中国认可
国际互认
检测
TESTING
CNAS L2264

RF TEST REPORT

Applicant	OBSERVA Telecom
FCC ID	2AI23SQI4N4
Product	WIFI LTE ROUTER
Brand	observatelecom
Model	SQI4N4
Report No.	RXA1610-0218RF02R2
Issue Date	December 26, 2016

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2016)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Xianqing Li | *Approved by: Kai Xu*

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TABLE OF CONTENT

1. Test Laboratory 4
1.1. Notes of the test report 4
1.2. Test facility 4
1.3. Testing Location 5
2. General Description of Equipment under Test 6
3. Applied Standards 7
4. Test Configuration 8
5. Test Case Results 9
5.1. Peak Power Output –Conducted 9
5.2. 6dB Bandwidth 12
5.3. Band Edge 19
5.4. Power Spectral Density 22
5.5. Spurious RF Conducted Emissions 29
5.6. Radiated Emissions in the Restricted Band 41
5.7. Radiates Emission 45
5.8. Conducted Emission 96
6. Main Test Instruments 104
ANNEX A: EUT Appearance and Test Setup 105
A.1 EUT Appearance 105
A.2 Test Setup 107

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Summary of measurement results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	Maximum average conducted output power	15.247(b)(3)	PASS
2	6 dB bandwidth	15.247(a)(2)	PASS
3	Maximum 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: November 2, 2016~ November 15, 2016			

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1. Test Laboratory

1.1. Notes of the test report

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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 (recognition number is 428261)

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-766)

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.

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1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
Country:	P. R. China
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E-mail:	xukai@ta-shanghai.com

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2. General Description of Equipment under Test

Client Information

Applicant	OBSERVA Telecom
Applicant address	Monte Esquinza, 28 – 1st floor – Right hand
Manufacturer	OBSERVA Telecom
Manufacturer address	Monte Esquinza, 28 – 1st floor – Right hand

General information

EUT Description	
Model:	SQI4N4
SN:	/
Hardware Version:	V3.3
Software Version:	SQI4N4-1.2.5-R19-ARG
Power Supply:	AC adapter
Antenna Type:	Internal Antenna
Antenna Connector:	A permanently attached Antenna(meet with the standard FCC Part 15.203 requirement)
Antenna Gain:	Antenna 1: 3.00dBi Antenna 2: 3.00dBi
Directional Gain:	3.00 dBi
additional beamforming gain:	0 dB
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: 14.94 dBm
Operating Frequency Range(s)	2400 ~ 2483.5 MHz
EUT Accessory	
Adapter	Model: ASSA55D-120100 Manufacturer: AQUILSTAR PRECISION INDUSTRIAL(SHENZHEN)CO., LTD
Ethernet cables	Model : UTP CAT5E
Note: The information of the EUT is declared by the manufacturer. Please refer to the specifications or user manual for details.	

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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 (2016) Radio Frequency Devices**
- **ANSI C63.10 (2013)**
- **KDB 558074 D01 DTS Meas Guidance v03r05**
- **KDB 662911 D01 Multiple Transmitter Output v02r01**

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4. Test Configuration

Test Mode

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

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.

Worst-case data rates are shown as following table.

Band	Data Rate		
	Antenna 1	Antenna 2	MIMO
802.11b	1 Mbps	1 Mbps	/
802.11g	6 Mbps	6 Mbps	/
802.11n HT20	MCS0	MCS0	MCS8
802.11n HT40	MCS0	MCS0	MCS8

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

Test Cases	Antenna1	Antenna2	MIMO
average conducted output power	O	O	802.11n HT20/40
6 dB bandwidth	O	O	--
Maximum power spectral density	O	O	802.11n HT20/40
Band Edge	O	O	--
Spurious RF Conducted Emissions	O	O	802.11n HT20/40
Radiated Emissions in restricted frequency bands	--	802.11 b/g	802.11n HT20/40
Radiated Emissions	--	802.11 b/g	802.11n HT20/40
Conducted Emissions	--	802.11 b/g	802.11n HT20/40
Note：“O”: test all bands			

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5. Test Case Results

5.1. Average Power Output –Conducted

Ambient condition

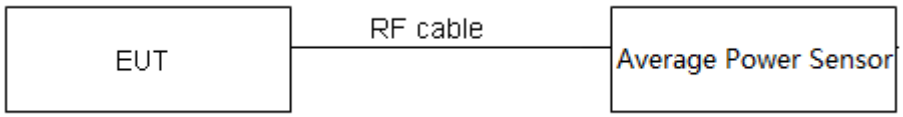
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to Average power meter with a known loss. The EUT is max power transmission with proper modulation. The Average detector is used. We use Maximum Average Conducted Output Power Level Method in KDB 558074 D01/KDB662911 D01 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 (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.

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Test Results

Antenna 1

Network Standards	Carrier frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	Conclusion
802.11b	2412	12.16	30	PASS
	2437	13.05	30	PASS
	2462	13.84	30	PASS
802.11g	2412	9.09	30	PASS
	2437	9.85	30	PASS
	2462	10.68	30	PASS
802.11n HT20	2412	11.22	30	PASS
	2437	11.84	30	PASS
	2462	12.53	30	PASS
802.11n HT40	2422	11.60	30	PASS
	2437	12.15	30	PASS
	2452	12.60	30	PASS

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Antenna 2

Network Standards	Carrier frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	Conclusion
802.11b	2412	11.68	30	PASS
	2437	13.37	30	PASS
	2462	14.94	30	PASS
802.11g	2412	8.20	30	PASS
	2437	10.10	30	PASS
	2462	11.96	30	PASS
802.11n HT20	2412	10.26	30	PASS
	2437	12.17	30	PASS
	2462	13.95	30	PASS
802.11n HT40	2422	11.14	30	PASS
	2437	12.62	30	PASS
	2452	13.70	30	PASS

MIMO

Network Standards	Carrier frequency (MHz)	Average Output Power (dBm)			Limit (dBm)	Conclusion
		MIMO ANT1	MIMO ANT2	MIMO ANT1+ANT2		
802.11n HT20	2412	8.67	8.34	11.52	30	PASS
	2437	10.03	9.61	12.84	30	PASS
	2462	10.54	11.37	13.99	30	PASS
802.11n HT40	2422	9.42	8.66	12.07	30	PASS
	2437	9.87	9.89	12.89	30	PASS
	2452	9.91	11.19	13.61	30	PASS

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5.2. 6dB Bandwidth

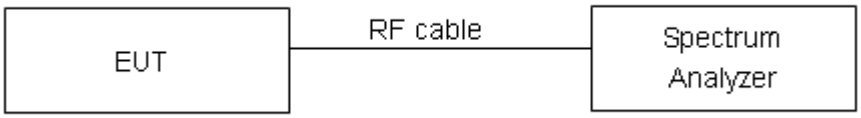
Ambient condition

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.

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.

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Test Results:

Antenna 1

Network Standards	Carrier frequency (MHz)	Minimum 6 dB bandwidth (MHz)	Limit(kHz)	Conclusion
802.11b	2412	10.11	500	PASS
	2437	10.13	500	PASS
	2462	10.12	500	PASS
802.11g	2412	16.10	500	PASS
	2437	16.39	500	PASS
	2462	16.36	500	PASS
802.11n HT20	2412	16.39	500	PASS
	2437	17.58	500	PASS
	2462	17.35	500	PASS
802.11n HT40	2422	35.86	500	PASS
	2437	36.43	500	PASS
	2452	36.39	500	PASS

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Antenna 2

Network Standards	Carrier frequency (MHz)	Minimum 6 dB bandwidth (MHz)	Limit(kHz)	Conclusion
802.11b	2412	10.11	500	PASS
	2437	10.12	500	PASS
	2462	10.10	500	PASS
802.11g	2412	15.78	500	PASS
	2437	16.18	500	PASS
	2462	16.36	500	PASS
802.11n HT20	2412	16.55	500	PASS
	2437	17.19	500	PASS
	2462	17.09	500	PASS
802.11n HT40	2422	35.81	500	PASS
	2437	35.81	500	PASS
	2452	35.82	500	PASS

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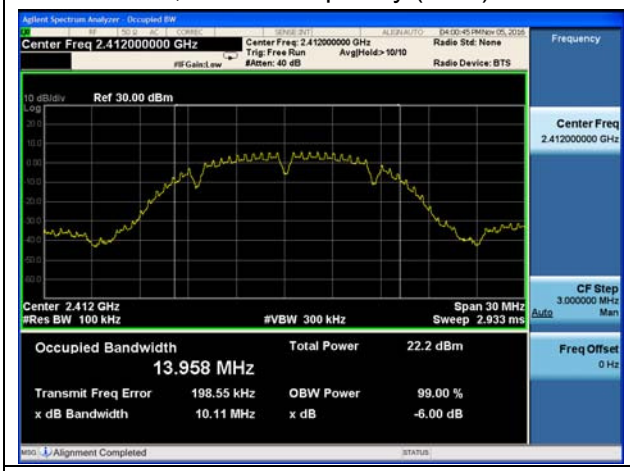
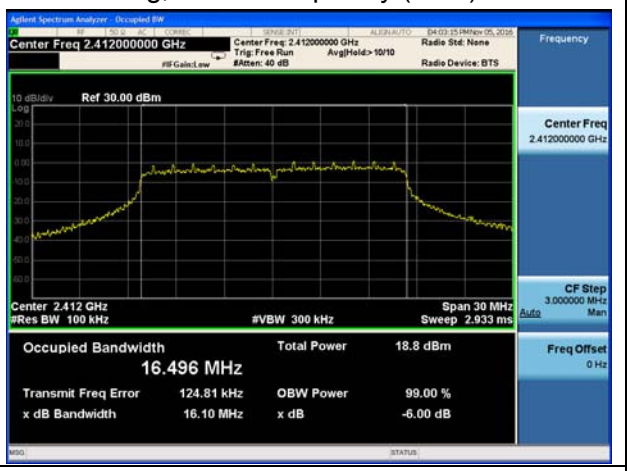
Antenna 1

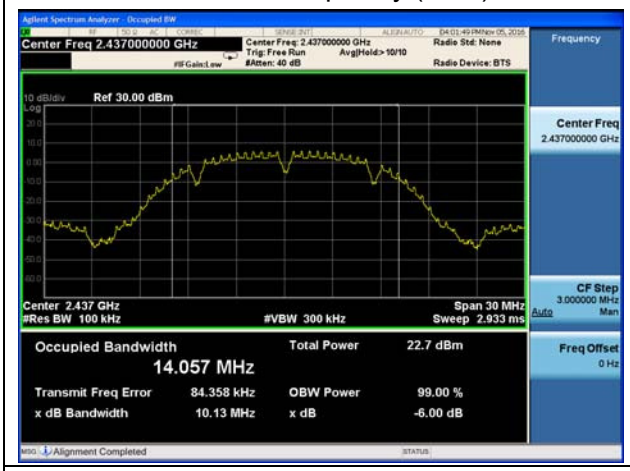
802.11b, Carrier frequency (MHz): 2412



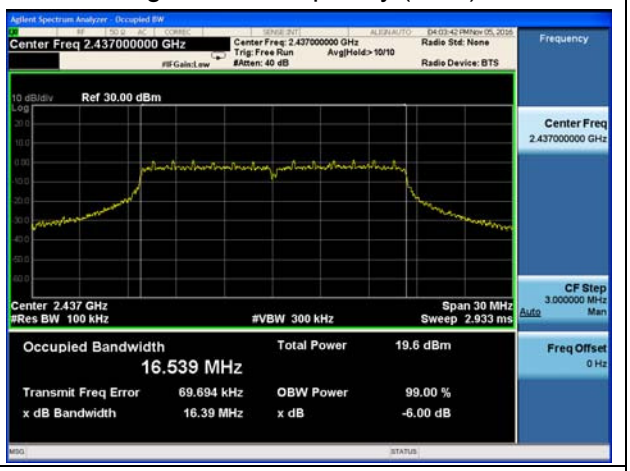
802.11g, Carrier frequency (MHz): 2412



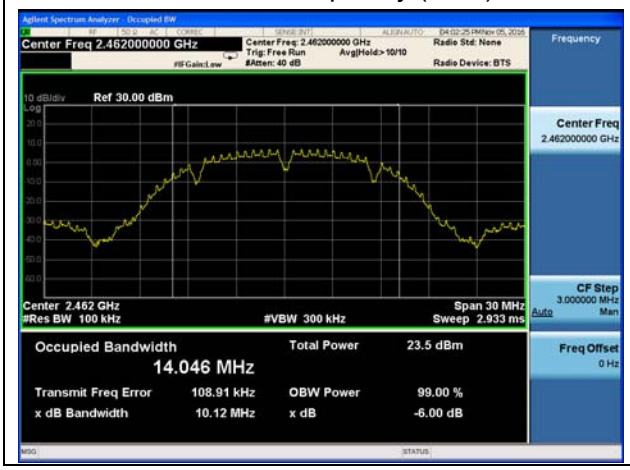
802.11b, Carrier frequency (MHz): 2437



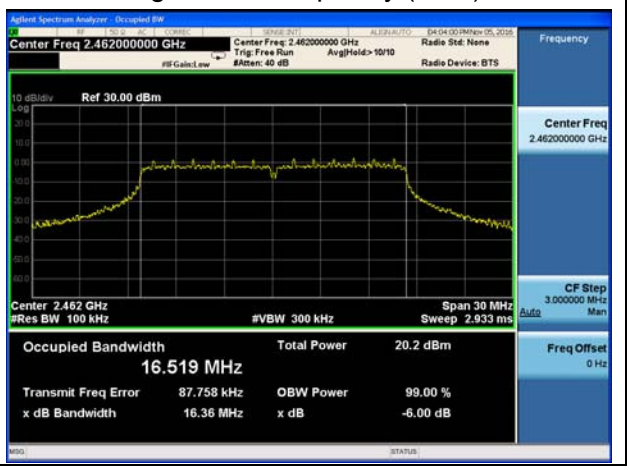
802.11g, Carrier frequency (MHz): 2437



802.11b, Carrier frequency (MHz):2462



802.11g, Carrier frequency (MHz):2462



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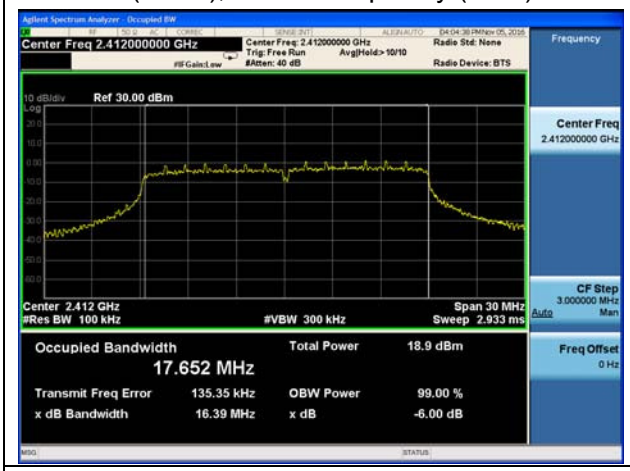
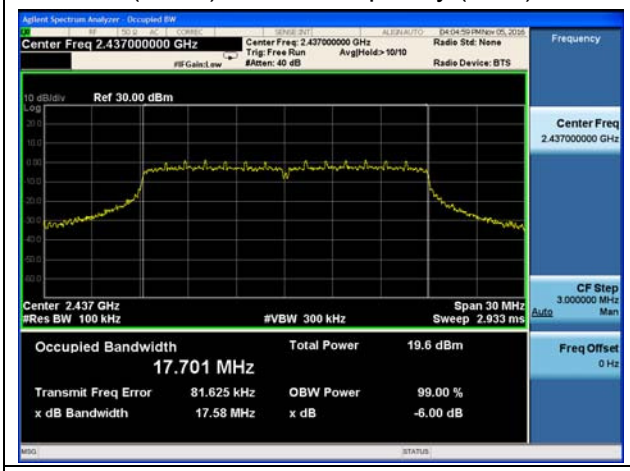
802.11n(HT20), Carrier frequency (MHz): 2412



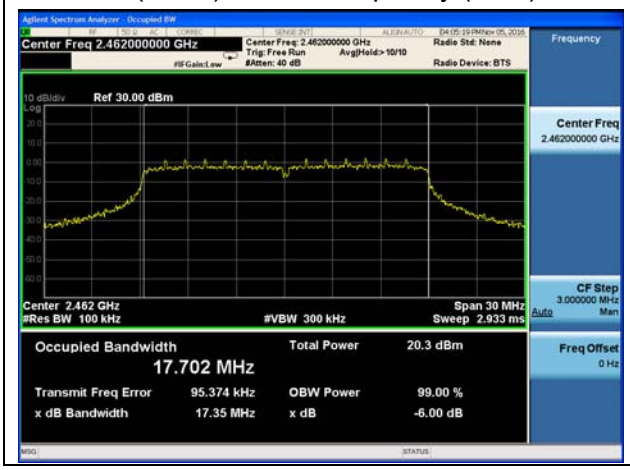
802.11n(HT40), Carrier frequency (MHz): 2422

