

# FCC Radio Test Report

# FCC ID: KA2AP1610B1

This report concerns: Original Grant

Project No.	:	2006H024
Equipment	:	1) AC1200 Mesh Wi-Fi Range Extender
		2) AC750 Mesh Wi-Fi Range Extender
Brand Name	:	D-Link
Test Model	:	1) DAP-1610
Series Model	:	2) DAP-1530
Applicant	:	D-Link Corporation
Address	:	17595 Mt. Herrmann, Fountain Valley, California, UnitedStates, 92708
Manufacturer	:	D-Link Corporation
Address	:	No.289, Xinhu 3rd Rd., Neihu District, Taipei City 11494, Taiwan,
		R.O.C.
Factory	:	Edimax Technology Co., Ltd.& Intelligent Technology INC.
Address	:	No. 278, Xinhu 1st Rd., Neihu Dist., Taipei City, Taiwan & Yuanhe 3
		Street, Tongsha Industrial Zone, Dongcheng Area, Dongguan,
		Guangdong, China
Date of Receipt	:	Aug. 04, 2020
Date of Test	:	Aug. 18, 2020 ~ Sep. 04, 2020
Issued Date	:	Dec. 11, 2020
<b>Report Version</b>	:	R02
Test Sample	:	Engineering Sample No.: DG202008055
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.

Chen

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Approved by : Ethan Ma



Certificate # 5123.03

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#### Declaration

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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.



REPORT ISSUED HISTORY61. SUMMARY OF TEST RESULTS71.1 TEST FACILITY81.2 MEASUREMENT UNCERTAINTY81.3 TEST ENVIRONMENT CONDITIONS92. GENERAL INFORMATION102.1 GENERAL DESCRIPTION OF EUT102.2 DESCRIPTION OF TEST MODES122.3 PARAMETERS OF TEST SOFTWARE142.4 DUTY CYCLE152.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED163. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS234.7 TEST RESULTS - 9 KHZ TO 30 MHZ224.8 TEST RESULTS - 8 ADVE 1000 MHZ235.1 LIMIT235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD235.4 TEST SETUP23	Table of Contents	Page
1. SUMMARY OF TEST RESULTS71.1 TEST FACILITY81.2 MEASUREMENT UNCERTAINTY81.3 TEST ENVIRONMENT CONDITIONS92. GENERAL INFORMATION102.1 GENERAL DESCRIPTION OF EUT102.2 DESCRIPTION OF TEST MODES122.3 PARAMETERS OF TEST SOFTWARE142.4 DUTY CYCLE152.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED162.6 SUPPORT UNITS163. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 30 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225.1 LIMIT235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23		
1.1 TEST FACILITY81.2 MEASUREMENT UNCERTAINTY81.3 TEST ENVIRONMENT CONDITIONS92. GENERAL INFORMATION102.1 GENERAL DESCRIPTION OF EUT102.2 DESCRIPTION OF TEST MODES122.3 PARAMETERS OF TEST SOFTWARE142.4 DUTY CYCLE152.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED163. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION TEST STANDARD204.4 TEST SETUP183.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 30 MHZ224.8 TEST RESULTS - 9 KHZ TO 30 MHZ224.8 TEST RESULTS - ABOVE 1000 MHZ225.1 LIMIT235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	REPORT ISSUED HISTORY	6
1.2 MEASUREMENT UNCERTAINTY81.3 TEST ENVIRONMENT CONDITIONS92. GENERAL INFORMATION102.1 GENERAL DESCRIPTION OF EUT102.2 DESCRIPTION OF TEST MODES122.3 PARAMETERS OF TEST SOFTWARE142.4 DUTY CYCLE152.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED162.6 SUPPORT UNITS163. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 30 MHZ224.7 TEST RESULTS - 30 MHZ224.8 TEST RESULTS - 30 MHZ224.8 TEST RESULTS - 30 MHZ224.8 TEST RESULTS - 30 MHZ235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	1 . SUMMARY OF TEST RESULTS	7
1.3 TEST ENVIRONMENT CONDITIONS92. GENERAL INFORMATION102.1 GENERAL DESCRIPTION OF EUT102.2 DESCRIPTION OF TEST MODES122.3 PARAMETERS OF TEST SOFTWARE142.4 DUTY CYCLE152.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED162.6 SUPPORT UNITS163. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS214.7 TEST RESULTS224.6 TEST RESULTS - 30 MHZ224.7 TEST RESULTS - 30 MHZ224.8 TEST RESULTS - 30 MHZ225.1 LIMIT235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	1.1 TEST FACILITY	8
2. GENERAL INFORMATION102.1 GENERAL DESCRIPTION OF EUT102.2 DESCRIPTION OF TEST MODES122.3 PARAMETERS OF TEST SOFTWARE142.4 DUTY CYCLE152.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED162.6 SUPPORT UNITS163. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 30 MHZ224.7 TEST RESULTS - 30 MHZ224.8 TEST RESULTS - 30 MHZ225.1 LIMIT235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	1.2 MEASUREMENT UNCERTAINTY	8
2.1 GENERAL DESCRIPTION OF EUT       10         2.2 DESCRIPTION OF TEST MODES       12         2.3 PARAMETERS OF TEST SOFTWARE       14         2.4 DUTY CYCLE       15         2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED       16         2.6 SUPPORT UNITS       16         3. AC POWER LINE CONDUCTED EMISSIONS TEST       17         3.1 LIMIT       17         3.2 TEST PROCEDURE       17         3.3 DEVIATION FROM TEST STANDARD       17         3.4 TEST SETUP       18         3.5 EUT OPERATION CONDITIONS       18         3.6 TEST RESULTS       19         4.1 RADIATED EMISSIONS TEST       19         4.1 LIMIT       19         4.2 TEST PROCEDURE       20         4.3 DEVIATION FROM TEST STANDARD       20         4.4 TEST SETUP       21         4.5 EUT OPERATION CONDITIONS       22         4.6 TEST RESULTS       19         4.1 LIMIT       20         4.3 DEVIATION FROM TEST STANDARD       20         4.4 TEST SETUP       21         4.5 EUT OPERATION CONDITIONS       22         4.6 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ       22	1.3 TEST ENVIRONMENT CONDITIONS	9
2.2 DESCRIPTION OF TEST MODES       12         2.3 PARAMETERS OF TEST SOFTWARE       14         2.4 DUTY CYCLE       15         2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED       16         2.6 SUPPORT UNITS       16         3. AC POWER LINE CONDUCTED EMISSIONS TEST       17         3.1 LIMIT       17         3.2 TEST PROCEDURE       17         3.3 DEVIATION FROM TEST STANDARD       17         3.4 TEST SETUP       18         3.5 EUT OPERATION CONDITIONS       18         3.6 TEST RESULTS       19         4.1 RADIATED EMISSIONS TEST       19         4.1 LIMIT       19         4.2 TEST PROCEDURE       20         4.3 DEVIATION FROM TEST STANDARD       20         4.4 TEST SETUP       21         4.5 EUT OPERATION CONDITIONS       22         4.6 TEST RESULTS       19         4.1 LIMIT       19         4.2 TEST PROCEDURE       20         4.3 DEVIATION FROM TEST STANDARD       22         4.4 TEST SETUP       21         4.5 EUT OPERATION CONDITIONS       22         4.6 TEST RESULTS - 3 MHZ TO 30 MHZ       22         4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ       22         5. BANDWIDTH	2 . GENERAL INFORMATION	10
2.3 PARAMETERS OF TEST SOFTWARE142.4 DUTY CYCLE152.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED162.6 SUPPORT UNITS163. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS194.7 TEST RESULTS - 30 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	2.1 GENERAL DESCRIPTION OF EUT	10
2.4 DUTY CYCLE       15         2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED       16         2.6 SUPPORT UNITS       16         3. AC POWER LINE CONDUCTED EMISSIONS TEST       17         3.1 LIMIT       17         3.2 TEST PROCEDURE       17         3.3 DEVIATION FROM TEST STANDARD       17         3.4 TEST SETUP       18         3.5 EUT OPERATION CONDITIONS       18         3.6 TEST RESULTS       18         4. RADIATED EMISSIONS TEST       19         4.1 LIMIT       19         4.2 TEST PROCEDURE       20         4.3 DEVIATION FROM TEST STANDARD       20         4.3 DEVIATION FROM TEST STANDARD       20         4.4 TEST SETUP       21         4.5 EUT OPERATION CONDITIONS       22         4.6 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.7 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.8 TEST RESULTS - 30 MHZ TO 1000 MHZ       22         4.8 TEST RESULTS - ABOVE 1000 MHZ       22         5.1 LIMIT       23         5.2 TEST PROCEDURE       23         5.3 DEVIATION FROM STANDARD       23	2.2 DESCRIPTION OF TEST MODES	12
2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED       16         2.6 SUPPORT UNITS       16         3. AC POWER LINE CONDUCTED EMISSIONS TEST       17         3.1 LIMIT       17         3.2 TEST PROCEDURE       17         3.3 DEVIATION FROM TEST STANDARD       17         3.4 TEST SETUP       18         3.5 EUT OPERATION CONDITIONS       18         3.6 TEST RESULTS       18         4. RADIATED EMISSIONS TEST       19         4.1 LIMIT       19         4.2 TEST PROCEDURE       20         4.3 DEVIATION FROM TEST STANDARD       20         4.4 TEST SETUP       21         4.5 EUT OPERATION CONDITIONS       22         4.6 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.6 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.7 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.8 TEST RESULTS - 30 MHZ TO 1000 MHZ       22         4.8 TEST RESULTS - ABOVE 1000 MHZ       22         5. BANDWIDTH TEST       23         5.1 LIMIT       23         5.2 TEST PROCEDURE       23         5.3 DEVIATION FROM STANDARD       23	2.3 PARAMETERS OF TEST SOFTWARE	14
2.6 SUPPORT UNITS163. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS184. RADIATED EMISSIONS TEST194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 30 MHZ224.7 TEST RESULTS - 30 MHZ224.8 TEST RESULTS - 30 MHZ224.8 TEST RESULTS - 30 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	2.4 DUTY CYCLE	15
3. AC POWER LINE CONDUCTED EMISSIONS TEST173.1 LIMIT173.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS194.1 RADIATED EMISSIONS TEST194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 30 MHZ224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 30 MHZ TO 1000 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	16
3.1 LIMIT       17         3.2 TEST PROCEDURE       17         3.3 DEVIATION FROM TEST STANDARD       17         3.4 TEST SETUP       18         3.5 EUT OPERATION CONDITIONS       18         3.6 TEST RESULTS       18         4. RADIATED EMISSIONS TEST       19         4.1 LIMIT       19         4.2 TEST PROCEDURE       20         4.3 DEVIATION FROM TEST STANDARD       20         4.4 TEST SETUP       21         4.5 EUT OPERATION CONDITIONS       22         4.6 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.6 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ       22         4.8 TEST RESULTS - 30 MHZ TO 1000 MHZ       22         5. BANDWIDTH TEST       23         5.1 LIMIT       23         5.2 TEST PROCEDURE       23         5.3 DEVIATION FROM STANDARD       23	2.6 SUPPORT UNITS	16
3.2 TEST PROCEDURE173.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS184. RADIATED EMISSIONS TEST194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 30 MHZ224.8 TEST RESULTS - 9 KHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	3 . AC POWER LINE CONDUCTED EMISSIONS TEST	17
3.3 DEVIATION FROM TEST STANDARD173.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS184. RADIATED EMISSIONS TEST194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 1000 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	3.1 LIMIT	17
3.4 TEST SETUP183.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS184. RADIATED EMISSIONS TEST194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 30 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	3.2 TEST PROCEDURE	17
3.5 EUT OPERATION CONDITIONS183.6 TEST RESULTS184. RADIATED EMISSIONS TEST194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 1000 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	3.3 DEVIATION FROM TEST STANDARD	17
3.6 TEST RESULTS184. RADIATED EMISSIONS TEST194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 30 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	3.4 TEST SETUP	18
4. RADIATED EMISSIONS TEST194.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 30 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	3.5 EUT OPERATION CONDITIONS	18
4.1 LIMIT194.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 1000 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	3.6 TEST RESULTS	18
4.2 TEST PROCEDURE204.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 9 KHZ TO 1000 MHZ224.8 TEST RESULTS - 30 MHZ TO 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	4 . RADIATED EMISSIONS TEST	19
4.3 DEVIATION FROM TEST STANDARD204.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 30 MHZ TO 1000 MHZ224.8 TEST RESULTS - ABOVE 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	4.1 LIMIT	19
4.4 TEST SETUP214.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 30 MHZ TO 1000 MHZ224.8 TEST RESULTS - ABOVE 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	4.2 TEST PROCEDURE	20
4.5 EUT OPERATION CONDITIONS224.6 TEST RESULTS - 9 KHZ TO 30 MHZ224.7 TEST RESULTS - 30 MHZ TO 1000 MHZ224.8 TEST RESULTS - ABOVE 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	4.3 DEVIATION FROM TEST STANDARD	20
4.6 TEST RESULTS - 9 KHZ TO 30 MHZ       22         4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ       22         4.8 TEST RESULTS - ABOVE 1000 MHZ       22         5. BANDWIDTH TEST       23         5.1 LIMIT       23         5.2 TEST PROCEDURE       23         5.3 DEVIATION FROM STANDARD       23	4.4 TEST SETUP	21
4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ224.8 TEST RESULTS - ABOVE 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	4.5 EUT OPERATION CONDITIONS	22
4.8 TEST RESULTS - ABOVE 1000 MHZ225. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	4.6 TEST RESULTS - 9 KHZ TO 30 MHZ	22
5. BANDWIDTH TEST235.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ	22
5.1 LIMIT235.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	4.8 TEST RESULTS - ABOVE 1000 MHZ	22
5.2 TEST PROCEDURE235.3 DEVIATION FROM STANDARD23	5 . BANDWIDTH TEST	23
5.3 DEVIATION FROM STANDARD 23	5.1 LIMIT	23
	5.2 TEST PROCEDURE	23
5.4 TEST SETUP 23	5.3 DEVIATION FROM STANDARD	23
	5.4 TEST SETUP	23

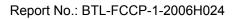




Table of Contents	Page				
5.5 EUT OPERATION CONDITIONS	23				
5.6 TEST RESULTS	23				
6 . MAXIMUM OUTPUT POWER TEST	24				
6.1 LIMIT	24				
6.2 TEST PROCEDURE	24				
6.3 DEVIATION FROM STANDARD	24				
6.4 TEST SETUP	24				
6.5 EUT OPERATION CONDITIONS	24				
6.6 TEST RESULTS	24				
7 . CONDUCTED SPURIOUS EMISSIONS	25				
7.1 LIMIT	25				
7.2 TEST PROCEDURE	25				
7.3 DEVIATION FROM STANDARD	25				
7.4 TEST SETUP	25				
7.5 EUT OPERATION CONDITIONS	25				
7.6 TEST RESULTS	25				
8 . POWER SPECTRAL DENSITY TEST	26				
8.1 LIMIT	26				
8.2 TEST PROCEDURE	26				
8.3 DEVIATION FROM STANDARD	26				
8.4 TEST SETUP	26				
8.5 EUT OPERATION CONDITIONS	26				
8.6 TEST RESULTS	26				
9 . MEASUREMENT INSTRUMENTS LIST	27				
10 . EUT TEST PHOTO	29				
APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS	33				
APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ	38				
APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ	43				
APPENDIX D - RADIATED EMISSION- ABOVE 1000 MHZ	46				
APPENDIX E - BANDWIDTH	98				
APPENDIX F - MAXIMUM OUTPUT POWER	103				
APPENDIX G - CONDUCTED SPURIOUS EMISSIONS 109					



#### Table of Contents

Page

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

116

# **REPORT ISSUED HISTORY**

Report Version	Description	Issued Date
R00	Original Issue.	Oct. 09, 2020
R01	Change the description of model difference and added the 240V data of AC Power Line Conducted Emissions.	Nov. 25, 2020
R02	Modified the comments of CETECOM.	Dec. 11, 2020

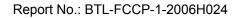
# 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.247)						
Standard(s) Section	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)
		9 KHz~30 MHz	V	3.79
		9 KHz~30 MHz	Н	3.57
	CISPR	30 MHz~200 MHz	V	4.56
		30 MHz~200 MHz	Н	3.90
DG-CB01		200 MHz~1,000 MHz	V	4.64
DG-CB01		200 MHz~1,000 MHz	Н	4.38
		1 GHz~18 GHz	V	4.46
		1 GHz~18 GHz	Н	4.40
		18 GHz~40 GHz	V	3.95
		18 GHz~40 GHz	Н	3.95

#### 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
Time	±0.58 %
Supply voltages	±0.3 %

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 AC 240V/50Hz	Kwok Guo
Radiated Emissions-9K-30MHz	25°C	60%	AC 120V/60Hz	Kwok Guo
Radiated Emissions-30 MHz to 1GHz	22°C	54%	AC 120V/60Hz	Kwok Guo
Radiated Emissions-Above 1000 MHz	26°C	52%	AC 120V/60Hz	Kwok Guo
Bandwidth	25°C	63%	AC 120V/60Hz	Jesse Wang
Maximum output power	25°C	63%	AC 120V/60Hz	Hand Huang
Conducted Spurious Emissions	25°C	63%	AC 120V/60Hz	Jesse Wang
Power Spectral Density	25°C	63%	AC 120V/60Hz	Jesse Wang



# 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

	1) AC1200 Mesh Wi-Fi Range Extender
Equipment	2) AC750 Mesh Wi-Fi Range Extender
Brand Name	D-Link
Test Model	1) DAP-1610
Series Model	2) DAP-1530
Model Difference(s)	Only differ in model name and product name.
Power Source	AC Mains.
Power Rating	100-240V~, 50/60Hz
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
Maximum Output Power Non-Beamforming	IEEE 802.11b: 22.49 dBm (0.1774 W) IEEE 802.11g: 24.11 dBm (0.2576 W) IEEE 802.11n (HT20): 26.18 dBm (0.4150 W) IEEE 802.11n (HT40): 25.99 dBm (0.3972 W)
Maximum Output Power Beamforming	IEEE 802.11n (HT20): 24.83 dBm (0.3041 W) IEEE 802.11n (HT40): 24.86 dBm (0.3062 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)							
							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	P/N	Antenna Type	Connector	Gain (dBi)			
1	RFlink	RF21C05288A	PCB	Cable	2.5			
2	RFlink RF21C05288A		PCB	Cable	2.5			

Note: This EUT supports CDD, and all antennas have the same gain, so,

(1) For Non Beamforming: Directional gain= $G_{ANT}$ +Array Gain.

For output power measurements, Array Gain=0 ( $N_{ANT} \le 4$ ), so the Directional gain=2.5. For power spectral density measurements, Array Gain=10log( $N_{ANT}/N_{SS}$ ) dB, so the Directional gain=2.5+10log(2/1)=5.51.

(2) For Beamforming: Beamforming Gain: 2.5dB. So the Directional gain=2.5+2.5=5.

#### 4. Table for Antenna Configuration:

For Non Beamforming:

Operating Mode TX Mode	1TX	2TX
802.11b	V (Ant. 1)	
802.11g	V (Ant. 1)	
802.11n(20 MHz)		V (Ant. 1 + Ant. 2)
802.11n(40 MHz)		V (Ant. 1 + Ant. 2)

#### For Beamforming:

Operating Mode TX Mode	2TX
802.11n(20 MHz)	V (Ant. 1 + Ant. 2)
802.11n(40 MHz)	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 N-20 MHz Mode Channel	

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 N-20 MHz Mode Channel	

Radiated emissions test - Below 1GHz		
Final Test Mode Description		
Mode 5	TX N-20 MHz Mode Channel	

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	

Output Power test_Non Beamforming			
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			



Output Power test_ Beamforming			
Final Test Mode: Description			
Mode 3	TX N-20 MHz Mode Channel 01/06/11		
Mode 4	TX N-40 MHz Mode Channel 03/06/09		

#### Other Conducted test\_Non Beamforming

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 802.11n20 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.
- (5) The measurements for Power were tested, the Non Beamforming and Beamforming were recorded in this report. The worst case was Non Beamforming and only the worst case was documented for other test items.
- (6) For radiated emissions, the TX WLAN 2.4G N40 Mode 2437 + WLAN 5G N20 Mode 5785MHz was found the worst case of simultaneous transmission and recorded.

