FCC PART 15C
TEST REPORT
No.I19Z62331-IOT05

for

Client name: LG Electronics USA,Inc.

Product name: Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN

Model name: LM-K510BMW/ LMK510BMW/ K510BMW/ LM-K510HM/ LMK510HM, K510HM

With

FCC ID: ZNFK510HM

Issued Date: 2020-03-13

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.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL-Telecommunication Technology Labs, CAICT

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z62331-IOT05	Rev.0	1st edition	2020-03-04
I19Z62331-IOT05	Rev.1	Update the basic information and the number of channels in section 3.1	2020-03-10
I19Z62331-IOT05	Rev.2	Add antenna gain	2020-03-13

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. 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

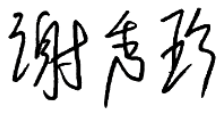
1.3. Testing Environment

Normal Temperature:	15-35℃
Relative Humidity:	20-75%

1.4. Project data

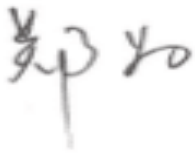
Testing Start Date:	2020-01-16
Testing End Date:	2020-02-29

1.5. Signature



Xiu Xiuzhen

(Prepared this test report)



Zheng Wei

(Reviewed this test report)

Hu Xiaoyu

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	LG Electronics USA,Inc.
Address:	1000 Sylvan Avenue,Englewood Cliffs NJ 07632
City:	/
Postal Code:	/
Country:	/
Telephone:	/
Fax:	/

2.2. Manufacturer Information

Company Name:	LG Electronics Inc.
Address:	LG Twin Towers,128,Yeoui-daero,Yeongdeungpo-gu,Seoul， Korea 150-721
City:	Seoul
Postal Code:	/
Country:	Korea
Telephone:	+82-2-6946-1675
Fax:	/

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

3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN
Model name	LM-K510BMW/LMK510BMW/K510BMW/ LM-K510HM/LMK510HM/K510HM
FCC ID	ZNFK510HM
With WLAN Function	Yes
Frequency Range	ISM 2400MHz~2483.5MHz
Type of Modulation	DSSS/CCK/OFDM
Number of Channels	13
Antenna	Integral Antenna
MAX Conducted Power	24.27dBm
Power Supply	3.85V

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI
EUT1	353265110055672/ 353265110055680
EUT2	353265110054113/ 353265110054121

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

3.3. Internal Identification of AE

AE ID*	Description	SN	Remarks
AE1	Battery	/	Inbuilt
AE2	Charger	/	/
AE3	USB Cable	/	/

AE1

Model	BL-T49
Manufacturer	ATL
Capacitance	4000mAh
Nominal voltage	3.87v

AE2

Model	MCS-V02WR
Manufacturer	Sunlin Electrocnis
Length of cable	/

AE3

Model	DC15WB-G
Manufacturer	Ningbo
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 Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN with integrated antenna and inbuilt battery.
It has Bluetooth (EDR) function.
It consists of normal options: travel charger, USB cable.
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

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 558074 D01	Federal Communications Commission Office of Engineering and Technology Laboratory Division GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES	2019

5. Test Results

5.1. 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

5.2. 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.

The model of LM-K510BMW/ LMK510BMW/ K510BMW is double card, and the model of LM-K510HM/ LMK510HM/ K510HM is single card.

5.3. 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	3.85V
Humidity	H nom	20-75%

6. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	1 year	2020-05-15
2	Test Receiver	ESCI 3	100344	Rohde & Schwarz	1 year	2021-02-27
3	LISN	ENV216	101200	Rohde & Schwarz	1 year	2020-03-14
4	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100235	Rohde & Schwarz	1 year	2021-03-03
2	BiLog Antenna	VULB9163	9163-1222	Schwarzbeck	1 year	2020-03-14
3	Dual-Ridge Waveguide Horn Antenna	3115	00167250	ETS-Lindgren	1 year	2020-05-15
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	1 year	2020-05-31
5	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2020-05-16

7. Measurement Uncertainty

7.1. Maximum Output Power

Measurement Uncertainty: 0.387dB,k=1.96

7.2. Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

7.3. DTS 6-dB Signal Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

7.4. Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

7.5. Transmitter Spurious Emission

Conducted (k=1.96)

Frequency Range	Uncertainty(dB)
30MHz ≤ f ≤ 2GHz	1.22
2GHz ≤ f ≤3.6GHz	1.22
3.6GHz ≤ f ≤8GHz	1.22
8GHz ≤ f ≤12.75GHz	1.51
12.75GHz ≤ f ≤26GHz	1.51
26GHz ≤ f ≤40GHz	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
30MHz ≤ f ≤ 1GHz	5.16
1GHz ≤ f ≤18GHz	5.44
18GHz ≤ f ≤40GHz	5.28

7.6. AC Power-line Conducted Emission

Measurement Uncertainty : 3.08dB,k=2

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

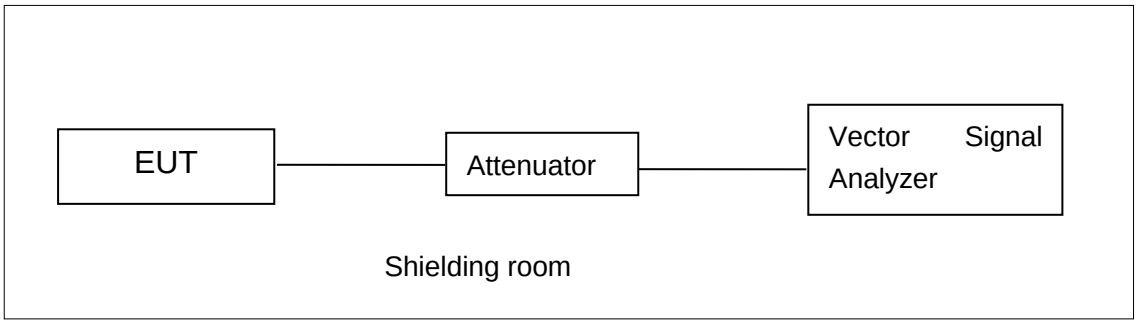


Fig.A.1.1.1: Test Setup Diagram for Conducted Measurements

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;

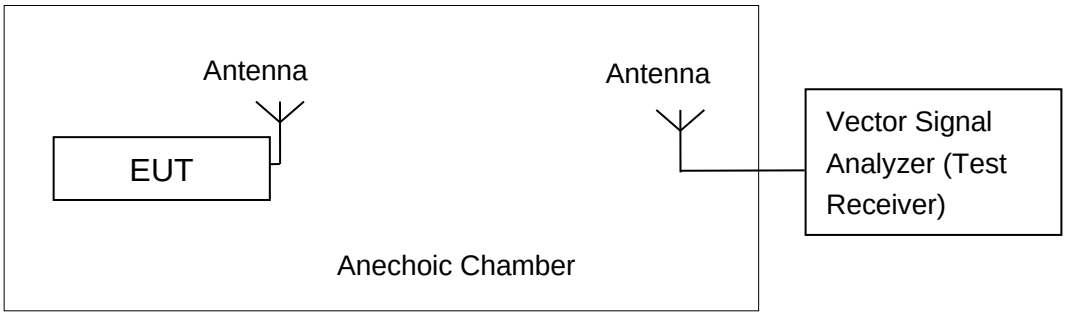


Fig.A.1.2.1: Test Setup Diagram for Radiated Measurements

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).

Duty cycle meets the requirement of 98% and above

Measurement Limit:

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

EUT ID: EUT2

A.2.1 Antenna Gain

Peak antenna gain is -0.93dBi and the value is supplied by the applicant or manufacturer.

A.2.2. 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	20.09	/	/	/	/
	2	20.30	/	/	/	/
	5.5	21.64	/	/	/	/
	11	23.18	23.99	23.54	11.76	11.57
802.11g	6	22.74	/	/	/	/
	9	22.72	/	/	/	/
	12	22.52	/	/	/	/
	18	22.49	/	/	/	/
	24	22.99	/	/	/	/
	36	23.00	/	/	/	/
	48	23.43	/	/	/	/
	54	23.45	24.27	22.82	13.72	13.65

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	21.70	/	/	/	/
	MCS1	21.70	/	/	/	/
	MCS2	21.46	/	/	/	/
	MCS3	21.90	/	/	/	/
	MCS4	22.01	/	/	/	/
	MCS5	22.22	/	/	/	/
	MCS6	22.42	23.32	21.67	13.79	13.74
	MCS7	22.28	/	/	/	/

The data rate MCS6 is selected as worse condition, and the following cases are performed with this condition.

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	-6.23	**P**
	6	Fig.A.3.2	-5.92	**P**
	11	Fig.A.3.3	-6.25	**P**
	12	Fig.A.3.4	-15.77	**P**
	13	Fig.A.3.5	-16.99	**P**
802.11g	1	Fig.A.3.6	-10.42	**P**
	6	Fig.A.3.7	-8.09	**P**
	11	Fig.A.3.8	-11.19	**P**
	12	Fig.A.3.9	-18.09	**P**
	13	Fig.A.3.10	-19.62	**P**

802.11n-HT20 mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11n (HT20)	1	Fig.A.3.11	-11.34	**P**
	6	Fig.A.3.12	-9.46	**P**
	11	Fig.A.3.13	-12.30	**P**
	12	Fig.A.3.14	-18.23	**P**
	13	Fig.A.3.15	-19.52	**P**

Conclusion: Pass

Test graphs as below:

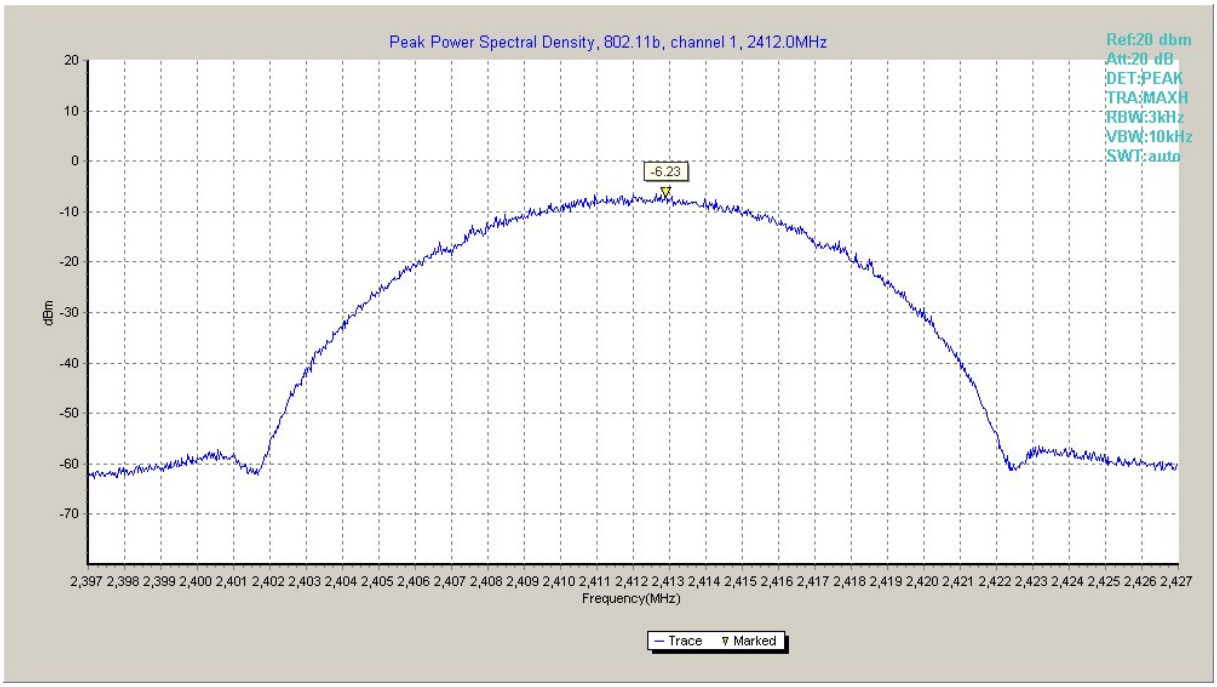


Fig.A.3.1 Power Spectral Density(802.11b,Ch1)

