

# FCC Radio Test Report

# FCC ID: 2ACSVHF-LPT230-0

#### This report concerns: Original Grant

Project No.	:	2012H045
Equipment	:	WIFI Module
Brand Name	:	HF
Test Model	:	HF-LPT230-0
Series Model	:	N/A
Applicant	:	High-Flying Electronics Technology Co., Ltd.
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		Area,Shanghai ,China
Manufacturer	:	High-Flying Electronics Technology Co., Ltd.
Address	:	Room 1002, Building 1, No.3000, Longdong Avenue, Pudong New
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Date of Receipt	:	Jan. 4, 2021
Date of Test	:	Jan. 4, 2021~Jan. 18, 2021
Issued Date	:	Jan. 26, 2021
Report Version	:	R00
Test Sample	:	Engineering Sample No.: SH2020122872, SH2020122873,
		SH2020122874
Standard(s)	:	FCC Part15, Subpart C (15.247)
		ANSI C63.10-2013
		KDB 558074 D01 15.247 Meas Guidance v05r02

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Maker Q

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Certificate # 5123.03

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#### Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective. Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.



Table of Contents	Page
REPORT ISSUED HISTORY	6
1 . SUMMARY OF TEST RESULTS	7
1.1 TEST FACILITY	7
1.2 MEASUREMENT UNCERTAINTY	8
1.3 TEST ENVIRONMENT CONDITIONS	8
2 . GENERAL INFORMATION	9
2.1 GENERAL DESCRIPTION OF EUT	9
2.2 DESCRIPTION OF TEST MODES	10
2.3 PARAMETERS OF TEST SOFTWARE	11
2.4 DUTY CYCLE	12
2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	13
2.6 SUPPORT UNITS	13
3 . AC POWER LINE CONDUCTED EMISSIONS TEST	14
3.1 LIMIT	14
3.2 TEST PROCEDURE	14
3.3 DEVIATION FROM TEST STANDARD	14
3.4 TEST SETUP	15
3.5 EUT OPERATION CONDITIONS	15
3.6 TEST RESULTS	15
4 . RADIATED EMISSIONS TEST	16
4.1 LIMIT	16
4.2 TEST PROCEDURE	17
4.3 DEVIATION FROM TEST STANDARD	17
4.4 TEST SETUP	18
4.5 EUT OPERATION CONDITIONS	19
4.6 TEST RESULTS - 9 KHZ TO 30 MHZ	19
4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ	19
4.8 TEST RESULTS - ABOVE 1000 MHZ	19
5 . BANDWIDTH TEST	20
5.1 LIMIT	20
5.2 TEST PROCEDURE	20
5.3 DEVIATION FROM STANDARD	20
5.4 TEST SETUP	20



Table of Contents	Page
5.5 EUT OPERATION CONDITIONS	20
5.6 TEST RESULTS	20
6 . MAXIMUM OUTPUT POWER TEST	21
6.1 LIMIT	21
6.2 TEST PROCEDURE	21
6.3 DEVIATION FROM STANDARD	21
6.4 TEST SETUP	21
6.5 EUT OPERATION CONDITIONS	21
6.6 TEST RESULTS	21
7 . CONDUCTED SPURIOUS EMISSIONS	22
7.1 LIMIT	22
7.2 TEST PROCEDURE	22
7.3 DEVIATION FROM STANDARD	22
7.4 TEST SETUP	22
7.5 EUT OPERATION CONDITIONS	22
7.6 TEST RESULTS	22
8 . POWER SPECTRAL DENSITY TEST	23
8.1 LIMIT	23
8.2 TEST PROCEDURE	23
8.3 DEVIATION FROM STANDARD	23
8.4 TEST SETUP	23
8.5 EUT OPERATION CONDITIONS	23
8.6 TEST RESULTS	23
9. MEASUREMENT INSTRUMENTS LIST	24
10 . EUT TEST PHOTO	26
APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS	28
APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ	29
APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ	30
APPENDIX D - RADIATED EMISSION- ABOVE 1000 MHZ	33
APPENDIX E - BANDWIDTH	82
APPENDIX F - MAXIMUM OUTPUT POWER	87
APPENDIX G - CONDUCTED SPURIOUS EMISSIONS	89



#### **Table of Contents**

Page

## **APPENDIX H - POWER SPECTRAL DENSITY**

94



# **REPORT ISSUED HISTORY**

Report Version	Description	Issued Date
R00	Original Issue.	Jan. 26, 2021

# 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.247)					
Standard(s) Section	ard(s) Section Test Item		Judgment	Remark	
15.207	AC Power Line Conducted Emissions	APPENDIX A	N/A		
15.247(d) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS		
15.247(a)(2)	Bandwidth	APPENDIX E	PASS		
15.247(b)(3)	Maximum Output Power	APPENDIX F	PASS		
15.247(d)	Conducted Spurious Emissions	APPENDIX G	PASS		
15.247(e)	Power Spectral Density	APPENDIX H	PASS		
15.203	Antenna Requirement		PASS	Note(2)	

Note:

(1) "N/A" denotes test is not applicable in this test report.

#### 1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China BTL's Test Firm Registration Number for FCC: 476765 BTL's Designation Number for FCC: CN1241



#### **1.2 MEASUREMENT UNCERTAINTY**

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)) The BTL measurement uncertainty as below table:

#### A. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
		9 KHz~30 MHz	V	3.79
		9 KHz~30 MHz	Н	3.57
		30 MHz~200 MHz	V	4.04
	CISPR	30 MHz~200 MHz	Н	3.76
SH-CB01		200 MHz~1,000 MHz	V	4.24
31-0001		200 MHz~1,000 MHz	Н	3.84
		1 GHz~18 GHz	V	4.46
		1 GHz~18 GHz	Н	4.40
		18 GHz~40 GHz	V	3.95
		18 GHz~40 GHz	Н	3.95

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

#### **1.3 TEST ENVIRONMENT CONDITIONS**

Test Item	Temperature	Humidity	Test Voltage	Tested By
Radiated Emissions-30 MHz to 1GHz	24°C	58%	DC 3.3V	Forest Li
Radiated Emissions-Above 1000 MHz	24°C	58%	DC 3.3V	Forest Li
Bandwidth	20°C	40%	DC 3.3V	Danny Dang
Maximum output power & e.i.r.p.	20°C	40%	DC 3.3V	Danny Dang
Conducted Spurious Emissions	20°C	40%	DC 3.3V	Danny Dang
Power Spectral Density	20°C	40%	DC 3.3V	Danny Dang



# 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	WIFI Module
Brand Name	HF
Test Model	HF-LPT230-0
Series Model	N/A
Model Difference(s)	N/A
Software Version	V4.13.31
Hardware Version	V1
Power Source	DC voltage supplied from external power supply.
Power Rating	DC 3.3V
Operation Frequency	2412 MHz ~ 2462 MHz
Modulation Type	IEEE 802.11b: DSSS IEEE 802.11g: OFDM IEEE 802.11n: OFDM
Bit Rate of Transmitter	IEEE 802.11b: 11/5.5/2/1 Mbps IEEE 802.11g: 54/48/36/24/18/12/9/6 Mbps IEEE 802.11n: up to 150 Mbps
Maximum Output Power Non-Beamforming	IEEE 802.11b: 19.59 dBm (0.0910 W) IEEE 802.11g: 22.41 dBm (0.1742 W) IEEE 802.11n (HT20): 23.28 dBm (0.2128 W) IEEE 802.11n (HT40): 23.68 dBm (0.2333 W)

Note:

- 1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- 2. Channel List:

	CH01 - CH11 for IEEE 802.11b, IEEE 802.11g, IEEE 802.11n (HT20)						
		CH03	- CH09 for IE	EE 802.11	n (HT40)		
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		



#### 3. Antenna Specification:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	N/A	N/A	FPCB	N/A	1.67	N/A

Note:

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The antenna gain is provided by the manufacturer.

#### 2.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX B Mode Channel 01/06/11
Mode 2	TX G Mode Channel 01/06/11
Mode 3	TX N-20 MHz Mode Channel 01/06/11
Mode 4	TX N-40 MHz Mode Channel 03/06/09
Mode 5	TX G Mode Channel 11

Following mode(s) as (were) found to be the worst case(s) and selected for the final test.

Radiated emissions test - Below 1GHz		
Final Test Mode:	Description	
Mode 5	TX G Mode Channel 11	

Radiated emissions test- Above 1GHz		
Final Test Mode:	Description	
Mode 1	TX B Mode Channel 01/06/11	
Mode 2	TX G Mode Channel 01/06/11	
Mode 3	TX N-20 MHz Mode Channel 01/06/11	
Mode 4	TX N-40 MHz Mode Channel 03/06/09	

Conducted test	
Final Test Mode:	Description
Mode 1	TX B Mode Channel 01/06/11
Mode 2	TX G Mode Channel 01/06/11
Mode 3	TX N-20 MHz Mode Channel 01/06/11
Mode 4	TX N-40 MHz Mode Channel 03/06/09



#### NOTE:

- (1) The measurements are performed at the high, middle, low available channels.
- (2) 802.11b mode: CCK (1 Mbps)
  - 802.11g mode: OFDM (6 Mbps)
  - 802.11n HT20 mode : BPSK (6.5 Mbps)
  - 802.11n HT40 mode : BPSK (13.5 Mbps)
  - For radiated emission tests, the highest output powers were set for final test.
- (3) For radiated emission below 1 GHz test, the IEEE 802.11 g Channel 11 is found to be the worst case and recorded.

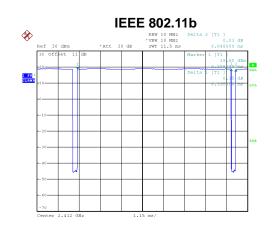
#### 2.3 PARAMETERS OF TEST SOFTWARE

Test Software	SecureCRT_6.5.3.490		
Frequency (MHz)	2412	2437	2462
IEEE 802.11b	default	default	default
IEEE 802.11g	Ox64	Ox64	Ox64
IEEE 802.11n (HT20)	Ox64	Ox64	Ox64
Frequency (MHz)	2422	2437	2452
IEEE 802.11n (HT40)	Ox64	Ox64	Ox64



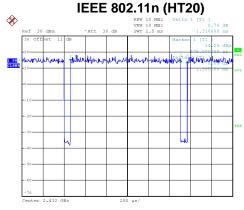
## 2.4 DUTY CYCLE

If duty cycle is  $\geq$  98 %, duty factor is not required. If duty cycle is < 98 %, duty factor shall be considered. The output power = measured power + duty factor.



Date: 4.JAN.2021 19:36:55

Duty cycle = 8.395 ms / 8.648 ms = 97.07%Duty Factor =  $10 \log(1/\text{Duty cycle}) = 0.13$ 

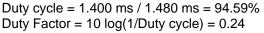


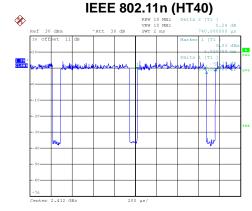
Date: 4.JAN.2021 19:40:51

Duty cycle = 1.310 ms / 1.385 ms = 94.58% Duty Factor = 10 log(1/Duty cycle) = 0.24

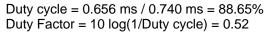
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Date: 4.JAN.2021 19:42:03



#### NOTE:

For IEEE 802.11b:

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is MHz and the video bandwidth is 1 kHz (Duty cycle < 98%).

#### For IEEE 802.11g and IEEE 802.11n (HT20):

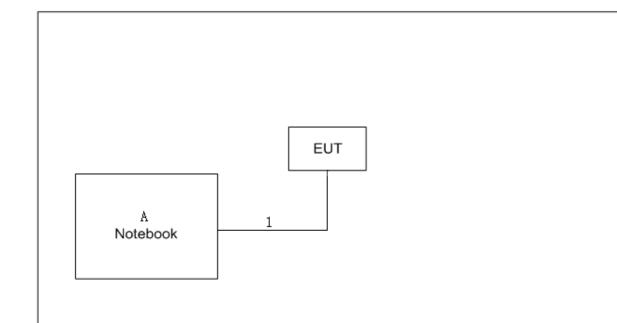
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is MHz and the video bandwidth is 1 kHz (Duty cycle < 98%).

#### For IEEE 802.11n (HT40):

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is MHz and the video bandwidth is 2 kHz (Duty cycle < 98%).



### 2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



#### 2.6 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
A	Notebook	Dell	Inspiron 15-7559	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	USB Cable	NO	NO	0.8m



# 3. AC POWER LINE CONDUCTED EMISSIONS TEST

#### 3.1 LIMIT

Frequency of Emission (MHz)	Limit (d	BμV)
Frequency of Emission (MHz)	Quasi-peak	Average
0.15 - 0.50	66 to 56*	56 to 46*
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

#### The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

#### 3.2 TEST PROCEDURE

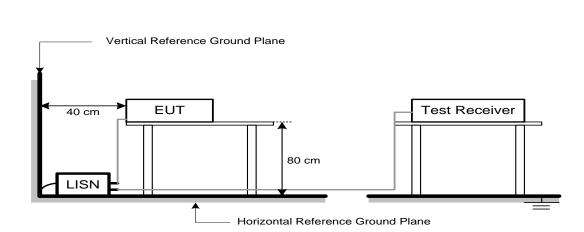
- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item -EUT Test Photos.

#### 3.3 DEVIATION FROM TEST STANDARD

No deviation



## 3.4 TEST SETUP



#### 3.5 EUT OPERATION CONDITIONS

EUT was programmed to be in continuously transmitting mode.

#### 3.6 TEST RESULTS

Please refer to the APPENDIX A.



## 4. RADIATED EMISSIONS TEST

#### 4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

	Frequency (MHz)	(dBuV/m at 3 m)	
		Peak	Average
	Above 1000	74	54

NOTE:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:
- Measurement Value = Reading Level + Correct Factor Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use) Margin Level = Measurement Value - Limit Value

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW	1 MHz / 3 MHz for Peak,
(Emission in restricted band)	1 MHz / 1/T for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector

#### 4.2 TEST PROCEDURE

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- i. For the actual test configuration, please refer to the related Item -EUT Test Photos.

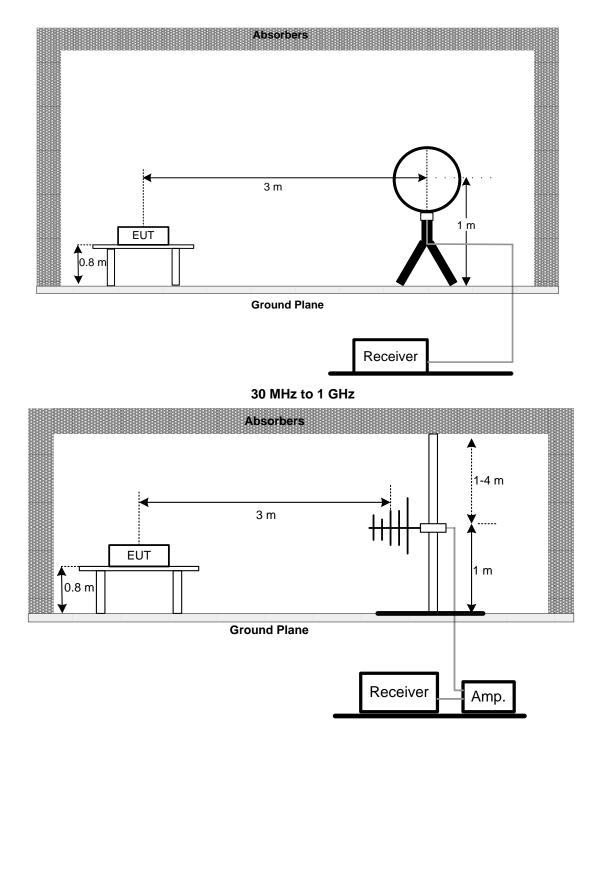
#### 4.3 DEVIATION FROM TEST STANDARD

No deviation

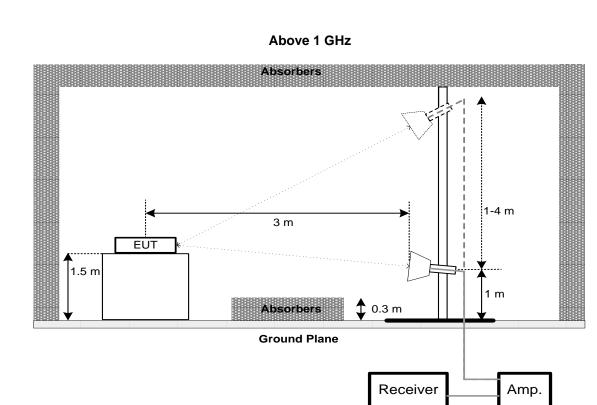


# 4.4 TEST SETUP





# <u>3TL</u>



#### 4.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 4.6 TEST RESULTS - 9 KHZ TO 30 MHZ

Please refer to the APPENDIX B

#### Remark:

- (1) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

#### 4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ

Please refer to the APPENDIX C.

