

**FCC PART 15 SUBPART C TEST REPORT**

**for**

**MagicNode**

**Model No.: MN-S02**

**FCC ID: 2ABCKSAILS0000MNS02**

**of**

**Applicant: SAILS Technology Co., Ltd.**

**Address: 10F.-5, NO. 209, SEC. 2, CINGHAI RD,  
TAICHUNG 407 TAIWAN**

**Tested and Prepared**

**by**

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

**FCC Registration No.: 930600**

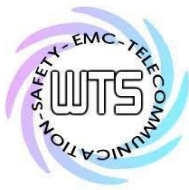
**Industry Canada filed test laboratory Reg. No. IC 5679A-1**

**A2LA Accredited No.: 2732.01**



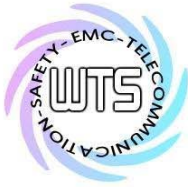
**Report No.: W6M21311-13643-C-1**

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



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

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

## **1 General Information**

### **1.1 Notes**

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

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

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

Neither is there any guarantee that such a test sample will interwork with other genuinely open systems.

The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that its performance generally conforms to representative cases of communications equipment.

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

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

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

#### **Specific Conditions:**

Usage of the hereunder tested device in combination with other integrated or external antennas requires at least additional output power measurements, spurious emission measurements, conducted emission measurements (AC supply lines) and radio frequency exposure evaluations for each individual configuration performed, for certification by FCC.

#### **Tester:**

December 03, 2013

Spencer Yang

Date

WTS-Lab.

Name

Signature

#### **Technical responsibility for area of testing:**

December 03, 2013

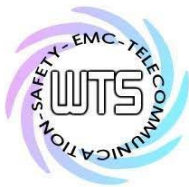
Kevin Wang

Date

WTS

Name

Signature



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

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## **1.2 Testing laboratory**

### **1.2.1 Location**

OATS

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

3 meter semi-anechoic chamber

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

TEL:886-2-6613-0228

FAX:886-2-2791-5046

Company

Worldwide Testing Services(Taiwan) Co., Ltd.

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

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

Tel : 886-2-66068877

Fax : 886-2-66068879

### **1.2.2 Details of accreditation status**

Accredited testing laboratory

A2LA accredited number: 2732.01

FCC filed test laboratory Reg. No. 930600

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



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

Name: ./.

Accredited number: ./.

Street: ./.

Town: ./.

Country: ./.

Telephone: ./.

Fax: ./.

## **1.3 Details of approval holder**

Name: SAILS Technology Co., Ltd.

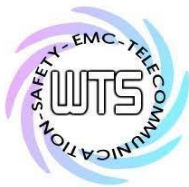
Street: 10F.-5, NO. 209, SEC. 2, CINGHAI RD,

City: TAICHUNG 407

Country: TAIWAN

Telephone: 04-27066547

Fax: ./.



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## **1.4 Application details**

Date of receipt of test item: November 14, 2013

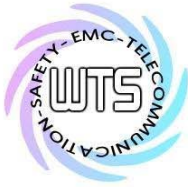
Date of test: from November 15, 2013 to December 03, 2013

## **1.5 General information of Test item**

Type of test item: MagicNode  
Model Number: MN-S02  
Brand Name: SAILS  
Multi-listing model number: ./.  
Photos: see Appendix

### **Technical data**

Frequency band: 2402 MHz – 2480 MHz  
Frequency ( ch 0 or A): 2402 MHz  
Frequency ( ch 19 or B): 2440 MHz  
Frequency ( ch 39 or C): 2480 MHz  
Number of Channels: 40  
Operation modes: Duplex  
Modulation Type: GFSK  
  
Fixed point-to-point operation: ☐ Yes / ☒ No  
Type of Antenna: PCB antenna  
Antenna gain: -3.96 dBi  
Power supply: Battery: 3VDC (CR2477)  
Emission designator: 1M25G1D



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

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Host device: none

Classification :

Fixed Device	<input type="checkbox"/>
Mobile Device (Human Body distance > 20cm)	<input type="checkbox"/>
Portable Device (Human Body distance < 20cm)	<input checked="" type="checkbox"/>

## **Transmitter**

## **Unom**

**Power ( ch 0 or A):** Conducted: -1.64 dBm  
**Power ( ch 19 or B):** Conducted: -1.72 dBm  
**Power ( ch 39 or C):** Conducted: -1.99 dBm

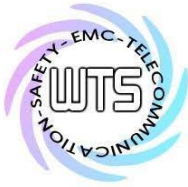
## **Manufacturer: (if applicable)**

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

Additional information: ./.

## **1.6 Test standards**

Technical standard : FCC RULES SUBPART C § 15.247 (2011-10)



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## **2 Technical test**

### **2.1 Summary of test results**

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



**or**

The deviations as specified in 2.5 were ascertained in the course of the tests performed.



### **2.2 Test environment**

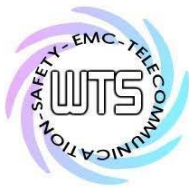
Temperature: 23 °C

Relative humidity content: 20 ... 75 %

Air pressure: 86 ... 103 kPa

Power supply: Battery: 3VDC (CR2477)

Extreme conditions parameters: ./.



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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	2013/9/2	2014/9/1
ETSTW-CE 003	AC POWER SOURCE	APS-9102	D161137	GW	Function Test	
ETSTW-CE 004	ZWEILEITER-V- NETZNACHBILDUNG TWO-LINE V-NETWORK	ESH3-Z5	840731/011	R&S	2012/12/21	2013/12/20
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	2013/3/4	2014/3/3
ETSTW-CE 008	HF-EICHLITUNG RF STEP ATTENUATOR 139dB DPSP	334.6010.02	844581/024	R&S	Function Test	
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2013/7/10	2014/7/9
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2013/9/2	2014/9/1
ETSTW-RE 005	EMI TEST RECEIVER	ESVS10	843207/020	R&S	2013/9/2	2014/9/1
ETSTW-RE 012	TUNABLE BANDREJECT FILTER	D.C 0309	146	K&L	Function Test	
ETSTW-RE 013	TUNABLE BANDREJECT FILTER	D.C 0336	397	K&L	Function Test	
ETSTW-RE 018	MICROWAVE HORN ANTENNA	AT4560	27212	AR	2013/10/15	2014/10/14
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	ETS-Lindgren	2013/7/3	2014/7/2
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	EMCO	2013/3/4	2014/3/3
ETSTW-RE 045	ESA-E SERIES SPECTRUM ANALYZER	E4404B	MY45111242	Agilent	Pre-test Use	
ETSTW-RE 049	TRILOG Super Broadband test Antenna	VULB 9160	9160-3185	Schwarzbeck	2013/3/21	2014/3/20
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2013/3/4	2014/3/3
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2013/3/4	2014/3/3
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2013/3/4	2014/3/3
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2013/5/31	2014/5/30
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2013/3/4	2014/3/3
ETSTW-RE 062	Amplifier Module	CHC 2	None	KMIC	2013/11/27	2014/11/26
ETSTW-RE 064	Bluetooth Test Set	MT8852B-042	6K00005709	Anritsu	Function Test	
ETSTW-RE 069	Double-Ridged Guide Horn Antenna	3117	00069377	EMCO	Function Test	
ETSTW-RE 072	CELL SITE TEST SET	8921A	3339A00375	HP	2013/10/7	2014/10/6
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2013/10/11	2014/10/10
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2013/3/4	2014/3/3
ETSTW-RE 106	Humidity Temperature Meter	TES-1366	091011113	TES	2013/11/27	2014/11/26
ETSTW-RE 111	TRILOG Super Broadband test Antenna	VULB 9160	9160-3309	Schwarz beck	2012/12/13	2013/12/12
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	None	T-Power	Function test	
ETSTW-RE 115	2.4GHz Notch Filter	N0124411	473874	MICROWAVE CIRCUITS	2013/1/11	2014/1/10
ETSTW-RE 120	RF Player	MP9200	MP9210-111022	ADIVIC	Function test	
ETSTW-RE 122	SIGNAL GENERATOR	SMF100A	102149	R&S	2013/6/28	2014/6/27





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ETSTW-RE 125	5GHz Notch filter	5NSL11-5200/E221.3-O/O	1	K&L Microwave	2013/8/16	2014/8/15
ETSTW-RE 126	5GHz Notch filter	5NSL11-5800/E221.3-O/O	1	K&L Microwave	2013/8/16	2014/8/15
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2013/3/4	2014/3/3
ETSTW-RE 128	5.3GHz Notch filter	N0153001	SN487233	Microwave Circuits	2013/8/13	2014/8/12
ETSTW-RE 129	5.5GHz Notch filter	N0555984	SN487234	Microwave Circuits	2013/8/13	2014/8/12
ETSTW-RE 130	Handheld RF Spectrum Analyzer	N9340A	CN0147000204	Agilent	Pre-test Use	
ETSTW-GSM 002	Universal Radio Communication Tester	CMU 200	109439	R&S	2013/10/7	2014/10/6
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40 /12+9SS	3	WI	2013/1/11	2014/1/10
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2013/1/11	2014/1/10
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2013/1/11	2014/1/10
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2013/1/11	2014/1/10
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2013/9/18	2014/9/17
ETSTW-Cable 010	BNC Cable	5 M BNC Cable	None	JYE BAO CO.,LTD.	2013/3/4	2014/3/3
ETSTW-Cable 011	BNC Cable	BNC Cable 1	None	JYE BAO CO.,LTD.	Pre-test Use NCR	
ETSTW-Cable 012	N TYPE To SMA Cable	Cable 012	None	JYE BAO CO.,LTD.	2013/3/4	2014/3/3
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2013/3/4	2014/3/3
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2013/3/4	2014/3/3
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2013/3/4	2014/3/3
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2013/3/4	2014/3/3
ETSTW-Cable 022	N TYPE Cable	5006	0002	JYE BAO CO.,LTD.	2013/3/26	2014/3/25
ETSTW-Cable 026	Microwave Cable	SUCOFLEX 104	279075	HUBER+SUHNER	2013/3/4	2014/3/3
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2013/3/4	2014/3/3
ETSTW-Cable 028	Microwave Cable	FA147A0015M2020	30064-2	UTIFLEX	2013/10/11	2014/10/10
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2013/10/11	2014/10/10
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 (S_Cable 9)	279067	HUBER+SUHNER	2013/3/4	2014/3/3
ETSTW-Cable 031	Microwave Cable	SUCOFLEX 104 (S_Cable 10)	238092	HUBER+SUHNER	2013/11/27	2014/11/26
ETSTW-Cable 043	Microwave Cable	SUCOFLEX 104	317576	HUBER+SUHNER	2013/11/27	2014/11/26
ETSTW-Cable 047	Microwave Cable	SUCOFLEX 104	325518	HUBER+SUHNER	2013/11/27	2014/11/26
ETSTW-Cable 053	N TYPE To SMA Cable	RG142	None	JYE BAO CO.,LTD.	2013/3/26	2014/3/25
ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2013/6/20	2014/6/19
WTSTW-SW 002	EMI TEST SOFTWARE	EZ EMC	None	Farad	Version ETS-03A1	



## **2.4 General Test Procedure**

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

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

**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 $\mu$ 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 $\mu$ V + 10.36 dB + 6 dB = 36.36 dB $\mu$ V/m @3m

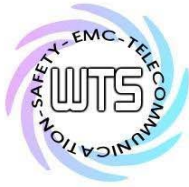
The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m (non metallic table) and arranged according to ANSI C63.4-2009 6.3.1. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to the frequency specified as follows:

- (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 Worldwide Testing Services(Taiwan) Co., Ltd. at the registered open field test site located at No.5-1, Lishui, Shuang Sing Village, Wanli Dist., New Taipei City 207, Taiwan (R.O.C.). The Registration Number: 930600.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.



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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:

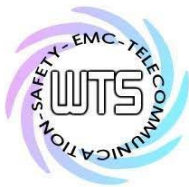
Average = Peak + Duty Factor

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

$T = 100\text{ms}$  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

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



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

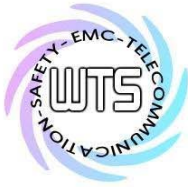
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FCC ID: 2ABCKSAILS0000MNS02

## **3 Test results (enclosure)**

TEST CASE	Para. Number	Required	Test passed	Test failed
Peak Output Power	15.247(b)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Equivalent isotropically radiated Power	15.247(b)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Spurious Emissions radiated – Transmitter operating	15.247(c): 15.209	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Band Edge Measurement	15.247(d)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Minimum 6 dB Bandwidth	15.247(a)(2)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Peak Power Spectral Density	15.247(e)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Radiated Emission from Digital Part	15.109	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power Line Conducted Emission	15.207	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The following is intentionally left blank.



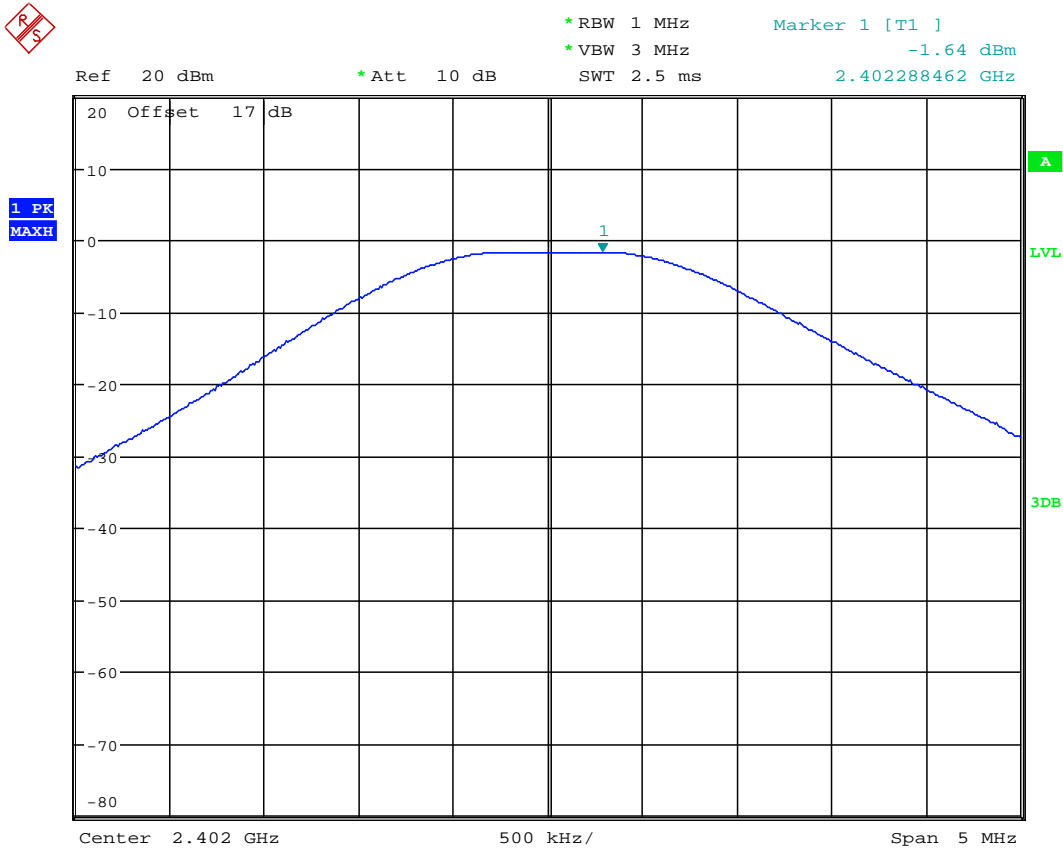
Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

## 3.1 Peak Output Power (transmitter)

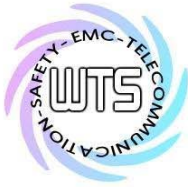
FCC Rule: 15.247(b)(3)

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.

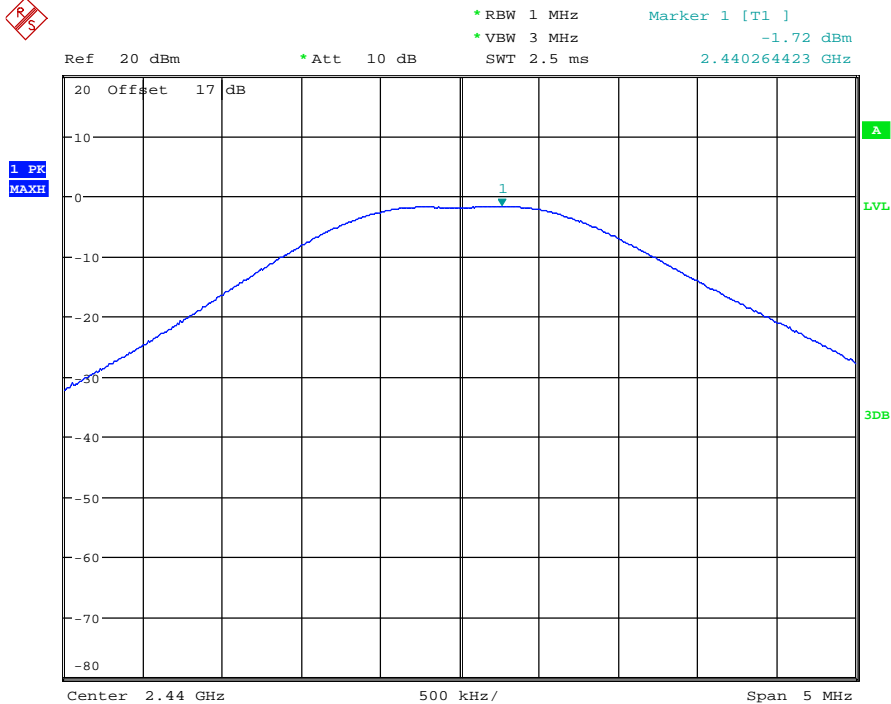


MAX OUTPUT POWER BT4.0 CH00

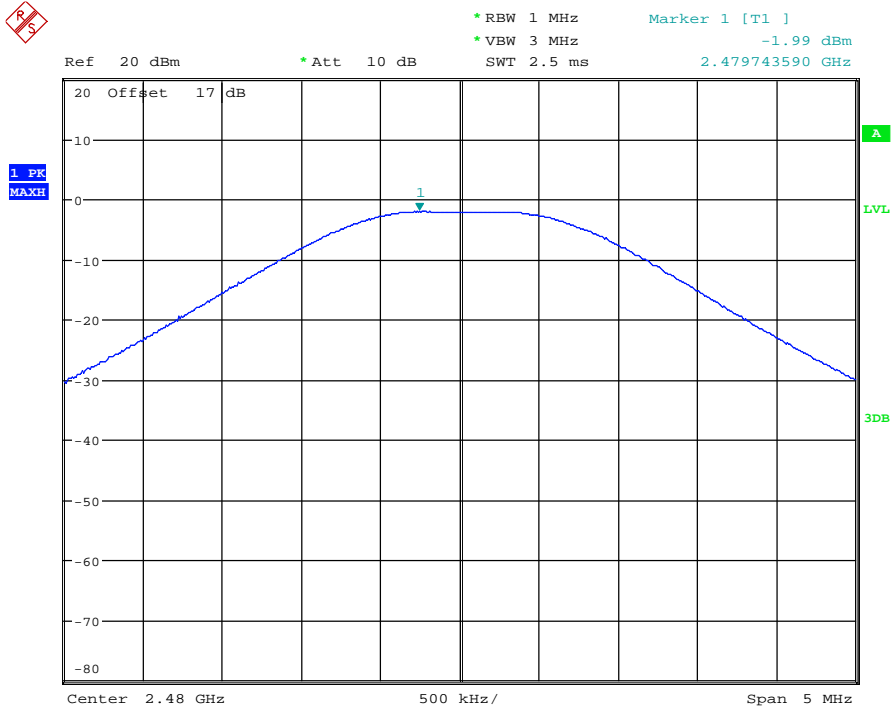
Date: 21.NOV.2013 12:43:14



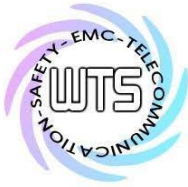
Registration number: W6M21311-13643-C-1  
FCC ID: 2ABCKSAILS0000MNS02



MAX OUTPUT POWER BT4.0 CH19  
Date: 21.NOV.2013 12:44:10



MAX OUTPUT POWER BT4.0 CH39  
Date: 21.NOV.2013 12:44:52



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

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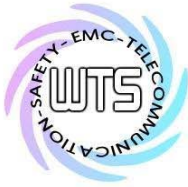
FCC ID: 2ABCKSAILS0000MNS02

Limits:

Frequency MHz	Power dBm
902 - 928	30
2400 – 2483.5	30
5725 – 5850	30

In case of employing transmitter antennas having antenna gain  $> 6$  dBi and using fixed point-to point operation consider §15.247 (b)(4)

Test equipment used: ETSTW-RE 055, ETSTW-RE 050



Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

## **3.2 Equivalent isotropic radiated power**

FCC Rule: 15.247(b)(3)

EIRP = max. conducted output power + antenna gain

$$\begin{aligned} \text{EIRP} &= -1.64\text{dBm} + (-3.96 \text{ dBi}) \\ &= -5.6 \text{ dBm} \end{aligned}$$

Limit: EIRP = +36 dBm for Antenna gain <6dBi

Test equipment used: ETSTW-RE 055

## **3.3 RF Exposure Compliance Requirements**

Conclusion: No Evaluation required if power is below this threshold:

F(GHz)		mW
Low	2.402	24.58
High	2.480	

Maximum measured transmitter power:

Conducted Power	-1.64 dBm (0.6855 mW)
EIRP Power	- 5.6 dBm (0.2754 mW)

- The antenna is PCB antenna, antenna gain is -3.96 dBi.

