



RF TEST REPORT

Applicant Alcatel-Lucent Shanghai Bell Co., Ltd.
FCC ID 2ADZRXS250WXAB
Product XGSPON ONU
Brand NOKIA
Model XS-250WX-A/XS-240W-A
Report No. RBA1709-0095RF04R1
Issue Date January 4, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2017)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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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: December 20, 2016 ~ January 24, 2017 and September 18, 2017~ October 17, 2017			

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. This report must not be used by the client to claim product certification, approval, or endorsement by CNAS or any government agencies.

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.
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2. General Description of Equipment under Test

Client Information

Applicant	Alcatel-Lucent Shanghai Bell Co.,Ltd.
Applicant address	388-389#,Ningqiao Road,Pudong Jinqiao, Shanghai, P.R. China
Manufacturer	Alcatel-Lucent Shanghai Bell Co.,Ltd.
Manufacturer address	388-389#,Ningqiao Road,Pudong Jinqiao, Shanghai, P.R. China

General information

EUT Description	
Model:	XS-250WX-A/XS-240W-A
SN:	/
Hardware Version:	3FE 48307 AA /3FE 48631 AA
Software Version:	3FE47059
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: 3.00 dBi Antenna 2: 3.00 dBi Antenna 3: 3.00 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: 25.55 dBm
Operating Frequency Range(s)	2400 ~ 2483.5 MHz
EUT Accessory	
Adapter	Manufacturer: DELTA electronics, INC. Model: ADP-66CR BC
Note: The information of the EUT is declared by the manufacturer.	

XS-250WX-A	XS-240W-A
With 10GE port	Without 10GE port
Note: Customer declaration, two models is the same except 10GE port. During the test, both of two models are evaluated, XS-250WX-A selected as the worst condition, but only the worst case is recorded in this report.	

	Model	ONU Part number	Kit Part number
US ONU	XS-250WX-A	3FE 48307 AA	-
US Kit	XS-250WX-A	3FE 48307 AA	3FE 48439 AA
US ONU	XS-240W-A	3FE 48631 AA	-
US Kit	XS-240W-A	3FE 48631 AA	3FE 48626 AA

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 (2017) 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 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.

Test Cases	Worst case for 802.11b/ g/ n HT20/ HT40
Maximum Average conducted output power	1Mbps/6Mbps/MCS16/MCS16
6 dB bandwidth	1Mbps/6Mbps/MCS16/MCS16
Maximum power spectral density	1Mbps/6Mbps/MCS16/MCS16
Band Edge	1Mbps/6Mbps/MCS16/MCS16
Spurious RF Conducted Emissions	1Mbps/6Mbps/MCS16/MCS16
Radiated Emissions in restricted frequency bands	1Mbps/6Mbps/MCS16/MCS16
Radiated Emissions	1Mbps/6Mbps/MCS16/MCS16
Conducted Emissions	1Mbps/6Mbps/MCS16/MCS16

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

Test Cases	Antenna 1	Antenna 2	Antenna 3	MIMO
Maximum Average conducted output power	802.11b/g	802.11g	802.11g	802.11n HT20/40
6 dB bandwidth	802.11b	--	802.11g	802.11n HT20/40
Maximum power spectral density	802.11b/g	802.11g	802.11g	802.11n HT20/40
Band Edge	802.11b	--	802.11g	802.11n HT20/40
Spurious RF Conducted Emissions	802.11b/g	802.11g	802.11g	802.11n HT20/40
Radiated Emissions in restricted frequency bands	802.11b	--	802.11g	802.11n HT20/40
Radiated Emissions	802.11b	--	802.11g	802.11n HT20/40
Conducted Emissions	802.11b	--	802.11g	802.11n HT20/40

5. Test Case Results

5.1. Average Power Output –Conducted

Ambient condition

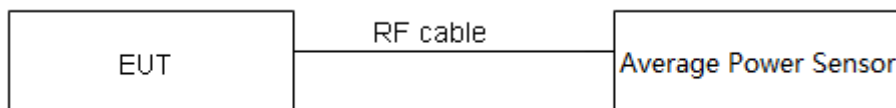
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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	$\leq 1W$ (30dBm)
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Measurement Uncertainty

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

Test Results

Note: According to client requirement, testing SISO antenna mode.

SISO Antenna Power Index									
Packet Type	Antenna 1 Power Index			Antenna 2 Power Index			Antenna 3 Power Index		
	CH1	CH6	CH11	CH1	CH6	CH11	CH1	CH6	CH11
802.11b	92	92	92	Not support	Not support	Not support	Not support	Not support	Not support
802.11g	92	92	92	92	92	92	92	92	92

MIMO Antenna 1&2&3 Power Index			
Packet Type	CH1	CH6	CH11
802.11n HT20	74	74	74
Packet Type	CH3	CH6	CH9
802.11n HT40	74	74	74

SISO Antenna 1

Network Standards	Carrier frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	Conclusion
802.11b	2412	24.96	30	PASS
	2437	24.85	30	PASS
	2462	25.25	30	PASS
802.11g	2412	24.50	30	PASS
	2437	24.82	30	PASS
	2462	24.94	30	PASS

SISO Antenna 2

Network Standards	Carrier frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	Conclusion
802.11g	2412	24.39	30	PASS
	2437	24.21	30	PASS
	2462	24.61	30	PASS

SISO Antenna 3

Network Standards	Carrier frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	Conclusion
802.11g	2412	25.32	30	PASS
	2437	25.50	30	PASS
	2462	25.55	30	PASS

MIMO without beamforming

Network Standards	Carrier frequency (MHz)	Average Output Power (dBm)				Limit (dBm)	Conclusion
		ANT1	ANT2	ANT3	MIMO		
802.11 n HT20	2412	20.15	19.01	20.14	24.57	30	PASS
	2437	19.96	18.48	20.18	24.37	30	PASS
	2462	19.99	19.02	20.24	24.55	30	PASS
802.11 n HT40	2422	19.84	18.63	19.96	24.29	30	PASS
	2437	20.18	18.73	20.13	24.50	30	PASS
	2452	20.09	18.65	19.89	24.36	30	PASS

According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain,

For power measurements on IEEE 802.11 devices,

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

Array Gain = 0 dB (i.e., no array gain) for channel widths $\geq$ 40 MHz for any NANT;

Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less, for 20-MHz channel widths with NANT $\geq$ 5.

So directional gain = GANT + Array Gain = 3+0=3 dBi < 6dBi. So the power limit is 30dBm.

MIMO with beamforming

Network Standards	Carrier frequency (MHz)	Average Output Power (dBm)				Limit (dBm)	Conclusion
		ANT1	ANT2	ANT3	MIMO		
802.11 n HT20	2412	20.35	19.41	20.38	24.84	28.23	PASS
	2437	19.95	18.92	20.49	24.61	28.23	PASS
	2462	20.00	19.30	20.39	24.69	28.23	PASS
802.11 n HT40	2422	20.07	20.07	20.20	24.89	28.23	PASS
	2437	20.64	20.64	20.67	25.42	28.23	PASS
	2452	20.74	20.74	20.35	25.39	28.23	PASS
According to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e) (i), If all antennas have the same gain, directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS}) = 3 + 10 \log(3/1) = 7.77 > 6 \text{ dBi}$. So the PSD limit = used limit + (30 - directional gain) dBm is 28.23 dBm							

5.2. 6dB Bandwidth

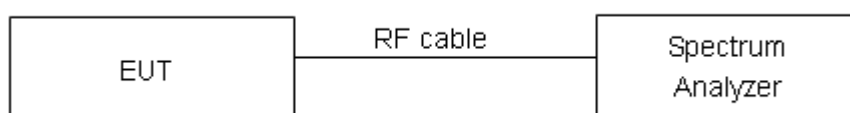
Ambient condition

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
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Measurement Uncertainty

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

**Test Results:****SISO Antenna 1**

Network Standards	Carrier frequency (MHz)	Minimum 6 dB bandwidth (MHz)	99% bandwidth (MHz)	Limit (kHz)	Conclusion
802.11b	2412	8.619	11.486	500	PASS
	2437	9.081	11.833	500	PASS
	2462	9.077	11.911	500	PASS

SISO Antenna 3

Network Standards	Carrier frequency (MHz)	Minimum 6 dB bandwidth (MHz)	99% bandwidth (MHz)	Limit (kHz)	Conclusion
802.11g	2412	16.070	16.890	500	PASS
	2437	16.100	16.711	500	PASS
	2462	16.330	16.632	500	PASS

**MIMO Antenna 3**

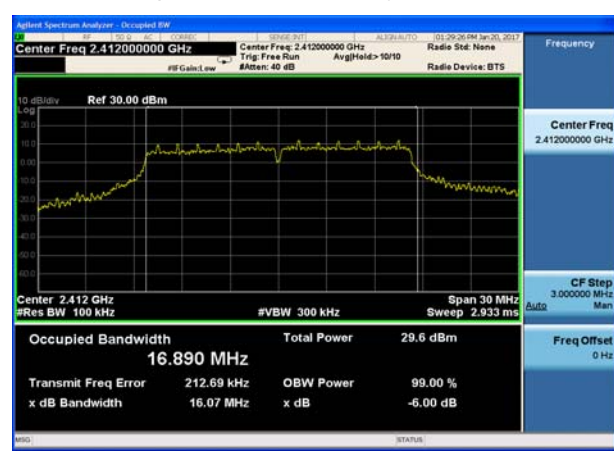
Network Standards	Carrier frequency (MHz)	Minimum 6 dB bandwidth (MHz)	99% bandwidth (MHz)	Limit (kHz)	Conclusion
802.11n HT20	2412	16.980	17.672	500	PASS
	2437	17.600	17.648	500	PASS
	2462	17.610	17.637	500	PASS
802.11n HT40	2422	35.780	35.993	500	PASS
	2437	36.310	36.124	500	PASS
	2452	36.420	36.194	500	PASS

**SISO Antenna 1**

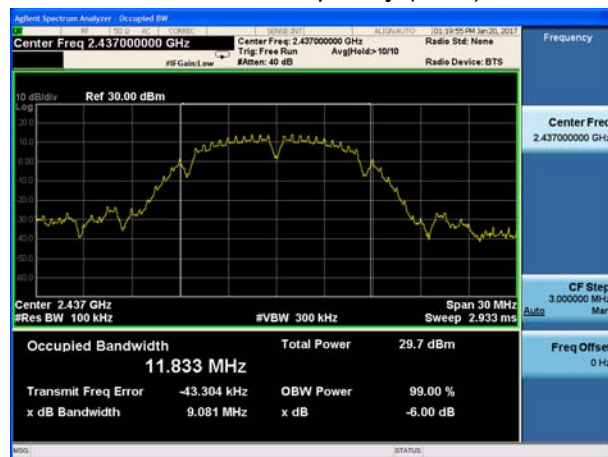
802.11b, Carrier frequency (MHz): 2412

**SISO Antenna 3**

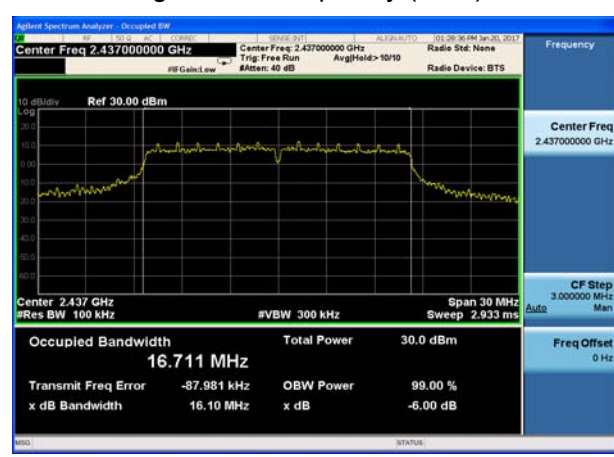
802.11g, Carrier frequency (MHz): 2412



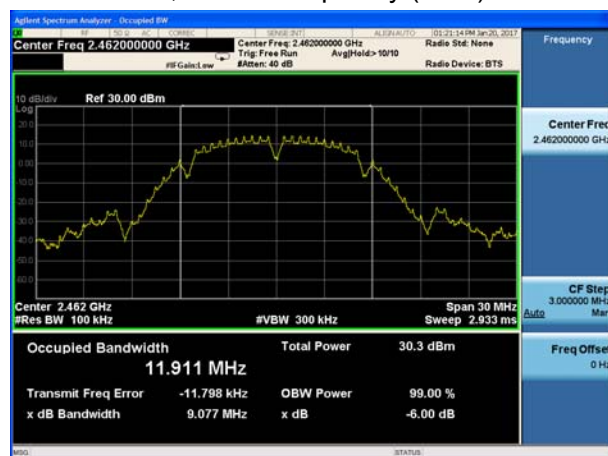
802.11b, Carrier frequency (MHz): 2437



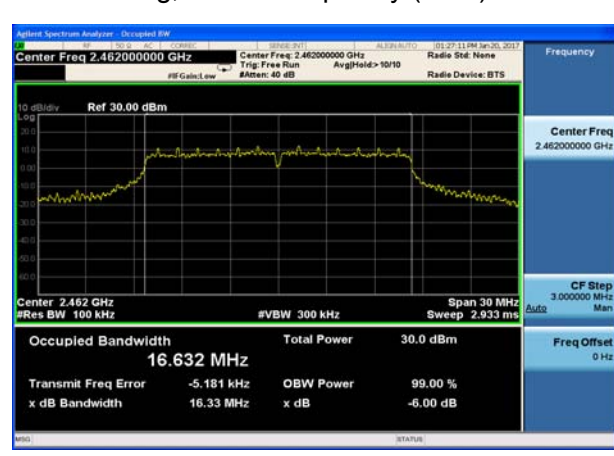
802.11g, Carrier frequency (MHz): 2437



802.11b, Carrier frequency (MHz): 2462



802.11g, Carrier frequency (MHz): 2462





MIMO Antenna 3

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



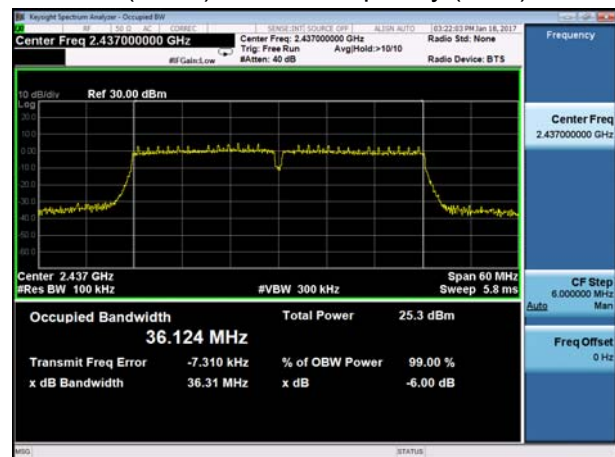
802.11n(HT40), Carrier frequency (MHz): 2422



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

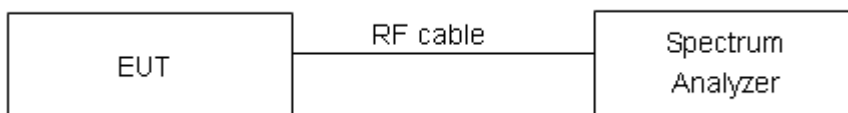
Ambient condition

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.”

Measurement Uncertainty

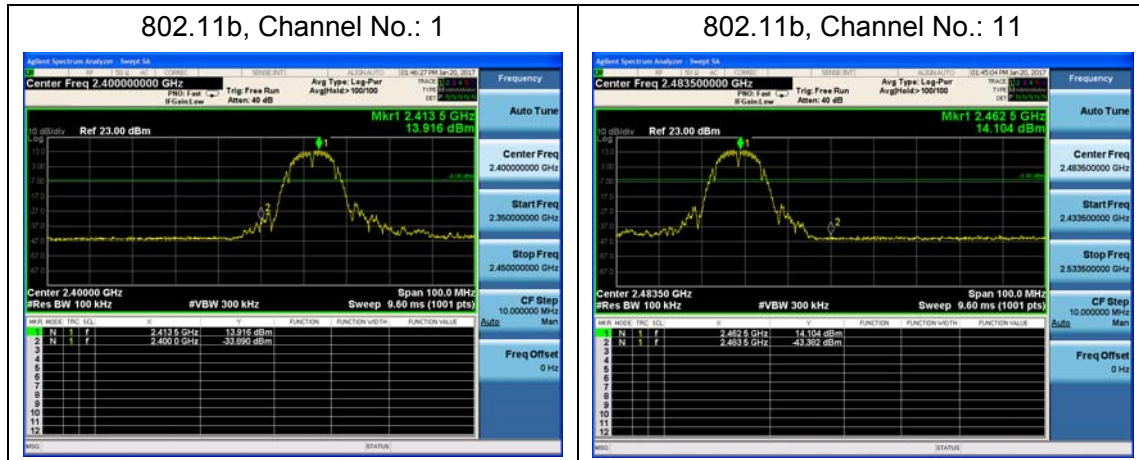
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
2GHz-3GHz	1.407 dB

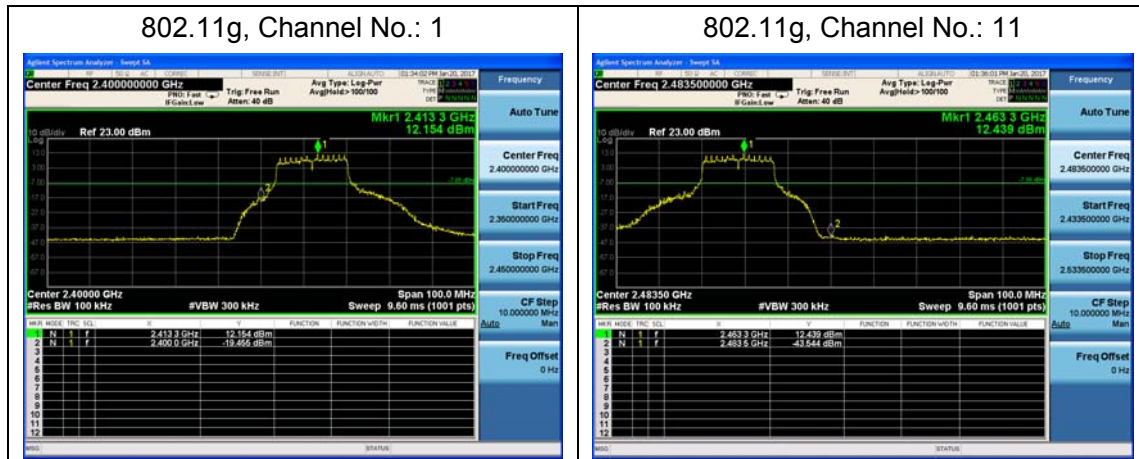


Test Results: PASS

SISO Antenna 1



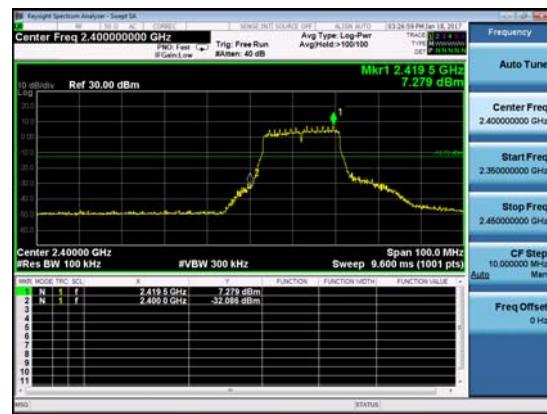
SISO Antenna3



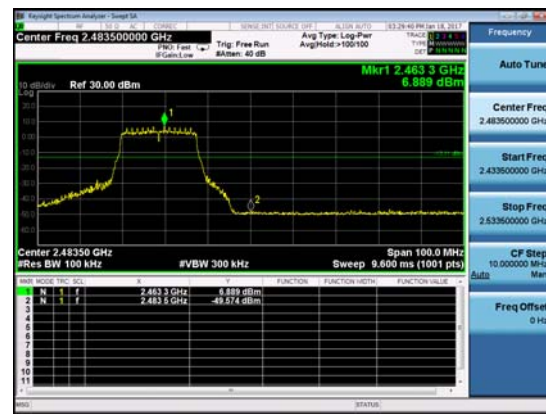


MIMO Antenna 3

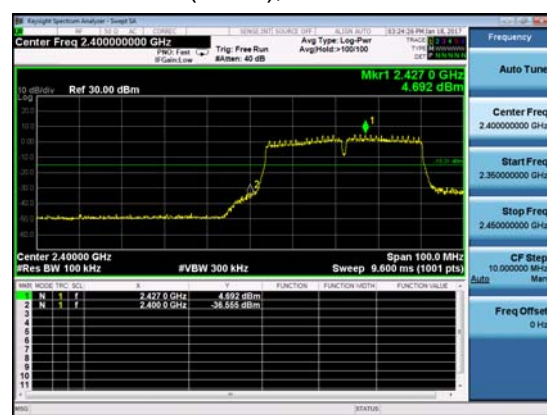
802.11n(HT20), Channel No.: 1



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

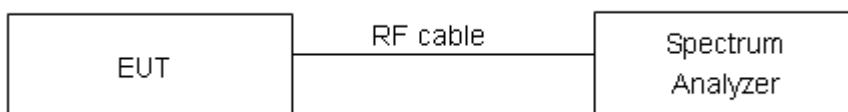
The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.

RBW is set to 3 kHz and VBW is set to 10 kHz for 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 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	$\leq 8 \text{ dBm} / 3\text{kHz}$
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Measurement Uncertainty

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

Test Results:

Note: According to client requirment, testing SISO antenna mode.

SISO Antenna 1

Network Standards	Channel Number	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-10.527	8	PASS
	6	-10.758	8	PASS
	11	-10.437	8	PASS
802.11g	1	-12.249	8	PASS
	6	-12.636	8	PASS
	11	-12.195	8	PASS

SISO Antenna 2

Network Standards	Channel Number	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11g	1	-12.870	8	PASS
	6	-13.400	8	PASS
	11	-12.656	8	PASS

SISO Antenna 3

Network Standards	Channel Number	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11g	1	-11.307	8	PASS
	6	-14.559	8	PASS
	11	-11.596	8	PASS

MIMO without beamforming

Network Standards	Channel Number	Power Spectral Density (dBm / 3kHz)				Limit (dBm / 3kHz)	Conclusion
		ANT1	ANT2	ANT3	MIMO		
802.11n HT20	1	-18.566	-18.085	-17.089	-13.100	6.23	PASS
	6	-17.657	-18.309	-16.996	-12.850	6.23	PASS
	11	-19.959	-18.953	-16.795	-13.590	6.23	PASS
802.11n HT40	3	-19.906	-20.575	-19.674	-15.260	6.23	PASS
	6	-20.787	-20.676	-20.491	-15.880	6.23	PASS
	9	-20.615	-21.431	-19.808	-15.800	6.23	PASS

According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB, so directional gain=GANT+Array Gain=3+10log (3/1) =7.77>6dBi. So the PSD limit=used limit+(6dBi- directional gain) dBm is 6.23dBm.

MIMO with beamforming

Network Standards	Channel Number	Power Spectral Density (dBm / 3kHz)				Limit (dBm / 3kHz)	Conclusion
		ANT1	ANT2	ANT3	MIMO		
802.11n HT20	1	-15.82	-15.57	-14.64	-10.54	6.23	PASS
	6	-14.87	-15.87	-14.83	-10.39	6.23	PASS
	11	-15.30	-16.23	-14.28	-10.42	6.23	PASS
802.11n HT40	3	-17.75	-19.03	-16.96	-13.06	6.23	PASS
	6	-17.83	-19.21	-17.12	-13.20	6.23	PASS
	9	-17.97	-20.02	-18.04	-13.81	6.23	PASS

According to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e) (i), If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=3+10log (3/1) =7.77>6dBi. So the PSD limit=used limit+(6dBi- directional gain) dBm is 6.23dBm.

