RF TEST REPORT

Applicant	Huawei Technologies Co., Ltd.
FCC ID	QISAP6150DN
Product	Wireless LAN Access Point
Model	AP6150DN
Report No.	R1803H0033-R4V2
Issue Date	July 4, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2018)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Zhengqiang Zhou *Approved by: Kai Xu*

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Summary of measurement results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	Maximum conducted output power	15.247(b)(3)	PASS
2	6 dB bandwidth	15.247(a)(2)	PASS
3	Power spectral density	15.247(e)	PASS
4	Band Edge	15.247(d)	PASS
5	Spurious RF Conducted Emissions	15.247(d)	PASS
6	Radiated Emissions in restricted frequency bands	15.247(d),15.205,15.209	PASS
7	Radiated Emissions	15.247(d),15.205,15.209	PASS
8	Conducted Emissions	15.207	PASS
Date of Testing: March 15, 2018~ May 4, 2018			

1. Test Laboratory

1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

CNAS (accreditation number: L2264)

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

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

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

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
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2. General Description of Equipment under Test

Client Information

Applicant	Huawei Technologies Co., Ltd.
Applicant address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129 P.R.China
Manufacturer	Huawei Technologies Co., Ltd.
Manufacturer address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129 P.R.China

General information

EUT Description		
Model	AP6150DN	
IMEI	024VWS10J2800003Y2	
Hardware Version	VA	
Software Version	V200R009C00B905	
Power Supply	DC Adapter/ Powered over Ethernet	
Antenna Type	External Antenna	
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement	
Antenna Gain	Antenna Type 1	Antenna Type 2
	Antenna 1: 3.50 dBi Antenna 2: 3.50 dBi Antenna 3: 3.50 dBi Antenna 4: 3.50 dBi	Antenna 1: 4.00 dBi Antenna 2: 4.00 dBi Antenna 3: 4.00 dBi Antenna 4: 4.00 dBi
additional beamforming gain	3 dBi	
Loss of RF cable	≤2dbi	
Test Mode	802.11b 802.11g, 802.11n(HT20/HT40);	
Modulation Type	802.11b: DSSS; 802.11g/n(HT20/HT40): OFDM	
Max. Conducted Power	Wi-Fi 2.4G :25.58dBm	
Operating Frequency Range(s)	802.11b/g/n(HT20): 2412 ~ 2462 MHz 802.11n(HT40): 2422 ~ 2452 MHz	
EUT Accessory		
POE Adapter 1	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd. Model: PoE35-54A Input voltage: 100-240 V/50-60 Hz,1.0A	

	Output voltage: -48V ⎓ 0.65 A
POE Adapter 2	Manufacturer: Shenzhen Huntkey Electric Co., Ltd. Model: PoE35-54A Input voltage: 100-240 V/50-60 Hz 1.0A Output voltage: -48V ⎓ 0.65 A
DC Adapter 1	Manufacturer: Shenzhen Huntkey Electric Co., Ltd. Model: HKA02412020-3K Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 2	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd. Model: HW-120200E1W Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 3	Manufacturer: Shenzhen Huntkey Electric Co., Ltd. Model: HKA02412020-4K Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 4	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd. Model: HW-120200B1W Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 5	Manufacturer: Shenzhen Huntkey Electric Co., Ltd. Model: HKA02412020-1K Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 6	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd. Model: HW-120200C1W Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 7	Manufacturer: Shenzhen Huntkey Electric Co., Ltd. Model: HW-120200A1W Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 8	Manufacturer: Shenzhen Huntkey Electric Co., Ltd. Model: HW-120200U1W Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 9	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd. Model: HW-120200U1W Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 10	Manufacturer: Shenzhen Huntkey Electric Co., Ltd. Model: HW-120200Z1W Input voltage: 100-240 V/50-60 Hz 0.8A

	Output voltage: 12 V ⎓ 2.0 A
DC Adapter 11	Manufacturer: Shenzhen Huntkey Electric Co., Ltd. Model: HW-24-12AC8D Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
DC Adapter 12	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd. Model: HW-24-12AC8D Input voltage: 100-240 V/50-60 Hz 0.8A Output voltage: 12 V ⎓ 2.0 A
Note: 1. The information of the EUT is declared by the manufacturer. 2. There is more than one Adapter, each one should be applied throughout the compliance test respectively, however, only the worst case (Adapter 1) will be recorded in this report.	

AP6050DN is all the same with AP6150DN except that the antenna of AP6050DN is inside the enclosure and antenna of AP6150DN is outside the enclosure.

Partial test values duplicated from **AP6050DN (Report No: R1803H0032-R3)** for **AP6150DN**.
Test items tested for AP6150DN see the table below.

Test Cases	**AP6150DN (R1803H0033-R4V1)**
Maximum conducted output power	pass (Full test)
6dB Bandwidth	Refer to the AP6050DN
Band Edge	Refer to the AP6050DN
Power Spectral Density	pass (spot test)
Spurious RF Conducted Emissions	Refer to the AP6050DN
Radiates Emission in the Restricted Band	pass
Radiates Emission	pass
Conducted Emission	pass

3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

- **FCC CFR47 Part 15C (2018) Radio Frequency Devices**
- **ANSI C63.10 (2013)**
- **KDB 558074 D01 DTS Meas Guidance v04**
- **KDB 662911 D01 Multiple Transmitter Output v02r01**

4. Test Configuration

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. Preliminary tests have been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

The test software is used IPOP: IPOP+CAL 2G
Worst-case data rates are shown as following table.

Band	Data Rate			
	Antenna 1	Antenna 2	Antenna 3	Antenna 4
802.11b	1 Mbps	1 Mbps	1 Mbps	1 Mbps
802.11g	6 Mbps	6 Mbps	6 Mbps	6 Mbps
802.11n HT20	MCS0	MCS0	MCS0	MCS0
802.11n HT40	MCS0	MCS0	MCS0	MCS0

The EUT incorporate a MIMO function.

Band	Modulation Mode	CDD Mode	Beamforming Mode	TX Function
2.4GHz	802.11b	Support	Not Support	1TX, 2TX, 3TX, 4TX
	802.11g	Support	Not Support	1TX, 2TX, 3TX, 4TX
	802.11n HT20	Support	Support	1TX, 2TX, 3TX, 4TX
	802.11n HT40	Support	Support	1TX, 2TX, 3TX, 4TX

The worst case Antenna mode for each of the following tests for Wi-Fi:

Test Cases	SISO Ant	MIMO Ant 2X2	MIMO Ant 3X3	MIMO Ant 4X4
Maximum conducted output power	O	O	O	O
6dB Bandwidth	--	--	--	O
Band Edge	--	--	--	O
Power Spectral Density	O	O	O	O
Spurious RF Conducted Emissions	--	--	--	O
Radiates Emission in the Restricted Band	--	--	--	O
Radiates Emission	--	--	--	O
Conducted Emission	--	--	--	O

5. Test Case Results

5.1. Maximum conducted output power

Ambient condition

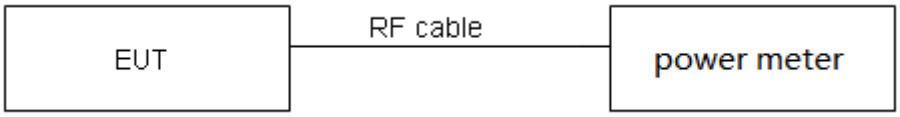
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to Average Power meter with a known loss. The EUT is max power transmission with proper modulation. The signal transmission is continuous.

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test Setup



Limits

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

Average Output Power	≤ 1W (30dBm)

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.

Test Results

Antenna Type 1: Gain = 3.5 dBi, Antenna Type 2: Gain = 4 dBi. In this report we use a larger antenna gain (Antenna Type 2: Gain = 4 dBi) to evaluate the limits.

SISO Antenna

SISO Antenna Power Index												
Packet Type	Antenna 1			Antenna 2			Antenna 3			Antenna 4		
	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11
802.11b	20	20	20	20	20	20	20	20	20	21	21	21
802.11g	18	18	18	18	18	18	18	18	18	18	18	18
802.11n HT20	17	17	17	17	17	17	17	17	17	17	17	17
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	17	17	17	17	17	17	17	17	17	17	17	17

MIMO Antenna 2X2 without beamforming

MIMO Antenna Power Index						
Packet Type	Antenna 1			Antenna 2		
	CH1	CH6	CH11	CH1	CH6	CH11
802.11b	20	20	20	20	20	20
802.11g	18	18	18	18	18	18
802.11n HT20	17	17	17	17	17	17
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	17	17	17	17	17	17

MIMO Antenna 2X2 with beamforming

MIMO Antenna Power Index						
Packet Type	Antenna 1			Antenna 2		
	CH1	CH6	CH11	CH1	CH6	CH11
802.11n HT20	17	17	17	17	17	17
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	17	17	17	17	17	17

MIMO Antenna 3X3 without beamforming

MIMO Antenna Power Index									
Packet Type	Antenna 1			Antenna 2			Antenna 3		
	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11
802.11b	20	20	20	20	20	20	20	20	20
802.11g	18	18	18	18	18	18	18	18	18
802.11n HT20	18	18	18	18	18	18	18	18	18
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	17	17	17	17	17	17	17	17	17

MIMO Antenna 3X3 with beamforming

MIMO Antenna Power Index									
Packet Type	MIMO Antenna 1			MIMO Antenna 2			MIMO Antenna 3		
	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11
802.11n HT20	18	18	18	18	18	18	18	18	18
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	17	17	17	17	17	17	17	17	17

MIMO Antenna 4X4 without beamforming

MIMO Antenna Power Index												
Packet Type	MIMO Antenna 1			MIMO Antenna 2			MIMO Antenna 3			MIMO Antenna 4		
	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11
802.11b	20	20	20	20	20	20	20	20	20	20	20	20
802.11g	17	18	15.5	17	18	15.5	17	18	15.5	17	18	15.5
802.11n HT20	16	18	14.5	16	18	14.5	16	18	14.5	16	18	14.5
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	15	17	15	15	17	15	15	17	15	15	17	15

MIMO Antenna 4X4 with beamforming

MIMO Antenna Power Index												
Packet Type	MIMO Antenna 1			MIMO Antenna 2			MIMO Antenna 3			MIMO Antenna 4		
	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11
802.11n HT20	16	18	14.5	16	18	14.5	16	18	14.5	16	18	14.5
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	15	17	15	15	17	15	15	17	15	15	17	15

Duty cycle：

Band	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11b	12.22	12.29	0.99	NA
802.11g	2.03	2.10	0.97	0.15
802.11n HT20	4.96	5.02	0.99	NA
802.11n HT40	2.41	2.48	0.97	0.12
Note: when Duty cycle>0.98, Duty cycle correction Factor not required.				