Threshold for no SAR evaluation is 24.58 mW.

Conclusion: No SAR evaluation required since Transmitter output power is below FCC threshold.





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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 26500 MHz.

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

Frequency  $\leq$  1 GHz, RBW:100 kHz, VBW: 100 kHz (Peak measurements)

Frequency  $>$  1 GHz, RBW: 1 MHz, VBW: 1 MHz (Peak measurements)

Frequency  $>$  1 GHz , RBW:1 MHz , VBW: 10 Hz (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	500	54.0

For frequencies above 1GHz (Average measurements).

Guidance on Measurement of Digit Transmission Systems:

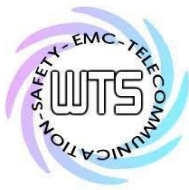
“If the emission is pulsed, modify the unit for continuous operation, use the setting shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.”

The correction factor, based on the total channel dwell time in a 100 ms period, may be mathematically applied to a measurement made with an average detector, to further reduce the value.

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

Note: No duty cycle correction was added to the reading of this EUT.

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))

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 above 1GHz (Peak measurements).

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

For frequencies above 1GHz (Average measurements).

Max. reading – 20dB

Max. reading – 20 dB

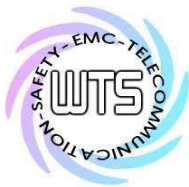
Guidance on Measurement of Digit Transmission Systems:

“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.”

The correction factor, based on the total channel dwell time in a 100 ms period, may be mathematically applied to a measurement made with an average detector, to further reduce the value.

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

Note: No duty cycle correction was added to the reading of EUT.



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SAMPLE CALCULATION OF LIMIT. All results will be updated by an automatic measuring system in accordance with 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 and 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 "Correction Factor".

## Summary table with radiated data of the test plots

Model: MN-S02

Date: 2013/11/22

Mode: TX Bluetooth 4.0 CH0

Temperature: 24 °C

Engineer: Roy

Polarization: Horizontal

Humidity: 60 %

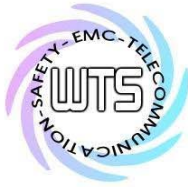
Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
148.5772	4.27	peak	15.26	19.53	43.50	-23.97	95	100
863.9280	5.09	peak	26.72	31.81	46.00	-14.19	240	100

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave.			
4804.0000	42.53	---	0.45	42.98	---	74.00	54.00	-31.02	90	100
7206.0000	40.35	---	4.01	44.36	---	74.00	54.00	-29.64	310	100
9608.0000	34.00	---	9.14	43.14	---	74.00	54.00	-30.86	240	100
12010.0000	33.34	---	13.41	46.75	---	74.00	54.00	-27.25	110	100

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
160.2405	3.86	peak	15.24	19.10	43.50	-24.40	25	100
568.4568	5.08	peak	22.00	27.08	46.00	-18.92	130	100

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave.			
4804.0000	42.76	---	0.45	43.21	---	74.00	54.00	-30.79	40	100
7206.0000	41.44	---	4.01	45.45	---	74.00	54.00	-28.55	155	100
9608.0000	35.09	---	9.14	44.23	---	74.00	54.00	-29.77	70	100
12010.0000	33.17	---	13.41	46.58	---	74.00	54.00	-27.42	325	100



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

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

Mode: TX Bluetooth 4.0 CH19

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
150.5210	3.69	peak	15.29	18.98	43.50	-24.52	165	100
768.6774	4.65	peak	25.31	29.96	46.00	-16.04	110	100

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave			
4880.0000	41.90	---	0.62	42.52	---	74.00	54.00	-31.48	165	100
7320.0000	41.26	---	4.23	45.49	---	74.00	54.00	-28.51	285	100
9760.0000	34.94	---	9.58	44.52	---	74.00	54.00	-29.48	340	100
12200.0000	31.93	---	14.93	46.86	---	74.00	54.00	-27.14	135	100

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
150.5210	3.73	peak	15.29	19.02	43.50	-24.48	75	100
809.4990	4.46	peak	26.10	30.56	46.00	-15.44	220	100

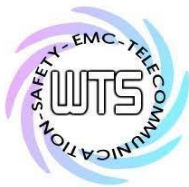
Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave			
4880.0000	42.11	---	0.62	42.73	---	74.00	54.00	-31.27	225	100
7320.0000	40.57	---	4.23	44.80	---	74.00	54.00	-29.20	100	100
9760.0000	34.46	---	9.58	44.04	---	74.00	54.00	-29.96	145	100
12200.0000	32.39	---	14.93	47.32	---	74.00	54.00	-26.68	25	100

Mode: TX Bluetooth 4.0 CH39

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
158.2966	3.68	peak	15.26	18.94	43.50	-24.56	80	100
780.3406	5.24	peak	25.56	30.80	46.00	-15.20	300	100

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave			
4960.0000	40.94	---	1.10	42.04	---	74.00	54.00	-31.96	265	100
7440.0000	41.23	---	4.47	45.70	---	74.00	54.00	-28.30	140	100
9920.0000	33.68	---	9.65	43.33	---	74.00	54.00	-30.67	30	100
12400.0000	31.26	---	15.29	46.55	---	74.00	54.00	-27.45	190	100



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

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
98.0361	7.47	peak	10.52	17.99	43.50	-25.51	120	100
832.8257	4.65	peak	26.39	31.04	46.00	-14.96	200	100

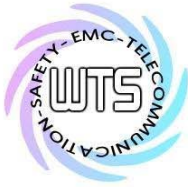
Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
	Peak	Ave.		Peak	Ave.	Peak	Ave			
4960.0000	41.04	---	1.10	42.14	---	74.00	54.00	-31.86	155	100
7440.0000	41.57	---	4.47	46.04	---	74.00	54.00	-27.96	235	100
9920.0000	34.53	---	9.65	44.18	---	74.00	54.00	-29.82	115	100
12400.0000	31.98	---	15.29	47.27	---	74.00	54.00	-26.73	210	100

## **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. **Measurement uncertainty for 3m measurement: 30-1000 MHz =  $\pm 3.72$  dB, 1-18 GHz =  $\pm 5.33$  dB, 18-40 GHz =  $\pm 3.43$  dB ; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.**
6. **See attached diagrams in Appendix.**

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

Test equipment used: ETSTW-RE 004, ETSTW-RE 030, ETSTW-RE 111,  
ETSTW-RE 088, ETSTW-RE 018



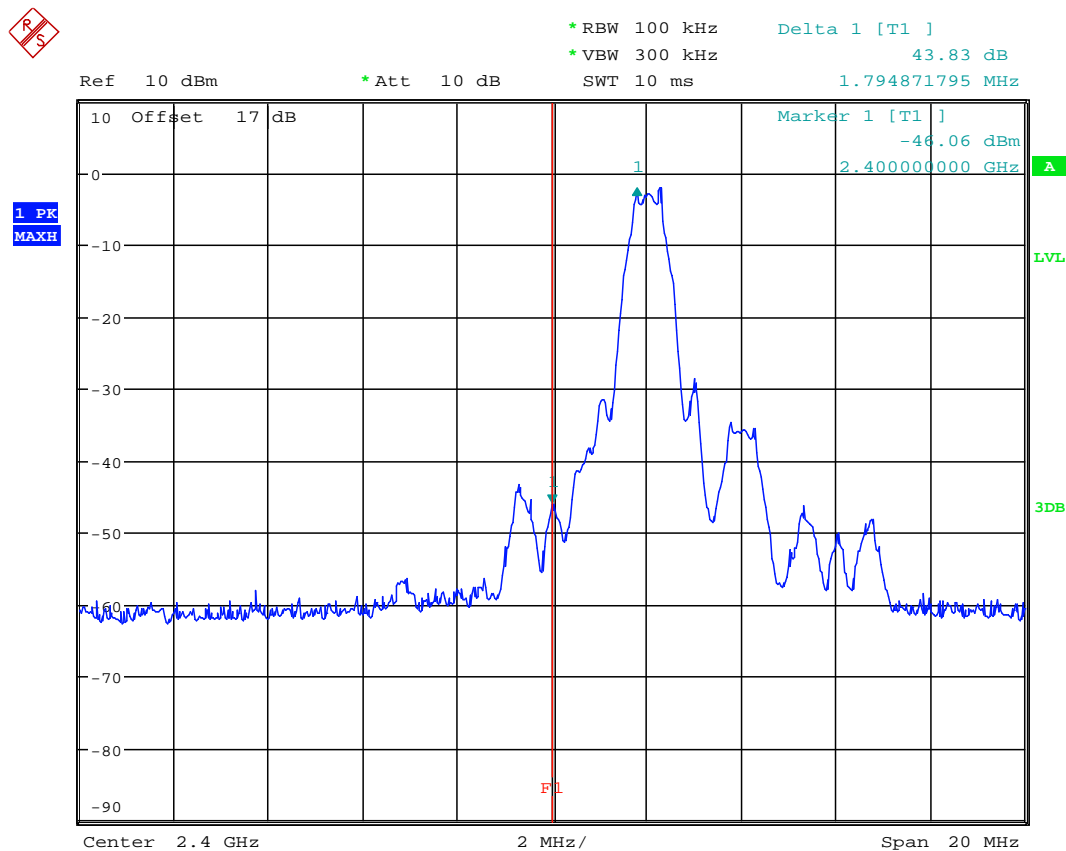
Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

## 3.6 Radiated Emission on the band edge

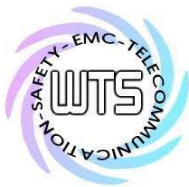
According to FCC rules part 15 subpart C §15.247(d) in any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that 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.



BANDEDGE BT4.0 CH00

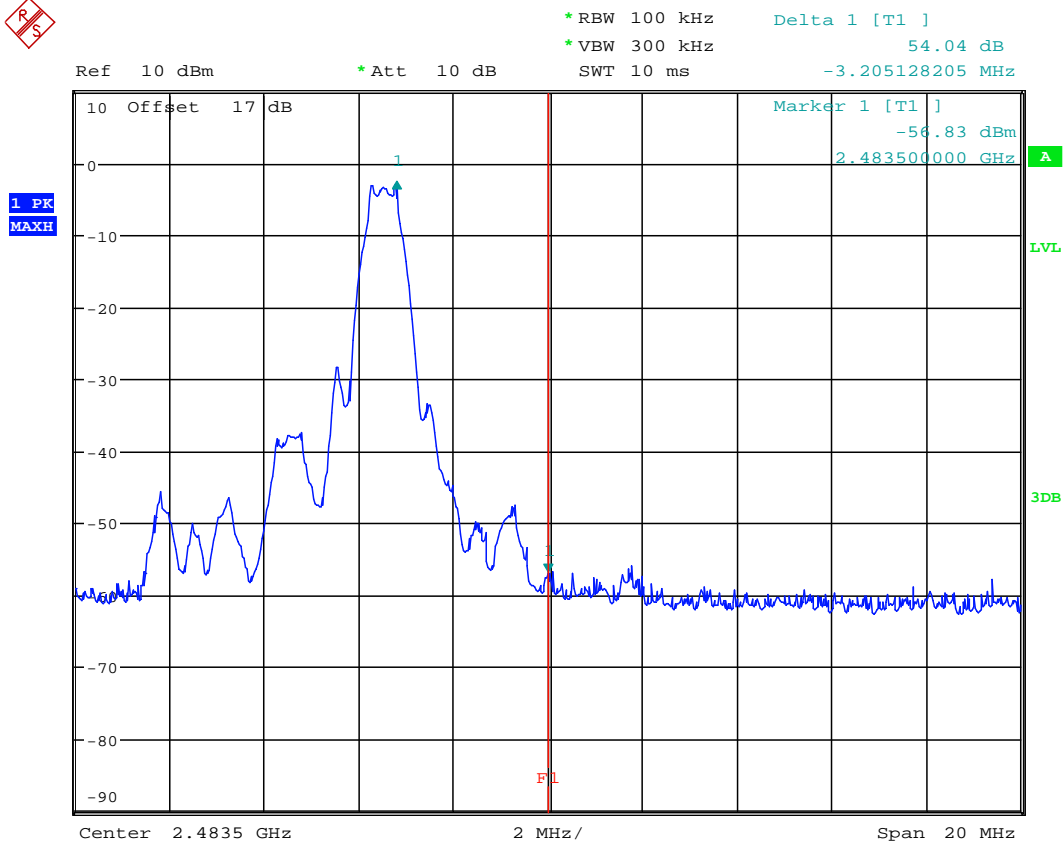
Date: 21.NOV.2013 12:43:46



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Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02



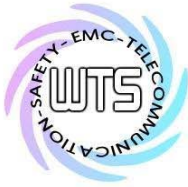
BANDEDGE BT4.0 CH39

Date: 21.NOV.2013 12:45:24

Limit:

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

Test equipment used: ETSTW-RE 055, ETSTW-RE 050



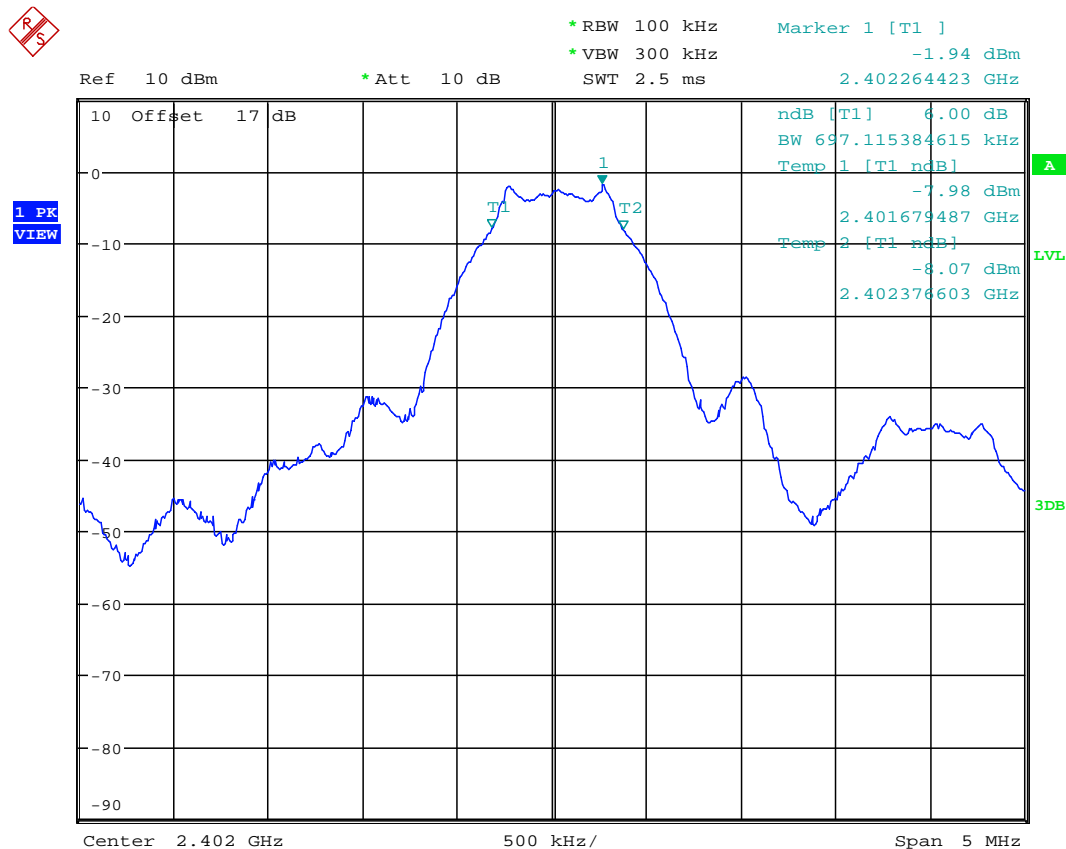
Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

## 3.7 Minimum 6 dB Bandwidth

The analyzer ResBW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK reading was taken, two markers were set 6 dB below the maximum level on the right and the left side of the emission.

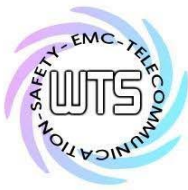
The 6 dB bandwidth is the frequency difference between the two markers.



