = $20 \log (\text{dwell time}/T)$

T = 100ms when the pulse train period is over 100 ms or the period of the pulse train.

Modified Limits for peak according to 15.35 (b) = Max Permitted average Limits + 20dB

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3 Test results (enclosure)

TEST CASE	Para. Number	Required	Test passed	Test failed
Peak Output Power	15.247(b)	☒	☒	☐
Equivalent radiated Power	15.247(b)	☒	☒	☐
Spurious Emissions radiated – Transmitter operating	15.247(c)	☒	☒	☐
Spurious Emissions conducted – Transmitter operating	15.247	☐	☐	☐
Carrier Frequency Separation	15.247(a) (1)	☒	☒	☐
Number of Hopping Frequencies	15.247(a) (1)(i)	☒	☒	☐
Time of Occupancy (Dwell Time)	15.247(a) (1)(i)	☒	☒	☐
20 dB Bandwidth	15.247(a) (1)(i)	☒	☒	☐
Band-edge Compliance of RF Emission	15.247(c)	☒	☒	☐
Radiated Emission from Digital Part And Receiver L.O.	15.109	☐	☐	☐
Power Line Conducted Emission	15.207(a)	☒	☒	☐

The follows is intended to leave blank.

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3.1 Peak Output Power (transmitter)

FCC Rule: 15.247

This measurement applies to equipment with an integral antenna and to equipment with an antenna connector and equipped with an antenna as declared by the applicant.

The power was measured with modulation (declared by the applicant).

Test conditions		Conducted Power		
		Channel A [dBm]	Channel B [dBm]	Channel C [dBm]
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120\text{ V}$	15.07	15.17	15.48

Test conditions		Radiated Power		
		Channel A [dBm]	Channel B [dBm]	Channel C [dBm]
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120\text{ V}$	--	--	--

Test conditions	Signal Field strength TX highest power mode
$T_{nom} = 23^{\circ}\text{C}$, $V_{nom} = 120\text{ V}$	dB $\mu\text{V/m}$
Frequency[MHz]	
--	--
Measurement uncertainty	< 3 dB

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Maximum Peak Output Power

Limits:

Frequency MHz	Number of hopping channels			
	≥ 75	≥ 50	$49 \geq 25$	$74 \geq 15$
902-928		30 dBm	24 dBm	
2400-2483.5 MHz	30 dBm	-		21 dbm
5725-5850 MHz	30 dBm	-		

In case of employing transmitter antennas having antenna gain >dBi and using fixed poin-to point operation consider §15.247 (b)(4).

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 055 ETSTW-RE 064

Explanation: The diagrams for the peak output power measurements are included in Appendix.

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3.2 Equivalent isotropic radiated power

FCC Rule: 15.239(b), 15.35

Because using an internal antenna there are no deviations from the radiated test results according 3.1.

3.3 RF Exposure Compliance Requirements

According to Supplement C, Edition 01-01 to OET Bulletin 65, Edition 97-01 this spread spectrum transmitter is categorically excluded from routine environmental evaluation because of the low power level, where there is a high likelihood of compliance with RF exposure standards.

The antenna used for this Bluetooth transceiver module must not be co-located or operating in conjunction with any other antenna or transmitter.

3.4 Out of Band Radiated Emissions

FCC Rule: 15.247(c) , 15.35

For out of band emissions that are close to or that exceed the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the general radiated emission requirement.

Limits:

For frequencies below 1GHz :

Max. reading – 20 dB

Guidance on Measurement of FHSS Systems:

“If the emission is pulsed, modify the unit for continuous operation , use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.” Here the correction was added to the limit instead subtracted from the reading.

Duty Cycle correction = $20 \log (\text{dwell time}/100\text{ms})$

Duty Factor = $20\log \times 4.807/100 = -26.3 \text{ dB}$

For frequencies above 1GHz (Peak measurements).

Limit = max. aver. reading-20dB +20dB(because Peak detector is used)

For frequencies above 1GHz (Average measurements).

Max. reading – 20 dB - duty cycle correction:

No duty cycle correction was added to the reading

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 017 ETSTW-RE 021 ETSTW-RE 028
ETSTW-RE 030 ETSTW-RE 043 ETSTW-RE 044 ETSTW-RE 064

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3.5 Transmitter Radiated Emissions in restricted Bands

FCC Rules: 15.247 (c), 15.205, 15.209, 15.35

Radiated emission measurements were performed from 30 MHz to 26000 MHz.

For radiated emission tests, the analyzer setting was as followings:

RES BW VID BW

Frequency <1 GHz 100 kHz 100 kHz (Peak measurements)

Frequency >1 GHz 1 MHz 1 MHz (Peak measurements)

1 MHz 1 MHz (Average measurements)

Limits:

For frequencies below 1GHz :

Frequency of Emission (MHz)	Field strength (microvolts/meter)	Field Strength (dB microvolts/meter)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

For frequencies above 1GHz (Average measurements).

Guidance on Measurement of FHSS Systems:

“If the emission is pulsed, modify the unit for continuous operation , use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.” Here the correction was added to the limit instead subtracted from the reading.

Duty cycle correction = $20 \log (\text{dwell time}/100\text{ms})$

For frequencies above 1GHz (Average measurements).

Limit – duty cycle correction

No duty cycle correction was added to the reading.

54.0dBμV/m

For frequencies above 1GHz (Peak measurements).

Limit + 20dB

54.0dBμV/m + 20 dB= 74 dBμV/m

Explanation: See attached diagrams.

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 017ETSTW-RE 028
ETSTW-RE 029 ETSTW-RE 030 ETSTW-RE 042 ETSTW-RE 043
ETSTW-RE 044 ETSTW-RE 064

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3.6 Spurious emissions (tx)

Spurious emission was measured with modulation (declared by manufacturer).

In any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c))

SAMPLE CALCULATION OF LIMIT. All results will be updated by an automatic measuring system in accordance to point 2.3.

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.

The peak and average spurious emission plots was measured with the average limits.

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

If in the column's correction factor states a value then the max. Field strength in the same row is corrected by a value gained from the "Marker-Delta-Method" or the „Duty-Cycle Correction Factor“.

Summary table with radiated data of the test plots

Model:	TVee 2.1	Date:	2007/7/27						
Mode:	low channel Tx Mode	Temperature:	26 °C	Engineer:	Danny				
Polarization:	Horizontal	Humidity:	60 %						
Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)	Note
172.305	19.55	peak	14.75	34.3	43.5	-9.2	150	310	
405.210	20.13	peak	17.90	38.03	46	-7.97	245	110	

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)	Note
172.305	21.42	peak	14.75	36.17	43.5	-7.33	145	145	
405.210	18.73	peak	17.90	36.63	46	-9.37	250	325	

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Polarization: Horizontal

Frequency (MHz)	Reading (dBuV) Peak Ave.		Factor (dB) Corr.	Result @3m (dBuV/m) Peak Ave.		Limit @3m (dBuV/m) Peak Ave.		Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
1601.202	48.57	---	-9.40	39.17	---	74	54	-34.83	150	150	
1905.812	48.53	---	-8.08	40.45	---	74	54	-33.55	145	150	
3202.405	59.44	---	-2.28	57.16	---	74	54	-16.84	150	150	
4000	46.26	---	-2.90	47.46	---	74	54	-26.54	150	150	
7214.429	54.12	---	1.89	56.01	---	74	54	-17.99	150	150	

Polarization: Vertical

Frequency (MHz)	Reading (dBuV) Peak Ave.		Factor (dB) Corr.	Result @3m (dBuV/m) Peak Ave.		Limit @3m (dBuV/m) Peak Ave.		Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
1462.926	49.5	---	-11.73	37.77	---	74	54	-36.23	150	150	
3202.405	64.58	---	-2.28	62.3	---	74	54	-11.7	145	150	
4000	46.48	---	-2.90	47.68	---	74	54	-26.32	145	150	
7214.429	55.16	---	1.89	57.05	---	74	54	-16.95	145	150	

Mode: middle channel Tx Mode

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
172.305	20.67	peak	14.75	35.42	43.5	-8.08	150	310	
405.210	19.44	peak	17.90	37.34	46	-8.66	250	135	

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
172.305	20.74	peak	14.75	35.49	43.5	-8.01	150	115	
405.210	18.80	peak	17.90	36.7	46	-9.3	260	320	

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV) Peak Ave.		Factor (dB) Corr.	Result @3m (dBuV/m) Peak Ave.		Limit @3m (dBuV/m) Peak Ave.		Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
1629.258	51.03	---	-9.28	41.75	---	74	54	-32.25	150	150	
1901.804	50.36	---	-8.09	42.27	---	74	54	-31.73	150	150	
3258.517	55.16	---	-1.89	53.27	---	74	54	-20.73	150	150	
4064.128	46.29	---	-2.84	43.45	---	74	54	-30.55	150	150	
4881.764	44.53	---	-1.30	43.23	---	74	54	-30.77	150	150	
7328.518	52.37	48.72	1.86	54.23	50.58	74	54	-3.42	145	150	

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Polarization: Vertical

Frequency (MHz)	Reading (dBuV) Peak Ave.		Factor (dB) Corr.	Result @3m (dBuV/m) Peak Ave.		Limit @3m (dBuV/m) Peak Ave.		Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
1629.258	49.84	---	-9.28	40.56	---	74	54	-33.44	145	150	
2440.882	51.8	---	-5.10	46.7	---	74	54	-27.3	145	150	
3258.517	61.18	---	-1.89	59.29	---	74	54	-14.71	145	150	
4064.128	51.37	---	-2.84	48.53	---	74	54	-25.47	150	150	
4881.764	52.48	---	-1.30	51.18	---	74	54	-22.82	150	150	
7328.364	60.67	51.1	1.86	62.53	52.96	74	54	-1.04	150	150	

Mode: high channel Tx Mode

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
172.305	19.67	peak	14.75	34.42	43.5	-9.08	150	322	
405.210	19.86	peak	17.90	37.76	46	-8.24	250	140	

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
172.305	19.72	peak	14.75	34.47	43.5	-9.03	155	115	
405.210	19.56	peak	17.90	37.46	46	-8.54	260	310	

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV) Peak Ave.		Factor (dB) Corr.	Result @3m (dBuV/m) Peak Ave.		Limit @3m (dBuV/m) Peak Ave.		Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
1653.307	58.41	---	-9.19	49.22	---	74	54	-24.78	150	150	
1901.804	50.65	---	-8.09	42.56	---	74	54	-31.44	150	150	
3306.613	57.07	---	-1.55	55.52	---	74	54	-18.48	145	150	
4128.257	45.13	---	-2.72	42.41	---	74	54	-31.59	150	150	
4953.908	47.1	---	-1.08	46.02	---	74	54	-27.98	155	150	
7438.878	50.59	---	1.81	52.4	---	74	54	-21.6	145	150	

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Polarization: Vertical

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (m)	Note
	Peak	Ave.		Peak	Ave.	Peak	Ave.				
1653.307	54.21	---	-9.19	45.02	---	74	54	-28.98	150	150	
3306.613	60.32	---	-1.55	58.77	---	74	54	-15.23	155	150	
4128.257	48.77	---	-2.72	46.05	---	74	54	-27.95	145	150	
4953.908	52.55	---	-1.08	51.47	---	74	54	-22.53	145	150	
7439.022	62.09	50.76	1.80	63.89	52.56	74	54	-1.44	150	150	

- Note**
1. Correction Factor = Antenna factor + Cable loss - Preamplifier
 2. The formula of measured value as: Test Result = Reading + Correction Factor
 3. Detector function in the form : PK = Peak, QP = Quasi Peak, AV = Average
 4. All not in the table noted test results are more than 20 dB below the relevant limits.

All other not noted test plots do not contain significant test results in relation to the limits.

TEST RESULT (Transmitter): The unit DOES meet the FCC requirements.

Explanation: see attached diagrams

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 017 ETSTW-RE 028
 ETSTW-RE 029 ETSTW-RE 030 ETSTW-RE 042 ETSTW-RE 043
 ETSTW-RE 044 ETSTW-RE 064

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3.7 Carrier Frequency Separation

Carrier Frequency Separation was measured with modulation (declared by manufacturer).

According to FCC rules part 15 subpart C §15.247 frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or 20 dB bandwidth of the hopping channel, whichever is greater.

Test conditions		Channel Separation	
		Channel A	Channel A+1
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120\text{ V}$	4.102564103 MHz	

Test conditions		Channel Separation	
		Channel B	Channel B+1
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120\text{ V}$	6.089743590 MHz	

Test conditions		Channel Separation	
		Channel C	Channel C+1
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120\text{ V}$	4.102564103 MHz	

Limits:

Frequency Range MHz	Limits	
	20 dB bandwidth < 25 kHz	20 dB bandwidth > 25 kHz
902-928	25 kHz	20 dB bandwidth
2400-2483.5 5725-5850.0	25 kHz	20 dB bandwidth

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 055 ETSTW-RE 064

Explanation: see attached diagram

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3.8 Number of Hopping Frequencies

According to FCC rules part 15 subpart C §15.247 frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping frequencies. Frequency hopping systems in 5725-5850 MHz bands shall use least 75 hopping frequencies.

For frequency hopping systems operating in the 902-928 MHz band: if the 20dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20dB bandwidth of the hopping channel 250 kHz or greater, the system shall use at least 25 hopping frequencies.

Test conditions		Operating Mode	Number of Channels
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120\text{ V}$	normal transmitting	20

Limits:

Frequency Range MHz	Limit			
	20dB Bandwidth		20dB Bandwidth < 250 kHz	20dB Bandwidth ≥ 250 kHz
	≤ 1MHz			
902-928 MHz			≥ 50	≥ 25
2400-2483.5	≥ 15	≥ 15		
5725-5850.0 MHz	≥ 75			

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 055 ETSTW-RE 064

Explanation: see attached diagrams

3.8.1 Pseudorandom Frequency Hopping Sequence

The generation of the hopping sequence is determined by the Bluetooth cord specification and complies with the FCC requirements.

3.8.2 Coordination of hopping sequences to other transmitters

According to the Bluetooth core specification V1.1 such a coordination is not possible. During scatternet function only one of the two hopping sequences will be used at a definite moment.

3.8.3 System Receiver Hopping Capability

According to the Bluetooth core specification. The system receivers shift frequencies in synchronization with the transmitted signals.

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3.9 Time of Occupancy (Dwell Time)

Frequency hopping systems operating in the 5725-5850 MHz band shall use an average time of occupancy on any frequency not greater than 0.4 seconds within a 30 second period.

In 2400-2483,5 MHz band the average time of occupancy on any channel shall not be greater than 0,4 seconds multiplied by the number of hopping channels employed.

For frequency hopping systems operating in the 902-928 MHz band: if the 20dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not greater than 0.4 seconds within a 20 second period; if the 20dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Test conditions	Operating mode	Measurement periode	Time of Occupancy
$T_{nom} = 23^{\circ}\text{C}$ $V_{nom} = 120\text{ V}$	Channel A		392.24 ms
	Channel B		384.56 ms
	Channel C		384.56 ms

Limits and measurement periods:

Frequency MHz	Number of channels	Measurement Periode	Limit
902 – 928	≥ 50	20 s	0,4 s
	$49 \geq 25$	10 s	0,4 s
2400 – 2483,5	≥ 15	0,4 s * number of used channels	0,4 s
5725- 5850	≥ 75	30 s	0,4s

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 055 ETSTW-RE 064

Explanation: See attached diagram, which show the On-time and the number of counted events during the measurement period

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3.10 20dB Bandwidth

Frequency hopping systems operating in the 5725-5850 MHz bands shall use a maximum 20dB bandwidth of 1 MHz.

The 20dB bandwidth is measured on the lowest, middle and highest hopping channel.

For frequency hopping systems operating in the 902-928 MHz band the maximum 20dB bandwidth of the hopping channel is 500 kHz.

Test conditions		20 dB Bandwidth		
		Channel A	Channel B	Channel C
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120\text{ V}$	1.839743590 MHz	1.820512821 MHz	1.807692308 MHz

Limits:

Frequency Range / MHz	Number of channels	Limit
902-928	< 50	$< 250\text{ kHz}$
	$49 \geq 25$	$500\text{ kHz} \geq 250\text{ kHz}$
2400-2483.5	≥ 15	not determined
5725-5850	75	$\leq 1\text{ MHz}$

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 055 ETSTW-RE 064

Explanation: See attached diagram

3.10.1 System Receiver Input Bandwidth

It is determined in the Bluetooth core specification. The value matches to the bandwidth of transmitter signal.

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3.11 Band-edge Compliance of RF Emissions

According to FCC rules part 15 subpart C §15.247(c) in any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required.

In addition radiated emission which fall in the restricted bands, as defined in section 15.205(a), must also with the radiated emission limits.

Test conditions		Attenuation at or outside band-edges Hopping Frequency	
		Lower Band-edge	Upper Band-edge
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120 \text{ V}$	56.21 dB	56.81 dB

Test conditions		Attenuation at or outside band-edges Single Frequency	
		Lower Band-edge	Upper Band-edge
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 120 \text{ V}$	55.13 dB	57.63 dB

Limits:

Frequency Range / MHz	Limit
902 – 928	- 20 dB
2400 – 2483.5	
5725 - 5850	

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 017ETSTW-RE 028
ETSTW-RE 030 ETSTW-RE 043 ETSTW-RE 044 ETSTW-RE 064

Explanation: See attached diagrams

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3.12 Radiated Emissions from Receiver Section of Transceiver

FCC Rule: 15.109

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)	Field Strength (dBmicrovolts/meter)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Test equipment used: ETSTW-RE 003 ETSTW-RE 004 ETSTW-RE 017 ETSTW-RE 028
ETSTW-RE 029 ETSTW-RE 030 ETSTW-RE 042 ETSTW-RE 043
ETSTW-RE 044 ETSTW-RE 064

Explanation: This test is not application.

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3.13 Power Line Conducted Emission

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.

Frequency	Level (dBμV)	
	quasi-peak	average
150 kHz	lower limit line	Lower limit line

Model: TVee 2.1 Date: 2007/8/10
 Mode: TX Temperture: 26 °C Engineer: Danny
 Polarization: N Humidity: 60 %

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
0.1624	32.43	24.43	10.10	42.53	34.53	65.34	55.34	-20.81
0.2173	27.7	19.68	10.10	37.8	29.78	62.92	52.92	-23.14
0.2733	24.53	16.54	10.10	34.63	26.64	61.02	51.02	-24.38
0.545	19.48	11.45	10.10	29.58	21.55	56	46	-24.45
7.6944	20.64	12.75	10.10	30.74	22.85	60	50	-27.15
21.4166	18.21	10.23	10.10	28.31	20.33	60	50	-29.67

Polarization: L1

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
0.1632	32.2	24.12	10.10	42.3	34.22	65.3	55.3	-21.08
0.2153	27.7	19.65	10.10	37.8	29.75	63	53	-23.25
0.2717	24.76	16.87	10.10	34.86	26.97	61.07	51.07	-24.1
0.695	18.56	10.66	10.10	28.66	20.76	56	46	-25.24
7.6944	19.58	11.64	10.10	29.68	21.74	60	50	-28.26
28.2778	18	10.12	10.10	28.1	20.22	60	50	-29.78

Limits:

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

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- Note:**
- 1. The formula of measured value as: Test Result = Reading + Correction Factor**
 - 2. The Correction Factor = Cable Loss + LISN Insertion Loss + Pulse Limit Loss**
 - 3. Detector function in the form : PK = Peak, QP = Quasi Peak, AV = Average**
 - 4. All not in the table noted test results are more than 20 dB below the relevant limits.**
 - 5. See attached diagrams in the Appendix.**

Test equipment used: ETSTW-CE 001 ETSTW-CE 003 ETSTW-CE 004 ETSTW-CE 006 ETSTW-RE 064

Explanation: See attached diagram

Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

Appendix

A Measurement diagrams

1. Peak Output Power

2. Spurious Emissions radiated

(The measurement diagrams plots attached below are preliminary wideband scan with a peak detector and for reference only. The final test results are listed on section 3.6)

3. Carrier Frequency Separation

4. Number of Hopping Frequencies

5. Time of Occupancy (Dwell Time)

6. 20dB Bandwidth

7. Band-edge Compliance of RF Conducted Emissions

8. Power Line Conducted Emission

(The measurement diagrams plots attached below are preliminary wideband scan with a peak and average detector for reference only. The final test results are listed on section 3.13)

B Photos

1. External Photos

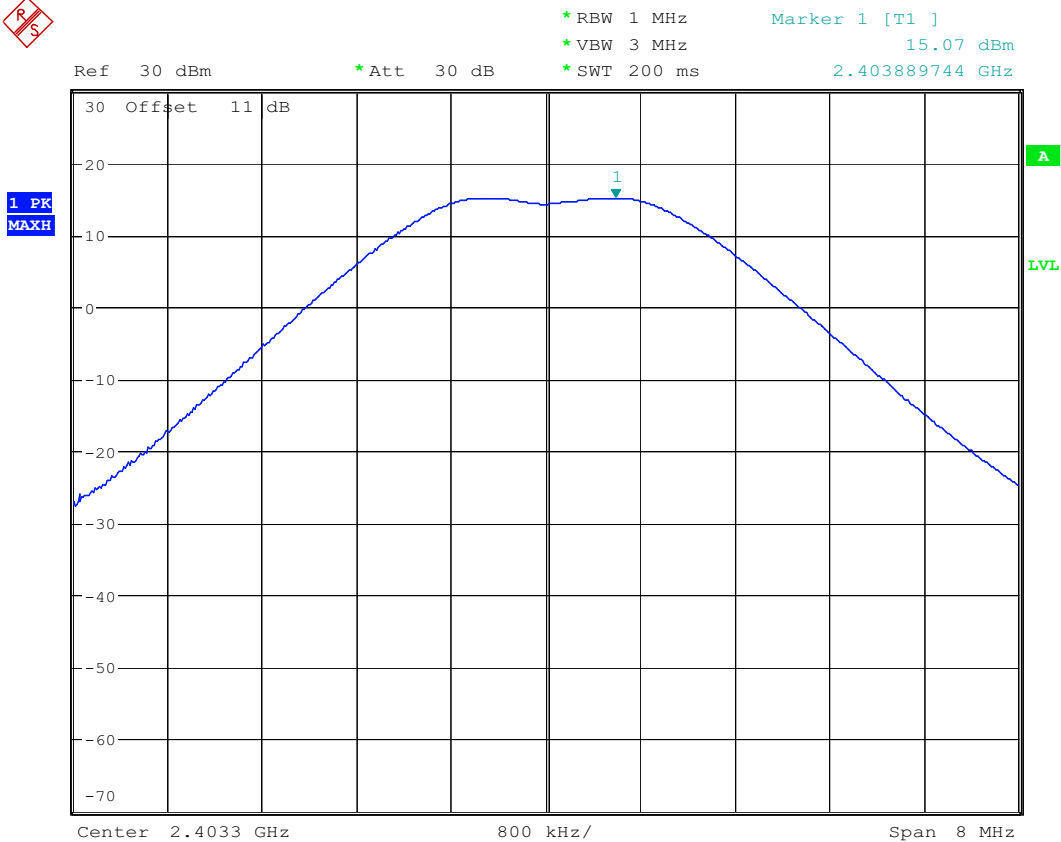
2. Internal Photos

3. Set Up Photo of Radiated Emission

4. Set Up Photo of Conducted Emission

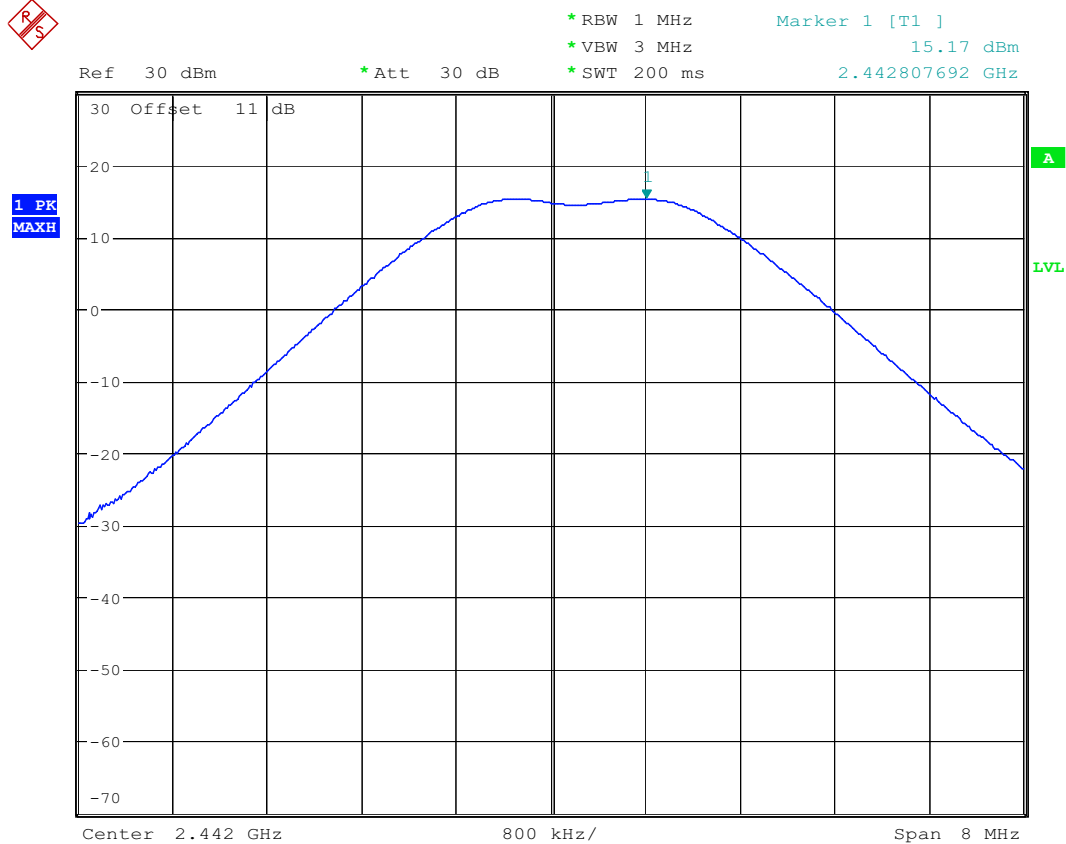
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

Peak Output Power



MAX OUTPUT POWER LOW CHANNEL
Date: 10.AUG.2007 13:47:03

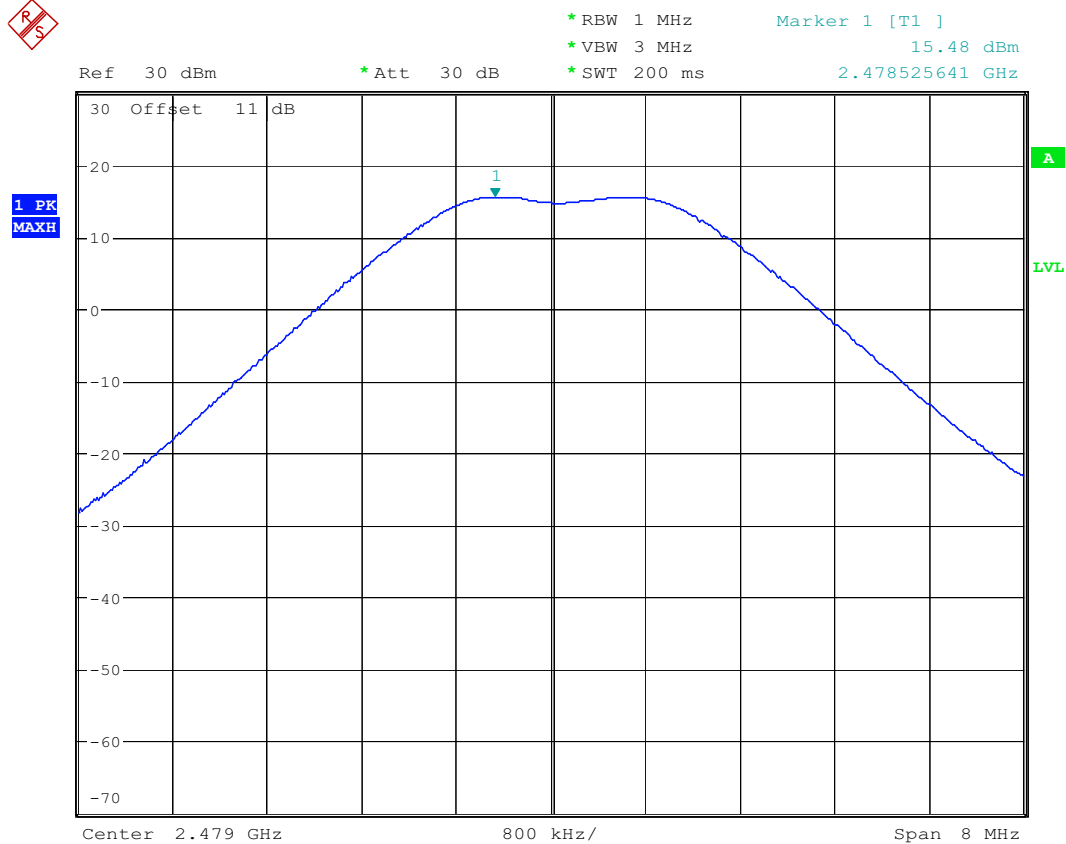
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



