

FCC PART 15 SUBPART C TEST REPORT

for

Bluetooth Adaptor

Model No.: BU-2086

FCC ID: QQGBU2086

of

Applicant: J-THREE INTERNATIONAL HOLDING CO., LTD.

**Address: No. 23-7, Dungshyh 12 Lirn, Dungshyh Lii Pingchien City
Taoyuan Hsien, 324 Taiwan**

Tested and Prepared

by

Taiwan ETS Product Service Co., Ltd.

FCC Registration No.: 930600

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

A2LA Accredited No.: 1983.02

PTCRB Accredited Type Certification Test House

Report No.: W6M20712-8780-P-15

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.
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1 General Information

1.1 Notes

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

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

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

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

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

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

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Tester:

February 4, 2008

Jay Chaing

Date

ETS-Lab.

Name

Signature

Technical responsibility for area of testing:

February 4, 2008

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
Taiwan ETS Product Service 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: 1983.02

FCC filed test laboratory Reg. No. 930600

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

PCTRB Accredited Type Certification Test House

1.3 Details of approval holder

Name:	J-THREE INTERNATIONAL HOLDING CO., LTD.
Street:	No. 23-7, Dungshyh 12 Lirn, Dungshyh Lii Pingchien City
Town:	Taoyuan Hsien, 324
Country:	Taiwan
Telephone:	+886-2-8227-5069
Fax:	+886-2-3234-4064



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1.4 Application details

Date of receipt of test item: January 18, 2008
Date of test: from January 19, 2008 to February 1, 2008

1.5 General information of Test item

Type of test item: Bluetooth Adaptor
Model Number: BU-2086
Multi-listing model number: ./.
Photos: see Annex

Technical data

Frequency band: 2402 - 2480 MHz
Frequency (ch A): 2.402 GHz
Frequency (ch B): 2.441 GHz
Frequency (ch C): 2.480 GHz

Transmitter

Unom

Normal Mode

Power (ch A or ch 0): Conducted: -0.61 dBm
Power (ch B or ch 39): Conducted: -1.35 dBm
Power (ch C or ch 78): Conducted: -1.49 dBm

EDR Mode

Power (ch A or ch 0): Conducted: 0.61 dBm
Power (ch B or ch 39): Conducted: -0.42 dBm
Power (ch C or ch 78): Conducted: -0.32 dBm

Power supply: 5 Vdc from PC

Operation modes: duplex

Modulation Type: FHSS

Antenna Type: MONOPOLE Antenna

Antenna gain: 0 dBi

Host device: none



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Classification:

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

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 (2007-10)



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2 Technical test

2.1 Summary of test results

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



or

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



2.2 Test environment

Temperature:	23 °C
Relative humidity content:	20 ... 75 %
Air pressure:	86 ... 103 kPa
Details of power supply	5 Vdc from PC
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	2007/10/15	2008/10/14
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	2007/10/15	2008/10/14
ETSTW-CE 005	Line-Impedance Stabilisation Network	NNBM 8126D	137	Schwarzbeck	2007/10/15	2008/10/14
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	2007/5/11	2008/5/10
ETSTW-CE 008	ABSORBING CLAMP	MDS 21	3469	Schwarzbeck	2007/10/23	2009/10/22
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	2007/11/2	2009/11/1
ETSTW-CE 014	CISPR 22 TWO BALANCED TELECOM PAIRS IMPEDANCE STABILIZATION NETWORK	FCC-TLISN-T2-02	20241	FCC	2005/12/7	2008/12/6
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	2007/10/29	2008/10/28
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	2007/12/3	2008/12/2
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2007/10/29	2008/10/28
ETSTW-RE 005	EMI TEST RECEIVER	ESVS10	843207/020	R&S	2007/10/11	2008/10/12
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	2007/11/7	2010/11/6
ETSTW-RE 020	MICROWAVE HORN ANTENNA	AT4002A	306915	AR	Function Test	
ETSTW-RE 021	SWEEP GENERATOR	SWM05	835130/010	R&S	2007/10/9	2008/10/8
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	EMCO	2007/6/29	2008/6/28
ETSTW-RE 028	Log-Periodic DipoleArray 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	2007/10/9	2008/10/8



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ETSTW-RE 033	WaveRunner 6000A Serie Oscilloscope	WAVERUNNER 6100A	LCRY0604P14508	LeCroy	2007/7/9	2008/7/8
ETSTW-RE 034	Power Sensor	URV5-Z4	839313/006	R&S	2007/10/16	2009/10/15
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
ETSTW-RE 044	Log-Periodic Antenna	HL050	100094	R&S	2006/5/29	2008/5/28
ETSTW-RE 047	ESA-E SERIES SPECTRUM ANALYZER	E4445A	MY46181369	Agilent	2007/7/19	2008/7/18
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 EUT 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 Taiwan ETS Product Service 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	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).

Normal mode

Test conditions		Conducted Power		
		Channel A [dBm]	Channel B [dBm]	Channel C [dBm]
$T_{nom}=23^{\circ}\text{C}$	$V_{nom}=5\text{ V}$	-0.61	-1.35	-1.49

EDR mode

Test conditions		Conducted Power		
		Channel A [dBm]	Channel B [dBm]	Channel C [dBm]
$T_{nom}=23^{\circ}\text{C}$	$V_{nom}=5\text{ V}$	0.61	-0.42	-0.32

Test conditions		Radiated Power		
		Channel A [dBm]	Channel B [dBm]	Channel C [dBm]
$T_{nom}=23^{\circ}\text{C}$	$V_{nom}=5\text{ V}$	--	--	--

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

The diagrams for the field strength measurements are included in Appendix.



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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

Explanation: See attached diagrams in appendix.



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3.2 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.

3.3 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 = $20 \log (\text{dwell time}/100\text{ms})$

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

Explanation: See attached diagrams in appendix.



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3.4 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 continues 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.

54.0dB μ V/m

For frequencies above 1GHz (Peak measurements).

Limit + 20dB

54.0dB μ V/m + 20 dB= 74 dB μ V/m

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

Explanation: See attached diagrams in appendix.



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3.5 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: BU-2086 Date: 2008/1/23
Mode: TX CH0 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)
74.369	18.57	peak	11.15	29.72	40.00	-10.28	260	150
675.952	16.90	peak	22.97	39.87	74.00	-34.13	130	150

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave.			
1841.667	52.68	---	-8.33	44.35	---	74.00	54.00	-29.65	175	150
2370.000	48.67	---	-5.25	43.42	---	74.00	54.00	-30.58	290	150
4806.667	50.85	---	-1.30	49.55	---	74.00	54.00	-24.45	115	150
7206.667	43.41	---	1.89	45.30	---	74.00	54.00	-28.70	230	150



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Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
74.369	25.18	peak	11.15	36.33	40.00	-3.67	130	150
500.601	17.74	peak	19.82	37.56	74.00	-36.44	190	150

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave.			
1841.667	51.78	---	-8.33	43.45	---	74.00	54.00	-30.55	165	150
2656.667	48.83	---	-4.23	44.60	---	74.00	54.00	-29.40	315	150
4806.667	49.15	---	-1.30	47.85	---	74.00	54.00	-26.15	190	150
7206.667	47.21	---	1.89	49.10	---	74.00	54.00	-24.90	330	150

Mode: TX CH39

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
168.517	17.86	peak	15.04	32.90	43.50	-10.60	160	150
671.744	14.41	peak	22.93	37.34	74.00	-36.66	190	150

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave.			
1841.667	52.53	---	-8.33	44.20	---	74.00	54.00	-29.80	150	150
2536.667	46.97	---	-4.84	42.13	---	74.00	54.00	-31.87	140	150
4880.000	50.33	---	-1.30	49.03	---	74.00	54.00	-24.97	240	150
7320.000	43.70	---	1.84	45.54	---	74.00	54.00	-28.46	235	150

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
74.369	25.32	peak	11.15	36.47	40.00	-3.53	130	150
660.521	10.35	peak	22.85	33.20	74.00	-40.80	210	150



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Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave.			
1841.667	51.44	---	-8.33	43.11	---	74.00	54.00	-30.89	235	150
2666.667	48.15	---	-4.20	43.95	---	74.00	54.00	-30.05	190	150
4880.000	47.82	---	-1.30	46.52	---	74.00	54.00	-27.48	230	150
7320.000	44.93	---	1.84	46.77	---	74.00	54.00	-27.23	200	150

Mode: TX CH78

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
166.353	19.94	peak	15.15	35.09	43.50	-8.41	110	150
664.730	13.89	peak	22.88	36.77	74.00	-37.23	195	150

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave.			
1841.667	50.49	---	-8.33	42.16	---	74.00	54.00	-31.84	140	150
2513.333	50.31	---	-5.01	45.30	---	74.00	54.00	-28.70	350	150
4960.000	51.67	---	-1.06	50.61	---	74.00	54.00	-23.39	155	150
7440.000	44.63	---	1.80	46.43	---	74.00	54.00	-27.57	190	150

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
74.369	24.85	peak	11.15	36.00	40.00	-4.00	265	150
962.124	8.34	peak	27.24	35.58	54.00	-18.42	235	150

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave.			
1841.667	52.26	---	-8.33	43.93	---	74.00	54.00	-30.07	335	150
2663.333	47.99	---	-4.21	43.78	---	74.00	54.00	-30.22	185	150
4960.000	47.15	---	-1.06	46.09	---	74.00	54.00	-27.91	130	150
7440.000	48.17	---	1.80	49.97	---	74.00	54.00	-24.03	195	150



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- 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.**
 5. **See attached diagrams in appendix.**

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.

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



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3.6 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 0	Channel 0+1
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5\text{V}$	1000.000000 kHz	

Test conditions		Channel Separation	
		Channel 39	Channel 39+1
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5\text{V}$	1000.000000 kHz	

Test conditions		Channel Separation	
		Channel 78	Channel 78+1
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5\text{V}$	1000.000000 kHz	

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

Explanation: See attached diagrams in appendix.



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3.7 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
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5\text{ V}$	normal transmitting	79

Limits:

Frequency Range MHz	Limit	
	20dB Bandwidth	Number of Channels
902-928 MHz	Bandwidth < 250 kHz	≥ 50
	Bandwidth ≥ 250 kHz	≥ 25
2400-2483.5	not defined	15
5725-5850.0 MHz	1 MHz	75

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

Explanation: See attached diagrams in appendix.

3.7.1 Pseudorandom Frequency Hopping Sequence

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

3.7.2 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.

3.7.3 System Receiver Hopping Capability

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



3.8 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 period	Time of Occupancy
$T_{nom} = 23^{\circ}\text{C}$ $V_{nom} = 5\text{ V}$ Channel 0	normal transmitting-DH 1	31.6 s	129.23 ms
	normal transmitting-DH 3	31.6 s	266.67 ms
	normal transmitting-DH 5	31.6 s	321.54 ms

Test conditions	Operating mode	Measurement period	Time of Occupancy
$T_{nom} = 23^{\circ}\text{C}$ $V_{nom} = 5\text{ V}$ Channel 39	normal transmitting-DH 1	31.6 s	129.23 ms
	normal transmitting-DH 3	31.6 s	267.70 ms
	normal transmitting-DH 5	31.6 s	320.84 ms

Test conditions	Operating mode	Measurement period	Time of Occupancy
$T_{nom} = 23^{\circ}\text{C}$ $V_{nom} = 5\text{ V}$ Channel 78	normal transmitting-DH 1	31.6 s	129.23 ms
	normal transmitting-DH 3	31.6 s	266.67 ms
	normal transmitting-DH 5	31.6 s	321.54 ms



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Limits and measurement periods:

Frequency MHz	Number of channels	Measurement Period	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

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



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3.9 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.

Normal mode

Test conditions		20 dB Bandwidth		
		Channel A	Channel B	Channel C
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5\text{ V}$	961.538461538 kHz	961.538461538 kHz	955.128205128 kHz

EDR mode

Test conditions		20 dB Bandwidth		
		Channel A	Channel B	Channel C
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5\text{ V}$	1.346153846 MHz	1.352564103 MHz	1.365384615 MHz

Limits:

Frequency Range / MHz	Limit
902-928	$\leq 500\text{ kHz}$
2400-2483.5	not defined
5725-5850	$\leq 1\text{ MHz}$

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

Explanation: See attached diagrams in appendix.

3.9.1 System Receiver Input Bandwidth

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



3.10 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.

Normal mode

Test conditions		Attenuation at or outside band-edges Single Frequency	
		Lower Band-edge	Upper Band-edge
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5 \text{ V}$	41.99 dB	44.06 dB

Test conditions		Attenuation at or outside band-edges Hopping Frequency	
		Lower Band-edge	Upper Band-edge
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5 \text{ V}$	30.66 dB	44.22 dB

EDR mode

Test conditions		Attenuation at or outside band-edges Single Frequency	
		Lower Band-edge	Upper Band-edge
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5 \text{ V}$	30.48 dB	38.62 dB

Test conditions		Attenuation at or outside band-edges Hopping Frequency	
		Lower Band-edge	Upper Band-edge
$T_{nom} = 23^{\circ}\text{C}$	$V_{nom} = 5 \text{ V}$	30.25 dB	38.62 dB



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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 017 ETSTW-RE 028
ETSTW-RE 030 ETSTW-RE 043 ETSTW-RE 044

Explanation: See attached diagrams in appendix.



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3.11 Radiated Emissions from Digital Part

FCC Rule: 15.109

According to FCC part 15.109 (g), digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement".

Summary table with radiated data of the test plots

Model: BU-2086 Date: 2008/1/23
Mode: Temperature: 26 °C Engineer: Brian
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)
69.499	11.50	peak	12.24	23.74	30.00	-6.26	120	330
156.072	7.93	peak	15.43	23.36	30.00	-6.64	310	370
199.900	13.62	peak	12.15	25.77	30.00	-4.23	180	355
499.198	10.54	peak	19.80	30.34	37.00	-6.66	160	130
671.744	4.80	peak	22.93	27.73	37.00	-9.27	220	150
900.401	3.04	peak	26.23	29.27	37.00	-7.73	190	120

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
68.958	14.27	peak	12.38	26.65	30.00	-3.35	250	160
81.403	17.00	peak	9.94	26.94	30.00	-3.06	90	110
193.407	13.20	peak	12.55	25.75	30.00	-4.25	330	180
500.601	10.32	peak	19.82	30.14	37.00	-6.86	130	330
761.523	3.82	peak	24.72	28.54	37.00	-8.46	180	310
820.441	2.73	peak	25.46	28.19	37.00	-8.81	140	350

- 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.**
 - 5. See attached diagrams in appendix.**



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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



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3.12 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: BU-2086 Date: 2008/2/1
Mode: Temperature: 26 °C Engineer: Brian
Polarization: N Humidity: 60 %

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
0.1508	40.81	27.95	10.10	50.91	38.05	65.96	55.96	-15.05
0.2122	32.58	25.16	10.10	42.68	35.26	63.12	53.12	-17.86
0.5000	37.09	31.53	10.10	47.19	41.63	56.00	46.00	-4.37
0.5700	37.35	31.98	10.10	47.45	42.08	56.00	46.00	-3.92
2.8450	31.89	18.29	10.10	41.99	28.39	56.00	46.00	-14.01
22.5556	40.85	33.13	10.10	50.95	43.23	60.00	50.00	-6.77

Polarization: L1

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
0.1516	36.42	24.90	10.10	46.52	35.00	65.91	55.91	-19.39
0.2126	35.86	27.37	10.10	45.96	37.47	63.10	53.10	-15.63
0.5000	40.52	33.29	10.10	50.62	43.39	56.00	46.00	-2.61
0.6400	39.14	32.84	10.10	49.24	42.94	56.00	46.00	-3.06
1.5700	35.93	28.83	10.10	46.03	38.93	56.00	46.00	-7.07
22.6944	41.11	32.52	10.10	51.21	42.62	60.00	50.00	-7.38



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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

- Note:** 1.The formula of measured value as: $\text{Test Result} = \text{Reading} + \text{Correction Factor}$
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 Appendix.

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



Appendix

A Measurement diagrams

1. Peak Output Power
2. Spurious Emissions radiated
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. Radiated Emissions from Digital Part
9. Power Line Conducted Emission

B Photos

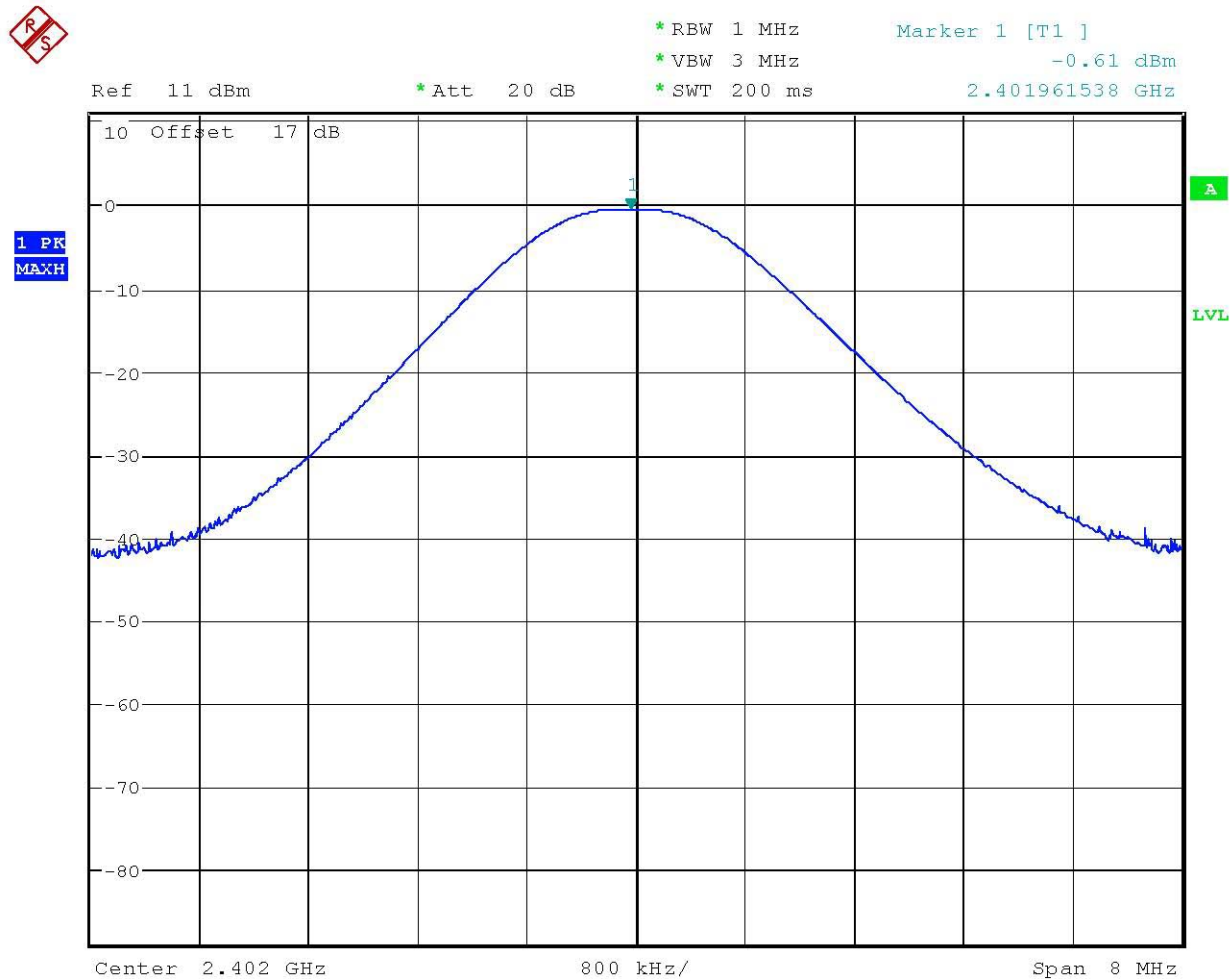
1. External Photos
2. Internal Photos
3. Set Up Photo of Radiated Emission
4. Set Up Photo of Conducted Emission



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Peak Output Power



MAX OUTPUT POWER CH0

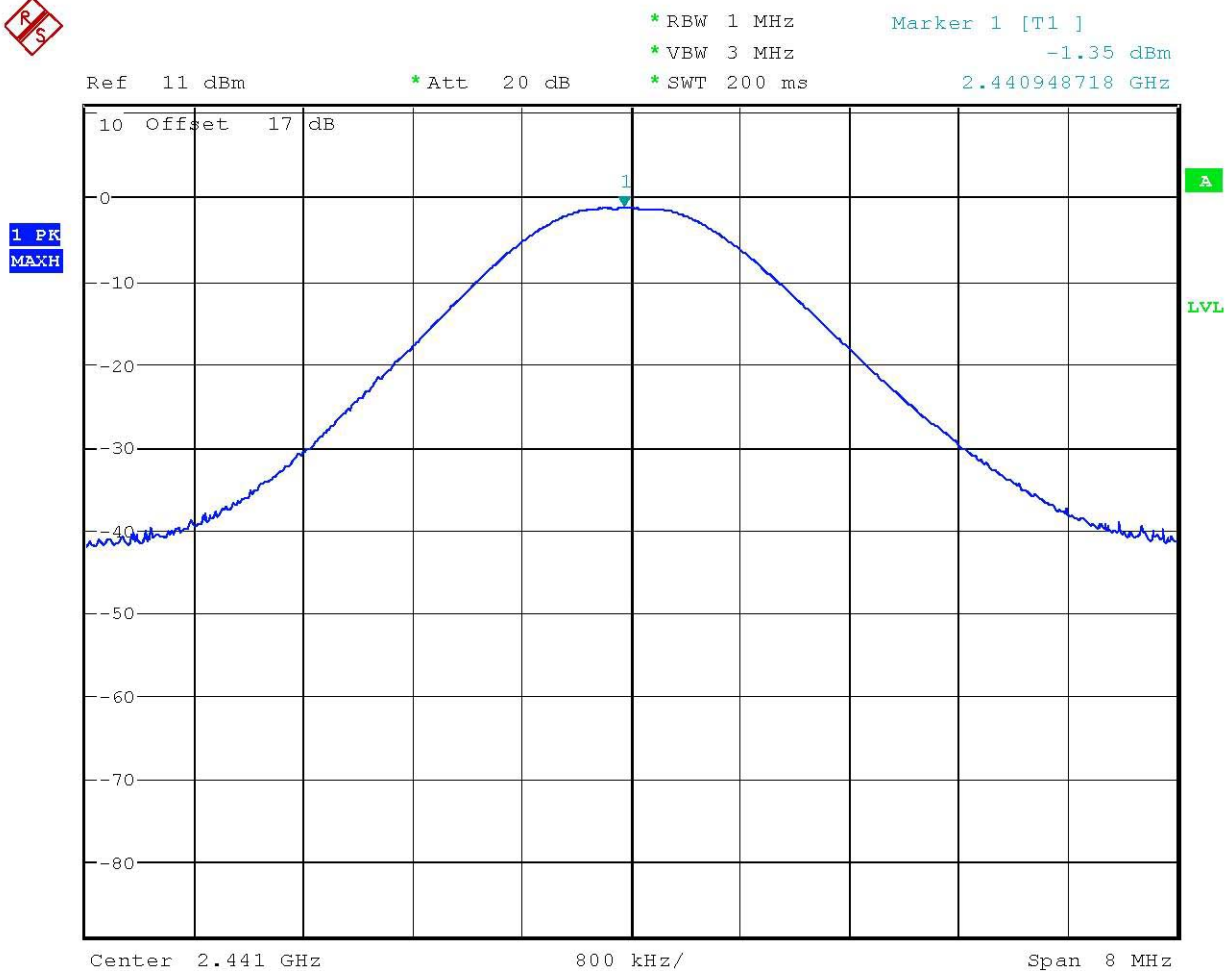
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FCC ID: QQGBU2086



