RF TEST REPORT

Applicant	SKSpruce Technologies Co., Ltd.
FCC ID	2AHKT-WOA5300-20
Product	Outdoor Access Point
Brand	SKSPRUCE
Model	WOA5300-20
Report No.	R1805A0243-R1V2
Issue Date	September 28, 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.

Peng Tao

Performed by: Peng Tao

Kai Xu

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000

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. Maximum conducted output power 9
5.2. 6dB Bandwidth 14
5.3. Band Edge 18
5.4. Power Spectral Density 20
5.5. Spurious RF Conducted Emissions 32
5.6. Unwanted Emission 37
5.7. Conducted Emission 71
6. Main Test Instruments 73

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: June 4, 2018~ July 9, 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
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

2. General Description of Equipment under Test

Client Information

Applicant	SKSpruce Technologies Co., Ltd.
Applicant address	A1, Tianfu Software Park, 1129 Century City Road, Hi-tech Zone, Chengdu, China
Manufacturer	SKSpruce Technologies Co., Ltd.
Manufacturer address	A1, Tianfu Software Park, 1129 Century City Road, Hi-tech Zone, Chengdu, China

General information

EUT Description	
Model	WOA5300-20
SN	8162017081500043
Hardware Version	A0
Software Version	AmOS 3.0
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: 8.00 dBi Antenna 2: 8.00 dBi
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 :22.36dBm
Operating Frequency Range(s)	802.11b/g/n(HT20): 2412 ~ 2462 MHz 802.11n(HT40): 2422 ~ 2452 MHz
EUT Accessory	
Adapter	Manufacturer: PROCET(Creative Lianjie Network Technology Co.Ltd) Model: PT-PSE106GRO
Note: The information of the EUT is declared by the manufacturer.	

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 lie-down position (X 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+QRCT

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	Antenna 1	Antenna 2	MIMO
Maximum conducted output power	O	O	O
6dB Bandwidth	--	O	--
Band Edge	--	O	--
Power Spectral Density	O	O	O
Spurious RF Conducted Emissions	--	O	--
Unwanted Emission	--	O	--
Conducted Emission	--	O	--
Note：“O”: test all bands			

5. Test Case Results

5.1. Maximum conducted output power

Ambient condition

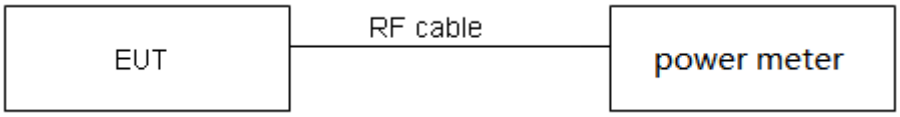
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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

SISO Antenna Gain Index						
Packet Type	Antenna 1			Antenna 2		
	CH1	CH6	CH11	CH1	CH6	CH11
802.11b	17.50	17.50	17.50	18	18	18
802.11g	17.50	17.50	17.50	18	18	18
802.11n HT20	17.50	17.50	17.50	18	18	18
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	17.50	17.50	17.50	18	18	18

MIMO Antenna Gain Index						
Packet Type	Antenna 1			Antenna 2		
	CH1	CH6	CH11	CH1	CH6	CH11
802.11b	15.50	15.50	15.50	15.50	15.50	15.50
802.11g	15.50	15.50	15.50	15.50	15.50	15.50
802.11n HT20	15.50	15.50	15.50	15.50	15.50	15.50
Packet Type	**CH3**	**CH6**	**CH9**	**CH3**	**CH6**	**CH9**
802.11n HT40	15.50	15.50	15.50	15.50	15.50	15.50

Band	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11b	12.44	12.52	0.99	NA
802.11g	2.06	2.14	0.96	0.17
802.11n HT20	5.00	5.08	0.99	NA
802.11n HT40	2.42	2.50	0.97	0.14
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	21.08	21.08	28	PASS
	2437	21.25	21.25	28	PASS
	2462	21.19	21.19	28	PASS
802.11g	2412	20.97	21.14	28	PASS
	2437	21.11	21.28	28	PASS
	2462	21.15	21.32	28	PASS
802.11n HT20	2412	21.08	21.08	28	PASS
	2437	21.31	21.31	28	PASS
	2462	21.15	21.15	28	PASS
802.11n HT40	2422	20.91	21.05	28	PASS
	2437	21.18	21.32	28	PASS
	2452	21.22	21.36	28	PASS
Note: Average Power with duty factor = Average Power Measured +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	22.31	22.31	28	PASS
	2437	22.33	22.33	28	PASS
	2462	22.25	22.25	28	PASS
802.11g	2412	22.14	22.31	28	PASS
	2437	22.19	22.36	28	PASS
	2462	22.11	22.28	28	PASS
802.11n HT20	2412	22.28	22.28	28	PASS
	2437	22.12	22.12	28	PASS
	2462	22.24	22.24	28	PASS
802.11n HT40	2422	22.14	22.28	28	PASS
	2437	22.20	22.34	28	PASS
	2452	22.18	22.32	28	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

MIMO

Network Standards	Carrier frequency (MHz)	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
		Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11b	2412	18.22	18.22	18.48	18.48	21.36	28	PASS
	2437	18.31	18.31	18.35	18.35	21.34	28	PASS
	2462	18.35	18.35	18.39	18.39	21.38	28	PASS
802.11g	2412	18.05	18.22	18.24	18.41	21.32	28	PASS
	2437	18.06	18.23	18.09	18.26	21.25	28	PASS
	2462	18.25	18.42	17.99	18.16	21.30	28	PASS
802.11n HT20	2412	17.93	17.93	18.19	18.19	21.07	28	PASS
	2437	18.15	18.15	18.14	18.14	21.16	28	PASS
	2462	18.06	18.06	18.13	18.13	21.11	28	PASS
802.11n HT40	2422	18.39	18.53	18.37	18.51	21.53	28	PASS
	2437	18.44	18.58	18.31	18.45	21.53	28	PASS
	2452	18.55	18.69	18.46	18.60	21.66	28	PASS

Note: 1.Average Power with duty factor = Average Power Measured +Duty cycle correction factor

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

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

3. 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 =8+0=8 dBi>6dBi. So the power limt is 30-(8-6)=28dBm

5.2. 6dB Bandwidth

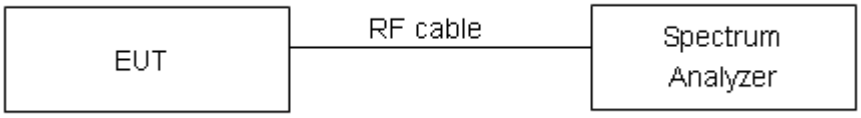
Ambient condition

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

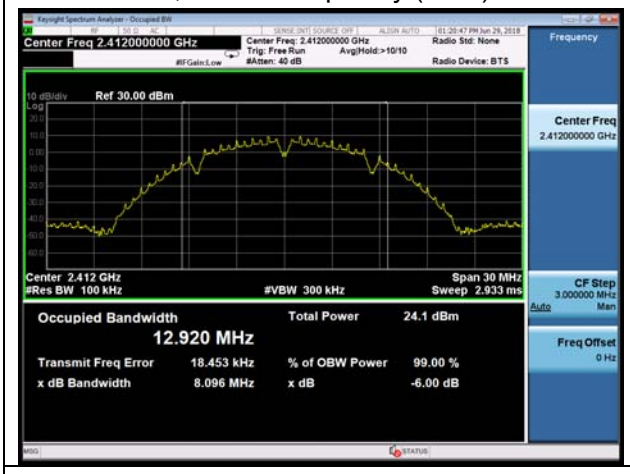
Measurement Uncertainty

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

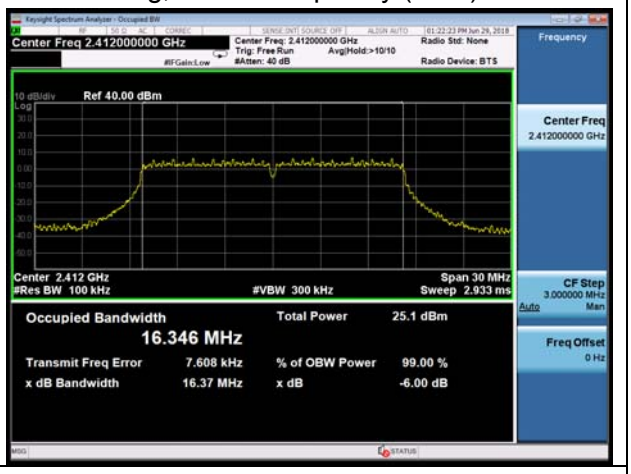
Test Results:

Network Standards	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11b	2412	12.920	8.096	500	PASS
	2437	12.893	8.092	500	PASS
	2462	12.853	8.091	500	PASS
802.11g	2412	16.346	16.370	500	PASS
	2437	16.344	16.370	500	PASS
	2462	16.339	16.360	500	PASS
802.11n HT20	2412	17.554	17.590	500	PASS
	2437	17.550	17.580	500	PASS
	2462	17.540	17.570	500	PASS
802.11n HT40	2422	35.881	35.200	500	PASS
	2437	35.870	35.140	500	PASS
	2452	35.869	35.190	500	PASS

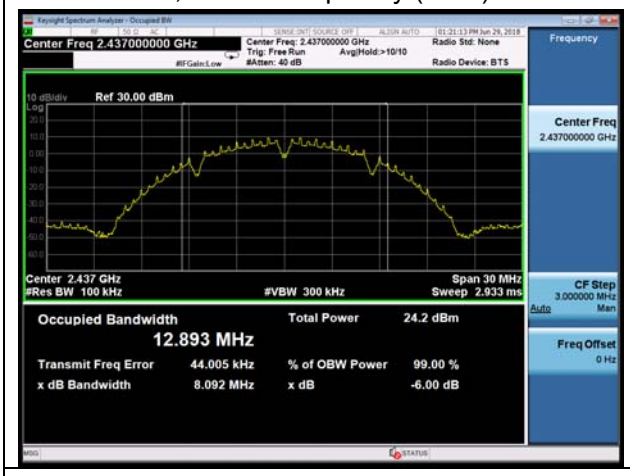
802.11b, Carrier frequency (MHz): 2412



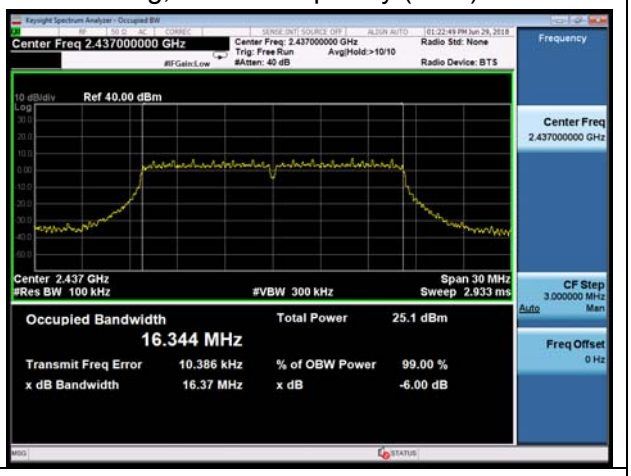
802.11g, Carrier frequency (MHz): 2412



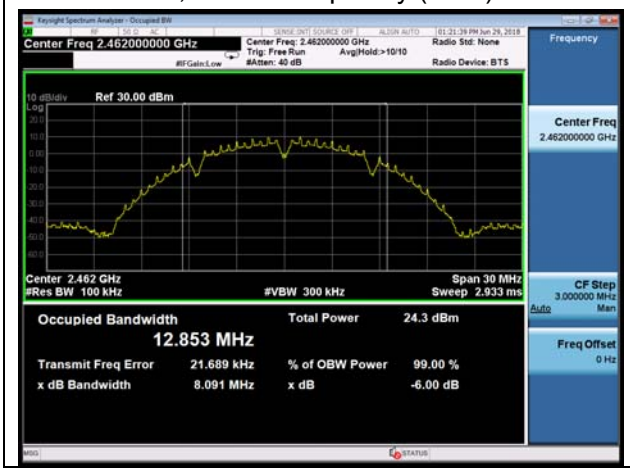
802.11b, Carrier frequency (MHz): 2437



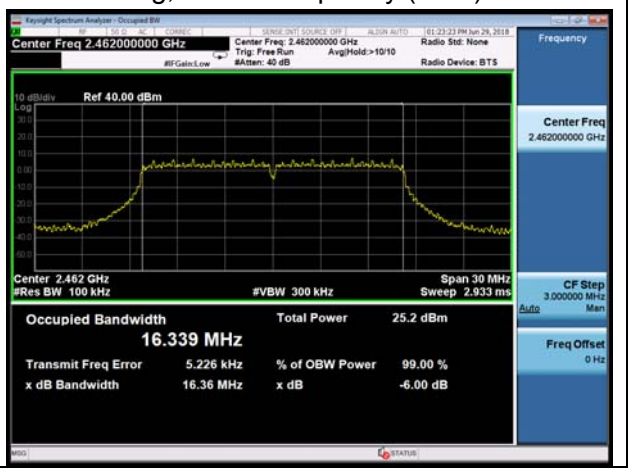
802.11g, Carrier frequency (MHz): 2437



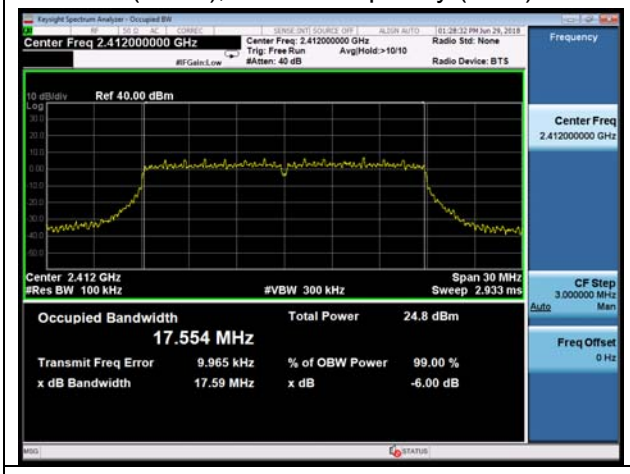
802.11b, Carrier frequency (MHz):2462



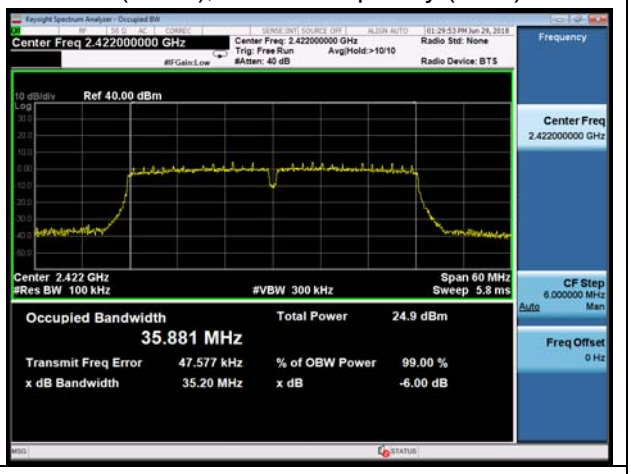
802.11g, Carrier frequency (MHz):2462



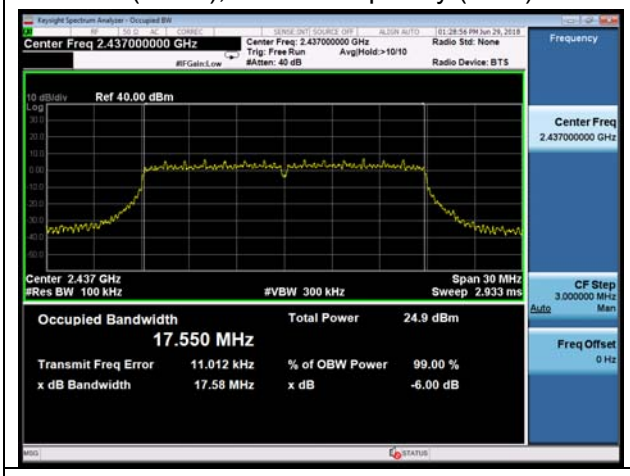
802.11n(HT20), Carrier frequency (MHz): 2412



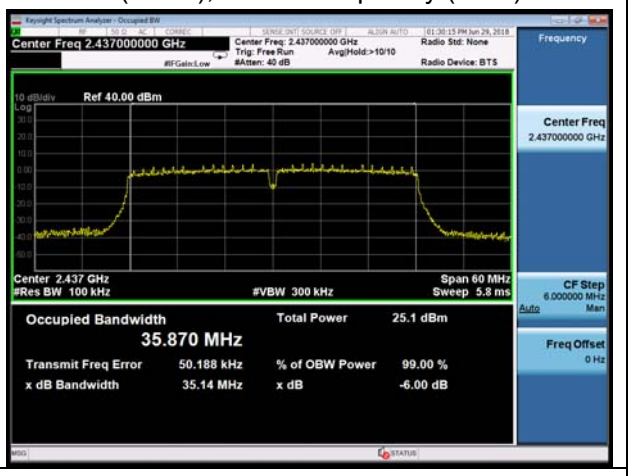
802.11n(HT40), Carrier frequency (MHz): 2422



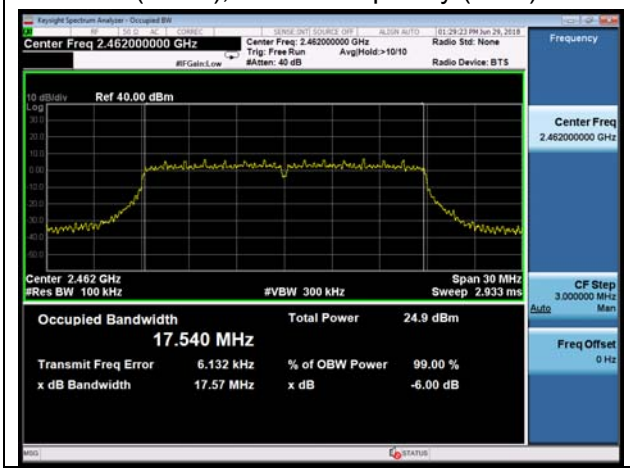
802.11n(HT20), Carrier frequency (MHz): 2437



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

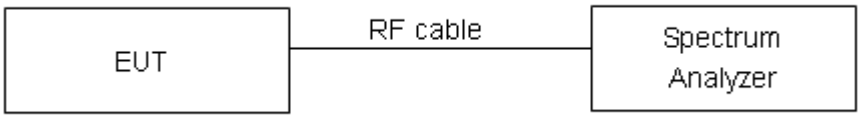
Ambient condition

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.”

