TEST REPORT

No. I20N00104-WLAN

for

TCL Communication Ltd.

Wifi Router

WR1O

with

Hardware Version: V2.0

Software Version: WRIO_ZZ_01.00_01

FCC ID: 2ACCJB119

Issued Date: 2020-03-12

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

Test Laboratory:

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1. Summary of Test Report

1.1. Test Items

Description	Wifi Router
Model Name	WR1O
Applicant's name	TCL Communication Ltd.
Manufacturer's Name	TCL Communication Ltd.

1.2. Test Standards

FCC Part15-2018; ANSI C63.10-2013; KDB 662911-v02r01

1.3. Test Result

Pass

1.4. Testing Location

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518026

1.5. Project data

Testing Start Date:	2020-01-16
Testing End Date:	2020-03-10

1.6. Signature

Lin Zechuang
(Prepared this test report)

Tang Weisheng
(Reviewed this test report)

Zhang Bojun
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
Contact Person	Gong Zhizhou
E-Mail	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
Contact Person	Gong Zhizhou
E-Mail	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Wifi Router
Model Name	WR1O
Brand Name	TCL
RF Protocol	IEEE 802.11 b/g/n-HT20/n-HT40
Operating Frequency	2412MHz~2462MHz
Number of Channels	11
Antenna Type	Integrated
Antenna Gain	Antenna A = 4.50 dBi. Antenna B = 4.50 dBi. MIMO = 7.50 dBi.
Power Supply	9 V DC
FCC ID	2ACCJB119
Condition of EUT as received	No abnormality in appearance

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Shenzhen Academy of Information and Communications Technology.

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Receive Date
EUT1	191187820100040313	V2.0	WRIO_ZZ_01.00_01	2020-01-13
EUT2	191187820100040340	V2.0	WRIO_ZZ_01.00_01	2020-01-13

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE

AE ID*	Description	AE ID*
AE1	SMPS Adaptor	/
AE2	SWITHING Adaptor	/

AE1

Model	S012CDU1200100
Manufacturer	Tenpao
Length of DC line	/cm

AE2

Model	BN073-A09009U
Manufacturer	HEWEISHUN
Length of DC line	/cm

*AE ID: is used to identify the test sample in the lab internally.

3.4. General Description

The Equipment under Test (EUT) is a model of Wifi Router with integrated antenna.
It consists of normal options: Charger.
Manual and specifications of the EUT were provided to fulfil the test.
Samples undergoing test were selected by the client.

4. Reference Documents

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz	2018
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
KDB 662911	Emissions Testing of Transmitters with Multiple Outputs in the Same Band	v02r01

5. Test Results

5.1. Testing Environment

Normal Temperature: 15~35°C

Relative Humidity: 20~75%

5.2. Test Results

No	Test cases	Sub-clause of Part 15C	Verdict
1	Antenna Requirement	15.203	**P**
2	Maximum Output Power	15.247 (b)	**P**
3	Peak Power Spectral Density	15.247 (e)	**P**
4	6dB Bandwidth	15.247 (a)	**P**
5	Band Edges Compliance	15.247 (d)	**P**
6	Conducted Emission	15.247 (d)	**P**
7	Radiated Emission	15.247, 15.205, 15.209	**P**
8	AC Power line Conducted	15.207	**P**

See **ANNEX B** for details.

5.3. Statements

SAICT has evaluated the test cases requested by the applicant/manufacturer as listed in section 5.2 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2.

6. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Vector Signal Analyzer	FSV40	100903	Rohde & Schwarz	2021-01-01	1 year
2	Power Sensor	U2021XA	MY55430013	Agilent	2021-01-15	1 year
3	Test Receiver	ESCI	100702	Rohde & Schwarz	2021-01-14	1 year
4	LISN	ENV216	102067	Rohde & Schwarz	2020-07-17	1 year

Radiated test system

NO.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Loop Antenna	HLA6120	35779	TESEQ	2020-04-25	3 years
2	BiLog Antenna	3142E	00224831	ETS-Lindgren	2021-05-17	3 years
3	Horn Antenna	3117	00066577	ETS-Lindgren	2022-04-02	3 years
4	Test Receiver	ESR7	101676	Rohde & Schwarz	2020-11-27	1 year
5	Spectrum Analyser	FSV40	101192	Rohde & Schwarz	2021-01-14	1 year
6	Chamber	FACT3-2.0	1285	ETS-Lindgren	2021-07-19	3 years
7	Antenna	QSH-SL-18-26-S-20	17013	Q-par	2023-01-06	3 years
8	Antenna	QSH-SL-26-40-K-20	17014	Q-par	2023-01-06	3 years

Test software

No.	Equipment	Manufacturer	Version
1	TechMgr Software	CAICT	2.1.1
2	EMC32	Rohde & Schwarz	8.53.0
3	EMC32	Rohde & Schwarz	10.01.00

EUT is engineering software provided by the customer to control the transmitting signal. The EUT was programmed to be in continuously transmitting mode.

Anechoic Chamber

Fully anechoic Chamber by ETS-Lindgren.

7. Laboratory Environment

Semi-anechoic chambe

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< ±4 dB, 3 m distance, from 30 to 1000 MHz

Shielded room

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. =20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-1000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω

Fully-anechoic chamber

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Voltage Standing Wave Ratio （VSWR）	≤ 6 dB, from 1 to 18 GHz， 3 m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

8. Measurement Uncertainty

Test Name	Uncertainty(*k*=2)	
1. RF Output Power - Conducted	1.32dB	
2.Power Spectral Density - Conducted	2.32dB	
3.Occupied channel bandwidth - Conducted	66Hz	
4 Transmitter Spurious Emission - Conducted	30MHz≤f≤1GHz	1.41dB
	1GHz≤f≤7GHz	1.92dB
	7GHz≤f≤13GHz	2.31dB
	13GHz≤f≤26GHz	2.61dB
5. Transmitter Spurious Emission - Radiated	9kHz≤f≤30MHz	1.70dB
	30MHz≤f≤1GHz	4.90dB
	1GHz≤f≤18GHz	4.60dB
	18GHz≤f≤40GHz	4.10dB
6. AC Power line Conducted Emission	150kHz≤f≤30MHz	3.00dB

ANNEX A: Detailed Test Results

A.1 Antenna requirement

Measurement Limit:

Standard	Requirement
FCC CRF Part 15.203	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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Conclusion: The Directional gains of antenna used for transmitting: Antenna A = 4.50 dBi.
Antenna B = 4.50 dBi.
MIMO = 7.50 dBi.

The RF transmitter uses an integrate antenna without connector.

A.2 Maximum Output Power - Conducted

Measurement of method :See ANSI C63.10-2013-Clause 11.9.2.3.2

Method AVGPM-G is a measurement using a gated RF average power meter.

Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Measurement Limit:

Standard	Limit (dBm)
FCC CRF Part 15.247(b)	< 30

Measurement Results:

Antenna A:

Mode	Output Power (dBm)		
	2412MHz (Ch1)	**2437MHz (Ch6)**	**2462MHz (Ch11)**
802.11b	13.84	14.19	14.53
802.11g	12.42	12.87	13.21
802.11n(HT20)	12.39	12.74	13.13
/	**2422MHz (Ch3)**	**2437MHz (Ch7)**	**2452MHz (Ch9)**
802.11n(HT40)	12.28	12.70	12.92

Antenna B:

Mode	Output Power (dBm)		
	2412MHz (Ch1)	**2437MHz (Ch6)**	**2462MHz (Ch11)**
802.11b	13.67	14.08	14.44
802.11g	12.38	12.82	13.06
802.11n(HT20)	12.24	12.68	12.92
/	**2422MHz (Ch3)**	**2437MHz (Ch7)**	**2452MHz (Ch9)**
802.11n(HT40)	12.37	12.67	12.81

MIMO:

Mode	Output Power (dBm)								
	2412MHz (Ch1)			**2437MHz (Ch6)**			**2462MHz (Ch11)**		
	Ant A	Ant B	Sum	Ant A	Ant B	Sum	Ant A	Ant B	Sum
802.11n (HT20)	12.06	11.92	15.00	12.38	12.32	15.36	12.68	12.57	15.64
Mode	**2422MHz (Ch3)**			**2437MHz (Ch7)**			**2452MHz (Ch9)**		
	Ant A	Ant B	Sum	Ant A	Ant B	Sum	Ant A	Ant B	Sum
802.11n (HT40)	12.25	12.14	15.21	12.50	12.28	15.40	12.63	12.55	15.60

Conclusion: PASS

Note:

The data rate 1Mbps (11b mode), 6Mbps (11g mode) and MCS0 (11n mode) are selected as the maximum power are got with these data rate. Antenna A is selected as the worst condition (SISO). The following cases and test graphs are mostly performed with this condition.

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

A.3 Peak Power Spectral Density

Measurement Limit:

Standard	Limit
FCC CRF Part 15.247(e)	< 8 dBm/3 kHz

Measurement Results:

SISO:

Mode	Channel	Frequency (MHz)	Test Results(dBm/3 kHz)		Conclusion
802.11b	CH 1	2412	Fig.1	-9.57	P
	CH 6	2437	Fig.2	-9.35	P
	CH 11	2462	Fig.3	-8.98	P
802.11g	CH 1	2412	Fig.4	-12.22	P
	CH 6	2437	Fig.5	-12.08	P
	CH 11	2462	Fig.6	-11.58	P
802.11n HT20	CH 1	2412	Fig.7	-11.09	P
	CH 6	2437	Fig.8	-10.80	P
	CH 11	2462	Fig.9	-10.32	P
802.11n HT40	CH 3	2422	Fig.10	-14.55	P
	CH 6	2437	Fig.11	-14.20	P
	CH 9	2452	Fig.12	-14.08	P

MIMO:

Mode	Channel	Frequency (MHz)	Test Results(dBm/3 kHz)			Conclusion
			Ant A	Ant B	Sum	
802.11n HT20	CH 1	2412	-11.93	-12.72	-9.30	P
	CH 6	2437	-11.87	-12.58	-9.20	P
	CH 11	2462	-11.49	-12.12	-8.78	P
802.11n HT40	CH 3	2422	-13.59	-15.90	-11.58	P
	CH 6	2437	-13.41	-16.00	-11.50	P
	CH 9	2452	-13.24	-15.85	-11.34	P

See below for test graphs.

Conclusion: PASS

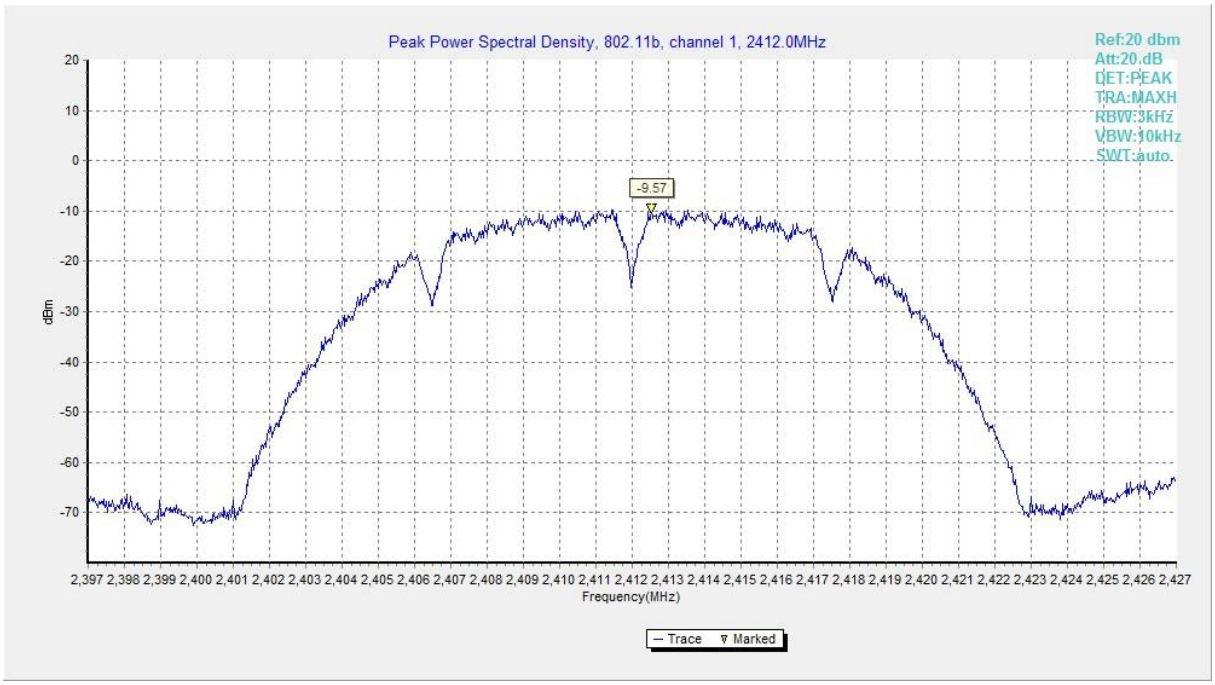

Fig.1 Power Spectral Density (802.11b, CH 1)

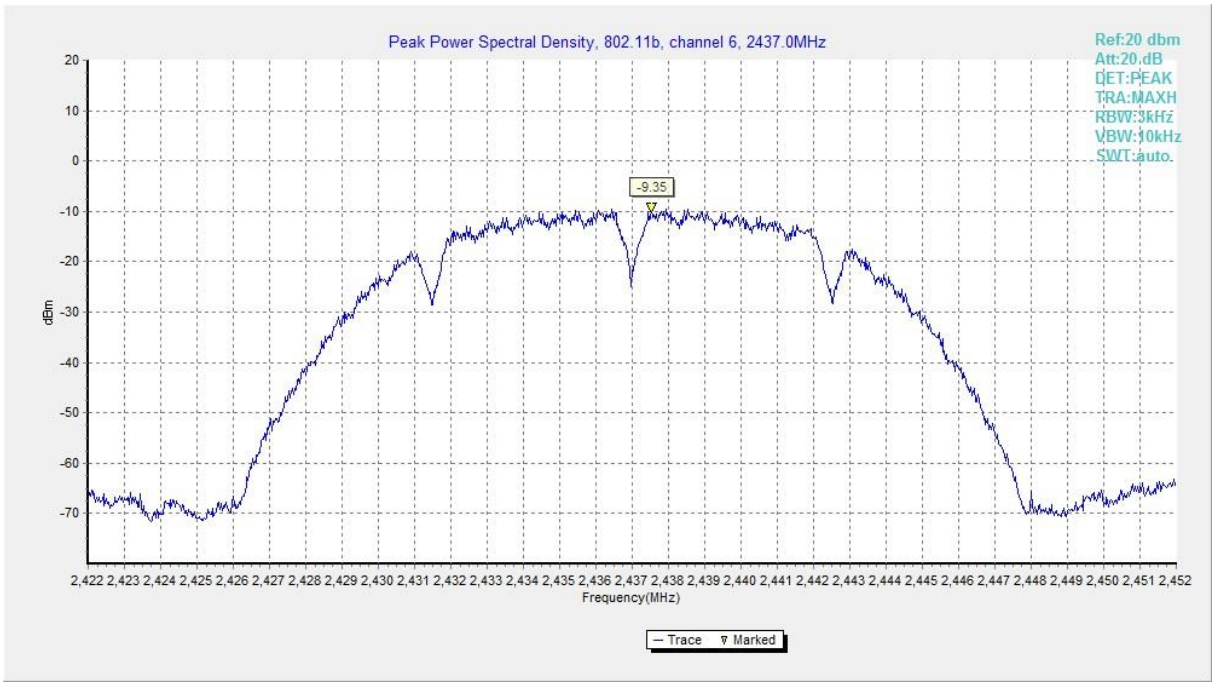

Fig.2 Power Spectral Density (802.11b, CH 6)

