



Part 15C

TEST REPORT

Product Name	Access Router
Model Name	AR121W/ AR161W/ AR129W/ AR169W
FCC ID	QIS-AR12191619W
Client	Huawei Technologies Co., Ltd.
Manufacturer	Huawei Technologies Co., Ltd.
Date of issue	September 15, 2015

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GENERAL SUMMARY

Reference Standard(s)	FCC CFR47 Part 15C (2013) Radio Frequency Devices 15.205 Restricted bands of operation; 15.207 Conducted limits; 15.209 Radiated emission limits; general requirements; 15.247 Operation within the bands 902-928 MHz,2400-2483.5 MHz, and 5725-5850MHz. ANSI C63.4 Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40GHz. (2009) KDB 558074 D01 DTS Meas Guidance v03r02 Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 KDB 662911 D01 Multiple Transmitter Output v02r01Emissions Testing of Transmitters with Multiple Outputs in the Same Band
Conclusion	This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 2of this test report are below limits specified in the relevant standards. General Judgment: Pass
Comment	The test result only responds to the measured sample.

Approved by Kai Xu
Kai Xu
Director

Revised by Lingling Kang
Lingling Kang
RF Manager

Performed by Wenbin Wu
Wenbin Wu
RF Engineer

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1. General Information

1.1. Notes of the test report

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L2264.

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 428261.

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 8510A.

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. The sample under test was selected by the Client. This report only refers to the item that has undergone the test.

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 **TA Technology (Shanghai) Co., Ltd.**

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1.2. Testing laboratory

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Xu Kai
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com

1.3. Applicant Information

Company: Huawei Technologies Co., Ltd.
Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District
Address: Shenzhen
518129
P.R.China

1.4. Manufacturer Information

Company: Huawei Technologies Co., Ltd.
Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District
Address: Shenzhen
518129
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1.5. Information of EUT

General information

Hardware Version:	VER.D
Software Version:	V200R006C11
Antenna Type:	External Antenna
Device Operating Configurations:	
Network Standards:	802.11b, 802.11g, 802.11n(HT20/HT40); (tested)
Test Modulation:	(802.11b)DSSS; (802.11g)OFDM; 802.11n(HT20/HT40) OFDM
Power Supply:	AC Adapter
Antenna Connector:	RP-SMA-J(meet with the standard FCC Part 15.203 requirement)
Antenna Gain	2.15dBi
Max Conducted Power	17.15 dBm
Operating Frequency Range(s)	2412MHz~ 2462MHz (HT20)
	2422MHz~ 2452MHz (HT40)
TestedFrequency Range(s)	2400MHz~ 2483.5 MHz

Note: We tested the all samples in the preliminary test. The test data of the worst-case condition (AR161W) was recorded.

What the differences between them are as follows:

Models:	Number of interfaces					hardware	software
	FE	GE	VDSL	WIFI	USB		
AR121W	5	0	0	1	1	The same	Different
AR161W	0	5	0	1	1		
AR129W	4	0	1	1	1	The same	Different
AR169W	0	4	1	1	1		

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Auxiliary Equipment Details

AE1:Adapter 1

Model: HW-120200C4W

Manufacturer: HUNTKEY

S/N: /

AE2: Adapter 2

Model: HW-120200C4W

Manufacturer: UE Electronic

S/N: /

1.6. Test Date

The test is performed from May 8, 2015 to June 10, 2015.

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2. Test Information

2.1. Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate declared in basic standard IEEE802.11. Preliminary tests has been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

Results of test modes, data rates and test channels are shown as following table.

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

/	Test items	Chain	Mode	Date rate	Test channel
Conducted test cases	peak power output-conducted	chain0	802.11b	1Mbps	1/6/11
			802.11g	6Mbps	1/6/11
			802.11n(HT20)	MCS0	1/6/11
			802.11n(HT40)	MCS0	3/6/9
		chain1	802.11b	1Mbps	1/6/11
			802.11g	6Mbps	1/6/11
			802.11n(HT20)	MCS0	1/6/11
			802.11n(HT40)	MCS0	3/6/9
		MIMO	802.11n(HT20)	MCS8	1/6/11
			802.11n(HT40)	MCS8	3/6/9
	Minimum 6dB bandwidth	chain0	802.11b	1Mbps	1/6/11
			802.11g	6Mbps	1/6/11
			802.11n(HT20)	MCS0	1/6/11
			802.11n(HT40)	MCS0	3/6/9
		chain1	802.11b	1Mbps	1/6/11
			802.11g	6Mbps	1/6/11
			802.11n(HT20)	MCS0	1/6/11
			802.11n(HT40)	MCS0	3/6/9
	Band edge compliance	chain0	802.11b	1Mbps	1/11
			802.11g	6Mbps	1/11
			802.11n(HT20)	MCS0	1/11
			802.11n(HT40)	MCS0	3/9
		chain1	802.11b	1Mbps	1/11
			802.11g	6Mbps	1/11
			802.11n(HT20)	MCS0	1/11

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Radiated test cases	Power spectral density	chain0	802.11n(HT40)	MCS0	3/9
			802.11b	1Mbps	1/6/11
			802.11g	6Mbps	1/6/11
			802.11n(HT20)	MCS0	1/6/11
		chain1	802.11n(HT40)	MCS0	3/6/9
			802.11b	1Mbps	1/6/11
			802.11g	6Mbps	1/6/11
			802.11n(HT20)	MCS0	1/6/11
			802.11n(HT40)	MCS0	3/6/9
		MIMO	802.11n(HT20)	MCS8	1/6/11
			802.11n(HT40)	MCS8	3/6/9
	Conducted spurious emission	chain0	802.11b	1Mbps	1/6/11
			802.11g	6Mbps	1/6/11
			802.11n(HT20)	MCS8	1/6/11
			802.11n(HT40)	MCS8	3/6/9
		chain1	802.11b	1Mbps	1/6/11
			802.11g	6Mbps	1/6/11
			802.11n(HT20)	MCS0	1/6/11
			802.11n(HT40)	MCS0	3/6/9
	Conducted emission	Simultaneous on	802.11b	1Mbps	6
			802.11g	6Mbps	6
			802.11n(HT20)	MCS0	6
			802.11n(HT40)	MCS0	6
Radiated test cases	Spurious radiated emission in the restricted band	chain0	802.11b	2Mbps	1/11
			802.11g	6Mbps	1/11
			802.11n(HT20)	MCS0	1/11
			802.11n(HT40)	MCS0	3/9
		chain1	802.11b	1Mbps	1/11
			802.11g	6Mbps	1/11
			802.11n(HT20)	MCS0	1/11
			802.11n(HT40)	MCS0	3/9
		MIMO	802.11n(HT20)	MCS8	1/6/11
			802.11n(HT40)	MCS8	3/6/9
	Radiated emission	simultaneous on	802.11b	1Mbps	6
			802.11g	6Mbps	6
			802.11n(HT20)	MCS0	6
			802.11n(HT40)	MCS0	6

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2.2. Summary of test results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	Peak Power Output –Conducted	15.247(b)(3)	PASS
2	Minimum 6dB bandwidth	15.247(a)(2)	PASS
3	Band Edges compliance	15.247(d)	PASS
4	Spurious Radiated Emissions in the restricted band	15.247(d),15.205,15.209	PASS
5	Power spectral Density	15.247(e)	PASS
6	Conducted Spurious Emission	15.247	PASS
7	Radiates Emission	15.247(d),15.205,15.209	PASS
8	Conducted Emissions	15.207,15.107	PASS

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2.3. Peak Power Output –Conducted

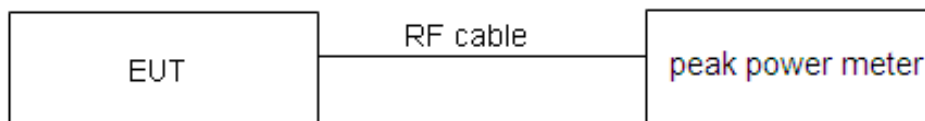
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~ 25°C	45% ~ 50%	101.5kPa

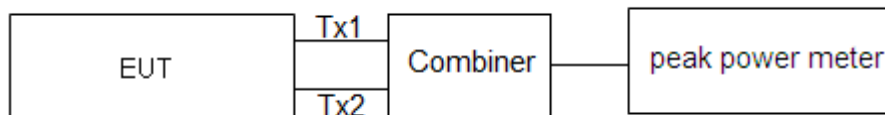
Methods of Measurement

During the process of the testing, The EUT was connected to the peak power meter through an external attenuator and a known loss cable. The EUT is max power transmission with proper modulation. We use 5.2.1 Maximum Peak Conducted Output Power Level Method in KDB 558074 D01 for this test.

Test Setup



For MIMO



Limits

Rule Part 15.247 (b) (3) specifies that " For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt."

Peak Output Power	$\leq 1\text{W}$ (30dBm)
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=0.44$ dB.

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Test Results:

Antenna	Network Standards	Carrier frequency (MHz)	Peak Output Power (dBm)	Conclusion
Antenna 1	802.11b	2412	15.41	PASS
		2437	15.02	PASS
		2462	14.03	PASS
	802.11g	2412	10.01	PASS
		2437	9.22	PASS
		2462	8.32	PASS
	802.11n HT20	2412	9.92	PASS
		2437	8.97	PASS
		2462	7.84	PASS
	802.11n HT40	2422	6.32	PASS
		2437	6.10	PASS
		2452	4.54	PASS
Antenna 2	802.11b	2412	16.63	PASS
		2437	17.15	PASS
		2462	16.68	PASS
	802.11g	2412	11.06	PASS
		2437	11.12	PASS
		2462	10.56	PASS
	802.11n HT20	2412	9.83	PASS
		2437	10.13	PASS
		2462	9.59	PASS
	802.11n HT40	2422	7.38	PASS
		2437	6.41	PASS
		2452	6.57	PASS
MIMO	802.11n HT20	2412	9.58	PASS
		2437	9.46	PASS
		2462	8.28	PASS
	802.11n HT40	2422	9.94	PASS
		2437	9.62	PASS
		2452	8.94	PASS

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2.4. Occupied Bandwidth (6dB)

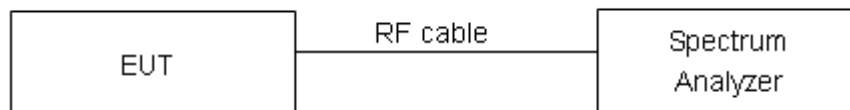
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 100 kHz, VBW is set to 300 kHz on spectrum analyzer.

Test Setup



Limits

Rule Part 15.247 (a) (2) specifies that “Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

minimum 6 dB bandwidth	≥ 500 kHz
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=936$ Hz.

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Test Results:

Antenna	Network Standards	Carrier frequency (MHz)	Minimum 6 dB bandwidth (MHz)	Conclusion
Antenna 1	802.11b	2412	10.14	PASS
		2437	10.13	PASS
		2462	10.13	PASS
	802.11g	2412	16.38	PASS
		2437	16.42	PASS
		2462	16.38	PASS
	802.11n HT20	2412	17.63	PASS
		2437	17.62	PASS
		2462	17.60	PASS
	802.11n HT40	2422	36.46	PASS
		2437	36.48	PASS
		2452	36.47	PASS
Antenna 2	802.11b	2412	10.14	PASS
		2437	10.14	PASS
		2462	10.13	PASS
	802.11g	2412	16.39	PASS
		2437	16.40	PASS
		2462	16.43	PASS
	802.11n HT20	2412	17.61	PASS
		2437	17.61	PASS
		2462	17.61	PASS
	802.11n HT40	2422	36.48	PASS
		2437	36.48	PASS
		2452	36.50	PASS

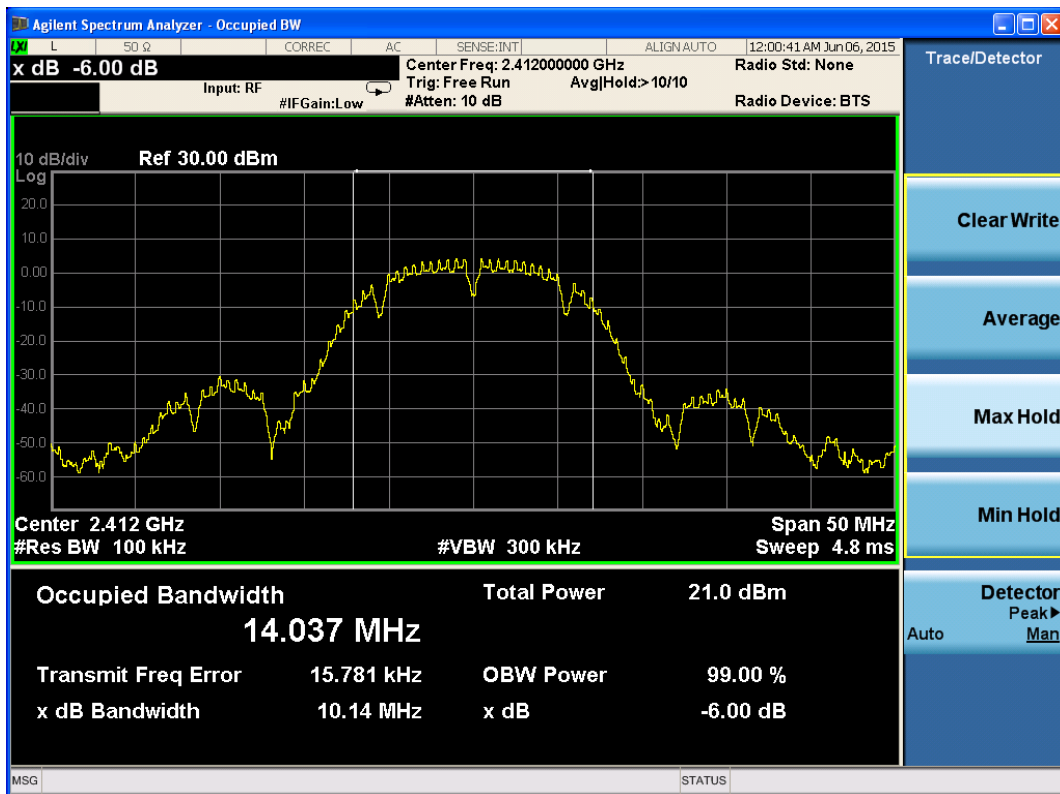
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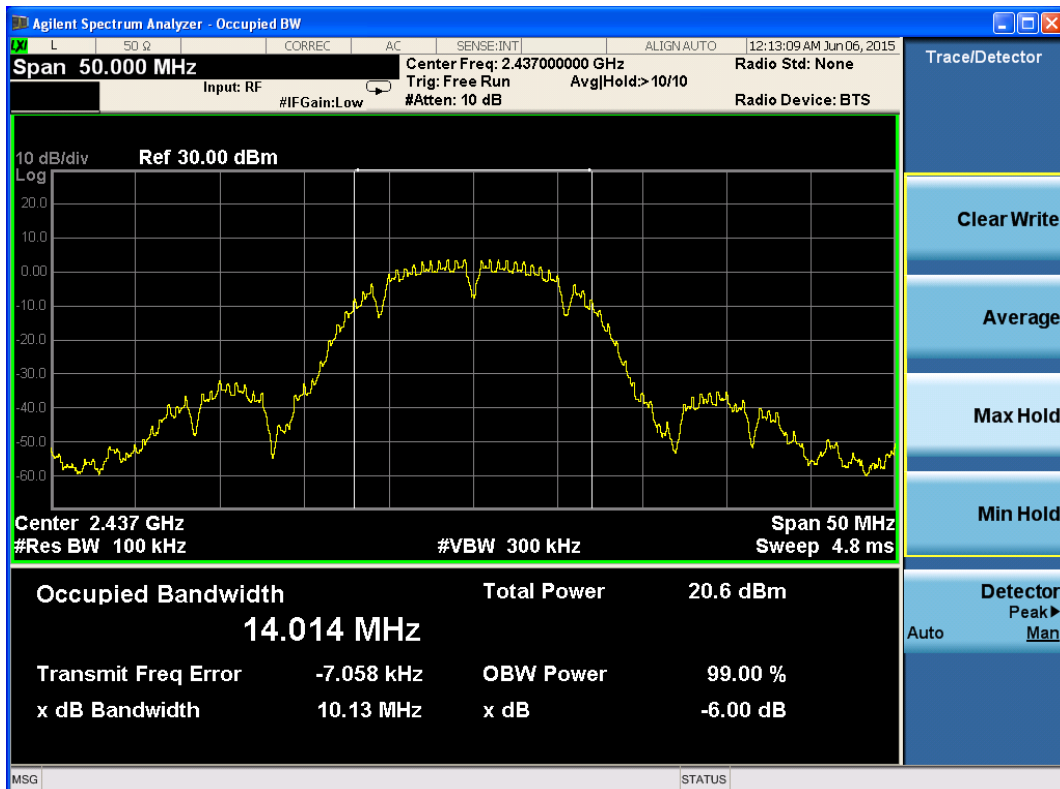
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Antenna 1
802.11b



802.11b, Carrier frequency (MHz): 2412



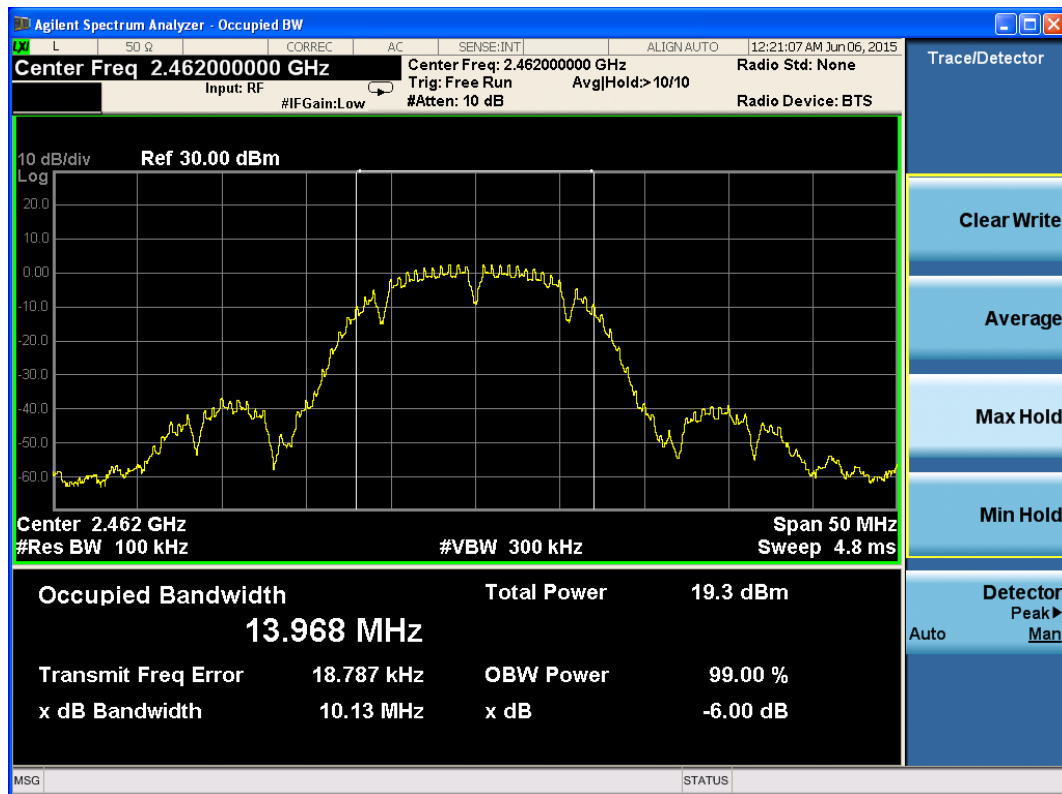
802.11b, Carrier frequency (MHz): 2437

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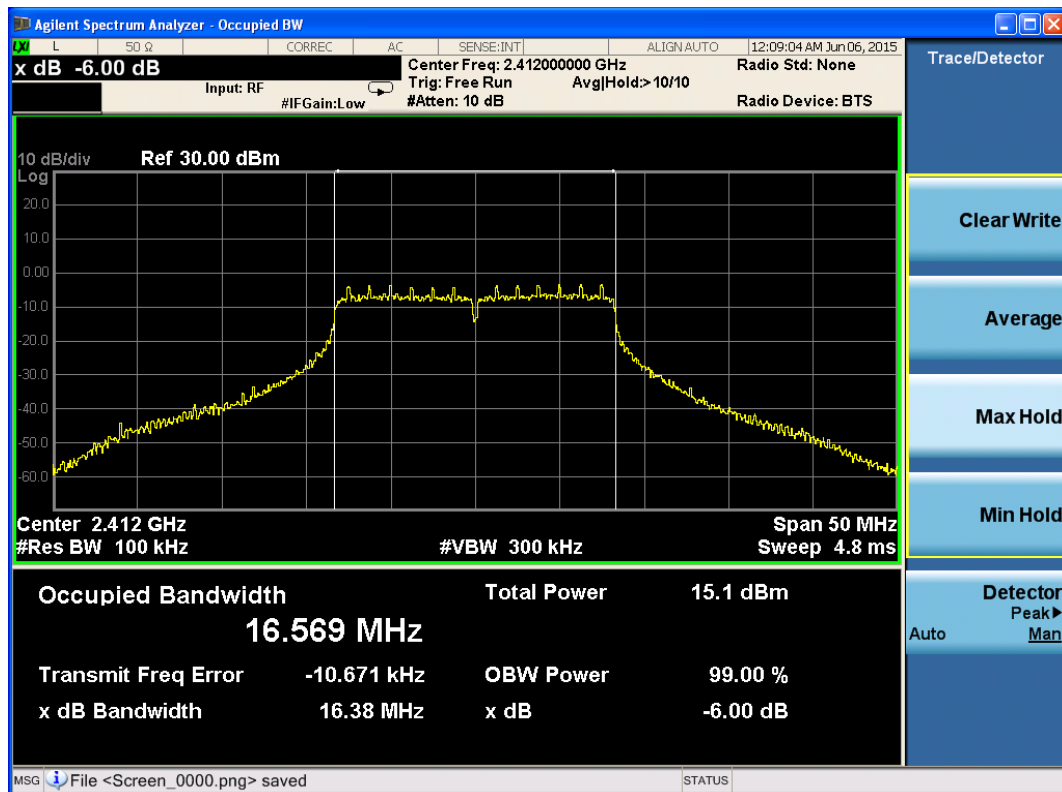
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802.11b, Carrier frequency (MHz):2462

802.11g



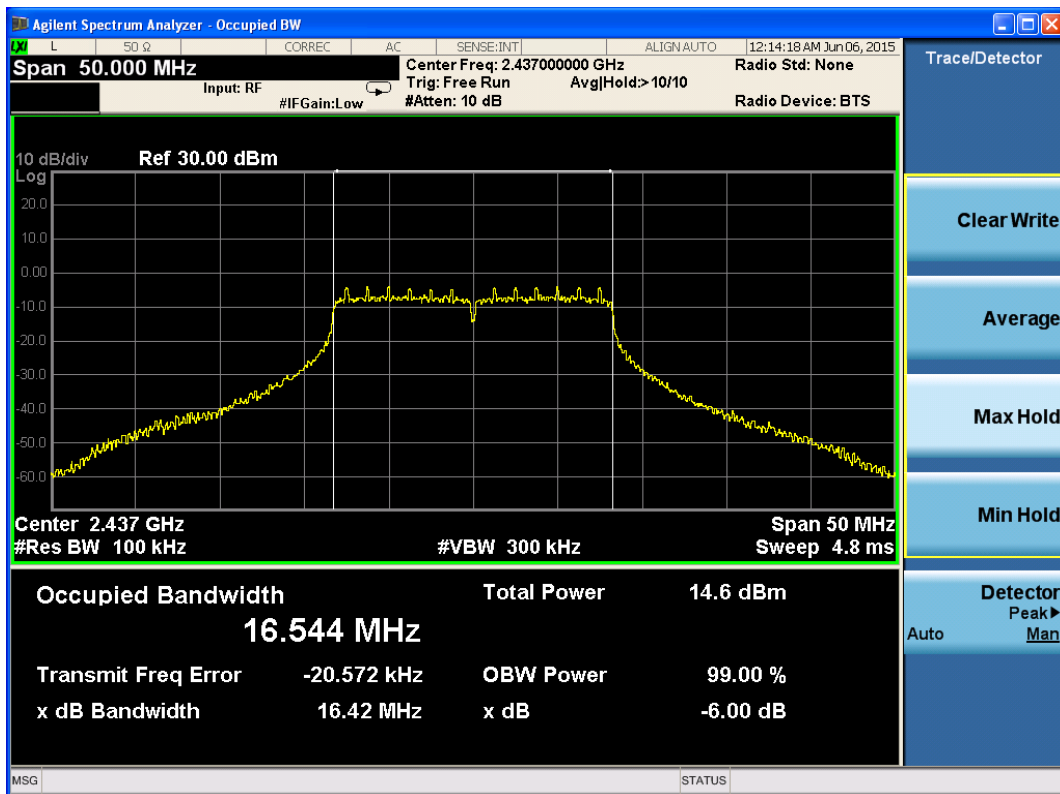
802.11g, Carrier frequency (MHz): 2412

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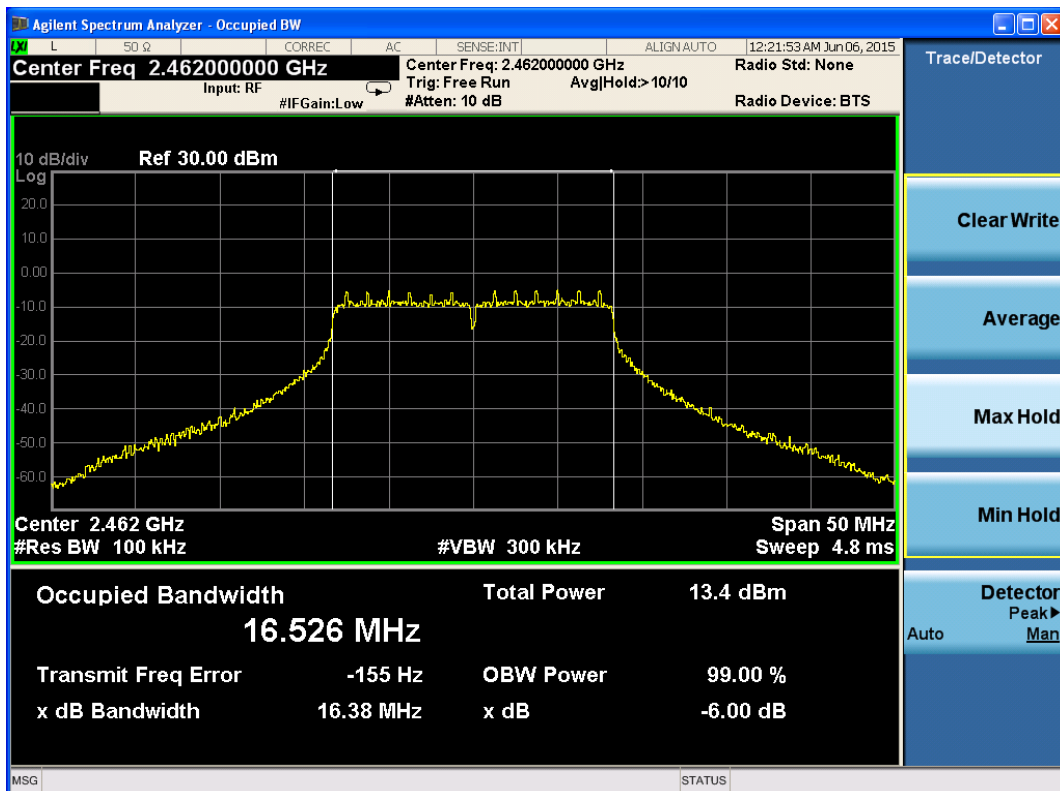
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802.11g, Carrier frequency (MHz): 2437



802.11g, Carrier frequency (MHz): 2462

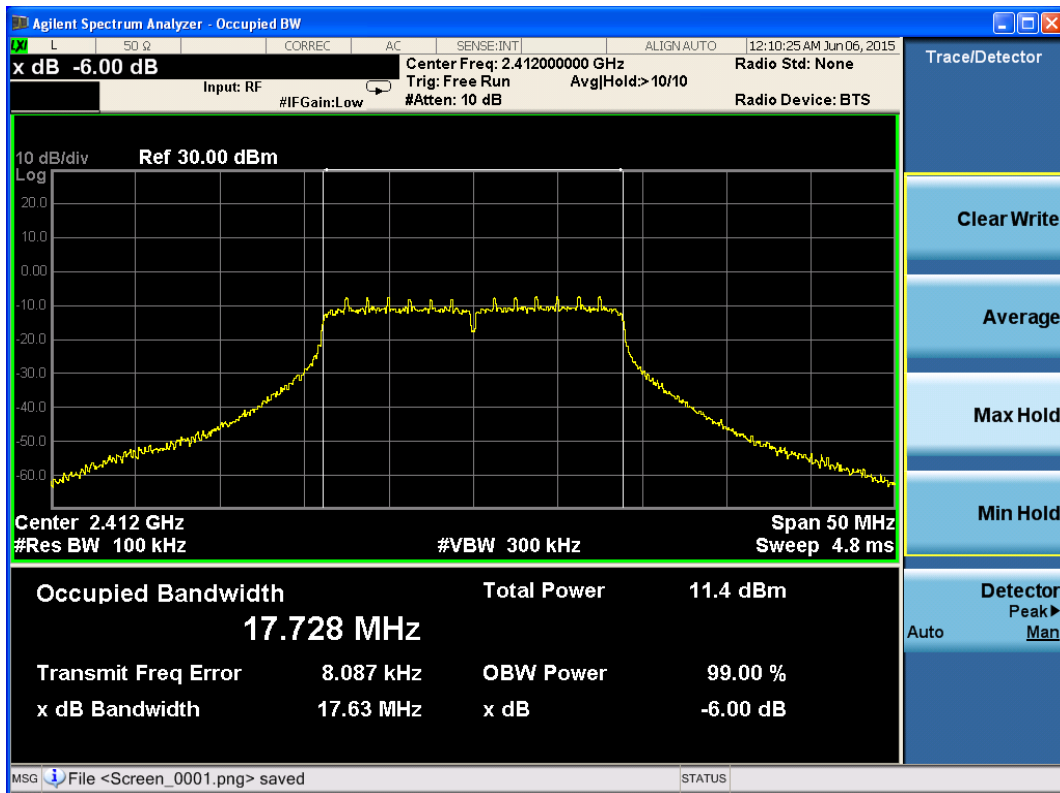
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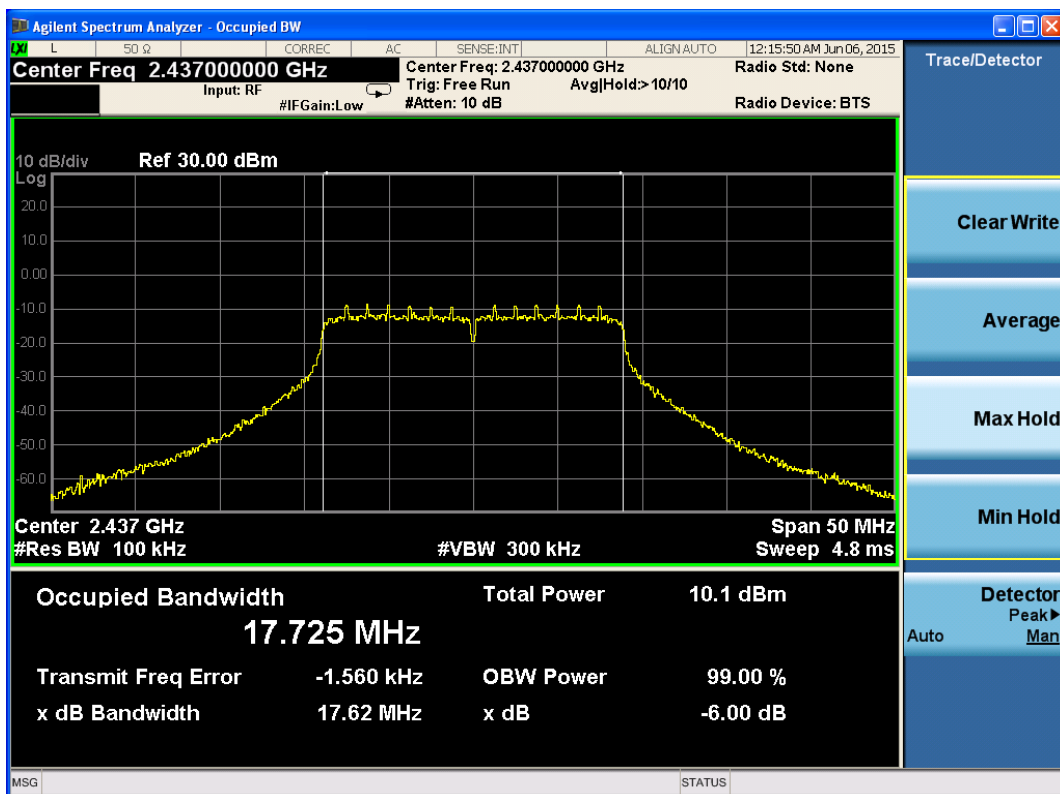
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802.11n(HT20)



802.11n, Carrier frequency (MHz): 2412



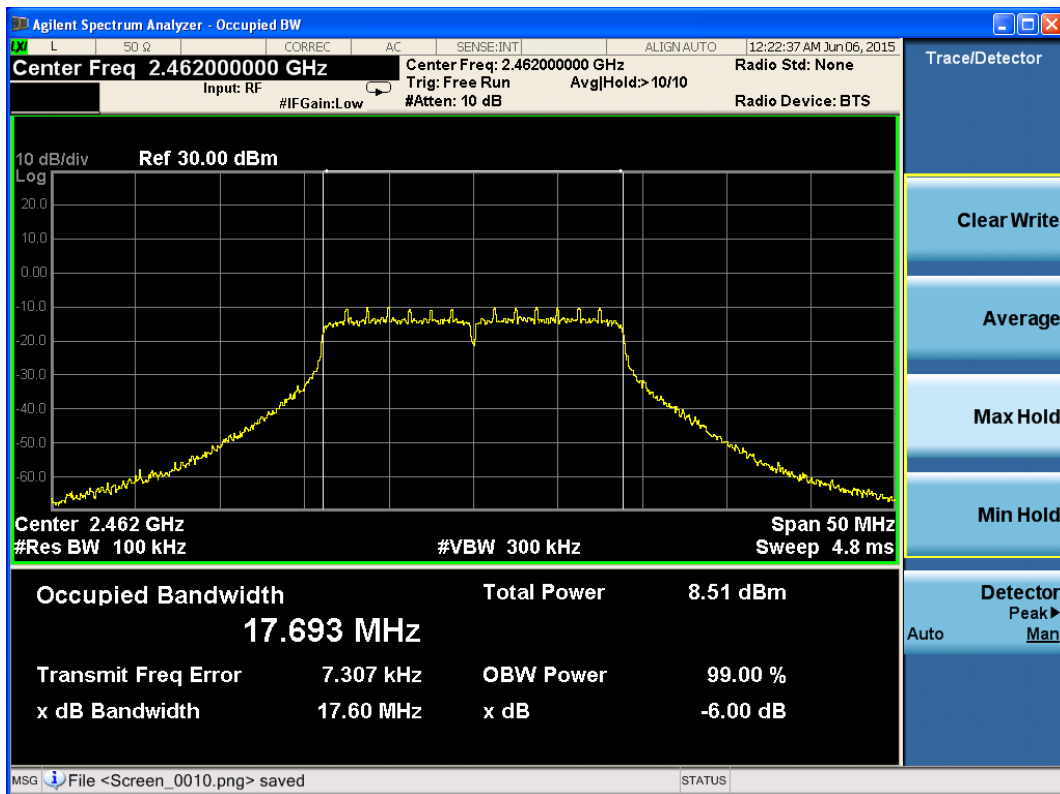
802.11n, Carrier frequency (MHz): 2437

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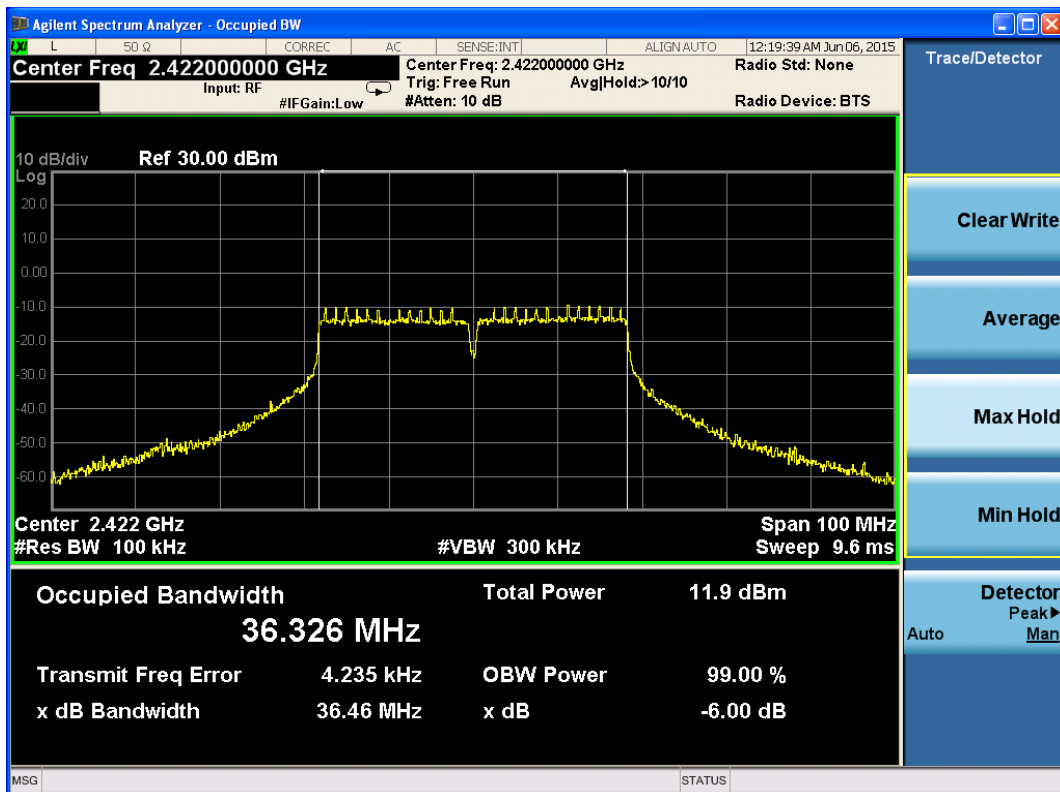
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802.11n, Carrier frequency (MHz):2462

802.11n(HT40)



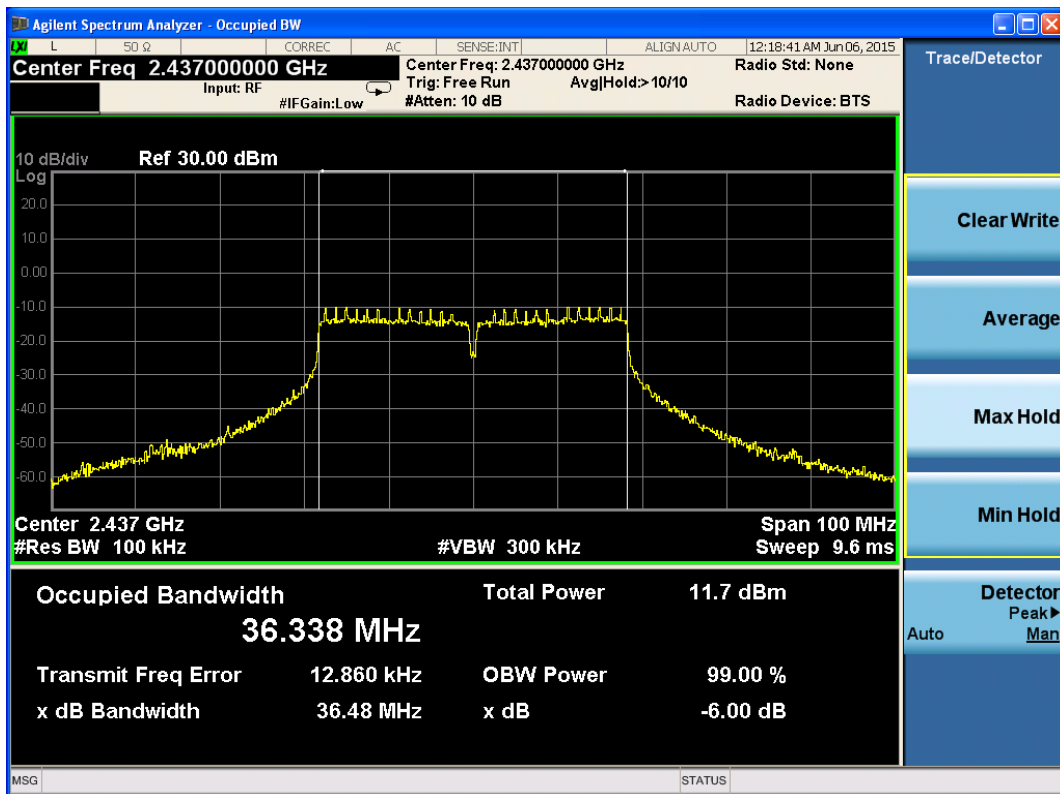
802.11n, Carrier frequency (MHz): 2422

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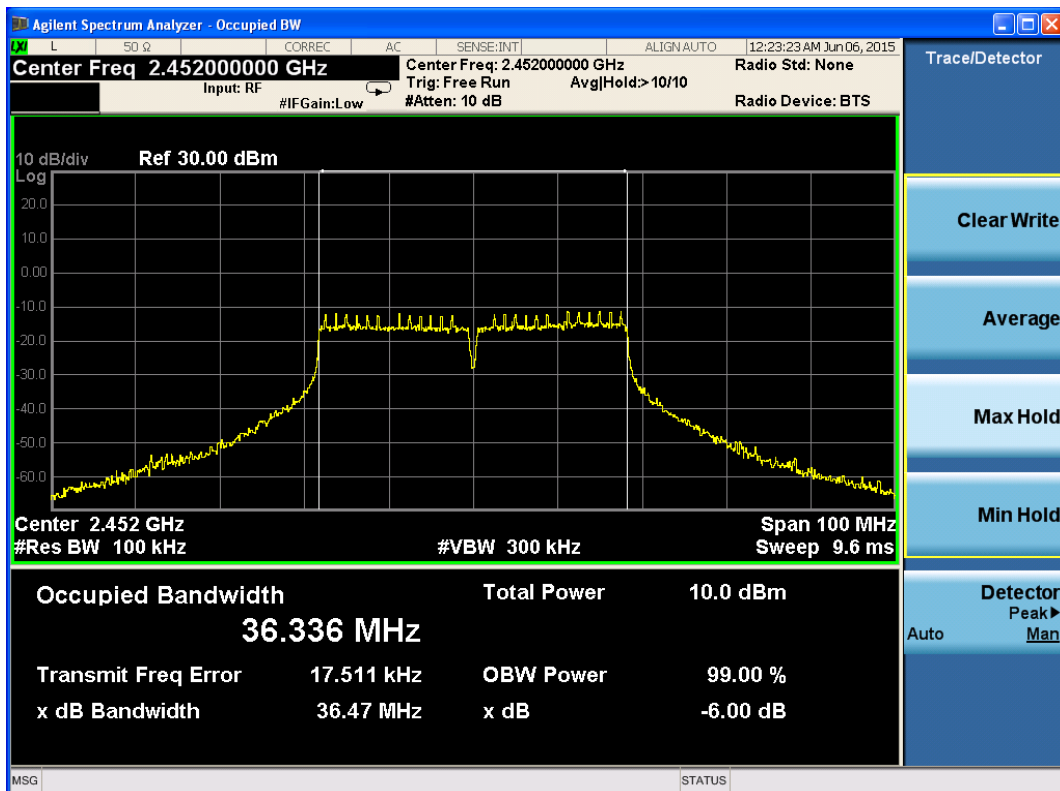
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802.11n, Carrier frequency (MHz): 2437



802.11n, Carrier frequency (MHz): 2452

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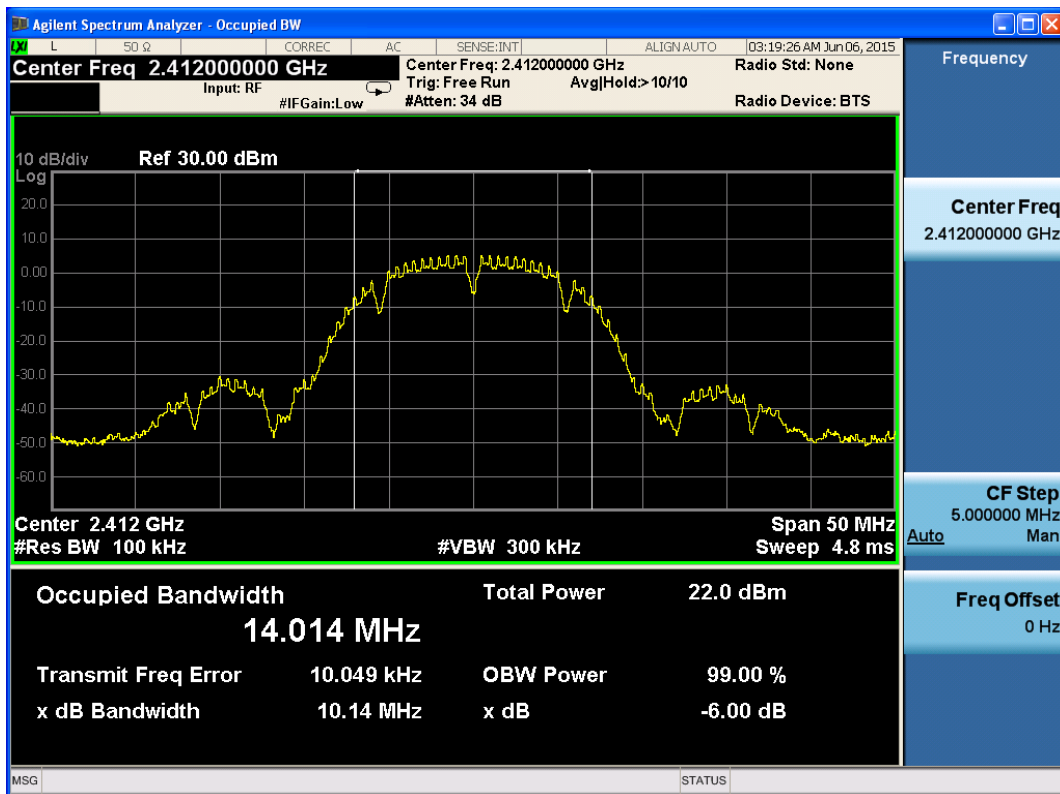
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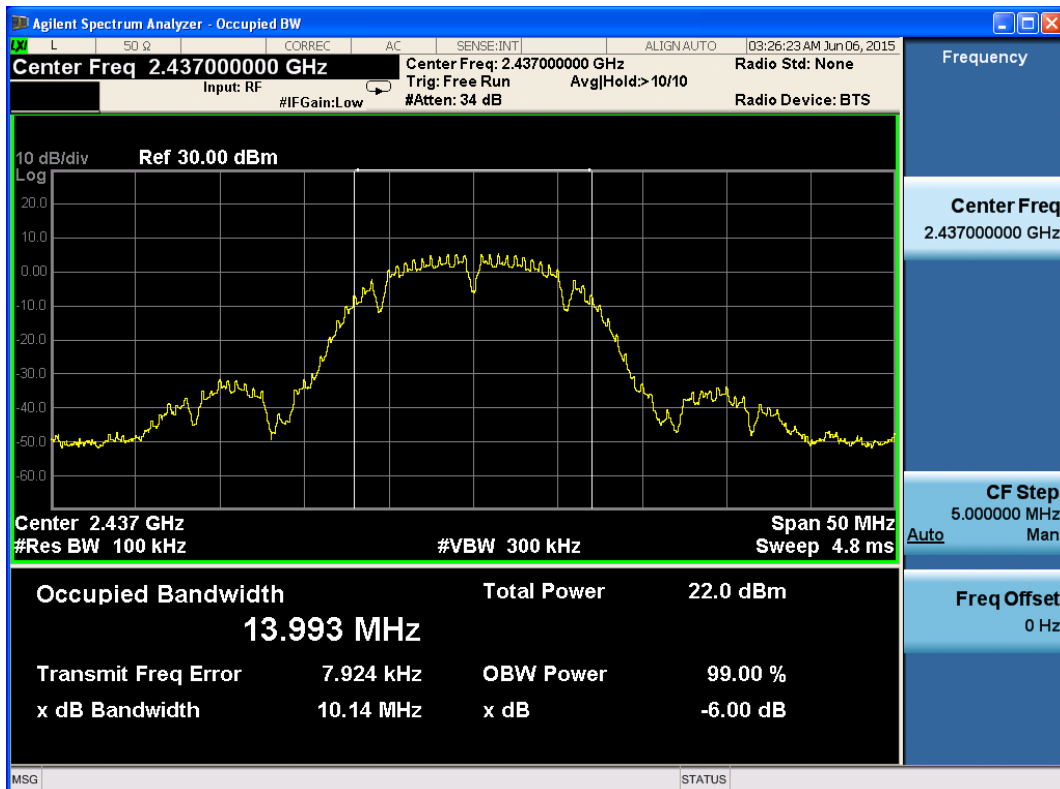
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Antenna 2

