FCC PART 15C TESTREPORT

No. I16Z40666-SRD04

For

TCL Communication Ltd.

LTE / UMTS / GSM mobile phone

MODEL NAME: VFD500

with

FCC ID: 2ACCJH049

Hardware Version: PIO

Software Version: v8F27

Issued Date: 2016-04-28

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 CTTL.

Test Laboratory:

CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I16Z40666-SRD04	Rev.0	1st edition	2016-04-28

CONTENTS

1. Test Laboratory

1.1. Testing Location

Location 1:CTTL(Huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

Location 2:CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.2. Testing Environment

Normal Temperature: 15-35℃

Extreme Temperature: -10/+55℃

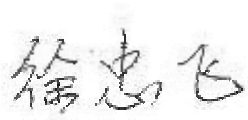
Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2016-04-06

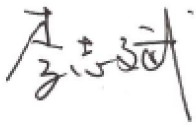
Testing End Date: 2016-04-28

1.4. Signature



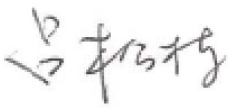
Xu Zhongfei

(Prepared this test report)



Li Zhibin

(Reviewed this test report)



Lv Songdong

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
City:	Shanghai
Postal Code:	201203
Country:	China
Telephone:	0086-21-31363544
Fax:	0086-21-61460602

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
City:	Shanghai
Postal Code:	201203
Country:	China
Telephone:	0086-21-31363544
Fax:	0086-21-61460602

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

3.1. About EUT

Description	LTE / UMTS / GSM mobile phone
Model name	VFD500
FCC ID	2ACCJH049
IC ID	/
With WLAN Function	Yes
Frequency Range	ISM 2400MHz~2483.5MHz
Type of Modulation	DSSS/CCK/OFDM
Number of Channels	11
Antenna	Integral Antenna
MAX Conducted Power	24.08dBm(DSSS)
Power Supply	3.8V DC by Battery

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
UT36a	357911070006629	PIO	v8F27
UT37a	357911070006603	PIO	v8F27

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

3.3. Internal Identification of AE

AE ID*	Description	SN
AE1	Battery	/
AE2	Charger	/

AE1

Commercial name	Battery
Type	CAB2000047C1
Manufacturer	BYD
Length of cable	/

AE2

Commercial name	Charger
Type	CBA0066AA4C1
Manufacturer	BYD
Length of cable	/

*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 LTE / UMTS / GSM mobile phone with integrated antenna and inbuilt battery.
It has Bluetooth (EDR) function.
It consists of normal options: travel charger, USB cable and Phone.
Manual and specifications of the EUT were provided to fulfil the test.
Samples undergoing test were selected by the client.

3.5. Interpretation of the Test Environment

For the test methods, the test environment uncertainty figures correspond to an expansion factor k=2.
Measurement Uncertainty

Parameter	Uncertainty
temperature	0.48°C
humidity	2 %
DC voltages	0.003V

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

5. 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.	2015
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013

6. Test Results

6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.247 (b)	/	P
Peak Power Spectral Density	15.247 (e)	/	P
Occupied 6dB Bandwidth	15.247 (a)	/	P
Band Edges Compliance	15.247 (d)	/	P
Transmitter Spurious Emission - Conducted	15.247 (d)	/	P
Transmitter Spurious Emission - Radiated	15.247, 15.205, 15.209	/	P
AC Powerline Conducted Emission	15.107, 15.207	/	P

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NP	Not Perform, The test was not performed by CTTL
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard
F	Fail, The EUT does not comply with the essential requirements in the standard

6.2. Statements

The test cases as listed in section 5.1 of this report for the EUT specified in section 3 was performed by CTTL and according to the standards or reference documents listed in section 4.2

The EUT met all requirements of the standards or reference documents, and only the WLAN function was tested in this report.

6.3. Test Conditions

T nom	Normal Temperature
T min	Low Temperature
T max	High Temperature
V nom	Normal Voltage

For this report, if the test cases listed above are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	T nom	26℃
Voltage	V nom	3.8V(By battery)
Humidity	H nom	44%

7. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	2015-07-08	2016-07-07
2	Test Receiver	ESCI	100344	Rohde & Schwarz	2016-03-04	2017-03-03
3	LISN	ENV216	101200	Rohde & Schwarz	2015-07-08	2016-07-07
4	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Calibration Due date
1	Test Receiver	ESCI 7	100948	Rohde & Schwarz	2015-07-08	2016-07-07
2	Loop antenna	HFH2-Z2	829324/007	Rohde & Schwarz	2014-12-17	2017-12-16
3	BiLog Antenna	VULB9163	234	Schwarzbeck	2013-09-16	2016-09-15
4	Dual-Ridge Waveguide Horn Antenna	3115	6914	EMCO	2014-12-16	2017-12-15
5	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	2014-06-18	2017-06-17
6	Vector Signal Analyzer	FSV	101047	Rohde & Schwarz	2015-07-03	2016-07-02
7	Semi-anechoic chamber	/	CT000332-1074	Frankonia German	/	/

ANNEX A: Detailed Test Results

A.1. Measurement Method

A.1.1. Conducted Measurements

Connect the EUT to the test system as Fig.A.1.1.1 shows.
Set the EUT to the required work mode.
Set the EUT to the required channel.
Set the Vector Signal Analyzer and start measurement.
Record the values. Vector Signal Analyzer

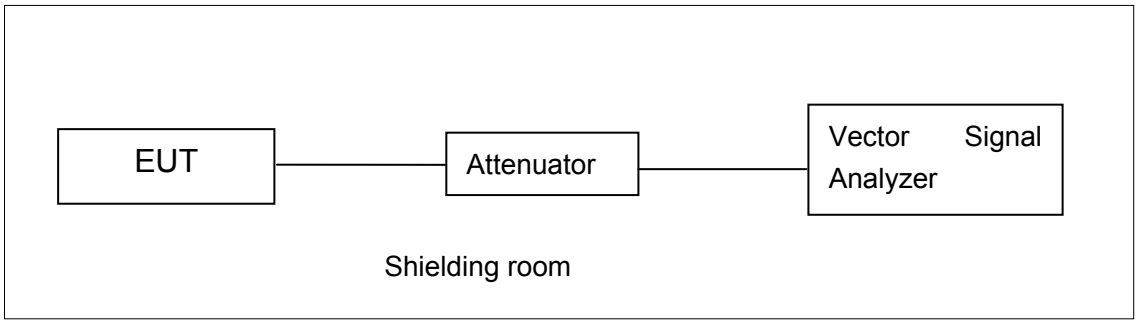


Fig.A.1.1.1: Test Setup Diagram for Conducted Measurements

A.1.2. Radiated Emission Measurements

In the case of radiated emission, the used settings are as follows,
Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;
Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 10Hz;

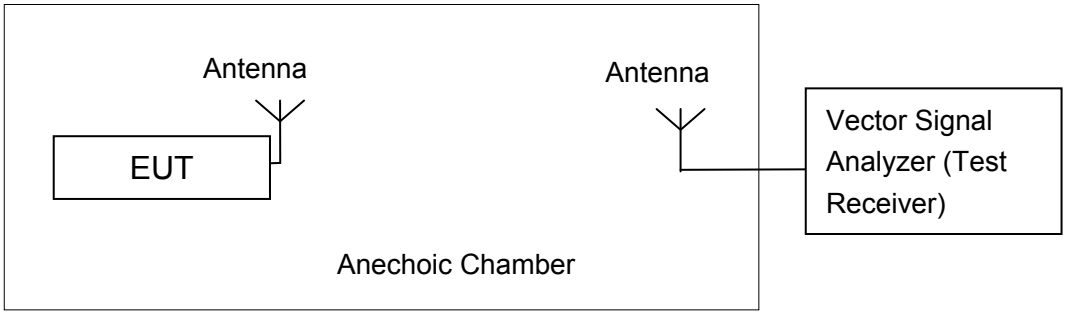


Fig.A.1.2.1: Test Setup Diagram for Radiated Measurements

A.2. Maximum Output Power

Method of Measurement: See ANSI C63.10-2013-clause 11.9.1.2

a) Set the RBW = 1 MHz.
b) Set the VBW = 3 MHz.
c) Set the span ≥ [1.5 × DTS bandwidth].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector).

Measurement Limit:

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

EUT ID: EUT2

A.2.1. Peak Output Power-conducted

Measurement Results:

802.11b/g mode

Mode	Data Rate (Mbps)	Test Result (dBm)				
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)	2467 MHz (Ch12)	2472 MHz (Ch13)
802.11b	1	15.45	/	/	/	/
	2	15.25	/	/	/	/
	5.5	16.67	/	/	/	/
	11	19.01	24.08	11.61	16.03	16.35
802.11g	6	16.57	/	/	/	/
	9	16.59	/	/	/	/
	12	16.58	/	/	/	/
	18	16.52	/	/	/	/
	24	17.11	/	/	/	/
	36	17.06	/	/	/	/
	48	17.11	/	/	/	/
	54	17.13	23.08	9.32	14.74	14.52

The data rate 11Mbps and 54Mbps are selected as worse condition, and the following cases are performed with this condition.

802.11n-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)				
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)	2467 MHz (Ch12)	2472 MHz (Ch13)
802.11n (20MHz)	MCS0	16.56	/	/	/	/
	MCS1	16.60	/	/	/	/
	MCS2	16.59	/	/	/	/
	MCS3	17.10	/	/	/	/
	MCS4	17.15	21.98	9.36	13.66	13.43
	MCS5	17.06	/	/	/	/
	MCS6	17.05	/	/	/	/
	MCS7	17.03	/	/	/	/

The data rate MCS4 is selected as worse condition, and the following cases are performed with this condition.

802.11n-HT40 mode

Mode	Data Rate (Index)	Test Result (dBm)				
		2422MHz (Ch3)	2437MHz (Ch6)	2452 MHz (Ch9)	2457 MHz (Ch10)	2462 MHz (Ch11)
802.11n (40MHz)	MCS0	15.55	/	/	/	/
	MCS1	15.77	/	/	/	/
	MCS2	16.07	/	/	/	/
	MCS3	16.08	/	/	/	/
	MCS4	16.32	21.27	10.05	14.04	13.80
	MCS5	16.06	/	/	/	/
	MCS6	16.27	/	/	/	/
	MCS7	16.26	/	/	/	/

The data rate MCS4 is selected as worse condition, and the following cases are performed with this condition.

Conclusion: Pass

A.2.2. Average Output Power-conducted

Method of Measurement: See ANSI C63.10-2013-clause 11.9.2.2.2

The procedure for this method is as follows:

a) Set span = 80MHz.

b) Set RBW = 1MHz.

c) Set VBW = 3MHz

d) Number of points in sweep = 625

e) Sweep time = auto.

f) Detector = RMS.

g) The trigger shall be set to “free run.”

h) Trace average 100 traces in power averaging (rms) mode.

i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges.

802.11b/g mode

Mode	Test Result (dBm)				
	2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)	2467 MHz (Ch12)	2472 MHz (Ch13)
802.11b	12.57	17.14	5.05	9.97	9.68
802.11g	8.51	14.47	0.88	6.07	5.86

802.11n-HT20 mode

Mode	Test Result (dBm)				
	2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)	2467 MHz (Ch12)	2472 MHz (Ch13)
802.11n (20MHz)	8.58	13.54	0.94	6.85	4.86

802.11n-HT40 mode

Mode	Test Result (dBm)				
	2422MHz (Ch3)	2437MHz (Ch6)	2452 MHz (Ch9)	2457 MHz (Ch10)	2462 MHz (Ch11)
802.11n (40MHz)	8.16	12.66	1.51	5.36	4.88

Conclusion: Pass

A.3. Peak Power Spectral Density

Method of Measurement: See ANSI C63.10-2013-clause 11.10.2

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to RBW = 3 kHz.
d) Set the VBW = 10 kHz.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.

Measurement Limit:

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

Measurement Results:

802.11b/g mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11b	1	Fig.A.3.1	-0.34	P
	6	Fig.A.3.2	-6.55	P
	11	Fig.A.3.3	-18.37	P
	12	Fig.A.3.4	-13.77	P
	13	Fig.A.3.5	-12.98	P
802.11g	1	Fig.A.3.6	-16.66	P
	6	Fig.A.3.7	-9.99	P
	11	Fig.A.3.8	-24.37	P
	12	Fig.A.3.9	-18.83	P
	13	Fig.A.3.10	-18.39	P

802.11n-HT20 mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11n (HT20)	1	Fig.A.3.11	-16.68	P
	6	Fig.A.3.12	-11.83	P
	11	Fig.A.3.13	-22.38	P
	12	Fig.A.3.14	-19.58	P
	13	Fig.A.3.15	-18.96	P

802.11n-HT40 mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11n (HT40)	3	Fig.A.3.16	-19.67	P
	6	Fig.A.3.17	-15.26	P

	9	Fig.A.3.18	-23.07	**P**
	10	Fig.A.3.19	-22.39	**P**
	11	Fig.A.3.20	-22.93	**P**

Conclusion: Pass

Test graphs as below:

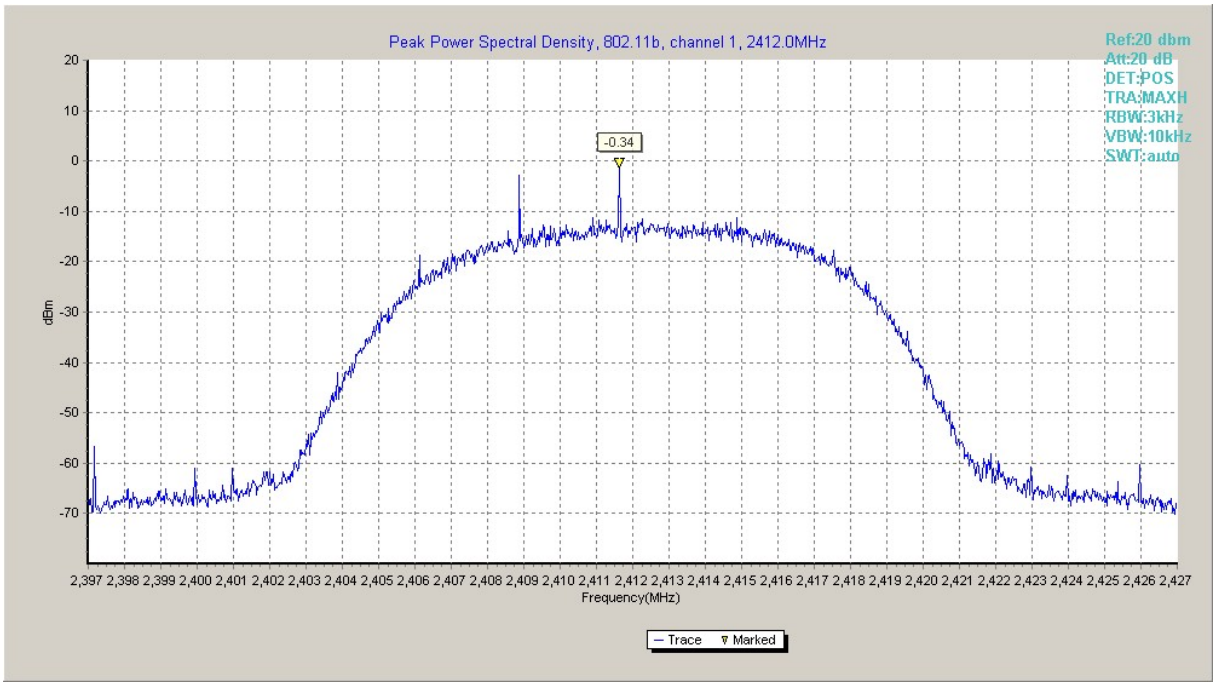


Fig.A.3.1 Power Spectral Density(802.11b,Ch1)