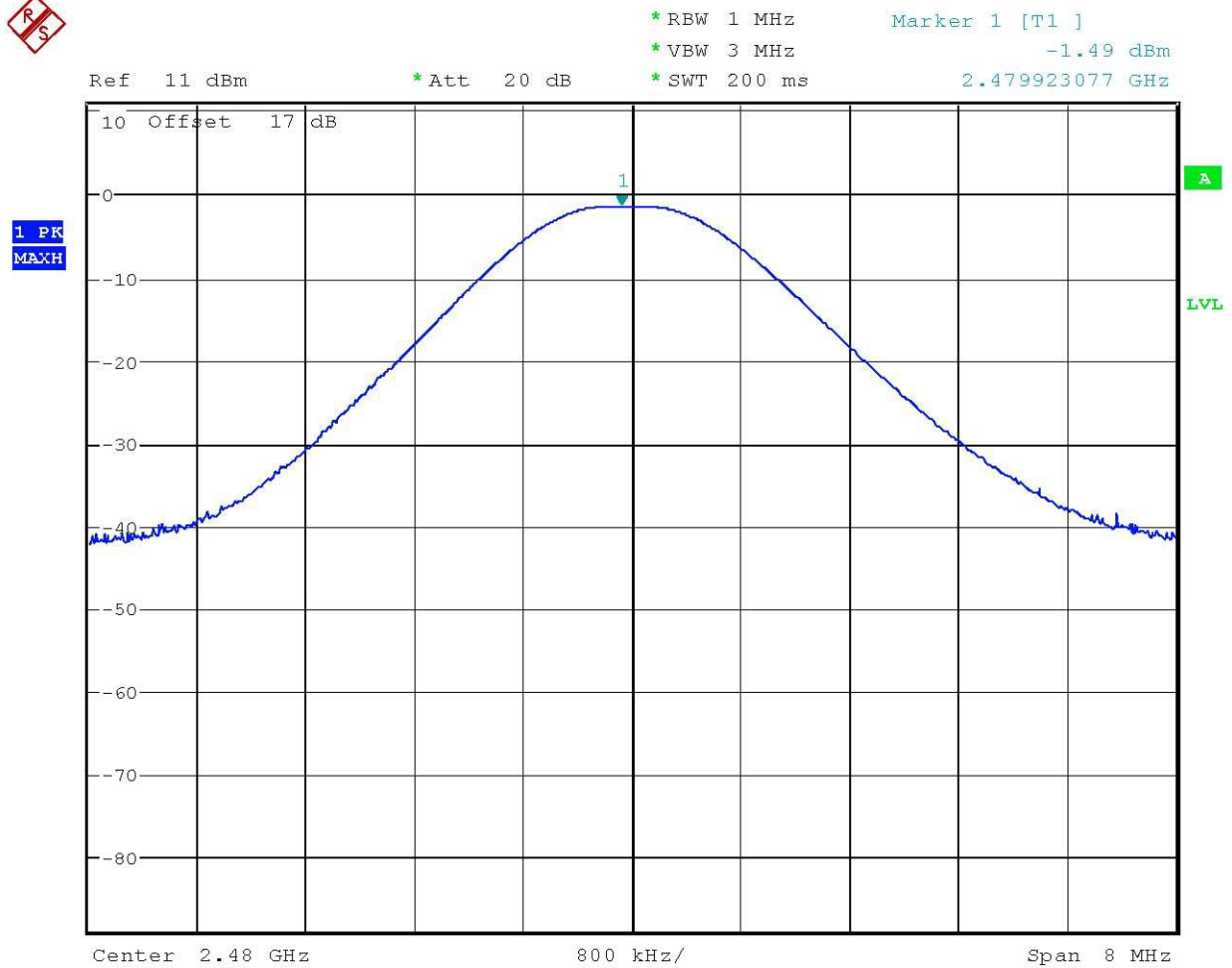
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Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15
FCC ID: QQGBU2086



MAX OUTPUT POWER CH78

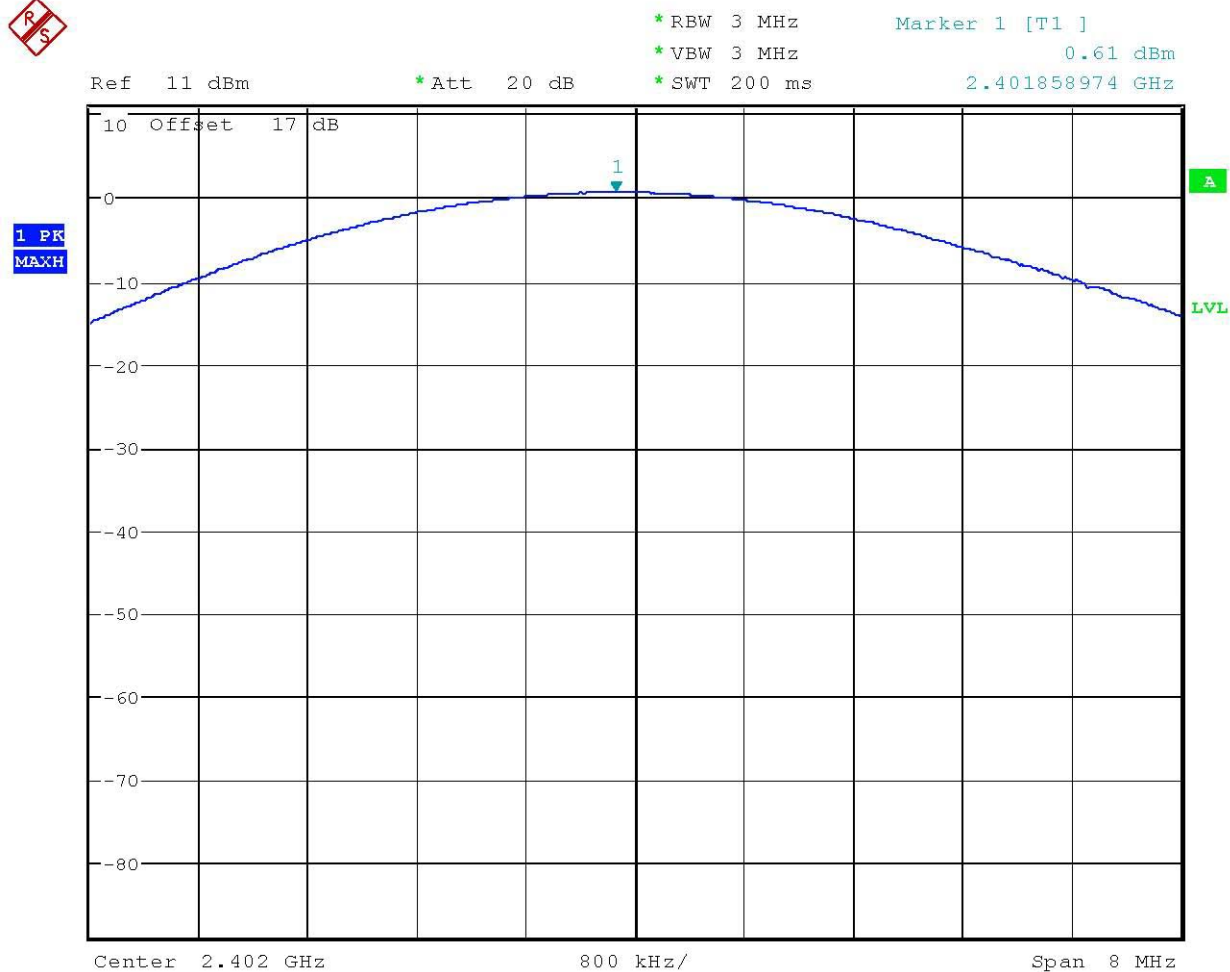
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Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086



MAX OUTPUT POWER CH0 EDR MODE

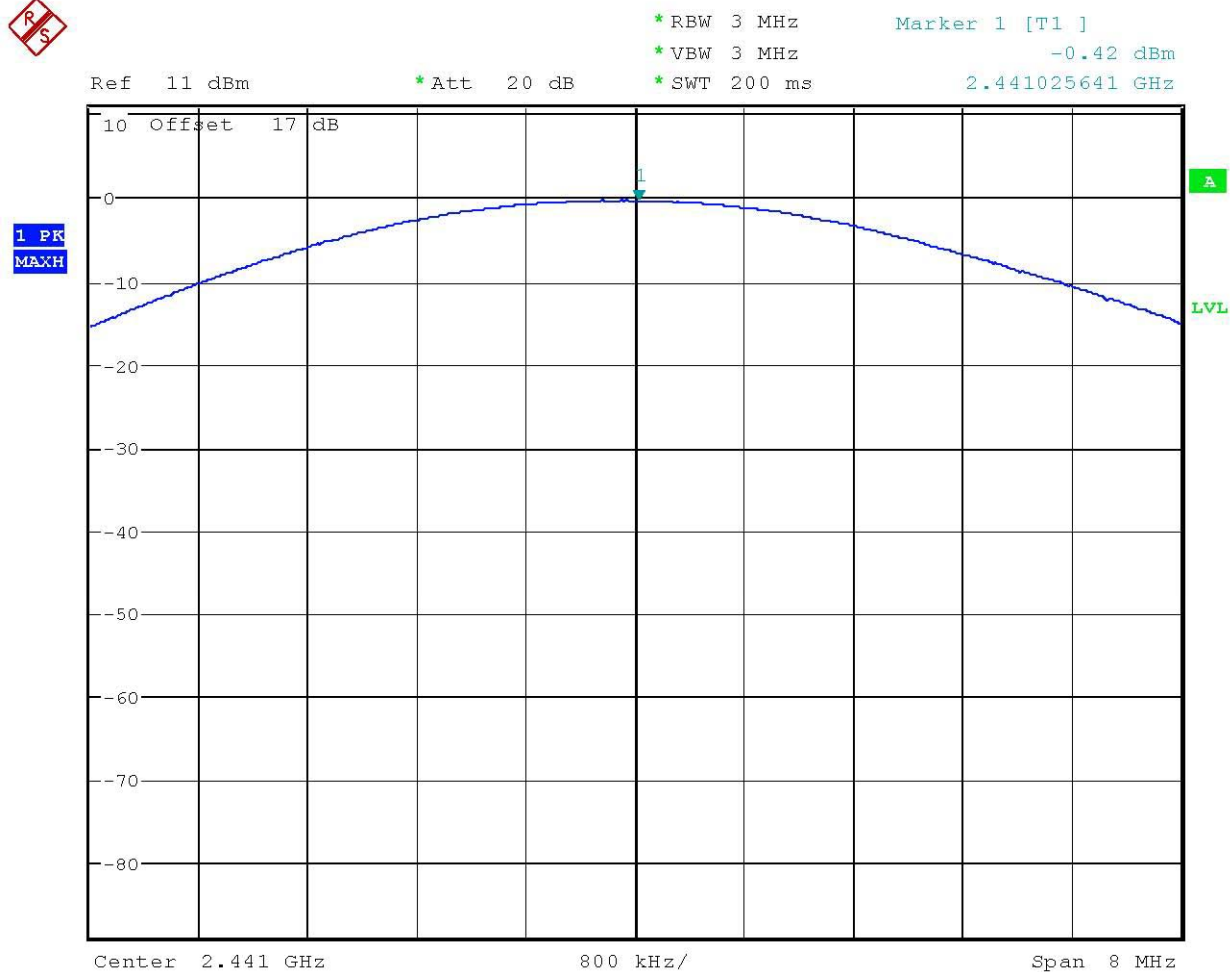
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Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086



MAX OUTPUT POWER CH39 EDR MODE

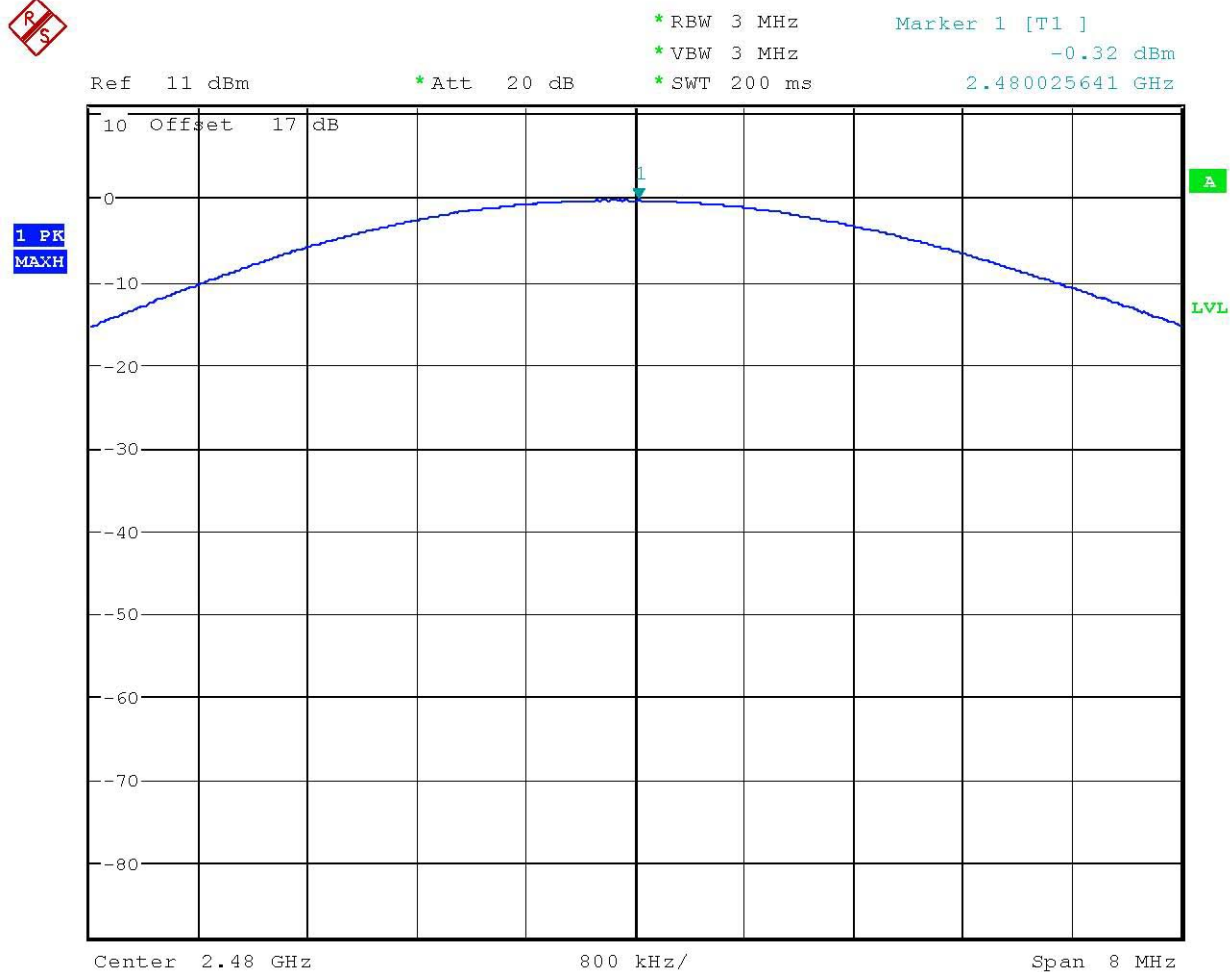
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Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086



MAX OUTPUT POWER CH78 EDR MODE

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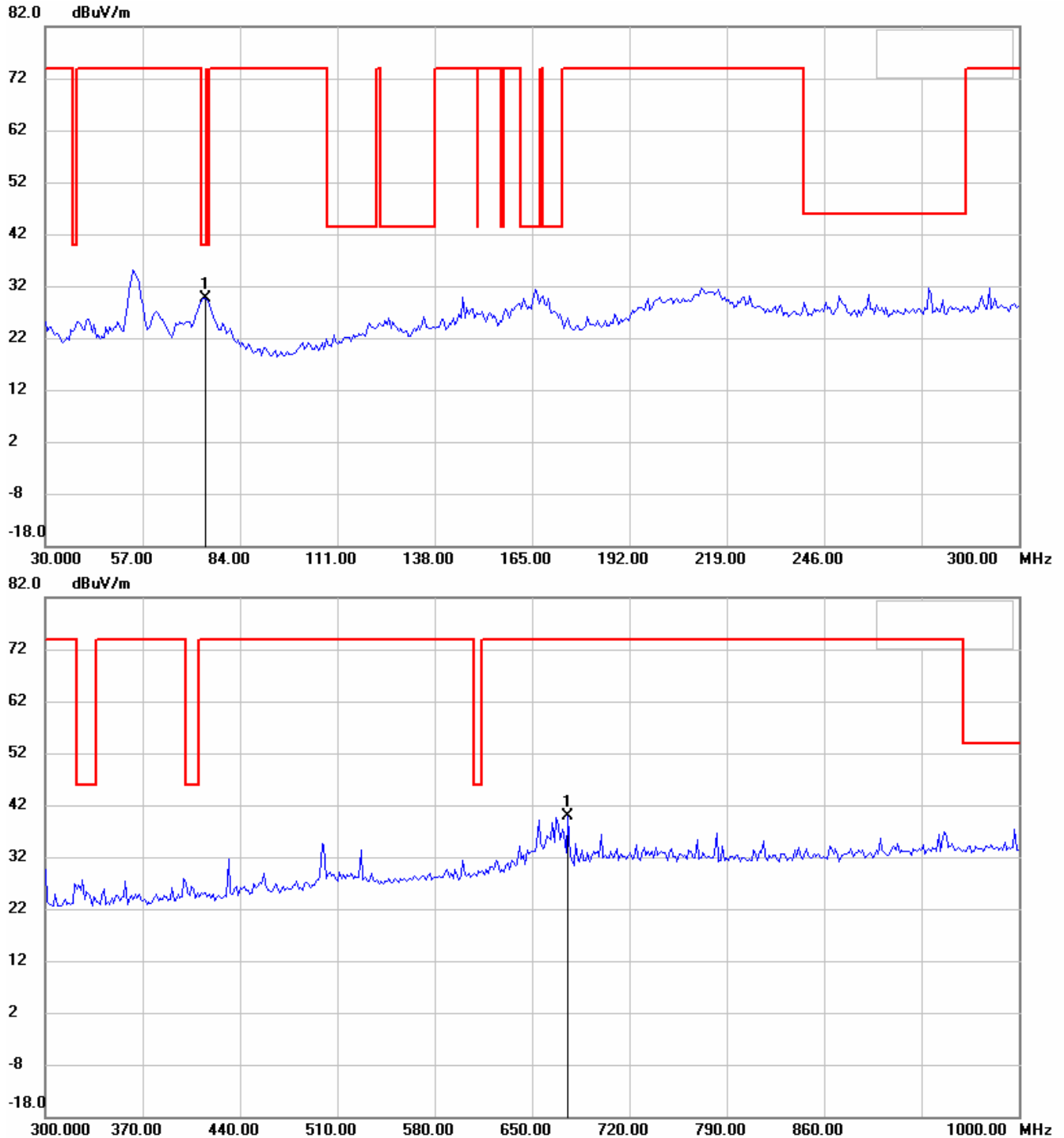


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FCC ID: QQGBU2086

Spurious Emissions radiated

TX CH0

Antenna Polarization H

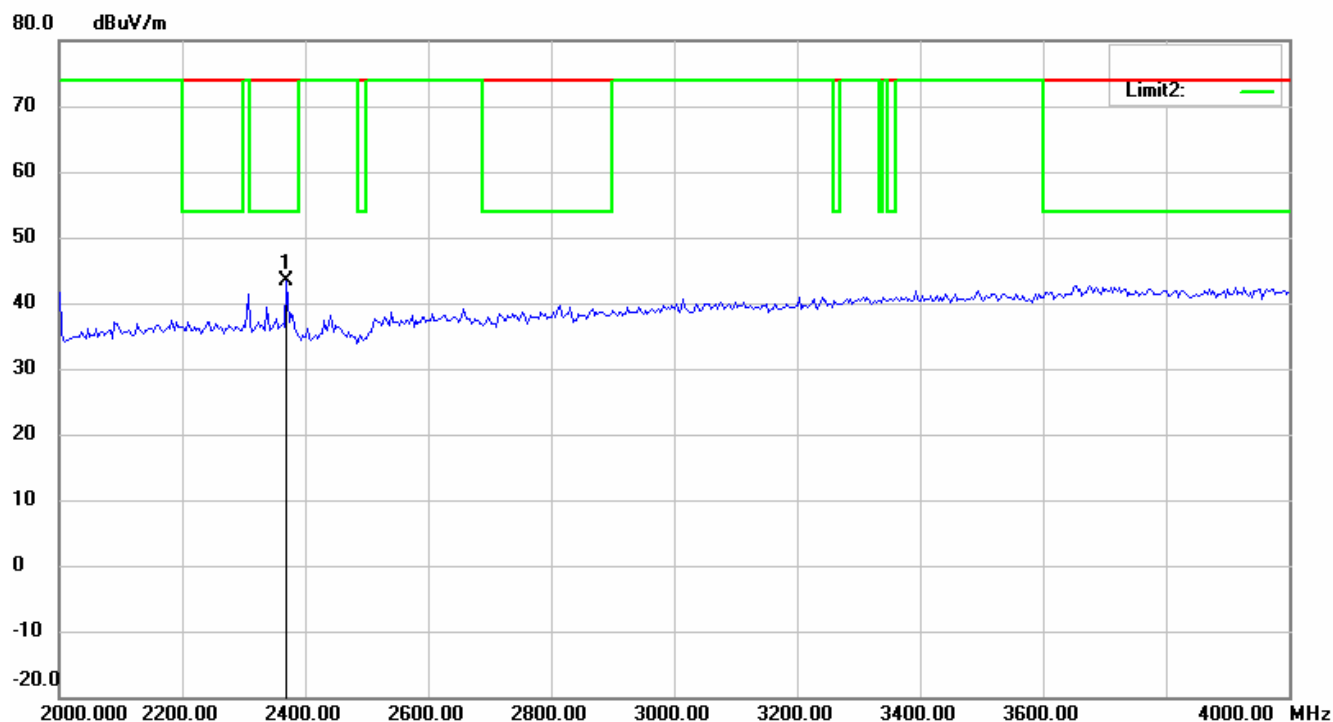
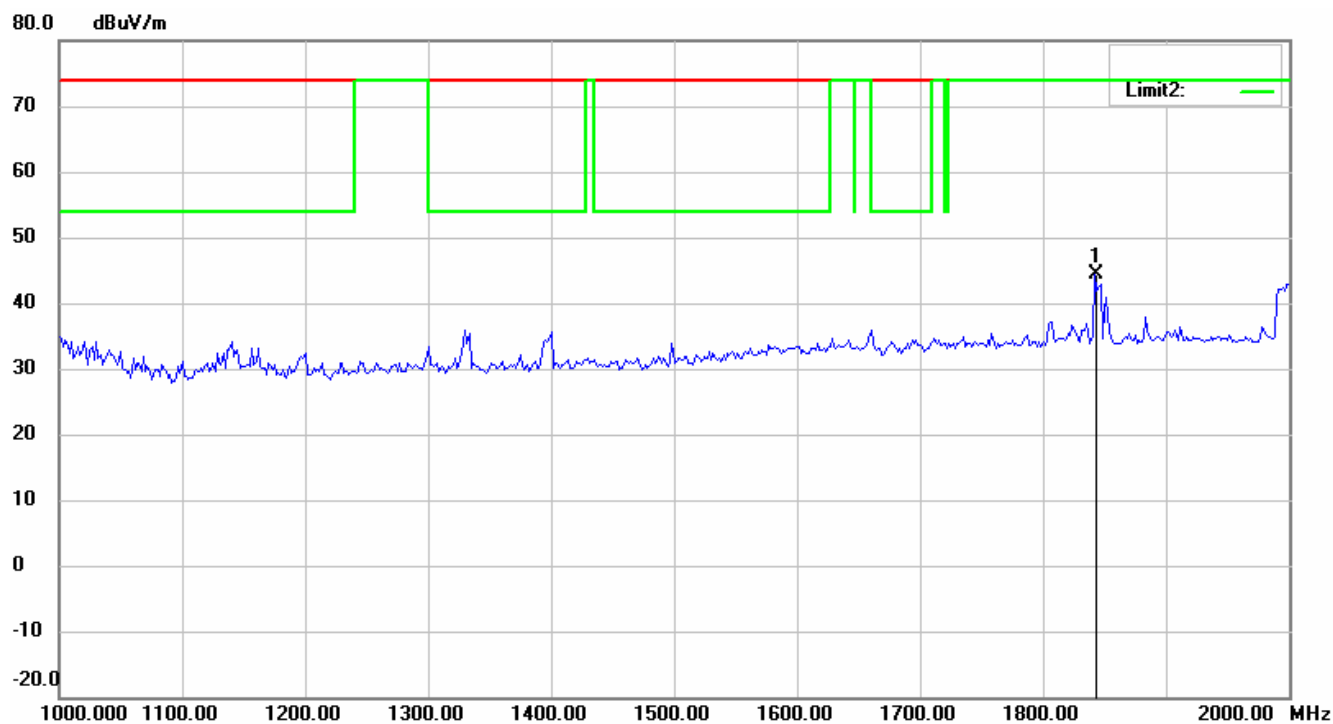




