FCC PART 15C REPORT FOR CERTIFICATION
On Behalf of

Guangzhou Shikun Electronics Co., Ltd

IEEE802.11a/b/g/n/ac 2T2R USB Wi-Fi Module Integrated Bluetooth 2.1/3.0/4.2/5.0

Model Number: SKI.WB822CU.2

FCC ID: 2AR82-SKIWB822CU2

Applicant :	Guangzhou Shikun Electronics Co., Ltd
Address:	NO.6 Liankun Road, Huangpu District, Guangzhou, China
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

Report Number:	ESTE-R2112274
Date of Test:	Dec. 01-24, 2021
Date of Report:	Dec. 29, 2021

TABLE OF CONTENTS

Description Page

EST Technology Co., Ltd.

Applicant: **Address:**	Guangzhou Shikun Electronics Co., Ltd NO.6 Liankun Road, Huangpu District, Guangzhou, China
Manufacturer: **Address:**	Guangzhou Shikun Electronics Co., Ltd NO.6 Liankun Road, Huangpu District, Guangzhou, China
E.U.T:	IEEE802.11a/b/g/n/ac 2T2R USB Wi-Fi Module Integrated Bluetooth 2.1/3.0/4.2/5.0
Model Number:	SKI.WB822CU.2
Power Supply:	DC 3.3V From Adapter Input 120V/60Hz
Trade Name:	------ Serial No.: ------
Date of Receipt:	Dec. 01, 2021 Date of Test: Dec. 01-24, 2021
Test Specification:	FCC Part 15 Subpart C (15.247) ANSI C63.10:2013 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 FCC KDB 662911 D01 Multiple Transmitter Output v02r01
Test Result:	The device described above is tested by EST Technology Co., Ltd. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC Rules and Regulations Part 15 Subpart C requirements. This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd. **Date:** Dec. 25, 2021

Prepared by:	Reviewed by:	Approved by:
Emily Cai / Assistant	Seven Wang / Engineer	Iceman Hu / Manager

Other Aspects:
None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Product Name	:	IEEE802.11a/b/g/n/ac 2T2R USB Wi-Fi Module Integrated Bluetooth 2.1/3.0/4.2/5.0
Model Number	:	SKI.WB822CU.2
Software Version	:	N/A
Hardware Version	:	SKI.WB822CU.2
Operation frequency	:	2412MHz~2462MHz 2422MHz~2452MHz
Number of channel	:	IEEE 802.11b: 11 Channels IEEE 802.11g: 11 Channels IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Max Output Power (PEAK)	:	IEEE 802.11b: 12.00dBm IEEE 802.11g: 17.31dBm IEEE 802.11n HT20: 15dBm IEEE 802.11n HT40: 15.61dBm
Modulation Type	:	IEEE 802.11b mode: DSSS(CCK,QPSK, BPSK) IEEE 802.11g mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n mode: OFDM (BPSK/QPSK/16QAM/64QAM)
Sample Type	:	Prototype production

Note:

For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

1.2. Antenna Information

Ant No.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	-	-	External	-	3
2	-	-	External	-	3

Note:

1. The EUT has two antennas,the antennas can support SISO function in IEEE 802.11b and IEEE 802.11g,and can support MIMO function in IEEE 802.11n.
2. The EUT can work as CDD mode in IEEE 802.11n HT20 and IEEE 802.11n HT40,and can operate with one spatial stream.
3. According to ANSI C63.10:2013 14.4.3.2.5 a):
   Directional gain=3dBi+10×log(2/1)dB=6.01dBi＞6dBi
4. After pre-test all antenna configurations,the worst case configuration as list below.
5. This information is provided by the applicant.

ANT No. / TX Mode	SISO Configuration	MIMO Configuration
IEEE 802.11b	ANT 1 and ANT2	/
IEEE 802.11g	ANT 1 and ANT2	/
IEEE 802.11n HT20	/	ANT1+ANT2
IEEE 802.11n HT40	/	ANT1+ANT2

1.3. Information of RF Cable

Cable Loss(dB)	Provided by
1.0	Guangzhou Shikun Electronics Co., Ltd
Note: 1.The customer declared the loss value of the RF Cable, and the test results of this report only apply to the sample as received. 2. This information is provided by the applicant.	

2. SUMMARY OF TEST

2.1. Summary of test result

Report Section	Description of Test Item	FCC Standard Section	Results
3	6dB Bandwidth	15.247(a)(2)	PASS
4	Maximum Peak Output Power	15.247(b)(3)	PASS
5	Power Spectral Density	15.247(e)	PASS
6	Conducted Band Edge	15.247(d)	PASS
7	Conducted Spurious Emissions	15.247(d)	PASS
8	Radiated Spurious Emissions and Band Edge	15.205 15.209 15.247(d)	PASS
9	AC Power Line Conducted Emissions	15.207	PASS
10	Antenna Requirement	15.203	PASS

Note:

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

2.2. Test Facilities

EMC Lab : Certificated by CNAS, CHINA
Registration No.: L5288
This Certificate is valid until: November 12, 2023

Certificated by FCC, USA
Designation Number: CN1215
This Certificate is valid until: January 31, 2022

Certificated by A2LA, USA
Registration No.: 4366.01
This Certificate is valid until: January 31, 2022

Certificated by Industry Canada
CAB identifier No.: CN0035
This Certificate is valid until: January 31, 2022

Certificated by VCCI, Japan
Registration No.:C-14103; T-20073; R-13663; R-20103; G-20097
Date of registration: Apr. 20, 2020
This Certificate is valid until: Apr. 19, 2023

Certificated by TUV Rheinland, Germany
Registration No.: UA 50413872 0001
Date of registration: July 31, 2018

Certificated by Intertek
Registration No.: 2011-RTL-L2-64
Date of registration: November 08, 2018

Name of Firm : EST Technology Co., Ltd.

Site Location : Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China

2.3. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	±3.48dB
Uncertainty for spurious emissions test (30MHz-1GHz)	±4.60 dB(Polarize: H)
	±4.68 dB(Polarize: V)
Uncertainty for spurious emissions test (1GHz to 25GHz)	±4.96dB
Uncertainty for radio frequency	7×10^{-8}
Uncertainty for conducted RF Power	1.08dB
Uncertainty for Power density test	0.26dB

Note：This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.4. Assistant equipment used for test

Item	Equipment	Brand	Model Name/Type No.	FCC ID	Series No.
A	Notebook	Lenovo	Thinkpad X280	-	-

Item	Shielded Type	Ferrite Core	Length	Note
-	-	-	-	-

2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 (or 1.5) meter high above ground. EUT was beset into 2.4G WIFI test mode by software before test.

A	EUT

DC 3.3V From Adapter Input 120V/60Hz

(EUT: IEEE802.11a/b/g/n/ac 2T2R USB Wi-Fi Module Integrated Bluetooth 2.1/3.0/4.2/5.0)

2.6. Test Mode

The test mode was selected for the final test as listed below.

Test Item	Mode	Date Rate	Test Channel
6dB Bandwidth	IEEE 802.11b	1Mbps	Low/Middle/High
	IEEE 802.11g	6Mbps	Low/Middle/High
	IEEE 802.11n HT20	MCS0	Low/Middle/High
	IEEE 802.11n HT40	MCS0	Low/Middle/High
Maximum Peak Output Power	IEEE 802.11b	1Mbps	Low/Middle/High
	IEEE 802.11g	6Mbps	Low/Middle/High
	IEEE 802.11n HT20	MCS0	Low/Middle/High
	IEEE 802.11n HT40	MCS0	Low/Middle/High
Power Spectral Density	IEEE 802.11b	1Mbps	Low/Middle/High
	IEEE 802.11g	6Mbps	Low/Middle/High
	IEEE 802.11n HT20	MCS0	Low/Middle/High
	IEEE 802.11n HT40	MCS0	Low/Middle/High
Conducted Band Edge	IEEE 802.11b	1Mbps	Low/ High
	IEEE 802.11g	6Mbps	Low/ High
	IEEE 802.11n HT20	MCS0	Low/ High
	IEEE 802.11n HT40	MCS0	Low/ High
Conducted Spurious Emissions	IEEE 802.11b	1Mbps	Low/Middle/High
	IEEE 802.11g	6Mbps	Low/Middle/High
	IEEE 802.11n HT20	MCS0	Low/Middle/High
	IEEE 802.11n HT40	MCS0	Low/Middle/High
Radiated Spurious Emissions(Below 1GHz)	IEEE 802.11b	1Mbps	Low/Middle/High
	IEEE 802.11g	6Mbps	Low/Middle/High
	IEEE 802.11n HT20	MCS0	Low/Middle/High
	IEEE 802.11n HT40	MCS0	Low/Middle/High
Radiated Spurious Emissions(Above 1GHz)	IEEE 802.11b	1Mbps	Low/Middle/High
	IEEE 802.11g	6Mbps	Low/Middle/High
	IEEE 802.11n HT20	MCS0	Low/Middle/High
	IEEE 802.11n HT40	MCS0	Low/Middle/High
Radiated Band Edge	IEEE 802.11b	1Mbps	Low/Middle/High
	IEEE 802.11g	6Mbps	Low/Middle/High
	IEEE 802.11n HT20	MCS0	Low/Middle/High
	IEEE 802.11n HT40	MCS0	Low/Middle/High
AC Power Line Conducted Emissions	IEEE 802.11b	1Mbps	Low/Middle/High
	IEEE 802.11g	6Mbps	Low/Middle/High
	IEEE 802.11n HT20	MCS0	Low/Middle/High
	IEEE 802.11n HT40	MCS0	Low/Middle/High

Note:

1. In radiated measurement,the EUT had been pre-scan on the positioned of each 3 axis(X,Y,Z), the worst case was found when positioned on **X-plane.**
2. 6dB Bandwidth The data only show the worst antenna 1.

2.7. Power Setting of Test Software

Software Name			
Frequency(MHz)	2412	2437	2462
IEEE 802.11b Setting	default	default	default
IEEE 802.11g Setting	default	default	default
IEEE 802.11n HT20 Setting	default	default	default
Frequency(MHz)	2422	2437	2452
IEEE 802.11n HT40 Setting	default	default	default

Note: This information is provided by the applicant.

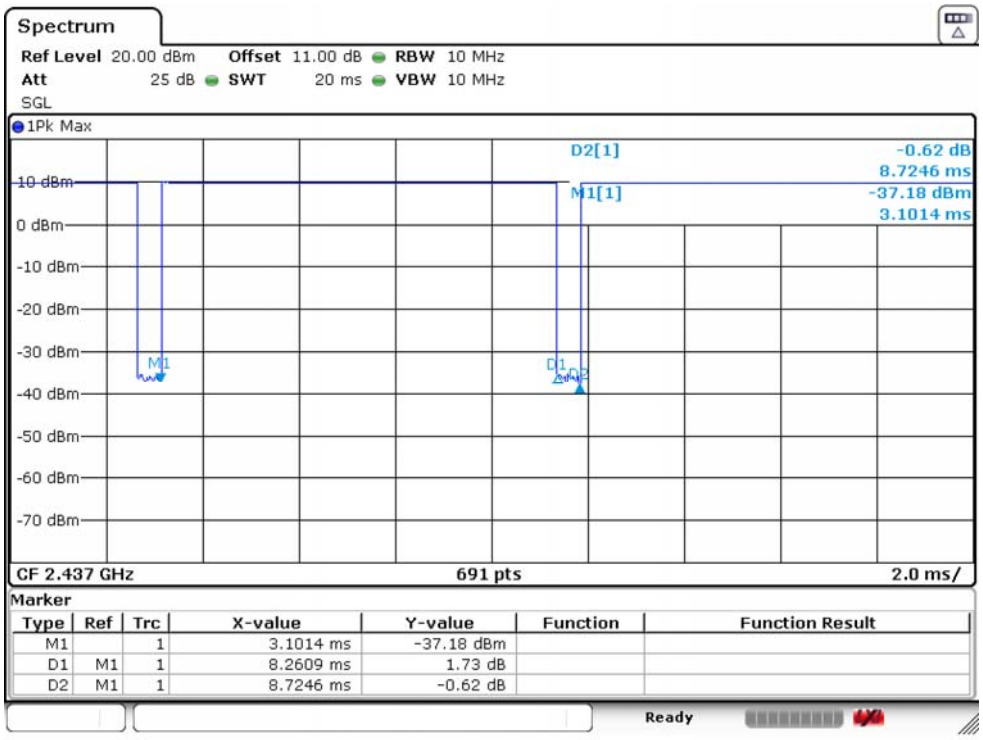
2.8. Duty Cycle

Temperature	24.1℃	Relative Humidity	46.7%	Test Voltage	DC 3.3V
Mode	Fre(MHz)	On time(ms)	Total Time(ms)	Duty Cycle	Duty Factor
IEEE 802.11b	2437	8.26090	8.72460	94.69%	0.24
IEEE 802.11g	2437	1.39130	1.86957	74.42%	1.28
IEEE 802.11n HT20	2437	1.28986	1.77536	72.65%	1.39
IEEE 802.11n HT40	2437	0.64958	1.13623	57.17%	2.43

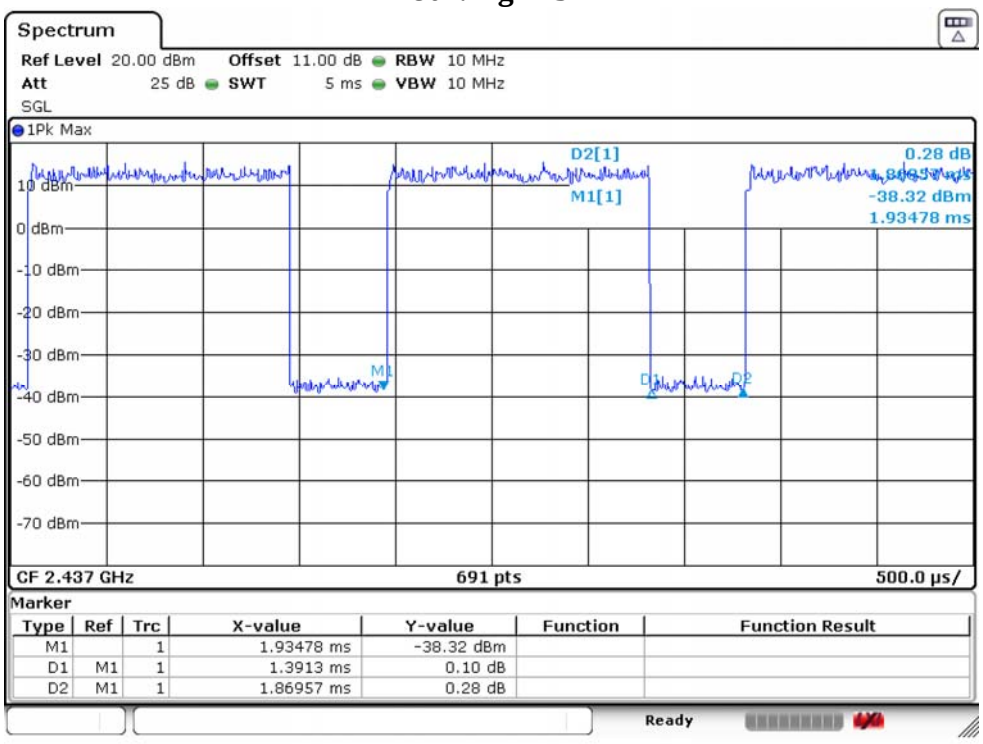
Note:

1. If duty cycle <98 %, the conducted average output power and average power spectral density should be add duty factor.
2. If duty cycle≥98 %,the EUT is consider to be transmitting continuously,the conducted average output power and average power spectral density no need to add duty factor(consider to be zero).
3. The conducted peak output power and peak power spectral density no need to consider duty factor.
4. The on-time time is transmission duration(T).

