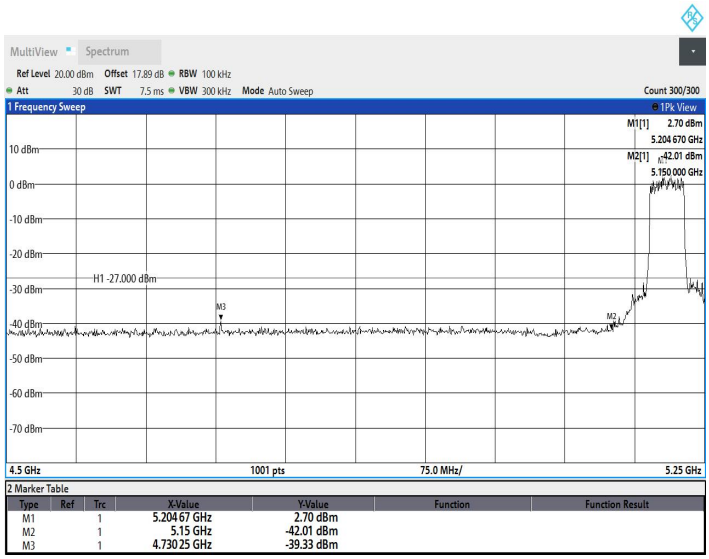
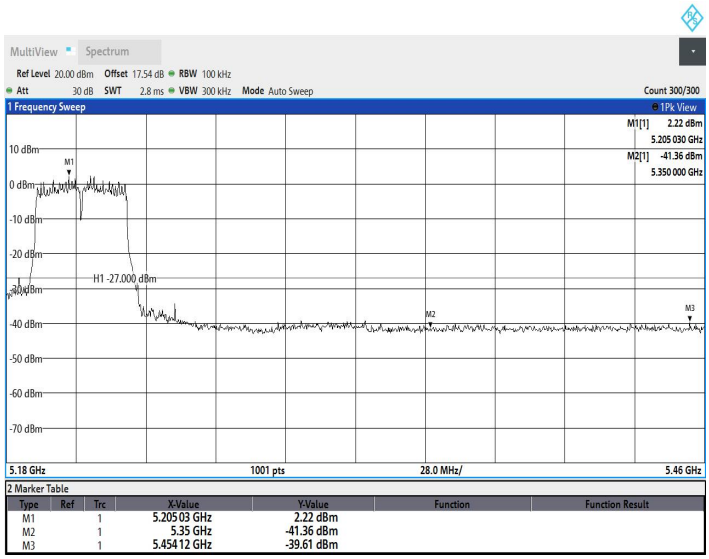
11AC80MIMO_Ant1_Low_5210



11AC80MIMO_Ant2_Low_5210



11AC80MIMO_Ant1_High_5210

11AC80MIMO_Ant2_High_5210

Band Edges - Radiated

Measurement Limit:

Standard	Limit (dBμV/m)	
FCC 47 CFR Part 15.209 & 15.407(b)(9),(10)	Peak	74
	Average	54

The measurement is made according to KDB 789033.

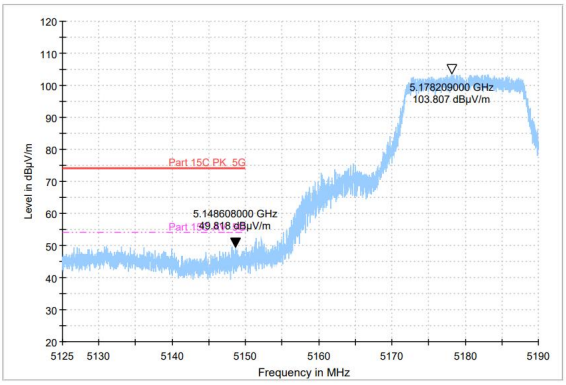
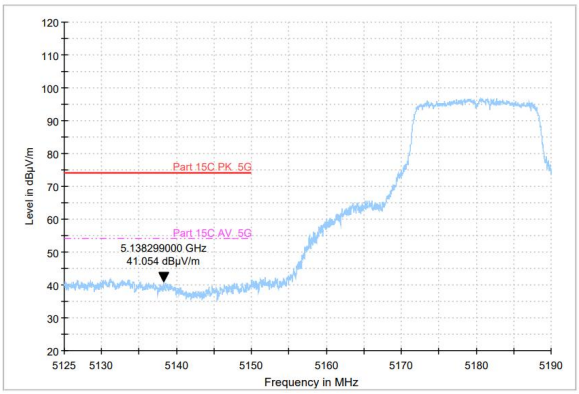
For maximum emissions measurements, follow the procedures described in II.G.5., "Procedures for Unwanted Maximum Emissions Measurements above 1000 MHz," except for the following changes:

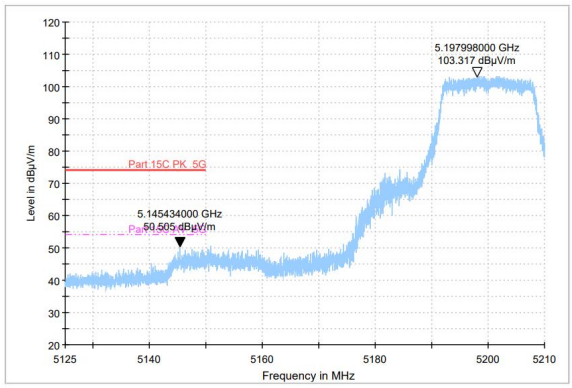
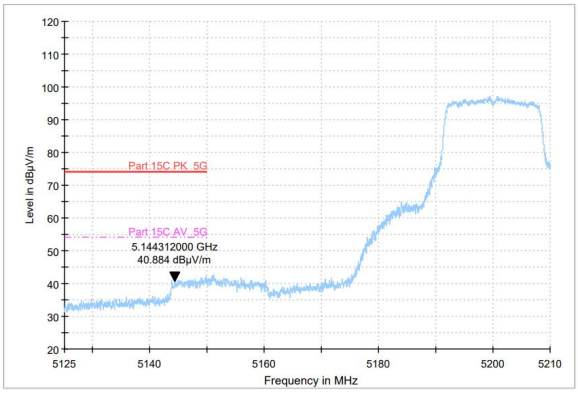
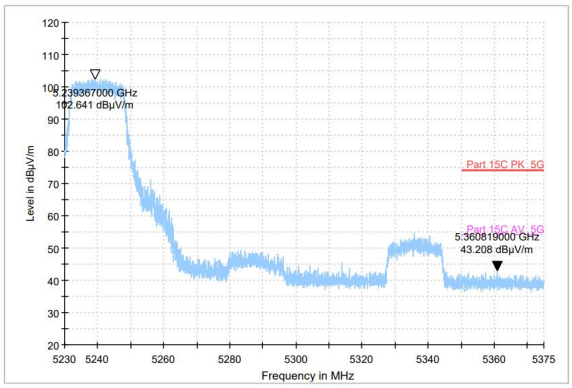
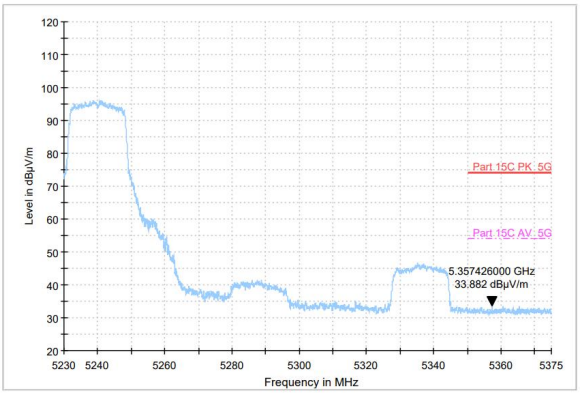
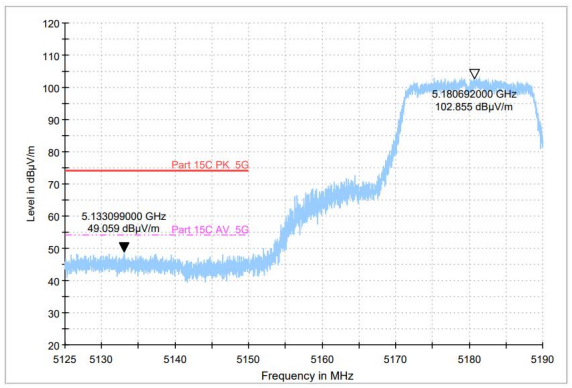
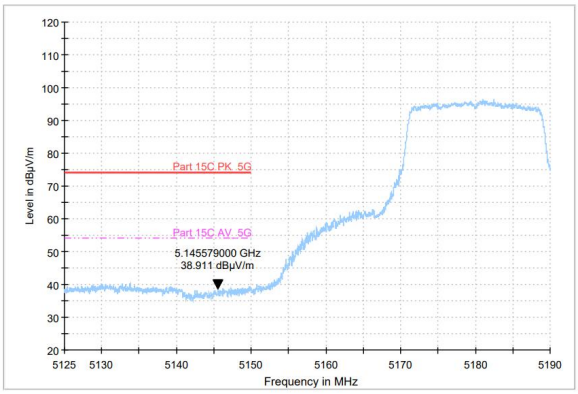
1. Set RBW = 100 kHz
2. Set VBW ≥ 3 × RBW
3. Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured. CAUTION: You must ensure that the spectrum analyzer or EMI receiver is set for peak-detection and max-hold for this measurement.

