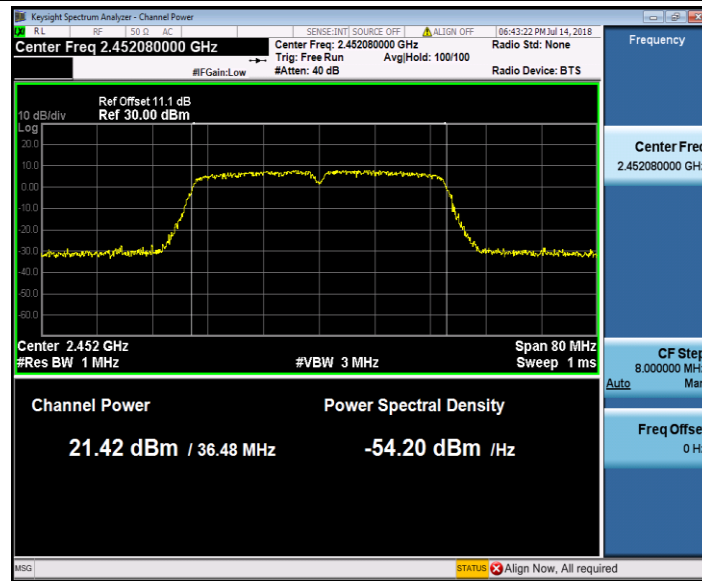


802.11n(HT40)(2452MHz)

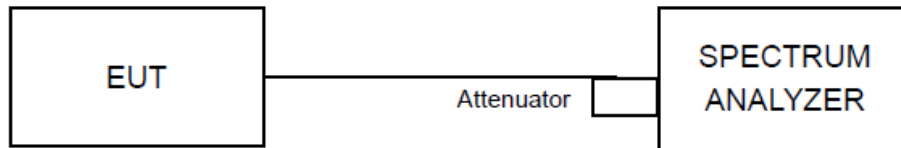


4.3 Power Spectral Density Measurement

4.3.1 Limit

The Maximum of Power Spectral Density Measurement is 8 dBm.

4.3.2 Test Setup



4.3.3 Test Procedures

The power output per FCC § 15.247(e) was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 10.5) for compliance to FCC 47CFR 15.247 requirements.

- a) Measure the duty cycle (x) of the transmitter output signal.
- b) Set instrument center frequency to DTS channel center frequency.
- c) Set span to at least 1.5 OBW.
- d) Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- e) Set VBW $\geq 3 \text{ RBW}$.
- f) Detector = power averaging (RMS) or sample detector (when RMS not available).
- g) Ensure that the number of measurement points in the sweep $\geq 2 \text{ span/RBW}$.
- h) Sweep time = auto couple.
- i) Do not use sweep triggering. Allow sweep to “free run”.
- j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- k) Use the peak marker function to determine the maximum amplitude level.
- l) Add $10 \log (1/x)$, where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.
- m) If resultant value exceeds the limit, then reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

4.3.4 Deviation of Test Standard

No deviation.

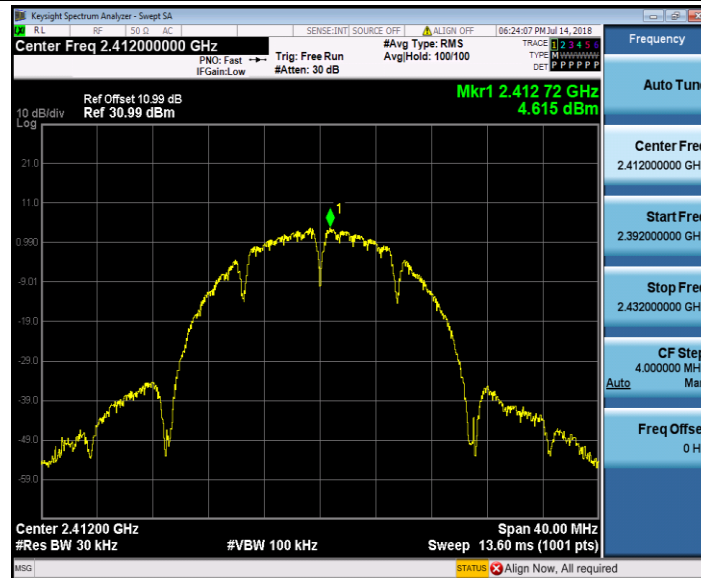
4.3.5 Test Results

802.11b

Channel	Frequency (MHz)	PSD (dBm/30kHz)	Limit (dBm/30kHz)	Pass / Fail
1	2412	4.62	8	Pass
6	2437	4.41	8	Pass
11	2462	4.43	8	Pass

Spectrum Plot

802.11b(2412MHz)



802.11b(2437MHz)



802.11b(2462MHz)

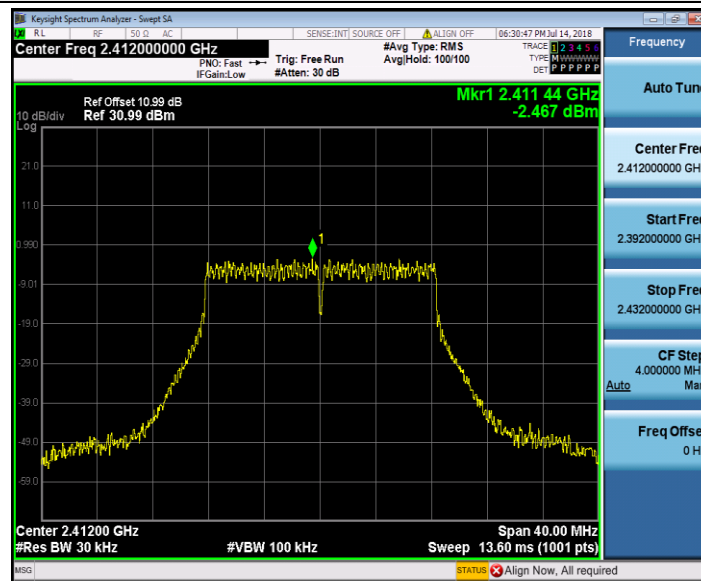


802.11g

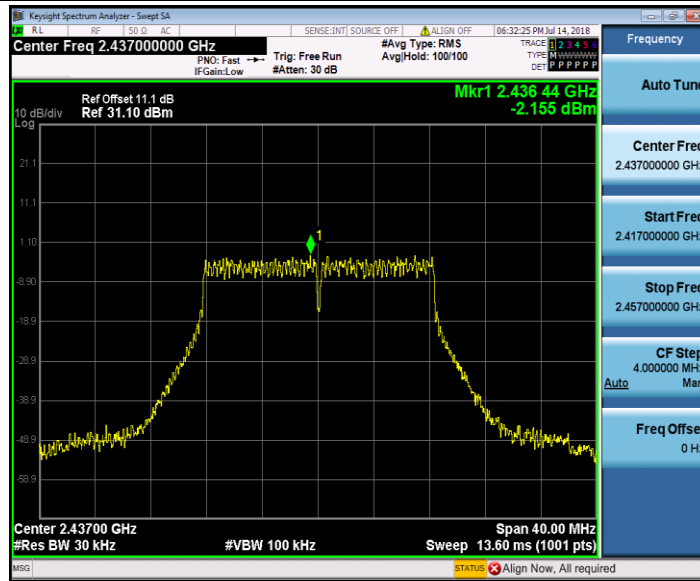
Channel	Frequency (MHz)	PSD (dBm/30kHz)	Limit (dBm/30kHz)	Pass / Fail
1	2412	-2.47	8	Pass
6	2437	-2.16	8	Pass
11	2462	-1.81	8	Pass

Spectrum Plot

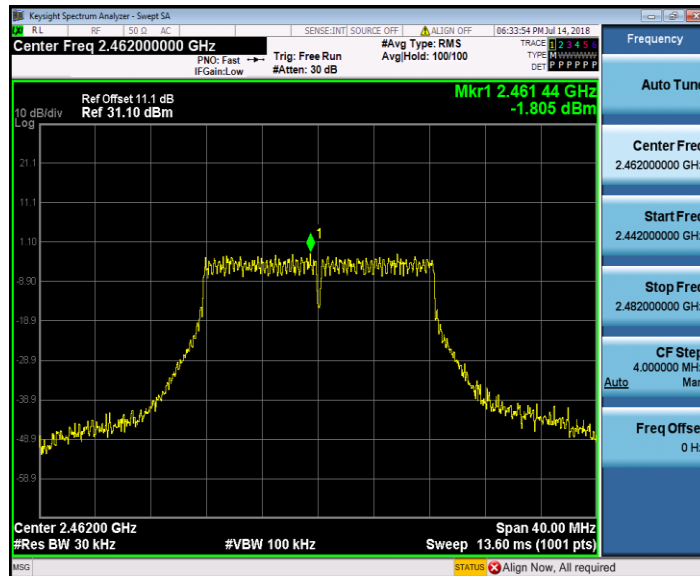
802.11g(2412MHz)



802.11g(2437MHz)



802.11g(2462MHz)

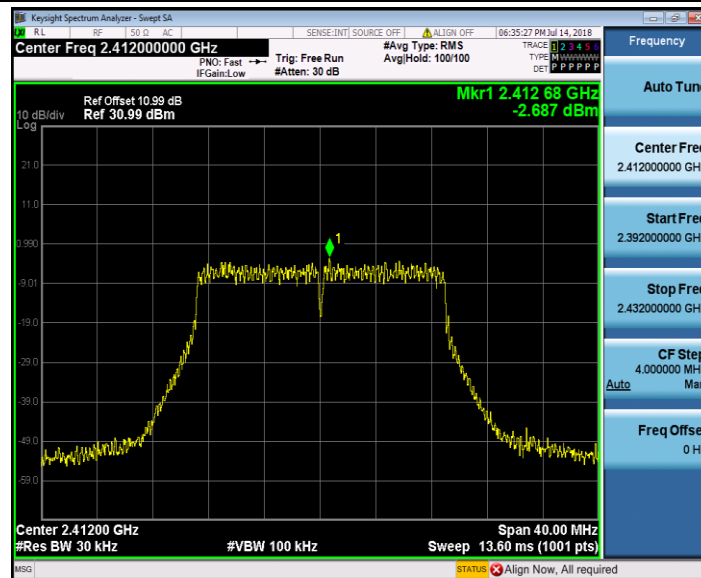


802.11n(HT20)