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

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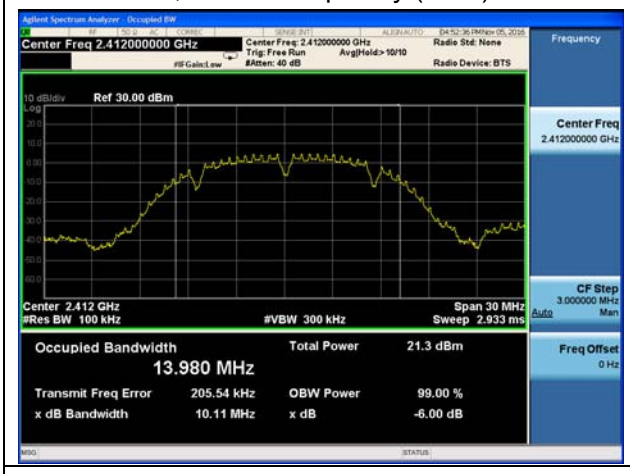
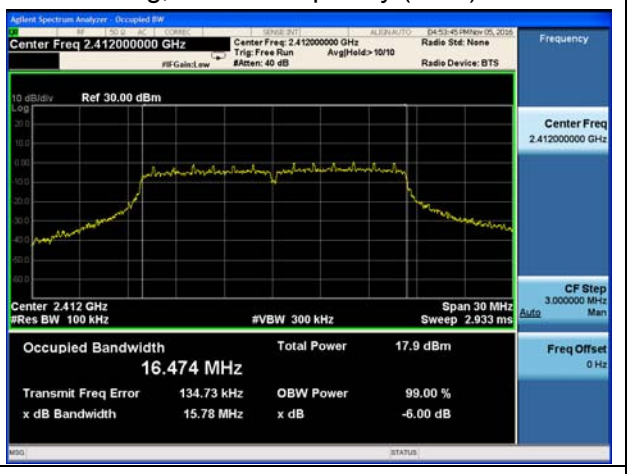
Antenna 2

802.11b, Carrier frequency (MHz): 2412

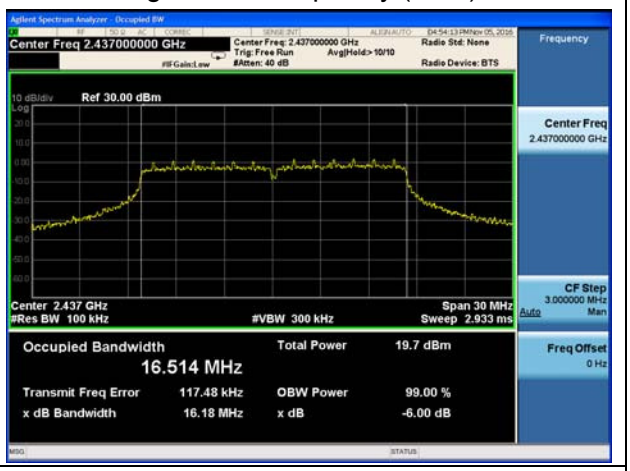


802.11g, Carrier frequency (MHz): 2412



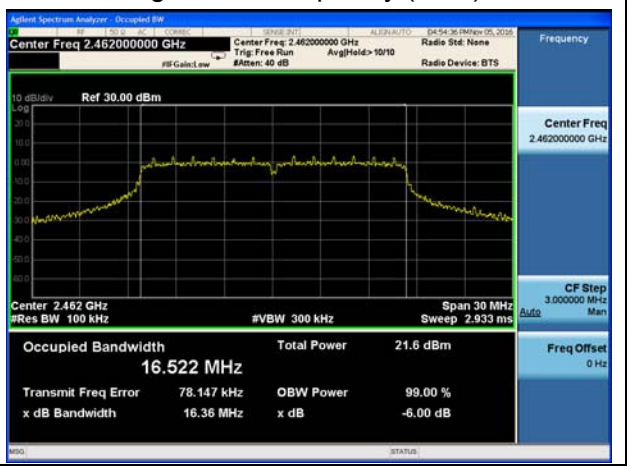
802.11b, Carrier frequency (MHz): 2437

802.11g, Carrier frequency (MHz): 2437



802.11b, Carrier frequency (MHz):2462

802.11g, Carrier frequency (MHz):2462



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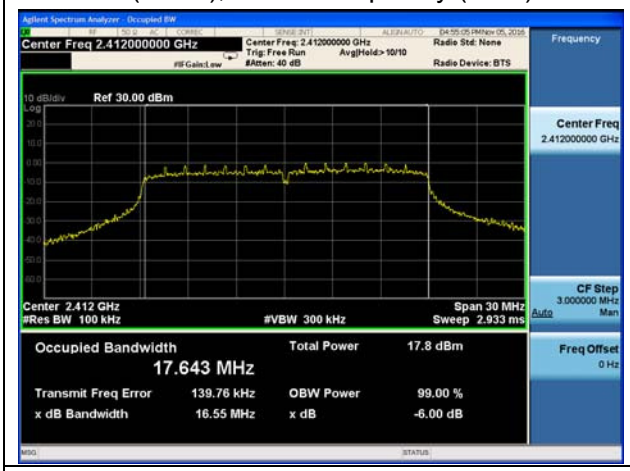
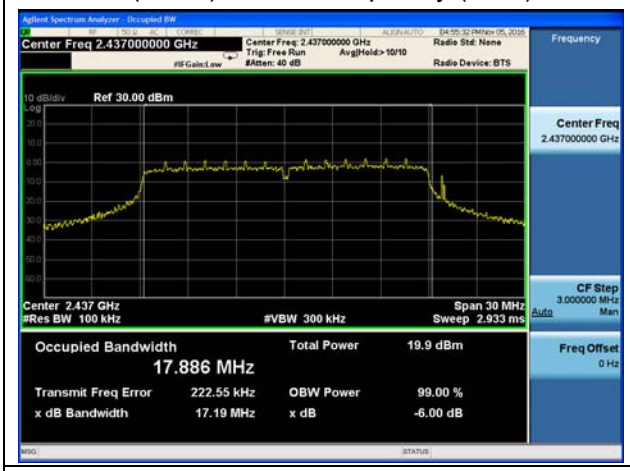
802.11n(HT20), Carrier frequency (MHz): 2412



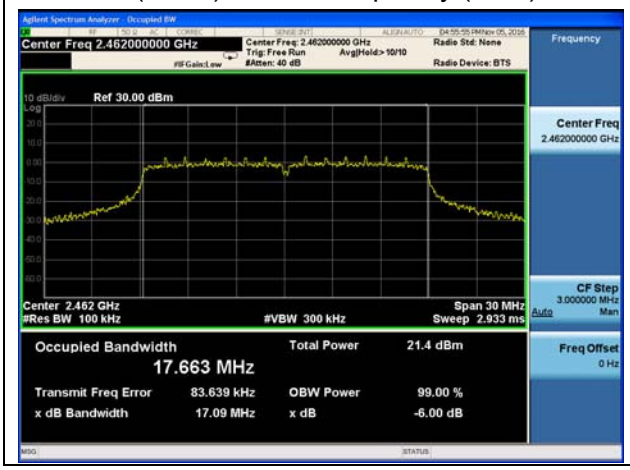
802.11n(HT40), Carrier frequency (MHz): 2422

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

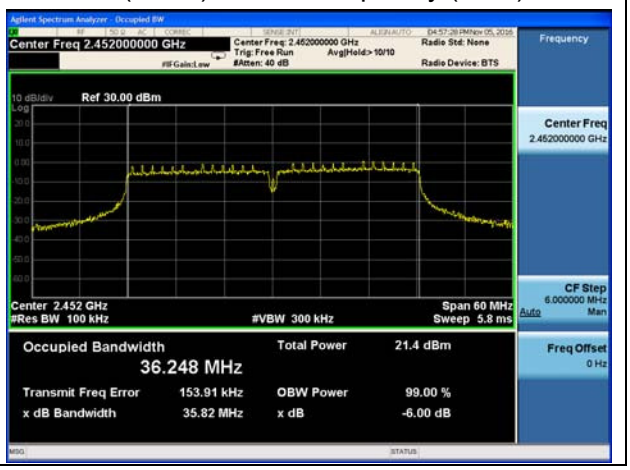


802.11n(HT40), Carrier frequency (MHz): 2437

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



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



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5.3. Band Edge

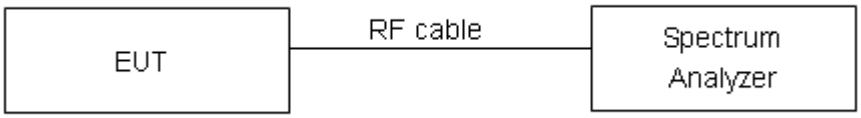
Ambient condition

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."

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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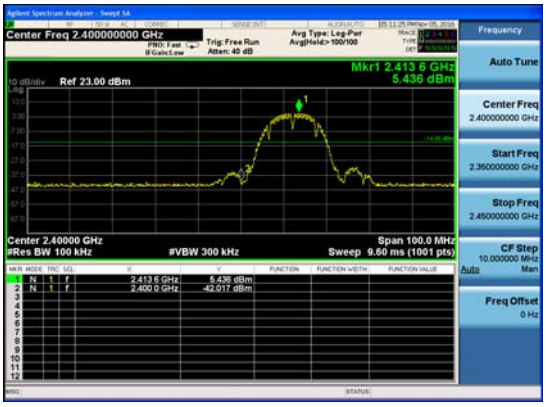
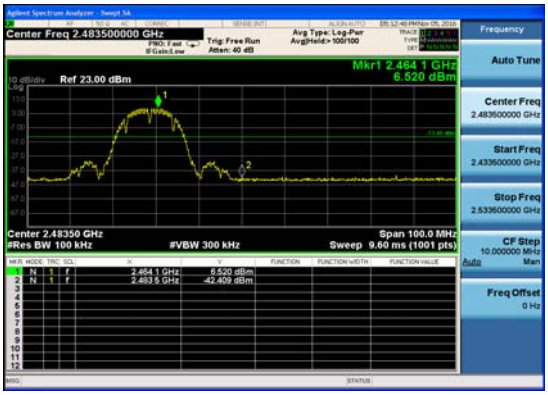
Test Results: PASS

Antenna 1

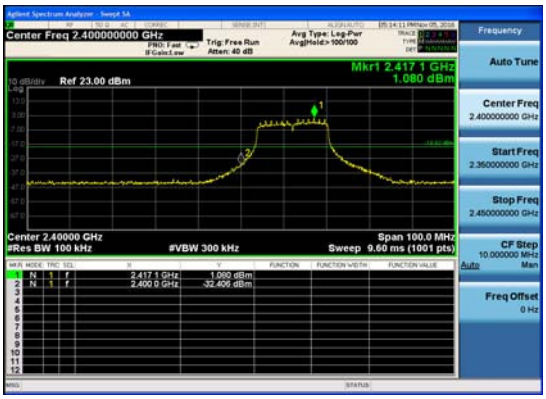
802.11b, Channel No.: 1



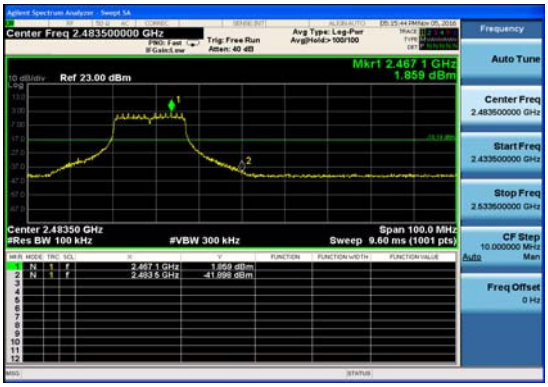
802.11b, Channel No.: 11



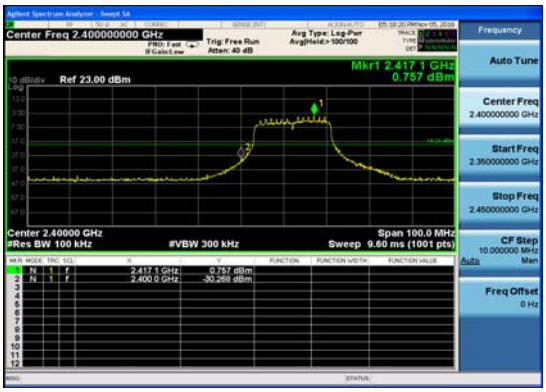
802.11g, Channel No.: 1



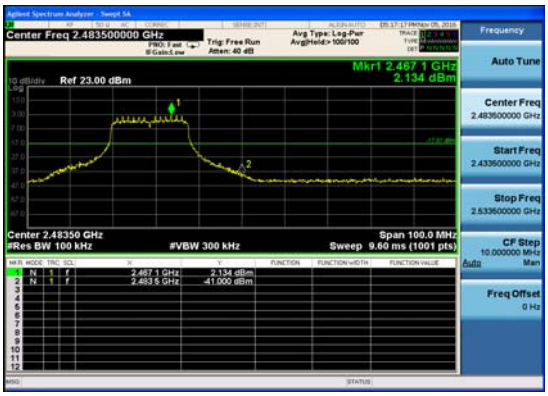
802.11g, Channel No.: 11



802.11n(HT20), Channel No.: 1



802.11n(HT20), Channel No.: 11



802.11n(HT40), Channel No.: 3

802.11n(HT40), Channel No.: 9

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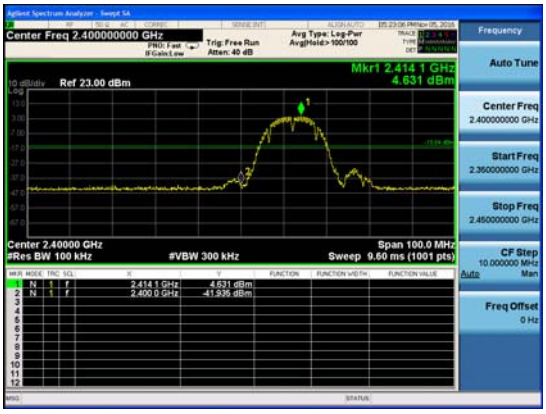
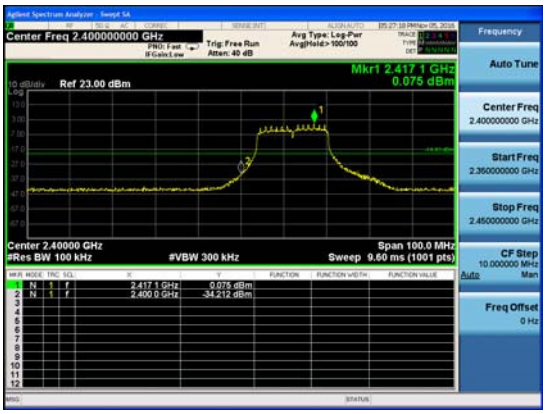
Antenna 2

802.11b, Channel No.: 1

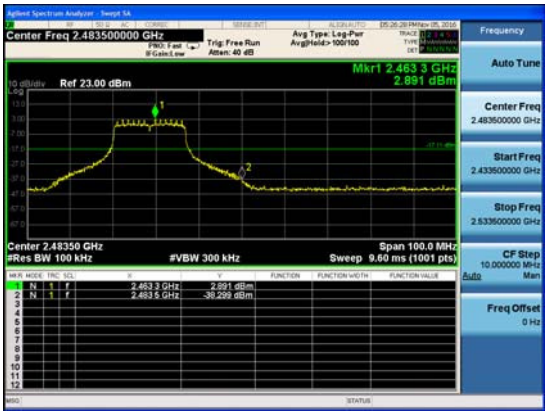


802.11b, Channel No.: 11

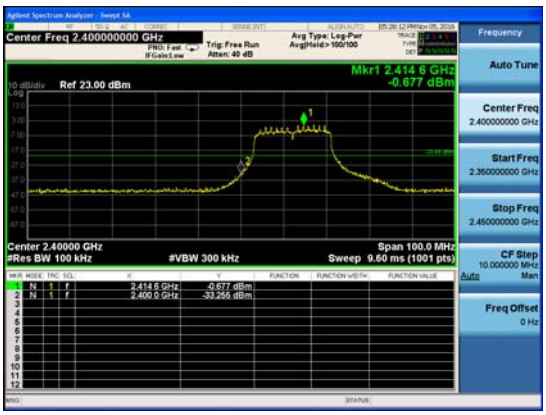
802.11g, Channel No.: 1



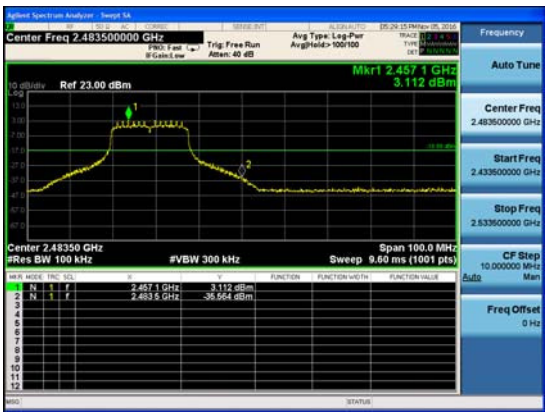
802.11g, Channel No.: 11



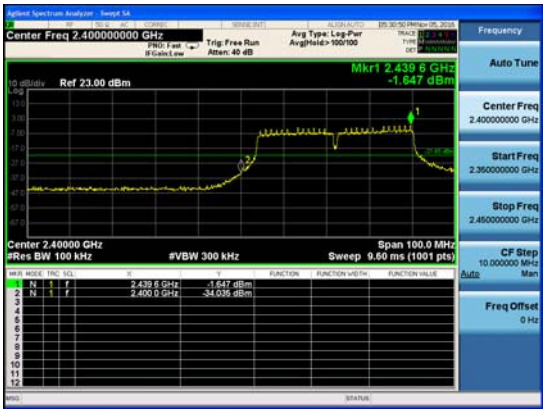
802.11n(HT20), Channel No.: 1



802.11n(HT20), Channel No.: 11



802.11n(HT40), Channel No.: 3



802.11n(HT40), Channel No.: 9

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5.4. Power Spectral Density

Ambient condition

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

Method of Measurement

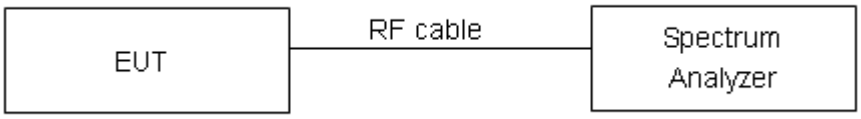
The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.