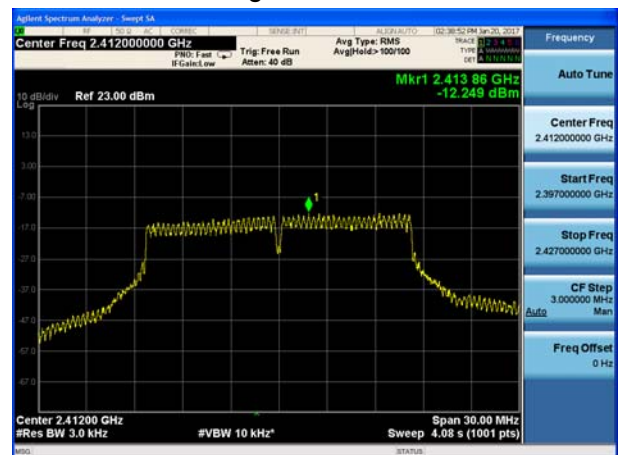


SISO Antenna 1

802.11b, Channel No.: 1



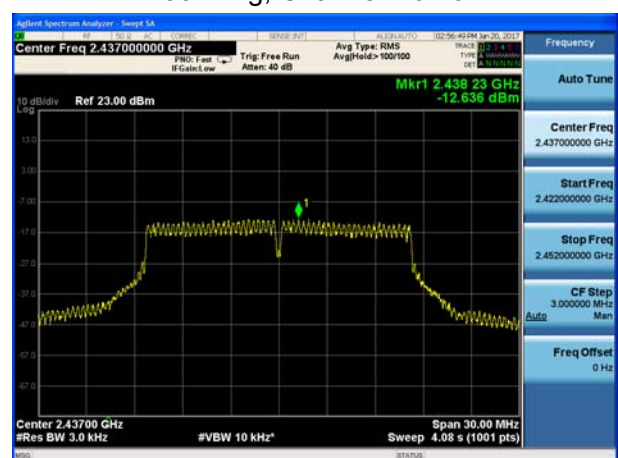
802.11g, Channel No.: 1



802.11b, Channel No.: 6



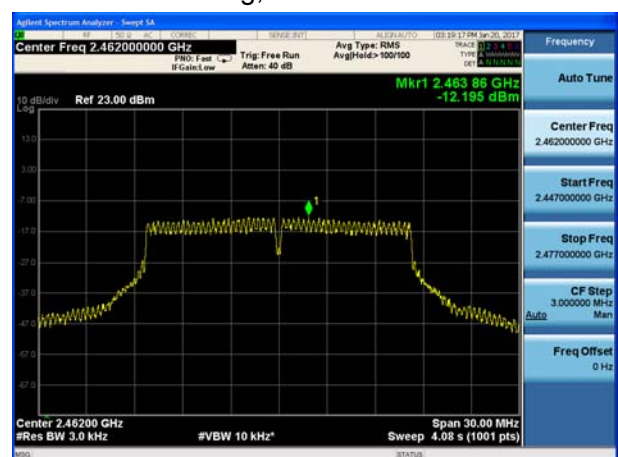
802.11g, Channel No.: 6



802.11b, Channel No.: 11



802.11g, Channel No.: 11





SISO Antenna 2

802.11g, Channel No.: 1

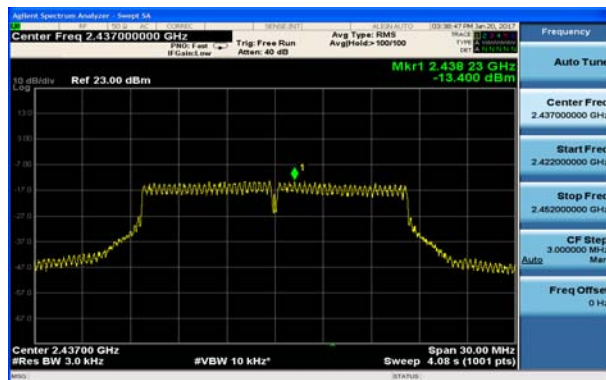


SISO Antenna 3

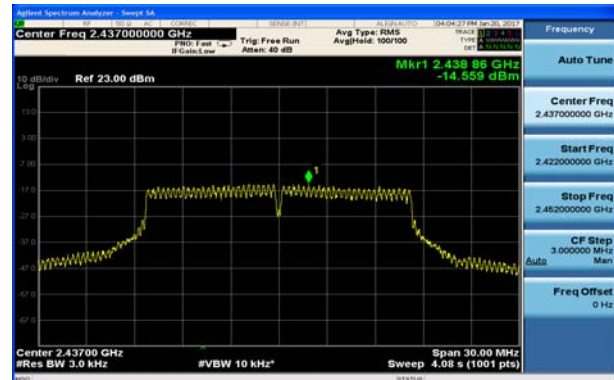
802.11g, Channel No.: 1



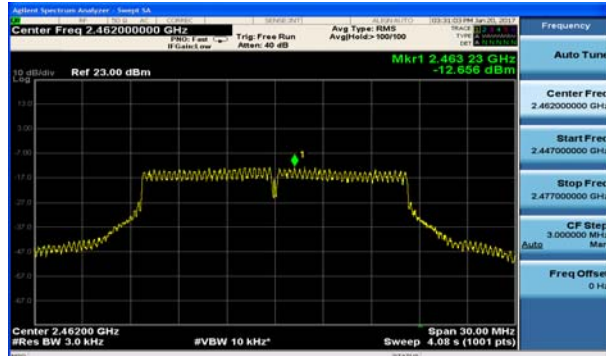
802.11g, Channel No.: 6



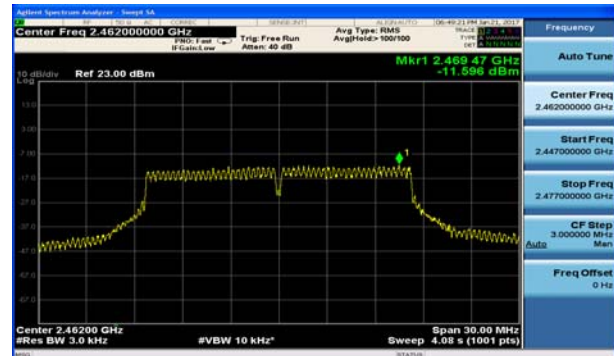
802.11g, Channel No.: 6



802.11g, Channel No.: 11



802.11g, Channel No.: 11

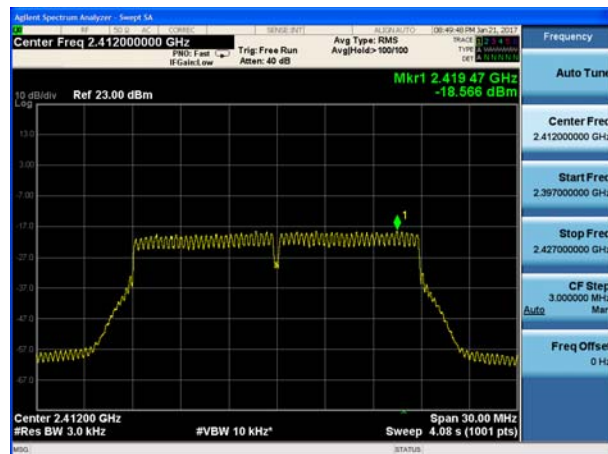




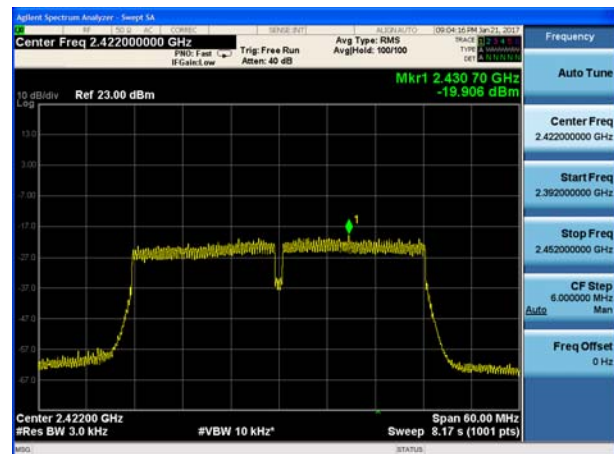
MIMO without beamforming

MIMO Antenna 1

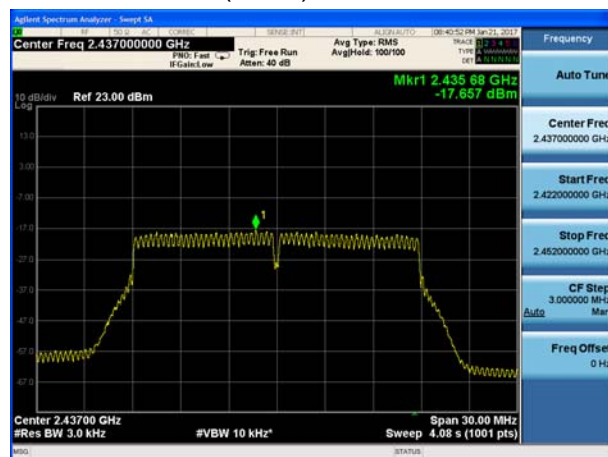
802.11n(HT20), Channel No. 1



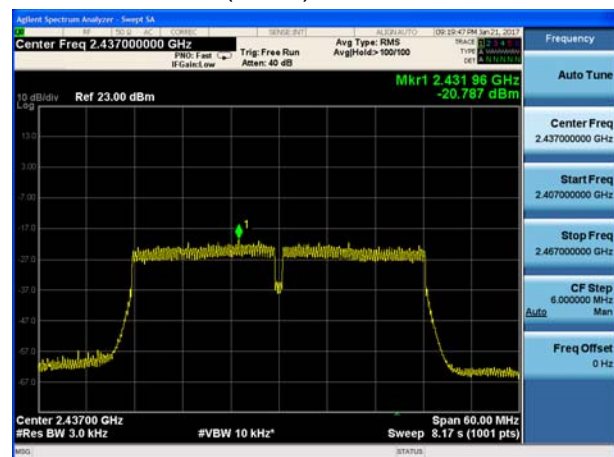
802.11n(HT40), Channel No. 3



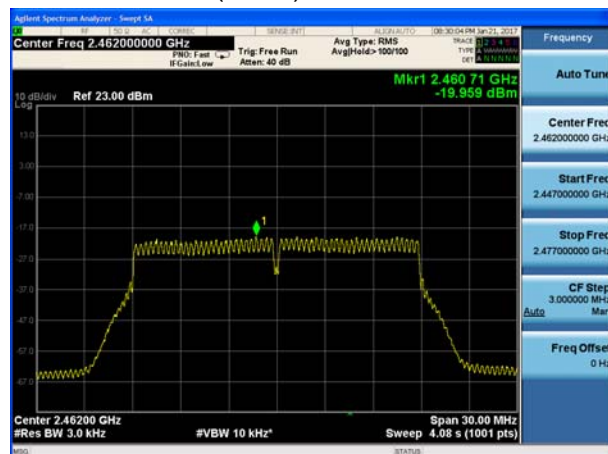
802.11n(HT20), Channel No. 6



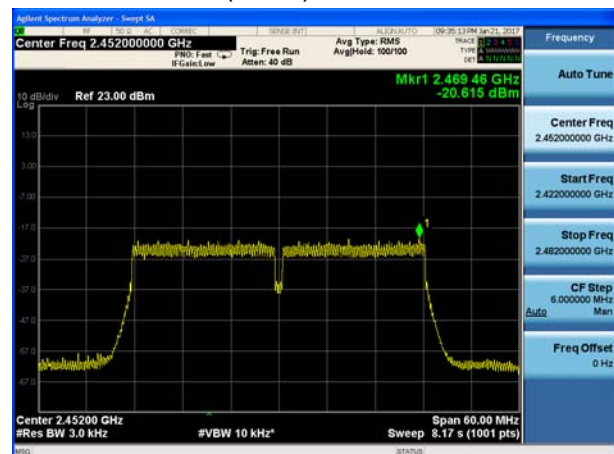
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



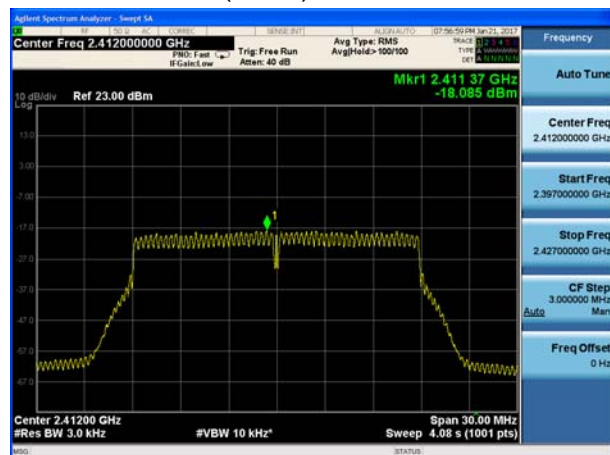
802.11n(HT40), Channel No. 9



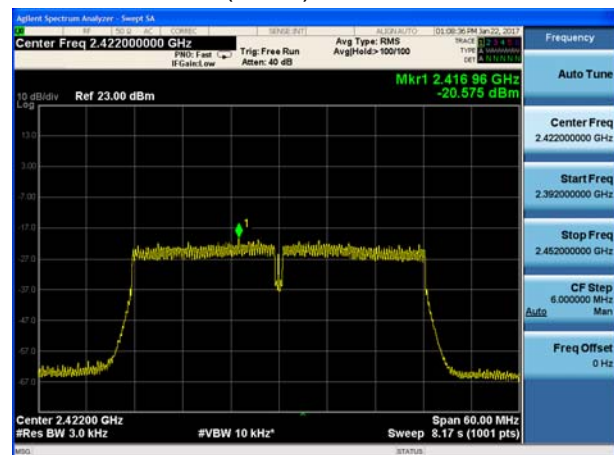


MIMO Antenna 2

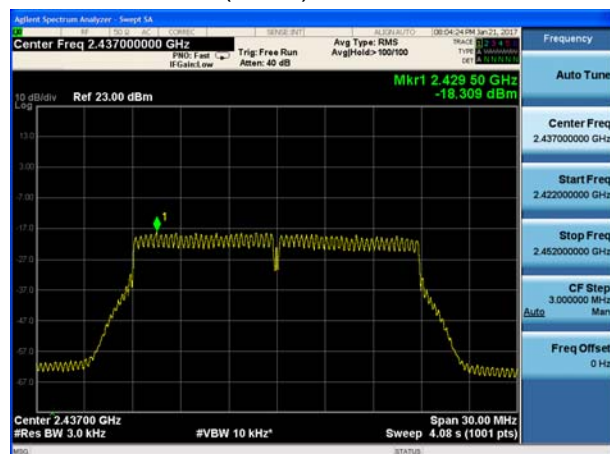
802.11n(HT20), Channel No. 1



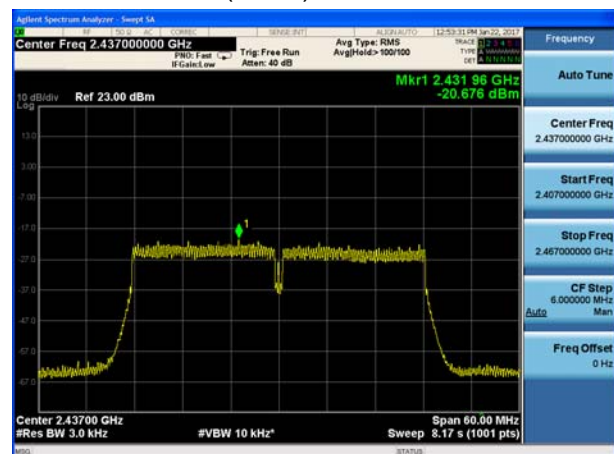
802.11n(HT40), Channel No. 3



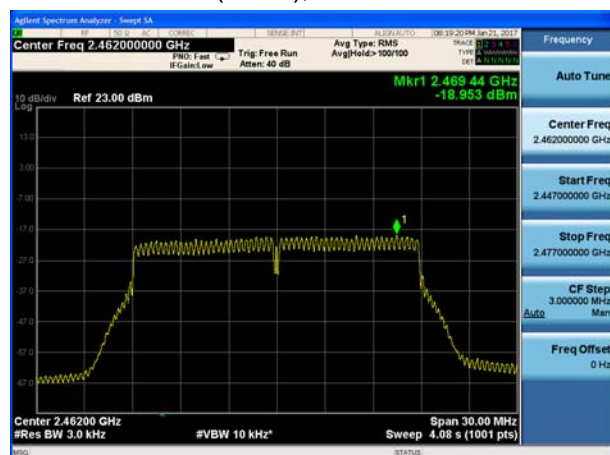
802.11n(HT20), Channel No. 6



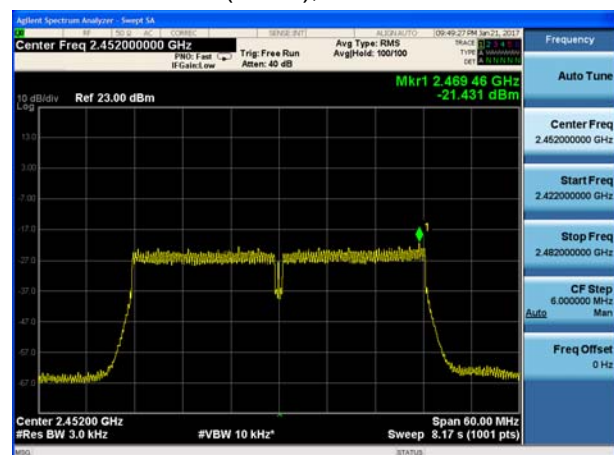
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



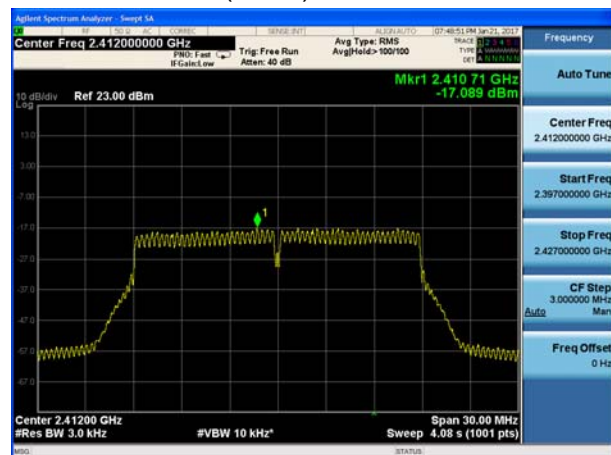
802.11n(HT40), Channel No. 9



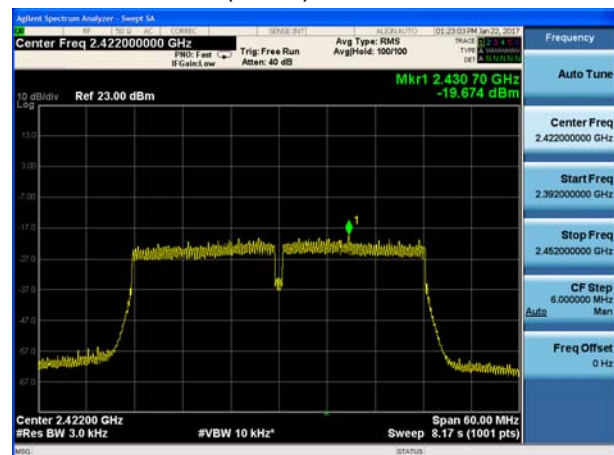


MIMO Antenna 3

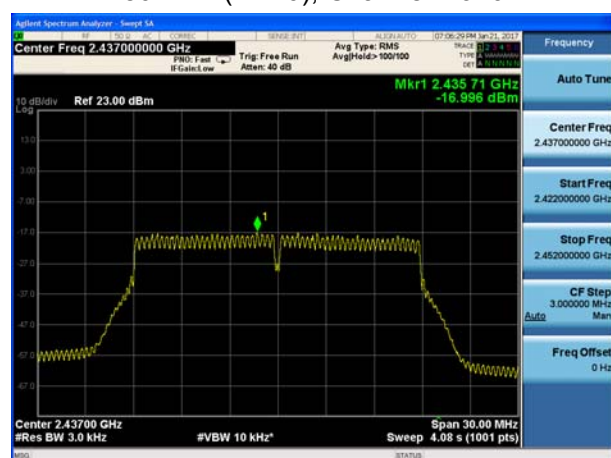
802.11n(HT20), Channel No. 1



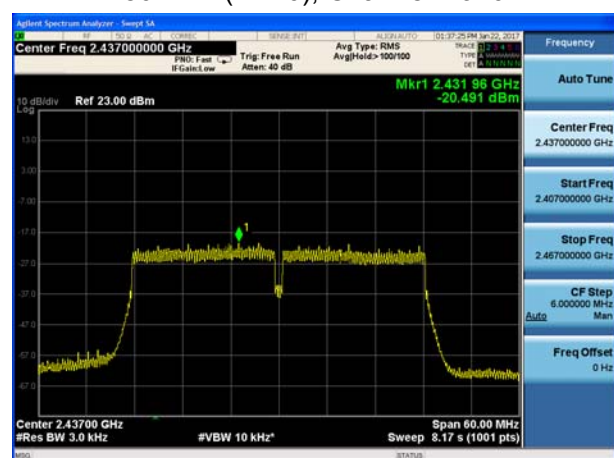
802.11n(HT40), Channel No. 3



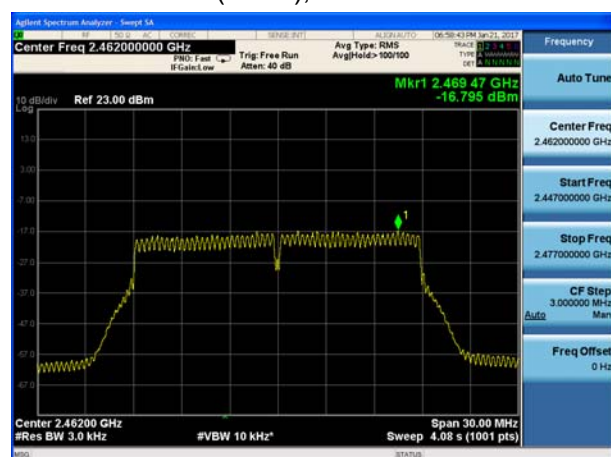
802.11n(HT20), Channel No. 6



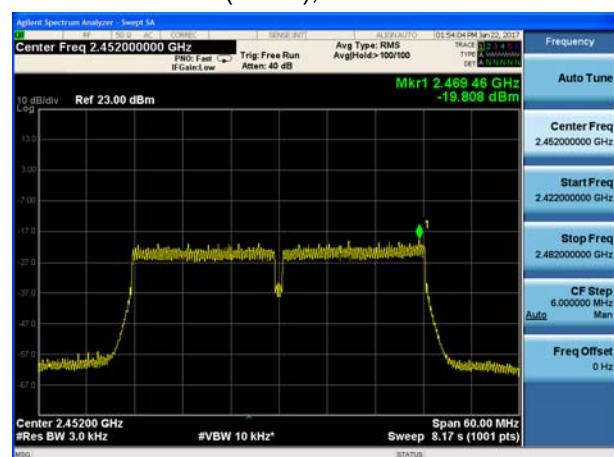
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9





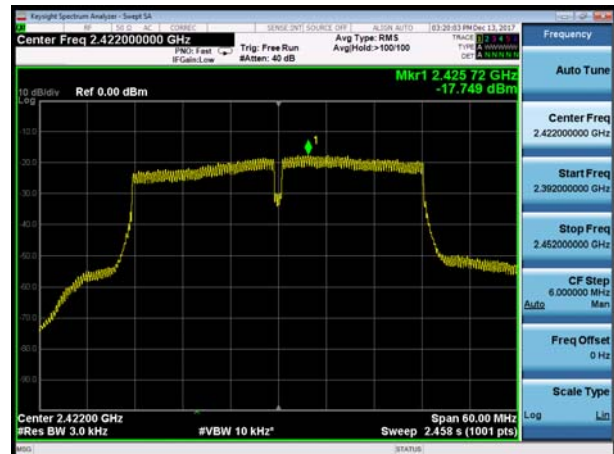
MIMO with beamforming

MIMO Antenna 1

802.11n(HT20), Channel No. 1



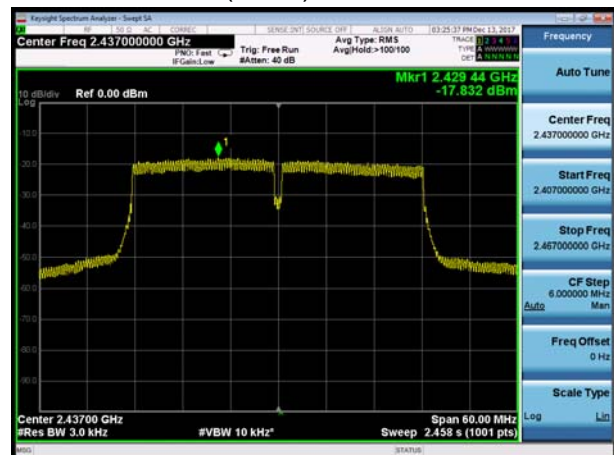
802.11n(HT40), Channel No. 3



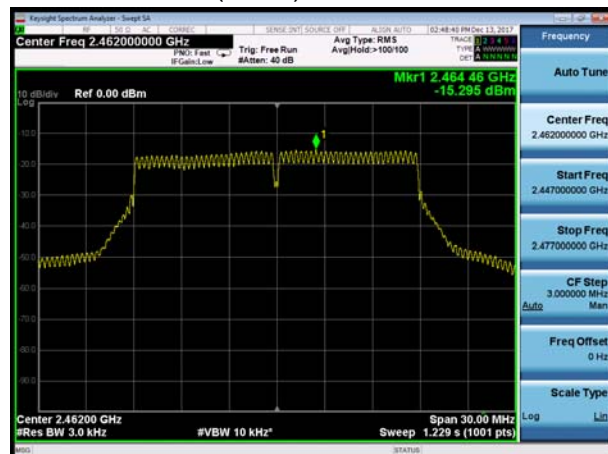
802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9