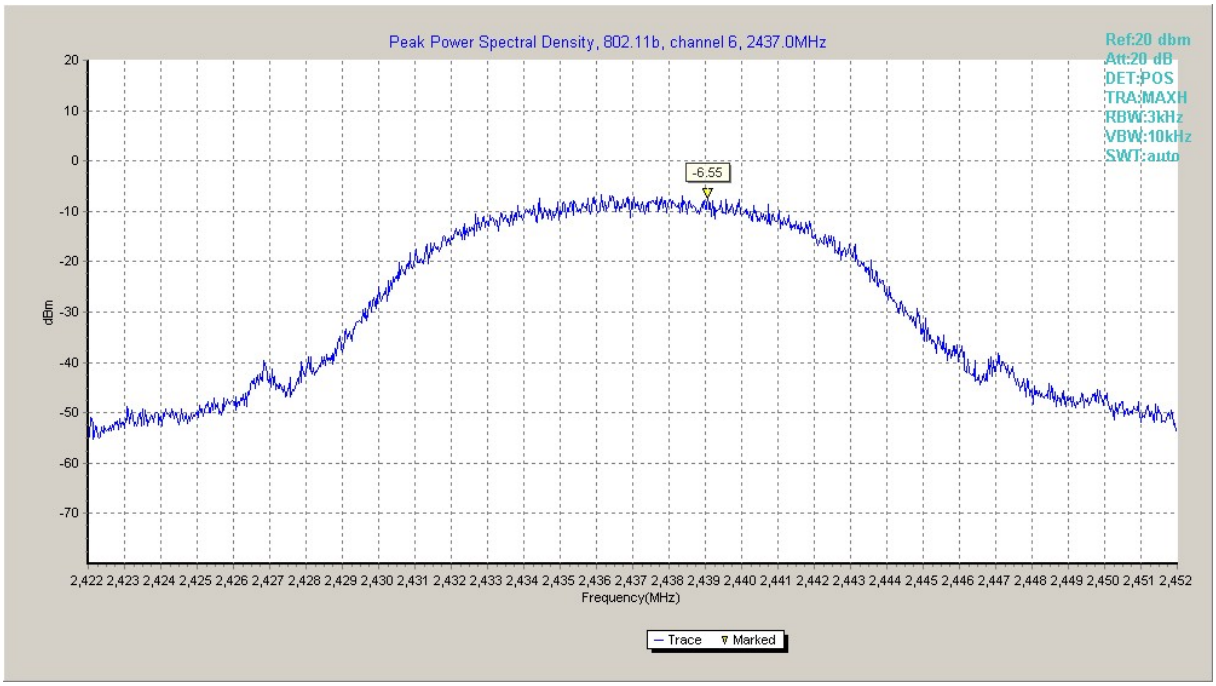


Fig.A.3.2 Power Spectral Density (802.11b, Ch 6)

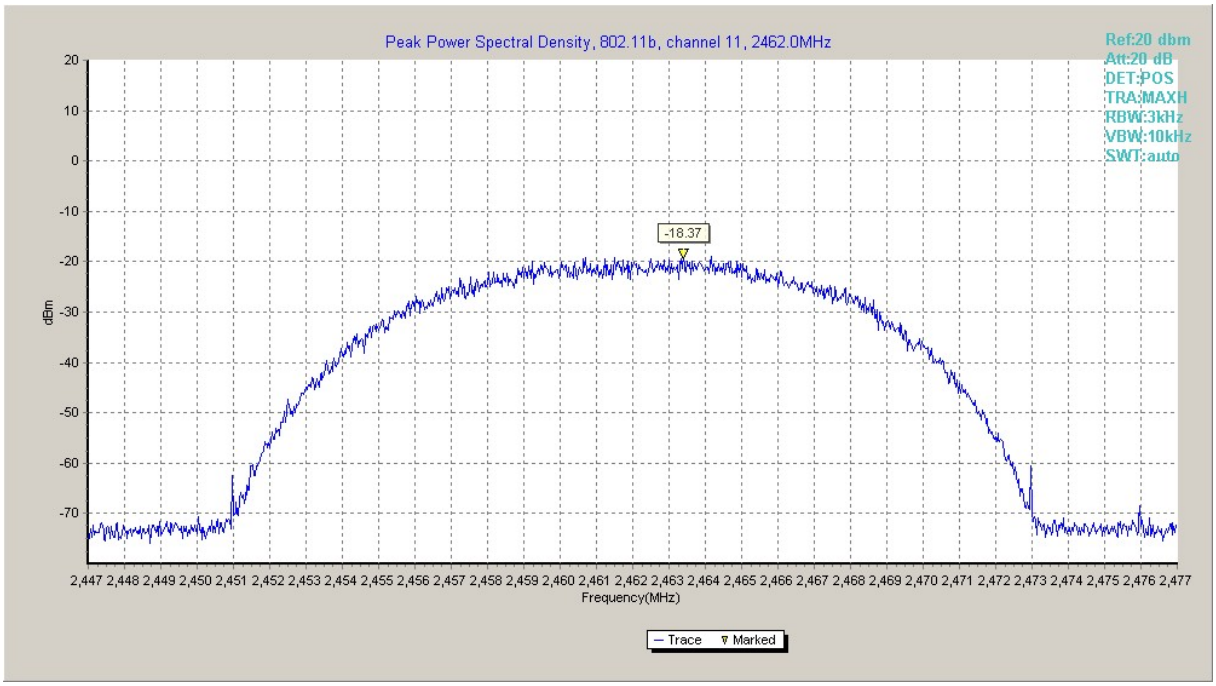


Fig.A.3.3 Power Spectral Density (802.11b, Ch 11)

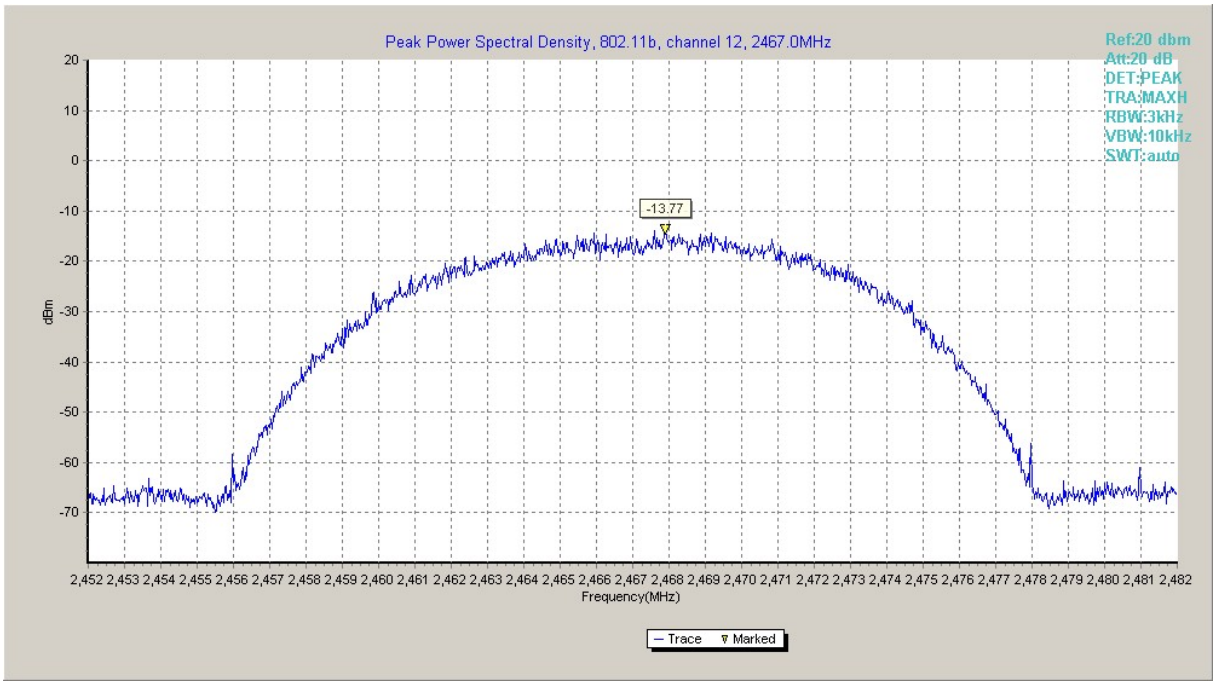


Fig.A.3.4 Power Spectral Density (802.11b, Ch 12)

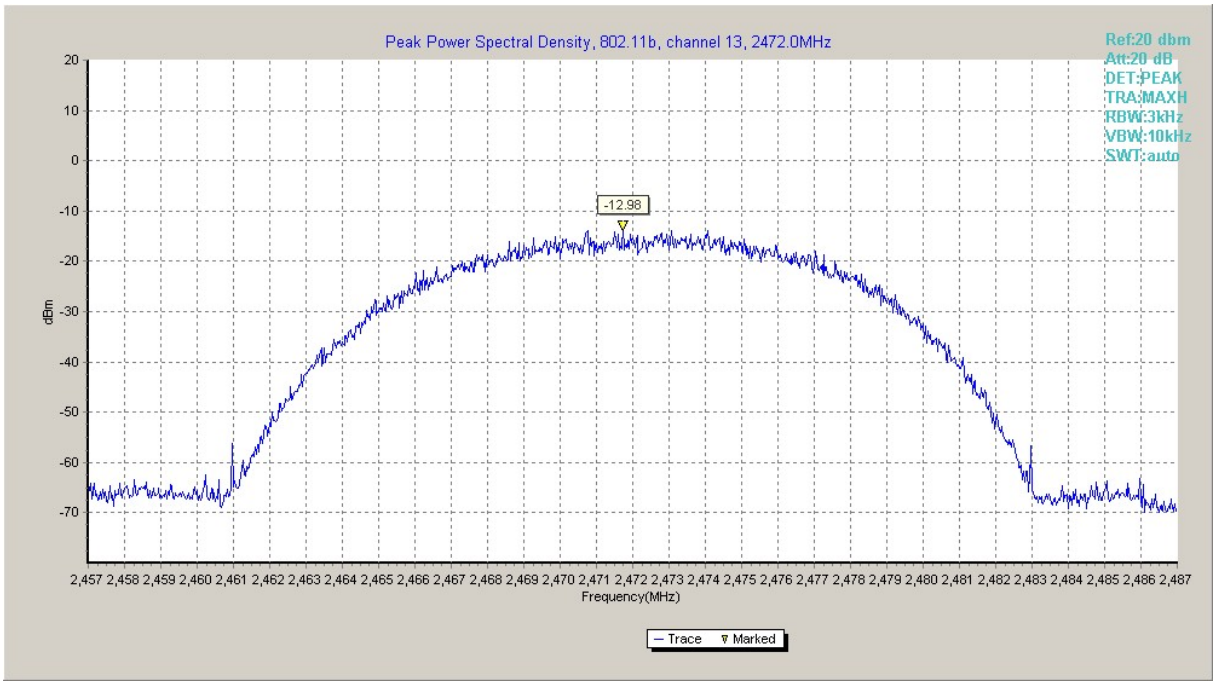


Fig.A.3.5 Power Spectral Density (802.11b, Ch 13)

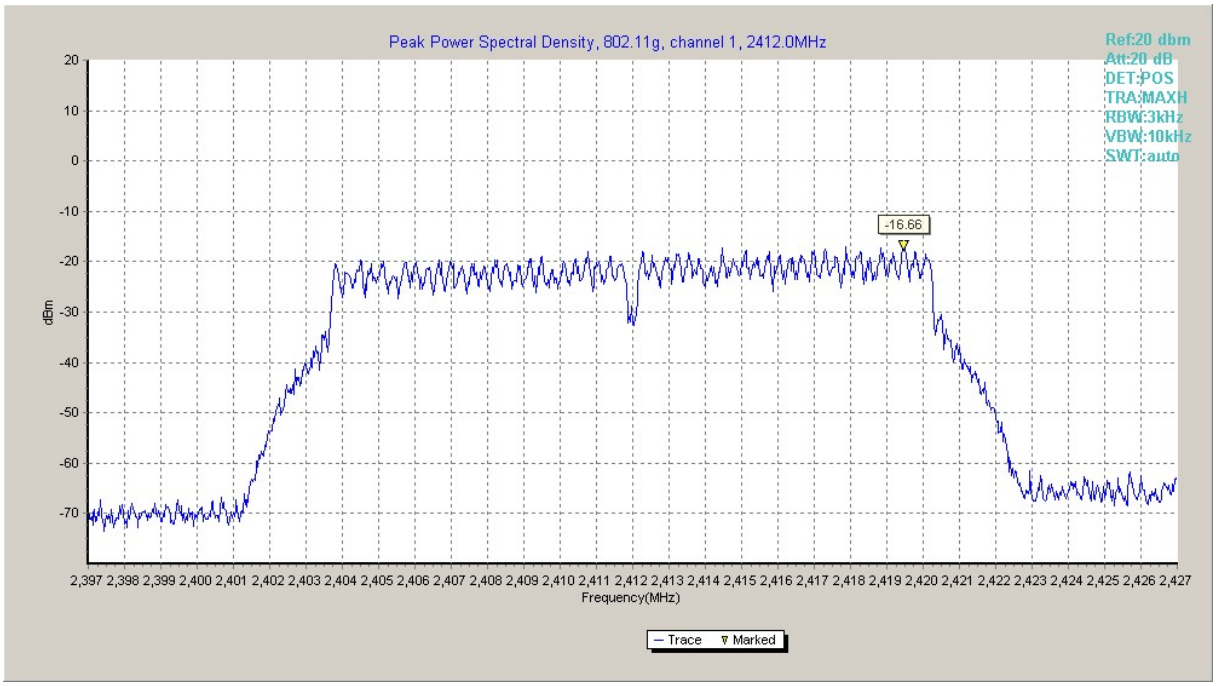


Fig.A.3.6 Power Spectral Density (802.11g, Ch 1)

