

FCC Radio Test Report

FCC ID: 2AIMRMITVMDZ22AG

This report concerns: Original Grant

Project No.	:	2012C059
Equipment	:	MIBOX
Brand Name	:	MI
Test Model	:	MDZ-22-AG
Series Model	:	N/A
Applicant	:	Beijing Xiaomi Electronics Co., Ltd.
Address	:	Room 707, 7F, Building 5, No 58, JinghaiWulu Road, Beijing
		Economic and Technological Development Zone, China.
Manufacturer	:	Beijing Xiaomi Electronics Co., Ltd.
Address	:	Room 707, 7F, Building 5, No 58, JinghaiWulu Road, Beijing
		Economic and Technological Development Zone, China.
Factory	:	SHENZHEN 3NOD ELECTRONICS CO., LTD
Address	:	No.74 Yangyong Road, Yanluostreet, Tangxiayong Community,
		Songgang, Baoan, Shenzhen, China
Date of Receipt	:	Dec. 14, 2020
Date of Test	:	Jan. 25, 2021 ~ Feb. 03, 2021
Issued Date	:	Mar. 26, 2021
Report Version	:	R01
Test Sample	:	Engineering Sample No.: DG2021012236-1
Standard(s)	:	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.

Nige Chen Prepared by: Nick Chen

Telhan Ma

Approved by : Ethan Ma



Certificate #5123.02

Add: No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China. Tel: +86-769-8318-3000 Web: www.newbtl.com



Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

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	8
1.2 MEASUREMENT UNCERTAINTY	8
1.3 TEST ENVIRONMENT CONDITIONS	9
2 . GENERAL INFORMATION	10
2.1 GENERAL DESCRIPTION OF EUT	10
2.2 DESCRIPTION OF TEST MODES	11
2.3 PARAMETERS OF TEST SOFTWARE	12
2.4 DUTY CYCLE	13
2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	14
2.6 SUPPORT UNITS	14
3 . AC POWER LINE CONDUCTED EMISSIONS TEST	15
3.1 LIMIT	15
3.2 TEST PROCEDURE	15
3.3 DEVIATION FROM TEST STANDARD	15
3.4 TEST SETUP	16
3.5 EUT OPERATION CONDITIONS	16
3.6 TEST RESULTS	16
4 . RADIATED EMISSIONS TEST	17
4.1 LIMIT	17
4.2 TEST PROCEDURE	18
4.3 DEVIATION FROM TEST STANDARD	18
4.4 TEST SETUP	19
4.5 EUT OPERATION CONDITIONS	20
4.6 TEST RESULTS - 9 KHZ TO 30 MHZ	20
4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ	20
4.8 TEST RESULTS - ABOVE 1000 MHZ	20
5 . BANDWIDTH TEST	21
5.1 LIMIT	21
5.2 TEST PROCEDURE	21
5.3 DEVIATION FROM STANDARD	21
5.4 TEST SETUP	21



Table of Contents	Page
5.5 EUT OPERATION CONDITIONS	21
5.6 TEST RESULTS	21
6 . MAXIMUM OUTPUT POWER TEST	22
6.1 LIMIT	22
6.2 TEST PROCEDURE	22
6.3 DEVIATION FROM STANDARD	22
6.4 TEST SETUP	22
6.5 EUT OPERATION CONDITIONS	22
6.6 TEST RESULTS	22
7 . CONDUCTED SPURIOUS EMISSIONS	23
7.1 LIMIT	23
7.2 TEST PROCEDURE	23
7.3 DEVIATION FROM STANDARD	23
	23
7.5 EUT OPERATION CONDITIONS	23
	23
8 . POWER SPECTRAL DENSITY TEST	24
	24
8.2 TEST PROCEDURE	24
8.3 DEVIATION FROM STANDARD 8.4 TEST SETUP	24 24
8.5 EUT OPERATION CONDITIONS	24 24
8.6 TEST RESULTS	24
9 . MEASUREMENT INSTRUMENTS LIST	25
10 . EUT TEST PHOTO	27
APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS	31
APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ	34
APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ	39
APPENDIX D - RADIATED EMISSION- ABOVE 1000 MHZ	42
APPENDIX E - BANDWIDTH	90
APPENDIX F - MAXIMUM OUTPUT POWER	95
APPENDIX G - CONDUCTED SPURIOUS EMISSIONS	97



Table of Contents

Page

APPENDIX H - POWER SPECTRAL DENSITY

102



REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Feb. 26, 2021
R01	Updated the comments.	Mar. 26, 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	2.60

B. Radiated emissions test:

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

C. Other Measurement:

Parameter	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	Hand Huang
Radiated Emissions-9K-30MHz	25°C	60%	DC 5.2V	Kwok Guo
Radiated Emissions-30 MHz to 1GHz	26°C	52%	DC 5.2V	Kwok Guo
Radiated Emissions-Above 1000 MHz	26°C	52%	DC 5.2V	Kwok Guo
Bandwidth	25°C	60%	DC 5.2V	Hayden Chen
Maximum output power	25°C	60%	DC 5.2V	Evan Yang
Conducted Spurious Emissions	25°C	60%	DC 5.2V	Hayden Chen
Power Spectral Density	25°C	60%	DC 5.2V	Hayden Chen



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	MIBOX
Brand Name	MI
Test Model	MDZ-22-AG
Series Model	N/A
Model Difference(s)	N/A
Power Source	DC Voltage supplied from AC adapter. Model: AY11BA-AF0522102
Power Rating	I/P:100-240V~ 0.5A 50/60Hz O/P:5.2V2.1A
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: 18.16 dBm (0.0655 W) IEEE 802.11g: 23.69 dBm (0.2339 W) IEEE 802.11n (HT20): 23.08 dBm (0.2032 W) IEEE 802.11n (HT40): 23.17 dBm (0.2075 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								
01	2412	04	2427	07	2442	10	2457	
02	2417	05	2432	08	2447	11	2462	
03	2422	06	2437	09	2452			

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	MI	MDZ-22-AG	РСВ	N/A	0.5

Note:

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 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.

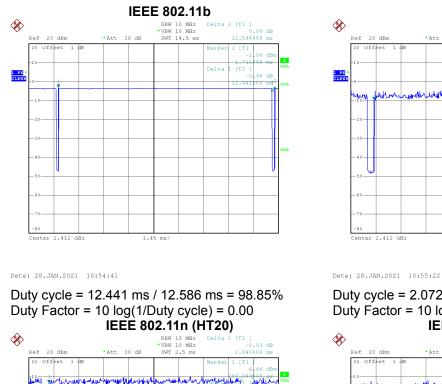
2.3 PARAMETERS OF TEST SOFTWARE

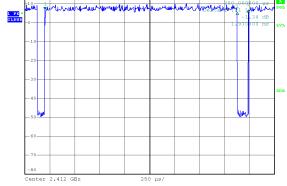
Test Software	IPOP V4.1		
Frequency (MHz)	2412 2437 2462		
IEEE 802.11b	34	35	36
IEEE 802.11g	39	44	45
IEEE 802.11n (HT20)	37	41	42
Frequency (MHz)	2422	2437	2452
IEEE 802.11n (HT40)	34	41	42



2.4 DUTY CYCLE

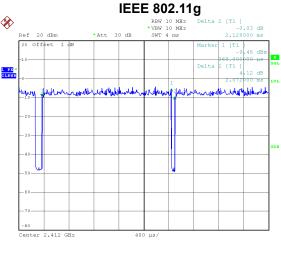
If duty cycle is \geq 98 %, duty factor is not required. If duty cycle is < 98 %, duty factor shall be considered. The output power = measured power + duty factor.

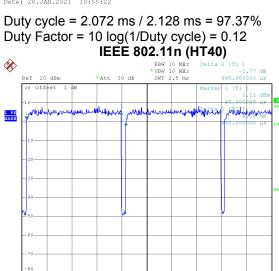




Date: 28.JAN.2021 10:55:59

Duty cycle = 1.930 ms / 2.040 ms = 94.61% Duty Factor = 10 log(1/Duty cycle) = 0.24





Date: 28.JAN.2021 10:57:48

enter 2.422 GH:

Duty cycle = 0.950 ms / 0.995 ms = 95.48% Duty Factor = 10 log(1/Duty cycle) = 0.20

NOTE:

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

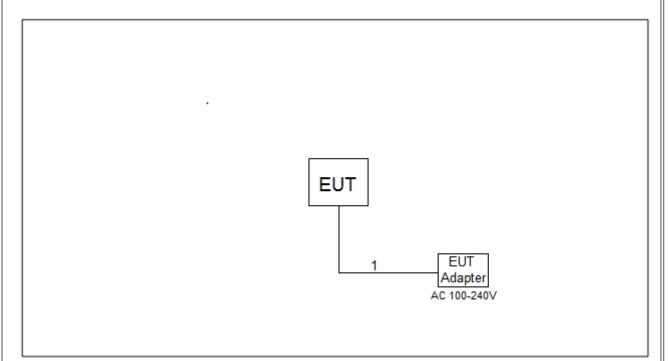
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz (Duty cycle < 98%).

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%).



2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.6 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
-	-	_	_	-

Ite	em	Cable Type	Shielded Type	Ferrite Core	Length
	1	DC Cable	NO	NO	1.2m



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

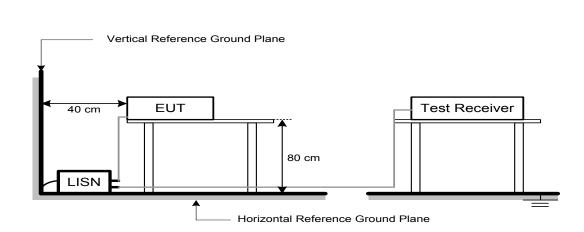
- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.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

Setting			
Auto			
9 kHz~90 kHz for PK/AVG detector			
90 kHz~110 kHz for QP detector			
110 kHz~490 kHz for PK/AVG detector			
490 kHz~30 MHz for QP detector			
30 MHz~1000 MHz for QP detector			



4.2 TEST PROCEDURE

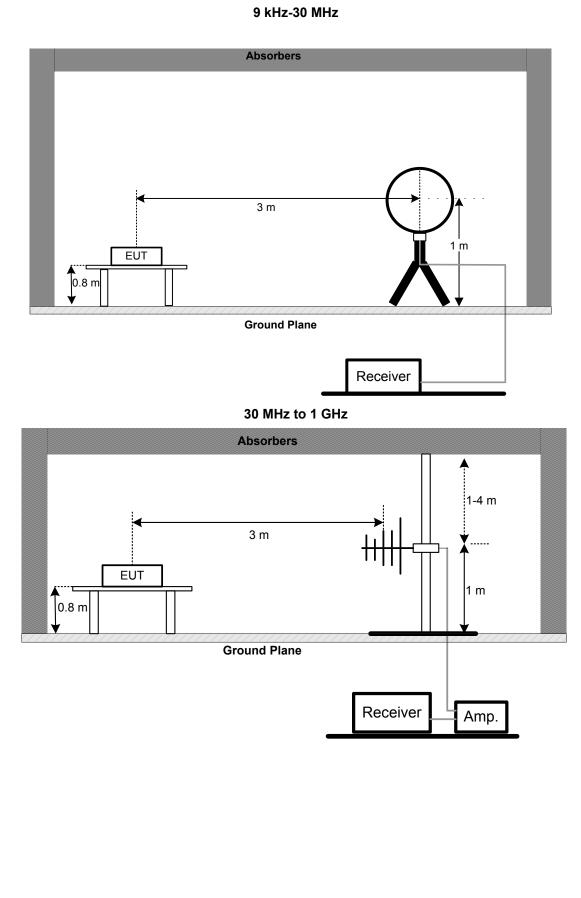
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b. The measuring distance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



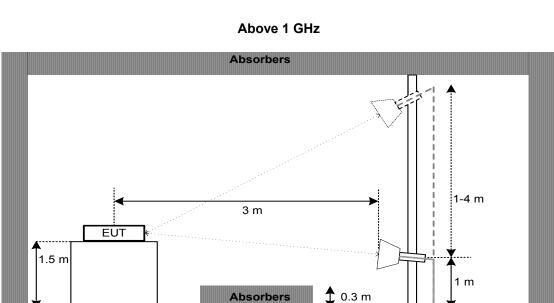
4.4 TEST SETUP





Amp.

3โL



Ground Plane

Receiver

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			
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= 100 kHz, VBW=300 kHz, Sweep time = auto.

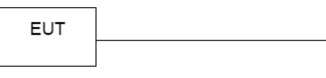
For 99% Emission Bandwidth B/G/N-20 Mode: RBW= 300 KHz, VBW=1 MHz, Sweep time = 2.5 ms. For 99% Emission Bandwidth N-40 Mode: RBW= 1 MHz, VBW=3 MHz, Sweep time = 2.5 ms.

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



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		

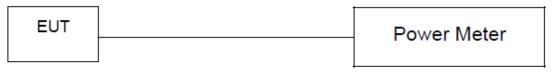
6.2 TEST PROCEDURE

- 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 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	Test Item	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, 2021			
2	LISN	EMCO	3816/2	52765	Mar. 01, 2021			
3	TWO-LINE V-NETWORK	R&S	ENV216	101447 Feb. 28, 202				
4	50Ω Terminator	SHX	TF5-3	15041305	Mar. 01, 2021			
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A			
6	Cable	N/A	RG223	12m Mar. 10, 2021				
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. 28, 2021			
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	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2021			
2*	Amplifier	HP	8447D	2944A09673	Aug. 11, 2021			
3	Receiver	Agilent	Agilent N9038A N		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 N/A Ver.NB-03A1-01		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	3008A02333	Mar. 01, 2021	
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 07, 2021	
5	Receiver	Agilent	N9038A	MY52130039	Jul. 25, 2021	
6	Controller	СТ	SC100	N/A	N/A	
7	Controller	MF	MF-7802	MF780208416	N/A	
8	Cable	N/A	EMC104-SM-SM-6 000	N/A	May 09, 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 & Antenna Conducted Spurious Emissions & Power Spectral Density								
Item	tem Kind of Equipment Manufacturer Type No. Serial No. Calibrated until							
1	Spectrum Analyzer R&S FSP40 100185 Jul. 25, 2021							
2	2 RF Cable Tongkaichuan N/A N/A N/A							
3	3 DC Block Mini N/A N/A N/A							
4	Attenuator	WOKEN	6SM3502	VAS1214NL	Feb. 11, 2021			

	Maximum Output Power							
Item	tem Kind of Equipment Manufacturer Type No. Serial No. Calibrated un							
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. 11, 2021			
4	RF Cable	Tongkaichuan	N/A	N/A	N/A			

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

"*" calibration period of equipment list is three year.

Except * item, all calibration period of equipment list is one year.