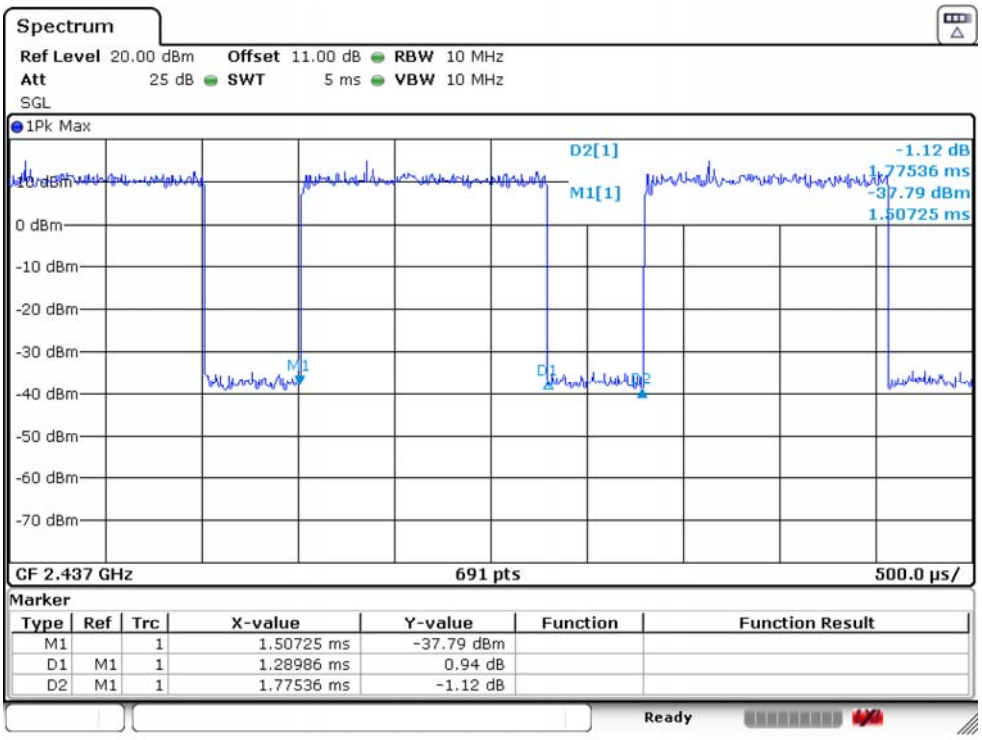
IEEE 802.11b 2437MHz



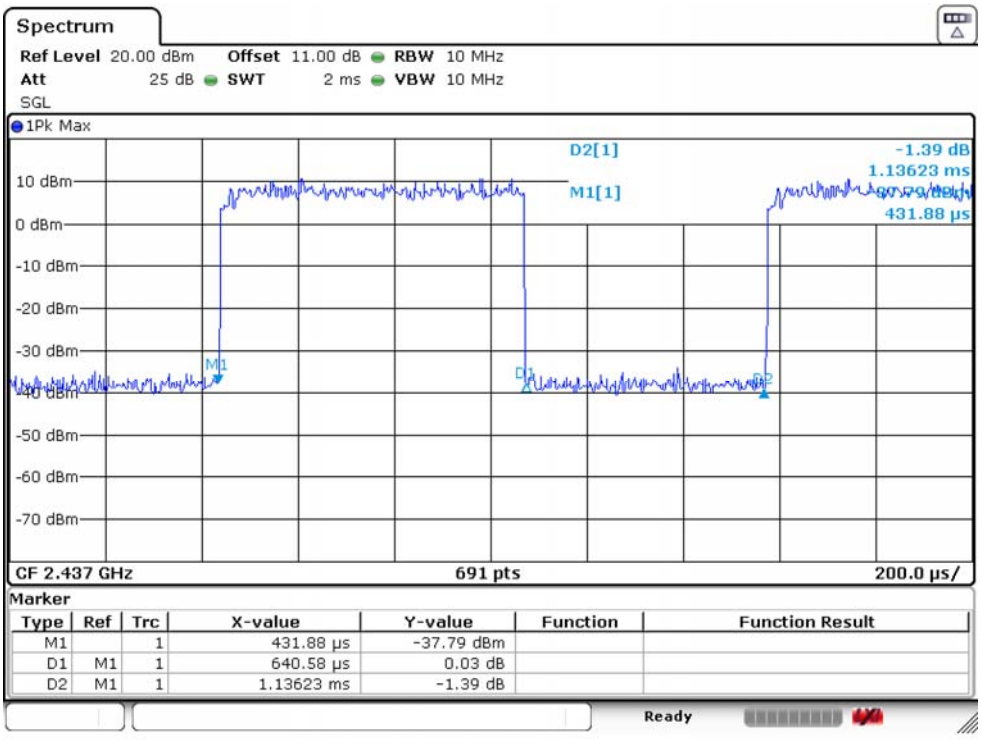
IEEE 802.11g 2437MHz



IEEE 802.11n HT20 2437MHz



IEEE 802.11n HT40 2437MHz



2.9. Channel List

IEEE 802.11b/802.11g/802.11n HT20					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	6	2437	11	2462
2	2417	7	2442		
3	2422	8	2447		
4	2427	9	2452		
5	2432	10	2457		
IEEE 802.11n HT40					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	6	2437	9	2452
4	2427	7	2442		
5	2432	8	2447		

2.10. Test Equipment List

For conducted emission test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	EST-E001	LISAI	June 13,21	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	EST-E002	LISAI	June 13,21	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	EST-E078	LISAI	June 13,21	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

For radiated emission test(9kHz-30MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	EST-E047	LISAI	June 13,21	1 Year
Active Loop Antenna	SCHWAREBECK	FMZB 1519B	EST-E054	LISAI	June 13,21	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
9kHz-30MHz Cable	N/A	EST-001	N/A	N/A	N/A	N/A

For radiated emissions test (30MHz-1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	EST-E047	LISAI	June 13,21	1 Year
Bilog Antenna	Teseq	CBL 6111D	EST-E034	LISAI	June 13,21	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
30-1000MHz Cable	N/A	EST-002	N/A	N/A	N/A	N/A

For radiated emission test(Above 1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Horn Antenna	SCHWARZBECK	BBHA9120D	EST-E031	LISAI	June 13,21	1 Year
Signal Amplifier	SCHWARZBECK	BBV9718	EST-E032	LISAI	June 13,21	1 Year
Spectrum Analyzer	Rohde &Schwarz	FSV40	EST-E069	LISAI	July 19,21	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
Above 1GHz Cable	N/A	EST-003	N/A	N/A	N/A	N/A

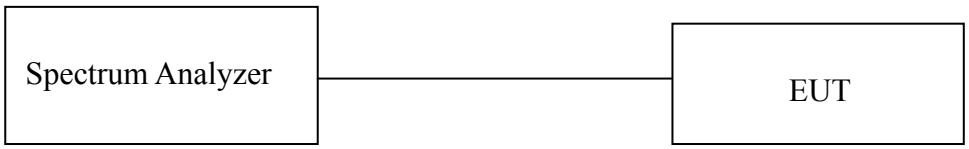
For connect EUT antenna terminal test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Spectrum Analyzer	Rohde &Schwarz	FSV40	EST-E069	LISAI	July 19,21	1 Year

3. 6DB BANDWIDTH

3.1. Limit

Systems using digital modulation techniques operate in the 2400-2483.5 MHz,the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2. Test Setup



3.3. Spectrum Analyzer Setting

6dB Bandwidth

Spectrum Parameters	Setting
RBW	100KHz
VBW	300KHz
Span	40MHz(20MHz Bandwidth mode)/80MHz(40MHz Bandwidth mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

99% Occupied Bandwidth

Spectrum Parameters	Setting
RBW	300KHz(20MHz Bandwidth mode)/1MHz(40MHz Bandwidth mode)
VBW	1MHz(20MHz Bandwidth mode)/3MHz(40MHz Bandwidth mode)
Span	40MHz(20MHz Bandwidth mode)/80MHz(40MHz Bandwidth mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

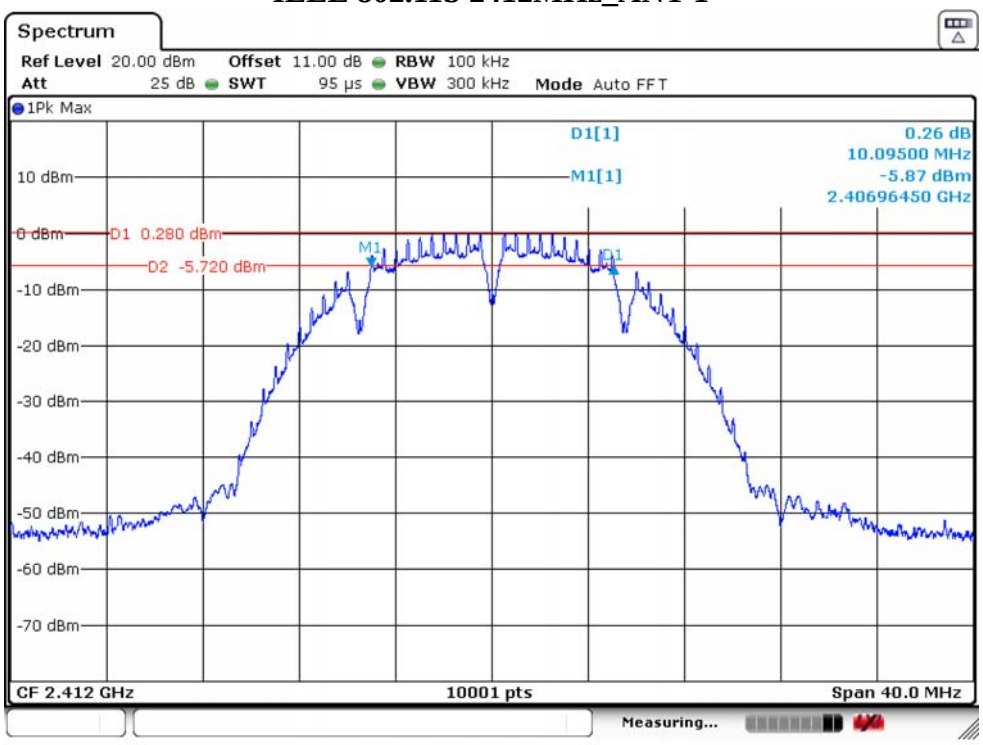
3.4. Test Procedure

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 3.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.

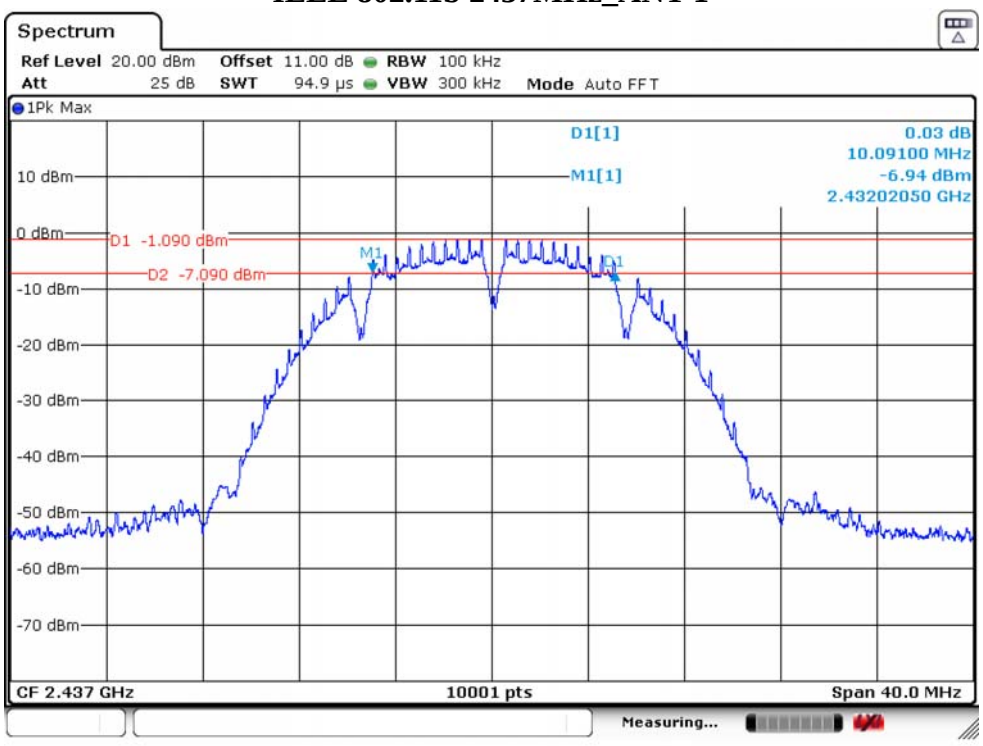
3.5. Test Result

Temperature	24.1℃	Relative Humidity	46.7%	Test Voltage	DC 3.3V
Mode	Freq (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result	
		ANT 1			
IEEE 802.11b	2412	10.10	≥0.5	PASS	
	2437	10.09	≥0.5	PASS	
	2462	10.09	≥0.5	PASS	
IEEE 802.11g	2412	16.29	≥0.5	PASS	
	2437	16.28	≥0.5	PASS	
	2462	16.28	≥0.5	PASS	
IEEE 802.11n HT20	2412	16.99	≥0.5	PASS	
	2437	16.64	≥0.5	PASS	
	2462	16.65	≥0.5	PASS	
IEEE 802.11n HT40	2422	35.14	≥0.5	PASS	
	2437	35.14	≥0.5	PASS	
	2452	35.46	≥0.5	PASS	