RBW is set to 3 kHz and VBW is set to 10 kHz for BLE/ Wi-Fi 2.4G on spectrum analyzer.

Set the span to 1.5 times the DTS channel bandwidth. Sweep time = auto couple. Trace mode = max hold. The Average power spectral density is recorded.

The power spectral density 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.

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Test Results:

Antenna 1

Network Standards	Channel Number	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-20.652	8	PASS
	6	-17.470	8	PASS
	11	-17.093	8	PASS
802.11g	1	-25.578	8	PASS
	6	-21.319	8	PASS
	11	-21.459	8	PASS
802.11n HT20	1	-25.011	8	PASS
	6	-21.546	8	PASS
	11	-21.001	8	PASS
802.11n HT40	3	-25.183	8	PASS
	6	-23.763	8	PASS
	9	-24.196	8	PASS

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Antenna 2

Network Standards	Channel Number	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-23.148	8	PASS
	6	-15.292	8	PASS
	11	-18.921	8	PASS
802.11g	1	-27.368	8	PASS
	6	-19.920	8	PASS
	11	-23.426	8	PASS
802.11n HT20	1	-27.754	8	PASS
	6	-20.389	8	PASS
	11	-23.175	8	PASS
802.11n HT40	3	-23.085	8	PASS
	6	-23.352	8	PASS
	9	-24.036	8	PASS

MIMO

Network Standards	Channel Number	Power Spectral Density (dBm / 3kHz)			Limit (dBm / 3kHz)	Conclusion
		MIMO ANT1	MIMO ANT2	MIMO ANT1+ANT2		
802.11n HT20	1	-14.425	-14.918	-11.654	8	PASS
	6	-14.551	-14.822	-11.674	8	PASS
	11	-13.44	-12.596	-9.987	8	PASS
802.11n HT40	3	-15.425	-17.622	-13.376	8	PASS
	6	-15.383	-16.730	-12.994	8	PASS
	9	-13.835	-15.696	-11.656	8	PASS

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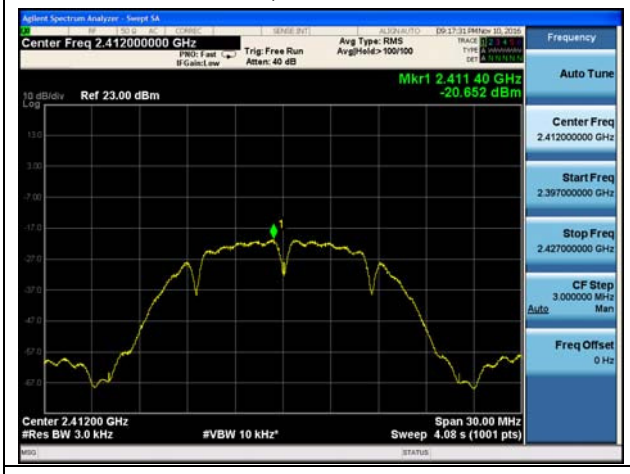
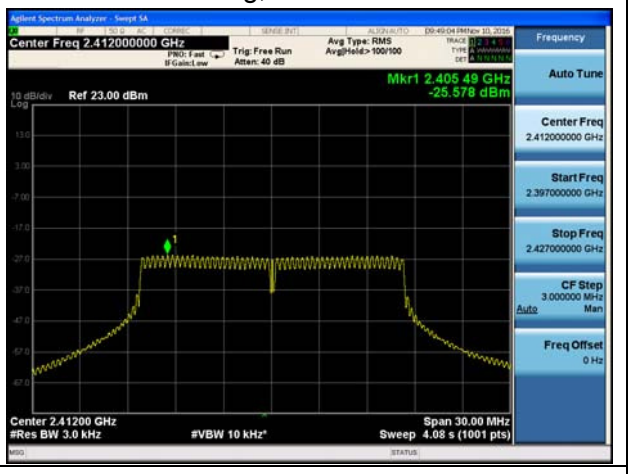
Antenna 1

802.11b, Channel No.: 1

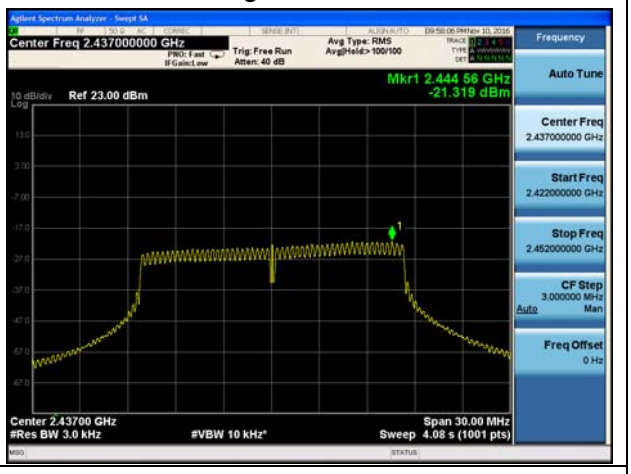


802.11g, Channel No.: 1



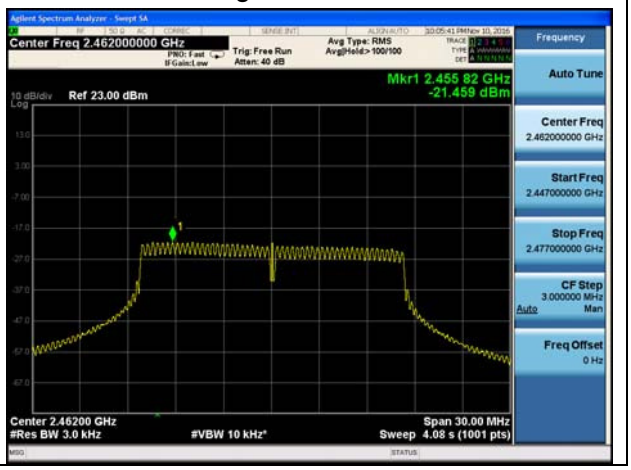
802.11b, Channel No.: 6

802.11g, Channel No.: 6



802.11b, Channel No.: 11

802.11g, Channel No.: 11



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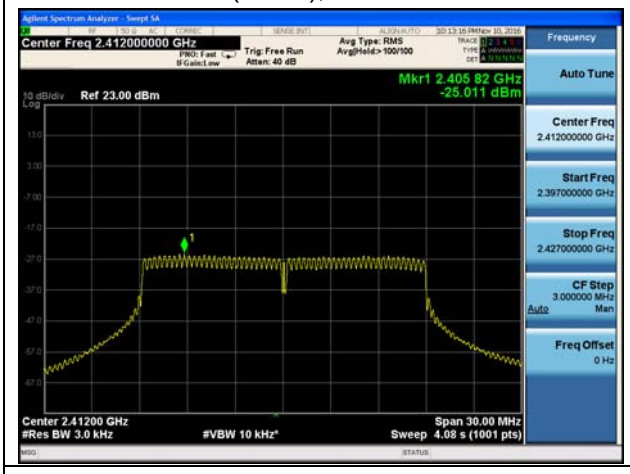
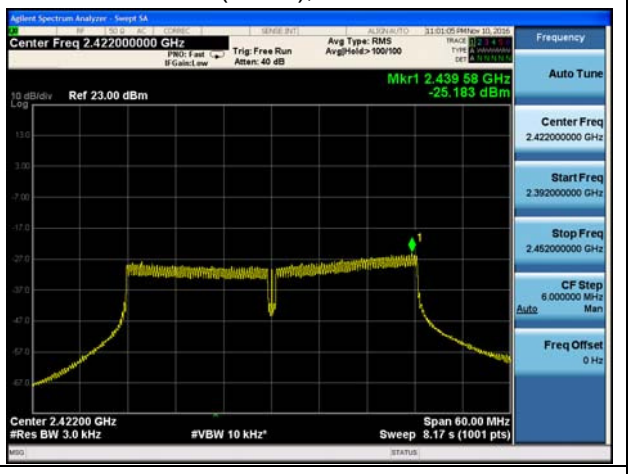
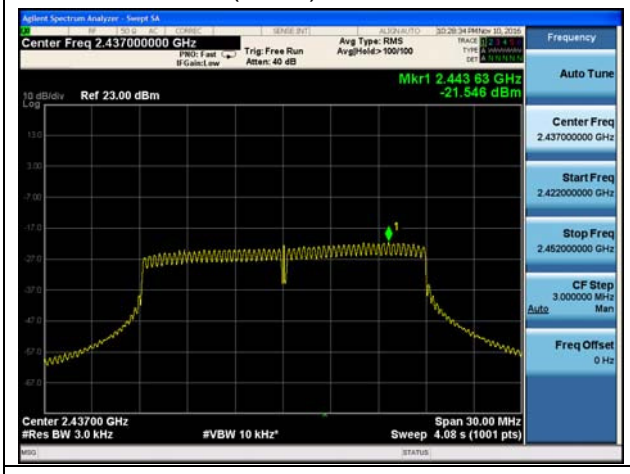
802.11n(HT20), Channel No. 1



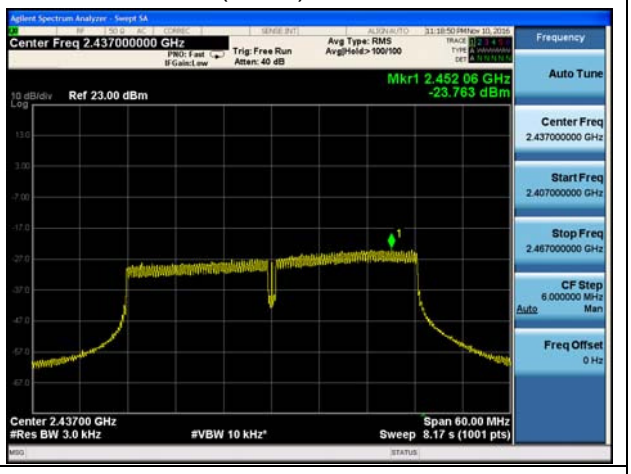
802.11n(HT40), Channel No. 3



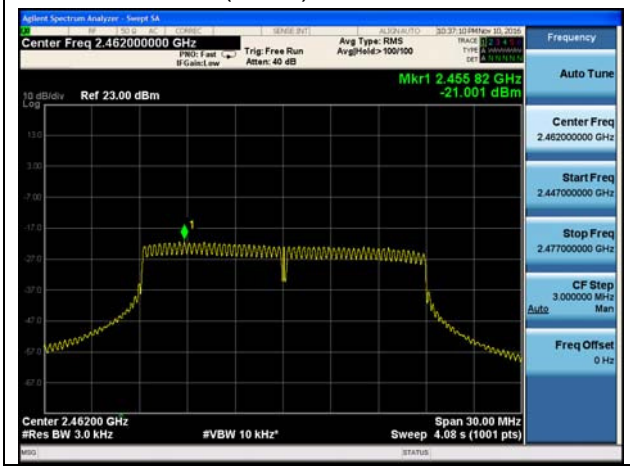
802.11n(HT20), Channel No. 6



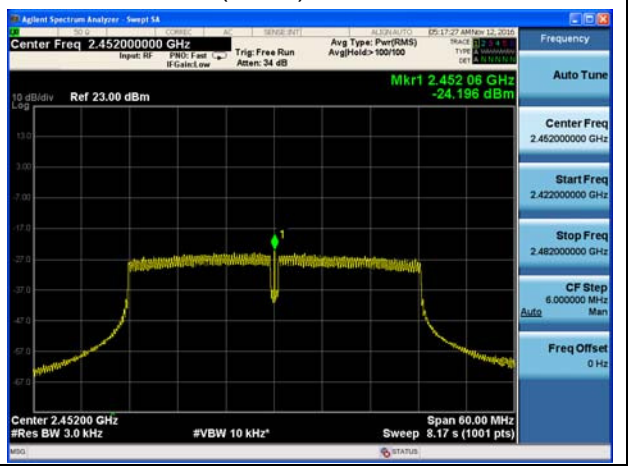
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9



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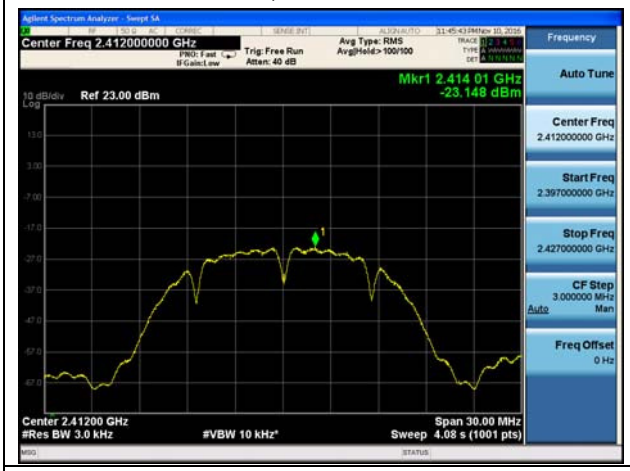
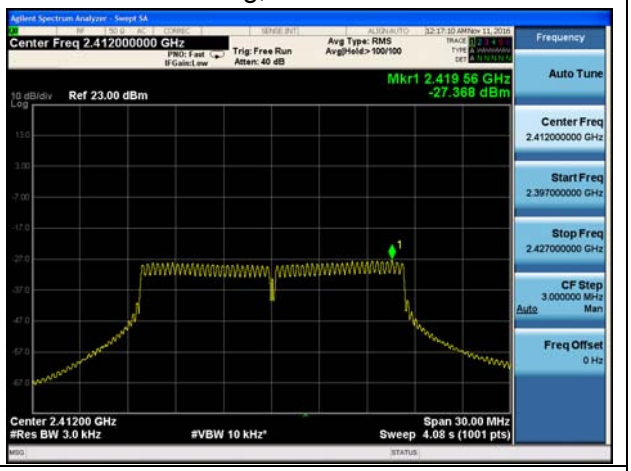
Antenna 2

802.11b, Channel No.: 1

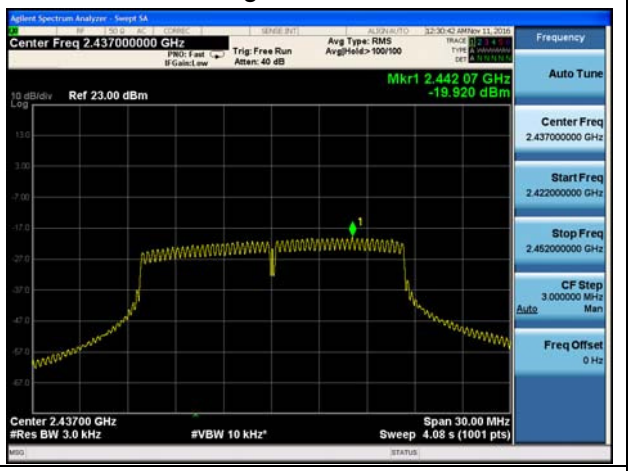


802.11g, Channel No.: 1



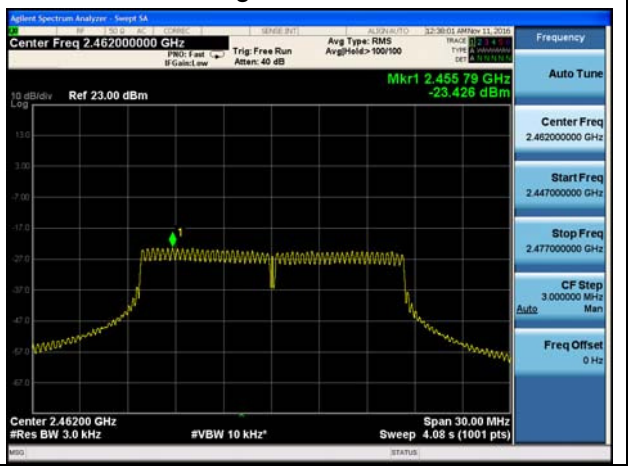
802.11b, Channel No.: 6

802.11g, Channel No.: 6



802.11b, Channel No.: 11

802.11g, Channel No.: 11



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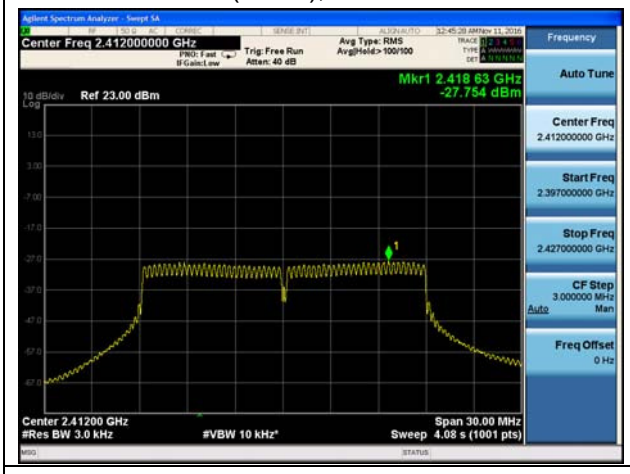
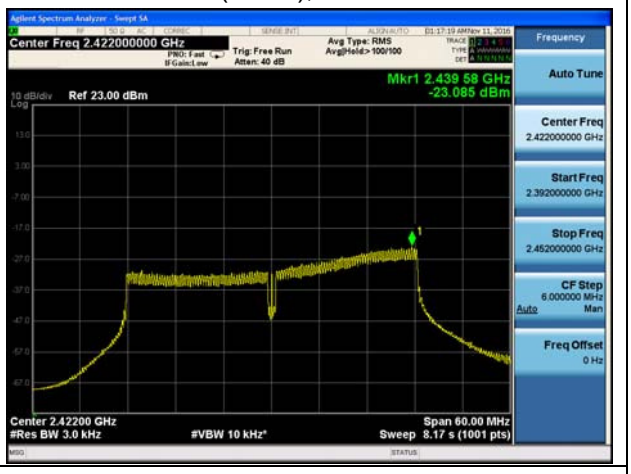
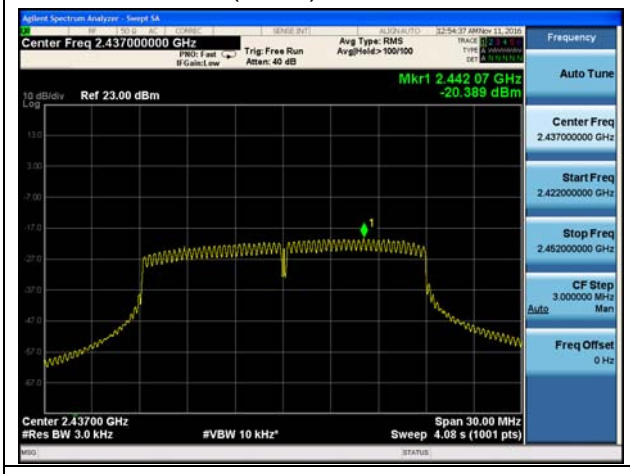
802.11n(HT20), Channel No. 1



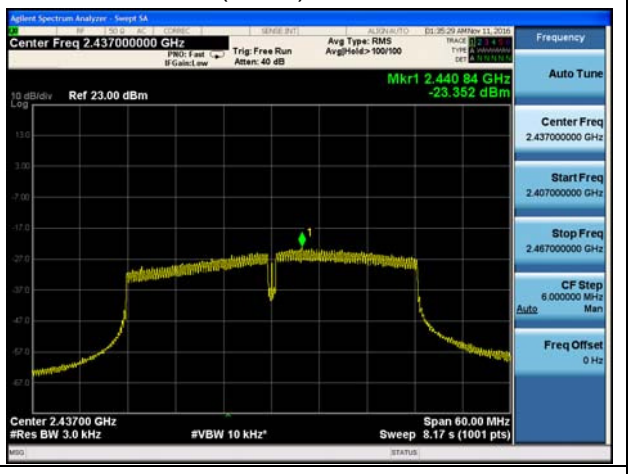
802.11n(HT40), Channel No. 3



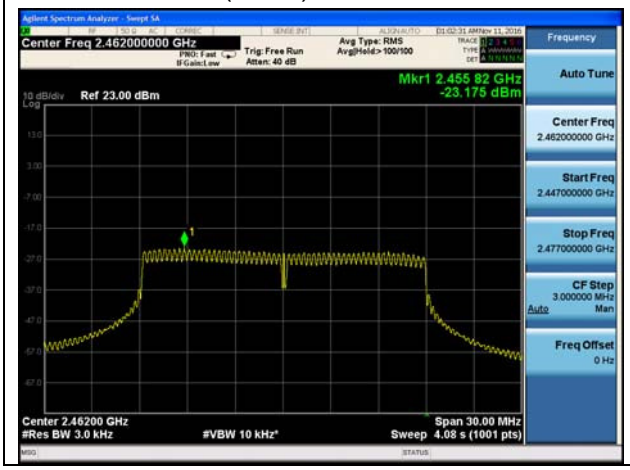
802.11n(HT20), Channel No. 6



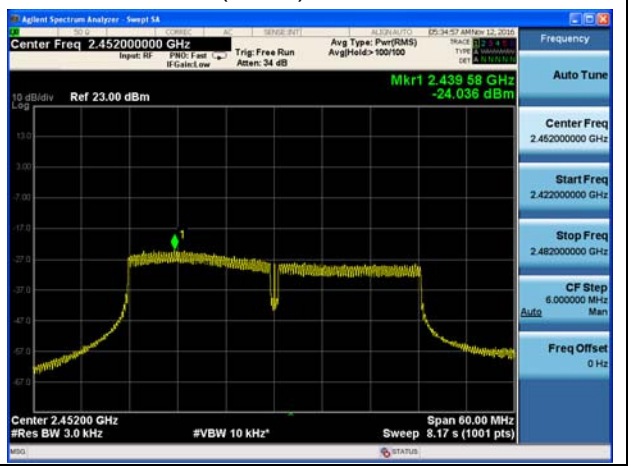
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9



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5.5. 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 with a known loss. The spectrum analyzer scans from 30MHz 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) pacifies 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.”

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Network Standards		Carrier frequency (MHz)	Reference value (dBm)	Limit
Antenna 1	802.11b	2412	-1.466	-21.466
		2437	-2.195	-22.195
		2462	-0.626	-20.626
	802.11g	2412	-0.732	-20.732
		2437	-1.497	-21.497
		2462	0.968	-19.032
	802.11n HT20	2412	1.684	-18.316
		2437	-2.563	-22.563
		2462	1.915	-18.085
	802.11n HT40	2422	1.772	-18.228
		2437	-2.078	-22.078
		2452	-1.506	-21.506
Antenna 2	802.11b	2412	-3.586	-23.586
		2437	-1.480	-21.480
		2462	2.230	-17.770
	802.11g	2412	-3.731	-23.731
		2437	1.436	-18.564
		2462	0.689	-19.311
	802.11n HT20	2412	-0.405	-20.405
		2437	-1.614	-21.614
		2462	-0.651	-20.651
	802.11n HT40	2422	-1.971	-21.971
		2437	-1.250	-21.250
		2452	1.491	-18.509
MIMO	802.11n HT20	2412	-5.097	-25.097
		2437	-6.055	-26.055
		2462	-7.903	-27.903
	802.11n HT40	2422	-8.524	-28.524
		2437	-9.294	-29.294
		2452	-9.304	-29.304

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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* = 1.96.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

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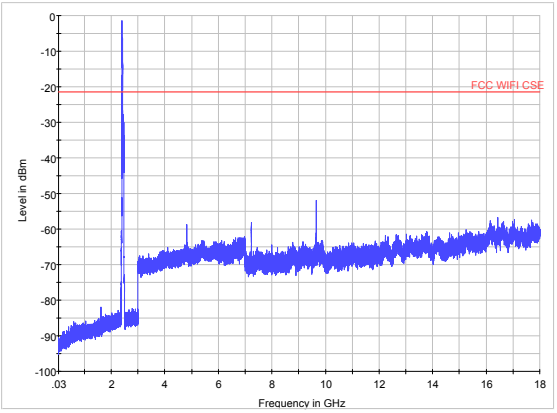
Test Results:

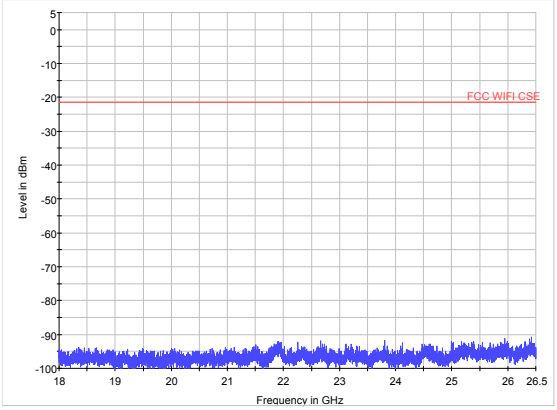
If disturbances were found more than 20dB below limit line, the mark is not required for the EUT. The signal beyond the limit is carrier.

The signal beyond the limit is carrier

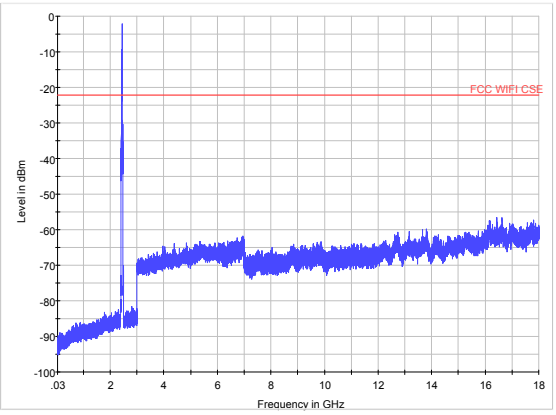
Antenna 1



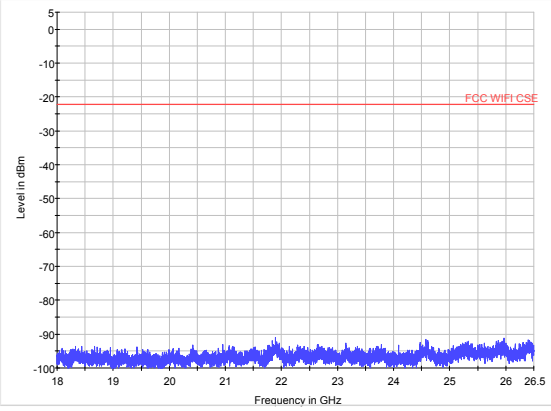
802.11b CH1 30MHz to 18GHz



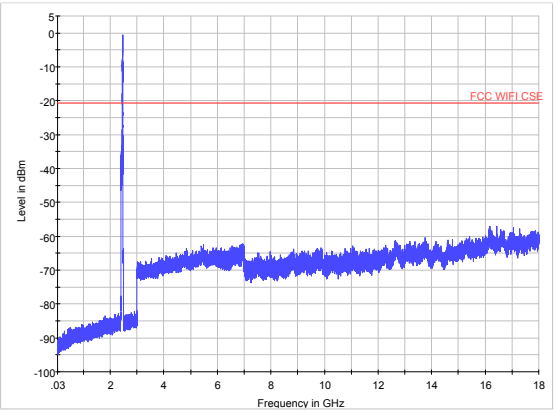
802.11b CH1 18GHz to 26.5GHz



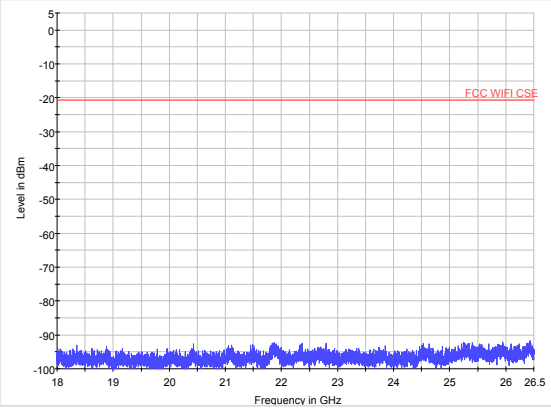
802.11b CH6 30MHz to 18GHz



802.11b CH6 18GHz to 26.5GHz



802.11b CH11 30MHz to 18GHz



802.11b CH11 18GHz to 26.5GHz

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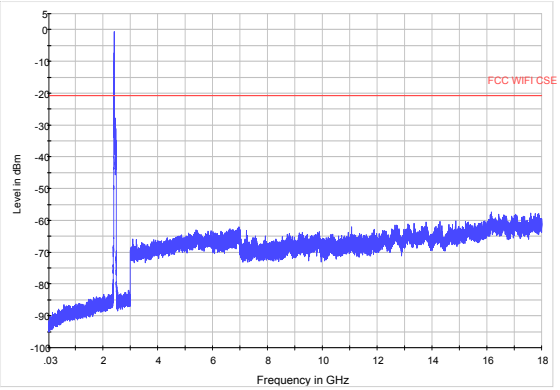
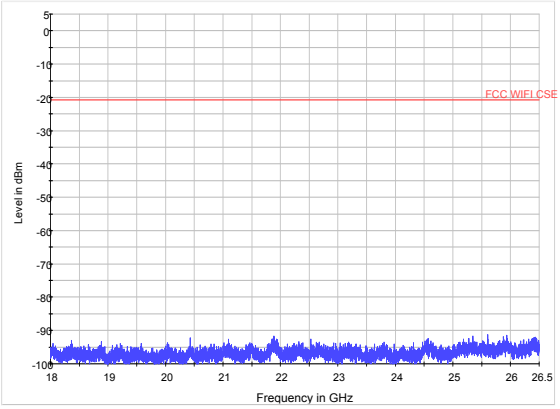
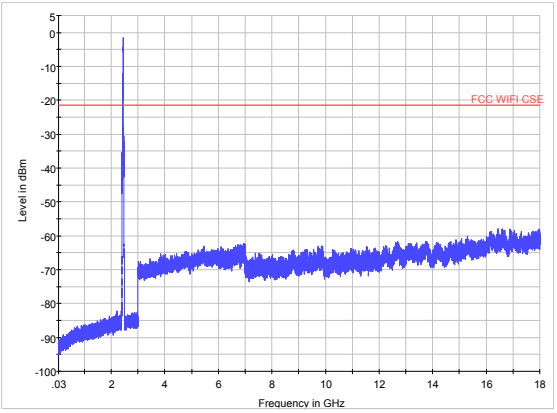


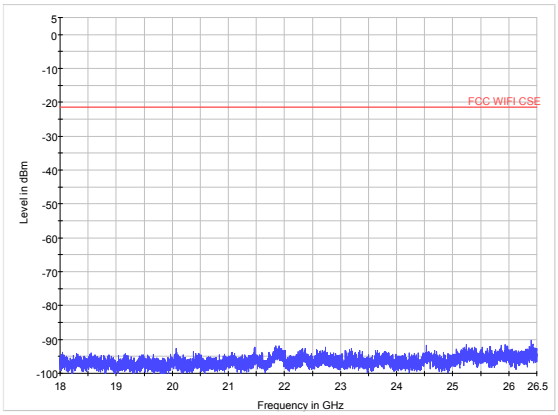
802.11g CH1 30MHz to 18GHz



802.11g CH1 18GHz to 26.5GHz



802.11g CH6 30MHz to 18GHz



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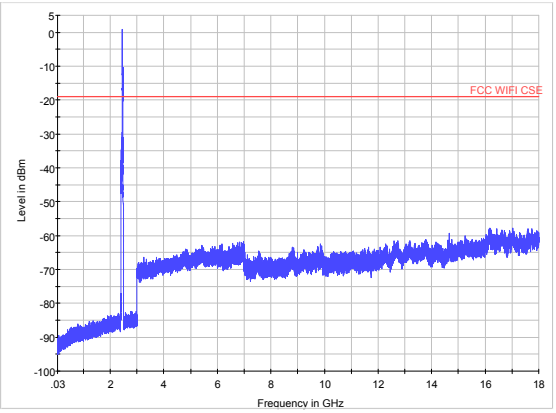

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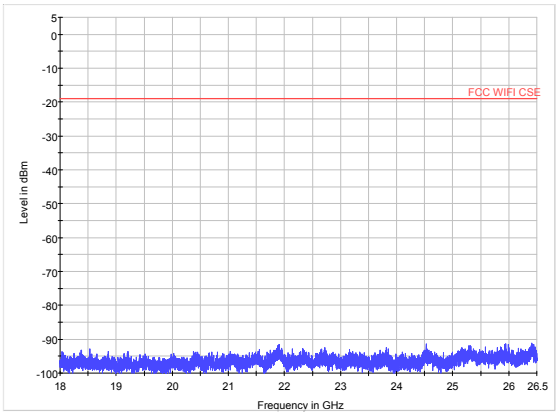

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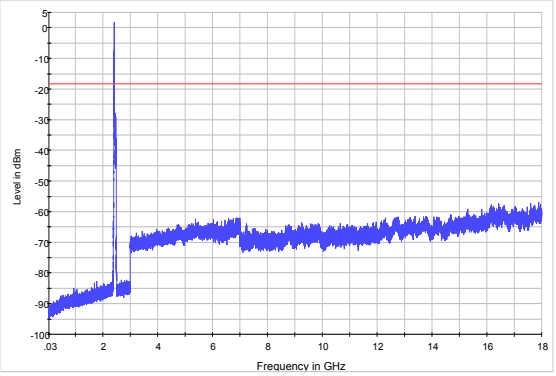

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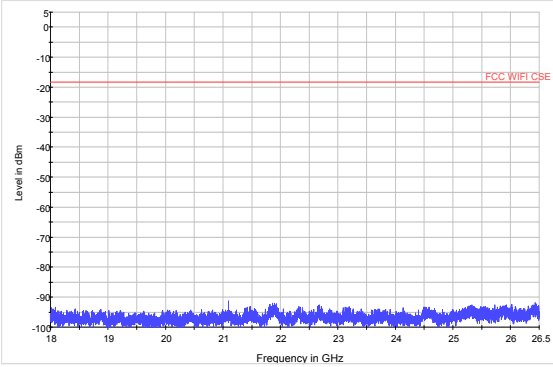

