



**SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch**

No. 1 Workshop, M-10, Middle section, Science & Technology Park,
Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053
Fax: +86 (0) 755 2671 0594
Email: ee.shenzhen@sgs.com

Report No.: SZEM170100059801
Page: 1 of 89

TEST REPORT

Application No.: SZEM1701000598CR
Applicant: iLuun Inc
Address of Applicant: 5005 Hillen Road, Baltimore, MD 21239 USA
Manufacturer: Shenzhen Damai Technology Co., Ltd.
Address of Manufacturer: 5/F. 1 Building, Financial Base, No.8 kefa Road, High-Tech Park, Shenzhen, China
Factory: Global Brands Manufacture Ltd
Address of Factory: Hunagjiang town, Dongguan City, Guangdong province
Product Name: iLuun Air
Model No.: IA1209
Trade mark: iLuun
FCC ID: 2AK46-A4
Standards: 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2017-01-22(for original report SZEM170100059701)
Date of Test: 2017-02-16 to 2017-03-06(for original report SZEM170100059701)
Date of Issue: 2017-03-14(for original report SZEM170100059701)
2017-03-24(for new report SZEM SZEM170100059801)

Test Result :	Pass*
----------------------	--------------

* In the configuration tested, the EUT complied with the standards specified above.



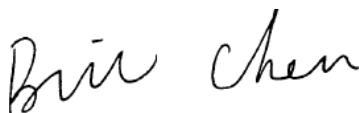
Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2017-03-24		Original

Authorized for issue by:			
Tested By			
		2017-03-06	
Checked By			
		2017-03-24	

Bill Chen /Project Engineer	Date
Eric Fu /Reviewer	Date



2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Disturbance at AC Power Line(150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1.2	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.4	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass

Remark:

Original model No. in report SZEM170100059701: A4

Only the model A4 was tested in report SZEM170100059701.

New model No. in report SZEM170100059801: IA1209

This report was an additional report copied from the report SZEM170100059701, just changed the information of applicant, product name, model No. and trade mark, added the new pictures. Since the electrical circuit design, layout, components used and internal wiring for the model in the report SZEM170100059701 was exactly the same as the model in this report, only the difference on model name. Therefore original data were kept in this report SZEM170100059801.



3 Contents

	Page
1 COVER PAGE	1
2 TEST SUMMARY	3
3 CONTENTS	4
4 GENERAL INFORMATION	6
4.1 DETAILS OF E.U.T.	6
4.2 TEST ENVIRONMENT AND MODE	7
4.3 DESCRIPTION OF SUPPORT UNITS	8
4.4 MEASUREMENT UNCERTAINTY	9
4.5 TEST LOCATION	10
4.6 TEST FACILITY	10
4.7 DEVIATION FROM STANDARDS	10
4.8 ABNORMALITIES FROM STANDARD CONDITIONS	10
5 EQUIPMENT LIST	11
6 RADIO SPECTRUM TECHNICAL REQUIREMENT	13
6.1 ANTENNA REQUIREMENT	13
6.1.1 Test Requirement:	13
6.1.2 Conclusion	13
7 RADIO SPECTRUM MATTER TEST RESULTS	14
7.1 CONDUCTED DISTURBANCE AT AC POWER LINE(150kHz-30MHz)	14
7.1.1 E.U.T. Operation	15
7.1.2 Test Setup Diagram	15
7.1.3 Measurement Data	15
7.2 CONDUCTED PEAK OUTPUT POWER	18
7.2.1 E.U.T. Operation	19
7.2.2 Test Setup Diagram	19
7.2.3 Measurement Data	19
7.3 MINIMUM 6dB BANDWIDTH	20
7.3.1 E.U.T. Operation	20
7.3.2 Test Setup Diagram	20
7.3.3 Measurement Data	20
7.4 POWER SPECTRUM DENSITY	21
7.4.1 E.U.T. Operation	21
7.4.2 Test Setup Diagram	21
7.4.3 Measurement Data	21
7.5 CONDUCTED SPURIOUS EMISSIONS	22
7.5.1 E.U.T. Operation	23
7.5.2 Test Setup Diagram	23
7.5.3 Measurement Data	23
7.6 RADIATED SPURIOUS EMISSIONS	24
7.6.1 E.U.T. Operation	25
7.6.2 Test Setup Diagram	25
7.6.3 Measurement Data	26
7.7 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	34
7.7.1 E.U.T. Operation	35
7.7.2 Test Setup Diagram	35



7.7.3	Measurement Data	36
7.8	CONDUCTED BAND EDGES MEASUREMENT	49
7.8.1	E.U.T. Operation	49
7.8.2	Test Setup Diagram	50
7.8.3	Measurement Data	50
8	PHOTOGRAPHS	51
8.1	CONDUCTED DISTURBANCE AT AC POWER LINE(150kHz-30MHz) TEST SETUP	51
8.2	RADIATED SPURIOUS EMISSION	52
8.3	EUT CONSTRUCTIONAL DETAILS	53
9	APPENDIX	54
9.1	APPENDIX 15.247	54-89



4 General Information

4.1 Details of E.U.T.

Product Name: Wireless Flash Drive - A4
Model No.: A4
Trade Mark: AirDisk
Operation Frequency: IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers: IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
Channel Separation: 5MHz
Type of Modulation: IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK)
IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK)
IEEE for 802.11n(HT20) : OFDM (64QAM, 16QAM,QPSK,BPSK)
Sample Type: Portable production
Antenna Type: Chip
Antenna Gain: 1dBi
Power supply: Test voltage:120V 60Hz
DC input:DC 5V
Rechargeable battery: 3.7V 400mAh 1.48Wh(Charge by USB)

Operation Frequency each of channel(802.11b/g/n HT20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11b/g/n (HT20):

Channel	Frequency
The Lowest channel	2412MHz
The Middle channel	2437MHz
The Highest channel	2462MHz



4.2 Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	55 % RH
Atmospheric Pressure:	1015 mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.
Transmitting+charge mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate ,being charging and adapter.



4.3 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.
Laptop	Lenovo	T430u
Test board	Supply to SGS	FT232
Adaptor	Apple	A1357 W010A051

4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25 x 10 ⁻⁸
2	Timeout	2s
3	Duty cycle	0.37%
4	Occupied Bandwidth	3%
5	RF conducted power	0.75dB
6	RF power density	2.84dB
7	Conducted Spurious emissions	0.75dB
8	RF Radiated power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
9	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
10	Temperature test	1 °C
11	Humidity test	3%
12	Supply voltages	1.5%
13	Time	3%



4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China.
518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

- **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None



5 Equipment List

Conducted Disturbance at AC Power Line(150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2016-05-13	2017-05-13
LISN	Rohde & Schwarz	ENV216	SEM007-01	2016-10-09	2017-10-09
LISN	ETS-LINDGREN	3816/2	SEM007-02	2016-04-25	2017-04-25
8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02	EMC0120	2016-09-28	2017-09-28
4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T4-02	EMC0121	2016-09-28	2017-09-28
2 Line ISN	Fischer Custom	FCC-TLISN-T2-02	EMC0122	2016-09-28	2017-09-28

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2016-04-25	2017-04-25
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

Minimum 6dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2016-04-25	2017-04-25
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

Power Spectrum Density					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2016-04-25	2017-04-25
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09



Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2016-04-25	2017-04-25
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2016-04-25	2017-04-25
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2016-10-12	2017-10-12
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2016-05-18	2017-05-18

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247

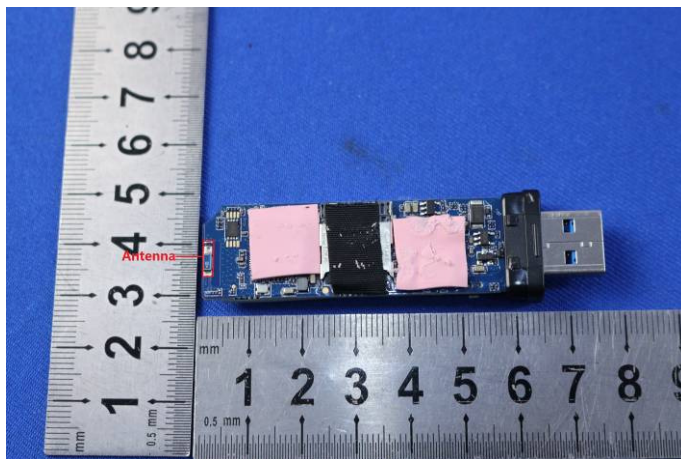
6.1.2 Conclusion

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 1dBi.



7 Radio Spectrum Matter Test Results

7.1 Conducted Disturbance at AC Power Line(150kHz-30MHz)

Test Requirement: 47 CFR Part 15, Subpart C 15.247

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

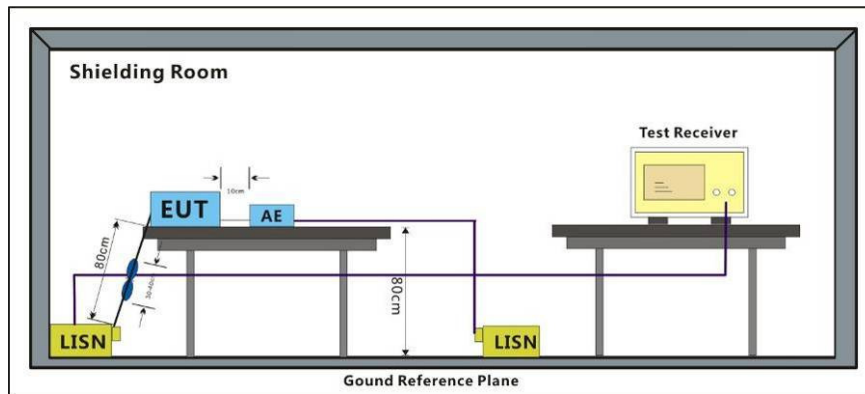
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C Humidity: 56 % RH Atmospheric Pressure: 1020 mbar

Test mode: b:Tx+Charge mode

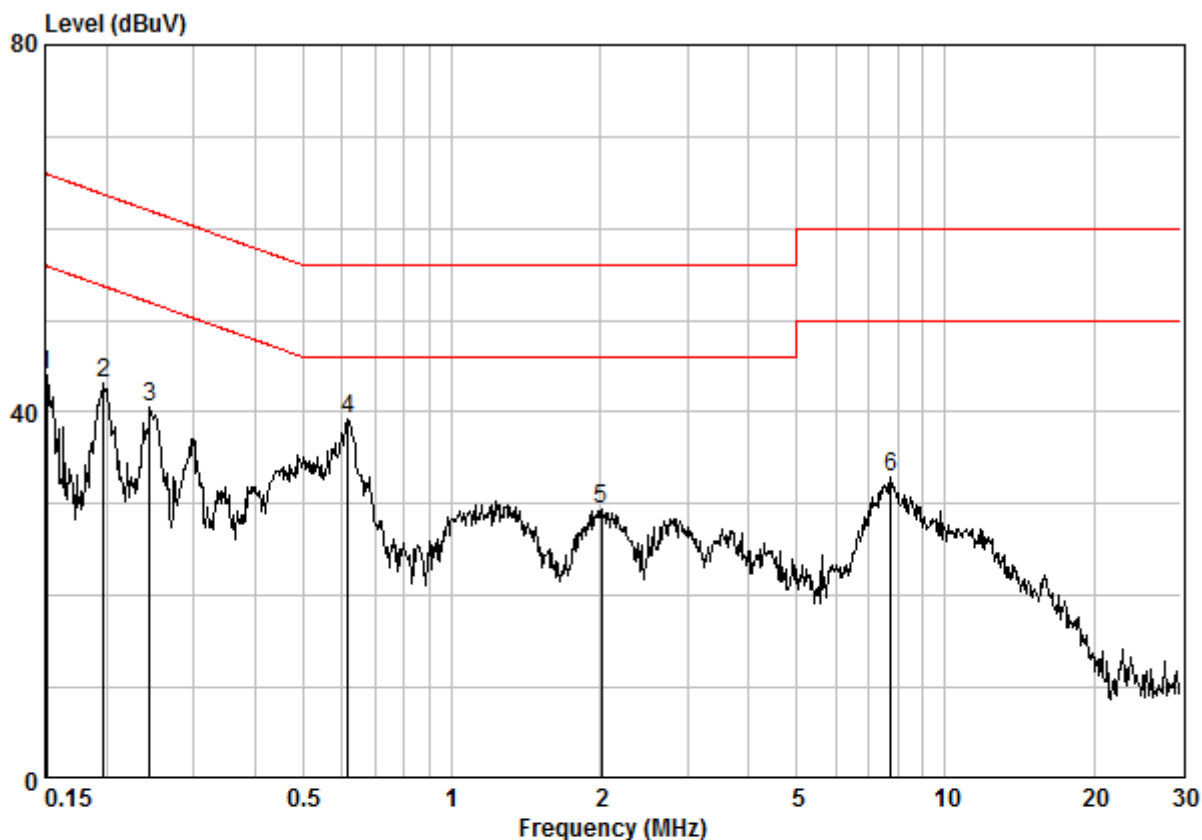
7.1.2 Test Setup Diagram



7.1.3 Measurement Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

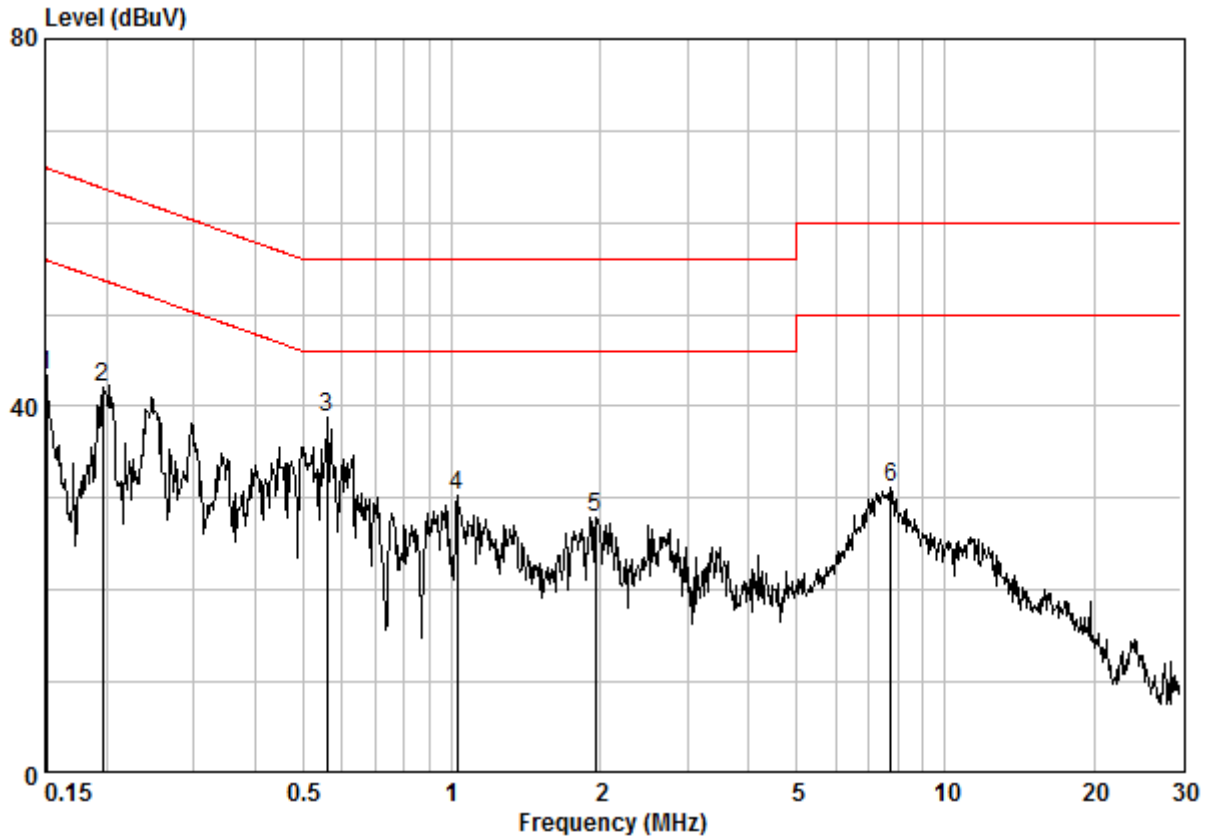
Mode:b;Line:Live Line



Site : Shielding Room
Condition : CE LINE
Job No. : 00597CR
Test Mode : b

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 @	0.15080	0.02	9.64	34.43	44.09	55.96	-11.87	Peak
2 @	0.19758	0.02	9.64	33.51	43.17	53.71	-10.54	Peak
3 @	0.24422	0.02	9.64	30.86	40.52	51.95	-11.43	Peak
4 @	0.61726	0.02	9.65	29.56	39.24	46.00	-6.76	Peak
5 @	2.012	0.03	9.67	19.68	29.38	46.00	-16.62	Peak
6 @	7.769	0.10	9.81	22.93	32.83	50.00	-17.17	Peak

Mode:b;Line:Neutral Line



Site : Shielding Room
Condition : CE NEUTRAL
Job No. : 00597CR
Test Mode : b

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 @	0.15080	0.02	9.64	33.64	43.30	55.96	-12.66	Peak
2 @	0.19654	0.02	9.63	32.46	42.11	53.76	-11.64	Peak
3 @	0.55814	0.02	9.63	29.17	38.83	46.00	-7.17	Peak
4 @	1.027	0.03	9.64	20.68	30.35	46.00	-15.65	Peak
5	1.959	0.03	9.66	18.17	27.86	46.00	-18.14	Peak
6	7.769	0.10	9.79	21.39	31.27	50.00	-18.73	Peak



7.2 Conducted Peak Output Power

Test Requirement: 47 CFR Part 15, Subpart C 15.247
Test Method: ANSI C63.10 (2013) Section 11.9.1.2
Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22.0 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.

Transmitting mode and Charge + Transmitting mode.

Final Test Mode: Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case

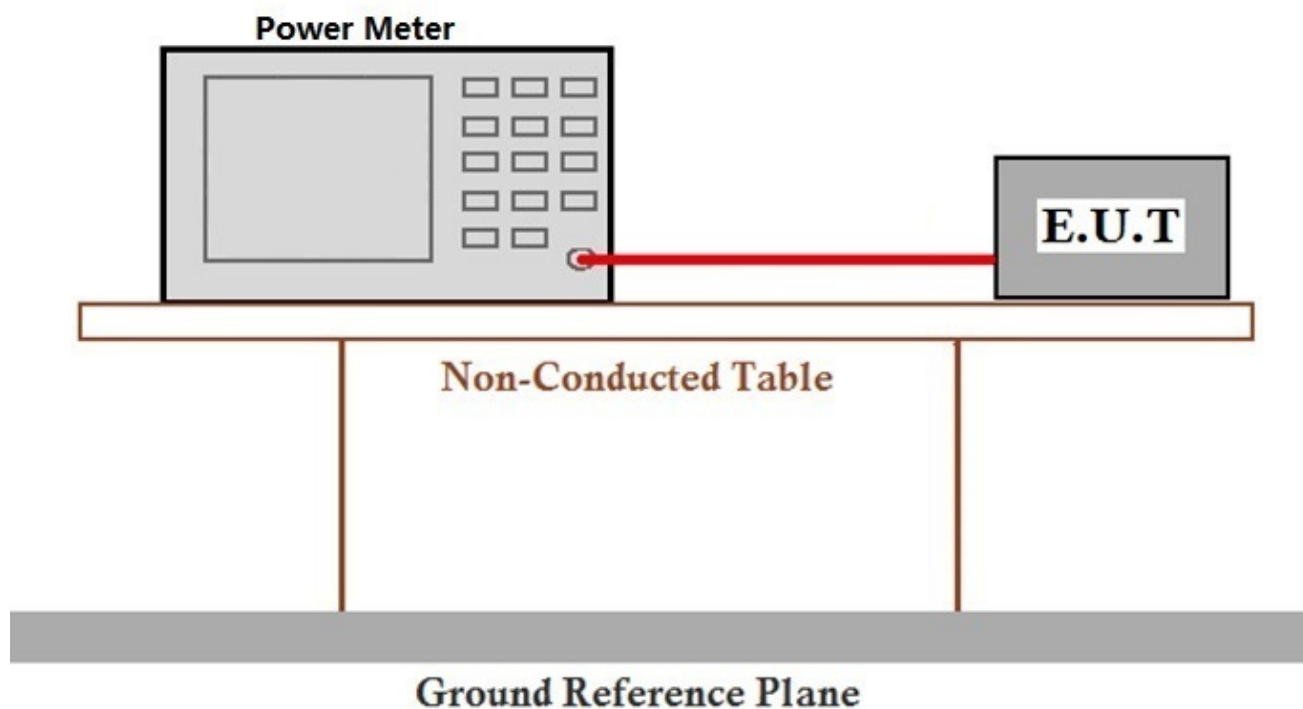
Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b;

6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20)

Transmitting mode.

Only the worst case is recorded in the report.

7.2.2 Test Setup Diagram



7.2.3 Measurement Data

The detailed test data see: Appendix 15.247

7.3 Minimum 6dB Bandwidth

Test Requirement: 47 CFR Part 15, Subpart C 15.247
Test Method: ANSI C63.10 (2013) Section 11.8.1
Limit: ≥ 500 kHz

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22.0 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.