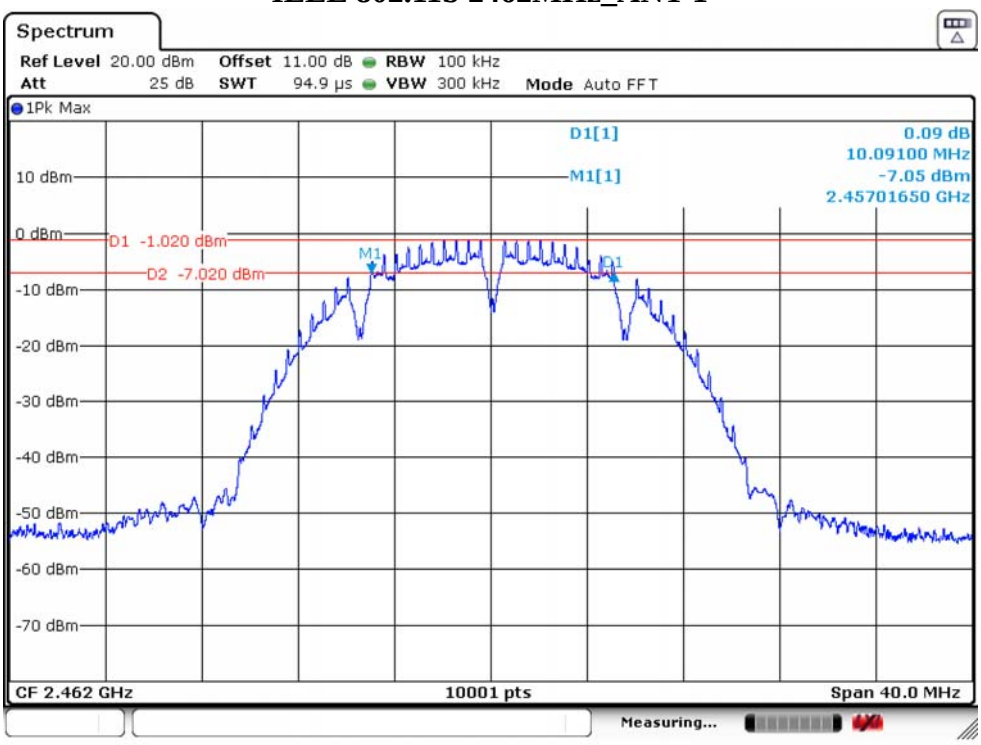
IEEE 802.11b 2412MHz_ANT 1



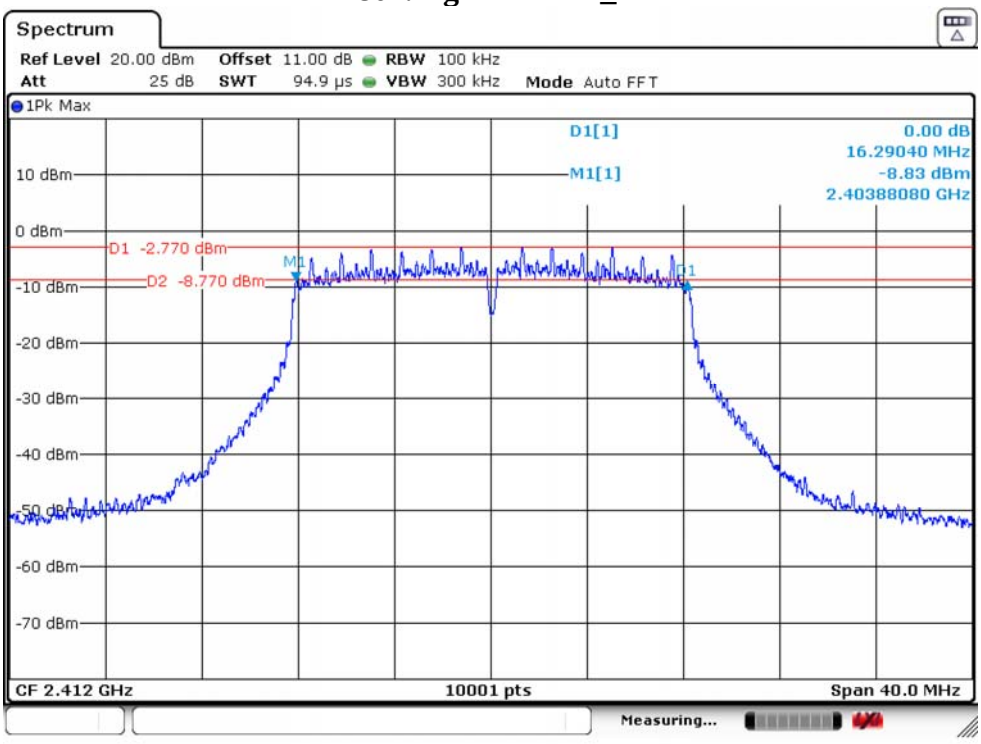
IEEE 802.11b 2437MHz_ANT 1



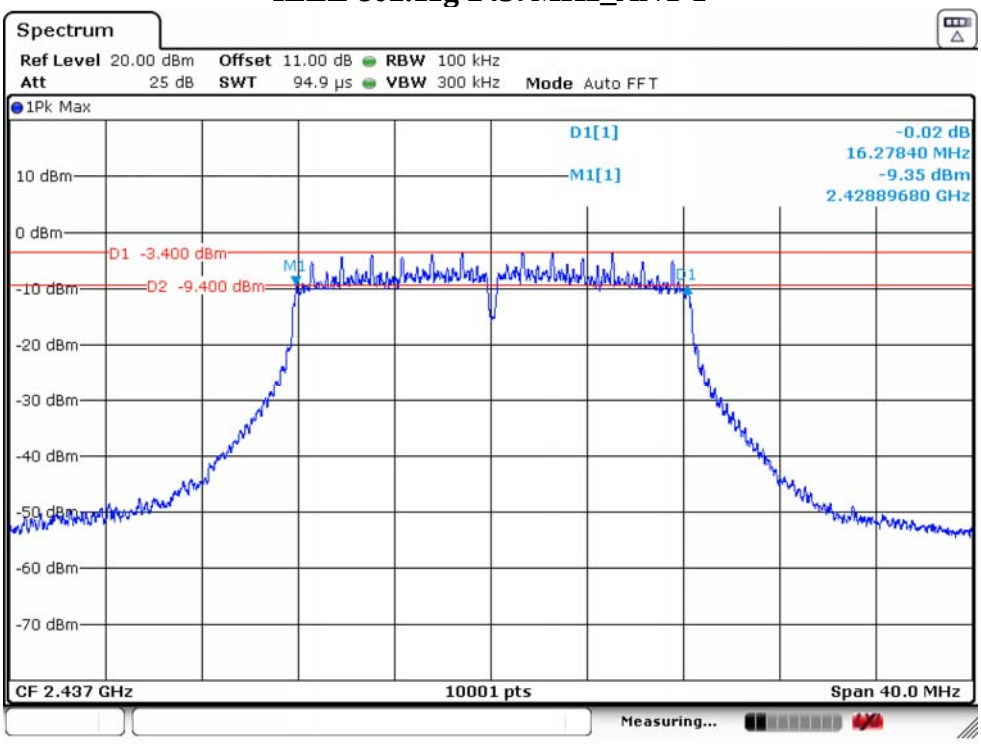
IEEE 802.11b 2462MHz_ANT 1



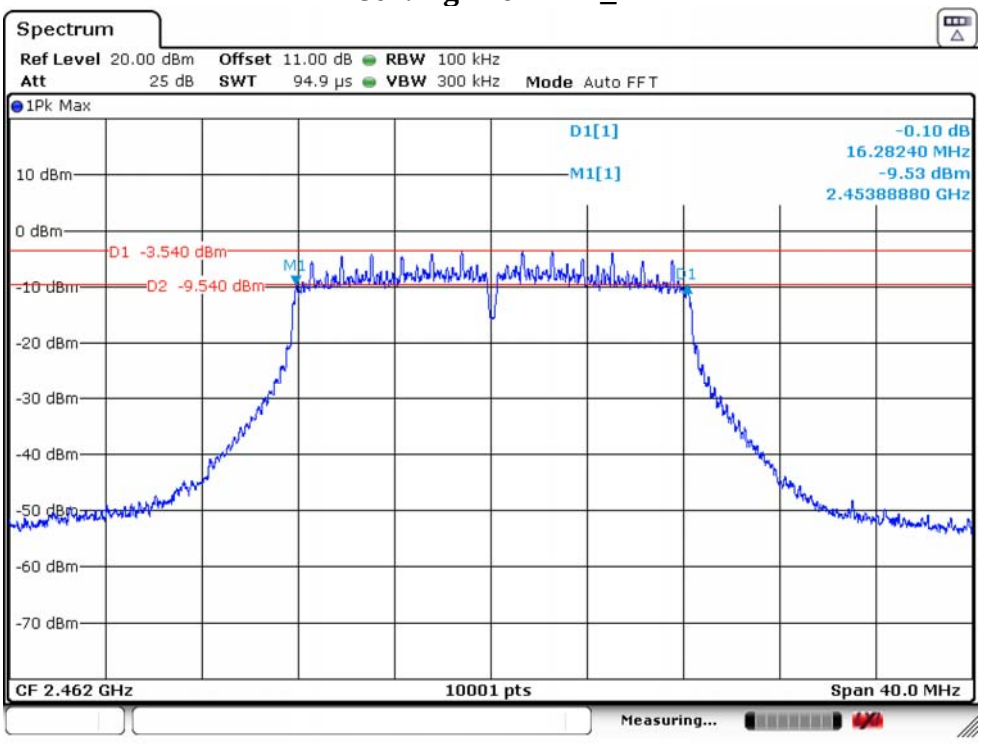
IEEE 802.11g 2412MHz_ANT 1



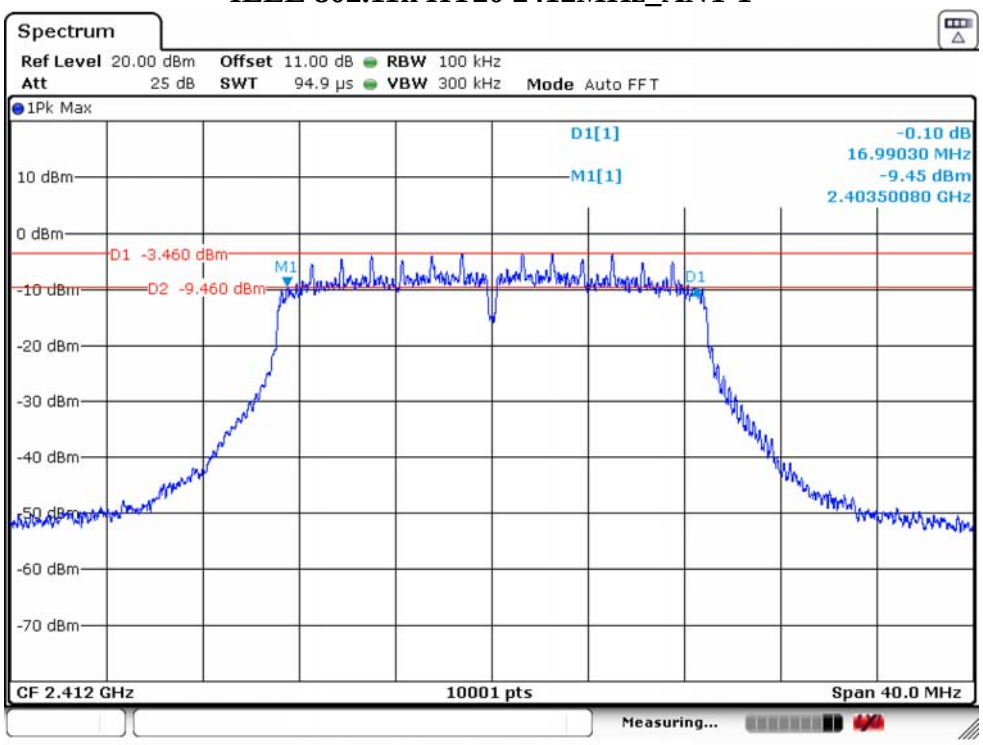
IEEE 802.11g 2437MHz_ANT 1



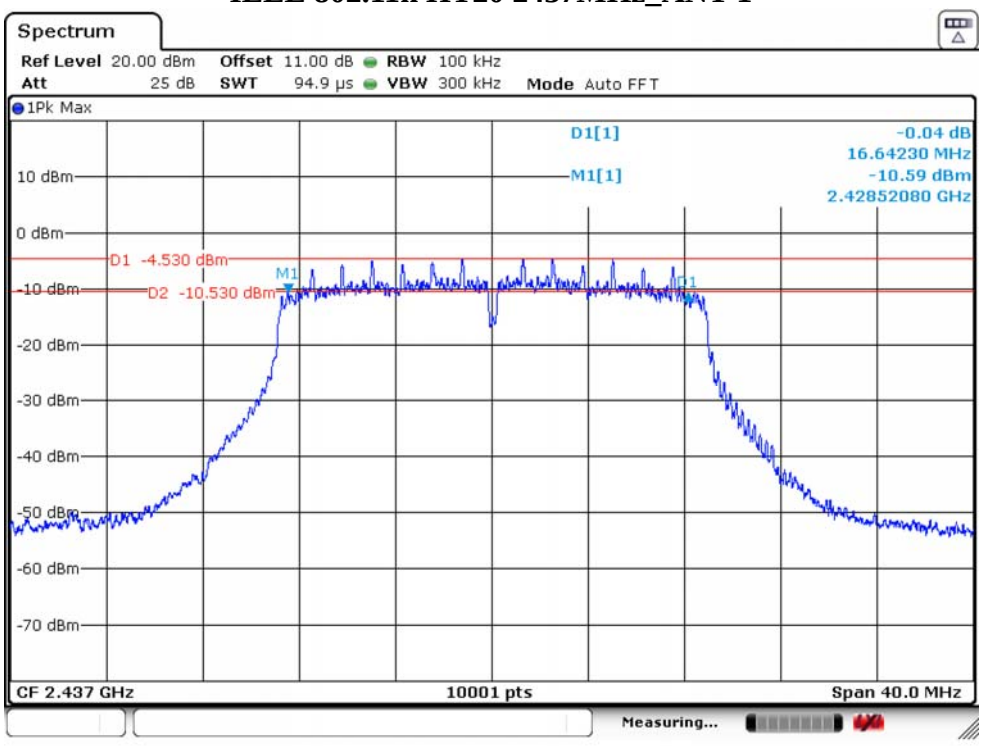
IEEE 802.11g 2462MHz_ANT 1



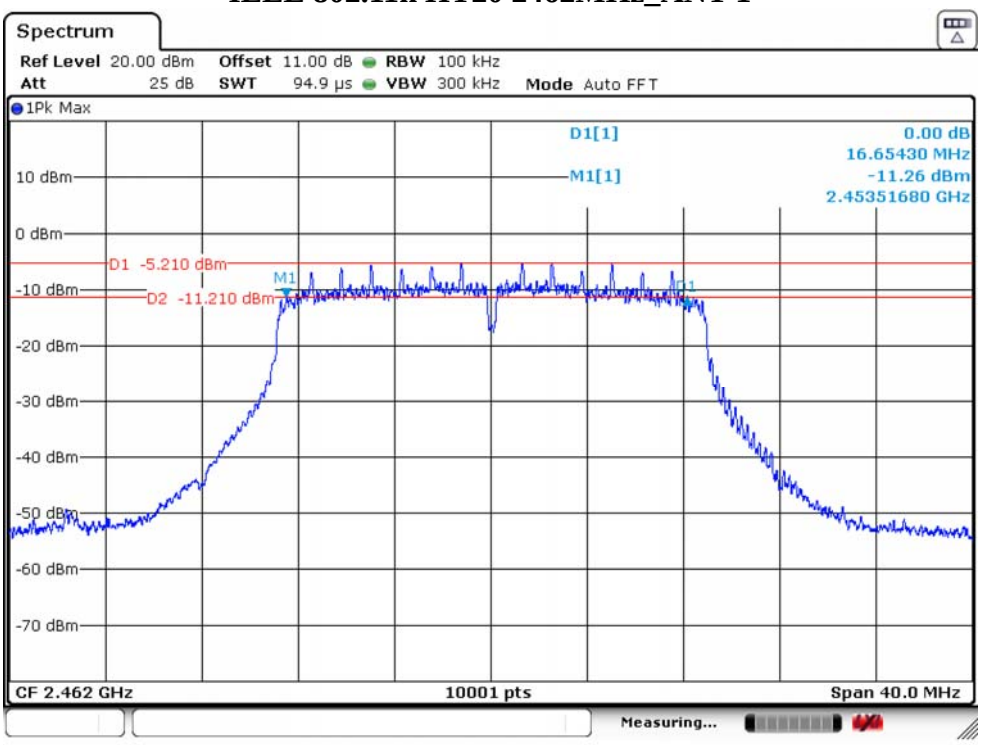
IEEE 802.11n HT20 2412MHz_ANT 1



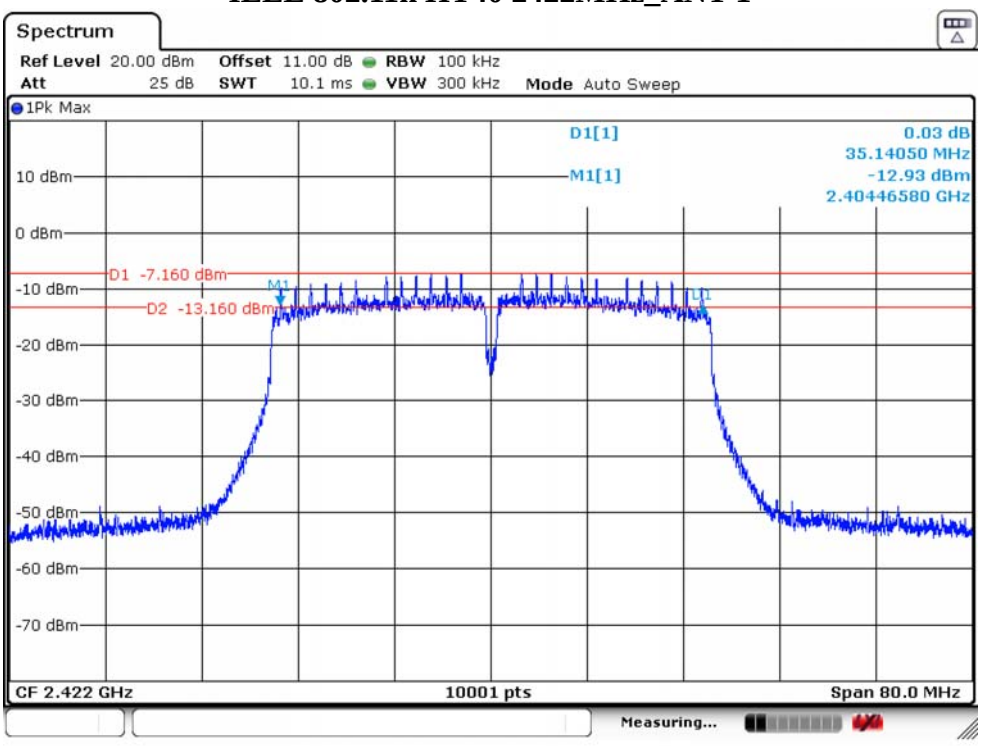
IEEE 802.11n HT20 2437MHz_ANT 1



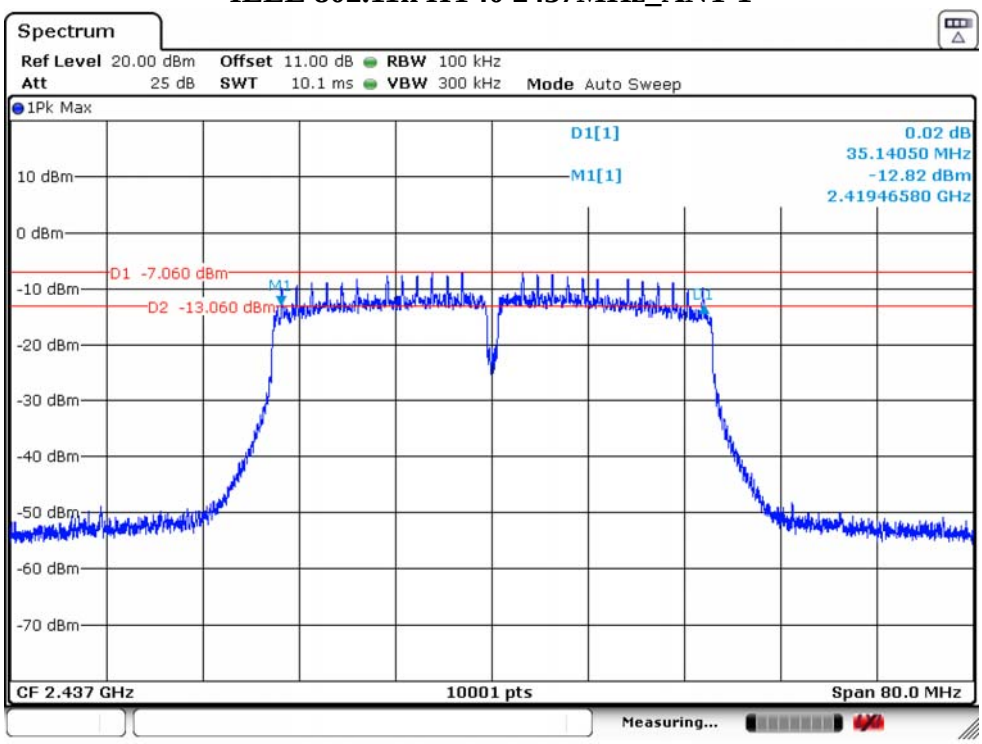
IEEE 802.11n HT20 2462MHz_ANT 1



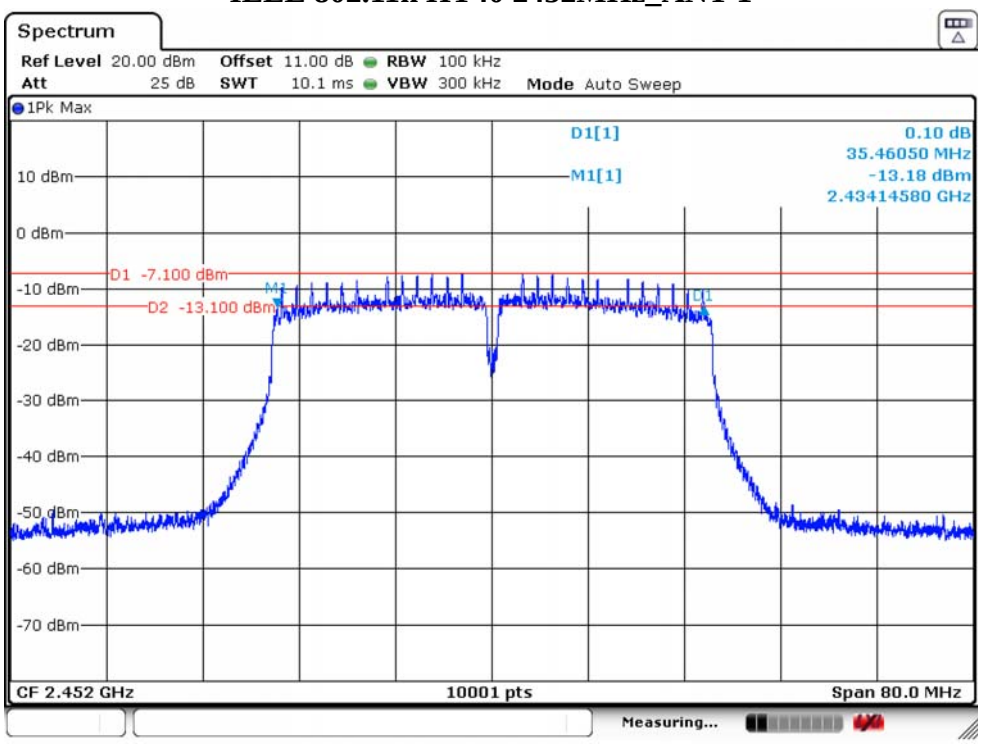
IEEE 802.11n HT40 2422MHz_ANT 1



IEEE 802.11n HT40 2437MHz_ANT 1



IEEE 802.11n HT40 2452MHz_ANT 1



4. MAXIMUM PEAK OUTPUT POWER

4.1. Limit

For systems using digital modulation in 2400-2483.5MHz,the maximum peak output power is 1 Watt(30dBm).

4.2. Test Setup

4.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	1MHz
VBW	3MHz
Span	40MHz(20MHz Bandwidth mode)/80MHz(40MHz Bandwidth mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

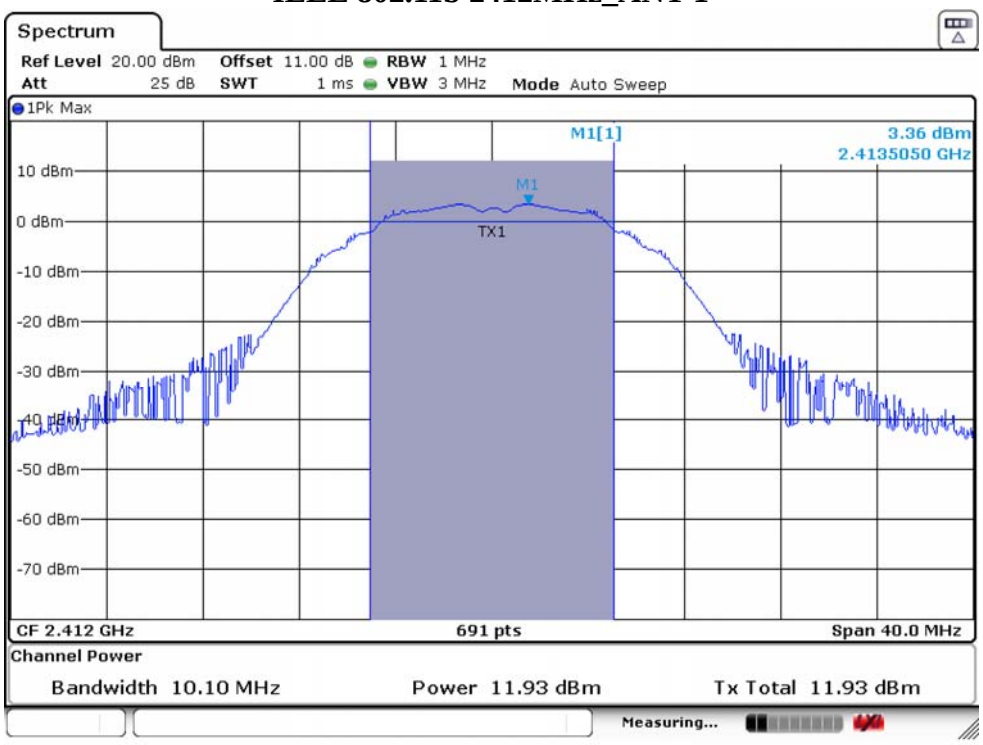
4.4. Test Procedure