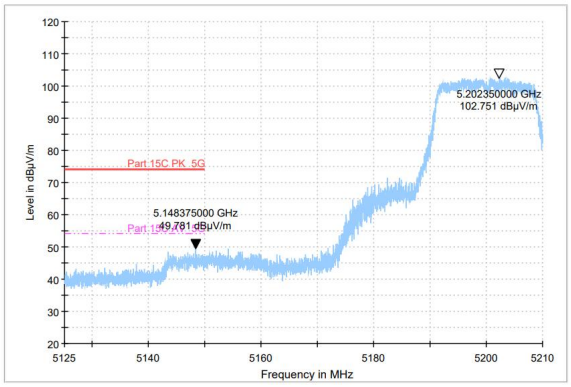
For average emissions measurements, follow the procedures described in II.G.6., "Procedures for Average Unwanted Emissions Measurements above 1000 MHz," except for the following changes:

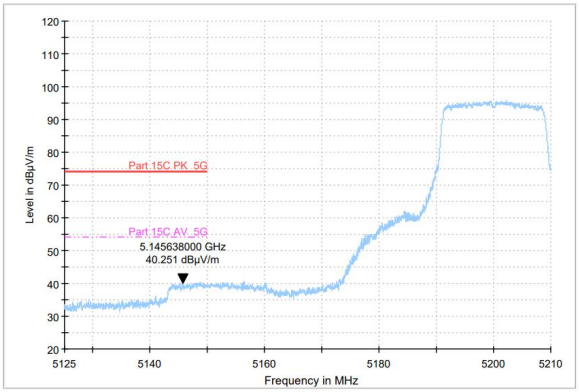
1. Set RBW = 100 kHz
2. Set VBW ≥ 3 × RBW
3. Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

Test Result：

Band Edges (802.11a, CH36)	
Peak detector	AV detector
	

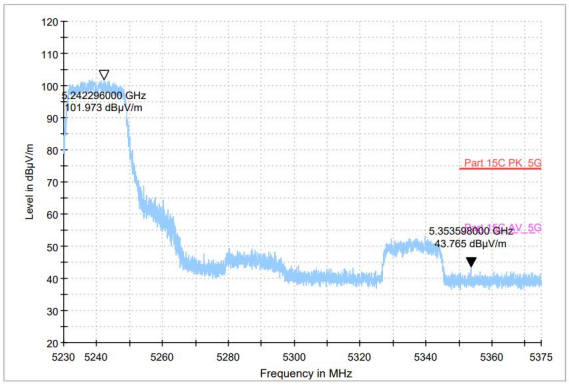
Band Edges (802.11a, CH40)	
Peak detector	AV detector
	
Band Edges (802.11a, CH48)	
Peak detector	AV detector
	
Band Edges (802.11n-20MHz, 5180MHz)	
Peak detector	AV detector
	
Band Edges (802.11n-20MHz, CH40)	
Peak detector	AV detector

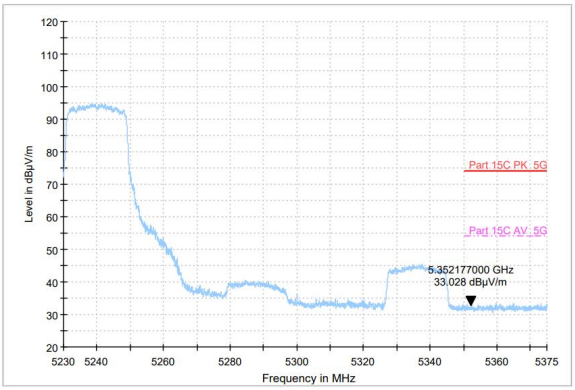




Band Edges (802.11n-20MHz, CH48)

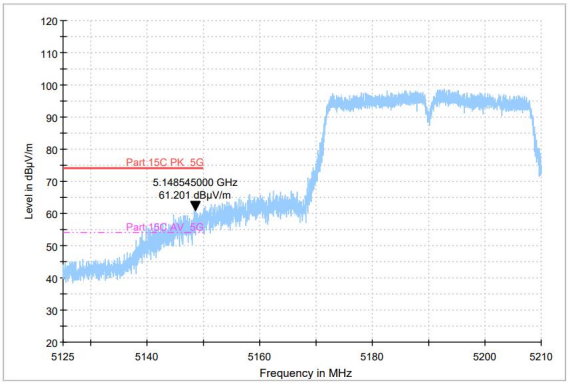
Peak detector	AV detector

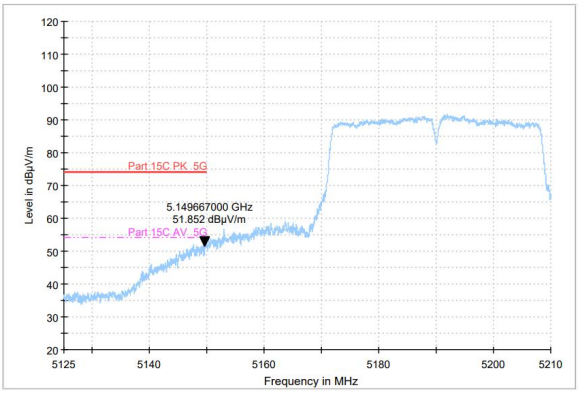




Band Edges (802.11n-40MHz, CH38)

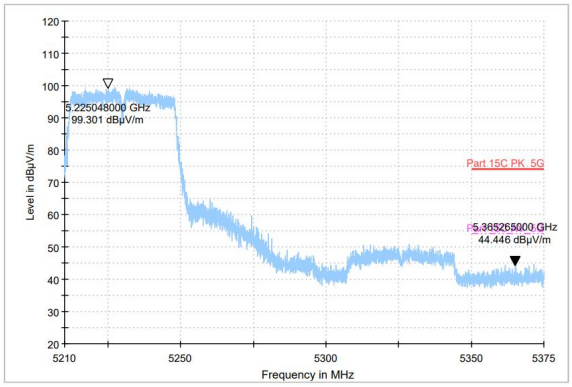
Peak detector	AV detector

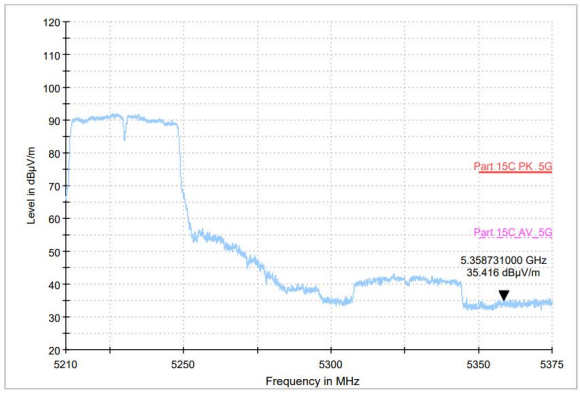




Band Edges (802.11n-40MHz, CH46)