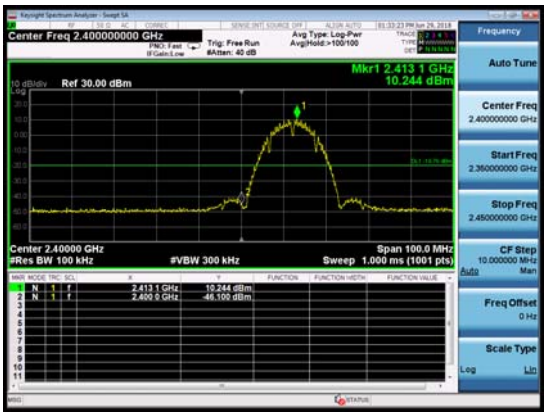
Measurement Uncertainty

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

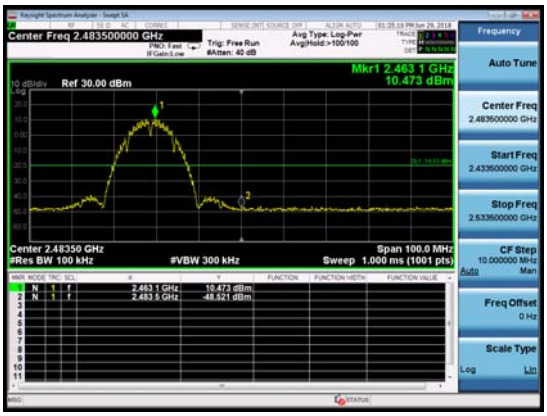
Frequency	Uncertainty
2GHz-3GHz	1.407 dB

Test Results: PASS

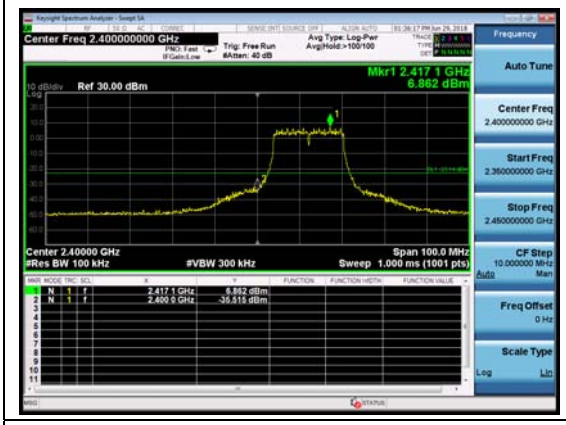
802.11b, Channel No.: 1



802.11b, Channel No.: 11

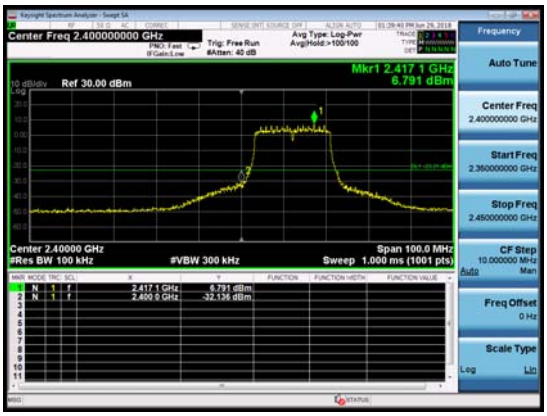


802.11g, Channel No.: 1

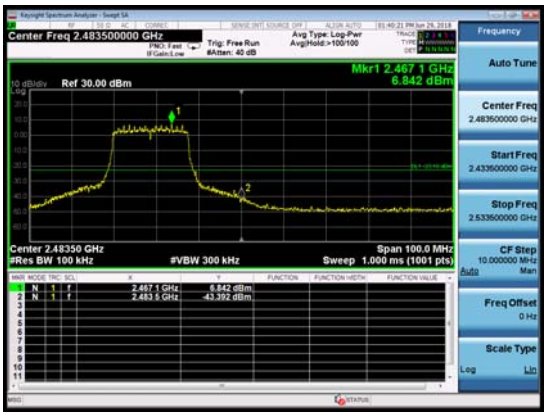


802.11g, Channel No.: 11

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

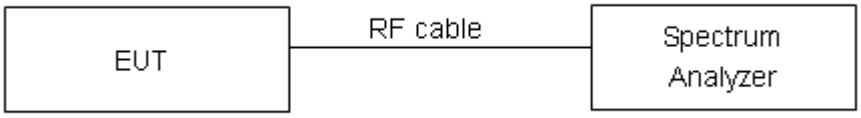
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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	-7.66	-7.66	6	PASS
	6	-7.43	-7.43	6	PASS
	11	-7.74	-7.74	6	PASS
802.11g	1	-10.89	-10.72	6	PASS
	6	-10.62	-10.46	6	PASS
	11	-11.07	-10.90	6	PASS
802.11n HT20	1	-10.75	-10.75	6	PASS
	6	-10.53	-10.53	6	PASS
	11	-10.99	-10.99	6	PASS
802.11n HT40	3	-13.66	-13.52	6	PASS
	6	-13.47	-13.32	6	PASS
	9	-13.51	-13.36	6	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	-8.11	-8.11	6	PASS
	6	-7.12	-7.12	6	PASS
	11	-7.74	-7.74	6	PASS
802.11g	1	-11.28	-11.12	6	PASS
	6	-11.00	-10.83	6	PASS
	11	-10.91	-10.74	6	PASS
802.11n HT20	1	-11.05	-11.05	6	PASS
	6	-10.66	-10.66	6	PASS
	11	-10.79	-10.79	6	PASS
802.11n HT40	3	-14.03	-13.89	6	PASS
	6	-13.82	-13.68	6	PASS
	9	-13.56	-13.42	6	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

MIMO

Network Standards	Channel Number	Power Spectral Density				Total PSD	Limit (dBm / 3kHz)	Conclusion
		Antenna 1		Antenna 2				
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	(dBm / 3kHz)		
802.11b	1	-13.64	-13.64	-13.95	-13.95	-10.78	6.00	PASS
	6	-13.12	-13.12	-13.86	-13.86	-10.47	6.00	PASS
	11	-13.74	-13.74	-13.75	-13.75	-10.74	6.00	PASS
802.11g	1	-17.05	-16.88	-17.21	-17.04	-13.95	6.00	PASS
	6	-16.75	-16.58	-17.05	-16.88	-13.72	6.00	PASS
	11	-16.82	-16.65	-17.08	-16.91	-13.77	6.00	PASS
802.11n HT20	1	-17.25	-17.25	-17.76	-17.76	-14.49	6.00	PASS
	6	-17.03	-17.03	-16.74	-16.74	-13.87	6.00	PASS
	11	-16.87	-16.87	-16.72	-16.72	-13.79	6.00	PASS
802.11n HT40	3	-20.40	-20.25	-20.13	-19.99	-17.11	6.00	PASS
	6	-20.11	-19.97	-19.97	-19.82	-16.89	6.00	PASS
	9	-20.06	-19.92	-20.02	-19.88	-16.89	6.00	PASS

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

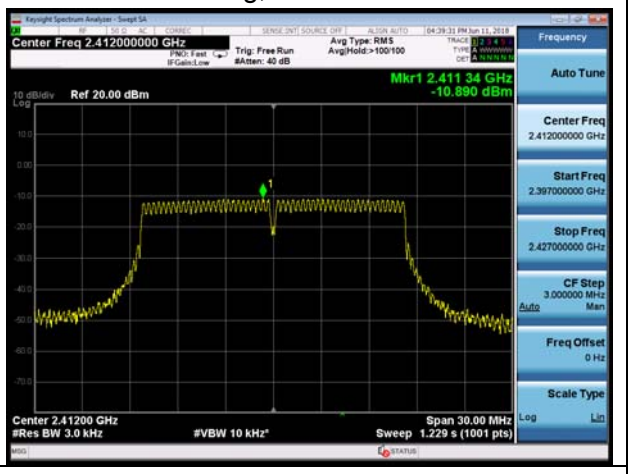
2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})})$

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=8+10log(2/2)=8 >6dBi. So the power limt is 8+6-MAX(6,8)dBm=6dBm.

SISO Antenna 1

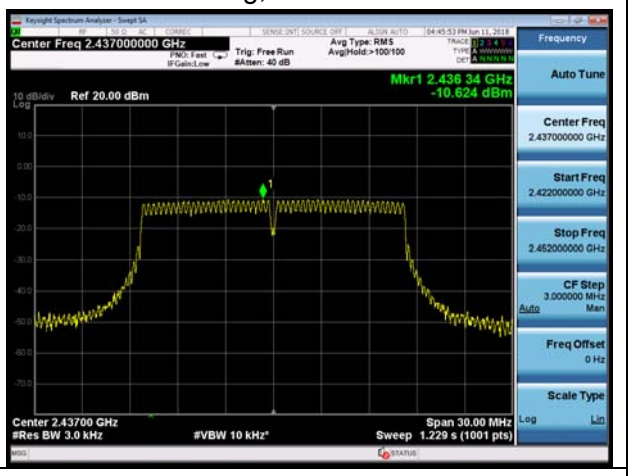
802.11b, Channel No.: 1

802.11g, Channel No.: 1

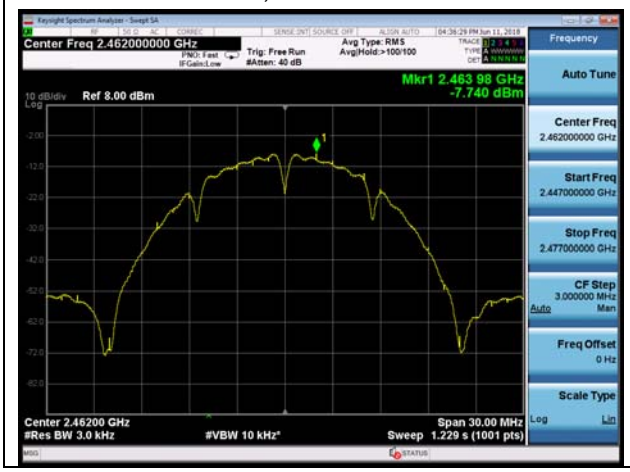


802.11b, Channel No.: 6

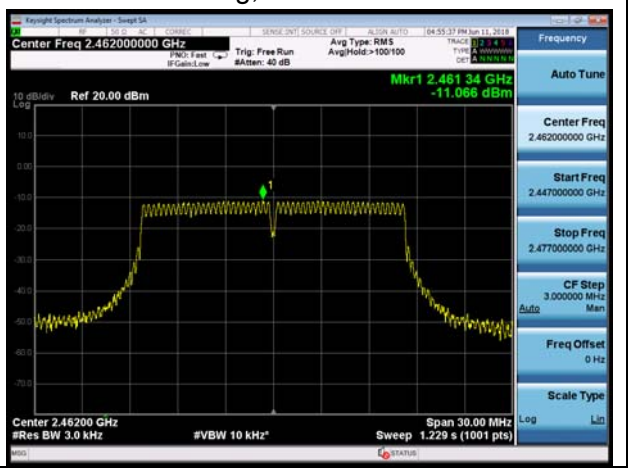
802.11g, Channel No.: 6



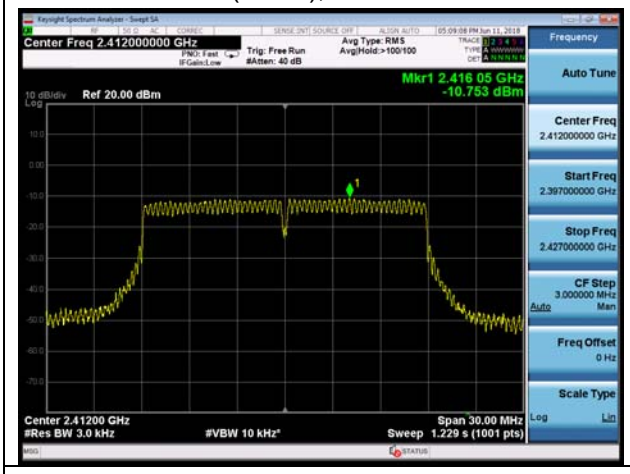
802.11b, Channel No.: 11



802.11g, Channel No.: 11

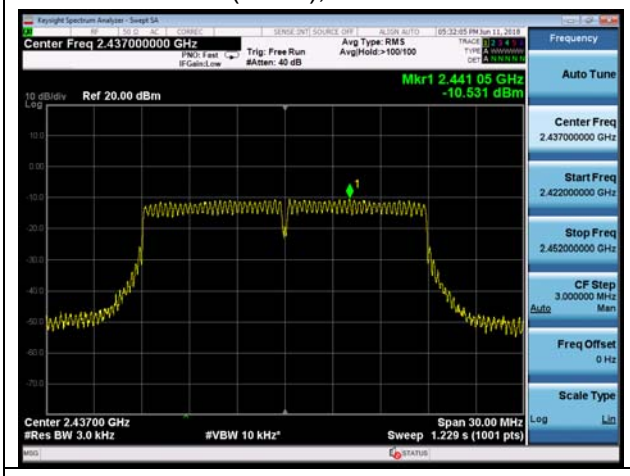


802.11n(HT20), Channel No. 1

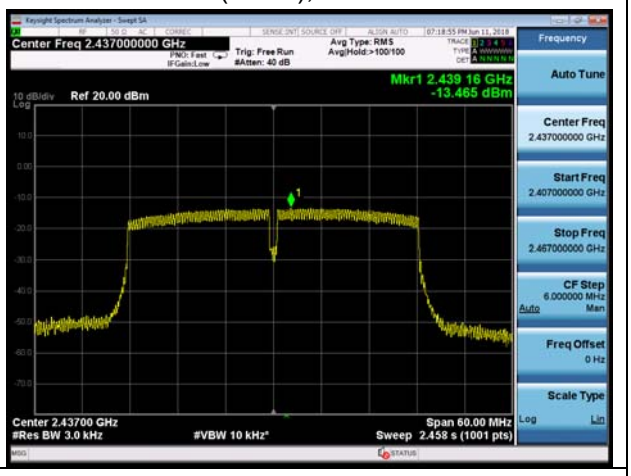


802.11n(HT40), Channel No. 3

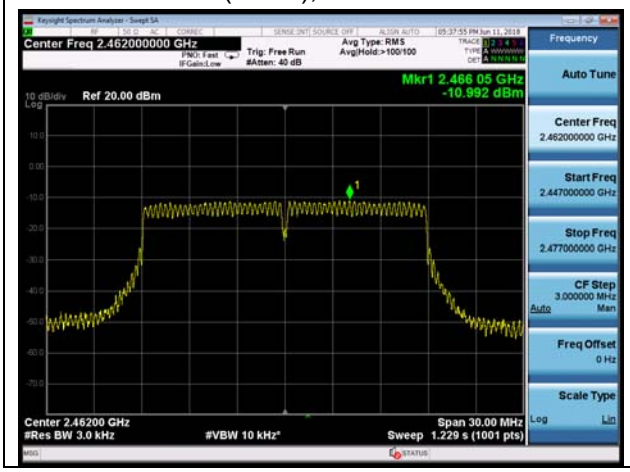
802.11n(HT20), Channel No. 6



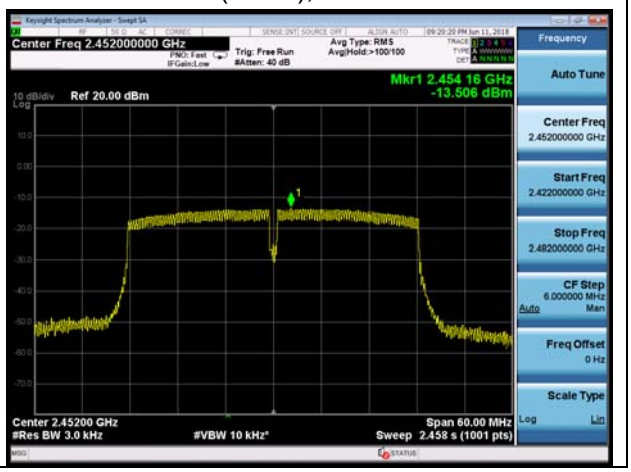
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