10. EUT TEST PHOTO

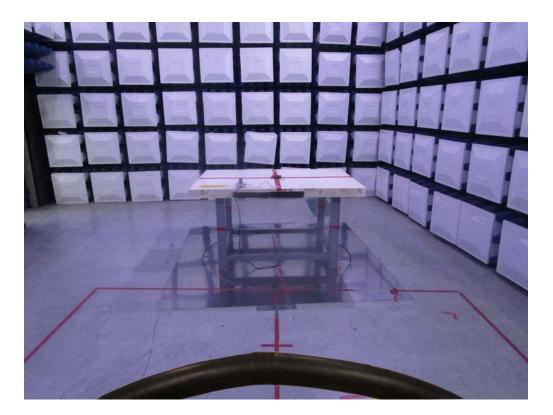
AC Power Line Conducted Emissions Test Photos







<section-header><section-header>

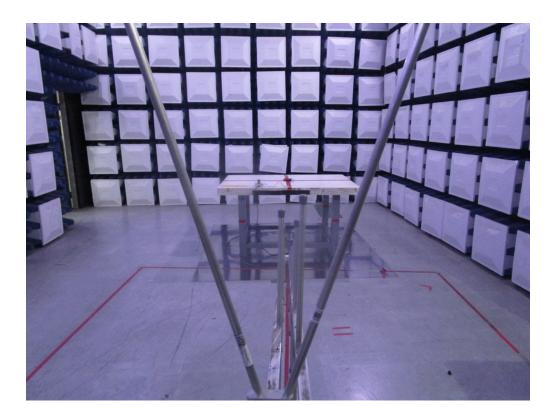




Radiated Emissions Test Photos

30 MHz to 1 GHz

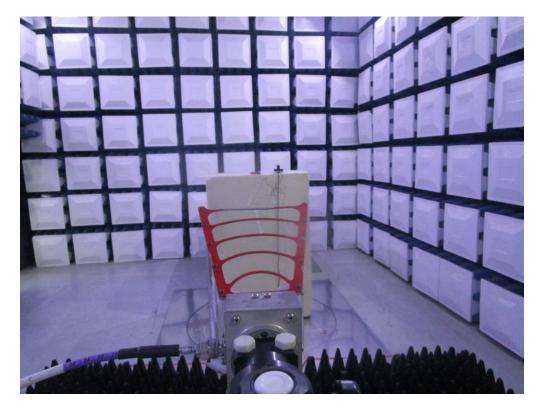


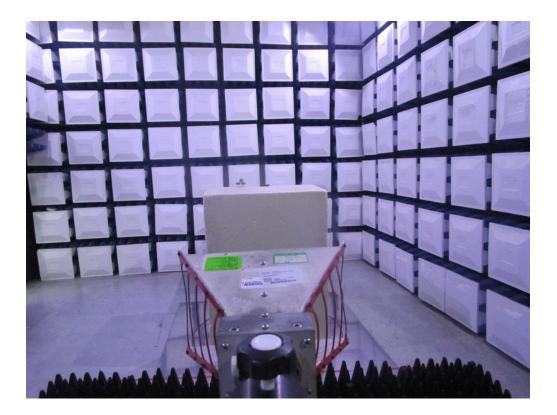




Radiated Emissions Test Photos

Above 1 GHz

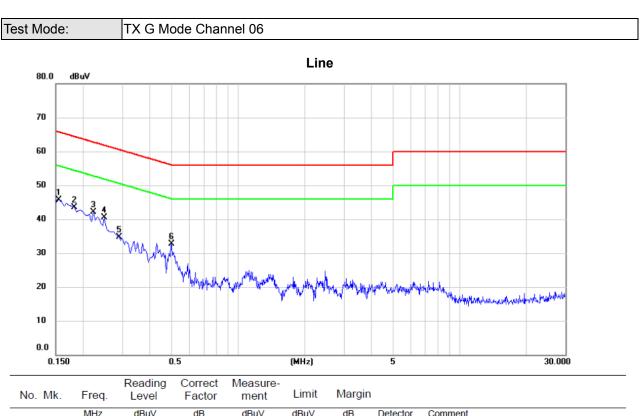






APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS



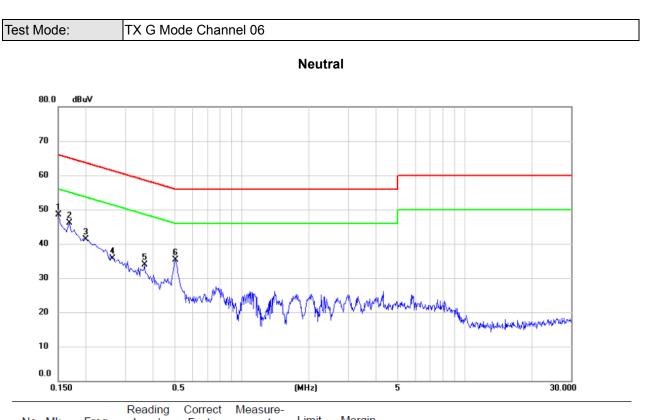


		20101	1 00001	mont				
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1545	36.03	9.70	45.73	65.75	-20.02	peak	
2	0.1825	33.71	9.85	43.56	64.37	-20.81	peak	
3	0.2220	32.27	9.89	42.16	62.74	-20.58	peak	
4	0.2490	30.55	9.87	40.42	61.79	-21.37	peak	
5	0.2910	24.88	9.88	34.76	60.50	-25.74	peak	
6	0.5010	22.75	9.93	32.68	56.00	-23.32	peak	

REMARKS:

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





No. Mk.	Freq.	Level	Factor	ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1500	38.79	9.74	48.53	66.00	-17.47	peak	
2	0.1680	36.18	9.88	46.06	65.06	-19.00	peak	
3	0.1997	31.28	10.01	41.29	63.62	-22.33	peak	
4	0.2630	25.71	9.98	35.69	61.34	-25.65	peak	
5	0.3660	23.81	10.05	33.86	58.59	-24.73	peak	
6	0.5055	25.15	10.12	35.27	56.00	-20.73	peak	

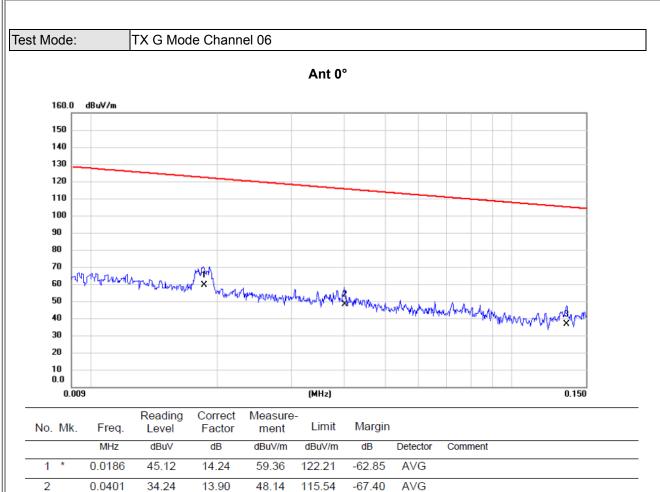
REMARKS:

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



APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ





AVG

-68.34

REMARKS:

3

0.1348

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

23.12

13.55

36.67

105.01





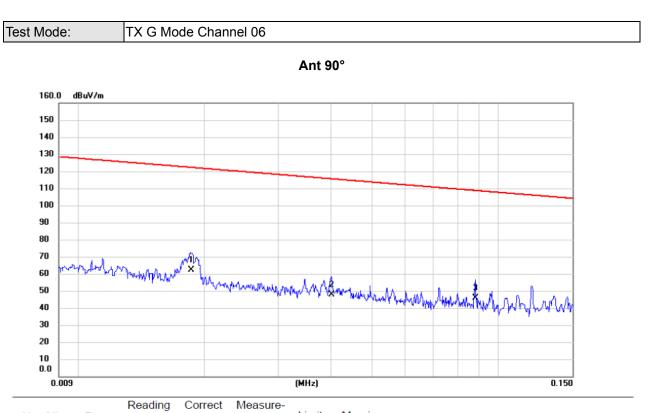
No. Mk.	Freq.			ment		Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	0.5020	38.12	13.06	51.18	73.59	-22.41	AVG	
2 *	1.0320	37.73	12.48	50.21	67.33	-17.12	QP	
3	2.2250	35.01	11.68	46.69	69.54	-22.85	QP	

REMARKS:

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

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





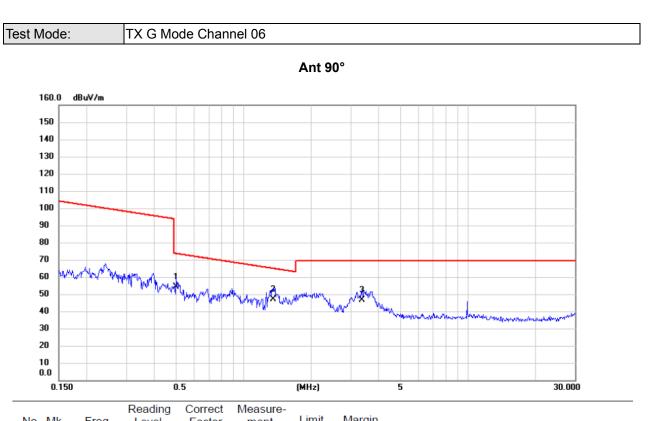
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment		Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	0.0186	48.04	14.24	62.28	122.21	-59.93	AVG	
2	0.0401	33.93	13.90	47.83	115.54	-67.71	AVG	
3	0.0881	32.25	13.54	45.79	108.71	-62.92	AVG	

REMARKS:

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

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





	No. Mk.	Freq.	Level		ment	Limit	Margin		
-		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
	1	0.4994	41.33	13.06	54.39	73.63	-19.24	QP	
	2 *	1.3521	34.56	12.26	46.82	64.98	-18.16	QP	
_	3	3.3635	35.54	11.13	46.67	69.54	-22.87	QP	

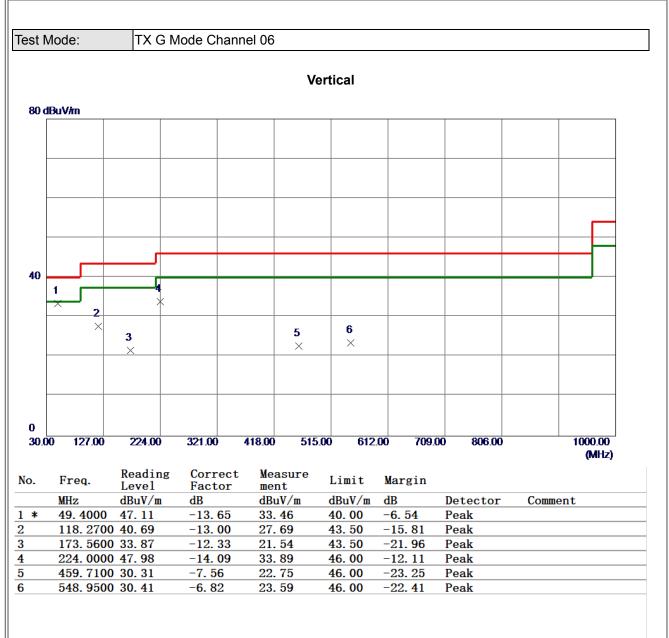
REMARKS:

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



APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

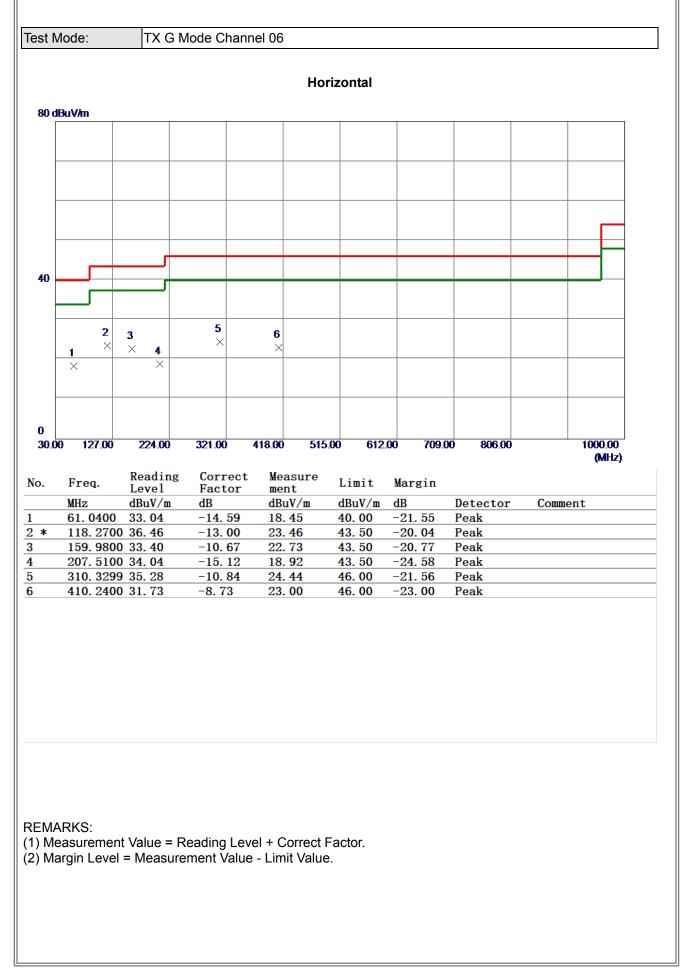




REMARKS:

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

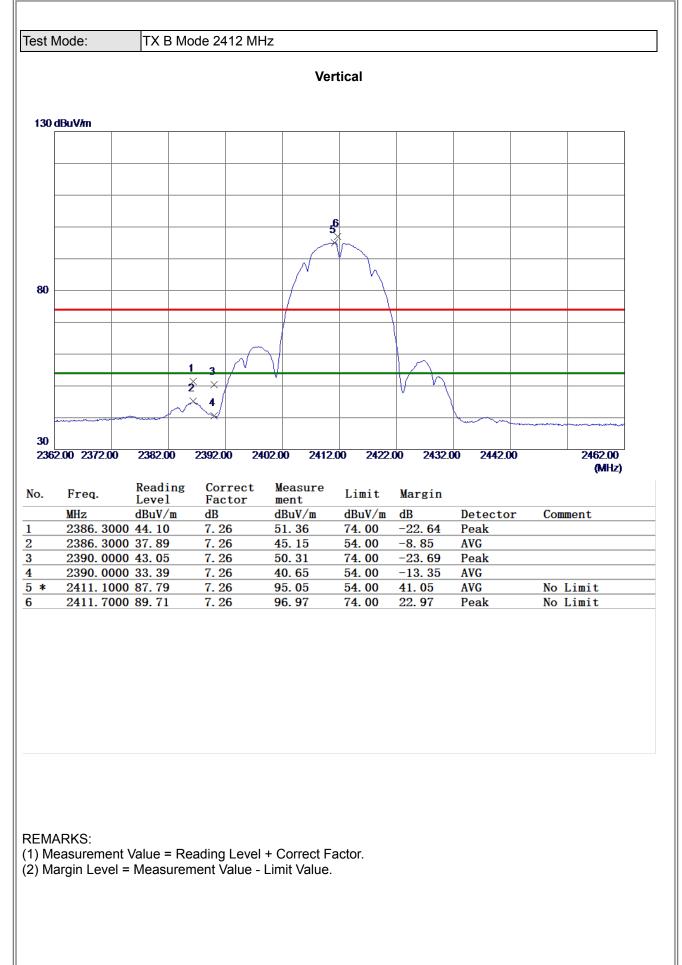




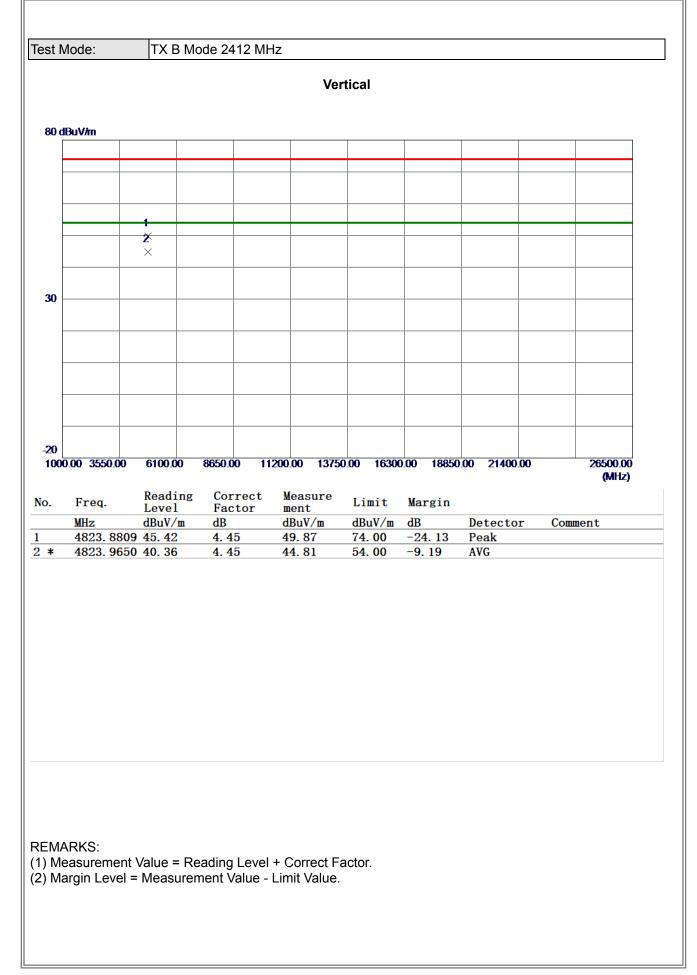


APPENDIX D - RADIATED EMISSION- ABOVE 1000 MHZ

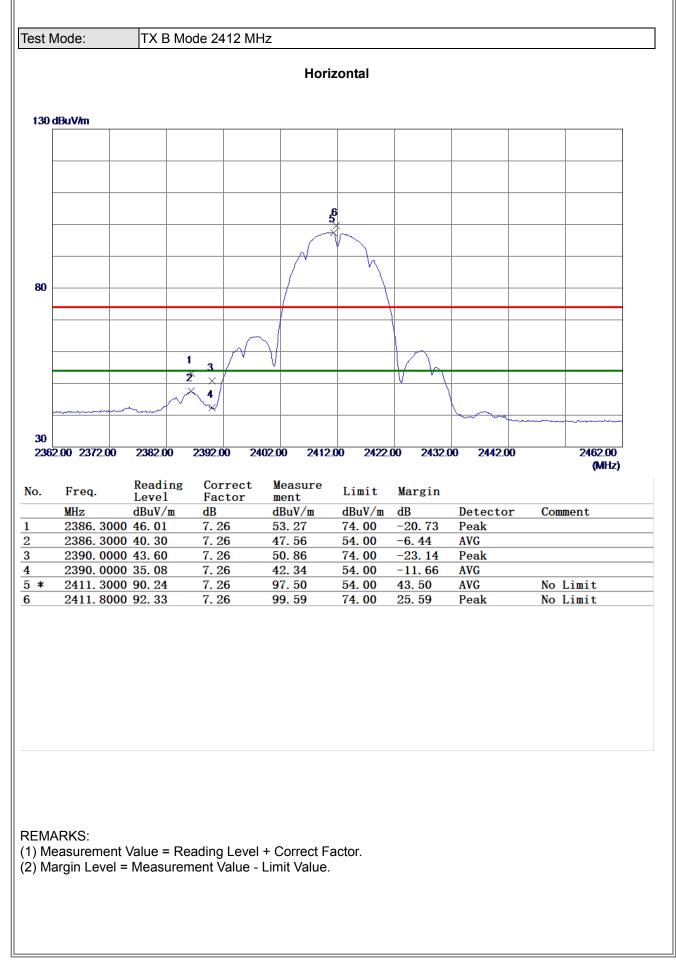




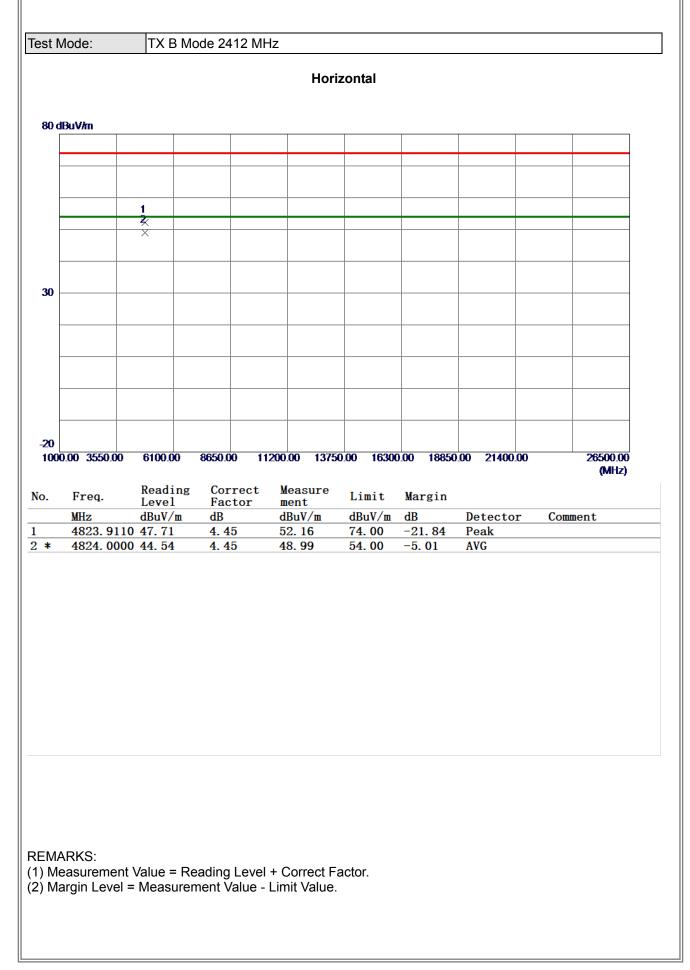




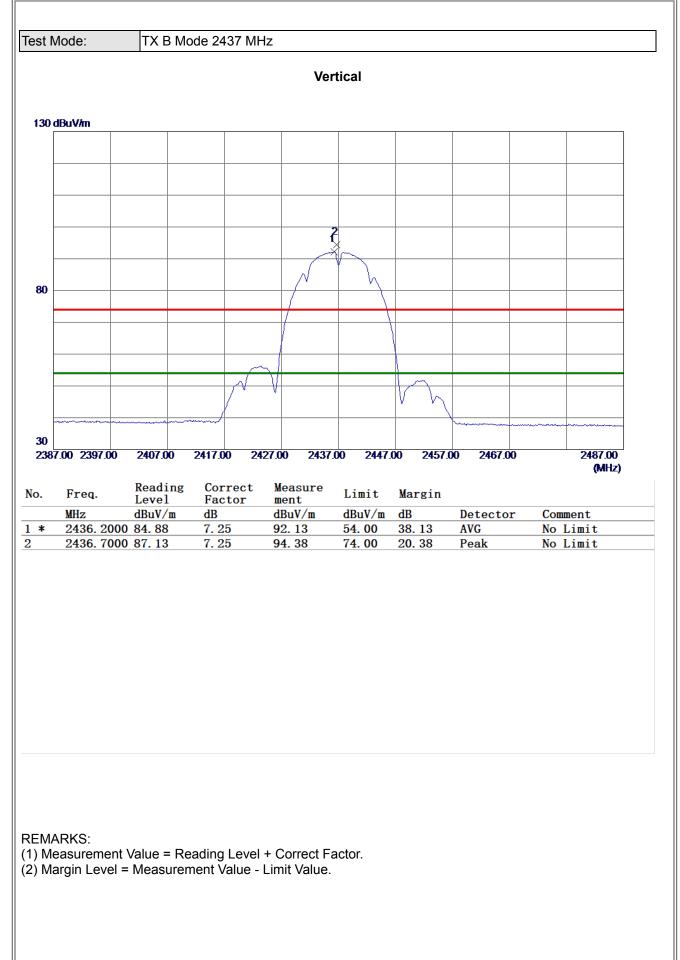




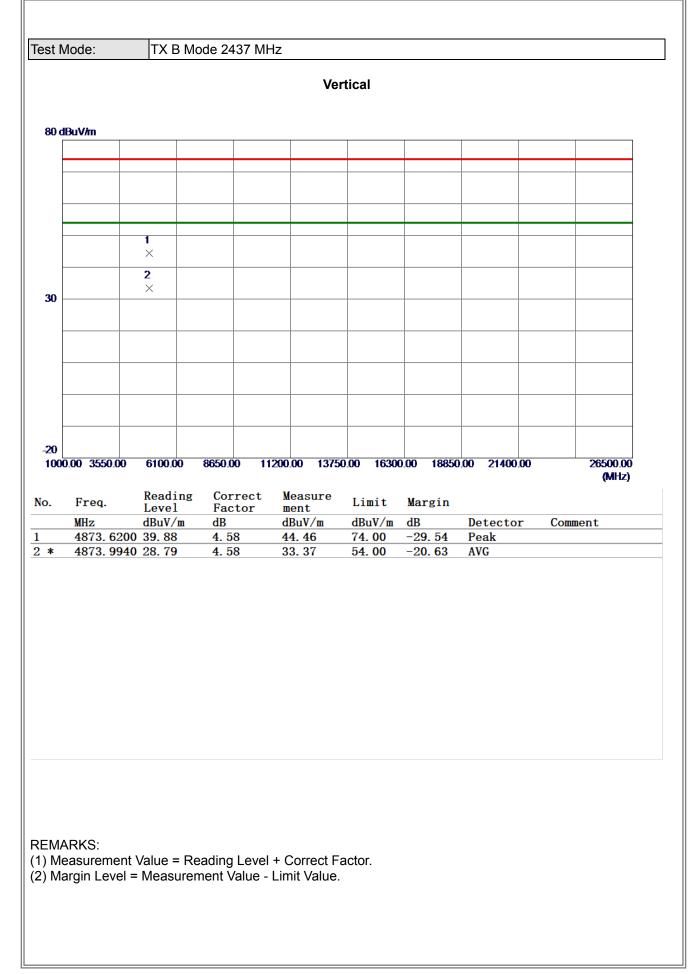




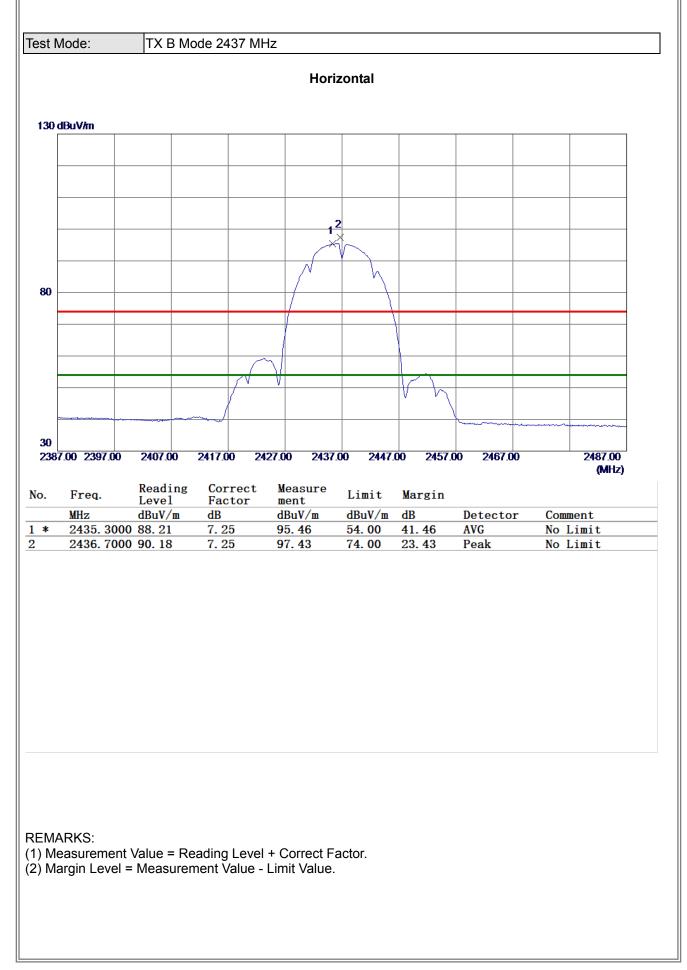




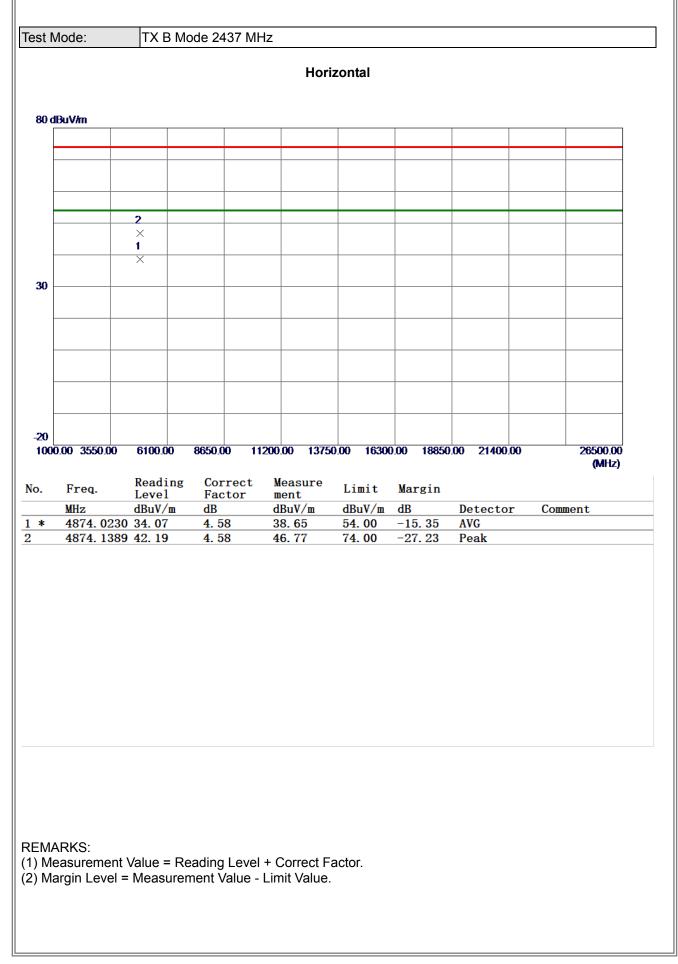




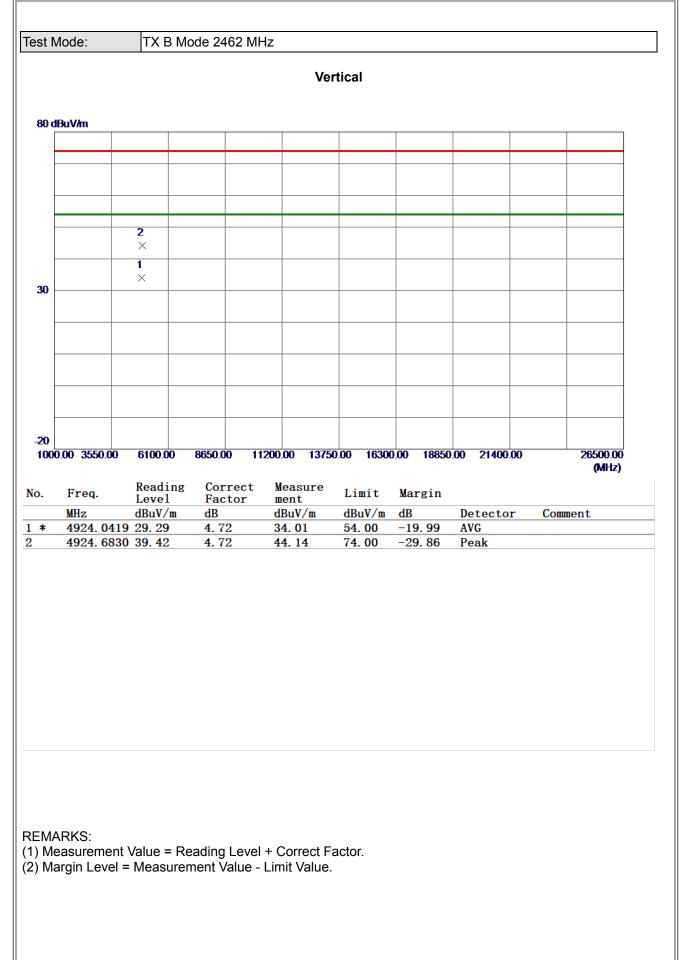




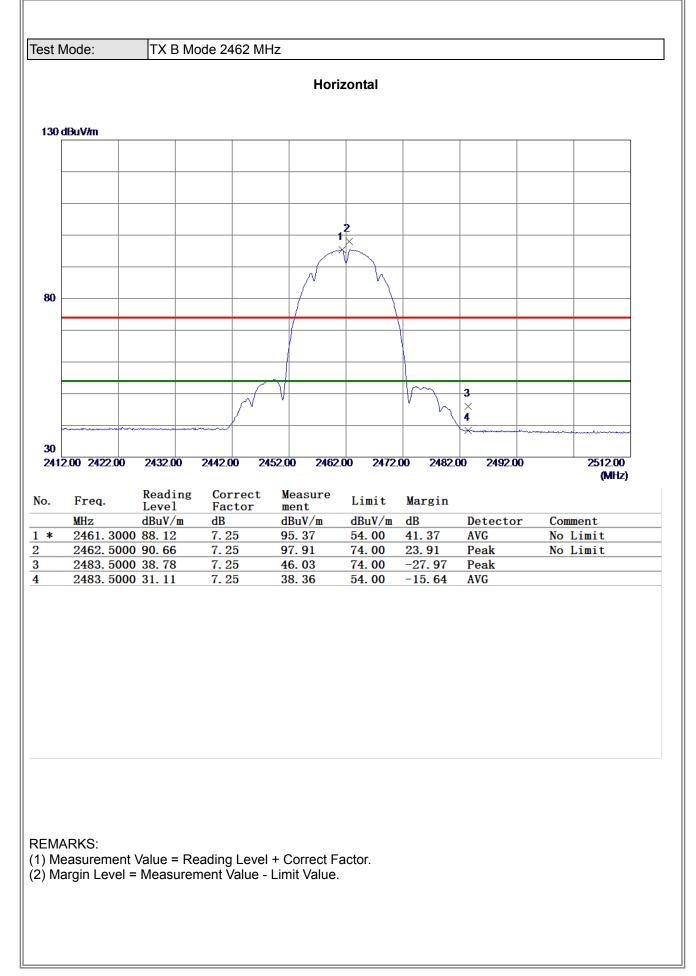




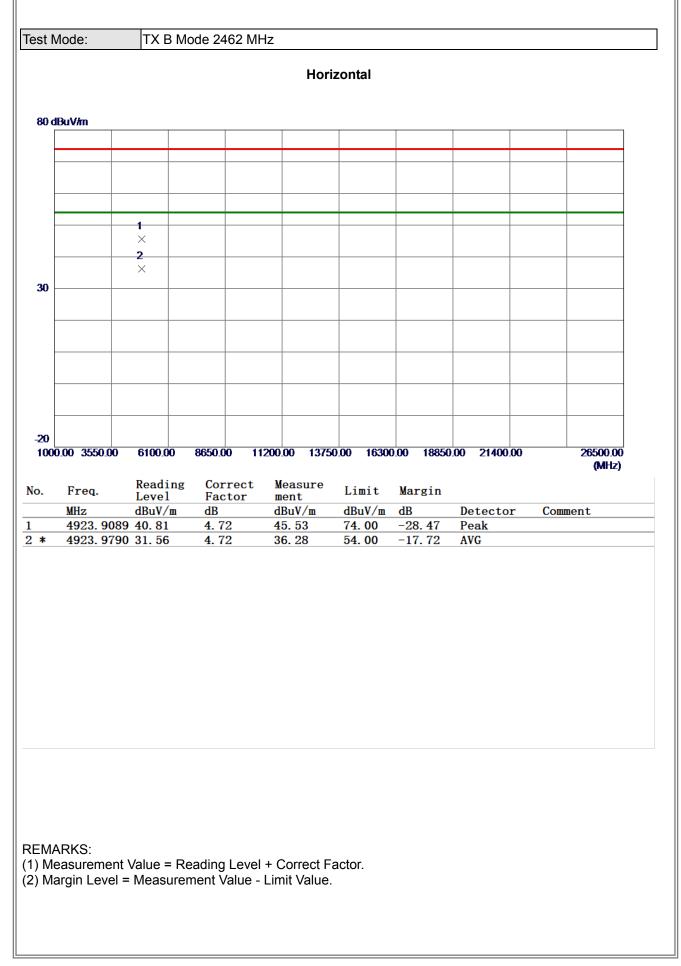




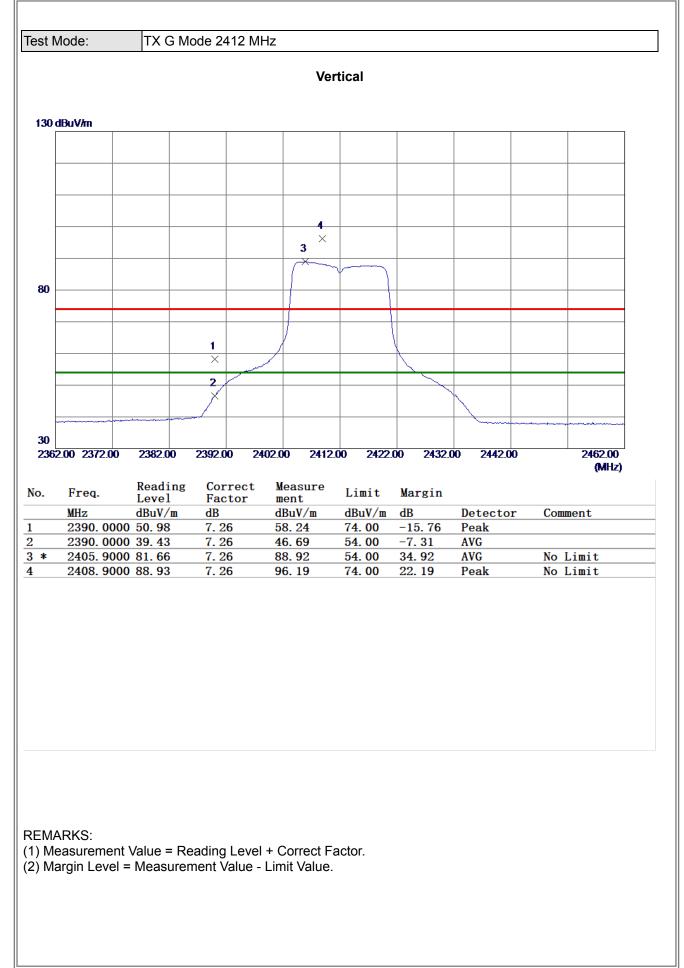




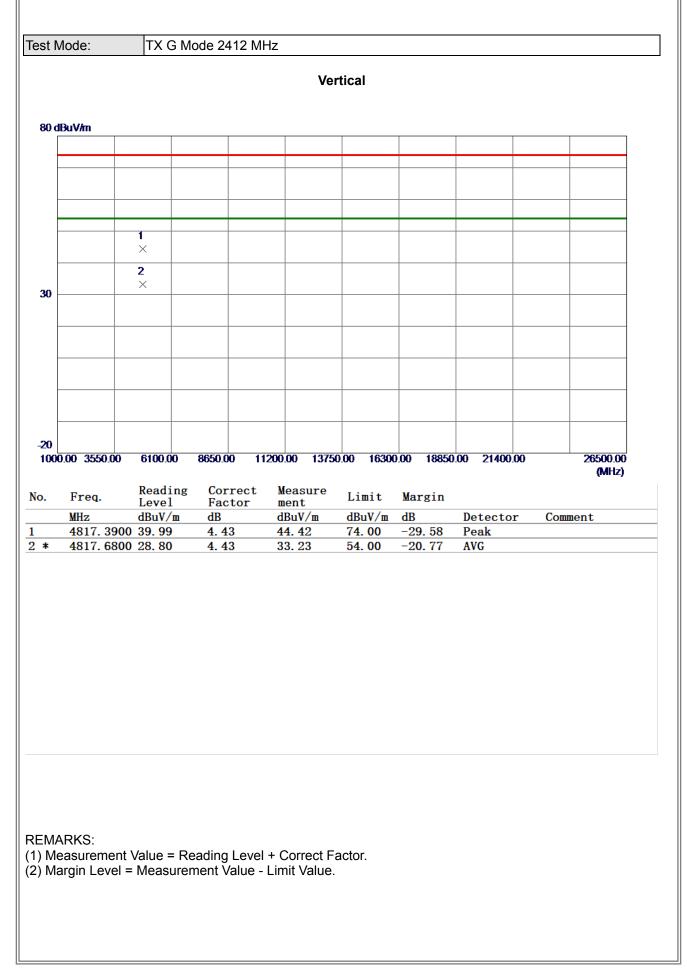




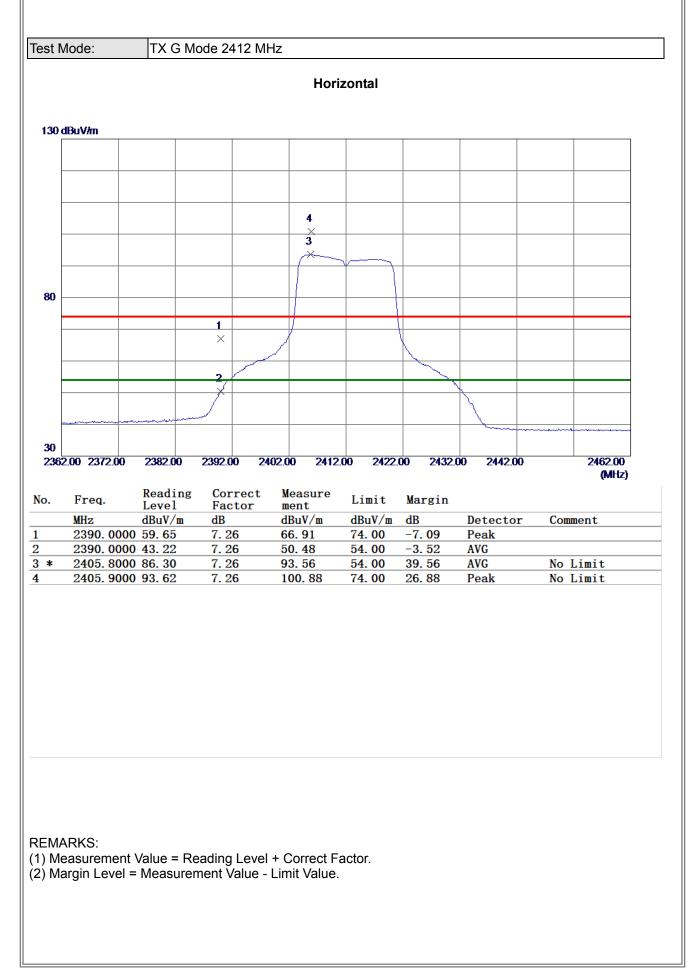




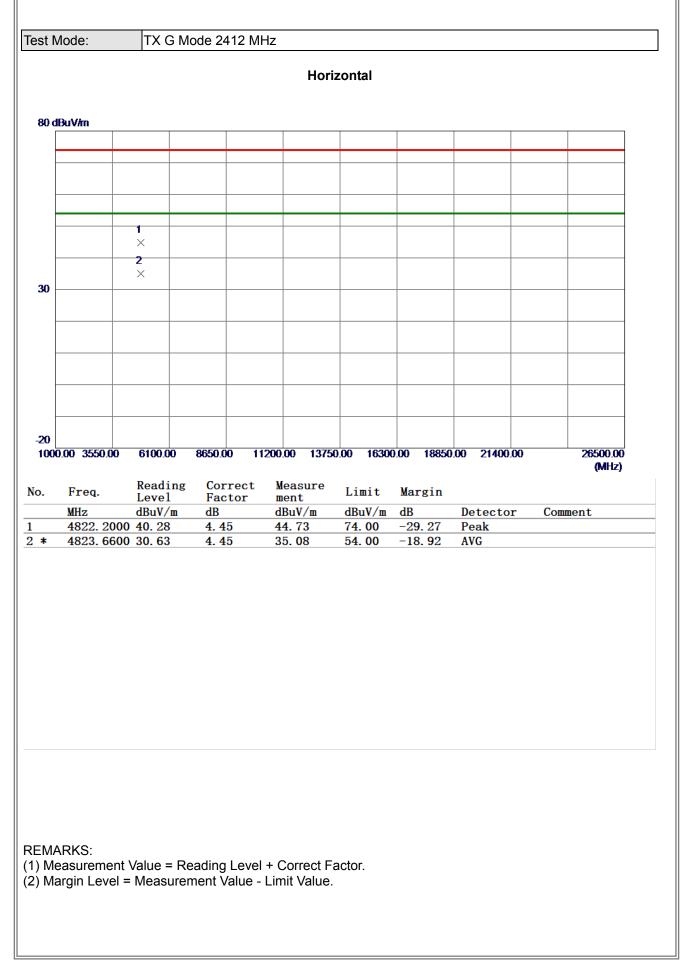




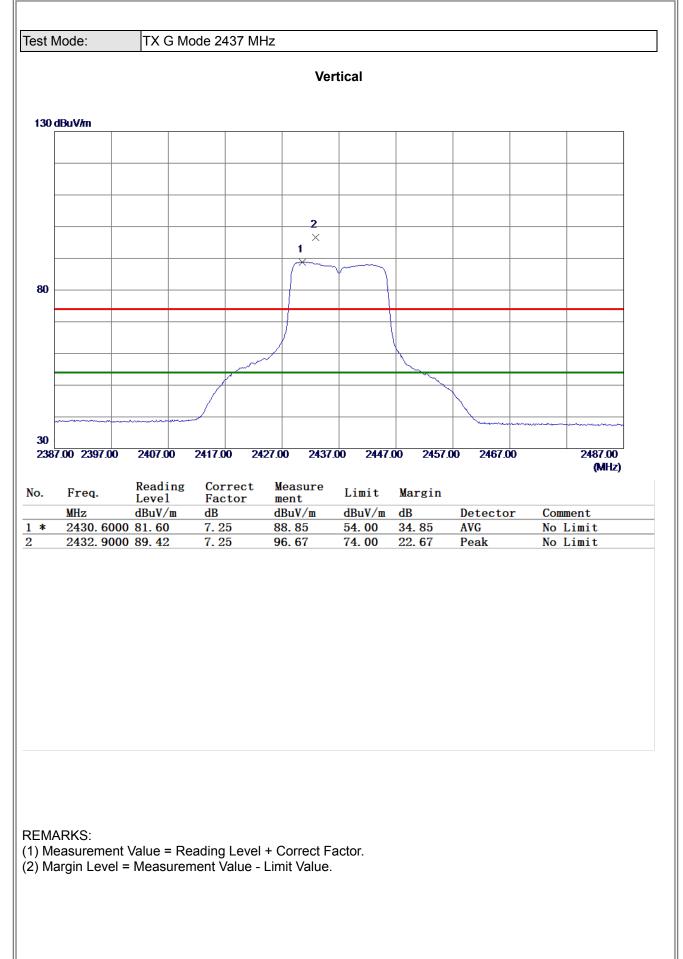




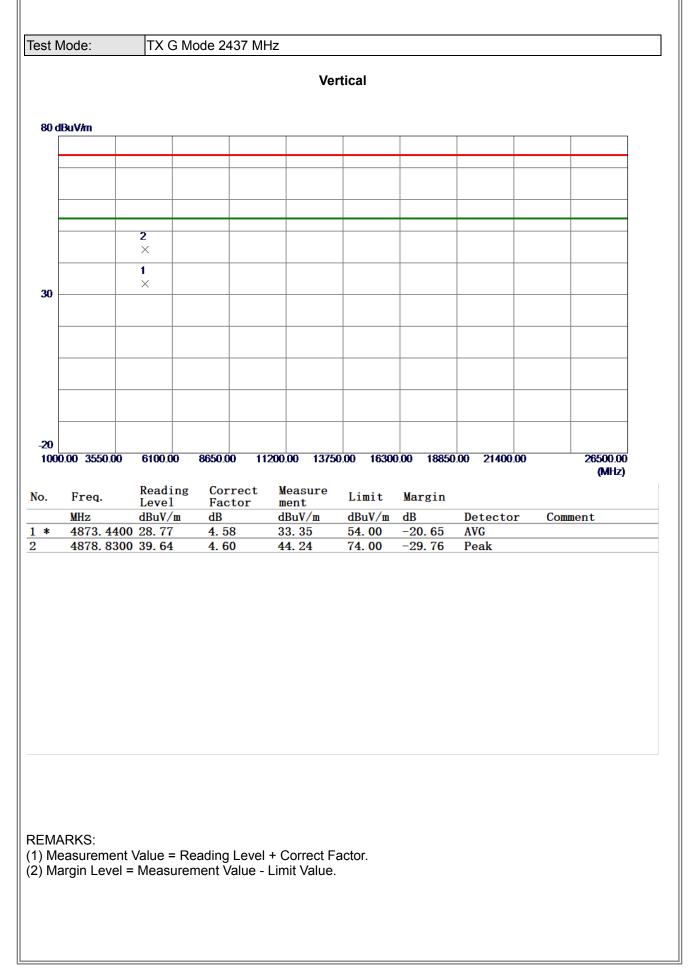




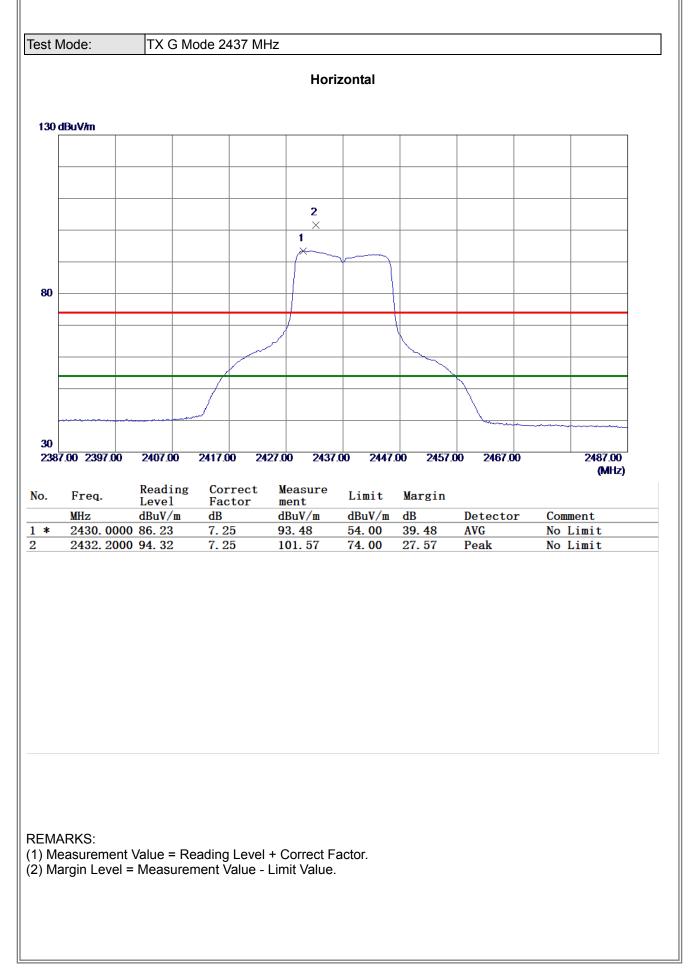




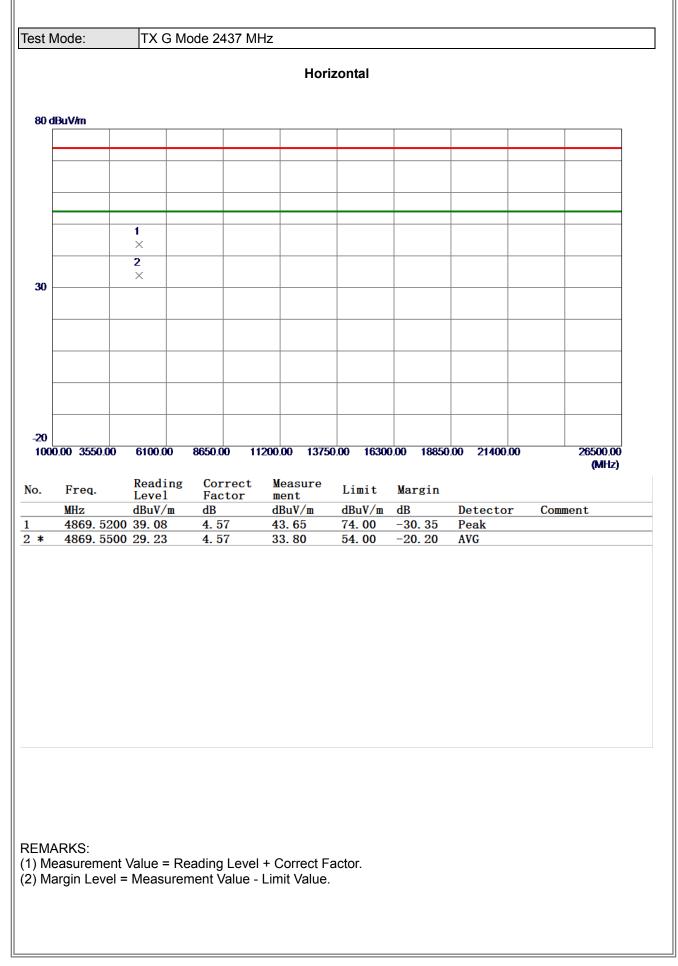




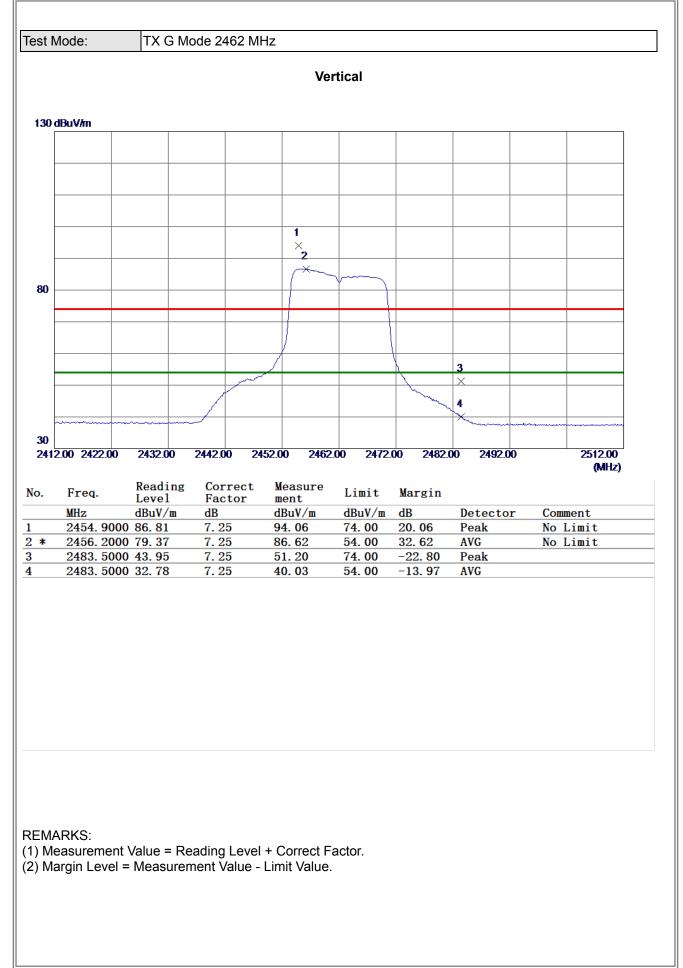