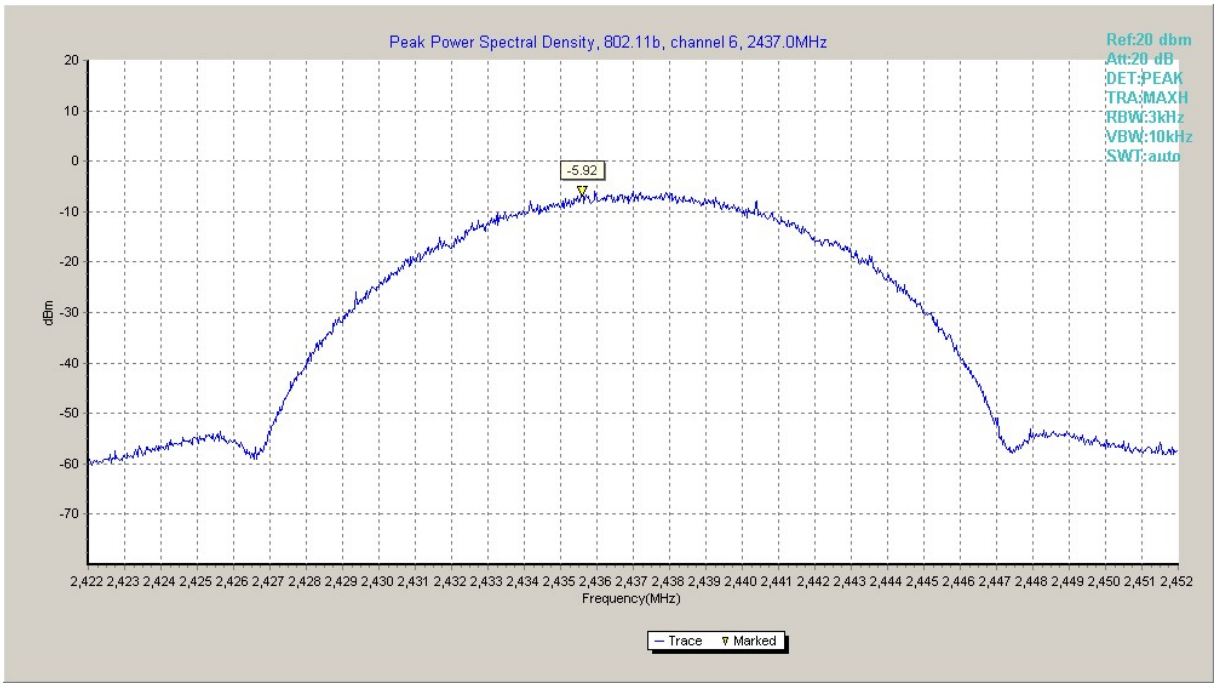


Fig.A.3.2 Power Spectral Density (802.11b, Ch 6)

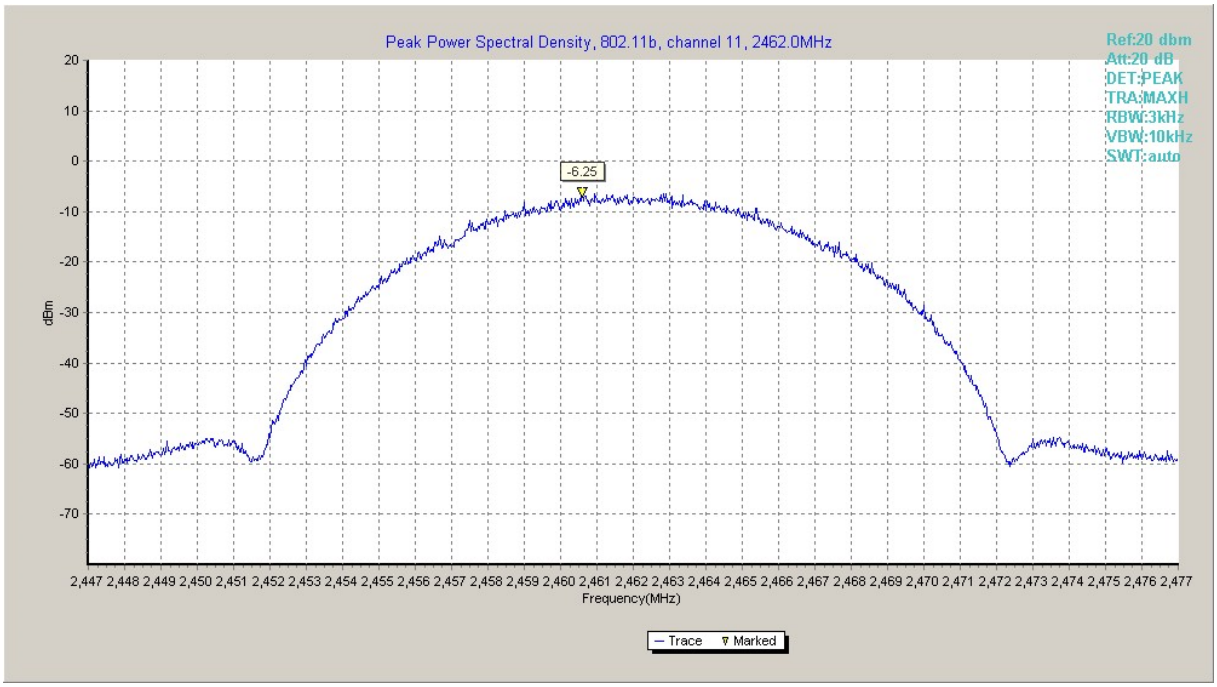


Fig.A.3.3 Power Spectral Density (802.11b, Ch 11)

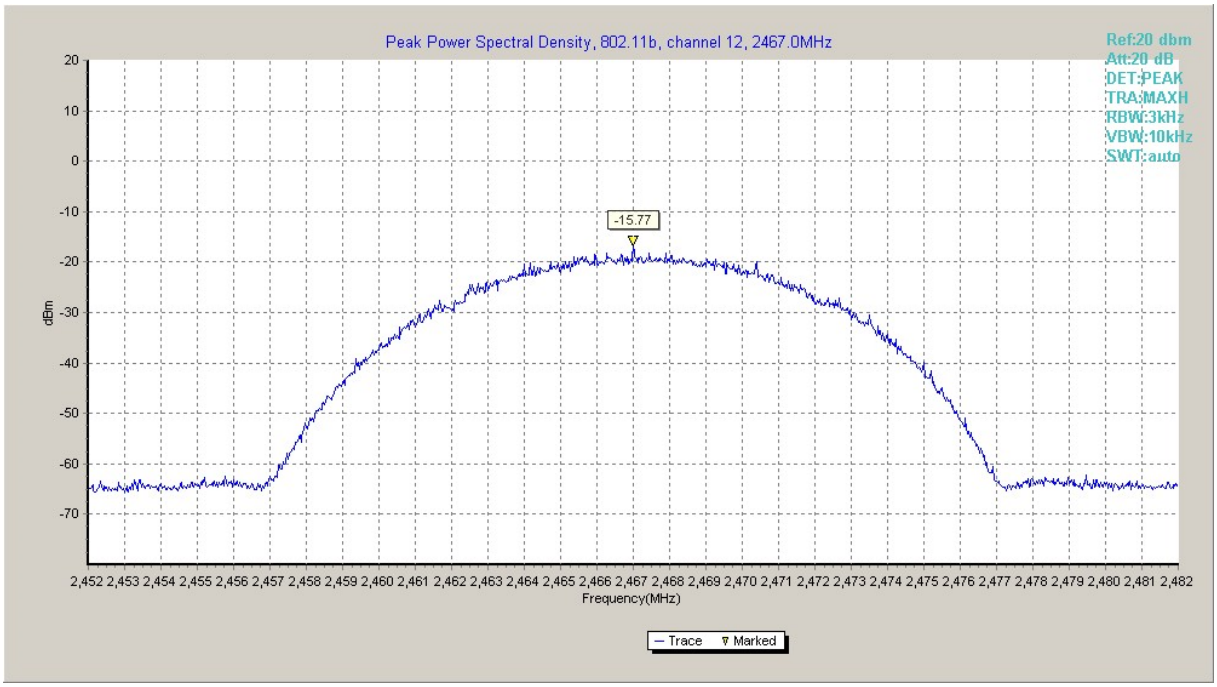


Fig.A.3.4 Power Spectral Density (802.11b, Ch 12)

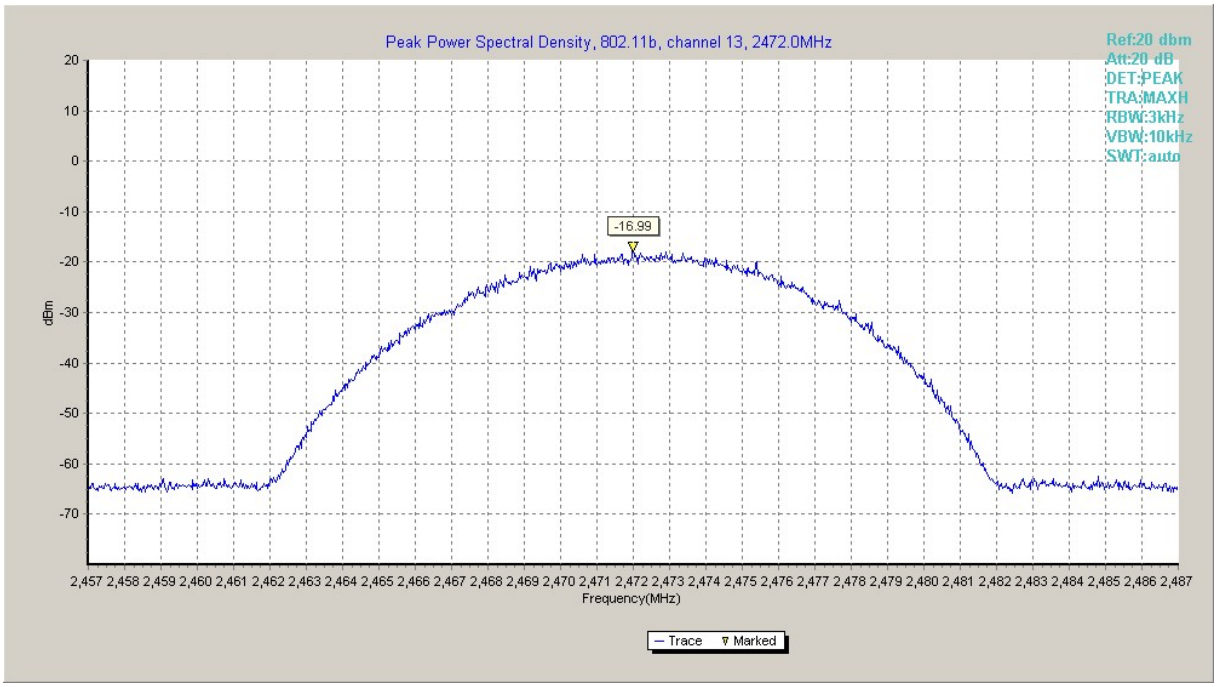


Fig.A.3.5 Power Spectral Density (802.11b, Ch 13)