#### 2.3 PARAMETERS OF TEST SOFTWARE

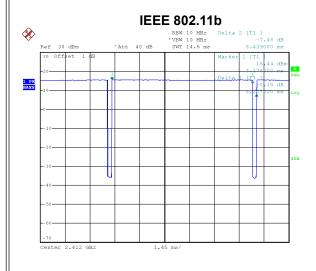
Non-Beamforming			
Test Software	MP_TOOL		
Frequency (MHz)	2412	2437	2462
IEEE 802.11b	94	95	97
IEEE 802.11g	104	115	105
IEEE 802.11n (HT20)	96	105	96
Frequency (MHz)	2422	2437	2452
IEEE 802.11n (HT40)	91	104	90

Bea	amfo	rmin	q

Test Software	MP_TOOL			
Frequency (MHz)	2412	2437	2462	
IEEE 802.11n (HT20)	96	105	96	
Frequency (MHz)	2422	2437	2452	
IEEE 802.11n (HT40)	91	104	90	

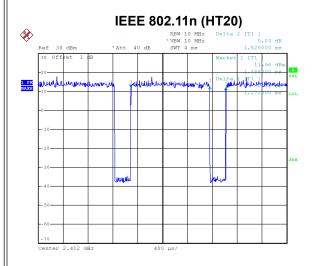
# **BIL**

# 2.4 DUTY CYCLE

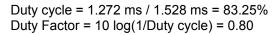


Date: 10.AUG.2020 13:46:27

Duty cycle = 8.207 ms / 8.439 ms = 97.25% Duty Factor = 10 log(1/Duty cycle) = 0.12



Date: 10.AUG.2020 13:49:08



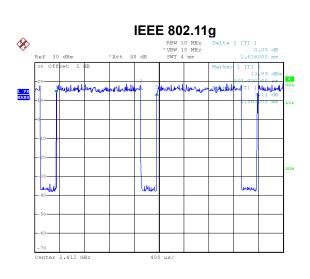
#### NOTE:

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%).

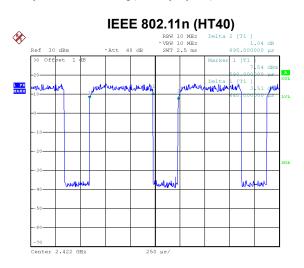
#### For IEEE 802.11n (HT40):

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%).



Date: 10.AUG.2020 13:47:55

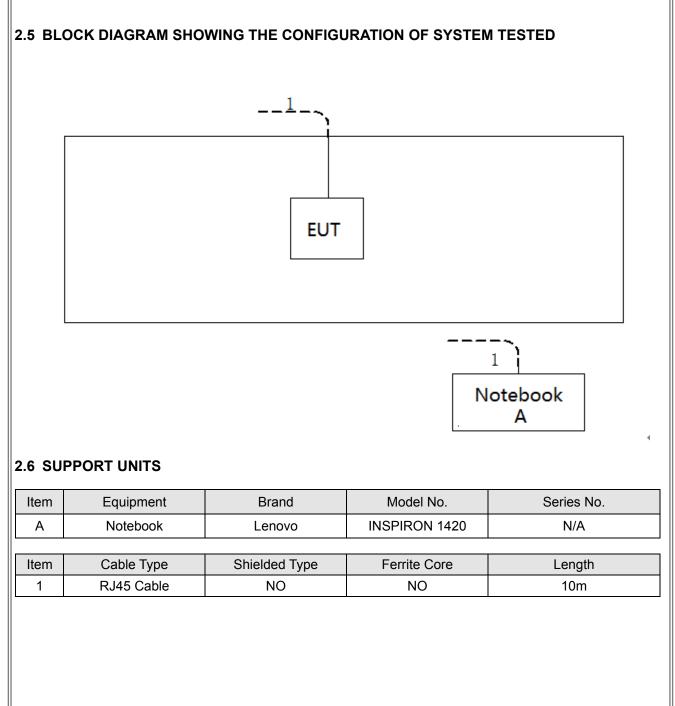
Duty cycle = 1.360 ms / 1.616 ms = 84.16% Duty Factor = 10 log(1/Duty cycle) = 0.75



Date: 10.AUG.2020 13:50:00

Duty cycle = 0.640 ms / 0.895 ms = 71.51% Duty Factor = 10 log(1/Duty cycle) = 1.46







# 3. AC POWER LINE CONDUCTED EMISSIONS TEST

#### 3.1 LIMIT

	Limit (dBµV)		
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

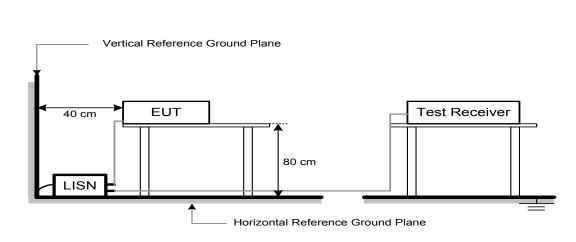
- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.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

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

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

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

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

NOTE:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).



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

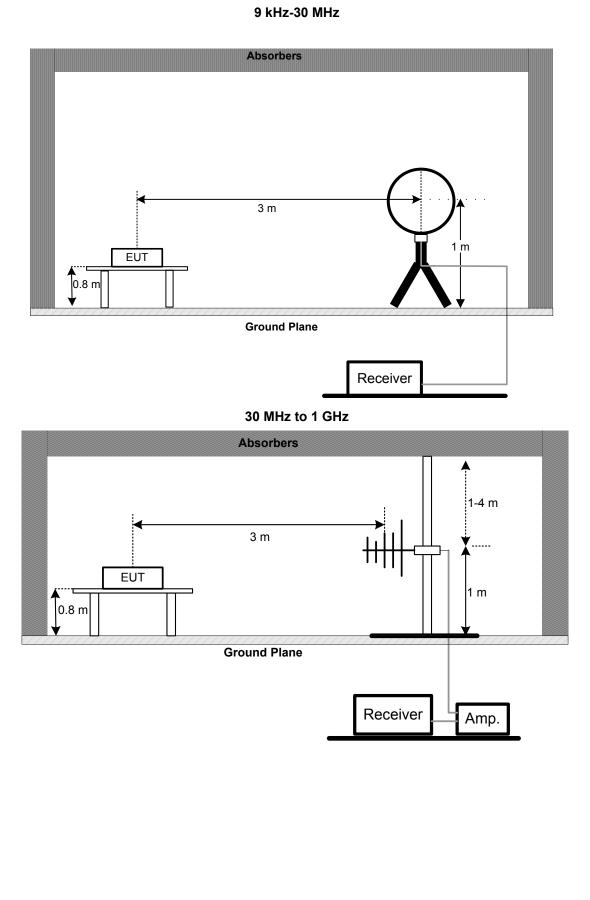
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b. The measuring distance of 3 m or 1.5m 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 1GHz)
- 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.

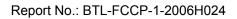
#### 4.3 DEVIATION FROM TEST STANDARD

No deviation



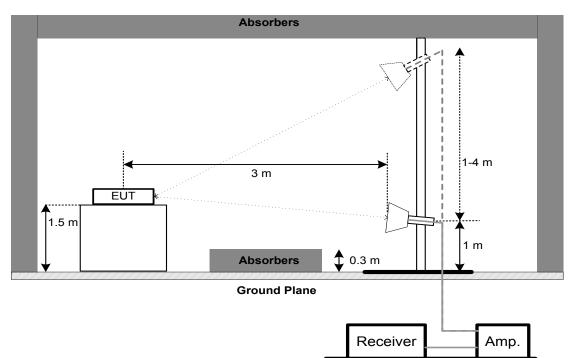
# 4.4 TEST SETUP





# **3**โL

#### 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 Test Item Limit				
15 247(2)(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.
- c. The bandwidth was performed in accordance with method 11.8.1 of ANSI C63.

#### 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		
13.247(8)	rower opectial Density	(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, 2021	
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	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	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	CT	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	Item Kind of Equipment Manufacturer Type No. Serial No. Calibrated until									
1	Spectrum Analyzer	R&S	FSP40	100185	Jul. 25, 2021					
2	RF Cable	Tongkaichuan	N/A	N/A	N/A					
3	DC Block	Mini	N/A	N/A	N/A					

	Maximum Output Power							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until			
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.

 $\ensuremath{^{\ast\ast}}\xspace$  calibration period of equipment list is three year.

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



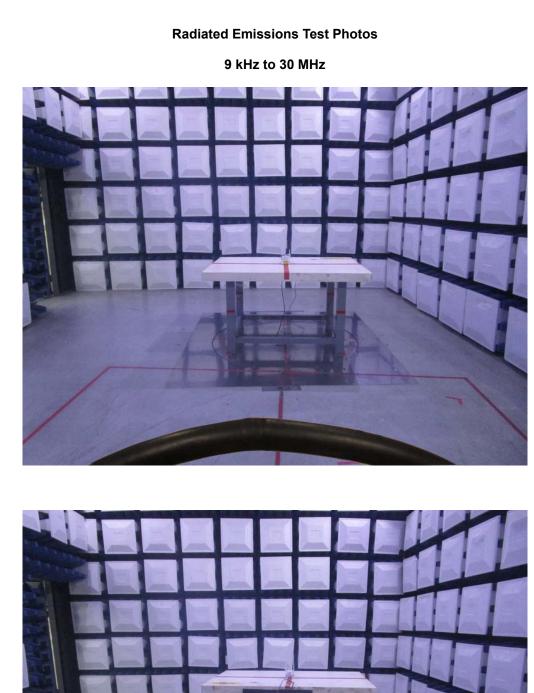
# 10. EUT TEST PHOTO













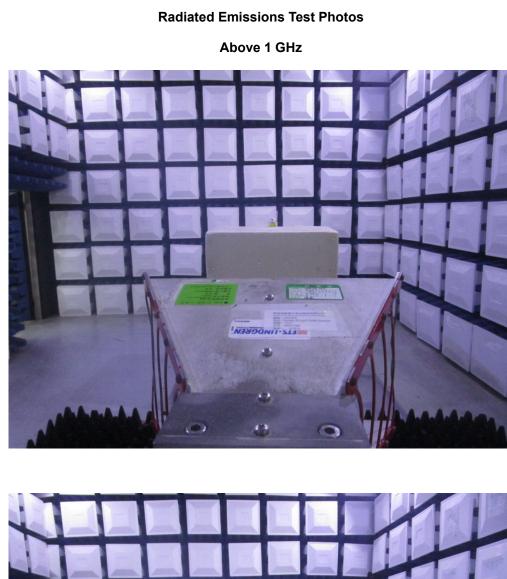
Radiated Emissions Test Photos

30 MHz to 1 GHz







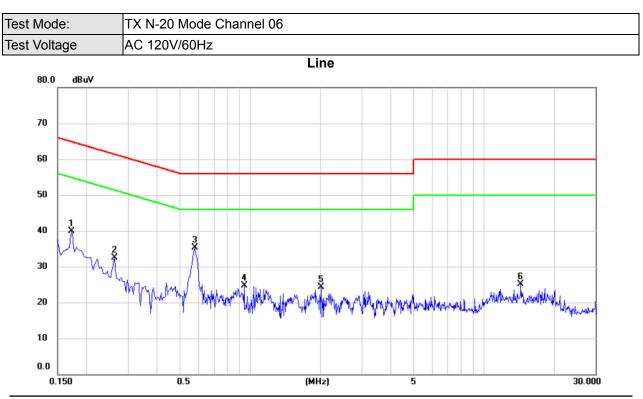






# **APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS**



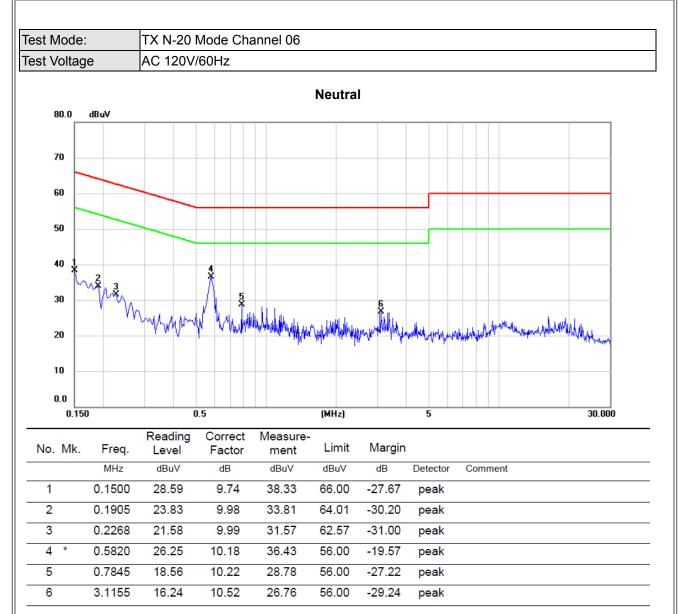


No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1725	30.02	9.83	39.85	64.84	-24.99	peak	
2	0.2625	22.68	9.88	32.56	61.35	-28.79	peak	
3 *	0.5820	25.25	9.96	35.21	56.00	-20.79	peak	
4	0.9420	14.63	10.00	24.63	56.00	-31.37	peak	
5	2.0175	14.12	10.09	24.21	56.00	-31.79	peak	
6	14.3655	14.16	10.89	25.05	60.00	-34.95	peak	

**REMARKS**:

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

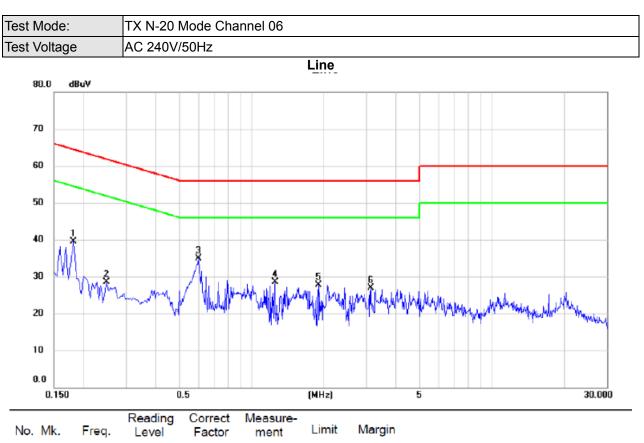




REMARKS:

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



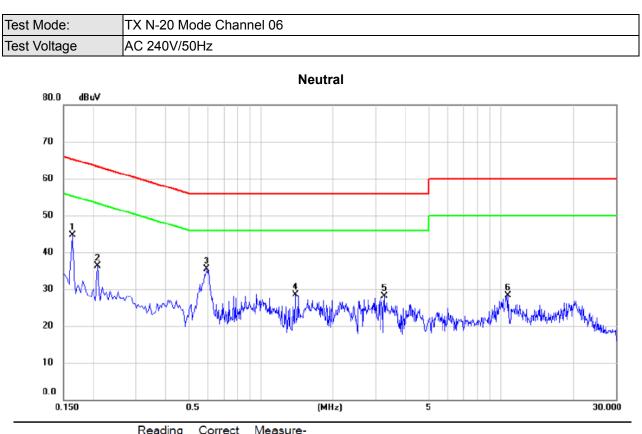


No.	Mk.	Freq.	Level	Factor	ment	Limit	Margin			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1		0.1815	29.57	9.85	39.42	64.42	-25.00	peak		
2		0.2490	18.58	9.87	28.45	61.79	-33.34	peak		
3	*	0.6000	24.96	9.96	34.92	56. <b>00</b>	-21.08	peak		
4		1.2525	18.54	10.03	28.57	56.00	-27.43	peak		
5		1.8960	17.65	10.08	27.73	56.00	-28.27	peak		
6		3.1290	16.70	10.19	26.89	56.00	-29.11	peak		

**REMARKS**:

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



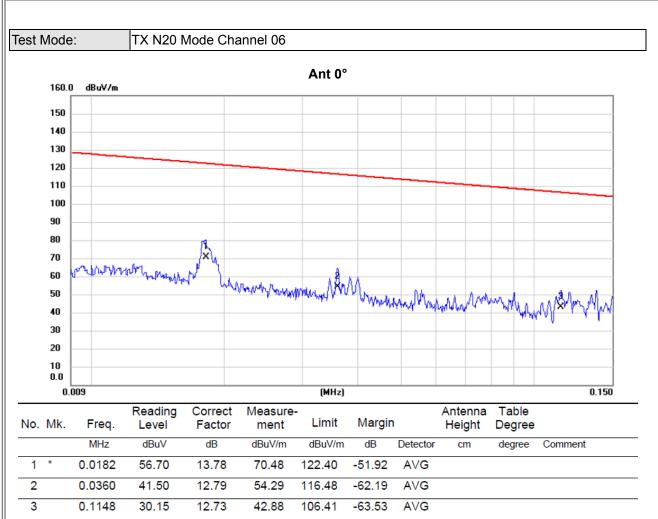


No. I	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1635	34.89	9.85	44.74	65.28	-20.54	peak	
2		0.2085	26.39	10.00	36.39	63.26	-26.87	peak	
3 '	*	0.5910	25.35	10.19	35.54	56.00	-20.46	peak	
4		1.3920	18.07	10.35	28.42	56.00	-27.58	peak	
5		3.2775	17.59	10.54	28.13	56.00	-27.87	peak	
6		10.7340	17.14	11.08	28.22	60.00	-31.78	peak	

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

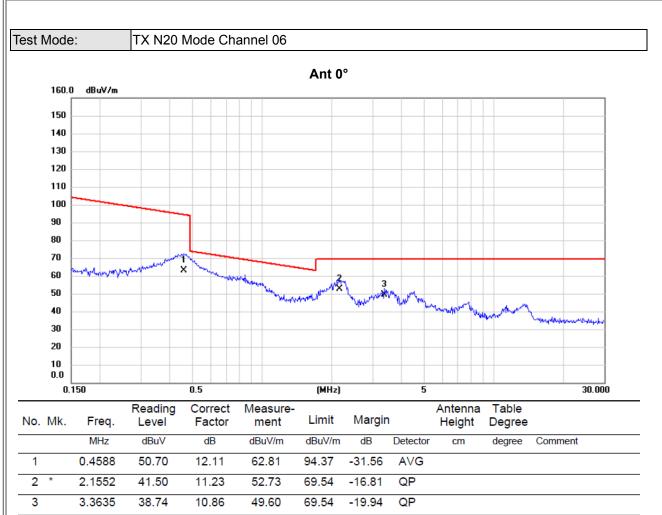
## **APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ**





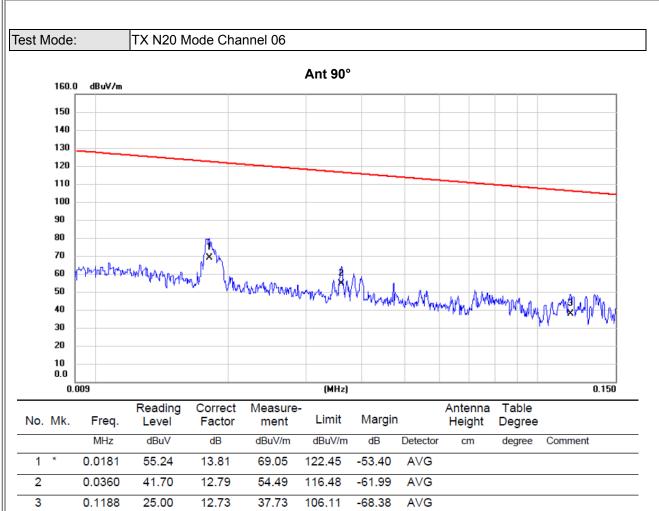
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