#### 4.8 TEST RESULTS - ABOVE 1000 MHZ

Please refer to the APPENDIX D.

#### Remark:

(1) No limit: This is fundamental signal, the judgment is not applicable. For fundamental signal judgment was referred to Peak output test.



# 5. BANDWIDTH TEST

#### 5.1 LIMIT

FCC Part15, Subpart C (15.247)			
Section	Test Item	Limit	
15.247(a)(2)	6 dB Bandwidth	Minimum 500 kHz	
	99% Emission Bandwidth	-	

#### 5.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting:

For 6 dB Bandwidth : RBW= 100 kHz, VBW=300 kHz, Sweep time = auto.

For 99% Emission Bandwidth B/G/N-20 Mode: RBW= 300 KHz, VBW=1 MHz, Sweep time = 2.5 ms. For 99% Emission Bandwidth N-40 Mode: RBW= 1 MHz, VBW=3 MHz, Sweep time = 2.5 ms.

c. The bandwidth was performed in accordance with method 11.8.1 of ANSI C63.10-2013.

#### **5.3 DEVIATION FROM STANDARD**

No deviation.

#### 5.4 TEST SETUP



#### 5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 5.6 TEST RESULTS

Please refer to the APPENDIX E.



## 6. MAXIMUM OUTPUT POWER TEST

#### 6.1 LIMIT

FCC Part15, Subpart C (15.247)				
Section Test Item Limit				
15.247(b)(3)	Maximum Output Power	1 Watt or 30dBm		

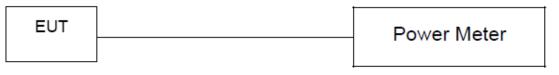
#### 6.2 TEST PROCEDURE

- a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below.
- b. The maximum conducted output power was performed in accordance with method 11.9.1.3 (for peak power) or 11.9.2.3.1 (for AVG power) of ANSI C63.10-2013.

#### 6.3 DEVIATION FROM STANDARD

No deviation.

#### 6.4 TEST SETUP



#### 6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 6.6 TEST RESULTS

Please refer to the APPENDIX F.



# 7. CONDUCTED SPURIOUS EMISSIONS

#### 7.1 LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB 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, provided the transmitter demonstrates compliance with the peak Output Power limits. If the transmitter complies with the Output Power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

#### 7.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW= 100 kHz, VBW=300 kHz, Sweep time = Auto.

#### 7.3 DEVIATION FROM STANDARD

No deviation.

#### 7.4 TEST SETUP



SPECTRUM ANALYZER

#### 7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 7.6 TEST RESULTS

Please refer to the APPENDIX G.



# 8. POWER SPECTRAL DENSITY TEST

#### 8.1 LIMIT

FCC Part15, Subpart C (15.247)				
Section	Limit			
15.247(e)	Power Spectral Density	8 dBm (in any 3 kHz)		

#### 8.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW=3 kHz, VBW=10 kHz, Sweep time = Auto.
- c. The Power Spectral Density was performed in accordance with method 11.10.2 of ANSI C63.10-2013.

#### 8.3 DEVIATION FROM STANDARD

No deviation.

#### 8.4 TEST SETUP

EUT	SPECTRUM	
	ANALYZER	

#### 8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 8.6 TEST RESULTS

Please refer to the APPENDIX H.

# 9. MEASUREMENT INSTRUMENTS LIST

	Radiated Emissions - 30 MHz to 1 GHz						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until		
1	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	719	Apr. 02, 2021		
2	Pre-Amplifier	emci	EMC9135	980400	Mar. 21, 2021		
3	MXE EMI Receiver	Keysight	N9038A	MY57150106	Mar. 21, 2021		
4	Test Cable	emci	EMC104-SM-SM-7 000	170330	Apr. 13, 2021		
5	Test Cable	emci	EMC104-SM-SM-1 000	170331	Apr. 13, 2021		
6	Test Cable	emci	EMC104-SM-NM-3 500	170621	Apr. 13, 2021		
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A		
Padiated Emissions Above 1 CHz							

	Radiated Emissions - Above 1 GHz				
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	9120D	00206960	Apr. 02, 2021
2	Pre-Amplifier	emci	EMC012645SE	980421	May. 11, 2021
3	EXA Spectrum Analyzer	Keysight	N9010A	MY56480545	Mar. 21, 2021
4	Test Cable	emci	EMC104-SM-SM-7 000	170330	Apr. 13, 2021
5	Test Cable	emci	EMC104-SM-SM-1 000	170331	Apr. 13, 2021
6	Test Cable	emci	EMC104-SM-NM-3 500	170621	Apr. 13, 2021
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	MXE EMI Receiver	Keysight	N9038A	MY57150106	May. 06, 2021
9	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	3116C	00203919	Jul. 20, 2021
10	Pre-Amplifier	emci	EMC184045SE	980409	Mar. 21, 2021
11	EXA Spectrum Analyzer	Keysight	N9010A	MY56480579	Mar. 21, 2021
12	Test Cable	emci	EMC102-KM-KM-8 00	170654	Apr. 13, 2021
13	Test Cable	emci	Super Reliable-40G-SS11- 7000	W0030860001	Apr. 13, 2021
14	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A



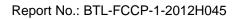
	Bandwidth				
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100626	May. 06, 2021
Maximum Output Power					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1 Peak Power Analyze Keysight 8990B				MY51000507	Mar. 21, 2021
2	Wideband Power Sensor	Keysight	N9123A	MY58310003	Mar. 21, 2021

	Antenna Conducted Spurious Emissions					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	R&S	FSP40	100626	May. 06, 2021	

Power Spectral Density					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100626	May. 06, 2021

Remark: "N/A" denotes no model name, serial no. or calibration specified.

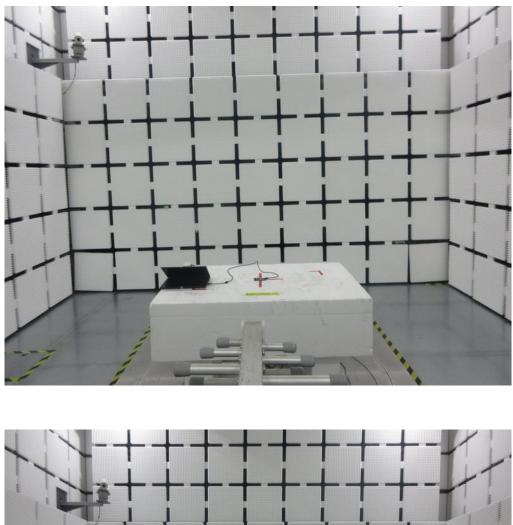
All calibration period of equipment list is one year.

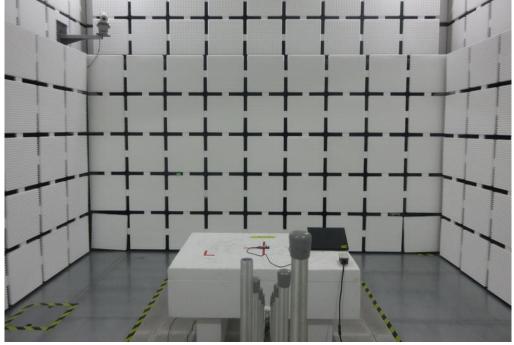


# 10. EUT TEST PHOTO

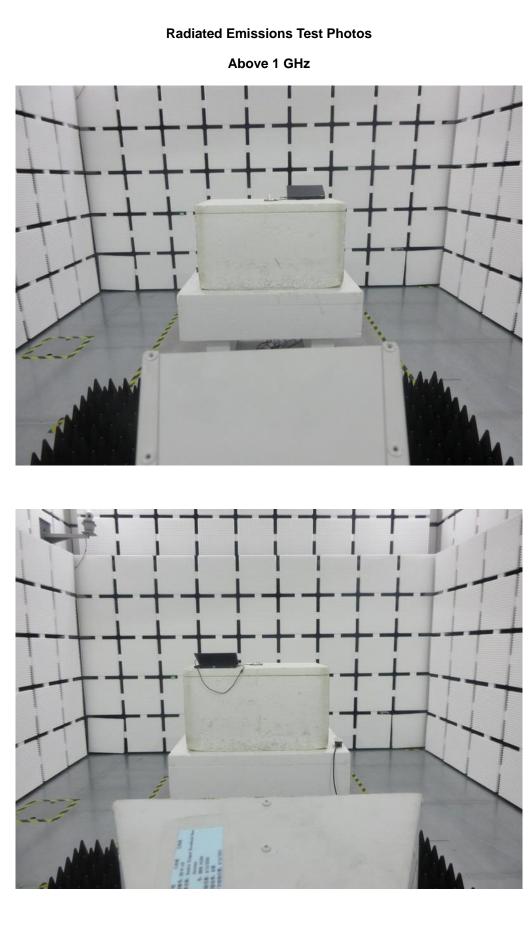
#### **Radiated Emissions Test Photos**

30 MHz to 1 GHz











# **APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS**

Note: The WIFI Module is powered by DC, therefore they are not tested.



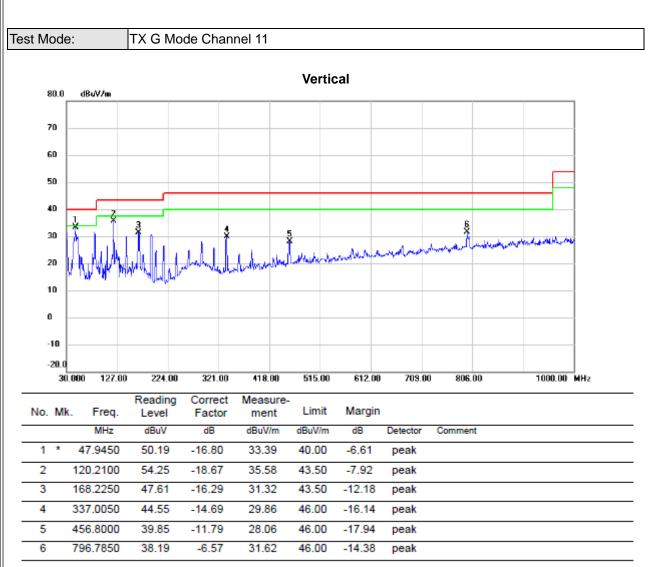
# **APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ**

Note: The measured value have enough margin over 20dB than the limit, therefore they are not reported.



# APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

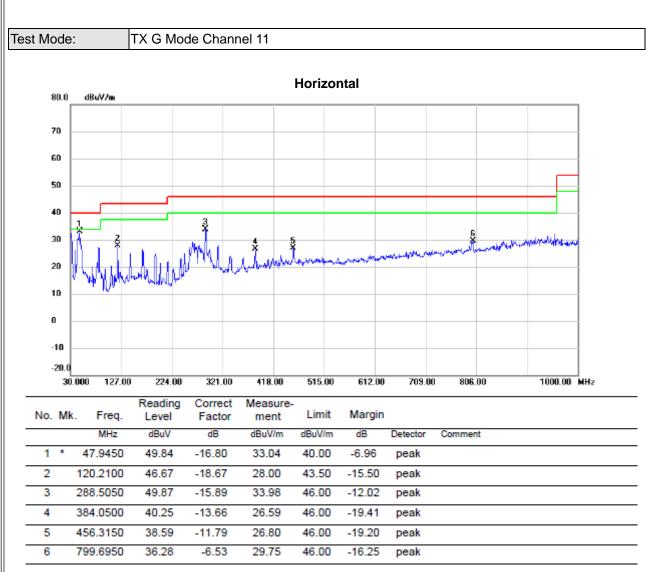




#### **REMARKS**:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





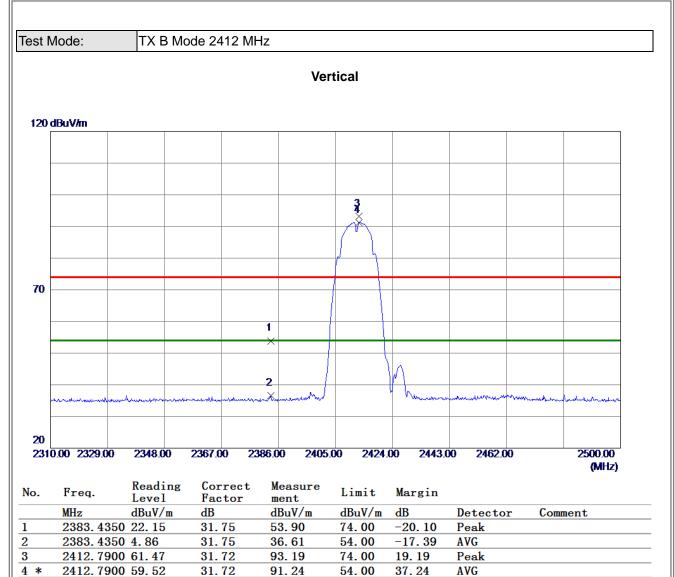
#### **REMARKS**:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



# **APPENDIX D - RADIATED EMISSION- ABOVE 1000 MHZ**

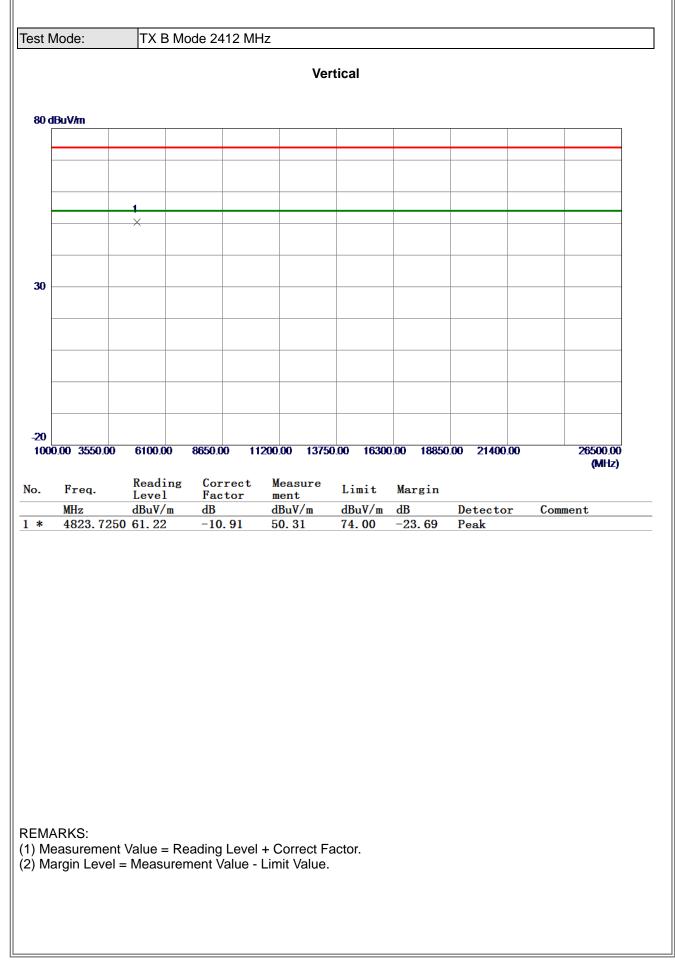




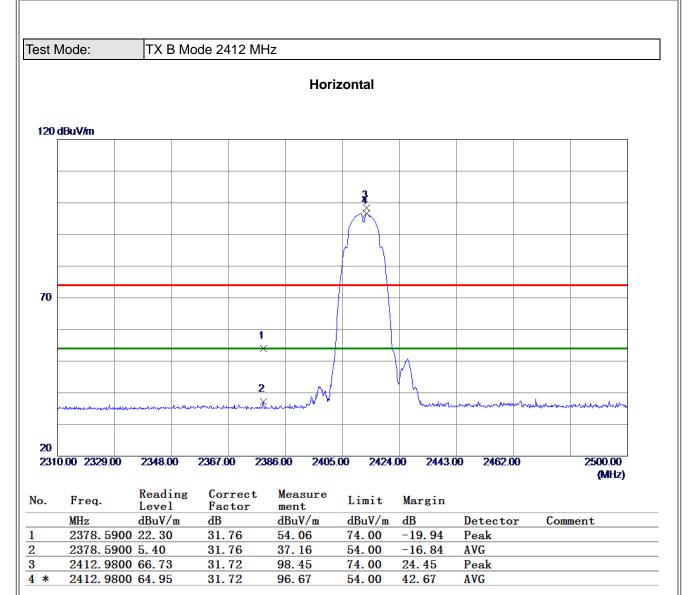
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.