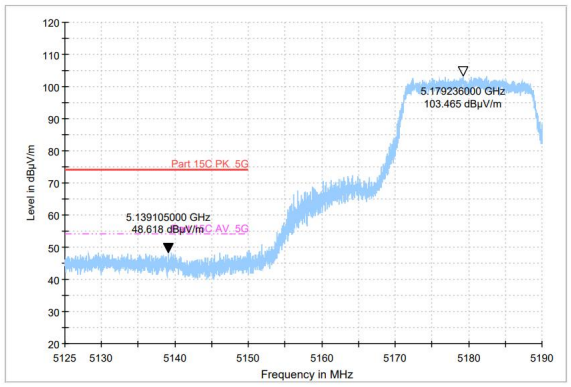
Peak detector	AV detector

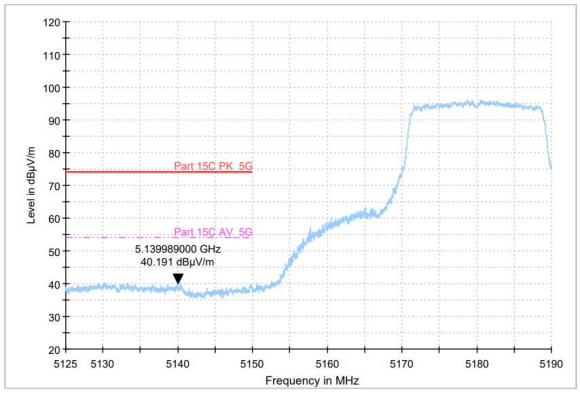




Band Edges (802.11ac-20MHz, 5180MHz)

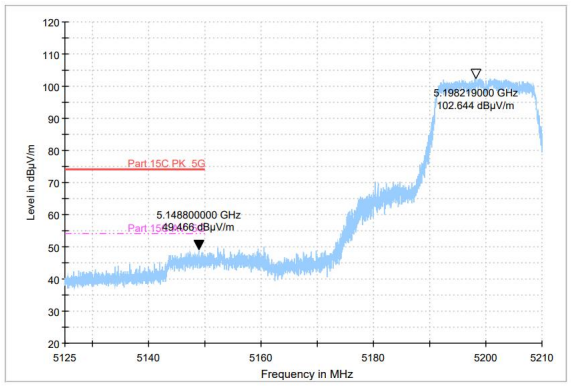
Peak detector	AV detector

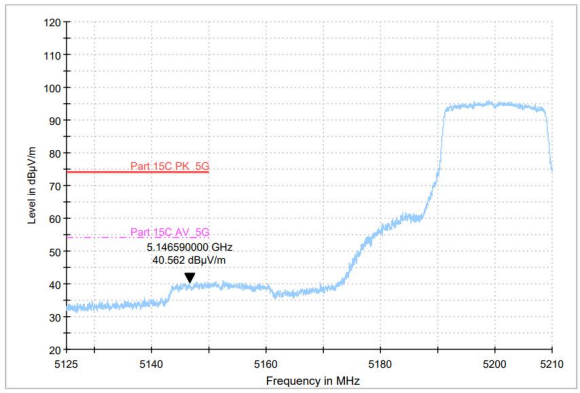




Band Edges (802.11ac-20MHz, CH40)

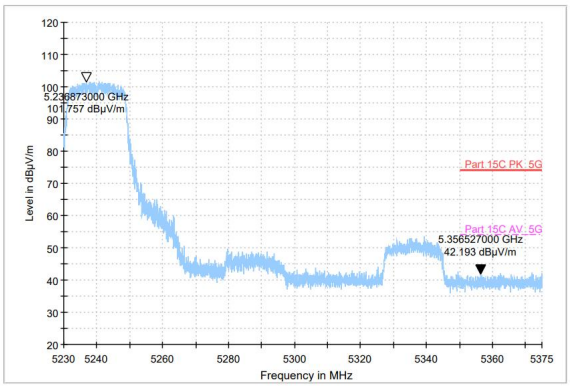
Peak detector	AV detector

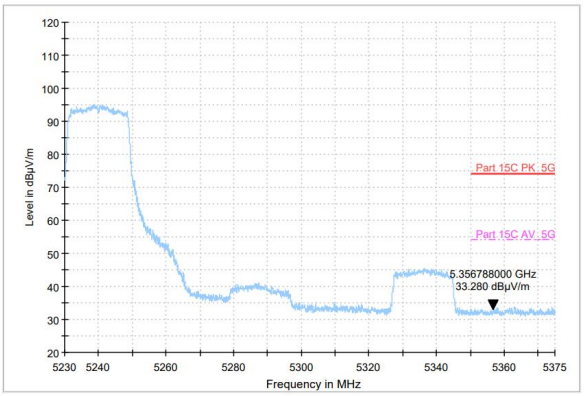




Band Edges (802.11ac-20MHz, CH48)

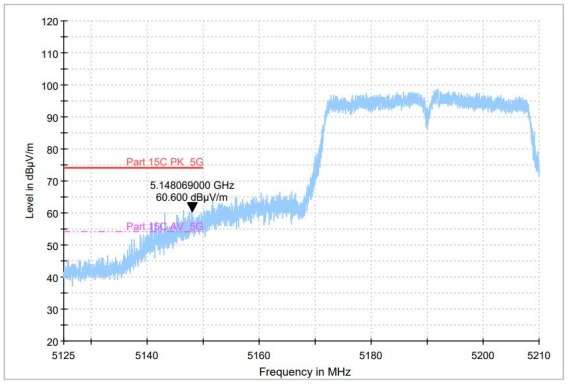
Peak detector	AV detector

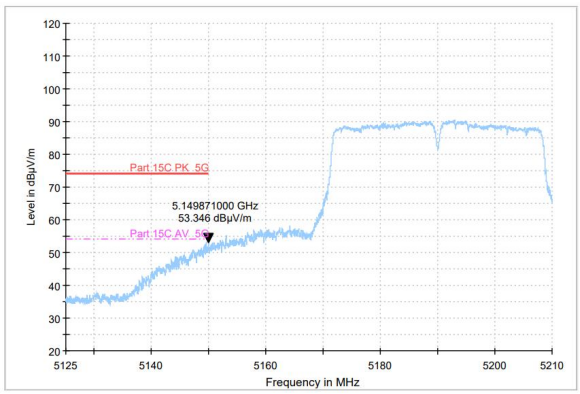




Band Edges (802.11ac-40MHz, CH38)

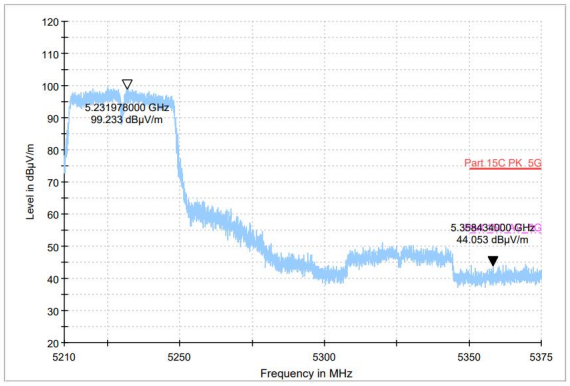
Peak detector	AV detector

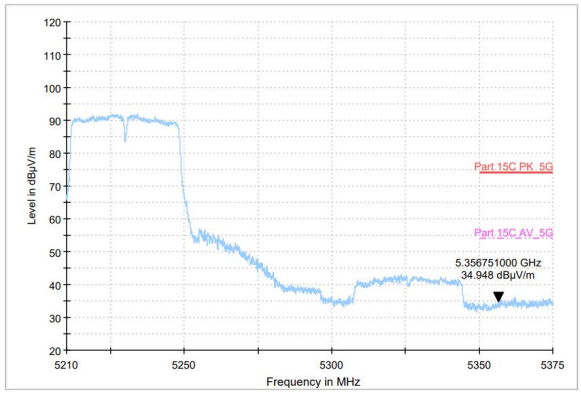




Band Edges (802.11ac-40MHz, CH46)