6DB BANDWIDTH BT4.0 CH00

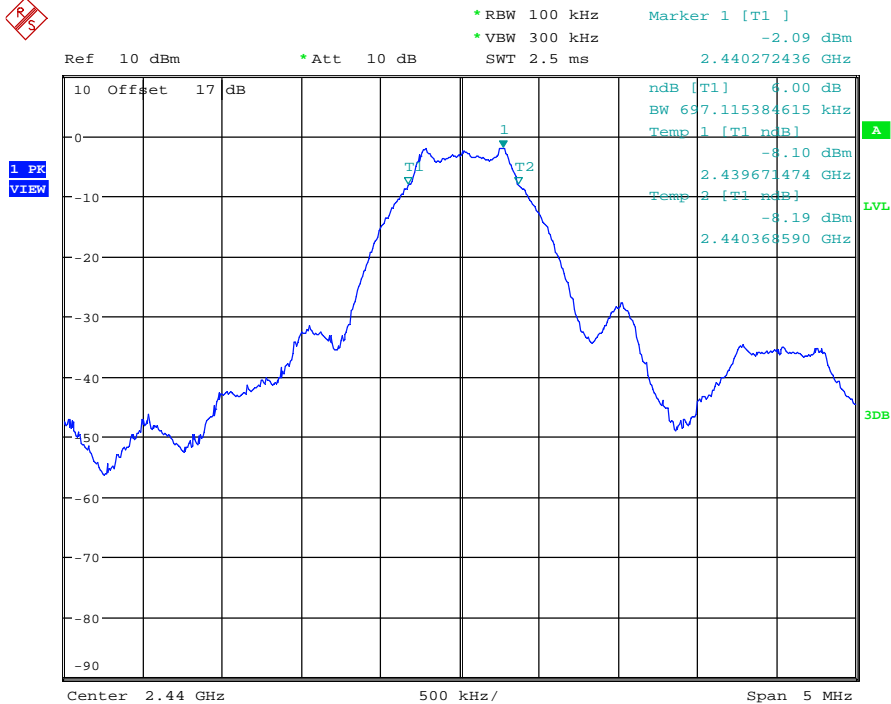
Date: 21.NOV.2013 12:43:26



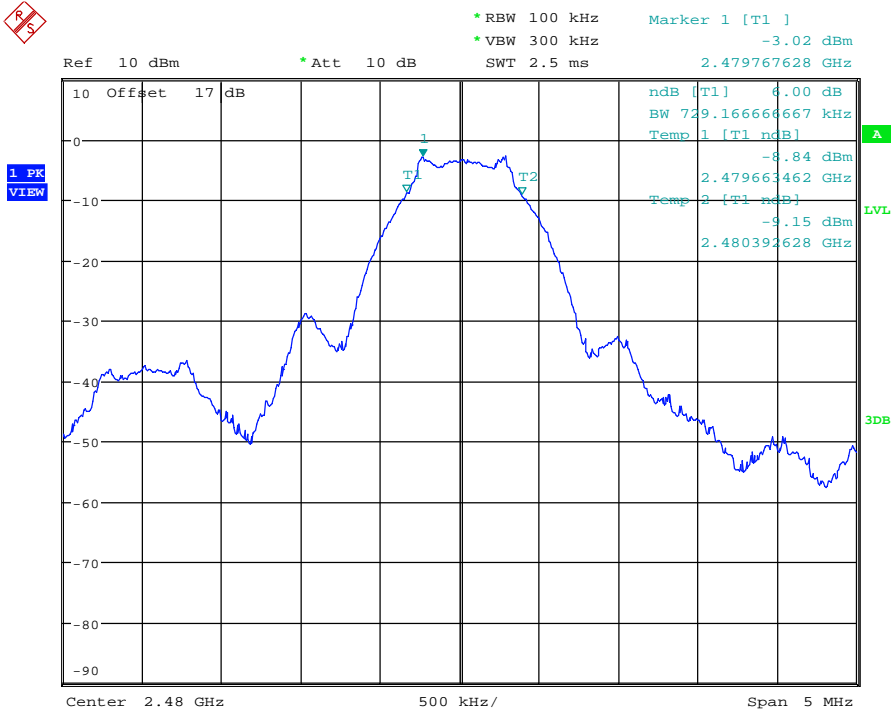


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6DB BANDWIDTH BT4.0 CH19  
Date: 21.NOV.2013 12:44:22



6DB BANDWIDTH BT4.0 CH39  
Date: 21.NOV.2013 12:45:04



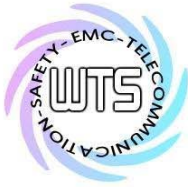
Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

**Limits:**

Frequency Range MHz	Limits
902-928	min 500 kHz
2400-2483.5	min 500 kHz
5725-5850	min 500 kHz

Test equipment used: ETSTW-RE 055, ETSTW-RE 050



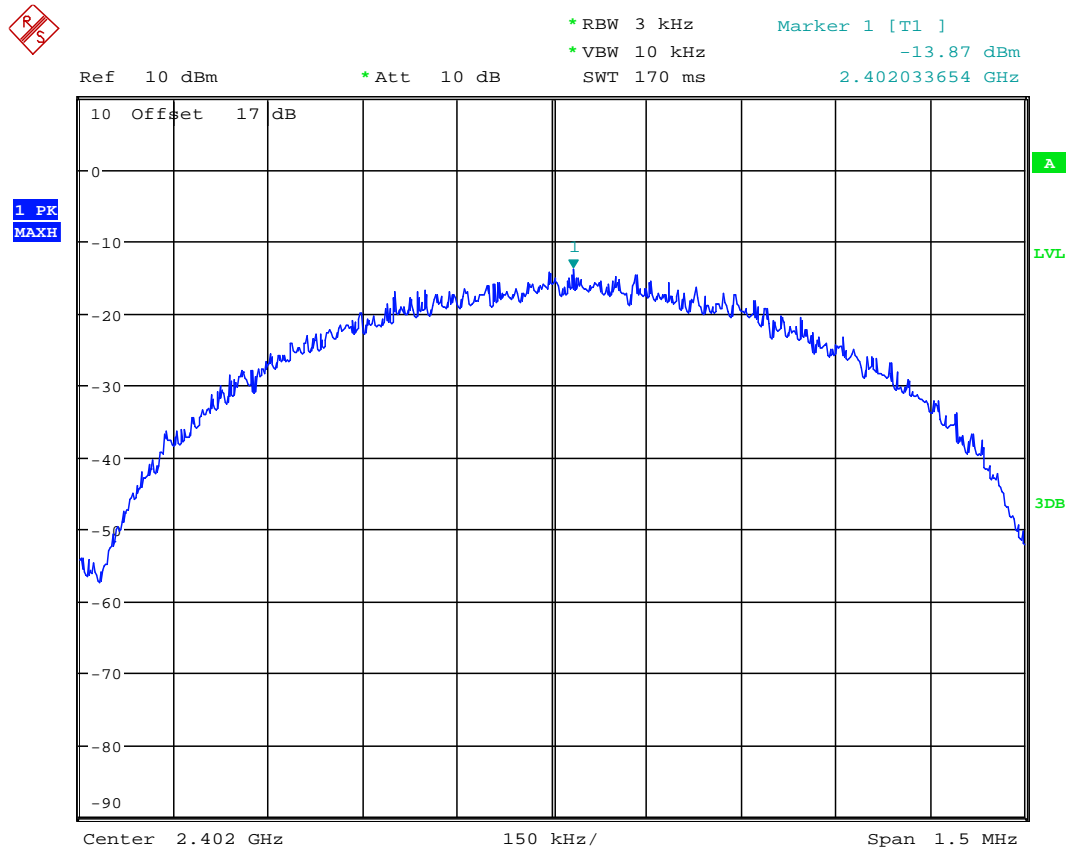
Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

## 3.8 Peak Power Spectral Density

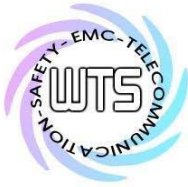
Peak Power Spectral density is a measured at low, middle and high channel.

The peak output power is measured with a measurement bandwidth of 10 MHz and displayed on diagram together with Peak Power Spectral Density result which was measured with a bandwidth of 3 kHz, appreciate frequency span and sweep time.

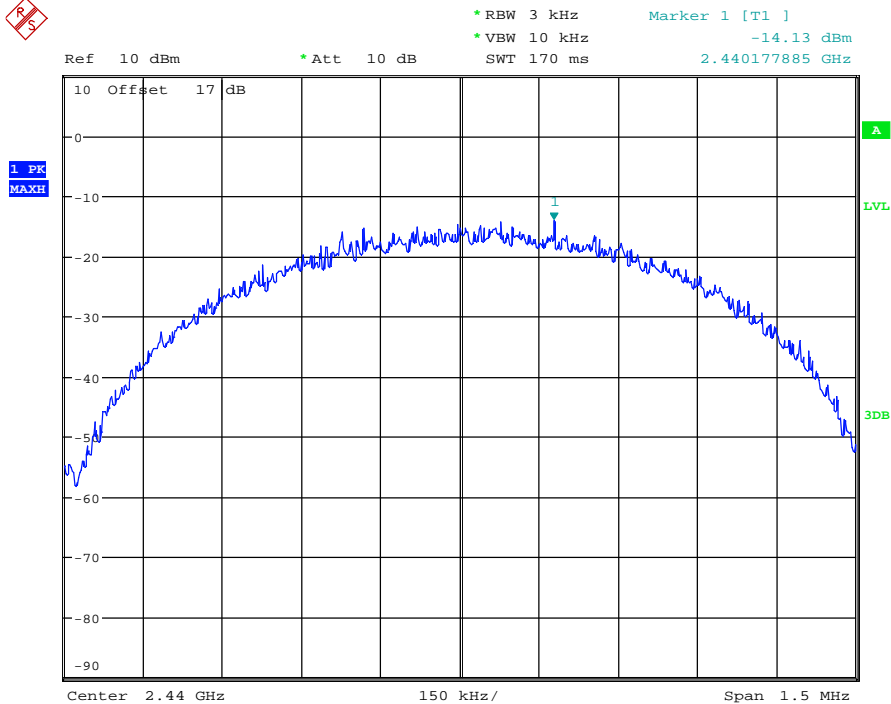


POWER DENSITY BT4.0 CH00

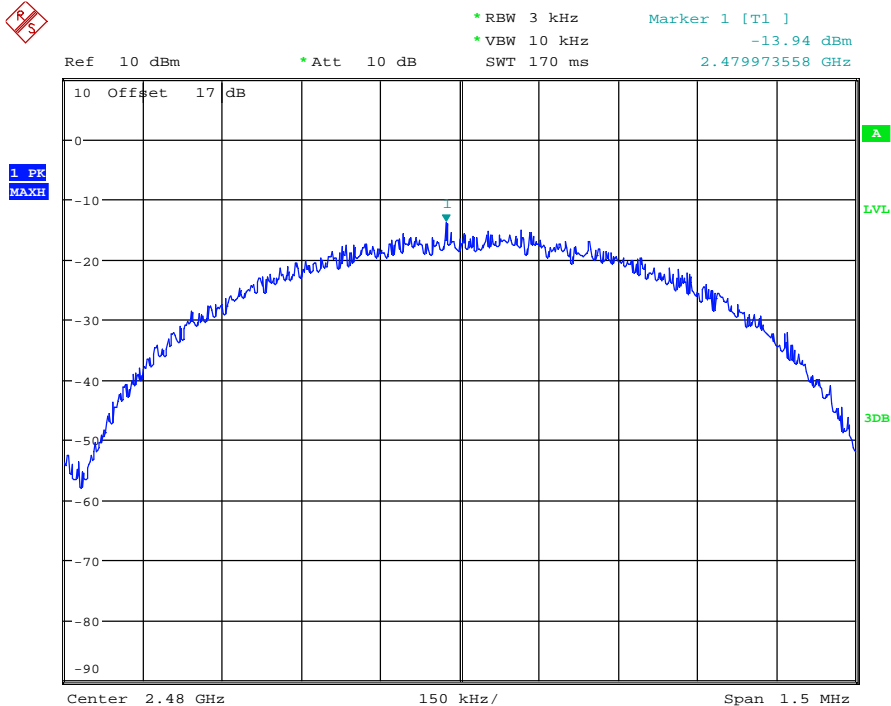
Date: 21.NOV.2013 12:43:38



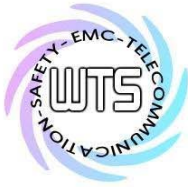
Registration number: W6M21311-13643-C-1  
FCC ID: 2ABCKSAILS0000MNS02



POWER DENSITY BT4.0 CH19  
Date: 21.NOV.2013 12:44:34



POWER DENSITY BT4.0 CH39  
Date: 21.NOV.2013 12:45:16



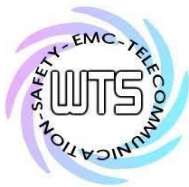
Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

**Limits:**

Frequency Range MHz	dBm
902-928	8
2400-2483.5	8
5725-5850	8

Test equipment used: ETSTW-RE 055, ETSTW-RE 050



Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

## 3.9 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.

Model: MN-S02 Date: --  
Mode: -- Temperature: -- °C Engineer: --  
Polarization: N Humidity: -- %

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
--	--	--	--	--	--	--	--	--

Polarization: L1

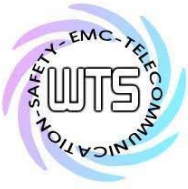
Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
--	--	--	--	--	--	--	--	--

- 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. Measurement uncertainty = ±1.10 dB; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.**  
**6. The EUT is battery-used, so this test is not required.**

### 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

Test equipment used: ETSTW-CE 001, ETSTW-CE 004, ETSTW-CE 006, ETSTW-RE 045

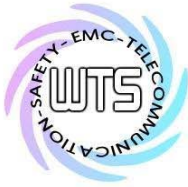


Registration number: W6M21311-13643-C-1  
FCC ID: 2ABCKSAILS0000MNS02

## **Appendix**

### **Measurement diagrams**

Spurious Emissions radiated



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

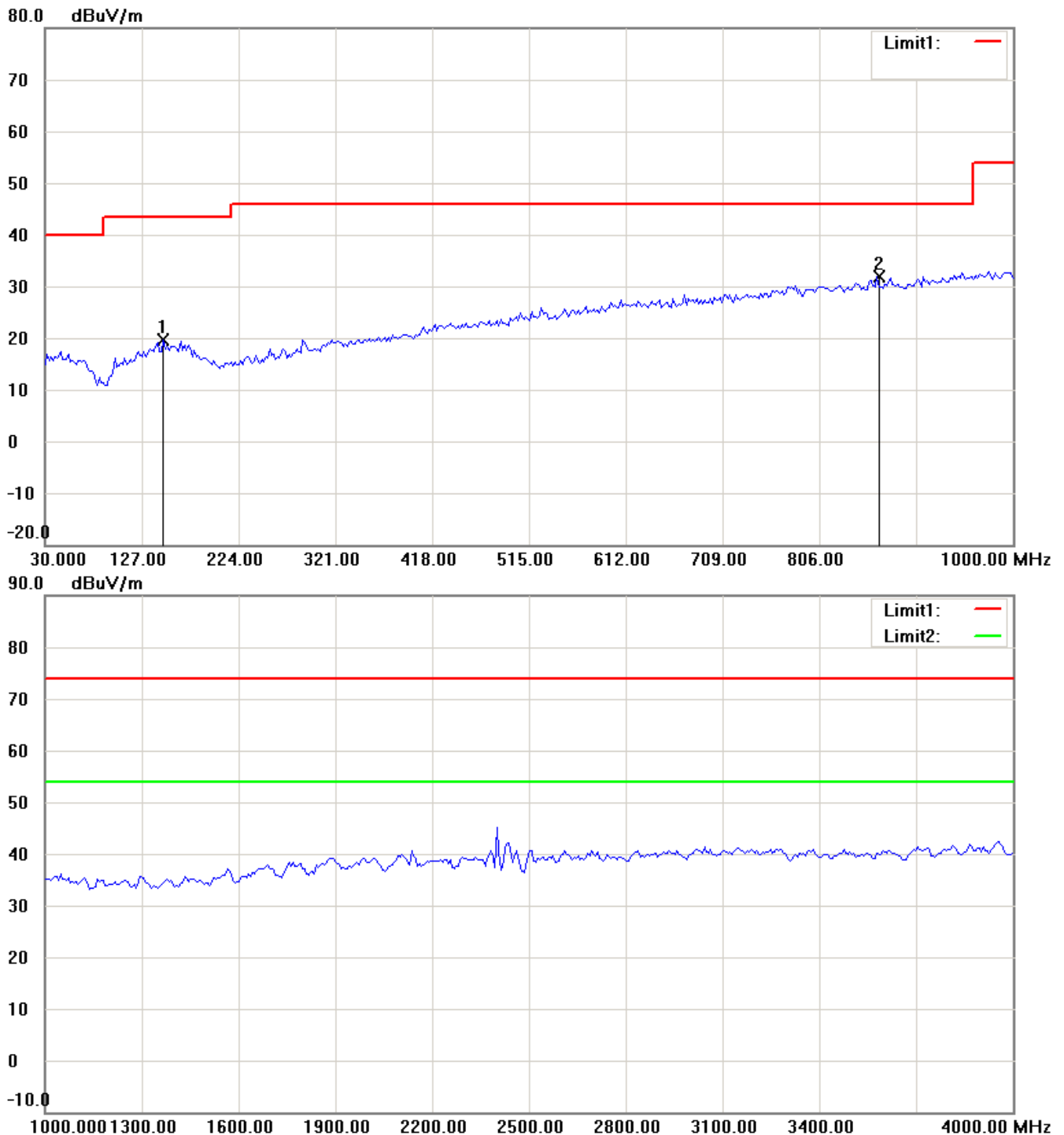
Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