SISO Antenna 1

Network Standards	Carrier frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11b	2412	19.22	19.22	30	PASS
	2437	19.16	19.16	30	PASS
	2462	19.03	19.03	30	PASS
802.11g	2412	17.58	17.73	30	PASS
	2437	17.49	17.64	30	PASS
	2462	17.44	17.59	30	PASS
802.11n HT20	2412	16.55	16.55	30	PASS
	2437	16.64	16.64	30	PASS
	2462	16.54	16.54	30	PASS
802.11n HT40	2422	16.38	16.50	30	PASS
	2437	16.29	16.41	30	PASS
	2452	16.23	16.35	30	PASS
Note: Output Power= Read Value +Duty cycle correction factor					

SISO Antenna 2

Network Standards	Carrier frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11b	2412	19.11	19.11	30	PASS
	2437	19.01	19.01	30	PASS
	2462	19.22	19.22	30	PASS
802.11g	2412	17.38	17.53	30	PASS
	2437	17.49	17.64	30	PASS
	2462	17.42	17.57	30	PASS
802.11n HT20	2412	16.55	16.55	30	PASS
	2437	16.41	16.41	30	PASS
	2462	16.48	16.48	30	PASS
802.11n HT40	2422	16.24	16.36	30	PASS
	2437	16.03	16.15	30	PASS
	2452	16.11	16.23	30	PASS
Note: Output Power= Read Value +Duty cycle correction factor					

SISO Antenna 3

Network Standards	Carrier frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11b	2412	18.84	18.84	30	PASS
	2437	18.94	18.94	30	PASS
	2462	18.99	18.99	30	PASS
802.11g	2412	17.33	17.48	30	PASS
	2437	17.31	17.46	30	PASS
	2462	17.46	17.61	30	PASS
802.11n HT20	2412	16.41	16.41	30	PASS
	2437	16.35	16.35	30	PASS
	2462	16.58	16.58	30	PASS
802.11n HT40	2422	16.01	16.13	30	PASS
	2437	16.07	16.19	30	PASS
	2452	16.16	16.28	30	PASS
Note: Output Power= Read Value +Duty cycle correction factor					

SISO Antenna 4

Network Standards	Carrier frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11b	2412	19.84	19.84	30	PASS
	2437	19.74	19.74	30	PASS
	2462	19.86	19.86	30	PASS
802.11g	2412	17.15	17.30	30	PASS
	2437	17.22	17.37	30	PASS
	2462	17.33	17.48	30	PASS
802.11n HT20	2412	16.28	16.28	30	PASS
	2437	16.29	16.29	30	PASS
	2462	16.27	16.27	30	PASS
802.11n HT40	2422	16.00	16.12	30	PASS
	2437	16.11	16.23	30	PASS
	2452	16.13	16.25	30	PASS
Note: Output Power= Read Value +Duty cycle correction factor					

MIMO Antenna 2X2 without beamforming

Network Standards	Carrier frequency (MHz)	Output Power (dBm)					Limit (dBm)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)		
		Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power			
802.11b	2412	19.21	19.21	19.02	19.02	22.13	30	PASS
	2437	19.16	19.16	18.94	18.94	22.06	30	PASS
	2462	18.99	18.99	19.16	19.16	22.09	30	PASS
802.11g	2412	17.58	17.73	17.54	17.69	20.72	30	PASS
	2437	17.39	17.54	17.28	17.43	20.49	30	PASS
	2462	17.31	17.46	17.26	17.41	20.44	30	PASS
802.11n HT20	2412	16.75	16.75	16.44	16.44	19.61	30	PASS
	2437	16.55	16.55	16.34	16.34	19.46	30	PASS
	2462	16.51	16.51	16.53	16.53	19.53	30	PASS
802.11n HT40	2422	16.19	16.31	16.19	16.31	19.32	30	PASS
	2437	16.17	16.29	16.02	16.14	19.23	30	PASS
	2452	16.11	16.23	16.37	16.49	19.38	30	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)})$

2. The manufacturer declared the transmitter output signals is CDD mode. And $N_{ss}=2$. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \le 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};

Array Gain = $5\log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \ge 5$.

So directional gain = G_{ANT} + Array Gain =4+0=4 dBi<6dBi. So the power limt is 30dBm

MIMO Antenna 2X2 with beamforming

Network Standards	Carrier frequency (MHz)	Output Power (dBm)					Limit (dBm)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)		
		Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power			
802.11n HT20	2412	16.28	16.28	16.37	16.37	19.34	30	PASS
	2437	16.37	16.37	16.08	16.08	19.24	30	PASS
	2462	16.03	16.03	16.25	16.25	19.15	30	PASS
802.11n HT40	2422	15.86	15.98	16.08	16.20	19.11	30	PASS
	2437	16.03	16.15	15.94	16.06	19.12	30	PASS
	2452	16.07	16.19	16.11	16.23	19.22	30	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),
The Total Power =$10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)})$

2. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=2. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e）(i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS) =4+10log（2/2）=4dBi< 6dBi. So the limt is 30dBm.

MIMO Antenna 3X3 without beamforming

Network Standards	Carrier frequency (MHz)	Output Power (dBm)							Limit (dBm)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		MIMO Antenna 3		Total Power (dBm)		
		Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power			
802.11b	2412	19.81	19.81	19.98	19.98	20.09	20.09	24.73	30	PASS
	2437	19.88	19.88	19.76	19.76	19.96	19.96	24.64	30	PASS
	2462	19.96	19.96	20.06	20.06	19.88	19.88	24.74	30	PASS
802.11g	2412	18.14	18.29	18.16	18.31	18.09	18.24	23.05	30	PASS
	2437	18.03	18.18	18.17	18.32	18.14	18.29	23.03	30	PASS
	2462	18.15	18.30	18.22	18.37	18.19	18.34	23.11	30	PASS
802.11n HT20	2412	17.84	17.84	17.69	17.69	17.94	17.94	22.60	30	PASS
	2437	17.86	17.86	17.99	17.99	18.03	18.03	22.73	30	PASS
	2462	18.00	18.00	18.11	18.11	18.01	18.01	22.81	30	PASS
802.11n HT40	2422	16.76	16.88	16.64	16.76	16.99	17.11	21.69	30	PASS
	2437	16.91	17.03	16.79	16.91	16.84	16.96	21.74	30	PASS
	2452	16.99	17.11	17.01	17.13	16.98	17.10	21.89	30	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}+10^{(\text{Power antenna3 in dBm}/10)})$.

2. The manufacturer declared the transmitter output signals is CDD mode. And $N_{ss}=3$. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \le 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \ge 5$.

So directional gain = G_{ANT} + Array Gain =4+0=4 dBi<6dBi. So the power limt is 30dBm

MIMO Antenna 3X3 with beamforming

Network Standards	Carrier frequency (MHz)	Output Power (dBm)							Limit (dBm)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		MIMO Antenna 3		Total Power (dBm)		
		Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power			
802.11n HT20	2412	17.88	17.88	17.94	17.94	18.02	18.02	22.72	30	PASS
	2437	17.56	17.56	17.88	17.88	17.96	17.96	22.57	30	PASS
	2462	17.69	17.69	17.86	17.86	17.99	17.99	22.62	30	PASS
802.11n HT40	2422	16.59	16.71	16.74	16.86	16.88	17.00	21.63	30	PASS
	2437	16.64	16.76	16.73	16.85	16.75	16.87	21.60	30	PASS
	2452	16.61	16.73	16.67	16.79	16.79	16.91	21.59	30	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),
The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}+10^{(\text{Power antenna3 in dBm}/10)})$.

2. The manufacturer declared the transmitter output signals is CDD mode. And $N_{ss}=3$. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e）(i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS) =4+10log（3/3）=4dBi< 6dBi. So the limt is 30dBm.

MIMO Antenna 4X4 without beamforming

Network Standards	Carrier frequency (MHz)	Output Power (dBm)									Limit (dBm)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		MIMO Antenna 3		MIMO Antenna 4		Total Power (dBm)		
		Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power			
802.11b HT20	2412	19.44	19.44	19.76	19.76	19.31	19.31	19.21	19.21	25.46	30	PASS
	2437	19.46	19.46	19.84	19.84	19.55	19.55	19.28	19.28	25.56	30	PASS
	2462	19.61	19.61	19.61	19.61	19.64	19.64	19.39	19.39	25.58	30	PASS
802.11g HT20	2412	16.99	17.14	16.74	16.89	16.75	16.90	16.64	16.79	22.95	30	PASS
	2437	17.89	18.04	18.03	18.18	17.94	18.09	17.65	17.80	24.05	30	PASS
	2462	15.44	15.59	15.21	15.36	15.38	15.53	15.33	15.48	21.51	30	PASS
802.11n HT20	2412	15.84	15.84	15.64	15.64	15.58	15.58	15.54	15.54	21.67	30	PASS
	2437	17.89	17.89	18.05	18.05	18.07	18.07	17.64	17.64	23.94	30	PASS
	2462	14.22	14.22	14.22	14.22	14.47	14.47	14.28	14.28	20.32	30	PASS
802.11n HT40	2422	14.35	14.47	14.38	14.50	14.32	14.44	14.31	14.43	20.49	30	PASS
	2437	16.99	17.11	16.74	16.86	16.75	16.87	16.62	16.74	22.92	30	PASS
	2452	15.39	15.51	15.23	15.35	15.19	15.31	15.33	15.45	21.43	30	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}+10^{(\text{Power antenna3 in dBm}/10)}+10^{(\text{Power antenna4 in dBm}/10)})$.

2. The manufacturer declared the transmitter output signals is CDD mode. And $N_{ss}=4$. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

So directional gain = G_{ANT} + Array Gain =4+0=4 dBi<6dBi. So the power limt is 30dBm

MIMO Antenna 4X4 with beamforming

Network Standards	Carrier frequency (MHz)	Output Power (dBm)									Limit (dBm)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		MIMO Antenna 3		MIMO Antenna 4		Total Power (dBm)		
		Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power	Read Value (dBm)	Average Output Power			
802.11n HT20	2412	15.88	15.88	15.84	15.84	15.67	15.67	14.55	14.55	21.54	30	PASS
	2437	17.59	17.59	17.96	17.96	18.00	18.00	17.64	17.64	23.82	30	PASS
	2462	14.28	14.28	14.23	14.23	14.27	14.27	14.39	14.39	20.31	30	PASS
802.11n HT40	2422	14.31	14.43	14.35	14.47	14.21	14.33	14.28	14.40	20.43	30	PASS
	2437	16.49	16.61	16.67	16.79	16.59	16.71	16.58	16.70	22.73	30	PASS
	2452	15.38	15.50	15.39	15.51	15.44	15.56	15.16	15.28	21.49	30	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),
The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}+10^{(\text{Power antenna3 in dBm}/10)}+10^{(\text{Power antenna4 in dBm}/10)})$.
2. The manufacturer declared the transmitter output signals is CDD mode. And $N_{ss}=4$. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e）(i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log（4/4）=4 dBi < 6dBi. So the limt is 30dBm.