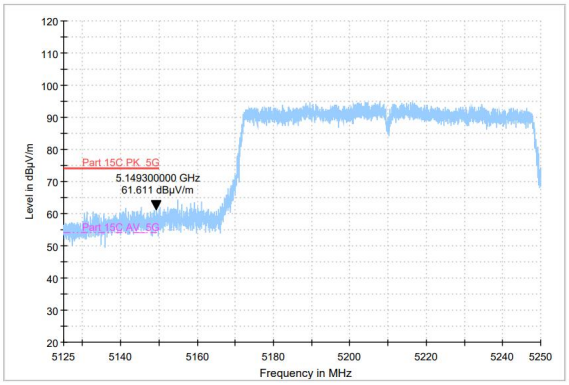
Peak detector	AV detector

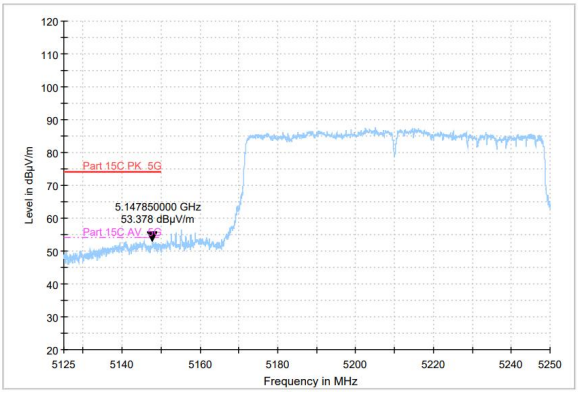




Band Edges (802.11ac-80MHz, CH42)

Peak detector	AV detector


Part 15C PK_5G
5.149300000 GHz
61.611 dBµV/m
Part 15C AV_5G
Level in dBµV/m
Frequency in MHz


Part 15C PK_5G
5.147850000 GHz
53.378 dBµV/m
Part 15C AV_5G
Level in dBµV/m
Frequency in MHz

6.7 Transmitter Spurious Emission

Specifications:	FCC 47 CFR Part 15.209 & 15.407(b)(9),(10)
DUT Serial Number:	S2
Test conditions:	Ambient Temperature:20℃ Relative Humidity:40% Air pressure: 90kPa
Test Results:	Pass

Measurement Limit and Method

Standard	Limit(dBμV/m)	
FCC 47 CFR Part 15.209 & 15.407(b)(9),(10)	Peak	74
	Average	54

Measurement Uncertainty:

Measurement Uncertainty	30MHz-1000MHz: 4.09 dB(MAX) (k=2). 1000MHz-6000MHz : 4.84 dB (k=2). 6000MHz-18000MHz : 4.52 dB (k=2). 18GHz-26.5GHz: 6.19 dB (k=2). 26.5GHz-40GHz: 6.03 dB (k=2).

The measurement is made according to KDB 789033

Set the spectrum analyzer in the following:

Below 1GHz:

a) Follow the requirements in II.G.3. “General Requirements for Unwanted Emissions Measurements.”

b) Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

Detector: Peak and Quasi-Peak

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz (detector: Peak):

a) Follow the requirements in II.G.3, “General Requirements for Unwanted Emissions Measurements.”

b) Maximum emission levels are measured by setting the analyzer as follows:

(i) RBW = 1 MHz.

(ii) VBW ≥ 3 MHz.

(iii) Detector = Peak.

(iv) Sweep time = auto.

(v) Trace mode = max hold.

(vi) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately 1/x, where x is the duty cycle. For example, at 50% duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

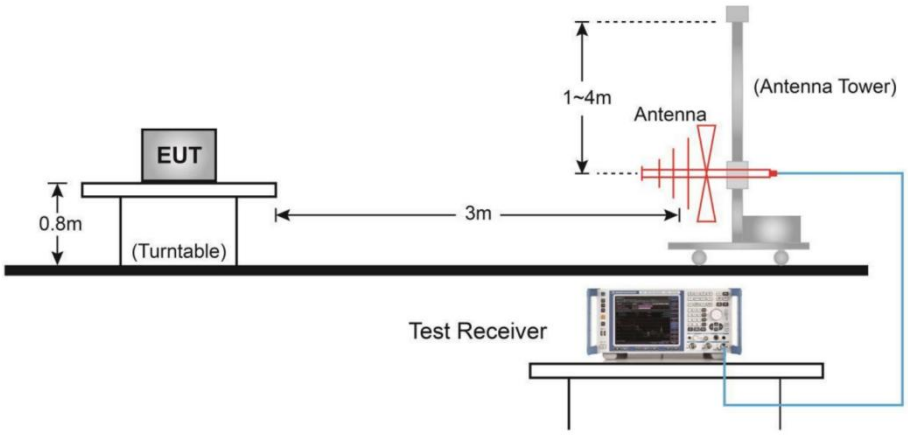
Limit in restricted band:

Frequency of emission (MHz)	Field strength(dBμV/m)	Measurement distance(m)
0.009-0.490	129-94	3
0.490-1.705	74-63	3
1.705-30	70	3
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

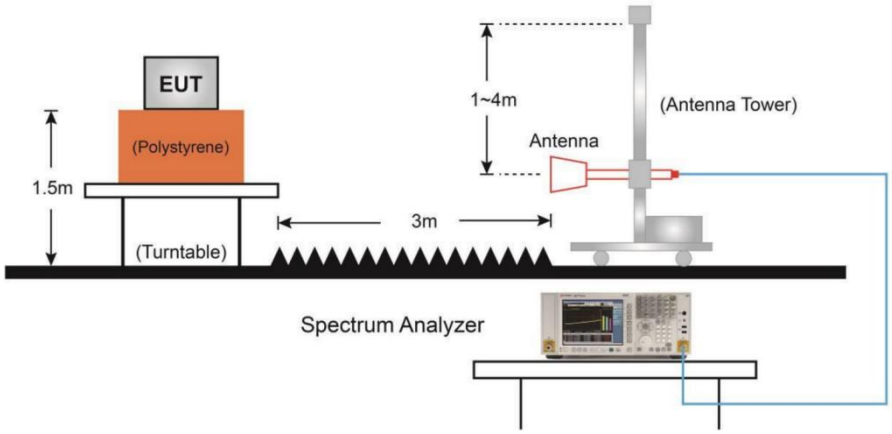
Note: for frequency range below 960MHz, the limit in 15.209 is defined in 10m test distance. The limit used above is calculated from 10m to 3m

Test Setup

Below 1GHz Test Setup



Above 1GHz Test Setup



Test procedures

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

The turntable rotated 360 degrees to determine the position of the maximum emission level.

The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The EUT was tested according to KDB 789033 D02: Section G.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 300 Hz, VBW = 1 kHz (9 kHz~150 kHz);

RBW = 10 kHz, VBW = 30 kHz (150 kHz~30MHz);

RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz for PK)

RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

Remark:

1. Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Measured level= Original Receiver Reading + Factor
3. Margin = Limit – Measured level
4. If the PK measured level is lower than AV limit, the AV test can be elided

The test data below 30MHz is more than 20dB lower than the limit value, so it is not provided in the report.

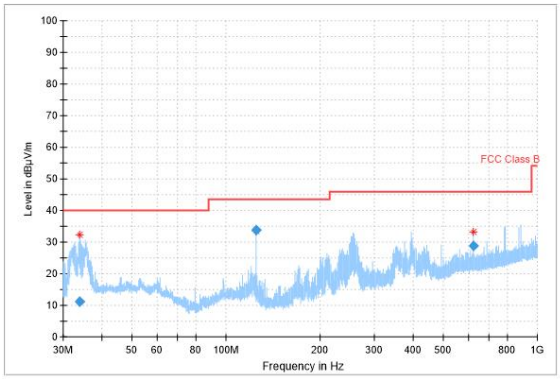
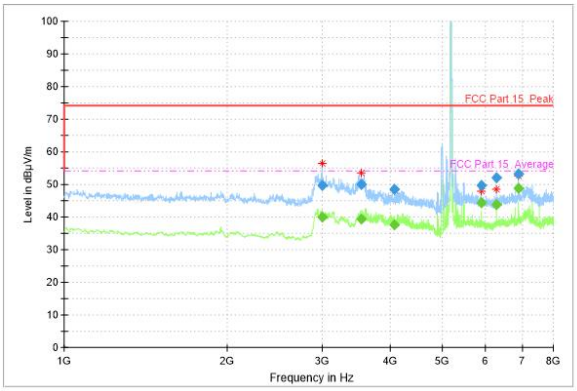
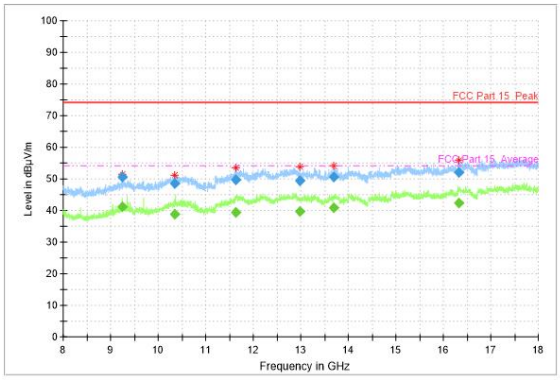
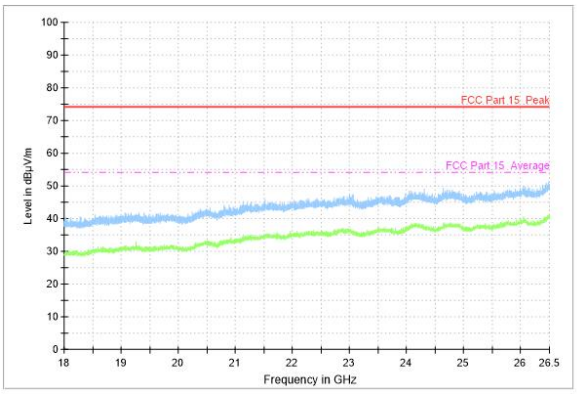
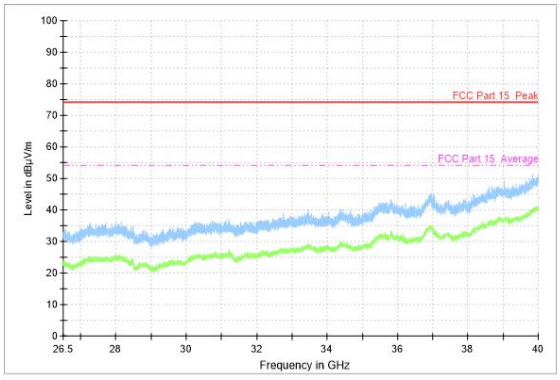
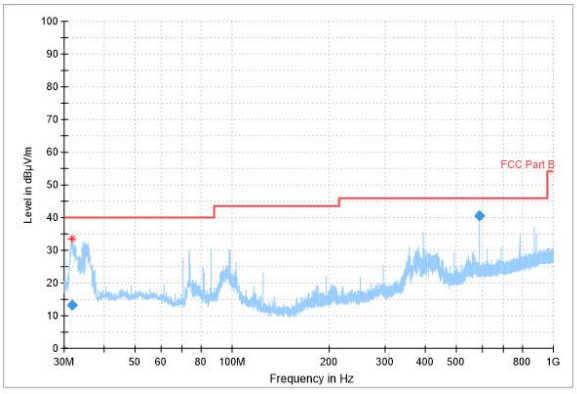
Modulation type and data rate tested (Only worst case result is given below):

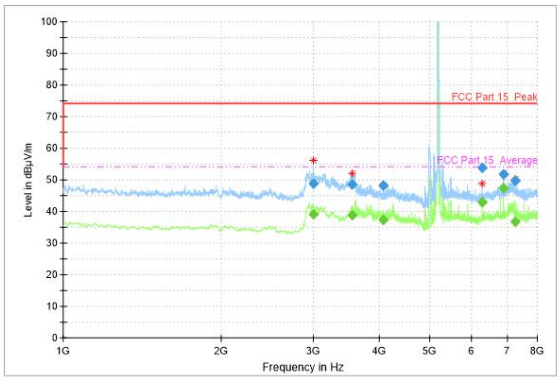
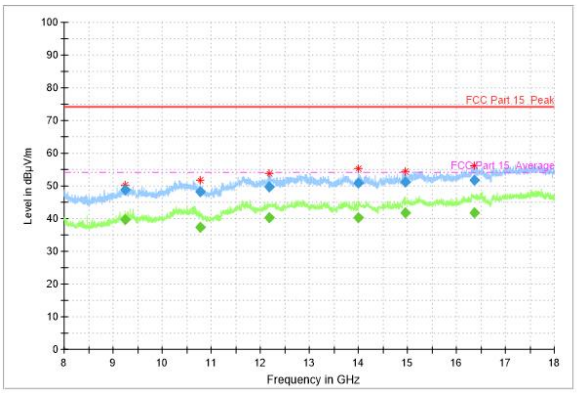
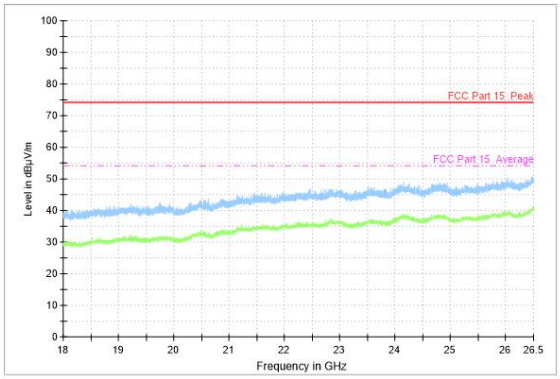
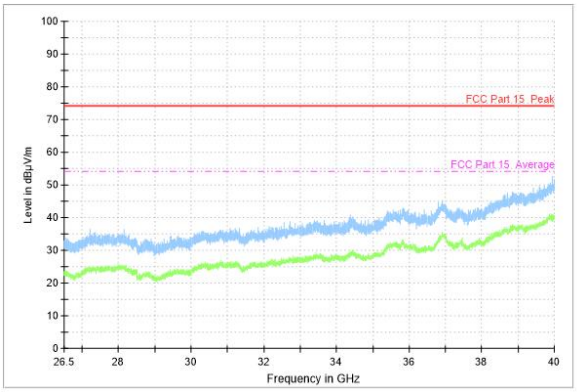
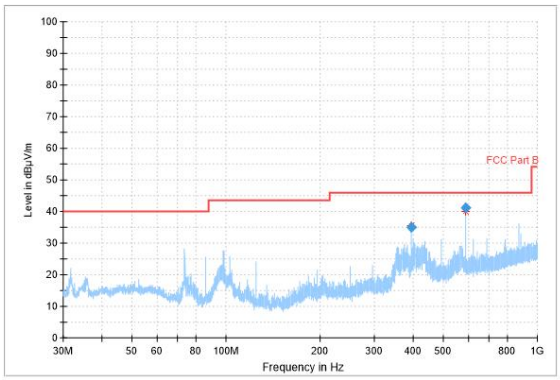
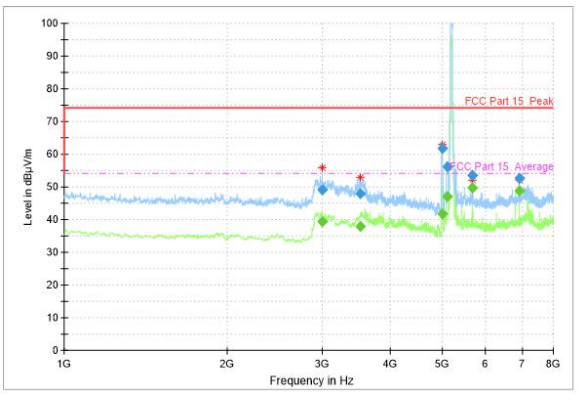
U-NII-1:

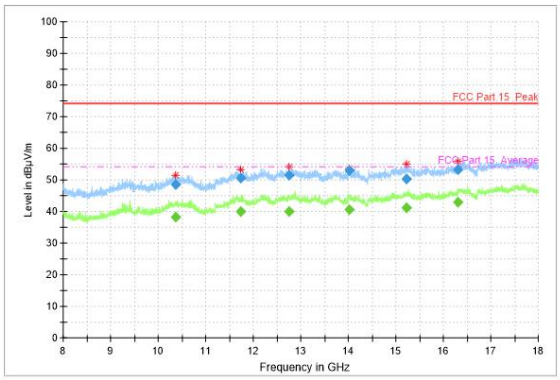
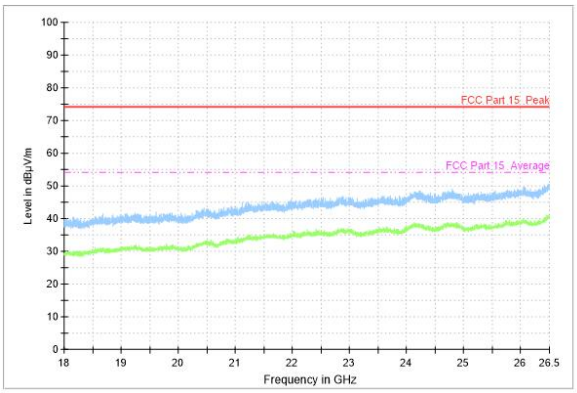
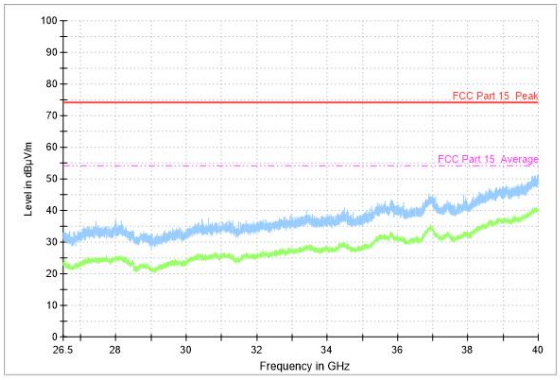
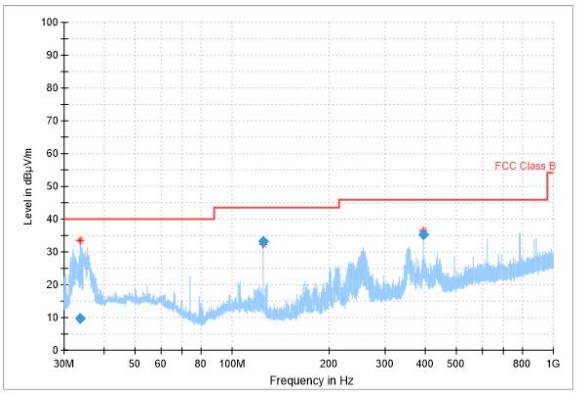
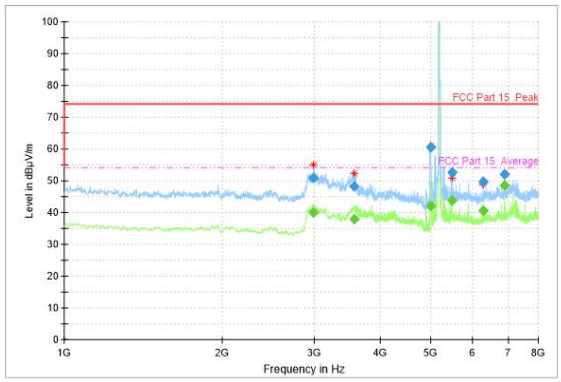
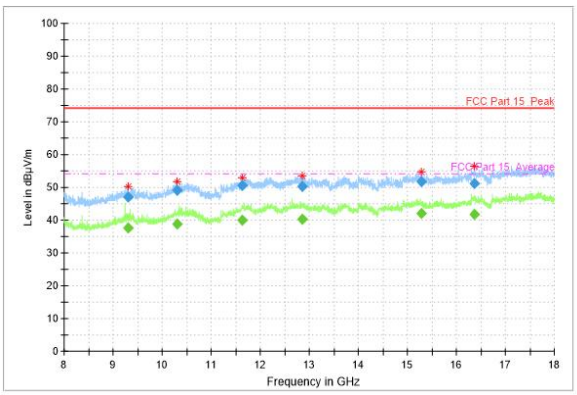
Mode	Data rate	Channel

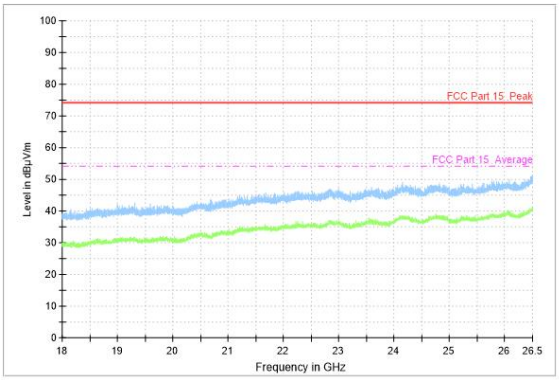
802.11a-	6Mps	36(5180MHz)
802.11n-HT20	MCS0	36(5180MHz)
802.11n-HT40	MCS0	38(5190MHz)
802.11ac-VHT20	MCS0	36(5180MHz)
802.11ac-VHT40	MCS0	38(5190MHz)
802.11ac-VHT20	MCS0	42(5210MHz)

Measurement Results

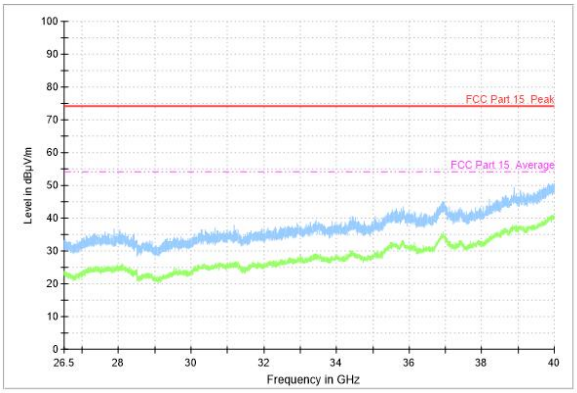
Radiated Spurious Emission (802.11a, ch36, 30MHz-1GHz)	Radiated Spurious Emission (802.11a, ch36, 1 GHz-8 GHz)
	
Radiated Spurious Emission (802.11a, ch36, 8GHz-18GHz)	Radiated Spurious Emission (802.11a, ch36, 18GHz-26.5GHz)
	
Radiated Spurious Emission (802.11a, ch36, 26.5 GHz-40 GHz)	Radiated Spurious Emission (802.11n-HT20MHz, ch36, 30MHz-1GHz)
	
Radiated Spurious Emission (802.11n-HT20MHz, ch36, 1 GHz-8 GHz)	Radiated Spurious Emission (802.11n-HT20MHz, ch36, 8GHz-18GHz)

	
Radiated Spurious Emission (802.11n-HT20MHz, ch36, 18GHz-26.5GHz)	Radiated Spurious Emission (802.11n-HT20MHz, ch36, 26.5 GHz-40 GHz)
	
Radiated Spurious Emission (802.11n-HT40MHz, ch38, 30MHz-1GHz)	Radiated Spurious Emission (802.11n-HT40MHz, ch38, 1 GHz-8 GHz)
	
Radiated Spurious Emission (802.11n-HT40MHz, ch38, 8GHz-18GHz)	Radiated Spurious Emission (802.11n-HT40MHz, ch38, 18GHz-26.5GHz

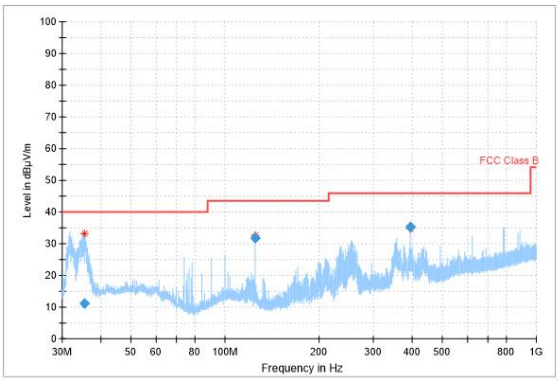
	
Radiated Spurious Emission (802.11n-HT40MHz, ch38, 26.5 GHz-40 GHz)	Radiated Spurious Emission (802.11ac-VHT20MHz, ch36, 30MHz-1GHz)
	
Radiated Spurious Emission (802.11ac- VHT20MHz, ch36, 1 GHz-8 GHz)	Radiated Spurious Emission (802.11ac- VHT20MHz, ch36, 8GHz-18GHz)
	
Radiated Spurious Emission (802.11ac- VHT20MHz, ch36, 18GHz-26.5GHz)	Radiated Spurious Emission (802.11ac- VHT20MHz, ch36, 26.5 GHz-40 GHz)



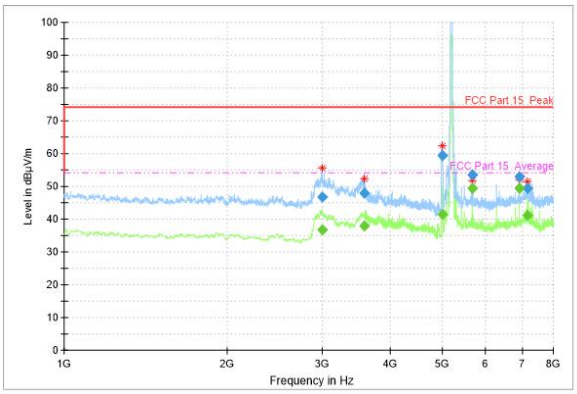
Radiated Spurious Emission
(802.11ac-VHT40MHz, ch38, 30MHz-1GHz)



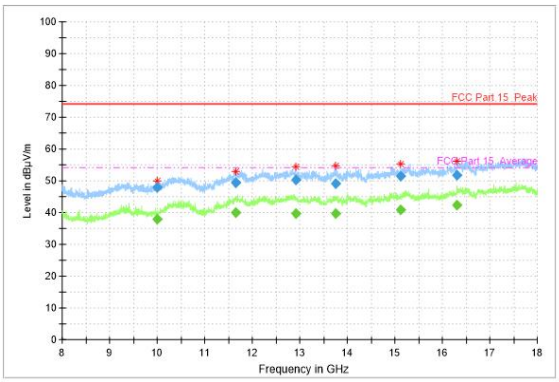
Radiated Spurious Emission
(802.11ac- VHT40MHz, ch38, 1 GHz-8 GHz)



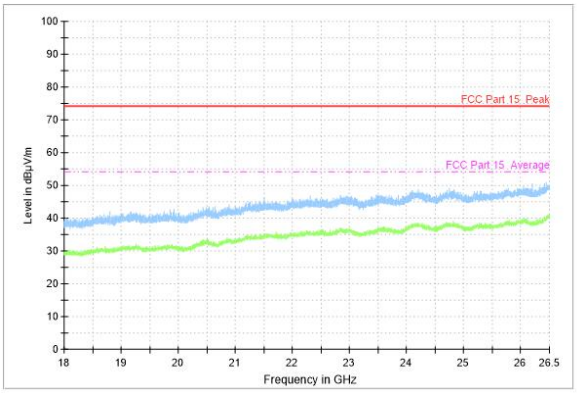
Radiated Spurious Emission
(802.11ac- VHT40MHz, ch38, 8GHz-18GHz)



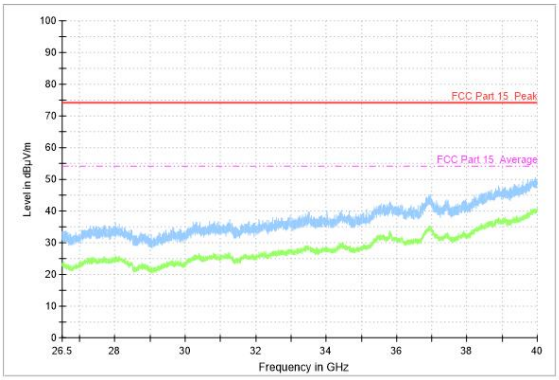
Radiated Spurious Emission
(802.11ac- VHT40MHz, ch38, 18GHz-26.5GHz)



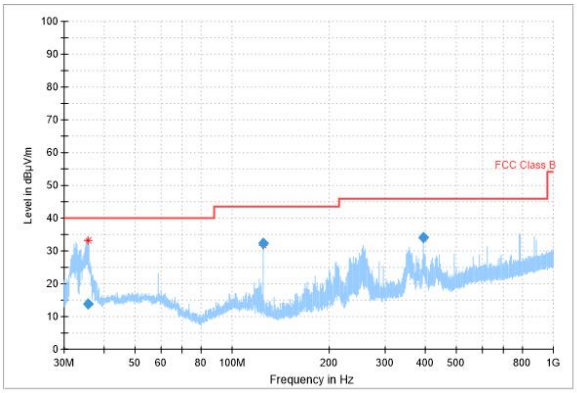
Radiated Spurious Emission
(802.11ac- VHT40MHz, ch38, 26.5 GHz-40 GHz)



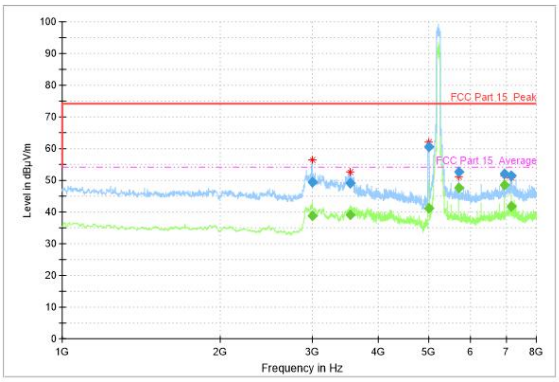
Radiated Spurious Emission
(802.11ac-VHT80MHz, ch42, 30MHz-1GHz)



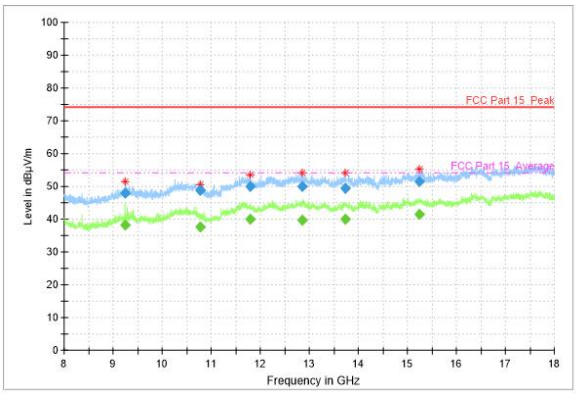
Radiated Spurious Emission
(802.11ac- VHT80MHz, ch42, 1 GHz-8 GHz)



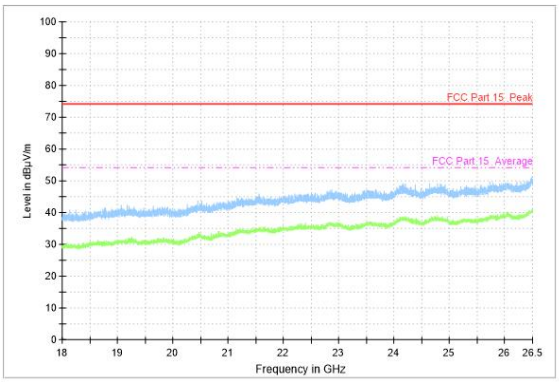
Radiated Spurious Emission
(802.11ac- VHT80MHz, ch42, 8GHz-18GHz)

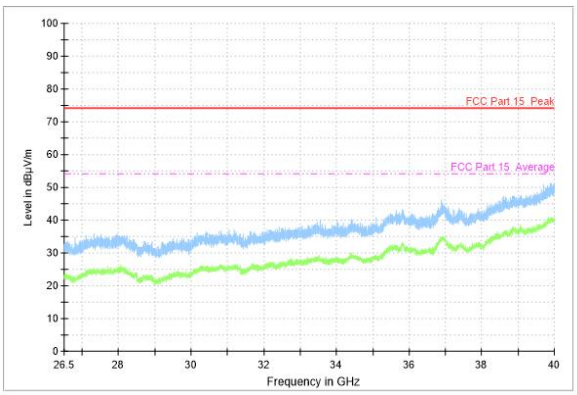


Radiated Spurious Emission
(802.11ac- VHT80MHz, ch42, 18GHz-26.5GHz)



Radiated Spurious Emission
(802.11ac- VHT80MHz, ch42, 26.5 GHz-40 GHz)





802.11a

Channel 36(30MHz ~1GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
33.9	11.14	-14.1	25.24	V
125.0	33.81	-15.9	49.71	H
624.9	28.9	-3.4	32.3	H

Channel 36(1GHz ~ 8GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2995.0	49.85	1.8	48.05	V
3540.2	49.99	1.2	48.79	H
4070.8	48.64	1.3	47.34	H
5900.0	49.71	2.4	47.31	H
6279.4	52.19	2.9	49.29	V
6906.6	53.16	4	49.16	H

Channel 36(8GHz ~ 18GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
9244.8	50.53	5.1	45.43	H
10355.8	48.4	7.8	40.6	H
11627.0	49.72	9.8	39.92	H
12973.0	49.42	11	38.42	V
13688.4	50.52	11.6	38.92	H
16332.8	52.18	16.2	35.98	V

802.11n-HT20MHz

Channel 36(30MHz ~1GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
31.7	13.22	-14.4	27.62	H
589.8	40.65	-3.7	44.35	V

Channel 36(1GHz ~ 8GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2995.4	48.73	1.7	47.03	V
3547.6	48.66	1.2	47.46	H
4069.8	48.31	1.3	47.01	H
6279.6	53.69	2.9	50.79	V
6906.6	51.67	4	47.67	H
7251.0	49.69	3.9	45.79	H

Channel 36(8GHz ~ 18GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity

9245.0	48.7	5.1	43.6	V
10781.0	48.25	7.3	40.95	V
12193.8	49.84	10.7	39.14	H
14003.4	50.95	12.4	38.55	V
14952.4	51.28	13.8	37.48	H
16369.8	51.86	16.4	35.46	V

802.11n-HT40MHz

Channel 38(30MHz ~1GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
393.2	34.94	-8.2	43.14	V
589.8	41.13	-3.7	44.83	V

Channel 38(1GHz ~ 8GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2991.6	49.2	1.8	47.4	V
3519.8	48.01	0.9	47.11	H
4982.6	61.69	3.5	58.19	H
5105.4	56.03	3.6	52.43	V
5670.0	53.6	2.3	51.3	H
6920.0	52.71	3.9	48.81	H

Channel 38 (1GHz ~ 8GHz)(Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
4982.6	41.9	3.5	38.4	H
5105.4	46.95	3.6	43.35	V

Channel 38(8GHz ~ 18GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
10359.2	48.43	7.8	40.63	V
11742.2	50.49	10	40.49	H
12756.6	51.5	10.9	40.6	V
14024.6	52.99	12.4	40.59	H
15225.2	50.27	14.1	36.17	V
16307.2	53.28	16.1	37.18	V

802.11ac-VHT20MHz

Channel 36(30M-1G)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
33.6	9.59	-14.1	23.69	V
125.0	33.12	-15.9	49.02	H
393.2	35.3	-8.3	43.6	V

Channel 36(1GHz ~ 8GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2989.0	50.78	1.9	48.88	H
3563.6	48.25	1.1	47.15	H
4987.6	60.49	3.7	56.79	V
5467.8	52.71	2.2	50.51	H
6278.8	49.6	2.9	46.7	H
6906.6	52.17	4	48.17	H

Channel 36(1GHz ~ 8GHz)(Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
4987.6	42.14	3.7	38.44	V

Channel 36(8GHz ~ 18GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
9310.6	47.06	5.4	41.66	H
10298.8	49.04	7.6	41.44	H
11627.0	50.59	9.8	40.79	V
12863.6	50.16	11.1	39.06	H
15295.2	51.75	14.4	37.35	H
16360.8	51.3	16.3	35	V

802.11ac-VHT40MHz

Channel 38(30M-1G)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
35.4	11.03	-13.7	24.73	V
125.0	31.9	-15.9	47.8	H
393.2	35.22	-8.3	43.52	V

Channel 38 (1GHz ~ 8GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2996.0	46.76	1.7	45.06	V
3577.2	47.99	1.1	46.89	H
4980.0	59.33	3.3	56.03	H
5670.0	53.48	2.3	51.18	H
6920.0	52.95	3.9	49.05	H
7152.2	49.34	4.1	45.24	V

Channel 38 (1GHz ~ 8GHz) (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
4980.0	41.35	3.3	38.05	H

Channel 38 (8GHz ~ 18GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
9993.0	47.92	6.1	41.82	H
11653.8	49.37	9.9	39.47	H
12914.4	50.16	11.2	38.96	H
13754.4	49.26	11.7	37.56	V
15115.8	51.46	13.6	37.86	H
16308.6	51.63	16.1	35.53	H

802.11ac-VHT80MHz

Channel 42(30M-1G)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
35.7	13.94	-13.6	27.54	V
125.0	32.32	-15.9	48.22	H
393.2	34.02	-8.3	42.32	V

Channel 42 (1GHz ~ 8GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2989.4	49.5	1.9	47.6	V
3538.6	49.1	1.3	47.8	H
4999.8	60.57	4.1	56.47	H
5690.0	52.61	2.3	50.31	H
6946.8	52.15	3.8	48.35	H
7152.0	51.44	4.1	47.34	V

Channel 42 (1GHz ~ 8GHz)(Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
4999.8	41.31	4.1	37.21	H

Channel 42 (8GHz ~ 18GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
9244.6	47.91	5.1	42.81	H
10767.2	48.76	7.3	41.46	H
11786.2	49.9	10	39.9	V
12852.0	50.04	11.1	38.94	H
13736.8	49.47	11.7	37.77	V
15249.4	51.55	14.2	37.35	H

6.8 Frequency Stability

Manufacturers ensured the EUT meet the requirement of frequency stability, such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.(According to15.407(g)).

6.9 AC Powerline Conducted Emission

In accordance with the requirements of standard FCC Part 15.207, conducted emission is not applicable.

Annex A EUT Photos

See the document"I23W00008-External Photos".
See the document" I23W00008-Internal Photos ".

ANNEX B Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

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