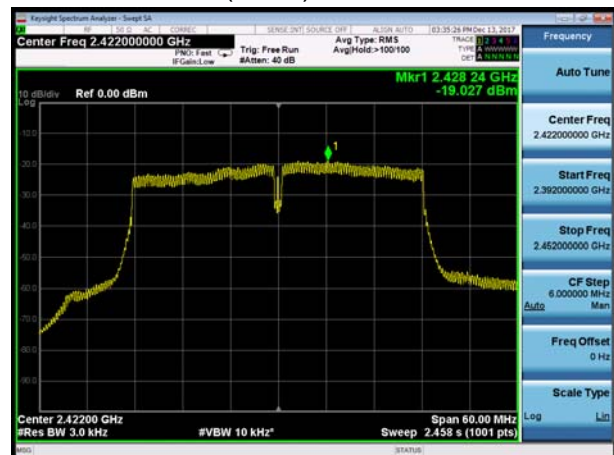


MIMO Antenna 2

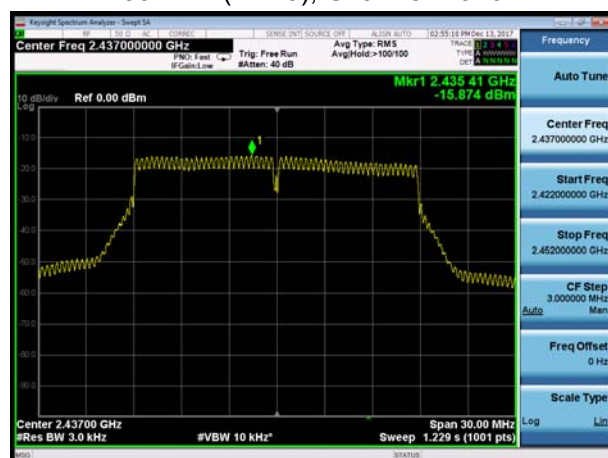
802.11n(HT20), Channel No. 1



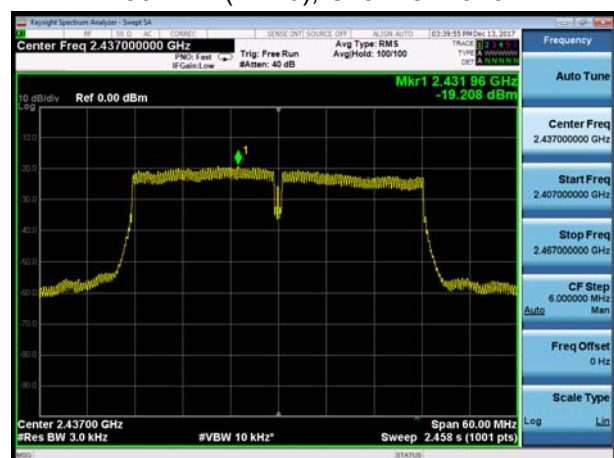
802.11n(HT40), Channel No. 3



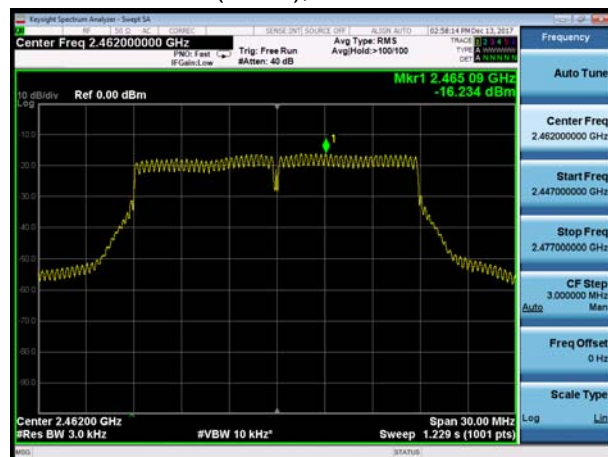
802.11n(HT20), Channel No. 6



802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9





MIMO Antenna 3

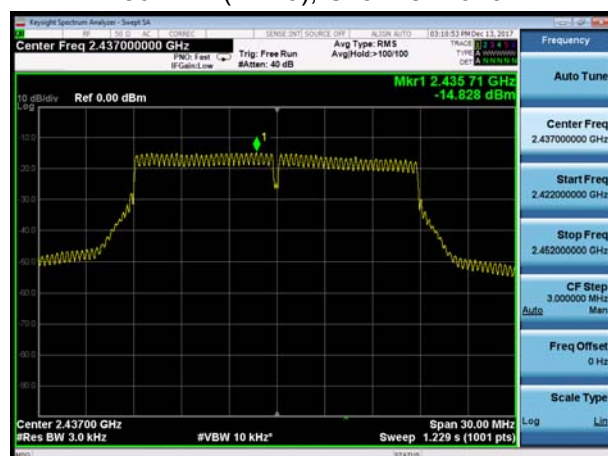
802.11n(HT20), Channel No. 1



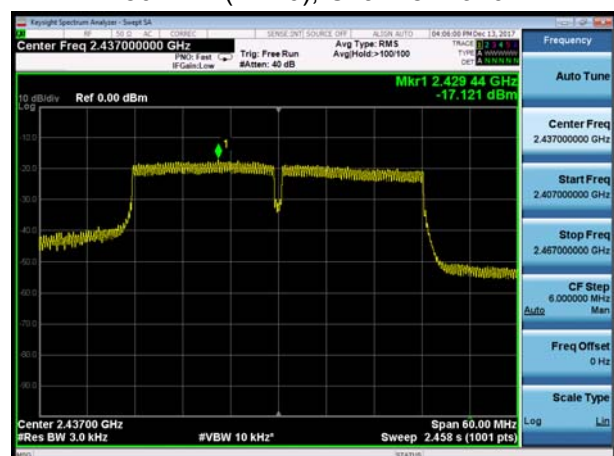
802.11n(HT40), Channel No. 3



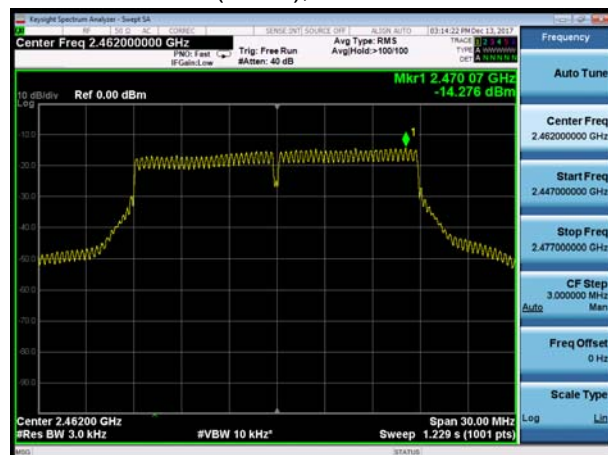
802.11n(HT20), Channel No. 6



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. 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.”

SISO Antenna 1

Network Standards	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11b	2412	4.323	-15.677
	2437	5.804	-14.196
	2462	5.726	-14.274
802.11g	2412	3.052	-16.948
	2437	2.355	-17.645
	2462	3.801	-16.199

SISO Antenna 2

Network Standards	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11g	2412	-0.183	-20.183
	2437	-0.248	-20.248
	2462	1.284	-18.716

SISO Antenna 3

Network Standards	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11g	2412	0.570	-19.430
	2437	4.208	-15.792
	2462	4.030	-15.970

MIMO

Network Standards	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11n HT20	2412	8.346	-11.654
	2437	10.620	-9.380
	2462	10.743	-9.257
802.11n HT40	2422	6.991	-13.009
	2437	7.369	-12.631
	2452	7.221	-12.779

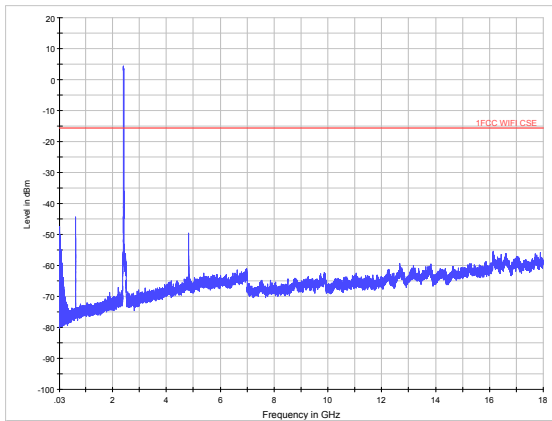
Measurement Uncertainty

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

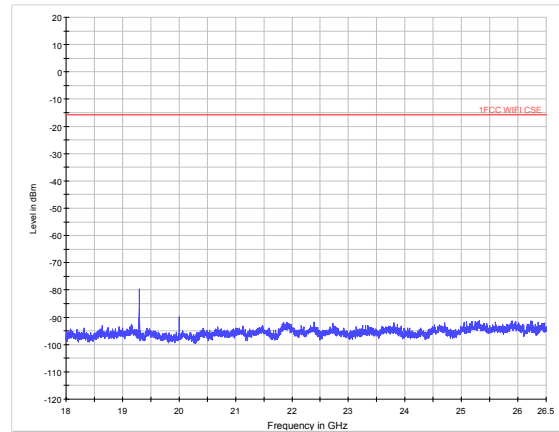
Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

**Test Results:**

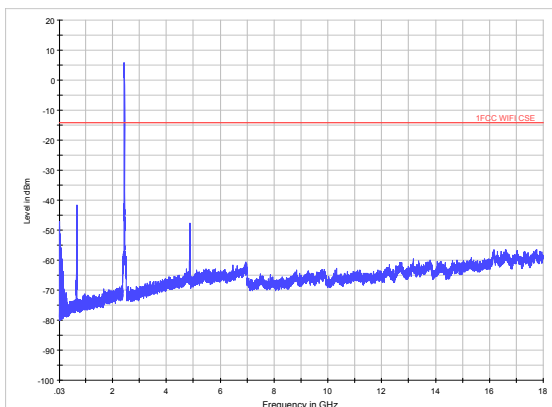
If disturbances were found more than 20dB below limit line, the mark is not required for the EUT.
The signal beyond the limit is carrier.