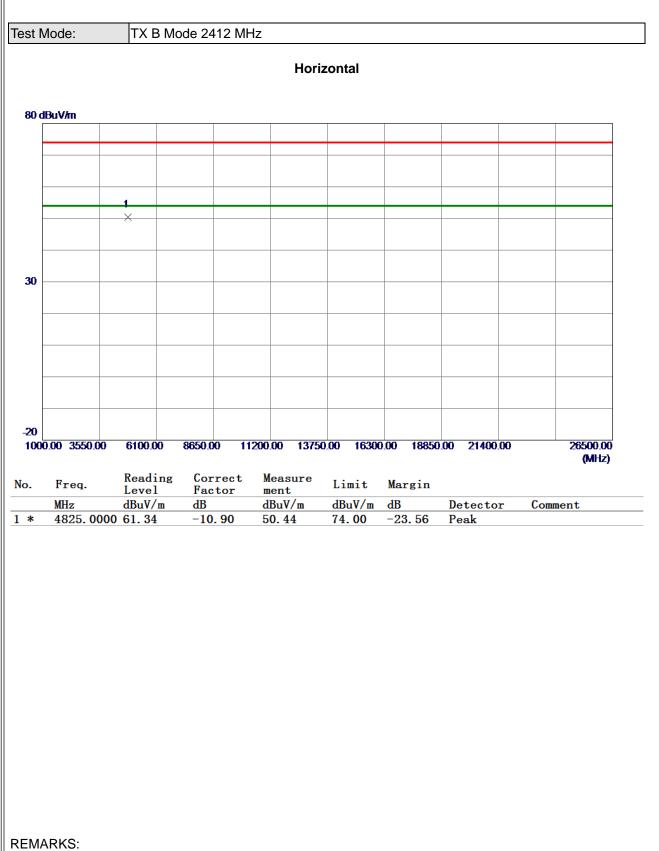


**REMARKS**:

(1) Measurement Value = Reading Level + Correct Factor.

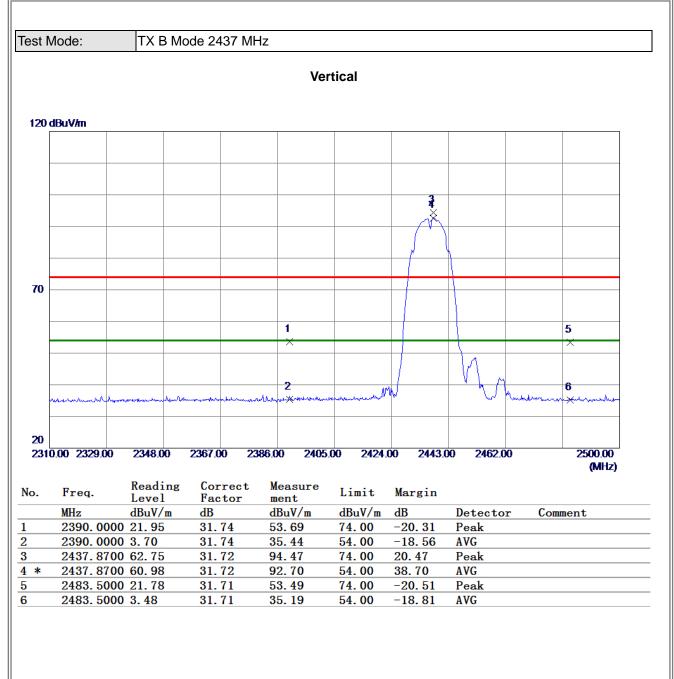
(2) Margin Level = Measurement Value - Limit Value.





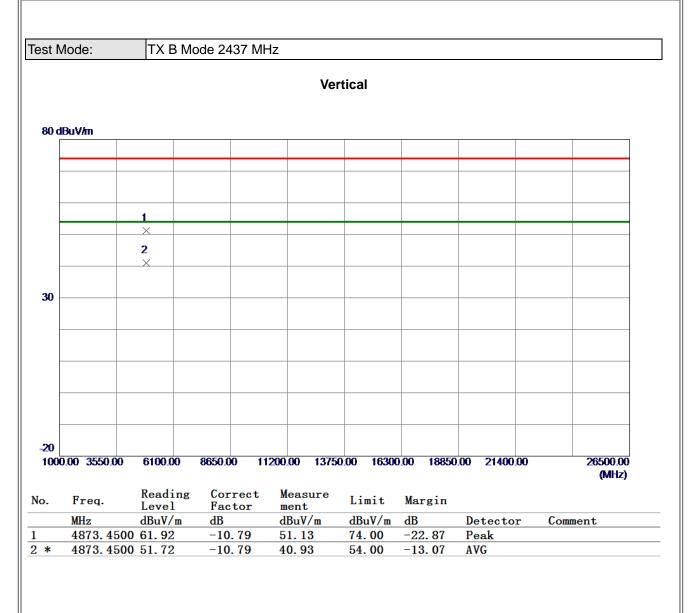
(1) Measurement Value = Reading Level + Correct Factor.





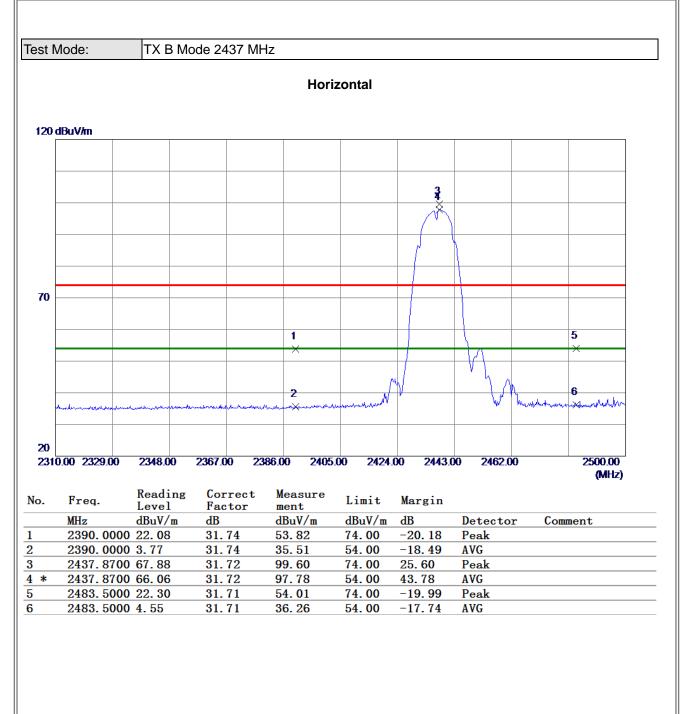
(1) Measurement Value = Reading Level + Correct Factor.





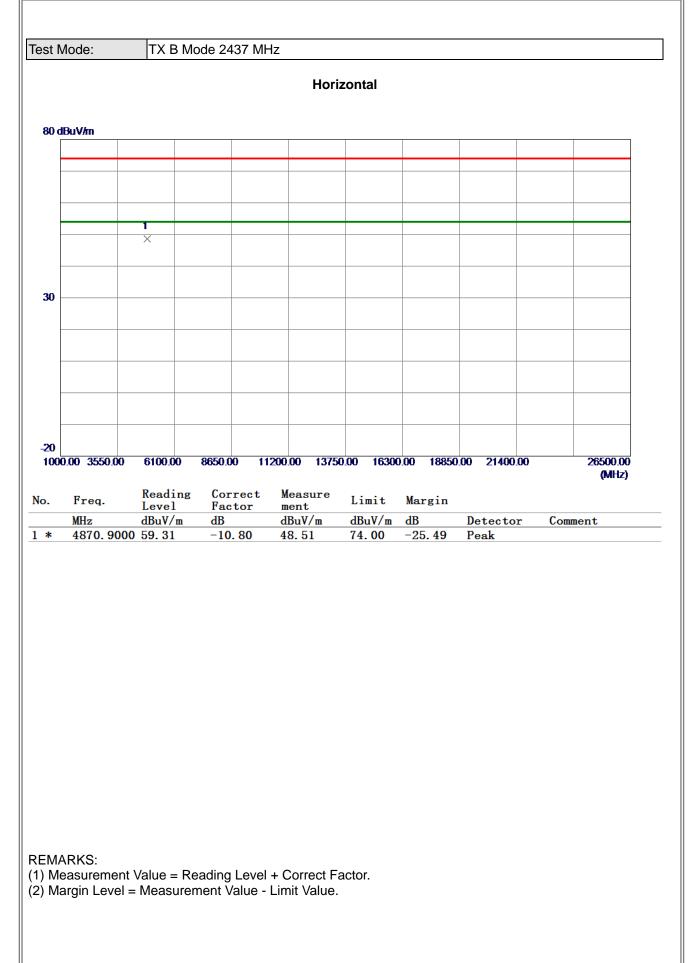
(1) Measurement Value = Reading Level + Correct Factor.



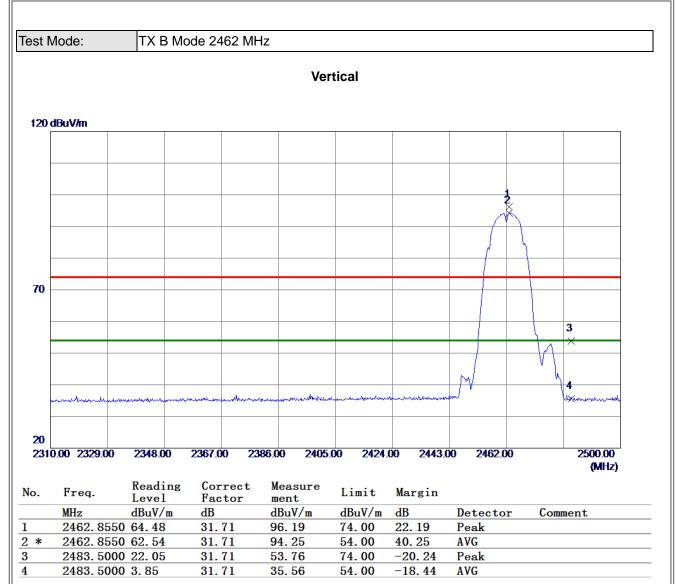


(1) Measurement Value = Reading Level + Correct Factor.







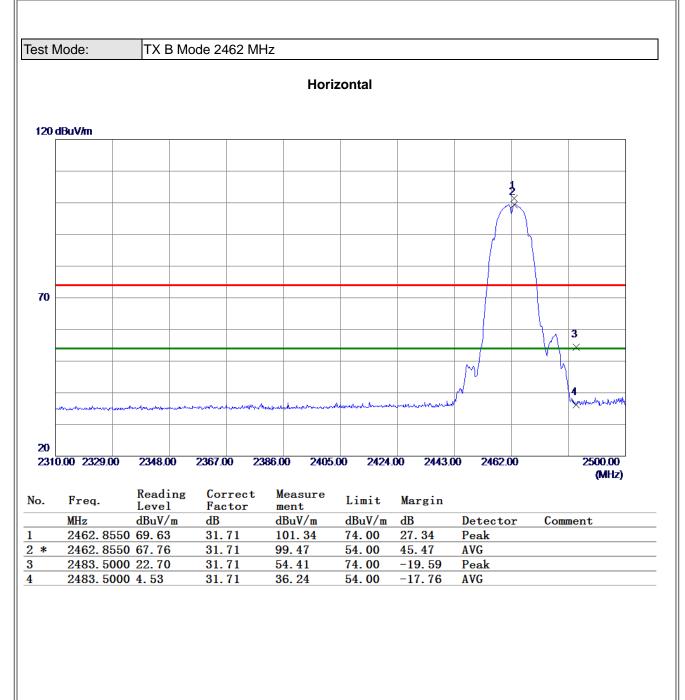


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



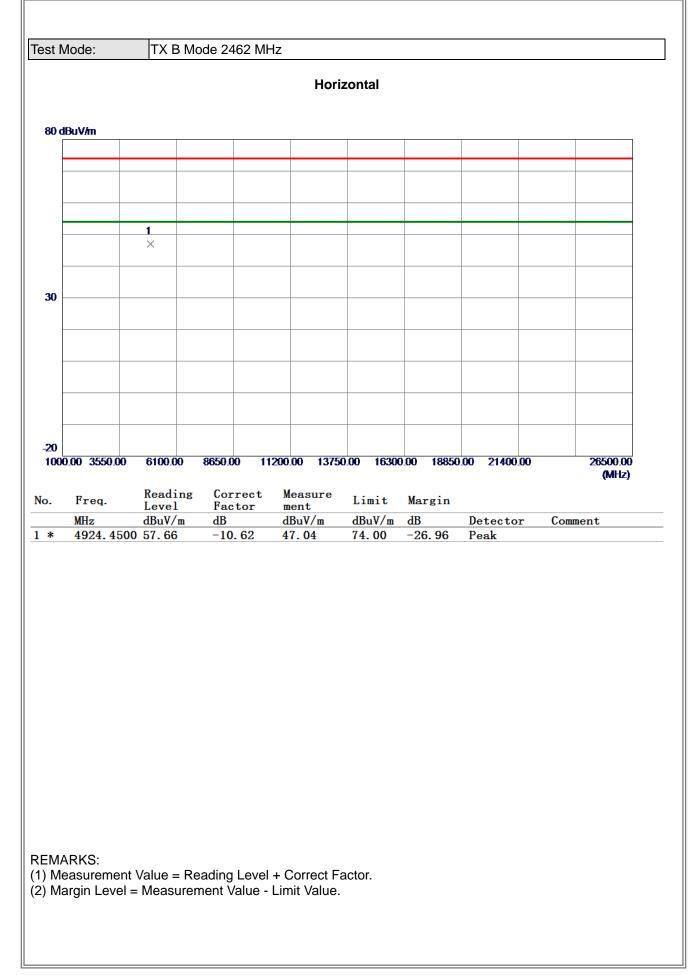




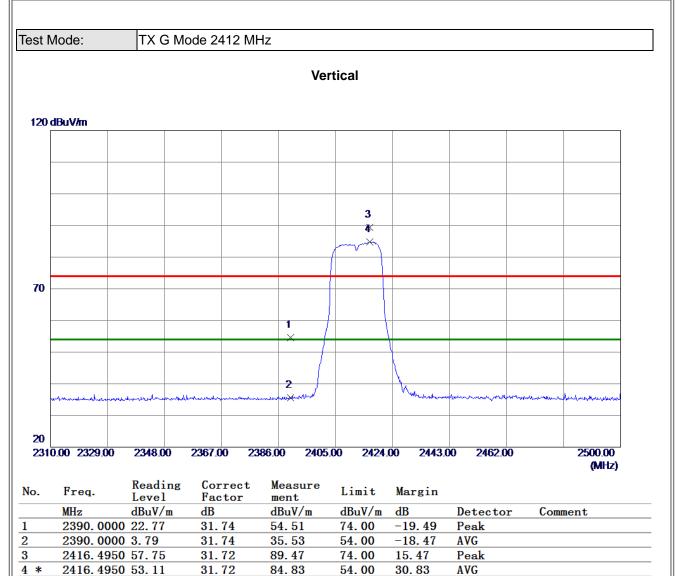


(1) Measurement Value = Reading Level + Correct Factor.