Radiated Emission

TX Bluetooth 4.0 CH0

Antenna Polarization H



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

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



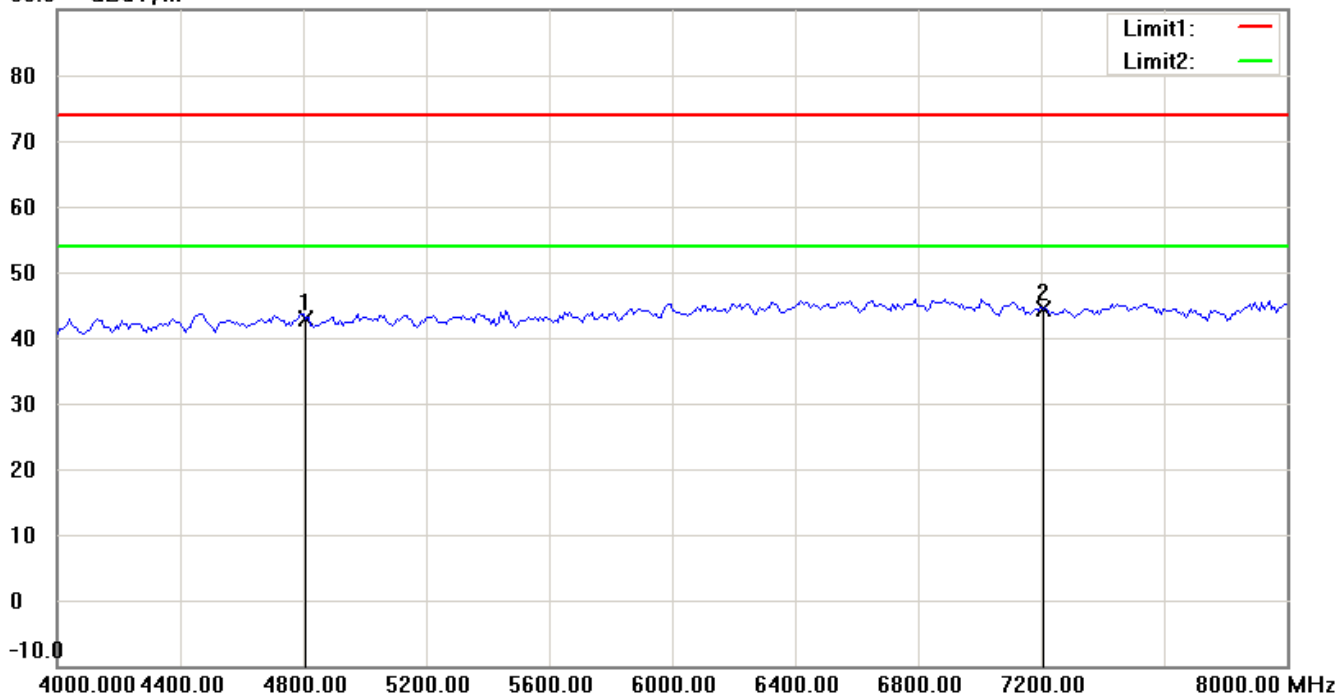


# Worldwide Testing Services(Taiwan) Co., Ltd.

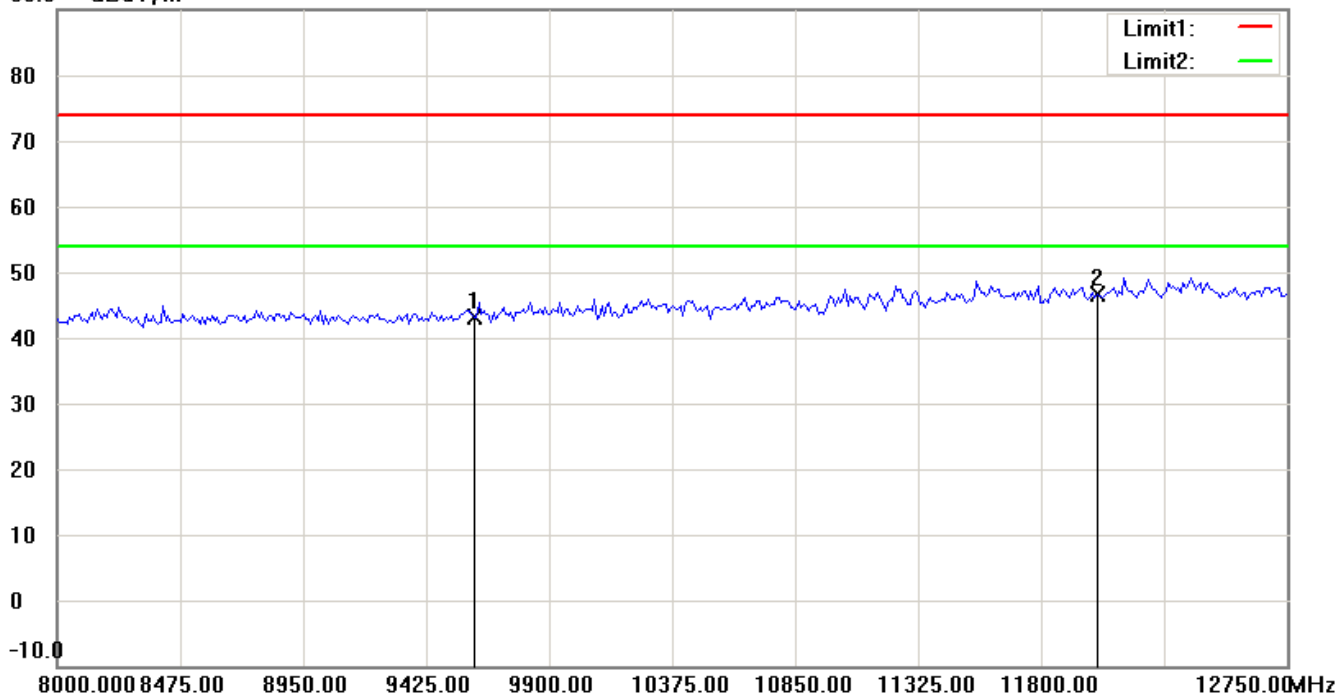
Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

90.0 dBuV/m



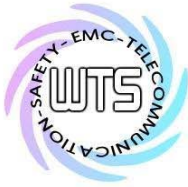
90.0 dBuV/m



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

1. The attached measurement plots are preliminarily pre-scanned with peak detector for determining the final checking frequencies and are for reference only.
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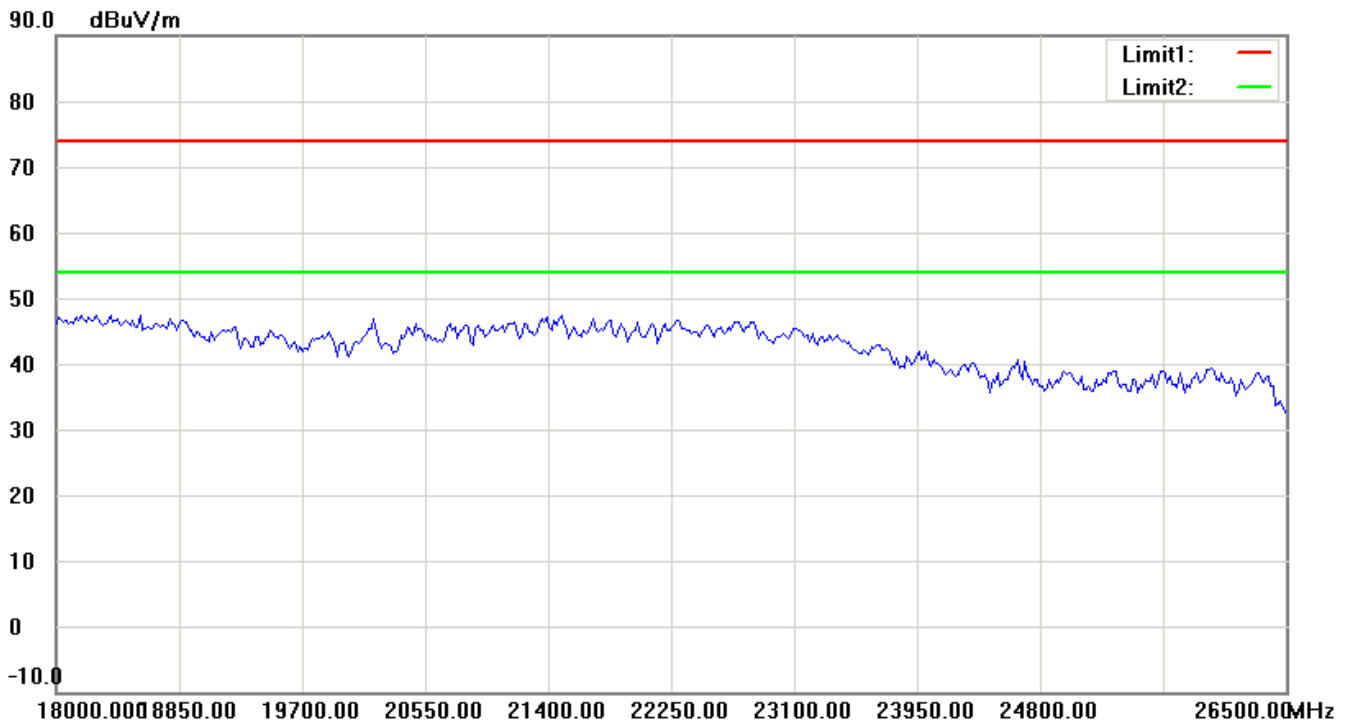
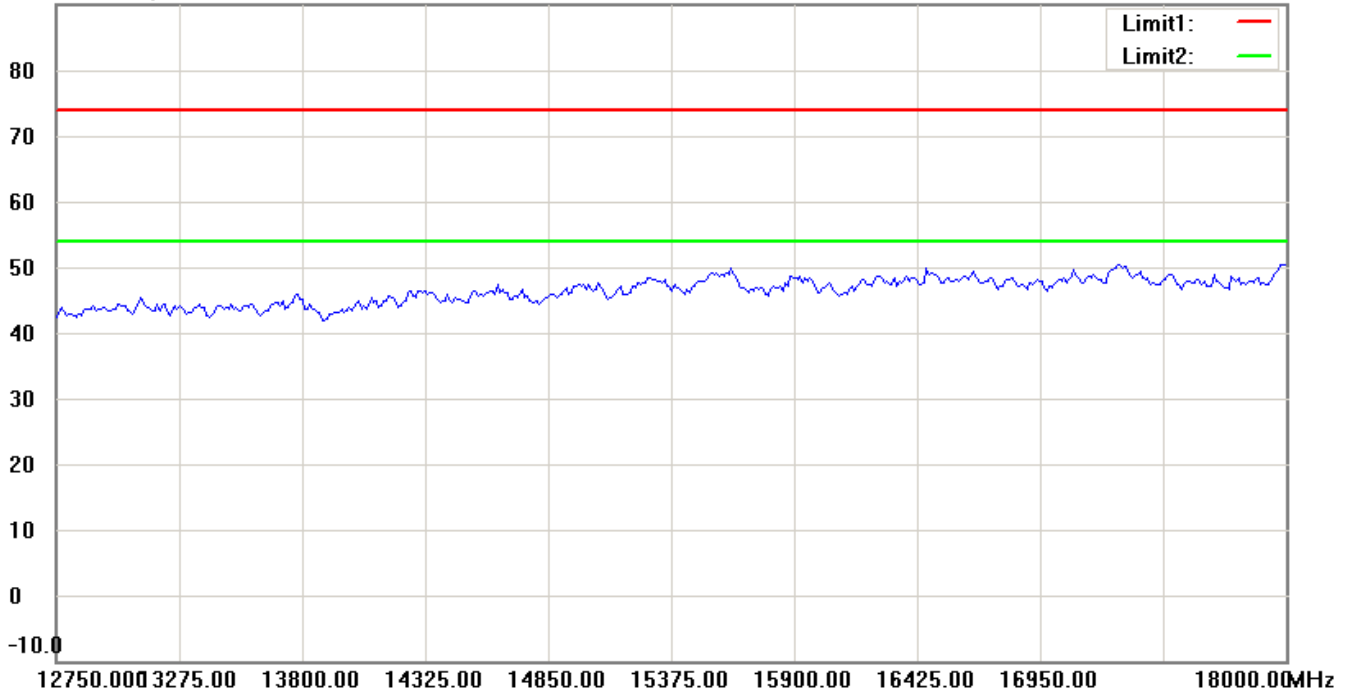


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

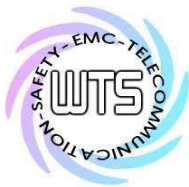
90.0 dBuV/m



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

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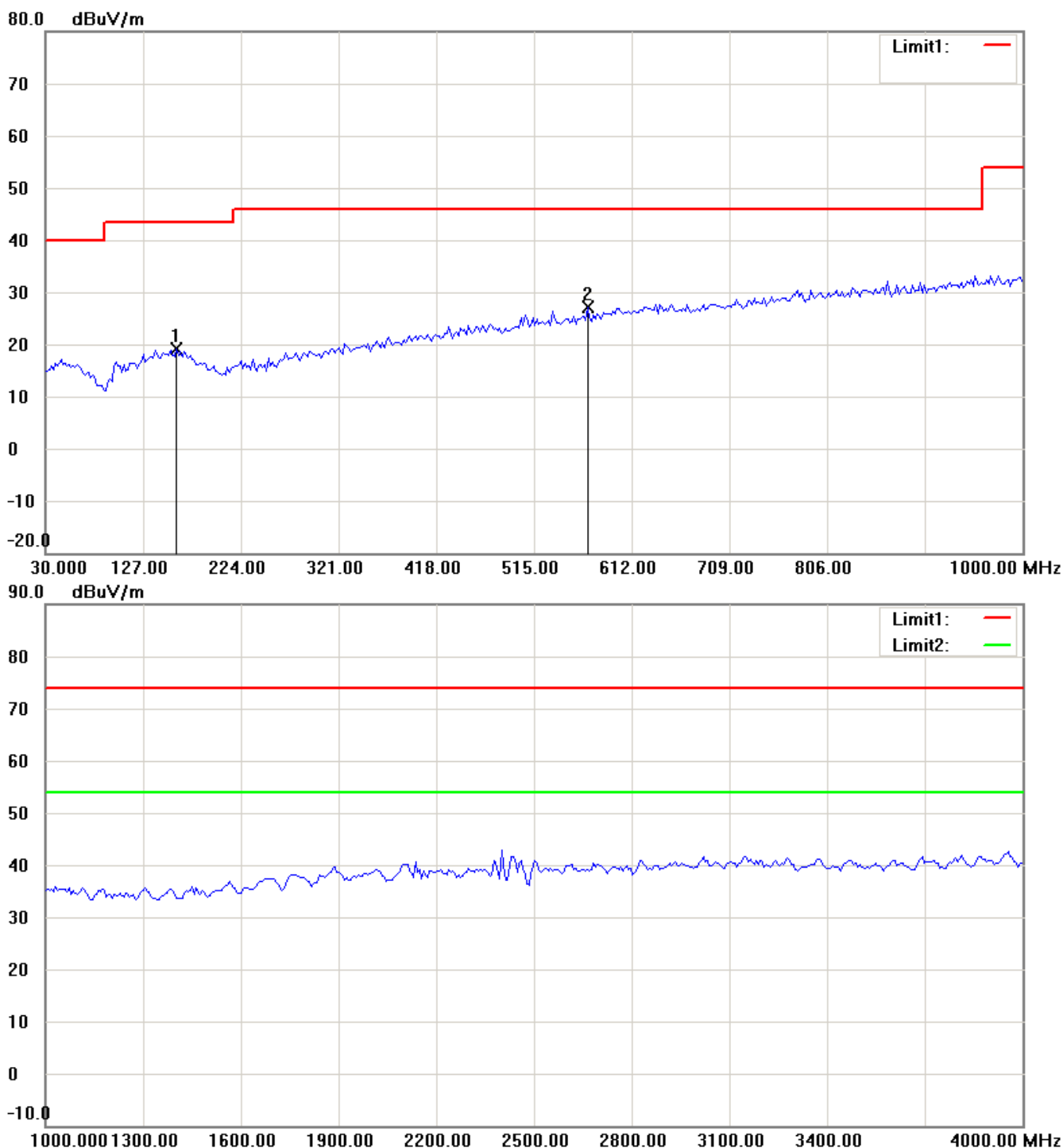


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

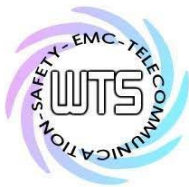
## Antenna Polarization V



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

1. The attached measurement plots are preliminarily pre-scanned with peak detector for determining the final checking frequencies and are for reference only.
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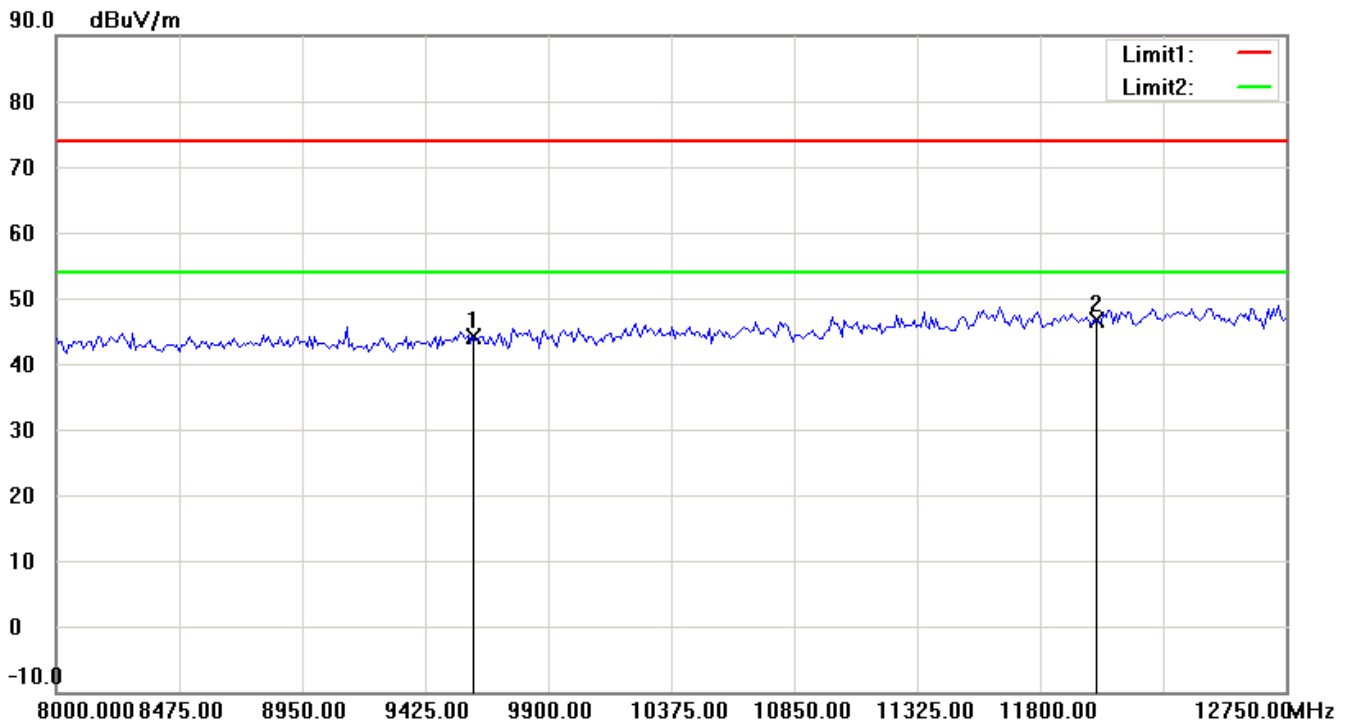
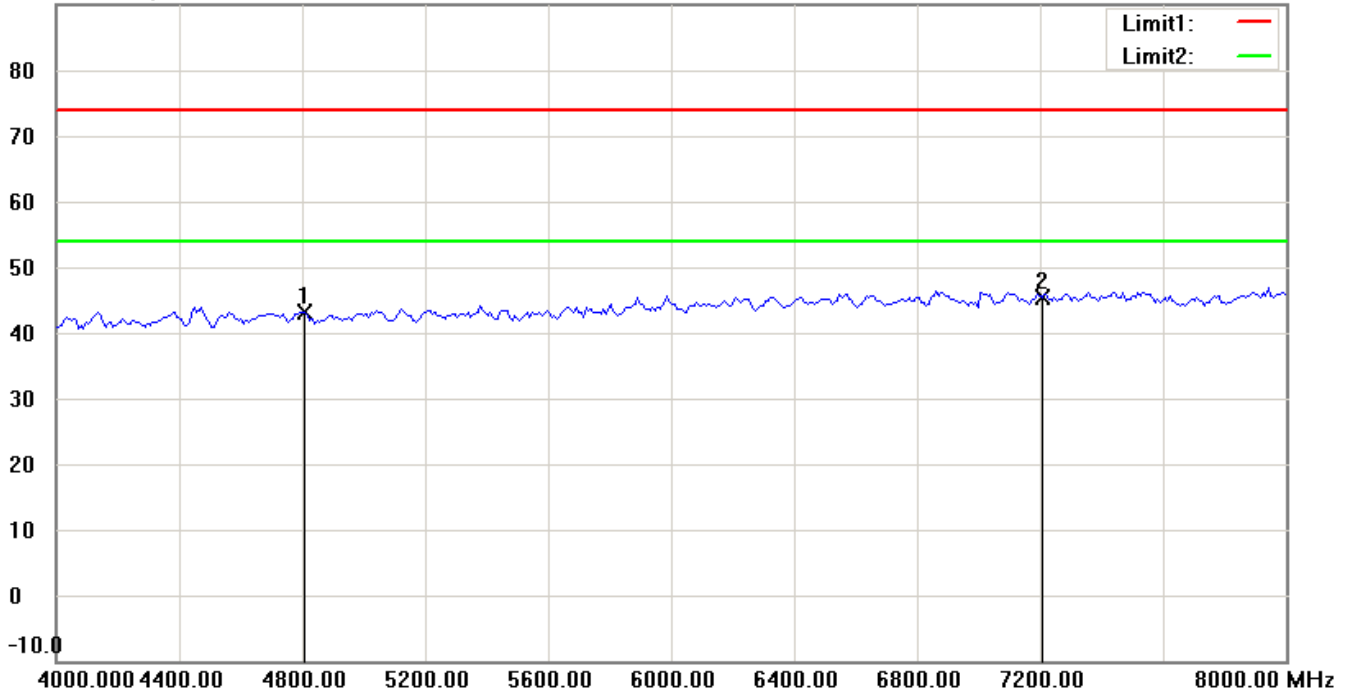