SISO Antenna 1

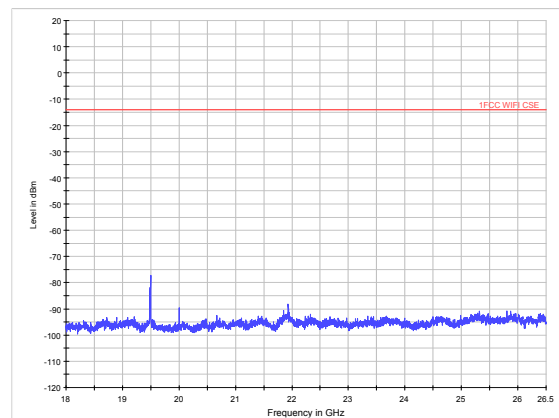
802.11b CH1 30MHz to 18GHz



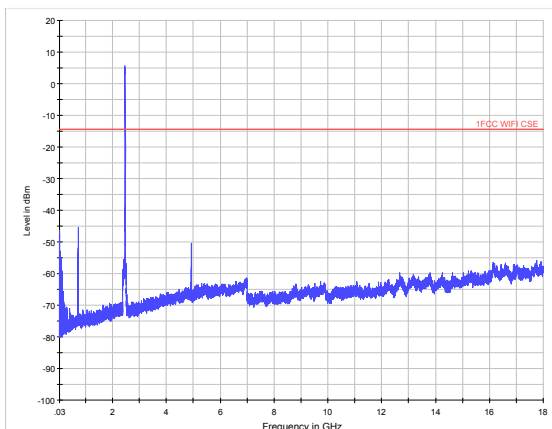
802.11b CH1 18GHz to 26.5GHz



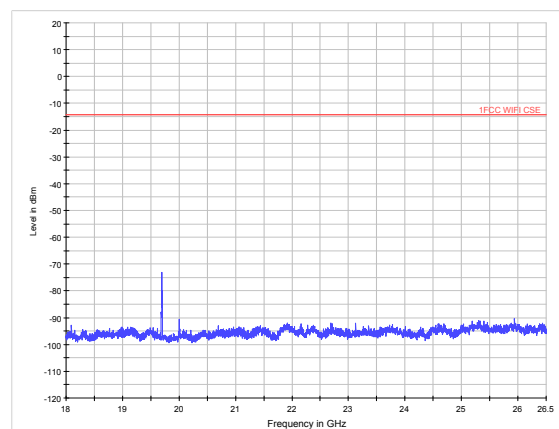
802.11b CH6 30MHz to 18GHz



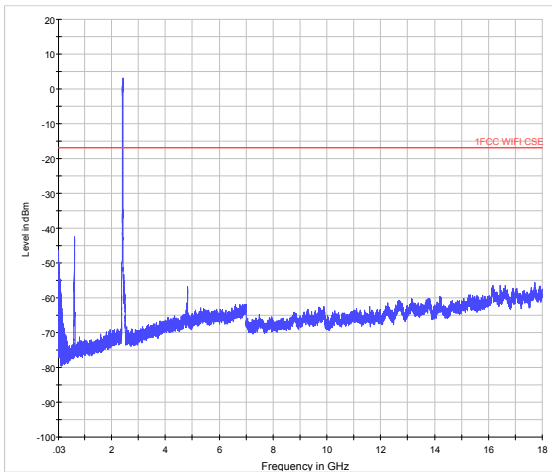
802.11b CH6 18GHz to 26.5GHz



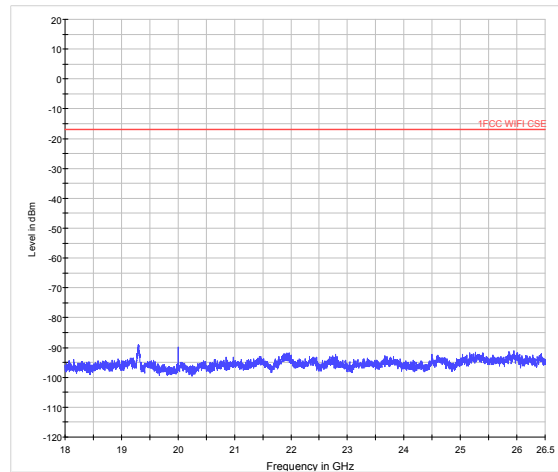
802.11b CH11 30MHz to 18GHz



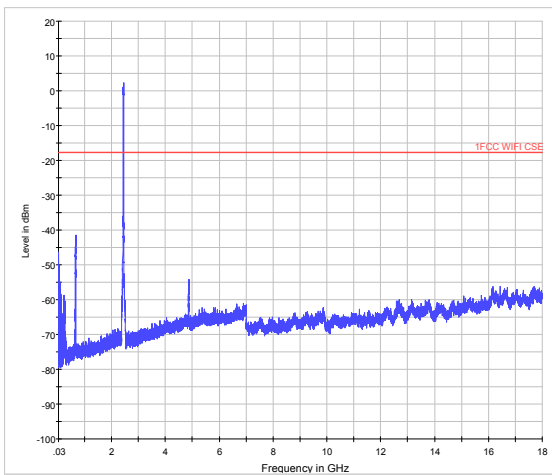
802.11b CH11 18GHz to 26.5GHz



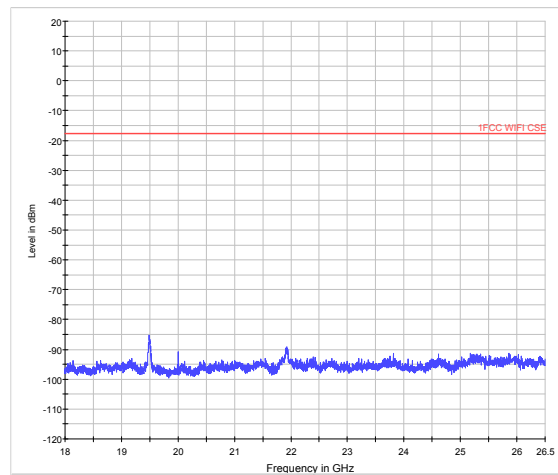
802.11g CH1 30MHz to 18GHz



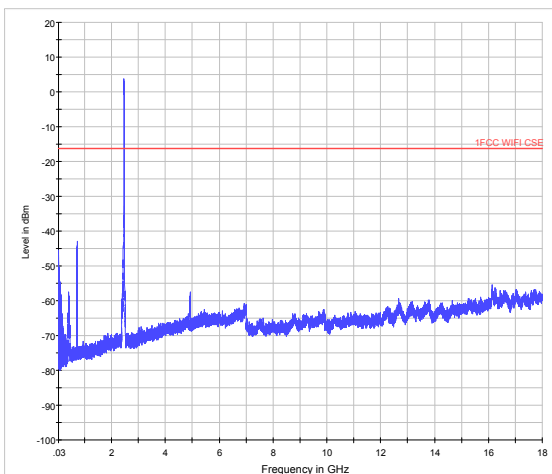
802.11g CH1 18GHz to 26.5GHz



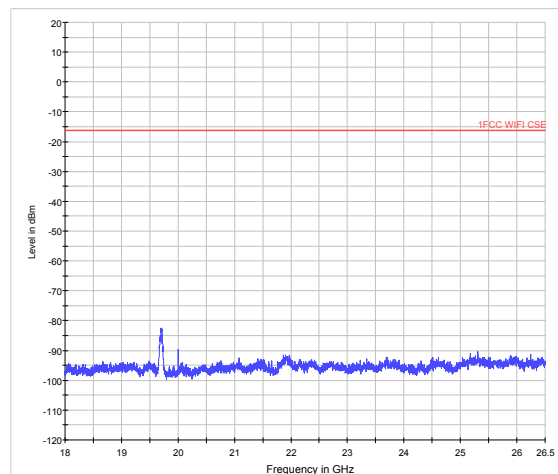
802.11g CH6 30MHz to 18GHz



802.11g CH6 18GHz to 26.5GHz



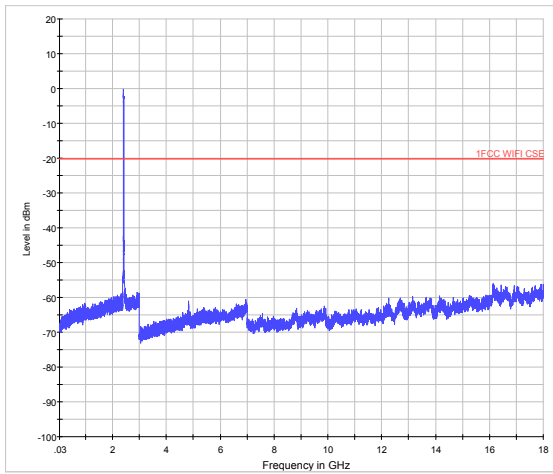
802.11g CH11 30MHz to 18GHz



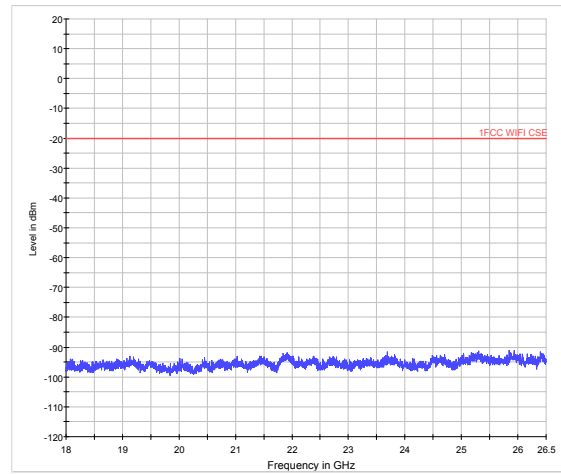
802.11g CH11 18GHz to 26.5GHz



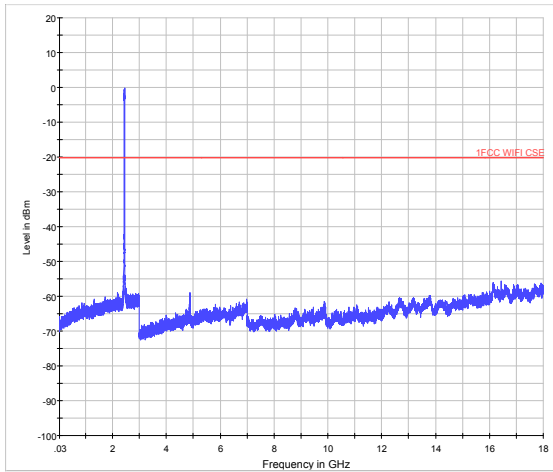
SISO Antenna 2



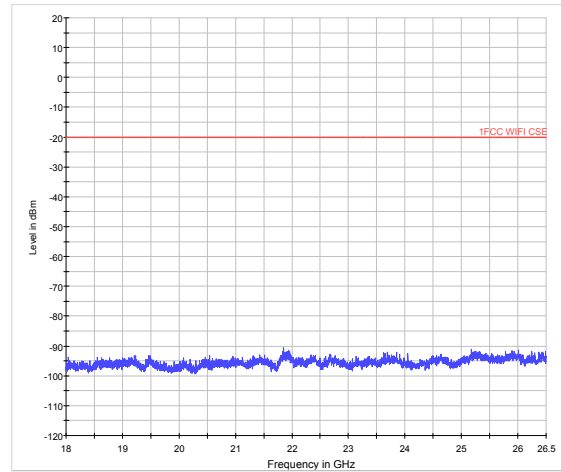
802.11g CH1 30MHz to 18GHz



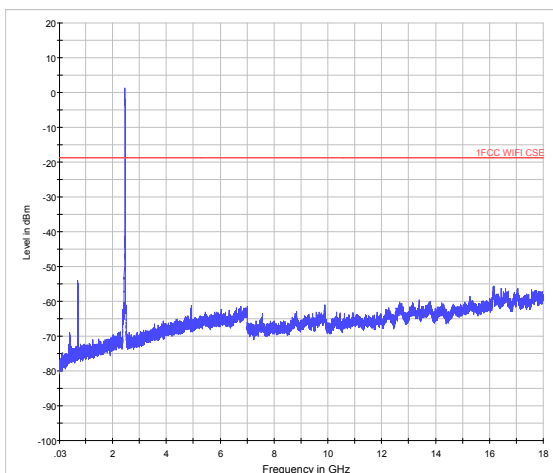
802.11g CH1 18GHz to 26.5GHz



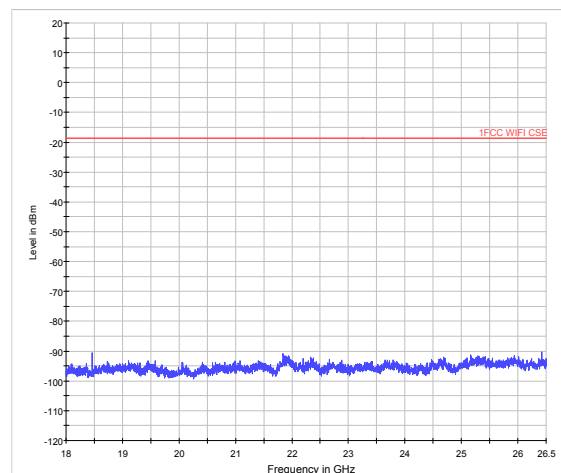
802.11g CH6 30MHz to 18GHz



802.11g CH6 18GHz to 26.5GHz



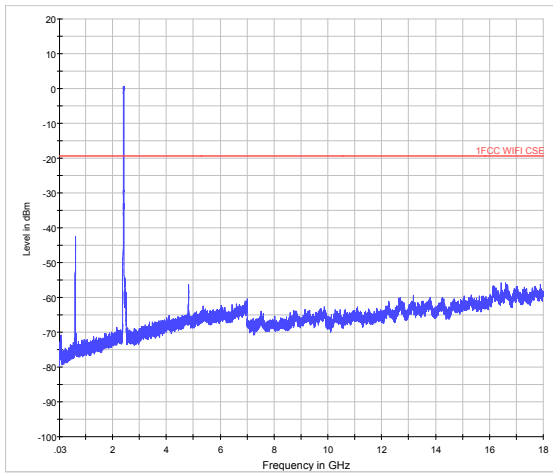
802.11g CH11 30MHz to 18GHz



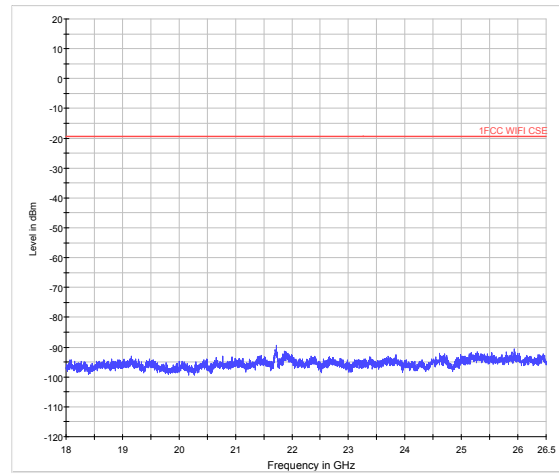
802.11g CH11 18GHz to 26.5GHz



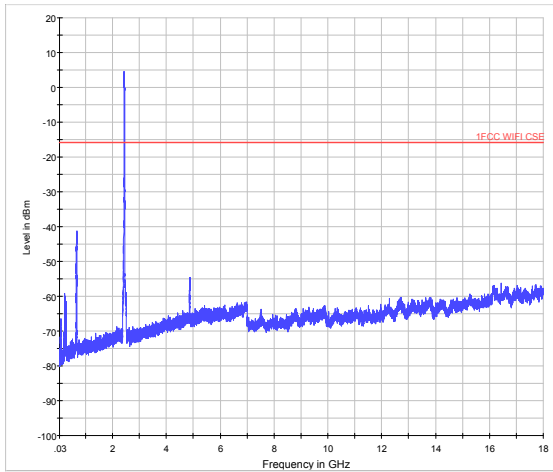
SISO Antenna 3



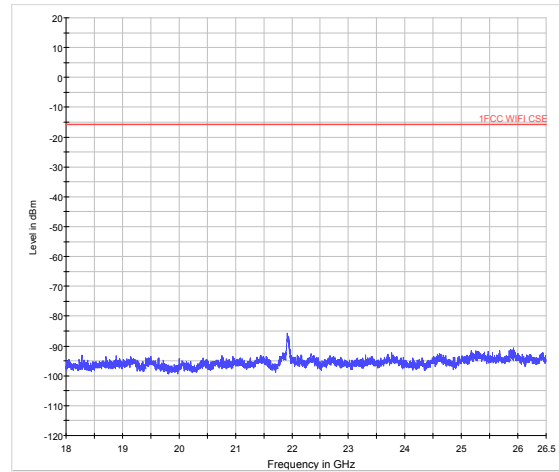
802.11g CH1 30MHz to 18GHz



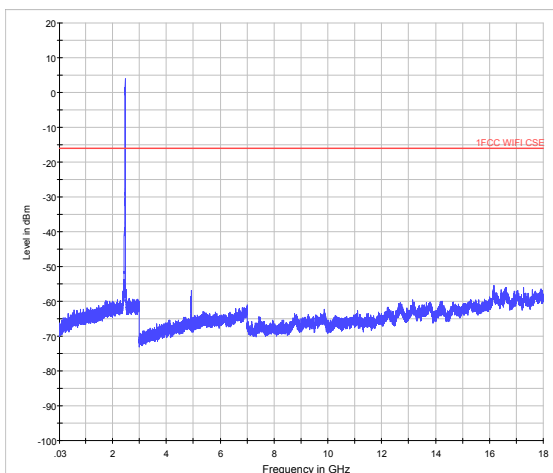
802.11g CH1 18GHz to 26.5GHz



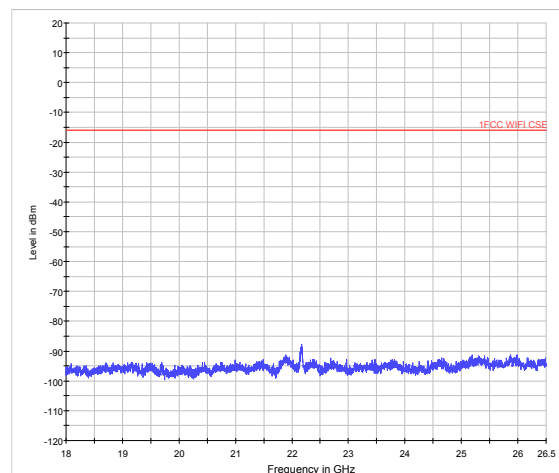
802.11g CH6 30MHz to 18GHz



802.11g CH6 18GHz to 26.5GHz



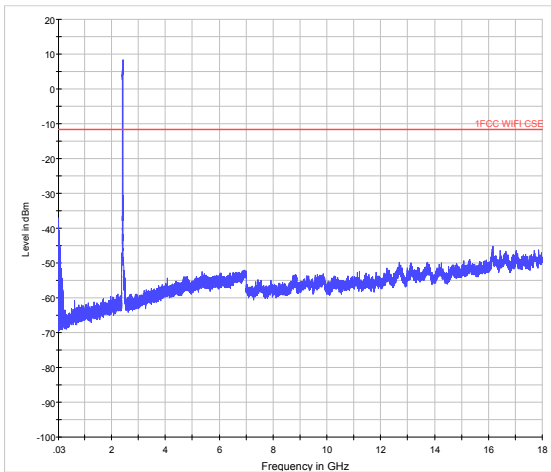
802.11g CH11 30MHz to 18GHz



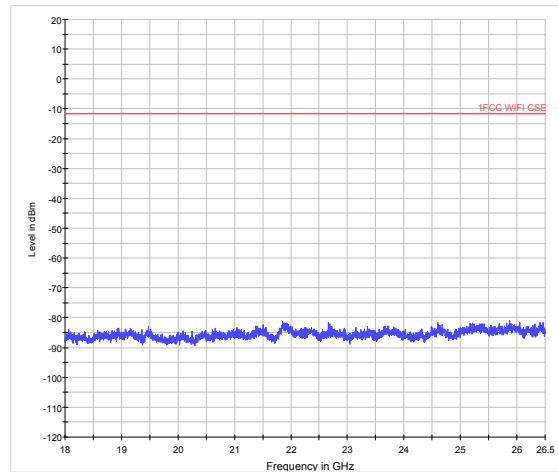
802.11g CH11 18GHz to 26.5GHz



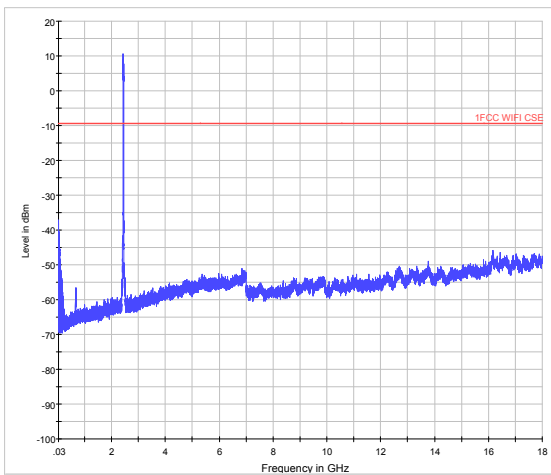
MIMO



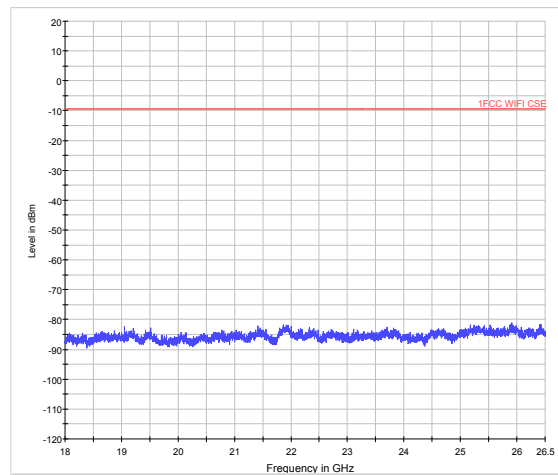
802.11n (HT20) CH1 30MHz to 18GHz



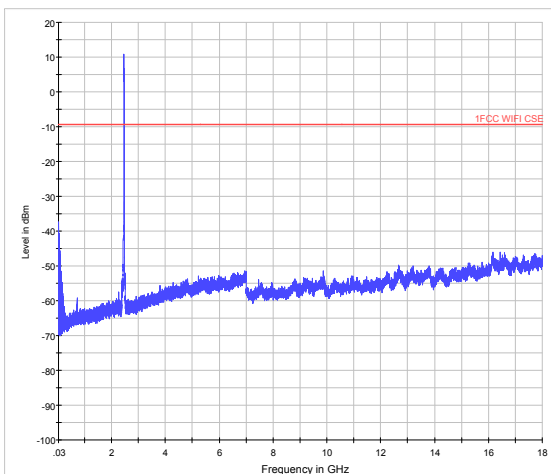
802.11n (HT20) CH1 18GHz to 26.5GHz



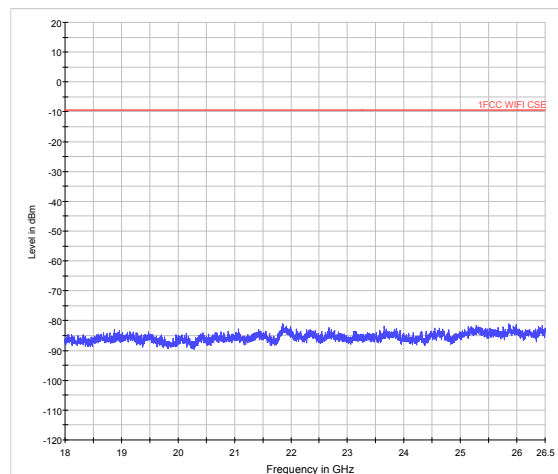
802.11n (HT20) CH6 30MHz to 18GHz



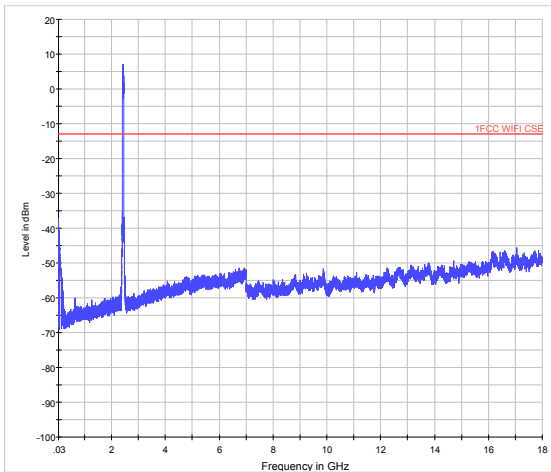
802.11n (HT20) CH6 18GHz to 26.5GHz



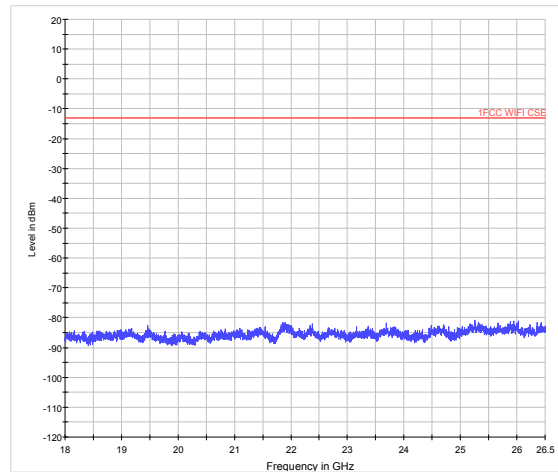
802.11n (HT20) CH11 30MHz to 18GHz



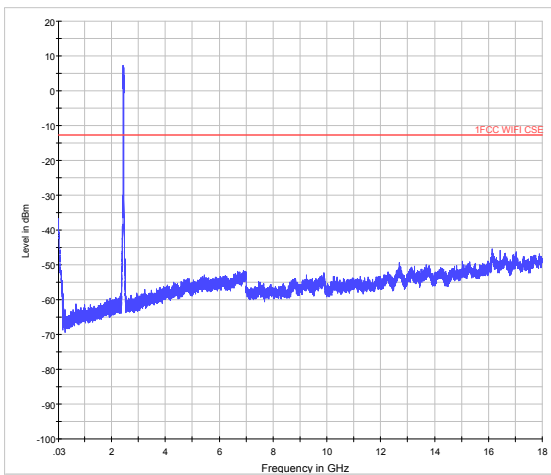
802.11n (HT20) CH11 18GHz to 26.5GHz



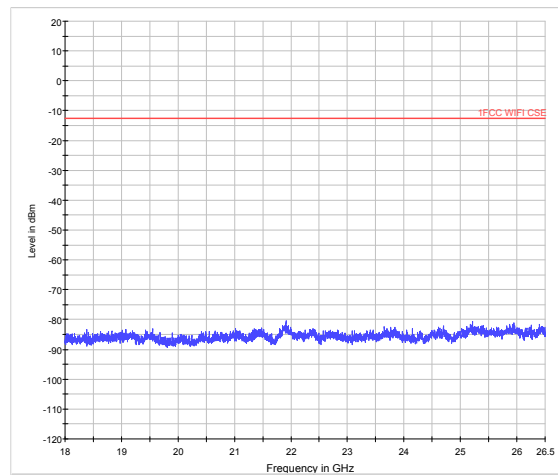
802.11n (HT40) CH3 30MHz to 18GHz



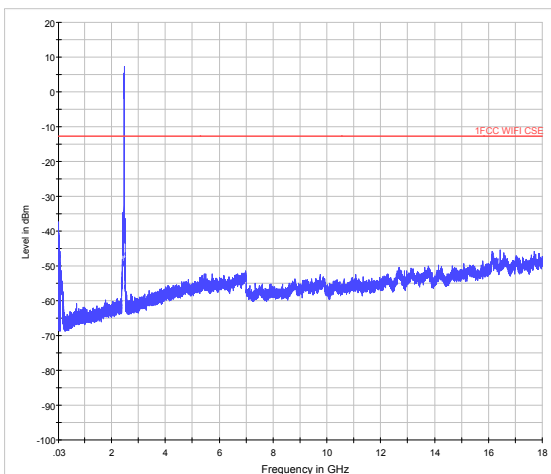
802.11n (HT40) CH3 18GHz to 26.5GHz



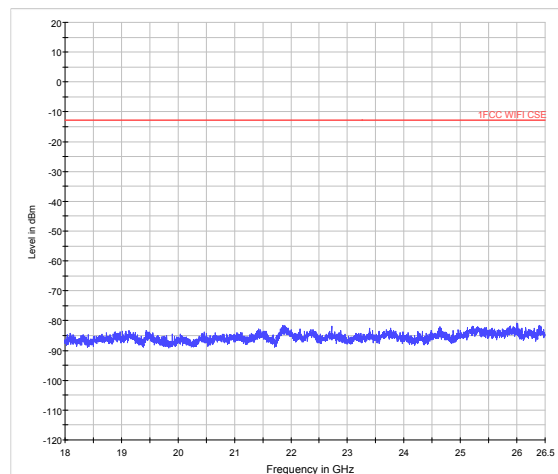
802.11n (HT40) CH6 30MHz to 18GHz



802.11n (HT40) CH6 18GHz to 26.5GHz



802.11n (HT40) CH9 30MHz to 18GHz



802.11n (HT40) CH9 18GHz to 26.5GHz

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:

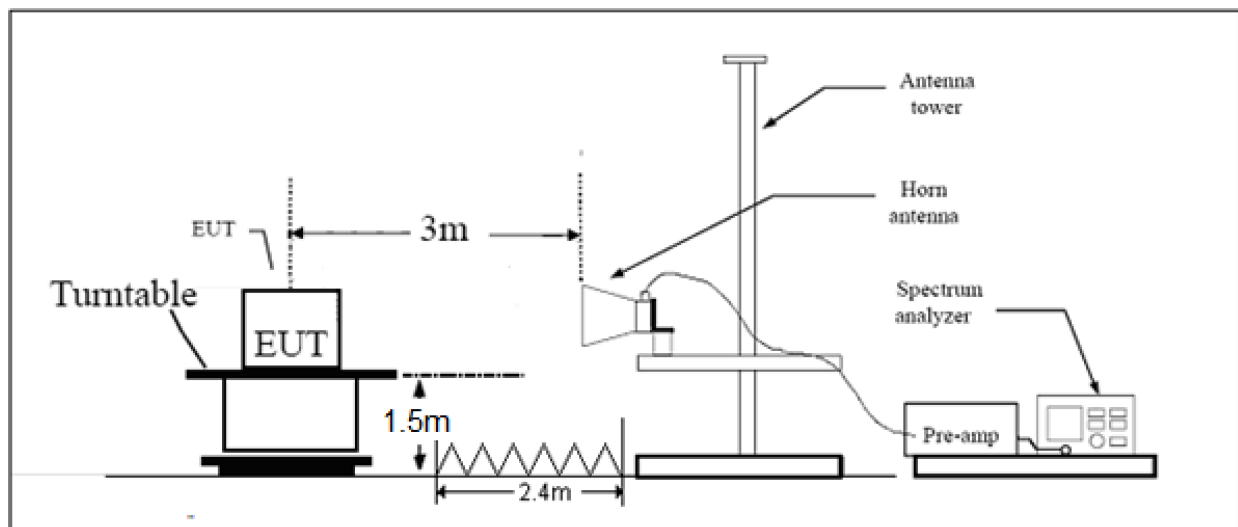
- (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
- (b) AVERAGE: RBW=1MHz / VBW=1MHz / Sweep=AUTO

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

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

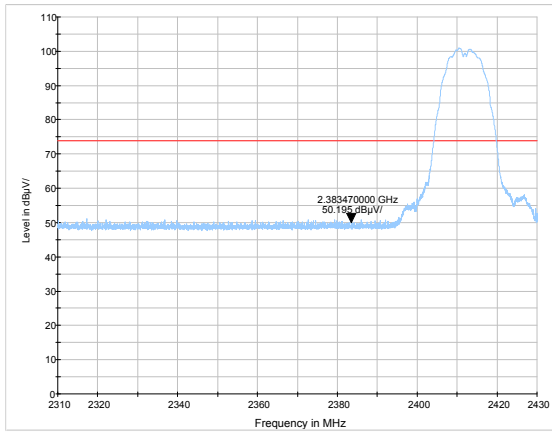
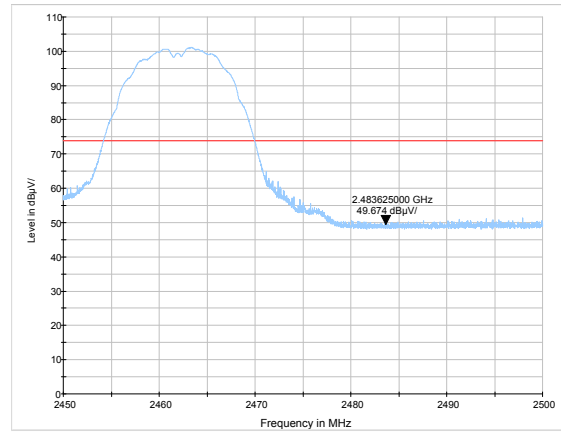
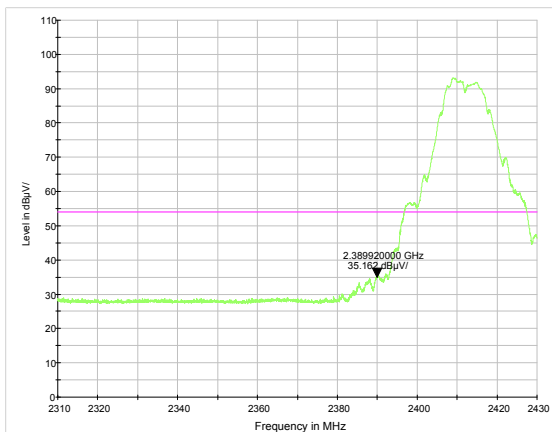
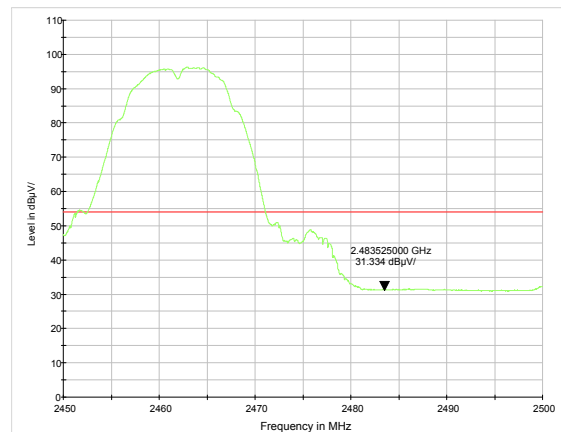
Average Limit=54 dBuV/m

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.

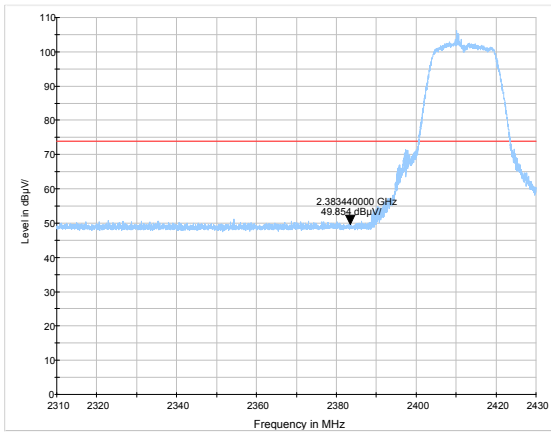
**Test Results:****PASS**

The signal beyond the limit is carrier.

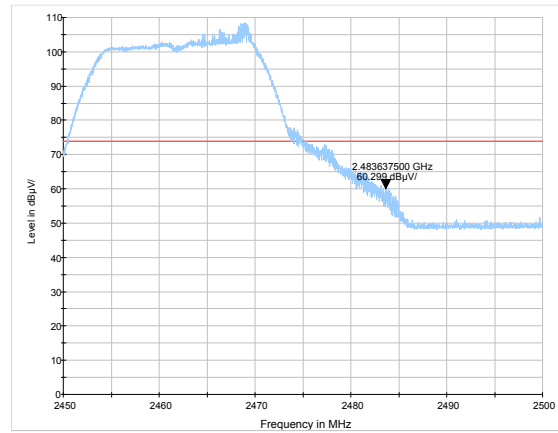
SISO Antenna 1**802.11b-Channel 1: Peak****802.11b-Channel 11: Peak****802.11b-Channel 1: Average****802.11b-Channel 11: Average**



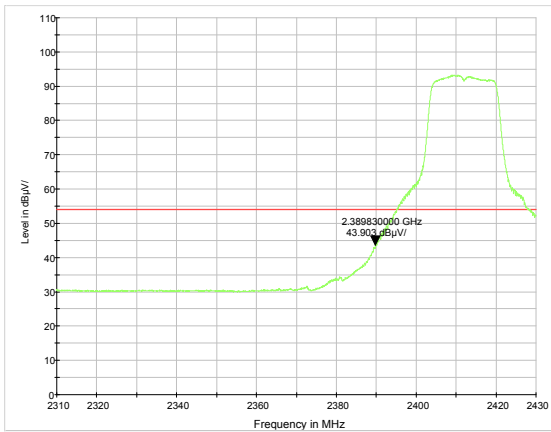
802.11g-Channel 1: Peak



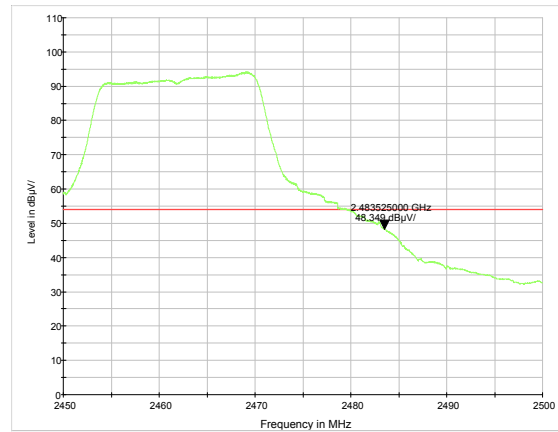
802.11g-Channel 11: Peak



802.11g-Channel 1: Average

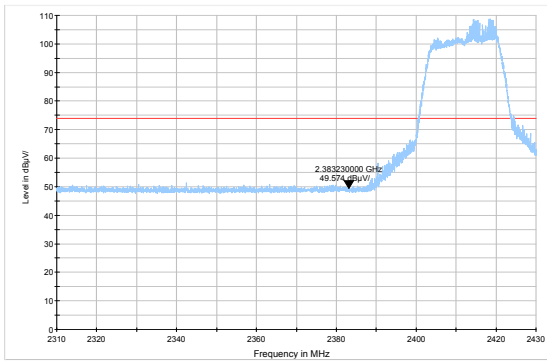


802.11g-Channel 11: Average

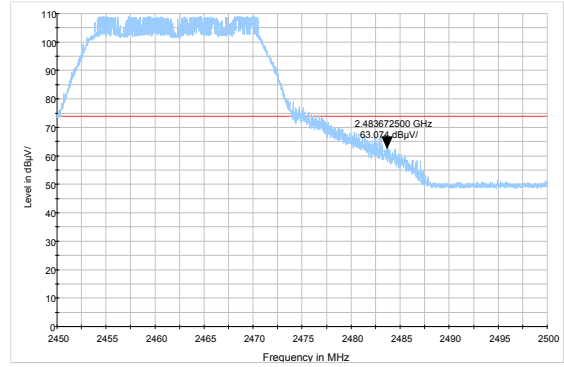


MIMO

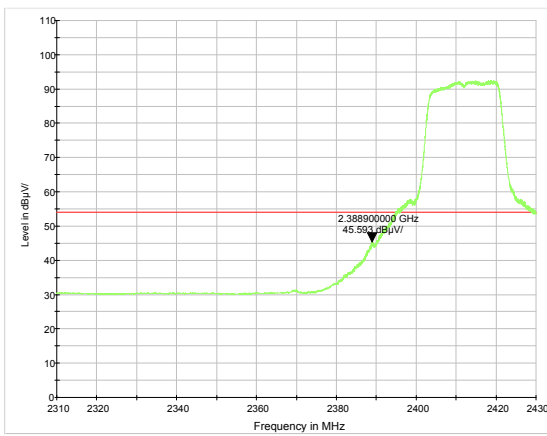
802.11n HT20 -Channel 1: Peak



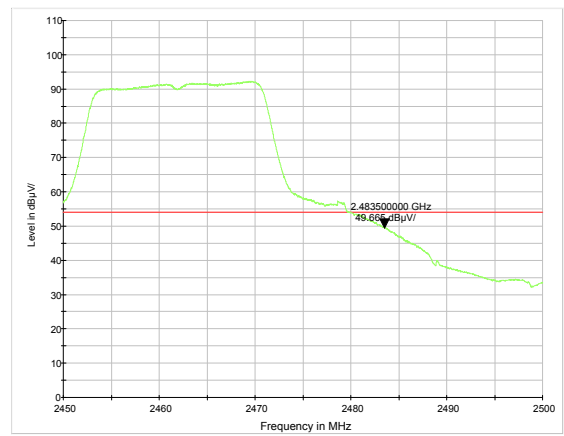
802.11n HT20-Channel 11: Peak



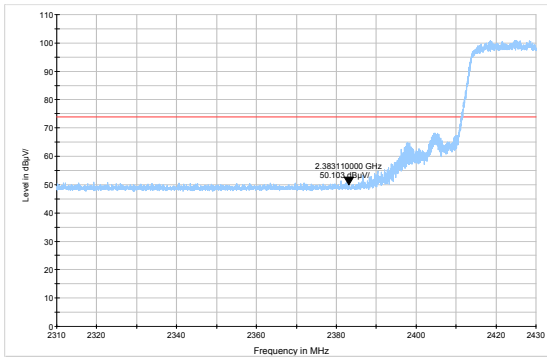
802.11n HT20-Channel 1: Average



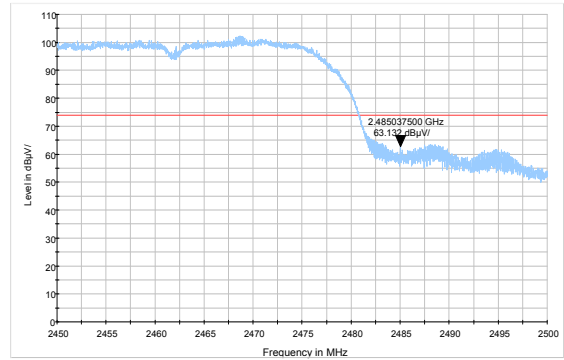
802.11n HT20-Channel 11: Average



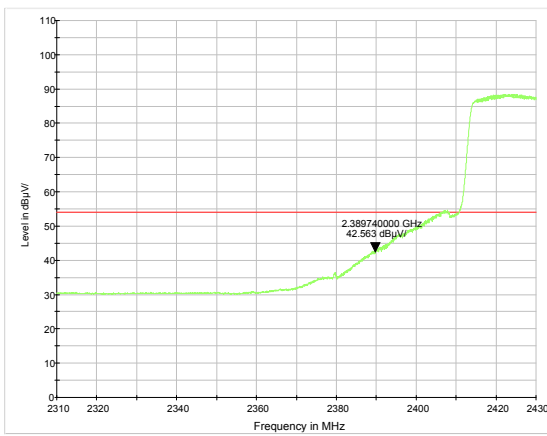
802.11n HT40 -Channel 3: Peak



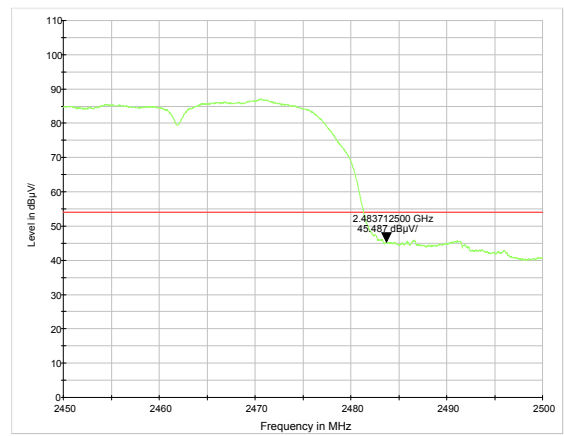
802.11n HT40-Channel 9: Peak



802.11n HT40-Channel 3: Average



802.11n HT40-Channel 9: Average



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

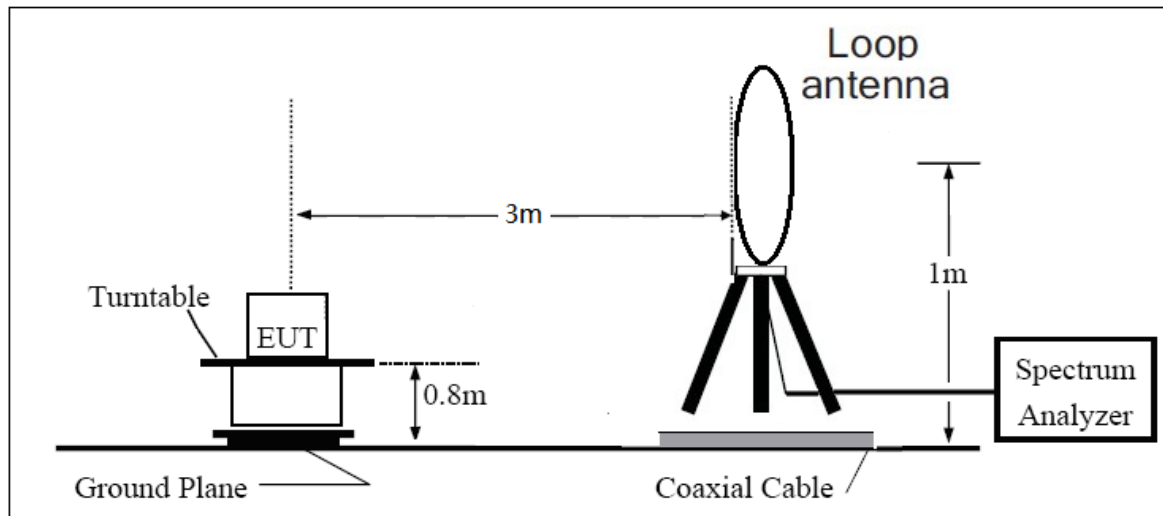
(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

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.