MAX OUTPUT POWER MIDDLE CHANNEL

Date: 10.AUG.2007 13:39:58

Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



MAX OUTPUT POWER HIGH CHANNEL

Date: 10.AUG.2007 13:58:42

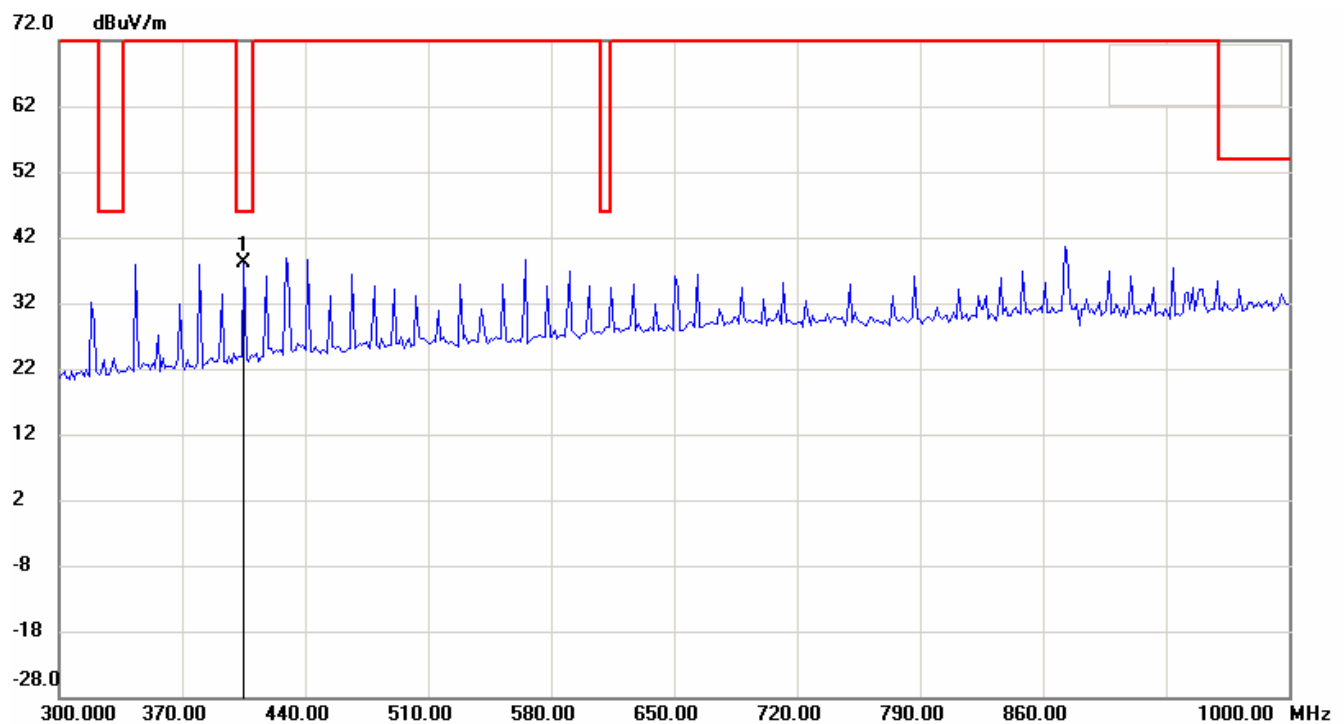
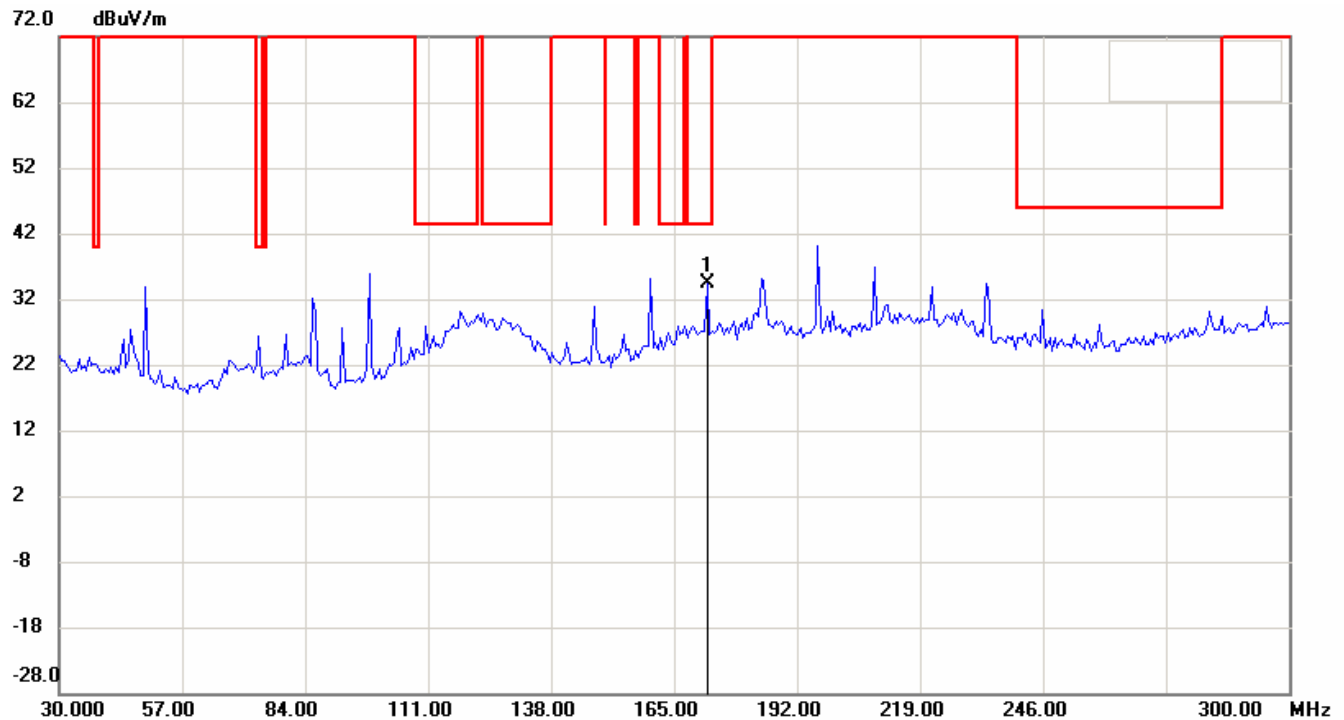
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FCC ID : R48TVEE21TX

Spurious Emissions radiated

Low channel

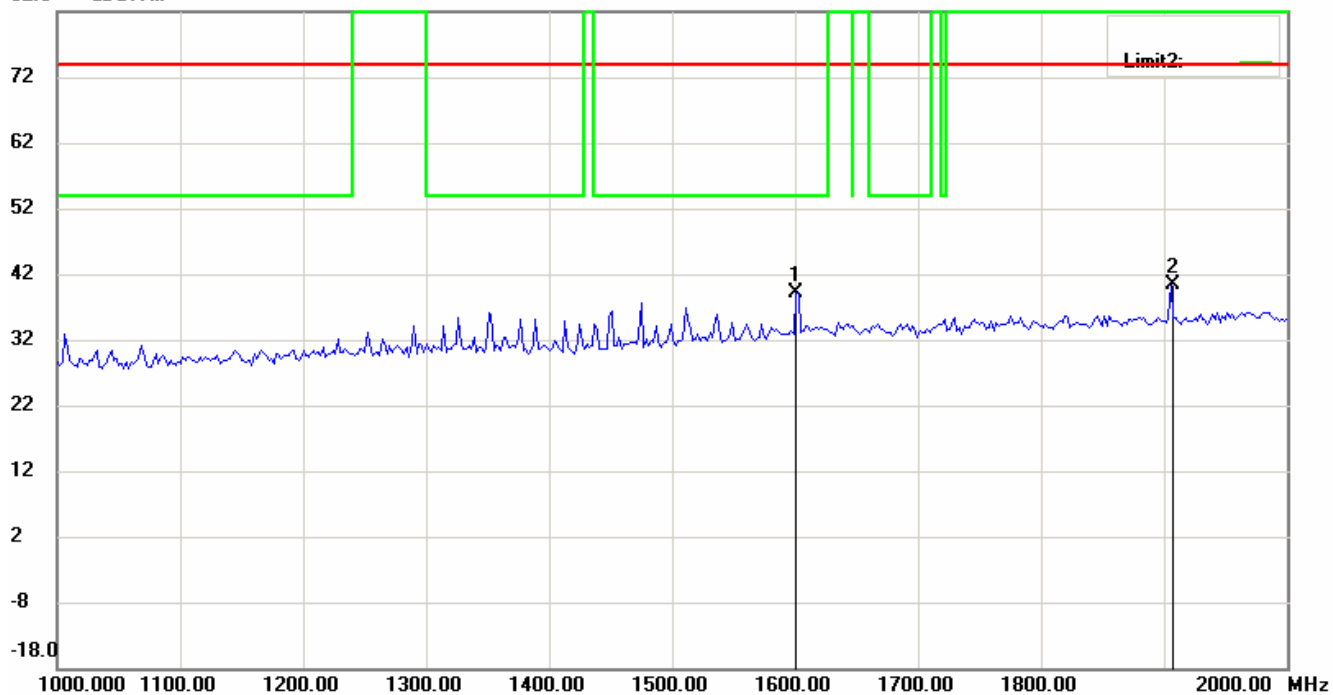
Antenna Polarization H



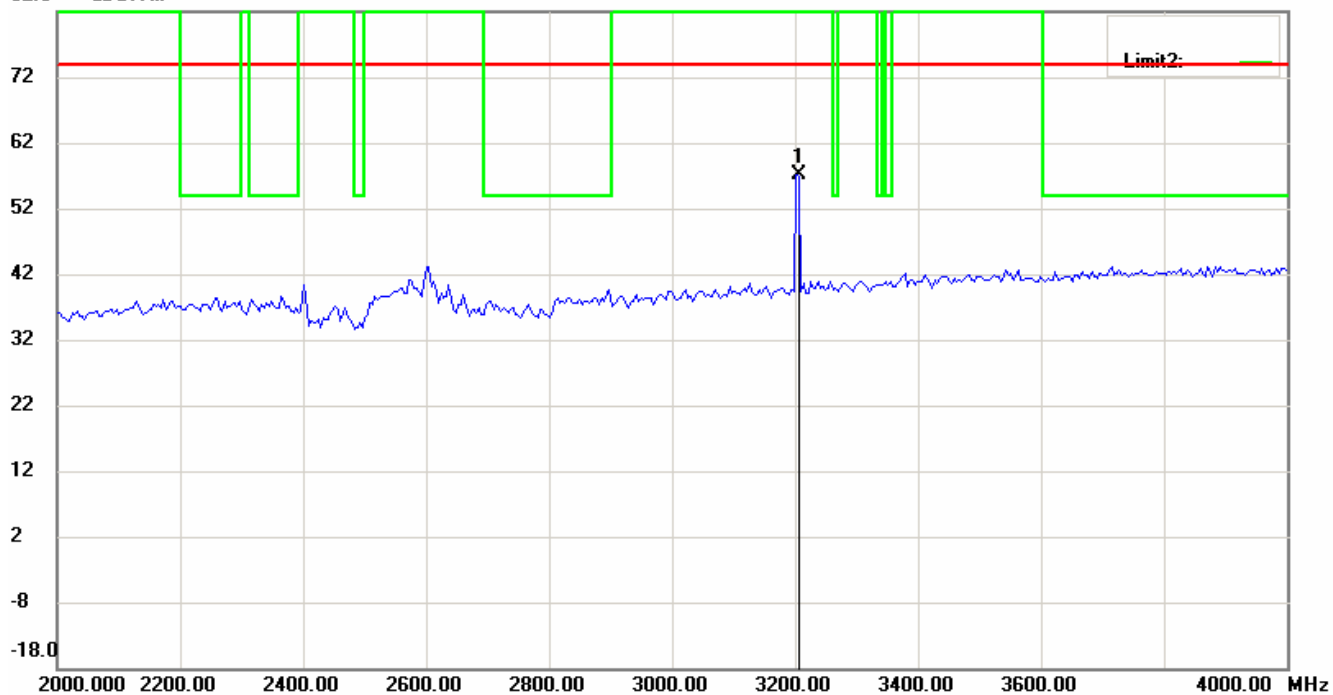
Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX

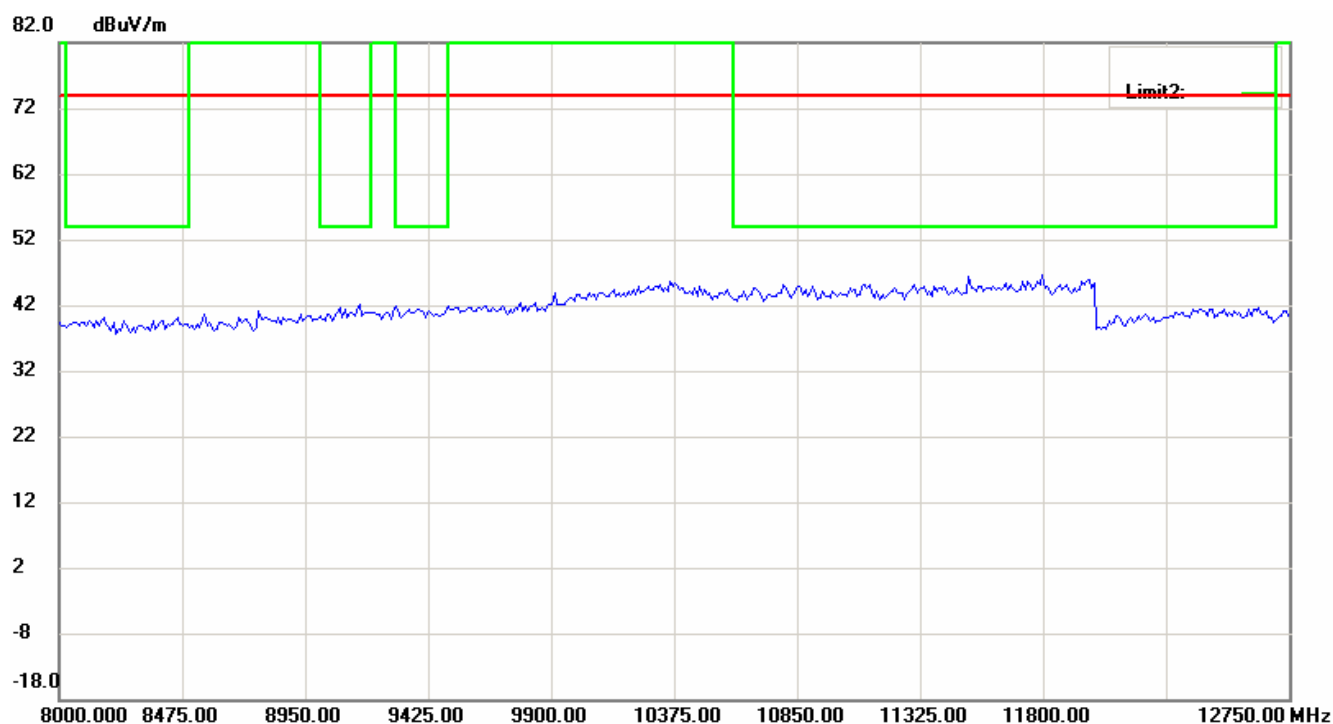
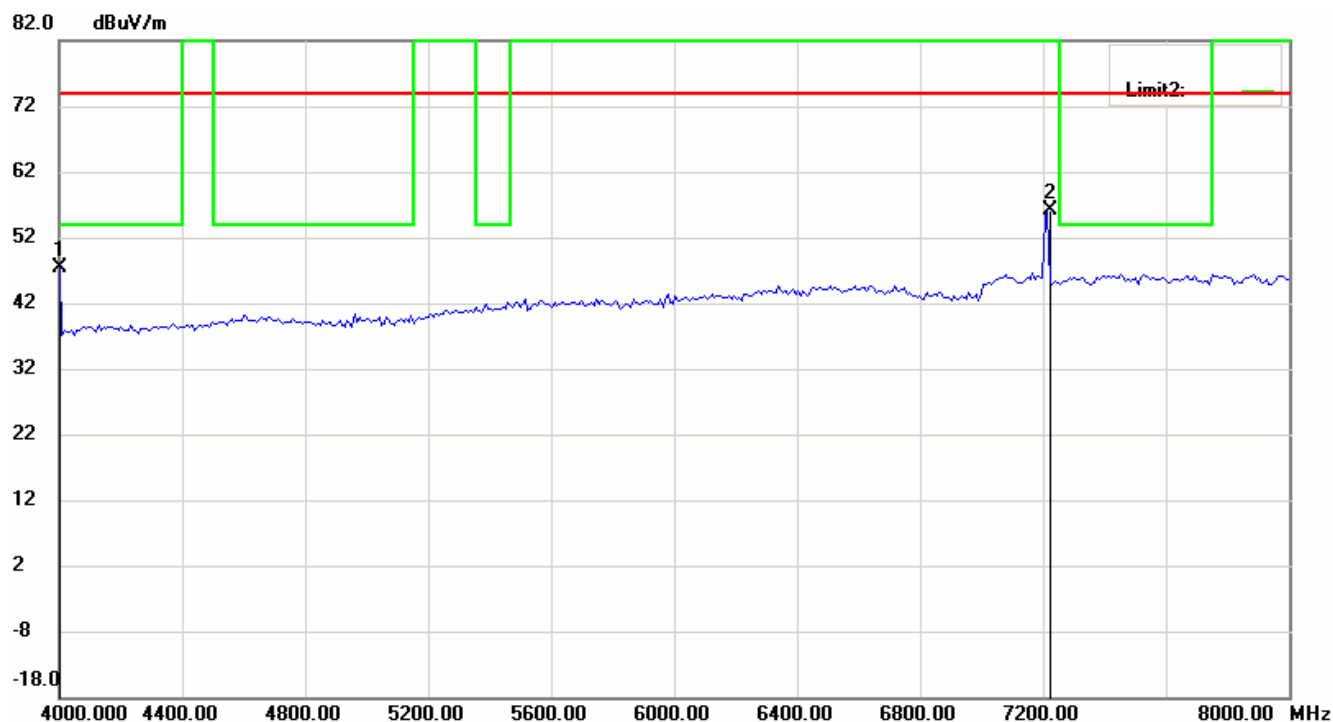
82.0 dBuV/m



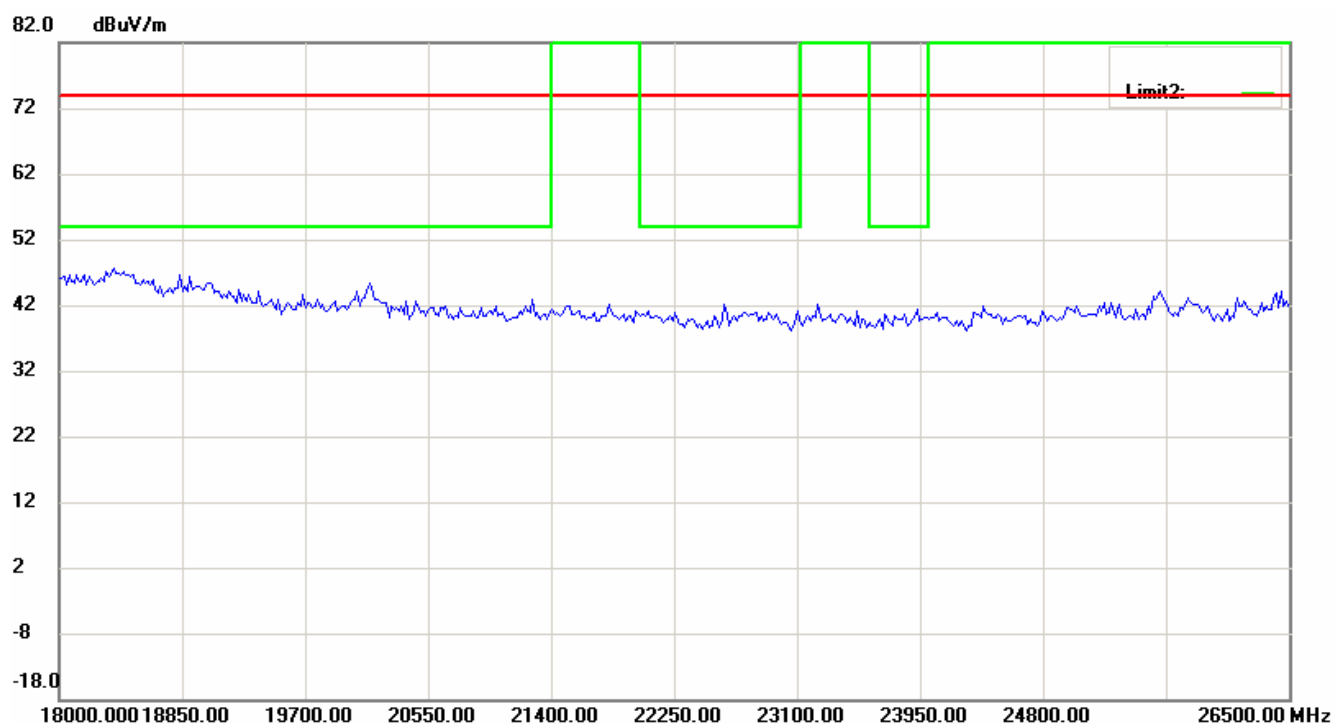
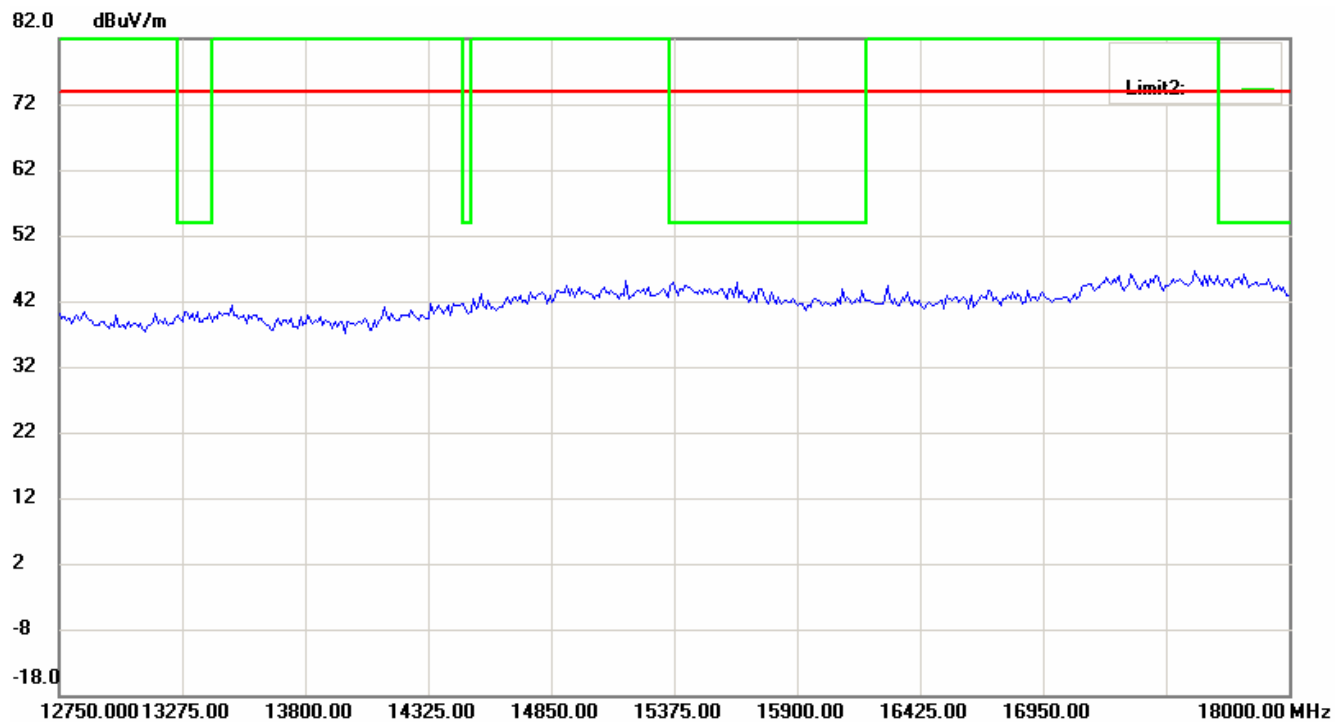
82.0 dBuV/m



Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

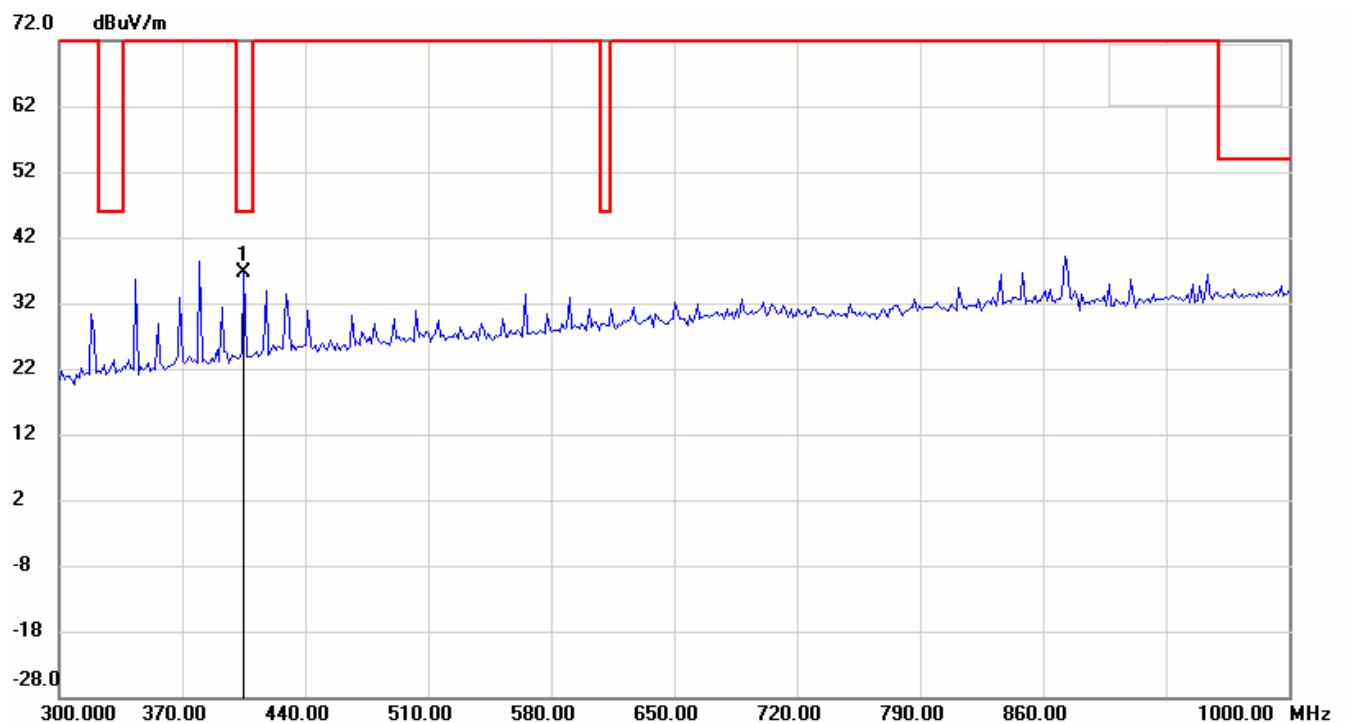
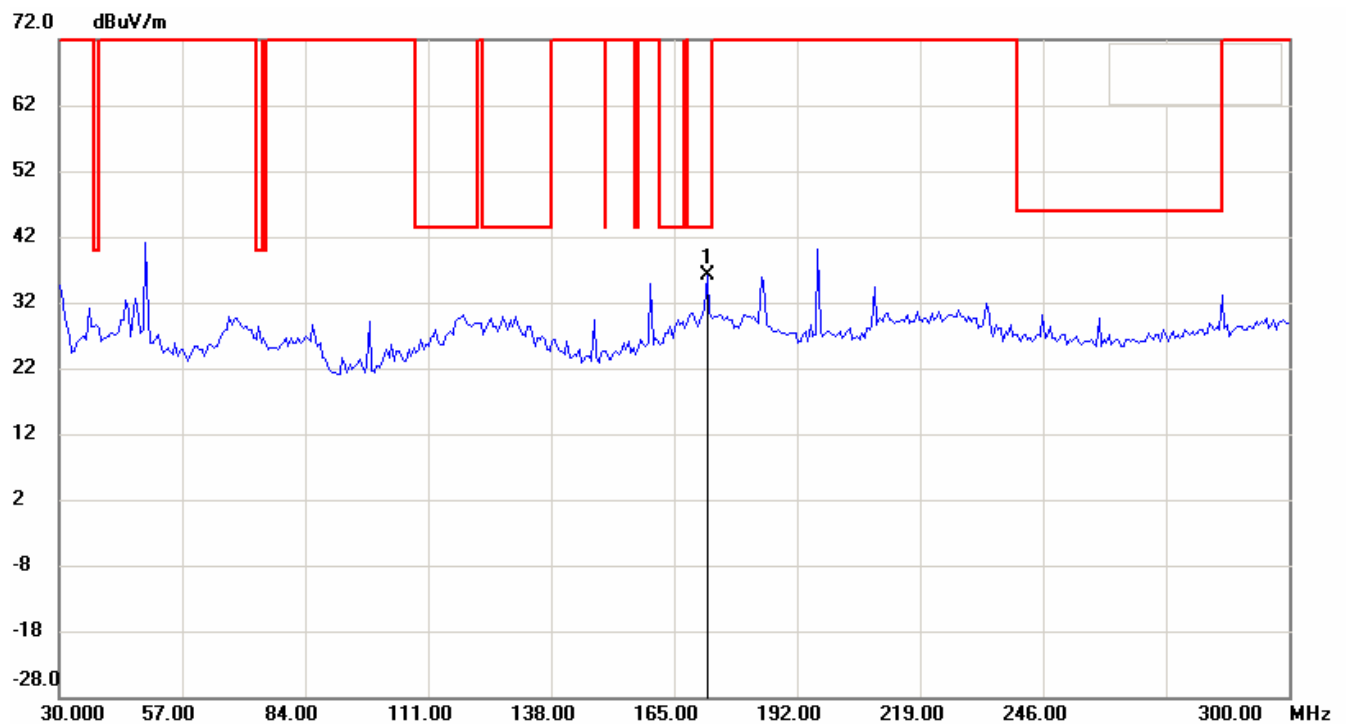


Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

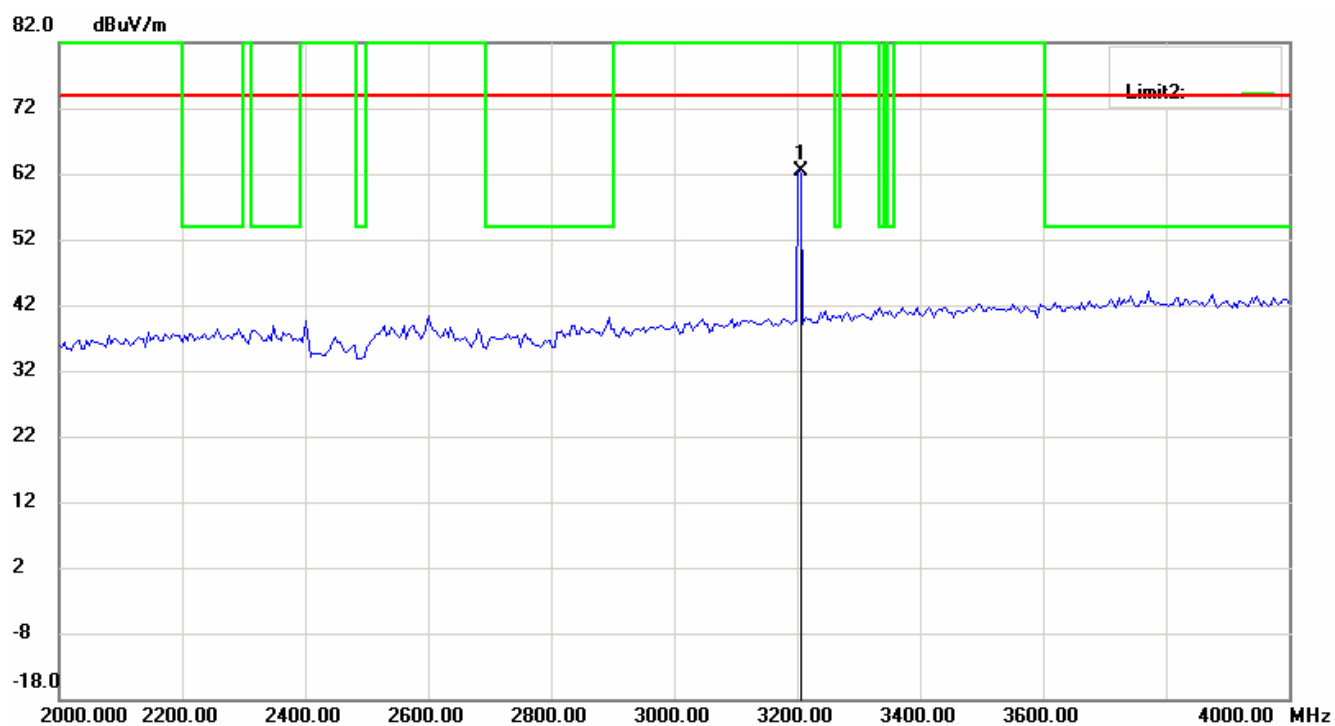
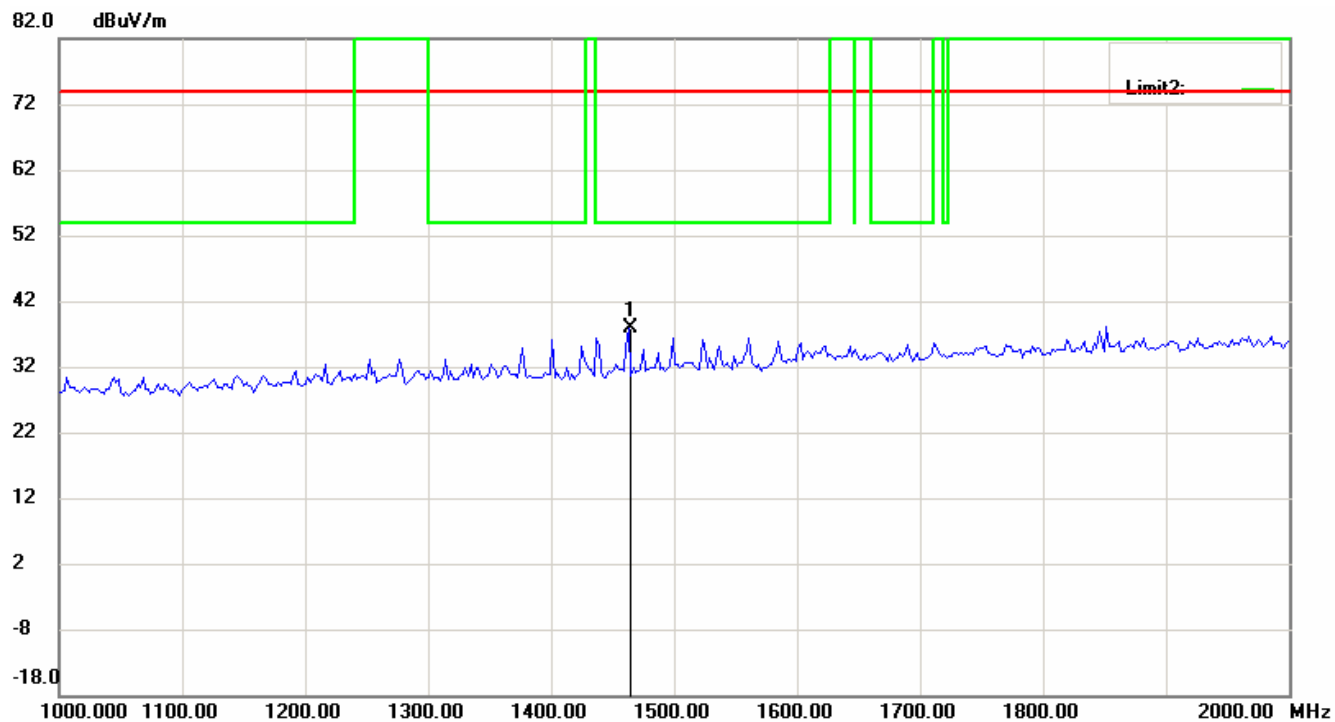


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FCC ID : R48TVEE21TX

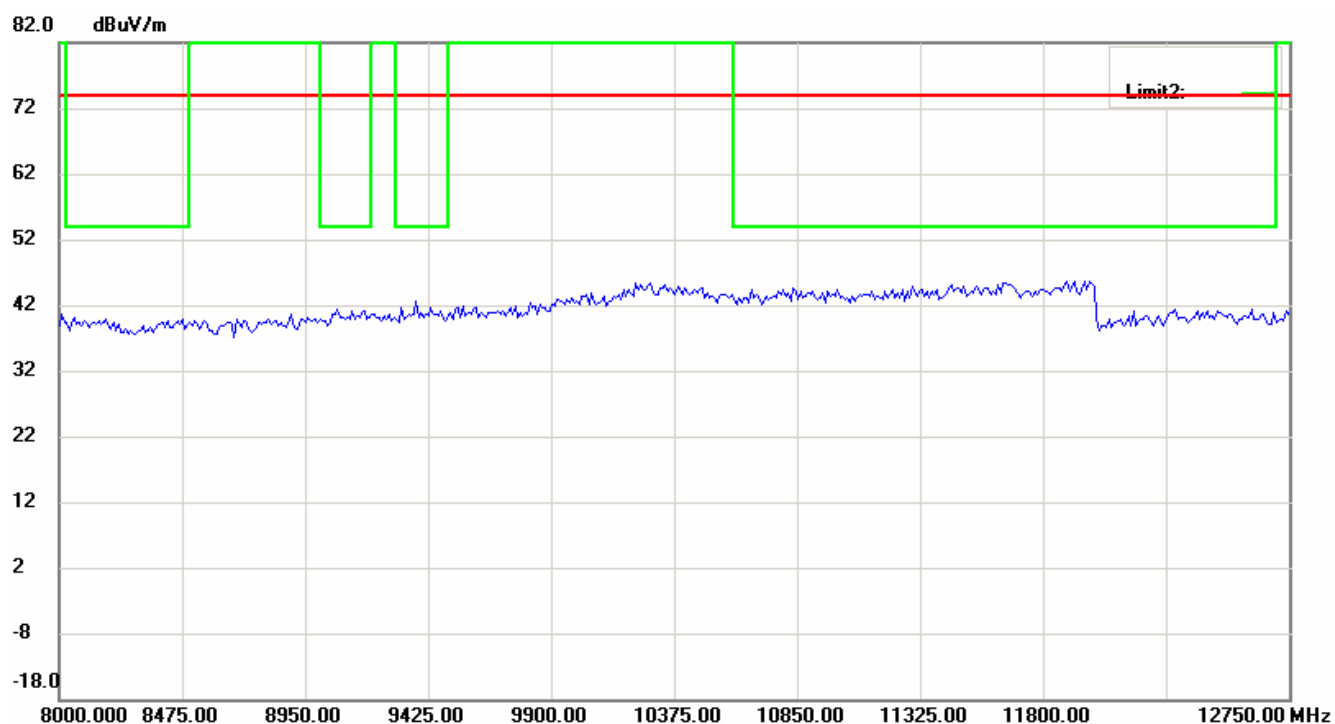
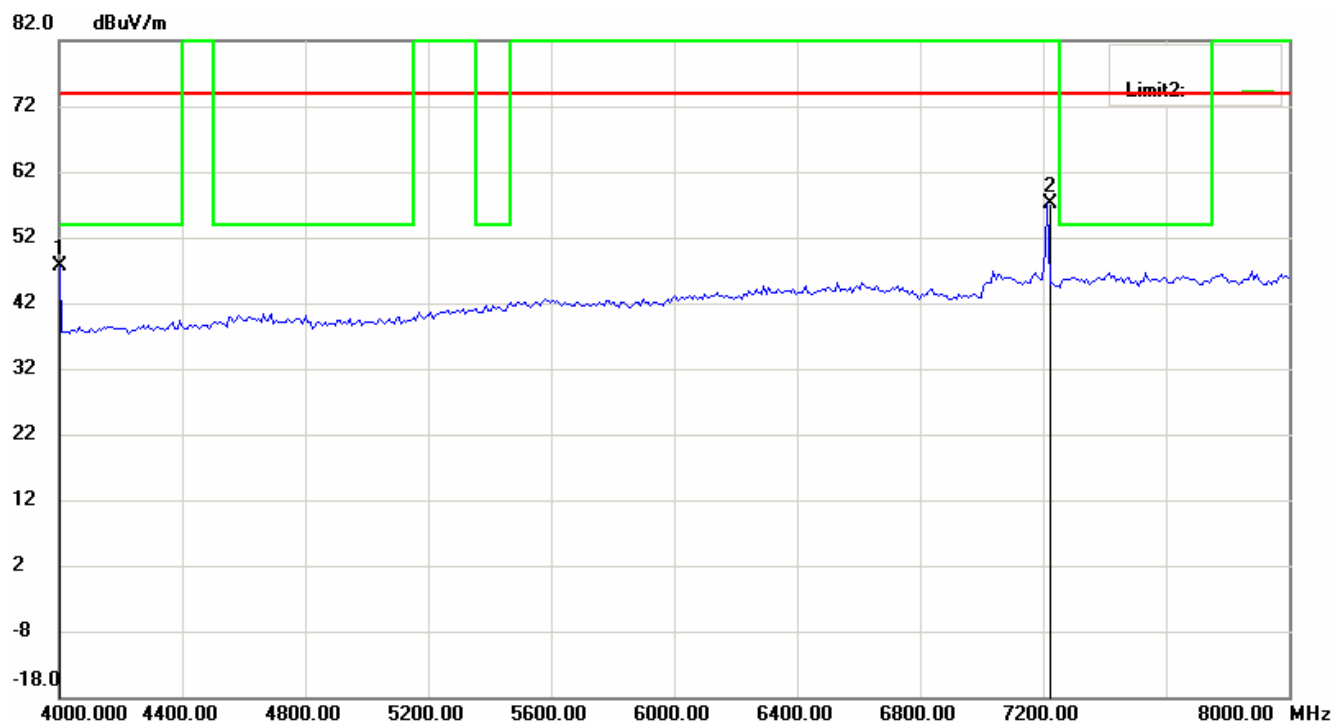
Antenna Polarization V



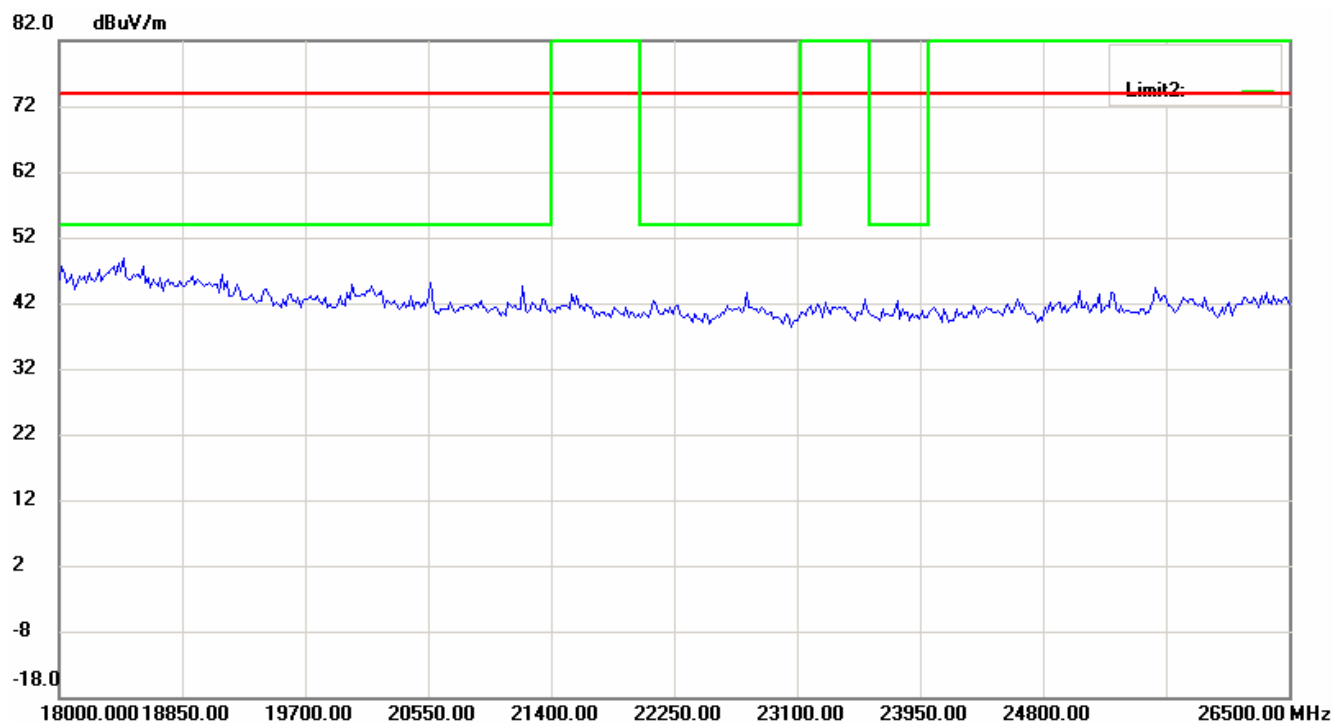
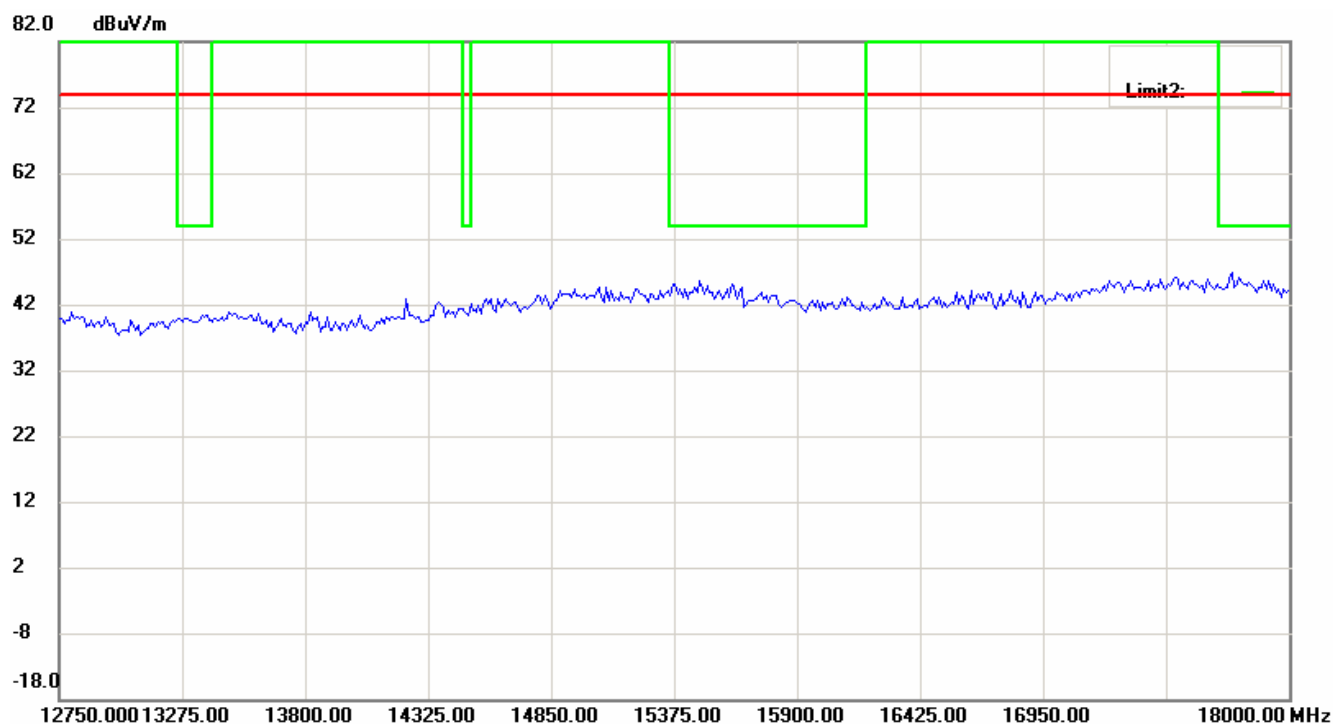
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FCC ID : R48TVEE21TX



Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



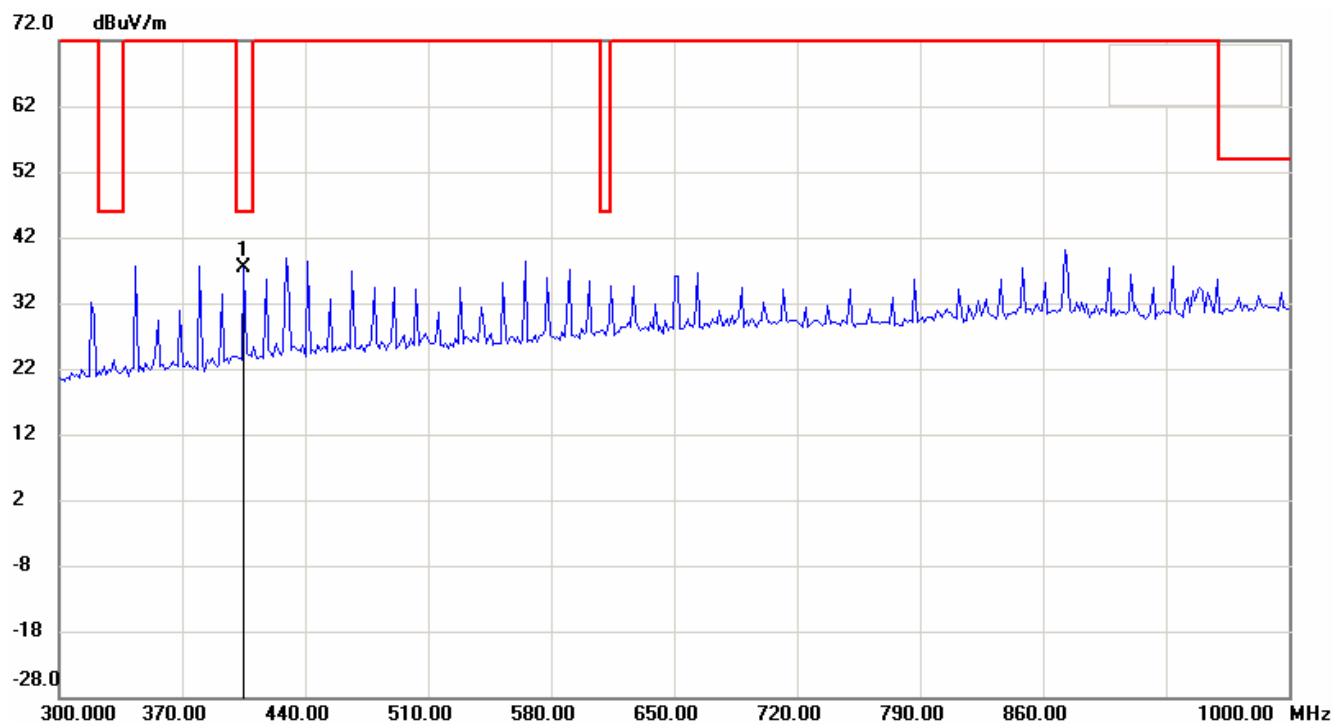
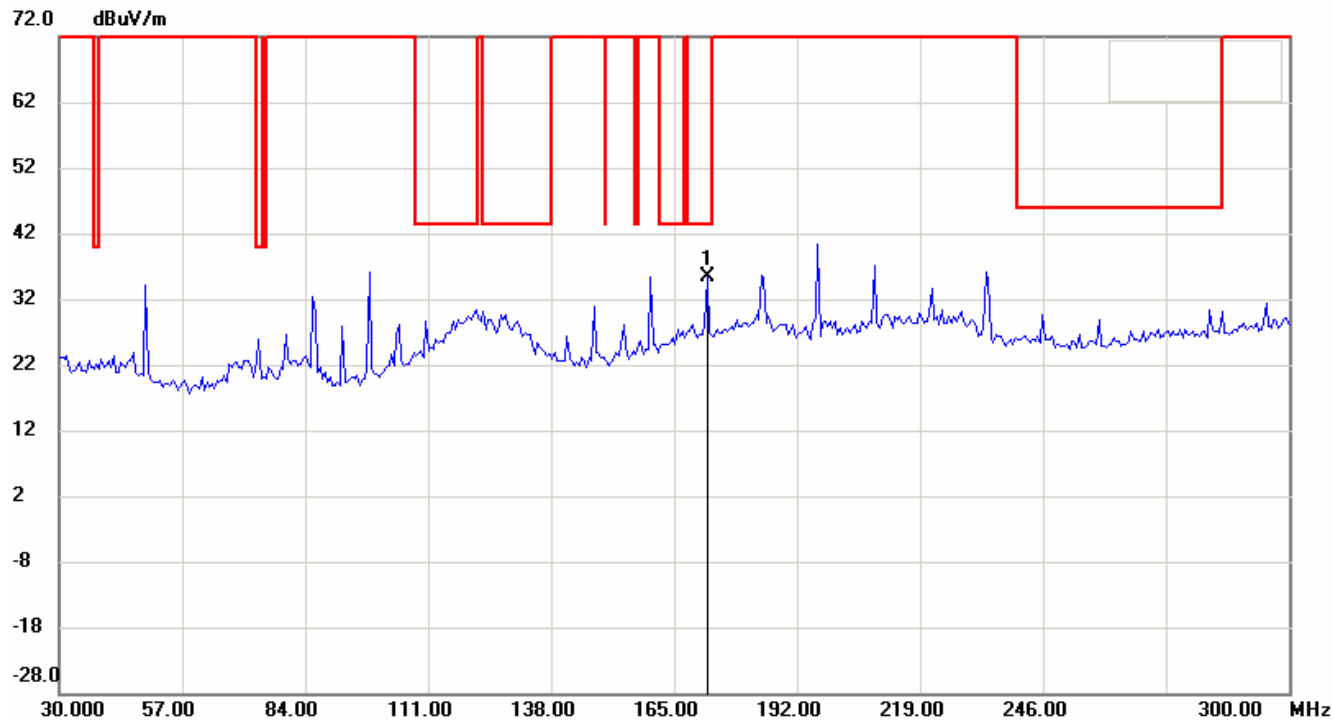
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