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

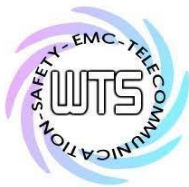
90.0 dBuV/m



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

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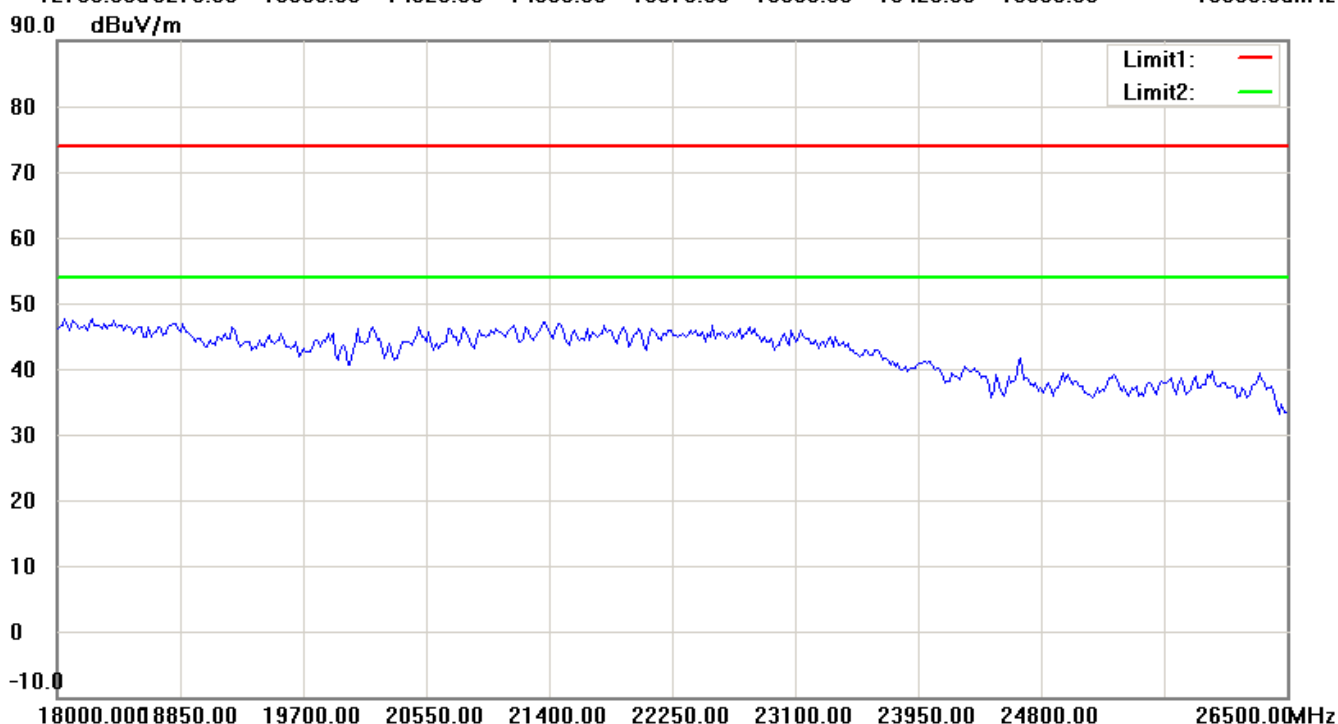
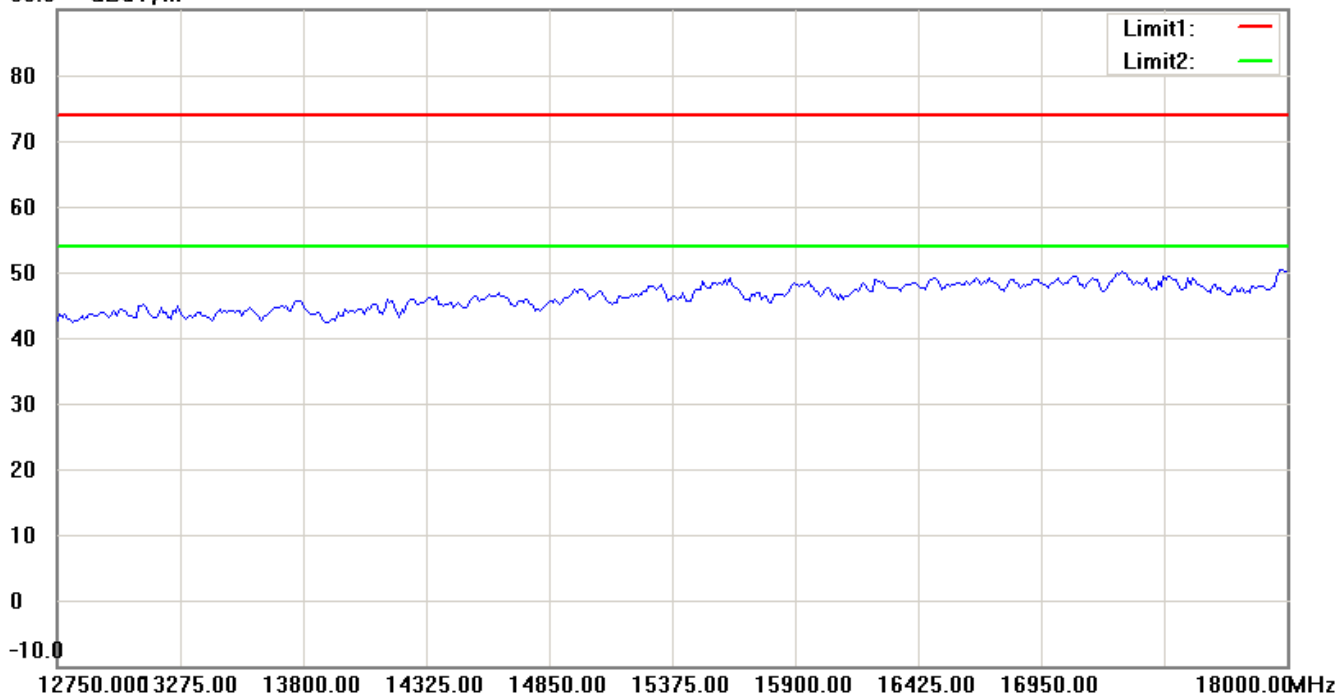


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

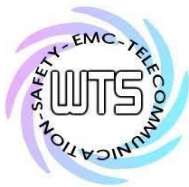
90.0 dBuV/m



Up Line: Peak Limit Line; Down Line: Ave Limit Line

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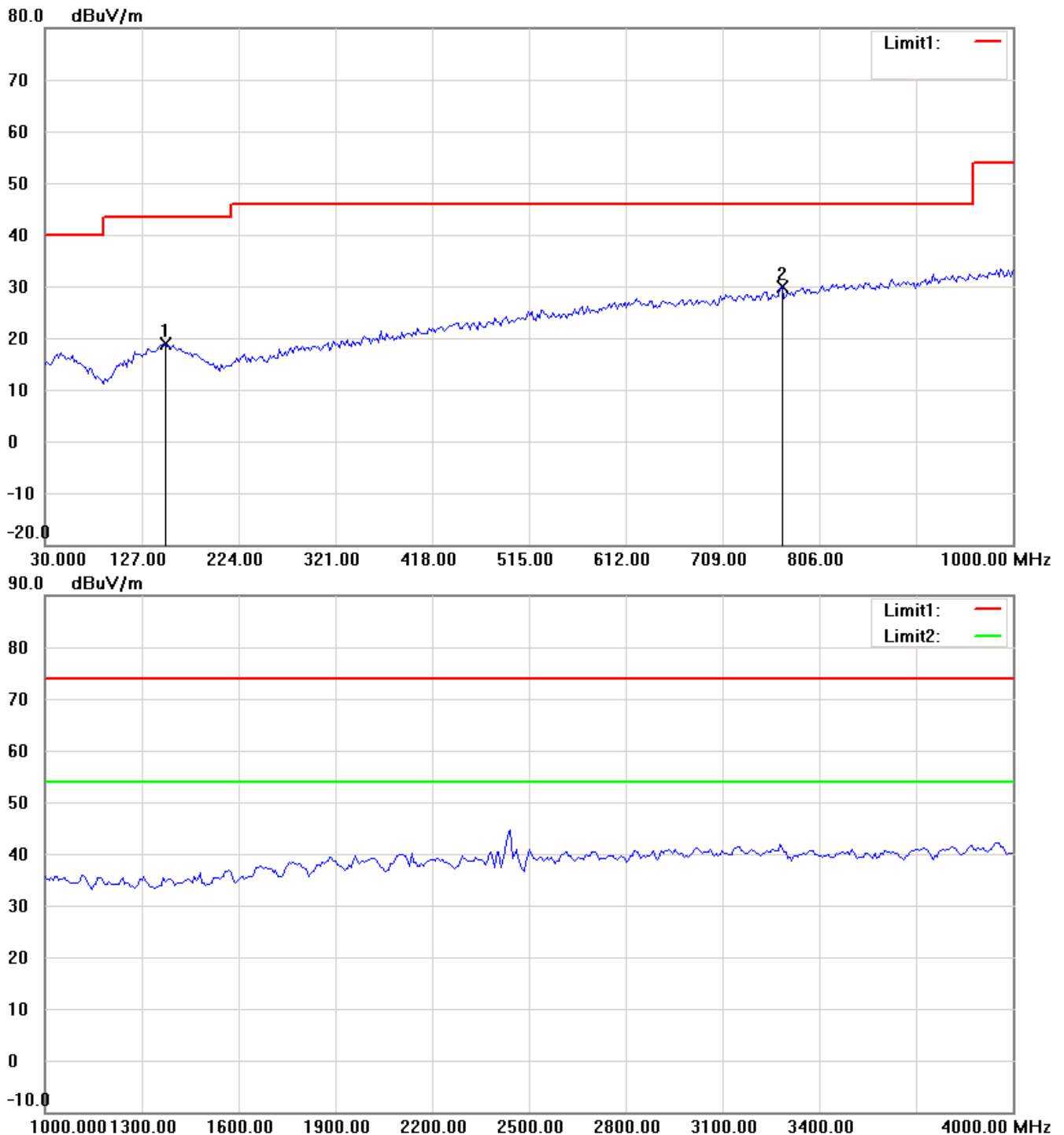
# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

TX Bluetooth 4.0 CH19

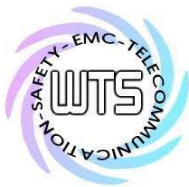
Antenna Polarization H



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

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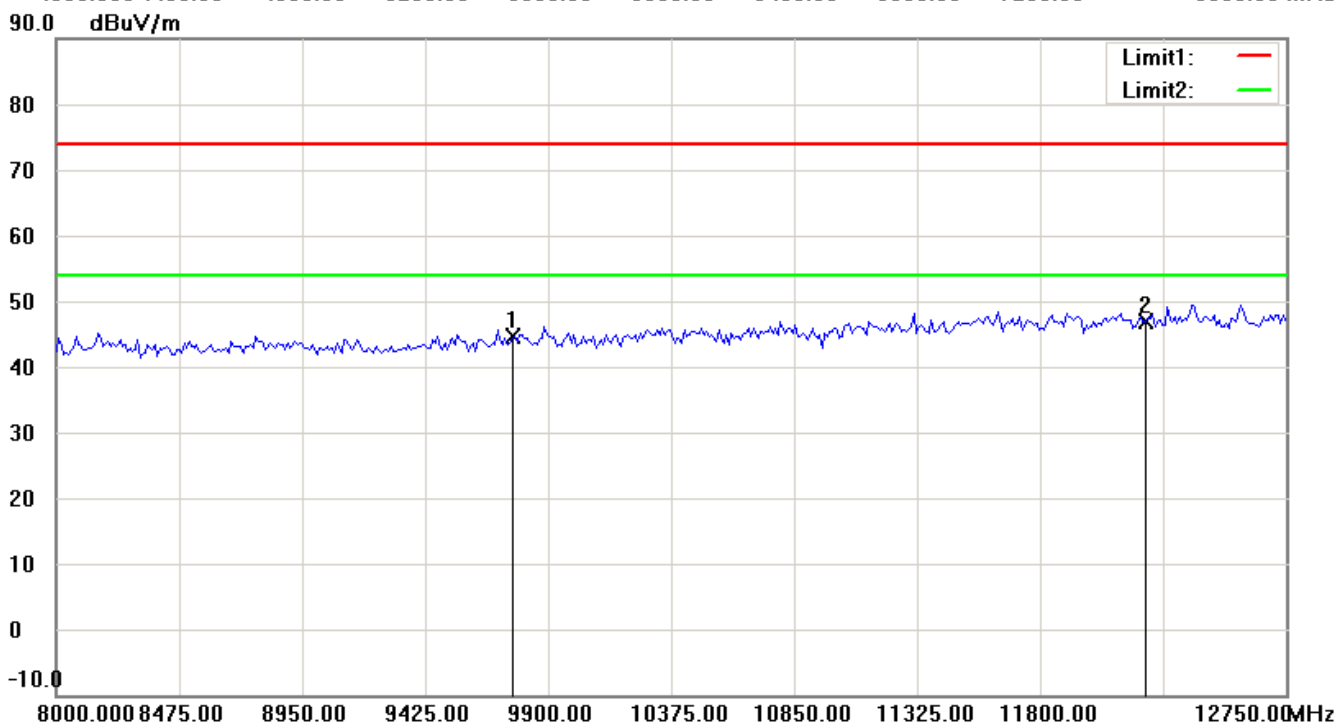
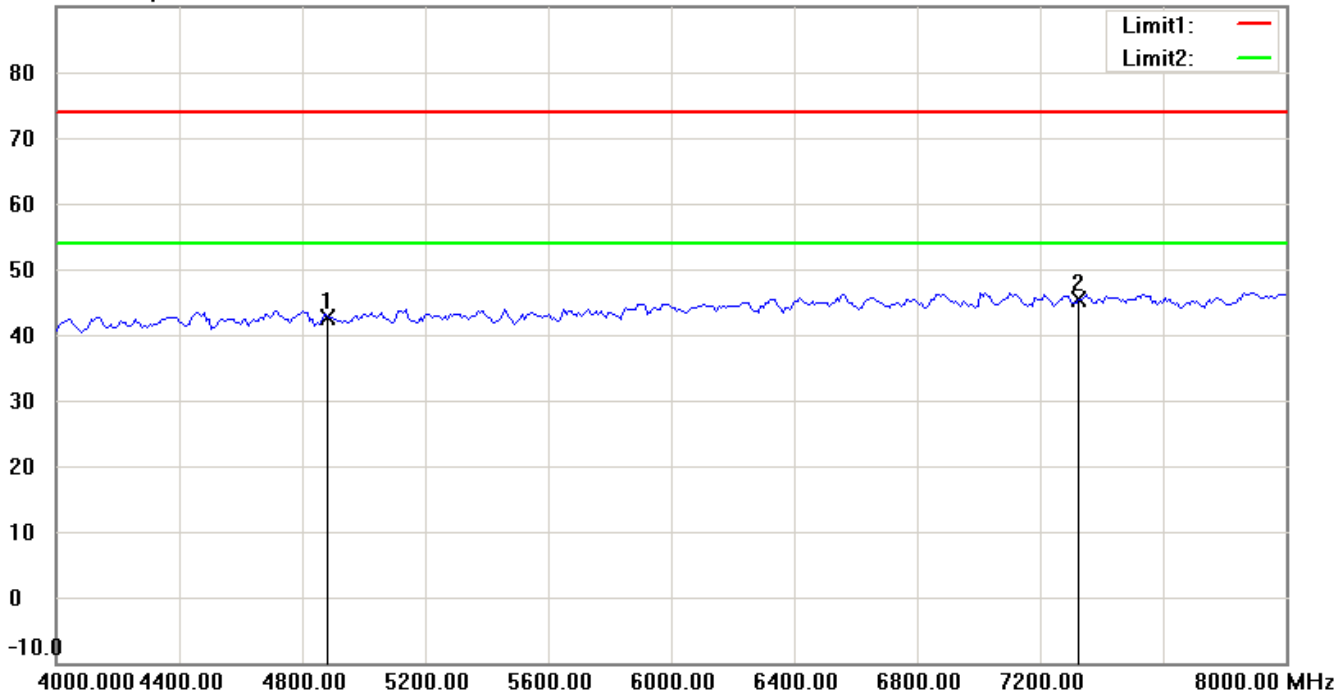


