

# FCC Radio Test Report

# FCC ID: 2AFZZR4A

#### This report concerns: Original Grant

Project No.	: 2	2101C239
Equipment	: 1	Mi Router 4A Gigabit Edition
Brand Name	: 1	MI
Test Model	: 1	R4A
Series Model	: 1	N/A
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Date of Receipt	: .	Jan. 28, 2021
Date of Test	: 1	Feb. 25, 2021 ~ Mar. 17, 2021
Issued Date	: /	Apr. 01, 2021
<b>Report Version</b>	: 1	R00
Test Sample		Engineering Sample No.: DG2021012799 for conducted, DG2021012797 for radiated.
Standard(s)	1	FCC Part15, Subpart C (15.247) ANSI C63.10-2013 FCC 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.

heldon.l

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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.



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

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# **REPORT ISSUED HISTORY**

Report Version	Description	Issued Date
R00	Original Issue.	Apr. 01, 2021

# 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

	FCC Part15, Subpart C (15.247)								
Standard(s) Section	Test Item	Test Result	Judgment	Remark					
15.207	AC Power Line Conducted Emissions	APPENDIX A	PASS						
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.
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.



#### 1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China. BTL's Test Firm Registration Number for FCC: 357015 BTL's Designation Number for FCC: CN1240

#### **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. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150kHz ~ 30MHz	2.68

#### B. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
		9kHz ~ 30MHz	-	3.02
		30MHz ~ 200MHz	V	4.26
	CISPR	30MHz ~ 200MHz	Н	3.38
DG-CB03		200MHz ~ 1,000MHz	V	3.98
		200MHz ~ 1,000MHz	Н	3.94
		1GHz ~ 6GHz	I	3.96
		6GHz ~ 18GHz	I	5.24
		18GHz ~ 26.5GHz	I	3.62
		26.5GHz ~ 40GHz	-	4.00

#### C. Other Measurement:

Test Item	Uncertainty
Bandwidth	±3.8 %
Maximum Output Power	±0.95 dB
Conducted Spurious Emission	±2.71 dB
Power Spectral Density	±0.86 dB
Temperature	±0.08 °C
Humidity	±1.5%

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
AC Power Line Conducted Emissions	25°C	53%	AC 120V/60Hz	Gerry Zhao
Radiated Emissions-9K-30MHz	25°C	60%	AC 120V/60Hz	Kwok Guo
Radiated Emissions-30 MHz to 1GHz	26°C	52%	AC 120V/60Hz	Hayden Chen
Radiated Emissions-Above 1000 MHz	26°C	52%	AC 120V/60Hz	Hayden Chen
Bandwidth	22°C	54%	DC 12V	Jesse Wang
Maximum Output Power	22°C	53%	DC 12V	Howard Wei
Conducted Spurious Emissions	22°C	54%	DC 12V	Jesse Wang
Power Spectral Density	22°C	54%	DC 12V	Jesse Wang

# 2. GENERAL INFORMATION

#### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Mi Router 4A Gigabit Edition					
Brand Name	ΛΙ					
Test Model	R4A					
Series Model	N/A					
Model Difference(s)	N/A					
Power Source	DC voltage supplied from AC adapter. Model: CYXT18-120100U					
Power Rating	I/P: 100-240V~ 50/60Hz 0.3A O/P: 12.0V === 1.0A					
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 300 Mbps					
IEEE 802.11b: 27.29 dBm (0.5358 W)        Maximum Peak Output        Power        IEEE 802.11g: 27.56 dBm (0.5702 W)        IEEE 802.11n (HT20): 26.93 dBm (0.4932 W)        IEEE 802.11n (HT40): 26.84 dBm (0.4831 W)						
Maximum Average Output      IEEE 802.11b: 24.52 dBm (0.2831 W)        Power      IEEE 802.11g: 22.61 dBm (0.1824 W)        IEEE 802.11n (HT20): 19.35 dBm (0.0861 W)        IEEE 802.11n (HT40): 19.17 dBm (0.0826 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 IEEE 802.11n (HT40)							
Channel      Frequency (MHz)      Channel      Frequency (MHz)      Channel      Frequency (MHz)      F						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)
1	South star	MTO-WRM43	Dipole	N/A	5.99
2	South star	MTO-WRM43	Dipole	N/A	6.03

Note:

This EUT supports CDD, and all antenna gains are not equal, so Directional gain=10log[(10<sup>G1/20</sup>+10<sup>G2/20</sup>+...10<sup>GN/20</sup>)<sup>2</sup>/N]dBi, that is Directional gain=10log[(10<sup>5.99/20</sup>+10<sup>6.03/20</sup>)<sup>2</sup>/2]dBi =9.02. So, the output power limit is 30-(9.02-6)=26.98, the power spectral density limit is 8-(9.02-6)=4.98.

2) The antenna gain is provided by the manufacturer.



#### 4. Table for Antenna Configuration:

Operating Mode TX Mode	1TX	2TX
IEEE 802.11b	V (Ant. 1)	-
IEEE 802.11g	V (Ant. 1)	-
IEEE 802.11n(HT20)	-	V (Ant. 1+Ant. 2)
IEEE 802.11n(HT40)	-	V (Ant. 1+Ant. 2)

## 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 06	

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

AC power line conducted emissions test	
Final Test Mode	Description
Mode 5	TX G Mode Channel 06

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 5	TX G Mode Channel 06

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) All the bit rate of transmitter have been tested and found the lowest rate is found to be the worst case and recorded.
- (3) For radiated emission below 1 GHz test, the IEEE 802.11g Channel 06 is found to be the worst case and recorded.
- (4) For radiated emission above 1 GHz test, 1GHz~26.5GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.

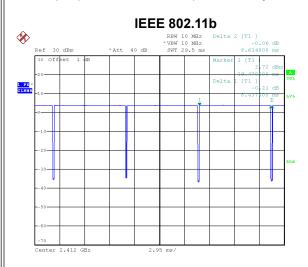
## 2.3 PARAMETERS OF TEST SOFTWARE

Test Software		N/A	
Frequency (MHz)	2412	2437	2462
IEEE 802.11b	33	40	38
IEEE 802.11g	26	38	28
IEEE 802.11n (HT20)	21	23	22
Frequency (MHz)	2422	2437	2452
IEEE 802.11n (HT40)	18	22	20



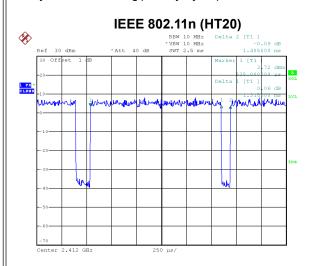
# 2.4 DUTY CYCLE

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.

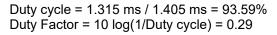


Date: 1.JAN.2003 01:27:08

Duty cycle = 8.437 ms / 8.614 ms = 97.95% Duty Factor = 10 log(1/Duty cycle) = 0.09



Date: 1.JAN.2003 01:28:08



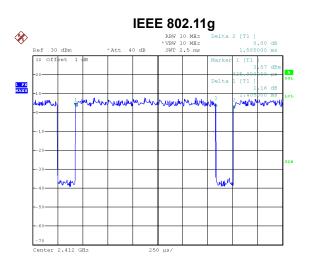
#### NOTE:

For IEEE 802.11b, IEEE 802.11g, IEEE 802.11n (HT20):

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

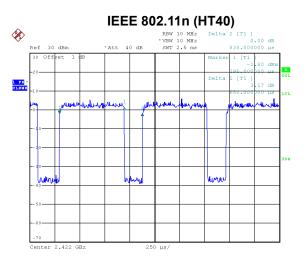
For IEEE 802.11n (HT40):

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



Date: 1.JAN.2003 01:25:46

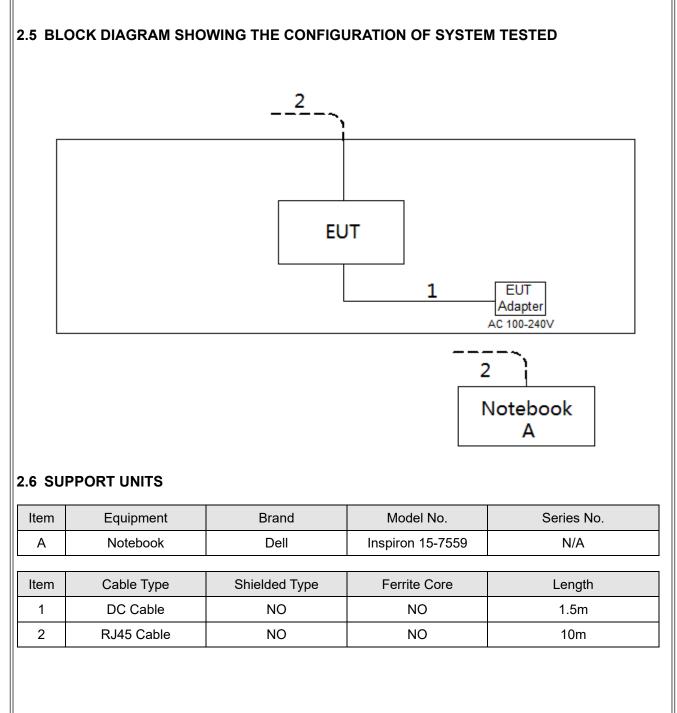
Duty cycle = 1.405 ms / 1.585 ms = 88.64% Duty Factor = 10 log(1/Duty cycle) = 0.52



Date: 1.JAN.2003 01:29:27

Duty cycle = 0.650 ms / 0.830 ms = 78.31%Duty Factor =  $10 \log(1/\text{Duty cycle}) = 1.06$ 









# 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 - 0.5	66 to 56*	56 to 46*
0.5 - 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

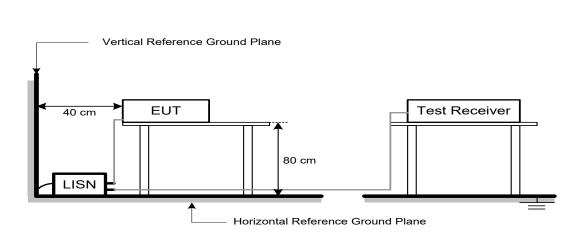
- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- 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)	(dł	(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).

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

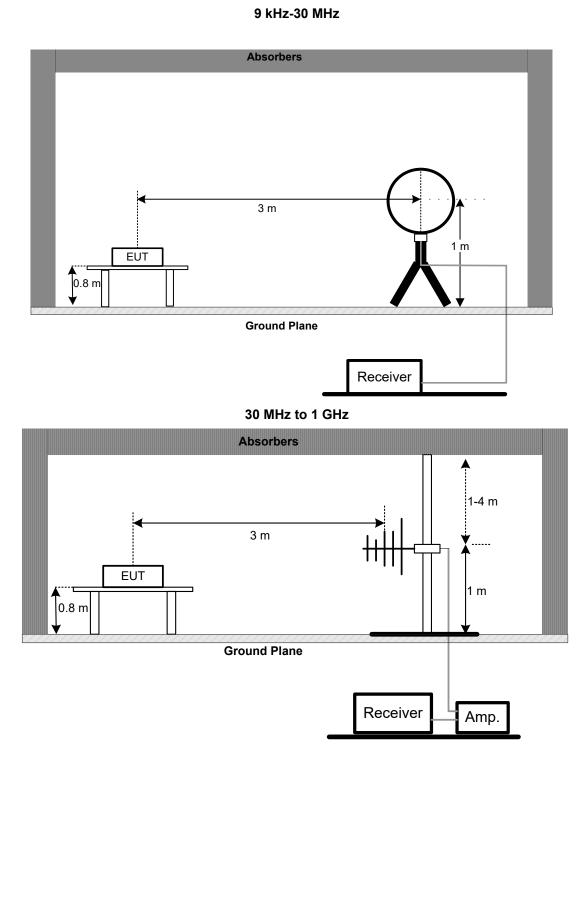
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b. The measuring distance 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

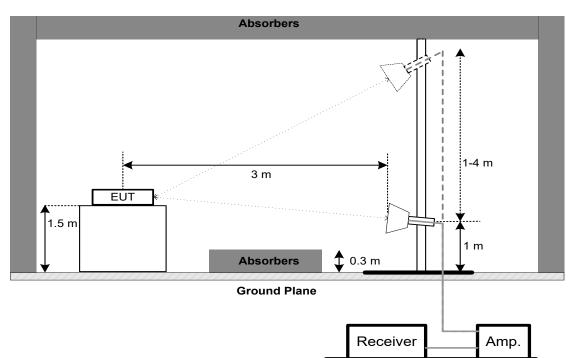


# 4.4 TEST SETUP



# <u>31L</u>

#### Above 1 GHz



#### 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	Section Test Item Limit						
15 247(a)(2)	6 dB Bandwidth	Minimum 500 kHz					
15.247(a)(2)	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= 100kHz, VBW=300kHz, Sweep time=auto.

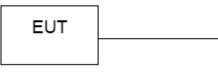
For 99% Emission Bandwidth B/G/N20 Mode: RBW=300kHz, VBW=1MHz, Sweep time=2.5 ms. For 99% Emission Bandwidth N40 Mode: RBW=1MHz, VBW=3MHz, Sweep time=2.5ms.

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



SPECTRUM ANALYZER

#### 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		

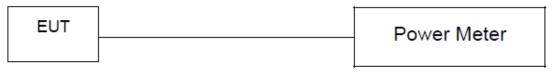
#### 6.2 TEST PROCEDURE

- 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 and 11.9.2.3.1 of ANSI C63.10-2013 and FCC KDB 662911 D01 v02r01 Multiple Transmitter Output.

#### 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.

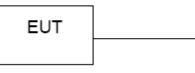
#### 7.2 TEST PROCEDURE

- 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



#### 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

	AC Power Line Conducted Emissions							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until			
1	EMI Test Receiver	R&S	ESCI	100382	Feb. 28, 2022			
2	LISN	EMCO	3816/2	52765	Feb. 27, 2022			
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	Feb. 27, 2022			
4	50Ω Terminator	SHX	TF5-3	15041305	Feb. 27, 2022			
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A			
6	Cable	N/A	RG223	12m	Mar. 09, 2022			
7	643 Shield Room	ETS	6*4*3m	N/A	N/A			

	Radiated Emissions - 9 kHz to 30 MHz							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until			
1	Antenna	EM	EM-6876-1	230	Apr. 16, 2021			
2	Cable	N/A	RG 213/U	N/A	May 29, 2021			
3	EMI Test Receiver	R&S	ESCI	100895	Feb. 27, 2022			
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A			
5	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021			

	Radiated Emissions - 30 MHz to 1 GHz								
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until				
1	Trilog-Broadband Antenna	Schwarzbeck	VULB9168	586	Nov. 27, 2021				
2	Amplifier	HP	8447D	2944A08742	Feb. 28, 2022				
3	Receiver	Agilent	N9038A	MY52130039	Jul. 25, 2021				
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	May 22, 2021				
5	Controller	СТ	SC100	N/A	N/A				
6	Controller	MF	MF-7802	MF780208416	N/A				
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A				
8	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021				

	Radiated Emissions - Above 1 GHz							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until			
1	Double Ridged Guide Antenna	ETS	3115	75789	May 12, 2021			
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jul. 07, 2021			
3	Amplifier	Agilent	8449B	3008A02584	Jul. 25, 2021			
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Feb. 28, 2022			
5	Receiver	Agilent	N9038A	MY52130039	Jul. 25, 2021			
6	Controller	СТ	SC100	N/A	N/A			
7	Controller	MF	MF MF-7802 MF7802084		N/A			
8	Cable	N/A	EMC104-SM-SM-6 000	N/A	Oct. 16, 2021			
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A			
10	Filter	STI	STI15-9912	N/A	Jul. 25, 2021			
11	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021			



Bandwidth & Conducted Spurious Emissions & Power Spectral Density									
Item	em Kind of Equipment Manufacturer Type No. Serial No. Calibrated unti								
1	Spectrum Analyzer	R&S	R&S FSP40 100185 Jul. 25						
2	RF Cable Tongkaichuan N/A N/A N/A								
3	3 DC Block Mini N/A N/A N/A								
4	4 Attenuator WOKEN 6SM3502 VAS1214NL Feb. 07, 2022								

	Maximum Output Power								
Item	Item Kind of Equipment Manufacturer Type No. Serial No. Calibrated								
1	Peak Power Analyzer	Keysight	8990B	MY51000506	Aug. 07, 2021				
2	Wideband power sensor	Keysight	N1923A	MY58310004	Jul. 25, 2021				
3	Attenuator	WOKEN	6SM3502	VAS1214NL	Feb. 07, 2022				
4	RF Cable	Tongkaichuan	N/A	N/A	N/A				

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

All calibration period of equipment list is one year.



TL

3

#### AC Power Line Conducted Emissions Test Photos



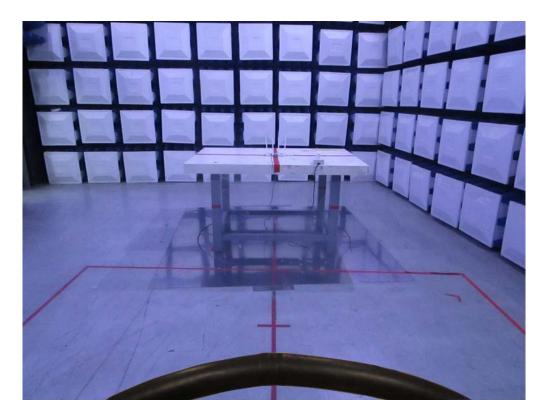




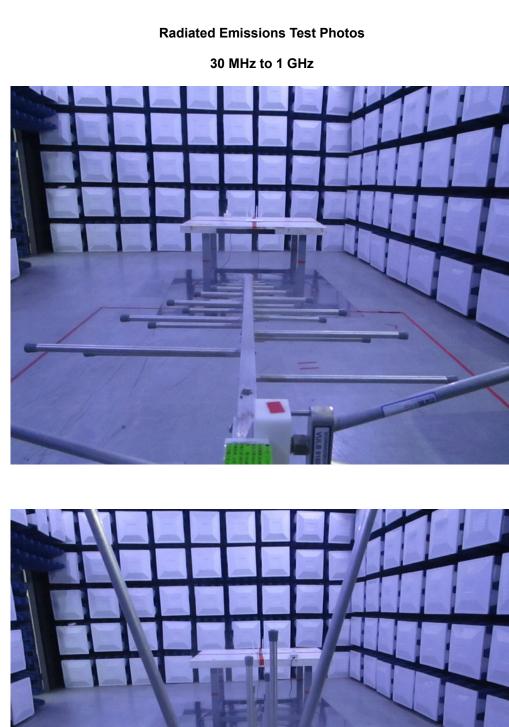
**Radiated Emissions Test Photos** 

9 kHz to 30 MHz



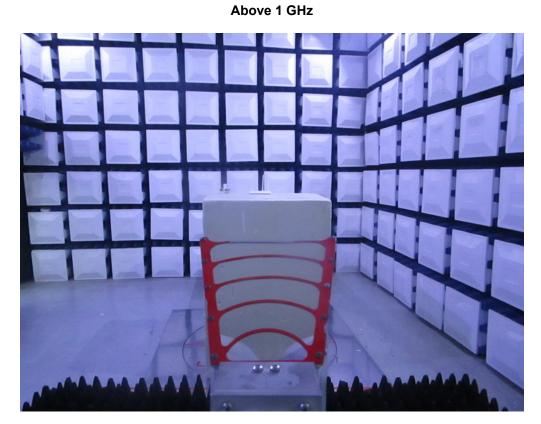


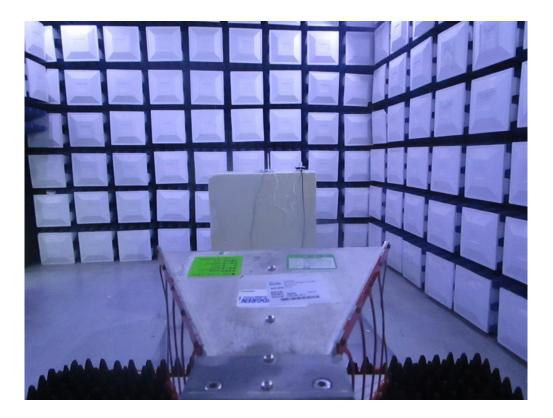






Radiated Emissions Test Photos

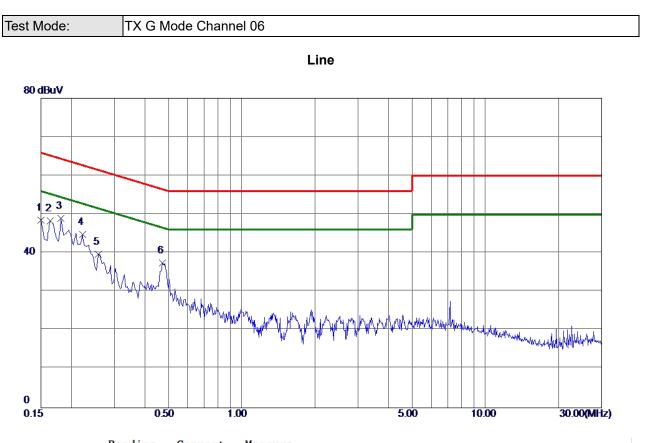






# **APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS**



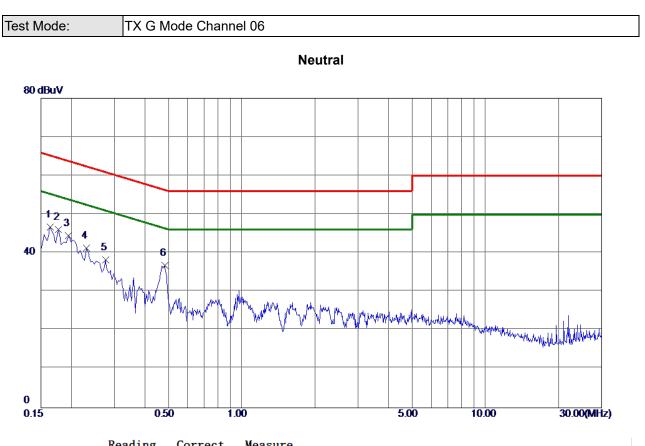


No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1500	38.82	9.67	48.49	66.00	-17.51	Peak	
2	0.1635	38.51	9.77	48.28	65.28	-17.00	Peak	
3 *	0.1815	39.04	9.85	48.89	<b>64.4</b> 2	-15. 53	Peak	
4	0. 2220	34.87	9.89	44.76	62.74	-17. 98	Peak	
5	0.2580	29.86	9.87	39.73	61.50	-21.77	Peak	
6	0.4740	27.45	9.92	37. 37	56.44	-19.07	Peak	

**REMARKS**:

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





No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1635	36.89	9.85	46.74	65.28	-18. 54	Peak	
2	0.1770	36.17	9.92	46.09	64.63	-18. 54	Peak	
3	0.1949	34. 50	9.99	44. 49	63.83	-19.34	Peak	
4	0.2310	31.22	9.99	41.21	62.41	-21. 20	Peak	
5	0.2760	28.19	9.99	38. 18	60.94	-22.76	Peak	
6	0.4830	26.63	10.11	36.74	56.29	-19. 55	Peak	

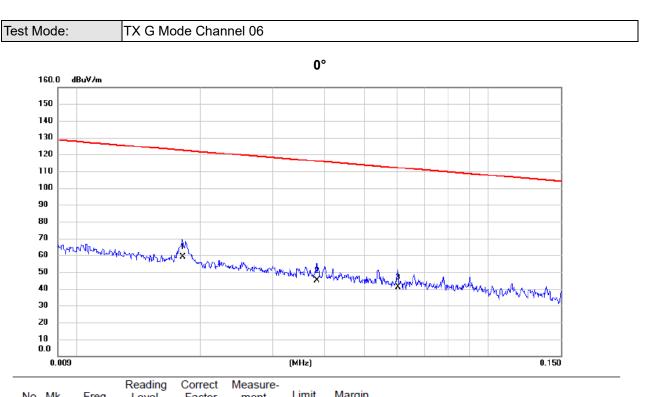
**REMARKS**:

- Measurement Value = Reading Level + Correct Factor.
  Margin Level = Measurement Value Limit Value.



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



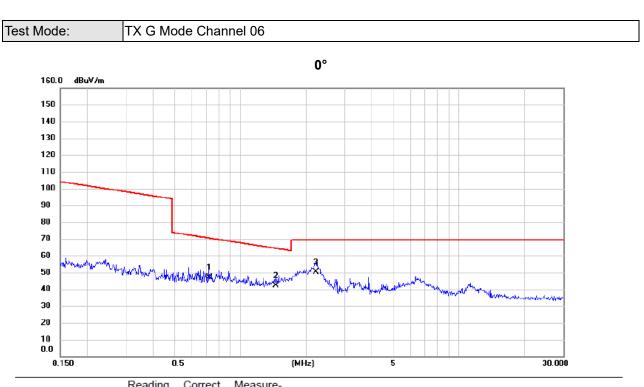


No. Mk.	Freq.	Level	Factor	ment	Limit	Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	0.0181	45.12	13.81	58.93	122.45	-63.52	AVG	
2	0.0383	32.27	12.73	45.00	115.94	-70.94	AVG	
3	0.0603	28.33	12.48	40.81	112.00	-71.19	AVG	

**REMARKS**:

- Measurement Value = Reading Level + Correct Factor.
  Margin Level = Measurement Value Limit Value.

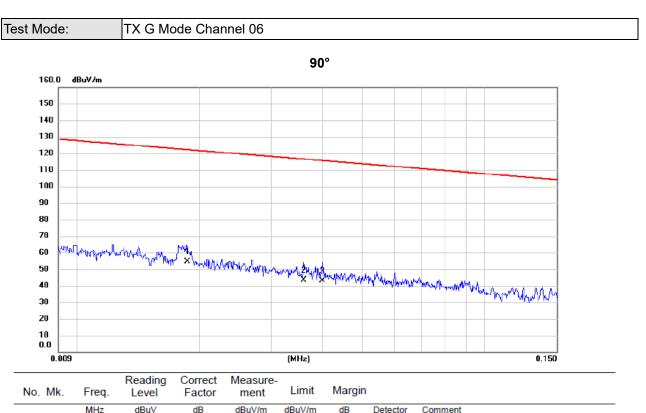




No. Mk.	Freq.		Factor	ment		Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	0.7198	35.16	11.92	47.08	70.46	-23.38	QP	
2	1.4562	30.77	11.58	42.35	64.34	-21.99	QP	
3 *	2.2250	39.02	11.20	50.22	69.54	-19.32	QP	

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

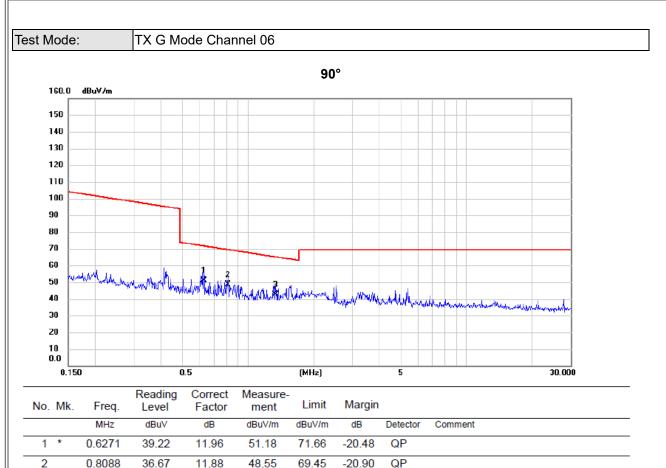




NO. MK	. Freq.	Level	Factor	ment	Linni	margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	0.0187	40.89	13.62	54.51	122.17	-67.66	AVG	
2	0.0360	30.69	12.79	43.48	116.48	-73.00	AVG	
3	0.0400	30.29	12.69	42.98	115.56	-72.58	AVG	

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





3

1.3380

30.84

11.63

42.47

65.08

-22.61

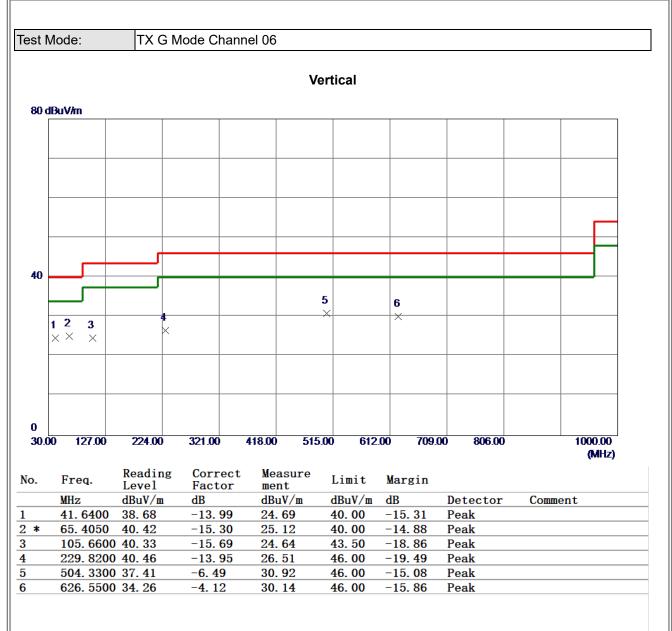
QP

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



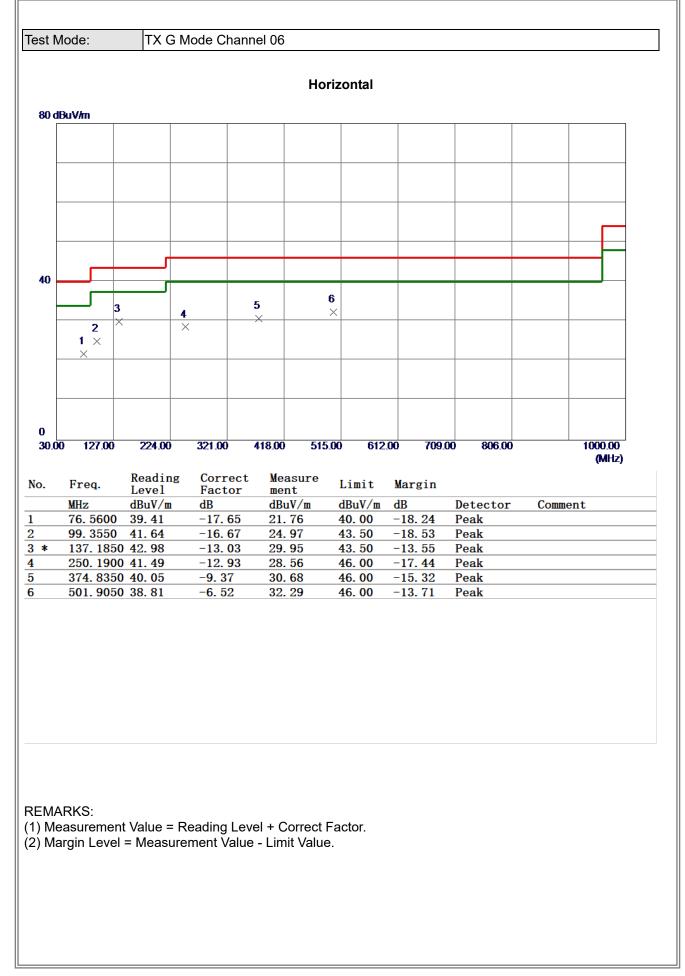
## APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ





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

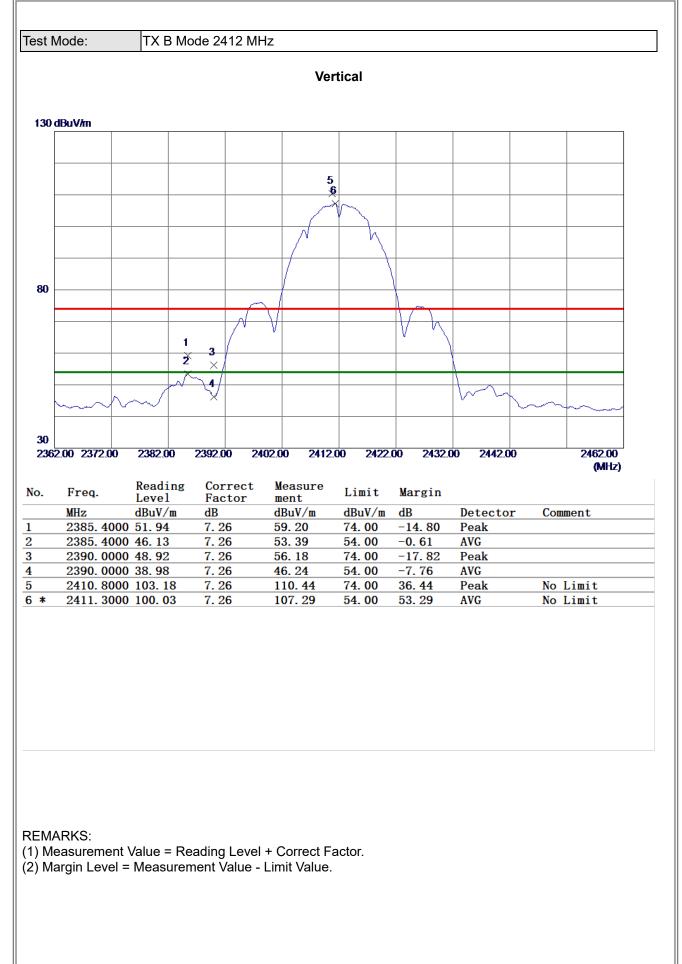




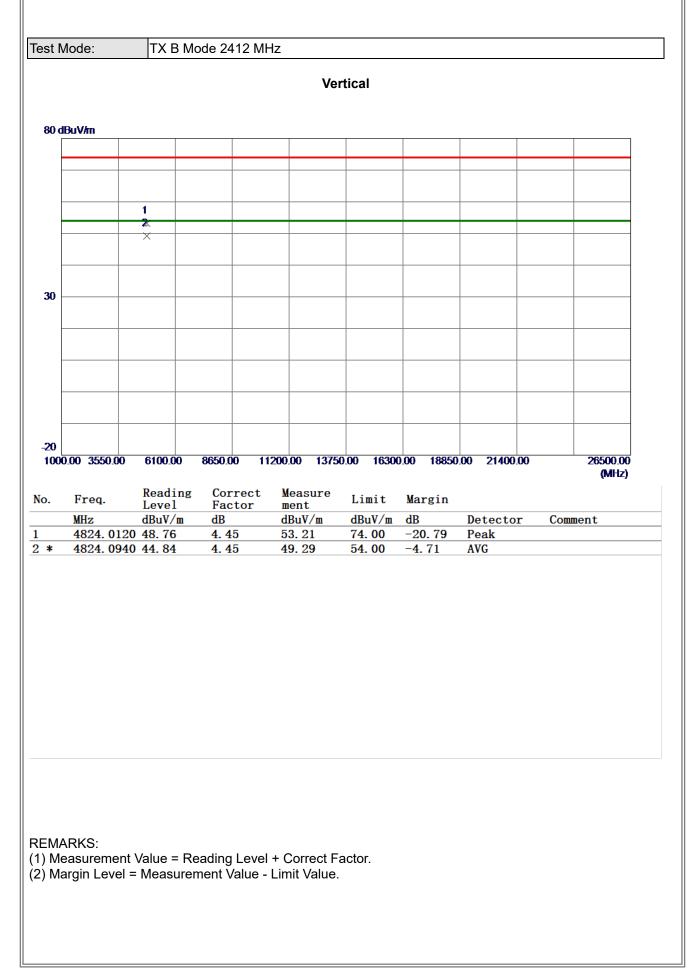


## **APPENDIX D - RADIATED EMISSION- ABOVE 1000 MHZ**

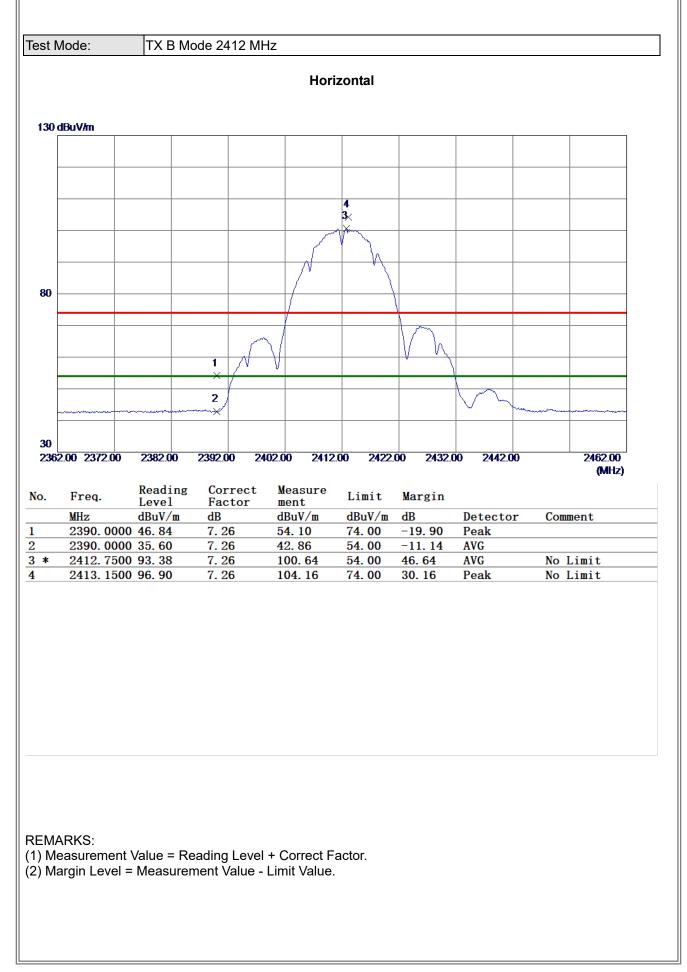




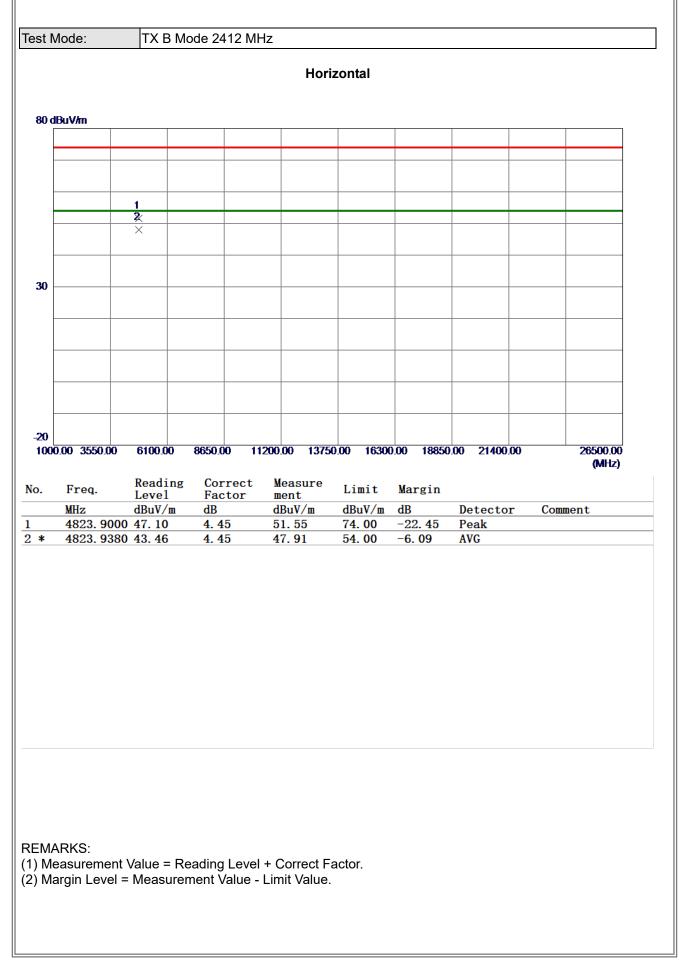




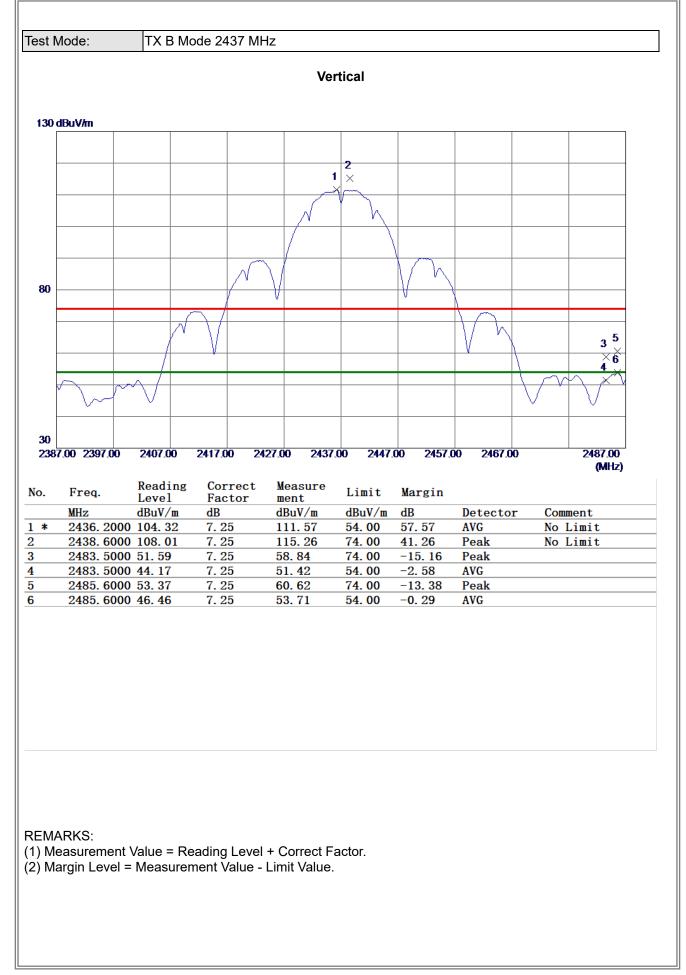




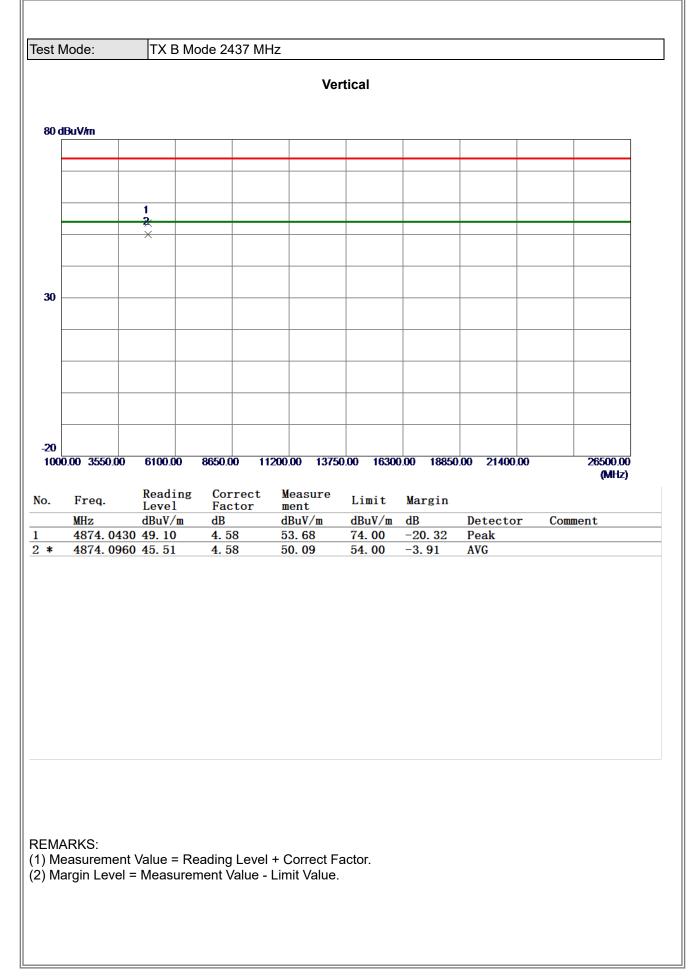




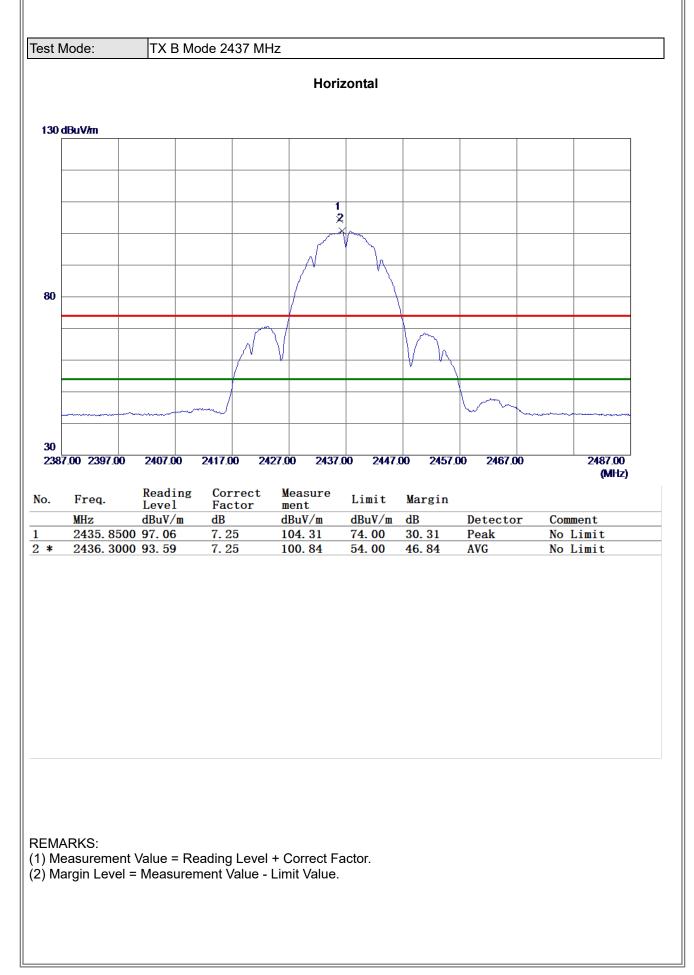




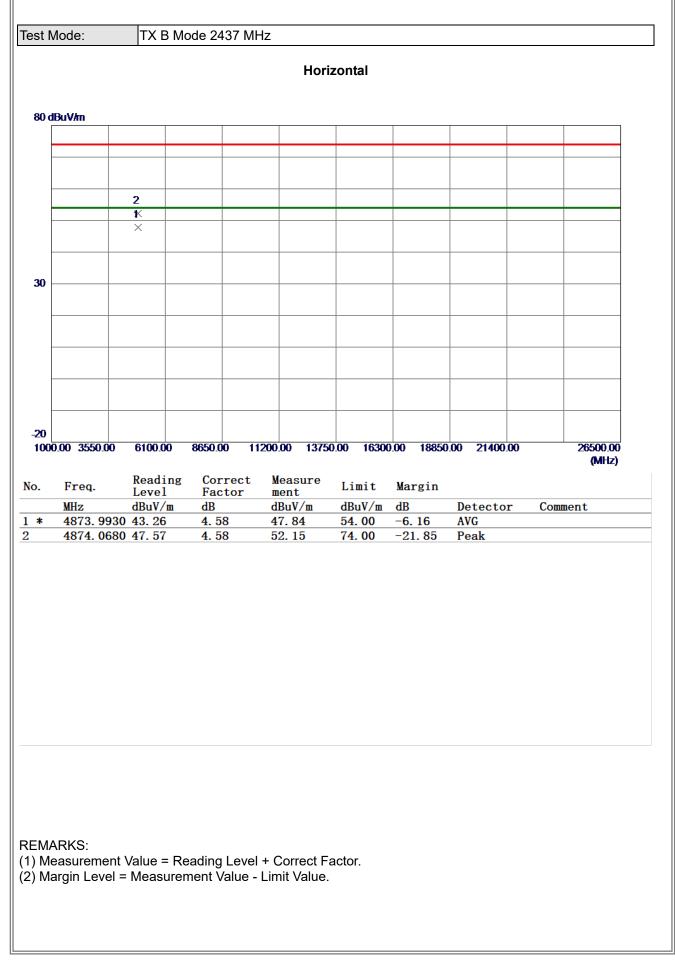




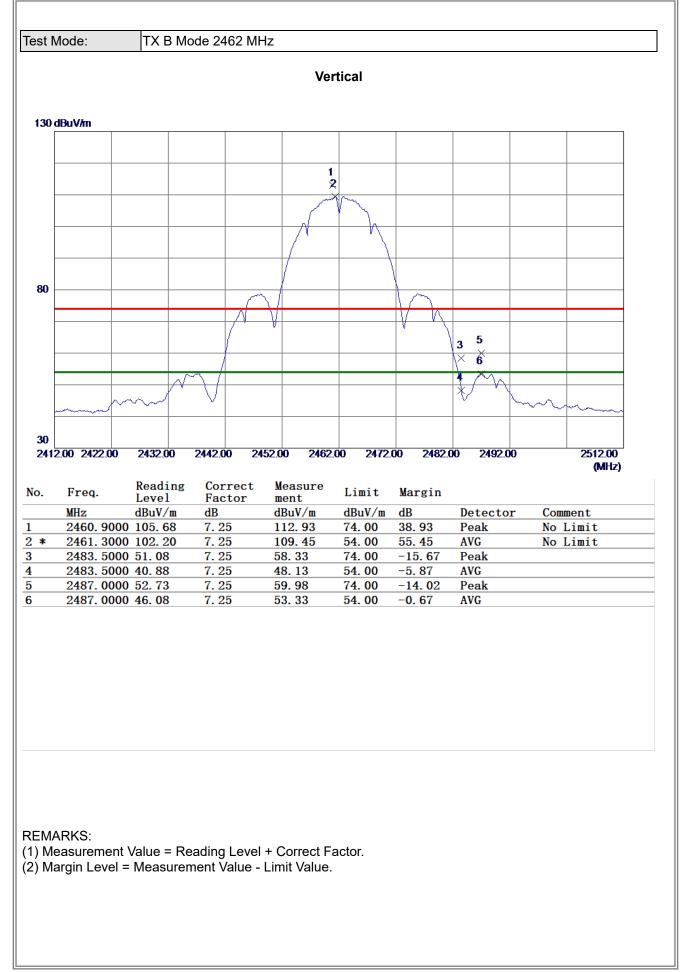




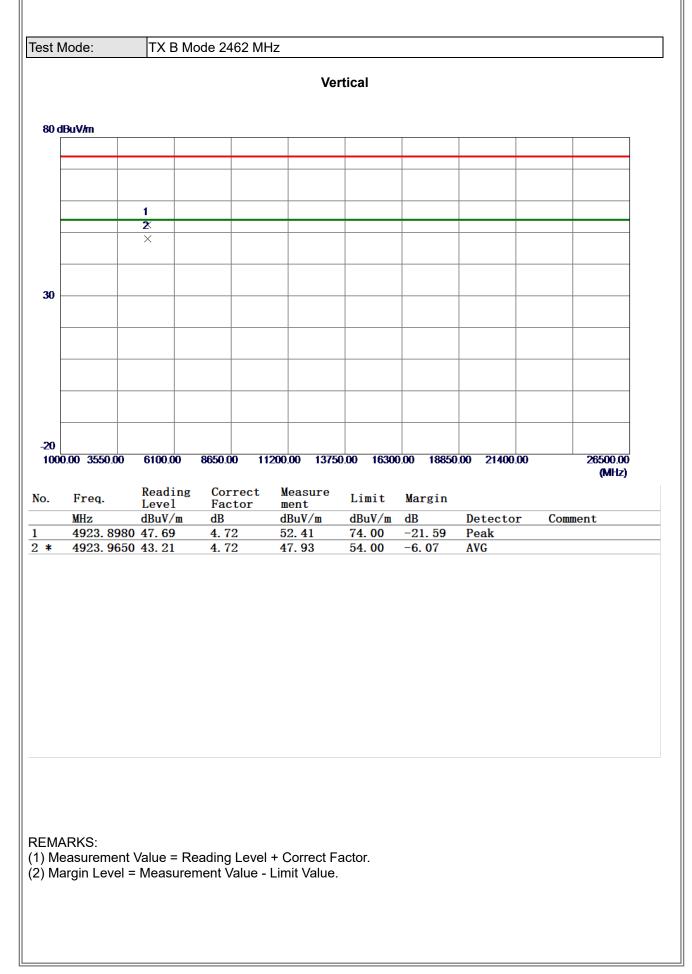




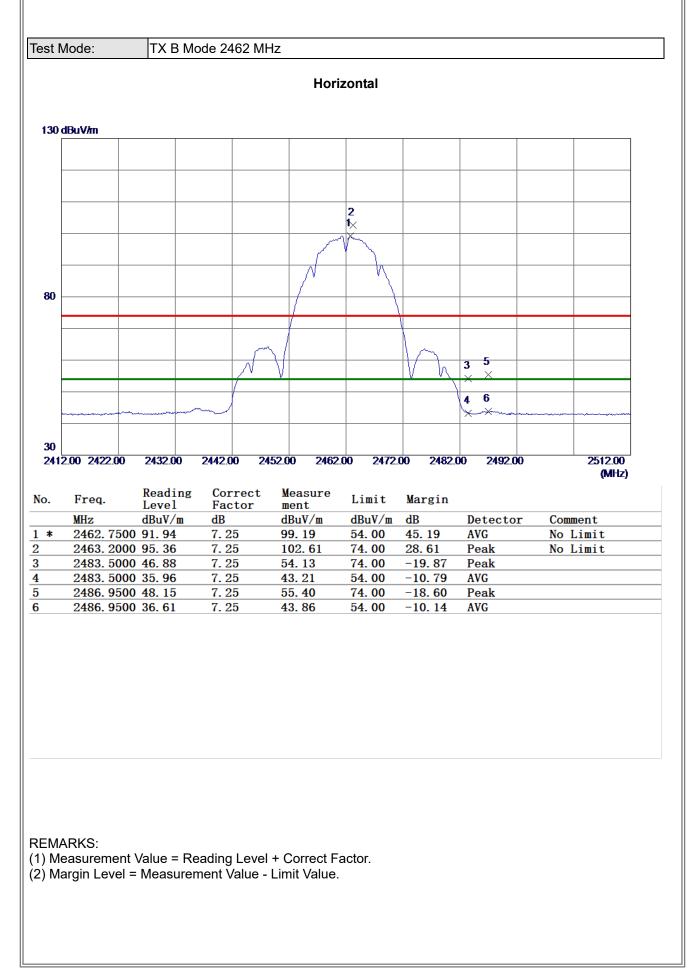




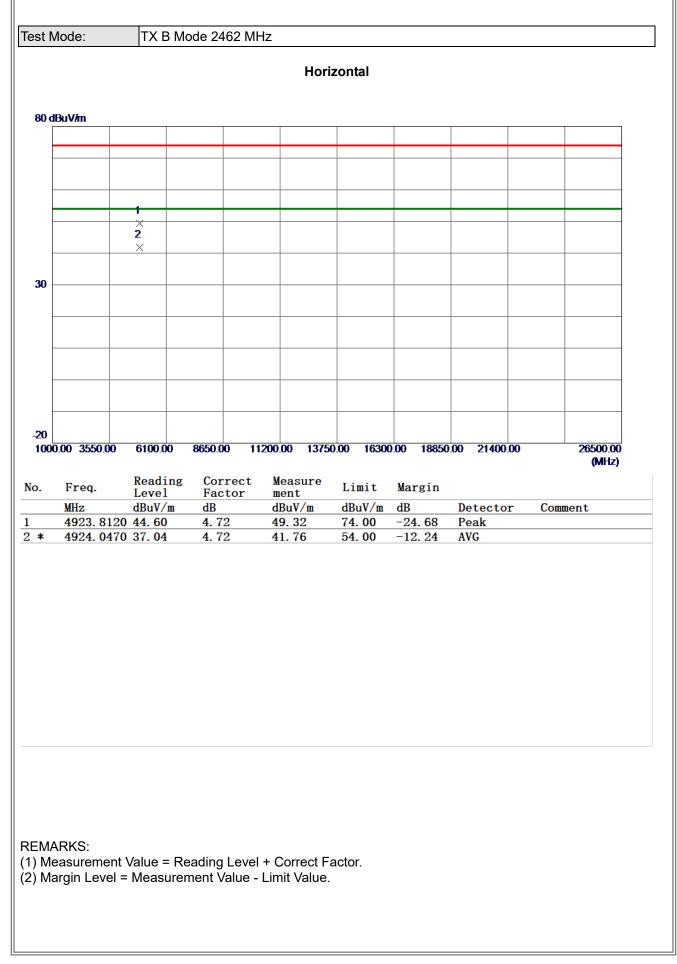




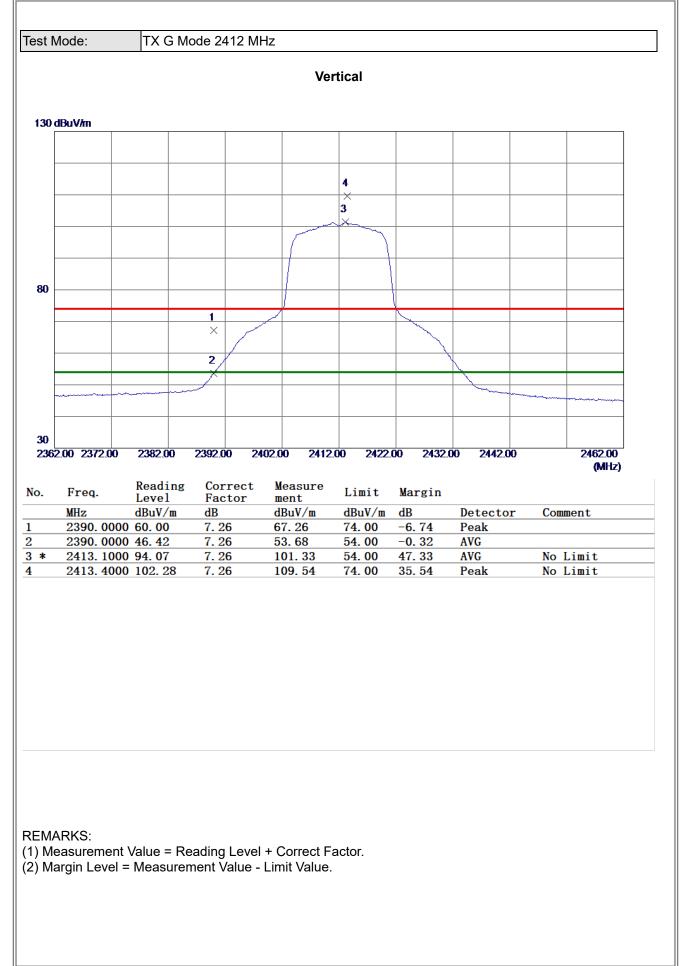




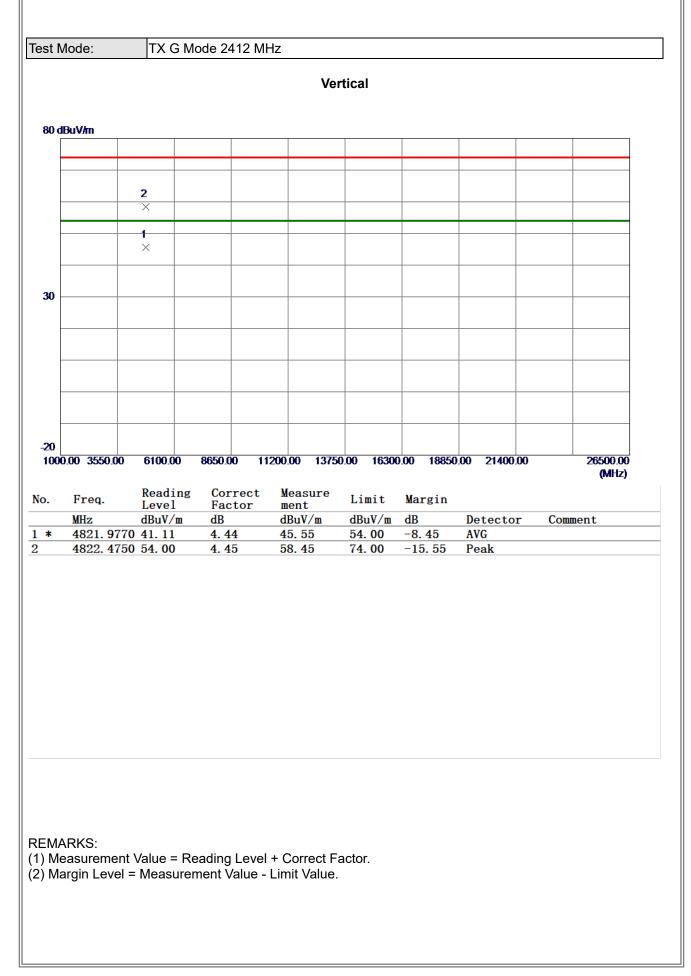




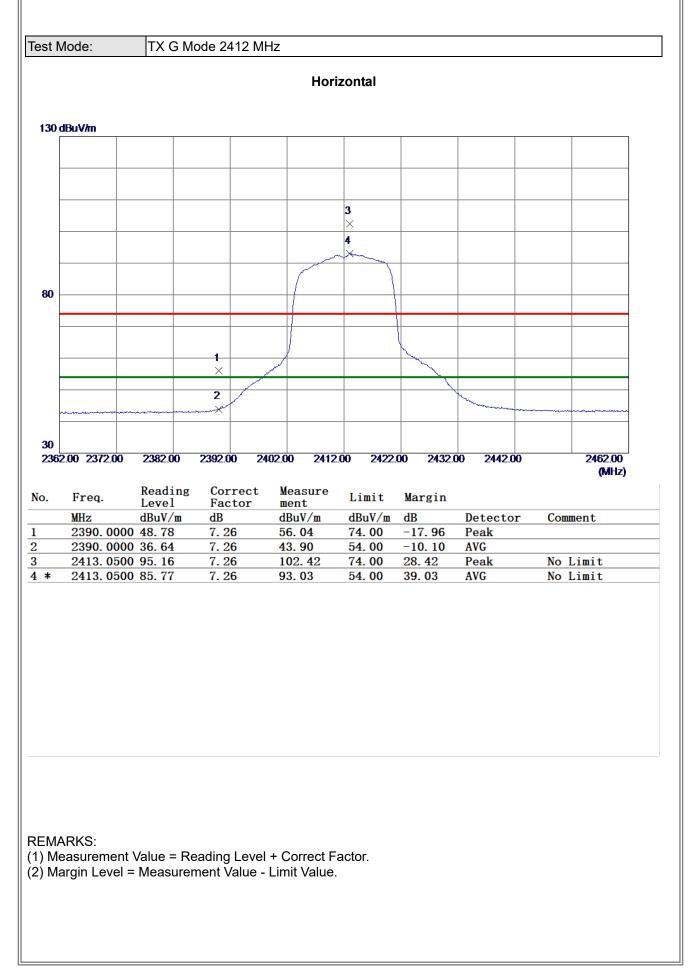




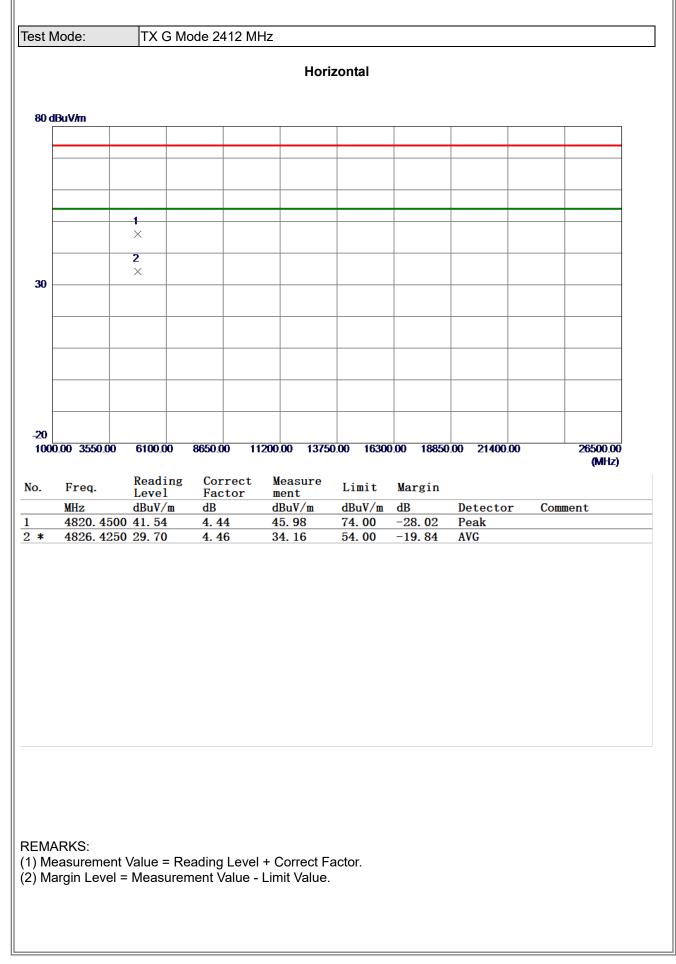




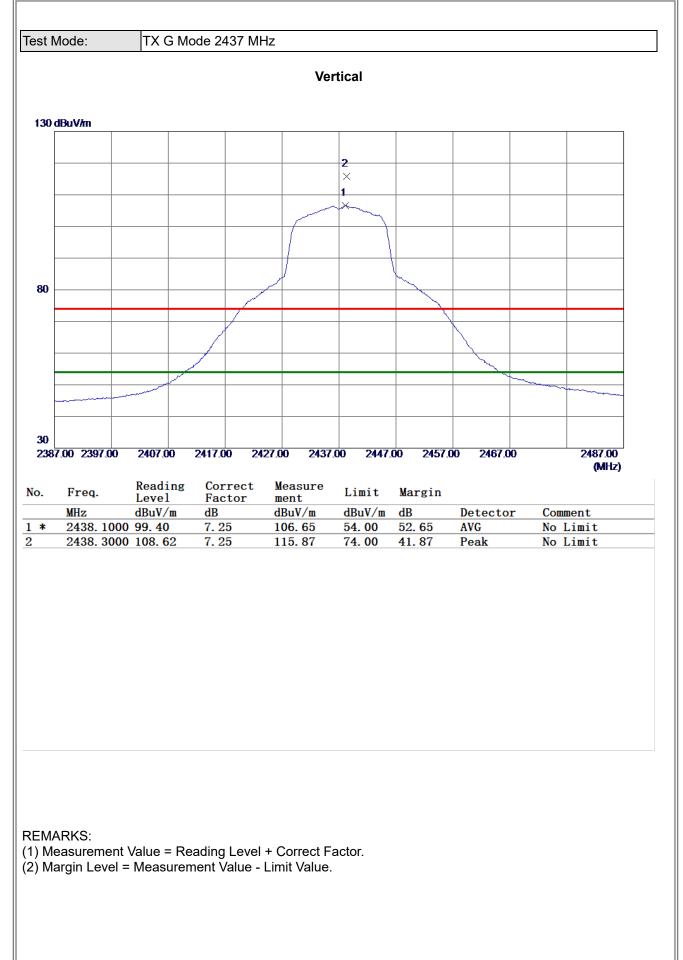




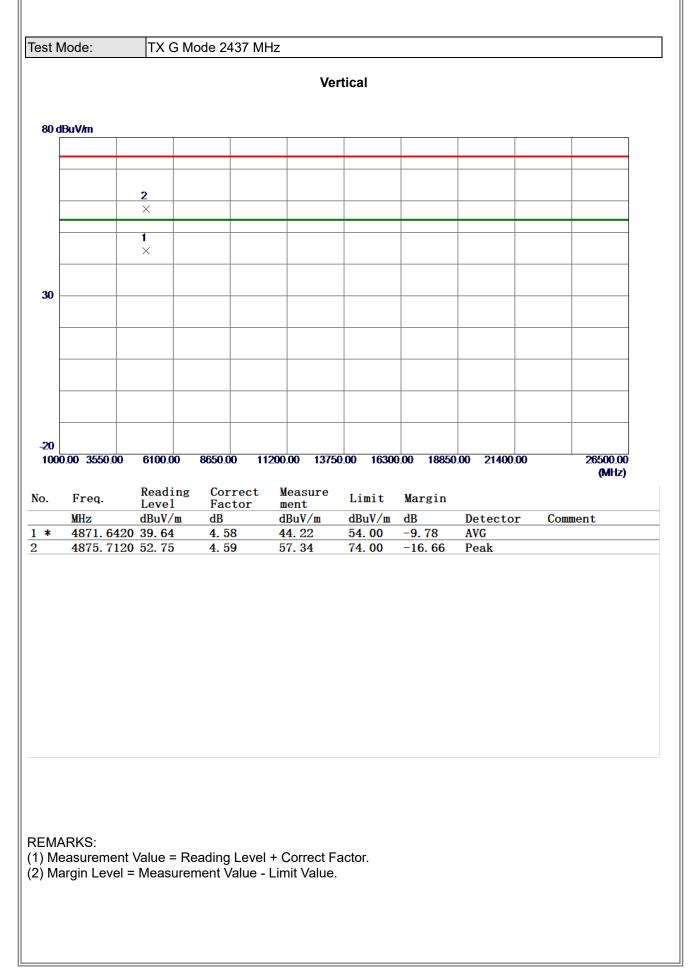




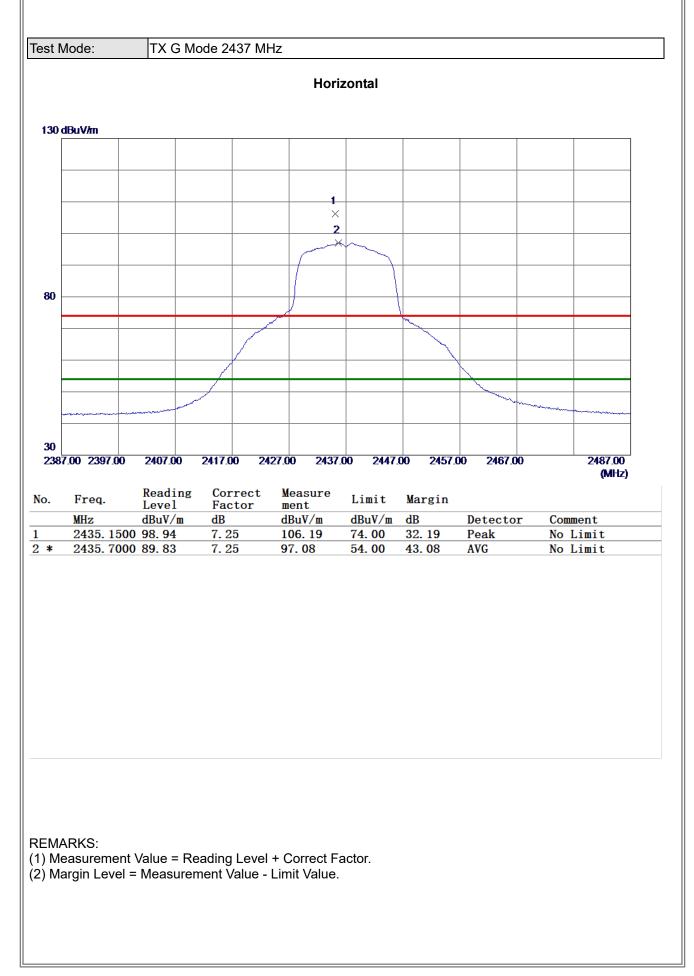




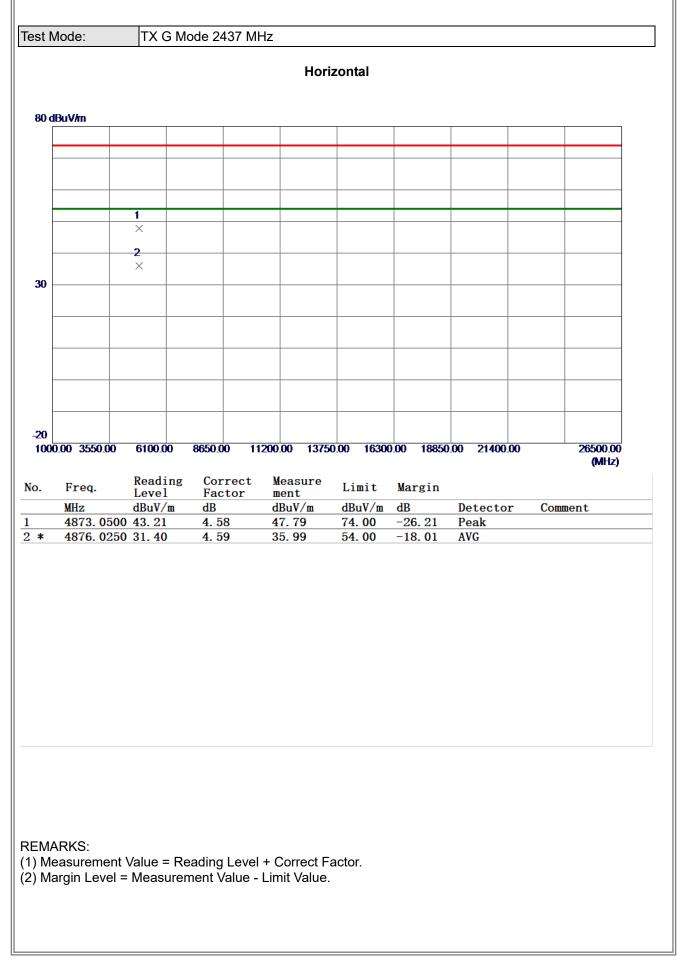




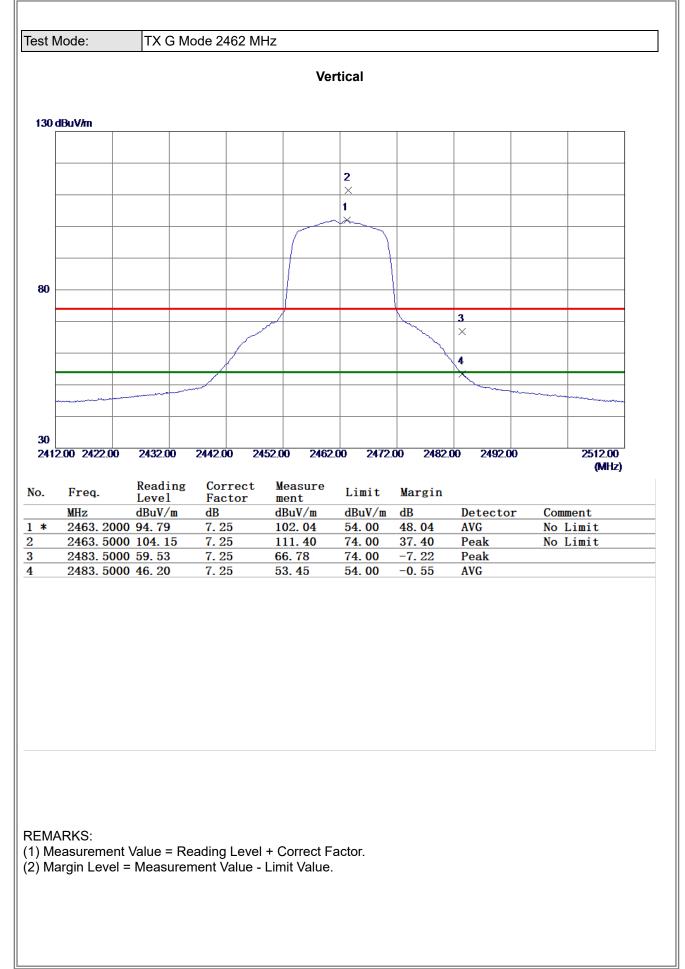




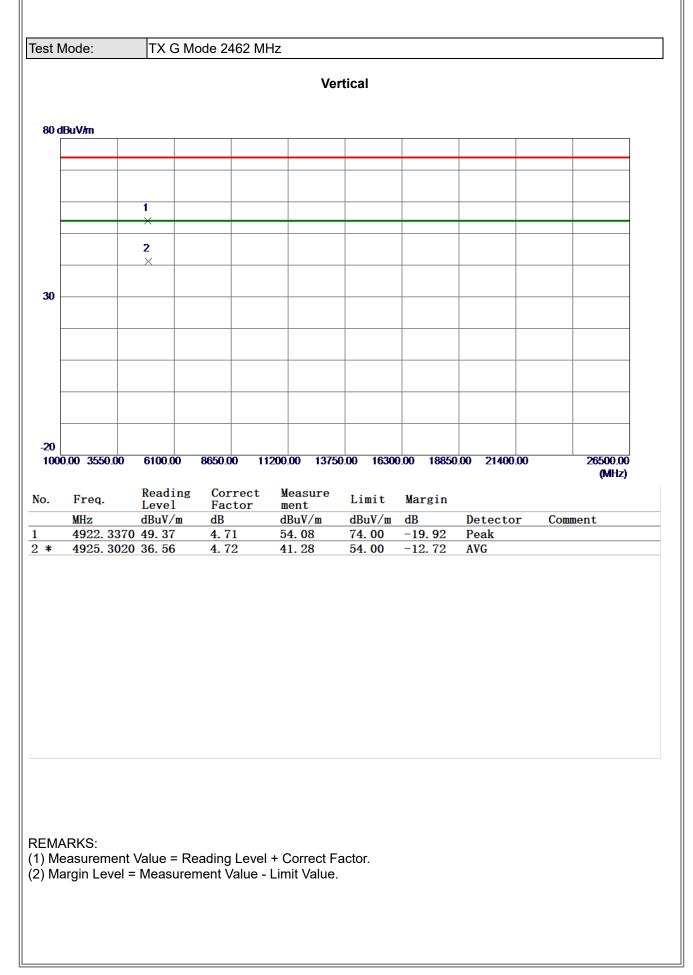




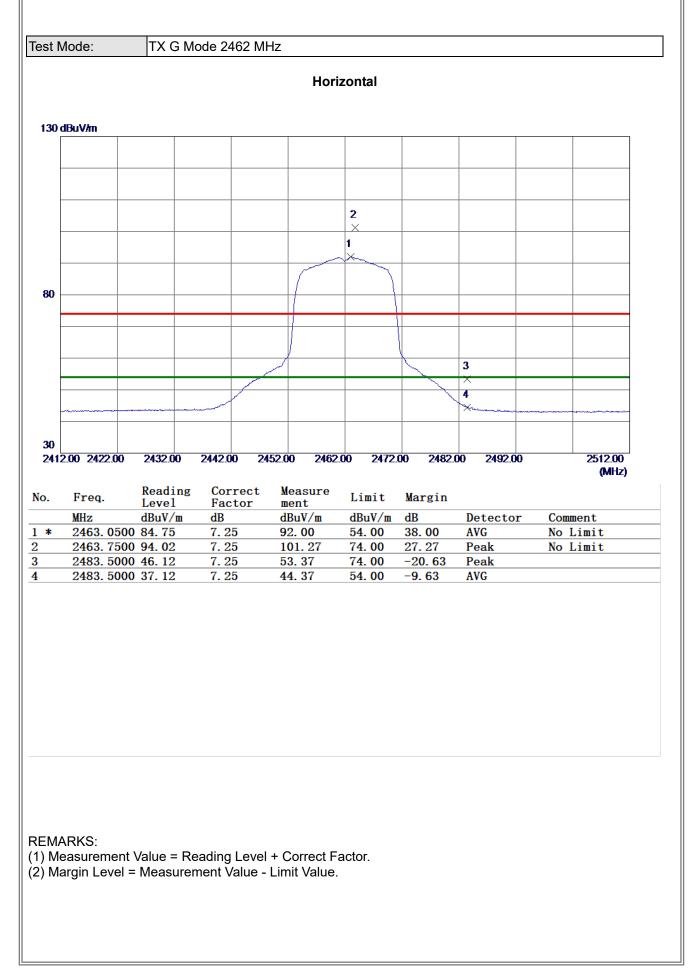




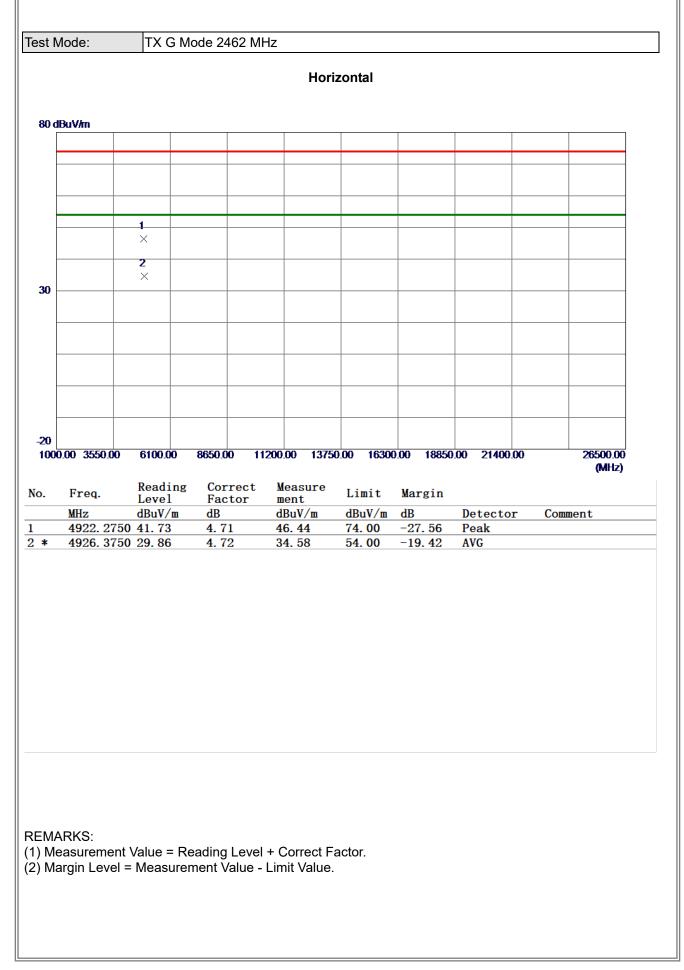




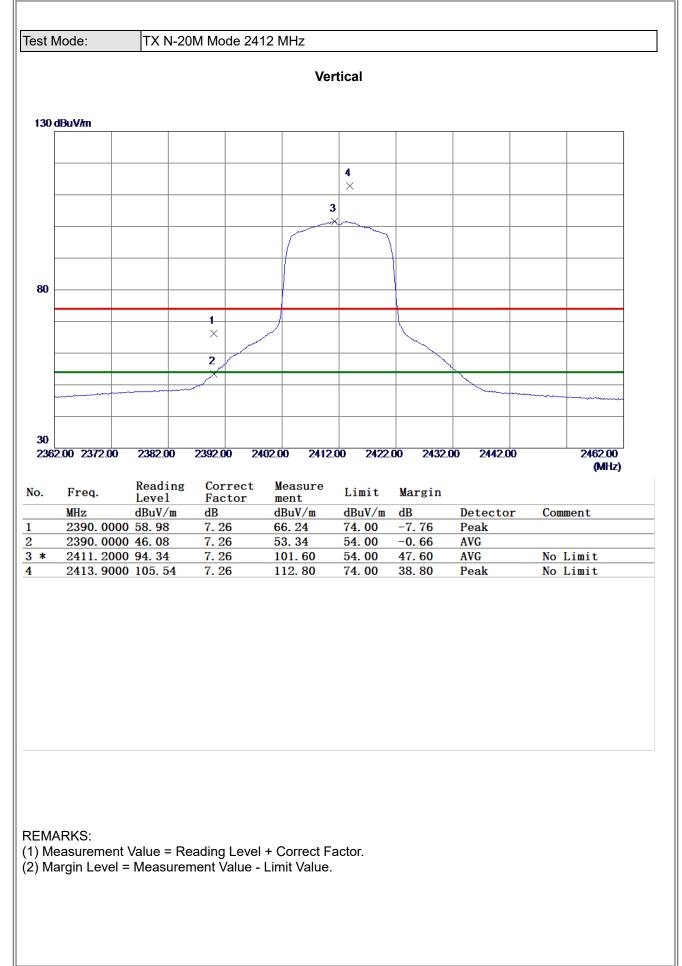




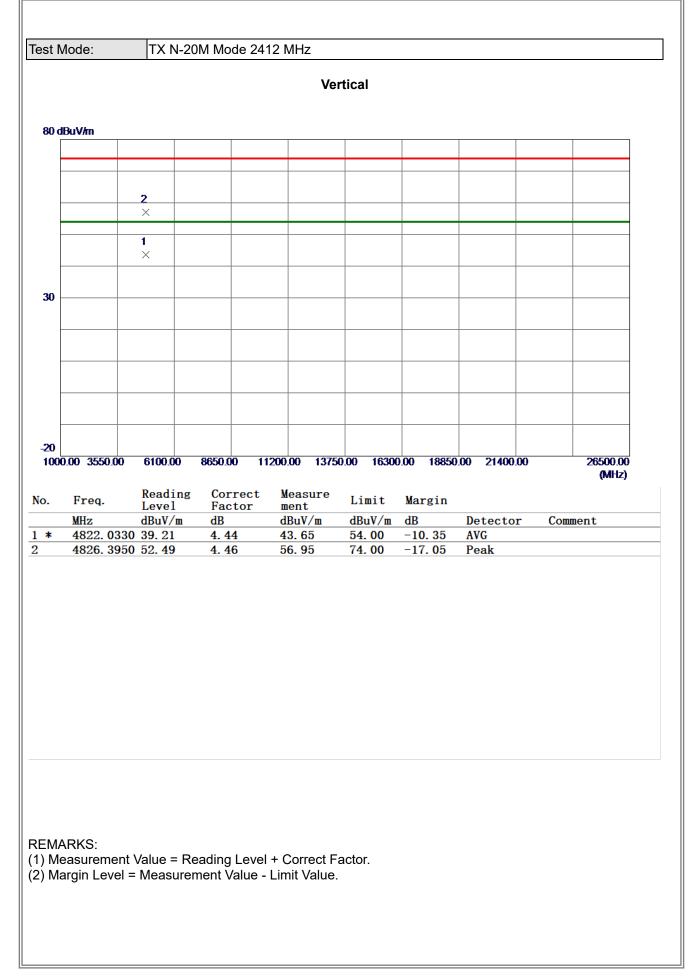




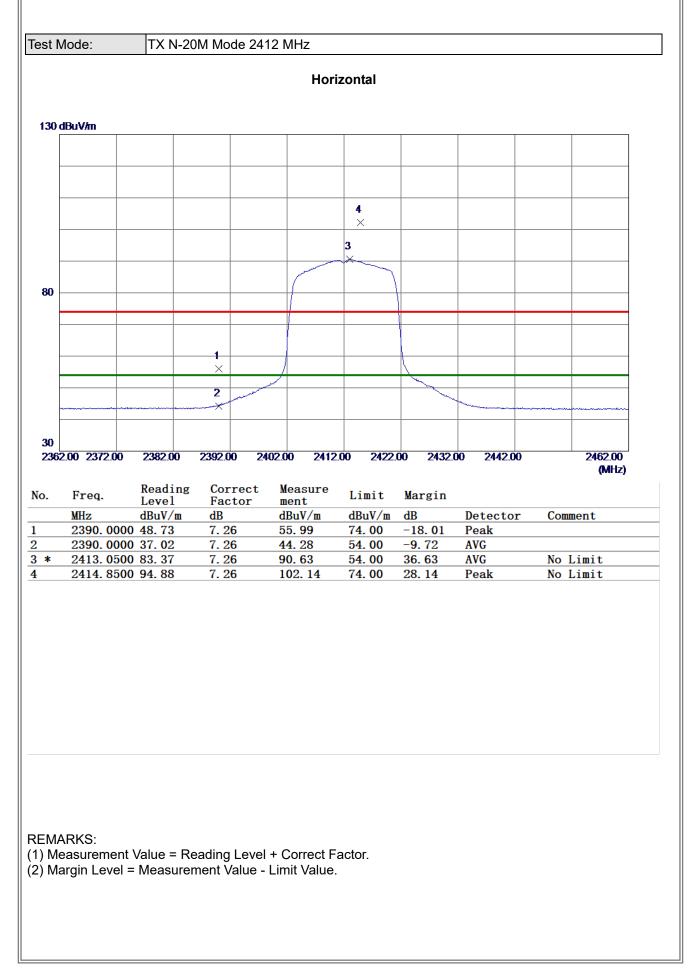




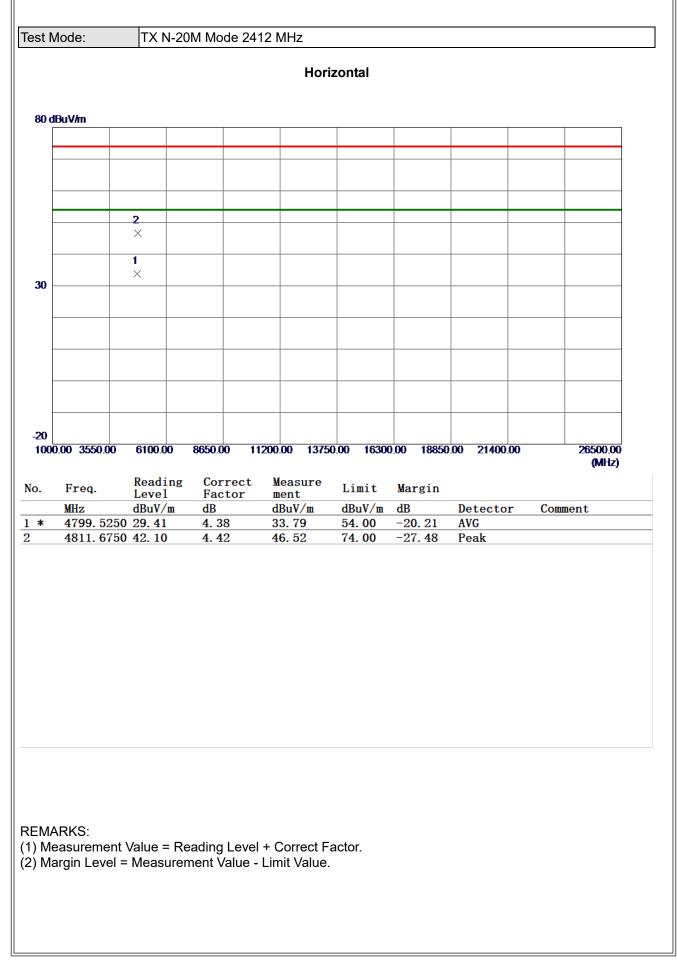




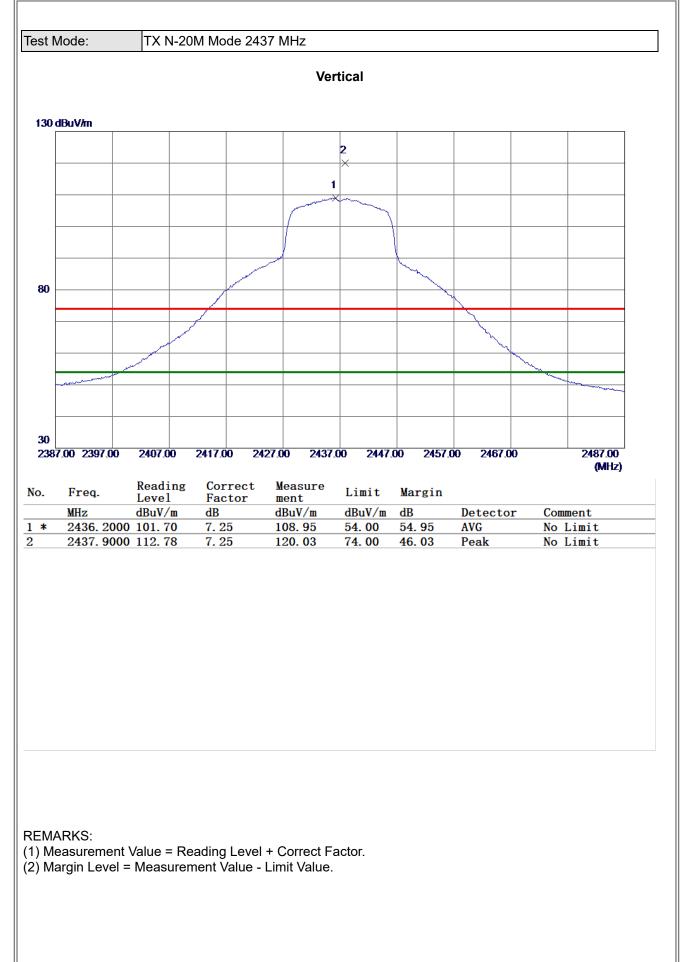




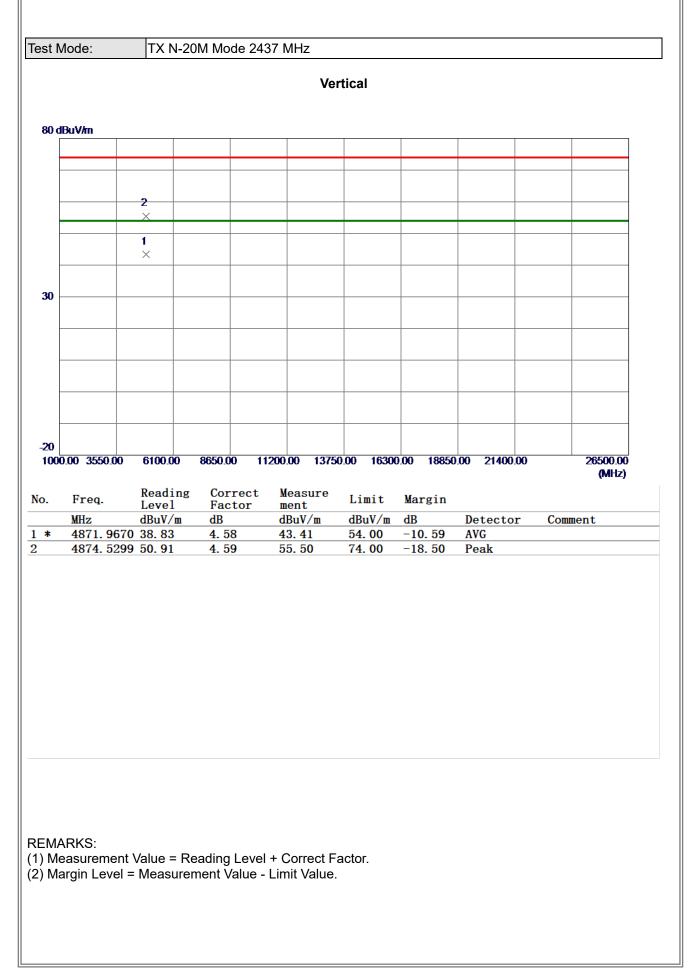




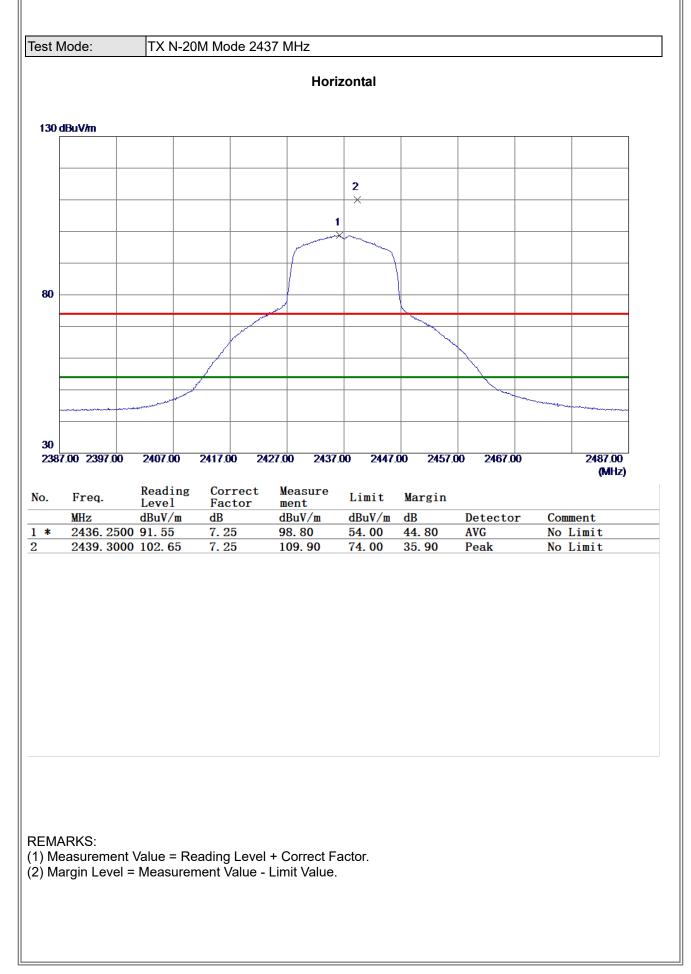




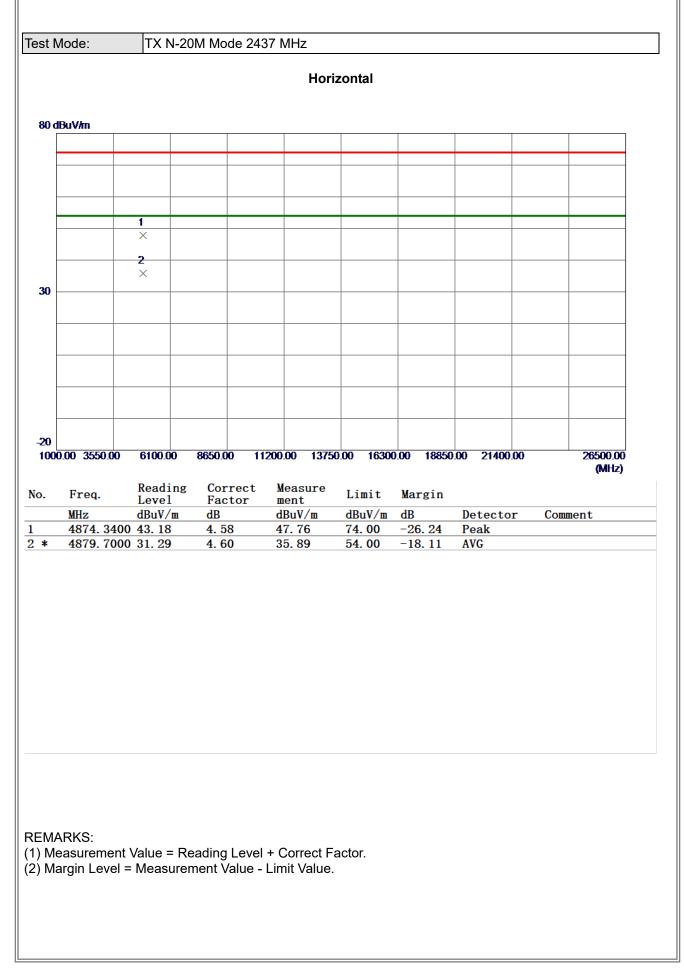




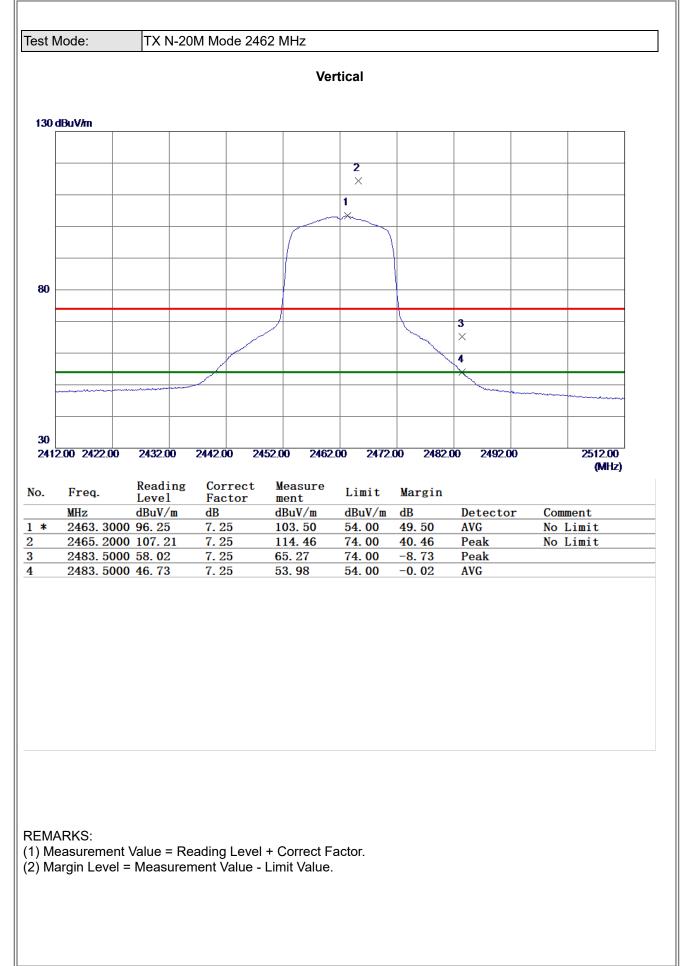




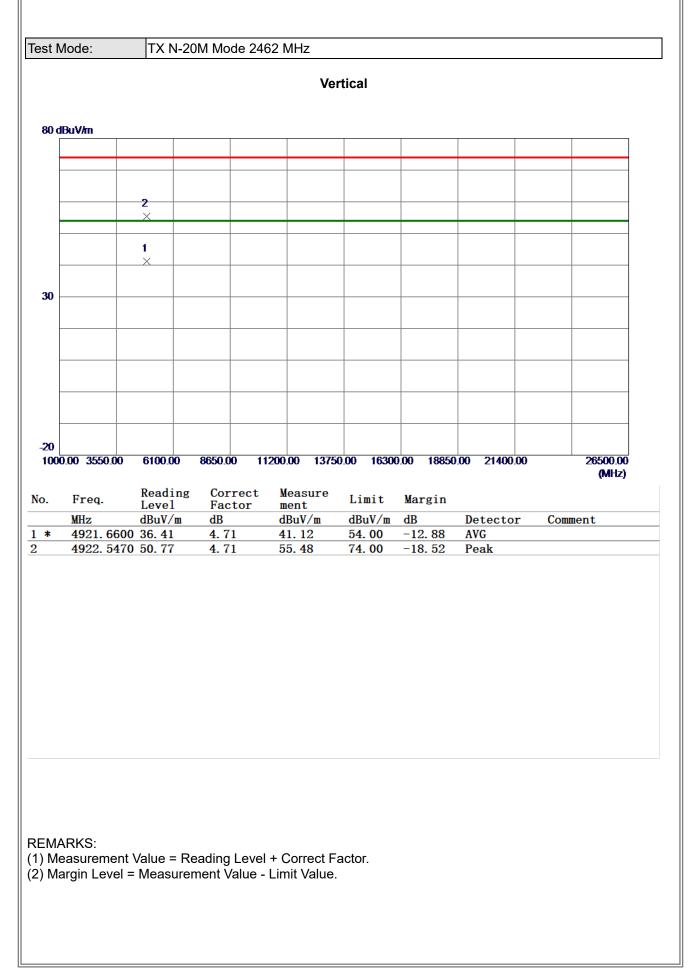




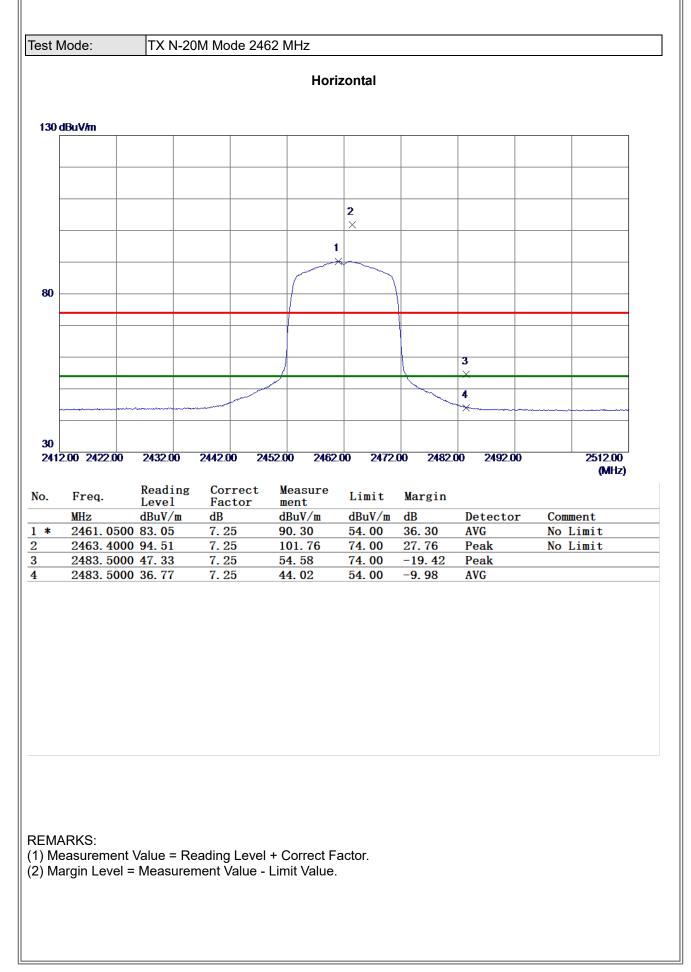




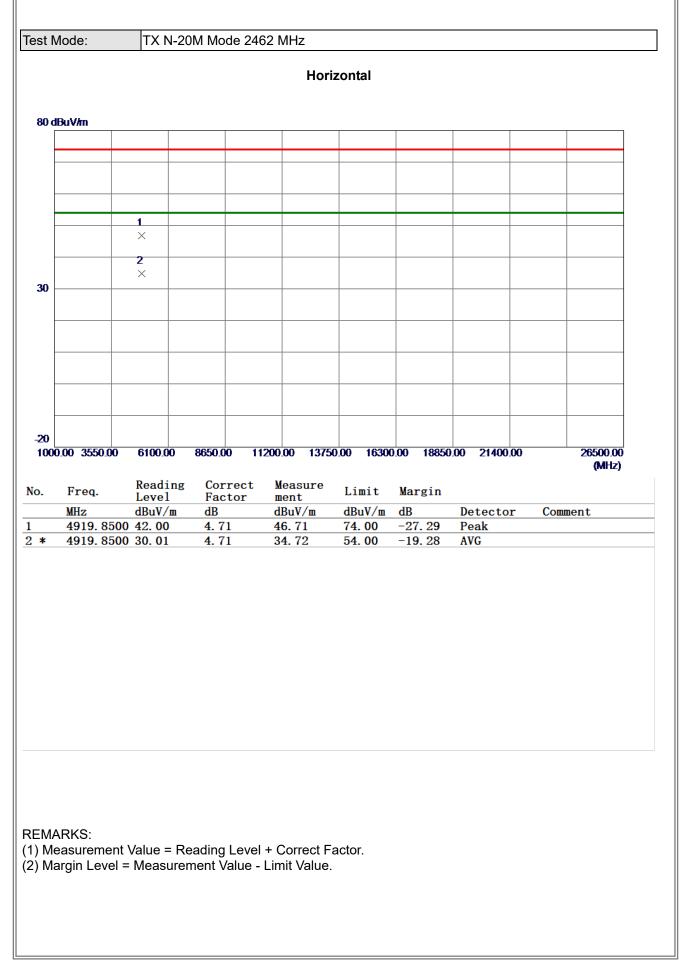




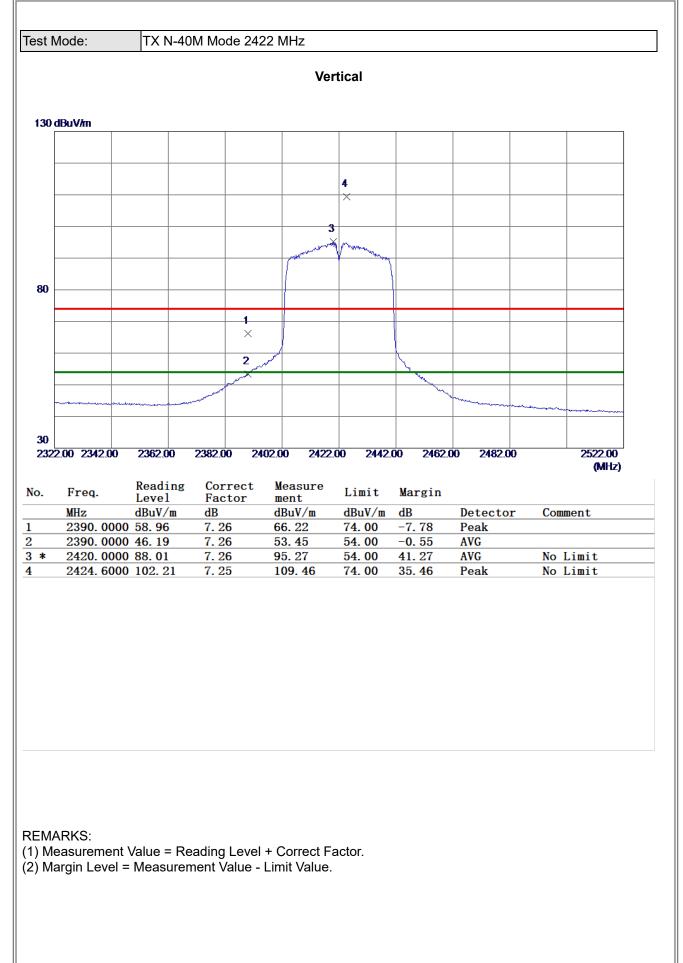




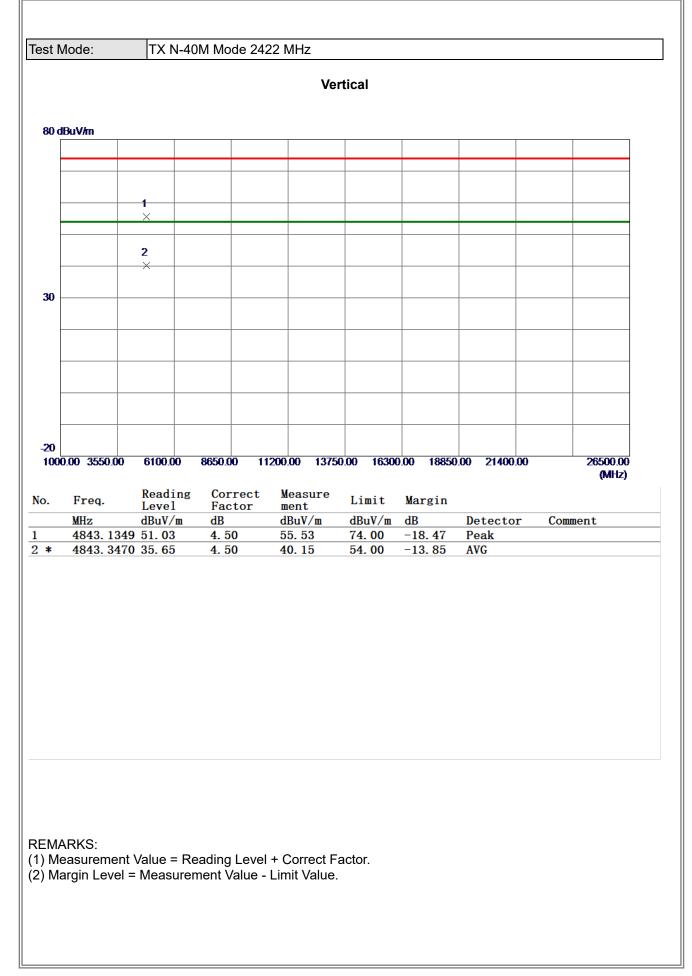




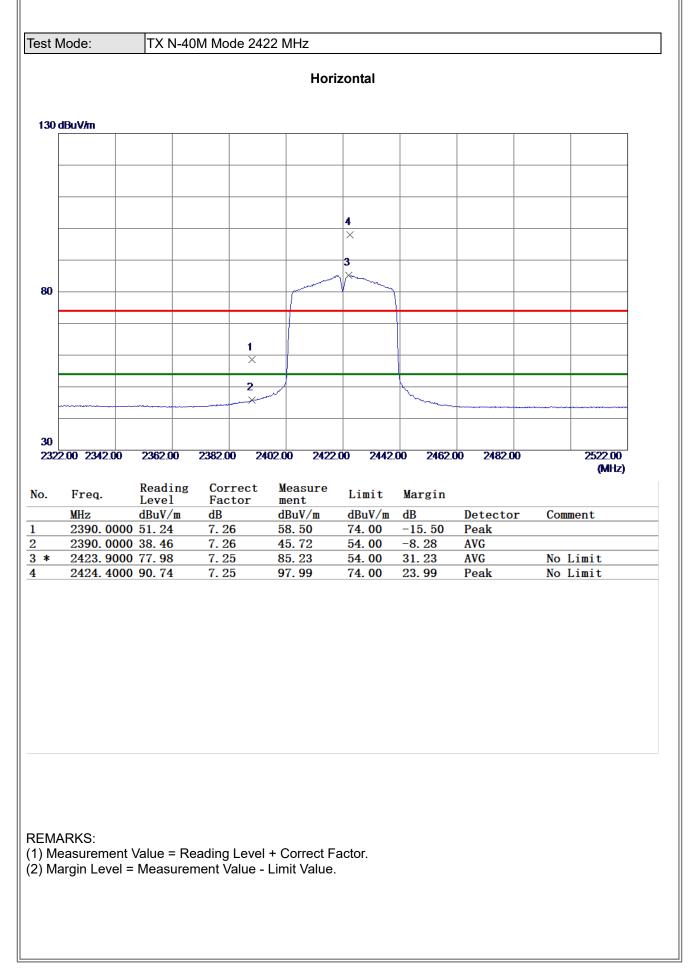




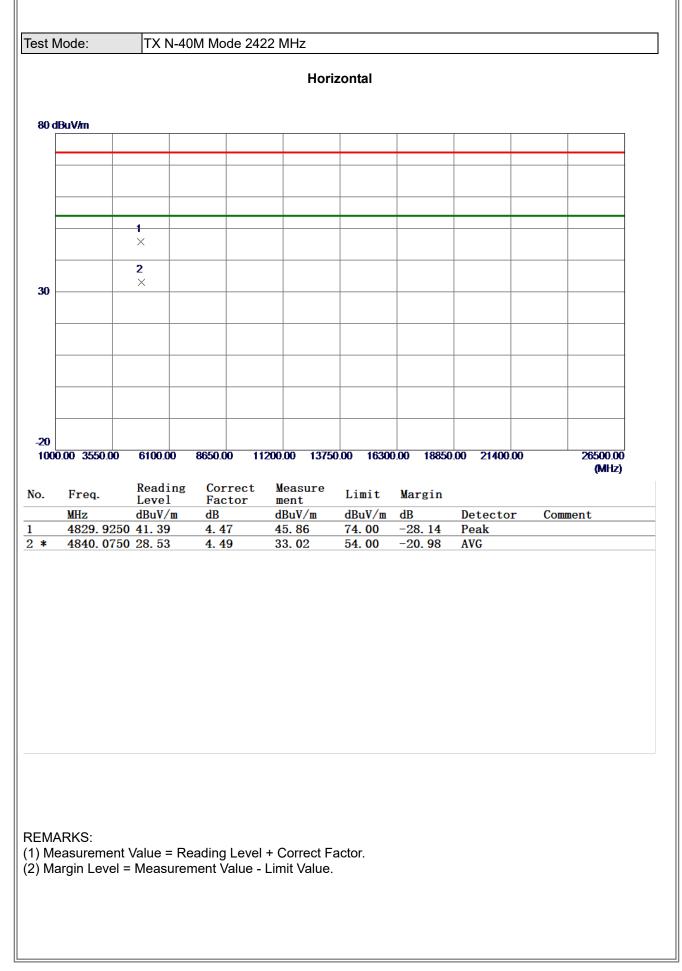




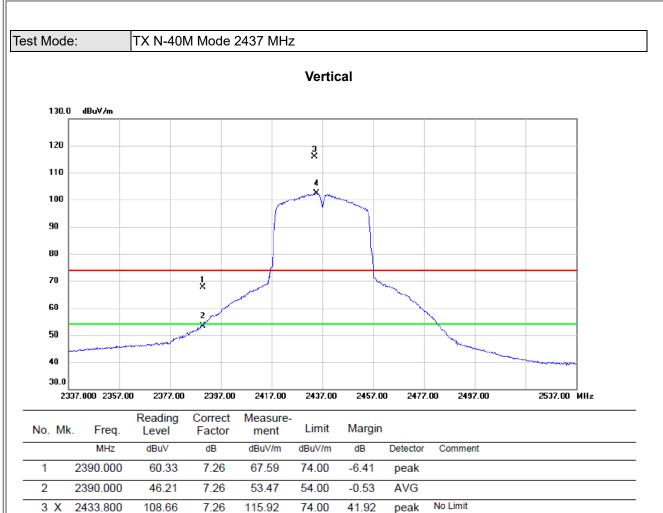












**REMARKS**:

4 \*

2434.800

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

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

95.11

7.25

102.36

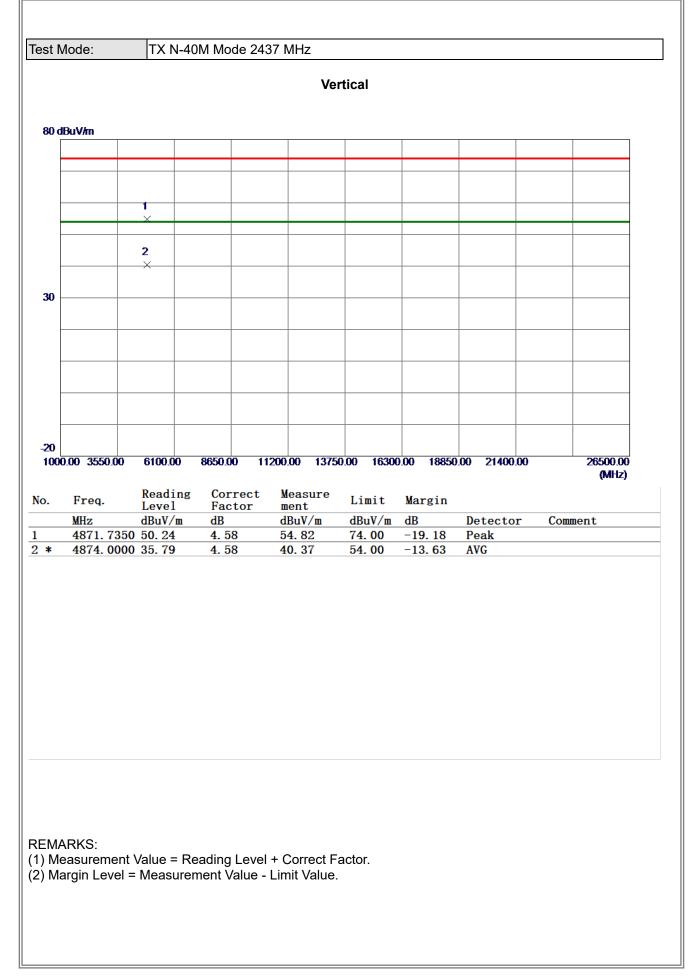
54.00

48.36

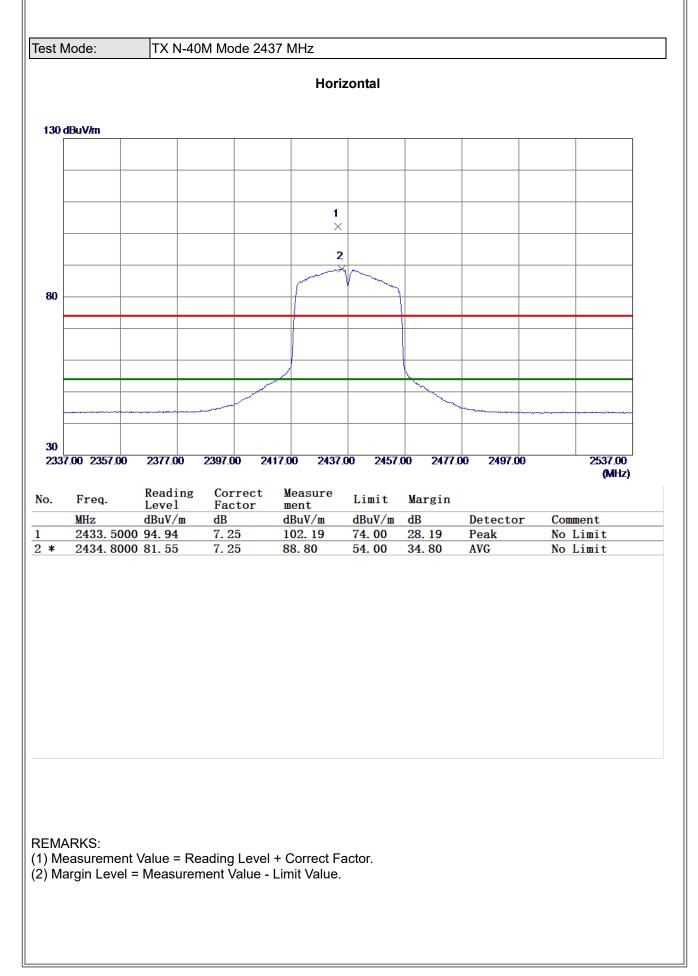
AVG

No Limit

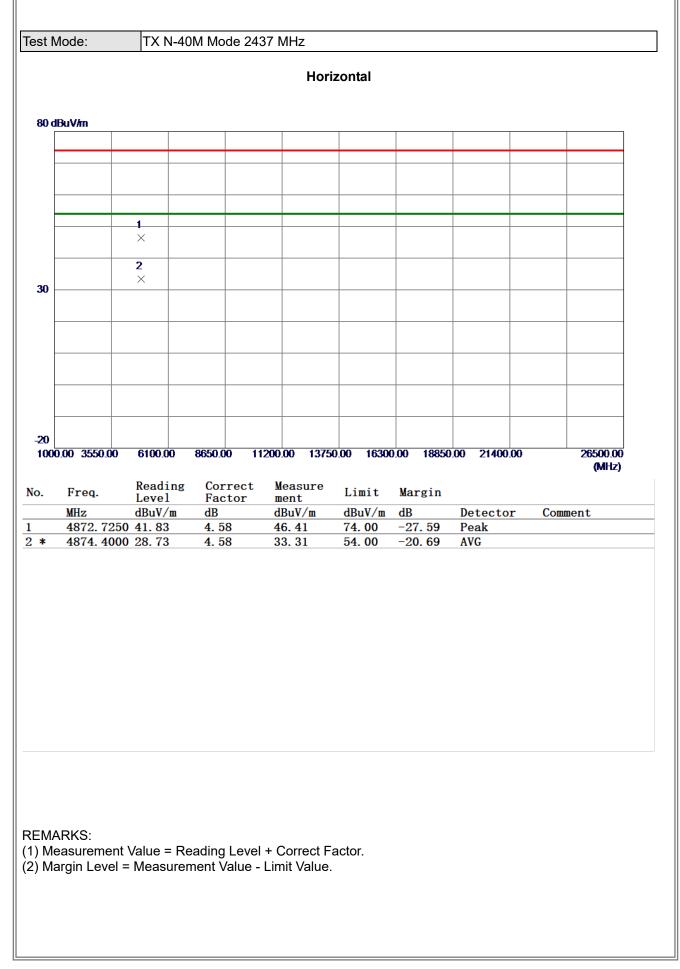




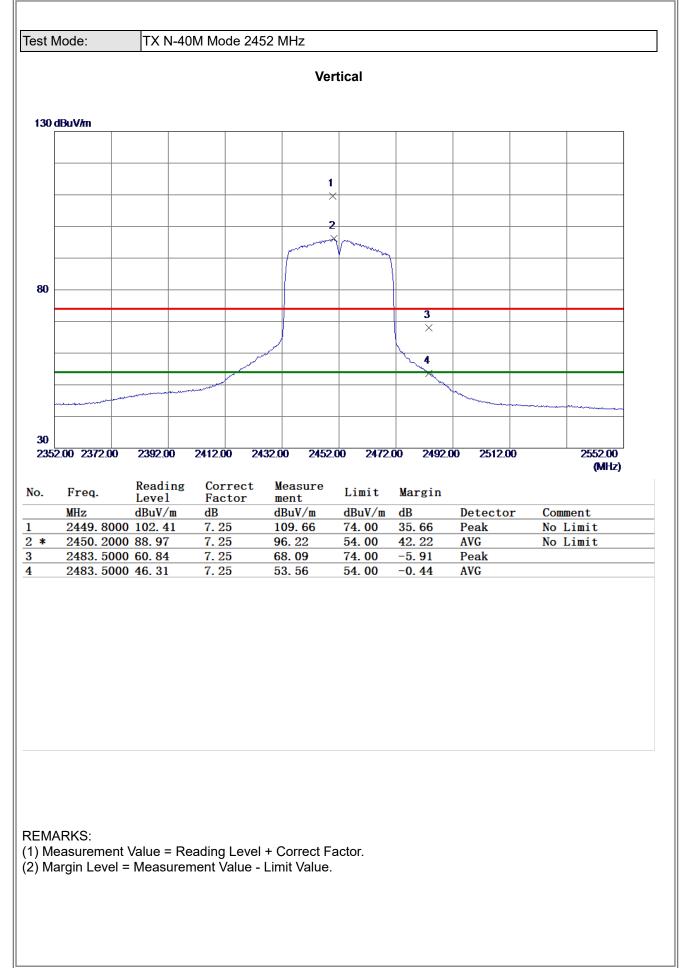




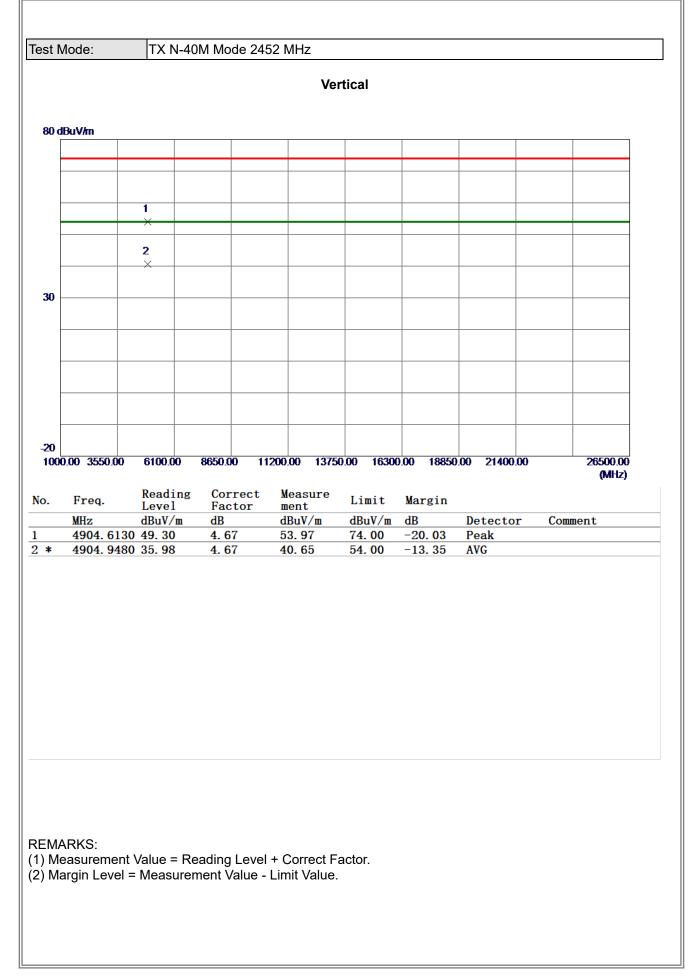




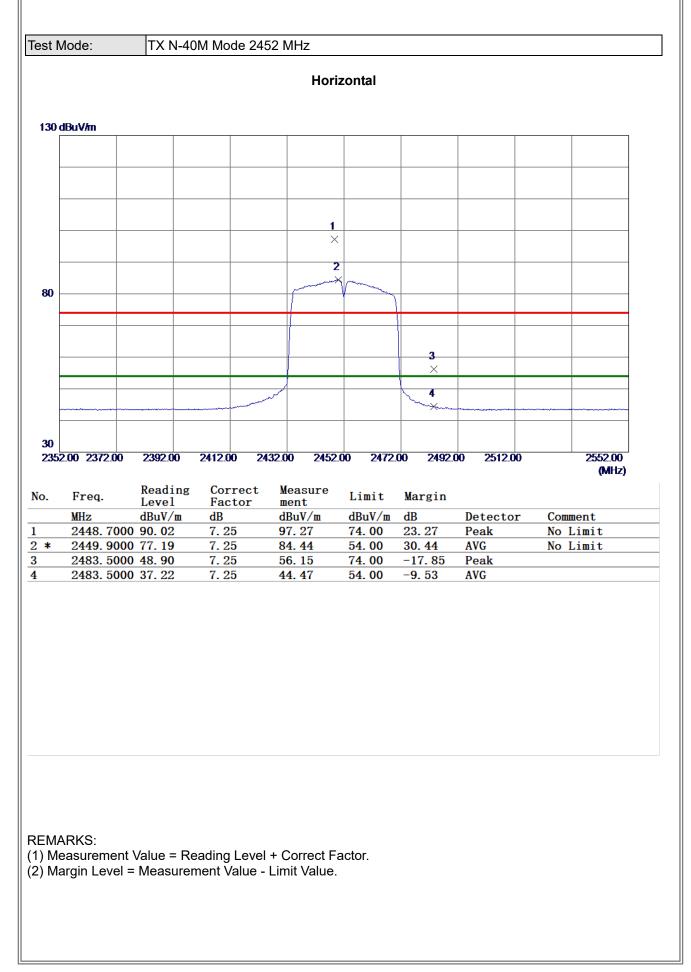




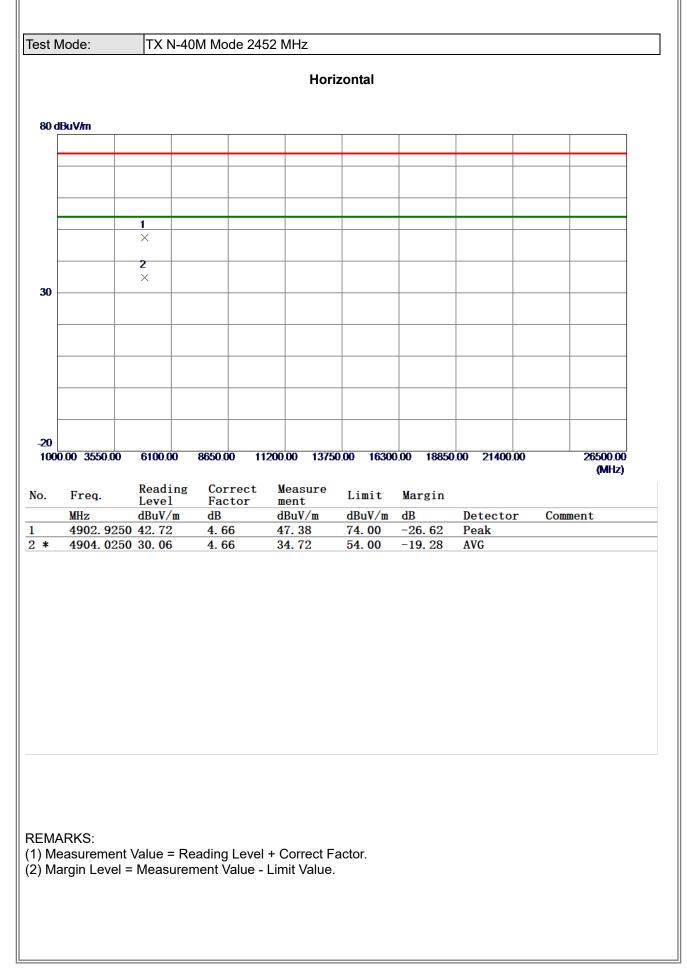










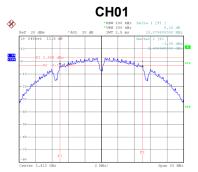




## **APPENDIX E - BANDWIDTH**



Test Mode TX B Mode					
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result	
01	2412	10.08	500	Complies	
06	2437	9.60	500	Complies	
11	2462	10.04	500 0		

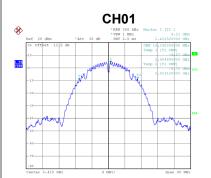


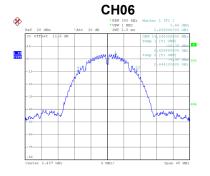




Date: 1.MAR.2021 10:13:28

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	14.24	Complies
06	2437	14.24	Complies
11	2462	14.24	Complies







Date: 1.MAR.2021 10:13:36

Date: 1.MAR.2021 10:16:12

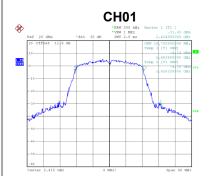
Date: 1.MAR.2021 10:18:17

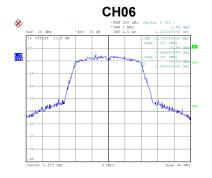
Date: 1.MAR.2021 10:18:09

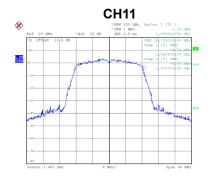


est Mode	TX G Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
01	2412	15.04	500	Complies
06	2437	15.16	500	Complies
11	2462	15.10	500	Complies
			0.56 dB      3.5593300 Mit        3.5593300 Mit      Bef 20 dBm        12 171	**#87 100 kHz 0x15a 1(7 1) **77 300 kHz 0x15a (7 1) *** 0x15a (1 1) **** 120000100 kHz 0x15a (1 1) *********************************
-70 Y1 Center 2,412 OHr 2 MH 1.MAR.2021 10:24:39	27 Byan 20 MHz	-17- -19- Center 2.437 082 2 ME/ Date: 1.MAR.2021 10:25:31	71      -70      -40        span 20 Mdz      Center 2.462 0Ez      2 9        Date: 1.M0R.2021 10:27:46      10:27:46	enz/ Span 20 Miz

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







Date: 1.MAR.2021 10:20:41

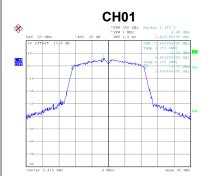
Date: 1.MAR.2021 10:25:38

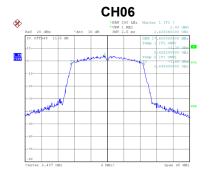
Date: 1.MAR.2021 10:27:54

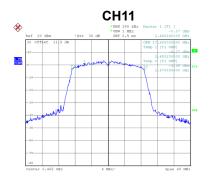


Test Mode	TX N-20M Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
01	2412	15.14	500	Complies
06	2437	15.14	500	Complies
11	2462	13.86	500	Complies
Ref 20 dBm      *Att 30 dB        10 Offbet 115 dB		• VBW 300 kHz	1 (17) 10,000 2000 2000 2000 2000 2000 2000 20	Hun

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	17.68	Complies
06	2437	17.60	Complies
11	2462	17.60	Complies







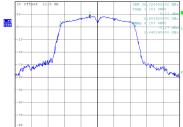
Date: 1.MAR.2021 10:31:12

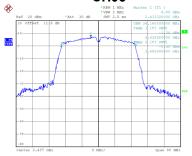
Date: 1.MAR.2021 10:32:36

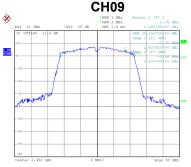
Date: 1.MAR.2021 10:34:27



Fest Mode	TX N-40M Mode				
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)			
03	2422	35.24	500	Complies	
06	2437	35.16	500	Complies	
09	2452	35.08	500	Complies	
· ·	H03 BND 100 ME ==================================	• VBN 300 kHz	1.150/1000 MBr 1.150/2000 MBr	CHO9	
Center 2.422 08z 4 M8z			1      1        1      1	ri B2/ Spon 40 MB2	
Channel	Frequency (MHz)	99 % Emissio	n Bandwidth (MHz)	Result	
03	2422	36.32 Complies			
06	2437	36.16 Complies			
09	2452		Complies		
:	H03 200 100: Rache 1 [71 ] 201 2.102: X-4122 (2000) 001: 2.4122 (2000) 001: 2.4122 (2000) 001: 1 [71 001] 1 [100]	CHO6 ************************************	r 1 [71] 6.88 dEm 2.433320000 dHz Ref 20 dEm *Att 30 dB 100 offpet 11[5 dB	2361 5 Mar. Server 1 [11] 2376 1 Mar. 2.76 (dm 3972 2.5 no 2.45576000 000 Twen 3 [11 - 0.8] 7090 2 343.34566000 000 141 - 0.45376000 000	







Date: 1.MAR.2021 10:36:06

Date: 1.MAR.2021 10:37:25

Date: 1.MAR.2021 10:38:46



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



st Mode	TX B Mode_Ant.	. 1			
Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	25.69	30.00	1.0000	Complies
06	2437	27.29	30.00	1.0000	Complies
11	2462	26.93	30.00	1.0000	Complies
Channel	Frequency (MHz)	Average Output Power+Duty Factor (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	20.83	30.00	1.0000	Complies
06	2437	24.52	30.00	1.0000	Complies

30.00

1.0000

Complies

22.45

Test Mode

11

TX G Mode\_Ant. 1

2462

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	25.14	30.00	1.0000	Complies
06	2437	27.56	30.00	1.0000	Complies
11	2462	25.54	30.00	1.0000	Complies

Channel	Frequency (MHz)	Average Output Power+Duty Factor (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	17.77	30.00	1.0000	Complies
06	2437	22.61	30.00	1.0000	Complies
11	2462	18.89	30.00	1.0000	Complies



st Mode	TX N-20M Mode	_Ant. 1			
Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	23.68	30.00	1.0000	Complies
06	2437	23.74	30.00	1.0000	Complies
11	2462	23.57	30.00	1.0000	Complies
Channel	Frequency (MHz)	Average Output Power+Duty Factor	Max. Limit (dBm)	Max. Limit (W)	Result

	(MHZ)	(dBm)	(dBm)	(VV)	
01	2412	15.53	30.00	1.0000	Complies
06	2437	16.46	30.00	1.0000	Complies
11	2462	16.23	30.00	1.0000	Complies

### Test Mode TX N-20M Mode\_Ant. 2

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	24.15	30.00	1.0000	Complies
06	2437	24.08	30.00	1.0000	Complies
11	2462	23.94	30.00	1.0000	Complies

Channel	Frequency (MHz)	Average Output Power+Duty Factor (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	15.66	30.00	1.0000	Complies
06	2437	16.23	30.00	1.0000	Complies
11	2462	15.92	30.00	1.0000	Complies

## Test Mode TX N-20M Mode\_Total

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	26.93	26.98	0.4989	Complies
06	2437	26.92	26.98	0.4989	Complies
11	2462	26.77	26.98	0.4989	Complies

Channel	Frequency (MHz)	Average Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
01	2412	18.60	26.98	0.4989	Complies
06	2437	19.35	26.98	0.4989	Complies
11	2462	19.09	26.98	0.4989	Complies



st Mode	TX N-40M Mode	e_Ant. 1			
Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
03	2422	23.09	30.00	1.0000	Complies
06	2437	23.81	30.00	1.0000	Complies
09	2452	23.77	30.00	1.0000	Complies
Channel	Frequency (MHz)	Average Output Power+Duty Factor (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result

03	2422	15.41	30.00	1.0000	Complies
06	2437	16.20	30.00	1.0000	Complies
09	2452	15.93	30.00	1.0000	Complies

### Test Mode TX N-40M Mode\_Ant. 2

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
03	2422	22.75	30.00	1.0000	Complies
06	2437	23.58	30.00	1.0000	Complies
09	2452	23.89	30.00	1.0000	Complies

Channel	Frequency (MHz)	Average Output Power+Duty Factor (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
03	2422	15.77	30.00	1.0000	Complies
06	2437	16.12	30.00	1.0000	Complies
09	2452	16.09	30.00	1.0000	Complies

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

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
03	2422	25.93	26.98	0.4989	Complies
06	2437	26.71	26.98	0.4989	Complies
09	2452	26.84	26.98	0.4989	Complies

Channel	Frequency (MHz)	Average Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
03	2422	18.61	26.98	0.4989	Complies
06	2437	19.17	26.98	0.4989	Complies
09	2452	19.02	26.98	0.4989	Complies



# **APPENDIX G - CONDUCTED SPURIOUS EMISSIONS**



