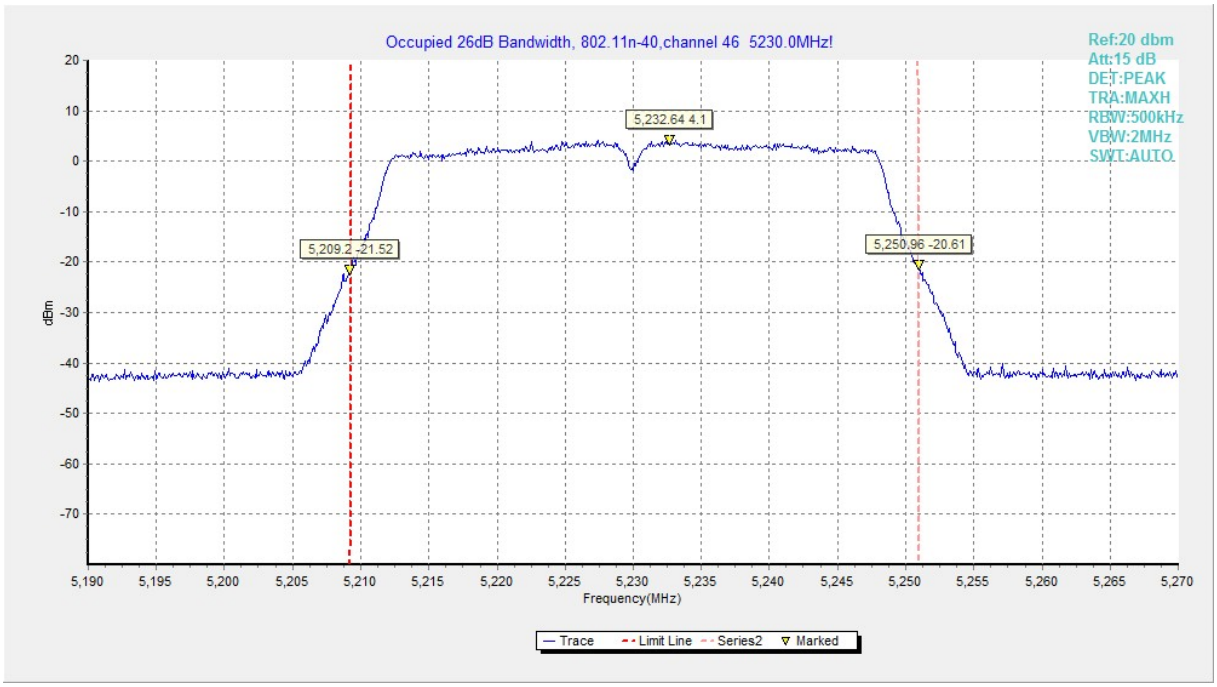


Fig.22 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)

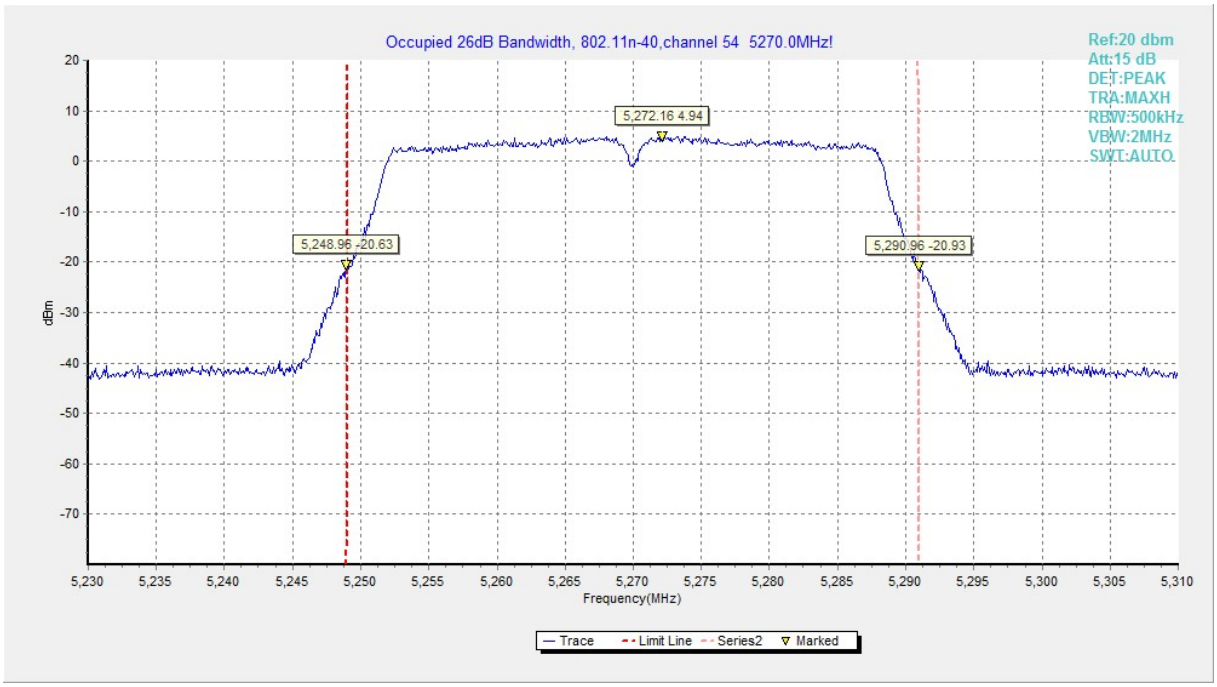


Fig.23 Occupied 26dB Bandwidth (802.11n-HT40, 5270MHz)

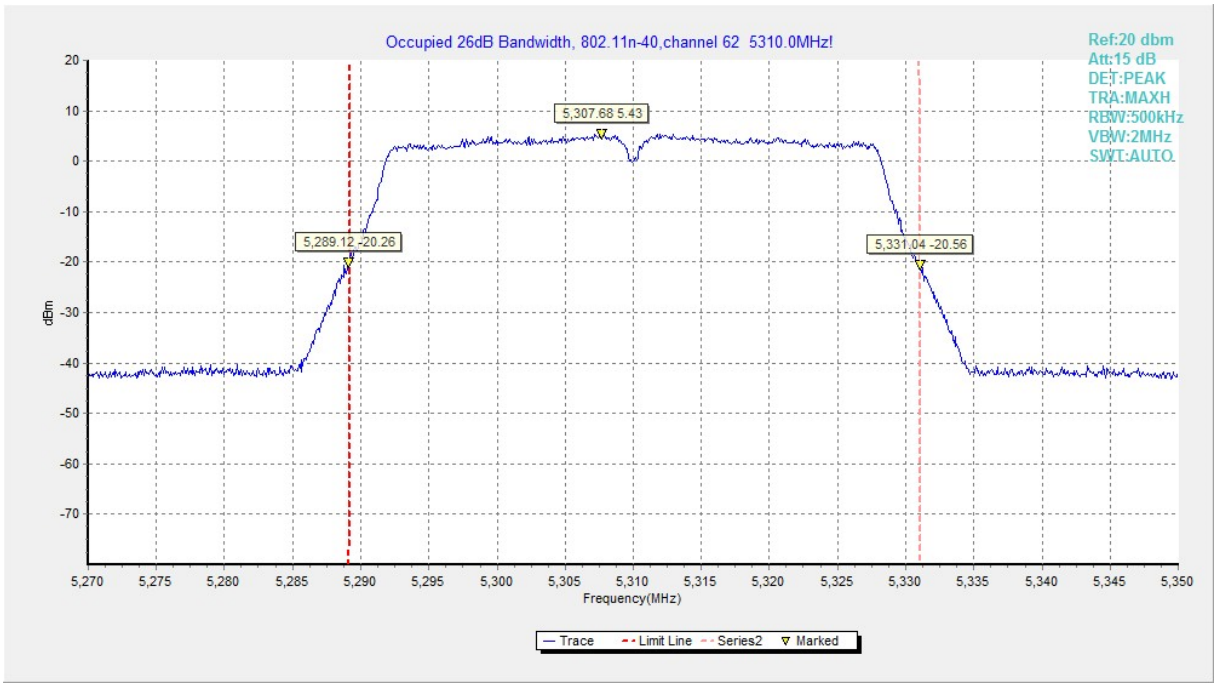


Fig.24 Occupied 26dB Bandwidth (802.11n-HT40, 5310MHz)

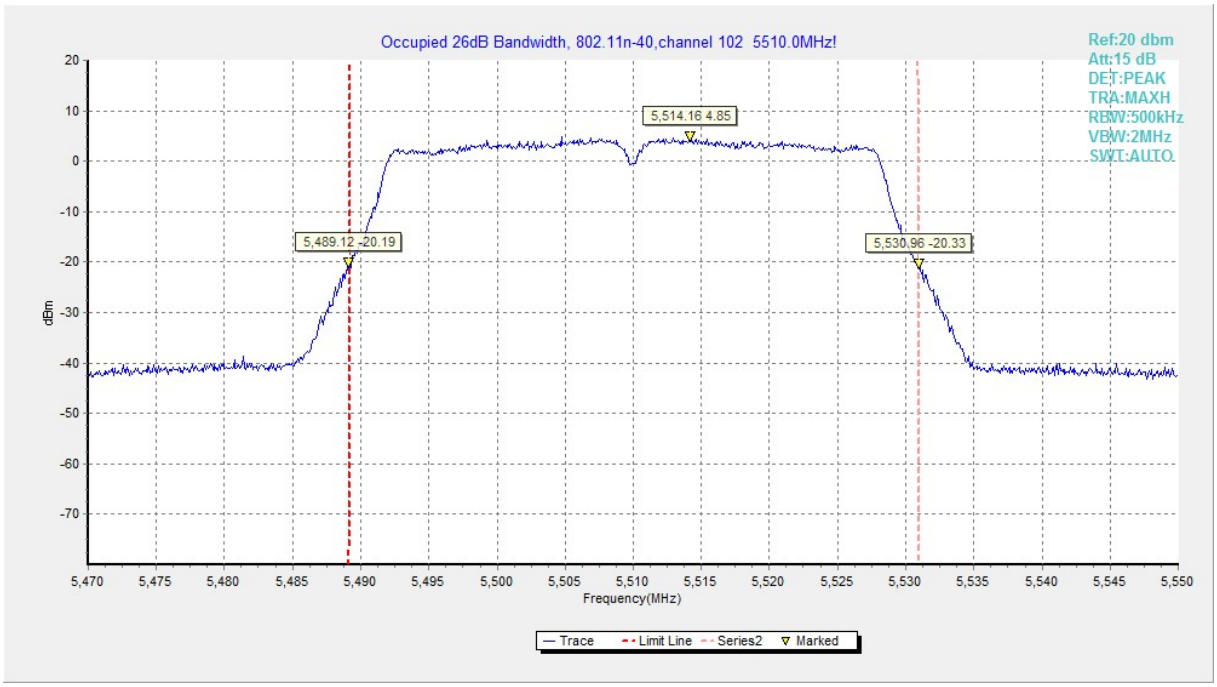


Fig.25 Occupied 26dB Bandwidth (802. 11n-HT40, 5510MHz)

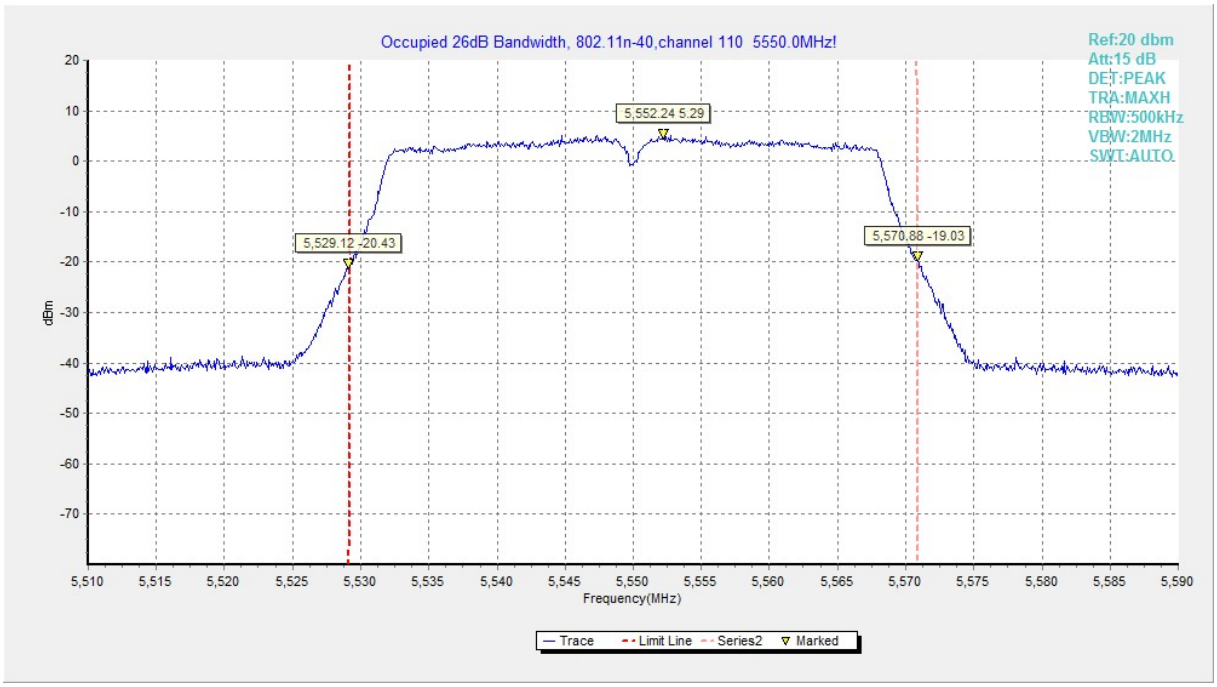


Fig.26 Occupied 26dB Bandwidth (802. 11n-HT40, 5550MHz)