5.2. 6dB Bandwidth

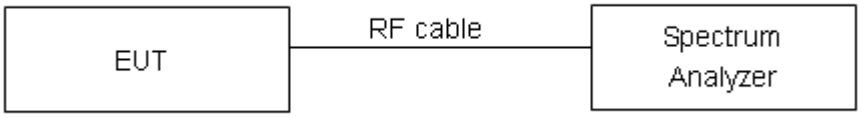
Ambient condition

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. Dector=Peak, Trace mode=max hold.

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 bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

minimum 6 dB bandwidth	≥ 500 kHz

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.

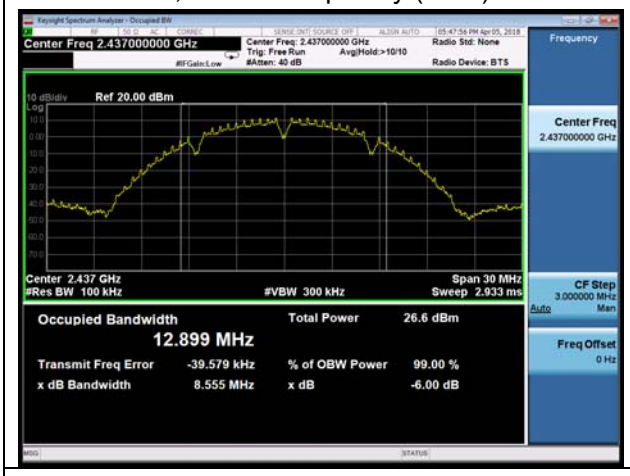
Test Results:

Network Standards	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11b	2412	12.916	8.082	500	PASS
	2437	12.899	8.555	500	PASS
	2462	12.929	8.079	500	PASS
802.11g	2412	16.489	16.35	500	PASS
	2437	16.473	16.35	500	PASS
	2462	16.489	16.36	500	PASS
802.11n HT20	2412	17.678	17.59	500	PASS
	2437	17.674	17.59	500	PASS
	2462	17.680	17.60	500	PASS
802.11n HT40	2422	36.150	36.30	500	PASS
	2437	36.147	35.76	500	PASS
	2452	36.174	36.33	500	PASS

802.11b, Carrier frequency (MHz): 2412

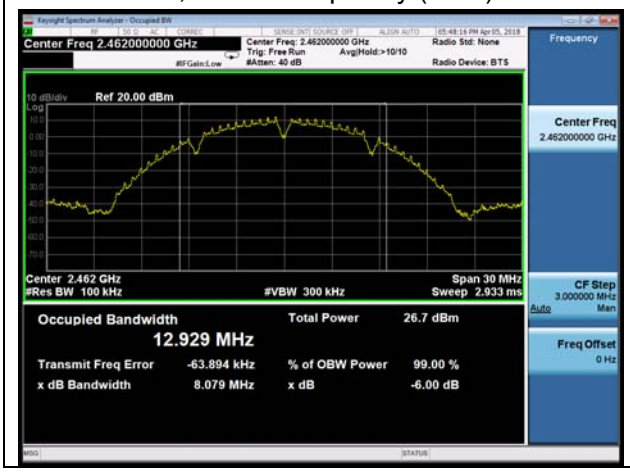
802.11g, Carrier frequency (MHz): 2412

802.11b, Carrier frequency (MHz): 2437



802.11g, Carrier frequency (MHz): 2437

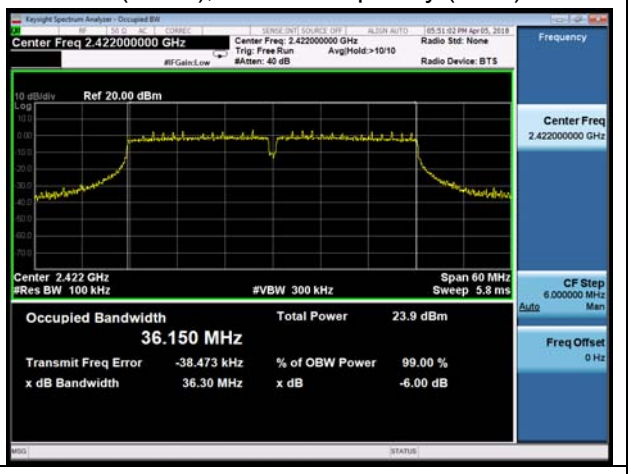
802.11b, Carrier frequency (MHz):2462



802.11g, Carrier frequency (MHz):2462

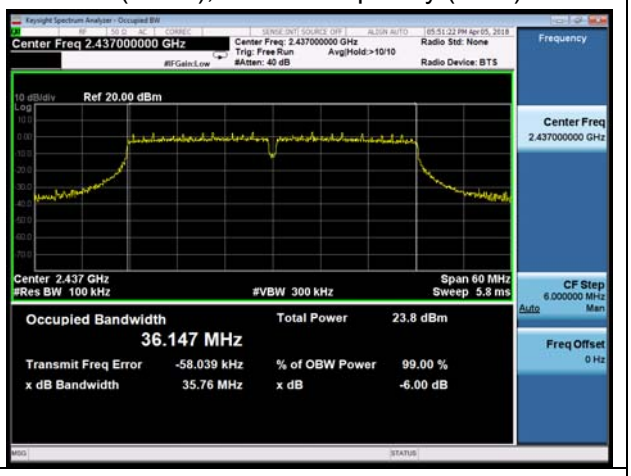
802.11n(HT20), Carrier frequency (MHz): 2412

802.11n(HT40), Carrier frequency (MHz): 2422



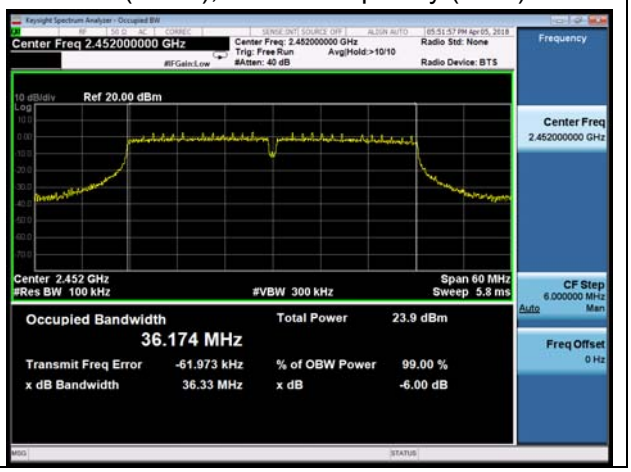
802.11n(HT20), Carrier frequency (MHz): 2437

802.11n(HT40), Carrier frequency (MHz): 2437



802.11n(HT20), Carrier frequency (MHz):2462

802.11n(HT40), Carrier frequency (MHz):2452



5.3. Band Edge

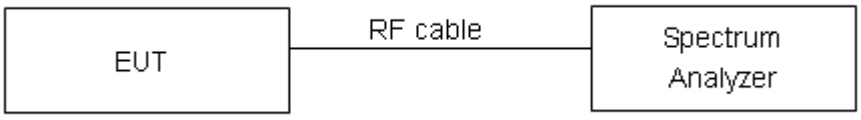
Ambient condition

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 100 kHz and VBW is set to 300 kHz 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, provided the transmitter demonstrates compliance with the peak conducted power limits.” If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.”

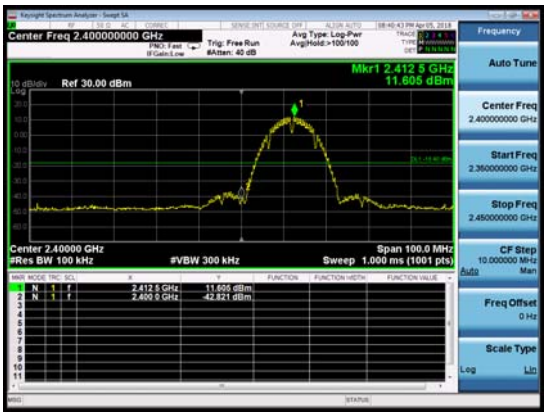
Measurement Uncertainty

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

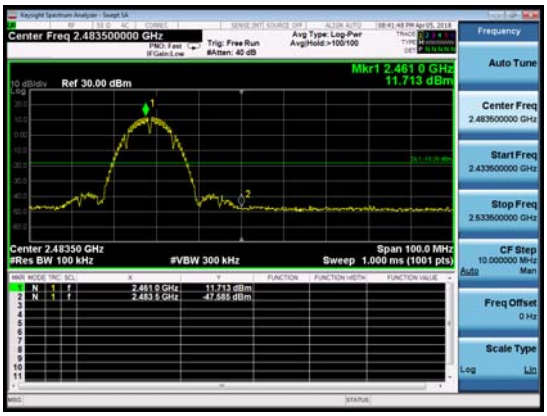
Frequency	Uncertainty
2GHz-3GHz	1.407 dB

Test Results: PASS

802.11b, Channel No.: 1



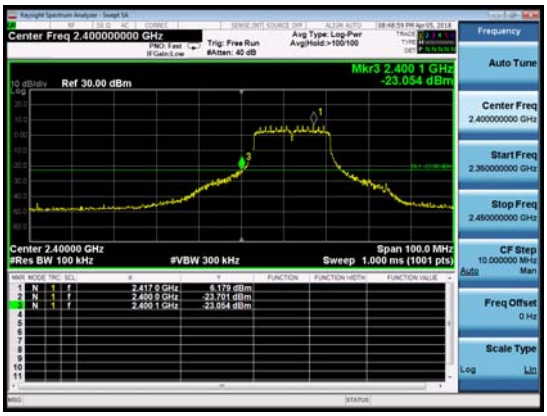
802.11b, Channel No.: 11



802.11g, Channel No.: 1

802.11g, Channel No.: 11

802.11n(HT20), Channel No.: 1



802.11n(HT20), Channel No.: 11

802.11n(HT40), Channel No.: 3

802.11n(HT40), Channel No.: 9

5.4. Power Spectral Density

Ambient condition

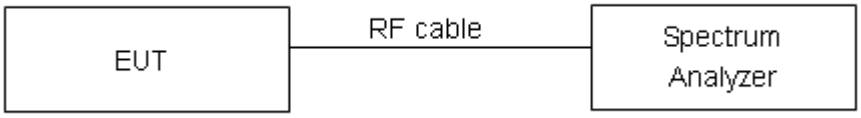
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation. Method AVGPSD-2 in KDB558074 D01 was used for this test.

