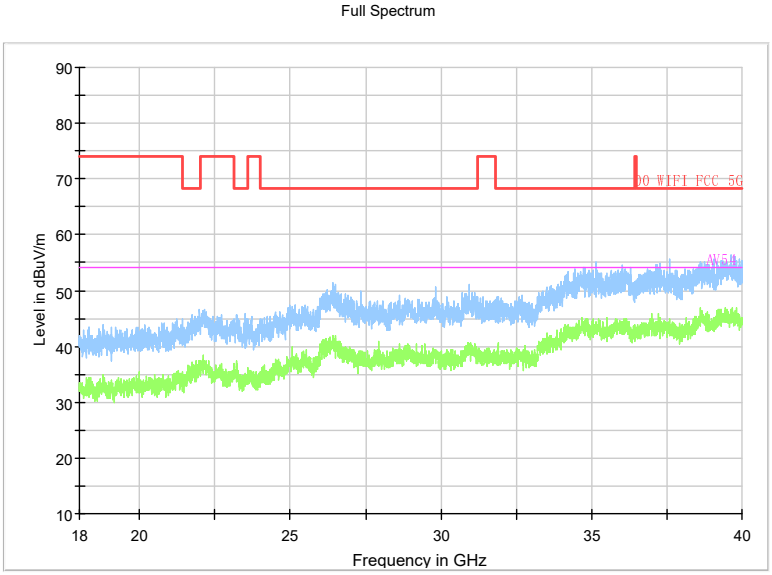
Frequency Range: 6GHz -18GHz

Detector: Av mode and PK mode

Test Mode: 802.11ac（VHT20)



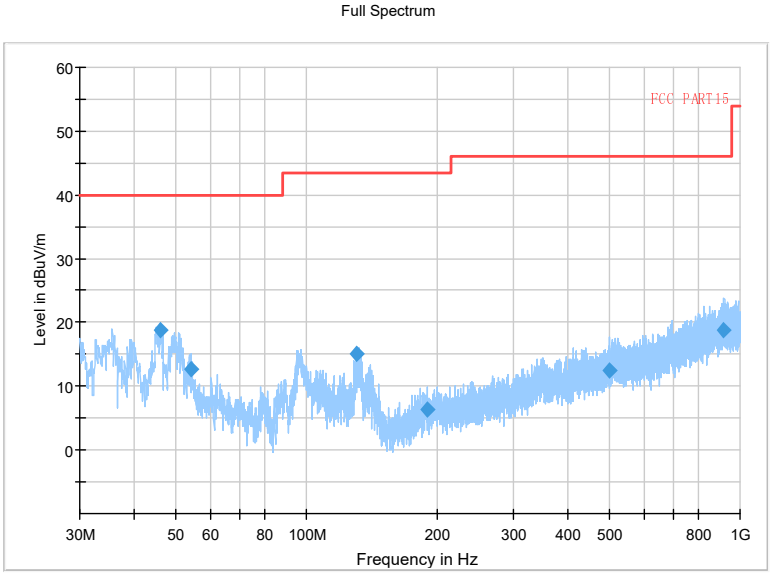
Frequency Range: 18GHz -40GHz

Detector: Av mode and PK mode

Test Mode: 802.11ac（VHT20)

Carrier frequency（MHz）：5755

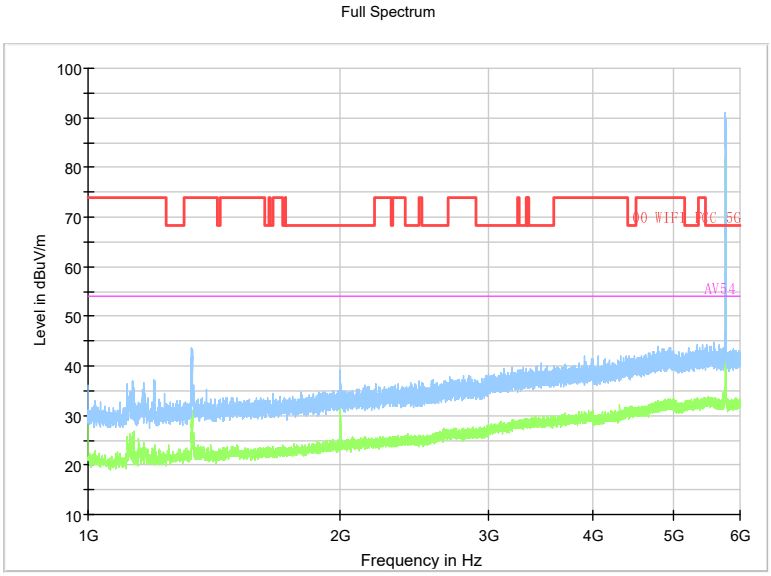
Channel No.:151



Frequency Range: 30MHz -1GHz

Detector: QP mode

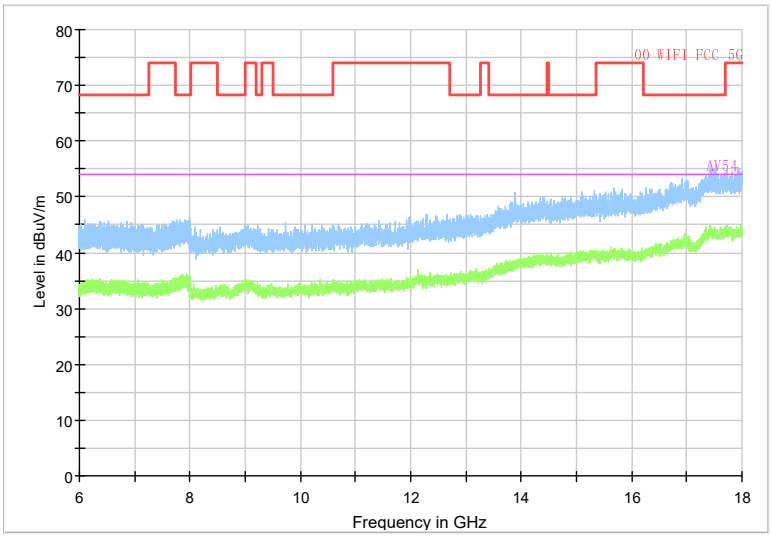
Modulation type: 802.11n（HT40）



Frequency Range: 1GHz -6GHz

Detector: Av mode and PK mode

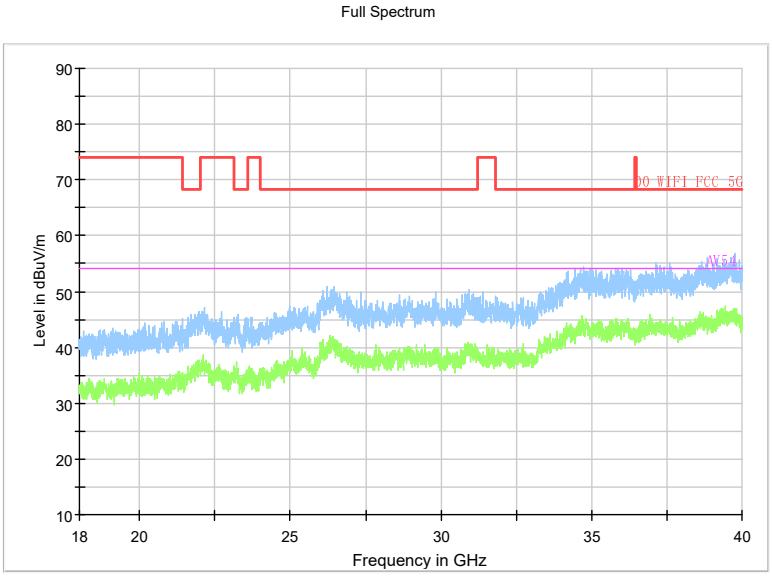
Modulation type: 802.11n（HT40)



Frequency Range: 6GHz -18GHz

Detector: Av mode and PK mode

Modulation type: 802.11n（HT40)

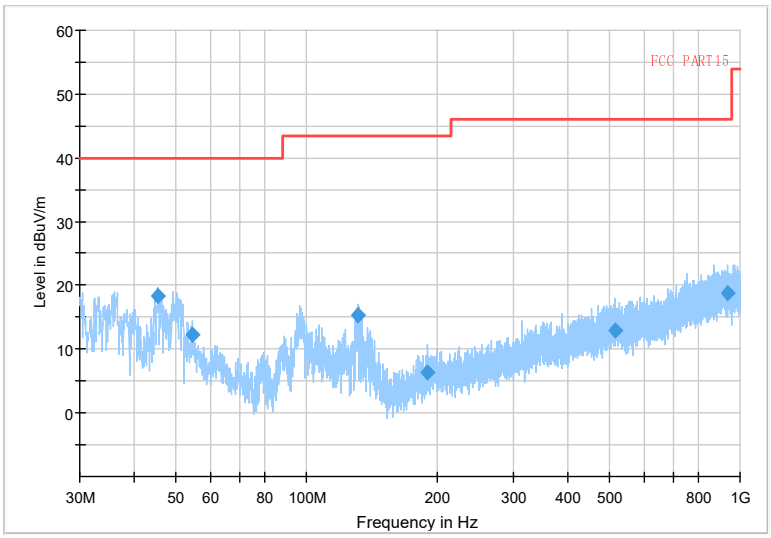


Frequency Range: 18GHz -40GHz

Detector: Av mode and PK mode

Modulation type: 802.11n（HT40)

Full Spectrum

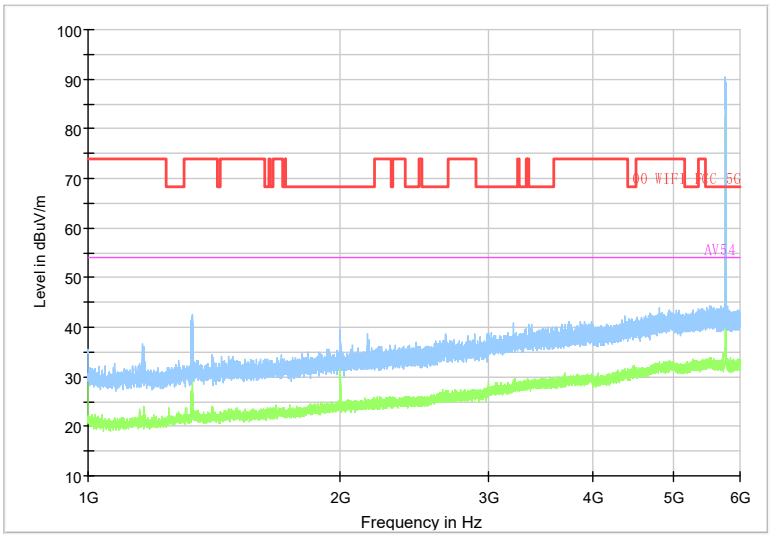


Frequency Range: 30MHz -1GHz

Detector: QP mode

Test Mode: 802.11ac（VHT40)

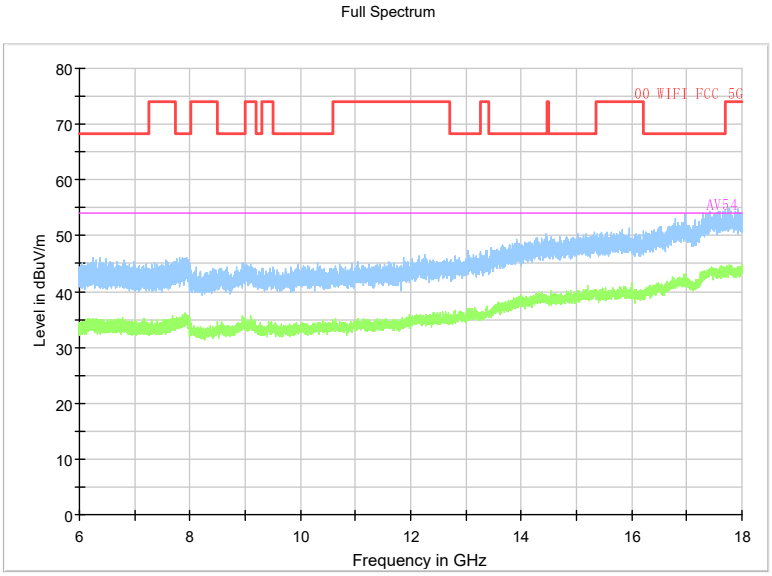
Full Spectrum



Frequency Range: 1GHz -6GHz

Detector: Av mode and PK mode

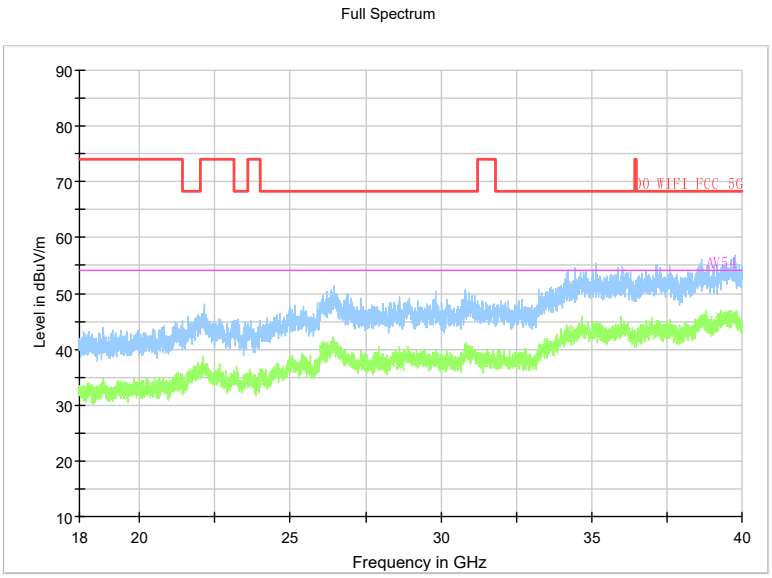
Test Mode: 802.11ac（VHT40)



Frequency Range: 6GHz -18GHz

Detector: Av mode and PK mode

Test Mode: 802.11ac（VHT40)



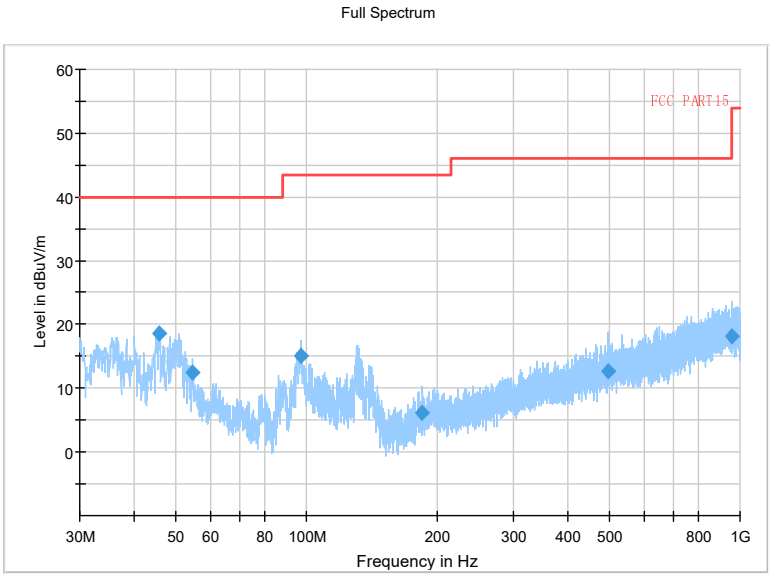
Frequency Range: 18GHz -40GHz

Detector: Av mode and PK mode

Test Mode: 802.11ac（VHT40)

Carrier frequency （MHz） : 5795

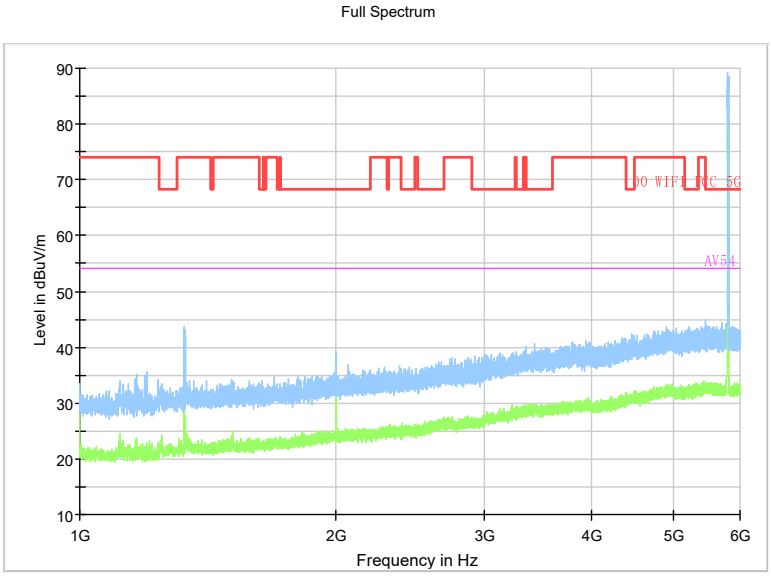
Channel No.:159



Frequency Range: 30MHz -1GHz

Detector: QP mode

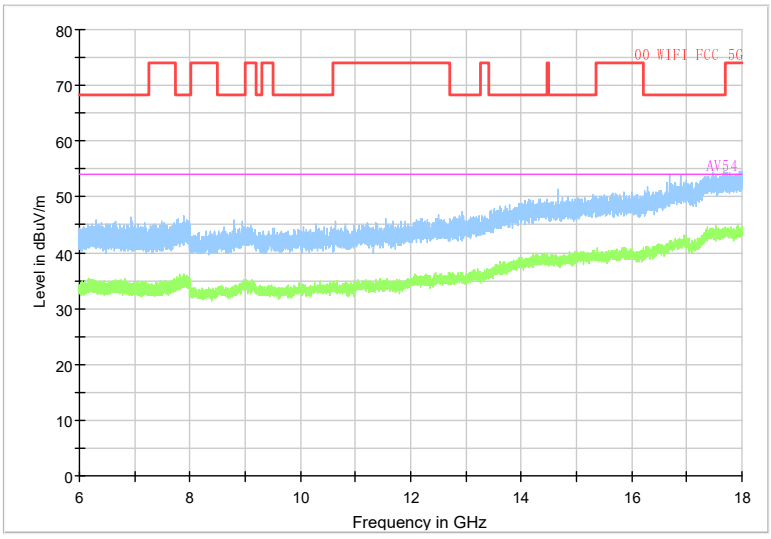
Modulation type: 802.11n（HT40)



Frequency Range: 1GHz -6GHz

Detector: Av mode and PK mode

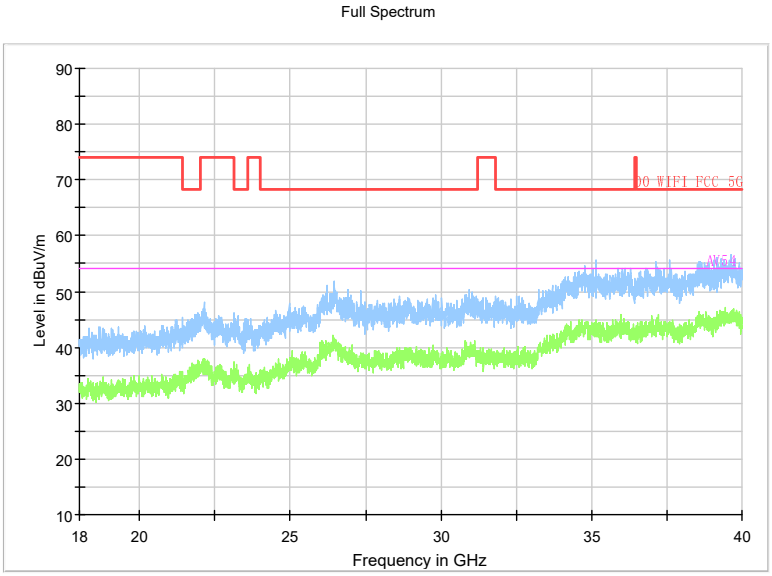
Modulation type: 802.11n（HT40)



Frequency Range: 6GHz -18GHz

Detector: Av mode and PK mode

Modulation type: 802.11n（HT40)

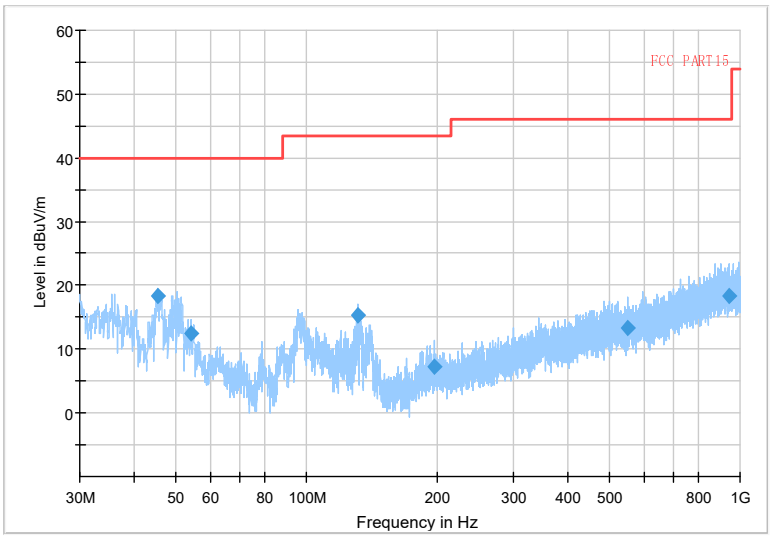


Frequency Range: 18GHz -40GHz

Detector: Av mode and PK mode

Modulation type: 802.11n（HT40)

Full Spectrum

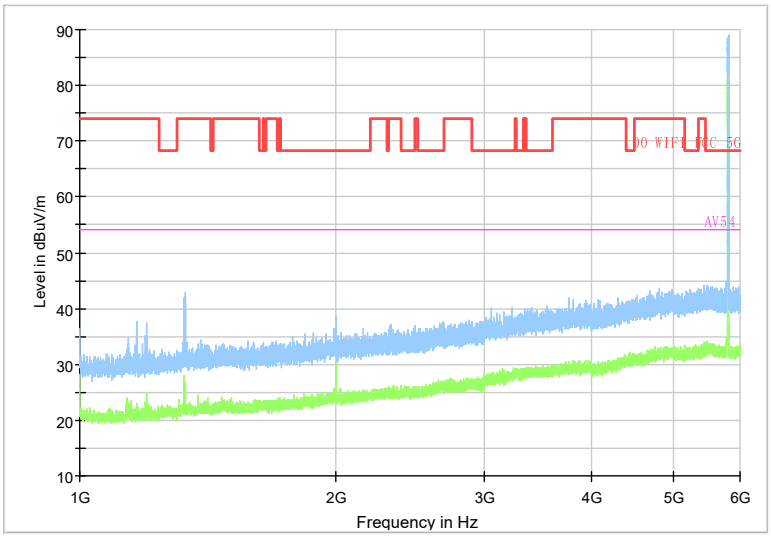


Frequency Range: 30MHz -1GHz

Detector: QP mode

Test Mode: 802.11ac（VHT40)

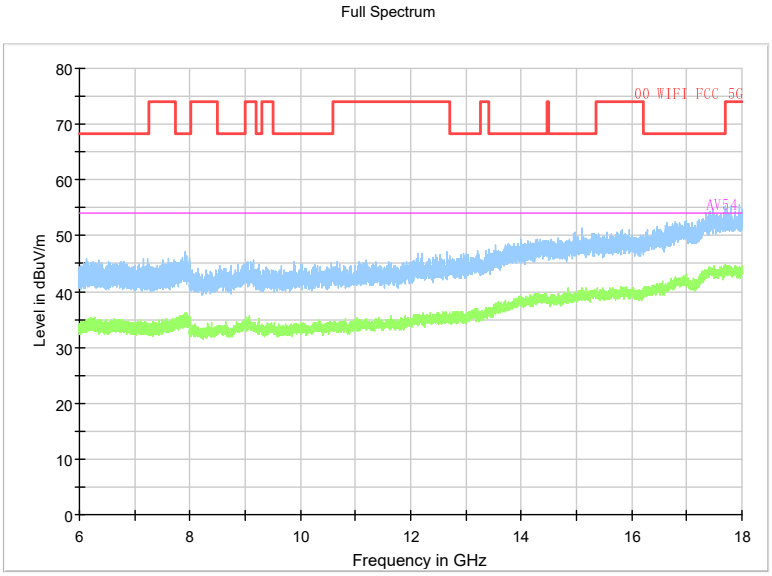
Full Spectrum



Frequency Range: 1GHz -6GHz

Detector: Av mode and PK mode

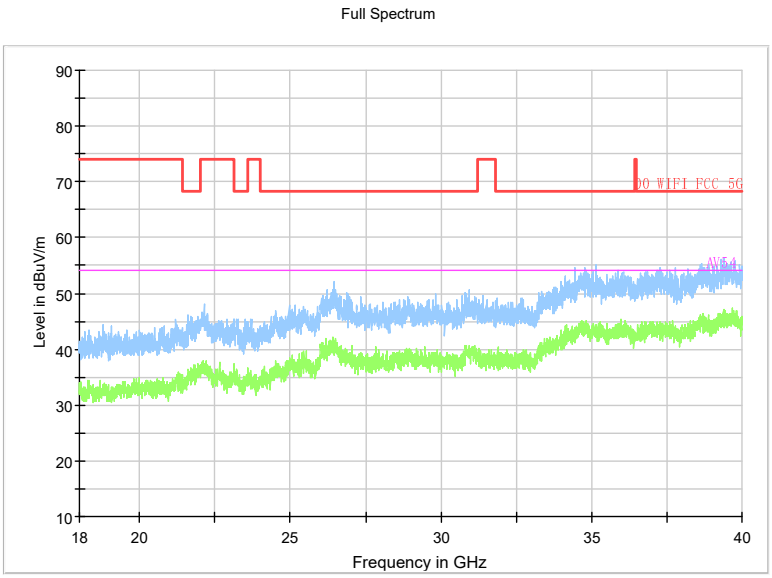
Test Mode: 802.11ac（VHT40)



Frequency Range: 6GHz -18GHz

Detector: Av mode and PK mode

Test Mode: 802.11ac（VHT40)



Frequency Range: 18GHz -40GHz

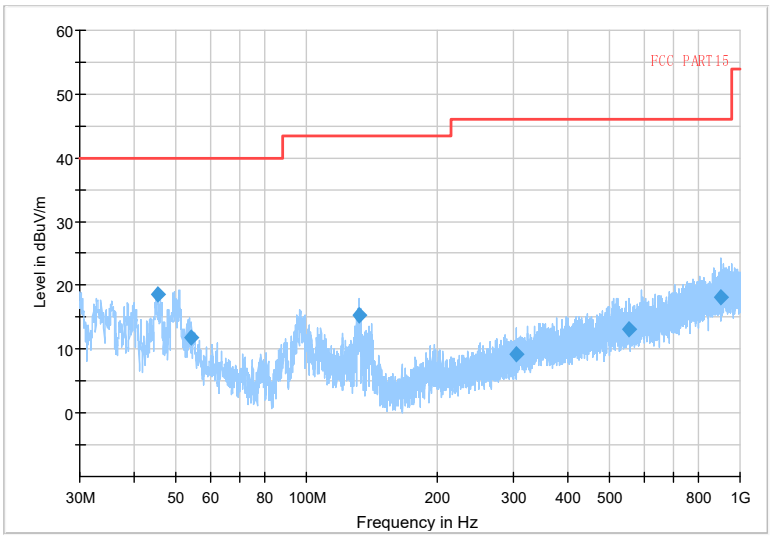
Detector: Av mode and PK mode

Test Mode: 802.11ac（VHT40)

Carrier frequency（MHz）: 5775

Channel No.:155

Full Spectrum

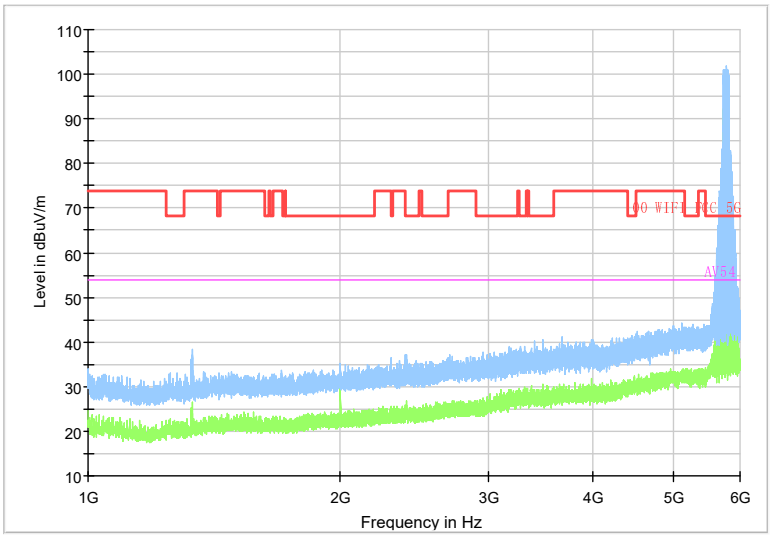


Frequency Range: 30MHz -1GHz

Detector: QP mode

Test Mode: 802.11ac（VHT80)

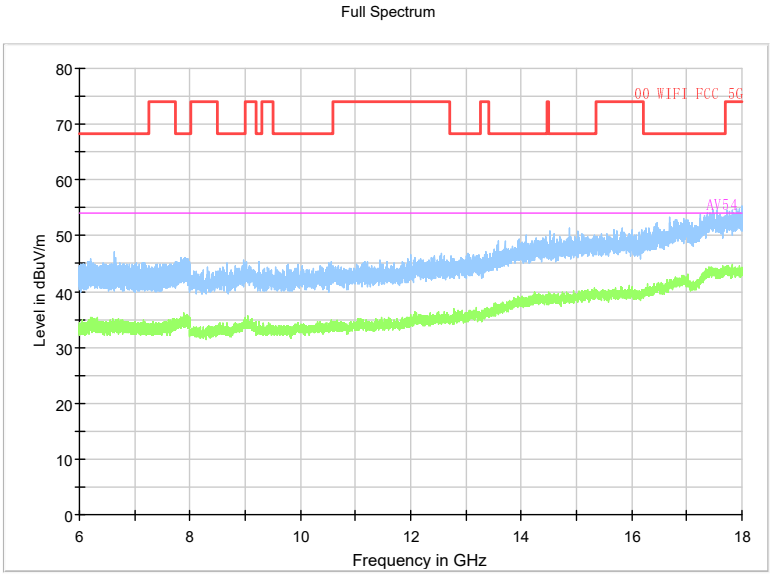
Full Spectrum



Frequency Range: 1GHz -6GHz

Detector: Av mode and PK mode

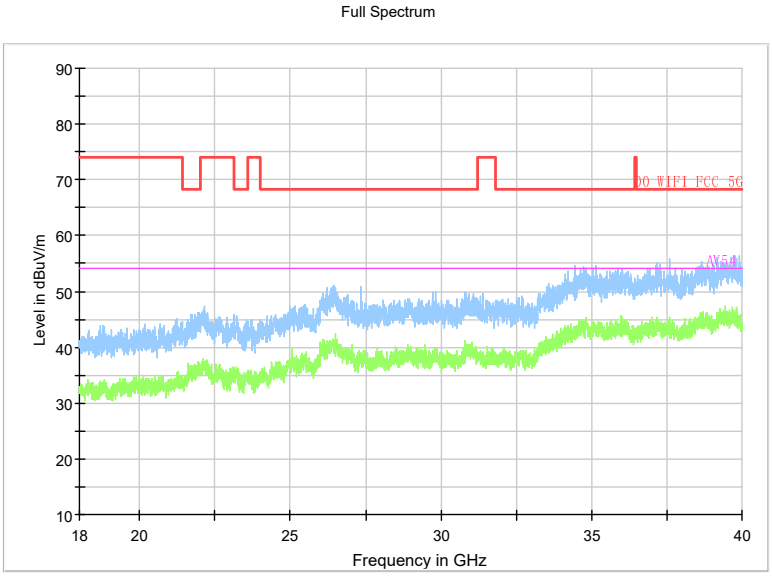
Test Mode: 802.11ac（VHT80)



Frequency Range: 6GHz -18GHz

Detector: Av mode and PK mode

Test Mode: 802.11ac（VHT80)



Frequency Range: 18GHz -40GHz

Detector: Av mode and PK mode

Test Mode: 802.11ac（VHT80)

3.2 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

3.2.1 LIMITS OF MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	1 Watt（30 dBm) (Max. e.i.r.p $_{VII}$ 125mW（21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt（30 dBm)
	B	Indoor Access Point	1 Watt（30 dBm)

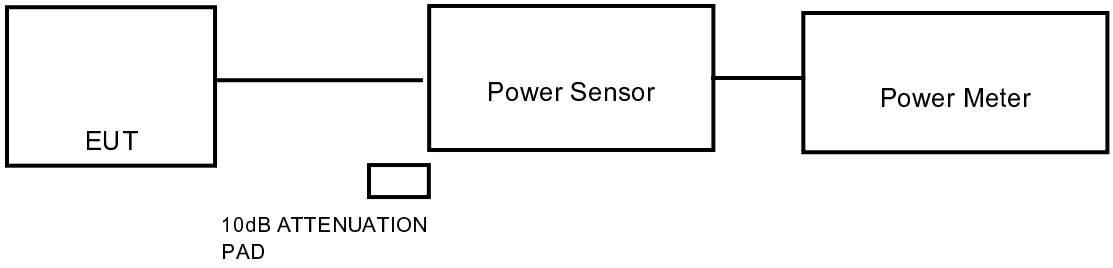
		Client devices	250mW（24 dBm)
U-NII-2A			250mW（24 dBm) or 11 dBm+10 log B*
U-NII-2C			250mW（24 dBm) or 11 dBm+10 log B*
U-NII-3			1 Watt（30 dBm)

NOTE: Where B is the 26dB emission bandwidth in MHz.