802.11b



802.11b, Carrier frequency (MHz): 2412



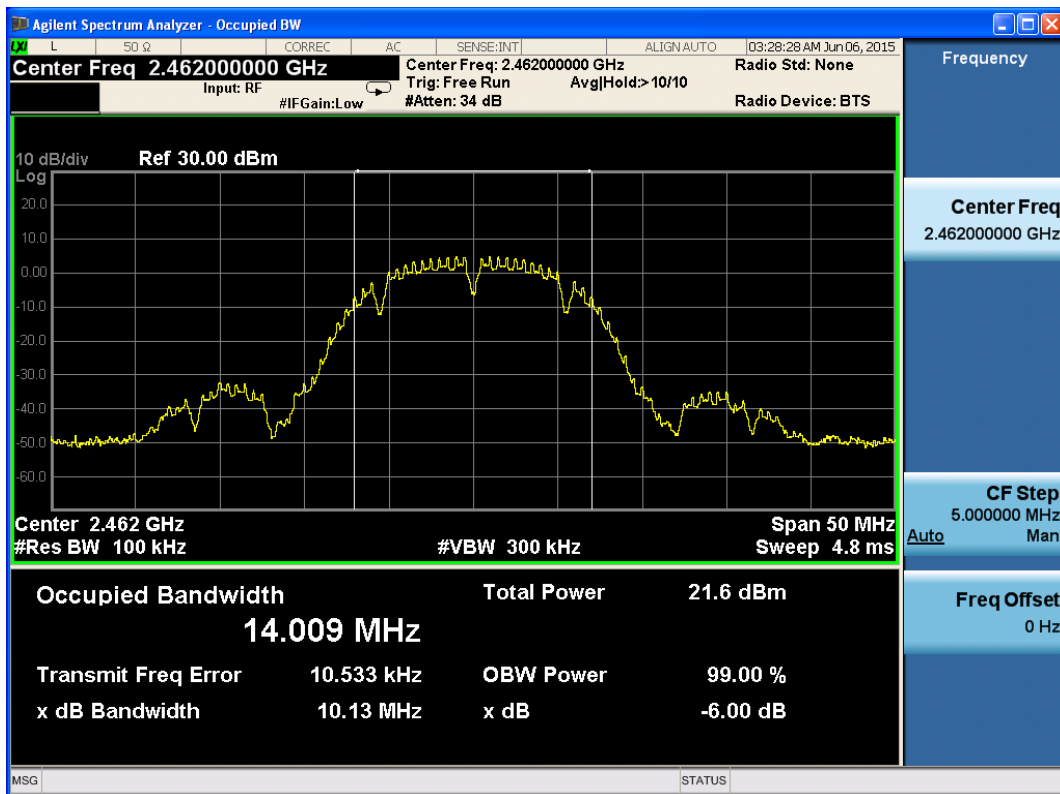
802.11b, Carrier frequency (MHz): 2437

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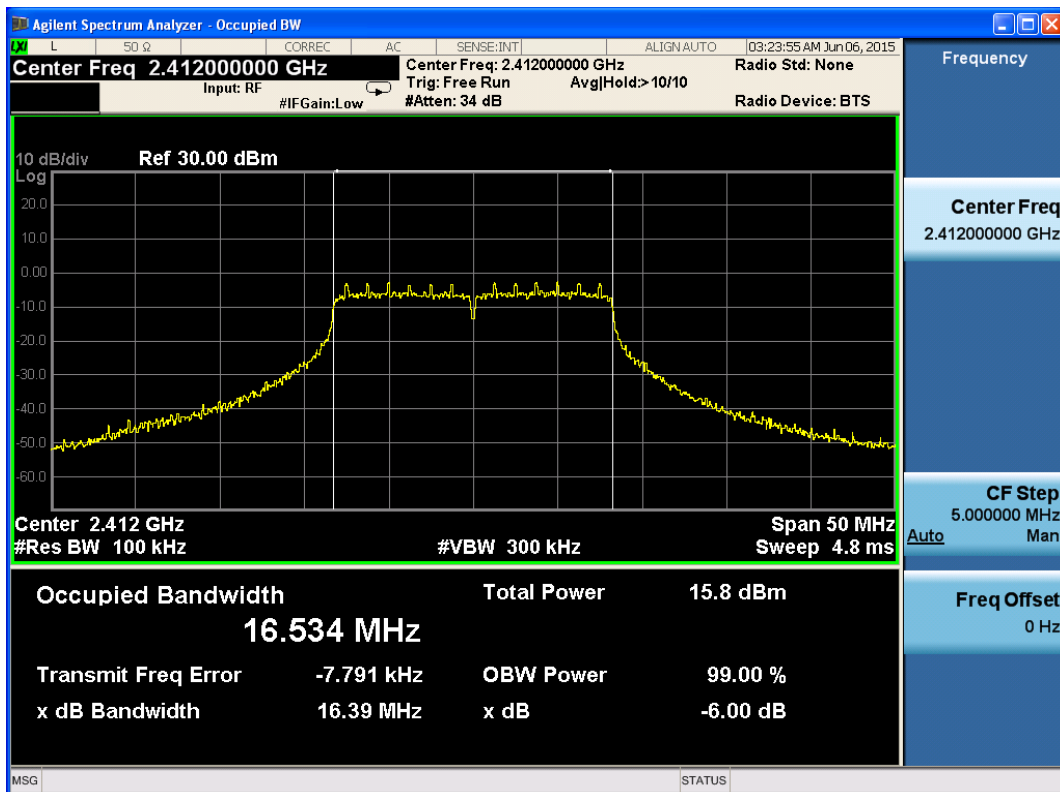
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802.11b, Carrier frequency (MHz):2462

802.11g



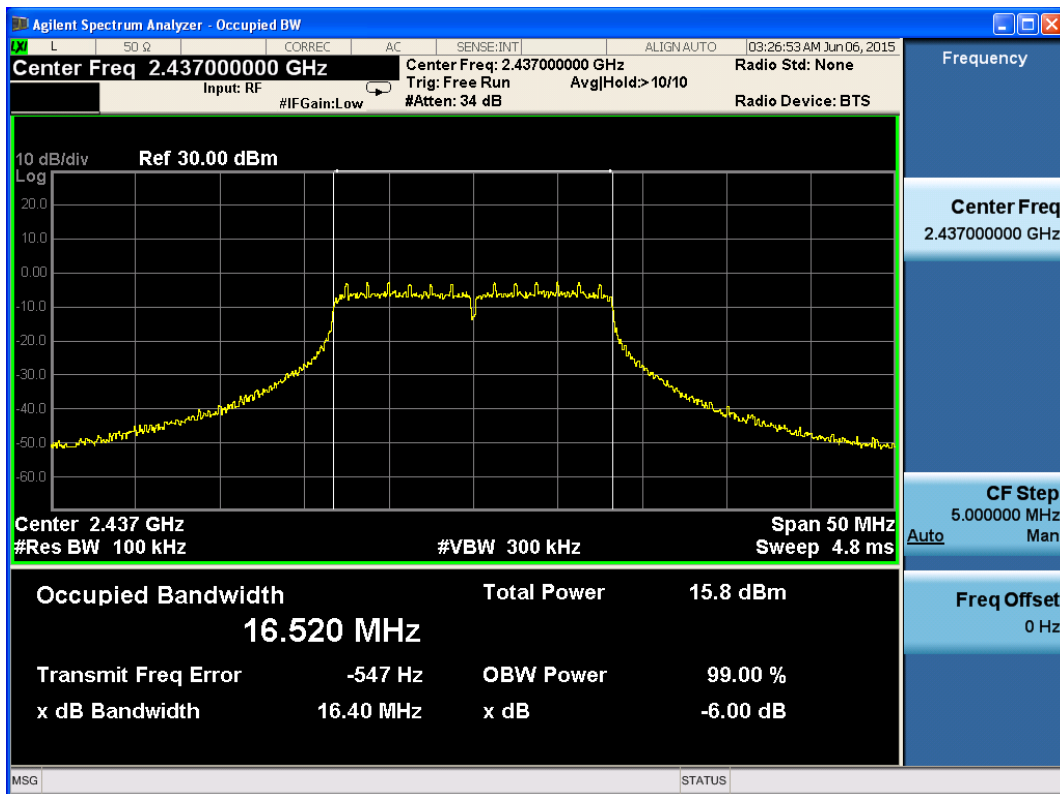
802.11g, Carrier frequency (MHz): 2412

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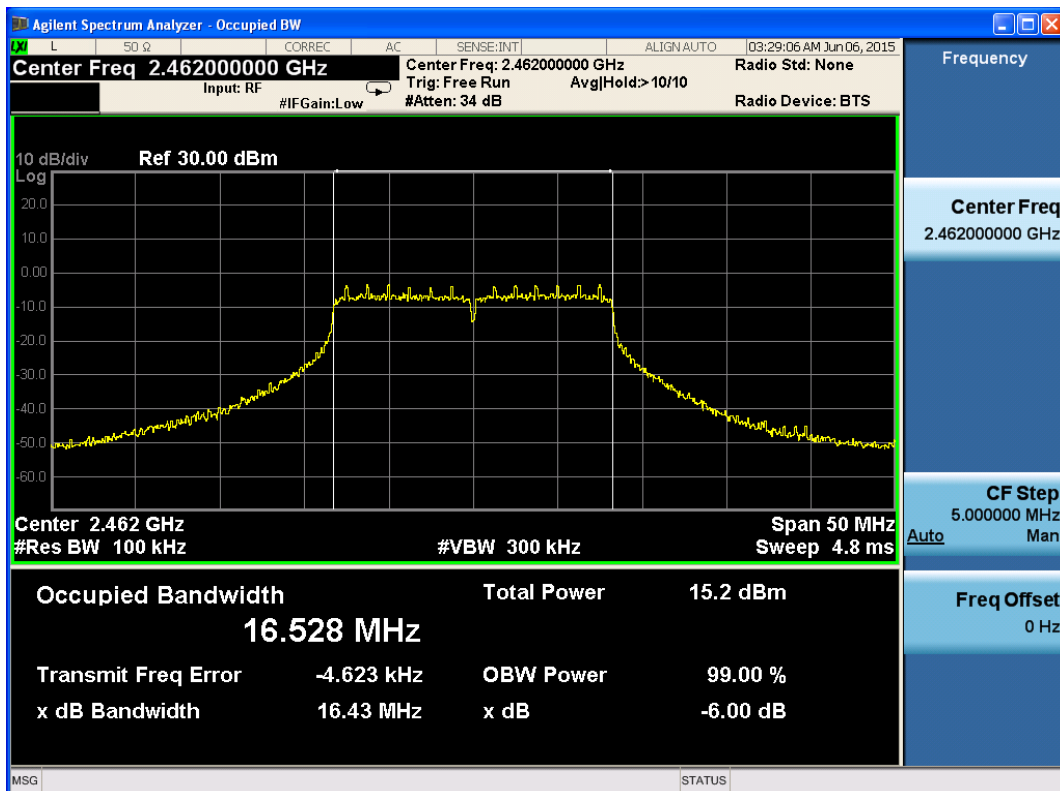
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802.11g, Carrier frequency (MHz): 2437



802.11g, Carrier frequency (MHz): 2462

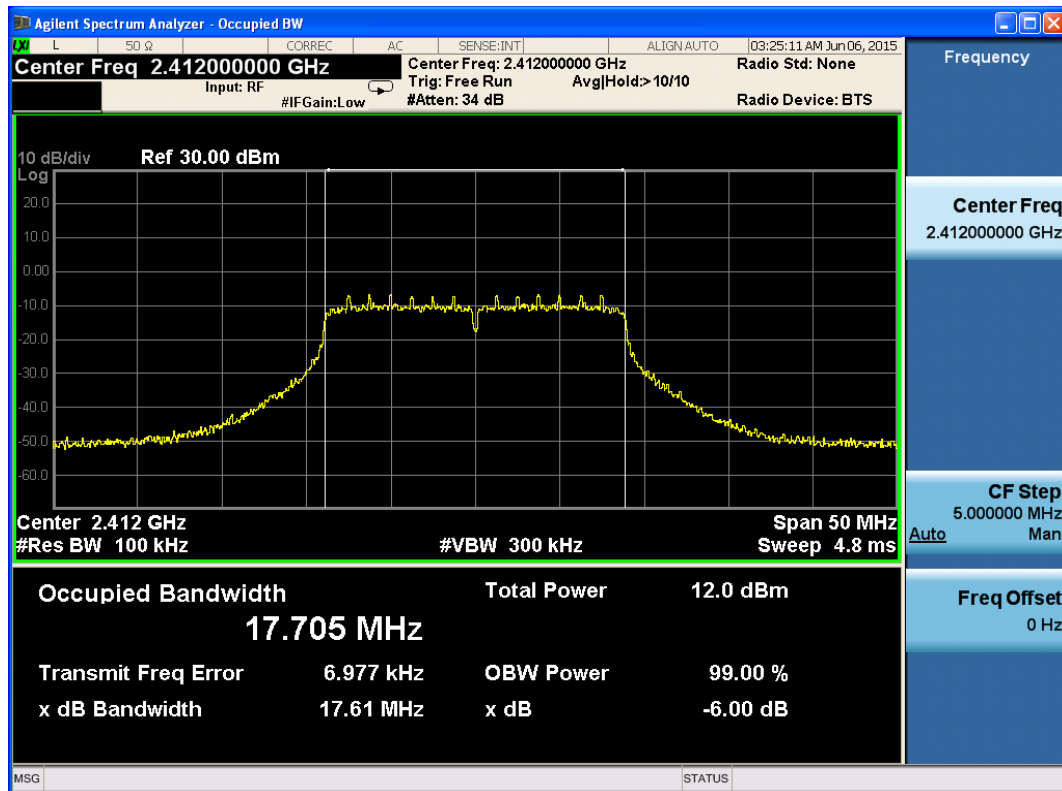
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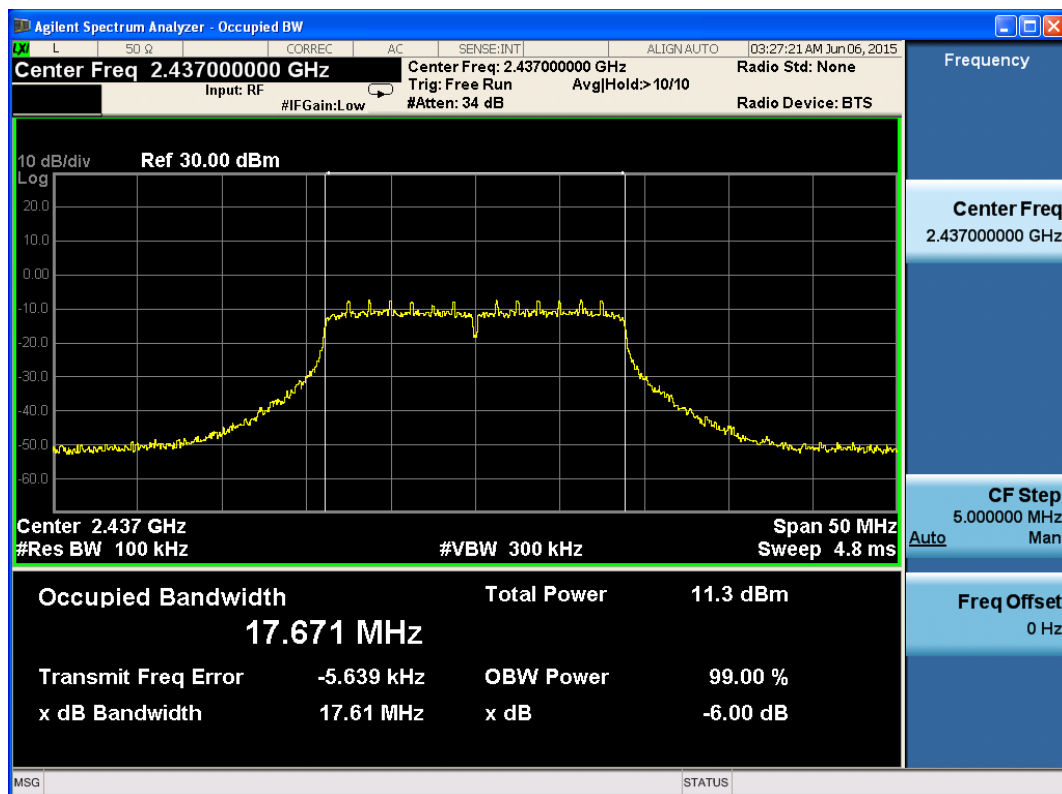
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802.11n(HT20)



802.11n, Carrier frequency (MHz): 2412



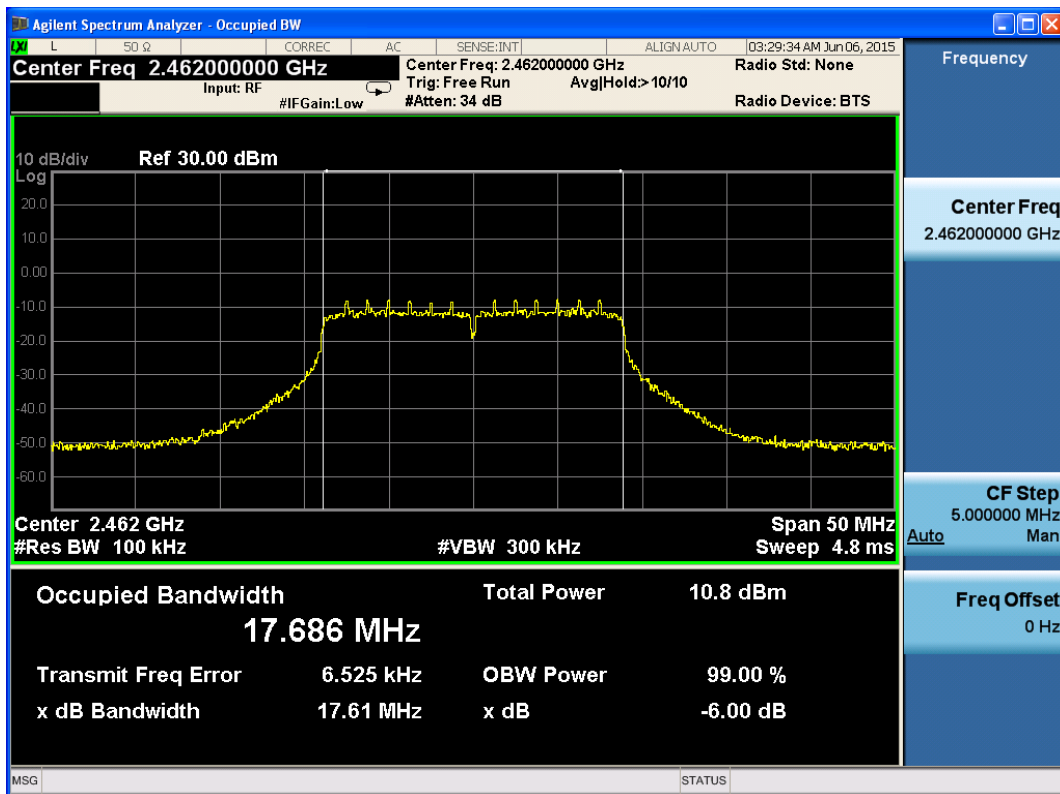
802.11n, Carrier frequency (MHz): 2437

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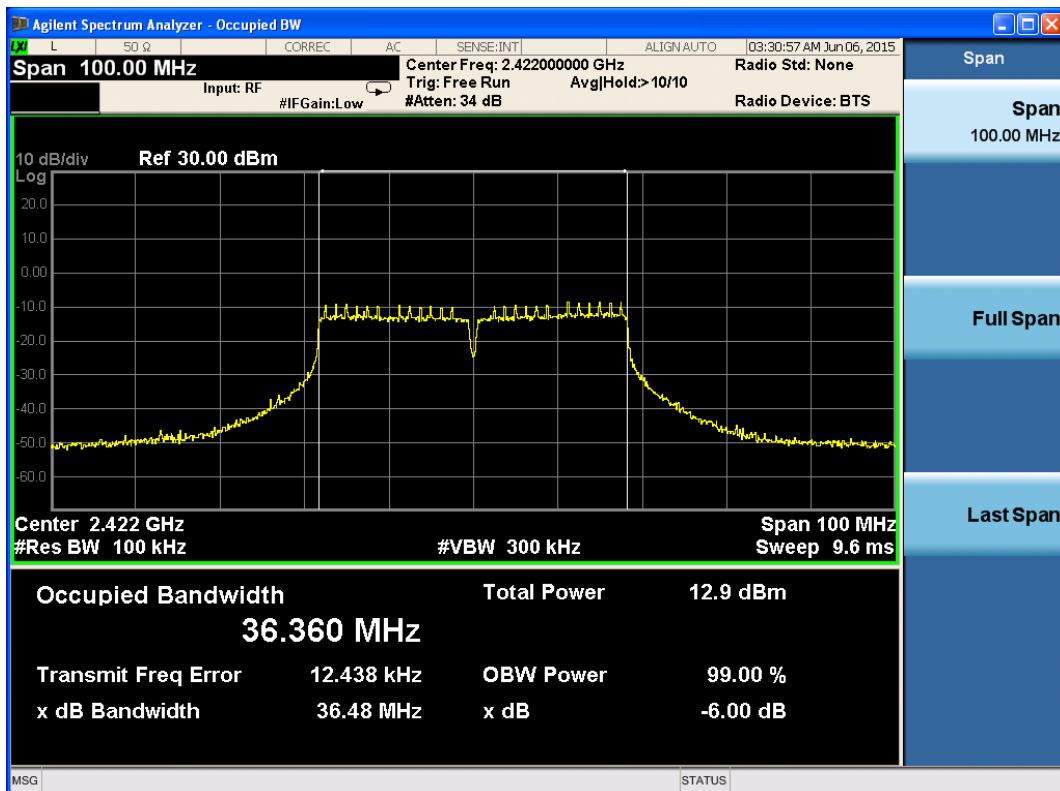
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802.11n, Carrier frequency (MHz):2462

802.11n(HT40)



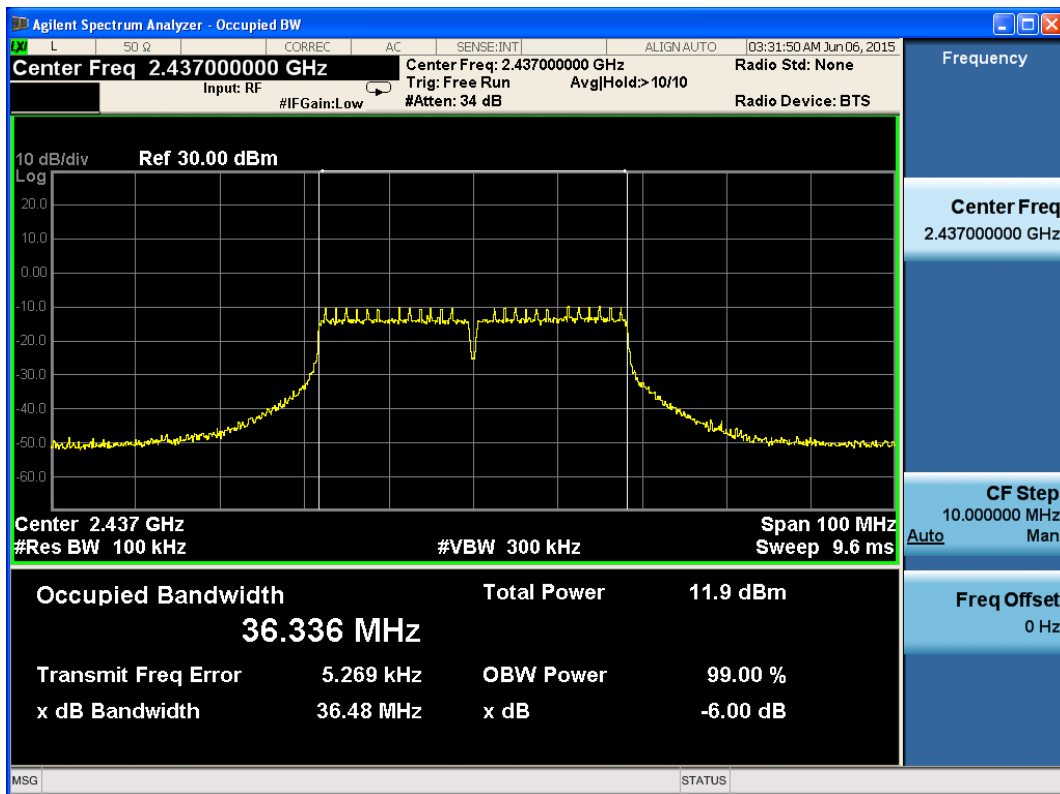
802.11n, Carrier frequency (MHz): 2422

TA Technology (Shanghai) Co., Ltd.

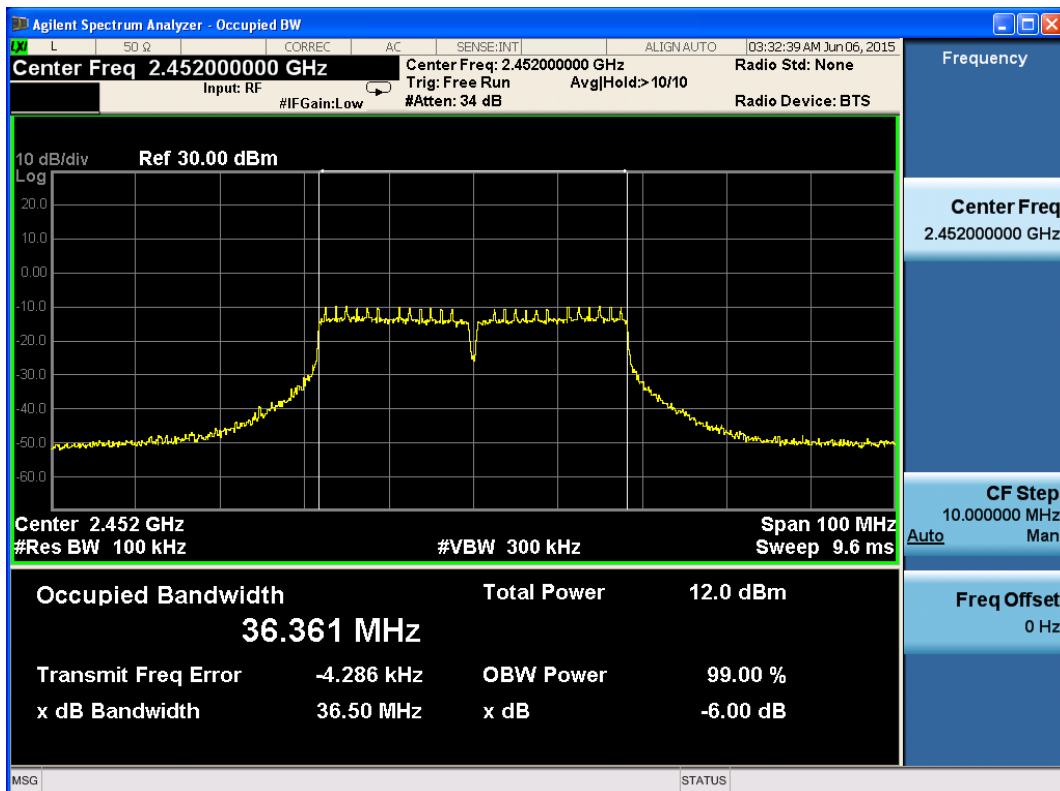
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802.11n, Carrier frequency (MHz): 2437



802.11n, Carrier frequency (MHz):2452

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2.5. Band Edge Compliance

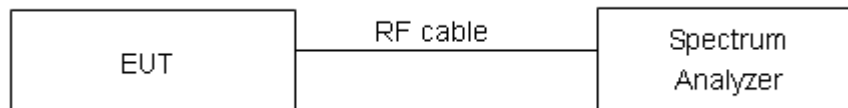
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100kHz and VBW is set to 300kHz on spectrum analyzer. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 15.247(d) specifies that “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 either an RF conducted or a radiated measurement.”

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
2GHz-3GHz	1.407 dB

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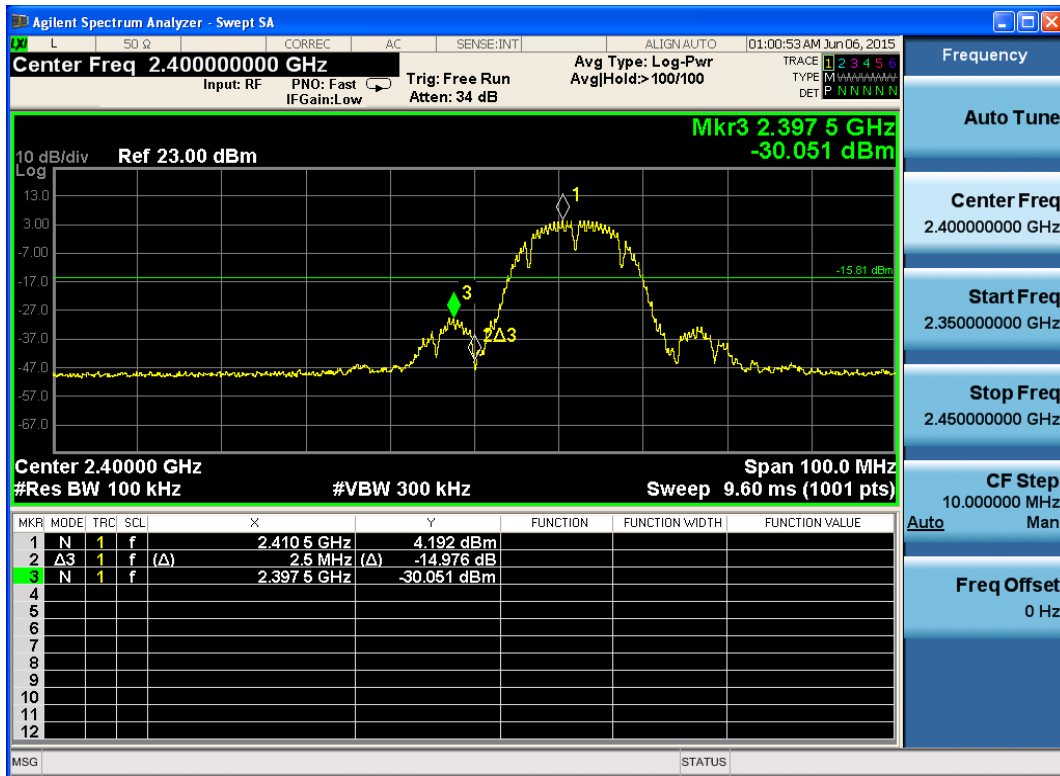
Report No.:RHA1505-0034RF01R3

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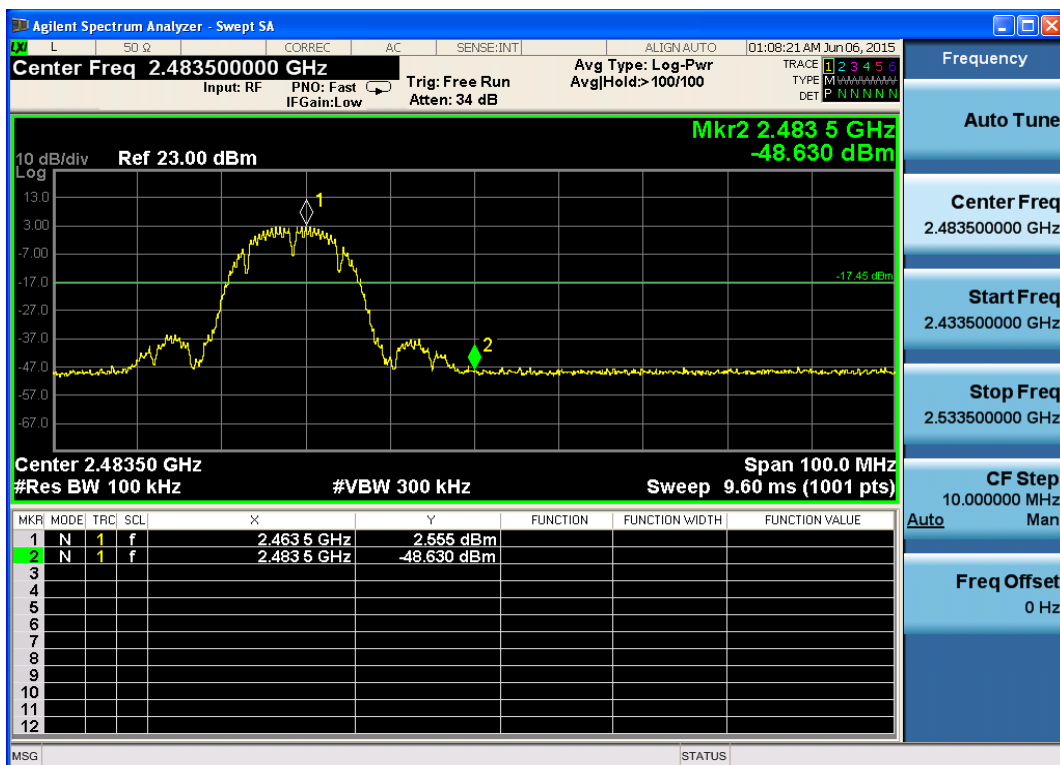
Test Results: PASS

Antenna 1

802.11b



802.11b, Channel No.: 1



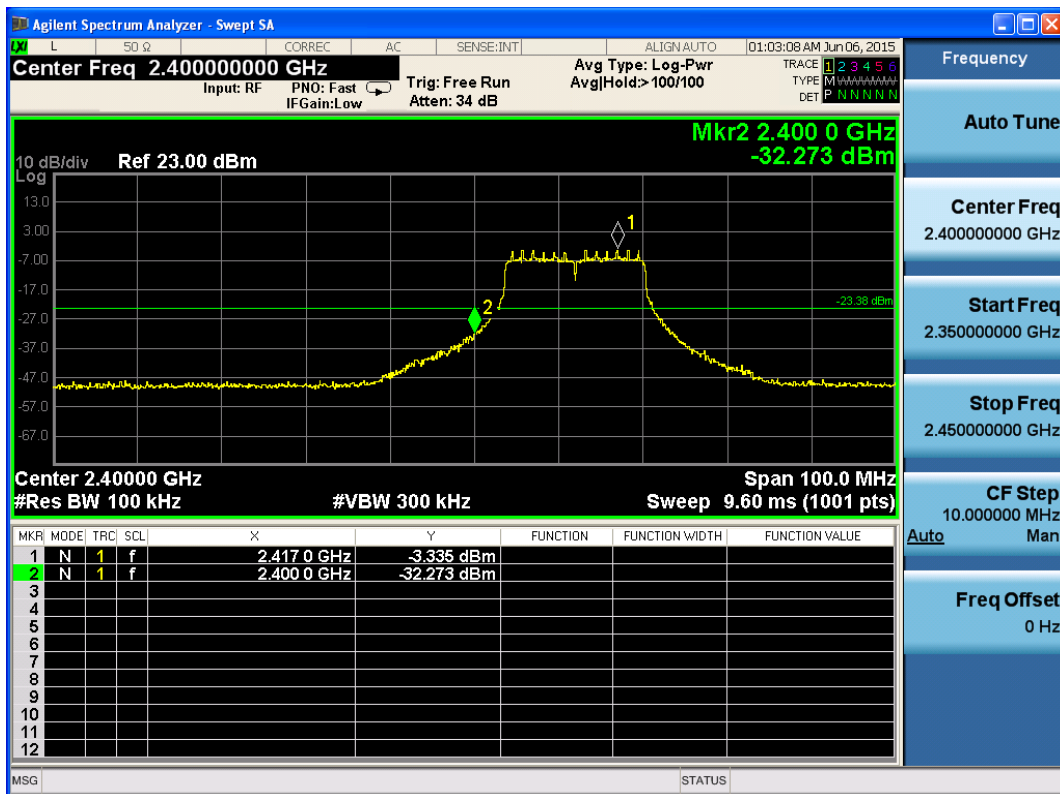
802.11b, Channel No.: 11

TA Technology (Shanghai) Co., Ltd. Test Report

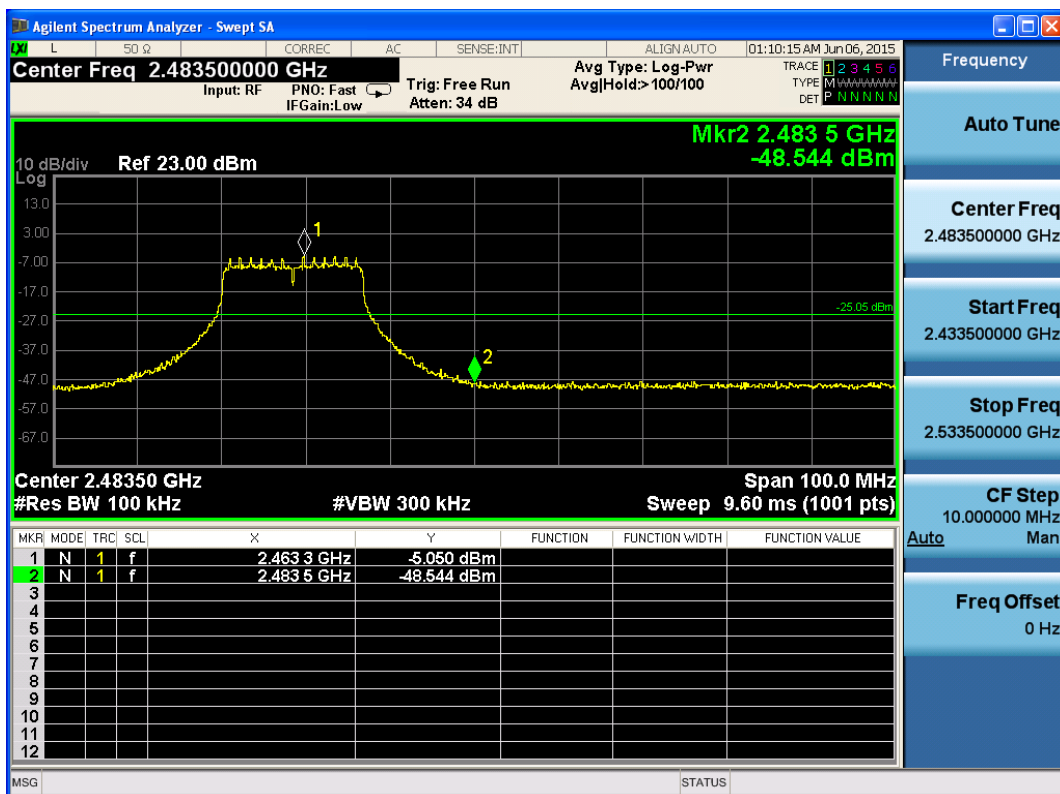
Report No.:RHA1505-0034RF01R3

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802.11g



802.11g, Channel No.: 1



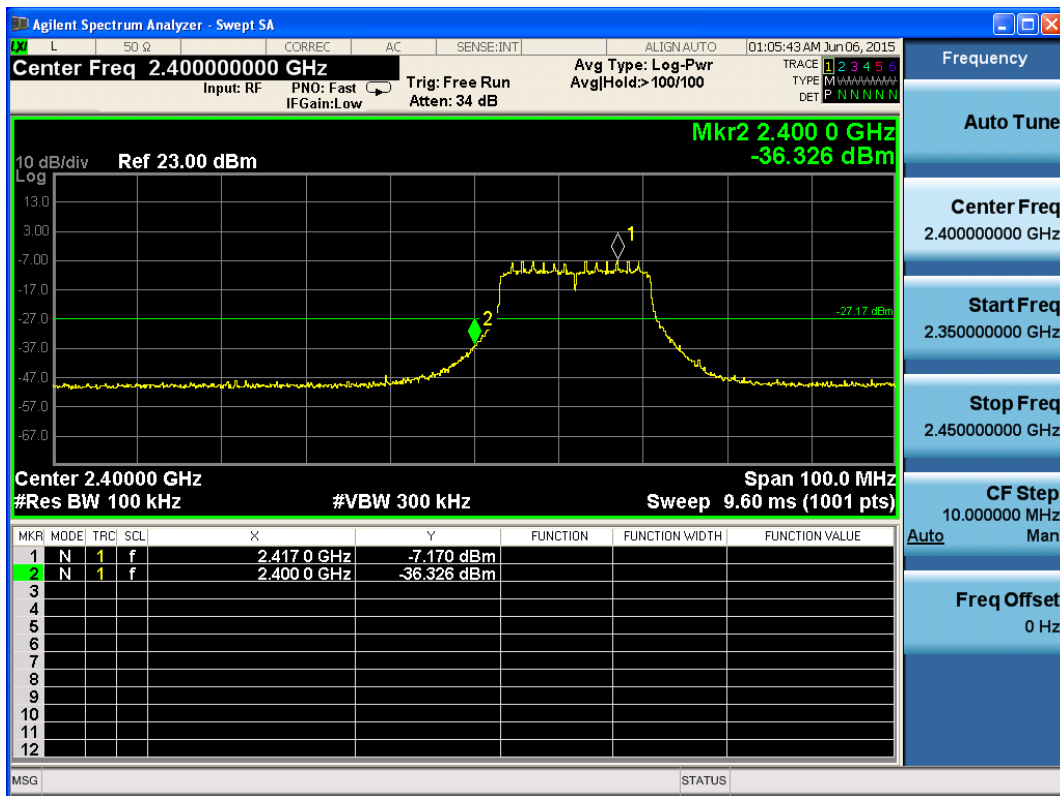
802.11g, Channel No.: 11

TA Technology (Shanghai) Co., Ltd. Test Report

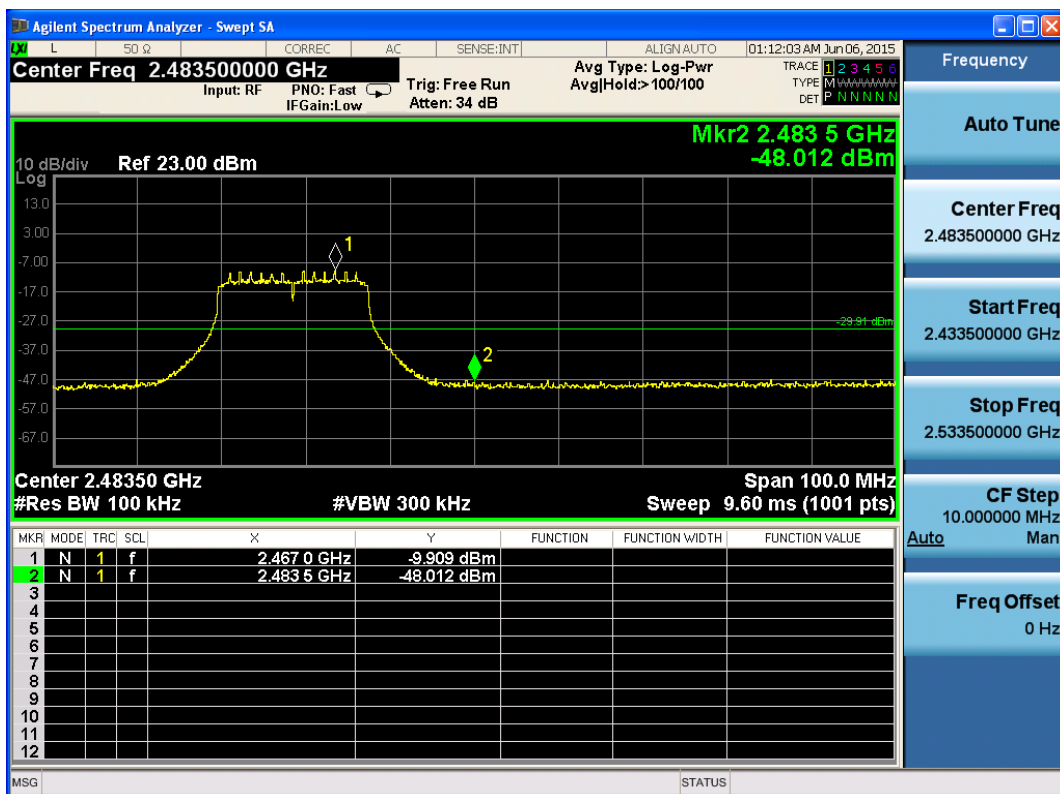
Report No.:RHA1505-0034RF01R3

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802.11n(HT20)



802.11n, Channel No.: 1



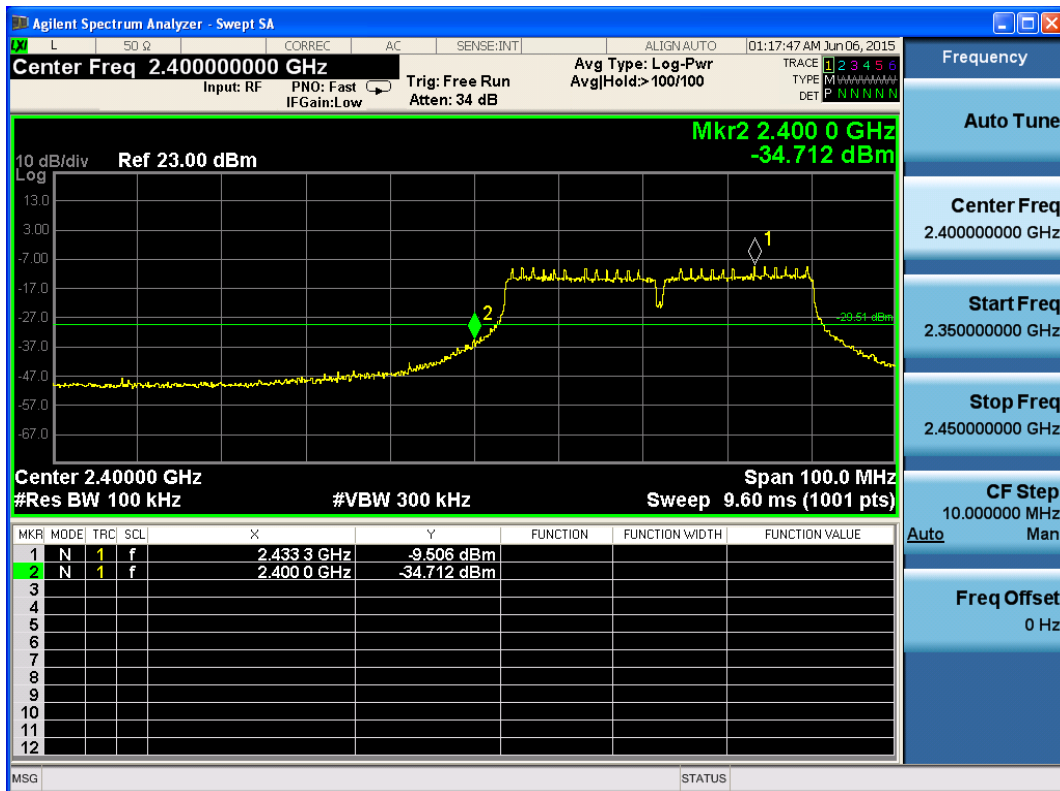
802.11n, Channel No.: 11

TA Technology (Shanghai) Co., Ltd. Test Report

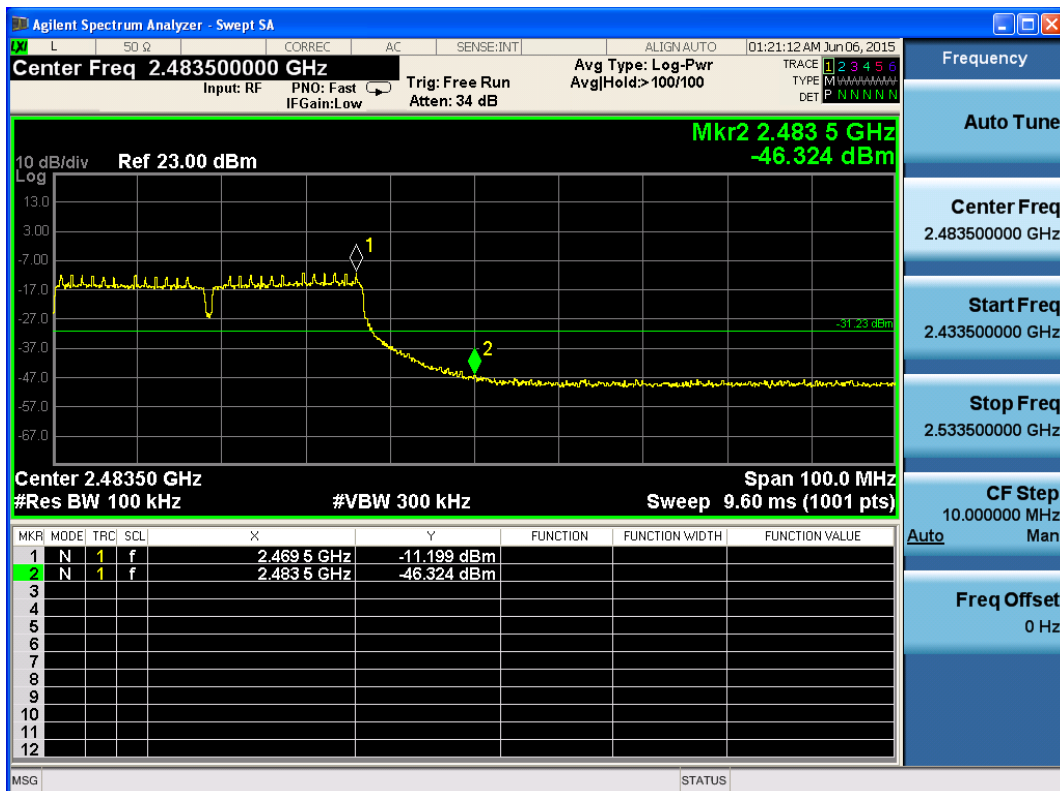
Report No.:RHA1505-0034RF01R3

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802.11n(HT40)