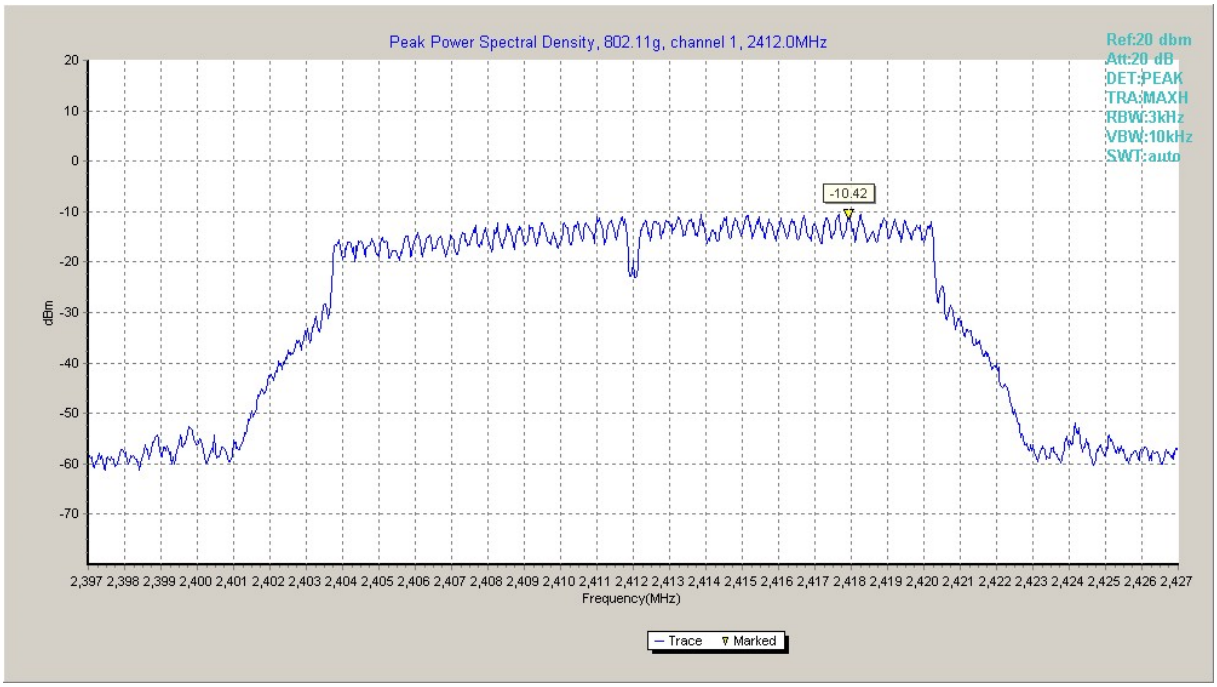


Fig.A.3.6 Power Spectral Density (802.11g, Ch 1)

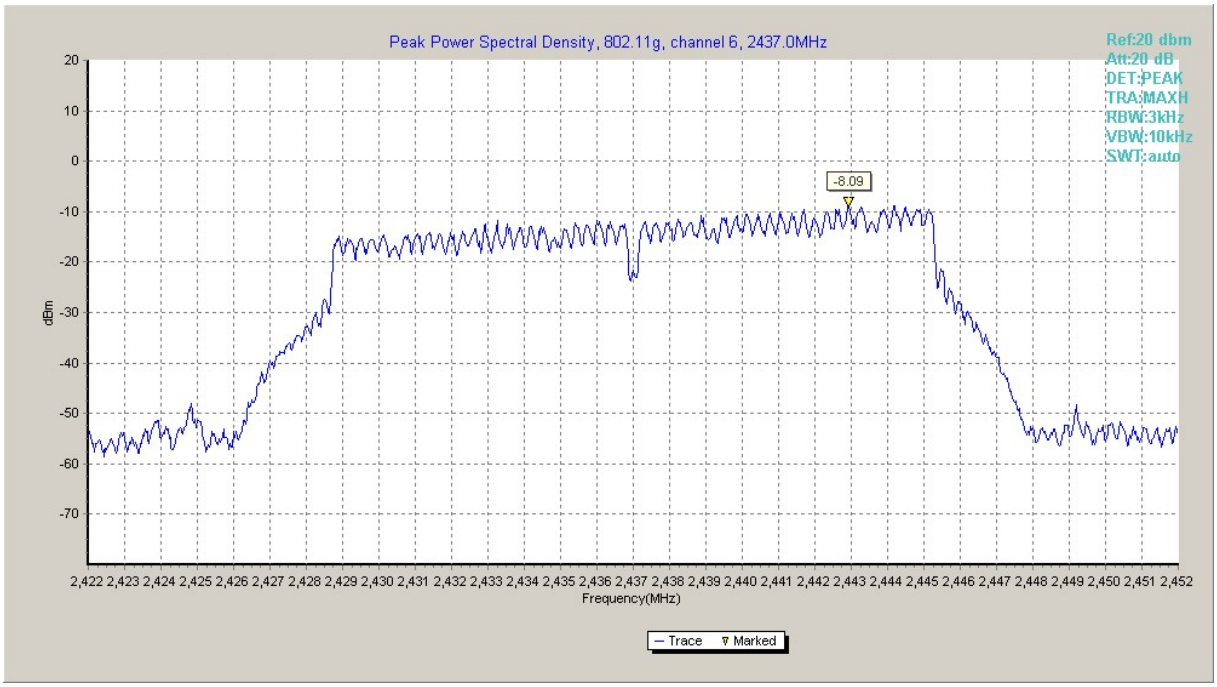


Fig.A.3.7 Power Spectral Density (802.11g, Ch 6)

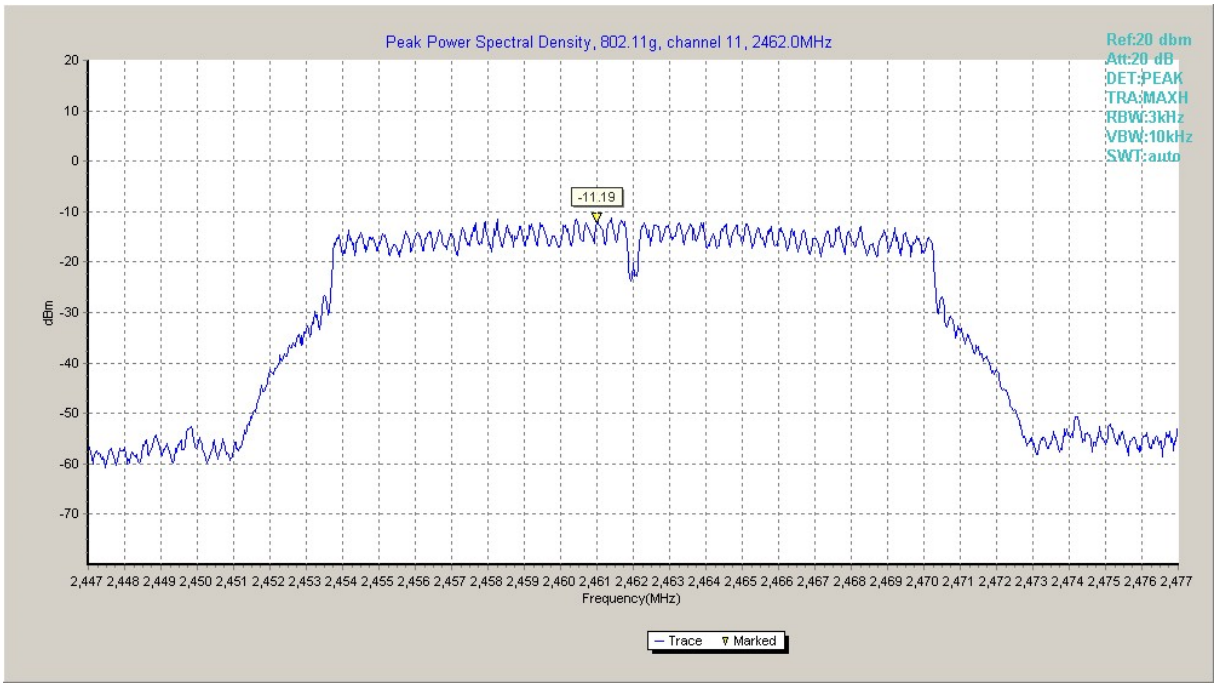


Fig.A.3.8 Power Spectral Density (802.11g, Ch 11)

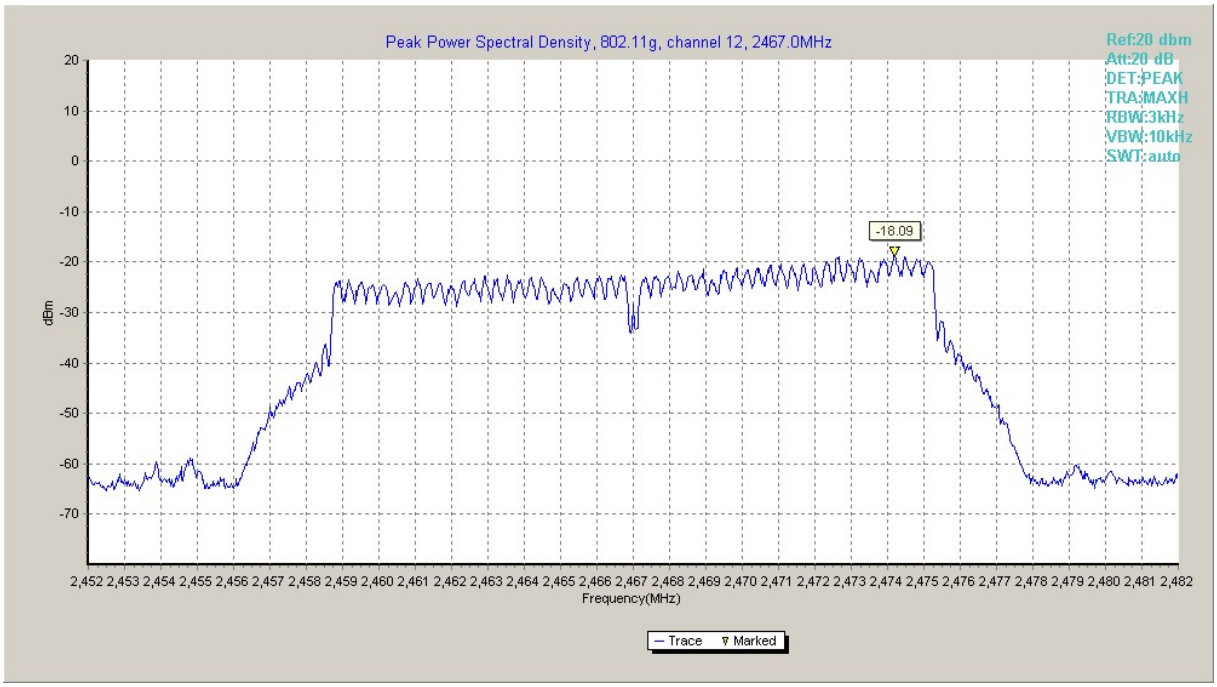


Fig.A.3.9 Power Spectral Density (802.11g, Ch 12)

