FCC PART 15C
TEST REPORT
No.I20Z70029-IOT01

for

Client name: Samsung Electronics. Co., Ltd.

Product name: Mobile phone

Model name: SM-A015T1

With

FCC ID: ZCASMA015T1

Hardware Version: REV3.0

Software Version: A015T1.001 (A015T1UVE1ATC1)

Issued Date: 2020-03-16

Note:

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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:

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I20Z70029-IOT01	Rev.0	1st edition	2020-03-16
I20Z70029-IOT01	Rev.1	2nd edition	2020-03-16

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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

1.3. Testing Environment

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

1.4. Project date

Testing Start Date:	2019-10-18
Testing End Date:	2020-01-13

1.5. Signature

Xie Xiuzhen

(Prepared this test report)

Zheng Wei

(Reviewed this test report)

Hu Xiaoyu

(Approved this test report)

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2. Client Information

2.1. Applicant Information

Company Name:	Samsung Electronics. Co., Ltd.
Address:	19 Chapin Rd.,Building D Pine Brook, NJ 07058
Contact:	Jenni Chun
Email:	j1.chun@samsung.com
Telephone:	+1-201-937-4203
Fax:	/

2.2. Manufacturer Information

Company Name:	Samsung Electronics. Co., Ltd.
Address:	Samsung R5, Maetan dong 129, Samsung ro Youngtong gu, Suwon city 443 742, Korea
Contact:	JP KIM
Email:	jp426.kim@samsung.com
Telephone:	+82-10-4376-0326
Fax:	/

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

3.1. About EUT

Description	Mobile phone
Model name	SM-A015T1
FCC ID	ZCASMA015T1
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	26.93dBm
Power Supply	3.85V

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	/	REV3.0	A015T1.001(A015T1UVE1ATC1)
EUT2	/	REV3.0	A015T1.001(A015T1UVE1ATC1)
EUT3	/	REV3.0	A015T1.001(A015T1UVE1ATC1)

*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	Inbuilt
AE3	Charger	/
AE6	USB Cable	/

AE1

Model	QL1695
Manufacturer	Ningde Amperex Technology Limited
Capacitance	/
Nominal voltage	3.85 V

AE3

Model	EP-TA50JWE
Manufacturer	DongYang E&P Inc.
Length of cable	/

AE6

Model	ECB-DU68WE
Manufacturer	SHENGHUA
Length of cable	/

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

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3.4. General Description

The Equipment under Test (EUT) is a model of Mobile phone 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

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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)	/	**BR**
Peak Power Spectral Density	15.247 (e)	/	**BR**
Occupied 6dB Bandwidth	15.247 (a)	/	**BR**
Band Edges Compliance	15.247 (d)	/	**BR**
Transmitter Spurious Emission - Conducted	15.247 (d)	/	**BR**
Transmitter Spurious Emission - Radiated	15.247, 15.205, 15.209	/	**BR**
AC Powerline Conducted Emission	15.107, 15.207	/	**BR**

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
BR	Re-use test data from basic model report.
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.

5.3. Explanation of re-use of test data

The Equipment Under Test (EUT) model SM-A015T1 (FCC ID: ZCASMA015T1) is a variant product of SM-A015V (FCC ID: ZCASMA015V), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements were performed on this device, all the test results are derived from test report No.I19Z70303-IOT05. For detail differences between two models please refer the Declaration of Changes document. 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	26℃
Voltage	3.85V
Humidity	44%

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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	Bluetooth Tester	CBT32	101042	Rohde & Schwarz	1 year	2020-02-08
3	LISN	ENV216	101200	Rohde & Schwarz	1 year	2020-03-14
4	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2020-02-14
5	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	2020-03-01
2	BiLog Antenna	VULB9163	1222	Schwarzbeck	1 year	2020-03-14
3	Dual-Ridge Waveguide Horn Antenna	3115	6914	ETS-Lindgren	1 year	2021-01-03

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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	5.40
1GHz ≤ f ≤18GHz	4.32
18GHz ≤ f ≤40GHz	5.26

7.6. AC Power-line Conducted Emission

Measurement Uncertainty : 3.38dB,k=2

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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

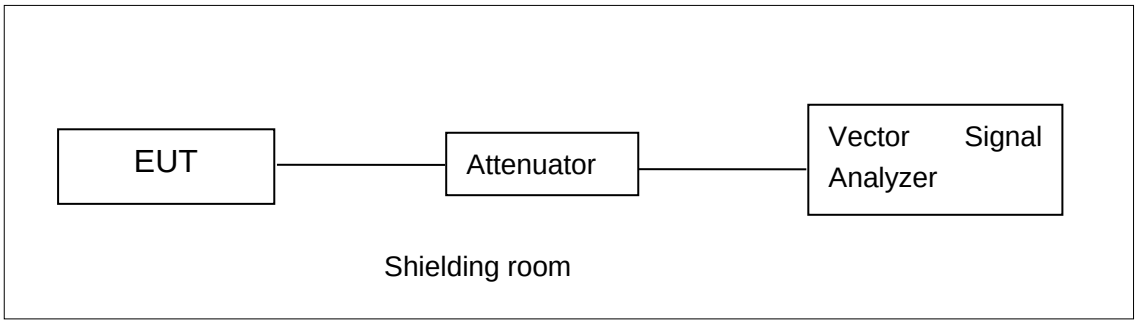

Fig.A.1.1.1: Test Setup Diagram for Conducted Measurements

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;

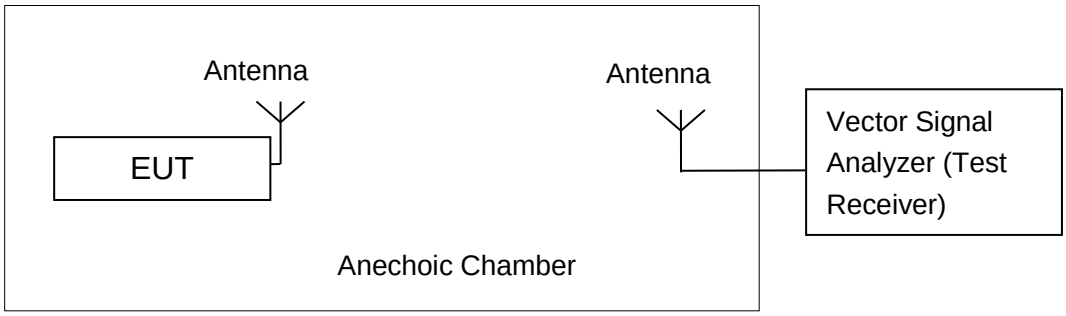

Fig.A.1.2.1: Test Setup Diagram for Radiated Measurements

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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)
802.11b	1	21.39	/	/
	2	21.80	/	/
	5.5	23.24	/	/
	11	24.23	24.33	24.47
802.11g	6	26.64	/	/
	9	26.66	26.93	26.85
	12	25.61	/	/
	18	25.65	/	/
	24	25.10	/	/
	36	25.05	/	/
	48	24.16	/	/
	54	24.11	/	/

The data rate 11Mbps and 9Mbps are selected as worse condition, and the following cases are performed with this condition.

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802.11n-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11n (20MHz)	MCS0	26.74	26.89	26.82
	MCS1	26.55	/	/
	MCS2	25.61	/	/
	MCS3	25.01	/	/
	MCS4	24.99	/	/
	MCS5	24.08	/	/
	MCS6	24.17	/	/
	MCS7	23.24	/	/

The data rate MCS0 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)
802.11n (40MHz)	MCS0	26.28	25.79	25.86
	MCS1	24.96	/	/
	MCS2	23.84	/	/
	MCS3	23.30	/	/
	MCS4	22.68	/	/
	MCS5	22.34	/	/
	MCS6	23.75	/	/
	MCS7	21.30	/	/

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

The spot check is 27.34(802.11g ch6 9Mbps).

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 = 1.5OBW.

b) Set RBW = 1MHz.

c) Set VBW = 3MHz

d) Number of points in sweep = 625

e) Sweep time = auto.

f) Detector = RMS.

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g) If transmit duty cycle < 98%, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at the maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFFintervals) or at duty cycle ⩾98%, and if each transmission is entirely at the maximum power control level, then 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. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Duty Cycle

802.11b	1Mbps	2Mbps	5.5Mbps	11Mbps
	100%	100%	100%	100%

802.11g	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
	100%	99%	99%	99%	99%	98%	97%	97%
802.11n(20MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
	99%	99%	98%	98%	97%	97%	97%	97%
802.11n(40MHz)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
	98%	96%	95%	93%	91%	87%	87%	86%

802.11b/g mode

Mode	**Test Result (dBm)**		
	2412MHz (Ch1)	**2437MHz (Ch6)**	**2462 MHz (Ch11)**
802.11b	18.68	18.83	18.76
802.11g	19.29	19.50	19.45

802.11n-HT20 mode

Mode	**Test Result (dBm)**		
	2412MHz (Ch1)	**2437MHz (Ch6)**	**2462 MHz (Ch11)**
802.11n (20MHz)	19.37	19.53	19.50

802.11n-HT40 mode

Mode	**Test Result (dBm)**		
	2422MHz (Ch3)	**2437MHz (Ch6)**	**2452 MHz (Ch9)**
802.11n(40MHz)	18.77	18.54	18.52

Conclusion: Pass

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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	-4.99	**P**
	6	Fig.A.3.2	-5.10	**P**
	11	Fig.A.3.3	-5.56	**P**
802.11g	1	Fig.A.3.4	-6.79	**P**
	6	Fig.A.3.5	-5.85	**P**
	11	Fig.A.3.6	-5.02	**P**

802.11n-HT20 mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11n (HT20)	1	Fig.A.3.7	-6.60	**P**
	6	Fig.A.3.8	-6.53	**P**
	11	Fig.A.3.9	-5.02	**P**

802.11n-HT40 mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11n (HT40)	3	Fig.A.3.10	-10.45	**P**
	6	Fig.A.3.11	-10.89	**P**
	9	Fig.A.3.12	-10.91	**P**

Conclusion: Pass

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Test graphs as below:

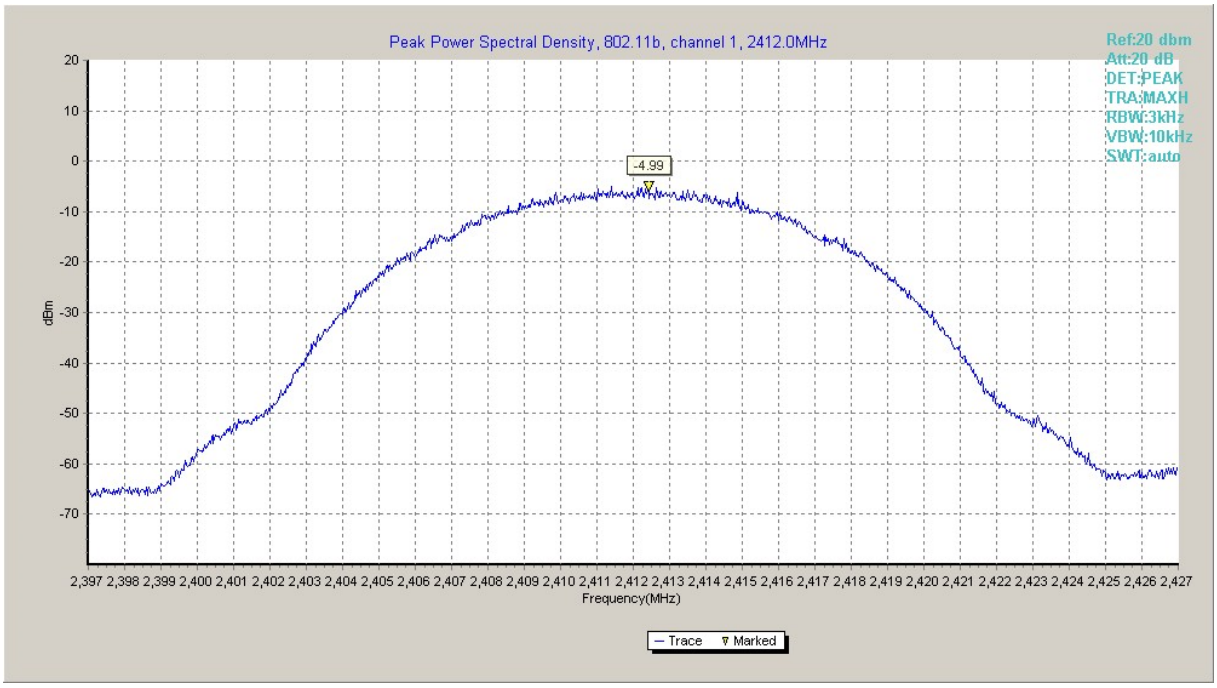

Fig.A.3.1 Power Spectral Density(802.11b,Ch1)