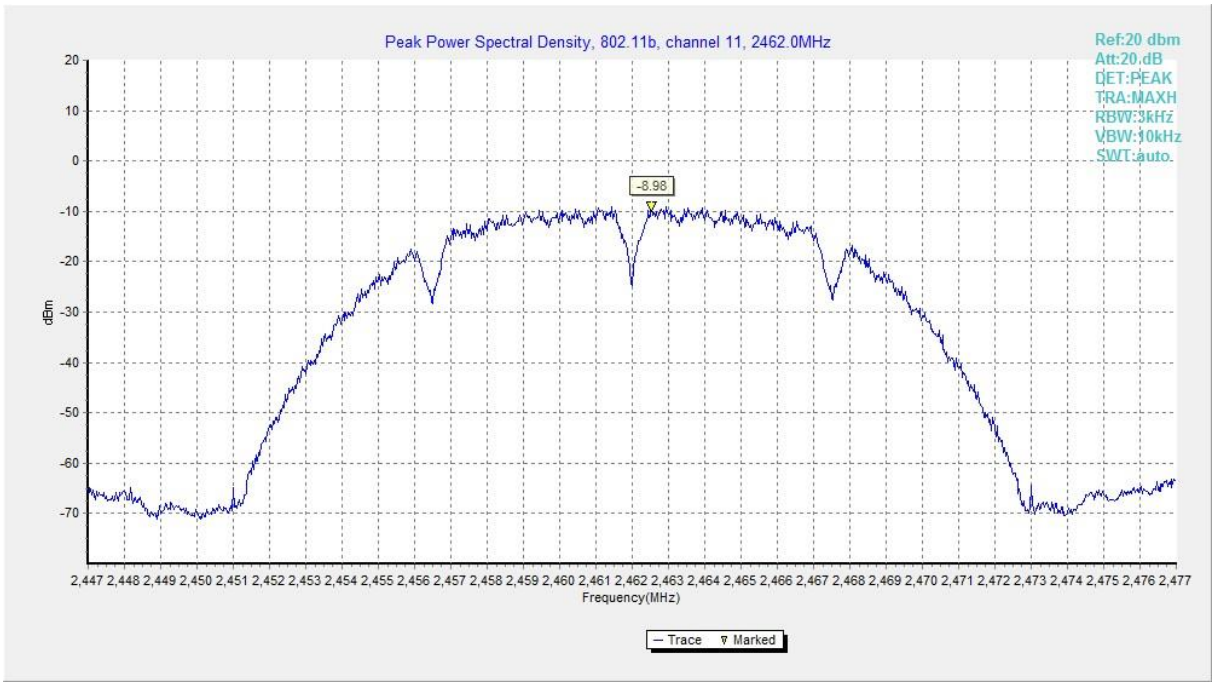

Fig.3 Power Spectral Density (802.11b, CH 11)

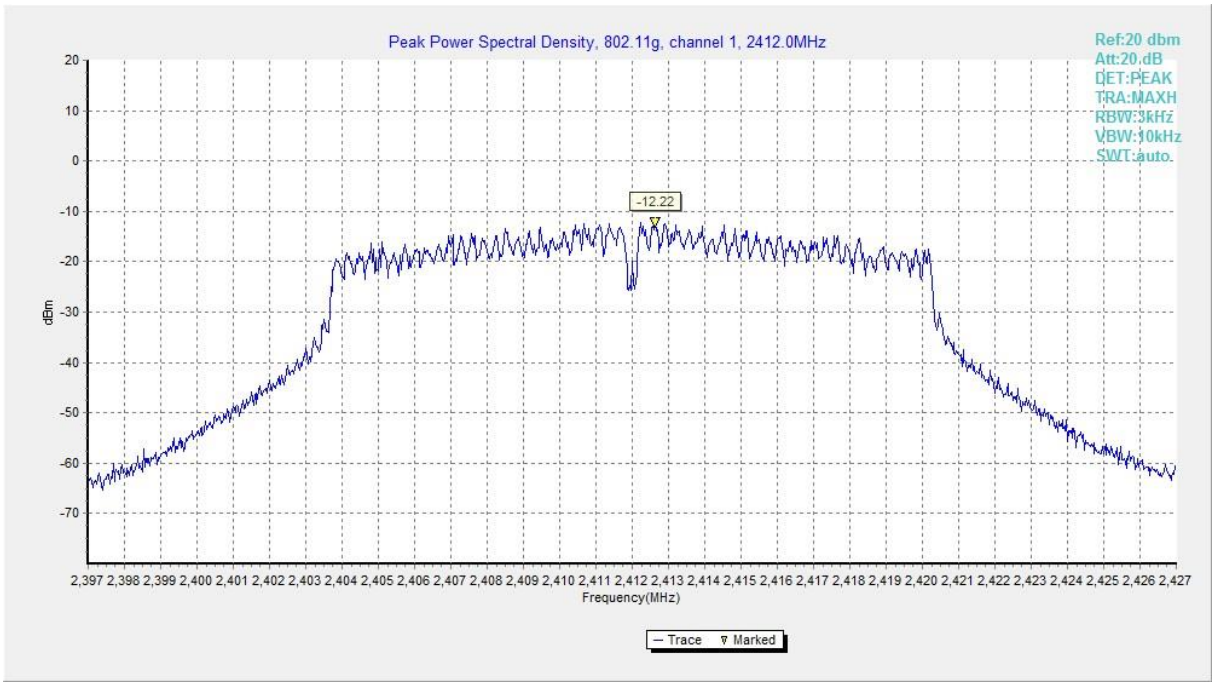

Fig.4 Power Spectral Density (802.11g, CH 1)

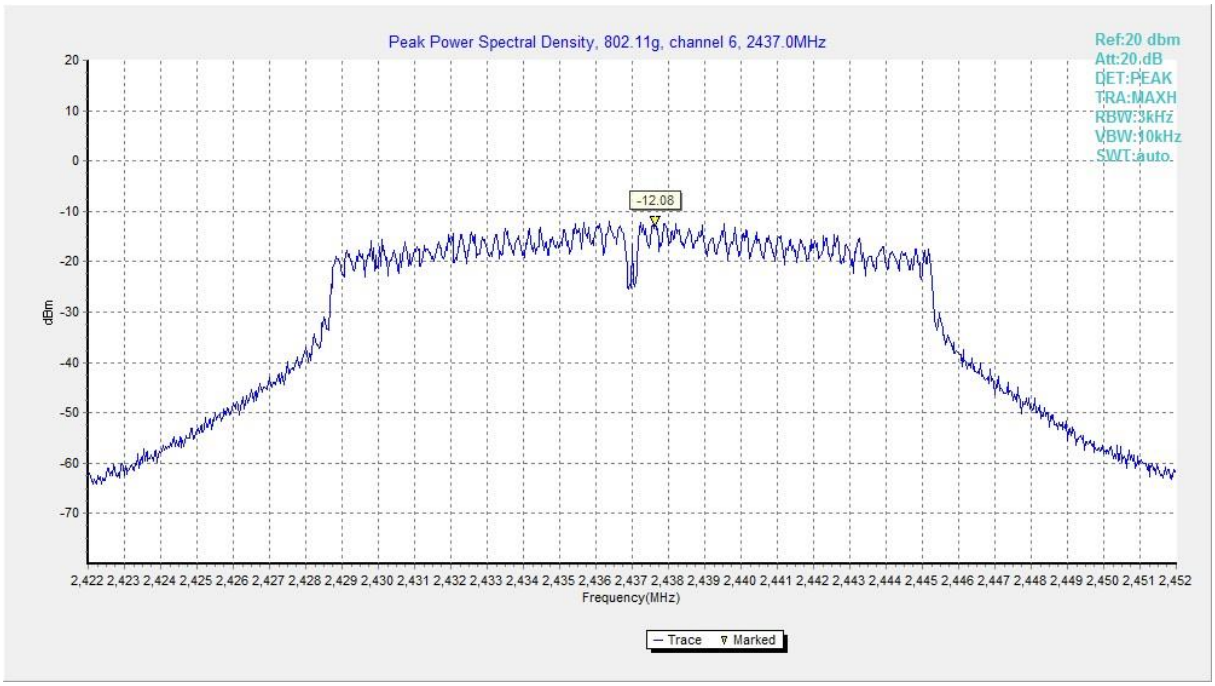

Fig.5 Power Spectral Density (802.11g, CH 6)

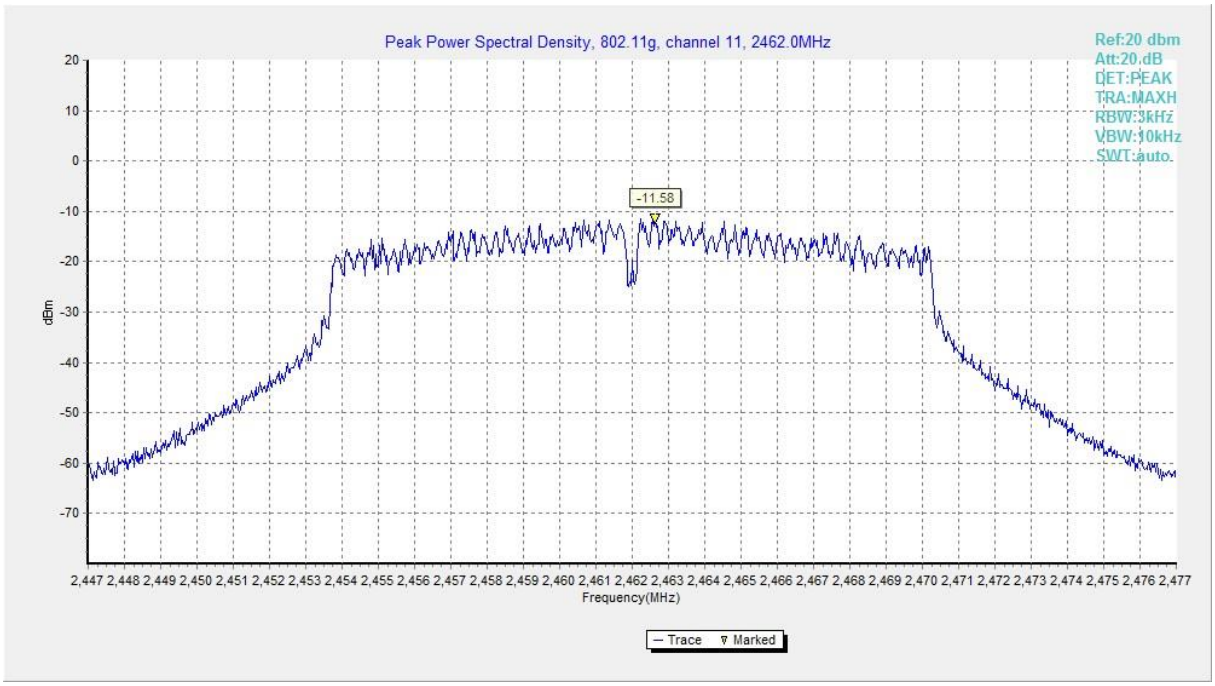

Fig.6 Power Spectral Density (802.11g, CH 11)

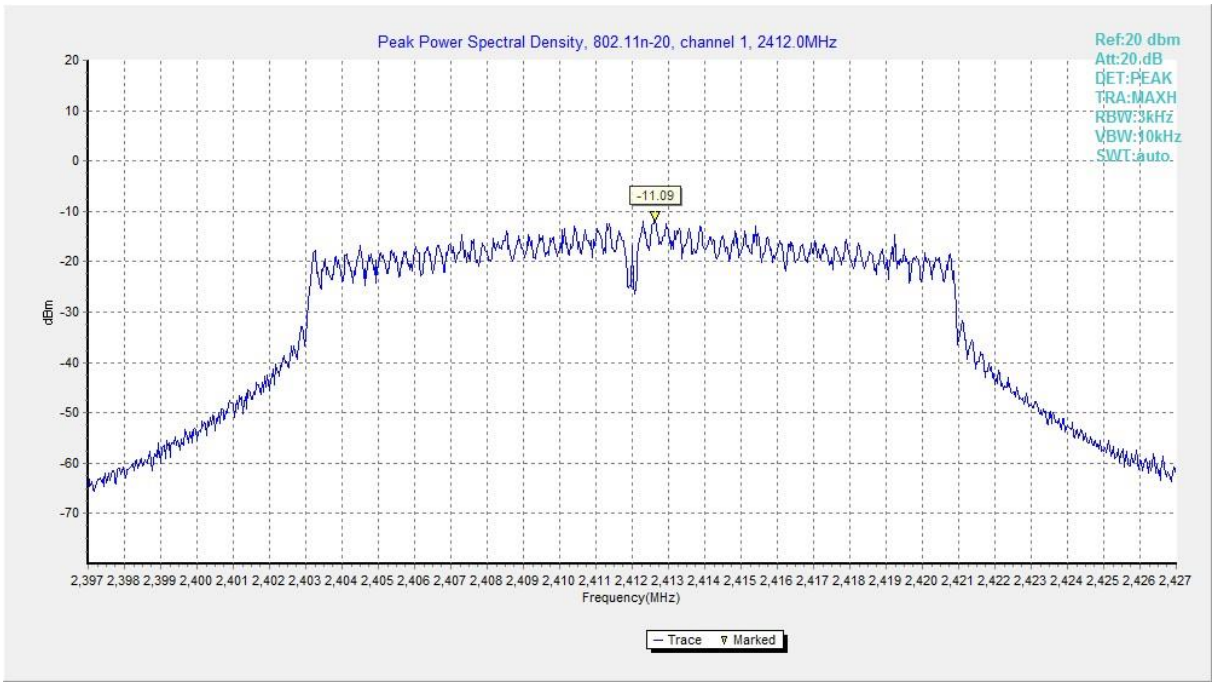

Fig.7 Power Spectral Density (802.11n HT20, CH 1)