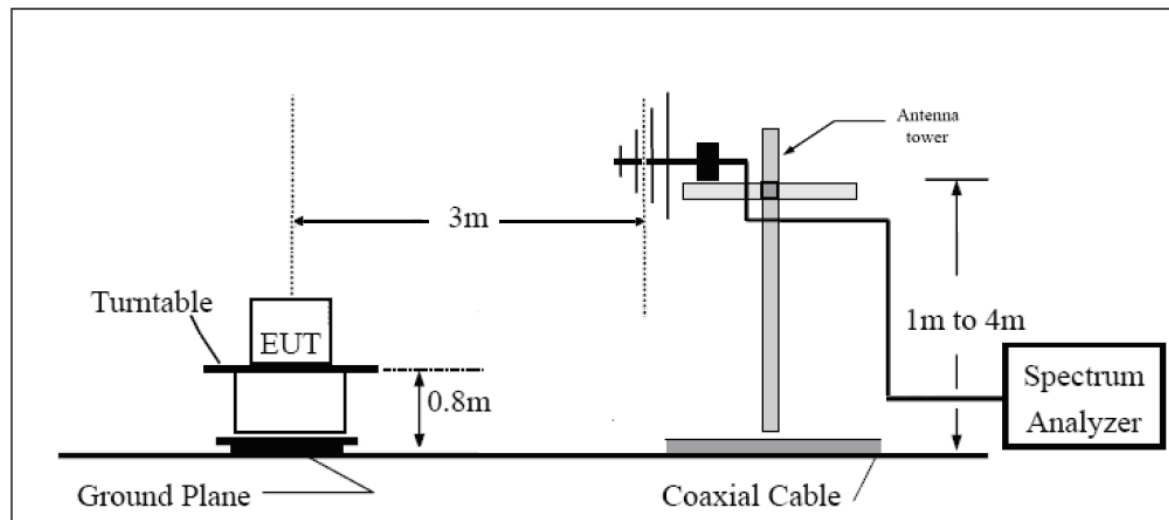
The test is in transmitting mode.

Test setup

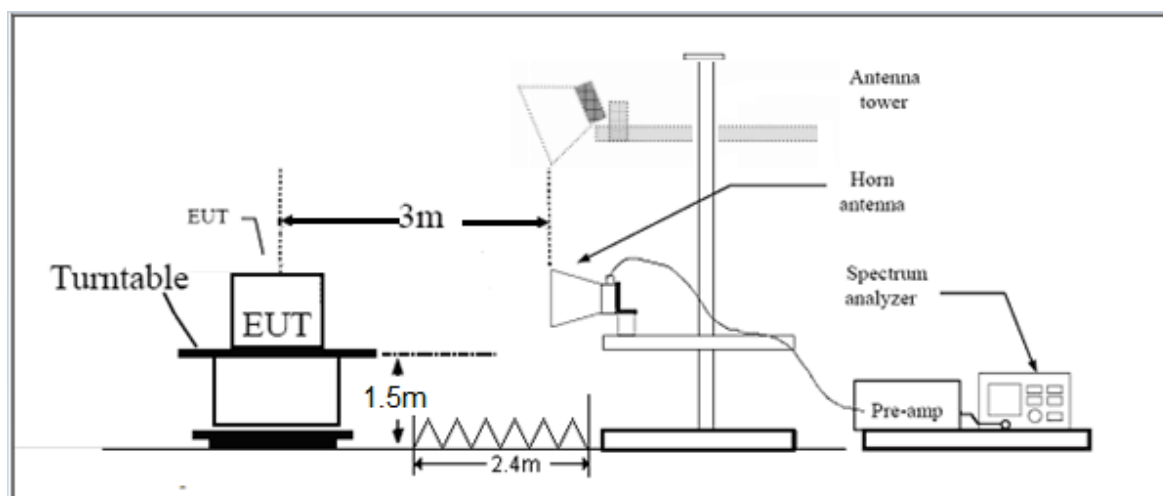
9KHz~~~ 30MHz



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.

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 result

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

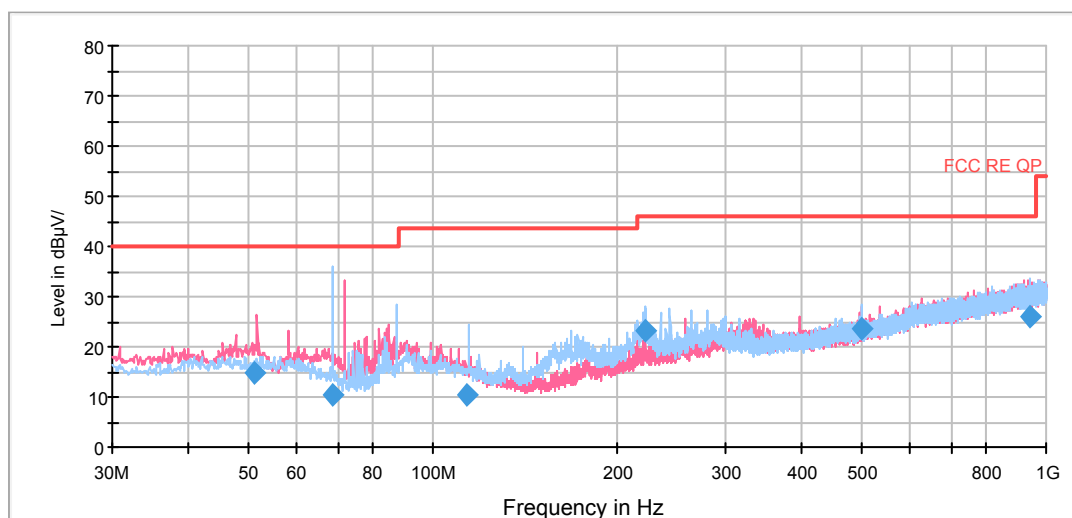
The following graphs display the maximum values of horizontal and vertical by software.

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

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, 802.11b, Channel 6 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)
51.223750	14.6	1.5	100.0	V	0.0	13.1	25.4	40.0
68.678750	10.2	1.1	125.0	H	351.0	9.1	29.8	40.0
113.708750	10.4	-1.4	125.0	H	150.0	11.8	33.1	43.5
221.578750	23.1	10.0	125.0	H	125.0	13.1	22.9	46.0
499.803750	23.5	3.0	100.0	H	13.0	20.5	22.5	46.0
939.011250	25.9	-1.2	114.0	H	4.0	27.1	20.1	46.0

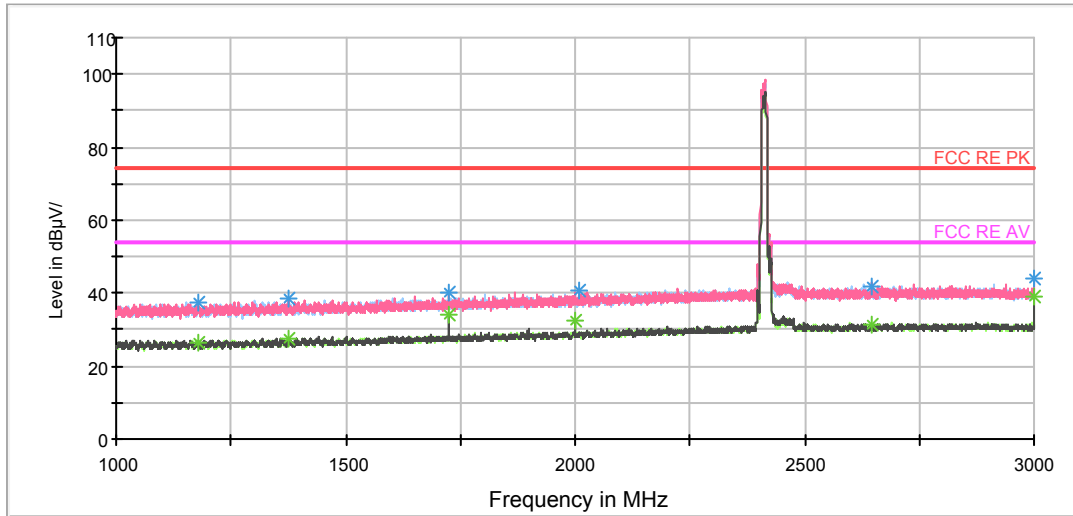
Remark: 1. Quasi-Peak = Reading value + Correction factor

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

3. Margin = Limit – Quasi-Peak

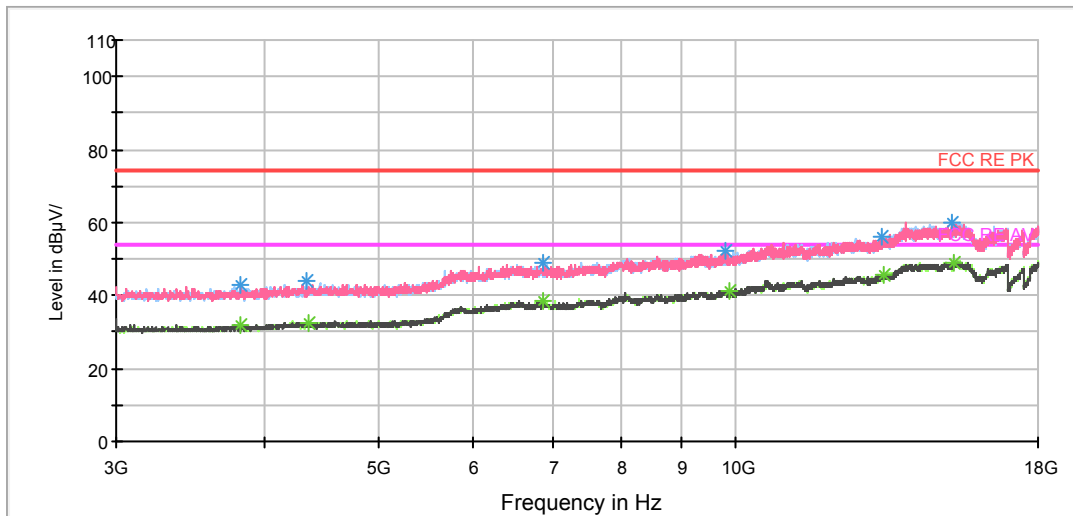
802.11b CH1

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



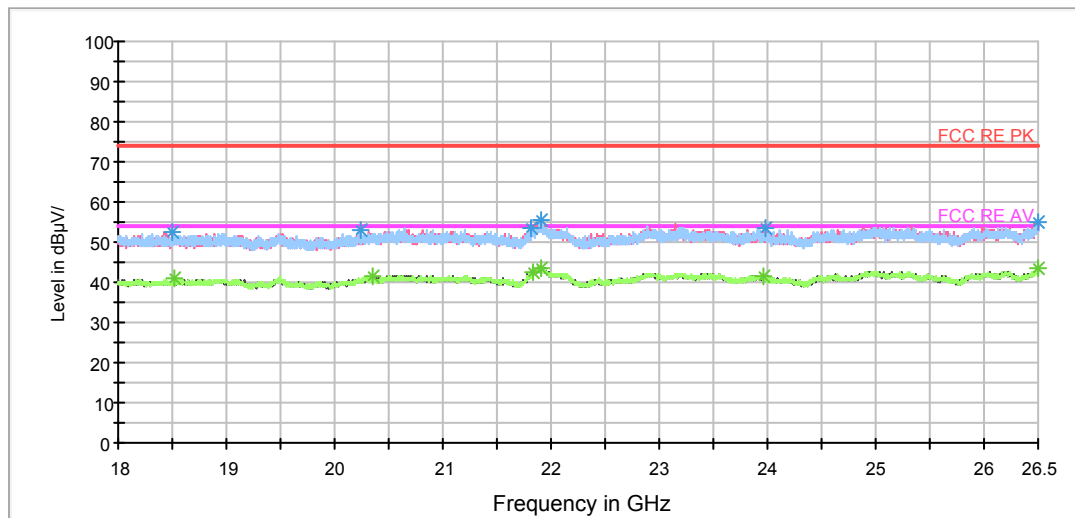
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1178.500000	37.5	100.0	V	123.0	45.9	-8.4	36.5	74
1375.750000	38.3	100.0	V	104.0	45.4	-7.1	35.7	74
1725.250000	40.1	100.0	V	1.0	45.2	-5.1	33.9	74
2008.750000	40.6	100.0	H	283.0	44.0	-3.4	33.4	74
2648.250000	41.8	100.0	V	16.0	42.6	-0.8	32.2	74
3000.000000	44.0	100.0	V	104.0	44.5	-0.5	30.0	74

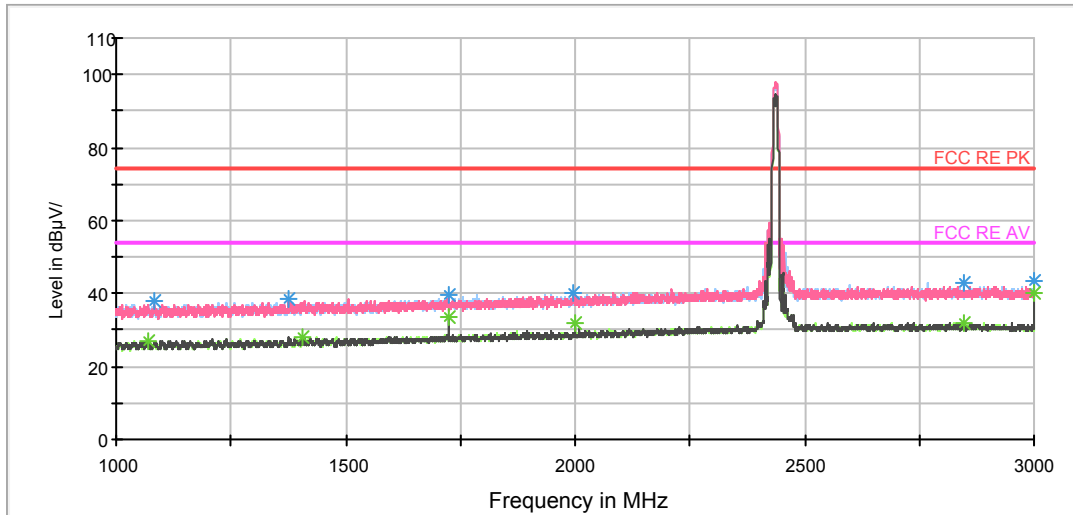
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1178.750000	26.3	100.0	H	0.0	34.7	-8.4	27.7	54
1374.000000	27.2	100.0	H	334.0	34.3	-7.1	26.8	54
1725.000000	34.1	100.0	V	0.0	39.2	-5.1	19.9	54
2000.000000	32.2	100.0	H	153.0	35.8	-3.6	21.8	54
2646.250000	31.3	100.0	H	356.0	32.1	-0.8	22.7	54
3000.000000	39.1	100.0	V	104.0	39.6	-0.5	14.9	54

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

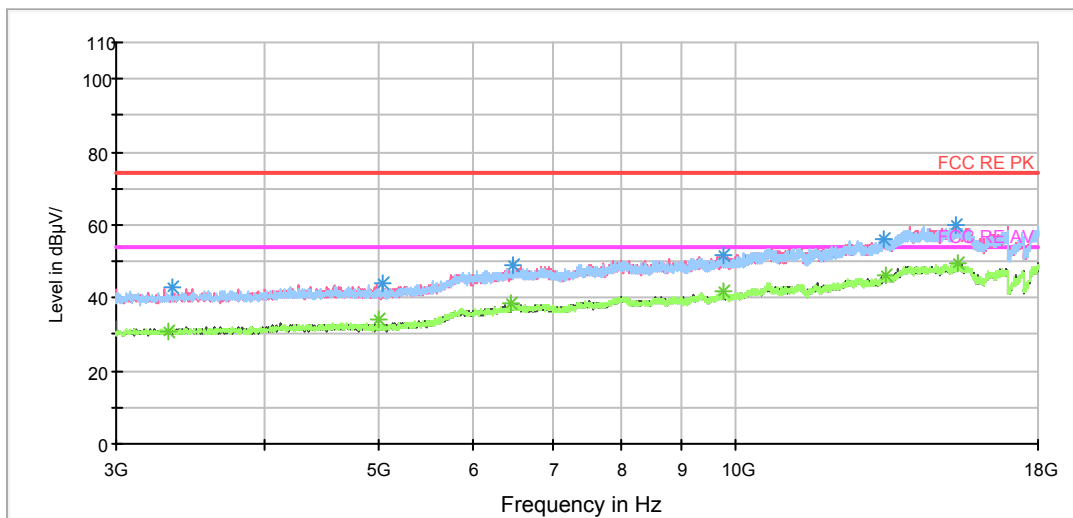
802.11b CH6

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



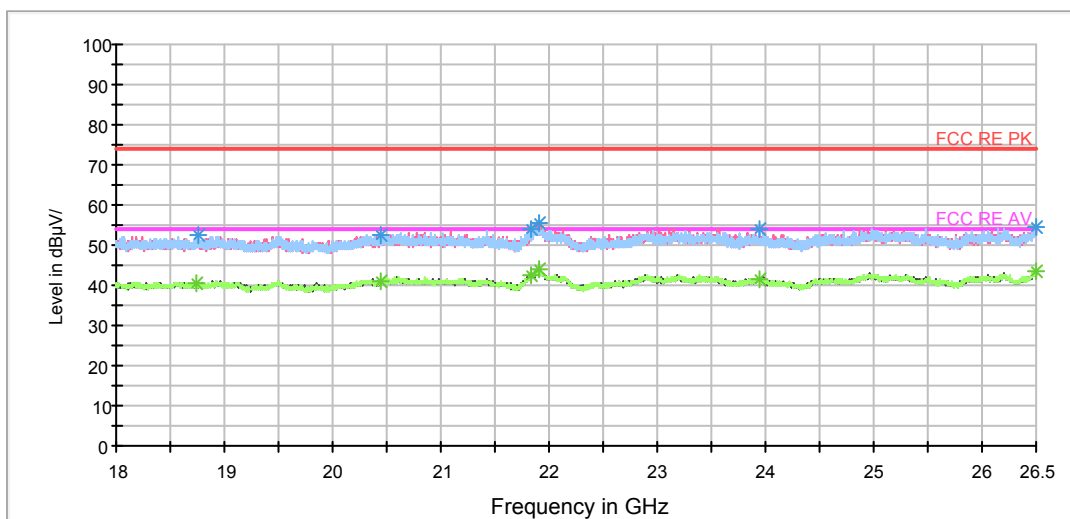
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1083.500000	37.9	100.0	H	112.0	46.7	-8.8	36.1	74
1377.250000	38.4	100.0	V	12.0	45.5	-7.1	35.6	74
1725.000000	39.7	100.0	V	1.0	44.8	-5.1	34.3	74
1997.500000	40.3	100.0	V	22.0	43.9	-3.6	33.7	74
2845.750000	42.9	100.0	H	0.0	43.4	-0.5	31.1	74
3000.000000	43.6	100.0	V	101.0	44.1	-0.5	30.4	74

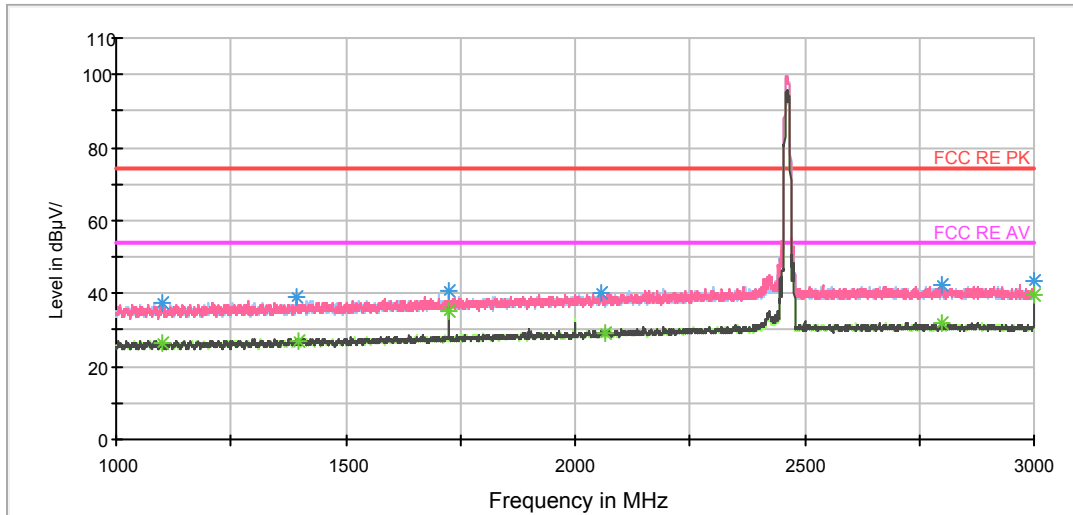
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1071.500000	27.1	100.0	V	0.0	35.9	-8.8	26.9	54
1406.500000	28.0	100.0	V	0.0	34.9	-6.9	26.0	54
1725.250000	33.6	100.0	V	0.0	38.7	-5.1	20.4	54
2000.000000	32.1	100.0	H	181.0	35.7	-3.6	21.9	54
2847.250000	32.0	100.0	V	22.0	32.6	-0.6	22.0	54
3000.000000	40.0	100.0	V	101.0	40.5	-0.5	14.0	54