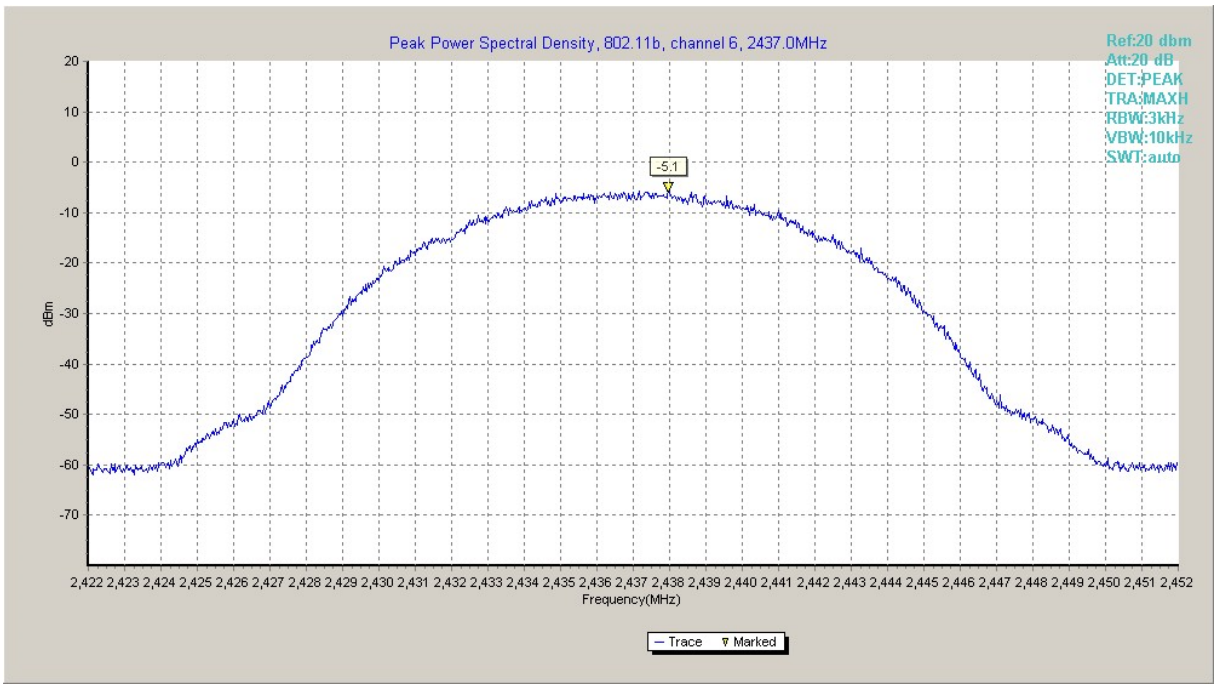

Fig.A.3.2 Power Spectral Density (802.11b, Ch 6)

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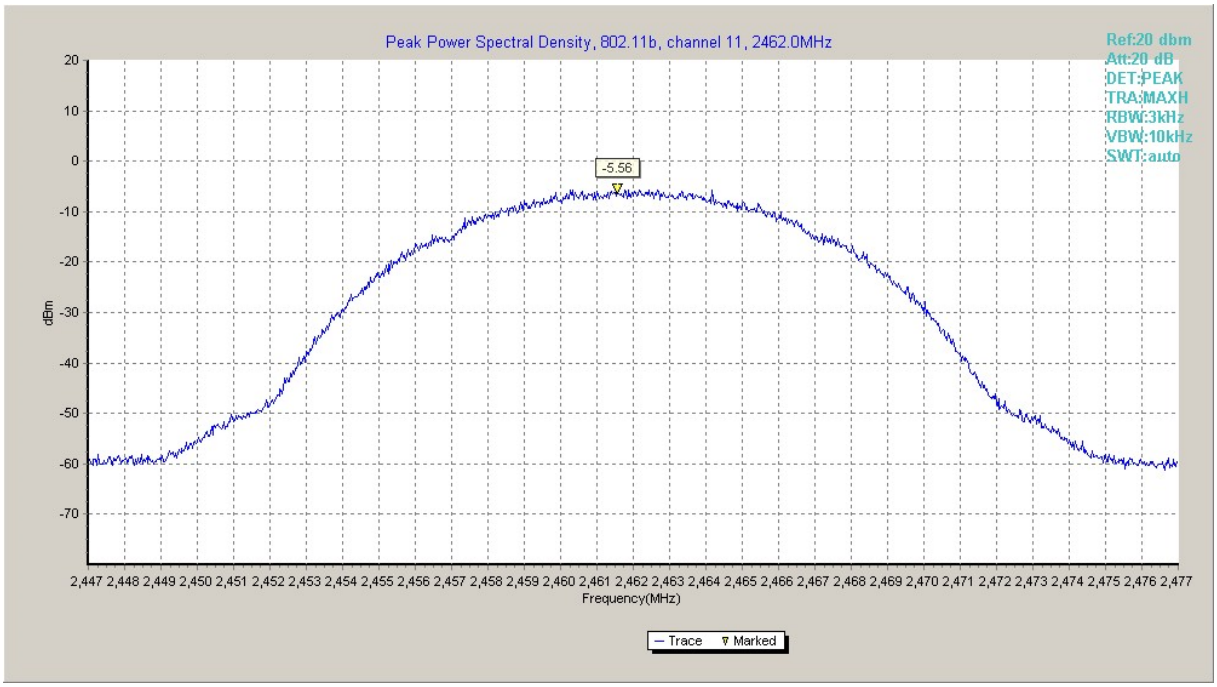

Fig.A.3.3 Power Spectral Density (802.11b, Ch 11)

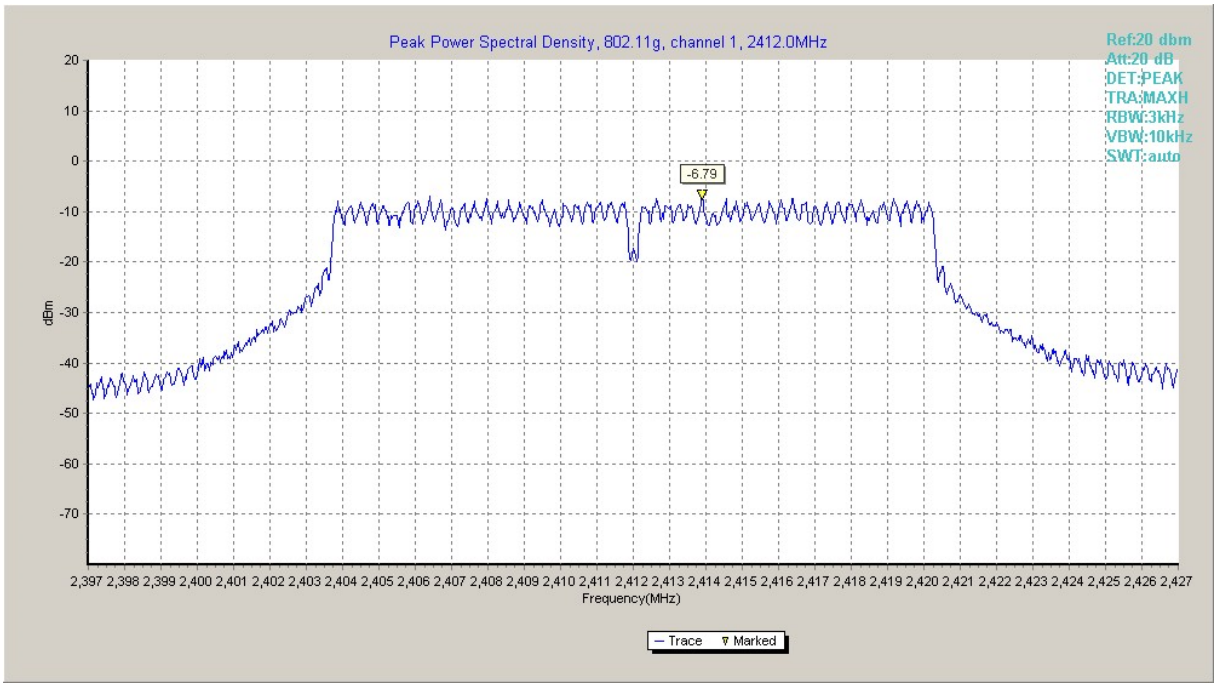

Fig.A.3.4 Power Spectral Density (802.11g, Ch 1)

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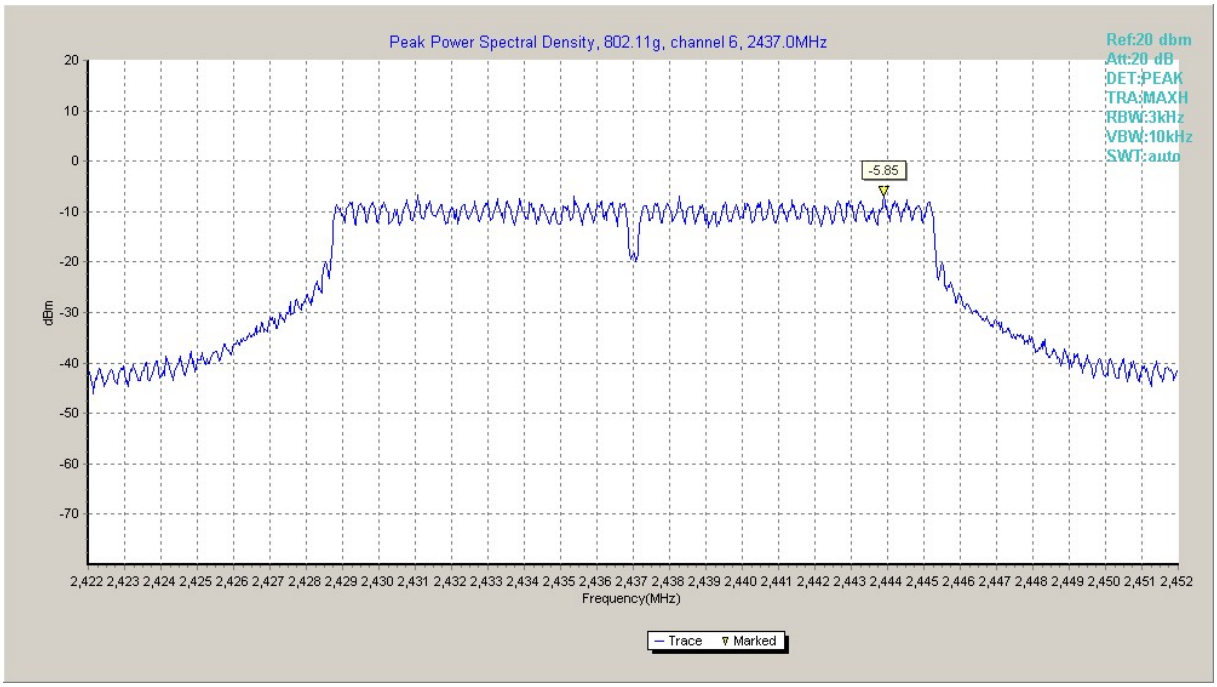