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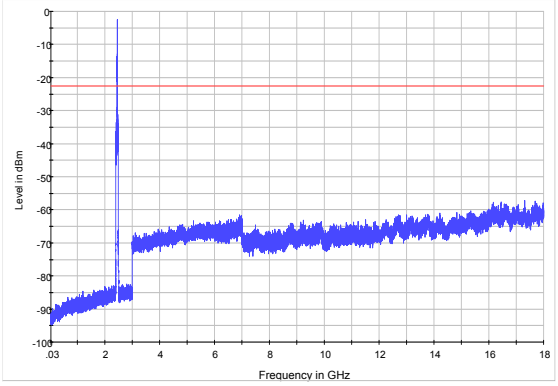

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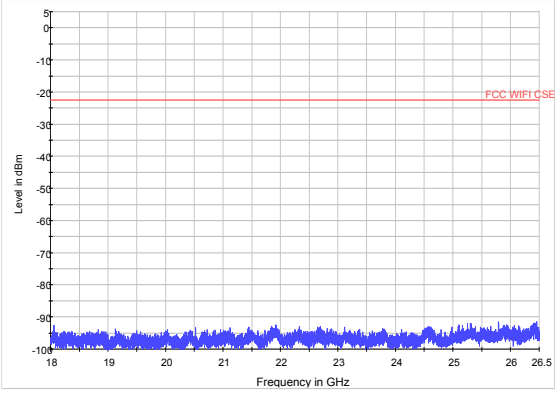

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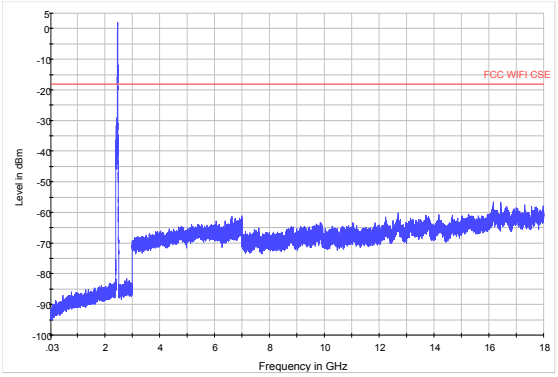

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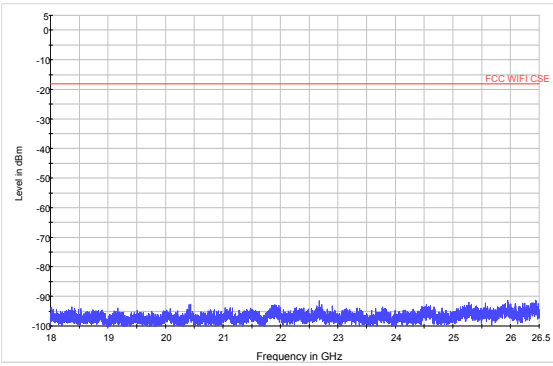

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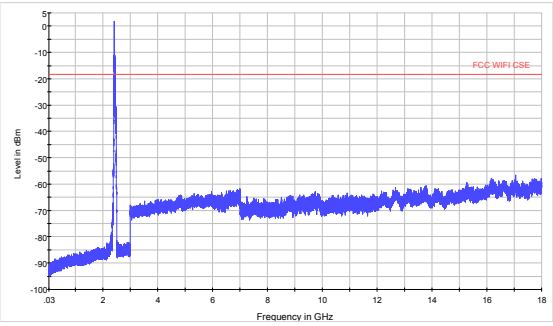

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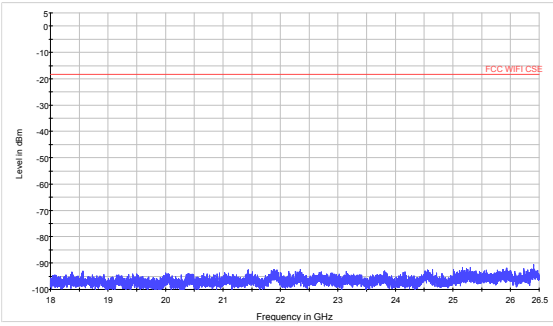

802.11n (HT40) CH3 18GHz to 26.5GHz

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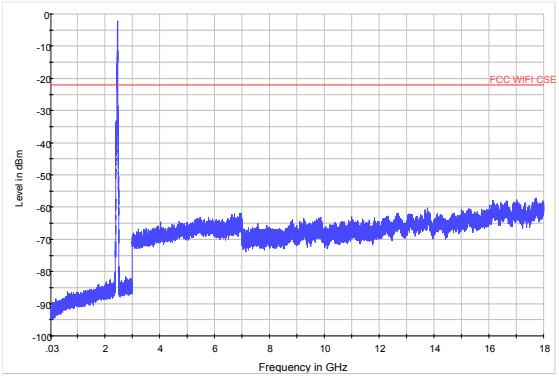

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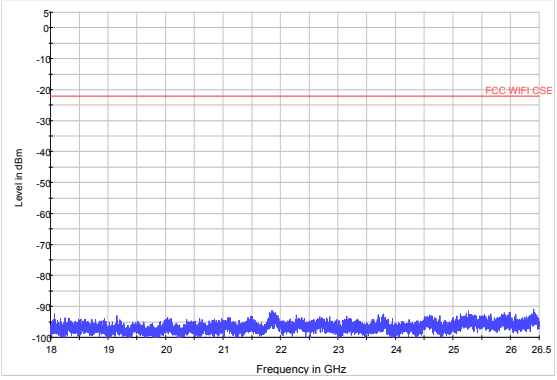

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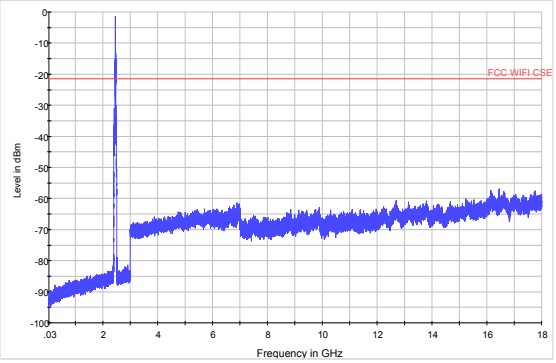

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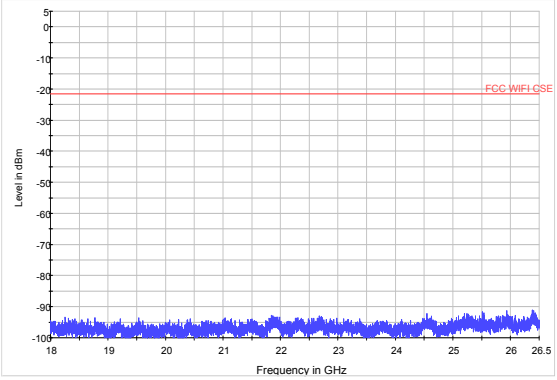

802.11n (HT40) CH9 18GHz to 26.5GHz

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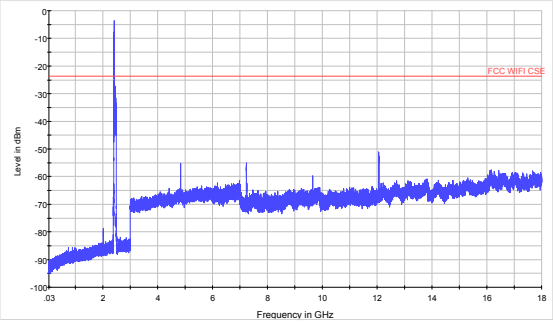
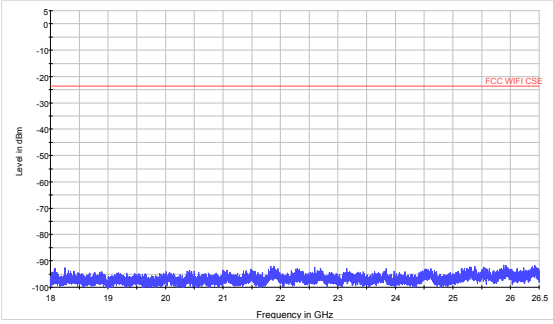
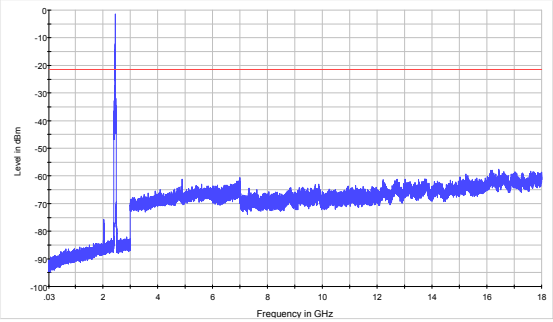
Antenna 2



802.11b CH1 30MHz to 18GHz



802.11b CH1 18GHz to 26.5GHz



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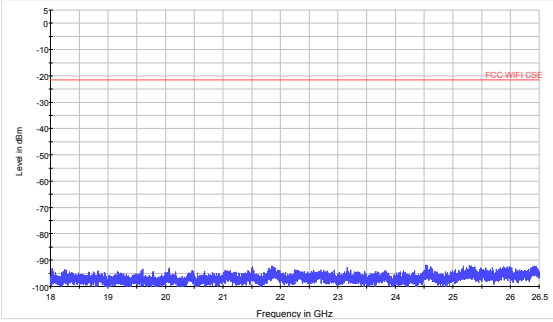

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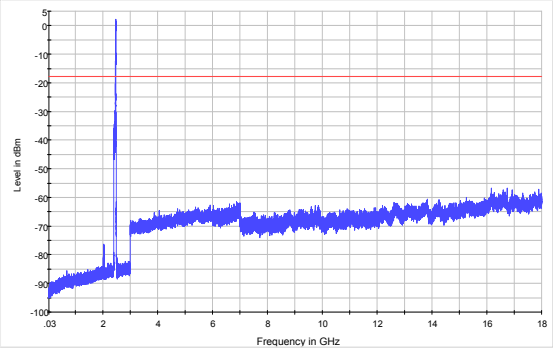

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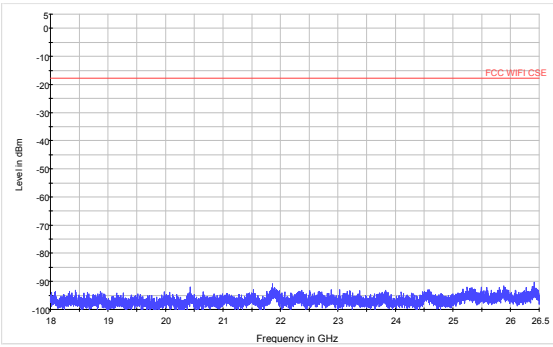

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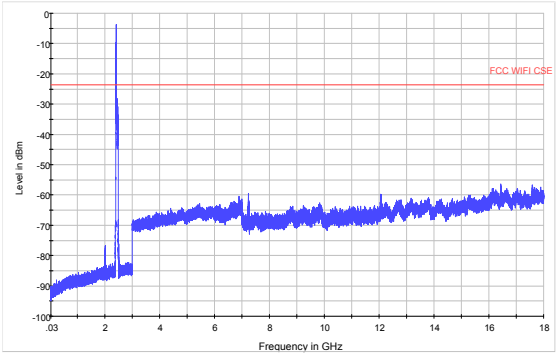

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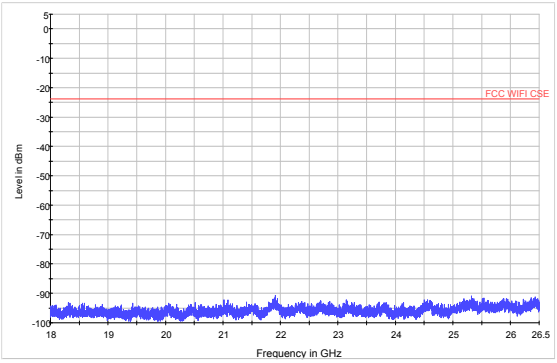

802.11g CH1 18GHz to 26.5GHz

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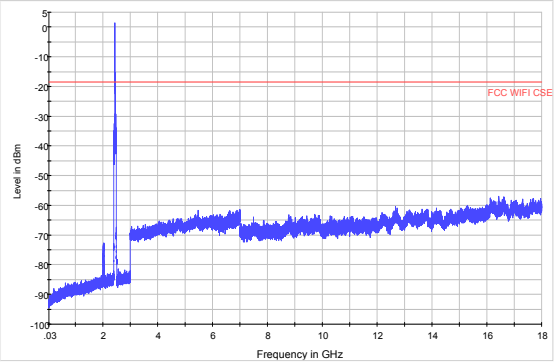

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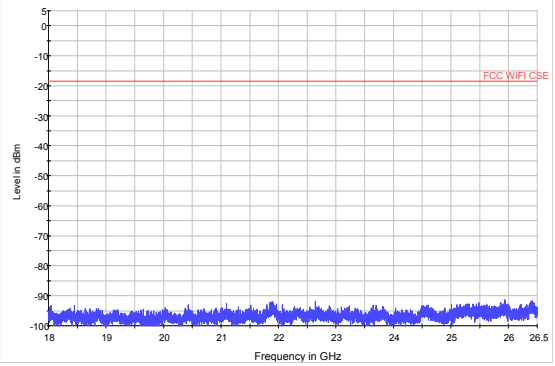

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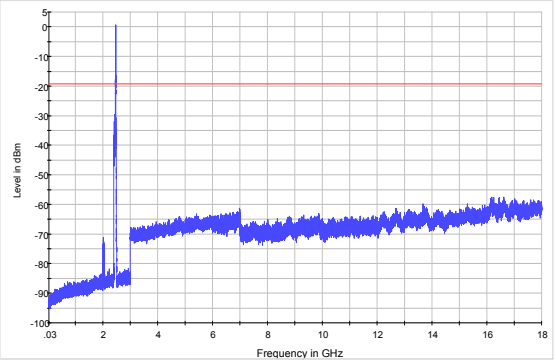

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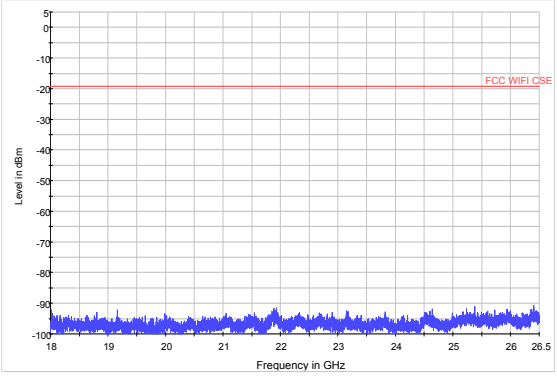

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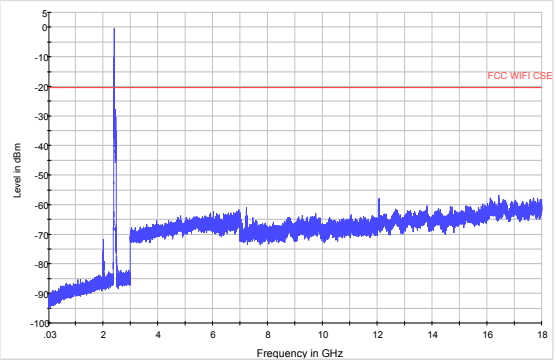

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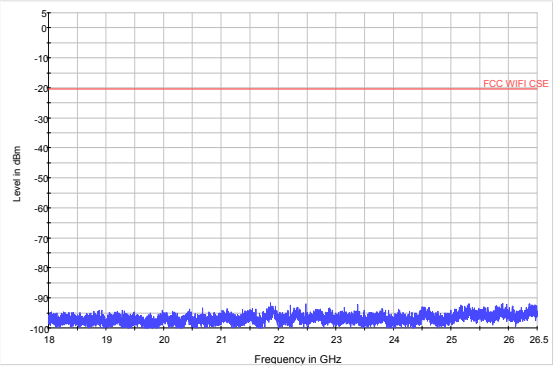

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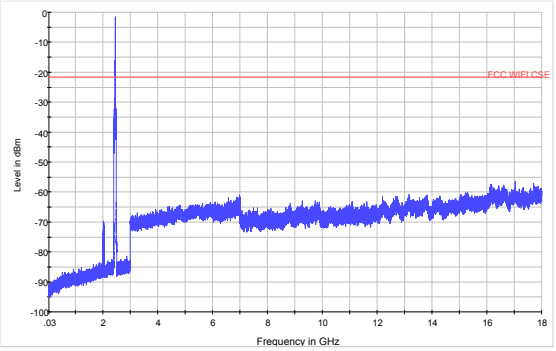

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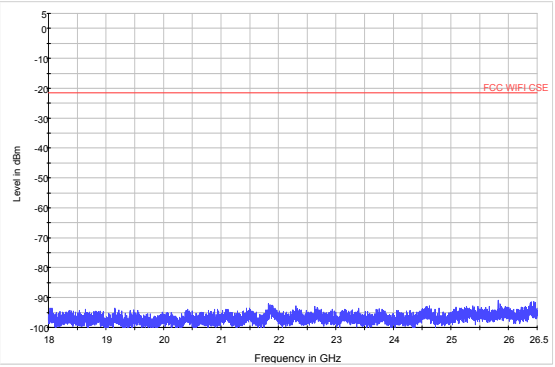

802.11n (HT20) CH6 18GHz to 26.5GHz

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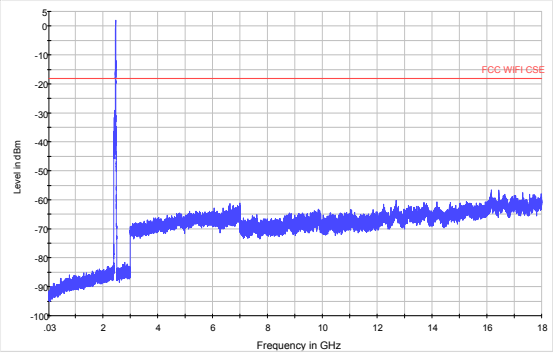

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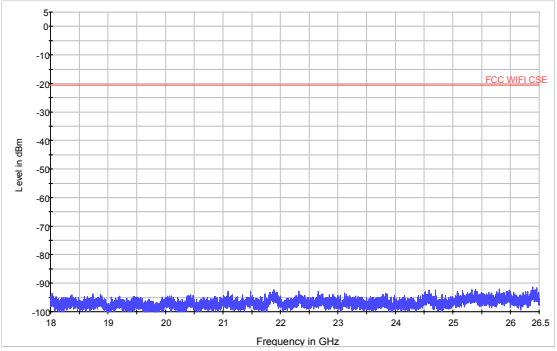

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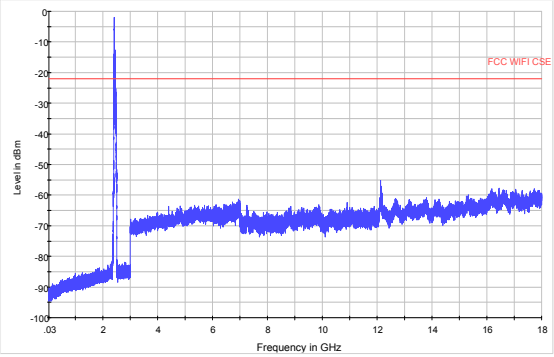

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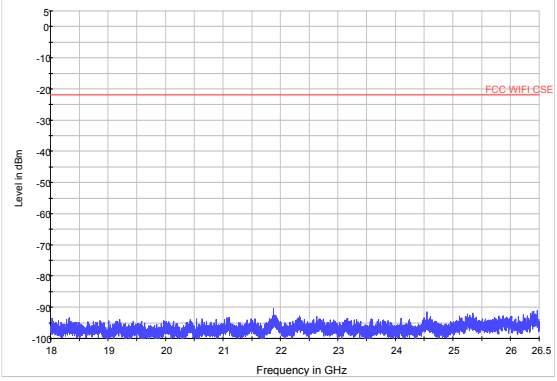

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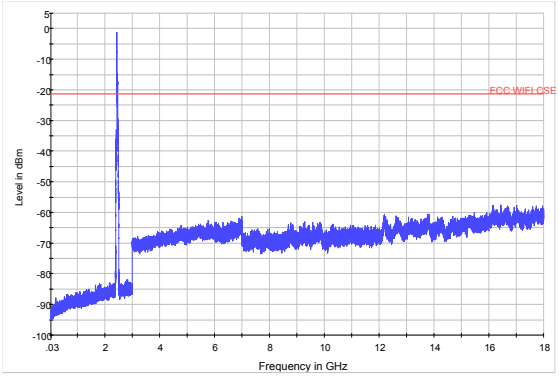

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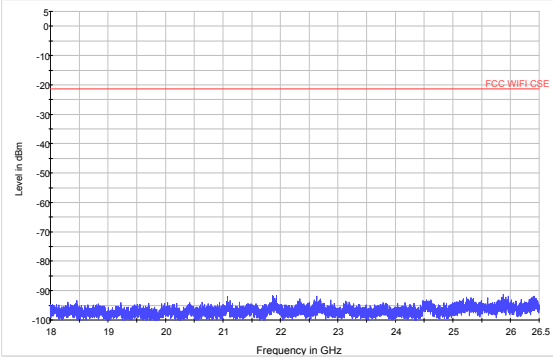

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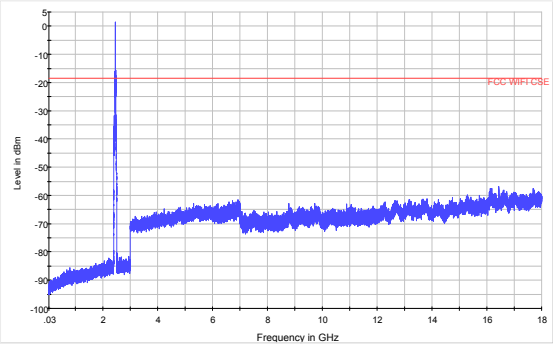

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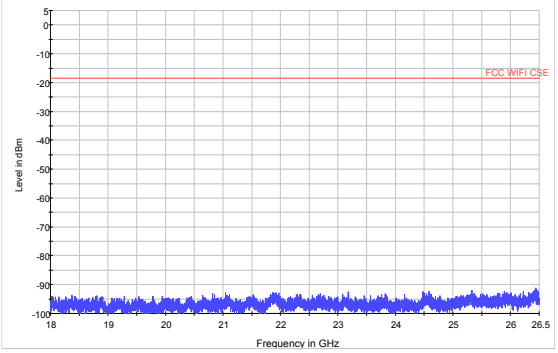

802.11n (HT40) CH9 18GHz to 26.5GHz

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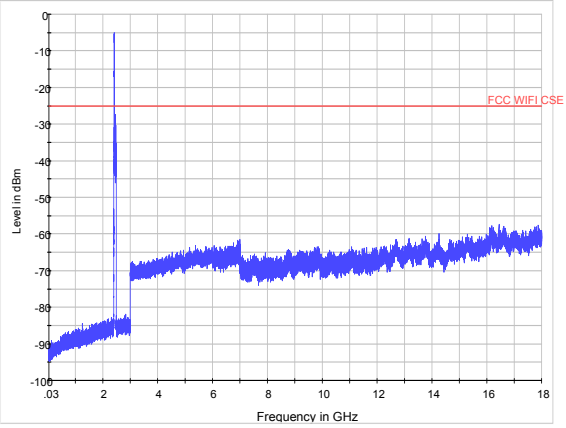
MIMO



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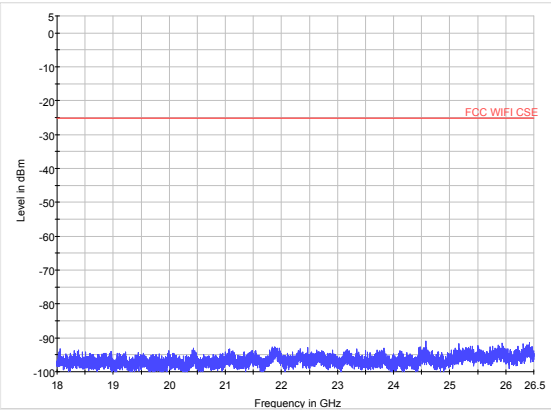

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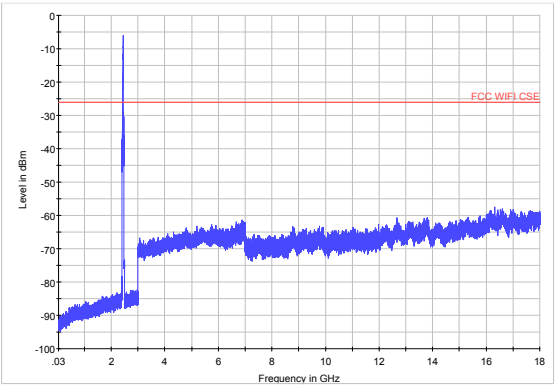

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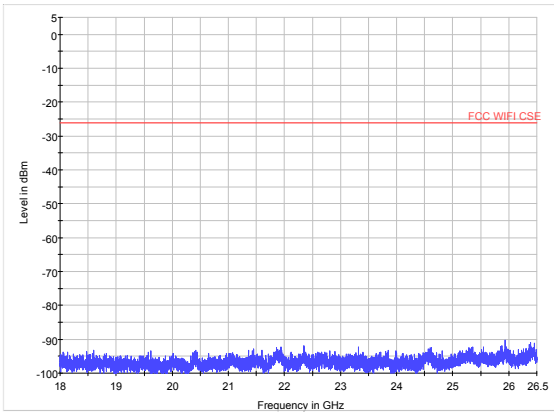

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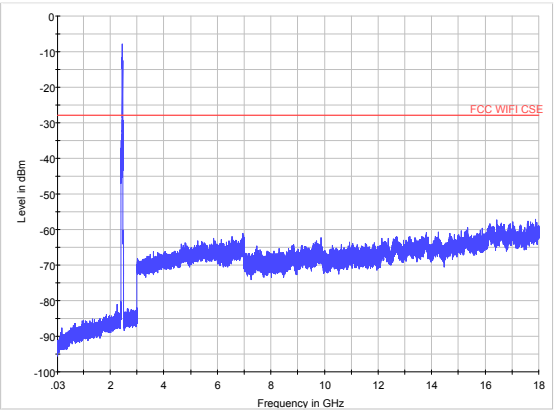

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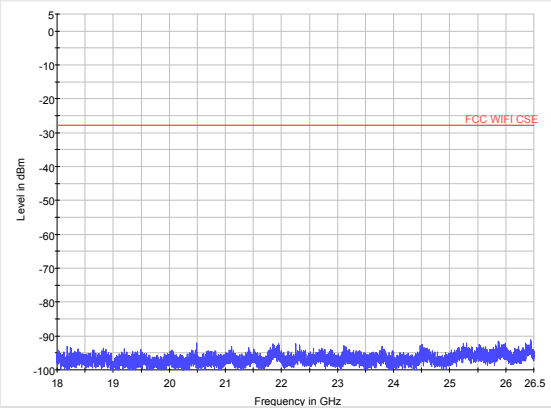

802.11n (HT20) CH11 18GHz to 26.5GHz

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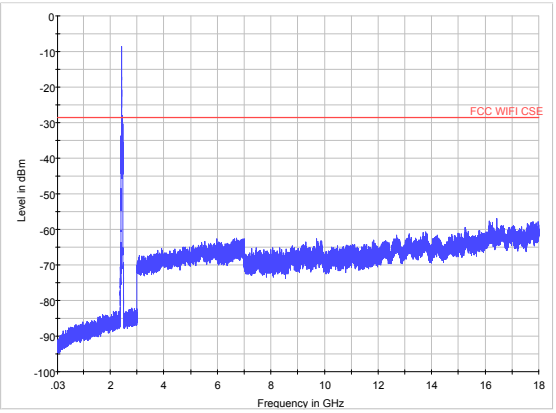

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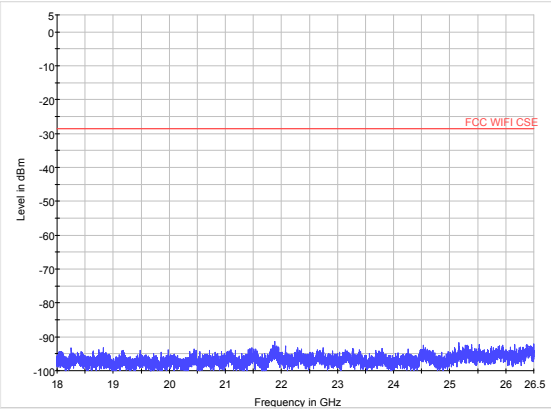
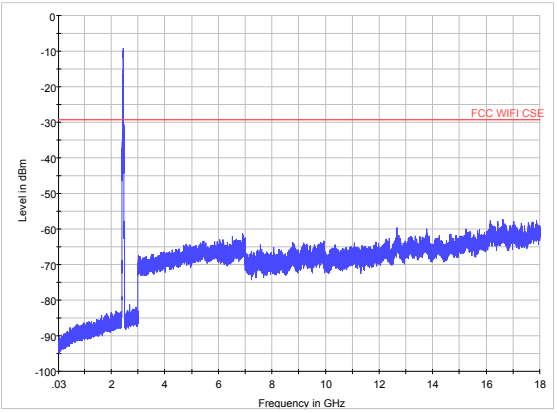
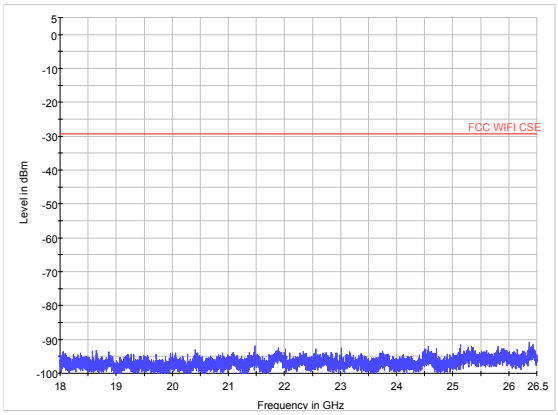


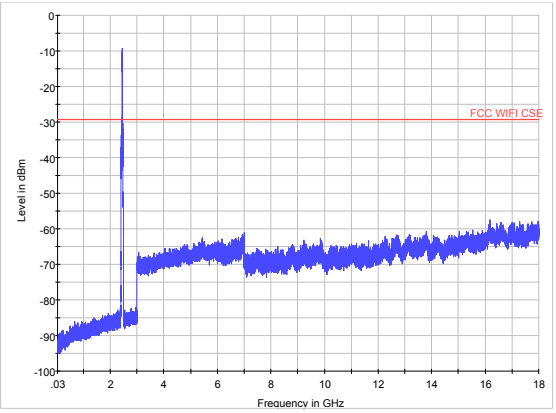
802.11n (HT40) CH3 18GHz to 26.5GHz



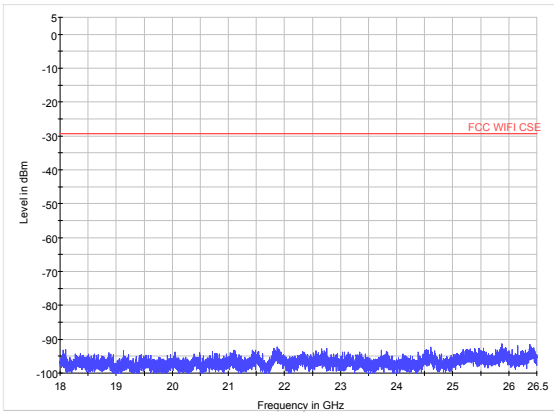
802.11n (HT40) CH6 30MHz to 18GHz



802.11n (HT40) CH6 18GHz to 26.5GHz



802.11n (HT40) CH9 30MHz to 18GHz



802.11n (HT40) CH9 18GHz to 26.5GHz

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5.6. Radiated Emissions in the Restricted Band

Ambient condition

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

Method of Measurement

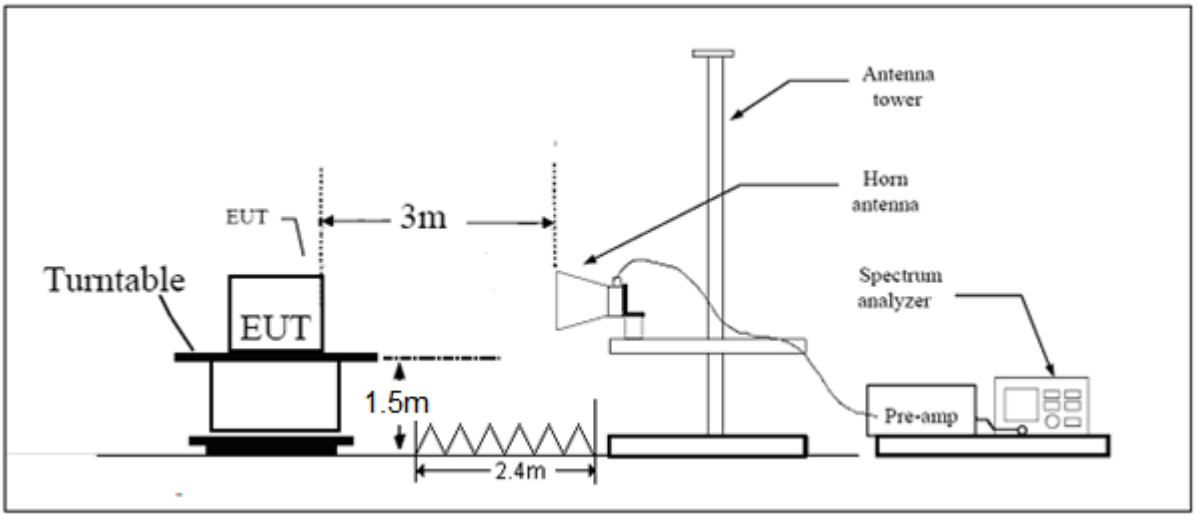
The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. 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=1MHz / 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

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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)
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=74 dBuV/m

Average Limit=54 dBuV/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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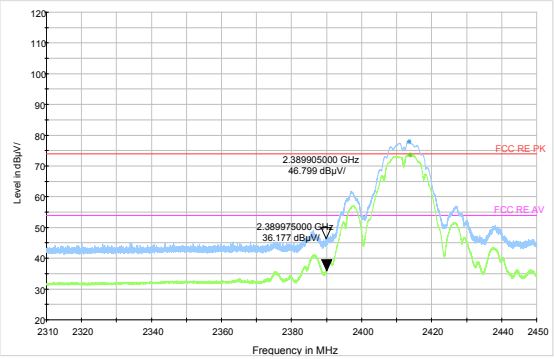
Test Results:

PASS

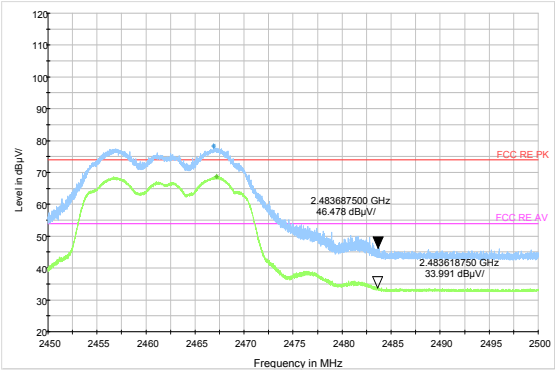
The signal beyond the limit is carrier.