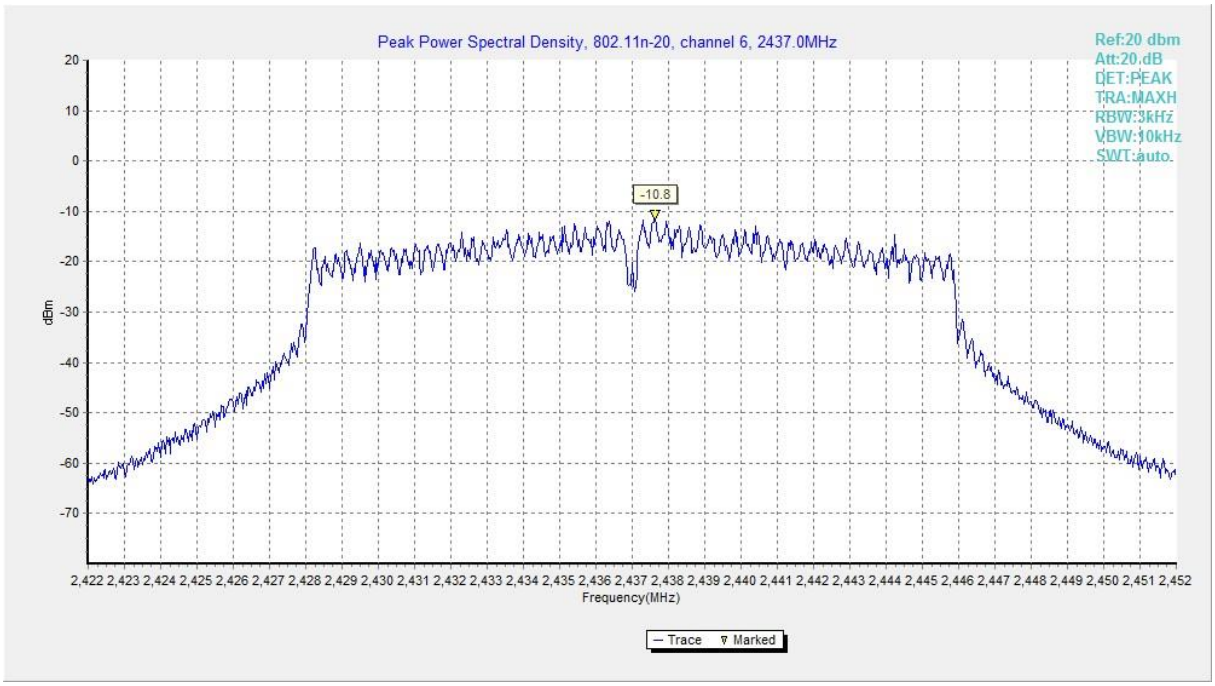

Fig.8 Power Spectral Density (802.11n HT20, CH 6)

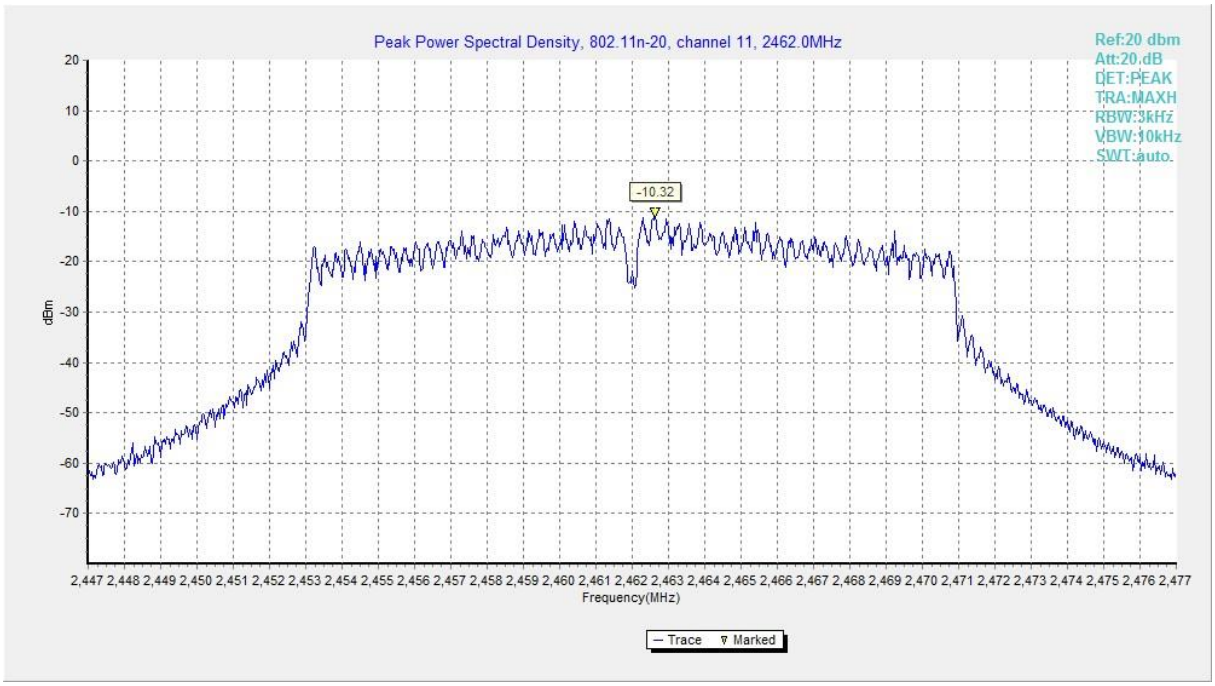

Fig.9 Power Spectral Density (802.11n HT20, CH 11)

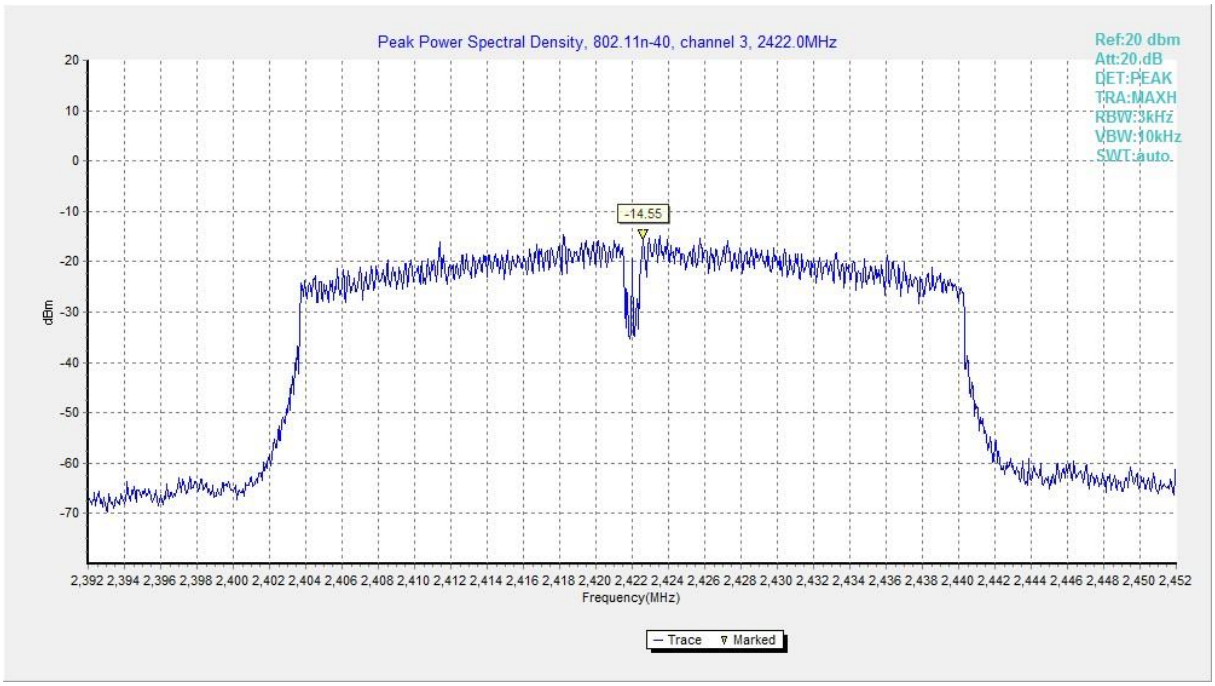

Fig.10 Power Spectral Density (802.11n HT40, CH 3)

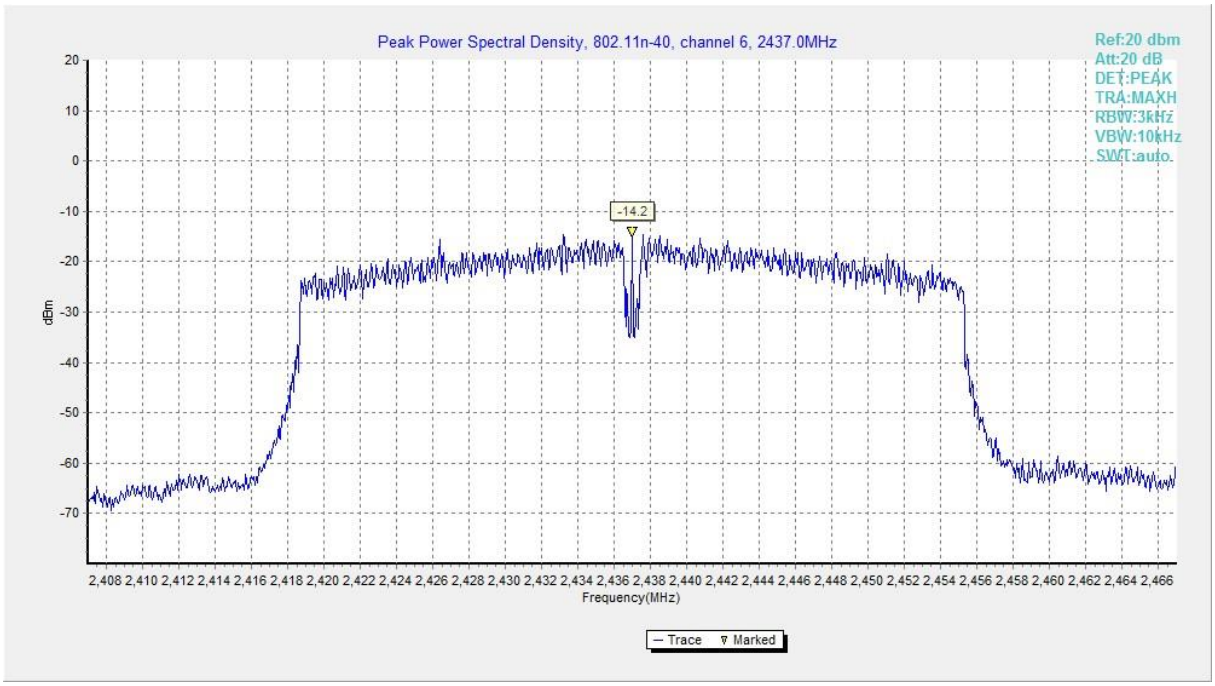

Fig.11 Power Spectral Density (802.11n HT40, CH 6)

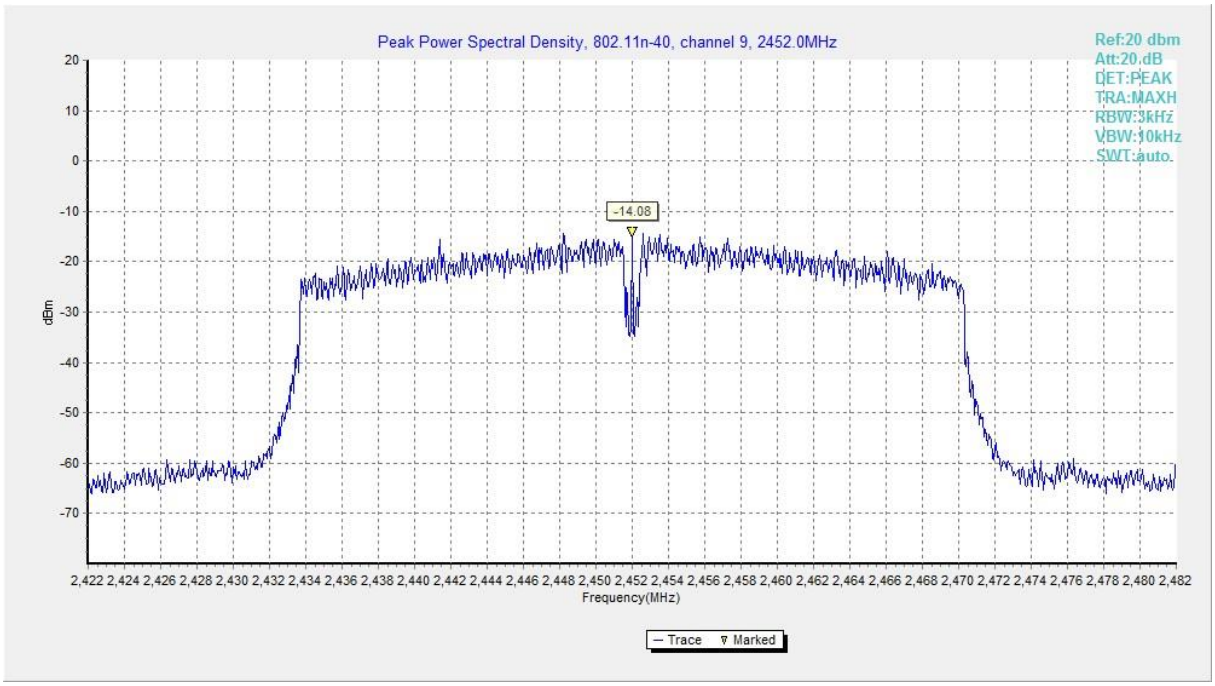

Fig.12 Power Spectral Density (802.11n HT40, CH 9)

A.4 6dB Bandwidth

Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a)	≥ 500

Measurement Result:

Mode	Channel	Frequency (MHz)	Test Results (kHz)		Conclusion
802.11b	CH 1	2412	Fig.13	10100	**P**
	CH 6	2437	Fig.14	10100	**P**
	CH 11	2462	Fig.15	10100	**P**
802.11g	CH 1	2412	Fig.16	15050	**P**
	CH 6	2437	Fig.17	15000	**P**
	CH 11	2462	Fig.18	15100	**P**
802.11n HT20	CH 1	2412	Fig.19	15050	**P**
	CH 6	2437	Fig.20	15050	**P**
	CH 11	2462	Fig.21	15100	**P**
802.11n HT40	CH 3	2422	Fig.22	30080	**P**
	CH 6	2437	Fig.23	31280	**P**
	CH 9	2452	Fig.24	32560	**P**

See below for test graphs.