Middle channel

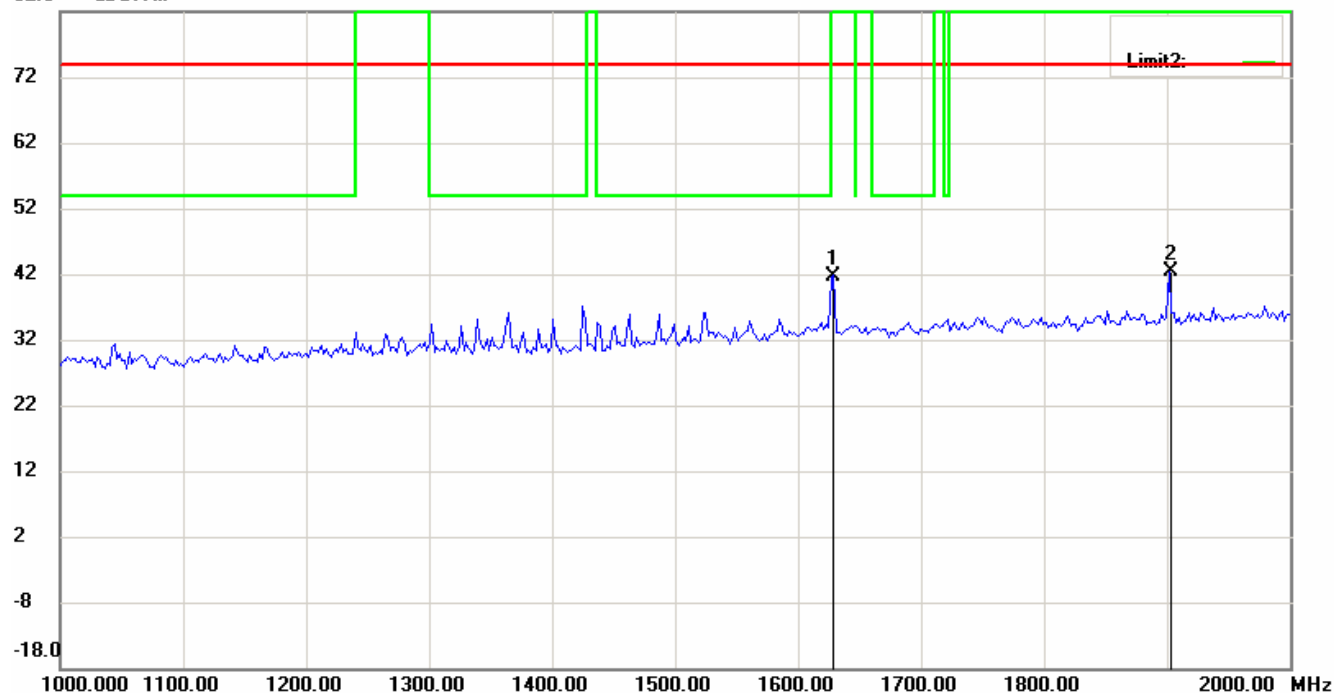
Antenna Polarization H



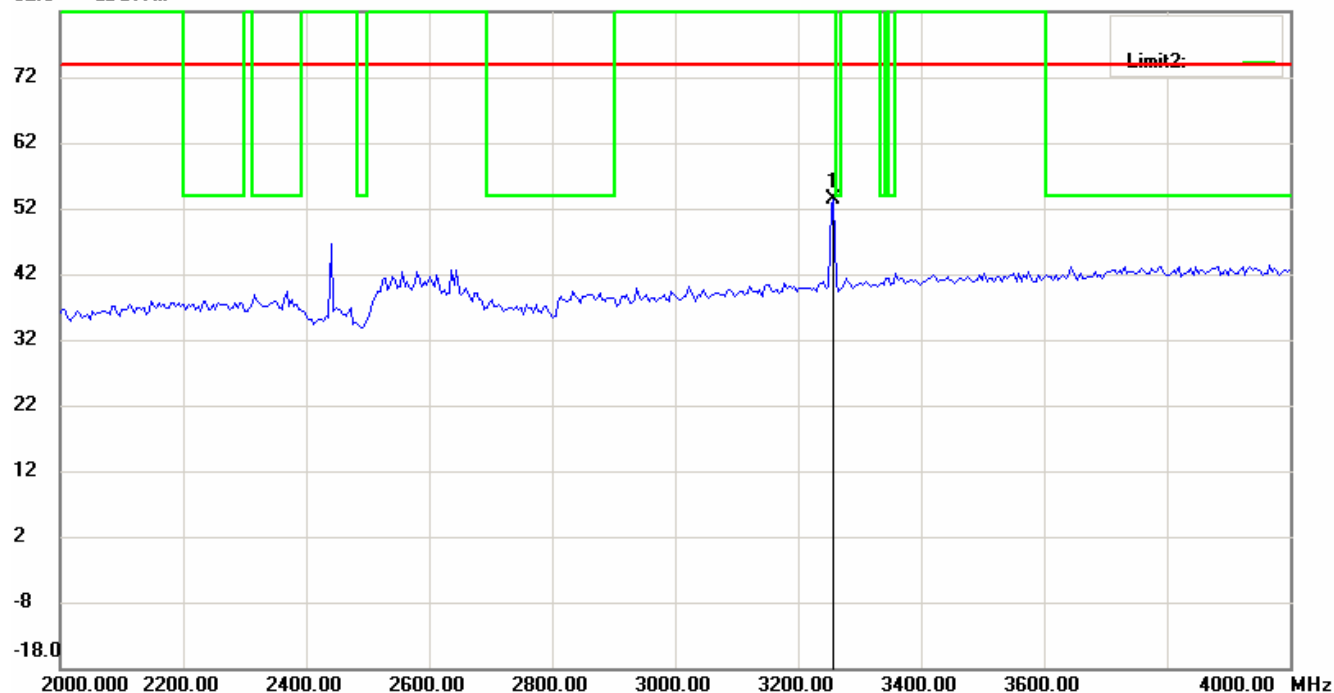
Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX

82.0 dBuV/m



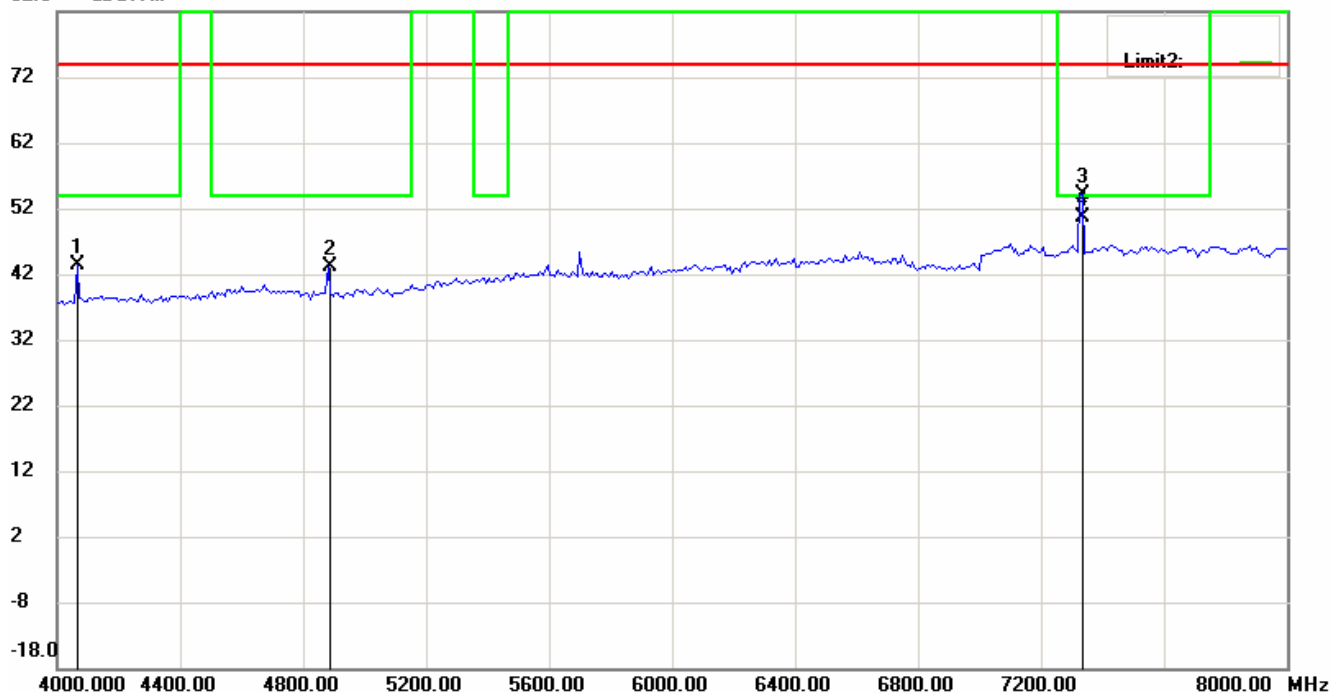
82.0 dBuV/m



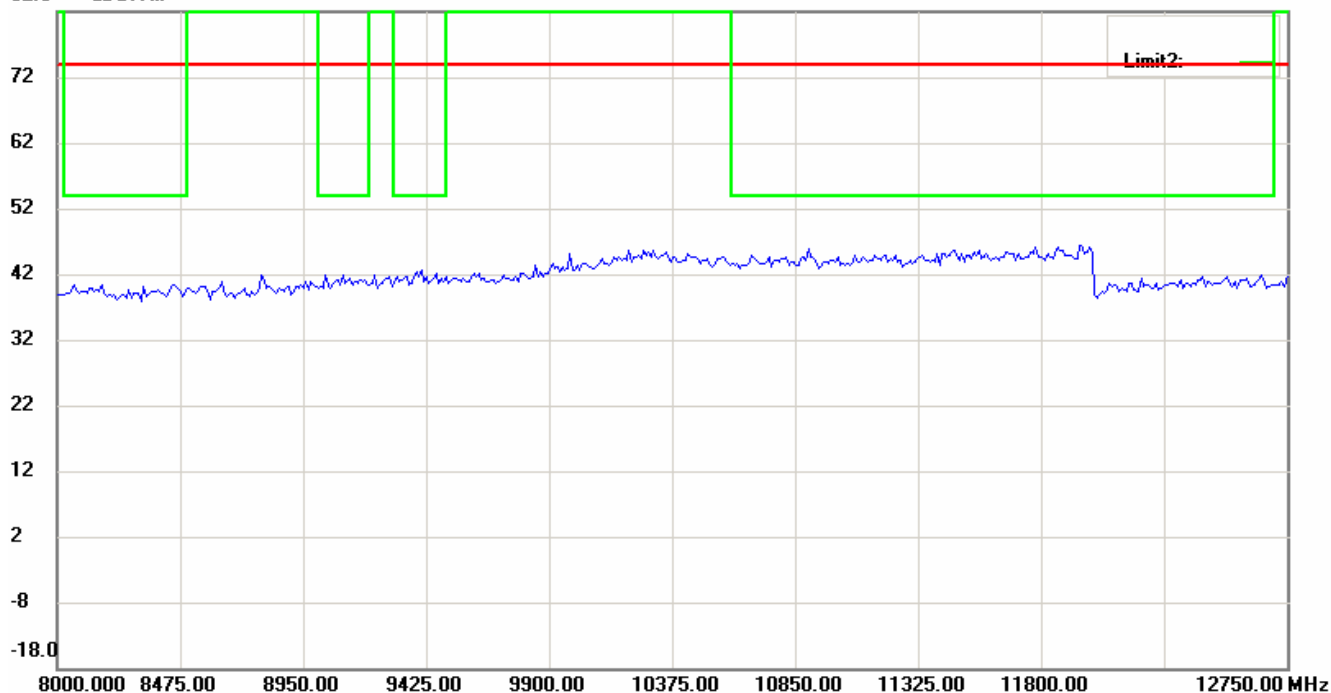
Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX

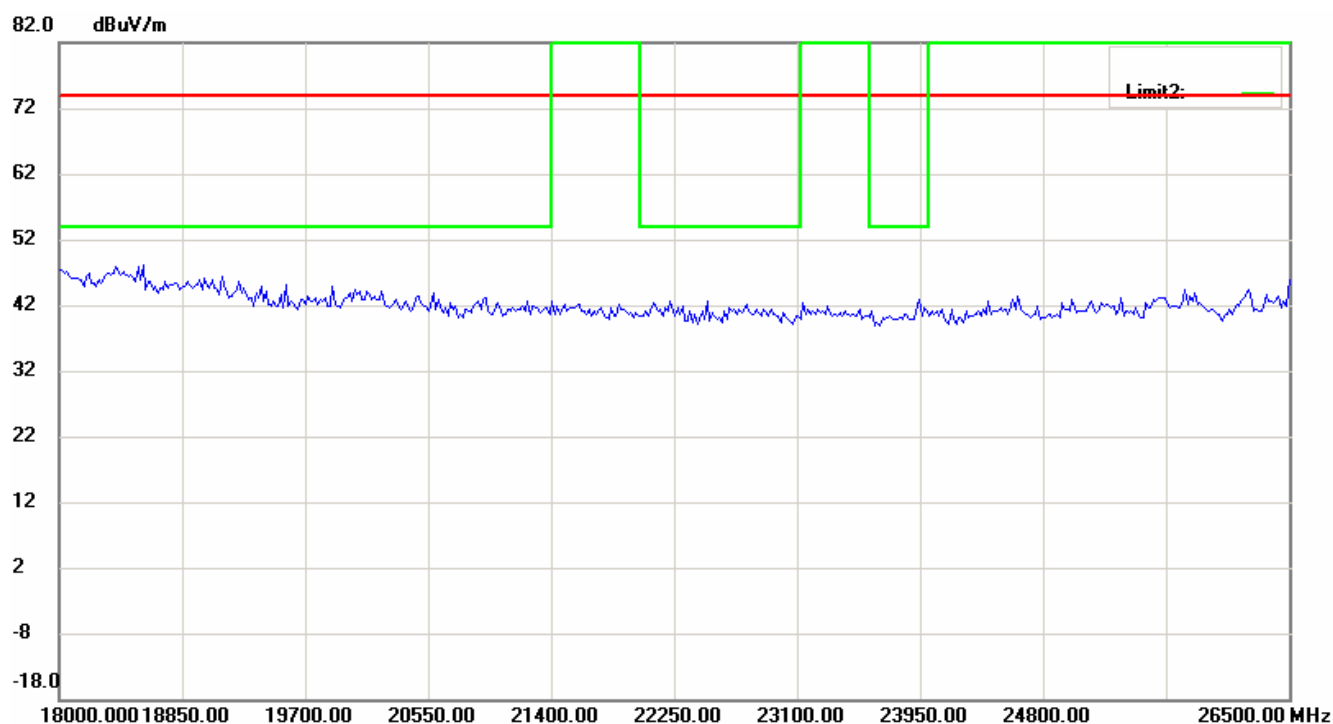
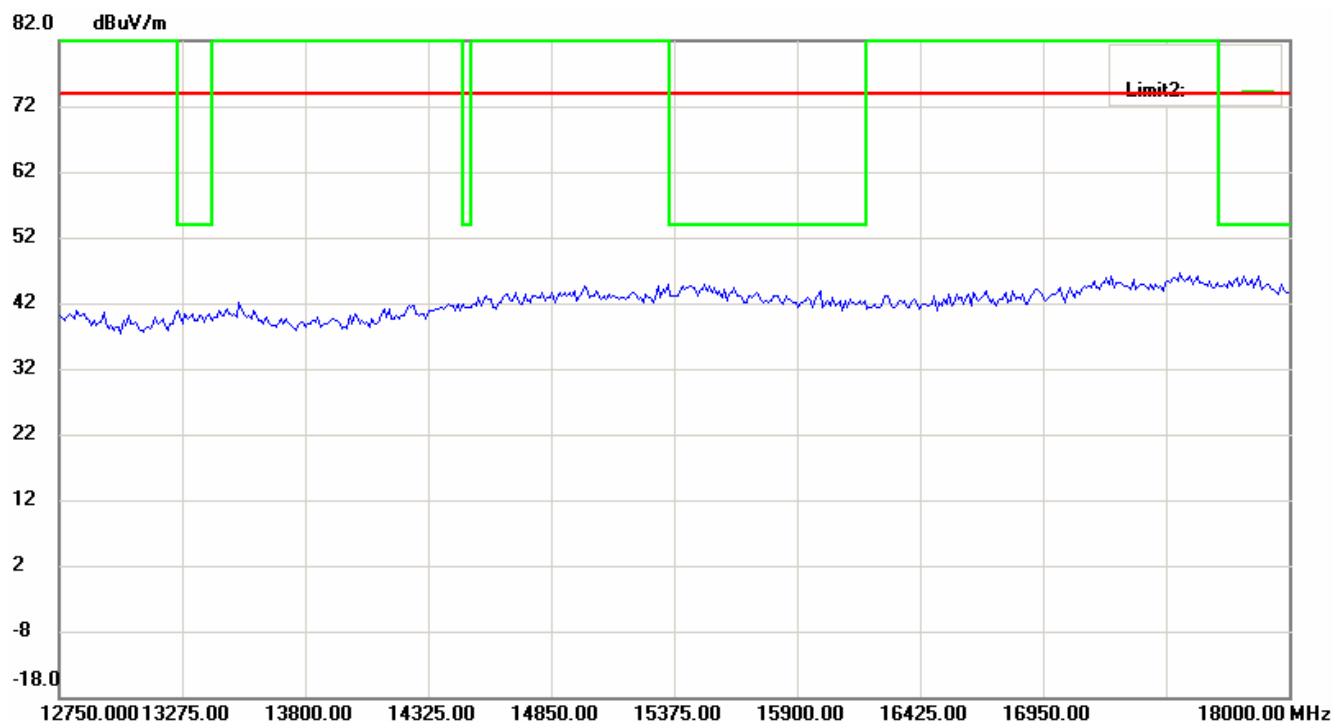
82.0 dBuV/m



82.0 dBuV/m

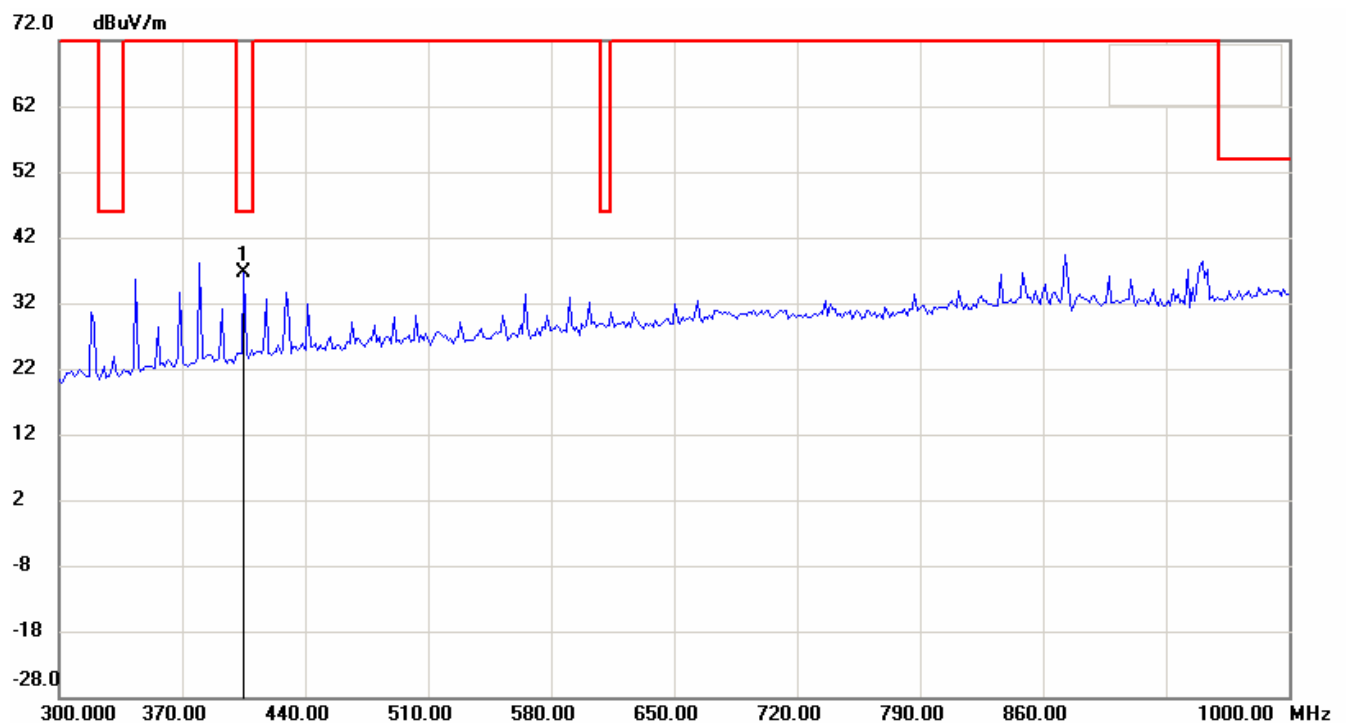
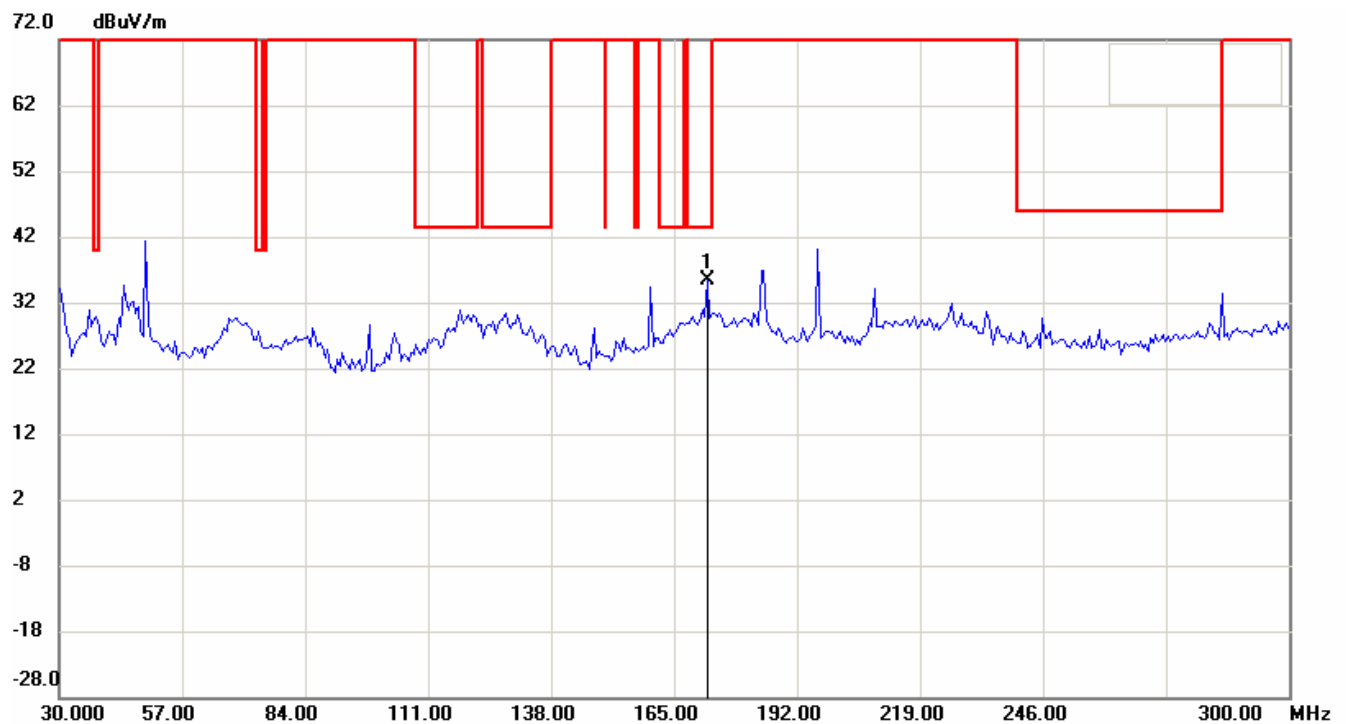


Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

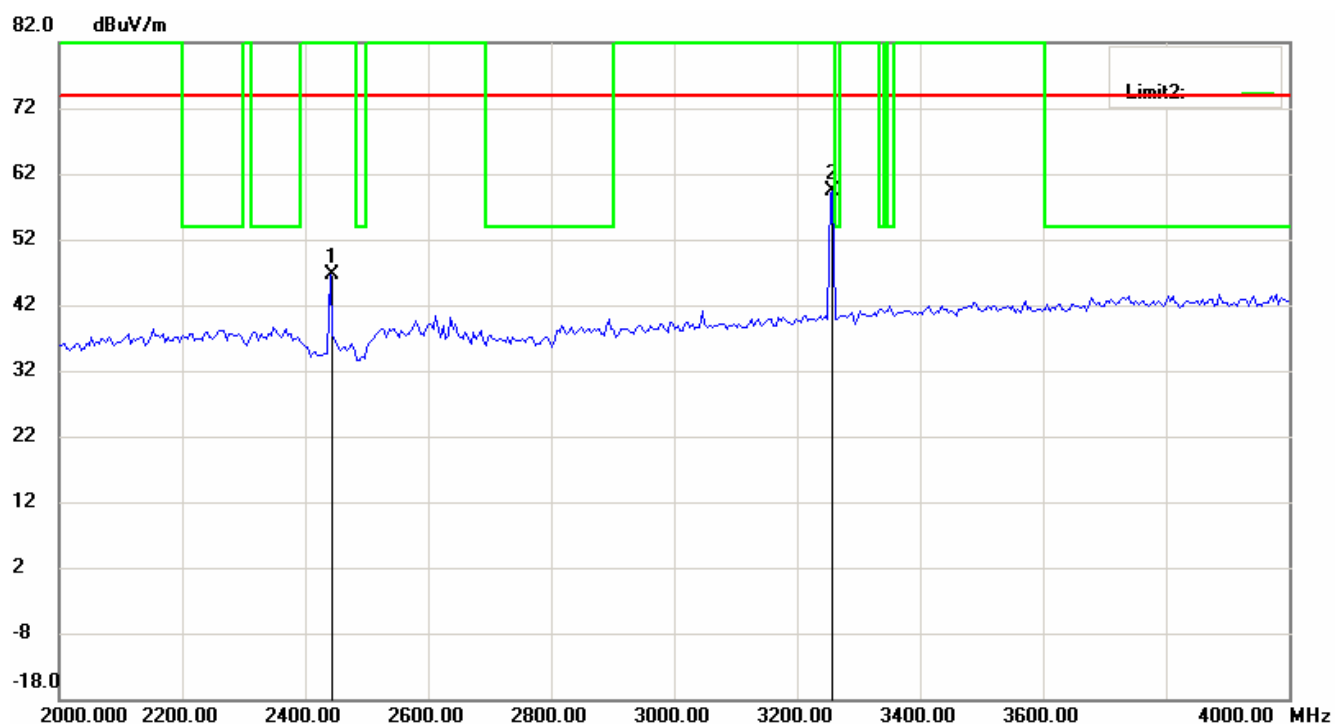
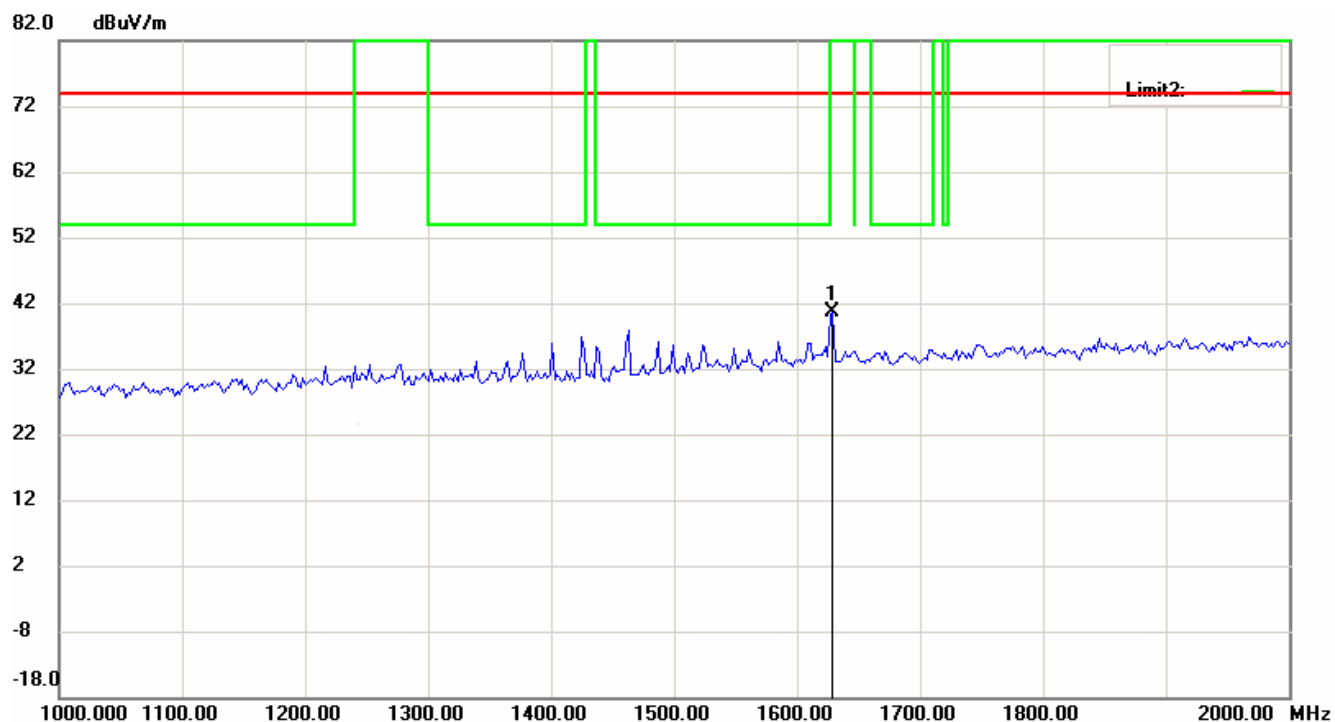


Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

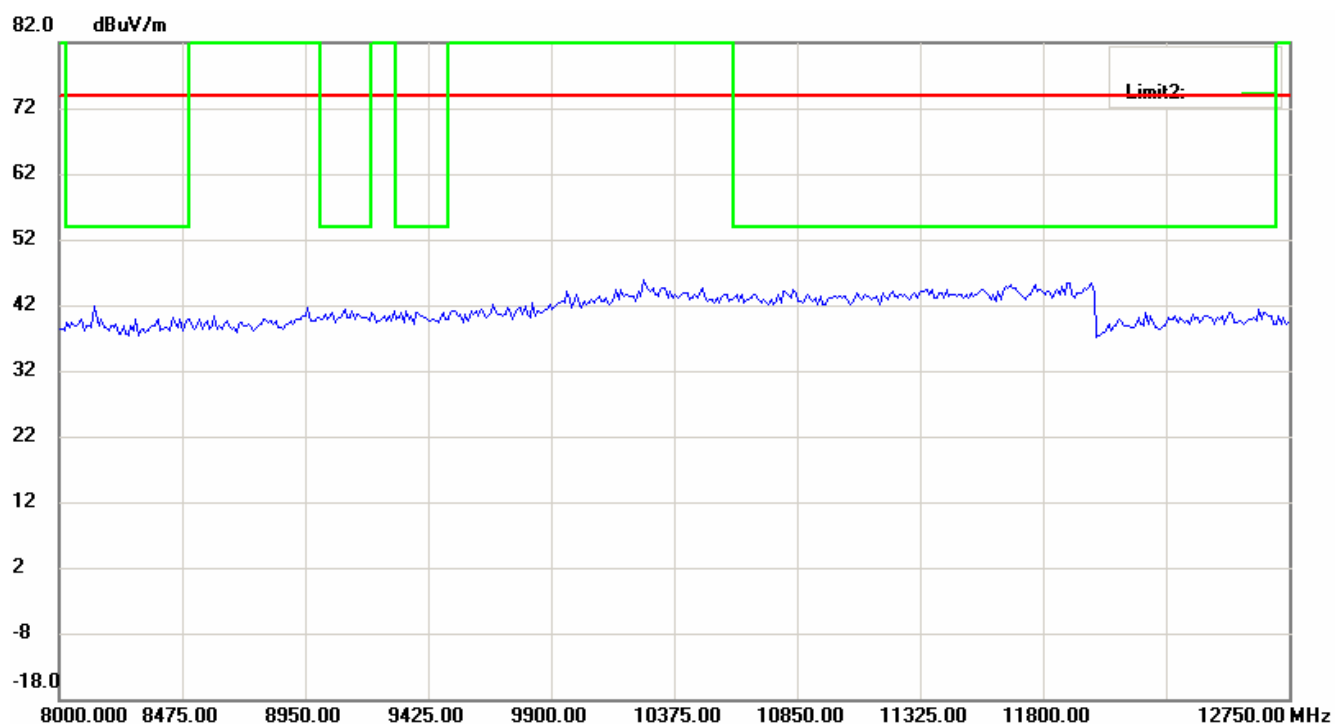
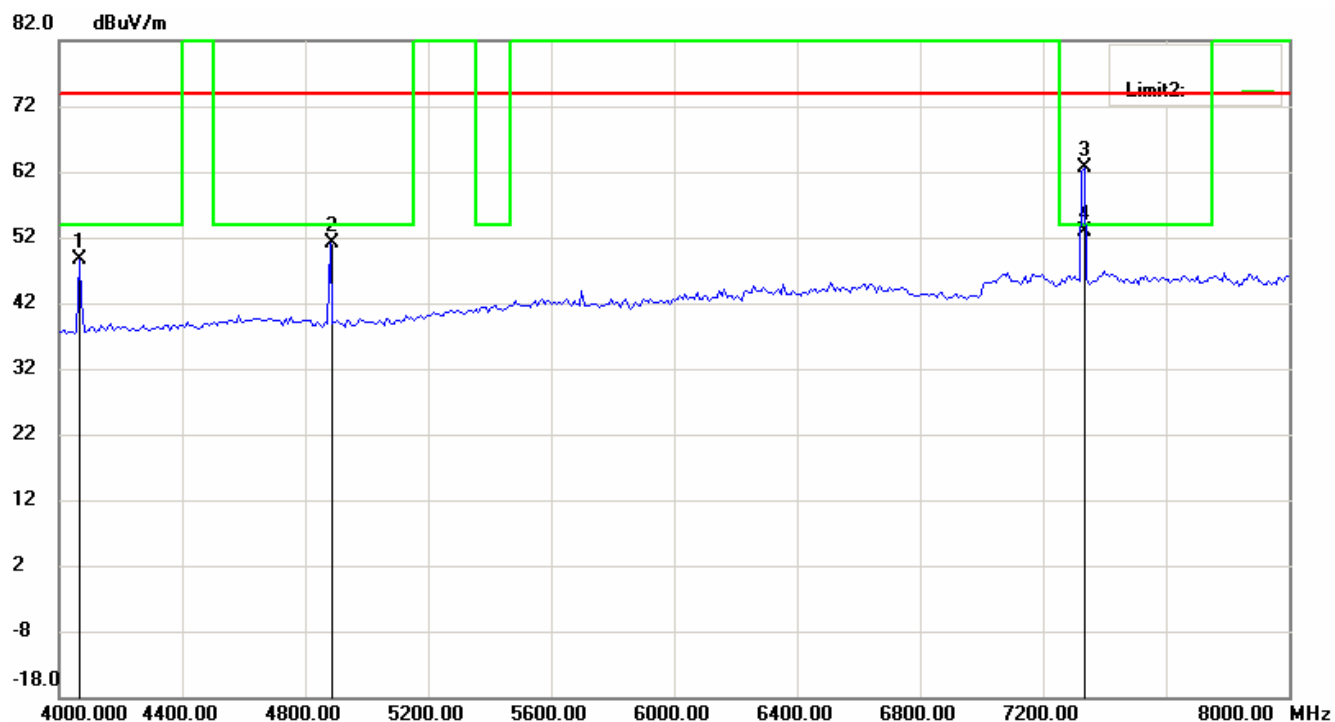
Antenna Polarization V



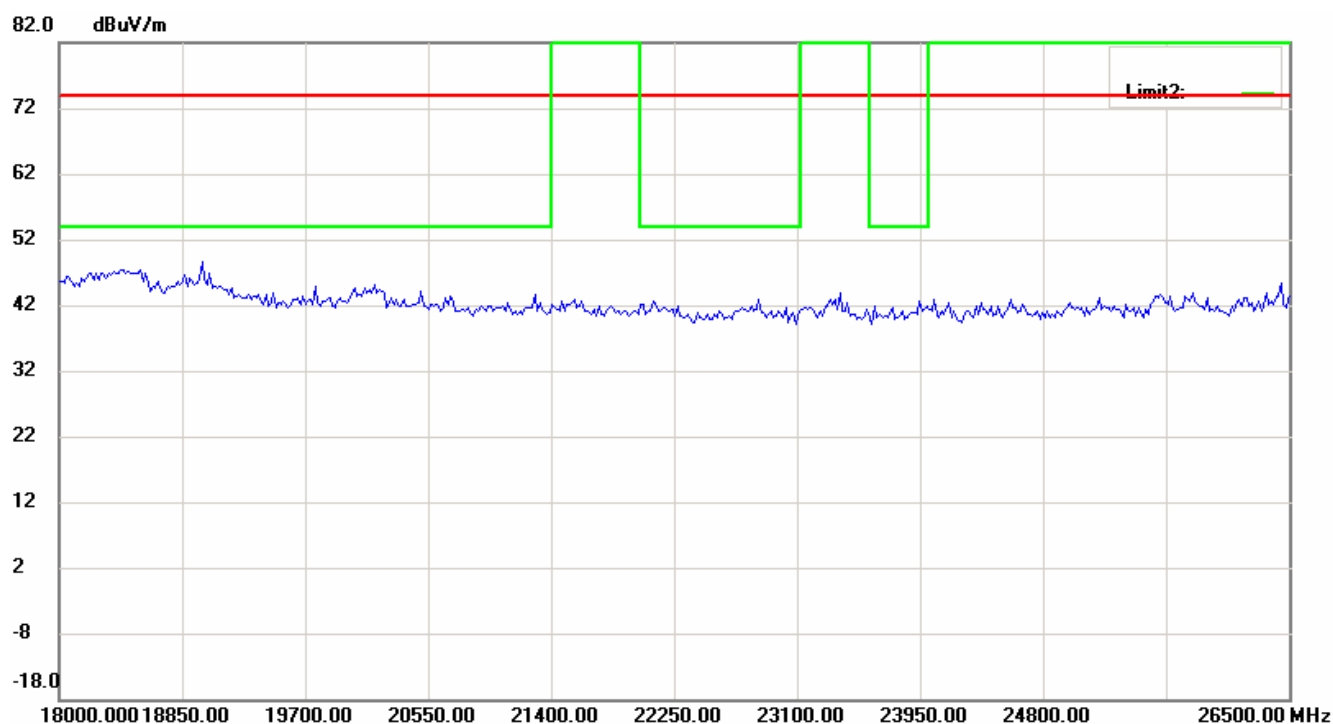
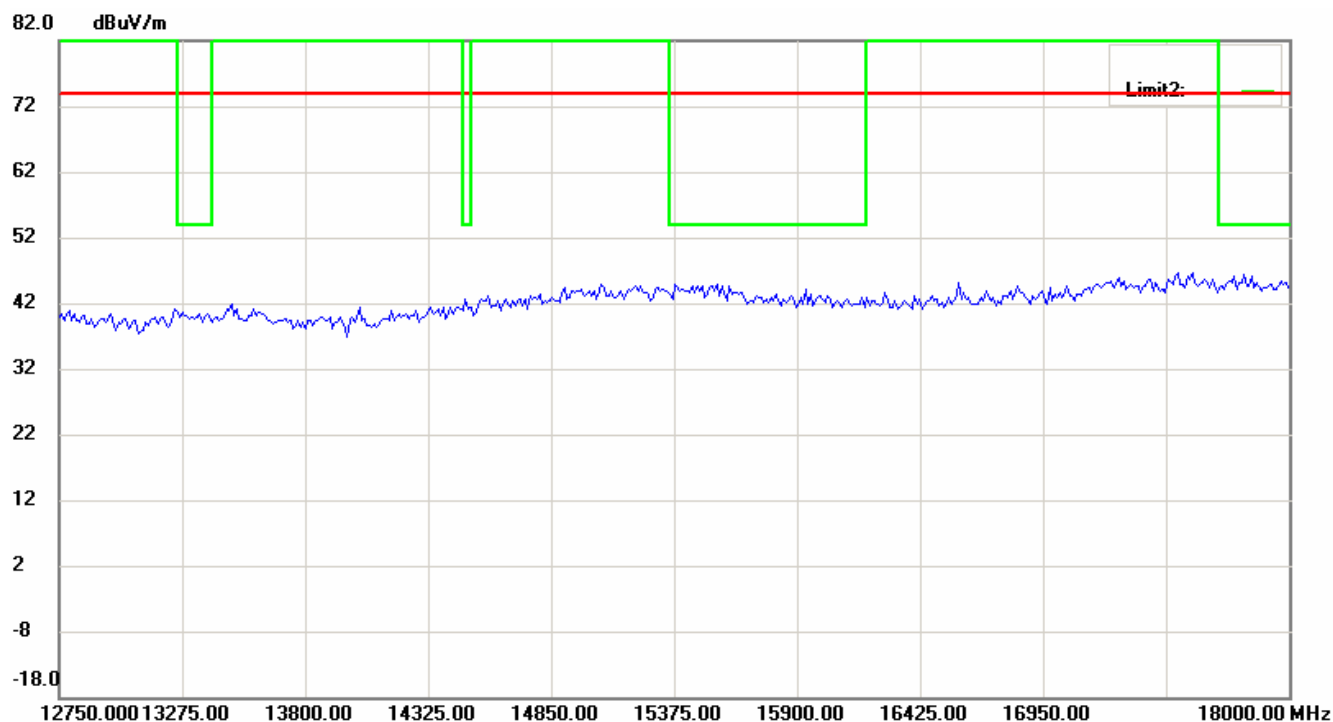
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



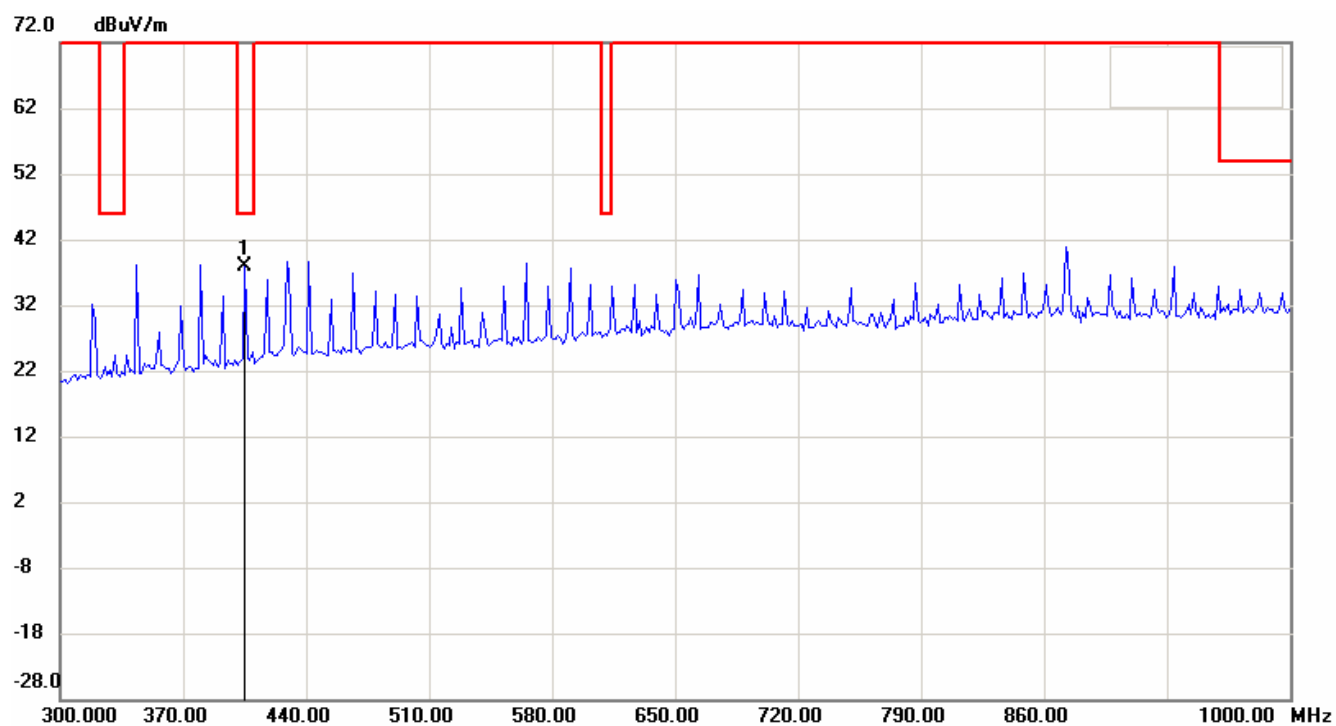
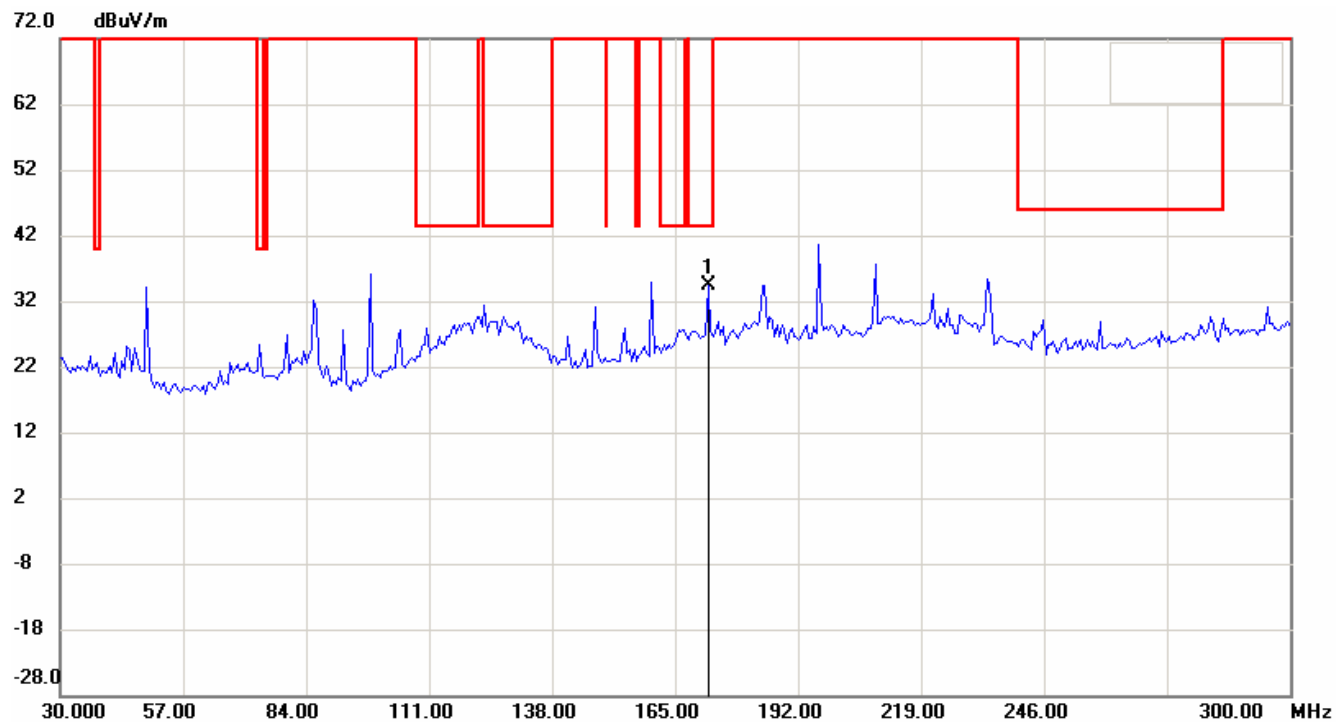
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

High channel

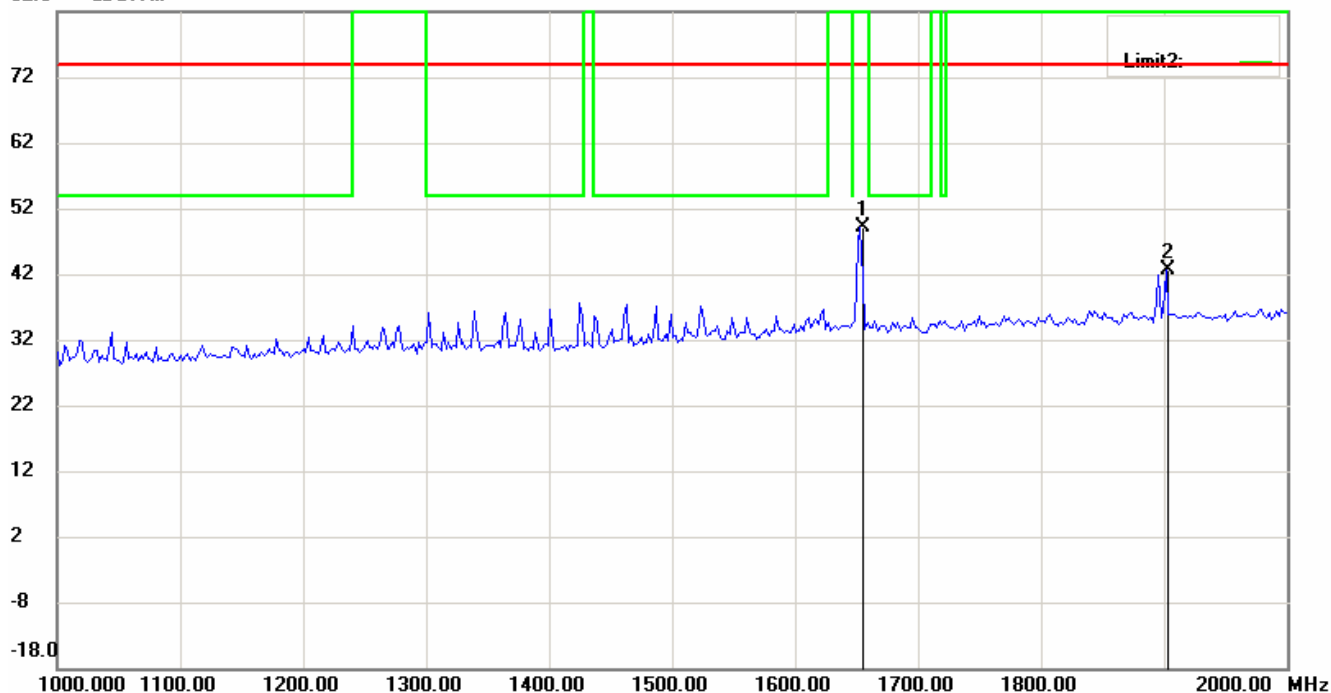
Antenna Polarization H



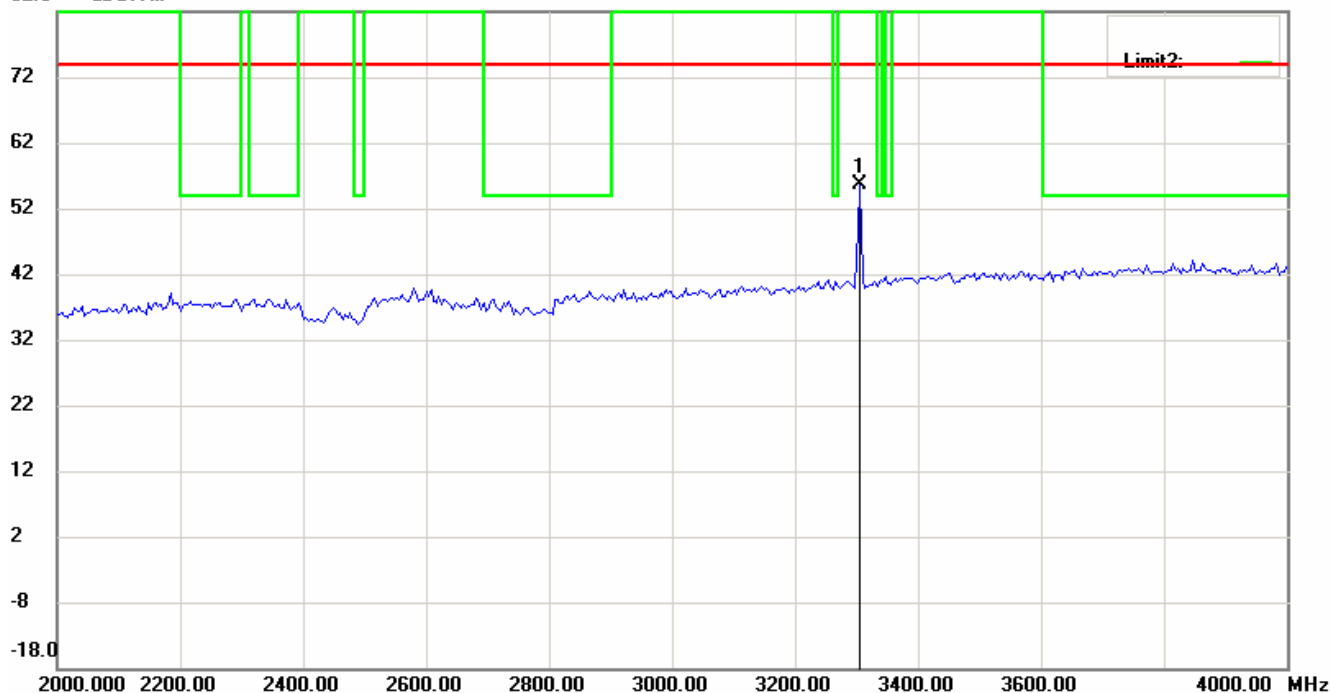
Registration number: W6M20707-8271-P-15-T