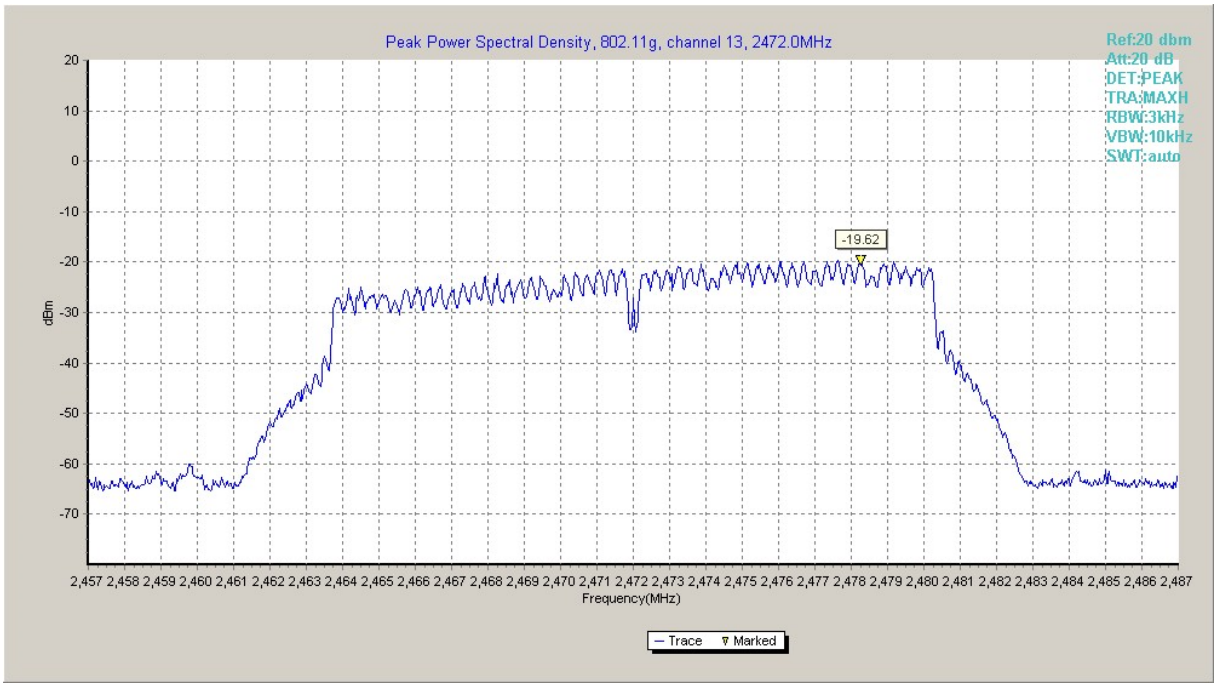


Fig.A.3.10 Power Spectral Density (802.11g, Ch 13)

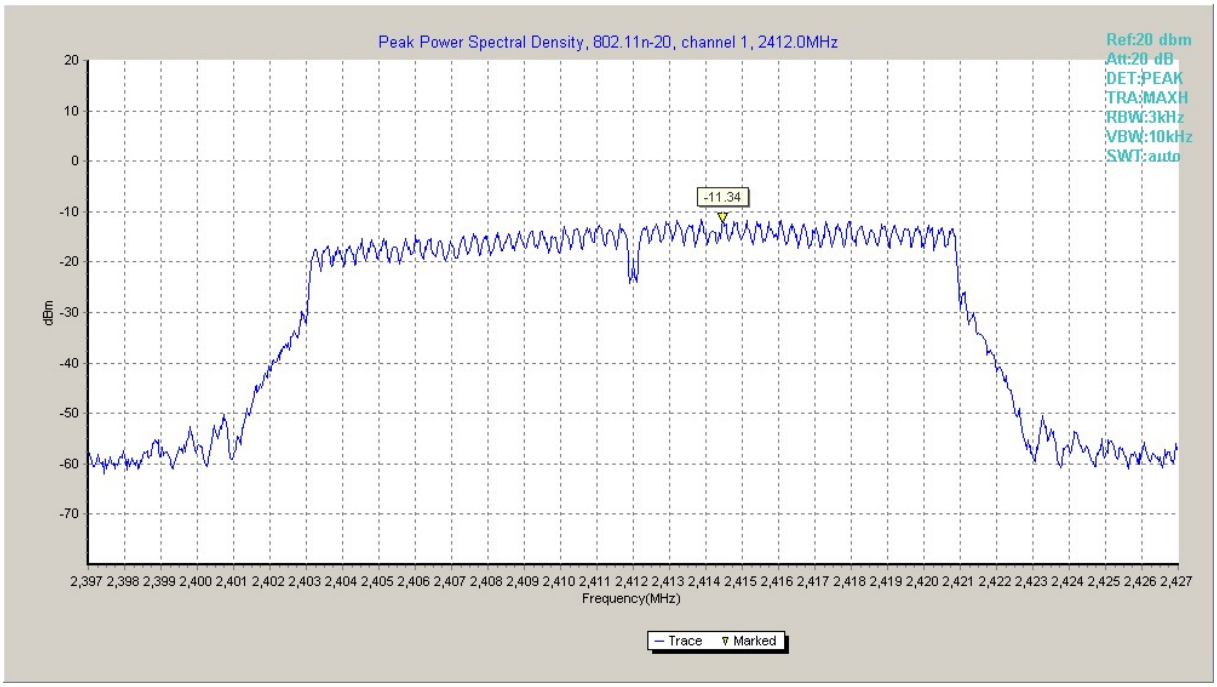


Fig.A.3.11 Power Spectral Density (802.11n-HT20, Ch 1)

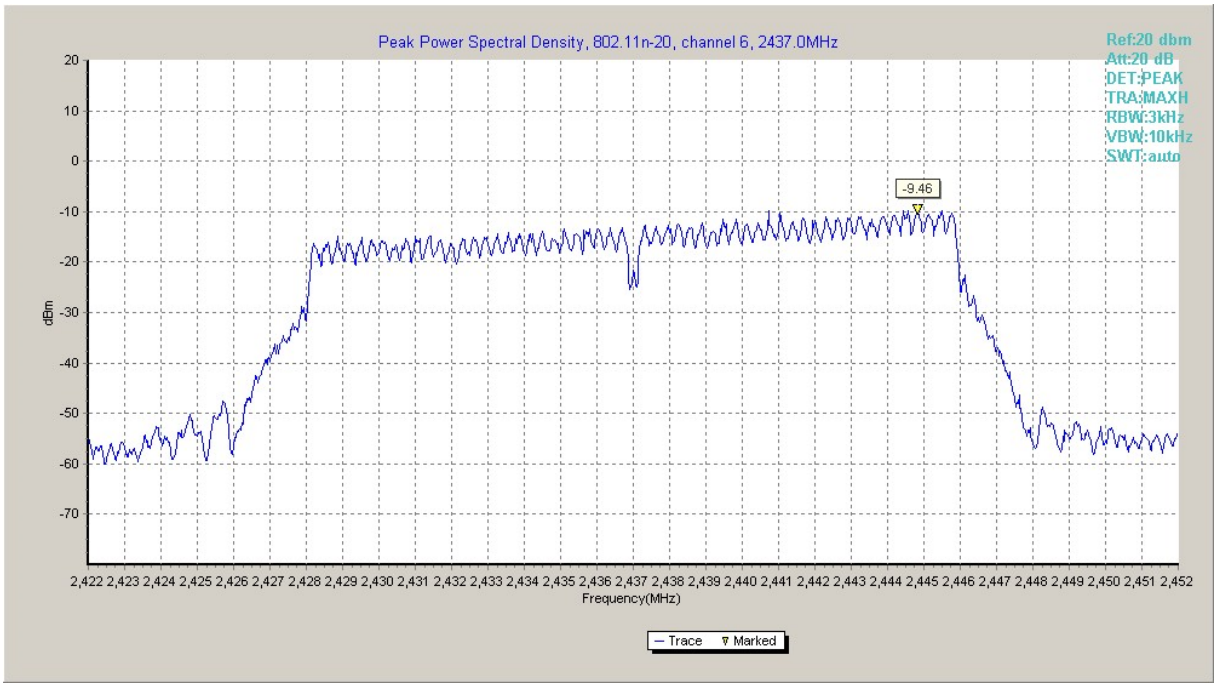


Fig.A.3.12 Power Spectral Density (802.11n-HT20, Ch 6)

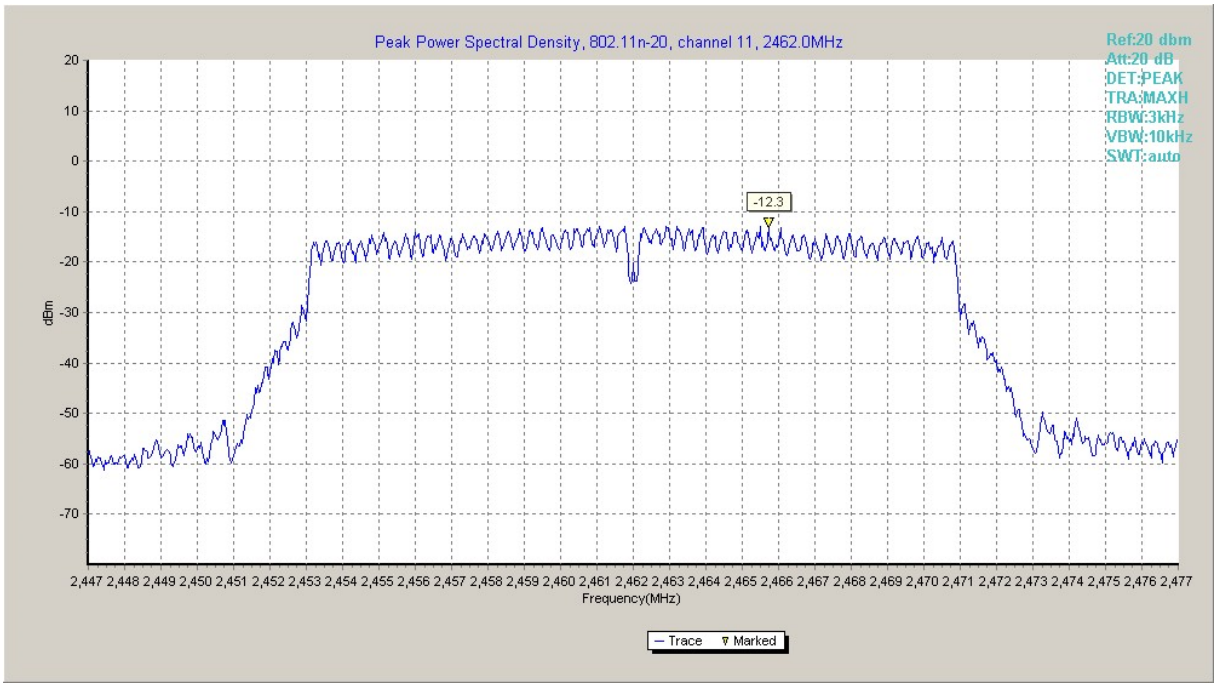


Fig.A.3.13 Power Spectral Density (802.11n-HT20, Ch 11)

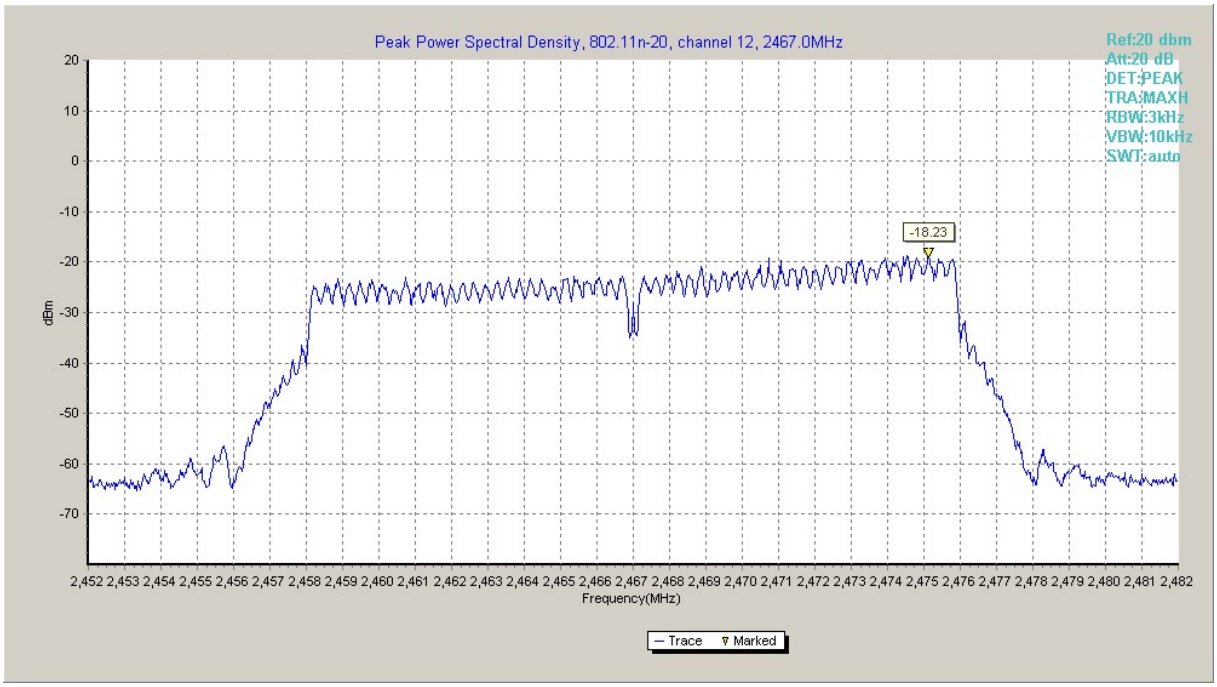


Fig.A.3.14 Power Spectral Density (802.11n-HT20, Ch 12)