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test setup



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	≤ 8 dBm / 3kHz

Measurement Uncertainty

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

Test Results:

SISO Antenna 1

Network Standards	Channel Number	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-12.53	-12.53	8	PASS
	6	-12.49	-12.49	8	PASS
	11	-12.52	-12.52	8	PASS
802.11g	1	-17.14	-16.99	8	PASS
	6	-17.33	-17.19	8	PASS
	11	-17.39	-17.24	8	PASS
802.11n HT20	1	-17.79	-17.79	8	PASS
	6	-18.49	-18.49	8	PASS
	11	-18.32	-18.32	8	PASS
802.11n HT40	3	-21.65	-21.53	8	PASS
	6	-21.75	-21.63	8	PASS
	9	-21.86	-21.73	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

SISO Antenna 2

Network Standards	Channel Number	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-12.27	-12.27	8	PASS
	6	-12.31	-12.31	8	PASS
	11	-12.40	-12.40	8	PASS
802.11g	1	-17.08	-16.93	8	PASS
	6	-17.16	-17.01	8	PASS
	11	-17.10	-16.95	8	PASS
802.11n HT20	1	-18.35	-18.35	8	PASS
	6	-18.52	-18.52	8	PASS
	11	-18.51	-18.51	8	PASS
802.11n HT40	3	-21.53	-21.40	8	PASS
	6	-21.73	-21.60	8	PASS
	9	-21.21	-21.09	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

SISO Antenna 3

Network Standards	Channel Number	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-12.07	-12.07	8	PASS
	6	-12.53	-12.53	8	PASS
	11	-12.41	-12.41	8	PASS
802.11g	1	-17.24	-17.10	8	PASS
	6	-17.26	-17.11	8	PASS
	11	-17.41	-17.26	8	PASS
802.11n HT20	1	-18.50	-18.50	8	PASS
	6	-18.63	-18.63	8	PASS
	11	-18.50	-18.50	8	PASS
802.11n HT40	3	-21.92	-21.79	8	PASS
	6	-21.80	-21.68	8	PASS
	9	-21.98	-21.85	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

SISO Antenna 4

Network Standards	Channel Number	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-11.89	-11.89	8	PASS
	6	-11.82	-11.82	8	PASS
	11	-11.56	-11.56	8	PASS
802.11g	1	-17.75	-17.60	8	PASS
	6	-17.71	-17.56	8	PASS
	11	-17.54	-17.39	8	PASS
802.11n HT20	1	-18.89	-18.89	8	PASS
	6	-18.74	-18.74	8	PASS
	11	-18.59	-18.59	8	PASS
802.11n HT40	3	-22.07	-21.95	8	PASS
	6	-22.16	-22.04	8	PASS
	9	-22.00	-21.88	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

MIMO Antenna 2X2 without beamforming

Network Standards	Channel Number	Power Spectral Density					Limit (dBm / 3kHz)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		Total PSD (dBm / 3kHz)		
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)			
802.11b	1	-12.55	-12.55	-12.68	-12.68	-9.61	8.00	PASS
	6	-12.90	-12.90	-12.70	-12.70	-9.79	8.00	PASS
	11	-12.73	-12.73	-12.65	-12.65	-9.68	8.00	PASS
802.11g	1	-17.45	-17.30	-17.07	-16.92	-14.10	8.00	PASS
	6	-17.52	-17.37	-17.12	-16.98	-14.16	8.00	PASS
	11	-17.59	-17.44	-17.29	-17.14	-14.28	8.00	PASS
802.11n HT20	1	-18.56	-18.56	-18.79	-18.79	-15.66	8.00	PASS
	6	-18.64	-18.64	-19.02	-19.02	-15.81	8.00	PASS
	11	-18.81	-18.81	-18.84	-18.84	-15.82	8.00	PASS
802.11n HT40	3	-21.89	-21.77	-22.20	-22.07	-18.91	8.00	PASS
	6	-22.06	-21.93	-22.18	-22.06	-18.98	8.00	PASS
	9	-22.08	-21.96	-22.05	-21.92	-18.93	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}$

2. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain, For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log(2/2)= 4dBi＜6dBi. So the power limt is 8dBm.

MIMO Antenna 2X2 with beamforming

Network Standards	Channel Number	Power Spectral Density					Limit (dBm / 3kHz)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		Total PSD (dBm / 3kHz)		
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)			
802.11n HT20	1	-18.67	-18.67	-18.80	-18.80	-15.72	8.00	PASS
	6	-18.82	-18.82	-18.74	-18.74	-15.77	8.00	PASS
	11	-18.74	-18.74	-18.59	-18.59	-15.65	8.00	PASS
802.11n HT40	3	-22.07	-21.94	-21.66	-21.53	-18.72	8.00	PASS
	6	-22.06	-21.93	-21.71	-21.58	-18.74	8.00	PASS
	9	-21.93	-21.81	-21.78	-21.65	-18.72	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})})$

2. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=2. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e）(i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log（2/2）=4 dBi < 6dBi. So the limt is 8dBm.

MIMO Antenna 3X3 without beamforming

Network Standards	Channel Number	Power Spectral Density							Limit (dBm / 3kHz)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		MIMO Antenna 3		Total PSD (dBm / 3kHz)		
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)			
802.11b	1	-12.49	-12.49	-11.73	-11.73	-11.86	-11.86	-7.24	8.00	PASS
	6	-12.57	-12.57	-12.17	-12.17	-11.87	-11.87	-7.42	8.00	PASS
	11	-12.00	-12.00	-11.73	-11.73	-12.16	-12.16	-7.19	8.00	PASS
802.11g	1	-16.68	-16.53	-17.10	-16.95	-16.70	-16.56	-11.90	8.00	PASS
	6	-16.80	-16.65	-16.65	-16.51	-16.46	-16.32	-11.72	8.00	PASS
	11	-16.85	-16.71	-16.83	-16.69	-16.39	-16.24	-11.77	8.00	PASS
802.11n HT20	1	-17.28	-17.28	-17.58	-17.58	-17.39	-17.39	-12.64	8.00	PASS
	6	-17.40	-17.40	-17.80	-17.80	-17.31	-17.31	-12.73	8.00	PASS
	11	-17.55	-17.55	-17.66	-17.66	-17.16	-17.16	-12.68	8.00	PASS
802.11n HT40	3	-21.42	-21.29	-21.77	-21.64	-21.50	-21.37	-16.66	8.00	PASS
	6	-21.54	-21.41	-21.81	-21.69	-21.16	-21.04	-16.60	8.00	PASS
	9	-21.70	-21.58	-21.64	-21.52	-21.19	-21.07	-16.61	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})})$

2. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=3. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain, For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log(3/3)= 4dBi＜6dBi. So the power limt is 8dBm.

MIMO Antenna 3X3 with beamforming

Network Standards	Channel Number	Power Spectral Density							Limit (dBm / 3kHz)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		MIMO Antenna 3		Total PSD (dBm / 3kHz)		
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)			
802.11n HT20	1	-17.64	-17.64	-17.36	-17.36	-17.01	-17.01	-12.56	8.00	PASS
	6	-17.49	-17.49	-17.26	-17.26	-16.77	-16.77	-12.39	8.00	PASS
	11	-17.71	-17.71	-17.00	-17.00	-17.07	-17.07	-12.48	8.00	PASS
802.11n HT40	3	-21.40	-21.28	-21.33	-21.20	-21.42	-21.30	-16.49	8.00	PASS
	6	-21.40	-21.28	-21.53	-21.40	-21.20	-21.07	-16.48	8.00	PASS
	9	-21.45	-21.33	-21.16	-21.04	-21.19	-21.06	-16.37	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})})$

2. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=3. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e）(i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log（3/3）=4 dBi < 6dBi. So the limt is 8dBm.

MIMO Antenna 4X4 without beamforming

Network Standards	Channel Number	Power Spectral Density									Limit (dBm / 3kHz)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		MIMO Antenna 3		MIMO Antenna 4		Total PSD (dBm / 3kHz)		
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)			
802.11b	1	-12.47	-12.47	-12.27	-12.27	-12.07	-12.07	-12.57	-12.57	-6.32	8.00	PASS
	6	-12.41	-12.41	-12.38	-12.38	-12.07	-12.07	-12.33	-12.33	-6.27	8.00	PASS
	11	-12.38	-12.38	-12.20	-12.20	-12.16	-12.16	-12.03	-12.03	-6.17	8.00	PASS
802.11g	1	-17.99	-17.84	-17.46	-17.31	-18.18	-18.03	-18.18	-18.03	-11.77	8.00	PASS
	6	-16.98	-16.84	-16.51	-16.36	-16.70	-16.55	-17.05	-16.90	-10.64	8.00	PASS
	11	-19.53	-19.38	-18.73	-18.58	-19.47	-19.33	-19.45	-19.30	-13.20	8.00	PASS
802.11n HT20	1	-19.26	-19.26	-19.41	-19.41	-19.42	-19.42	-19.80	-19.80	-13.44	8.00	PASS
	6	-17.41	-17.41	-17.40	-17.40	-16.72	-16.72	-17.62	-17.62	-11.25	8.00	PASS
	11	-21.00	-21.00	-20.95	-20.95	-20.85	-20.85	-20.78	-20.78	-14.87	8.00	PASS
802.11n HT40	3	-23.85	-23.72	-23.98	-23.85	-24.12	-23.99	-24.27	-24.15	-17.90	8.00	PASS
	6	-21.34	-21.22	-21.51	-21.39	-21.37	-21.25	-21.43	-21.31	-15.27	8.00	PASS
	9	-23.84	-23.71	-23.88	-23.76	-23.76	-23.63	-23.77	-23.64	-17.67	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})}+10^{(\text{PSD antenna4 in dBm/10})})$

2. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=4. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain, For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log(4/4)= 4dBi＜6dBi. So the power limt is 8dBm.

MIMO Antenna 4X4 with beamforming

Network Standards	Channel Number	Power Spectral Density									Limit (dBm / 3kHz)	Conclusion
		MIMO Antenna 1		MIMO Antenna 2		MIMO Antenna 3		MIMO Antenna 4		Total PSD (dBm / 3kHz)		
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)			
802.11n HT20	1	-19.32	-19.32	-19.09	-19.09	-18.91	-18.91	-19.44	-19.44	-13.17	8.00	PASS
	6	-17.43	-17.43	-17.26	-17.26	-16.66	-16.66	-17.36	-17.36	-11.15	8.00	PASS
	11	-20.90	-20.90	-20.32	-20.32	-20.09	-20.09	-20.92	-20.92	-14.52	8.00	PASS
802.11n HT40	3	-23.88	-23.75	-23.94	-23.81	-23.69	-23.57	-23.73	-23.61	-17.66	8.00	PASS
	6	-21.37	-21.25	-21.55	-21.43	-21.35	-21.22	-21.42	-21.29	-15.28	8.00	PASS
	9	-23.71	-23.59	-23.90	-23.78	-23.74	-23.61	-23.50	-23.38	-17.57	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})}+10^{(\text{PSD antenna4 in dBm/10})})$

2. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=4. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e）(i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log（4/4）=4 dBi < 6dBi. So the limt is 8dBm.