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

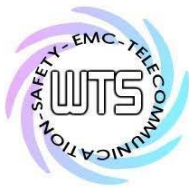
90.0 dBuV/m



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

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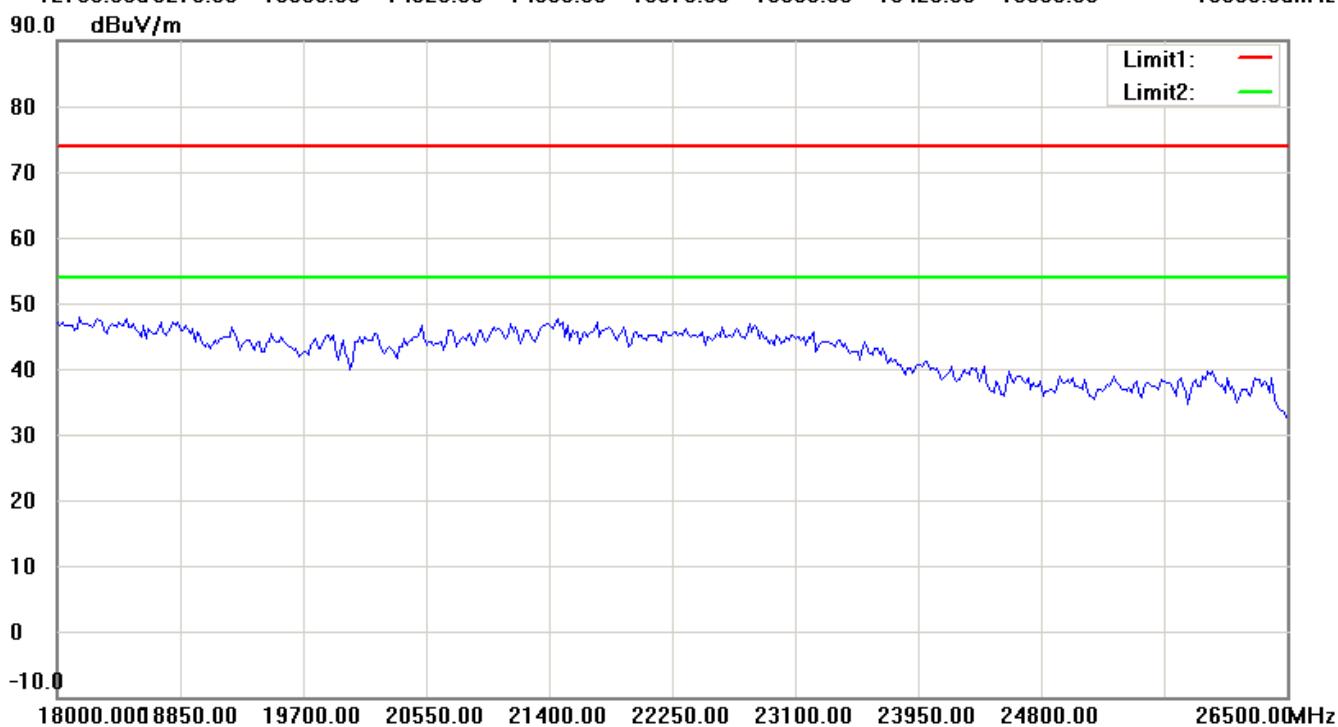
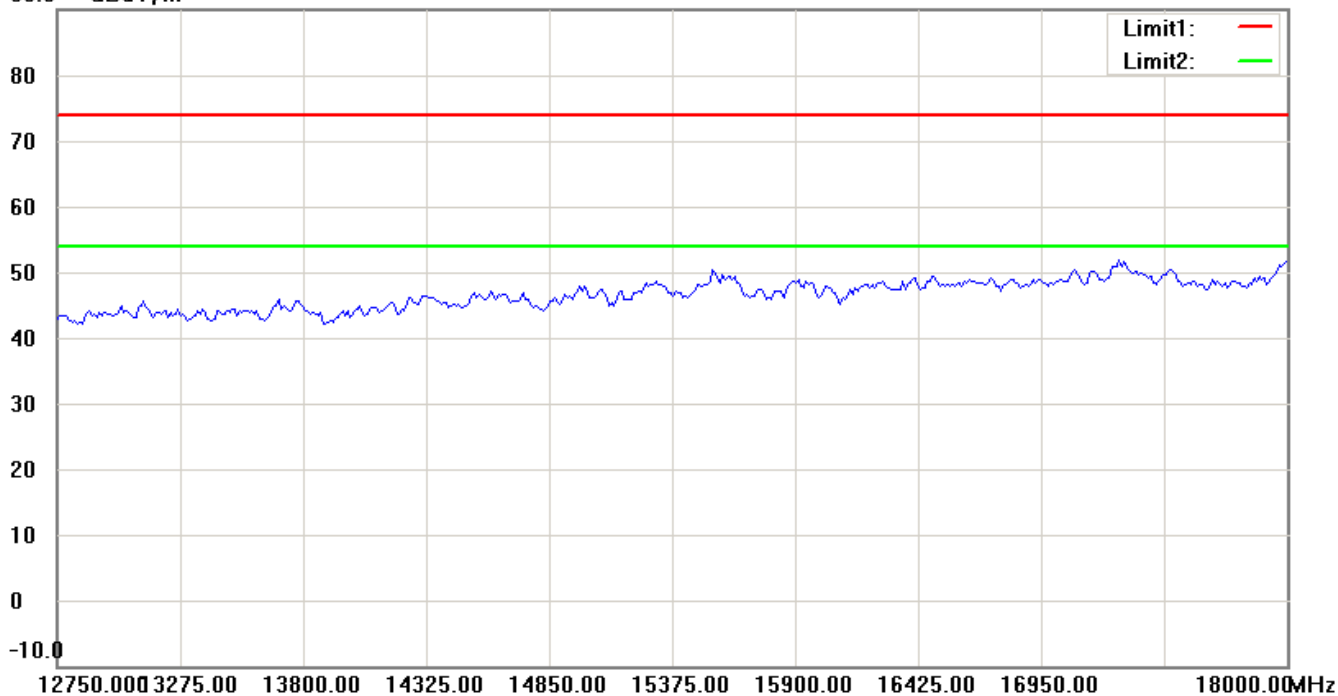


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

90.0 dBuV/m



Up Line: Peak Limit Line; Down Line: Ave Limit Line

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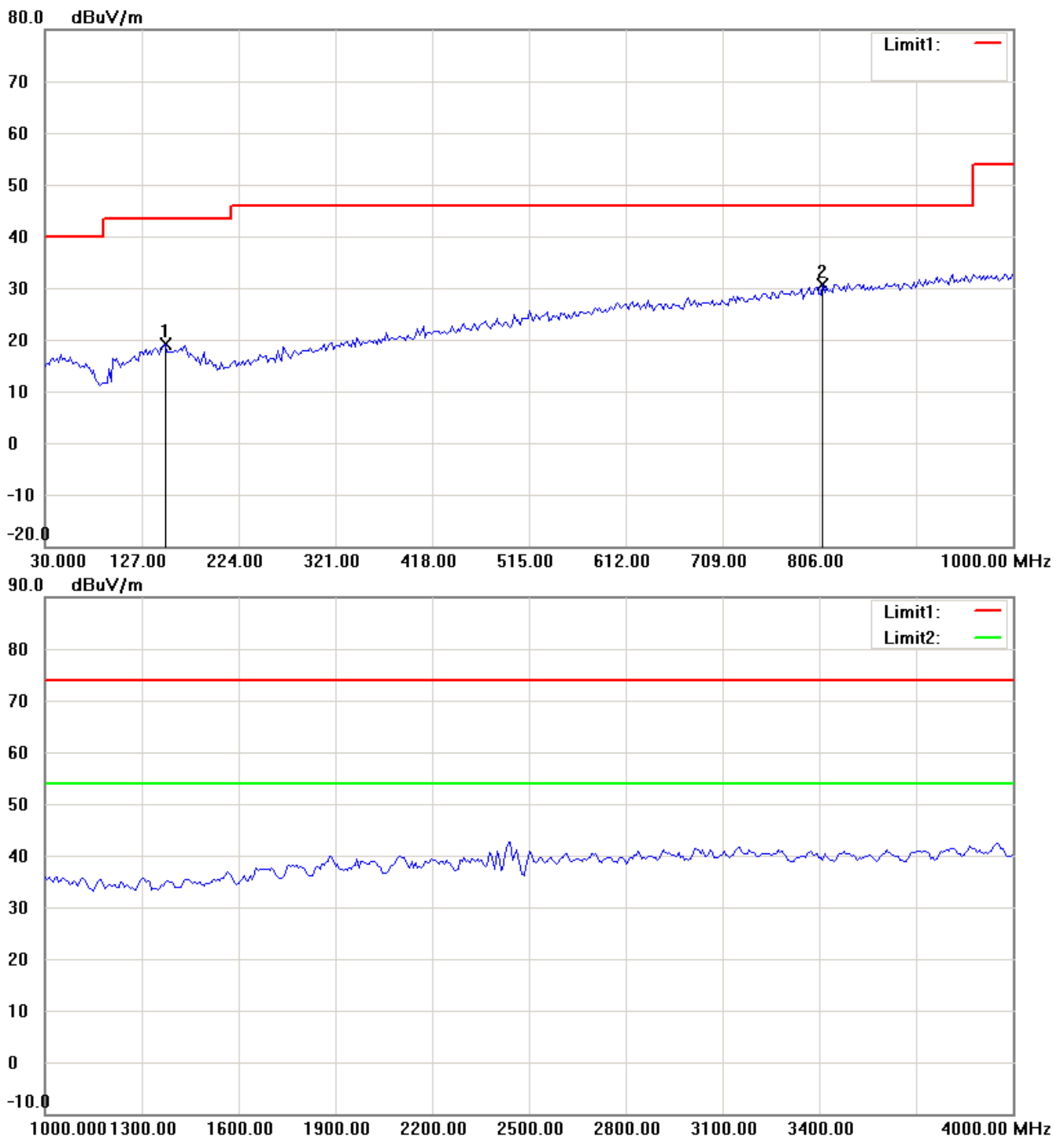


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

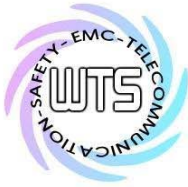
## Antenna Polarization V



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

1. The attached measurement plots are preliminarily pre-scanned with peak detector for determining the final checking frequencies and are for reference only.
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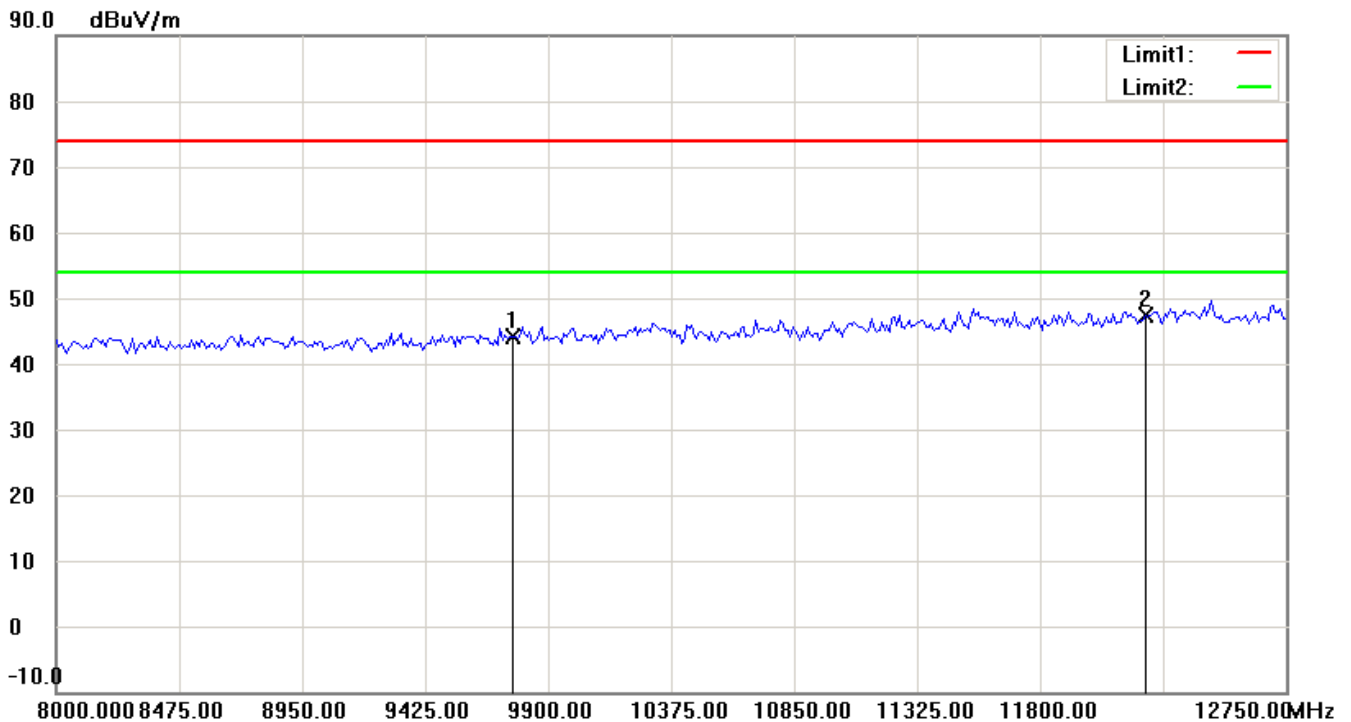
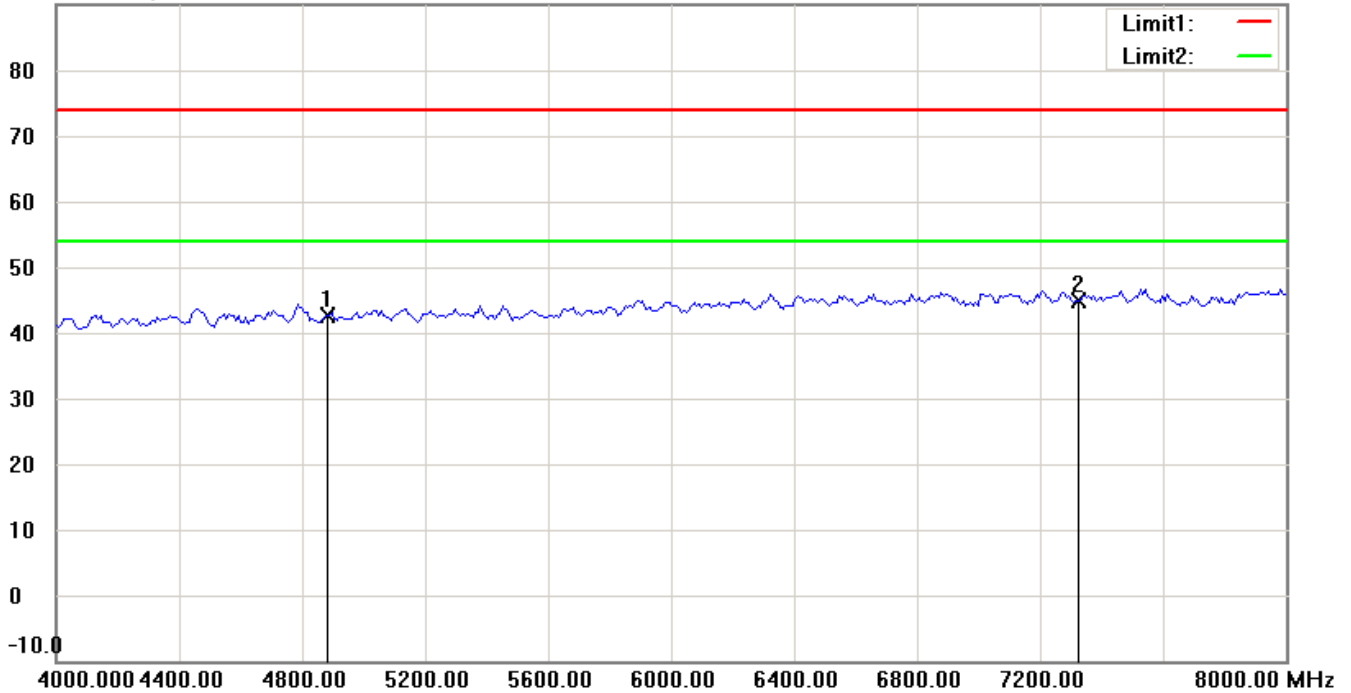


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Registration number: W6M21311-13643-C-1

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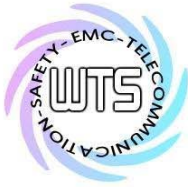
90.0 dBuV/m



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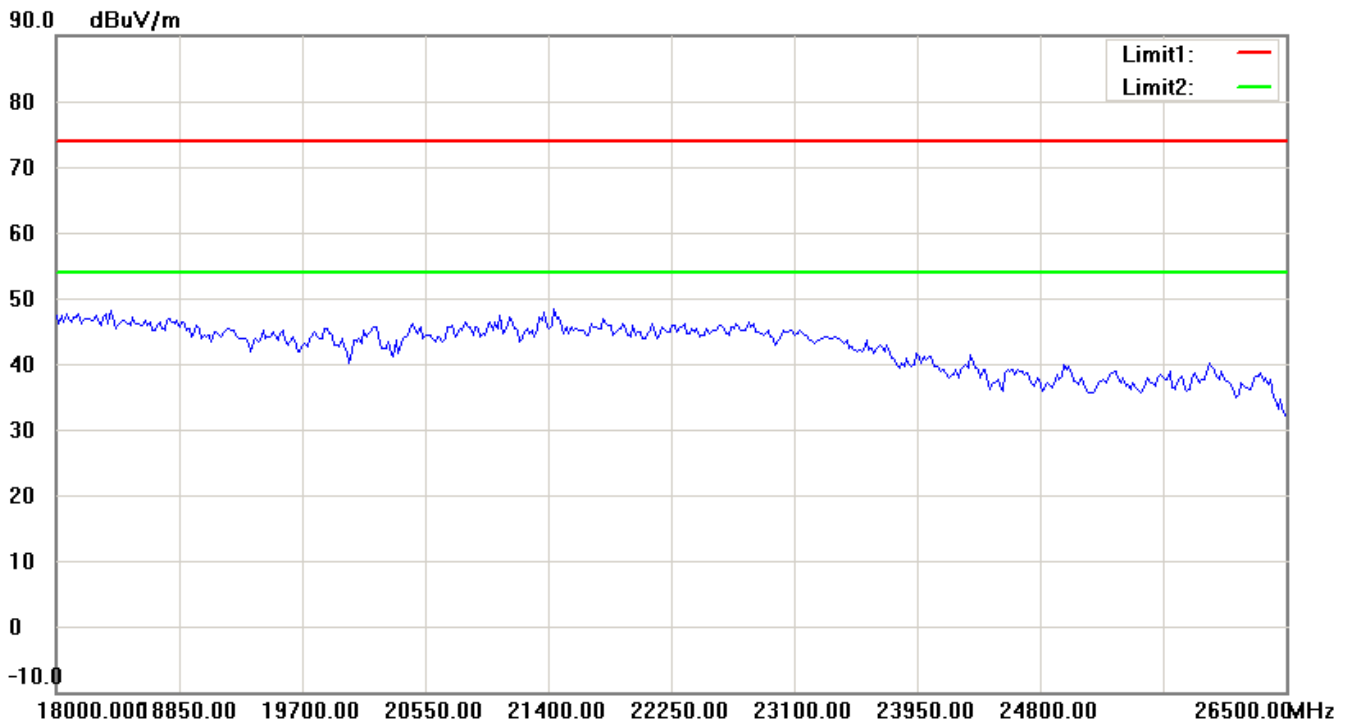
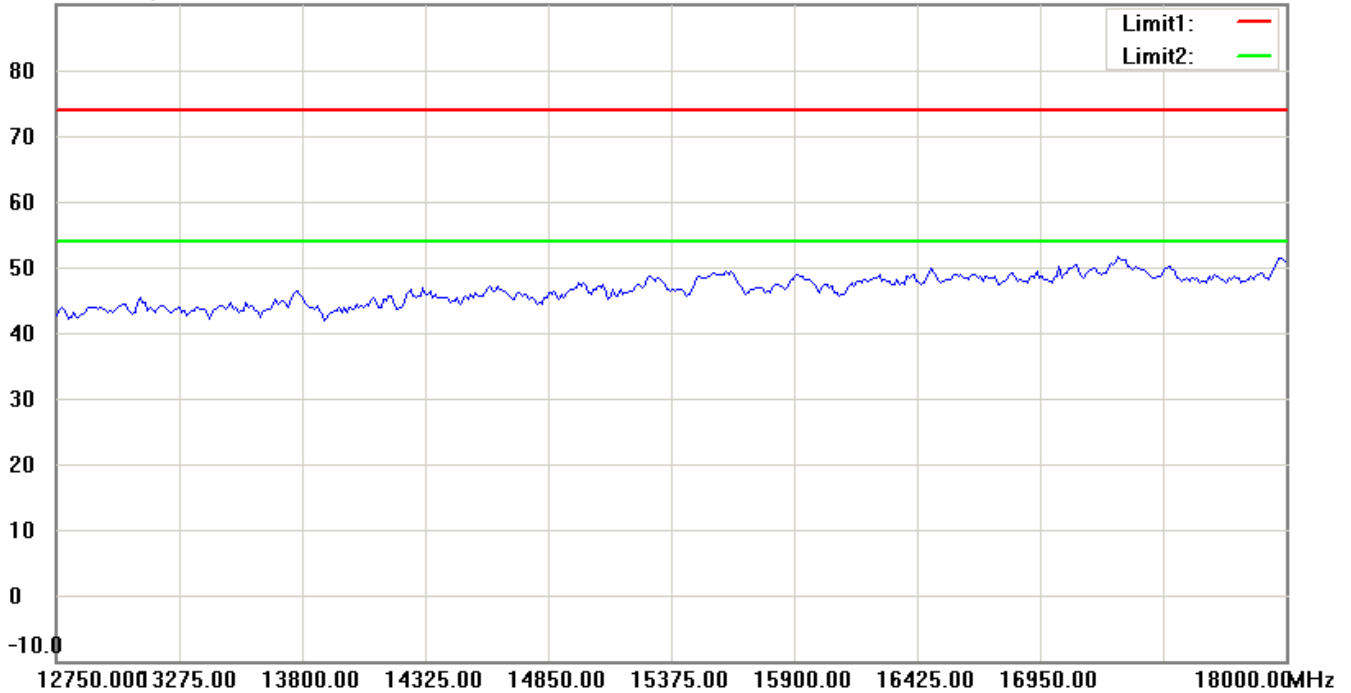