802.11n, Channel No.: 3



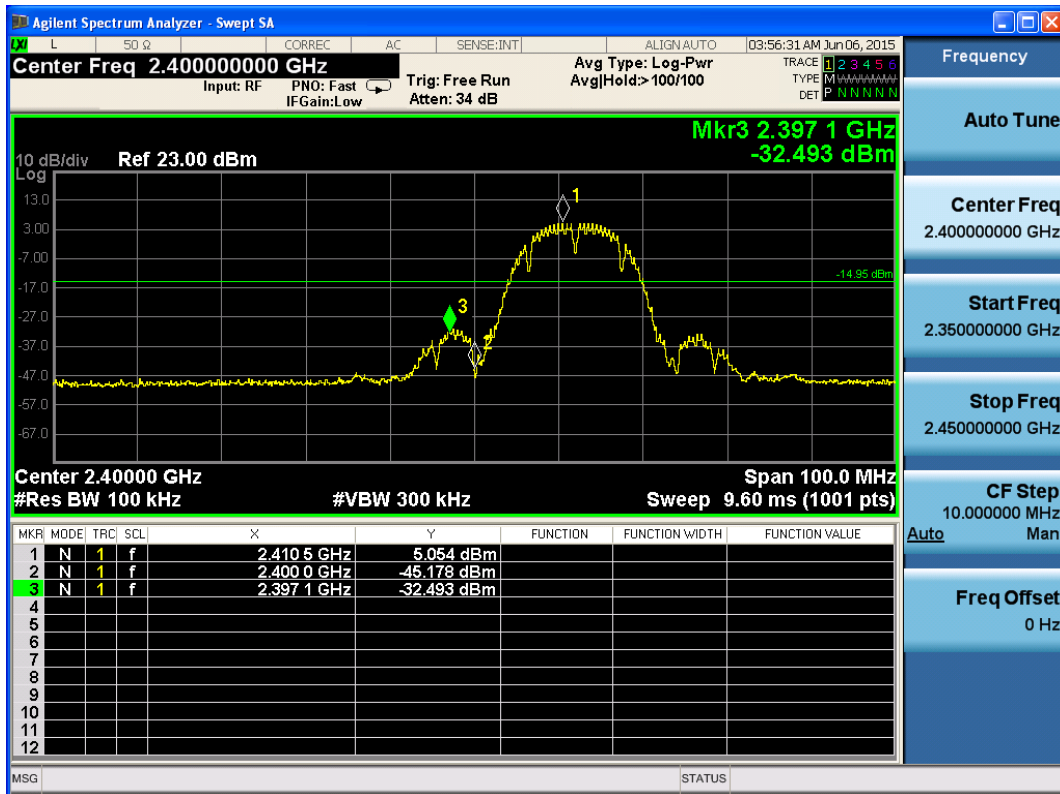
802.11n, Channel No.: 9

TA Technology (Shanghai) Co., Ltd. Test Report

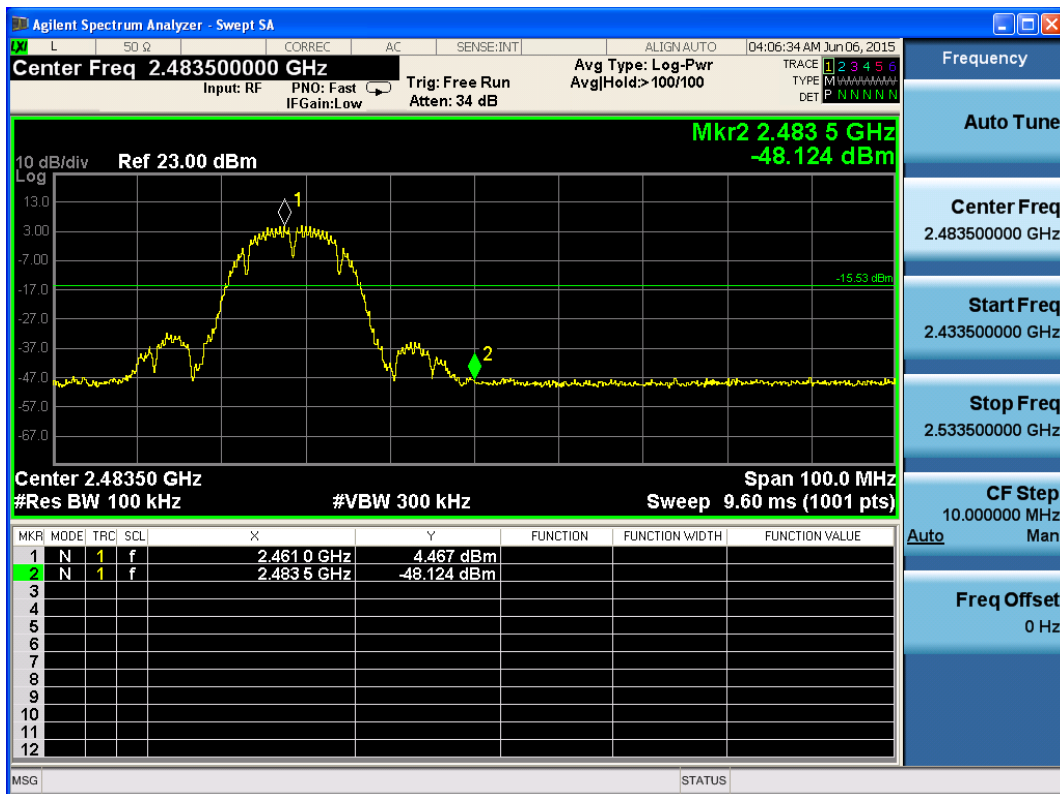
Report No.:RHA1505-0034RF01R3

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Antenna 2
802.11b



802.11b, Channel No.: 1



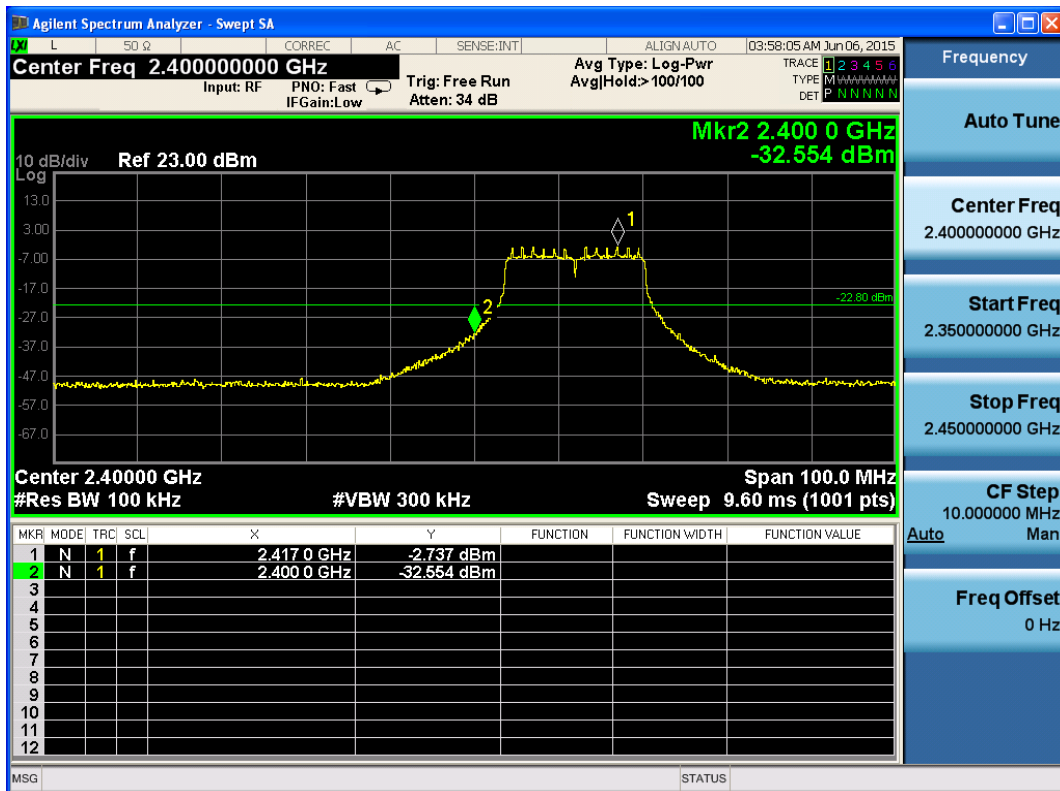
802.11b, Channel No.: 11

TA Technology (Shanghai) Co., Ltd. Test Report

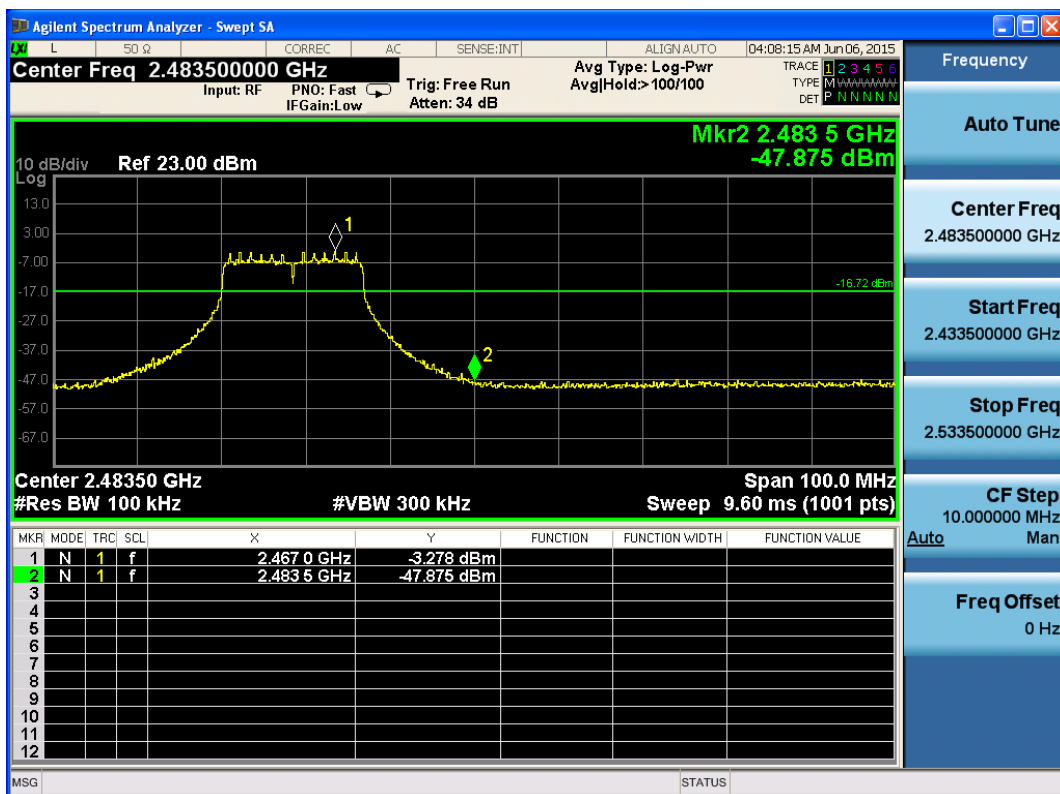
Report No.:RHA1505-0034RF01R3

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802.11g



802.11g, Channel No.: 1



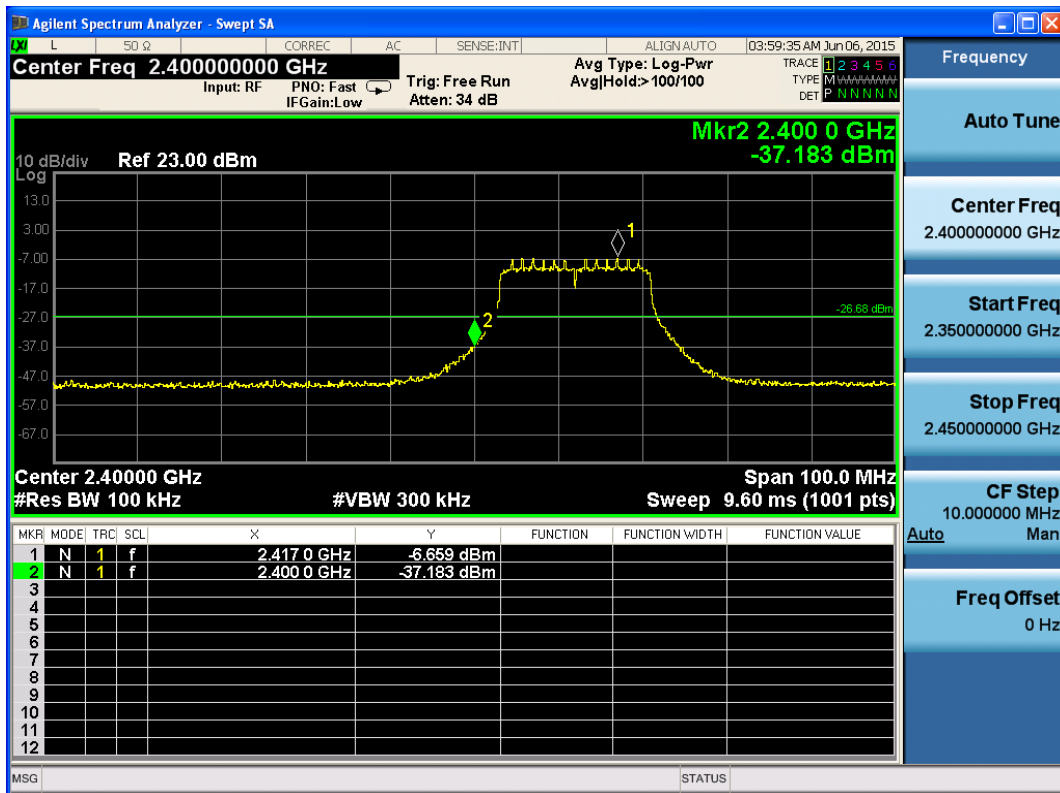
802.11g, Channel No.: 11

TA Technology (Shanghai) Co., Ltd. Test Report

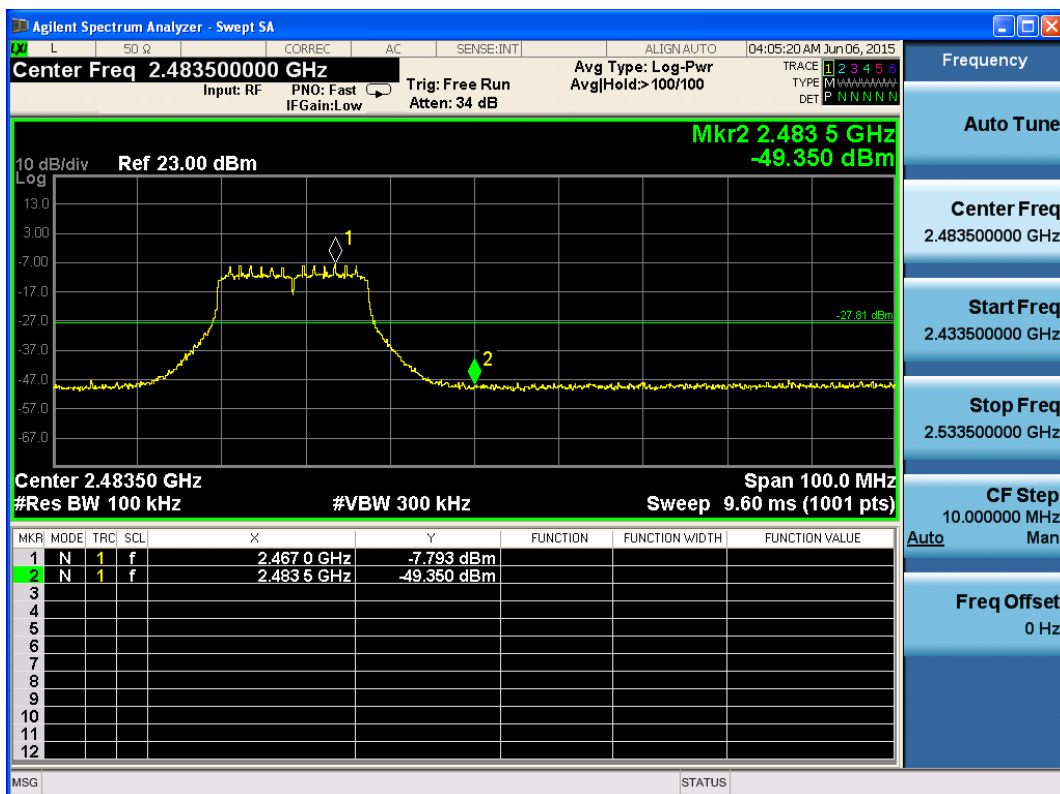
Report No.:RHA1505-0034RF01R3

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802.11n(HT20)



802.11n, Channel No.: 1



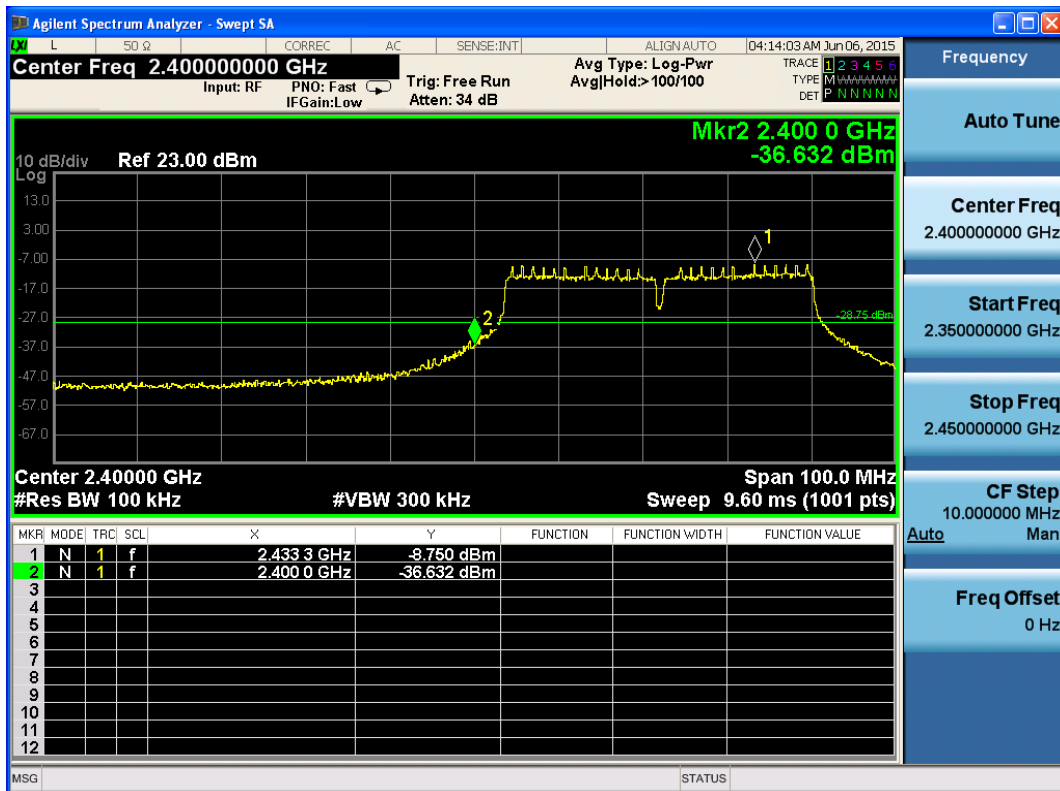
802.11n, Channel No.: 11

TA Technology (Shanghai) Co., Ltd. Test Report

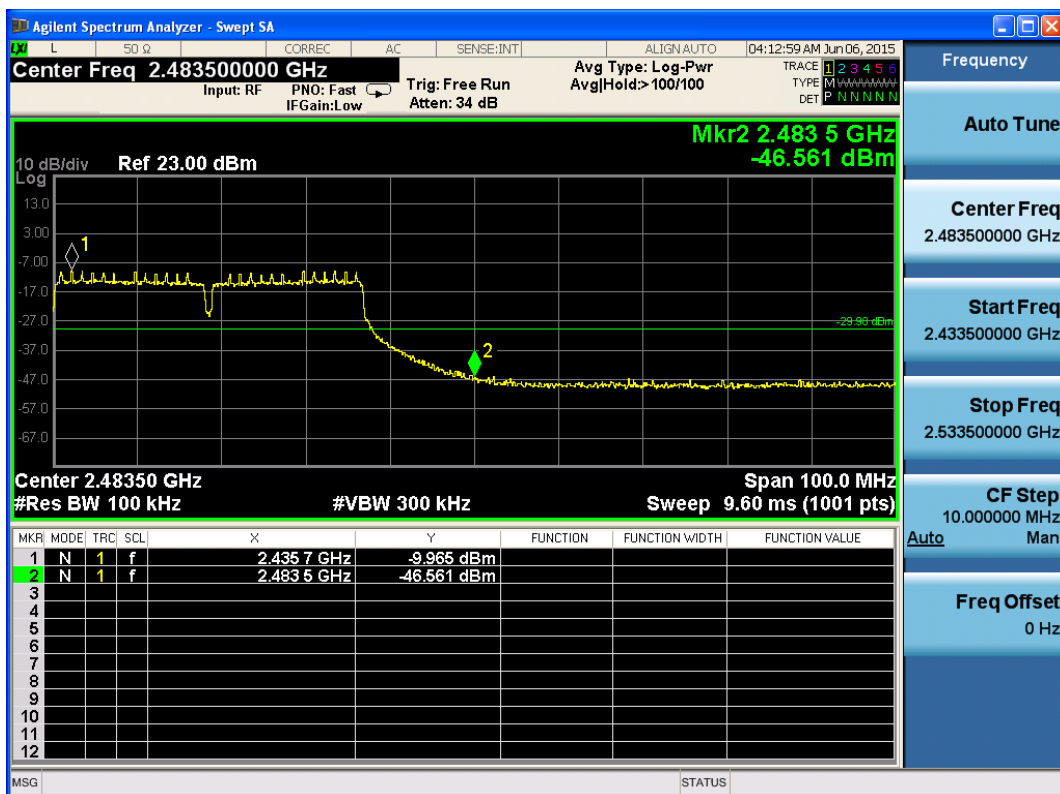
Report No.:RHA1505-0034RF01R3

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802.11n(HT40)



802.11n, Channel No.: 3



802.11n, Channel No.: 9

2.6. Spurious Radiated Emissions in the restricted band

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. RBW is set to 100kHz. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

Set the spectrum analyzer in the following:

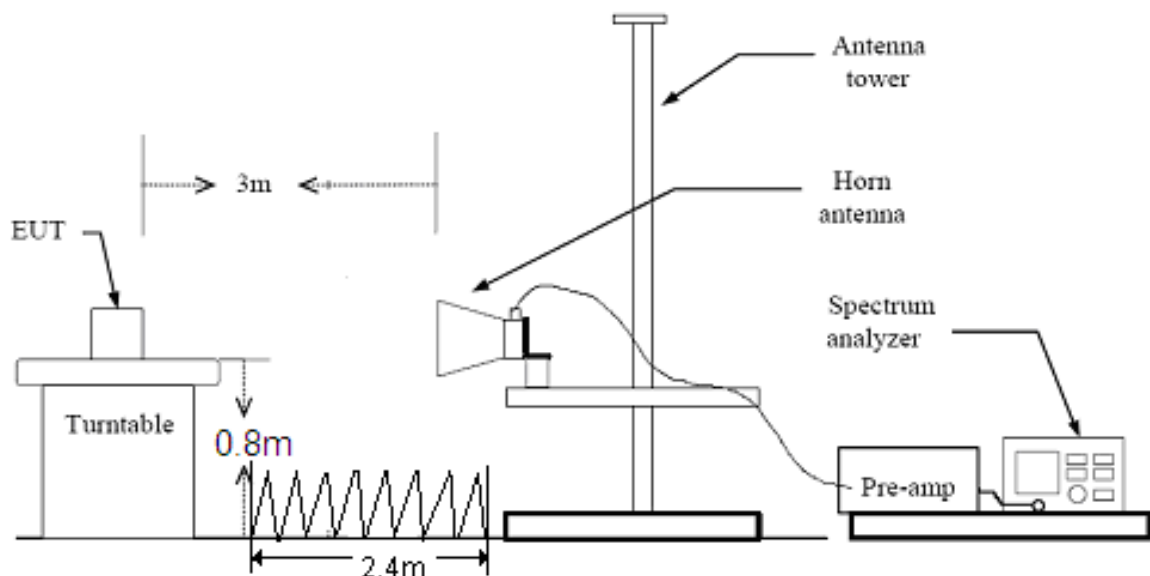
- (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
- (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

This setting method can refer to **KDB 558074**.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Y axis) and the antenna is vertical.

The test is in transmitting mode.

Test setup



Note: Area side:2.4mX3.6m

TA Technology (Shanghai) Co., Ltd.

Test Report

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Limits

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

Limit in restricted band

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009-0.490	2400/F(kHz)	/
0.490-1.705	24000/F(kHz)	/
1.705-30.0	30	/
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

§15.35(b)

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Peak Limit=74dBuV/m

Average Limit=54dBuV/m

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 3.55$ dB.

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Test Report

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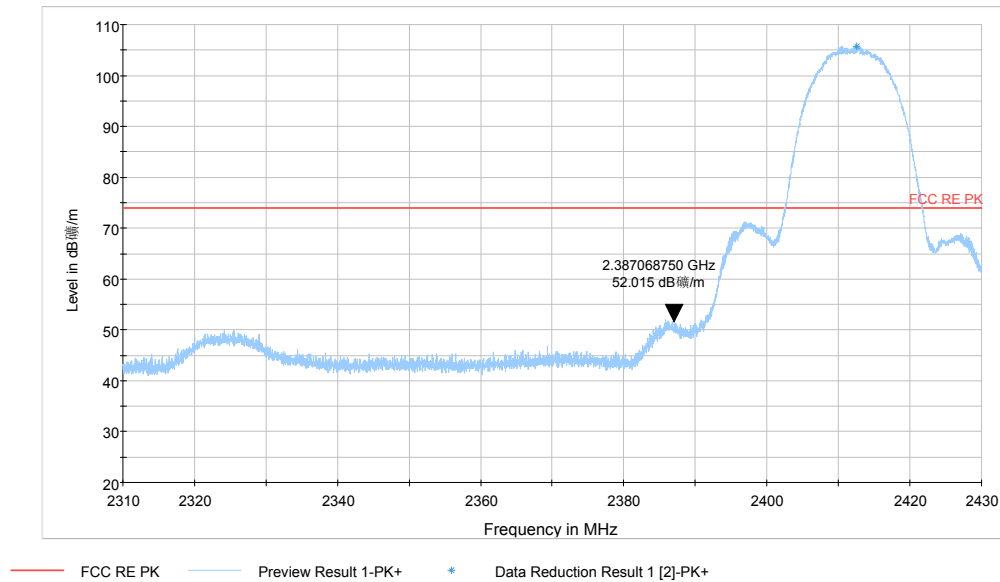
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Test Results:PASS

Antenna 1

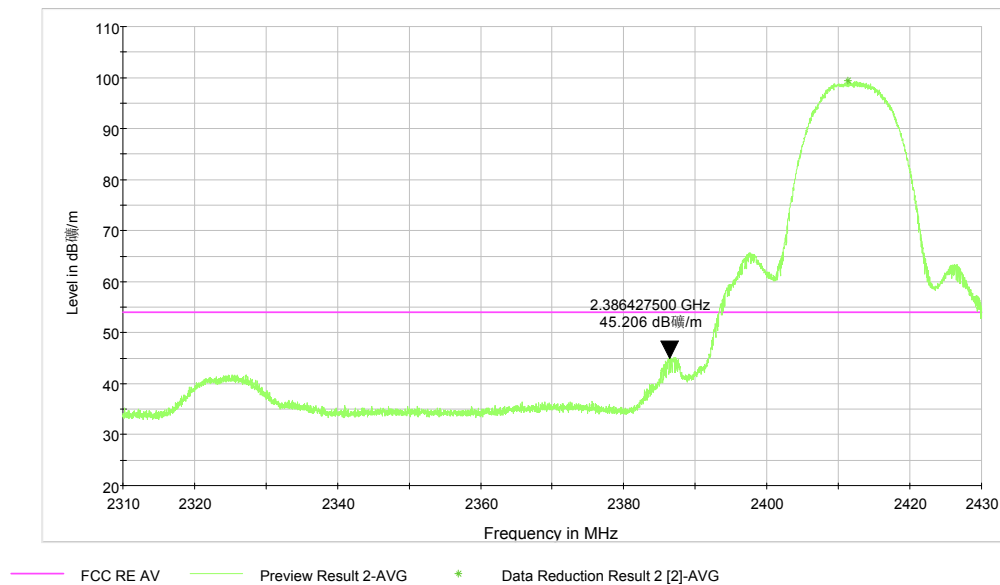
802.11b-Channel 1:

Peak



Note: The signal beyond the limit is carrier
Channel 1

Average



Note: The signal beyond the limit is carrier
Channel 1

TA Technology (Shanghai) Co., Ltd.

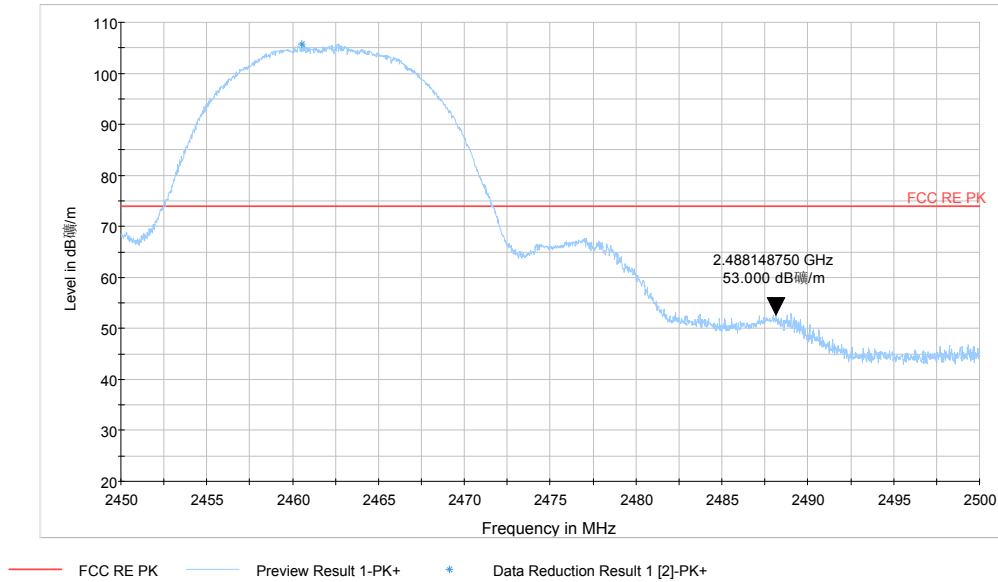
Test Report

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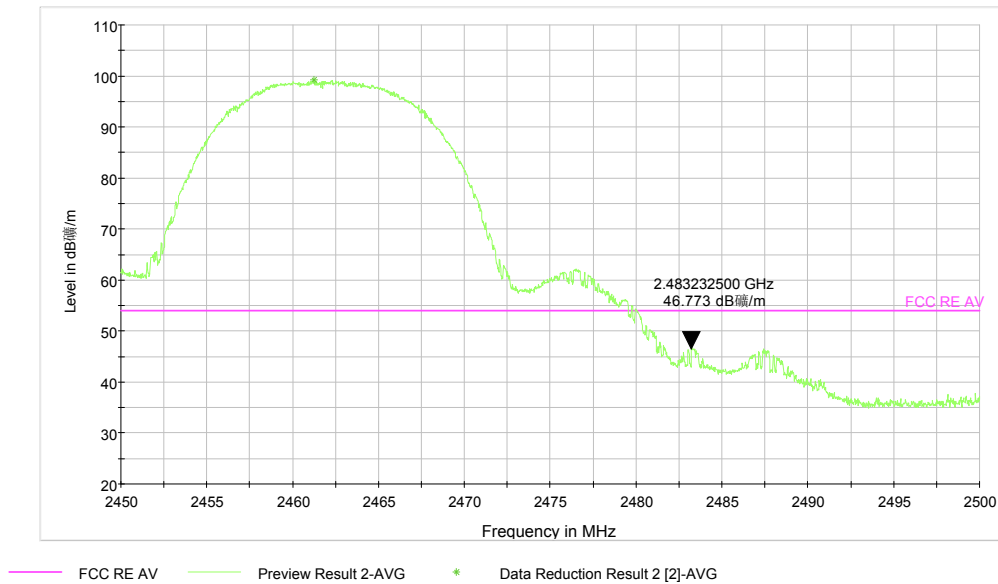
802.11b-Channel 11:

Peak



Note: The signal beyond the limit is carrier
Channel 11

Average



Note: The signal beyond the limit is carrier
Channel 11

TA Technology (Shanghai) Co., Ltd.

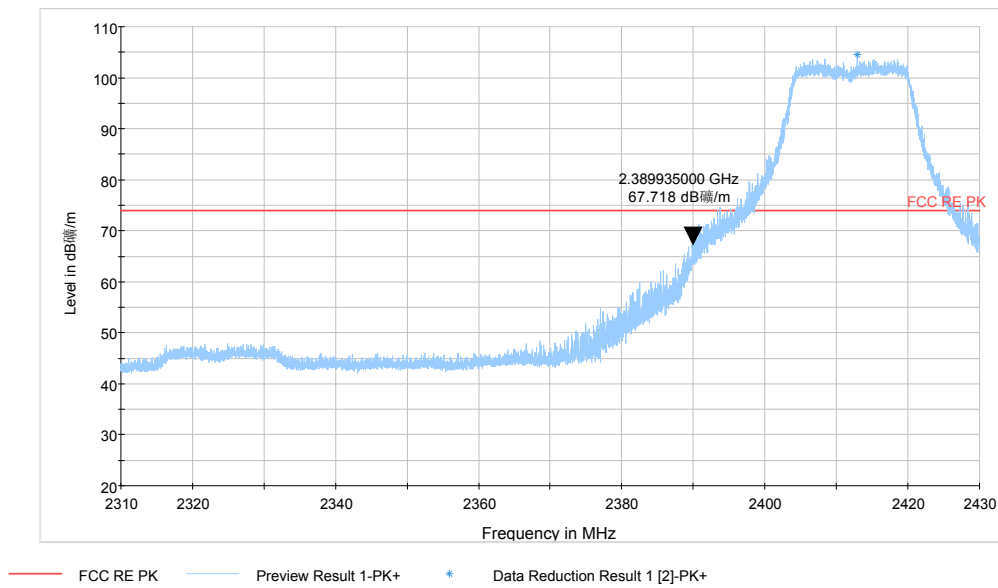
Test Report

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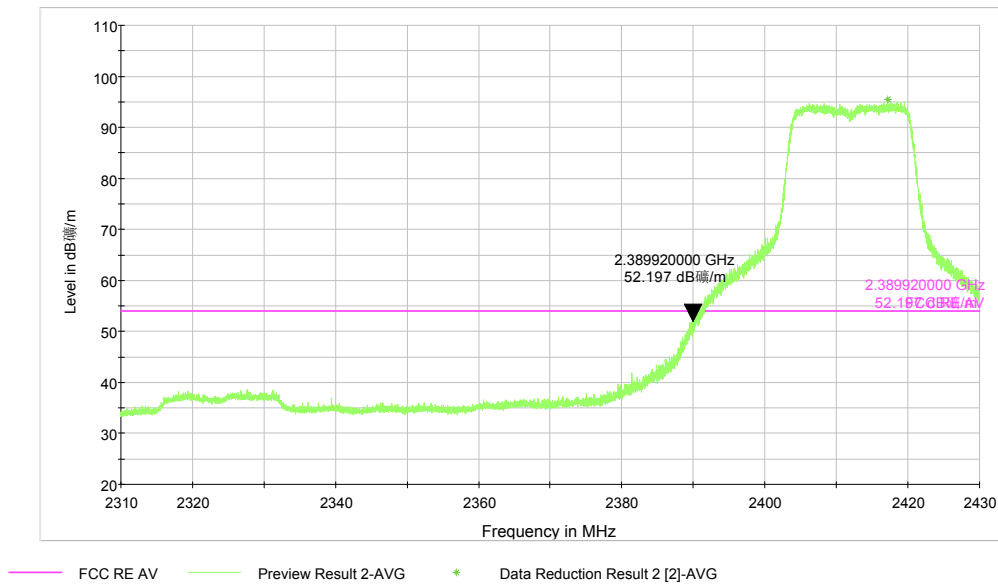
802.11g-Channel 1:

Peak



Note: The signal beyond the limit is carrier
Channel 1

Average



Note: The signal beyond the limit is carrier
Channel 1

TA Technology (Shanghai) Co., Ltd.

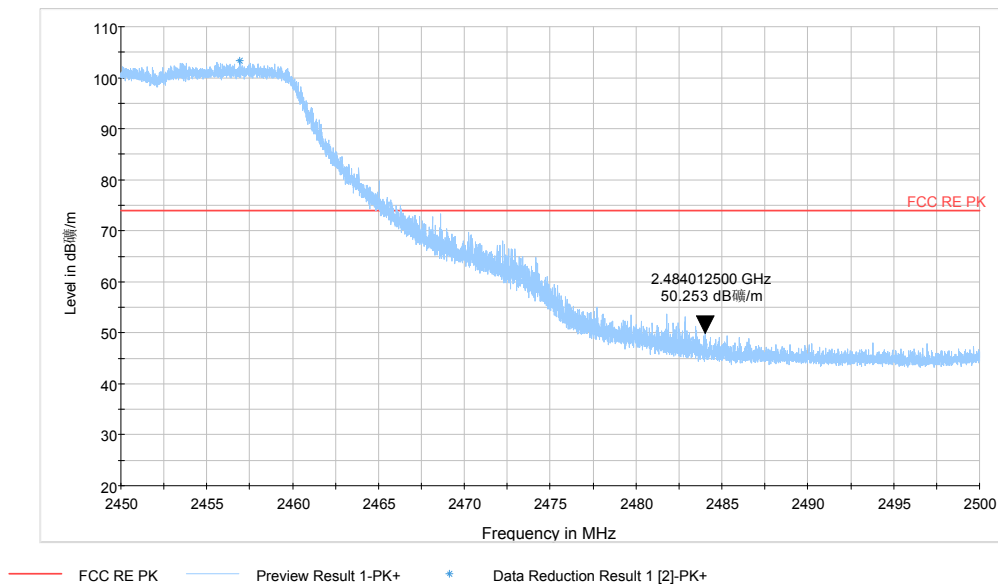
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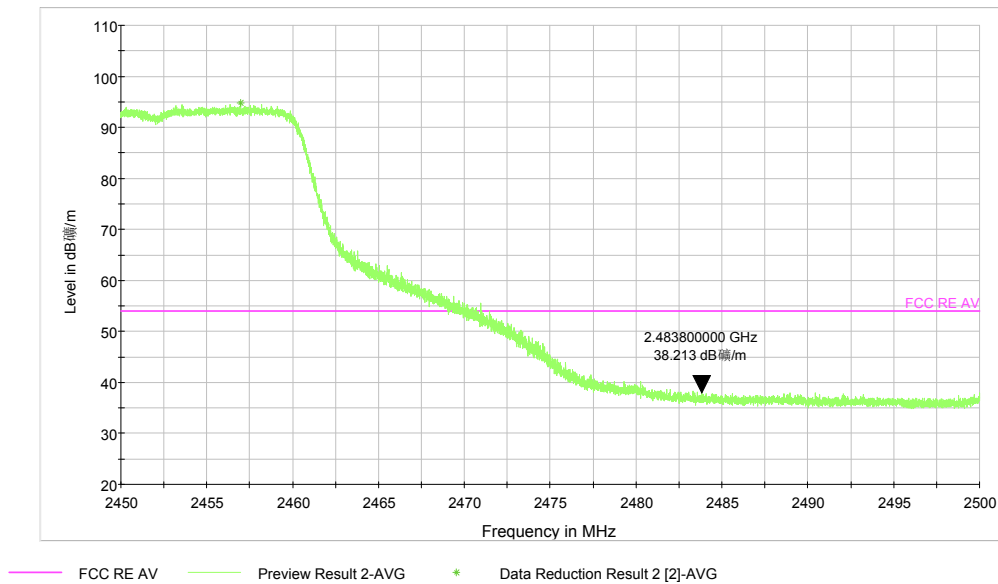
802.11g-Channel 11:

Peak



Note: The signal beyond the limit is carrier
Channel 11

Average



Note: The signal beyond the limit is carrier
Channel 11

TA Technology (Shanghai) Co., Ltd.

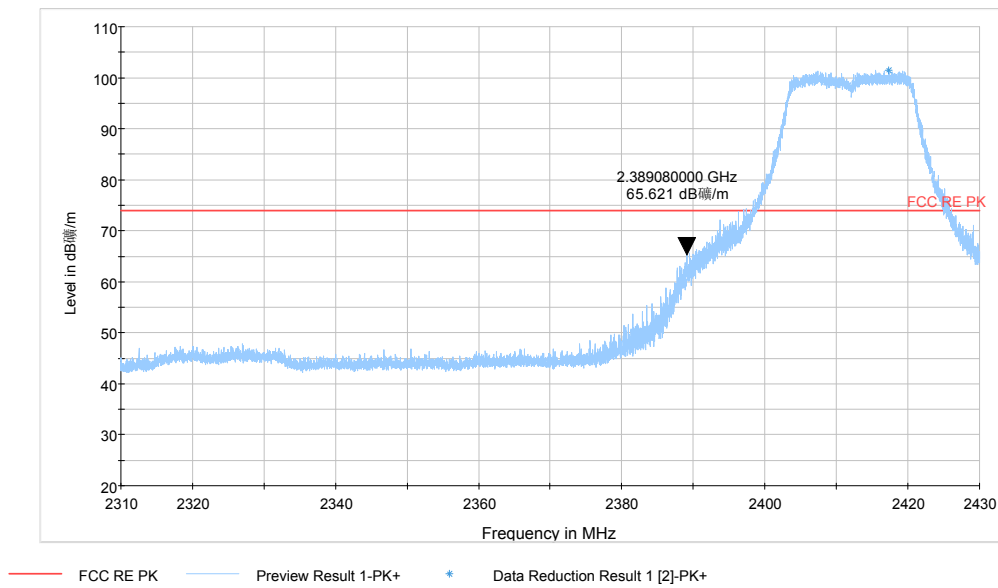
Test Report

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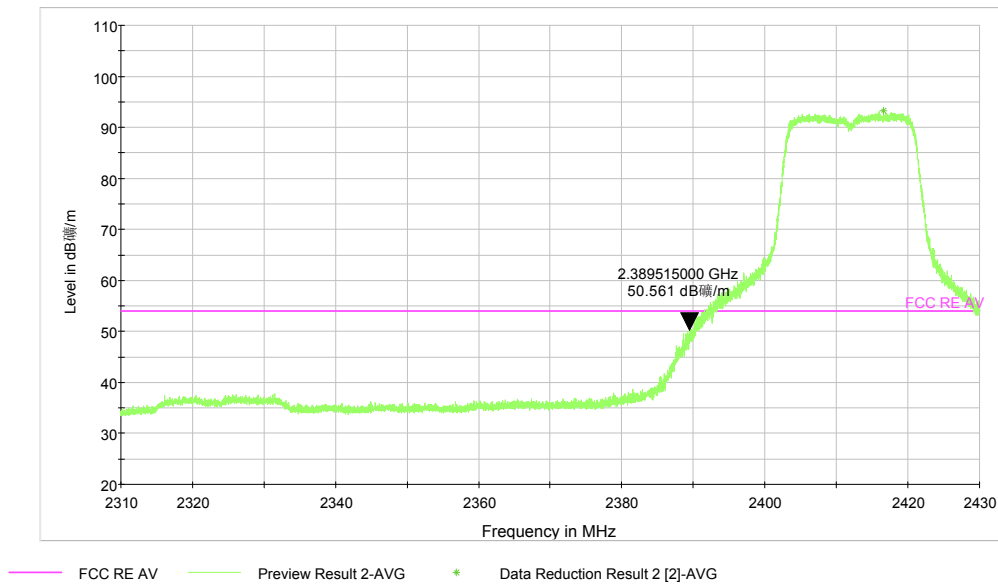
802.11n-Channel 1(HT20):

Peak



Note: The signal beyond the limit is carrier
Channel 1

Average



Note: The signal beyond the limit is carrier
Channel 1

TA Technology (Shanghai) Co., Ltd.

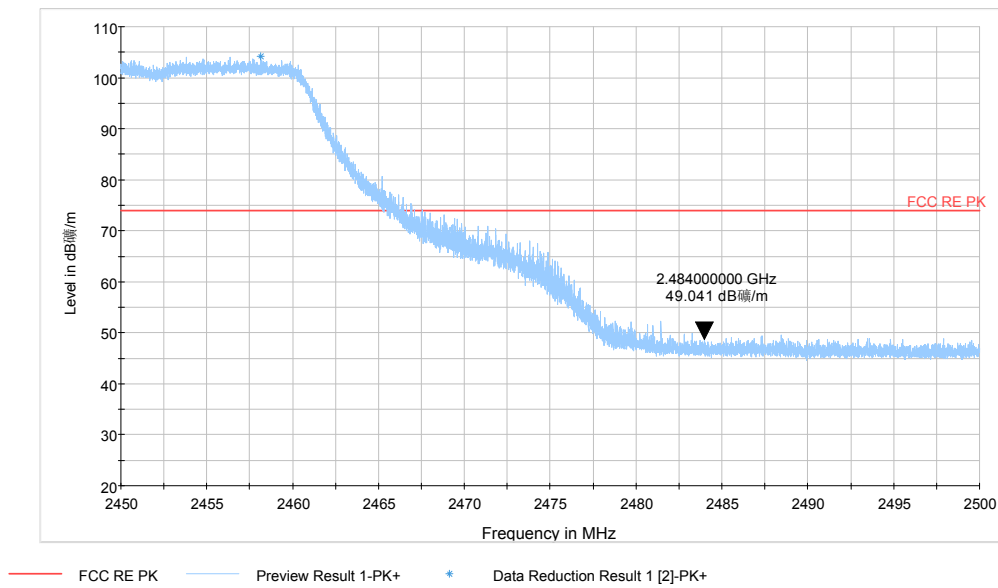
Test Report

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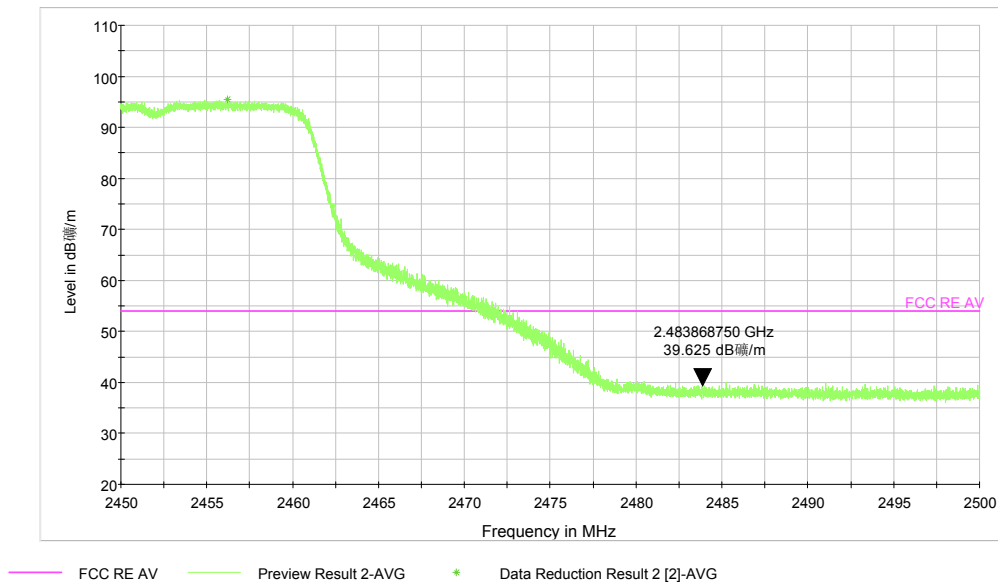
802.11n-Channel 11(HT20):

Peak



Note: The signal beyond the limit is carrier
Channel 11

Average



Note: The signal beyond the limit is carrier
Channel 11

TA Technology (Shanghai) Co., Ltd.

