TEST REPORT

Report Number		**RAPA12-O-152**
Type of Equipment		**USB dongle type Wireless LAN equipment**
Model Name		**WifiAn-Mini**
FCC ID		**BDD-WifiAn-Mini**
Applicant	**Name**	**ENJsoft Inc.**
	Logo	ENJsoft
	Address	**#1002, Ace Techno Tower 2-cha, 19, Digitalro 31 gil, Guro-gu, Seoul, Korea**
Manufacturer	**Name**	**ENJsoft Inc.**
	Address	**#1002, Ace Techno Tower 2-cha, 19, Digitalro 31 gil, Guro-gu, Seoul, Korea**
Application date		**January 20, 2012**
Date of test		**February 6, 2012 to February 24, 2012**
Date of issue		**February 29, 2012**
Total Page		**83 pages (including this page)**

SUMMARY

The equipment complies with FCC Part 15.247: Operation within the bands 902 MHz - 928 MHz, 2 400 MHz - 2 483.5 MHz, and 5 725 MHz - 5 850 MHz.

This test report contains only the results of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

Date : February 29, 2012

Tested by **Chang Young, Choi**
Deputy General Manager

Date : February 29, 2012

Reviewed by **Sukil, Park**
Executive Managing Director

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1. General description of EUT

1.1 Applicant

- Company name : ENJsoft Inc.
- Address : #1002, Ace Techno Tower 2-cha, 19, Digitalro 31 gil, Guro-gu, Seoul, Korea
- Contact person : Young A Choi
- Phone/Fax : 82-2-2109-1161 / 82-2-2109-1166

1.2 Manufacturer

- Company name : ENJsoft Inc.
- Address : #1002, Ace Techno Tower 2-cha, 19, Digitalro 31 gil, Guro-gu, Seoul, Korea
- Contact person : Young A Choi
- Phone / Fax : 82-2-2109-1161 / 82-2-2109-1166

1.3 Basic description of EUT

- Product name : USB dongle type Wireless LAN equipment
- Model name : WifiAn-Mini
- FCC ID : BDD-WifiAn-Mini
- Serial number : Not available(Proto Type)
- Frequency : 2 412 ~ 2 462 MHz
- Channel number : 11 Channels
- Modulation method : BPSK, QPSK, CCK, OFDM
- FCC Rule Part(s) : FCC Part 15 Subpart C Section 15.247
- FCC classification : DTS / Digital Transmission System
- Date of test : February 6, 2012 to February 24, 2012
- Date of issue : February 29, 2012
- Place of test : Head office

  824, Anyang megavalley, 799, Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do 431-767, Korea

  Open area test site

  80, Jeil-ri, Yangji-myun, Cheoin-gu, Yongin-si, Gyeonggi-do 449-825, Korea

  (FCC Registration Number : 337229)

  (IC Submission Number : 143881)

  (KCC Designation Number : KR0027)

1.4 Technical specification of EUT

Chip		RTL8188CU
LED		Link/Activity
Wireless Specification	**Frequency band**	2.412 GHz ~ 2.462 GHz
	Wireless signal rates	802.11n: Up to 150 Mbps
		802.11g: Up to 54 Mbps
		802.11b: Up to 54 Mbps
	Wireless transmit power	14 dBm (MAX EIRP)
	Modulation	OFDM / CCK / 16-QAM / 64-QAM
	Transmission distance	Maximum: 30 m
		Stable: 15 m
	Receive sensitivity	135 Mbps: -68 dBm @ 10% PER
		108 Mbps: -68 dBm @ 10% PER
		54 Mbps: -68 dBm @ 10% PER
		11 Mbps: -85 dBm @ 8% PER
	Wireless security	64/128 bit WEP
		WPA2 (AES)
	Number of selectable channels	USA, Canada (FCC): 11 channels
		Europe(CE): 13 channels
		Japan: 14 channels
Interface		USB2.0 Hi-Speed connector
Environment		Operating Temperature: 0 to 40℃
		Storage Temperature: 0 to 40℃
		Operating Humidity: -10 to 90 % non-condensing
		Storage Humidity: -5 to 95 % non-condensing

2. General information of test

2.1 Standards applied for testing

Applied Standard : 47 CFR Part 15, Subpart C		
FCC Rule	**Description of Test**	**Result**
15.203 / 15.204	Antenna information	Pass
15.207	Power line conducted emissions	Pass
15.209	Radiated emission in restricted band	Pass
15.247(a)	6 dB bandwidth	Pass
15.247(b)	Maximum peak output power	Pass
15.247(d)	Conducted spurious and out of band emission	Pass
15.247(d)	Radiated emission in band edge	Pass
15.247(e)	Power spectral density	Pass

2.2 Description of EUT modification

During the test, there was no mechanical or circuitry modification to improve RF and spurious characteristic, and any RF and spurious suppression device(s) was not added against the device tested.

2.3 Peripheral equipments and cables used for testing

• Type of peripheral equipment used

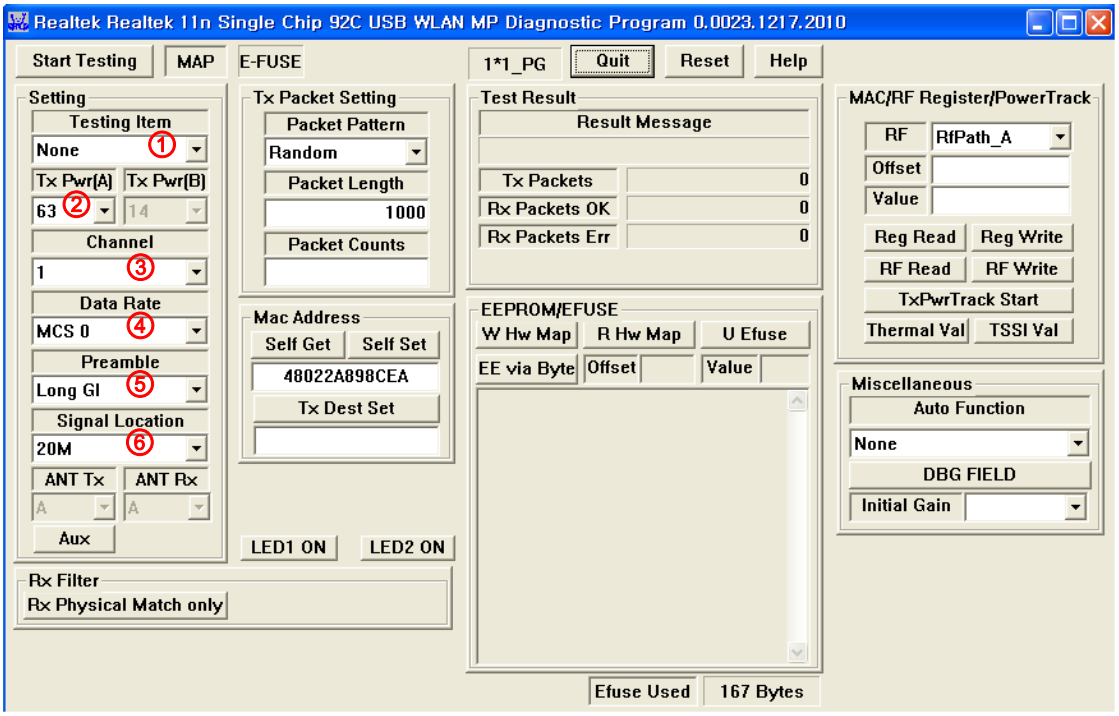
Description	Model Name	Serial No.	Manufacturer	FCC ID
EUT	WifiAn-Mini	N/A	ENJsoft Inc.	BDD-WifiAn-Mini
Control PC	NT-P560	EY9993HQ00078A	Samsung	-

• Type of cable used

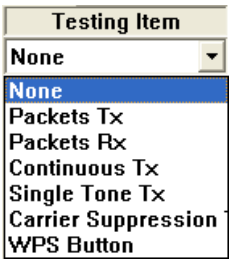
Device from	Device to	Type of Interface	Type of Cable	Length
EUT	Control PC	SPI Interface	Direct insertion	-

2.4 Information of test program

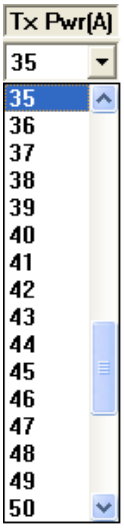
• Skin of program



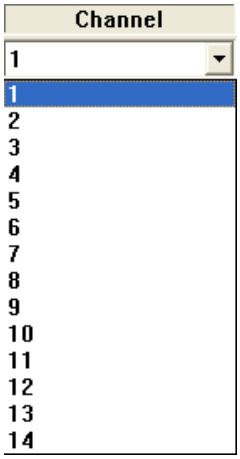
① Testing Item; selected by "Continuous TX" for all mode



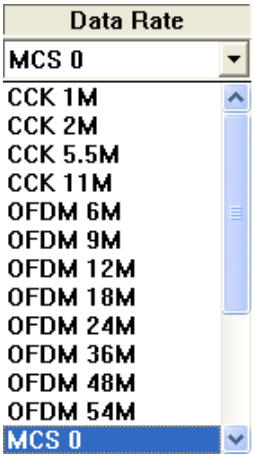
② TX Pwr(A); selected by "35" for all mode (range; 0 to 63)



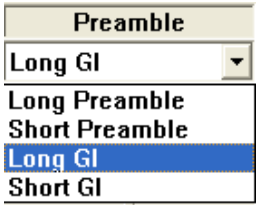
③ Channel; selected by "1", "6", "11" for 802.11b/g/n (20 MHz) mode
and "3", "6", "9" for 802.11n (40 MHz) mode



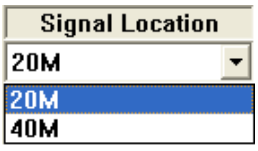
④ Data Rate; selected by "CCK 1M" to "CCK11M" for 802.11b mode,
"OFDM 6M" to "OFDM 54M" for 802.11g mode
and "MCS 0" to "MCS 7" for 802.11n (20 MHz and 40 MHz) mode



⑤ Preamble; selected by "Long Preamble" and "Short Preamble" for 802.11b mode
and "Long GI" and "Short GI" for other mode



⑥ Signal Location; selected by "20M" for 802.11b/g/n (20 MHz) mode and "40M" for other mode



3. Technical information of equipment

3.1 Antenna information

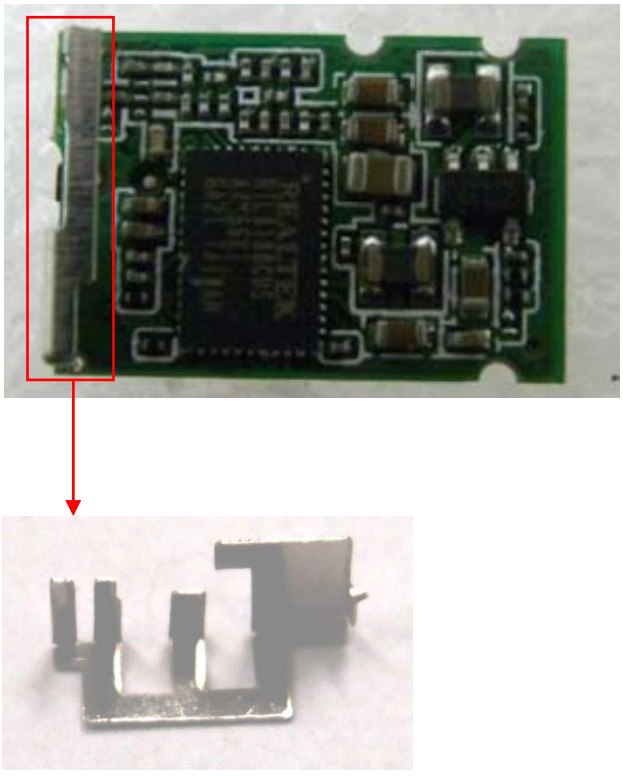
3.1.1 Electrical properties

- Frequency range: 2.4 to 2.5 GHz
- Impedance: 50 Ω Nominal
- VSWR: 1.92:1 Max
- Return loss: -10 dB Max
- Radiation: Omni-directional
- Gain (Peak): 2 dBi
- Polarization: Linear, Vertical
- Admitted power: 1 W

3.1.2 Physical properties

- Antenna material: FPCB
- Cable type: O.D. 1.13//70 mm
- Operating temperature: -10 to 60℃
- Storage temperature: -10 to 70℃

3.1.3 Picture of antenna



3.1.4 Requirement of antenna

The conducted output power limit specified in this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

4. Measurement data

4.1 6 dB bandwidth

4.1.1 Definition

A 6 dB Bandwidth is width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each lower 6 dB of the total mean power of a given emission

4.1.2 Specification

FCC Rules Part 15, Section 15.247(a)(2)

4.1.3 Method of measurement

Public Notice “558074 D01 DTS Meas Guidance v01”

4.1.4 Measurement set-up

4.1.5 Test equipment

Equipment	Model name	Manufacturer
EUT	WifiAn-Mini	ENJsoft Inc.
Control PC	NT-P560	Samsung
Spectrum Analyzer	N9020A	Agilent

4.1.6 Test procedure

① Connect the equipment as “Measurement set-up”
② Set RBW = 1 to 5 % of the emission bandwidth
③ Set VBW ≥ 3 x RBW
④ Detector = Peak
⑤ Trace mode = max hold
⑥ Sweep = auto couple
⑦ Measure the 6 dB bandwidth

4.1.7 Test condition

- Test place: Shield room
- Test mode: Maximum output power
- Test environment : 27℃, 53 % R.H.

4.1.8 Limit

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5 850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

4.1.9 Test result of IEEE802.11b mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured bandwidth (MHz)	
			6 dB bandwidth	99% bandwidth
2 412	11	Long Preamble	10.32	15.00
2 437	11	Long Preamble	10.30	14.96
2 462	11	Long Preamble	10.31	14.95

4.1.10 Test result of IEEE 802.11g mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured bandwidth (MHz)	
			6 dB bandwidth	99% bandwidth
2 412	54	Long GI	16.68	17.09
2 437	54	Long GI	16.65	17.08
2 462	54	Long GI	16.67	17.10

4.1.11 Test result of IEEE 802.11n (20 MHz) mode

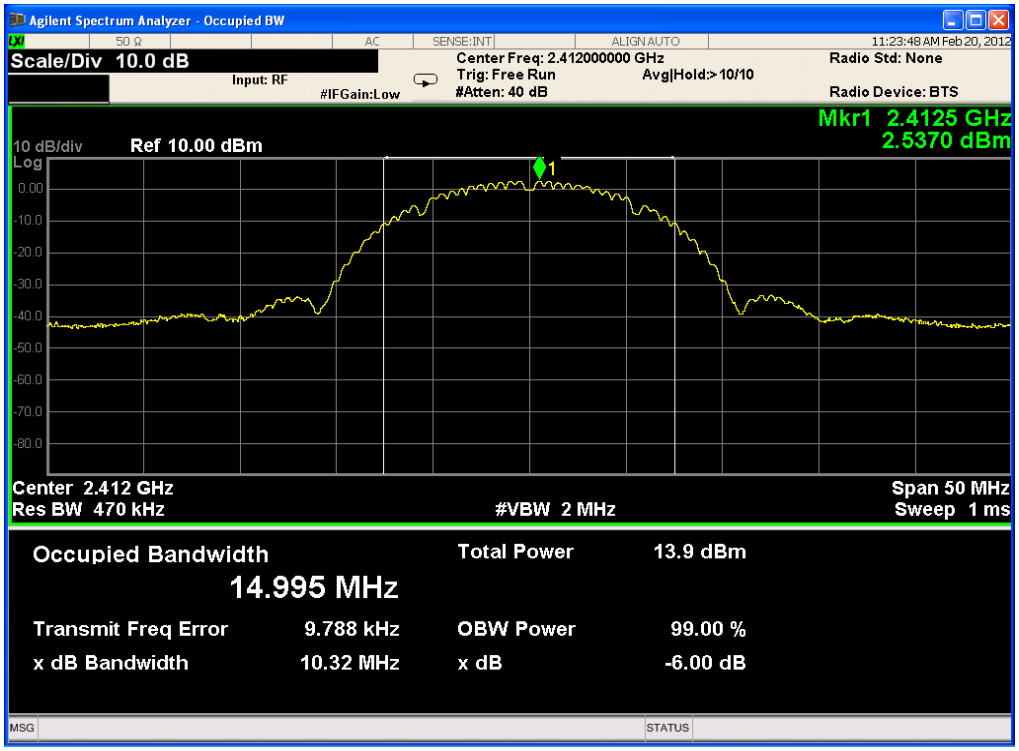
Frequency (MHz)	Data rate (Mbps)	Preamble	Measured bandwidth (MHz)	
			6 dB bandwidth	99% bandwidth
2 412	MCS 7	Long GI	17.66	18.09
2 437	MCS 7	Long GI	17.69	18.10
2 462	MCS 7	Long GI	17.66	18.09

4.1.12 Test result of IEEE 802.11n (40 MHz) mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured bandwidth (MHz)	
			6 dB bandwidth	99% bandwidth
2 422	MCS 7	Long GI	36.51	36.44
2 437	MCS 7	Long GI	36.51	36.41
2 452	MCS 7	Long GI	36.50	36.42

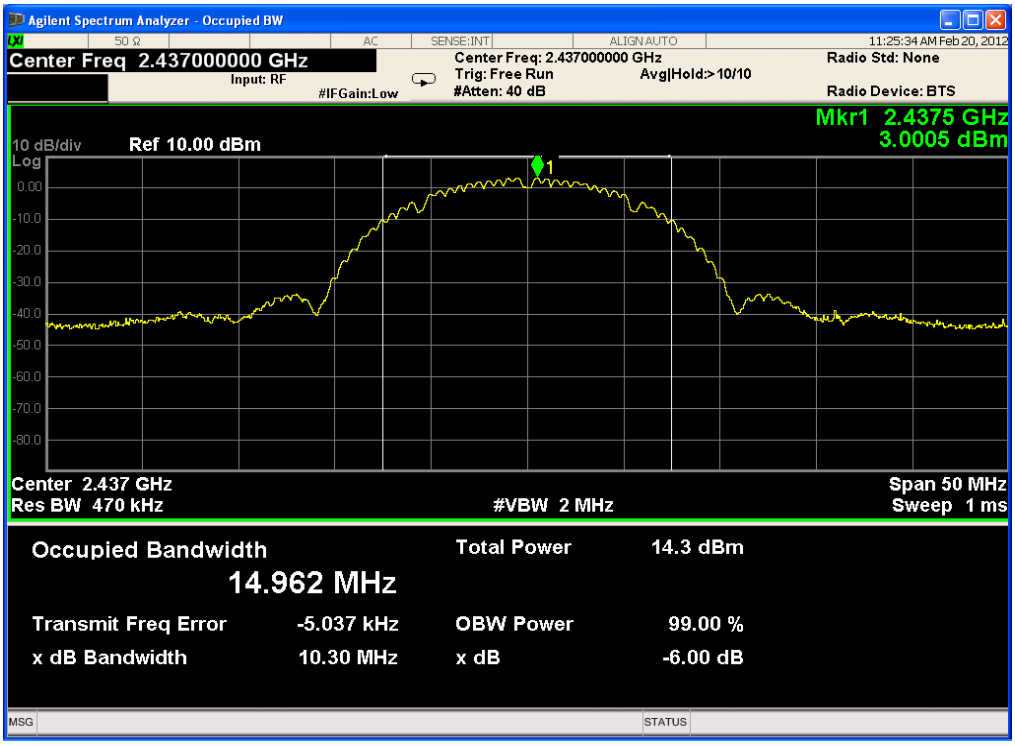
4.1.13 Plots of 6 dB bandwidth

① 2412 MHz at IEEE802.11b



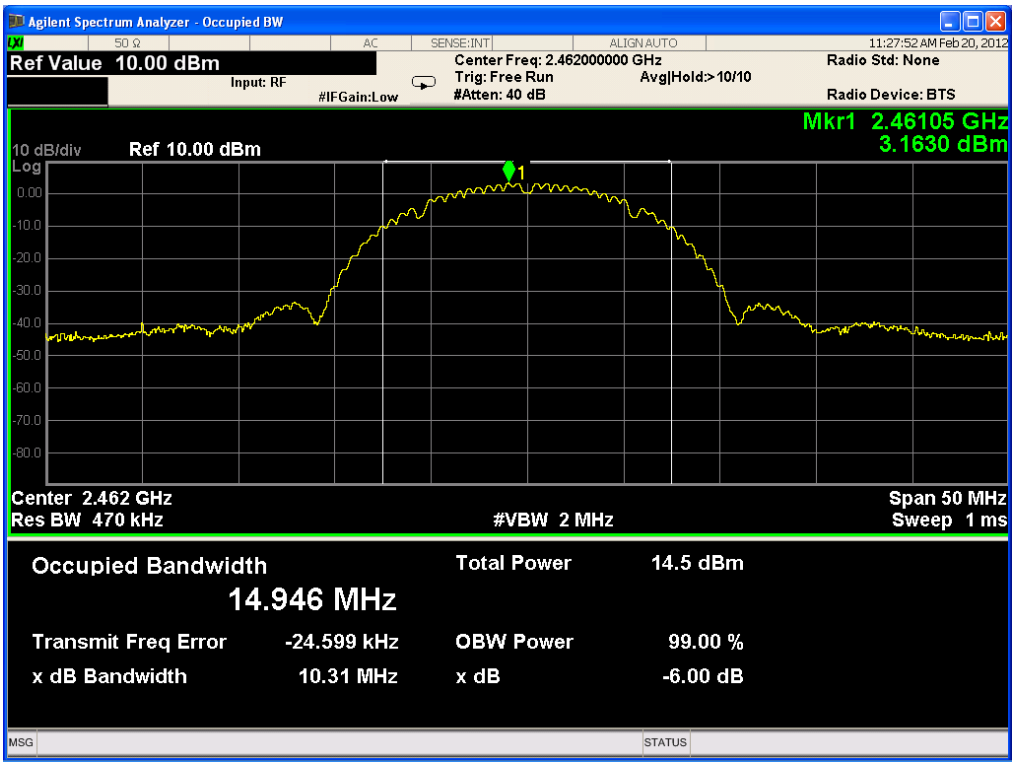
→ **6 dB bandwidth: 10.32 MHz**

② 2437 MHz at IEEE802.11b



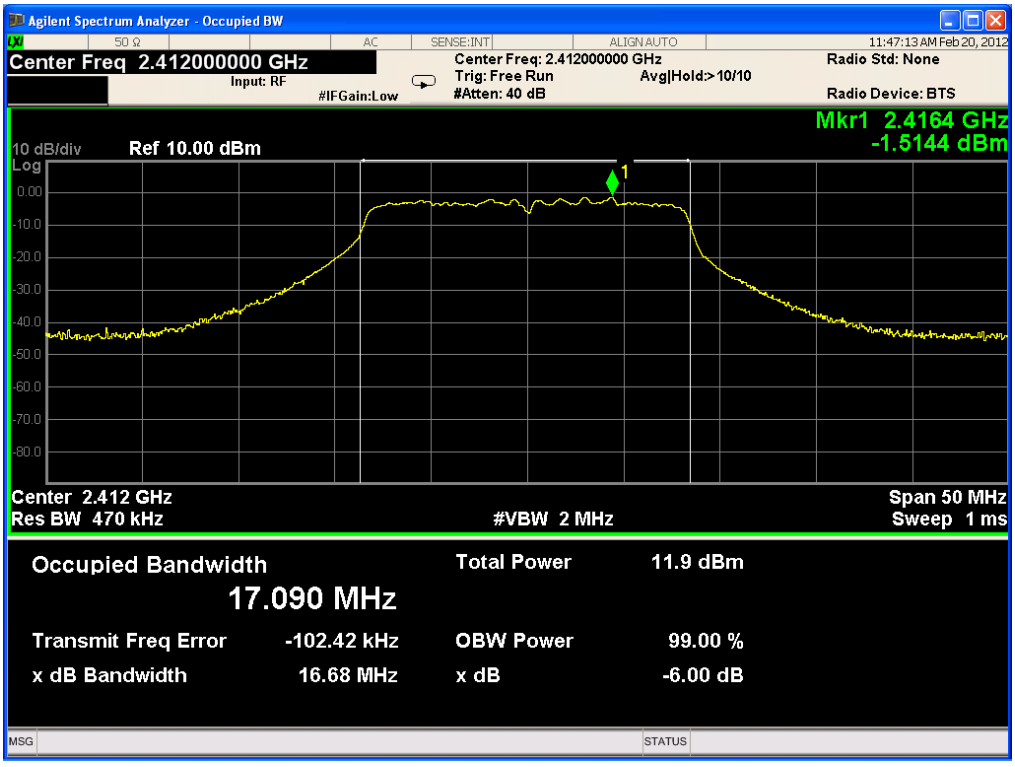
→ **6 dB bandwidth: 10.30 MHz**

③ 2462 MHz at IEEE802.11b



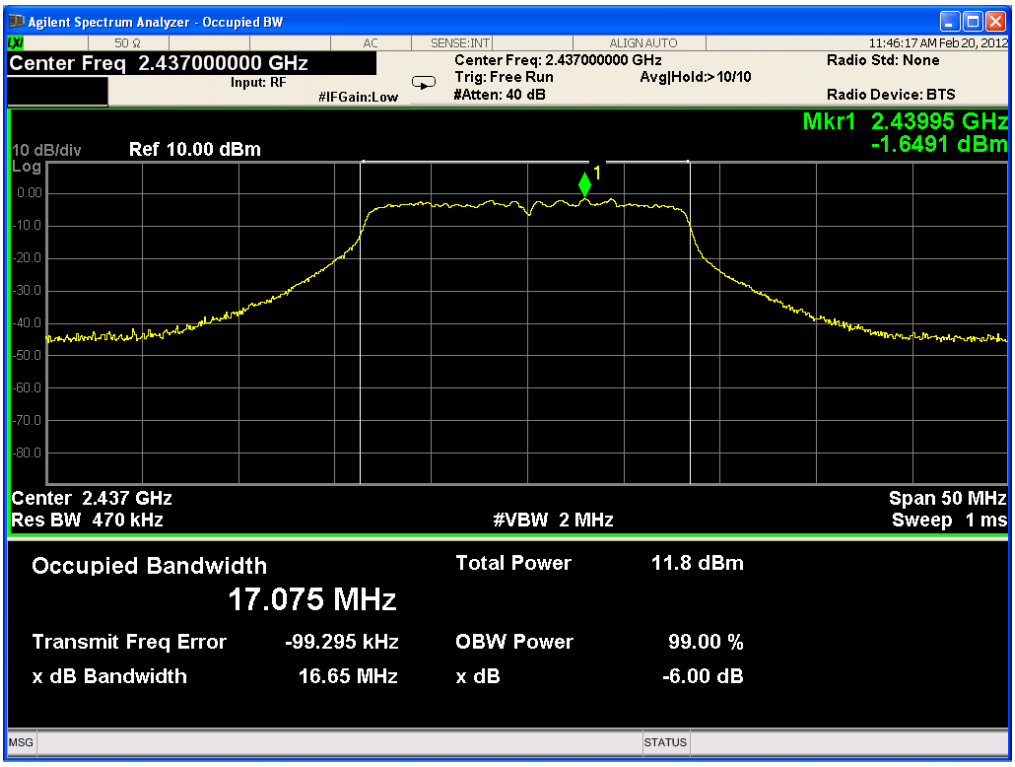
→ 6 dB bandwidth: 10.31 MHz

④ 2412 MHz at IEEE802.11g



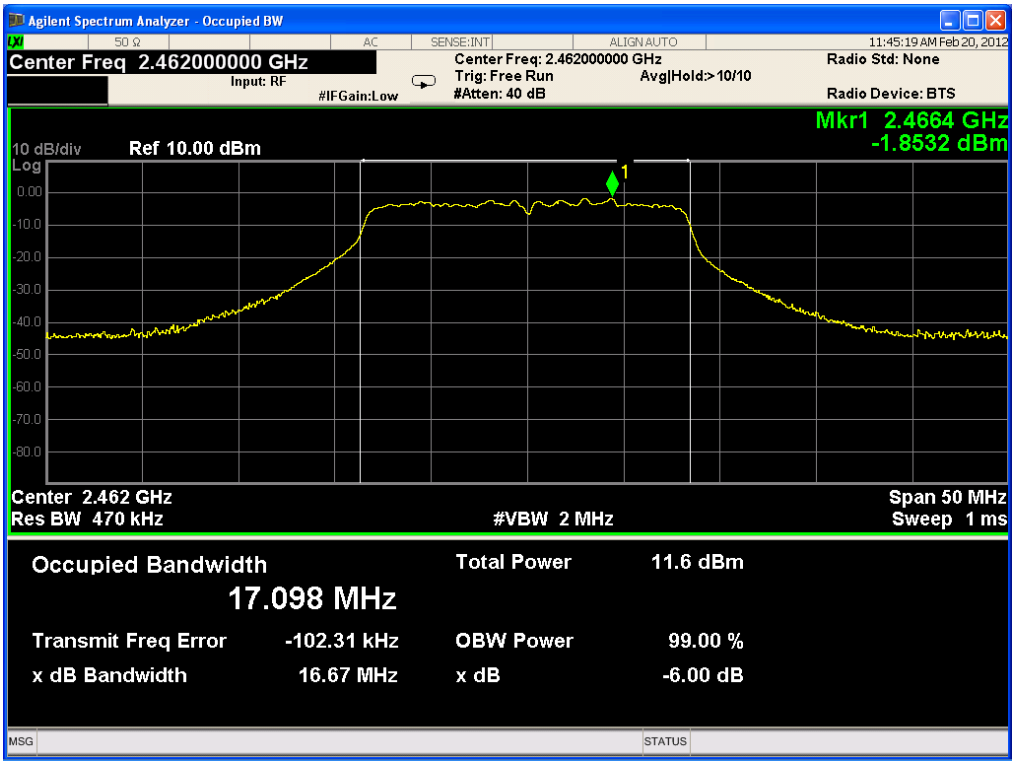
→ 6 dB bandwidth: 16.68 MHz

⑤ 2437 MHz at IEEE802.11g



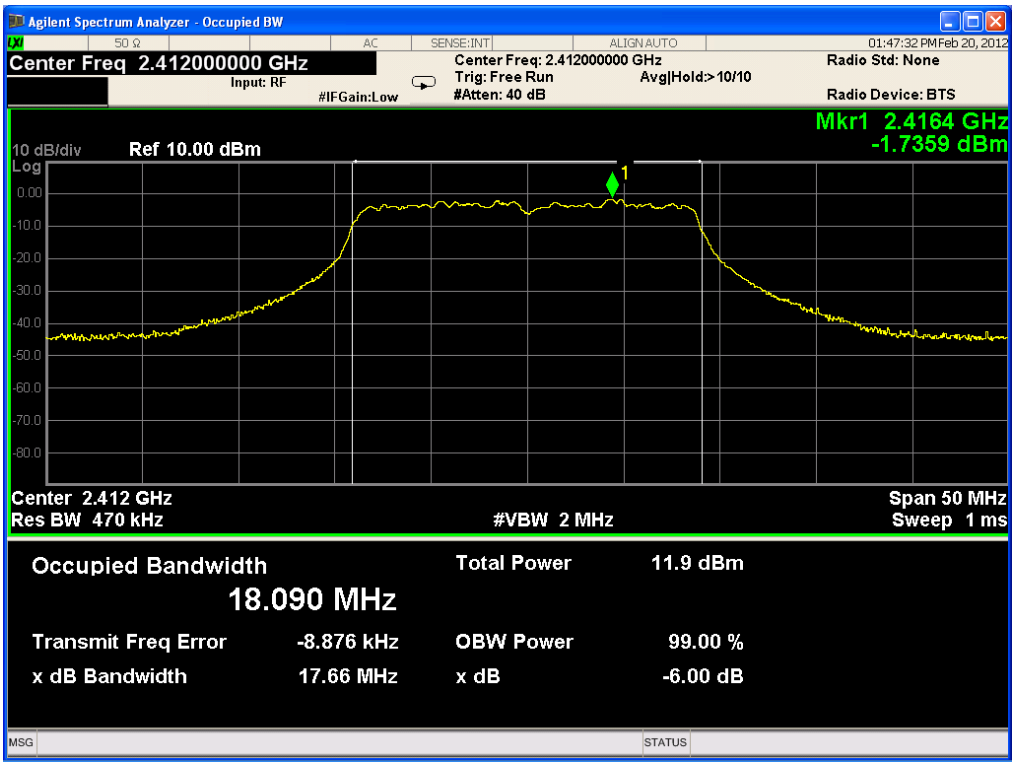
→ 6 dB bandwidth: 16.65 MHz

⑥ 2462 MHz at IEEE802.11g



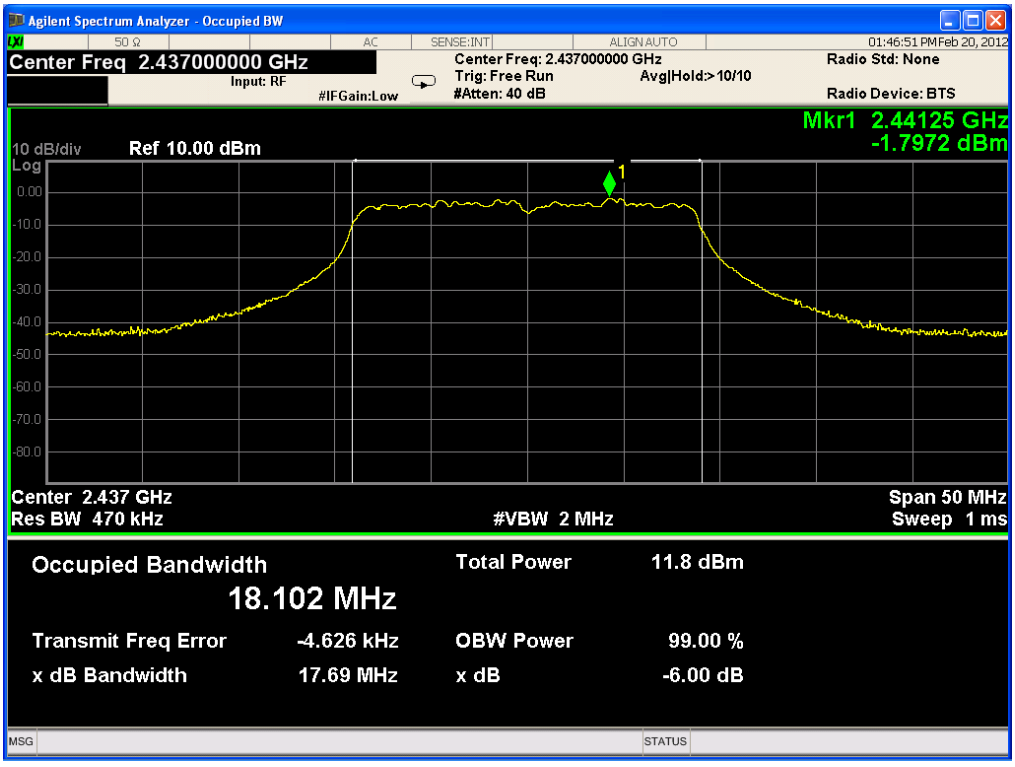
→ 6 dB bandwidth: 16.67 MHz

⑦ 2412 MHz at IEEE802.11n (20 MHz)



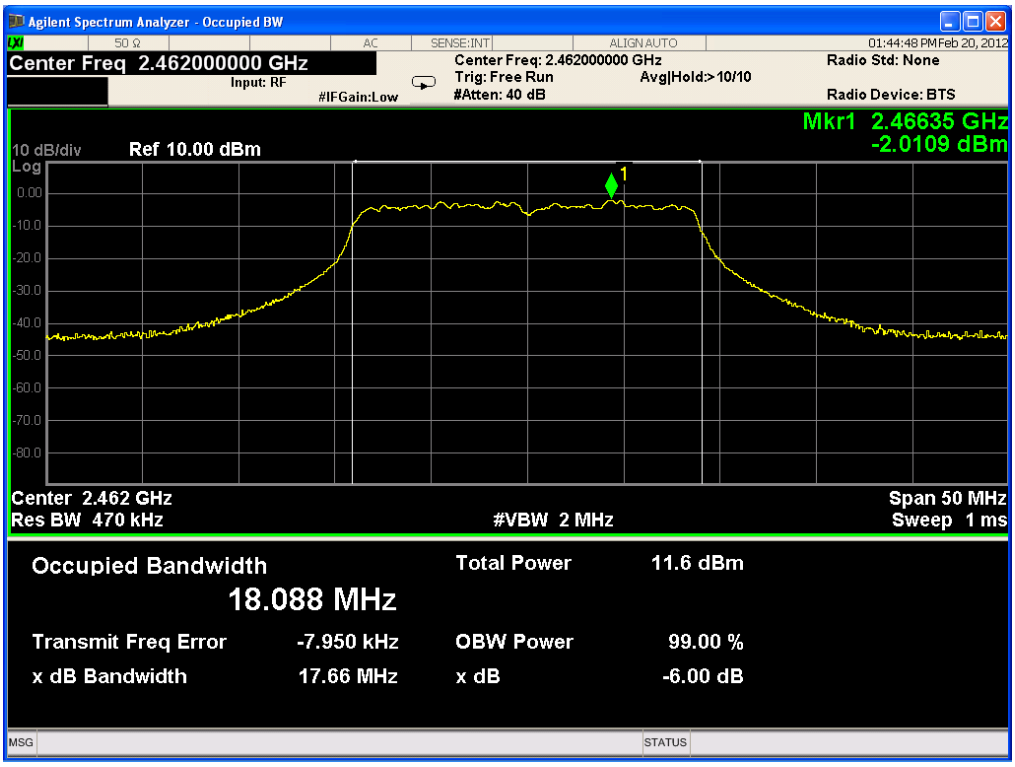
→ 6 dB bandwidth: 17.66 MHz

⑧ 2437 MHz at IEEE802.11n (20 MHz)



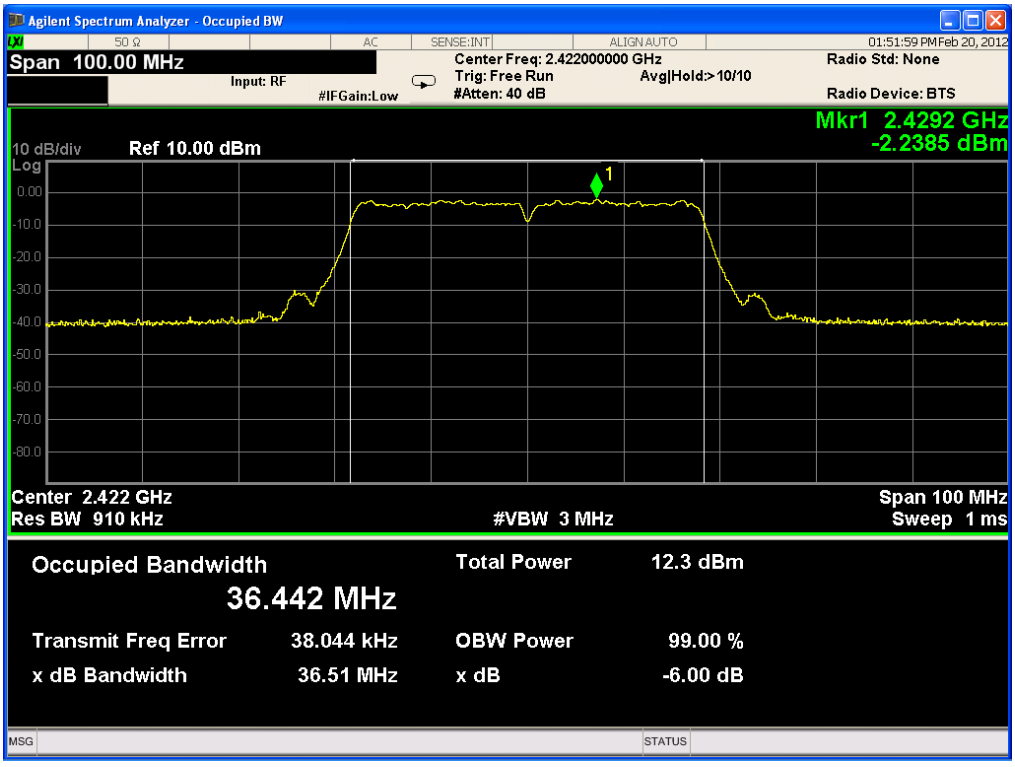
→ 6 dB bandwidth: 17.69 MHz

⑨ 2462 MHz at IEEE802.11n (20 MHz)



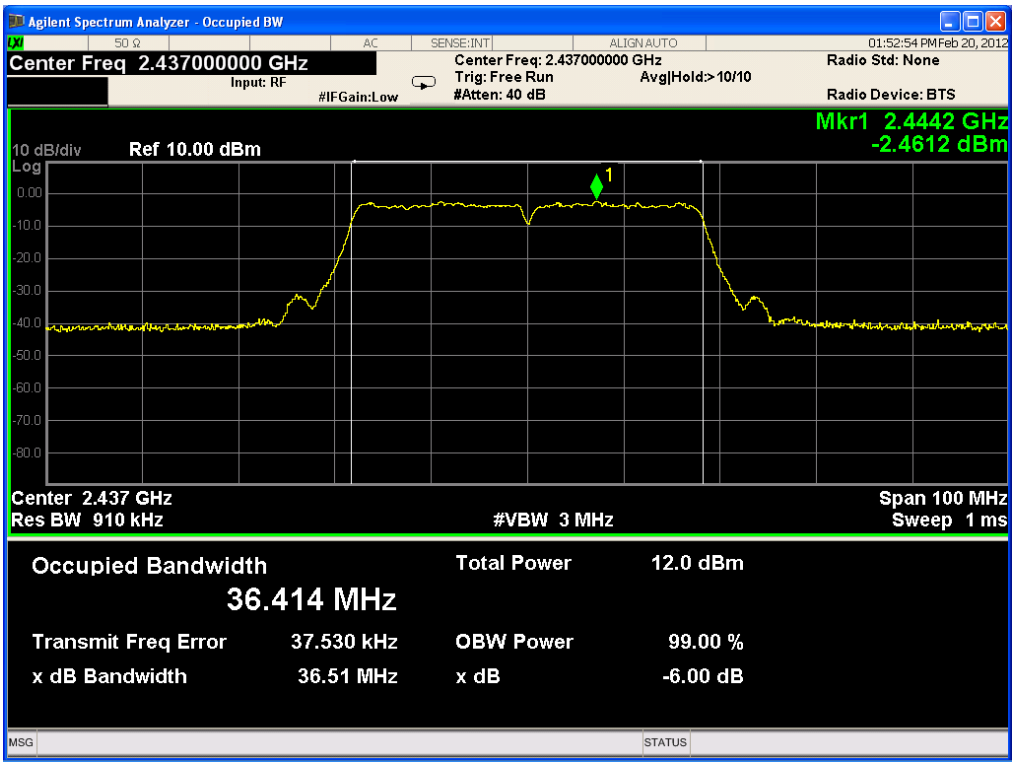
→ 6 dB bandwidth: 17.66 MHz

⑩ 2422 MHz at IEEE802.11n (40 MHz)



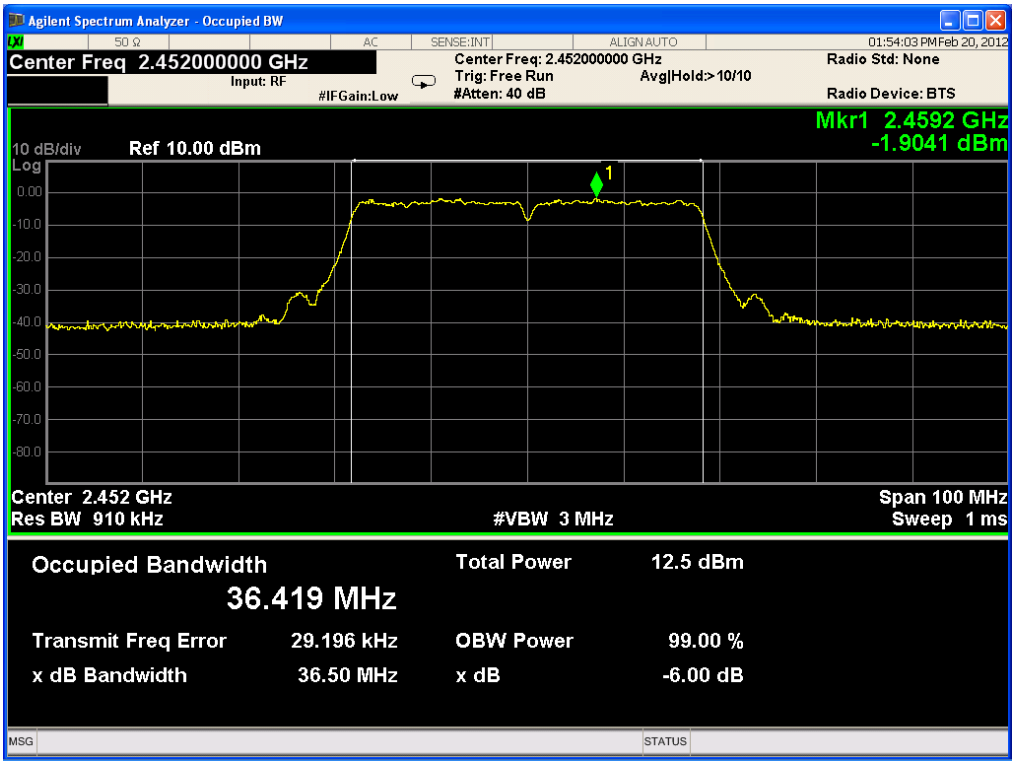
→ 6 dB bandwidth: 36.51 MHz

⑪ 2437 MHz at IEEE802.11n (40 MHz)



→ 6 dB bandwidth: 36.51 MHz

⑫ 2452 MHz at IEEE802.11n (40 MHz)



→ 6 dB bandwidth: 36.50 MHz

4.2 Maximum peak output power

4.2.1 Definition

Maximum conducted output power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level.