Fig.A.3.5 Power Spectral Density (802.11g, Ch 6)

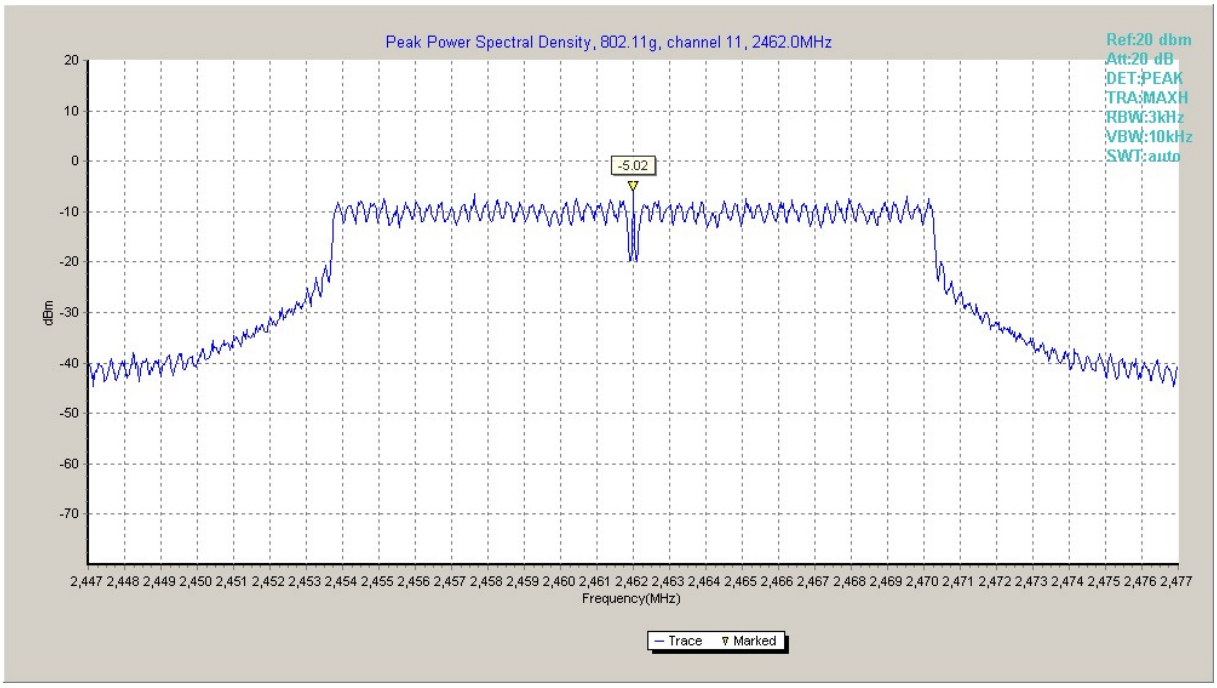

Fig.A.3.6 Power Spectral Density (802.11g, Ch 11)

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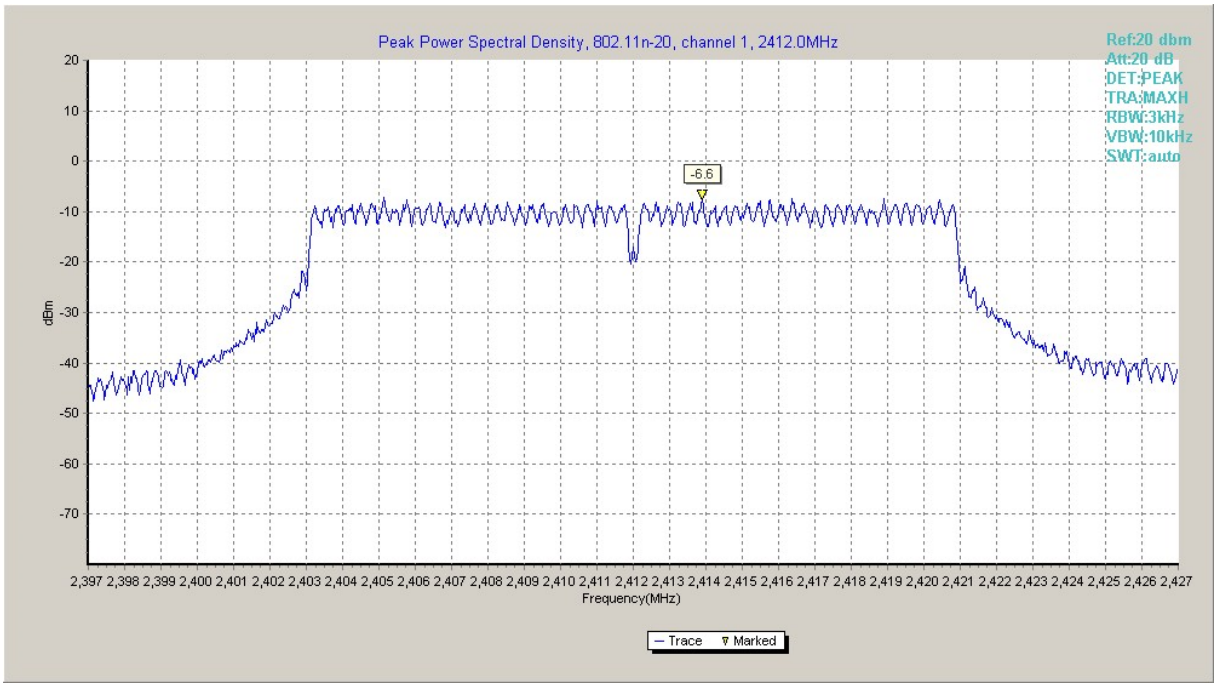

Fig.A.3.7 Power Spectral Density (802.11n-HT20, Ch 1)

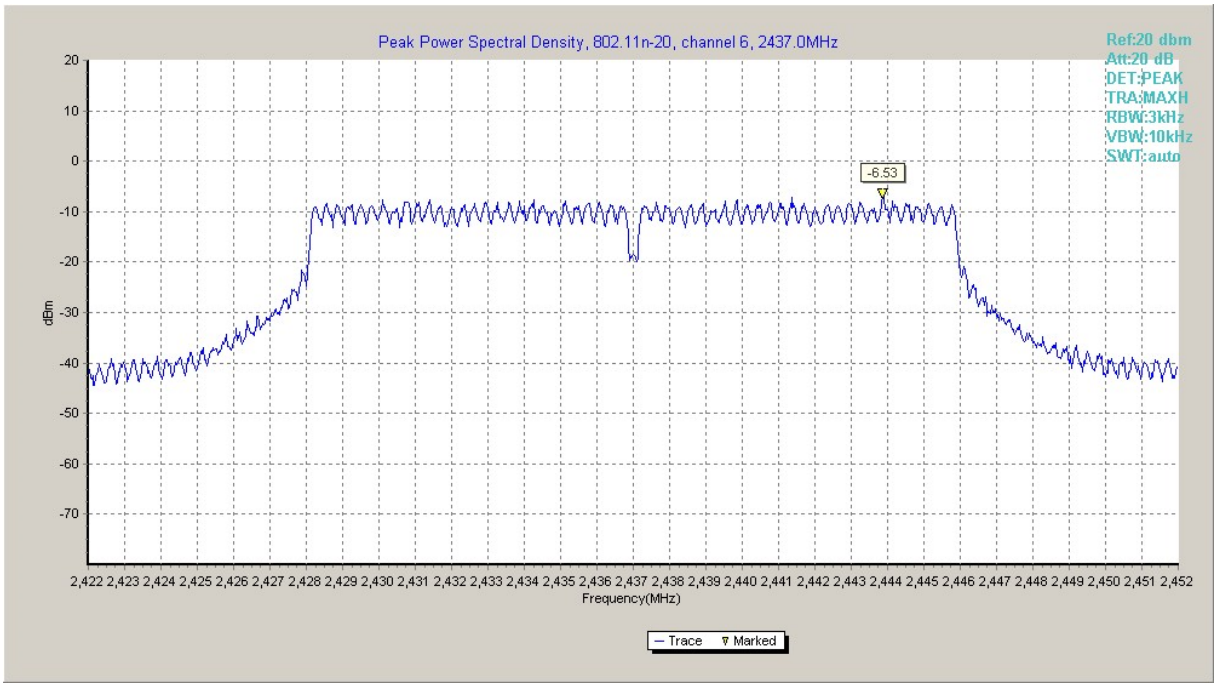

Fig.A.3.8 Power Spectral Density (802.11n-HT20, Ch 6)

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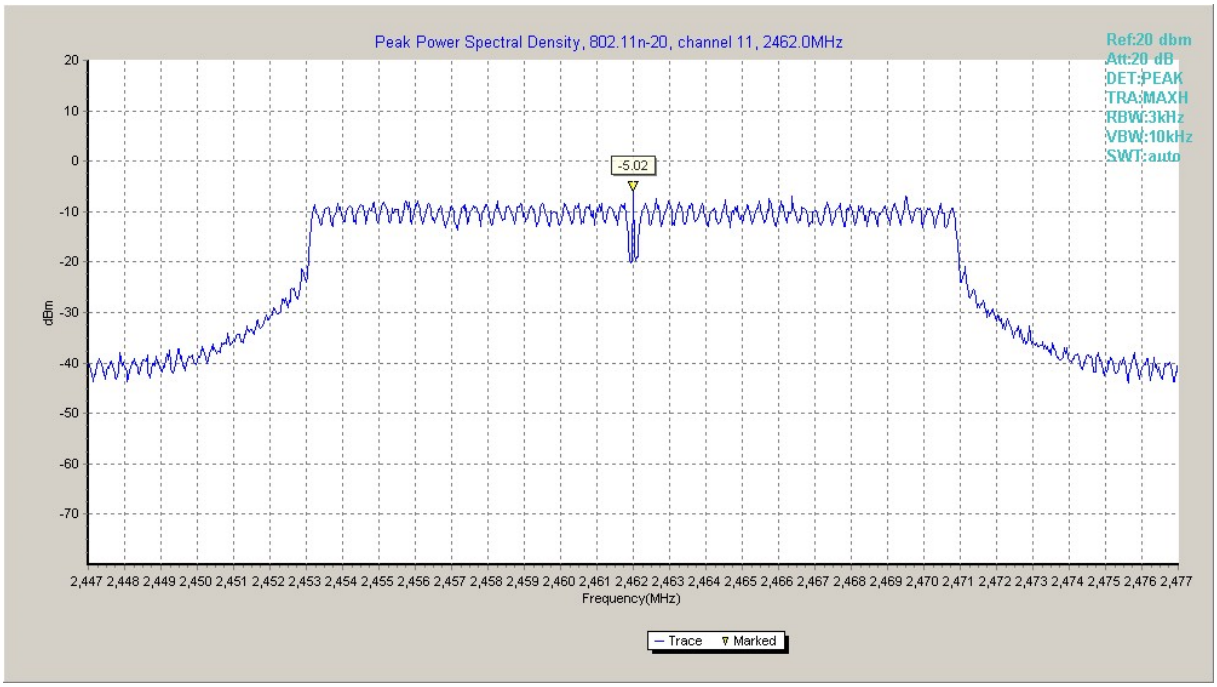

Fig.A.3.9 Power Spectral Density (802.11n-HT20, Ch 11)