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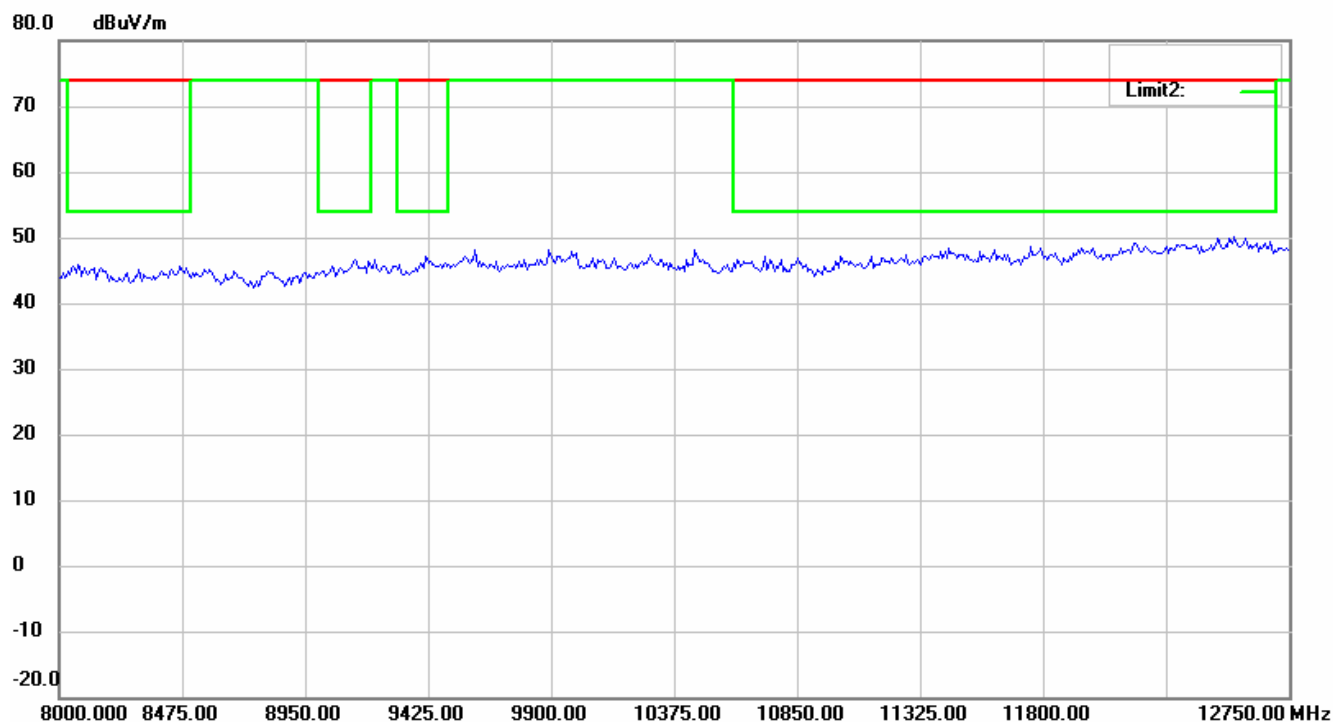
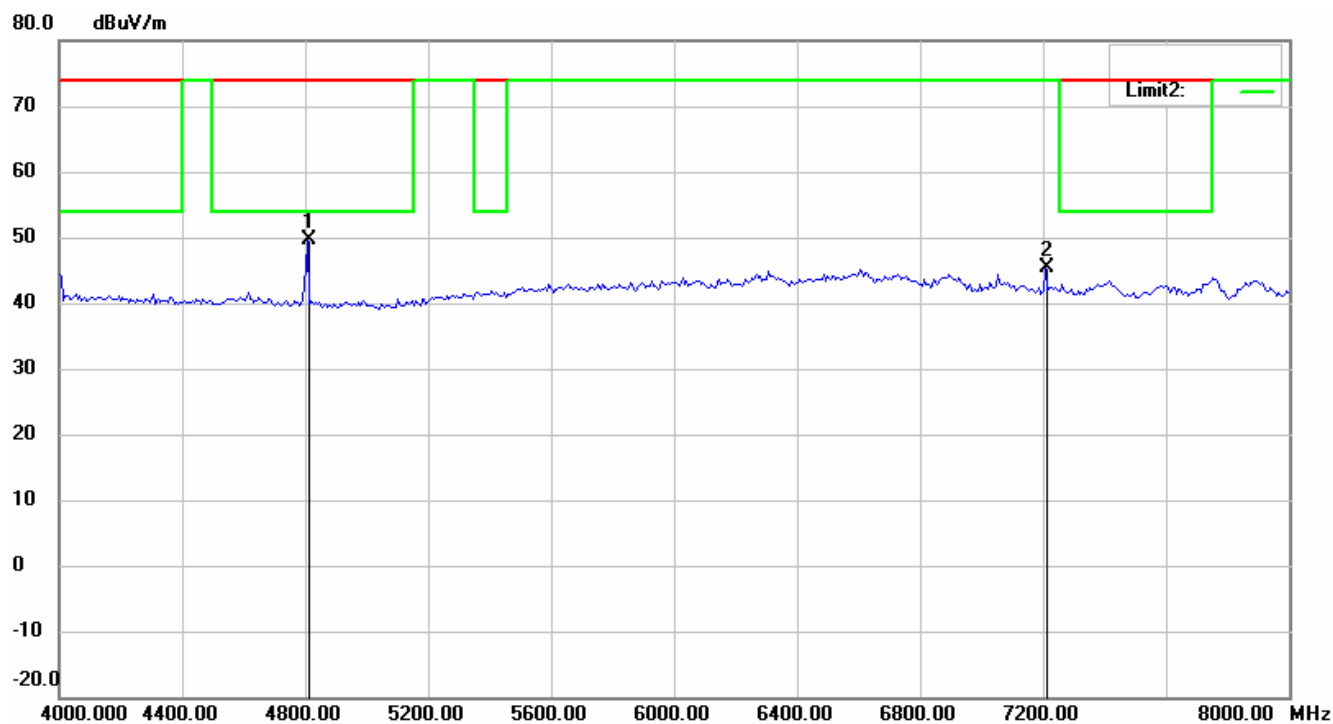




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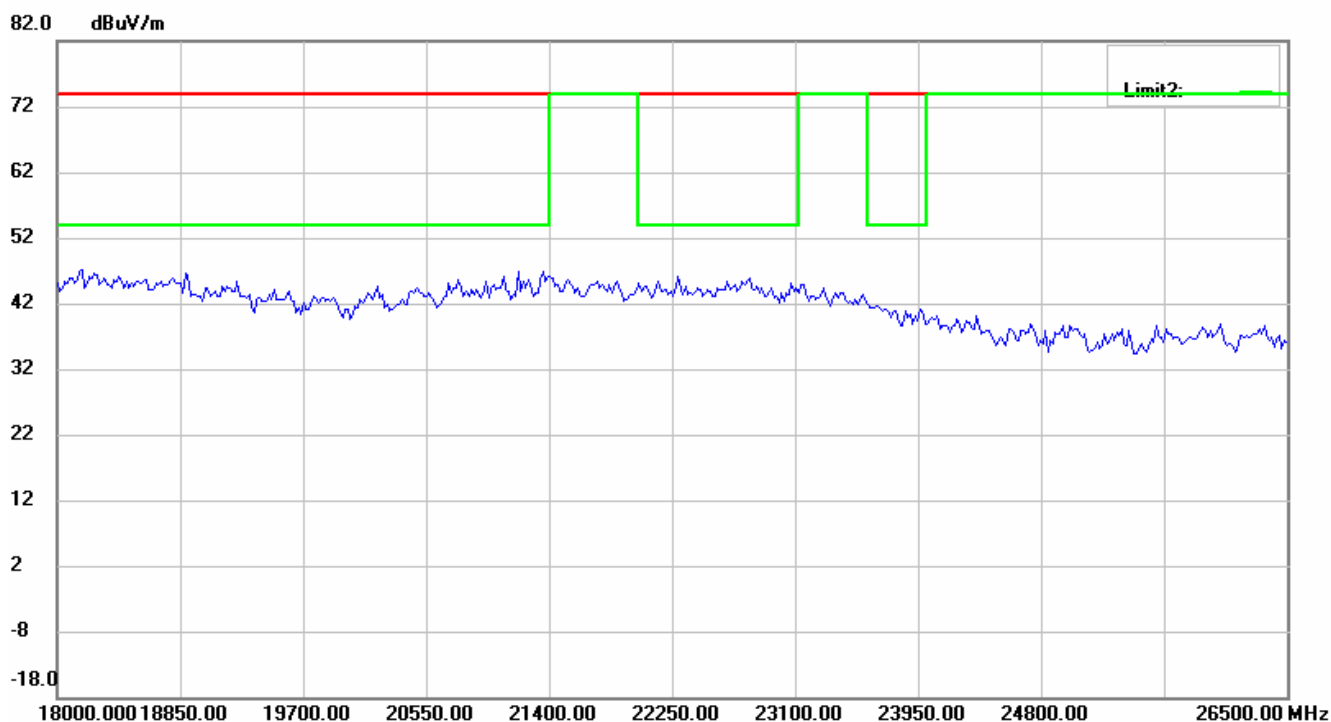
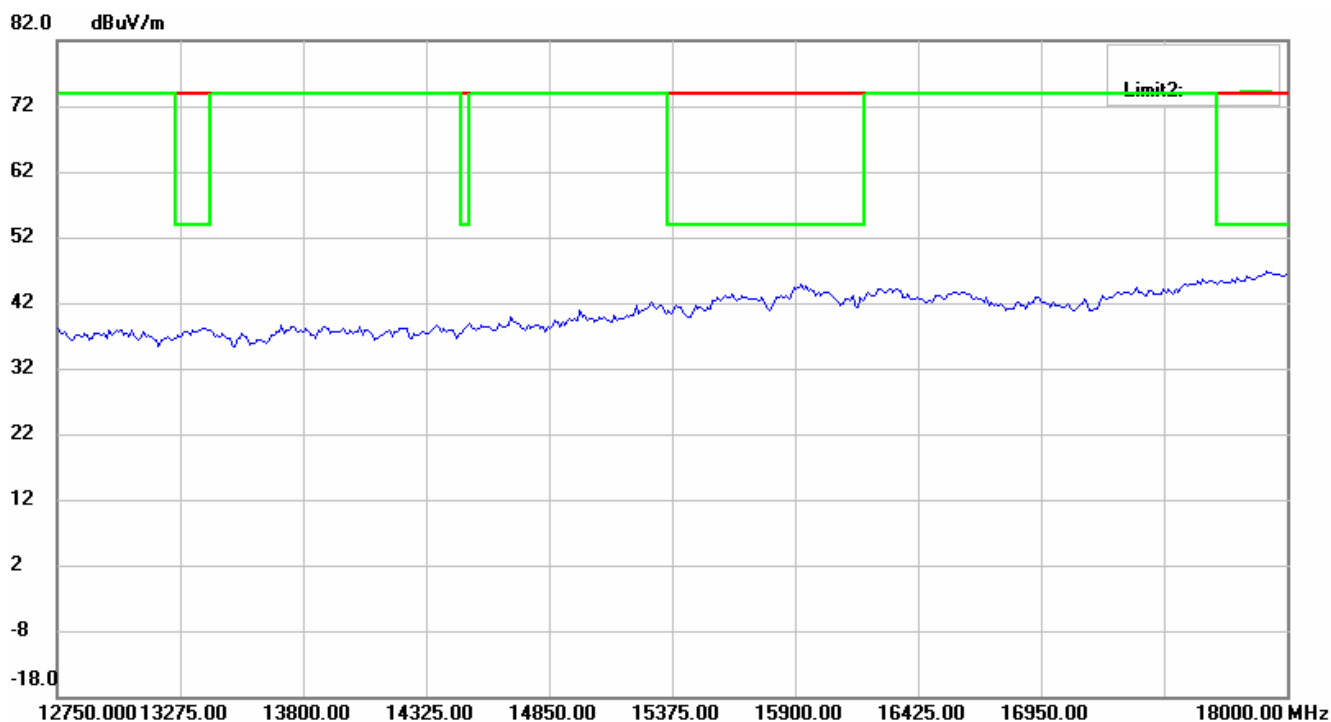




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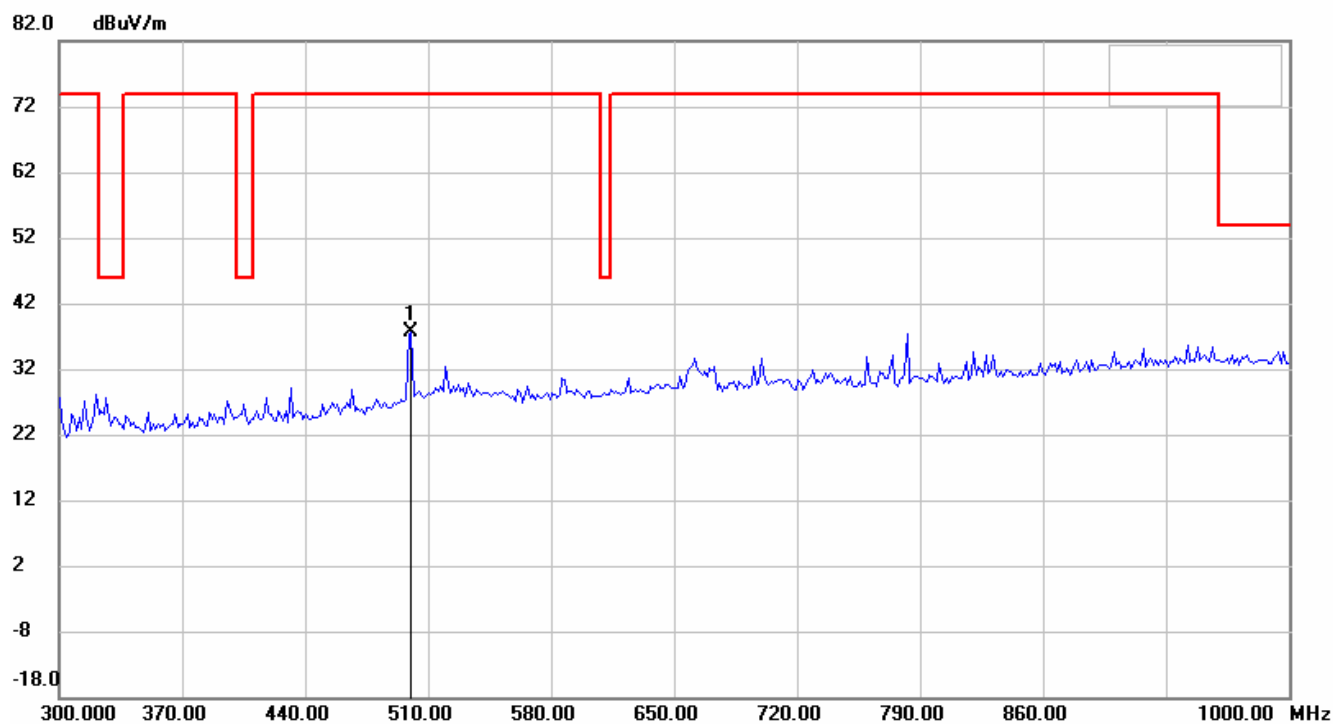
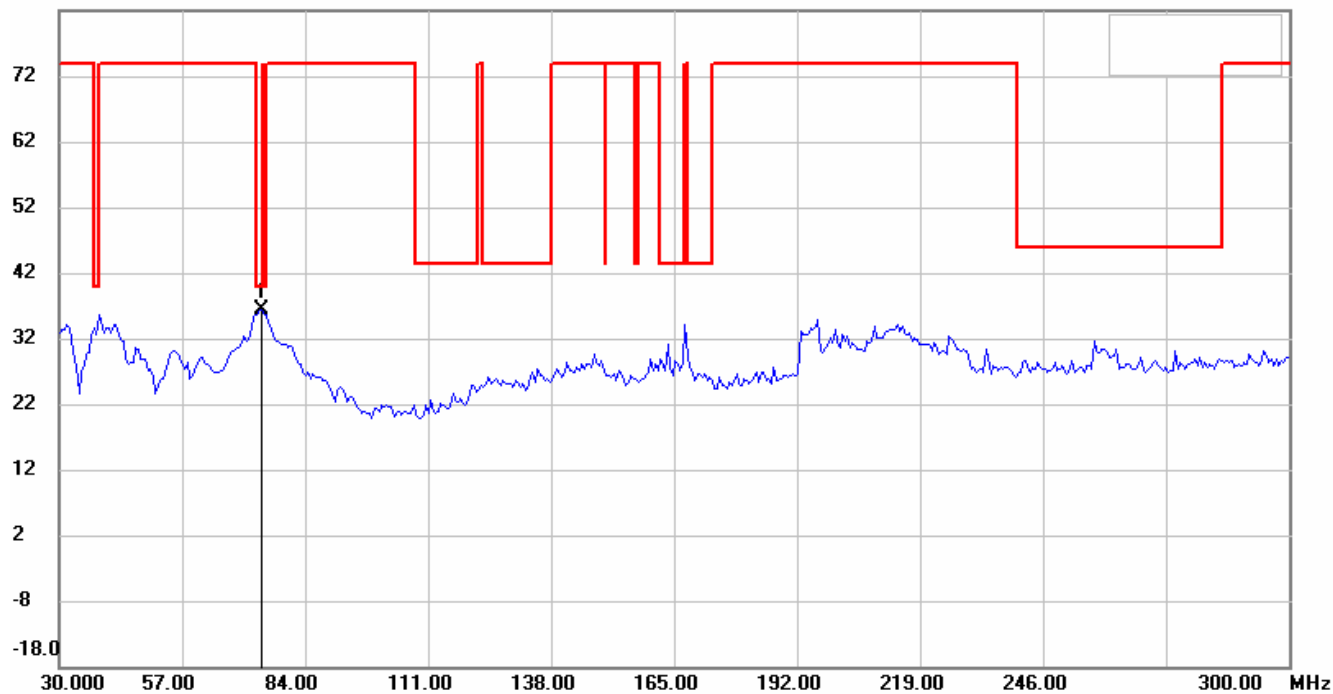
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FCC ID: QQGBU2086

82.0 dBuV/m

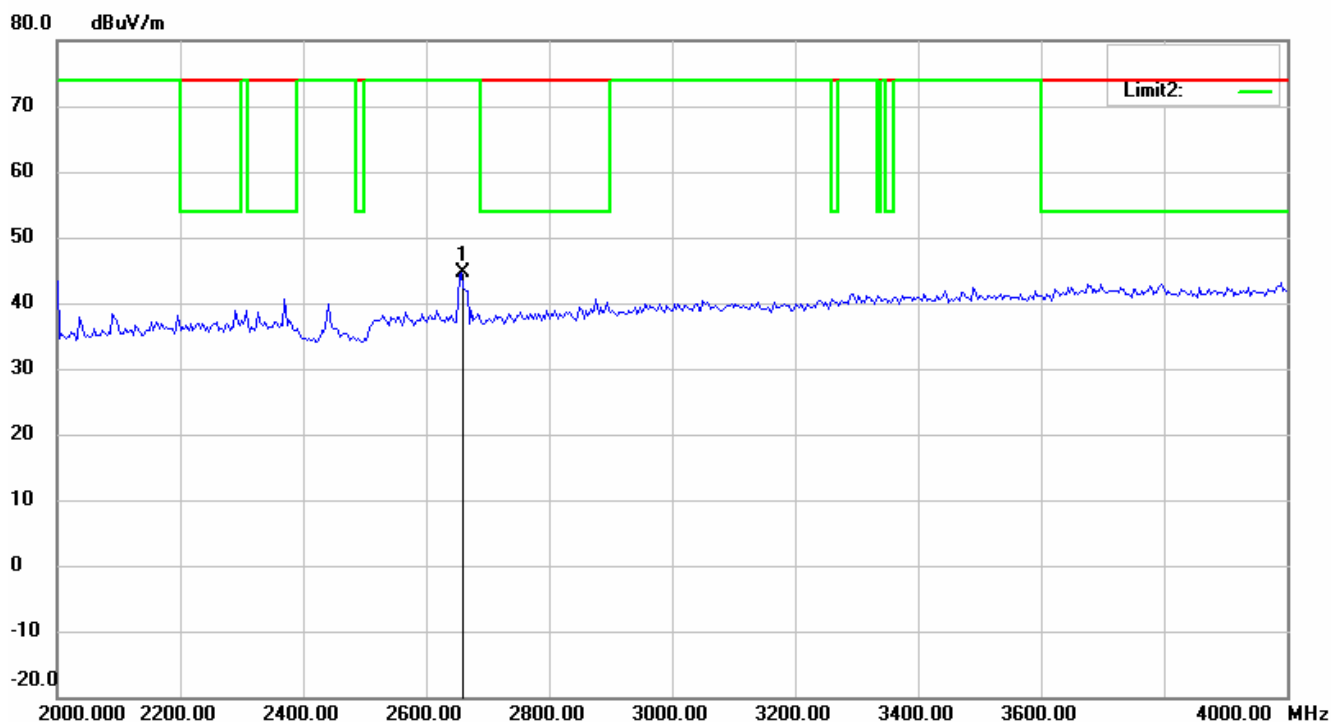
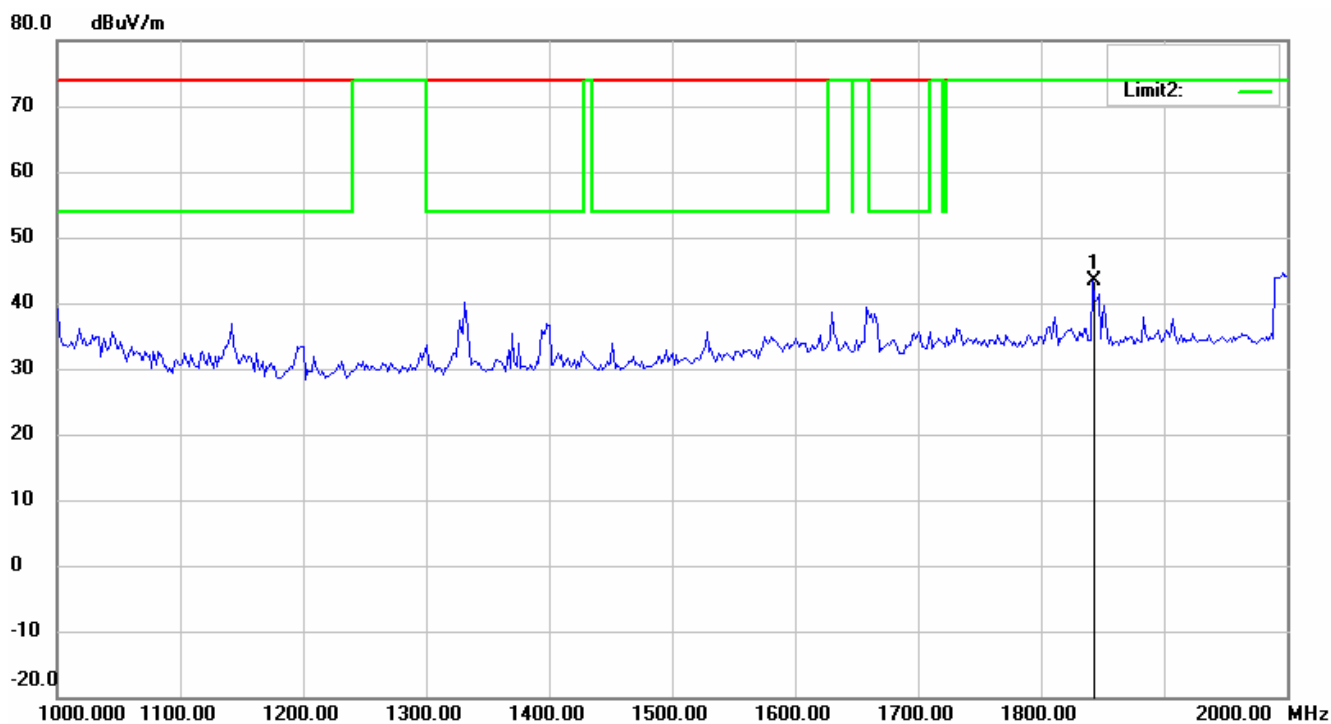




Taiwan ETS Product Service Co., Ltd.