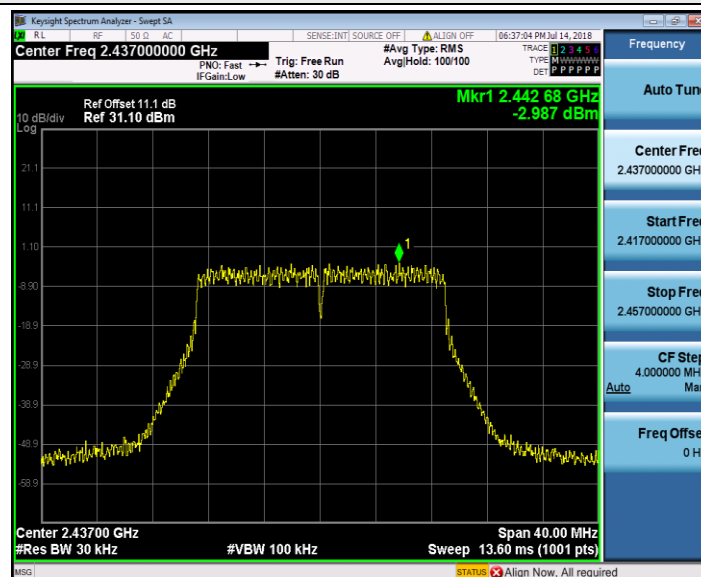
Channel	Frequency (MHz)	PSD (dBm/30kHz)	Limit (dBm/30kHz)	Pass / Fail
1	2412	-2.69	8	Pass
6	2437	-2.99	8	Pass
11	2462	-2.02	8	Pass

Spectrum Plot

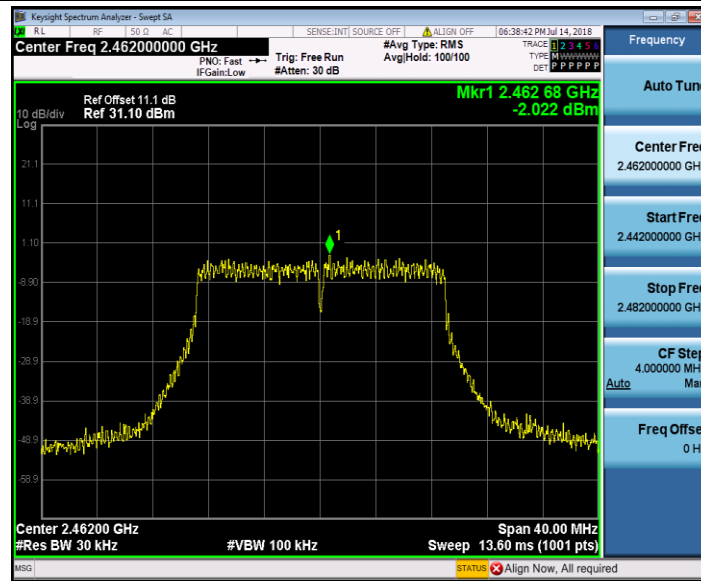
802.11n(HT20)(2412MHz)



802.11n(HT20)(2437MHz)



802.11n(HT20)(2462MHz)



802.11n(HT40)

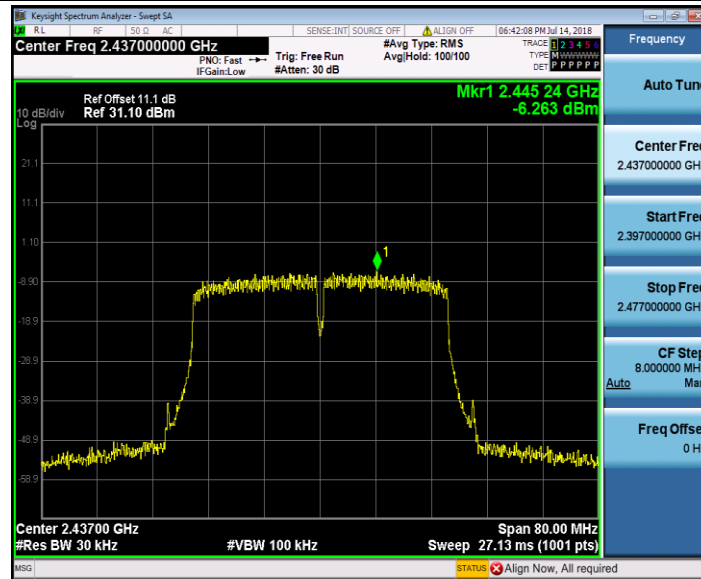
Channel	Frequency (MHz)	PSD (dBm/30kHz)	Limit (dBm/30kHz)	Pass / Fail
3	2422	-6.38	8	Pass
6	2437	-6.26	8	Pass
9	2452	-6.05	8	Pass

Spectrum Plot

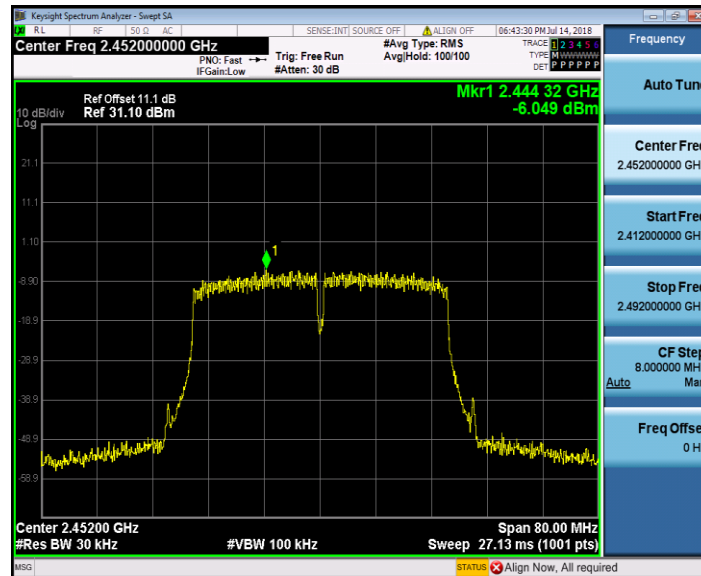
802.11n(HT40)(2422MHz)



802.11n(HT40)(2437MHz)



802.11n(HT40)(2452MHz)

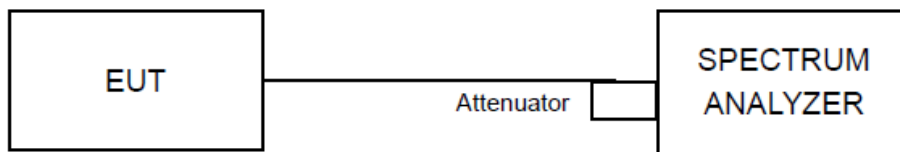


4.4 Emissions in non-restricted frequency bands

4.4.1 Limit

Below 30 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

4.4.2 Test Setup



4.4.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.4.4 Deviation of Test Standard

No deviation.

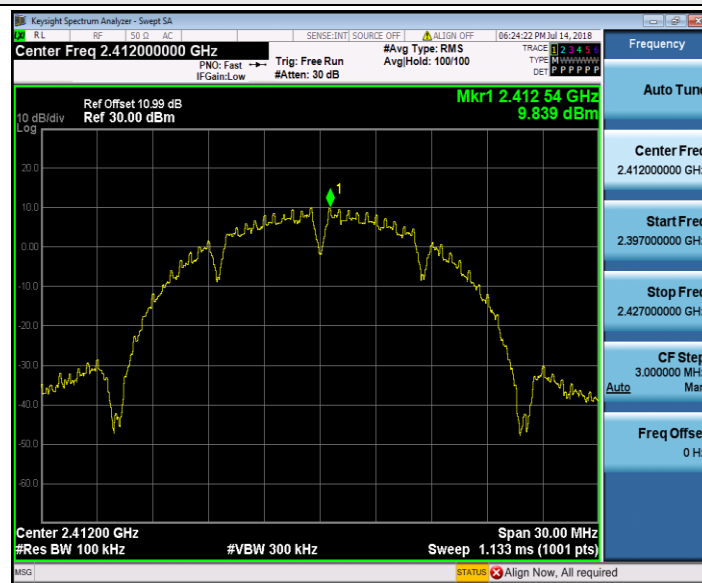
4.4.5 Test Results

802.11b

Channel	Frequency (MHz)	Pass / Fail
1	2412	Pass
11	2462	Pass

Spectrum Plot

802.11b(2412MHz)