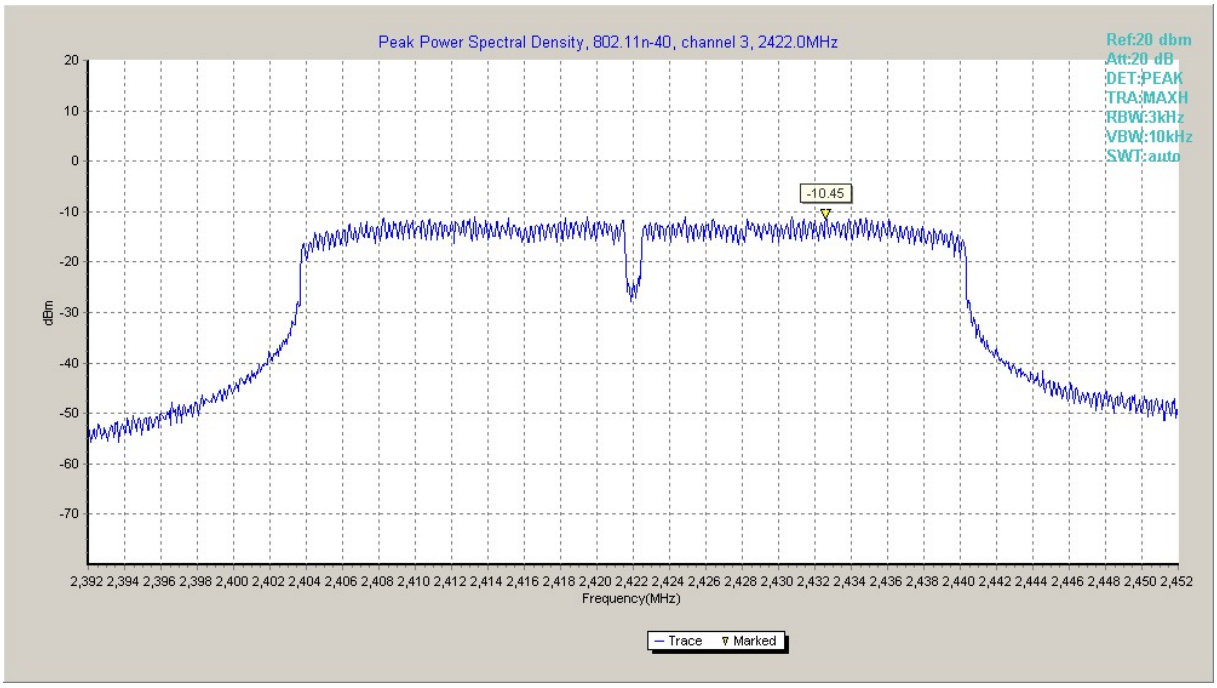

Fig.A.3.10 Power Spectral Density (802.11n-HT40, Ch 3)

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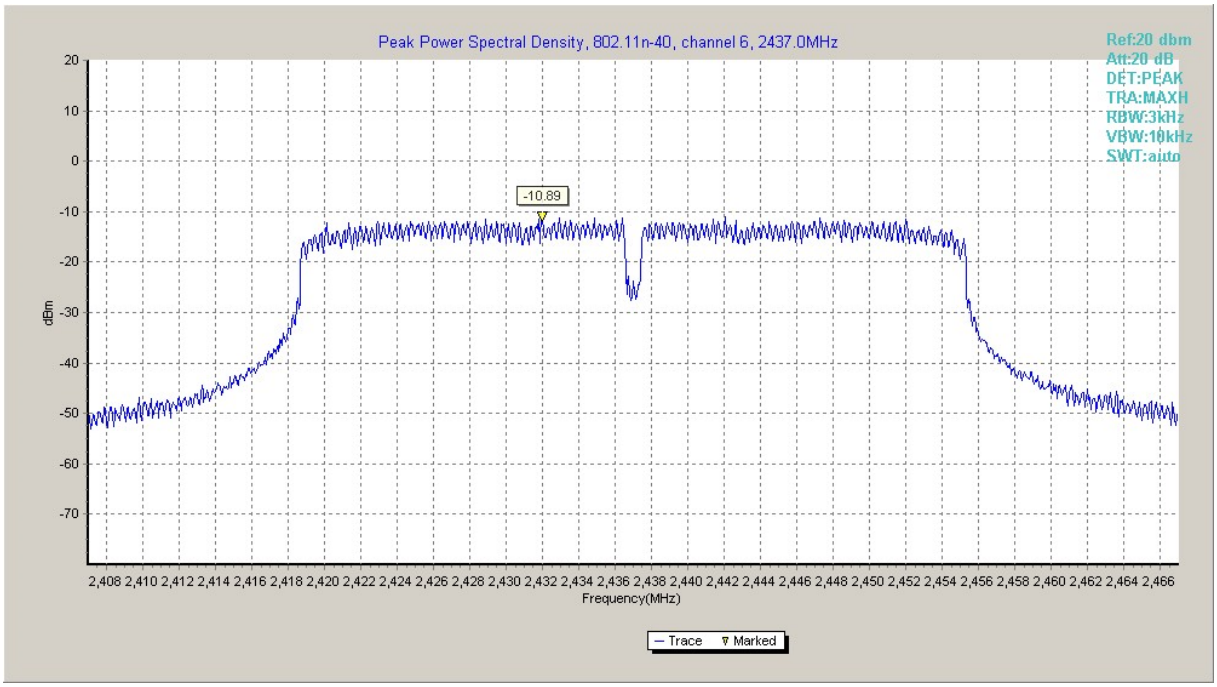

Fig.A.3.11 Power Spectral Density (802.11n-HT40, Ch 6)

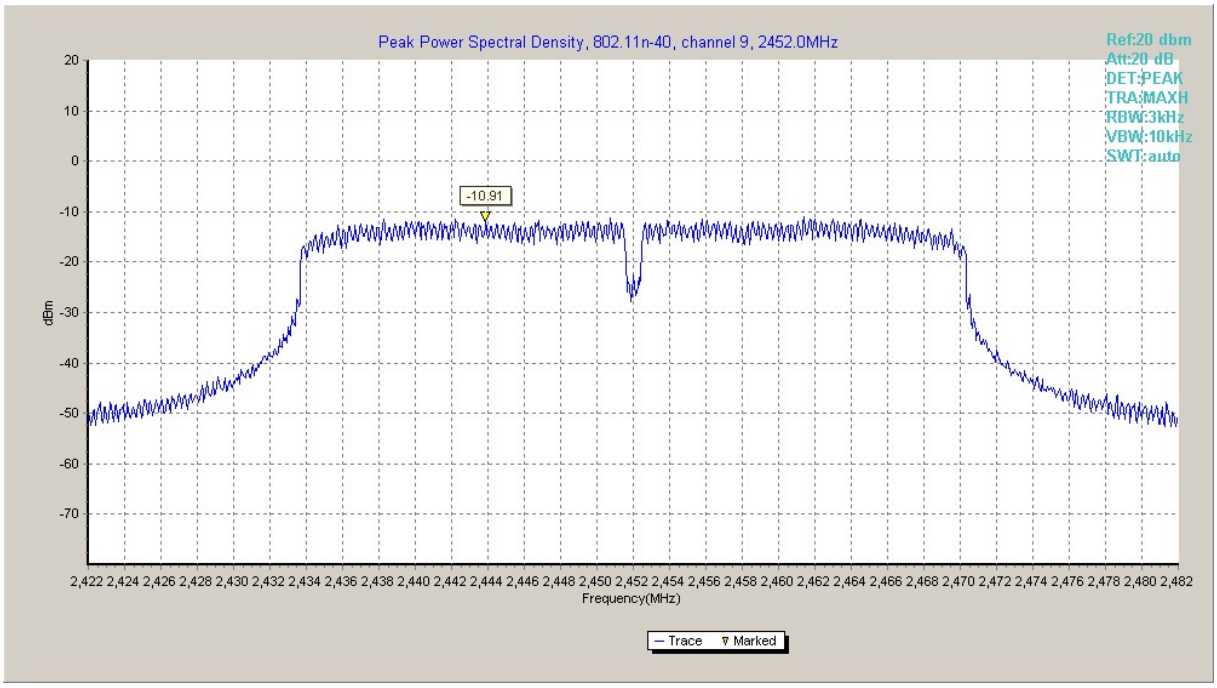

Fig.A.3.12 Power Spectral Density (802.11n-HT40, Ch 9)

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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 (MHz)		conclusion
802.11b	1	Fig.A.4.1	7.55	**P**
	6	Fig.A.4.2	8.45	**P**
	11	Fig.A.4.3	8.45	**P**
802.11g	1	Fig.A.4.4	16.35	**P**
	6	Fig.A.4.5	16.35	**P**
	11	Fig.A.4.6	16.30	**P**

802.11n-HT20 mode

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11n (HT20)	1	Fig.A.4.7	17.60	**P**
	6	Fig.A.4.8	17.60	**P**
	11	Fig.A.4.9	17.60	**P**

802.11n-HT40 mode

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11n (HT40)	3	Fig.A.4.10	35.12	**P**
	6	Fig.A.4.11	35.36	**P**
	9	Fig.A.4.12	35.12	**P**

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Conclusion: Pass

Test graphs as below:

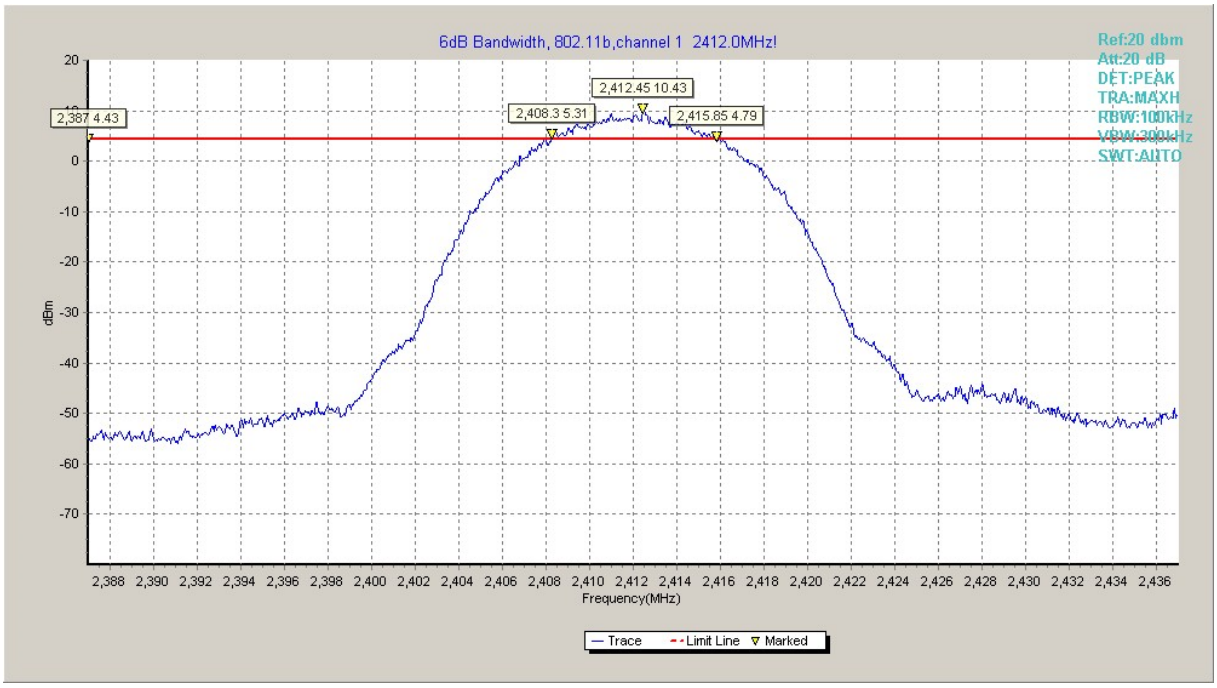

Fig.A.4.1 Occupied 6dB Bandwidth(802.11b,Ch 1)