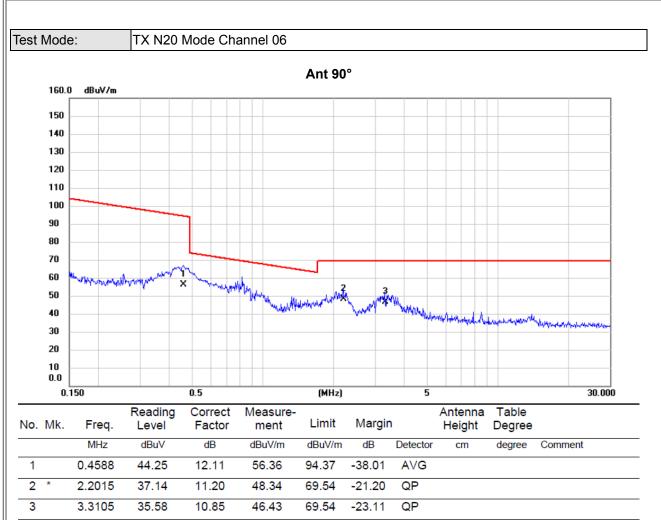
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





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



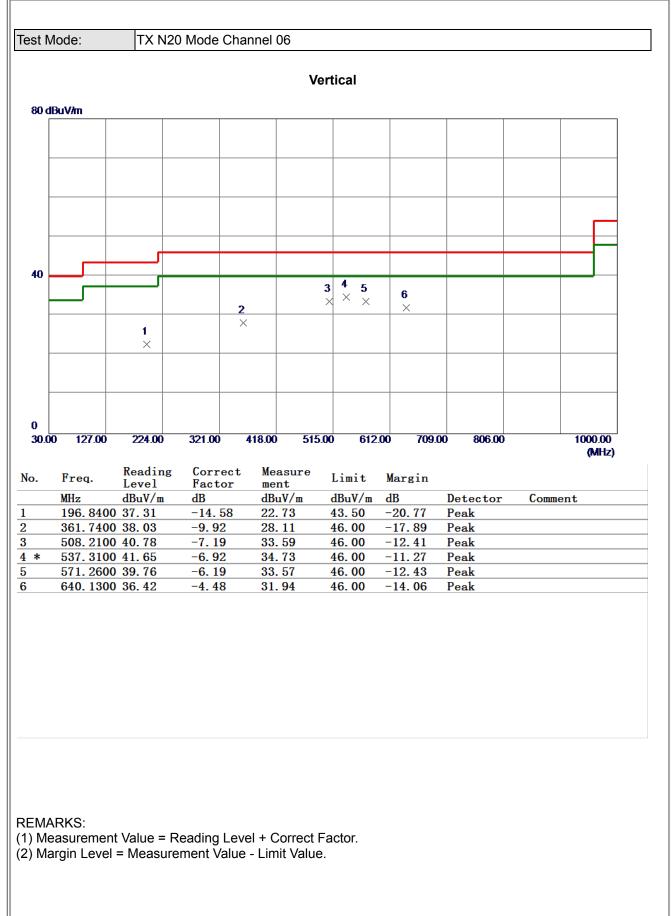


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

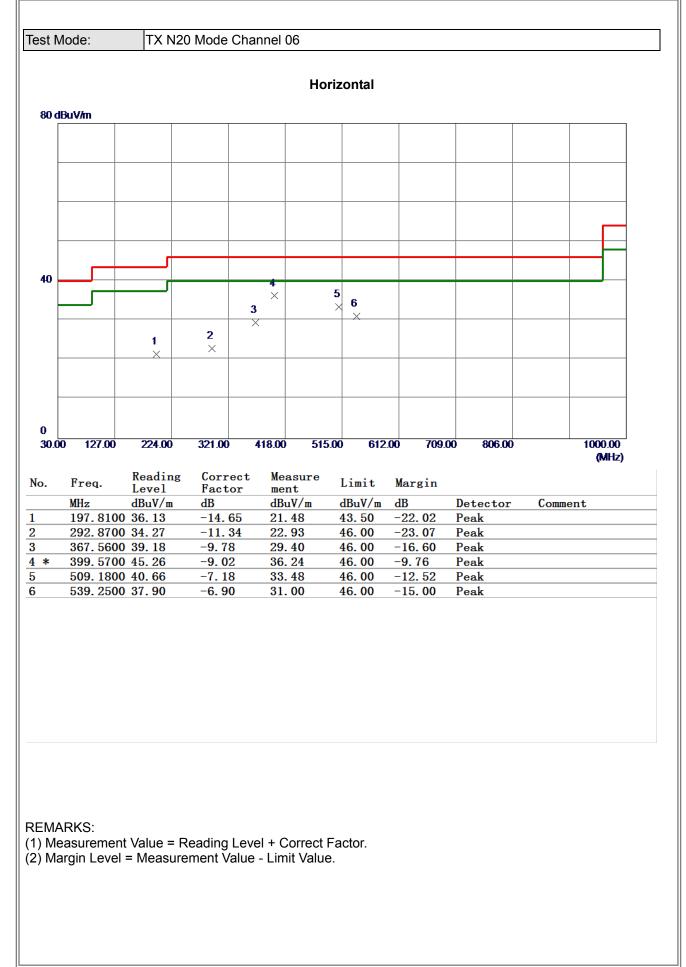


## APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ





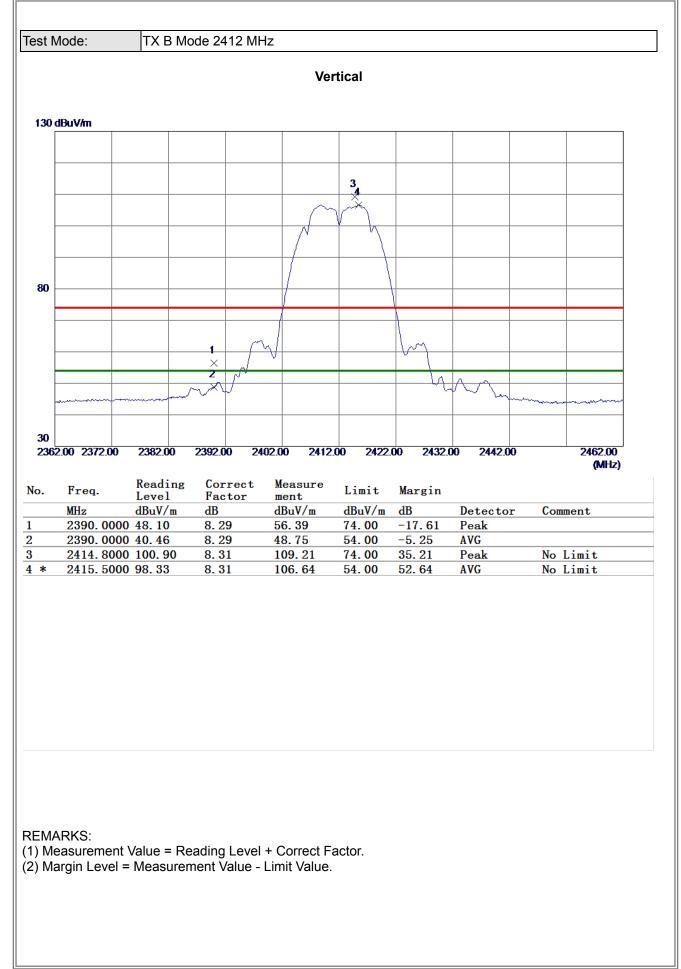




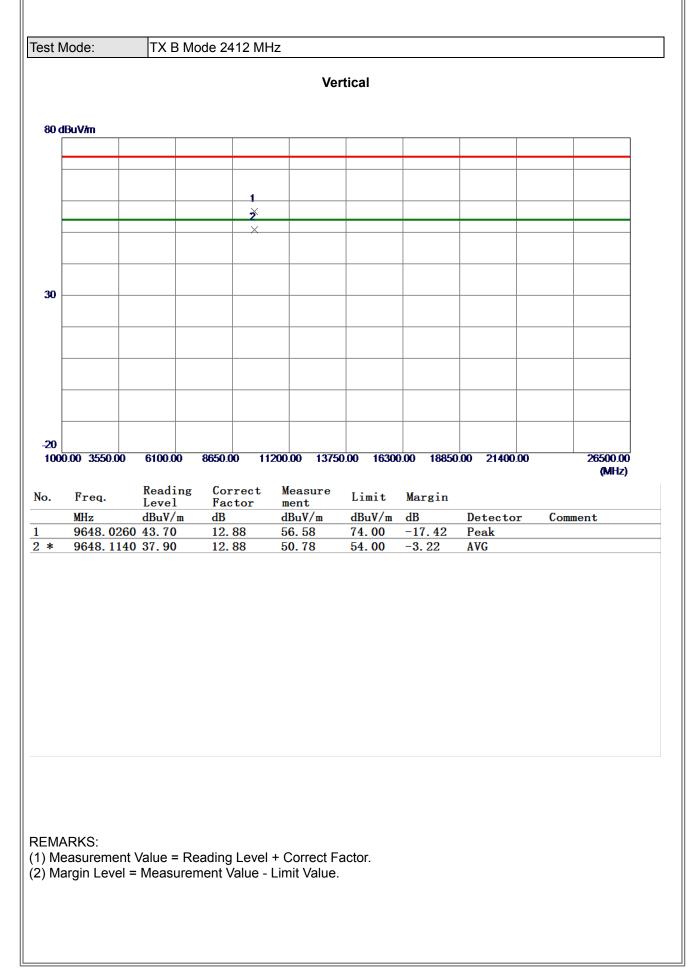