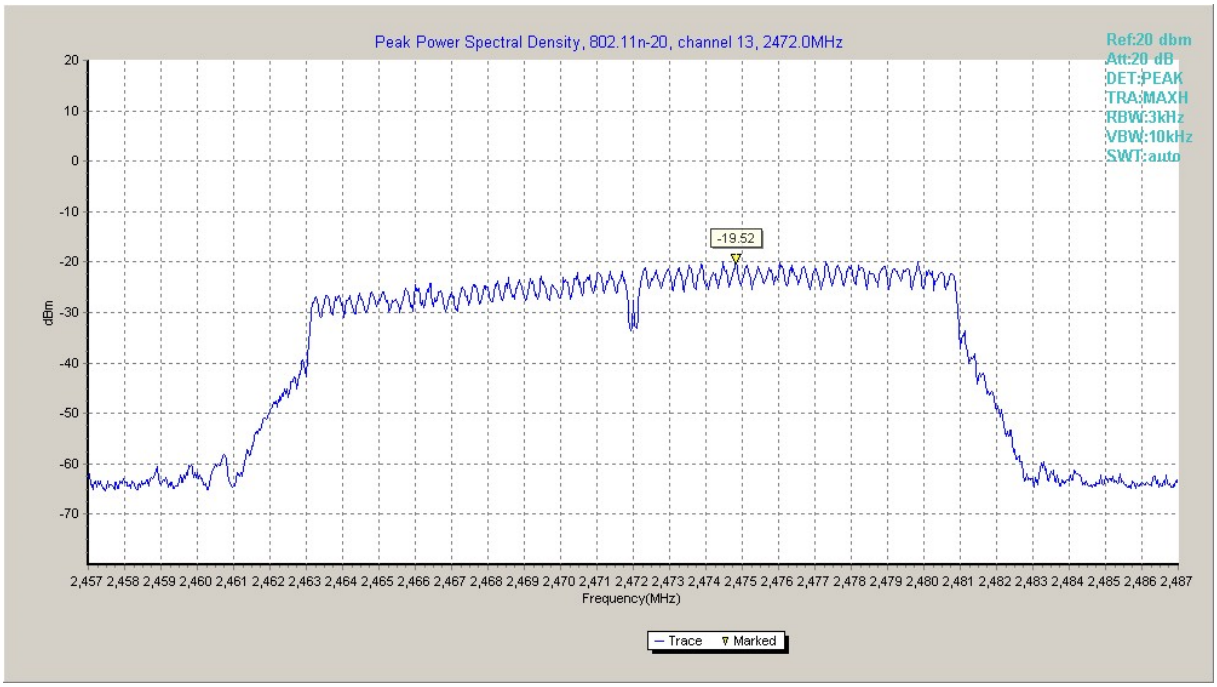


Fig.A.3.15 Power Spectral Density (802.11n-HT20, Ch 13)

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	7850.00	P
	6	Fig.A.4.2	8400.00	P
	11	Fig.A.4.3	8400.00	P
	12	Fig.A.4.4	8000.00	P
	13	Fig.A.4.5	7900.00	P
802.11g	1	Fig.A.4.6	16400.00	P
	6	Fig.A.4.7	15500.00	P
	11	Fig.A.4.8	16500.00	P
	12	Fig.A.4.9	16100.00	P
	13	Fig.A.4.10	14200.00	P

802.11n-HT20 mode

Mode	Channel	Occupied 6dB Bandwidth (kHz)		conclusion
802.11n (HT20)	1	Fig.A.4.11	17300.00	P
	6	Fig.A.4.12	15750.00	P
	11	Fig.A.4.13	17700.00	P
	12	Fig.A.4.14	17700.00	P
	13	Fig.A.4.15	16100.00	P

Conclusion: Pass

Test graphs as below:

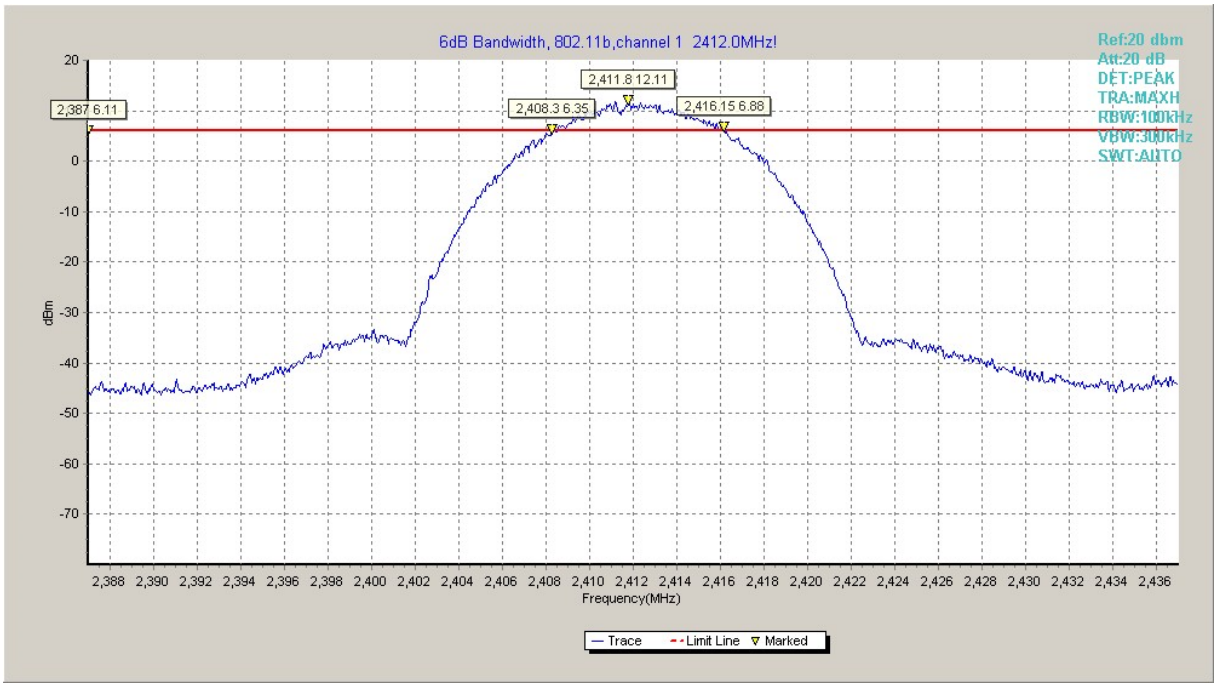


Fig.A.4.1 Occupied 6dB Bandwidth(802.11b,Ch 1)

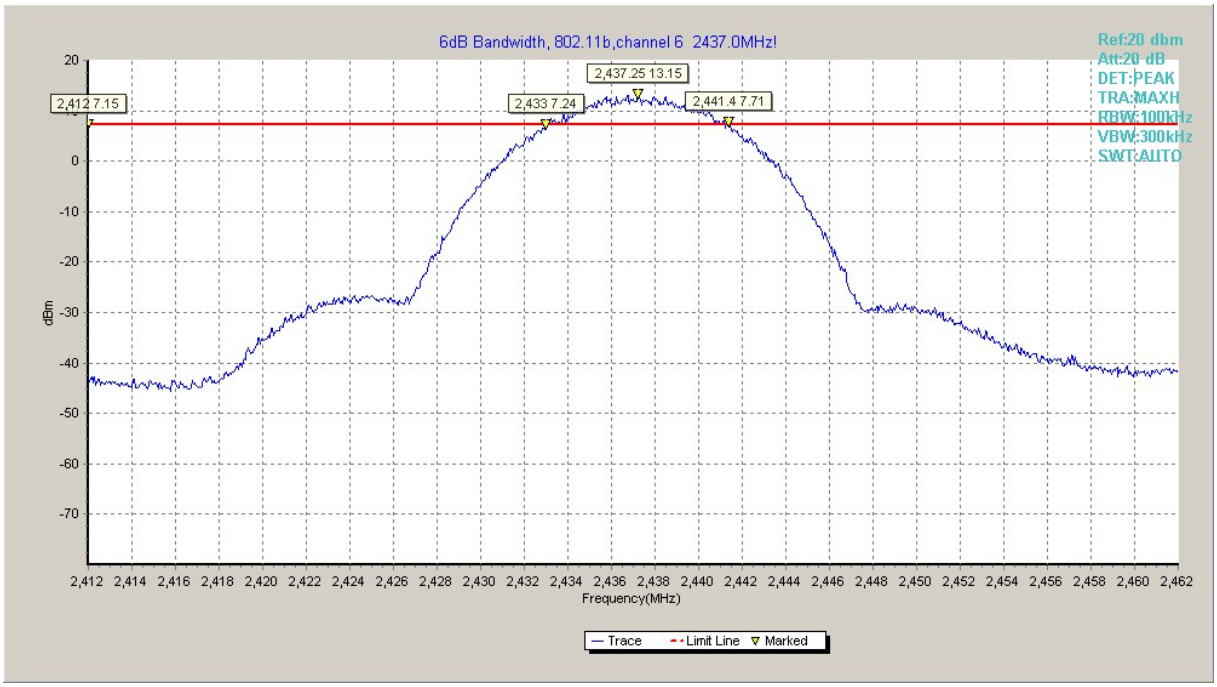


Fig.A.4.2 Occupied 6dB Bandwidth (802.11b, Ch 6)

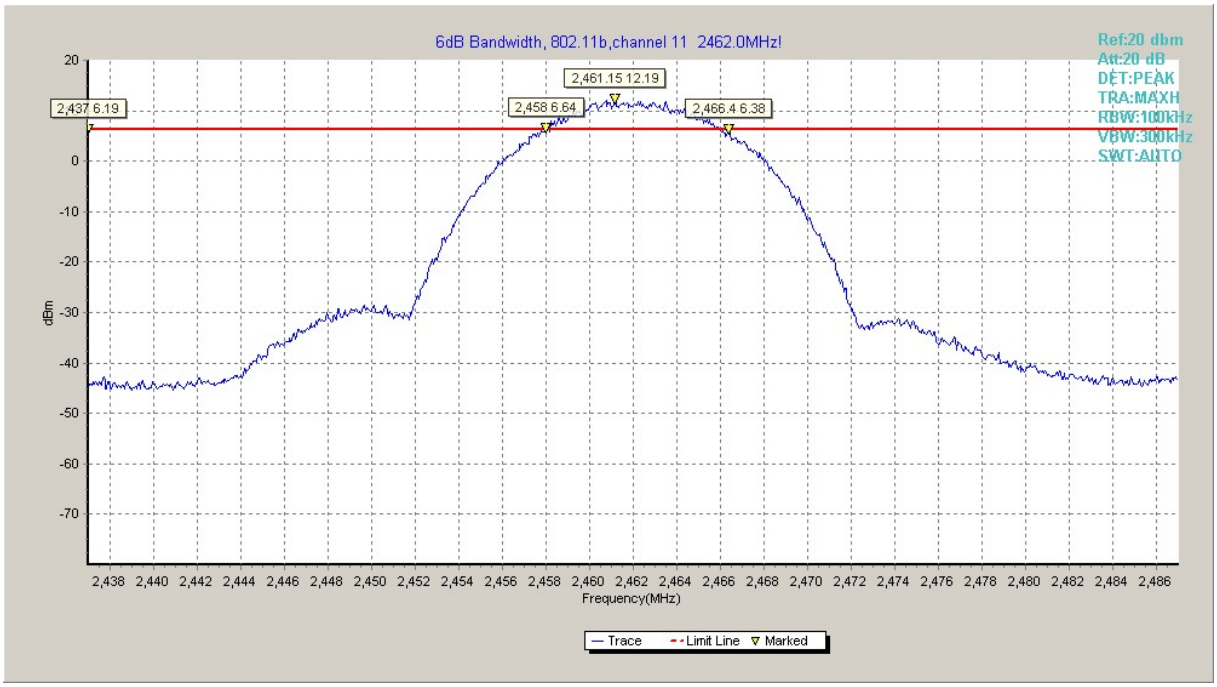


Fig.A.4.3 Occupied 6dB Bandwidth (802.11b, Ch 11)