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 4.3.
c. Set the EUT transmit continuously with maximum output power.
d. Use the channel power function to measure maximum peak output power, allow trace to stabilize, save test pictures.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.

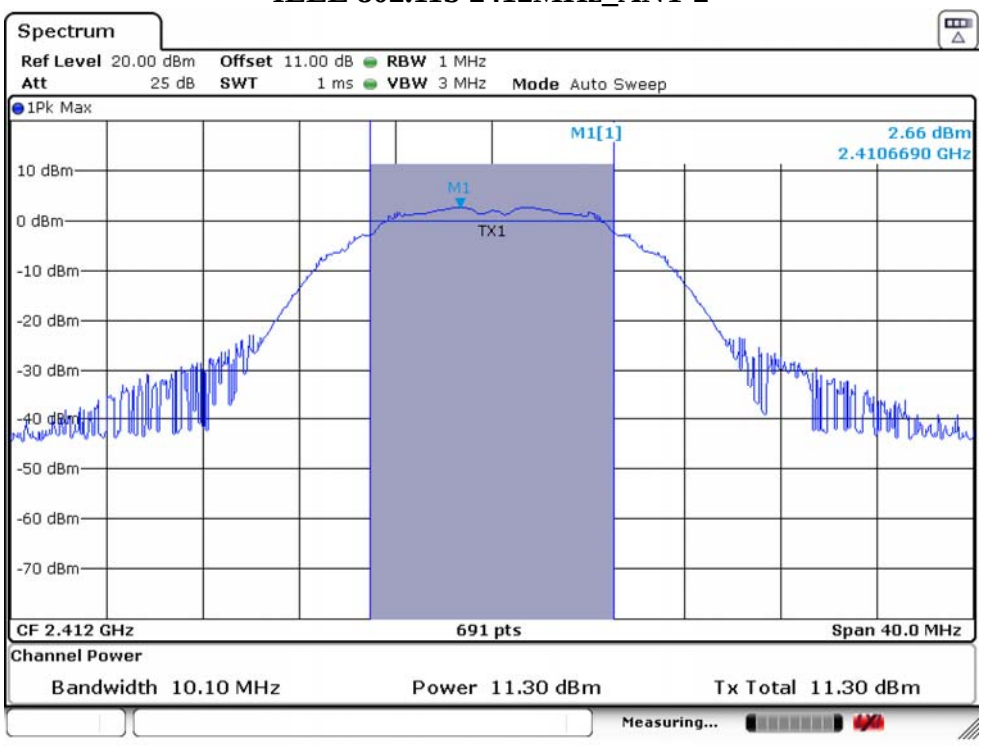
4.5. Test Result

Temperature	24.1℃	Relative Humidity		46.7%				Test Voltage		DC 3.3V
Mode	Freq (MHz)	Peak Output Power (dBm)		Total Peak Output Power (W)		Total Peak Output Power (dBm)		Limit		Result
		ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	W	dBm	
IEEE 802.11b	2412	11.93	11.3					1.0000	30.00	PASS
	2437	11.82	12.00					1.0000	30.00	PASS
	2462	11.72	11.88					1.0000	30.00	PASS
IEEE 802.11g	2412	17.31	17.17					1.0000	30.00	PASS
	2437	17.01	16.73					1.0000	30.00	PASS
	2462	16.74	16.48					1.0000	30.00	PASS
IEEE 802.11n HT20	2412	15.00	14.27	0.0584		17.66		1.0000	29.99	PASS
	2437	14.68	13.99	0.0544		17.36		1.0000	29.99	PASS
	2462	14.45	13.80	0.0518		17.15		1.0000	29.99	PASS
IEEE 802.11n HT40	2422	15.55	15.53	0.0716		18.55		1.0000	29.99	PASS
	2437	15.61	15.43	0.0713		18.53		1.0000	29.99	PASS
	2452	15.29	14.96	0.0651		18.14		1.0000	29.99	PASS