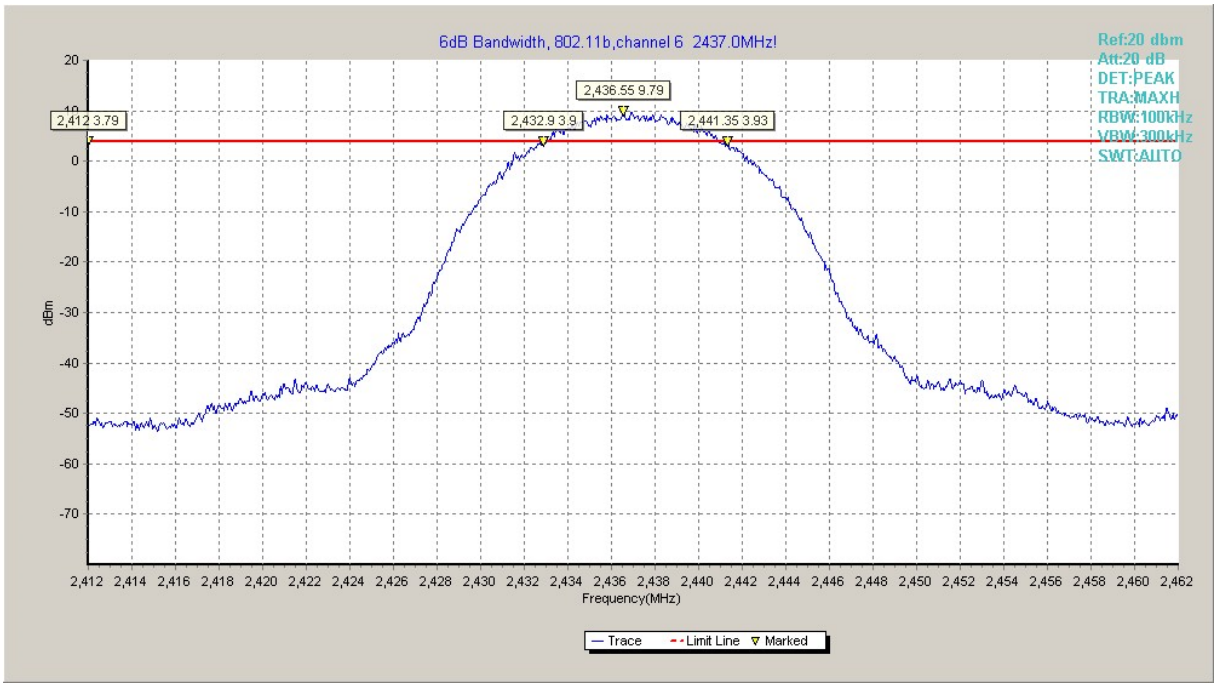

Fig.A.4.2 Occupied 6dB Bandwidth (802.11b, Ch 6)

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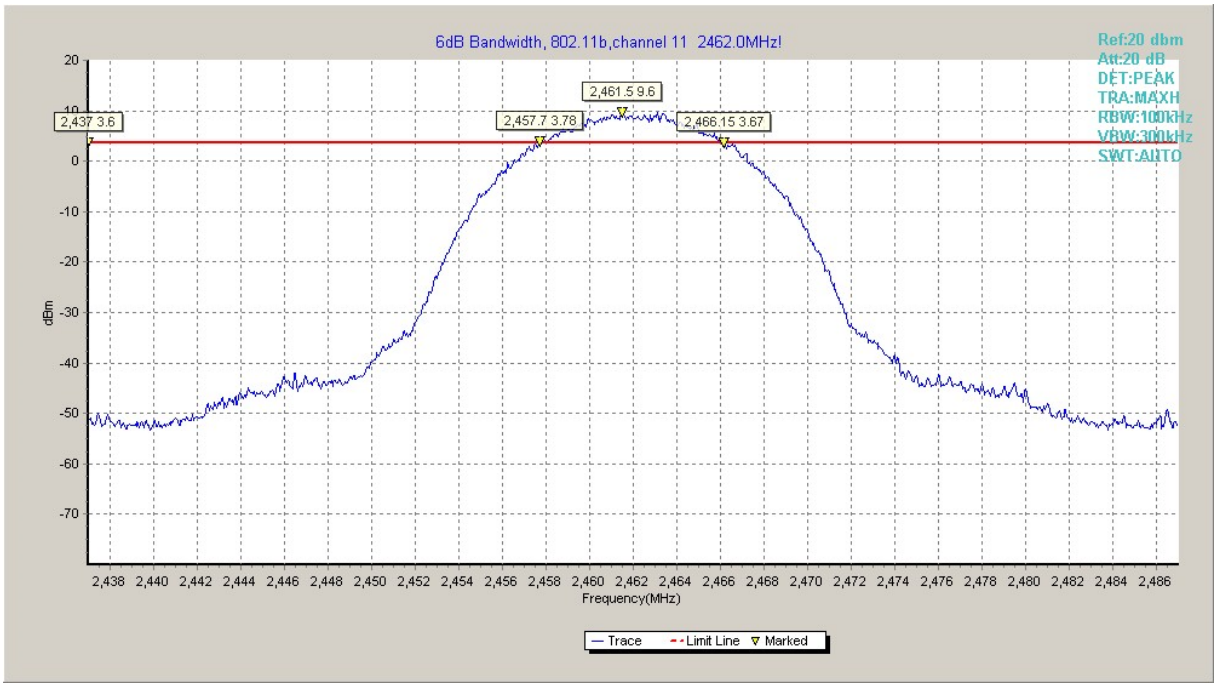

Fig.A.4.3 Occupied 6dB Bandwidth (802.11b, Ch 11)

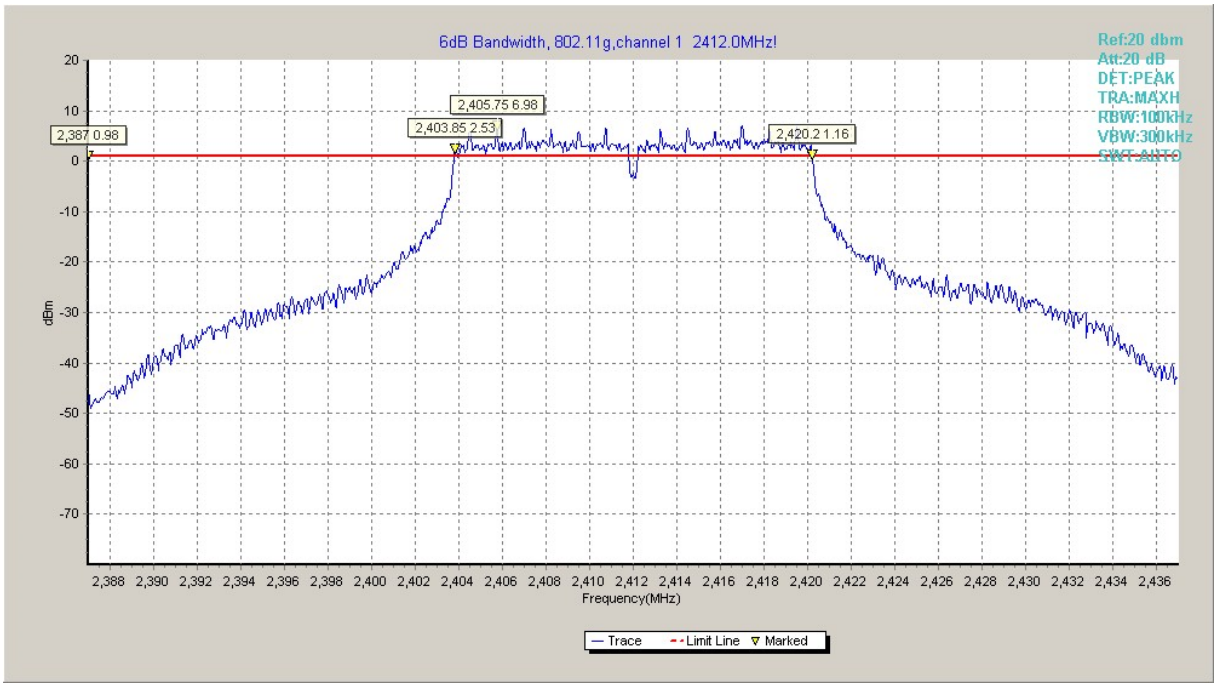

Fig.A.4.4 Occupied 6dB Bandwidth (802.11g, Ch 1)

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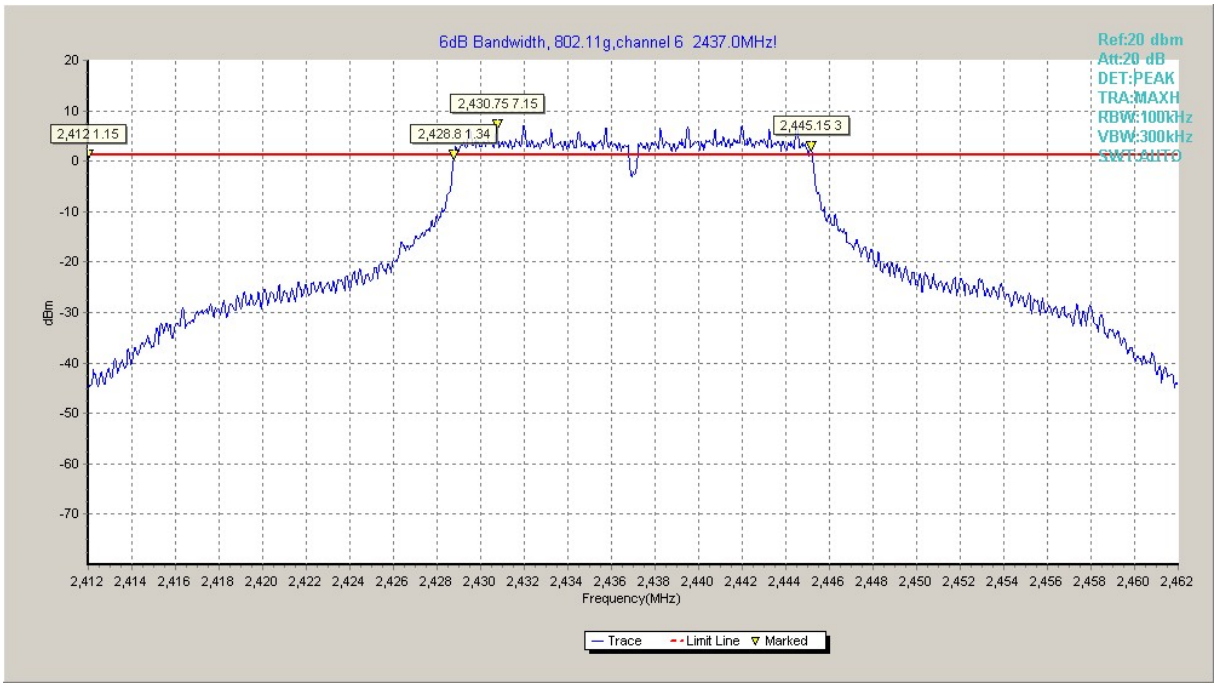

Fig.A.4.5 Occupied 6dB Bandwidth (802.11g, Ch 6)