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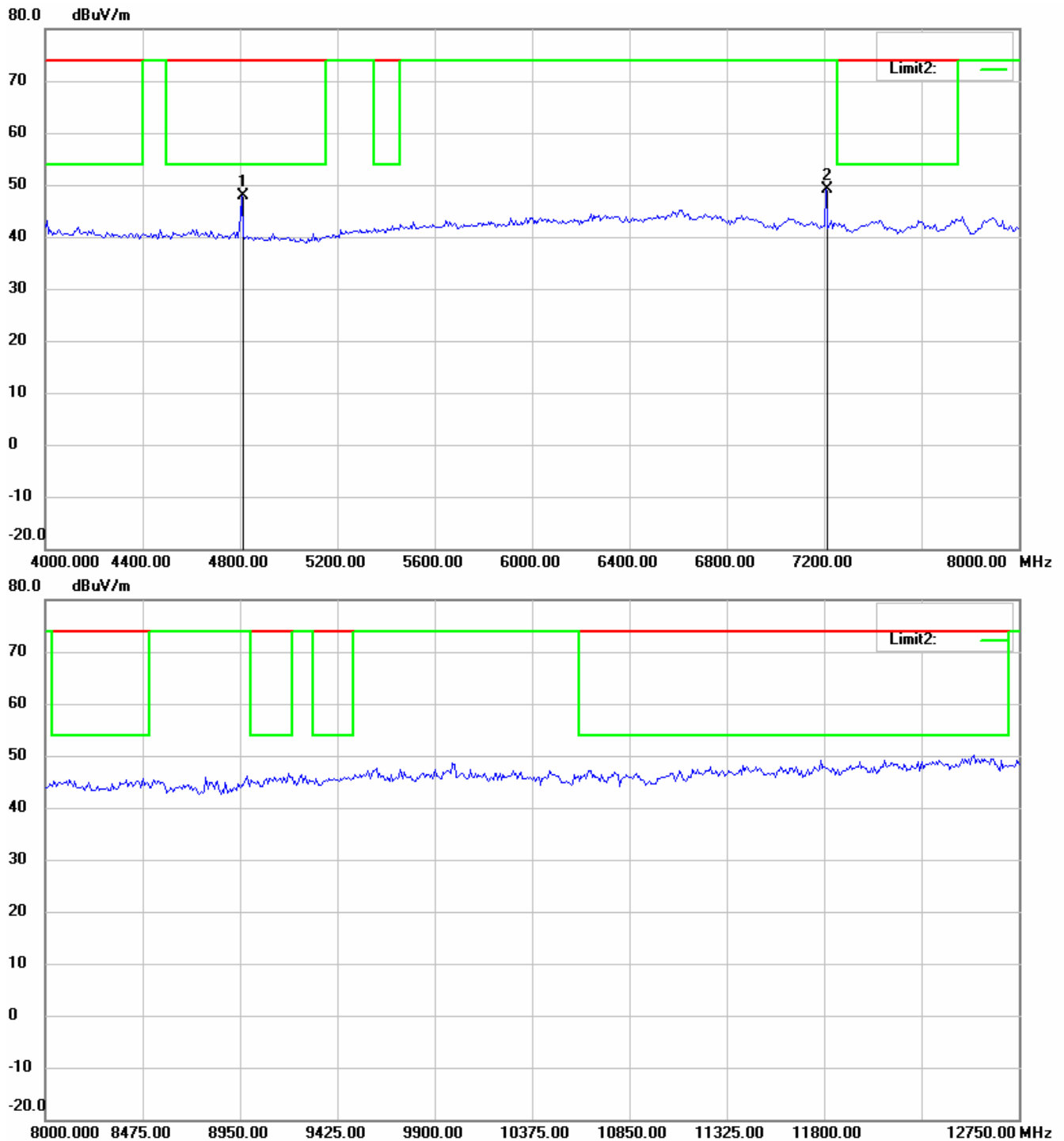
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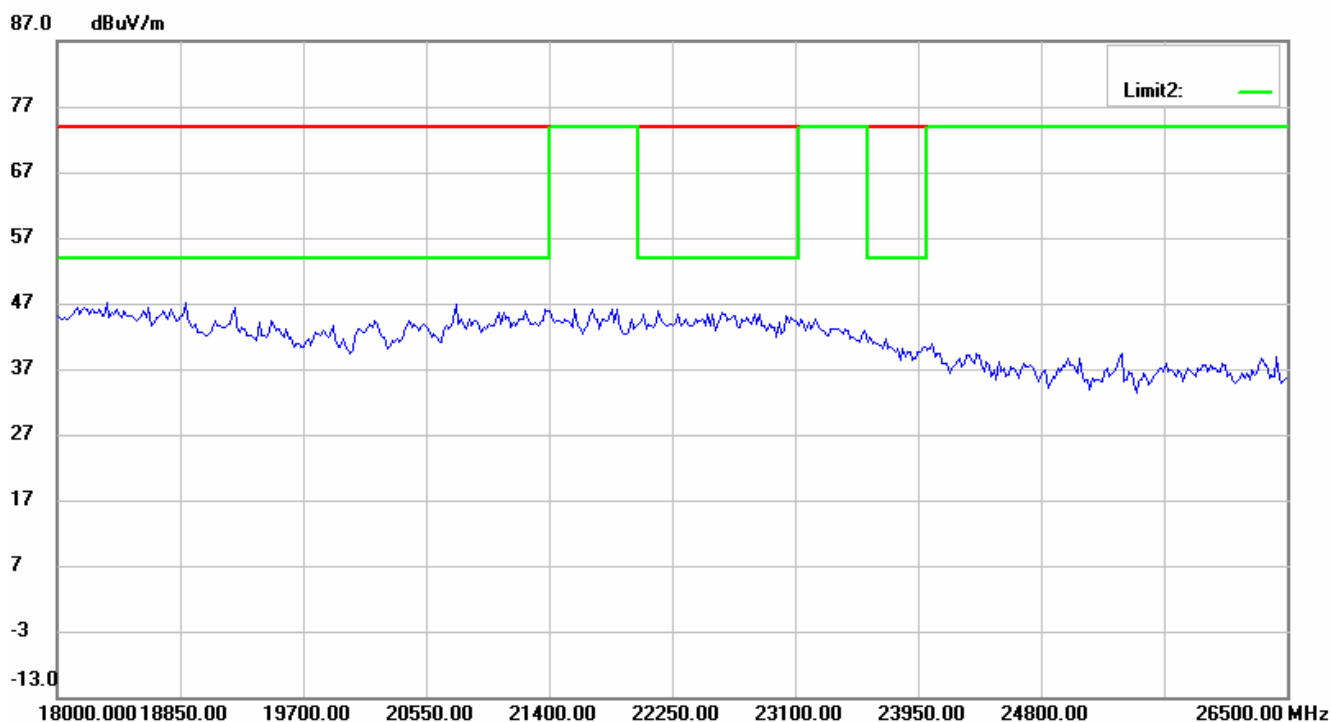
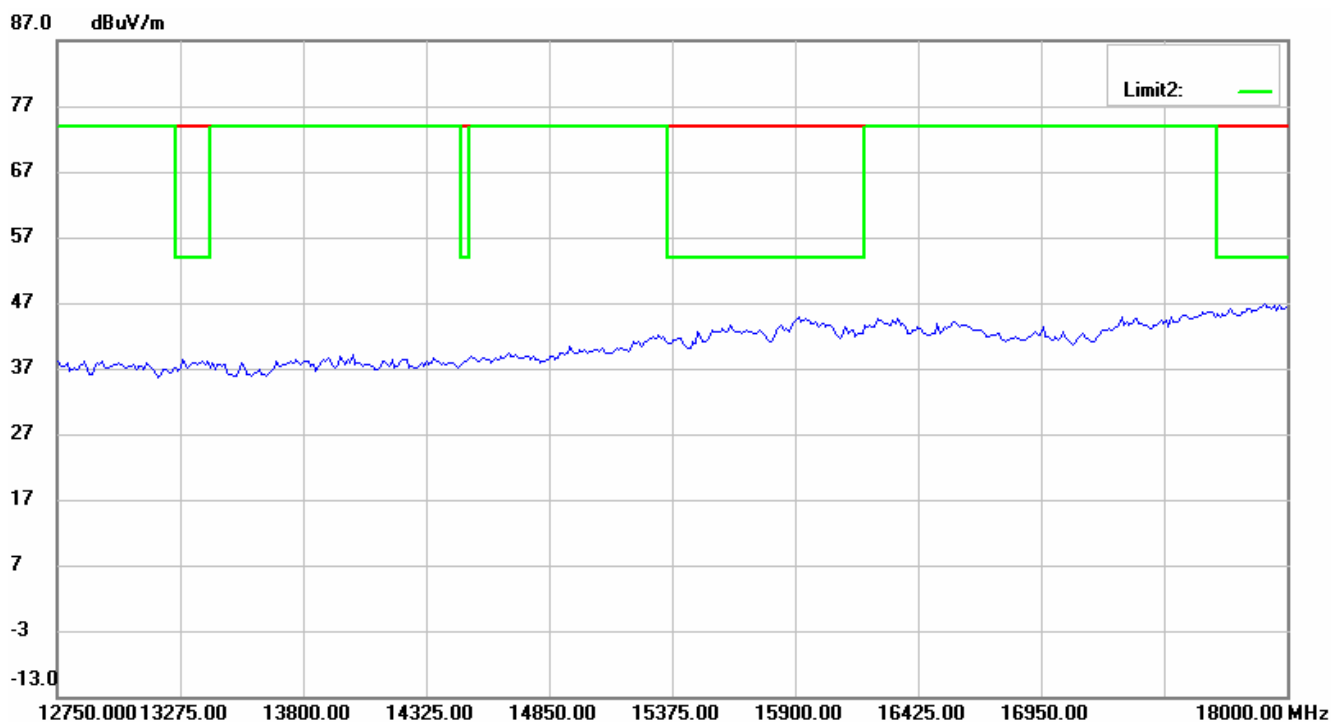




Taiwan ETS Product Service Co., Ltd.

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FCC ID: QQGBU2086



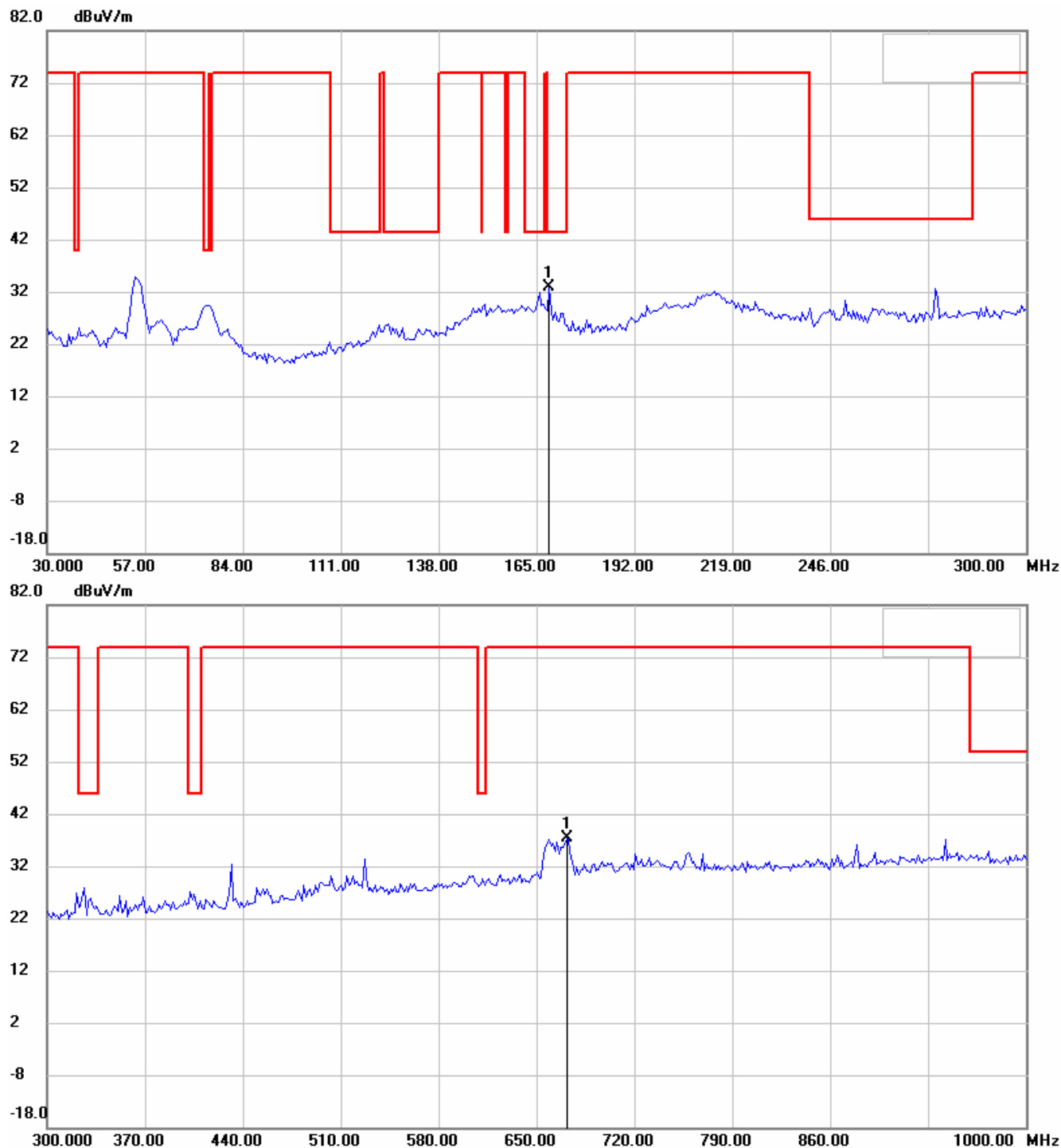


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FCC ID: QQGBU2086

TX CH39

Antenna Polarization H

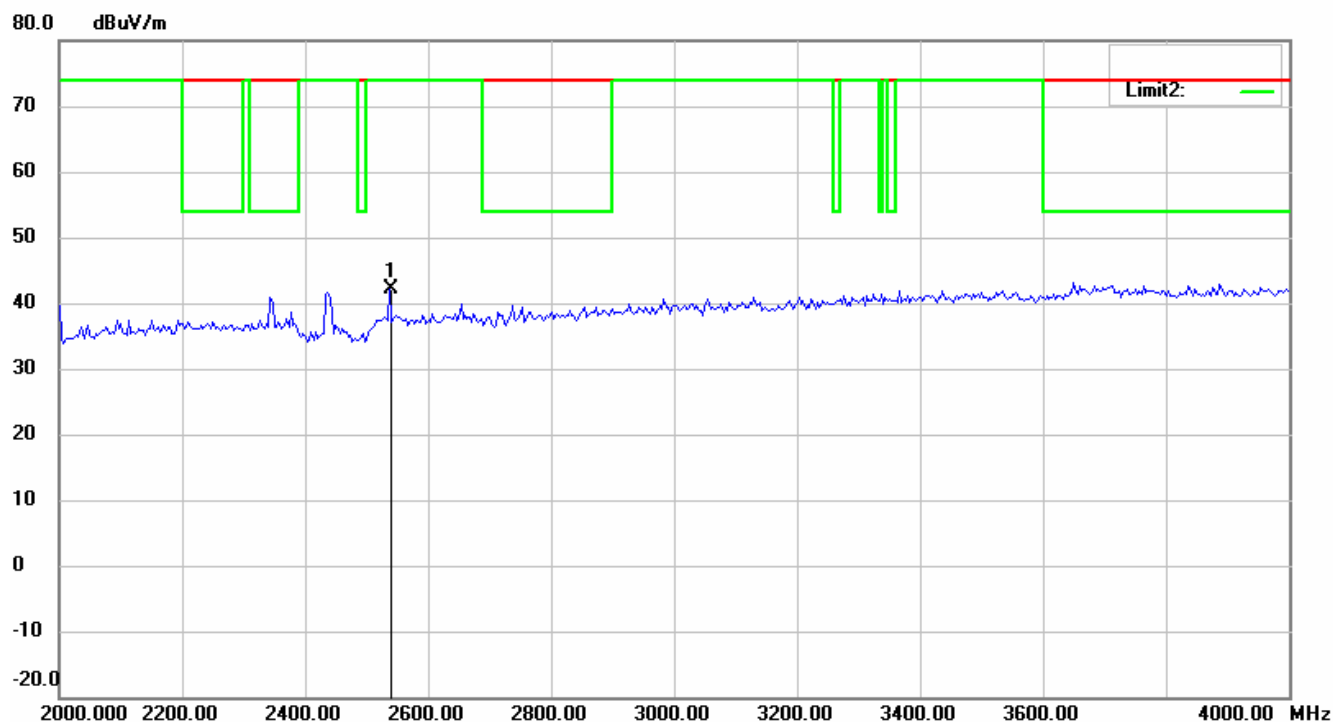
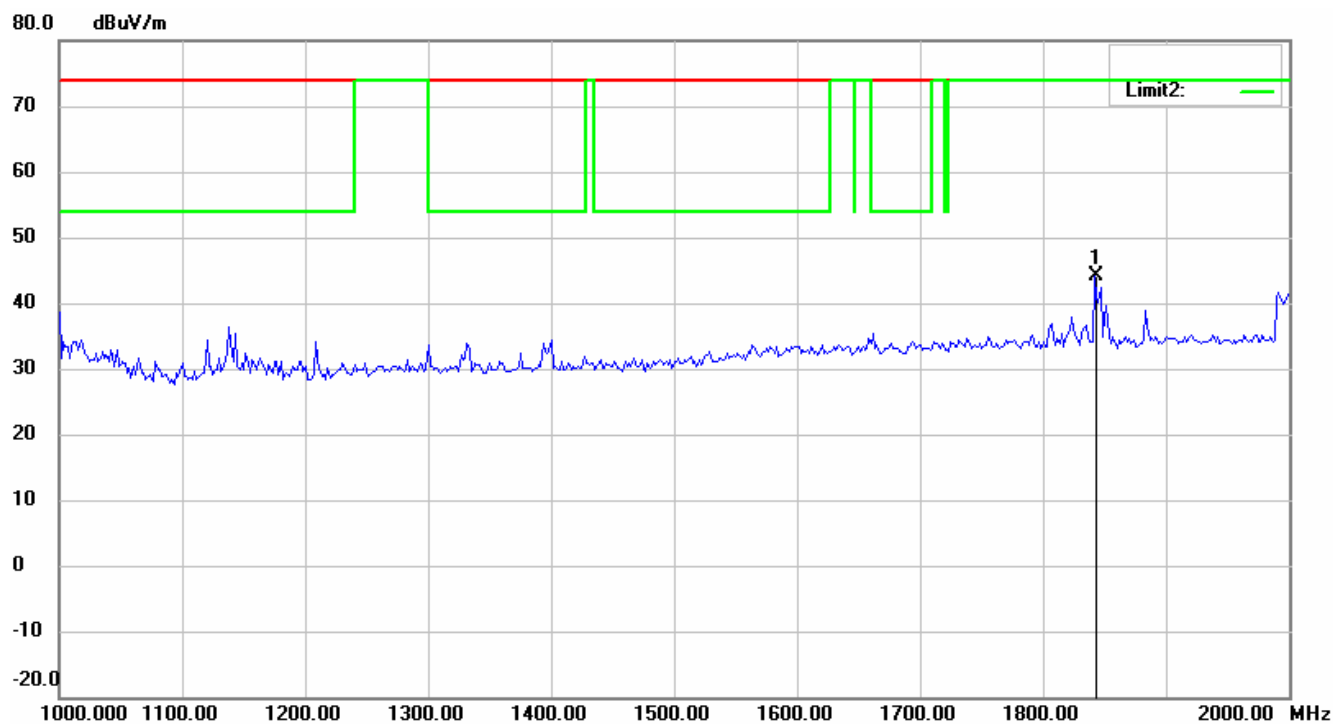




Taiwan ETS Product Service Co., Ltd.