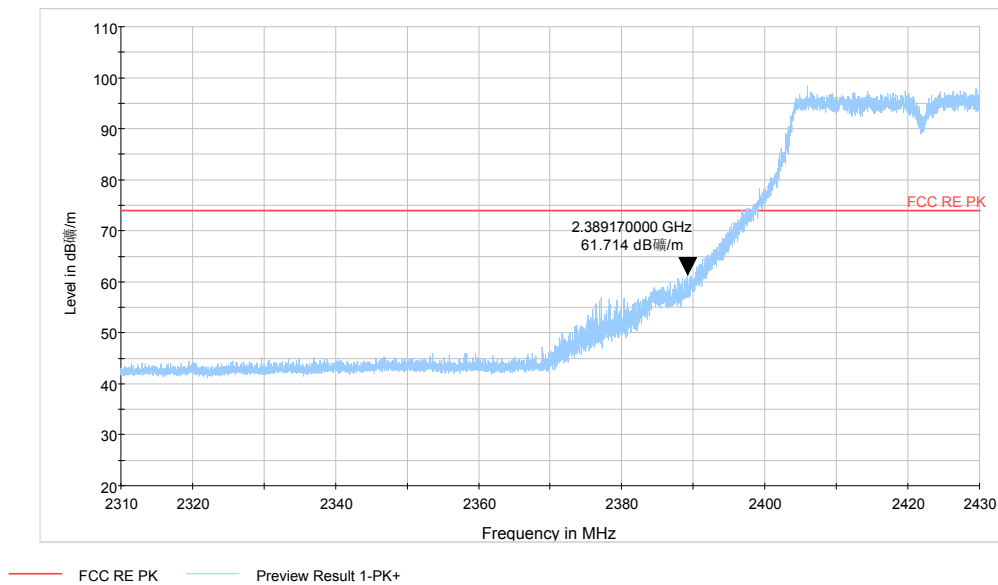
Test Report

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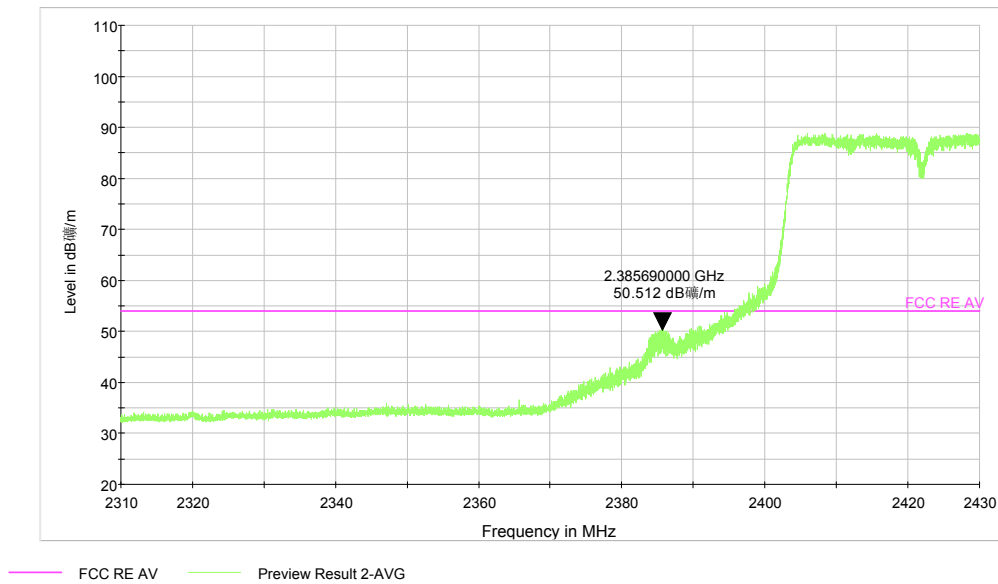
802.11n-Channel 3(HT40):

Peak



Note: The signal beyond the limit is carrier
Channel 3

Average



Note: The signal beyond the limit is carrier
Channel 3

TA Technology (Shanghai) Co., Ltd.

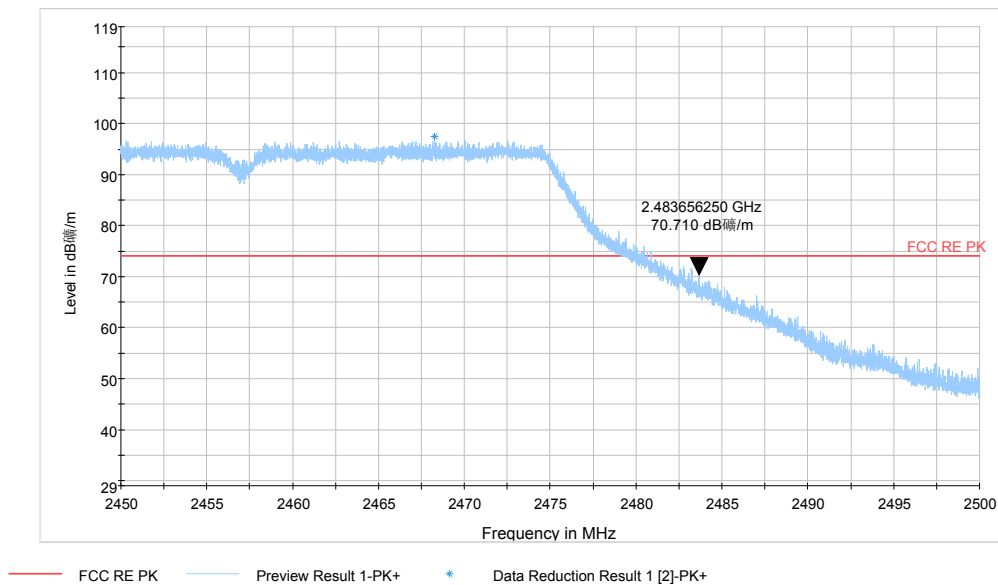
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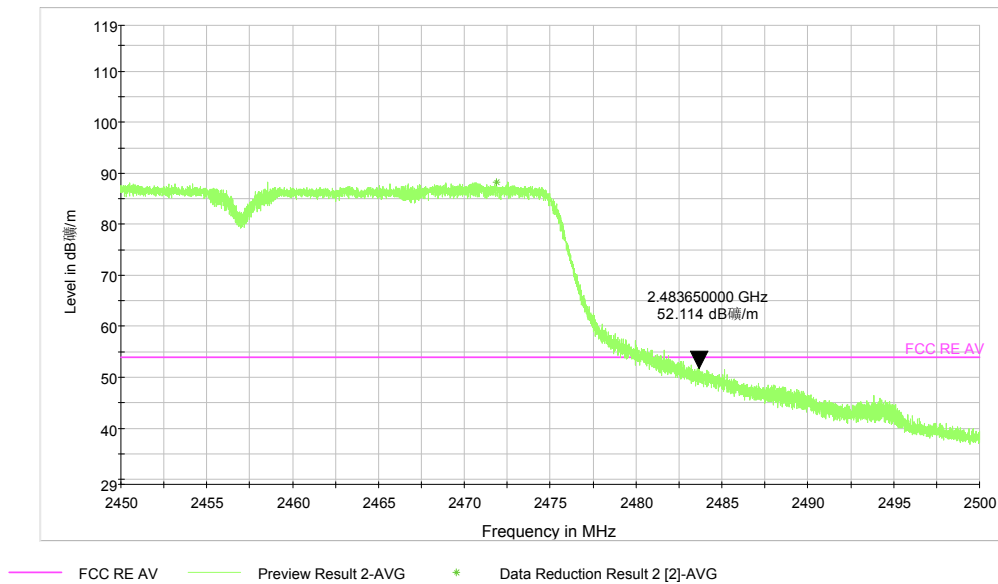
802.11n-Channel 9(HT40):

Peak



Note: The signal beyond the limit is carrier
Channel 9

Average



Note: The signal beyond the limit is carrier
Channel 9

TA Technology (Shanghai) Co., Ltd.

Test Report

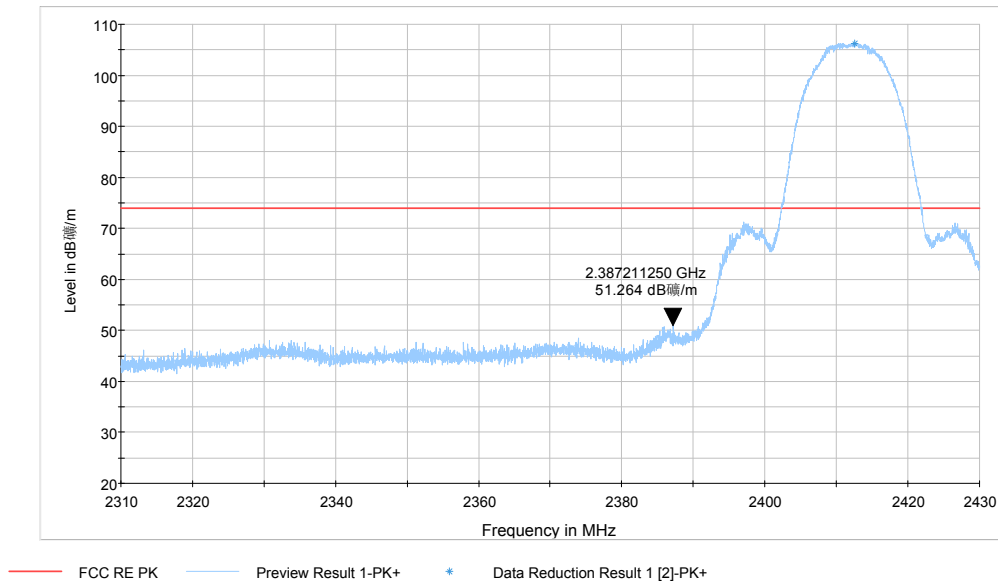
Report No.:RHA1505-0034RF01R3

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Antenna 2

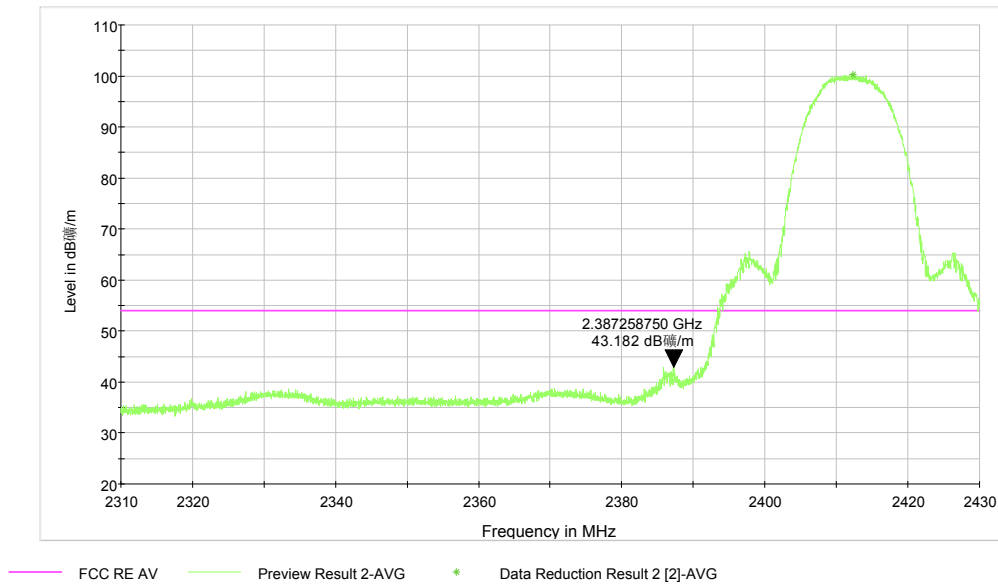
802.11b-Channel 1:

Peak



Note: The signal beyond the limit is carrier
Channel 1

Average



Note: The signal beyond the limit is carrier
Channel 1

TA Technology (Shanghai) Co., Ltd.

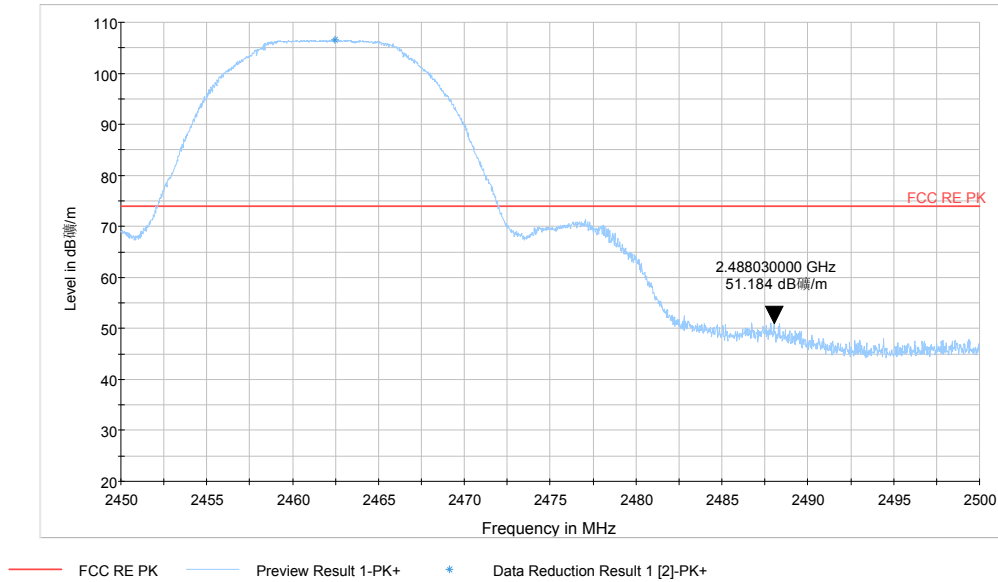
Test Report

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802.11b-Channel 11:

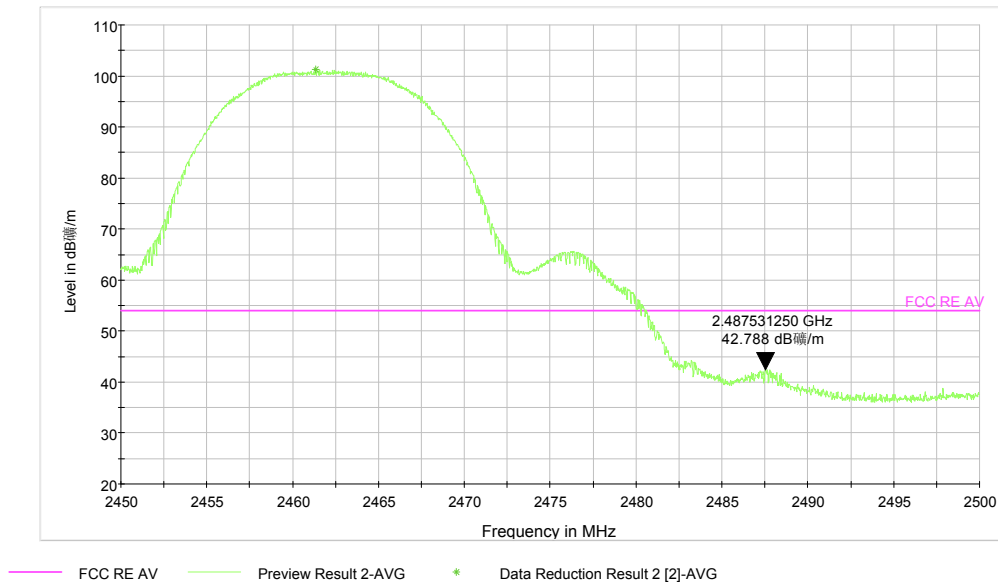
Peak



Note: The signal beyond the limit is carrier

Channel 11

Average



Note: The signal beyond the limit is carrier

Channel 11

TA Technology (Shanghai) Co., Ltd.

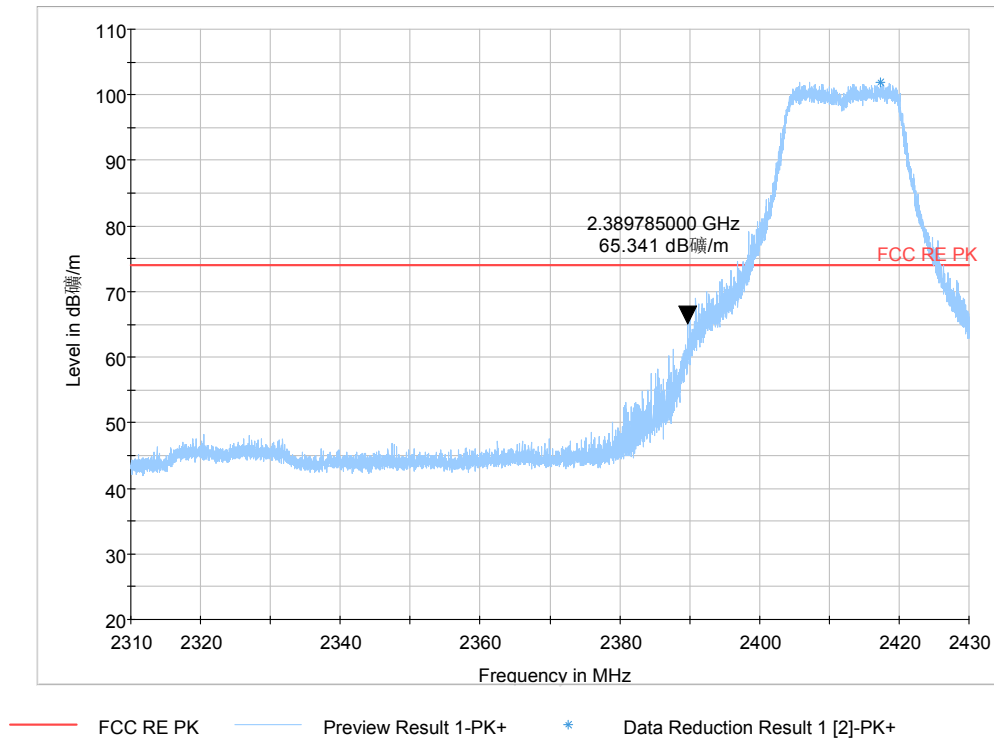
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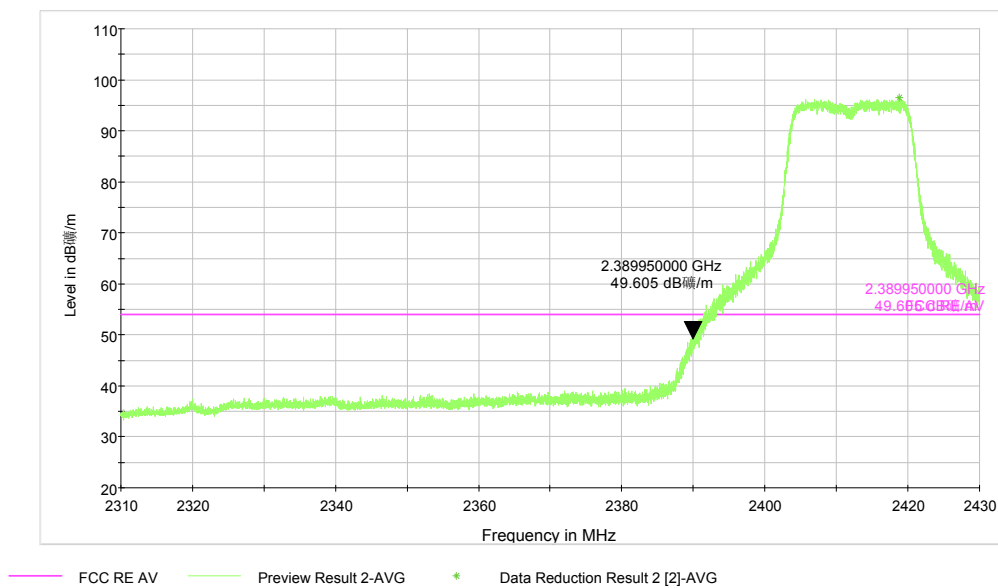
802.11g-Channel 1:

Peak



Note: The signal beyond the limit is carrier
Channel 1

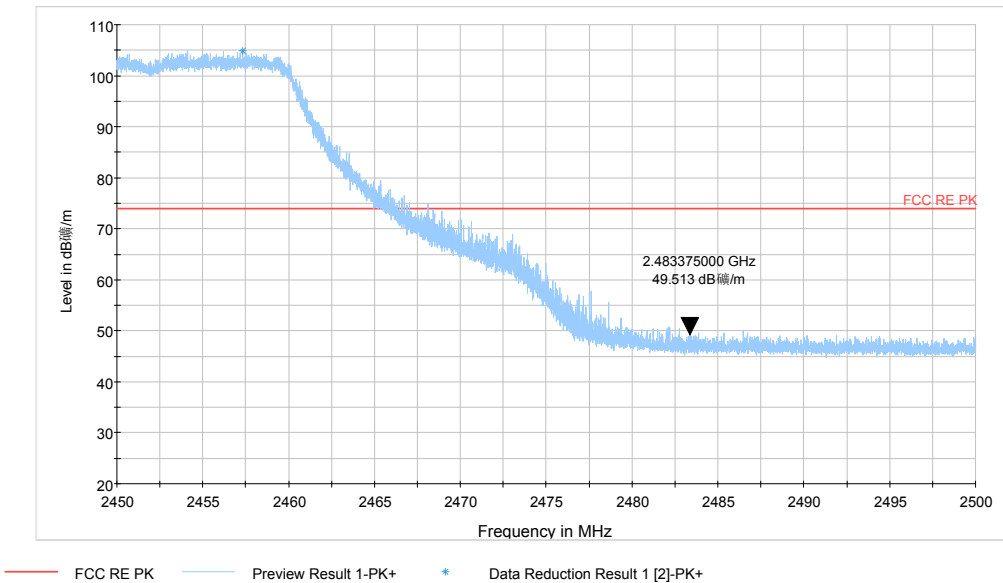
Average



Note: The signal beyond the limit is carrier
Channel 1

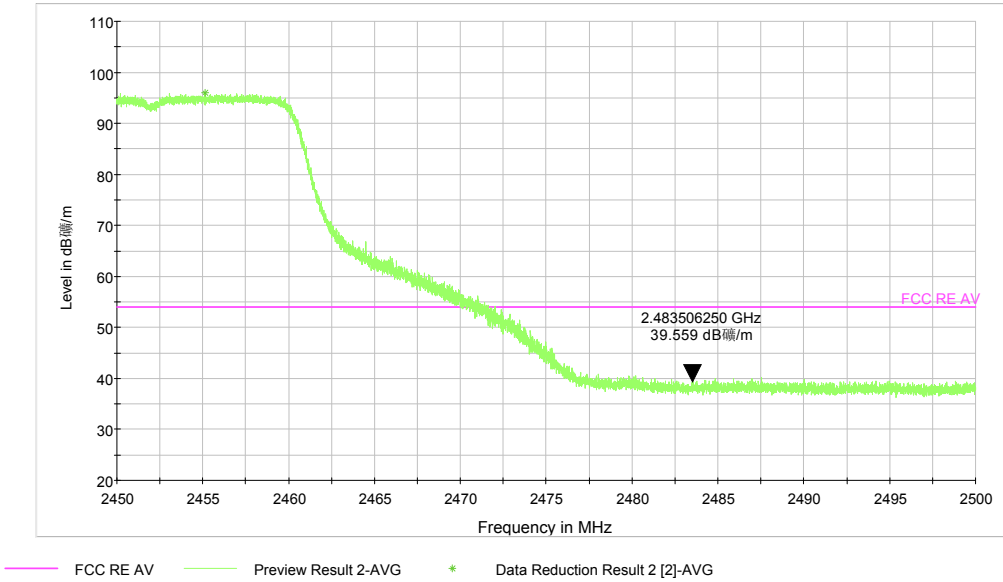
802.11g-Channel 11:

Peak



Note: The signal beyond the limit is carrier
Channel 11

Average



Note: The signal beyond the limit is carrier
Channel 11

TA Technology (Shanghai) Co., Ltd.

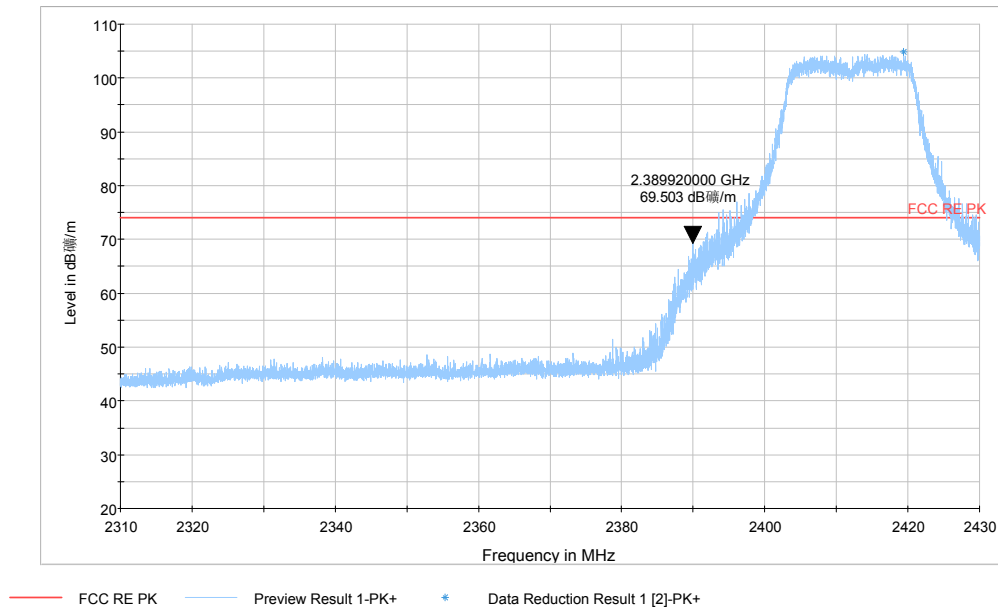
Test Report

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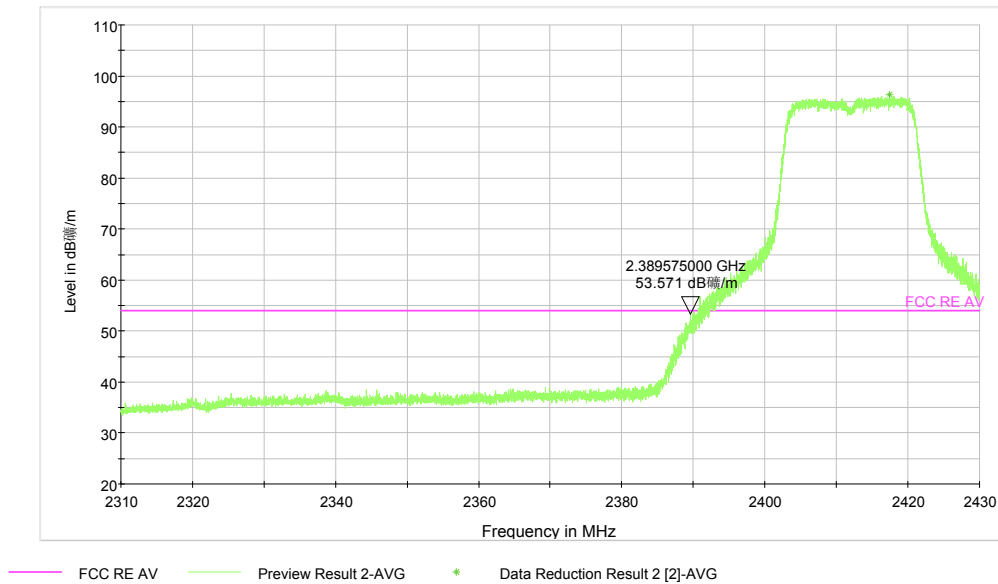
802.11n-Channel 1(HT20):

Peak



Note: The signal beyond the limit is carrier
Channel 1

Average



Note: The signal beyond the limit is carrier
Channel 1

TA Technology (Shanghai) Co., Ltd.

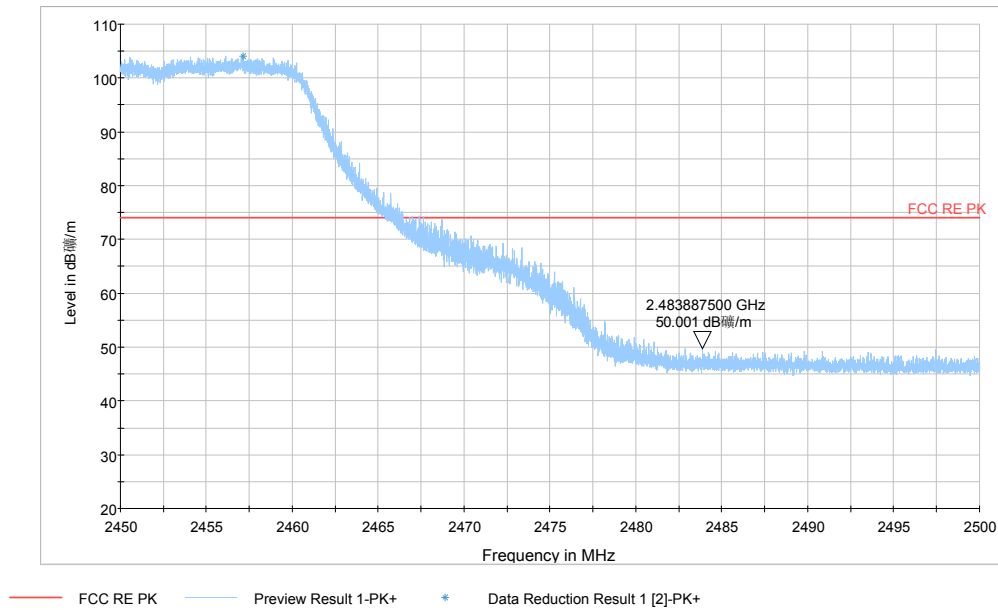
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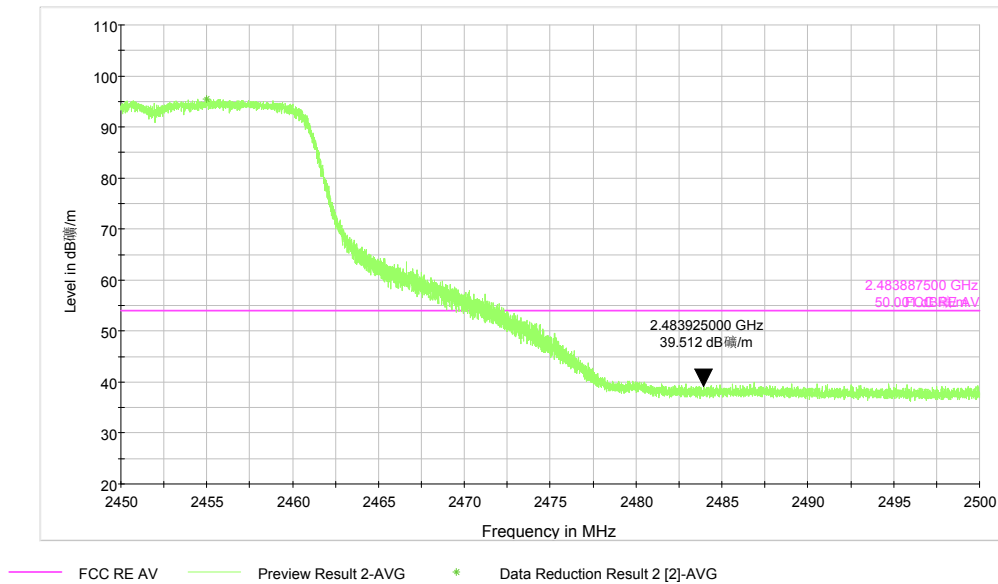
802.11n-Channel 11(HT20):

Peak



Note: The signal beyond the limit is carrier
Channel 11

Average



Note: The signal beyond the limit is carrier
Channel 11

TA Technology (Shanghai) Co., Ltd.

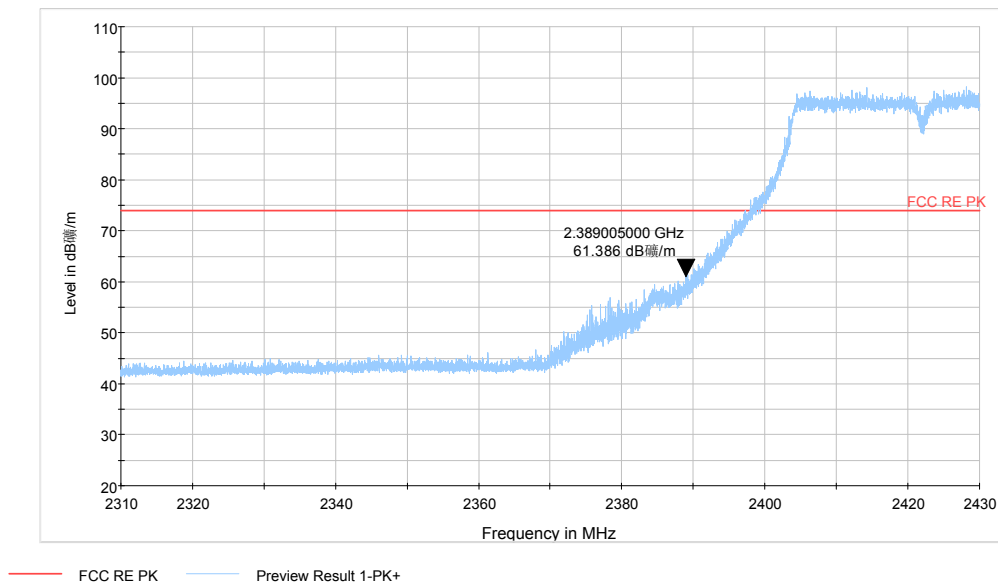
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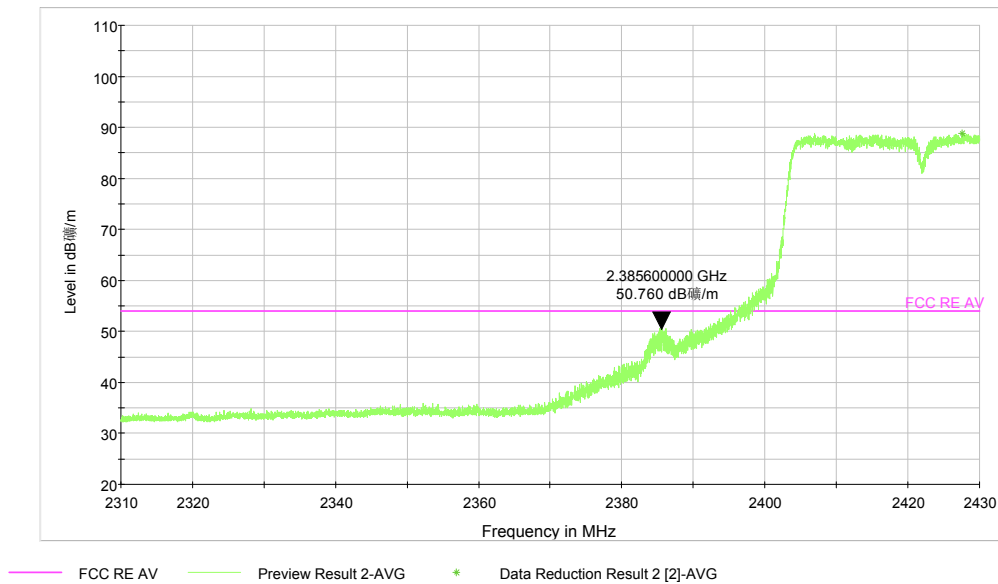
802.11n-Channel 3(HT40):

Peak



Note: The signal beyond the limit is carrier
Channel 3

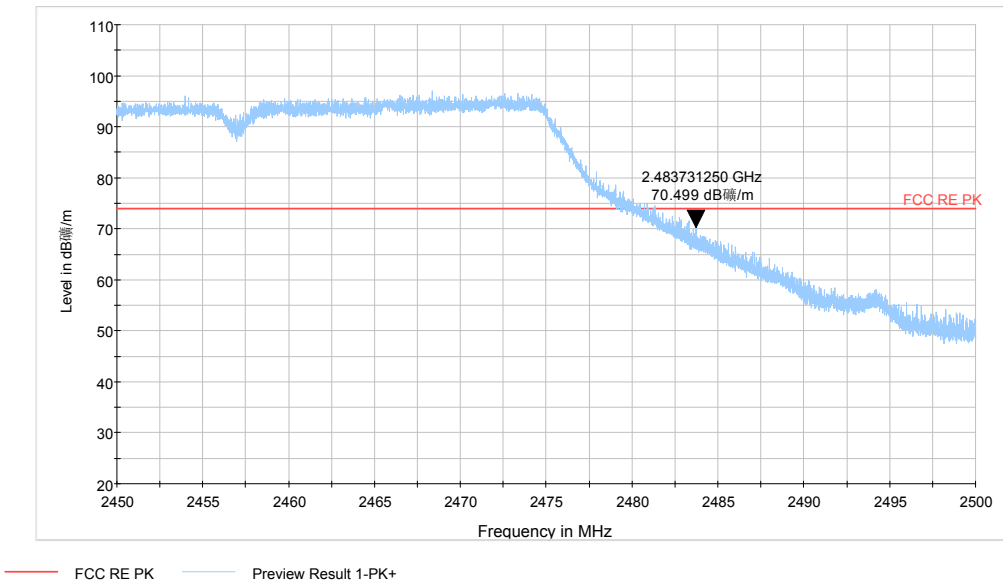
Average



Note: The signal beyond the limit is carrier
Channel 3

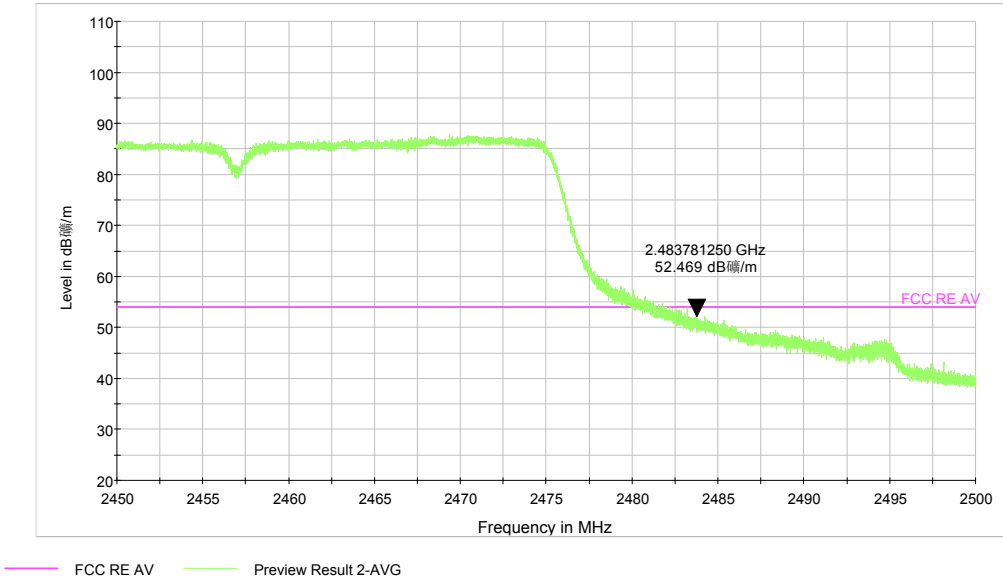
802.11n-Channel 9(HT40):

Peak



Note: The signal beyond the limit is carrier
Channel 9

Average



Note: The signal beyond the limit is carrier
Channel 9

TA Technology (Shanghai) Co., Ltd.

Test Report

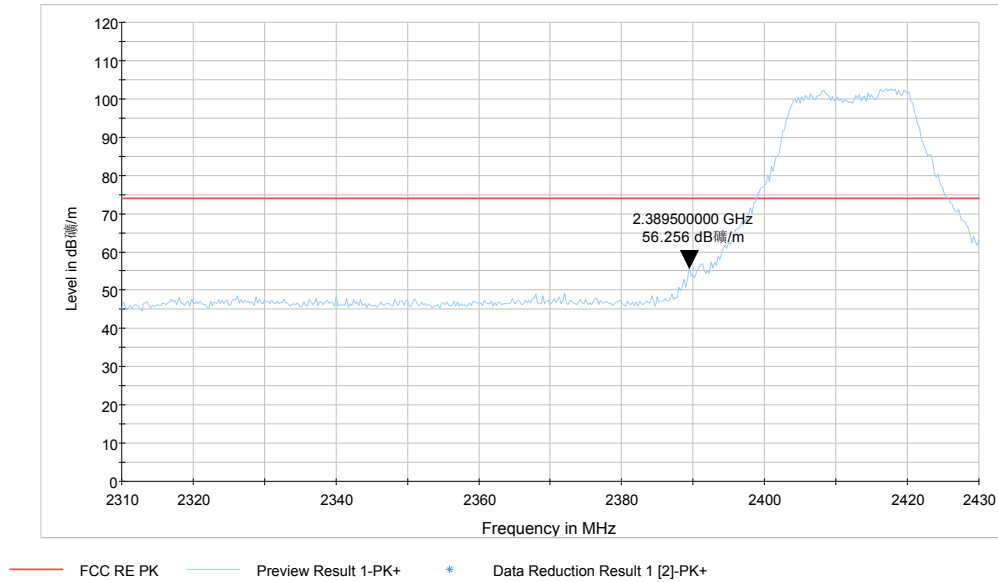
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MIMO

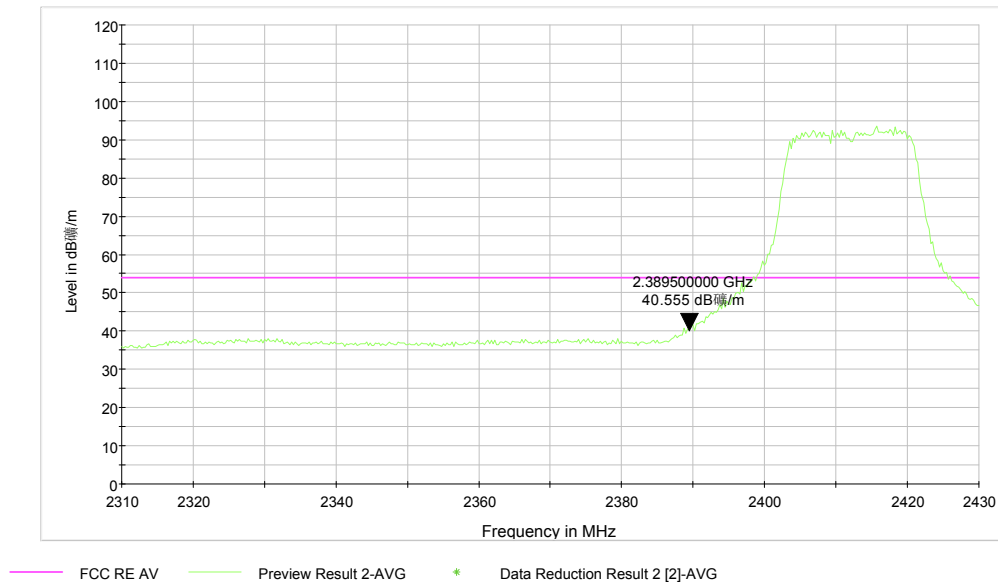
802.11n-Channel 1(HT20):

Peak



Note: The signal beyond the limit is carrier
Channel 1

Average



Note: The signal beyond the limit is carrier
Channel 1

TA Technology (Shanghai) Co., Ltd.

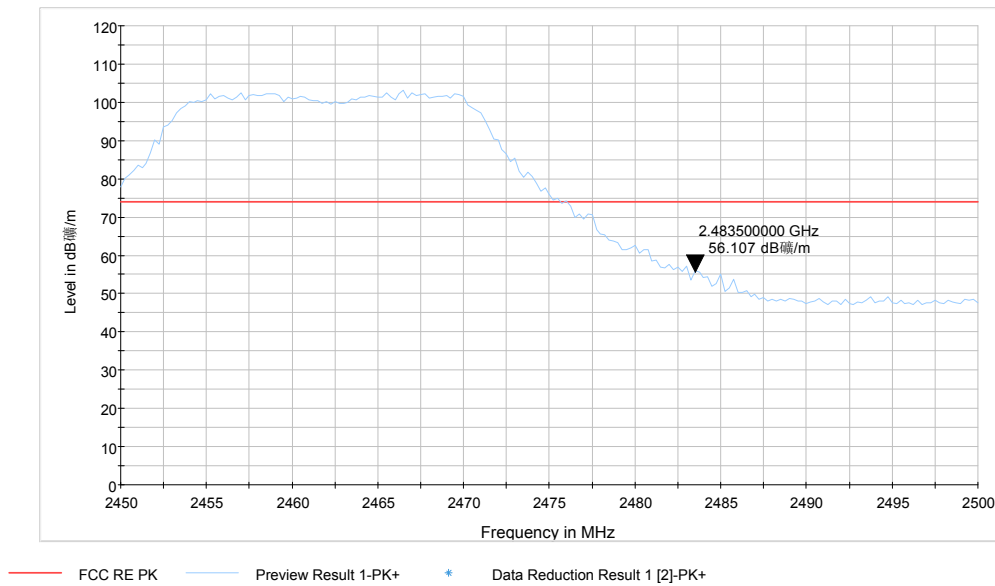
Test Report

Report No.:RHA1505-0034RF01R3

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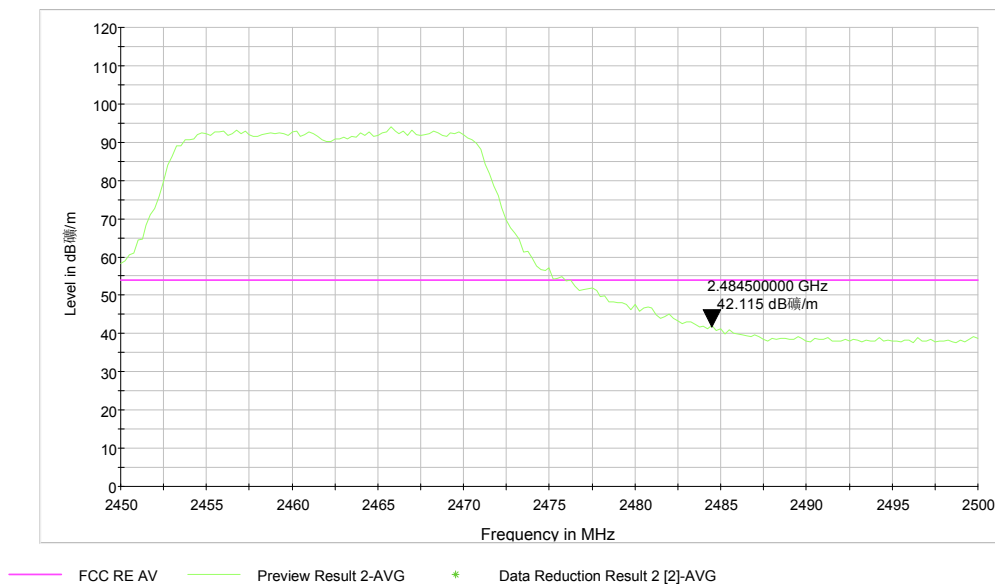
802.11n-Channel 11(HT20):

Peak



Note: The signal beyond the limit is carrier
Channel 11

Average



Note: The signal beyond the limit is carrier
Channel 11

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802.11n-Channel 03(HT40):

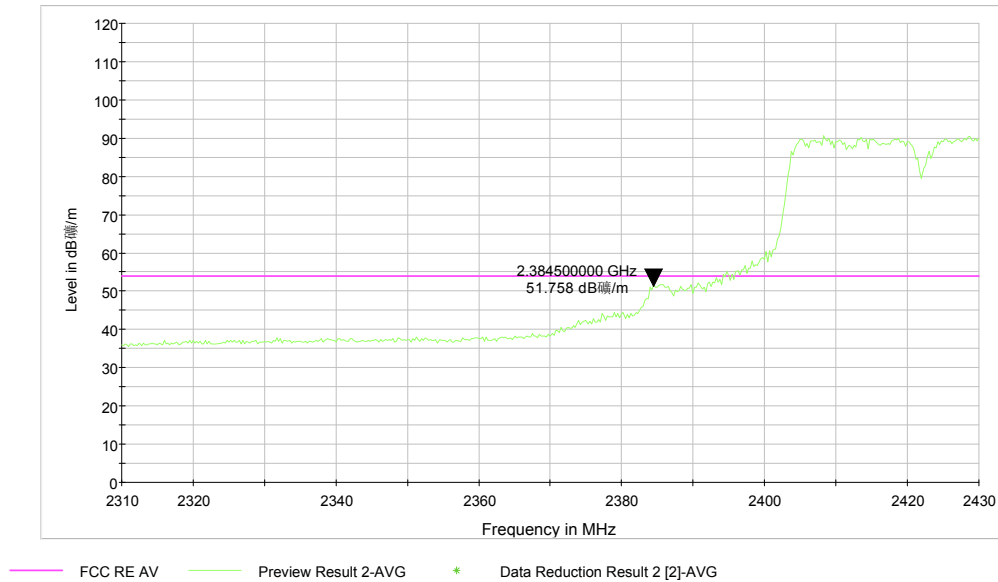
Peak



Note: The signal beyond the limit is carrier

Channel 3

Average



Note: The signal beyond the limit is carrier

Channel 3

TA Technology (Shanghai) Co., Ltd.