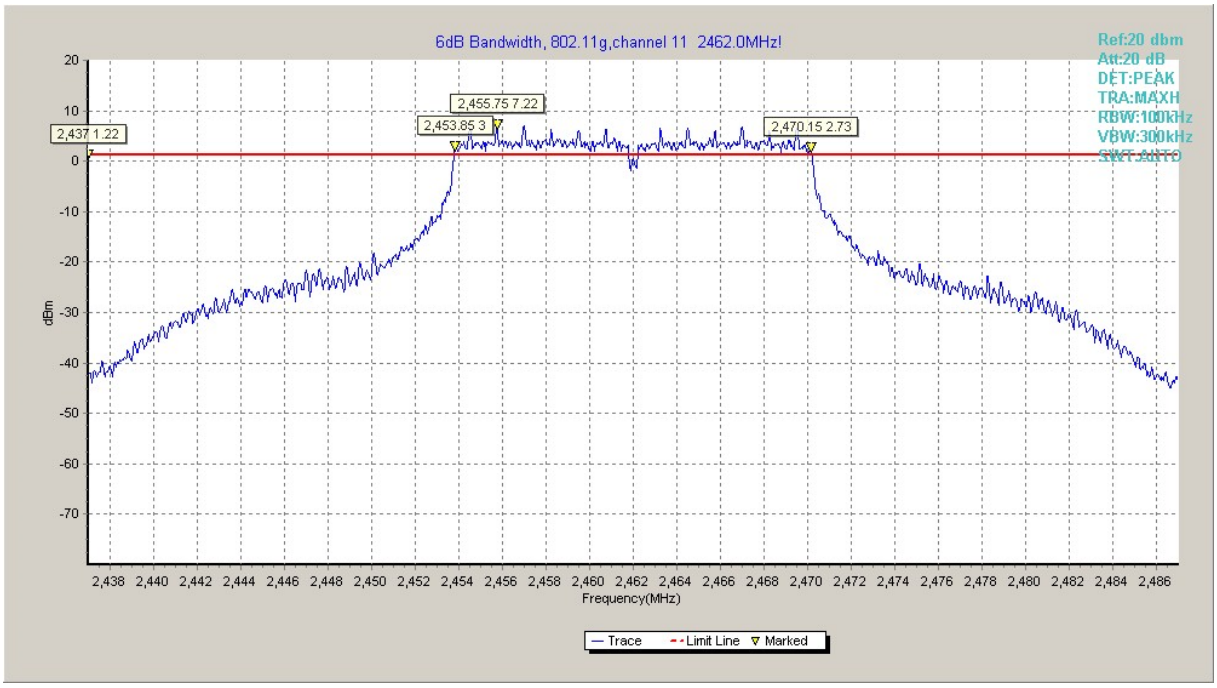

Fig.A.4.6 Occupied 6dB Bandwidth (802.11g, Ch 11)

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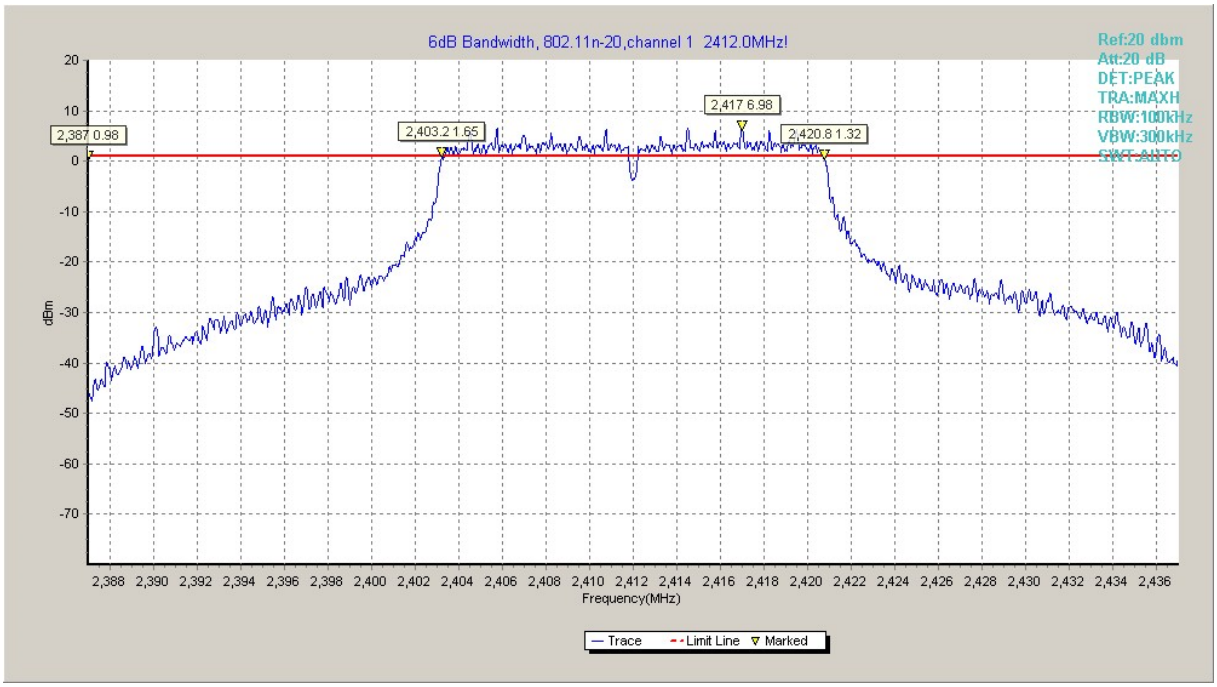

Fig.A.4.7 Occupied 6dB Bandwidth (802.11n-20MHz, Ch 1)

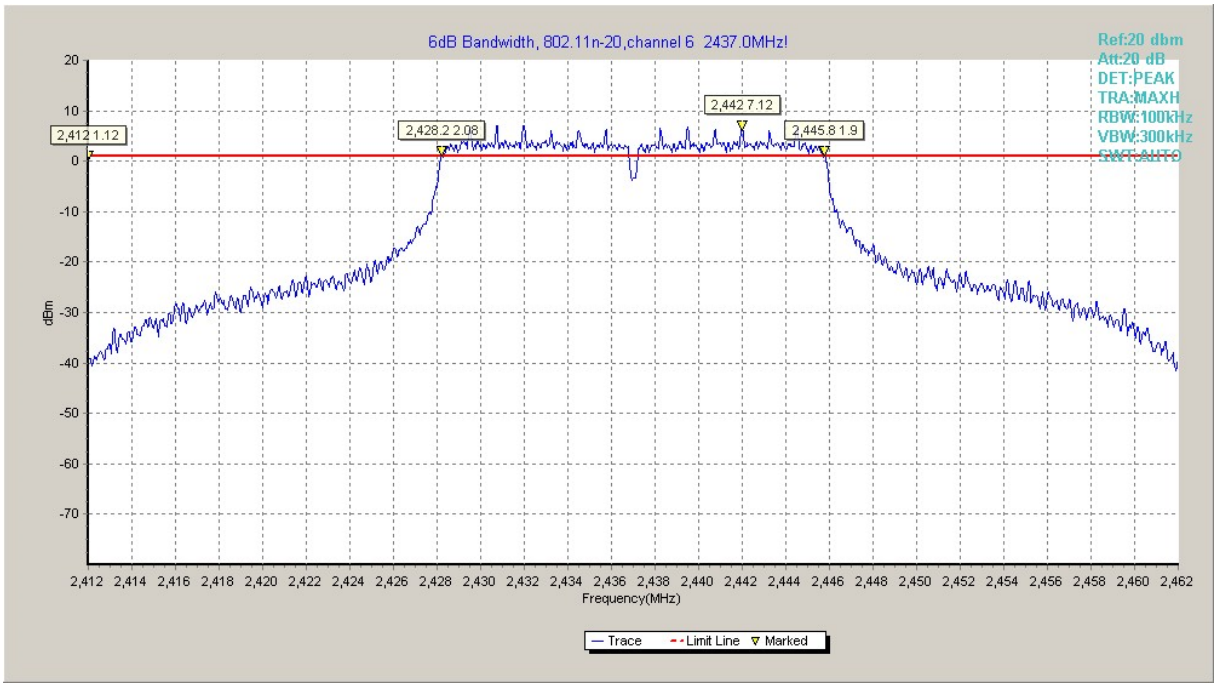

Fig.A.4.8 Occupied 6dB Bandwidth (802.11n-HT20, Ch 6)

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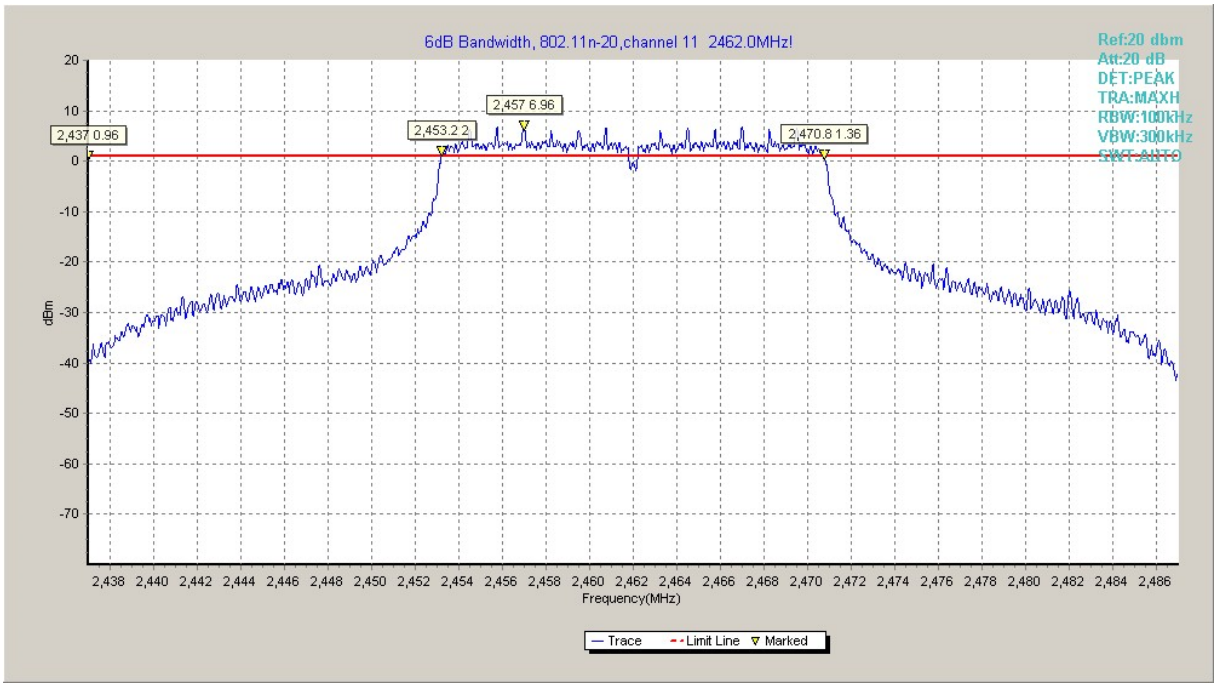

Fig.A.4.9 Occupied 6dB Bandwidth (802.11n-HT20, Ch 11)

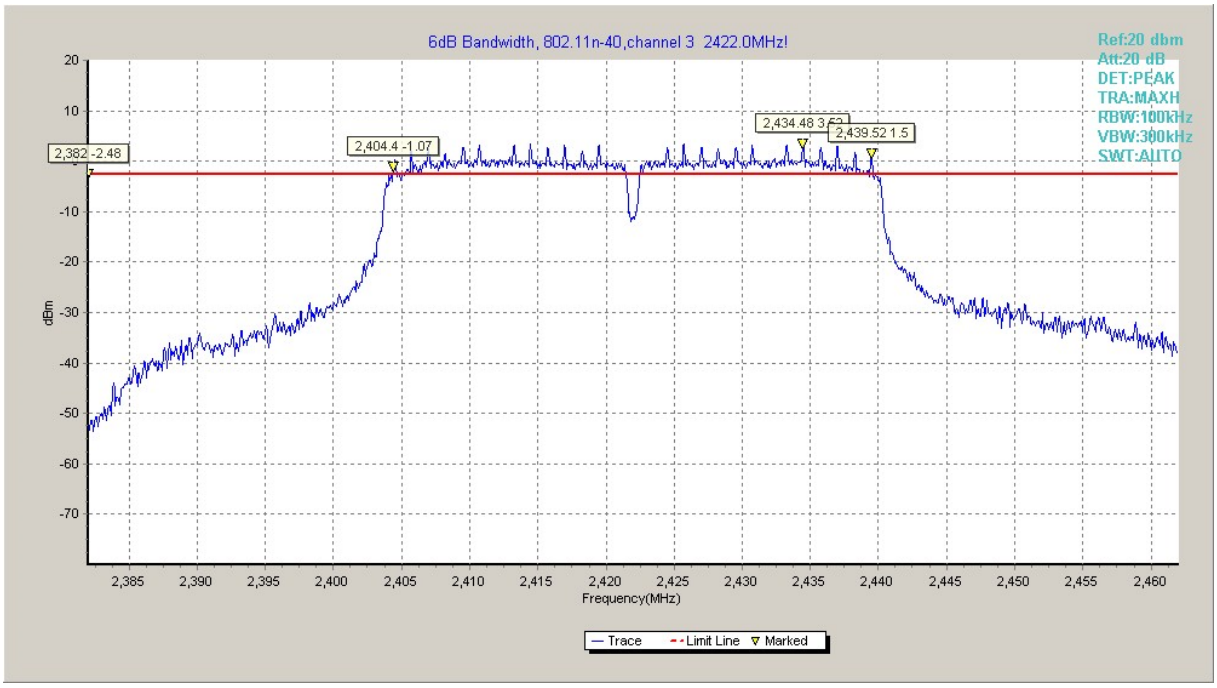

Fig.A.4.10 Occupied 6dB Bandwidth (802.11n-40MHz, Ch 3)

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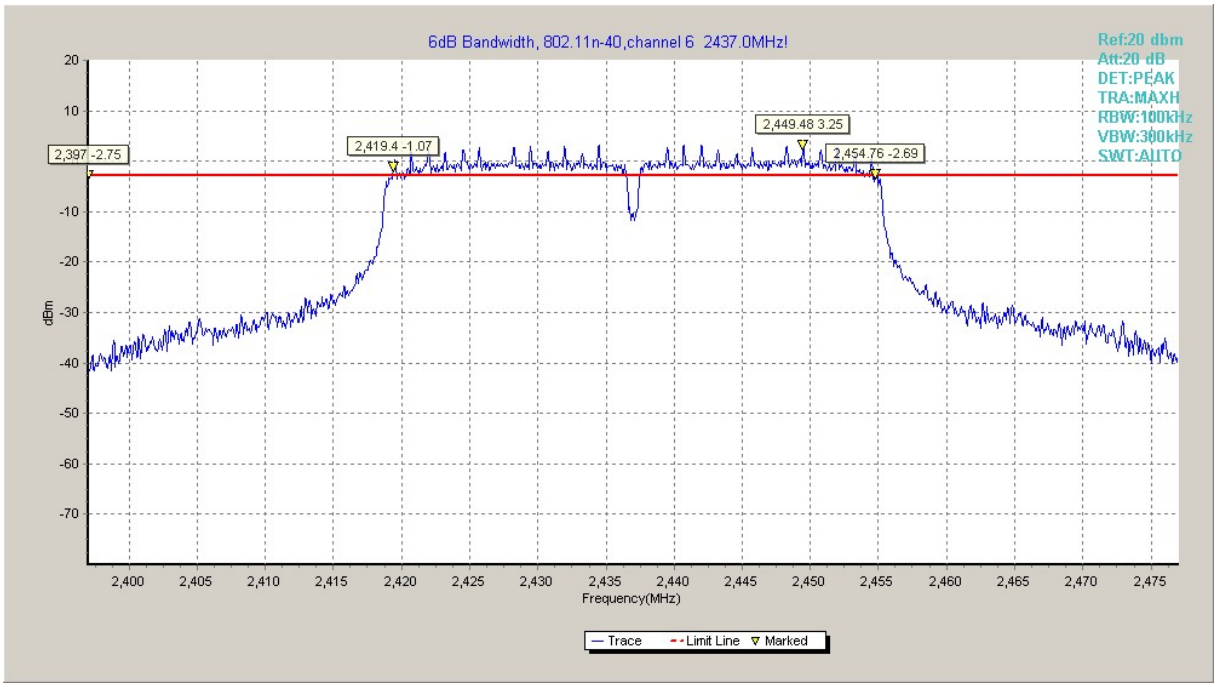

Fig.A.4.11 Occupied 6dB Bandwidth (802.11n-HT40, Ch 6)

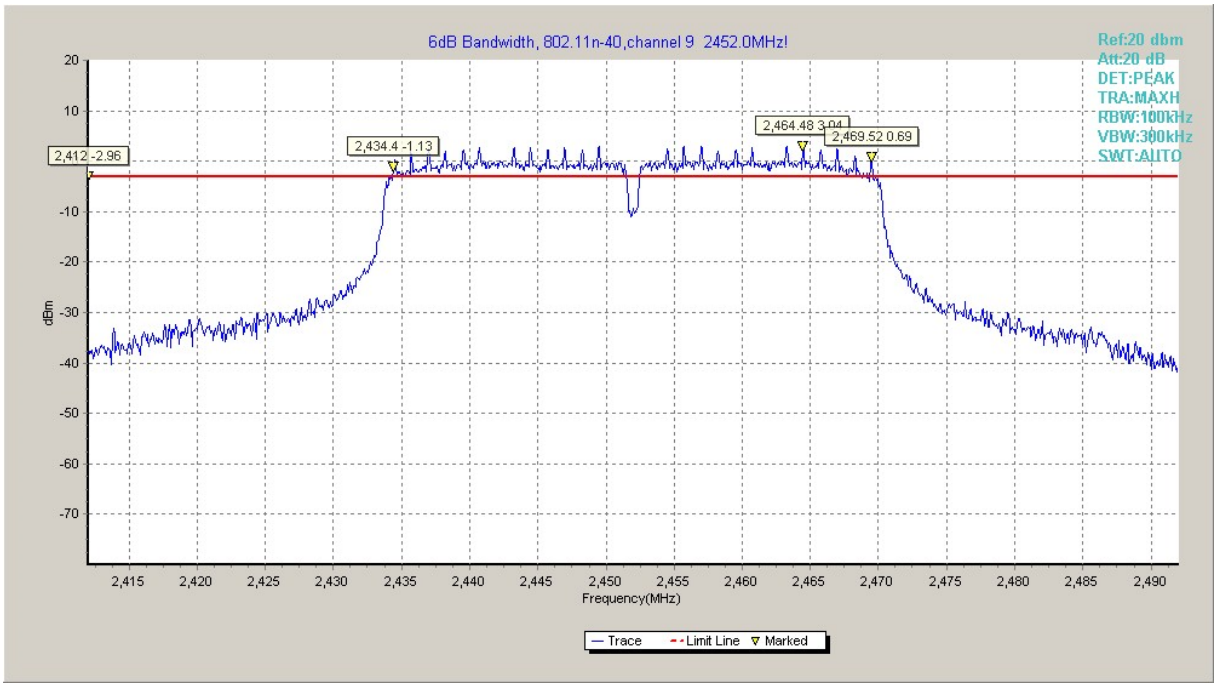

Fig.A.4.12 Occupied 6dB Bandwidth (802.11n-HT40, Ch 9)

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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**
802.11g	1	Fig.A.5.3	**P**
	11	Fig.A.5.4	**P**

802.11n-HT20 mode

Mode	Channel	Test Results	Conclusion
802.11n (HT20)	1	Fig.A.5.5	**P**
	11	Fig.A.5.6	**P**

802.11n-HT40 mode

Mode	Channel	Test Results	Conclusion
802.11n (HT40)	3	Fig.A.5.7	**P**
	9	Fig.A.5.8	**P**

Conclusion: Pass

Test graphs as below:

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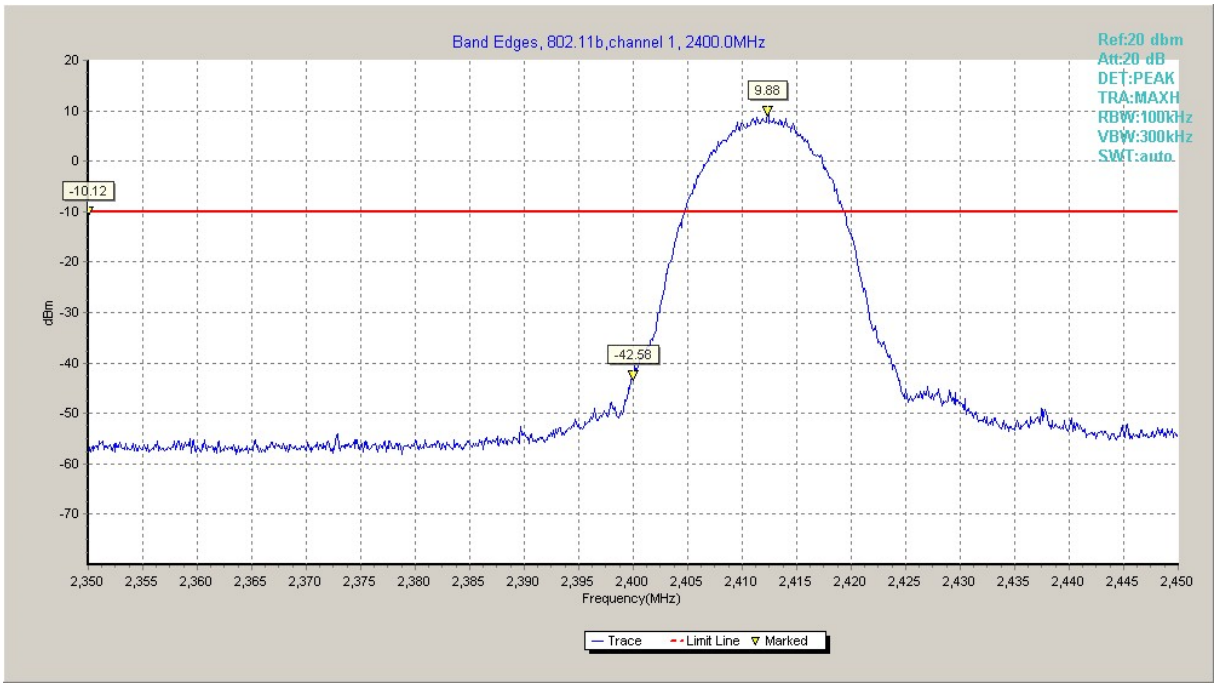

Fig.A.5.1 Band Edges (802.11b, Ch 1)

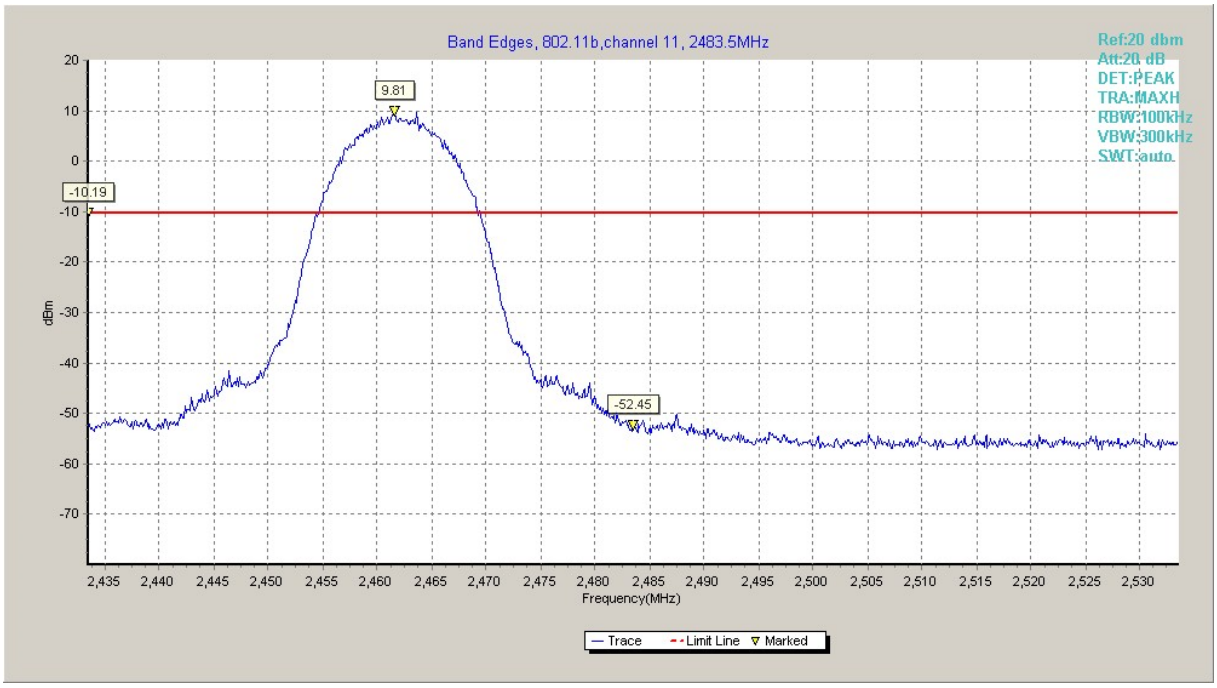

Fig.A.5.2 Band Edges (802.11b, Ch 11)