Antenna 2

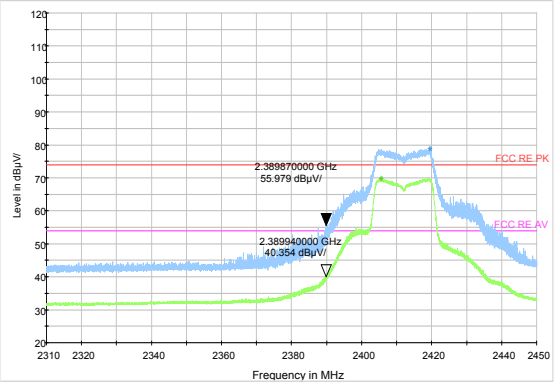
802.11b-Channel 1: Peak Average



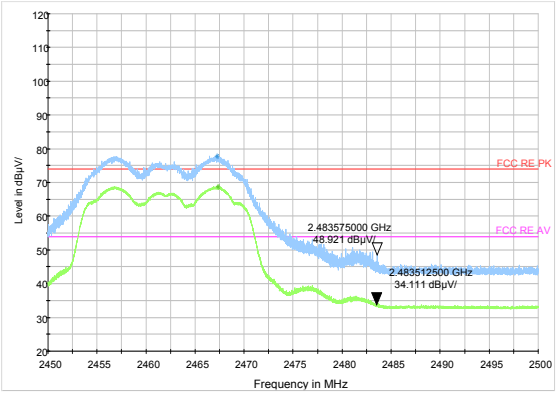
802.11b-Channel 11: Peak Average



802.11g-Channel 1: Peak Average



802.11g-Channel 11: Peak Average



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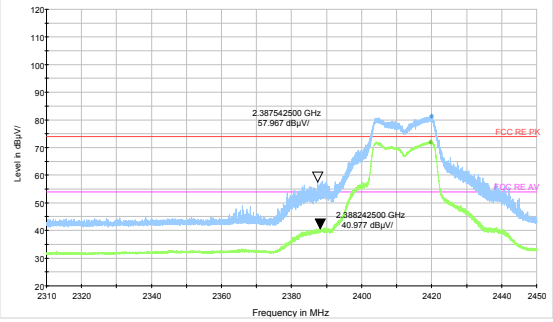
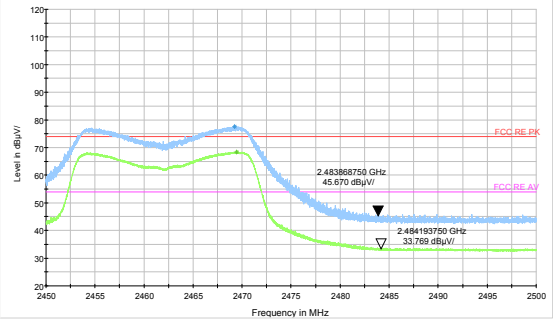
MIMO

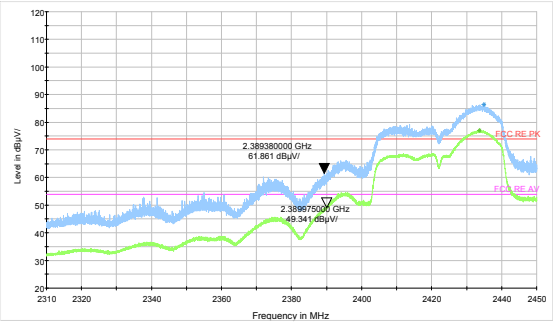
802.11n HT20 -Channel 1: Peak Average



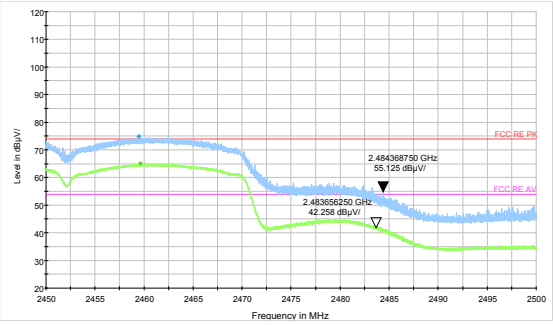
802.11n HT20-Channel 11: Peak Average



802.11n HT40 -Channel 3: Peak Average



802.11n HT40-Channel 9: Peak Average



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5.7. Radiates Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	102.5kPa

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013.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 radiated emissions measurements were made in a typical installation configuration.
Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. 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. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.
Set the spectrum analyzer in the following:
Below 1GHz (detector: Peak and Quasi-Peak)
RBW=100 kHz / VBW=300 kHz / Sweep=AUTO
Above 1GHz (detector: Peak):
(a) PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO
(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

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.

The test is in transmitting mode.

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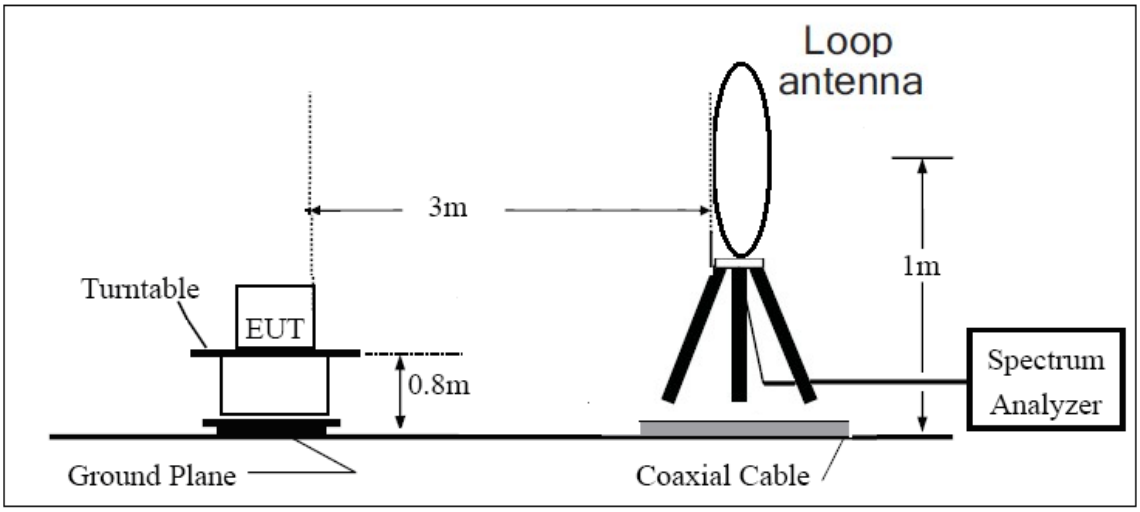
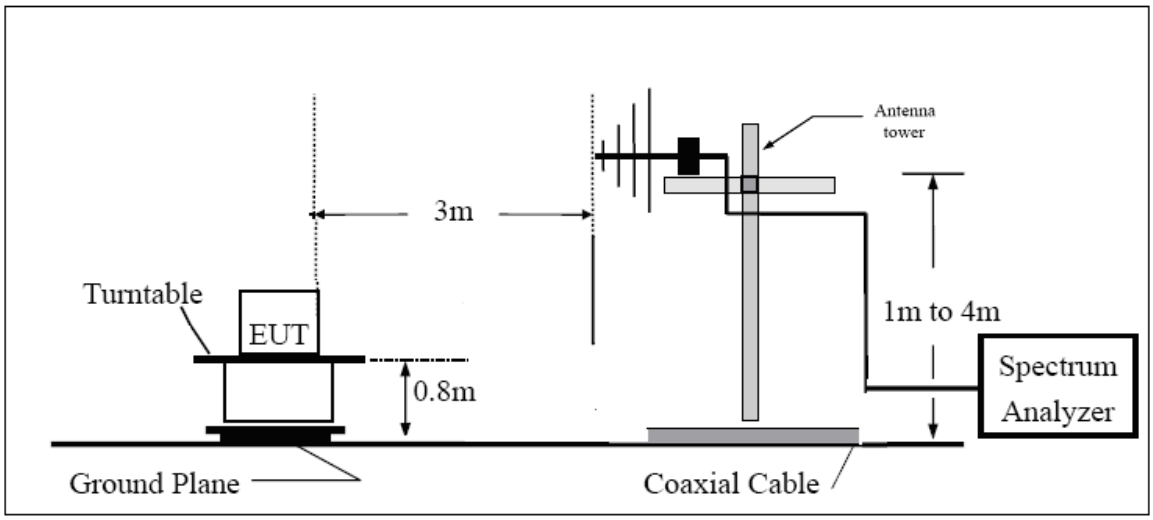
Test setup

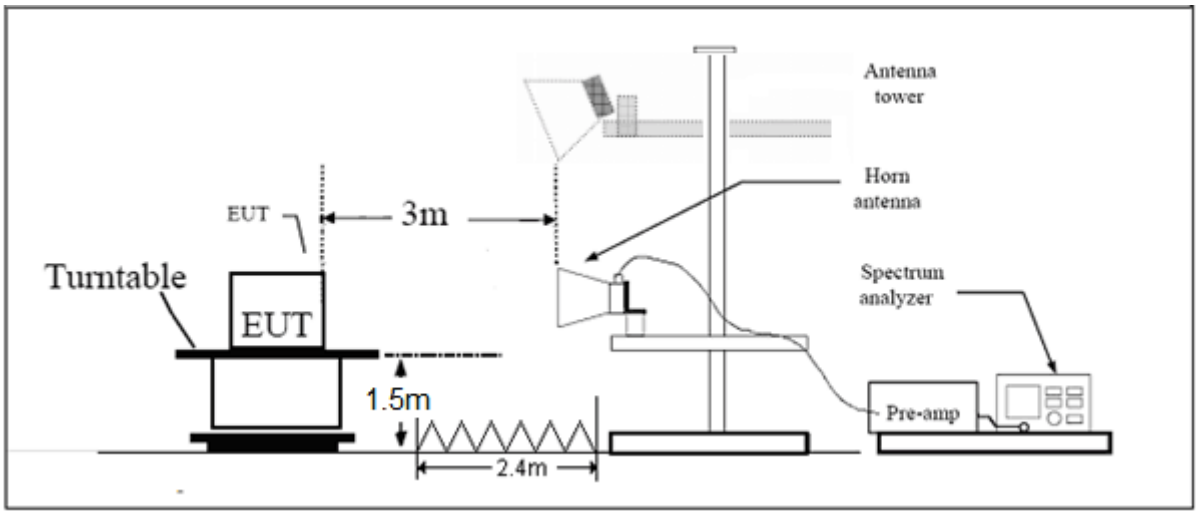
9KHz~~~ 30MHz



30MHz~~~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

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Limits

Rule Part 15.247(d) specifies that "In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c))."

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.

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
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

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Test result

Sweep from 9 kHz to 30MHz, and the emissions more than 20 dB below the permissible value are not reported.

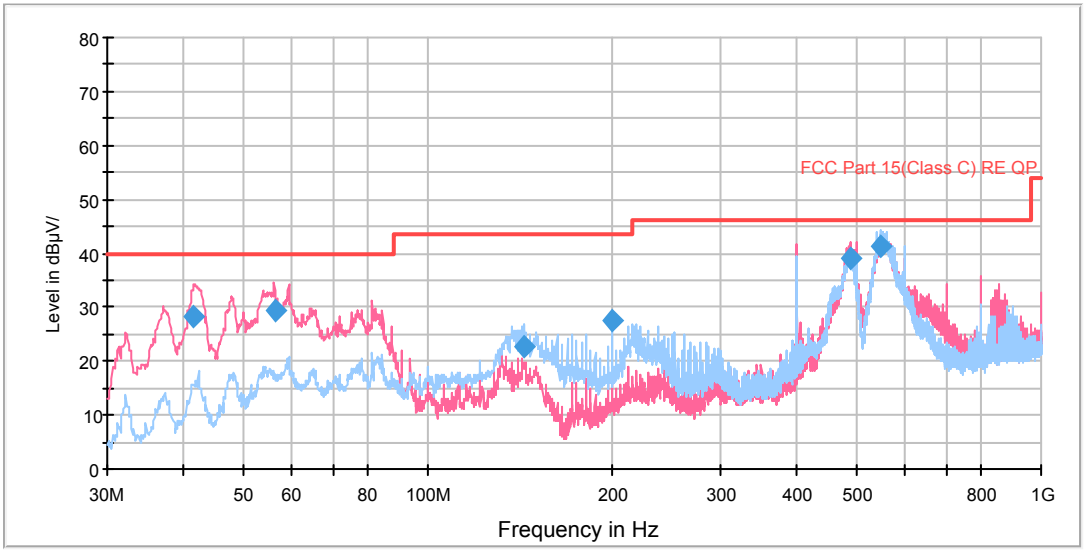
The following graphs display the maximum values of horizontal and vertical by software.

For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

Antenna 2

802.11b CH1

RE 0.03-1GHz QP Class B



Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
41.498750	28.2	100.0	V	304.0	48.6	-20.4	11.8	40.0
56.250000	29.5	102.0	V	274.0	51.0	-21.5	10.5	40.0
143.752500	22.7	127.0	H	16.0	52.5	-29.8	20.8	43.5
199.972500	27.4	127.0	H	339.0	53.7	-26.3	16.1	43.5
489.153750	39.2	102.0	V	347.0	58.8	-19.6	6.8	46.0
548.888750	41.4	122.0	H	6.0	59.7	-18.3	4.6	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss (cable loss+amplifier gain)

3. Margin = Limit – Quasi-Peak

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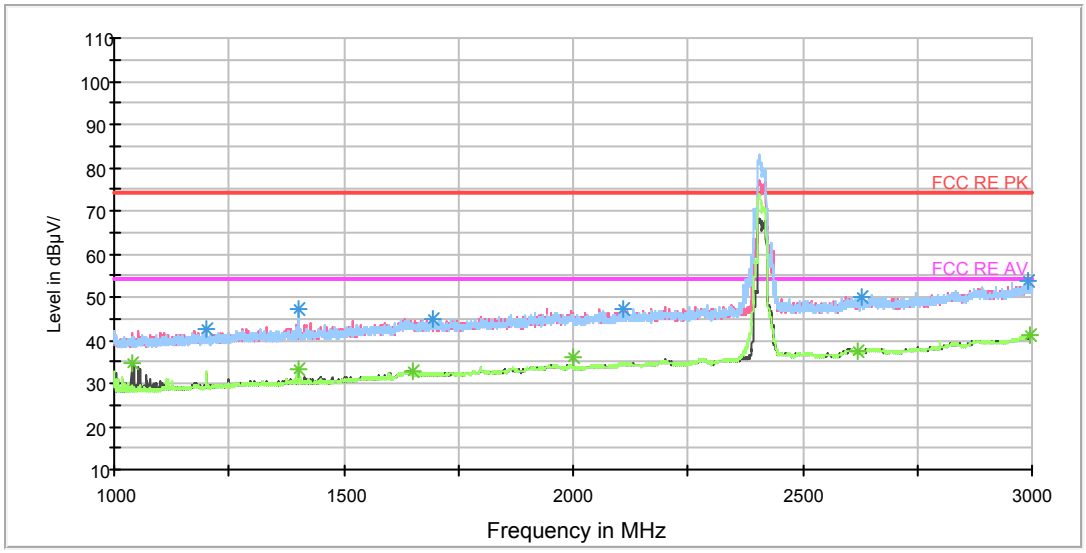
RE 1G-3GHz PK+AV



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1200.000000	42.6	102.0	V	0.0	50.8	-8.2	31.4	74
1400.500000	47.2	201.0	H	0.0	54.3	-7.1	26.8	74
1696.000000	44.8	101.0	H	0.0	49.8	-5.0	29.2	74
2108.250000	47.1	201.0	V	119.0	49.5	-2.4	26.9	74
2626.750000	49.8	201.0	H	102.0	49.9	-0.1	24.2	74
2990.000000	53.5	101.0	H	341.0	55.7	2.2	20.5	74

