



FCC PART 15C TEST REPORT No.I21Z70040-IOT05

for

Samsung Electronics Co., Ltd.

Tablet PC

SM-T220

With

FCC ID: ZCASMT220

Hardware Version: REV1.0

Software Version: T220.001

Issued Date: 2021-03-05

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.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z70040-IOT05	Rev.0	1st edition	2021-03-01
I21Z70040-IOT05	Rev.1	Add the information of attenuator on page 12.	2021-03-05

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1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 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 (ISED#: 24849). 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(BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology
Development Area, Beijing, P. R. China 100176

1.3. Testing Environment

Normal Temperature: 15-35°C

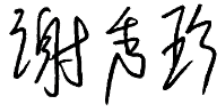
Relative Humidity: 20-75%

1.4. Project date

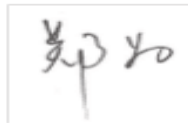
Testing Start Date: 2020-12-31

Testing End Date: 2021-03-01

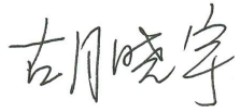
1.5. Signature



Xie 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: 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: Sunghoon Cho
Email: ggobi.cho@samsung.com
Telephone: +82-10-2722-4159
Fax: /

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

3.1. About EUT

Description	Tablet PC
Model name	SM-T220
FCC ID	ZCASMT220
With WLAN Function	Yes
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation	DSSS/CCK/OFDM
Number of Channels	11
Antenna Gain	-0.5dBi
MAX Conducted Power	22.89dBm
Power Supply	4.0V

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
UT07a	2170040UT07a	REV1.0	T220.001
UT01a	2170040UT01a	REV1.0	T220.001

*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	Charger1	/	/
AE2	Charger2	/	/
AE3	Charger3	/	/
AE4	Charger4	/	/
AE5	Charger5	/	/
AE6	Charger6	/	/
AE7	USB cable	/	/
AE8	Headset1	/	/
AE9	Headset2	/	/
AE10	battery	/	/

AE1

Model	EP-TA50JWE
Manufacturer	RFTECH Co., Ltd.
Length of cable	/

AE2

Model	EP-TA50JWE
Manufacturer	HAEM Co., Ltd.
Length of cable	/

AE3

Model	EP-TA200
Manufacturer	DongYang E&P Inc.
Length of cable	/
AE4	
Model	EP-TA200
Manufacturer	HAEM Co., Ltd.
Length of cable	/
AE5	
Model	EP-TA200
Manufacturer	SoluM Co.,Ltd
Length of cable	/
AE6	
Model	EP-TA200
Manufacturer	RFTECH Co., Ltd.
Length of cable	/
AE7	
Model	EP-DT725BWE
Manufacturer	Samsung Electronics Co., Ltd.
Length of cable	/
AE8	
Model	EHS61ASFWE
Manufacturer	ALMUS
Length of cable	/
AE9	
Model	EHS61ASFWE
Manufacturer	Cresyn
Length of cable	/
AE10	
Type	Secondary Li-ion Battery
SN	HQ-3565S
Manufacturer	SCUD (Fujian) Electronics CO.,LTD

*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 Tablet PC 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 Federal Communications Commission Office of Engineering and Technology Laboratory Division GUIDANCE FOR COMPLIANCE MEASUREMENTS ON	2013
KDB 558074 D01	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)	/	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	/	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
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. Test Conditions

The Equipment Under Test (EUT) model SM-T220 (FCC ID: ZCASMT220) is a variant product of SM-T225 (FCC ID: ZCASMT225), 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.I20Z60378-IOT03, except the result of radiated.

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	T nom	26°C
Voltage	V nom	4.0V
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	2021-05-06
2	LISN	ENV216	101459	R&S	1 year	2021-03-17
3	Test Receiver	ESCI	100766	R&S	1 year	2021-03-10
4	Shielding Room	S81	/	ETS-Lindgren	/	/
5	Attenuator	10dB	/	Rosenberger	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100376	Rohde & Schwarz	1 year	2021-09-04
2	BiLog Antenna	VULB9163	9163-482	Schwarzbeck	1 year	2021-11-04
3	Dual-Ridge Waveguide Horn Antenna	3117	00058888	ETS-Lindgren	1 year	2021-04-08
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	1 year	2021-08-05
5	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2021-05-18

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)
$30\text{MHz} \leq f \leq 2\text{GHz}$	1.22
$2\text{GHz} \leq f \leq 3.6\text{GHz}$	1.22
$3.6\text{GHz} \leq f \leq 8\text{GHz}$	1.22
$8\text{GHz} \leq f \leq 12.75\text{GHz}$	1.51
$12.75\text{GHz} \leq f \leq 26\text{GHz}$	1.51
$26\text{GHz} \leq f \leq 40\text{GHz}$	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.40
$1\text{GHz} \leq f \leq 18\text{GHz}$	4.32
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.26

7.6. AC Power-line Conducted Emission

Measurement Uncertainty : 3.10dB,k=2

ANNEX A: EUT parameters

Disclaimer: the antenna gain provided by the client may affect the validity of the measurement results in this report, and the client shall bear the impact and consequences arising therefrom.

ANNEX B: Detailed Test Results

B.1. Measurement Method

B.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

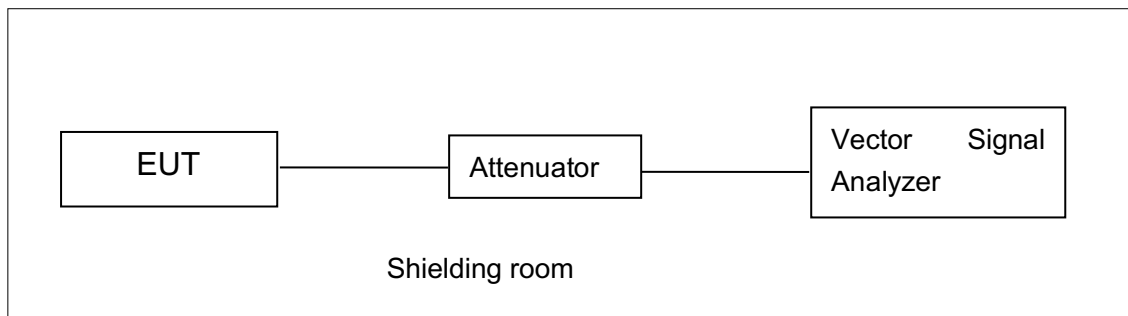


Fig.B.1.1.1: Test Setup Diagram for Conducted Measurements

B.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;

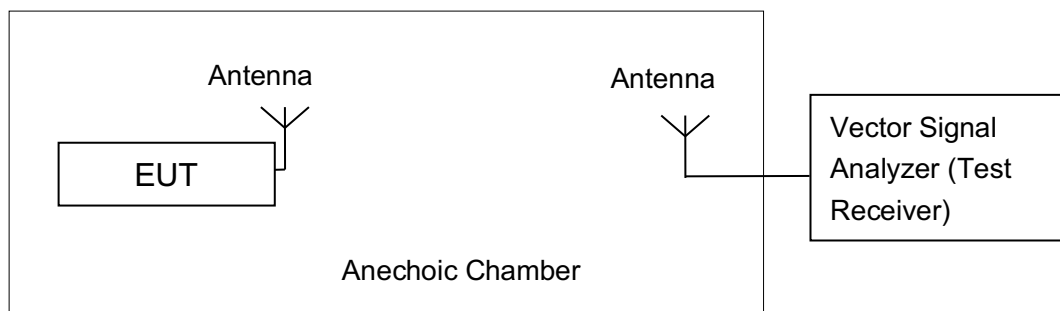


Fig.B.1.2.1: Test Setup Diagram for Radiated Measurements

B.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 $\geq [1.5 \times \text{DTS bandwidth}]$.
- 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: UT01a

B.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	17.91	/	/
	2	17.79	/	/
	5.5	19.16	/	/
	11	20.53	20.98	20.83
802.11g	6	22.44	/	/
	9	22.53	/	/
	12	22.37	/	/
	18	22.36	/	/
	24	22.60	/	/
	36	22.56	/	/
	48	22.62	22.79	22.49
	54	22.36	/	/

The data rate 11Mbps and 48Mbps 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)
802.11n (20MHz)	MCS0	22.53	/	/
	MCS1	22.52	/	/
	MCS2	22.48	/	/
	MCS3	22.49	/	/
	MCS4	22.63	22.89	22.53
	MCS5	22.81	/	/
	MCS6	22.33	/	/
	MCS7	22.36	/	/

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)
802.11n (40MHz)	MCS0	21.41	/	/
	MCS1	21.90	/	/
	MCS2	22.00	/	/
	MCS3	21.90	/	/
	MCS4	21.93	/	/
	MCS5	22.24	21.74	21.39
	MCS6	21.25	/	/
	MCS7	21.02	/	/

The data rate MCS5 is selected as worse condition, and the following cases are performed with this condition.