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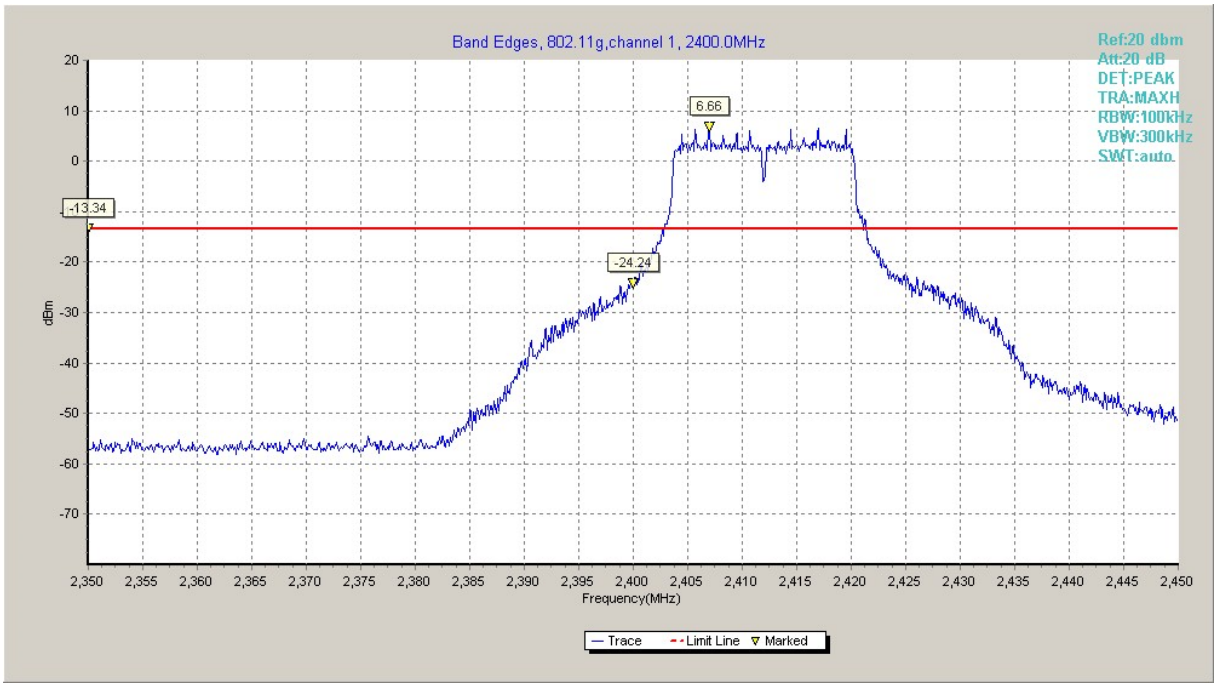

Fig.A.5.3 Band Edges (802.11g, Ch 1)

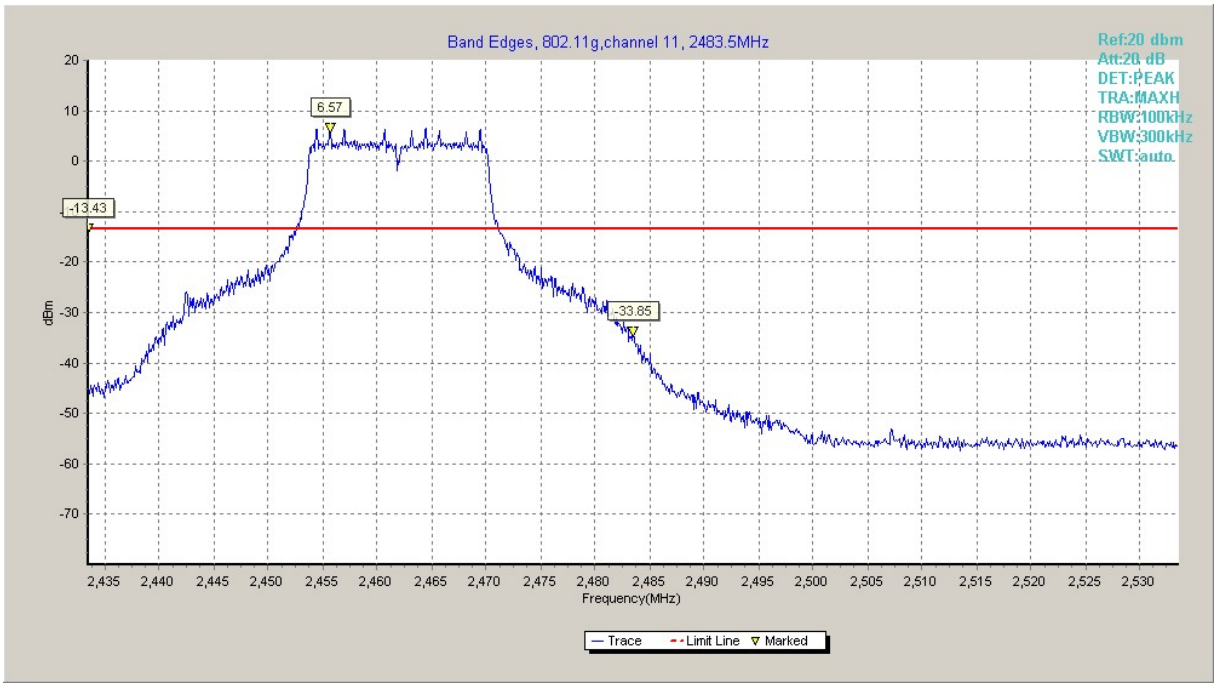

Fig.A.5.4 Band Edges (802.11g, Ch 11)

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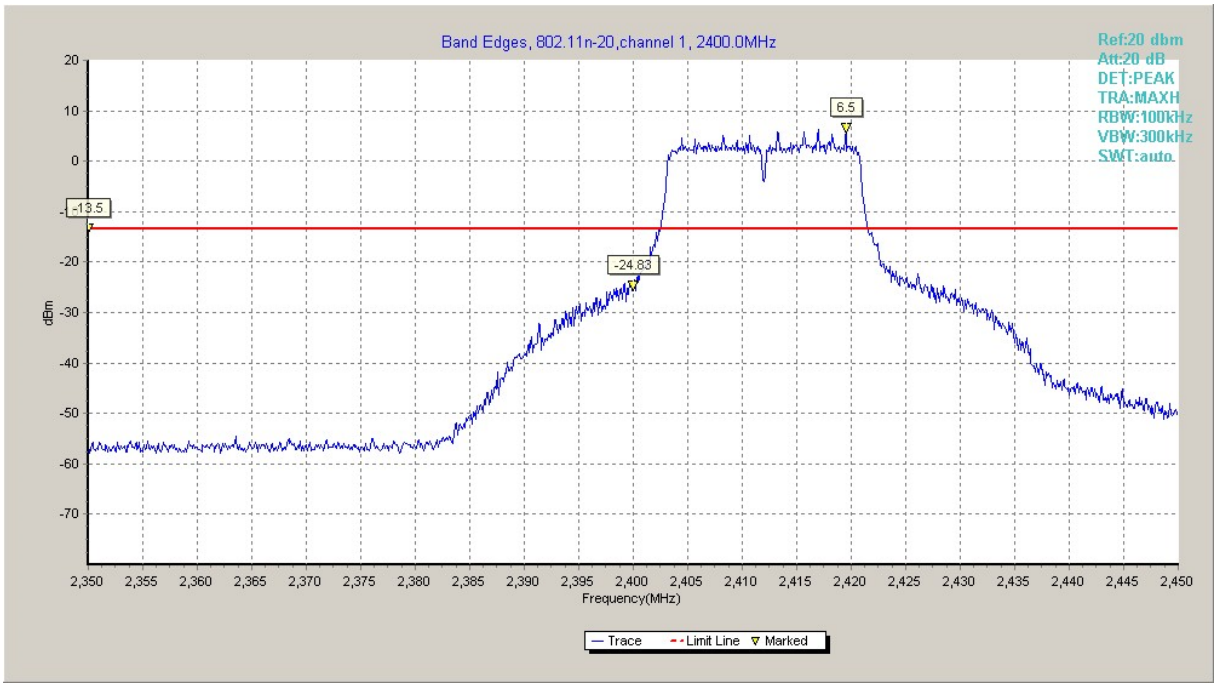

Fig.A.5.5 Band Edges (802.11n-HT20, Ch 1)

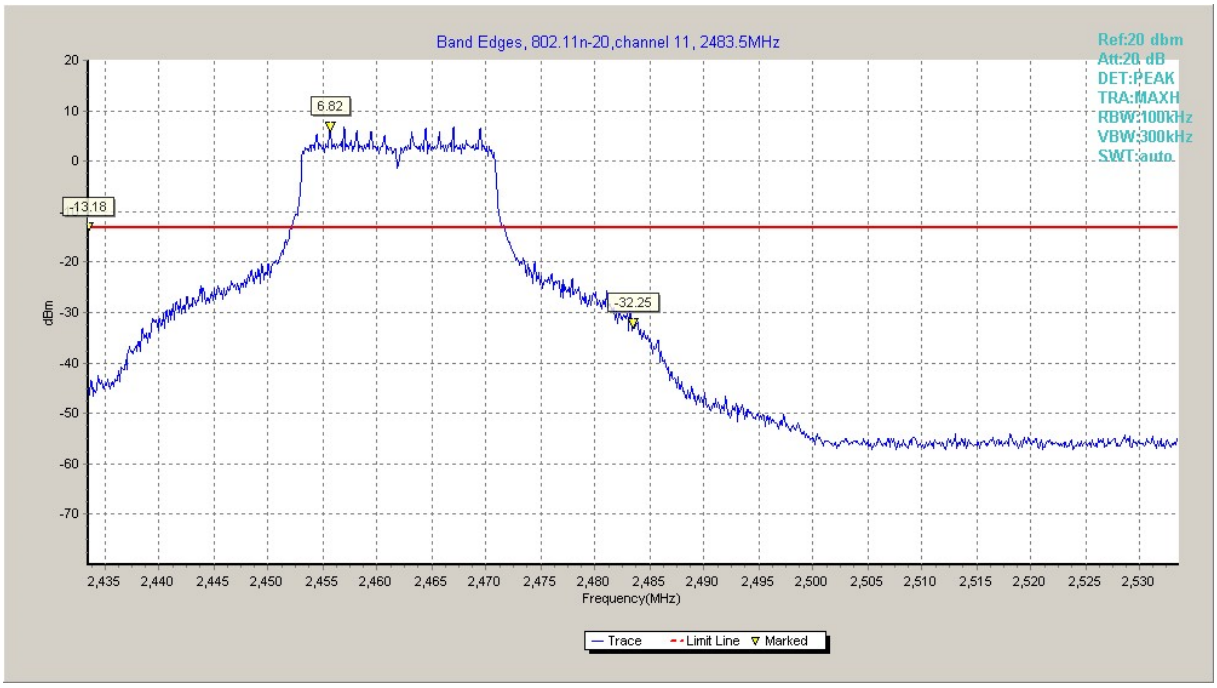

Fig.A.5.6 Band Edges (802.11n-HT20, Ch 11)

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