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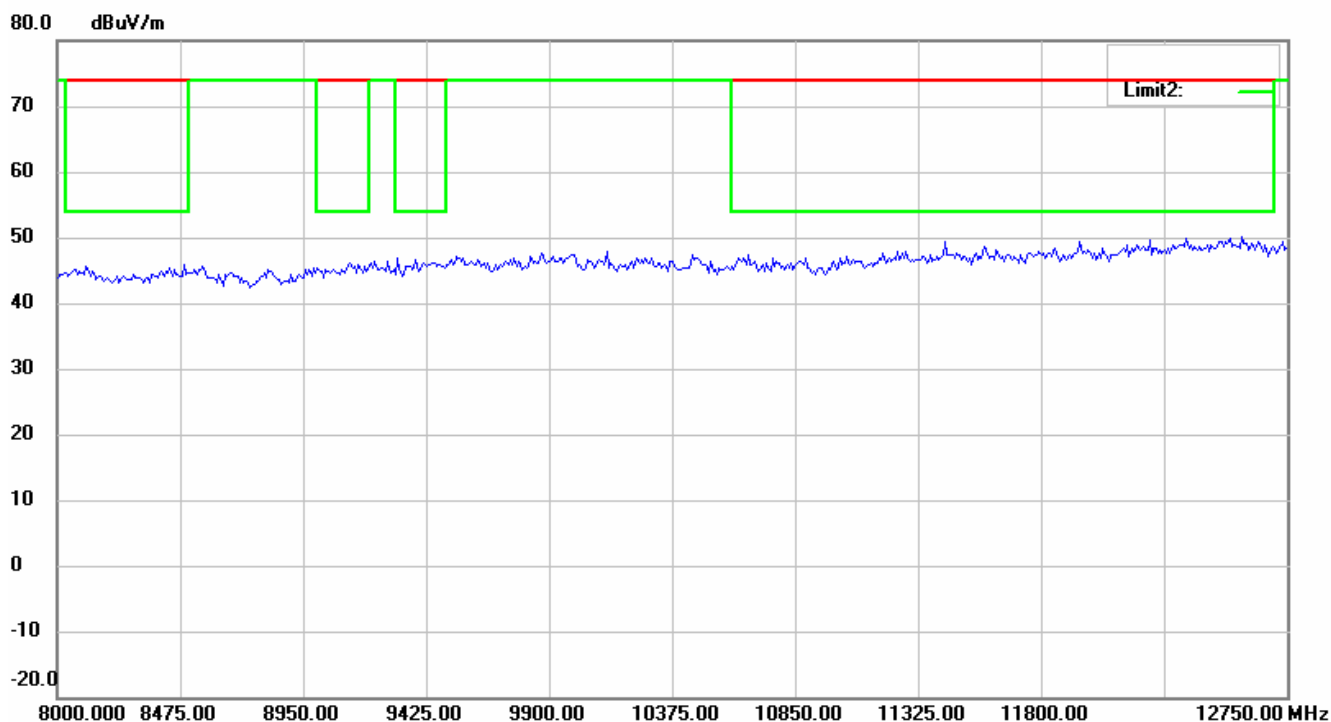
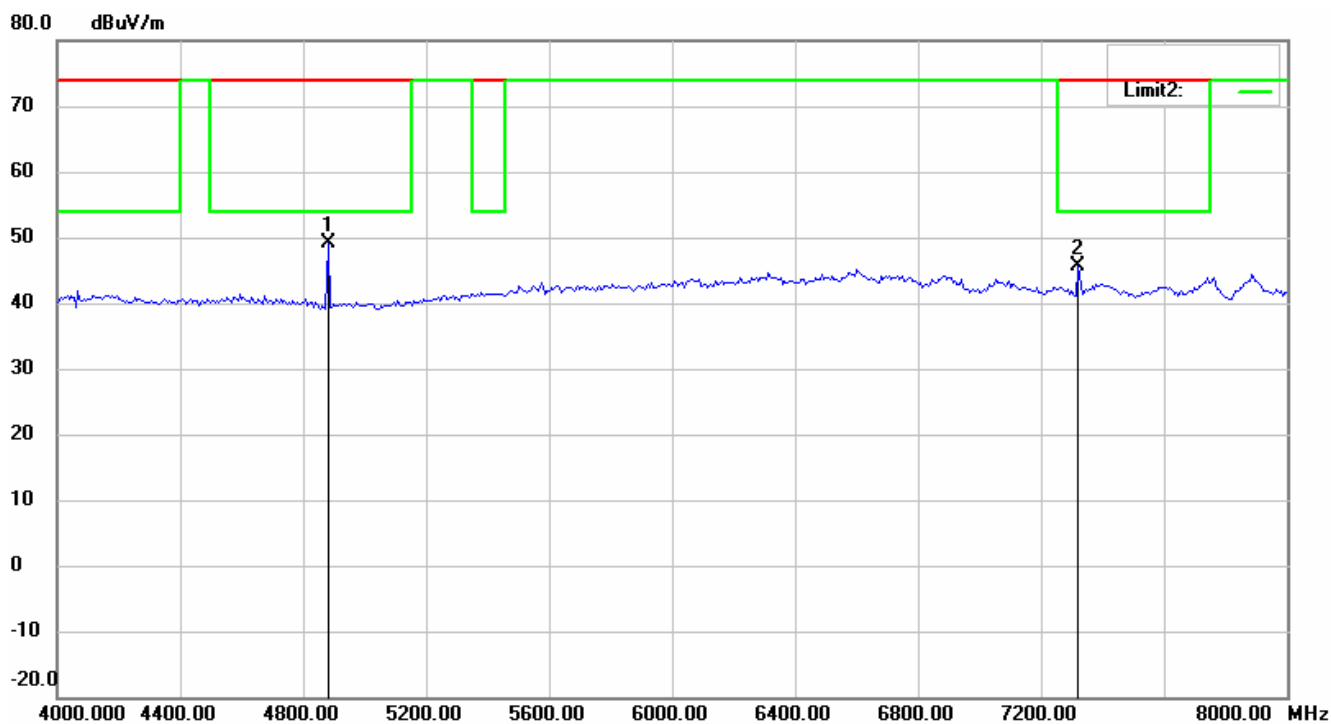




Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15

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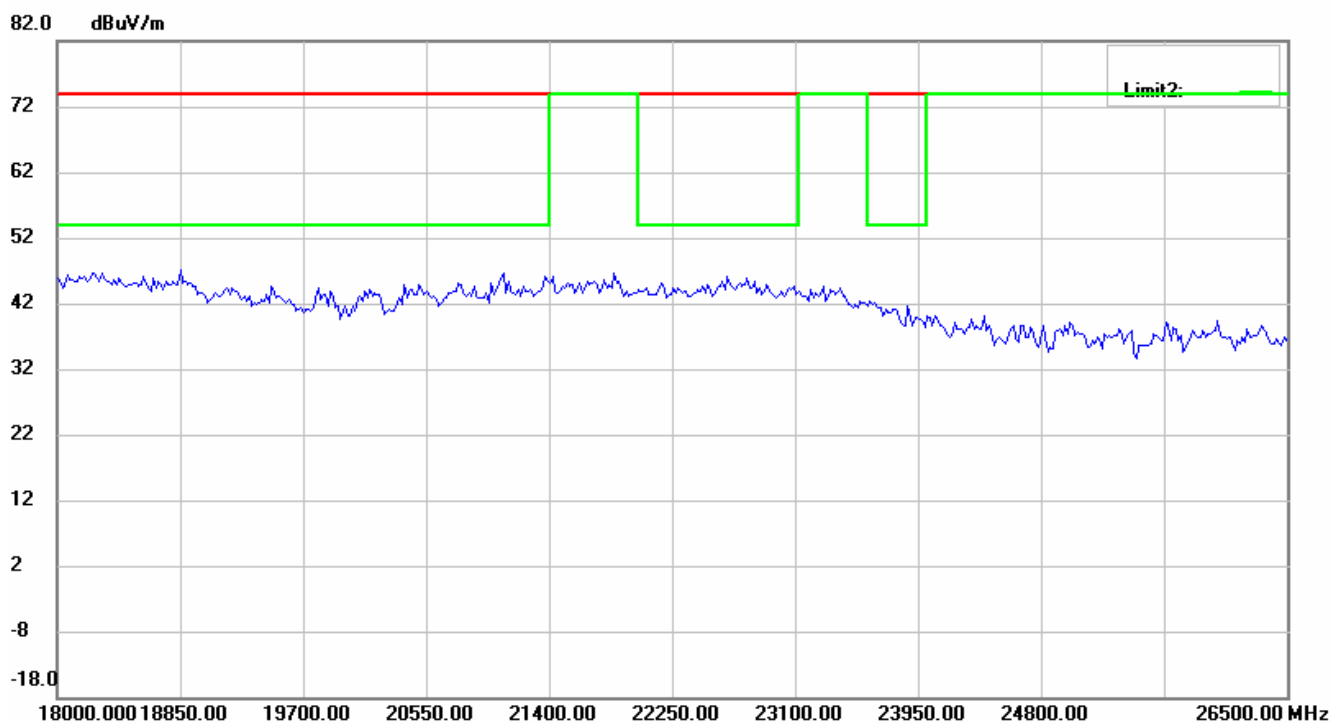
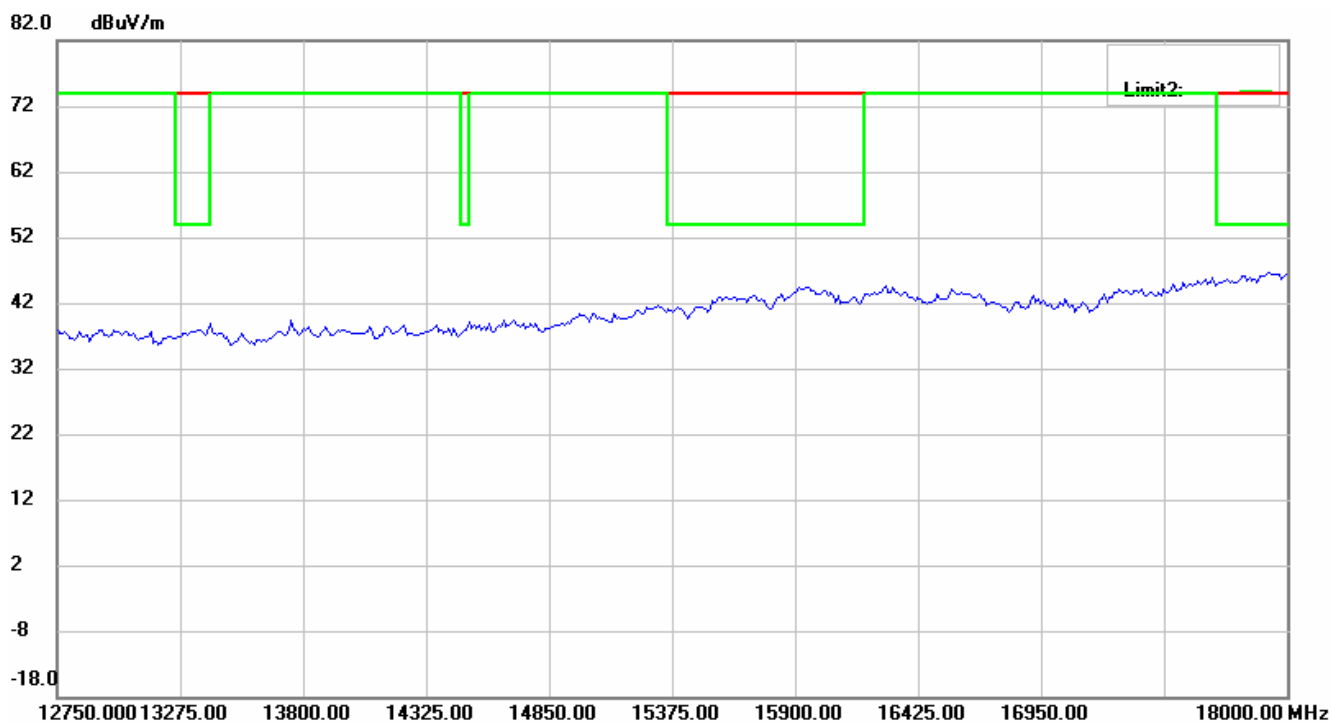




Taiwan ETS Product Service Co., Ltd.

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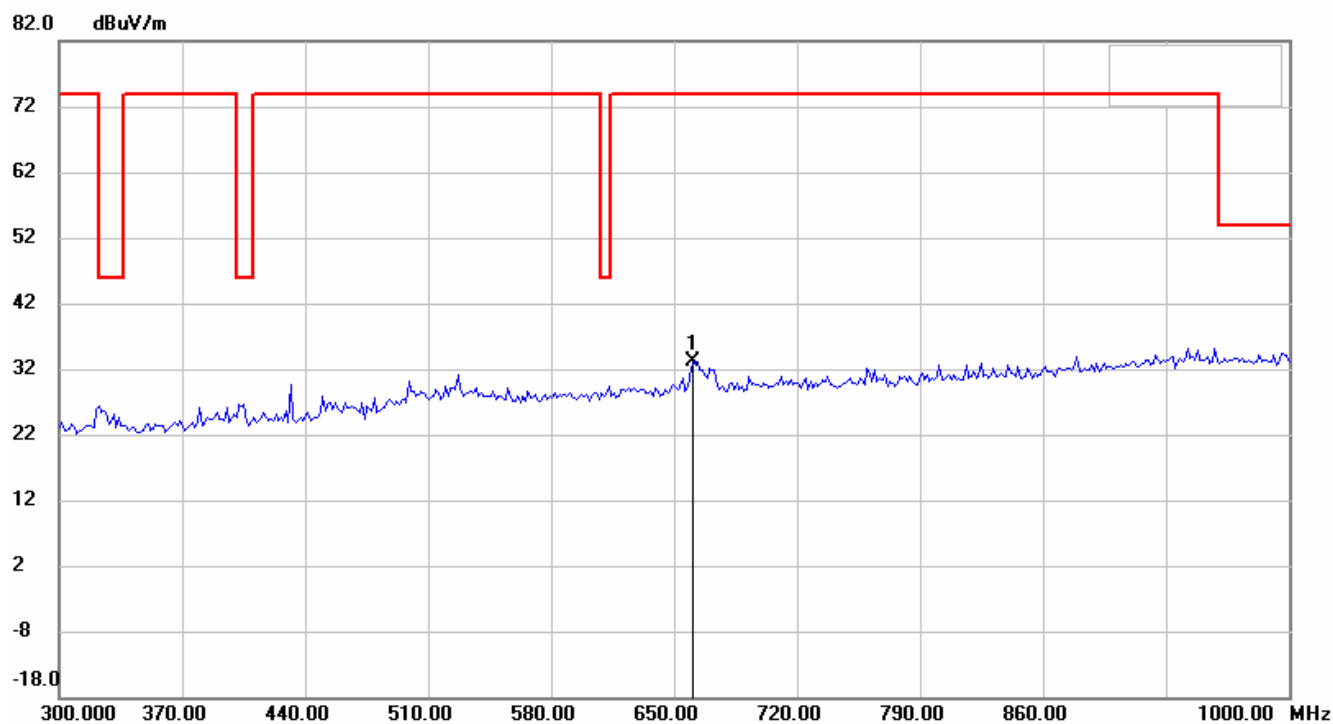
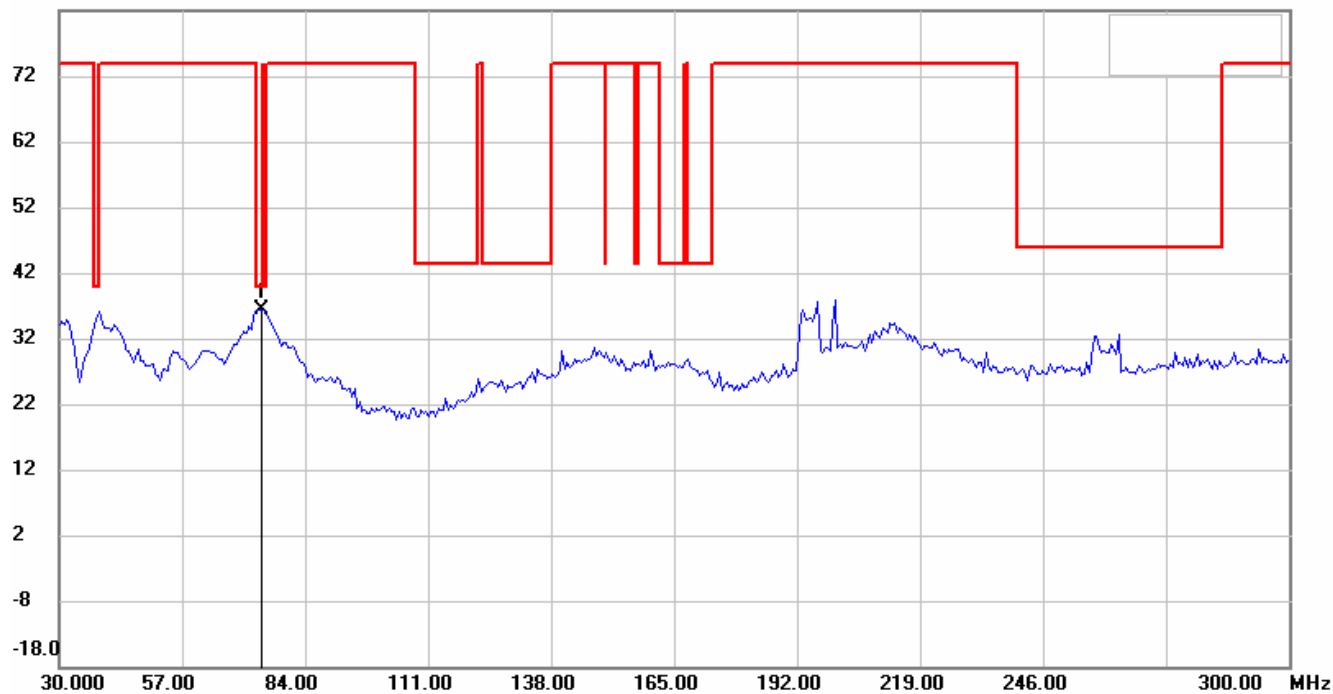
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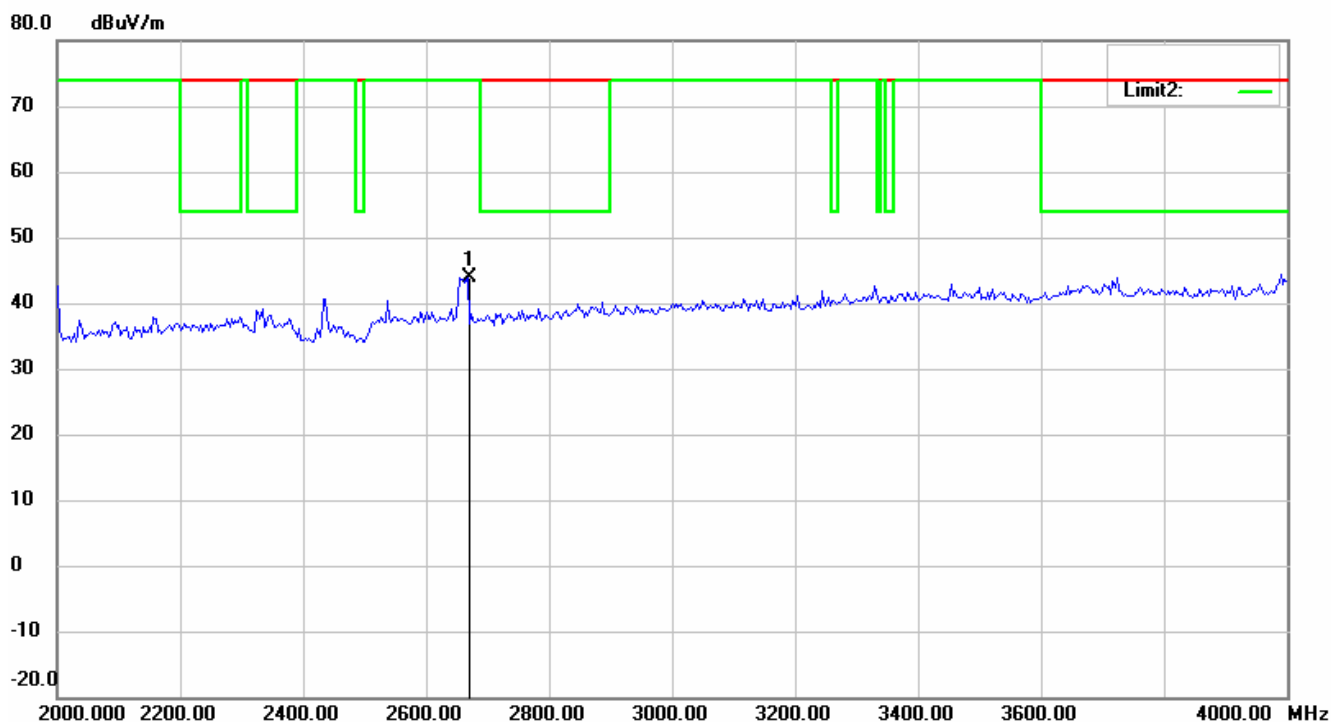
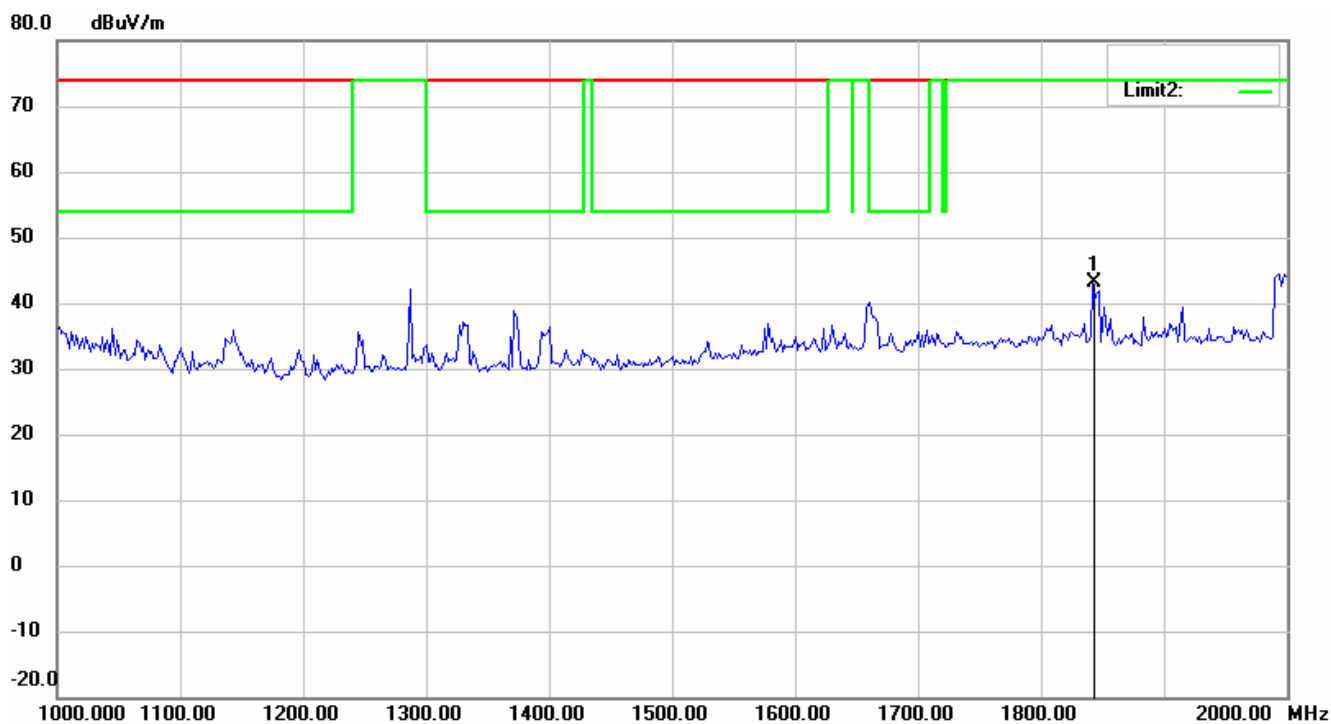




Taiwan ETS Product Service Co., Ltd.

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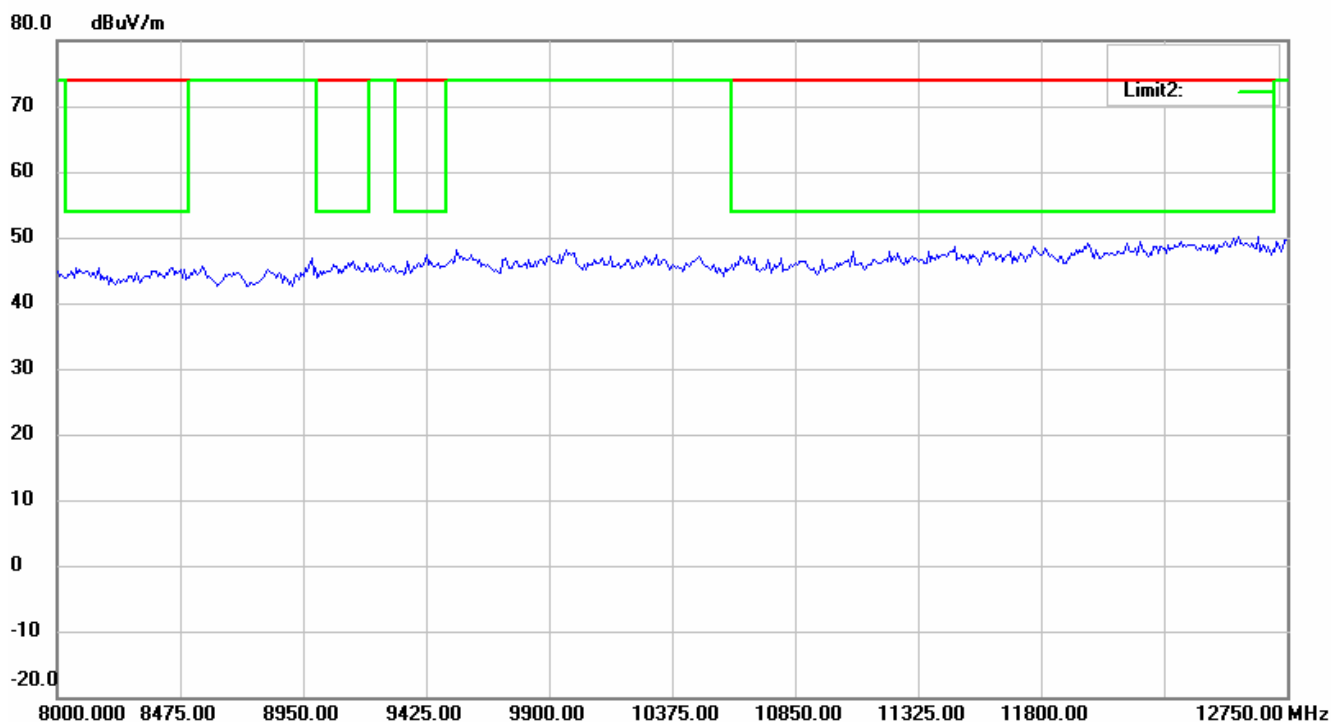
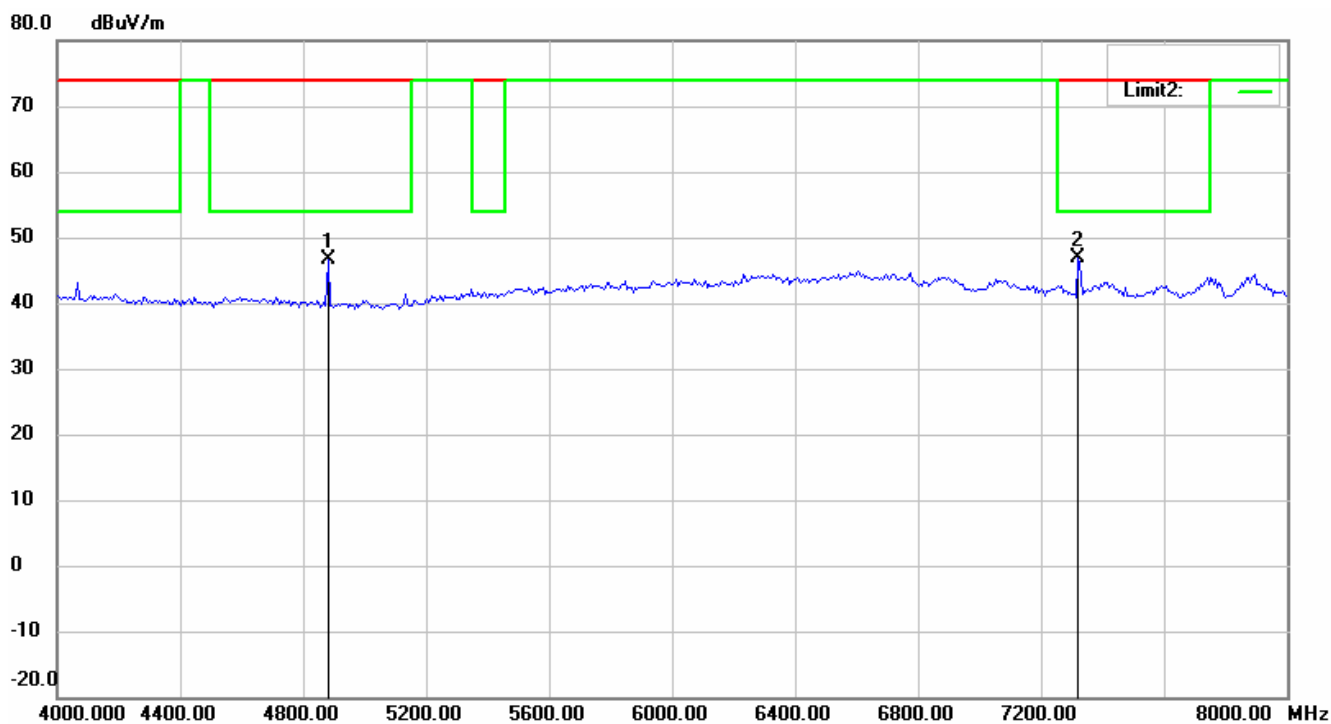




Taiwan ETS Product Service Co., Ltd.