SISO Antenna 1

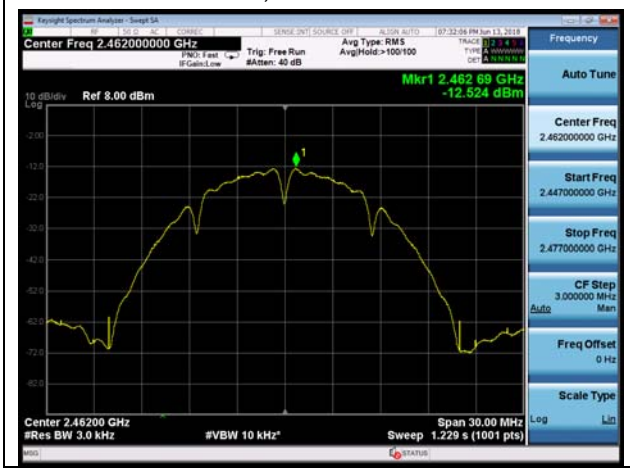
802.11b, Channel No.: 1

802.11g, Channel No.: 1

802.11b, Channel No.: 6

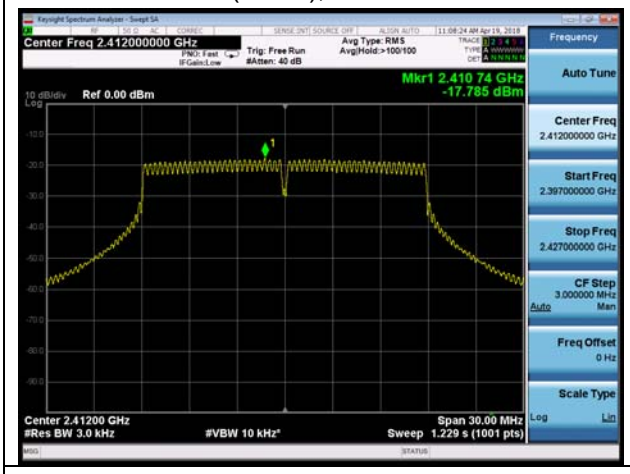
802.11g, Channel No.: 6

802.11b, Channel No.: 11



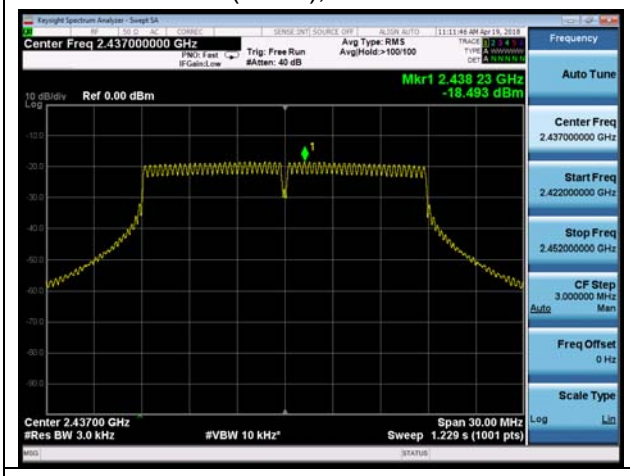
802.11g, Channel No.: 11

802.11n(HT20), Channel No. 1



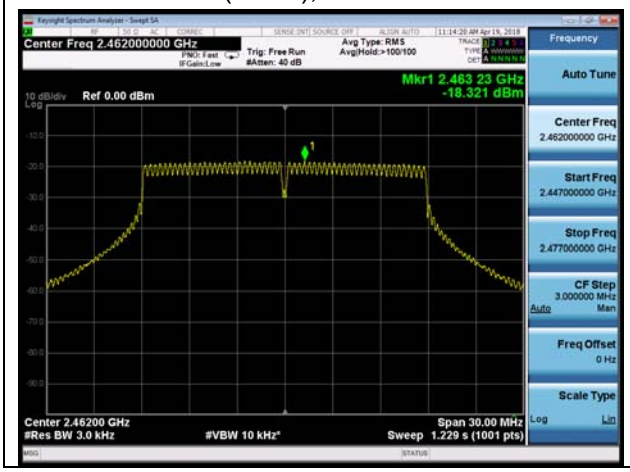
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