Conclusion: PASS

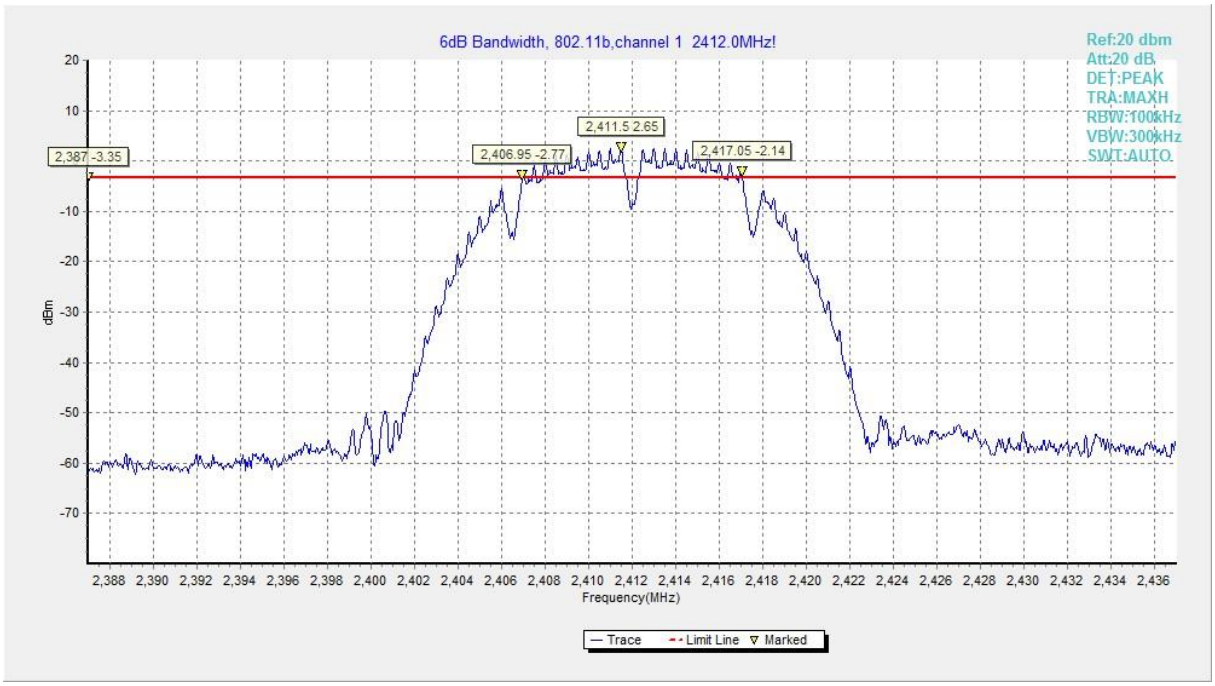

Fig.13 6dB Bandwidth (802.11b, CH 1)

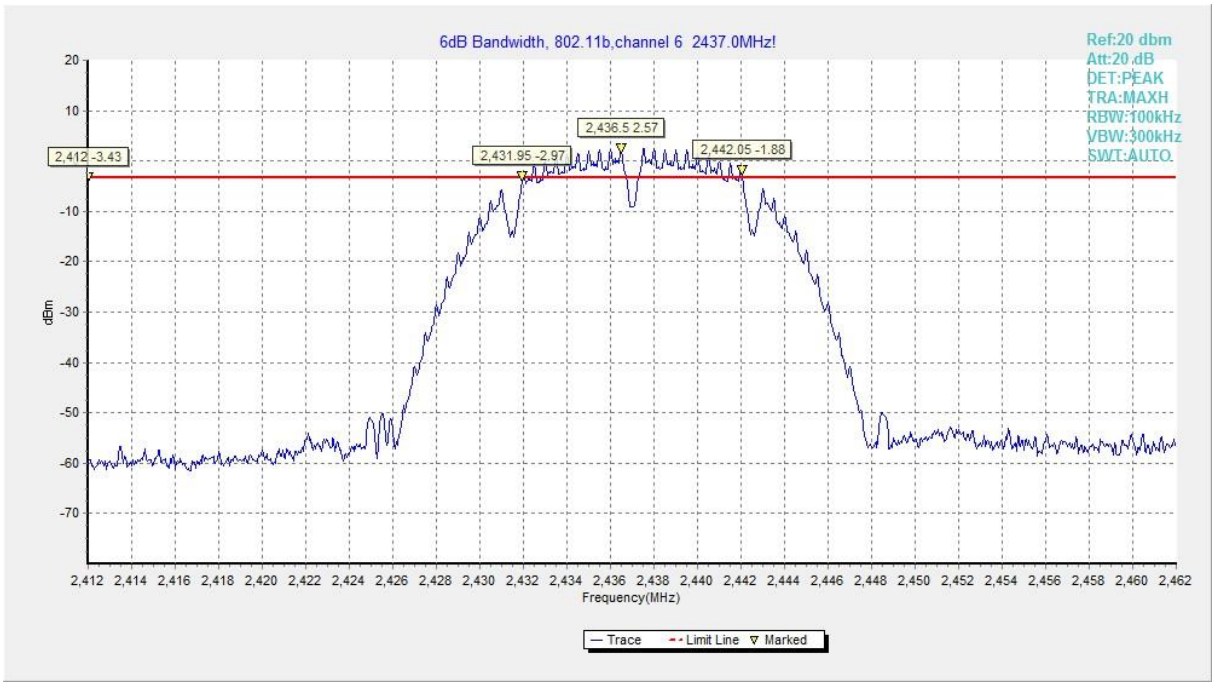

Fig.14 6dB Bandwidth (802.11b, CH 6)

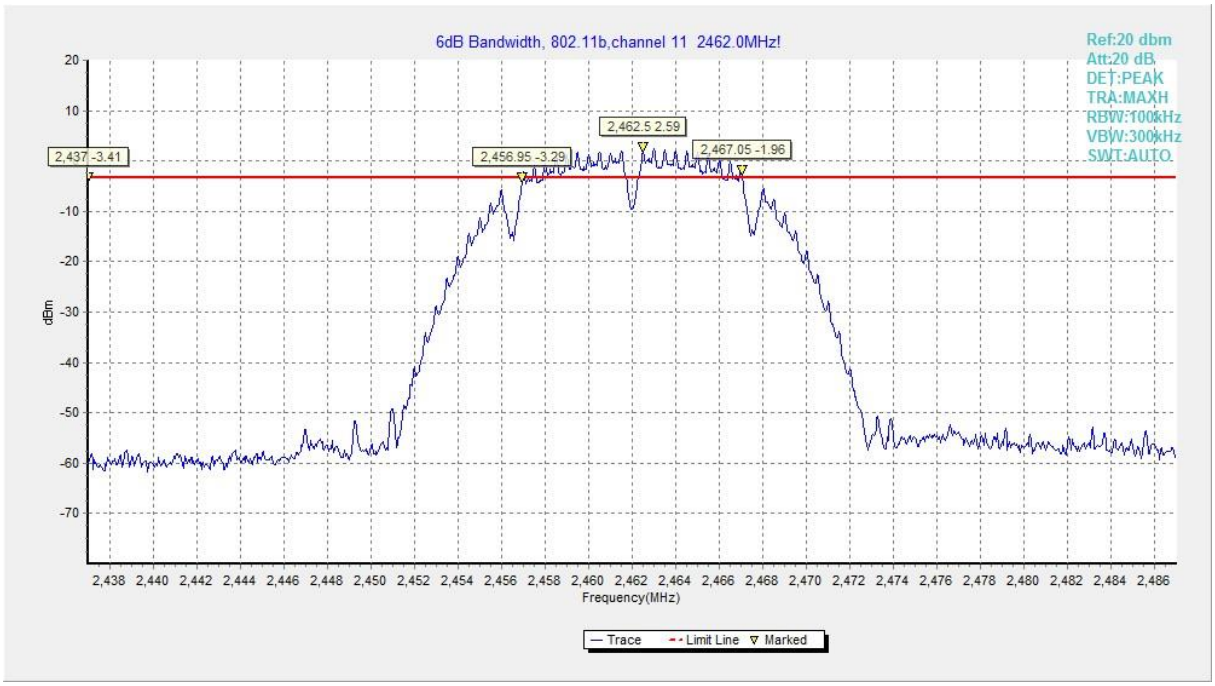

Fig.15 6dB Bandwidth (802.11b, CH 11)

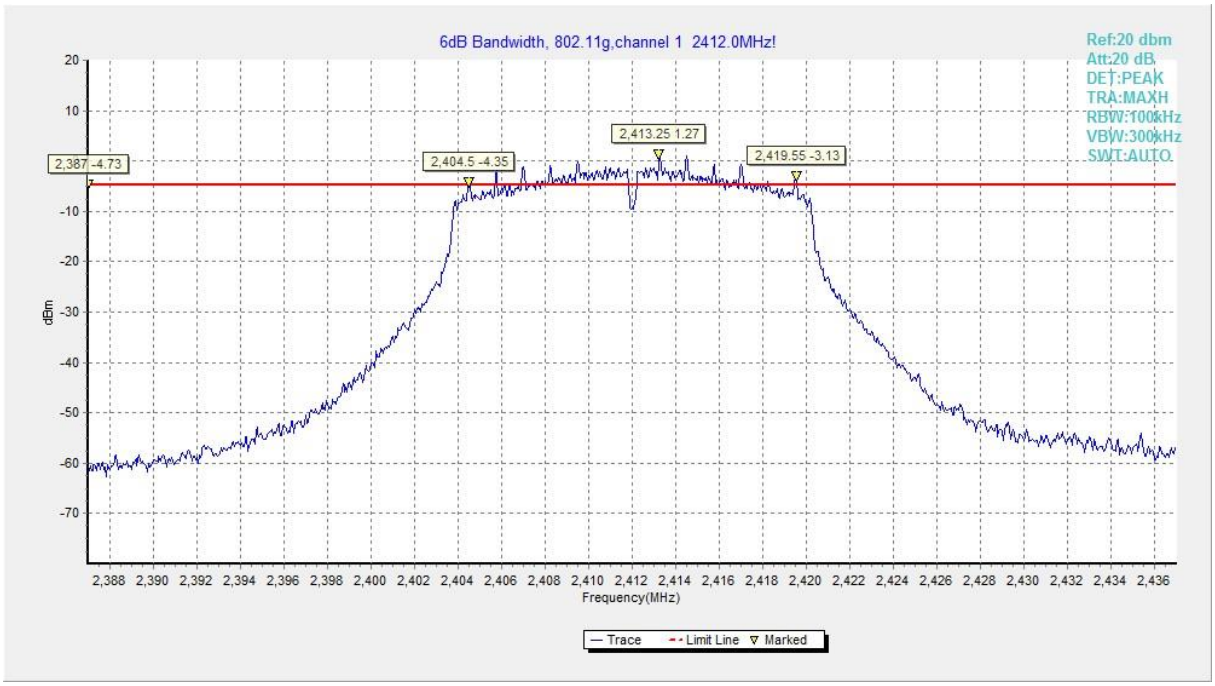

Fig.16 6dB Bandwidth (802.11g, CH 1)

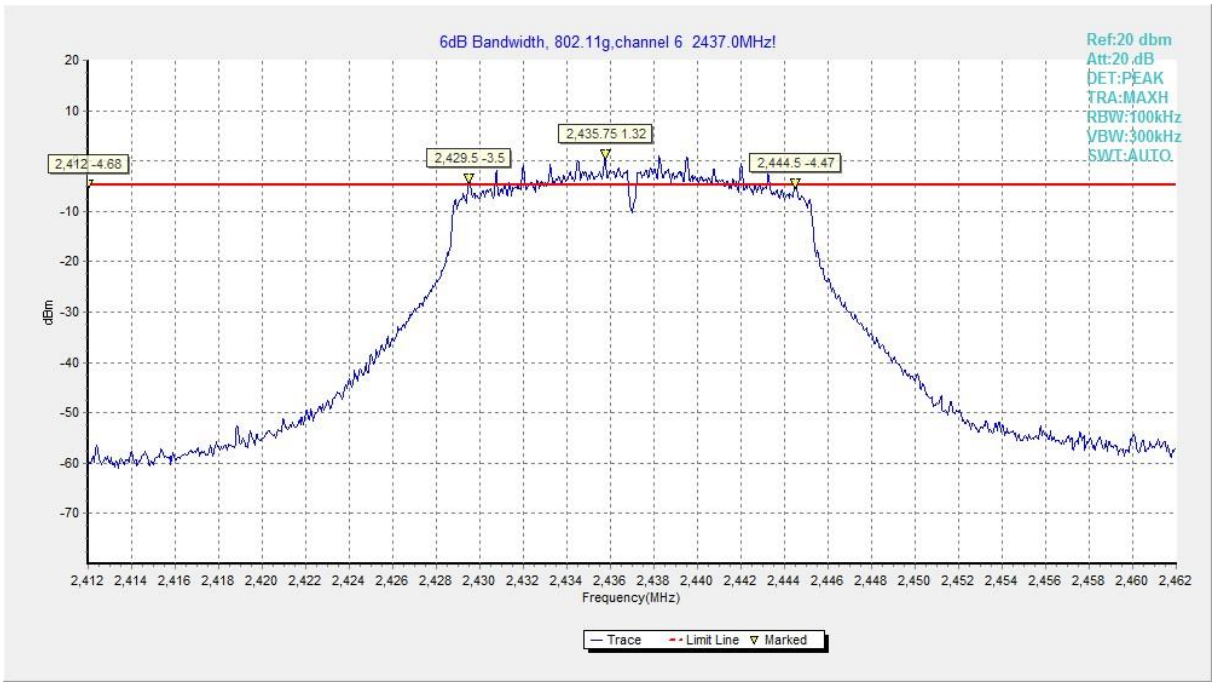

Fig.17 6dB Bandwidth (802.11g, CH 6)