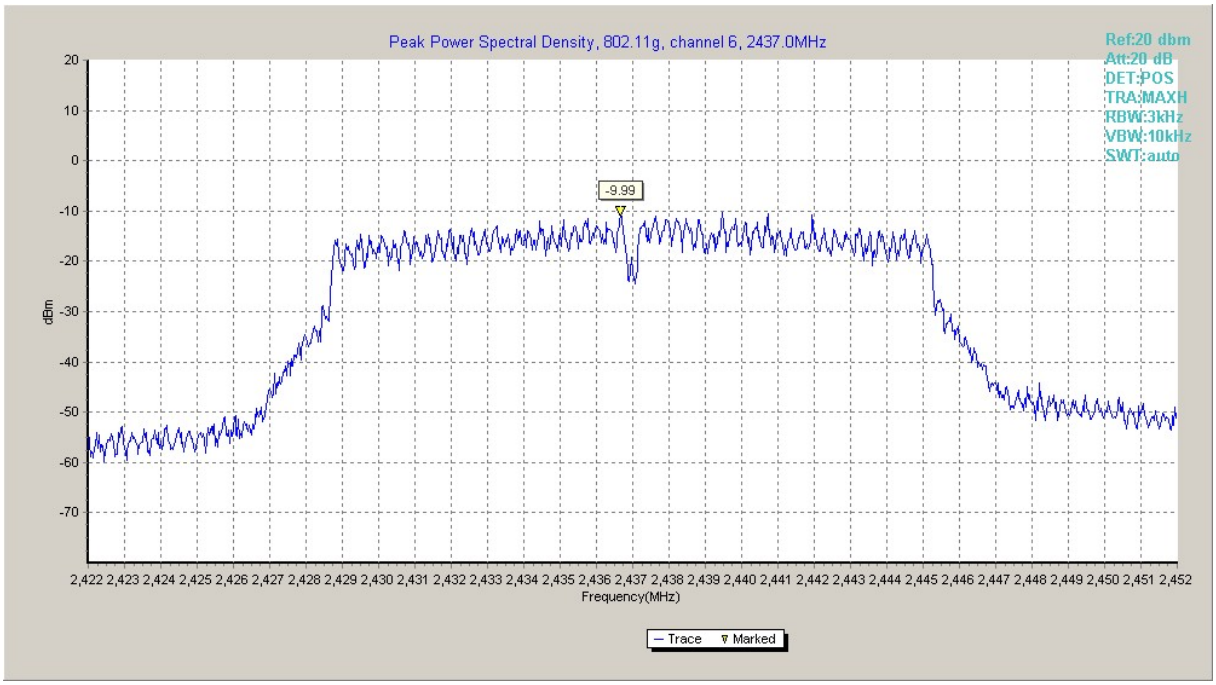


Fig.A.3.7 Power Spectral Density (802.11g, Ch 6)

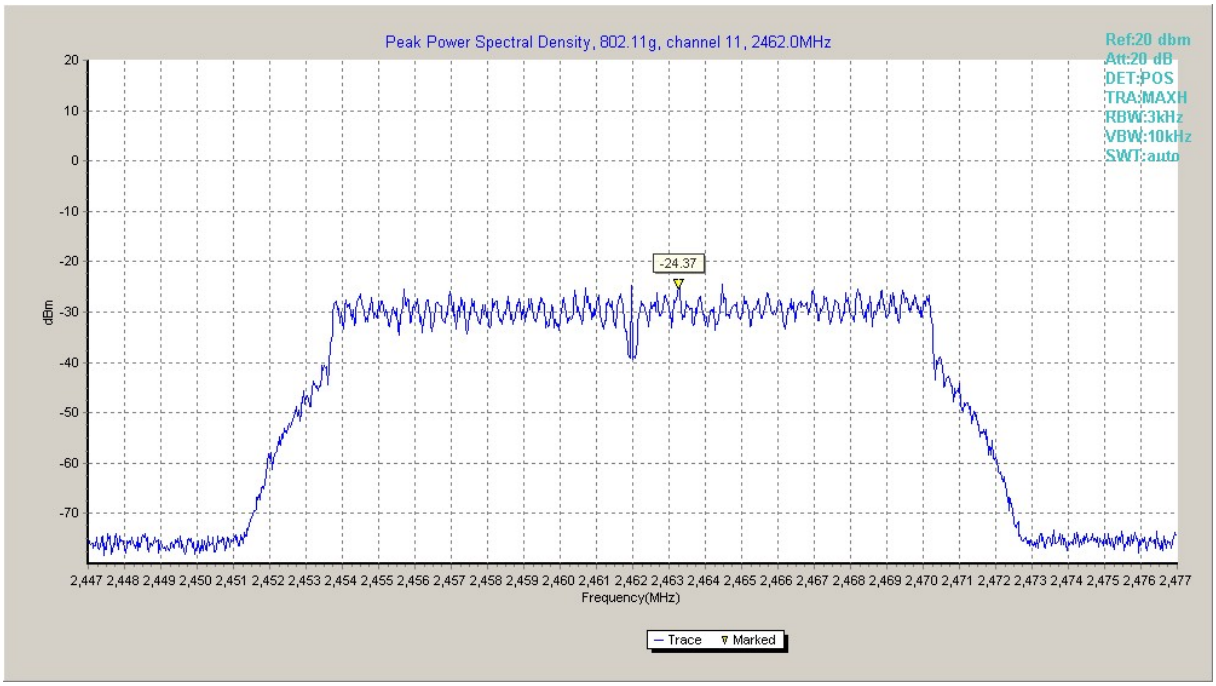


Fig.A.3.8 Power Spectral Density (802.11g, Ch 11)

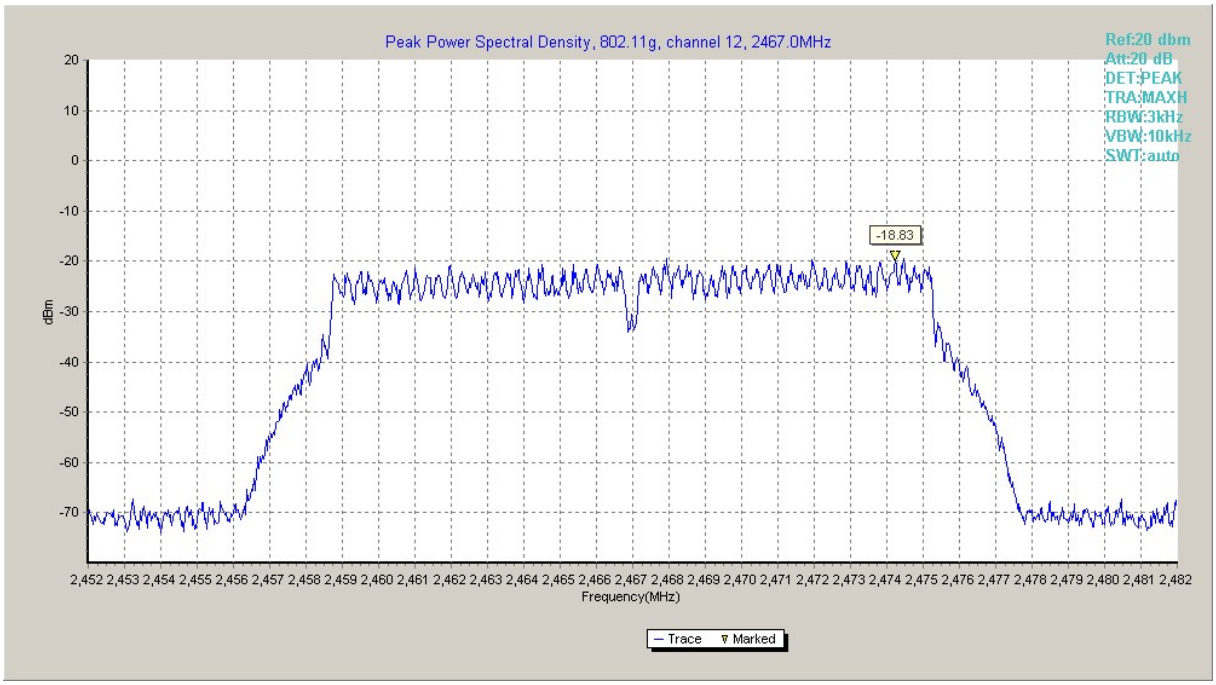


Fig.A.3.9 Power Spectral Density (802.11g, Ch 12)

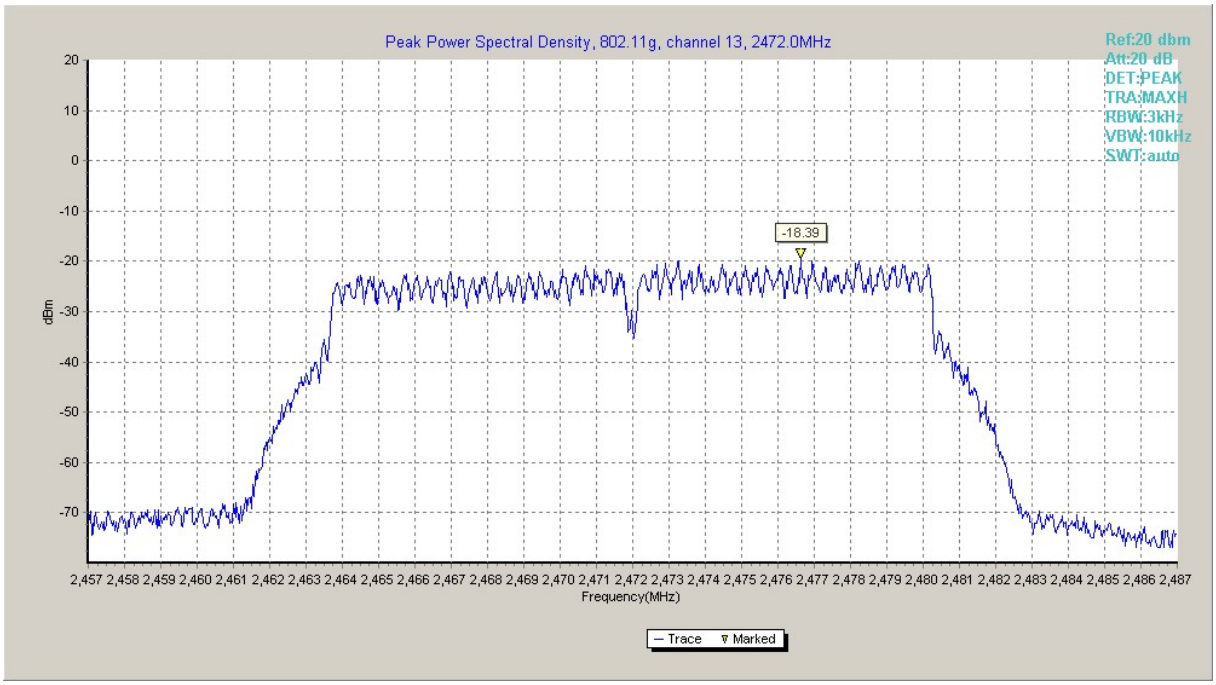


Fig.A.3.10 Power Spectral Density (802.11g, Ch 13)

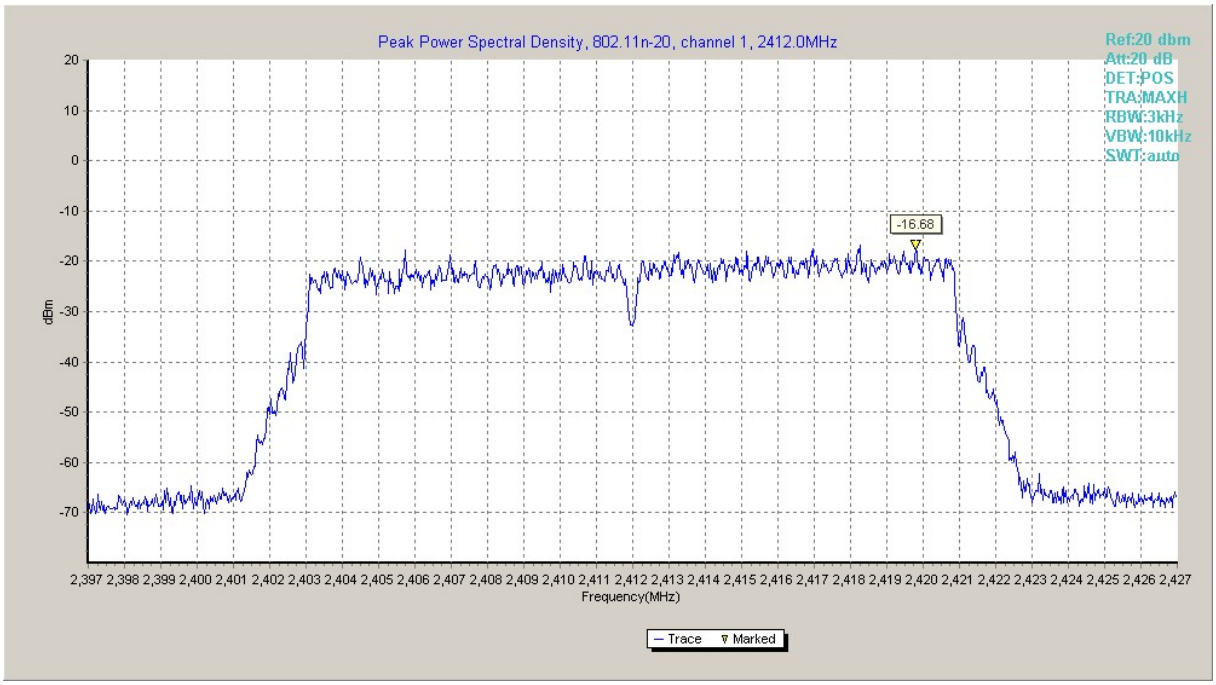


Fig.A.3.11 Power Spectral Density (802.11n-HT20, Ch 1)