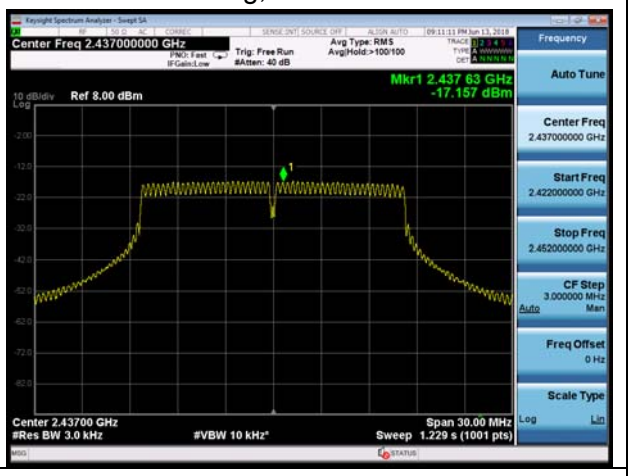
SISO Antenna 2

802.11b, Channel No.: 1

802.11g, Channel No.: 1

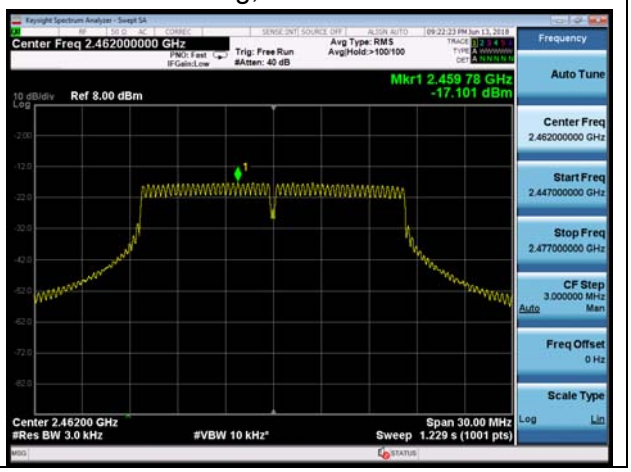
802.11b, Channel No.: 6

802.11g, Channel No.: 6



802.11b, Channel No.: 11

802.11g, Channel No.: 11



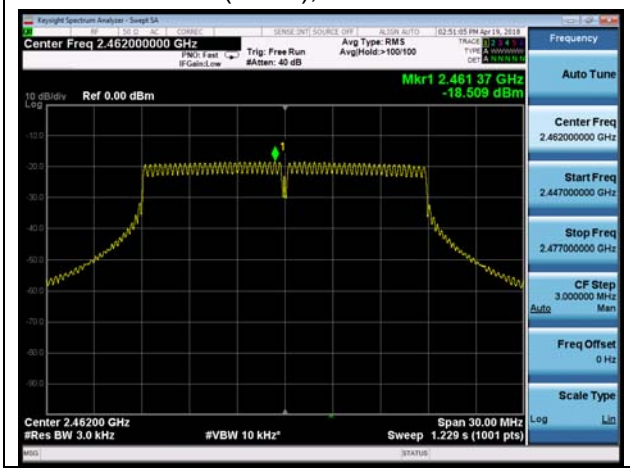
802.11n(HT20), Channel No. 1

802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6

802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

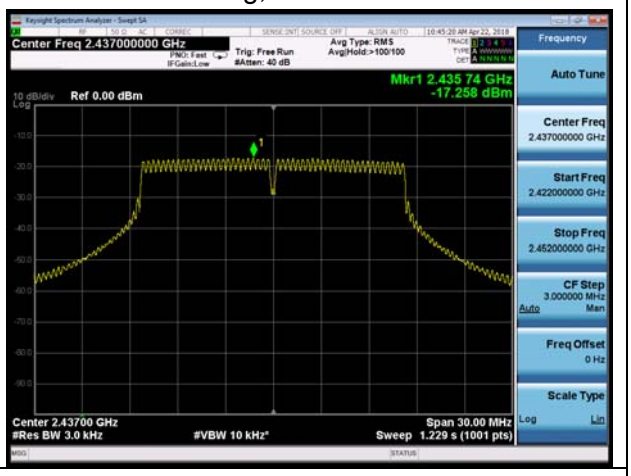
SISO Antenna 3

802.11b, Channel No.: 1

802.11g, Channel No.: 1

802.11b, Channel No.: 6

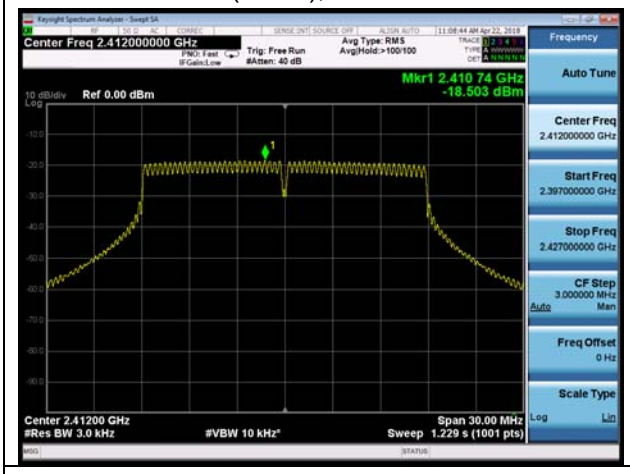
802.11g, Channel No.: 6



802.11b, Channel No.: 11

802.11g, Channel No.: 11

802.11n(HT20), Channel No. 1

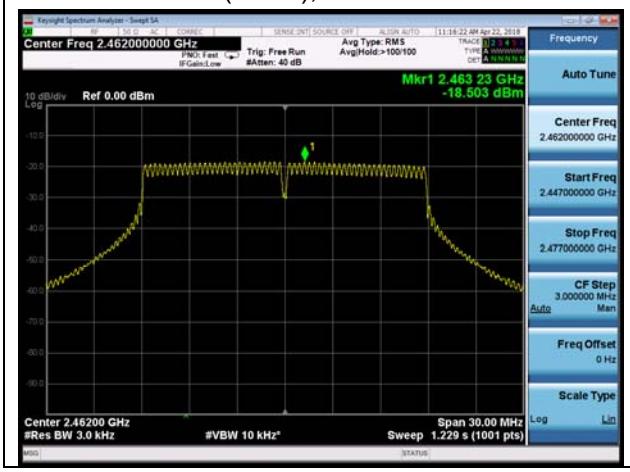


802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6

802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

SISO Antenna 4

802.11b, Channel No.: 1

802.11g, Channel No.: 1

802.11b, Channel No.: 6

802.11g, Channel No.: 6

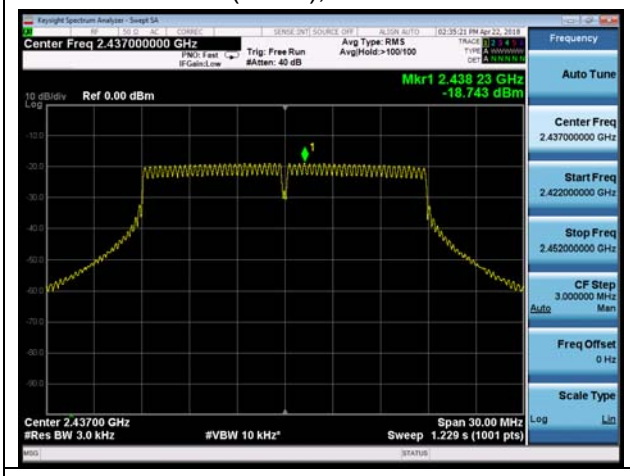
802.11b, Channel No.: 11

802.11g, Channel No.: 11

802.11n(HT20), Channel No. 1

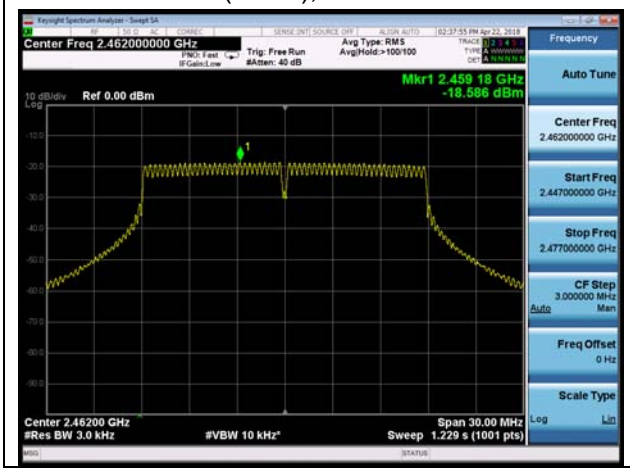
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

MIMO Antenna 2X2 without beamforming

MIMO Antenna 1

802.11b, Channel No.: 1

802.11g, Channel No.: 1

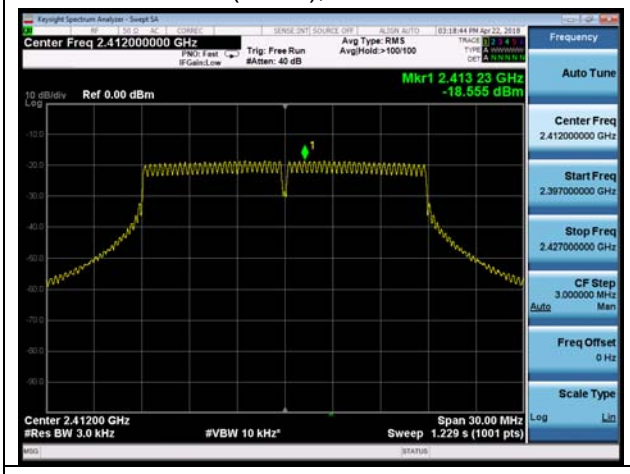
802.11b, Channel No.: 6

802.11g, Channel No.: 6

802.11b, Channel No.: 11

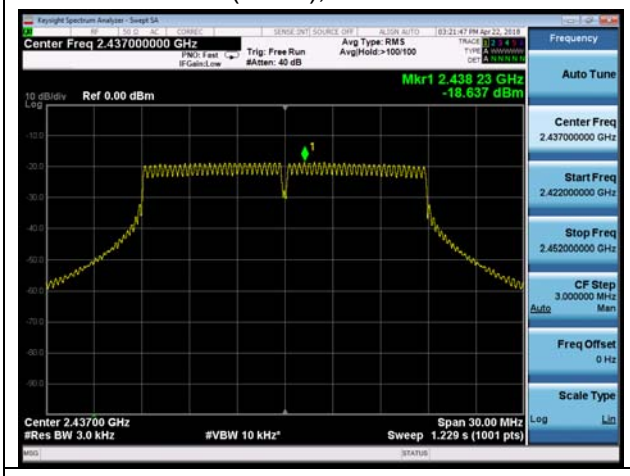
802.11g, Channel No.: 11

802.11n(HT20), Channel No. 1



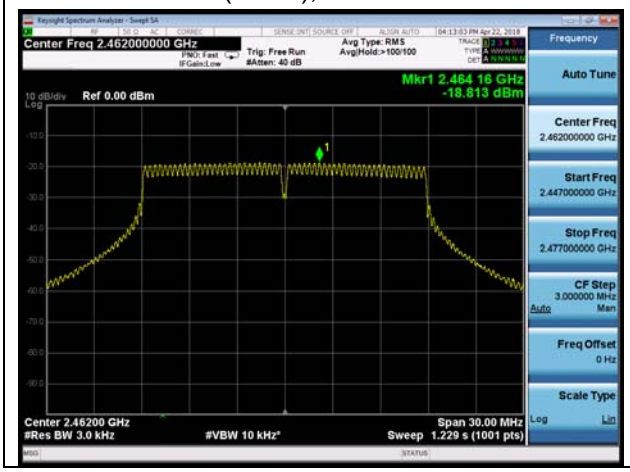
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11

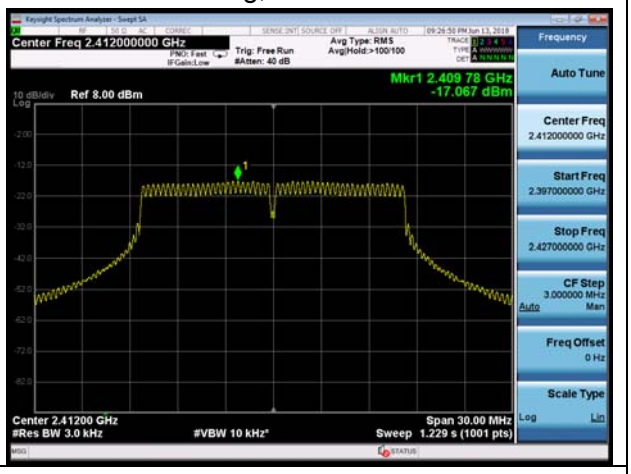


802.11n(HT40), Channel No. 9

MIMO Antenna 2

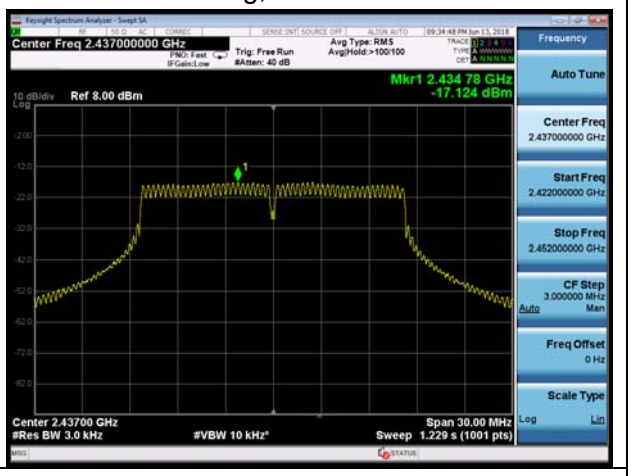
802.11b, Channel No.: 1

802.11g, Channel No.: 1



802.11b, Channel No.: 6

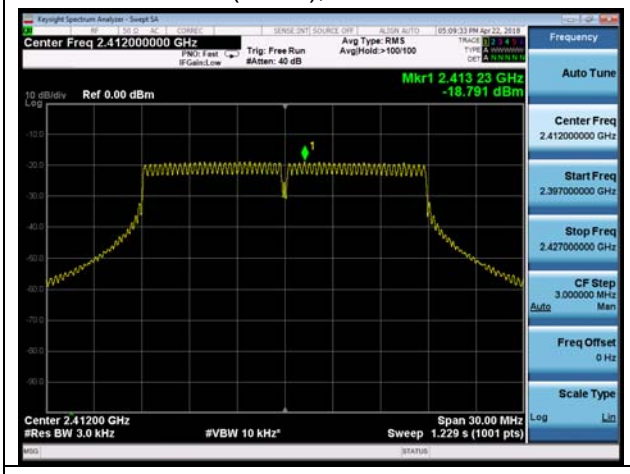
802.11g, Channel No.: 6



802.11b, Channel No.: 11

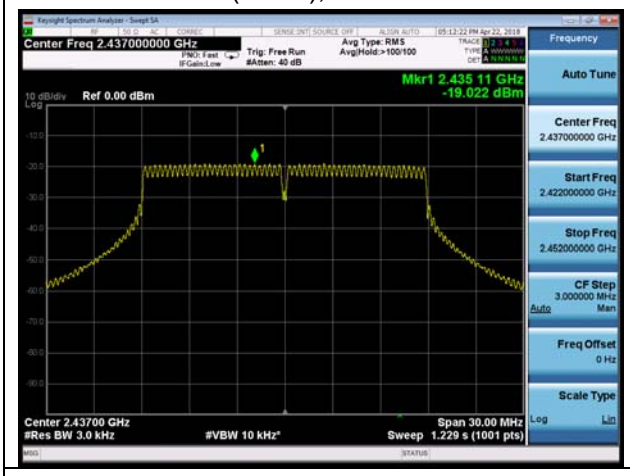
802.11g, Channel No.: 11

802.11n(HT20), Channel No. 1

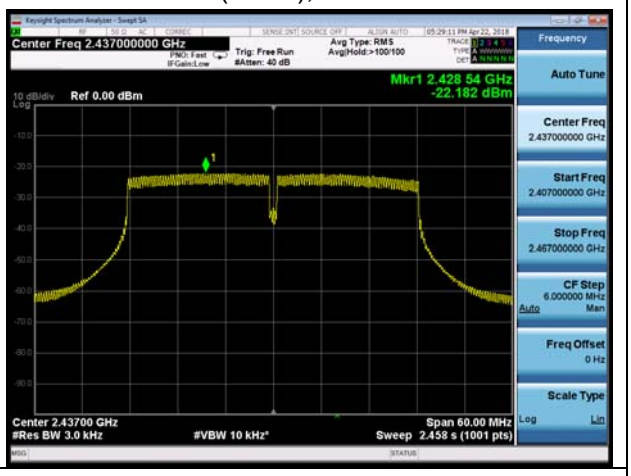


802.11n(HT40), Channel No. 3

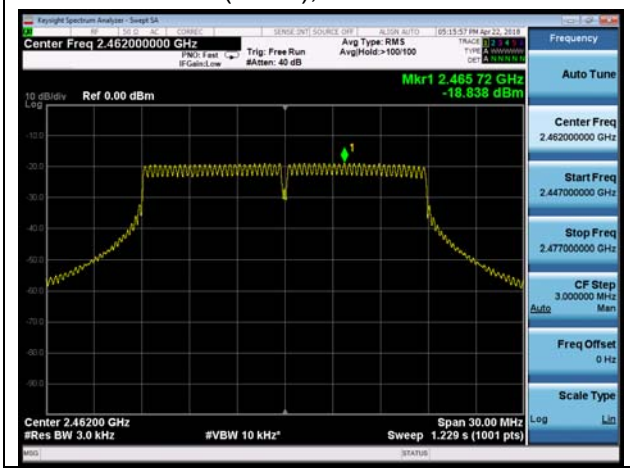
802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11