The duty cycle of all mode are 100%.

The spot check result of average output power is 15.87dBm (802.11b 1Mbps ch11 prototype result:16.26dBm)

Conclusion: Pass

B.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.B.3.1	-8.72	P
	6	Fig.B.3.2	-8.48	P
	11	Fig.B.3.3	-8.83	P
802.11g	1	Fig.B.3.4	-10.72	P
	6	Fig.B.3.5	-10.60	P
	11	Fig.B.3.6	-10.67	P

802.11n-HT20 mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11n (HT20)	1	Fig.B.3.7	-9.89	P
	6	Fig.B.3.8	-10.64	P
	11	Fig.B.3.9	-11.01	P

802.11n-HT40 mode

Mode	Channel	Power Spectral Density (dBm/3 kHz)		Conclusion
802.11n (HT40)	3	Fig.B.3.10	-14.76	P
	6	Fig.B.3.11	-14.76	P
	9	Fig.B.3.12	-13.13	P

Conclusion: Pass

Test graphs as below:

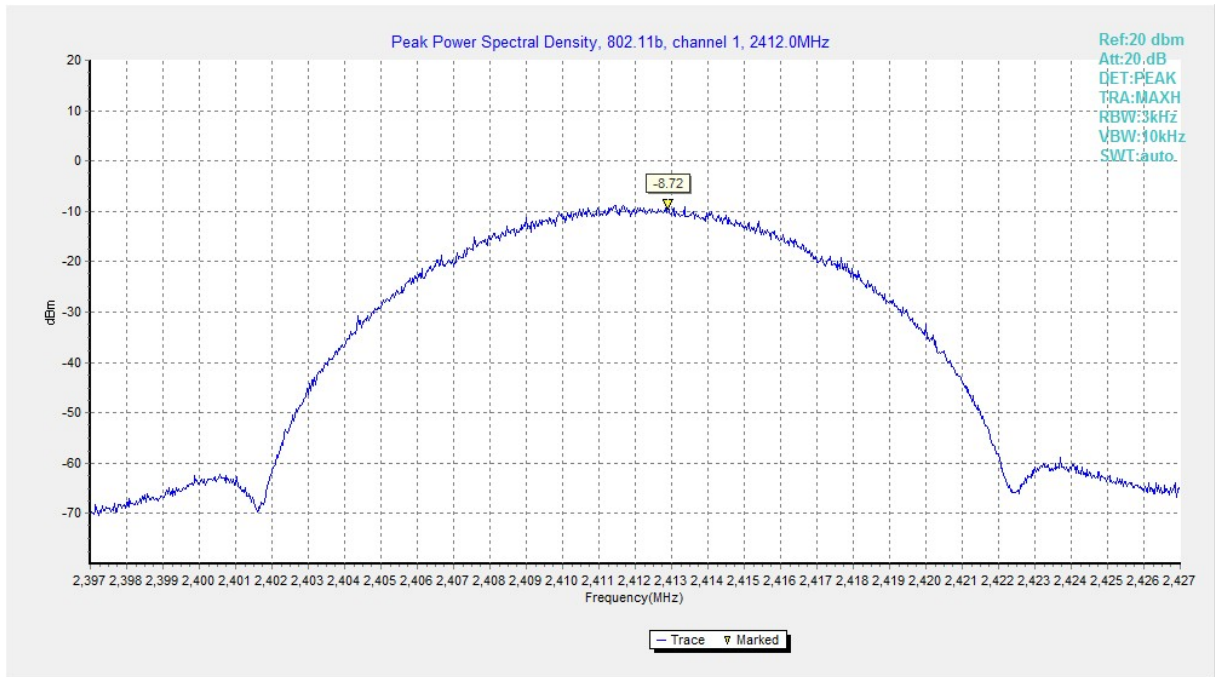


Fig.B.3.1 Power Spectral Density(802.11b,Ch1)

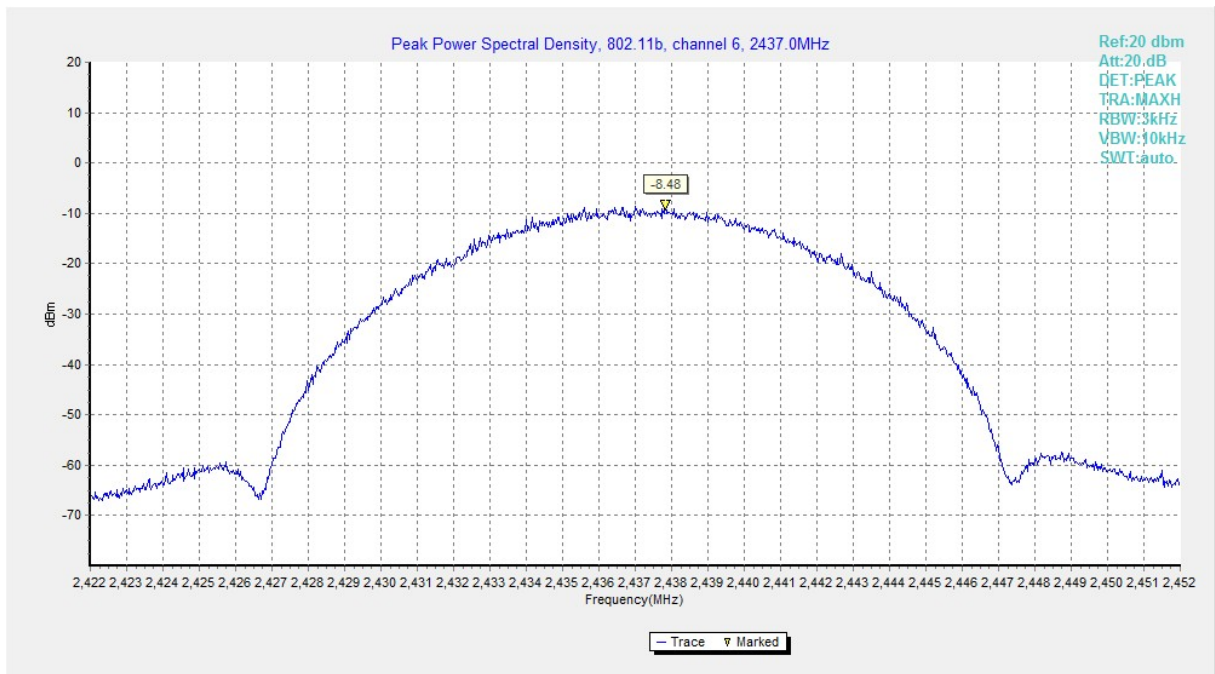


Fig.B.3.2 Power Spectral Density (802.11b, Ch 6)

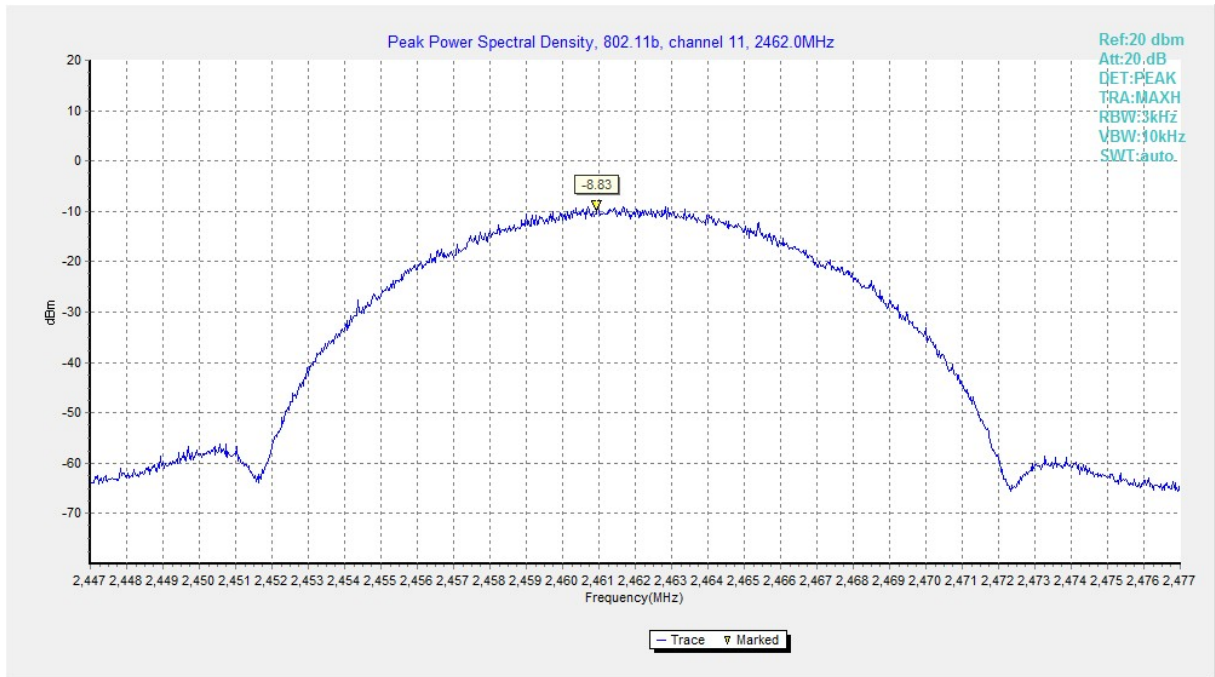


Fig.B.3.3 Power Spectral Density (802.11b, Ch 11)

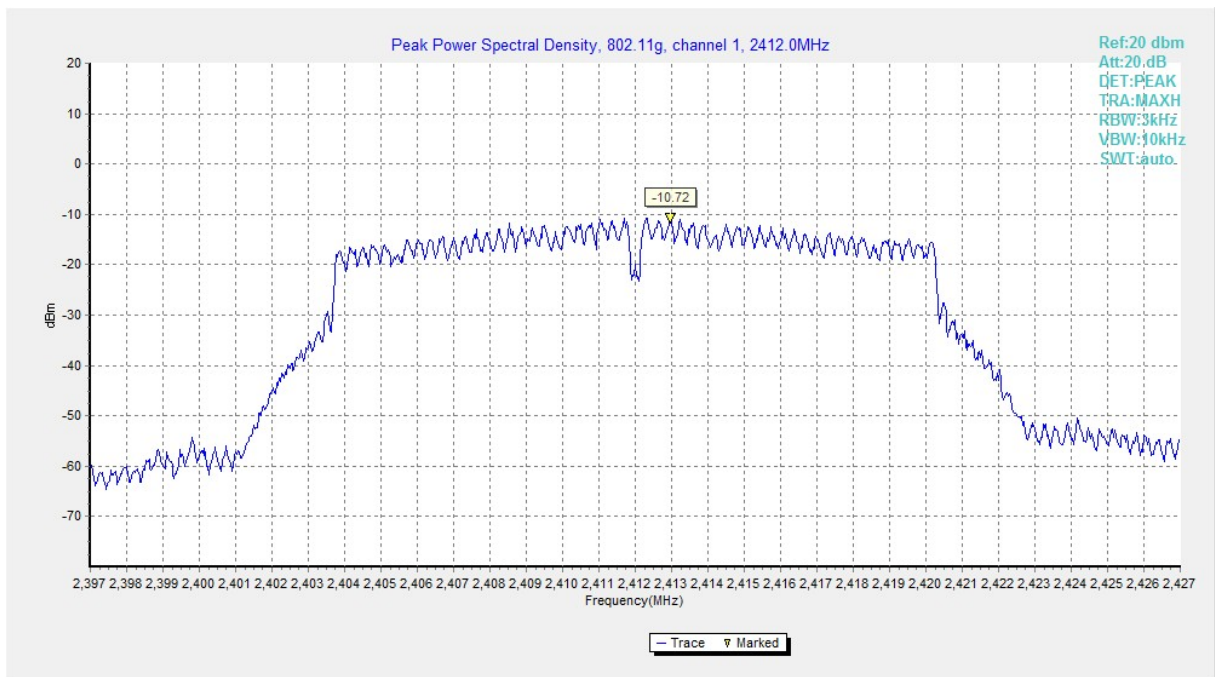


Fig.B.3.4 Power Spectral Density (802.11g, Ch 1)

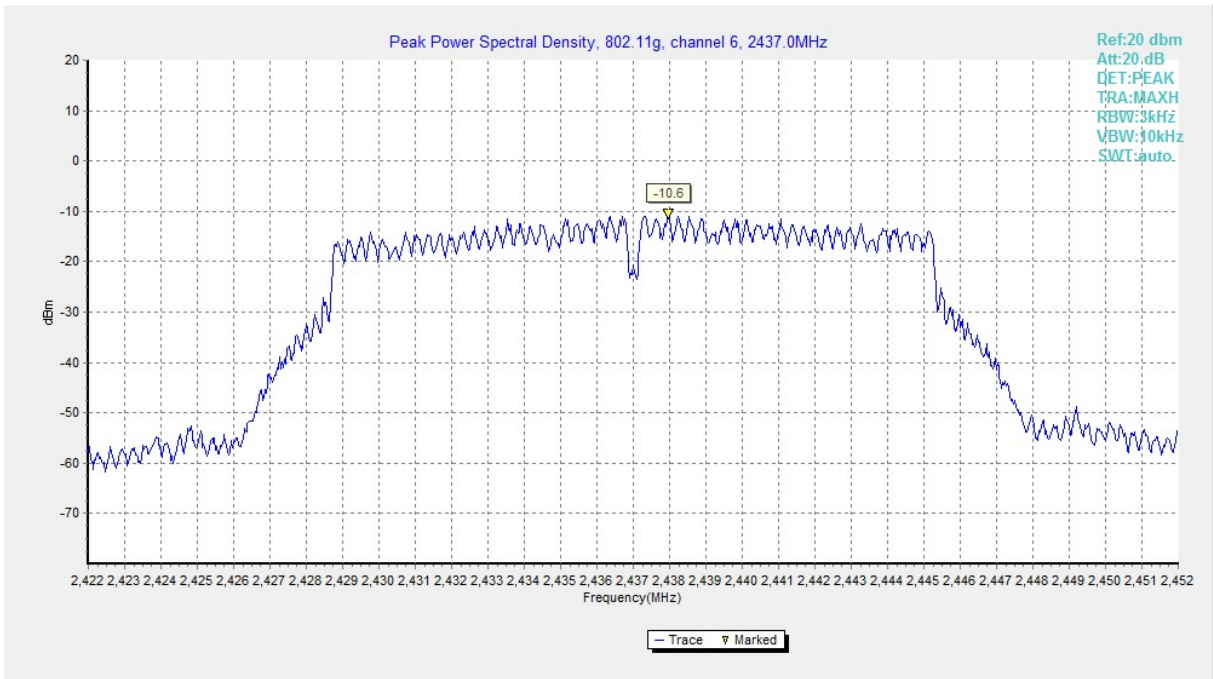


Fig.B.3.5 Power Spectral Density (802.11g, Ch 6)