4.2.2 Specification

FCC Rules Part 15, Section 15.247(b)(3)

4.2.3 Method of measurement

Public Notice “558074 D01 DTS Meas Guidance v01”

4.2.4 Measurement set-up

4.2.5 Test equipment

Equipment	Model name	Manufacturer
EUT	WifiAn-Mini	ENJsoft Inc.
Control PC	NT-P560	Samsung
Spectrum Analyzer	N9020A	Agilent

4.2.6 Test procedure (Peak mode)

① Connect the equipment as “Measurement set-up”
② Set RBW = 1 MHz
③ Set VBW = 3 MHz
④ Set the span ≥ 105 to 130 % of the emission bandwidth
⑤ Detector = Peak
⑥ Trace mode = max hold
⑦ Sweep = auto couple
⑧ Allow trace to fully stabilize
⑨ Measure the maximum output power

4.2.7 Test procedure (Averaging mode)

① Connect the equipment as “Measurement set-up”
② Set RBW = 1 MHz
③ Set VBW ≥ 3 MHz
④ Set the span ≥ 105 to 130 % of the emission bandwidth
⑤ Detector = Power average (RMS)
⑥ Sweep time = auto couple
⑦ Trace mode = power averaging mode over a minimum of 100 traces
⑧ Number of measurement point in the sweep ≥ 2 x (span/RBW).
Therefore, sweep point more than 1001
⑨ Measure the maximum output power

4.2.8 Test condition

- Test place: Shield room
- Test mode: Maximum output power
- Test environment: 27℃, 53 % R.H.

4.2.9 Limit

For systems using digital modulation in the 902 - 928 MHz, 2 400 - 2 483.5 MHz, and 5 725 - 5 850 MHz bands: 1 Watt.

As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

Power must be summed across all antennas and antenna elements.

The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level.

If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

4.2.10 Test result of IEEE802.11b mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured power (mW)	
			Peak mode	Average mode
2 412	1	Long Preamble	14.55	7.14
2 437	1	Long Preamble	14.76	7.35
2 462	1	Long Preamble	14.52	7.05

4.2.11 Test result of IEEE 802.11g mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured power (mW)	
			Peak mode	Average mode
2 412	6	Long GI	14.96	2.72
2 437	6	Long GI	14.55	2.62
2 462	6	Long GI	14.83	2.56

4.2.12 Test result of IEEE 802.11n (20 MHz) mode

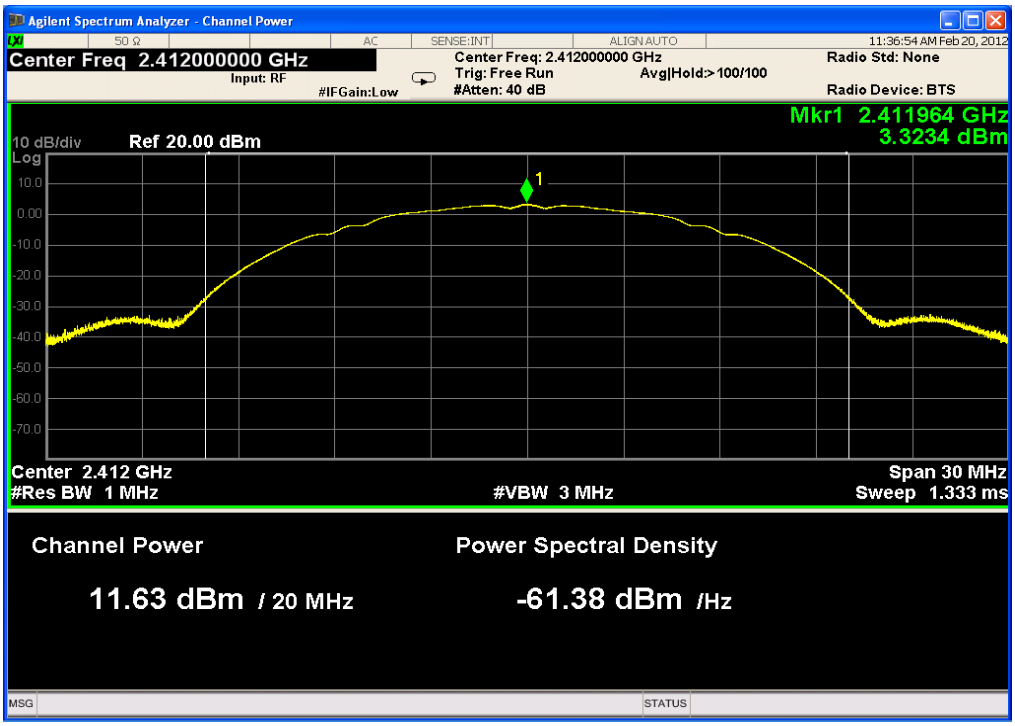
Frequency (MHz)	Data rate (Mbps)	Preamble	Measured power (mW)	
			Peak mode	Average mode
2 412	MCS 7	Long GI	15.21	2.59
2 437	MCS 7	Long GI	13.93	2.68
2 462	MCS 7	Long GI	13.93	2.46

4.2.13 Test result of IEEE 802.11n (40 MHz) mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured power (mW)	
			Peak mode	Average mode
2 422	MCS 7	Long GI	13.61	2.34
2 437	MCS 7	Long GI	13.49	2.37
2 452	MCS 7	Long GI	13.49	2.30

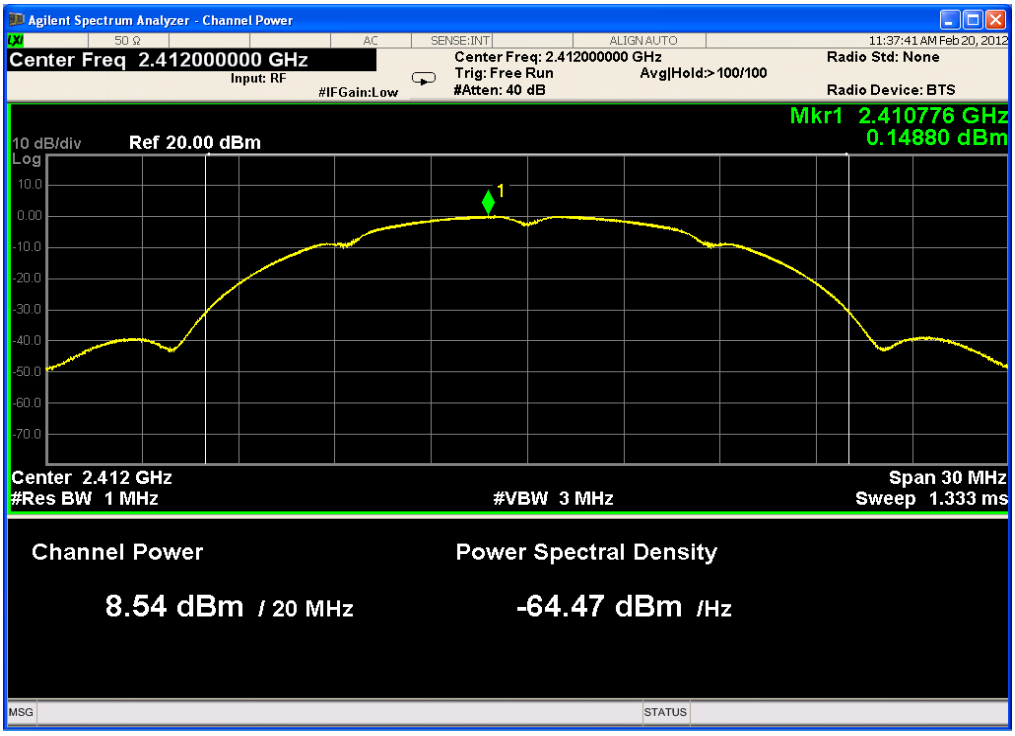
4.2.14 Plot of output power

① 2 412 MHz at IEEE802.11b



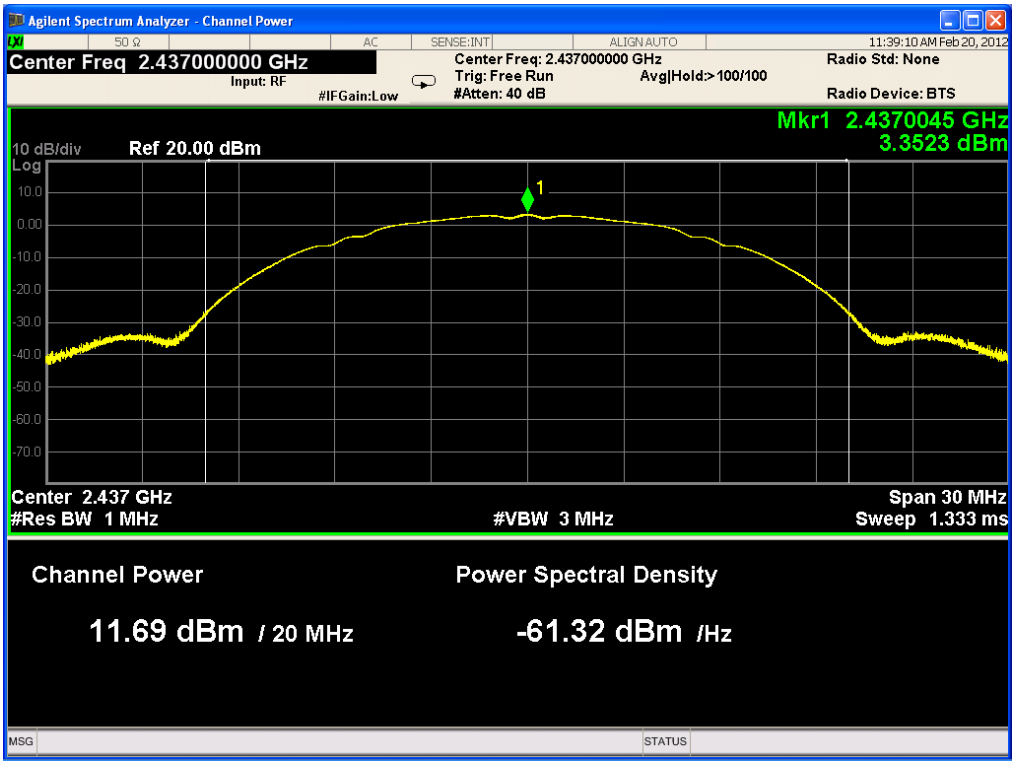
→ **Output Power (Peak mode): 11.63 dBm / 14.55 mW**

② 2 412 MHz at IEEE802.11b



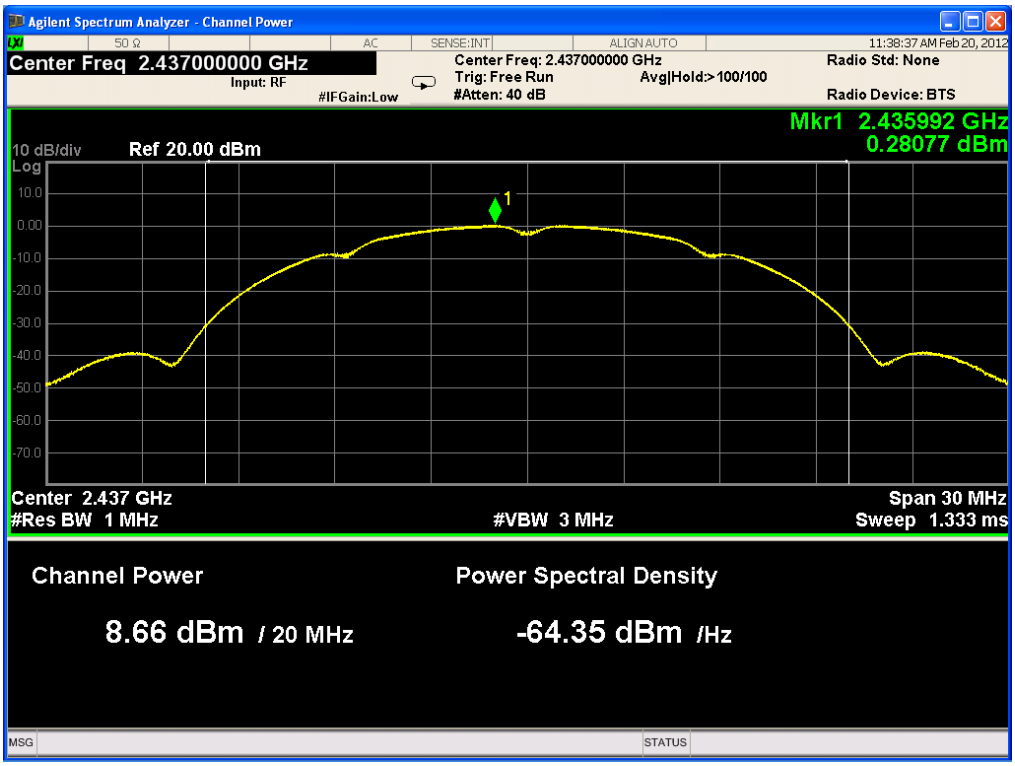
→ **Output Power (Average mode): 8.54 dBm / 7.14 mW**

③ 2 437 MHz at IEEE802.11b



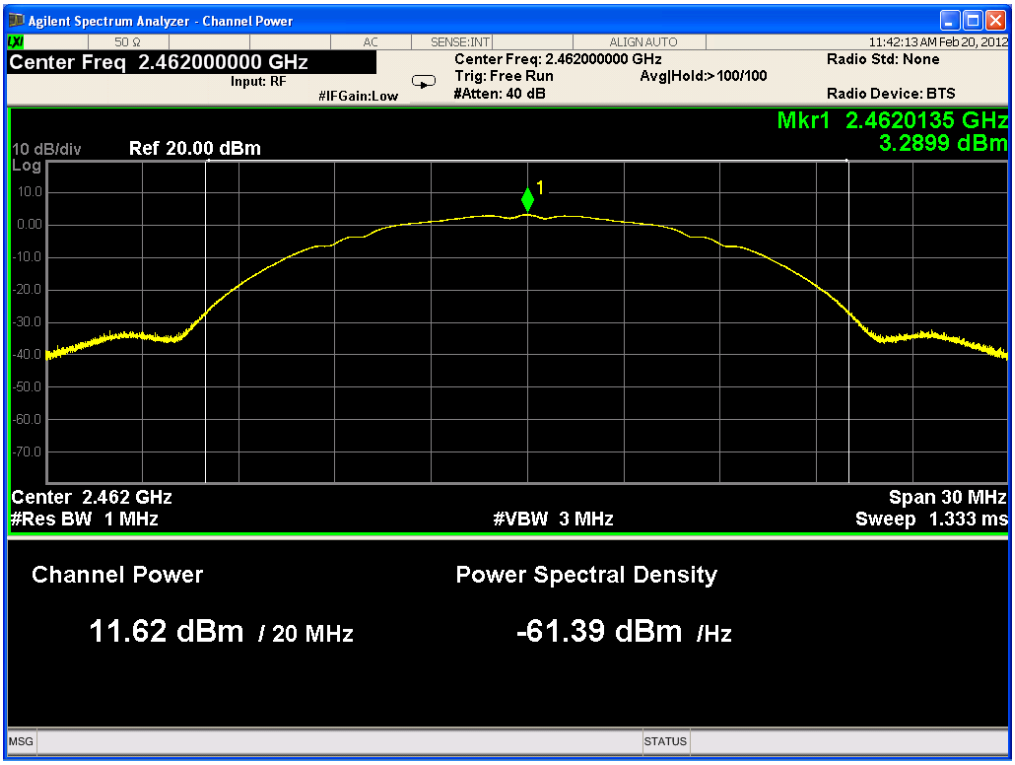
→ Output Power (Peak mode): 11.69 dBm / 14.76 mW

④ 2 437 MHz at IEEE802.11b



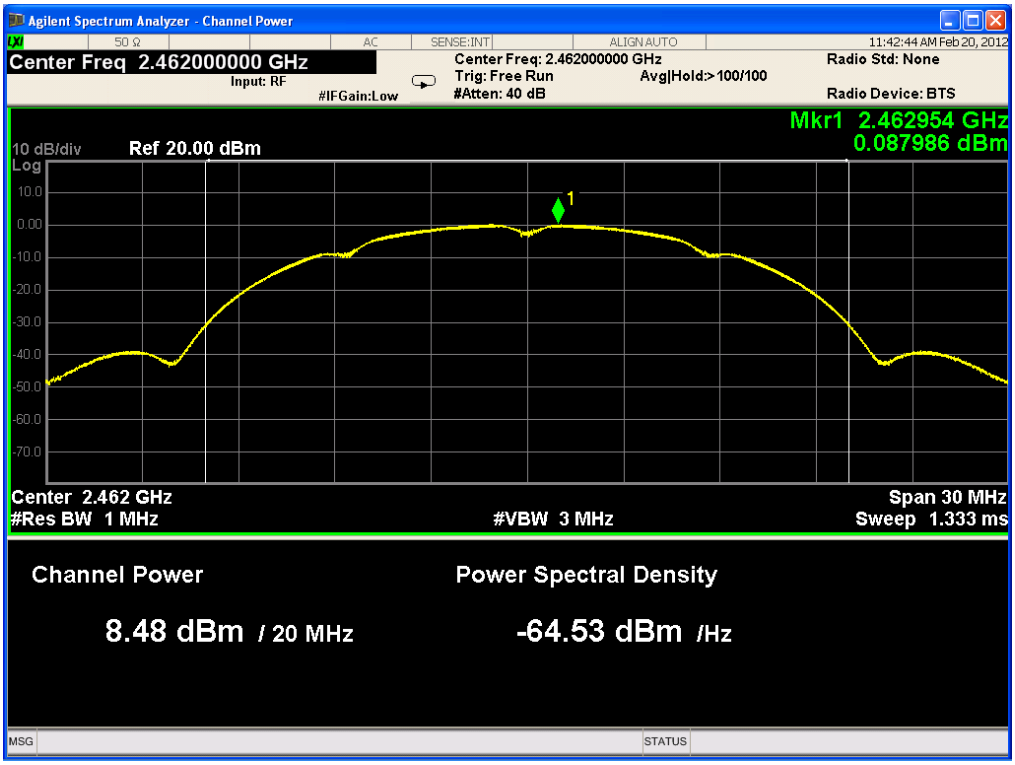
→ Output Power (Average mode): 8.66 dBm / 7.35 mW

⑤ 2 462 MHz at IEEE802.11b



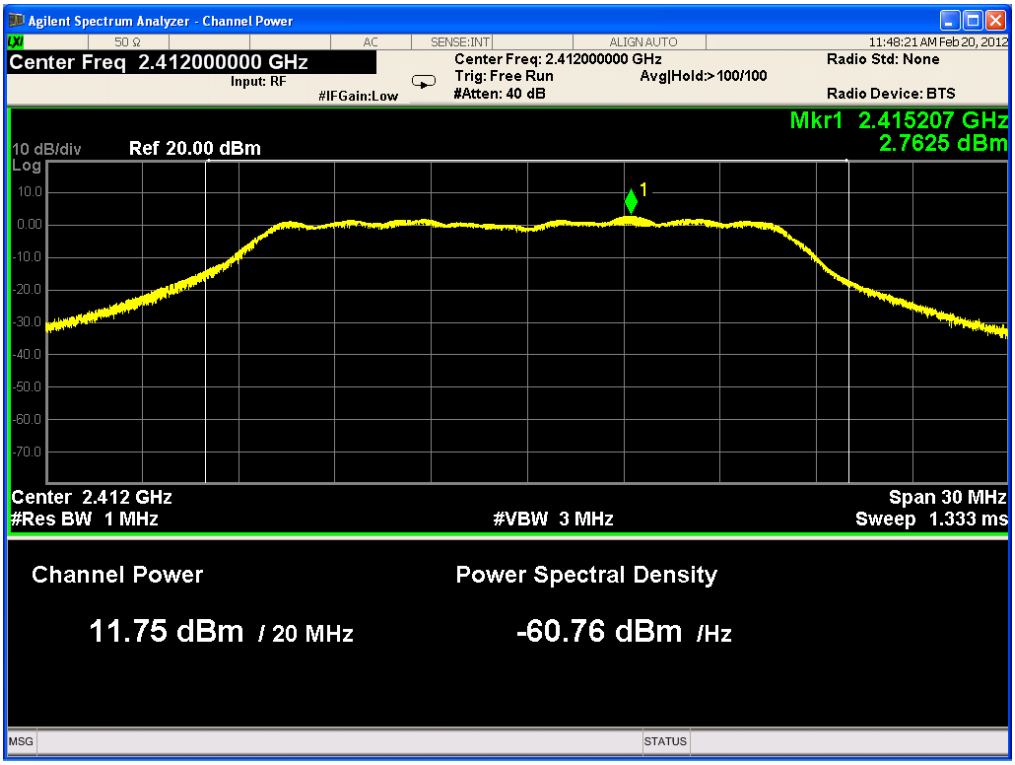
→ Output Power (Peak mode): 11.62 dBm / 14.52 mW

⑥ 2 462 MHz at IEEE802.11b



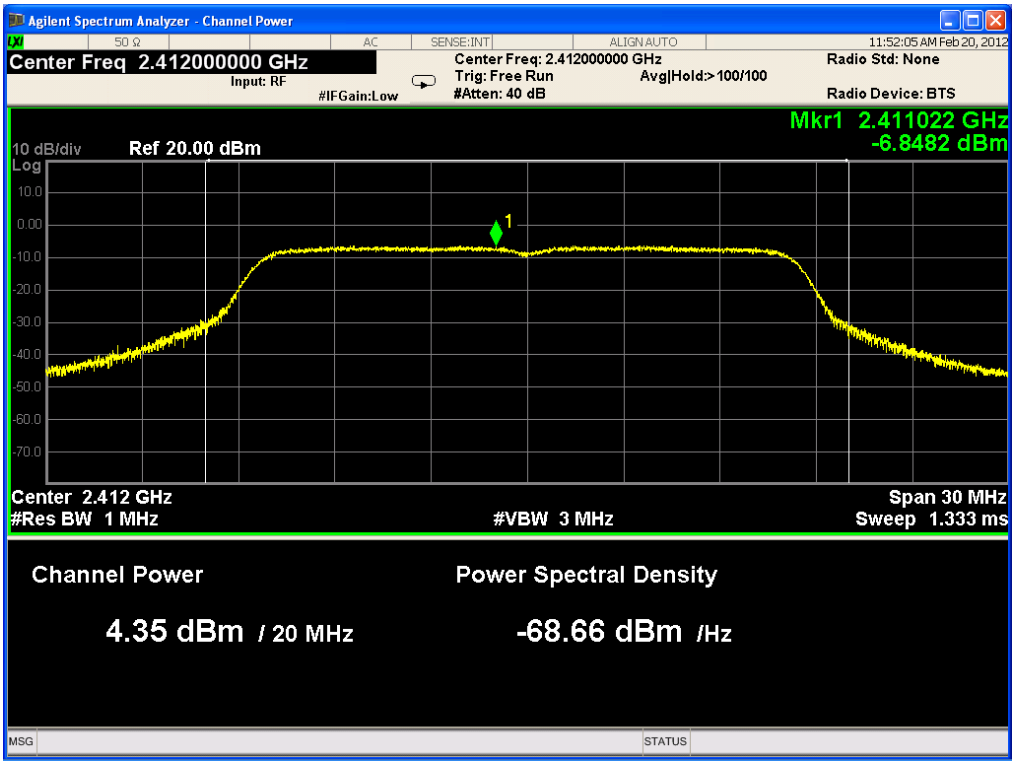
→ Output Power (Average mode): 8.48 dBm / 7.05 mW

⑦ 2 412 MHz at IEEE802.11g



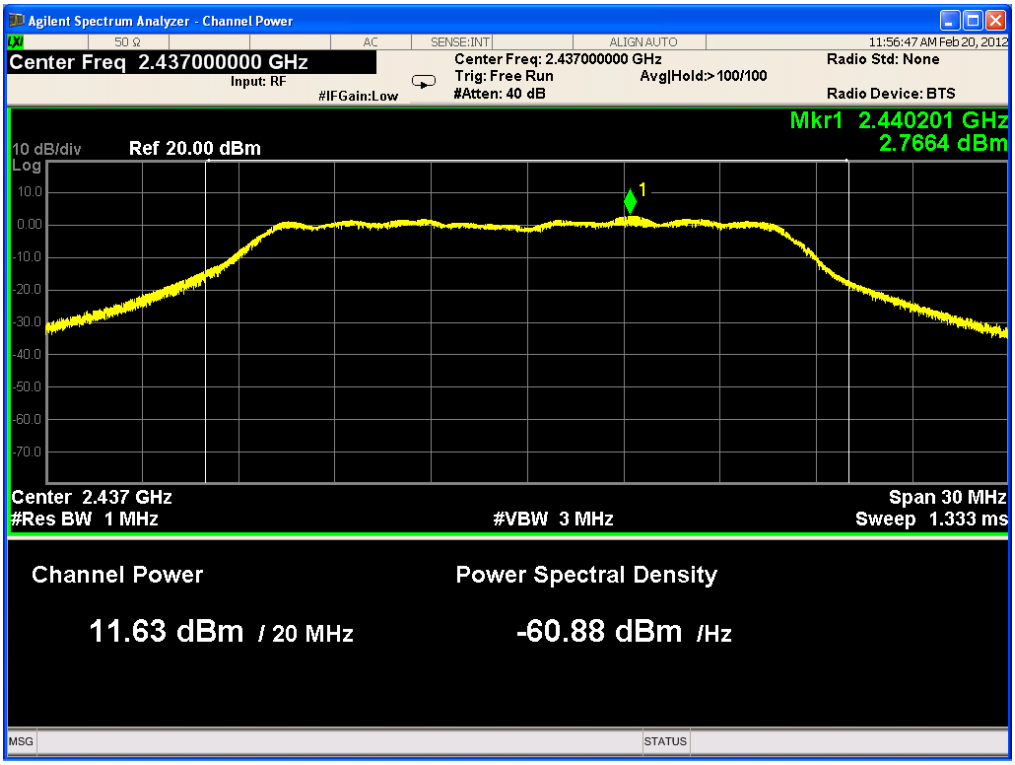
→ Output Power (Peak mode): 11.75 dBm / 14.96 mW

⑧ 2 412 MHz at IEEE802.11g



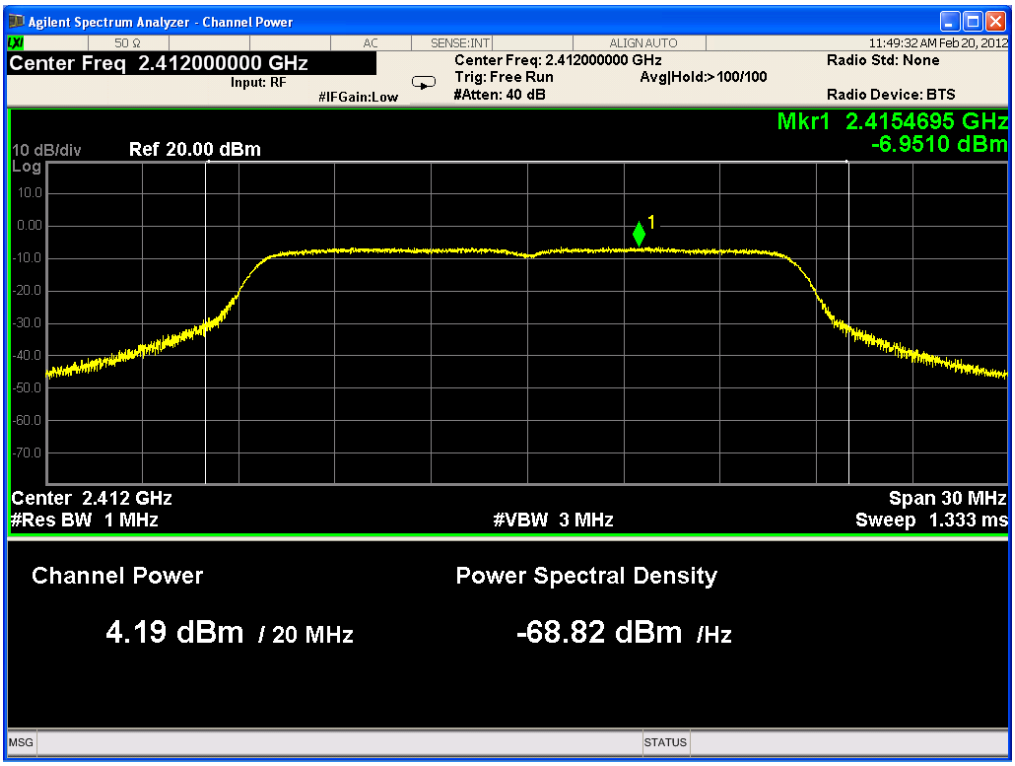
→ Output Power (Average mode): 4.35 dBm / 2.72 mW

⑨ 2 437 MHz at IEEE802.11g



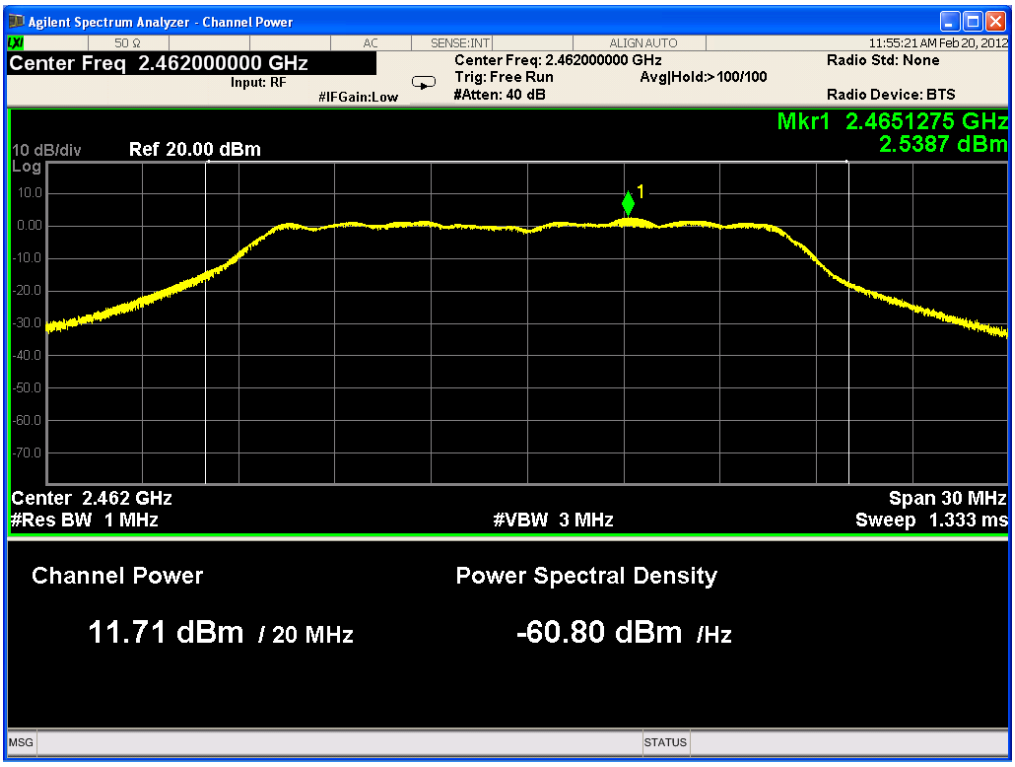
→ Output Power (Peak mode): 11.63 dBm / 14.55 mW

⑩ 2 437 MHz at IEEE802.11g



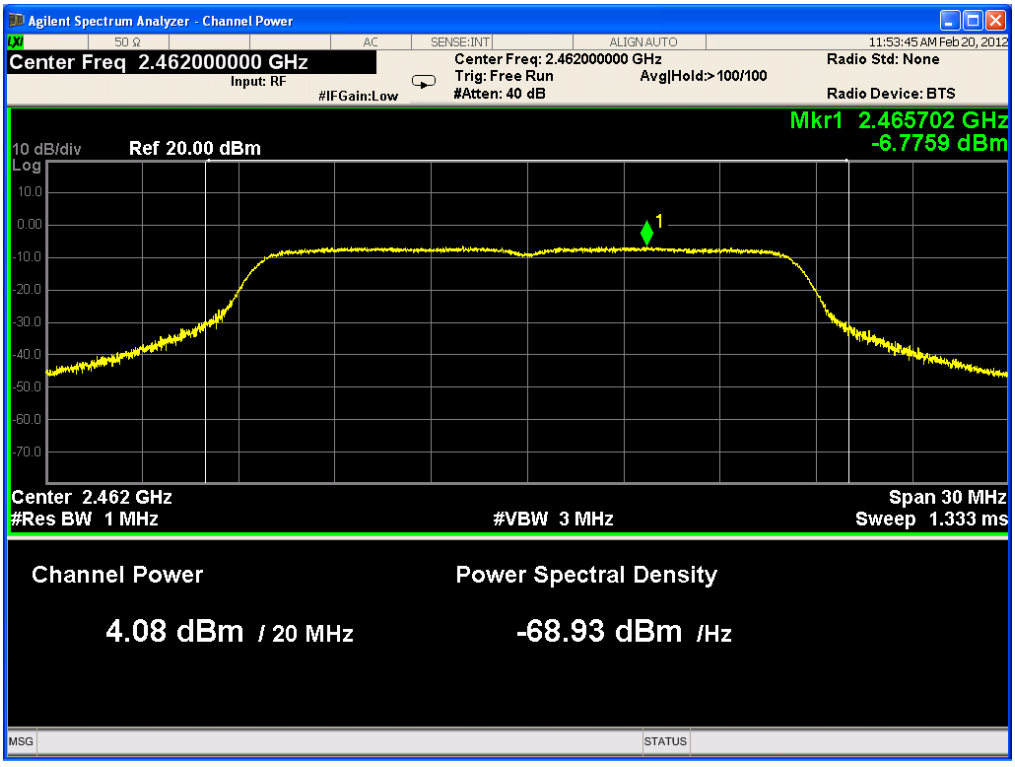
→ Output Power (Average mode): 4.19 dBm / 2.62 mW

⑪ 2 462 MHz at IEEE802.11g



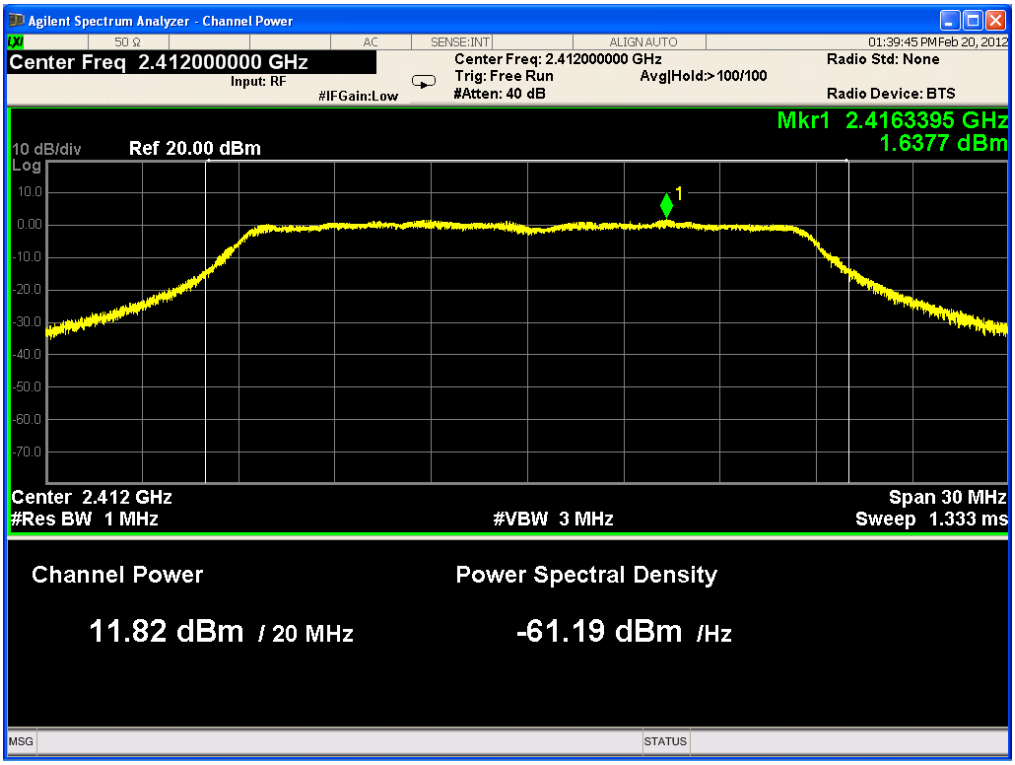
→ Output Power (Peak mode): 11.71 dBm / 14.83 mW

⑫ 2 462 MHz at IEEE802.11g



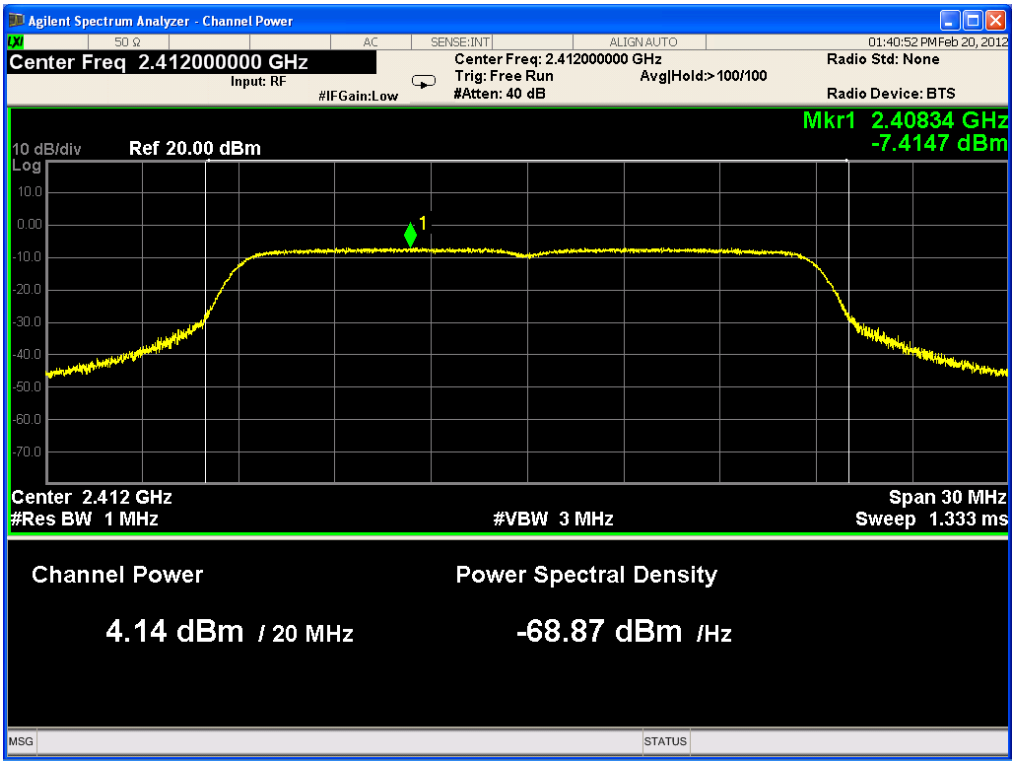
→ Output Power (Average mode): 4.08 dBm / 2.56 mW

⑬ 2 412 MHz at IEEE802.11n (20 MHz)



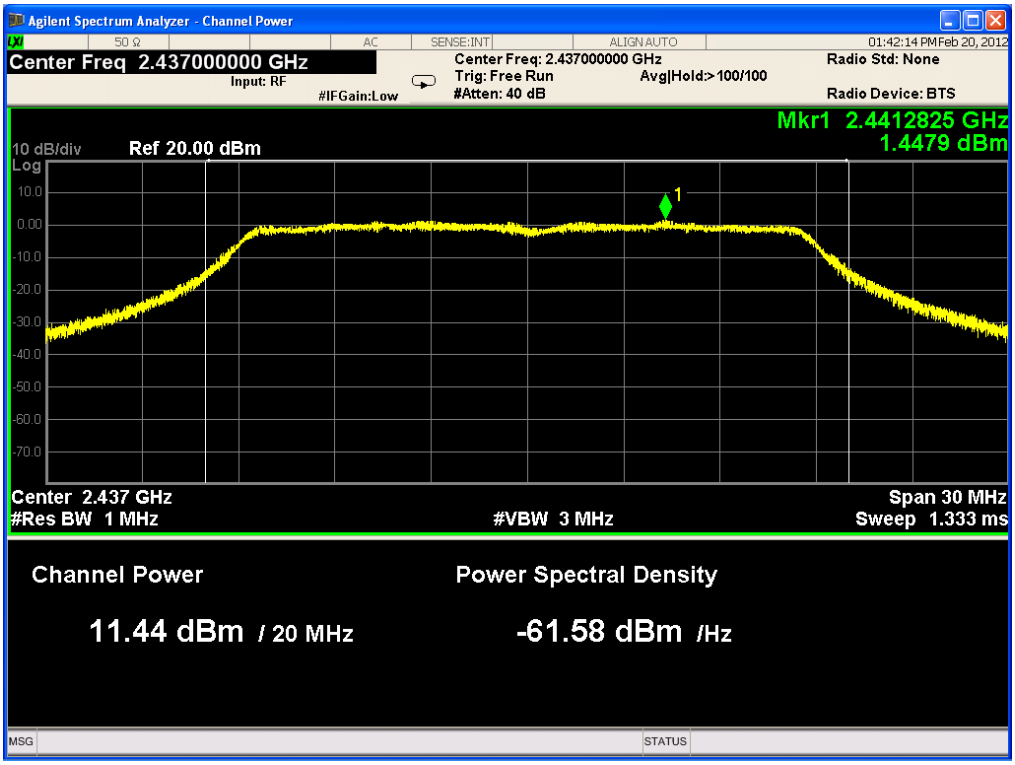
→ Output Power (Peak mode): 11.82 dBm / 15.21 mW

⑭ 2 412 MHz at IEEE802.11n (20 MHz)



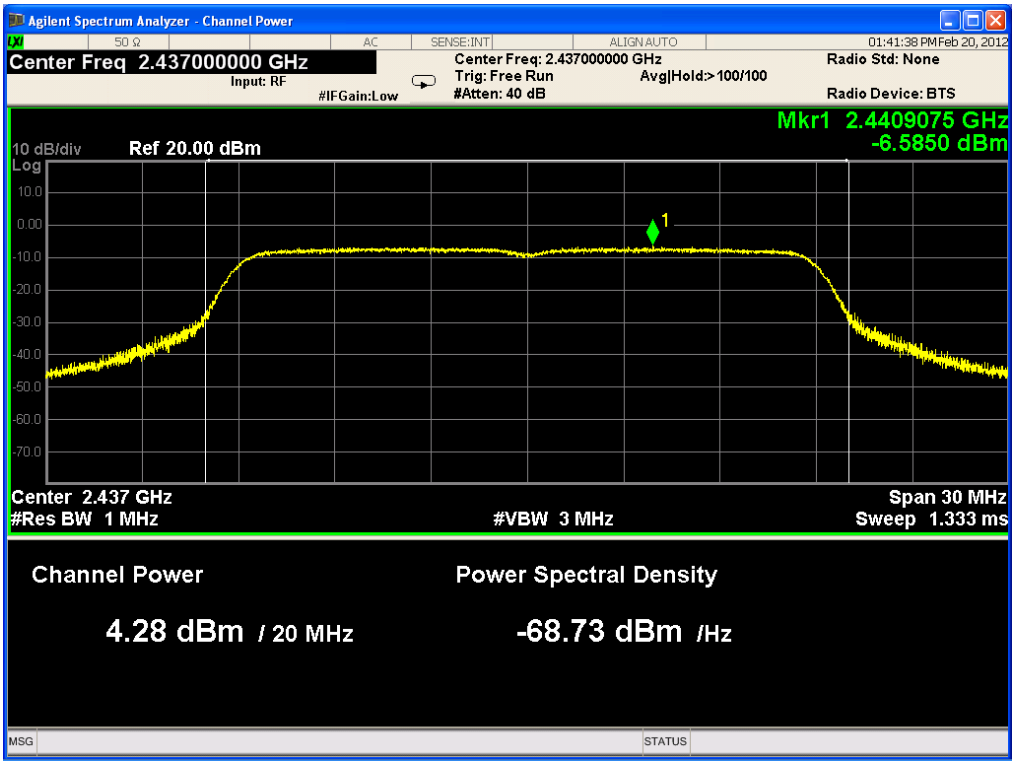
→ Output Power (Average mode): 4.14 dBm / 2.59 mW

⑮ 2 437 MHz at IEEE802.11n (20 MHz)



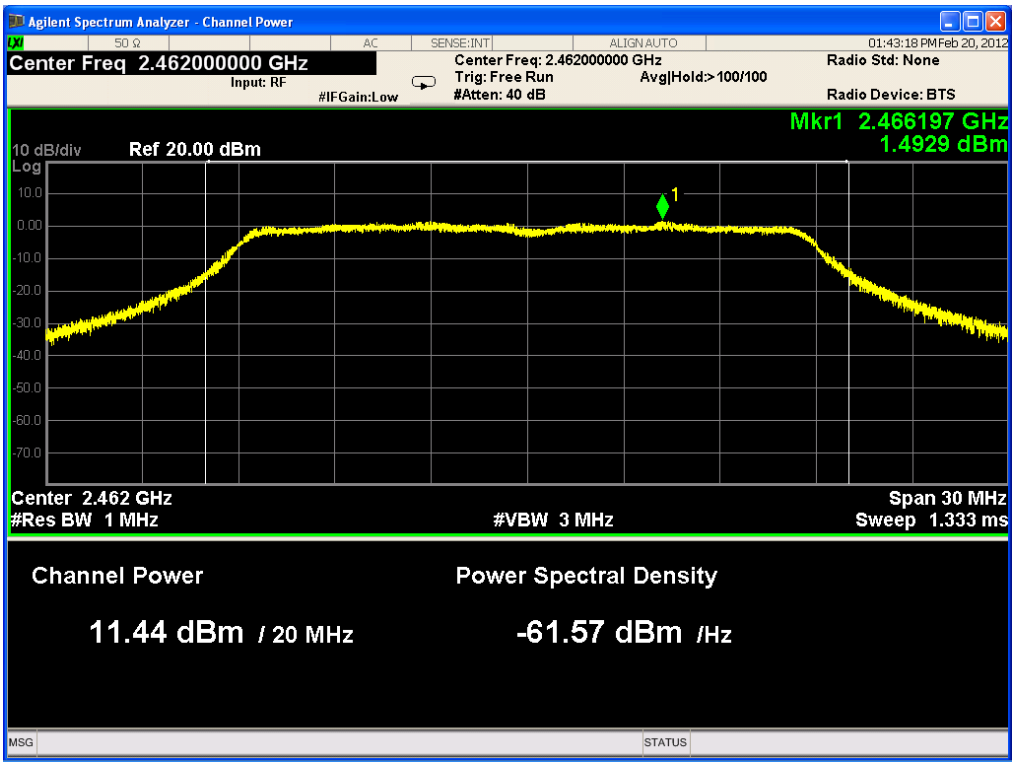
→ Output Power (Peak mode): 11.44 dBm / 13.93 mW

⑯ 2 437 MHz at IEEE802.11n (20 MHz)



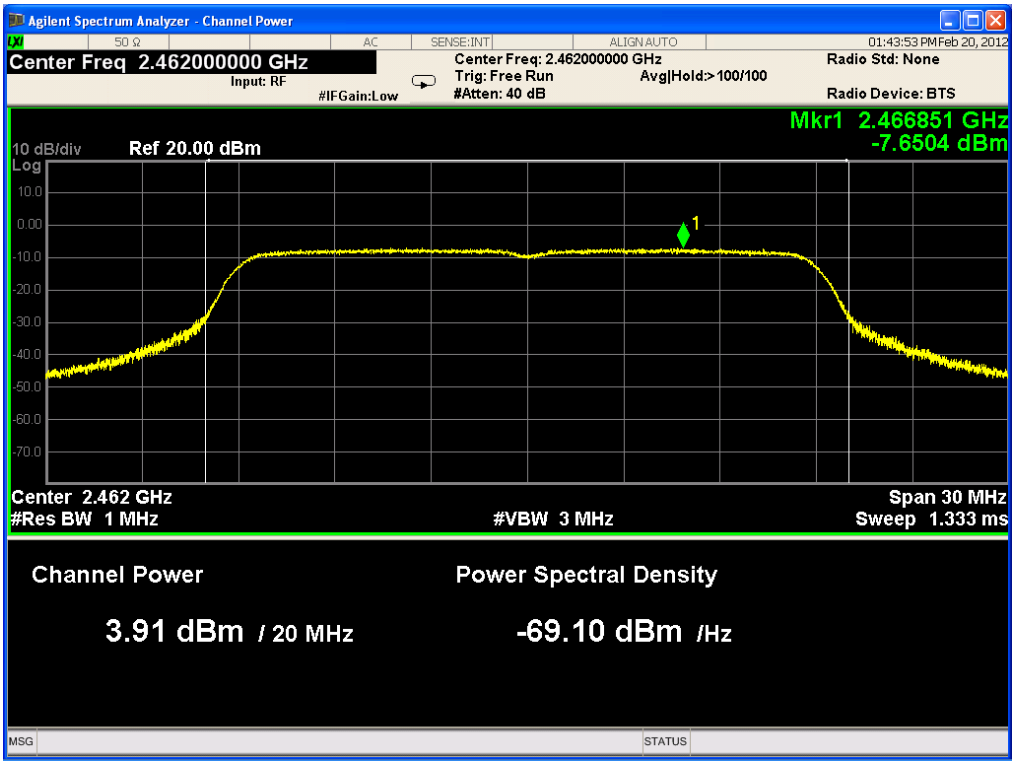
→ Output Power (Average mode): 4.28 dBm / 2.68 mW

⑰ 2 462 MHz at IEEE802.11n (20 MHz)



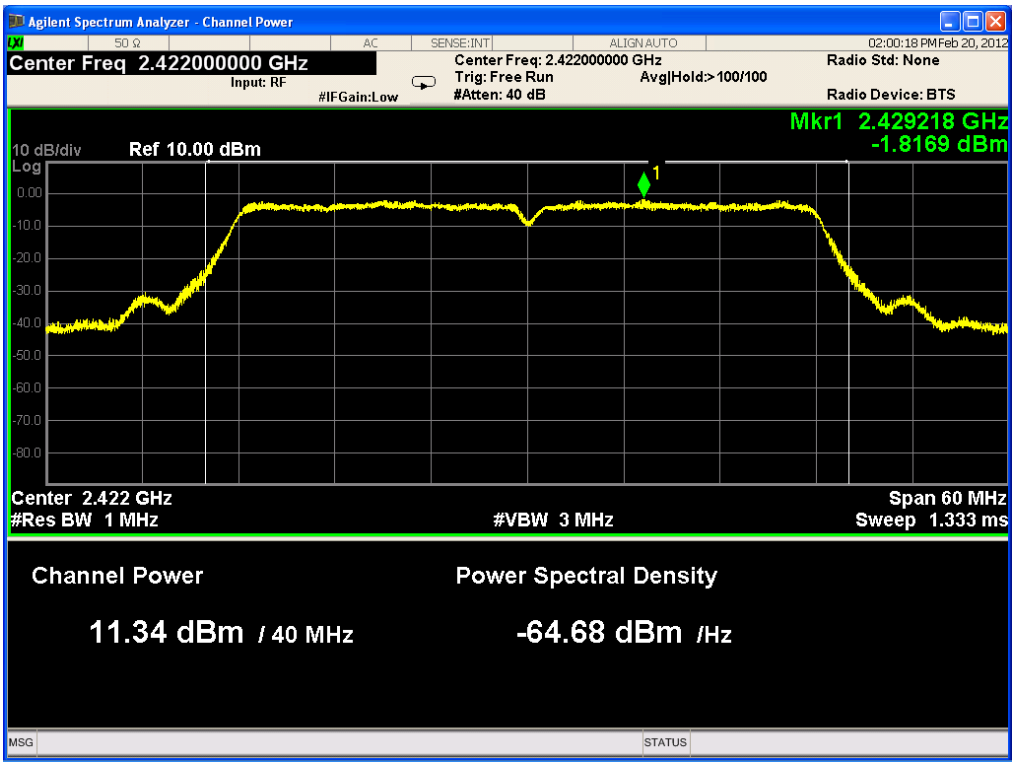
→ Output Power (Peak mode): 11.44 dBm / 13.93 mW

⑱ 2 462 MHz at IEEE802.11n (20 MHz)



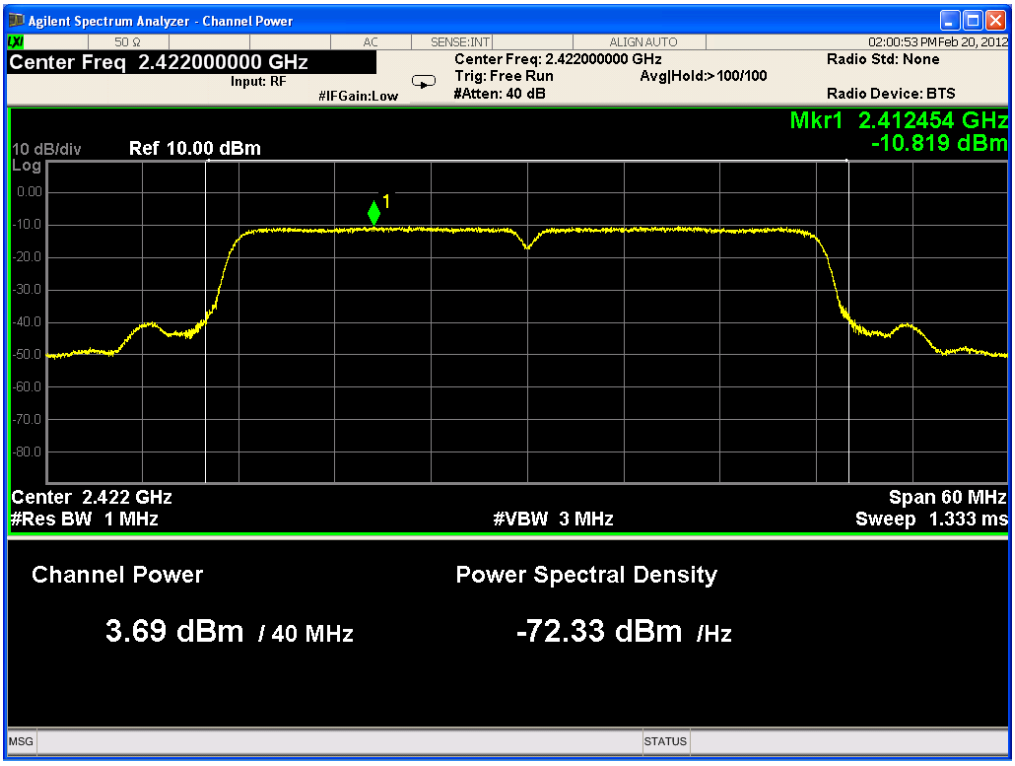
→ Output Power (Average mode): 3.91 dBm / 2.46 mW

⑲ 2 422 MHz at IEEE802.11n (40 MHz)



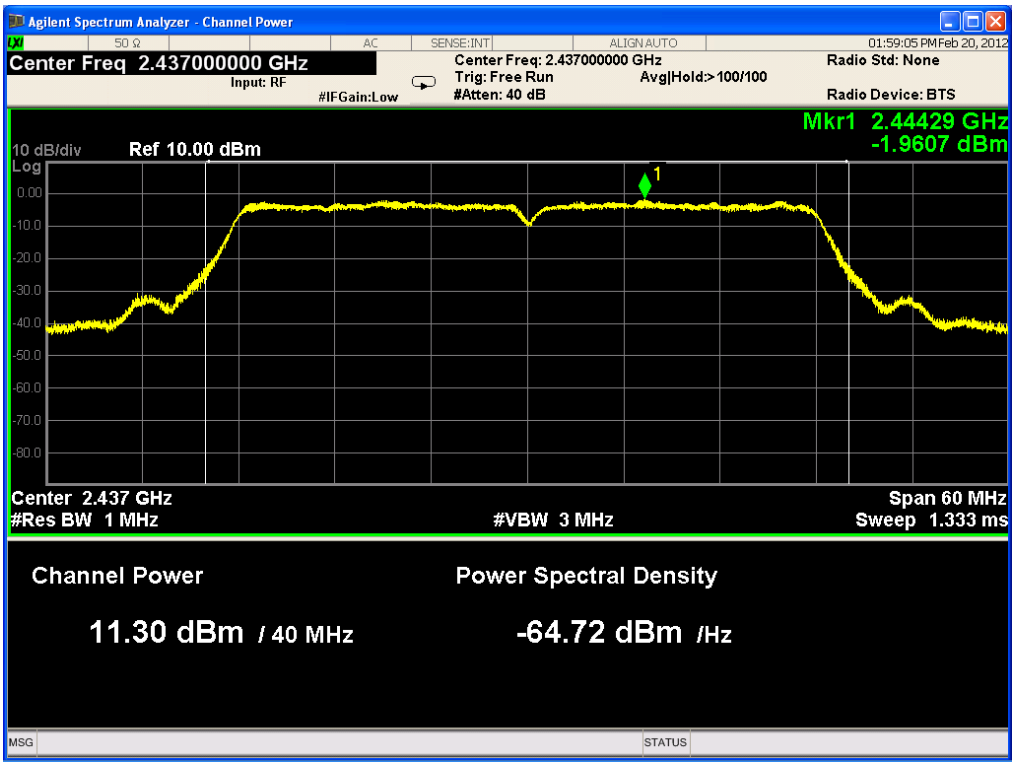
→ Output Power (Peak mode): 11.34 dBm / 13.61 mW

⑳ 2 422 MHz at IEEE802.11n (40 MHz)



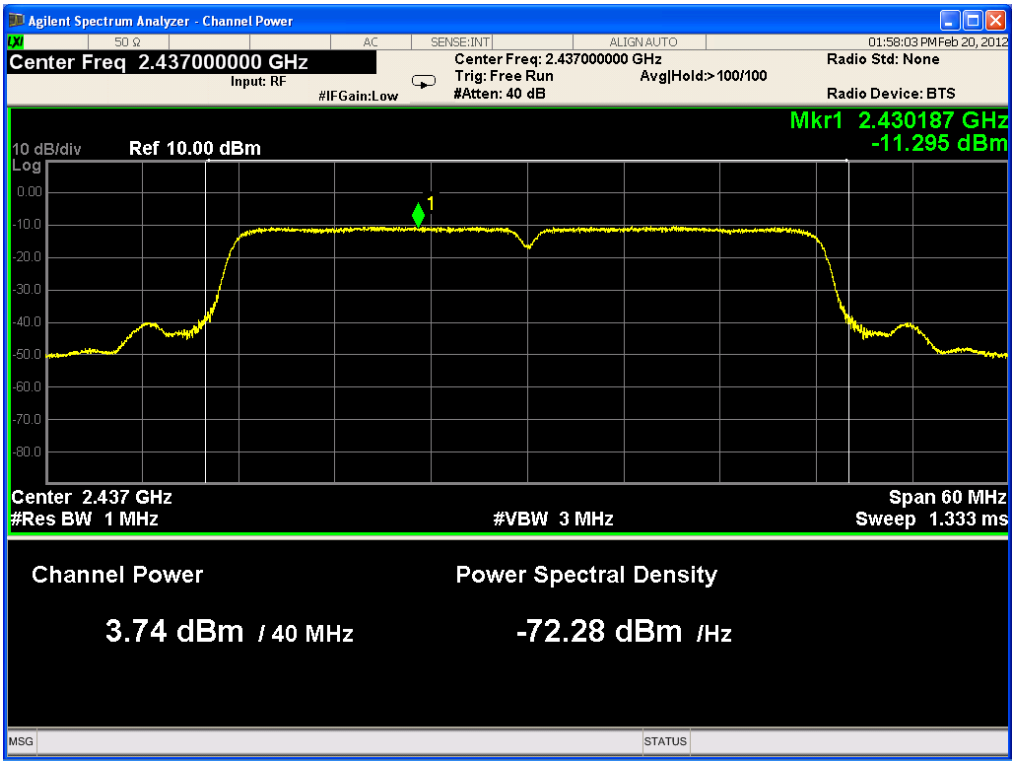
→ Output Power (Average mode): 3.69 dBm / 2.34 mW

㉑ 2 437 MHz at IEEE802.11n (40 MHz)



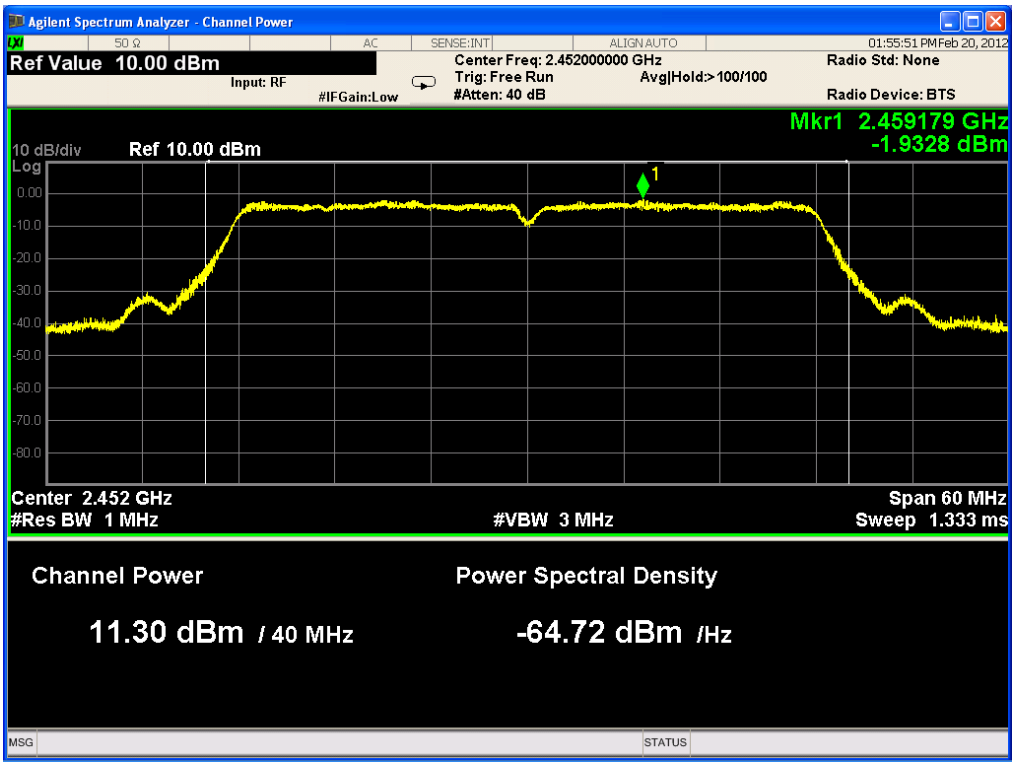
→ Output Power (Peak mode): 11.30 dBm / 13.49 mW

㉒ 2 437 MHz at IEEE802.11n (40 MHz)



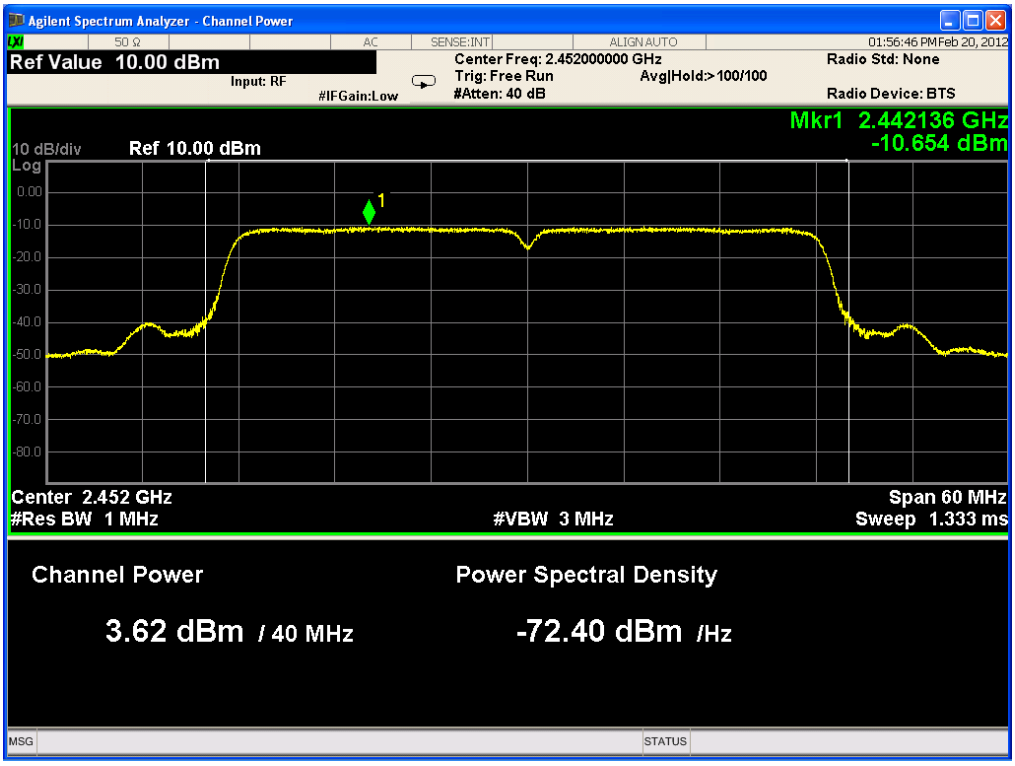
→ Output Power (Average mode): 3.74 dBm / 16.33 mW

㉓ 2 452 MHz at IEEE802.11n (40 MHz)



→ Output Power (Peak mode): 11.30 dBm / 13.49 mW

㉔ 2 452 MHz at IEEE802.11n (40 MHz)



→ Output Power (Average mode): 3.62 dBm / 2.30 mW

4.3 Maximum power spectral density

4.3.1 Definition

The maximum spectral density is defined as the highest level in Watts per Hertz generated by the transmitter within the power envelope.

4.3.2 Specification

FCC Rules Part 15, Section 15.247(e)

4.3.3 Method of measurement

Public Notice “558074 D01 DTS Meas Guidance v01”

4.3.4 Measurement set-up

4.3.5 Test equipment

Equipment	Model name	Manufacturer
EUT	WifiAn-Mini	ENJsoftn Inc.
Control PC	NT-P560	Samsung
Spectrum Analyzer	N9020A	Agilent

4.3.6 Test procedure (Peak mode)

① Connect the equipment as “Measurement set-up”
② Set RBW = 100 kHz
③ Set VBW ≥ 300 kHz
④ Set the span ≥ 105 to 130 % of the emission bandwidth
⑤ Detector = peak
⑥ Trace mode = max hold
⑦ Sweep = auto couple
⑧ Allow trace to stabilize fully
⑨ Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW
⑩ Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB)

4.3.7 Test procedure (Averaging mode)

① Connect the equipment as “Measurement set-up”
② Set RBW = 100 kHz
③ Set VBW ≥ 300 kHz
④ Set the span ≥ 105 to 130 % of the emission bandwidth
⑤ Detector = power average (RMS)
⑥ Number of measurement point in the sweep ≥ 2 x (span/RBW)
⑦ Sweep time ≥ 10 x (number of measurement point in sweep) x (transmission symbol period)
⑧ Perform the measurement over a single sweep
⑨ Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW
⑩ Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB)

4.3.8 Test condition

- Test place: Shield room
- Test mode: Maximum output power
- Test environment: 27 ℃, 53 % R.H.

4.3.9 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.10 Test result of IEEE802.11b mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured PSD (dBm)	
			Peak mode	Average mode
2 412	1	Long Preamble	-16.39	-24.45
2 437	1	Long Preamble	-16.86	-24.48
2 462	1	Long Preamble	-16.47	-24.55

4.3.11 Test result of IEEE 802.11g mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured PSD (dBm)	
			Peak mode	Average mode
2 412	6	Long GI	-24.09	-31.50
2 437	6	Long GI	-23.89	-31.44
2 462	6	Long GI	-24.01	-31.54

4.3.12 Test result of IEEE 802.11n (20 MHz) mode

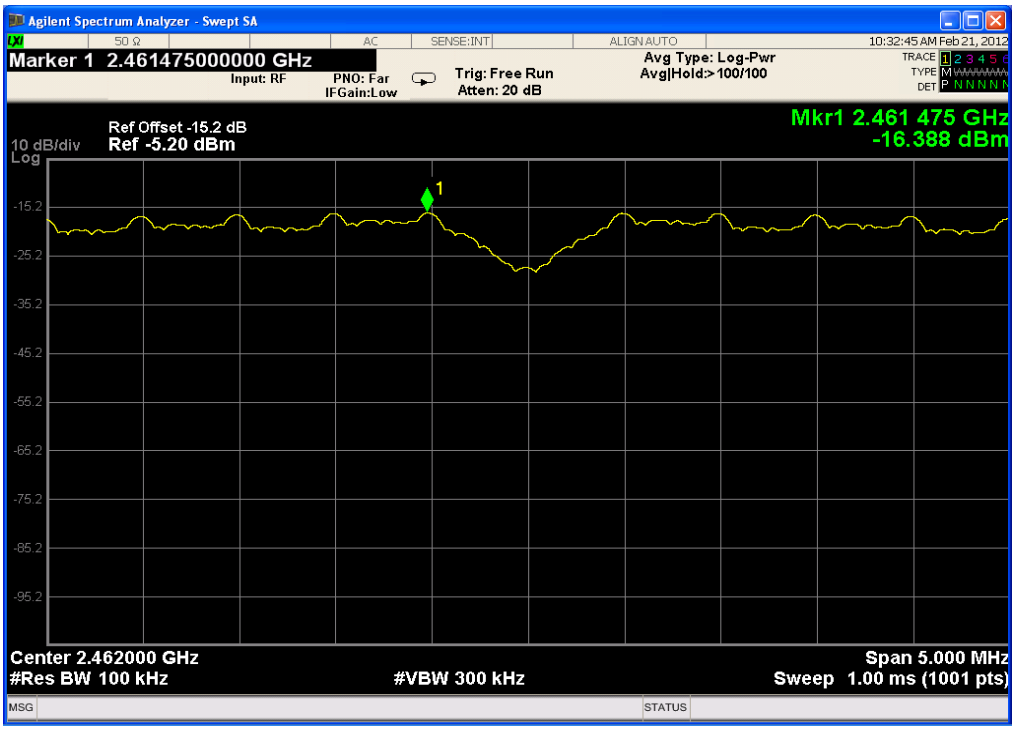
Frequency (MHz)	Data rate (Mbps)	Preamble	Measured PSD (dBm)	
			Peak mode	Average mode
2 412	MCS 7	Long GI	-24.63	-31.84
2 437	MCS 7	Long GI	-24.93	-32.15
2 462	MCS 7	Long GI	-24.98	-32.14

4.3.13 Test result of IEEE 802.11n (40 MHz) mode

Frequency (MHz)	Data rate (Mbps)	Preamble	Measured PSD (dBm)	
			Peak mode	Average mode
2 422	MCS 7	Long GI	-27.75	-34.86
2 437	MCS 7	Long GI	-27.84	-34.89
2 452	MCS 7	Long GI	-27.94	-35.22

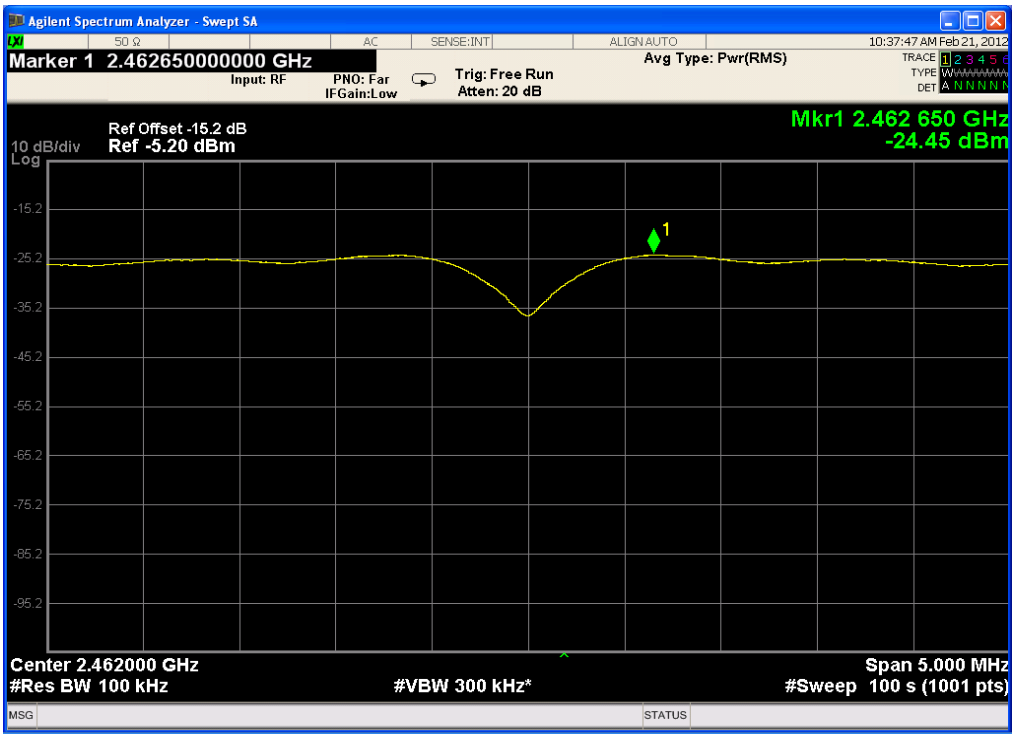
4.3.14 Plot of power spectral density

① 2 412 MHz at IEEE802.11b



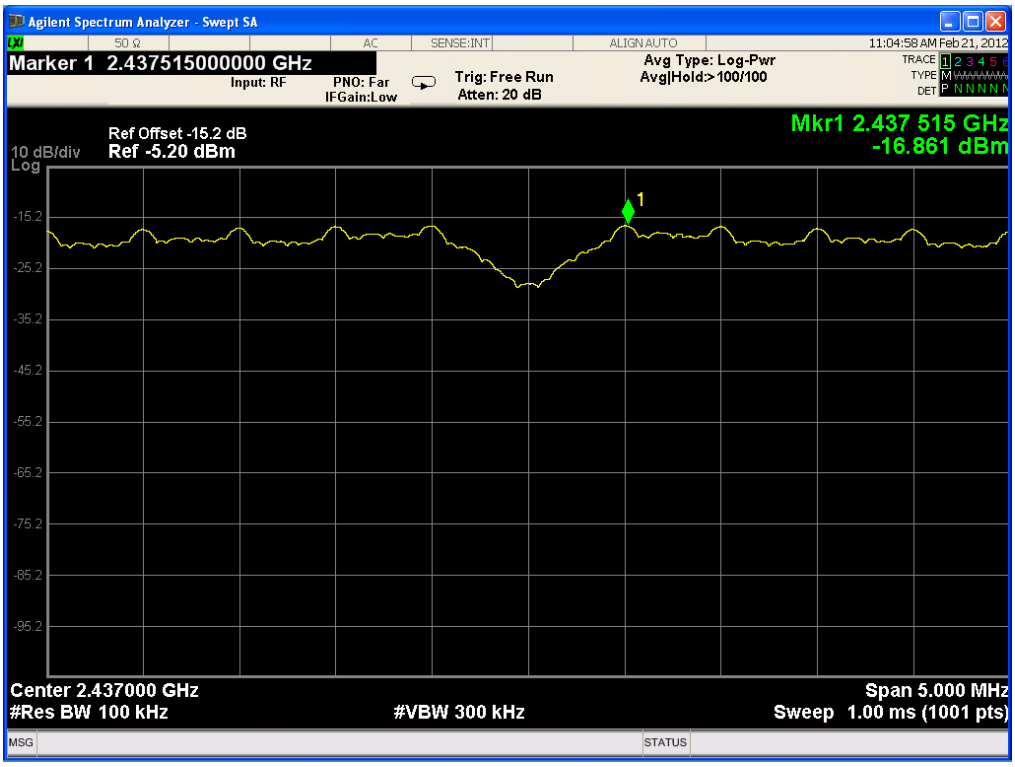
→ **Power Spectral Density (Peak mode): -16.39 dBm**

② 2 412 MHz at IEEE802.11b



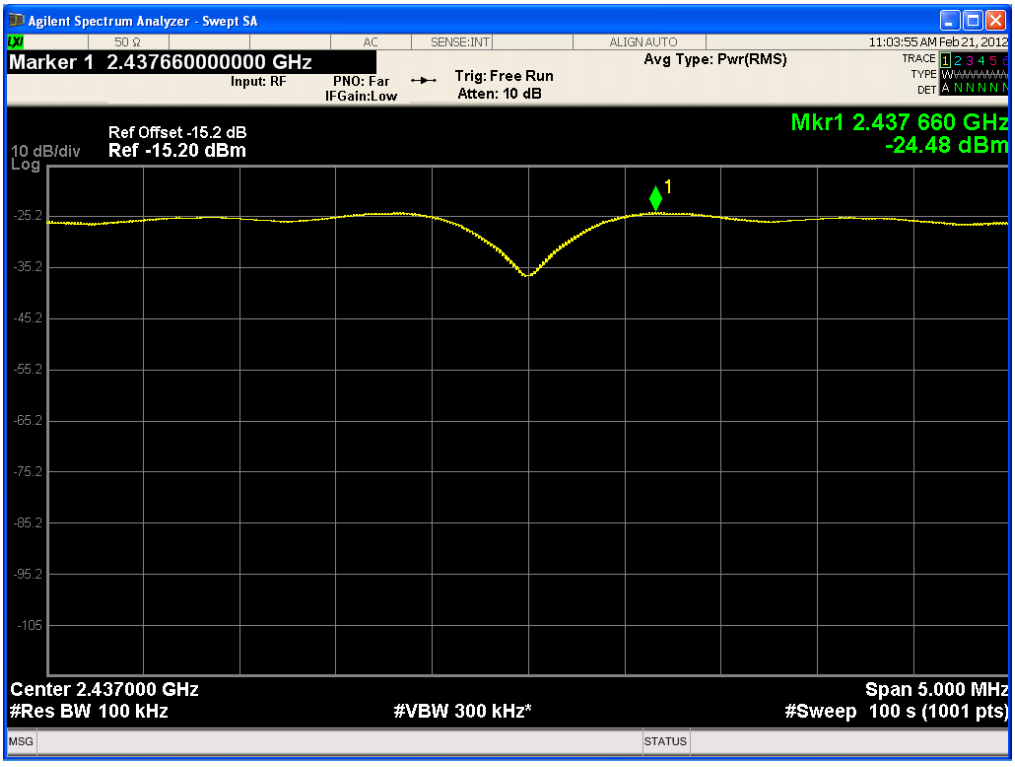
→ **Power Spectral Density (Average mode): -24.45 dBm**

③ 2 437 MHz at IEEE802.11b



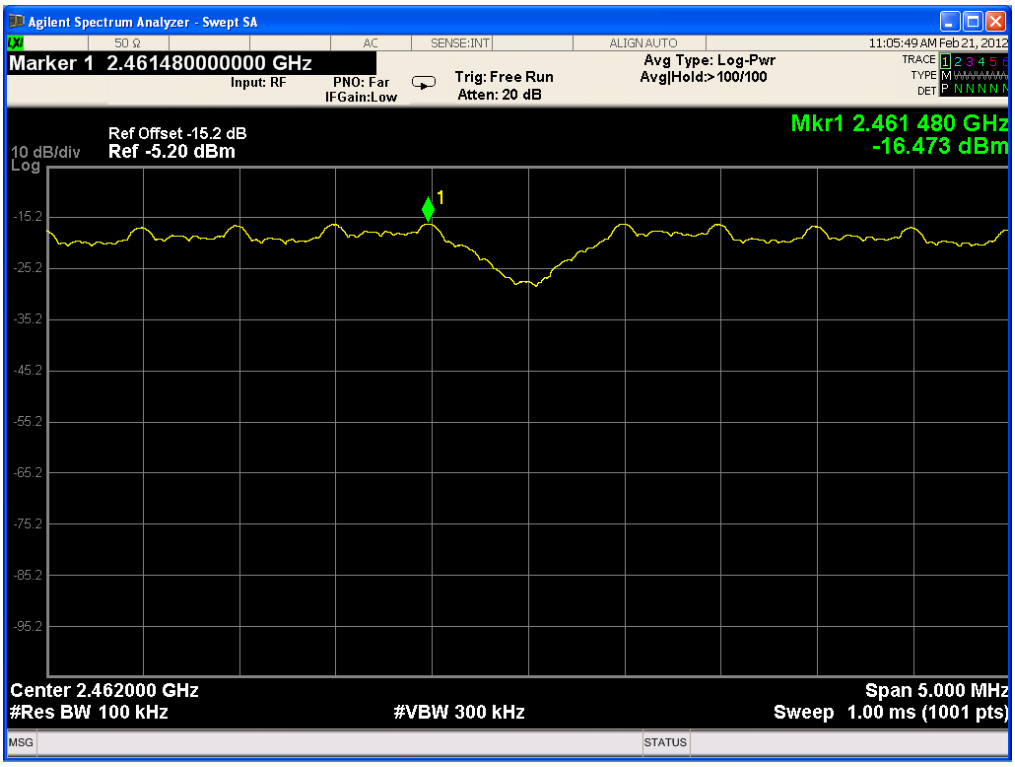
→ Power Spectral Density (Peak mode): -16.86 dBm

④ 2 437 MHz at IEEE802.11b



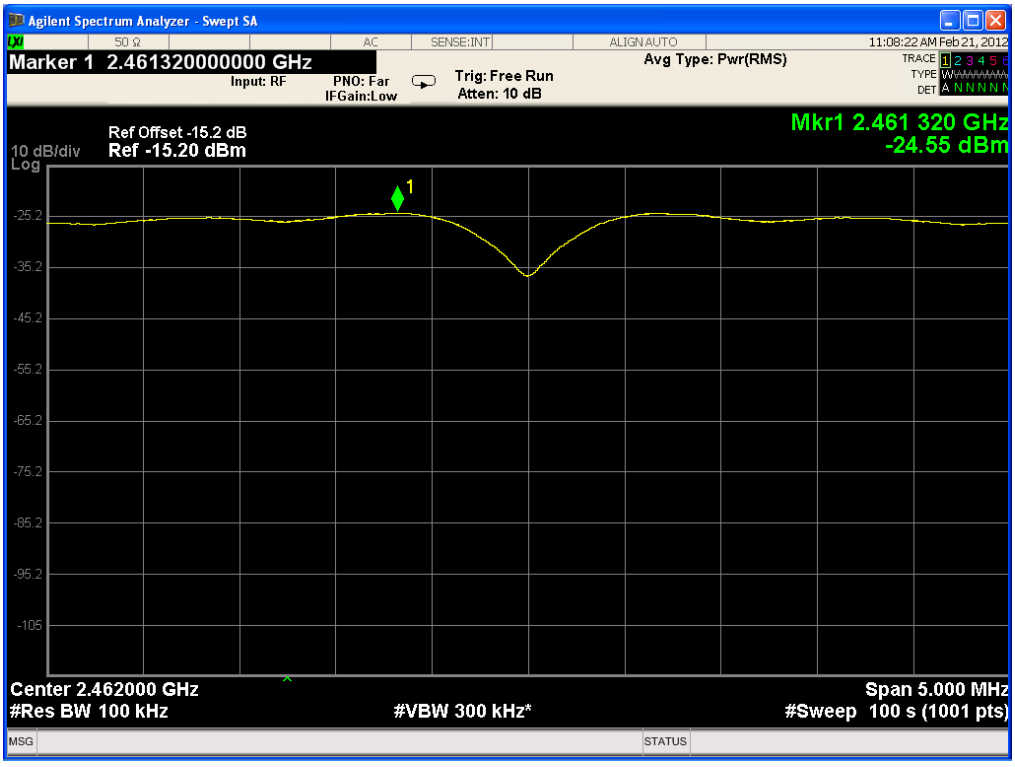
→ Power Spectral Density (Average mode): -24.48 dBm

⑤ 2 462 MHz at IEEE802.11b



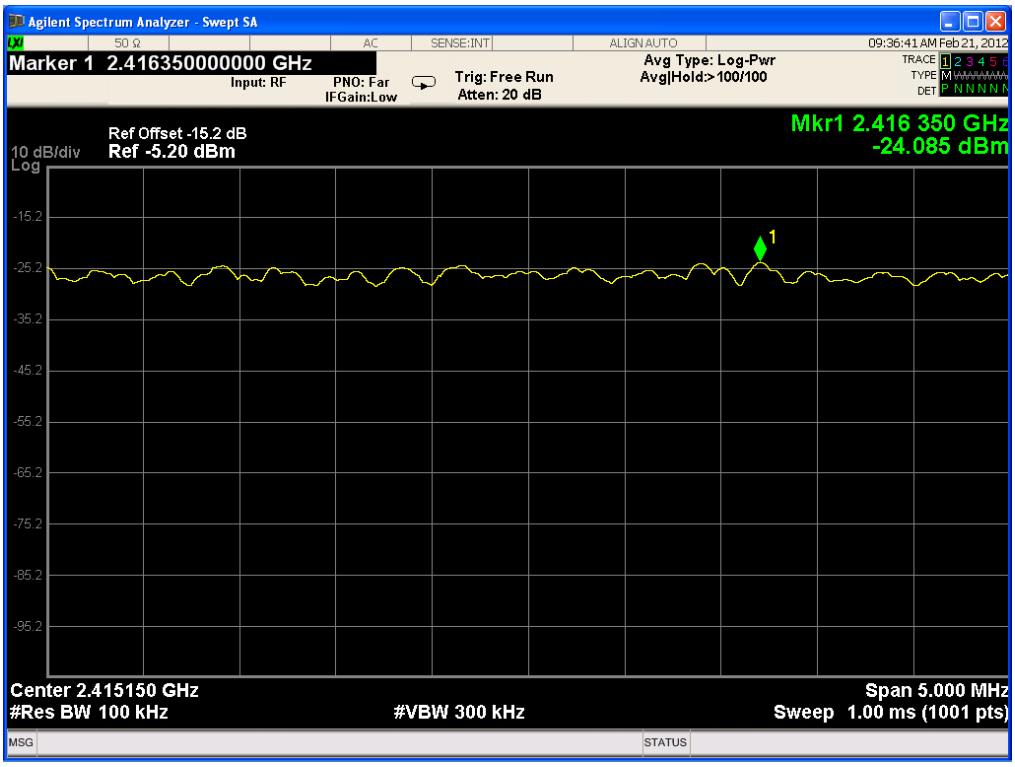
→ Power Spectral Density (Peak mode): -16.47 dBm

⑥ 2 462 MHz at IEEE802.11b



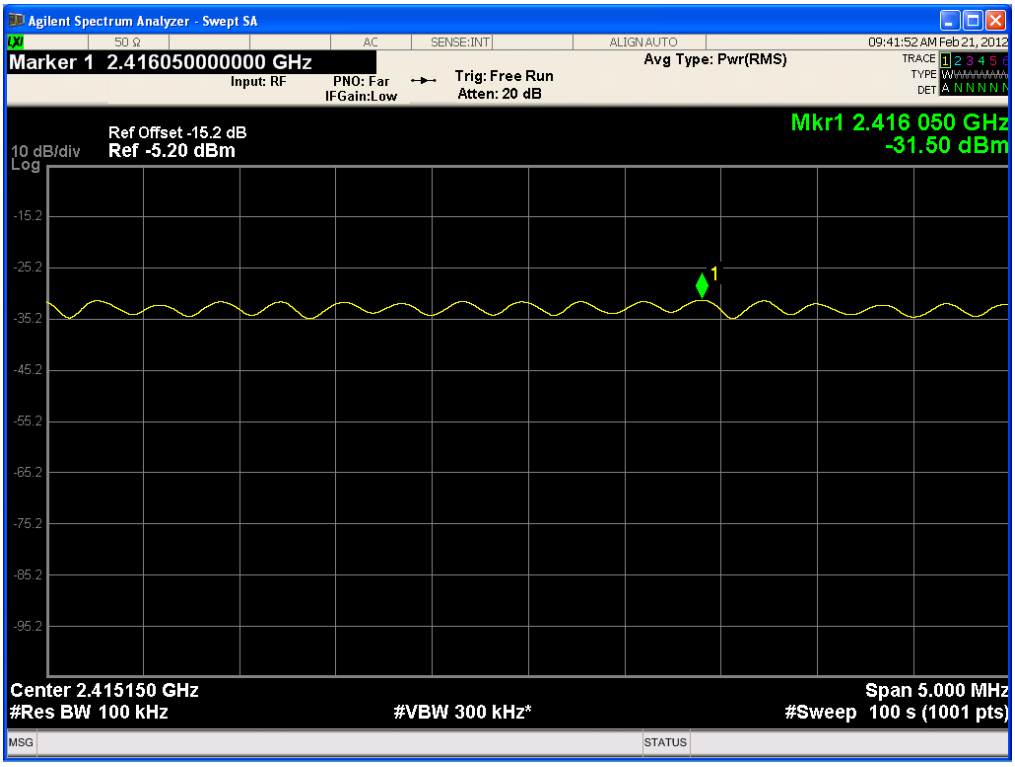
→ Power Spectral Density (Average mode): -16.55 dBm

⑦ 2 412 MHz at IEEE802.11g



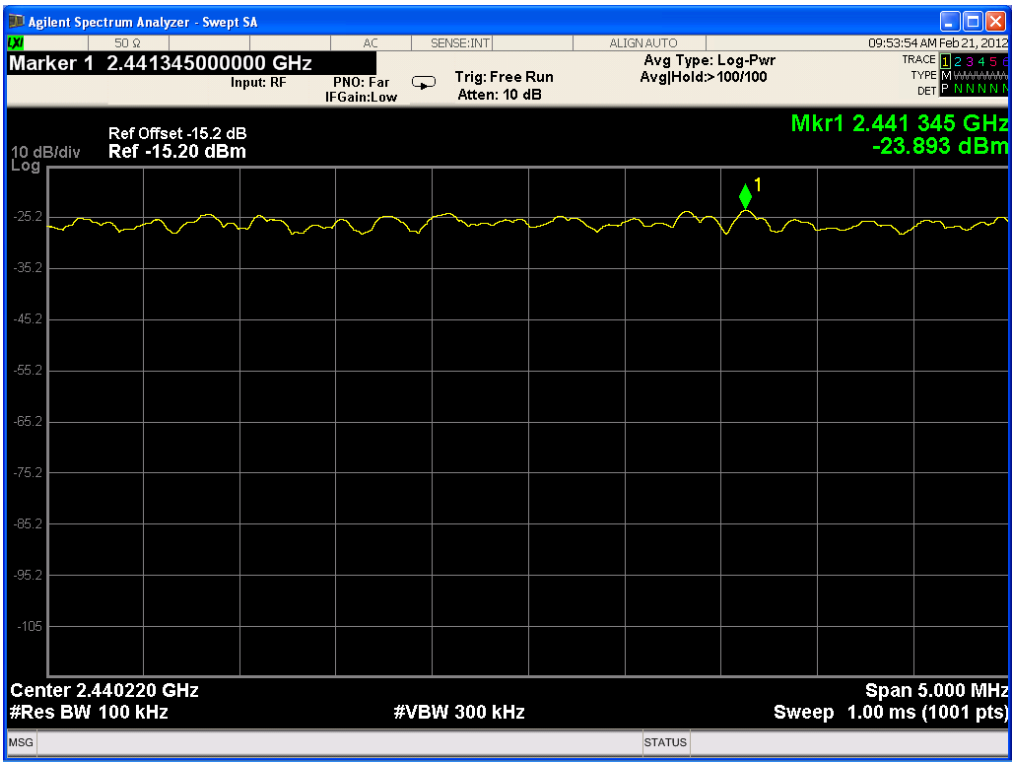
→ Power Spectral Density (Peak mode): -24.09 dBm

⑧ 2 412 MHz at IEEE802.11g



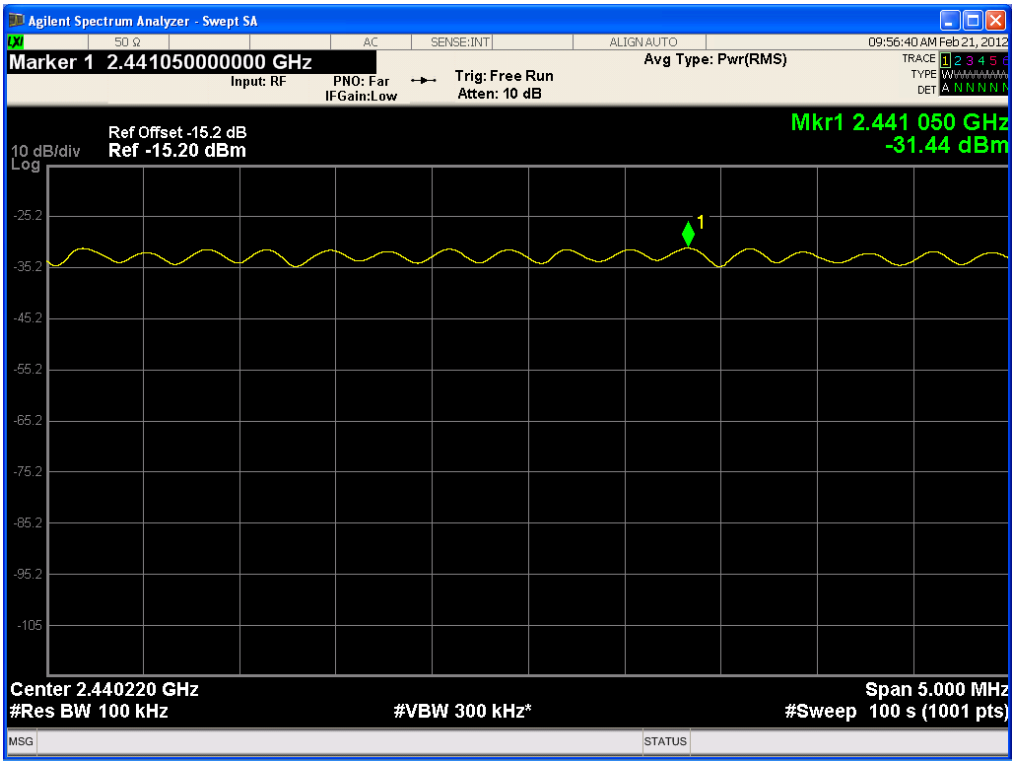
→ Power Spectral Density (Average mode): -31.50 dBm

⑨ 2 437 MHz at IEEE802.11g



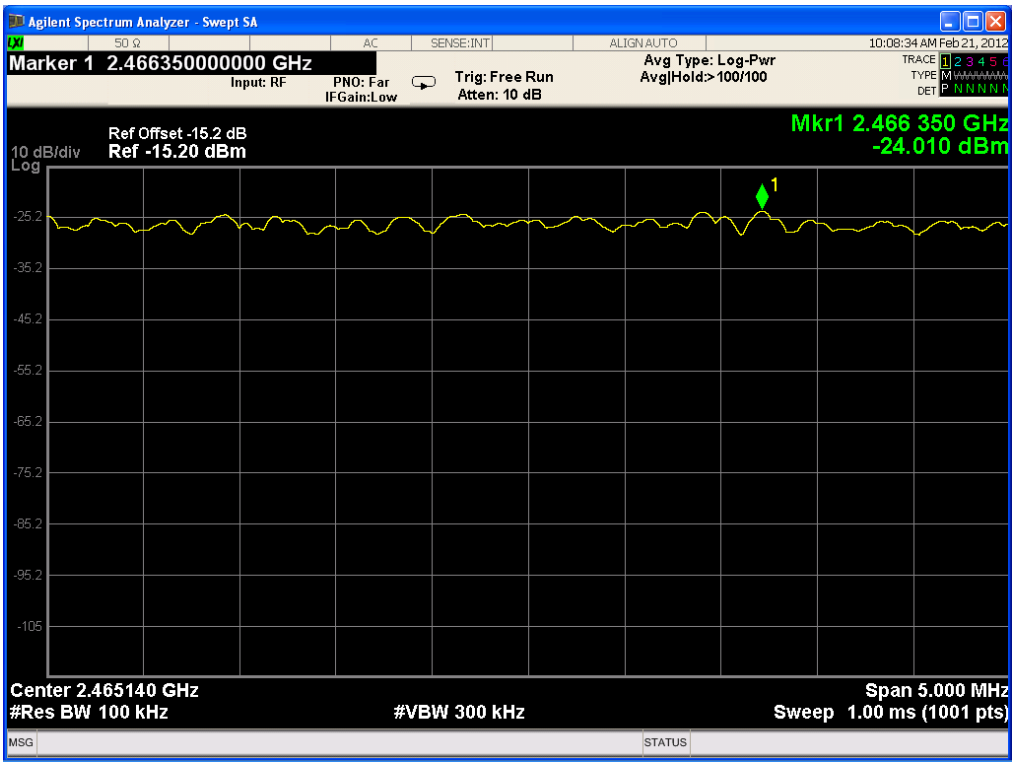
→ Power Spectral Density (Peak mode): -23.89 dBm

⑩ 2 437 MHz at IEEE802.11g



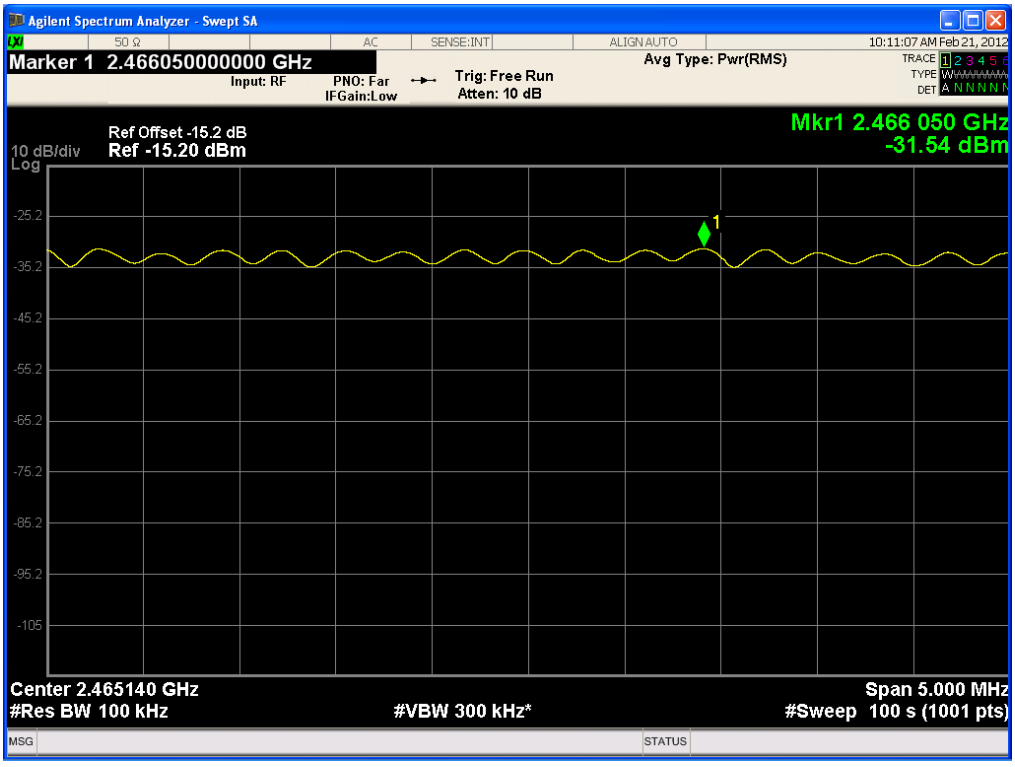
→ Power Spectral Density (Average mode): -31.44 dBm

⑪ 2 462 MHz at IEEE802.11g



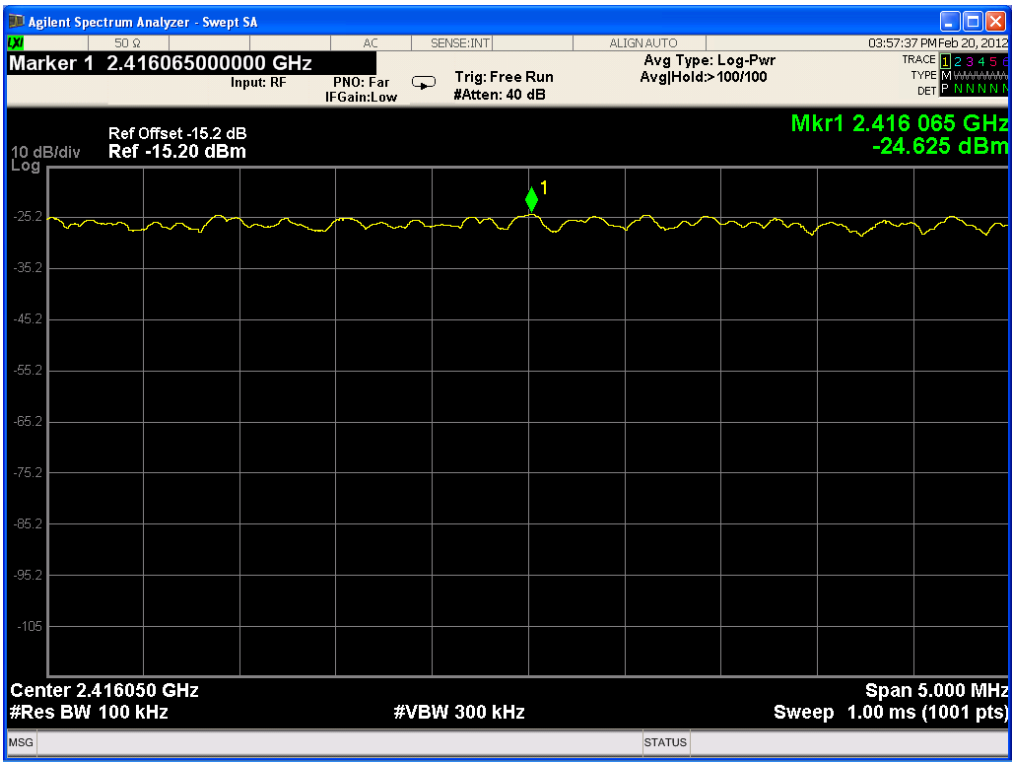
→ Power Spectral Density (Peak mode): -24.01 dBm

⑫ 2 462 MHz at IEEE802.11g



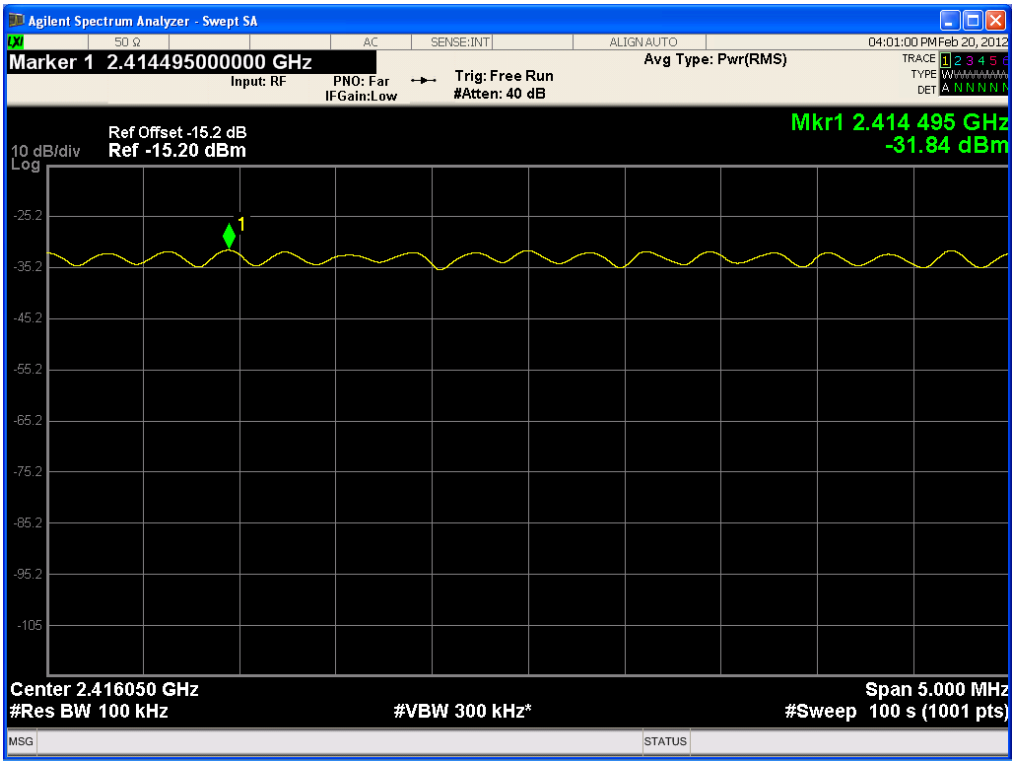
→ Power Spectral Density (Average mode): -31.54 dBm

⑬ 2 412 MHz at IEEE802.11n (20 MHz)



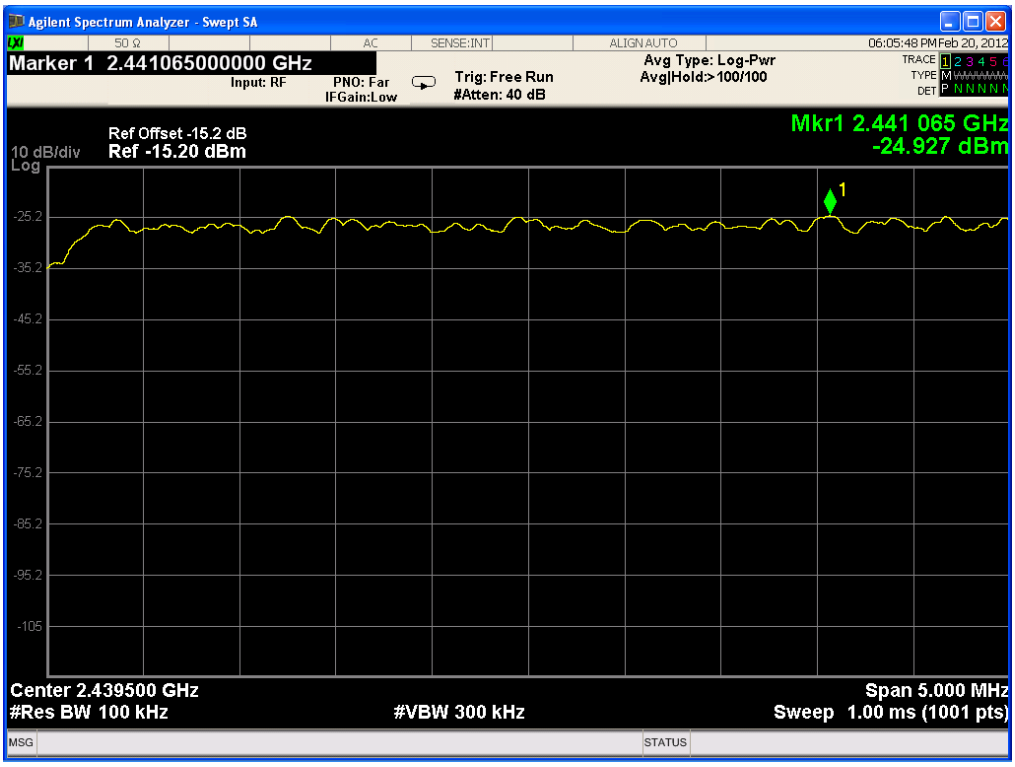
→ Power Spectral Density (Peak mode): -24.63 dBm

⑭ 2 412 MHz at IEEE802.11n (20 MHz)



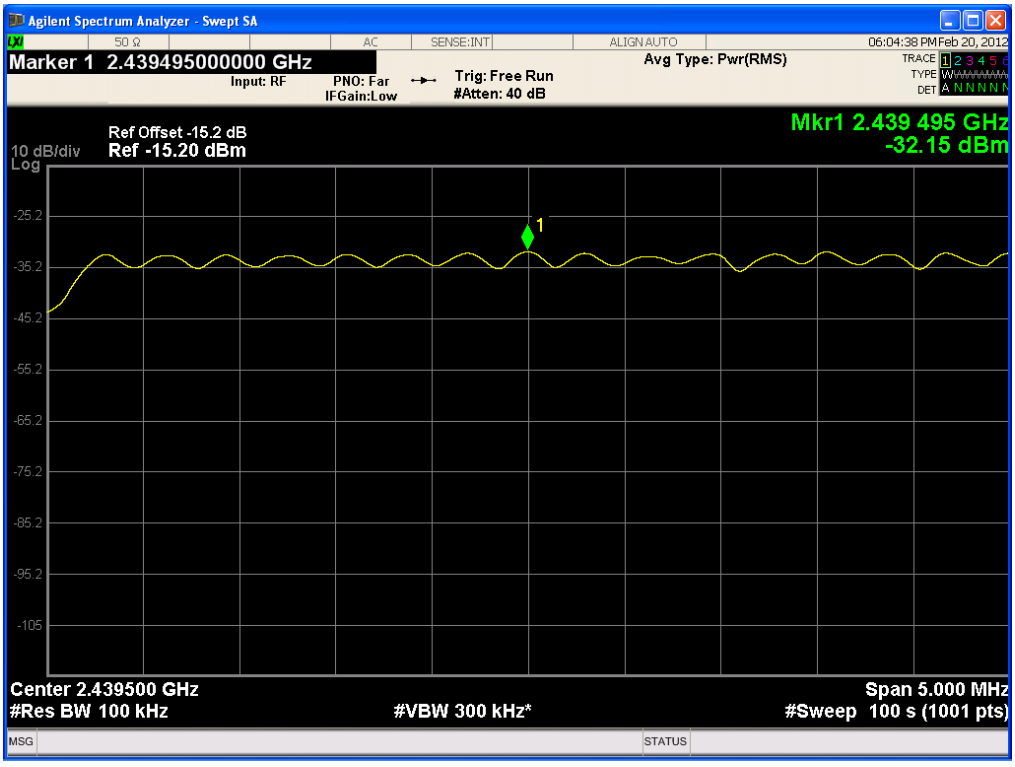
→ Power Spectral Density (Average mode): -31.84 dBm

⑮ 2 437 MHz at IEEE802.11n (20 MHz)



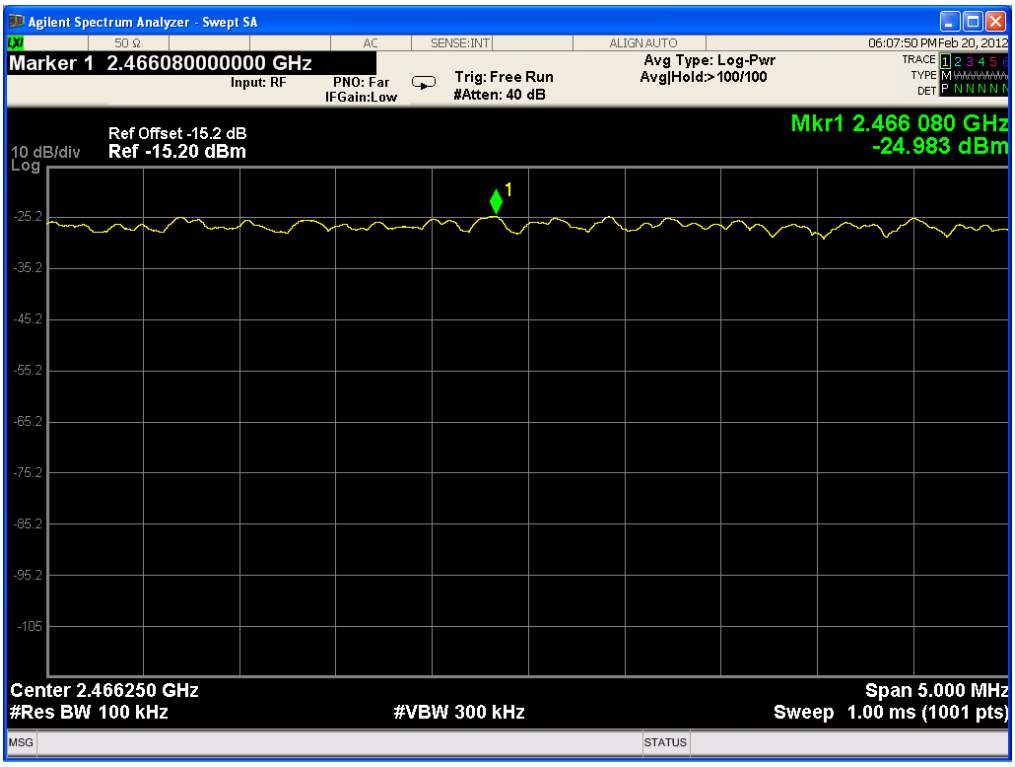
→ Power Spectral Density (Peak mode): -24.93 dBm

⑯ 2 437 MHz at IEEE802.11n (20 MHz)