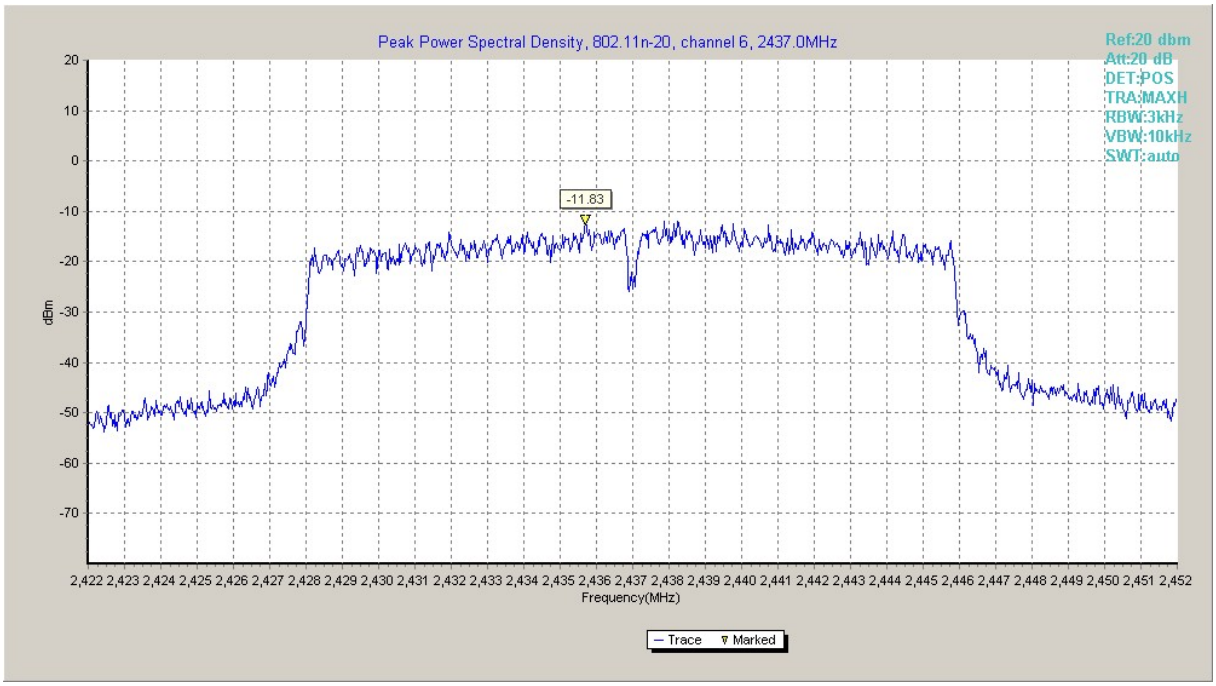


Fig.A.3.12 Power Spectral Density (802.11n-HT20, Ch 6)

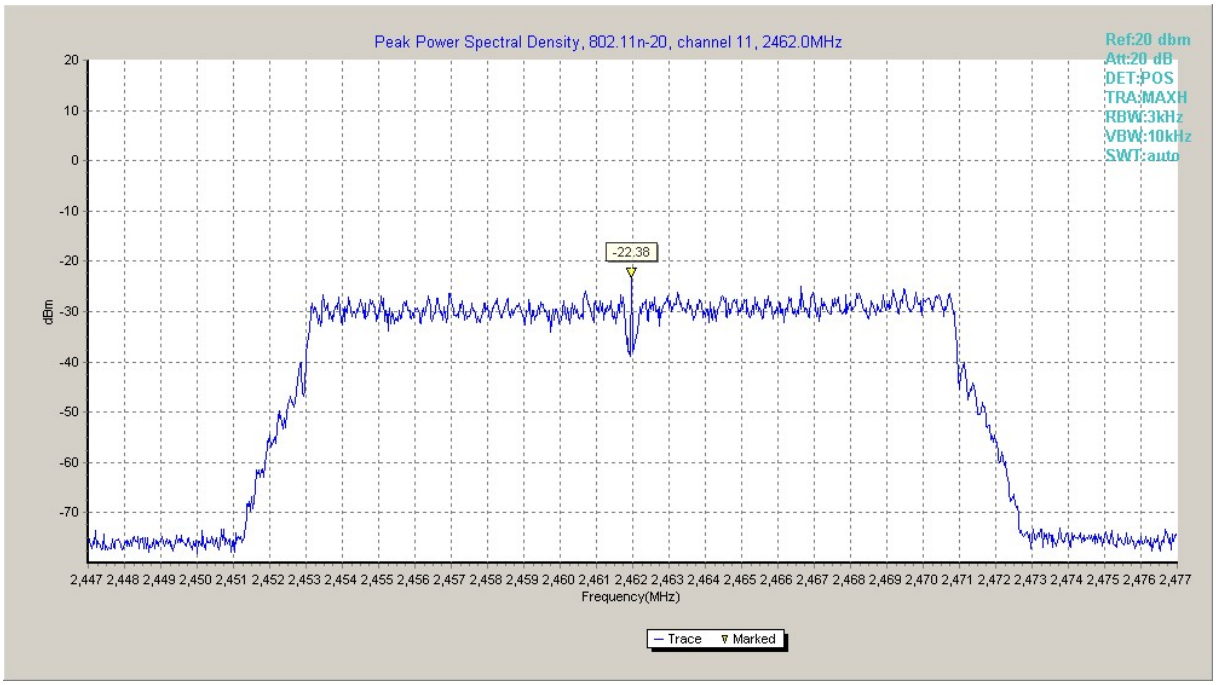


Fig.A.3.13 Power Spectral Density (802.11n-HT20, Ch 11)

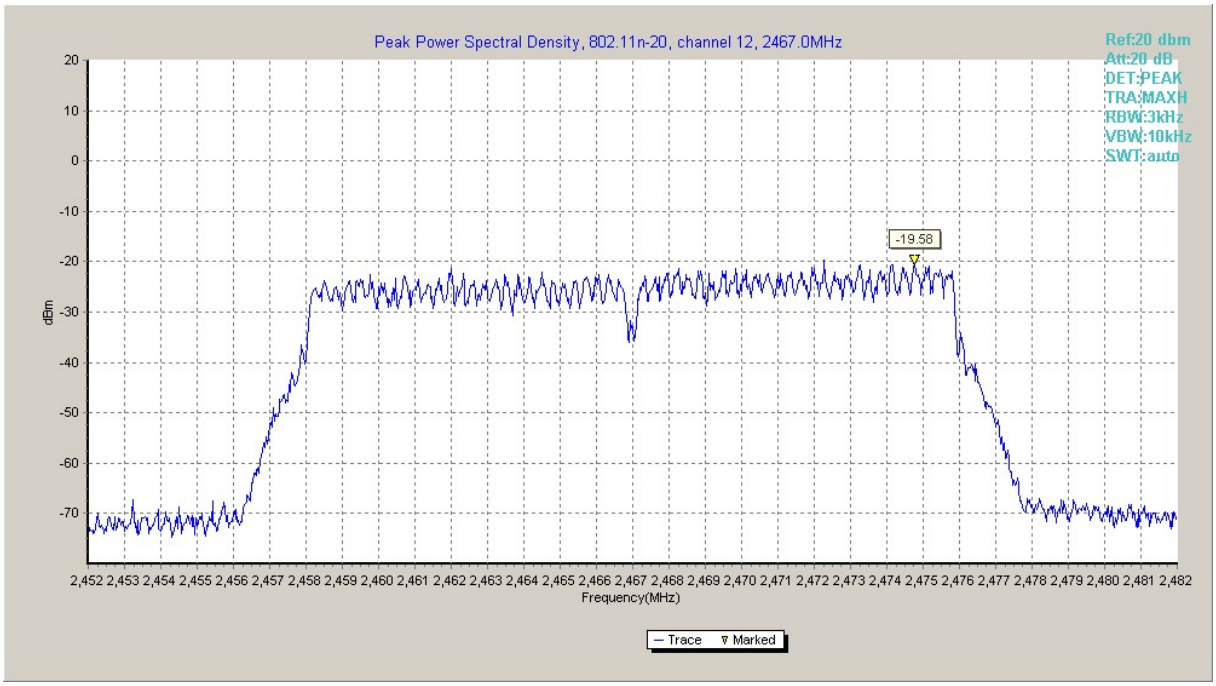


Fig.A.3.14 Power Spectral Density (802.11n-HT20, Ch 12)

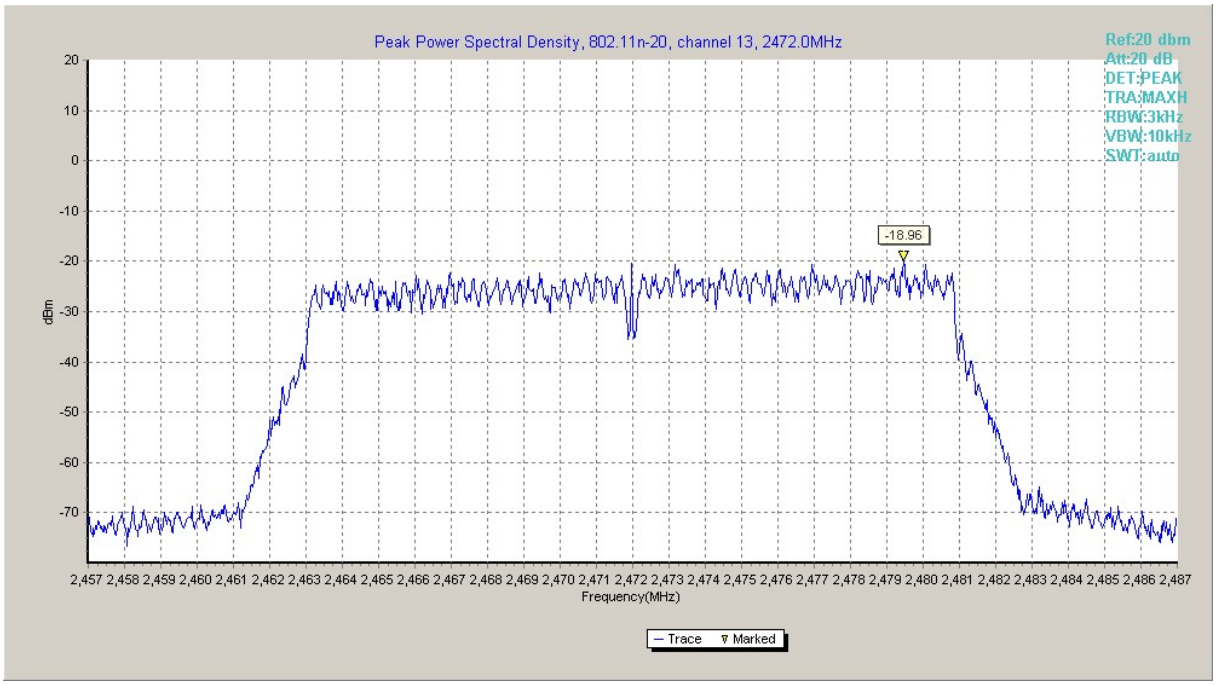


Fig.A.3.15 Power Spectral Density (802.11n-HT20, Ch 13)

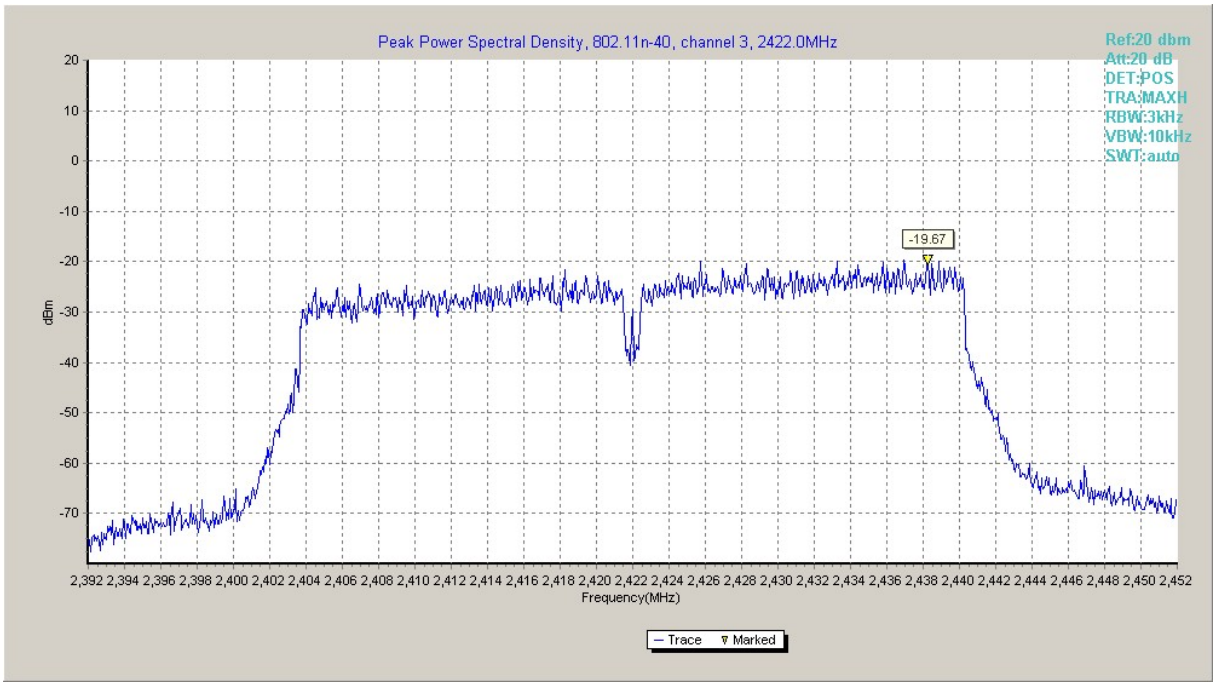


Fig.A.3.16 Power Spectral Density (802.11n-HT40, Ch 3)