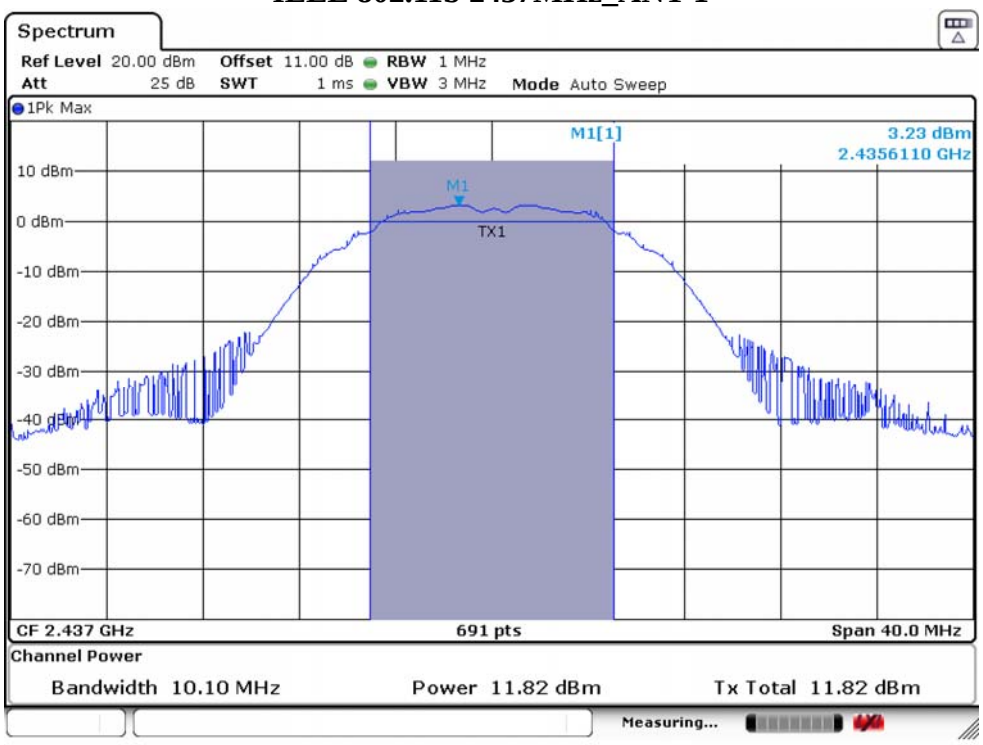
IEEE 802.11b 2412MHz_ANT 1



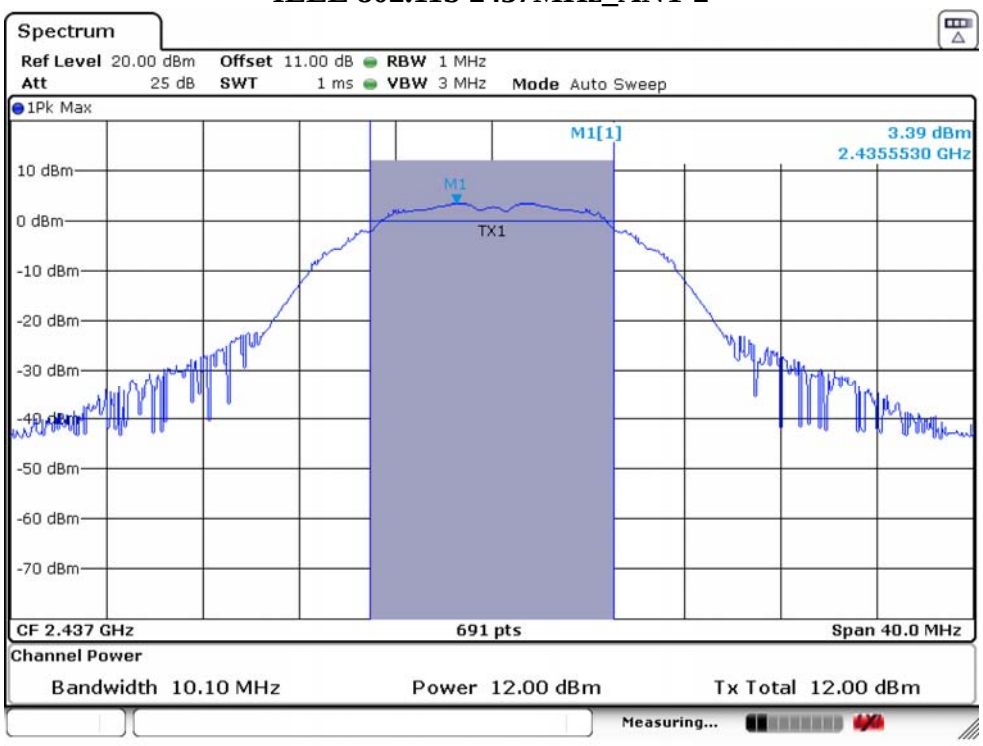
IEEE 802.11b 2412MHz_ANT 2



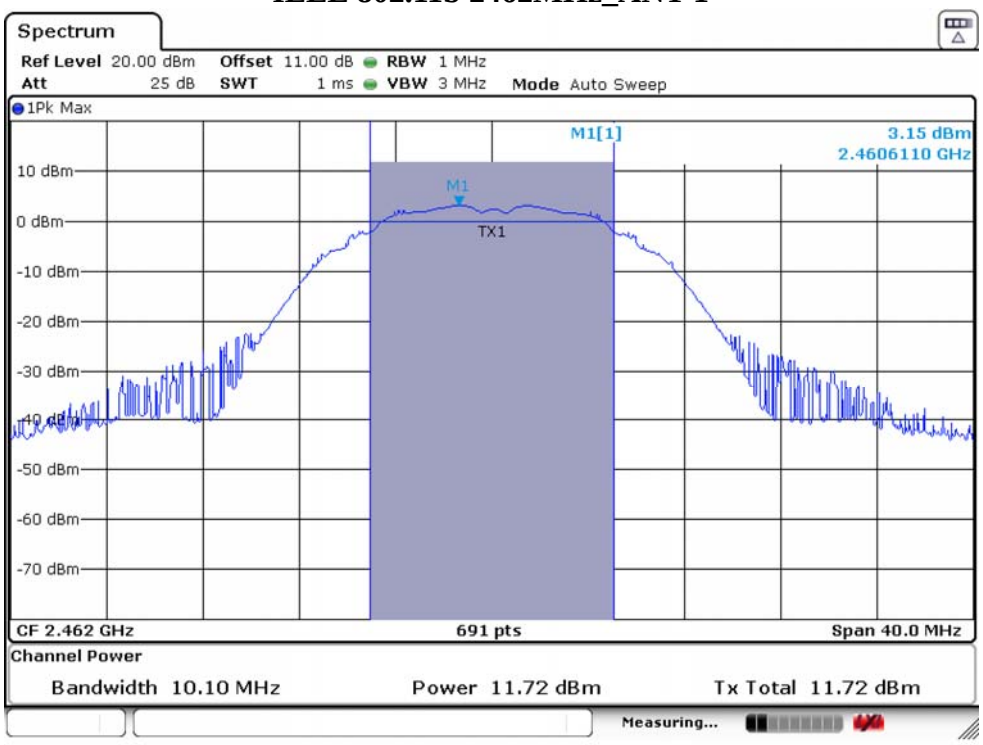
IEEE 802.11b 2437MHz_ANT 1



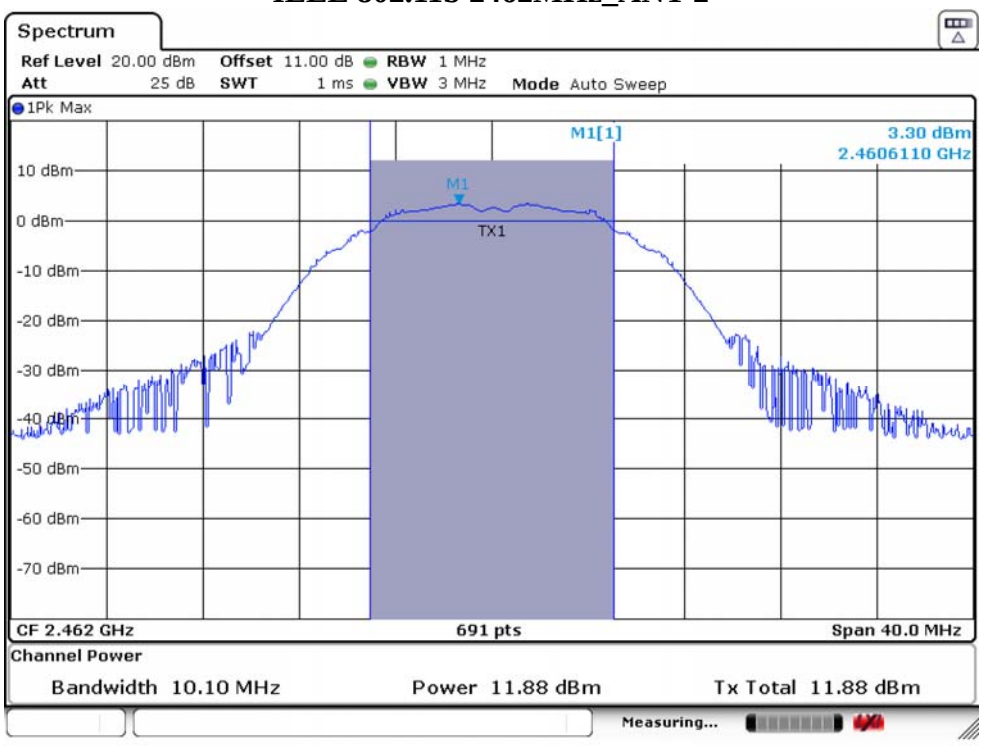
IEEE 802.11b 2437MHz_ANT 2



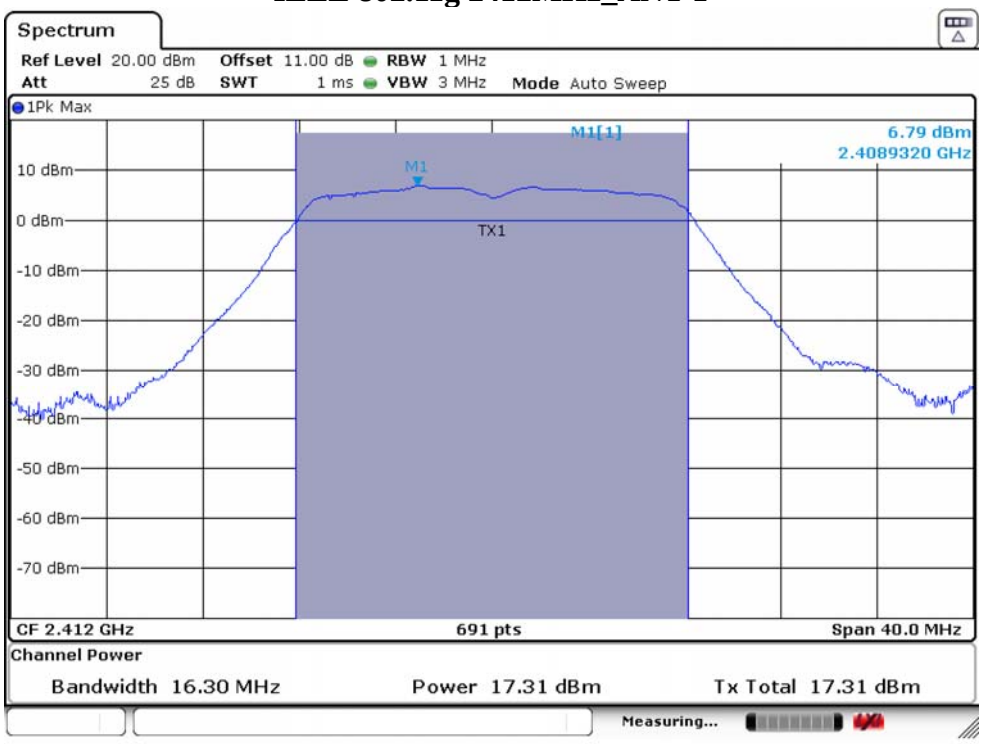
IEEE 802.11b 2462MHz_ANT 1



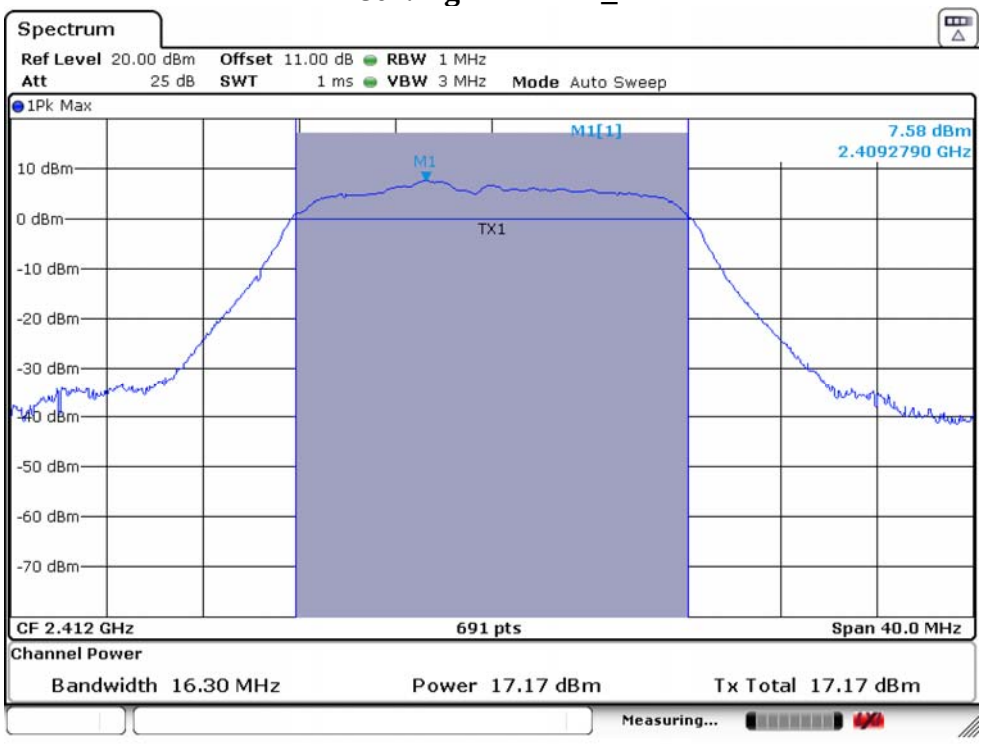
IEEE 802.11b 2462MHz_ANT 2



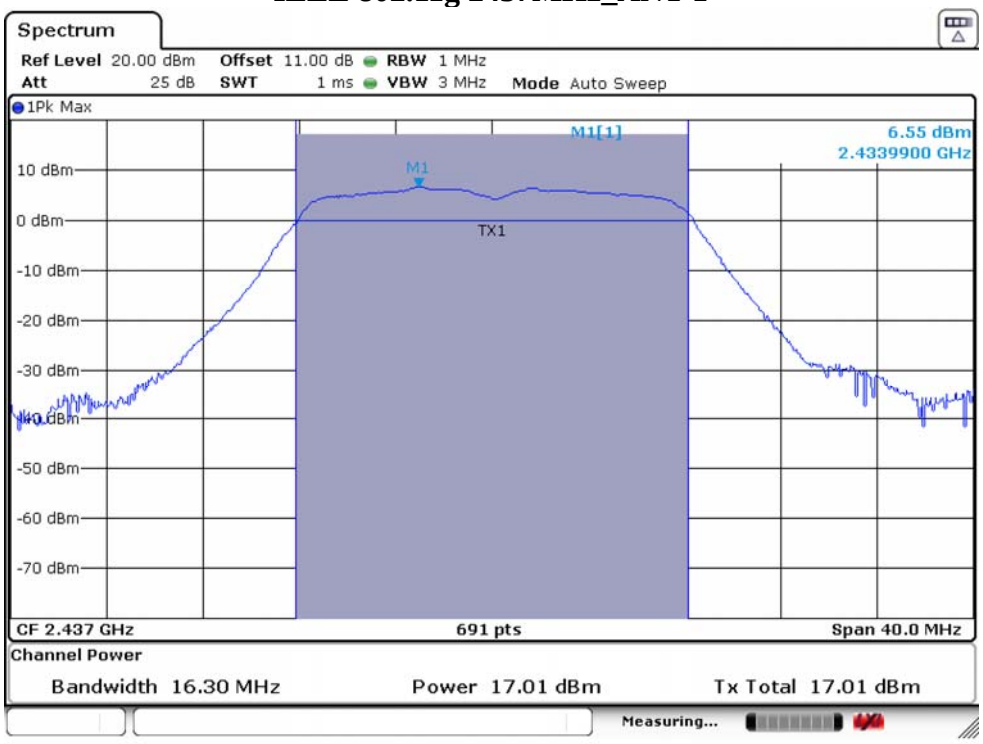
IEEE 802.11g 2412MHz_ANT 1



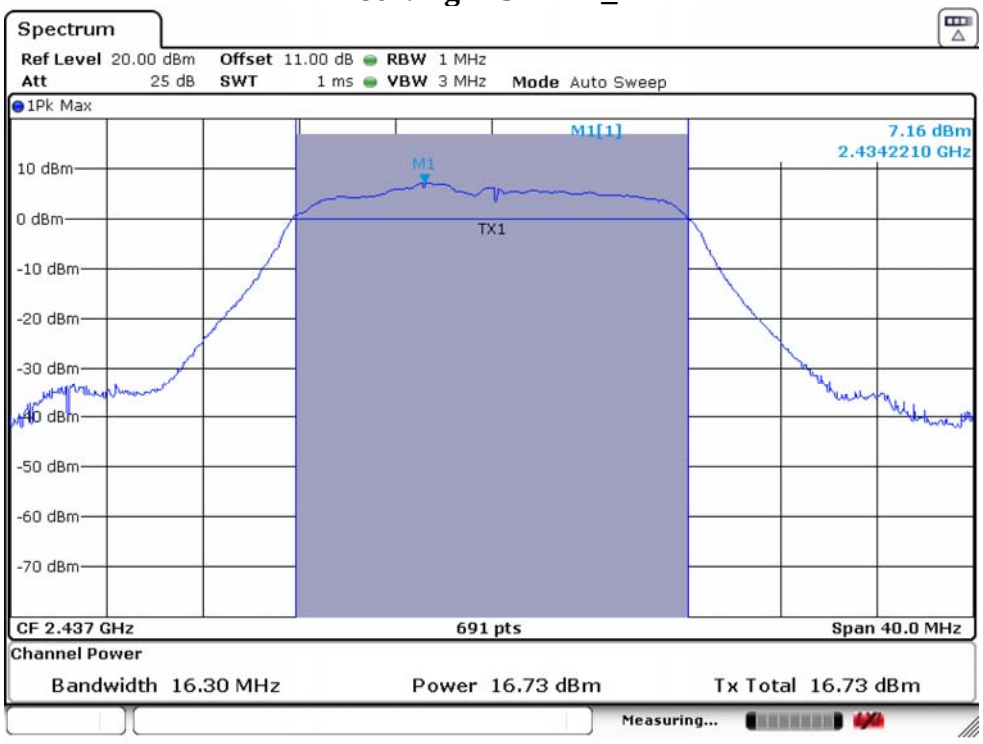
IEEE 802.11g 2412MHz_ANT 2



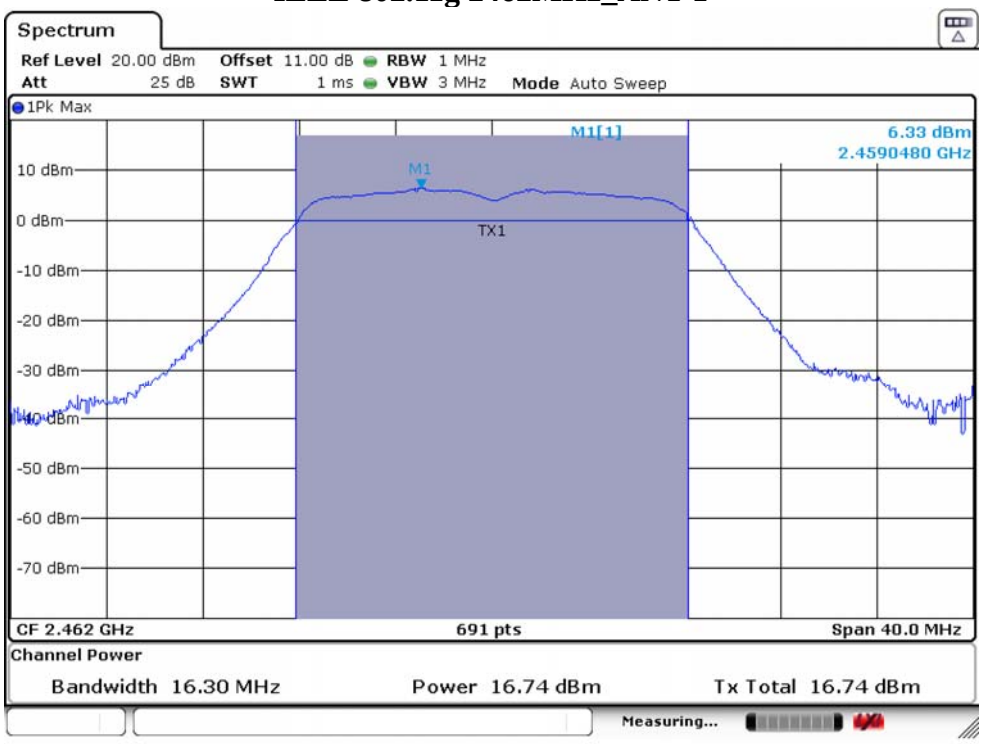
IEEE 802.11g 2437MHz_ANT 1



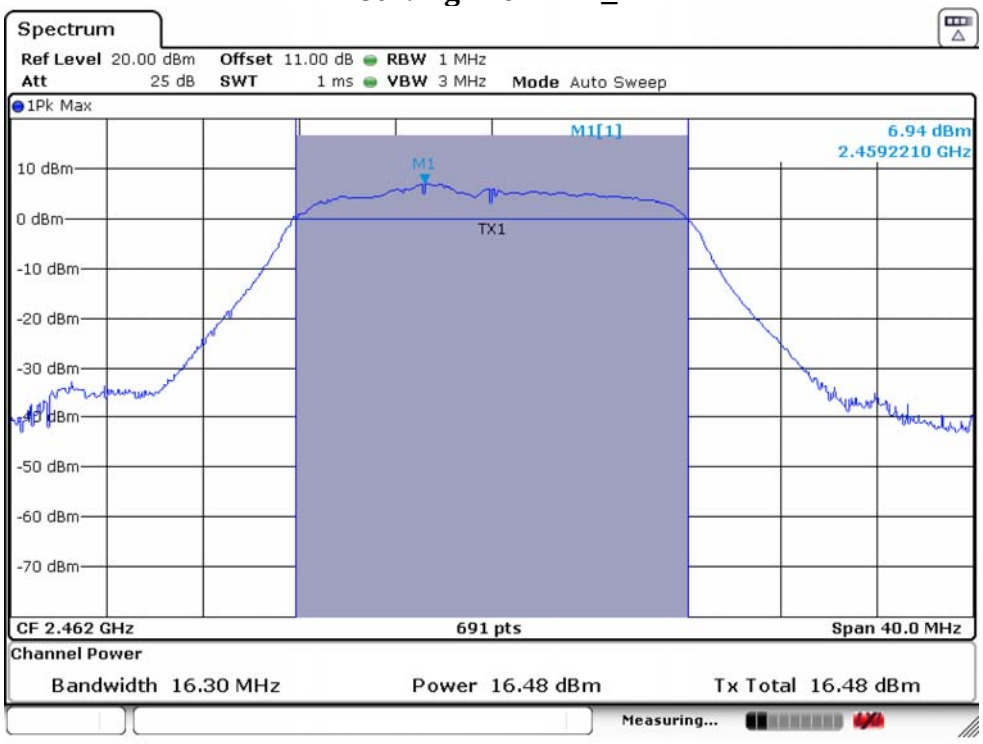
IEEE 802.11g 2437MHz_ANT 2