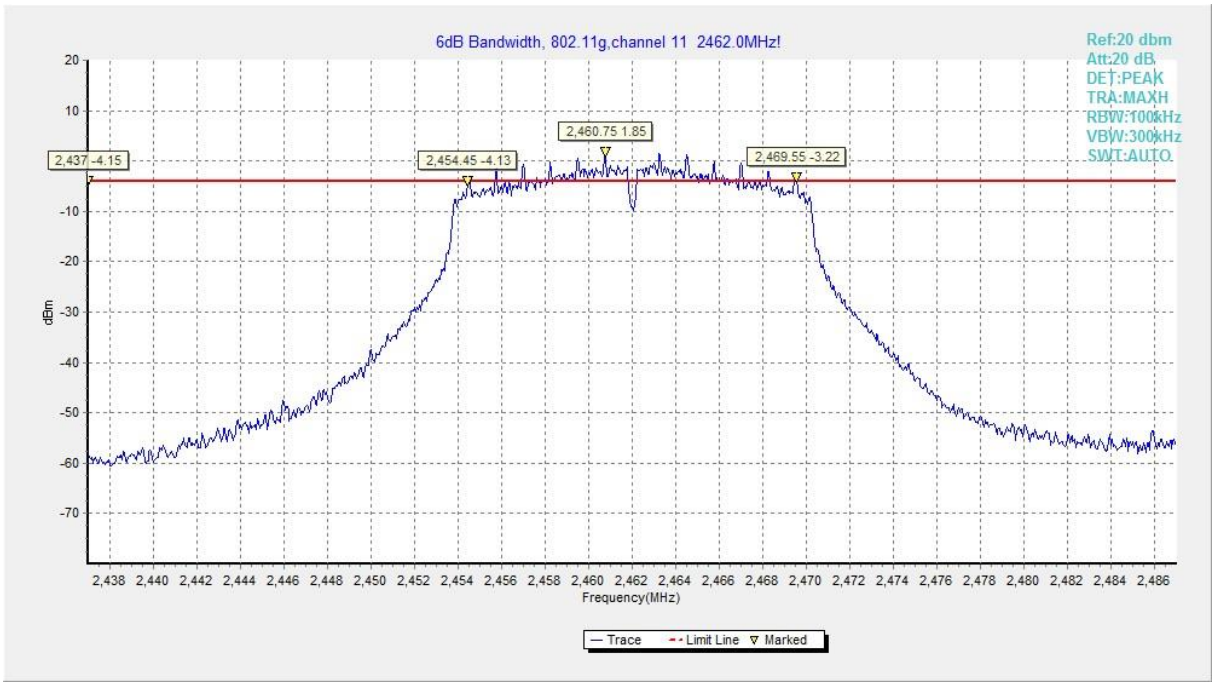

Fig.18 6dB Bandwidth (802.11g, CH 11)

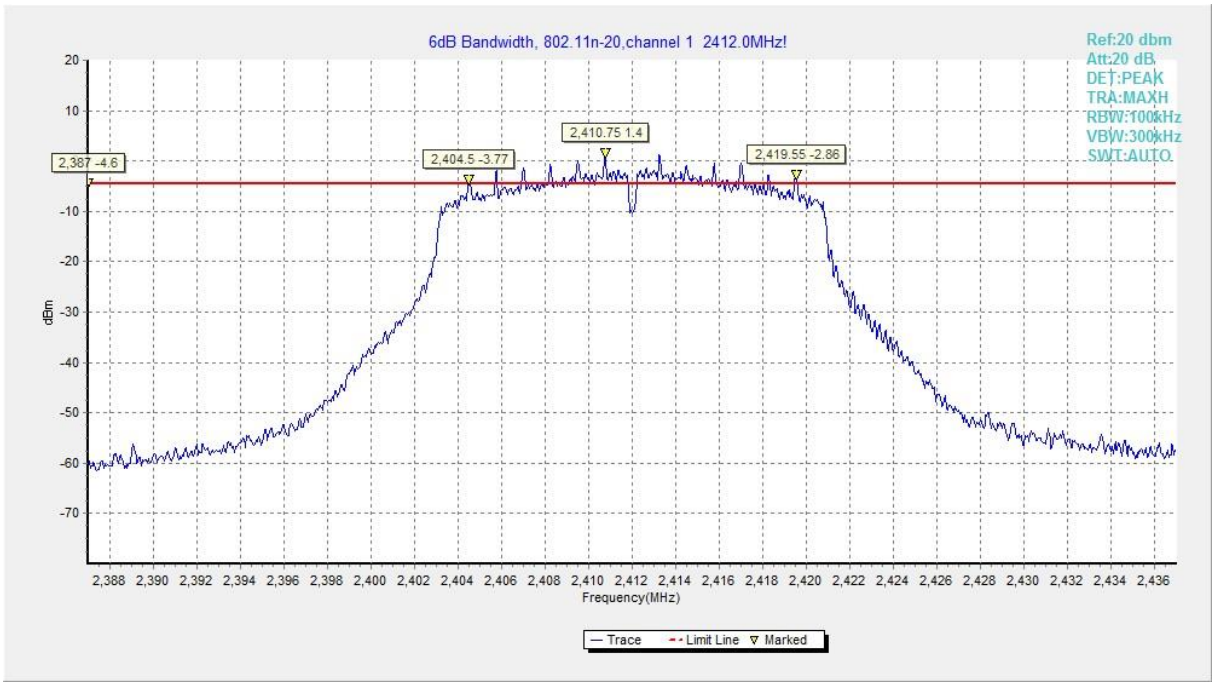

Fig.19 6dB Bandwidth (802.11n HT20, CH 1)

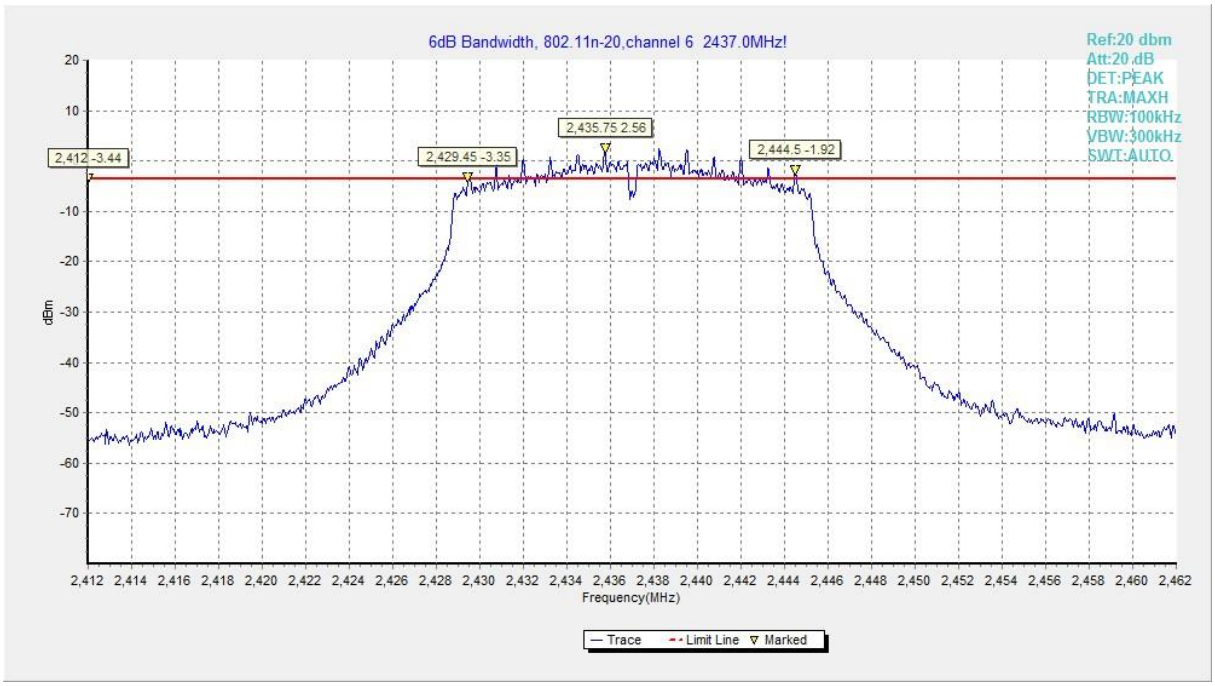

Fig.20 6dB Bandwidth (802.11n HT20, CH 6)

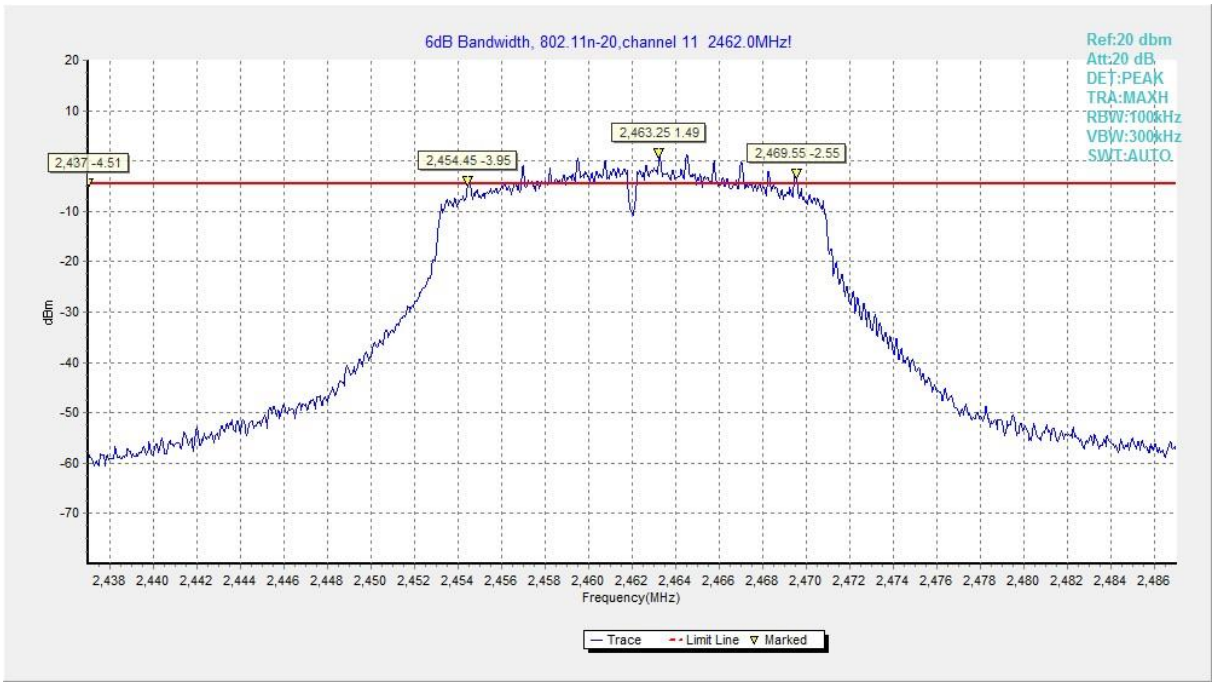

Fig.21 6dB Bandwidth (802.11n HT20, CH 11)

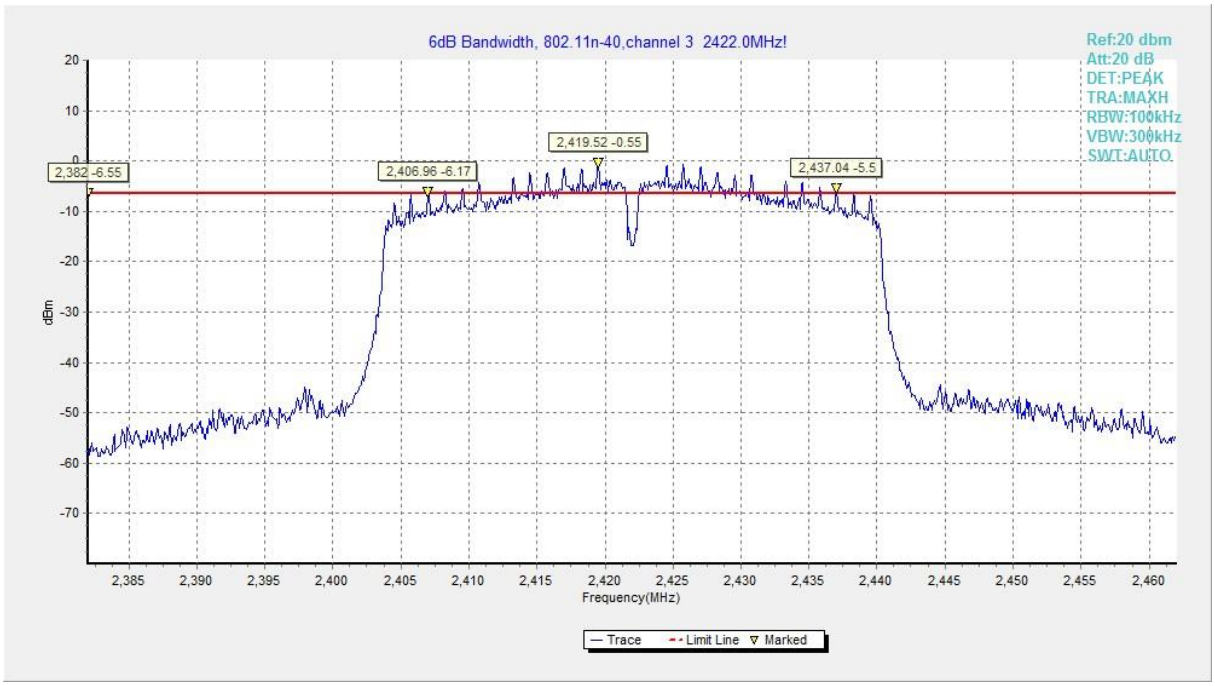

Fig.22 6dB Bandwidth (802.11n HT40, CH 3)

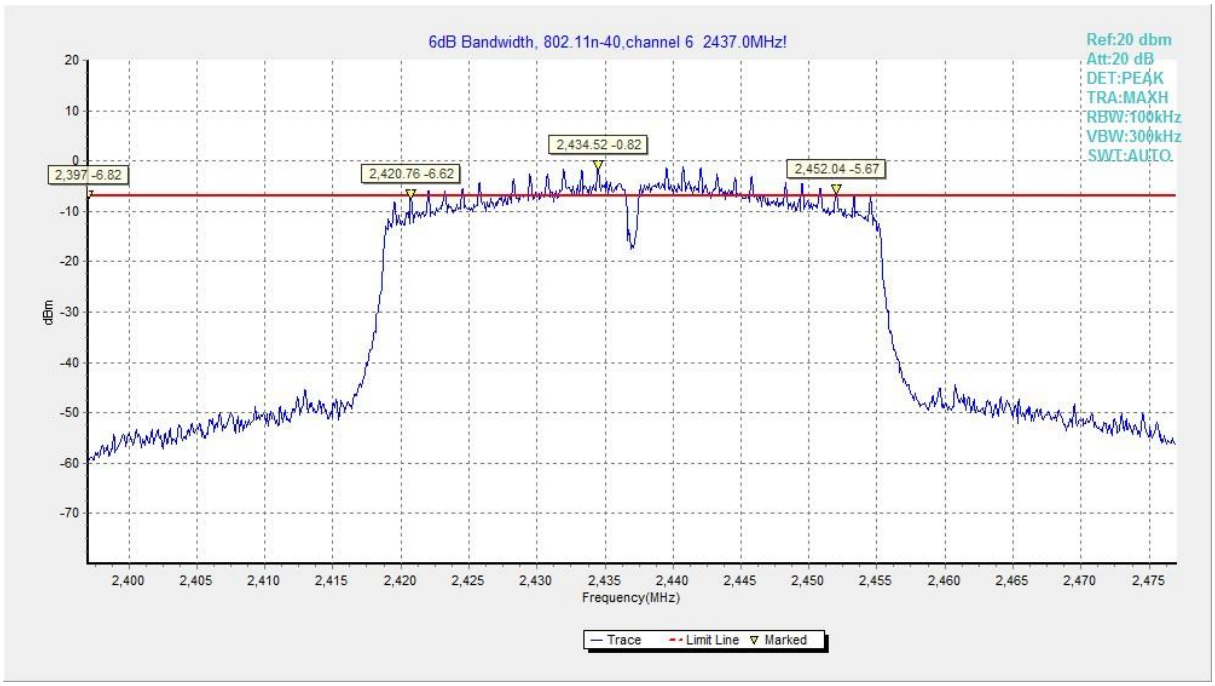

Fig.23 6dB Bandwidth (802.11n HT40, CH 6)