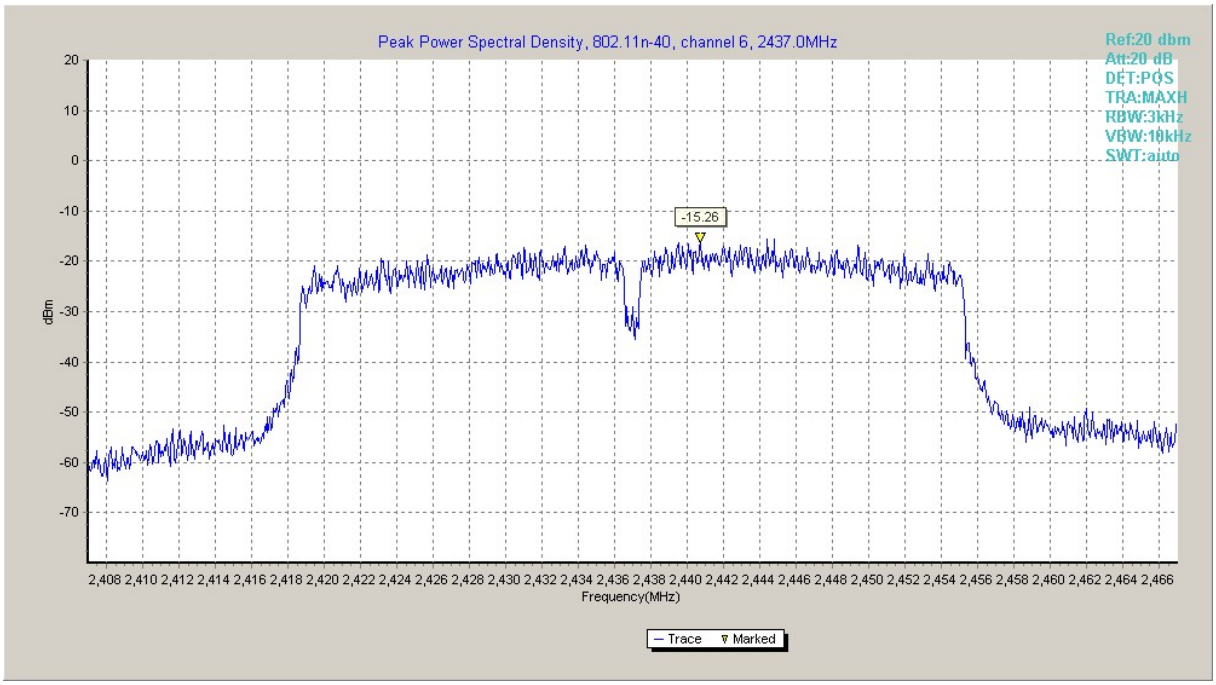


Fig.A.3.17 Power Spectral Density (802.11n-HT40, Ch 6)

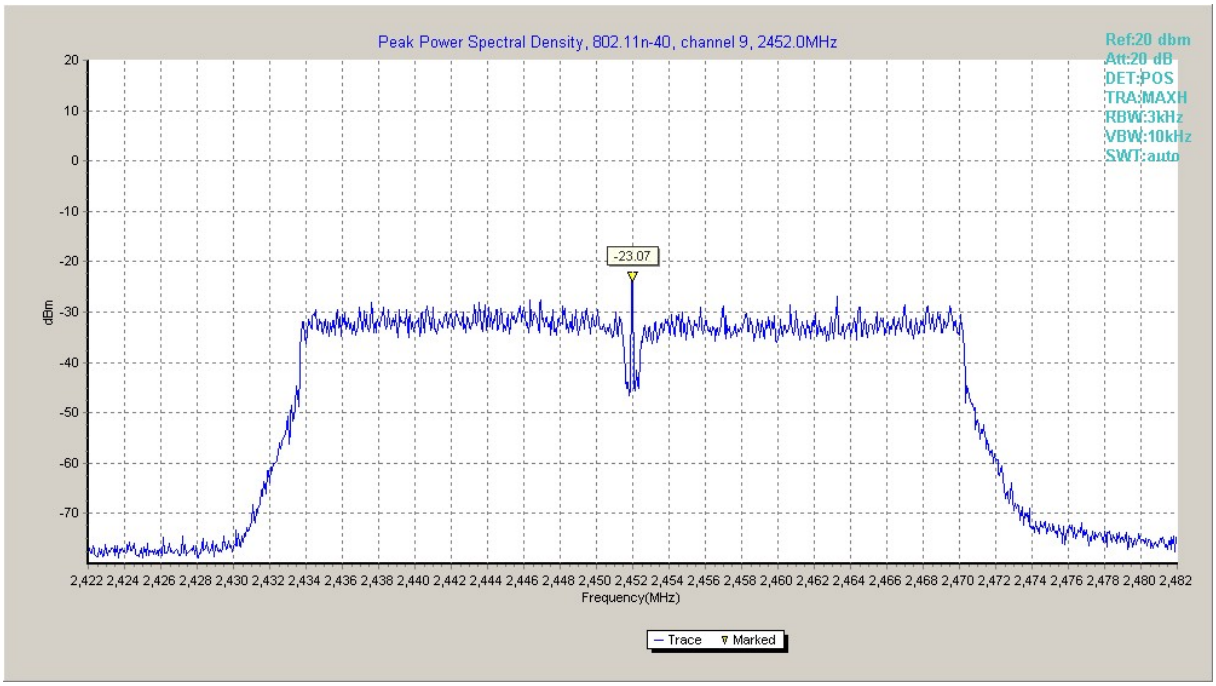


Fig.A.3.18 Power Spectral Density (802.11n-HT40, Ch 9)

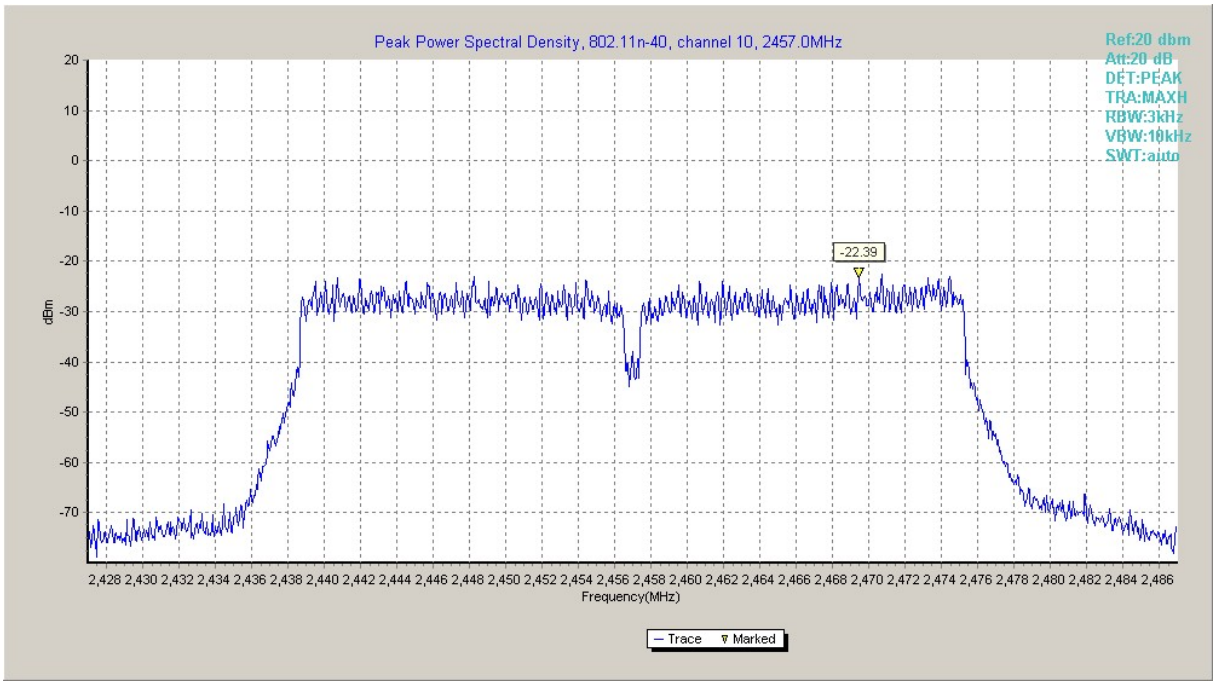


Fig.A.3.19 Power Spectral Density (802.11n-HT40, Ch 10)

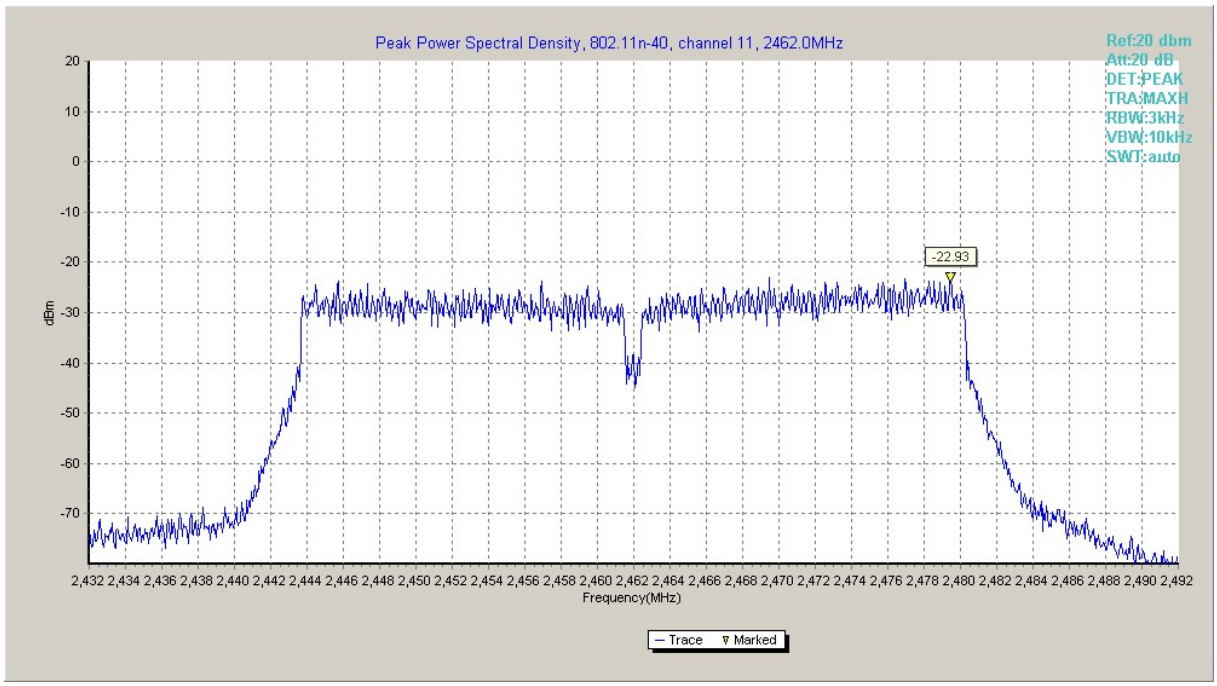


Fig.A.3.20 Power Spectral Density (802.11n-HT40, Ch 11)

A.4. DTS 6-dB Signal Bandwidth

Method of Measurement: See ANSI C63.10-2013 section 11.8.1.

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) = 300 kHz.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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.

Measurement Limit:

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

EUT ID: EUT2

Measurement Result:

802.11b/g mode

Mode	Channel	Occupied 6dB Bandwidth (kHz)		conclusion
802.11b	1	Fig.A.4.1	9600	P
	6	Fig.A.4.2	9700	P
	11	Fig.A.4.3	11100	P
	12	Fig.A.4.4	10000	P
	13	Fig.A.4.5	9700	P
802.11g	1	Fig.A.4.6	16450	P
	6	Fig.A.4.7	15050	P
	11	Fig.A.4.8	16500	P
	12	Fig.A.4.9	16500	P
	13	Fig.A.4.10	16400	P

802.11n-HT20 mode

Mode	Channel	Occupied 6dB Bandwidth (kHz)		conclusion
802.11n (HT20)	1	Fig.A.4.11	17600	P
	6	Fig.A.4.12	15950	P
	11	Fig.A.4.13	17750	P
	12	Fig.A.4.14	17650	P
	13	Fig.A.4.15	17650	P

802.11n-HT40 mode

Mode	Channel	Occupied 6dB Bandwidth (kHz)		conclusion
802.11n (HT40)	3	Fig.A.4.16	35760	P
	6	Fig.A.4.17	35040	P
	9	Fig.A.4.18	36160	P
	10	Fig.A.4.19	36400	P
	11	Fig.A.4.20	36400	P

Conclusion: Pass

Test graphs as below:

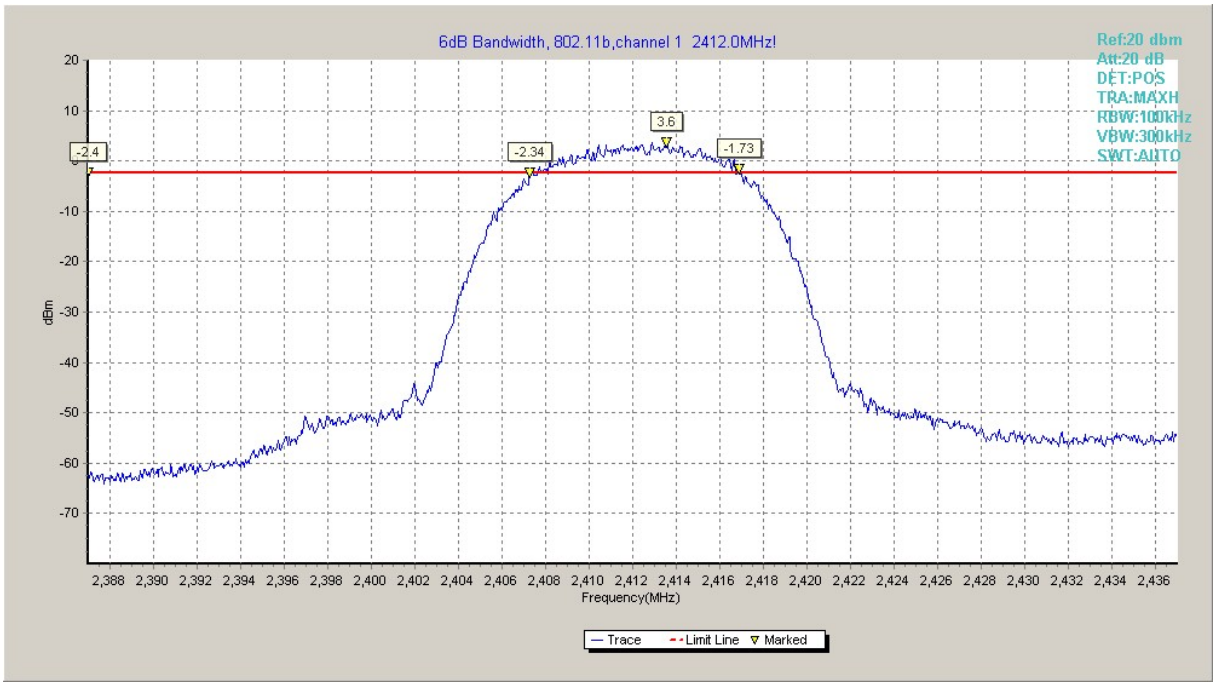


Fig.A.4.1 Occupied 6dB Bandwidth(802.11b,Ch 1)