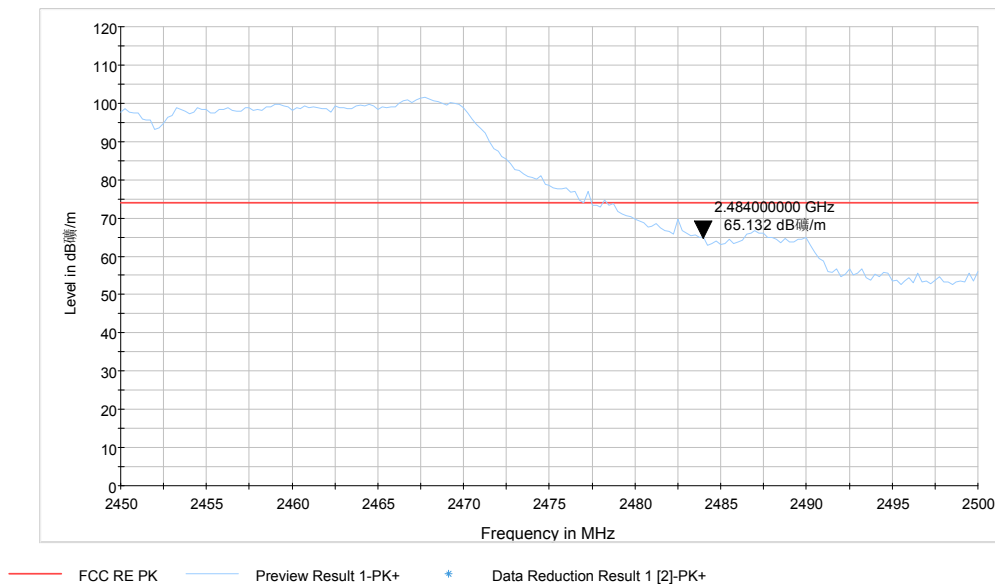
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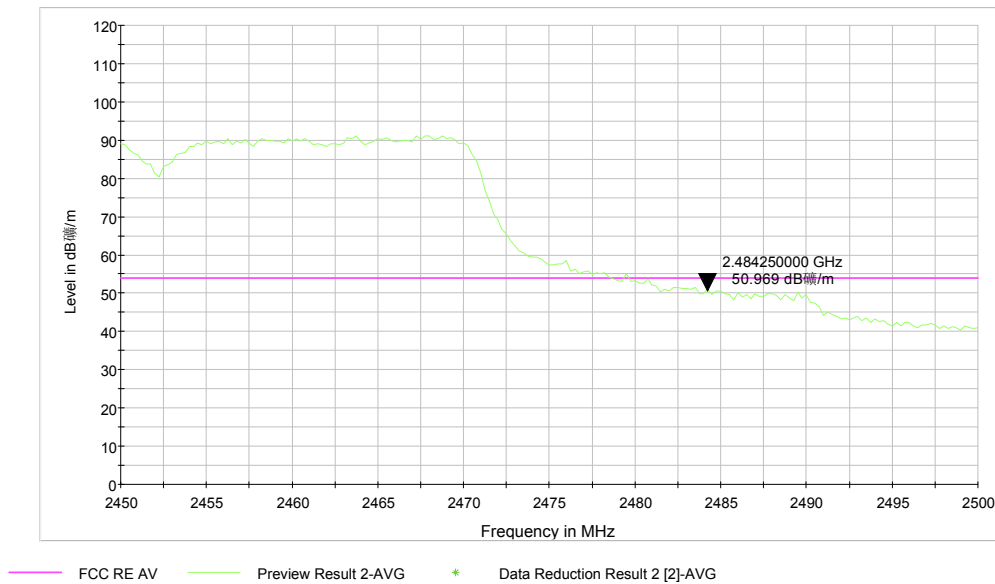
802.11n-Channel 09(HT40):

Peak



Note: The signal beyond the limit is carrier
Channel 9

Average



Note: The signal beyond the limit is carrier
Channel 9

2.7. Power Spectral Density

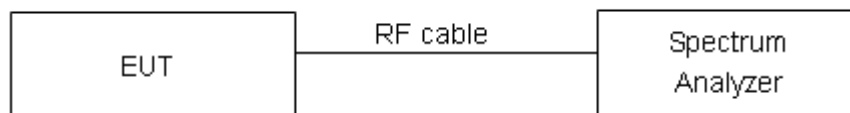
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

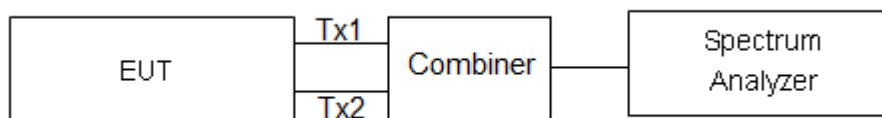
Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 3 kHz and VBW is set to 10 kHz on spectrum analyzer. Set the span to at least 1.5 times the DTS channel bandwidth. Sweep time = auto couple. Trace mode = max hold. The peak power spectral density is recorded.

Test setup



For MIMO



Limits

Rule Part 15.247(e) specifies that "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. "

Limits	$\leq 8 \text{ dBm} / 3\text{kHz}$
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=0.75\text{dB}$.

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Test Results:

Antenna	Network Standards	Channel Number	Power Spectral Density dBm / 3kHz	Conclusion
Antenna 1	802.11b	1	-10.497	PASS
		6	-11.305	PASS
		11	-12.335	PASS
	802.11g	1	-17.031	PASS
		6	-18.510	PASS
		11	-19.487	PASS
	802.11n HT20	1	-22.341	PASS
		6	-22.853	PASS
		11	-23.976	PASS
	802.11n HT40	3	-24.932	PASS
		6	-25.294	PASS
		9	-26.209	PASS
Antenna 2	802.11b	1	-10.452	PASS
		6	-10.068	PASS
		11	-10.693	PASS
	802.11g	1	-17.538	PASS
		6	-17.029	PASS
		11	-16.540	PASS
	802.11n HT20	1	-20.646	PASS
		6	-21.926	PASS
		11	-21.758	PASS
	802.11n HT40	3	-23.449	PASS
		6	-22.922	PASS
		9	-24.571	PASS
MIMO	802.11n HT20	1	-19.627	PASS
		6	-18.414	PASS
		11	-19.999	PASS
	802.11n HT40	3	-20.019	PASS
		6	-20.693	PASS
		9	-21.996	PASS

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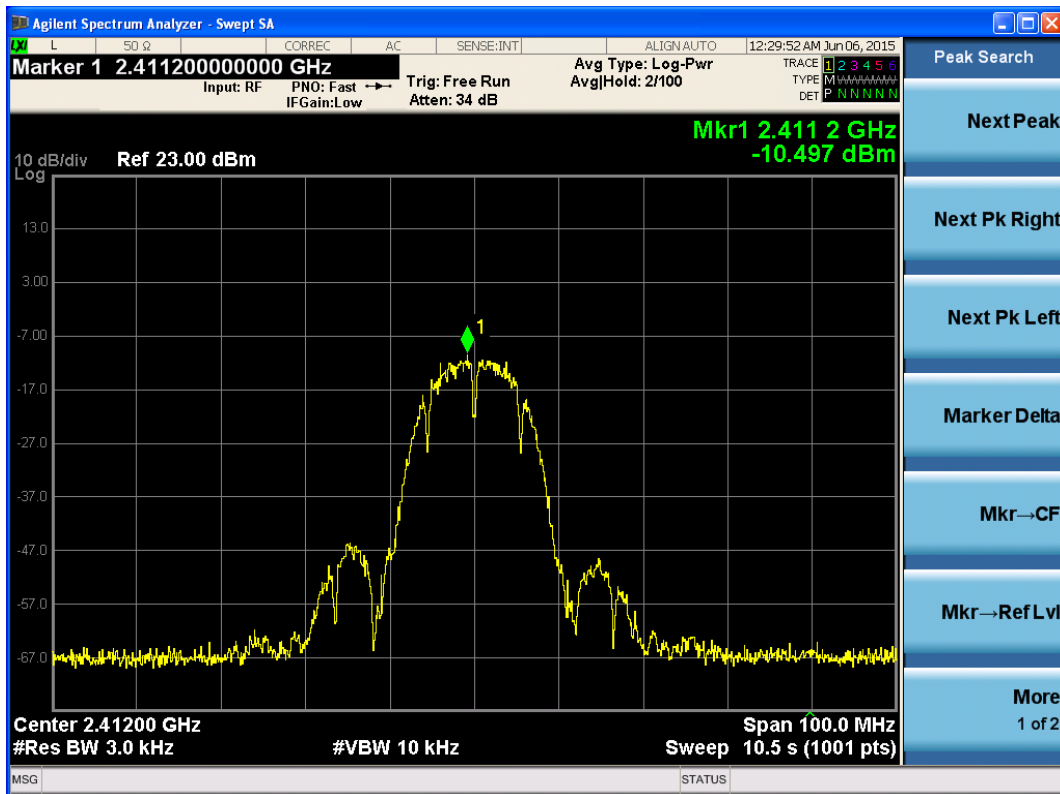
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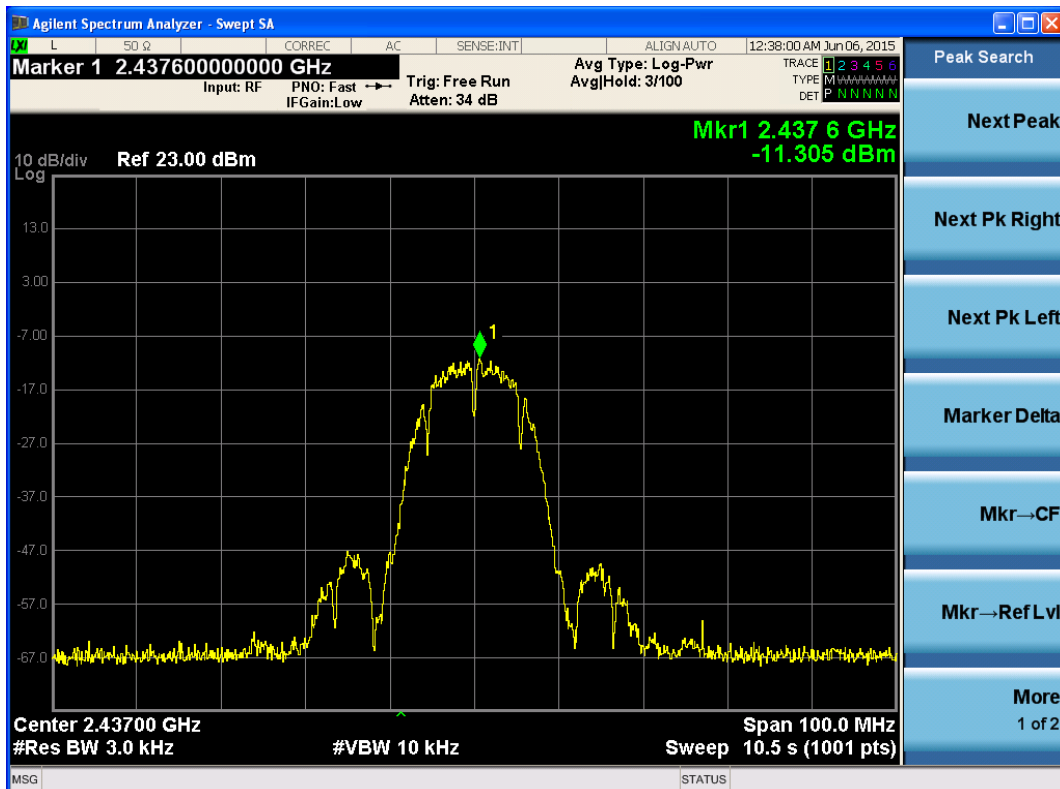
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Antenna 1

802.11b



802.11b, Channel No.: 1

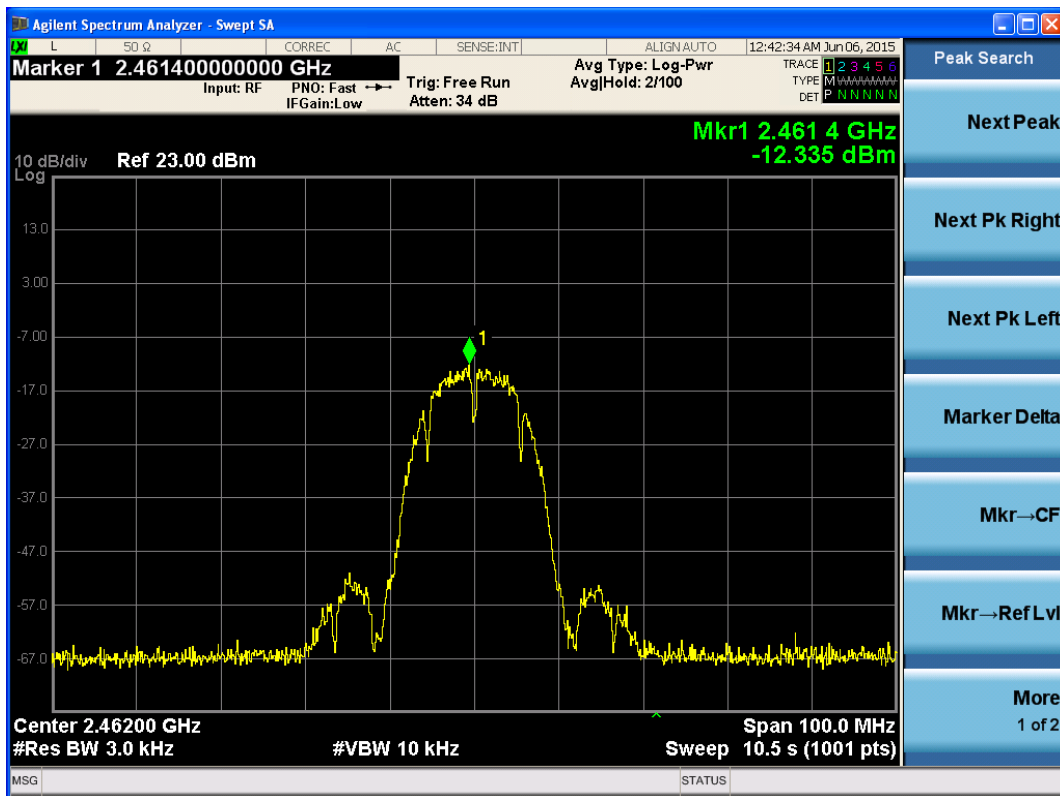


802.11b, Channel No.: 6

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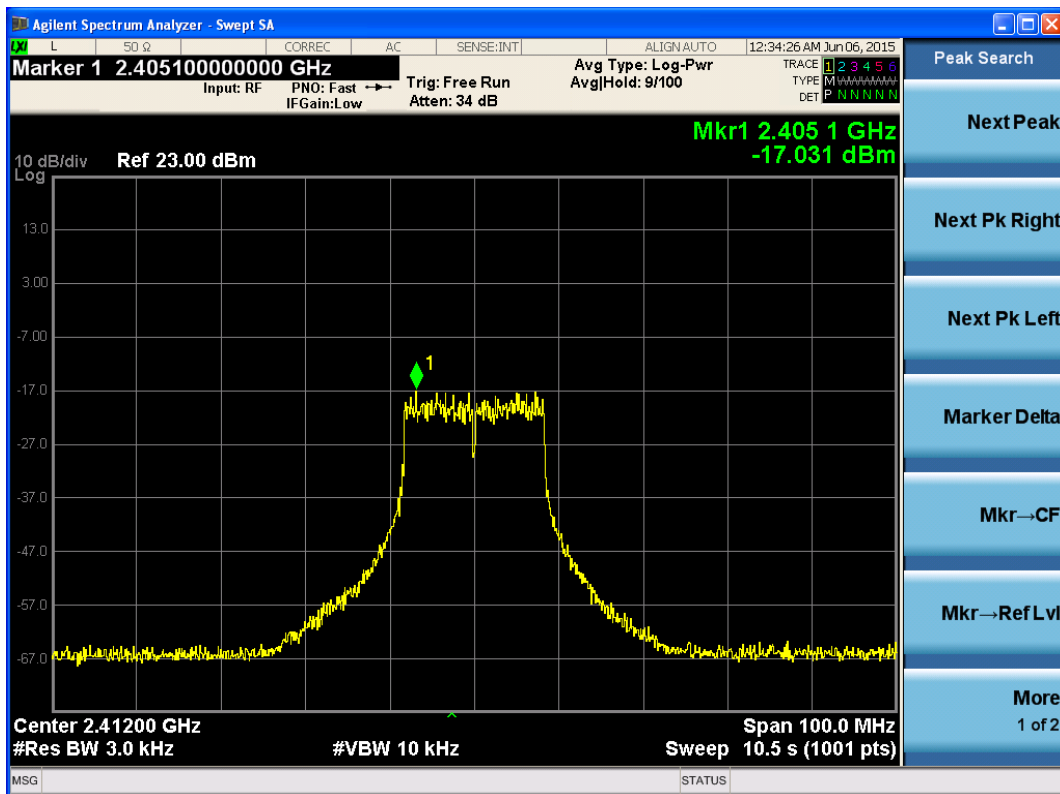
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802.11b, Channel No.: 11

802.11g

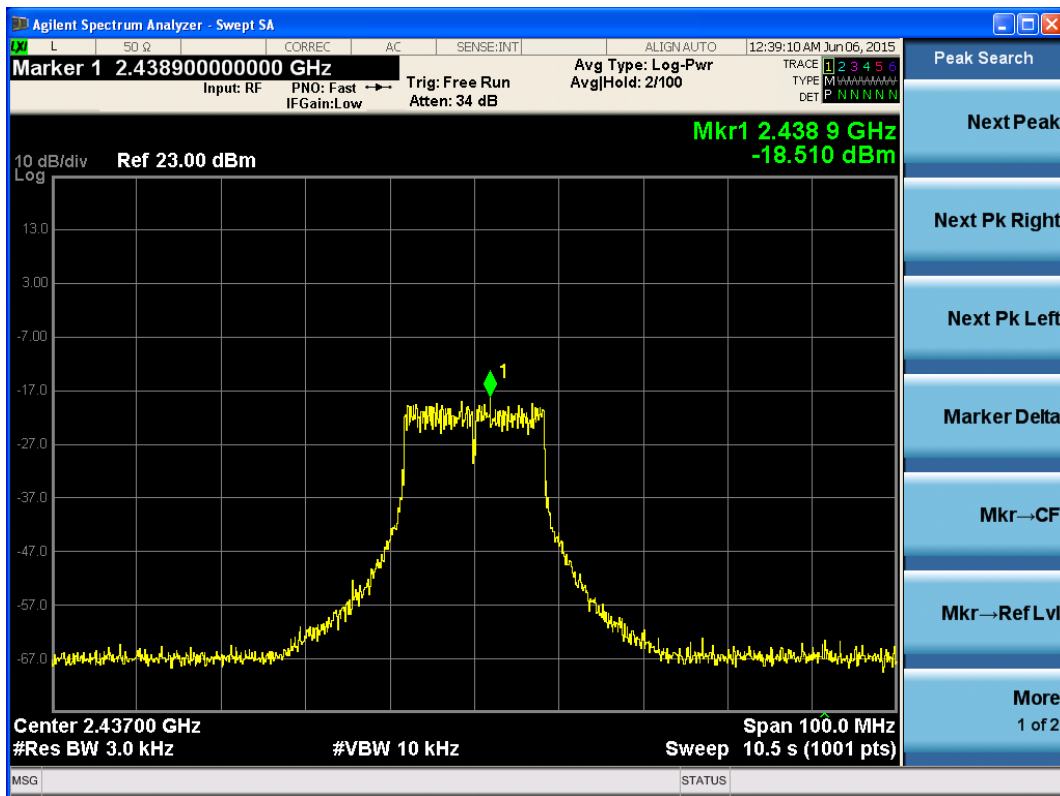


802.11g, Channel No.: 1

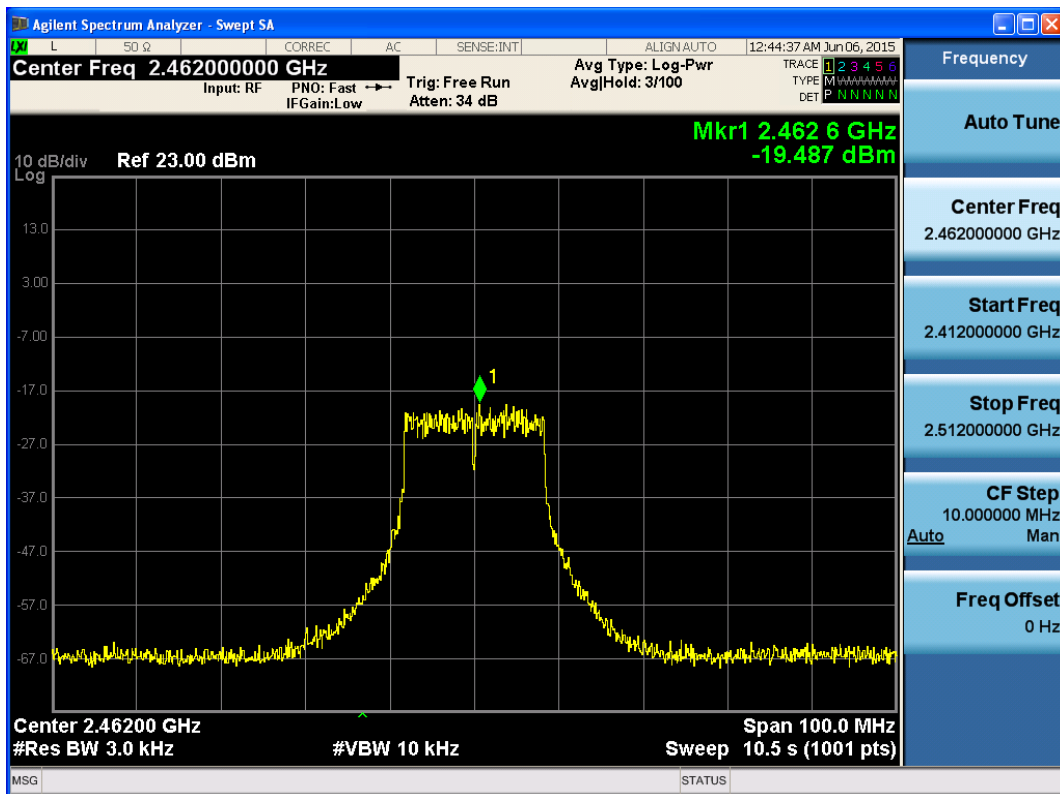
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802.11g, Channel No.: 6



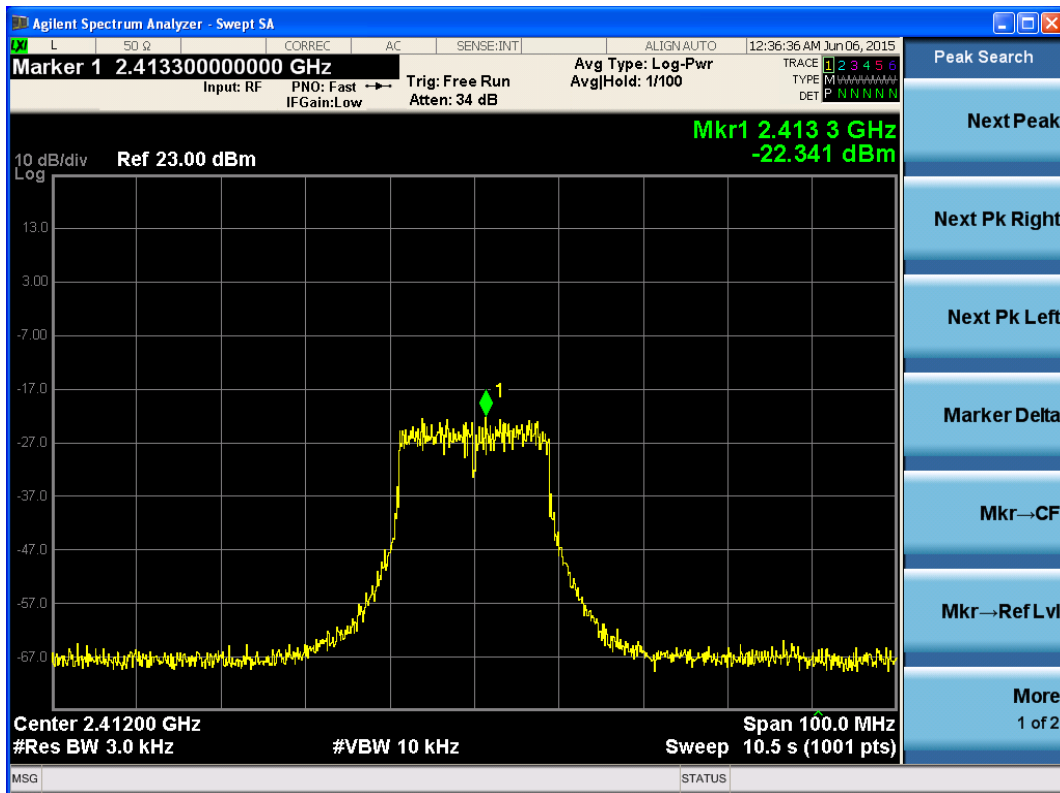
802.11g, Channel No.: 11

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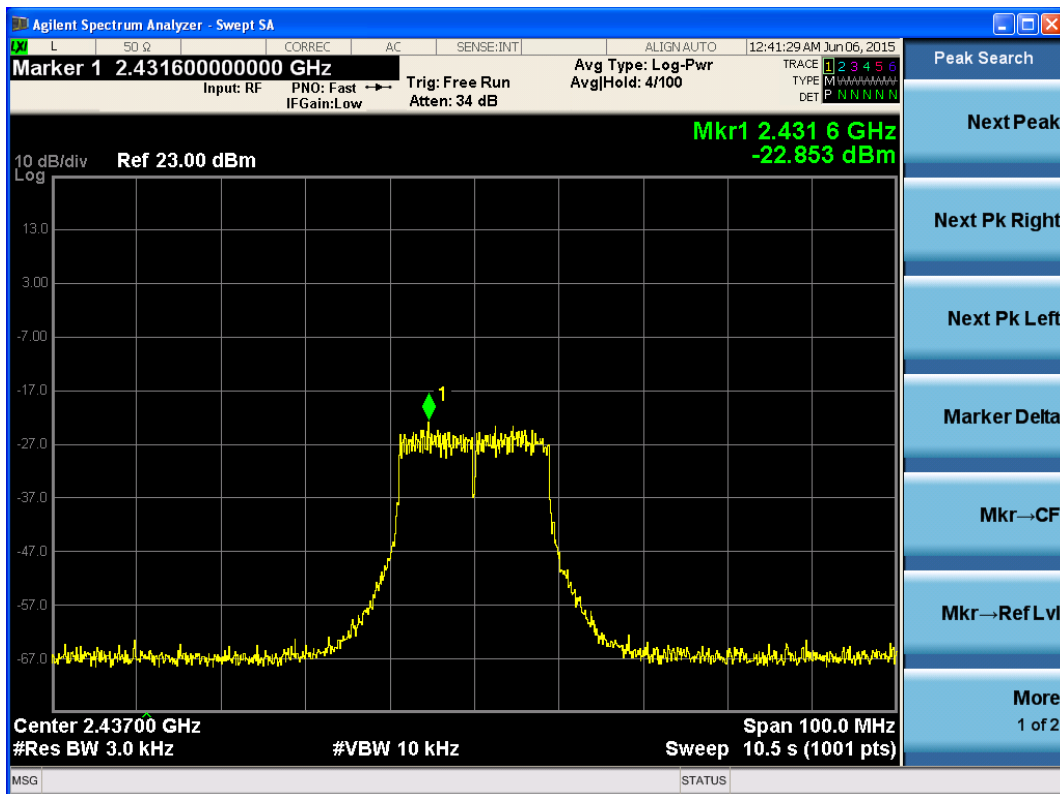
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802.11n(HT20)



802.11n, Channel No.: 1



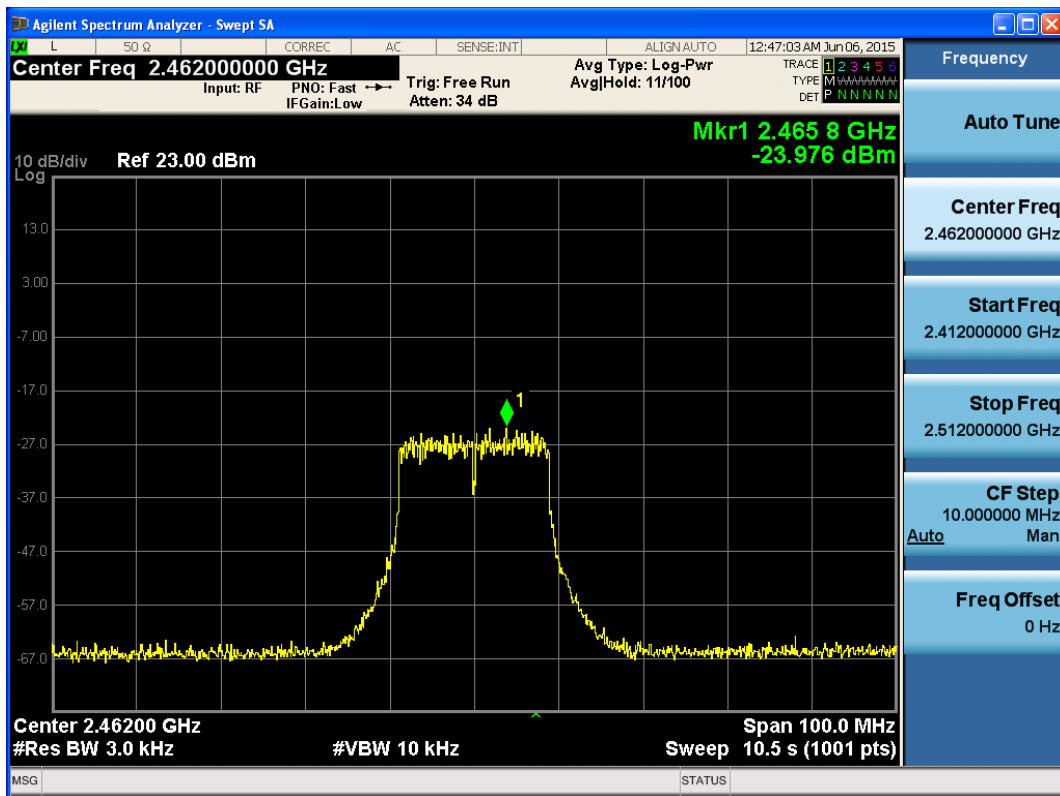
802.11n, Channel No.: 6

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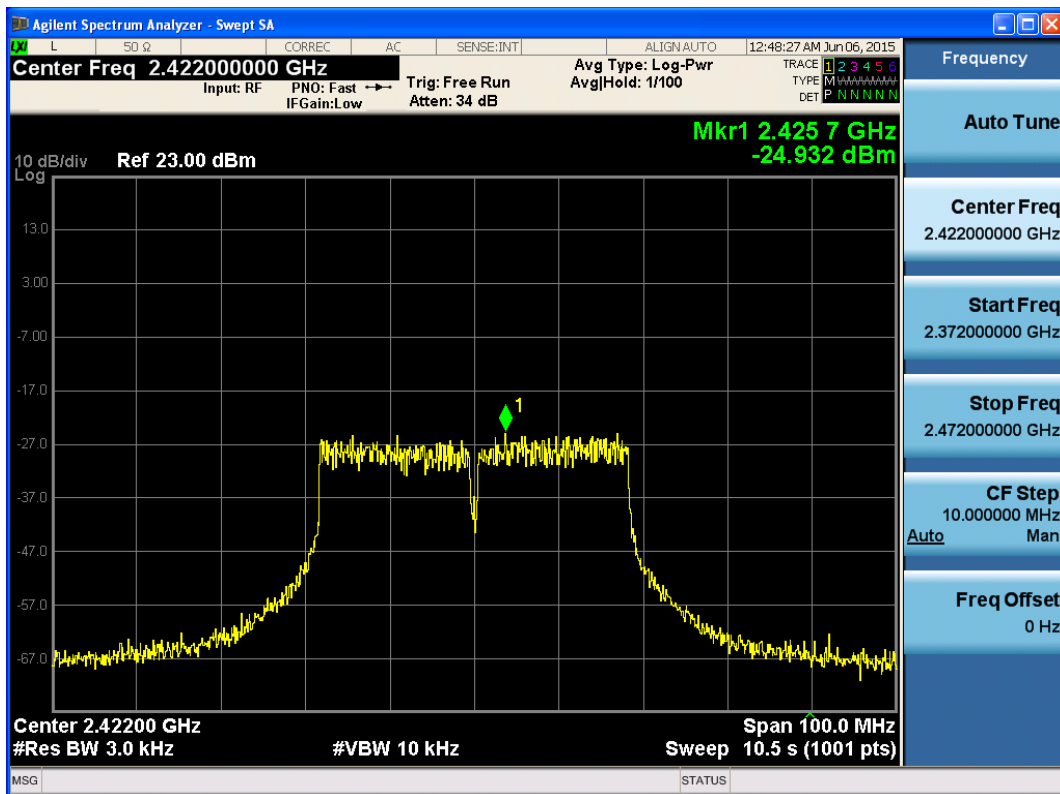
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802.11n, Channel No.: 11

802.11n(HT40)

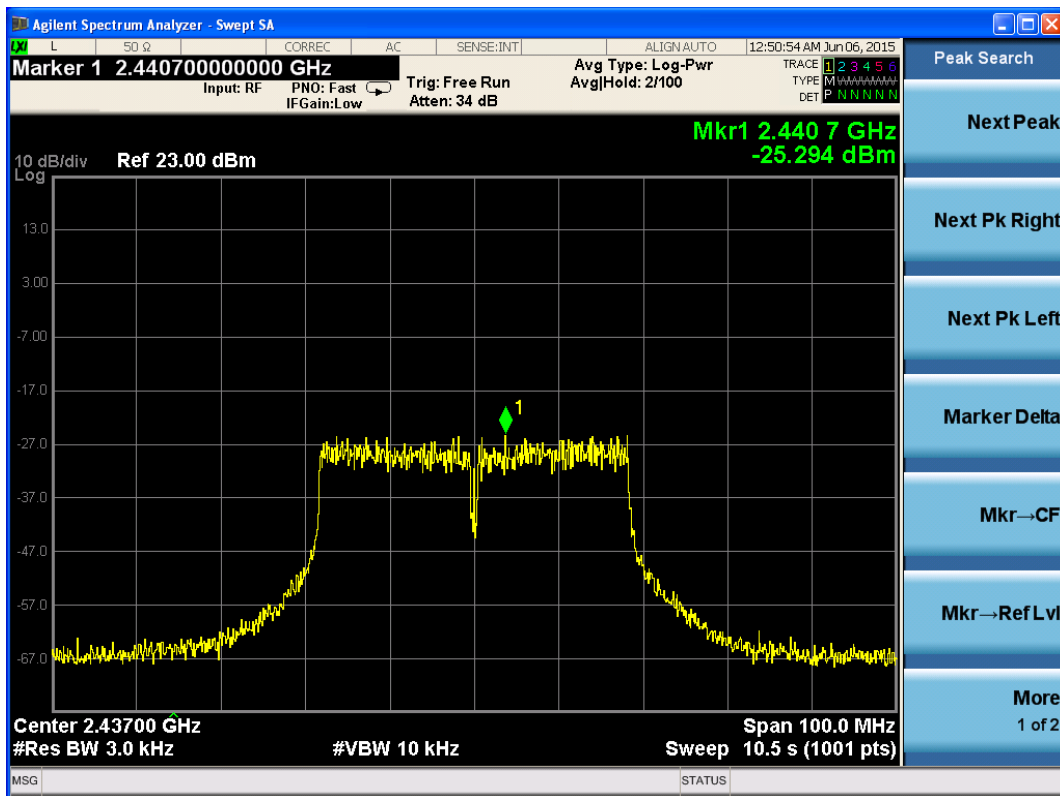


802.11n, Channel No.: 3

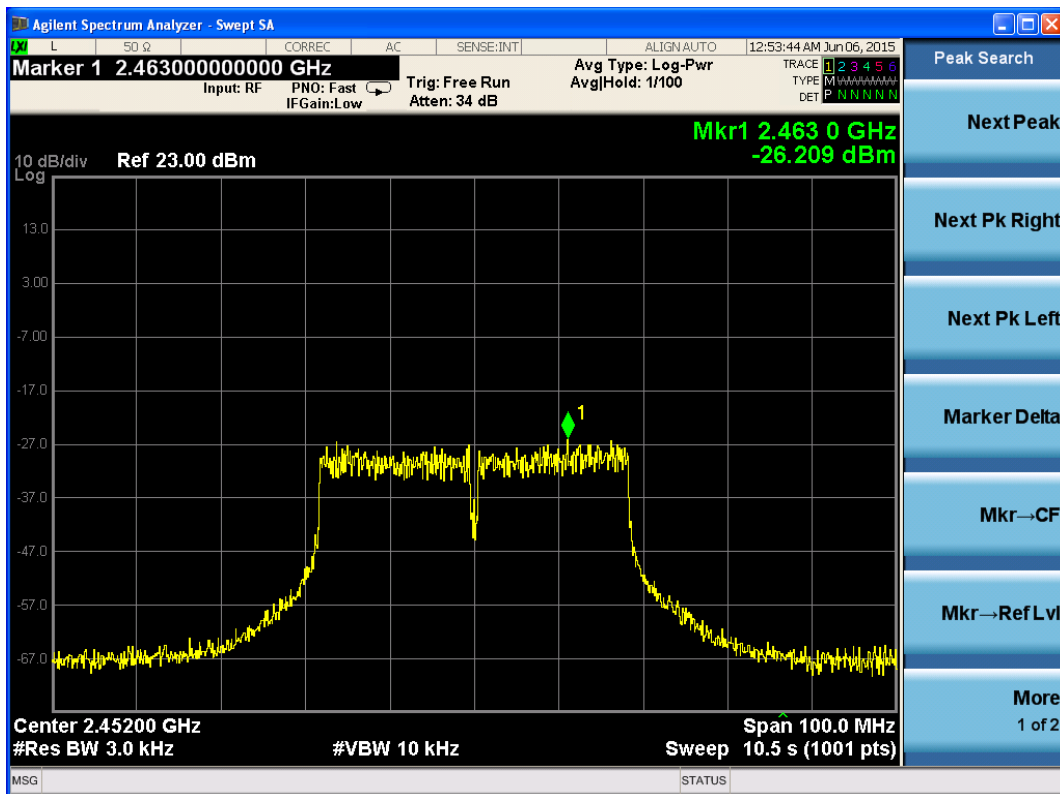
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802.11n, Channel No.: 6



802.11n, Channel No.: 9

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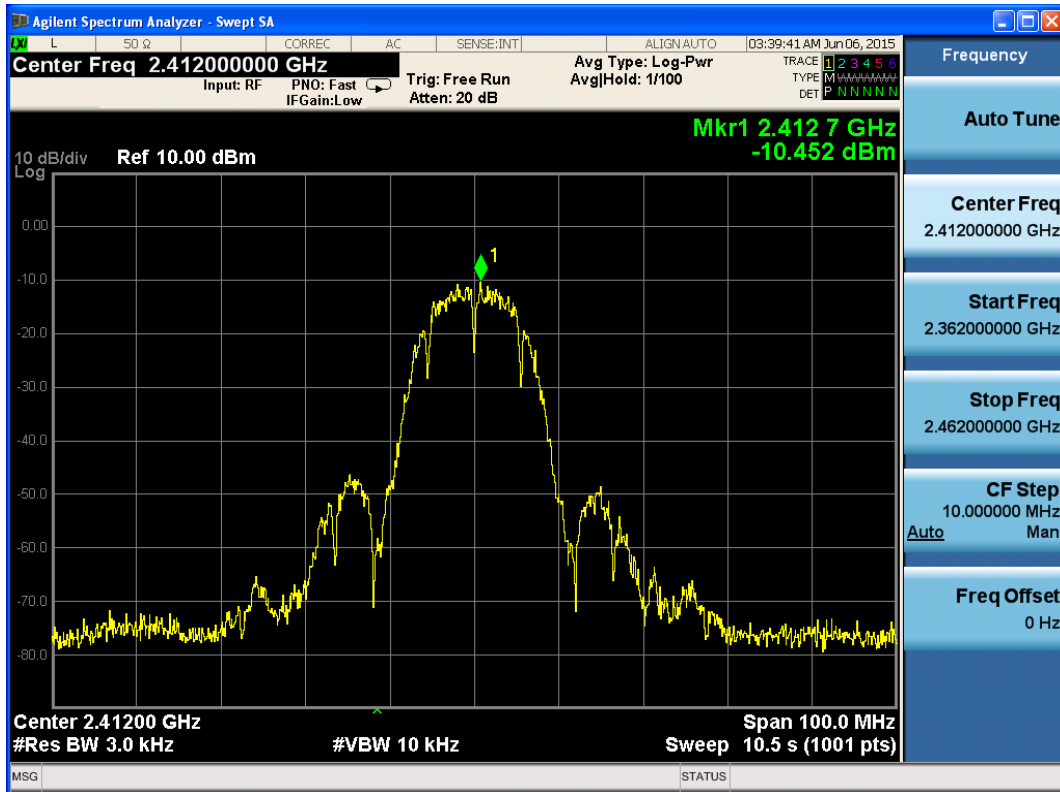
Test Report

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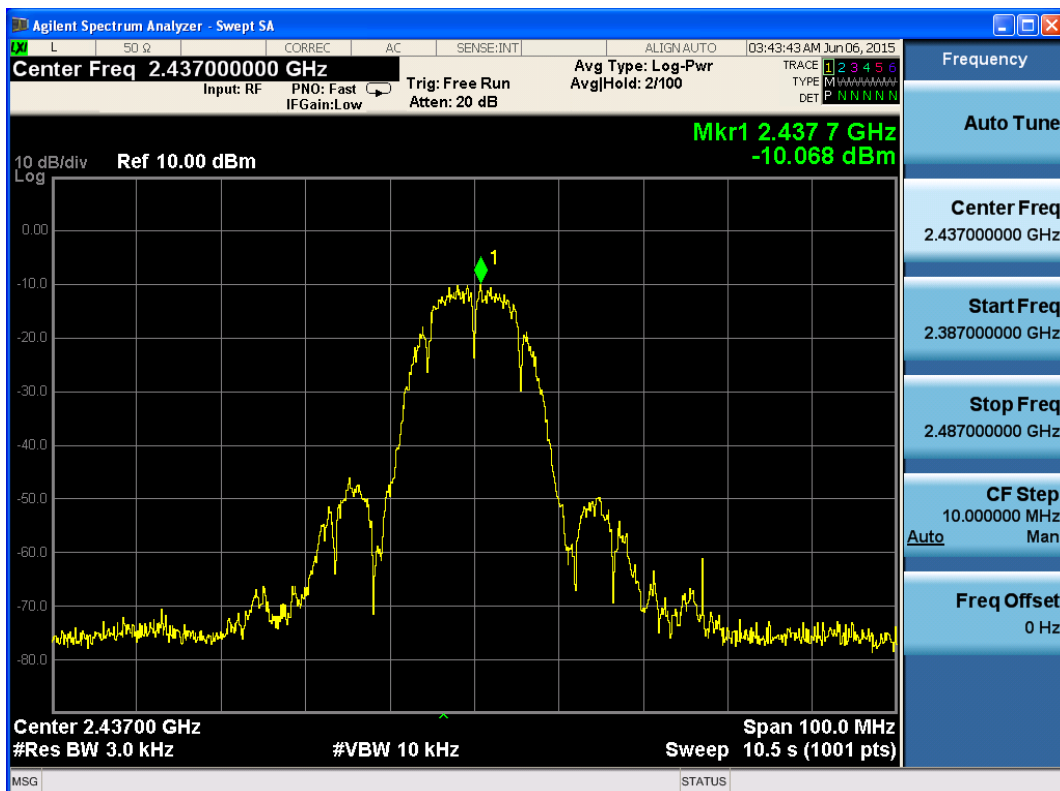
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Antenna 2

802.11b



802.11b, Channel No.: 1

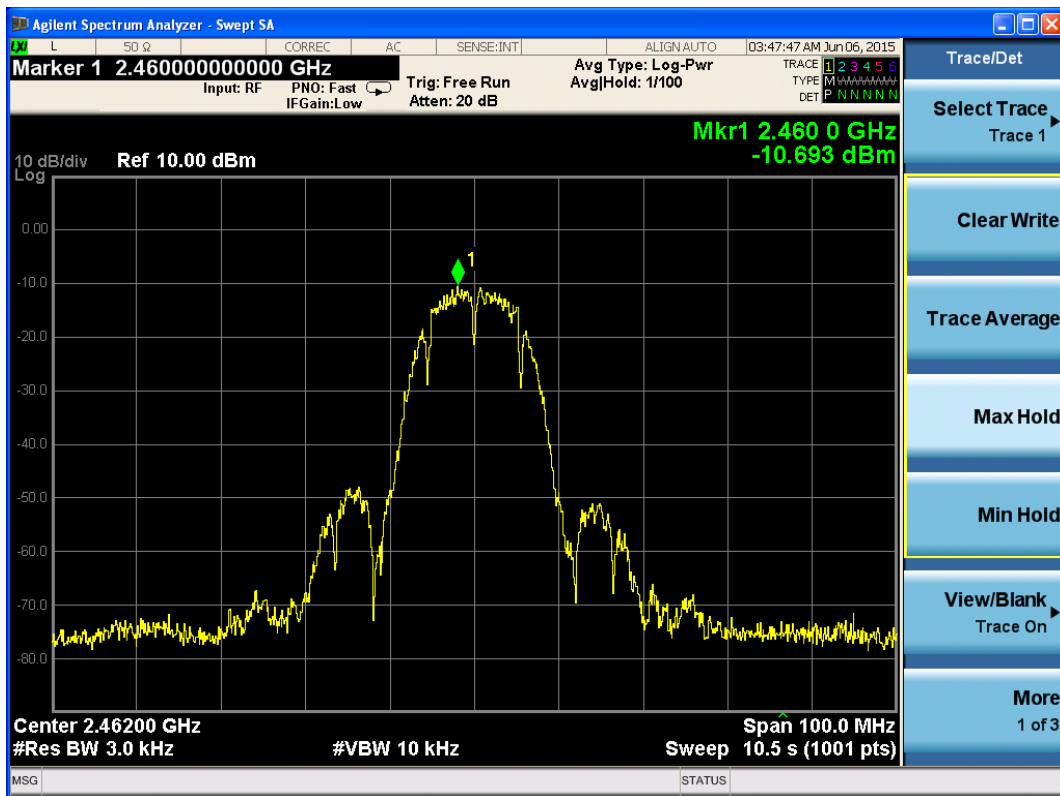


802.11b, Channel No.: 6

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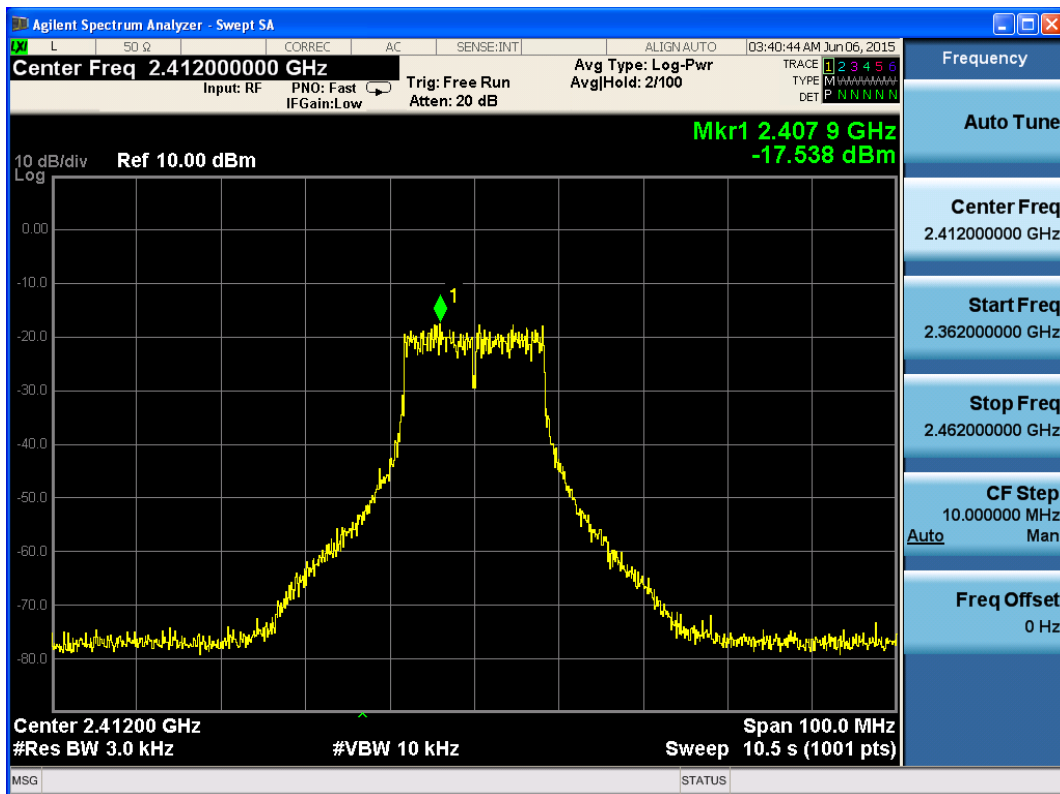
Report No.:RHA1505-0034RF01R3