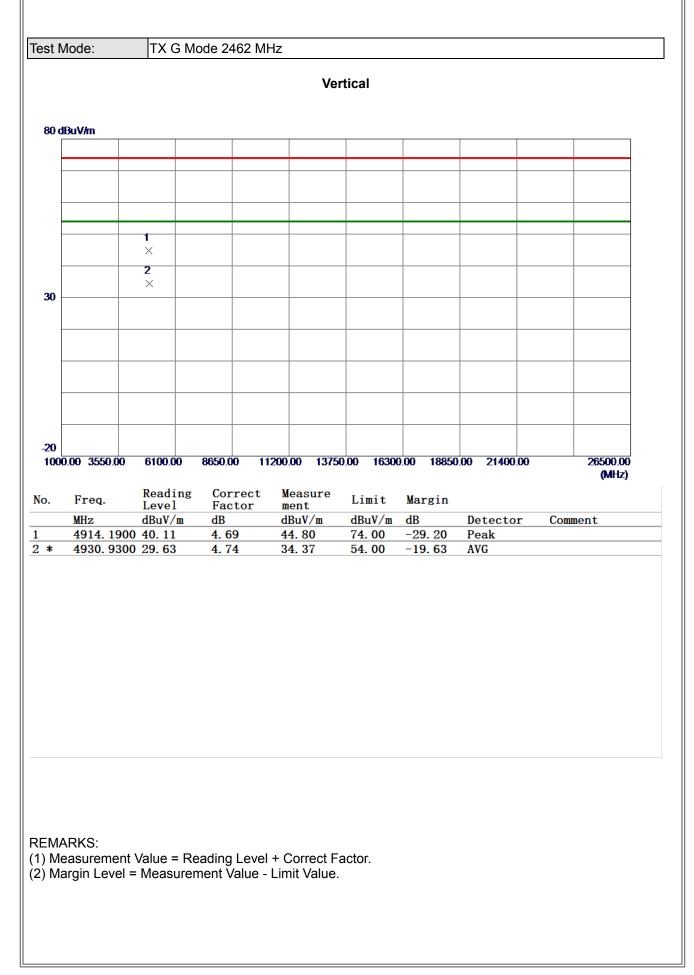




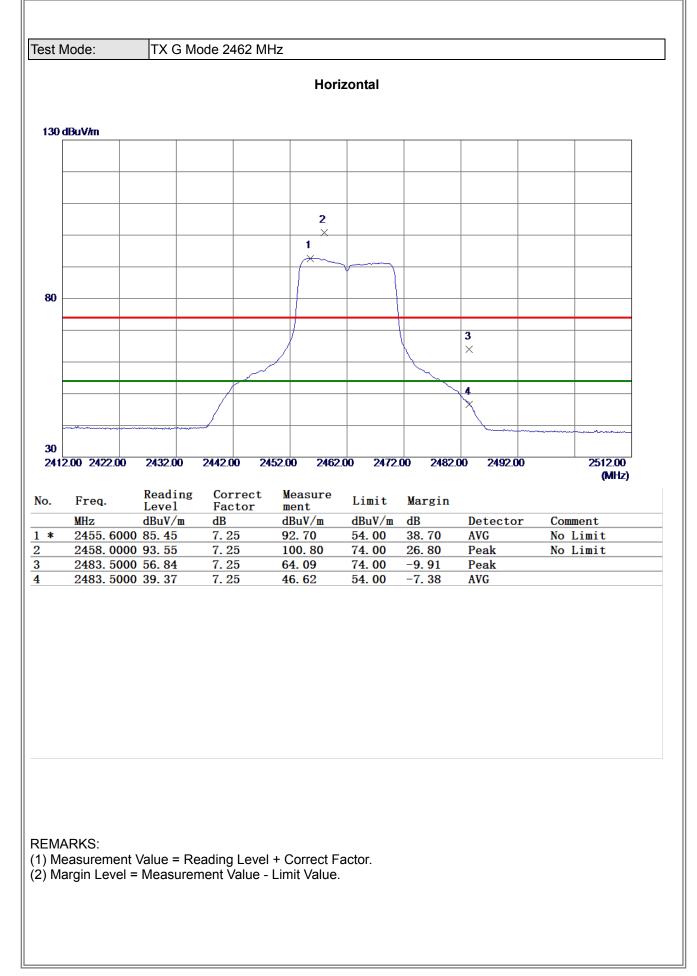




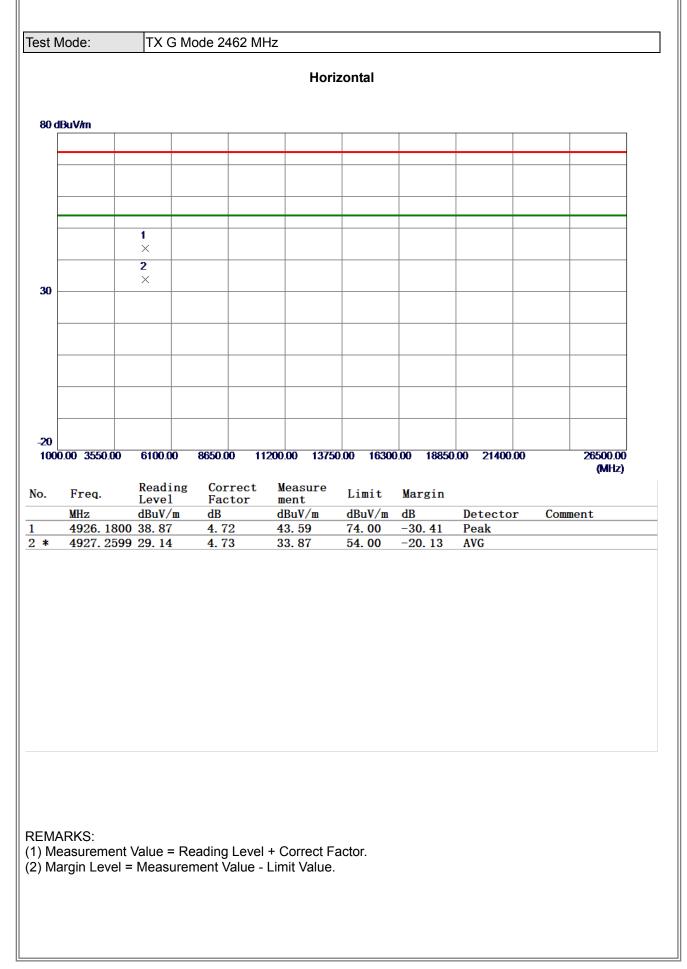




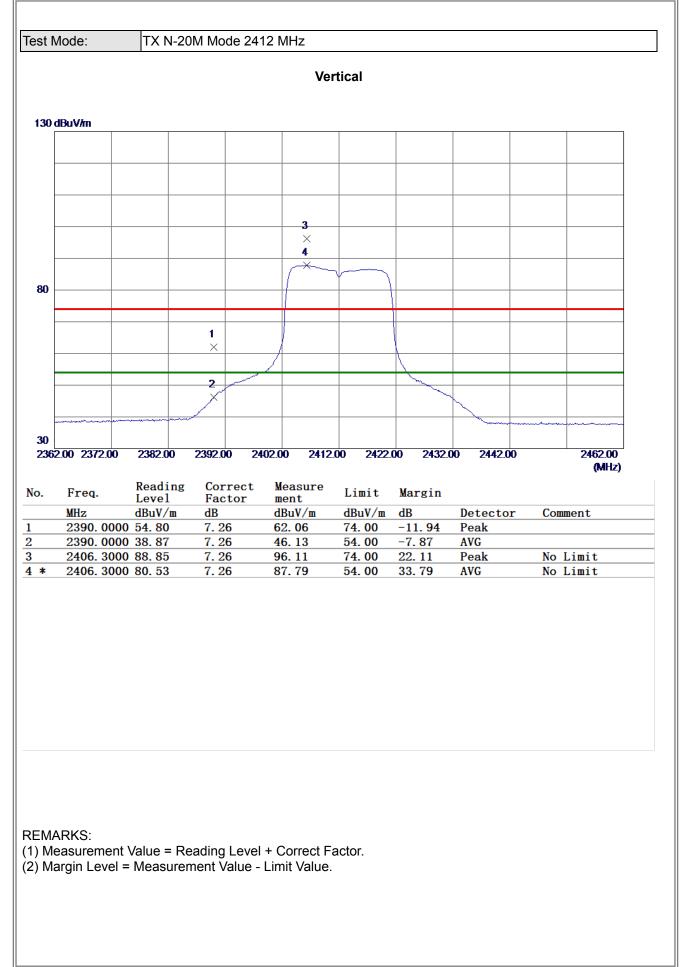




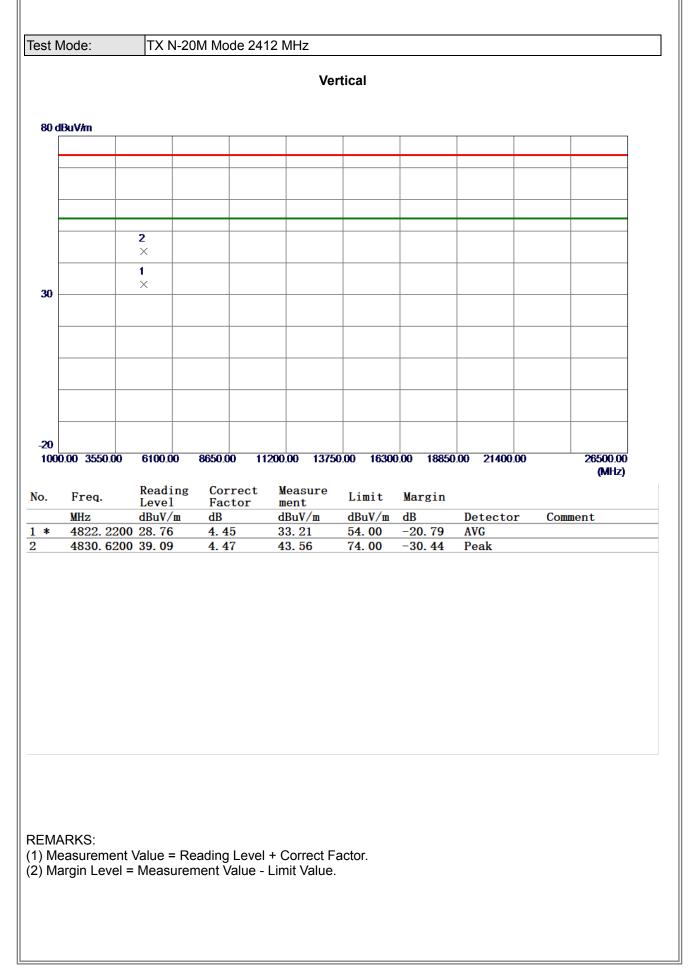




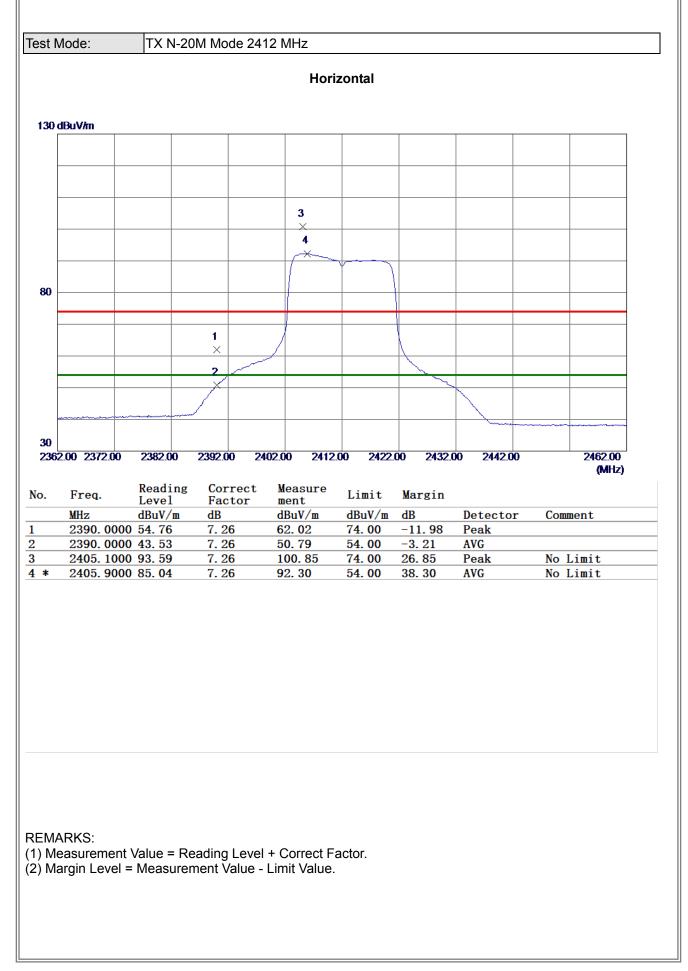




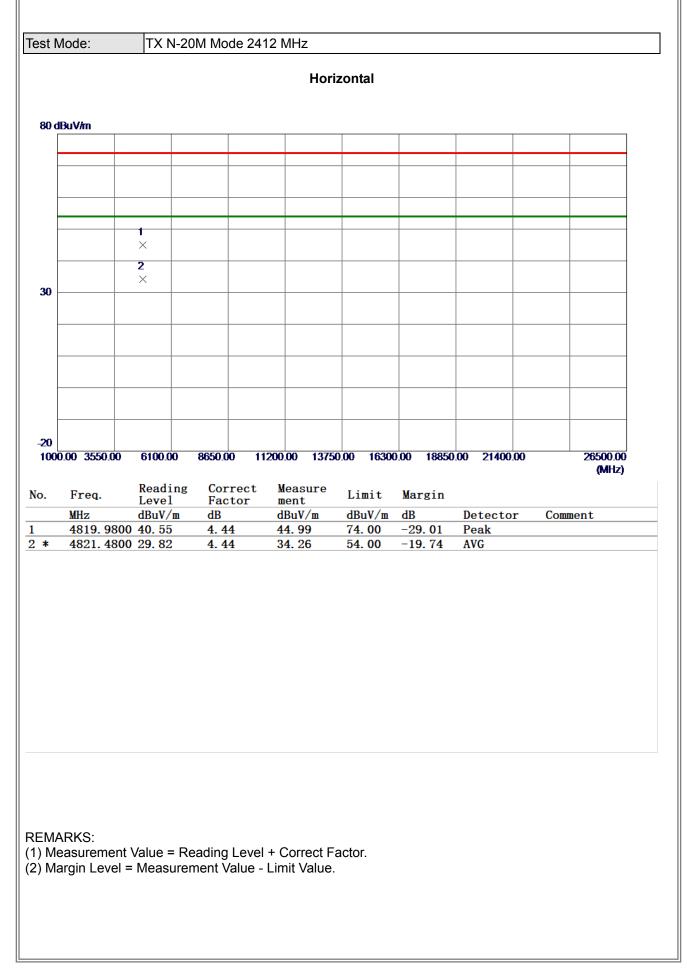




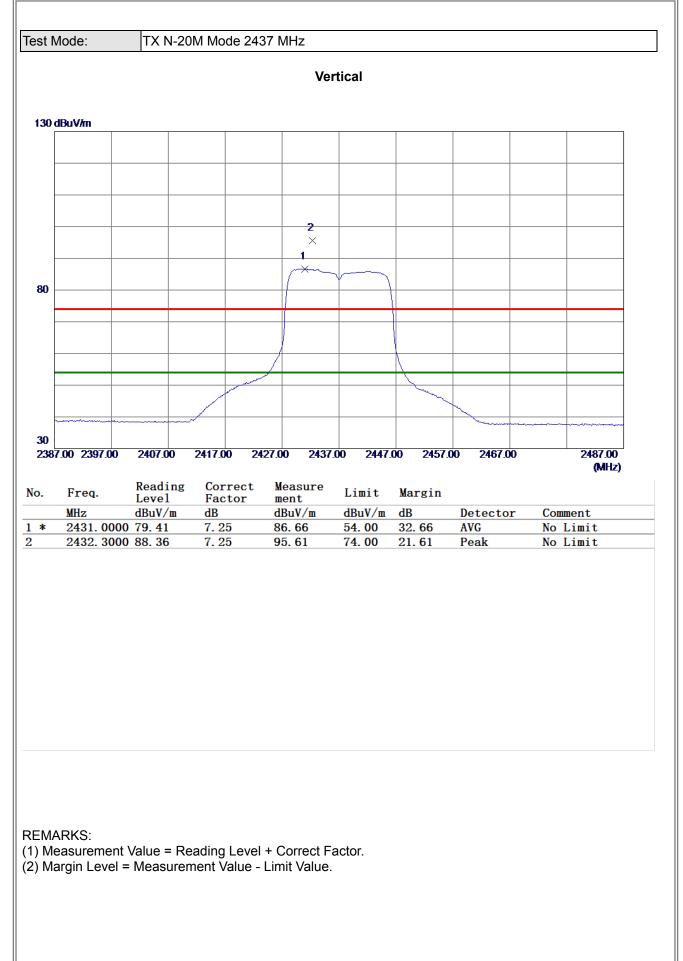




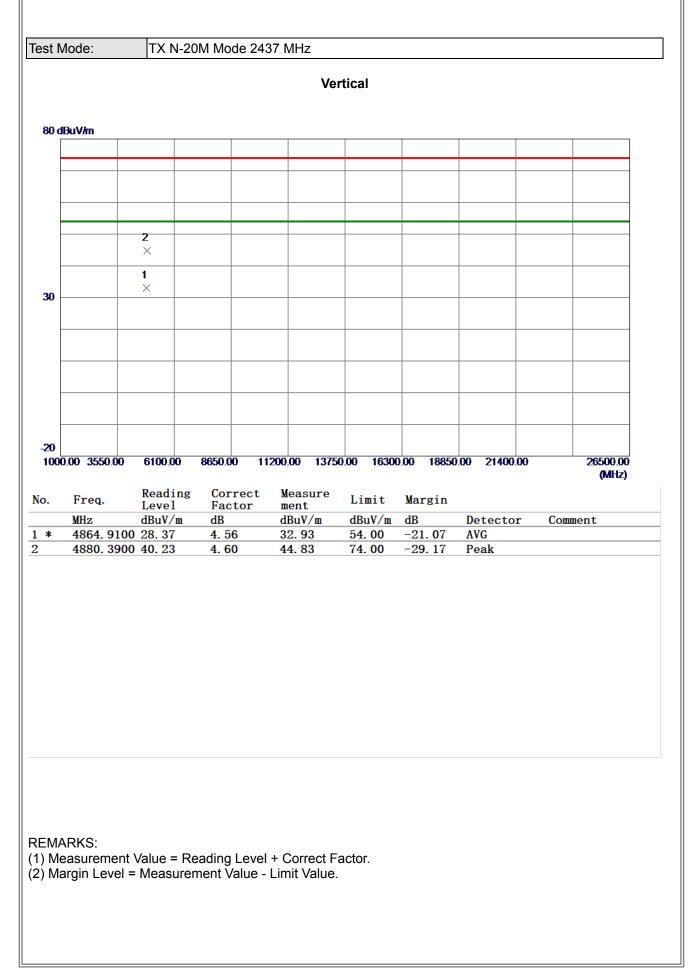




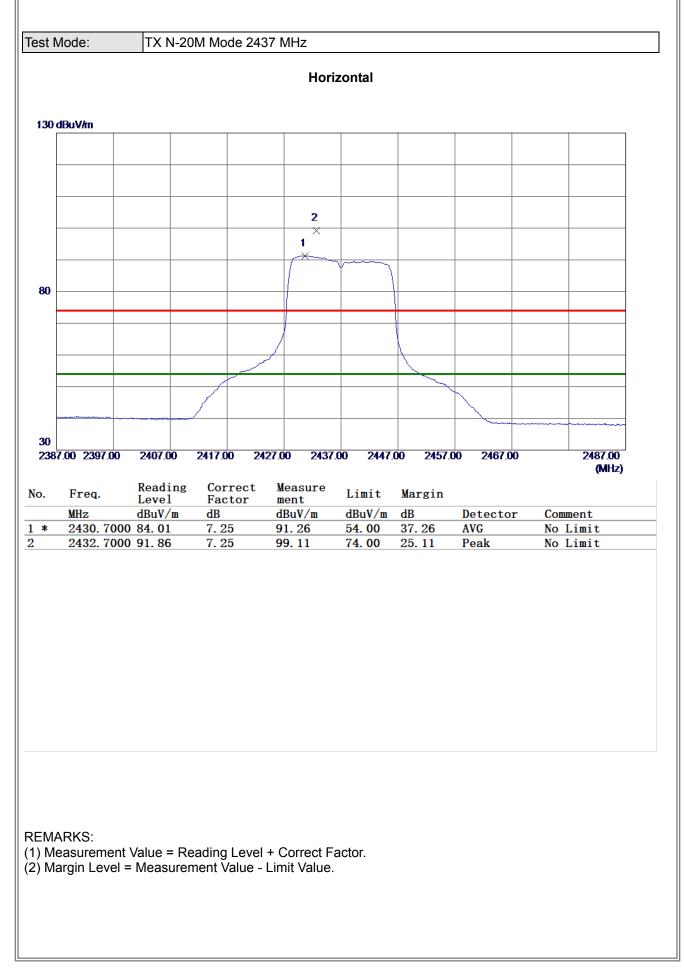




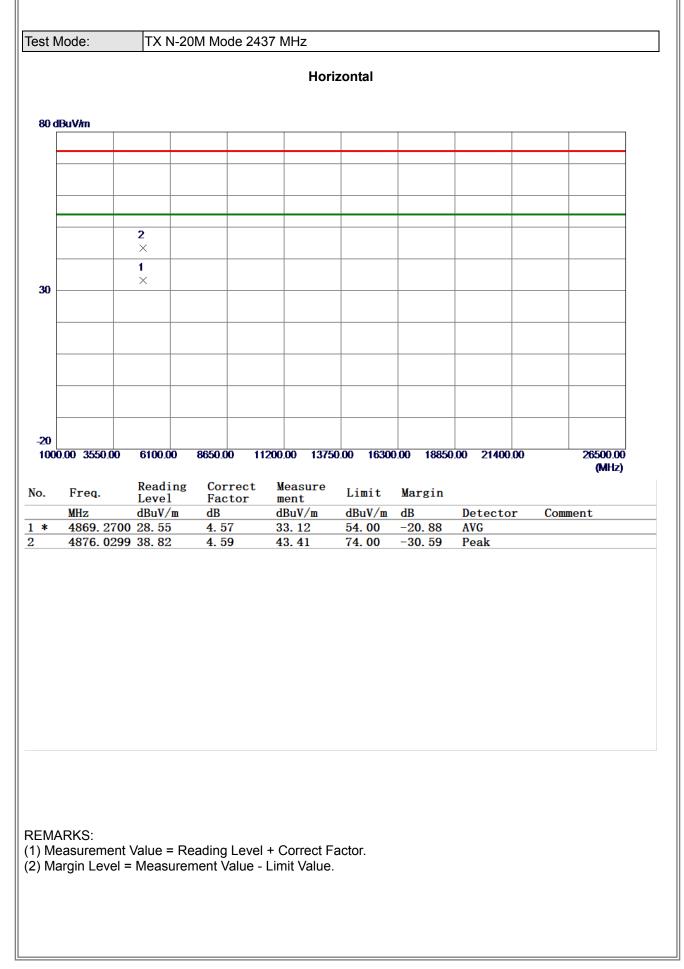




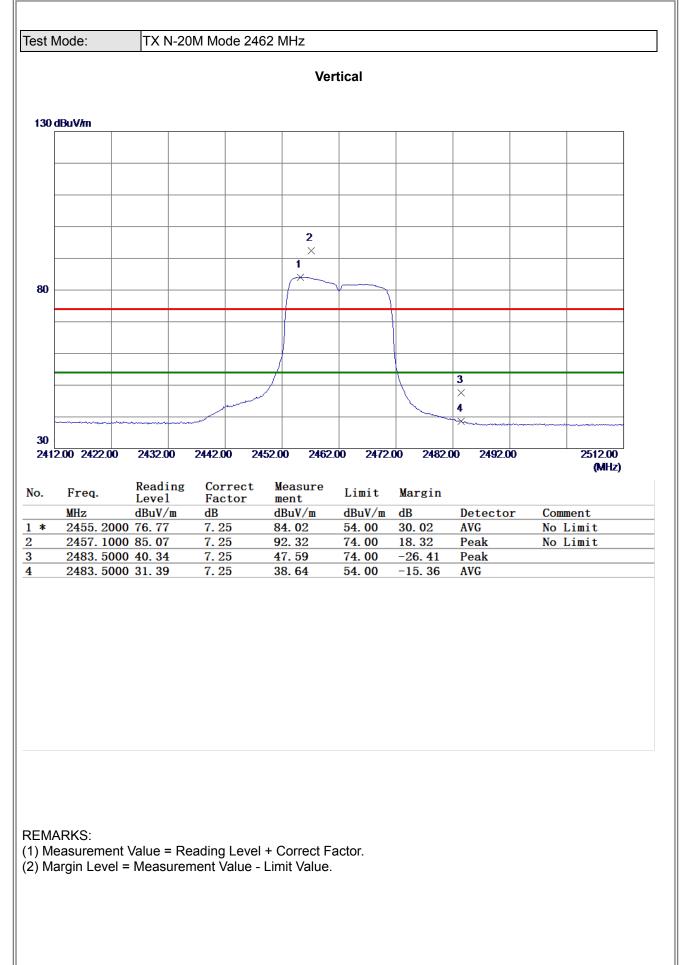




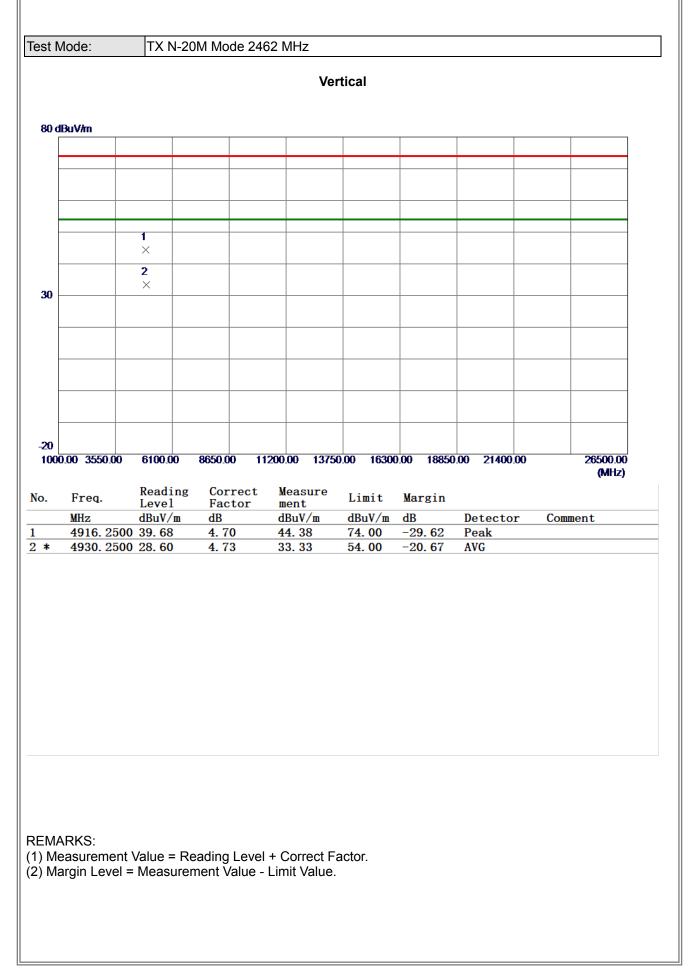




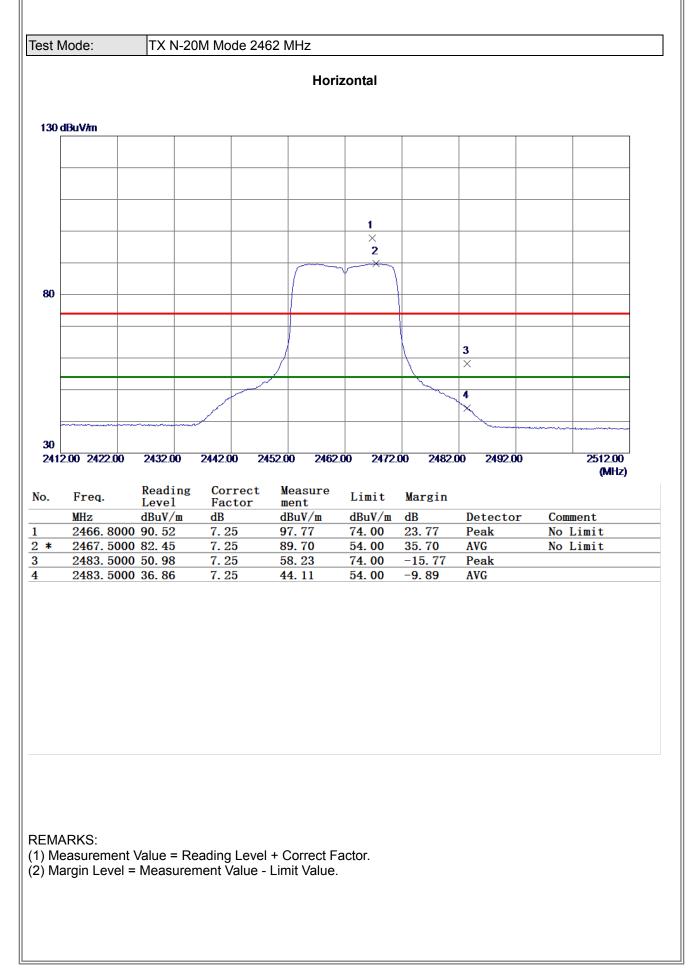




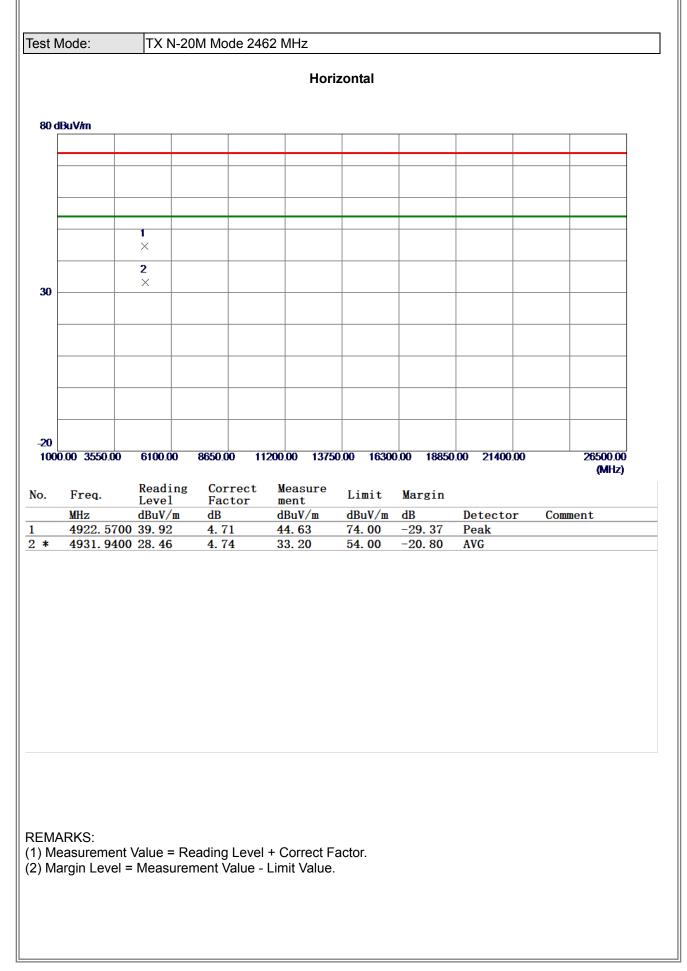




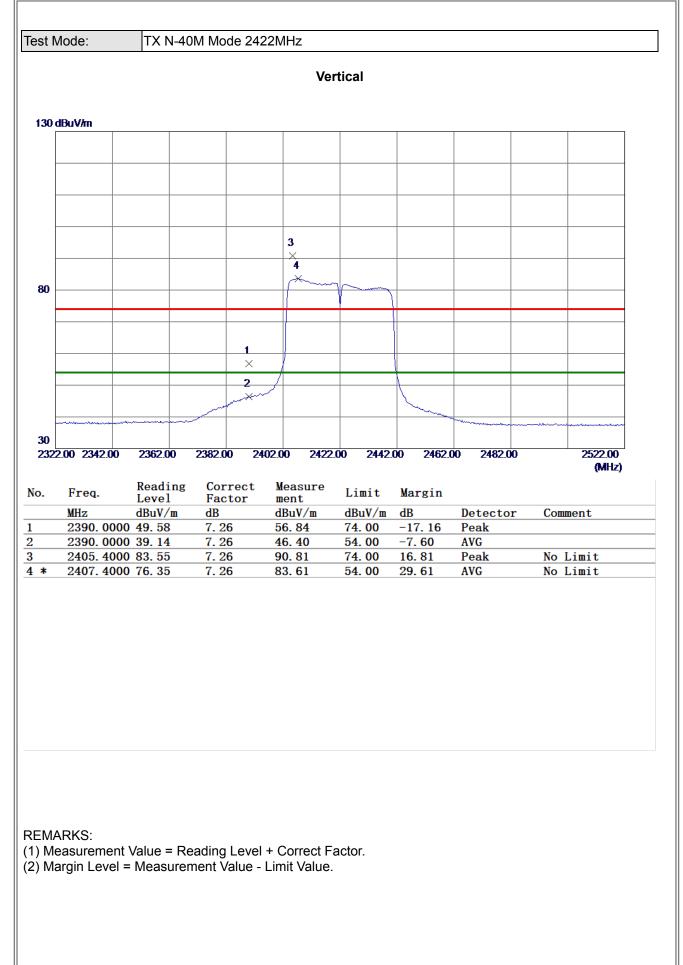




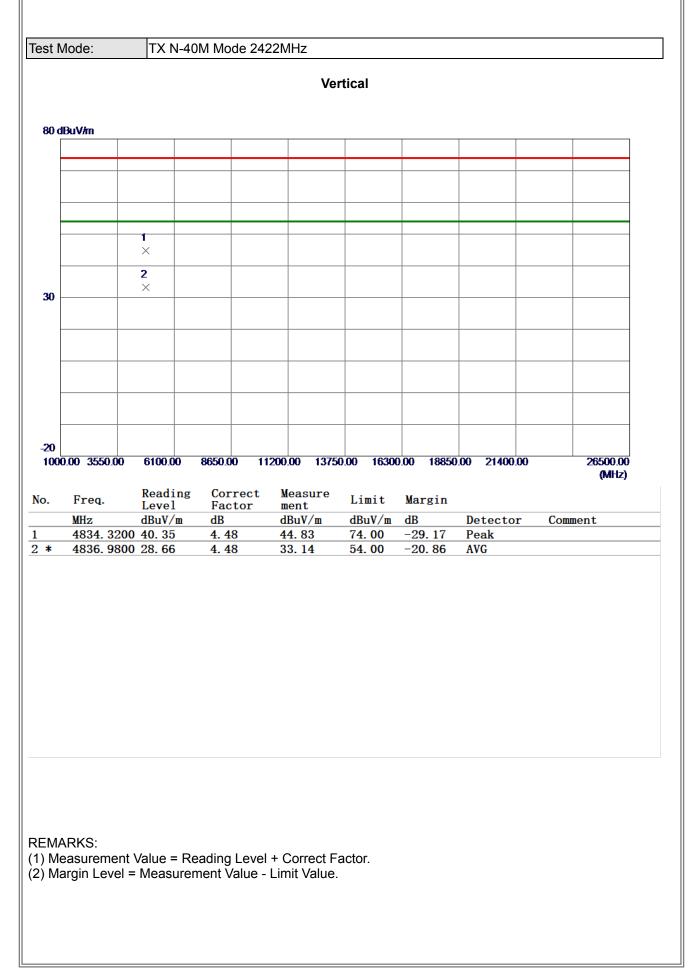




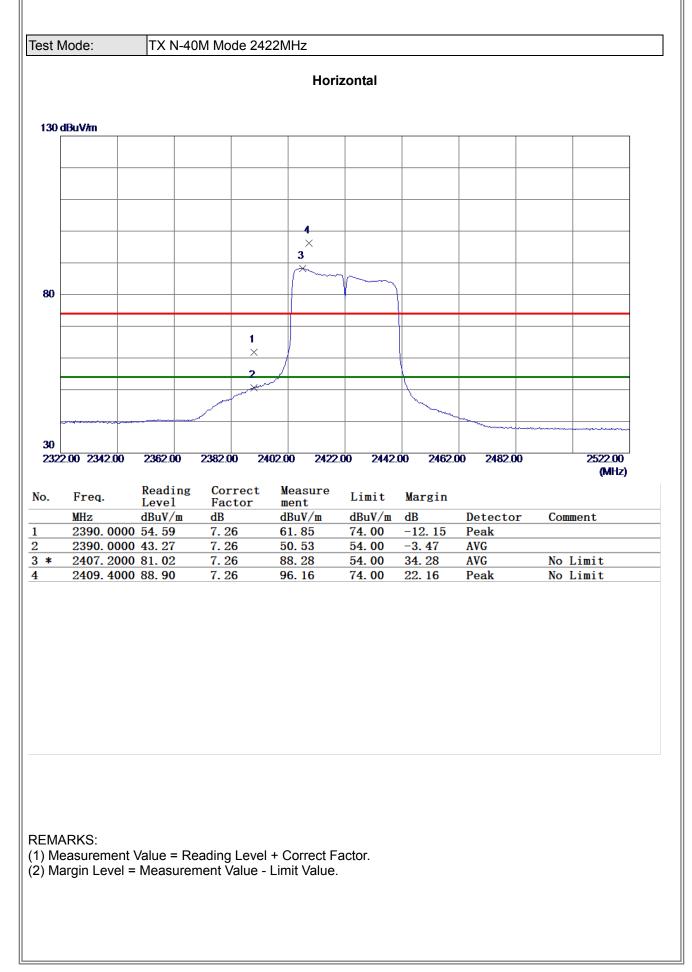




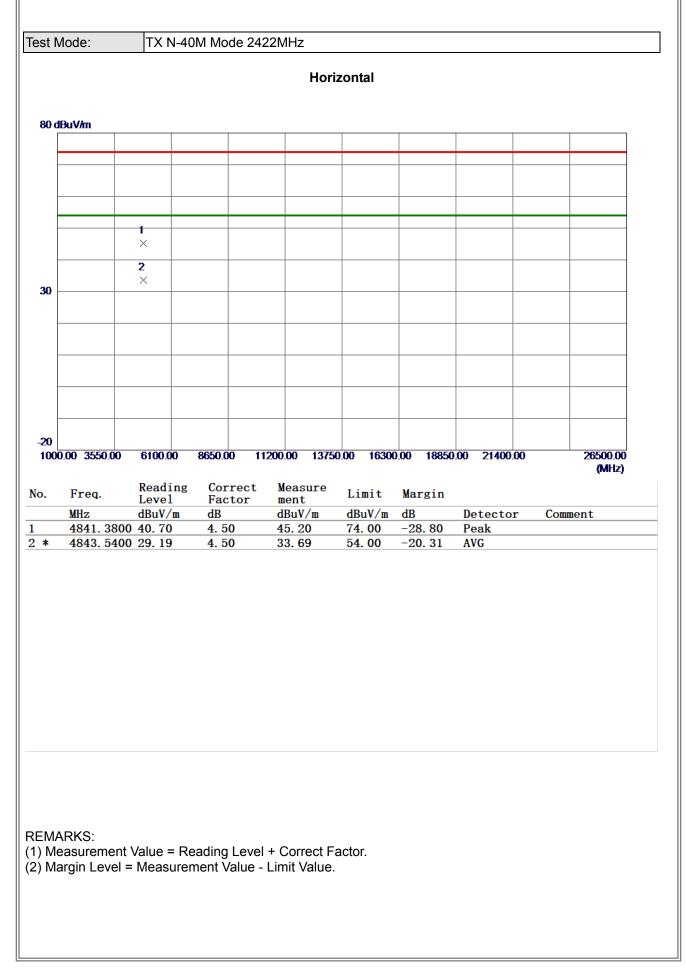




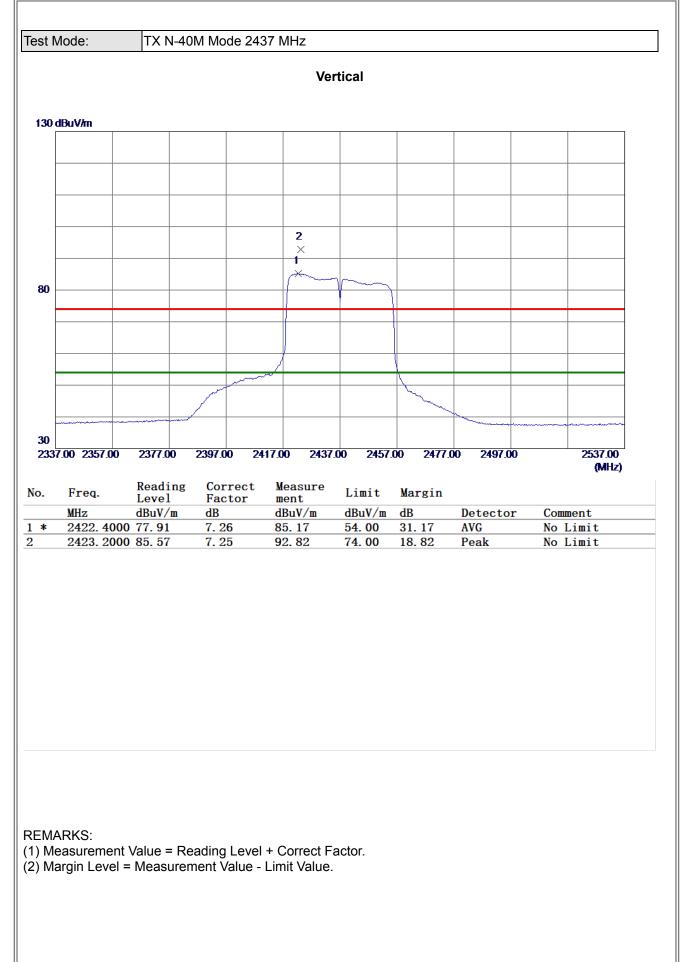




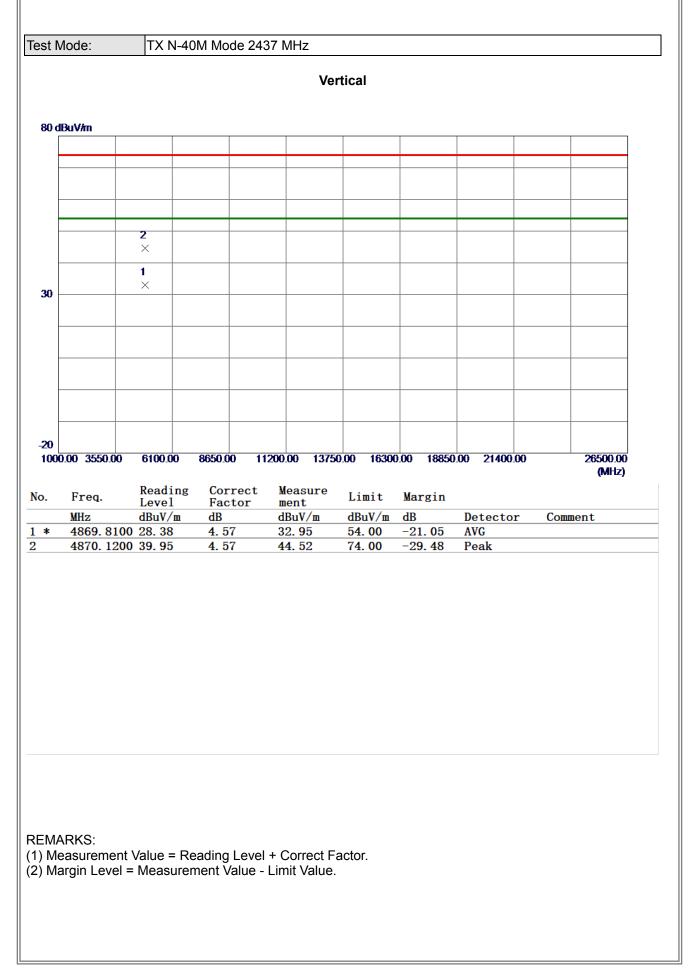




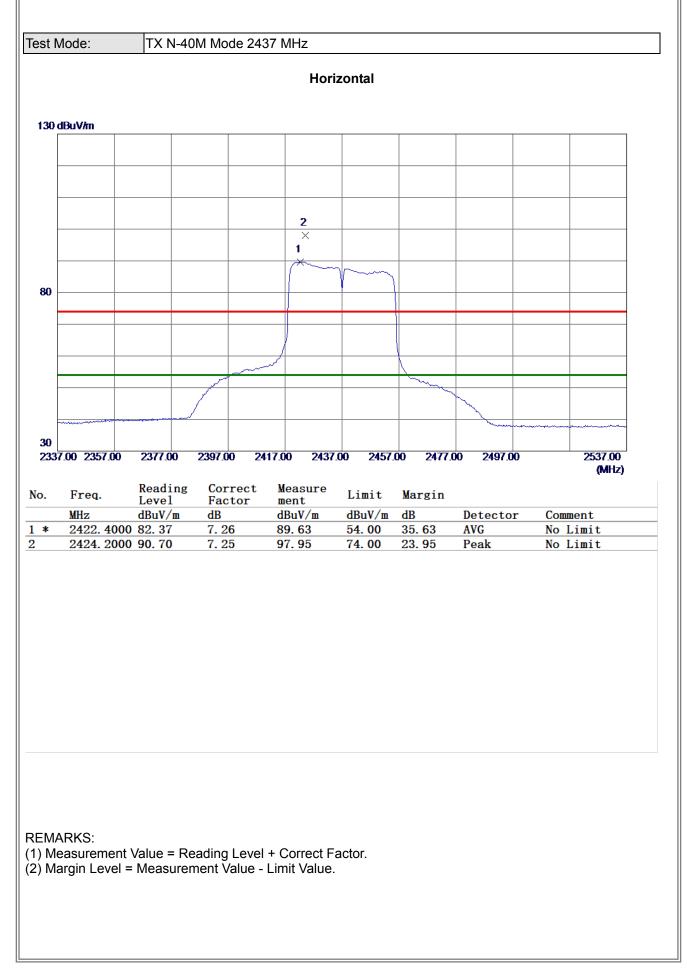