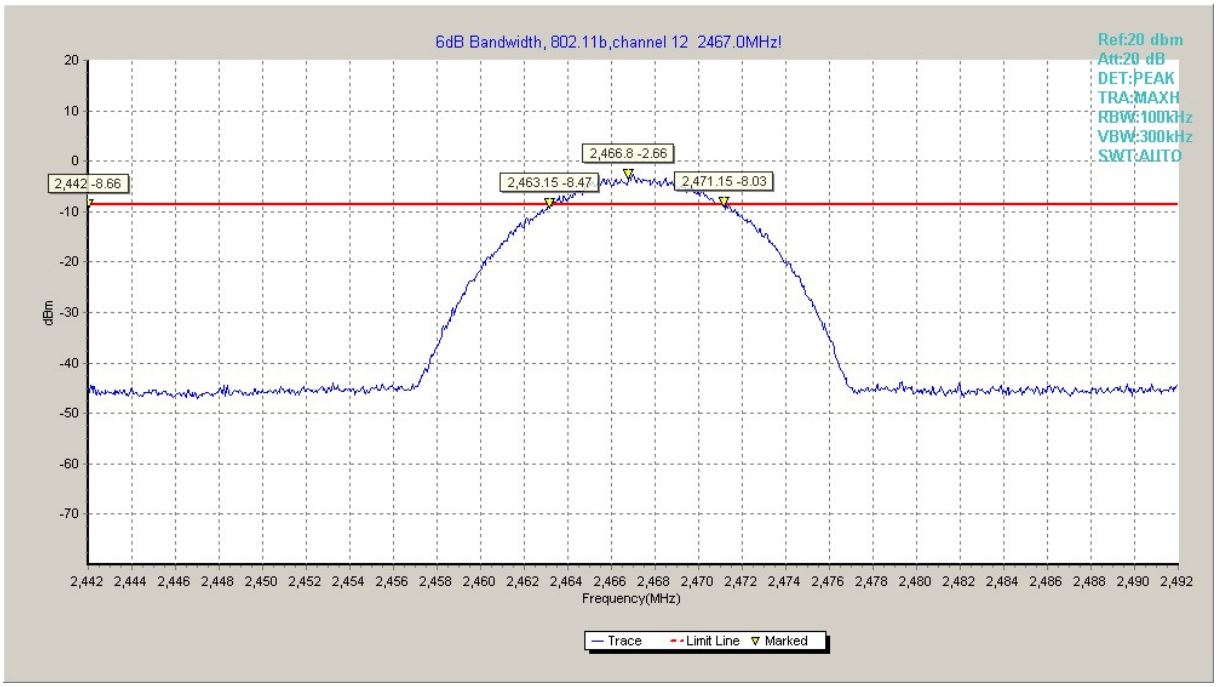


Fig.A.4.4 Occupied 6dB Bandwidth (802.11b, Ch 12)

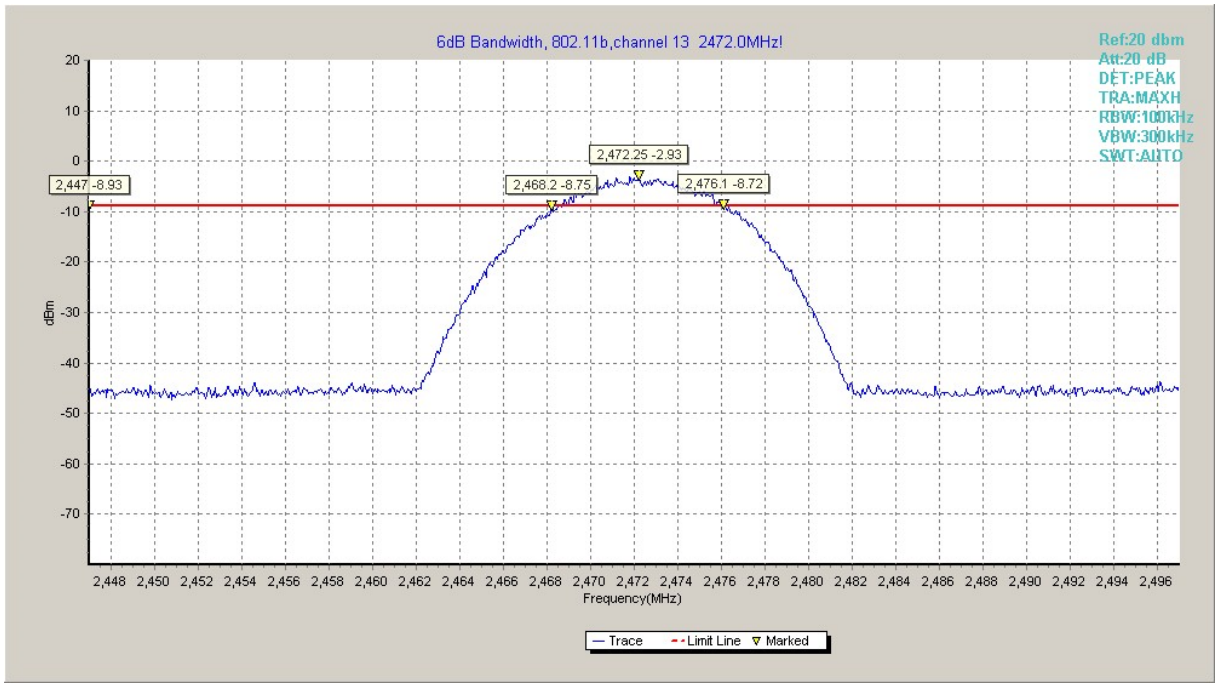


Fig.A.4.5 Occupied 6dB Bandwidth (802.11b, Ch 13)

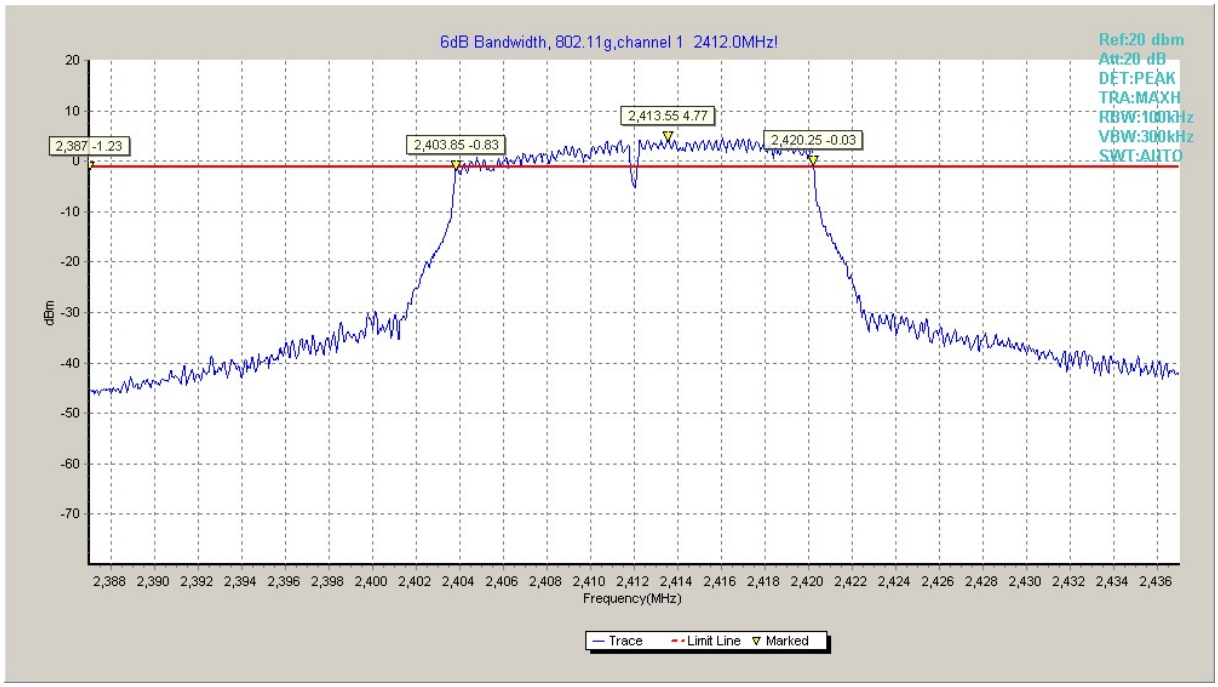


Fig.A.4.6 Occupied 6dB Bandwidth (802.11g, Ch 1)

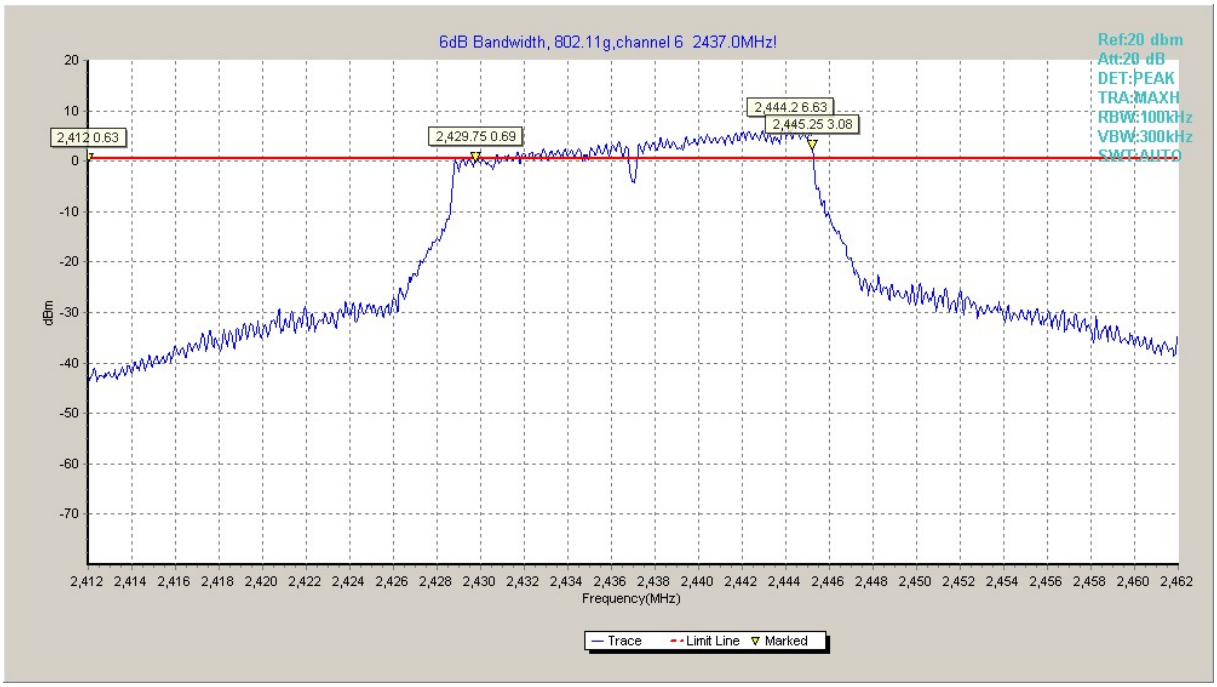


Fig.A.4.7 Occupied 6dB Bandwidth (802.11g, Ch 6)