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

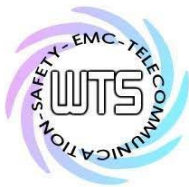
90.0 dBuV/m



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

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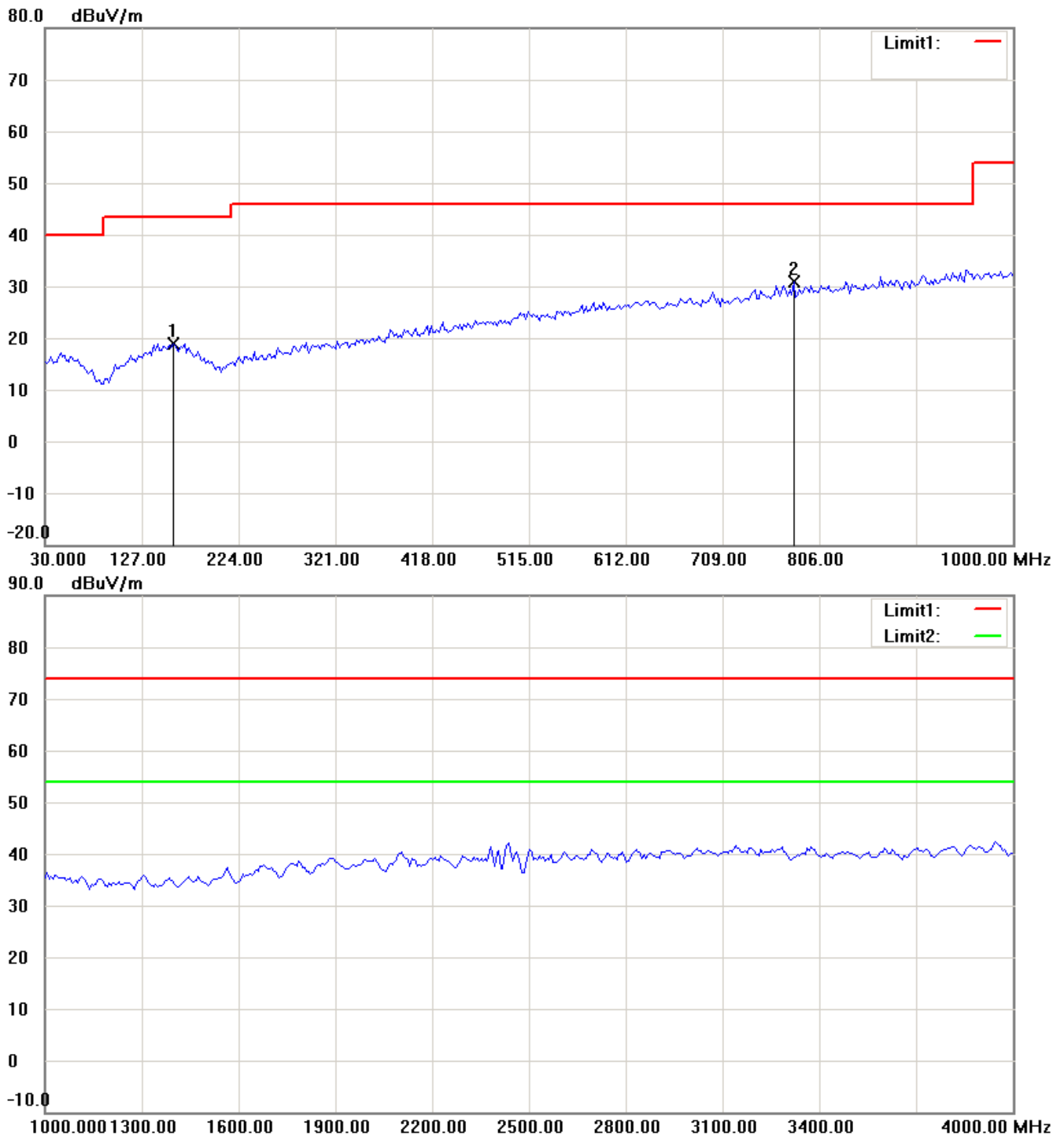
# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

FCC ID: 2ABCKSAILS0000MNS02

TX Bluetooth 4.0 CH39

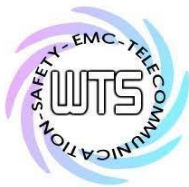
Antenna Polarization H



Up Line: Peak Limit Line; Down Line: Ave Limit Line

Note:

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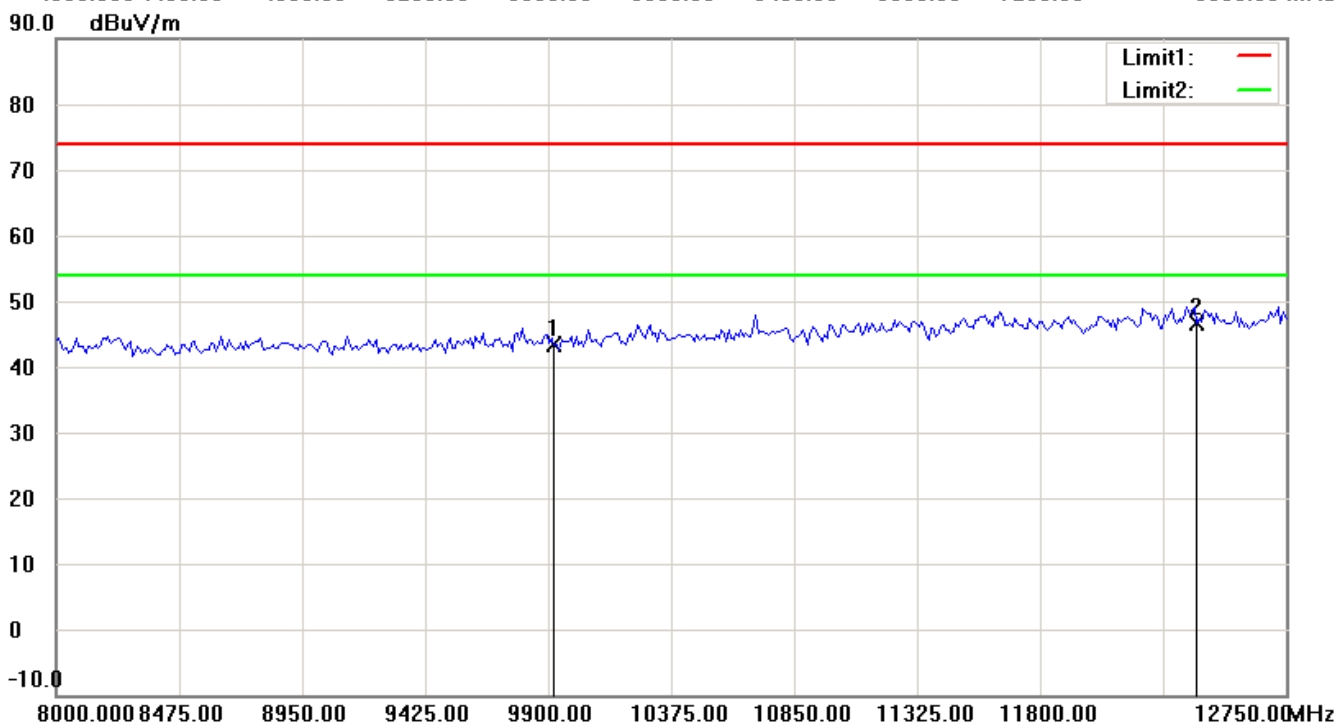
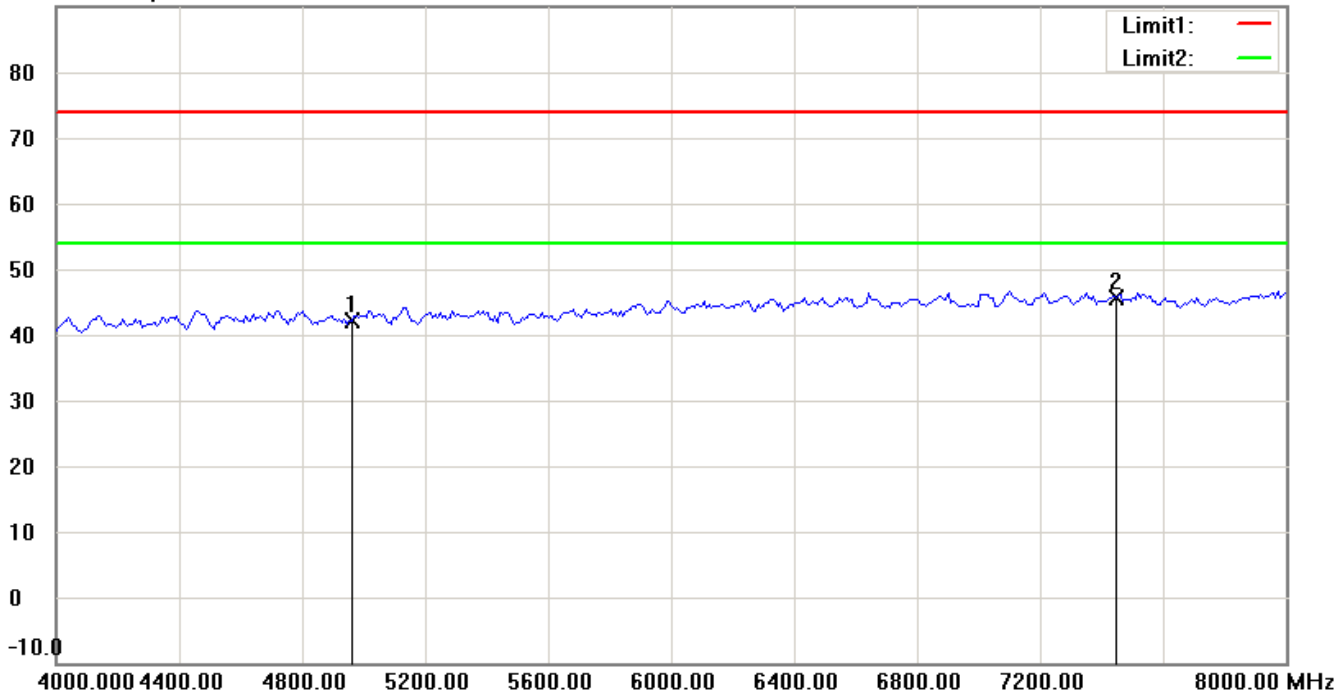


# Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21311-13643-C-1

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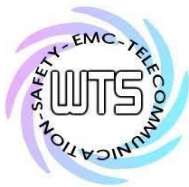
90.0 dBuV/m



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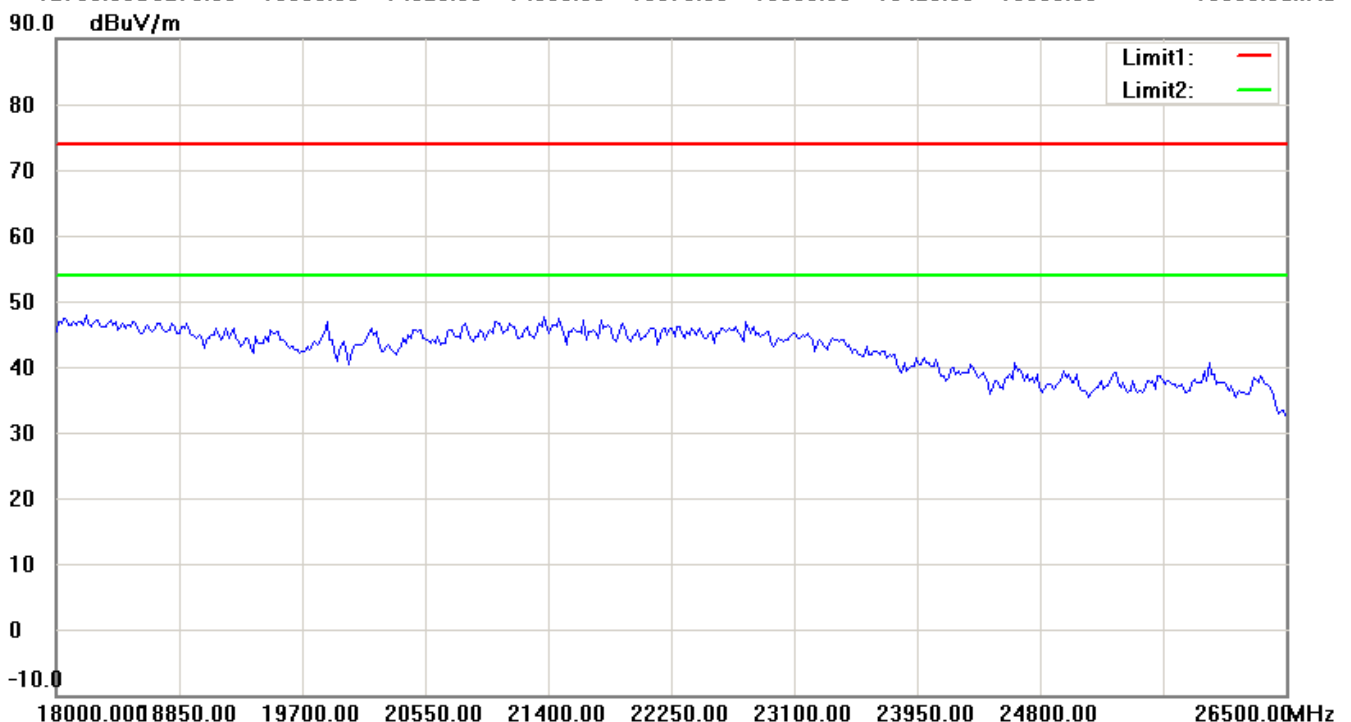
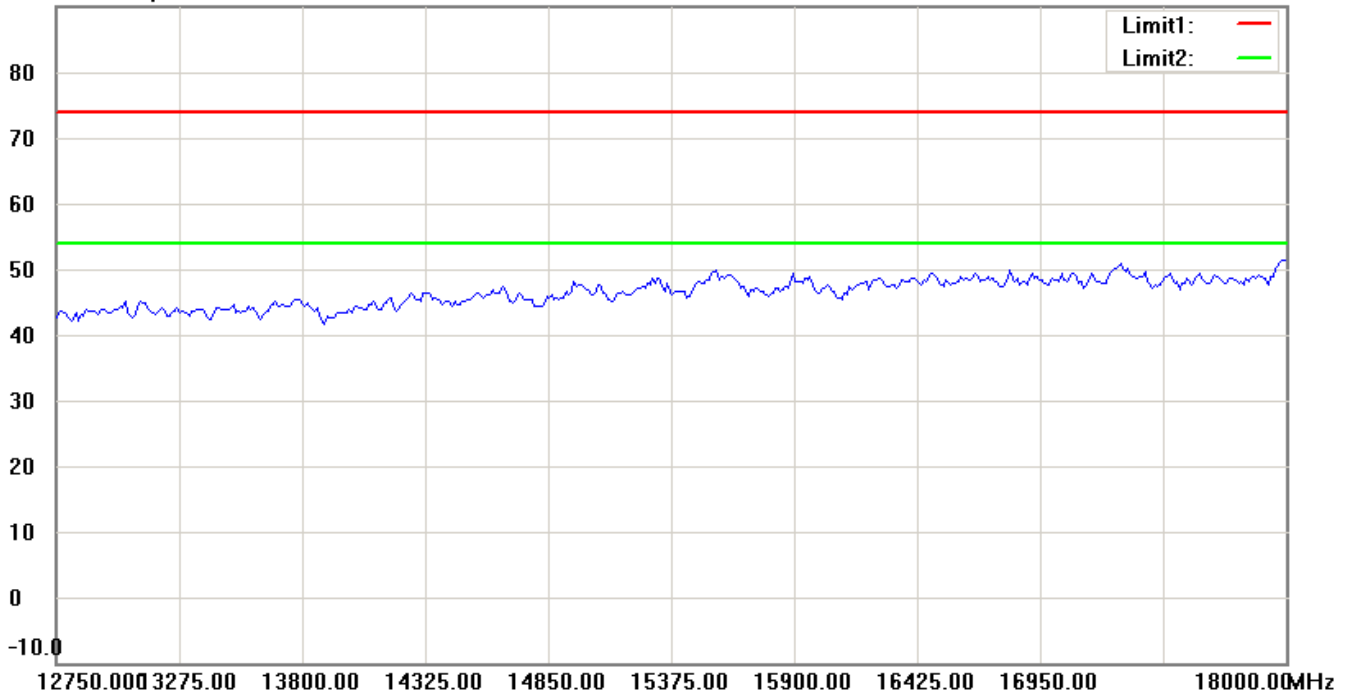