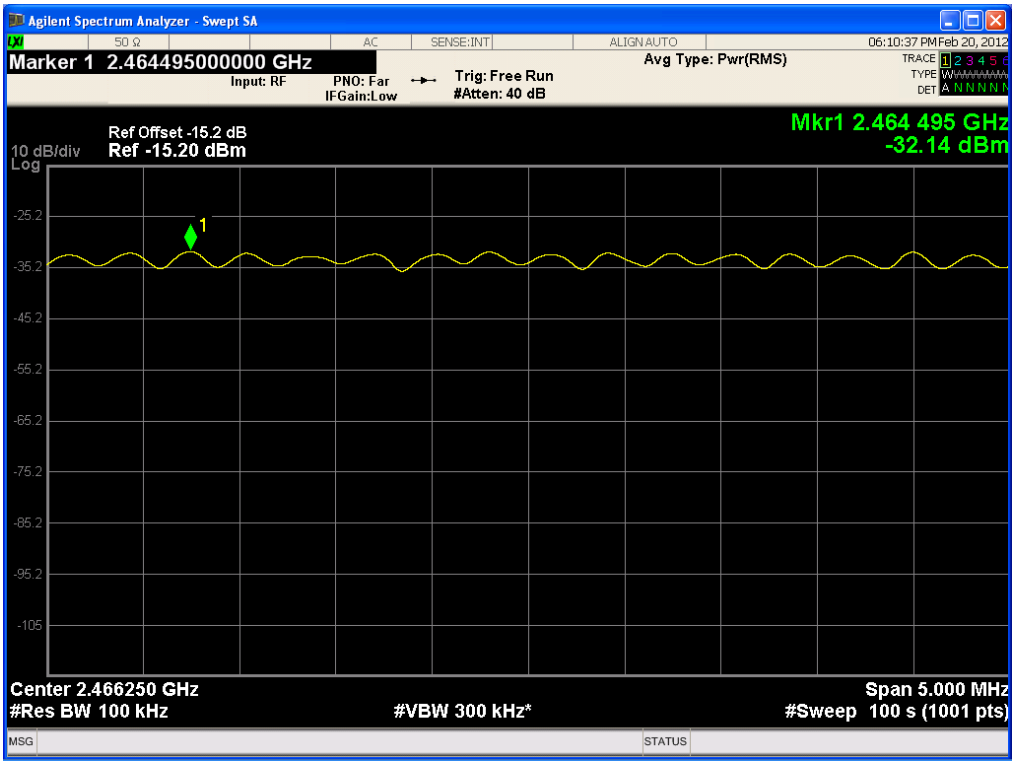
→ Power Spectral Density (Average mode): -32.15 dBm

⑰ 2 462 MHz at IEEE802.11n (20 MHz)



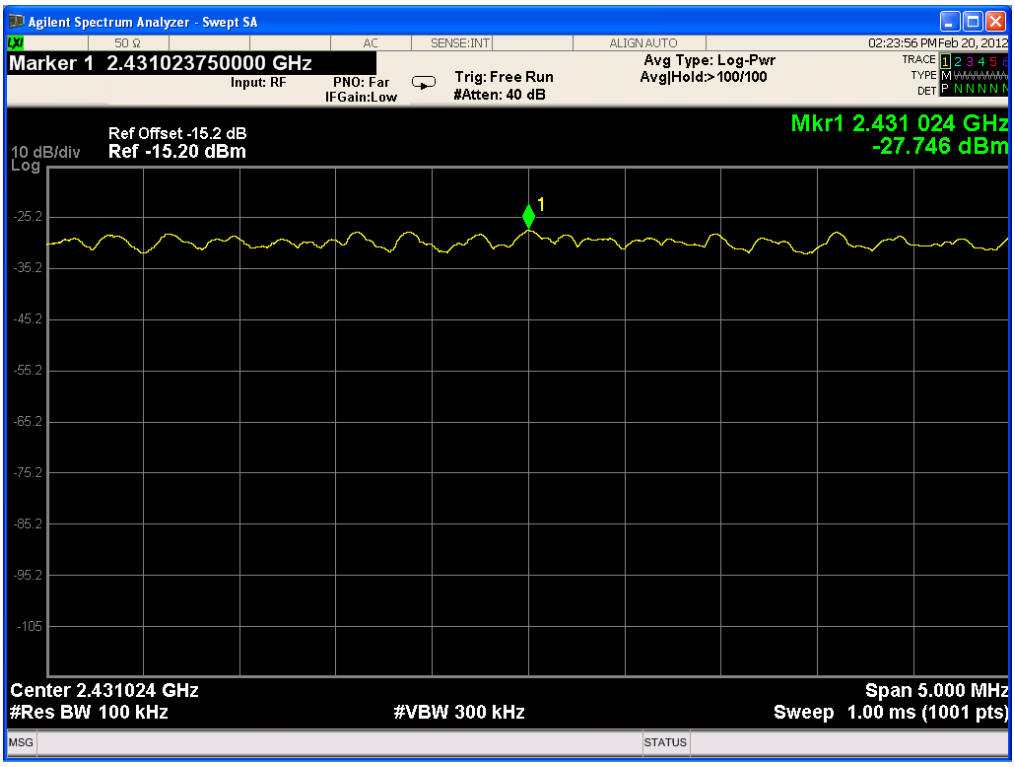
→ Power Spectral Density (Peak mode): -24.98 dBm

⑱ 2 462 MHz at IEEE802.11n (20 MHz)



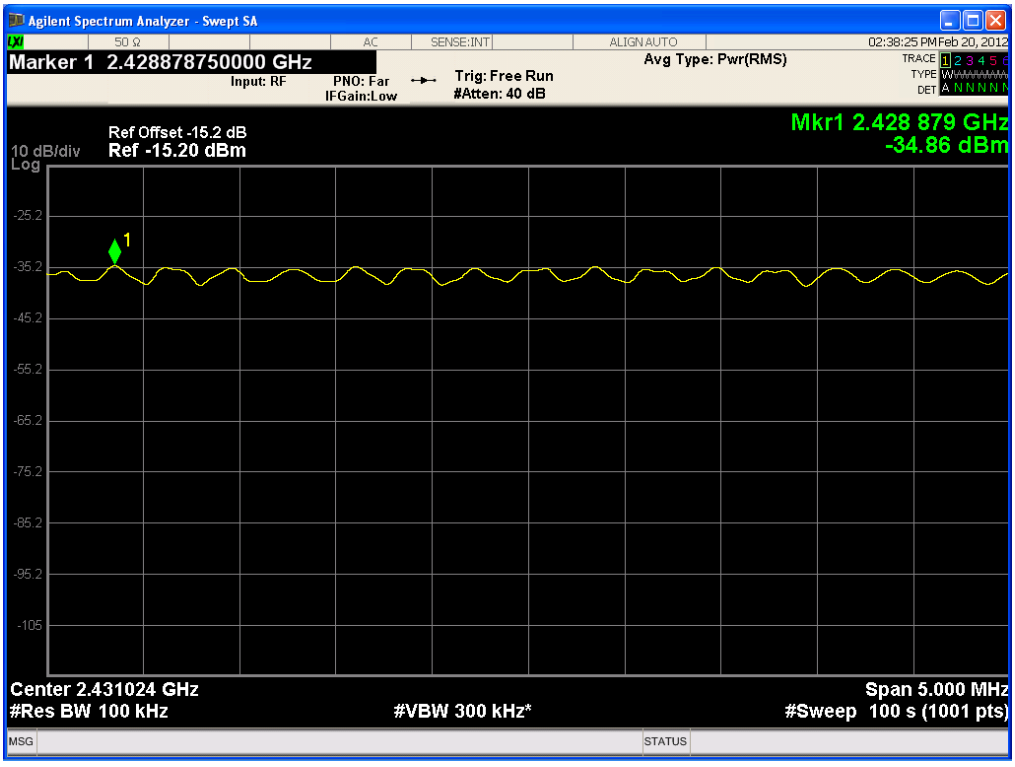
→ Power Spectral Density (Average mode): -32.14 dBm

⑲ 2 422 MHz at IEEE802.11n (40 MHz)



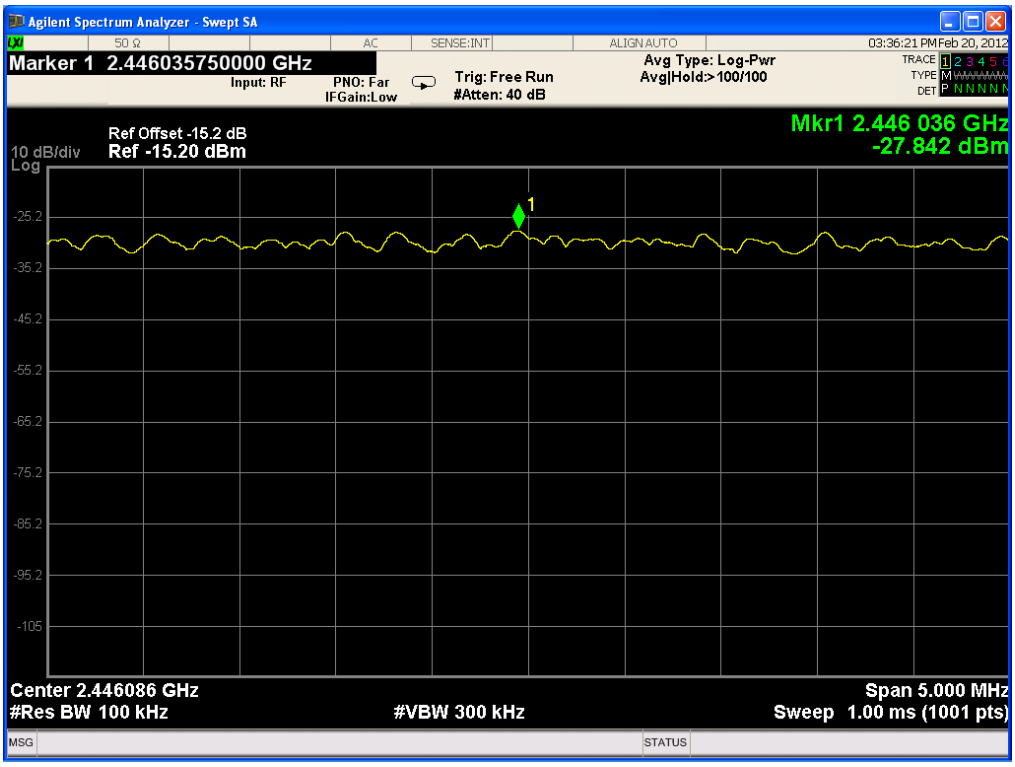
→ Power Spectral Density (Peak mode): -27.75 dBm

⑳ 2 422 MHz at IEEE802.11n (40 MHz)



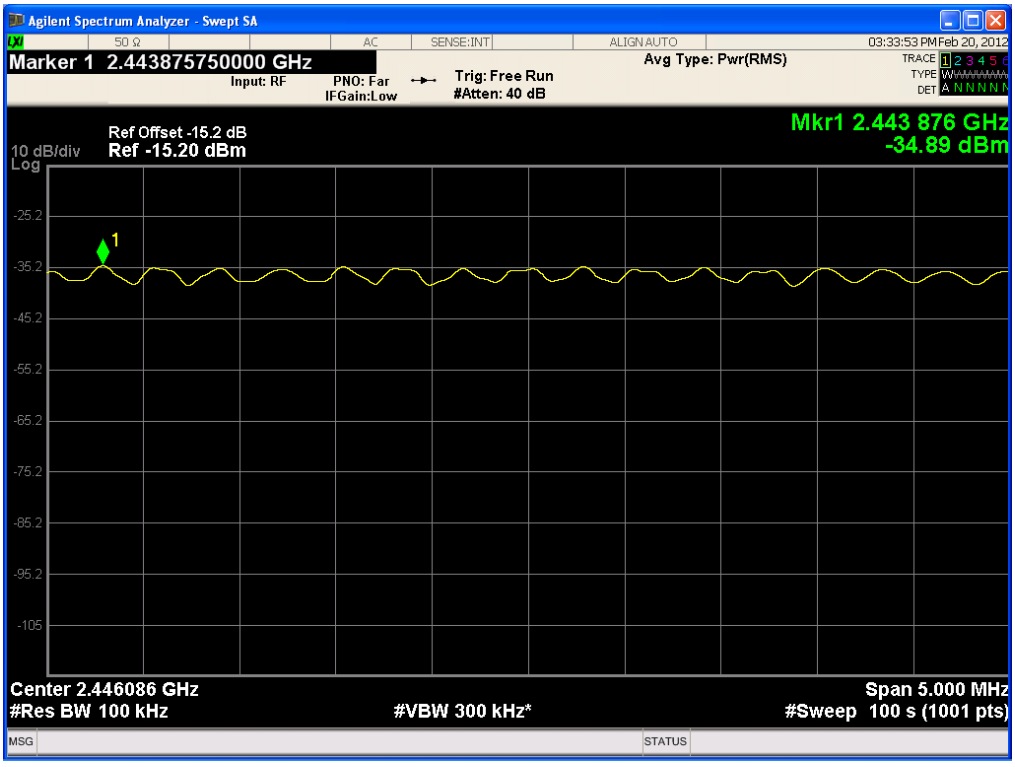
→ Power Spectral Density (Average mode): -34.86 dBm

㉑ 2 437 MHz at IEEE802.11n (40 MHz)



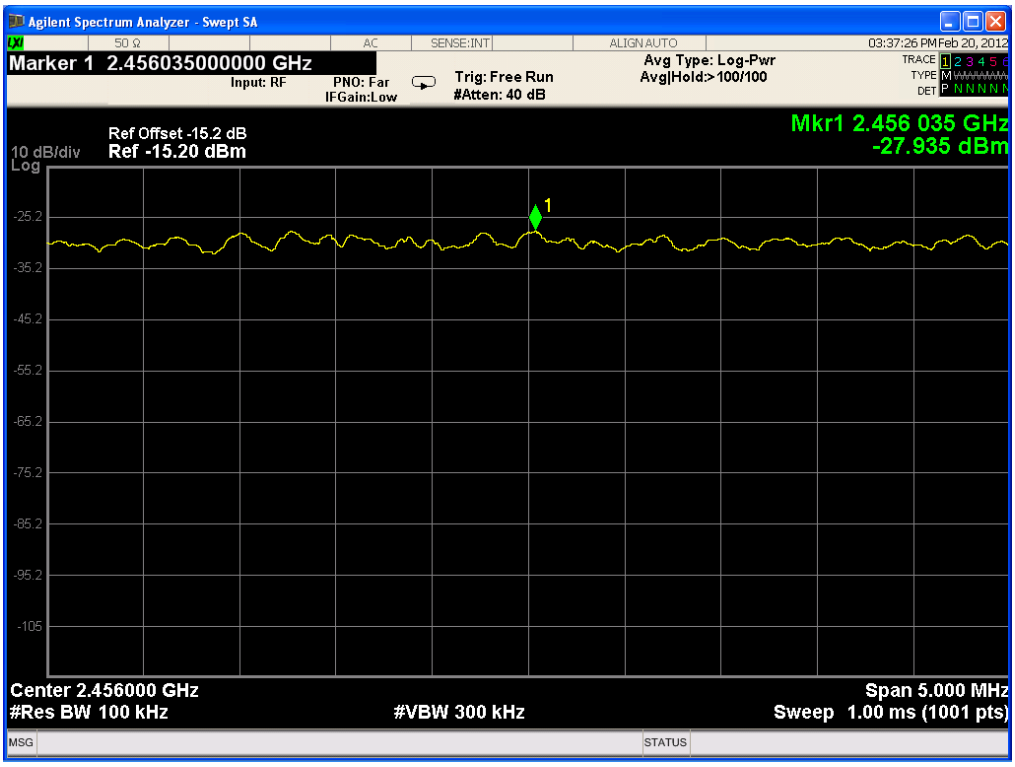
→ Power Spectral Density (Peak mode): -27.84 dBm

㉒ 2 437 MHz at IEEE802.11n (40 MHz)



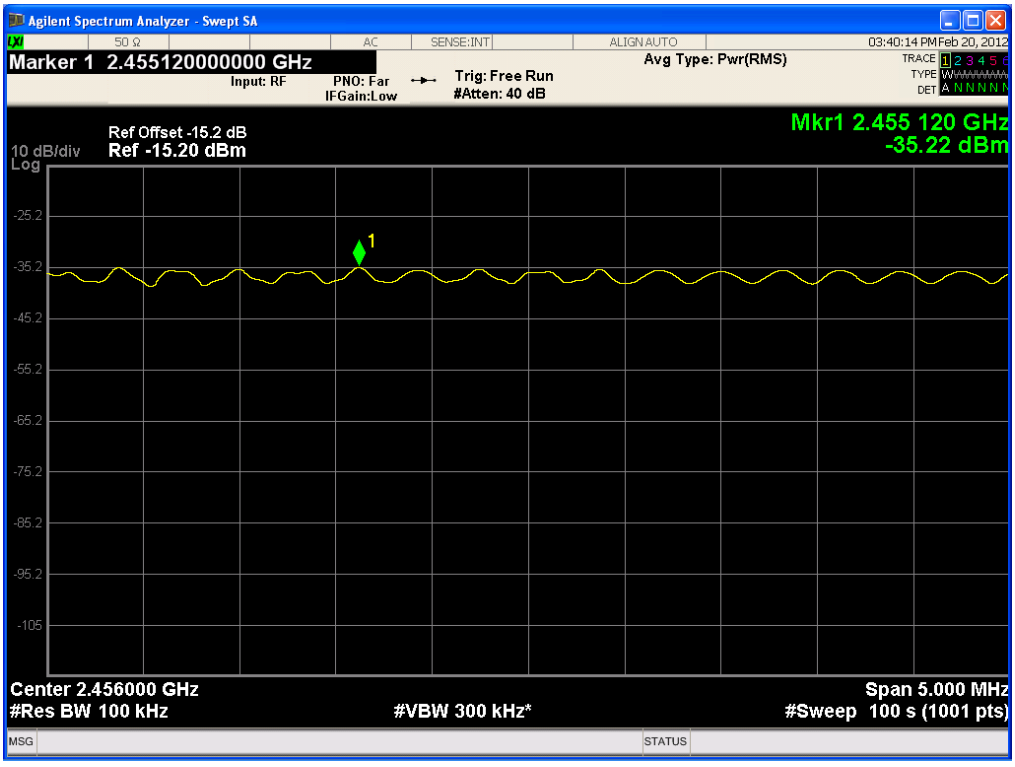
→ Power Spectral Density (Average mode): -34.89 dBm

㉓ 2 452 MHz at IEEE802.11n (40 MHz)



→ Power Spectral Density (Peak mode): -27.94 dBm

㉔ 2 452 MHz at IEEE802.11n (40 MHz)



→ Power Spectral Density (Average mode): -35.22 dBm

4.4 Conducted spurious and out of band emission

4.4.1 Definition

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on RF conducted measurement.

4.4.2 Specification

FCC Rules Part 15, Section 15.247(d)

4.4.3 Method of measurement

Public Notice “558074 D01 DTS Meas Guidance v01”

4.4.4 Measurement set-up

4.3.5 Test equipment

Equipment	Model name	Manufacturer
EUT	WifiAn-Mini	ENJsoft Inc.
Control PC	NT-P560	Samsung
Spectrum Analyzer	N9020A	Agilent

4.4.6 Test procedure

① Connect the equipment as “Measurement set-up”
② Set RBW = 100 kHz
③ Set VBW ≥ 300 kHz
④ Set span to encompass the spectrum to be examined
⑤ Detector = peak
⑥ Trace mode = max hold
⑦ Sweep = auto couple
⑧ Allowed the trace to stabilize

4.4.7 Test Condition

- Test place: Shield room
- Test mode: Maximum output power
- Test environment: 27℃, 53 % R.H.

4.4.8 Limit

The peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

4.4.9 Test result of IEEE802.11b

Conducted spurious emission				
Frequency (MHz)	Level (dBm)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
Low channel / 2 412 MHz				
2 412.00	-1.19	-	-	-
2 400.00	-40.04	38.85	20.00	18.85
Middle channel / 2 437 MHz				
2 437.00	-1.66	-	-	-
2 484.70	-56.95	55.29	20.00	35.29
High channel / 2 462 MHz				
2 462.00	-1.27	-	-	-
2 483.50	-54.43	53.16	20.00	33.16

4.4.10 Test result of IEEE802.11g

Conducted spurious emission				
Frequency (MHz)	Level (dBm)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
Low channel / 2 412 MHz				
2 412.00	-8.89	-	-	-
2 400.00	-38.85	29.96	20.00	9.96
Middle channel / 2 437 MHz				
2 437.00	-8.69	-	-	-
2 398.65	-60.47	51.78	20.00	31.78
High channel / 2 462 MHz				
2 462.00	-8.81	-	-	-
2 483.50	-58.71	49.90	20.00	29.90

4.4.11 Test result of IEEE802.11n (20 MHz)

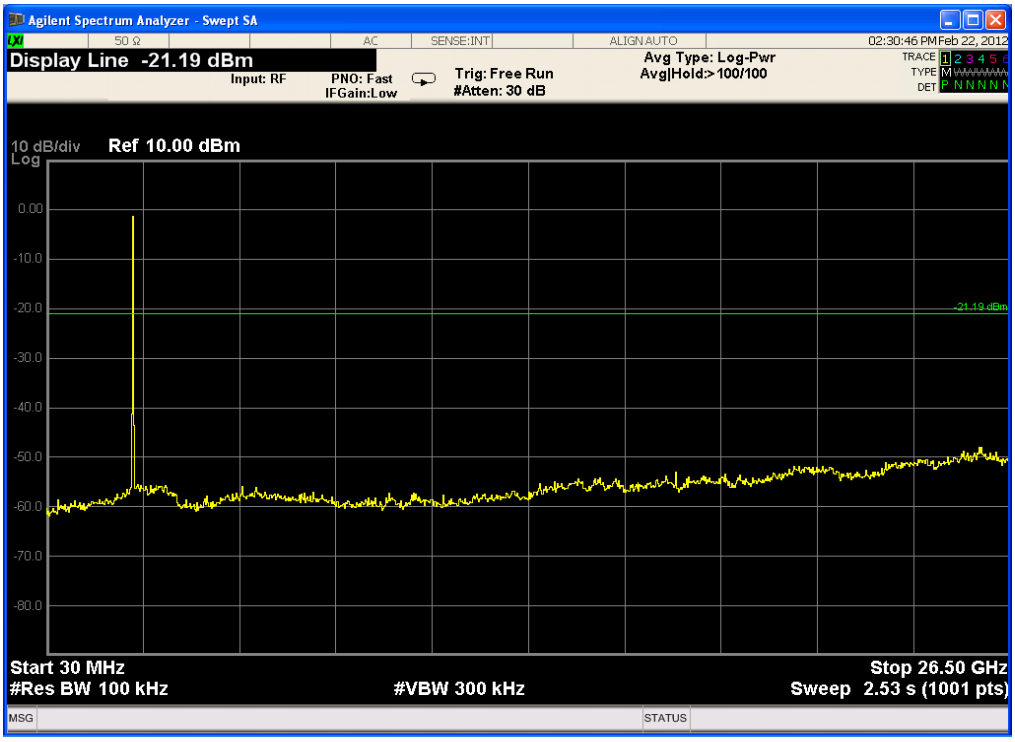
Conducted spurious emission				
Frequency (MHz)	Level (dBm)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
Low channel / 2 412 MHz				
2 412.00	-8.89	-	-	-
2 400.00	-40.71	31.82	20.00	11.82
Middle channel / 2 437 MHz				
2 437.00	-9.78	-	-	-
2 519.95	-58.01	48.23	20.00	28.23
High channel / 2 462 MHz				
2 462.00	-9.73	-	-	-
2 483.50	-57.45	47.72	20.00	27.72

4.4.12 Test result of IEEE802.11n (40 MHz)

Conducted spurious emission				
Frequency (MHz)	Level (dBm)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
Low channel / 2 422 MHz				
2 422.00	-12.55	-	-	-
2 400.00	-42.65	30.10	20.00	10.10
Middle channel / 2 437 MHz				
2 437.00	-12.64	-	-	-
2 400.00	-57.01	44.37	20.00	24.37
High channel / 2 452 MHz				
2 452.00	-12.74	-	-	-
2 483.50	-57.57	44.83	20.00	24.83

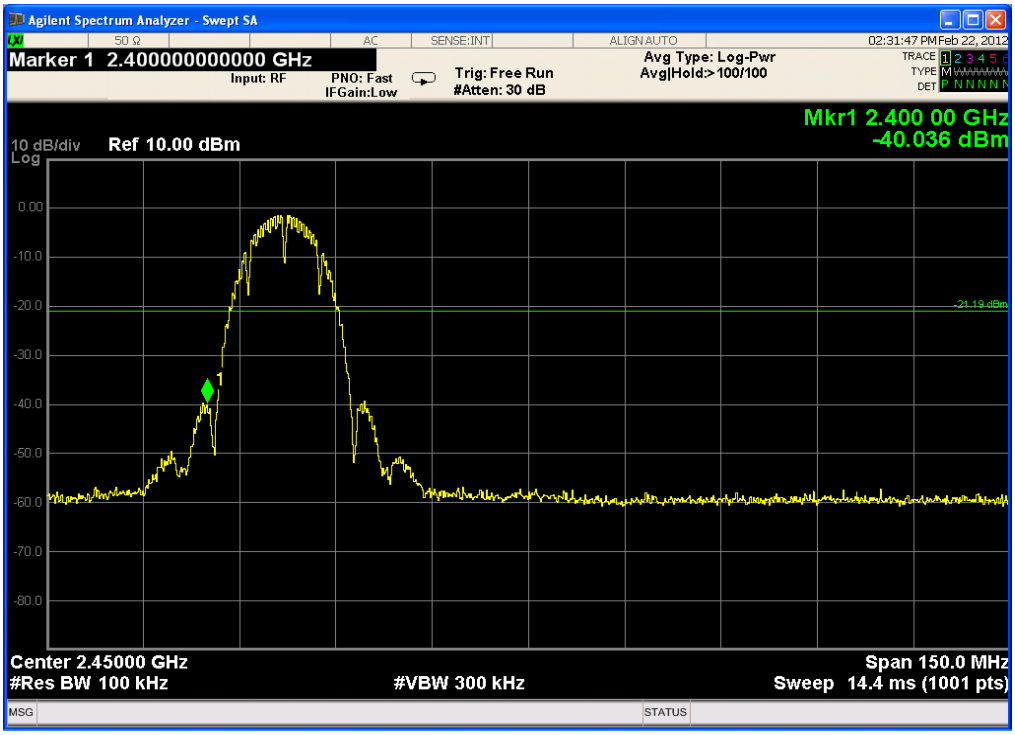
4.4.13 Plot of conducted spurious and out of band emission

① Spurious emission (2 412 MHz at IEEE802.11b)



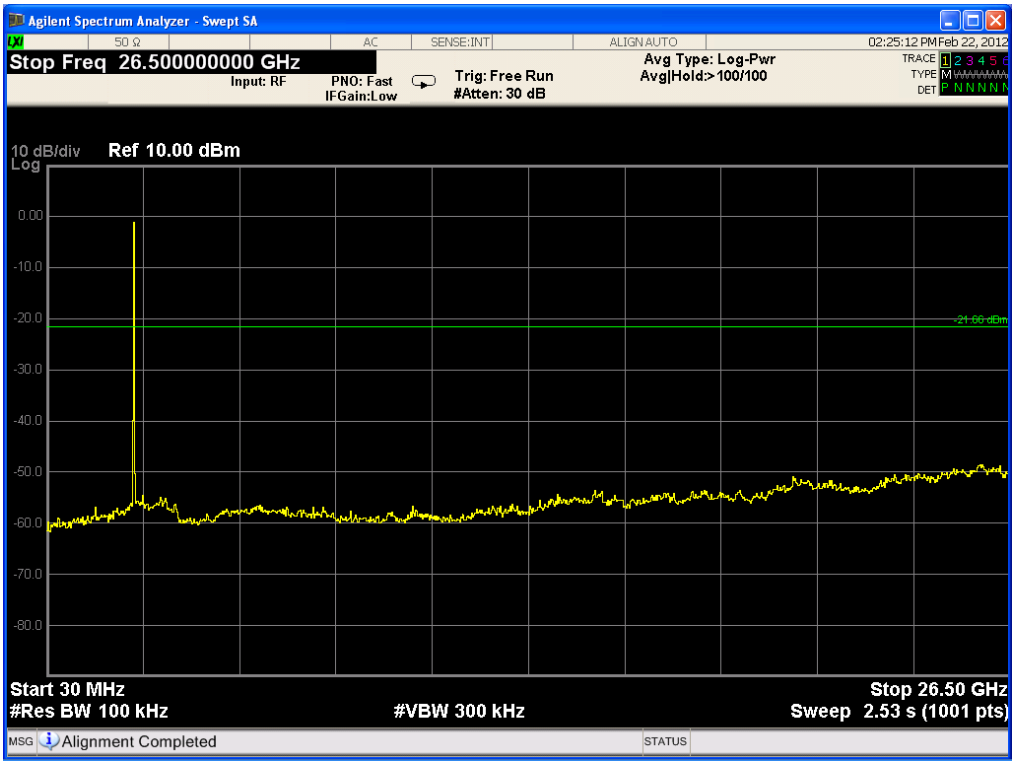
→ **30 MHz to 26.5 GHz: No data**

② Out of band emission (2 412 MHz at IEEE802.11b)



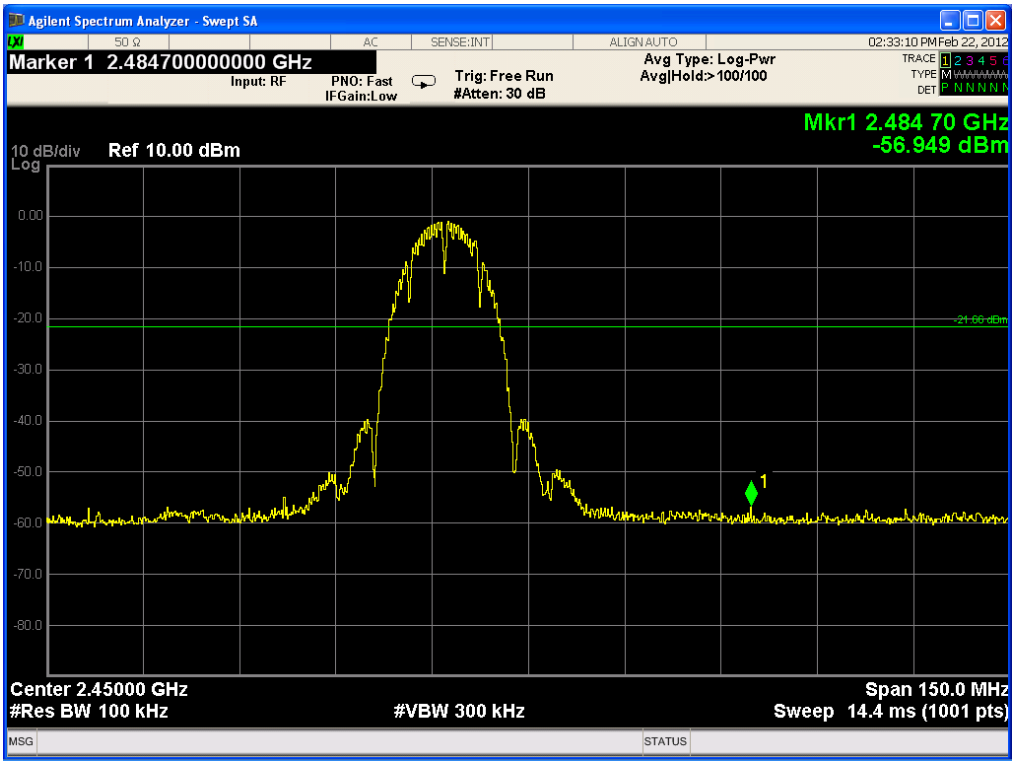
→ **2 400 MHz: -40.04 dBm**

③ Spurious emission (2 437 MHz at IEEE802.11b)



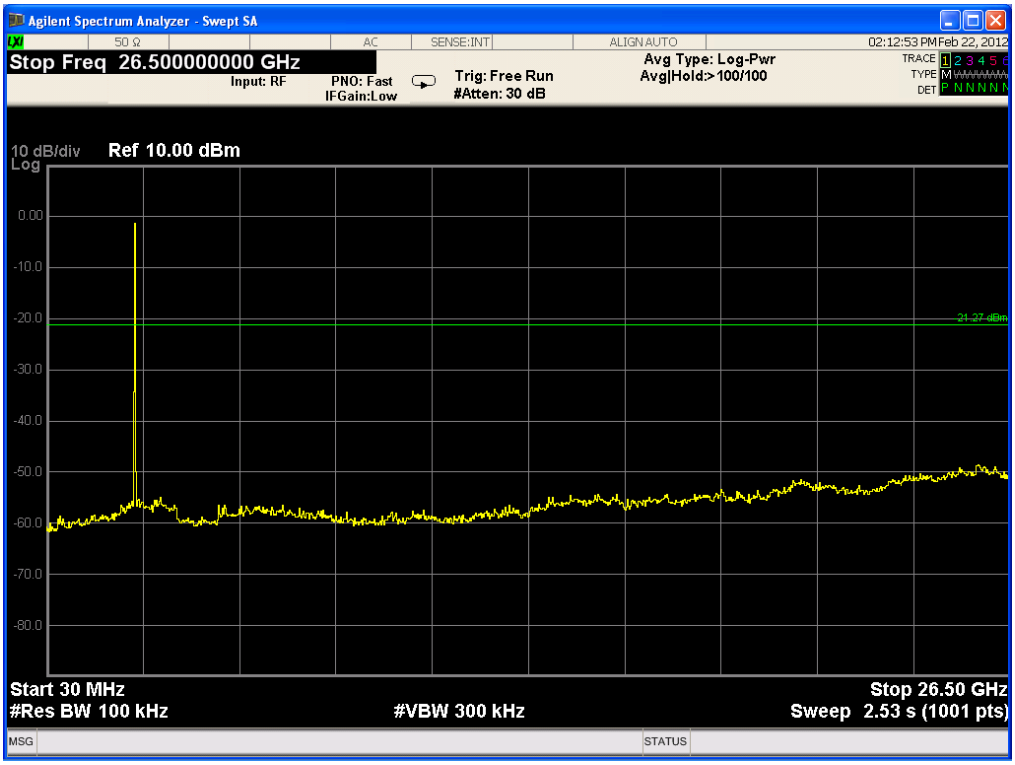
→ **30 MHz to 26.5 GHz: No data**

④ Out of band emission (2 437 MHz at IEEE802.11b)



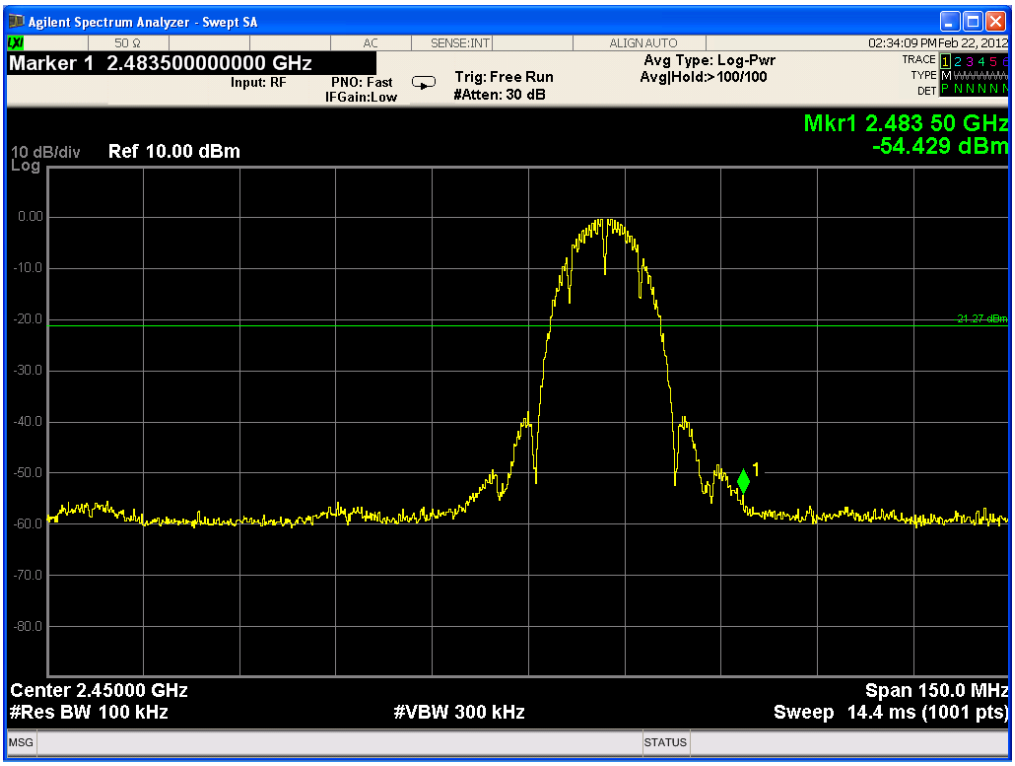
→ **2 484.7 MHz: -56.95 dBm**

⑤ Spurious emission (2 462 MHz at IEEE802.11b)



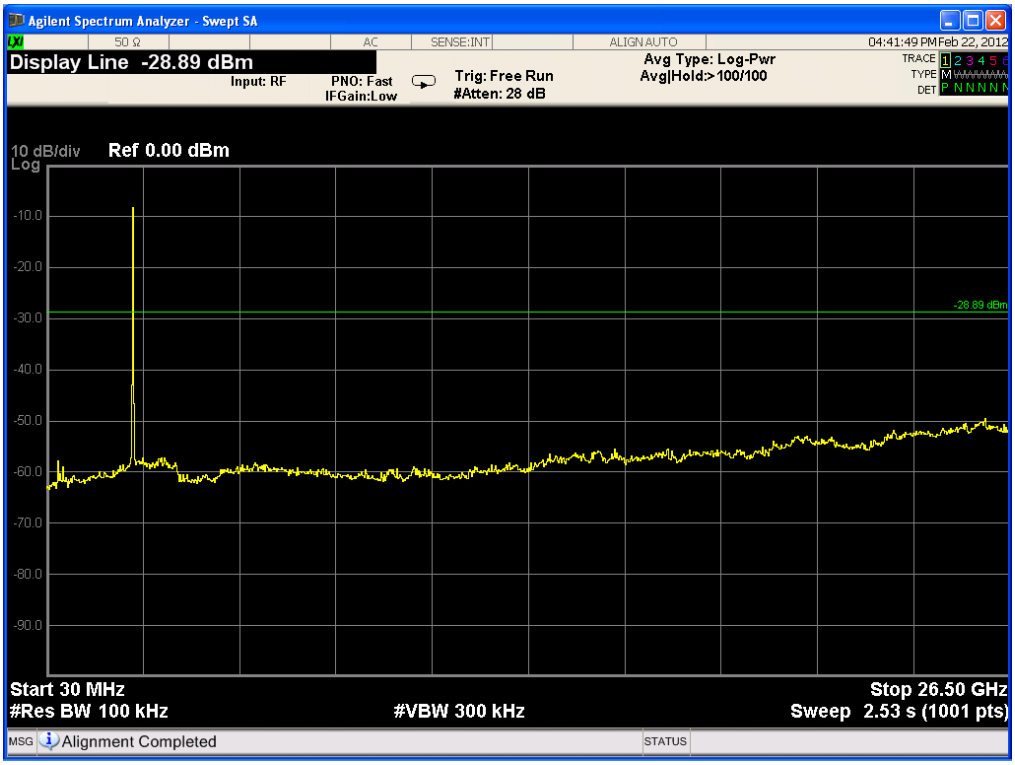
→ 30 MHz to 26.5 GHz: No data

⑥ Out of band emission (2 462 MHz at IEEE802.11b)



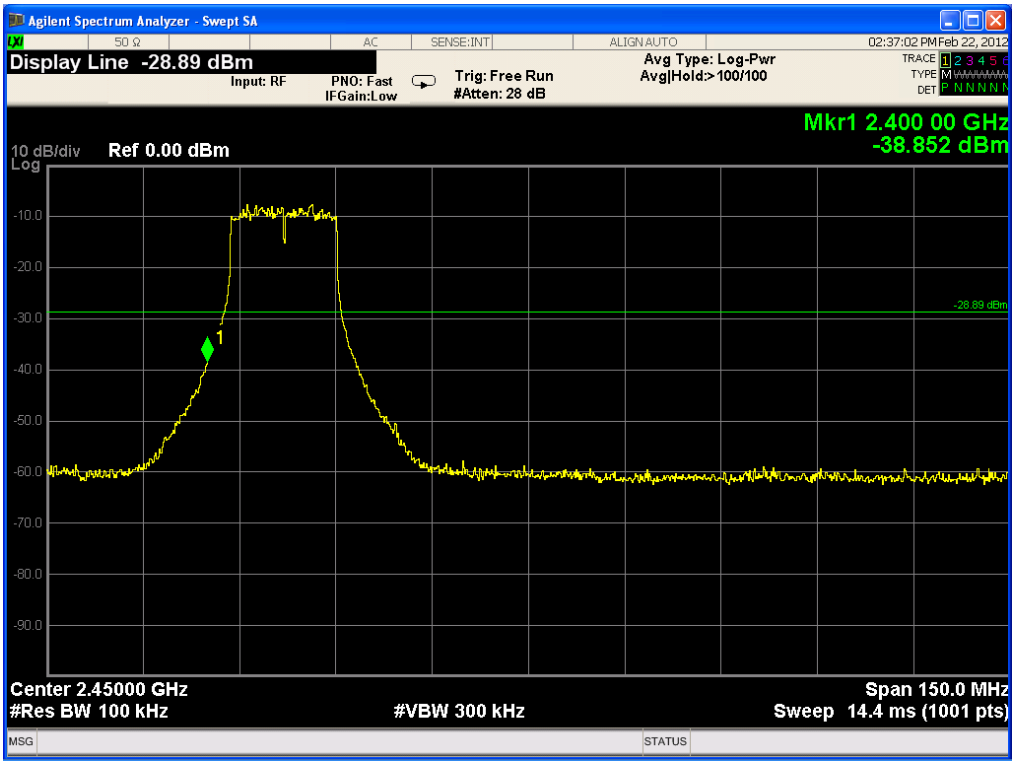
→ 2 483.5 MHz: -54.43 dBm

⑦ Spurious emission (2 412 MHz at IEEE802.11g)



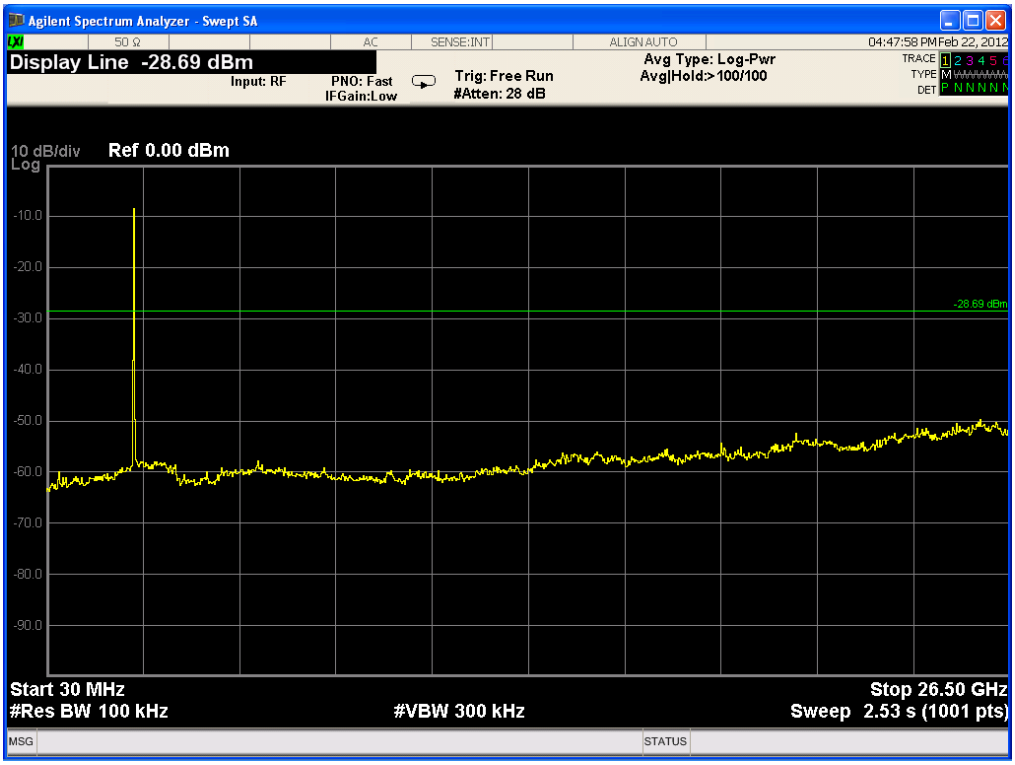
→ 30 MHz to 26.5 GHz: No data

⑧ Out of band emission (2 412 MHz at IEEE802.11g)



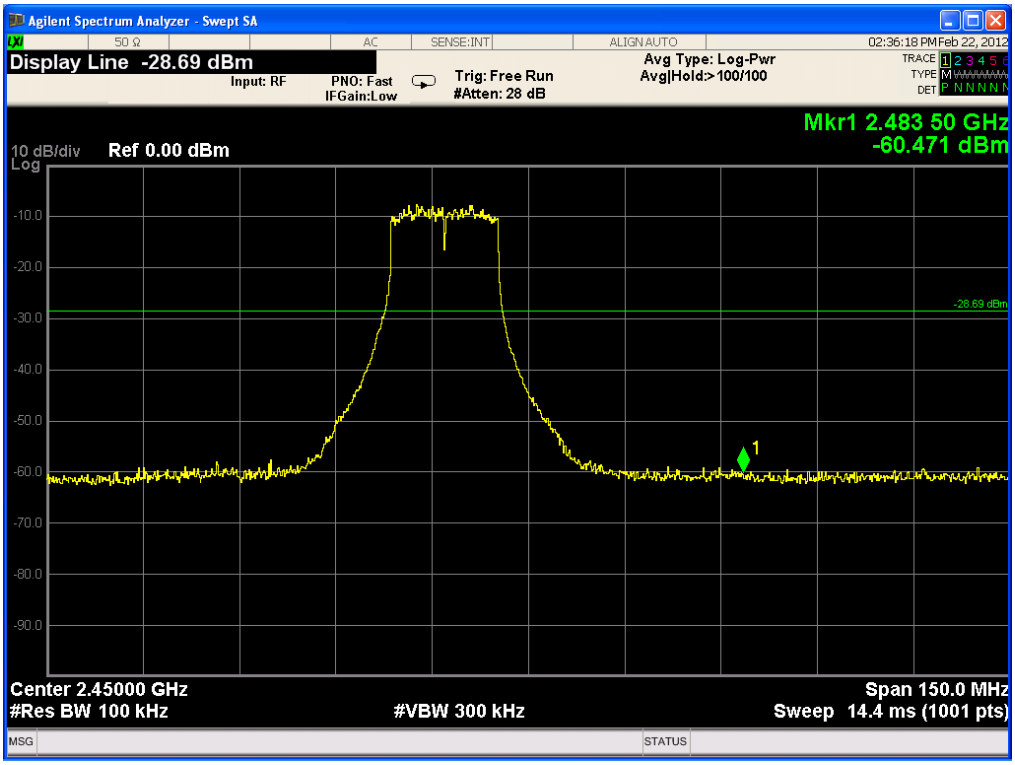
→ 2 400 MHz: -38.85 dBm

⑨ Spurious emission (2 437 MHz at IEEE802.11g)



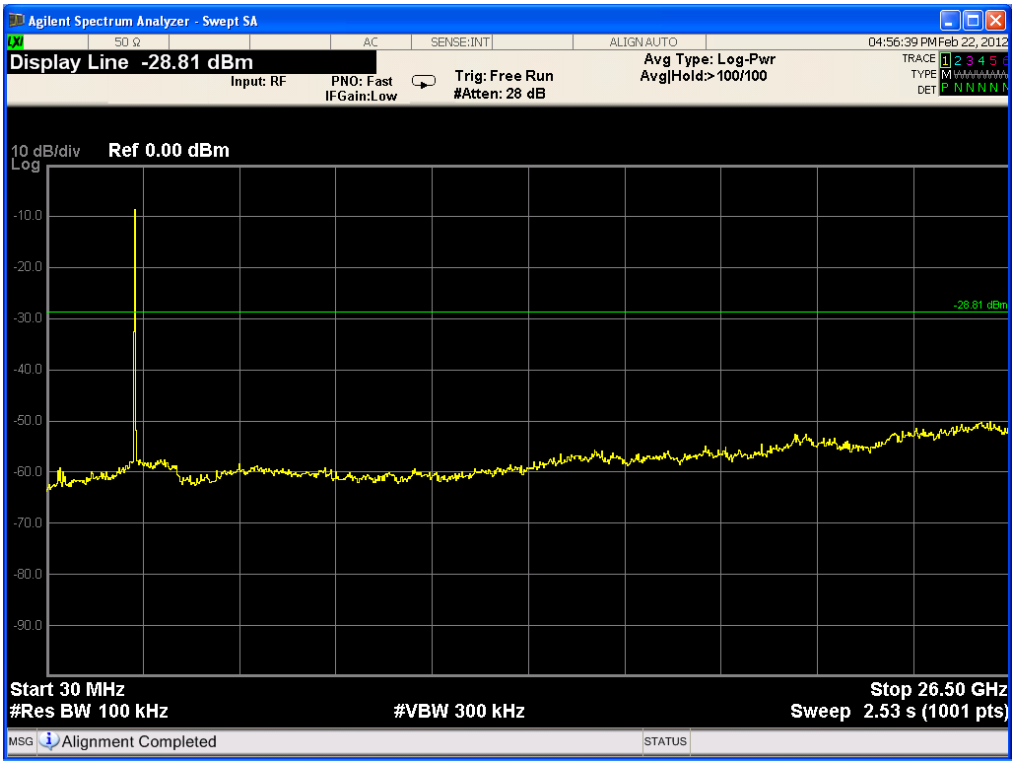
→ 30 MHz to 26.5 GHz: No data

⑩ Out of band emission (2 437 MHz at IEEE802.11g)



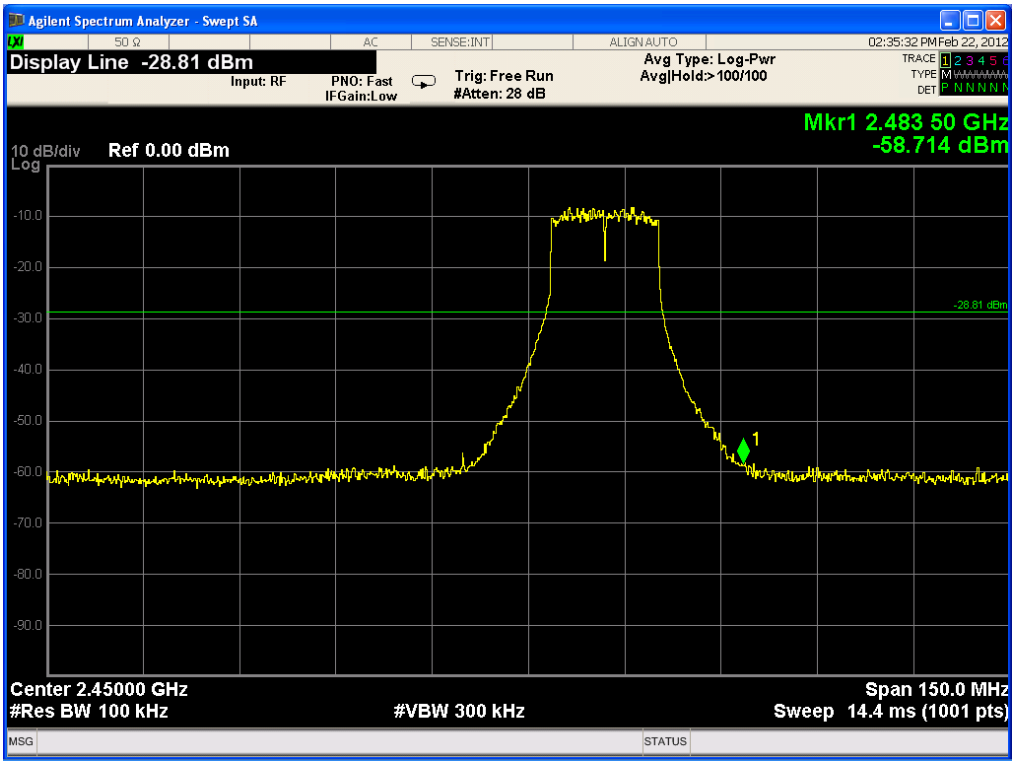
→ 2 483.5 MHz: -60.47 dBm

⑪ Spurious emission (2 462 MHz at IEEE802.11g)



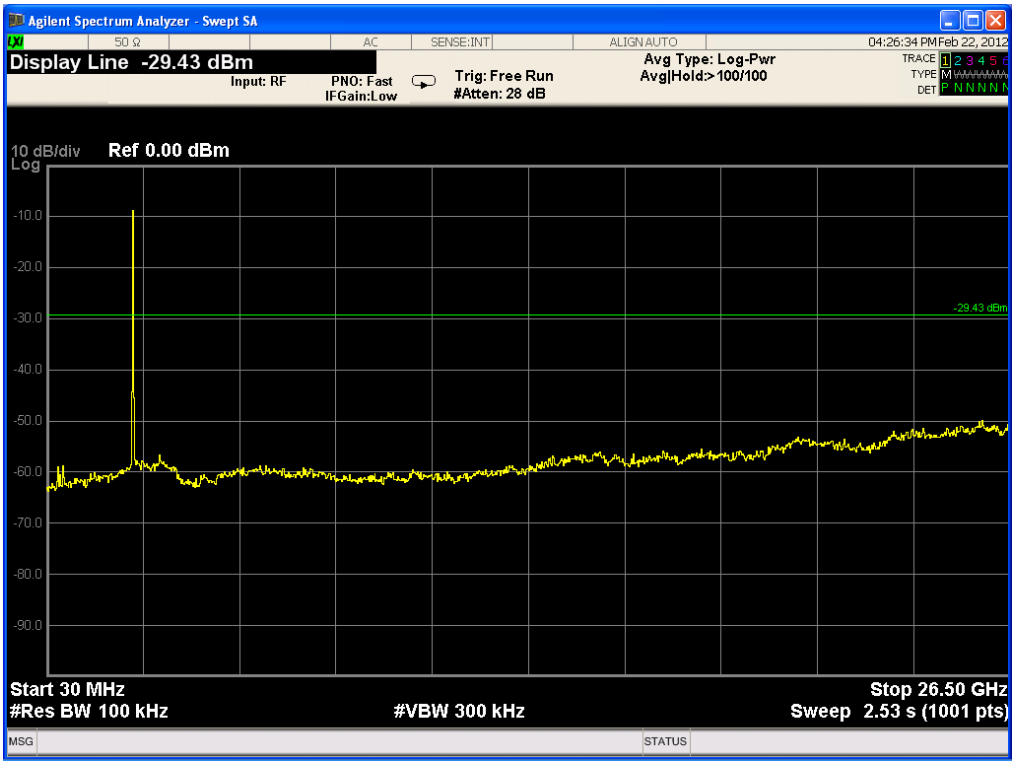
→ 30 MHz to 26.5 GHz: No data

⑫ Out of band emission (2 462 MHz at IEEE802.11g)



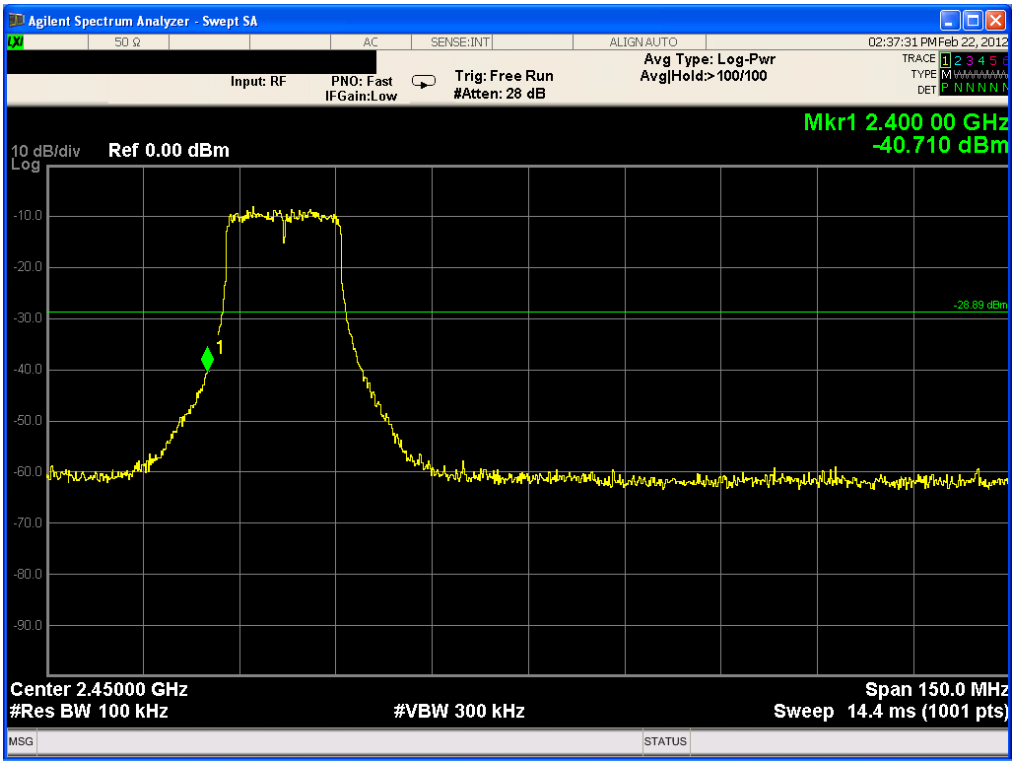
→ 2 483.5 MHz: -58.71 dBm

⑬ Spurious emission (2 412 MHz at IEEE802.11n / 20 MHz)



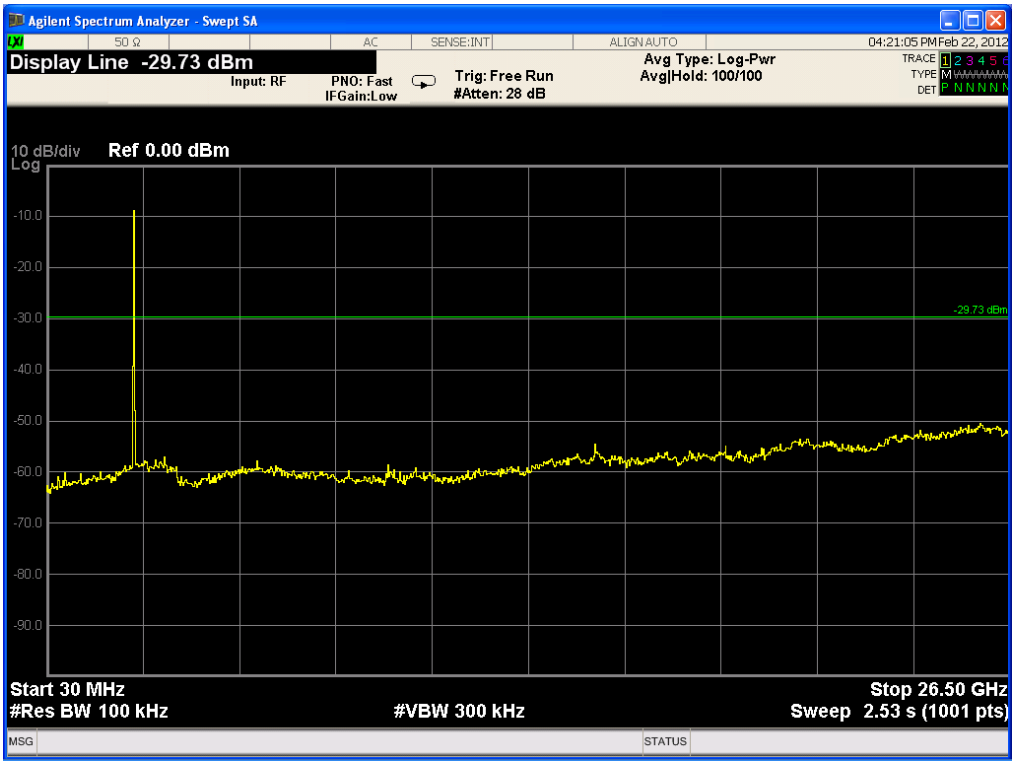
→ **30 MHz to 26.5 GHz: No data**

⑭ Out of band emission (2 412 MHz at IEEE802.11n / 20 MHz)



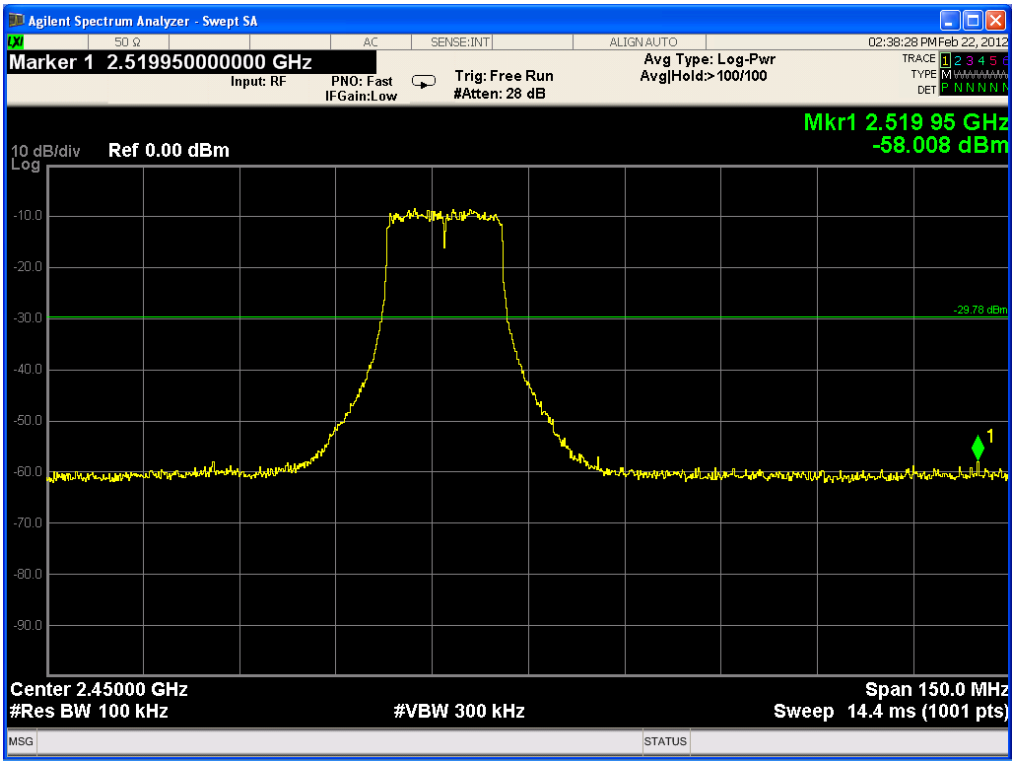
→ **2 400 MHz: -40.71 dBm**

⑮ Spurious emission (2 437 MHz at IEEE802.11n / 20 MHz)



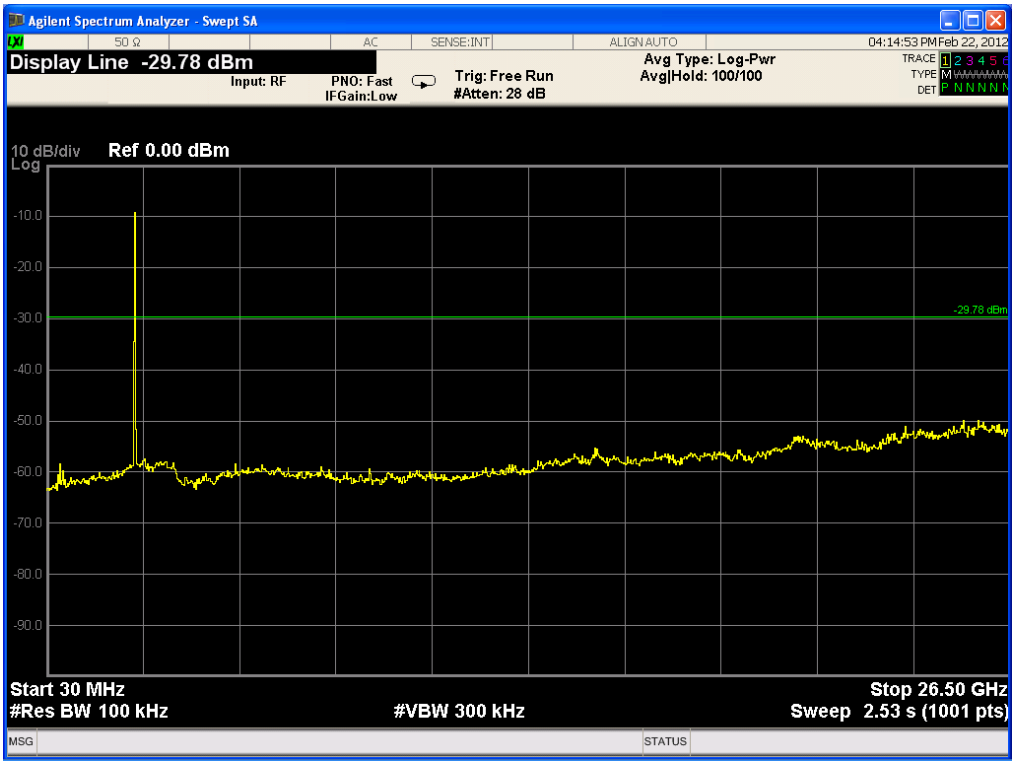
→ 30 MHz to 26.5 GHz: No data

⑯ Out of band emission (2 437 MHz at IEEE802.11n / 20 MHz)



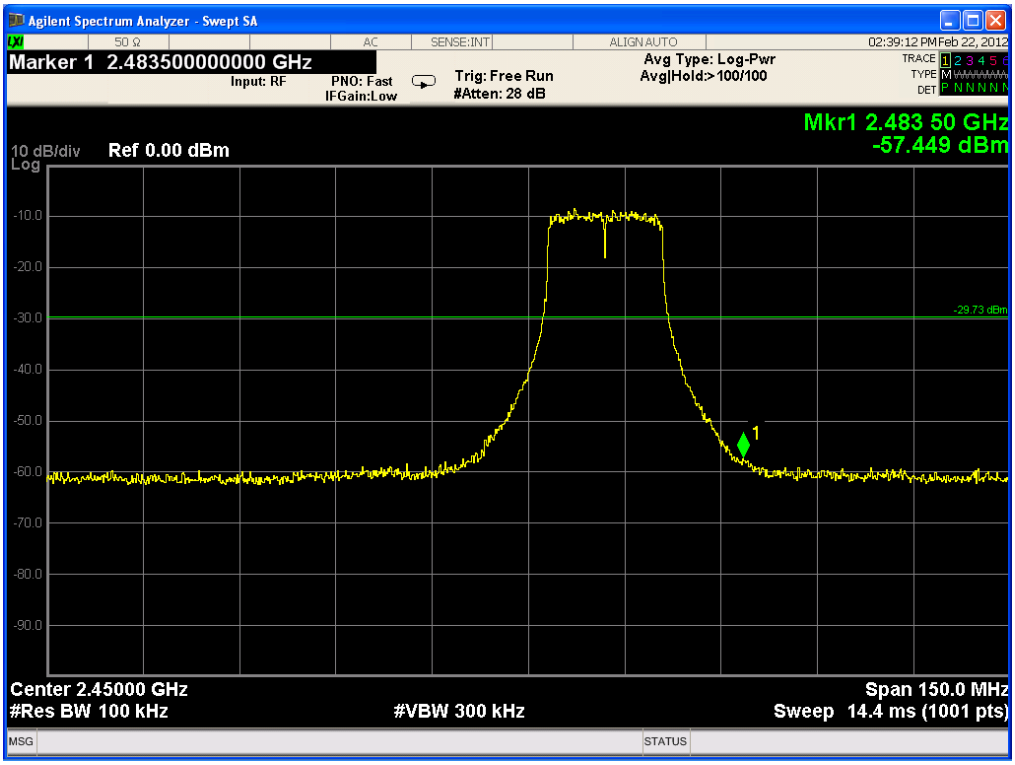
→ 2 519.95 MHz: -58.01 dBm

⑰ Spurious emission (2 462 MHz at IEEE802.11n / 20 MHz)



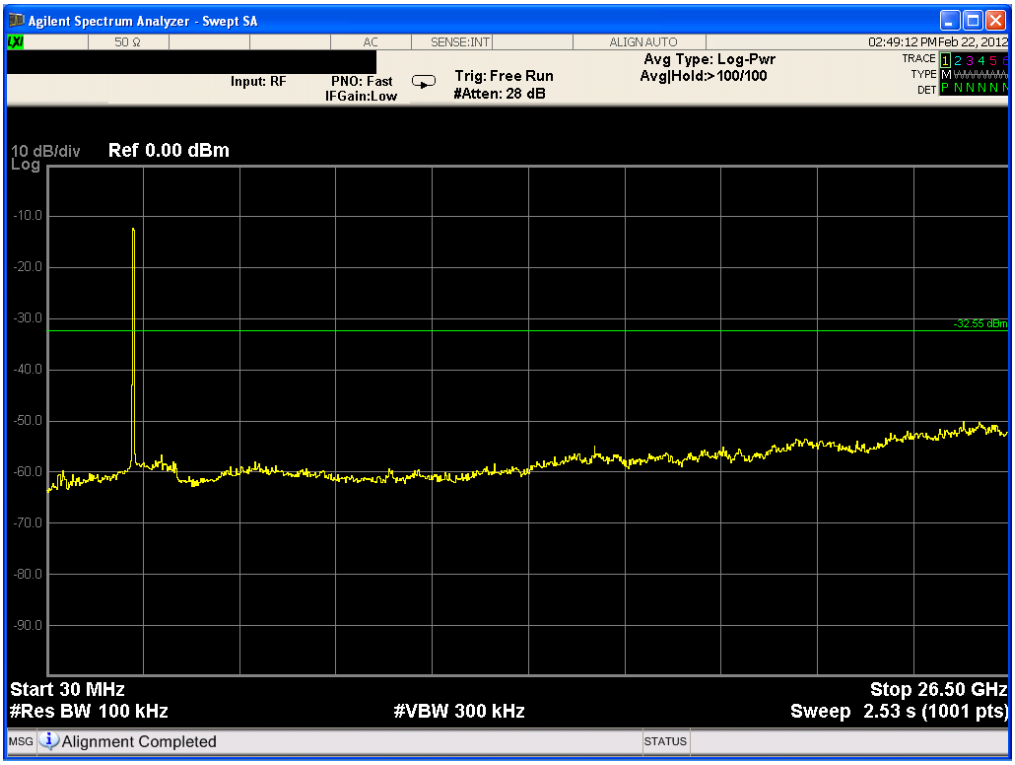
→ **30 MHz to 26.5 GHz: No data**

⑱ Out of band emission (2 462 MHz at IEEE802.11n / 20 MHz)



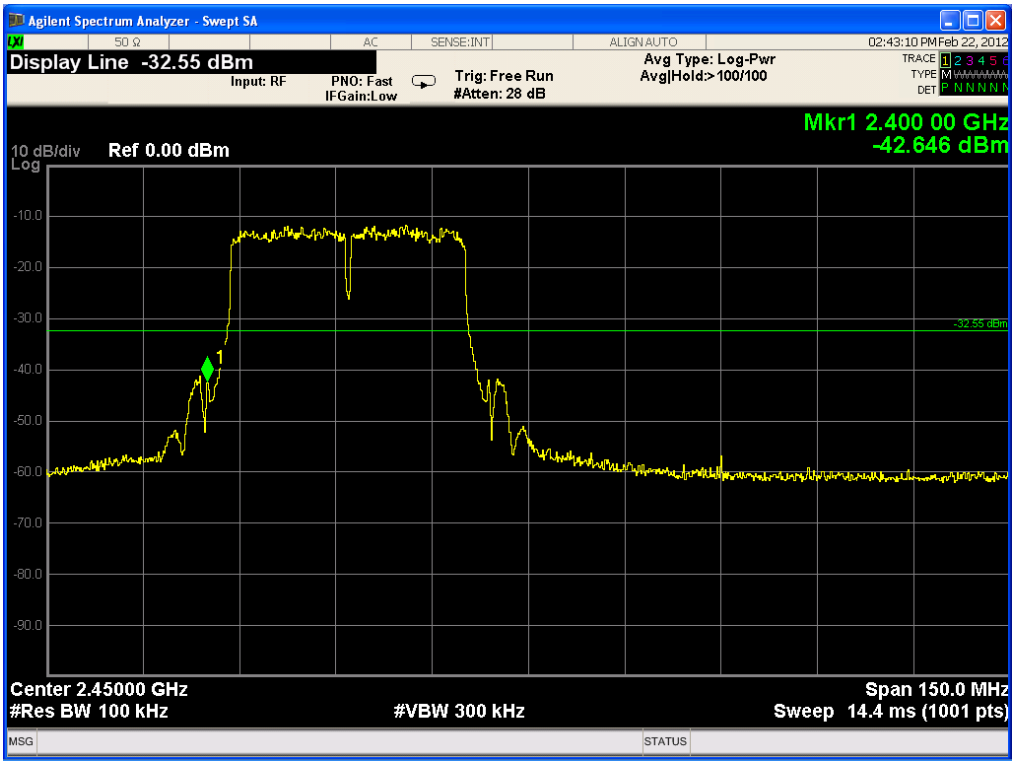
→ **2 400 MHz: -57.45 dBm**

⑲ Spurious emission (2 422 MHz at IEEE802.11n / 40 MHz)



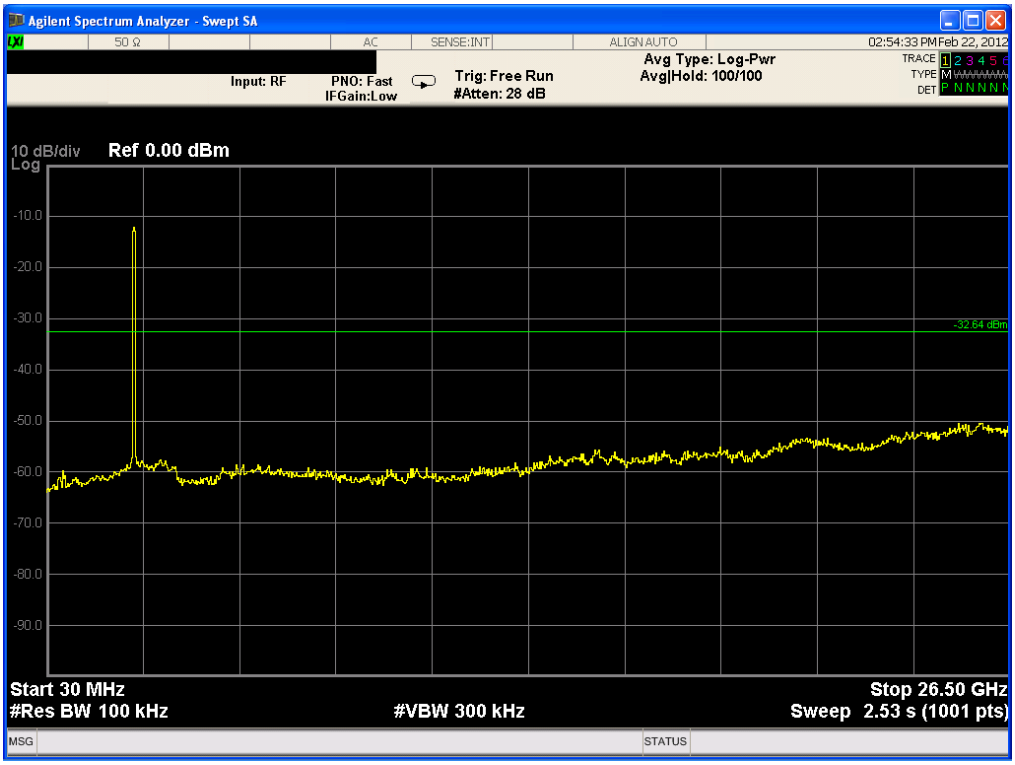
→ 30 MHz to 26.5 GHz: No data

⑳ Out of band emission (2 422 MHz at IEEE802.11n / 40 MHz)



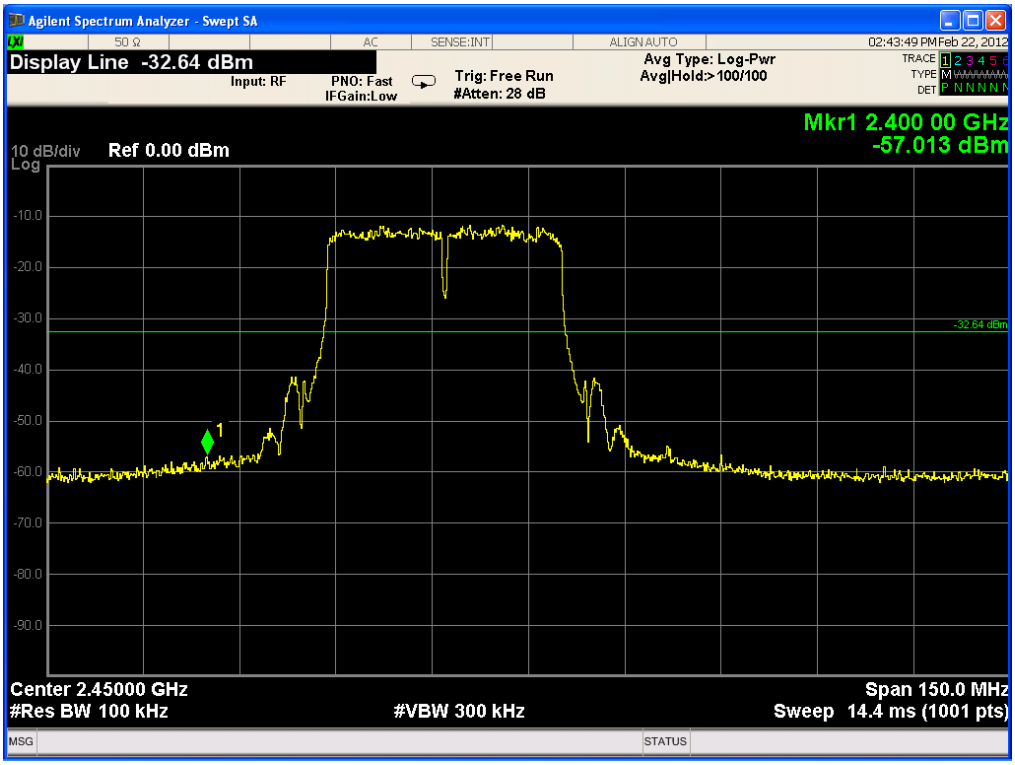
→ 2 400 MHz: -42.65 dBm

㉑ Spurious emission (2 437 MHz at IEEE802.11n / 40 MHz)



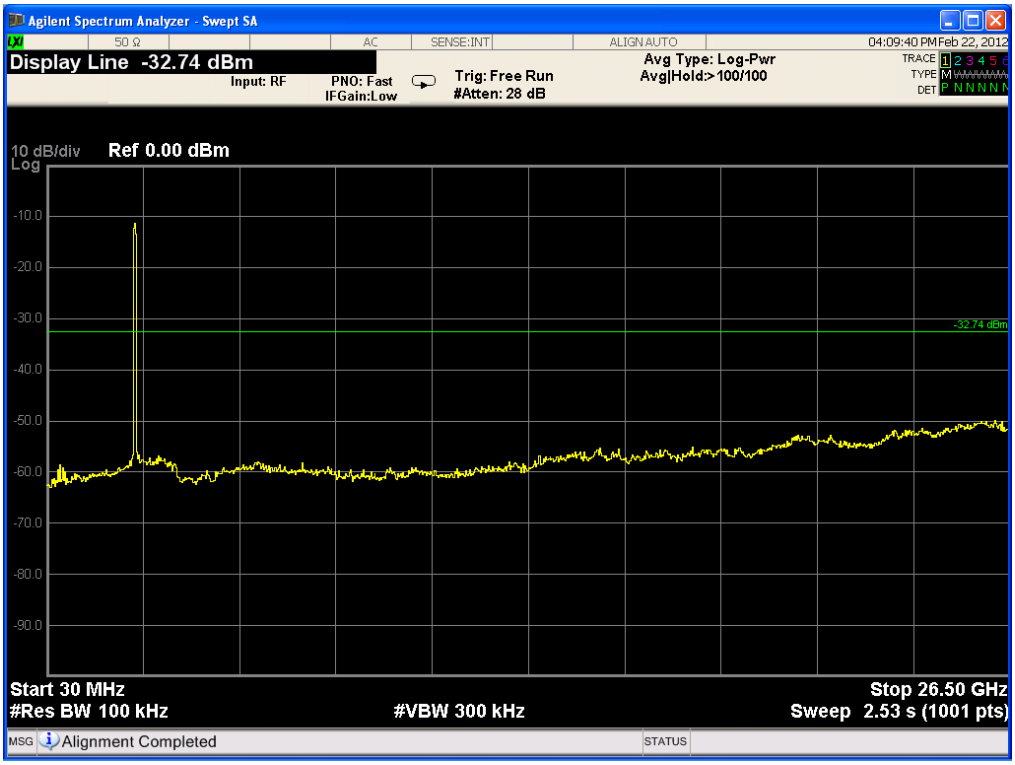
→ 30 MHz to 26.5 GHz: No data

㉒ Out of band emission (2 437 MHz at IEEE802.11n / 40 MHz)



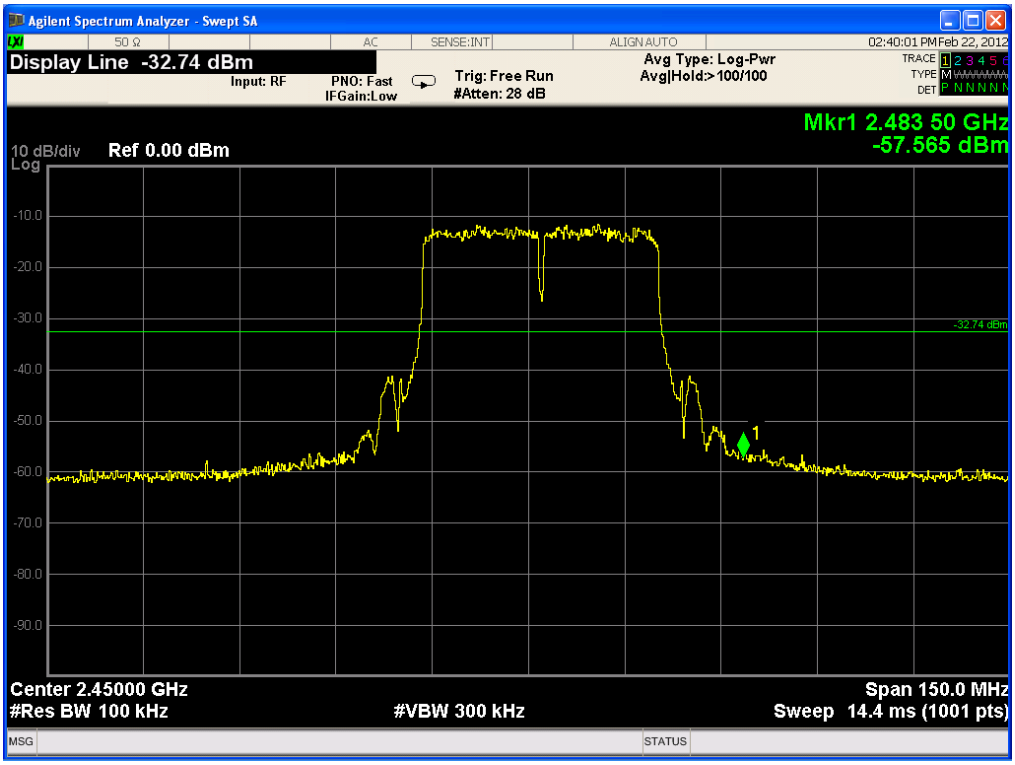
→ 2 400 MHz: -57.01 dBm

㉓ Spurious emission (2 452 MHz at IEEE802.11n / 40 MHz)



→ 30 MHz to 26.5 GHz: No data

㉔ Out of band emission (2 452 MHz at IEEE802.11n / 40 MHz)



→ 2 483.5 MHz: -57.57 dBm

4.5 Radiated emission in restricted band

4.5.1 Definition

A radiated emission is a emission from the equipment when transmitting into a non-radiating load on frequencies that are restricted band sufficient to ensure transmission of information of required quality for the class of communications desired.

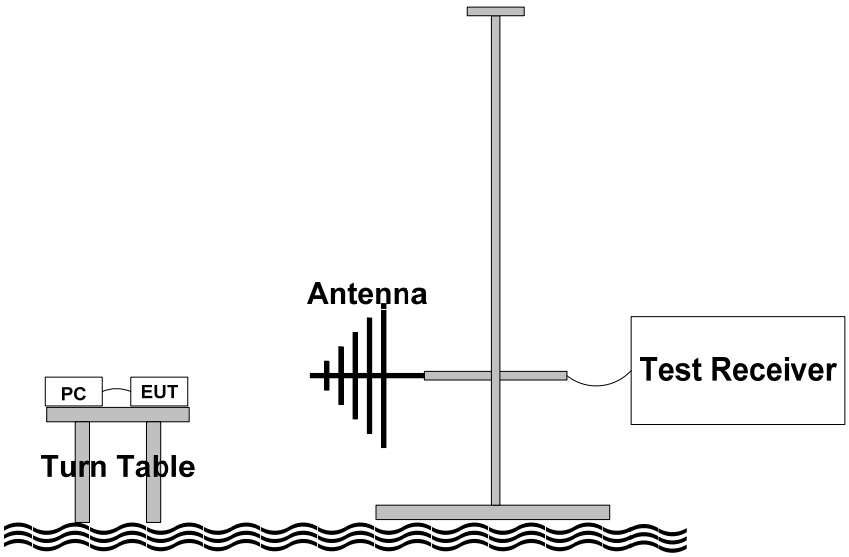
4.5.2 Specification

FCC Rules Part 15, Section 15.205(a) / Section 15.209(a) / Section 15.247(d)

4.5.3 Method of measurement

Public Notice “558074 D01 DTS Meas Guidance v01”
ANSI C63.4 (2009) Section 8.3.1

4.5.4 Measurement set-up



4.5.5 Test equipment list

Equipment	Model name	Manufacture
EUT	WifiAn-Mini	ENJsoft Inc.
Control PC	NT-P560	Samsung
Spectrum Analyzer	ESPI7	Rohde & Schwarz
Spectrum Analyzer	N9020A	Agilent
Loop Antenna	6502	EMCO
Bi-conical Antenna	VHA9103	Schwarzbeck
Log Periodic Antenna	VULP9118A	Schwarzbeck
Horn Antenna	BBHA-9120D	Schwarzbeck
Pre-Amplifier	JS4-00102600-26-5P	MITEQ

4.5.6 Test Procedure

① The EUT is placed on a turntable, which is 0.8 meter high above ground.
② The turntable rotates 360 degrees to determine the position of the maximum emission level.
③ EUT is set 3.0 meters away from the receiving antenna, broadband antenna, which is mounted on an antenna mast.
④ The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level form the EUT.
⑤ Both horizontal and vertical polarizations of the antenna are set on measurement.
⑥ In order to find out the maximum emission levels, all of the EUT location were manipulated according to ANSI 63.4 during the radiated emission measurement.
⑦ The EUT was tested in 3 orthogonal planes.
⑧ The bandwidth of test receiver is set at 200 Hz between 9 to 150 kHz, 9 kHz between 0.15 to 30 MHz, 120 kHz between 30 to 1 000 MHz, and 1 MHz between 1 to 26.5 GHz.

4.5.7 Test Condition

- Test place: OATS
- Test mode: Maximum output power
- Test environment: 18℃, 41 % R.H.

4.5.8 Limit

Section 15.247(b) specifies that emissions which fall in restricted band, as defined in section 15.205(a), must comply with the radiated emission limits specified in section 15.209(a)

FCC Rules Part 15, Section 15.205(a) restricted frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	13.36 – 13.41	322 – 335.4	3.6 – 4.4
0.495 – 0.505	16.42 – 16.423	399.9 – 410	4.5 – 5.15
2.1735 – 2.1905	16.69475 – 16.69525	608 – 614	5.35 – 5.46
4.125 – 4.128	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.17725 – 4.17775	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.20725 – 4.20775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
6.215 – 6.218	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.26775 – 6.26825	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.31175 – 6.31225	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
8.291 – 8.294	123 – 138	2200 – 2300	14.47 – 14.5
8.362 – 8.366	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.37625 – 8.38675	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.41425 – 8.41475	156.7 – 156.9	2690 – 2900	22.01 – 23.12
12.29 – 12.293	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.51975 – 12.52025	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.57675 – 12.57725	240 – 285	3345.8 – 3358	36.43 – 36.5

FCC Rules Part 15, Section 15.209(a) field strength levels specified in the following table:

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
0.009 – 0.490	2 400/F(kHz)	300
0.490 – 1.705	24 000/F(kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

4.5.9 Test result of IEEE802.11b mode

Frequency [MHz]	Polarization [H/V]	Detect Mode [Peak/QP/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
Operation frequency / 2 412 MHz									
280.0	V	QP	-9.9	19.1	6.0	-	15.2	46.0	30.8
332.0	V	QP	-4.2	16.3	6.2	-	18.3	46.0	27.7
400.0	V	QP	9.1	15.2	7.2	-	31.5	46.0	14.5
612.0	V	QP	-8.5	19.2	9.0	-	19.7	46.0	26.3
4 824.0	-	Peak	10.2	31.4	18.9	27.1	33.4	74.0	40.6
		AVG	7.0				30.2	54.0	23.8
Operation frequency / 2 437 MHz									
280.0	V	QP	-13.8	19.1	6.0	-	11.3	46.0	34.7
400.0	V	QP	11.8	15.2	7.2	-	34.2	46.0	11.8
4 874.0	-	Peak	8.5	31.6	19.2	27.3	32.0	74.0	42.0
		AVG	7.1				30.6	54.0	23.4
Operation frequency / 2 462 MHz									
280.0	V	QP	-14.1	19.1	6.0	-	11.0	46.0	35.0
400.0	V	QP	12.7	15.2	7.2	-	35.1	46.0	10.9
4 924.0	-	Peak	8.8	31.7	19.5	27.4	32.6	74.0	41.4
		AVG	7.1				30.9	54.0	23.1

4.5.10 Test result of IEEE802.11g mode

Frequency [MHz]	Polarization [H/V]	Detect Mode [Peak/QP/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
Operation frequency / 2 412 MHz									
280.0	V	QP	-10.5	19.1	6.0	-	14.6	46.0	31.4
400.0	V	QP	9.5	15.2	7.2	-	31.9	46.0	14.1
612.0	V	QP	-9.3	19.2	9.0		18.9	46.0	27.1
4 824.0	-	Peak	4.7	31.4	18.9	27.1	27.9	74.0	46.1
		AVG	-2.8				20.4	54.0	33.6
Operation frequency / 2 437 MHz									
280.0	V	QP	-12.4	19.1	6.0	-	12.7	46.0	33.3
400.0	V	QP	9.5	15.2	7.2	-	31.9	46.0	14.1
4 874.0	-	Peak	3.5	31.6	19.2	27.3	27.0	74.0	47.0
		AVG	-2.7				20.8	54.0	33.2
Operation frequency / 2 462 MHz									
280.0	V	QP	-14.3	19.1	6.0	-	10.8	46.0	35.2
400.0	V	QP	12.9	15.2	7.2	-	35.3	46.0	10.7
4 924.0	-	Peak	0.7	31.7	19.5	27.4	24.5	74.0	49.5
		AVG	-3.5				20.3	54.0	33.7

4.5.11 Test result of IEEE802.11n (20 MHz) mode

Frequency [MHz]	Polarization [H/V]	Detect Mode [Peak/QP/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
Operation frequency / 2 412 MHz									
280.0	V	QP	-10.4	19.1	6.0	-	14.7	46.0	31.3
400.0	V	QP	9.9	15.2	7.2	-	32.3	46.0	13.7
612.0	V	QP	-8.7	19.2	9.0		19.5	46.0	26.5
4 824.0	-	Peak	4.1	31.4	18.9	27.1	27.3	74.0	46.7
		AVG	-2.4				20.8	54.0	33.2
Operation frequency / 2 437 MHz									
280.0	V	QP	-12.9	19.1	6.0	-	12.2	46.0	33.8
400.0	V	QP	9.3	15.2	7.2	-	31.7	46.0	14.3
4 874.0	-	Peak	4.0	31.6	19.2	27.3	27.5	74.0	46.5
		AVG	-3.0				20.5	54.0	33.5
Operation frequency / 2 462 MHz									
280.0	V	QP	-15.4	19.1	6.0	-	9.7	46.0	36.3
400.0	V	QP	13.0	15.2	7.2	-	35.4	46.0	10.6
4 924.0	-	Peak	1.0	31.7	19.5	27.4	24.8	74.0	49.2
		AVG	-3.4				20.4	54.0	33.6

4.5.12 Test result of IEEE802.11n (40 MHz) mode

Frequency [MHz]	Polarization [H/V]	Detect Mode [Peak/QP/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
Operation frequency / 2 422 MHz									
280.0	V	QP	-9.9	19.1	6.0	-	15.2	46.0	30.8
400.0	V	QP	7.8	15.2	7.2	-	30.2	46.0	15.8
4 844.0	-	Peak	2.4	31.5	19.0	27.1	25.8	74.0	48.2
		AVG	-3.0				20.4	54.0	33.6
Operation frequency / 2 437 MHz									
280.0	V	QP	-11.8	19.1	6.0	-	13.3	46.0	32.7
400.0	V	QP	7.3	15.2	7.2	-	29.7	46.0	16.3
4 874.0	-	Peak	2.8	31.6	19.2	27.3	26.3	74.0	47.7
		AVG	-3.4				20.1	54.0	33.9
Operation frequency / 2 452 MHz									
280.0	V	QP	-13.1	19.1	6.0	-	12.0	46.0	34.0
332.0	V	QP	-2.9	16.3	6.2	-	19.6	46.0	26.4
400.0	V	QP	10.8	15.2	7.2	-	33.2	46.0	12.8
612.0	V	QP	-6.9	19.2	9.0		21.3	46.0	24.7
4 904.0	-	Peak	1.0	31.7	19.4	27.4	24.7	74.0	49.3
		AVG	-0.6				23.1	54.0	30.9

4.6 Radiated emission in band edge

4.6.1 Definition

A radiated emission is a emission from the equipment when transmitting into a non-radiating load on frequencies that are restricted band sufficient to ensure transmission of information of required quality for the class of communications desired.

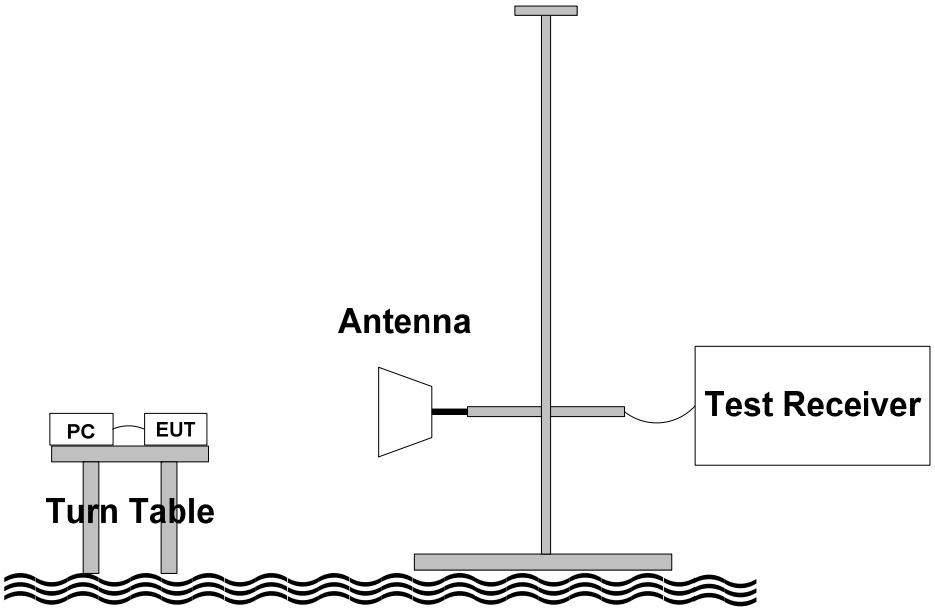
4.6.2 Specification

FCC Rules Part 15, Section 15.205(a) / Section 15.209(a) / Section 15.247(d)

4.6.3 Method of measurement

Public Notice “558074 D01 DTS Meas Guidance v01”
ANSI C63.4 (2009) Section 8.3.1

4.6.4 Measurement set-up



4.6.5 Test equipment list

Equipment	Model name	Manufacturer
EUT	WifiAn-Mini	ENJsoft Inc.
Control PC	NT-P560	Samsung
Spectrum Analyzer	N9020A	Agilent
Horn Antenna	BBHA-9120D	Schwarzbeck
Pre-Amplifier	JS4-00102600-26-5P	MITEQ

4.6.6 Test Procedure (Peak mode)

① Same as ① to ⑦ at the test procedure of radiated emission (4.5.6).
② Set the RBW = 1 MHz.
③ Set the VBW = 3 MHz.
④ Detector = peak
⑤ Span = 100 MHz
⑥ Sweep time = auto couple
⑦ Trace mode = max hold (more than 100 trace)

4.6.7 Test Procedure (Average mode)

① Same as ① to ⑦ at the test procedure of radiated emission (4.5.6).
② Set the RBW = 1 MHz.
③ Set the VBW = 3 MHz.
④ Detector = RMS
⑤ Span = 100 MHz
⑥ Sweep point = 24 000
⑦ Sweep time = 10 s (single sweep)

4.6.8 Test Condition

- Test place: OATS
- Test mode: Maximum output power
- Test environment: 18℃, 41 % R.H.

4.6.9 Limit

Section 15.247(b) specifies that emissions which fall in restricted band, as defined in section 15.205(a), must comply with the radiated emission limits specified in section 15.209(a)

Band edge in restricted frequency bands:

Band edge	Stating frequency (MHz)	Ending frequency (MHz)
Lower Upper	2 300 2 483.5	2 390 2 500

Field strength levels specified in the following table:

Frequency (MHz)	Field strength (uV/m)	Measurement distance (m)
Above 960	500 (Average) 5 000 (Peak)	3

4.6.10 Test result of IEEE802.11b mode

Frequency [MHz]	Detect Mode [Peak/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
Operation frequency / 2 412 MHz								
2 390.0	Peak	32.4	27.3	10.7	27.1	43.3	74.0	30.7
	AVG	24.0				34.9	54.0	19.1
Operation frequency / 2 462 MHz								
2 483.5	Peak	33.1	27.6	11.2	27.4	44.5	74.0	29.5
	AVG	23.7				35.1	54.0	18.9

4.6.11 Test result of IEEE802.11g mode

Frequency [MHz]	Detect Mode [Peak/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
Operation frequency / 2 412 MHz								
2 390.0	Peak	33.4	27.3	10.7	27.1	44.3	74.0	29.7
	AVG	23.3				34.2	54.0	19.8
Operation frequency / 2 462 MHz								
2 483.5	Peak	33.3	27.6	11.2	27.4	44.7	74.0	29.3
	AVG	23.0				34.4	54.0	19.6

4.6.12 Test result of IEEE802.11n (20 MHz) mode

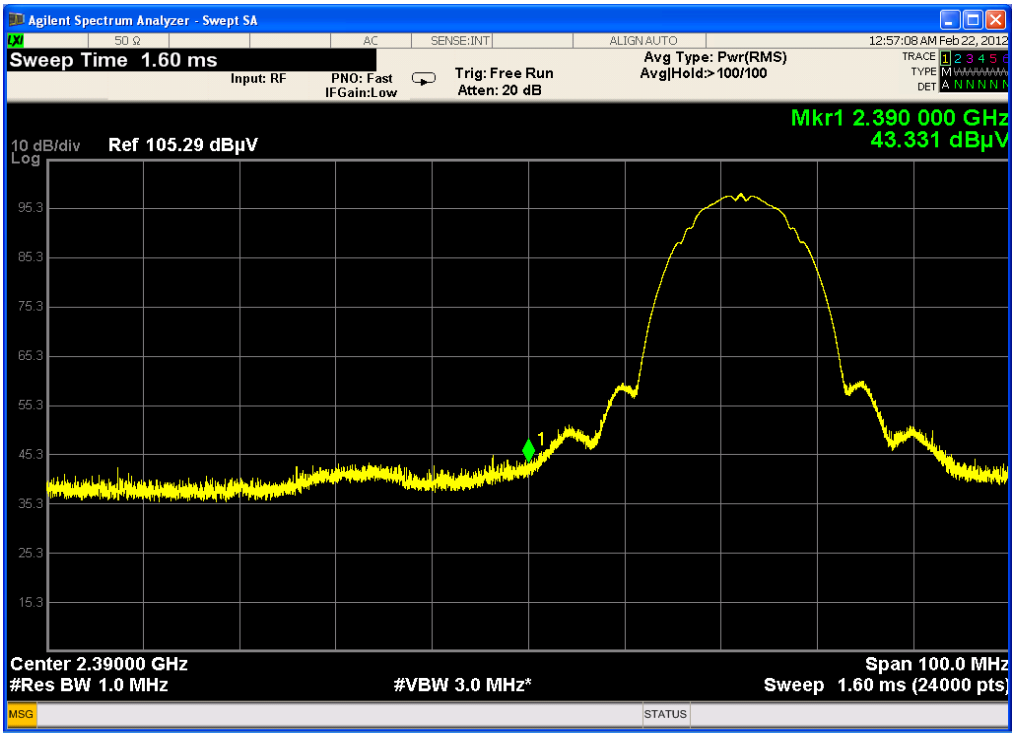
Frequency [MHz]	Detect Mode [Peak/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
Operation frequency / 2 412 MHz								
2 390.0	Peak	34.4	27.3	10.7	27.1	45.3	74.0	28.7
	AVG	23.9				34.8	54.0	19.2
Operation frequency / 2 462 MHz								
2 483.5	Peak	32.9	27.6	11.2	27.4	44.3	74.0	29.7
	AVG	24.1				35.5	54.0	18.5

4.6.13 Test result of IEEE802.11n (40 MHz) mode

Frequency [MHz]	Detect Mode [Peak/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
Operation frequency / 2 422 MHz								
2 390.0	Peak	32.4	27.3	10.7	27.1	43.3	74.0	30.7
	AVG	25.6				36.5	54.0	17.5
Operation frequency / 2 452 MHz								
2 483.5	Peak	34.9	27.6	11.2	27.4	46.3	74.0	27.7
	AVG	25.6				37.0	54.0	17.0

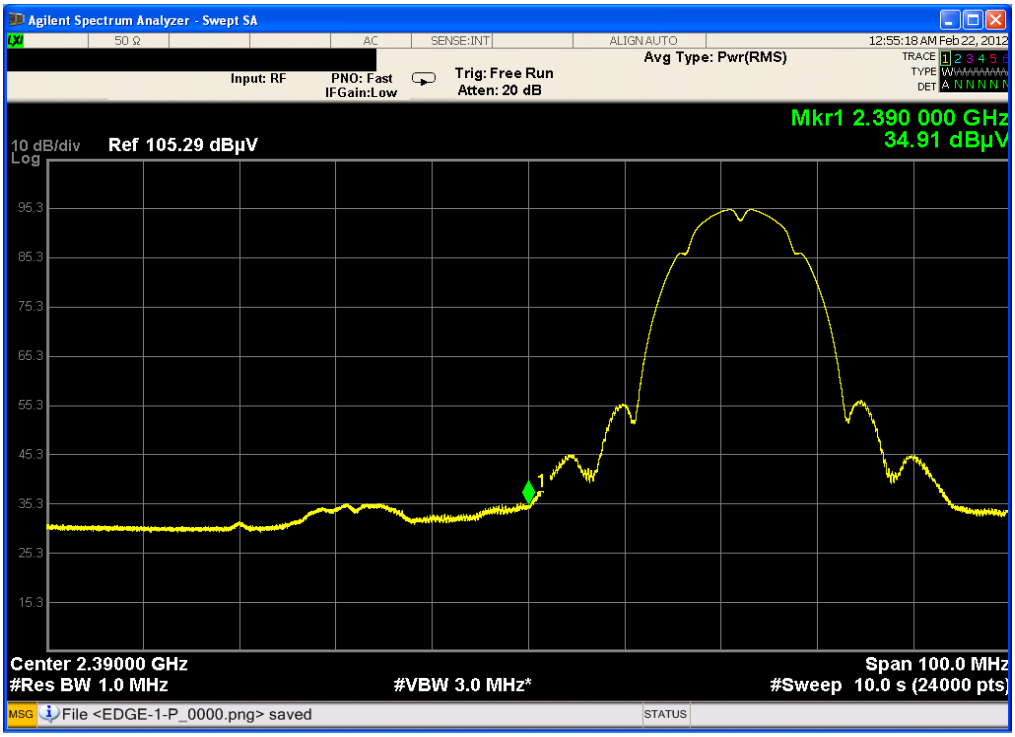
4.6.14 Plot of radiated emission in band edge

① 2 412 MHz at IEEE802.11b



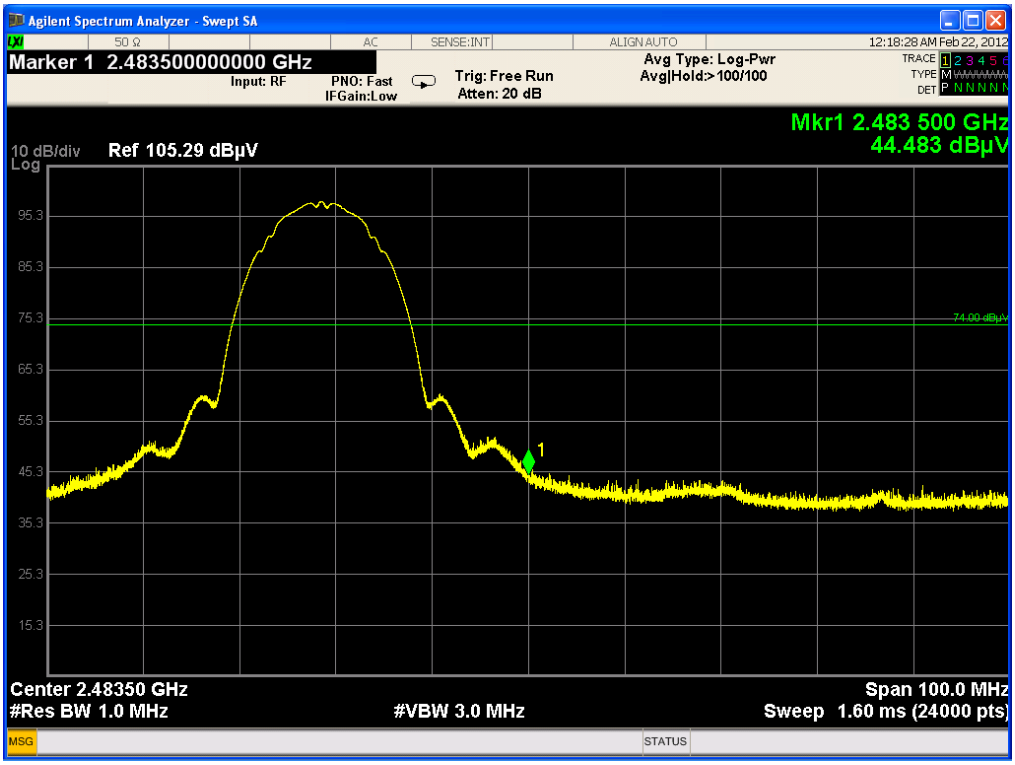
→ **Peak mode: 43.3 dBµV/m**

② 2 412 MHz at IEEE802.11b



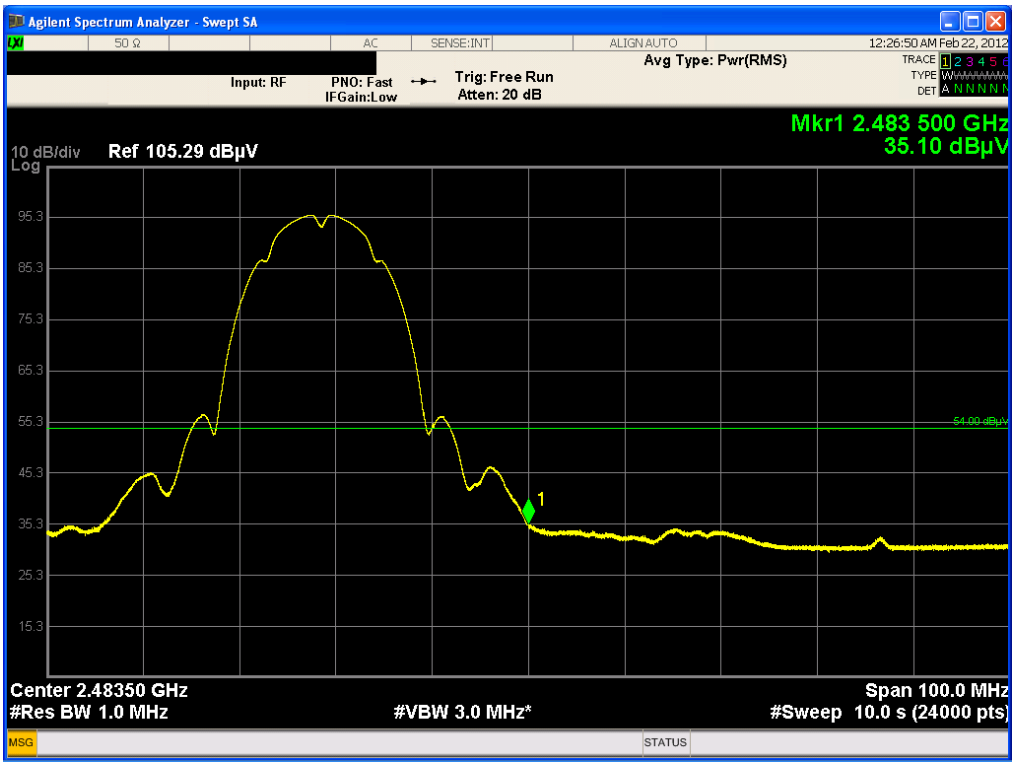
→ **Average mode: 34.9 dBµV/m**

③ 2 462 MHz at IEEE802.11b



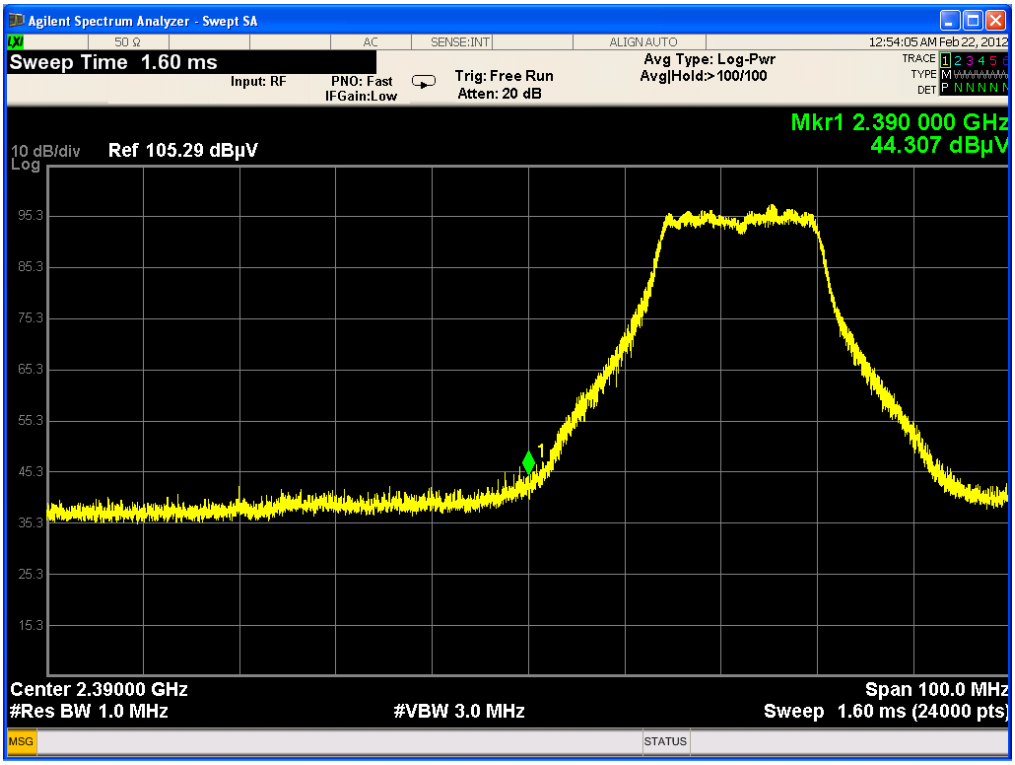
→ **Peak mode: 44.5 dBµV/m**

④ 2 462 MHz at IEEE802.11b



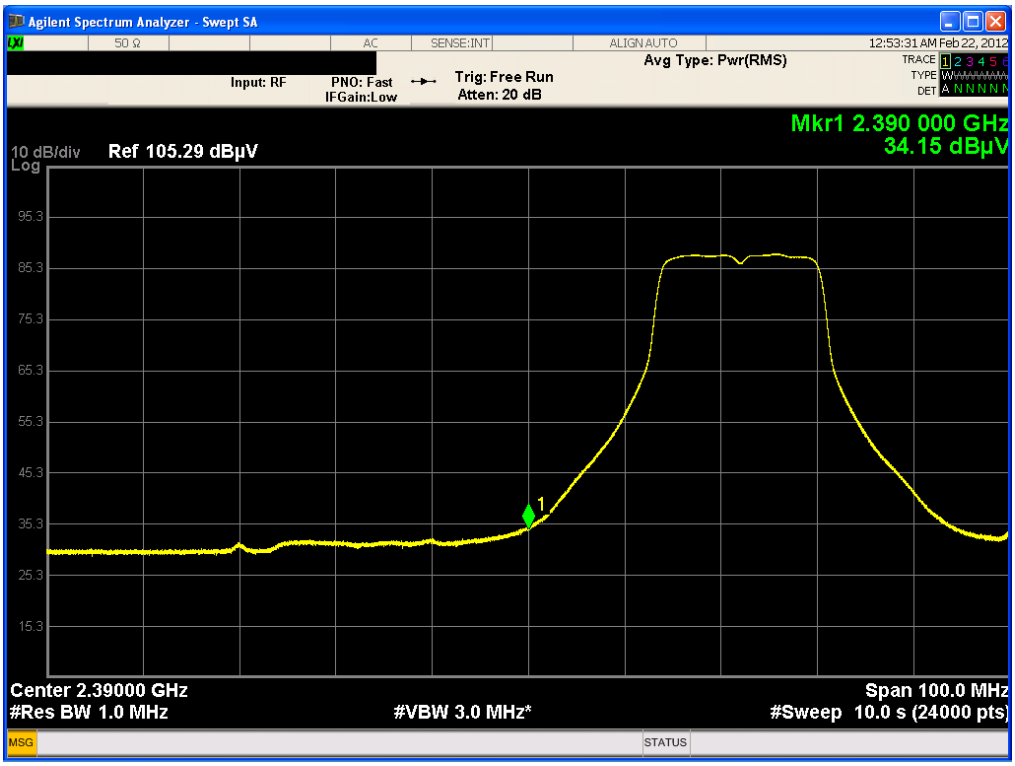
→ **Average mode: 35.1 dBµV/m**

⑤ 2 412 MHz at IEEE802.11g



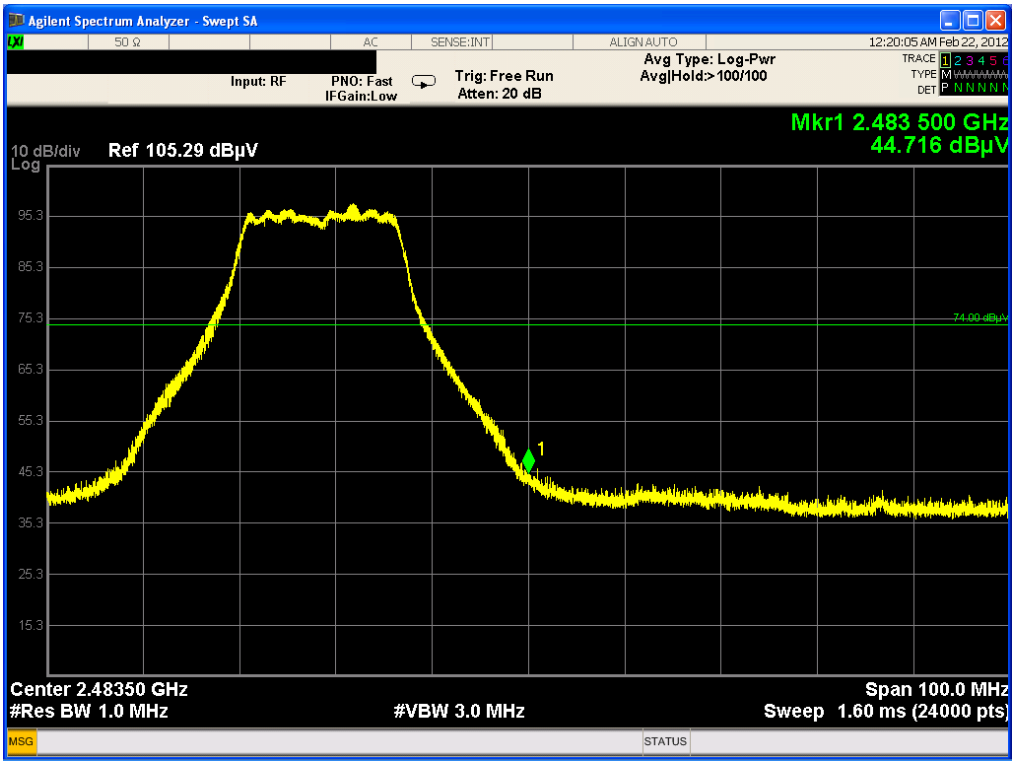
→ Peak mode: 44.3 dBµV/m

⑥ 2 412 MHz at IEEE802.11g



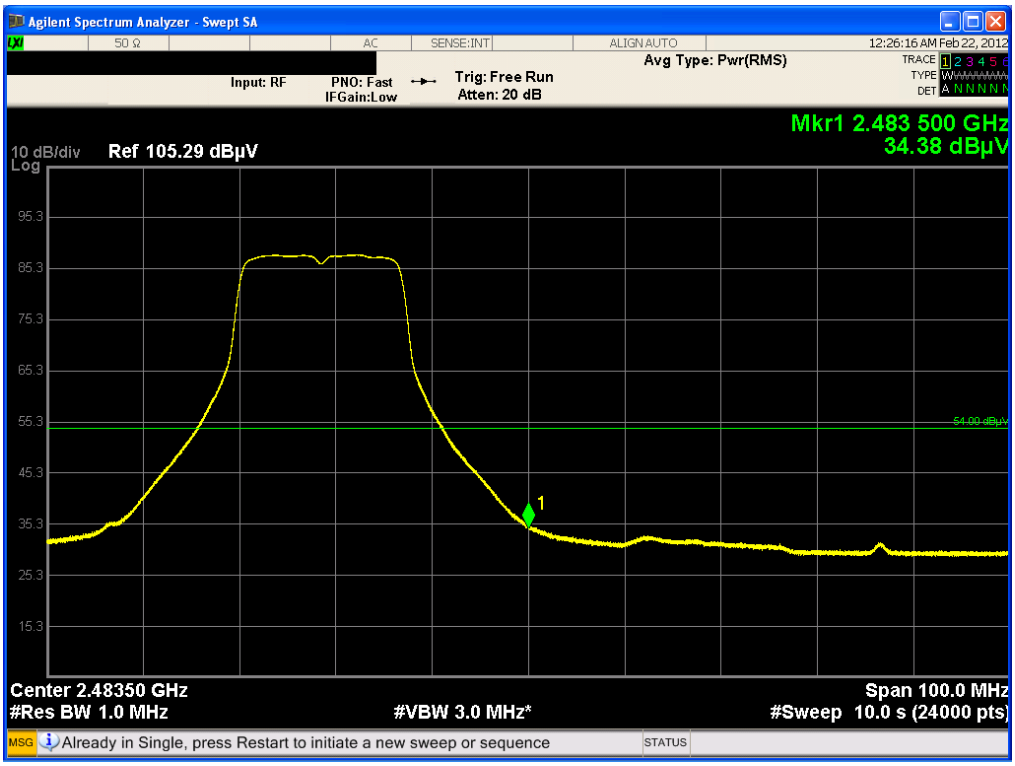
→ Average mode: 34.2 dBµV/m

⑦ 2 462 MHz at IEEE802.11g



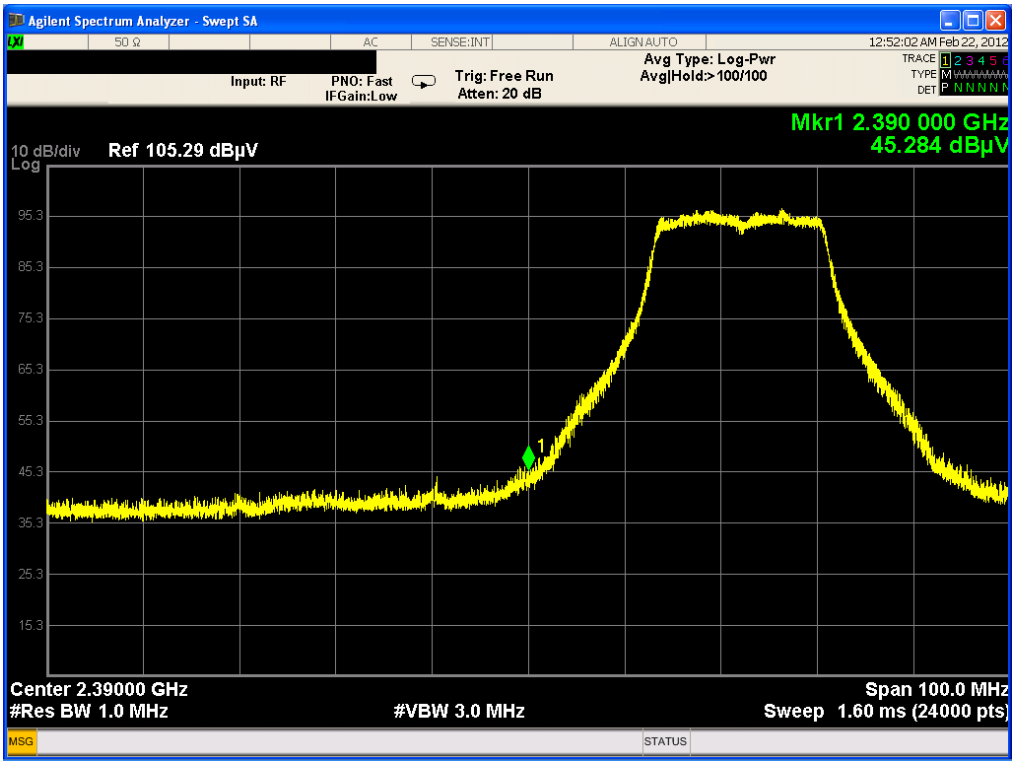
→ Peak mode: 44.7 dBµV/m

⑧ 2 462 MHz at IEEE802.11g



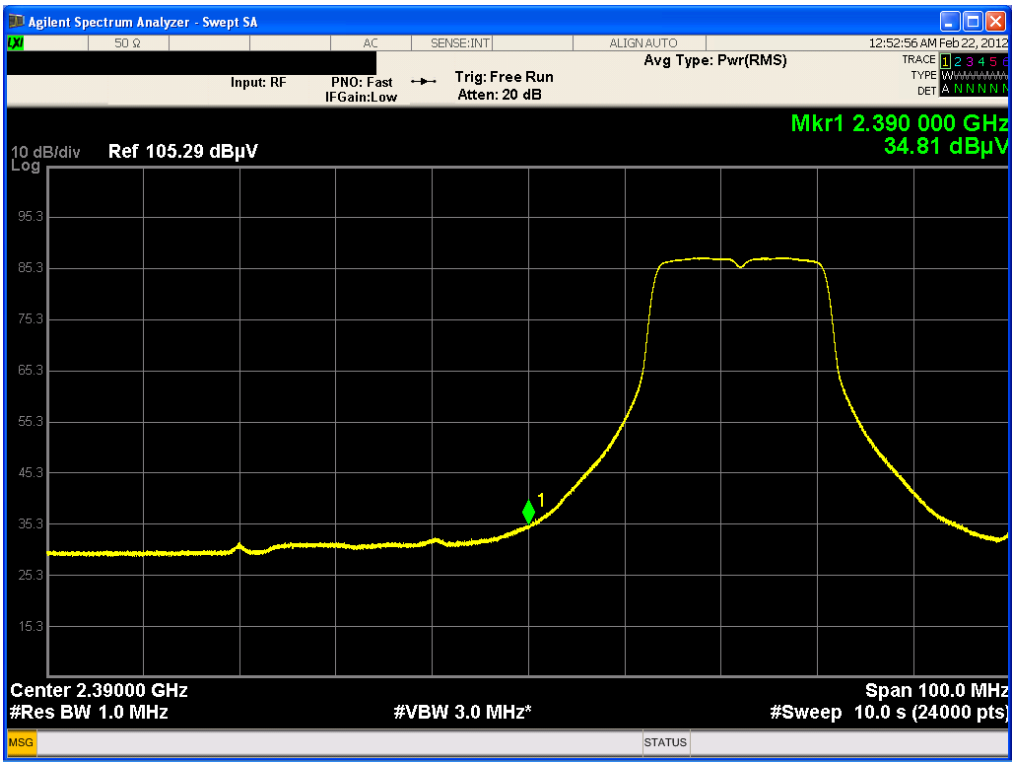
→ Average mode: 34.4 dBµV/m

⑨ 2 412 MHz at IEEE802.11n / 20 MHz



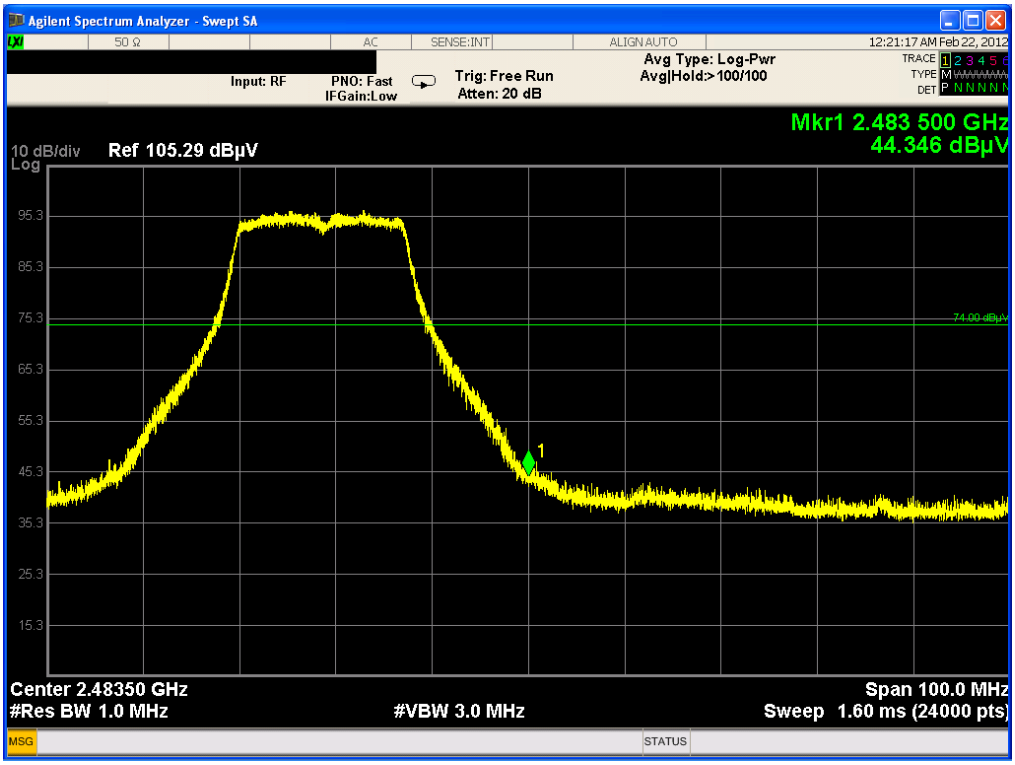
→ Peak mode: 45.3 dBµV/m

⑩ 2 412 MHz at IEEE802.11n / 20 MHz



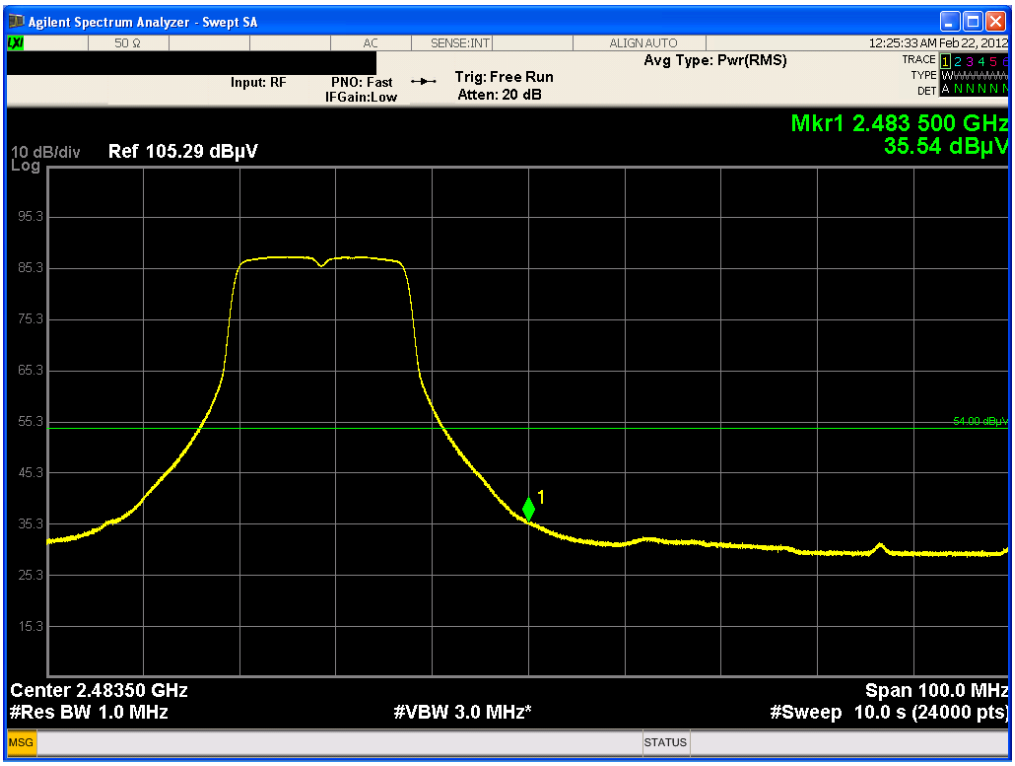
→ Average mode: 34.8 dBµV/m

⑪ 2 462 MHz at IEEE802.11n / 20 MHz



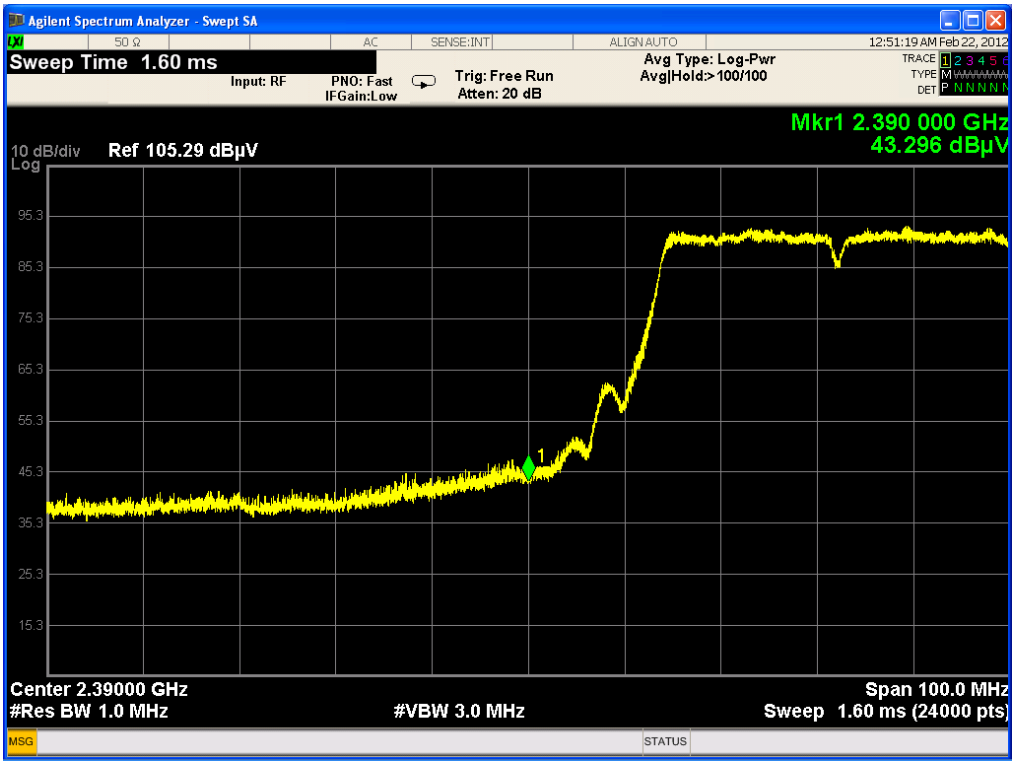
→ **Peak mode: 44.3 dBµV/m**

⑫ 2 462 MHz at IEEE802.11n / 20 MHz



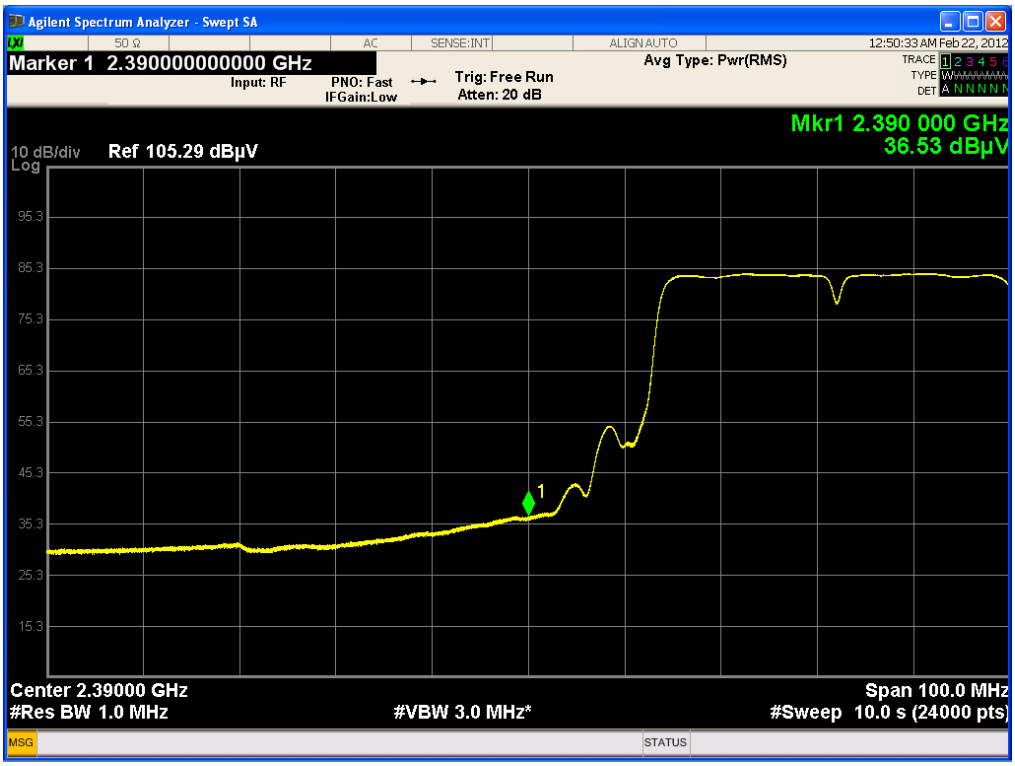
→ **Average mode: 35.5 dBµV/m**

⑬ 2 412 MHz at IEEE802.11n / 40 MHz



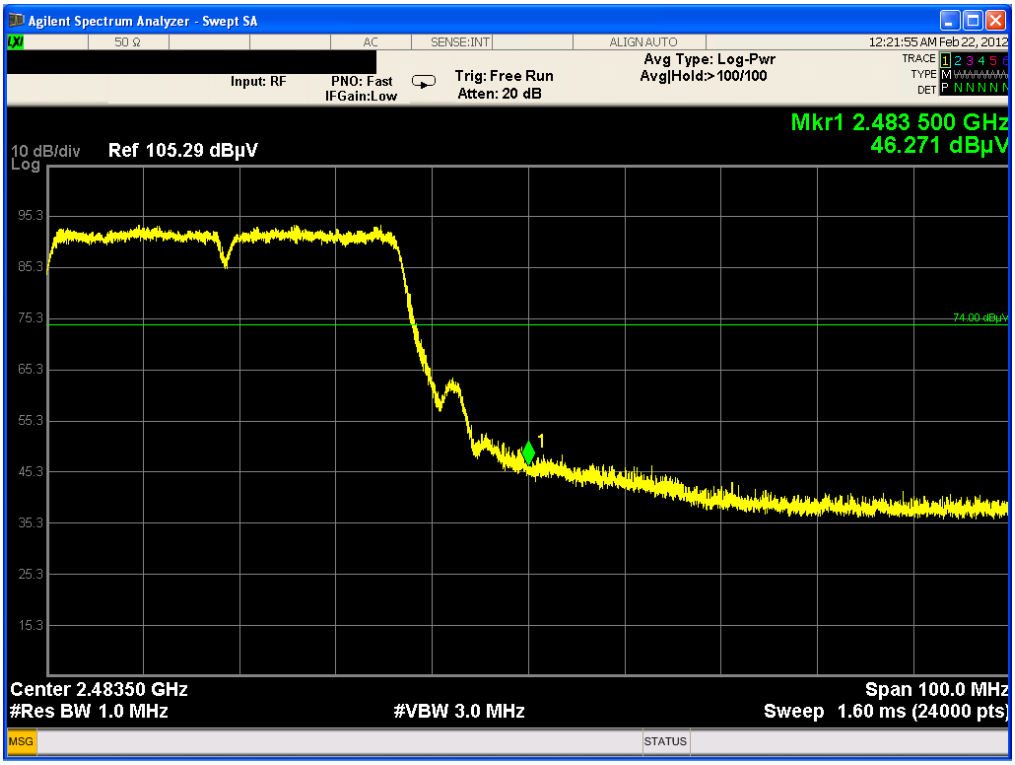
→ Peak mode: 43.3 dBµV/m

⑭ 2 412 MHz at IEEE802.11n / 40 MHz



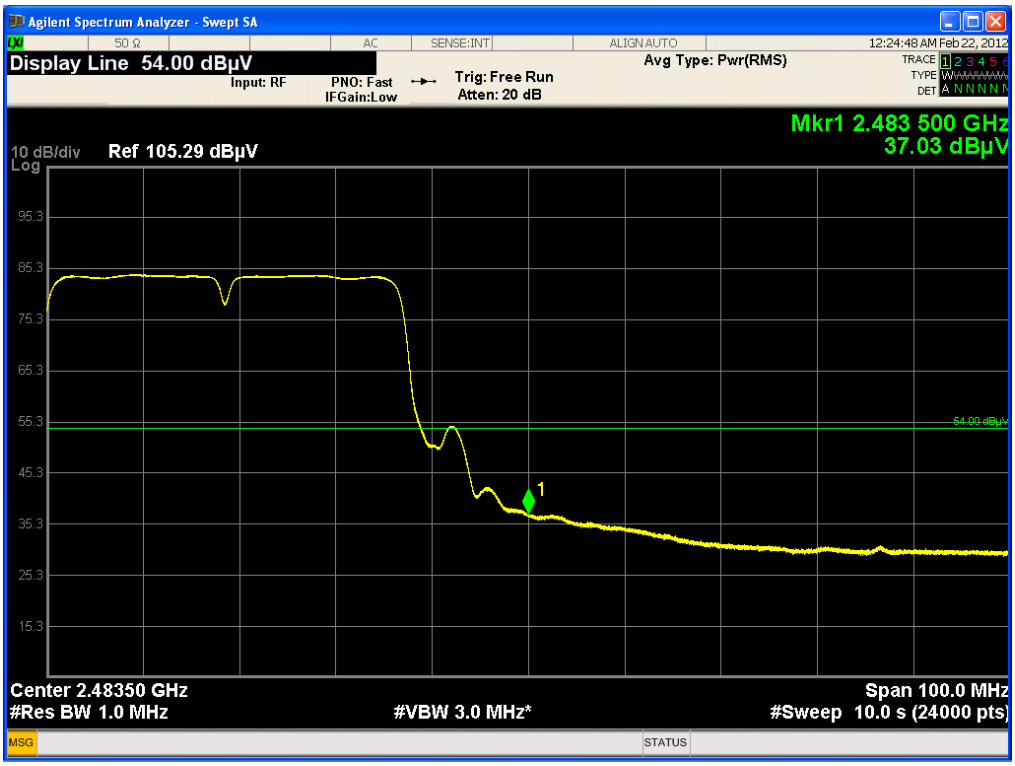
→ Average mode: 36.5 dBµV/m

⑮ 2 462 MHz at IEEE802.11n / 40 MHz



→ **Peak mode: 46.3 dBµV/m**

⑯ 2 462 MHz at IEEE802.11n / 40 MHz



→ **Average mode: 37.0 dBµV/m**

4.7 Power line conducted emission

4.7.1 Definition

The power line conducted emission is the emission that is generated or amplified in a equipment and appears between each power line terminal that connects to a public utility line and ground.

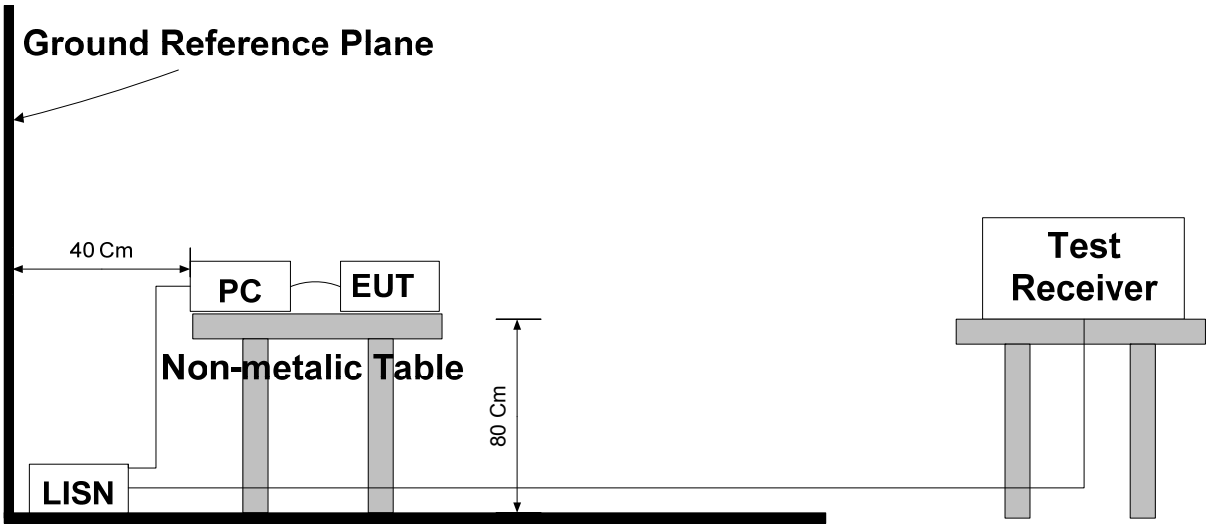
4.7.2 Specification

FCC Rules Part 15, Section 15.207(a)

4.7.3 Method of measurement

ANSI C63.4 (2009) Section 7.3.1

4.7.4 Measurement set-up



4.7.5 Test equipment list

Equipment	Model name	Manufacturer
EUT	WifiAn-Mini	ENJsoft Inc.
Control PC	NT-P560	Samsung
Test Receiver	ESS	R&S
LISN	ENV216	R&S

4.7.6 Test Procedure

① The EUT was placed on a Non-metallic table with 0.8 m height above the floor.
② The EUT was connected to AC power supply and the input power was supplied through a 50 Ω/ 50 μH ± 5 Ω Line Impedance Stabilization Network (LISN).
③ The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.
④ Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
⑤ The frequency range from 150 kHz to 30 MHz was searched.

4.7.8 Test Condition

- Test place: Shield room
- Test mode: Maximum output power
- Test environment: 21℃, 34 % R.H.

4.7.9 Limit

Frequency (MHz)	Quasi-peak (dBμV)	Average (dBμV)
0.15 – 0.5 0.5 – 5 5 – 30	66 to 56 56 60	56 to 46 46 50

4.7.10 Test result of not applied EUT (Peak mode)

Frequency (MHz)	Line	Peak (dBμV)		Margin (dB)
		Emission level	Limits	
0.155	H	45.4	65.7	20.3
0.240	N	43.2	62.1	18.9
0.360	N	41.6	58.7	17.1
0.715	N	42.6	56.0	13.4
0.825	H	36.0	56.0	20.0
0.960	N	41.9	56.0	14.1
12.975	H	40.3	60.0	19.7

4.7.11 Test result of not applied EUT (Average mode)

Frequency (MHz)	Line	Peak (dBμV)		Margin (dB)
		Emission level	Limits	
0.240	N	40.2	52.1	11.9
0.360	N	38.3	48.7	10.5
0.735	H	31.1	46.0	14.9
0.795	H	32.2	46.0	13.8
0.960	N	36.2	46.0	9.8
12.655	N	31.6	50.0	18.4
24.020	N	28.5	50.0	21.5

4.7.12 Test result of applied EUT in the worst case (Peak mode)

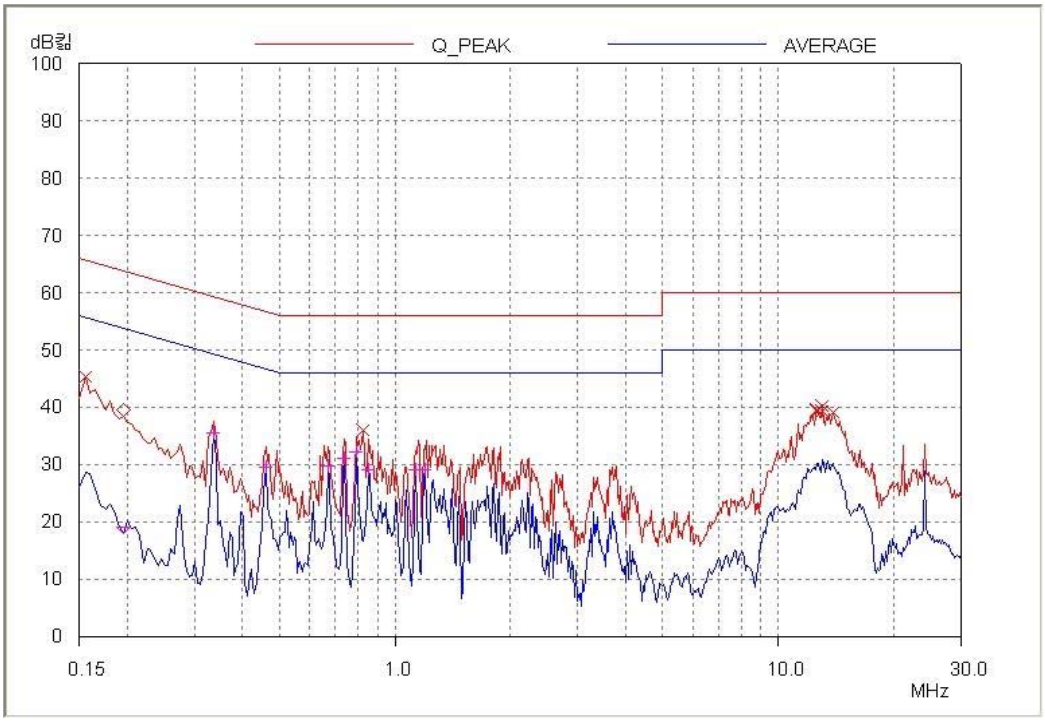
Frequency (MHz)	Line	Peak (dBμV)		Margin (dB)
		Emission level	Limits	
0.260	N	41.9	61.4	19.5
0.390	N	41.4	58.1	16.6
0.515	N	42.7	56.0	13.3
1.155	N	43.8	56.0	12.3
12.580	N	41.7	60.0	18.3
18.780	H	37.6	60.0	22.4
24.025	N	35.3	60.0	24.7

4.7.13 Test result of applied EUT in the worst case (Average mode)

Frequency (MHz)	Line	Peak (dBμV)		Margin (dB)
		Emission level	Limits	
0.260	N	39.8	51.4	11.6
0.390	N	38.2	48.1	9.9
0.515	N	35.0	46.0	11.0
0.795	H	31.9	46.0	14.1
1.155	N	34.5	46.0	11.6
12.580	N	34.2	50.0	15.8
24.025	N	28.8	50.0	21.3

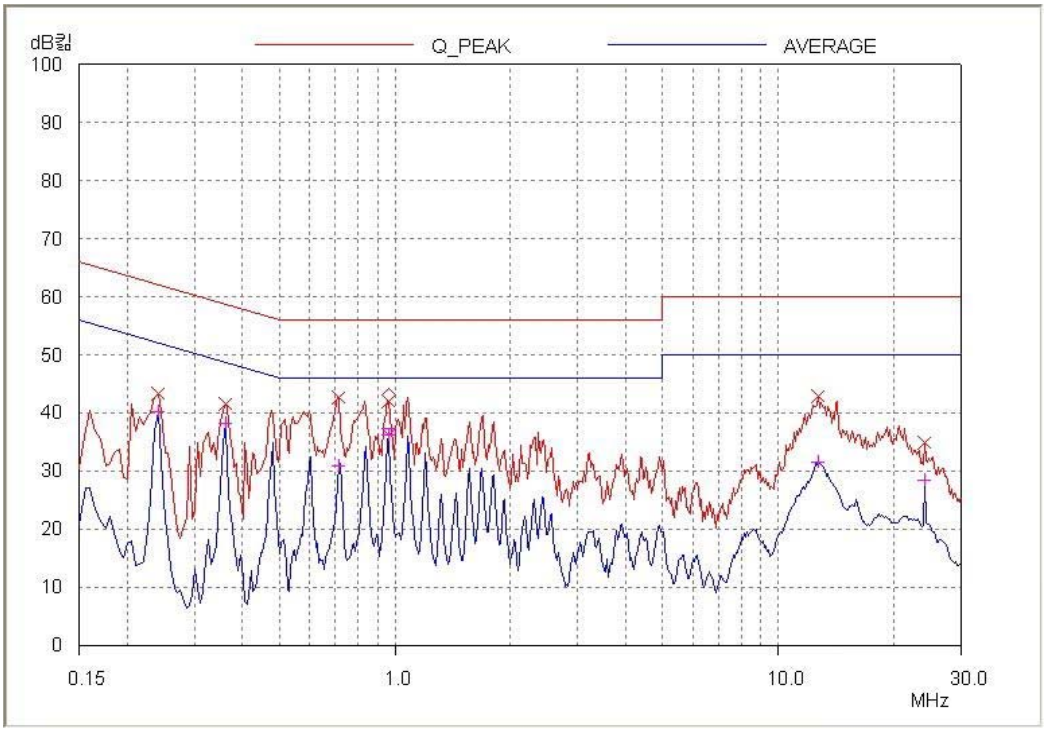
4.7.14 Plot of power line conducted emission

① EUT not inserted to control PC



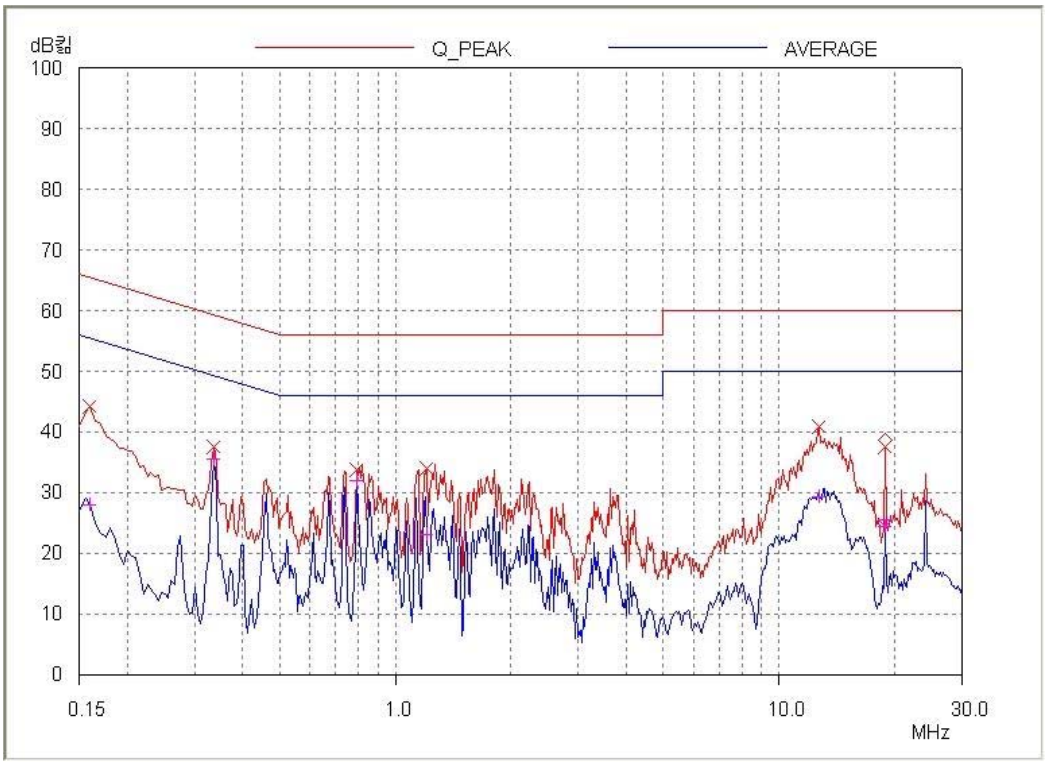
→ **Hot line**

② EUT not inserted to control PC



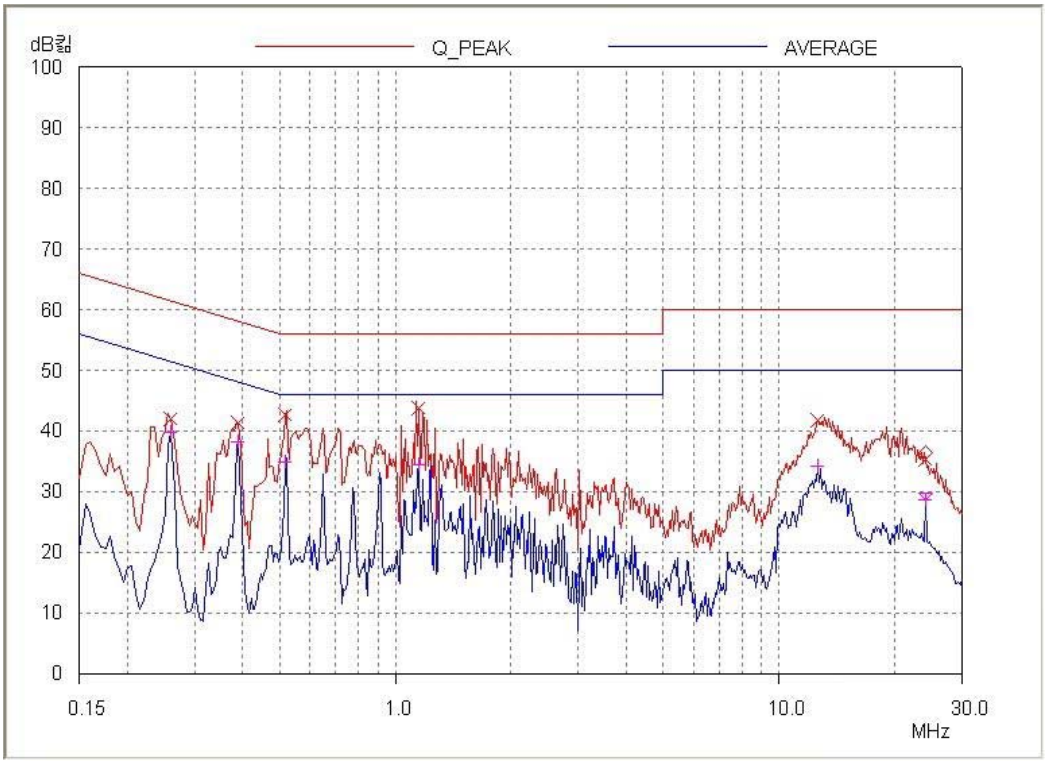
→ **Neutral line**

③ EUT inserted to control PC



→ Hot line

④ EUT inserted to control PC



→ Neutral line

5. RF exposure compliance requirement

According to FCC part 15 section 15.247(e)(i) and FCC part 1 section 1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. According to KDB 447498 (2)(a)(i).

5.1 The Max Conducted Peak Output Power is below;

Channel Number	Frequency	Output Power		Ant. Gain	EIRP		Requirement
	(MHz)	(mW)	(dBm)	(dBi)	(dBm)	(mW)	(mW)
IEEE802.11b Mode							
1	2 412	14.55	11.63	2.00	13.63	23.07	24.88
6	2 437	14.76	11.69	2.00	13.69	23.39	24.62
11	2 462	14.52	11.62	2.00	13.62	23.01	24.37
IEEE802.11g Mode							
1	2 412	14.96	11.75	2.00	13.75	23.71	24.88
6	2 437	14.55	11.63	2.00	13.63	23.07	24.62
11	2 462	14.83	11.71	2.00	13.71	23.50	24.37
IEEE802.11n Mode (20 MHz)							
1	2 412	15.21	11.82	2.00	13.82	24.10	24.88
6	2 437	13.93	11.44	2.00	13.44	22.08	24.62
11	2 462	13.93	11.44	2.00	13.44	22.08	24.37
IEEE802.11n Mode (40 MHz)							
3	2 422	13.61	11.34	2.00	13.34	21.58	24.77
6	2 437	13.49	11.30	2.00	13.30	21.38	24.62
9	2 452	13.49	11.30	2.00	13.30	21.38	24.47

EIRP values in the above table are calculated by the following formula.

EIRP= P x G = 11.71 dBm + 2.00 dBi = 13.71 dBm (23.50 mW)

From the requirement data in the above table,

SAR requirement: S= 60 / f (GHz) = 60/2.462 = 24.37 mW

So the SAR measurement is not required.

6. Test equipments list

The listing below denotes the test equipments for the test(s).

No.	Equipment	Model	Manufacturer	Serial number	Calibration due date
1	Spectrum Analyzer	ESPI7	R&S	101002	09/28/12
2	Spectrum Analyzer	N9020A	Agilent	MY48010456	02/10/13
3	Test Receiver	ESS	R&S	833776/011	10/07/12
4	LISN	ENV216	R&S	100103	09/28/12
5	Loop Antenna	6502	EMCO	9609-9087	02/10/13
6	Bi-conical Antenna	VHA9103	Schwarzbeck	2217	11/29/12
7	Log-Periodic Antenna	VULP9118A	Schwarzbeck	382	11/29/12
8	Horn Antenna	BBHA 9120 D	Schwarzbeck	395	08/12/12
9	Pre-Amplifier	JS4-00102600-26-5P	MITEQ	383521	02/10/13
10	Turn Table	N/A	Daeil EMC	N/A	N/A
11	Antenna Mast	EAM4.5	Daeil EMC	N/A	N/A
12	Controller	DE200	Daeil EMC	AAA69813111	N/A