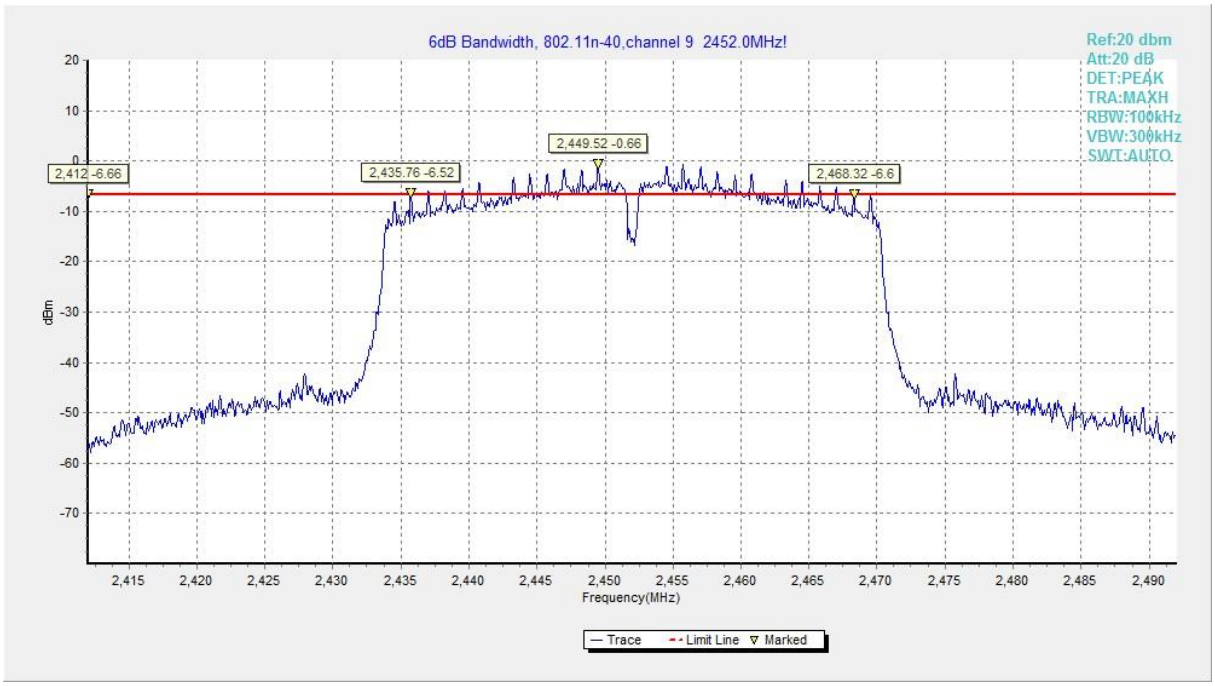

Fig.24 6dB Bandwidth (802.11n HT40, CH 9)

A.5 Band Edges Compliance

Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	> 30

Measurement Result:

Mode	Channel	Frequency (MHz)	Test Results (dBc)		Conclusion
802.11b	CH1	2412	Fig.25	54.27	**P**
	CH11	2462	Fig.26	55.93	**P**
802.11g	CH1	2412	Fig.27	40.69	**P**
	CH11	2462	Fig.28	56.71	**P**
802.11n HT20	CH1	2412	Fig.29	38.50	**P**
	CH11	2462	Fig.30	56.36	**P**
802.11n HT40	CH3	2422	Fig.31	48.70	**P**
	CH9	2452	Fig.32	47.02	**P**

See below for test graphs.

Conclusion: PASS

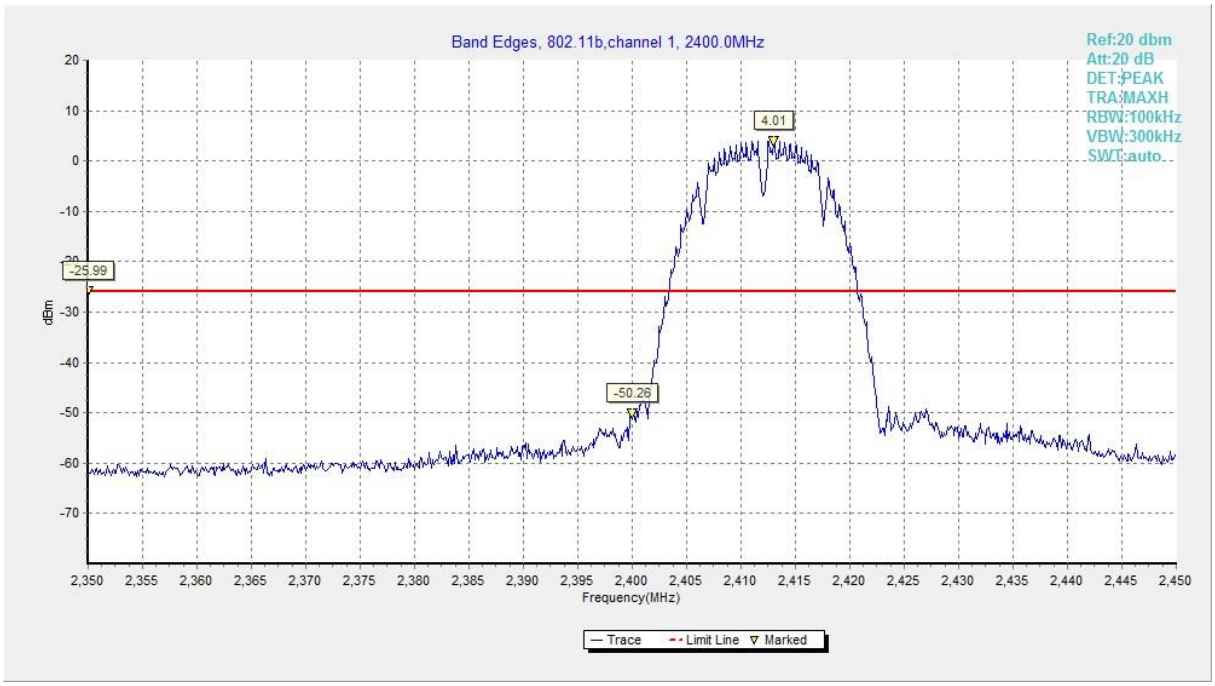

Fig.25 Band Edges (802.11b, CH 1)

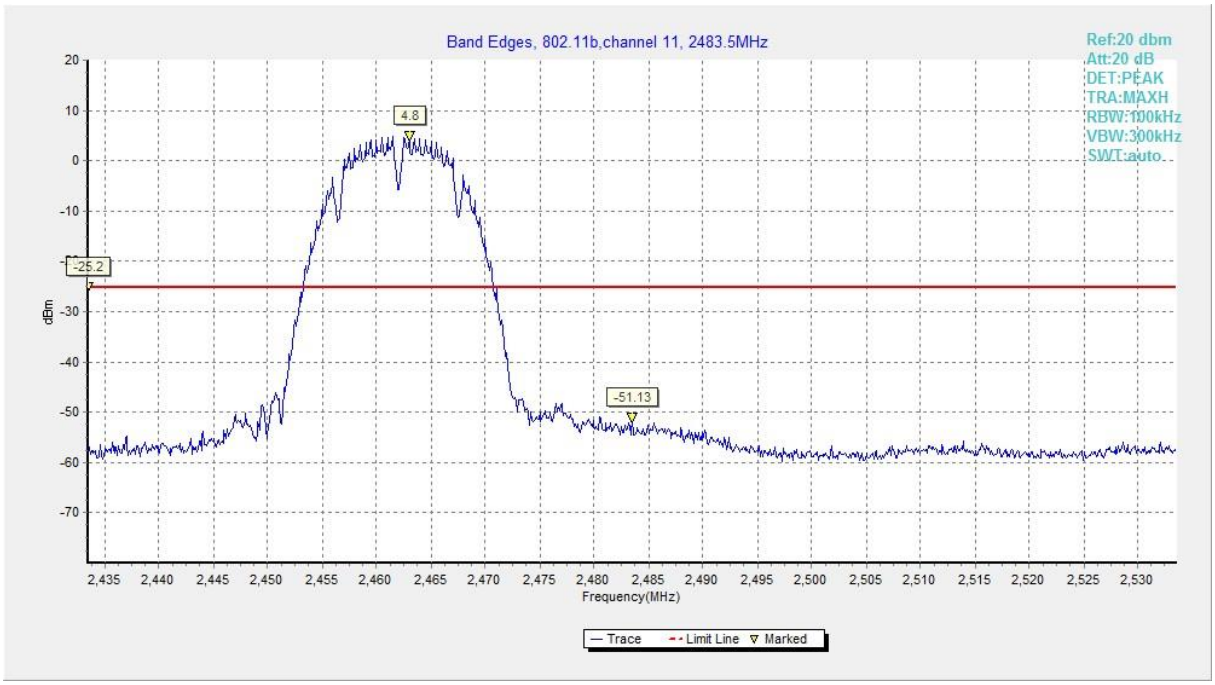

Fig.26 Band Edges (802.11b, CH 11)

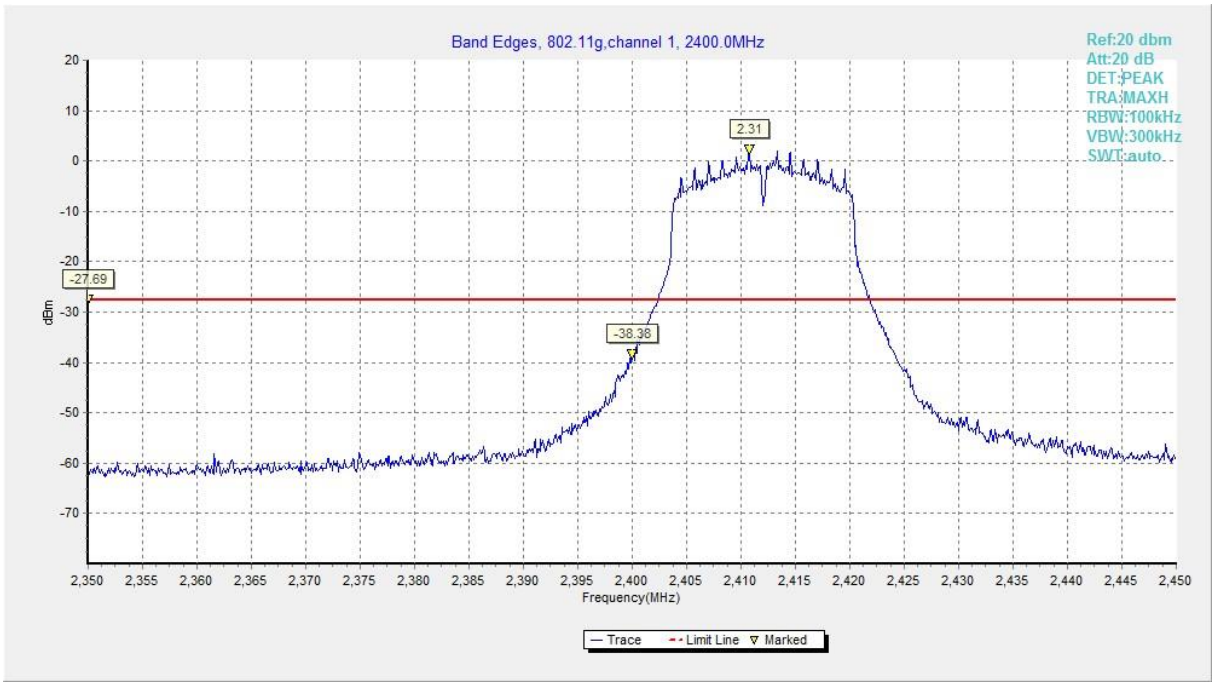

Fig.27 Band Edges (802.11g, CH 1)

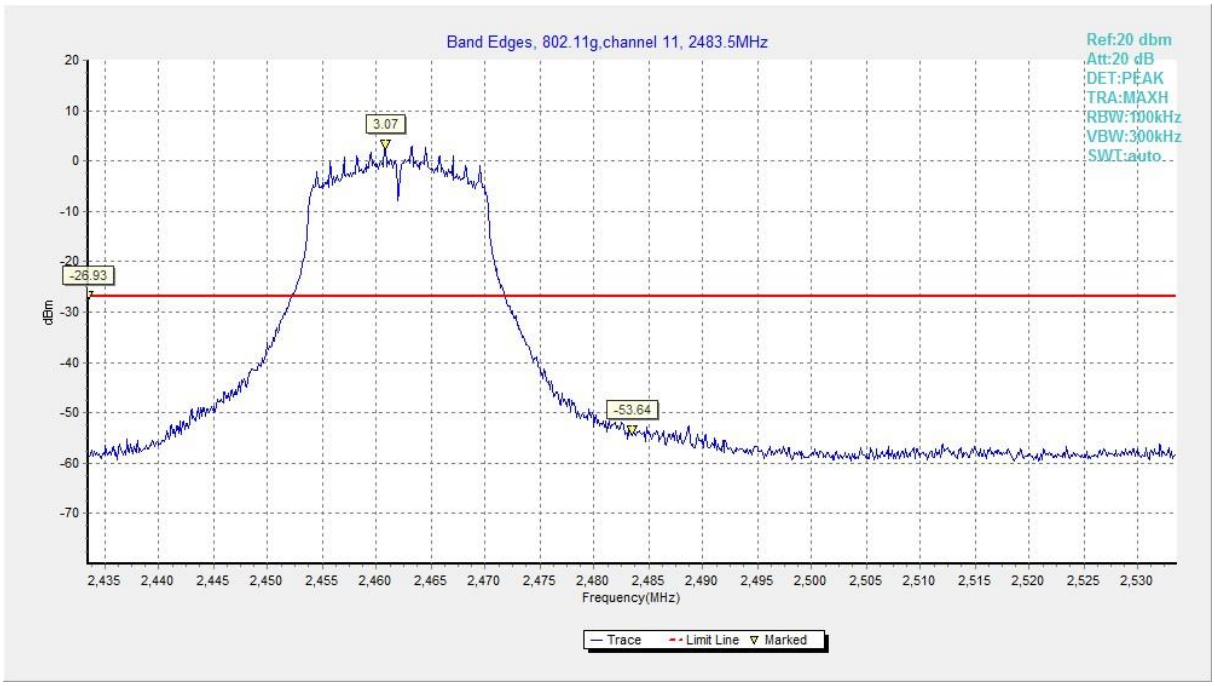

Fig.28 Band Edges (802.11g, CH 11)