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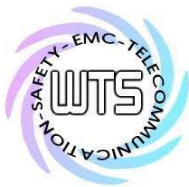
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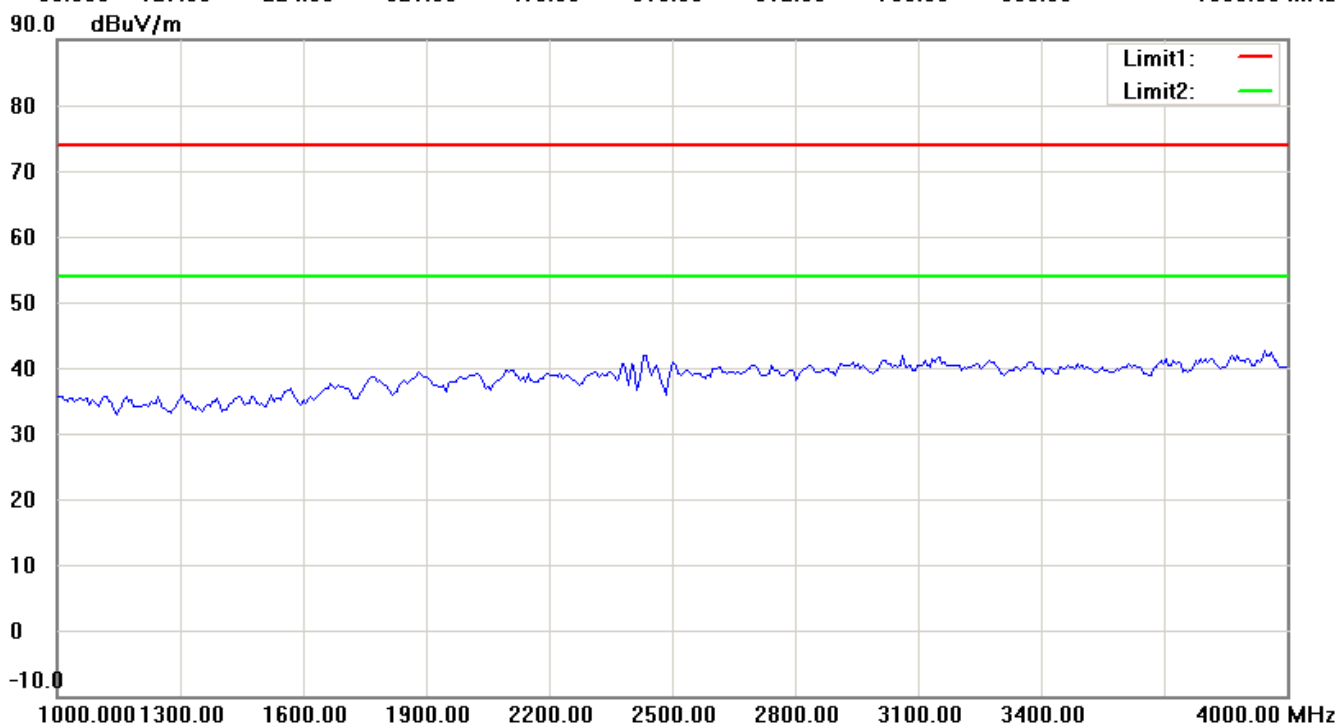
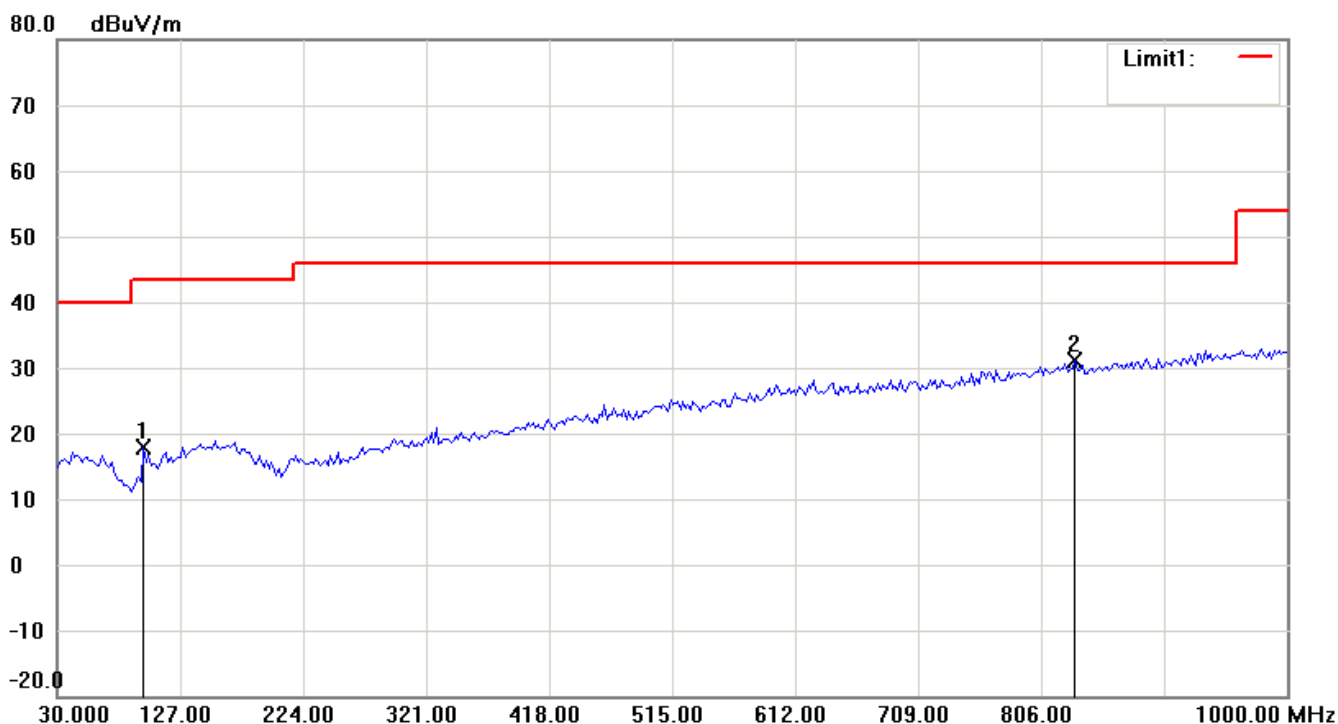


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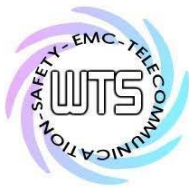
## Antenna Polarization V



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Note:

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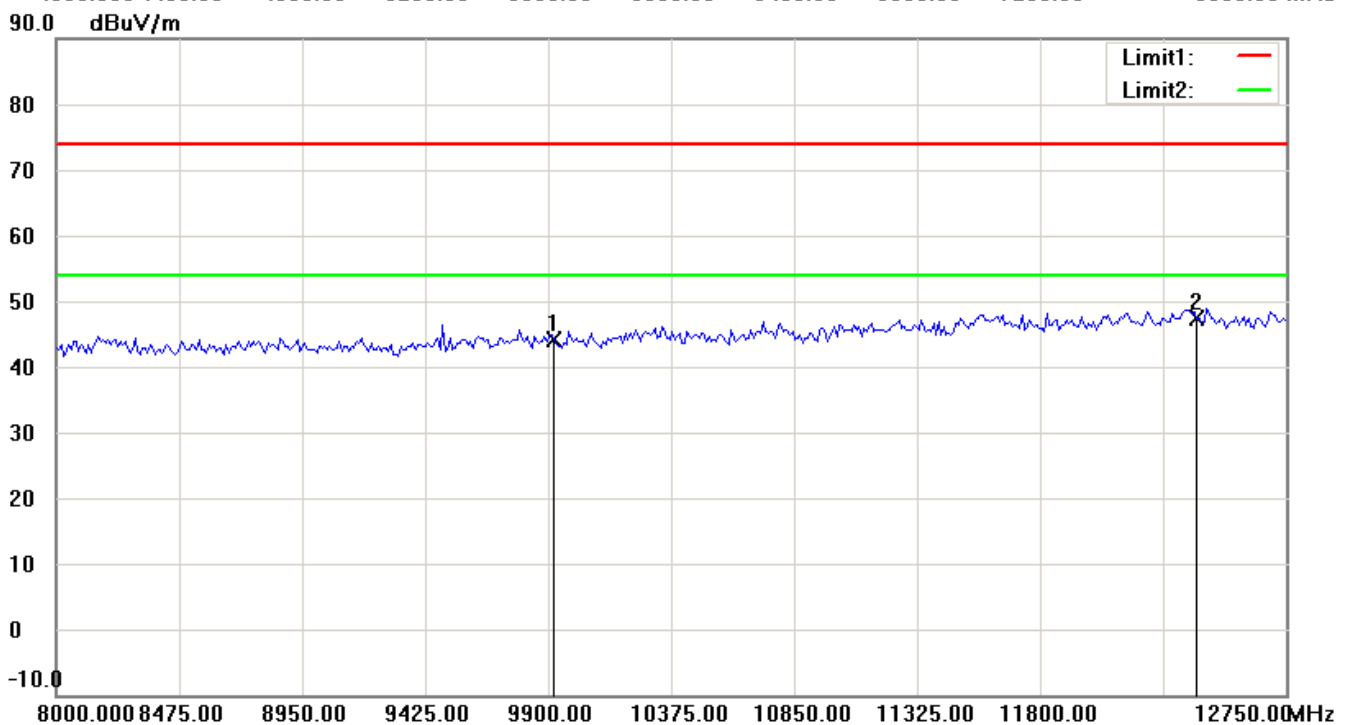
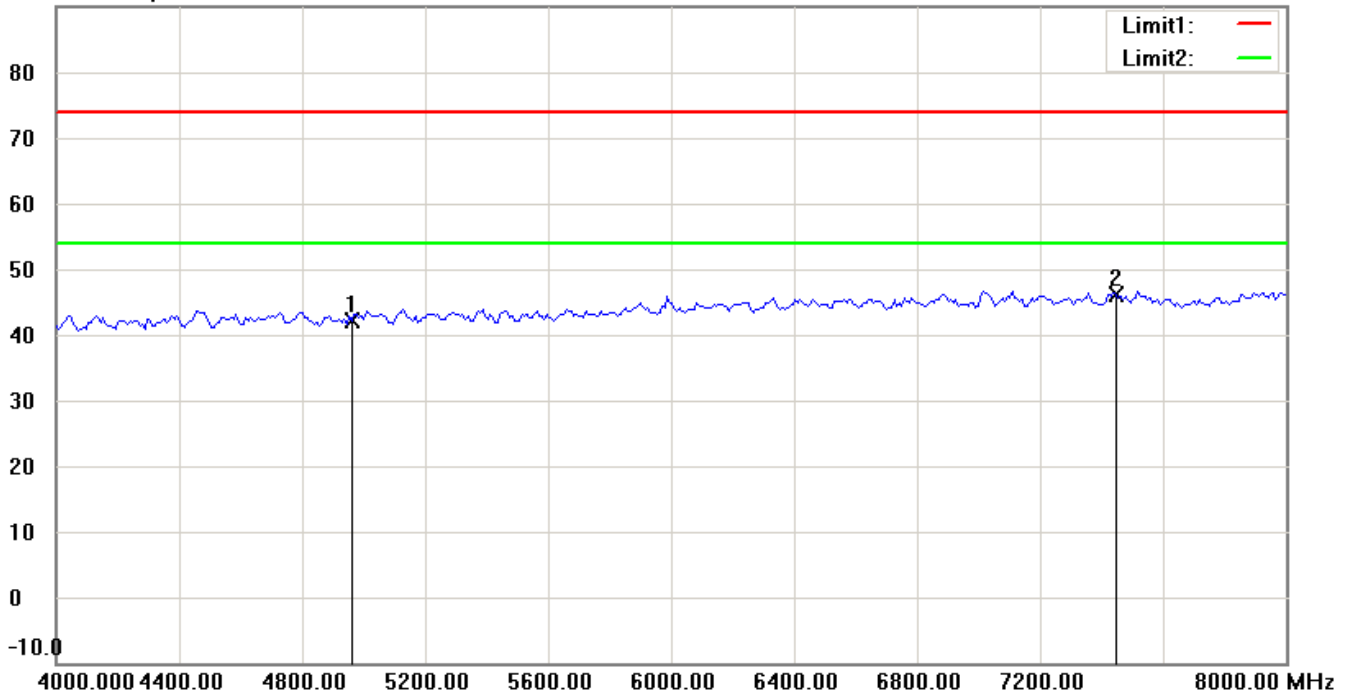


# Worldwide Testing Services(Taiwan) Co., Ltd.

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FCC ID: 2ABCKSAILS0000MNS02

90.0 dBuV/m

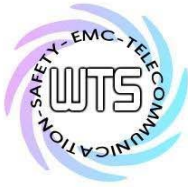


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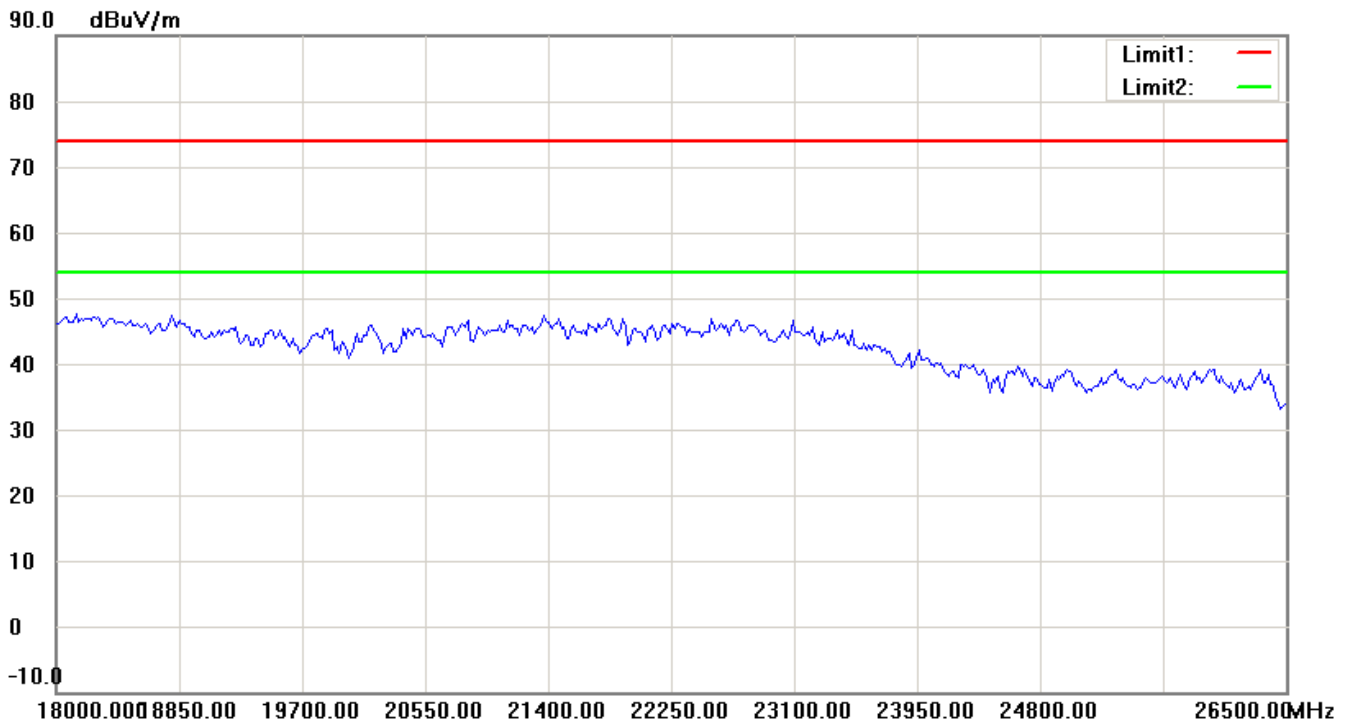
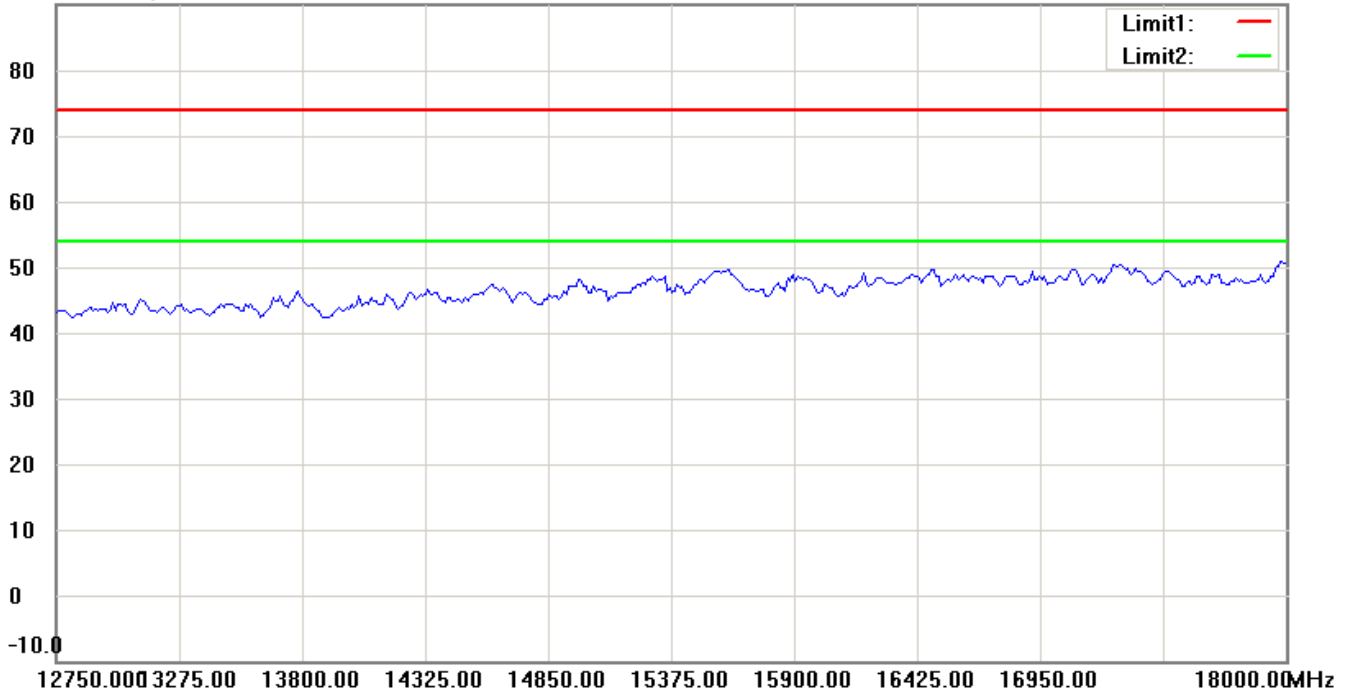


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90.0 dBuV/m



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