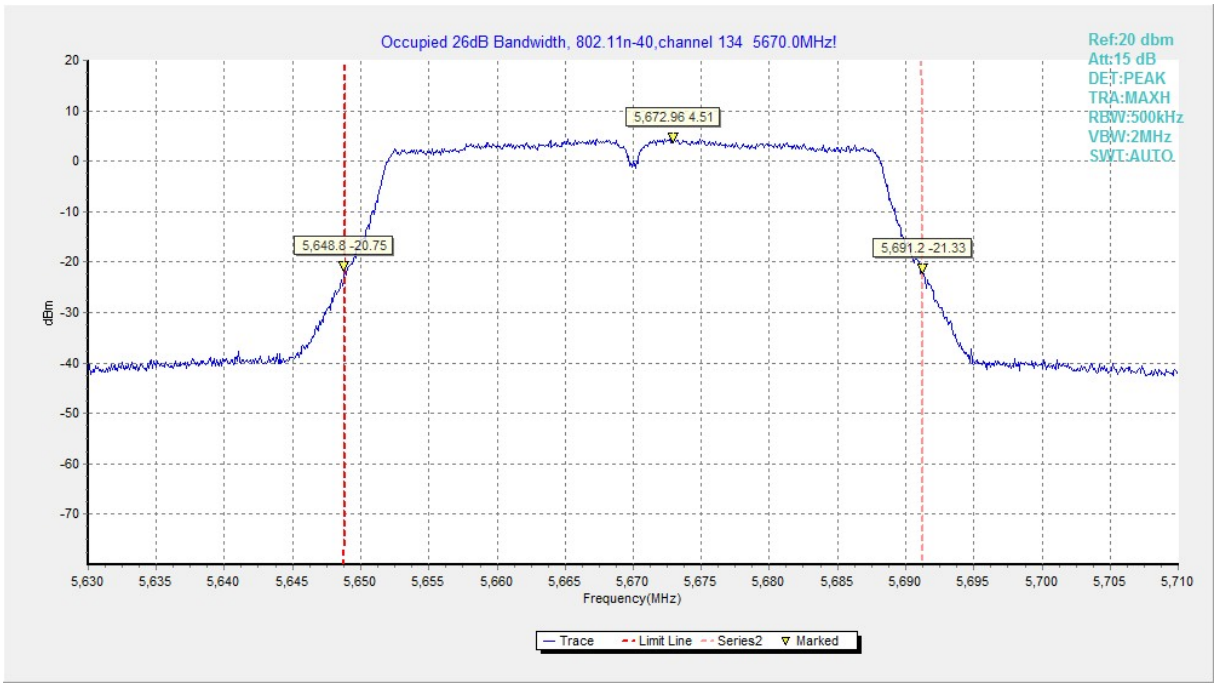


Fig.27 Occupied 26dB Bandwidth (802. 11n-HT40, 5670MHz)

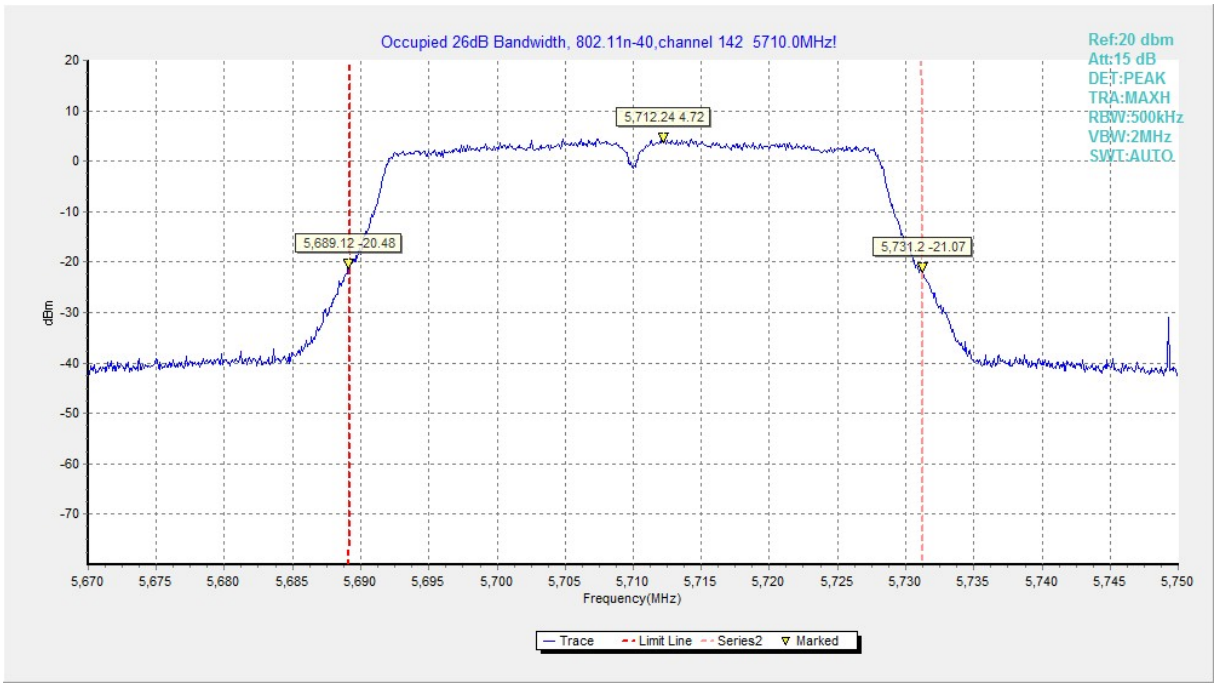


Fig.28 Occupied 26dB Bandwidth (802. 11n-HT40, 5710MHz)

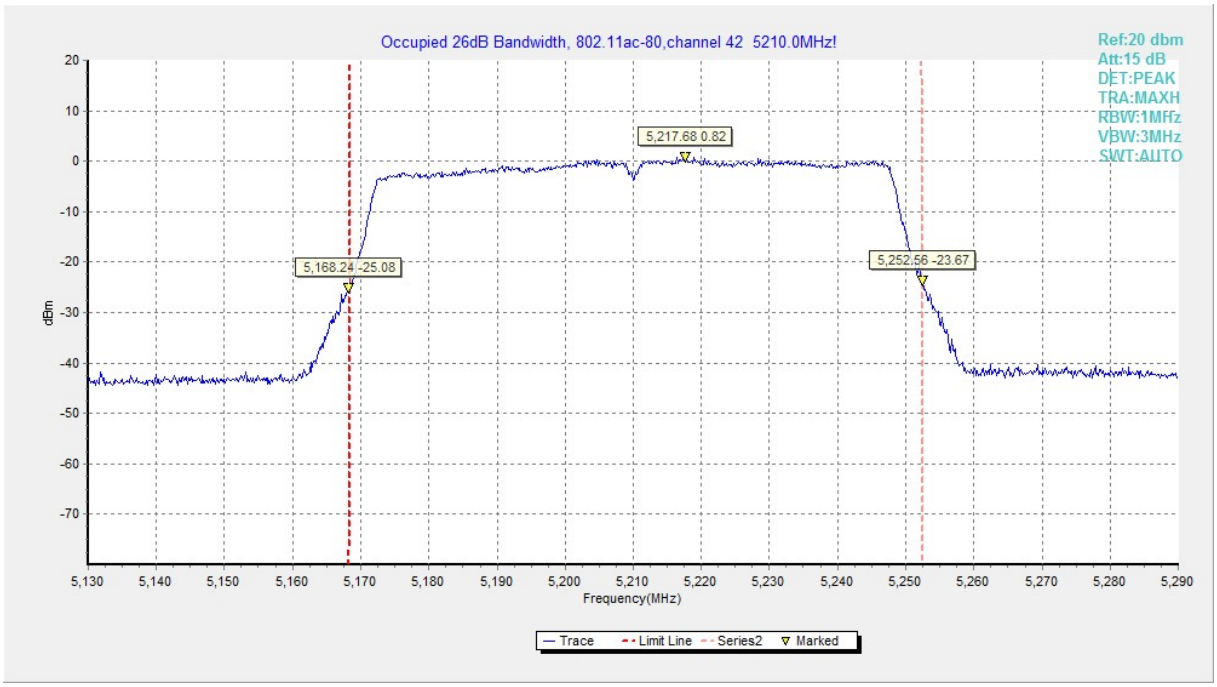


Fig.29 Occupied 26dB Bandwidth (802. 11ac-HT80, 5210MHz)

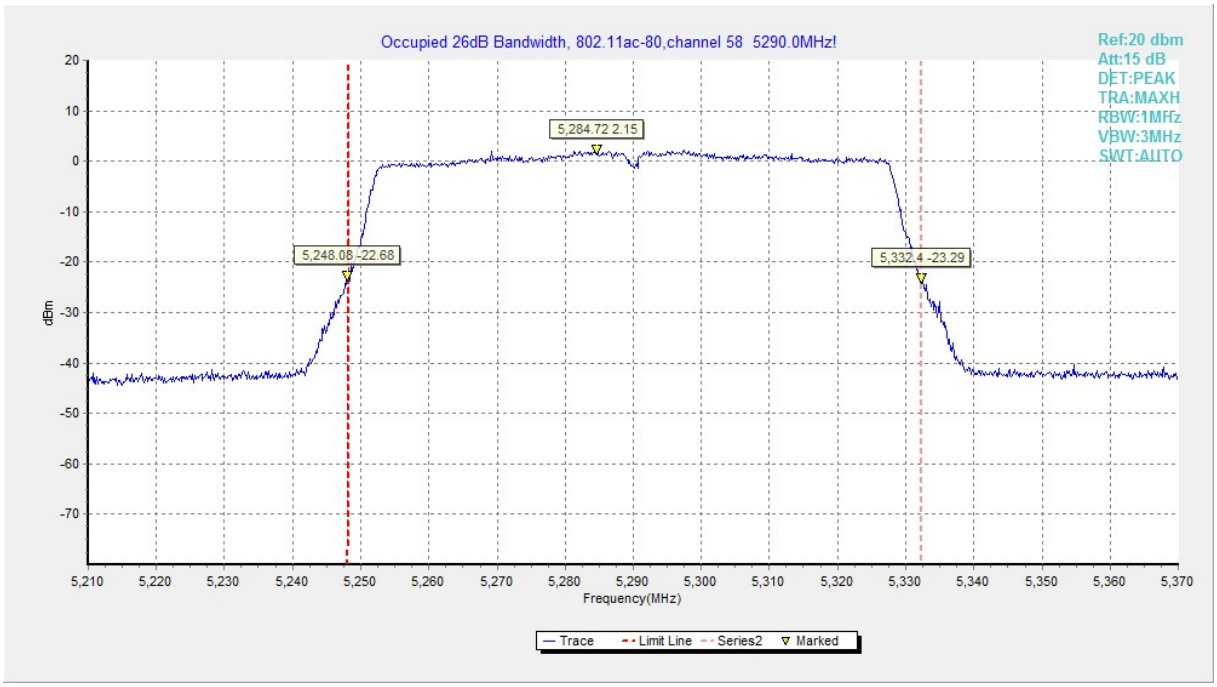


Fig.30 Occupied 26dB Bandwidth (802. 11ac-HT80, 5290MHz)

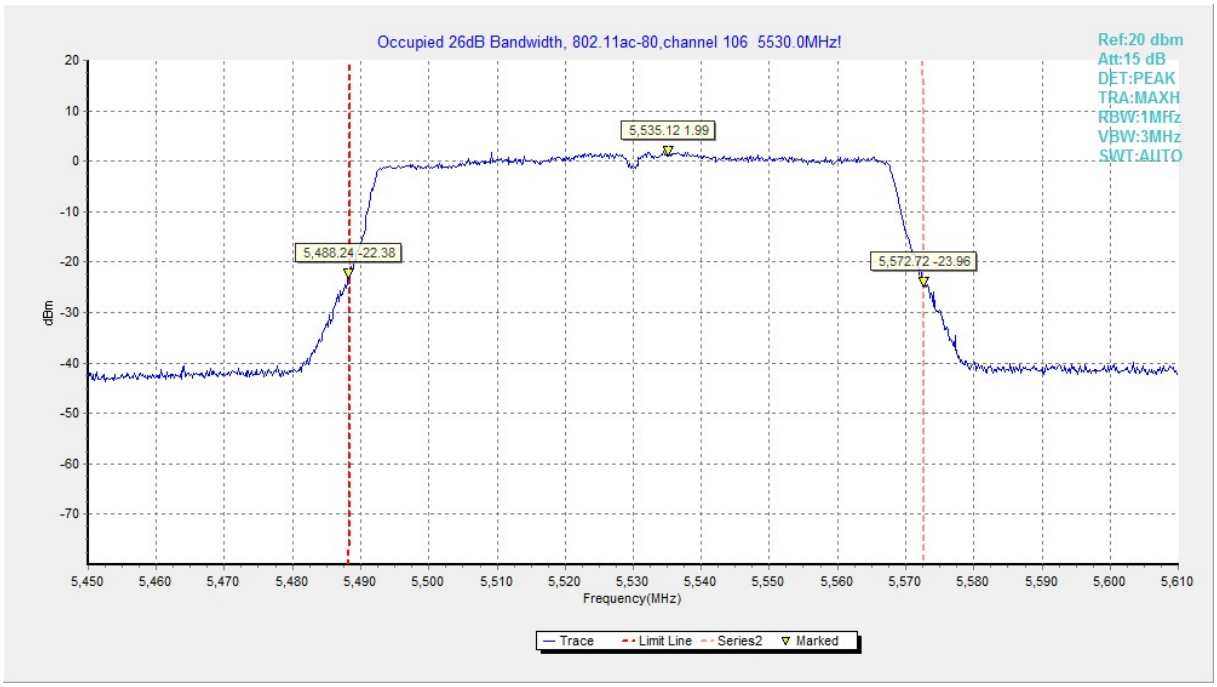


Fig.31 Occupied 26dB Bandwidth (802. 11ac-HT80, 5530MHz)

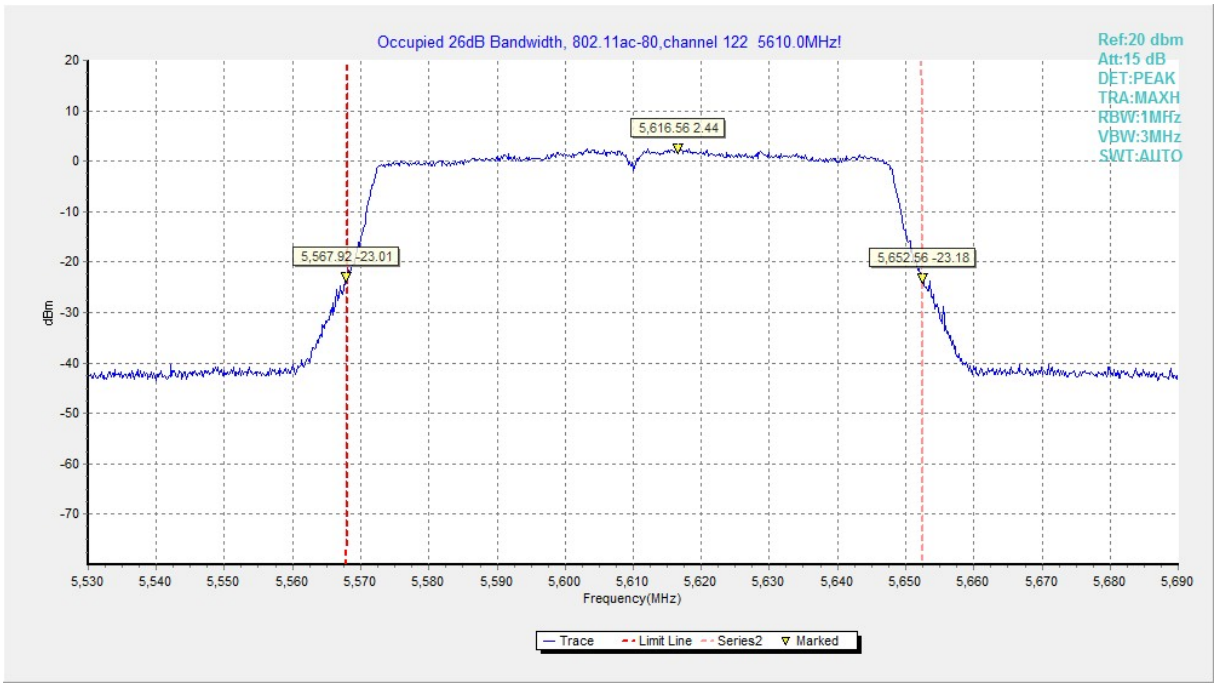


Fig.32 Occupied 26dB Bandwidth (802. 11ac-HT80, 5610MHz)

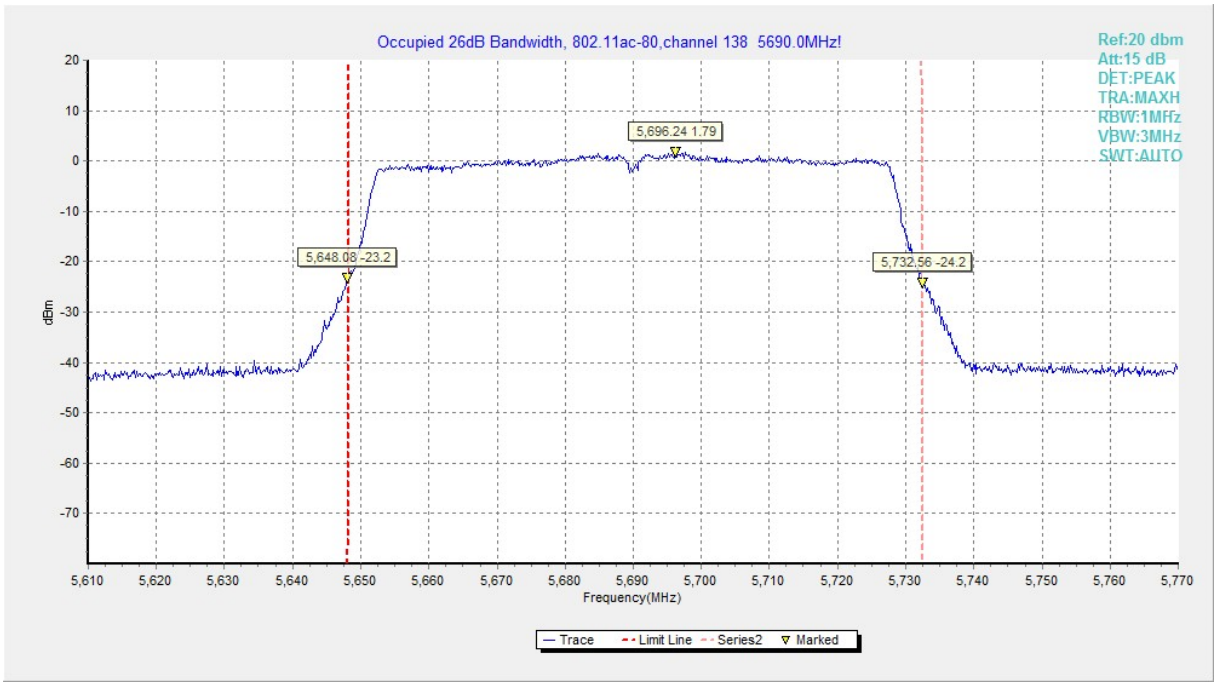


Fig.33 Occupied 26dB Bandwidth (802. 11ac-HT80, 5690MHz)

A.5. Band Edges Compliance

A5.1 Band Edges - Radiated

Method of Measurement: See ANSI C63.10-2013-clause 6.4 &6.5 & 6.6

Measurement Limit:

15.407(b) Undesirable emission limits.

Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

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 (MHz)	Field strength(μV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

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
Above 960	500	54

Set up:

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m and the table height shall be 1.5 m.

The EUT and transmitting antenna shall be centered on the turntable.

Test Condition

The EUT shall be tested 1 near top, 1 near middle, and 1 near bottom. Set the unlicensed wireless device to operate in continuous transmit mode. For unlicensed wireless devices unable to be configured for 100% duty cycle even in test mode, configure the system for the maximum duty cycle supported.

When required for unlicensed wireless devices, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as

appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Exploratory radiated emissions measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. The frequencies of maximum emission may be determined by manually positioning the antenna close to the EUT, and then moving the antenna over all sides of the EUT while observing a spectral display. It is advantageous to have prior knowledge of the frequencies of emissions, although this may be determined from such a near-field scan. The near-field scan shall only be used to determine the frequency but not the amplitude of the emissions. Where exploratory measurements are not adequate to determine the worst-case operating modes and are used only to identify the frequencies of the highest emissions, additional preliminary tests can be required.

For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of test. If either antenna height or EUT azimuth are not fully measured during exploratory testing, then complete testing can be required at the OATS or semi-anechoic chamber when the final full spectrum testing is performed.

Final radiated emissions measurements

The final measurements are using the orientation and equipment arrangement of the EUT based on the measurement results found during the preliminary (exploratory) measurements, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement.

For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. Final measurements for the EUT require a measurement antenna height scan of 1 m to 4 m and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable), as well as the frequency and amplitude of the six highest spurious emissions relative to the limit. Emissions more than 20 dB below the limit do not need to be reported.

This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The receiver references:

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100KHz/300KHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

Measurement Result:

Mode	Frequency	Test Results	Conclusion
802.11a	5180 MHz	Fig.34	P
	5320 MHz	Fig.35	P
	5500 MHz	Fig.36	P
	5700 MHz	Fig.37	P
802.11n HT20	5180 MHz	Fig.38	P
	5320 MHz	Fig.39	P
	5500 MHz	Fig.40	P
	5700 MHz	Fig.41	P
802.11ac HT20	5180 MHz	Fig.42	P
	5320 MHz	Fig.43	P
	5500 MHz	Fig.44	P
	5700 MHz	Fig.45	P
802.11n HT40	5190 MHz	Fig.46	P
	5310 MHz	Fig.47	P
	5510 MHz	Fig.48	P
	5670 MHz	Fig.49	P
802.11ac HT40	5190 MHz	Fig.50	P
	5310 MHz	Fig.51	P
	5510 MHz	Fig.52	P
	5670 MHz	Fig.53	P
802.11ac HT80	5210MHz	Fig.54	P
	5290MHz	Fig.55	P
	5530MHz	Fig.56	P

EUT ID: EUT4

Conclusion: PASS

Test graphs as below:

Note: The plot above is the combination results of both vertical and horizontal polarizations

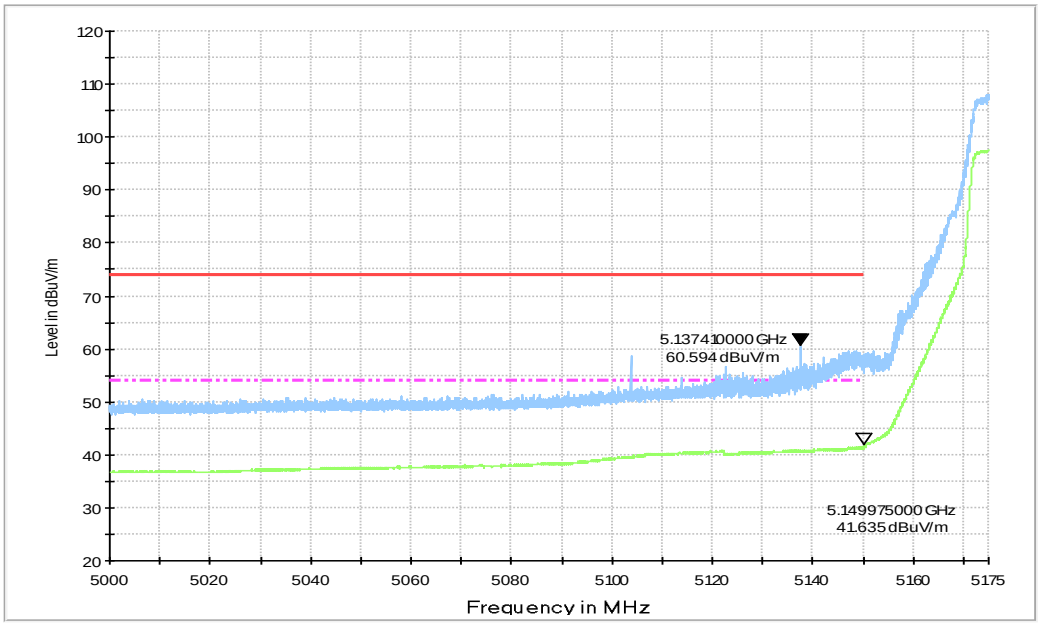


Fig.34 Band Edges (802.11a, 5180MHz)

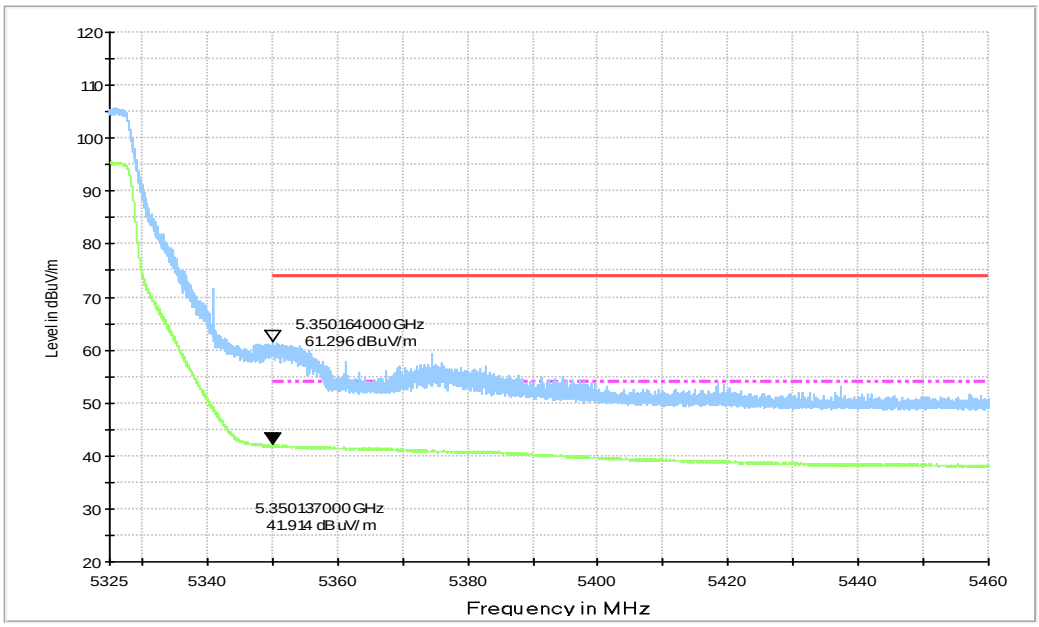


Fig.35 Band Edges (802.11a, 5320MHz)

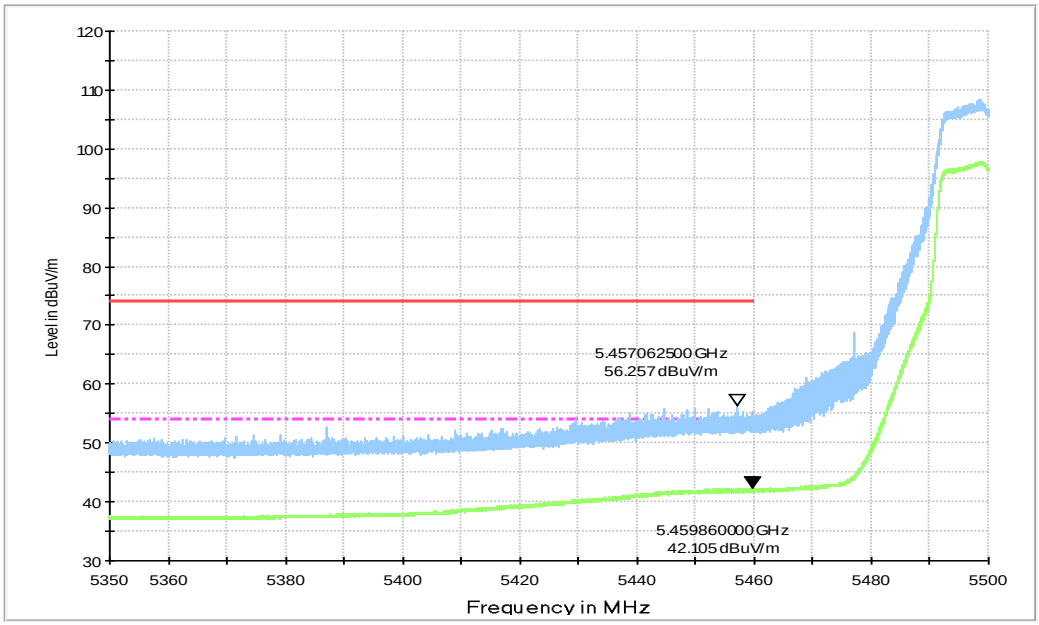


Fig.36 Band Edges (802.11a, 5500MHz)

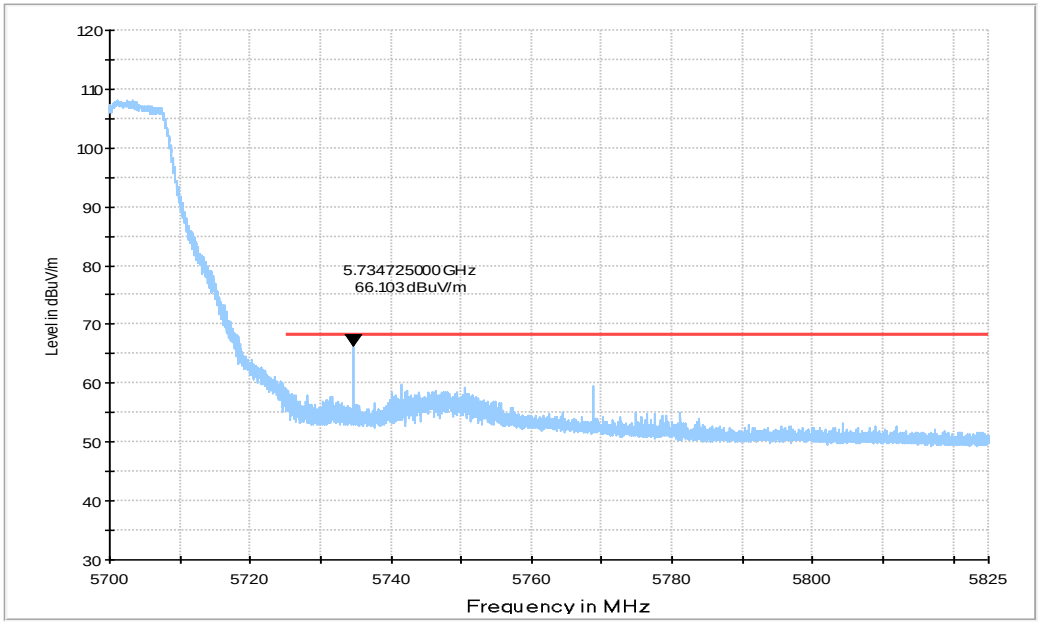


Fig.37 Band Edges (802.11a, 5700MHz)

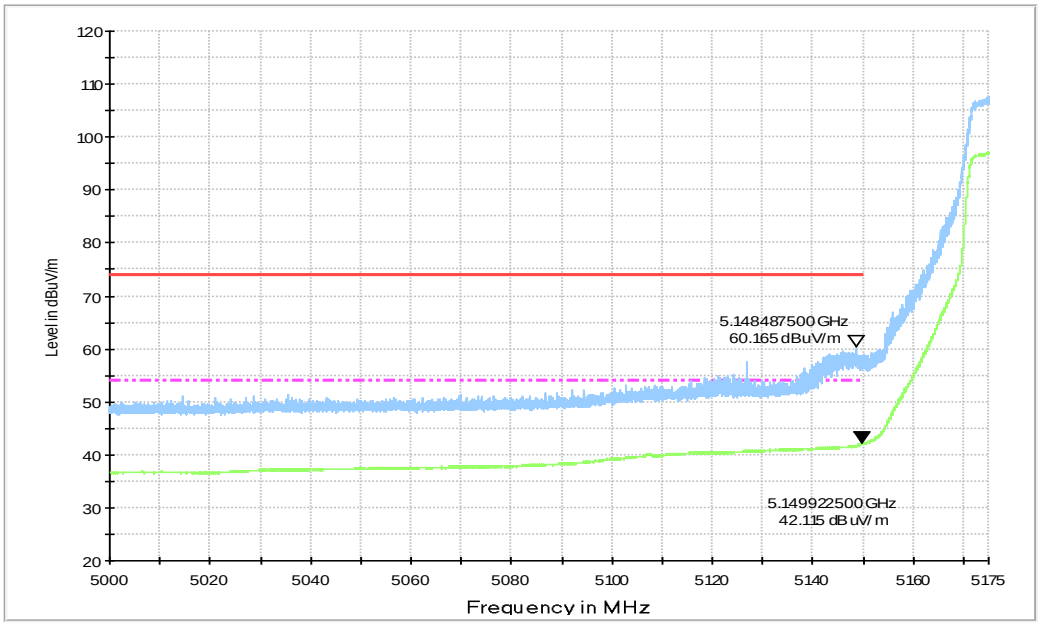


Fig.38 Band Edges (802.11n-HT20, 5180MHz)

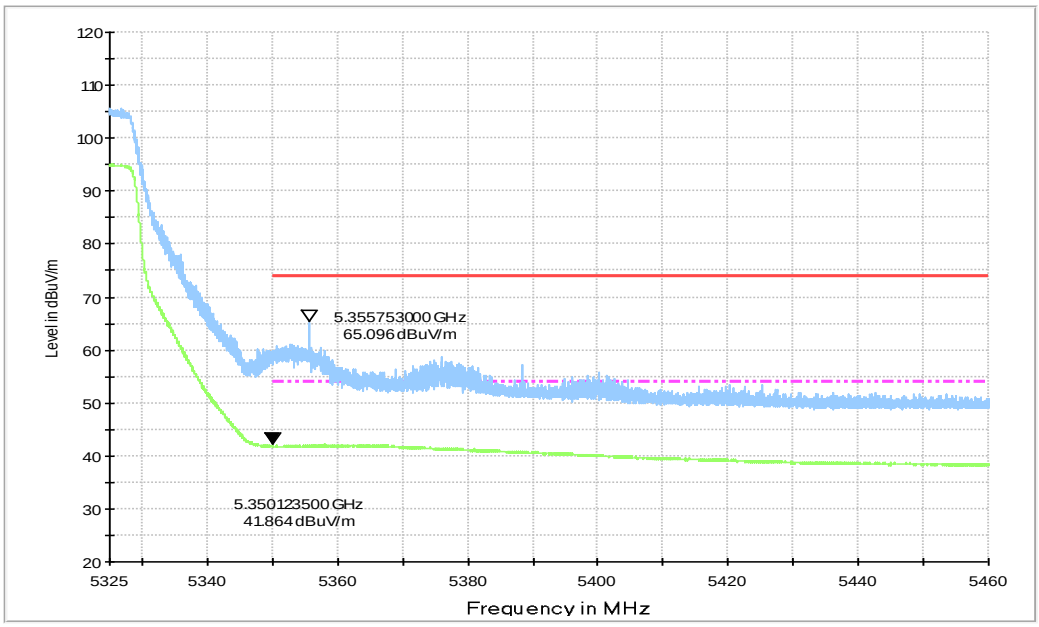


Fig.39 Band Edges (802.11n-HT20, 5320MHz)

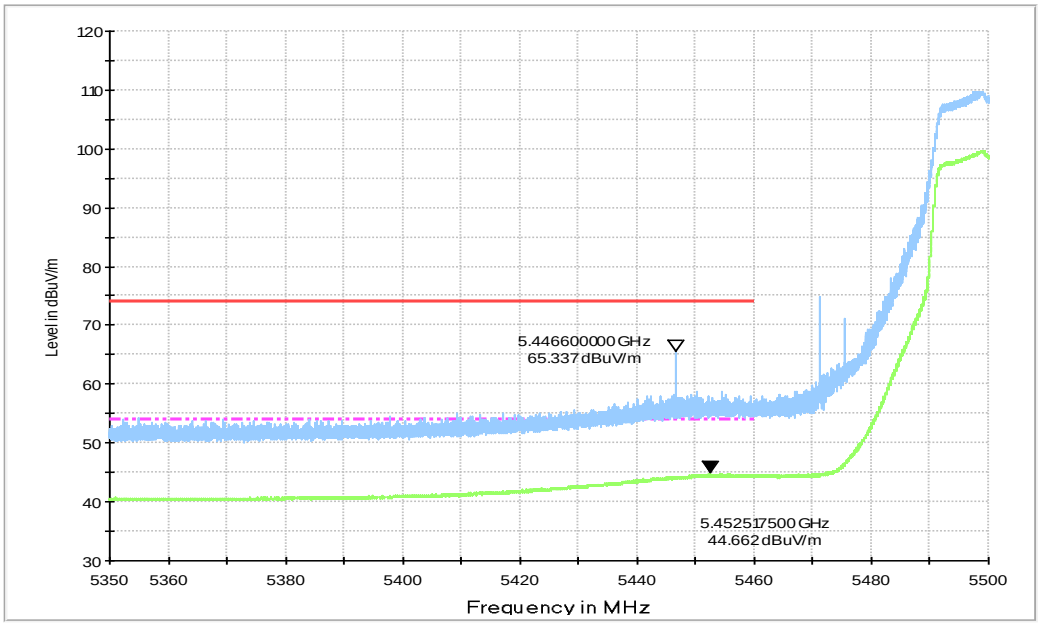


Fig.40 Band Edges (802.11n-HT20, 5500MHz)

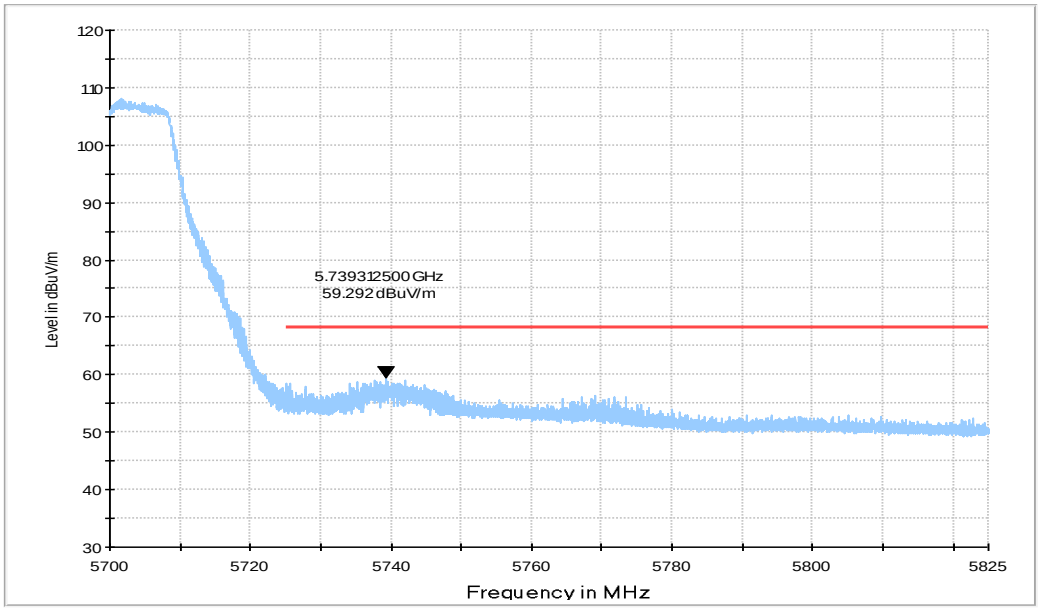


Fig.41 Band Edges (802.11n-HT20, 5700MHz)

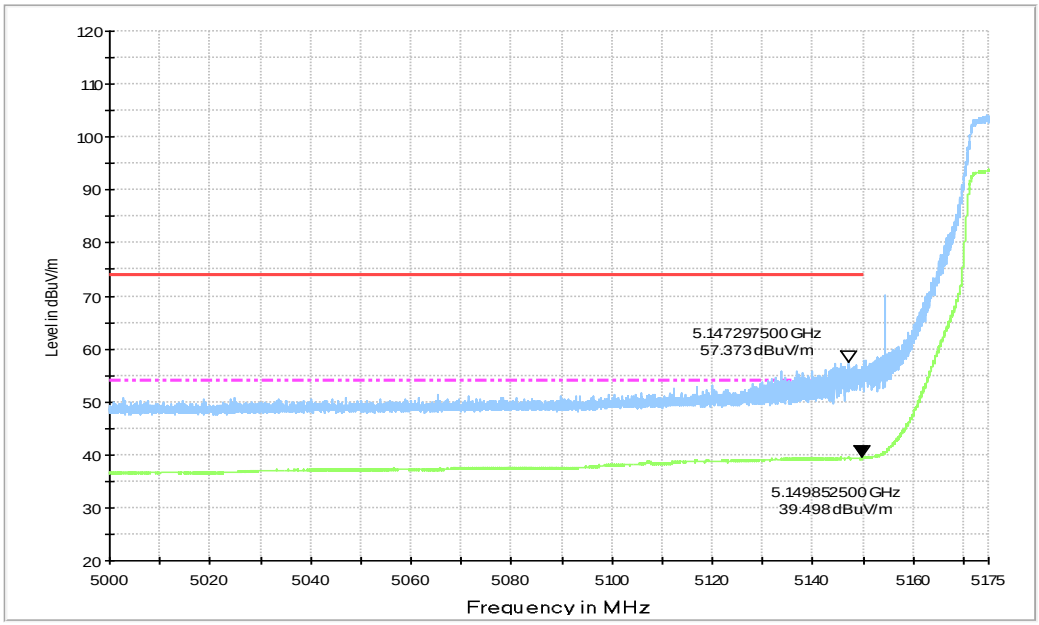


Fig.42 Band Edges (802.11ac-HT20, 5180MHz)

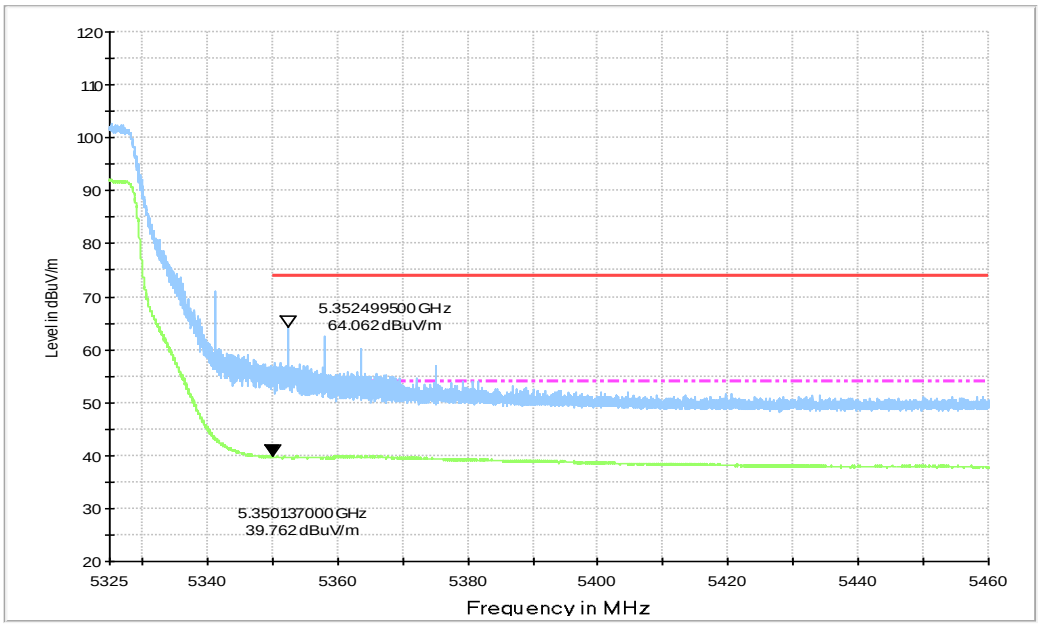


Fig.43 Band Edges (802.11ac-HT20, 5320MHz)

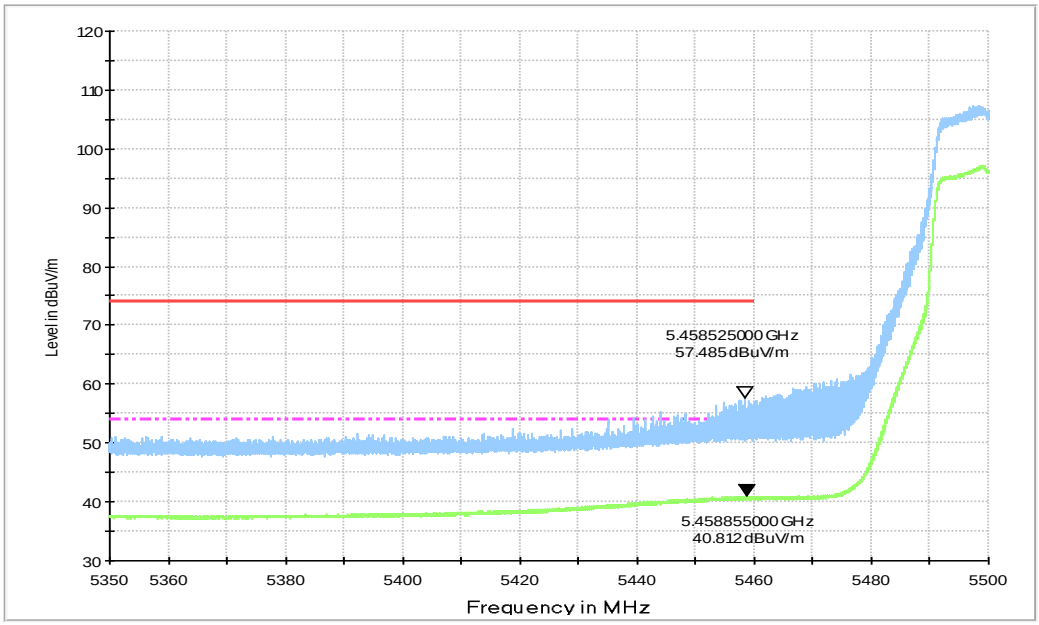


Fig.44 Band Edges (802.11ac-HT20, 5500MHz)

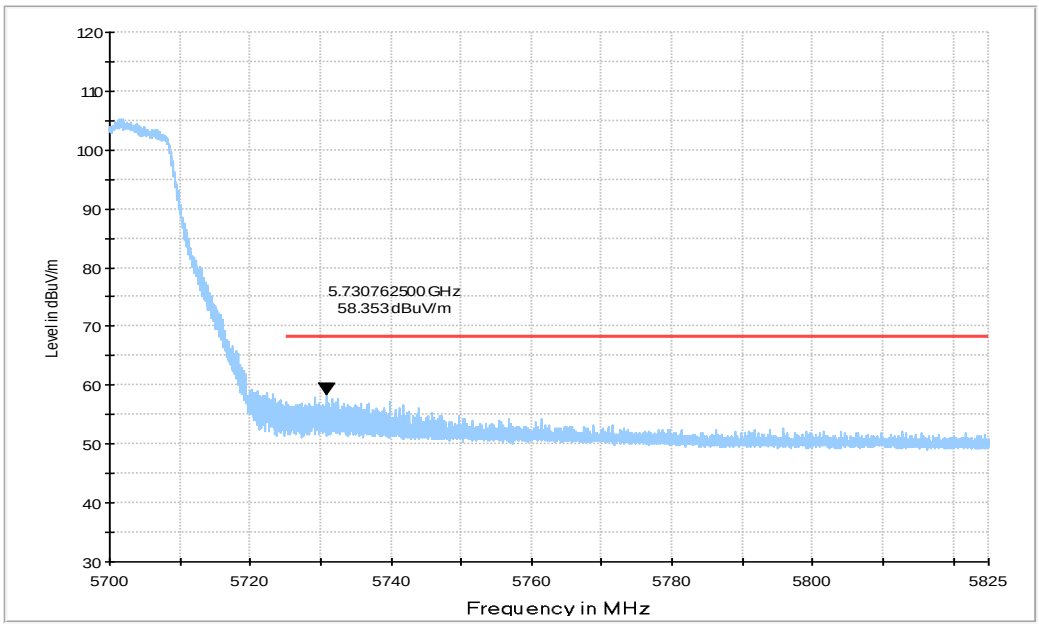


Fig.45 Band Edges (802.11ac-HT20, 5700MHz)

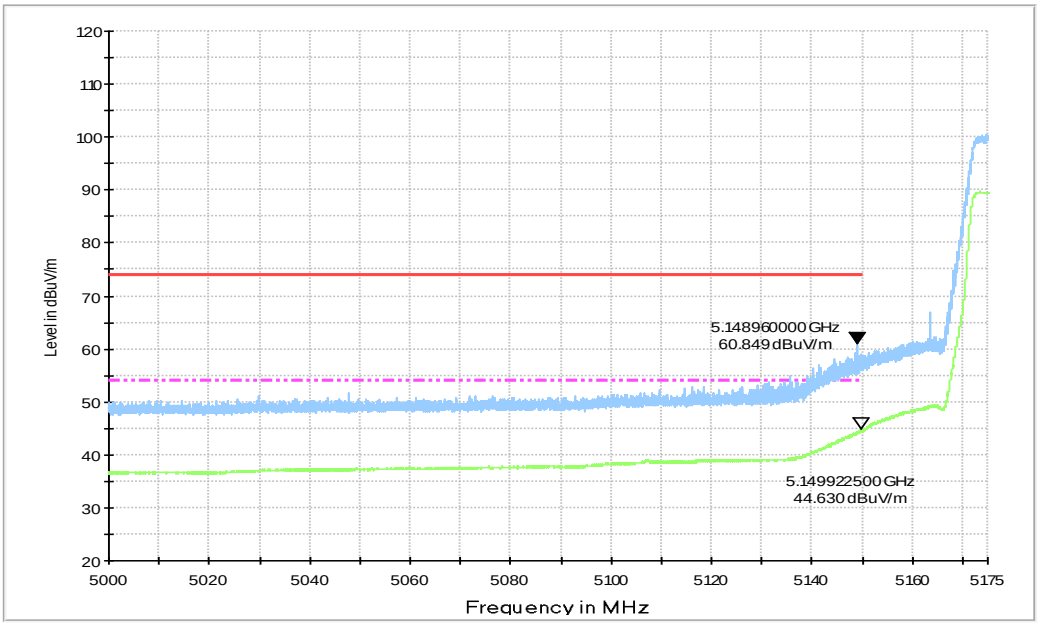


Fig.46 Band Edges (802.11n-HT40, 5190MHz)

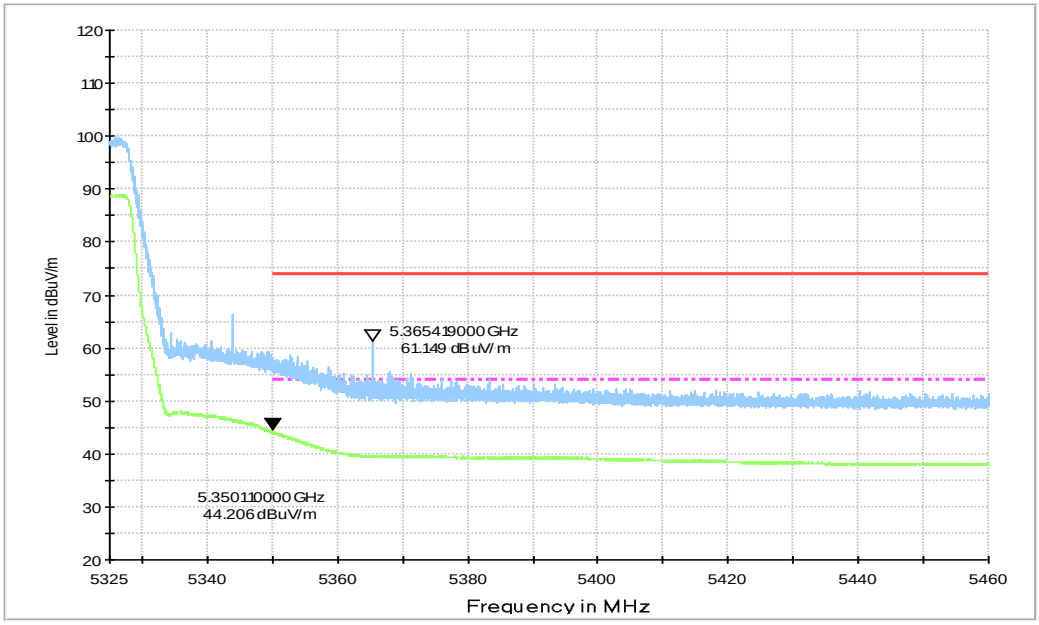


Fig.47 Band Edges (802.11n-HT40, 5310MHz)

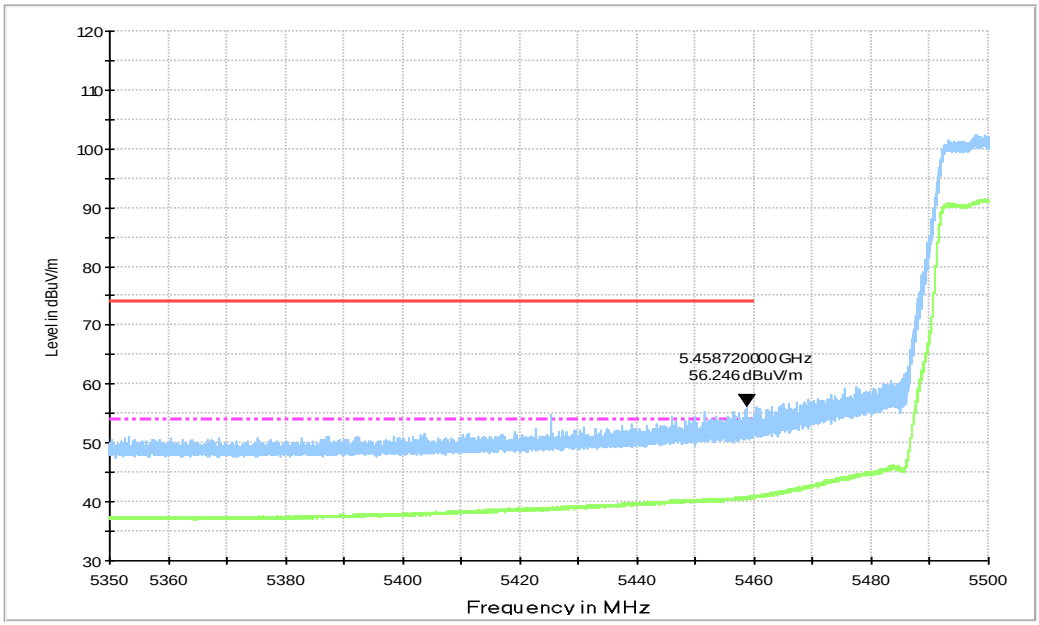


Fig.48 Band Edges (802.11n-HT40, 5510MHz)

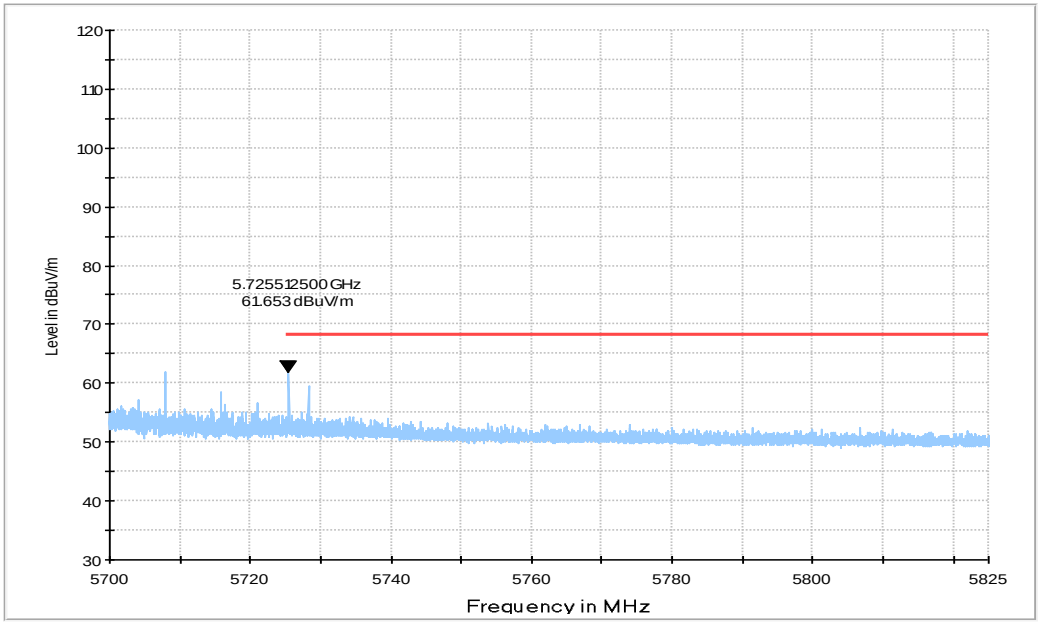


Fig.49 Band Edges (802.11n-HT40, 5670MHz)

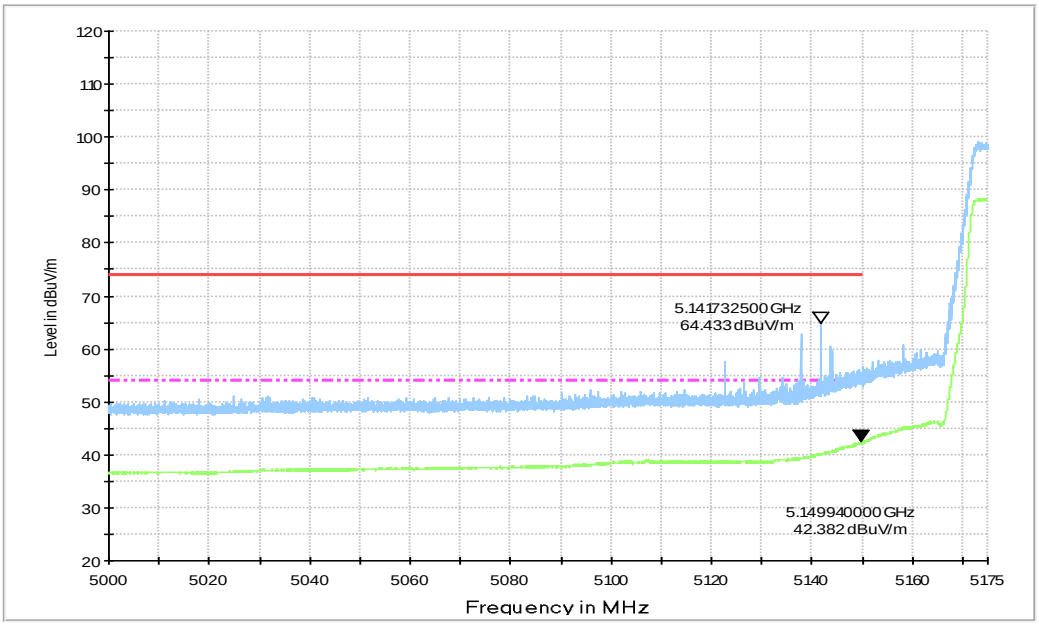


Fig.50 Band Edges (802.11ac-HT40, 5190MHz)

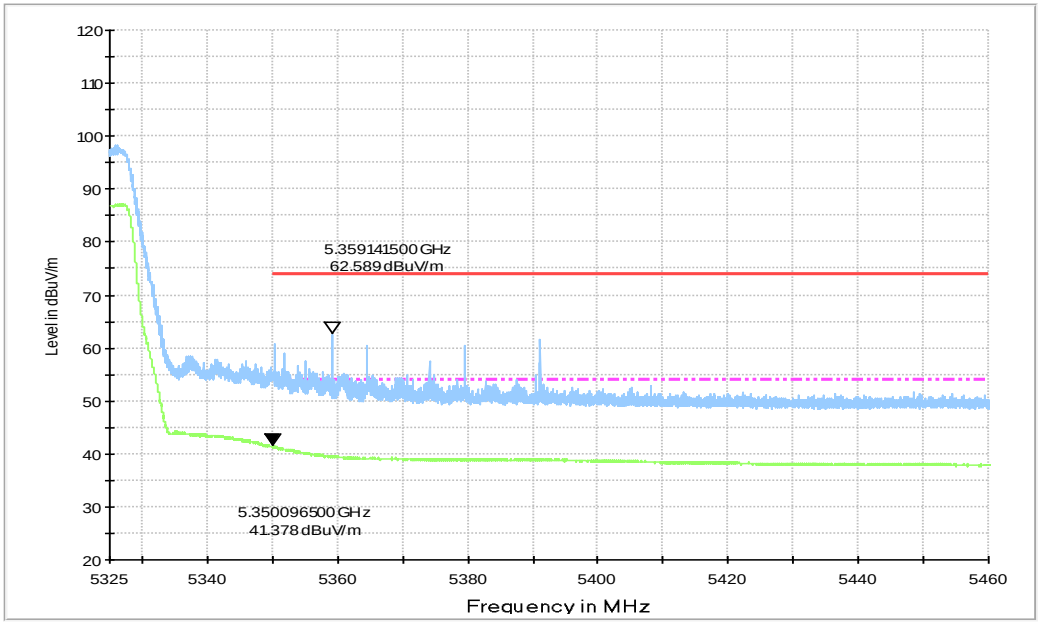


Fig.51 Band Edges (802.11ac-HT40, 5310MHz)

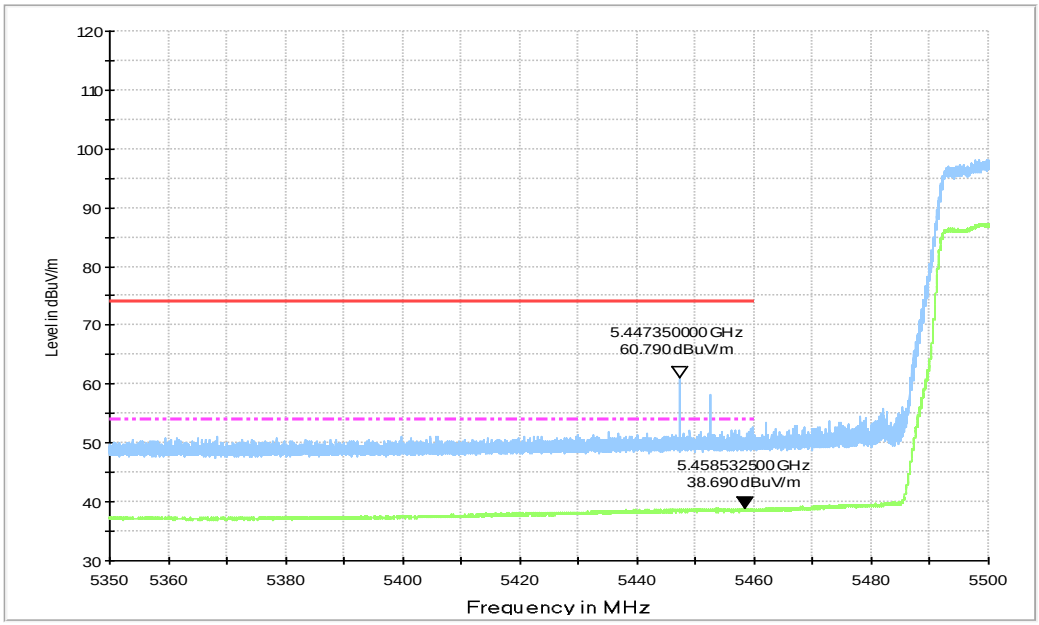


Fig.52 Band Edges (802.11ac-HT40, 5510MHz)

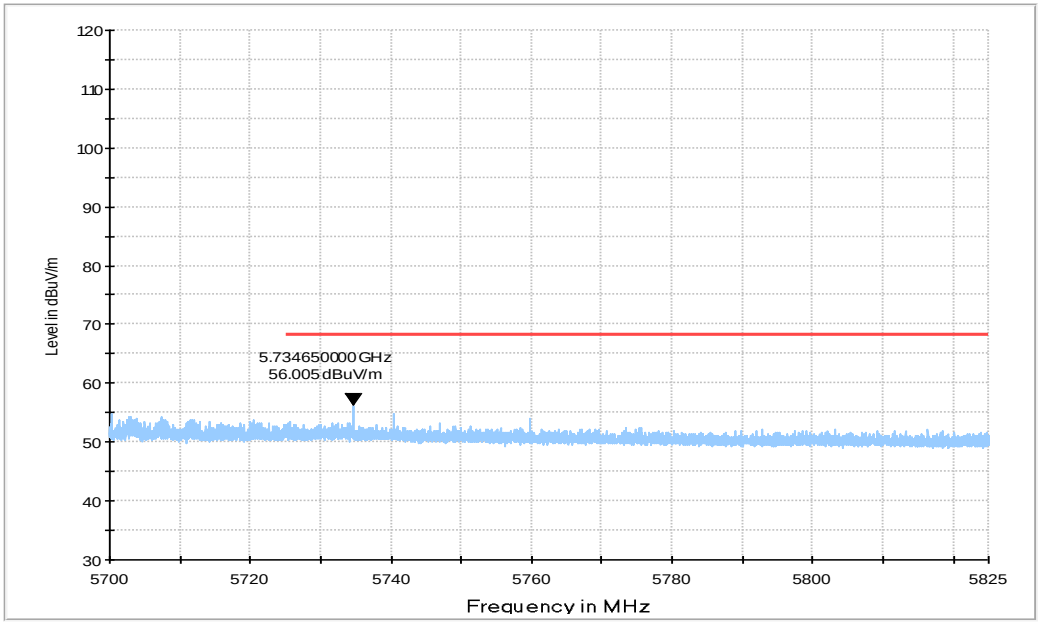


Fig.53 Band Edges (802.11ac-HT40, 5670MHz)

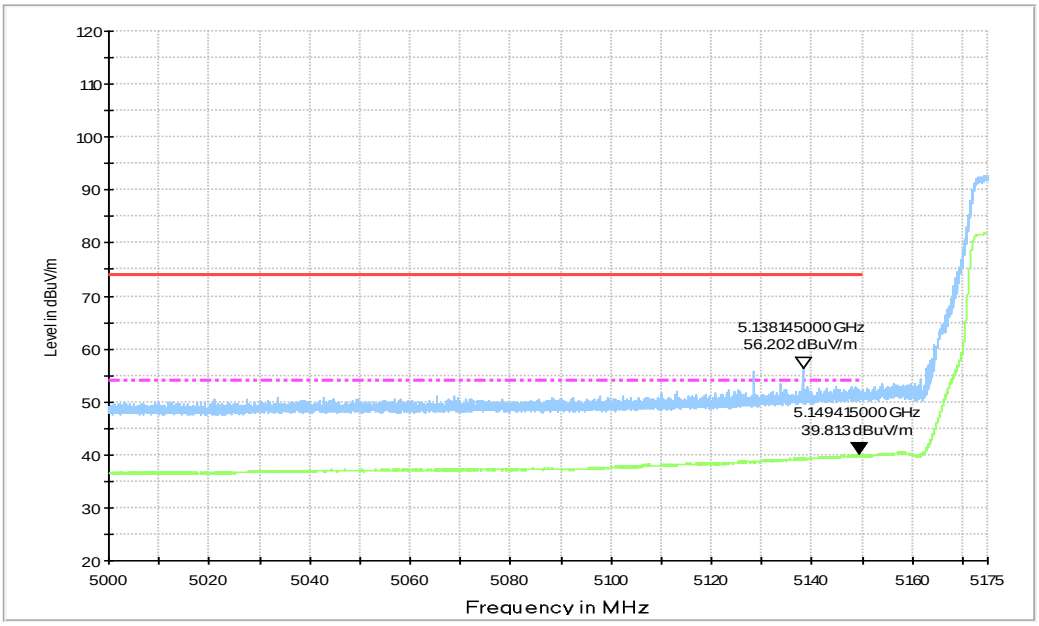


Fig.54 Band Edges (802.11ac-HT80, 5210MHz)

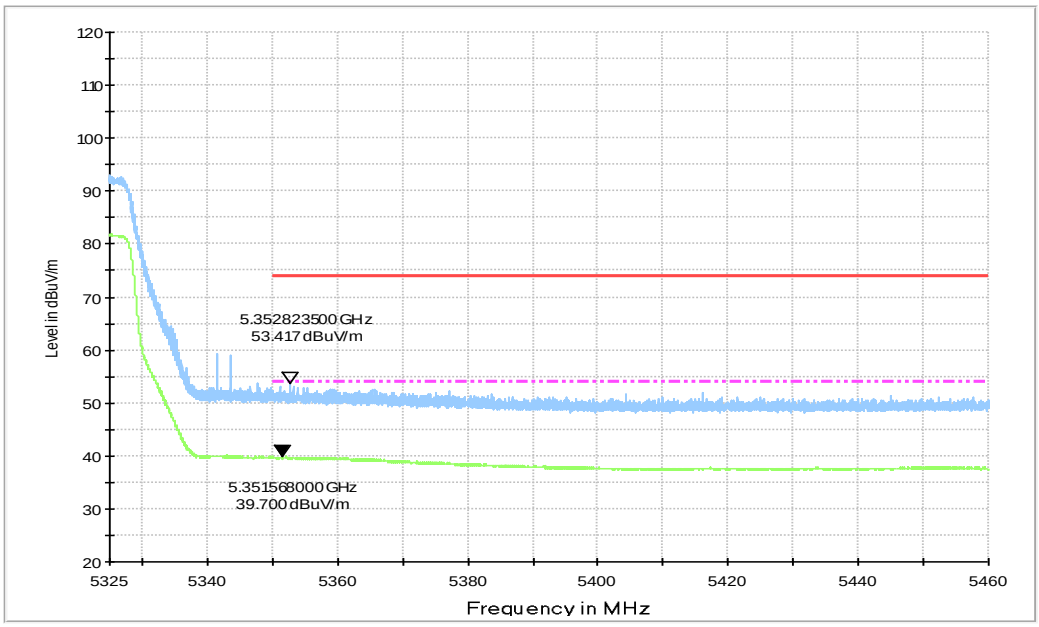


Fig.55 Band Edges (802.11ac-HT80, 5290MHz)

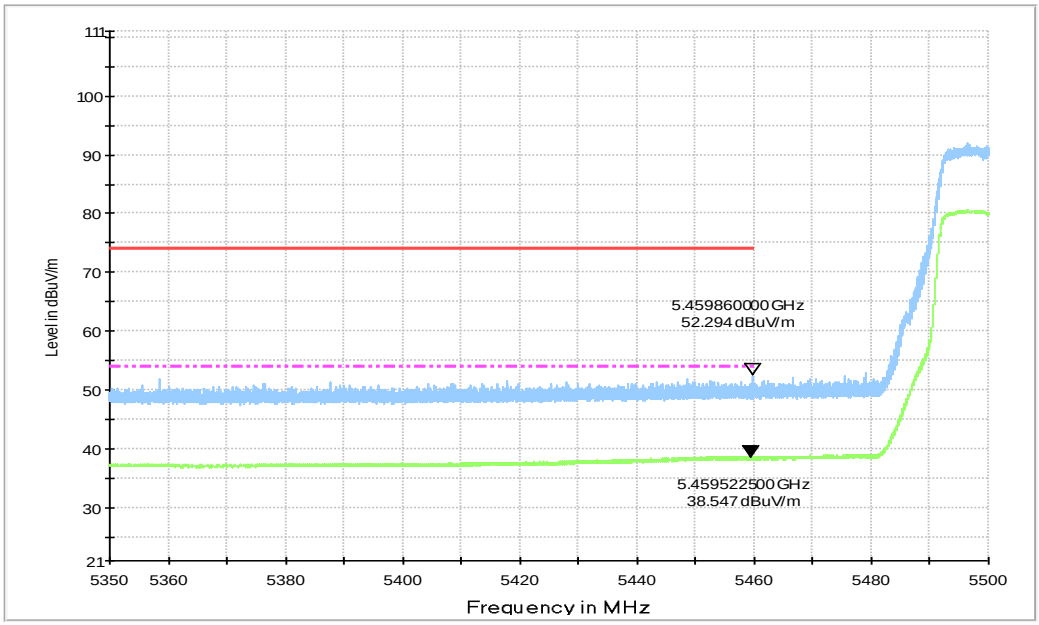


Fig.56 Band Edges (802.11ac-HT80, 5530MHz)

A.6. Transmitter Spurious Emission

Method of Measurement: See ANSI C63.10-2013-clause 6.4 &6.5 & 6.6

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.407	-27 dBm/MHz

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:

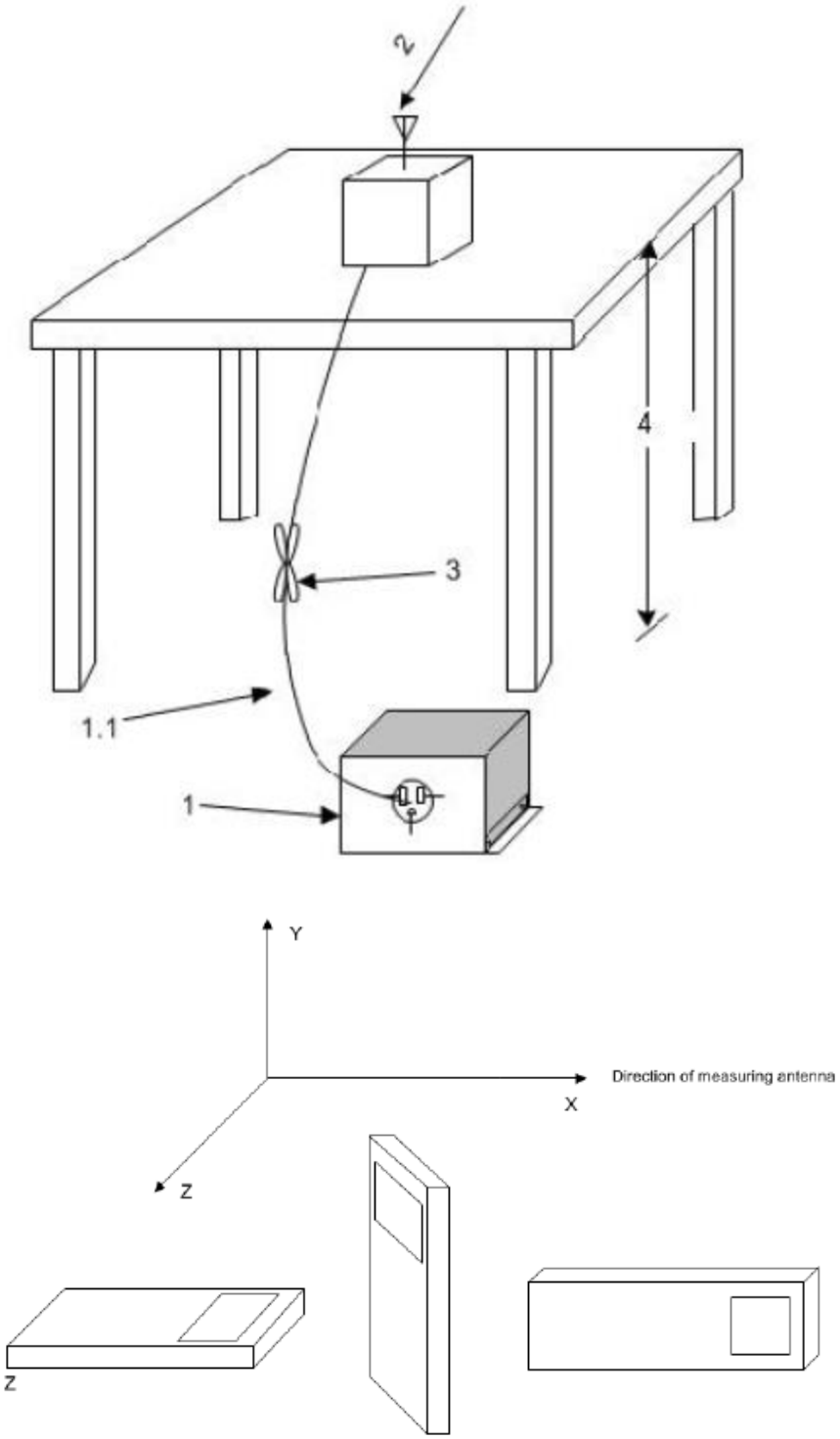
Frequency (MHz)	Field strength(μV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

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
Above 960	500	54

Set up:

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 EUT and transmitting antenna shall be centered on the turntable.



Test Condition

The EUT shall be tested 1 near top, 1 near middle, and 1 near bottom. Set the unlicensed wireless device to operate in continuous transmit mode. For unlicensed wireless devices unable to be configured for 100% duty cycle even in test mode, configure the system for the maximum duty cycle supported.

When required for unlicensed wireless devices, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as

appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Exploratory radiated emissions measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. The frequencies of maximum emission may be determined by manually positioning the antenna close to the EUT, and then moving the antenna over all sides of the EUT while observing a spectral display. It is advantageous to have prior knowledge of the frequencies of emissions, although this may be determined from such a near-field scan. The near-field scan shall only be used to determine the frequency but not the amplitude of the emissions. Where exploratory measurements are not adequate to determine the worst-case operating modes and are used only to identify the frequencies of the highest emissions, additional preliminary tests can be required.

For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of test. If either antenna height or EUT azimuth are not fully measured during exploratory testing, then complete testing can be required at the OATS or semi-anechoic chamber when the final full spectrum testing is performed.

Final radiated emissions measurements

The final measurements are using the orientation and equipment arrangement of the EUT based on the measurement results found during the preliminary (exploratory) measurements, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement.

For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.

For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable), as well as the frequency and amplitude of the six highest spurious emissions relative to the limit. Emissions more than 20 dB below the limit do not need to be reported.

This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The receiver references:

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100KHz/300KHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

P_{Mea} is the field strength recorded from the instrument.

The measurement results are obtained as described below:

Result= P_{Mea} + Cable Loss + Antenna Factor

Where:

P_{Mea} field strength recorded from the instrument

Test EUI ID: EUT4

Average

802.11a

Channel 36

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5146.800	41.6	-29.7	34.3	37.04	54.0	12.4	H
5148.800	41.8	-29.7	34.3	37.20	54.0	12.2	H
11958.800	35.2	-31.6	38.8	28.11	54.0	18.8	V
15540.400	36.2	-28.8	40.1	24.99	54.0	17.8	H
17765.700	38.2	-26.5	41.1	23.59	54.0	15.8	V
17853.700	38.4	-26.3	41.2	23.60	54.0	15.6	H

Channel 40

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5147.000	41.5	-29.7	34.3	36.95	54.0	12.5	H
5350.400	39.5	-29.8	34.5	34.78	54.0	14.5	H
12413.100	32.2	-31.2	38.9	24.55	54.0	21.8	H
15599.800	36.0	-28.7	40.1	24.52	54.0	18.0	H
17842.700	38.3	-26.4	41.2	23.48	54.0	15.7	V
17875.700	38.6	-26.3	41.2	23.65	54.0	15.4	H

Channel 48

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5148.200	40.2	-29.7	34.3	35.60	54.0	13.8	H
5351.200	39.8	-29.8	34.5	35.14	54.0	14.2	H
11962.100	35.1	-31.6	38.8	28.01	54.0	18.9	H
15719.700	36.1	-28.5	40.3	24.28	54.0	17.9	H
17852.600	38.4	-26.3	41.2	23.57	54.0	15.6	H
17950.500	38.5	-26.1	41.3	23.40	54.0	15.5	V

Channel 52

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5148.000	39.9	-29.7	34.3	35.32	54.0	14.1	H
5351.600	40.4	-29.8	34.5	35.66	54.0	13.6	H
12438.400	34.8	-31.1	38.9	27.10	54.0	19.2	H
15780.200	36.4	-28.4	40.4	24.39	54.0	17.6	V
17760.200	38.3	-26.5	41.1	23.69	54.0	15.7	H
17886.700	38.6	-26.3	41.2	23.62	54.0	15.4	V

Channel 56

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5146.600	39.7	-29.7	34.3	35.15	54.0	14.3	H
5350.800	41.4	-29.8	34.5	36.67	54.0	12.6	H
12410.900	34.8	-31.2	38.9	27.10	54.0	19.2	V
15839.600	37.1	-28.2	40.5	24.84	54.0	16.9	H
17844.900	38.3	-26.4	41.2	23.48	54.0	15.7	H
17950.500	38.6	-26.1	41.3	23.44	54.0	15.4	H

Channel 64

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5350.200	42.1	-29.8	34.5	37.40	54.0	11.9	H
5351.600	42.1	-29.8	34.5	37.38	54.0	11.9	H
10637.700	41.1	-33.3	37.6	36.84	54.0	12.9	V
15959.500	37.1	-27.7	40.6	24.08	54.0	16.9	H
17762.400	38.2	-26.5	41.1	23.55	54.0	15.8	H
17849.300	38.3	-26.3	41.2	23.46	54.0	15.7	V

Channel 100

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5459.000	42.4	-29.3	34.6	37.16	54.0	11.6	H
5460.000	42.4	-29.3	34.6	37.13	54.0	11.6	H
10998.500	38.6	-32.7	37.8	33.50	54.0	15.4	V
15948.500	37.6	-27.7	40.6	24.71	54.0	16.4	V
17755.800	38.1	-26.5	41.1	23.54	54.0	15.9	H
17850.400	38.6	-26.3	41.2	23.73	54.0	15.4	V

Channel 120

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5457.600	37.3	-29.3	34.6	32.07	54.0	16.7	H
5459.000	37.3	-29.3	34.6	32.07	54.0	16.7	V
11202.000	42.1	-32.1	38.0	36.23	54.0	11.9	V
15948.500	37.4	-27.7	40.6	24.52	54.0	16.6	V
17758.000	38.2	-26.5	41.1	23.57	54.0	15.8	H
17858.100	38.5	-26.3	41.2	23.60	54.0	15.5	V

Channel 140

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5457.600	36.9	-29.3	34.6	31.67	54.0	17.1	H
5459.000	36.9	-29.3	34.6	31.65	54.0	17.1	V
11402.200	40.5	-32.3	38.1	34.74	54.0	13.5	H
15926.500	37.2	-27.8	40.6	24.41	54.0	16.8	H
17844.900	38.3	-26.4	41.2	23.44	54.0	15.7	V
17886.700	38.4	-26.3	41.2	23.46	54.0	15.6	V

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Channel 36

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5149.400	42.2	-29.7	34.3	37.62	54.0	11.8	H
5149.800	42.3	-29.7	34.3	37.73	54.0	11.7	H
11925.800	35.0	-31.7	38.7	27.98	54.0	19.0	H
15540.400	36.2	-28.8	40.1	24.94	54.0	17.8	V
17842.700	38.2	-26.4	41.2	23.36	54.0	15.8	H
17881.200	38.4	-26.3	41.2	23.50	54.0	15.6	V

Channel 40

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5149.600	41.5	-29.7	34.3	36.97	54.0	12.5	H
5352.200	39.4	-29.8	34.5	34.74	54.0	14.6	H
12449.400	35.3	-31.1	38.9	27.52	54.0	18.7	V
15599.800	35.9	-28.7	40.1	24.47	54.0	18.1	V
17844.900	38.2	-26.4	41.2	23.42	54.0	15.8	V
17953.800	38.4	-26.1	41.3	23.23	54.0	15.6	H

Channel 48

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5149.000	40.1	-29.7	34.3	35.56	54.0	13.9	H
5350.400	42.4	-29.8	34.5	37.68	54.0	11.6	H
11934.600	34.9	-31.7	38.7	27.85	54.0	19.1	V
15719.700	36.4	-28.5	40.3	24.55	54.0	17.6	H
17880.100	38.6	-26.3	41.2	23.72	54.0	15.4	H
17951.600	38.7	-26.1	41.3	23.59	54.0	15.3	H

Channel 52

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5147.600	40.0	-29.7	34.3	35.39	54.0	14.0	H
5352.200	40.3	-29.8	34.5	35.59	54.0	13.7	H
11959.900	34.8	-31.6	38.8	27.68	54.0	19.2	V
15781.300	36.2	-28.4	40.4	24.14	54.0	17.8	H
17831.700	37.9	-26.4	41.2	23.10	54.0	16.1	H
17972.500	38.4	-26.1	41.3	23.14	54.0	15.6	V

Channel 56

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5148.600	39.7	-29.7	34.3	35.12	54.0	14.3	H
5351.800	41.2	-29.8	34.5	36.52	54.0	12.8	H
11958.800	34.7	-31.6	38.8	27.62	54.0	19.3	V
15839.600	36.9	-28.2	40.5	24.57	54.0	17.1	V
17784.400	37.9	-26.5	41.1	23.25	54.0	16.1	H
17979.100	38.3	-26.0	41.3	23.06	54.0	15.7	H

Channel 64

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5350.400	42.1	-29.8	34.5	37.44	54.0	11.9	H
5351.000	42.0	-29.8	34.5	37.34	54.0	12.0	H
10637.700	40.2	-33.3	37.6	35.97	54.0	13.8	H
15959.500	37.0	-27.7	40.6	24.05	54.0	17.0	V
17745.900	38.0	-26.5	41.1	23.39	54.0	16.0	V
17951.600	38.3	-26.1	41.3	23.19	54.0	15.7	V