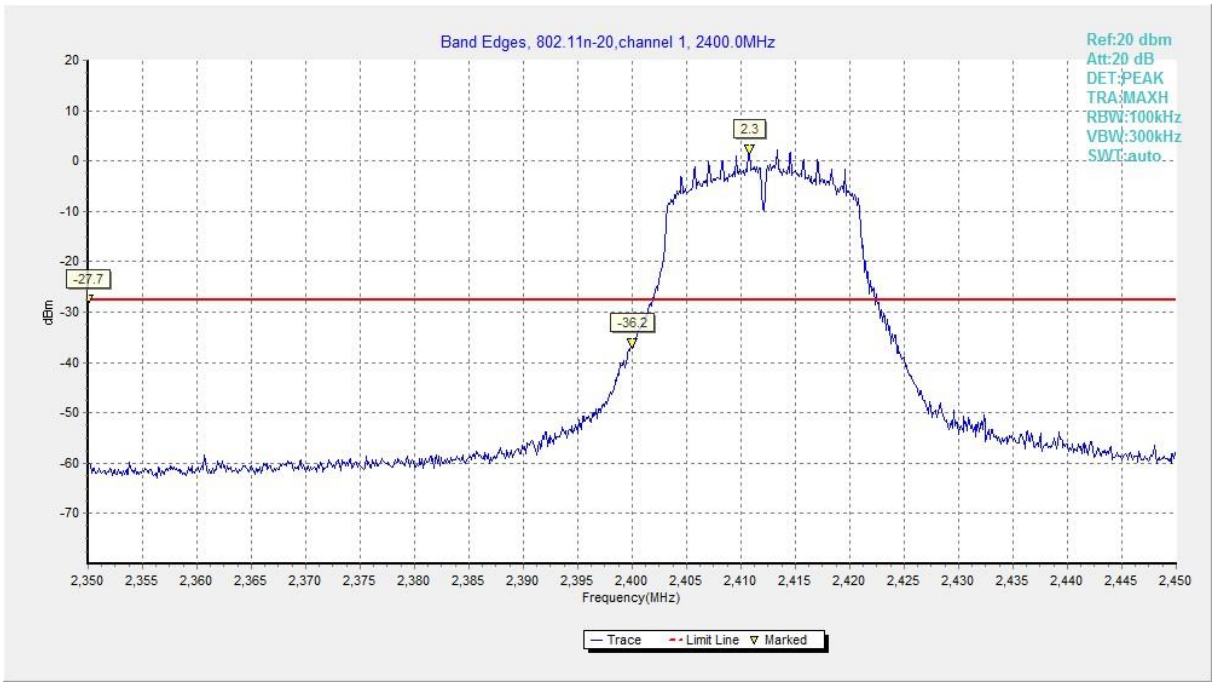

Fig.29 Band Edges (802.11n HT20, CH 1)

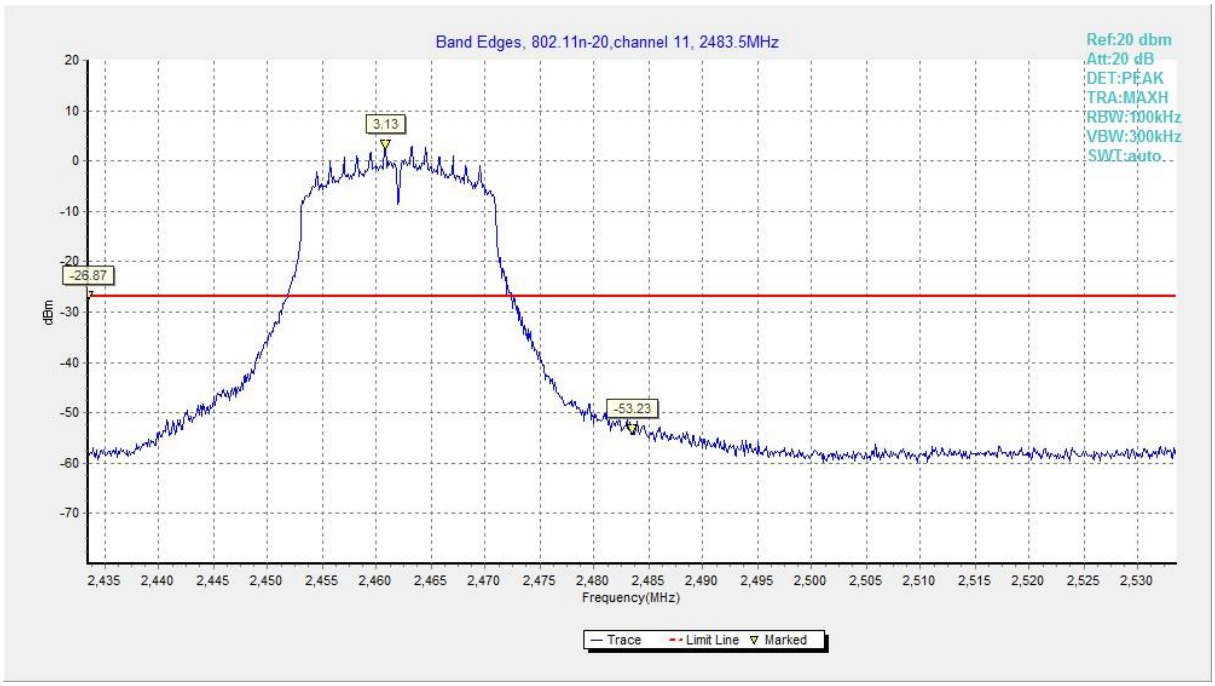

Fig.30 Band Edges (802.11n HT20, CH 11)

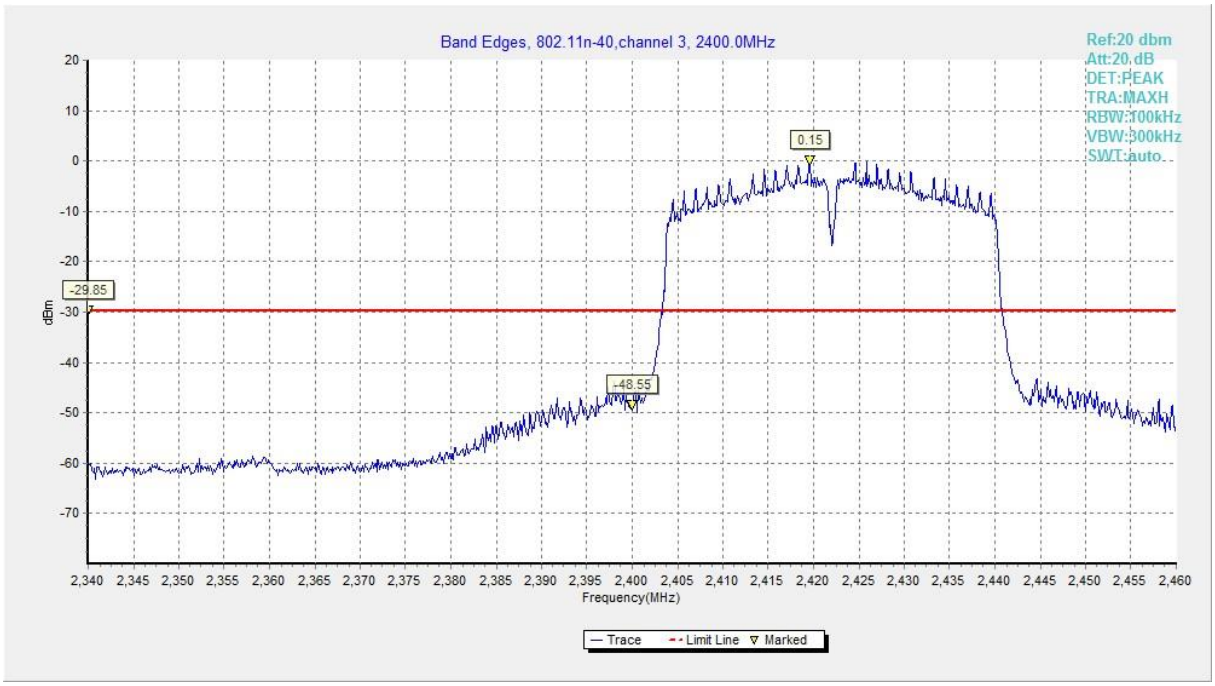

Fig.31 Band Edges (802.11n HT40, CH 3)

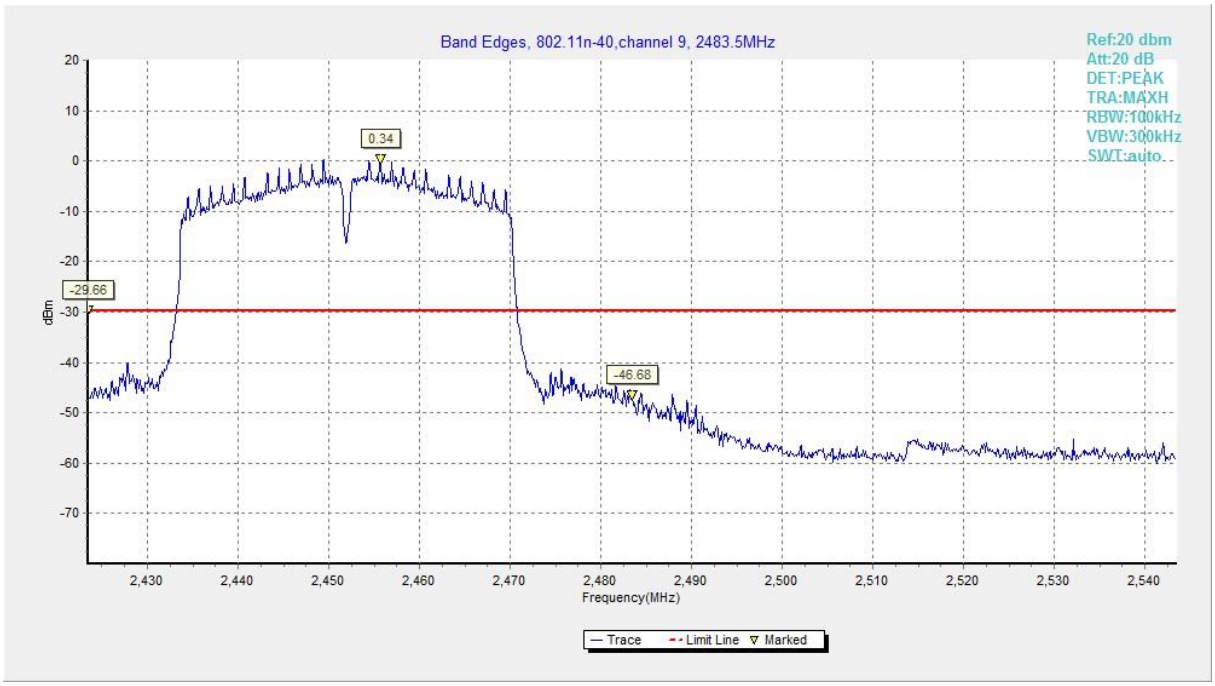

Fig.32 Band Edges (802.11n HT40, CH 9)

A.6 Conducted Emission

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (d)	30dB below peak output power in 100 kHz bandwidth

Measurement Results:

SISO:

Mode	Channel	Frequency (MHz)	Frequency Range	Test Results	Conclusion
802.11b	CH 1	2412	30MHz-26GHz	Fig.33	P
	CH 6	2437	30MHz-26GHz	Fig.34	P
	CH 11	2462	30MHz-26GHz	Fig.35	P
802.11g	CH 1	2412	30MHz-26GHz	Fig.36	P
	CH 6	2437	30MHz-26GHz	Fig.37	P
	CH 11	2462	30MHz-26GHz	Fig.38	P
802.11n HT20	CH 1	2412	30MHz-26GHz	Fig.39	P
	CH 6	2437	30MHz-26GHz	Fig.40	P
	CH 11	2462	30MHz-26GHz	Fig.41	P
802.11n HT40	CH 3	2422	30MHz-26GHz	Fig.42	P
	CH 6	2437	30MHz-26GHz	Fig.43	P
	CH 9	2452	30MHz-26GHz	Fig.44	P

MIMO:

Mode	Channel	Frequency (MHz)	Frequency Range	Test Results	Conclusion
802.11n HT20	CH 1	2412	30MHz-26GHz	Fig.45	P
	CH 6	2437	30MHz-26GHz	Fig.46	P
	CH 11	2462	30MHz-26GHz	Fig.47	P
802.11n HT40	CH 3	2422	30MHz-26GHz	Fig.48	P
	CH 6	2437	30MHz-26GHz	Fig.49	P
	CH 9	2452	30MHz-26GHz	Fig.50	P

See below for test graphs.