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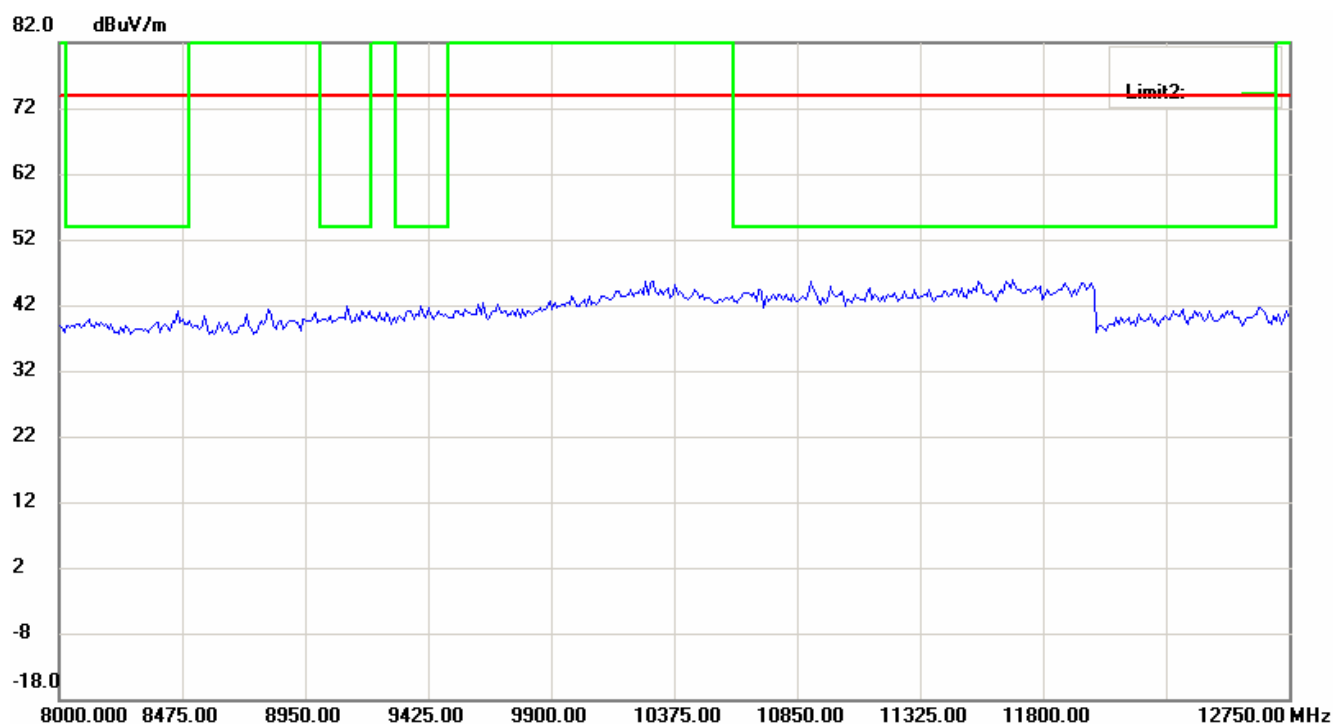
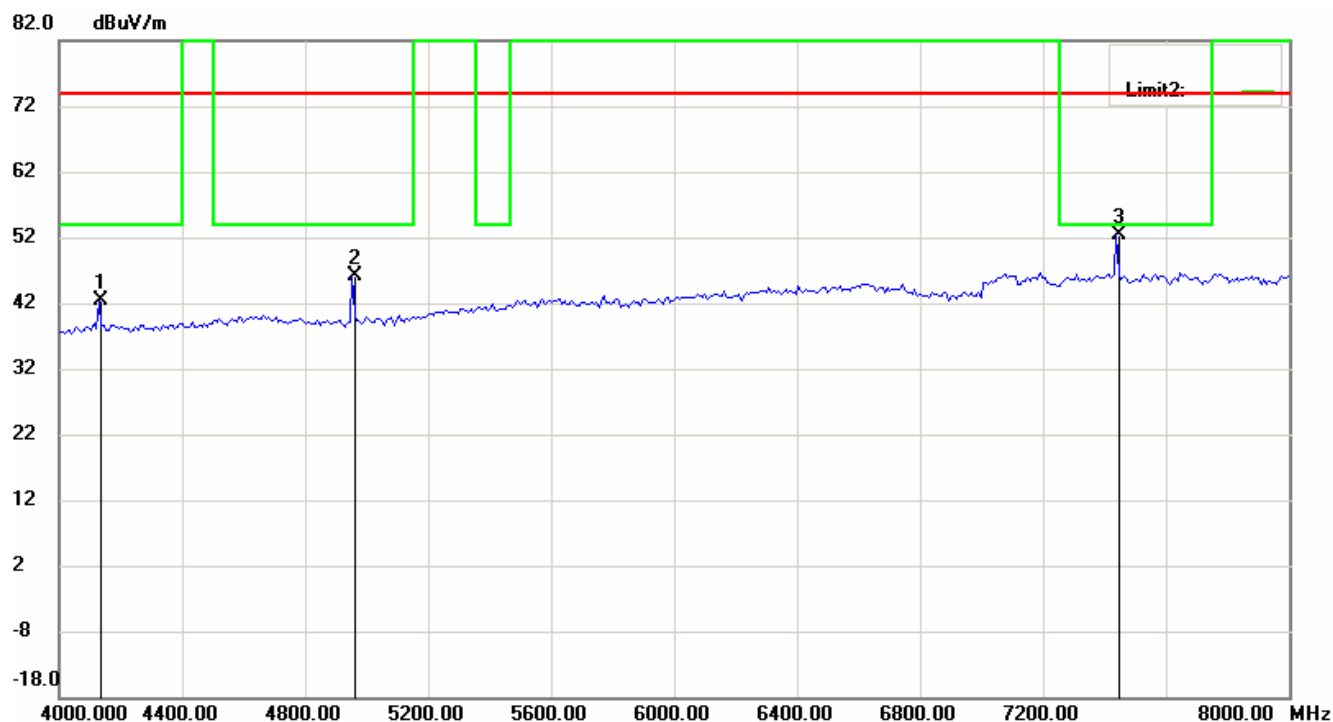
82.0 dBuV/m



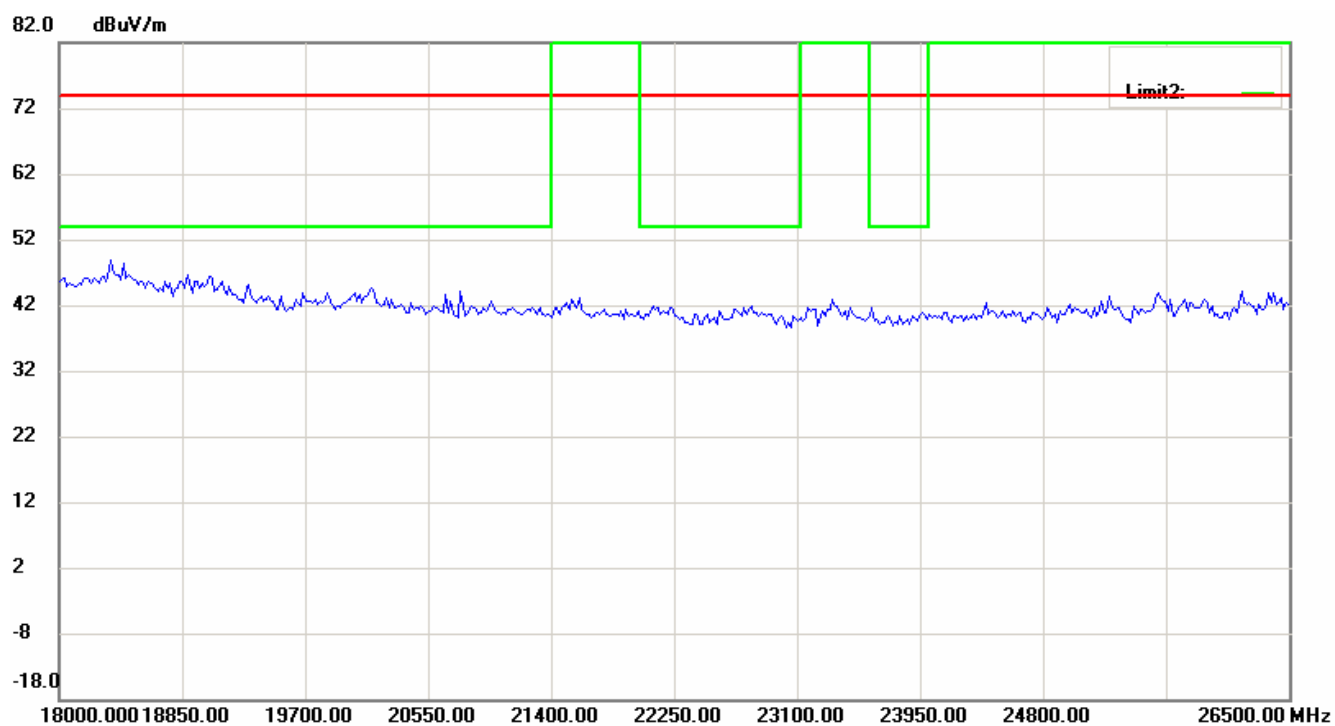
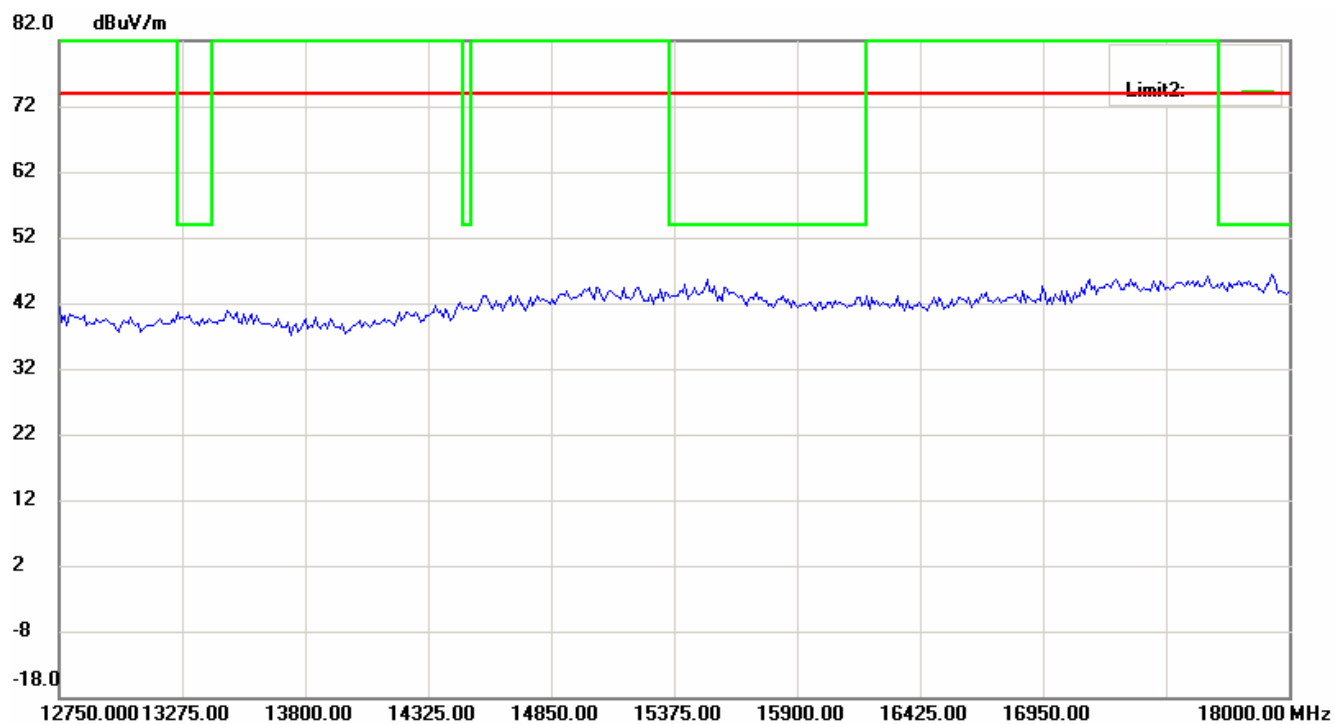
82.0 dBuV/m



Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



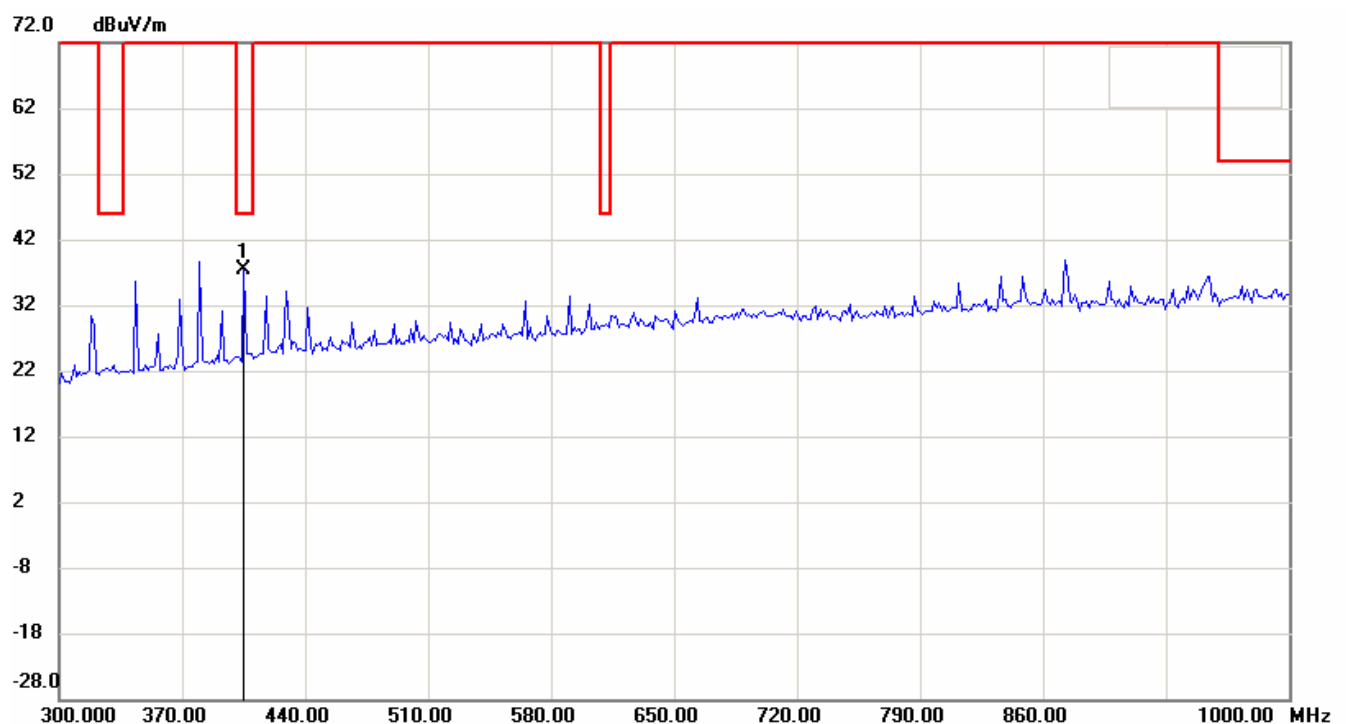
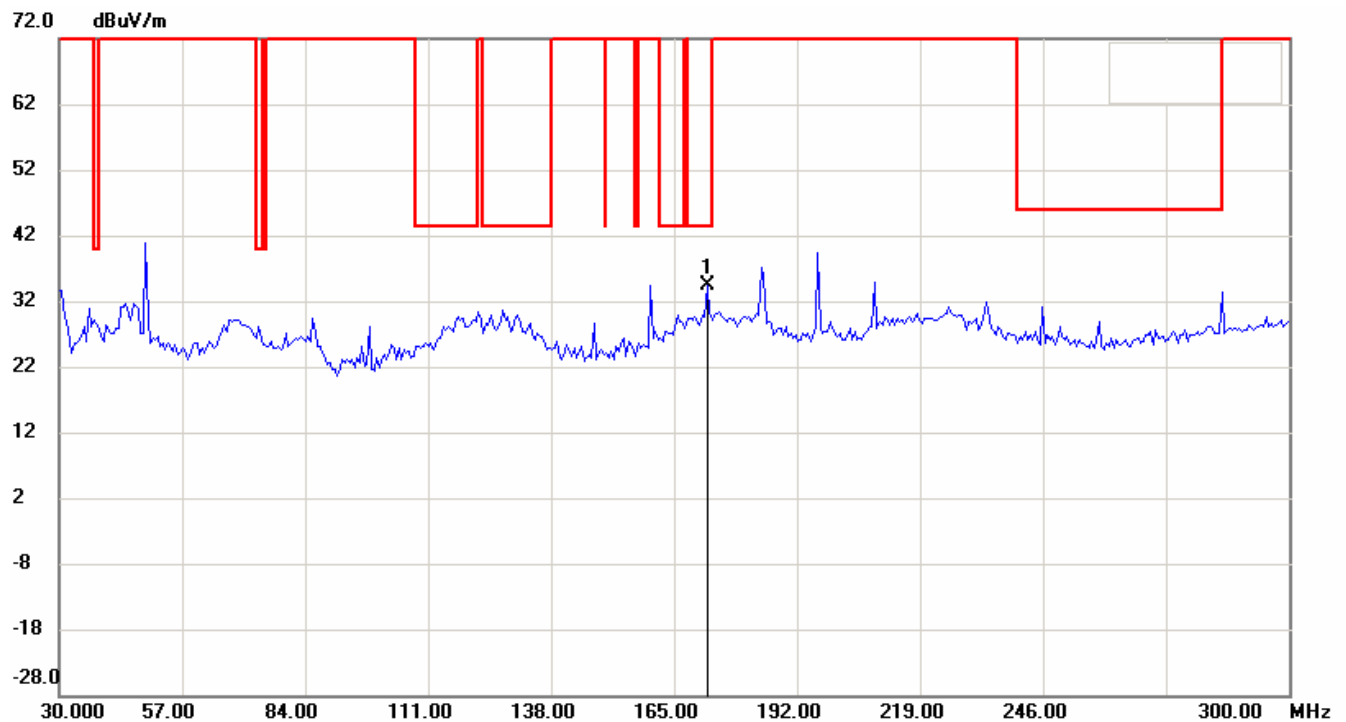
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



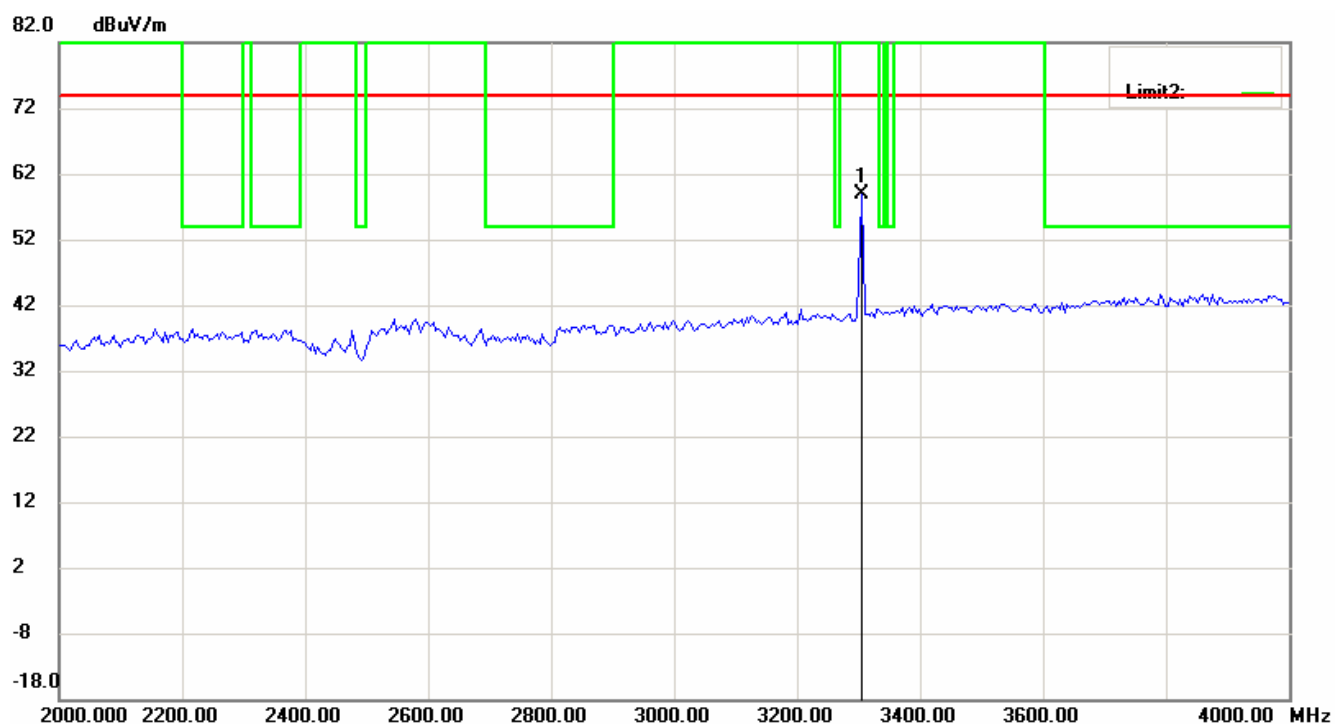
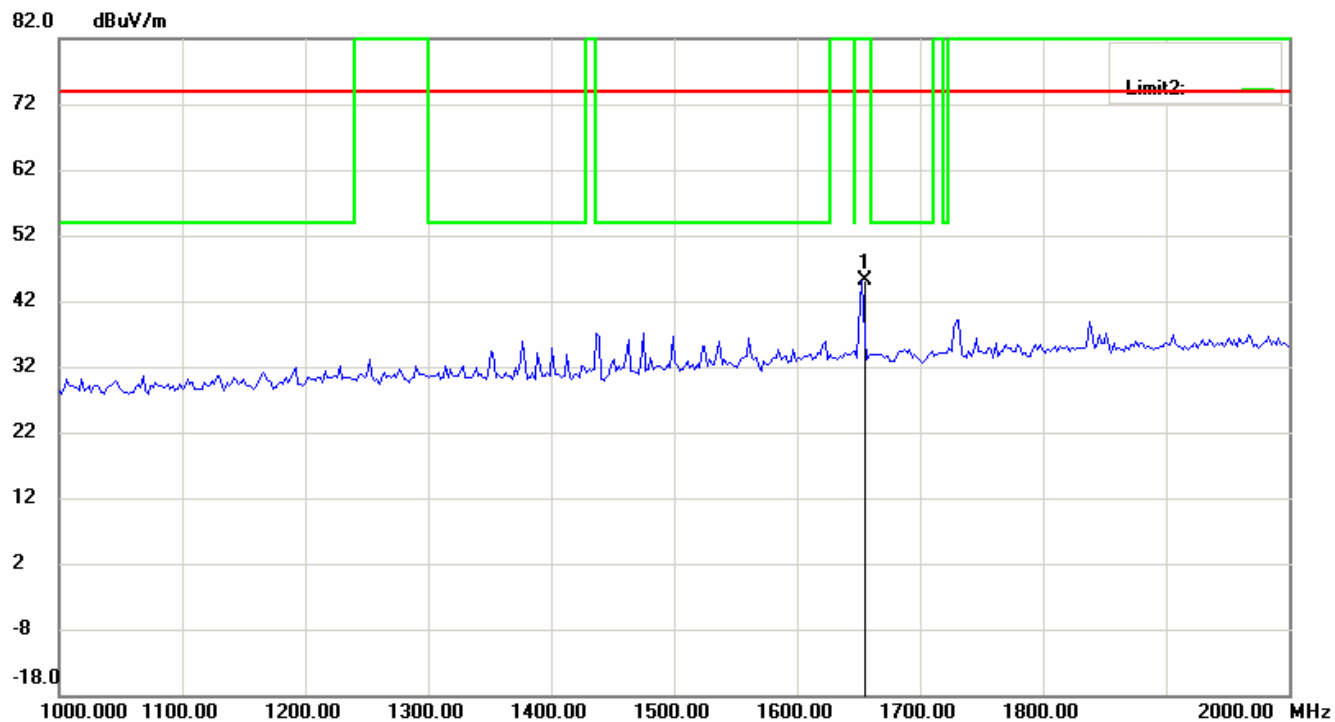
Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX

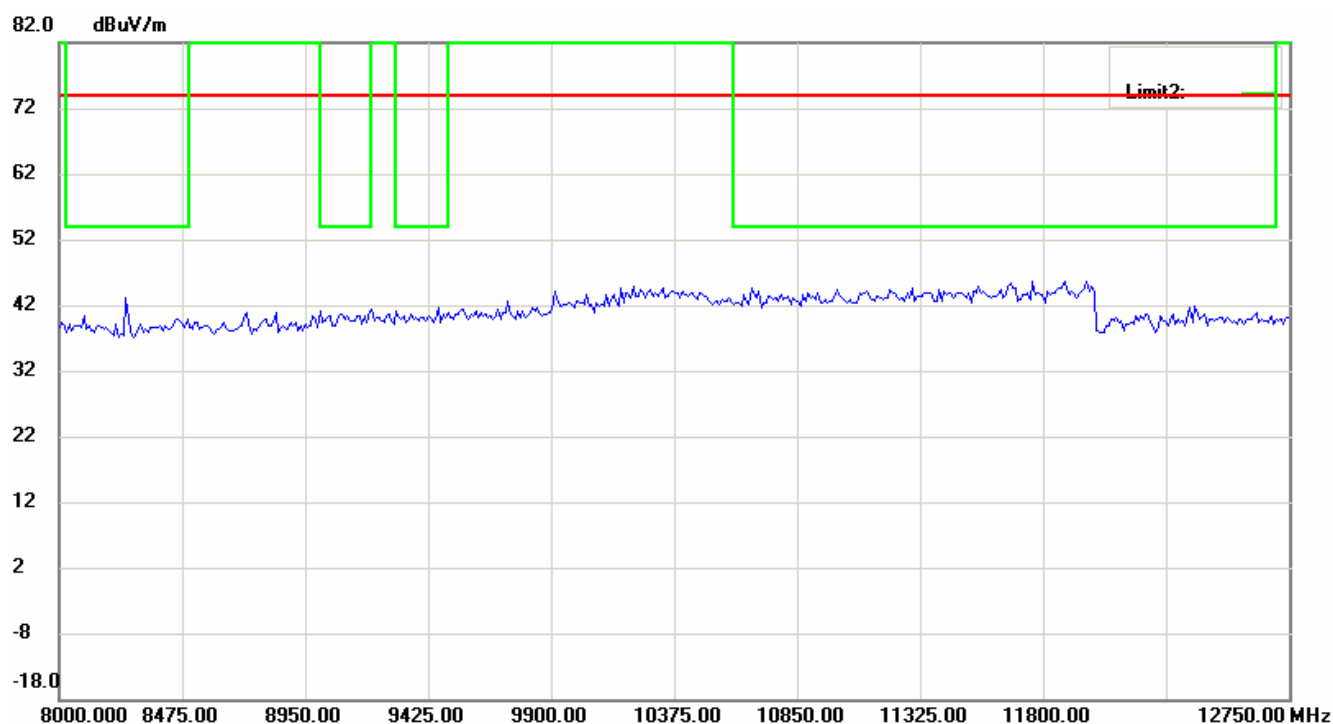
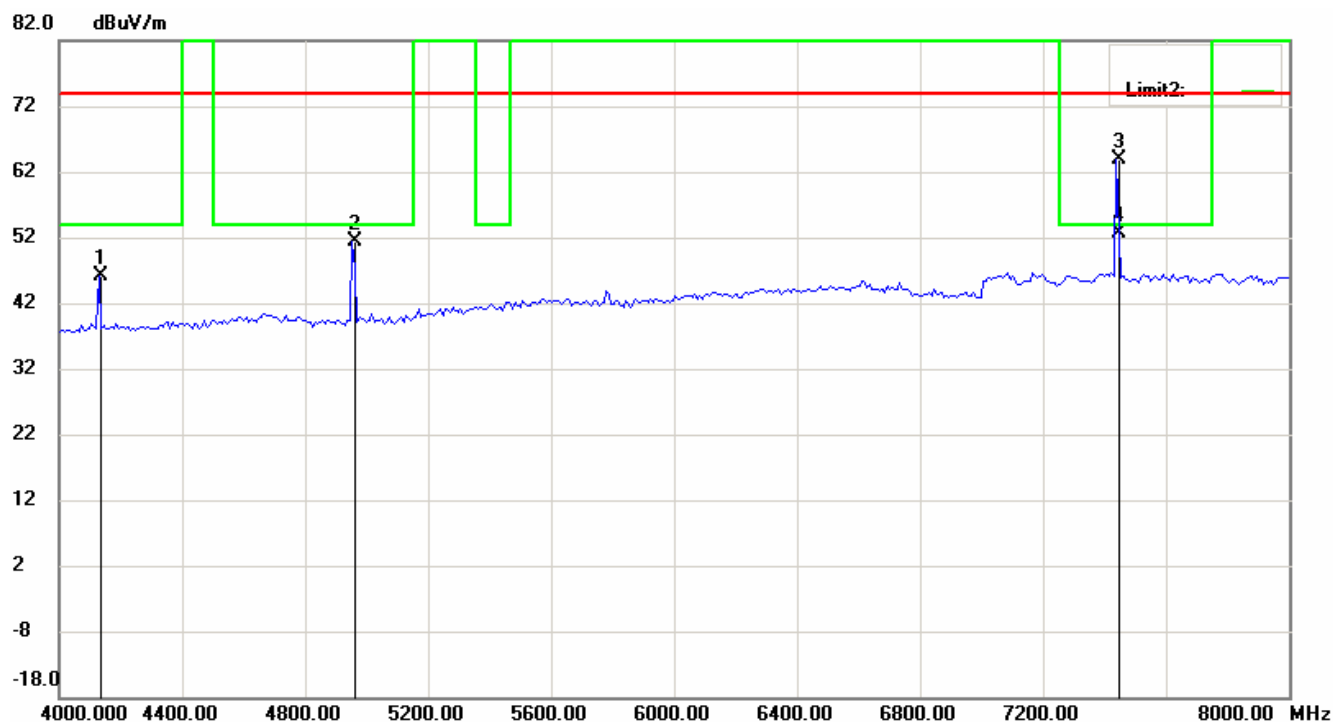
Antenna Polarization V



Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

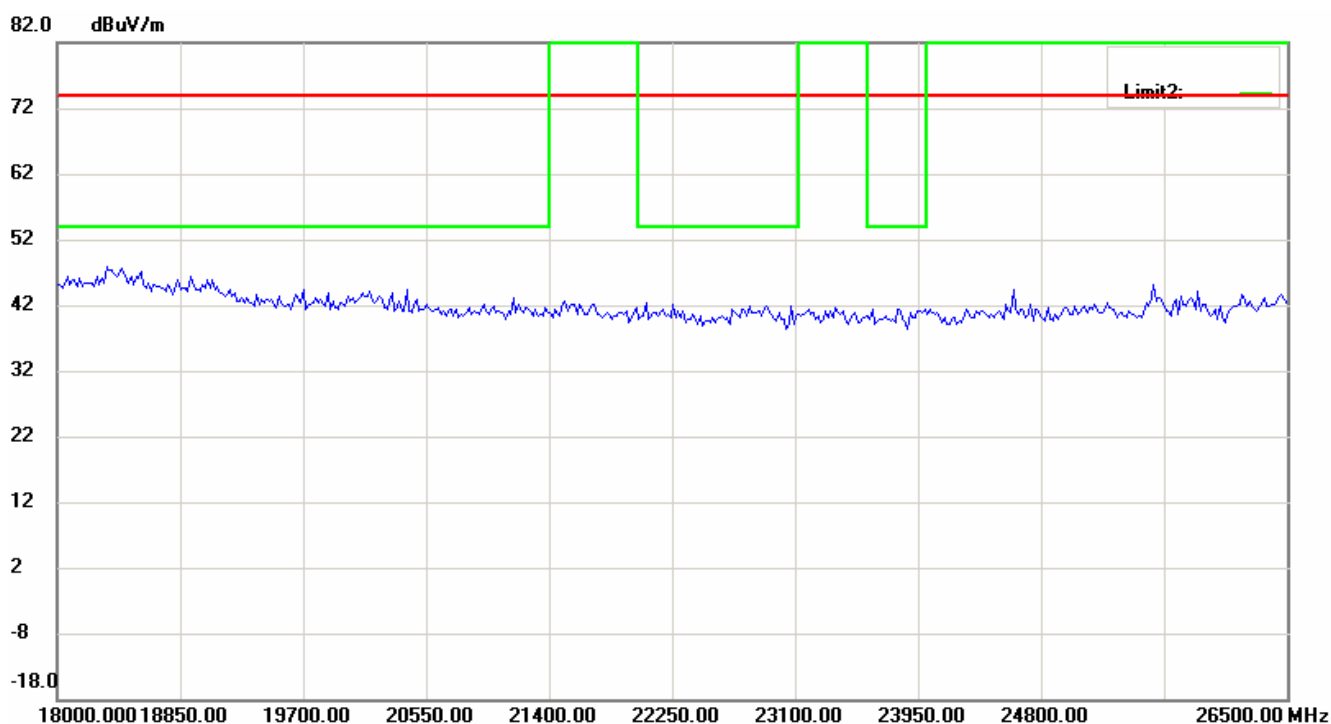
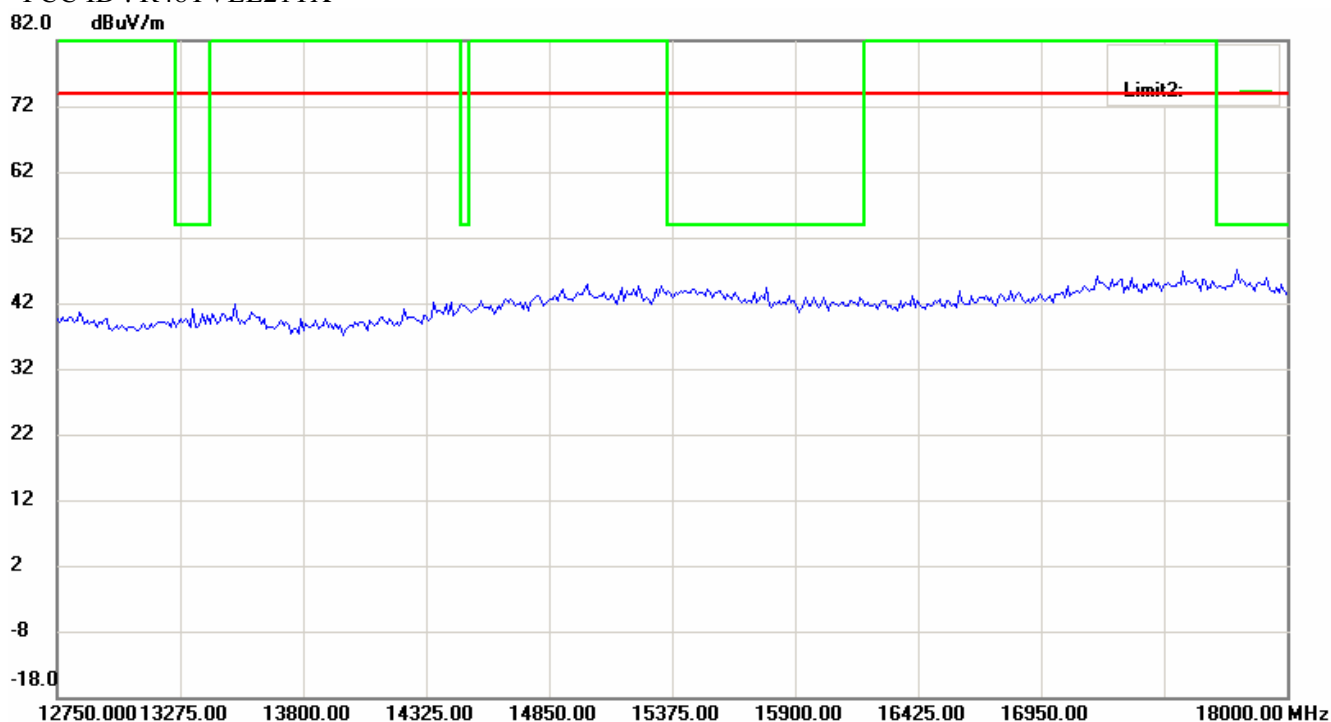


Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX



Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX

Carrier Frequency Separation



FREQUENCY SEPARATION LOW CHANNEL

Date: 10.AUG.2007 14:18:35

Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

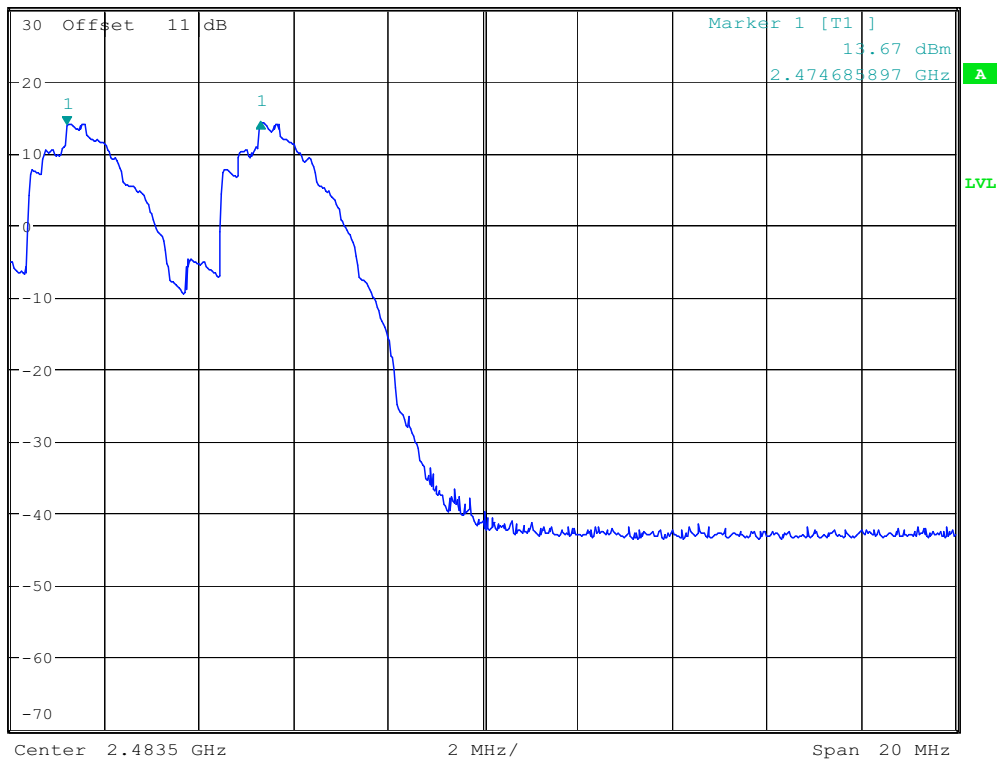


FREQUENCY SEPARATION MIDDLE CHANNEL

Date: 10.AUG.2007 14:21:07



1 PK
MAXH

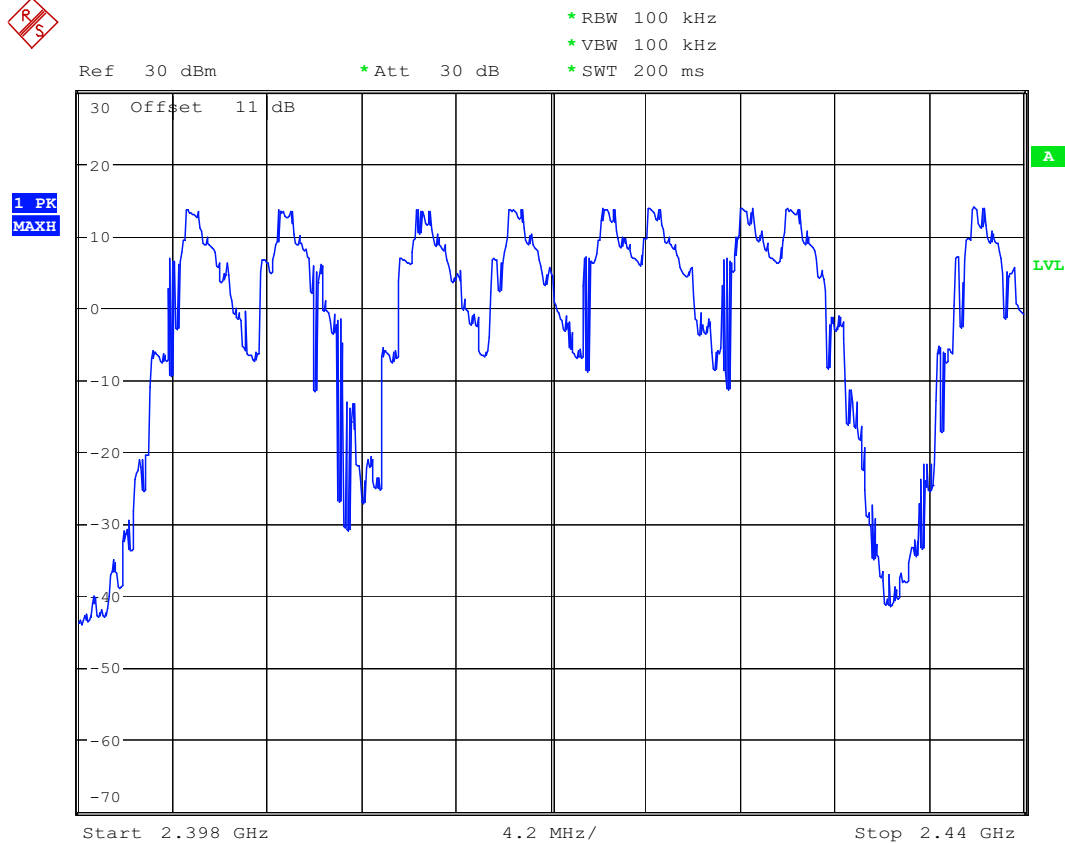


Date: 10.AUG.2007 14:51:24

Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX

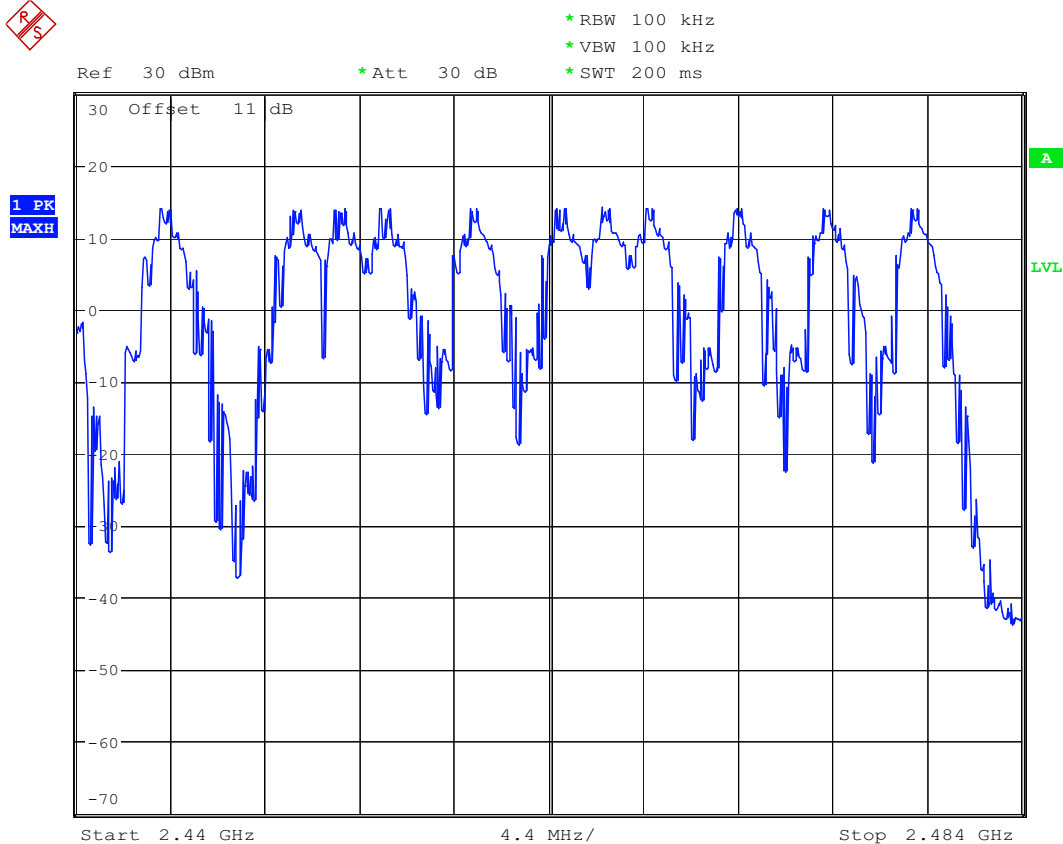
Number of Hopping Frequencies



NUMBER OF HOPPING

Date: 10.AUG.2007 14:56:10

Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



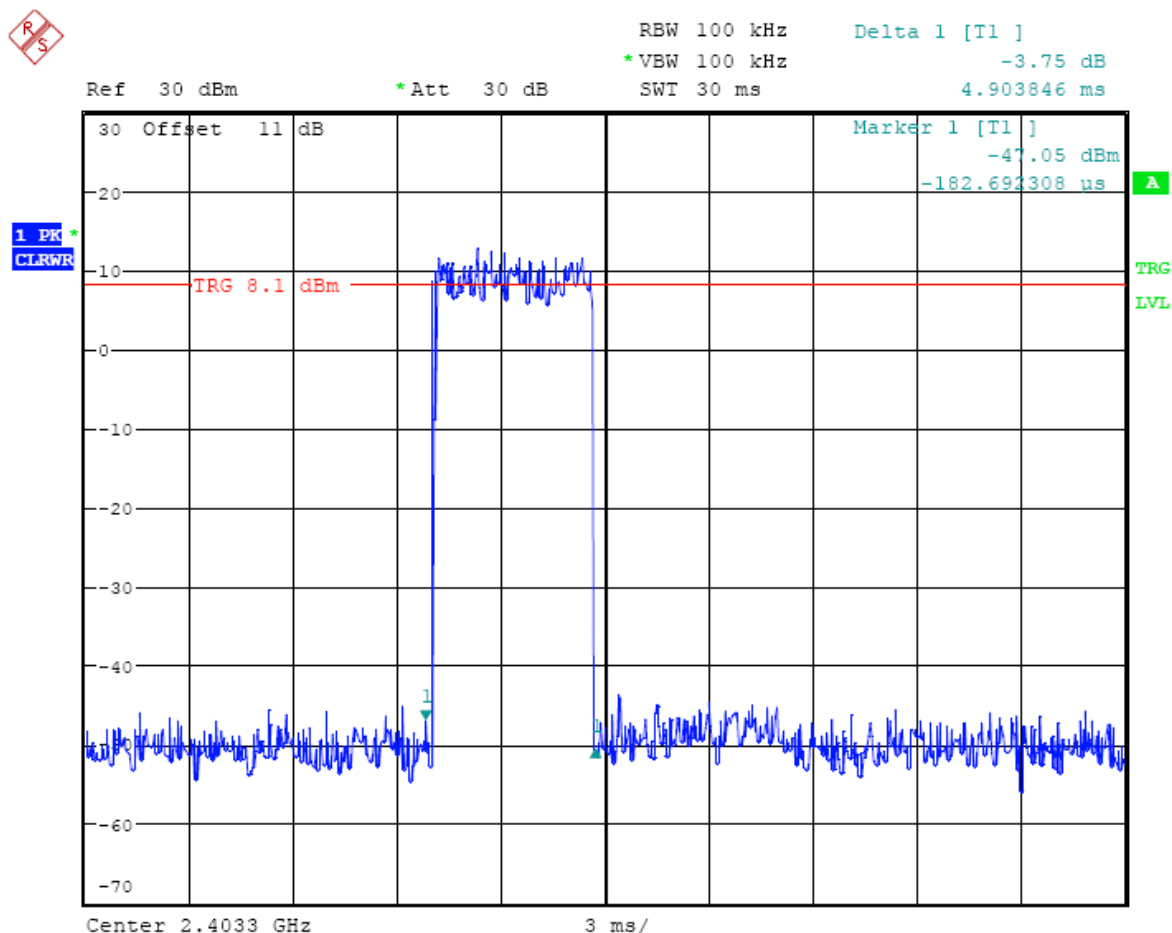
NUMBER OF HOPPING

Date: 10.AUG.2007 14:58:27

Registration number: W6M20707-8271-P-15-S

FCC ID : R48TVEE21RX

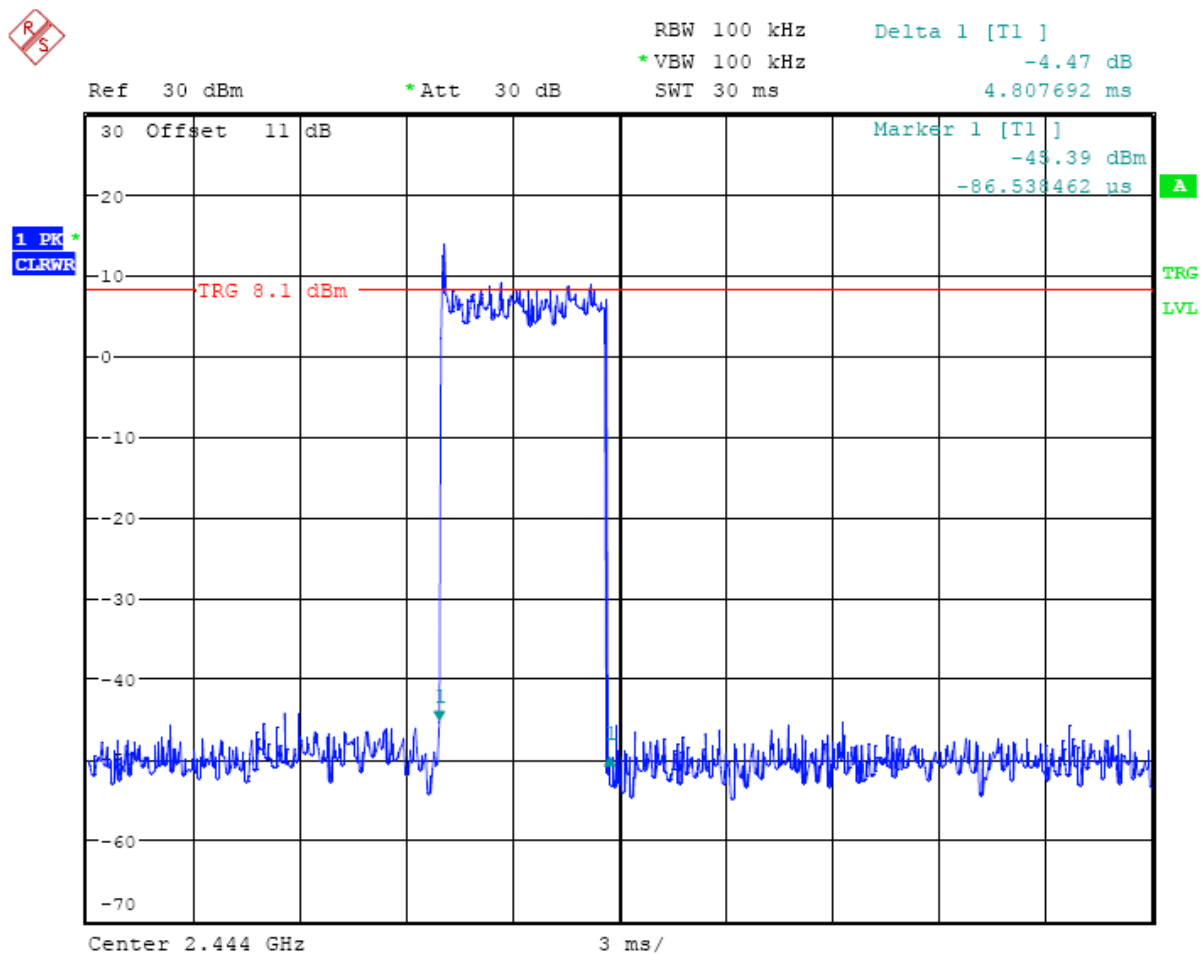
Time of Occupancy (Dwell Time)



DELL TIME LOW CHANNEL (4.903 * 80 events = 392.24 ms)

Date: 10.AUG.2007 15:01:27

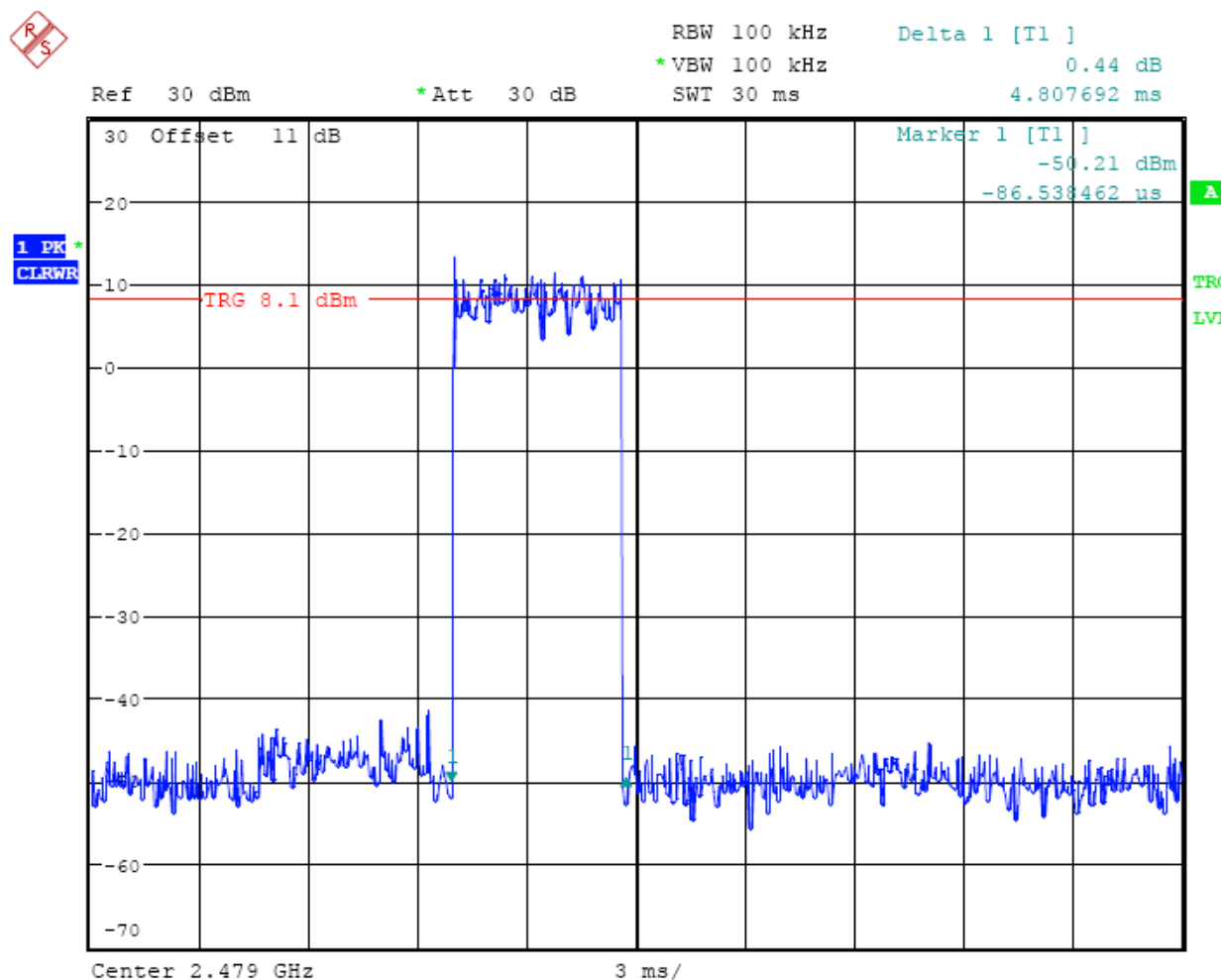
Registration number: W6M20707-8271-P-15-S
FCC ID : R48TVEE21RX