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802.11b, Channel No.: 11

802.11g



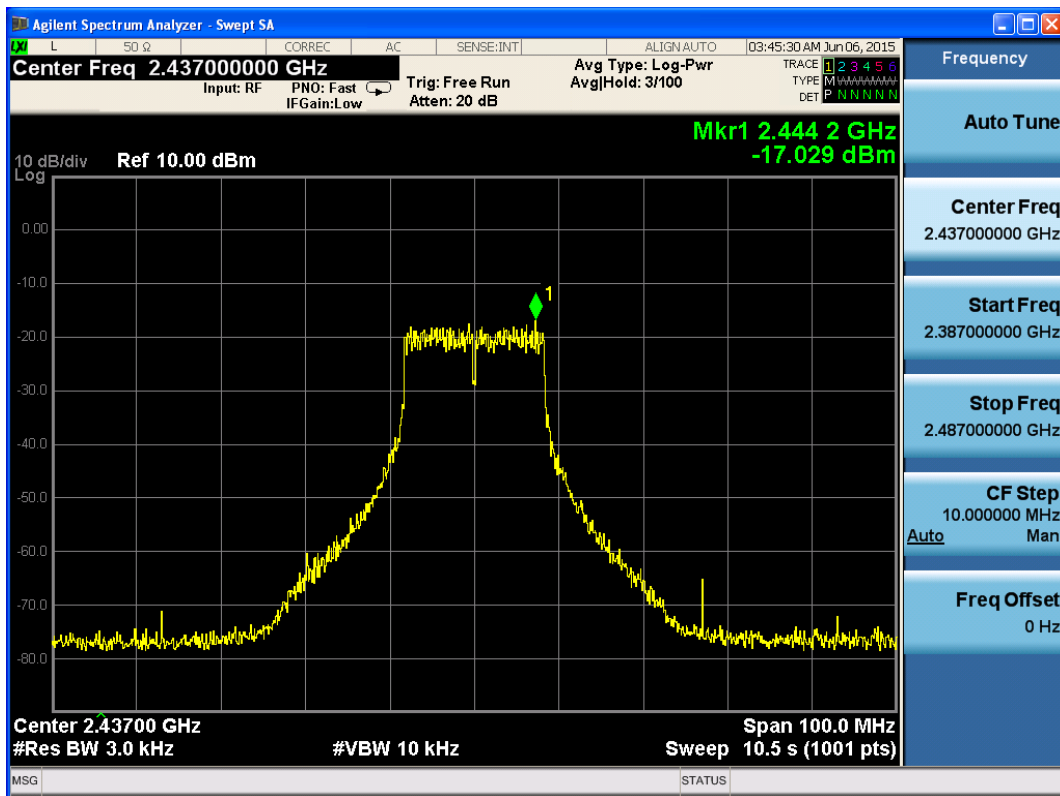
802.11g, Channel No.: 1

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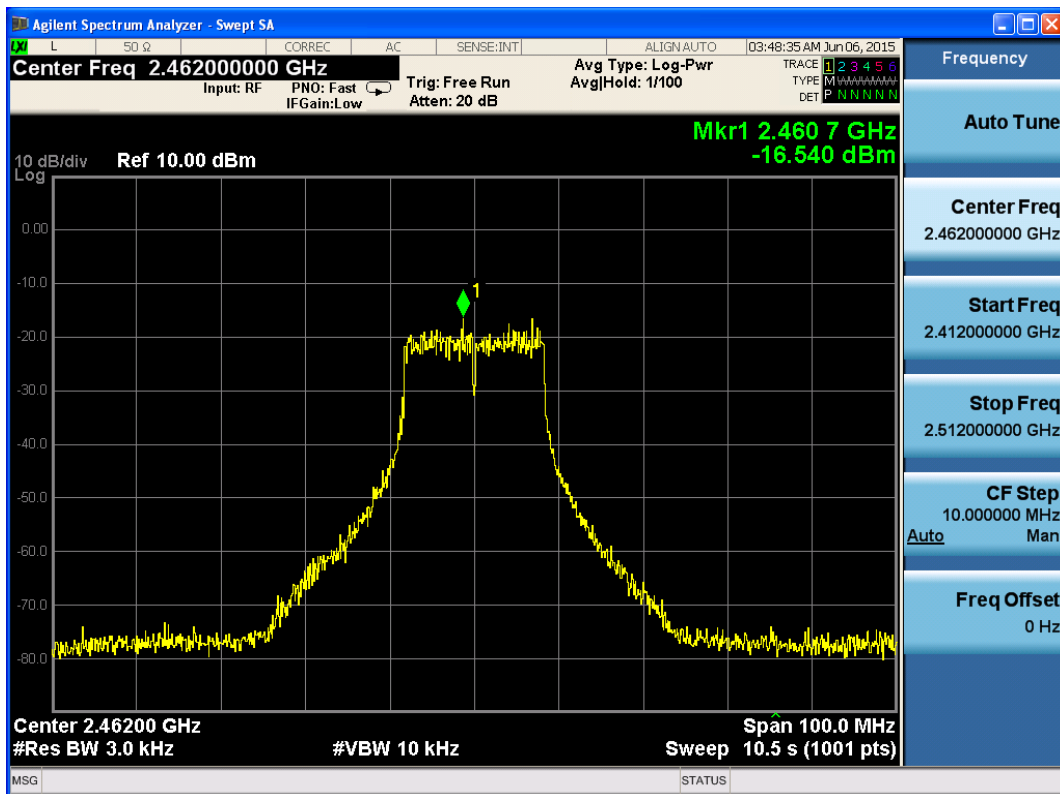
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802.11g, Channel No.: 6



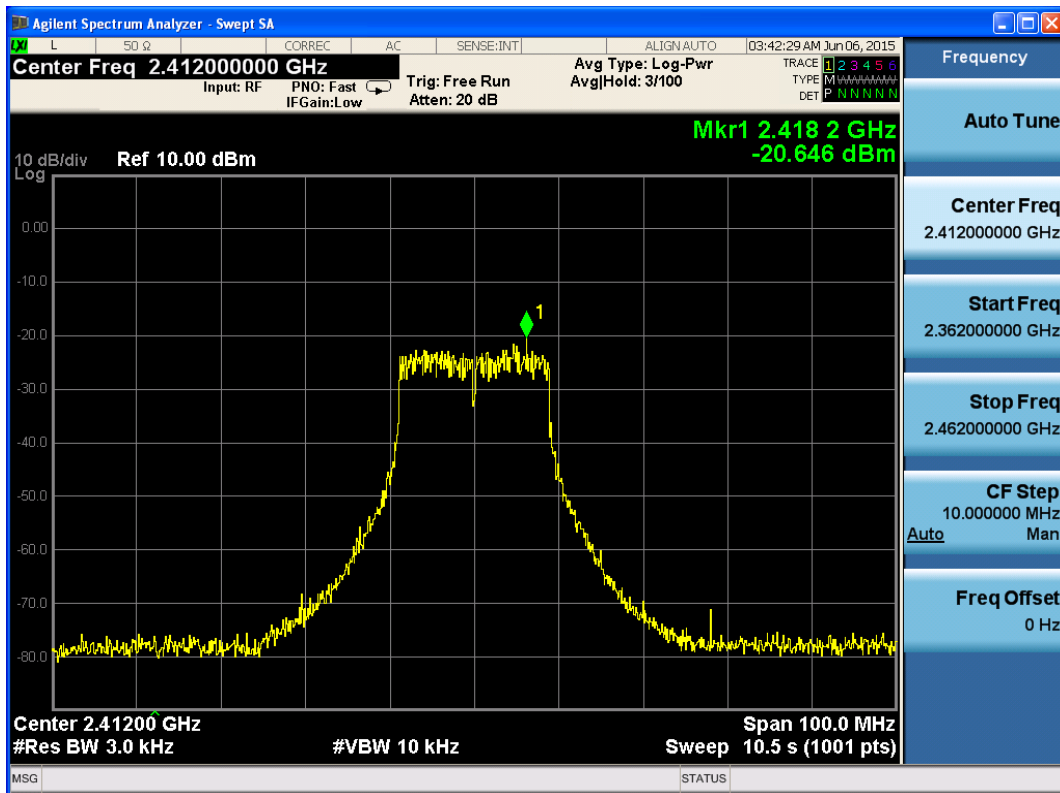
802.11g, Channel No.: 11

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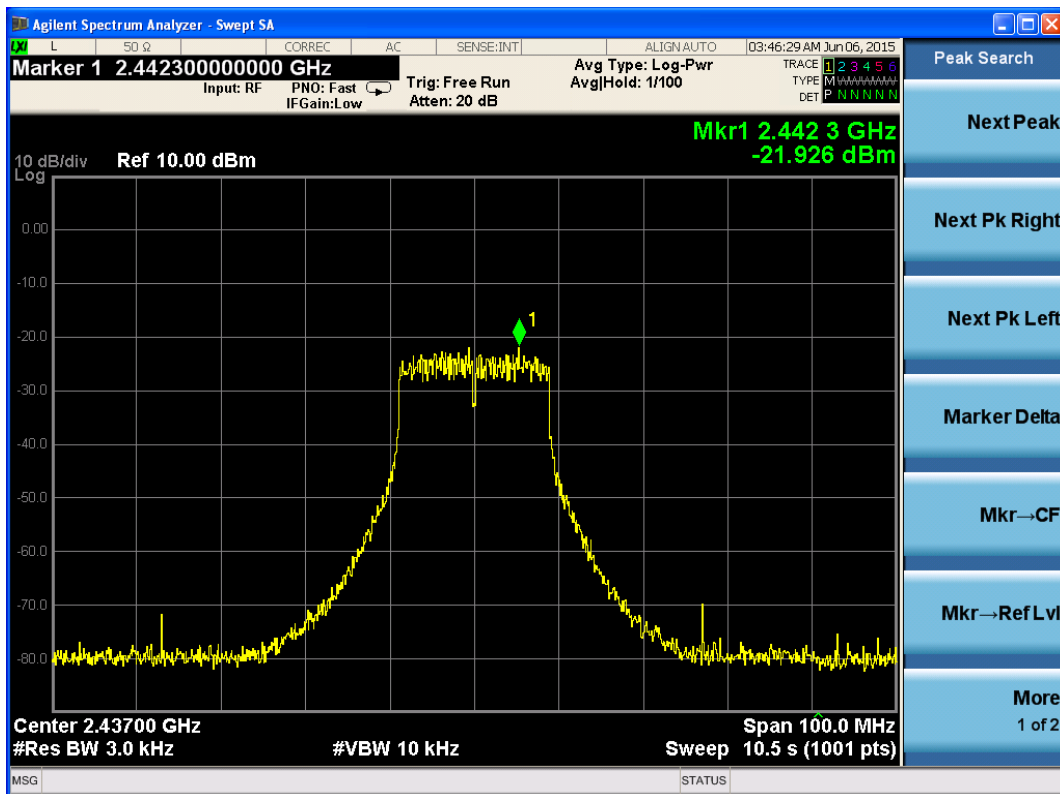
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802.11n(HT20)



802.11n, Channel No.: 1

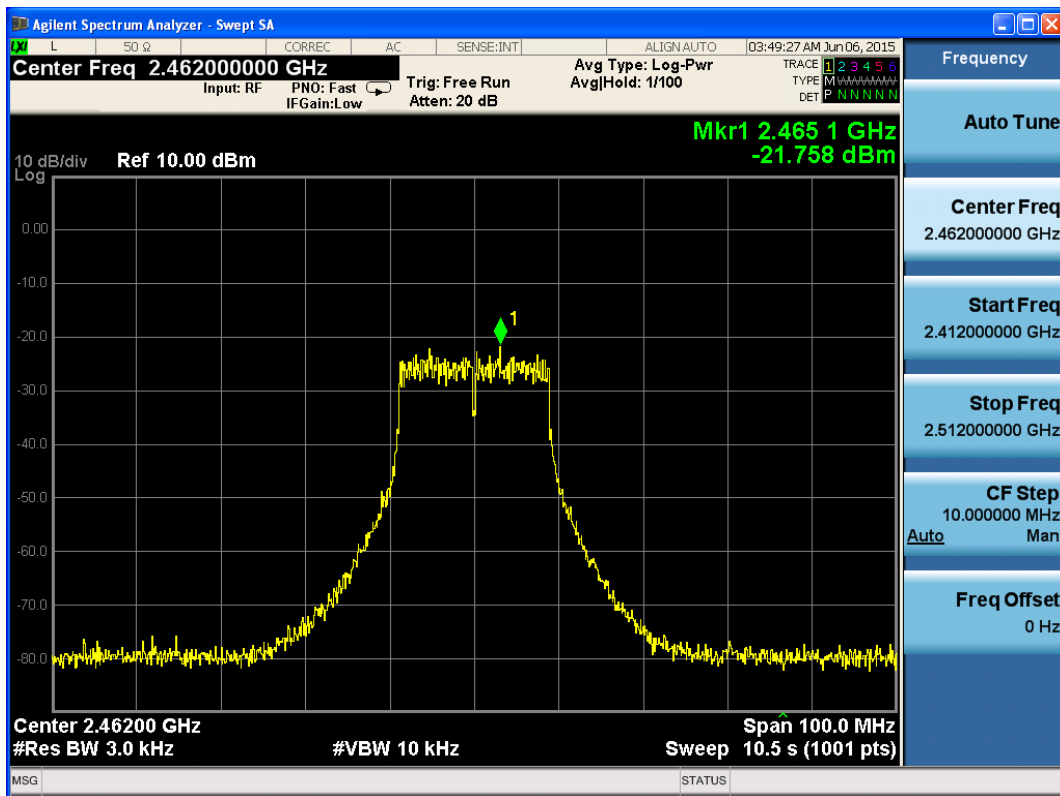


802.11n, Channel No.: 6

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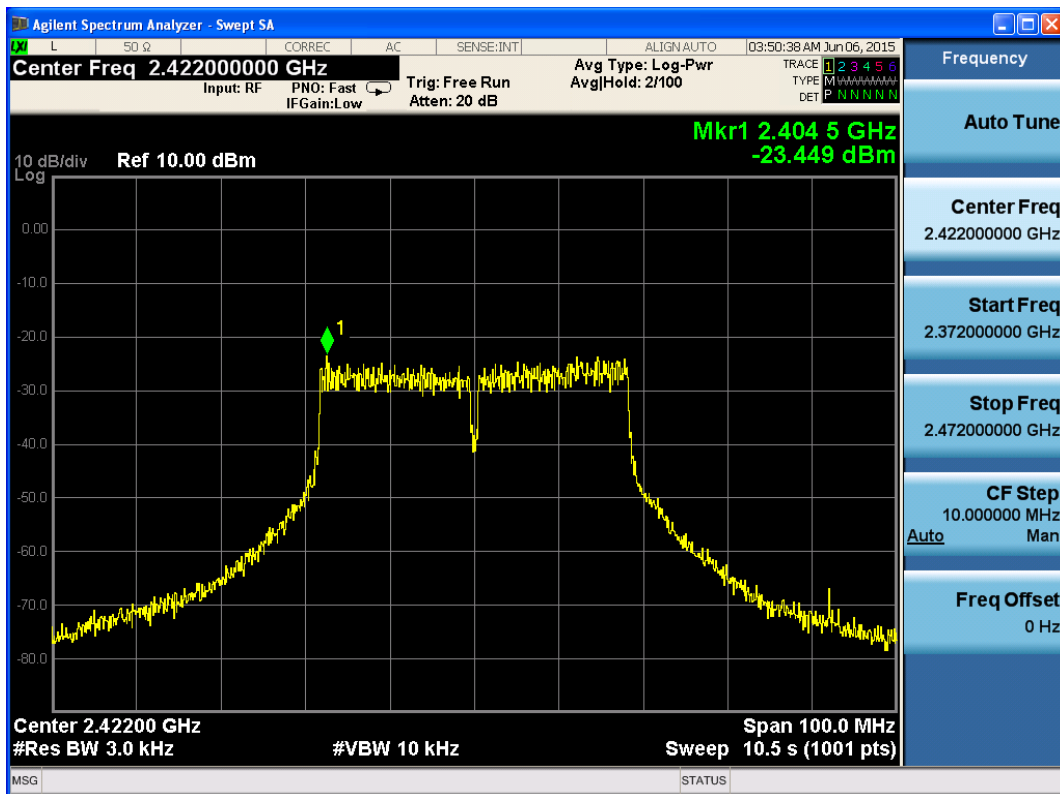
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802.11n, Channel No.: 11

802.11n(HT40)



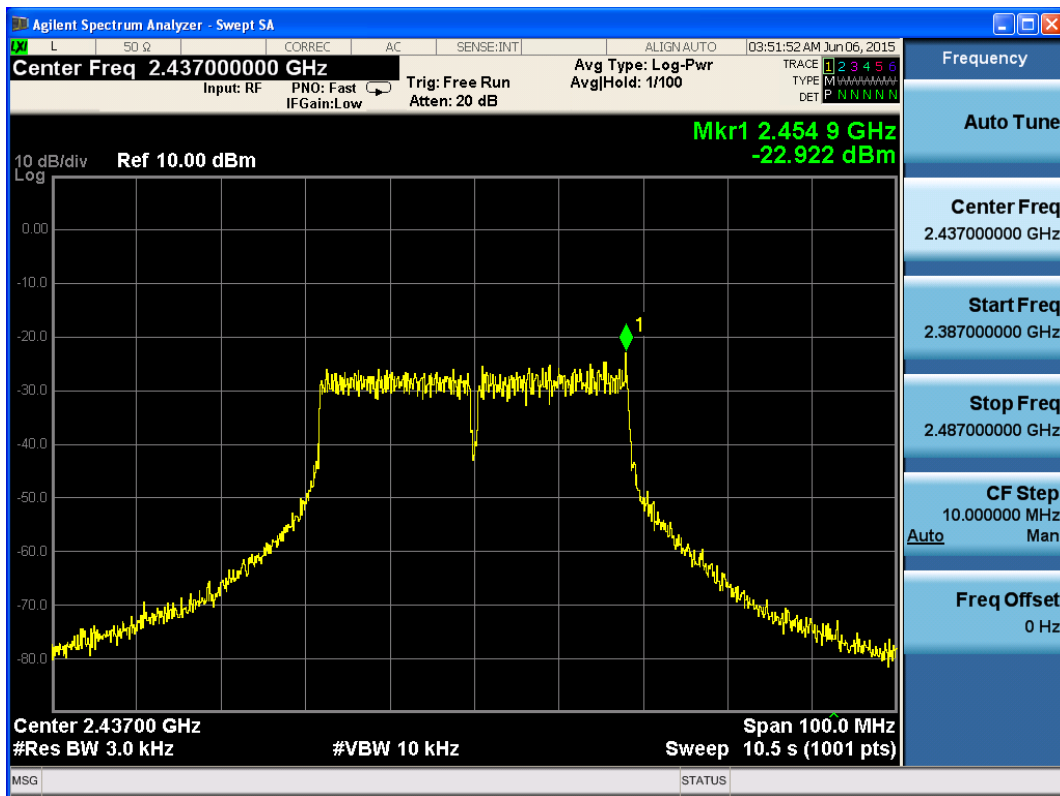
802.11n, Channel No.: 3

TA Technology (Shanghai) Co., Ltd.

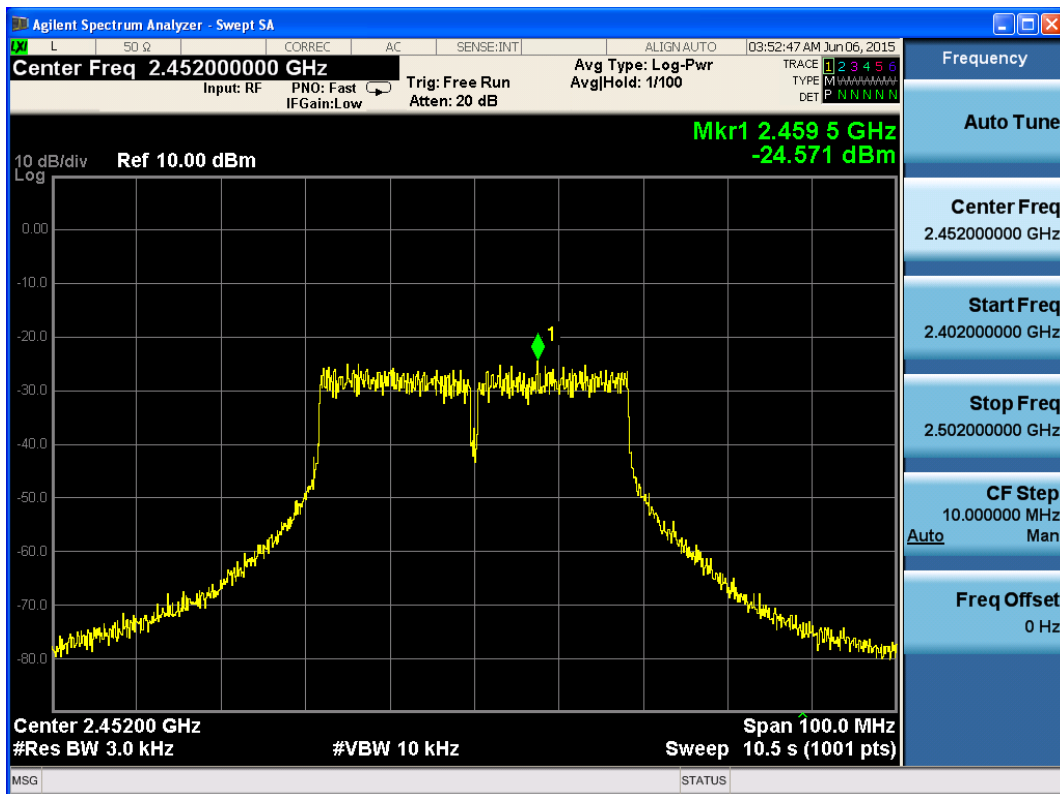
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802.11n, Channel No.: 6



802.11n, Channel No.: 9

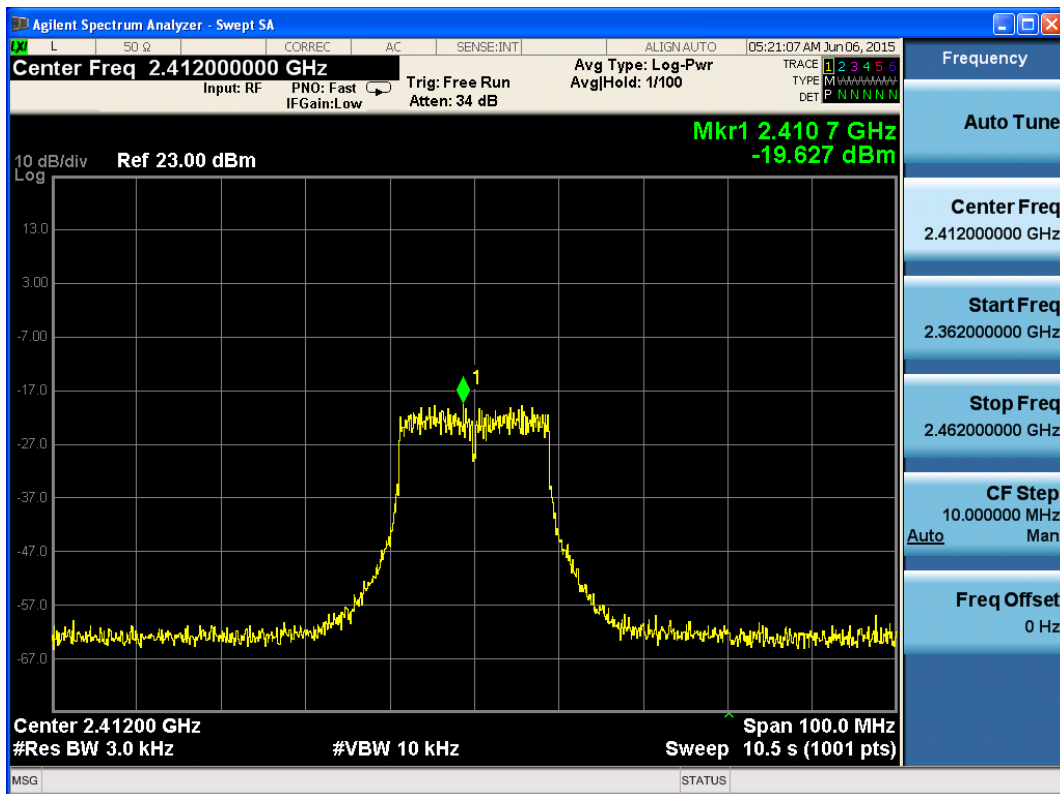
TA Technology (Shanghai) Co., Ltd. Test Report

Report No.:RHA1505-0034RF01R3

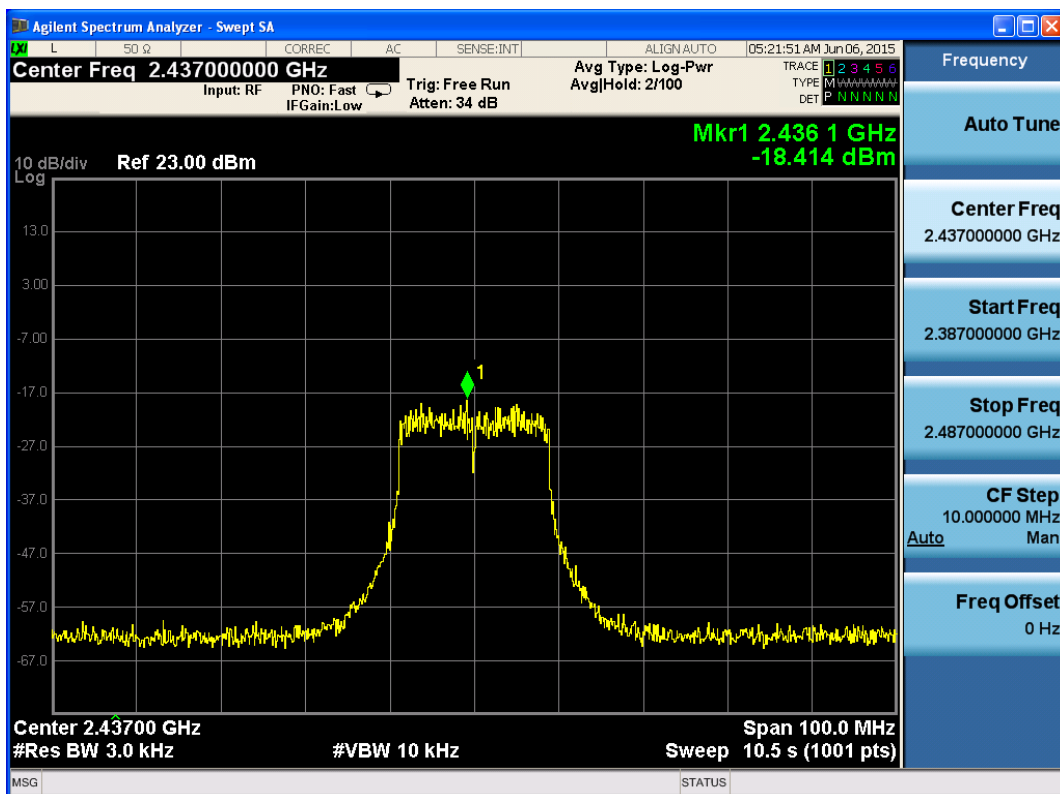
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MIMO

802.11n (HT20)



802.11n, Channel No.: 1

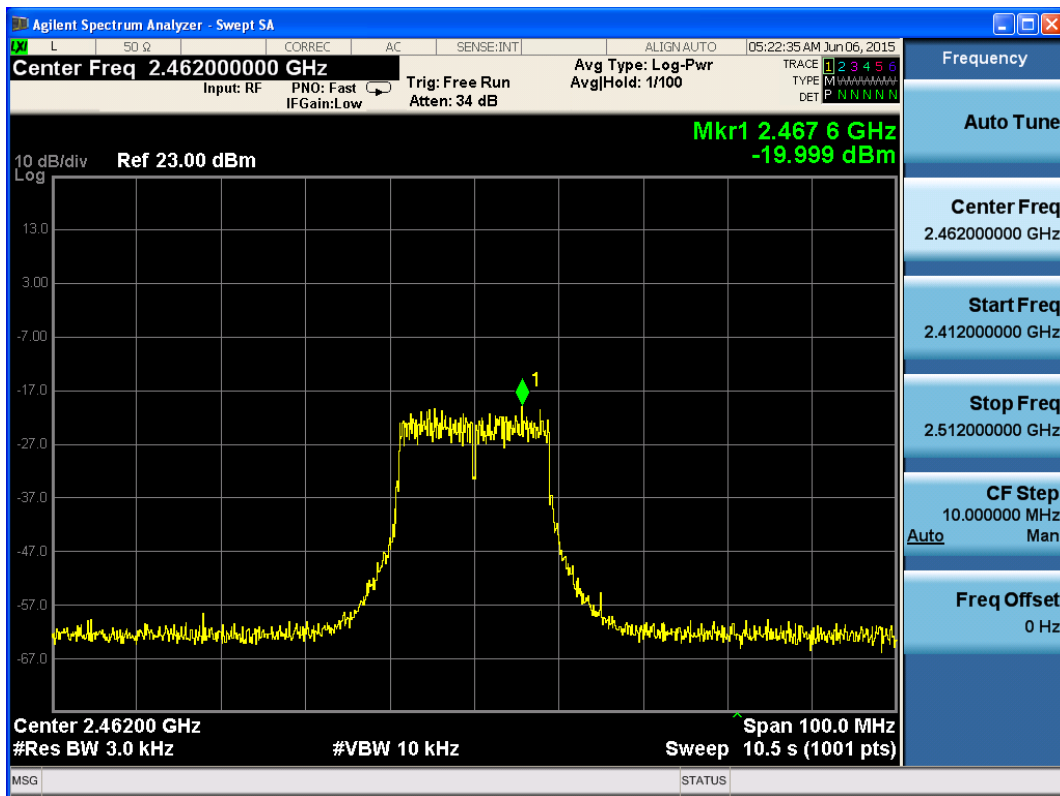


802.11n, Channel No.: 6

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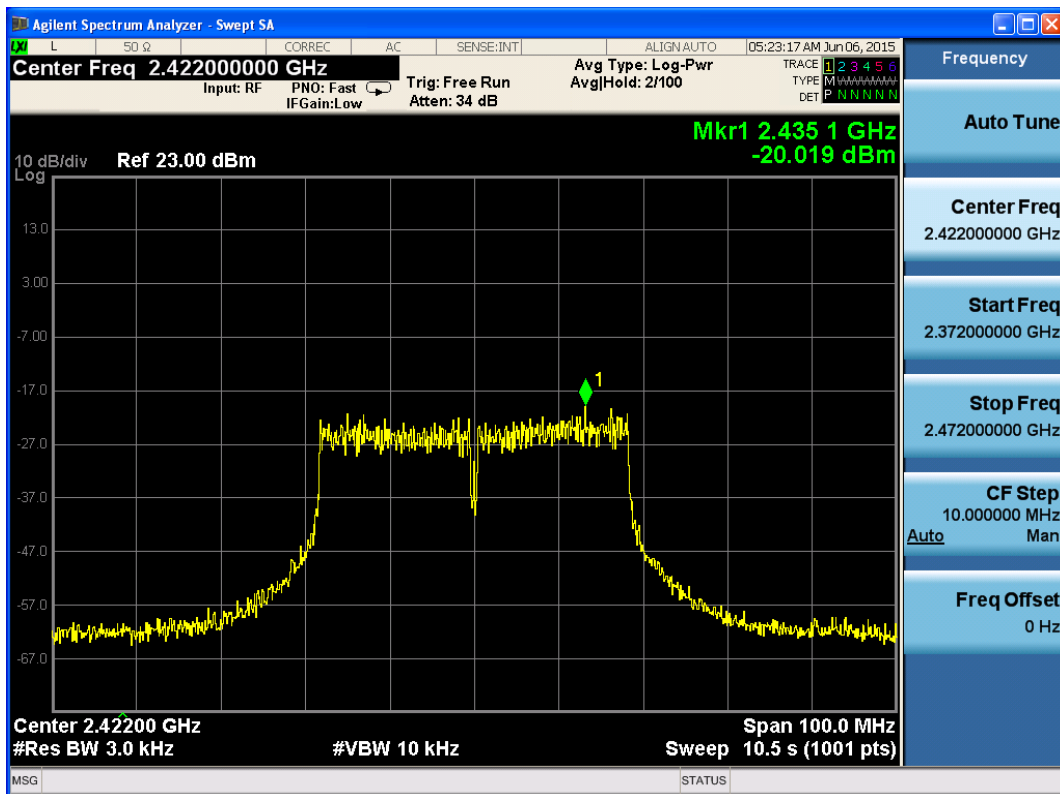
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802.11n, Channel No.: 11

802.11n (HT40)

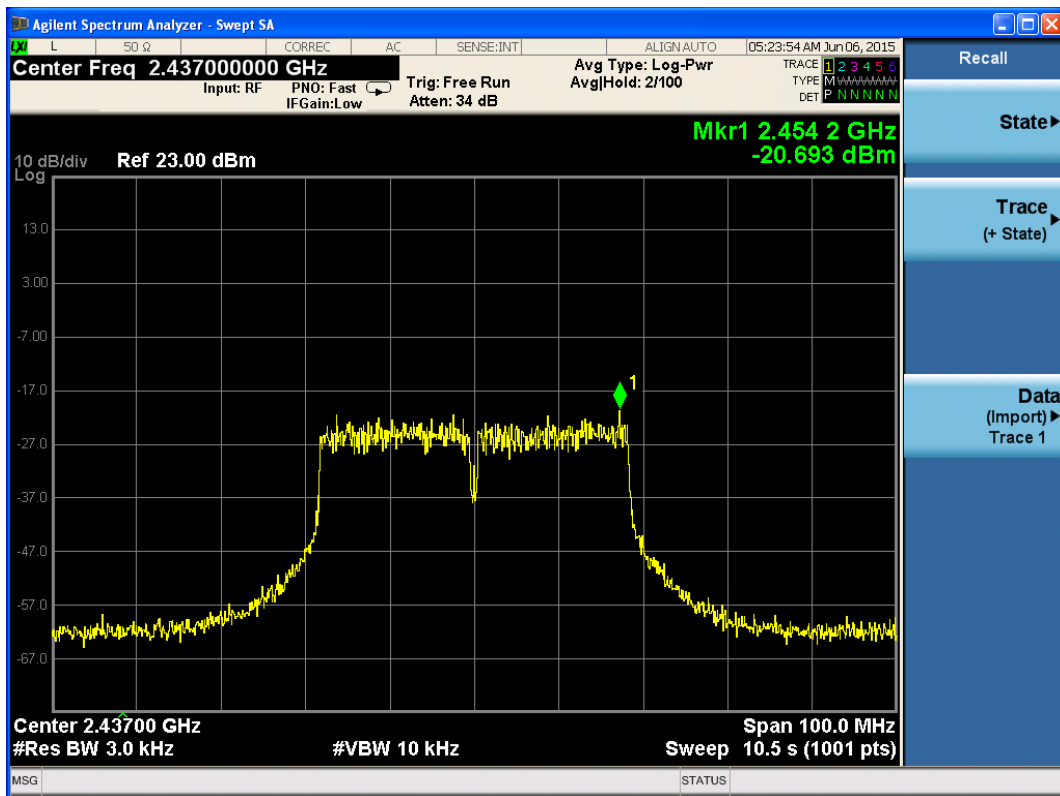


802.11n, Channel No.: 3

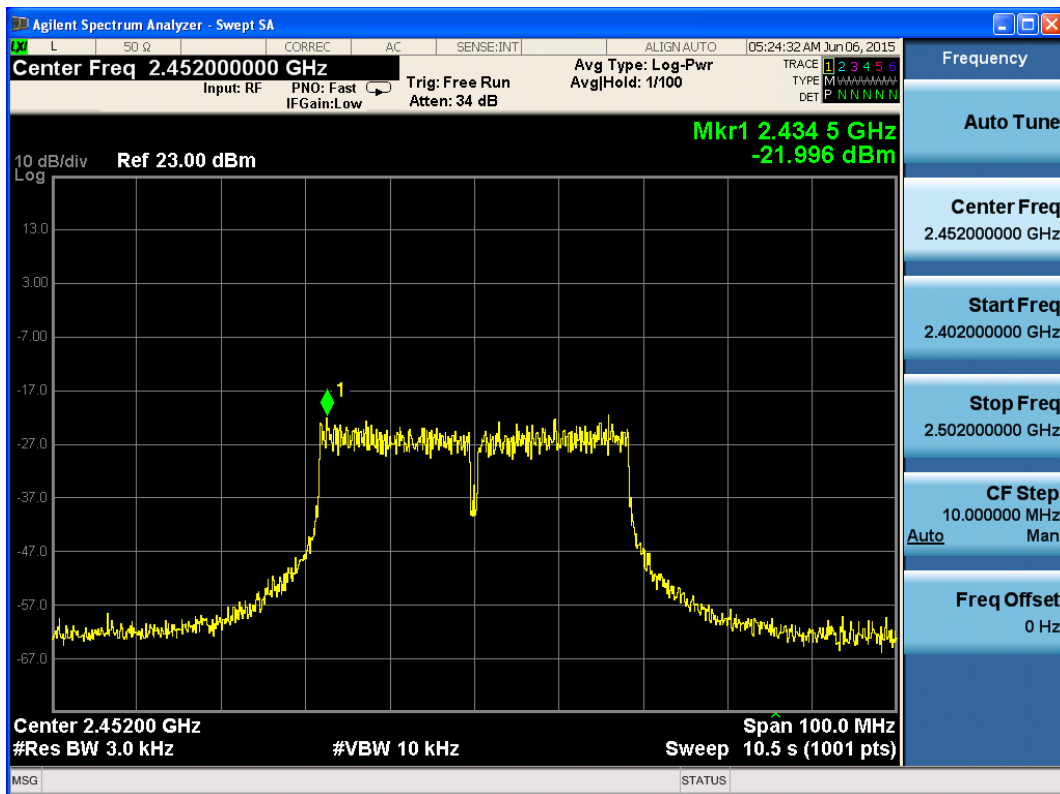
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802.11n, Channel No.: 6



802.11n, Channel No.: 9

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2.8. Spurious RF Conducted Emissions

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer and WIFI test set via a power splitter with a known loss. The spectrum analyzer scans from 30 MHz to the 10th harmonic of the carrier. The peak detector is used. RBW and VBW are set to 100 kHz, Sweep is set to ATUO.

The test is in transmitting mode.

Test setup



Limits

Rule Part 15.247(d) specifies that "In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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."

Antenna 1

Network Standards	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11b	2412	7	≤-13
	2437	-2	≤-22
	2462	7.5	≤-12.5
802.11g	2412	2.5	≤-17.5
	2437	-1.46	≤-21.46
	2462	4	≤-16.4
802.11n HT20	2412	2.63	≤-17.37
	2437	-2.7	≤-22.7
	2462	2.4	≤-17.6

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802.11n HT40	2422	-0.7	≤ -20.7
	2437	0.05	≤ -19.95
	2452	0.22	≤ -19.78

Antenna 2

Network Standards	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11b	2412	14.5	≤ -5.5
	2437	-0.4	≤ -20.4
	2462	8.3	≤ -11.7
802.11g	2412	4.9	≤ -15.1
	2437	-2.5	≤ -22.5
	2462	4.9	≤ -15.1
802.11n HT20	2412	4.7	≤ -15.3
	2437	-2.4	≤ -22.4
	2462	2.54	≤ -17.46
802.11n HT40	2422	-0.07	≤ -20.07
	2437	0	≤ -20
	2452	0.03	≤ -19.97

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26.5GHz	1.407 dB

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Test Report

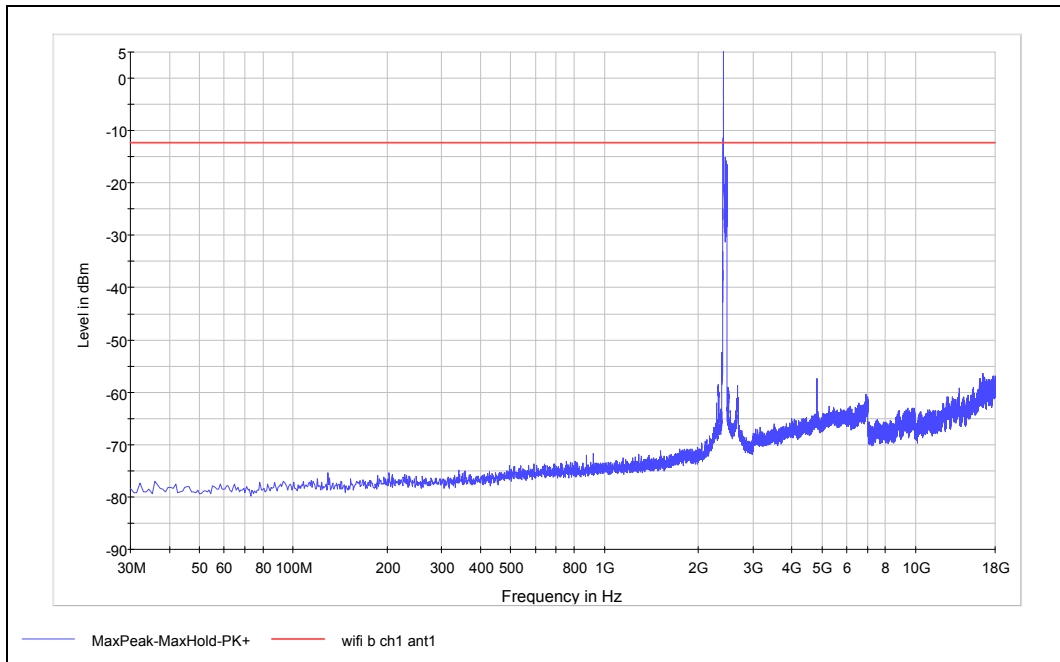
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Test Results:

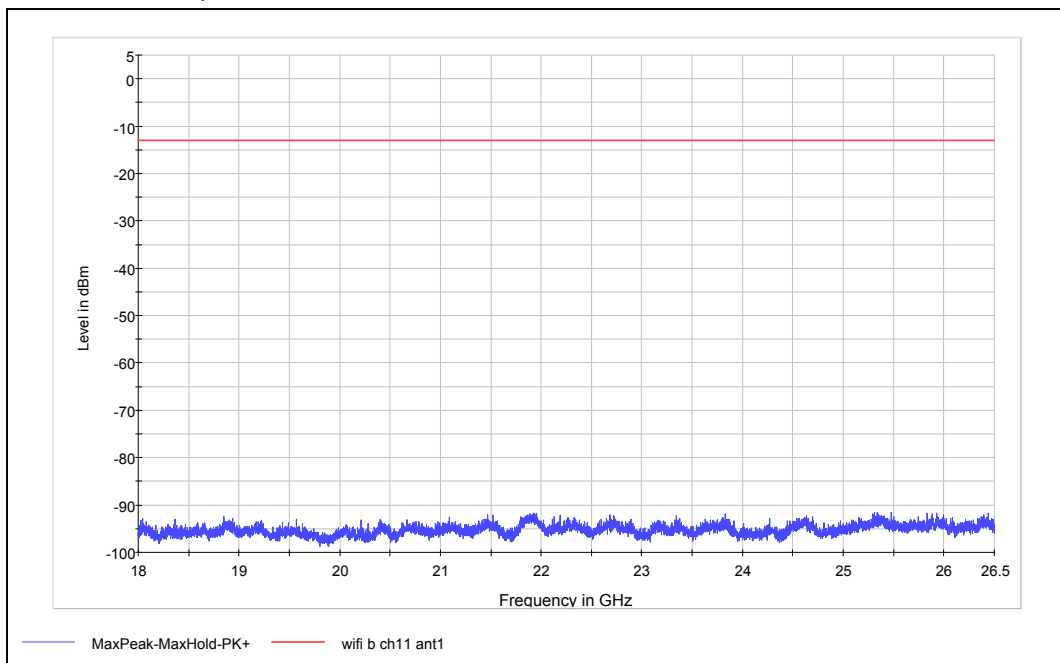
Antenna 1

802.11b CH1



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

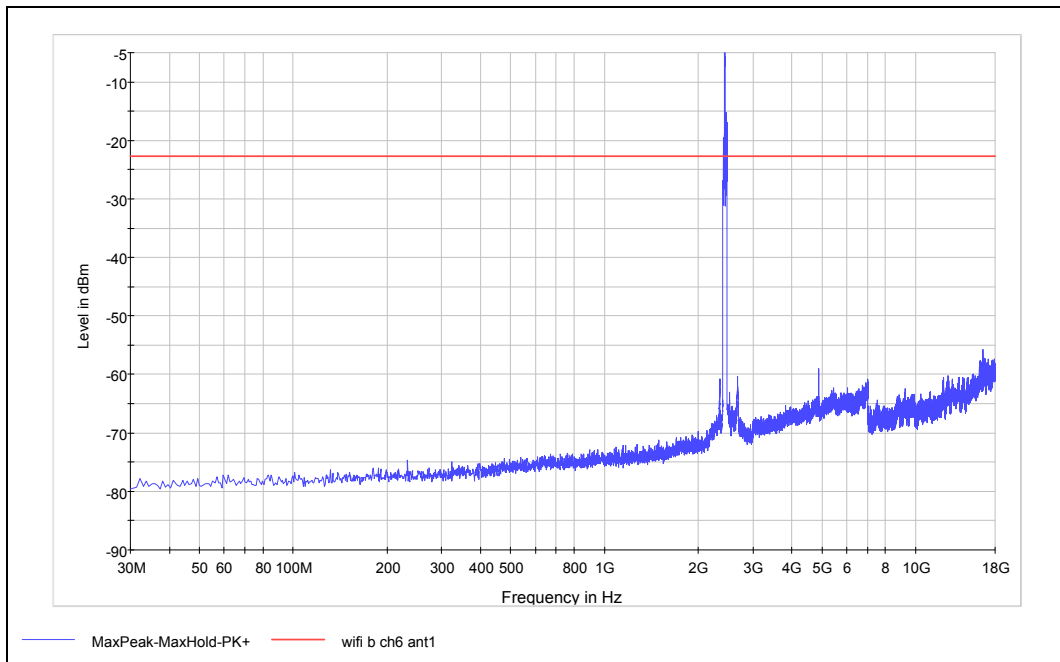
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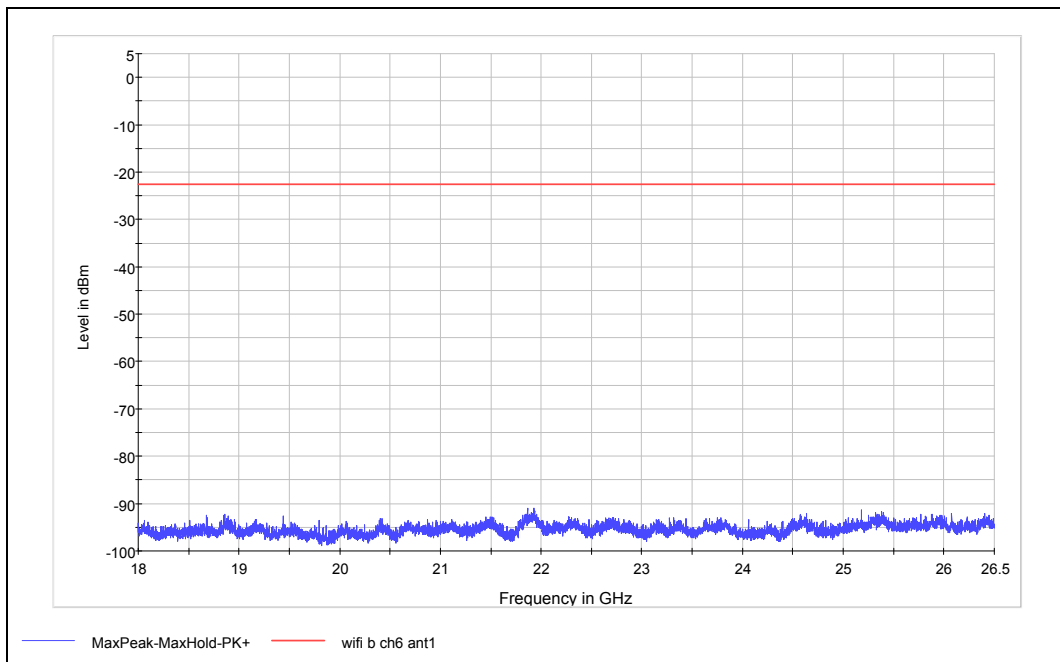
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802.11b CH6



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

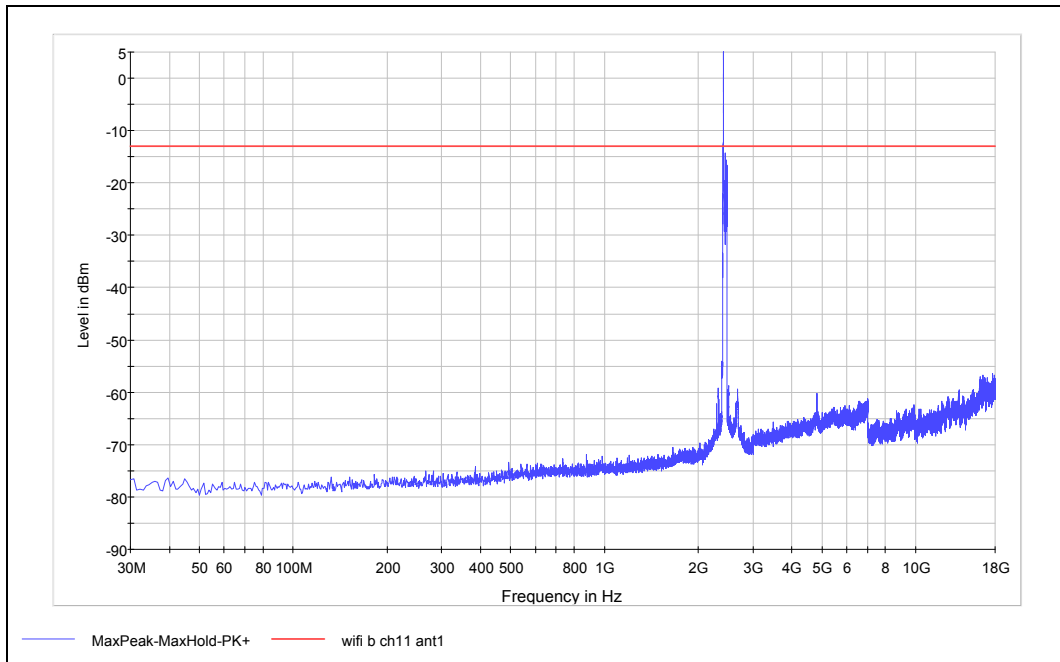
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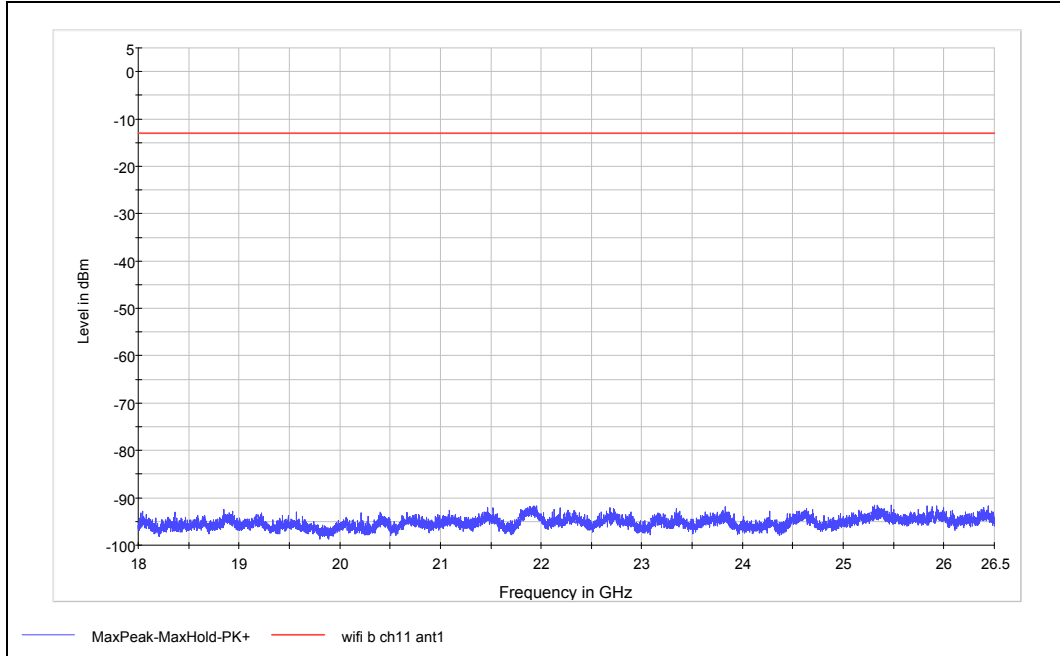
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802.11b CH11



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

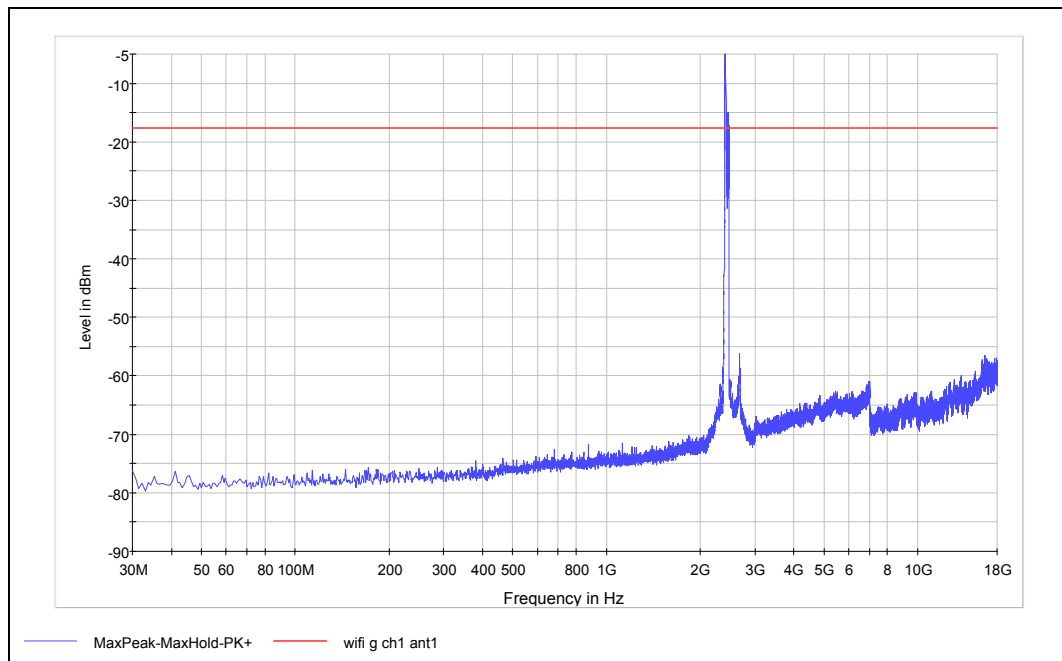
TA Technology (Shanghai) Co., Ltd.