Conclusion: PASS

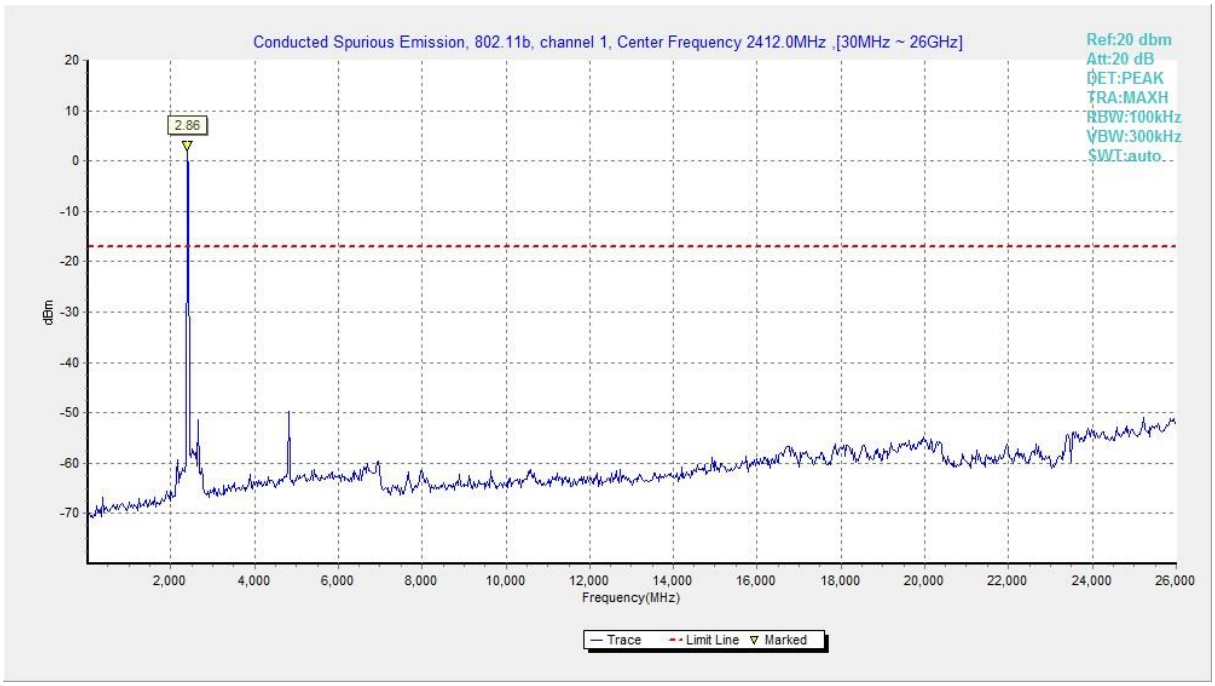

Fig.33 Conducted Spurious Emission (802.11b, CH1), SISO

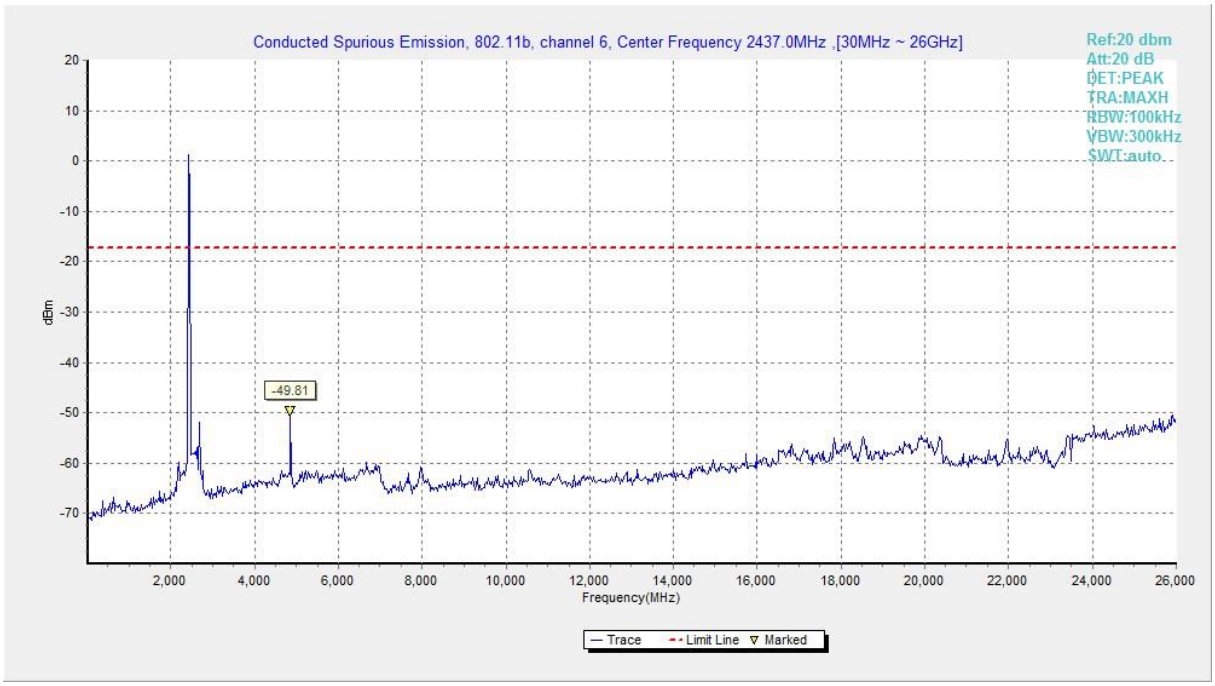

Fig.34 Conducted Spurious Emission (802.11b, CH6), SISO

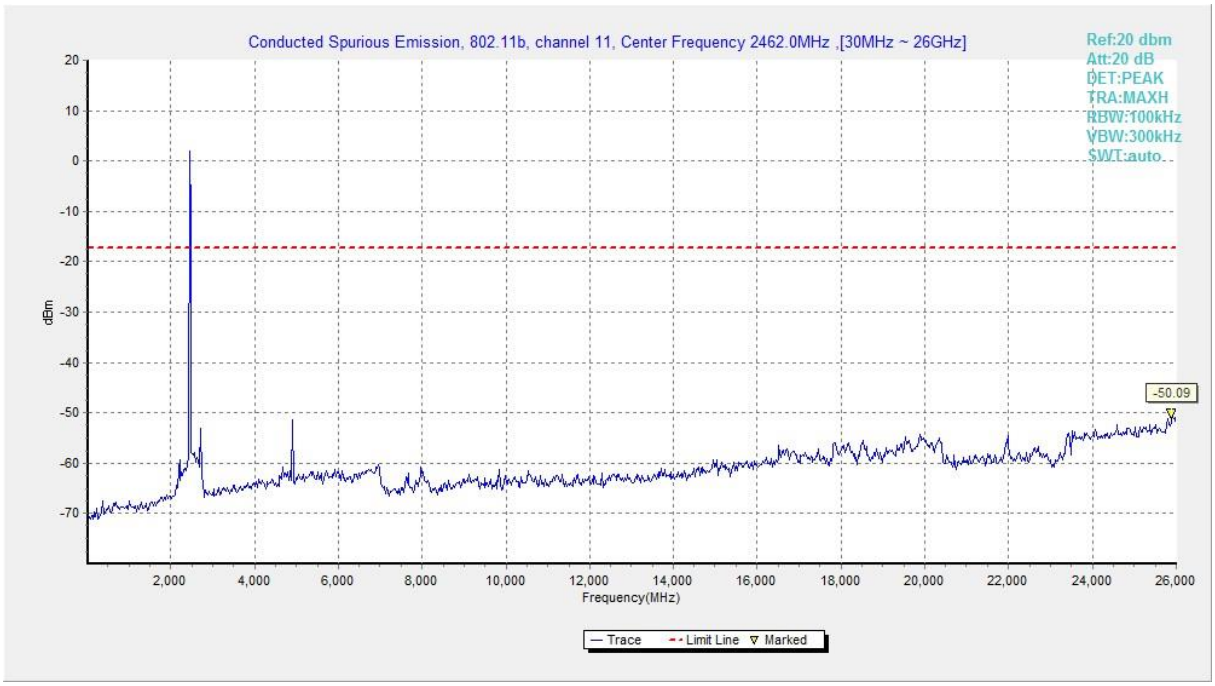

Fig.35 Conducted Spurious Emission (802.11b, CH11), SISO

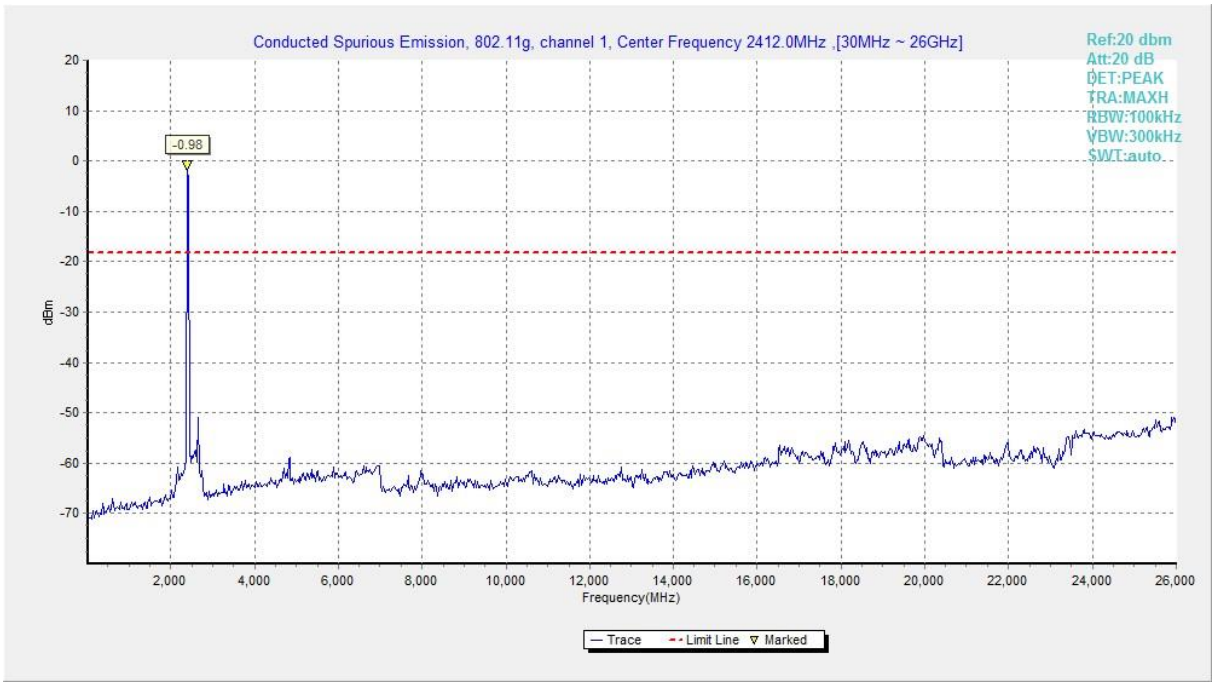

Fig.36 Conducted Spurious Emission (802.11g, CH1), SISO

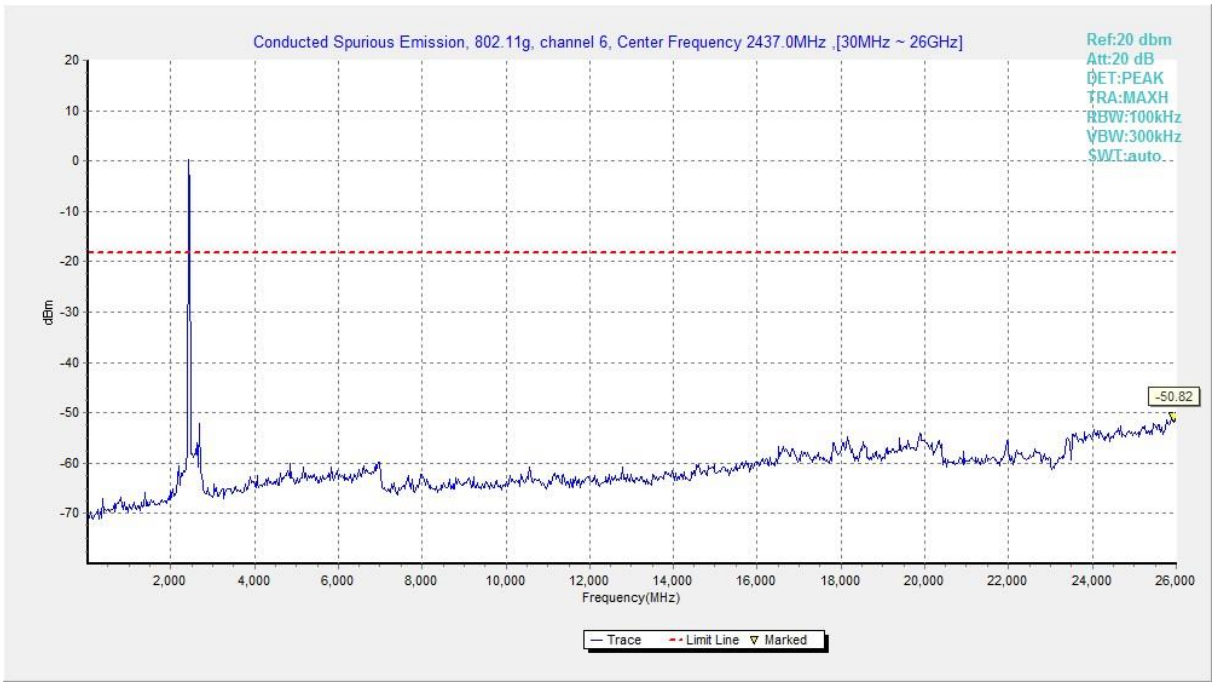

Fig.37 Conducted Spurious Emission (802.11g, CH6), SISO

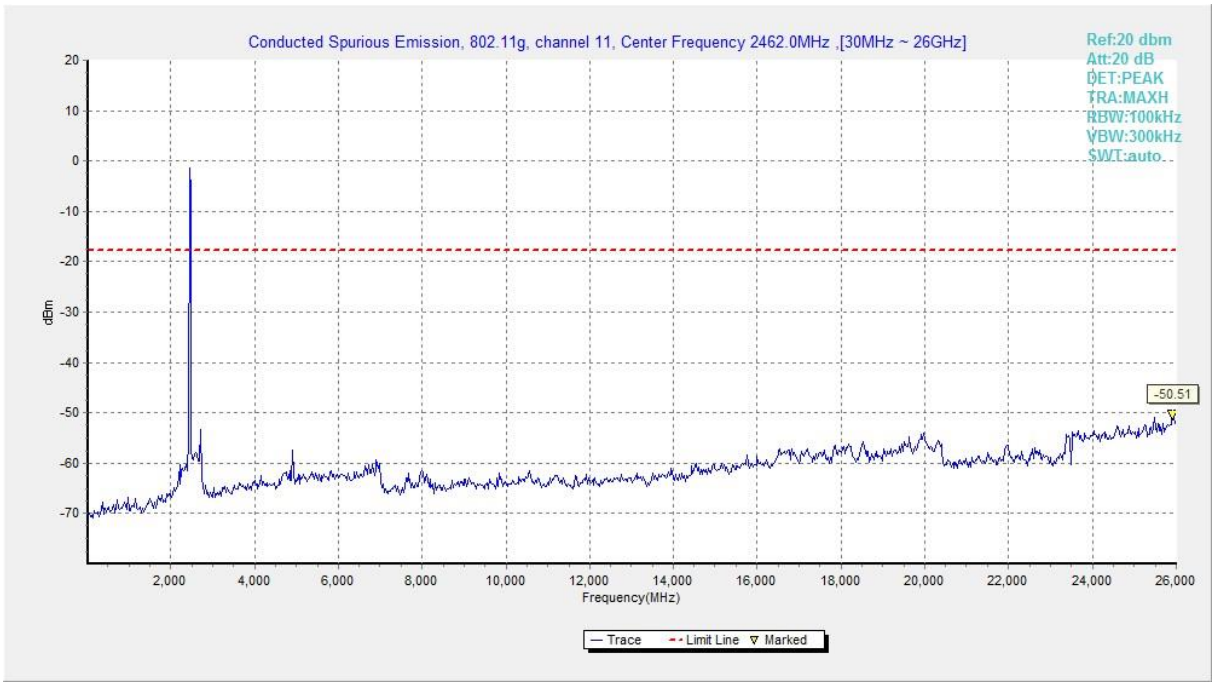

Fig.38 Conducted Spurious Emission (802.11g, CH11), SISO