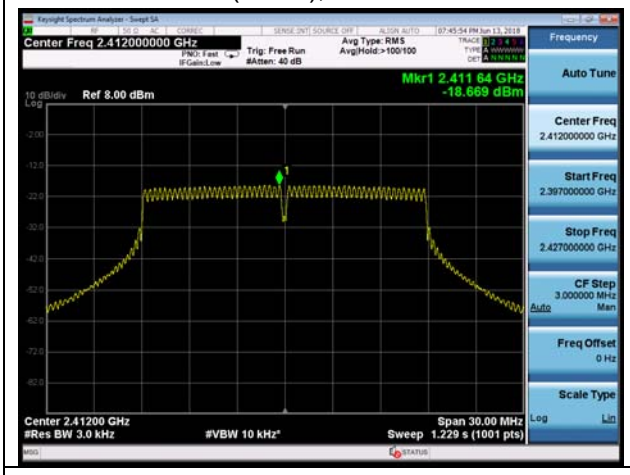


802.11n(HT40), Channel No. 9

MIMO Antenna 2X2 with beamforming

MIMO Antenna 1

802.11n(HT20), Channel No. 1

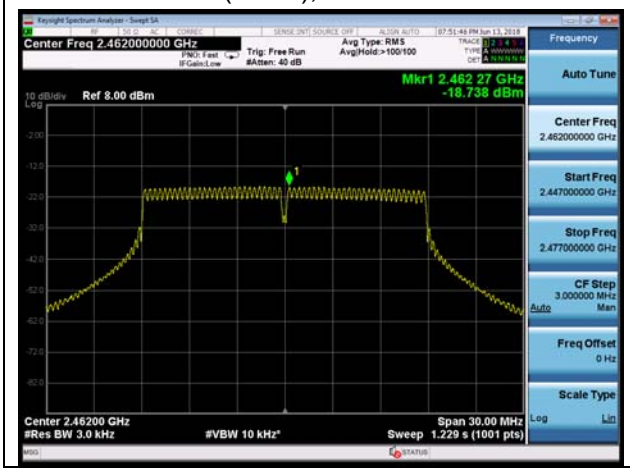


802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6

802.11n(HT40), Channel No. 6

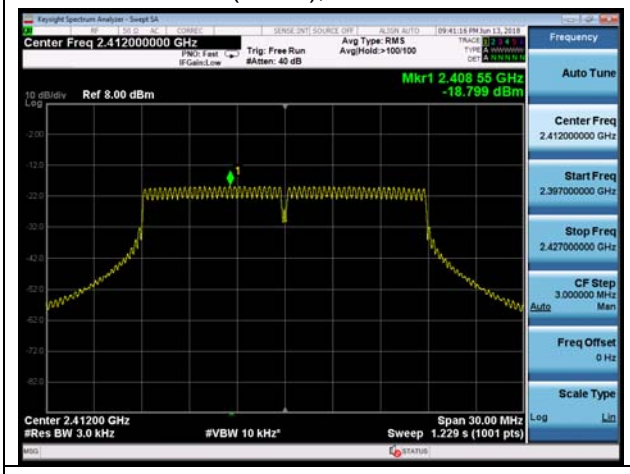
802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

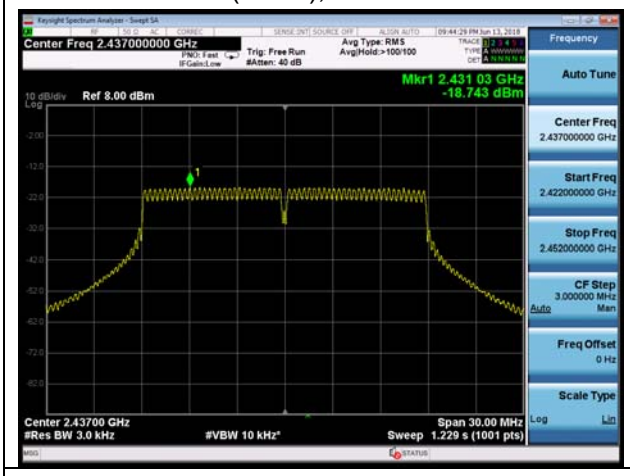
MIMO Antenna 2

802.11n(HT20), Channel No. 1



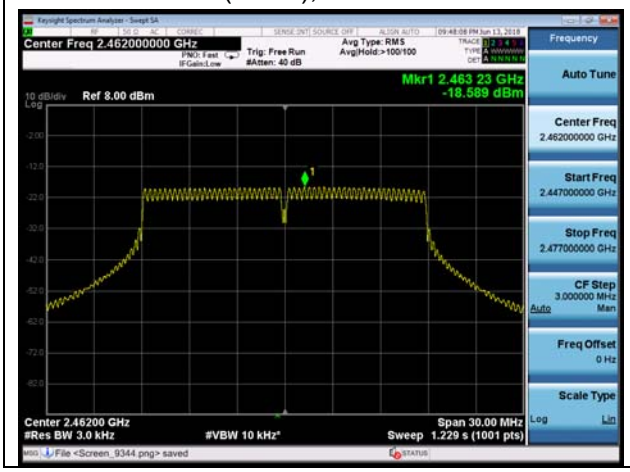
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