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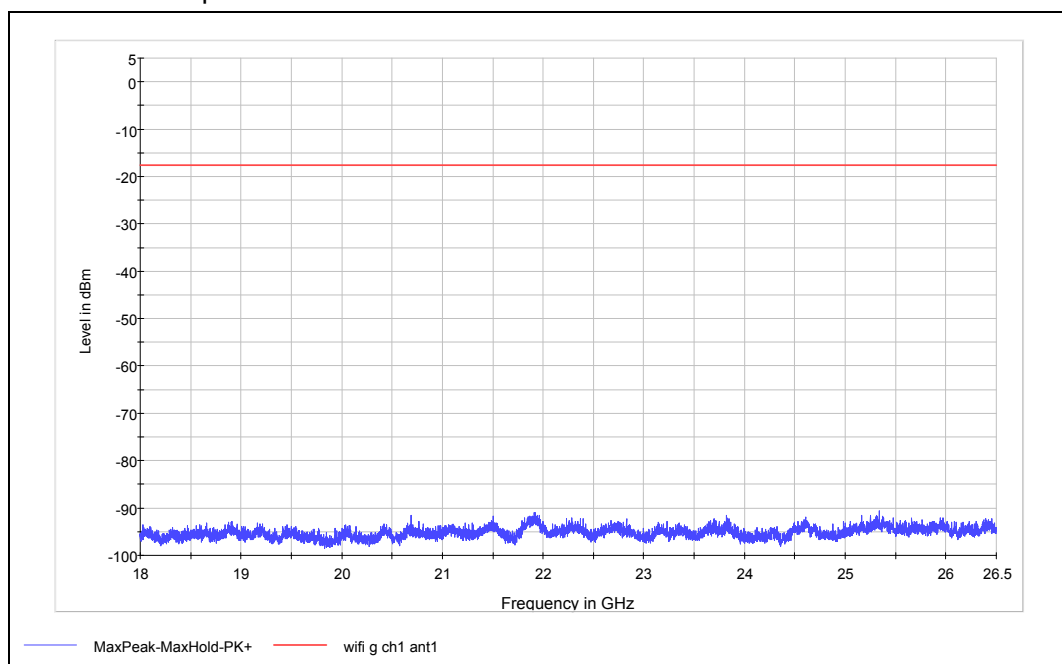
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802.11g CH1



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

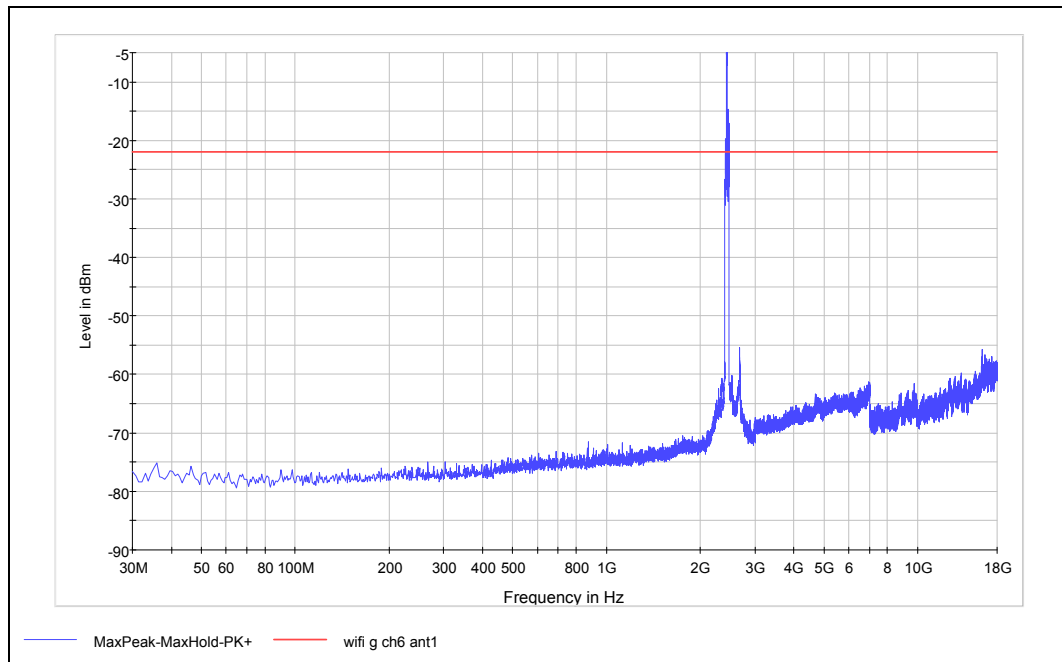
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Report No.:RHA1505-0034RF01R3

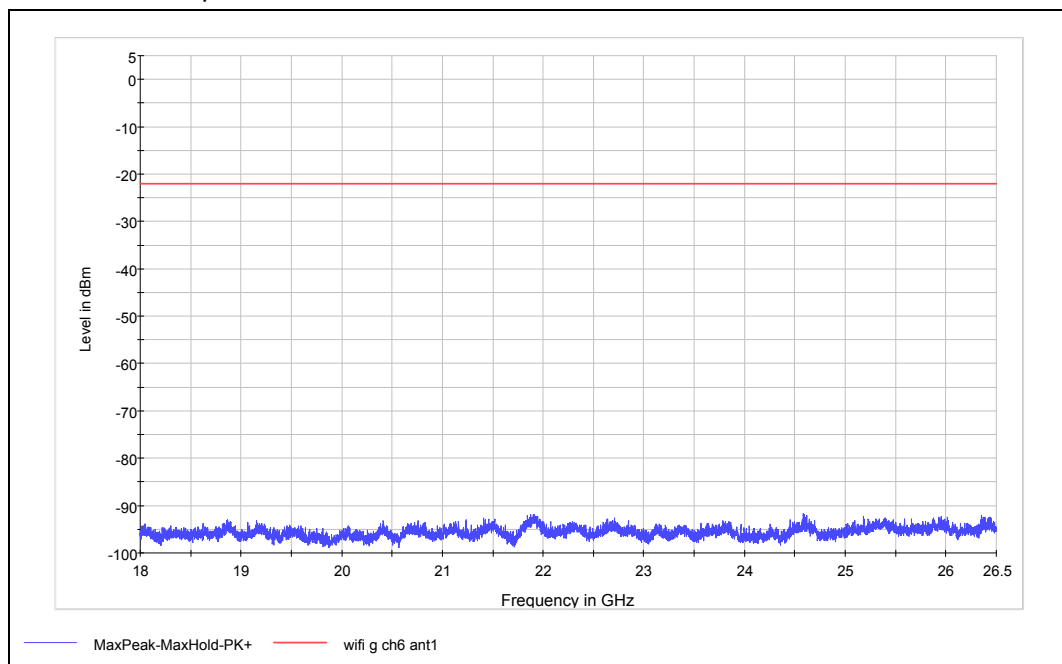
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802.11g CH6



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

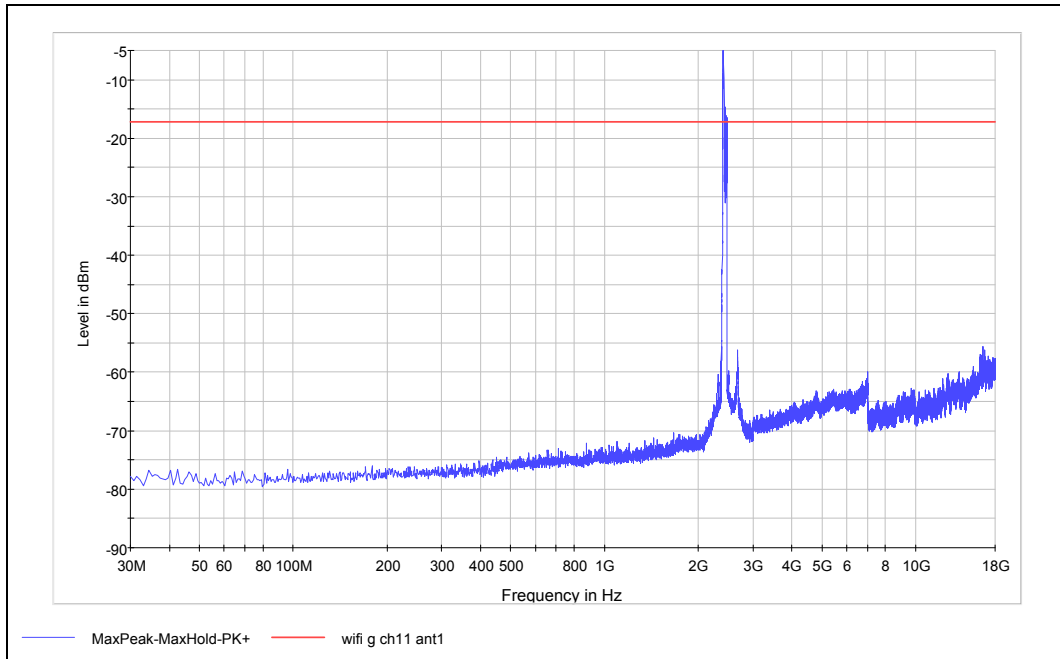
TA Technology (Shanghai) Co., Ltd.

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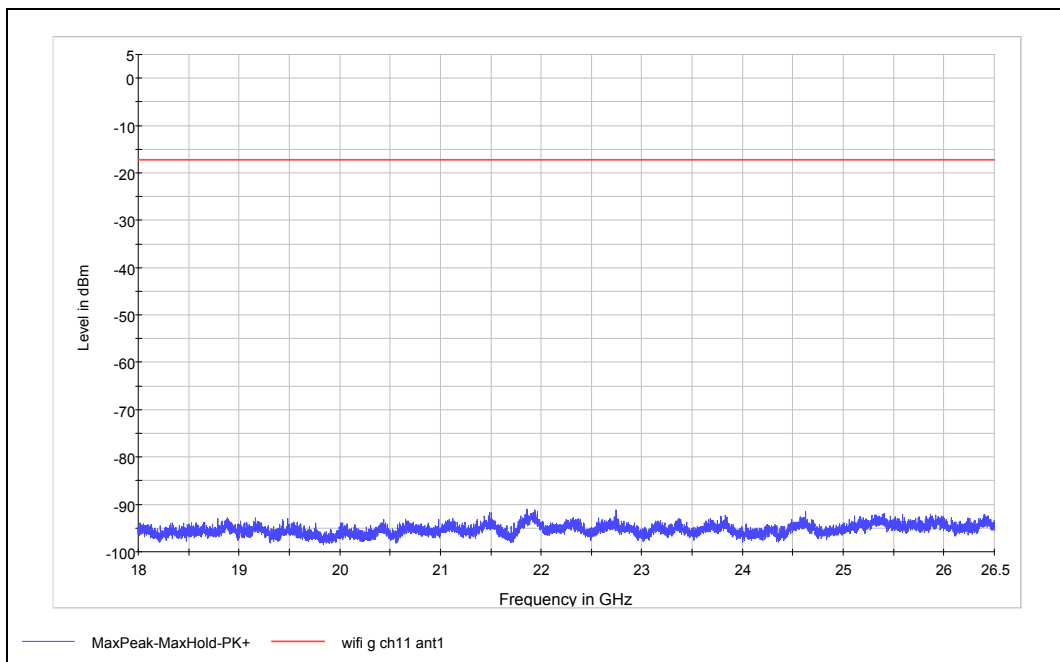
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802.11g CH11



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

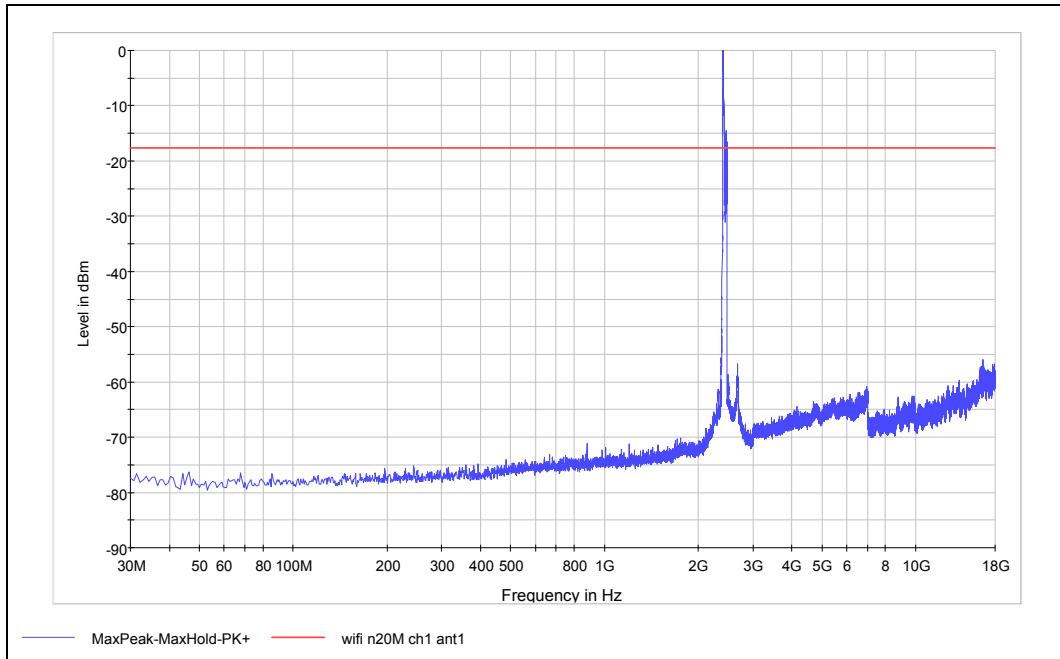
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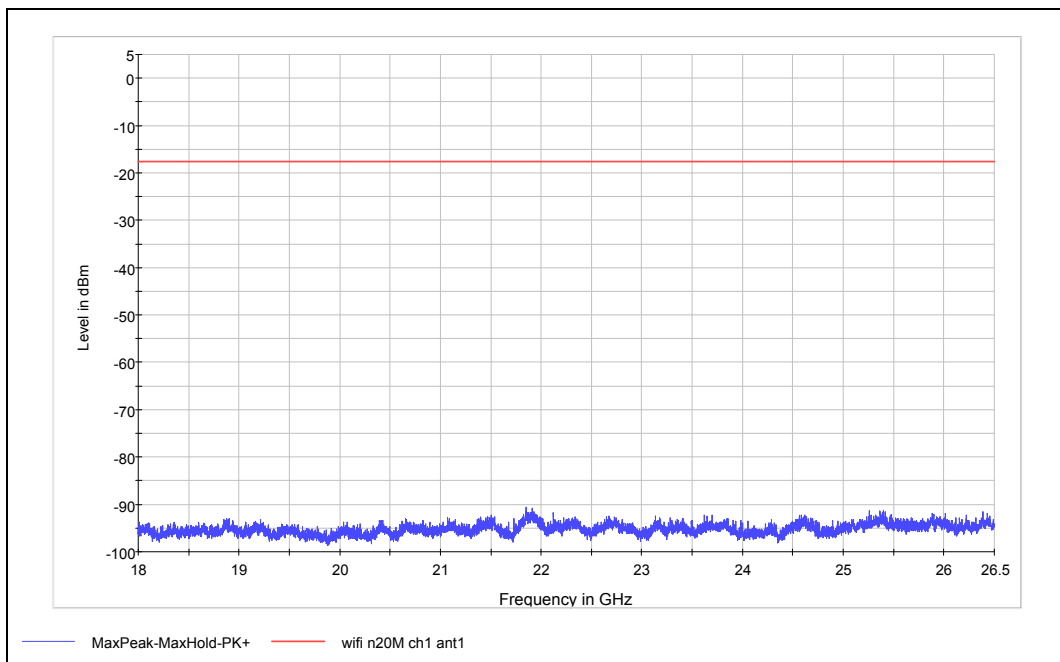
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802.11n(HT20) CH1



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

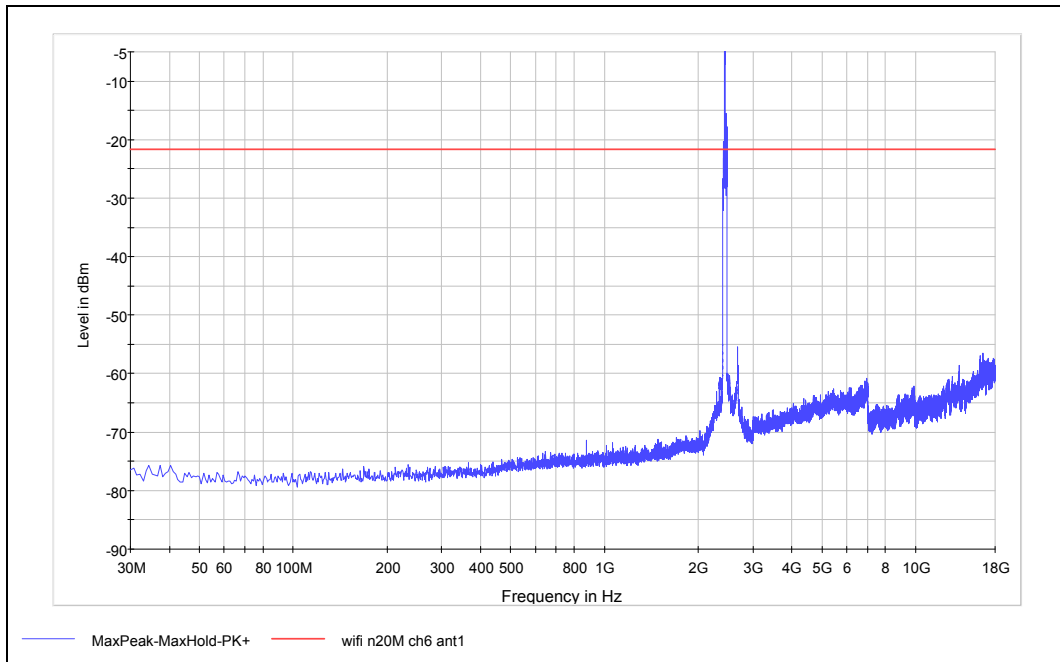
TA Technology (Shanghai) Co., Ltd.

Test Report

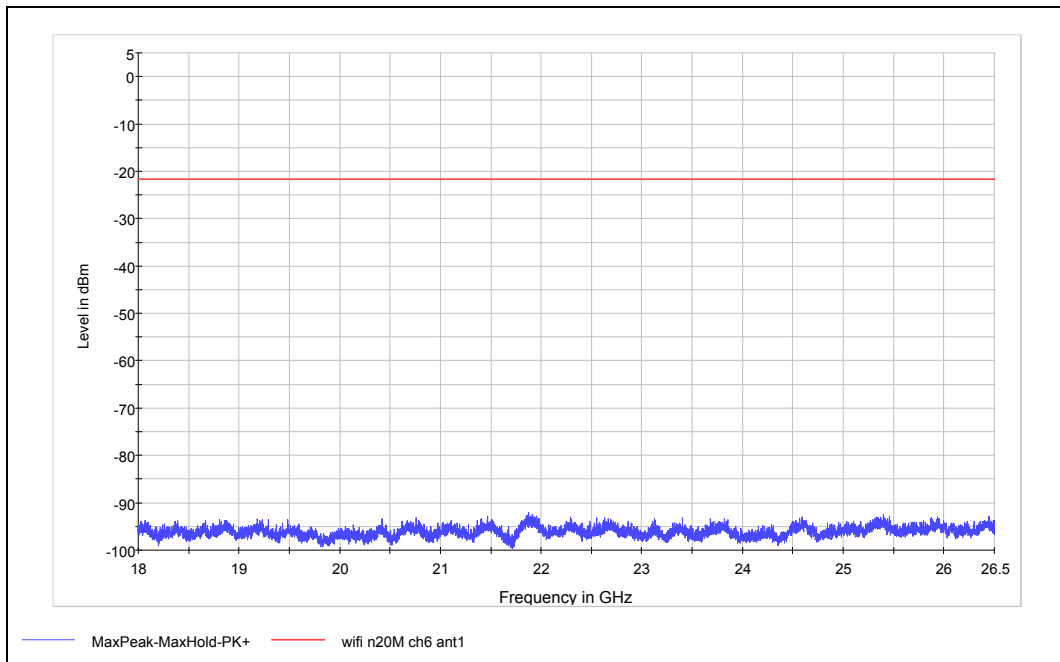
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802.11n(HT20) CH6



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

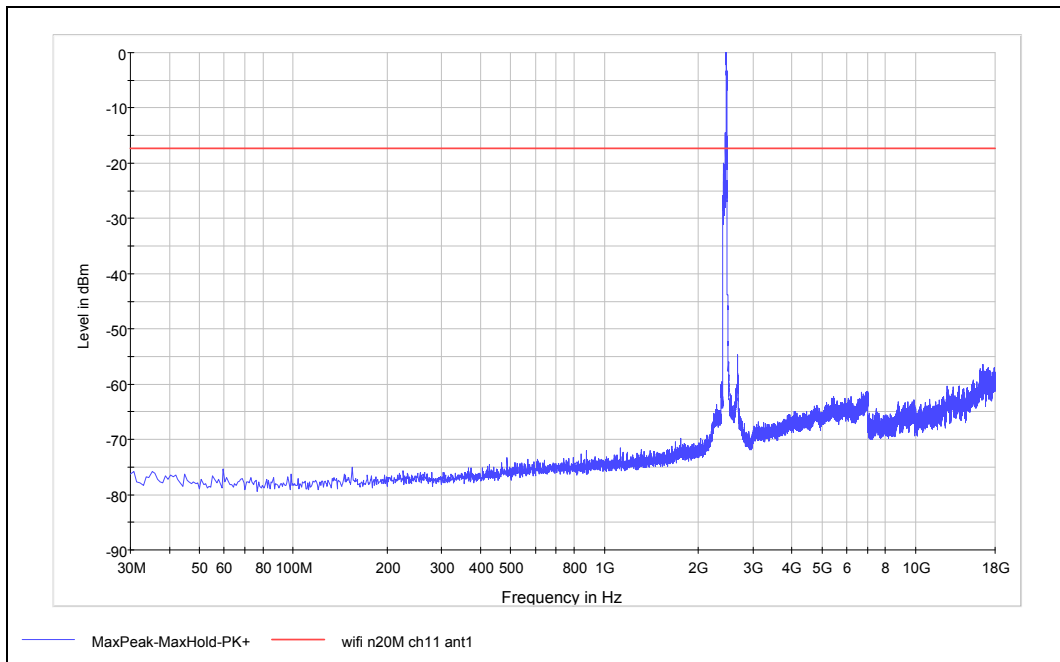
TA Technology (Shanghai) Co., Ltd.

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Report No.:RHA1505-0034RF01R3

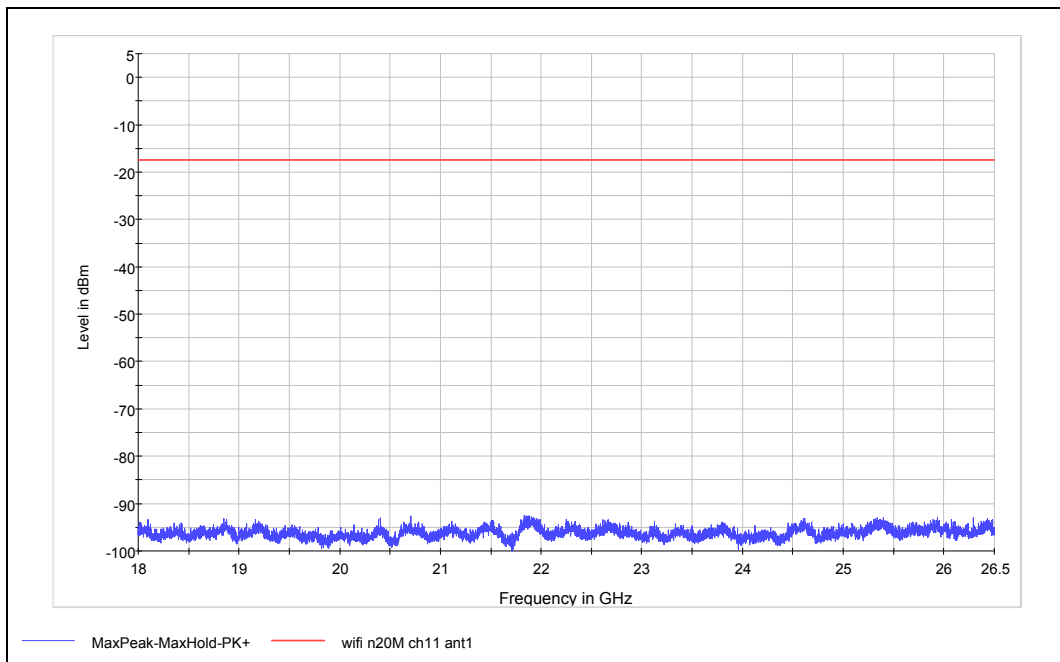
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802.11n(HT20) CH11



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

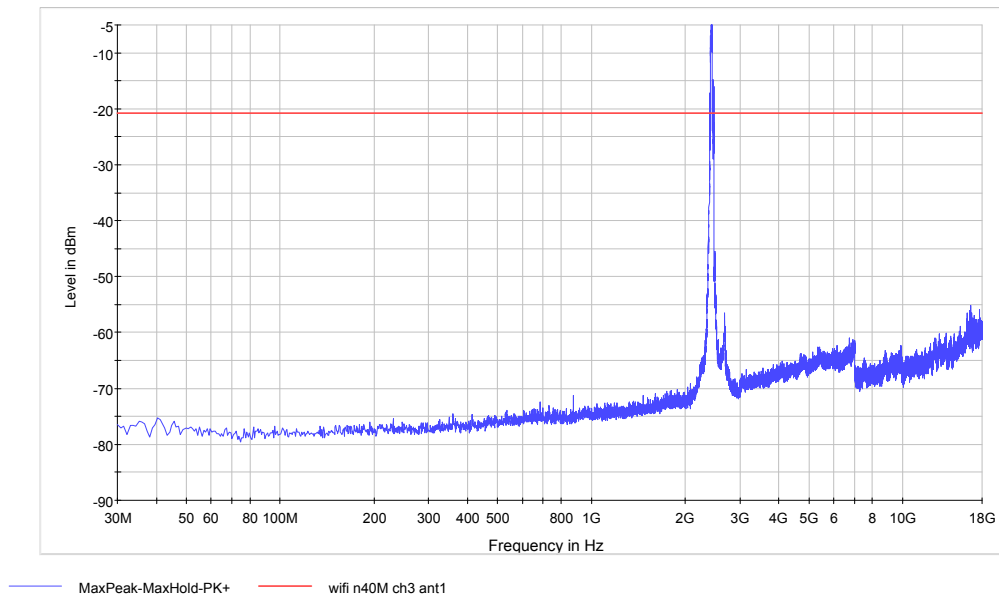
TA Technology (Shanghai) Co., Ltd.

Test Report

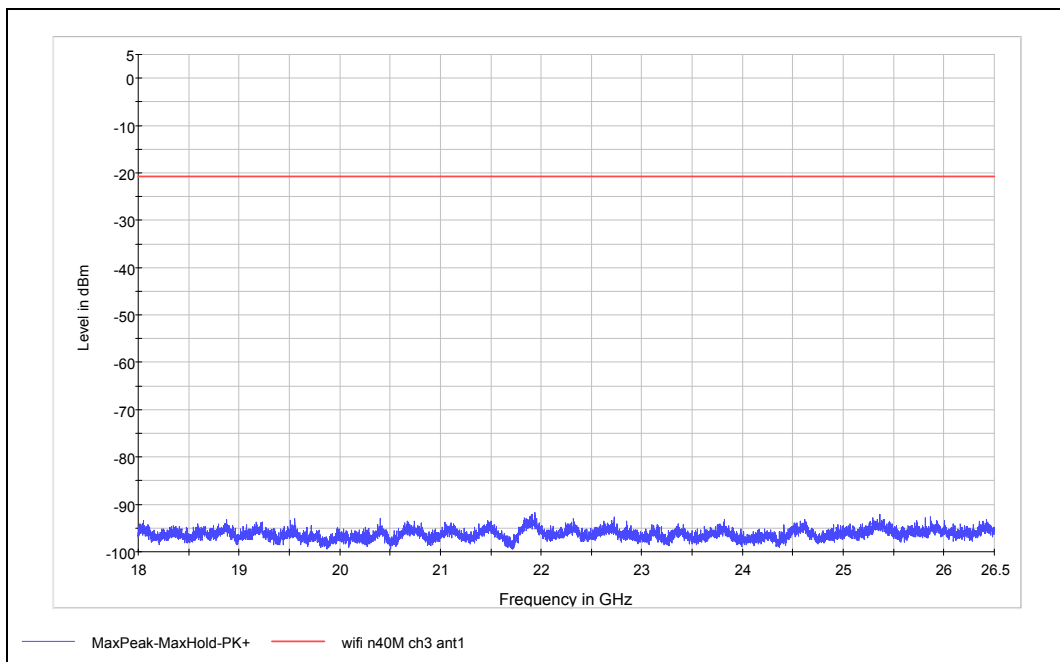
Report No.:RHA1505-0034RF01R3

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802.11n(HT40) CH3



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



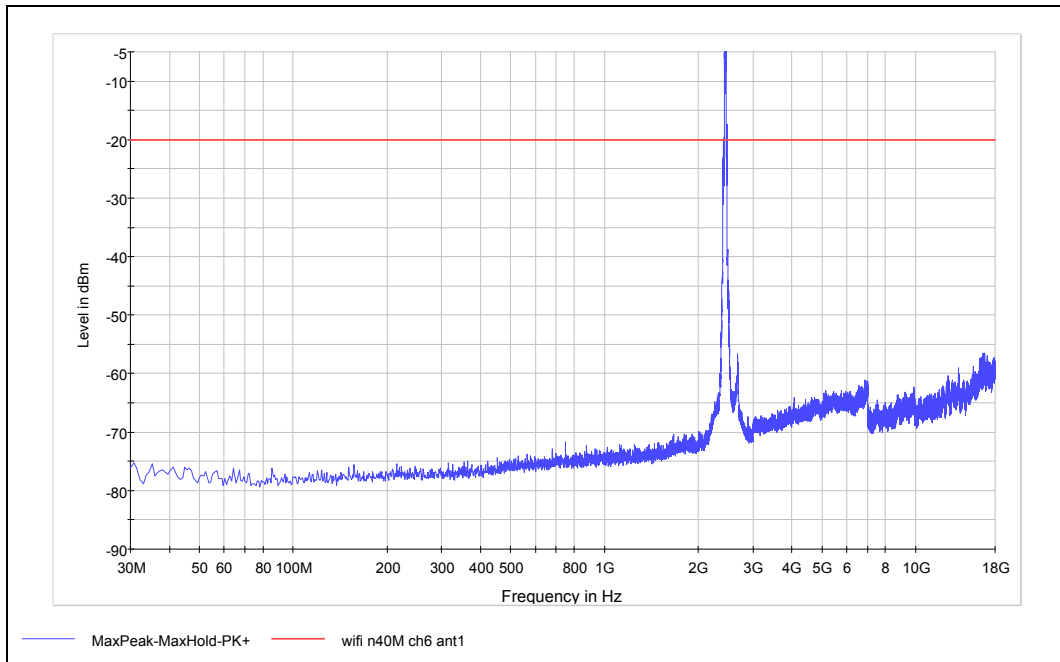
Spurious RF conducted emissions from 18GHz to 26.5GHz

TA Technology (Shanghai) Co., Ltd.
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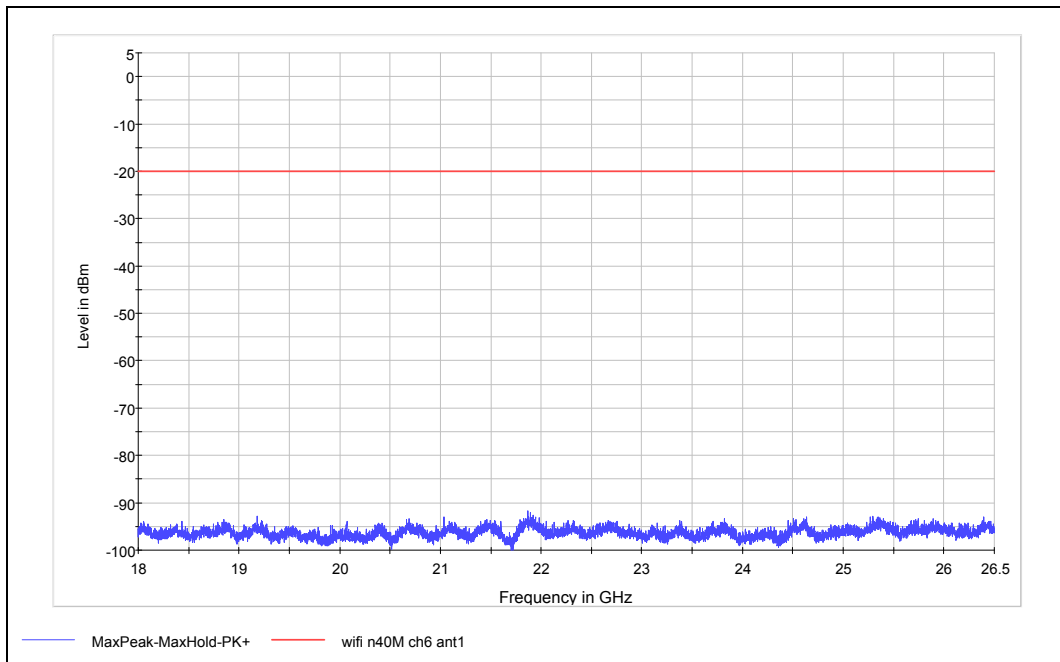
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802.11n(HT40) CH6



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

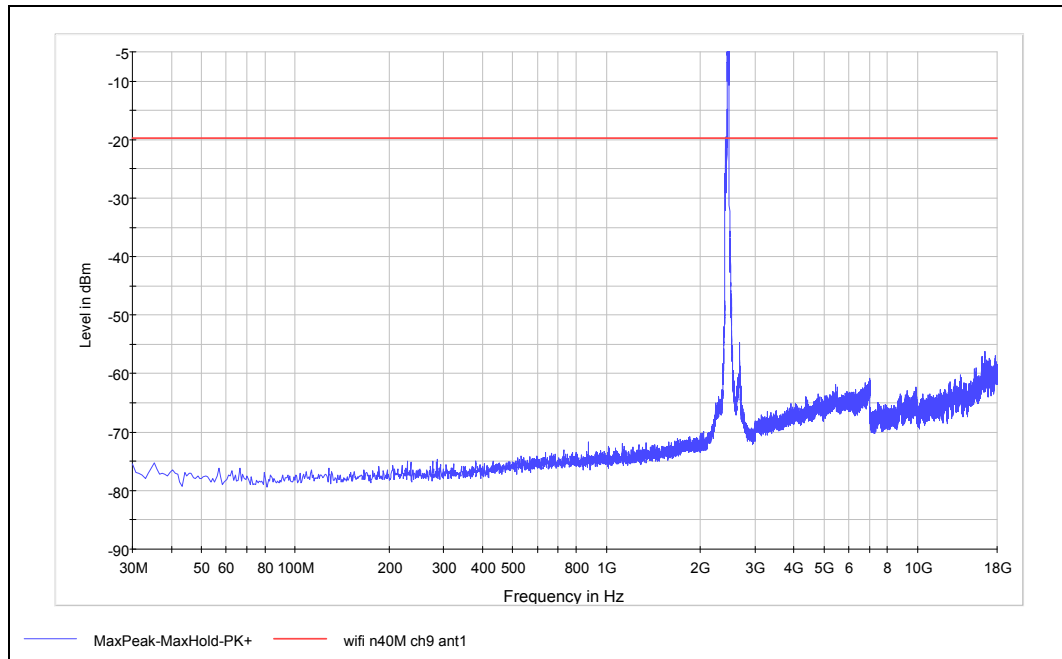
TA Technology (Shanghai) Co., Ltd.

Test Report

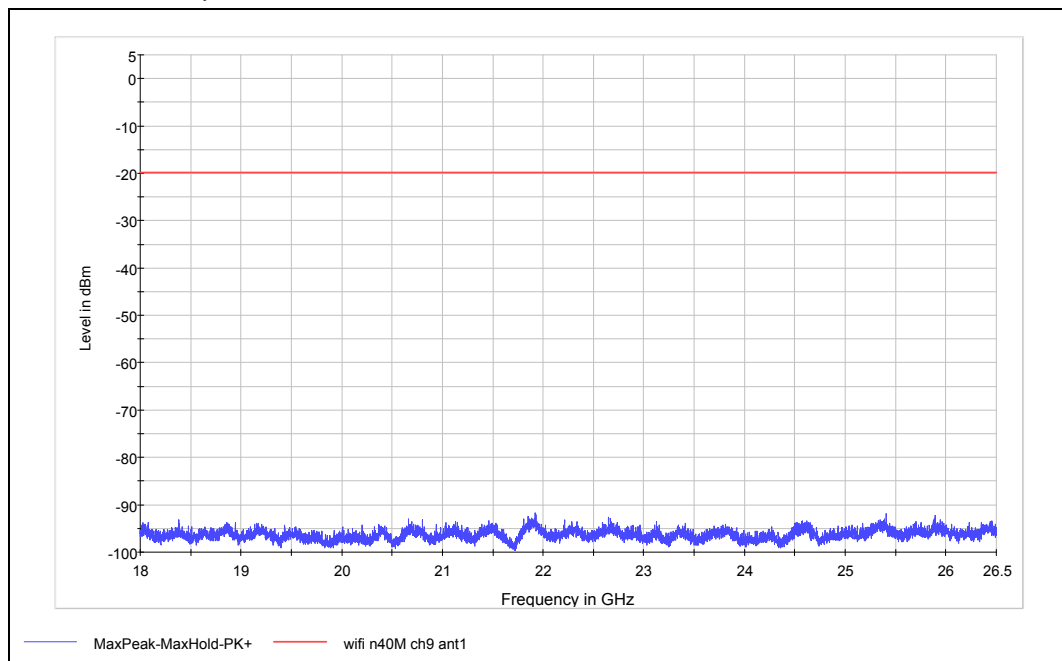
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802.11n(HT40) CH9



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

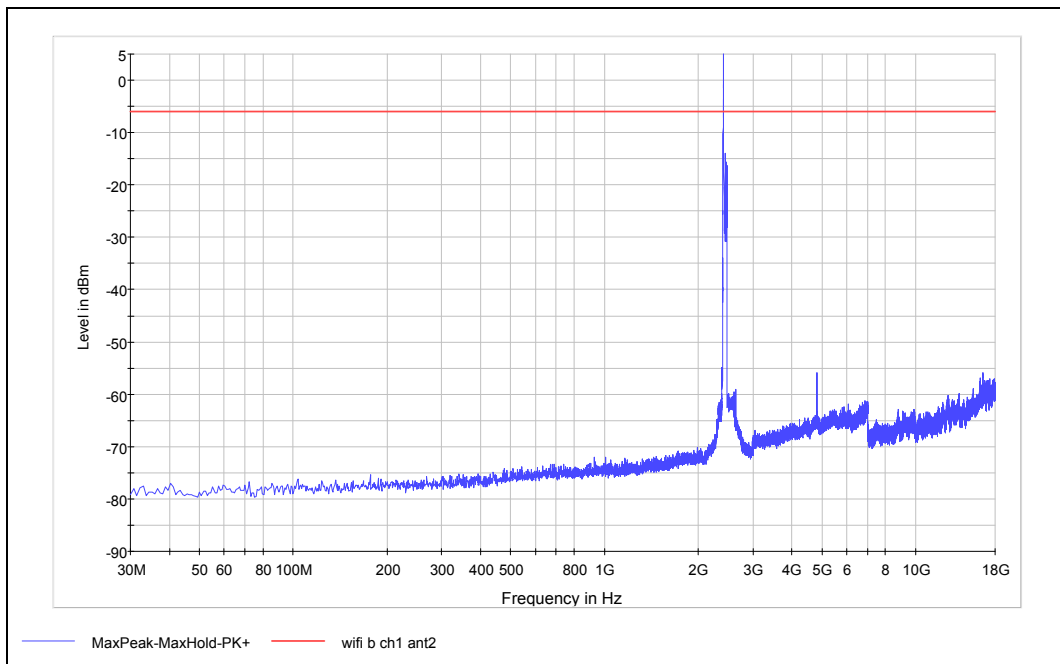
TA Technology (Shanghai) Co., Ltd.