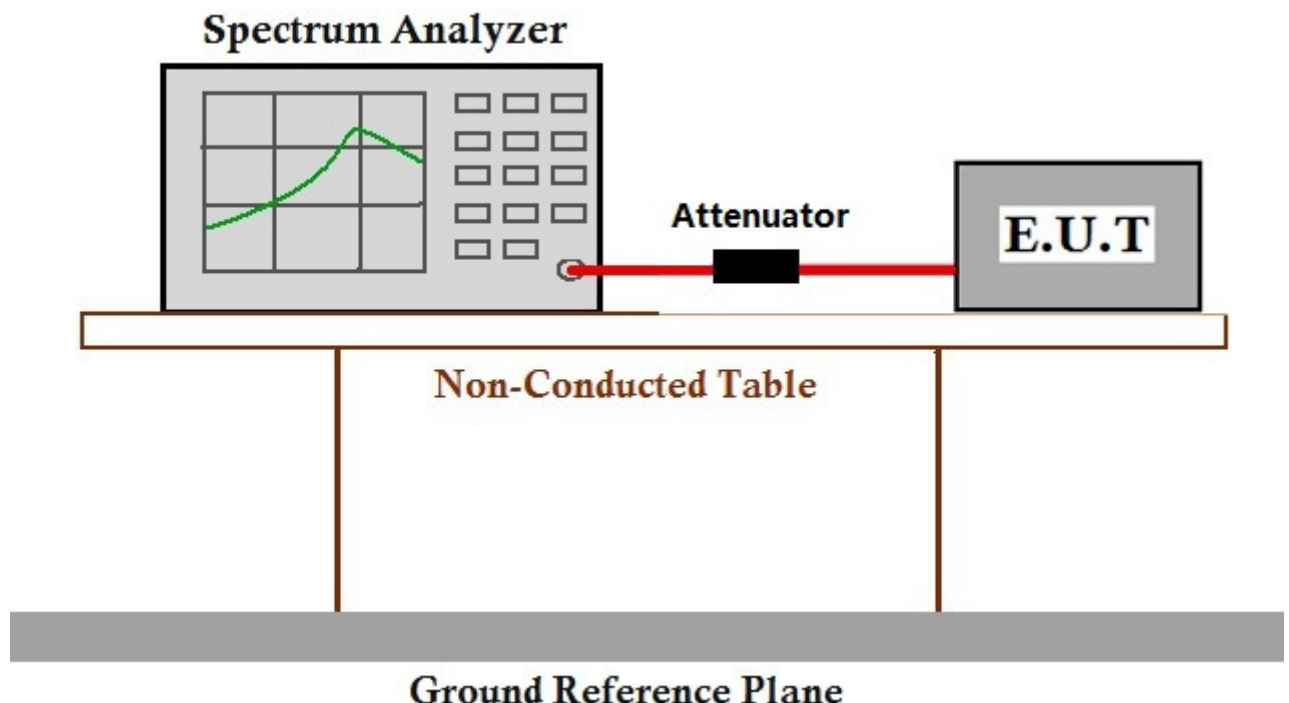
Transmitting mode and Charge + Transmitting mode.

Final Test Mode: Transmitting mode.

Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b;
6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20)

Only the worst case is recorded in the report.

7.3.2 Test Setup Diagram



7.3.3 Measurement Data

The detailed test data see: Appendix 15.247

7.4 Power Spectrum Density

Test Requirement: 47 CFR Part 15, Subpart C 15.247
Test Method: ANSI C63.10 (2013) Section 11.10.2
Limit: $\leq 8\text{dBm}$ in any 3 kHz band during any time interval of continuous transmission

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.0 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.

Transmitting mode and Charge + Transmitting mode.

Final Test Mode: Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case

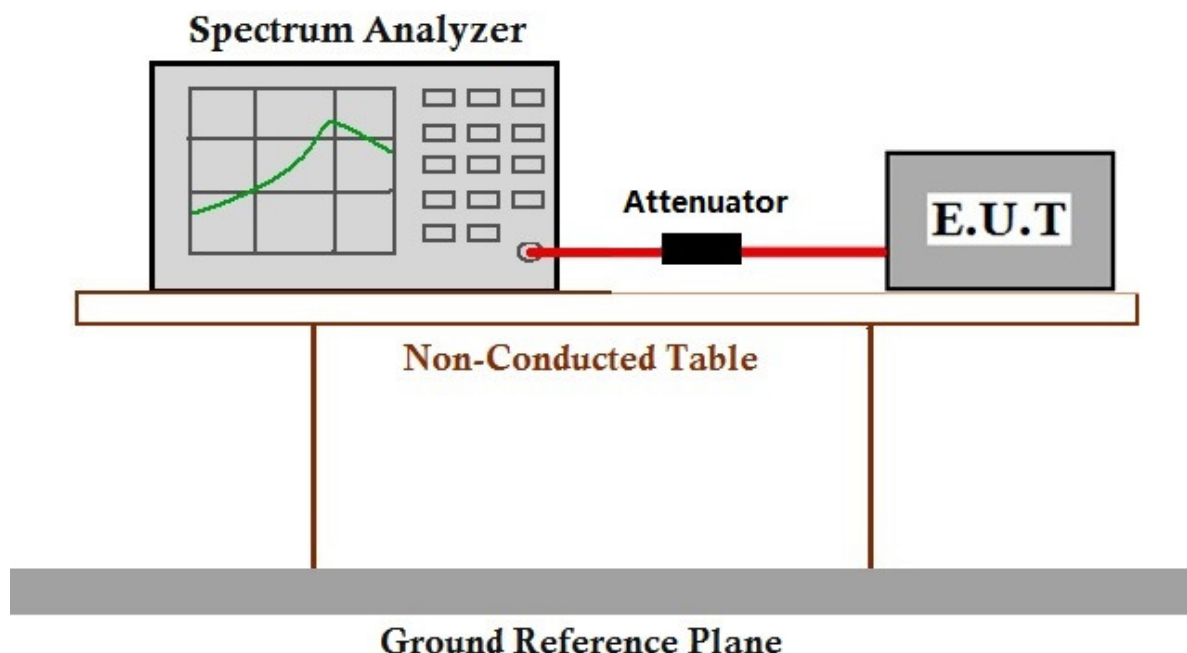
Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b;

6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20)

Transmitting mode.

Only the worst case is recorded in the report.

7.4.2 Test Setup Diagram



7.4.3 Measurement Data

The detailed test data see: Appendix 15.247



7.5 Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15, Subpart C 15.247
Test Method:	ANSI C63.10 (2013) Section 11.11
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22.0 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.

Transmitting mode and Charge + Transmitting mode.

Final Test Mode: Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case

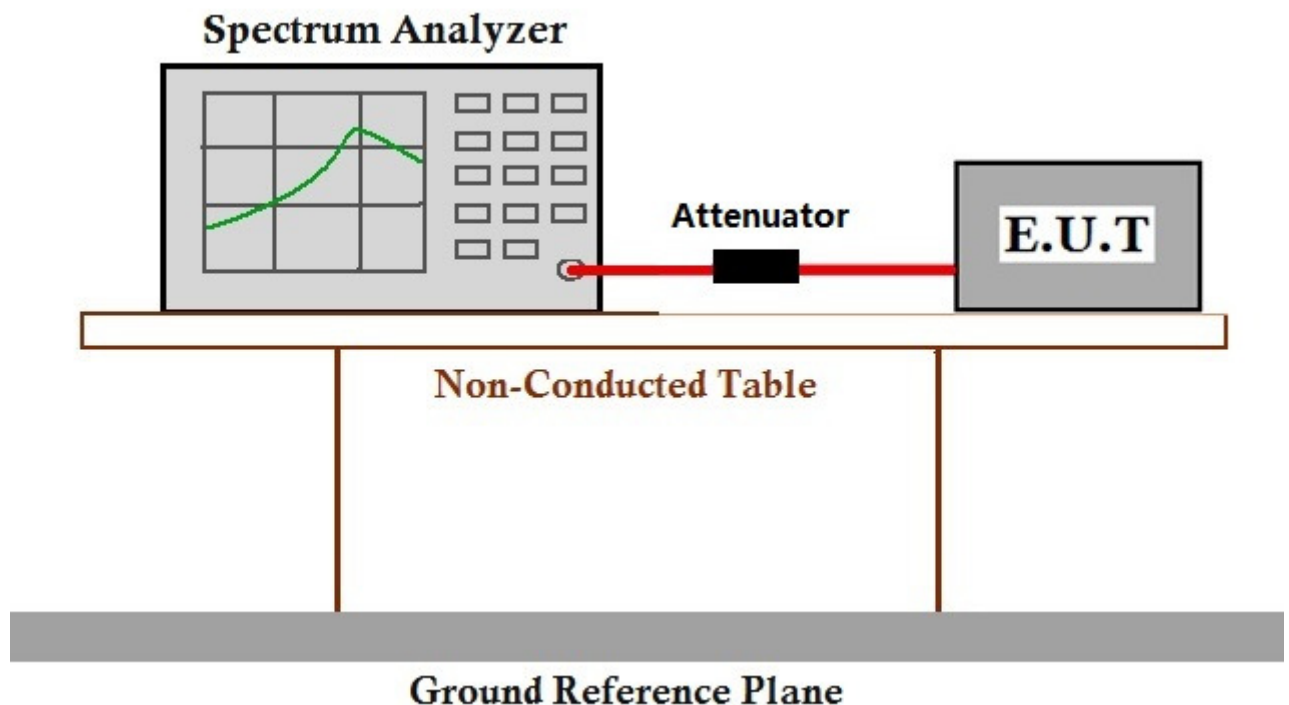
Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b;

6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20)

Transmitting mode.

Only the worst case is recorded in the report.

7.5.2 Test Setup Diagram



7.5.3 Measurement Data

The detailed test data see: Appendix 15.247



7.6 Radiated Spurious Emissions

Test Requirement: 47 CFR Part 15, Subpart C 15.247

Test Method: ANSI C63.10 (2013) Section 6.10.4

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C Humidity: 50 % RH Atmospheric Pressure: 1020 mbar

Pretest these mode to find the worst case: Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.

worst case: Transmitting mode and Charge + Transmitting mode.

The worst case for final test: Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case

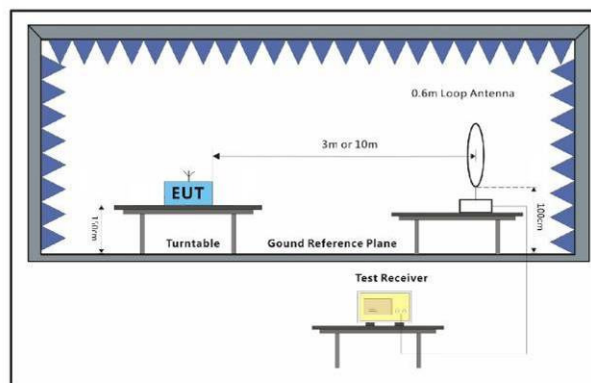
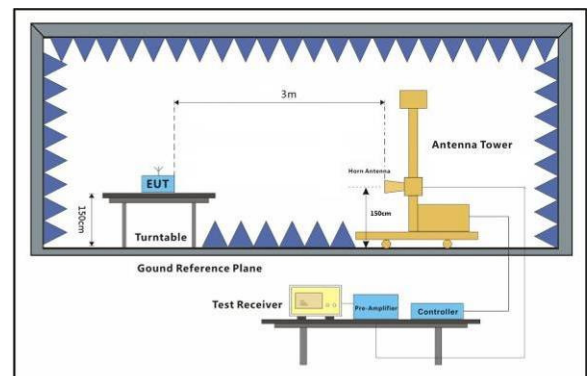
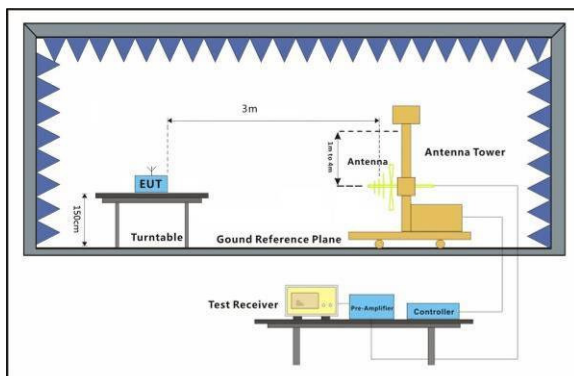
Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b;

6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20)

Charge + Transmitting mode.

Only the worst case is recorded in the report.

7.6.2 Test Setup Diagram





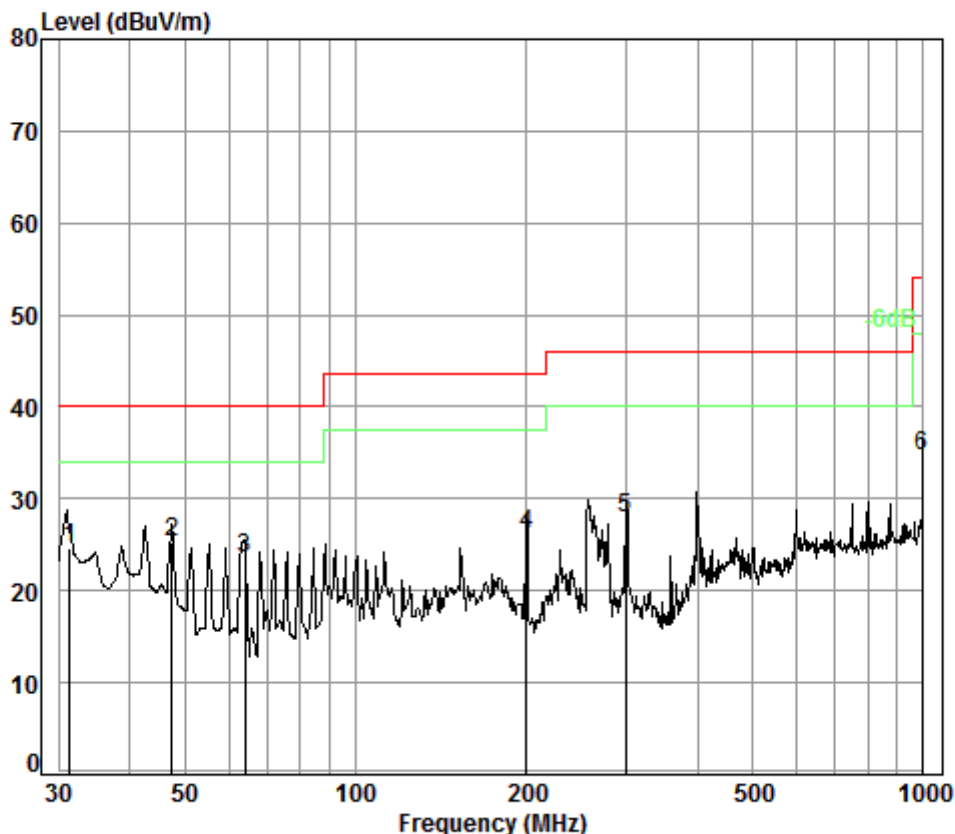
7.6.3 Measurement Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel (2402MHz), the middle channel (2441MHz), the Highest channel (2480MHz)
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.



Below 1GHz

Mode:c; Polarization:Vertical



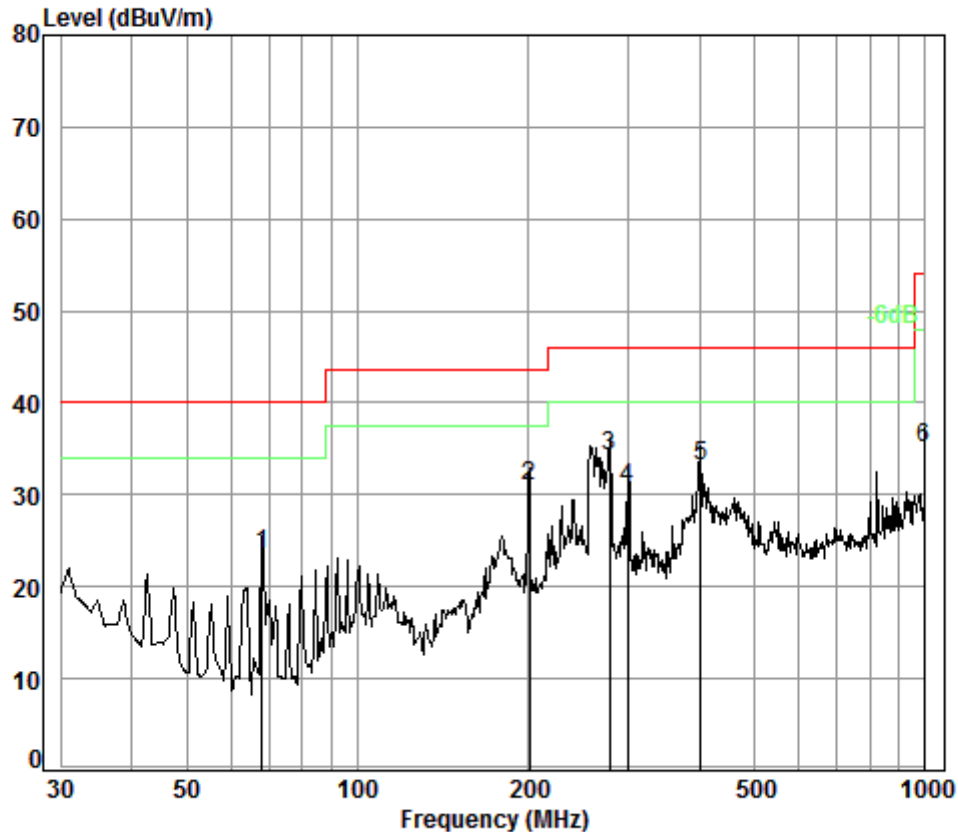
Condition: 3m VERTICAL

Job No. : 0597CR

Test mode: Charge + TX

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	31.40	0.60	17.92	27.35	33.45	24.62	40.00	-15.38
2 pp	47.49	0.75	9.80	27.30	42.00	25.25	40.00	-14.75
3	63.98	0.80	7.08	27.26	42.99	23.61	40.00	-16.39
4	199.99	1.40	10.20	26.70	41.26	26.16	43.50	-17.34
5	299.32	1.90	13.87	26.41	38.60	27.96	46.00	-18.04
6	996.50	3.70	24.16	26.33	33.20	34.73	54.00	-19.27

Mode:c;Polarization:Horizontal



Condition: 3m Horizontal

Job No. : 0597CR

Test mode: Charge + TX

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	67.91	0.80	6.96	27.25	43.05	23.56	40.00	-16.44
2	200.69	1.40	10.24	26.70	46.08	31.02	43.50	-12.48
3 pp	278.07	1.81	12.93	26.46	45.95	34.23	46.00	-11.77
4	299.32	1.90	13.87	26.41	41.30	30.66	46.00	-15.34
5	401.84	2.21	16.31	27.15	41.85	33.22	46.00	-12.78
6	996.50	3.70	24.16	26.33	33.66	35.19	54.00	-18.81



SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Report No.: SZEM170100059801

Page: 29 of 89

Above 1GHz

Test mode:		802.11b		Test channel:		Lowest		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3579.190	32.43	7.66	38.51	46.74	48.32	74.00	-25.68	Vertical	
4824.000	34.19	8.90	39.04	46.77	50.82	74.00	-23.18	Vertical	
6122.333	34.80	10.40	38.92	44.75	51.03	74.00	-22.97	Vertical	
7236.000	36.40	10.69	38.15	43.48	52.42	74.00	-21.58	Vertical	
9648.000	37.53	12.52	36.97	40.64	53.72	74.00	-20.28	Vertical	
12713.160	38.86	14.75	39.02	38.88	53.47	74.00	-20.53	Vertical	
3803.444	33.07	7.74	38.61	44.70	46.90	74.00	-27.10	Horizontal	
4824.000	34.19	8.90	39.04	47.43	51.48	74.00	-22.52	Horizontal	
6078.201	34.76	10.46	38.95	45.26	51.53	74.00	-22.47	Horizontal	
7236.000	36.40	10.69	38.15	43.62	52.56	74.00	-21.44	Horizontal	
9648.000	37.53	12.52	36.97	40.49	53.57	74.00	-20.43	Horizontal	
12713.160	38.86	14.75	39.02	38.26	52.85	74.00	-21.15	Horizontal	

Test mode:		802.11b		Test channel:		Middle		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3960.700	33.50	7.80	38.68	45.25	47.87	74.00	-26.13	Vertical	
4874.000	34.28	8.97	39.05	47.36	51.56	74.00	-22.44	Vertical	
6060.637	34.75	10.48	38.96	46.57	52.84	74.00	-21.16	Vertical	
7311.000	36.37	10.72	38.07	44.08	53.10	74.00	-20.90	Vertical	
9748.000	37.55	12.58	36.92	40.00	53.21	74.00	-20.79	Vertical	
12261.500	38.76	14.34	38.57	38.63	53.16	74.00	-20.84	Vertical	
3808.951	33.09	7.74	38.61	44.94	47.16	74.00	-26.84	Horizontal	
4874.000	34.28	8.97	39.05	46.91	51.11	74.00	-22.89	Horizontal	
5778.052	34.57	9.94	39.02	46.01	51.50	74.00	-22.50	Horizontal	
7311.000	36.37	10.72	38.07	43.81	52.83	74.00	-21.17	Horizontal	
9748.000	37.55	12.58	36.92	40.45	53.66	74.00	-20.34	Horizontal	
12440.210	38.86	14.20	38.75	38.43	52.74	74.00	-21.26	Horizontal	



SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Report No.: SZEM170100059801

Page: 30 of 89

Test mode:		802.11b		Test channel:		Highest		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3641.878	32.62	7.68	38.54	45.43	47.19	74.00	-26.81	Vertical	
4924.000	34.37	9.04	39.07	46.87	51.21	74.00	-22.79	Vertical	
5947.702	34.67	10.42	39.00	46.48	52.57	74.00	-21.43	Vertical	
7386.000	36.34	10.75	38.00	44.14	53.23	74.00	-20.77	Vertical	
9848.000	37.57	12.63	36.87	40.23	53.56	74.00	-20.44	Vertical	
12731.570	38.85	14.81	39.04	38.79	53.41	74.00	-20.59	Vertical	
3847.726	33.19	7.76	38.63	45.03	47.35	74.00	-26.65	Horizontal	
4924.000	34.37	9.04	39.07	47.61	51.95	74.00	-22.05	Horizontal	
6329.508	34.97	10.14	38.79	45.37	51.69	74.00	-22.31	Horizontal	
7386.000	36.34	10.75	38.00	44.75	53.84	74.00	-20.16	Horizontal	
9848.000	37.57	12.63	36.87	39.61	52.94	74.00	-21.06	Horizontal	
12494.320	38.90	14.15	38.80	39.24	53.49	74.00	-20.51	Horizontal	

Test mode:		802.11g		Test channel:		Lowest		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3759.672	32.95	7.73	38.59	46.08	48.17	74.00	-25.83	Vertical	
4824.000	34.19	8.90	39.04	46.88	50.93	74.00	-23.07	Vertical	
6069.413	34.76	10.47	38.96	45.08	51.35	74.00	-22.65	Vertical	
7236.000	36.40	10.69	38.15	43.81	52.75	74.00	-21.25	Vertical	
9648.000	37.53	12.52	36.97	40.42	53.50	74.00	-20.50	Vertical	
12731.570	38.85	14.81	39.04	38.76	53.38	74.00	-20.62	Vertical	
3960.700	33.50	7.80	38.68	45.94	48.56	74.00	-25.44	Horizontal	
4824.000	34.19	8.90	39.04	46.06	50.11	74.00	-23.89	Horizontal	
6016.949	34.71	10.54	38.99	44.77	51.03	74.00	-22.97	Horizontal	
7236.000	36.40	10.69	38.15	44.96	53.90	74.00	-20.10	Horizontal	
9648.000	37.53	12.52	36.97	40.43	53.51	74.00	-20.49	Horizontal	
12676.420	38.86	14.65	38.99	38.80	53.32	74.00	-20.68	Horizontal	



SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

Report No.: SZEM170100059801

Page: 31 of 89

Test mode:		802.11g		Test channel:		Middle		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3819.990	33.12	7.75	38.62	44.94	47.19	74.00	-26.81	Vertical	
4874.000	34.28	8.97	39.05	47.13	51.33	74.00	-22.67	Vertical	
6320.356	34.96	10.15	38.80	45.15	51.46	74.00	-22.54	Vertical	
7311.000	36.37	10.72	38.07	44.21	53.23	74.00	-20.77	Vertical	
9748.000	37.55	12.58	36.92	40.13	53.34	74.00	-20.66	Vertical	
12694.780	38.86	14.70	39.00	38.92	53.48	74.00	-20.52	Vertical	
3781.495	33.01	7.73	38.60	45.70	47.84	74.00	-26.16	Horizontal	
4874.000	34.28	8.97	39.05	46.11	50.31	74.00	-23.69	Horizontal	
5853.787	34.61	10.15	39.01	45.75	51.50	74.00	-22.50	Horizontal	
7311.000	36.37	10.72	38.07	44.34	53.36	74.00	-20.64	Horizontal	
9748.000	37.55	12.58	36.92	40.56	53.77	74.00	-20.23	Horizontal	
12676.420	38.86	14.65	38.99	38.80	53.32	74.00	-20.68	Horizontal	

Test mode:		802.11g		Test channel:		Highest		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3870.060	33.25	7.77	38.64	44.56	46.94	74.00	-27.06	Vertical	
4924.000	34.37	9.04	39.07	46.17	50.51	74.00	-23.49	Vertical	
6329.508	34.97	10.14	38.79	45.66	51.98	74.00	-22.02	Vertical	
7386.000	36.34	10.75	38.00	44.38	53.47	74.00	-20.53	Vertical	
9848.000	37.57	12.63	36.87	39.95	53.28	74.00	-20.72	Vertical	
12458.220	38.88	14.18	38.77	39.24	53.53	74.00	-20.47	Vertical	
3870.060	33.25	7.77	38.64	45.48	47.86	74.00	-26.14	Horizontal	
4924.000	34.37	9.04	39.07	45.37	49.71	74.00	-24.29	Horizontal	
6211.563	34.87	10.29	38.87	44.67	50.96	74.00	-23.04	Horizontal	
7386.000	36.34	10.75	38.00	44.48	53.57	74.00	-20.43	Horizontal	
9848.000	37.57	12.63	36.87	40.42	53.75	74.00	-20.25	Horizontal	
12440.210	38.86	14.20	38.75	38.67	52.98	74.00	-21.02	Horizontal	



SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

Report No.: SZEM170100059801

Page: 32 of 89

Test mode:		802.11n(HT20)		Test channel:		Lowest		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3836.607	33.16	7.75	38.63	44.93	47.21	74.00	-26.79	Vertical	
4824.000	34.19	8.90	39.04	44.96	49.01	74.00	-24.99	Vertical	
6069.413	34.76	10.47	38.96	45.08	51.35	74.00	-22.65	Vertical	
7236.000	36.40	10.69	38.15	43.53	52.47	74.00	-21.53	Vertical	
9648.000	37.53	12.52	36.97	40.45	53.53	74.00	-20.47	Vertical	
12731.570	38.85	14.81	39.04	38.76	53.38	74.00	-20.62	Vertical	
3836.607	33.16	7.75	38.63	45.33	47.61	74.00	-26.39	Horizontal	
4824.000	34.19	8.90	39.04	45.40	49.45	74.00	-24.55	Horizontal	
6016.949	34.71	10.54	38.99	44.77	51.03	74.00	-22.97	Horizontal	
7236.000	36.40	10.69	38.15	43.33	52.27	74.00	-21.73	Horizontal	
9648.000	37.53	12.52	36.97	40.24	53.32	74.00	-20.68	Horizontal	
12332.670	38.80	14.29	38.64	39.44	53.89	74.00	-20.11	Horizontal	

Test mode:		802.11n(HT20)		Test channel:		Middle		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3819.990	33.12	7.75	38.62	44.94	47.19	74.00	-26.81	Vertical	
4874.000	34.28	8.97	39.05	45.15	49.35	74.00	-24.65	Vertical	
5794.797	34.58	9.98	39.02	45.54	51.08	74.00	-22.92	Vertical	
7311.000	36.37	10.72	38.07	44.21	53.23	74.00	-20.77	Vertical	
9748.000	37.55	12.58	36.92	39.70	52.91	74.00	-21.09	Vertical	
12621.510	38.88	14.50	38.93	38.43	52.88	74.00	-21.12	Vertical	
3579.190	32.43	7.66	38.51	45.41	46.99	74.00	-27.01	Horizontal	
4874.000	34.28	8.97	39.05	46.11	50.31	74.00	-23.69	Horizontal	
5853.787	34.61	10.15	39.01	45.75	51.50	74.00	-22.50	Horizontal	
7311.000	36.37	10.72	38.07	43.98	53.00	74.00	-21.00	Horizontal	
9748.000	37.55	12.58	36.92	40.39	53.60	74.00	-20.40	Horizontal	
12243.770	38.75	14.36	38.55	38.63	53.19	74.00	-20.81	Horizontal	



SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

Report No.: SZEM170100059801

Page: 33 of 89

Test mode:		802.11n(HT20)		Test channel:		Highest		Remark:	Peak
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	
3599.965	32.50	7.67	38.52	44.90	46.55	74.00	-27.45	Vertical	
4924.000	34.37	9.04	39.07	44.95	49.29	74.00	-24.71	Vertical	
5794.797	34.58	9.98	39.02	45.80	51.34	74.00	-22.66	Vertical	
7386.000	36.34	10.75	38.00	44.38	53.47	74.00	-20.53	Vertical	
9848.000	37.57	12.63	36.87	40.03	53.36	74.00	-20.64	Vertical	
12621.510	38.88	14.50	38.93	38.35	52.80	74.00	-21.20	Vertical	
3579.190	32.43	7.66	38.51	44.67	46.25	74.00	-27.75	Horizontal	
4924.000	34.37	9.04	39.07	45.37	49.71	74.00	-24.29	Horizontal	
6034.386	34.73	10.52	38.98	44.63	50.90	74.00	-23.10	Horizontal	
7386.000	36.34	10.75	38.00	44.09	53.18	74.00	-20.82	Horizontal	
9848.000	37.57	12.63	36.87	40.49	53.82	74.00	-20.18	Horizontal	
12279.260	38.77	14.33	38.59	39.19	53.70	74.00	-20.30	Horizontal	

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

- 2) Scan from 9kHz to 25GHz, The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported .

- 3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.



7.7 Radiated Emissions which fall in the restricted bands

Test Requirement: 47 CFR Part 15, Subpart C 15.247
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m
Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C Humidity: 50 % RH Atmospheric Pressure: 1020 mbar

Pretest these mode to find the worst case: Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.

worst case: Transmitting mode and Charge + Transmitting mode.

The worst case for final test: Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case

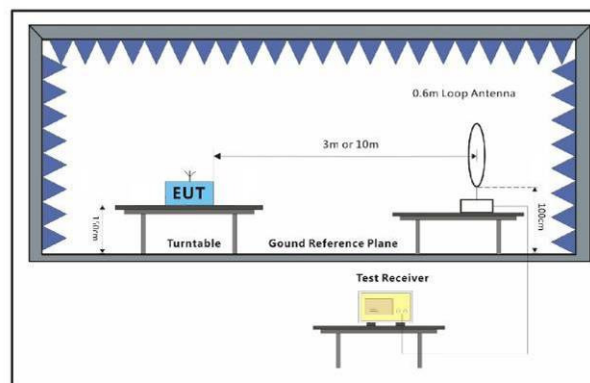
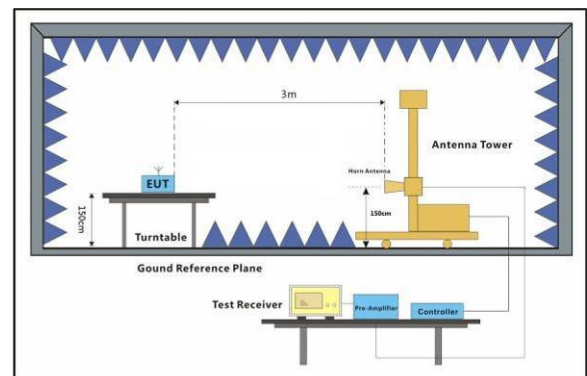
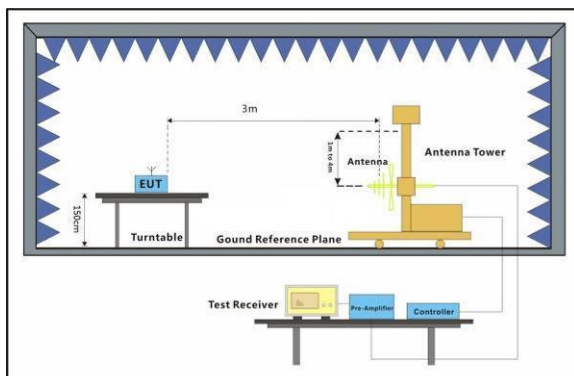
Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b;

6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20)

Charge + Transmitting mode.

Only the worst case is recorded in the report.

7.7.2 Test Setup Diagram





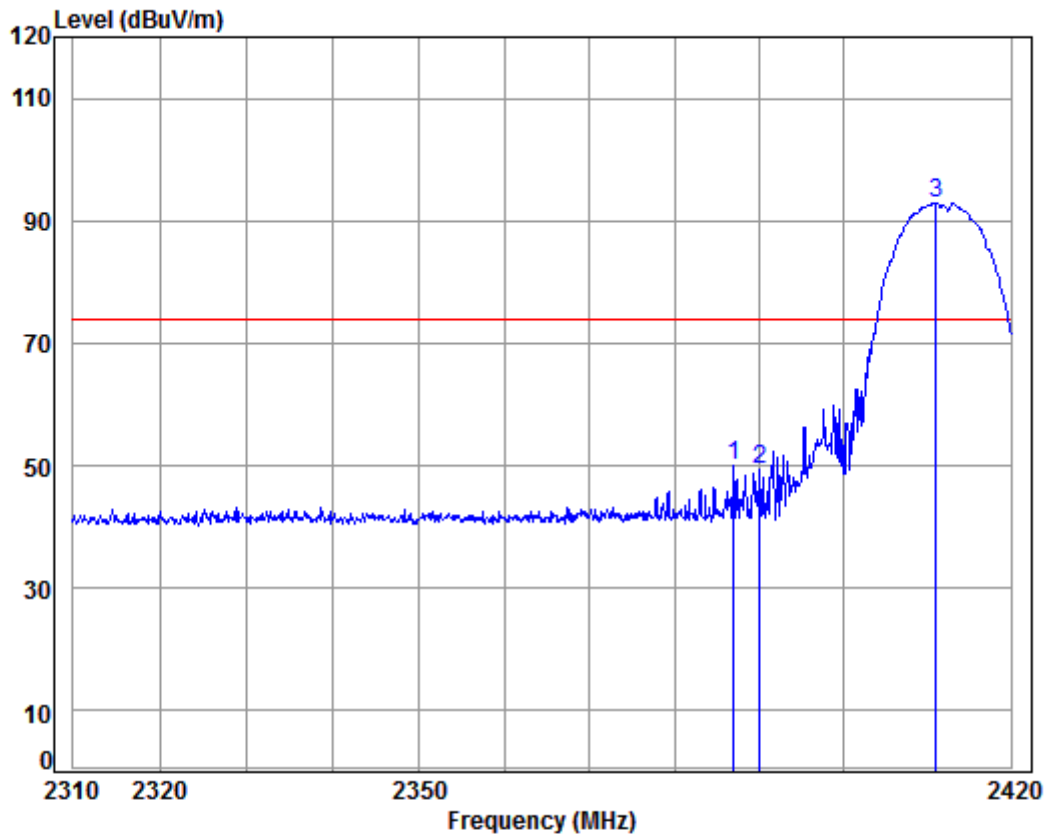
7.7.3 Measurement Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel (2402MHz), the middle channel (2441MHz), the Highest channel (2480MHz)
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.



Test plot as follows:

Worse case mode:	802.11b	Test channel:	Lowest	Remark:	Peak	Vertical
------------------	---------	---------------	--------	---------	------	----------



Condition: 3m Vertical

Job No: : 0597CR

Mode: : 2412 Band edge

: B

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2386.905	5.33	29.07	38.14	53.88	50.14	74.00	-23.86 Peak
2	2390.000	5.34	29.08	38.14	53.08	49.36	74.00	-24.64 Peak
3 pp	2411.010	5.35	29.14	38.15	96.63	92.97	74.00	18.97 Peak

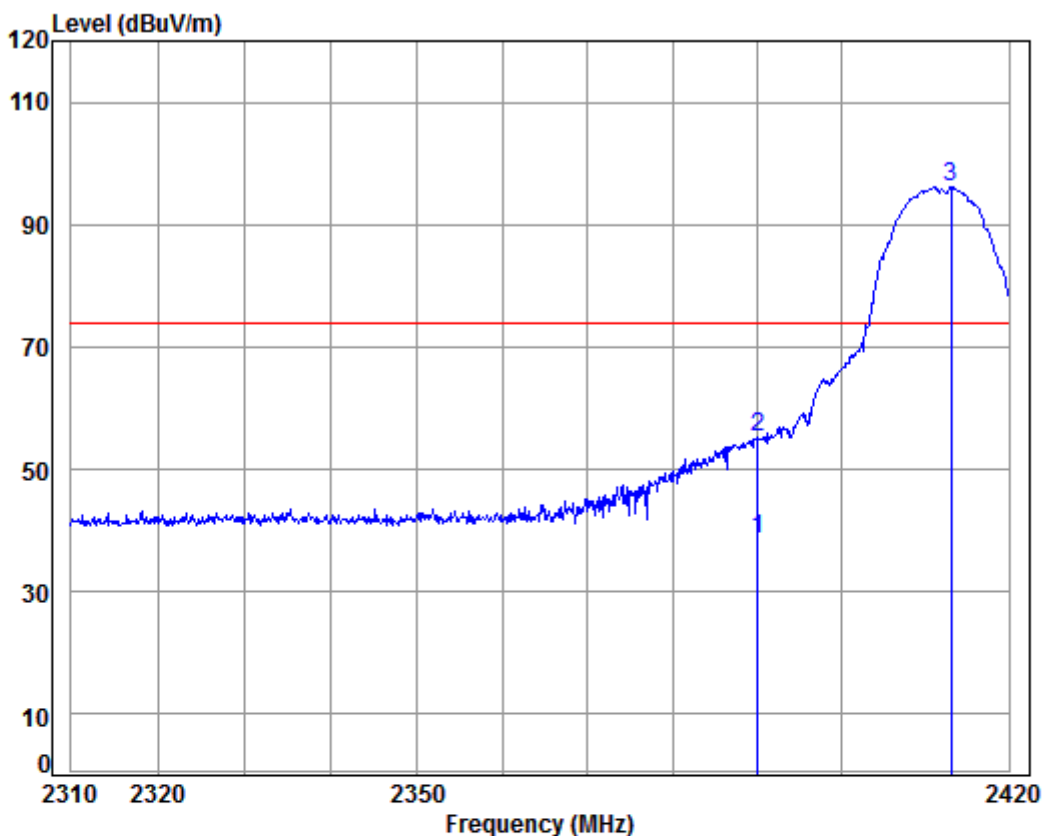


SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

Report No.: SZEM170100059801

Page: 38 of 89

Worse case mode:	802.11b	Test channel:	Lowest	Remark:	Peak	Horizontal
------------------	---------	---------------	--------	---------	------	------------



Condition: 3m Horizontal

Job No: : 0597CR

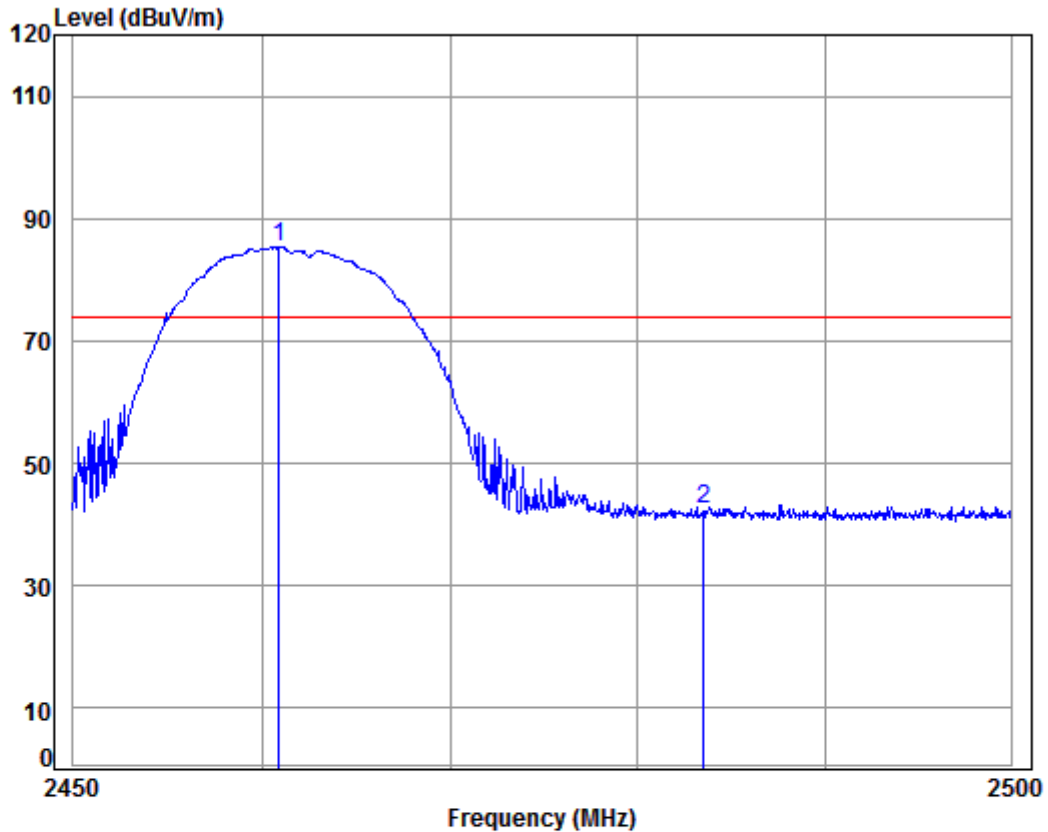
Mode: : 2412 Band edge

: B

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2390.000	5.34	29.08	38.14	42.18	38.46	54.00	-15.54 Average
2	2390.000	5.34	29.08	38.14	58.92	55.20	74.00	-18.80 Peak
3 pp	2413.030	5.35	29.15	38.15	99.79	96.14	74.00	22.14 Peak



Worse case mode:	802.11b	Test channel:	Highest	Remark:	Peak	Vertical
------------------	---------	---------------	---------	---------	------	----------



Condition: 3m Vertical

Job No: : 0597CR

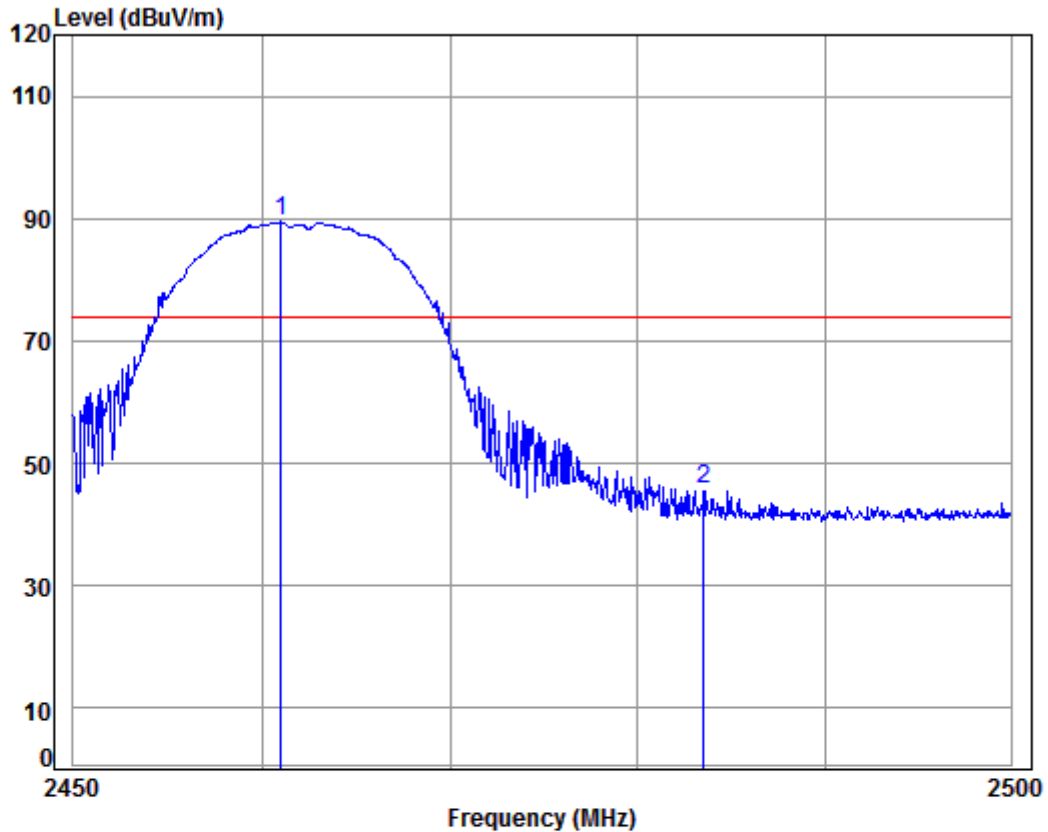
Mode: : 2462 Band edge

: B

		Cable	Ant	Preamp	Read		Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	2460.914	5.39	29.29	38.15	88.80	85.33	74.00	11.33	Peak
2	2483.500	5.41	29.35	38.15	46.05	42.66	74.00	-31.34	Peak



Worse case mode:	802.11b	Test channel:	Highest	Remark:	Peak	Horizontal
------------------	---------	---------------	---------	---------	------	------------