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1037.500000	34.7	102.0	V	80.0	43.8	-9.1	19.3	54
1400.000000	33.4	102.0	V	19.0	40.5	-7.1	20.6	54
1650.500000	33.0	102.0	V	0.0	38.1	-5.1	21.0	54
2000.000000	36.2	102.0	V	0.0	39.6	-3.4	17.8	54
2618.500000	37.6	102.0	V	314.0	37.6	0.0	16.4	54
2995.250000	41.0	102.0	V	0.0	43.3	2.3	13.0	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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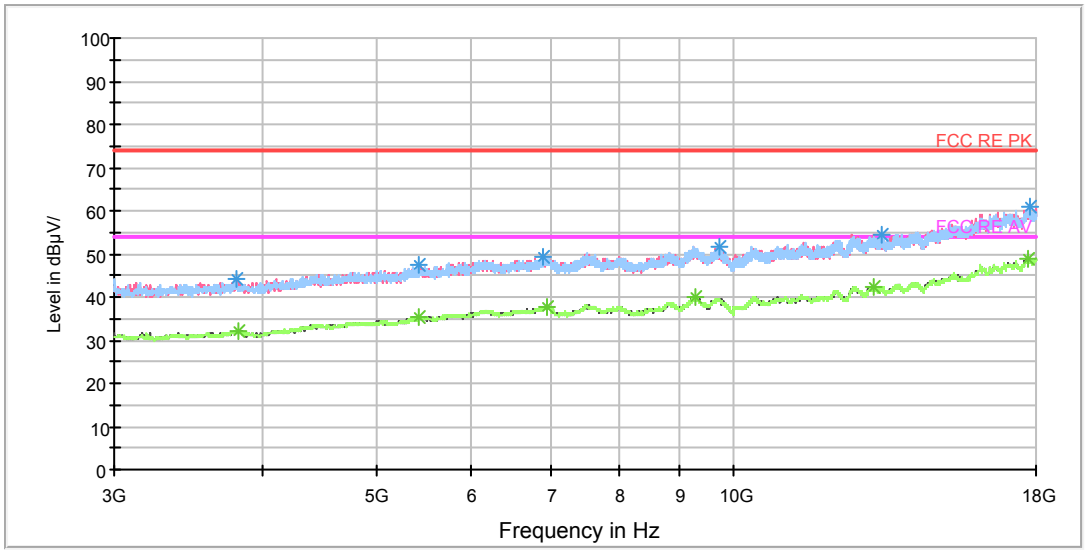
RE 3-18GHz PK+AV



Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3808.125000	44.2	201.0	V	0.0	46.3	2.1	29.8	74
5430.000000	47.4	100.0	H	211.0	53.8	6.4	26.6	74
6896.250000	49.4	100.0	V	0.0	58.2	8.8	24.6	74
9708.750000	51.8	201.0	H	111.0	64.2	12.4	22.2	74
13335.000000	54.4	201.0	H	0.0	70.8	16.4	19.6	74
17784.375000	60.7	100.0	V	319.0	83.2	22.5	13.3	74

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3821.250000	32.2	201.0	H	0.0	34.4	2.2	21.8	54
5431.875000	35.5	100.0	V	0.0	41.9	6.4	18.5	54
6965.625000	37.9	100.0	V	135.0	46.9	9.0	16.1	54
9283.125000	40.0	100.0	H	305.0	52.7	12.7	14.0	54
13153.125000	42.4	100.0	V	78.0	59.0	16.6	11.6	54
17722.500000	49.0	100.0	V	116.0	71.4	22.4	5.0	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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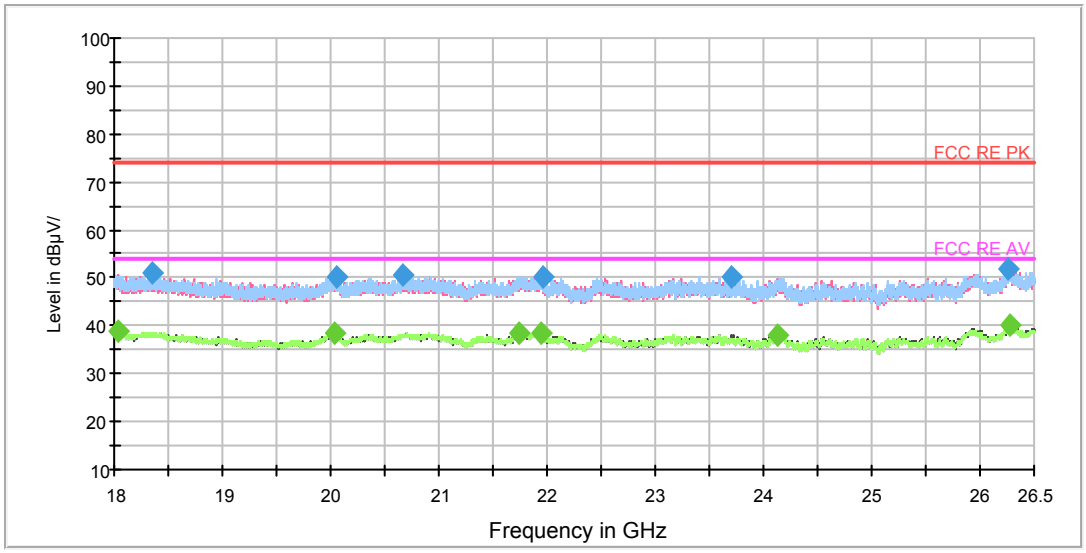
RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18348.500000	51.1	V	225.0	54.4	-3.3	22.9	74
20060.187500	50.1	V	343.0	55.8	-5.7	23.9	74
20669.000000	50.5	V	212.0	57.1	-6.6	23.5	74
21961.531250	50.0	V	343.0	58.0	-8.0	24.0	74
23712.000000	50.3	V	0.0	56.2	-5.9	23.7	74
26264.125000	51.9	H	0.0	57.3	-5.4	22.1	74

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18031.875000	38.9	H	105.0	40.8	-1.9	15.1	54
20041.593750	38.3	H	105.0	44.0	-5.7	15.7	54
21742.656250	38.6	V	181.0	46.6	-8.0	15.4	54
21939.218750	38.5	H	290.0	46.5	-8.0	15.5	54
24135.406250	38.1	V	0.0	44.0	-5.9	15.9	54
26274.218750	40.0	V	239.0	45.4	-5.4	14.0	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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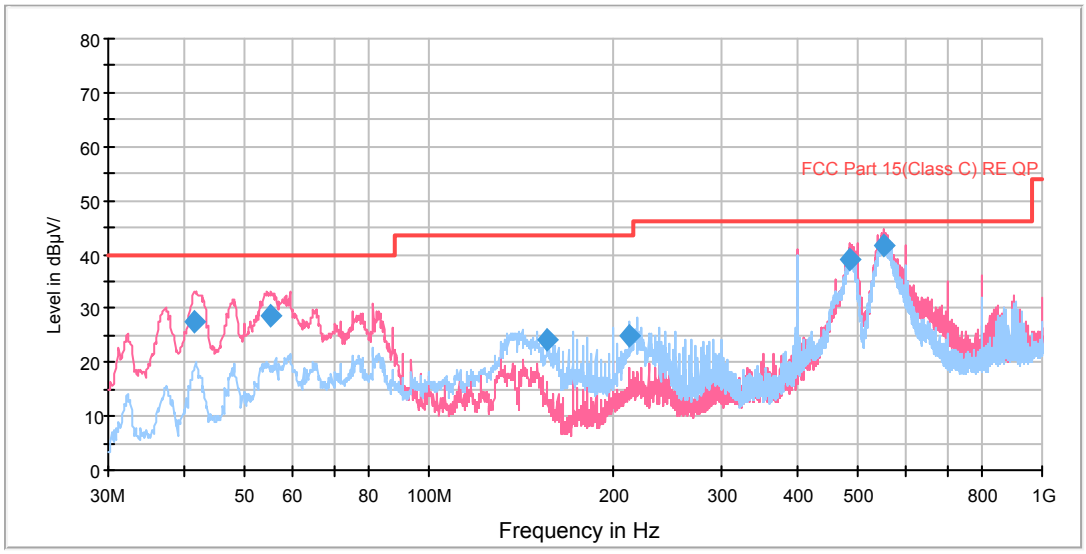
802.11b CH6

RE 0.03-1GHz QP Class B



Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
41.457500	27.7	102.0	V	80.0	48.1	-20.4	12.3	40.0
55.321250	28.7	100.0	V	266.0	49.8	-21.1	11.3	40.0
156.241250	24.2	127.0	H	24.0	53.2	-29.0	19.3	43.5
212.501250	24.8	120.0	H	16.0	50.5	-25.7	18.7	43.5
486.567500	39.2	102.0	V	349.0	58.7	-19.5	6.8	46.0
550.263750	41.7	100.0	V	0.0	60.1	-18.4	4.3	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss (cable loss+amplifier gain)

3. Margin = Limit – Quasi-Peak

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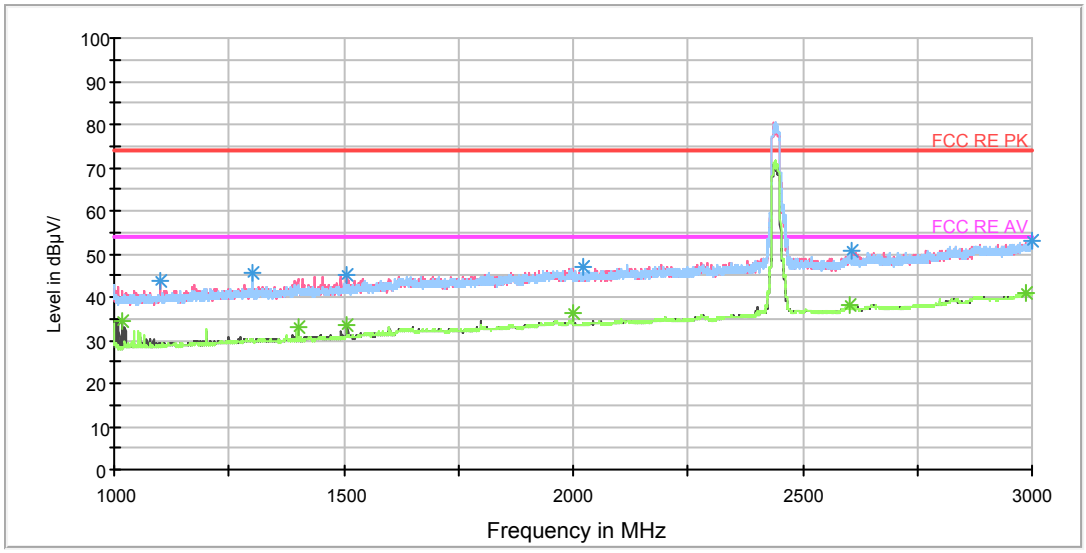
RE 1G-3GHz PK+AV



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1099.250000	43.7	102.0	V	0.0	52.6	-8.9	30.3	74
1300.000000	45.7	101.0	H	342.0	53.6	-7.9	28.3	74
1508.500000	45.0	102.0	V	139.0	51.5	-6.5	29.0	74
2023.500000	46.8	101.0	H	141.0	50.3	-3.5	27.2	74
2605.750000	50.6	201.0	V	141.0	50.9	0.3	23.4	74
2998.000000	53.1	201.0	V	181.0	55.4	2.3	20.9	74

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1017.000000	34.4	201.0	V	65.0	43.6	-9.2	19.6	54
1400.000000	33.0	201.0	H	238.0	40.1	-7.1	21.0	54
1508.500000	33.3	102.0	V	139.0	39.8	-6.5	20.7	54
2000.250000	36.5	201.0	V	201.0	39.9	-3.4	17.5	54
2600.500000	38.2	102.0	V	353.0	38.6	0.4	15.8	54
2988.000000	41.0	102.0	V	353.0	43.2	2.2	13.0	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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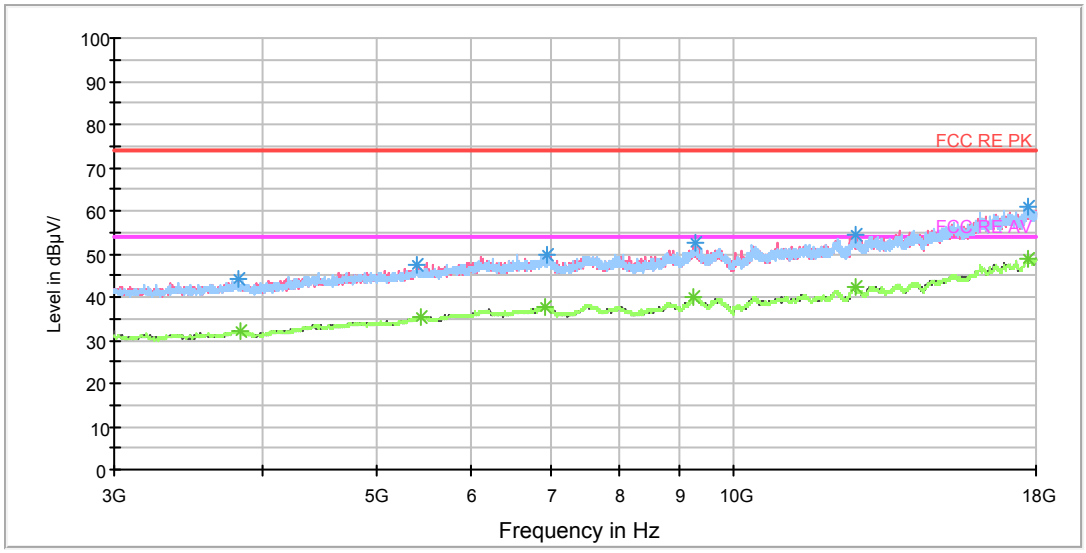
RE 3-18GHz PK+AV



Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3823.125000	44.0	201.0	V	154.0	46.2	2.2	30.0	74
5401.875000	47.2	100.0	V	281.0	53.5	6.3	26.8	74
6963.750000	50.0	100.0	H	43.0	59.0	9.0	24.0	74
9288.750000	52.7	201.0	H	115.0	65.4	12.7	21.3	74
12658.125000	54.4	201.0	H	228.0	70.2	15.8	19.6	74
17722.500000	60.9	100.0	H	62.0	83.3	22.4	13.1	74

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3840.000000	32.1	100.0	H	7.0	34.3	2.2	21.9	54
5433.750000	35.3	201.0	V	0.0	41.7	6.4	18.7	54
6937.500000	37.9	100.0	H	25.0	46.8	8.9	16.1	54
9230.625000	40.2	100.0	H	229.0	52.9	12.7	13.8	54
12656.250000	42.4	201.0	V	0.0	58.2	15.8	11.6	54
17700.000000	49.1	100.0	V	244.0	71.5	22.4	4.9	54

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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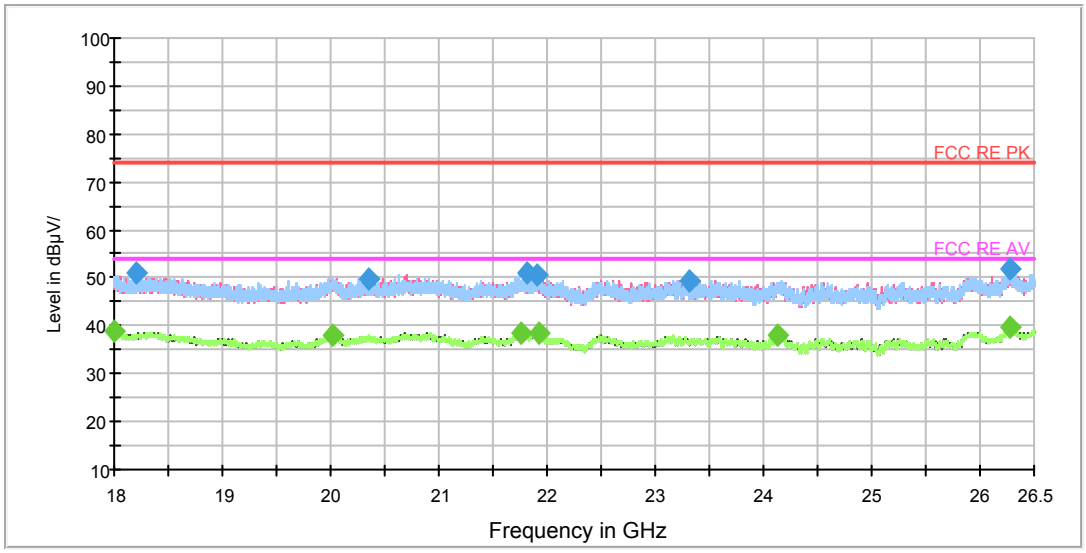
RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18204.531250	51.0	V	125.0	53.7	-2.7	23.0	74.0
20358.218750	49.9	H	0.0	55.9	-6.0	24.1	74.0
21819.687500	51.0	V	125.0	59.0	-8.0	23.0	74.0
21915.312500	50.7	V	138.0	58.7	-8.0	23.3	74.0
23323.125000	49.5	H	30.0	55.5	-6.0	24.5	74.0
26282.718750	52.0	H	0.0	57.4	-5.4	22.0	74.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
18003.718750	38.8	H	0.0	40.6	-1.8	15.2	54.0
20025.125000	38.2	H	0.0	43.9	-5.7	15.8	54.0
21750.625000	38.4	H	124.0	46.4	-8.0	15.6	54.0
21930.187500	38.5	V	180.0	46.5	-8.0	15.5	54.0
24135.937500	37.9	V	70.0	43.8	-5.9	16.1	54.0
26280.593750	39.7	V	165.0	45.1	-5.4	14.3	54.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

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