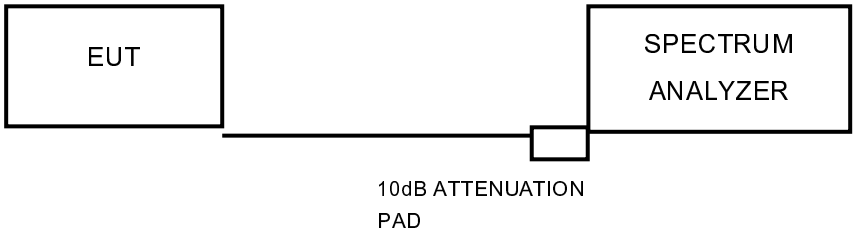
3.2.2 TEST SETUP

FOR POWER OUTPUT MEASUREMENT

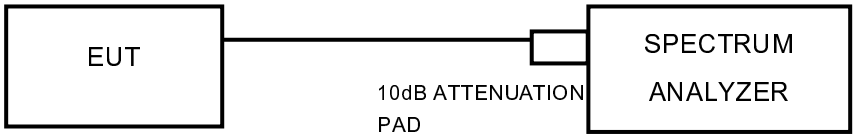
802.11a, 802.11n/ac（20MHz）, 802.11 n/ac（40MHz） TEST CONFIGURATION



802.11ac（80MHz） TEST CONFIGURATION



FOR 26dB BANDWIDTH



3.2.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	R&S	ESW 44	101973	Mar.28,24	Mar.27,26
Open Switch and Control Unit	R&S	OSP-B157W8	100836	N/A	N/A
Vector Signal Generator	R&S	SMBV100B	102176	Mar.29,24	Mar.28,26
Signal Generator	R&S	SMB100A03	182185	Mar.29,24	Mar.28,26
WIDEBANDRADIO COMMUNICATION TESTER	R&S	CMW500	169399	Jun.19,24	Jun.18,26
Hygrothermograph	DELI	20210528	SZ015	Sep.06,23	Sep.05,25
PC	LENOVO	E14	HRSW0024	N/A	N/A
CABLE	R&S	J12J103539-00-1	SEP-03-20-069	Apr.27,24	Apr.26,25
CABLE	R&S	J12J103539-00-1	SEP-03-20-070	Apr.27,24	Apr.26,25
Test Software	EMC32	EMC32	N/A	N/A	N/A
Temperature Chamber	votsch	VT4002	585660781000050	May.30,24	May.29,26
Power Meter	R&S	NRX	102380	Mar.28,24	Mar.27,26
Power Meter probe	R&S	NRP6A	102942	Mar.28,24	Mar.27,26

NOTE:

1. The calibration interval of the above test instruments is 12/24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in RF Oven room.

3.2.4 TEST PROCEDURE

FOR POWER MEASUREMENT

For 802.11a, 802.11 n/ac（20MHz），802.11 n/ac（40MHz)

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

For 802.11ac（80MHz)

1. Measure the duty cycle, x, of the transmitter output signal as described in II.B.

2. Set span to encompass the EBW（or, alternatively, the entire 99% occupied bandwidth) of the signal.

3. Set RBW = 1 MHz.

4. Set VBW ≥ 3 MHz.

5. Number of points in sweep ≥ 2 × span / RBW.（This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

6. Sweep time = auto.

7. Detector = power averaging（rms），if available. Otherwise, use sample detector mode.

8. Do not use sweep triggering. Allow the sweep to free run.

9. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.

10. Add 10 log (1/x), where x is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log (1/0.25) = 6 dB if the duty cycle is 25%.

FOR 99 PERCENT OCCUPIED BANDWIDTH

The following procedure shall be used for measuring （99 %） power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.

2. Set span = 1.5 times to 5.0 times the OBW.

3. Set RBW = 1 % to 5 % of the OBW

4. Set VBW ≥ 3 ． RBW

5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode （until the trace stabilizes） shall be used.

6. Use the 99 % power bandwidth function of the instrument （if available） .

7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

FOR 26dB BANDWIDTH

1) Set RBW = approximately 1% of the emission bandwidth.

2) Set the VBW > RBW.

3) Detector = Peak.

4) Trace mode = max hold.

5) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

FOR 6dB BANDWIDTH

1. Set RBW = 100 kHz.
2. Set the video bandwidth （VBW） ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points （upper and lower frequencies） that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.2.5 DEVIATION FROM TEST STANDARD

No deviation.

3.2.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

3.2.7 TEST RESULTS

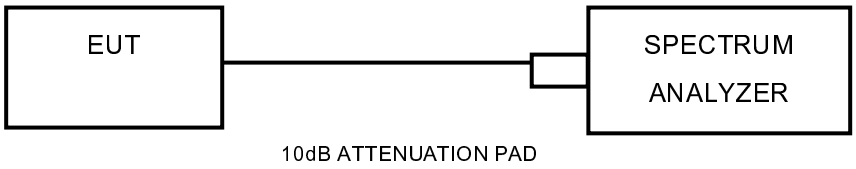
Please Refer to Appendix A/B Of this test report.

3.3 MAXIMUM POWER SPECTRAL DENSITY MEASUREMENT

3.3.1 LIMITS OF MAXIMUM POWER SPECTRAL DENSITY MEASUREMENT

Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
		Client devices	11dBm/ MHz
U-NII-3			30dBm/ 500kHz

3.3.2 TEST SETUP



3.3.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.3.4 TEST PROCEDURES

Using method SA-2 (Band1/2/3)

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.

2) Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS

3) Set Channel power measure = 1MHz

4) Sweep time = auto, trigger set to "free run".

5) Trace average at least 100 traces in power averaging mode.

6) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission).

7) Record the max value

Using method SA-2 (Band4)

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.

2) Set RBW = 300 KHz, Set VBW ≥ 1 MHz, Detector = RMS

3) Set Channel power measure = 1MHz

4) Sweep time = auto, trigger set to "free run".

5) Trace average at least 100 traces in power averaging mode.

6) Add 10 log（500kHz/RBW） to the test result. 10 log（500kHz/300KHZ） = 2.22dBm

7) Add 10 log （1/x） , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times （because the measurement represents an average over both the on and off times of the transmission） .

8) Record the max value

3.3.5 DEVIATION FROM TEST STANDARD

No deviation.

3.3.6 EUT OPERATING CONDITIONS

Same as 3.1.7.

3.3.7 TEST RESULTS

Please Refer to Appendix A/B Of this test report.

3.4 AUTOMATICALLY DISCONTINUE TRANSMISSION

3.4.1 LIMIT OF AUTOMATICALLY DISCONTINUE TRANSMISSION

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

3.4.2 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.4.3 TEST RESULT

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving 。The EUT can detect the controlling of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission

3.5 ANTENNA REQUIREMENTS

3.5.1 STANDARD APPLICABLE

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.5.2 ANTENNA CONNECTED CONSTRUCTION

An embedded-in antenna design is used.

3.5.3 ANTENNA GAIN

According to FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain=GANT +Array Gain, where Array Gain is as follows.

For power spectral density （PSD） measurements on all devices,

Array Gain= 10 log（NANT/ Nss） dB;

For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for $NANT_{VI}$ 4;

The EUT supports Cyclic Delay Diversity （CDD） mode,

For power measurements, the directional GANT is set equal to the antenna having the highest gain as following formulas.

Directional Gain = Max.Gain + Array Gain.

For PSD measurements, the directional GANT is calculation is following F) 2) f) ii of KDB 662911 D01 v02r01.

The directional gain is calculated as following table.

5GHz Band1/ 4	Ant 1 (dBi)	Ant 2 (dBi)	DG For Power (dBi)	DG For PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	2.82	4.44	3.71	3.71	0.00	0.00

NOTE :DG= directional gain, Power Limit Reduction = DG For Power Gain -6dbi<0

PSD Limit Reduction = DG For PSD - 6dBi<0.Therefore, it is not necessary to reduce maximum peak output power and PSD limit.

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

5 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

6 APPENDIX A: RLAN

EMISSION BANDWIDTH

TEST RESULT

UNII-1

Test Mode	Antenna	26dB Bandwidth （MHz)		
		5180MHz	5220MHz	5240MHz
802.11a	Chain0	20.94	20.83	21.11
802.11a	Chain1	20.70	20.48	21.35
802.11n HT20	Chain0	21.22	21.53	21.01
802.11n HT20	Chain1	21.14	21.84	21.23
802.11ac VHT20	Chain0	21.33	20.89	20.83
802.11ac VHT20	Chain1	21.06	20.67	21.16

Test Mode	Antenna	26dB Bandwidth （MHz)		
		5190MHz	---	5230MHz
802.11n HT40	Chain0	40.16	---	40.42
802.11n HT40	Chain1	40.25	---	40.25
802.11ac VHT40	Chain0	40.07	---	40.19
802.11ac VHT40	Chain1	40.42	---	40.17

Test Mode	Antenna	26dB Bandwidth （MHz)		
		5210MHz	---	---
802.11ac VHT80	Chain0	82.14	---	---
802.11ac VHT80	Chain1	82.56	---	---

U-NII-2A

Test Mode	Antenna	26dB Bandwidth（MHz）		
		5260MHz	5280MHz	5320MHz
802.11a	Chain0	26.93	25.15	24.01
802.11a	Chain1	26.45	27.45	26.67
802.11n HT20	Chain0	25.31	26.38	25.28
802.11n HT20	Chain1	23.82	25.96	25.20
802.11ac VHT20	Chain0	25.97	25.63	26.27
802.11ac VHT20	Chain1	27.87	24.95	25.87

Test Mode	Antenna	26dB Bandwidth（MHz）		
		5270MHz	---	5310MHz
802.11n HT40	Chain0	39.51	---	39.85
802.11n HT40	Chain1	39.92	---	39.63
802.11ac VHT40	Chain0	39.83	---	40.23
802.11ac VHT40	Chain1	39.85	---	40.92

Test Mode	Antenna	26dB Bandwidth（MHz）		
		5290MHz	---	---
802.11ac VHT80	Chain0	80.76	---	---
802.11ac VHT80	Chain1	80.55	---	---

U-NII-2C

Test Mode	Antenna	26dB Bandwidth （MHz）		
		5500MHz	5580MHz	5700MHz
802.11a	Chain0	26.61	26.91	27.06
802.11a	Chain1	26.44	25.80	24.75
802.11n HT20	Chain0	25.78	25.98	26.40
802.11n HT20	Chain1	26.20	26.21	24.27
802.11ac VHT20	Chain0	28.12	25.54	27.26
802.11ac VHT20	Chain1	25.40	25.97	27.40

Test Mode	Antenna	26dB Bandwidth （MHz）		
		5510MHz	5590MHz	5670MHz
802.11n HT40	Chain0	39.43	39.92	39.95
802.11n HT40	Chain1	40.23	40.14	40.30
802.11ac VHT40	Chain0	40.48	39.93	39.67
802.11ac VHT40	Chain1	40.55	39.67	40.16

Test Mode	Antenna	26dB Bandwidth （MHz）		
		5530MHz	---	5610MHz
802.11ac VHT80	Chain0	80.44	---	80.30
802.11ac VHT80	Chain1	80.39	---	80.44

UNII-3

Test Mode	Antenna	26dB Bandwidth （MHz）		
		5745MHz	5785MHz	5825MHz
802.11a	Chain0	19.96	19.64	19.84
802.11a	Chain1	19.84	20.01	19.81
802.11n HT20	Chain0	20.51	20.64	21.13
802.11n HT20	Chain1	21.20	21.45	21.75
802.11ac VHT20	Chain0	20.77	21.00	21.52
802.11ac VHT20	Chain1	21.52	21.33	21.35

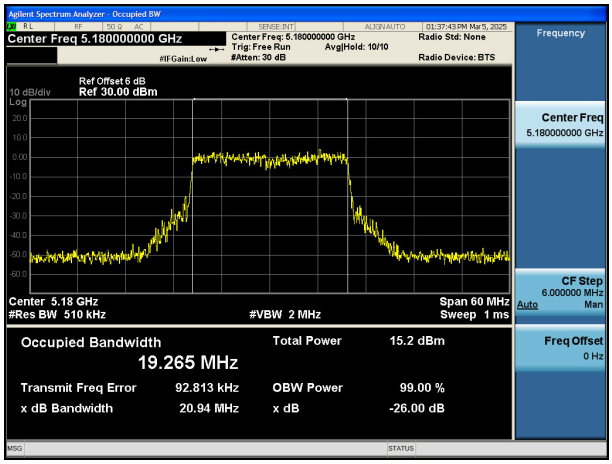
Test Mode	Antenna	26dB Bandwidth （MHz）		
		5755MHz	---	5795MHz
802.11n HT40	Chain0	39.57	---	40.10
802.11n HT40	Chain1	39.00	---	39.92
802.11ac VHT40	Chain0	39.27	---	39.13
802.11ac VHT40	Chain1	39.70	---	39.62

Test Mode	Antenna	26dB Bandwidth （MHz）		
		5775MHz	---	---
802.11ac VHT80	Chain0	82.23	---	---
802.11ac VHT80	Chain1	81.50	---	---

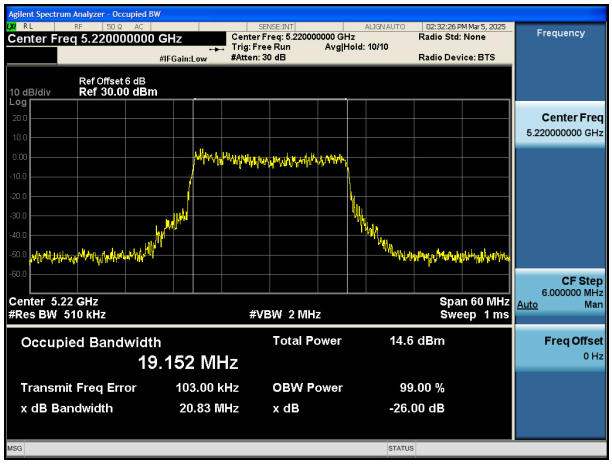
TEST GRAPHS

UNII-1

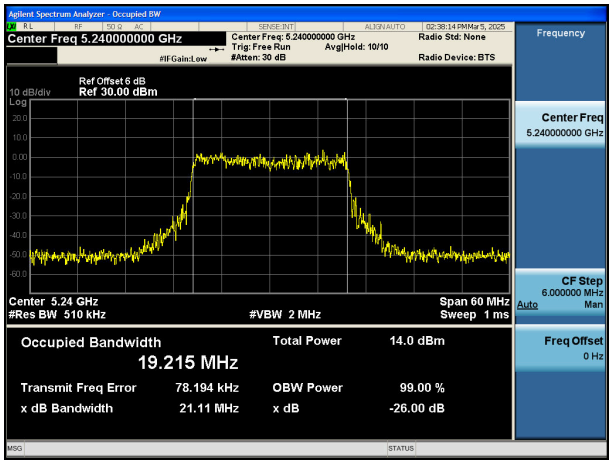
Test Mode: 802.11a



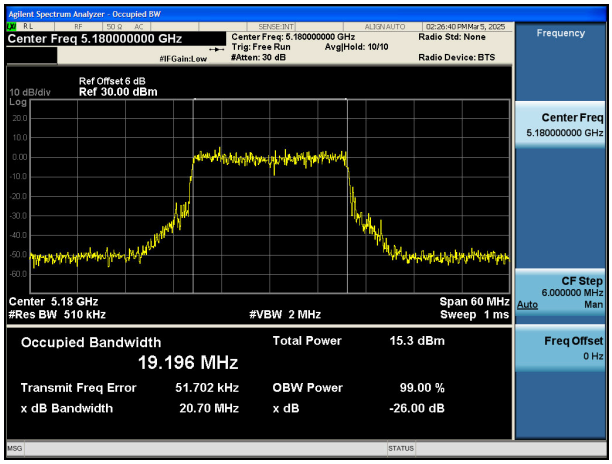
Mode:802.11a Frequency:5180MHz Ant:Chain0



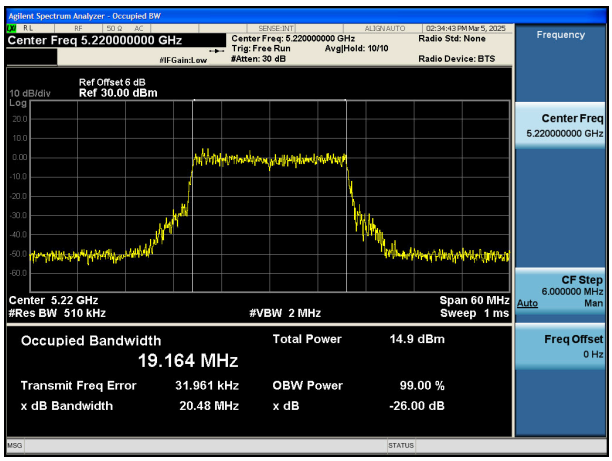
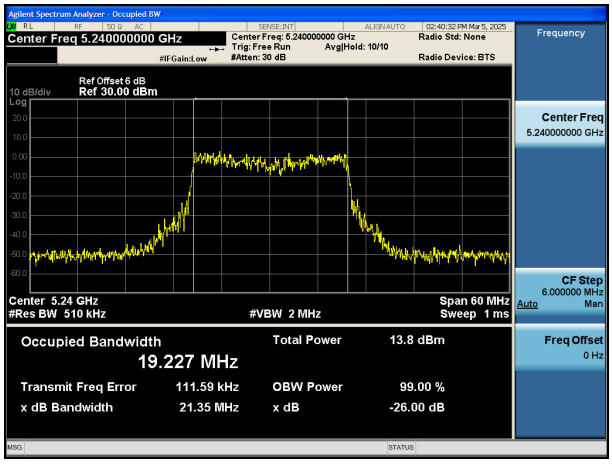
Mode:802.11a Frequency:5220MHz Ant:Chain0



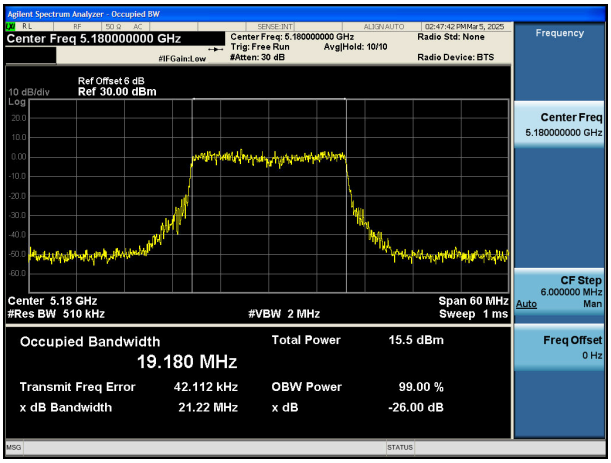
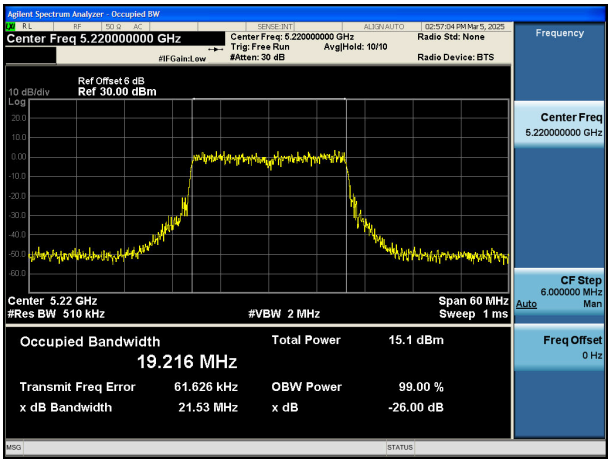
Mode:802.11a Frequency:5240MHz Ant:Chain0

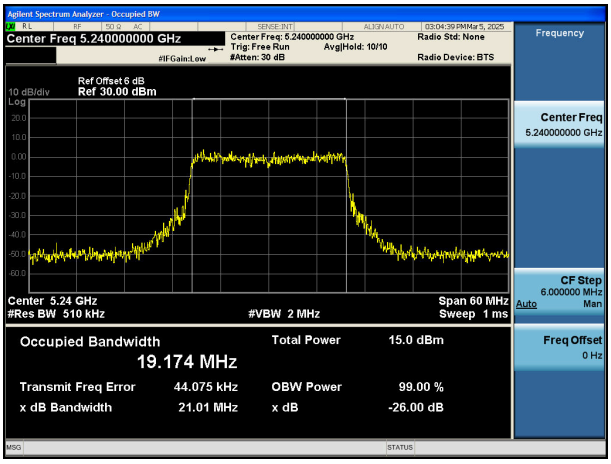


Mode:802.11a Frequency:5180MHz Ant:Chain1

	
Mode:802.11a Frequency:5220MHz Ant:Chain1	Mode:802.11a Frequency:5240MHz Ant:Chain1

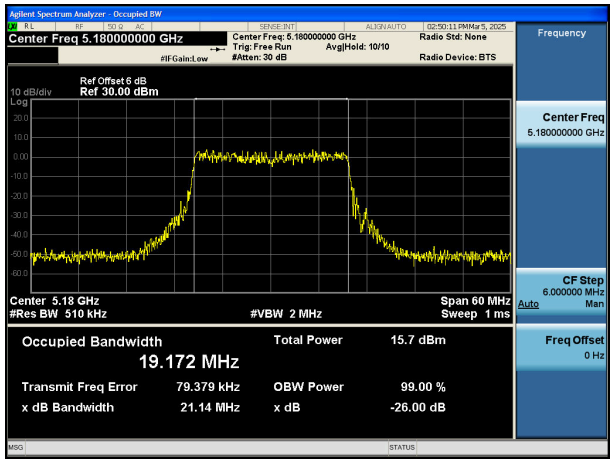
Test Mode: 802.11n HT20

	
Mode:802.11n HT20 Frequency:5180MHz Ant:Chain0	Mode:802.11n HT20 Frequency:5220MHz Ant:Chain0



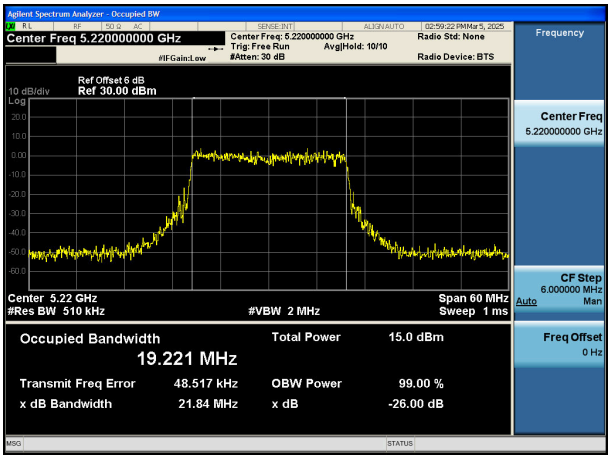
Mode:802.11n HT20 Frequency:5240MHz

Ant:Chain0



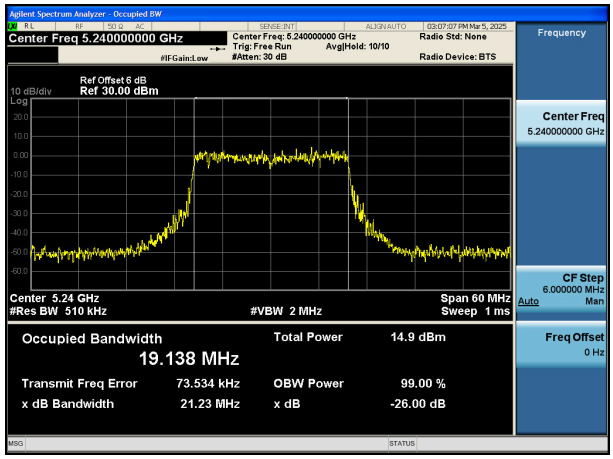
Mode:802.11n HT20 Frequency:5180MHz

Ant:Chain1



Mode:802.11n HT20 Frequency:5220MHz

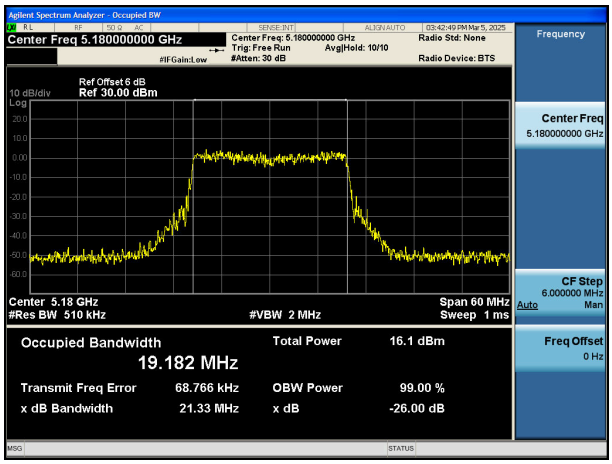
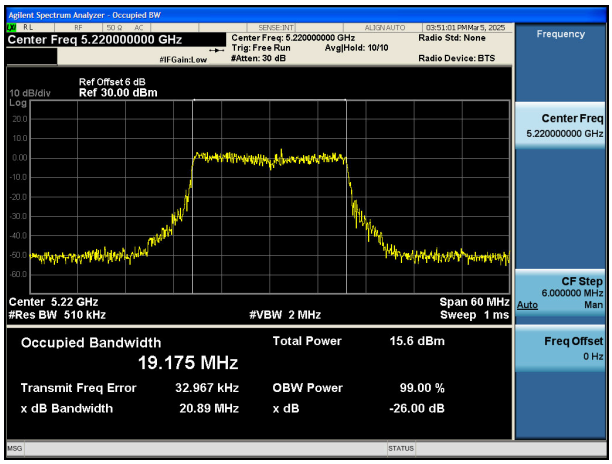
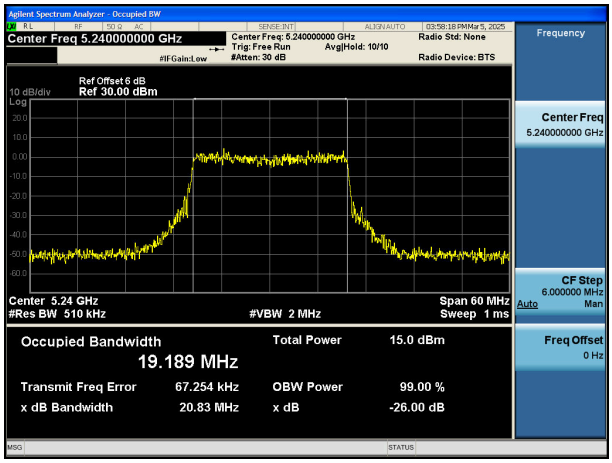
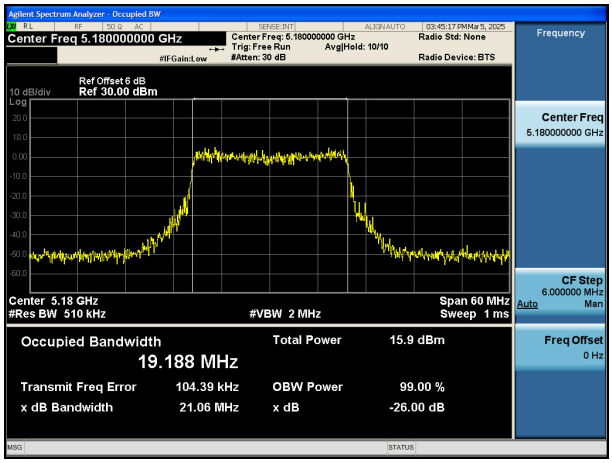
Ant:Chain1

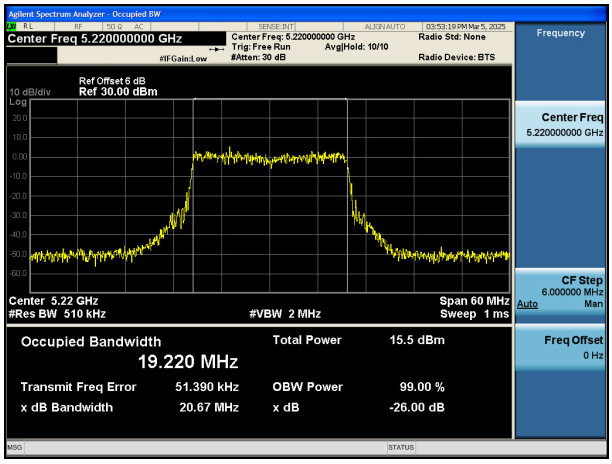
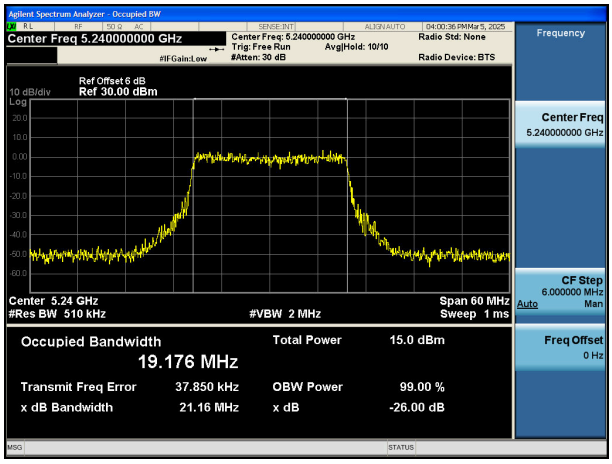


Mode:802.11n HT20 Frequency:5240MHz

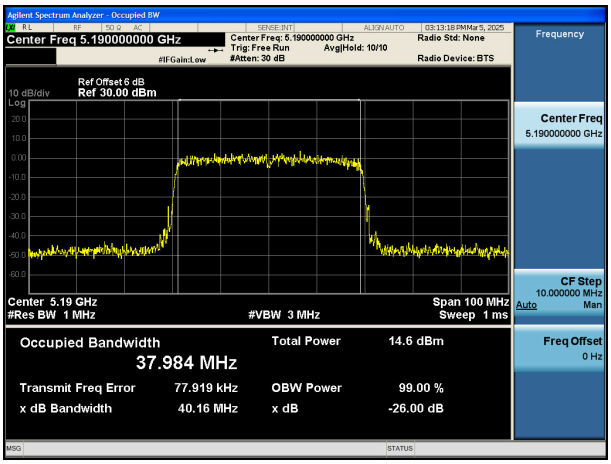
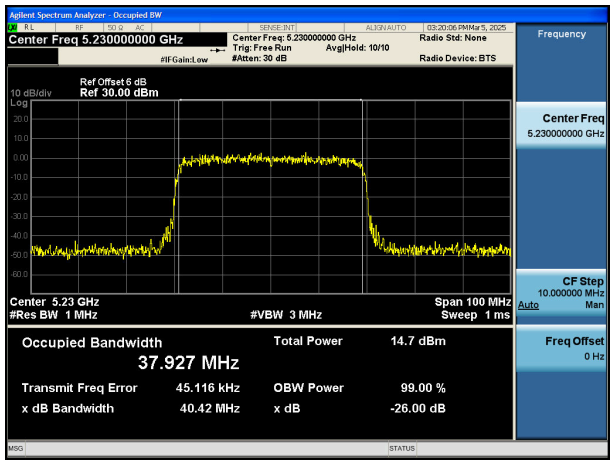
Ant:Chain1

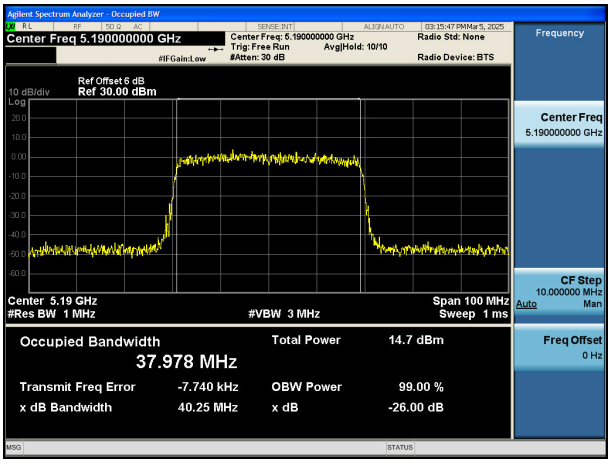
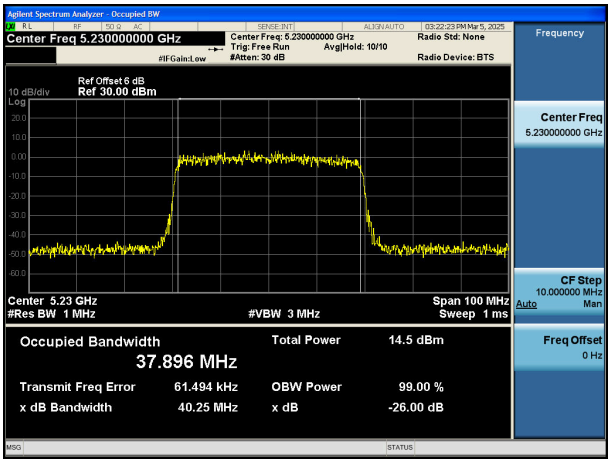
Test Mode: 802.11ac VHT20

	
Mode:802.11ac VHT20 Frequency:5180MHz Ant:Chain0	Mode:802.11ac VHT20 Frequency:5220MHz Ant:Chain0
	
Mode:802.11ac VHT20 Frequency:5240MHz Ant:Chain0	Mode:802.11ac VHT20 Frequency:5180MHz Ant:Chain1

	
Mode:802.11ac VHT20 Frequency:5220MHz Ant:Chain1	Mode:802.11ac VHT20 Frequency:5240MHz Ant:Chain1

Test Mode: 802.11n HT40

	
Mode:802.11n HT40 Frequency:5190MHz Ant:Chain0	Mode:802.11n HT40 Frequency:5230MHz Ant:Chain0

	
Mode:802.11n HT40 Frequency:5190MHz Ant:Chain1	Mode:802.11n HT40 Frequency:5230MHz Ant:Chain1