Condition: 3m Horizontal

Job No: : 0597CR

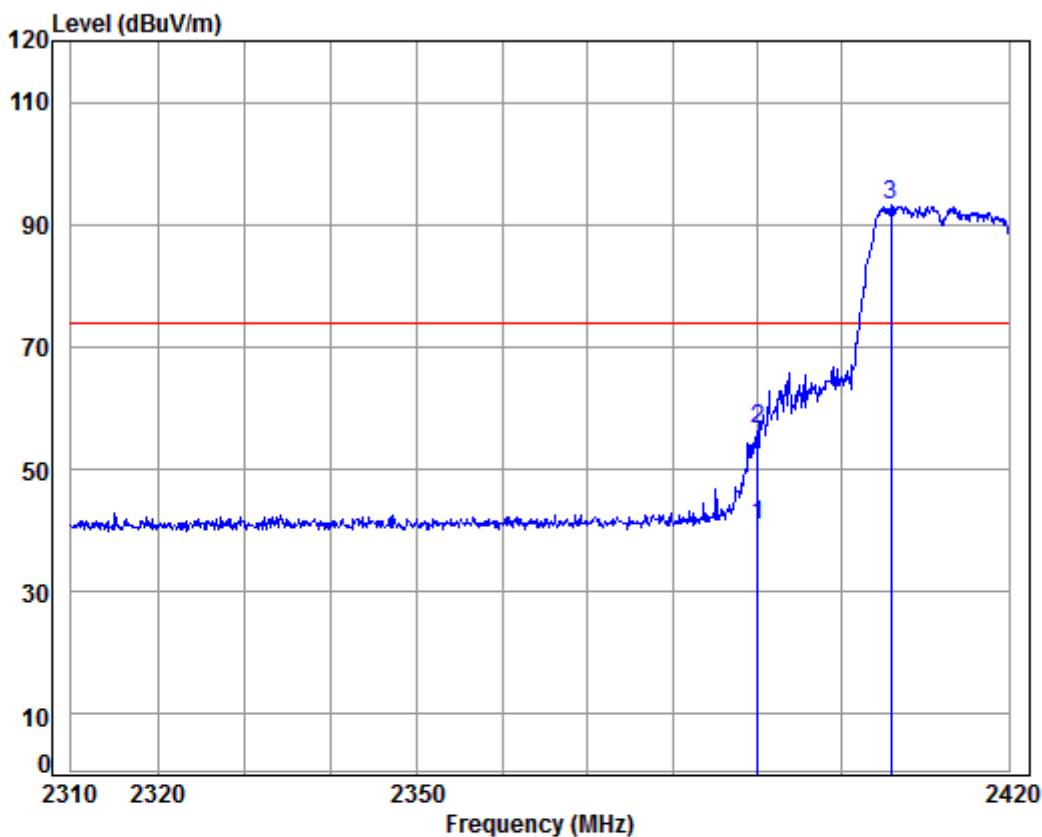
Mode: : 2462 Band edge

: B

		Cable	Ant	Preamp	Read		Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	2461.013	5.39	29.29	38.15	92.91	89.44	74.00	15.44	Peak
2	2483.500	5.41	29.35	38.15	49.19	45.80	74.00	-28.20	Peak



Worse case mode:	802.11g	Test channel:	Lowest	Remark:	Peak	Vertical
------------------	---------	---------------	--------	---------	------	----------

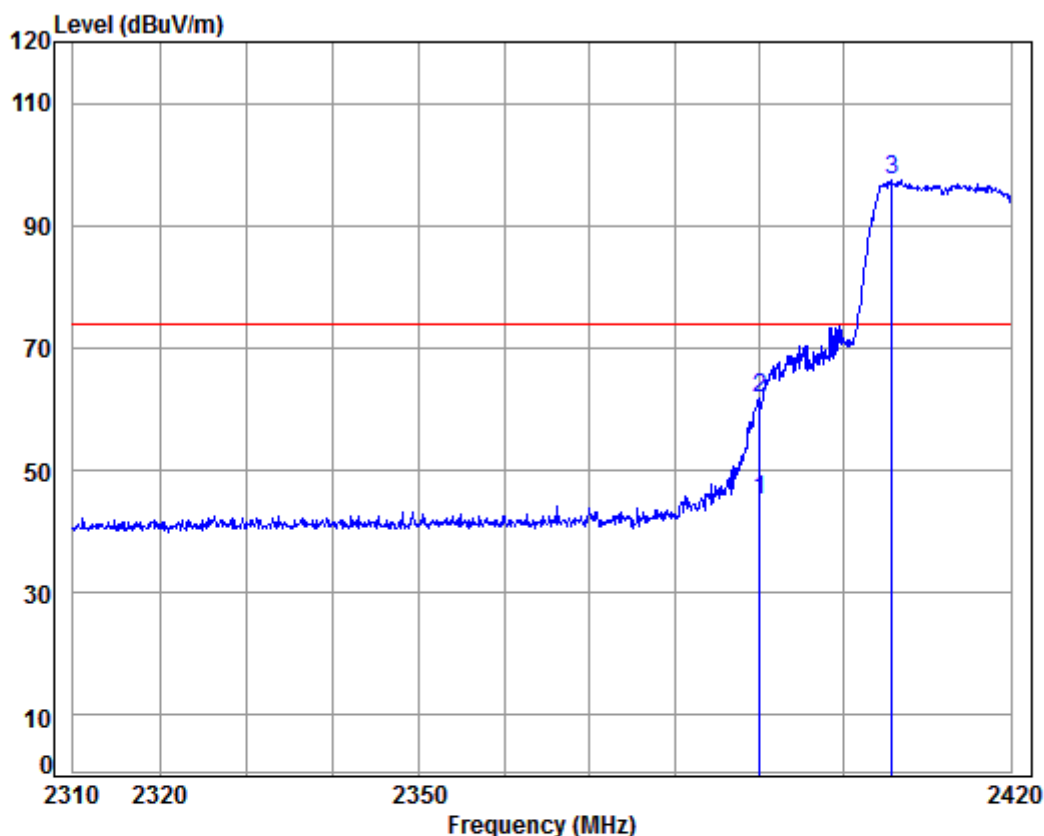


Condition: 3m Vertical
Job No: : 0597CR
Mode: : 2412 Band edge
: G

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2390.000	5.34	29.08	38.14	44.63	40.91	54.00	-13.09 Average
2	2390.000	5.34	29.08	38.14	60.21	56.49	74.00	-17.51 Peak
3 pp	2405.857	5.35	29.12	38.15	96.71	93.03	74.00	19.03 Peak



Worse case mode:	802.11g	Test channel:	Lowest	Remark:	Peak	Horizontal
------------------	---------	---------------	--------	---------	------	------------

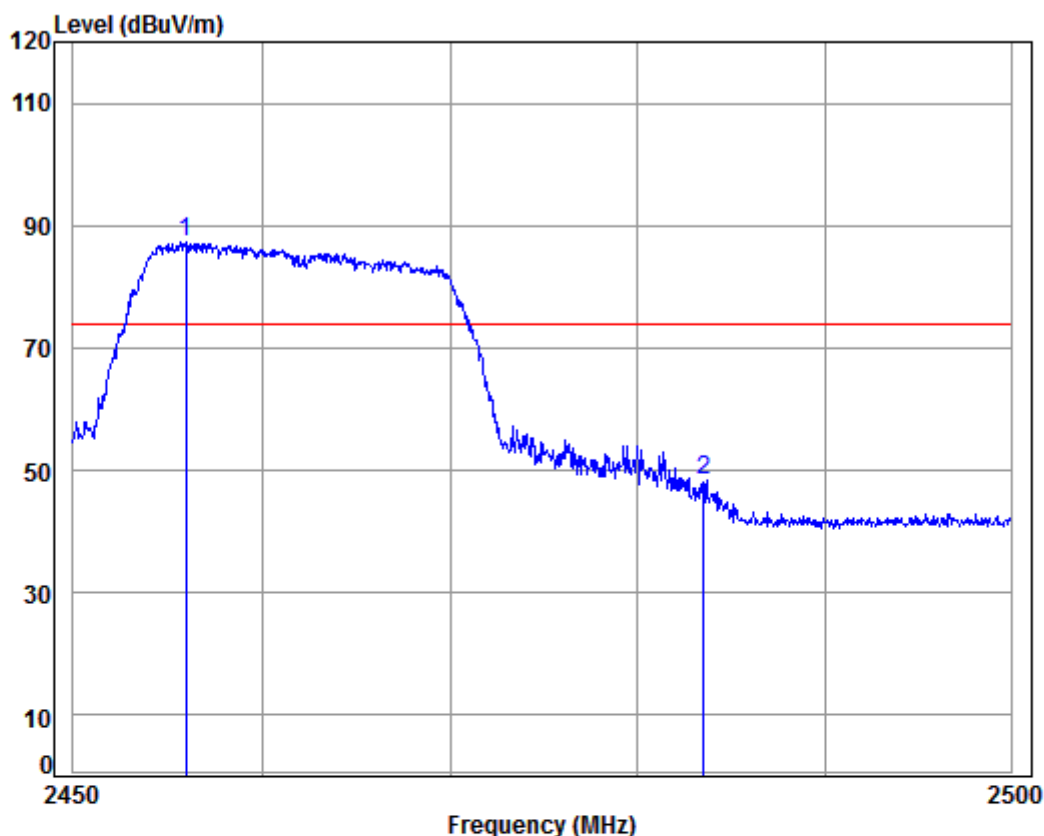


Condition: 3m Horizontal
Job No: : 0597CR
Mode: : 2412 Band edge
: G

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	
1 av	2390.000	5.34	29.08	38.14	48.94	54.00	-8.78	Average
2	2390.000	5.34	29.08	38.14	65.48	74.00	-12.24	Peak
3 pp	2405.745	5.35	29.12	38.15	101.14	74.00	23.46	Peak



Worse case mode:	802.11g	Test channel:	Highest	Remark:	Peak	Vertical
------------------	---------	---------------	---------	---------	------	----------



Condition: 3m Vertical

Job No: : 0597CR

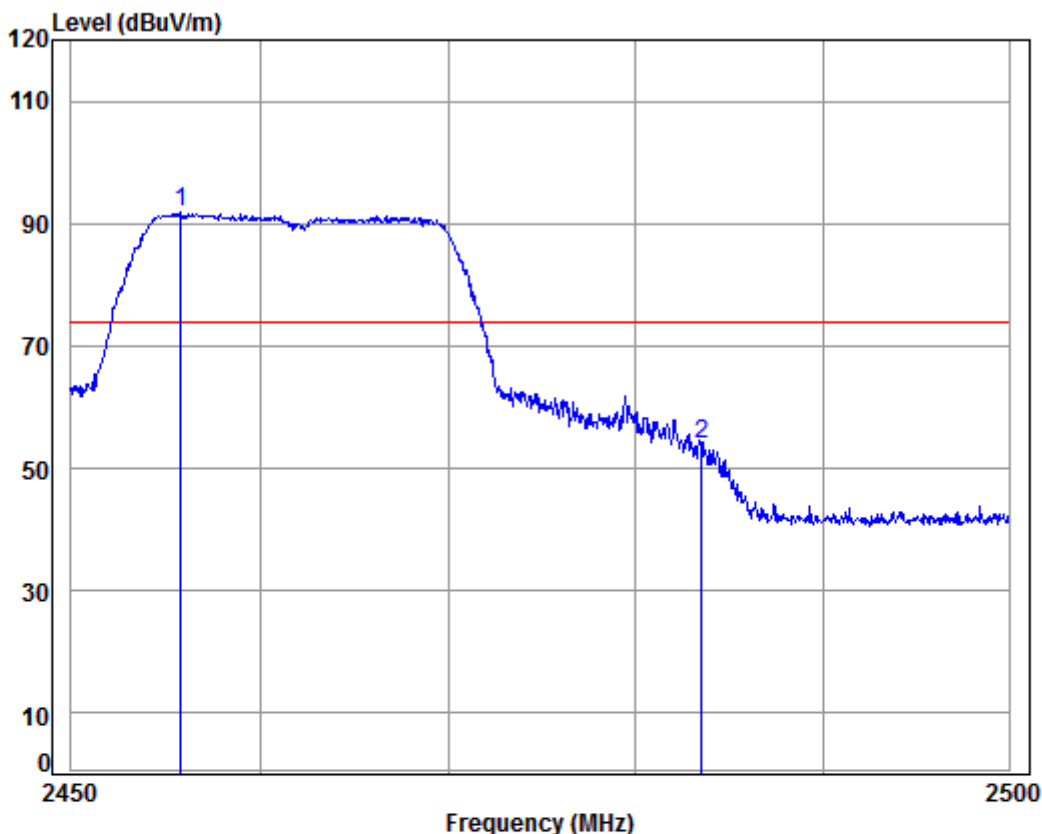
Mode: : 2462 Band edge

: G

		Cable	Ant	Preamp	Read		Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	2455.947	5.39	29.27	38.15	90.78	87.29	74.00	13.29	Peak
2	2483.500	5.41	29.35	38.15	51.90	48.51	74.00	-25.49	Peak



Worse case mode:	802.11g	Test channel:	Highest	Remark:	Peak	Horizontal
------------------	---------	---------------	---------	---------	------	------------

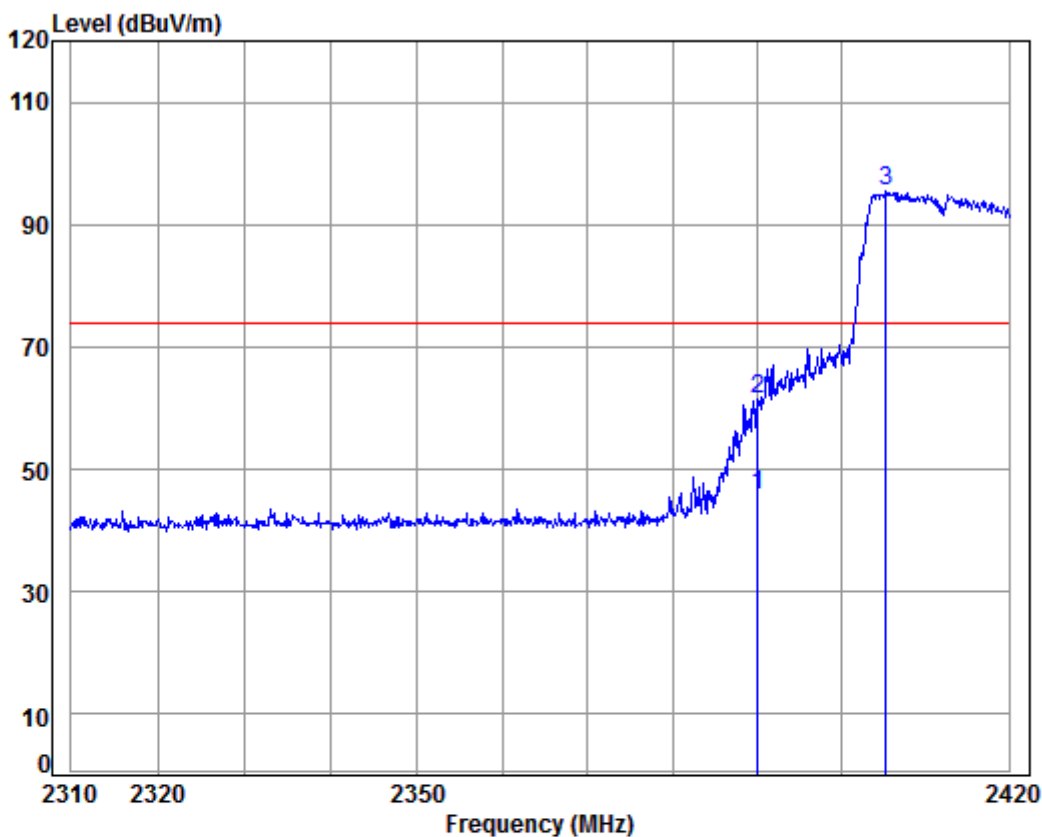


Condition: 3m Horizontal
Job No: : 0597CR
Mode: : 2462 Band edge
: G

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2455.798	5.39	29.27	38.15	95.25	91.76	74.00	17.76 Peak
2	2483.500	5.41	29.35	38.15	57.27	53.88	74.00	-20.12 Peak



Worse case mode:	802.11n(HT20)	Test channel:	Lowest	Remark:	Peak	Vertical
------------------	---------------	---------------	--------	---------	------	----------

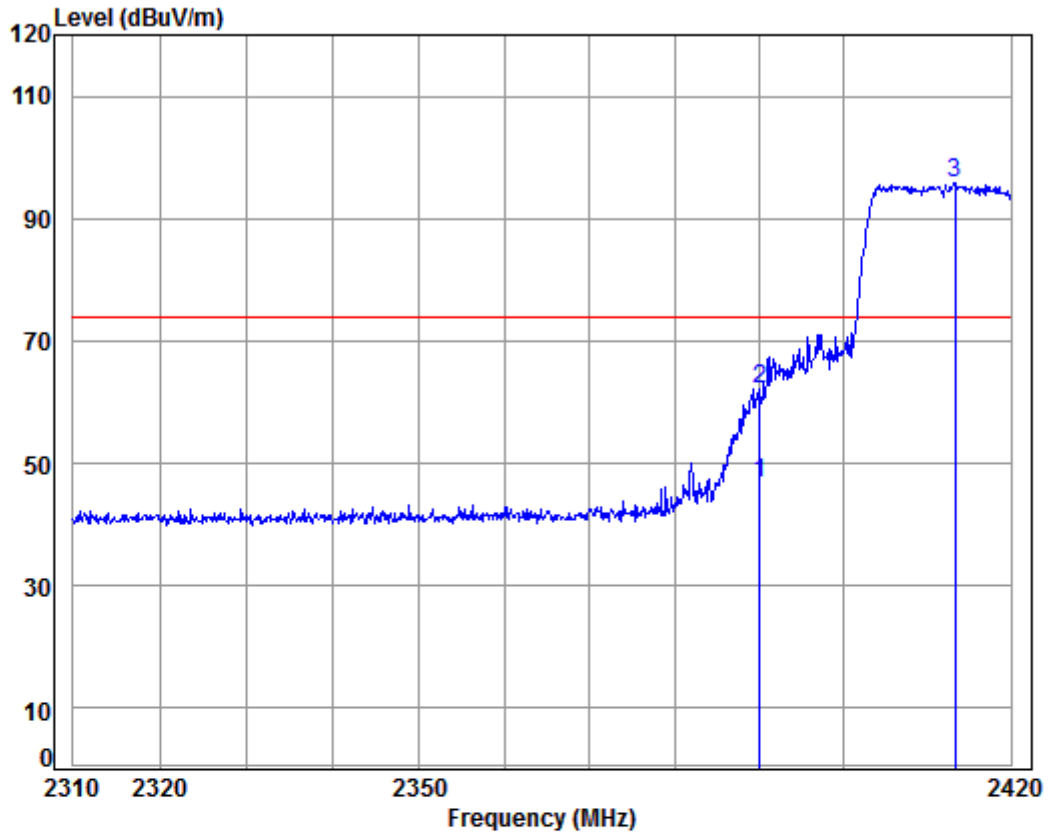


Condition: 3m Vertical
Job No: : 0597CR
Mode: : 2412 Band edge
: N20

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2390.000	5.34	29.08	38.14	49.53	45.81	54.00	-8.19 Average
2	2390.000	5.34	29.08	38.14	65.21	61.49	74.00	-12.51 Peak
3 pp	2405.297	5.35	29.12	38.15	99.04	95.36	74.00	21.36 Peak



Worse case mode:	802.11n(HT20)	Test channel:	Lowest	Remark:	Peak	Horizontal
------------------	---------------	---------------	--------	---------	------	------------



Condition: 3m Horizontal

Job No: : 0597CR

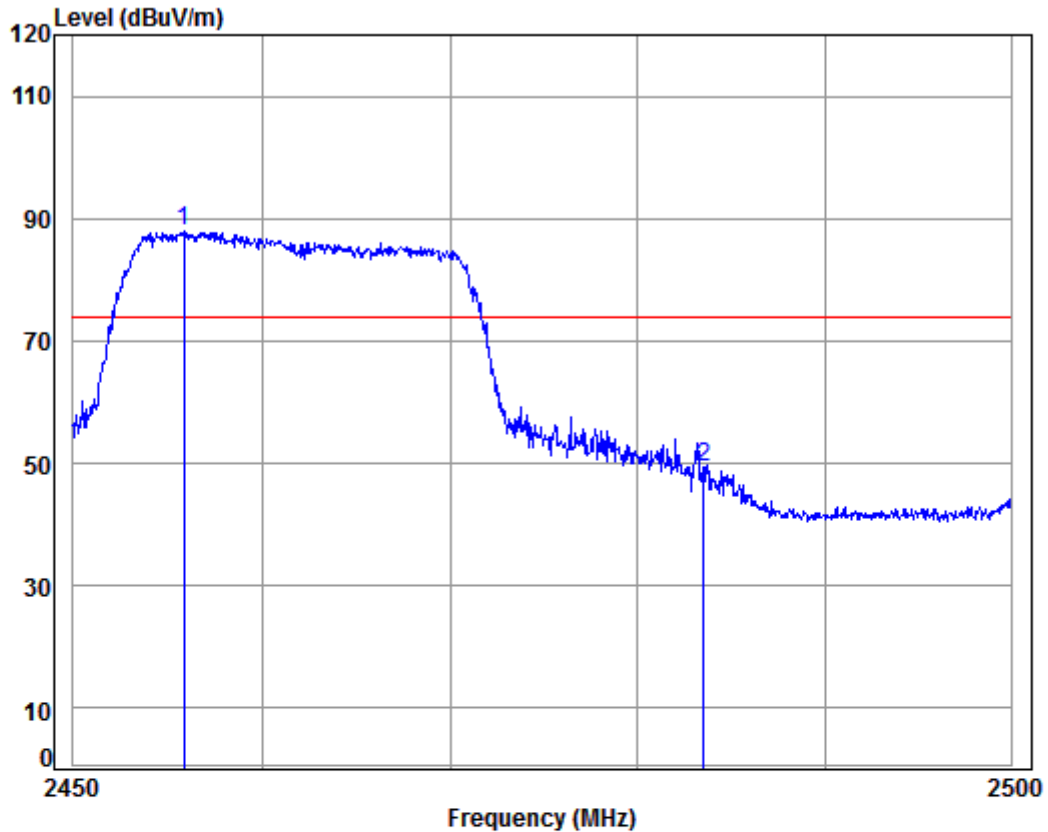
Mode: : 2412 Band edge

: N20

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2390.000	5.34	29.08	38.14	50.55	46.83	54.00	-7.17 Average
2	2390.000	5.34	29.08	38.14	65.98	62.26	74.00	-11.74 Peak
3 pp	2413.255	5.36	29.15	38.15	99.40	95.76	74.00	21.76 Peak



Worse case mode:	802.11n(HT20)	Test channel:	Highest	Remark:	Peak	Vertical
------------------	---------------	---------------	---------	---------	------	----------



Condition: 3m Vertical

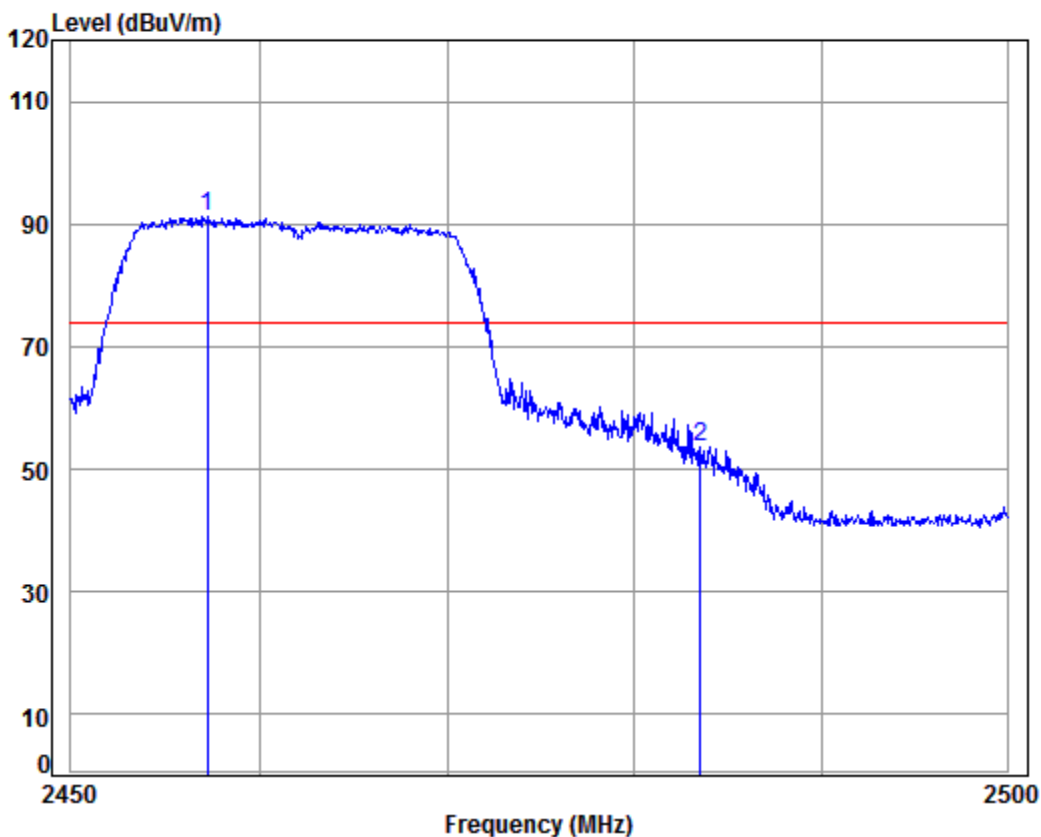
Job No: : 0597CR

Mode: : 2462 Band edge
: N20

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2455.848	5.39	29.27	38.15	91.32	87.83	74.00	13.83 Peak
2	2483.500	5.41	29.35	38.15	52.86	49.47	74.00	-24.53 Peak



Worse case mode:	802.11n(HT20)	Test channel:	Highest	Remark:	Peak	Horizontal
------------------	---------------	---------------	---------	---------	------	------------



Condition: 3m Horizontal
Job No: : 0597CR
Mode: : 2462 Band edge
: N20

		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2457.237	5.39	29.28	38.15	94.73	91.25	74.00	17.25 Peak
2	2483.500	5.41	29.35	38.15	57.12	53.73	74.00	-20.27 Peak

Note:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$



7.8 Conducted Band Edges Measurement

Test Requirement: 47 CFR Part 15, Subpart C 15.247
Test Method: ANSI C63.10 (2013) Section 11.13.3.2
Limit: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 22.0 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Exploratory Test Mode: Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.

Transmitting mode and Charge + Transmitting mode.

Final Test Mode: Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case

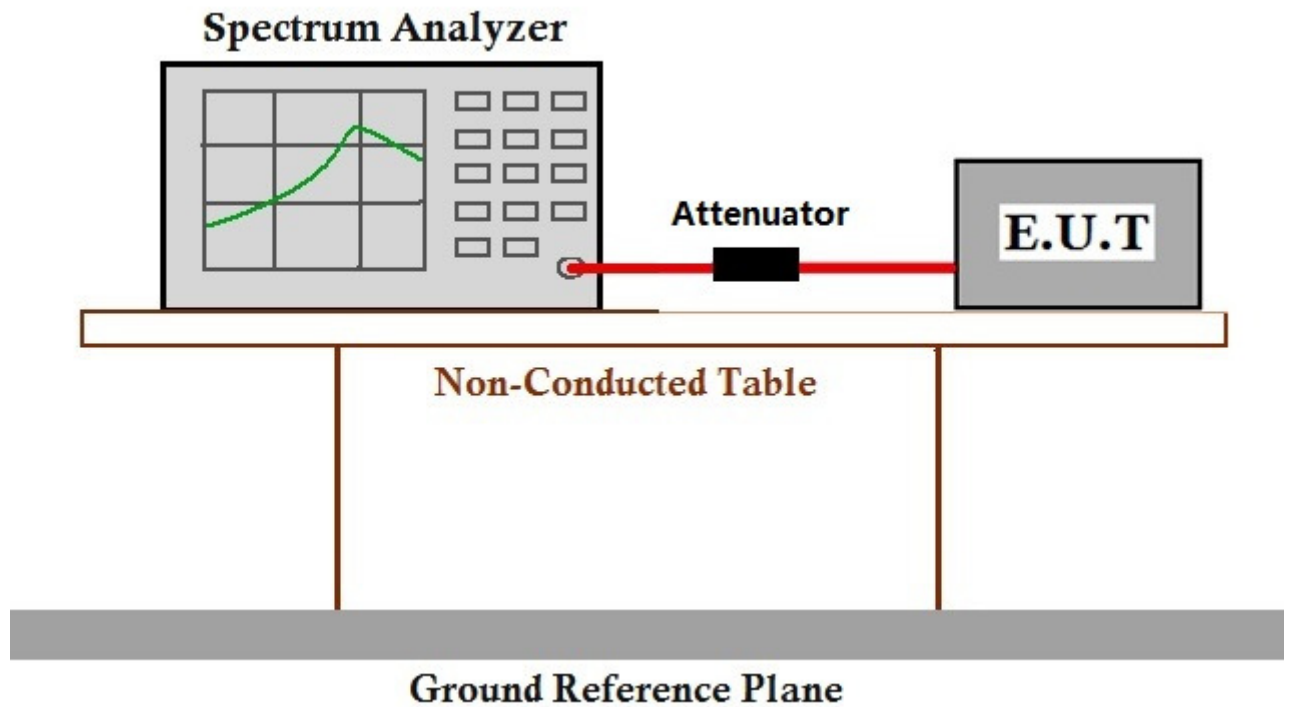
Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b;

6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20)

Transmitting mode.

Only the worst case is recorded in the report.

7.8.2 Test Setup Diagram



7.8.3 Measurement Data

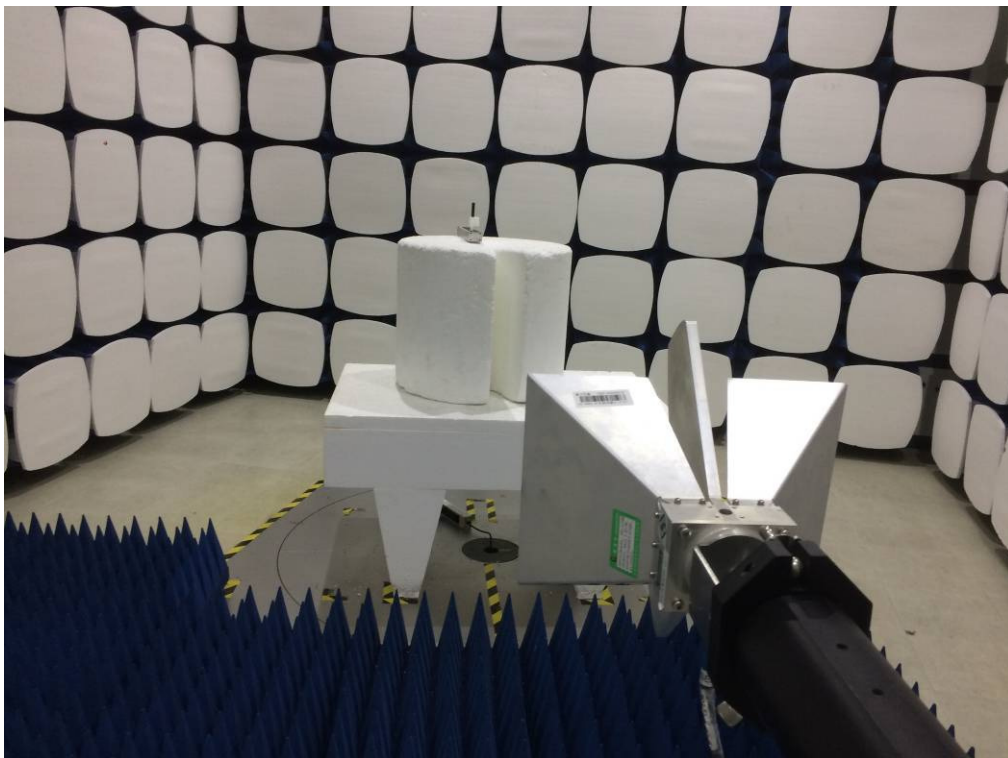
The detailed test data see: Appendix 15.247