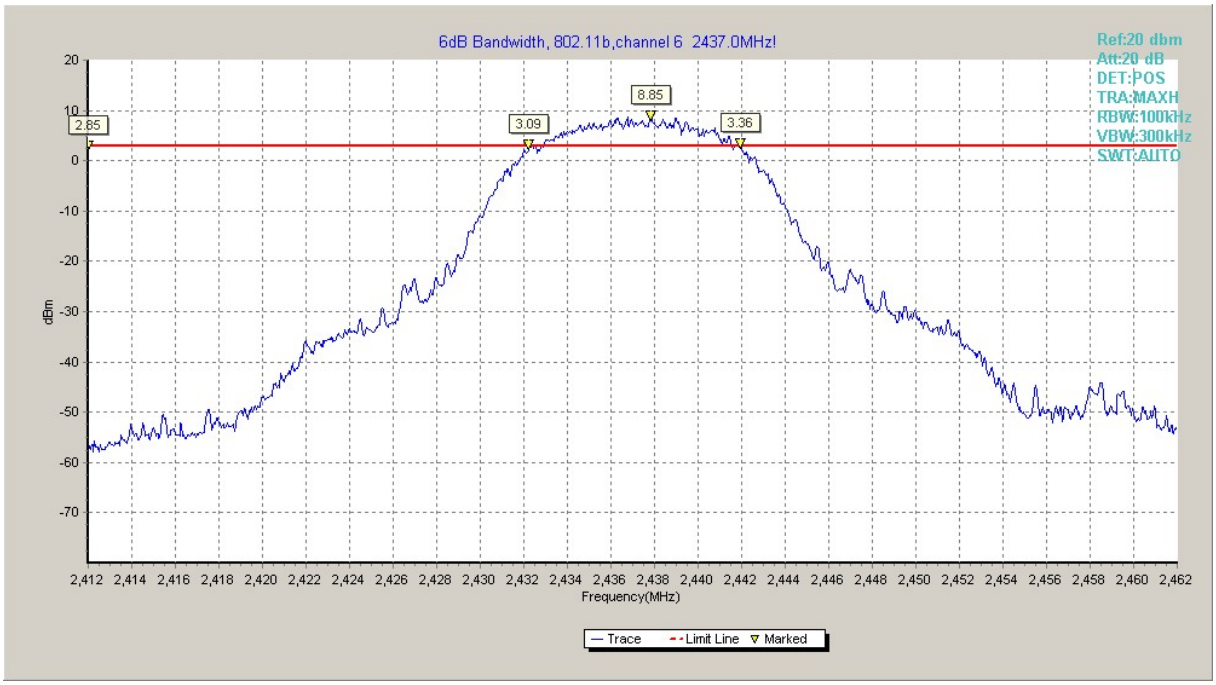


Fig.A.4.2 Occupied 6dB Bandwidth (802.11b, Ch 6)

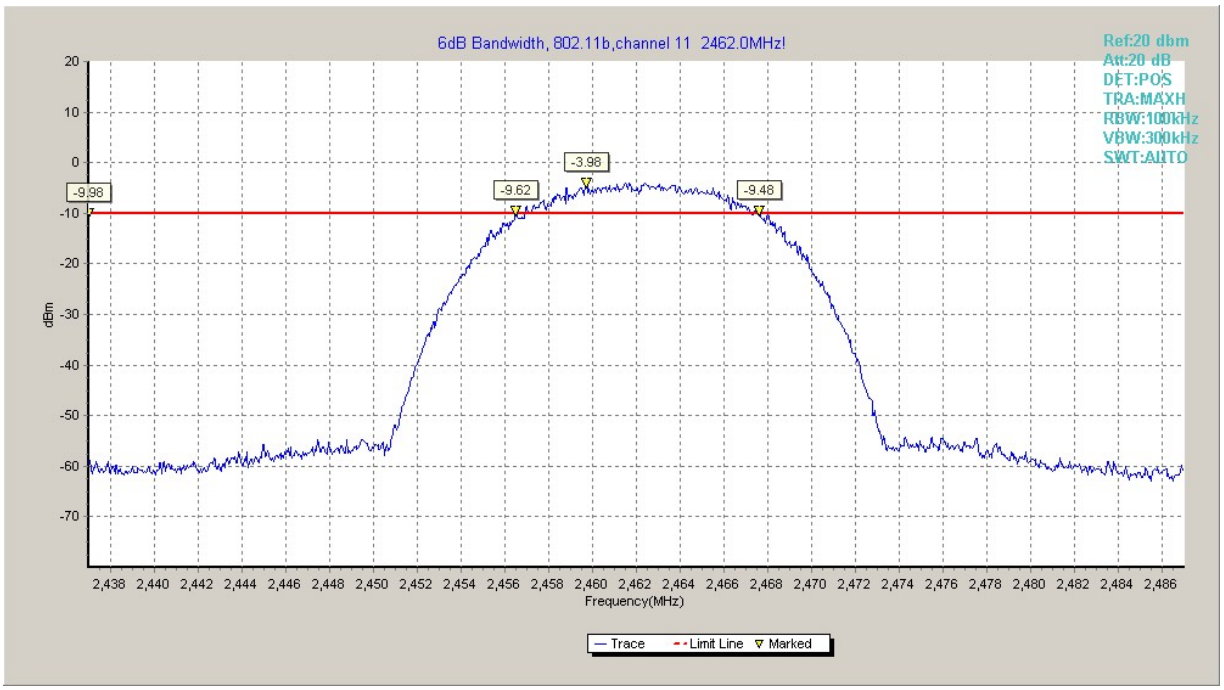


Fig.A.4.3 Occupied 6dB Bandwidth (802.11b, Ch 11)

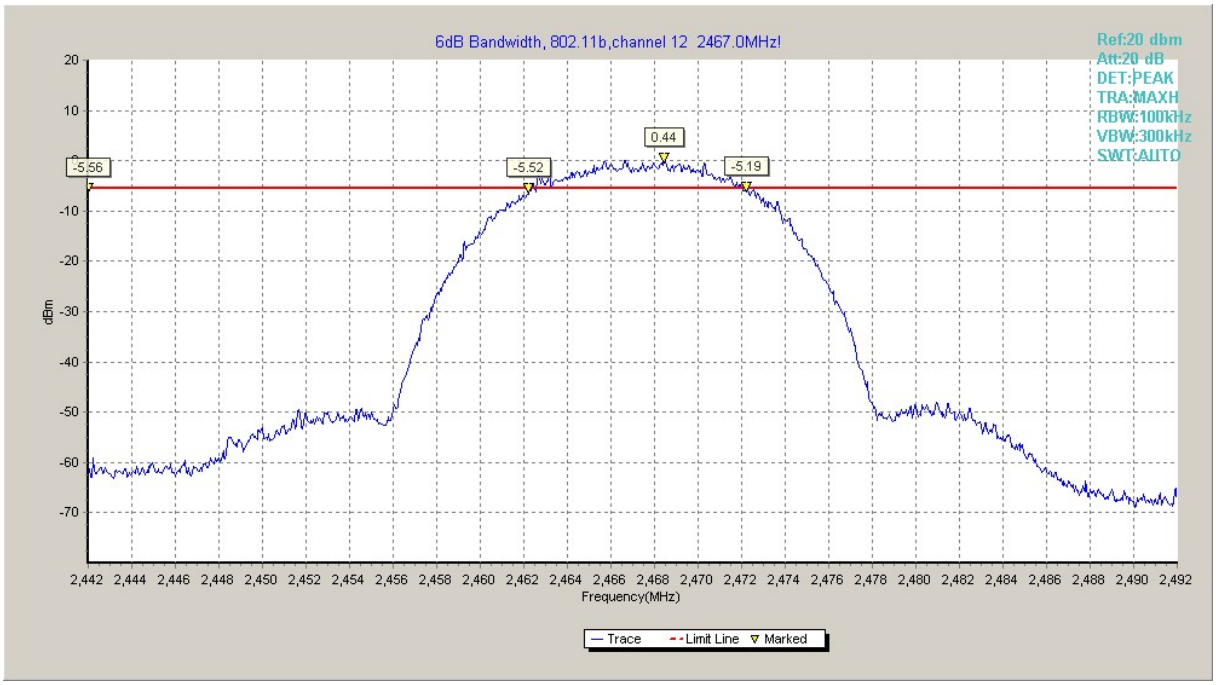


Fig.A.4.4 Occupied 6dB Bandwidth (802.11b, Ch 12)

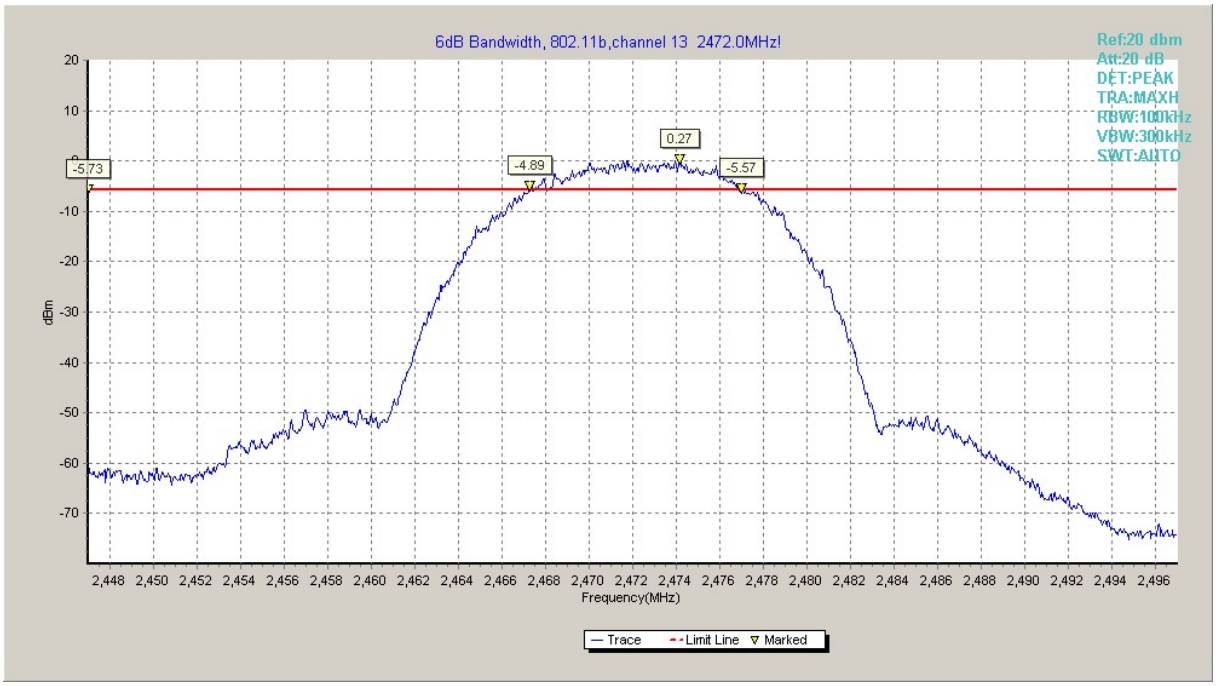


Fig.A.4.5 Occupied 6dB Bandwidth (802.11b, Ch 13)

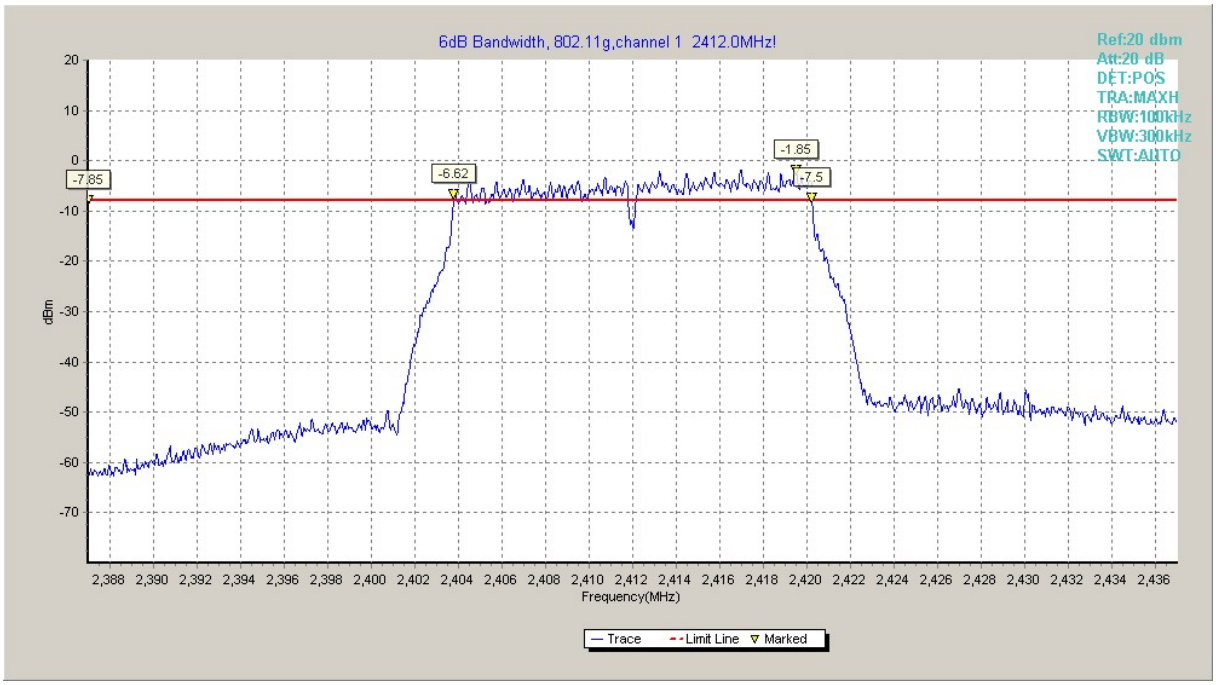


Fig.A.4.6 Occupied 6dB Bandwidth (802.11g, Ch 1)