## **APPENDIX D - RADIATED EMISSION- ABOVE 1000 MHZ**

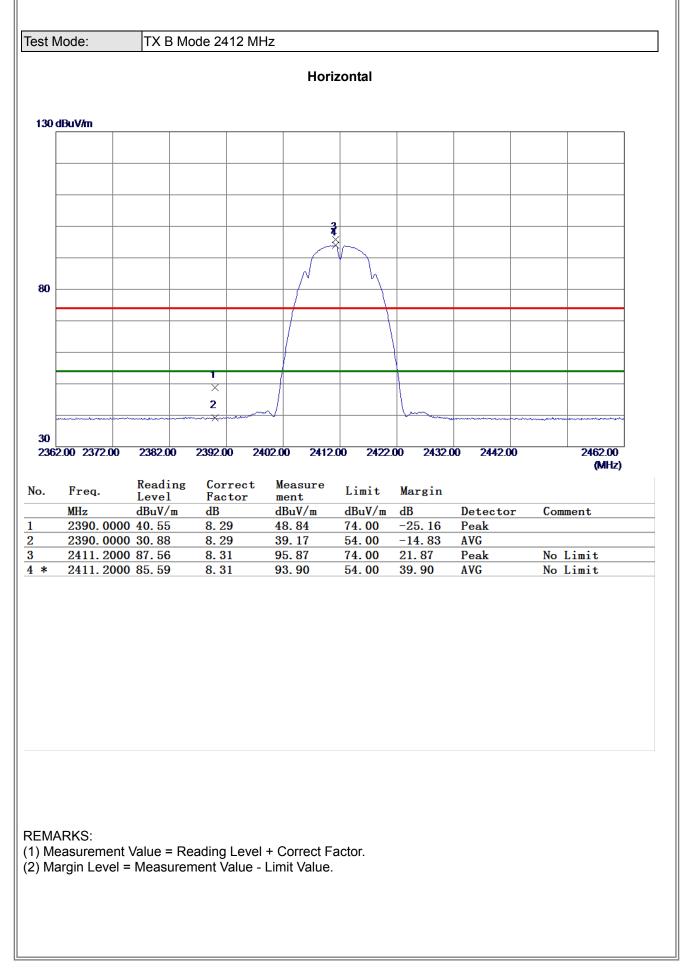




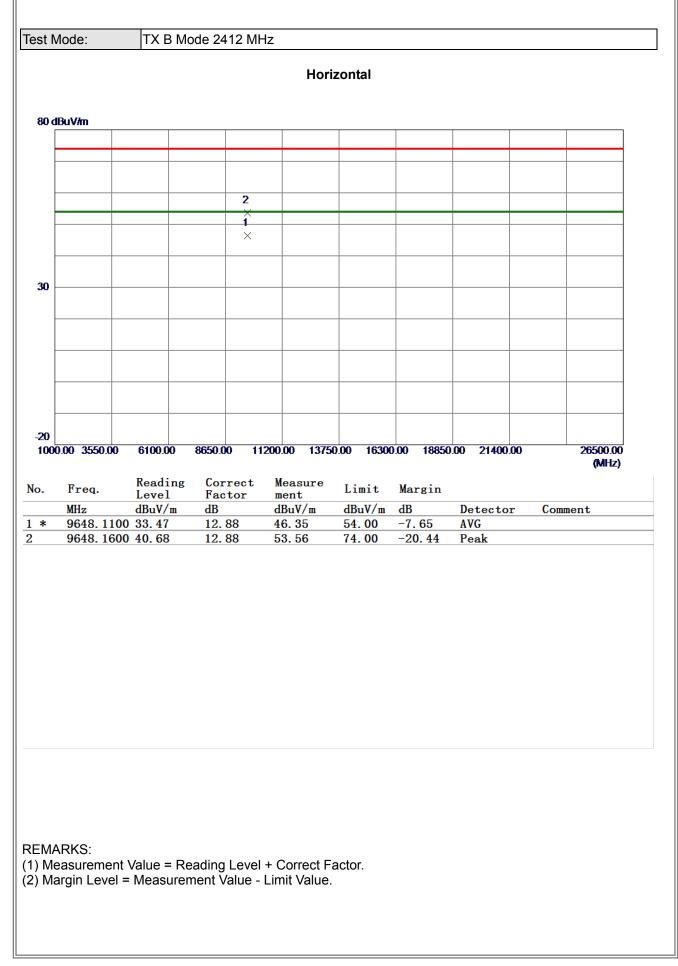




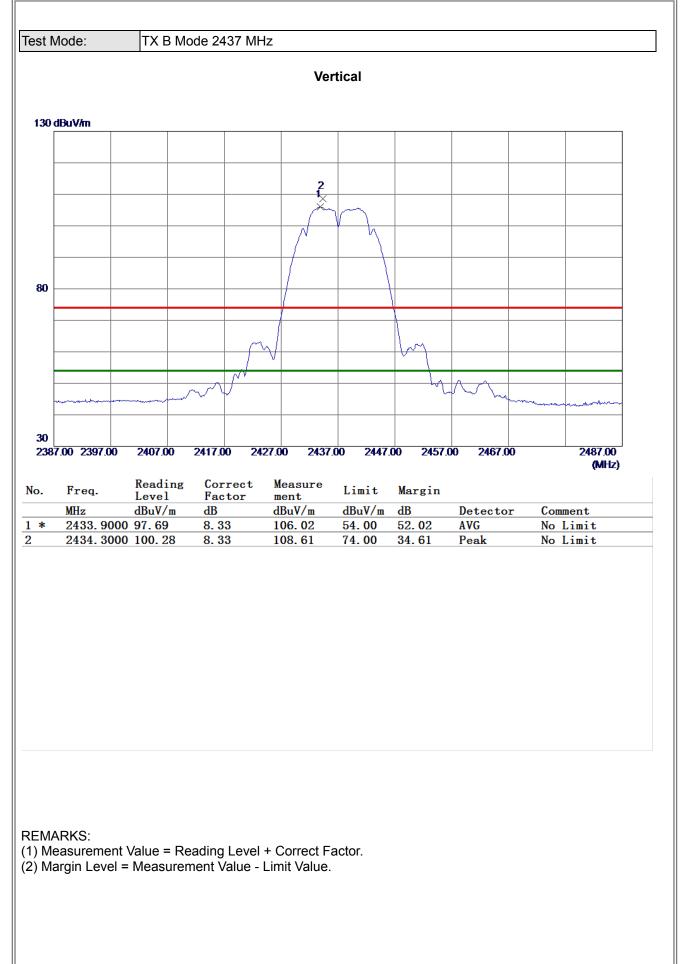




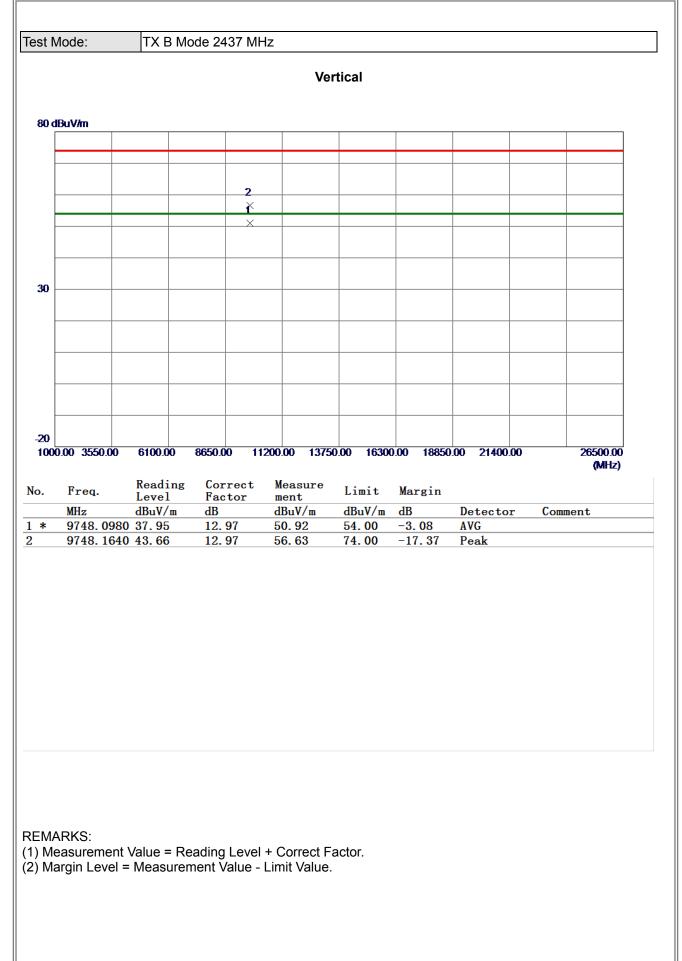




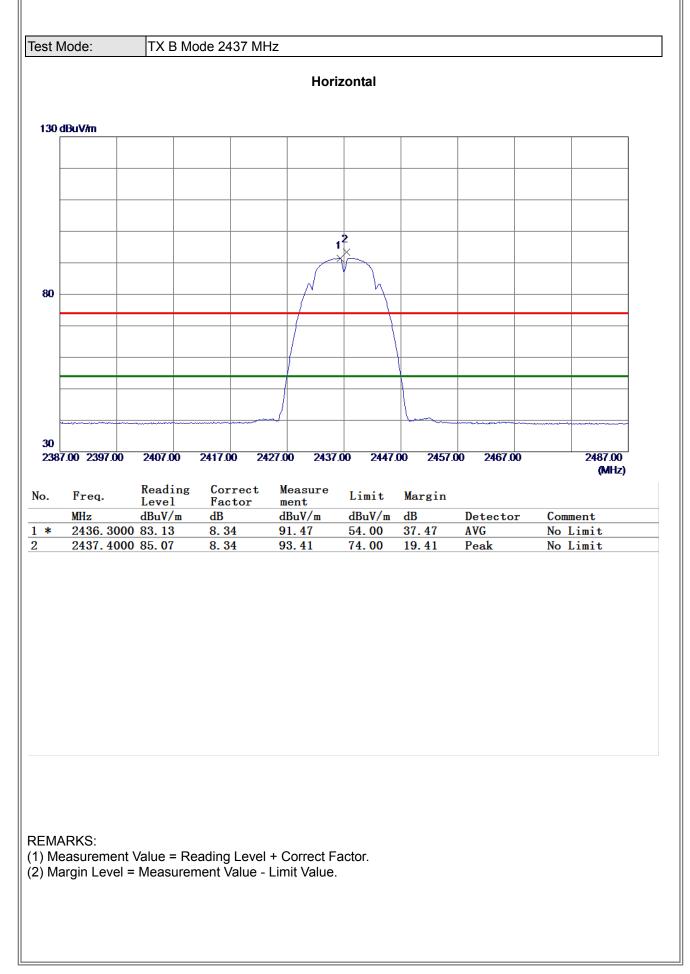




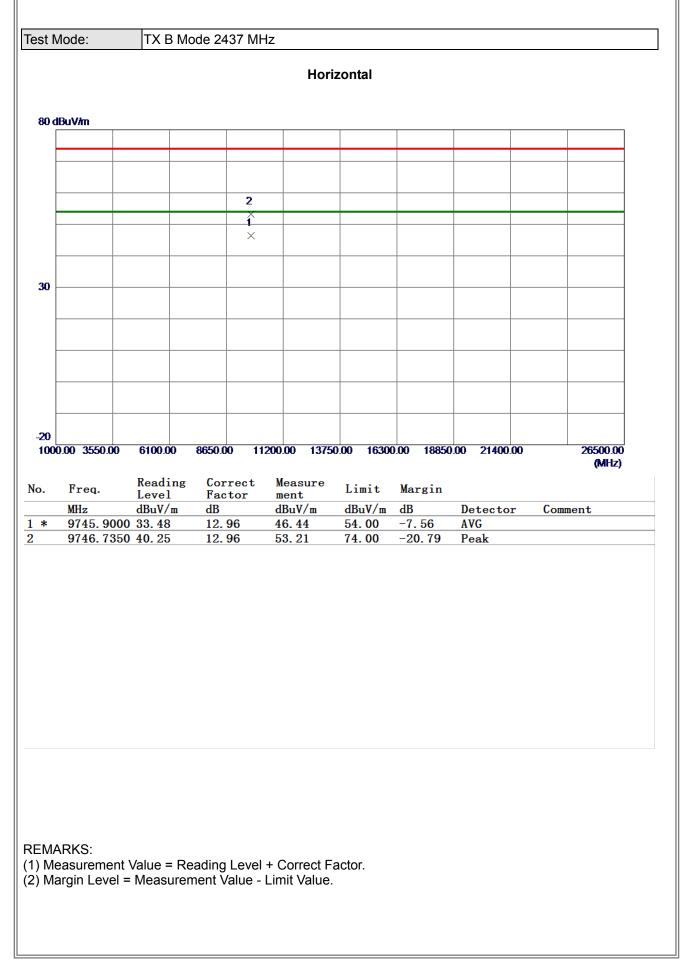




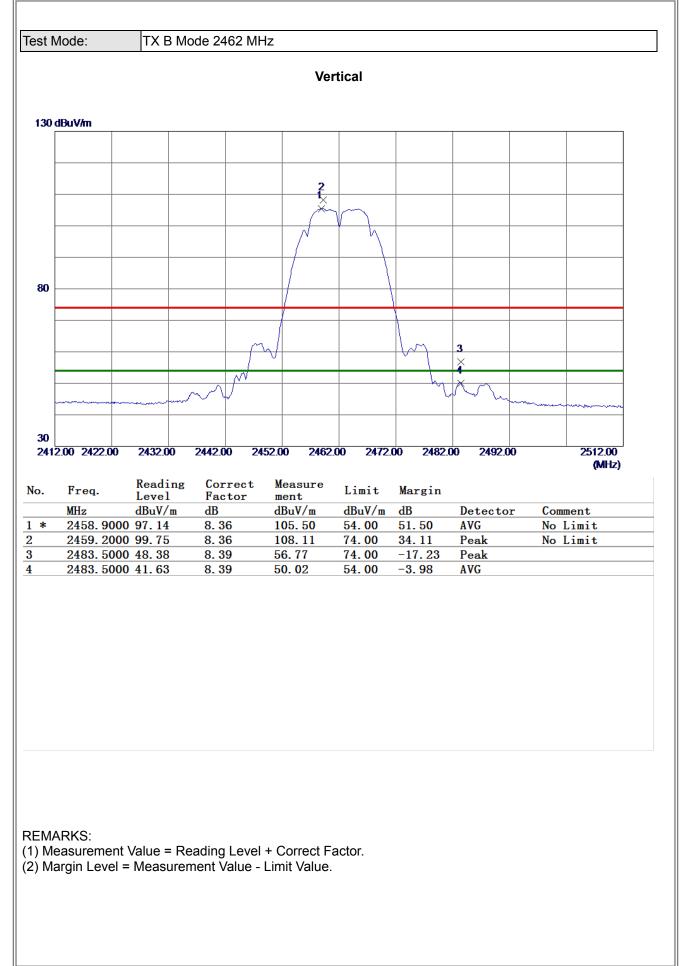




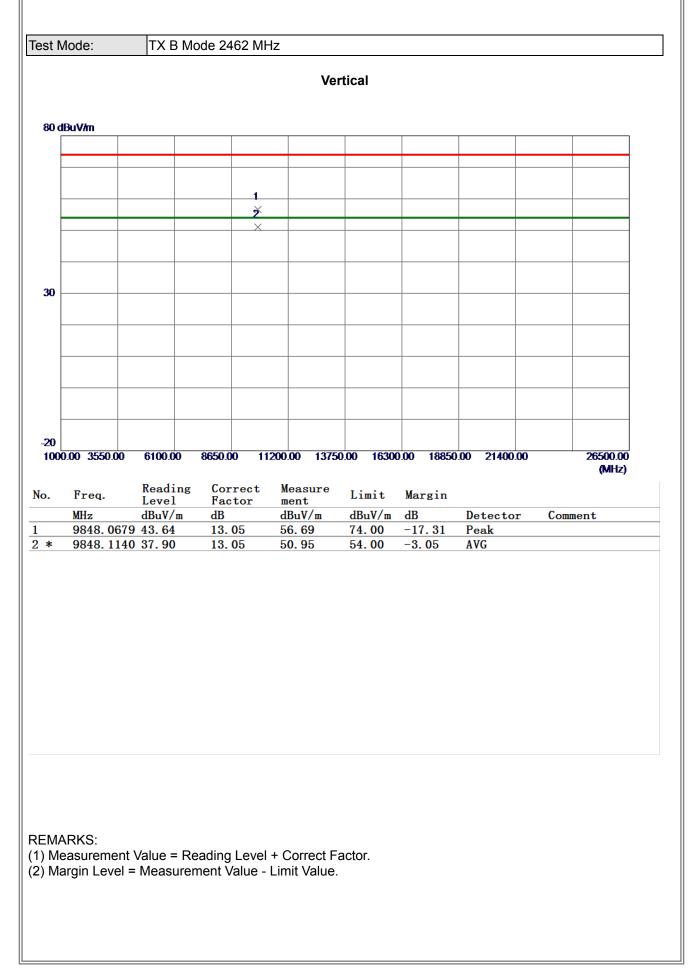




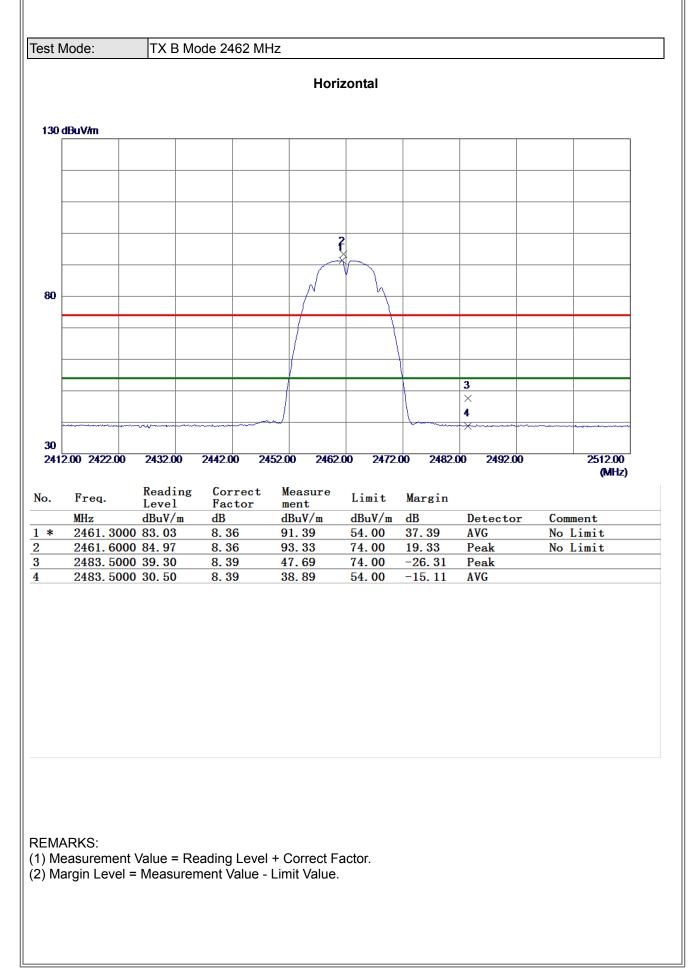




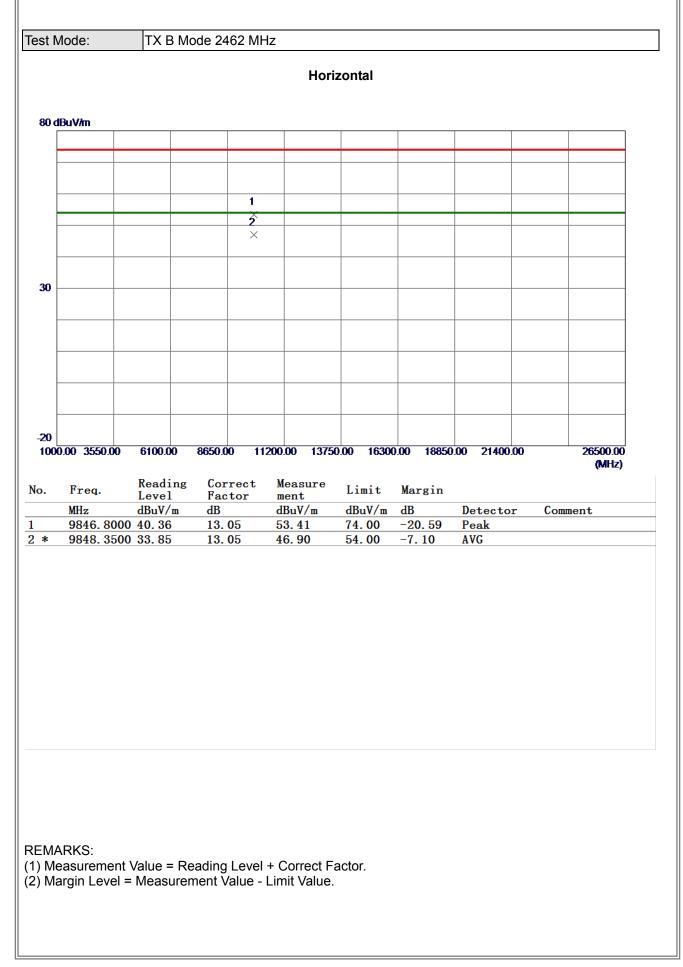




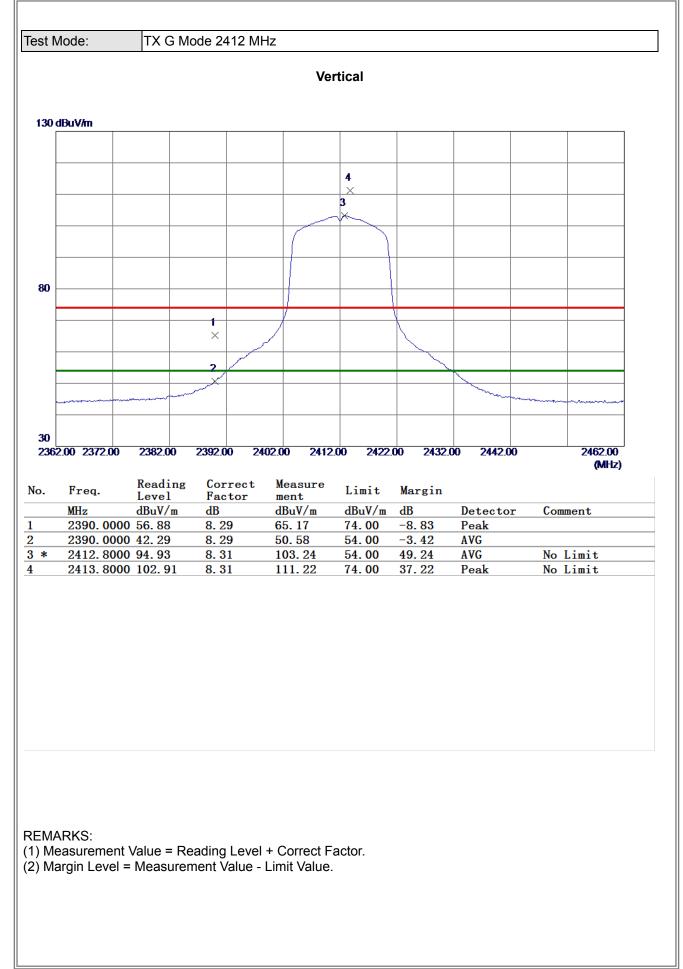




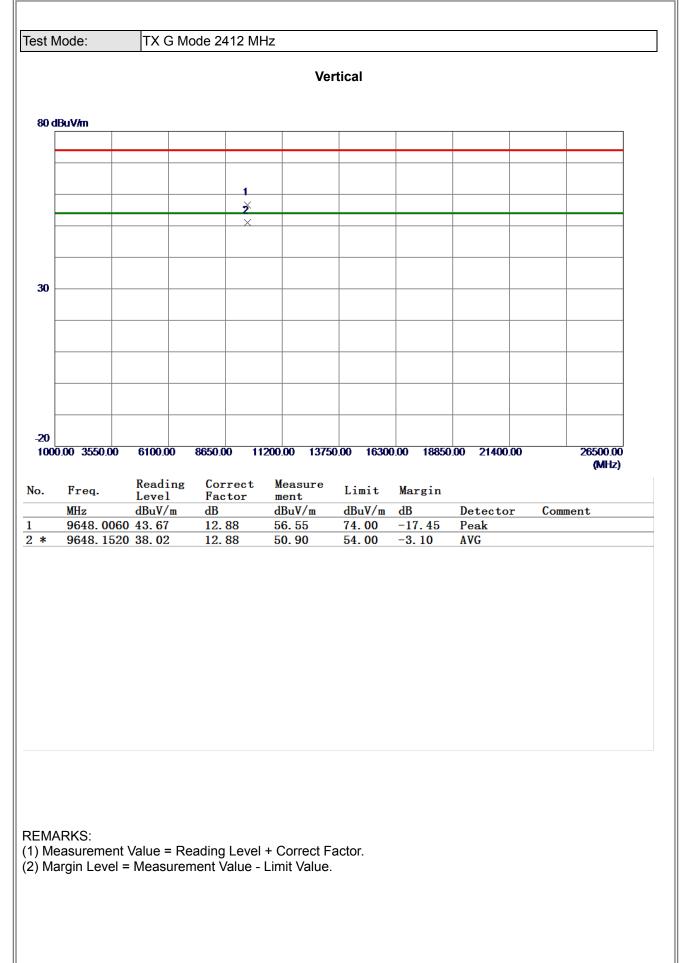




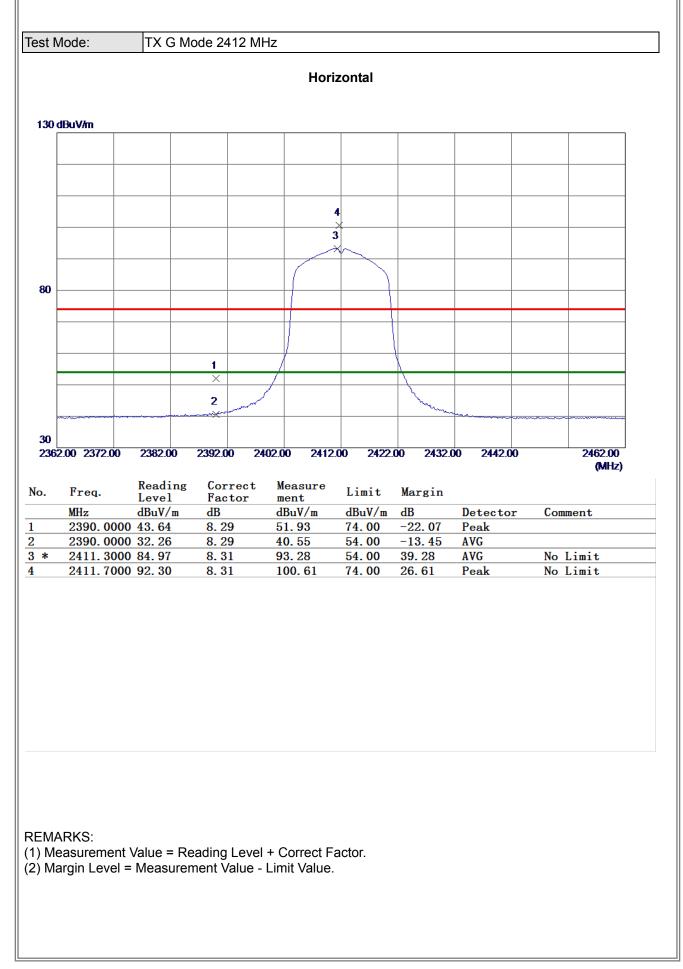




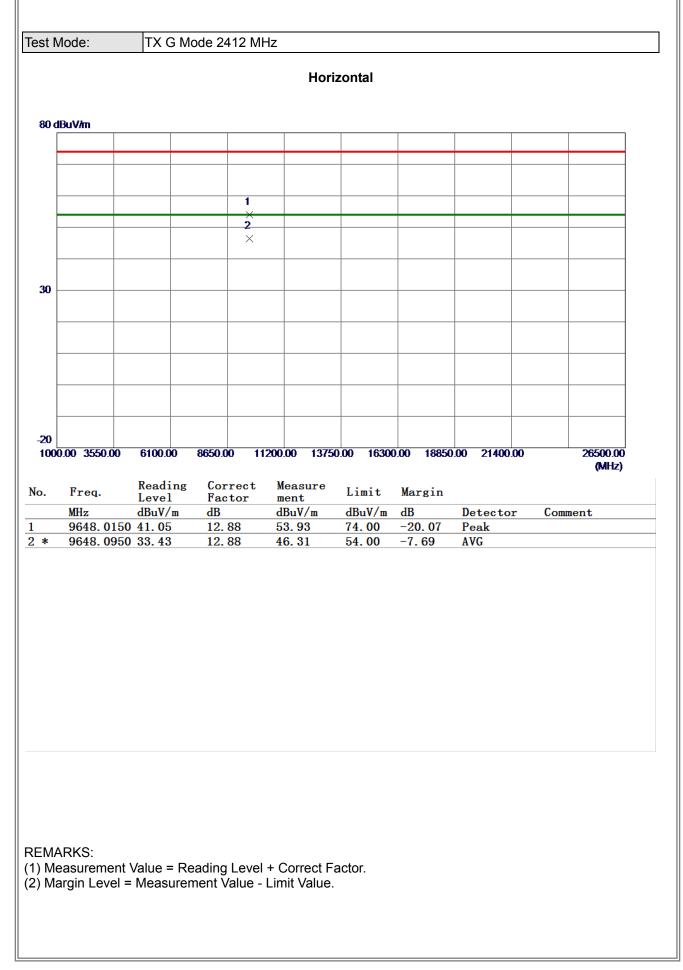




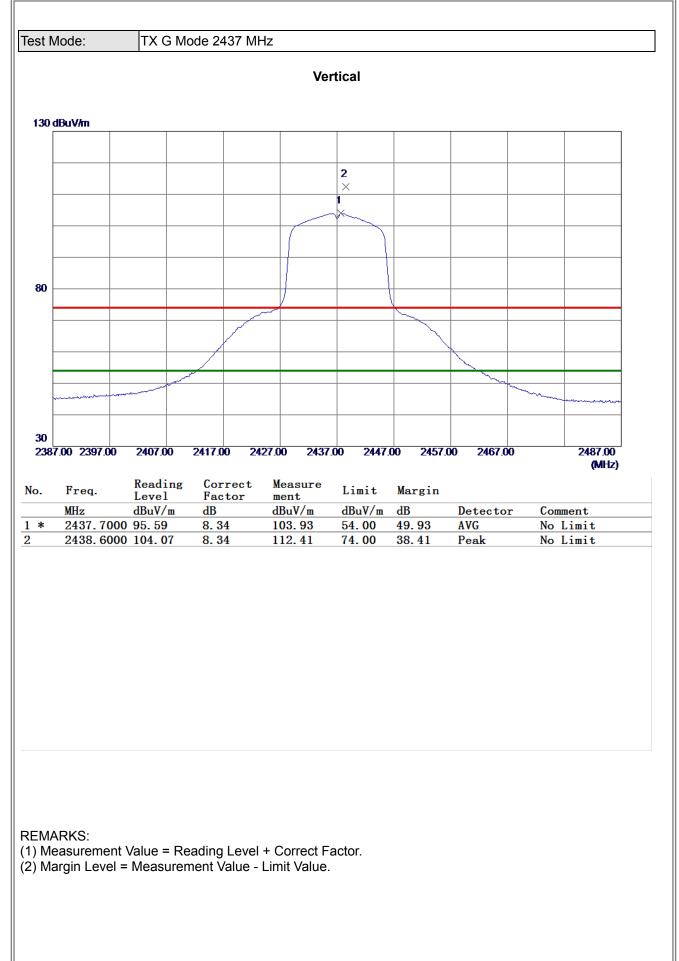




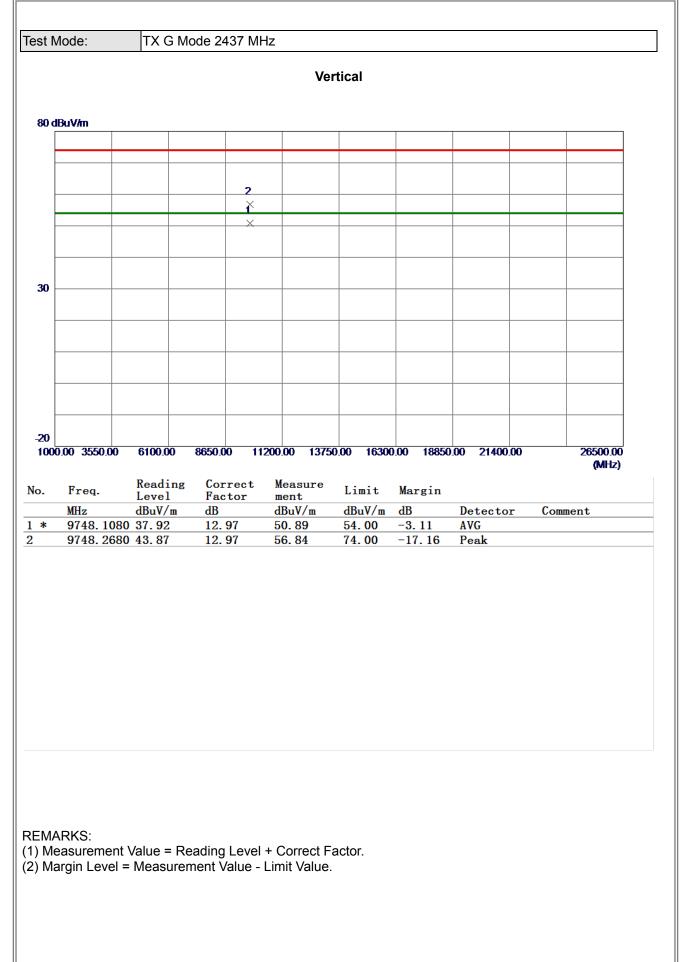




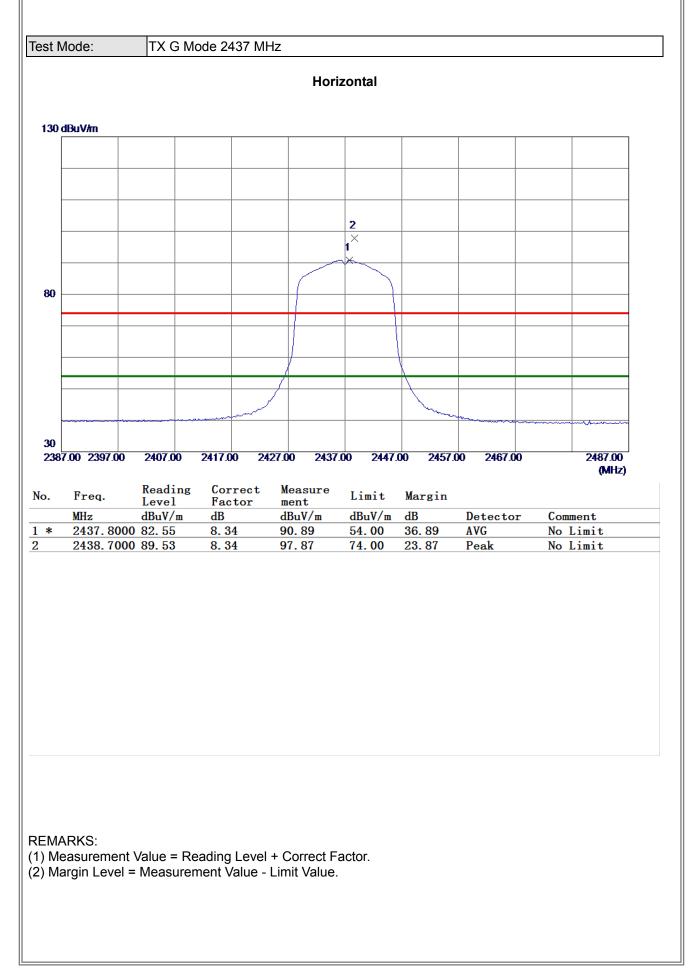




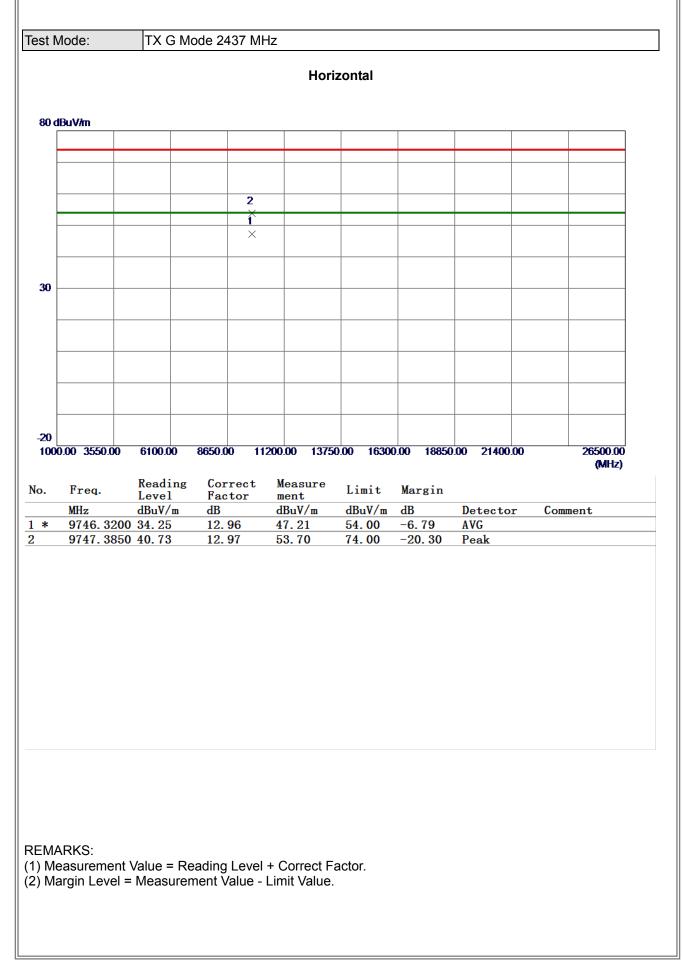




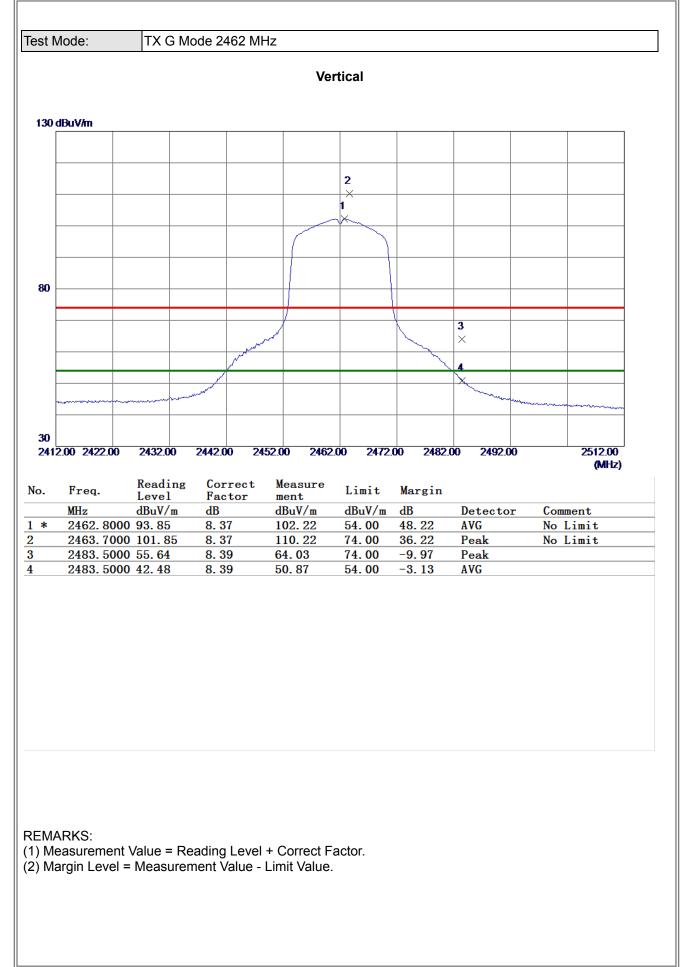




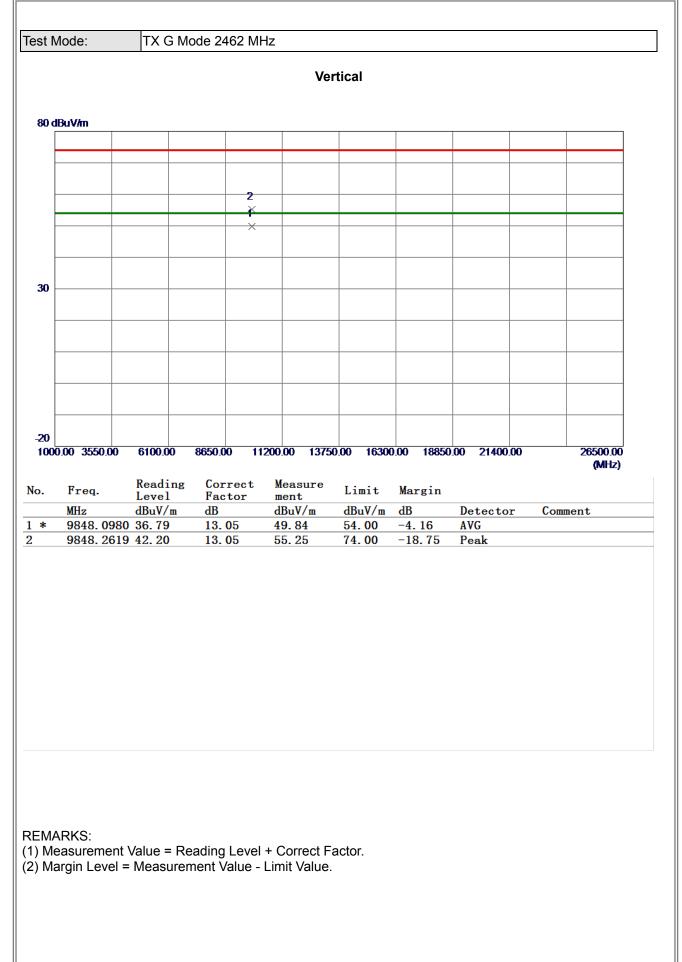




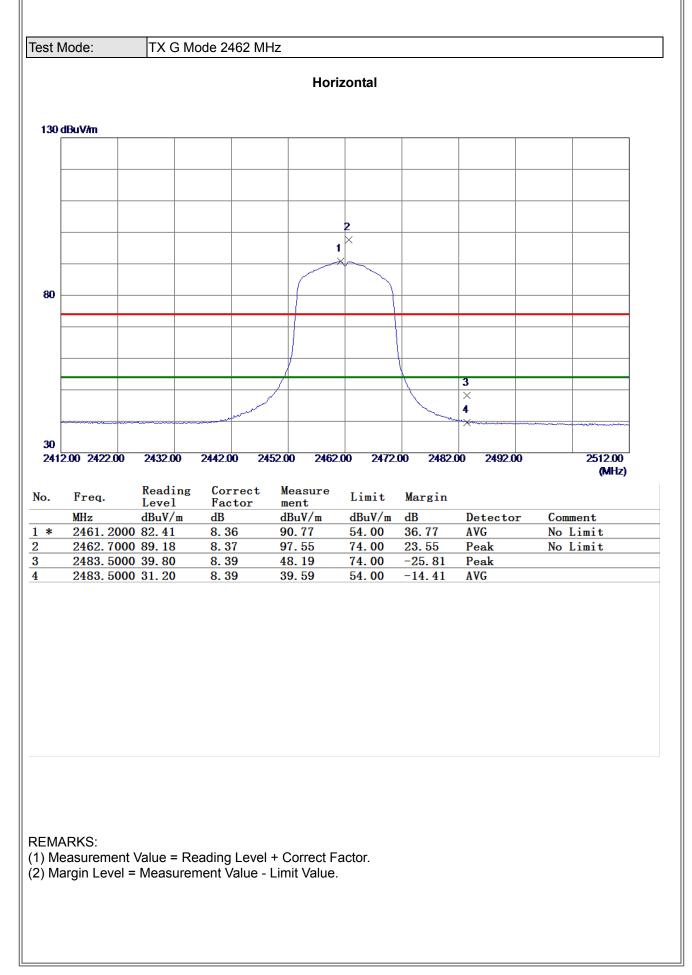




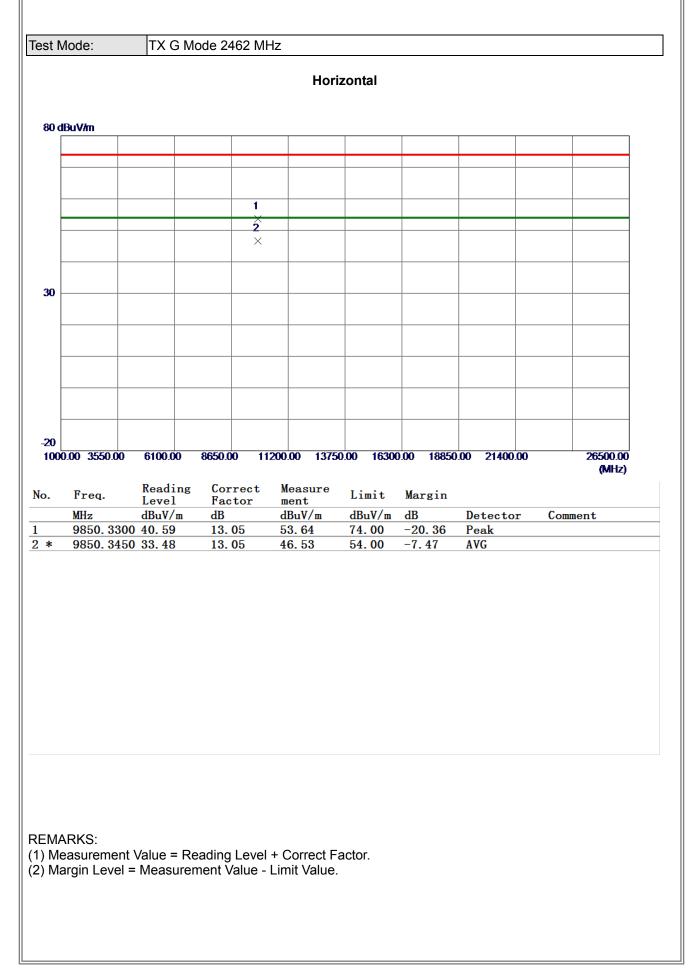




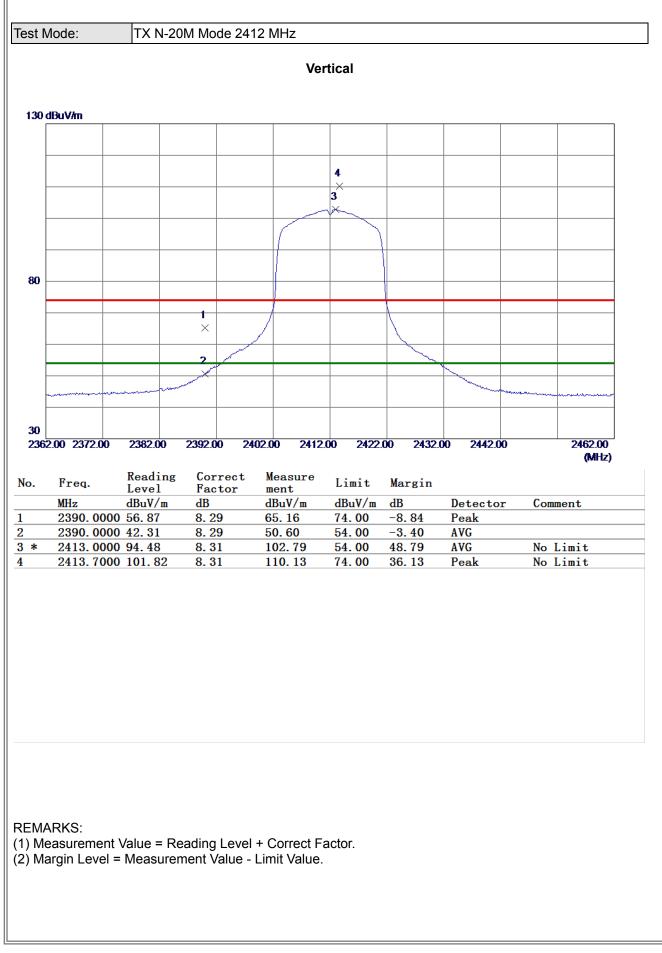




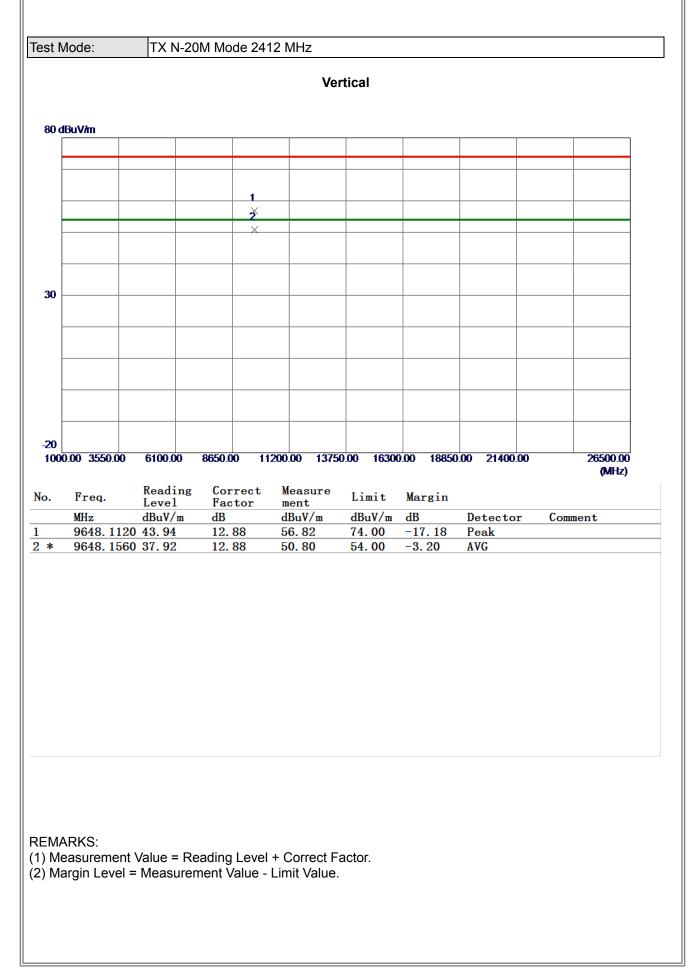




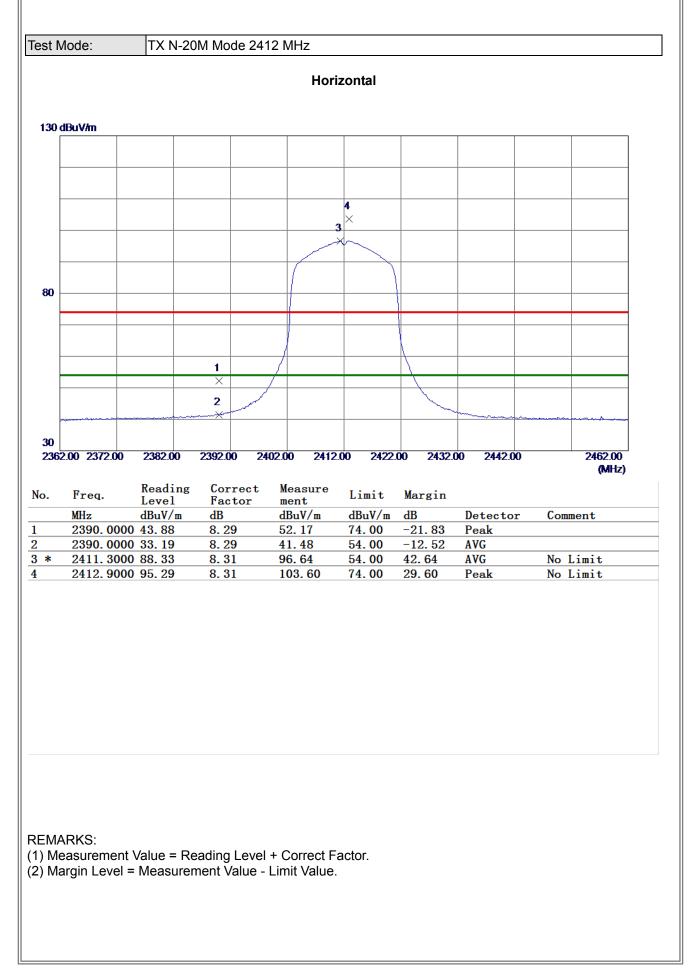




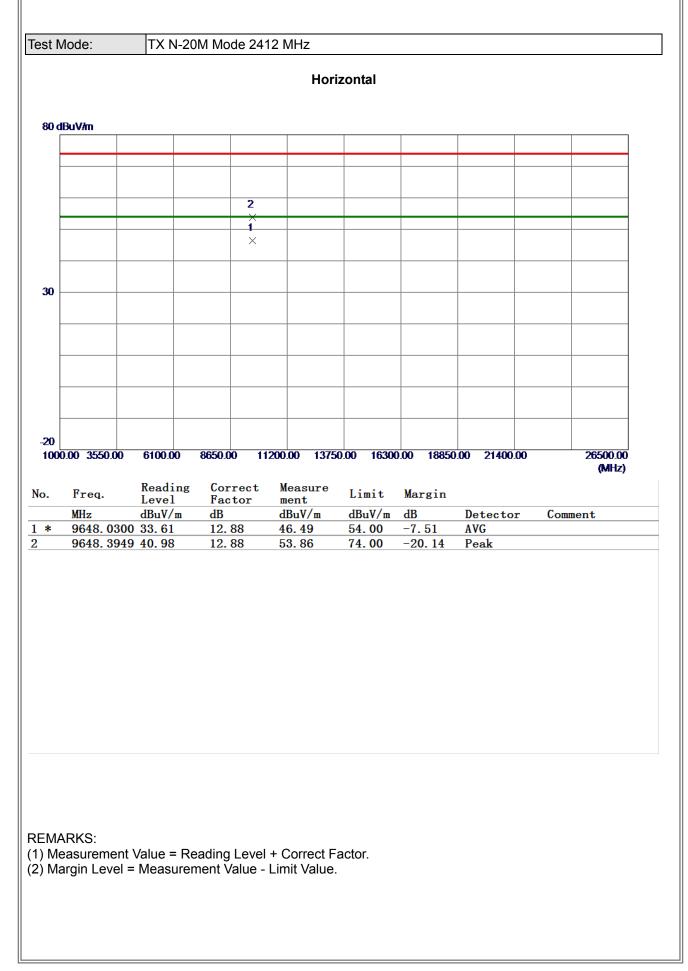




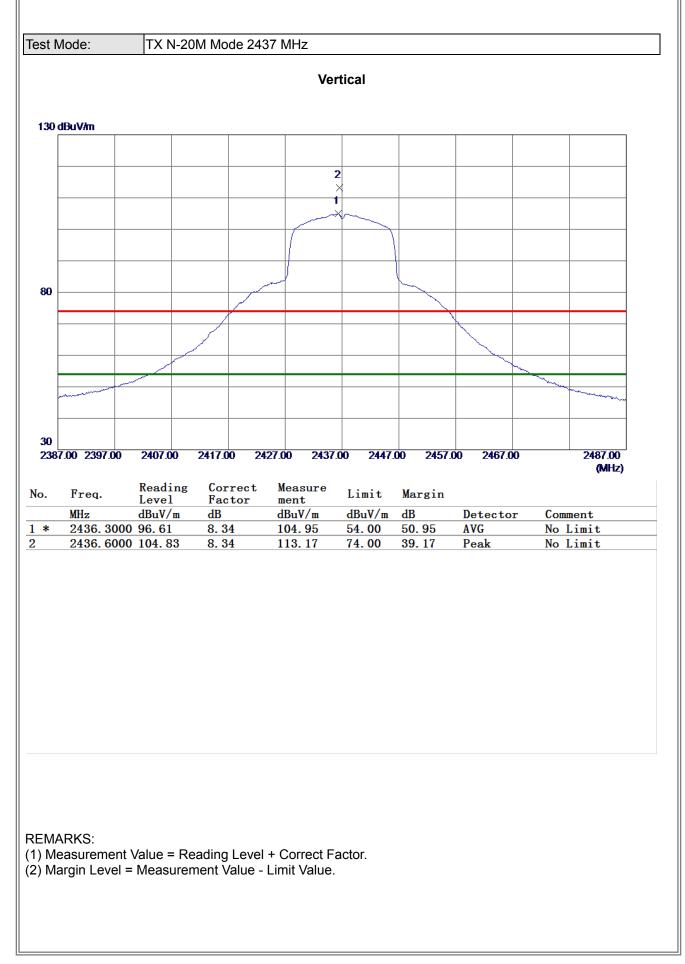




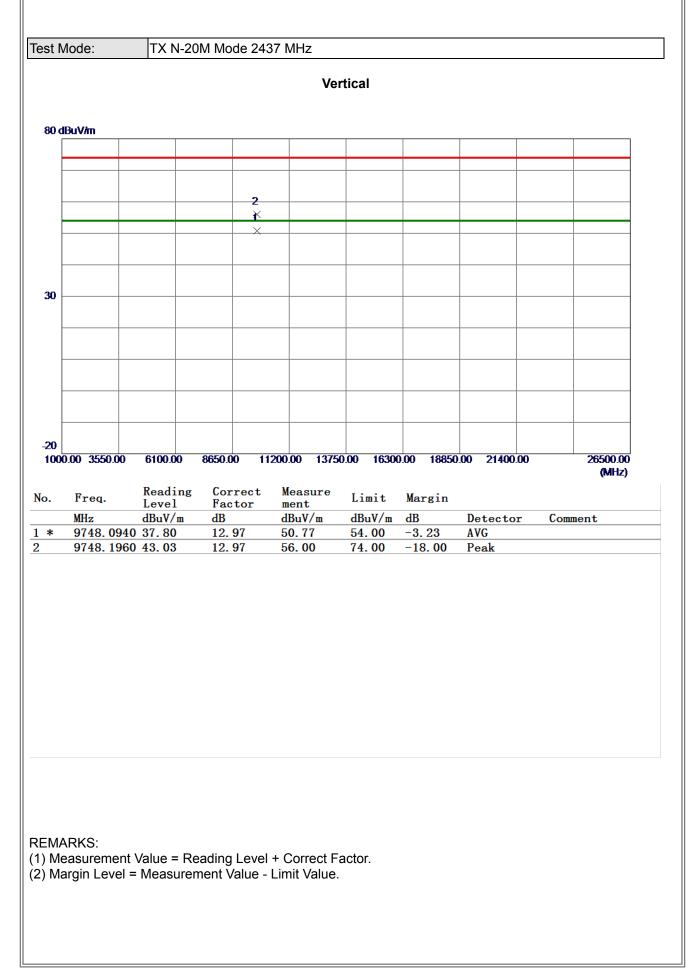




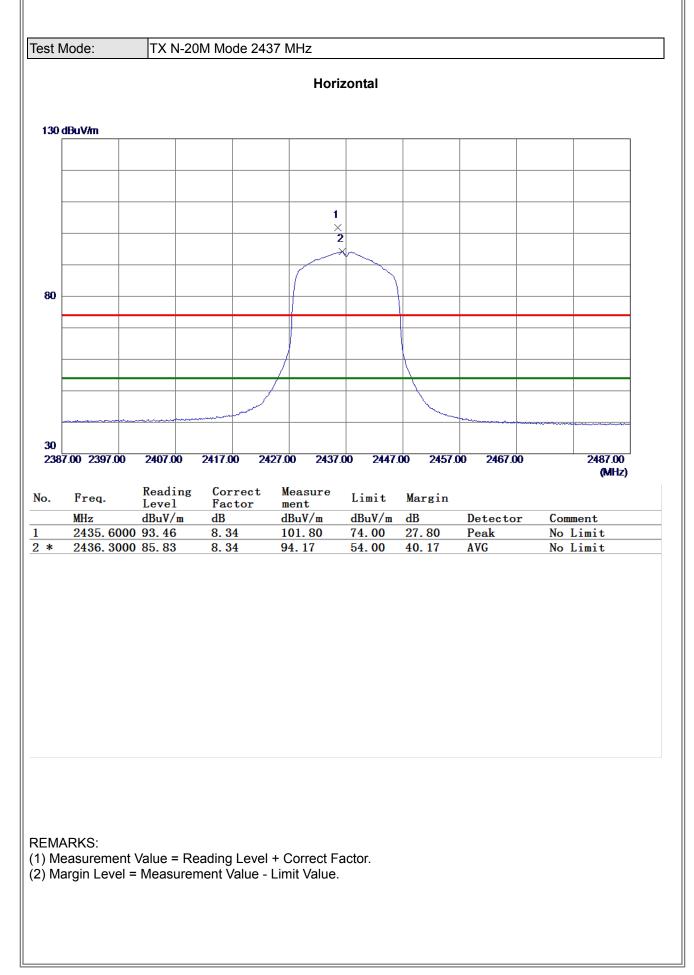




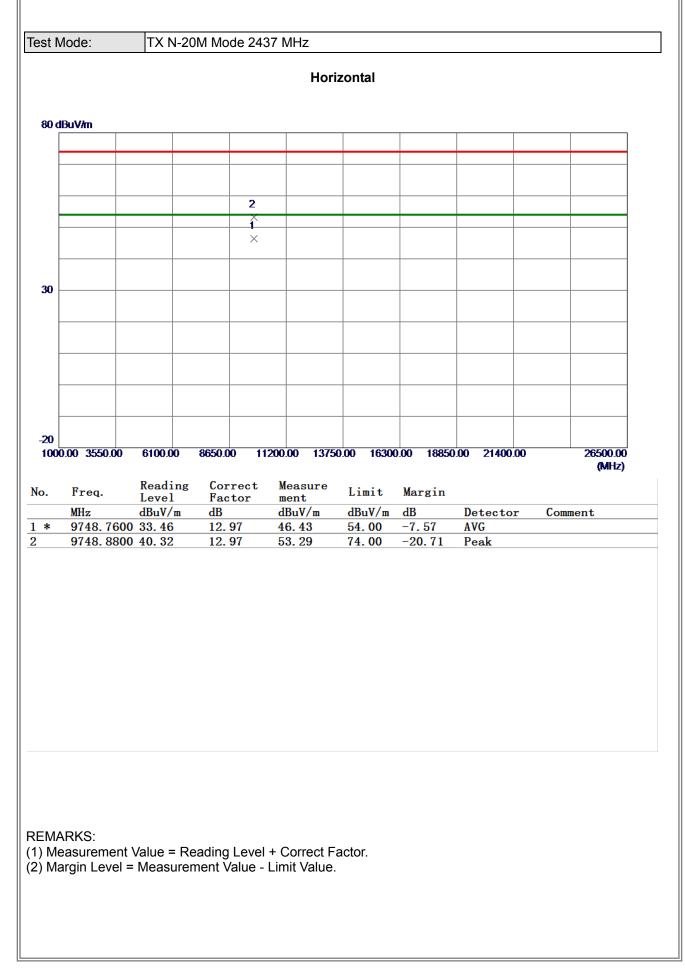




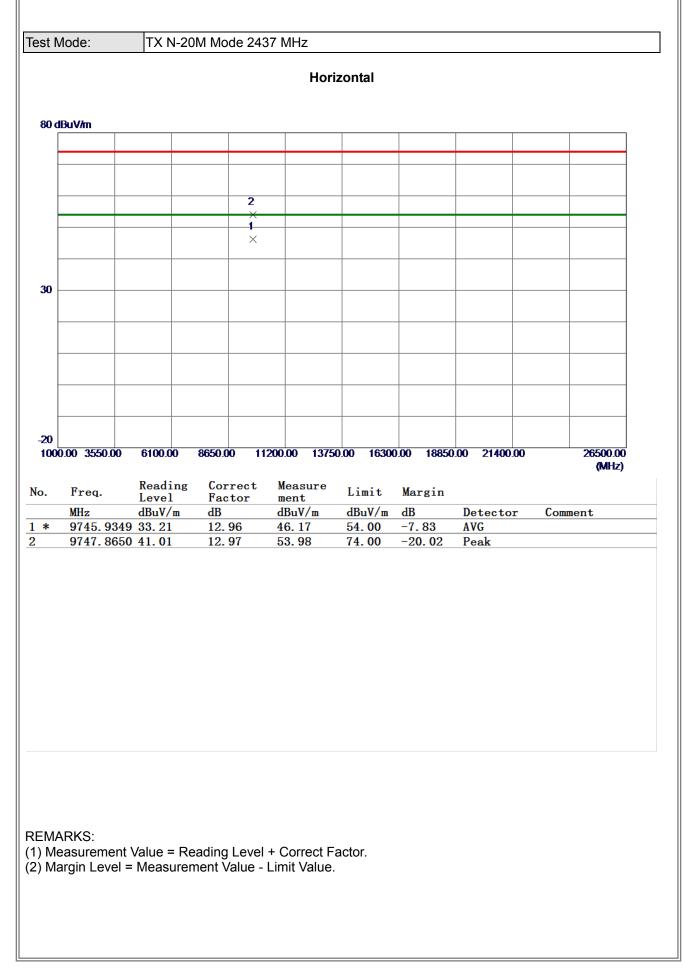




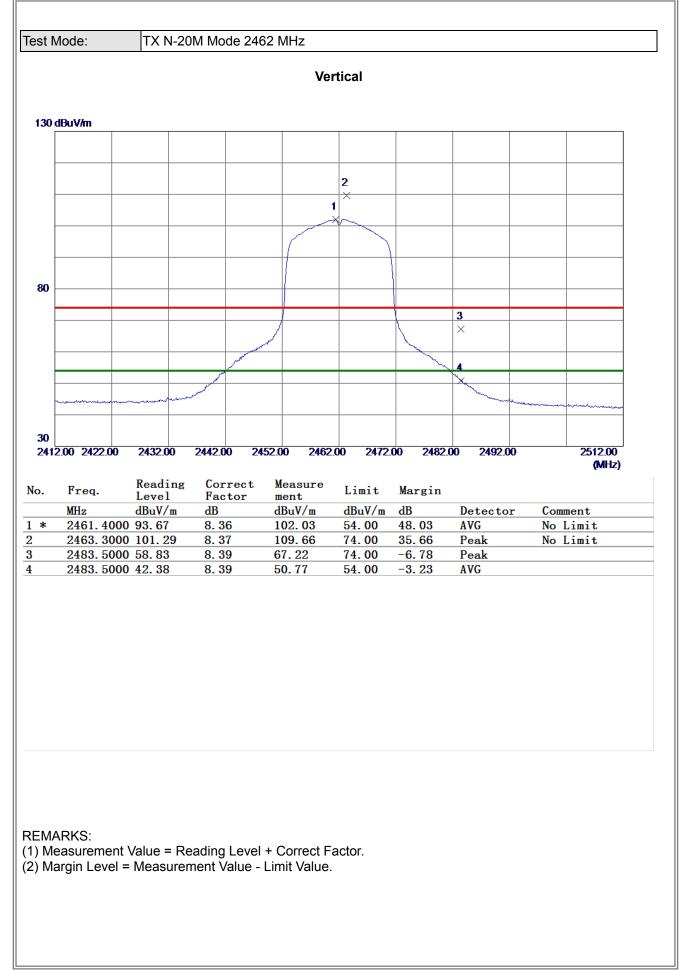