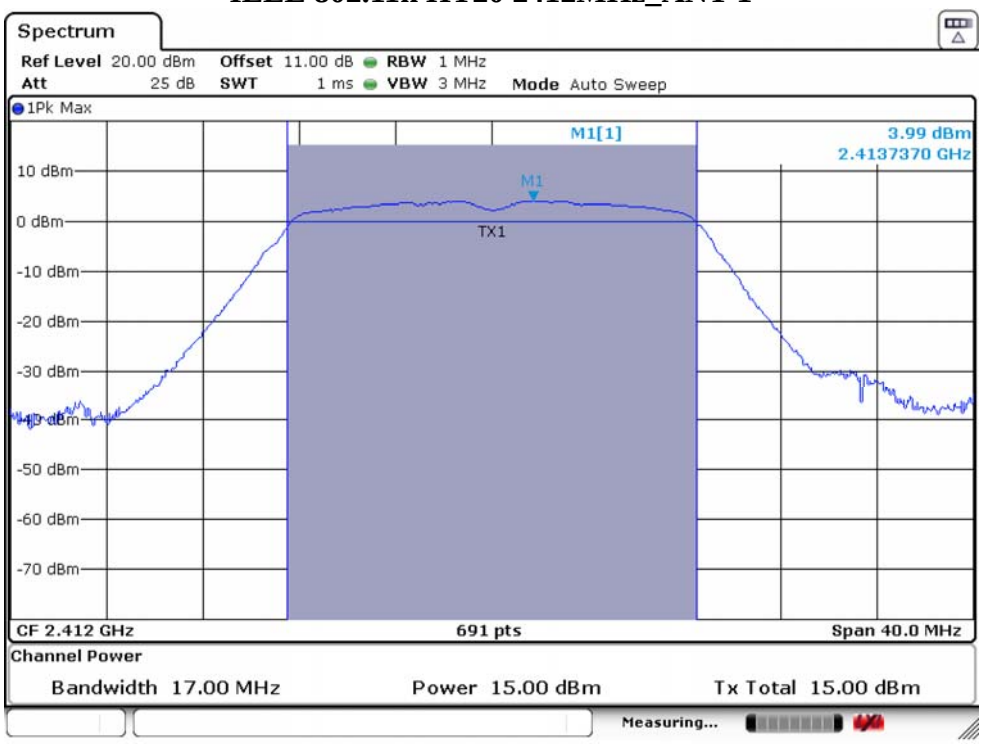
IEEE 802.11g 2462MHz_ANT 1



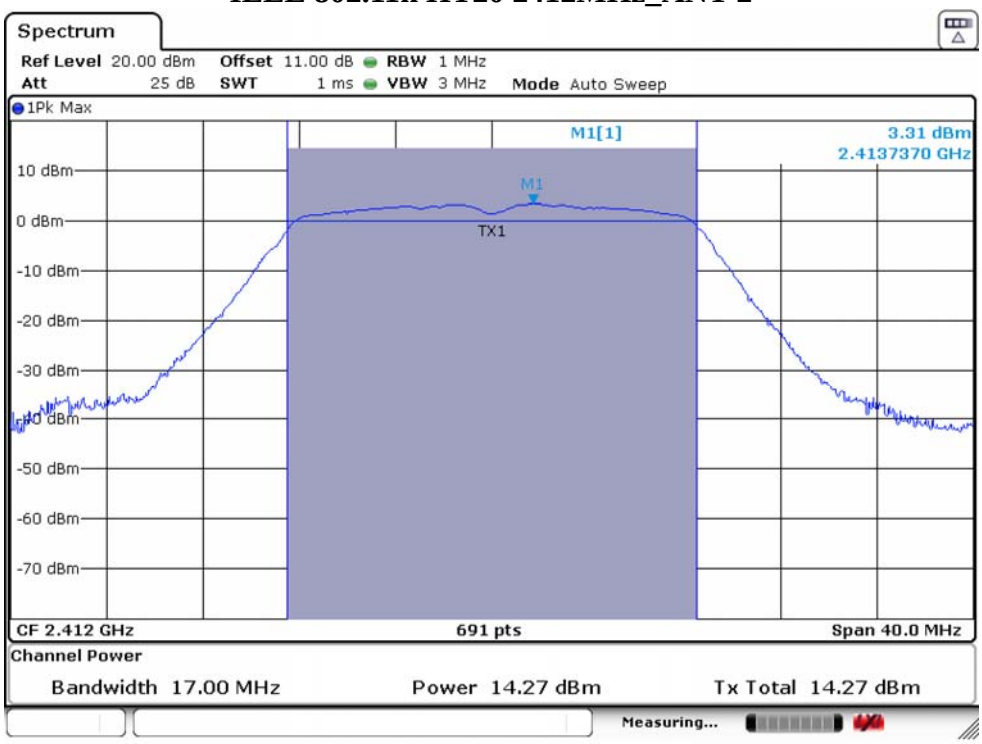
IEEE 802.11g 2462MHz_ANT 2



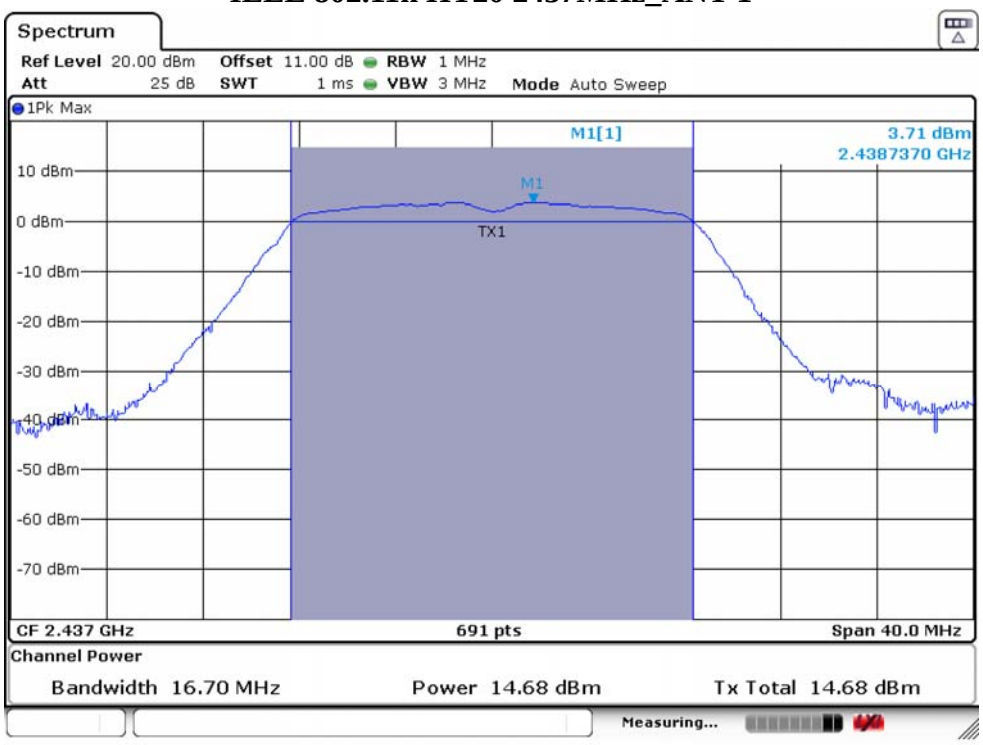
IEEE 802.11n HT20 2412MHz_ANT 1



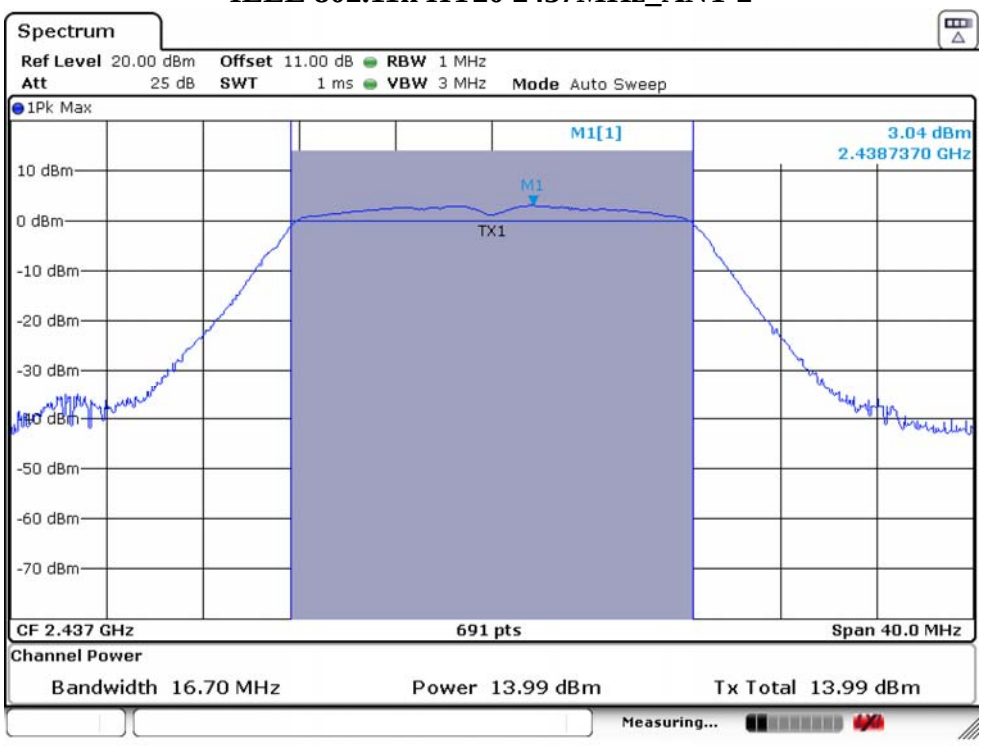
IEEE 802.11n HT20 2412MHz_ANT 2



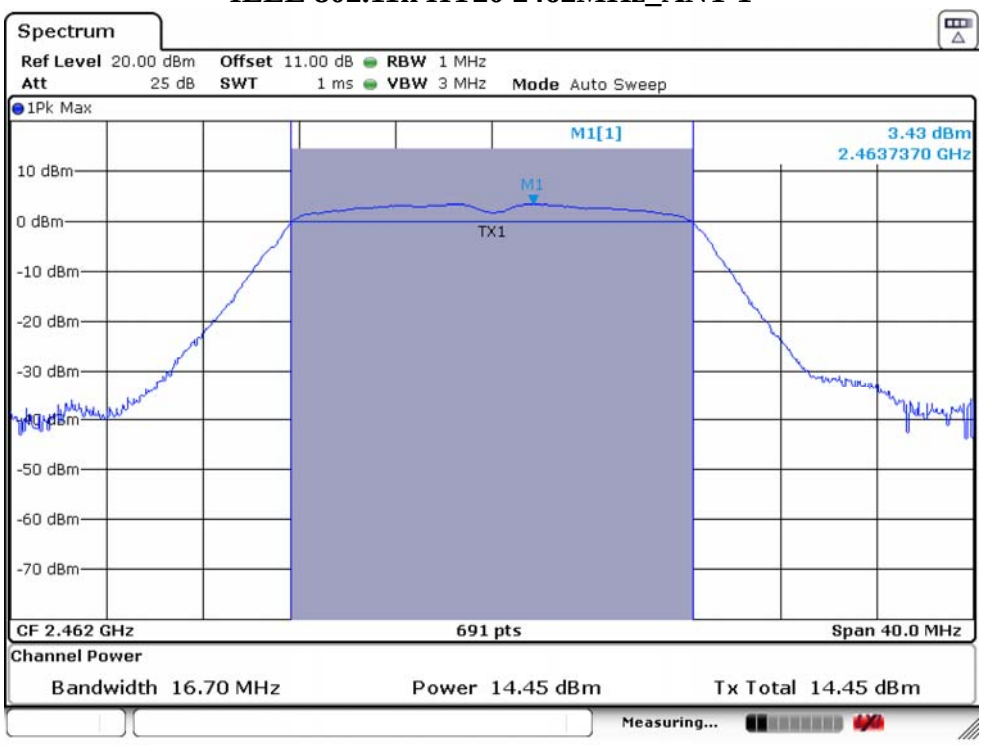
IEEE 802.11n HT20 2437MHz_ANT 1



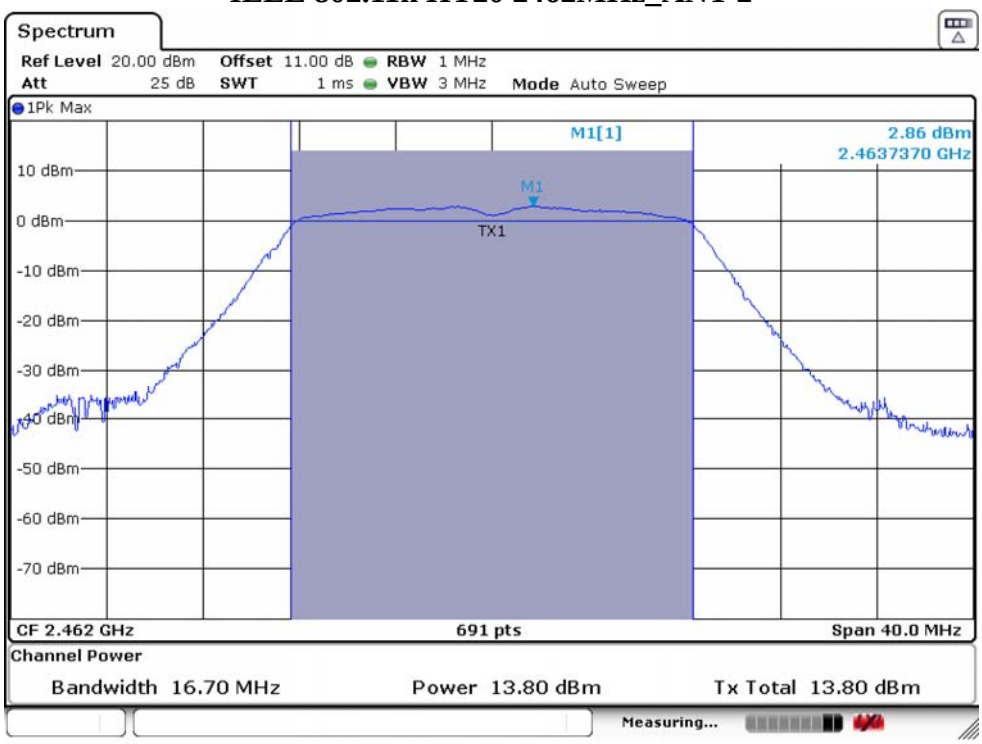
IEEE 802.11n HT20 2437MHz_ANT 2



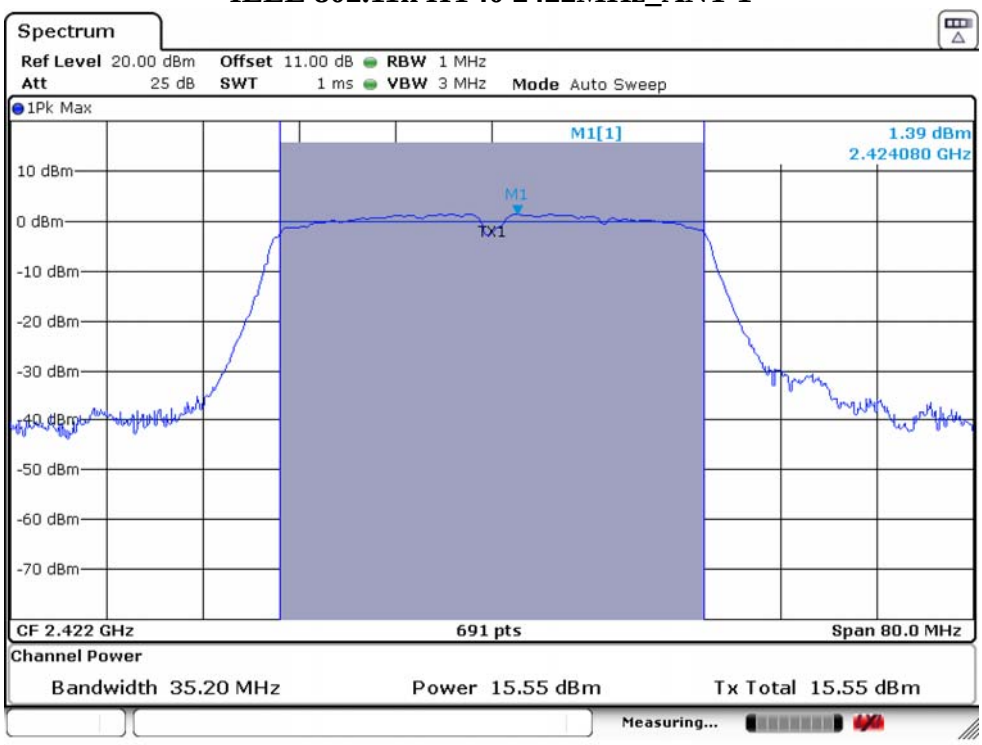
IEEE 802.11n HT20 2462MHz_ANT 1



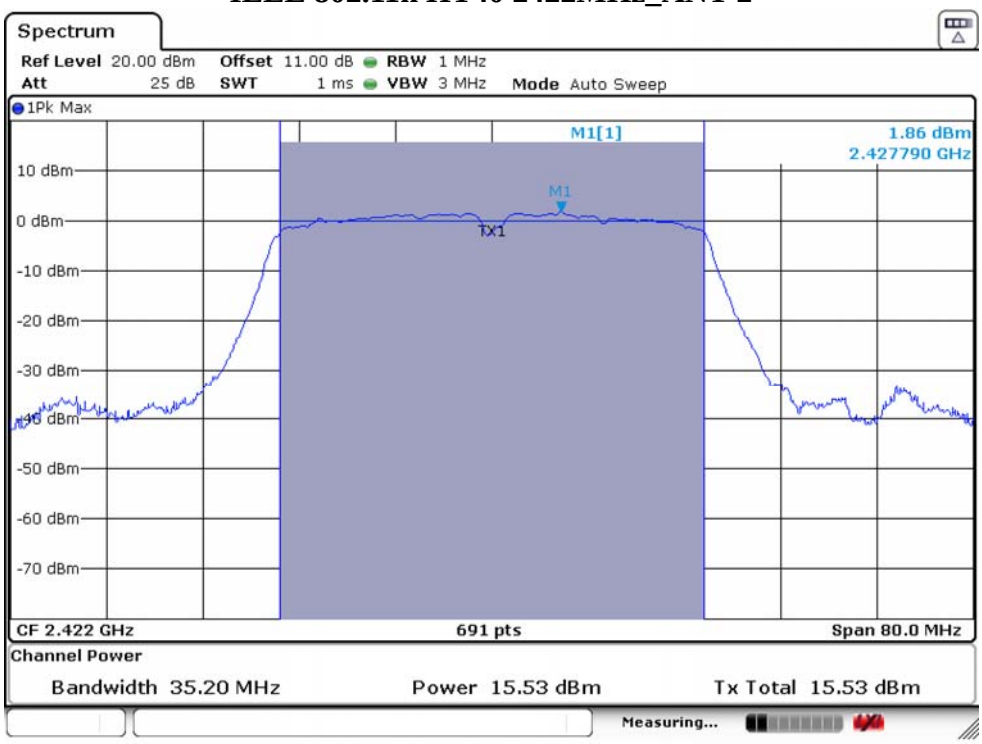
IEEE 802.11n HT20 2462MHz_ANT 2



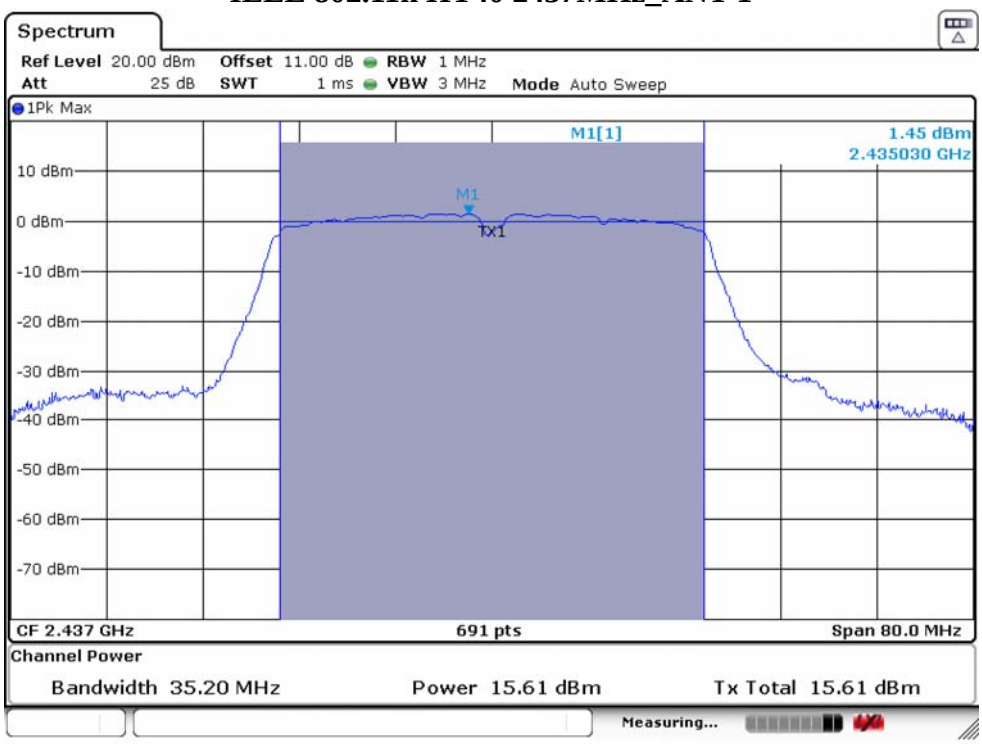
IEEE 802.11n HT40 2422MHz_ANT 1



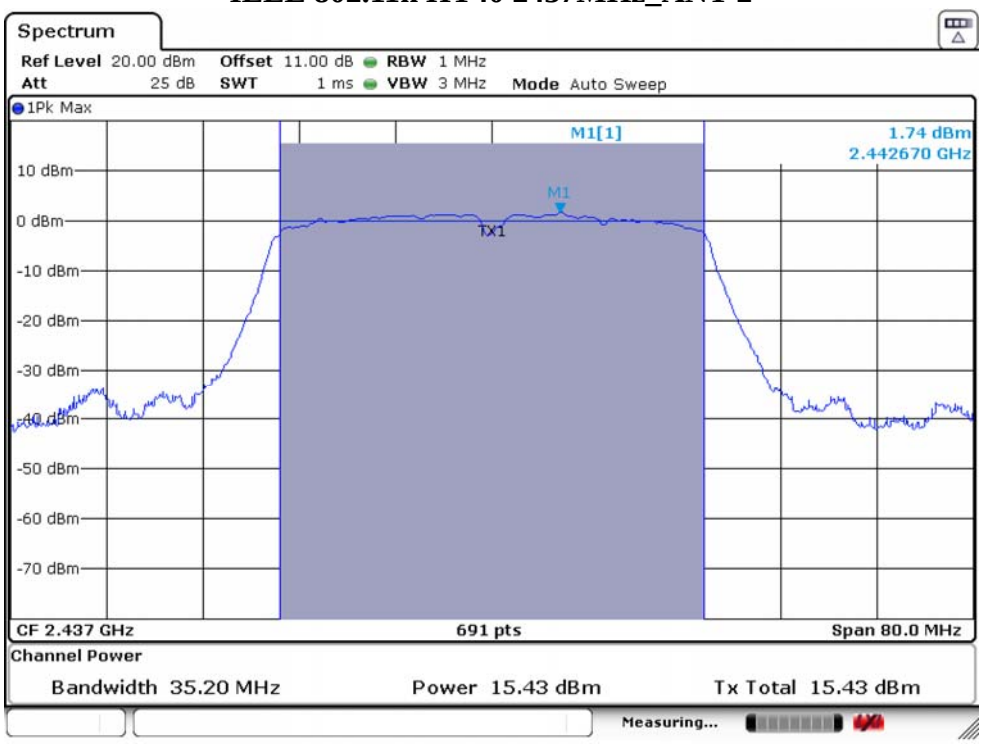
IEEE 802.11n HT40 2422MHz_ANT 2