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

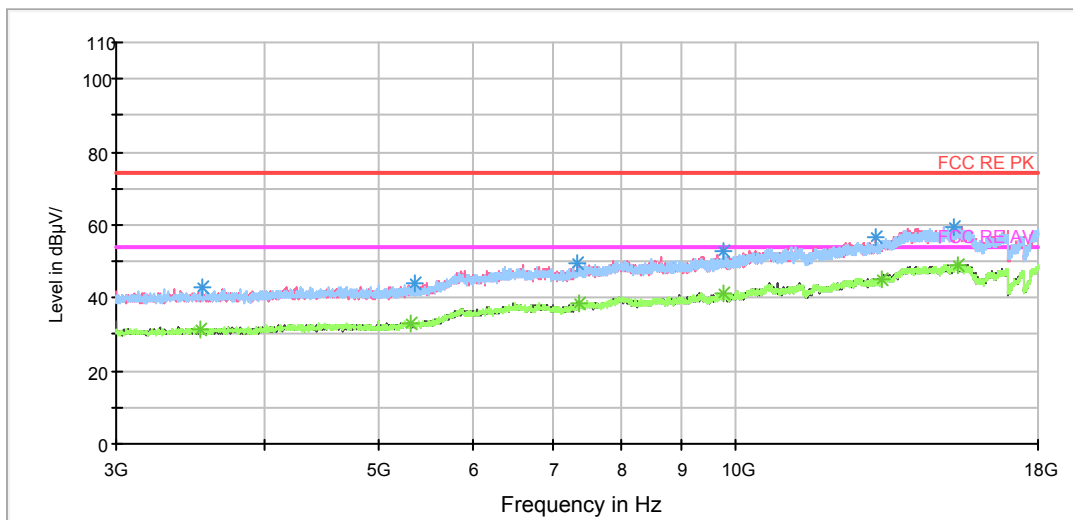
802.11b CH11

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



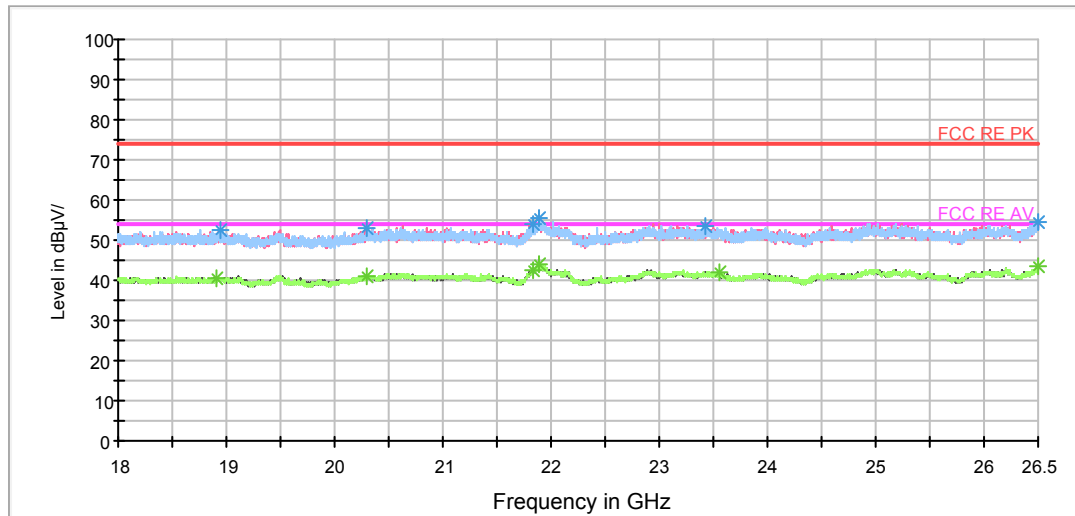
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1101.250000	37.4	100.0	H	60.0	46.1	-8.7	36.6	74
1393.000000	38.9	100.0	V	291.0	45.9	-7.0	35.1	74
1725.250000	40.6	100.0	V	0.0	45.7	-5.1	33.4	74
2058.250000	40.0	100.0	V	280.0	43.1	-3.1	34.0	74
2801.000000	42.6	100.0	V	19.0	43.2	-0.6	31.4	74
2999.750000	43.2	100.0	V	100.0	43.7	-0.5	30.8	74

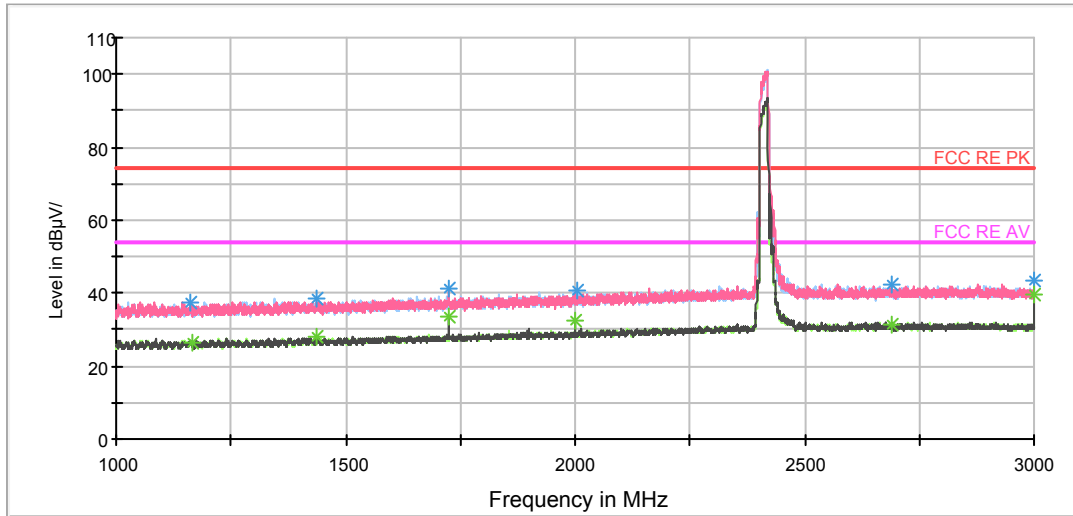
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1100.750000	26.6	100.0	H	135.0	35.3	-8.7	27.4	54
1396.500000	27.2	100.0	V	19.0	34.2	-7.0	26.8	54
1724.500000	35.1	100.0	V	0.0	40.2	-5.1	18.9	54
2063.750000	29.0	100.0	H	358.0	32.0	-3.0	25.0	54
2799.750000	31.8	100.0	V	6.0	32.4	-0.6	22.2	54
3000.000000	39.4	100.0	V	100.0	39.9	-0.5	14.6	54

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

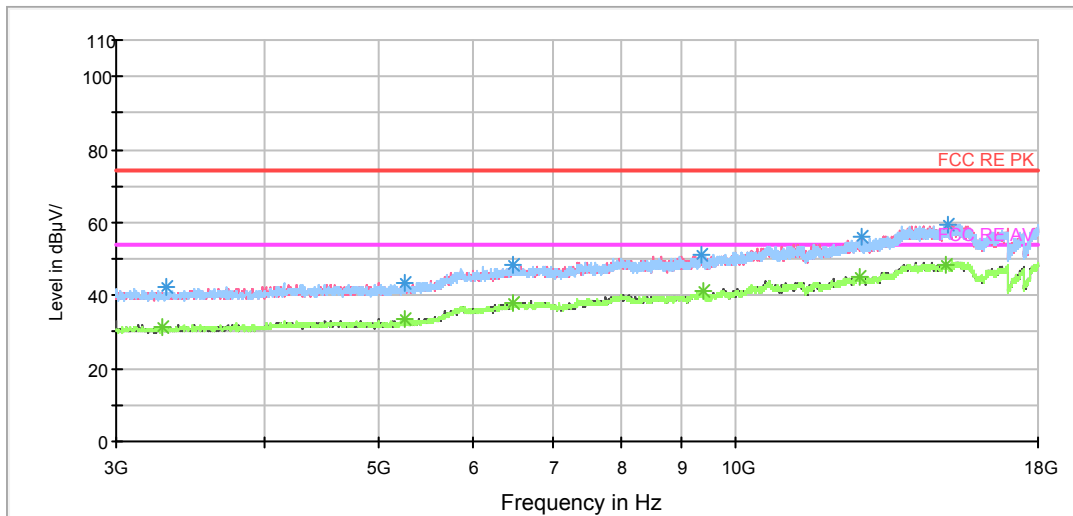
802.11g CH1

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



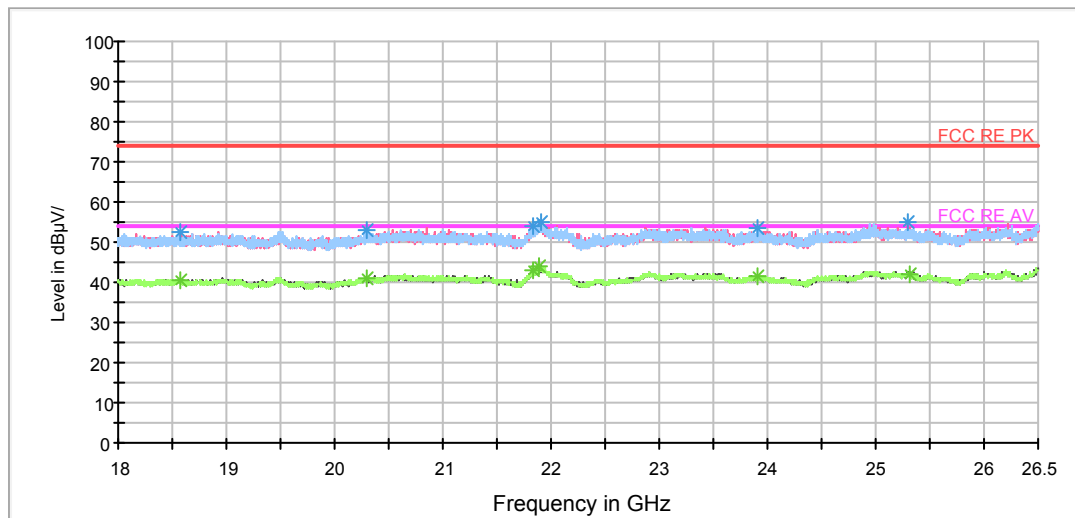
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1163.500000	37.5	100.0	H	148.0	45.9	-8.4	36.5	74
1438.250000	38.6	100.0	H	359.0	45.3	-6.7	35.4	74
1724.750000	41.2	100.0	V	4.0	46.3	-5.1	32.8	74
2005.500000	40.9	100.0	H	359.0	44.4	-3.5	33.1	74
2690.500000	42.4	100.0	V	95.0	43.1	-0.7	31.6	74
3000.000000	43.4	100.0	V	105.0	43.9	-0.5	30.6	74

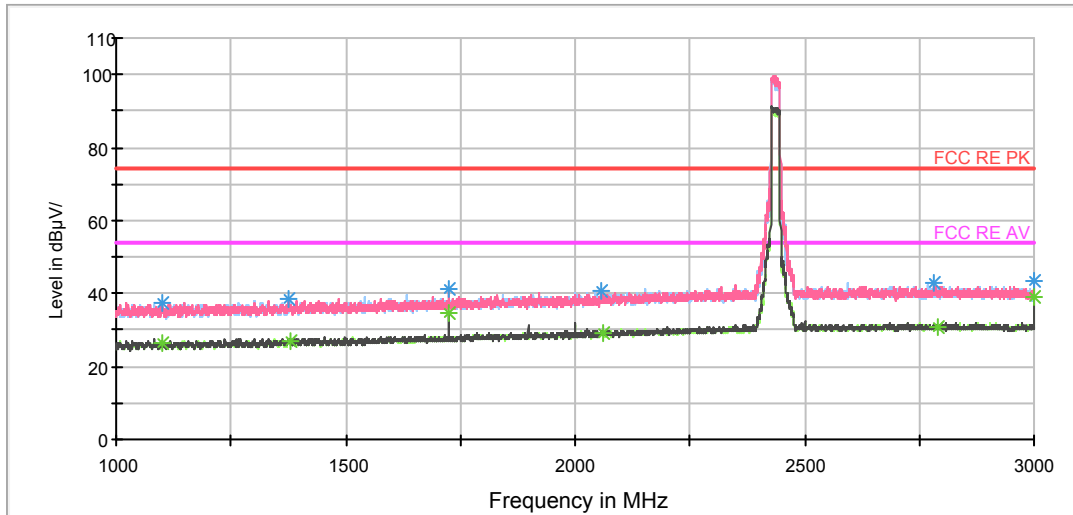
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1164.250000	26.4	100.0	H	304.0	34.8	-8.4	27.6	54
1436.250000	28.2	100.0	V	0.0	35.0	-6.8	25.8	54
1725.000000	33.6	100.0	V	16.0	38.7	-5.1	20.4	54
2000.000000	32.6	100.0	H	158.0	36.2	-3.6	21.4	54
2688.500000	31.5	100.0	H	323.0	32.2	-0.7	22.5	54
3000.000000	39.3	100.0	V	105.0	39.8	-0.5	14.7	54

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

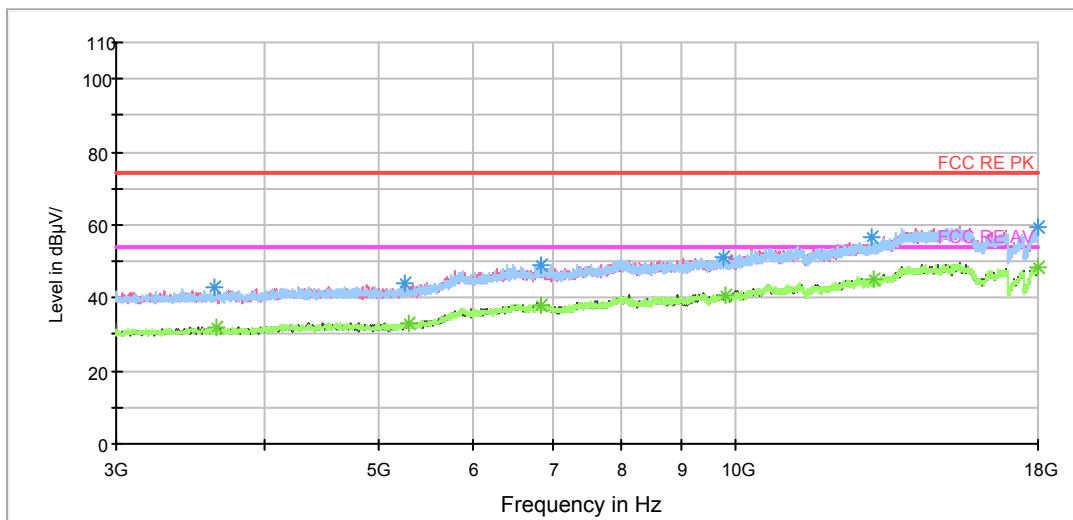
802.11g CH6

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



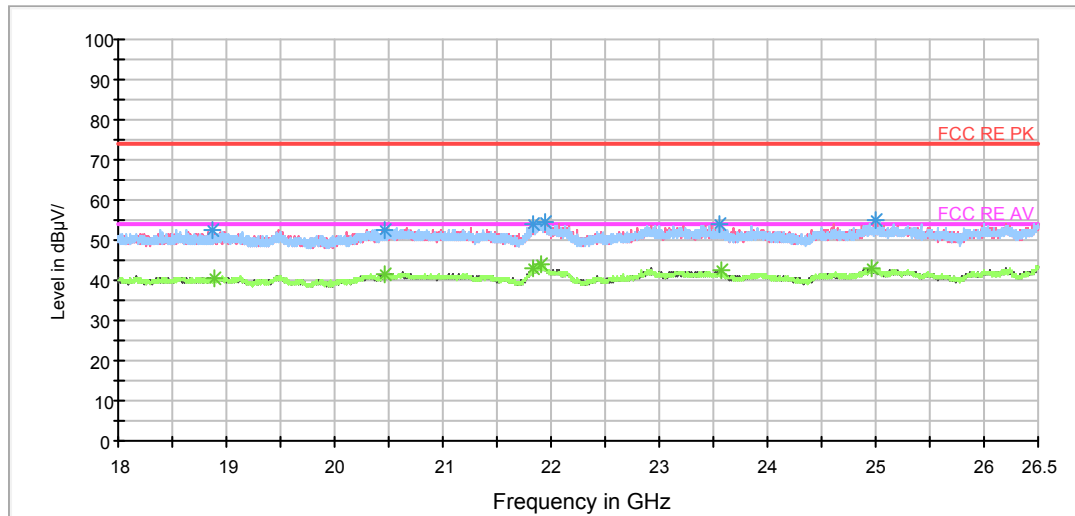
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1099.750000	37.6	100.0	V	34.0	46.3	-8.7	36.4	74
1376.750000	38.5	100.0	V	2.0	45.6	-7.1	35.5	74
1725.250000	41.5	100.0	V	1.0	46.6	-5.1	32.5	74
2054.750000	40.6	100.0	H	292.0	43.7	-3.1	33.4	74
2781.500000	42.7	100.0	V	81.0	43.2	-0.5	31.3	74
2999.750000	43.6	100.0	V	100.0	44.1	-0.5	30.4	74

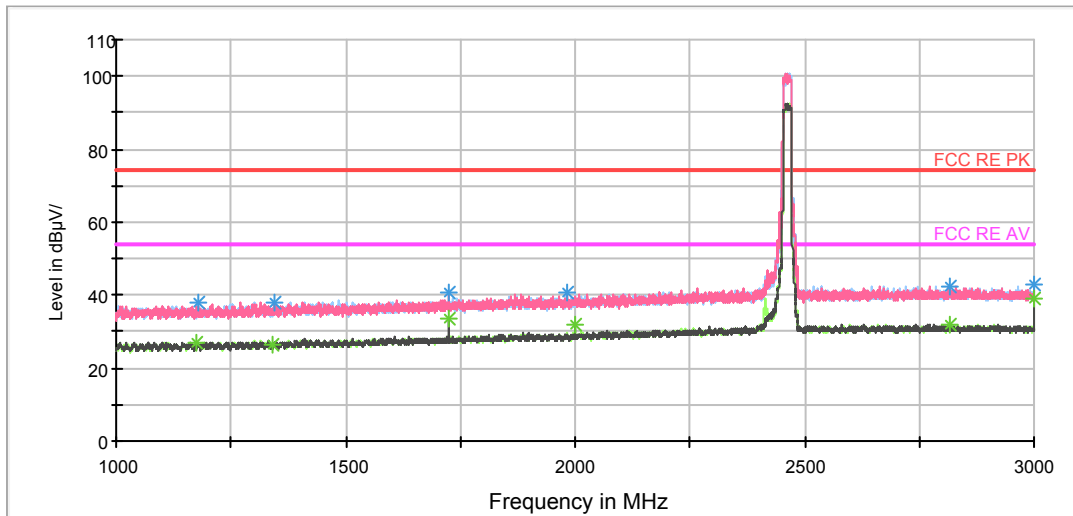
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1098.500000	26.5	100.0	H	320.0	35.3	-8.8	27.5	54
1378.000000	27.0	100.0	H	342.0	34.1	-7.1	27.0	54
1725.000000	34.9	100.0	V	1.0	40.0	-5.1	19.1	54
2061.250000	29.0	100.0	H	178.0	32.0	-3.0	25.0	54
2789.750000	30.8	100.0	H	264.0	31.3	-0.5	23.2	54
3000.000000	39.0	100.0	V	100.0	39.5	-0.5	15.0	54

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

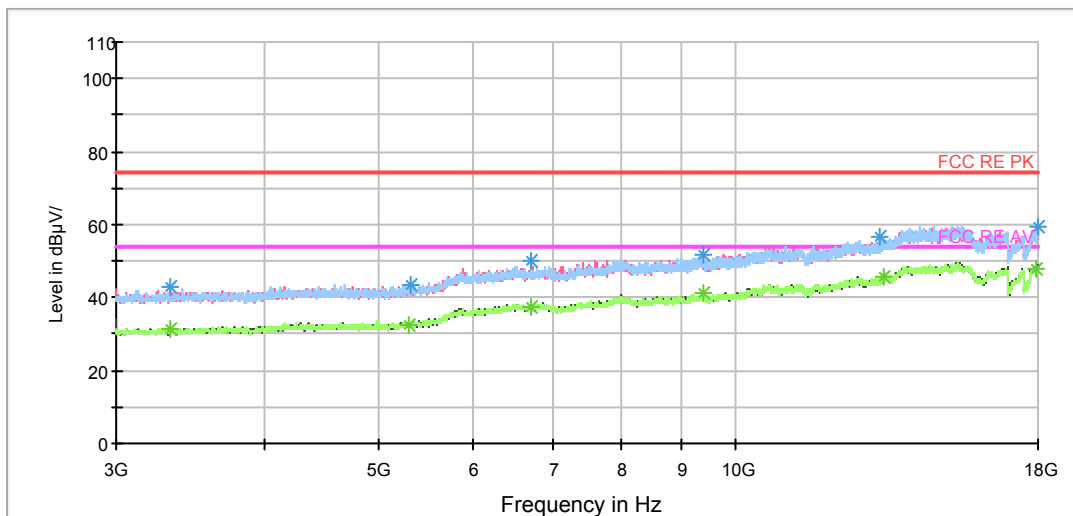
802.11g CH11

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



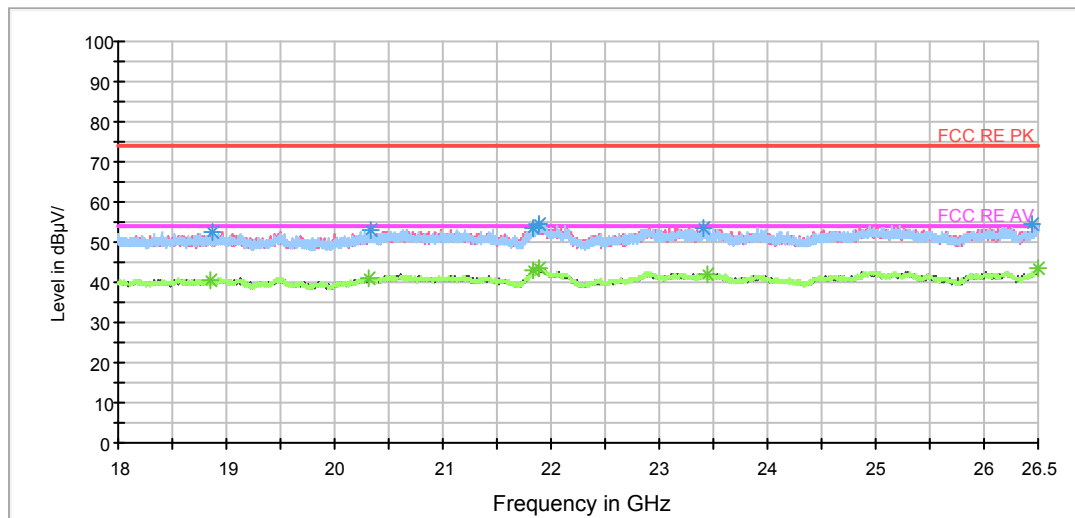
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1177.250000	37.8	100.0	H	319.0	46.2	-8.4	36.2	74
1345.000000	38.1	100.0	V	8.0	45.4	-7.3	35.9	74
1725.250000	40.5	100.0	V	22.0	45.6	-5.1	33.5	74
1981.000000	40.8	100.0	V	253.0	44.4	-3.6	33.2	74
2816.250000	42.6	100.0	V	16.0	43.1	-0.5	31.4	74
3000.000000	43.1	100.0	V	103.0	43.6	-0.5	30.9	74

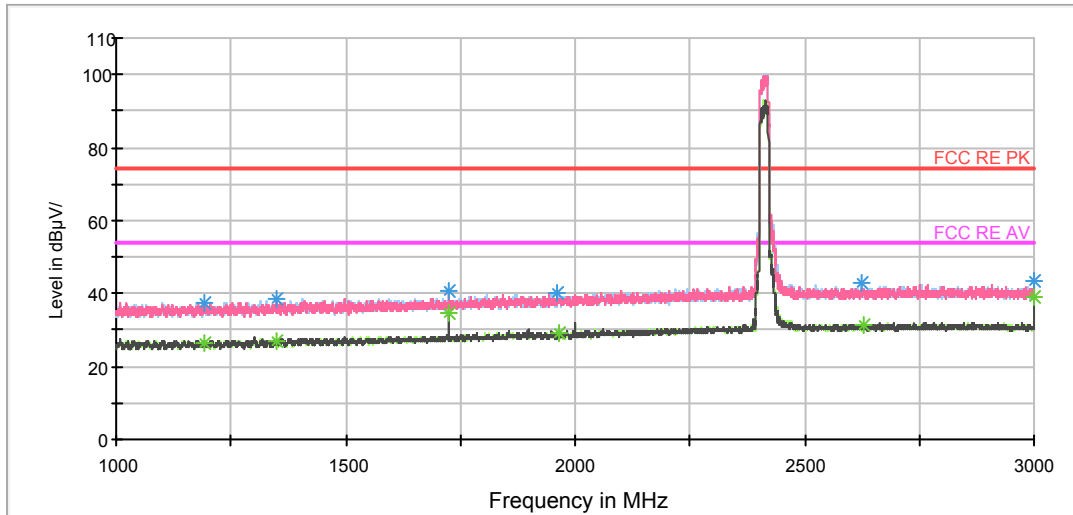
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1175.250000	27.0	100.0	H	253.0	35.4	-8.4	27.0	54
1341.500000	26.2	100.0	H	319.0	33.6	-7.4	27.8	54
1725.000000	33.4	100.0	V	0.0	38.5	-5.1	20.6	54
2000.000000	31.9	100.0	V	113.0	35.5	-3.6	22.1	54
2814.500000	31.6	100.0	V	11.0	32.1	-0.5	22.4	54
3000.000000	39.2	100.0	V	103.0	39.7	-0.5	14.8	54