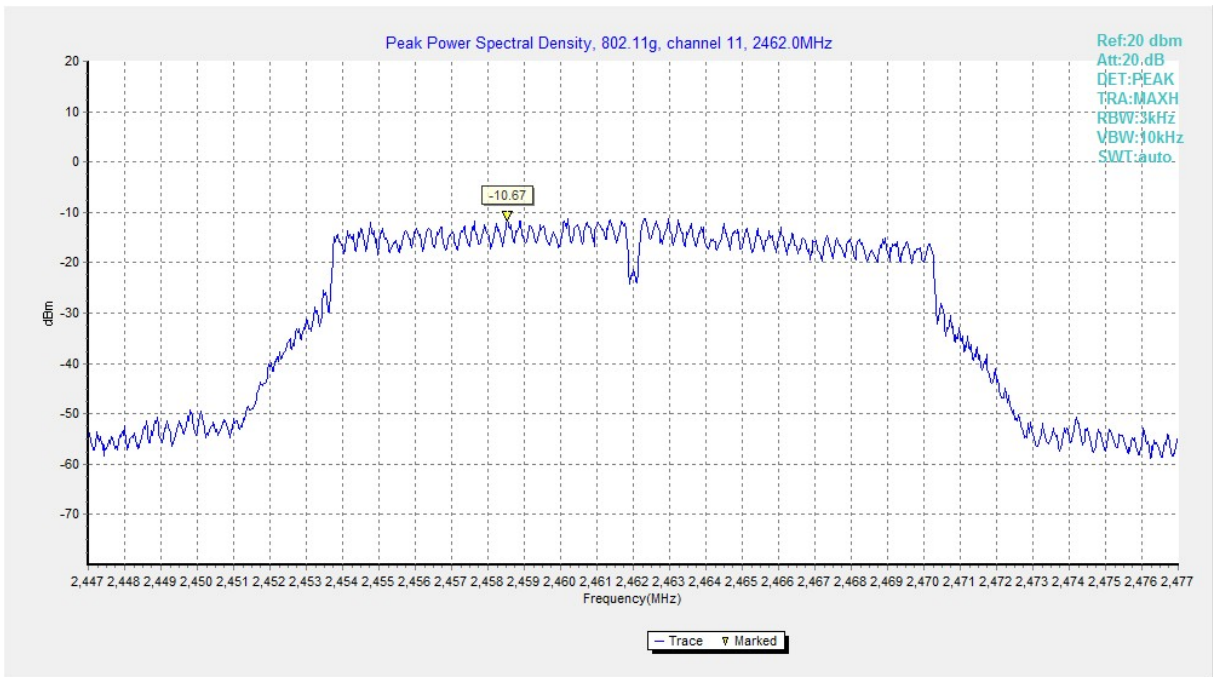


Fig.B.3.6 Power Spectral Density (802.11g, Ch 11)

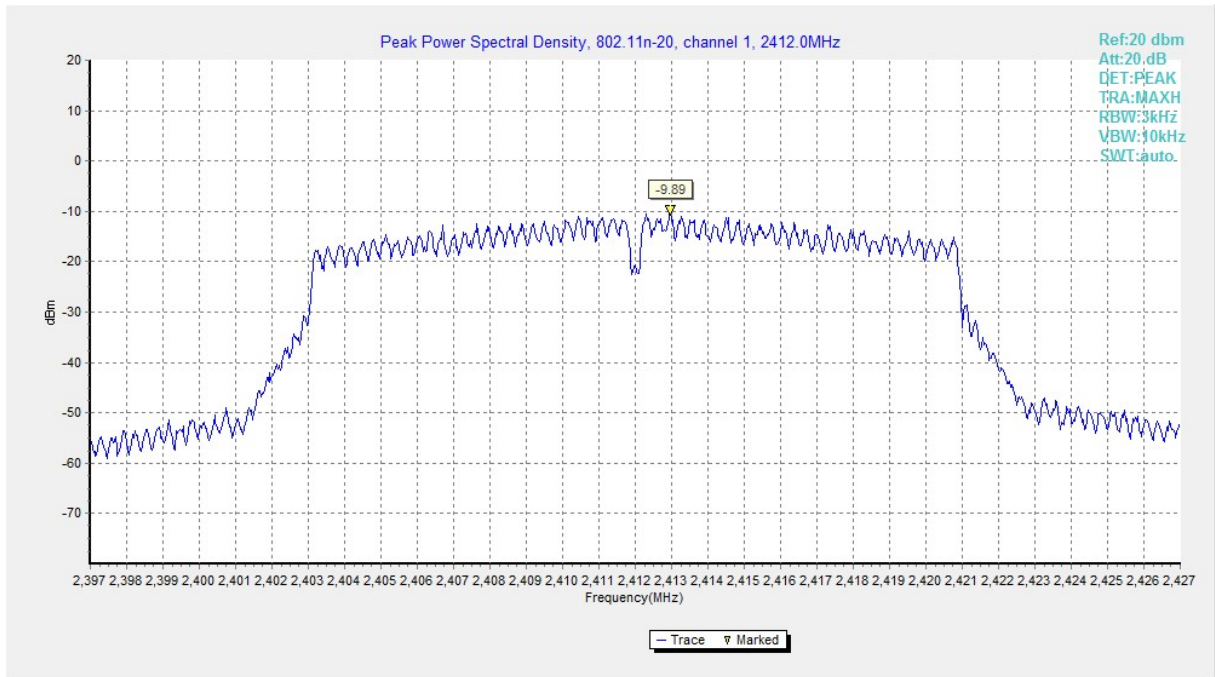


Fig.B.3.7 Power Spectral Density (802.11n-HT20, Ch 1)

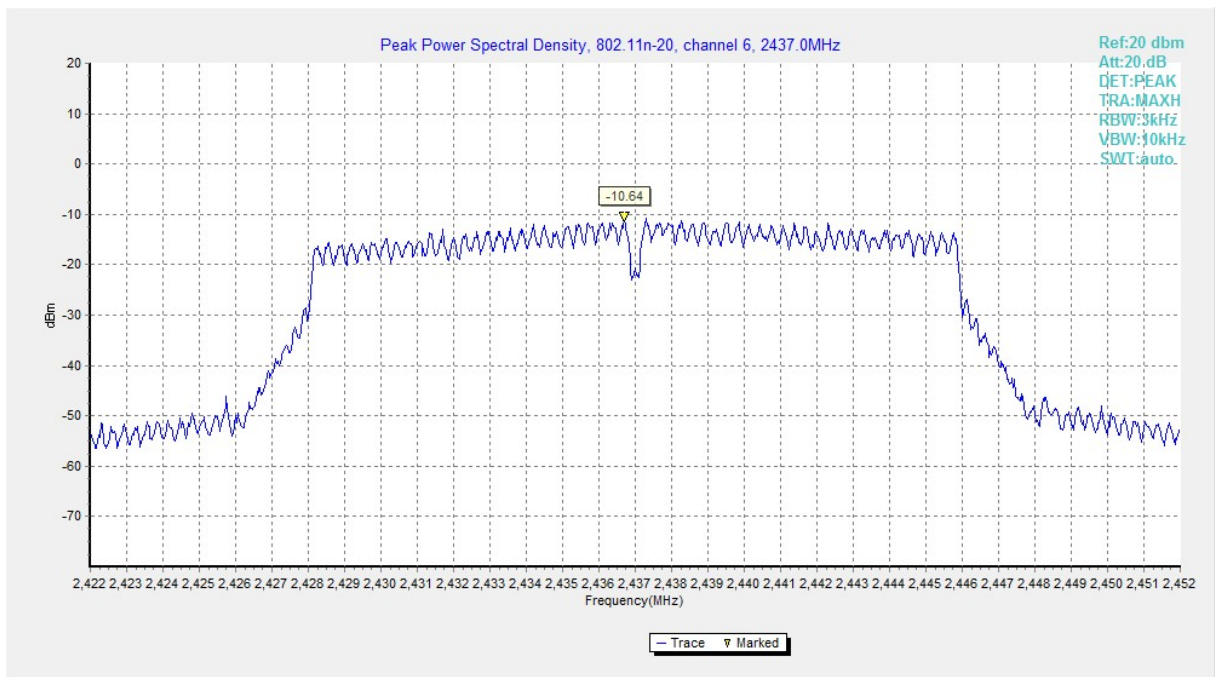


Fig.B.3.8 Power Spectral Density (802.11n-HT20, Ch 6)