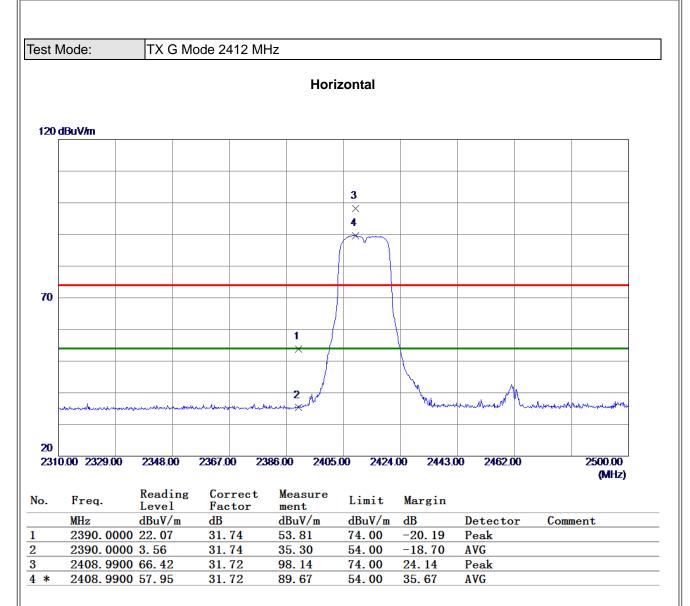


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



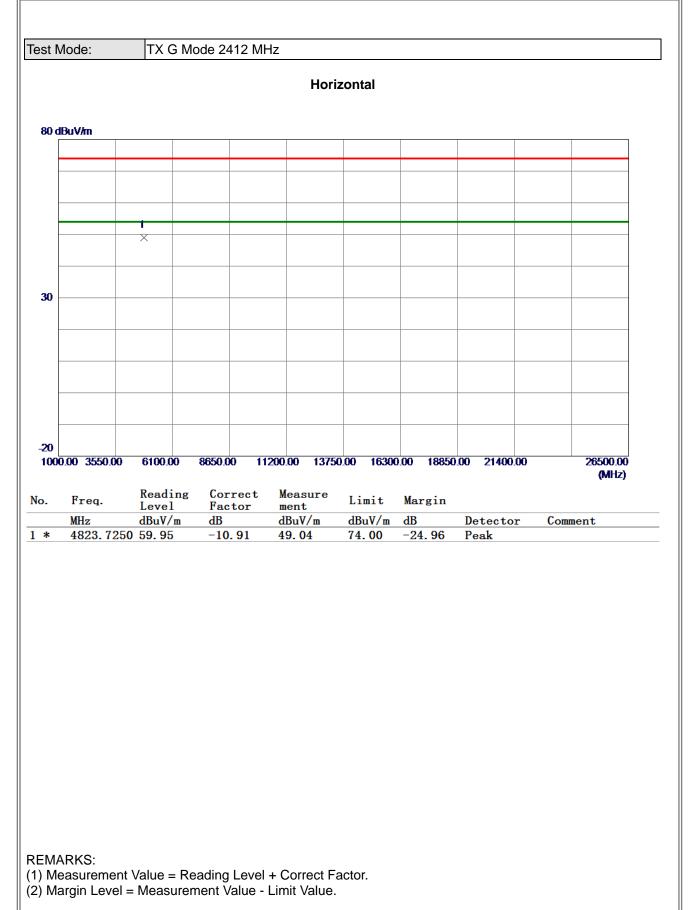




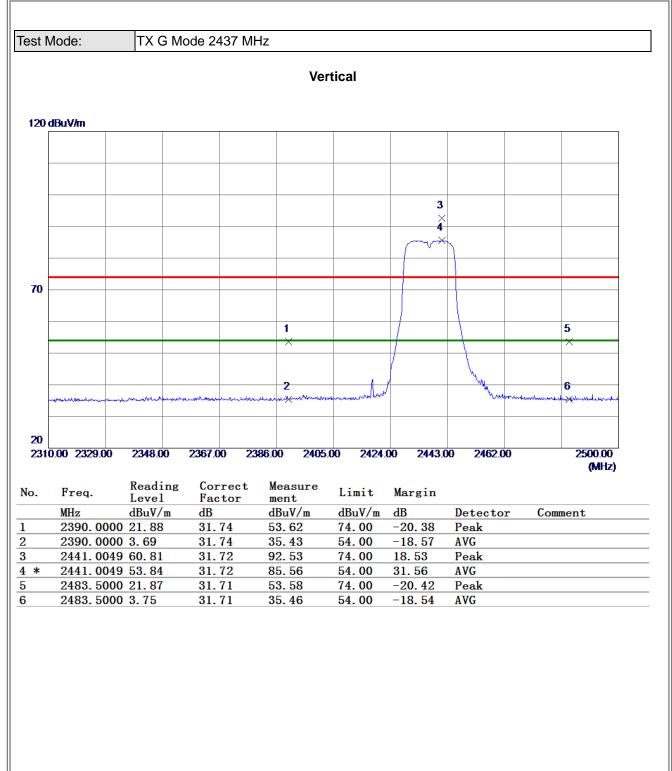


(1) Measurement Value = Reading Level + Correct Factor.



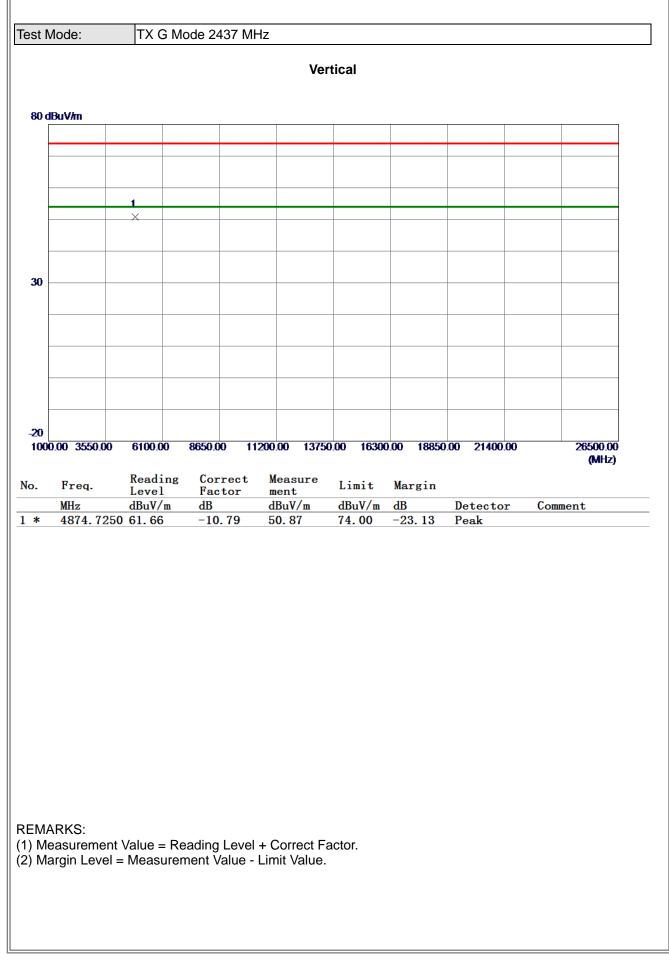




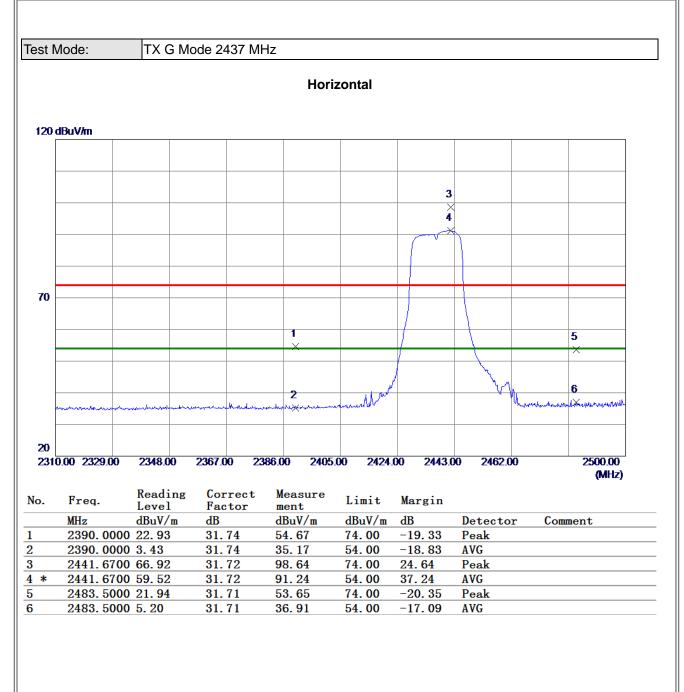


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



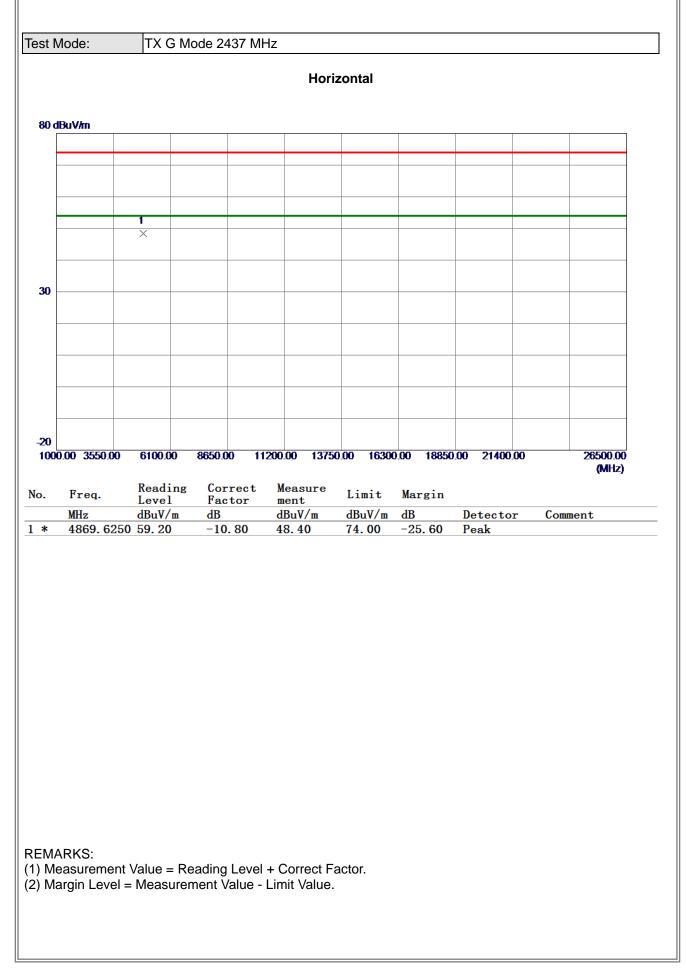




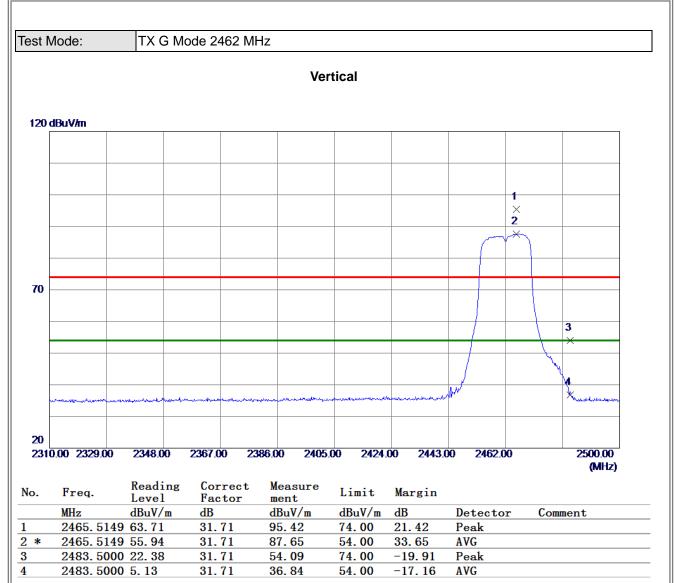


(1) Measurement Value = Reading Level + Correct Factor.