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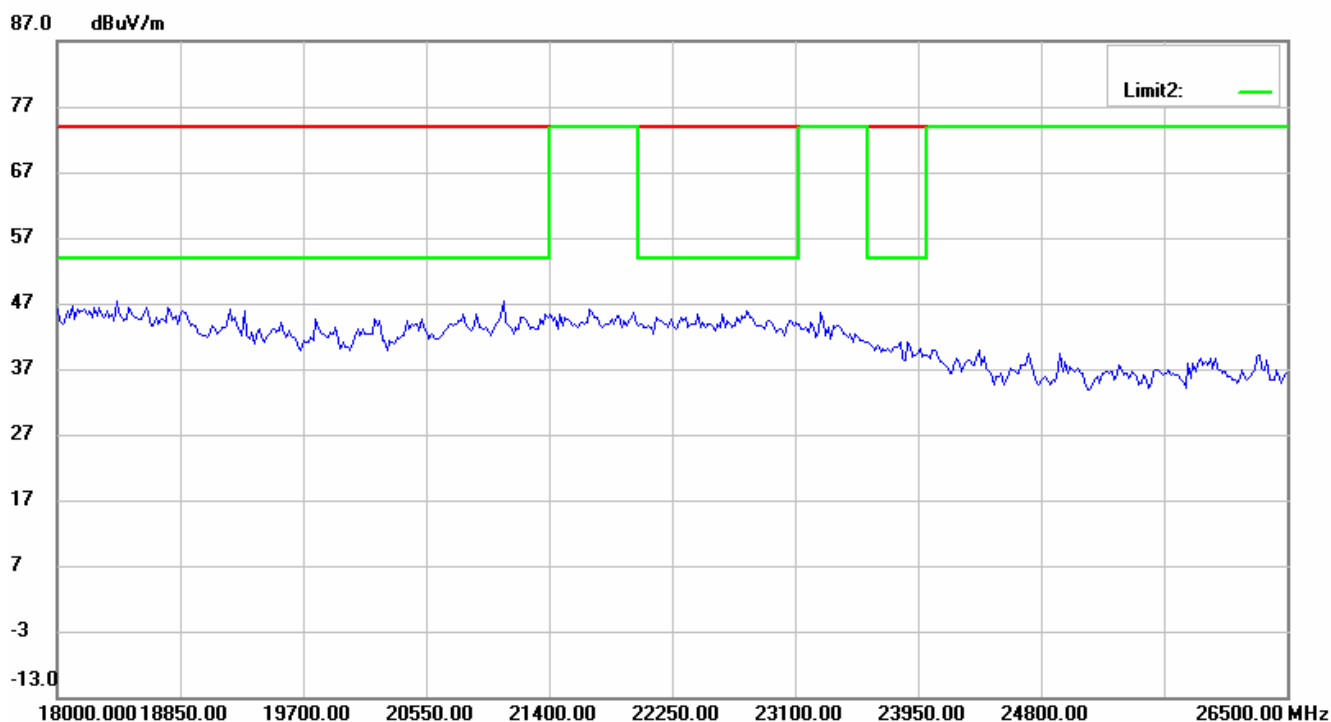
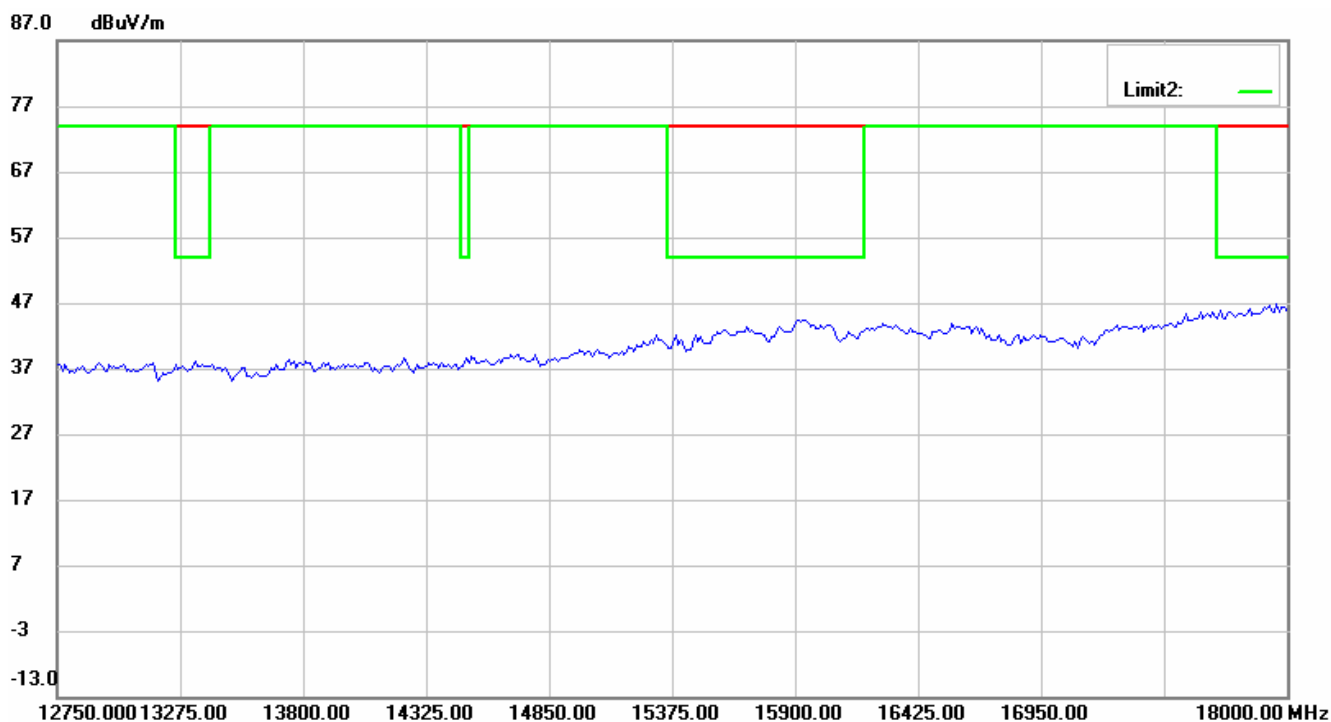
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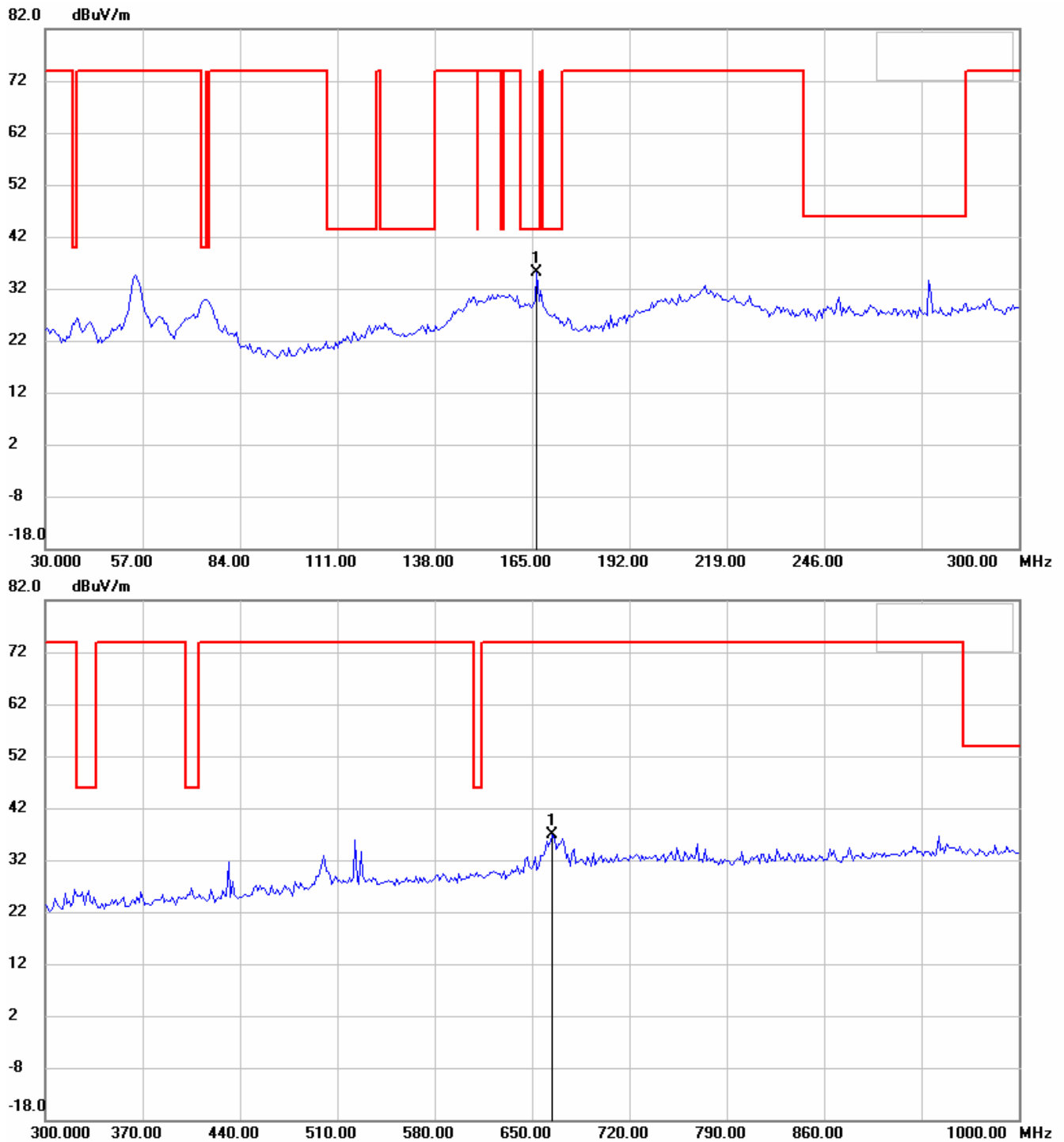




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TX CH78

Antenna Polarization H

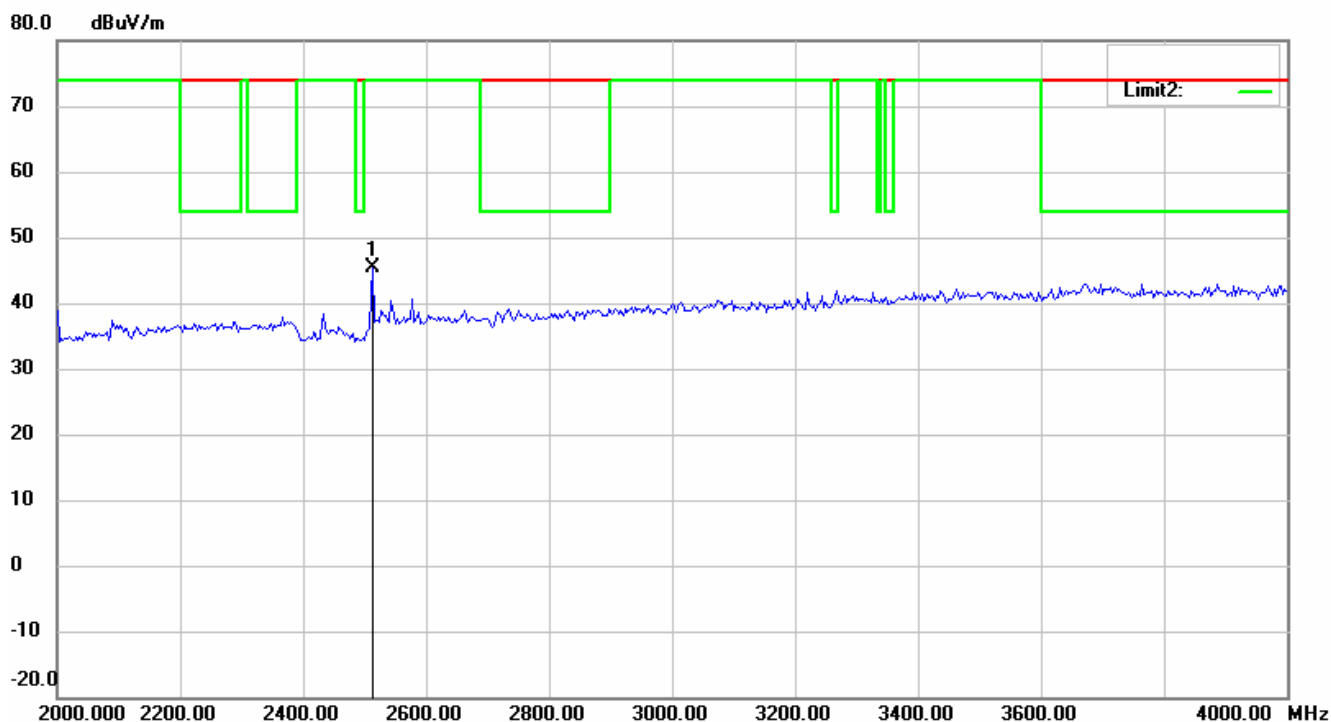
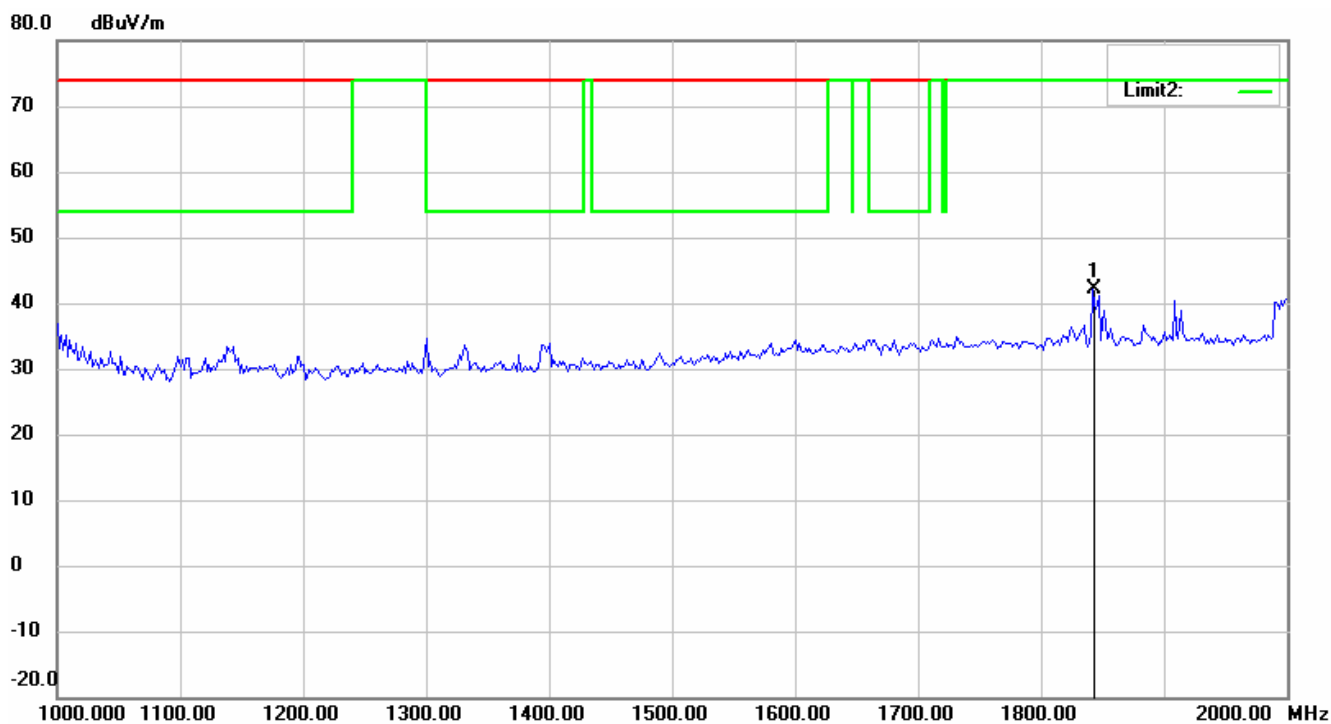




Taiwan ETS Product Service Co., Ltd.

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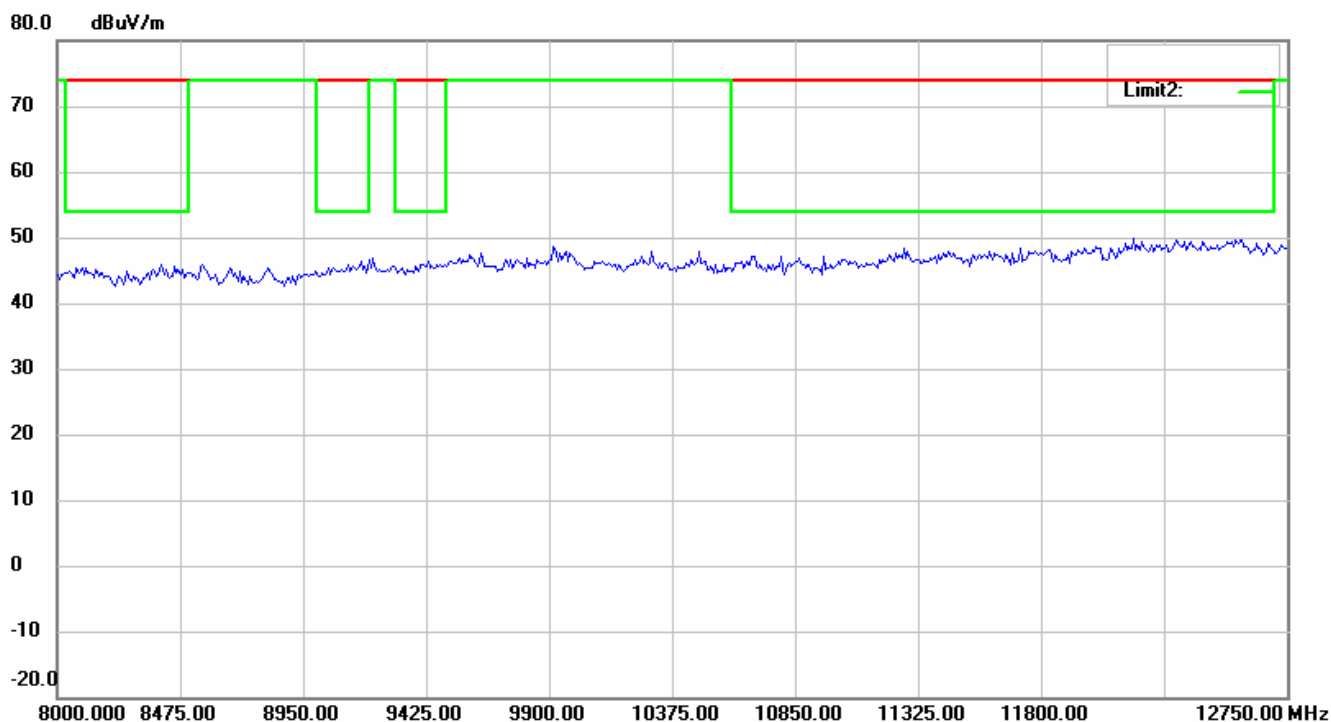
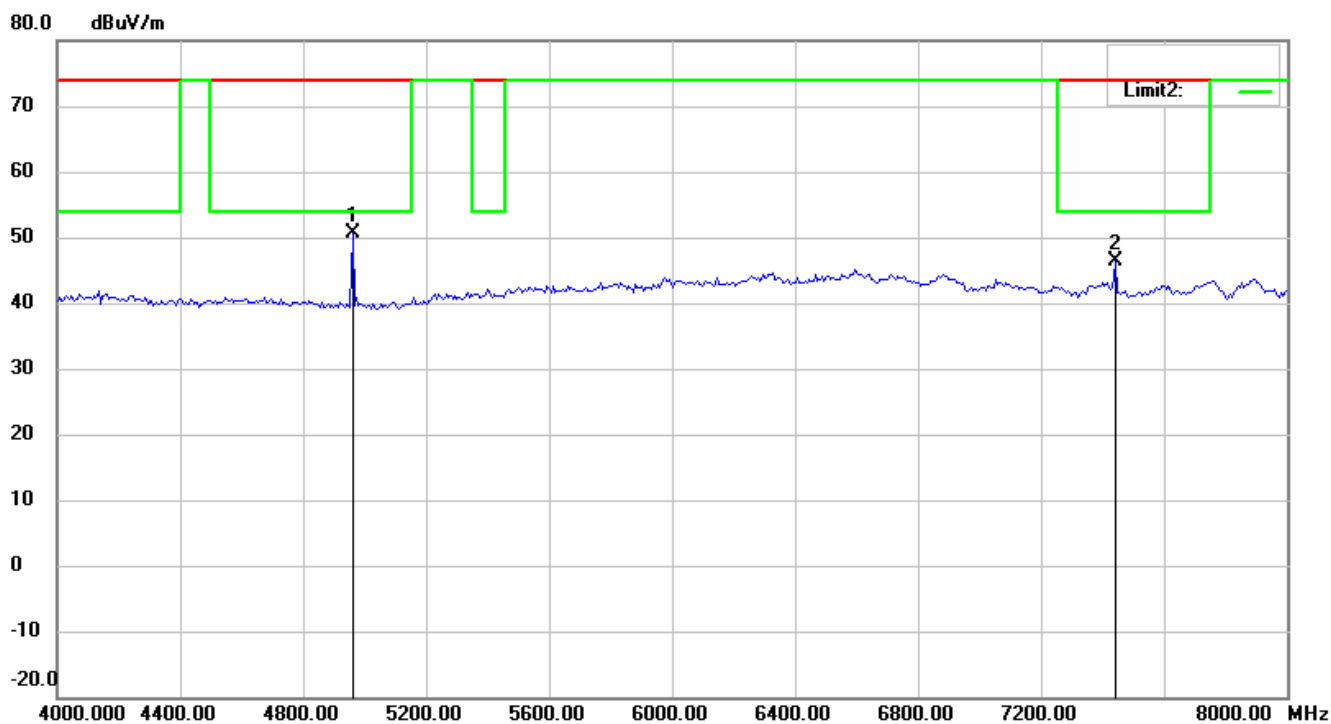




Taiwan ETS Product Service Co., Ltd.