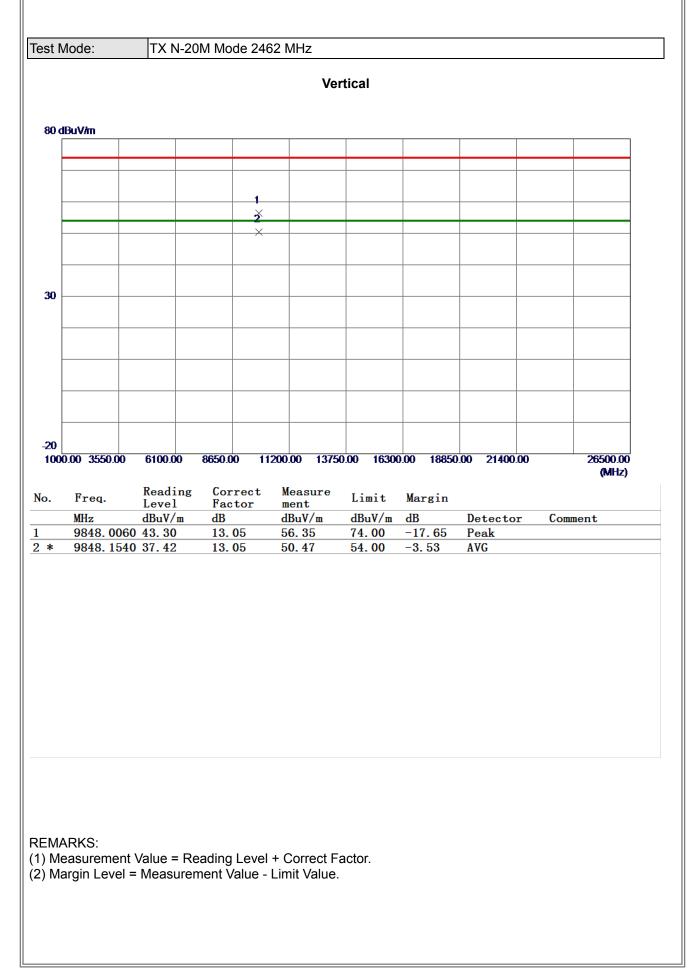




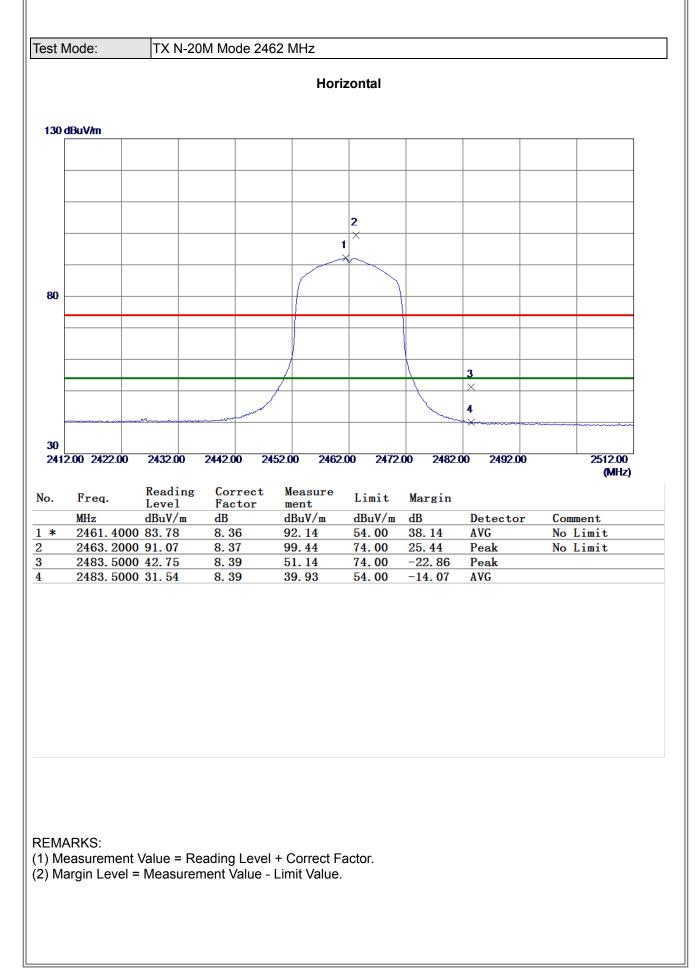




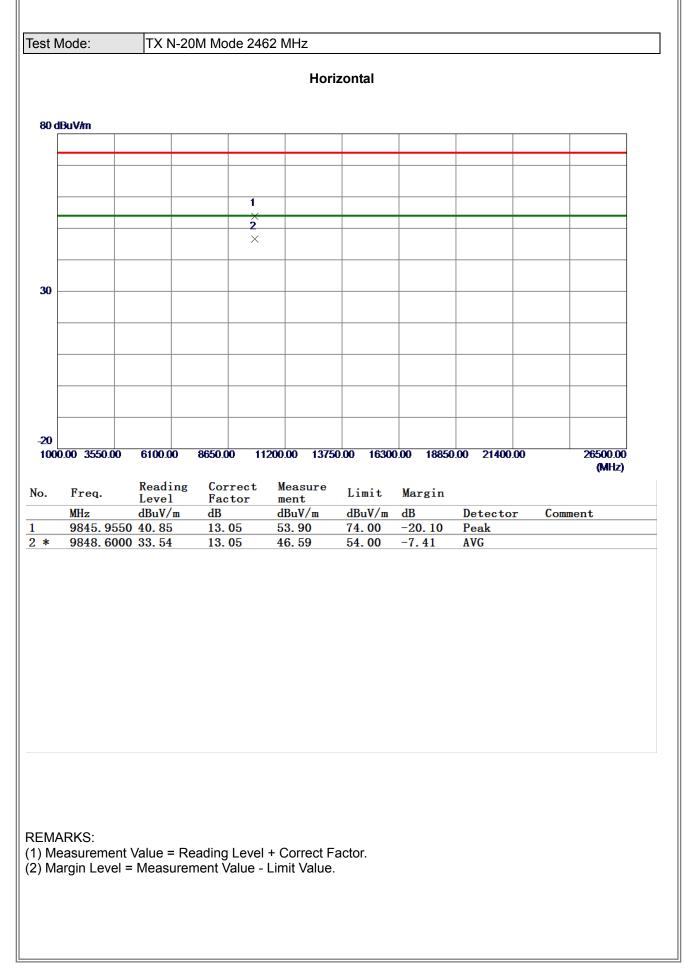




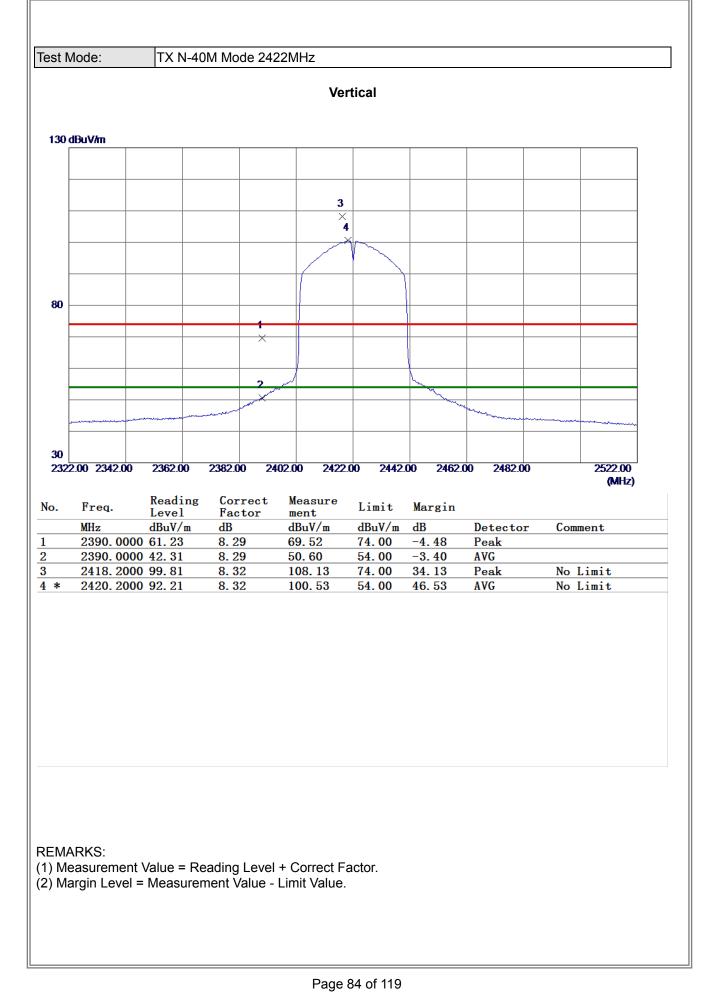




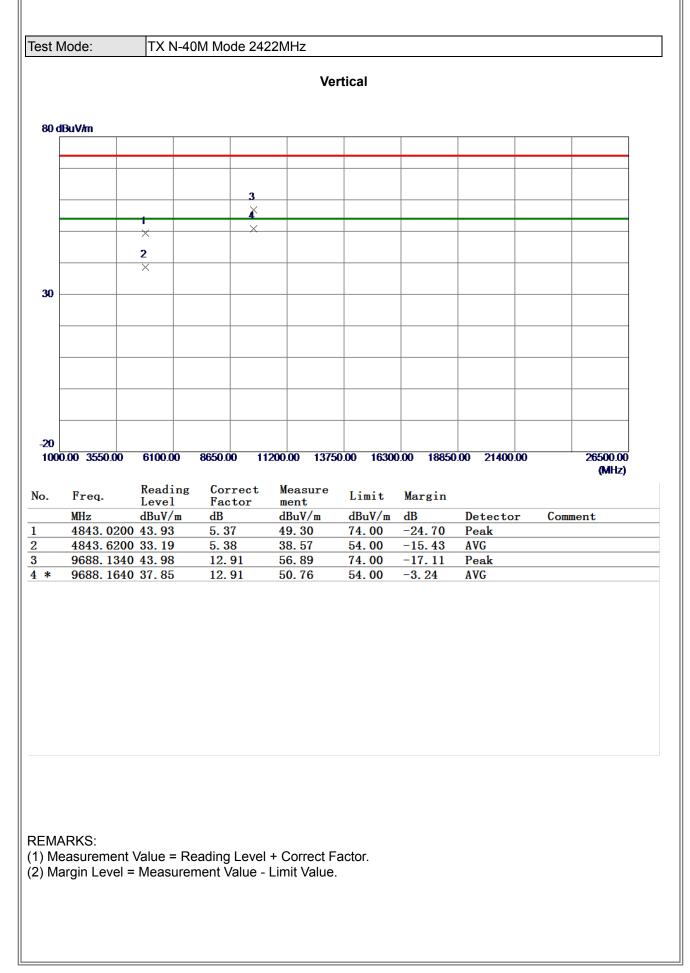




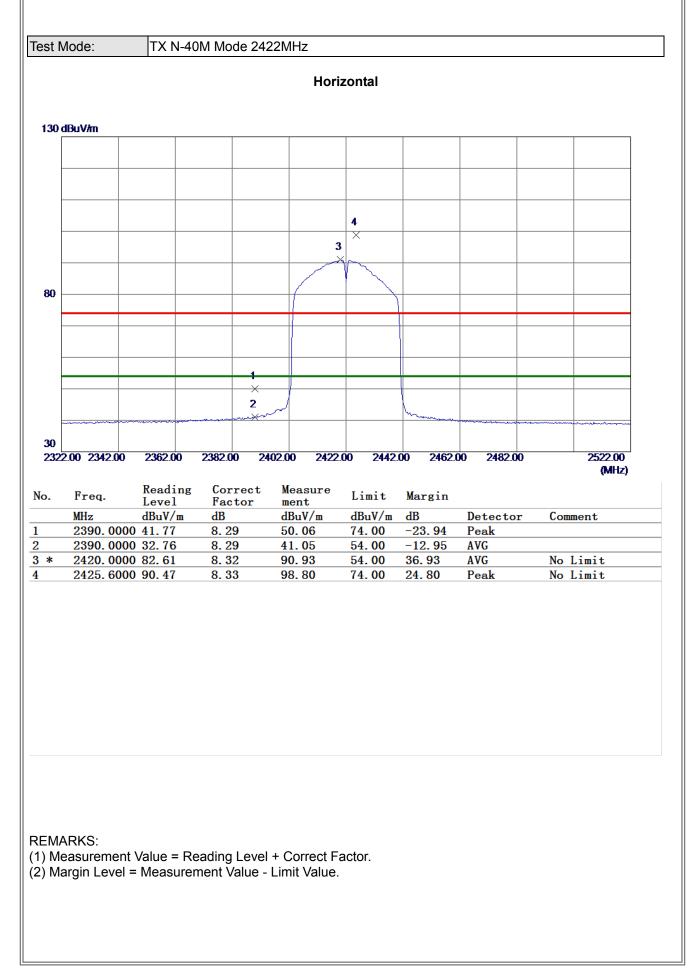




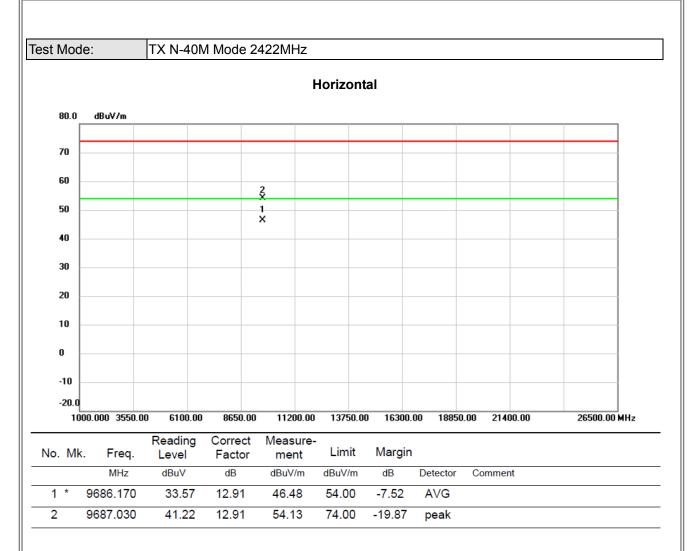






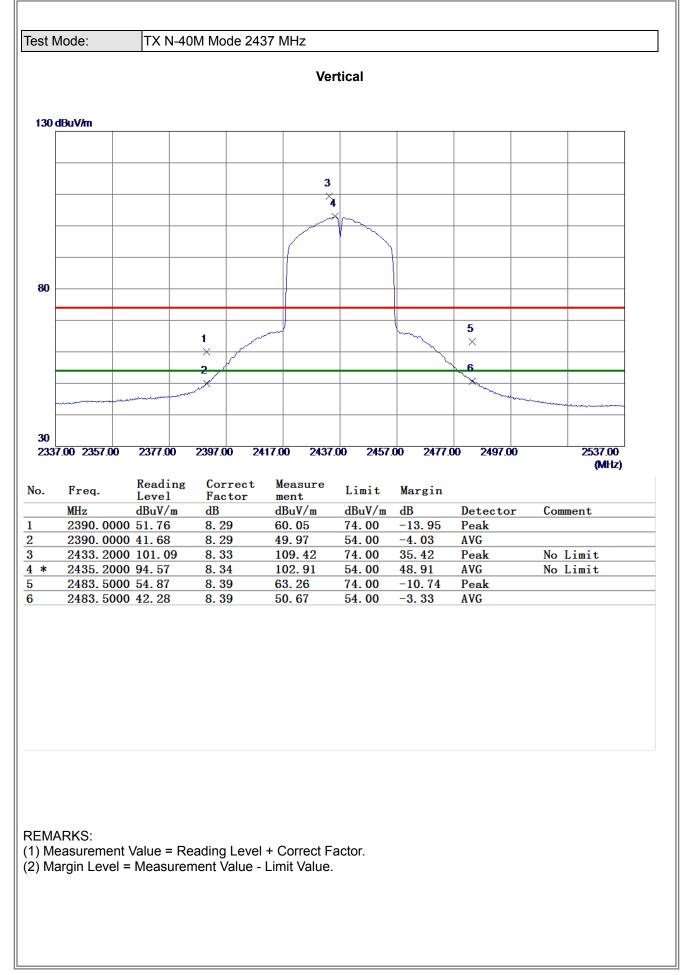




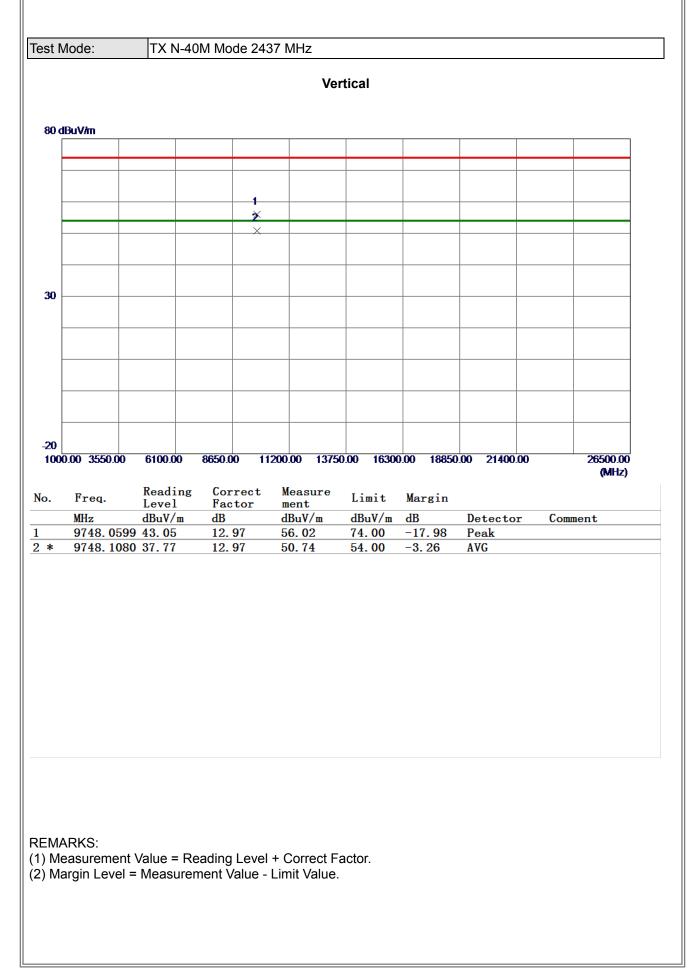


- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.

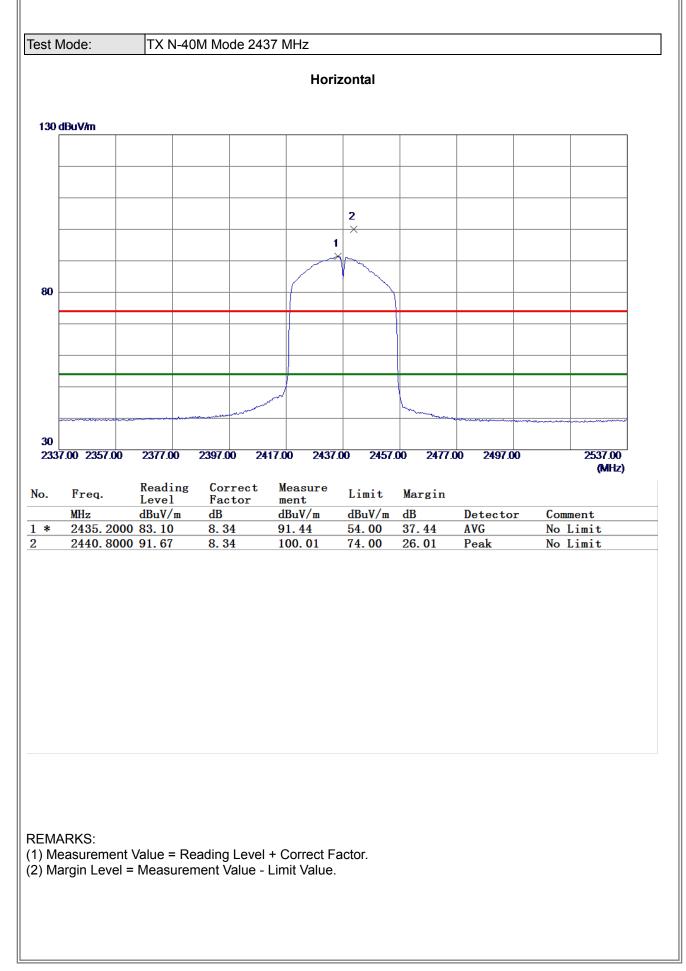




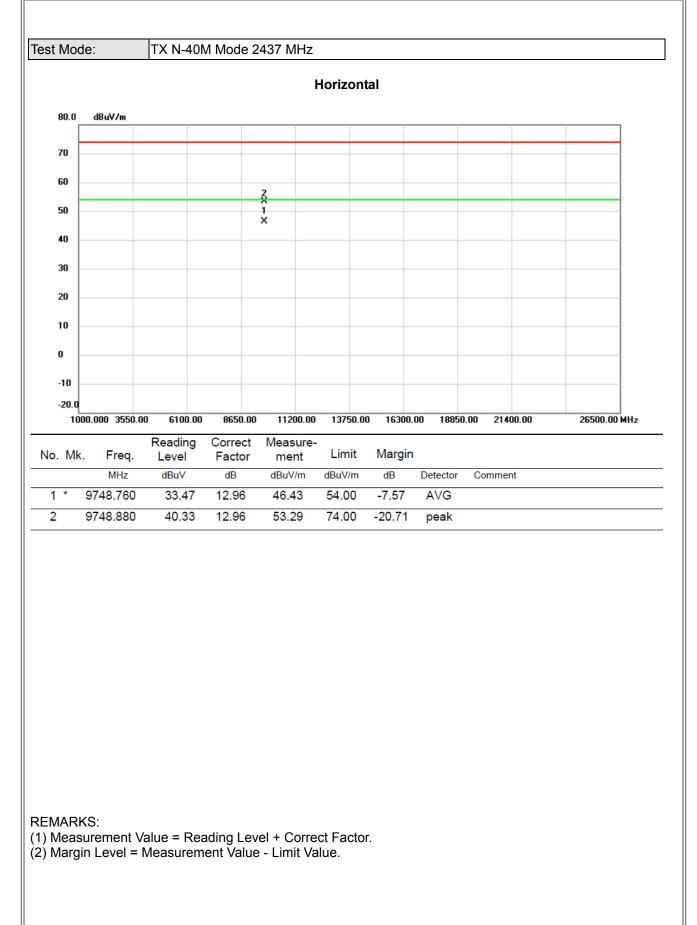




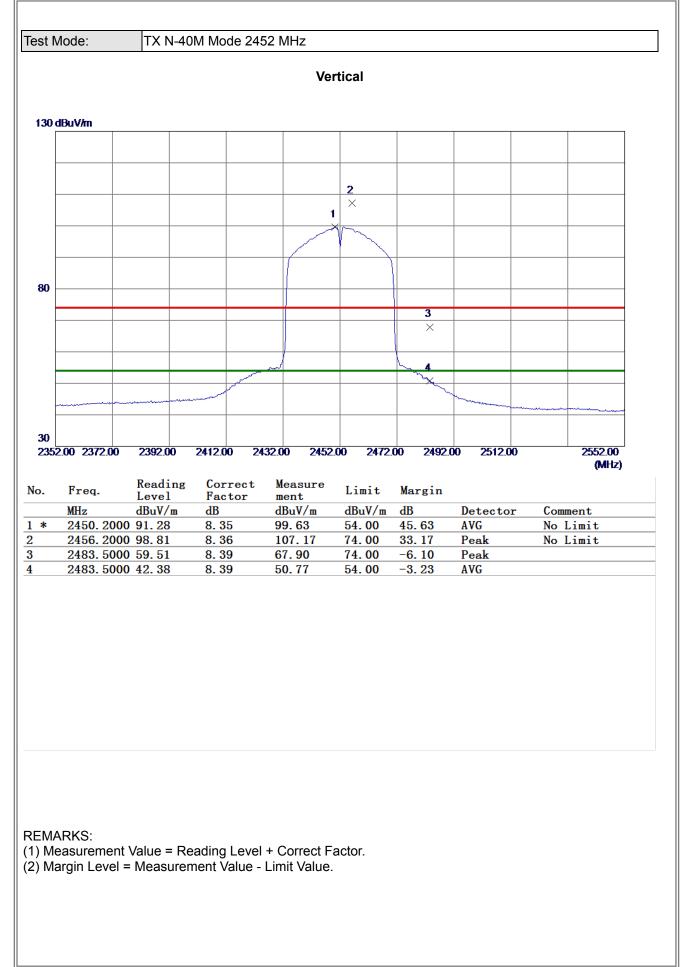




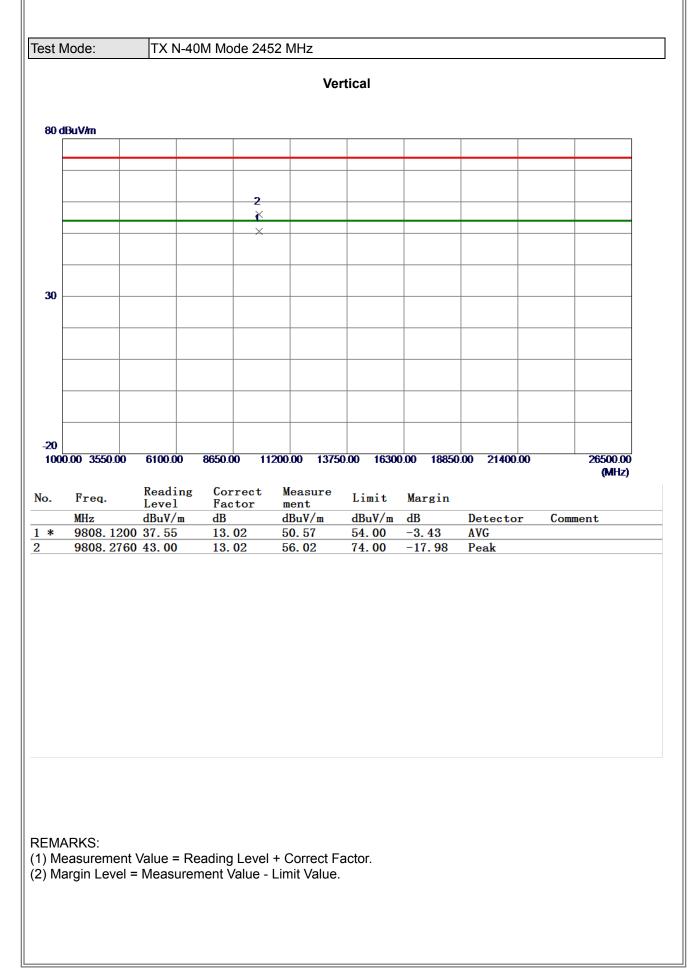




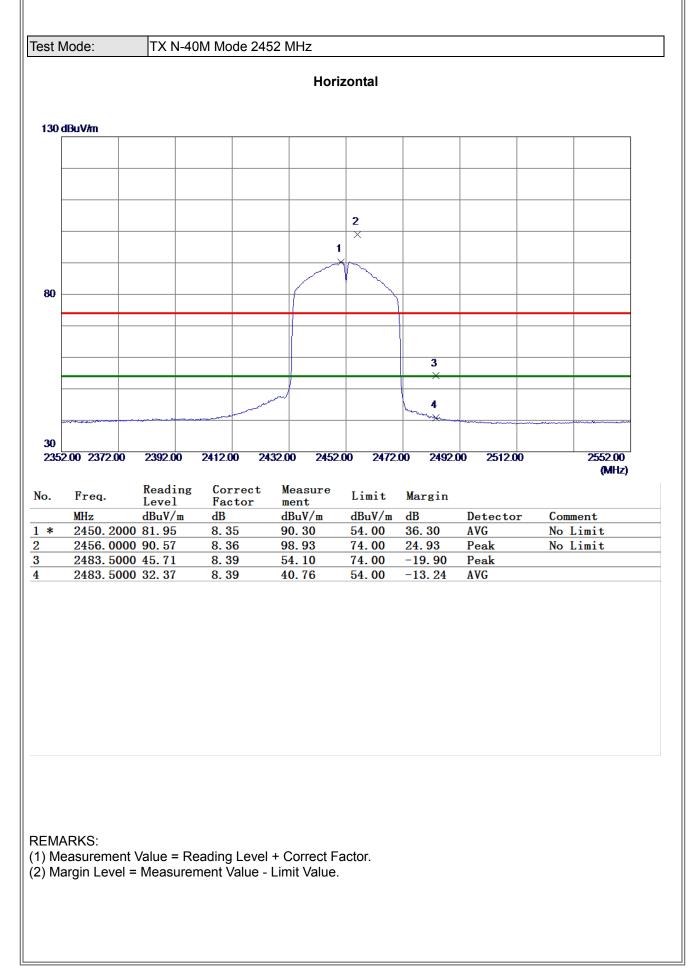




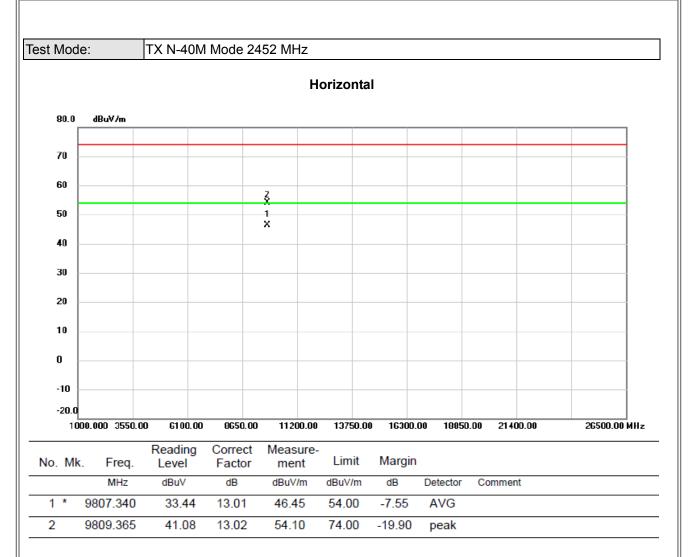






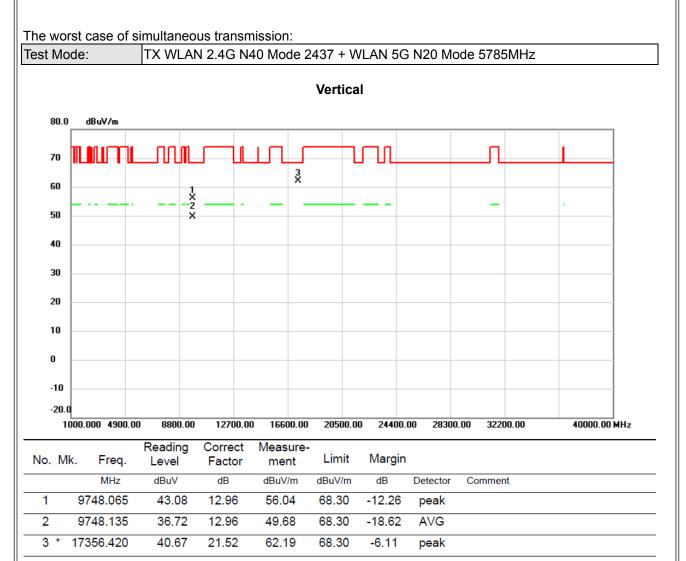






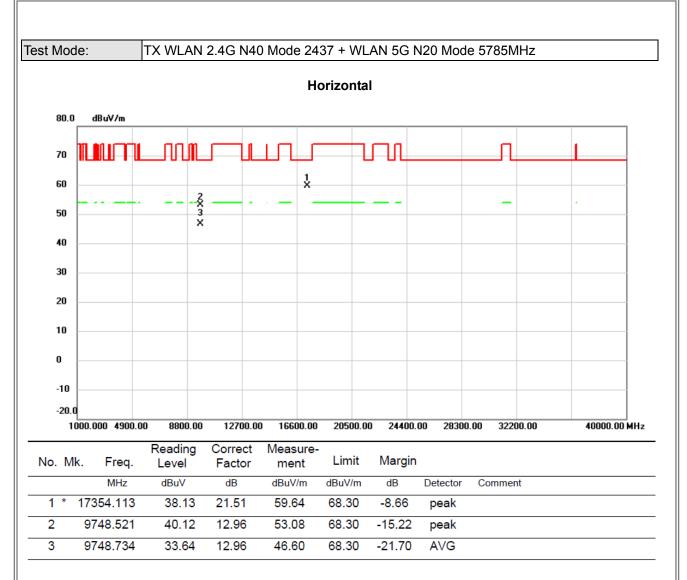
- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.





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





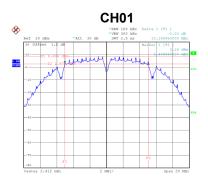
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



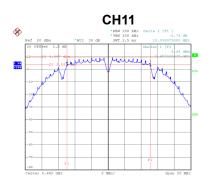
# **APPENDIX E - BANDWIDTH**



Test Mode	TX B Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
01	2412	10.15	500	Complies
06	2437	10.16	500	Complies
11	2462	10.10	500	Complies





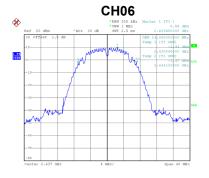


Date: 11.AUG.2020 10:33:23

Date: 11.AUG.2020 10:38:08

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	14.08	Complies
06	2437	14.08	Complies
11	2462	14.08	Complies







Date: 11.AUG.2020 10:33:32

Date: 11.AUG.2020 10:35:46

Date: 11.AUG.2020 10:38:16



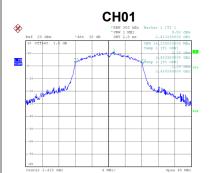
Test Mode	TX G Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
01	2412	13.86	500	Complies
06	2437	11.34	500	Complies
11	2462	14.24	500	Complies
8	<b>H01</b> 100 kHz Delta 1 [T1 ] TRM 300 kHz -1.26 dB T 2.5 mo 13.8596300 MHz	• VBW 300 kEz	1 (71 )	H111 *RMM 100 kHz Delts 1 [T1 ] *VRM 300 kHz 1.09 GB SVT 2.5 ms 14.2399000 (HHz
	Alexand 1 (7) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10         01         10<	4.79 dBm	

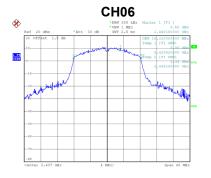
Date: 11.AUG.2020 10:40:11

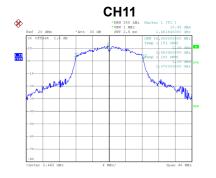
Date: 11.AUG.2020 10:42:36

Date: 11.AUG.2020 10:44:31

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
01	2412	16.32	Complies
06	2437	16.32	Complies
11	2462	16.40	Complies







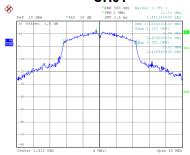
Date: 11.AUG.2020 10:40:19

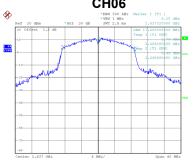
Date: 11.AUG.2020 10:42:43

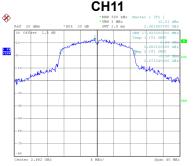
Date: 11.AUG.2020 10:44:39



Test Mode	TX N-20M Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
01	2412	13.88	500	Complies
06	2437	15.06	500	Complies
11	2462	13.88	500	Complies
A	H011 Ram 100 km: Delta 1 [T1 ] JVM 300 km: 1.22 cm	€ CH06	C	+RMM 100 kHz Delta 1 (T1 ) *RMM 100 kHz Delta 1 (T1 ) 2.16 dB
20 Offset 1.5 dB		NET         20 GBM         Art         30 GB         (MT 2, 5, 80)         1           Image: State of the	s.cectorizio inte 1 1 175 () de construir de la construir	207 2.5 MD 13.07990000 MHz
Channel	Frequency (MHz)	99 % Emissio	n Bandwidth (MHz)	Result
01	2412	17.60		Complies
06	2437	17.60		Complies
11	2462	17.92 Co		Complies
	H01 RBW 300 KHz Marker 1 (71 )	CH06	-	-RBM 300 kHz Marker 1 (71 )







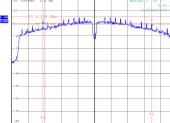
Date: 11.AUG.2020 10:46:50

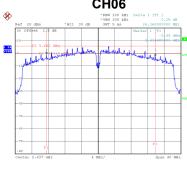
Date: 11.AUG.2020 10:48:54

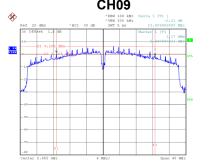
Date: 11.AUG.2020 10:50:58



Test Mode	TX N-40M Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (kHz)	Result
03	2422	26.36	500	Complies
06	2437	26.36	500	Complies
09	2452	23.91	500	Complies
Cł	403	CH06	С	H09
Ref 20 dBm *Att 30 dB S	MT 5 ma 26.36000000 MHz Marker 1 73 - 0.63 dBm 240435000 gHz	**************************************	0.25 (dB	300         100         100         -0,1         00           300         100         -0,1         00         100         100           301         50         100

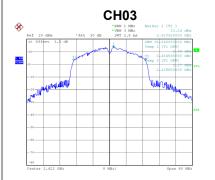


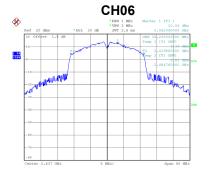


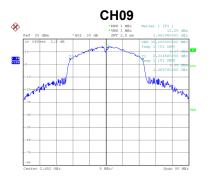


Date: 11.AUG.2020 10:55:58

Channel	Frequency (MHz)	99 % Emission Bandwidth (MHz)	Result
03	2422	35.04	Complies
06	2437	35.20	Complies
09	2452	35.20	Complies







Date: 11.AUG.2020 10:56:06

Date: 11.AUG.2020 10:58:20

Date: 11.AUG.2020 10:58:12

Date: 11.AUG.2020 11:00:26

Date: 11.AUG.2020 11:00:18



# **APPENDIX F - MAXIMUM OUTPUT POWER**



Non-Beamforming				
Test Mode	TX B Mode			
Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (W)	Result
01	2412	21.37	1.0000	Complies
06	2437	21.85	1.0000	Complies
11	2462	22.49	1.0000	Complies
Test Mode	TX G Mode			
	-		<b>NA</b> 1.1.11	

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (W)	Result
01	2412	23.73	1.0000	Complies
06	2437	24.11	1.0000	Complies
11	2462	23.62	1.0000	Complies



Test Mode TX N-20M Mode_Ant. 1					
Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (W)	Result	
01	2412	20.19	1.0000	Complies	
06	2437	22.57	1.0000	Complies	
11	2462	20.88	1.0000	Complies	

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

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (W)	Result
01	2412	22.07	1.0000	Complies
06	2437	23.69	1.0000	Complies
11	2462	22.54	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	24.24	30.00	1.0000	Complies
06	2437	26.18	30.00	1.0000	Complies
11	2462	24.80	30.00	1.0000	Complies



Test Mode TX N-40M Mode_Ant. 1						
Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (W)	Result		
03	2422	19.22	1.0000	Complies		
06	2437	22.55	1.0000	Complies		
09	2452	22.11	1.0000	Complies		

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

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (W)	Result
03	2422	20.37	1.0000	Complies
06	2437	23.37	1.0000	Complies
09	2452	22.64	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	22.84	30.00	1.0000	Complies
06	2437	25.99	30.00	1.0000	Complies
09	2452	25.39	30.00	1.0000	Complies



06

11

2437

2462

			Beamformi	ng			
Test Mode	TX N-20M Mode	e_Ant. 1		•			
Channel	Frequenc (MHz)	у	Peak Output P (dBm)	ower		k. Limit (W)	Result
01	2412		20.22		1.	0000	Complies
06	2437		21.76		1.	0000	Complies
11	2462		20.57		1.	0000	Complies
Test Mode	TX N-20M Mode	e_Ant. 2					
Channel	Frequency (MHz)		Peak Output Power (dBm)		-	k. Limit (W)	Result
01	2412		21.69		1.0000		Complies
06	2437		21.87		1.0000		Complies
11	2462	22.34		1.0000		Complies	
Test Mode	TX N-20M Mode_Total						
Channel	Frequency (MHz)	Peak			. Limit 3m)	Max. Limit (W)	Result
01	2412		24.03	30.00		1.0000	Complies

24.83

24.55

30.00

30.00

1.0000

1.0000

Complies

Complies



TX N-40M Mode_Ant. 1			
-		<b>NA</b> 1.5 %	
Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (W)	Result
2422	19.31	1.0000	Complies
2437	21.58	1.0000	Complies
2452	21.23	1.0000	Complies
	Frequency (MHz) 2422 2437	(MHz)         (dBm)           2422         19.31           2437         21.58	Frequency (MHz)         Peak Output Power (dBm)         Max. Limit (W)           2422         19.31         1.0000           2437         21.58         1.0000

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

Channel	Frequency (MHz)	Peak Output Power (dBm)	Max. Limit (W)	Result
03	2422	20.17	1.0000	Complies
06	2437	22.11	1.0000	Complies
09	2452	21.44	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	22.77	30.00	1.0000	Complies
06	2437	24.86	30.00	1.0000	Complies
09	2452	24.35	30.00	1.0000	Complies



# **APPENDIX G - CONDUCTED SPURIOUS EMISSIONS**