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

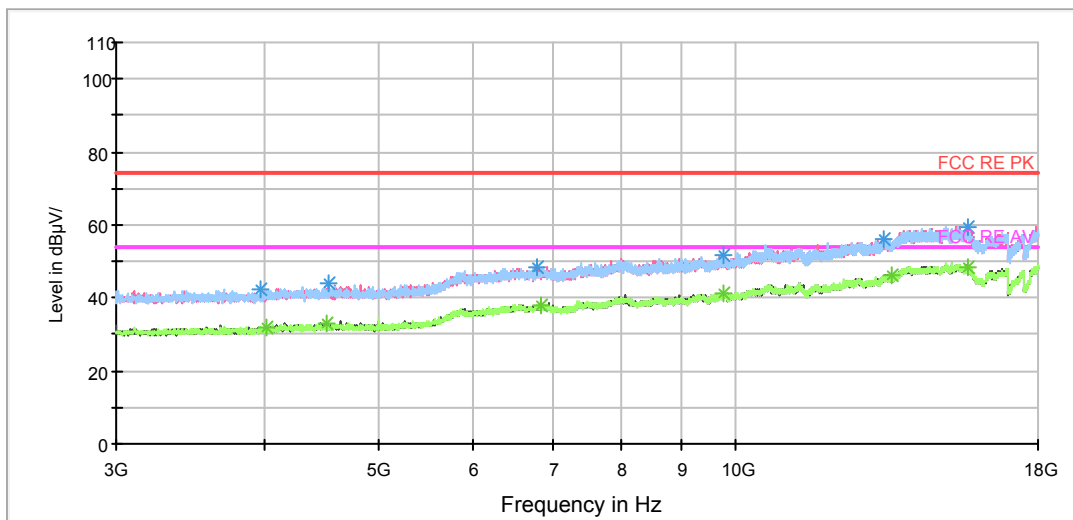
802.11n (HT20) CH1

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



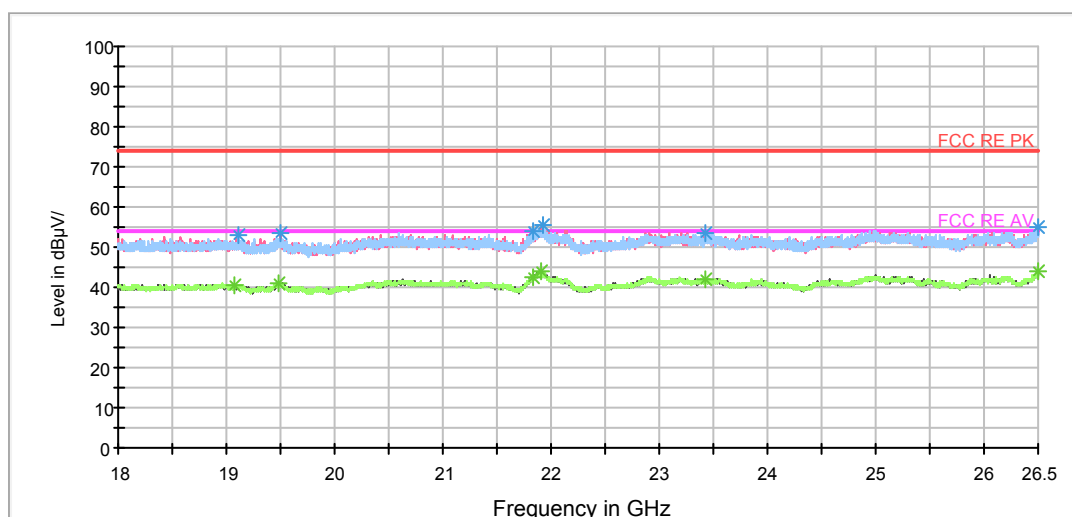
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1193.250000	37.6	100.0	V	18.0	45.9	-8.3	36.4	74
1350.500000	38.5	100.0	H	311.0	45.8	-7.3	35.5	74
1724.750000	40.7	100.0	V	0.0	45.8	-5.1	33.3	74
1961.750000	40.4	100.0	H	226.0	44.1	-3.7	33.6	74
2625.750000	42.6	100.0	H	149.0	43.3	-0.7	31.4	74
3000.000000	43.6	100.0	V	107.0	44.1	-0.5	30.4	74

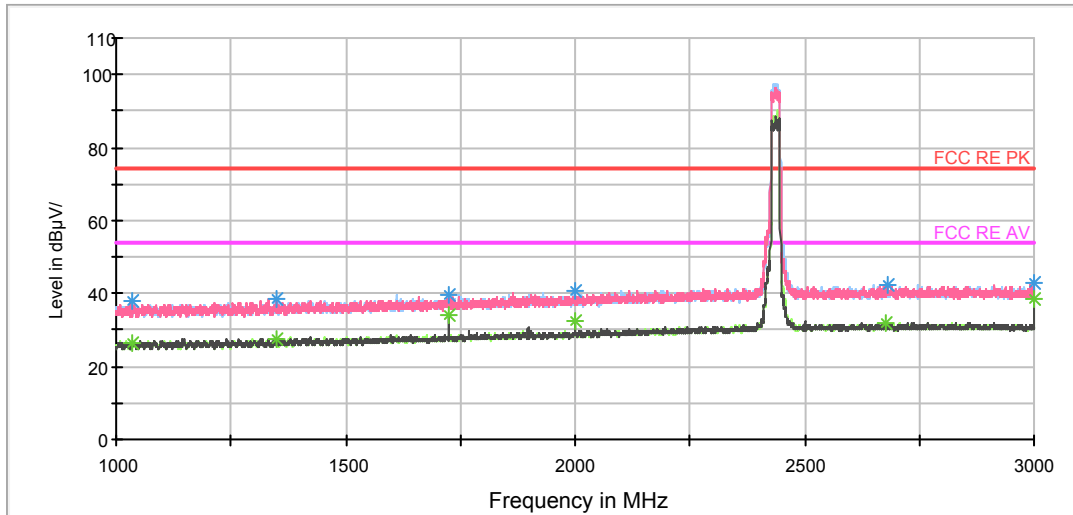
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1192.500000	26.3	100.0	H	357.0	34.6	-8.3	27.7	54
1348.750000	27.2	100.0	V	2.0	34.5	-7.3	26.8	54
1725.000000	34.4	100.0	V	1.0	39.5	-5.1	19.6	54
1964.500000	29.4	100.0	H	139.0	33.1	-3.7	24.6	54
2627.500000	31.4	100.0	V	50.0	32.1	-0.7	22.6	54
3000.000000	39.1	100.0	V	107.0	39.6	-0.5	14.9	54

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

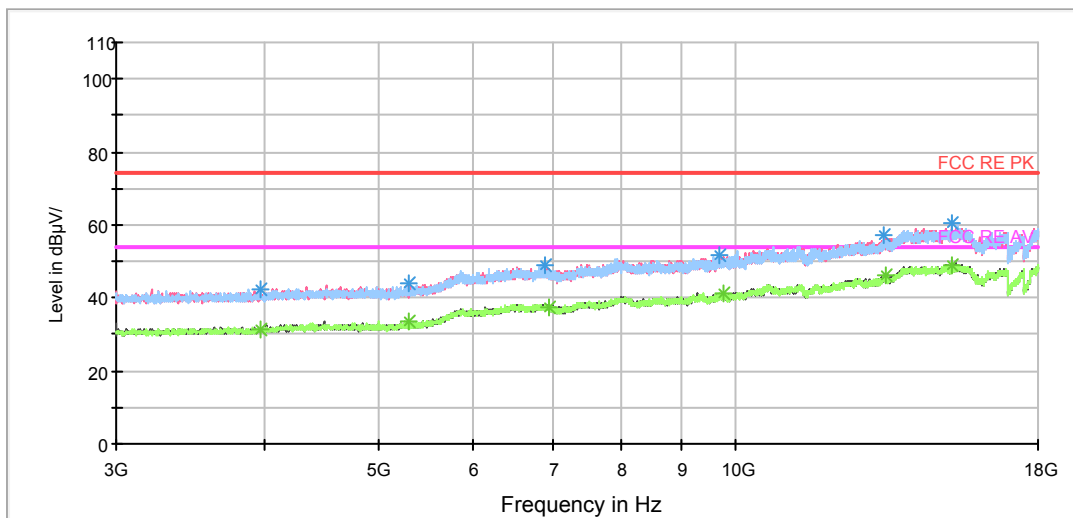
802.11n (HT20) CH6

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



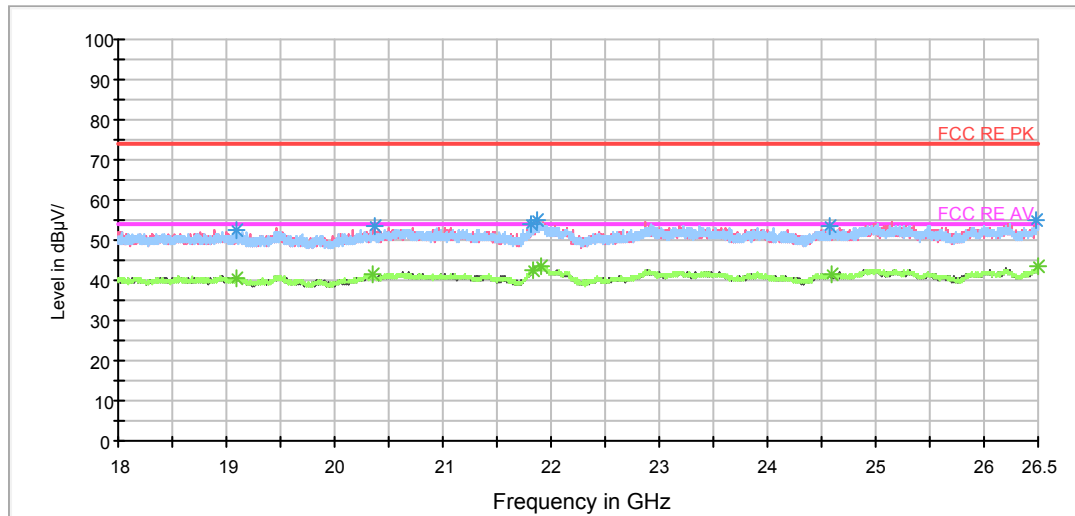
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1037.000000	37.8	100.0	H	229.0	46.9	-9.1	36.2	74
1348.000000	38.6	100.0	V	11.0	45.9	-7.3	35.4	74
1724.750000	39.7	100.0	V	4.0	44.8	-5.1	34.3	74
1999.750000	40.6	100.0	H	339.0	44.2	-3.6	33.4	74
2680.500000	42.2	100.0	H	0.0	42.8	-0.6	31.8	74
3000.000000	43.0	100.0	V	97.0	43.5	-0.5	31.0	74

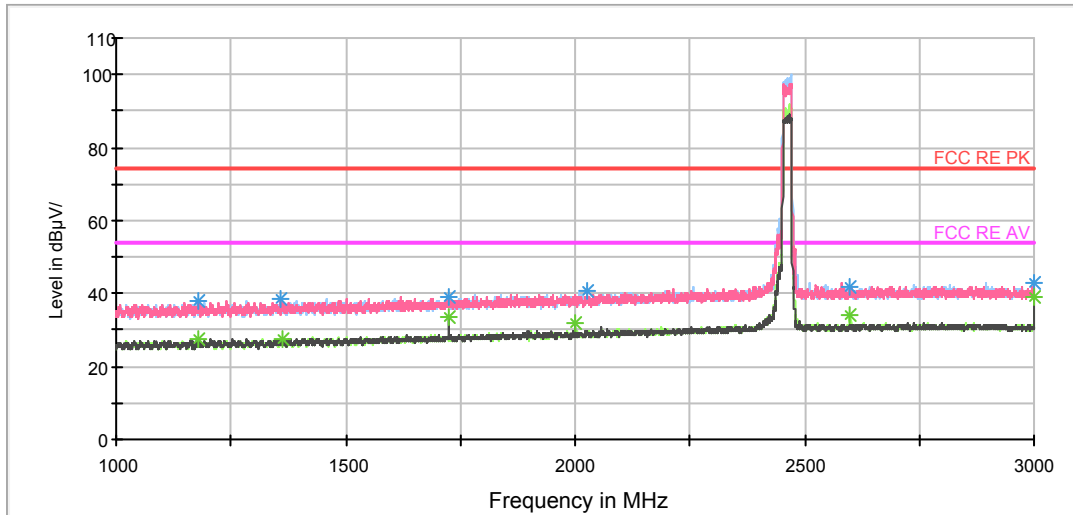
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1035.750000	26.6	100.0	H	345.0	35.7	-9.1	27.4	54
1348.750000	27.2	100.0	V	0.0	34.5	-7.3	26.8	54
1725.000000	34.1	100.0	V	352.0	39.2	-5.1	19.9	54
2000.000000	32.4	100.0	V	107.0	36.0	-3.6	21.6	54
2678.500000	31.7	100.0	H	286.0	32.3	-0.6	22.3	54
3000.000000	38.5	100.0	V	97.0	39.0	-0.5	15.5	54

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

802.11n (HT20) CH11

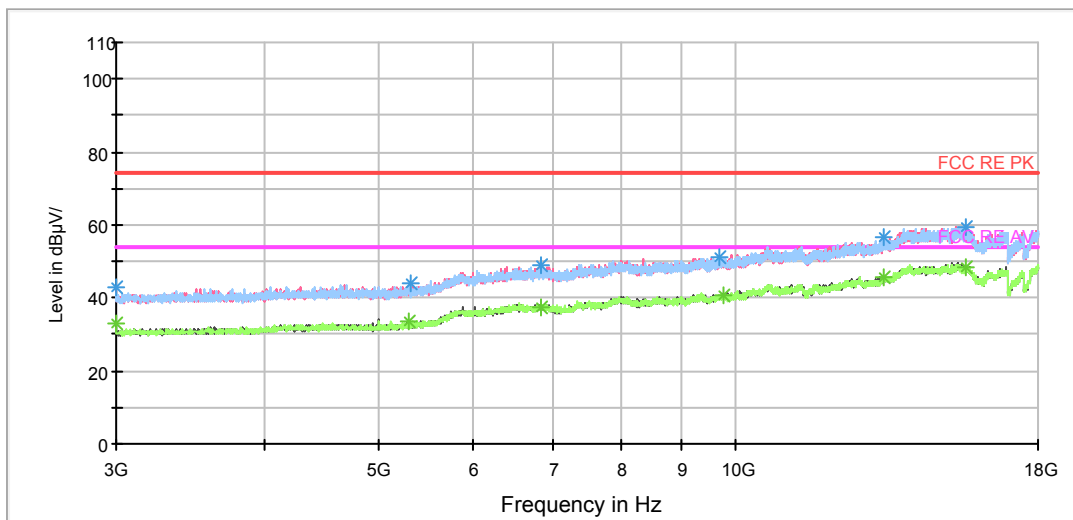
FCC RE 1G-18GHz PK+AV Class B



Note: The signal beyond the limit is carrier.

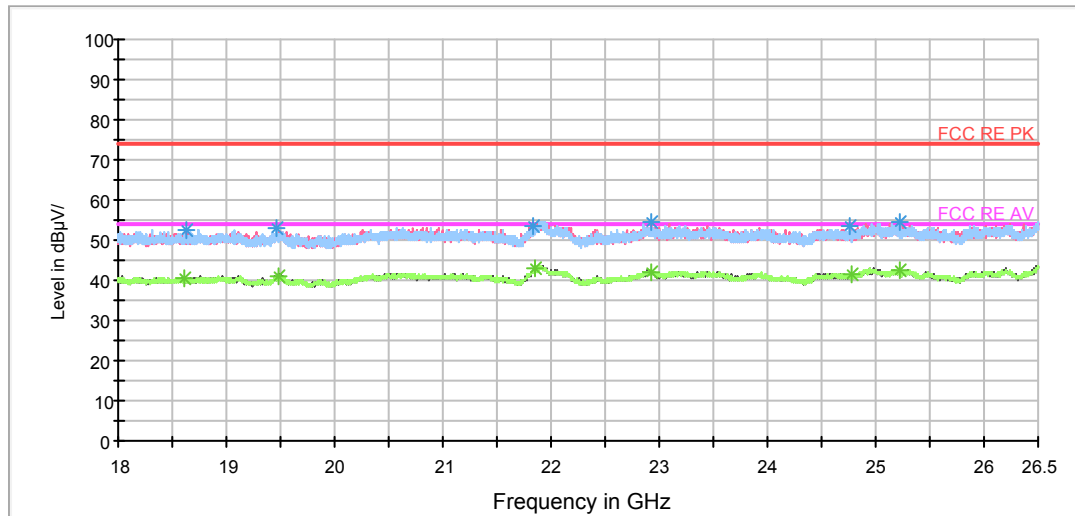
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1177.250000	37.8	100.0	V	0.0	46.2	-8.4	36.2	74
1359.500000	38.3	100.0	H	261.0	45.5	-7.2	35.7	74
1724.750000	39.3	100.0	V	25.0	44.4	-5.1	34.7	74
2026.250000	40.4	100.0	V	13.0	43.8	-3.4	33.6	74
2600.000000	42.1	100.0	H	351.0	42.9	-0.8	31.9	74
3000.000000	43.1	100.0	V	97.0	43.6	-0.5	30.9	74

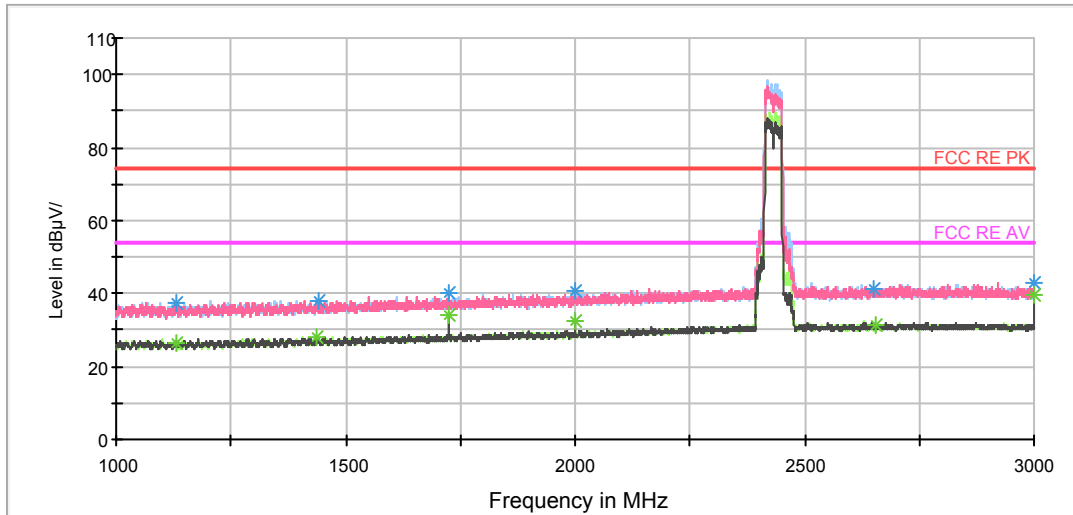
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1181.000000	27.3	100.0	V	222.0	35.7	-8.4	26.7	54
1361.250000	27.3	100.0	H	95.0	34.5	-7.2	26.7	54
1724.750000	33.4	100.0	V	25.0	38.5	-5.1	20.6	54
2000.250000	31.8	100.0	V	2.0	35.3	-3.5	22.2	54
2599.750000	34.2	100.0	H	351.0	35.0	-0.8	19.8	54
3000.000000	38.9	100.0	V	97.0	39.4	-0.5	15.1	54

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

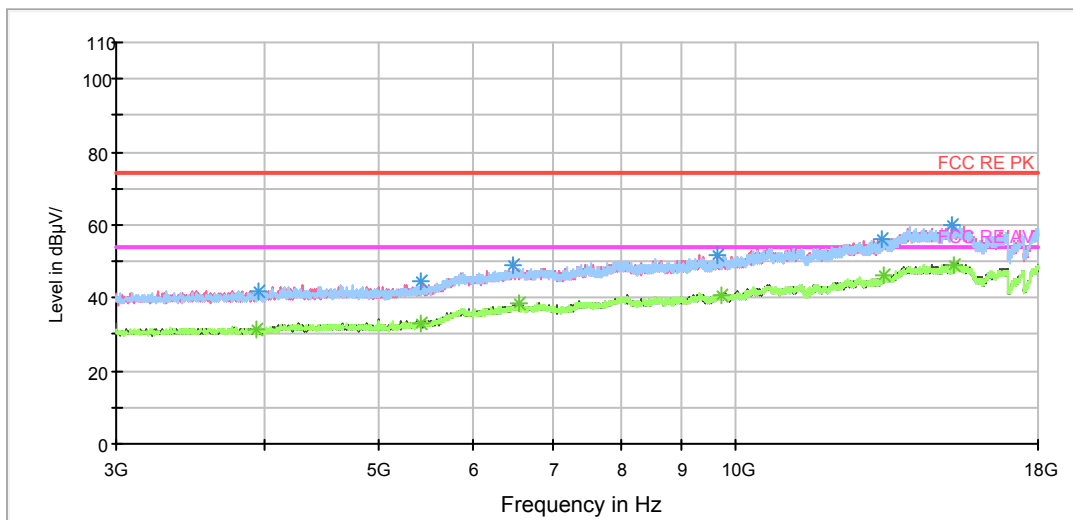
802.11n (HT40) CH3

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



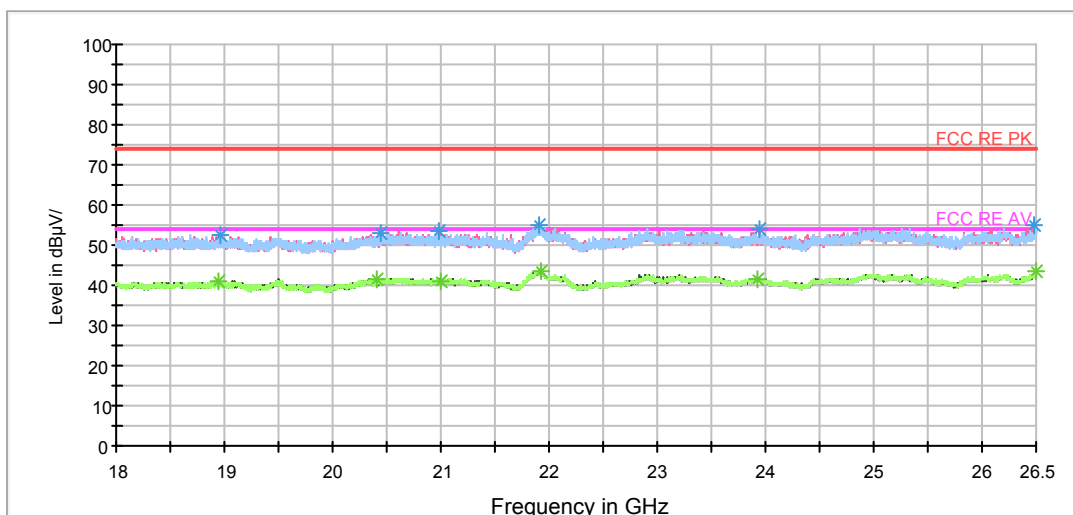
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1130.750000	37.6	100.0	V	0.0	46.2	-8.6	36.4	74
1441.250000	38.0	100.0	H	0.0	44.7	-6.7	36.0	74
1725.000000	40.2	100.0	V	7.0	45.3	-5.1	33.8	74
2000.000000	40.5	100.0	H	205.0	44.1	-3.6	33.5	74
2650.750000	41.3	100.0	H	345.0	42.1	-0.8	32.7	74
3000.000000	42.9	100.0	V	102.0	43.4	-0.5	31.1	74

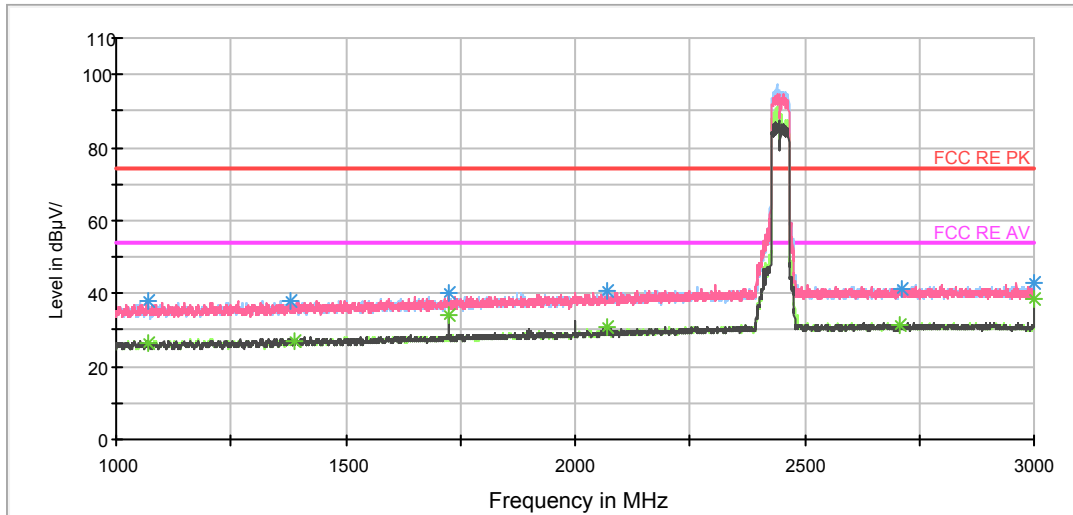
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1130.250000	26.5	100.0	H	224.0	35.1	-8.6	27.5	54
1438.000000	27.9	100.0	V	140.0	34.6	-6.7	26.1	54
1725.000000	34.3	100.0	V	7.0	39.4	-5.1	19.7	54
2000.000000	32.4	100.0	V	111.0	36.0	-3.6	21.6	54
2656.250000	31.3	100.0	H	345.0	32.1	-0.8	22.7	54
3000.000000	39.4	100.0	V	102.0	39.9	-0.5	14.6	54