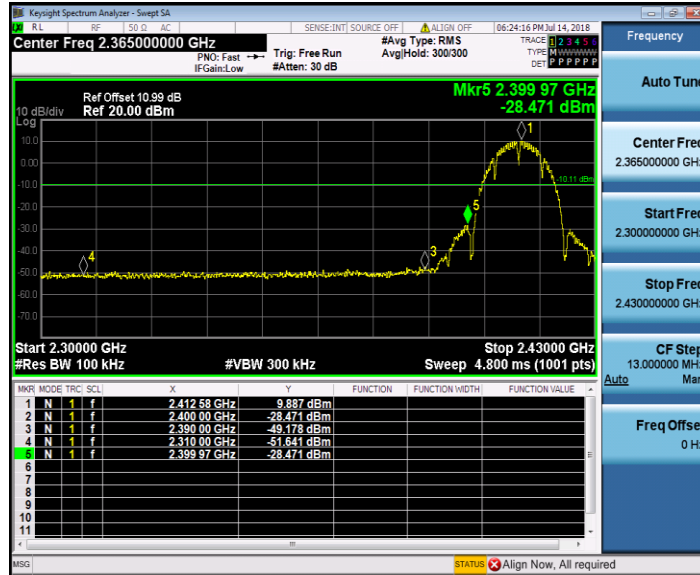
802.11b(2462MHz)



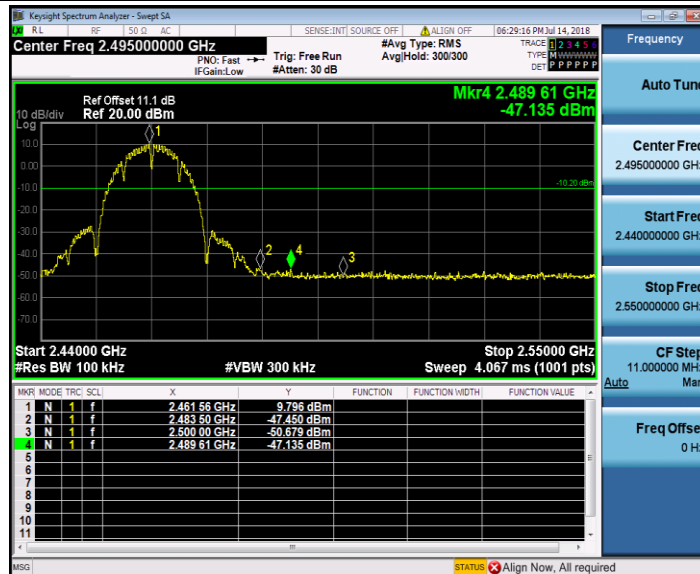


Spectrum Plot

802.11b(2412MHz) Band Edge

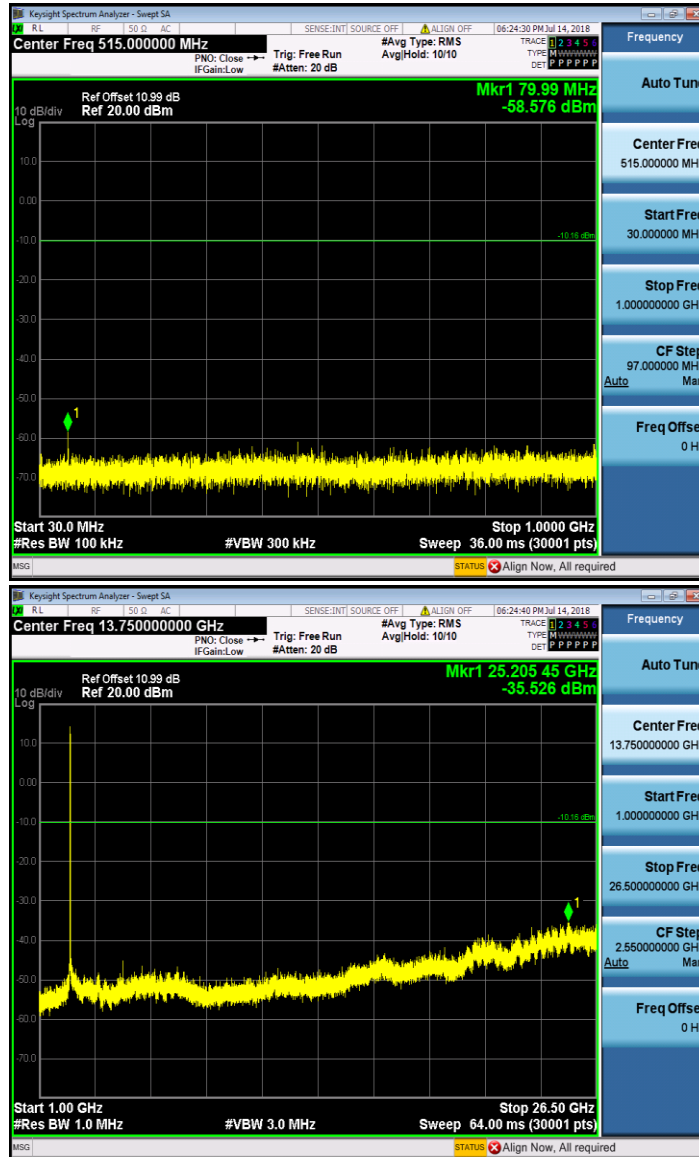


802.11b(2462MHz) Band Edge

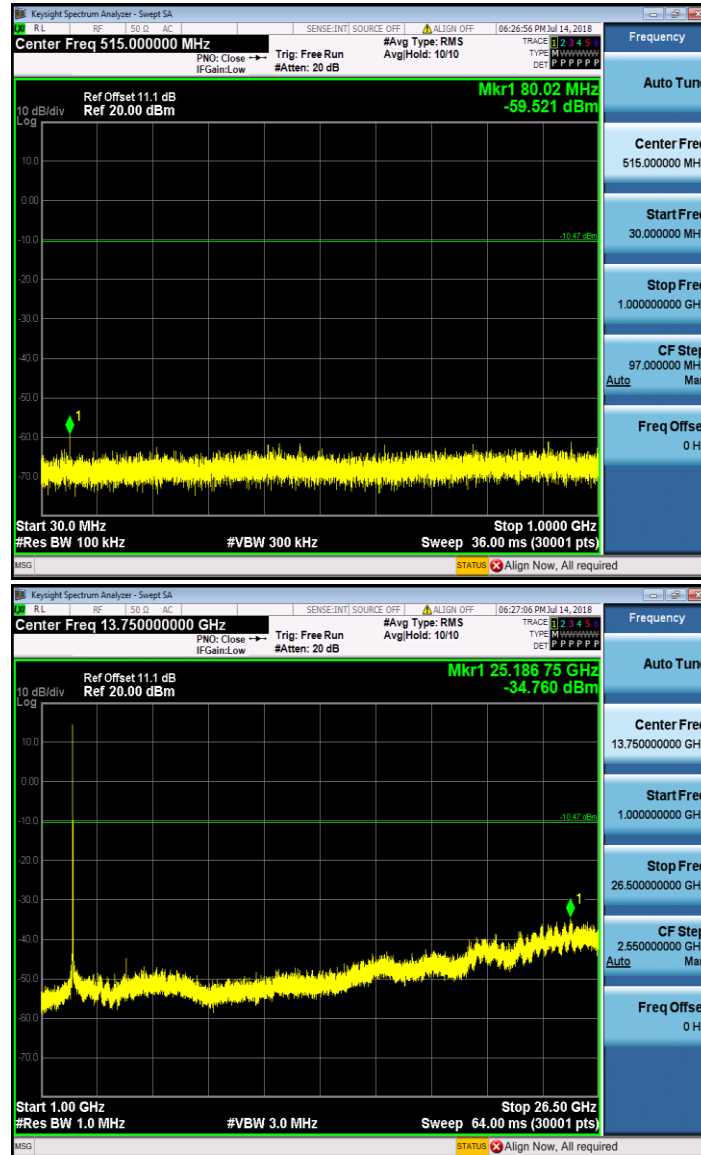


Spectrum Plot

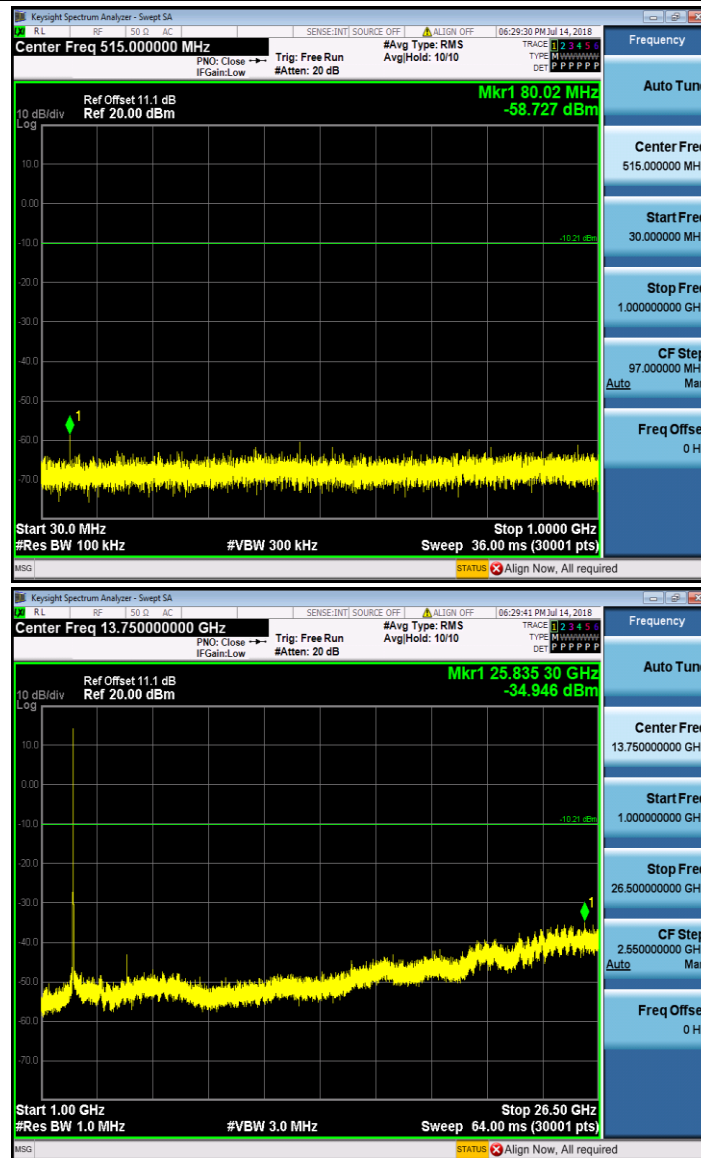
802.11b(2412MHz) Out-of-Band Emissions



802.11b(2437MHz) Out-of-Band Emissions



802.11b(2462MHz) Out-of-Band Emissions



802.11g

Channel	Frequency (MHz)	Pass / Fail
1	2412	Pass
11	2462	Pass

Spectrum Plot

802.11g(2412MHz)