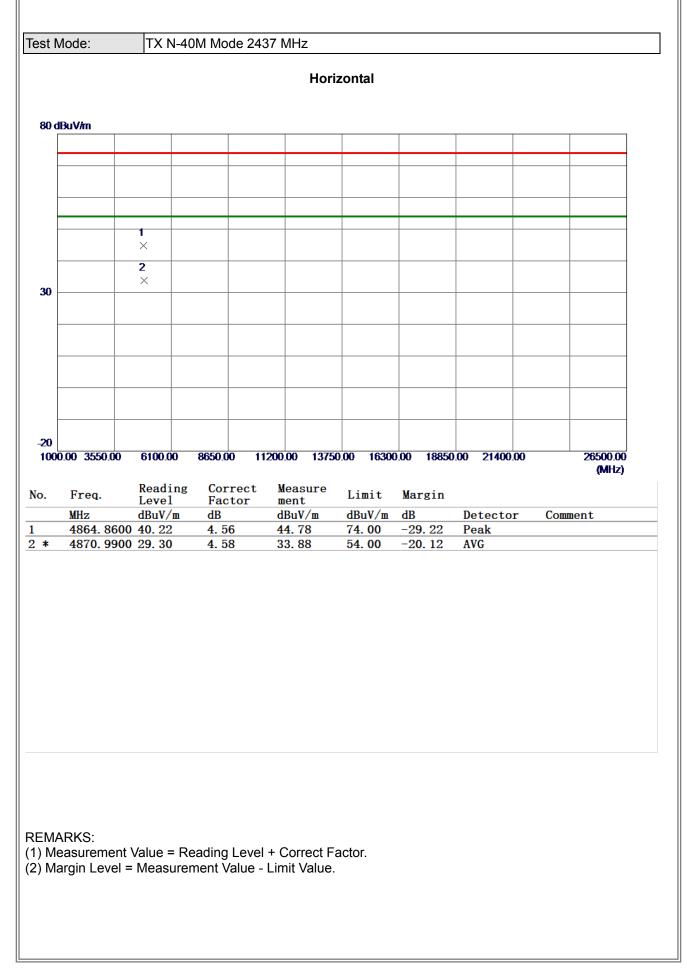




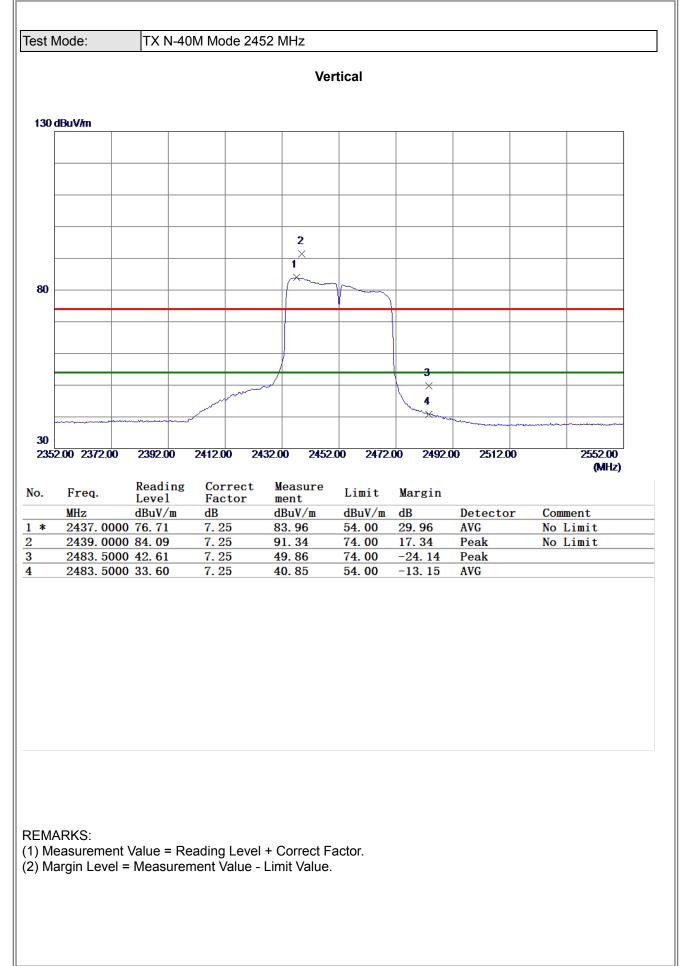




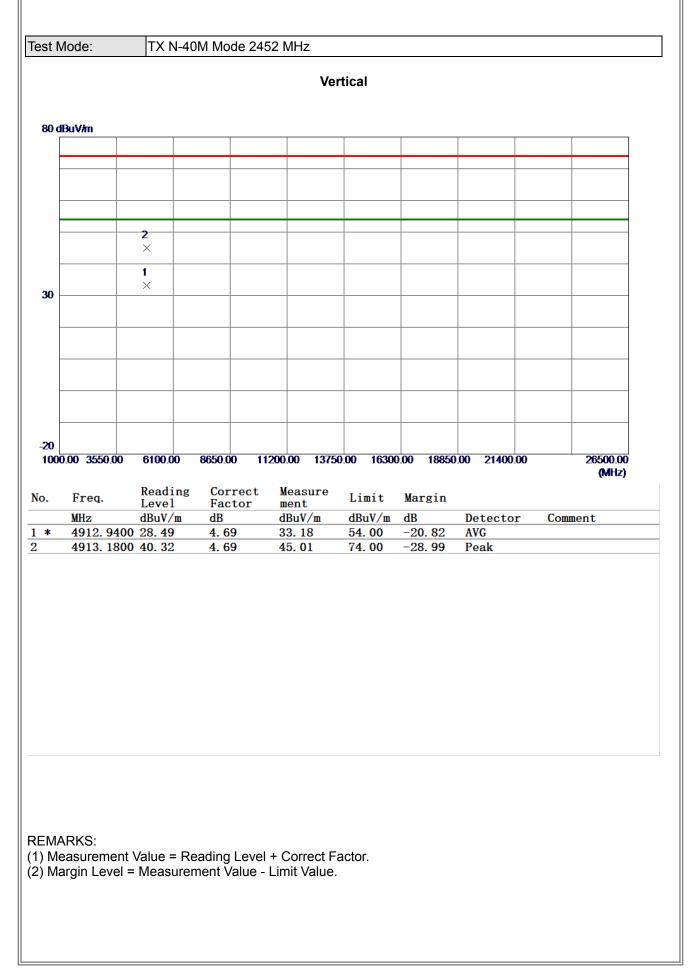




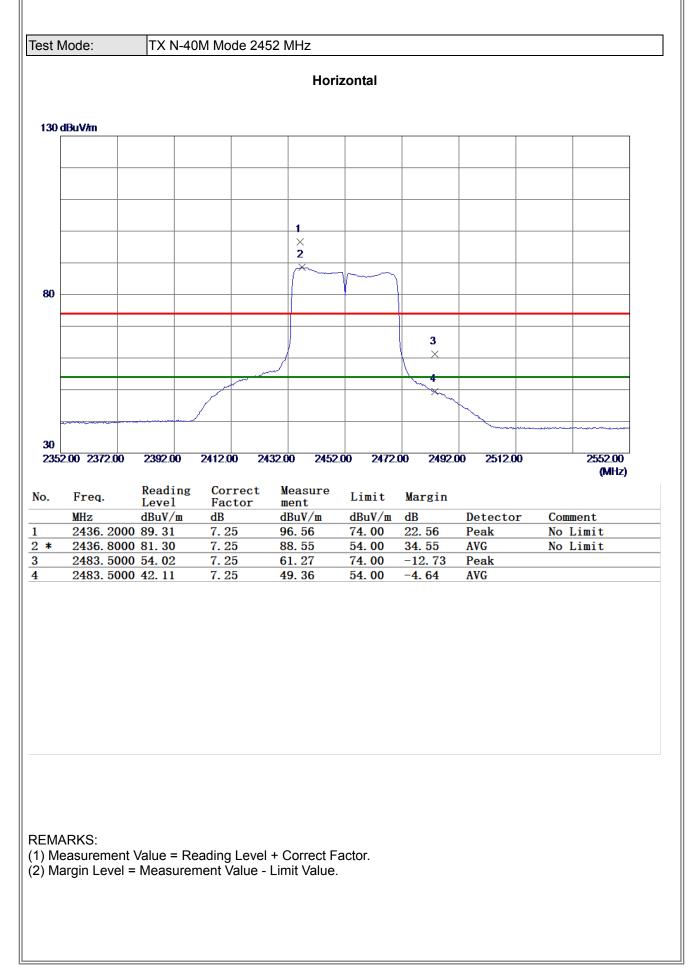




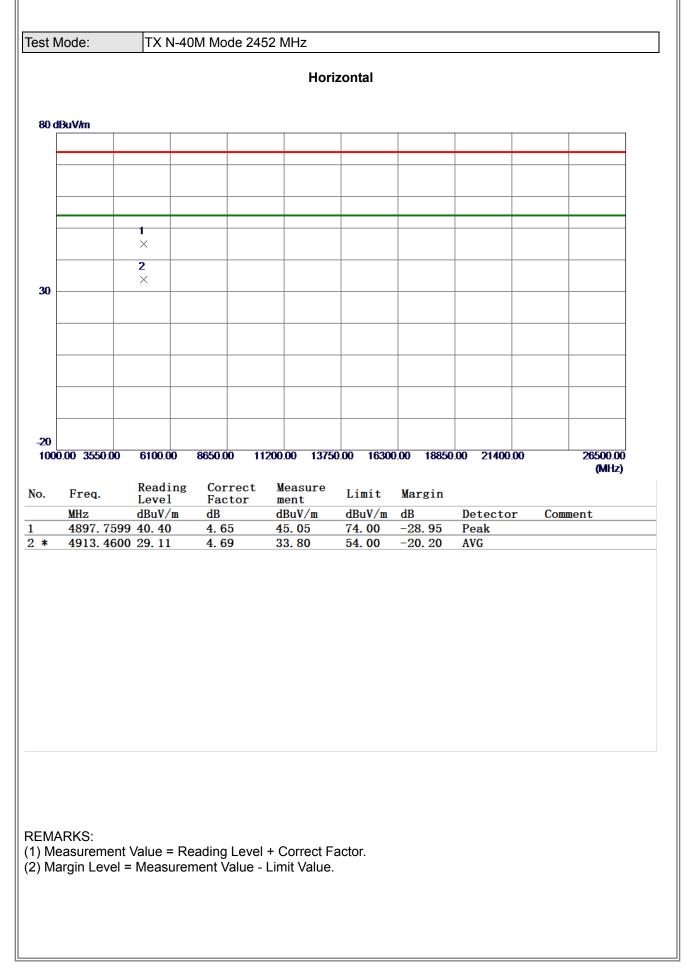










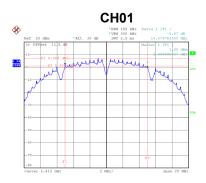




APPENDIX E - BANDWIDTH



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	10.16	500	Complies
11	2462	10.07	500	Complies







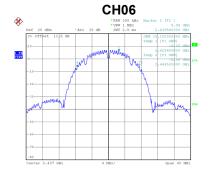
Date: 29.JAN.2021 09:01:20

Date: 29.JAN.2021 09:03:18

Date: 29.JAN.2021 09:05:09

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	15.12	Complies
06	2437	15.12	Complies
11	2462	15.12	Complies







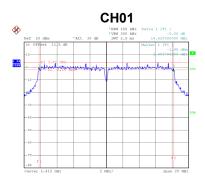
Date: 29.JAN.2021 09:01:27

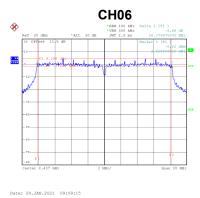
Date: 29.JAN.2021 09:03:26

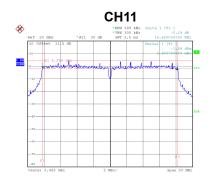
Date: 29.JAN.2021 09:05:17



Test Mode	TX G Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
01	2412	16.42	500	Complies
06	2437	16.38	500	Complies
11	2462	16.42	500	Complies