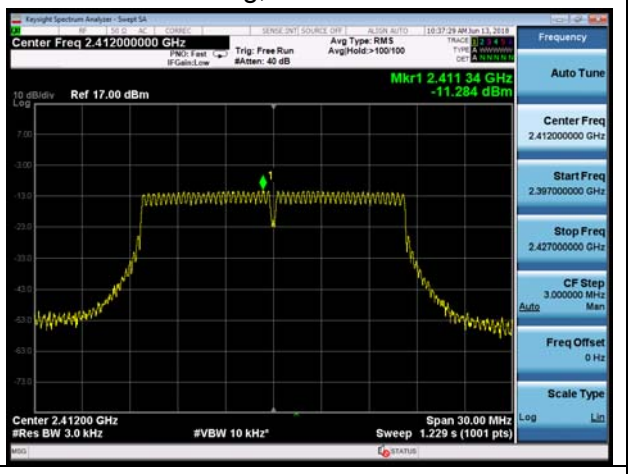
802.11n(HT40), Channel No. 9



SISO Antenna 2

802.11b, Channel No.: 1

802.11g, Channel No.: 1



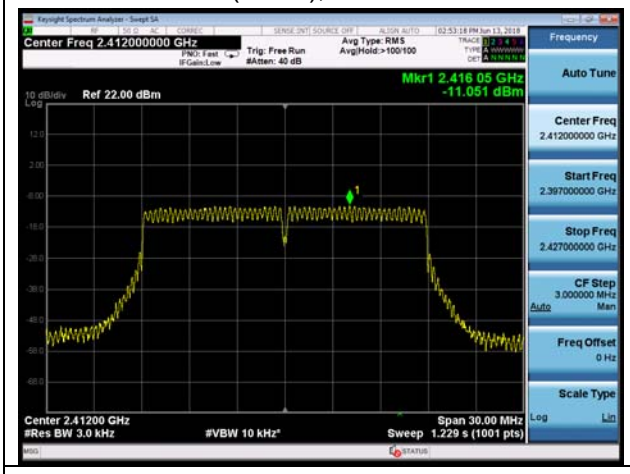
802.11b, Channel No.: 6

802.11g, Channel No.: 6

802.11b, Channel No.: 11

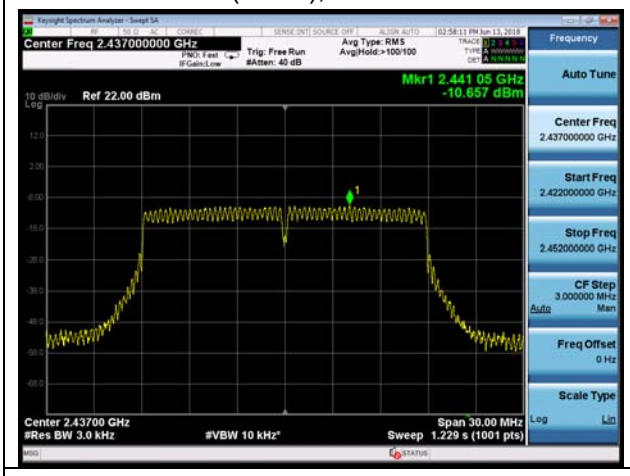
802.11g, Channel No.: 11

802.11n(HT20), Channel No. 1

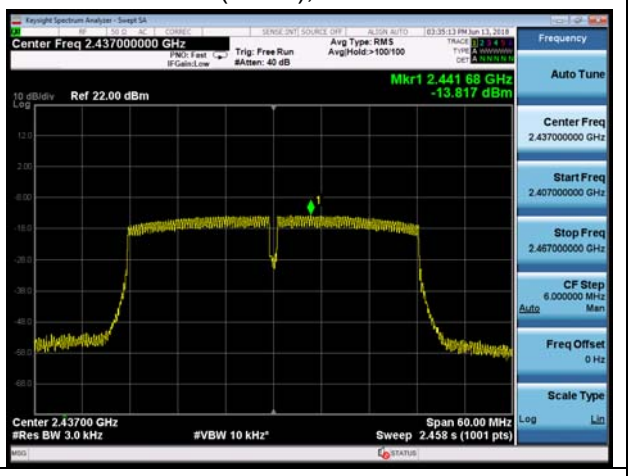


802.11n(HT40), Channel No. 3

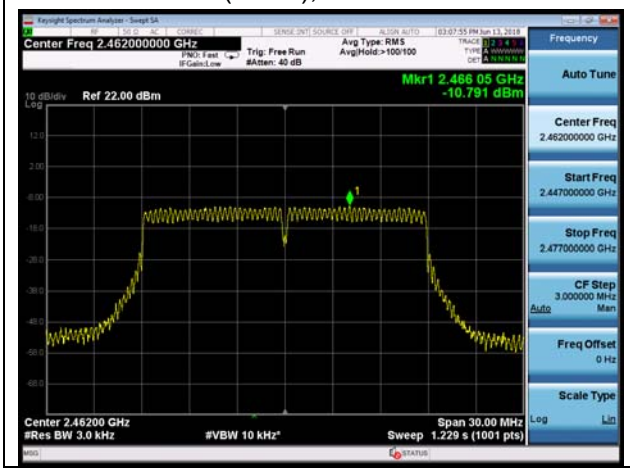
802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6



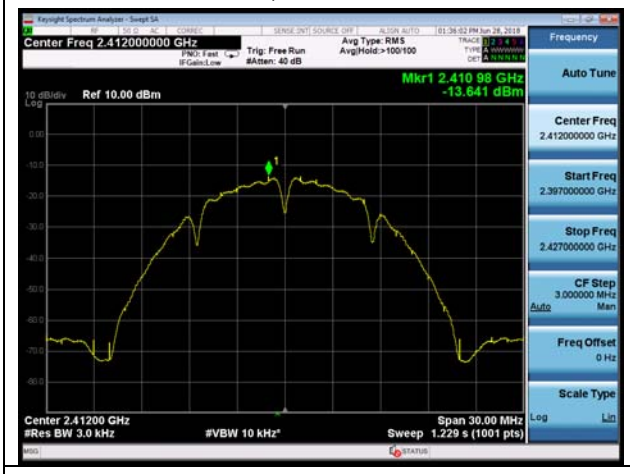
802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

MIMO Antenna 1

802.11b, Channel No.: 1



802.11g, Channel No.: 1

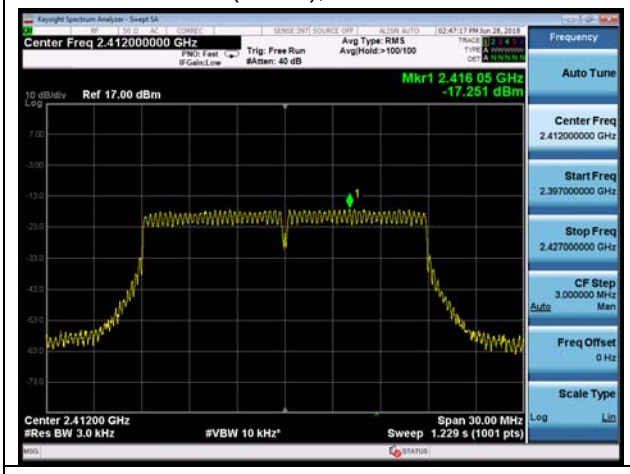
802.11b, Channel No.: 6

802.11g, Channel No.: 6

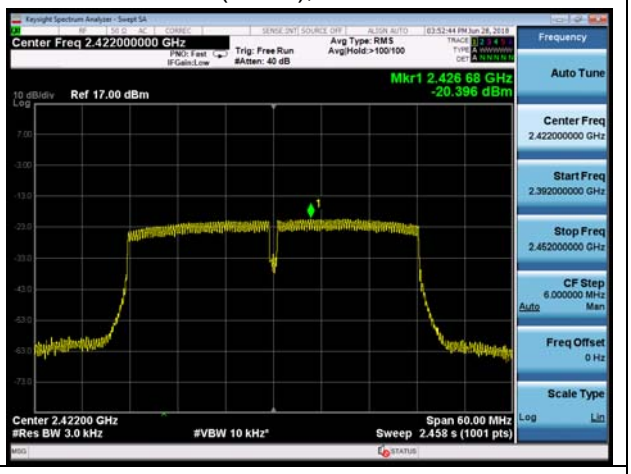
802.11b, Channel No.: 11

802.11g, Channel No.: 11

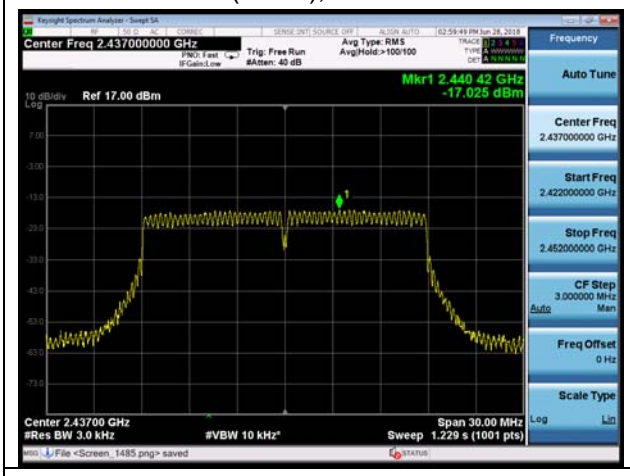
802.11n(HT20), Channel No. 1



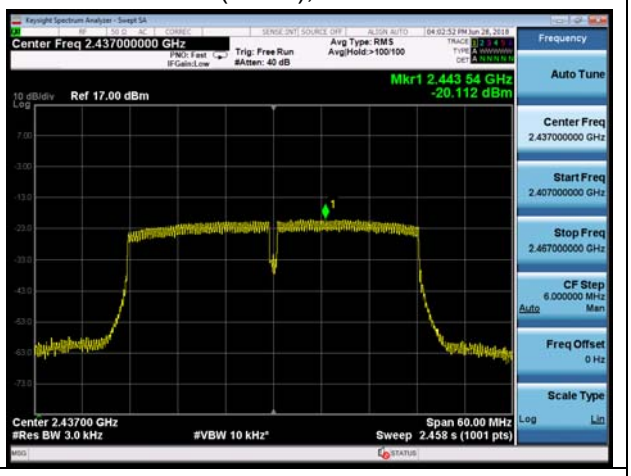
802.11n(HT40), Channel No. 3



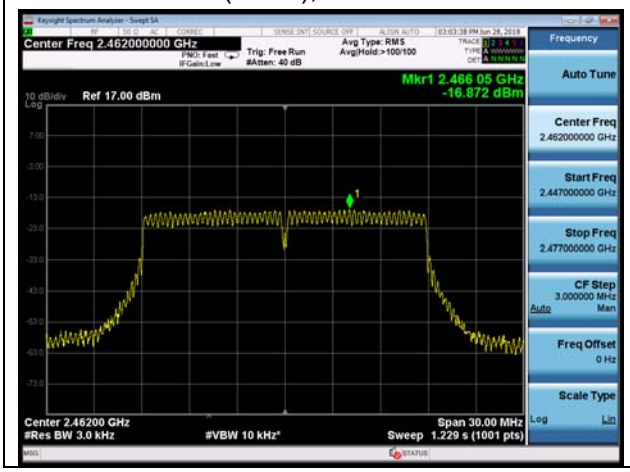
802.11n(HT20), Channel No. 6



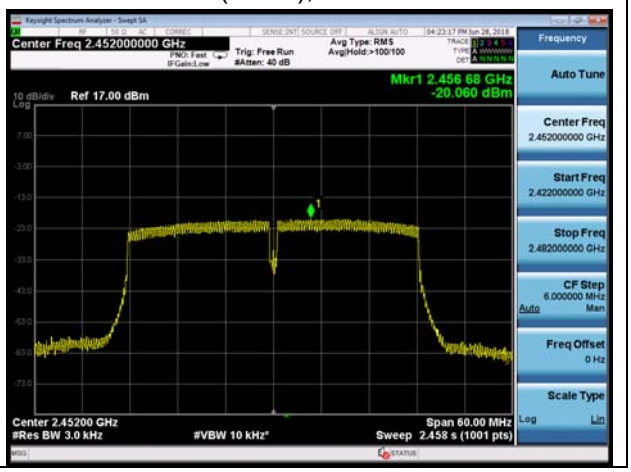
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



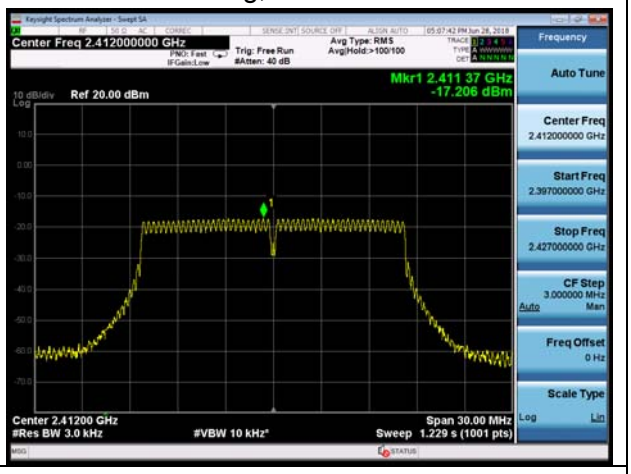
802.11n(HT40), Channel No. 9



MIMO Antenna 2

802.11b, Channel No.: 1

802.11g, Channel No.: 1

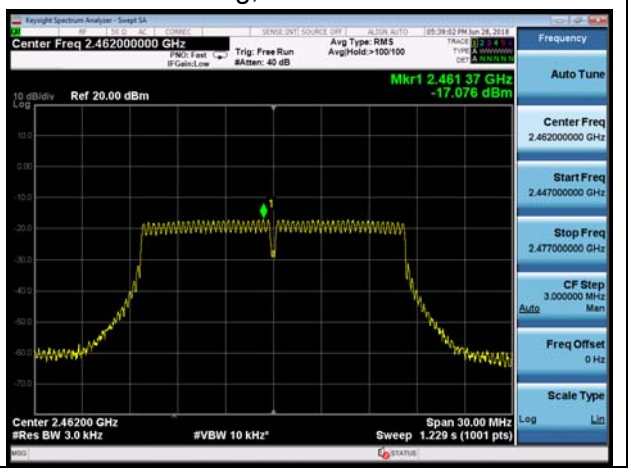


802.11b, Channel No.: 6

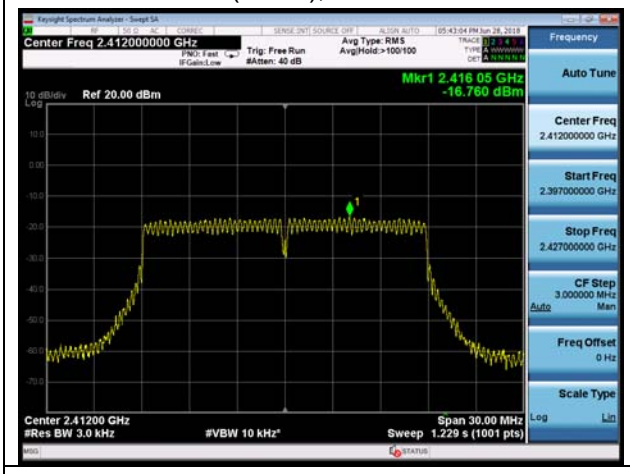
802.11g, Channel No.: 6

802.11b, Channel No.: 11

802.11g, Channel No.: 11

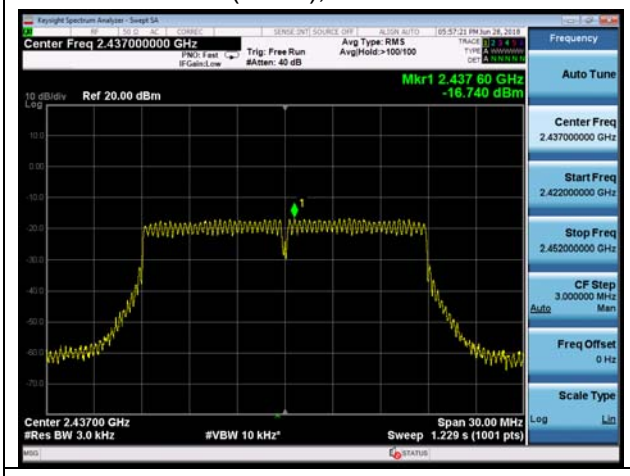


802.11n(HT20), Channel No. 1



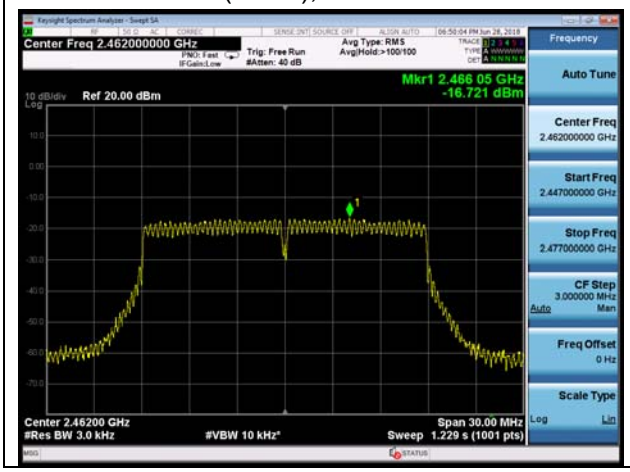
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6

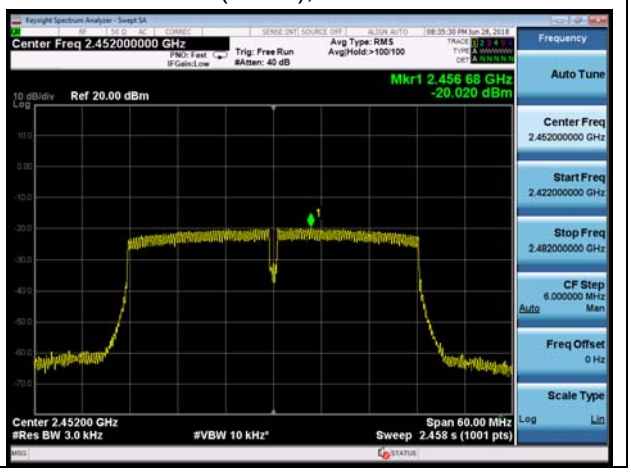


802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9



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. Set RBW to100kHz and VBW to 300 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 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.” 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.”