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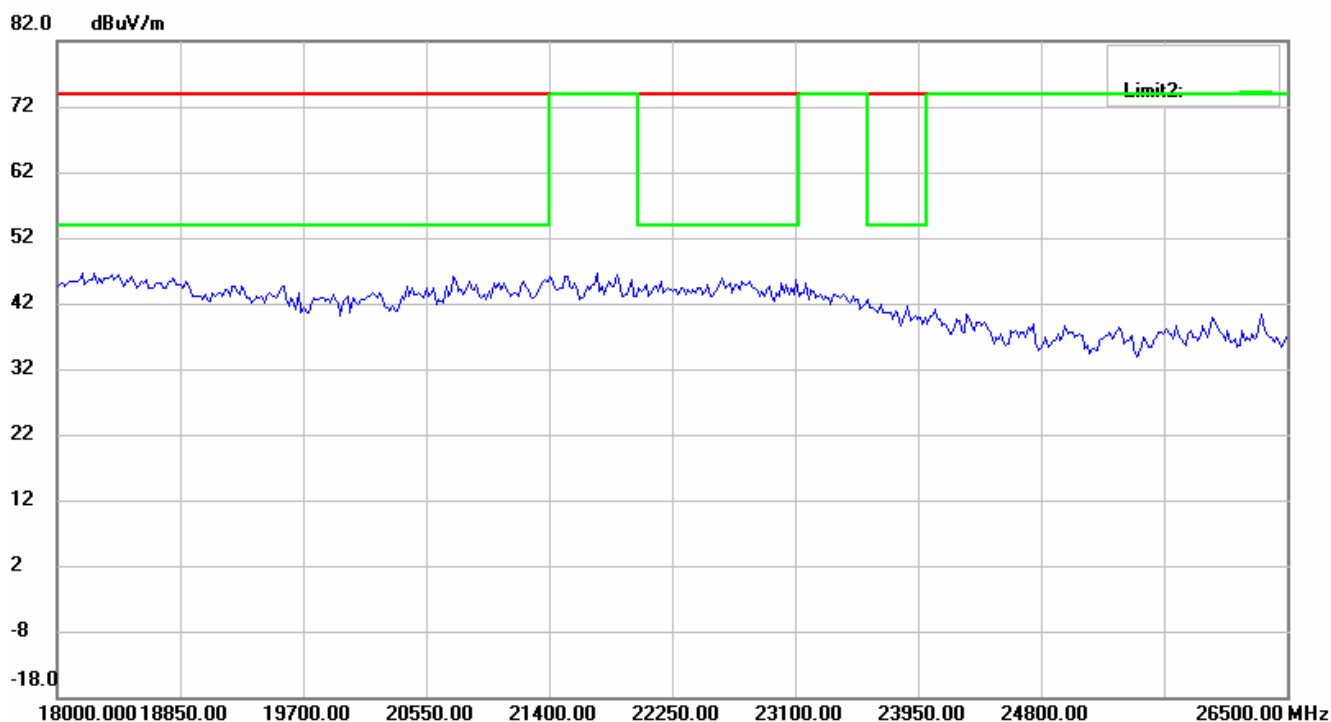
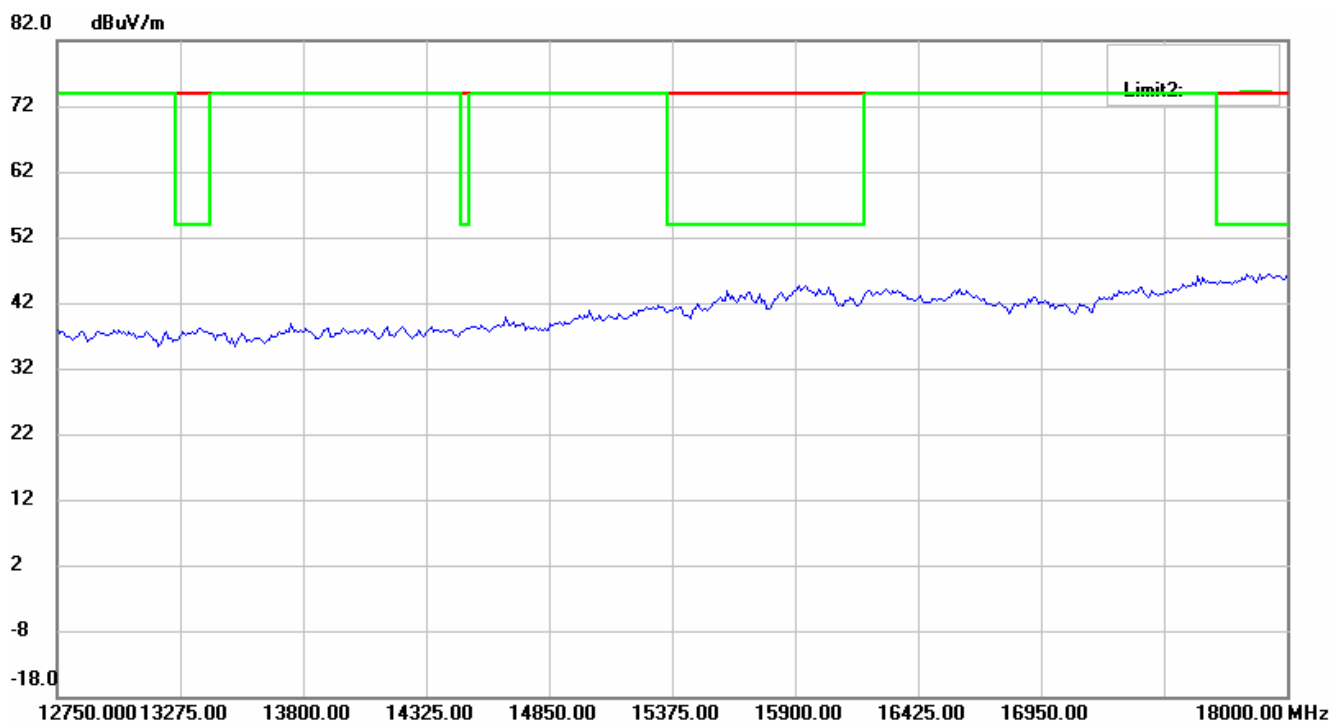




Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15

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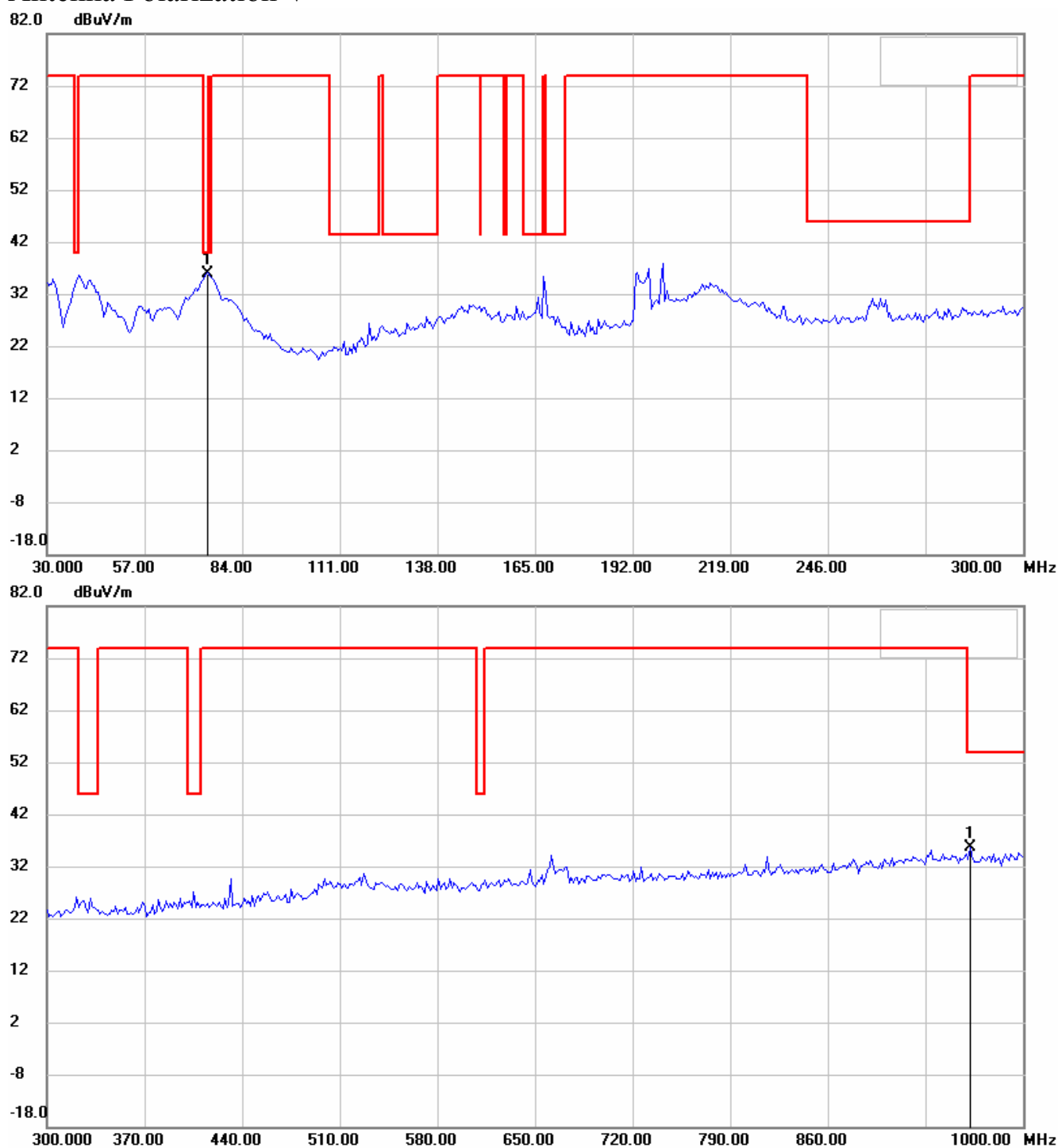




Registration number: W6M20712-8780-P-15

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Antenna Polarization V

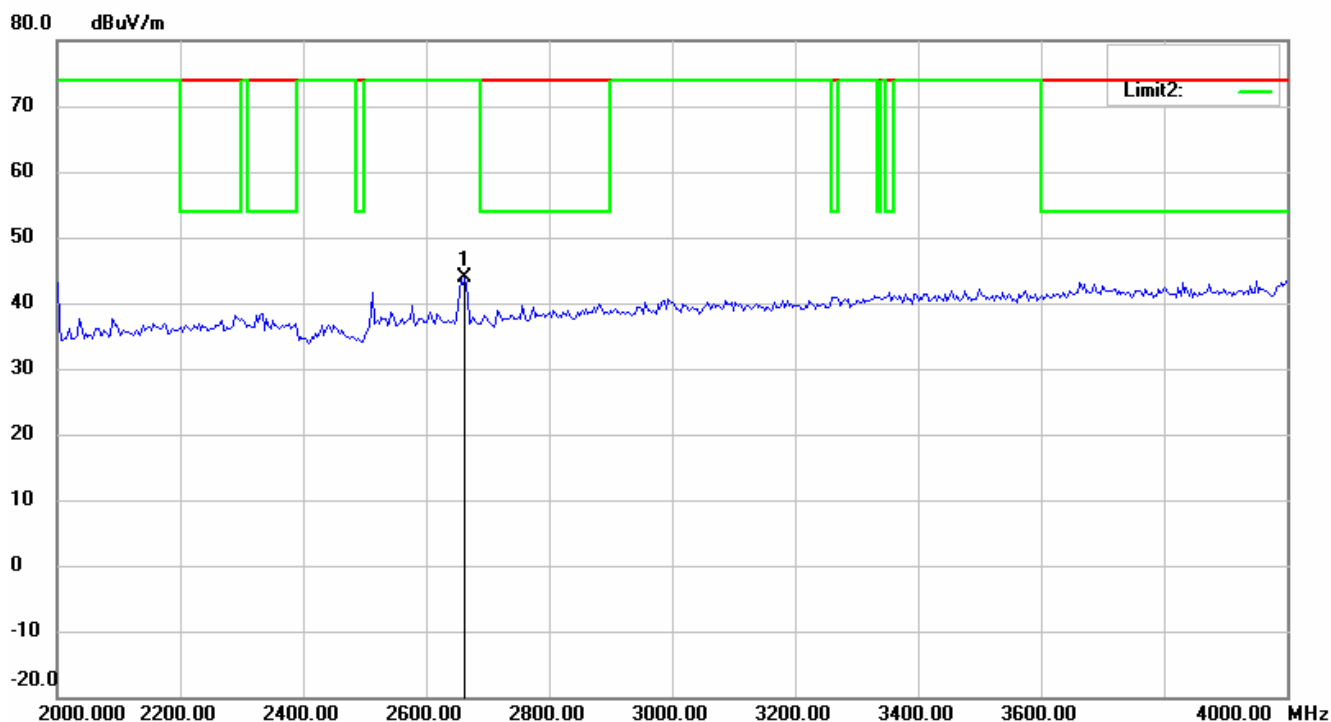
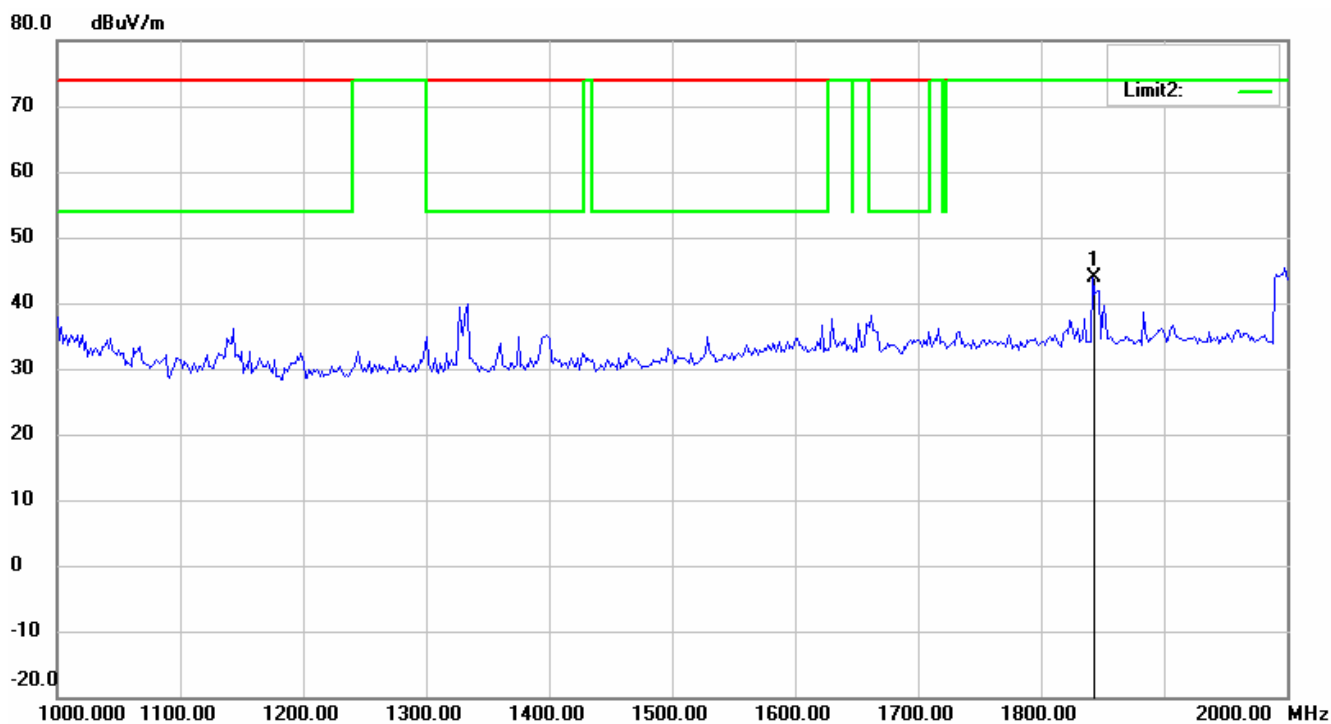




Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15

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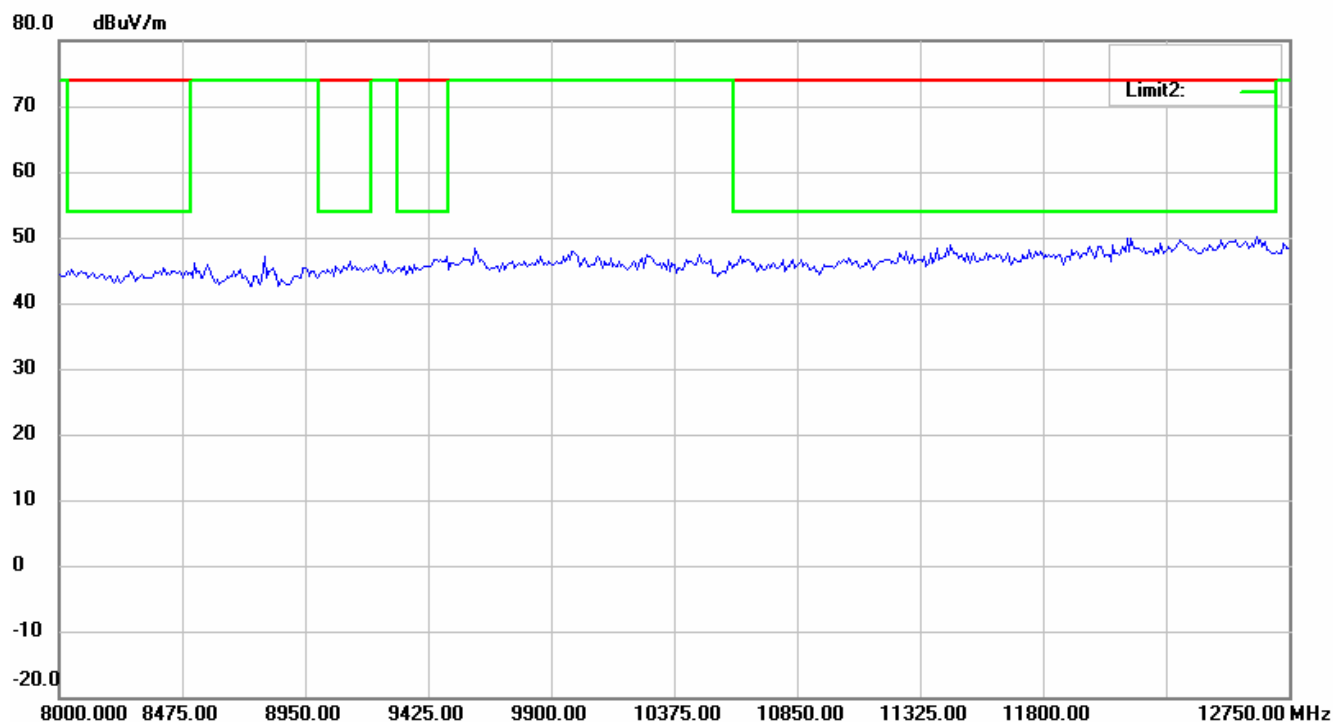
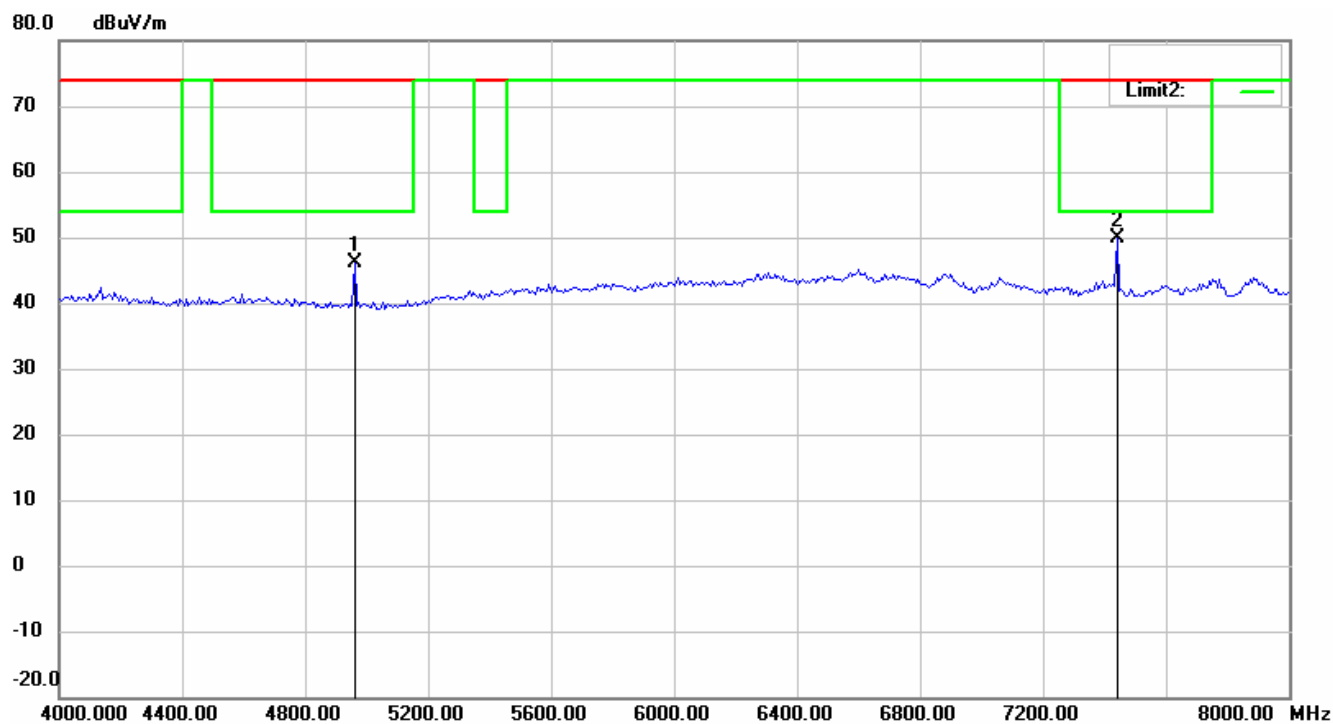




Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15

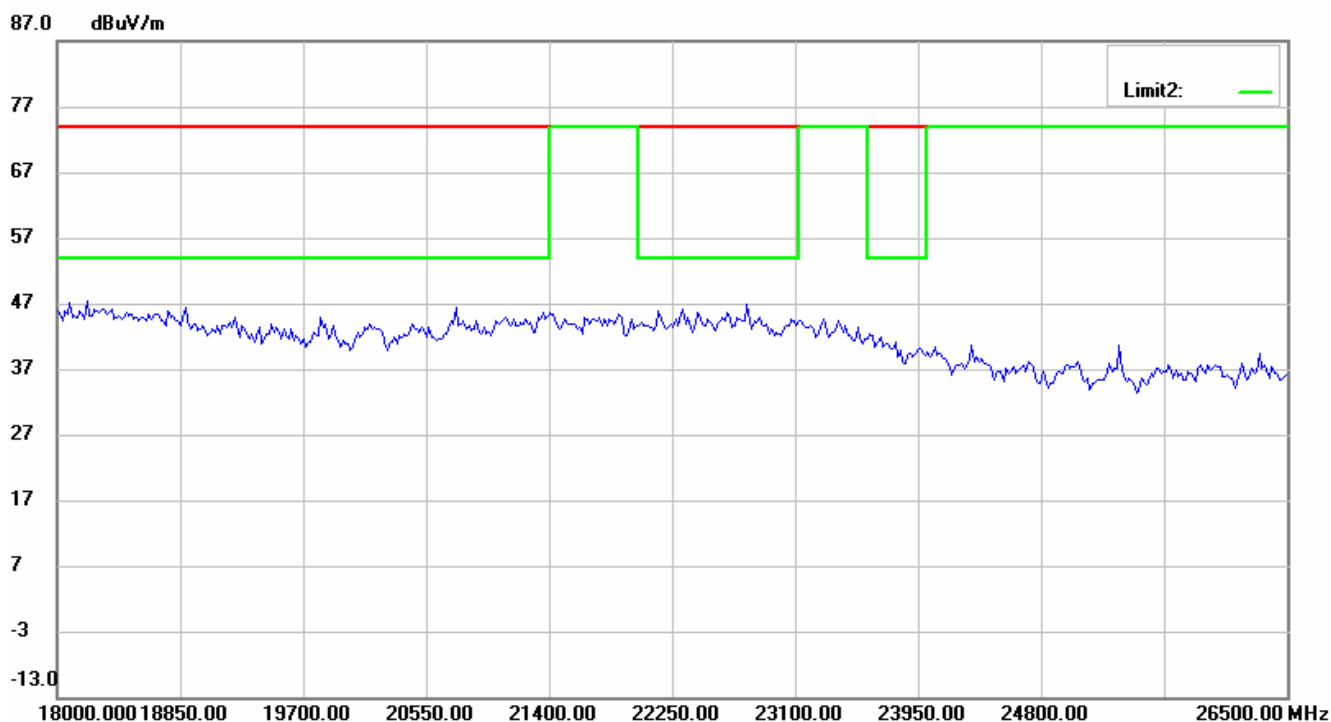
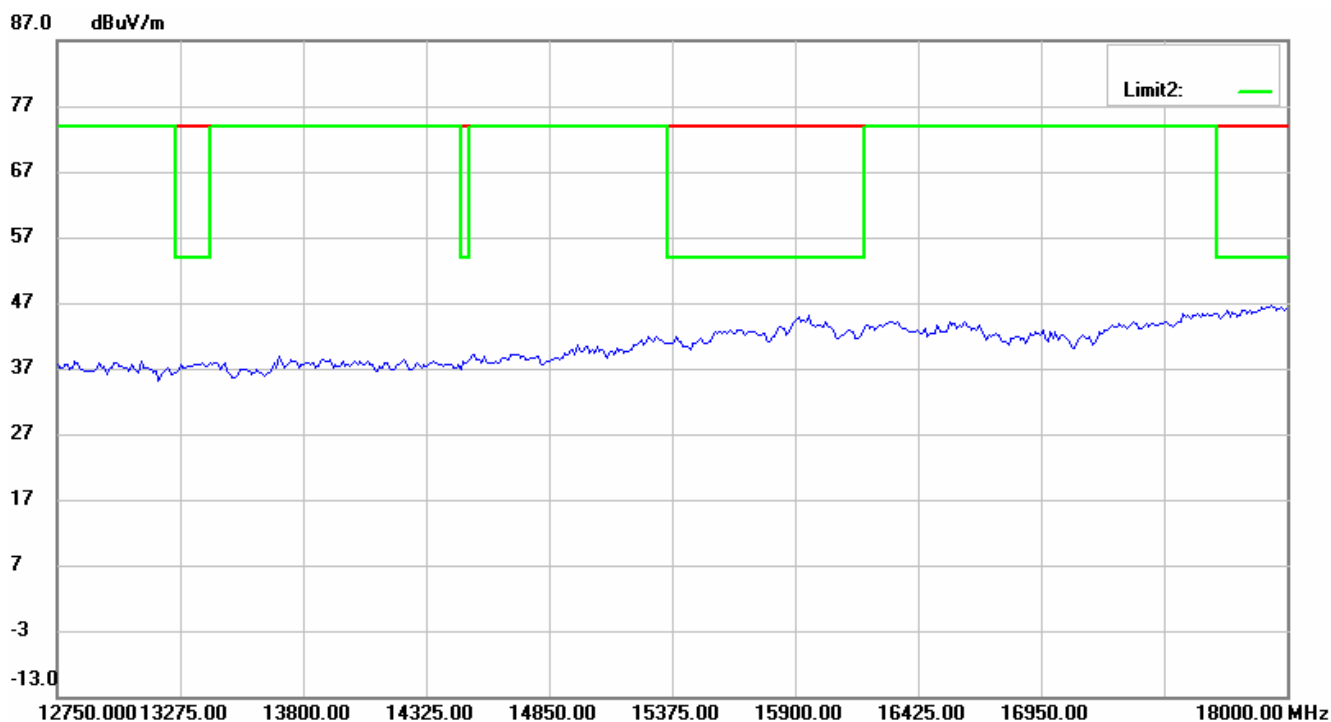
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Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086



Up Line: Peak Limit Line

Down Line: Ave Limit Line

Note:

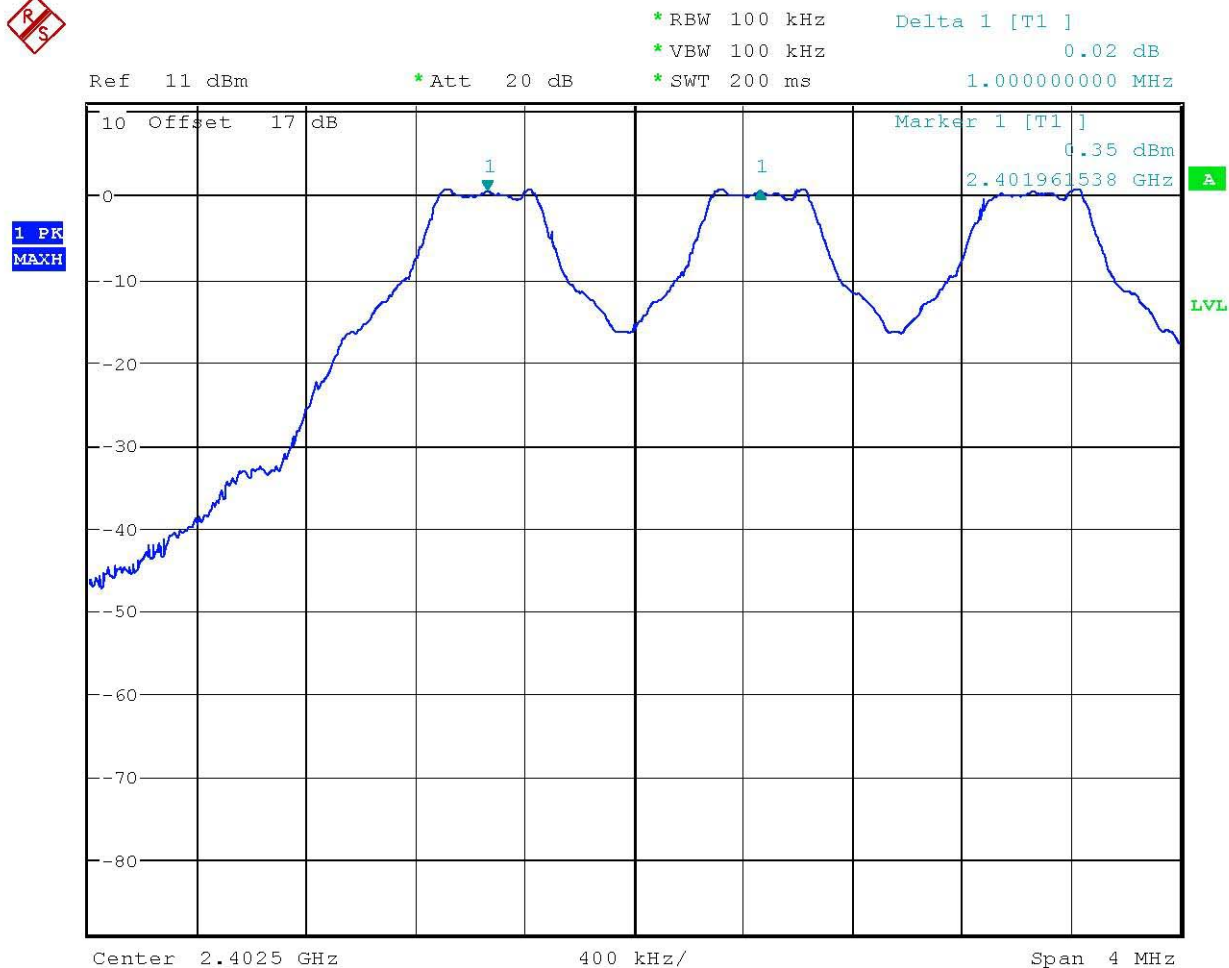
1. The plots are pre-scanned data for determining the tested points and for reference only.
2. The exact test result is shown in the data table of Radiated emission test of this test report.



Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086

Carrier Frequency Separation



FREQUENCY SEPARATION CH0~1

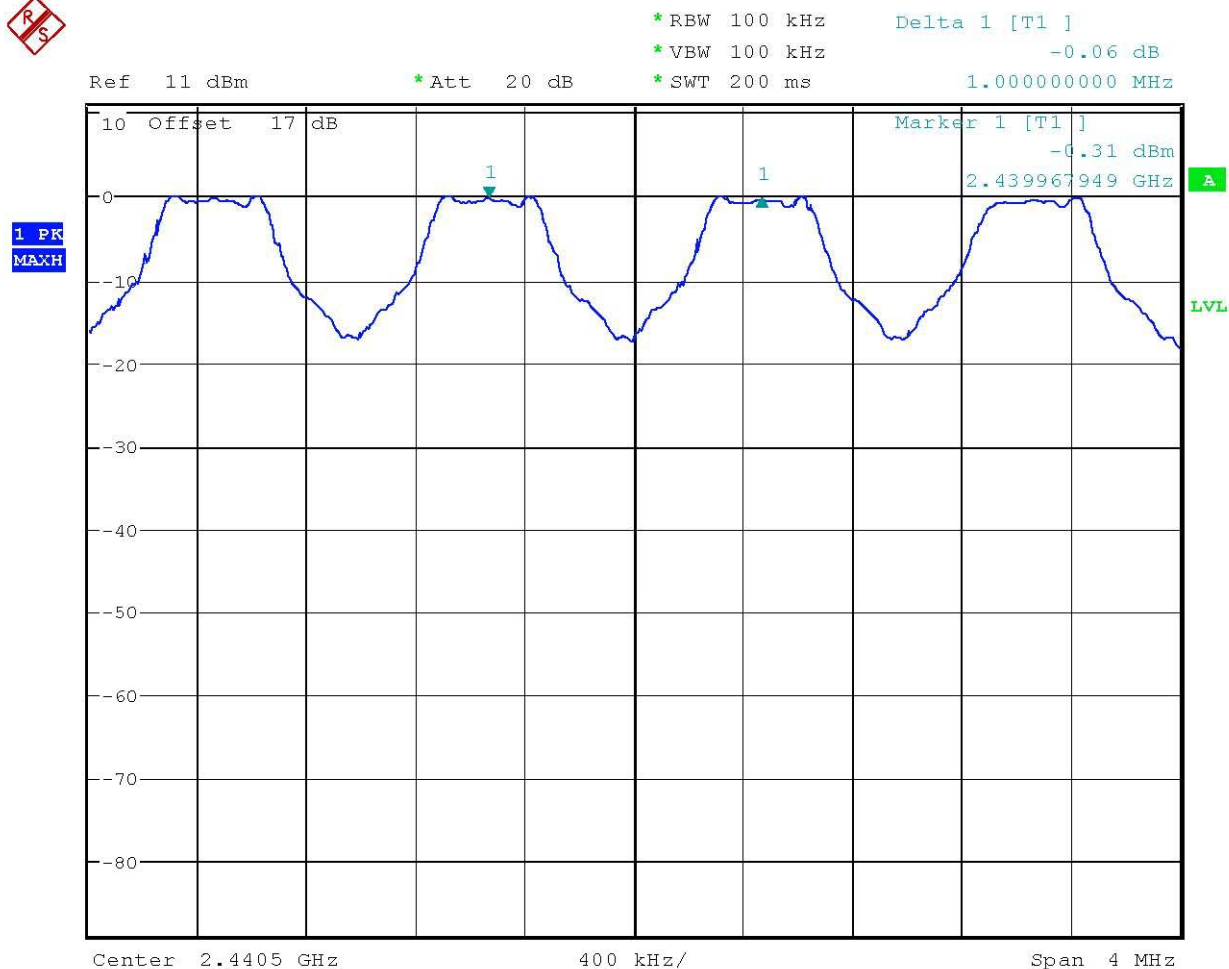
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Taiwan ETS Product Service Co., Ltd.

Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086



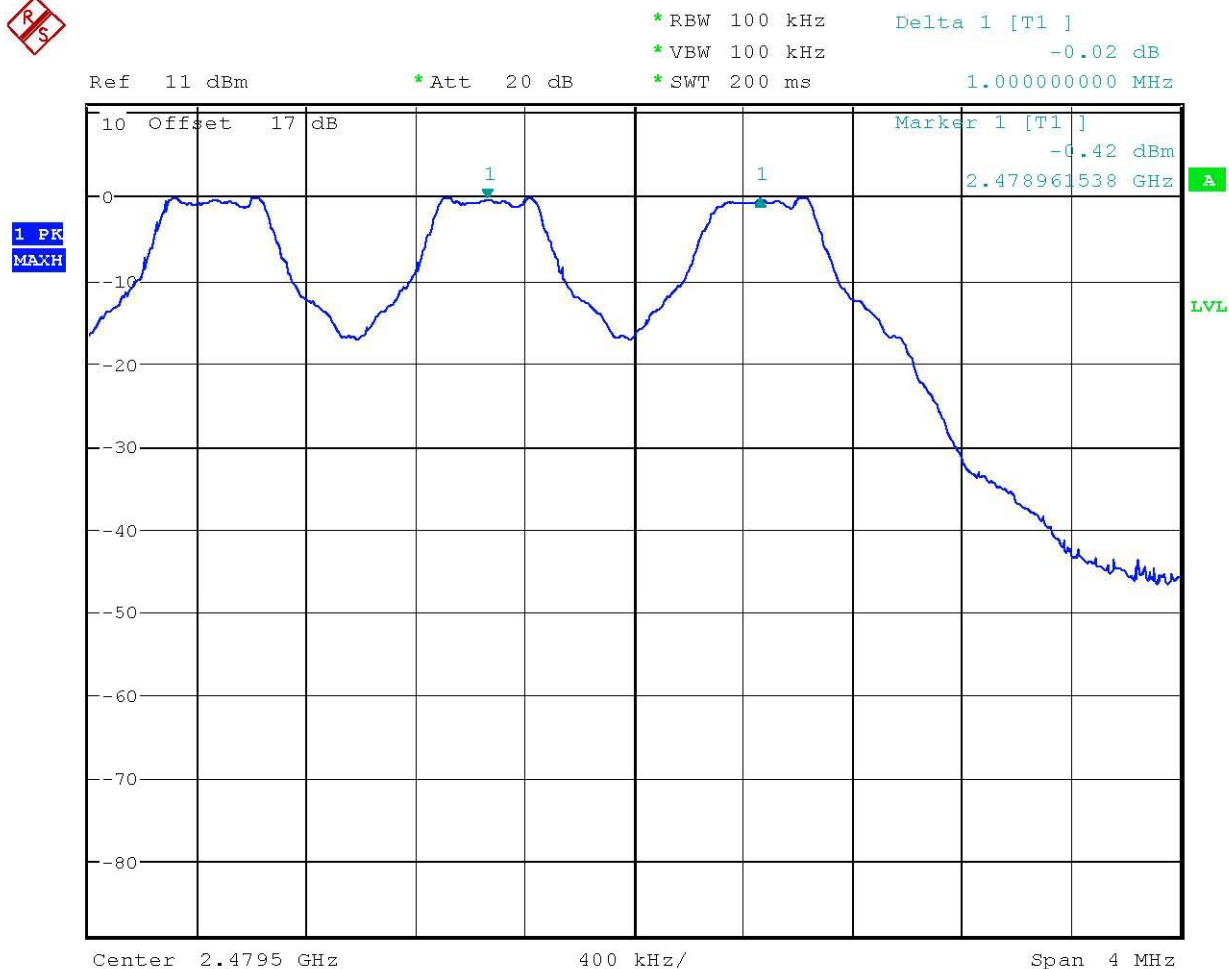
FREQUENCY SEPARATION CH38~39

Date: 30.JAN.2008 09:24:23



Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086



FREQUENCY SEPARATION CH77~78

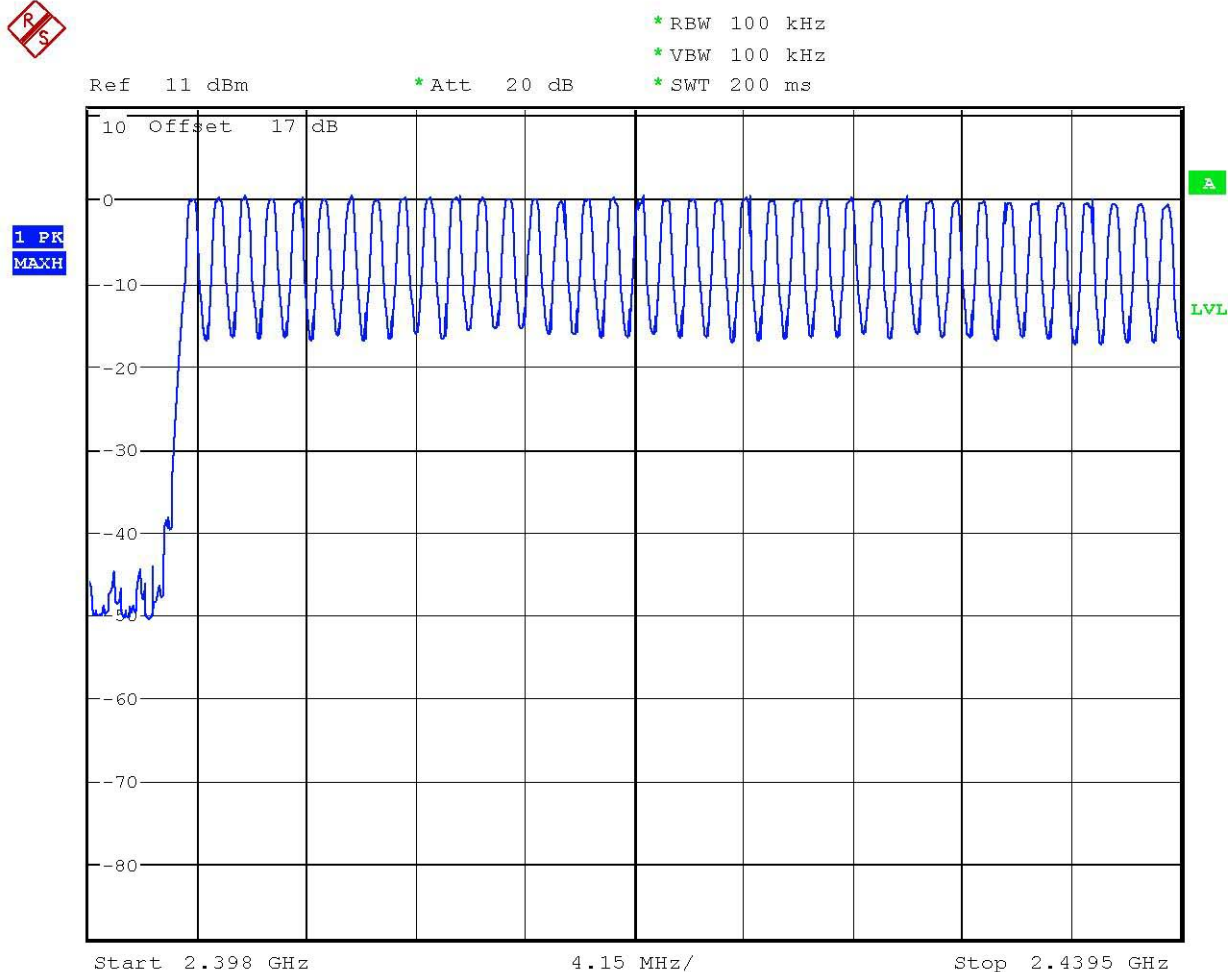
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Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086

Number of Hopping Frequencies



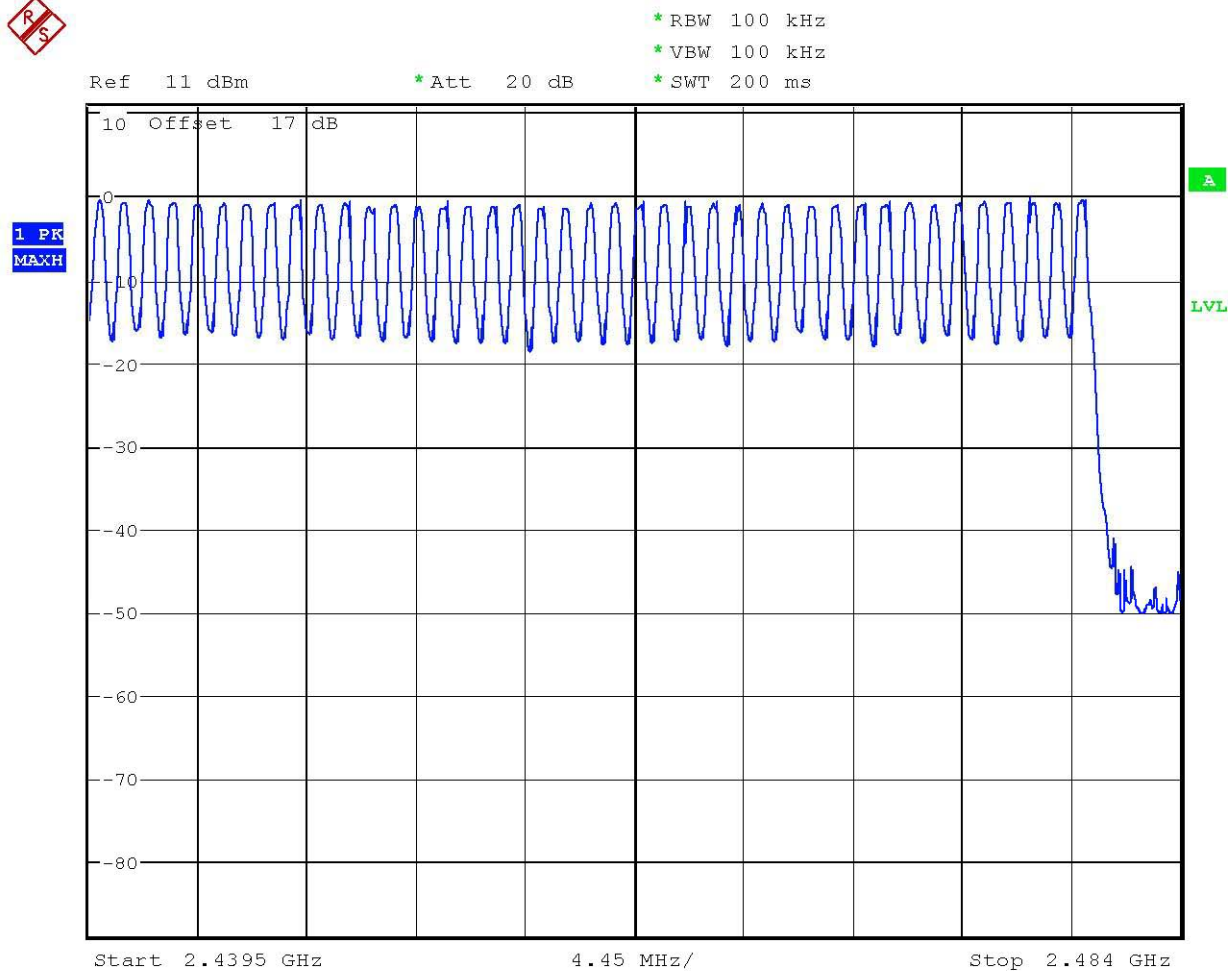
NUMBER OF HOPPING

Date: 30.JAN.2008 09:14:52



Registration number: W6M20712-8780-P-15

FCC ID: QQGBU2086



NUMBER OF HOPPING

Date: 30.JAN.2008 09:18:10