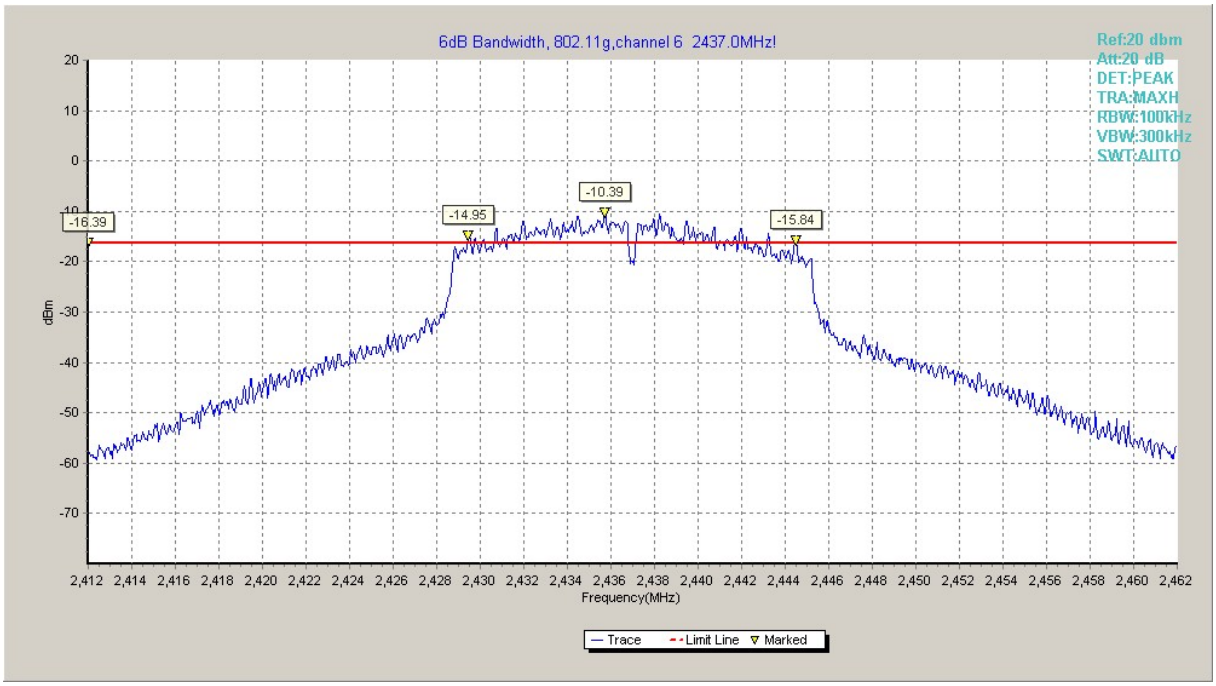


Fig.A.4.7 Occupied 6dB Bandwidth (802.11g, Ch 6)

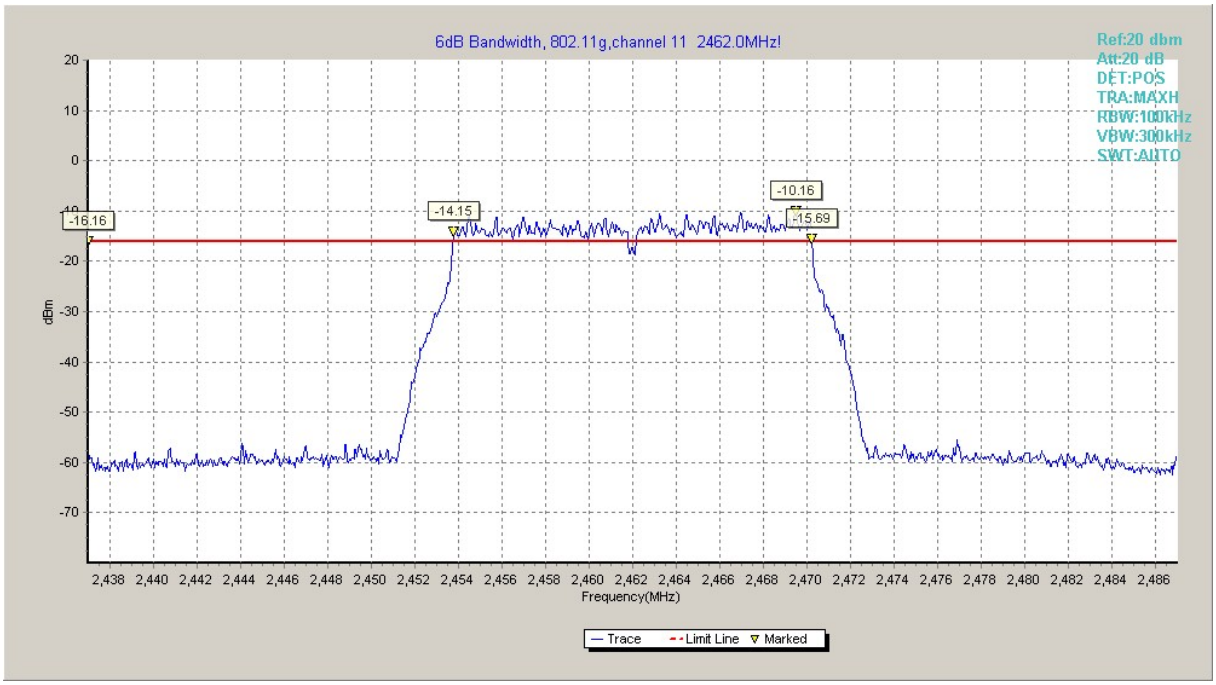


Fig.A.4.8 Occupied 6dB Bandwidth (802.11g, Ch 11)

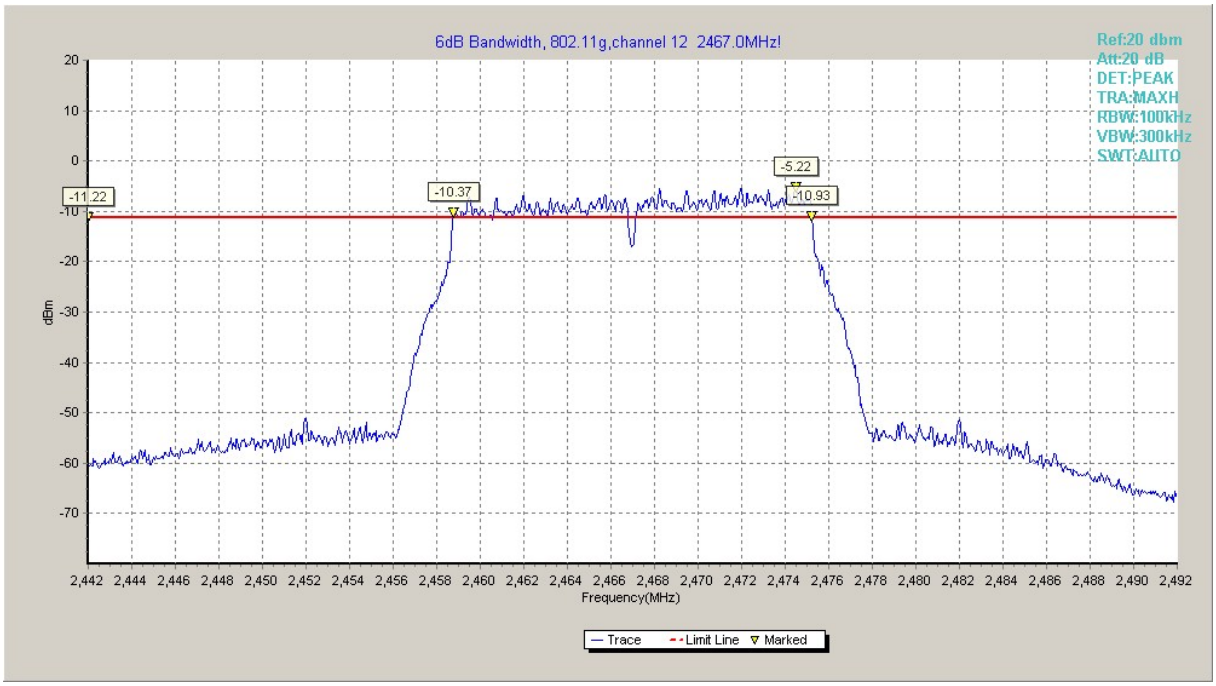


Fig.A.4.9 Occupied 6dB Bandwidth (802.11g, Ch 12)

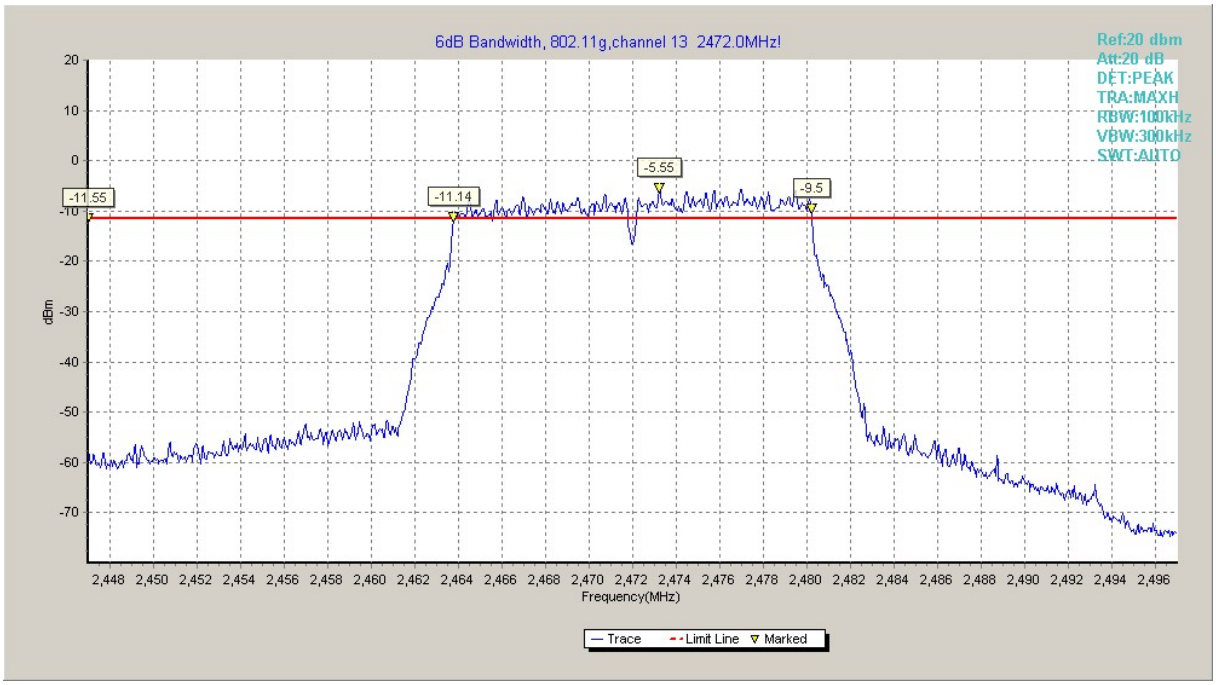


Fig.A.4.10 Occupied 6dB Bandwidth (802.11g, Ch 13)

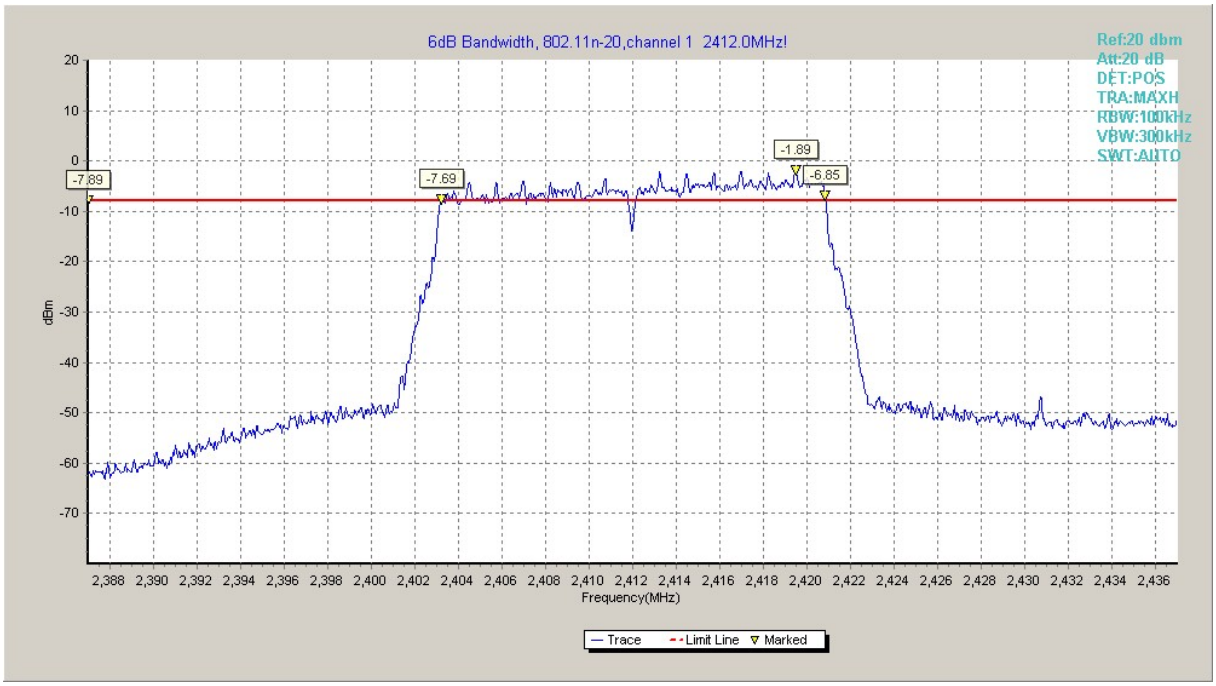


Fig.A.4.11 Occupied 6dB Bandwidth (802.11n-20MHz, Ch 1)

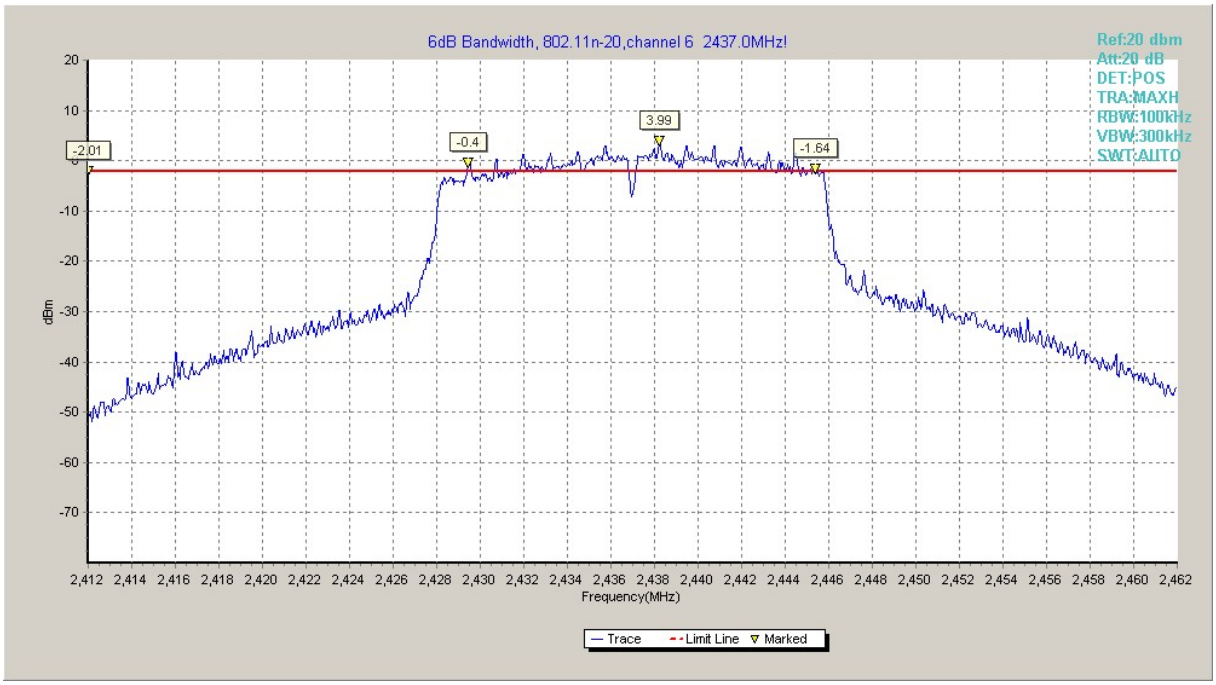


Fig.A.4.12 Occupied 6dB Bandwidth (802.11n-HT20, Ch 6)