Network Standards	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11b	2412	10.24	-19.76
	2437	10.39	-19.61
	2462	10.41	-19.59
802.11g	2412	6.37	-23.63
	2437	6.76	-23.24
	2462	5.95	-24.05
802.11n HT20	2412	6.24	-23.76
	2437	6.19	-23.81
	2462	5.93	-24.07
802.11n HT40	2422	4.04	-25.96
	2437	2.62	-27.38
	2452	3.99	-26.01

Measurement Uncertainty

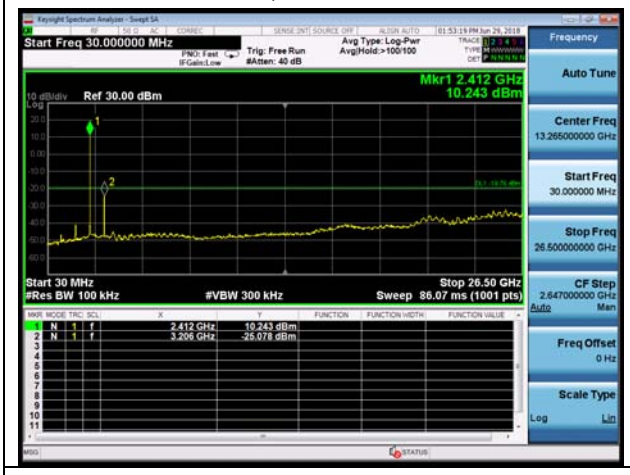
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

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

Test Results:

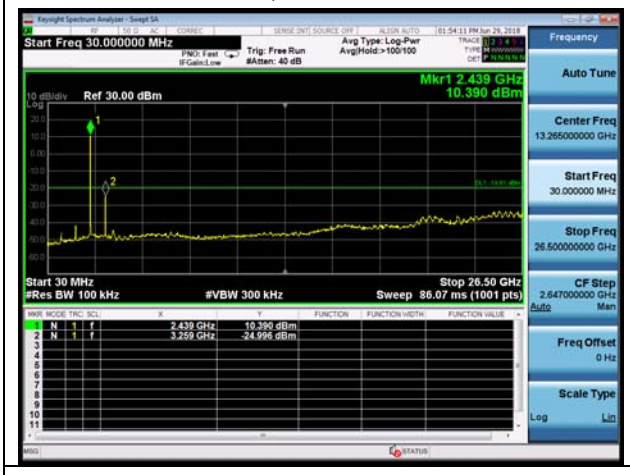
SISO Antenna 2

802.11b, Channel No.: 1



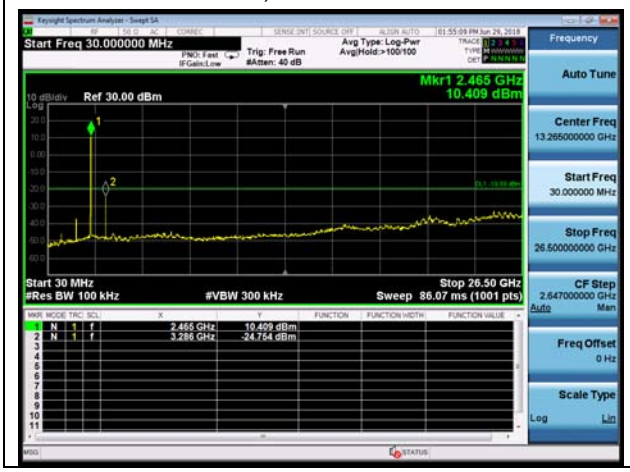
802.11g, Channel No.: 1

802.11b, Channel No.: 6



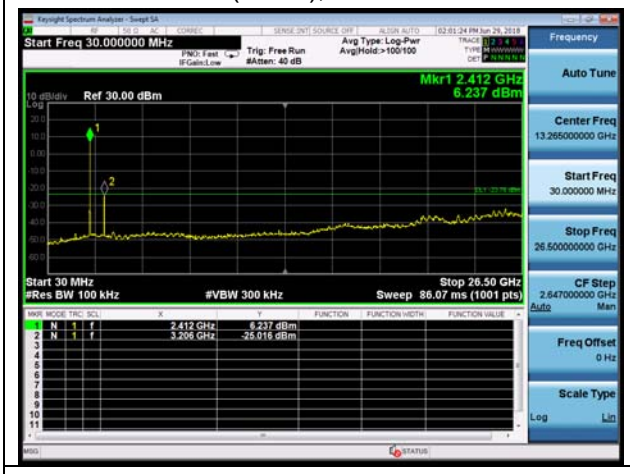
802.11g, Channel No.: 6

802.11b, Channel No.: 11



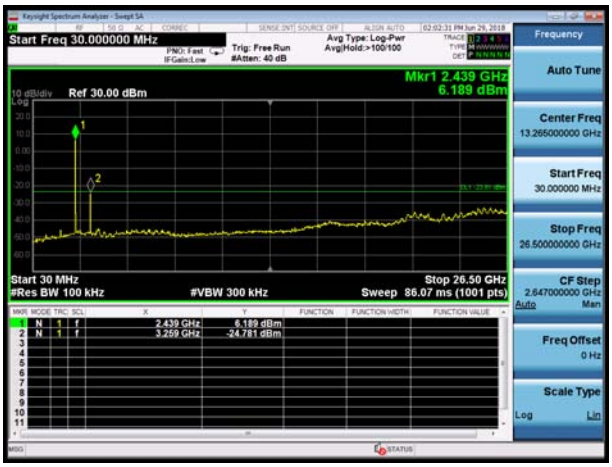
802.11g, Channel No.: 11

802.11n(HT20), Channel No. 1



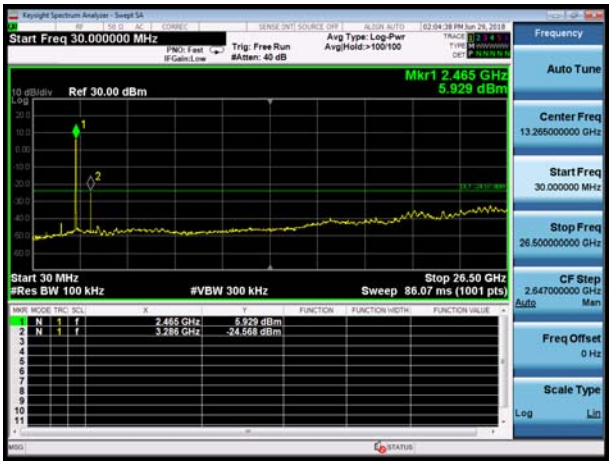
802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6

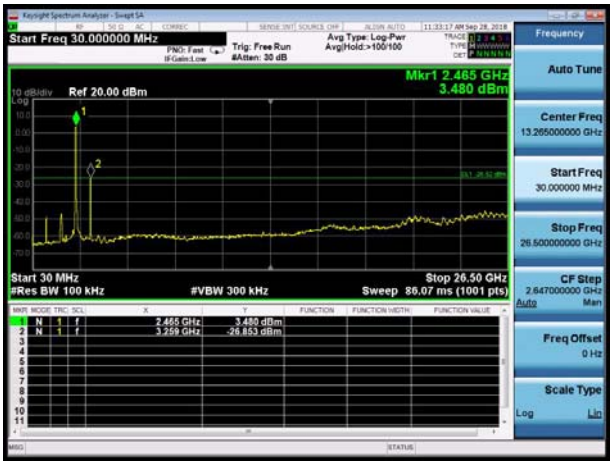


802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9



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.

Test Data File Name	Frequency (MHz)	Peak (dBm)	Margin (dB)	Limit (dBm)
CSE_WIFI 11b CH01_0.03-26.5GHz	3206.0	-25.08	5.32	-19.76
CSE_WIFI 11b CH06_0.03-26.5GHz	3259.0	-25.00	5.39	-19.61
CSE_WIFI 11b CH11_0.03-26.5GHz	3286.0	-24.75	5.16	-19.59
CSE_WIFI 11g CH01_0.03-26.5GHz	3206.0	-25.00	1.37	-23.63
CSE_WIFI 11g CH06_0.03-26.5GHz	3259.0	-24.82	1.58	-23.24
CSE_WIFI 11g CH11_0.03-26.5GHz	3286.0	-24.44	0.40	-24.05
CSE_WIFI 11n(20M) CH01_0.03-26.5GHz	3206.0	-25.02	1.25	-23.76
CSE_WIFI 11n(20M) CH06_0.03-26.5GHz	3259.0	-24.78	0.97	-23.81
CSE_WIFI 11n(20M) CH11_0.03-26.5GHz	3286.0	-24.57	0.50	-24.07
CSE_WIFI 11n(40M) CH03_0.03-26.5GHz	3233.0	-26.18	0.22	-25.96
CSE_WIFI 11n(40M) CH06_0.03-26.5GHz	3259.0	-28.02	0.64	-27.38
CSE_WIFI 11n(40M) CH09_0.03-26.5GHz	3259.0	-26.41	0.40	-26.01

5.6. Unwanted 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 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. Sweep the Restricted Band and the emissions less than 20 dB below the permissible value are reported.
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.

This method refer to KDB 558074.
The procedure for peak unwanted emissions measurements above 1000 MHz is as follows:
I) Peak emission levels are measured by setting the instrument as follows:
1) RBW = 1 MHz.
2) VBW ≥ [3 × RBW]
3) Detector = peak.
4) Sweep time = auto.
5) Trace mode = max hold.
6) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, then the time required for the trace to stabilize will increase by a factor of approximately 1 / D, where D is the duty cycle.

II) Average emission levels are measured by setting the instrument as follows:
a) RBW = 1 MHz.
b) VBW ≥ [3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage

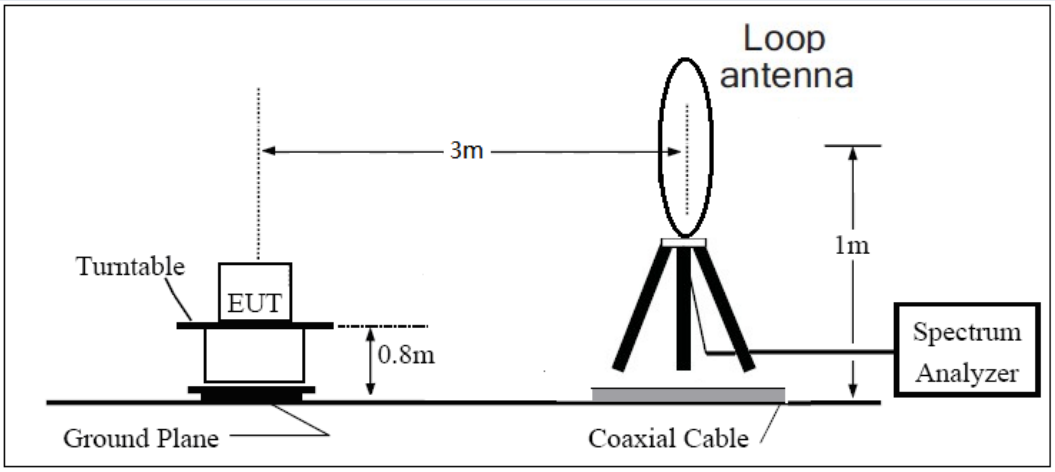
averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

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 lie-down position (X axis) and the antenna is vertical.

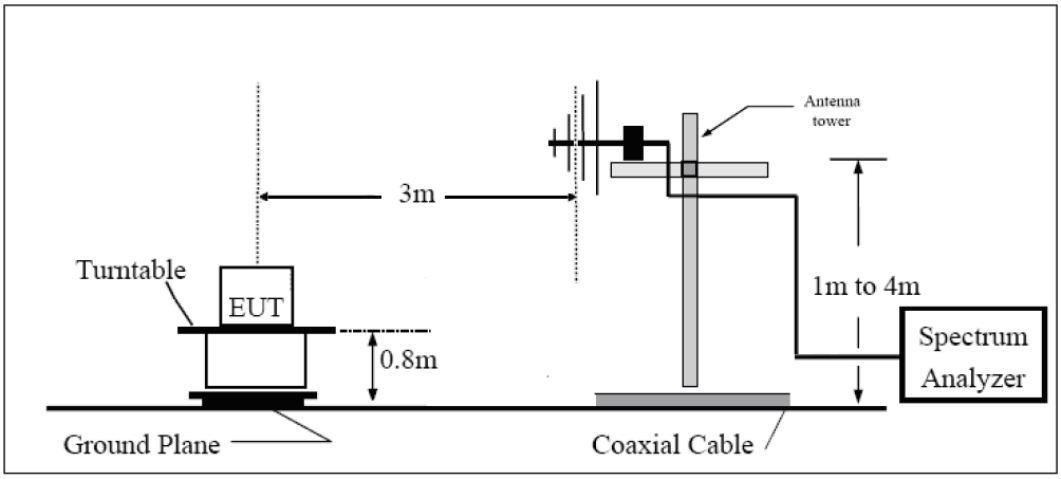
The test is in transmitting mode.

Test setup

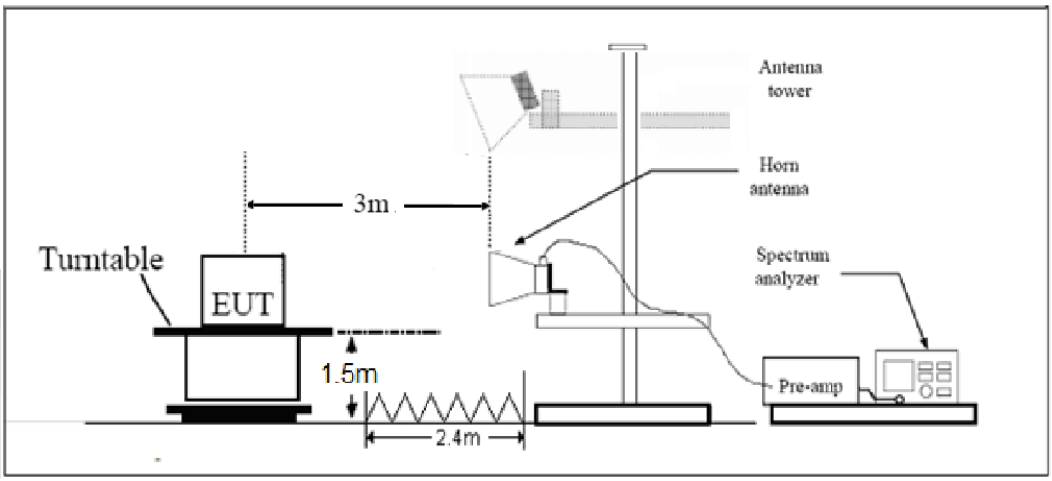
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

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.

Peak Limit=74 dBuV/m

Average Limit=54 dBuV/m

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			

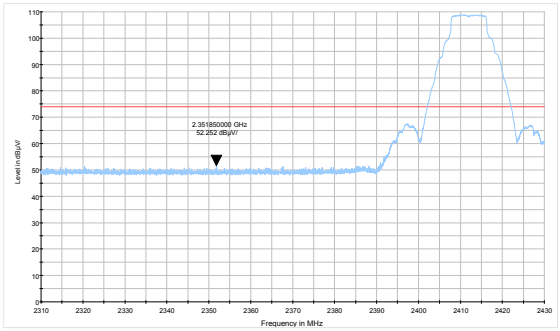
Measurement Uncertainty

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

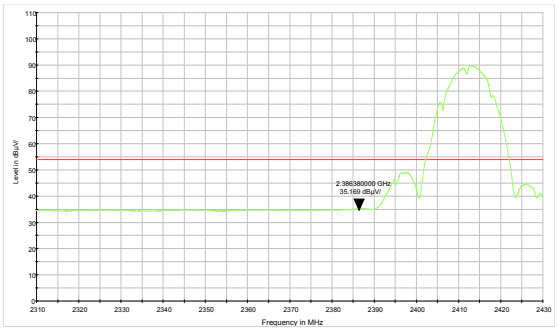
Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

Test Results:

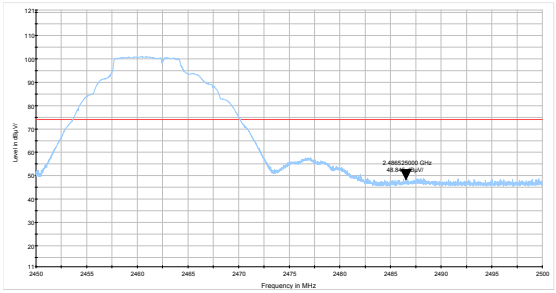
SISO Antenna 2



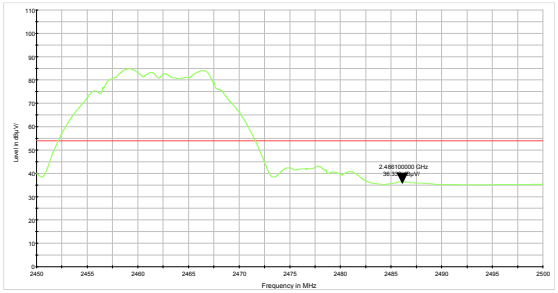
802.11b-Channel 1 Peak



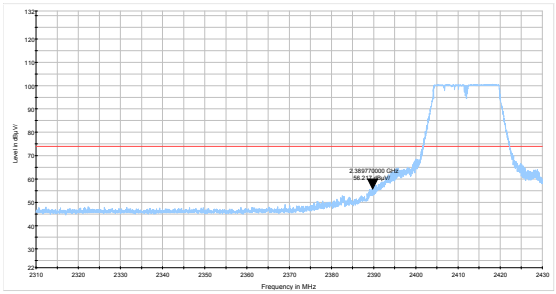
802.11b-Channel 1 Average



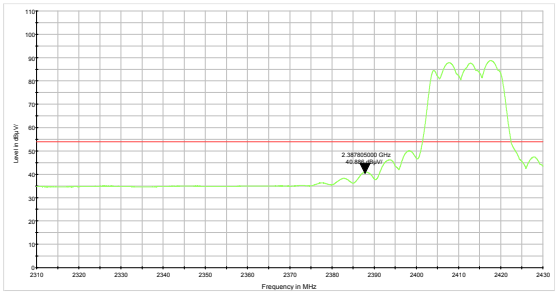
802.11b-Channel 11 Peak



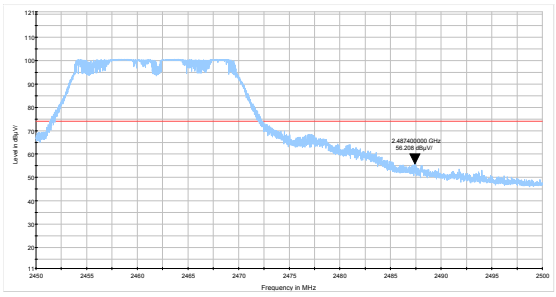
802.11b-Channel 11 Average



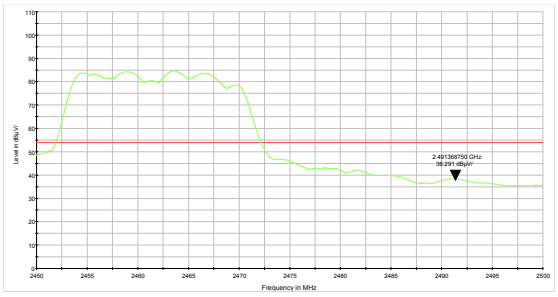
802.11g-Channel 1 Peak



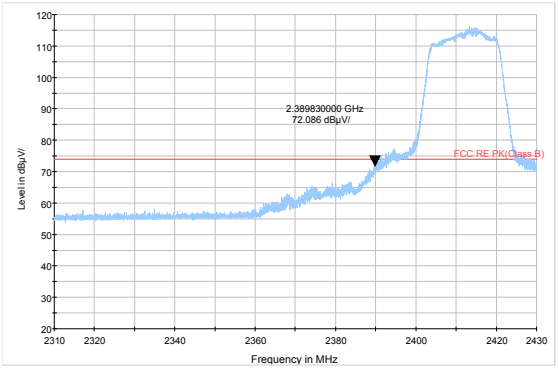
802.11g-Channel 1 Average



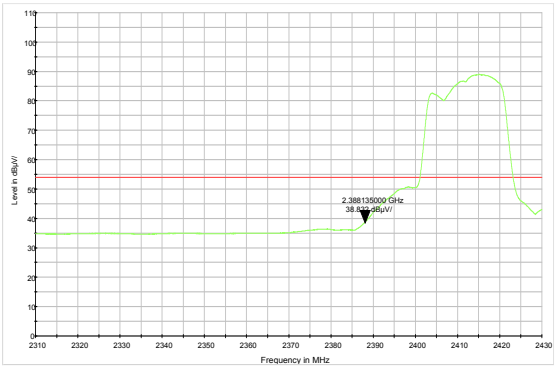
802.11g-Channel 11 Peak



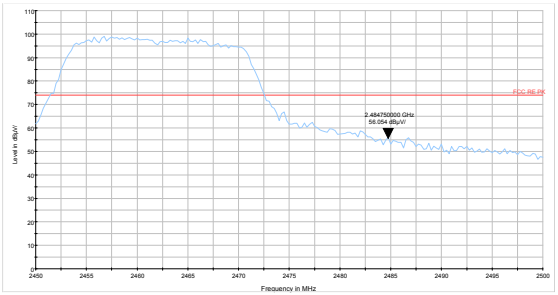
802.11g-Channel 11 Average



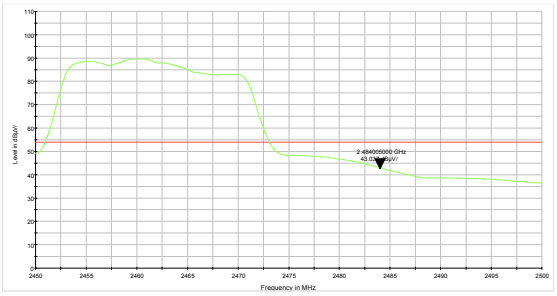
802.11n HT20 -Channel 1 Peak



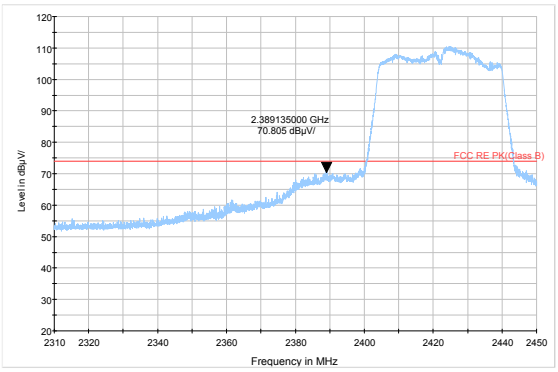
802.11n HT20 -Channel 1 Average



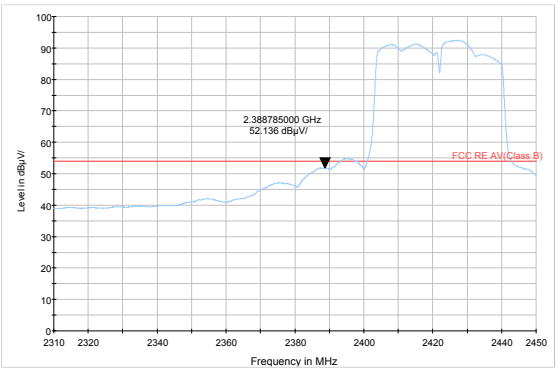
802.11n HT20 -Channel 11 Peak



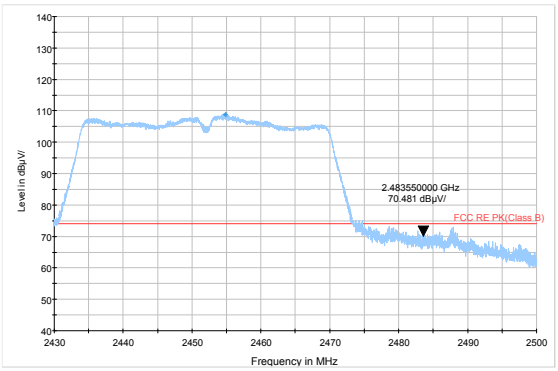
802.11n HT20 -Channel 11 Average



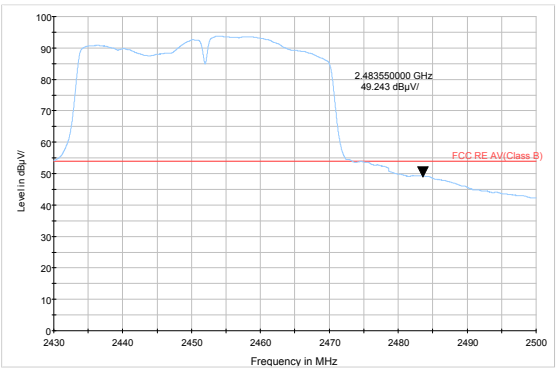
802.11n HT40 –Channel 3 Peak



802.11n HT40 -Channel 3 Average



802.11n HT40 -Channel 9 Peak



802.11n HT40 -Channel 9 Average

Band	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11b	12.44	12.52	0.99	0.00
802.11g	2.06	2.14	0.96	0.17
802.11n HT20	5.00	5.08	0.99	0.00
802.11n HT40	2.42	2.50	0.97	0.14
Note: when Duty cycle>0.98, Duty cycle correction Factor not required.				

SISO Antenna 2

802.11b-Channel 1

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Duty cycle correction Factor(dB)	conclusion value (dBuV/m)	Margin (dB)	Limit (dBuV/m)
2390	52.252	--	200.0	V	135	0.00	52.252	21.748	74
2390	--	35.169	200.0	V	135	0.00	35.169	18.831	54

802.11b-Channel 11

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Duty cycle correction Factor(dB)	conclusion value (dBuV/m)	Margin (dB)	Limit (dBuV/m)
2483.5	48.845	--	200.0	V	135	0.00	48.845	25.155	74
2483.5	--	36.336	200.0	V	135	0.00	36.336	17.664	54

802.11g-Channel 1

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Duty cycle correction Factor(dB)	conclusion value (dBuV/m)	Margin (dB)	Limit (dBuV/m)
2390	56.217	--	150	V	65	0.17	56.387	17.613	74
2390	--	40.886	150	V	65	0.17	41.056	12.944	54

802.11g-Channel 11

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Duty cycle correction Factor(dB)	conclusion value (dBuV/m)	Margin (dB)	Limit (dBuV/m)
2483.5	56.208	--	150	V	78	0.17	56.378	17.622	74
2483.5	--	38.291	150	V	78	0.17	38.461	15.539	54

802.11n HT20 -Channel 1

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Duty cycle correction Factor(dB)	conclusion value (dBuV/m)	Margin (dB)	Limit (dBuV/m)
2390	72.086	--	200	V	90	0.00	72.086	1.914	74
2390	--	38.832	200	V	90	0.00	38.832	15.168	54

802.11n HT20-Channel 11

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Duty cycle correction Factor(dB)	conclusion value (dBuV/m)	Margin (dB)	Limit (dBuV/m)
2483.5	56.054	--	200	V	90	0.00	56.054	17.946	74
2483.5	--	43.037	200	V	90	0.00	43.037	10.963	54

802.11n HT40 -Channel 3

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Duty cycle correction Factor(dB)	conclusion value (dBuV/m)	Margin (dB)	Limit (dBuV/m)
2390	70.805	--	150	V	46	0.14	70.945	3.055	74
2390	--	52.136	150	V	46	0.14	52.276	1.724	54

802.11n HT40-Channel 9

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Duty cycle correction Factor(dB)	conclusion value (dBuV/m)	Margin (dB)	Limit (dBuV/m)
2483.5	70.481	--	150	V	46	0.14	70.621	3.379	74
2483.5	--	49.243	150	V	46	0.14	49.383	4.617	54

Result of RE

Test result

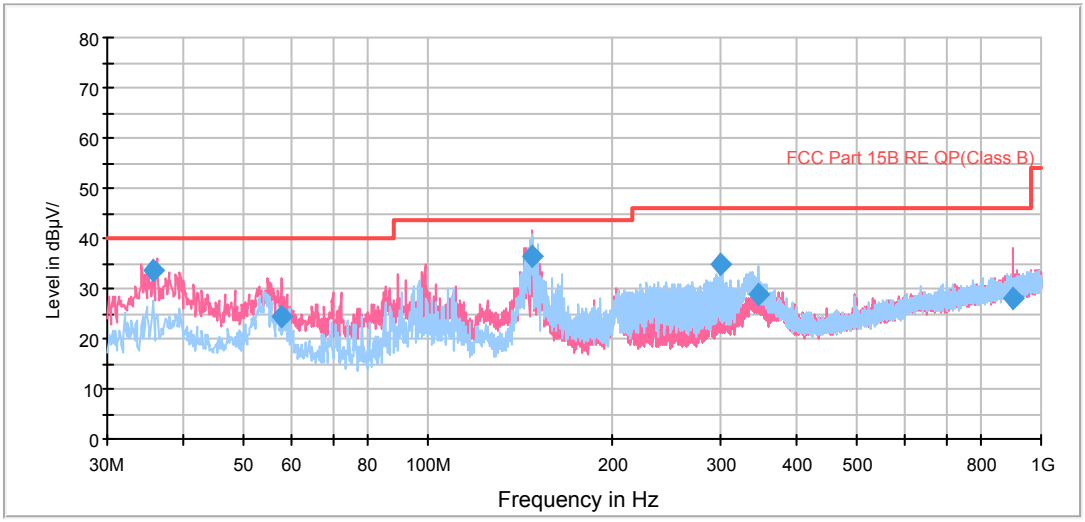
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the Emissions in the frequency band 9kHz-30MHz and 18GHz-26.5GHz are more than 20dB below the limit are not reported.

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.
After the pretest, SISO Antenna 2 was selected as the worst antenna.

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, 802.11b, Channel 11 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Continuous TX mode:

FCC RE 0.03-1GHz QP Class B



Radiates Emission from 30MHz to 1GHz

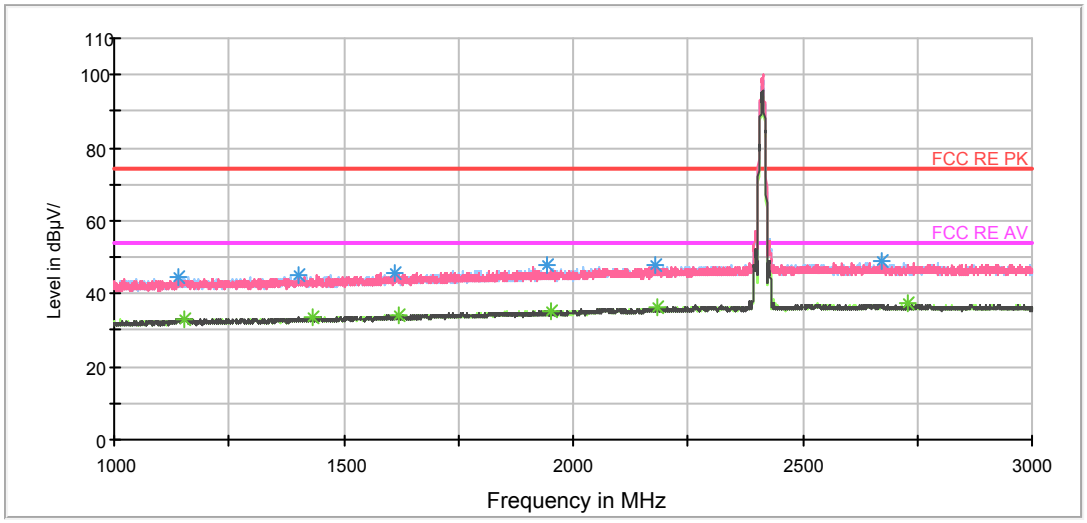
Frequency (MHz)	Quasi-Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
35.663750	33.6	21.3	100.0	V	0.0	12.3	6.4	40.0
57.645000	24.3	11.7	114.0	V	155.0	12.6	15.7	40.0
148.340000	36.3	27.2	100.0	V	22.0	9.1	7.2	43.5
298.938750	34.9	19.5	100.0	H	291.0	15.4	11.1	46.0
346.503750	28.7	11.7	100.0	H	250.0	17.0	17.3	46.0
899.970000	28.0	1.2	114.0	V	132.0	26.8	18.0	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

SISO Antenna 2

802.11b CH1

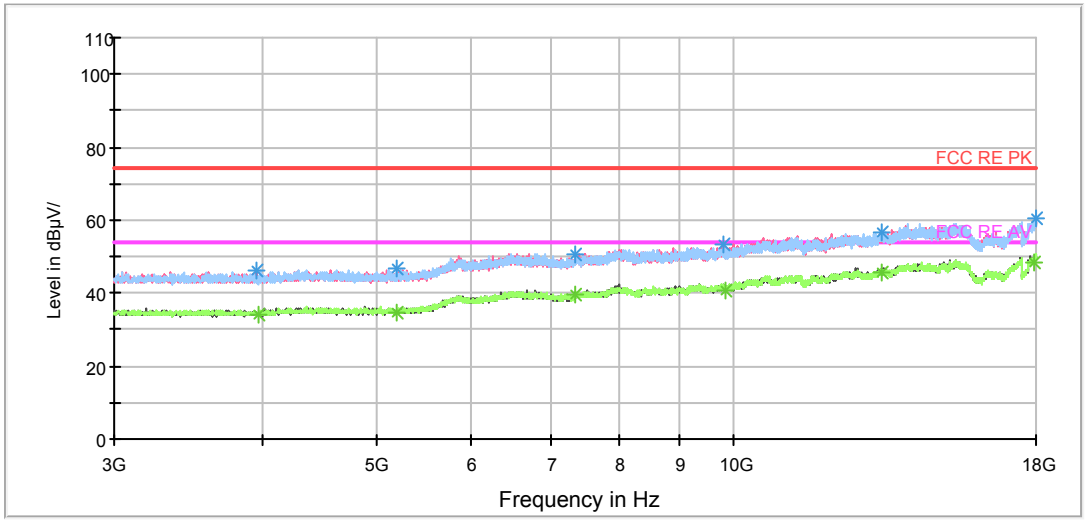
FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1140.250000	44.6	100.0	V	38.0	53.1	-8.5	29.4	74
1402.750000	45.0	200.0	V	0.0	51.9	-6.9	29.0	74
1609.500000	45.8	200.0	V	235.0	51.6	-5.8	28.2	74
1942.250000	47.7	100.0	V	0.0	51.6	-3.9	26.3	74
2180.500000	47.8	100.0	V	272.0	50.2	-2.4	26.2	74
2674.000000	48.8	100.0	H	302.0	49.4	-0.6	25.2	74

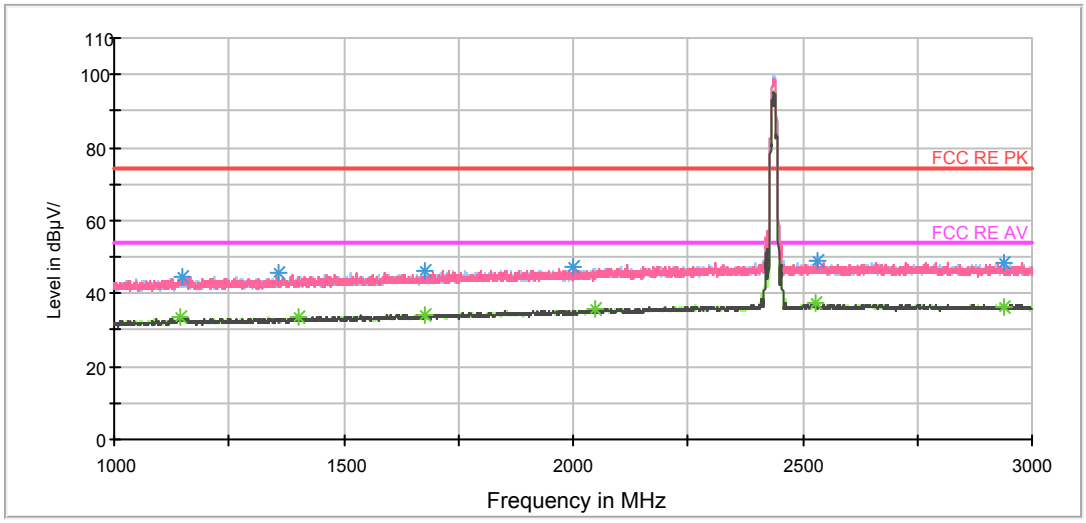
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1151.500000	33.3	200.0	H	0.0	41.8	-8.5	20.7	54
1430.250000	33.8	100.0	H	356.0	40.6	-6.8	20.2	54
1618.000000	34.0	200.0	H	0.0	39.7	-5.7	20.0	54
1952.250000	35.3	100.0	H	278.0	39.1	-3.8	18.7	54
2183.250000	36.1	100.0	H	314.0	38.5	-2.4	17.9	54
2730.000000	37.2	100.0	V	60.0	37.8	-0.6	16.8	54

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

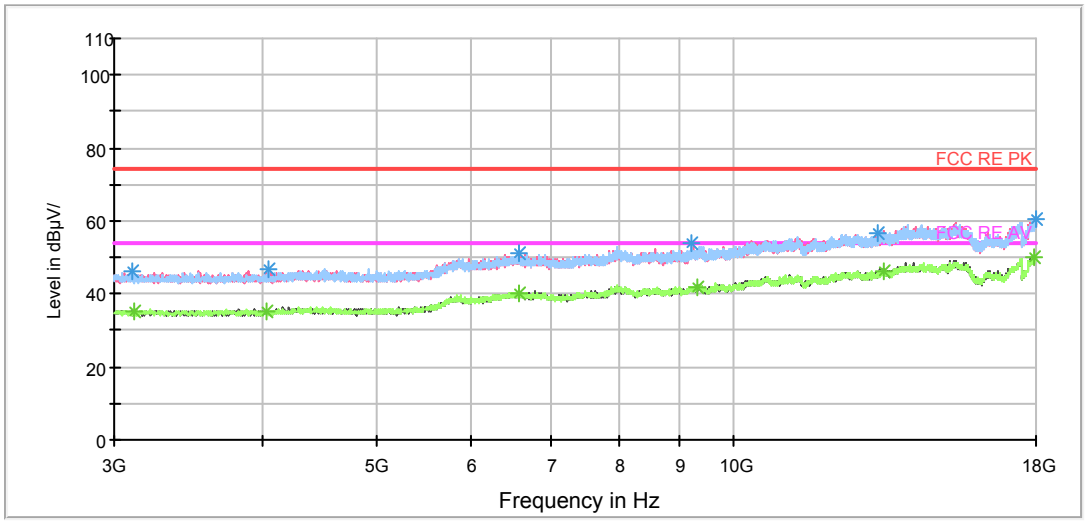
802.11b CH6

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1148.750000	44.7	100.0	V	0.0	53.2	-8.5	29.3	74
1357.750000	45.6	200.0	H	3.0	52.8	-7.2	28.4	74
1675.750000	46.3	200.0	H	0.0	51.7	-5.4	27.7	74
2001.750000	47.1	100.0	H	137.0	50.6	-3.5	26.9	74
2532.250000	48.7	200.0	V	187.0	49.6	-0.9	25.3	74
2938.000000	48.3	200.0	V	305.0	48.8	-0.5	25.7	74

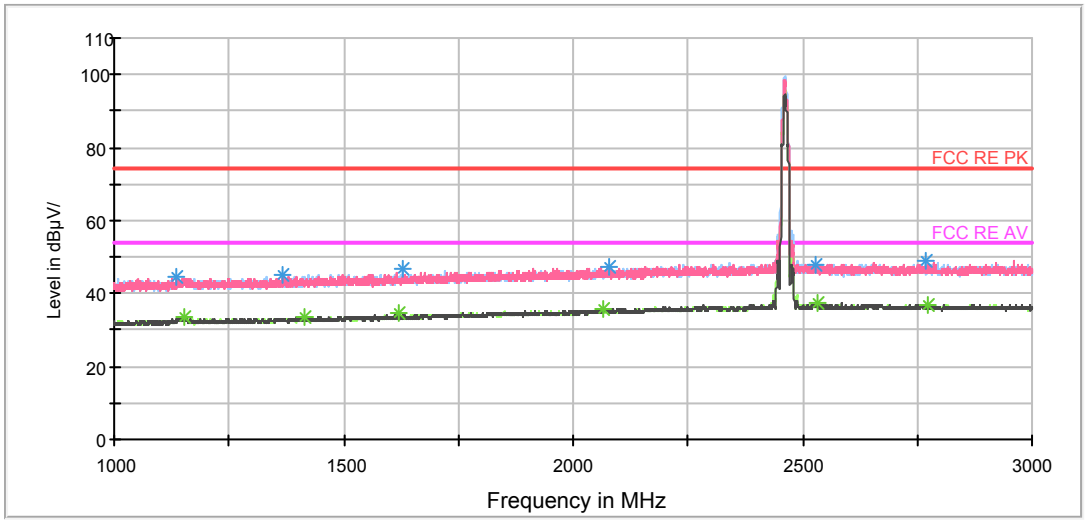
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1143.000000	33.4	100.0	H	0.0	41.9	-8.5	20.6	54
1399.750000	33.4	100.0	H	354.0	40.4	-7.0	20.6	54
1675.250000	34.4	200.0	H	0.0	39.8	-5.4	19.6	54
2049.500000	35.8	100.0	H	0.0	39.0	-3.2	18.2	54
2528.250000	37.2	200.0	V	223.0	38.1	-0.9	16.8	54
2940.000000	36.3	200.0	V	0.0	36.8	-0.5	17.7	54

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

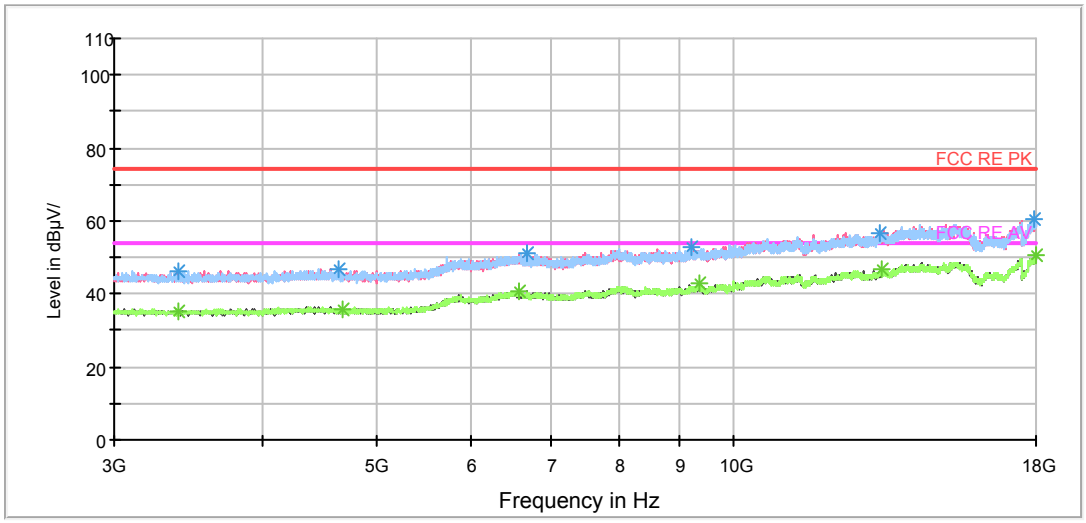
802.11b CH11

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1137.000000	44.5	200.0	V	353.0	53.1	-8.6	29.5	74
1365.750000	45.3	100.0	H	352.0	52.5	-7.2	28.7	74
1629.750000	46.5	100.0	H	348.0	52.2	-5.7	27.5	74
2079.750000	47.2	100.0	H	298.0	50.2	-3.0	26.8	74
2530.500000	47.7	100.0	H	177.0	48.6	-0.9	26.3	74
2768.250000	49.0	200.0	H	272.0	49.6	-0.6	25.0	74

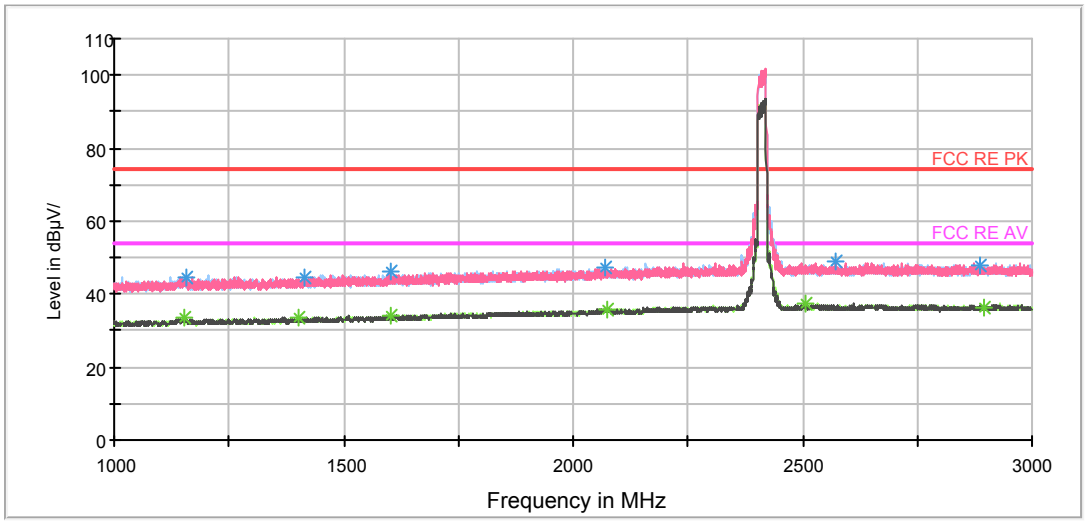
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1155.000000	33.6	200.0	V	0.0	42.0	-8.4	20.4	54
1415.500000	33.5	200.0	V	0.0	40.4	-6.9	20.5	54
1621.500000	34.4	200.0	H	3.0	40.1	-5.7	19.6	54
2065.250000	35.7	200.0	H	0.0	38.7	-3.0	18.3	54
2531.750000	37.4	200.0	V	357.0	38.3	-0.9	16.6	54
2775.000000	37.0	100.0	V	2.0	37.5	-0.5	17.0	54

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

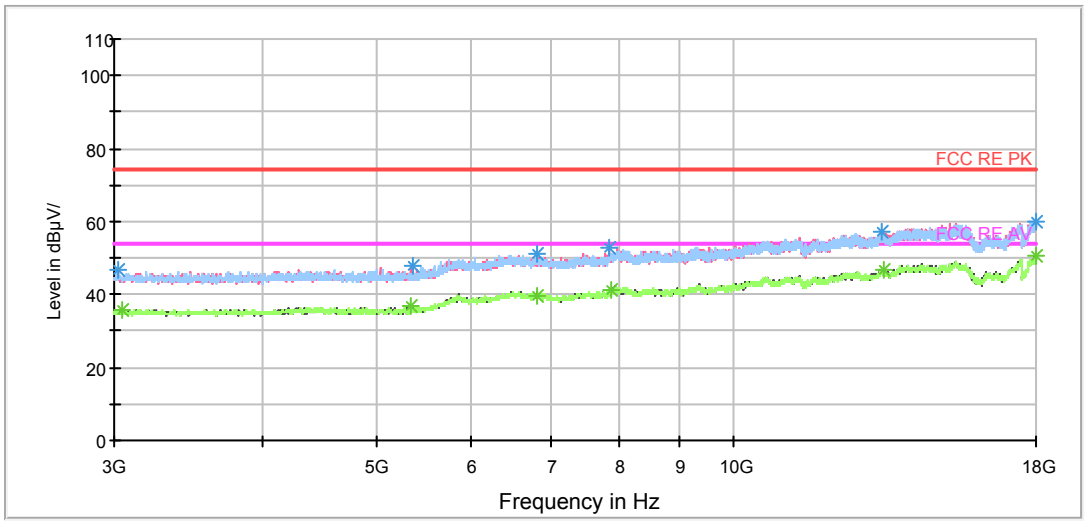
802.11g CH1

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1155.500000	44.8	200.0	V	0.0	53.2	-8.4	29.2	74
1415.250000	44.8	200.0	V	222.0	51.7	-6.9	29.2	74
1602.500000	46.0	200.0	H	19.0	51.8	-5.8	28.0	74
2069.500000	47.1	200.0	H	0.0	50.1	-3.0	26.9	74
2571.000000	48.7	100.0	V	245.0	49.5	-0.8	25.3	74
2887.000000	47.9	100.0	H	186.0	48.4	-0.5	26.1	74

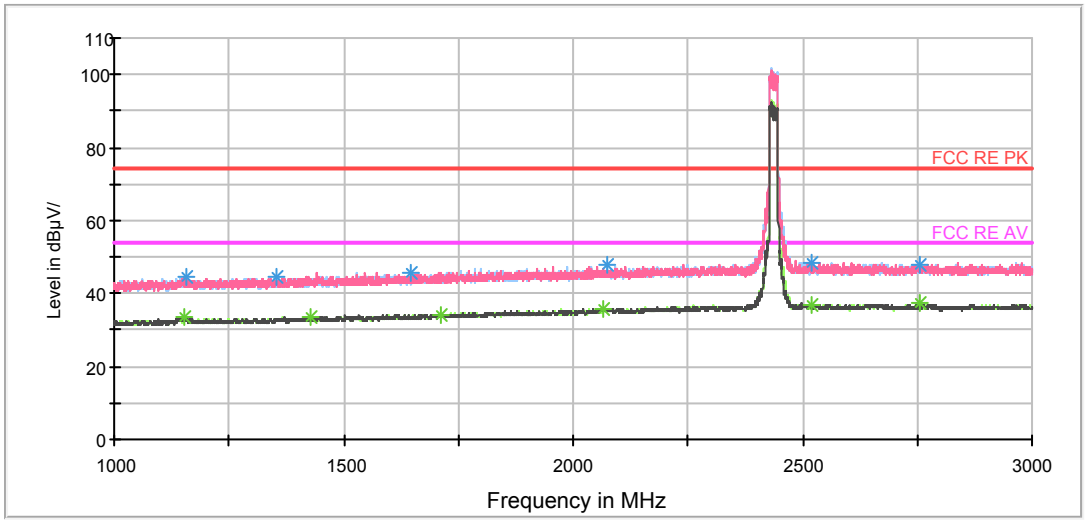
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1152.000000	33.4	200.0	V	0.0	41.9	-8.5	20.6	54
1403.500000	33.6	100.0	V	245.0	40.5	-6.9	20.4	54
1601.250000	33.9	100.0	H	0.0	39.7	-5.8	20.1	54
2075.250000	35.7	200.0	H	4.0	38.7	-3.0	18.3	54
2505.750000	37.3	100.0	V	11.0	38.2	-0.9	16.7	54
2896.250000	36.4	100.0	V	232.0	36.9	-0.5	17.6	54

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

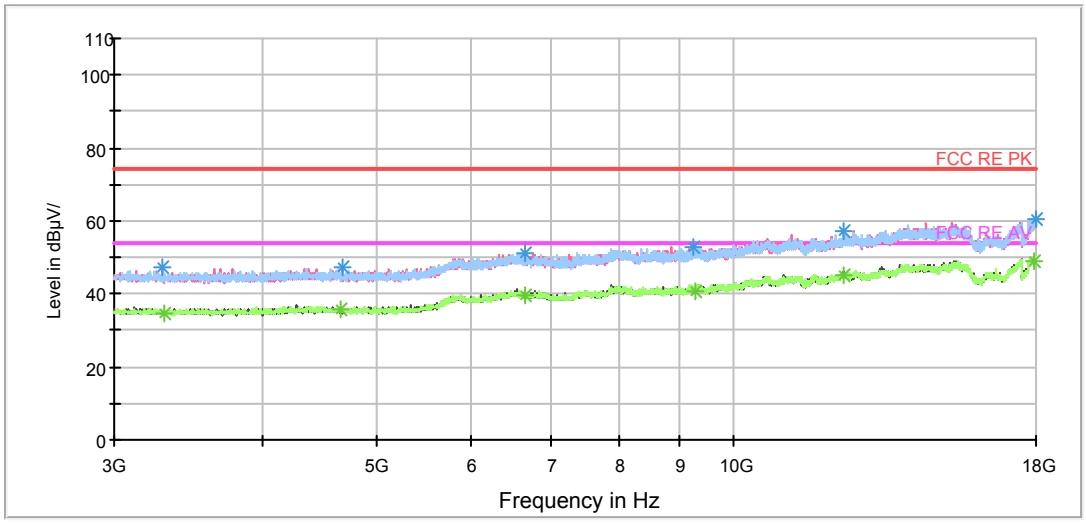
802.11g CH6

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1156.500000	44.8	100.0	H	148.0	53.2	-8.4	29.2	74
1354.250000	44.7	100.0	H	315.0	51.9	-7.2	29.3	74
1646.750000	45.9	200.0	H	41.0	51.5	-5.6	28.1	74
2076.000000	47.7	200.0	H	75.0	50.7	-3.0	26.3	74
2521.750000	48.6	100.0	V	0.0	49.5	-0.9	25.4	74
2754.250000	47.7	100.0	V	210.0	48.3	-0.6	26.3	74

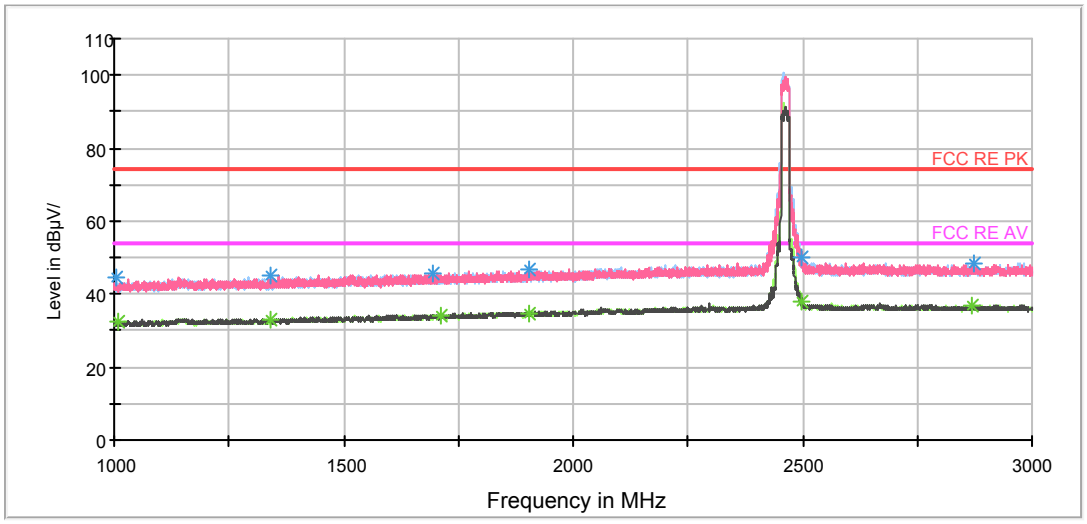
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1154.250000	33.4	200.0	V	308.0	41.8	-8.4	20.6	54
1428.000000	33.5	100.0	V	94.0	40.3	-6.8	20.5	54
1713.000000	34.3	200.0	H	8.0	39.5	-5.2	19.7	54
2065.750000	35.8	100.0	V	1.0	38.8	-3.0	18.2	54
2520.500000	37.0	200.0	V	328.0	37.9	-0.9	17.0	54
2756.000000	37.2	100.0	H	358.0	37.8	-0.6	16.8	54

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

802.11g CH11

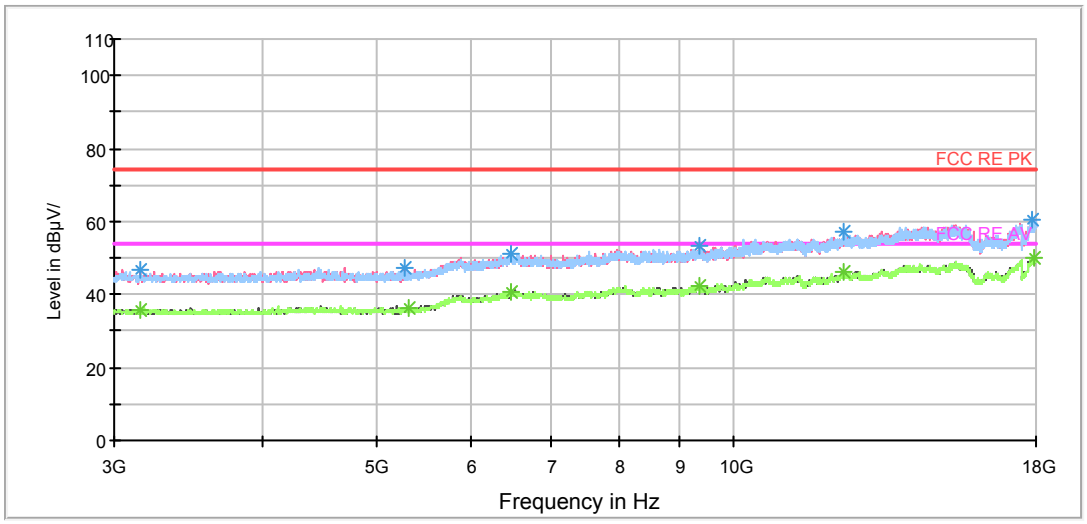
FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1004.250000	44.6	200.0	H	0.0	53.8	-9.2	29.4	74
1341.000000	44.9	200.0	H	4.0	52.3	-7.4	29.1	74
1694.750000	45.5	200.0	V	358.0	50.8	-5.3	28.5	74
1901.750000	46.9	200.0	V	0.0	50.9	-4.0	27.1	74
2499.250000	50.2	200.0	V	175.0	51.1	-0.9	23.8	74
2872.500000	48.1	100.0	V	0.0	48.5	-0.4	25.9	74

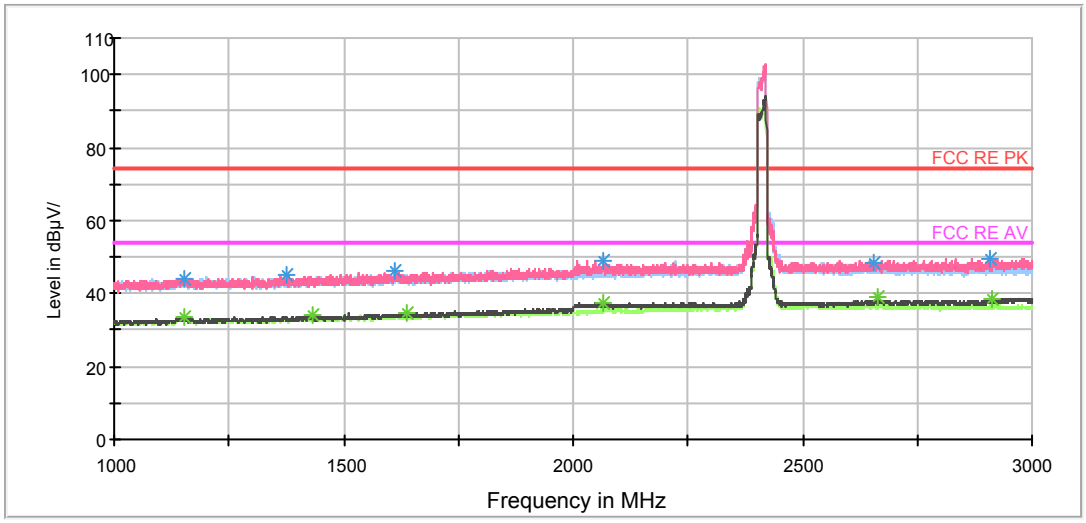
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1010.750000	32.3	100.0	H	0.0	41.5	-9.2	21.7	54
1341.250000	33.1	100.0	V	0.0	40.5	-7.4	20.9	54
1713.000000	34.4	200.0	V	0.0	39.6	-5.2	19.6	54
1904.000000	34.7	100.0	H	258.0	38.7	-4.0	19.3	54
2498.250000	38.0	200.0	H	286.0	38.9	-0.9	16.0	54
2870.250000	36.9	100.0	V	18.0	37.2	-0.3	17.1	54

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

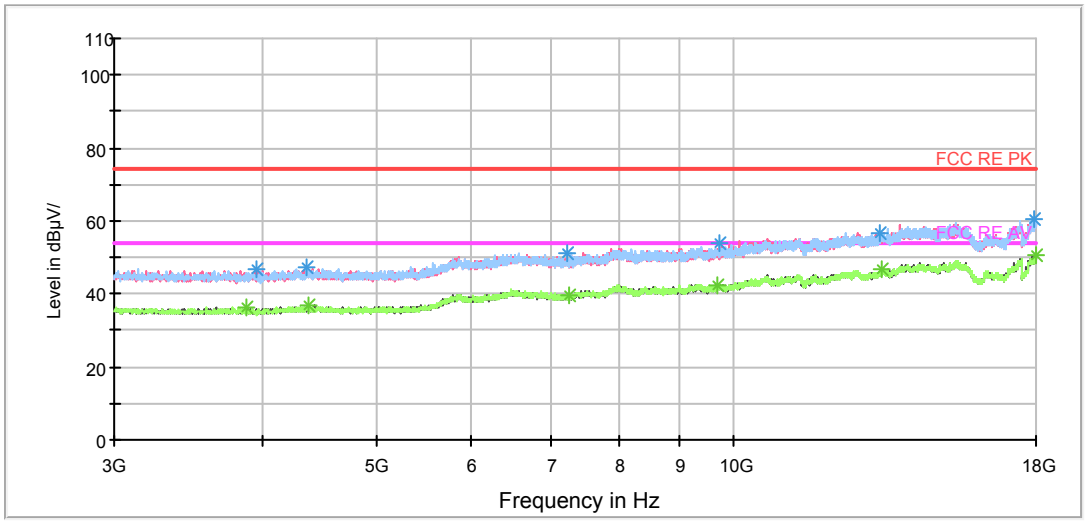
802.11n (HT20) CH1

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1153.500000	44.3	100.0	V	124.0	52.8	-8.5	29.7	74
1374.750000	45.0	100.0	H	355.0	52.1	-7.1	29.0	74
1612.250000	46.0	100.0	V	91.0	51.8	-5.8	28.0	74
2065.250000	48.8	200.0	V	357.0	51.8	-3.0	25.2	74
2655.750000	48.7	200.0	V	0.0	49.5	-0.8	25.3	74
2908.250000	49.6	200.0	V	312.0	50.0	-0.4	24.4	74

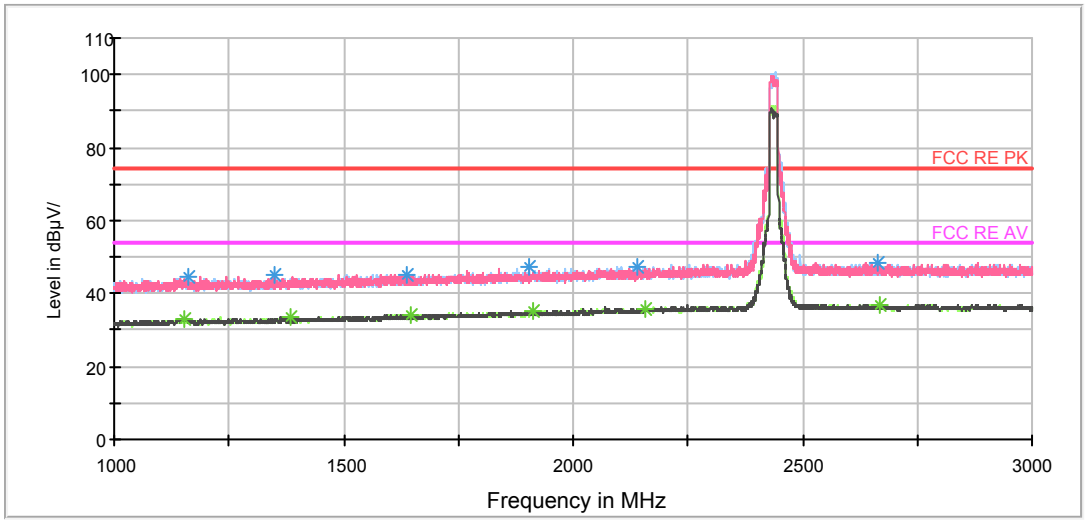
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1151.000000	33.5	200.0	H	223.0	42.0	-8.5	20.5	54
1434.250000	33.8	200.0	V	300.0	40.6	-6.8	20.2	54
1636.000000	34.8	200.0	V	251.0	40.5	-5.7	19.2	54
2064.500000	37.4	200.0	V	300.0	40.4	-3.0	16.6	54
2664.250000	38.9	200.0	V	312.0	39.6	-0.7	15.1	54
2914.500000	38.2	200.0	V	332.0	38.6	-0.4	15.8	54

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

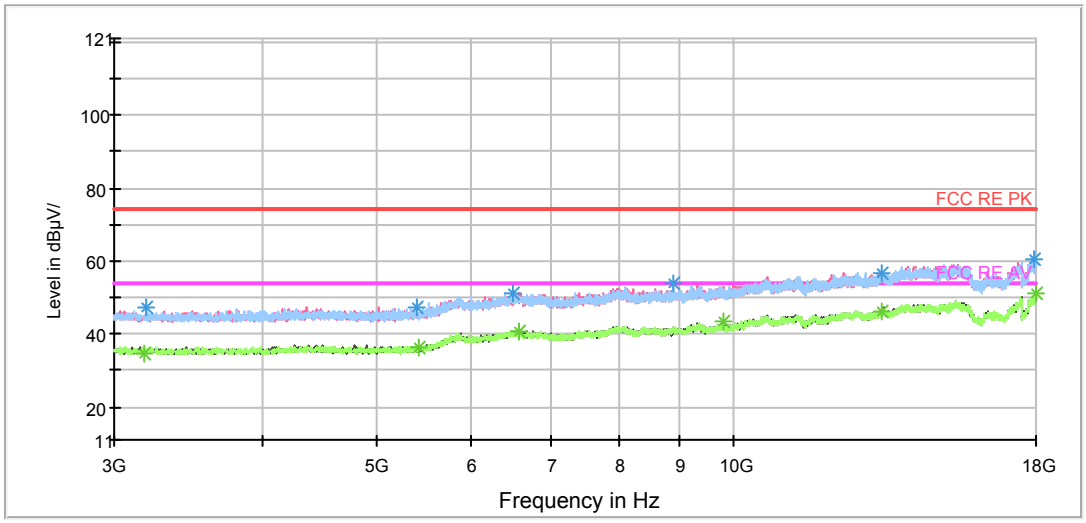
802.11n (HT20) CH6

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1161.750000	44.7	100.0	H	0.0	53.1	-8.4	29.3	74
1351.500000	45.0	100.0	H	218.0	52.3	-7.3	29.0	74
1636.750000	45.3	100.0	H	265.0	51.0	-5.7	28.7	74
1902.750000	47.2	100.0	V	136.0	51.2	-4.0	26.8	74
2140.750000	47.4	100.0	H	253.0	50.1	-2.7	26.6	74
2664.000000	48.5	100.0	V	0.0	49.2	-0.7	25.5	74

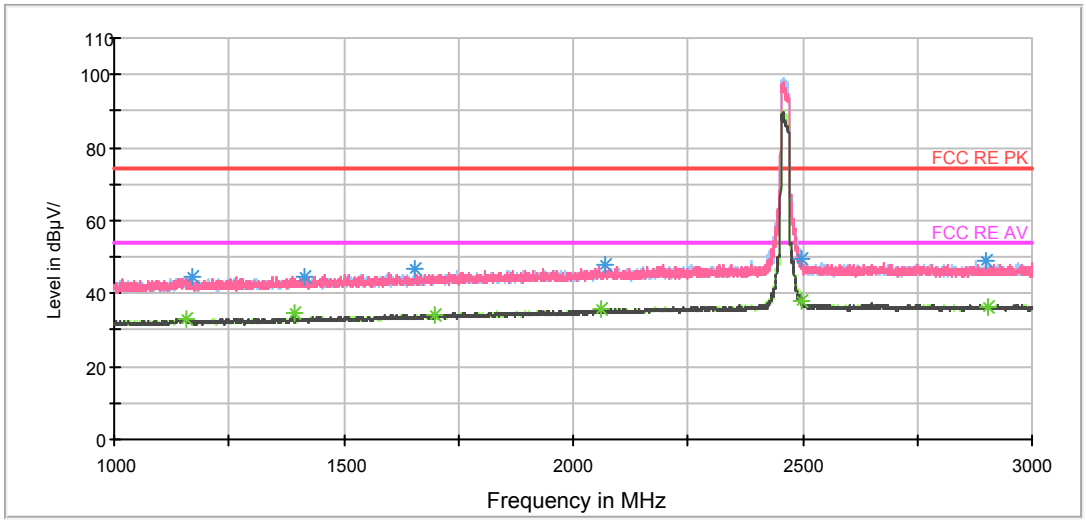
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1154.500000	33.2	100.0	V	0.0	41.6	-8.4	20.8	54
1386.250000	33.5	100.0	V	248.0	40.6	-7.1	20.5	54
1646.250000	34.0	100.0	H	345.0	39.6	-5.6	20.0	54
1911.500000	35.2	100.0	V	2.0	39.1	-3.9	18.8	54
2155.500000	35.7	100.0	H	349.0	38.3	-2.6	18.3	54
2668.500000	36.9	100.0	H	0.0	37.6	-0.7	17.1	54

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

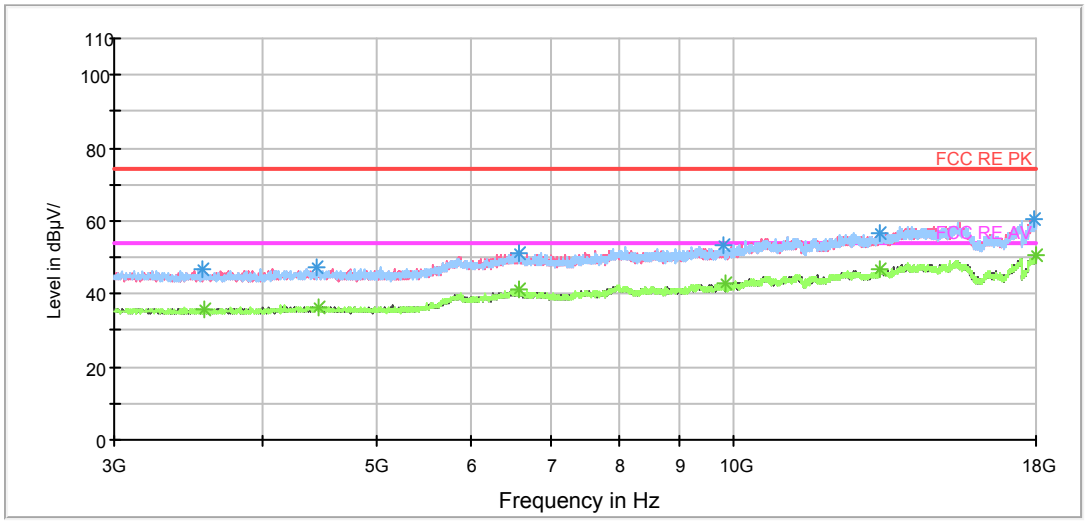
802.11n (HT20) CH11

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1168.500000	44.6	100.0	V	262.0	53.0	-8.4	29.4	74
1416.500000	44.7	100.0	V	0.0	51.6	-6.9	29.3	74
1655.000000	46.8	100.0	H	0.0	52.4	-5.6	27.2	74
2071.500000	47.6	100.0	V	66.0	50.5	-2.9	26.4	74
2499.000000	49.3	100.0	H	0.0	50.2	-0.9	24.7	74
2898.500000	49.2	100.0	V	125.0	49.7	-0.5	24.8	74

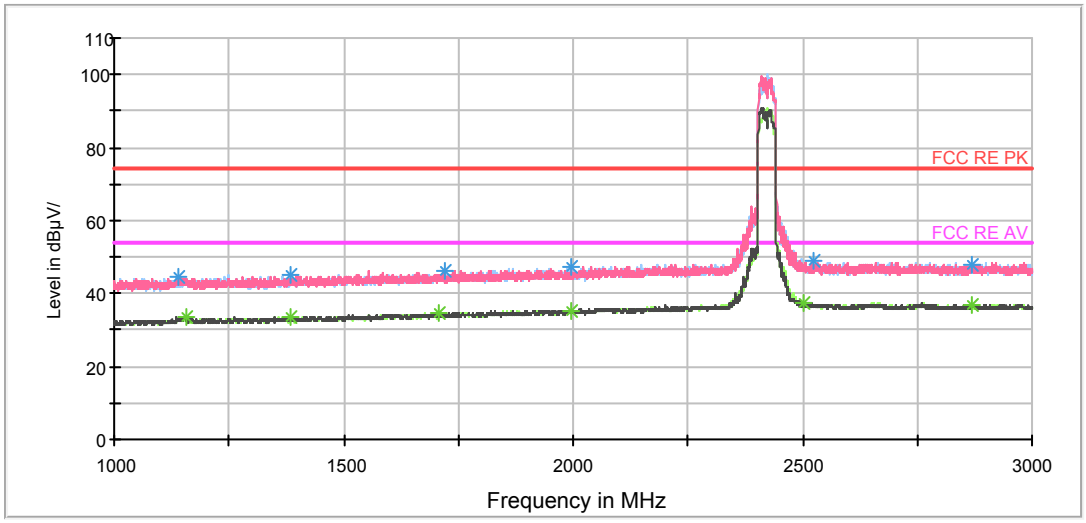
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1155.500000	33.2	100.0	H	0.0	41.6	-8.4	20.8	54
1394.250000	34.7	100.0	V	9.0	41.7	-7.0	19.3	54
1699.250000	34.4	100.0	H	356.0	39.7	-5.3	19.6	54
2060.000000	35.9	100.0	V	0.0	39.0	-3.1	18.1	54
2499.250000	38.1	100.0	H	0.0	39.0	-0.9	15.9	54
2905.000000	36.5	100.0	H	342.0	37.0	-0.5	17.5	54