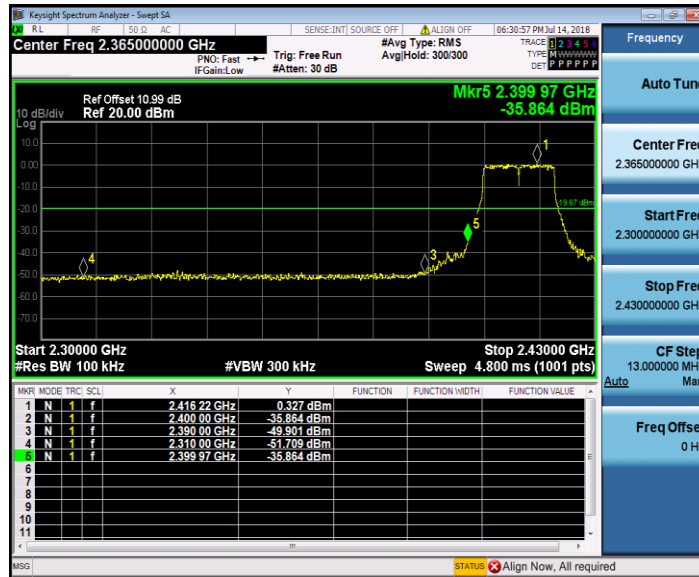
802.11g(2462MHz)



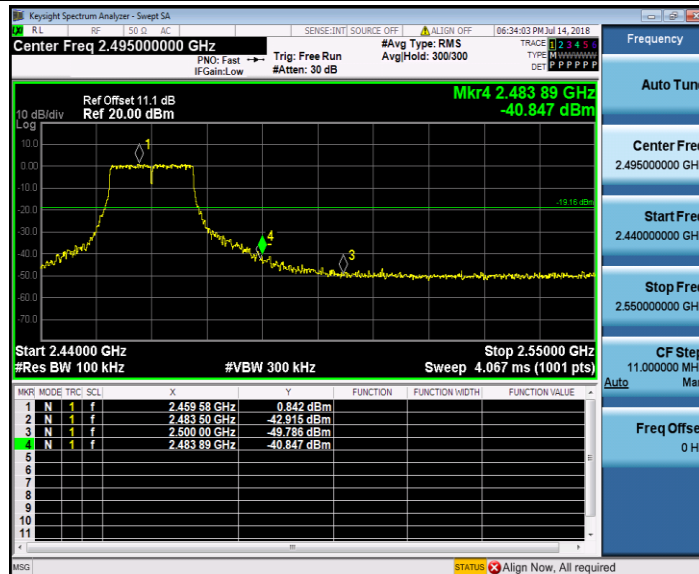


Spectrum Plot

802.11g(2412MHz) Band Edge

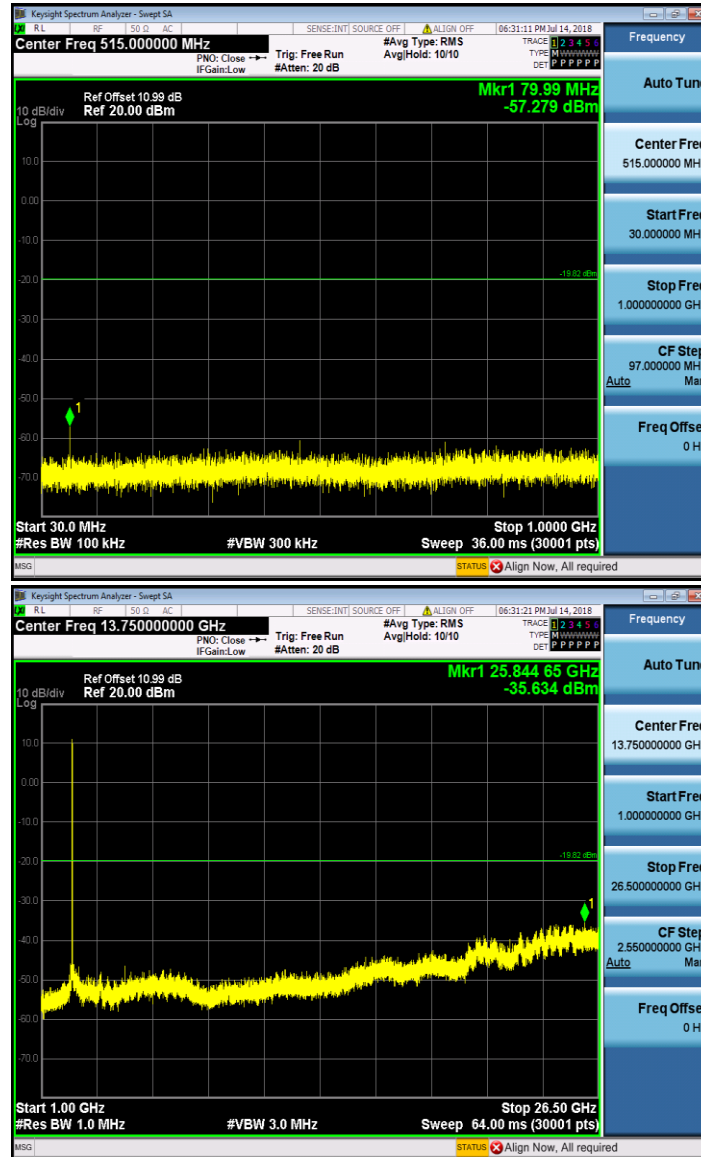


802.11g(2462MHz) Band Edge

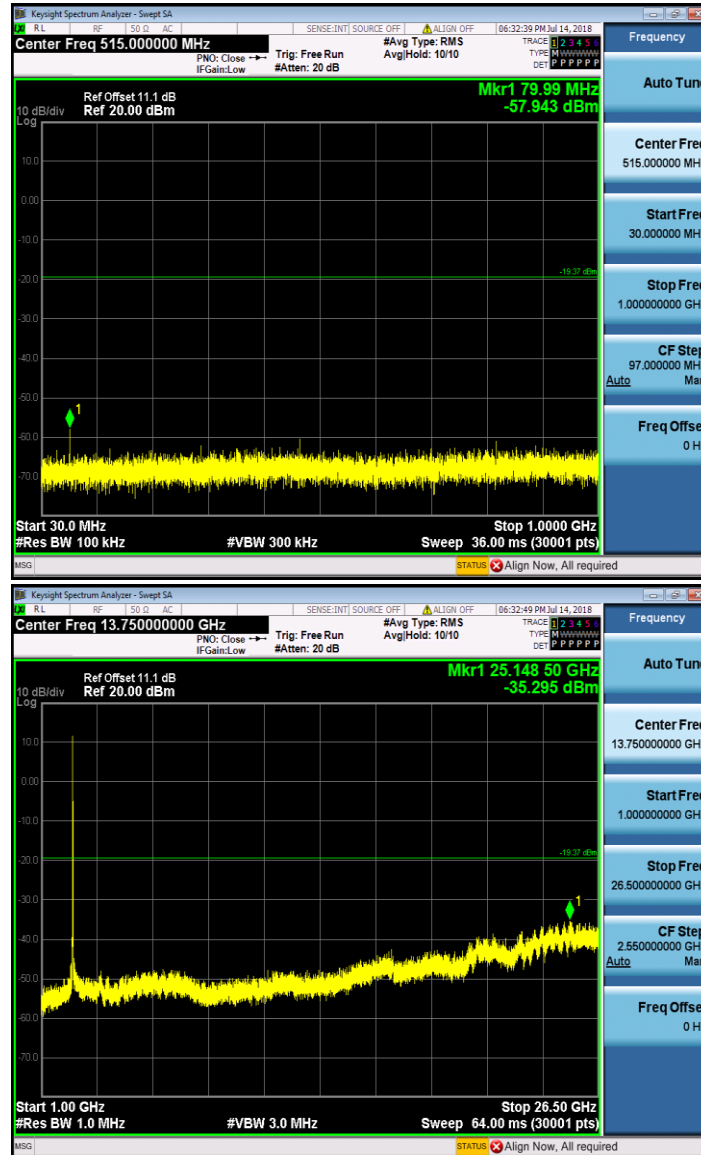


Spectrum Plot

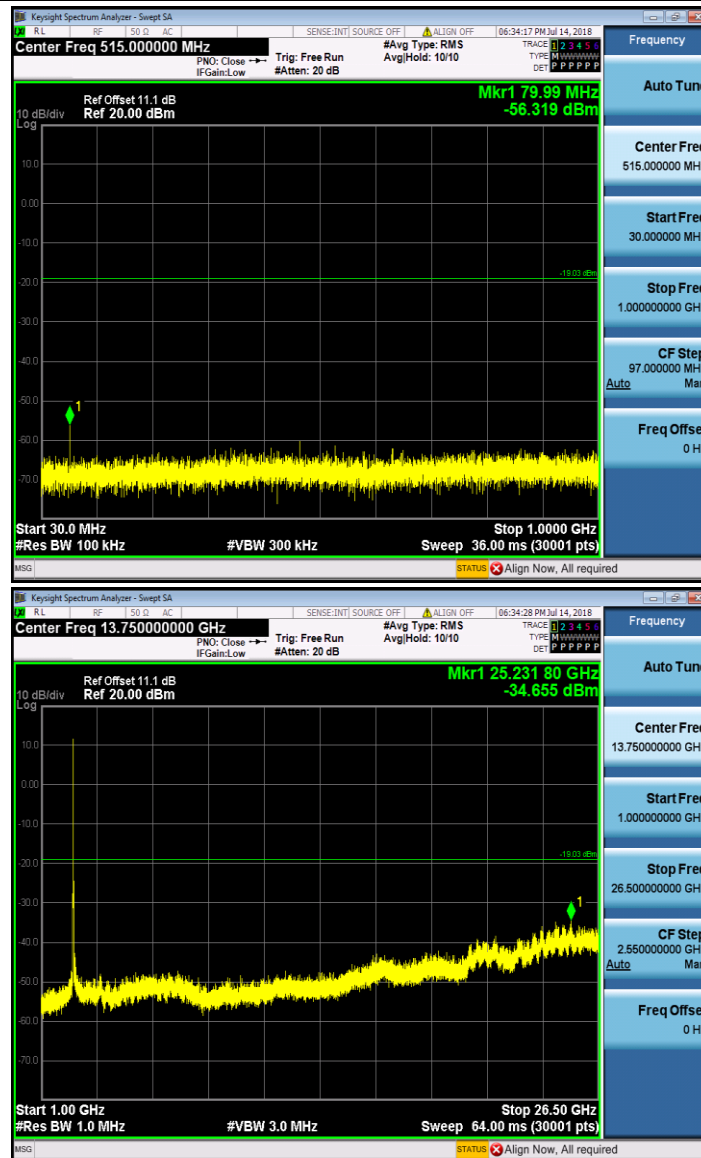
802.11g(2412MHz) Out-of-Band Emissions



802.11g(2437MHz) Out-of-Band Emissions



802.11g(2462MHz) Out-of-Band Emissions

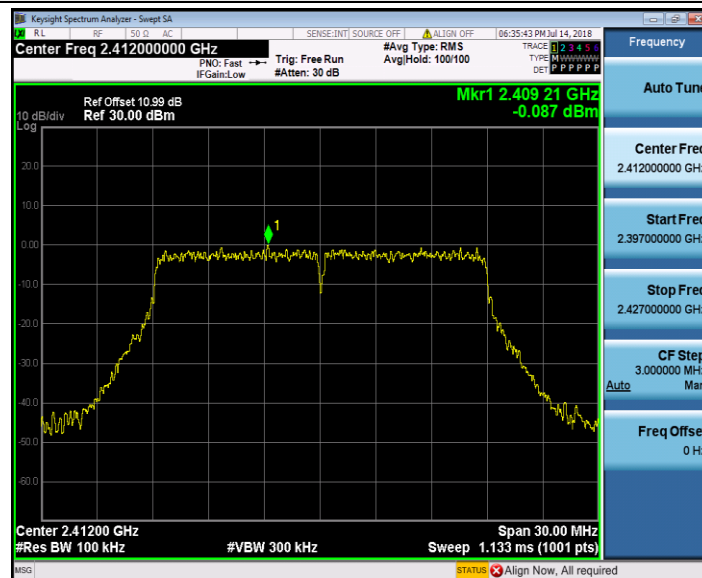


802.11n(HT20)

Channel	Frequency (MHz)	Pass / Fail
1	2412	Pass
11	2462	Pass

Spectrum Plot

802.11n(HT20)(2412MHz)



802.11n(HT20)(2462MHz)

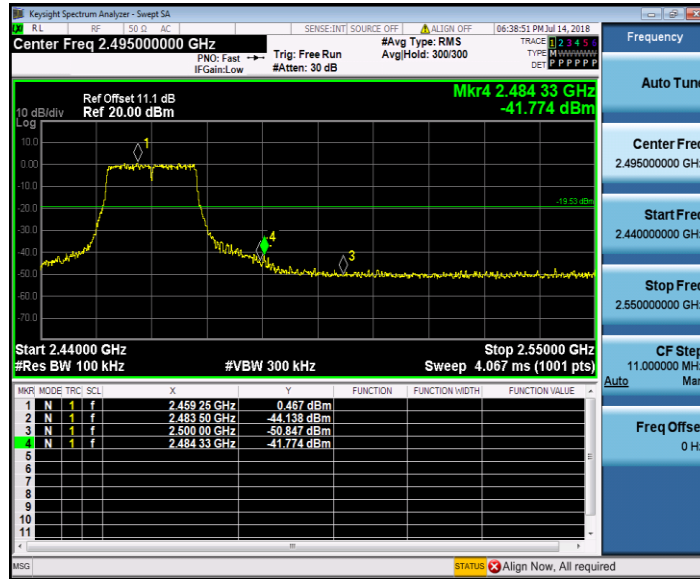


Spectrum Plot

802.11n(HT20)(2412MHz) Band Edge



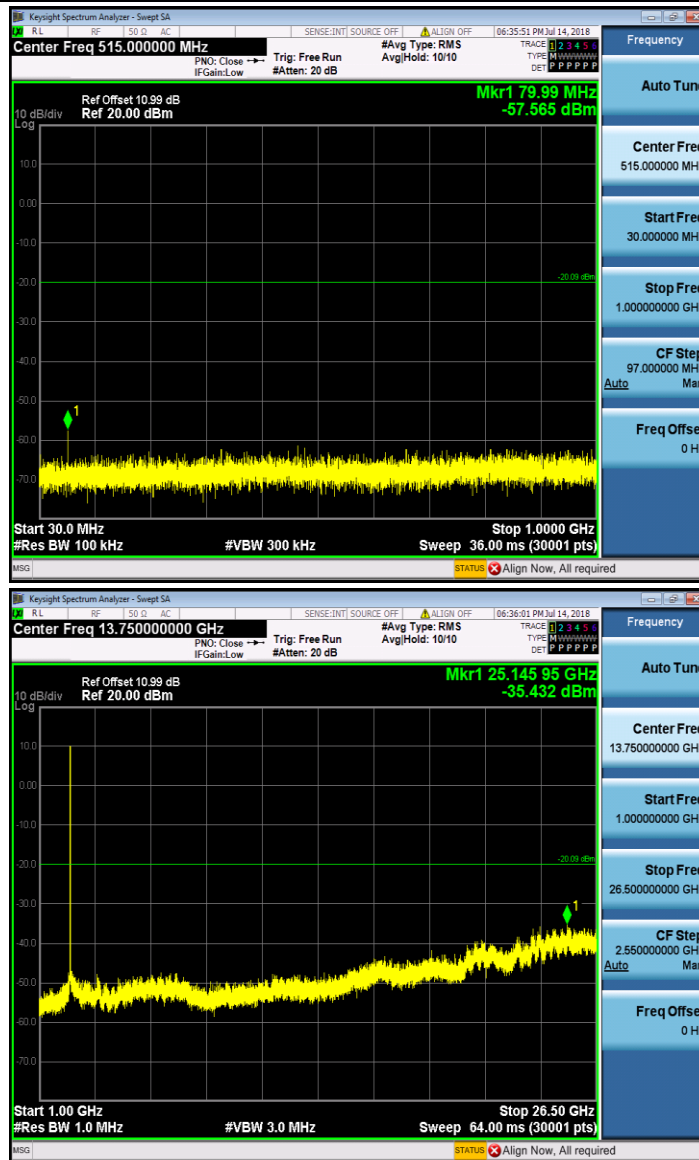
802.11n(HT20)(2462MHz) Band Edge



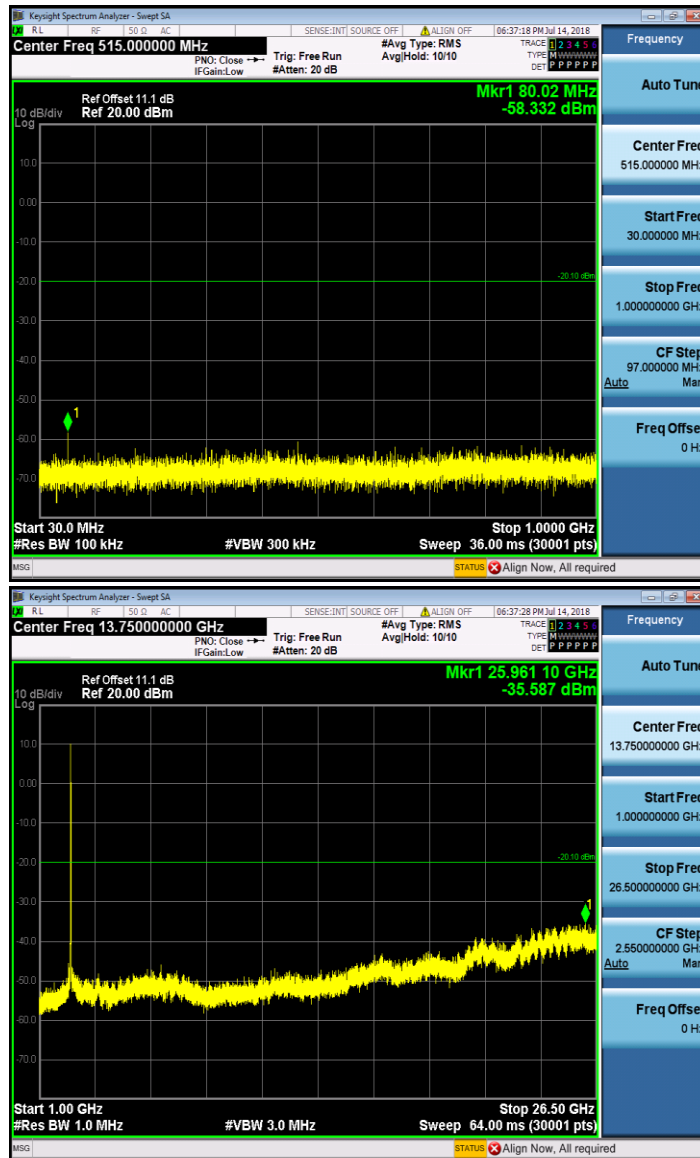


Spectrum Plot

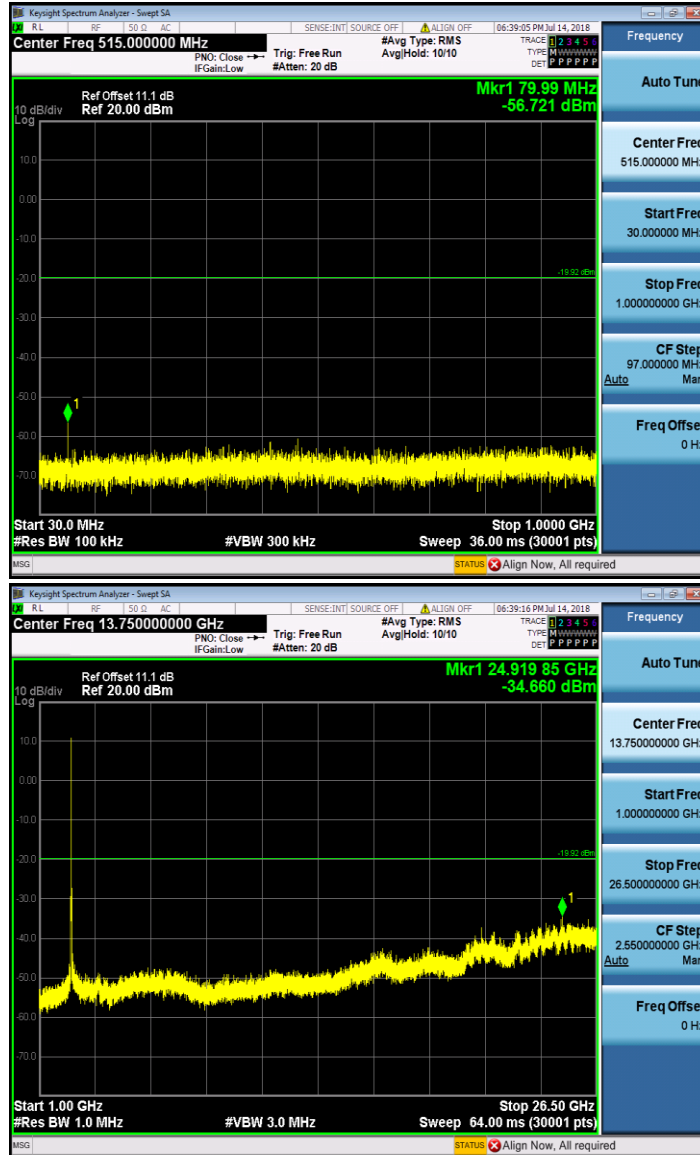
802.11n(HT20)(2412MHz) Out-of-Band Emissions



802.11n(HT20)(2437MHz) Out-of-Band Emissions



802.11n(HT20)(2462MHz) Out-of-Band Emissions



802.11n(HT40)

Channel	Frequency (MHz)	Pass / Fail
3	2422	Pass
9	2452	Pass

Spectrum Plot

802.11n(HT40)(2422MHz)

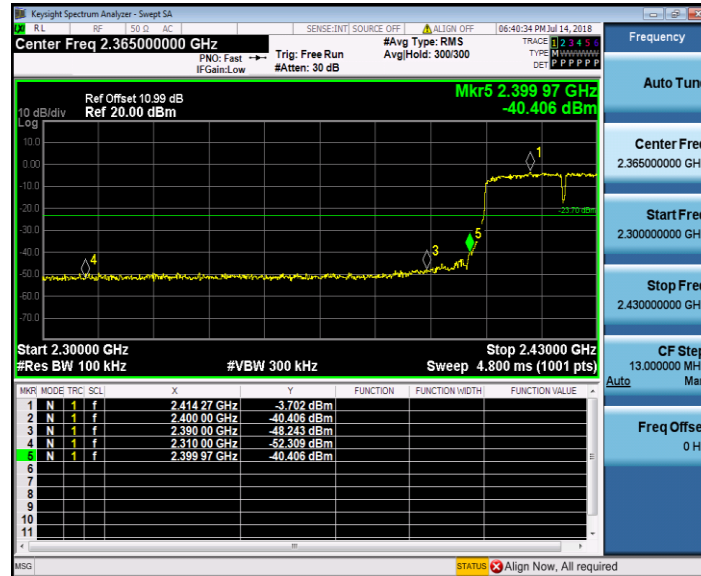


802.11n(HT40)(2452MHz)

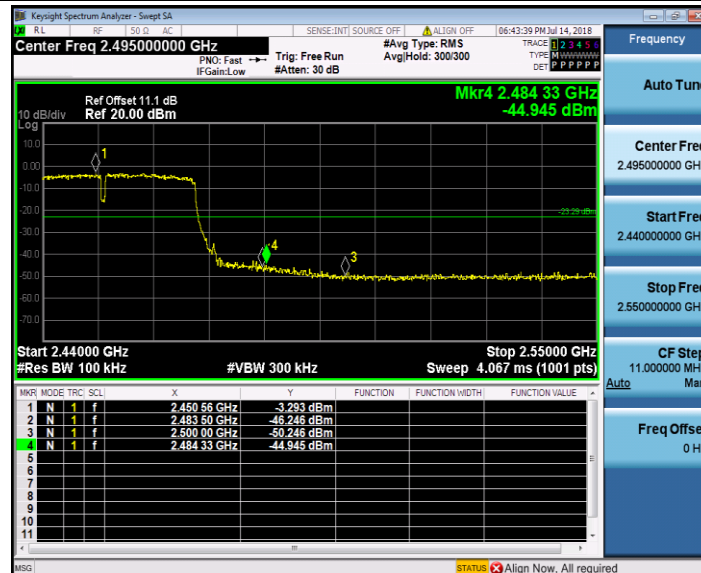


Spectrum Plot

802.11n(HT40)(2422MHz) Band Edge

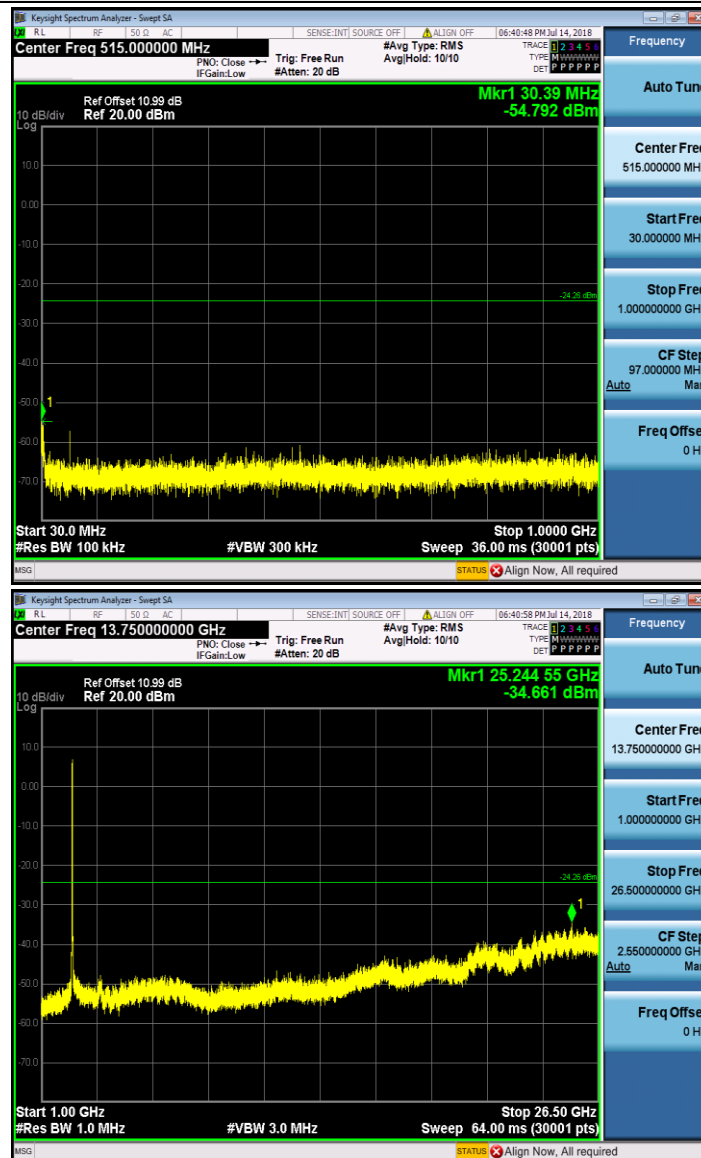


802.11n(HT40)(2452MHz) Band Edge

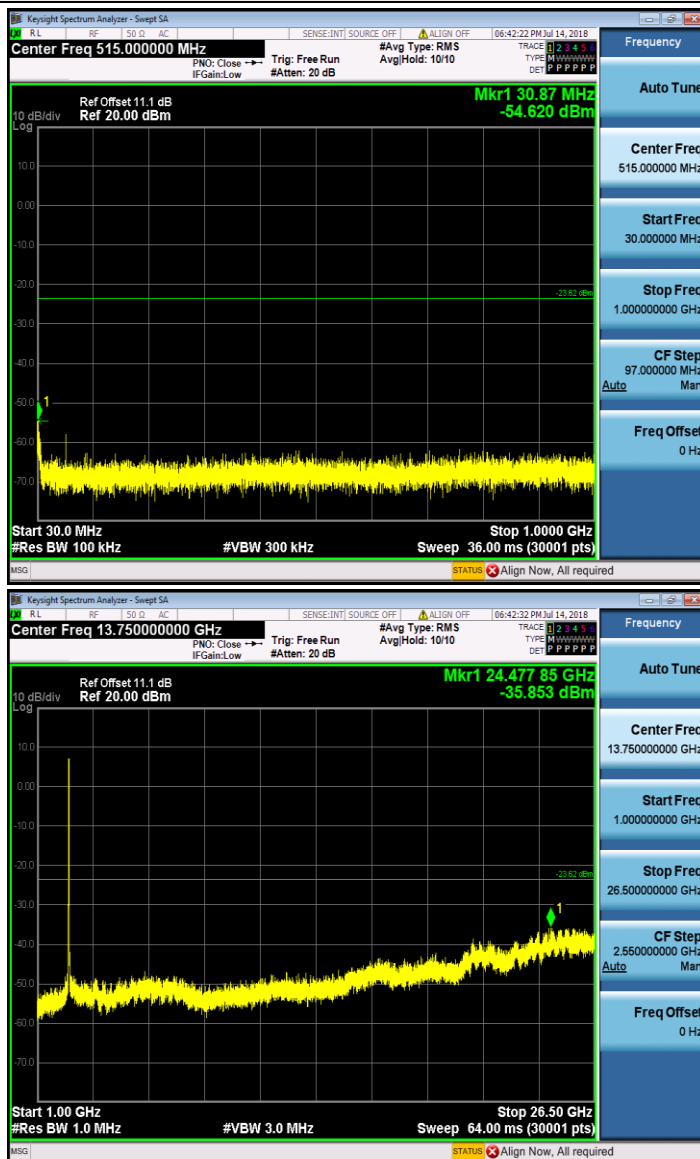


Spectrum Plot

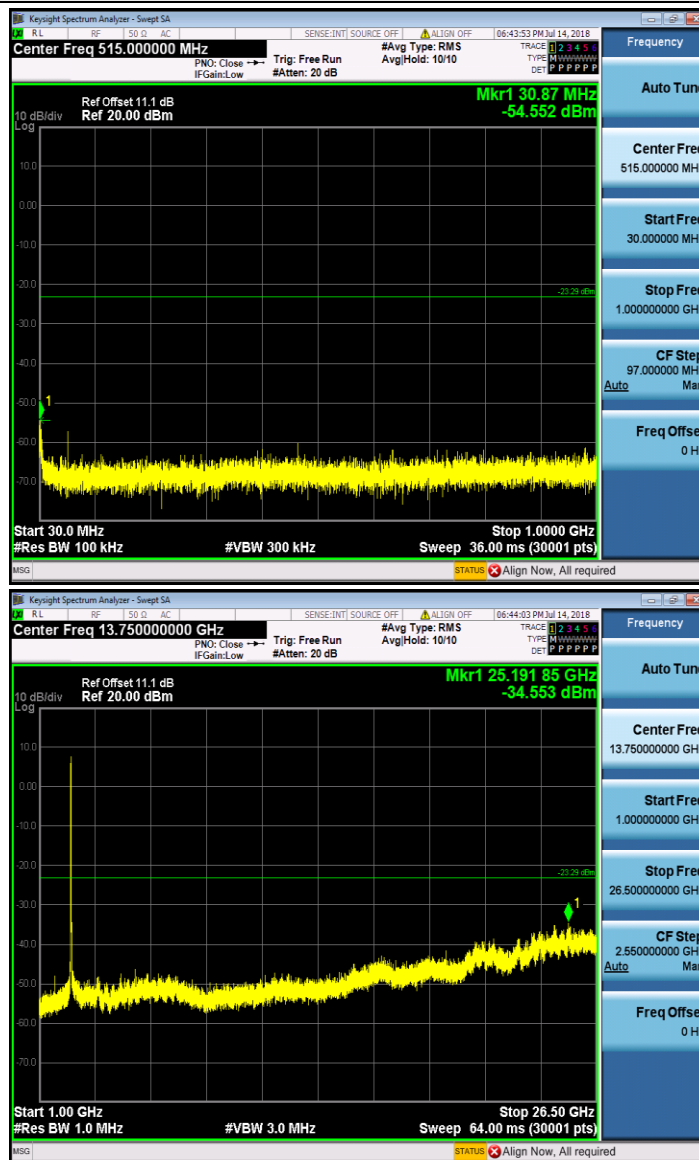
802.11n(HT40)(2422MHz) Out-of-Band Emissions



802.11n(HT40)(2437MHz) Out-of-Band Emissions



802.11n(HT40)(2452MHz) Out-of-Band Emissions



4.5 Radiated Emission Measurement

4.5.1 Limits

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

4.5.2 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degree to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotate table was turned from 0 degree to 360 degree to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

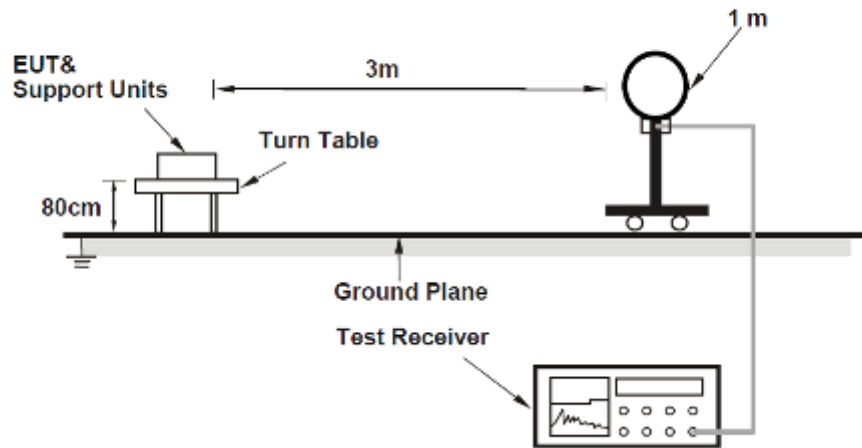
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for RMS Average (Duty cycle < 98 %) for Peak detection at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle $\geq$ 98 %) for Average detection (AV) at frequency above 1 GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.5.3 Deviation from Test Standard

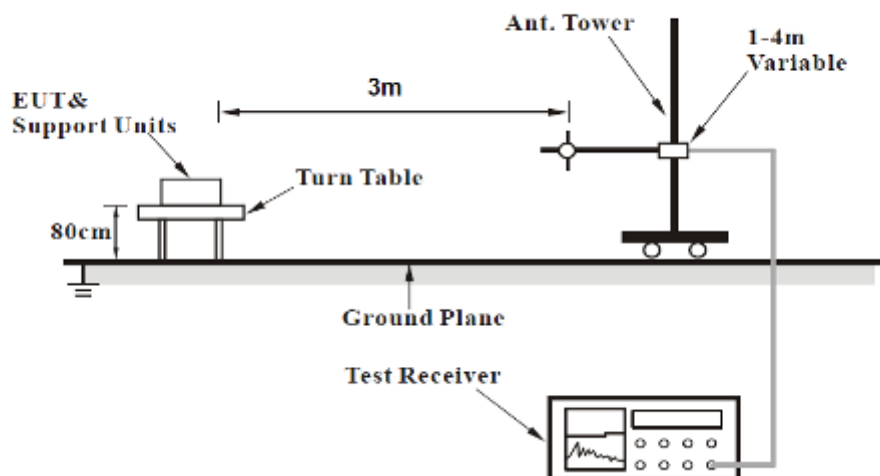
No deviation.

4.5.4 Test Setup

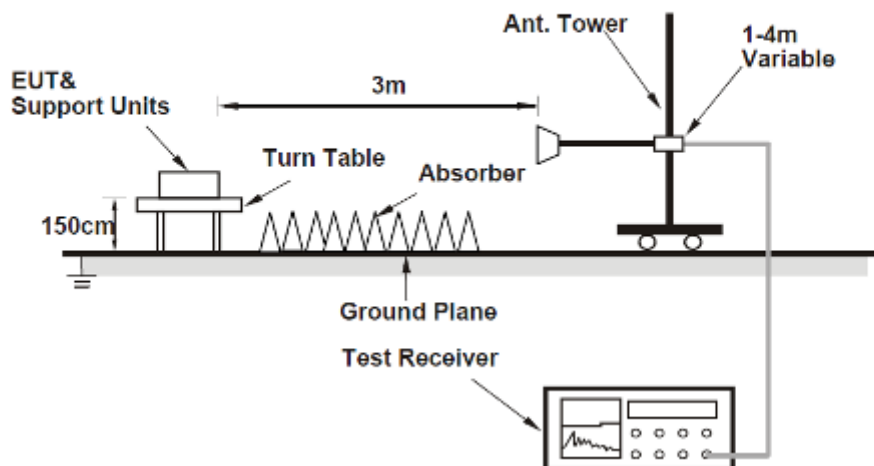
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.5.5 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.5.6 Test Results

Radiated Emissions Range 9kHz~30MHz

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Radiated Emissions Range 30MHz~1GHz

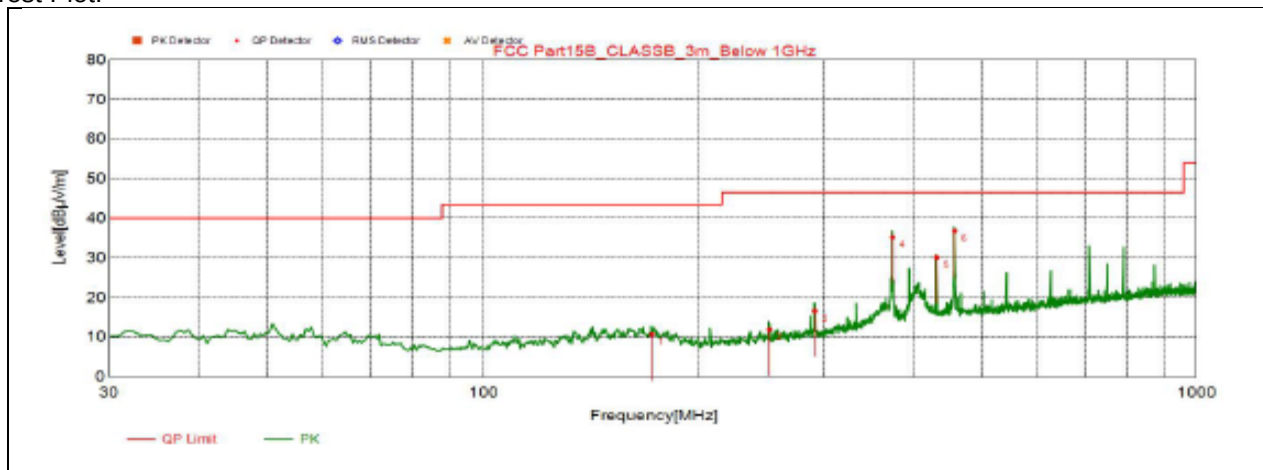
Mode	Normal working	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz	Antenna Polarity	Horizontal

Spurious Emission Level					
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)
1	172.1	10.71	43.5	-32.79	-16.3
2	251.6	11.95	43.5	-34.55	-17.42
3	291.4	16.67	43.5	-29.83	-16.17
4	374.9	35.26	46.5	-11.24	-13.92
5	432.1	30.17	46.5	-16.33	-12.65
6	458.0	36.85	46.5	-9.65	-12.16

REMARKS:

- Emission Level(dBuV/m) = Spectrum reading (dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value

Test Plot:



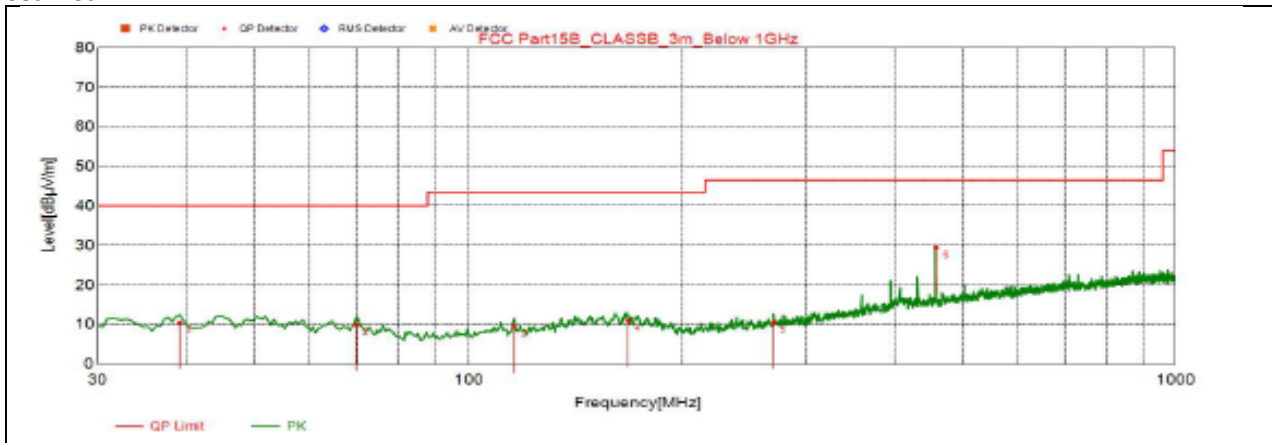
Mode	Normal working	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz	Antenna Polarity	Vertical

Spurious Emission Level					
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)
1	39.21	10.45	40	-29.55	-17.46
2	69.77	28.25	43.5	-30.06	-18.31
3	115.8	28.64	43.5	-34.05	-19.19
4	168.2	27.13	43.5	-32.51	-16.14
5	270.0	27.40	46.5	-35.93	-16.83
6	458.3	41.66	46.5	-17.00	-12.16

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Test Plot:





Radiated Emission Range 1GHz~10th Harmonic

802.11b

Channel	TX Channel 1	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4824.00	52.35	74.00	-21.65	4.42	H	PK
2	4824.00	42.43	54.00	-11.57	4.42	H	AV
3	4824.00	53.39	74.00	-20.61	4.42	V	PK
4	4824.00	44.3	54.00	-9.70	4.42	V	AV

Channel	TX Channel 6	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4874.00	49.66	74.00	-24.34	4.54	H	PK
2	4874.00	41.02	54.00	-12.98	4.54	H	AV
3	4874.00	53.48	74.00	-20.52	4.54	V	PK
4	4874.00	43.98	54.00	-10.02	4.54	V	AV

Channel	TX Channel 11	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4924.00	51.61	74.00	-22.39	7.81	H	PK
2	4924.00	41.96	54.00	-12.04	7.81	H	AV
3	4924.00	55.32	74.00	-18.68	7.81	V	PK
4	4924.00	45.29	54.00	-8.71	7.81	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

802.11g

Channel	TX Channel 1	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4824.00	49.01	74.00	-24.99	4.42	H	PK
2	4824.00	38.99	54.00	-15.01	4.42	H	AV
3	4824.00	48.89	74.00	-25.11	4.42	V	PK
4	4824.00	39.66	54.00	-14.34	4.42	V	AV

Channel	TX Channel 6	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4874.00	48.45	74.00	-25.55	4.54	H	PK
2	4874.00	38.59	54.00	-15.41	4.54	H	AV
3	4874.00	48.88	74.00	-25.12	4.54	V	PK
4	4874.00	38.89	54.00	-15.11	4.54	V	AV

Channel	TX Channel 11	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4924.00	50.42	74.00	-23.58	7.81	H	PK
2	4924.00	39.32	54.00	-14.68	7.81	H	AV
3	4924.00	50.22	74.00	-23.78	7.81	V	PK
4	4924.00	39.24	54.00	-14.76	7.81	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

**802.11n(HT20)**

Channel	TX Channel 1	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4824.00	48.44	74.00	-25.56	4.42	H	PK
2	4824.00	38.91	54.00	-15.09	4.42	H	AV
3	4824.00	50.27	74.00	-23.73	4.42	V	PK
4	4824.00	39.31	54.00	-14.69	4.42	V	AV

Channel	TX Channel 6	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4874.00	48.38	74.00	-25.62	4.54	H	PK
2	4874.00	38.75	54.00	-15.25	4.54	H	AV
3	4874.00	49.4	74.00	-24.60	4.54	V	PK
4	4874.00	38.72	54.00	-15.28	4.54	V	AV

Channel	TX Channel 11	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4924.00	49.56	74.00	-24.44	7.81	H	PK
2	4924.00	39.1	54.00	-14.90	7.81	H	AV
3	4924.00	50.43	74.00	-23.57	7.81	V	PK
4	4924.00	39.31	54.00	-14.69	7.81	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

802.11n(HT40)

Channel	TX Channel 3	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4844.00	49.08	74.00	-24.92	4.46	H	PK
2	4844.00	38.25	54.00	-15.75	4.46	H	AV
3	4844.00	48.21	74.00	-25.79	4.46	V	PK
4	4844.00	38.19	54.00	-15.81	4.46	V	AV

Channel	TX Channel 6	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4874.00	49.44	74.00	-24.56	4.54	H	PK
2	4874.00	38.41	54.00	-15.59	4.54	H	AV
3	4874.00	49.56	74.00	-24.44	4.54	V	PK
4	4874.00	38.83	54.00	-15.17	4.54	V	AV

Channel	TX Channel 9	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4904.00	49.48	74.00	-24.52	4.58	H	PK
2	4904.00	38.67	54.00	-15.33	4.58	H	AV
3	4904.00	49.5	74.00	-24.50	4.58	V	PK
4	4904.00	39.38	54.00	-14.62	4.58	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.6 Conducted Emission Measurement

4.6.1 Limits

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.6.2 Test Procedures

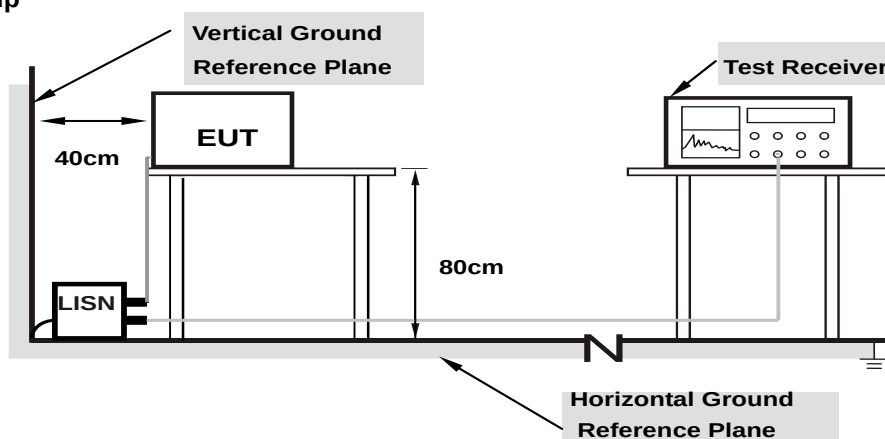
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.6.3 Deviation from Test Standard

No deviation.

4.6.4 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).



4.6.5 EUT Operating Conditions

Same as 4.1.6.

4.6.6 Test Results

Remarks: The EUT is powered by battery. therefore doesn't need to be tested.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

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