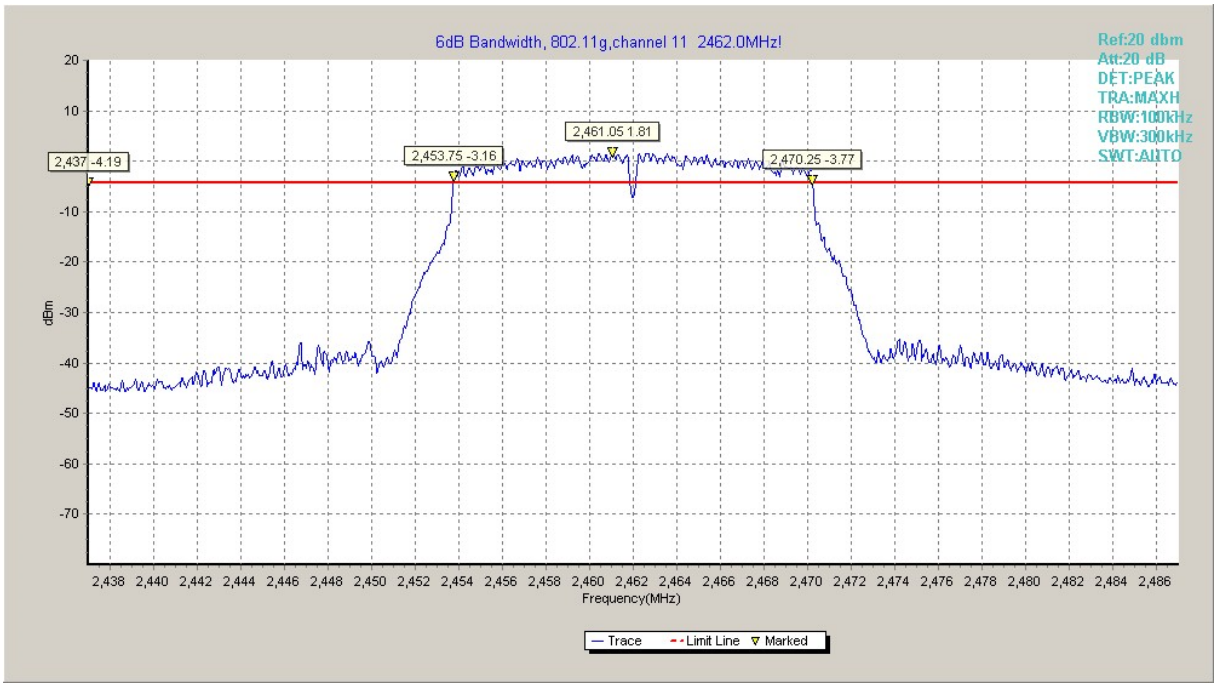


Fig.A.4.8 Occupied 6dB Bandwidth (802.11g, Ch 11)

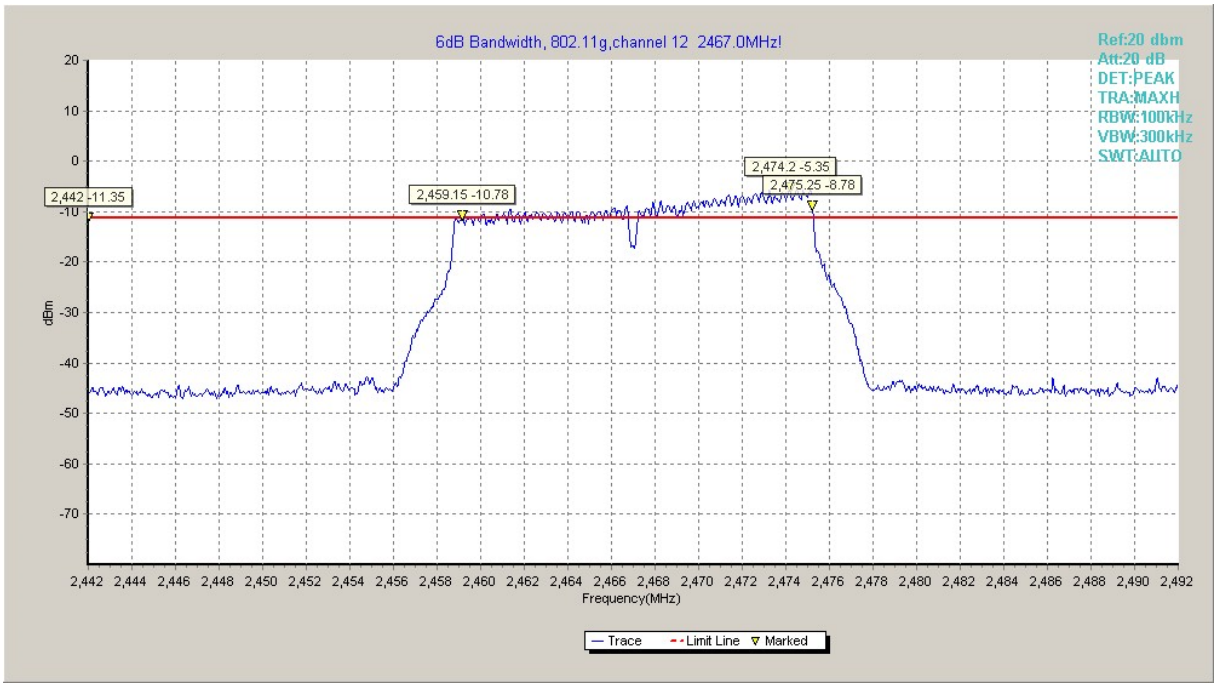


Fig.A.4.9 Occupied 6dB Bandwidth (802.11g, Ch 12)

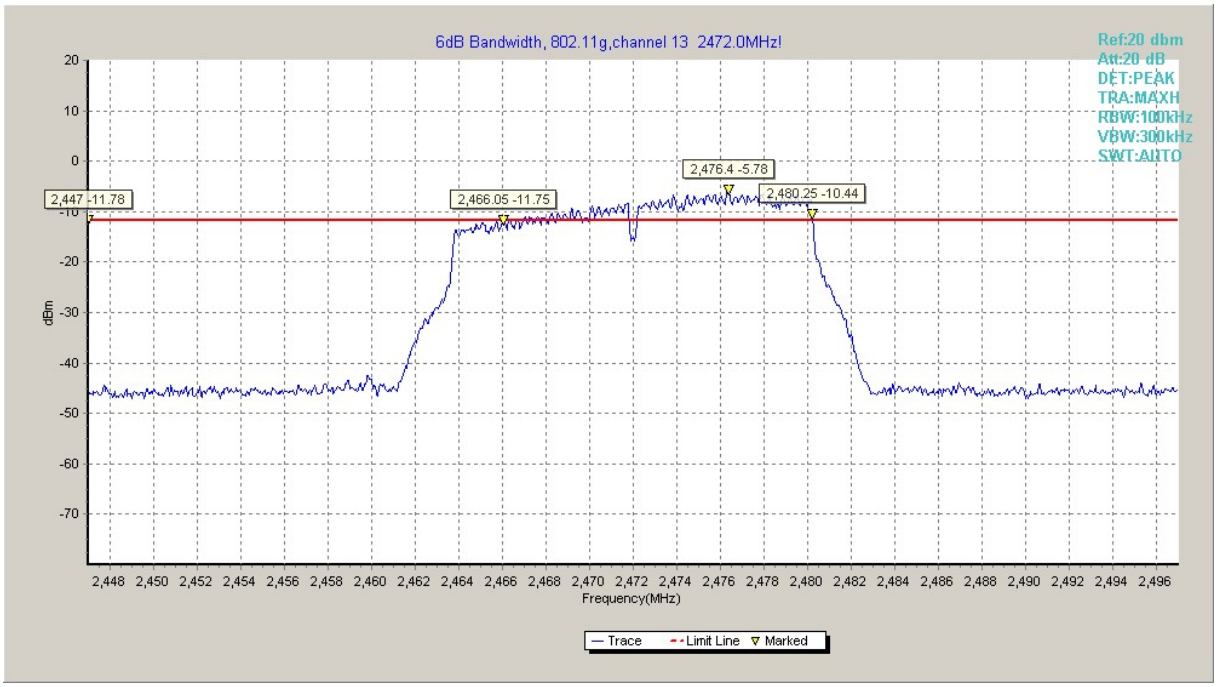


Fig.A.4.10 Occupied 6dB Bandwidth (802.11g, Ch 13)

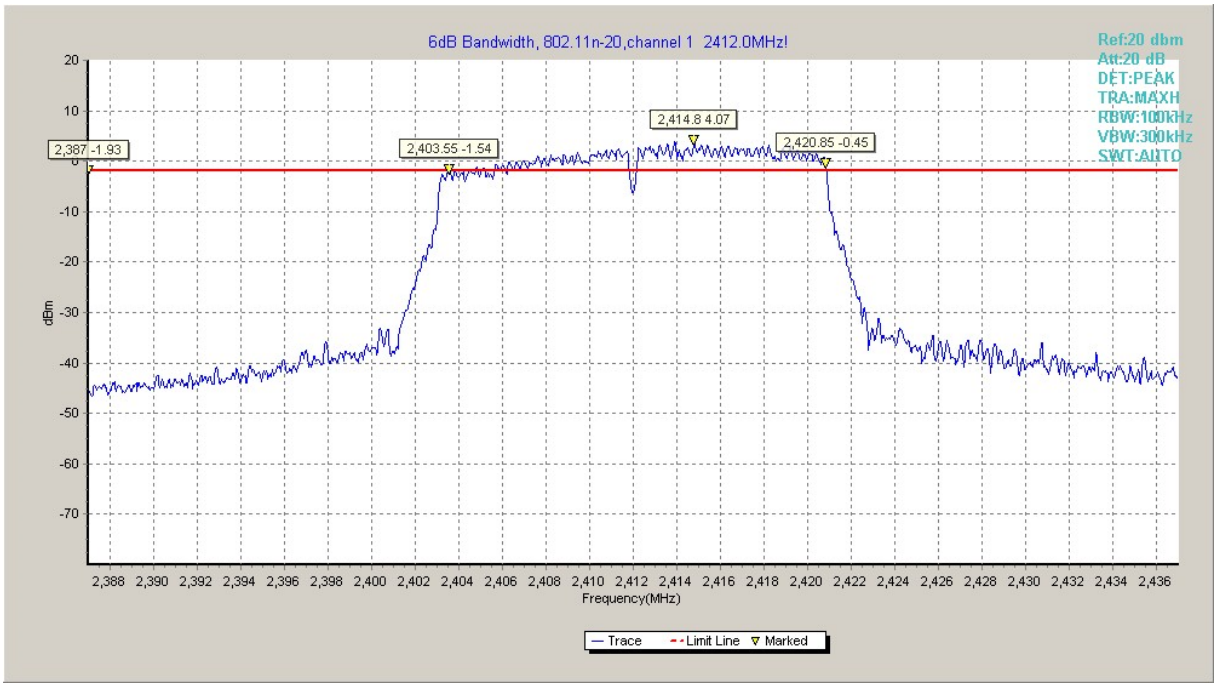


Fig.A.4.11 Occupied 6dB Bandwidth (802.11n-20MHz, Ch 1)