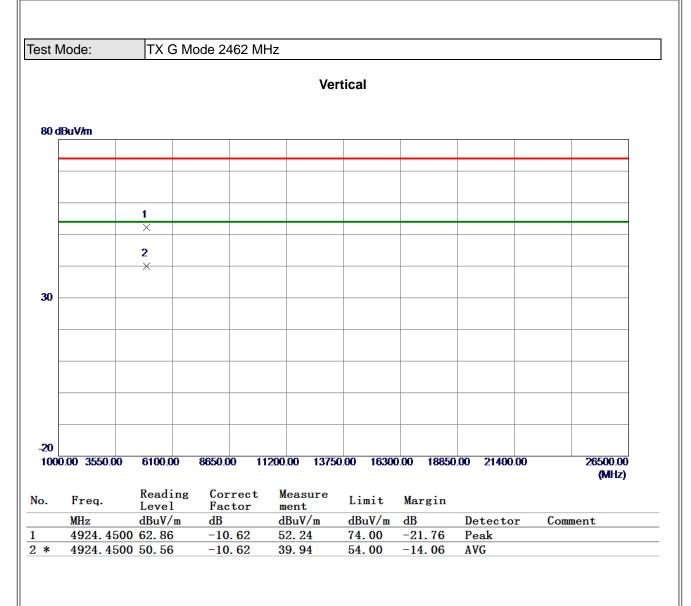






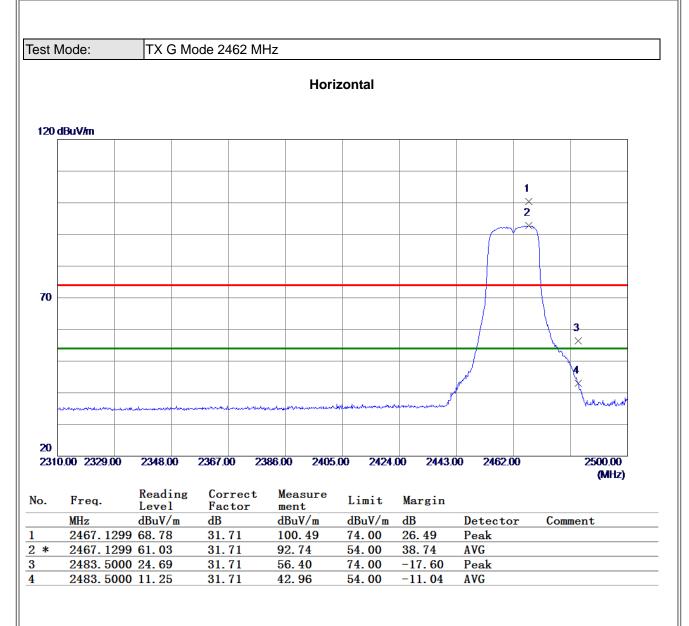
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





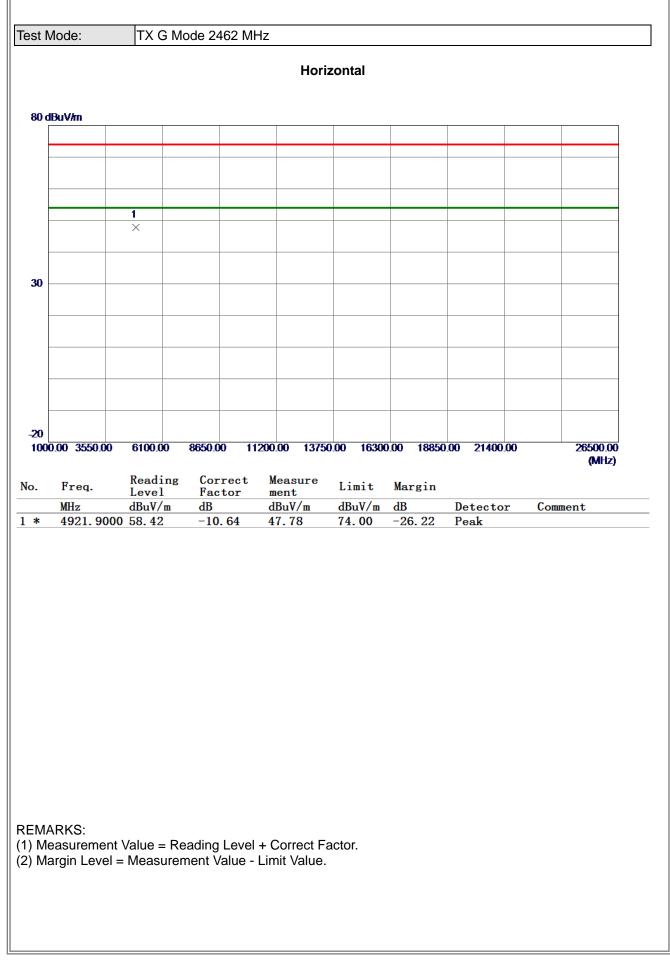
(1) Measurement Value = Reading Level + Correct Factor.



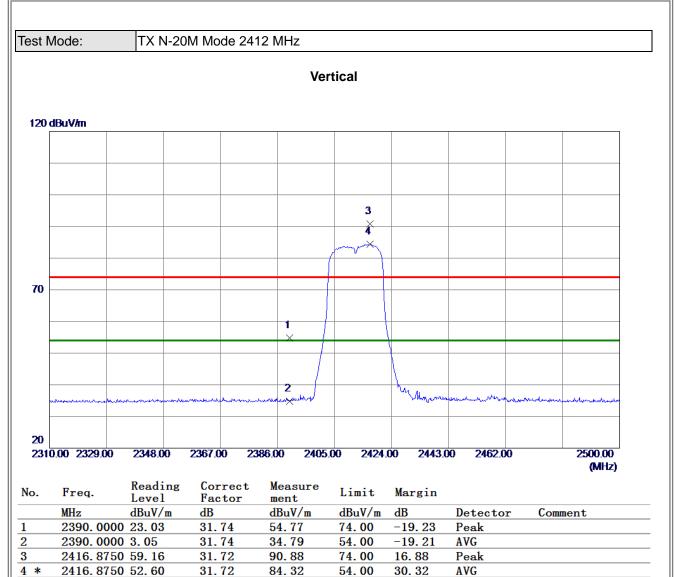


(1) Measurement Value = Reading Level + Correct Factor.



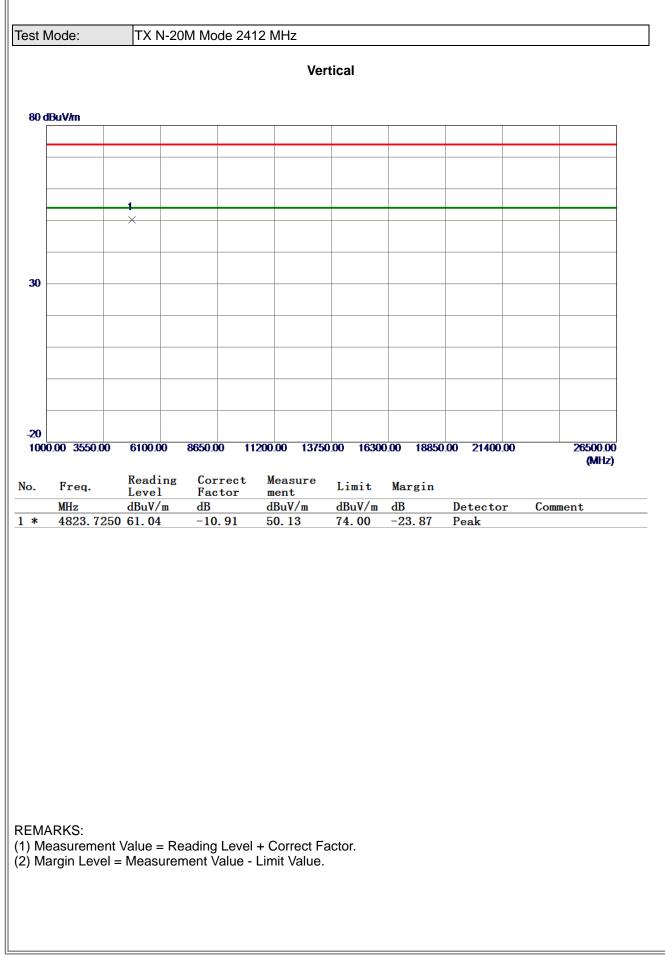




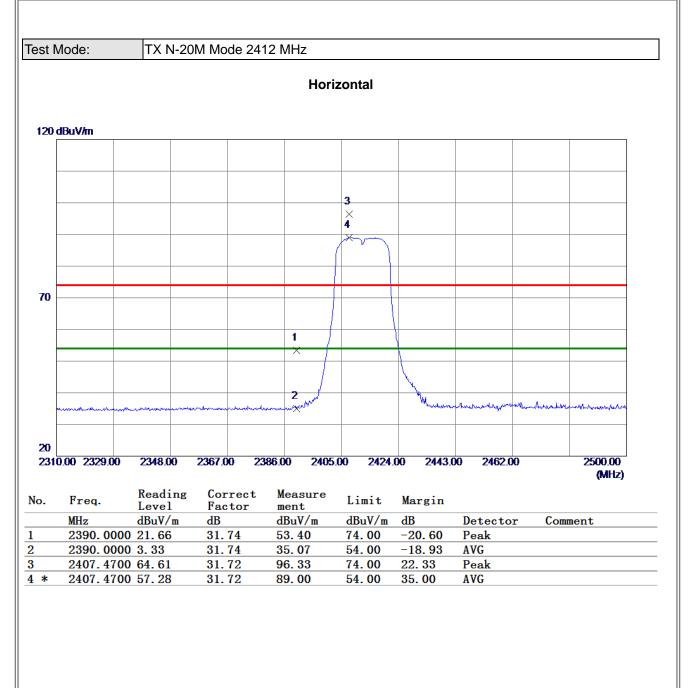


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



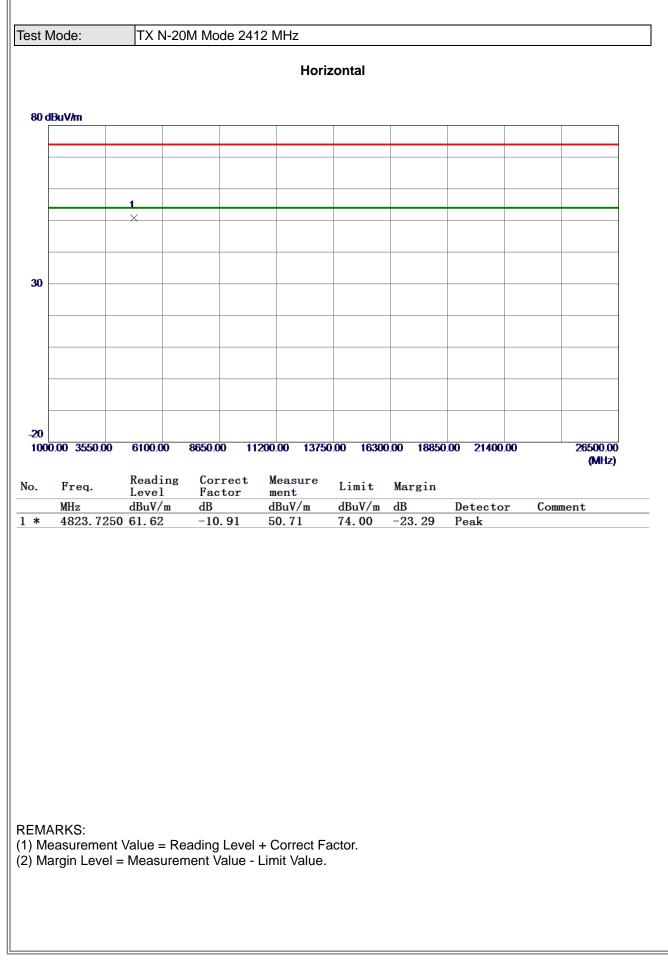




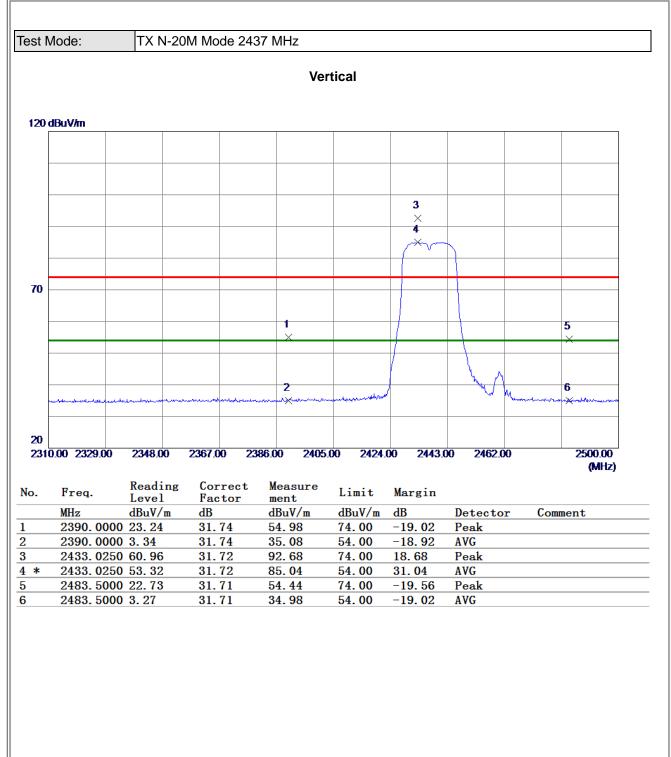


(1) Measurement Value = Reading Level + Correct Factor.