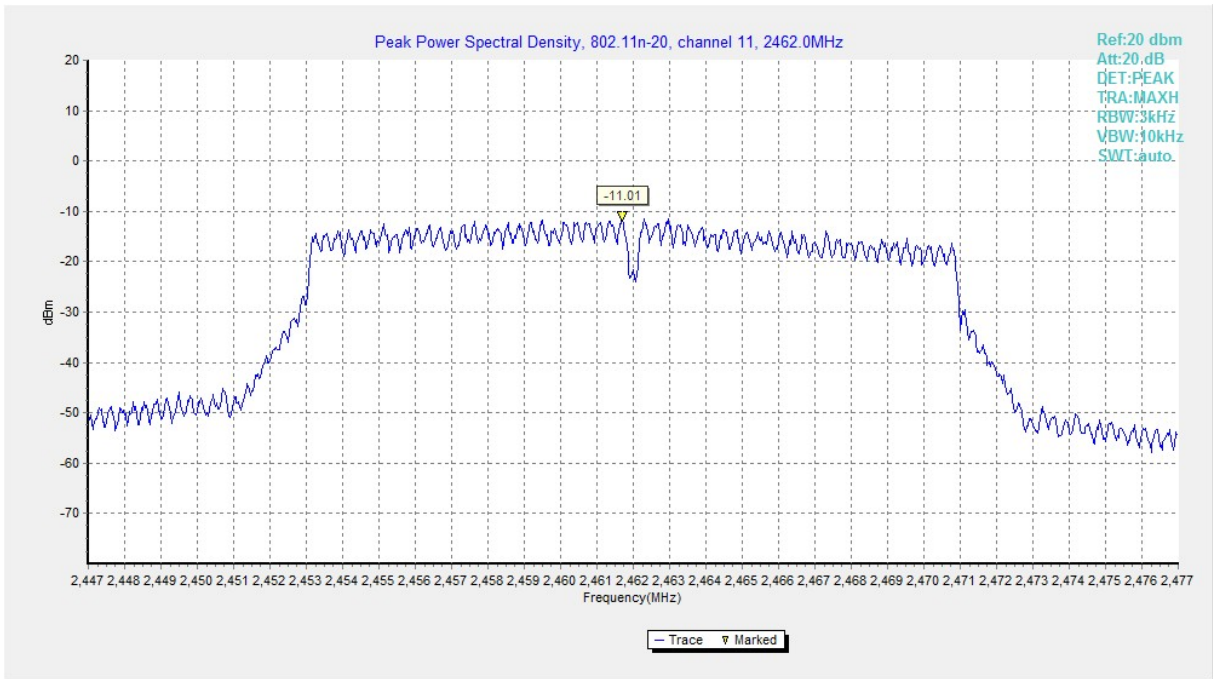


Fig.B.3.9 Power Spectral Density (802.11n-HT20, Ch 11)

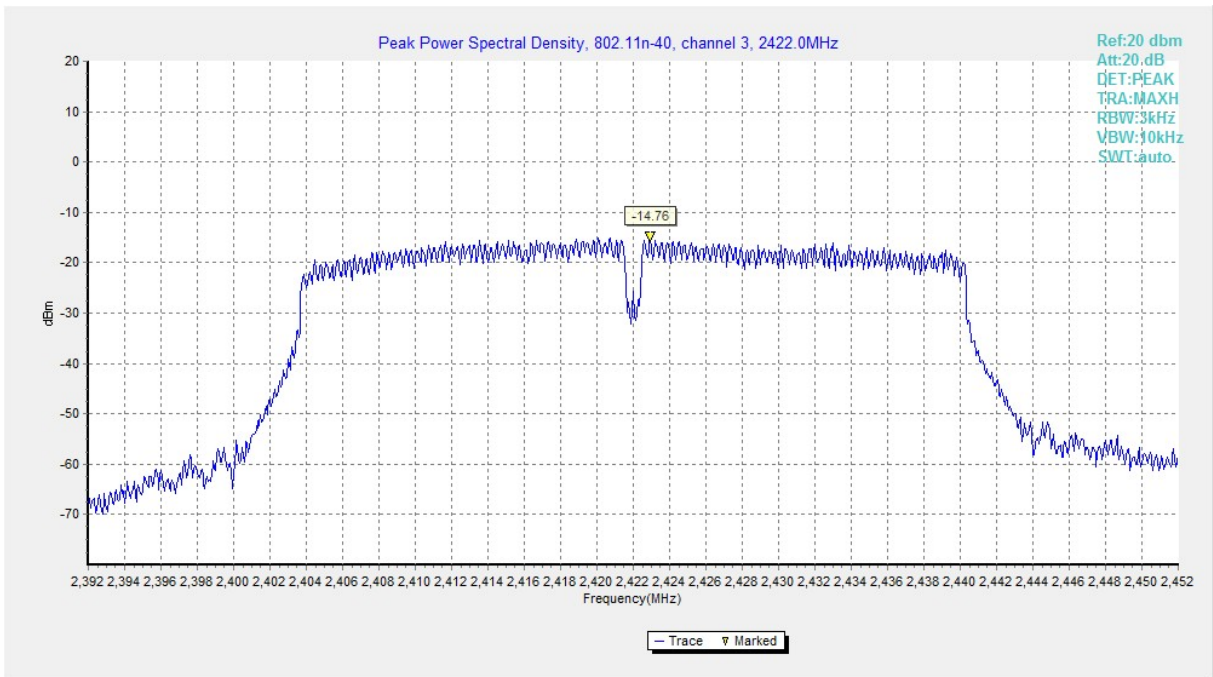


Fig.B.3.10 Power Spectral Density (802.11n-HT40, Ch 3)

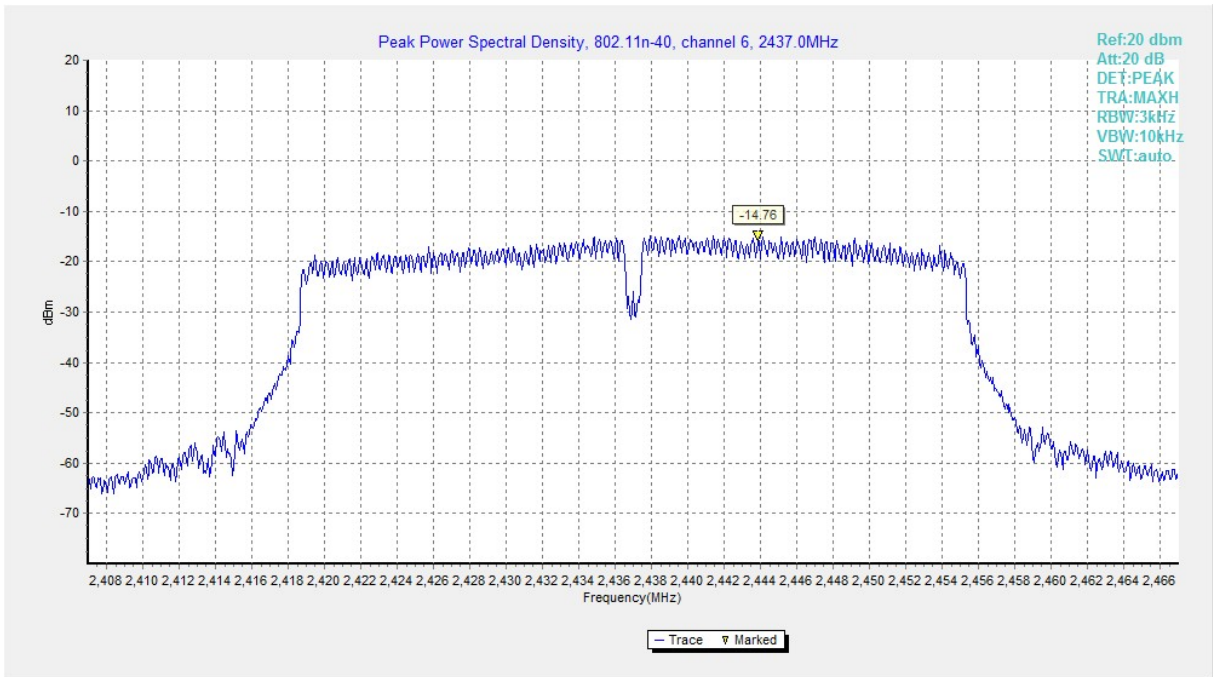


Fig.B.3.11 Power Spectral Density (802.11n-HT40, Ch 6)

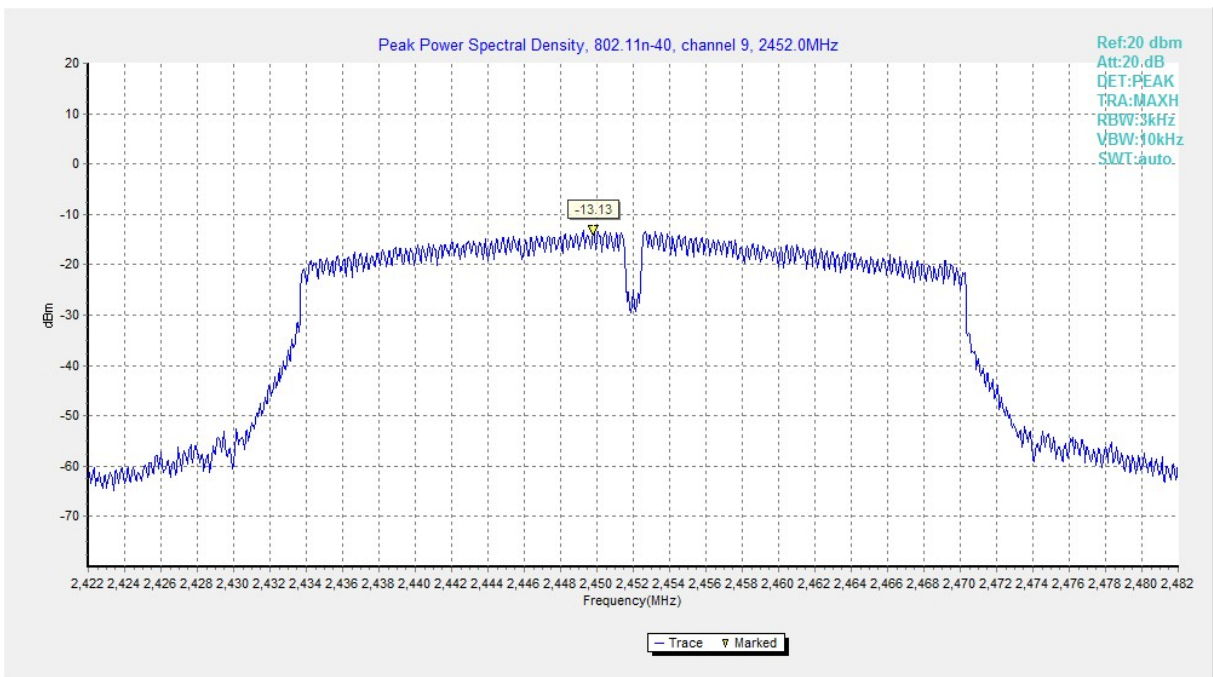


Fig.B.3.12 Power Spectral Density (802.11n-HT40, Ch 9)

B.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: UT01a

Measurement Result:

802.11b/g mode

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11b	1	Fig.B.4.1	8.05	P
	6	Fig.B.4.2	8.55	P
	11	Fig.B.4.3	8.05	P
802.11g	1	Fig.B.4.4	16.00	P
	6	Fig.B.4.5	16.35	P
	11	Fig.B.4.6	16.40	P

802.11n-HT20 mode

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11n (HT20)	1	Fig.B.4.7	16.45	P
	6	Fig.B.4.8	17.25	P
	11	Fig.B.4.9	17.25	P

802.11n-HT40 mode

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11n (HT40)	3	Fig.B.4.10	35.92	P
	6	Fig.B.4.11	35.44	P
	9	Fig.B.4.12	32.32	P

Conclusion: Pass

Test graphs as below:

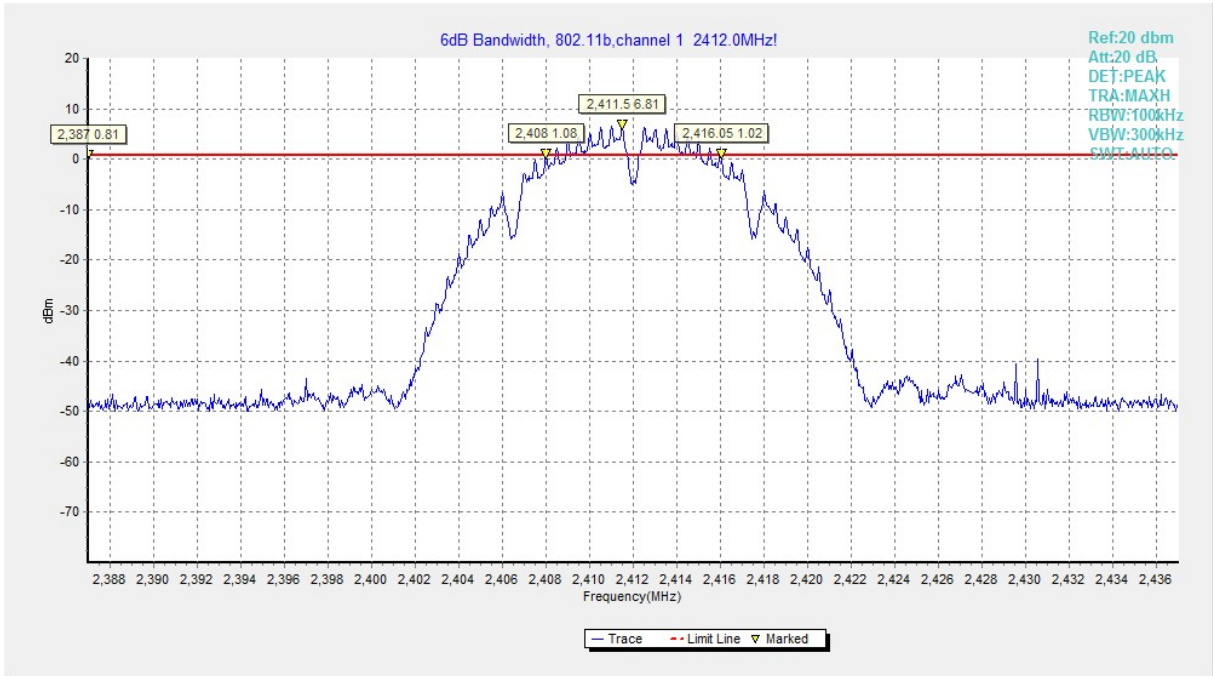


Fig.B.4.1 Occupied 6dB Bandwidth(802.11b,Ch 1)

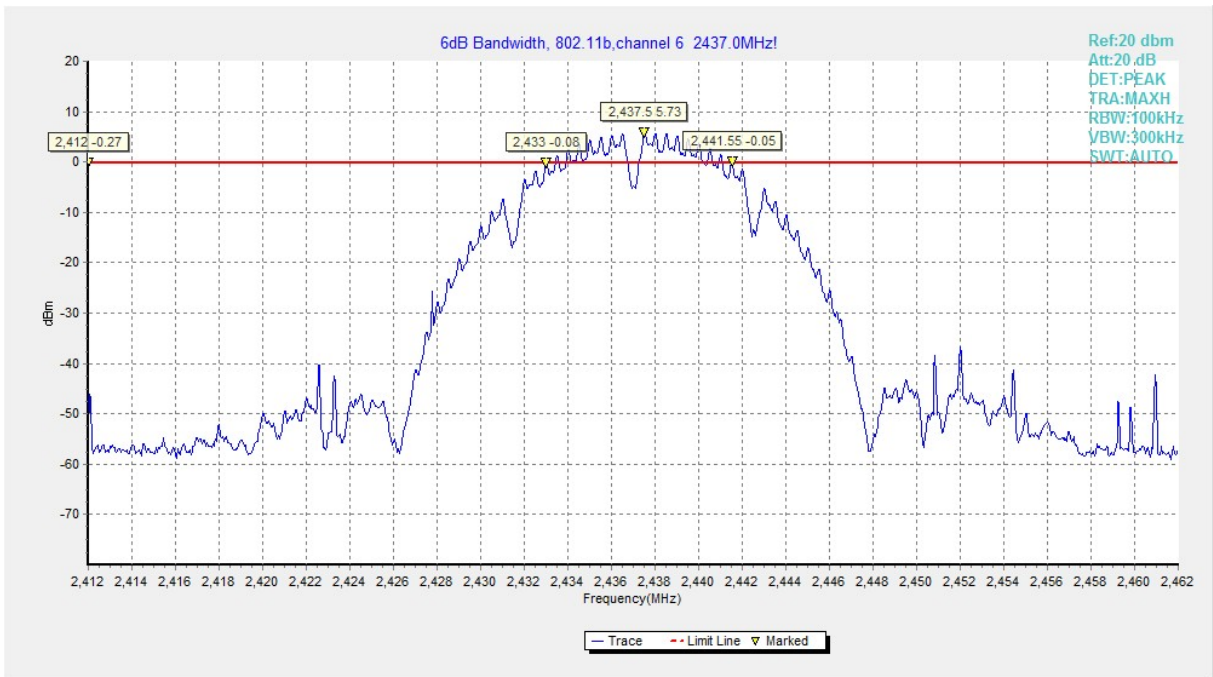


Fig.B.4.2 Occupied 6dB Bandwidth (802.11b, Ch 6)

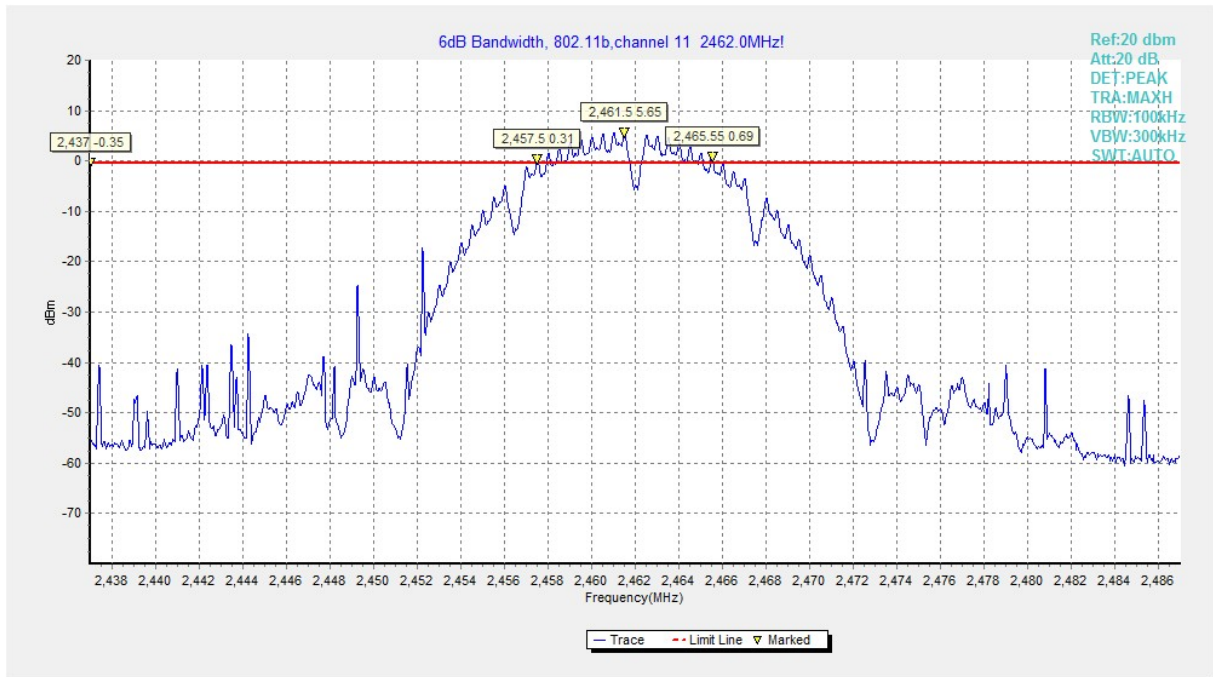


Fig.B.4.3 Occupied 6dB Bandwidth (802.11b, Ch 11)

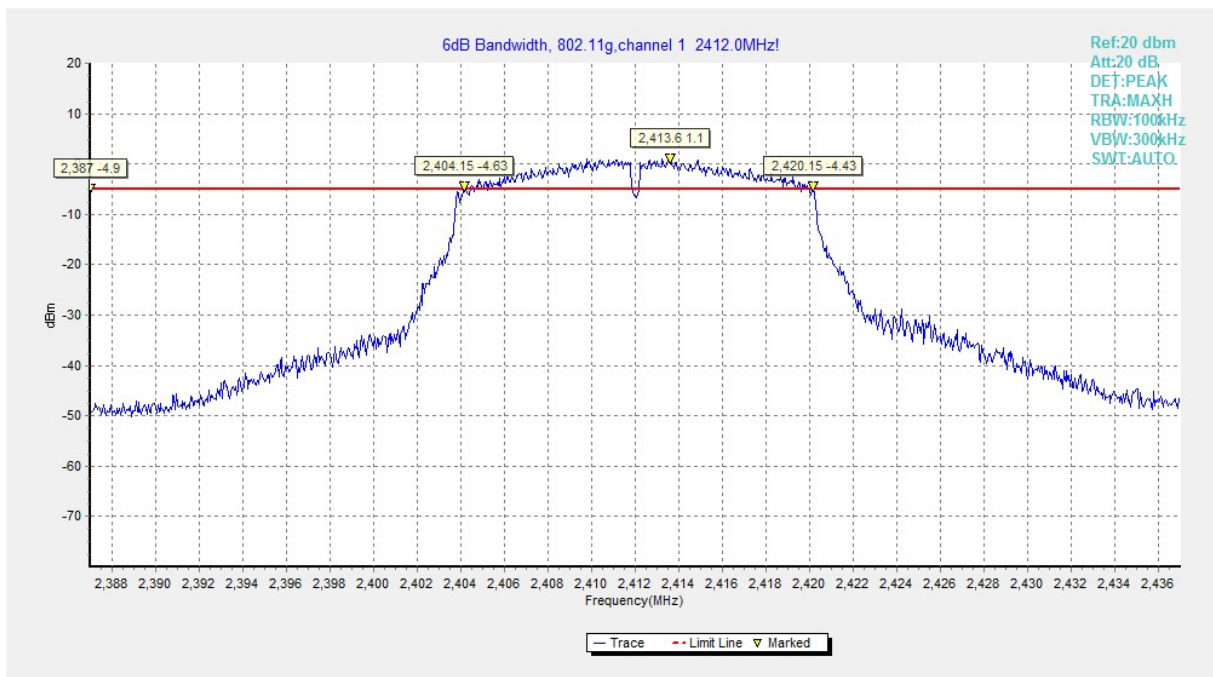


Fig.B.4.4 Occupied 6dB Bandwidth (802.11g, Ch 1)

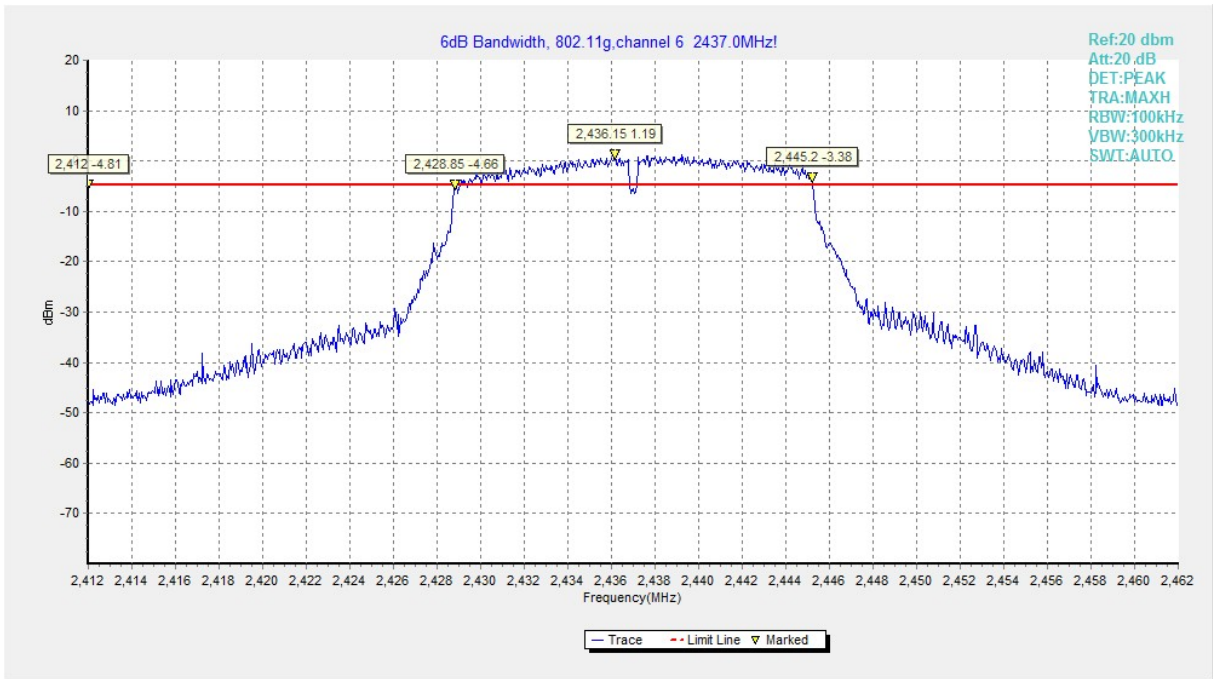


Fig.B.4.5 Occupied 6dB Bandwidth (802.11g, Ch 6)

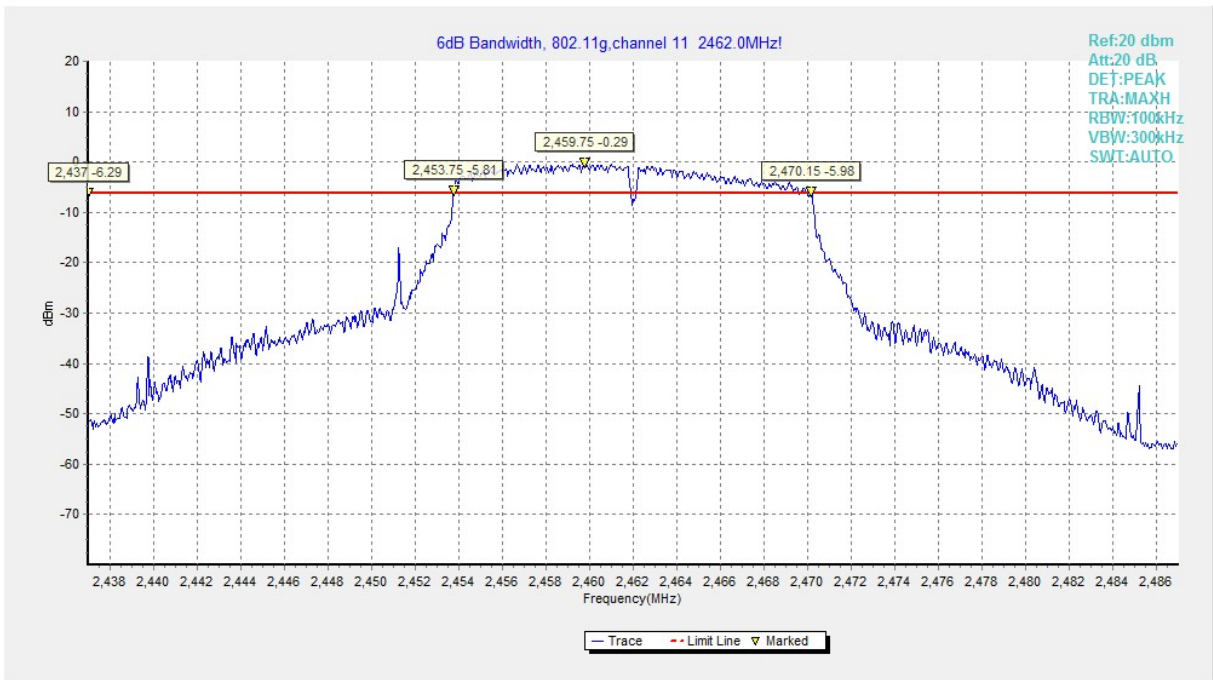


Fig.B.4.6 Occupied 6dB Bandwidth (802.11g, Ch 11)

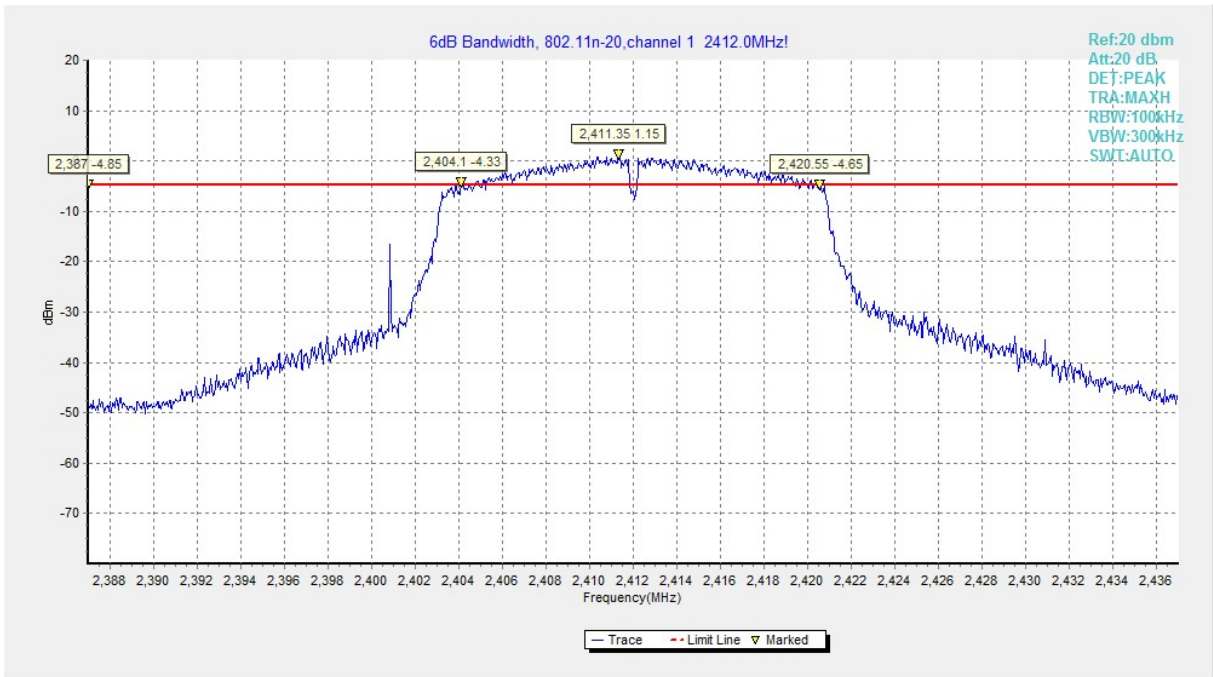


Fig.B.4.7 Occupied 6dB Bandwidth (802.11n-20MHz, Ch 1)

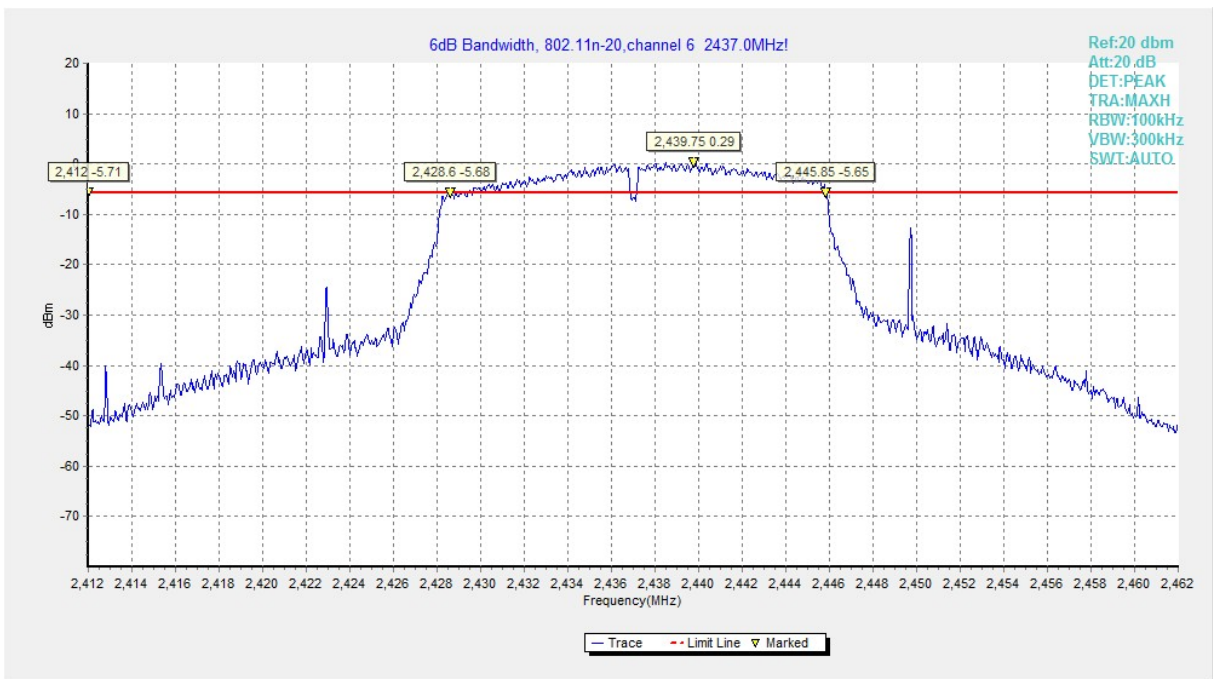


Fig.B.4.8 Occupied 6dB Bandwidth (802.11n-HT20, Ch 6)