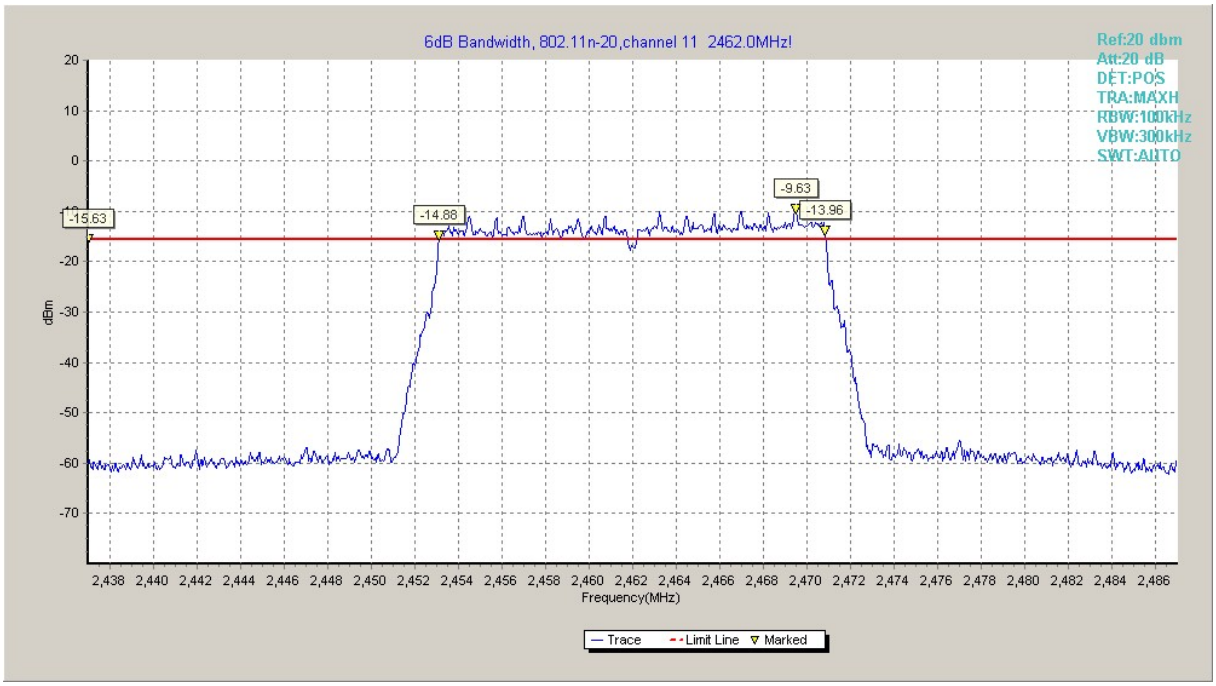


Fig.A.4.13 Occupied 6dB Bandwidth (802.11n-HT20, Ch 11)

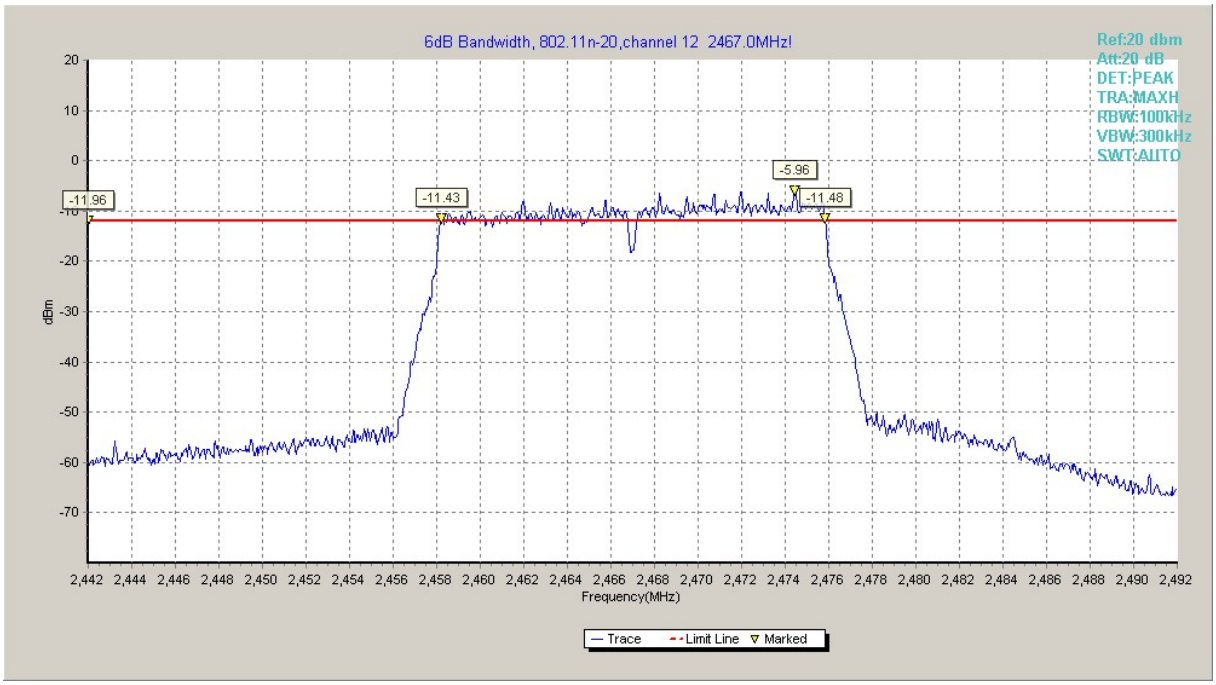


Fig.A.4.14 Occupied 6dB Bandwidth (802.11n-HT20, Ch 12)

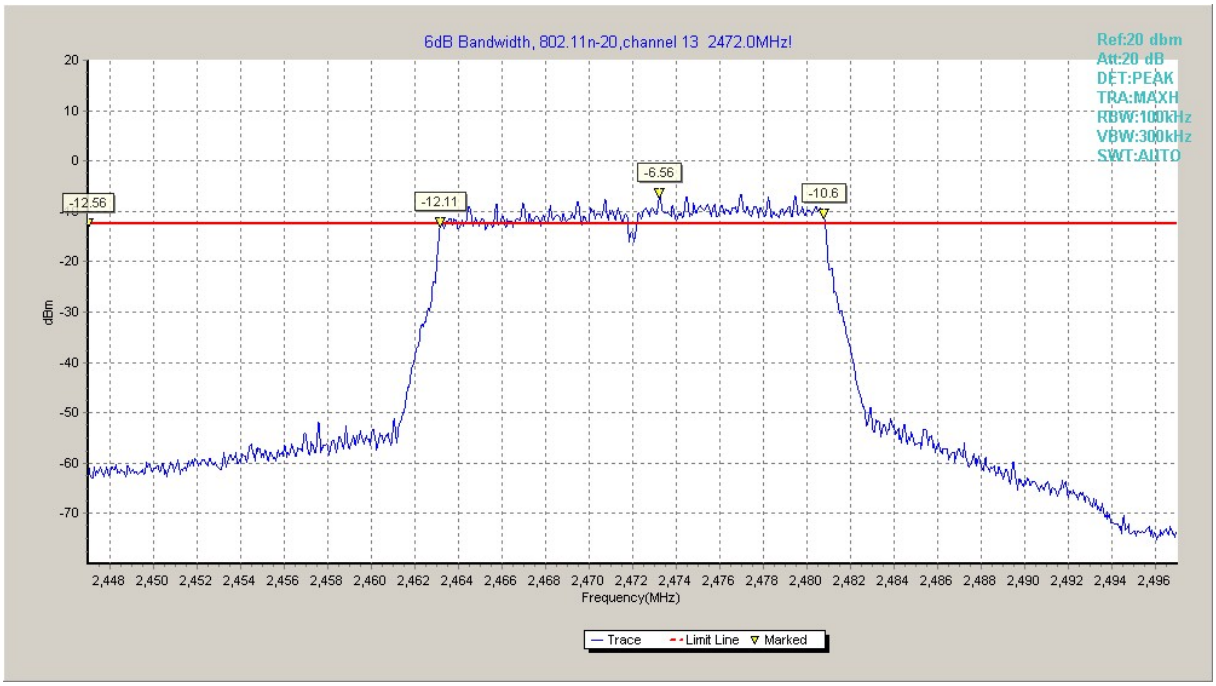


Fig.A.4.15 Occupied 6dB Bandwidth (802.11n-HT20, Ch 13)

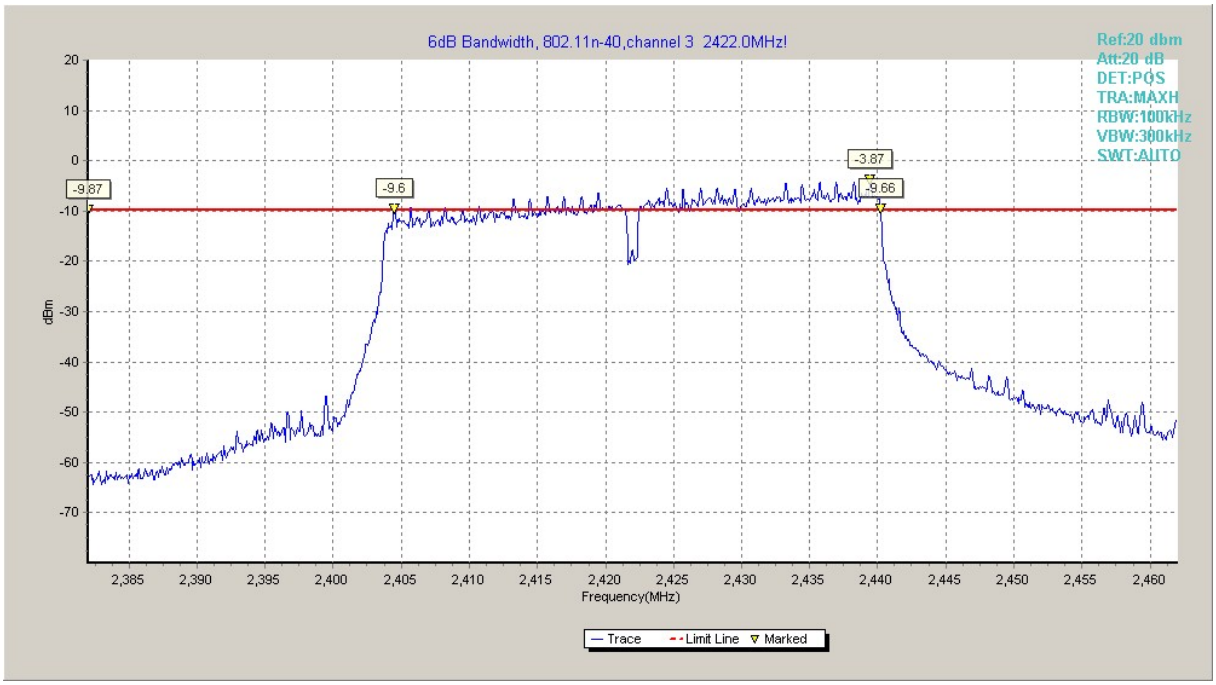


Fig.A.4.16 Occupied 6dB Bandwidth (802.11n-40MHz, Ch 3)

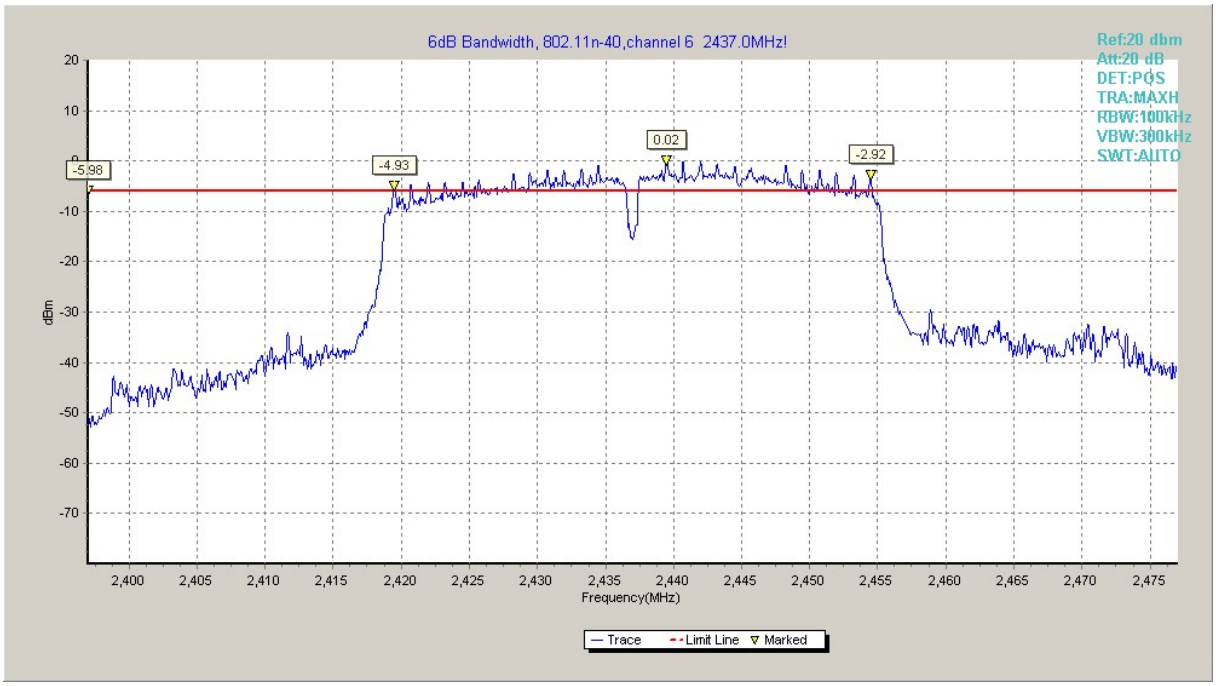


Fig.A.4.17 Occupied 6dB Bandwidth (802.11n-HT40, Ch 6)