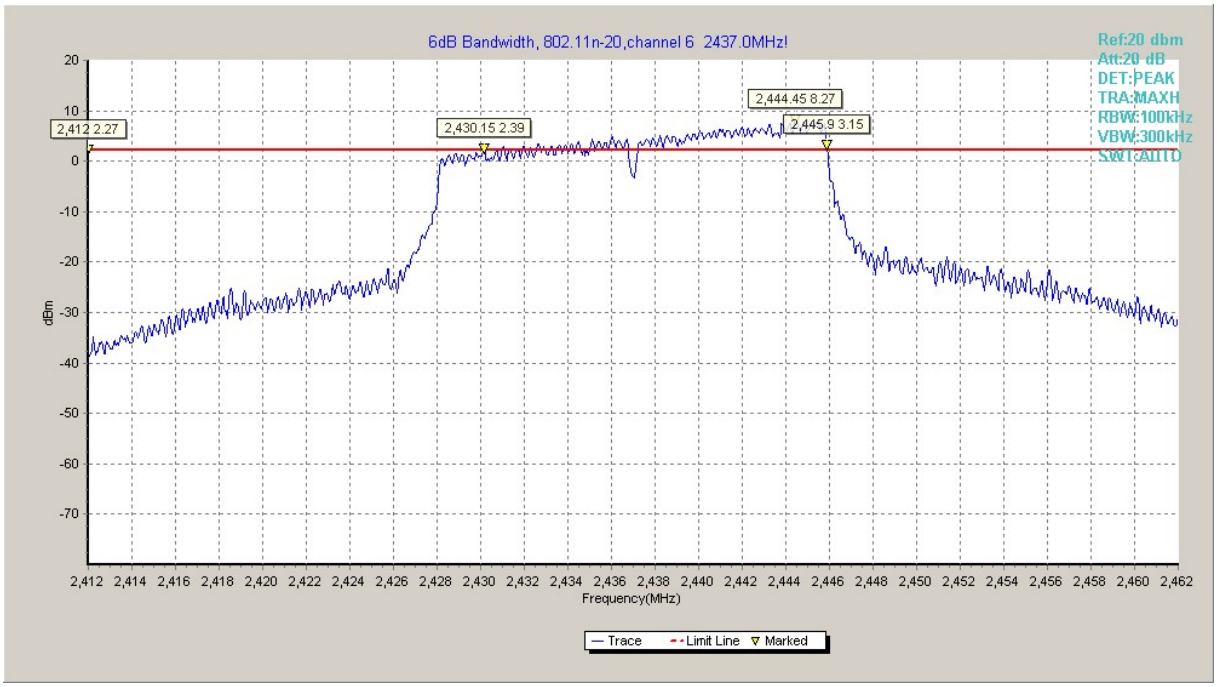


Fig.A.4.12 Occupied 6dB Bandwidth (802.11n-HT20, Ch 6)

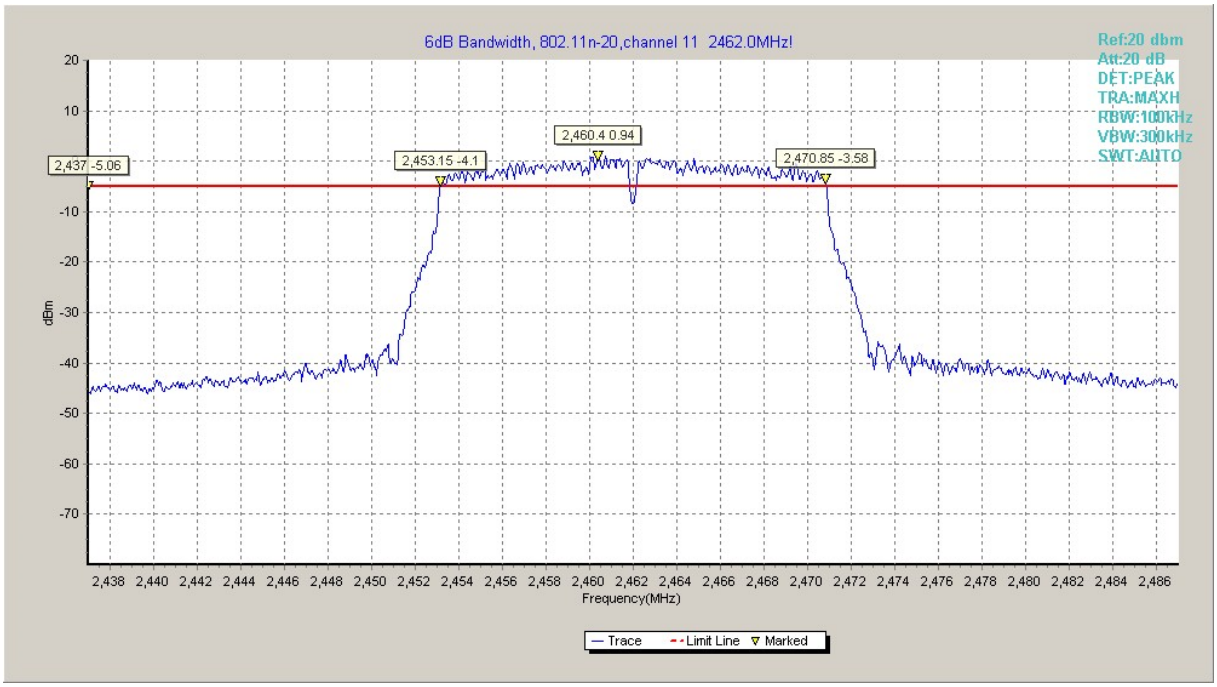


Fig.A.4.13 Occupied 6dB Bandwidth (802.11n-HT20, Ch 11)

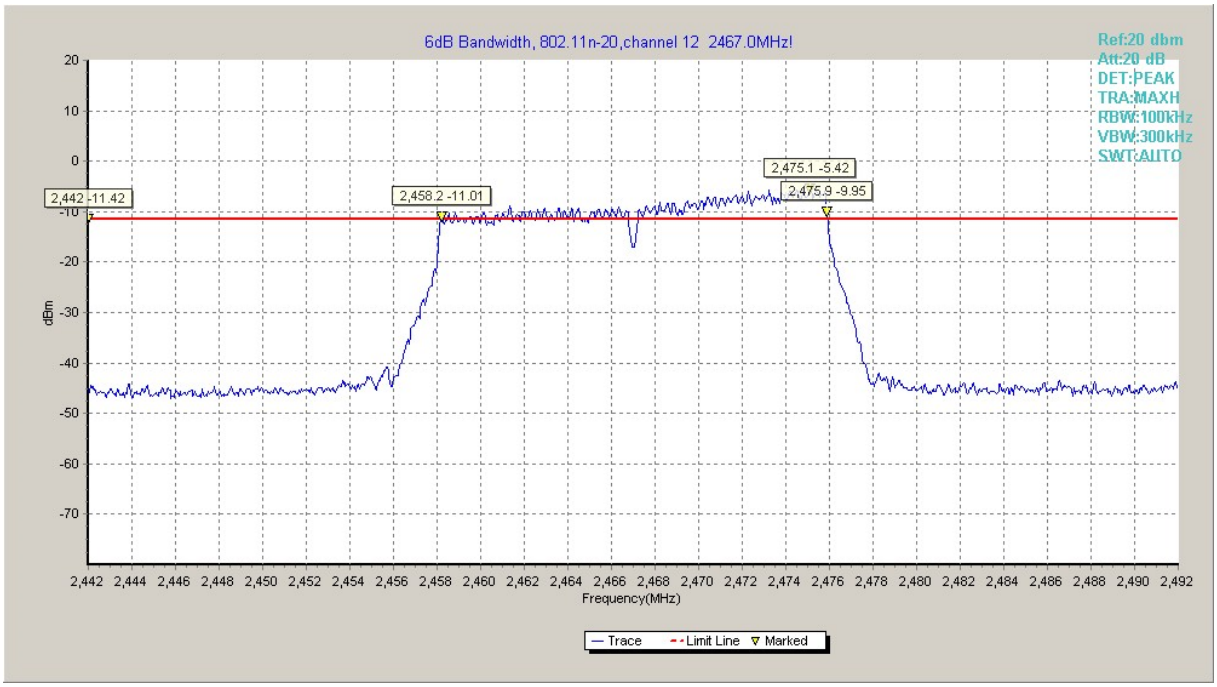


Fig.A.4.14 Occupied 6dB Bandwidth (802.11n-HT20, Ch 12)

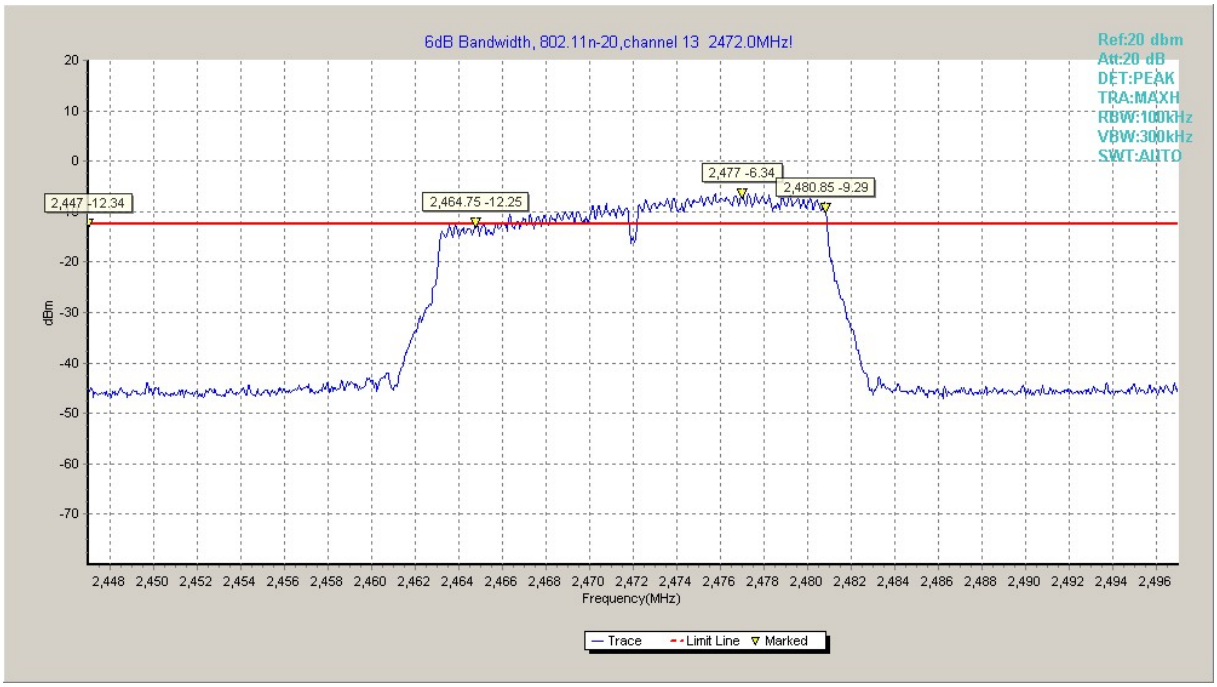


Fig.A.4.15 Occupied 6dB Bandwidth (802.11n-HT20, Ch 13)

A.5. Band Edges Compliance

Method of Measurement: See ANSI C63.10-2013-clause 6.10.4

Connect the spectrum analyzer to the EUT using an appropriate RF cable connected to the EUT output. Configure the spectrum analyzer settings as described below.

a) Set Span = 100MHz
b) Sweep Time: coupled
c) Set the RBW= 100 kHz
c) Set the VBW= 300 kHz
d) Detector: Peak
e) Trace: Max hold

Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	> 20

EUT ID: EUT2

Measurement Result:

802.11b/g mode

Mode	Channel	Test Results	Conclusion
802.11b	1	Fig.A.5.1	**P**
	11	Fig.A.5.2	**P**
	12	Fig.A.5.3	**P**
	13	Fig.A.5.4	**P**
802.11g	1	Fig.A.5.5	**P**
	11	Fig.A.5.6	**P**
	12	Fig.A.5.7	**P**
	13	Fig.A.5.8	**P**

802.11n-HT20 mode

Mode	Channel	Test Results	Conclusion
802.11n (HT20)	1	Fig.A.5.9	**P**
	11	Fig.A.5.10	**P**
	12	Fig.A.5.11	**P**
	13	Fig.A.5.12	**P**

Conclusion: Pass

Test graphs as below: