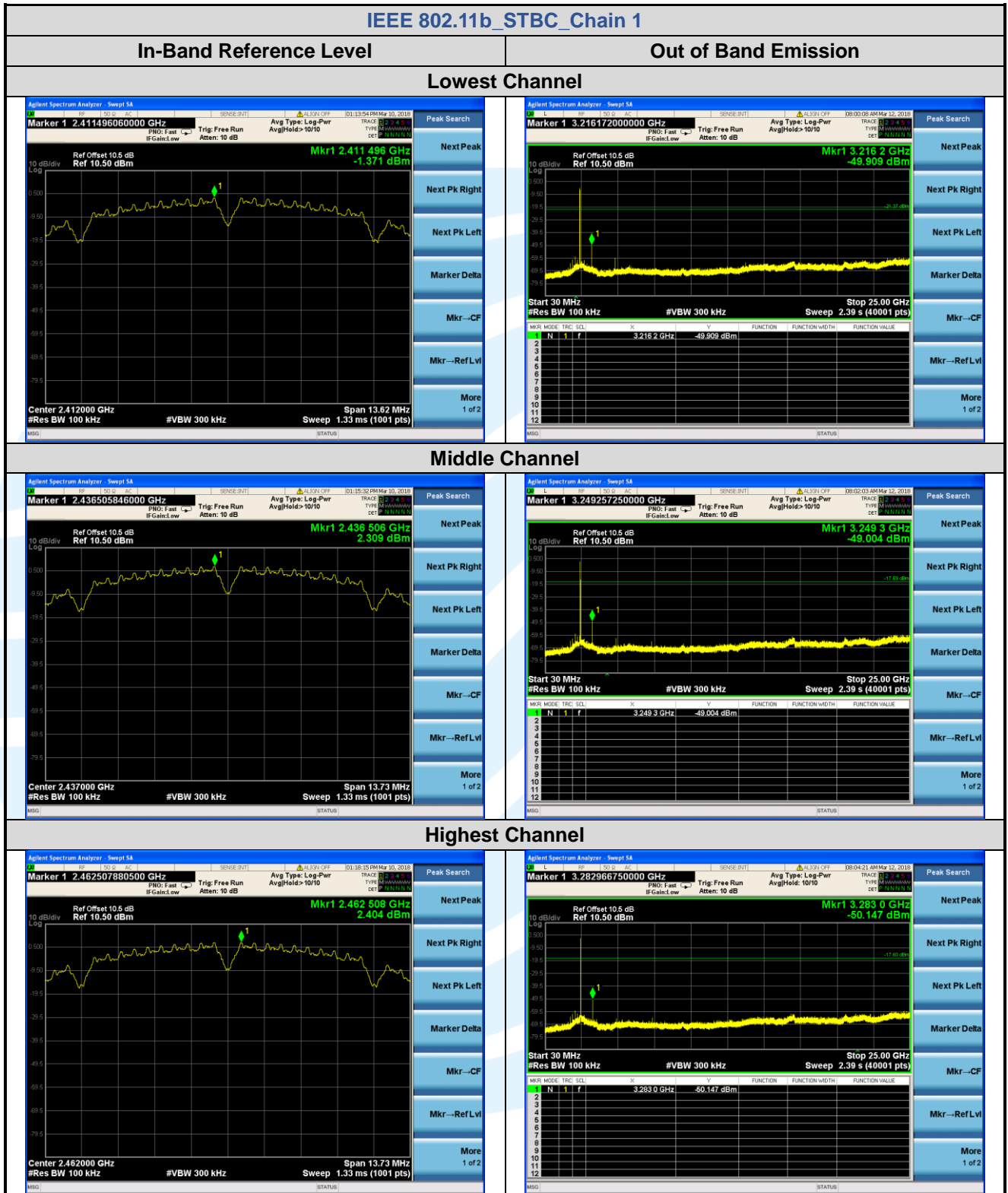


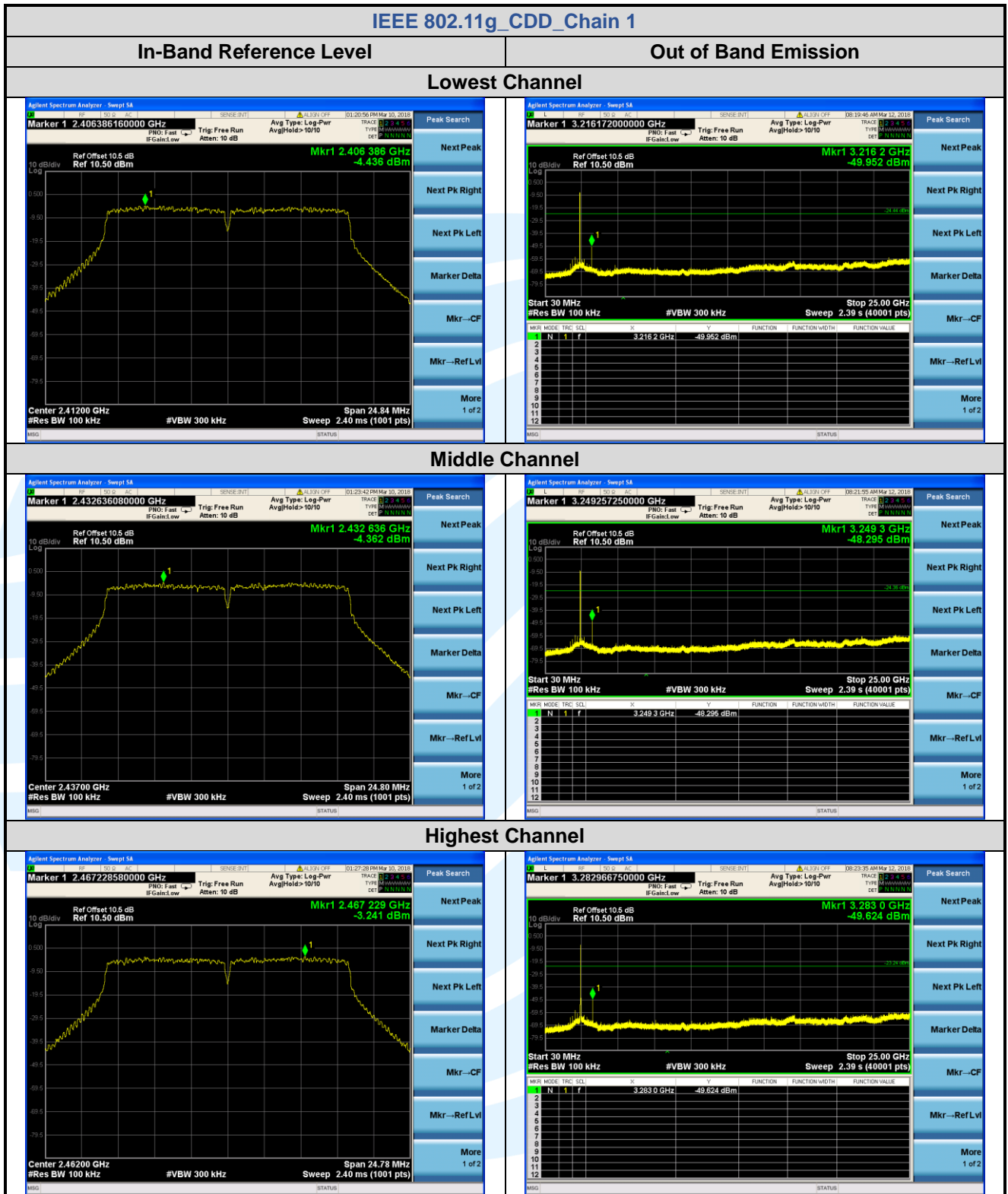
## 5.6 CONDUCTED OUT OF BAND EMISSION

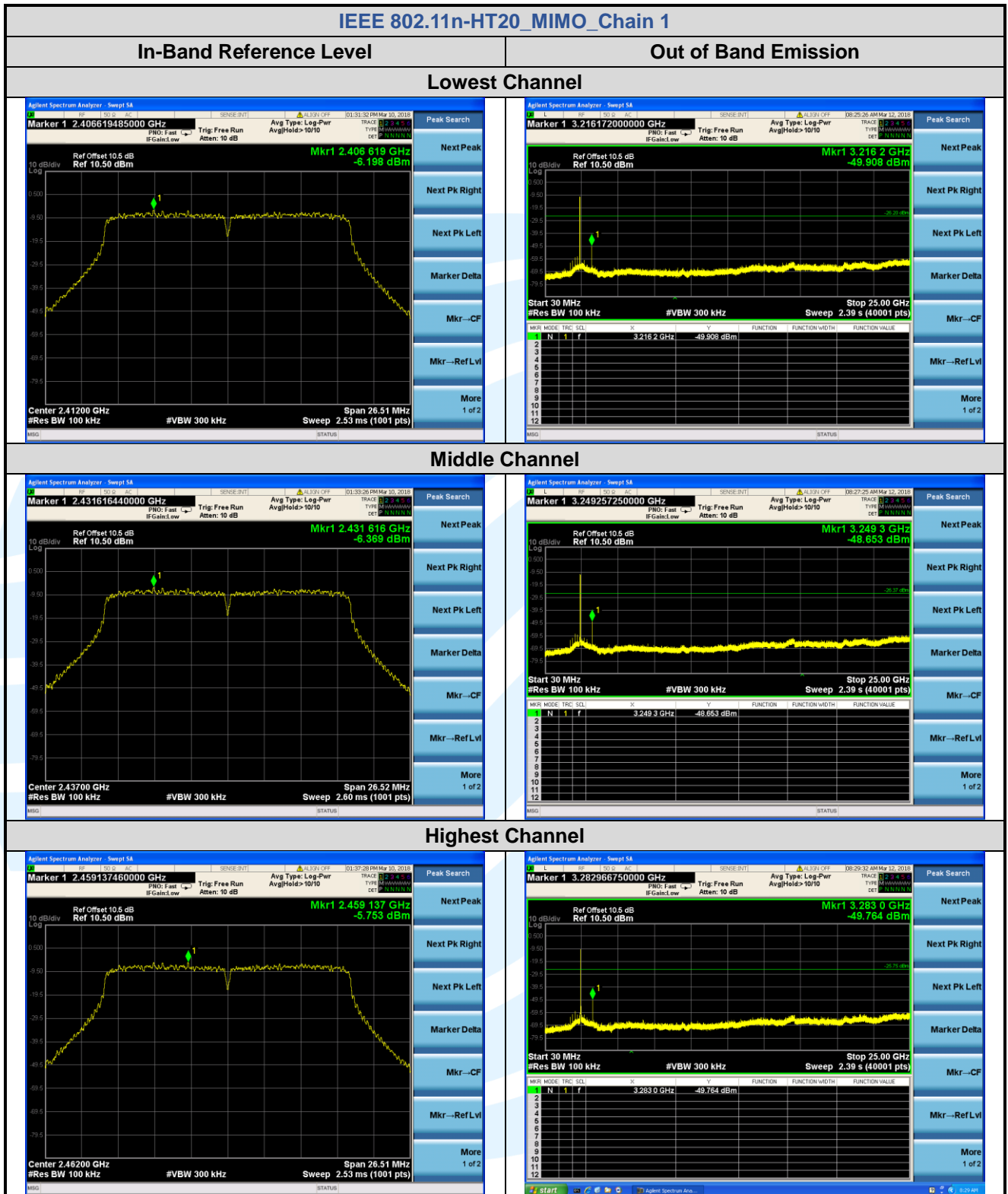
<b>Test Requirement:</b>	FCC 47 CFR Part 15 Subpart C Section 15.247(d)
<b>Test Method:</b>	KDB 558074 D01 v04, Section 11
<b>Limit:</b>	In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.
<b>Test Procedure:</b>	<p>Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.</p> <p>Use the following spectrum analyzer settings:</p> <p><b>Step 1: Measurement Procedure REF</b></p> <ol style="list-style-type: none"> <li>a) Set instrument center frequency to DTS channel center frequency.</li> <li>b) Set the span to <math>\geq 1.5</math> times the DTS bandwidth.</li> <li>c) Set the RBW = 100 kHz.</li> <li>d) Set the VBW <math>\geq 3 \times</math> RBW.</li> <li>e) Detector = peak.</li> <li>f) Sweep time = auto couple.</li> <li>g) Trace mode = max hold.</li> <li>h) Allow trace to fully stabilize.</li> <li>i) Use the peak marker function to determine the maximum PSD level.</li> <li>j) Note that the channel found to contain the maximum PSD level can be used to establish the reference level.</li> </ol> <p><b>Step 2: Measurement Procedure OOBE</b></p> <ol style="list-style-type: none"> <li>a) Set RBW = 1 MHz.</li> <li>b) Set VBW <math>\geq 3</math> MHz.</li> <li>c) Detector = peak.</li> <li>d) Sweep = auto couple.</li> <li>e) Trace Mode = max hold.</li> <li>f) Allow trace to fully stabilize.</li> <li>g) Use the peak marker function to determine the maximum amplitude level.</li> </ol> <p>Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.</p>
<b>Test Setup:</b>	Refer to section 4.4.3 for details.
<b>Instruments Used:</b>	Refer to section 3 for details
<b>Test Mode:</b>	Transmitter mode
<b>Test Results:</b>	Pass

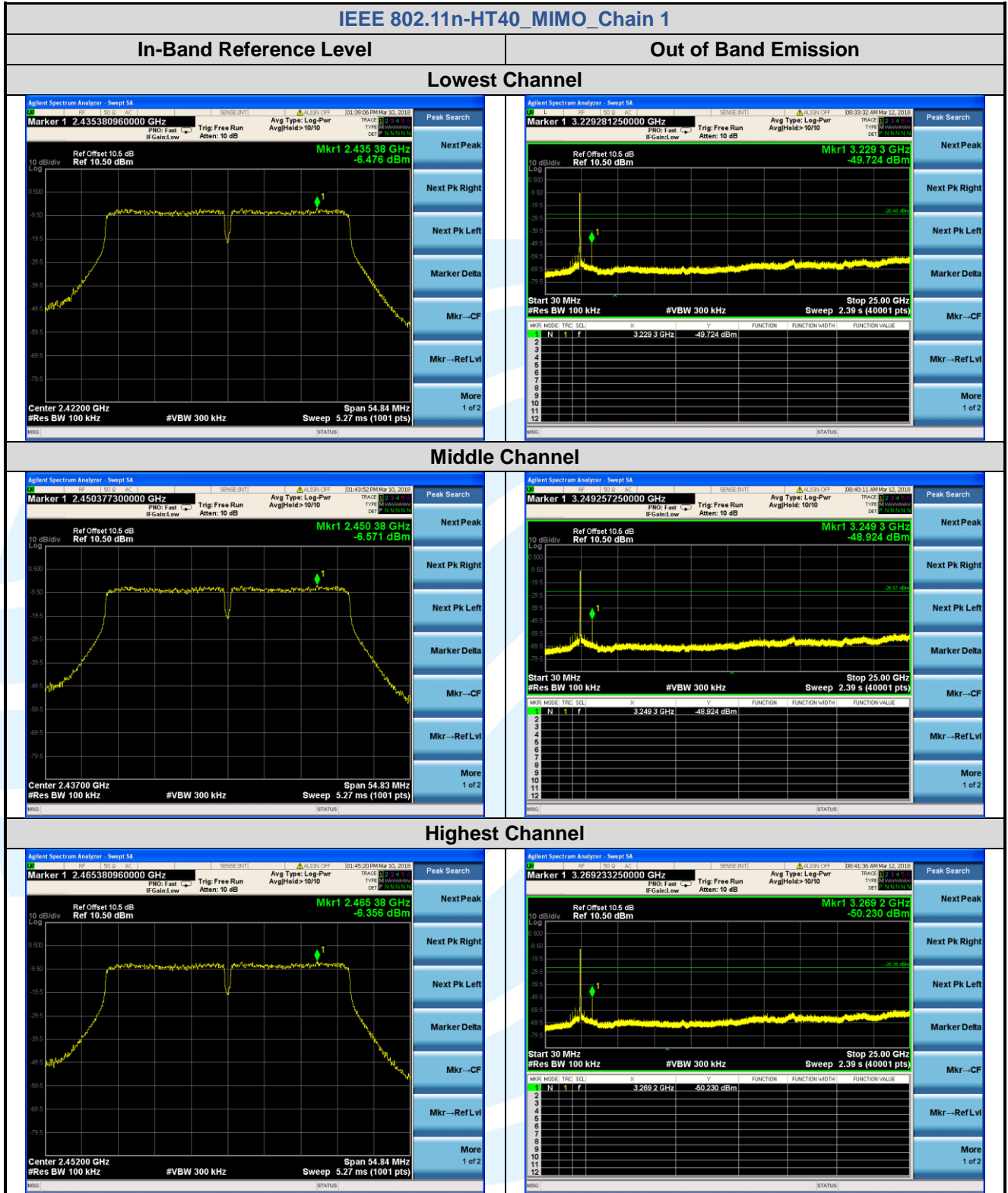
The test plot as follows:

The worst case test data:











### 5.7 RADIATED SPURIOUS EMISSIONS

**Test Requirement:** FCC 47 CFR Part 15 Subpart C Section 15.205/15.209

**Test Method:** KDB 558074 D01 v04, Section 12.1

**Receiver Setup:**

Frequency	Detector	RBW	VBW	Remark
0.009 MHz-0.090 MHz	Peak	10 kHz	30 KHz	Peak
0.009 MHz-0.090 MHz	Average	10 kHz	30 KHz	Average
0.090 MHz-0.110 MHz	Quasi-peak	10 kHz	30 KHz	Quasi-peak
0.110 MHz-0.490 MHz	Peak	10 kHz	30 KHz	Peak
0.110 MHz-0.490 MHz	Average	10 kHz	30 KHz	Average
0.490 MHz -30 MHz	Quasi-peak	10 kHz	30 kHz	Quasi-peak
30 MHz-1 GHz	Quasi-peak	100 kHz	300 KHz	Quasi-peak
Above 1 GHz	Peak	1 MHz	3 MHz	Peak
	Peak	1 MHz	10 Hz	Average

**Limits:**

**Spurious Emissions**

Frequency	Field strength (microvolt/meter)	Limit (dBµV/m )	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

**Note:** 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

**Remark:**

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.

**Test Setup:** Refer to section 4.4.1 for details.

**Test Procedures:**

1. From 30 MHz to 1GHz test procedure as below:
  - 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
  - 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
  - 3) The antenna height 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.
  - 4) 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
  - 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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- 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
2. Above 1GHz test procedure as below:
  - 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).
  - 2) Test the EUT in the lowest channel ,middle channel, the Highest channel
  - 3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Y axis positioning which it is worse case.
  - 4) Repeat above procedures until all frequencies measured was complete.

**Equipment Used:** Refer to section 3 for details.

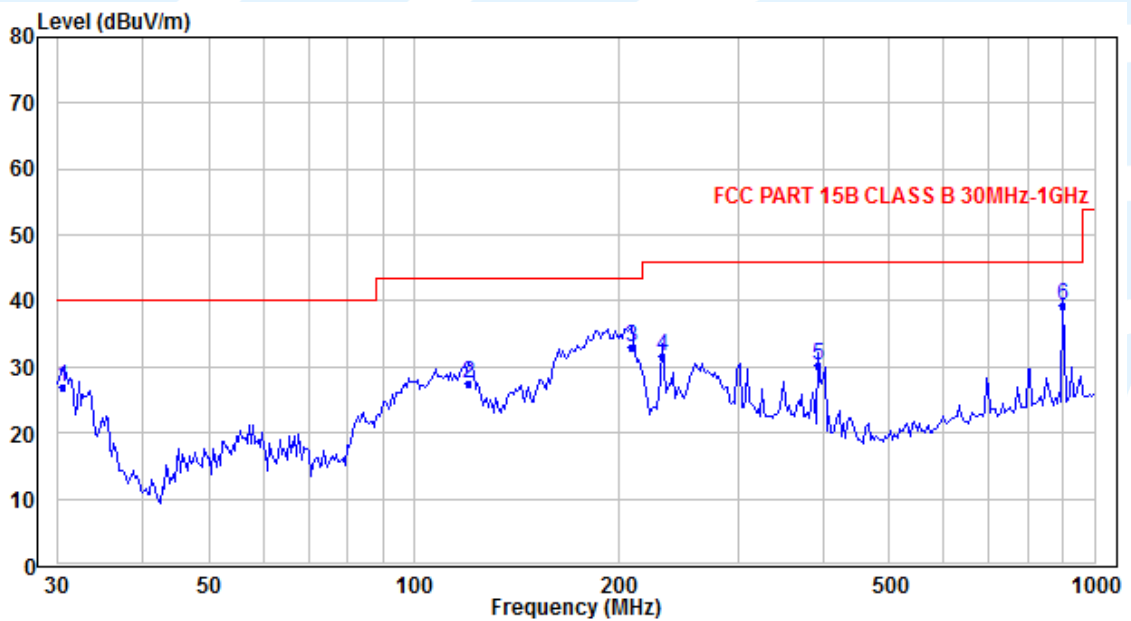
**Test Result:** Pass

**The measurement data as follows:**

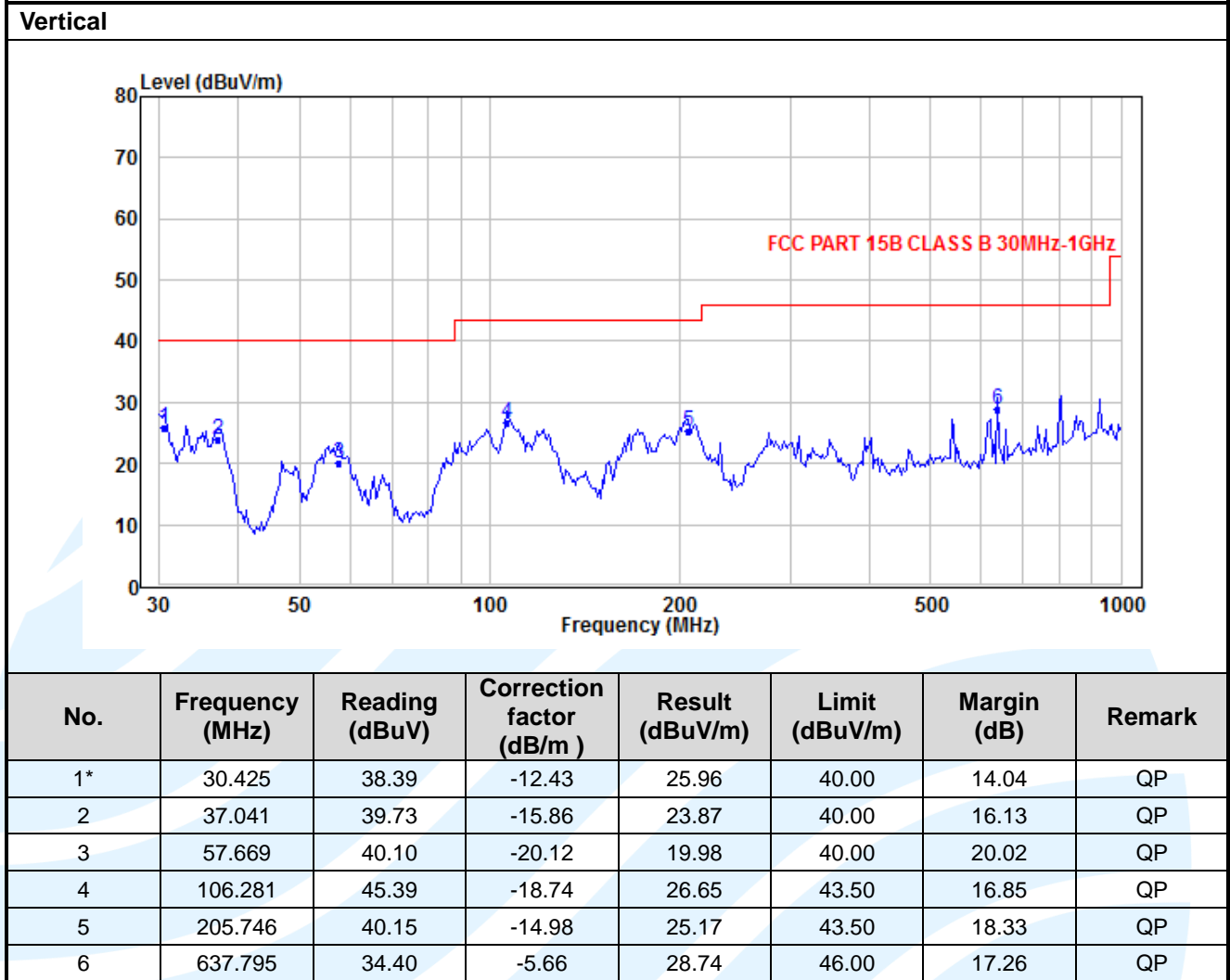
<b>Radiated Emission Test Data (9 KHz ~ 30 MHz):</b>
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

**Radiated Emission Test Data (30 MHz ~ 1 GHz Worst Case):**

**Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m )	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.425	38.42	-11.43	26.99	40.00	13.01	QP
2	120.612	45.62	-18.13	27.49	43.50	16.01	QP
3	208.658	48.00	-15.08	32.92	43.50	10.58	QP
4	231.853	45.42	-13.78	31.64	46.00	14.36	QP
5	392.738	38.77	-8.57	30.20	46.00	15.80	QP
6*	899.958	39.40	-0.10	39.30	46.00	6.70	QP



Radiated Emission Worst Test Data (Above 1GHz):						
IEEE 802.11b_STBC_Chain 0+1						
Lowest Channel:						
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4824.00	46.36	74.00	-27.64	Peak	Horizontal
2	4824.00	45.71	74.00	-28.29	Peak	Vertical

Middle Channel:						
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4874.00	49.33	74.00	-24.67	Peak	Horizontal
2	7311.00	45.67	74.00	-28.33	Peak	Horizontal
3	4874.00	48.46	74.00	-25.54	Peak	Vertical
4	7311.00	44.43	74.00	-29.57	Peak	Vertical

Highest Channel:						
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4924.00	48.22	74.00	-25.78	Peak	Horizontal
2	7386.00	45.87	74.00	-28.13	Peak	Horizontal
3	4924.00	47.57	74.00	-26.43	Peak	Vertical
4	7386.00	44.81	74.00	-29.19	Peak	Vertical

**IEEE 802.11g\_CDD\_Chain 0+1**  
**Lowest Channel:**

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4824.00	37.10	74.00	-36.90	Peak	Horizontal
2	4824.00	37.77	74.00	-36.23	Peak	Vertical

**Middle Channel:**

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4874.00	39.56	74.00	-34.44	Peak	Horizontal
2	7311.00	45.14	74.00	-28.86	Peak	Horizontal
3	4874.00	38.01	74.00	-35.99	Peak	Vertical
4	7311.00	45.07	74.00	-28.93	Peak	Vertical

**Highest Channel:**

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4924.00	40.20	74.00	-33.80	Peak	Horizontal
2	7386.00	44.74	74.00	-29.26	Peak	Horizontal
3	4924.00	39.58	74.00	-34.42	Peak	Vertical
4	7386.00	44.46	74.00	-29.54	Peak	Vertical

**IEEE 802.11n-HT20\_MIMO\_Chain 0+1**  
**Lowest Channel:**

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4824.00	38.68	74.00	-35.32	Peak	Horizontal
2	4824.00	36.63	74.00	-37.37	Peak	Vertical

**Middle Channel:**

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4874.00	37.03	74.00	-36.97	Peak	Horizontal
2	7311.00	42.84	74.00	-31.16	Peak	Horizontal
3	4874.00	37.58	74.00	-36.42	Peak	Vertical
4	7311.00	42.62	74.00	-31.38	Peak	Vertical

**Highest Channel:**

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4924.00	39.56	74.00	-34.44	Peak	Horizontal
2	7386.00	42.71	74.00	-31.29	Peak	Horizontal
3	4924.00	36.96	74.00	-37.04	Peak	Vertical
4	7386.00	42.83	74.00	-31.17	Peak	Vertical

IEEE 802.11n-HT40_MIMO_Chain 0+1						
Lowest Channel:						
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4844.00	37.92	74.00	-36.08	Peak	Horizontal
2	7266.00	43.08	74.00	-30.92	Peak	Horizontal
3	4844.00	38.38	74.00	-35.62	Peak	Vertical
4	7266.00	43.66	74.00	-30.34	Peak	Vertical

Middle Channel:						
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4874.00	37.94	74.00	-36.06	Peak	Horizontal
2	7311.00	43.32	74.00	-30.68	Peak	Horizontal
3	4874.00	37.72	74.00	-36.28	Peak	Vertical
4	7311.00	43.84	74.00	-30.16	Peak	Vertical

Highest Channel:						
No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polaxis	Remark
1	4924.00	39.50	74.00	-34.50	Peak	Horizontal
2	7386.00	42.52	74.00	-31.48	Peak	Horizontal
3	4924.00	38.48	74.00	-35.52	Peak	Vertical
4	7386.00	43.05	74.00	-30.95	Peak	Vertical

### 5.8 BAND EDGE MEASUREMENTS (RADIATED)

**Test Requirement:** FCC 47 CFR Part 15 Subpart C Section 15.205/15.209

**Test Method:** KDB 558074 D01 v04, Section 12.1

**Limits:**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Frequency	Limit (dBµV/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

**Test Setup:** Refer to section 4.4.1 for details.

**Test Procedures:**

Radiated band edge measurements at 2390 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

1. Use radiated spurious emission test procedure described in clause 5.10. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

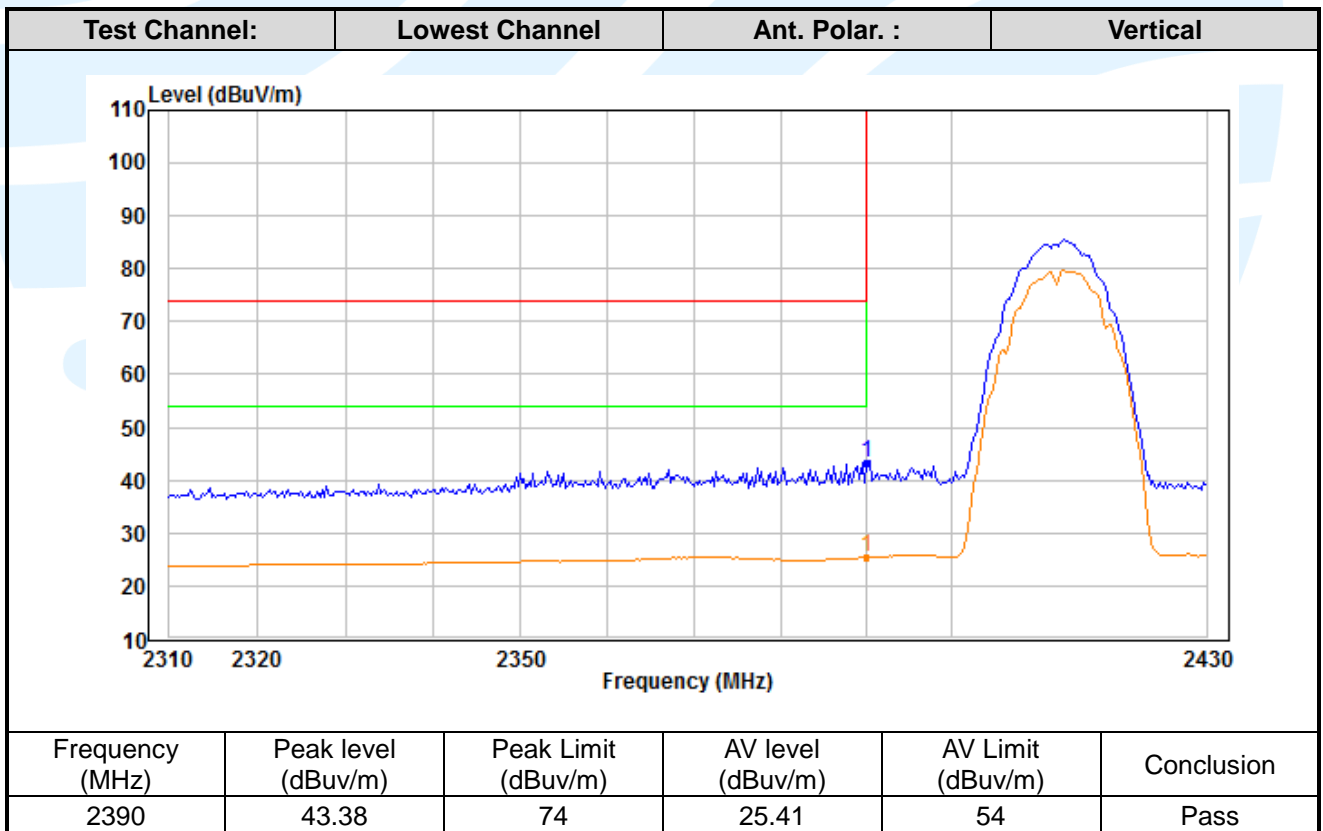
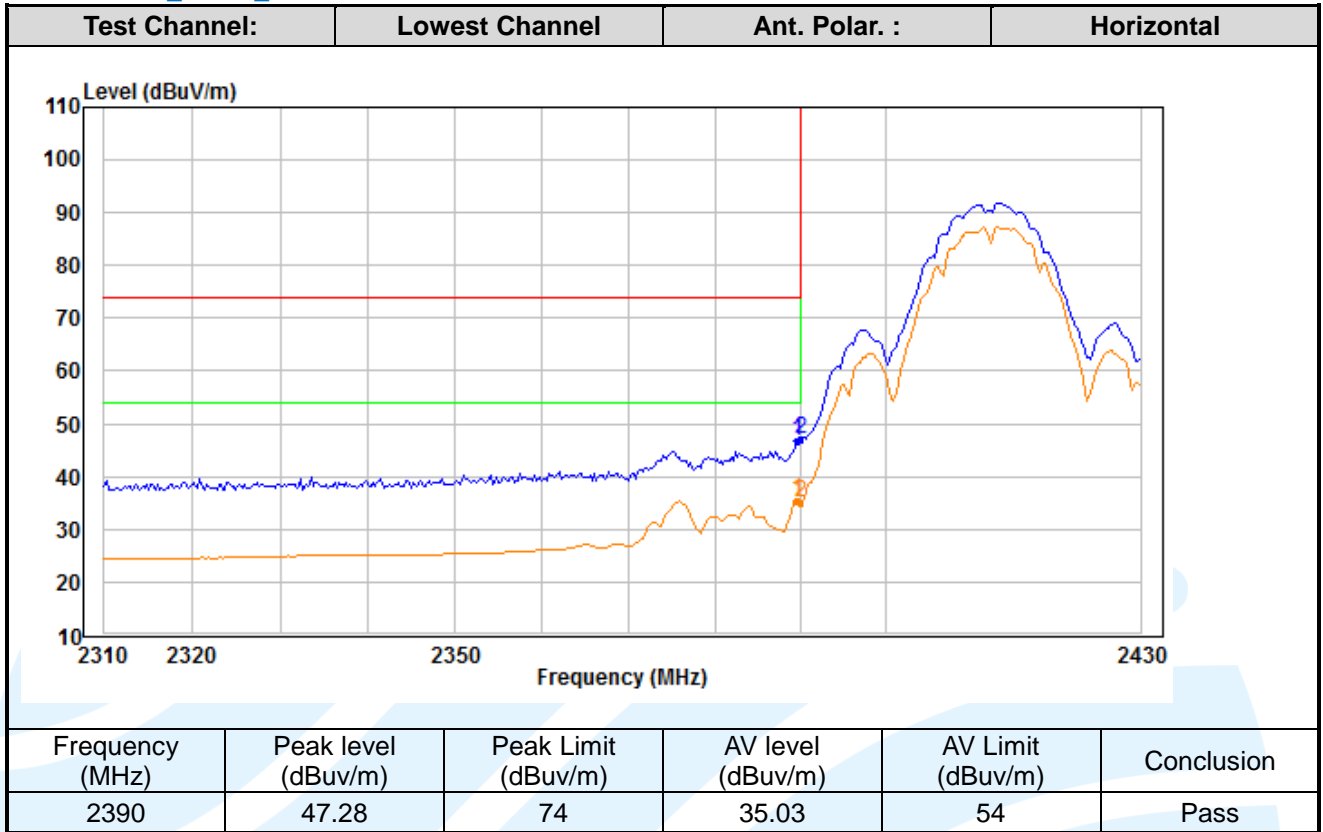
**Equipment Used:** Refer to section 3 for details.

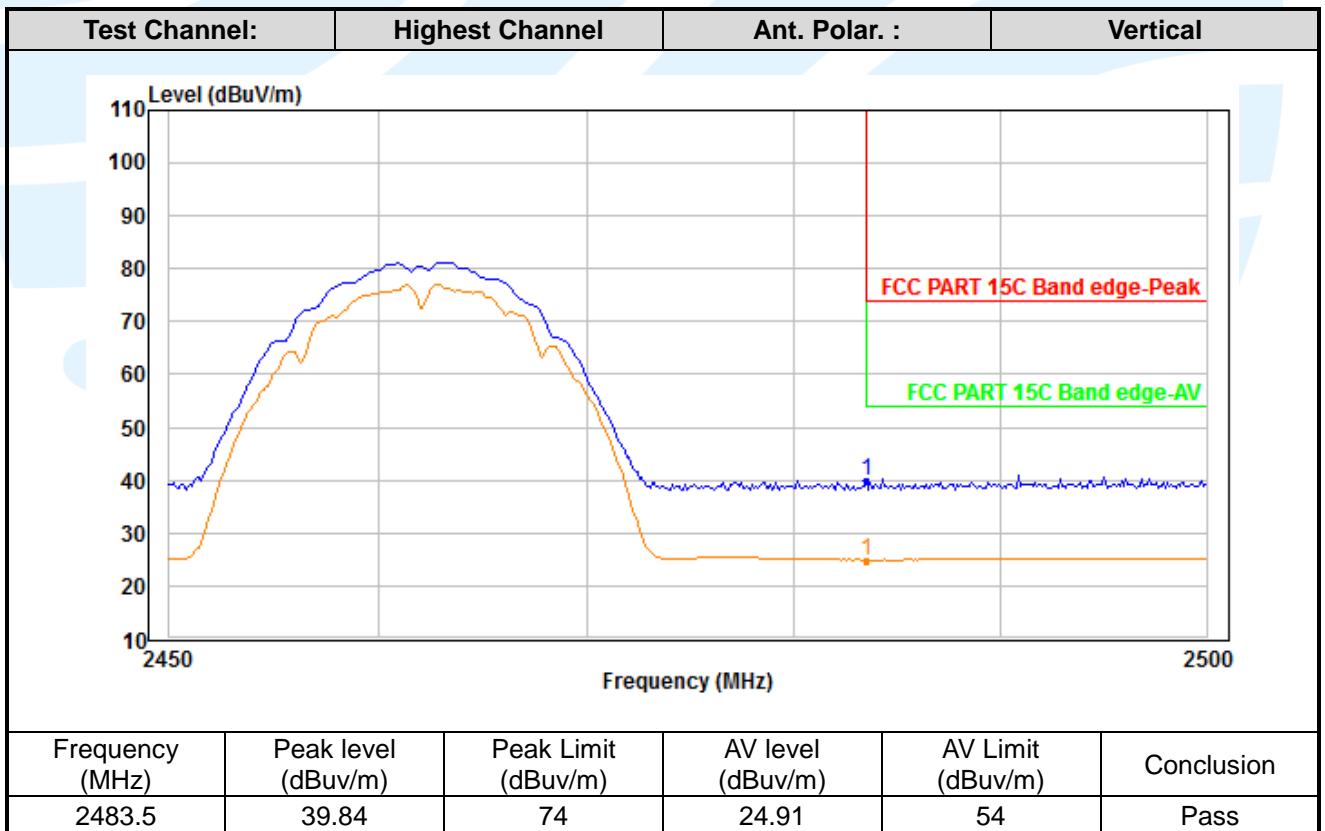
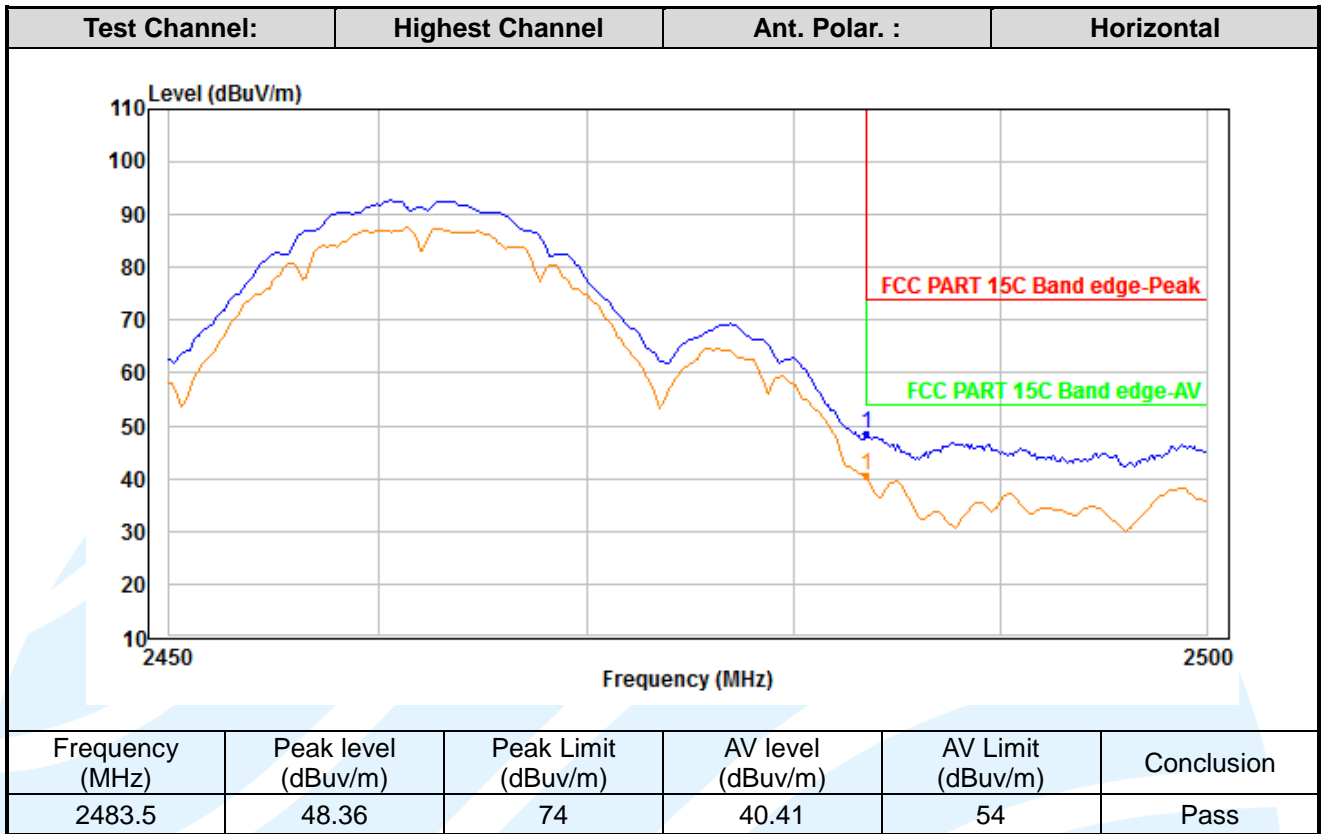
**Test Result:** Pass

**The measurement worst data as follows:**

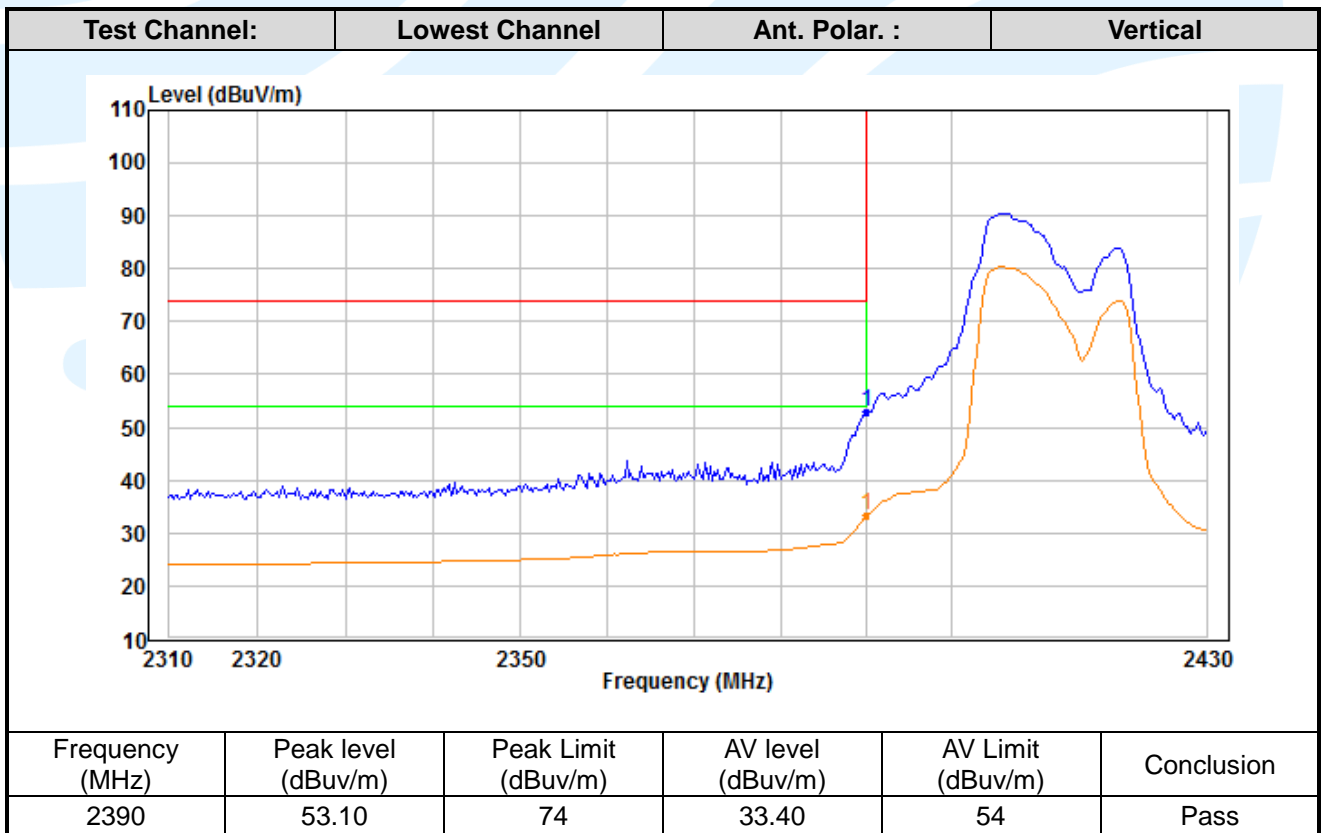
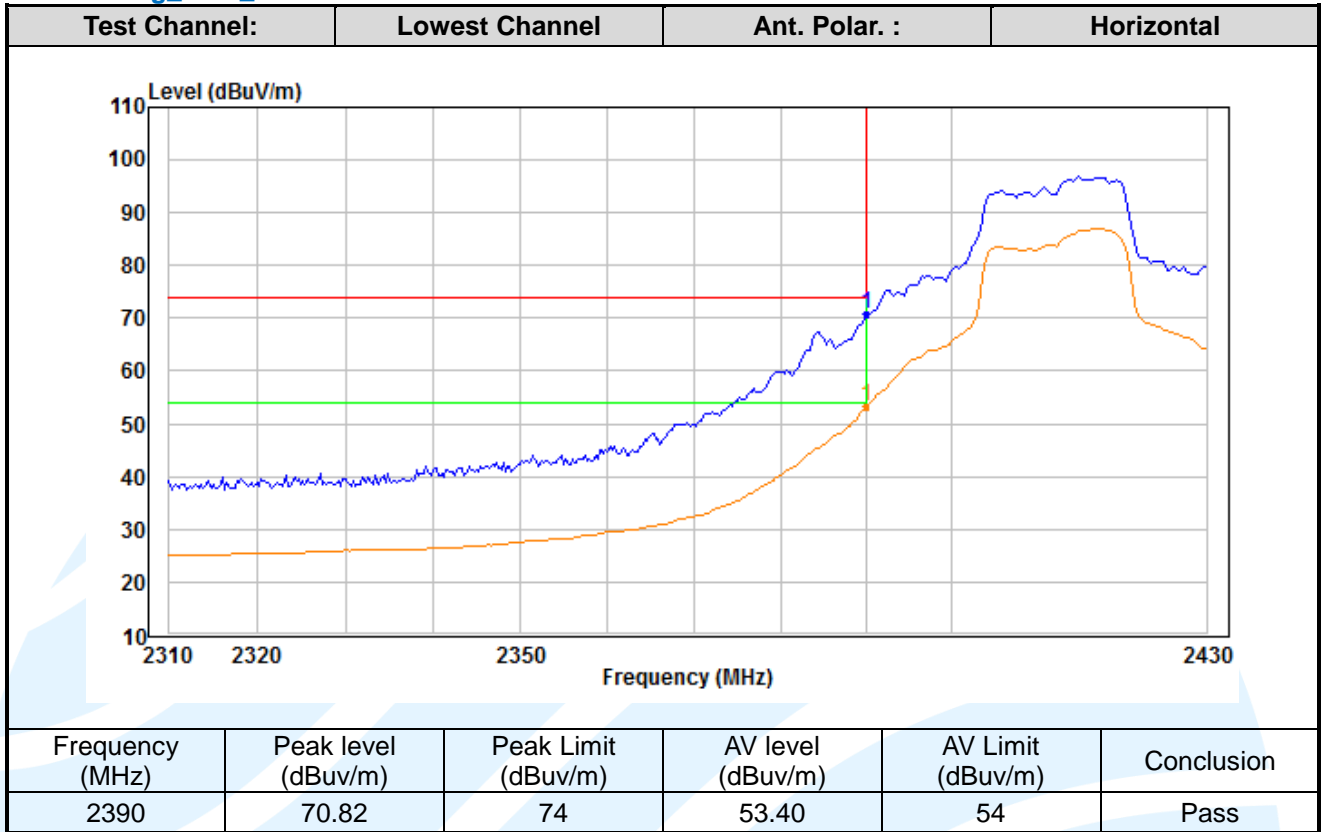


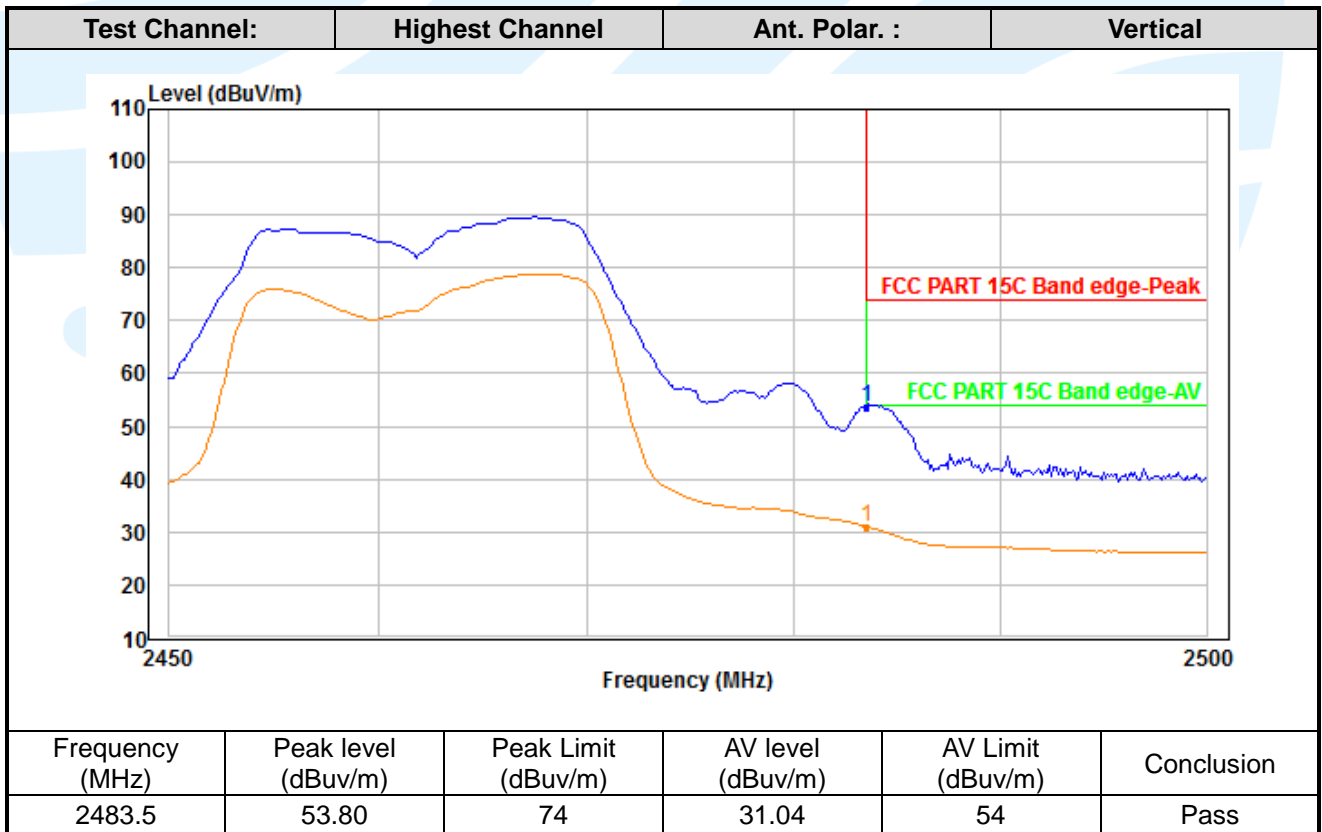
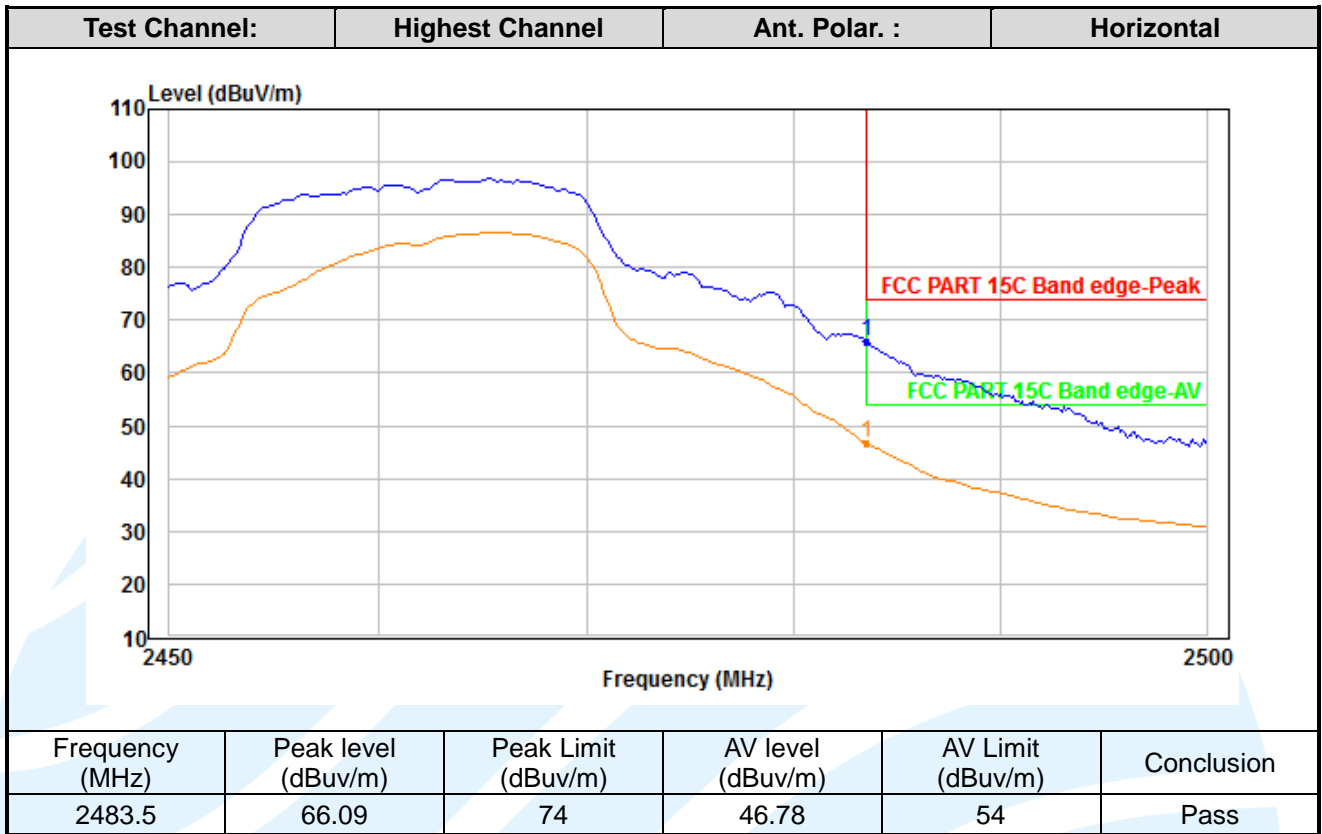
IEEE 802.11b\_STBC\_Chain 0+1



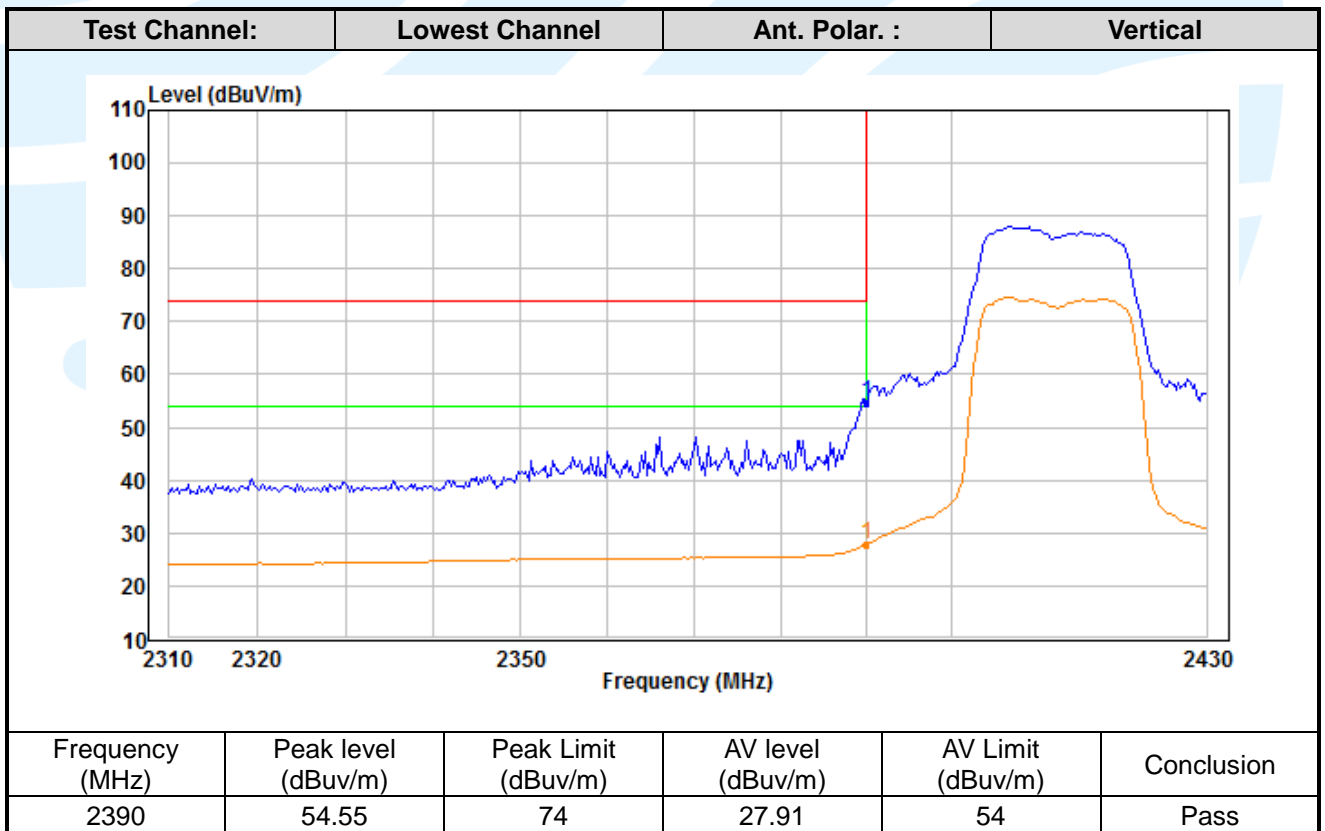
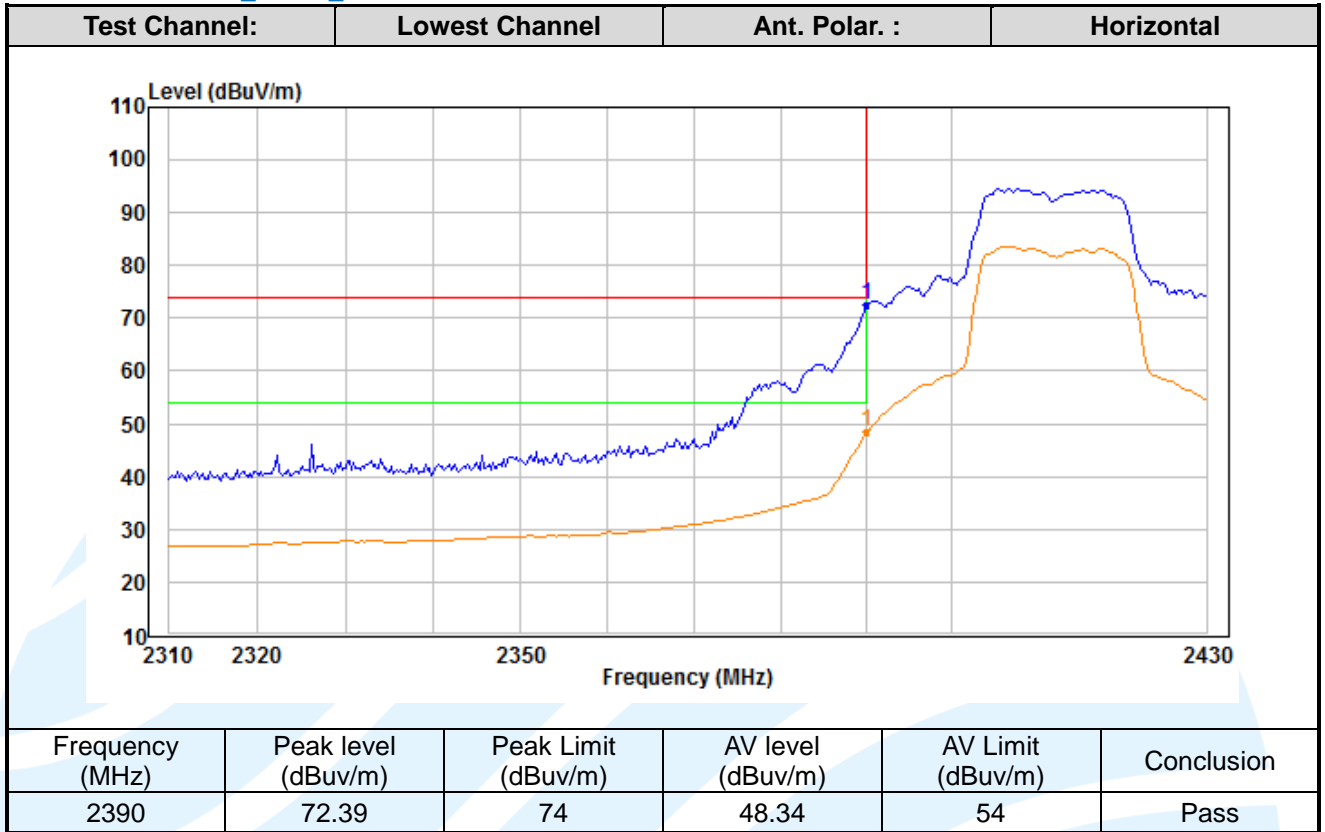


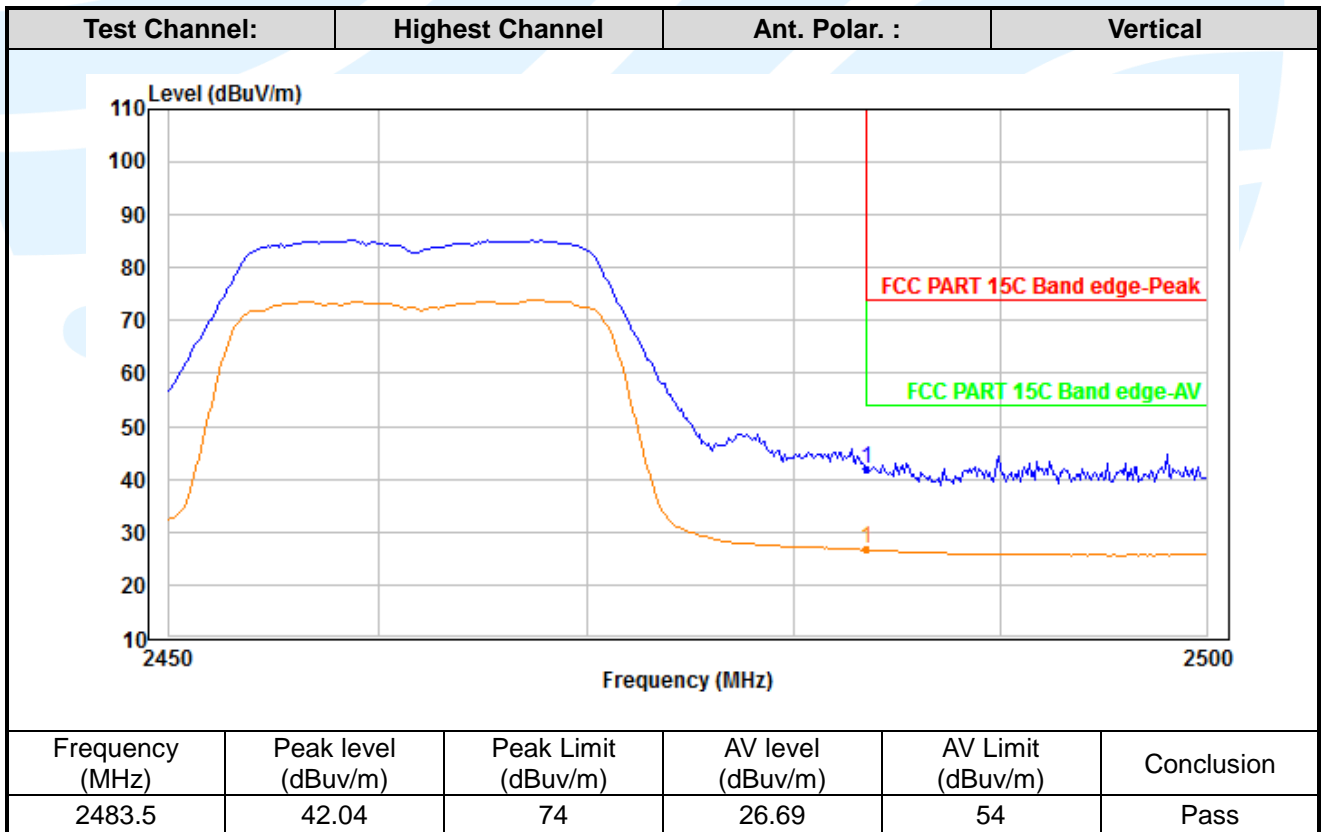
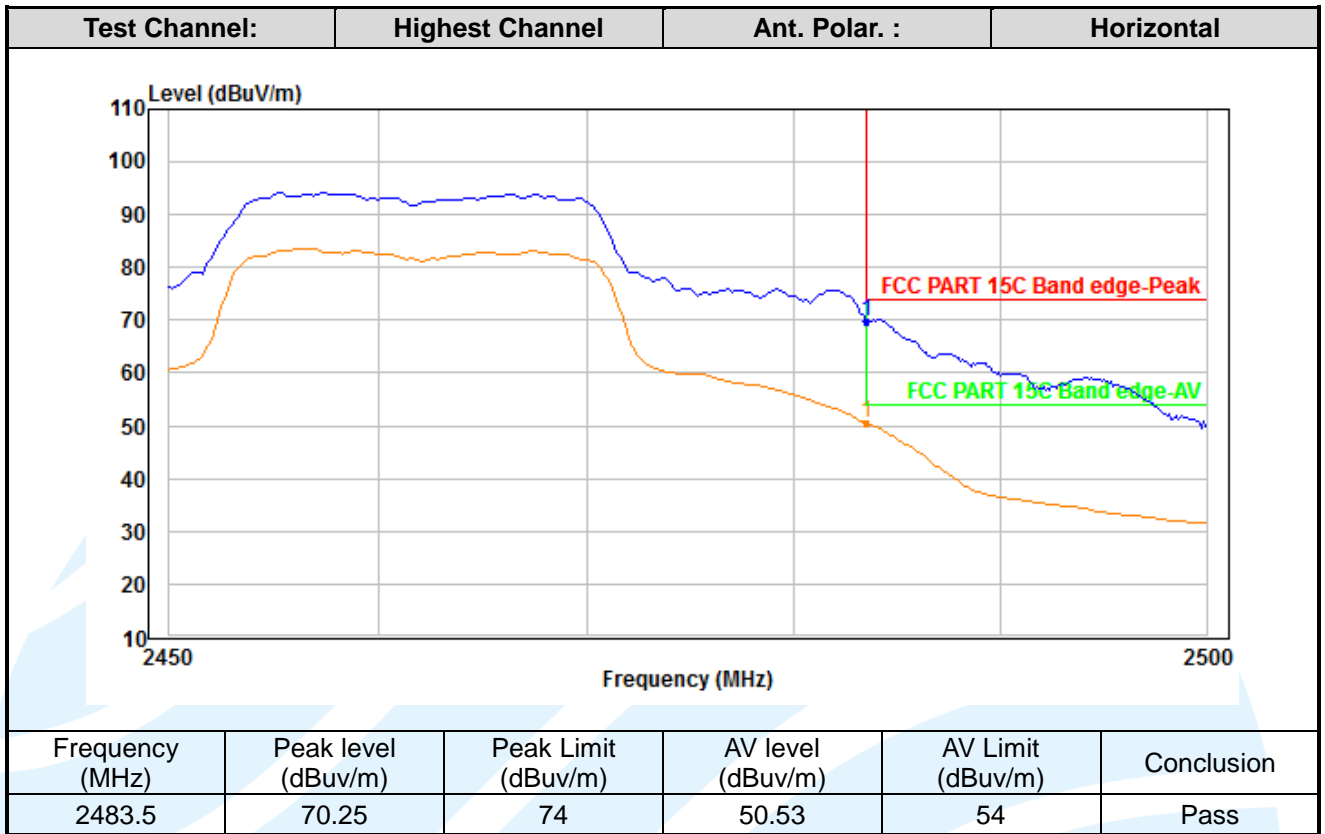
IEEE 802.11g\_CDD\_Chain 0+1



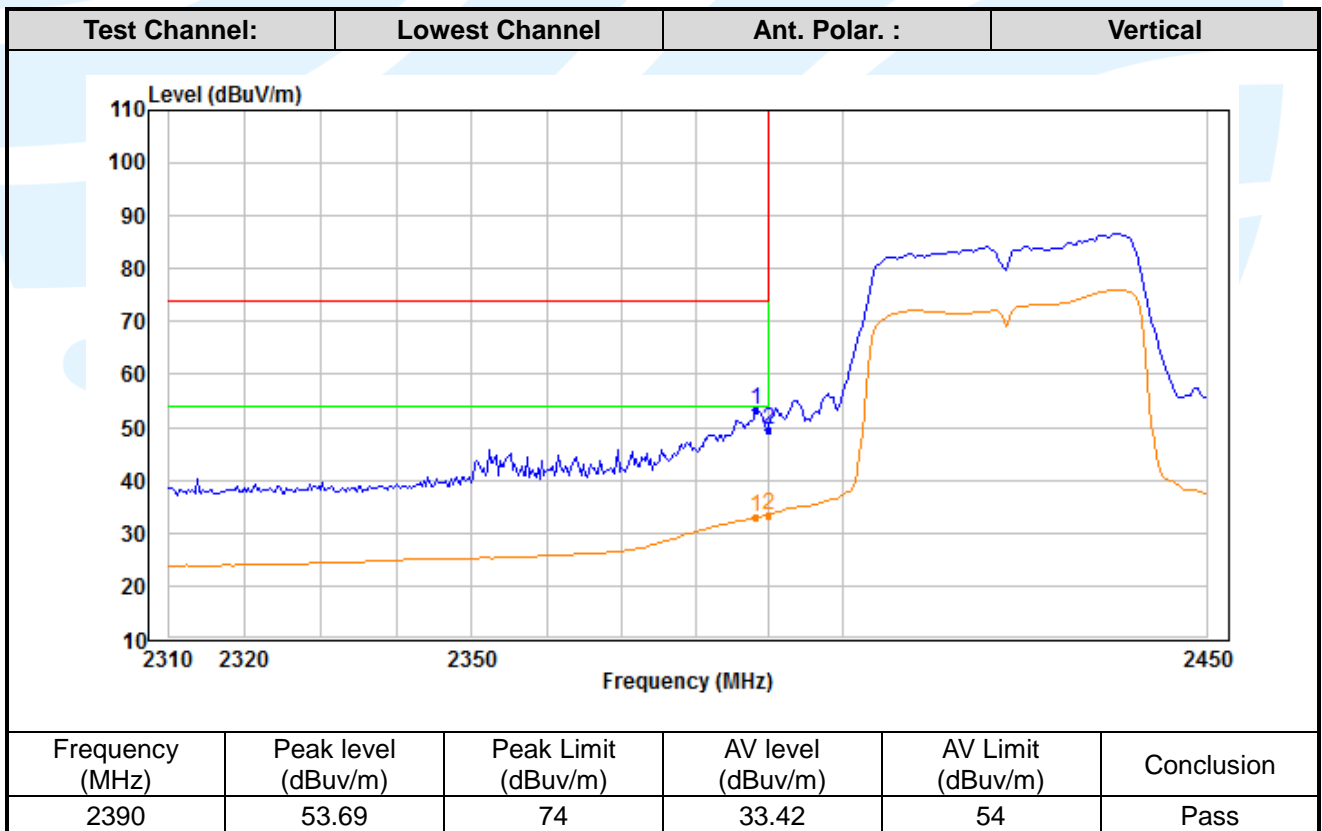
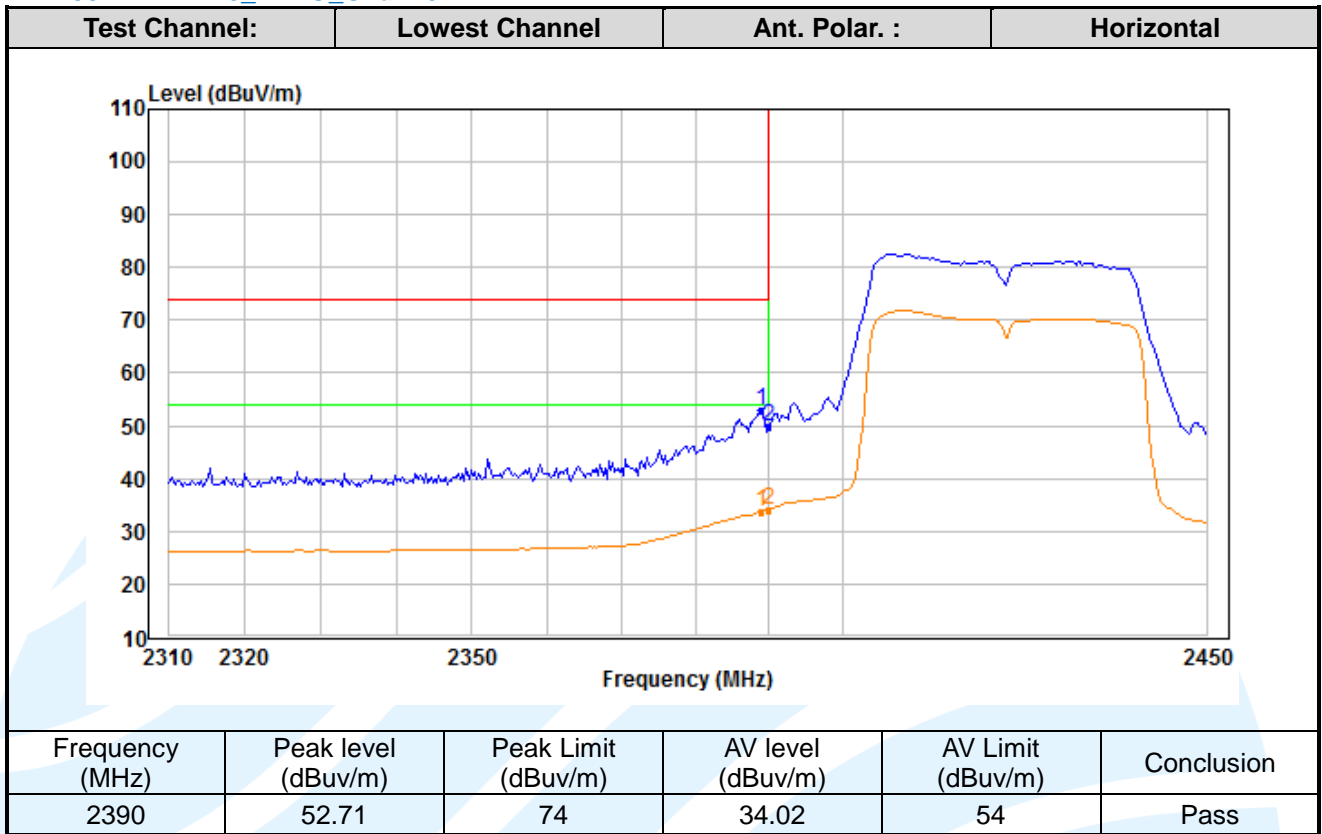


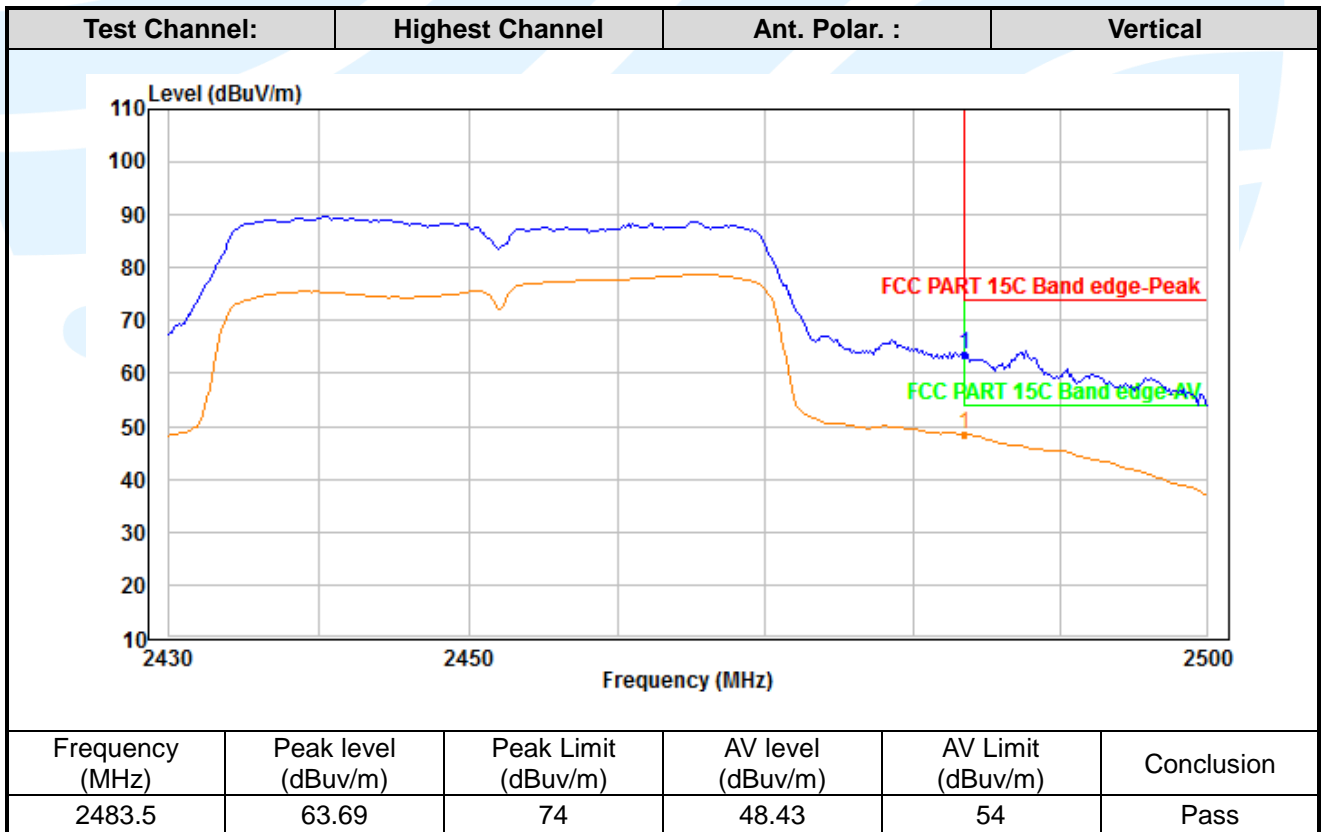
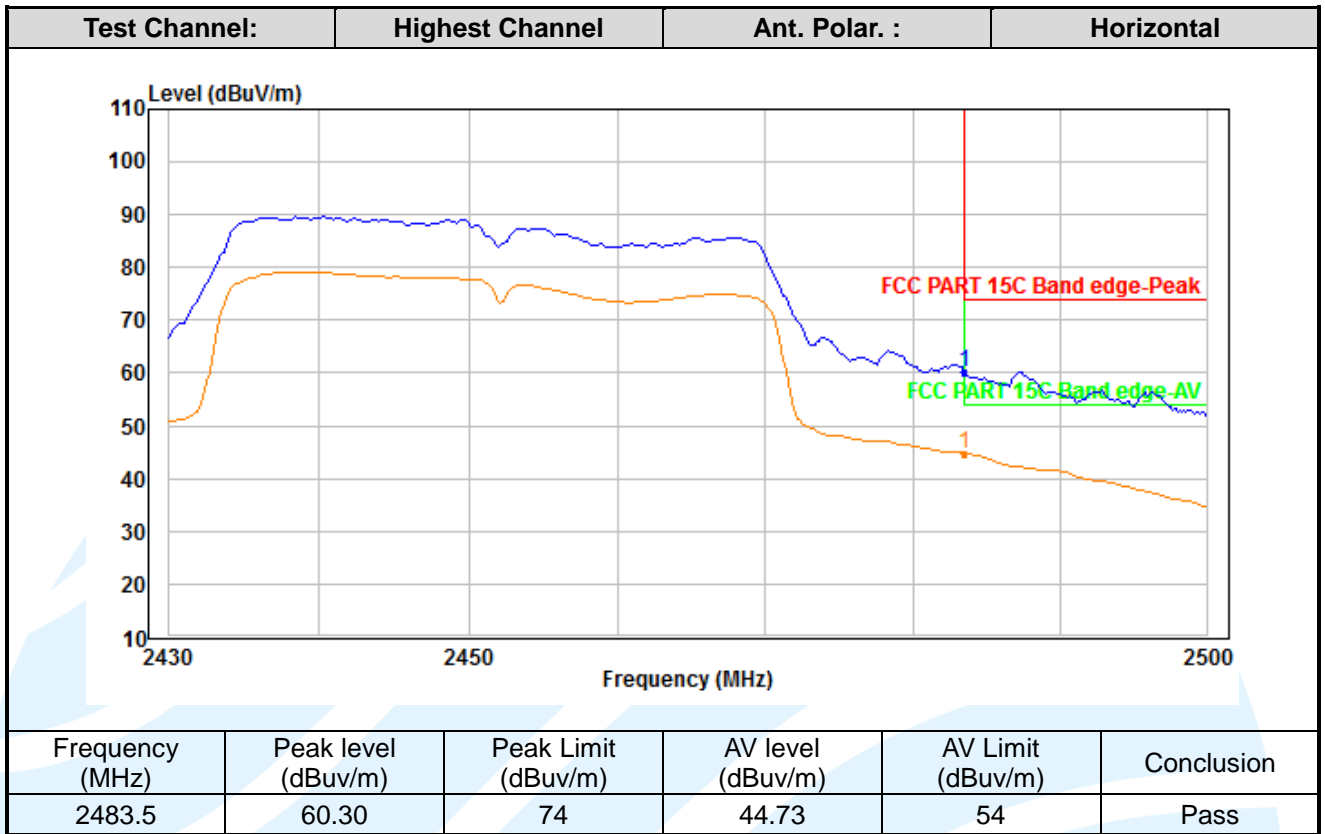
IEEE 802.11n-HT20\_MIMO\_Chain 0+1





IEEE 802.11n-HT40\_MIMO\_Chain 0+1







### 5.9 CONDUCTED EMISSION

**Test Requirement:** 47 CFR Part 15C Section 15.207

**Test Method:** ANSI C63.10-2013 Section 6.2

**Limits:**

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

**Remark:**

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

**Test Setup:** Refer to section 4.4.2 for details.

**Test Procedures:**

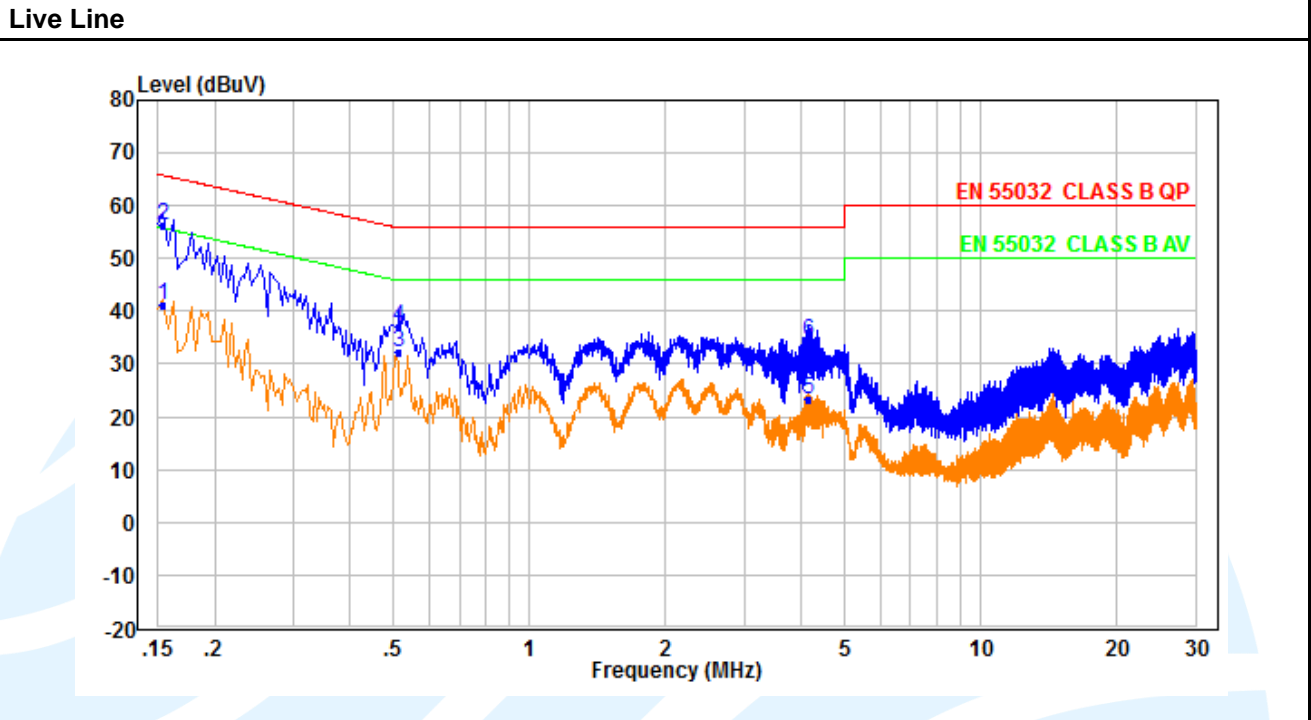
Test frequency range :150KHz-30MHz

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

**Equipment Used:** Refer to section 3 for details.

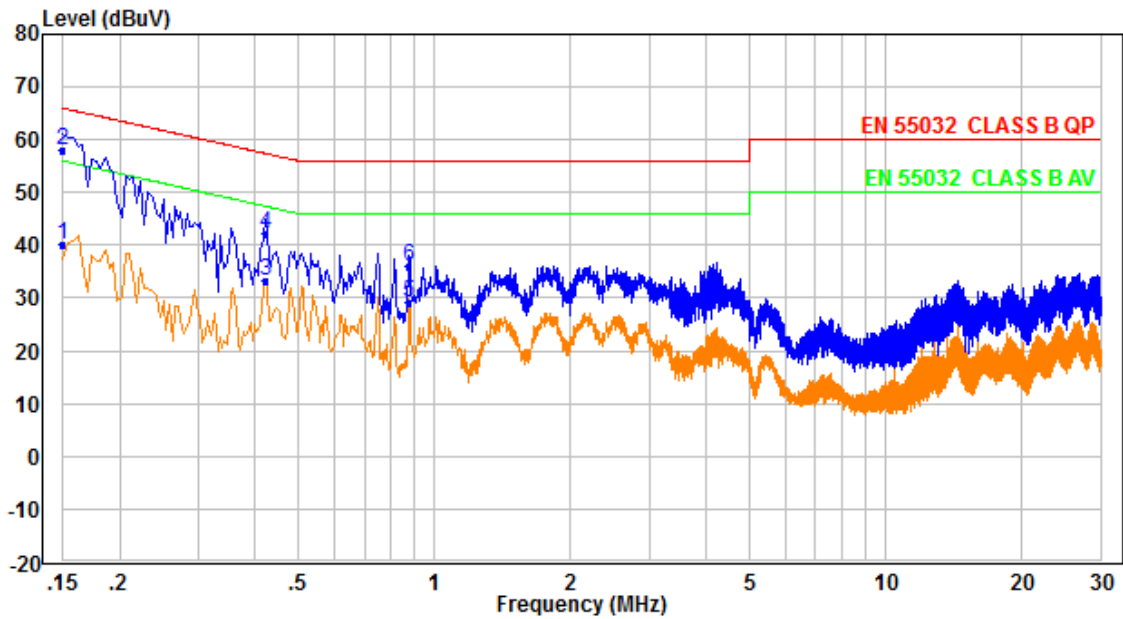
**Test Result:** Pass

The measurement data as follows:  
 Quasi Peak and Average:  
 Mode: WIFI Link



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.154	31.10	10.20	41.30	55.80	14.50	Average
2*	0.154	46.10	10.20	56.30	65.80	9.50	QP
3	0.514	21.90	10.20	32.10	46.00	13.90	Average
4	0.514	26.90	10.20	37.10	56.00	18.90	QP
5	4.154	12.90	10.40	23.30	46.00	22.70	Average
6	4.154	23.90	10.40	34.30	56.00	21.70	QP

**Neutral Line**



No.	Frequency (MHz)	Reading (dBUV)	Correction factor (dB)	Result (dBUV)	Limit (dBUV)	Margin (dB)	Remark
1	0.150	30.00	10.20	40.20	56.00	15.80	Average
2*	0.150	48.00	10.20	58.20	66.00	7.80	QP
3	0.422	22.70	10.40	33.10	47.40	14.30	Average
4	0.422	31.70	10.40	42.10	57.40	15.30	QP
5	0.878	18.70	10.40	29.10	46.00	16.90	Average
6	0.878	25.70	10.40	36.10	56.00	19.90	QP

**Remark:**

1. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

## APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

See test photographs attached in Appendix 1 for the actual connections between Product and support equipment.

## APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photographs.

\*\*\* End of Report \*\*\*

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The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.

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