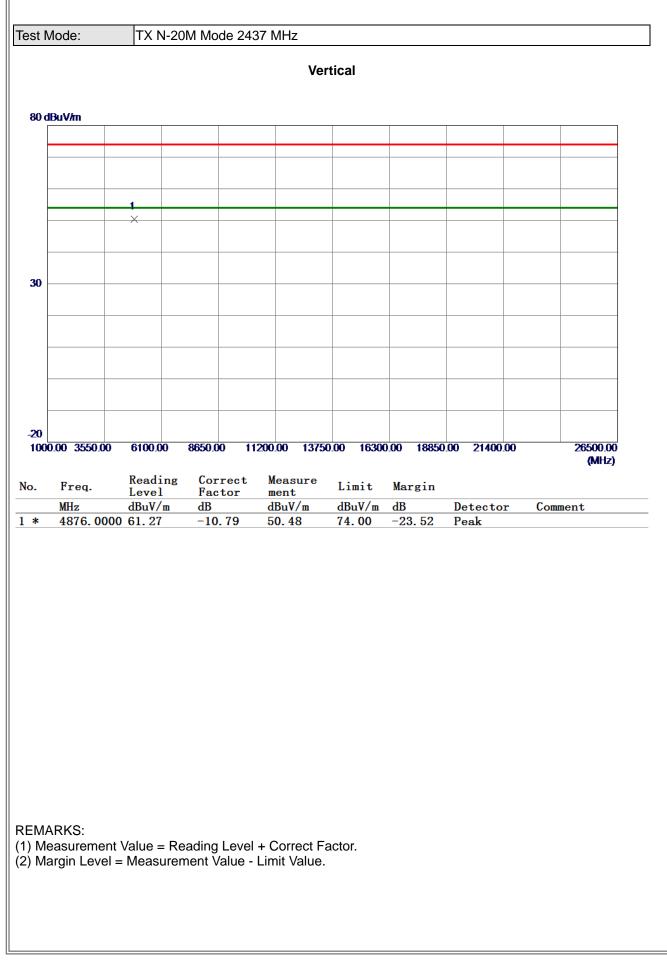




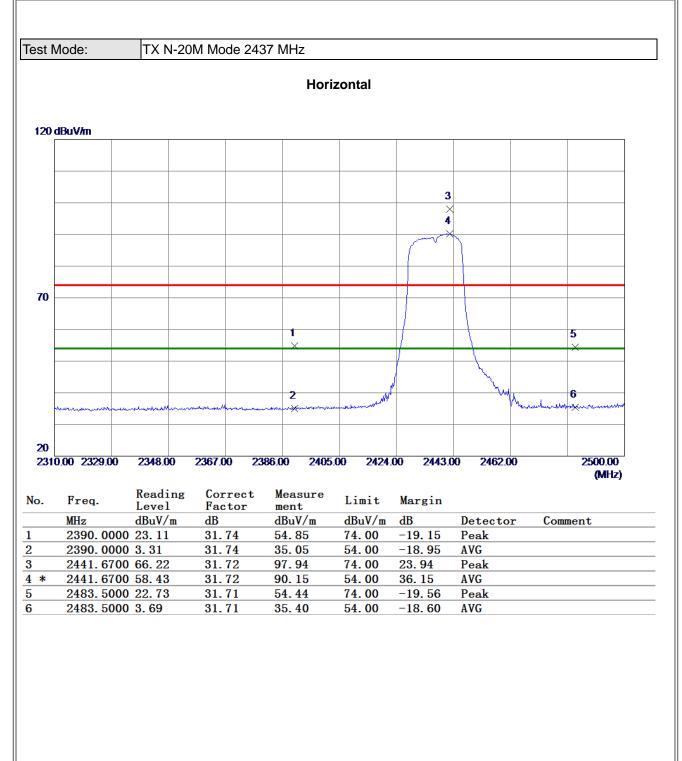


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



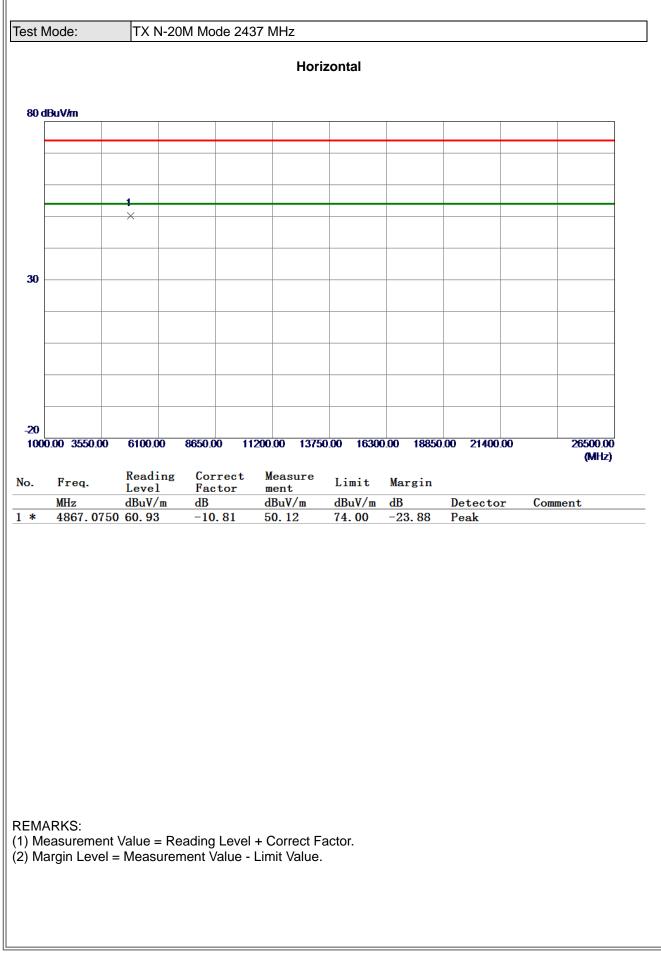




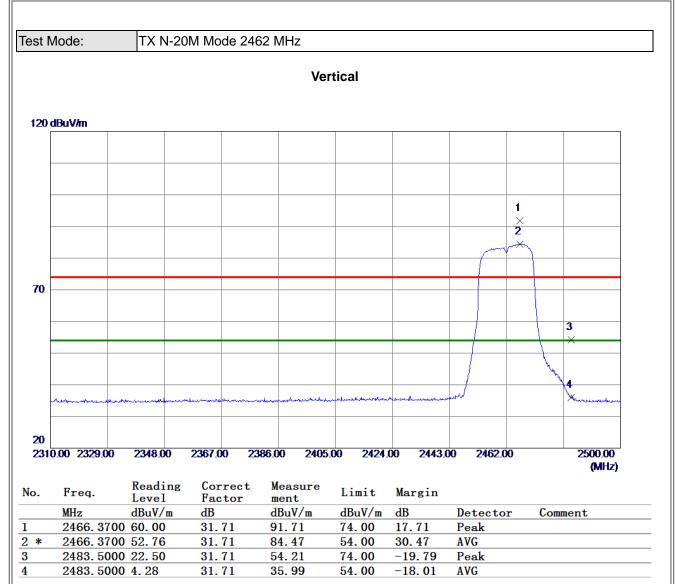


(1) Measurement Value = Reading Level + Correct Factor.



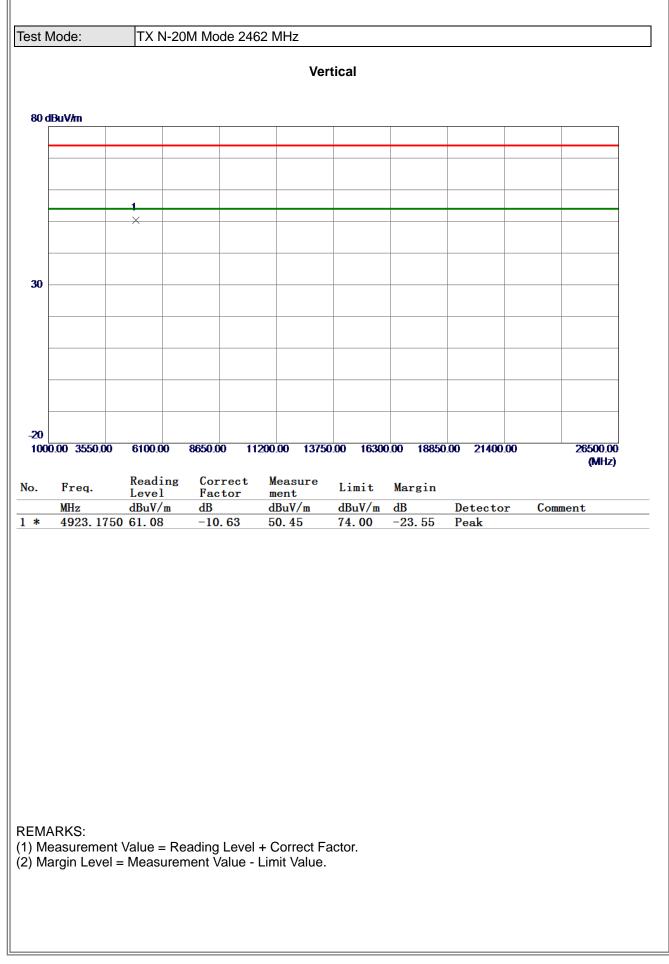




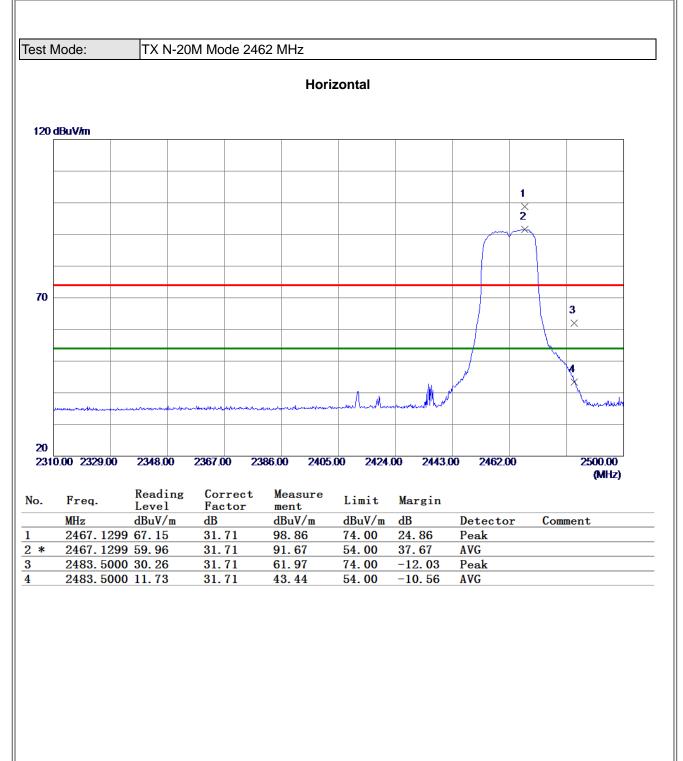


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



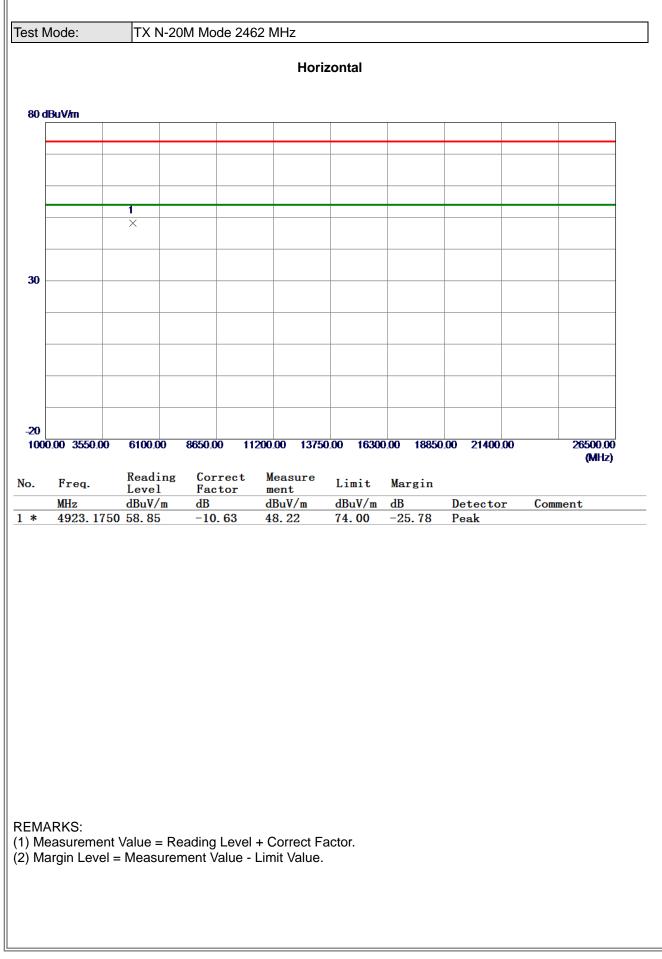




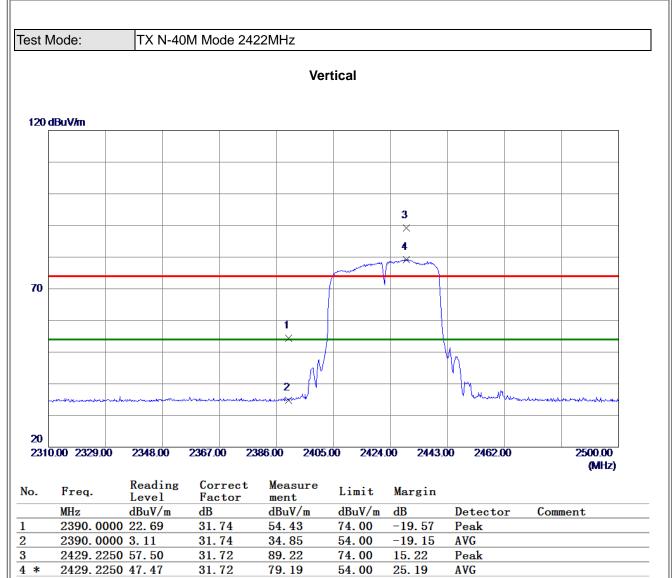


(1) Measurement Value = Reading Level + Correct Factor.



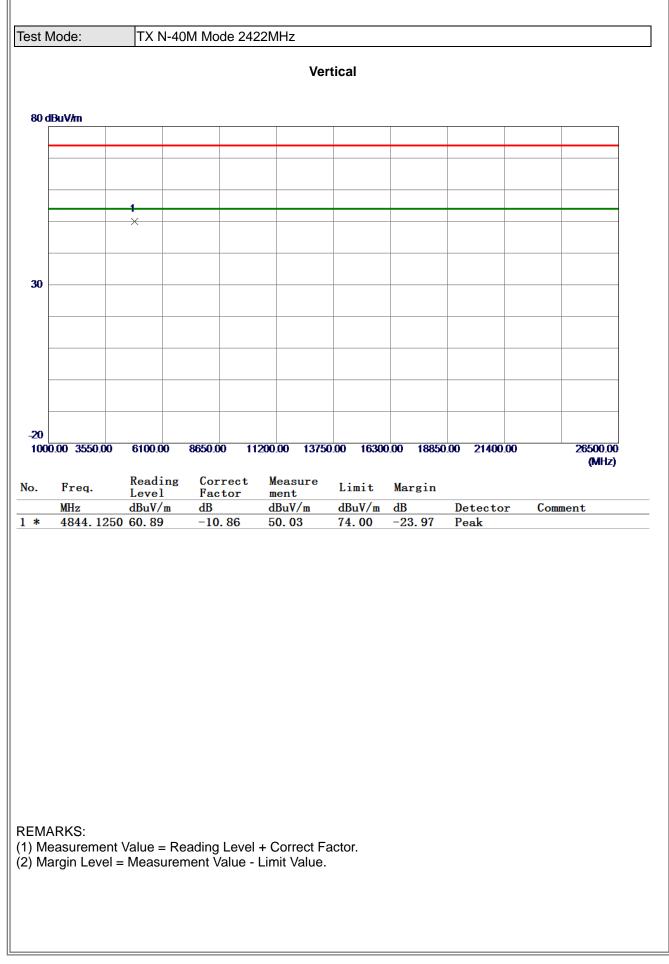




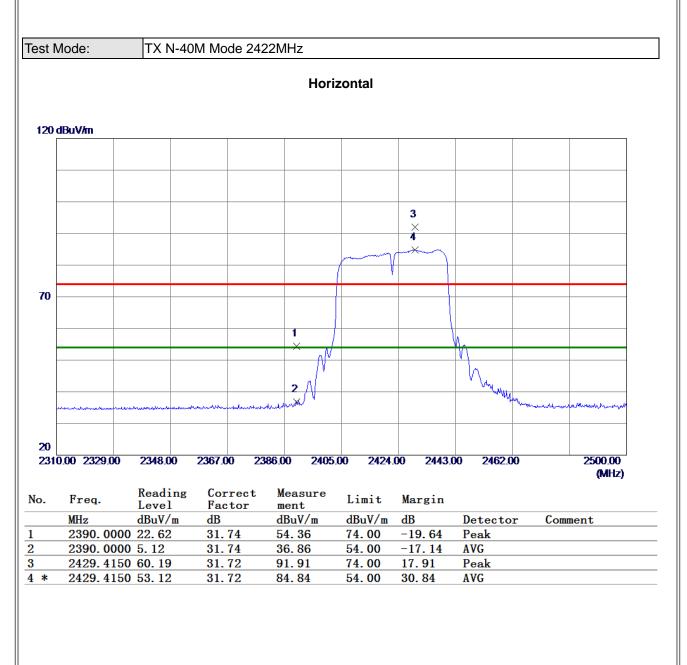


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



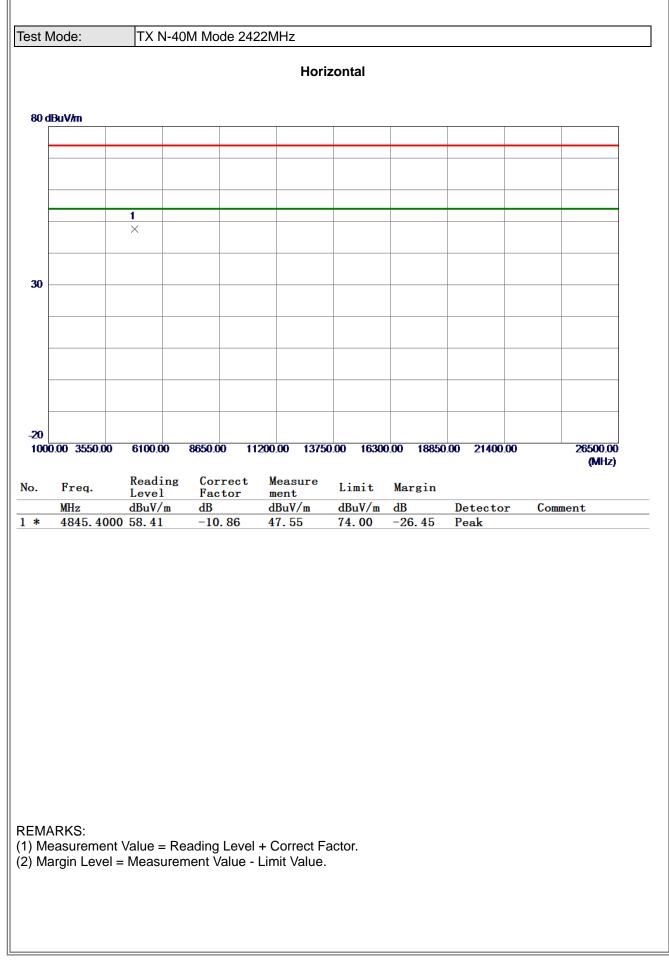




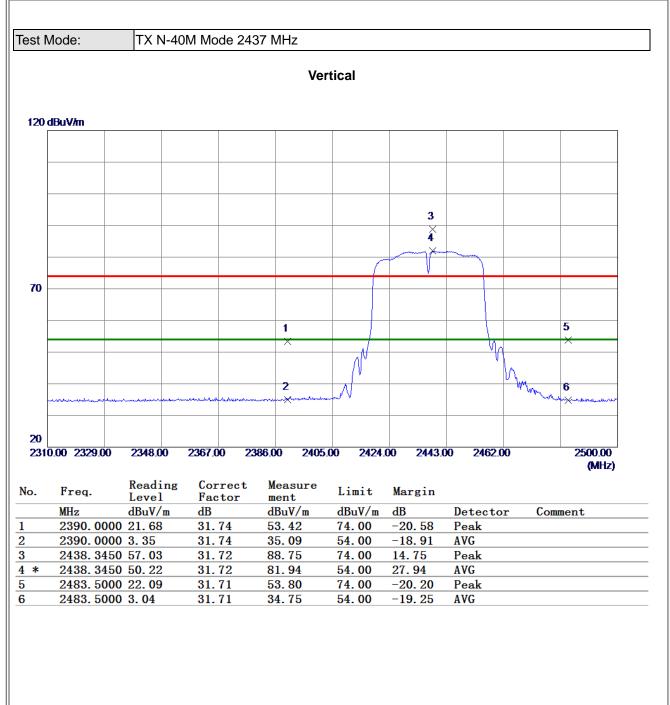


(1) Measurement Value = Reading Level + Correct Factor.



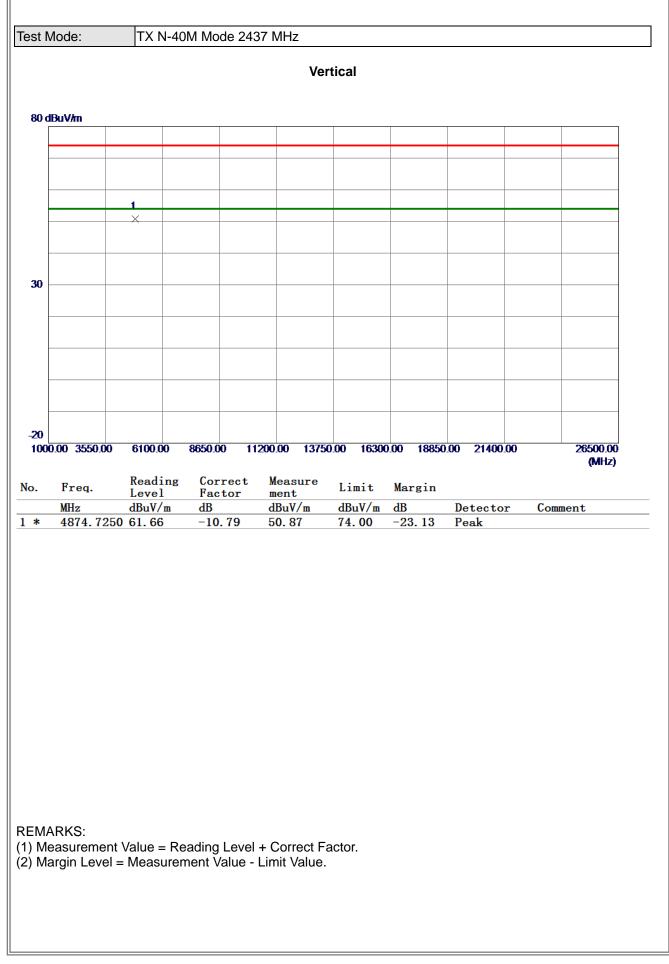




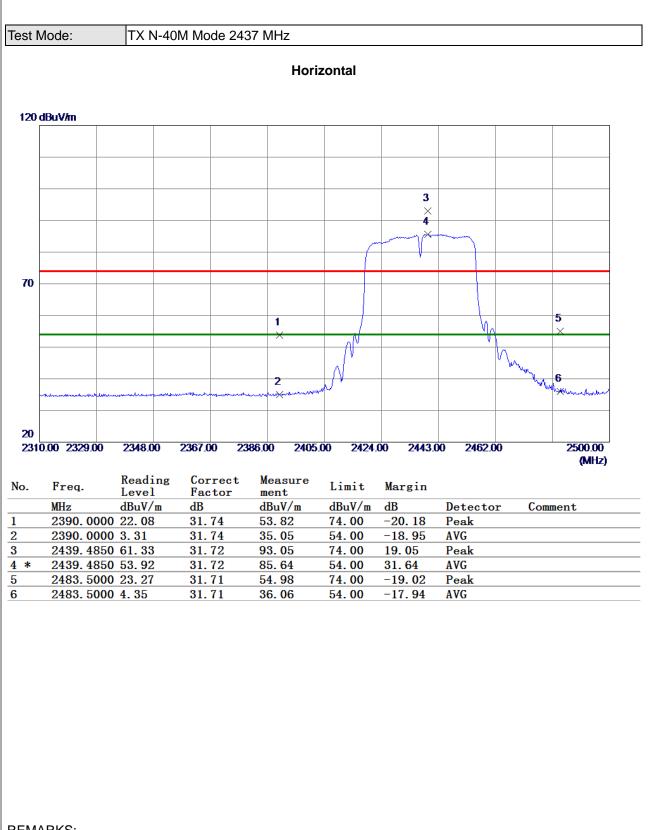


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





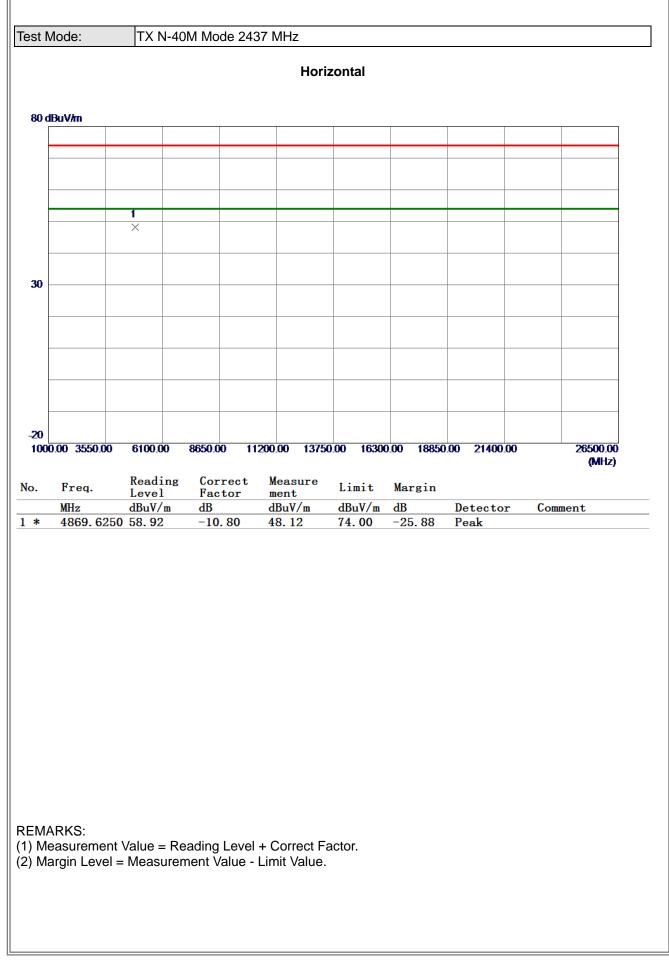




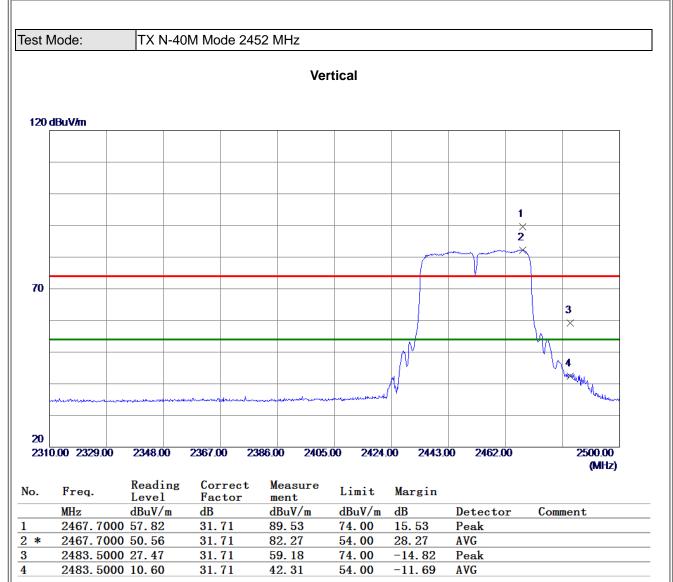
(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.



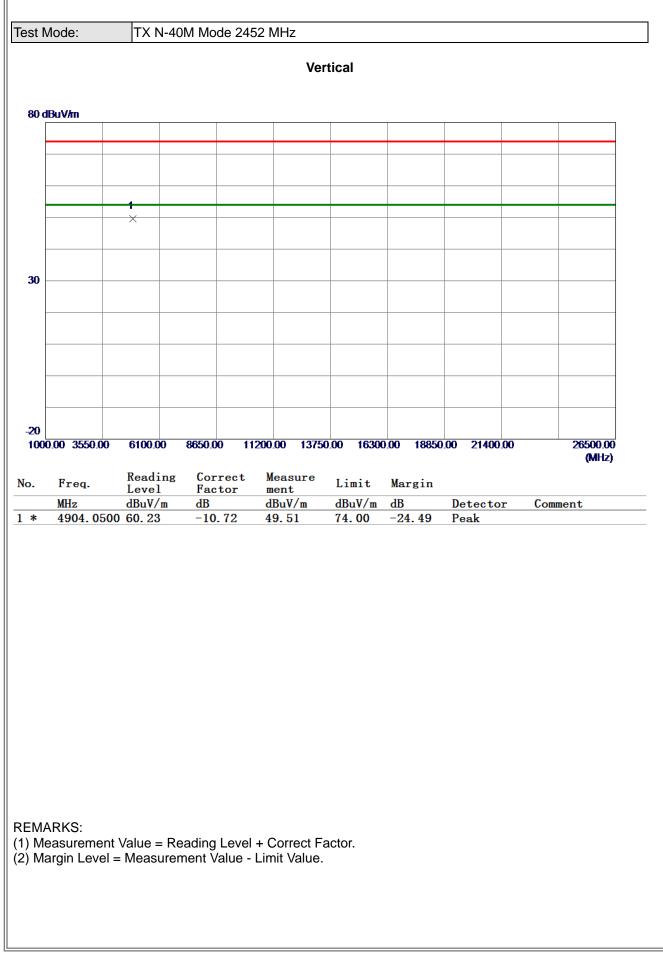




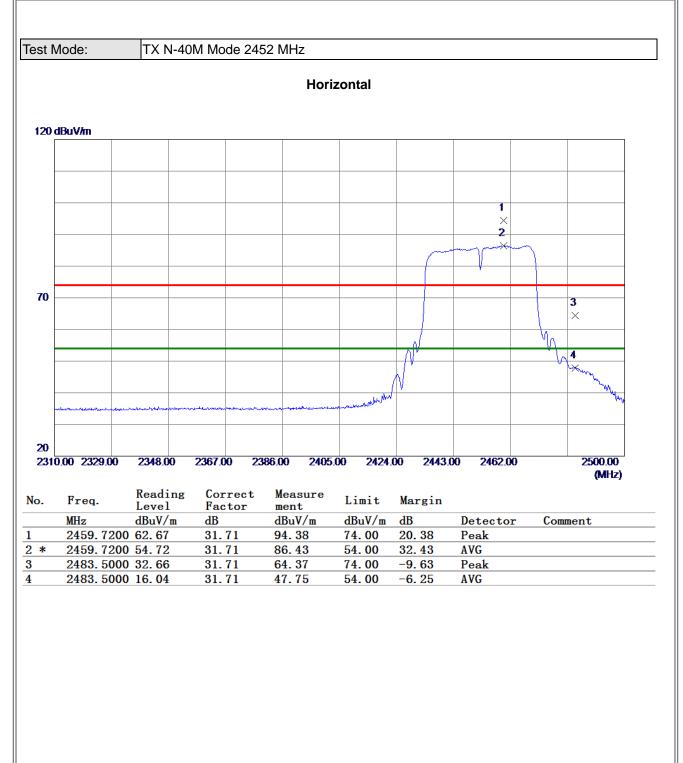


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





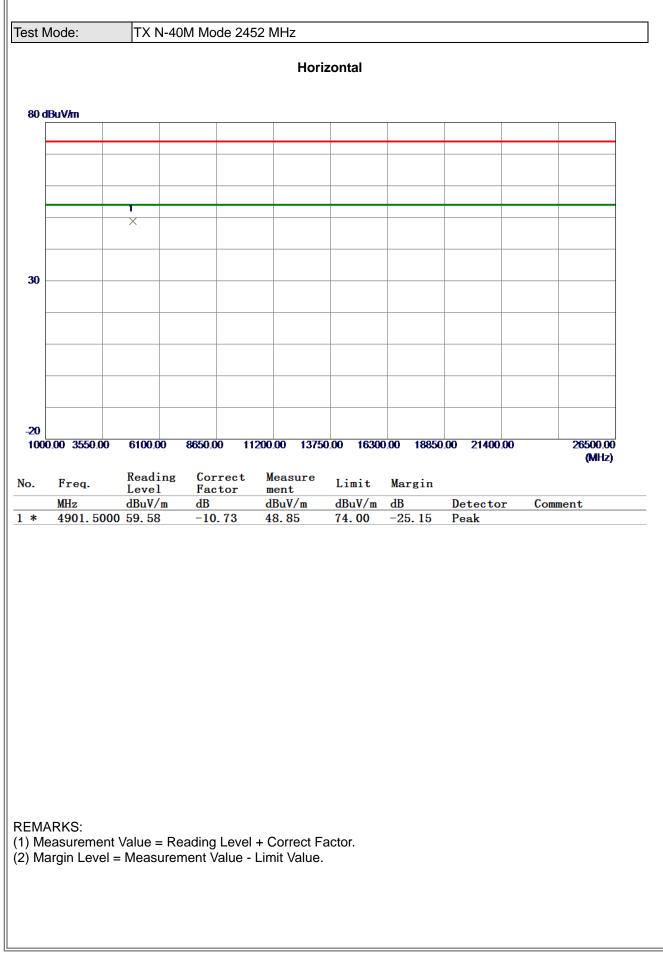




(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.





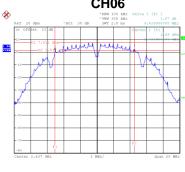


### **APPENDIX E - BANDWIDTH**



Test Mode	TX B Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
01	2412	10.06	500	Complies
06	2437	9.64	500	Complies
11	2462	9.06	500	Complies
C	H01	CH06	c	H11

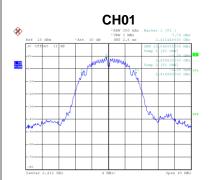


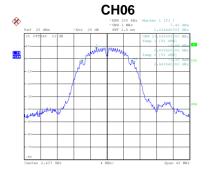


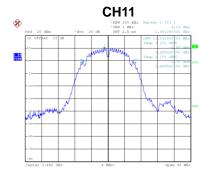


Date: 6.JAN.2021 20:26:44

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	13.04	Complies
06	2437	13.04	Complies
11	2462	13.04	Complies







Date: 6.JAN.2021 20:26:50

Date: 6.JAN.2021 20:30:07

Date: 6.JAN.2021 20:30:00

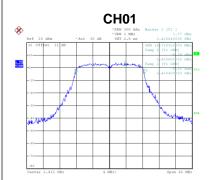
Date: 6.JAN.2021 20:33:50

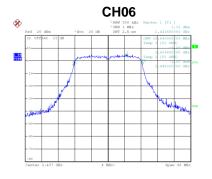
Date: 6.JAN.2021 20:33:43

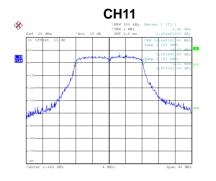


Test Mode TX G Mode					
Test Mode	TX G Mode				
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result	
01	2412	16.12	500	Complies	
06	2437	16.08	500	Complies	
11	2462	15.96	500	Complies	
Ref 20 dBm         *Att 30 dB           10 cflet 31 dB         1	97 2-5 min 19.1190/019 98.0 19.1190/019 98.0 19.1190/0100/0100/0100/01000000000000000	CFUCO CALCELOR OF CALCULAR CONTRACTOR CALCELOR OF CALCELOR OF CALCULAR CONTRACTOR CALCELOR OF CALCULAR CONTRACTOR CALCULAR CONTRACTOR CA	1 [T1] -0.15 db -0.755 db -0.7	Hun (11, 11, 1, 1, 1) (11, 12, 12, 11, 1) (11, 12, 12, 1) (11, 12, 1)	
Channel	Frequency	99 % Emissio	n Bandwidth (MHz)	Result	

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	16.72	Complies
06	2437	16.64	Complies
11	2462	16.64	Complies







Date: 6.JAN.2021 20:37:29

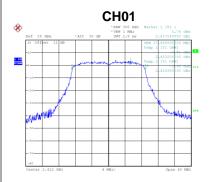
Date: 6.JAN.2021 20:39:43

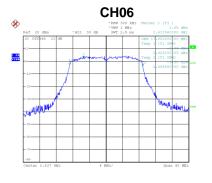
Date: 6.JAN.2021 20:41:48

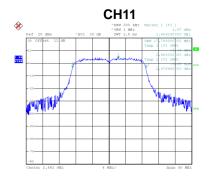


est Mode	TX N-20M Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
01	2412	16.60	500	Complies
06	2437	16.34	500	Complies
11	2462	16.00	500	Complies
Ref 20 dBm *Att 30 dB S	107 2-5 00 10 100 107 2-5 00 10 100 	Contract 21.217 (BB	6.348000000 Miz Bef 20 dBm *Act 30 dB 1 [1] -5.49 dBm 1 case of the t 1 dB 1 case of the t 1 case of the t 1 dB 1 case of the t 1 case of t 1 case of the t 1 case of t 1 c	<ul> <li>VIEW 26 MBR</li> <li>DET 2-16 MB</li> <li>DET 2-16</li></ul>

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	17.68	Complies
06	2437	17.68	Complies
11	2462	17.76	Complies







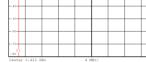
Date: 6.JAN.2021 20:44:19

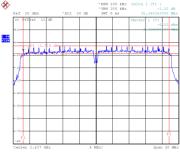
Date: 6.JAN.2021 20:46:53

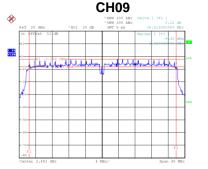
Date: 6.JAN.2021 20:48:31



Test Mode	TX N-40M Mode			
			-	
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
03	2422	35.56	500	Complies
06	2437	35.35	500	Complies
09	2452	35.52	500	Complies
-	H03	CH06	-	:H09
	RBW 100 kHz Delta 1 [71 ] VBW 300 kHz -3.04 dB SWT 5 ms 35.559969000 HHz	*RBW 100 kHz Delta •VBW 300 kHz Ref 20 dEm *Att 30 dB SWT 5 mg 30	1 [71 ] -2.32 dB 5.348363000 MEr Ref 20 dBm *Att 30 dB	*REW 100 kHz Delta 1 [T1 ] *VEW 300 kHz 0.12 dB SWT 5 HS 35.519300000 HHz
20 Øffet 11 dB	Marker 1 [71] -6.30 dBm -2.500200733 JHz			





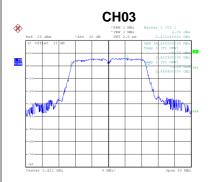


Date: 6.JAN.2021 20:50:36

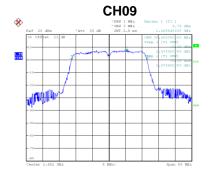
Date: 6.JAN.2021 20:52:11

Date: 6.JAN.2021 20:54:16

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
03	2422	36.48	Complies
06	2437	36.48	Complies
09	2452	36.48	Complies



CH06 **%** 1 PE VIEW -AMA ANY W MAR



Date: 6.JAN.2021 20:50:43

Date: 6.JAN.2021 20:52:17

Date: 6.JAN.2021 20:54:23



## **APPENDIX F - MAXIMUM OUTPUT POWER**



Test Mode

TX B Mode

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	18.32	30.00	1.0000	Complies
06	2437	18.90	30.00	1.0000	Complies
11	2462	19.59	30.00	1.0000	Complies

Test Mod

	le TX G Mode
--	--------------

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	21.88	30.00	1.0000	Complies
06	2437	22.02	30.00	1.0000	Complies
11	2462	22.41	30.00	1.0000	Complies

Test Mode

TX N-20M Mode

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	22.06	30.00	1.0000	Complies
06	2437	22.50	30.00	1.0000	Complies
11	2462	23.28	30.00	1.0000	Complies

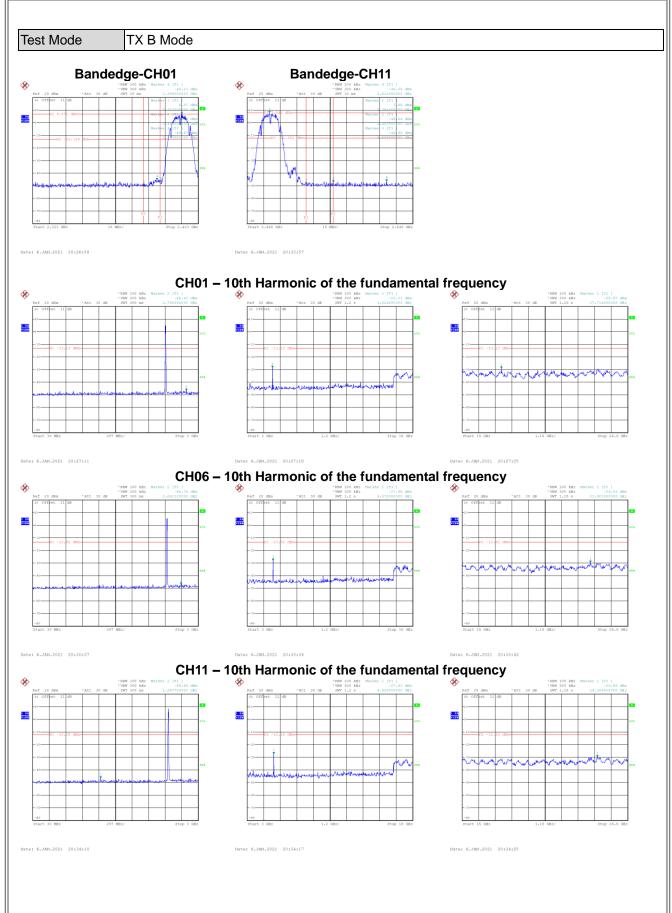
#### Test Mode TX N-40M Mode

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
03	2422	23.27	30.00	1.0000	Complies
06	2437	23.22	30.00	1.0000	Complies
09	2452	23.68	30.00	1.0000	Complies

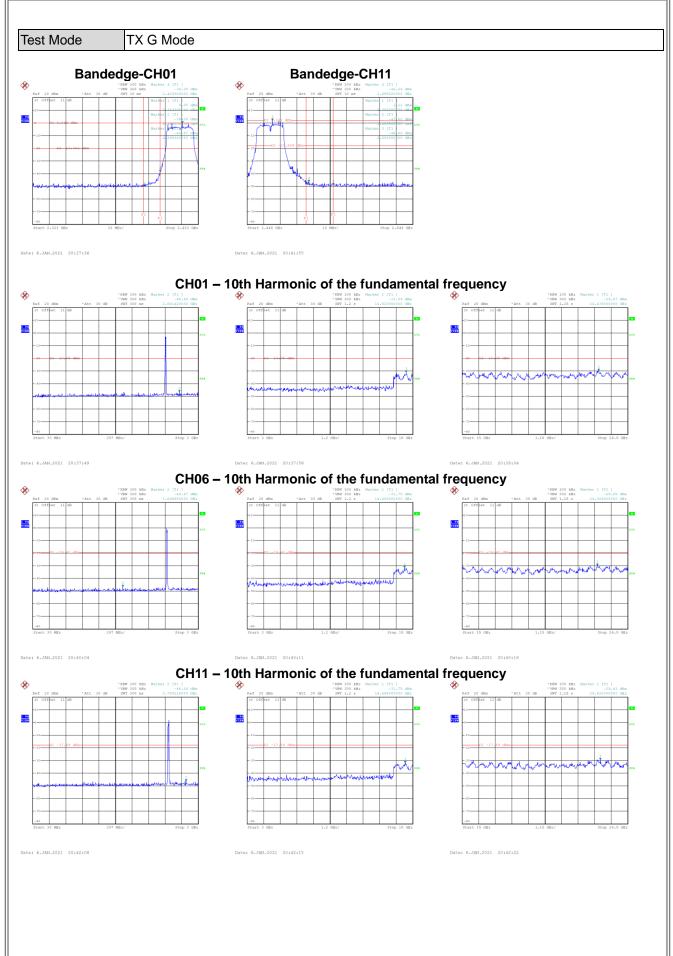


# **APPENDIX G - CONDUCTED SPURIOUS EMISSIONS**

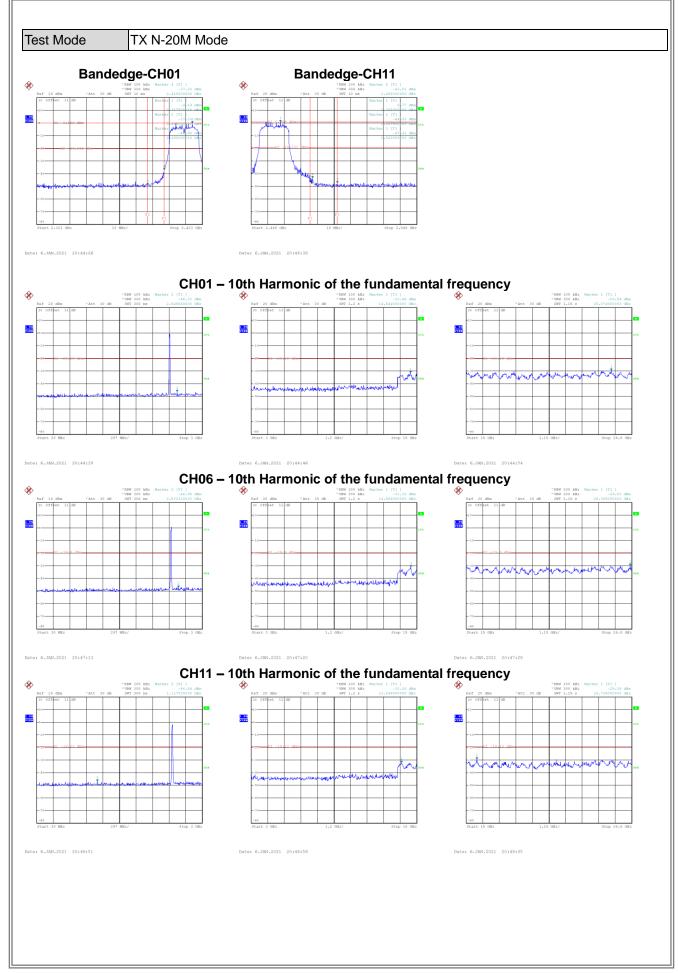




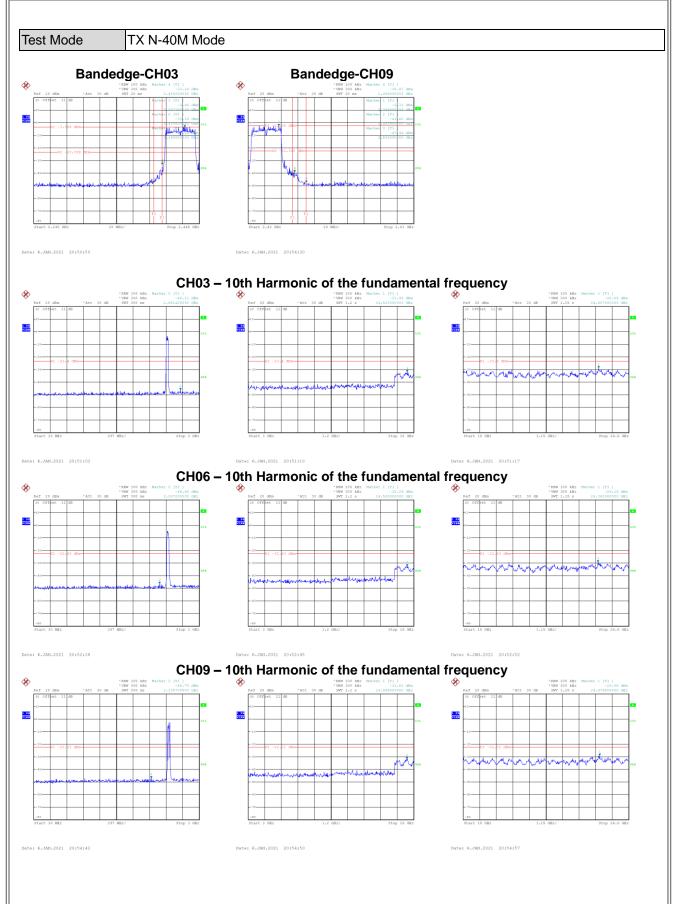










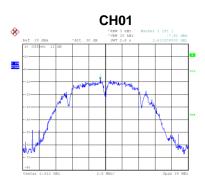




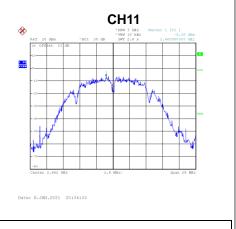
## **APPENDIX H - POWER SPECTRAL DENSITY**



Test Mode	TX B Mode			
Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
01	2412	-7.92	8	Complies
06	2437	-6.69	8	Complies
11	2462	-6.30	8	Complies





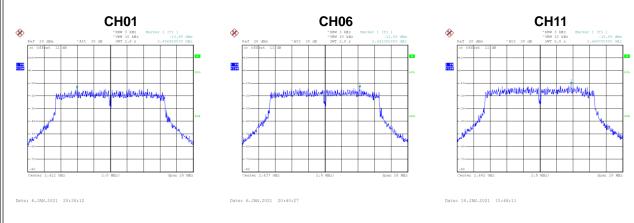


Test Mode TX

Date: 6.JAN.2021 20:27:34

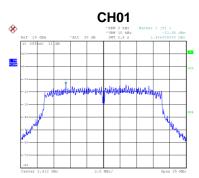
TX G Mode

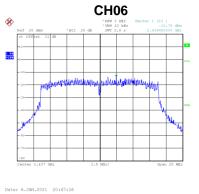
Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
01	2412	-13.98	8	Complies
06	2437	-13.58	8	Complies
11	2462	-10.85	8	Complies

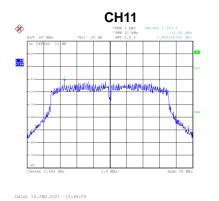




Test Mode	TX N-20M Mode			
Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
01	2412	-13.95	8	Complies
06	2437	-13.78	8	Complies
11	2462	-11.49	8	Complies







Date: 6.JAN.2021 20:45:02

Test Mode TX N-40M Mode

Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
03	2422	-17.67	8	Complies
06	2437	-17.33	8	Complies
09	2452	-15.58	8	Complies