MIMO Antenna 3X3 without beamforming

MIMO Antenna 1

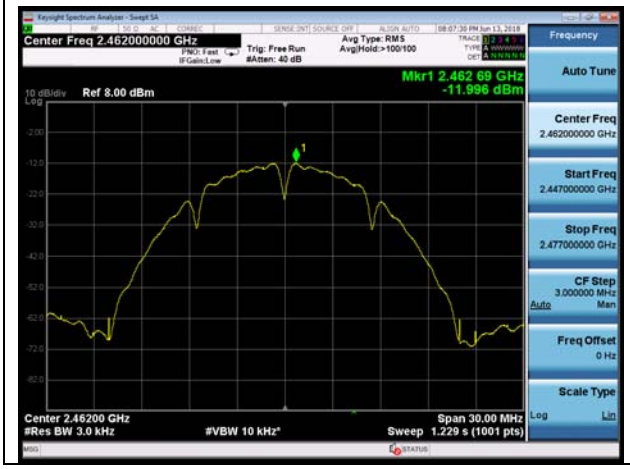
802.11b, Channel No.: 1

802.11g, Channel No.: 1

802.11b, Channel No.: 6

802.11g, Channel No.: 6

802.11b, Channel No.: 11



802.11g, Channel No.: 11

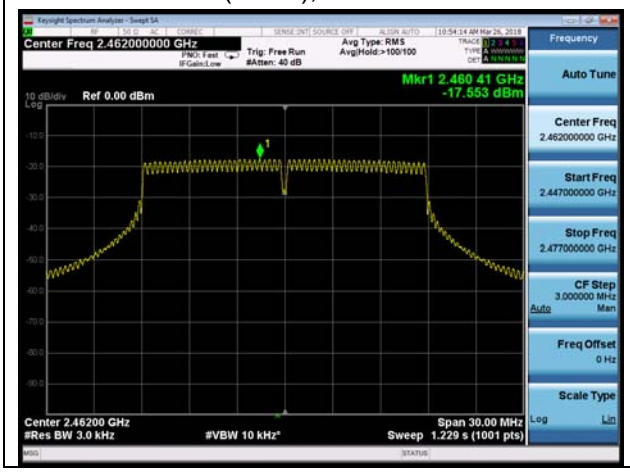
802.11n(HT20), Channel No. 1

802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6

802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11

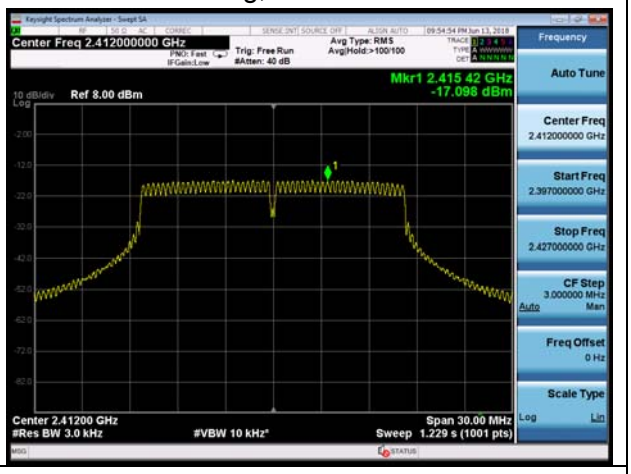


802.11n(HT40), Channel No. 9

MIMO Antenna 2

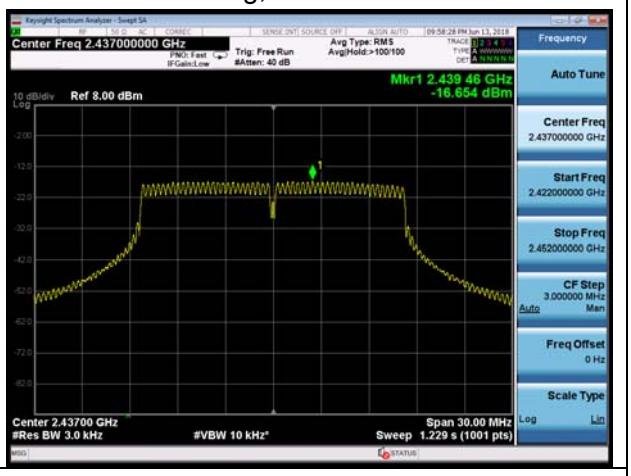
802.11b, Channel No.: 1

802.11g, Channel No.: 1



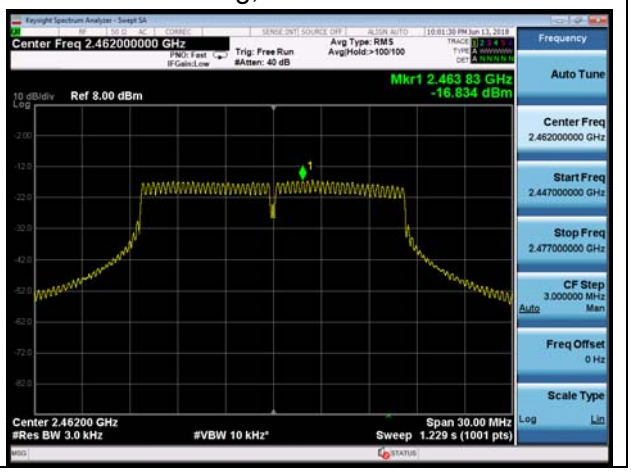
802.11b, Channel No.: 6

802.11g, Channel No.: 6



802.11b, Channel No.: 11

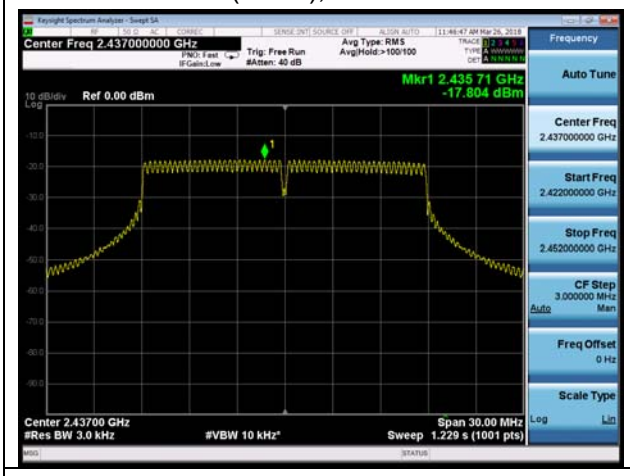
802.11g, Channel No.: 11



802.11n(HT20), Channel No. 1

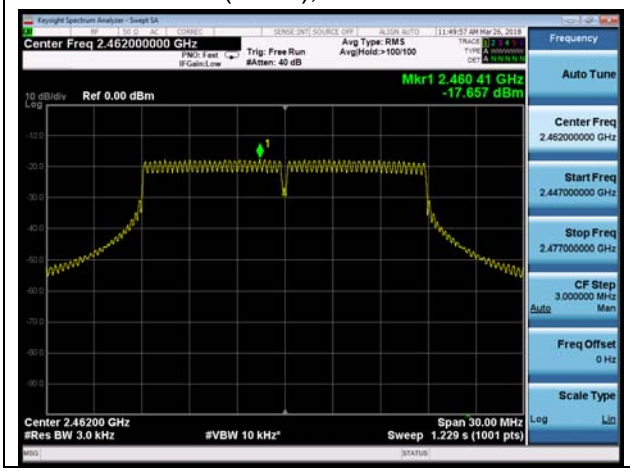
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

MIMO Antenna 3

802.11b, Channel No.: 1

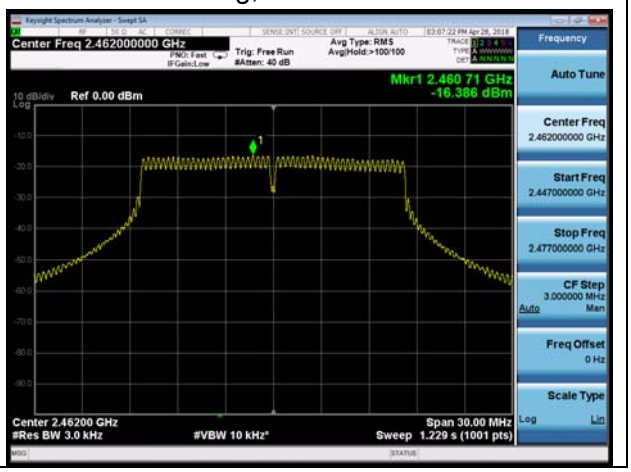
802.11g, Channel No.: 1

802.11b, Channel No.: 6

802.11g, Channel No.: 6

802.11b, Channel No.: 11

802.11g, Channel No.: 11



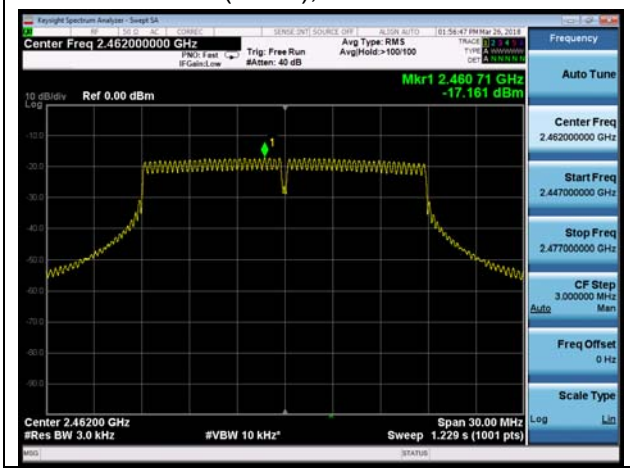
802.11n(HT20), Channel No. 1

802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6

802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11

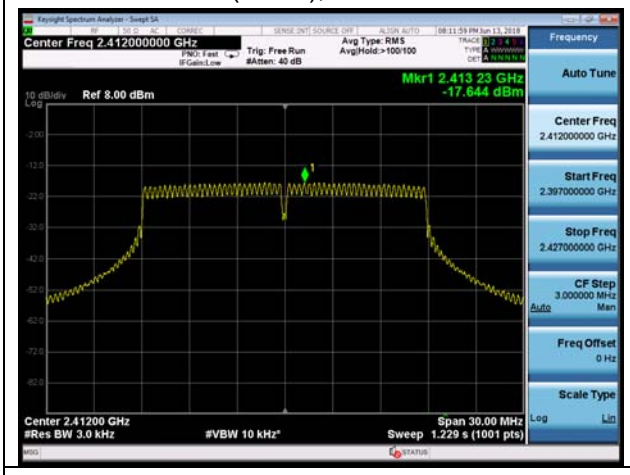


802.11n(HT40), Channel No. 9

MIMO Antenna 3X3 with beamforming

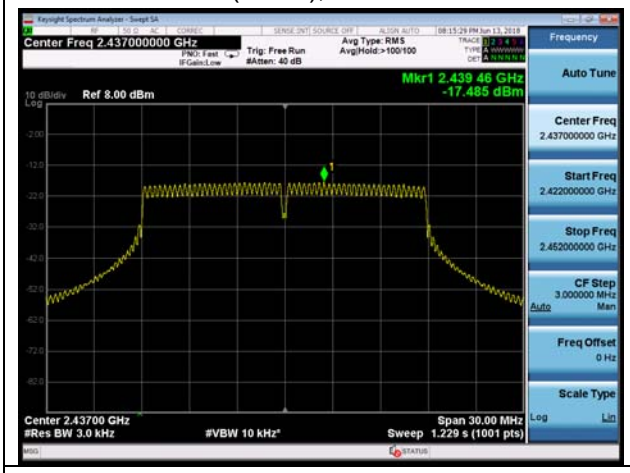
MIMO Antenna 1

802.11n(HT20), Channel No. 1



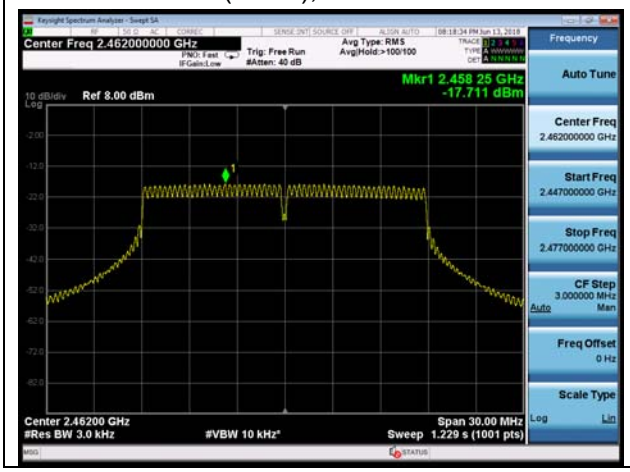
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6

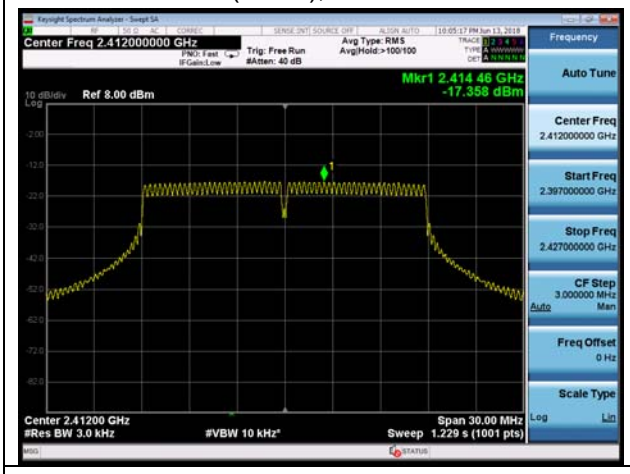
802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

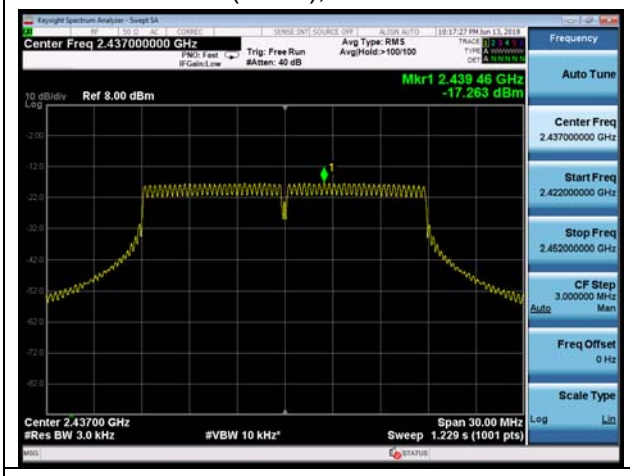
MIMO ANT2

802.11n(HT20), Channel No. 1



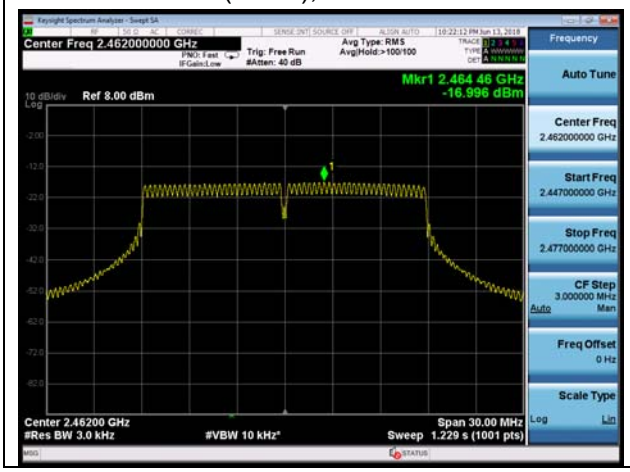
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9