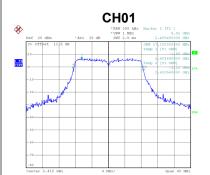


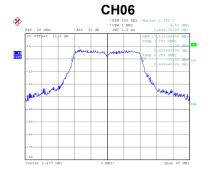
Date: 29.JAN.2021 09:07:30

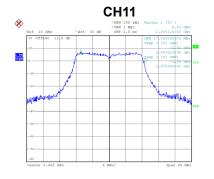
Date: 29.0AN.2021 09:0

Date: 29.JAN.2021 09:10:55

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	17.12	Complies
06	2437	17.12	Complies
11	2462	17.04	Complies







Date: 29.JAN.2021 09:07:37

Date: 29.JAN.2021 09:09:23

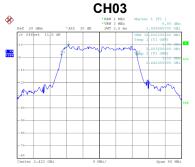
Date: 29.JAN.2021 09:11:02

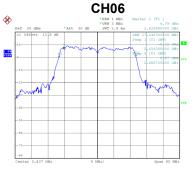


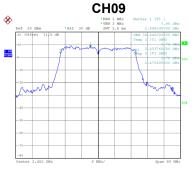
est Mode	TX N-20M Mode				
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result	
01	2412	17.62	500	Complies	
06	2437	17.60	500	Complies	
11	2462	17.59	500	Complies	
C 20 20 20 20 20 20 20 20 20 20 20 20 20 2	Frequency		(a) (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	EH11 ***********************************	
01	(MHz) 2412		99 % Emission Bandwidth (MHz)		
06	2412	17.92		Complies	
Un	2437			Complies	
11	2437 2462		17.92 18.08 17.92	Complies Complies Complies	