DELL TIME MIDDLE CHANNEL (4.807 * 80 events = 384.56 ms)

Date: 10.AUG.2007 15:02:05

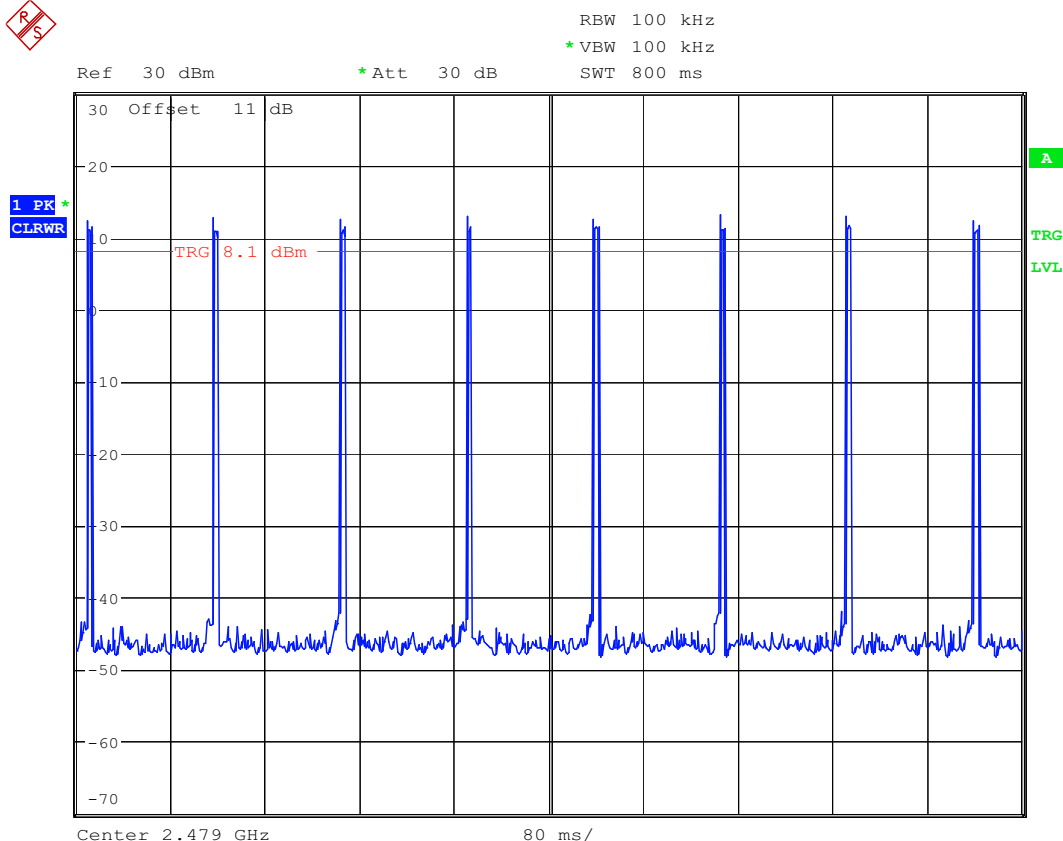
Registration number: W6M20707-8271-P-15-S
FCC ID : R48TVEE21RX



DELL TIME HIGH CHANNEL (4.807 * 80 events = 384.56 ms)

Date: 10.AUG.2007 15:02:44

Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX

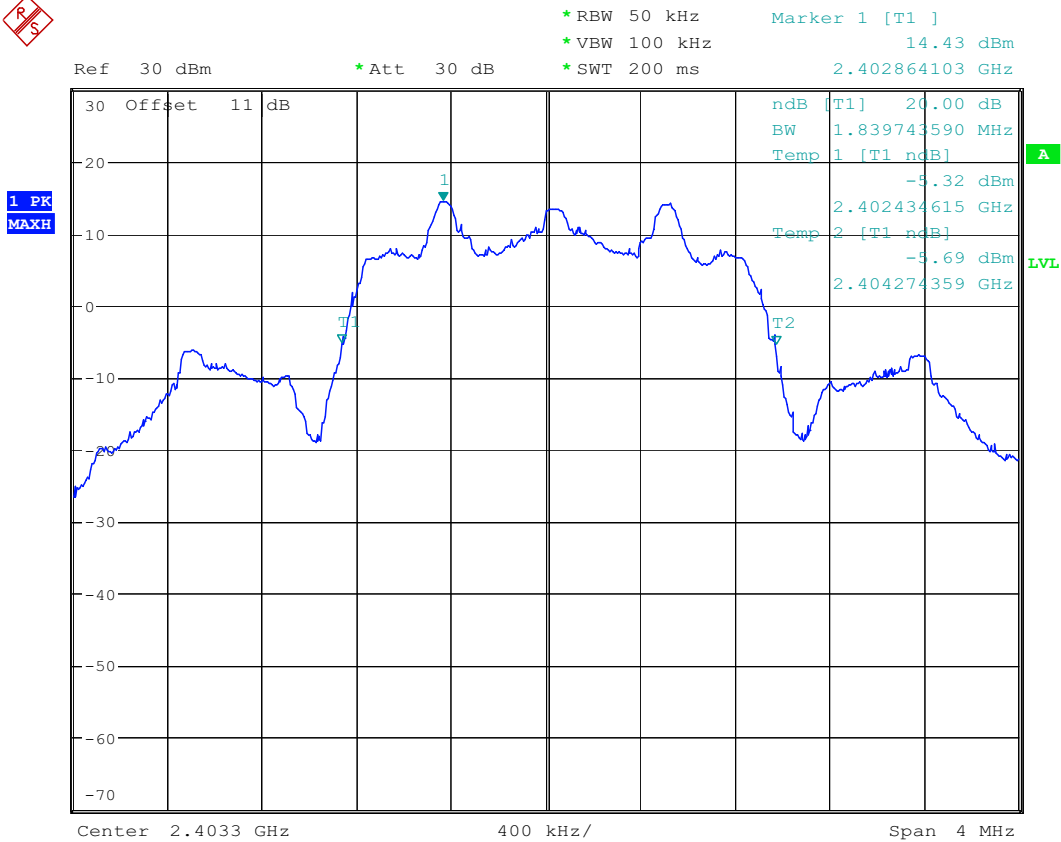


DELL TIME

Date: 10.AUG.2007 15:03:42

20dB Bandwidth

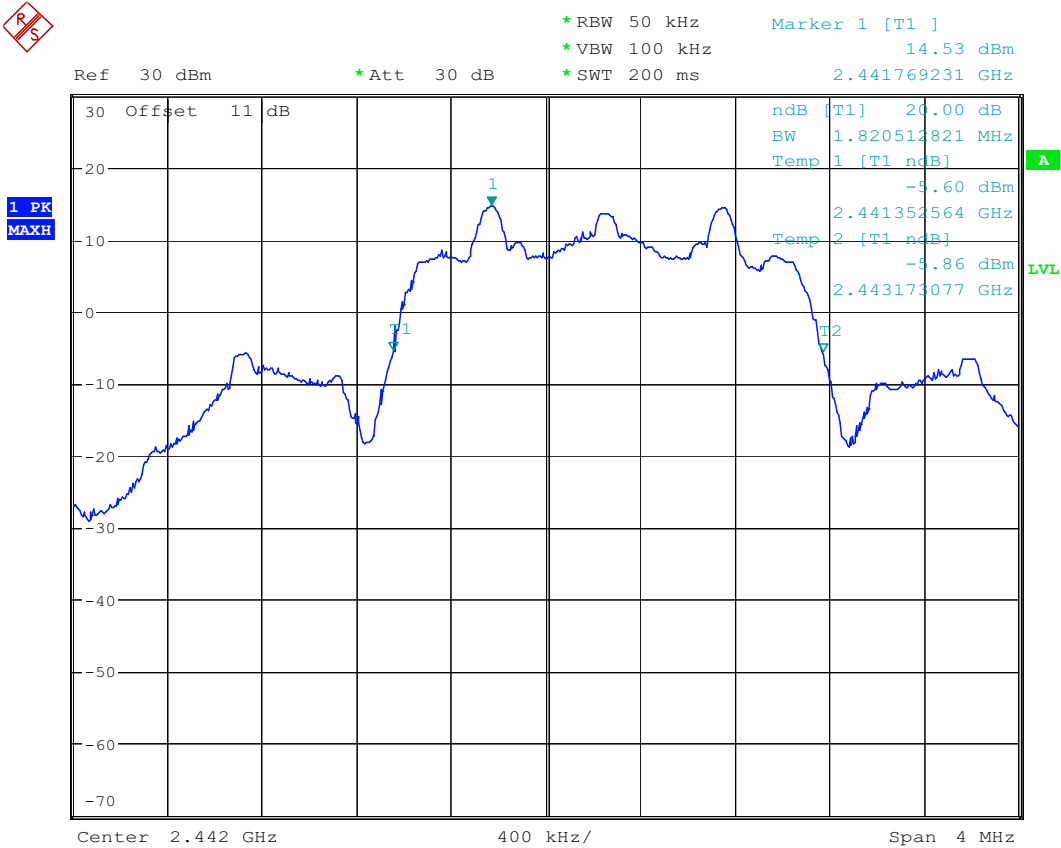
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



20DB BANDWIDTH LOW CHANNEL

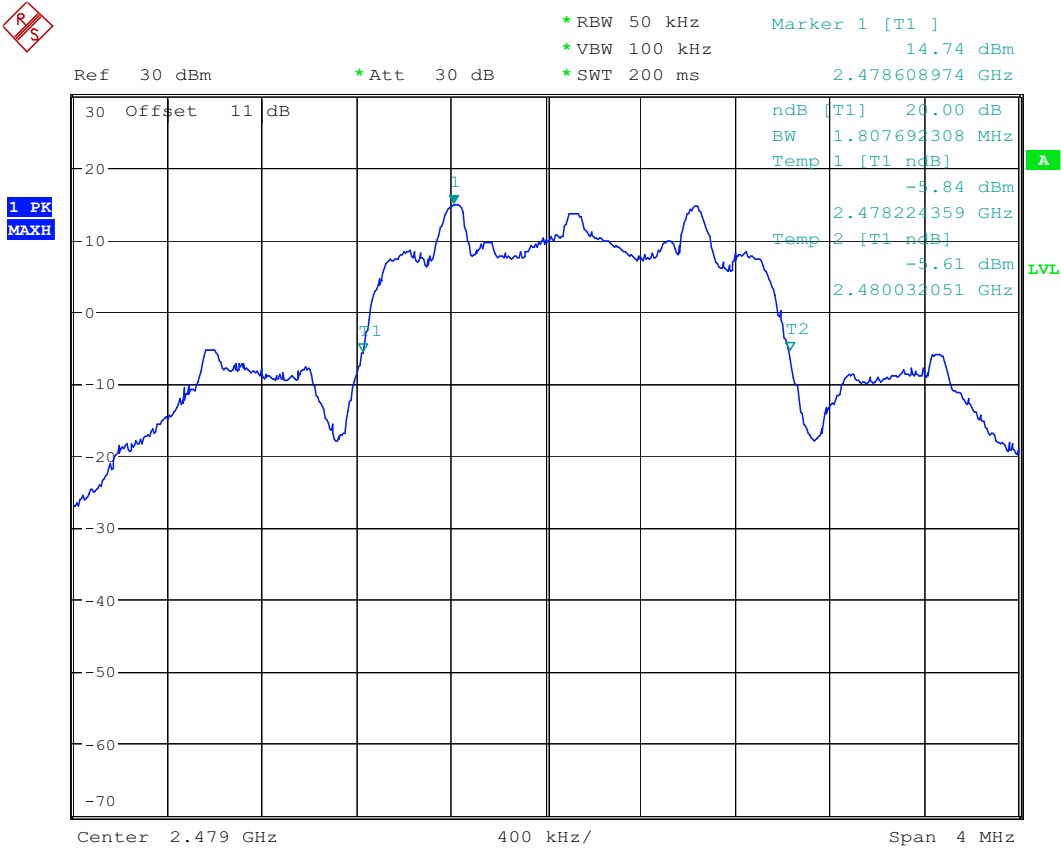
Date: 10.AUG.2007 13:47:52

Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



20dB BANDWIDTH MIDDLE CHANNEL
Date: 10.AUG.2007 13:41:21

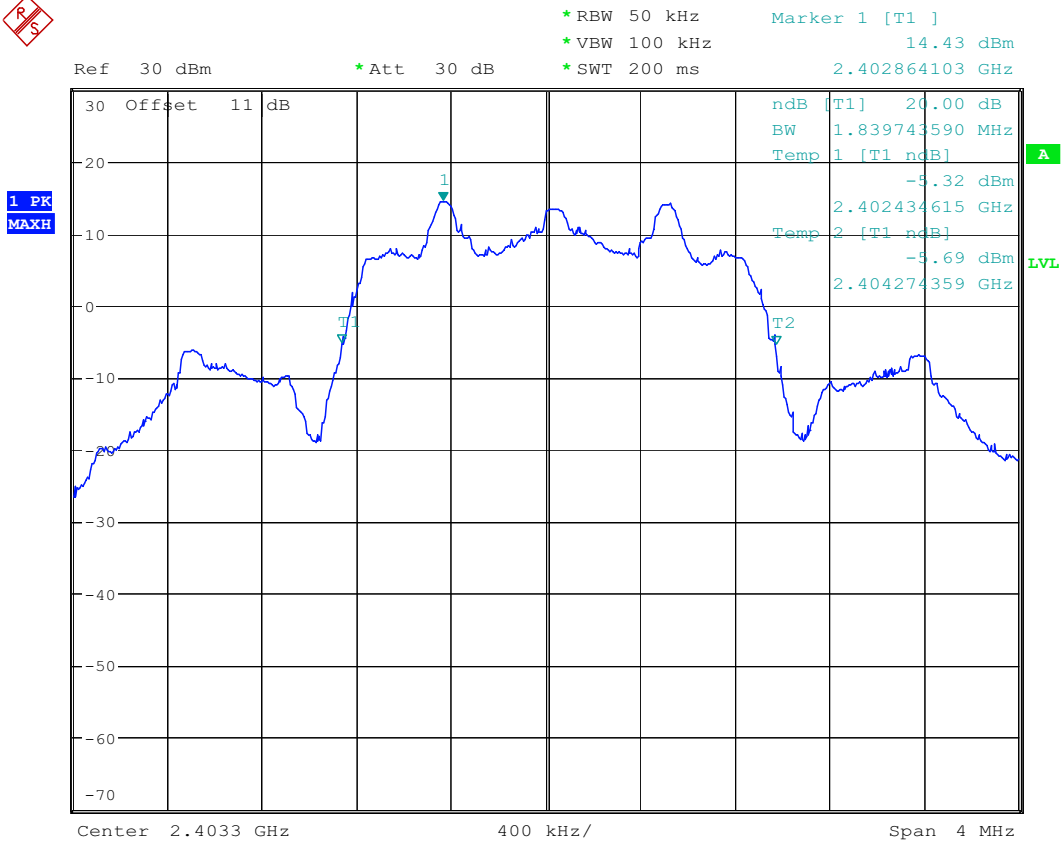
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



20DB BANDWIDTH HIGH CHANNEL

Date: 10.AUG.2007 14:08:11

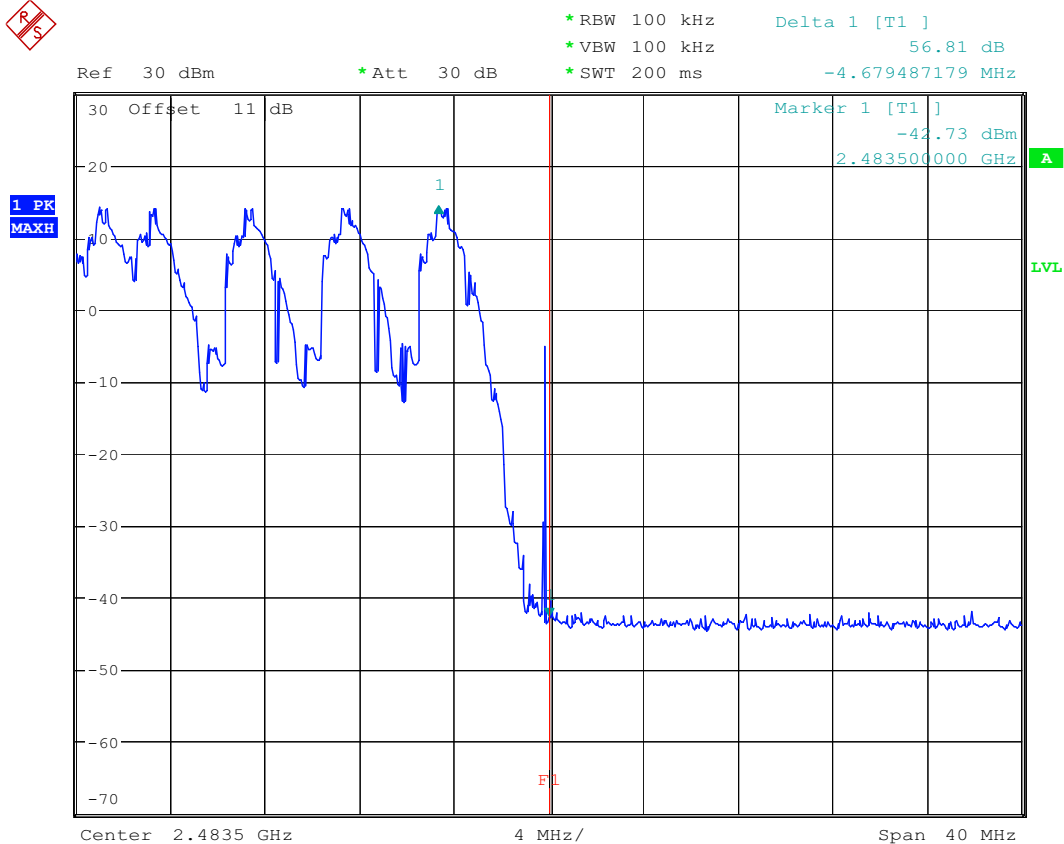
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



20DB BANDWIDTH LOW CHANNEL

Date: 10.AUG.2007 13:47:52

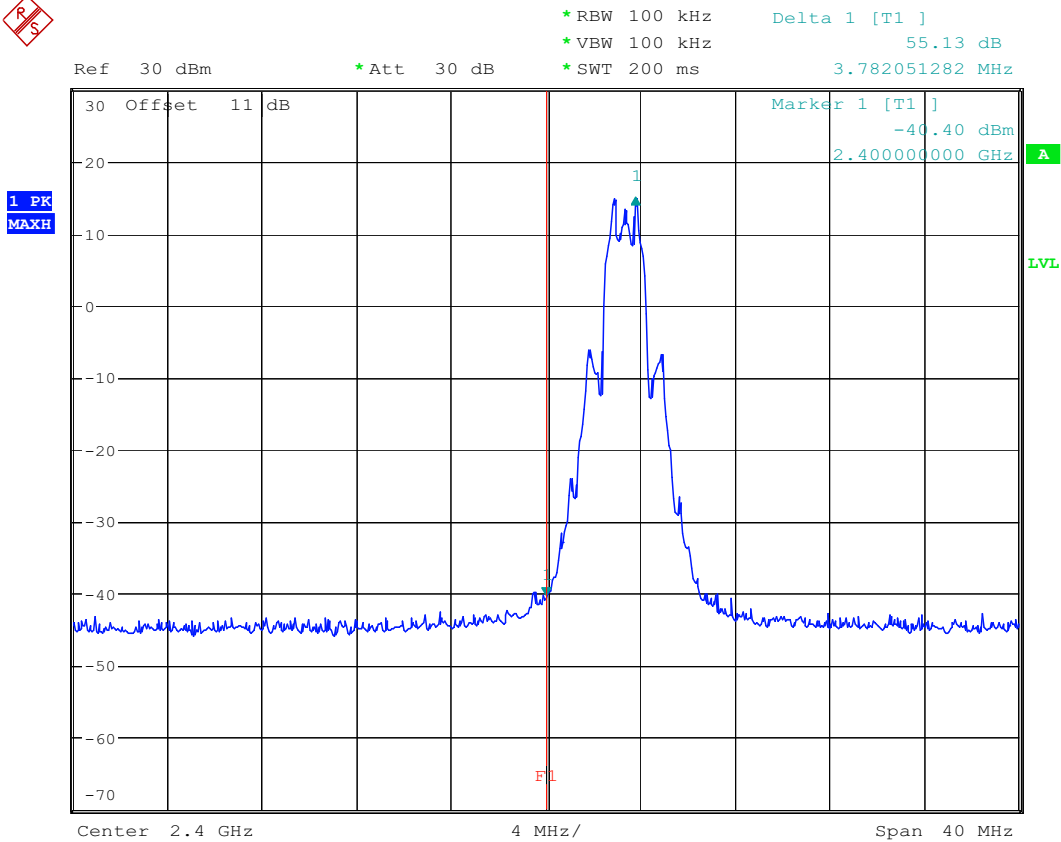
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



BANDEDGE HIGH CHANNEL HOPPING MODE

Date: 10.AUG.2007 14:13:24

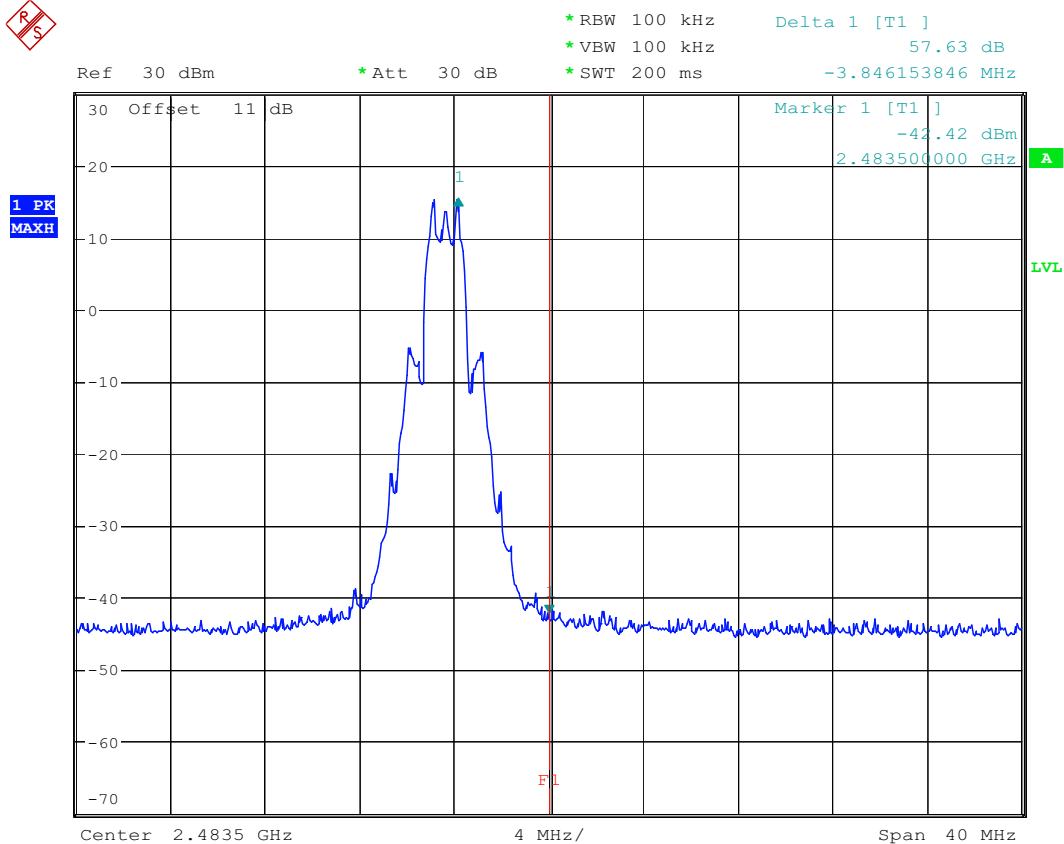
Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



BANDEDGE LOW CHANNEL

Date: 10.AUG.2007 13:48:54

Registration number: W6M20707-8271-P-15-T
FCC ID : R48TVEE21TX



BANDEDGE HIGH CHANNEL

Date: 10.AUG.2007 14:06:53

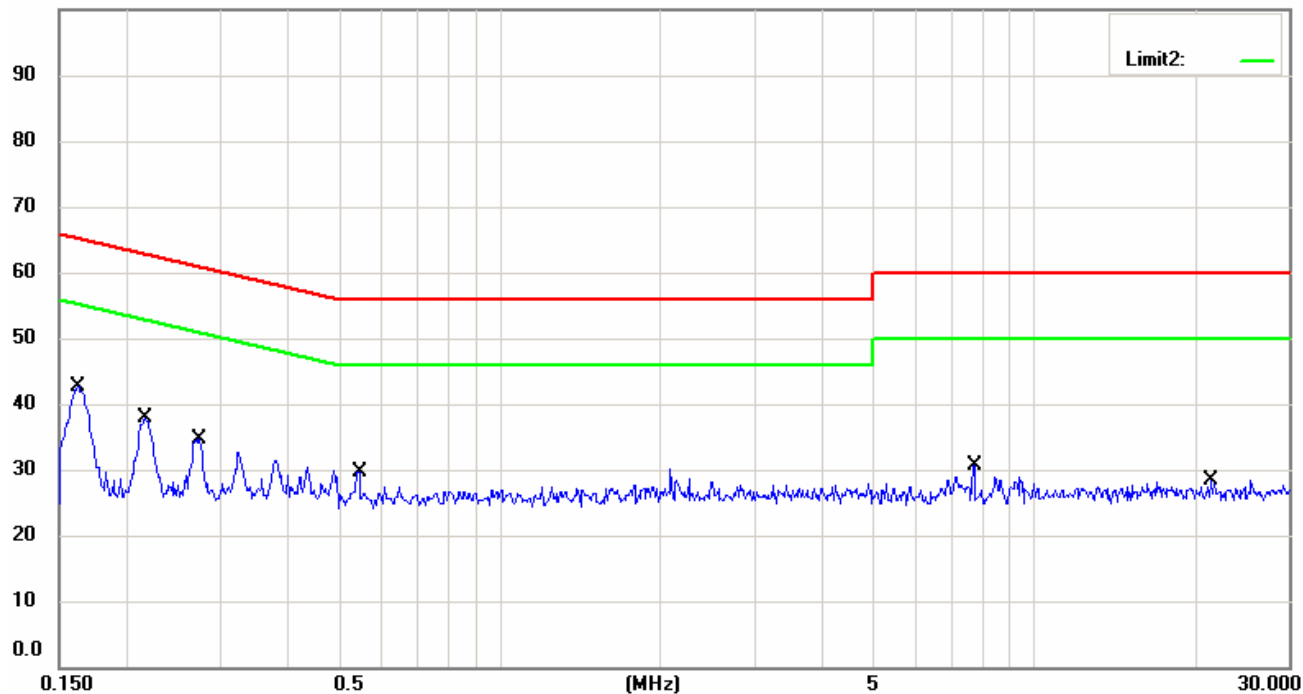
Registration number: W6M20707-8271-P-15-T

FCC ID : R48TVEE21TX

Power Line Conducted Emission

LISN N

100.0 dBuV



LISN L1

100.0 dBuV