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

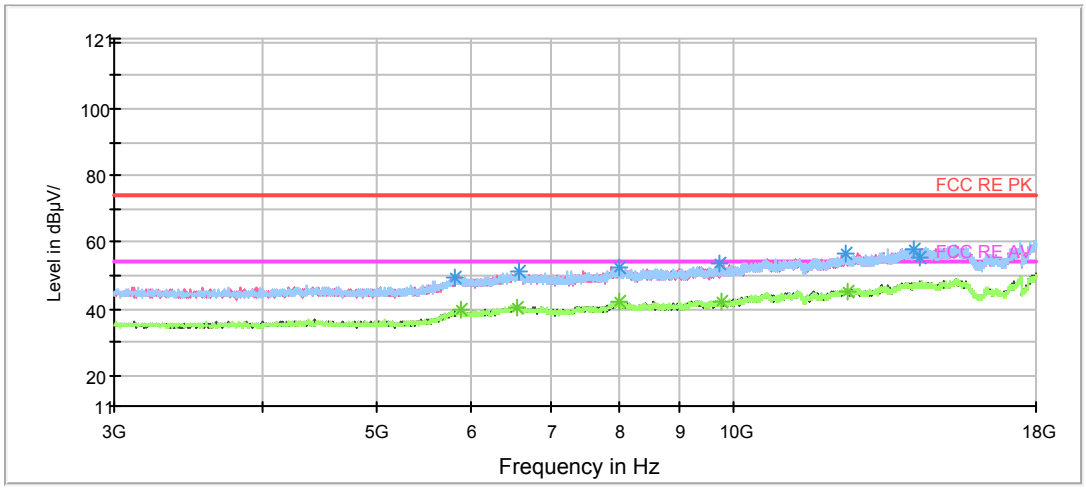
802.11n (HT40) CH3

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1141.750000	44.7	100.0	H	356.0	53.2	-8.5	29.3	74
1385.500000	45.1	200.0	H	0.0	52.2	-7.1	28.9	74
1722.250000	46.0	200.0	V	0.0	51.1	-5.1	28.0	74
1995.250000	47.4	200.0	V	123.0	51.0	-3.6	26.6	74
2524.750000	48.9	100.0	H	353.0	49.8	-0.9	25.1	74
2868.250000	48.1	100.0	H	256.0	48.4	-0.3	25.9	74

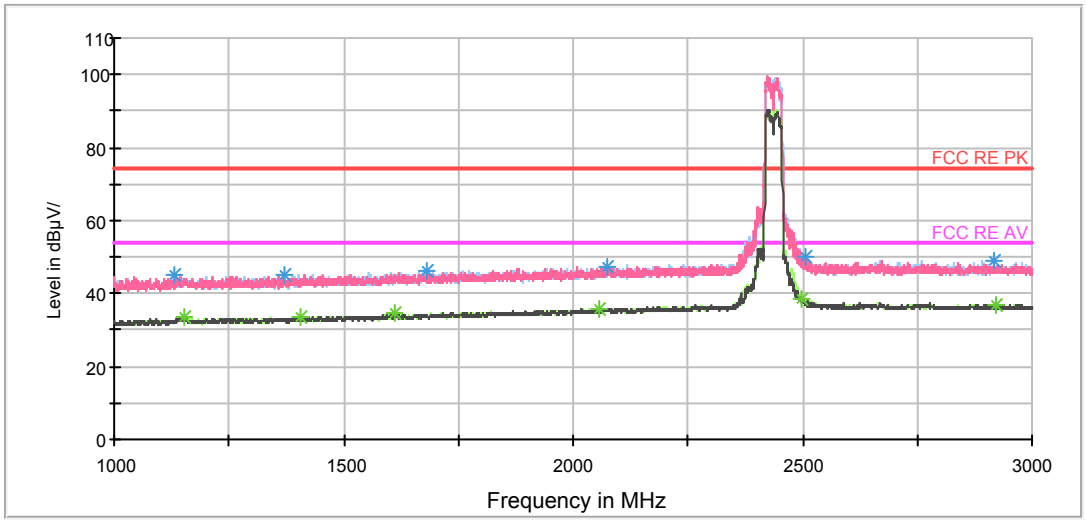
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1155.500000	33.4	100.0	H	333.0	41.8	-8.4	20.6	54
1385.500000	33.5	200.0	V	279.0	40.6	-7.1	20.5	54
1707.500000	34.6	100.0	V	4.0	39.9	-5.3	19.4	54
1996.250000	35.3	100.0	H	324.0	38.9	-3.6	18.7	54
2501.250000	37.3	100.0	V	0.0	38.2	-0.9	16.7	54
2869.750000	37.0	100.0	H	314.0	37.3	-0.3	17.0	54

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

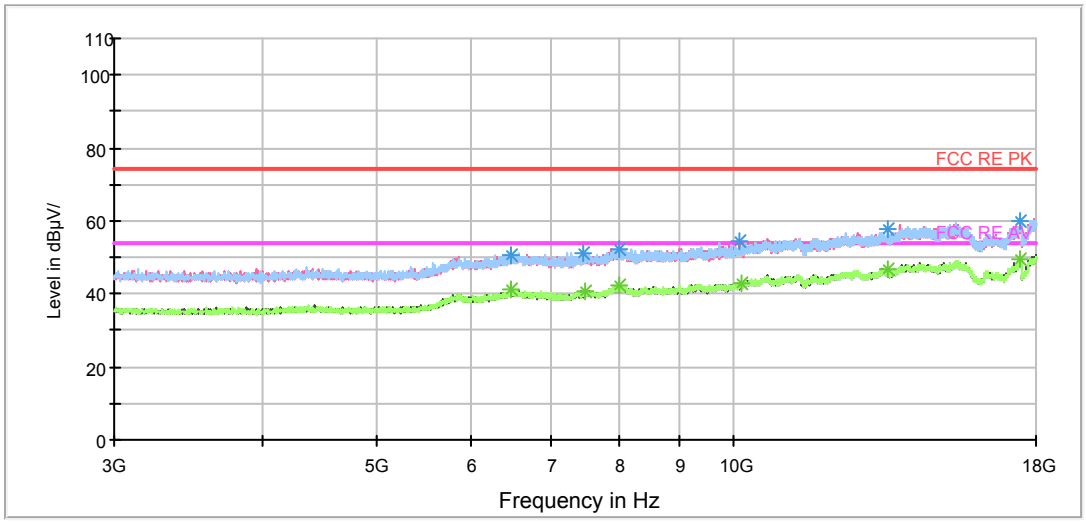
802.11n (HT40) CH6

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1133.000000	45.1	100.0	V	0.0	53.7	-8.6	28.9	74
1371.750000	45.2	200.0	H	130.0	52.3	-7.1	28.8	74
1682.000000	46.0	200.0	H	3.0	51.4	-5.4	28.0	74
2076.250000	47.4	200.0	H	14.0	50.4	-3.0	26.6	74
2504.750000	49.9	200.0	V	175.0	50.8	-0.9	24.1	74
2916.000000	48.8	200.0	V	282.0	49.2	-0.4	25.2	74

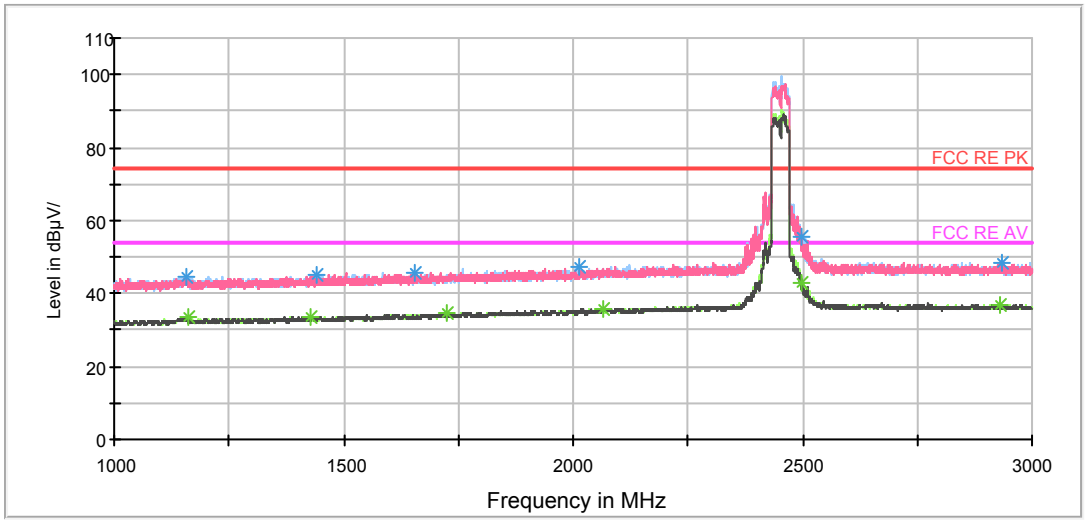
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1153.500000	33.6	200.0	H	7.0	42.1	-8.5	20.4	54
1404.250000	33.6	100.0	H	309.0	40.5	-6.9	20.4	54
1611.750000	34.7	100.0	H	224.0	40.5	-5.8	19.3	54
2056.500000	36.0	100.0	V	19.0	39.1	-3.1	18.0	54
2498.250000	38.5	200.0	V	175.0	39.4	-0.9	15.5	54
2919.500000	36.7	200.0	V	347.0	37.0	-0.3	17.3	54

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

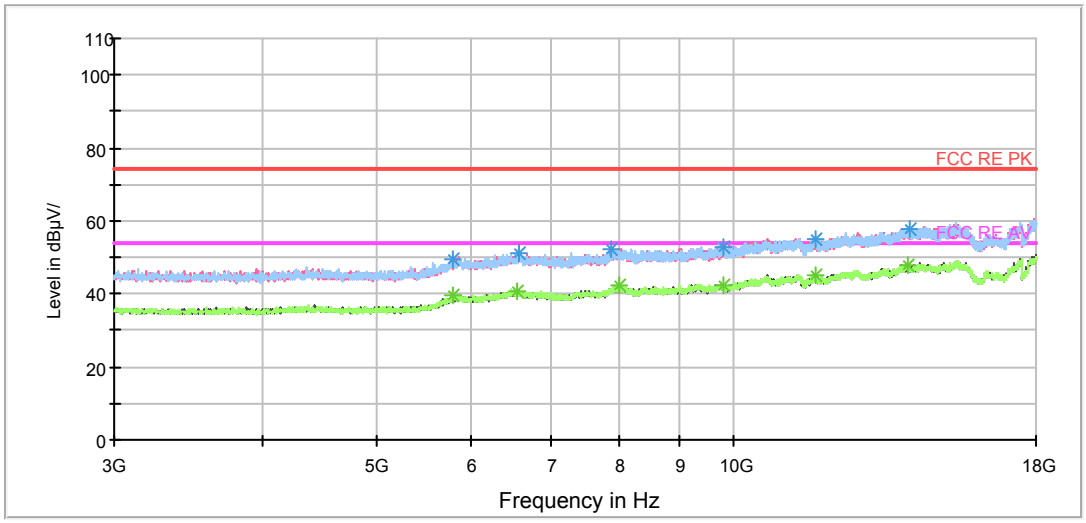
802.11n (HT40) CH9

FCC RE 1G-3GHz PK+AV Class B



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

FCC RE 1G-18GHz PK+AV Class B



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)
1157.500000	44.8	200.0	H	24.0	53.2	-8.4	29.2	74
1439.000000	45.0	200.0	H	6.0	51.7	-6.7	29.0	74
1653.750000	45.7	200.0	H	32.0	51.3	-5.6	28.3	74
2011.500000	47.0	200.0	H	77.0	50.4	-3.4	27.0	74
2499.000000	55.6	100.0	H	0.0	56.5	-0.9	18.4	74
2935.750000	48.5	100.0	V	0.0	49.0	-0.5	25.5	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)
1159.500000	33.5	100.0	V	151.0	41.9	-8.4	20.5	54
1427.000000	33.7	200.0	H	18.0	40.5	-6.8	20.3	54
1723.500000	34.5	200.0	V	0.0	39.6	-5.1	19.5	54
2063.500000	35.9	100.0	H	0.0	38.9	-3.0	18.1	54
2498.250000	43.0	200.0	H	89.0	43.9	-0.9	11.0	54
2929.750000	36.7	200.0	H	136.0	37.1	-0.4	17.3	54

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

5.7. Conducted Emission

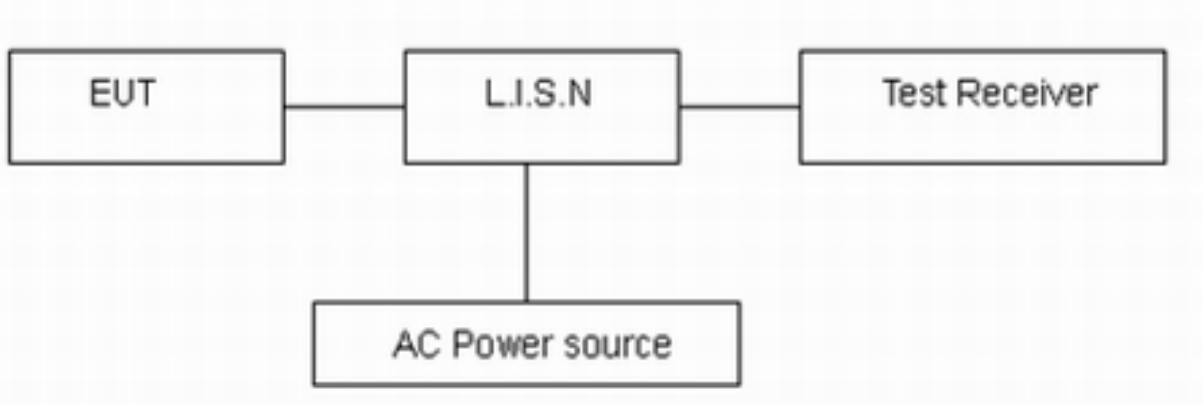
Ambient condition

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

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10-2013. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.
The test is in transmitting mode.

Test Setup



Note: AC Power source is used to change the voltage 110V/60Hz.

Limits

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

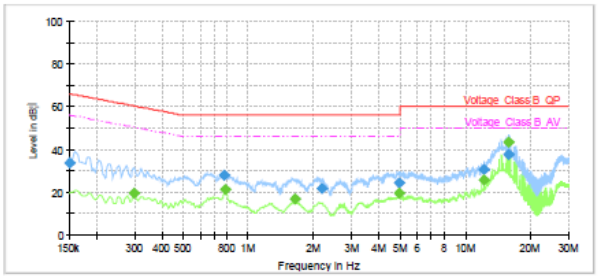
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U= 2.69 dB.

Test Results:

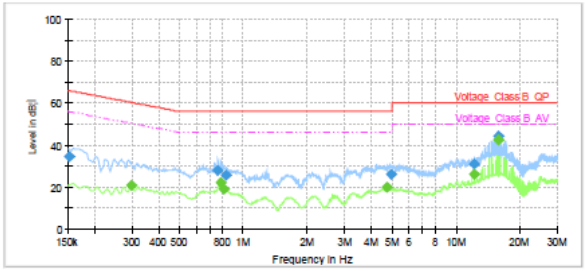
Following plots, Blue trace uses the peak detection and Green trace uses the average detection. During the test, the Conducted Emission was performed in all modes (WIFI 2.4G) with all channels, 802.11b, Channel 11 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

L Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	33.80	---	66.00	32.20	1000.0	9.000	L1	ON	19.1
0.298500	---	19.26	50.28	31.03	1000.0	9.000	L1	ON	19.2
0.771000	27.96	---	56.00	28.04	1000.0	9.000	L1	ON	19.2
0.782250	---	21.14	46.00	24.86	1000.0	9.000	L1	ON	19.2
1.648500	---	16.75	46.00	29.25	1000.0	9.000	L1	ON	19.2
2.170500	21.61	---	56.00	34.39	1000.0	9.000	L1	ON	19.1
4.962750	24.50	---	56.00	31.50	1000.0	9.000	L1	ON	19.1
4.983000	---	19.43	46.00	26.57	1000.0	9.000	L1	ON	19.1
12.183000	30.67	---	60.00	29.33	1000.0	9.000	L1	ON	19.4
12.183000	---	25.48	50.00	24.52	1000.0	9.000	L1	ON	19.4
15.765000	---	43.36	50.00	6.64	1000.0	9.000	L1	ON	19.4
15.776250	37.48	---	60.00	22.52	1000.0	9.000	L1	ON	19.4

N Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.152250	34.56	---	65.88	31.31	1000.0	9.000	N	ON	19.1
0.296250	---	20.66	50.35	29.68	1000.0	9.000	N	ON	19.2
0.757500	27.92	---	56.00	28.08	1000.0	9.000	N	ON	19.2
0.780000	---	22.00	46.00	24.00	1000.0	9.000	N	ON	19.2
0.809250	---	18.96	46.00	27.04	1000.0	9.000	N	ON	19.2
0.825000	25.69	---	56.00	30.31	1000.0	9.000	N	ON	19.2
4.726500	---	20.00	46.00	26.00	1000.0	9.000	N	ON	19.1
4.953750	26.14	---	56.00	29.86	1000.0	9.000	N	ON	19.1
12.180750	---	26.14	50.00	23.86	1000.0	9.000	N	ON	19.4
12.183000	30.98	---	60.00	29.02	1000.0	9.000	N	ON	19.4
15.762750	---	42.62	50.00	7.38	1000.0	9.000	N	ON	19.4
15.765000	44.45	---	60.00	15.55	1000.0	9.000	N	ON	19.4

6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Spectrum Analyzer	R&S	FSV30	100815	2017-12-17	2018-12-16
EMI Test Receiver	R&S	ESCI	100948	2018-05-20	2019-05-19
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-201	2017-11-18	2020-11-17
Double Ridged Waveguide Horn Antenna	R&S	HF907	100126	2014-12-06	2019-12-05
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-11-18	2020-11-17
Standard Gain Horn	ETS-Lindgren	3160-09	00102644	2015-01-30	2020-01-29
EMI Test Receiver	R&S	ESR	101667	2017-09-06	2018-09-05
LISN	R&S	ENV216	101171	2016-12-16	2019-12-15
Spectrum Analyzer	Agilent	N9010A	MY47191109	2018-05-20	2019-05-19
Power Meter	R&S	NRP2	1144.1374K02 -104306-EX	2017-12-21	2018-12-20
Power Sensor	R&S	NRP-Z21	104799	2018-05-20	2019-05-19
RF Cable	Agilent	SMA 15cm	0001	/	/
Software	ROHDE&SCHW ARZ	EMC32	9.26.0	/	/

*******END OF REPORT *******