11	2462	ECHOG -BURGE BURGE	18.08 17.92 C	Complies Complies	



est Mode	TX N-40M Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
03	2422	35.84	500	Complies
06	2437	35.68	500	Complies
09	2452	35.59	500	Complies
Per 20.00m *Att. 30.00 10 000 000 <tr< th=""><th>EXPENSE 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2</th><th>CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC</th><th>1 (11) 1 - 15 - 00 - (75) 5000 Wir 1 (17) - (-14) dia - (14) - (14</th><th>CHORD 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2</th></tr<>	EXPENSE 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	1 (11) 1 - 15 - 00 - (75) 5000 Wir 1 (17) - (-14) dia - (14) - (14	CHORD 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
e: 29.JAN.2021 09:18:37		Date: 29.JAN.2021 09:20:26	Date: 29.JAN.2021 09:22:07	
Channel	Frequency (MHz)	99 % Emission	n Bandwidth (MHz)	Result
03	2422	3	36.80	Complies
06	2437	3	37.44	Complies
09	2452		36.64	Complies







Date: 29.JAN.2021 09:22:14

Date: 29.JAN.2021 09:18:44

Date: 29.JAN.2021 09:20:34

Page 94 of 104



APPENDIX F - MAXIMUM OUTPUT POWER



Tes	t Mode	TX B Mode					
103							
	Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result	
	01	2412	17.95	30.00	1.0000	Complies	
	06	2437	18.09	30.00	1.0000	Complies	
	11	2462	18.16	30.00	1.0000	Complies	
		·		·			
Tes	t Mode	TX G Mode					
	Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result	
	01	2412	22.57	30.00	1.0000	Complies	
	06	2437	23.69	30.00	1.0000	Complies	
	11	2462	23.58	30.00	1.0000	Complies	
-							
Tes	t Mode	TX N-20M Mode					
	Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result	
	01	2412	22.31	30.00	1.0000	Complies	
	06	2437	23.08	30.00	1.0000	Complies	
	11	2462	22.65	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	

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (dBm)	Max. Limit (W)	Result
03	2422	21.66	30.00	1.0000	Complies
06	2437	23.17	30.00	1.0000	Complies
09	2452	22.84	30.00	1.0000	Complies



APPENDIX G - CONDUCTED SPURIOUS EMISSIONS