8 Photographs

8.1 Conducted Disturbance at AC Power Line(150kHz-30MHz) Test Setup



8.2 Radiated Spurious Emission





8.3 EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM1701000597CR.

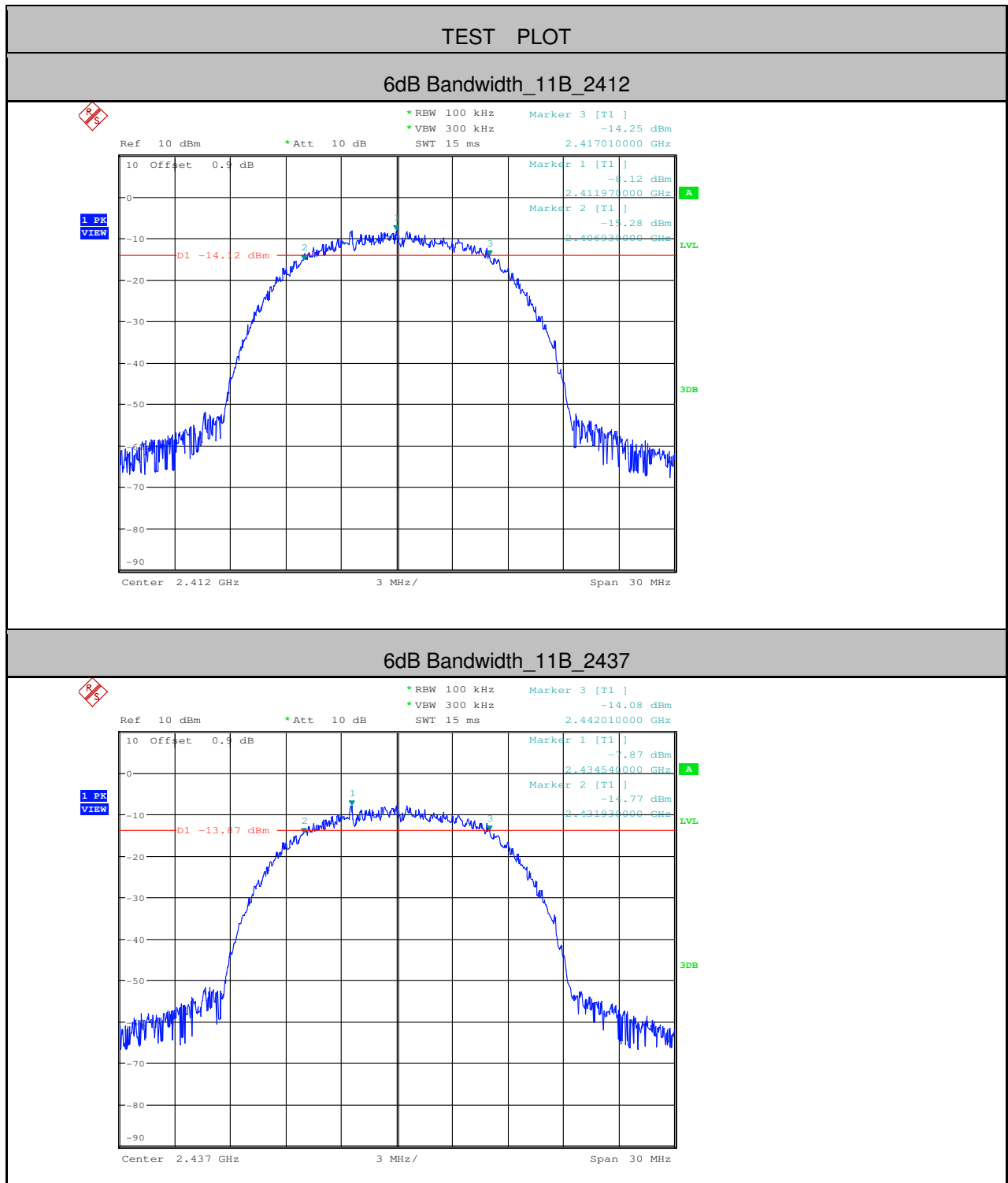


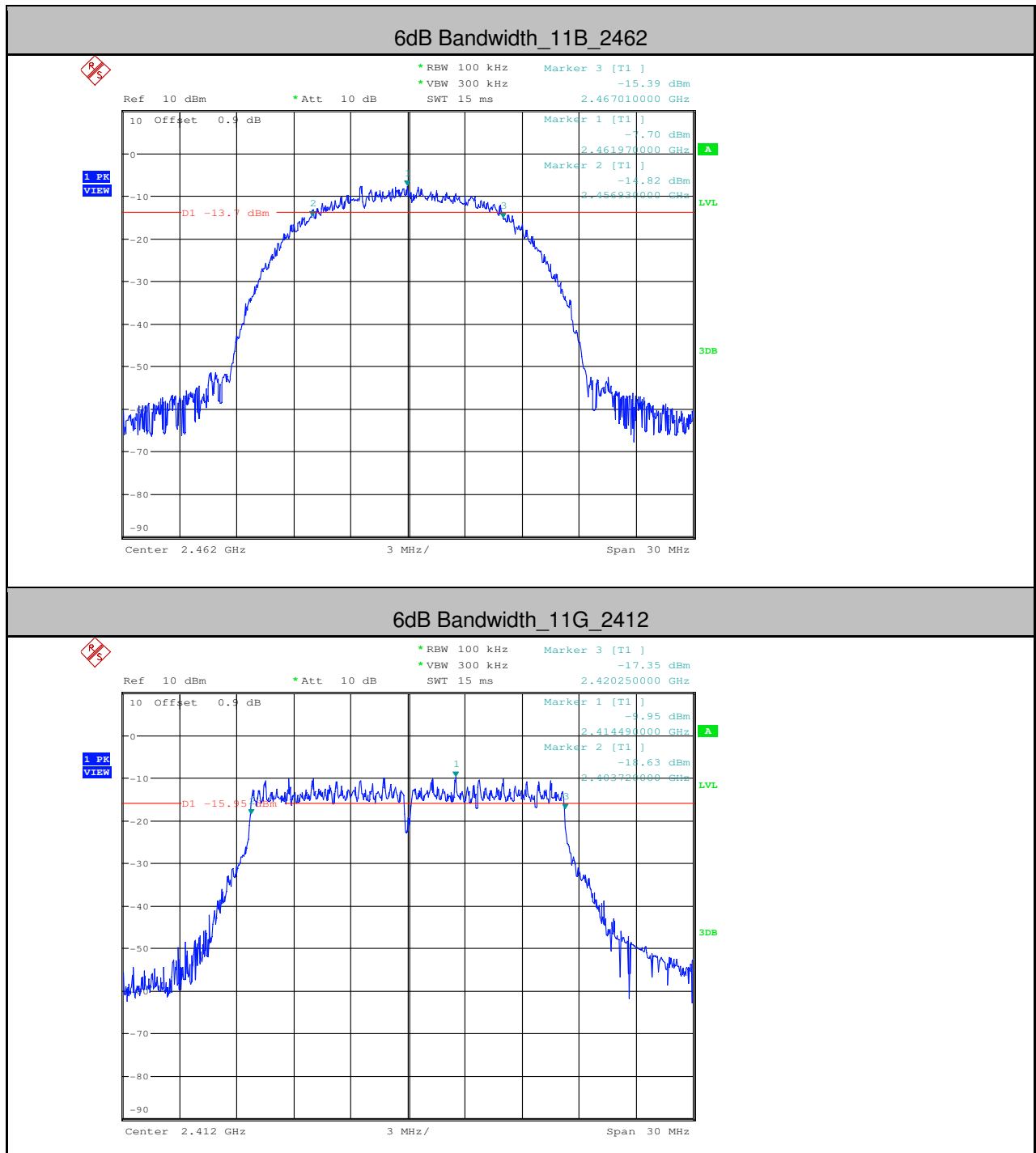
9 Appendix

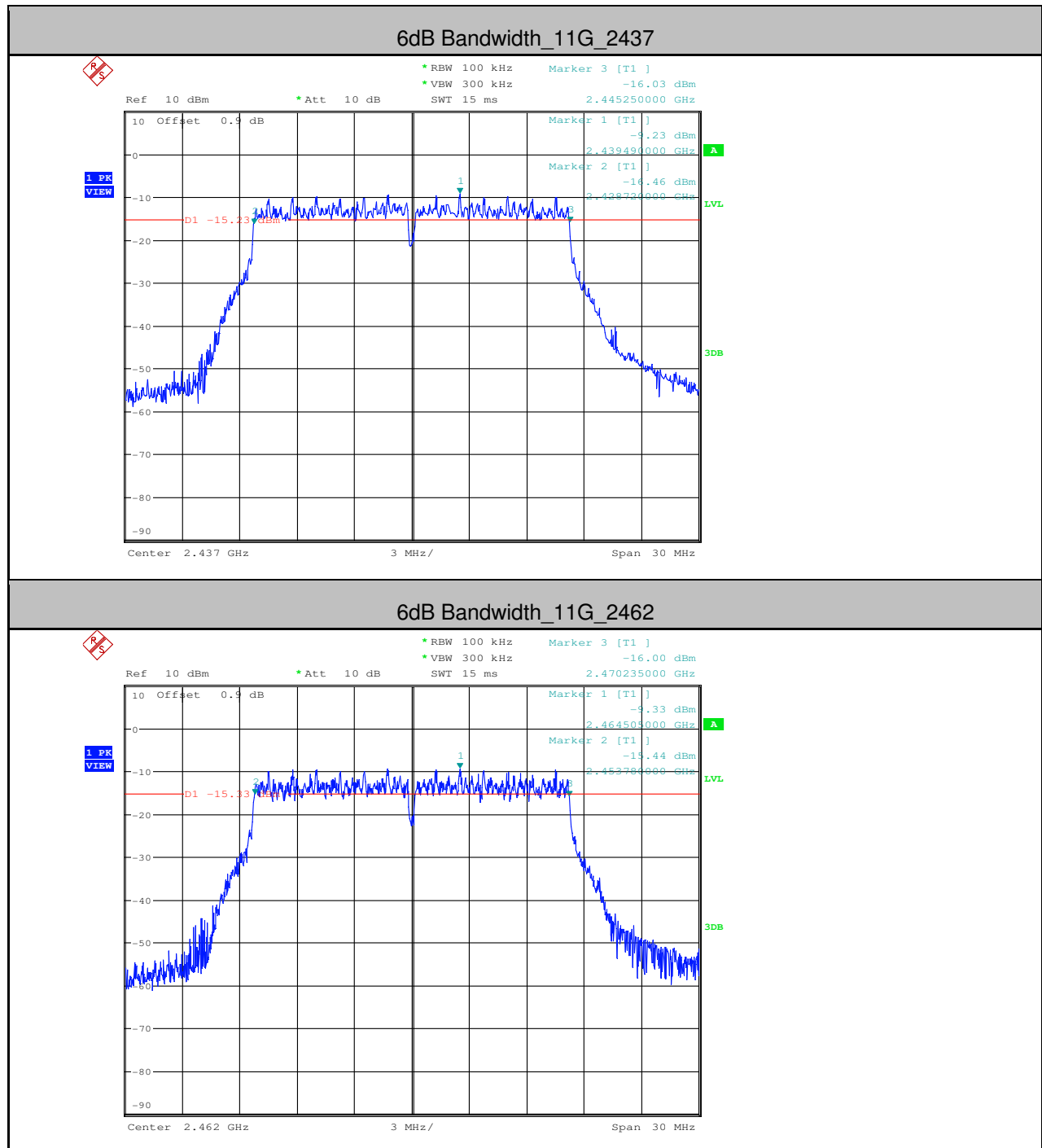
9.1 Appendix 15.247

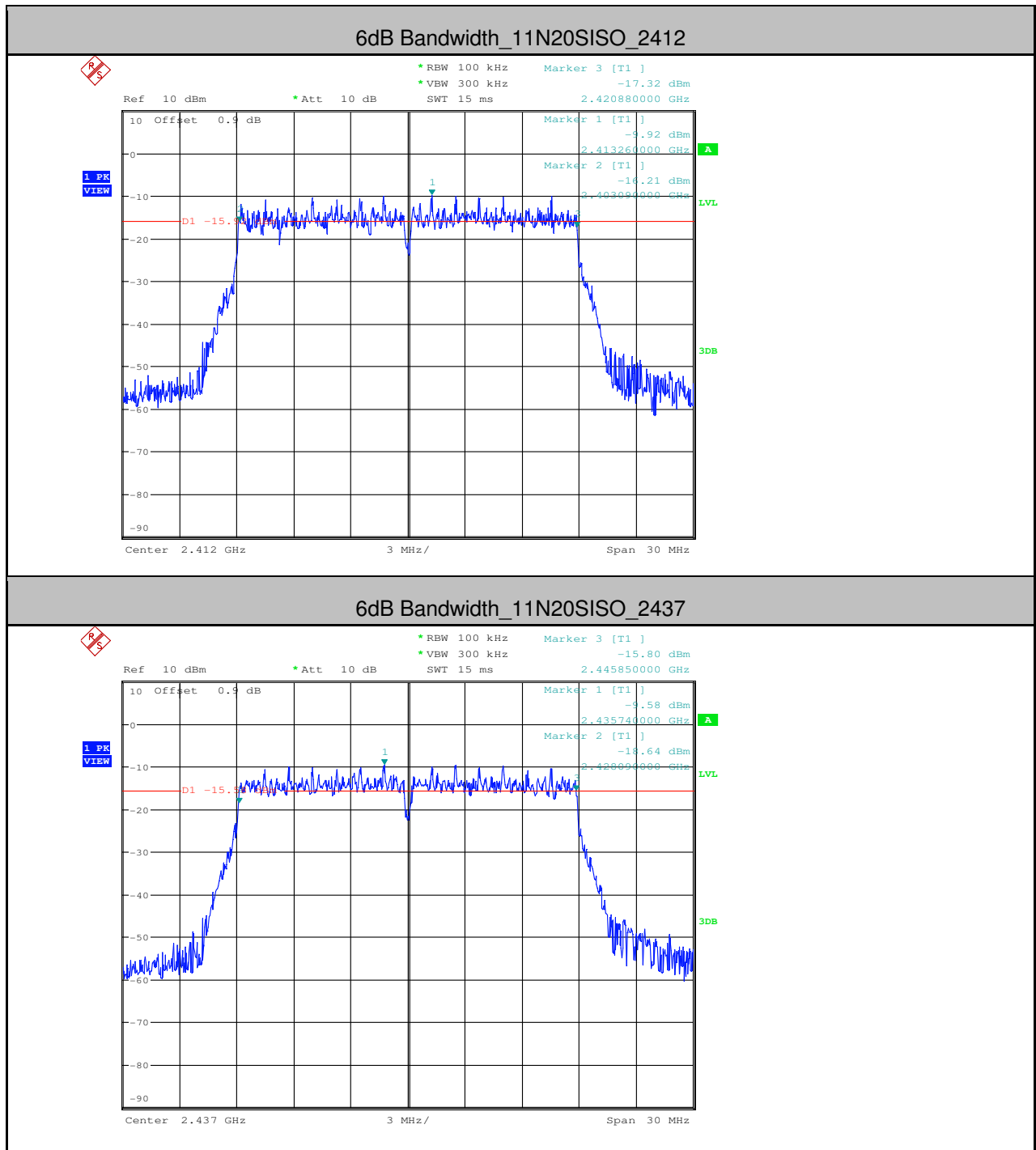
1.6dB Bandwidth

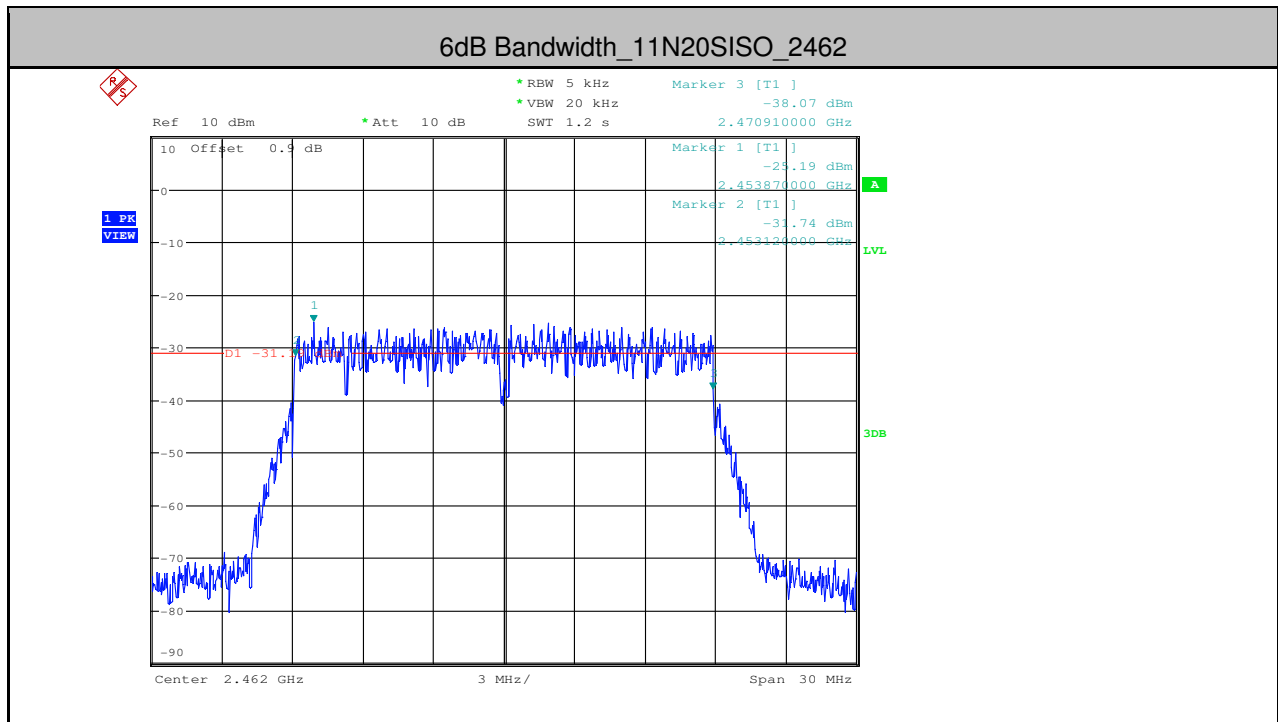
Test Mode	Test Channel[MHz]	EBW[MHz]	Limit[MHz]	Verdict
11B	2412	10.080	≥ 0.5	PASS
11B	2437	10.080	≥ 0.5	PASS
11B	2462	10.080	≥ 0.5	PASS
11G	2412	16.530	≥ 0.5	PASS
11G	2437	16.530	≥ 0.5	PASS
11G	2462	16.455	≥ 0.5	PASS
11N20SISO	2412	17.790	≥ 0.5	PASS
11N20SISO	2437	17.760	≥ 0.5	PASS
11N20SISO	2462	17.790	≥ 0.5	PASS













2.Maximum peak conducted output power

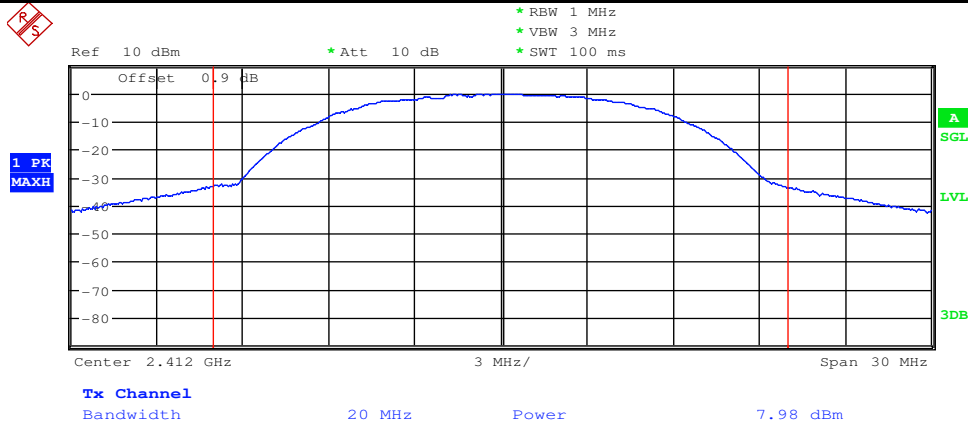
Pre-scan under all rate								
Mode	802.11b							
Data Rate	1Mbps	2Mbps	5.5Mbps	11Mbps				
Power (dBm)	8.28	8.19	8.15	8.09				
Mode	802.11g							
Data Rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
Power (dBm)	9.72	9.69	9.67	9.64	9.61	9.59	9.57	9.54
Mode	802.11n(HT20)							
Data Rate	6.5Mbps	13Mbps	19.5Mbps	26Mbps	39Mbps	52Mbps	58.5Mbps	65Mbps
Power (dBm)	9.78	9.73	9.69	9.64	9.59	9.55	9.52	9.49
Through Pre-scan, 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20).								

Test Mode	Test Channel	Power[dBm]	Limit[dBm]	Verdict
11B	2412	7.98	<30	PASS
11B	2437	8.18	<30	PASS
11B	2462	8.28	<30	PASS
11G	2412	9.51	<30	PASS
11G	2437	9.72	<30	PASS
11G	2462	9.44	<30	PASS
11N20SISO	2412	9.78	<30	PASS
11N20SISO	2437	9.47	<30	PASS
11N20SISO	2462	9.05	<30	PASS

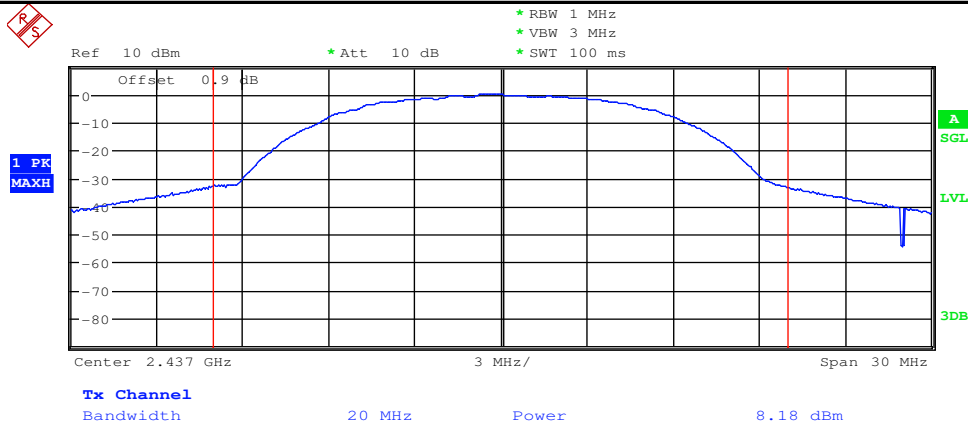


TEST PLOT

Maximum peak conducted output power_11B_2412

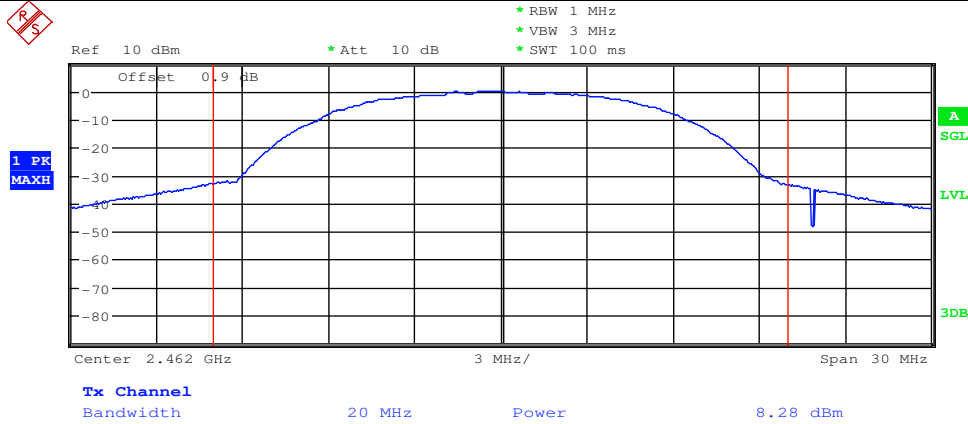


Maximum peak conducted output power_11B_2437

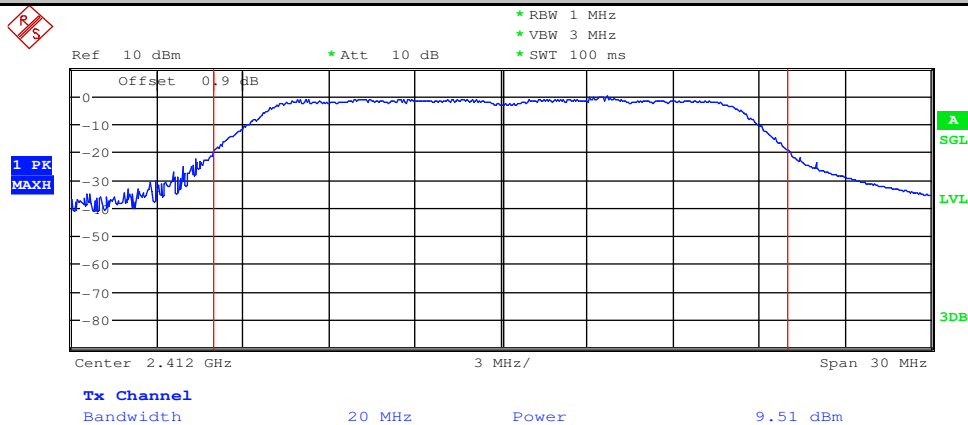




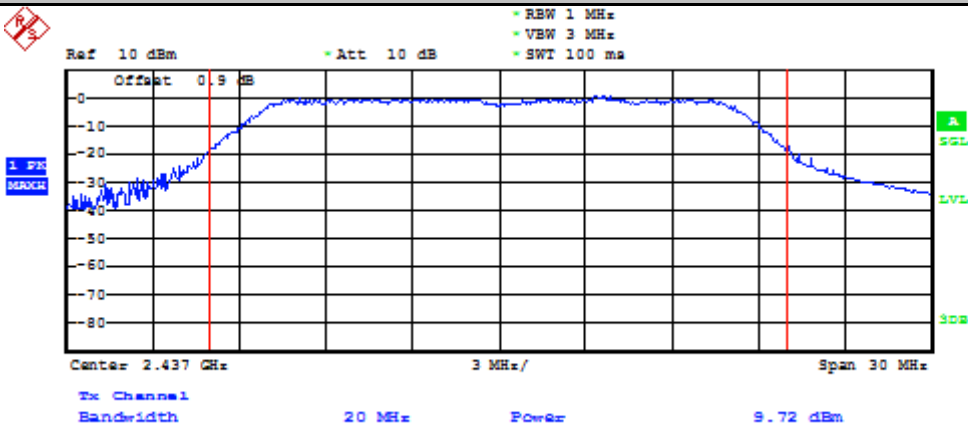
Maximum peak conducted output power_11B_2462



Maximum peak conducted output power_11G_2412

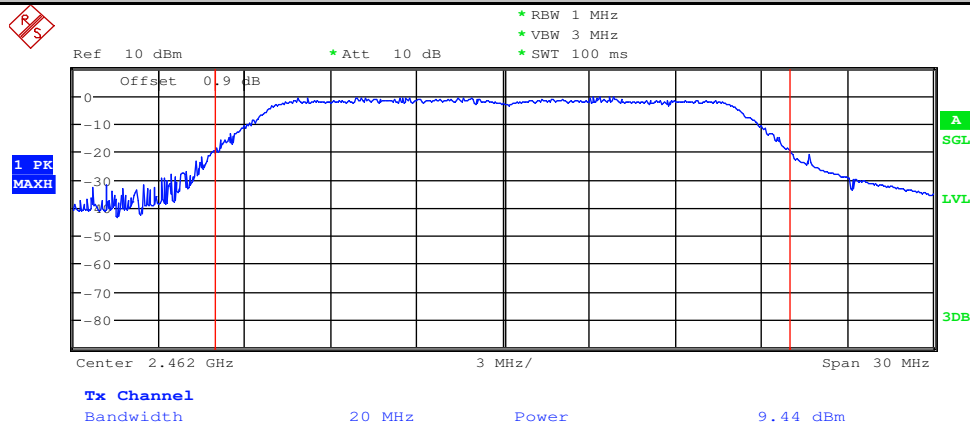


Maximum peak conducted output power_11G_2437

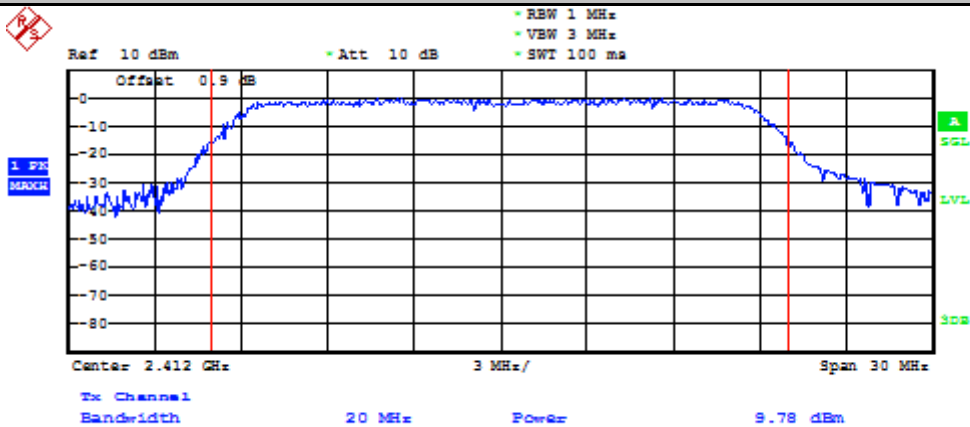




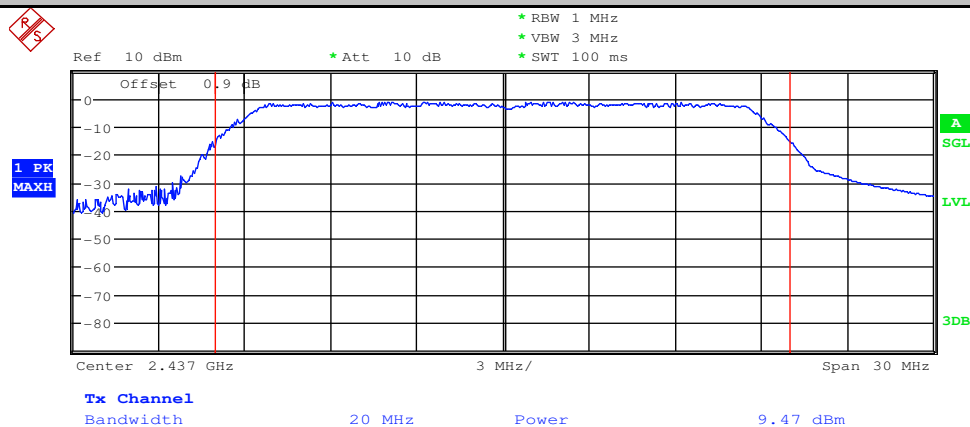
Maximum peak conducted output power_11G_2462

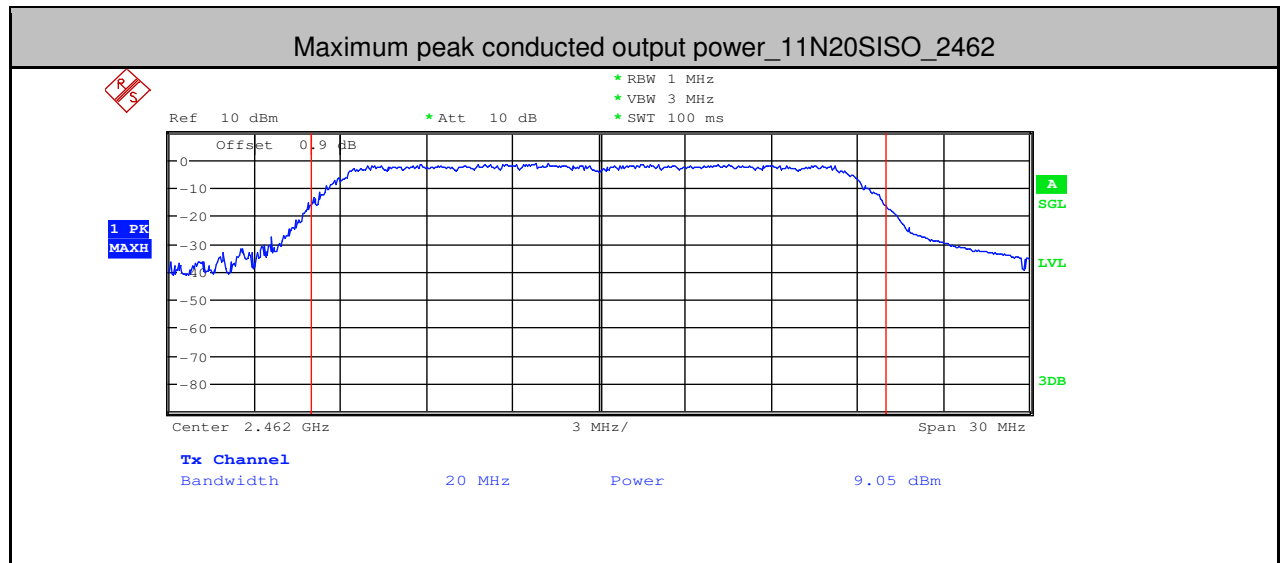


Maximum peak conducted output power_11N20SISO_2412



Maximum peak conducted output power_11N20SISO_2437







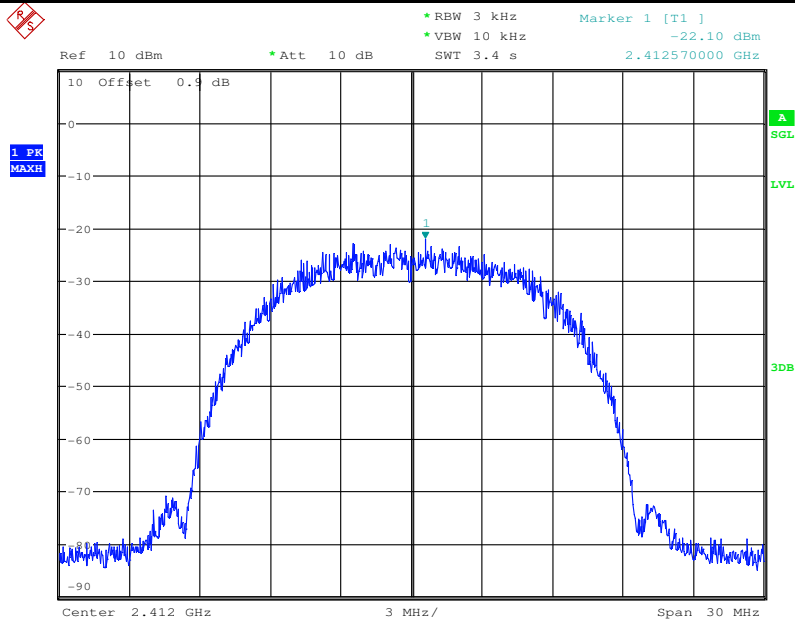
3.Maximum Peak power spectral density

Test Mode	Test Channel	PSD[dBm/MHz]	Limit[dBm/MHz]	Verdict
11B	2412	-22.1	<8.00	PASS
11B	2437	-21.56	<8.00	PASS
11B	2462	-21.45	<8.00	PASS
11G	2412	-24.5	<8.00	PASS
11G	2437	-23.03	<8.00	PASS
11G	2462	-24.22	<8.00	PASS
11N20SISO	2412	-25.8	<8.00	PASS
11N20SISO	2437	-24.54	<8.00	PASS
11N20SISO	2462	-25.76	<8.00	PASS

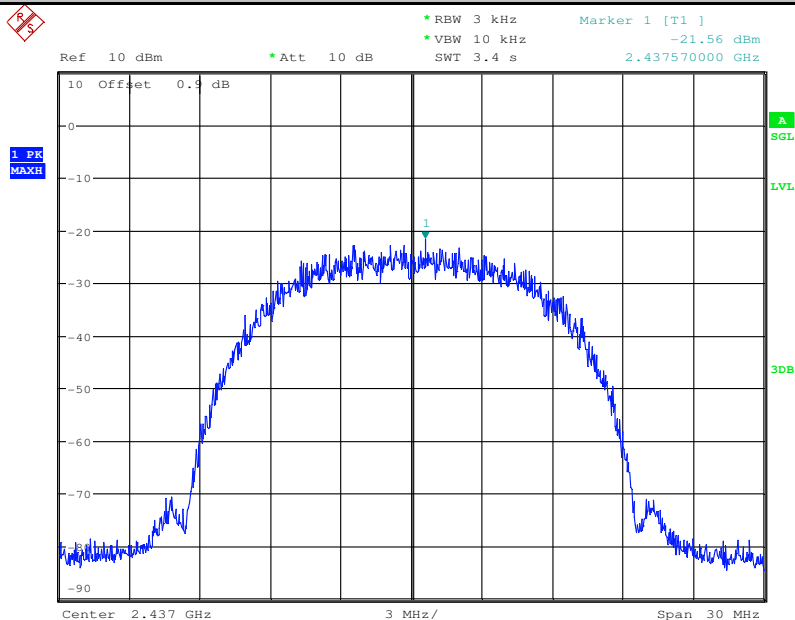


TEST PLOT

Maximum Peak power spectral density_11B_2412

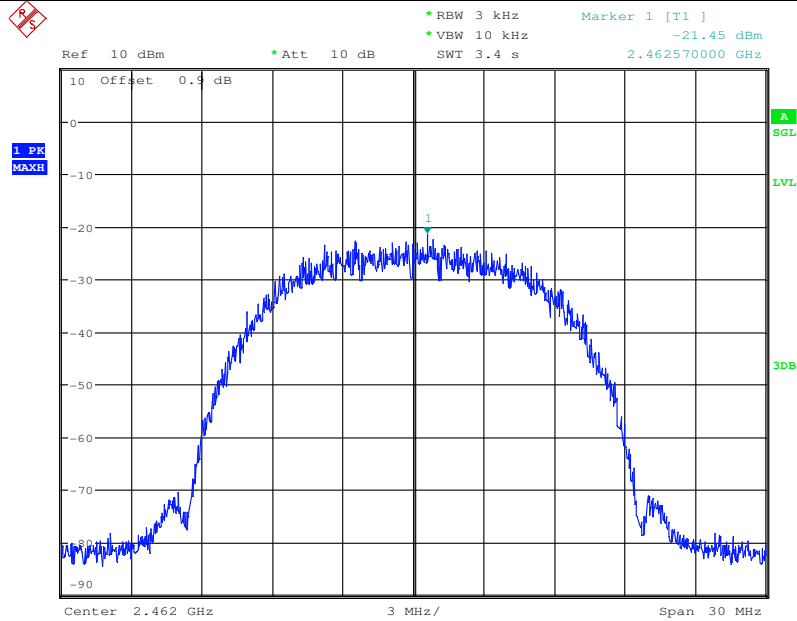


Maximum Peak power spectral density_11B_2437

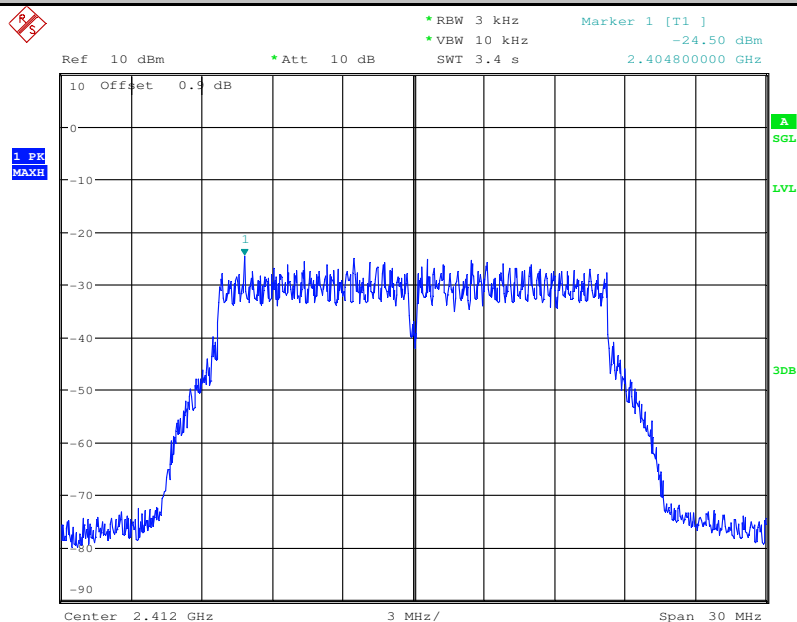




Maximum Peak power spectral density_11B_2462

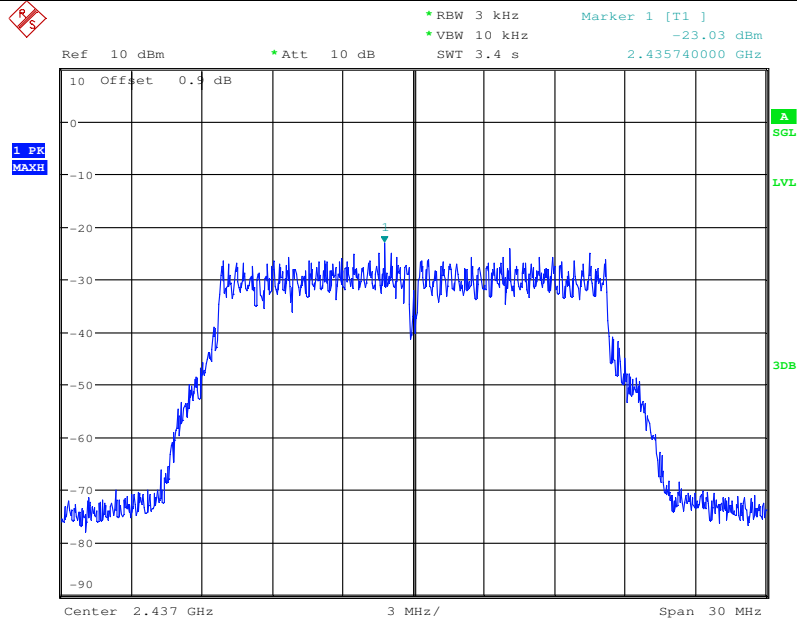


Maximum Peak power spectral density_11G_2412

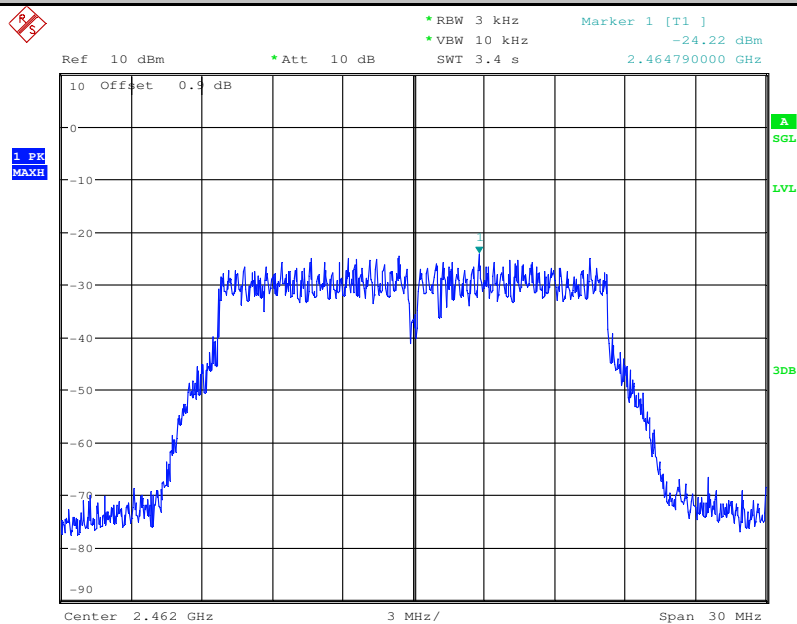




Maximum Peak power spectral density_11G_2437

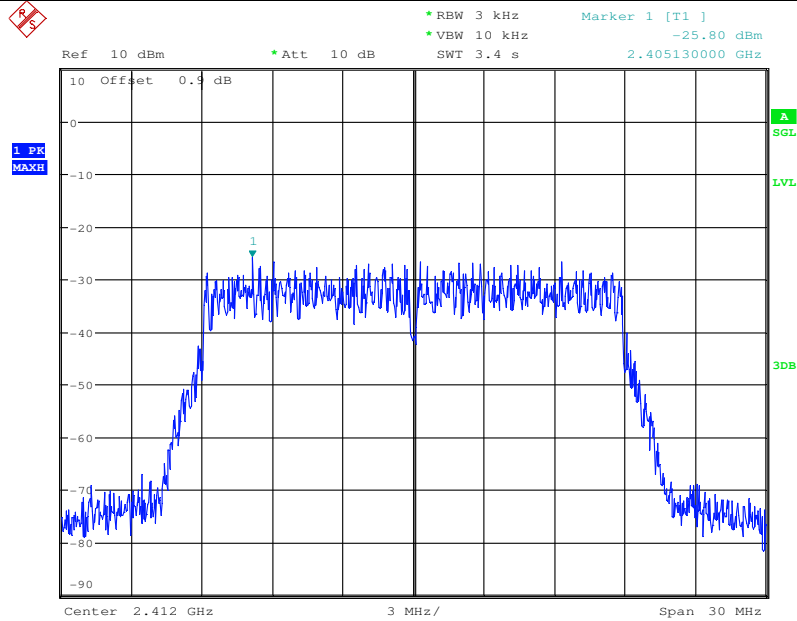


Maximum Peak power spectral density_11G_2462

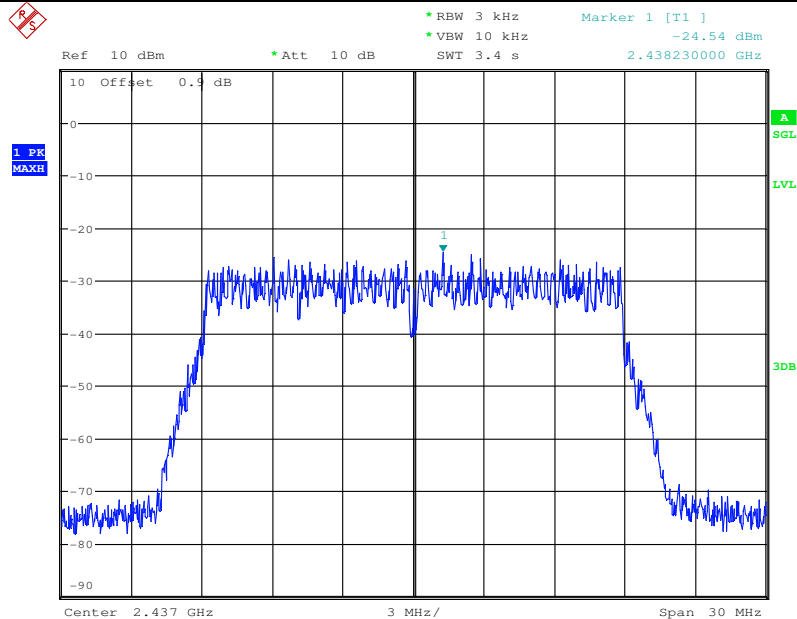


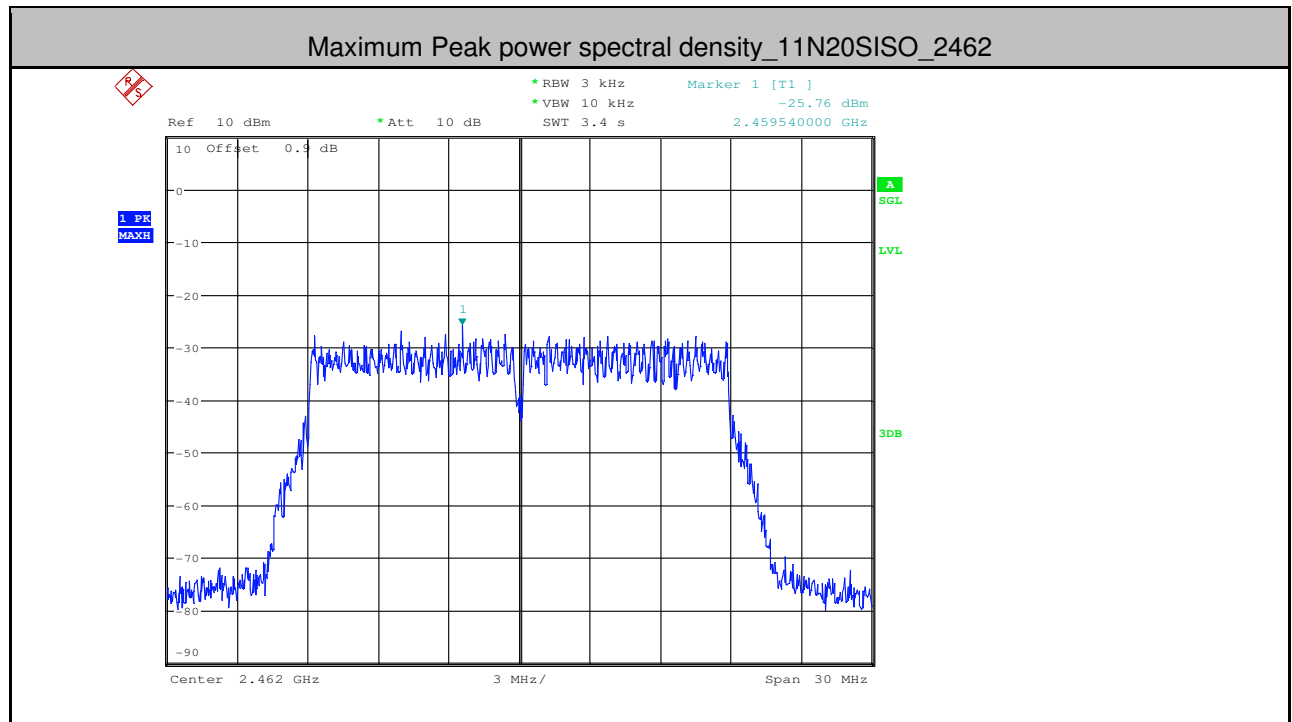


Maximum Peak power spectral density_11N20SISO_2412



Maximum Peak power spectral density_11N20SISO_2437







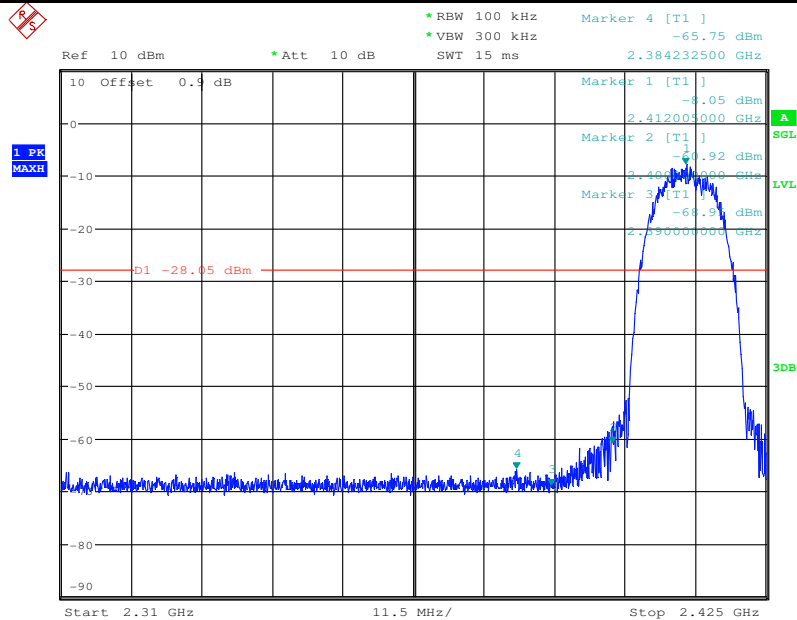
4.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
11B	2412	-8.050	-65.750	<-28.05	PASS
11B	2462	-7.800	-65.772	<-27.8	PASS
11G	2412	-10.230	-64.006	<-30.23	PASS
11G	2462	-9.310	-63.390	<-29.31	PASS
11N20SISO	2412	-10.380	-63.305	<-30.38	PASS
11N20SISO	2462	-11.130	-65.298	<-31.13	PASS

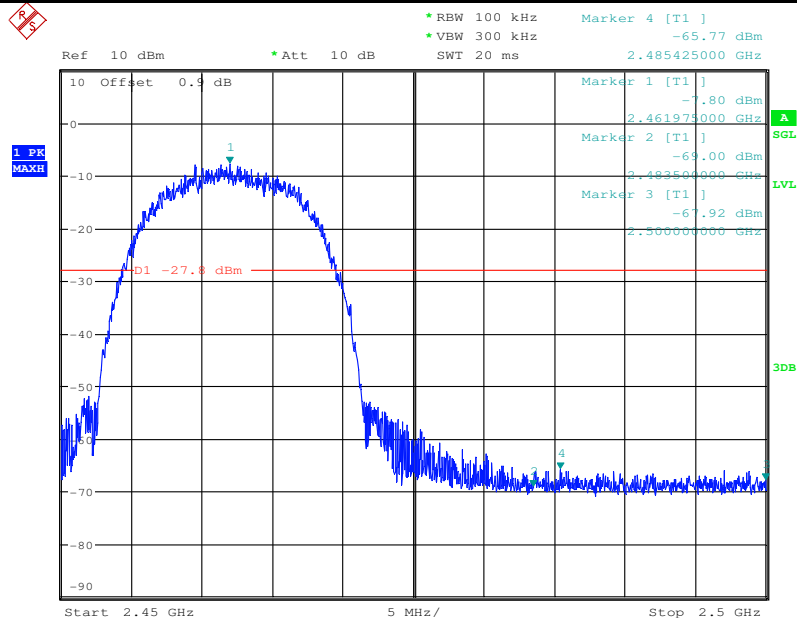


TEST PLOT

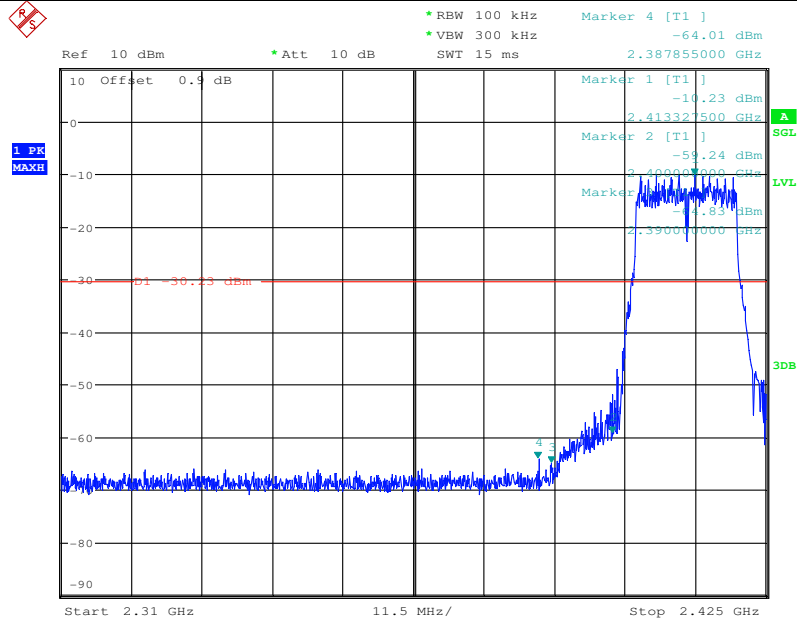
Band-edge for RF Conducted Emissions_11B_2412



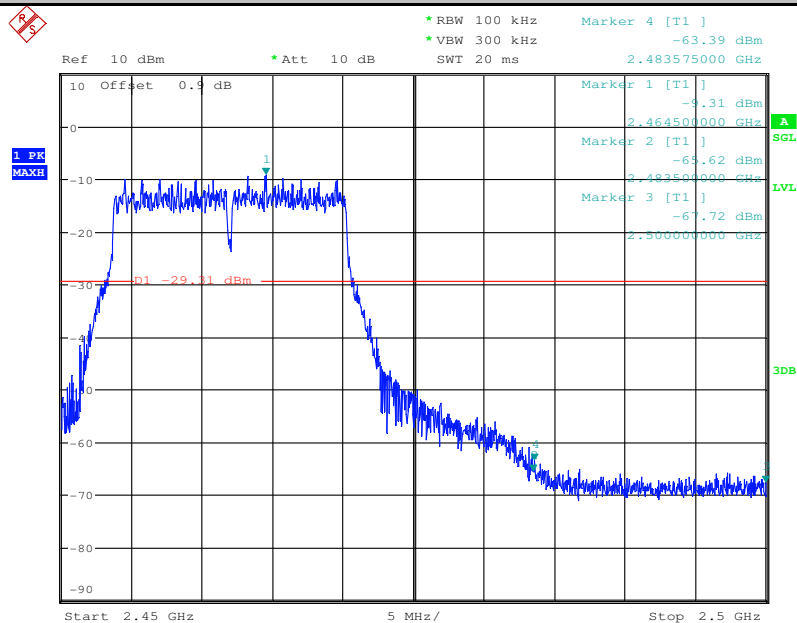
Band-edge for RF Conducted Emissions_11B_2462



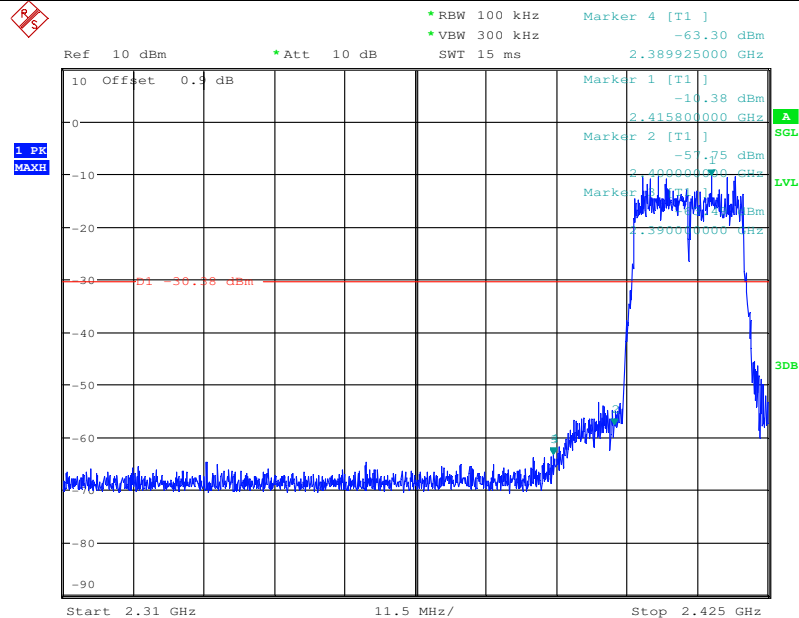
Band-edge for RF Conducted Emissions_11G_2412



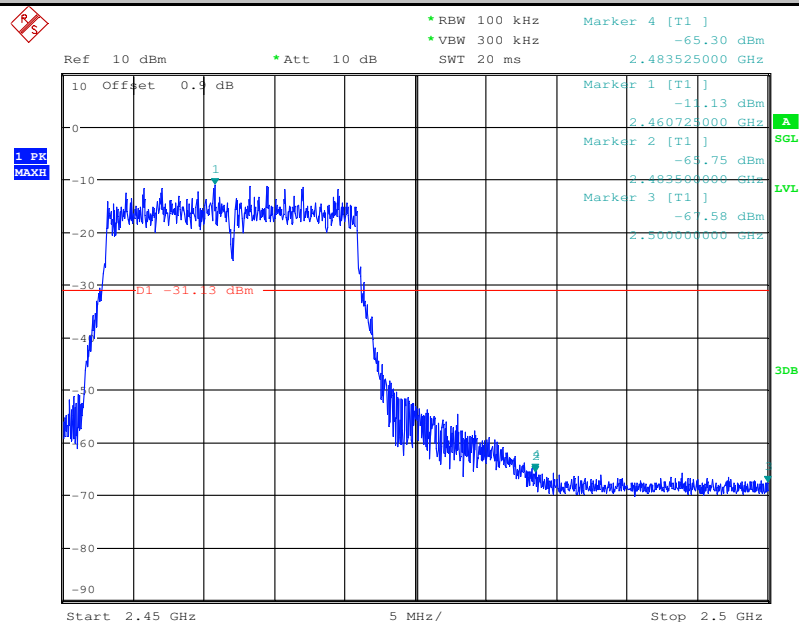
Band-edge for RF Conducted Emissions_11G_2462



Band-edge for RF Conducted Emissions_11N20SISO_2412



Band-edge for RF Conducted Emissions_11N20SISO_2462



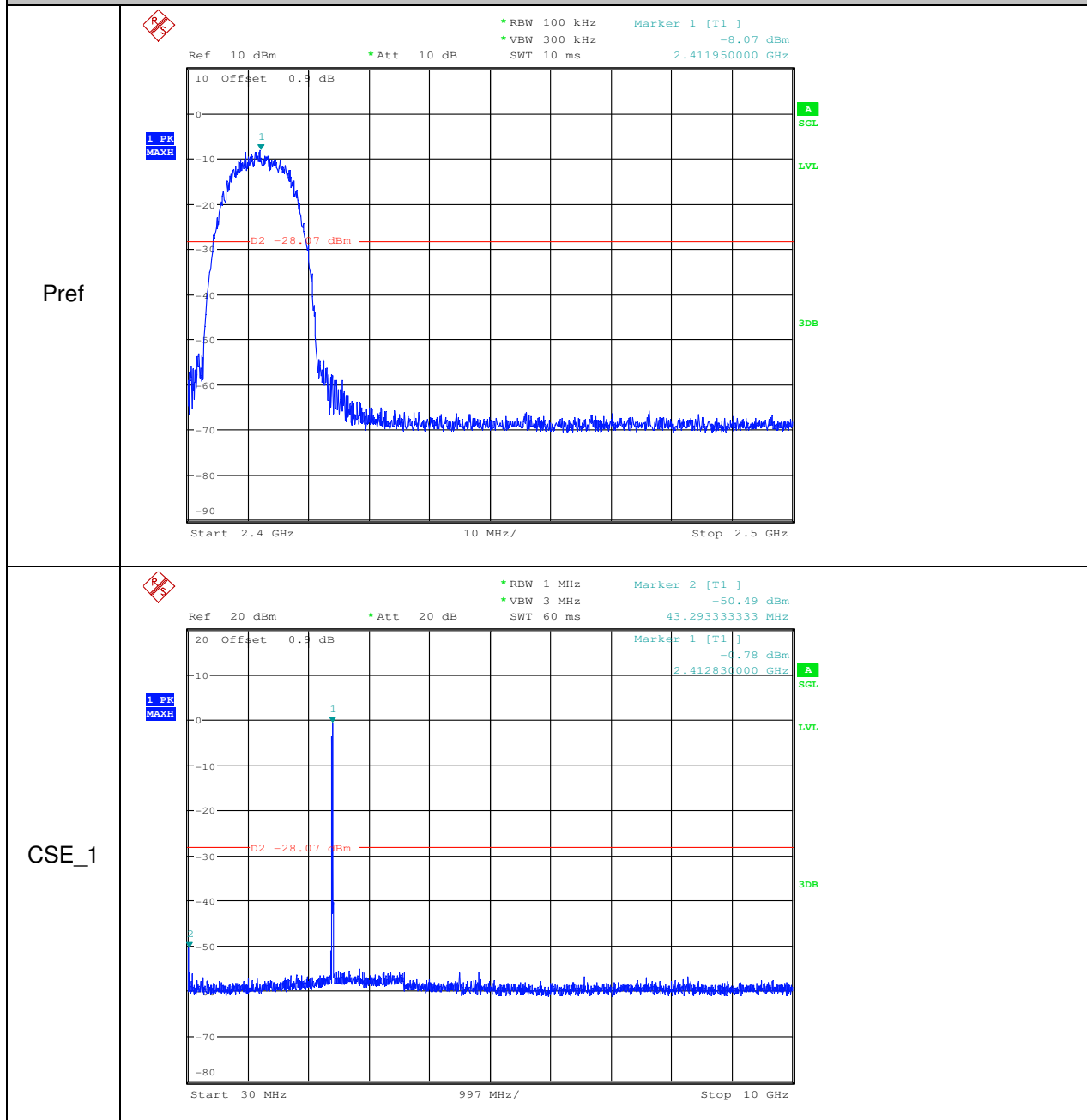


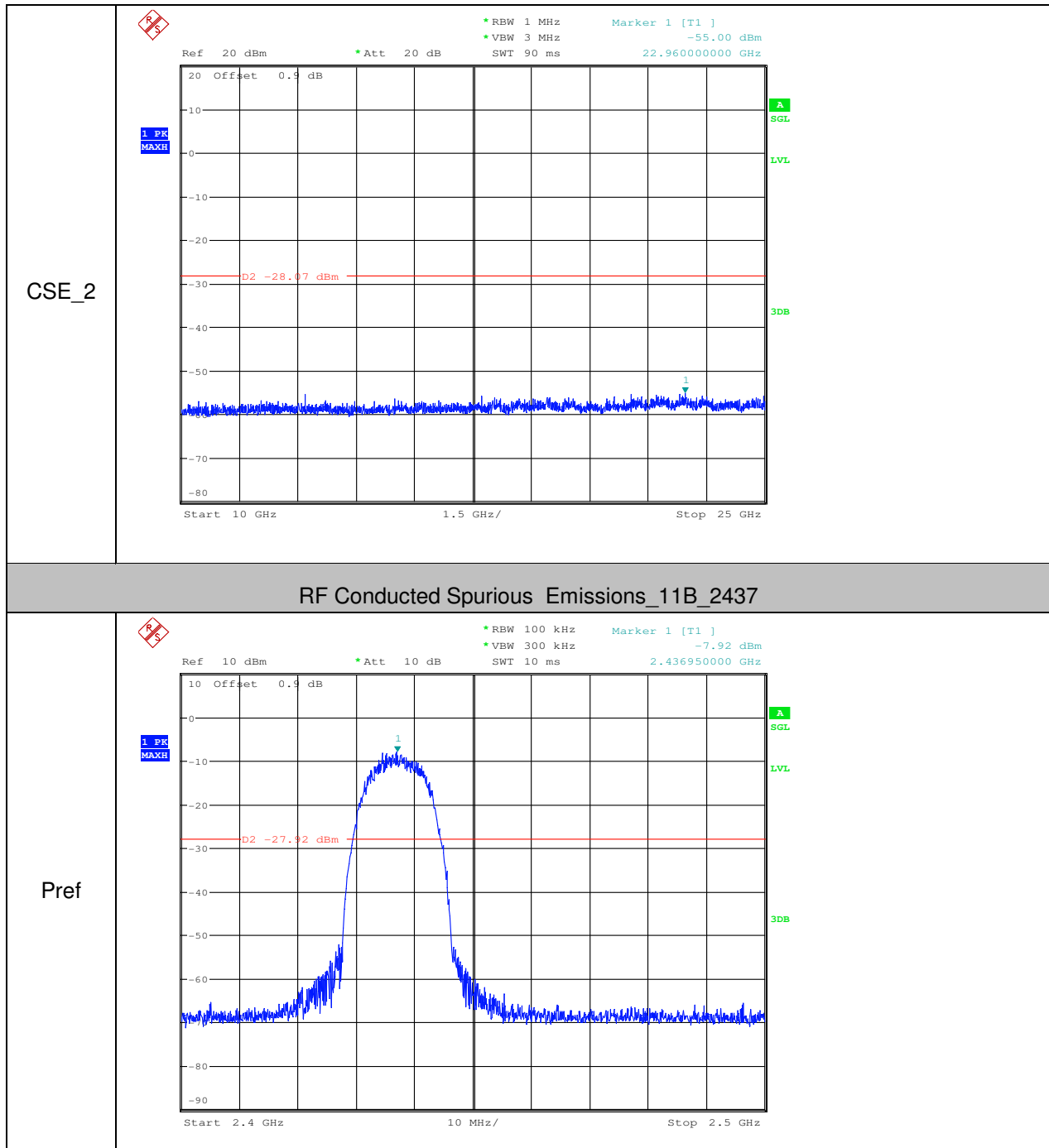
5.RF Conducted Spurious Emissions

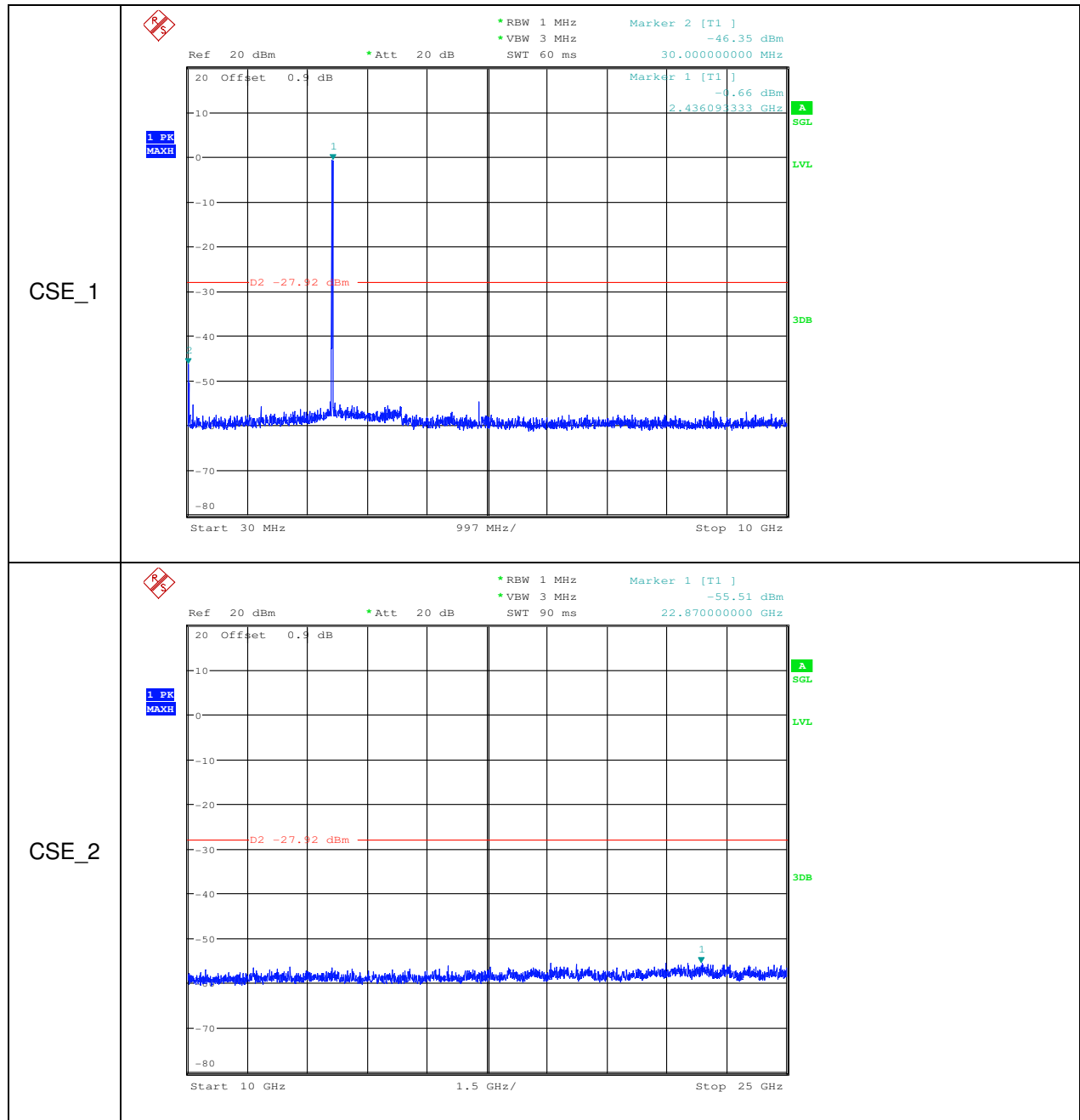
Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
11B	2412	10000	25000	1000	3000	-8.07	-55.000	<-28.07	PASS
11B	2437	30	10000	1000	3000	-7.92	-46.350	<-27.92	PASS
11B	2437	10000	25000	1000	3000	-7.92	-55.510	<-27.92	PASS
11B	2462	30	10000	1000	3000	-7.77	-54.400	<-27.77	PASS
11B	2462	10000	25000	1000	3000	-7.77	-55.340	<-27.77	PASS
11G	2412	30	10000	1000	3000	-10.33	-47.260	<-30.33	PASS
11G	2412	10000	25000	1000	3000	-10.33	-55.020	<-30.33	PASS
11G	2437	30	10000	1000	3000	-9.34	-53.290	<-29.34	PASS
11G	2437	10000	25000	1000	3000	-9.34	-55.380	<-29.34	PASS
11G	2462	30	10000	1000	3000	-9.64	-47.710	<-29.64	PASS
11B	2412	30	10000	1000	3000	-8.07	-50.490	<-28.07	PASS
11G	2462	10000	25000	1000	3000	-9.64	-54.630	<-29.64	PASS
11N20SISO	2412	30	10000	1000	3000	-10.66	-50.660	<-30.66	PASS
11N20SISO	2412	10000	25000	1000	3000	-10.66	-55.230	<-30.66	PASS
11N20SISO	2437	30	10000	1000	3000	-9.96	-46.990	<-29.96	PASS
11N20SISO	2437	10000	25000	1000	3000	-9.96	-54.530	<-29.96	PASS
11N20SISO	2462	30	10000	1000	3000	-10.81	-55.220	<-30.81	PASS
11N20SISO	2462	10000	25000	1000	3000	-10.81	-54.620	<-30.81	PASS

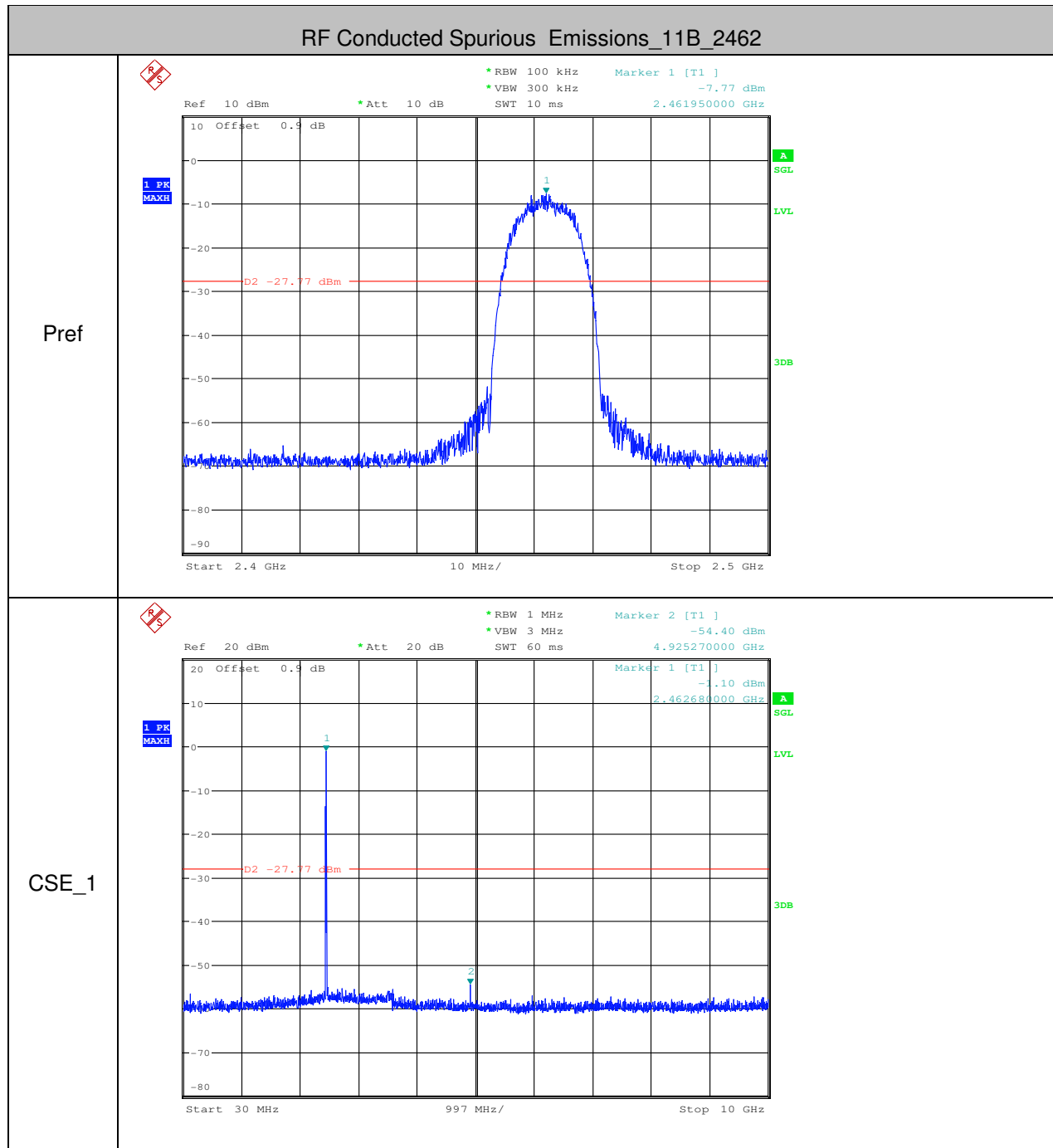
TEST PLOT

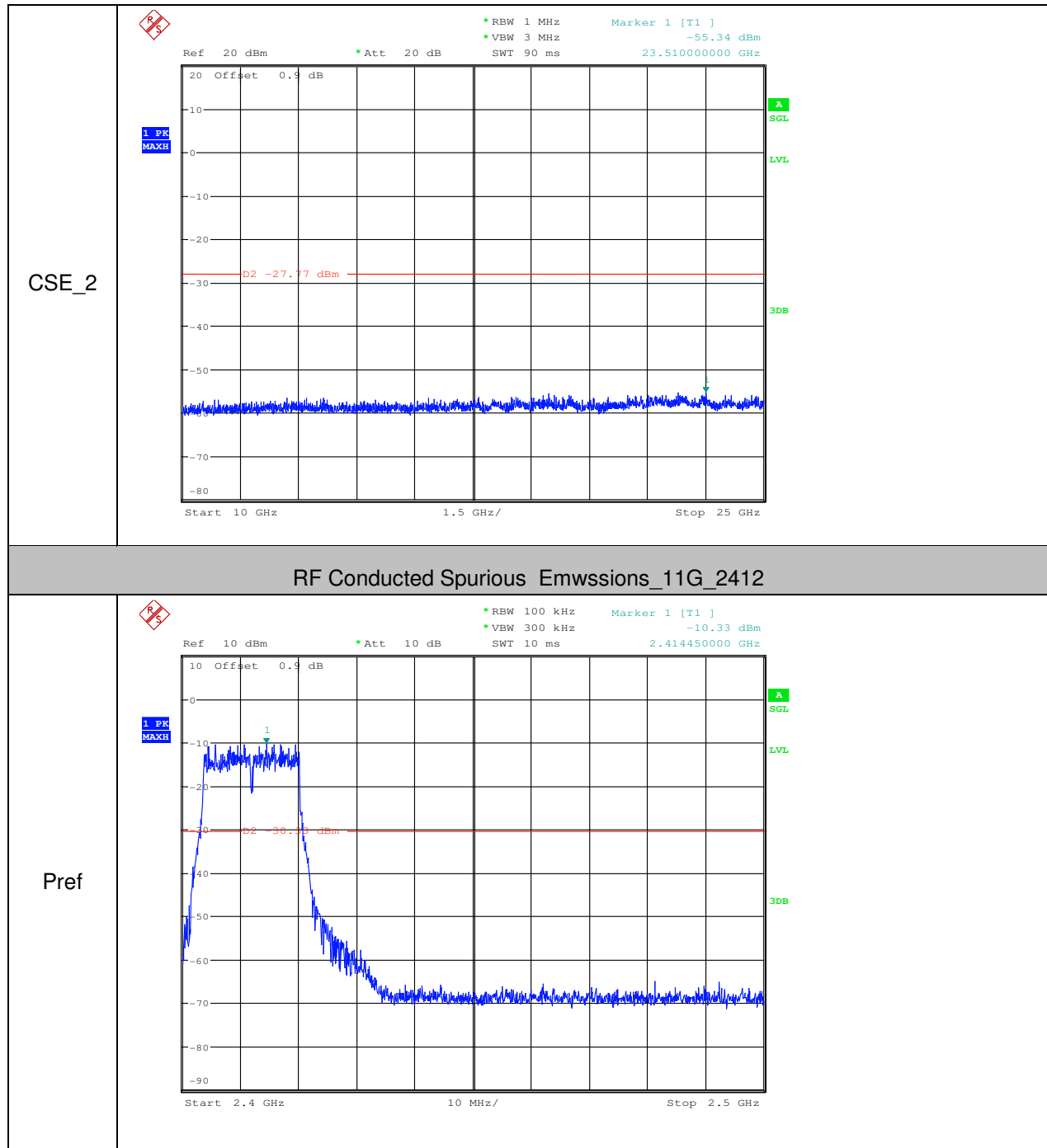
RF Conducted Spurious Emissions_11B_2412













Page: 81 of 89