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

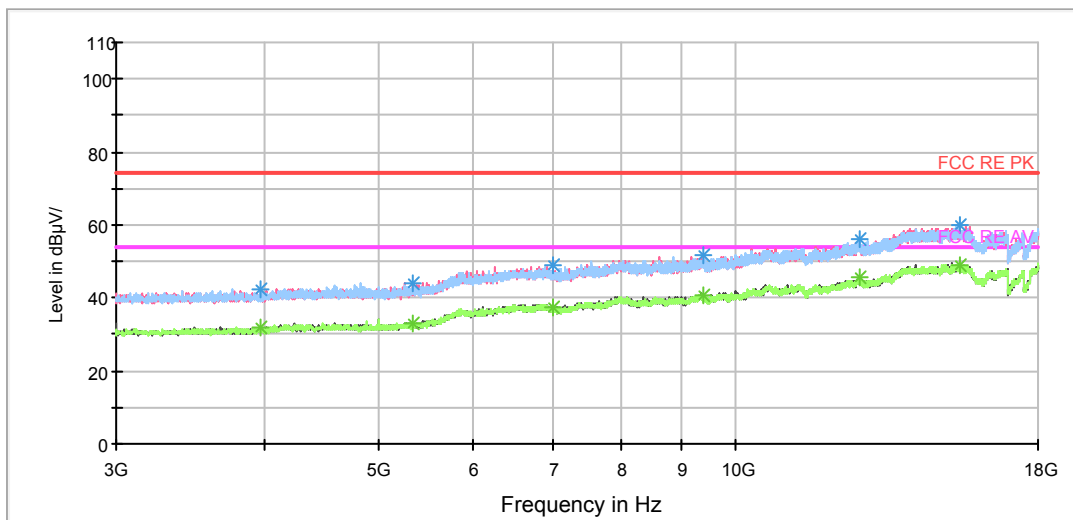
802.11n (HT40) CH6

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



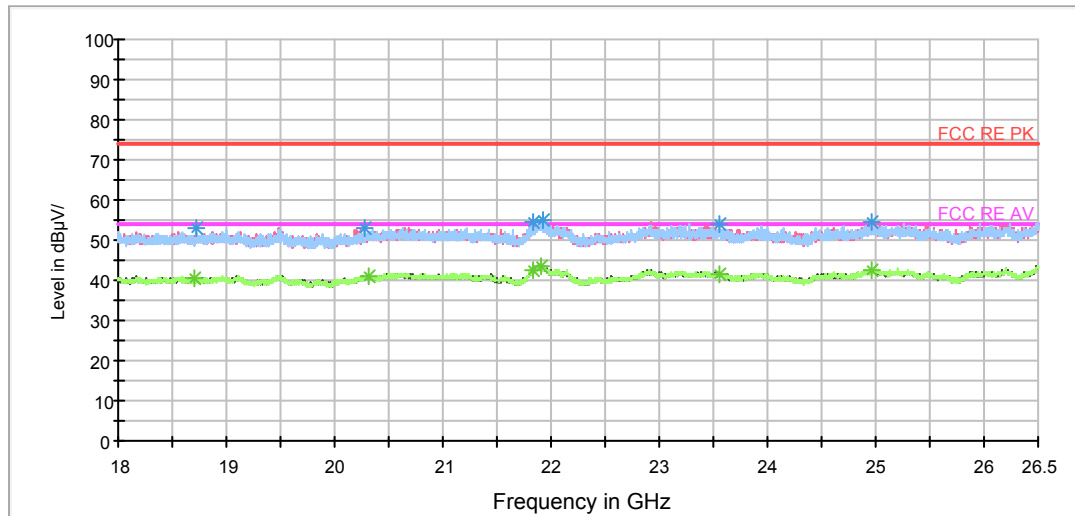
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1068.750000	37.9	100.0	V	4.0	46.8	-8.9	36.1	74
1378.250000	38.0	100.0	H	292.0	45.1	-7.1	36.0	74
1725.000000	40.1	100.0	V	12.0	45.2	-5.1	33.9	74
2072.000000	40.8	100.0	V	96.0	43.7	-2.9	33.2	74
2710.000000	41.4	100.0	V	242.0	42.0	-0.6	32.6	74
3000.000000	43.1	100.0	V	105.0	43.6	-0.5	30.9	74

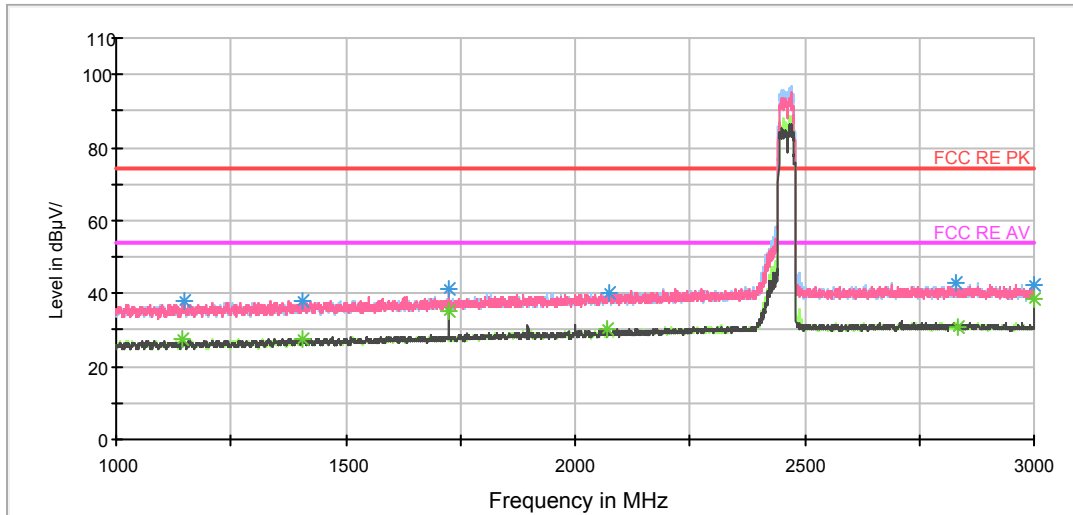
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1068.500000	26.7	100.0	H	168.0	35.6	-8.9	27.3	54
1389.250000	26.9	100.0	H	178.0	34.0	-7.1	27.1	54
1725.000000	34.1	100.0	V	12.0	39.2	-5.1	19.9	54
2069.750000	30.8	100.0	V	12.0	33.8	-3.0	23.2	54
2709.000000	31.5	100.0	H	57.0	32.1	-0.6	22.5	54
3000.000000	38.5	100.0	V	105.0	39.0	-0.5	15.5	54

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

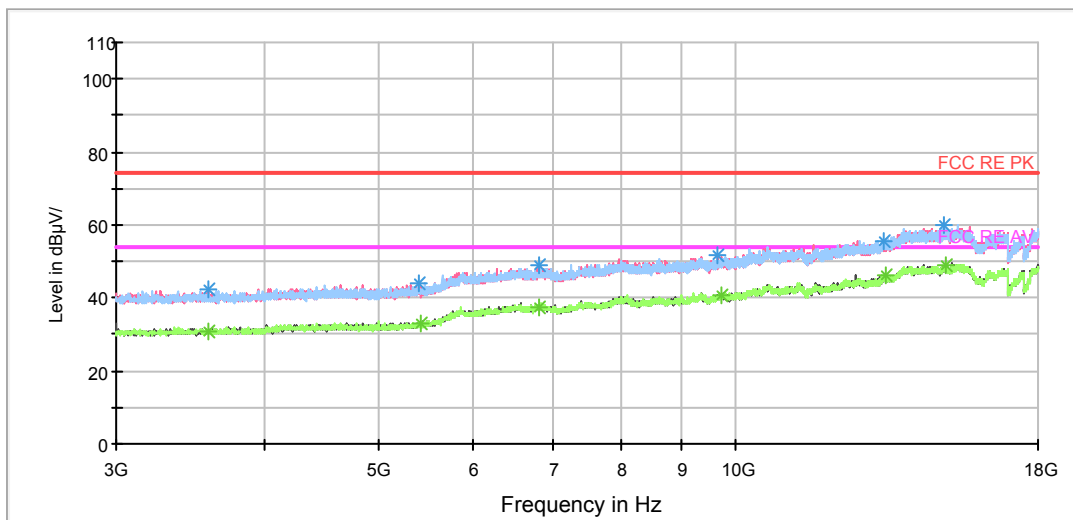
802.11n (HT40) CH9

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



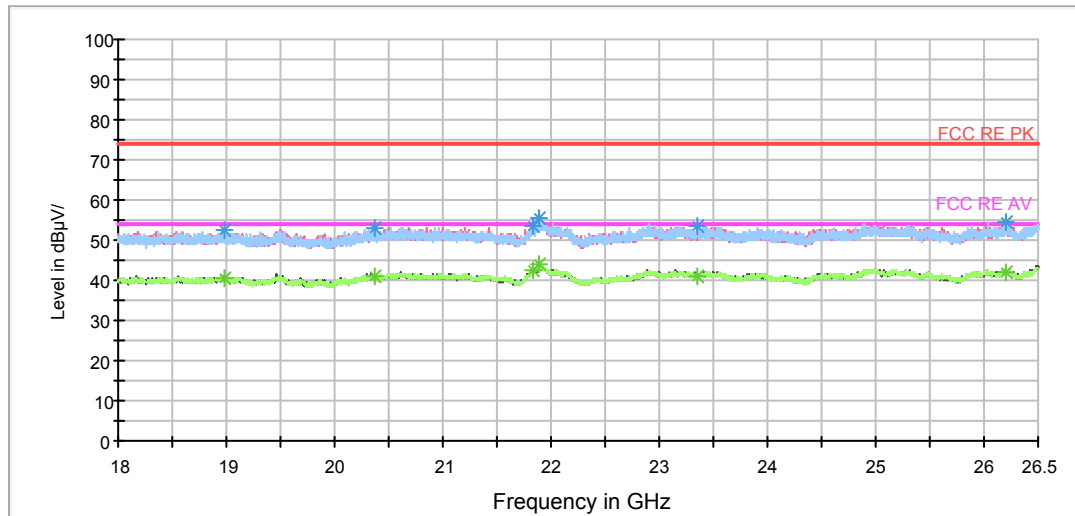
Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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



Radiates Emission from 3GHz to 18GHz

RE 18-26.5GHz PK+AV



Radiates Emission from 18GHz to 26.5GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1147.000000	37.8	100.0	V	154.0	46.3	-8.5	36.2	74
1407.500000	37.8	100.0	H	348.0	44.7	-6.9	36.2	74
1725.000000	41.0	100.0	V	2.0	46.1	-5.1	33.0	74
2073.250000	40.4	100.0	H	357.0	43.4	-3.0	33.6	74
2830.750000	43.2	100.0	H	264.0	43.6	-0.4	30.8	74
2999.500000	42.4	100.0	V	107.0	42.9	-0.5	31.6	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	27.5	100.0	V	69.0	36.0	-8.5	26.5	54
1404.000000	27.7	100.0	H	21.0	34.6	-6.9	26.3	54
1725.250000	35.3	100.0	V	4.0	40.4	-5.1	18.7	54
2070.250000	30.2	100.0	V	18.0	33.2	-3.0	23.8	54
2835.250000	30.9	100.0	H	355.0	31.4	-0.5	23.1	54
3000.000000	38.4	100.0	V	97.0	38.9	-0.5	15.6	54

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

5.8. Conducted Emission

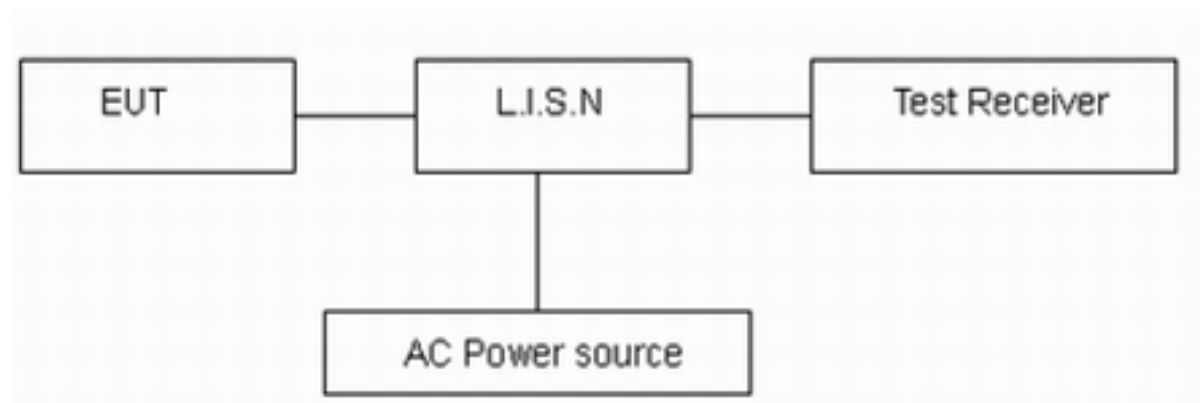
Ambient condition

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

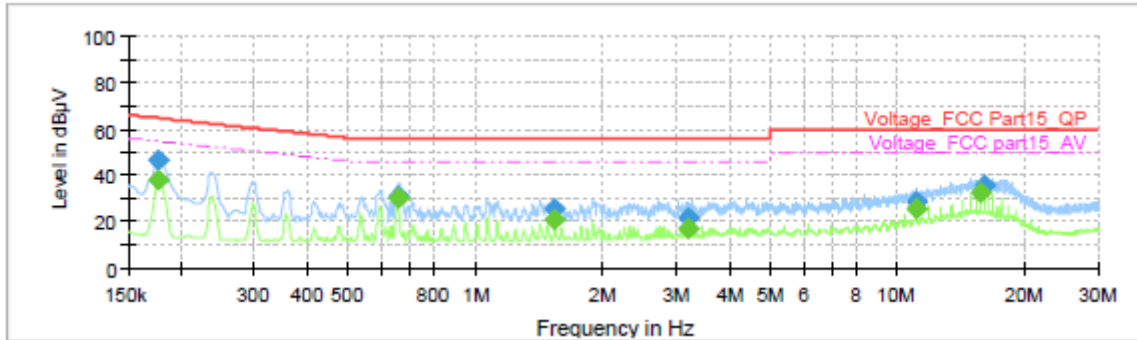
*: Decreases with the logarithm of the frequency.

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.

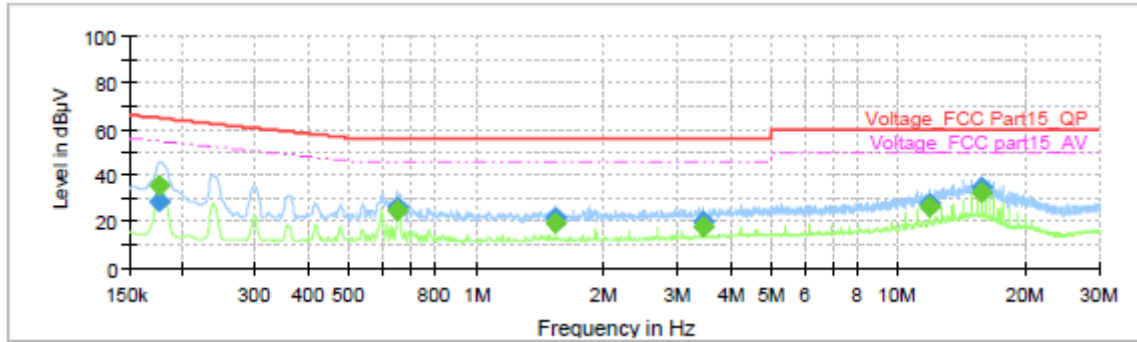
Test Results:

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 with all channels, 802.11b, Channel 6 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.177000	---	37.64	54.63	16.99	1000.0	9.000	L1	ON	19.2
0.177000	46.21	---	64.63	18.42	1000.0	9.000	L1	ON	19.2
0.654000	---	30.35	46.00	15.65	1000.0	9.000	L1	ON	19.3
0.658500	31.39	---	56.00	24.61	1000.0	9.000	L1	ON	19.3
1.536000	---	20.89	46.00	25.11	1000.0	9.000	L1	ON	19.2
1.536000	25.27	---	56.00	30.73	1000.0	9.000	L1	ON	19.2
3.198750	---	16.96	46.00	29.04	1000.0	9.000	L1	ON	19.1
3.205500	21.60	---	56.00	34.40	1000.0	9.000	L1	ON	19.1
11.134500	29.04	---	60.00	30.96	1000.0	9.000	L1	ON	19.4
11.136750	---	25.84	50.00	24.16	1000.0	9.000	L1	ON	19.4
15.744750	---	32.49	50.00	17.51	1000.0	9.000	L1	ON	19.4
16.127250	35.32	---	60.00	24.68	1000.0	9.000	L1	ON	19.5

L Line



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.177000	---	35.52	54.63	19.10	1000.0	9.000	N	ON	19.2
0.177000	28.48	---	64.63	36.15	1000.0	9.000	N	ON	19.2
0.645000	26.27	---	56.00	29.73	1000.0	9.000	N	ON	19.3
0.651750	---	24.87	46.00	21.13	1000.0	9.000	N	ON	19.3
1.536000	---	19.74	46.00	26.26	1000.0	9.000	N	ON	19.2
1.536000	21.53	---	56.00	34.47	1000.0	9.000	N	ON	19.2
3.455250	19.77	---	56.00	36.23	1000.0	9.000	N	ON	19.0
3.455250	---	18.00	46.00	28.00	1000.0	9.000	N	ON	19.0
11.901750	28.18	---	60.00	31.82	1000.0	9.000	N	ON	19.4
11.904000	---	26.38	50.00	23.62	1000.0	9.000	N	ON	19.4
15.744750	---	32.33	50.00	17.67	1000.0	9.000	N	ON	19.4
15.744750	34.81	---	60.00	25.19	1000.0	9.000	N	ON	19.4

N Line

6. Main Test Instruments

Name	Type	Manufacturer	Serial Number	Calibration Date	Expiration Time
Spectrum Analyzer	R&S	FSV30	100815	2016-12-16	2017-12-15
EMI Test Receiver	R&S	ESCI	100948	2016-06-01	2017-05-31
EMI Test Receiver	R&S	ESCI	100948	2017-05-20	2018-05-19
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	2018-01-29
EMI Test Receiver	R&S	ESCS30	100138	2016-12-16	2017-12-15
LISN	R&S	ENV216	101171	2016-12-17	2019-12-16
Spectrum Analyzer	Agilent	N9010A	MY47191109	2016-05-21	2017-05-20
Spectrum Analyzer	Agilent	N9010A	MY47191109	2017-05-20	2018-05-19
MOB COMMS DC SUPPLY	Agilent	66319D	MY43004105	2016-05-21	2017-05-20
MOB COMMS DC SUPPLY	Agilent	66319D	MY43004105	2017-05-20	2018-05-19
AV power meter	Keysight	U2021XA	MY55240003	2016-06-26	2017-06-25
AV power meter	Keysight	U2021XA	MY55240003	2017-06-25	2018-06-24
RF Cable	Agilent	SMA 15cm	0001	2016-12-06	2017-06-05
RF Cable	Agilent	SMA 15cm	0001	2017-06-05	2017-12-04
RF Cable	Agilent	SMA 15cm	0001	2017-12-04	2018-06-03

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

ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance



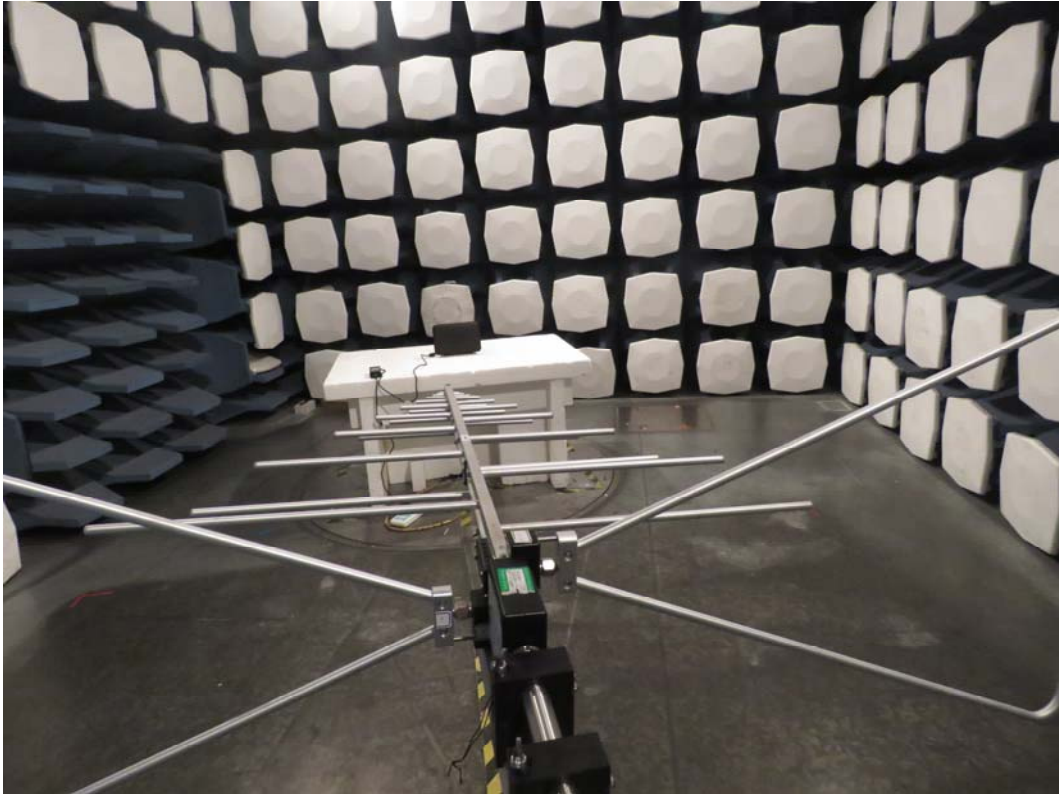
a: EUT



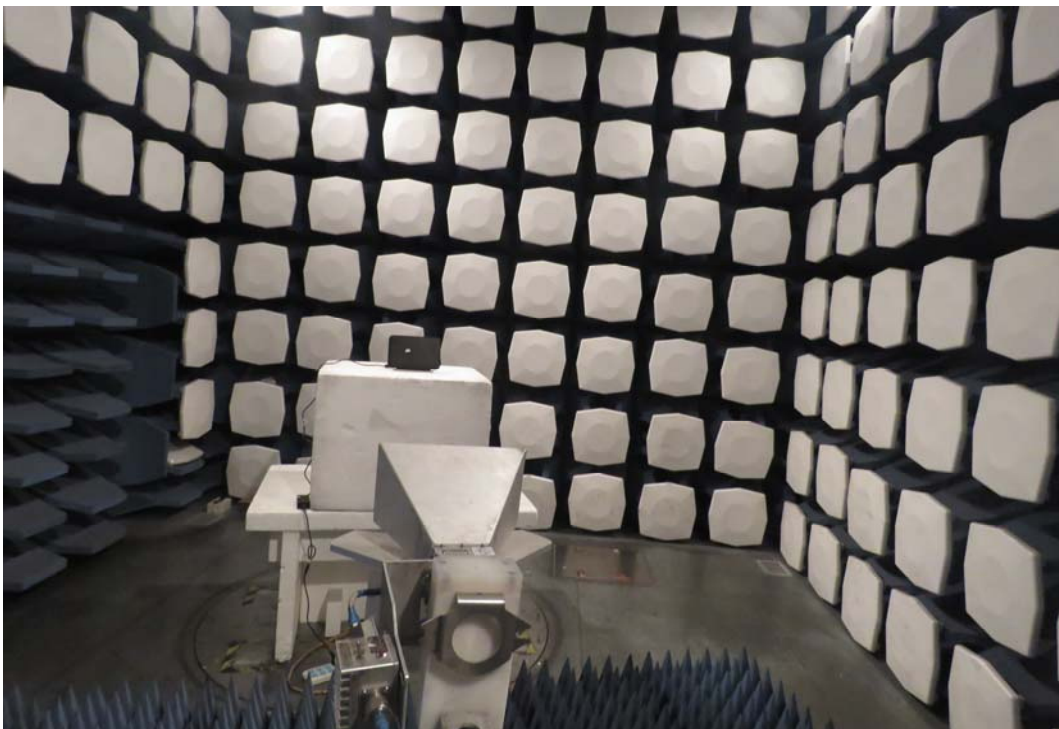
b: Adapter

Picture 1 EUT and Accessory

A.2 Test Setup

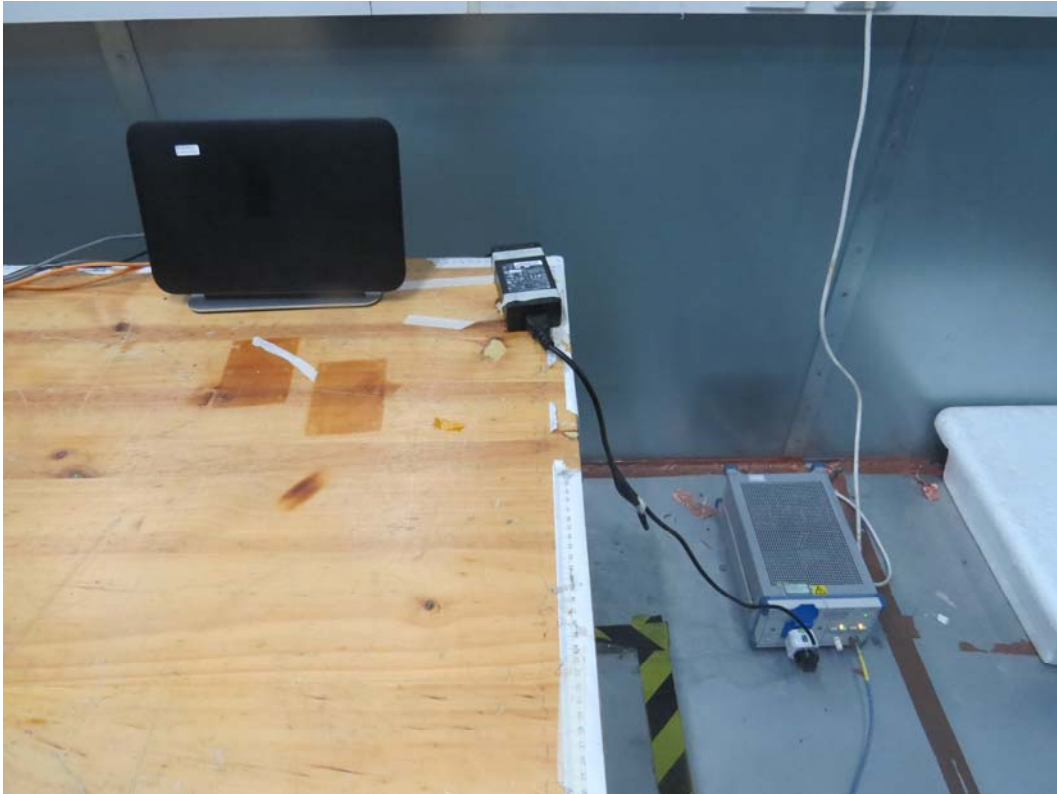


30MHz-1GHz



Above 1GHz

Picture 2 Radiated Emission Test Setup



Picture 3 Conducted Emission Test Setup