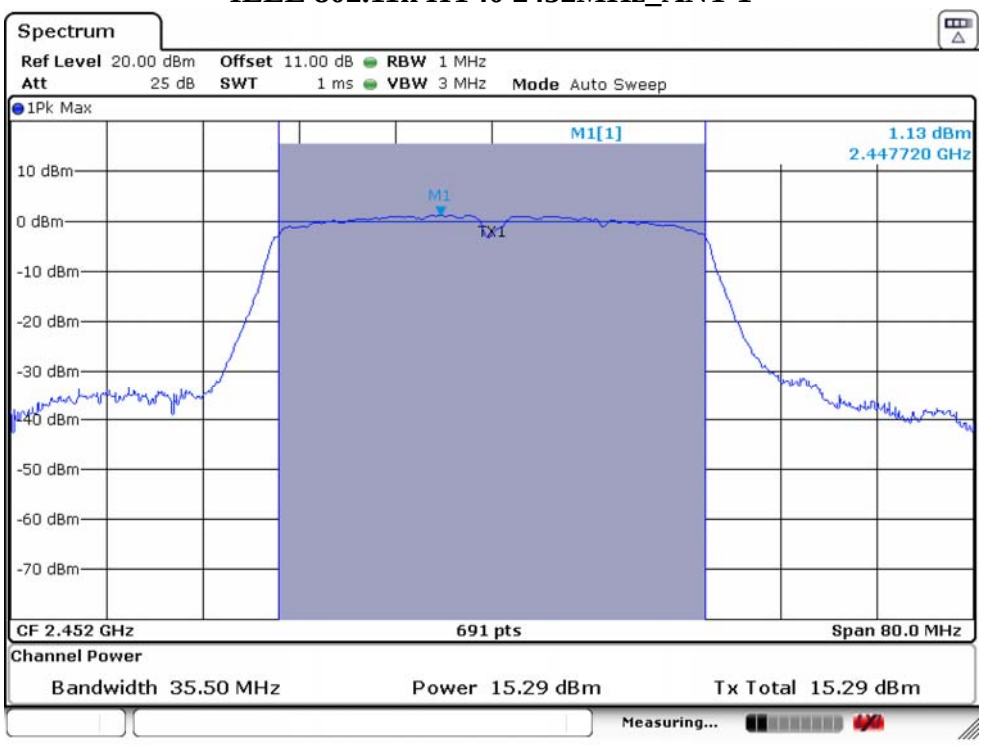
IEEE 802.11n HT40 2437MHz_ANT 1



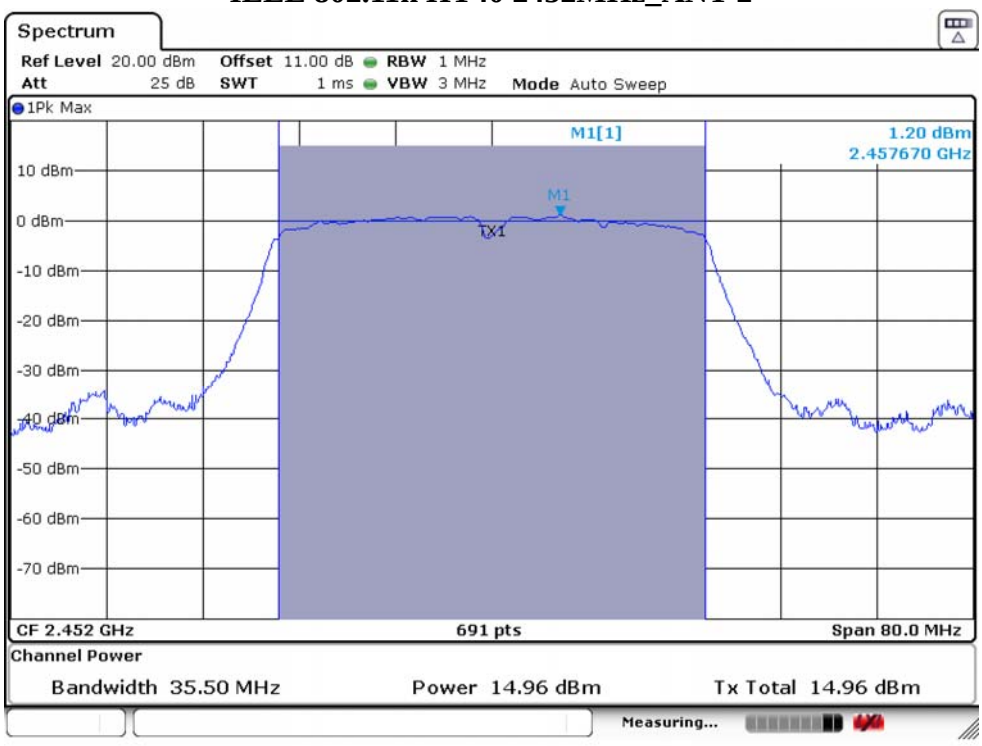
IEEE 802.11n HT40 2437MHz_ANT 2



IEEE 802.11n HT40 2452MHz_ANT 1



IEEE 802.11n HT40 2452MHz_ANT 2

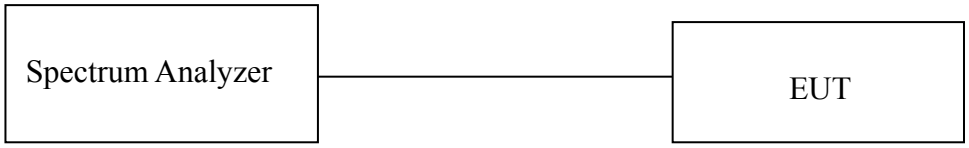


5. POWER SPECTRAL DENSITY

5.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.2. Test Setup



5.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	3KHz
VBW	10KHz
Span	30MHz(20MHz Bandwidth mode)/60MHz(40MHz Bandwidth mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

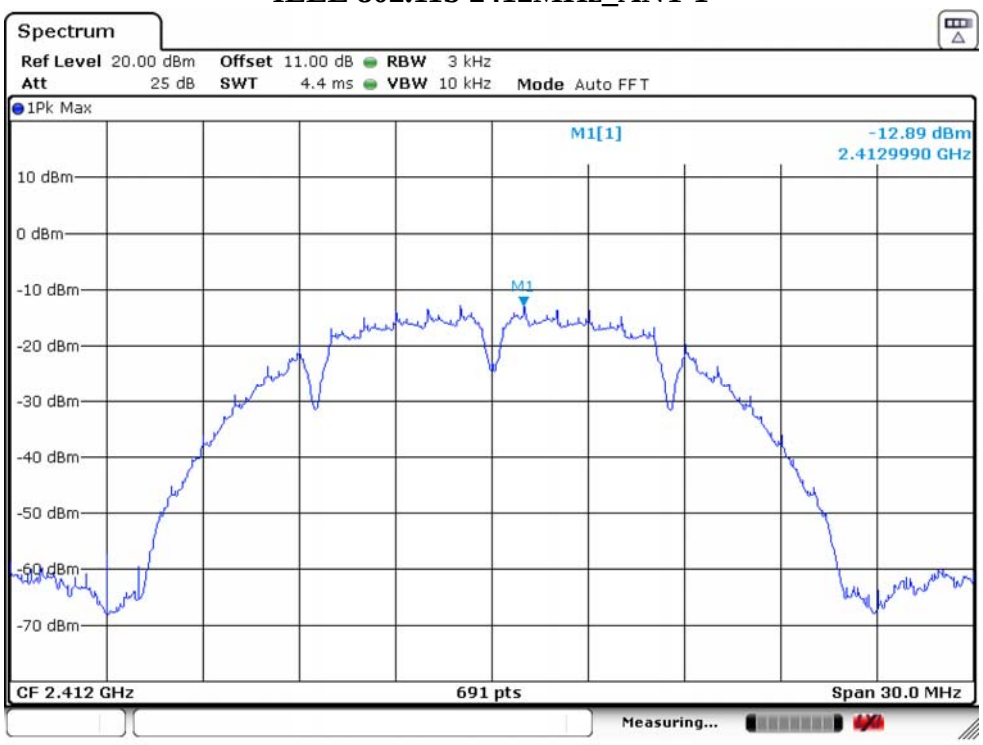
5.4. Test Procedure

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 5.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.

5.5. Test Result

Temperature	24.1℃	Relative Humidity		46.7%	Test Voltage	DC 3.3V
Mode	Freq (MHz)	Power Density (dBm/3KHz)		Total Power Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
		ANT 1	ANT 2			
IEEE 802.11b	2412	-12.89	-13.17		8.0	PASS
	2437	-13.45	-14.55		8.0	PASS
	2462	-14.23	-15.28		8.0	PASS
IEEE 802.11g	2412	-15.93	-17.12		8.0	PASS
	2437	-16.27	-17.08		8.0	PASS
	2462	-16.83	-17.30		8.0	PASS
IEEE 802.11n HT20	2412	-17.66	-18.71	-15.14	7.99	PASS
	2437	-17.96	-19.00	-15.44	7.99	PASS
	2462	-18.41	-18.29	-15.34	7.99	PASS
IEEE 802.11n HT40	2422	-19.96	-20.06	-17.00	7.99	PASS
	2437	-19.87	-20.38	-17.11	7.99	PASS
	2452	-19.83	-20.49	-17.14	7.99	PASS

IEEE 802.11b 2412MHz_ANT 1



IEEE 802.11b 2412MHz_ANT 2