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Report No.:RHA1505-0034RF01R3

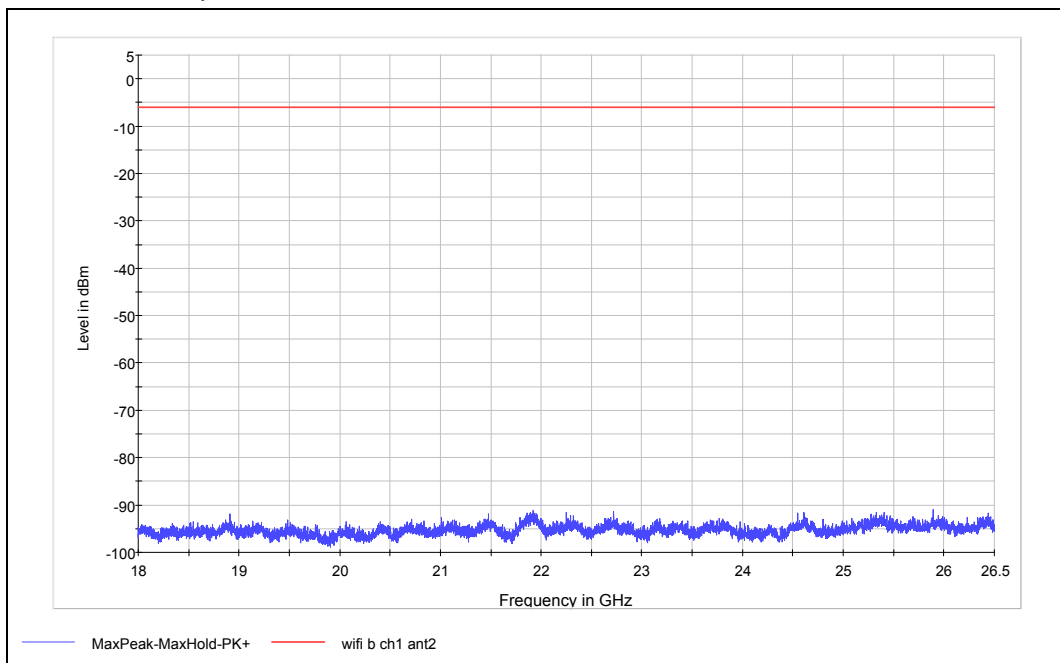
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Antenna 2
802.11b CH1



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

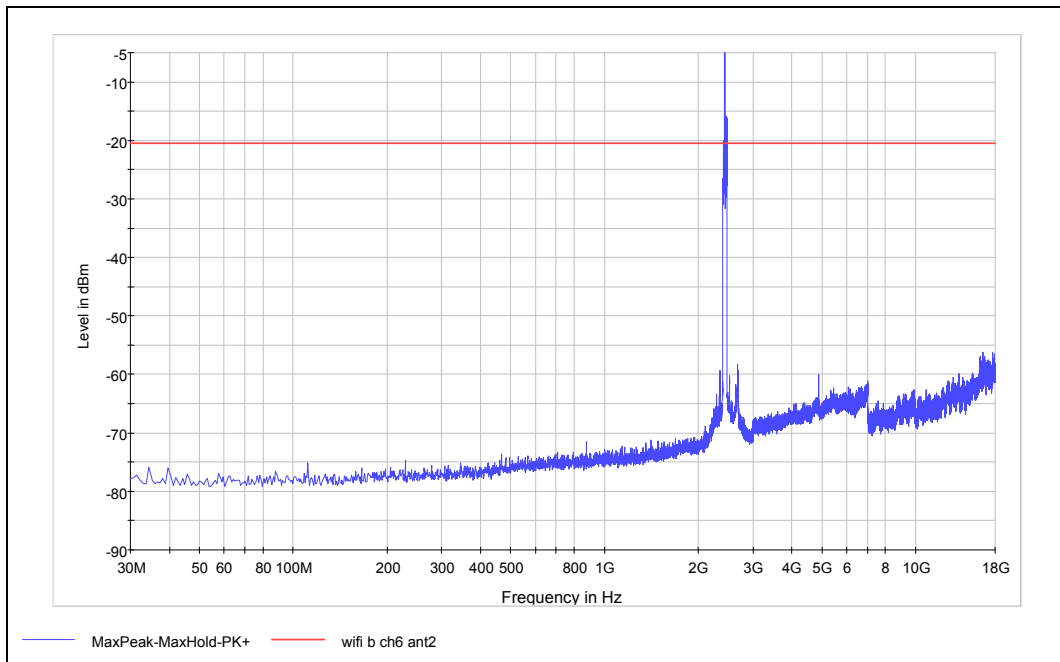
TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.:RHA1505-0034RF01R3

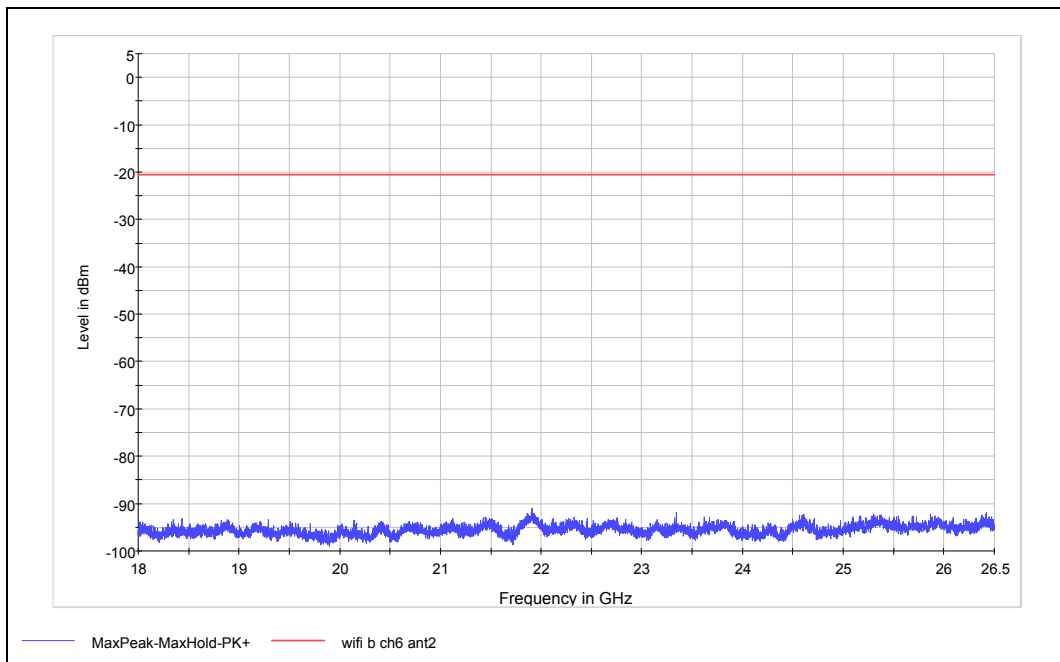
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802.11b CH6



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

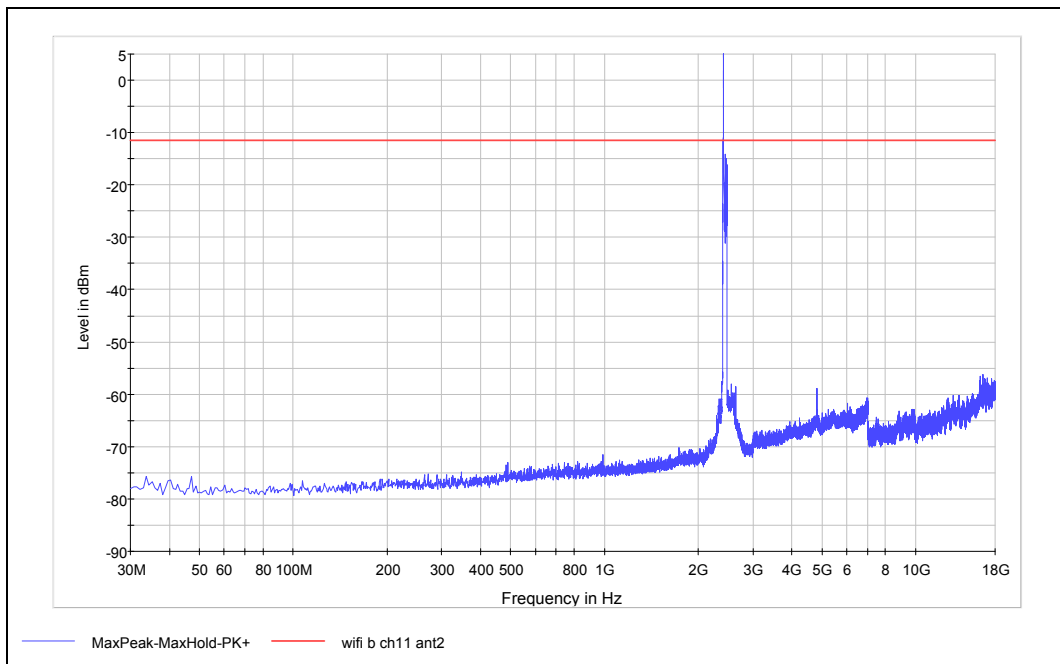
TA Technology (Shanghai) Co., Ltd.

Test Report

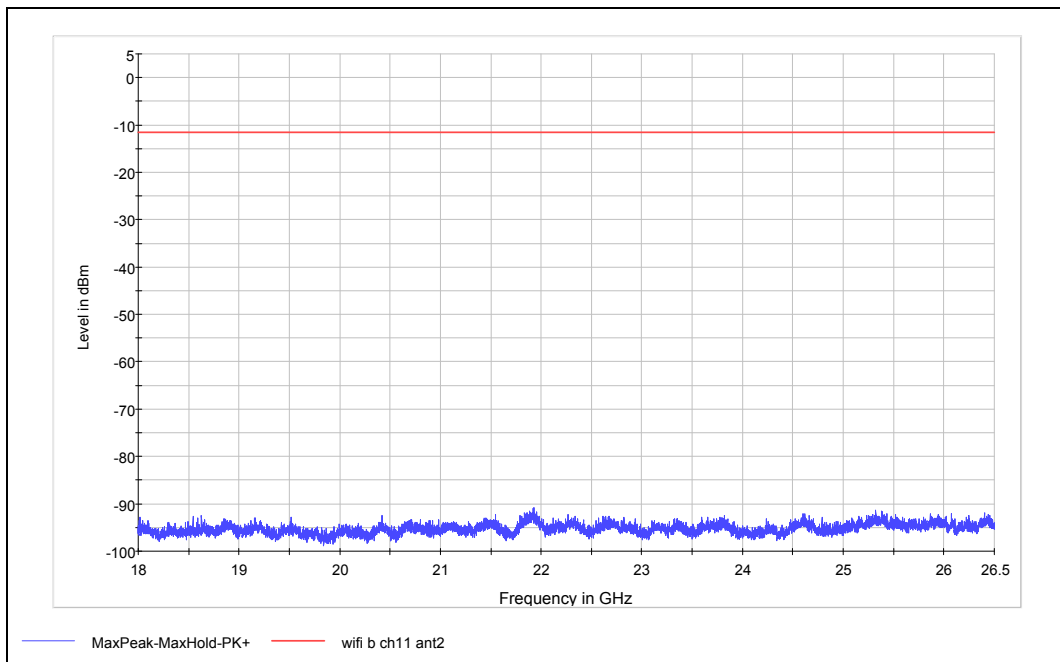
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802.11b CH11



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

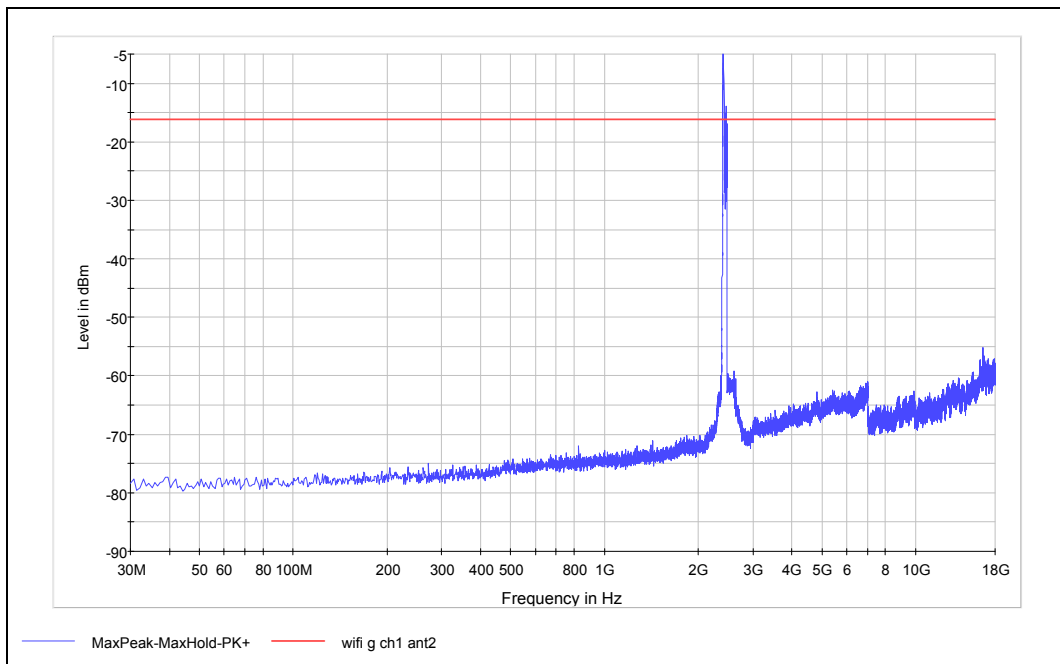
TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.:RHA1505-0034RF01R3

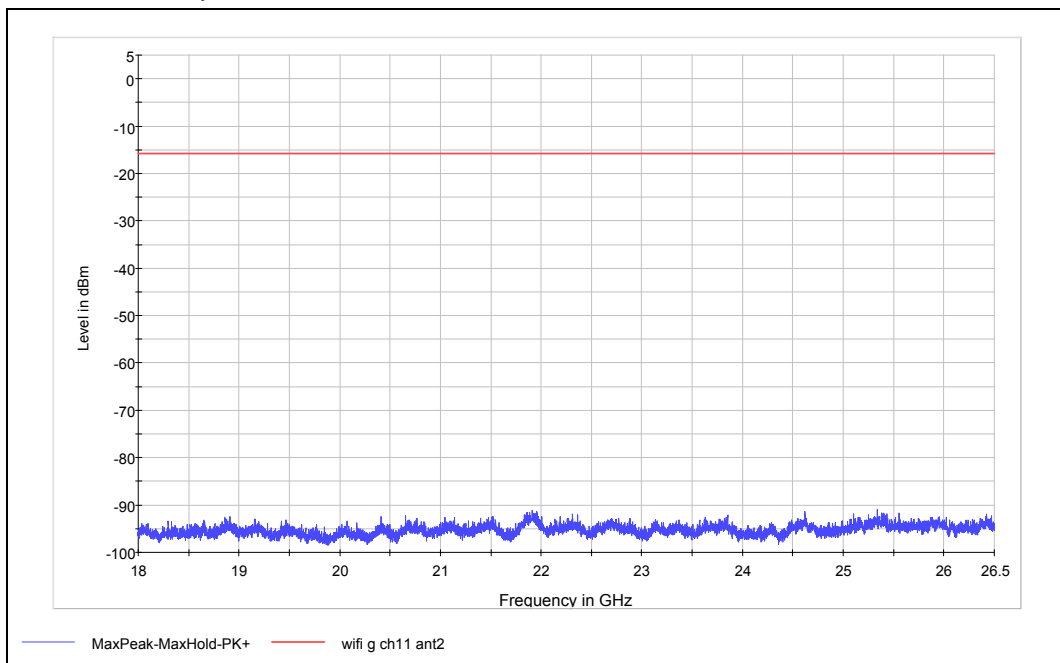
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802.11g CH1



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

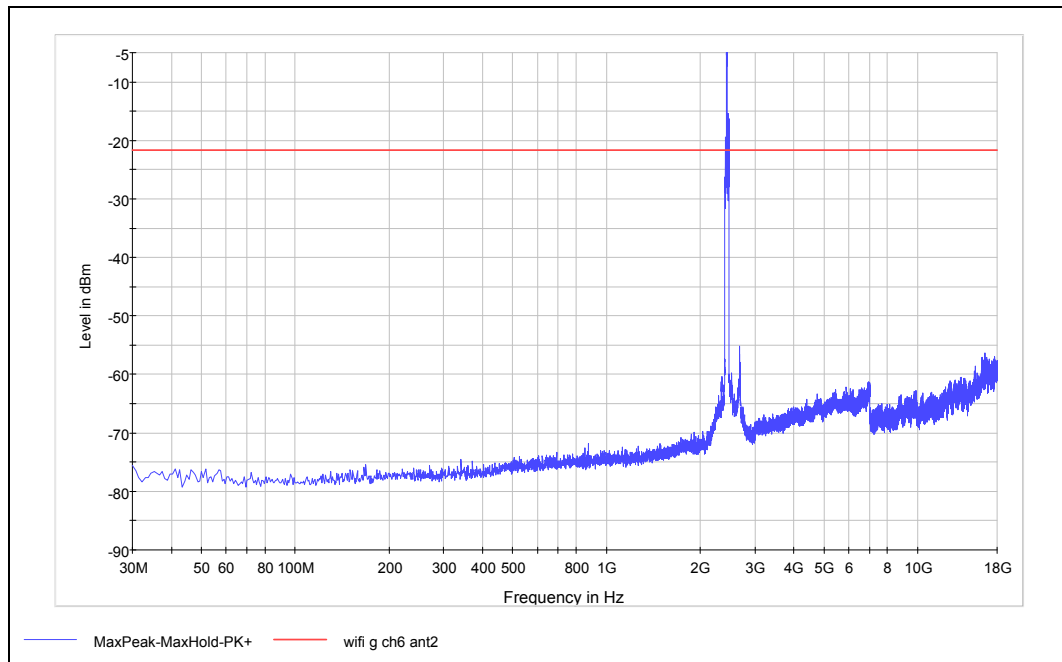
TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.:RHA1505-0034RF01R3

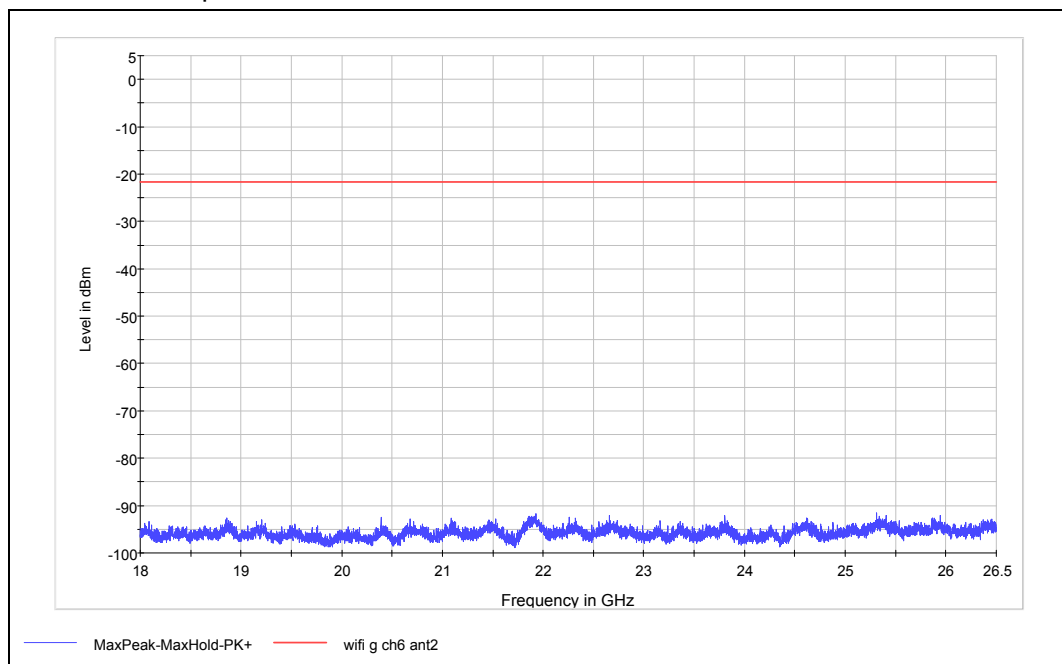
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802.11g CH6



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

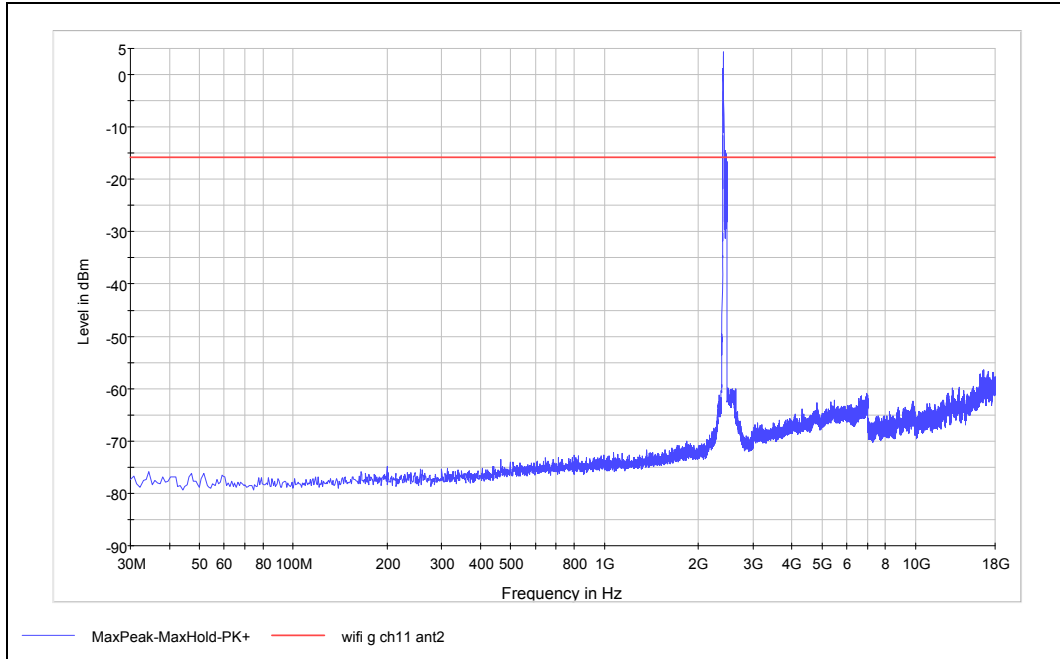
TA Technology (Shanghai) Co., Ltd.

Test Report

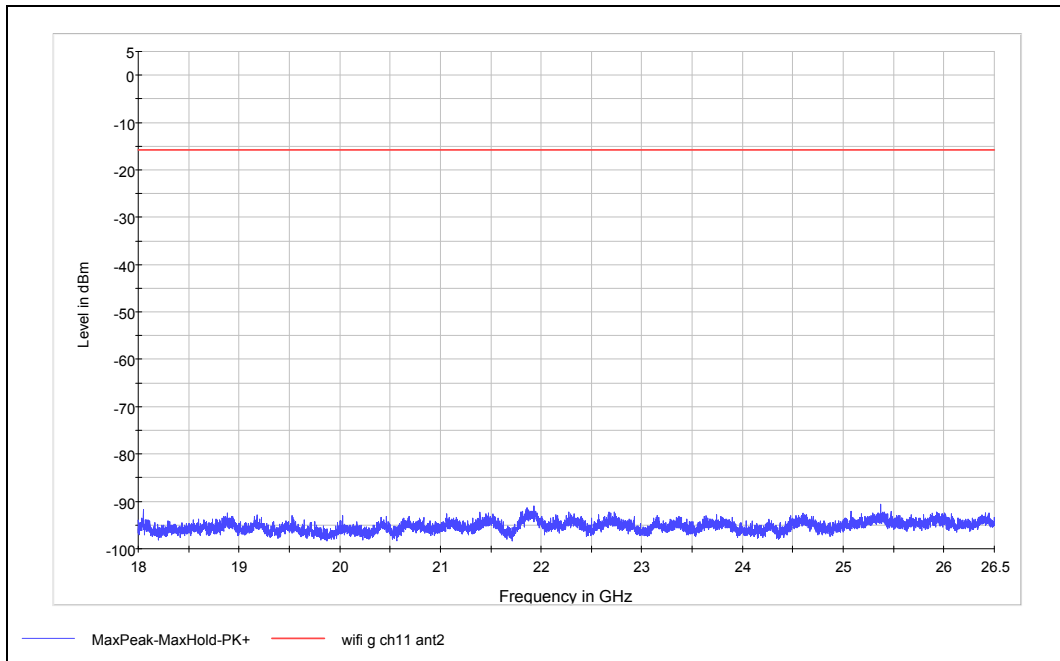
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802.11g CH11



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

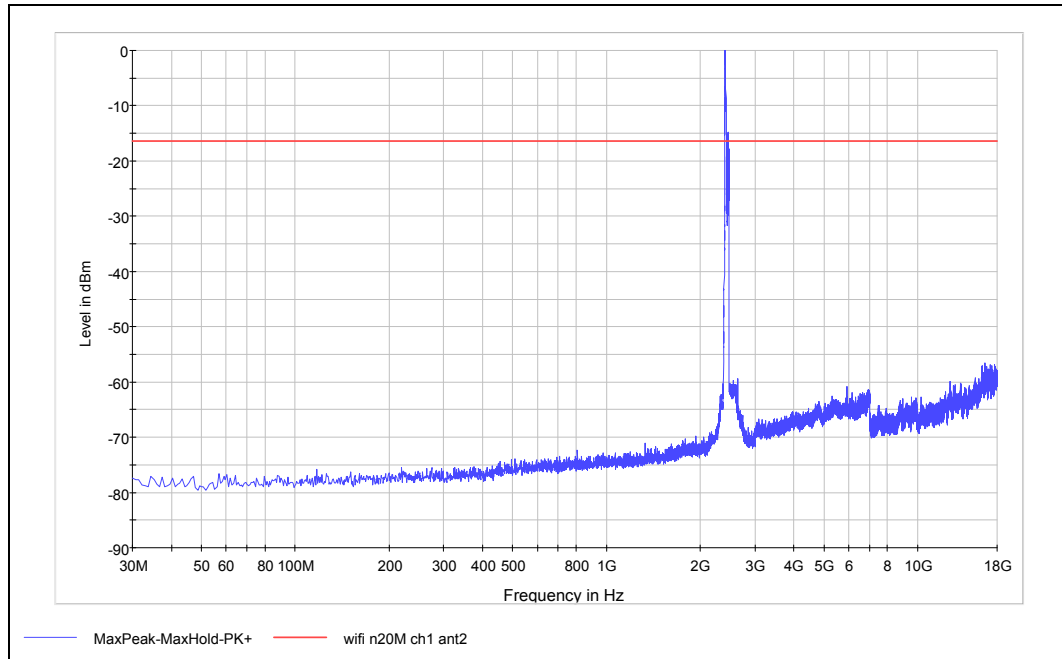
TA Technology (Shanghai) Co., Ltd.

Test Report

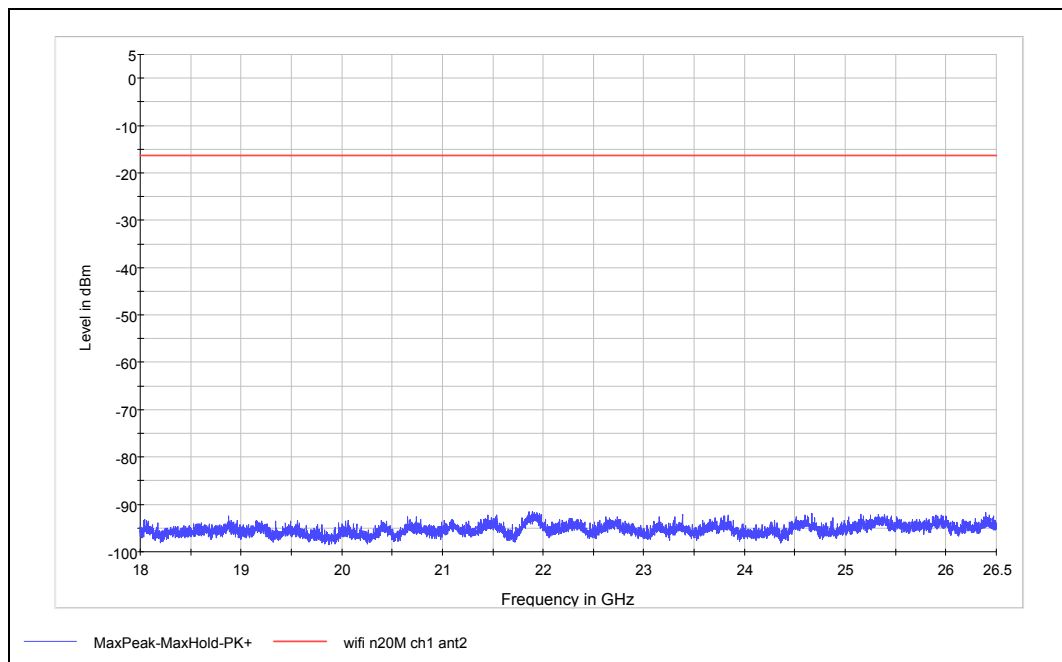
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802.11n(HT20) CH1



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

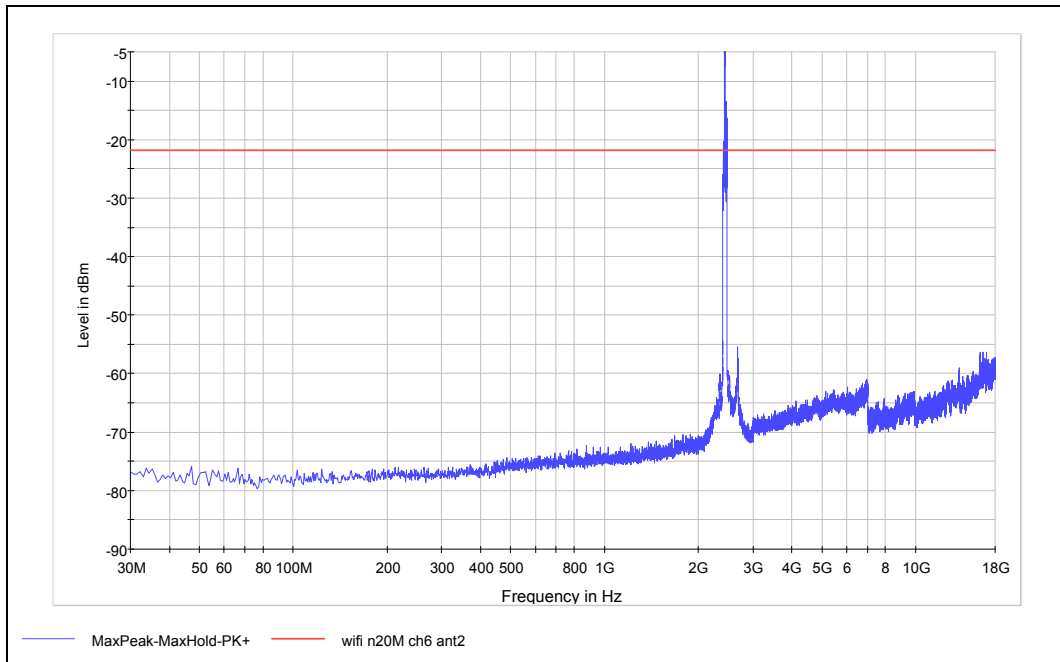
TA Technology (Shanghai) Co., Ltd.

Test Report

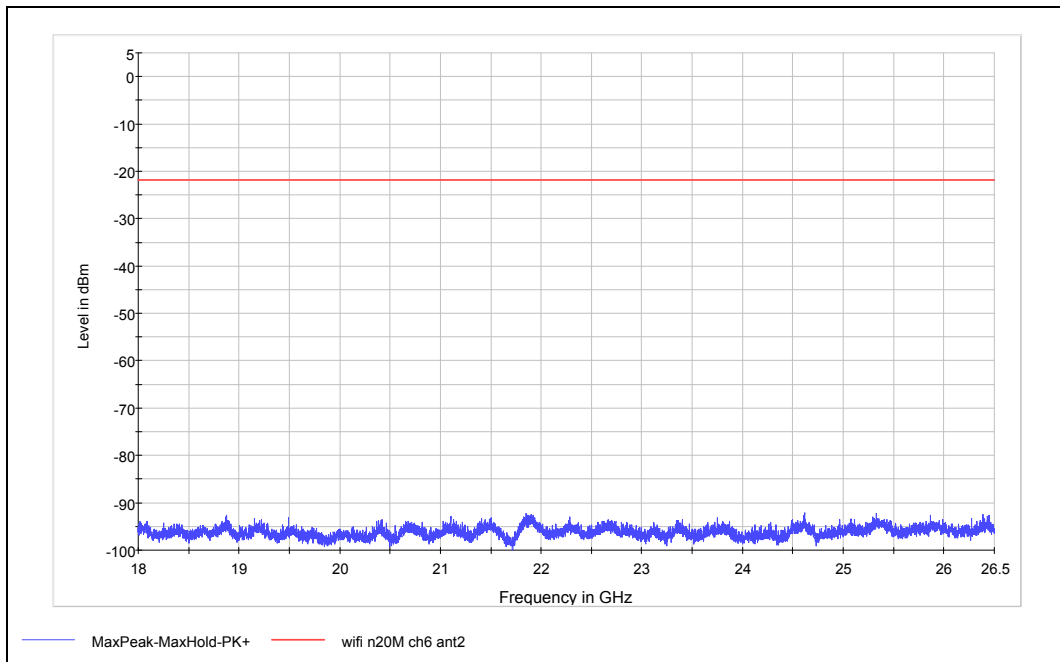
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802.11n(HT20) CH6



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

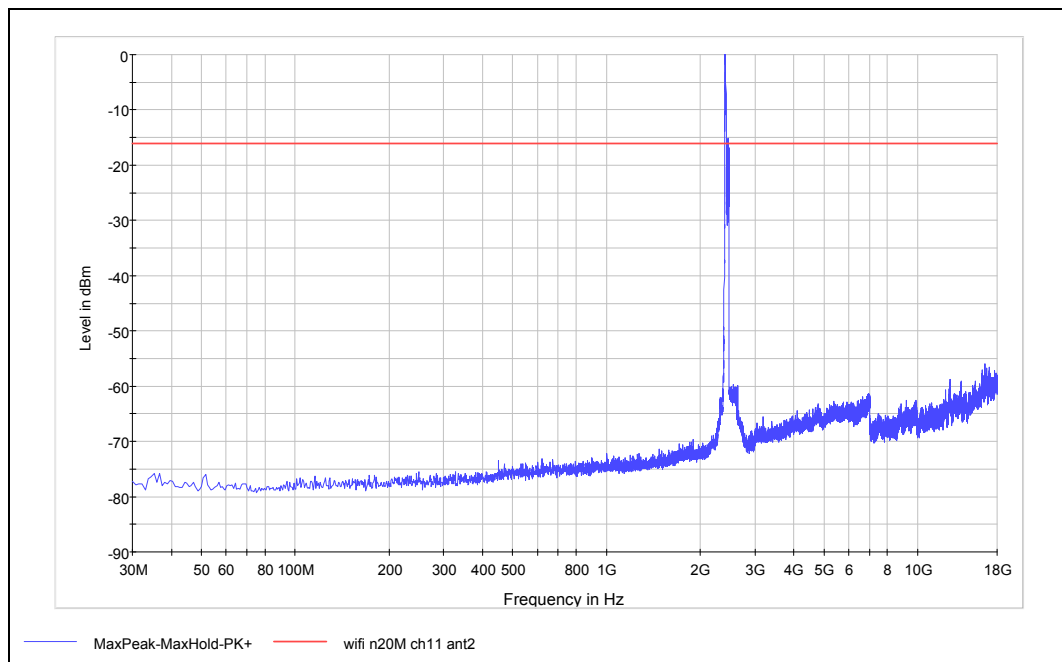
TA Technology (Shanghai) Co., Ltd.

Test Report

Report No.:RHA1505-0034RF01R3

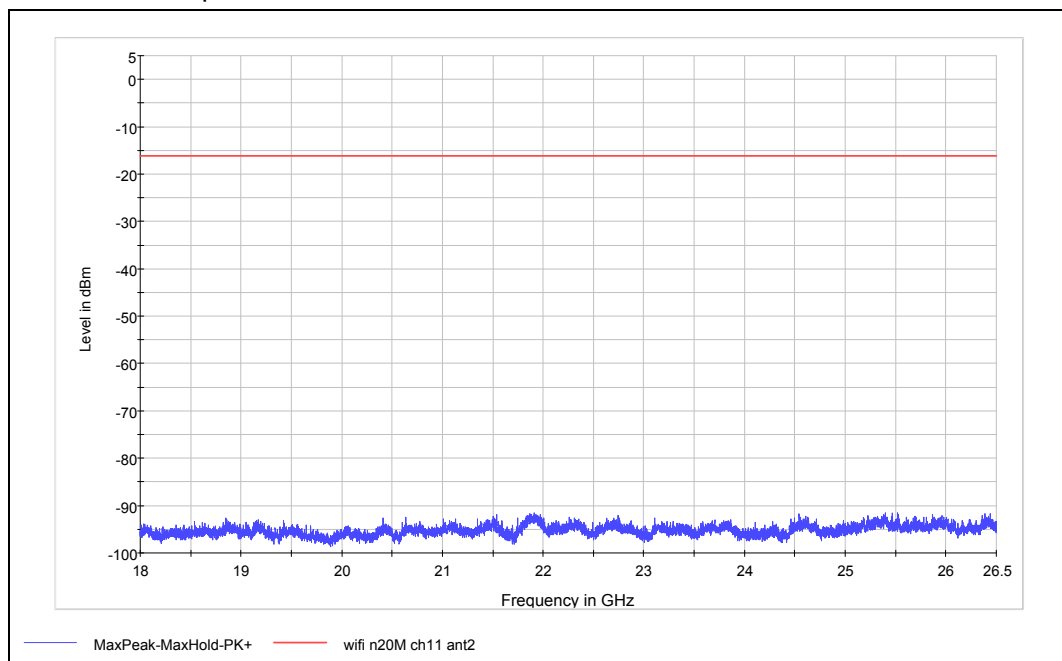
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802.11n(HT20) CH11



Note: The signal beyond the limit is carrier

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

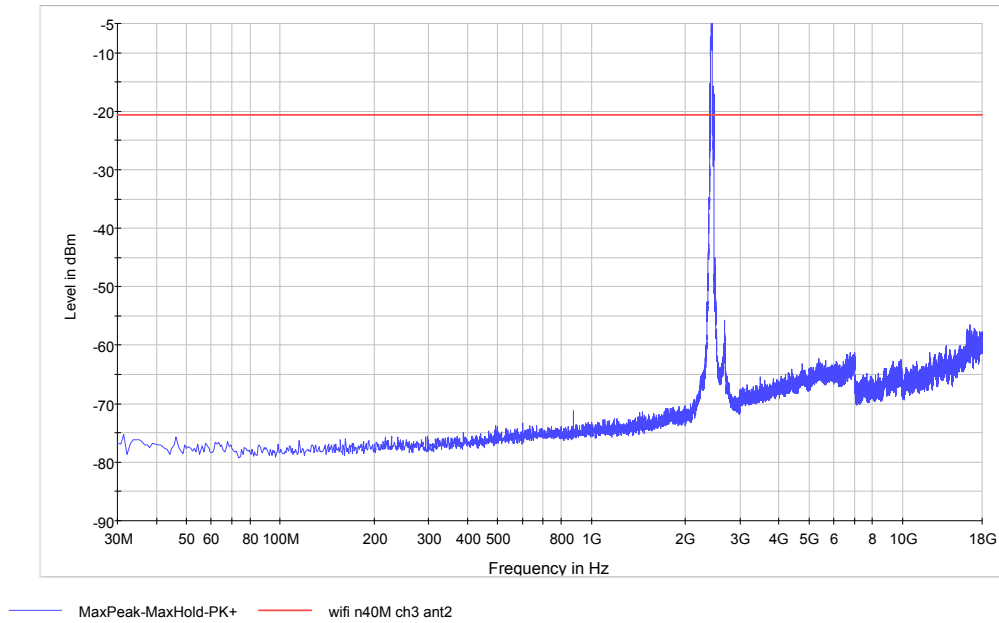
TA Technology (Shanghai) Co., Ltd.

Test Report

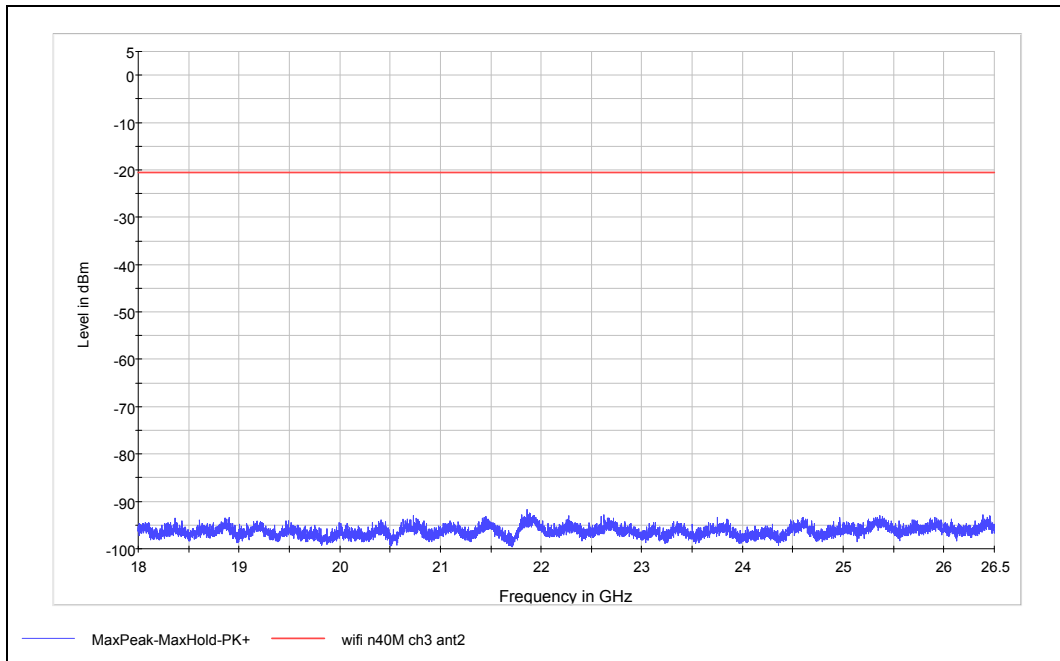
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802.11n(HT40) CH3



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

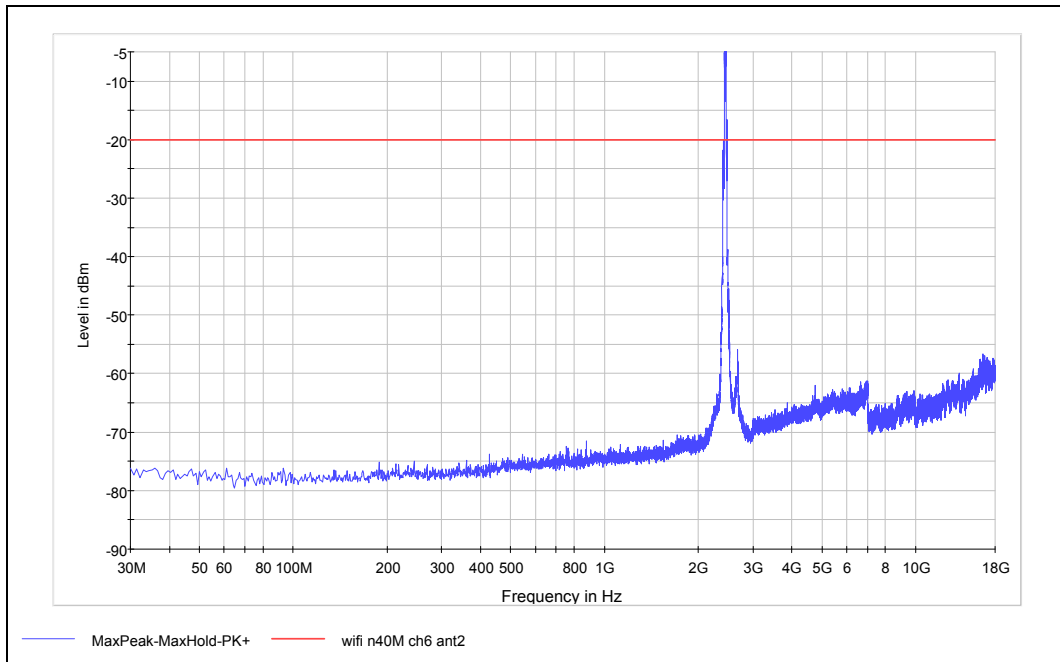
TA Technology (Shanghai) Co., Ltd.

Test Report

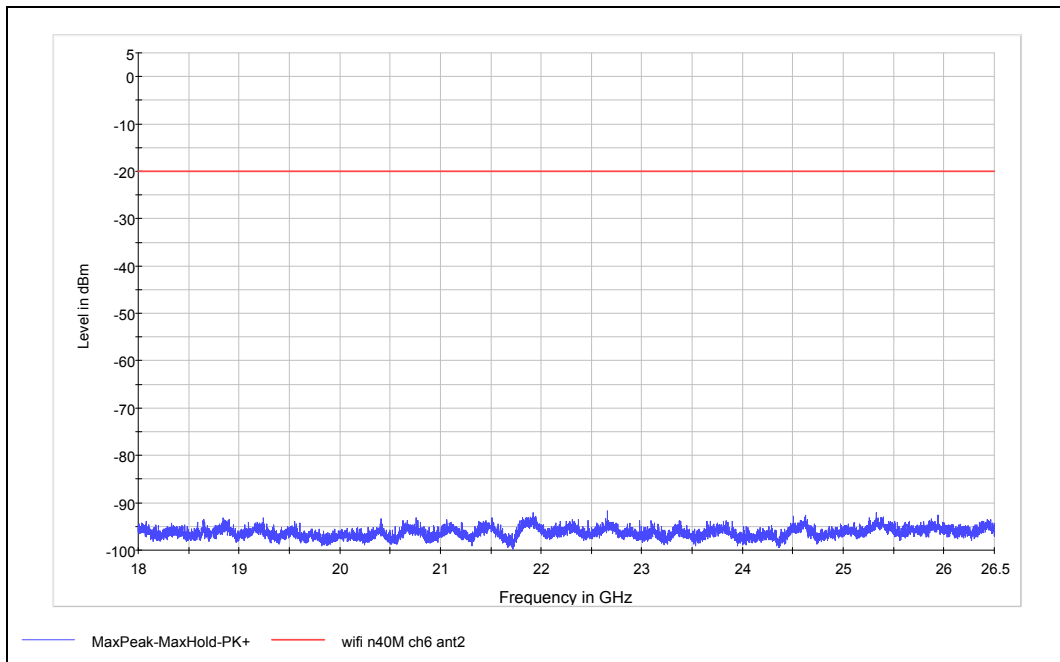
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802.11n(HT40) CH6



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

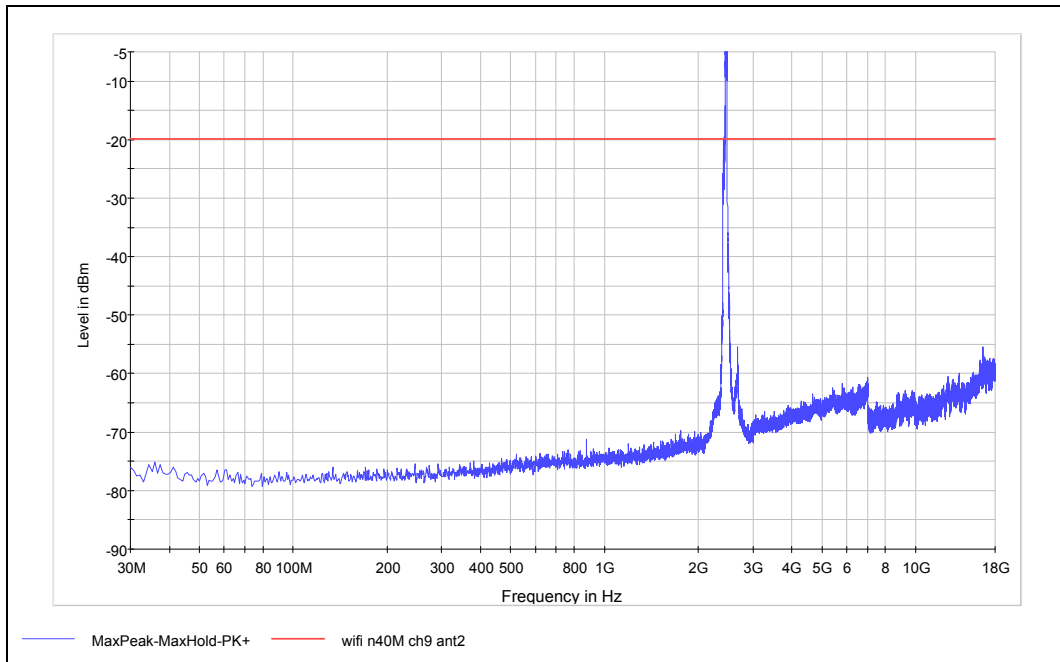
TA Technology (Shanghai) Co., Ltd.

Test Report

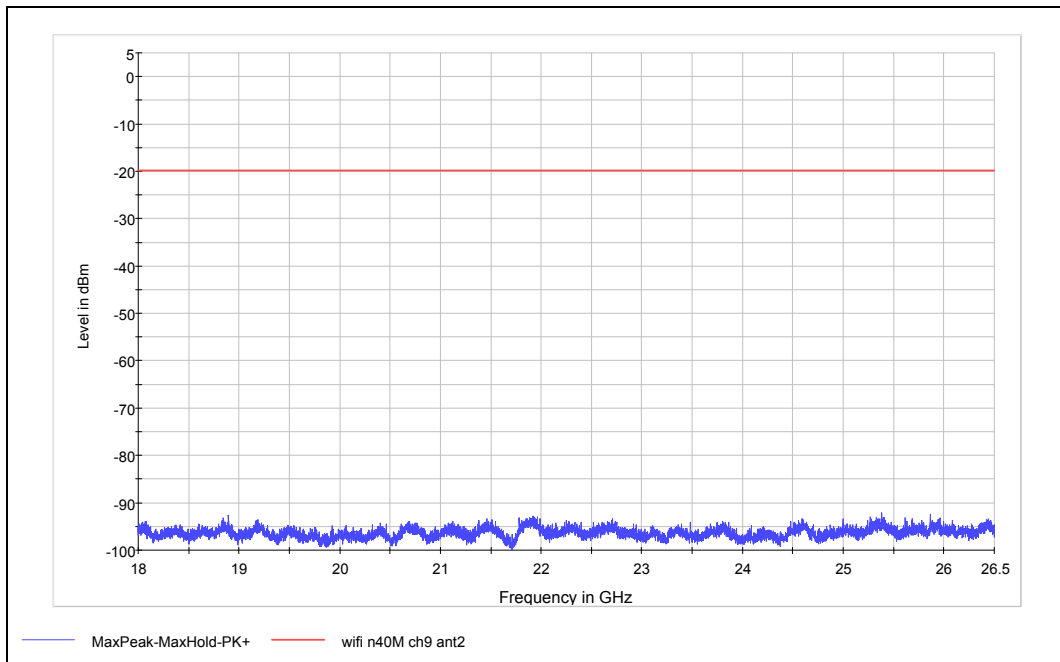
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802.11n(HT40) CH9



Note: The signal beyond the limit is carrier
Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz