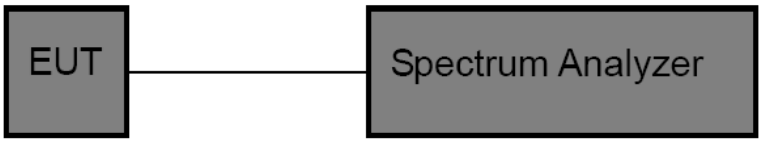
3.4. Bandwidth

Limit

FCC CFR Title 47 Part 15 Subpart E Section 15.407(a) & (e) / RSS-247 6.2.1.2 & 6.2.4.1

Test Item	Limit	Frequency Range (MHz)
26dB Bandwidth& 99% Bandwidth	N/A	5150~5250
		5250~5350
		5500~5700
6 dB Bandwidth	≥500 kHz	5725~5850

Test Configuration



Test Procedure

Please refer to KDB789033 D02 for the measurement methods.

The setting of the spectrum analyzer as below:

26dB Bandwidth Test	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span	>26 dB Bandwidth
RBW	Approximately 1% of the emission bandwidth
VBW	>RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

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6dB Bandwidth Test	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span	>6 dB Bandwidth
RBW	100 kHz
VBW	≥ 3*RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto
99% Occupied Bandwidth Test	
Spectrum Parameters	**Setting**
Attenuation	Auto
RBW	1% to 5% of the OBW
VBW	≥ 3*RBW
Detector	Peak
Trace	Max Hold

NOTE: The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.

Test Mode

Please refer to the clause 2.4.

Test Result

99% Bandwidth

Test Mode	Freq(MHz)	OCB [MHz]	Limit[MHz]	Verdict
IEEE 802.11a	5180	16.975	---	---
	5200	16.942	---	---
	5240	17.008	---	---
	5745	16.935	---	---
	5785	16.940	---	---
	5825	16.968	---	---
IEEE 802.11n_20	5180	18.015	---	---
	5200	17.973	---	---
	5240	18.045	---	---
	5745	17.942	---	---
	5785	17.944	---	---
	5825	17.938	---	---
IEEE 802.11n_40	5190	36.330	---	---
	5230	36.445	---	---
	5755	36.376	---	---
	5795	36.420	---	---

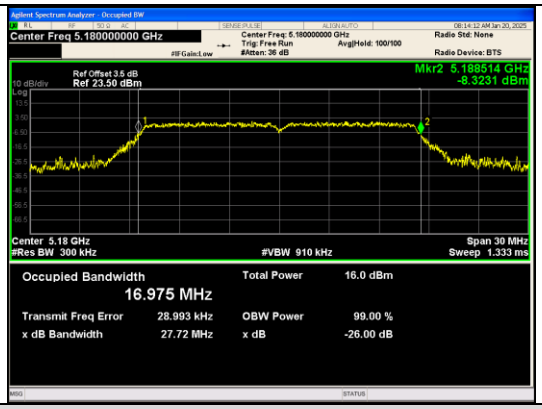
26dB Bandwidth

Test Mode	Freq(MHz)	26dB Bandwidth [MHz]	Limit[MHz]	Verdict
IEEE 802.11a	5180	20.28	---	---
	5200	20.24	---	---
	5240	20.28	---	---
	5745	20.24	---	---
	5785	20.28	---	---
	5825	20.52	---	---
IEEE 802.11n_20	5180	20.64	---	---
	5200	20.64	---	---
	5240	20.72	---	---
	5745	20.92	---	---
	5785	20.80	---	---
	5825	21.20	---	---
IEEE 802.11n_40	5190	40.24	---	---
	5230	40.56	---	---
	5755	40.40	---	---
	5795	40.72	---	---

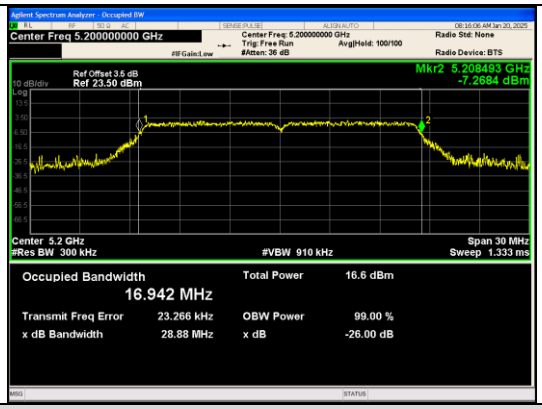
6dB Bandwidth

Test Mode	Freq(MHz)	6dB Bandwidth [MHz]	Limit[MHz]	Verdict
IEEE 802.11a	5745	16.34	≥0.5	PASS
	5785	16.33	≥0.5	PASS
	5825	16.33	≥0.5	PASS
IEEE 802.11n_20	5745	17.60	≥0.5	PASS
	5785	17.59	≥0.5	PASS
	5825	17.60	≥0.5	PASS
IEEE 802.11n_40	5755	35.35	≥0.5	PASS
	5795	36.33	≥0.5	PASS

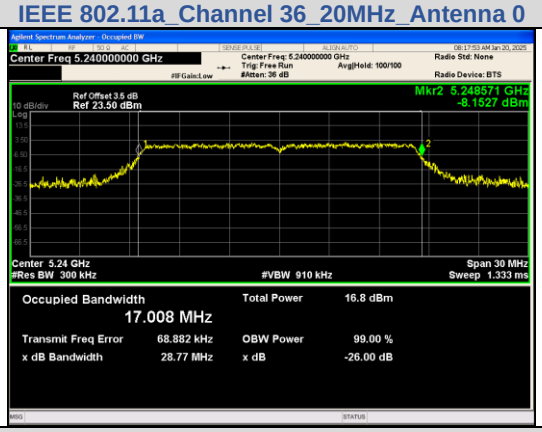
99% Bandwidth:



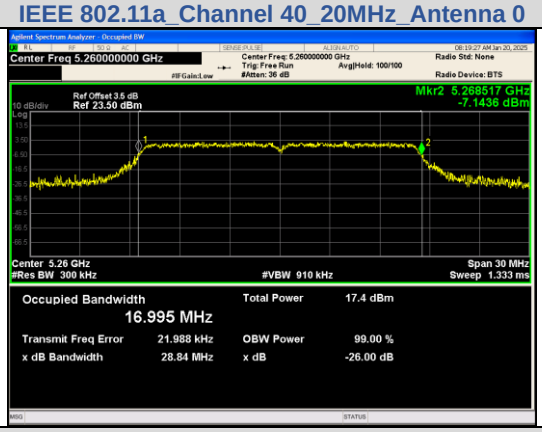
IEEE 802.11a_Channel 36_20MHz_Antenna 0



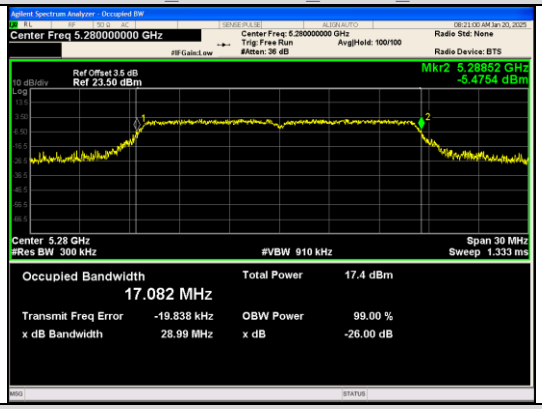
IEEE 802.11a_Channel 40_20MHz_Antenna 0



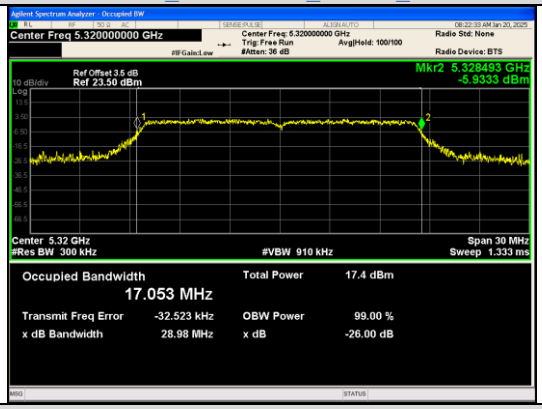
IEEE 802.11a_Channel 48_20MHz_Antenna 0



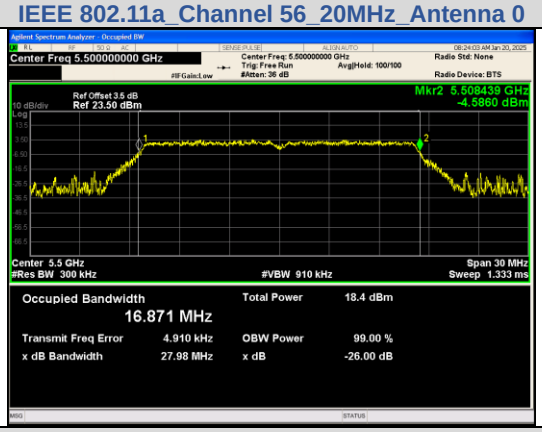
IEEE 802.11a_Channel 52_20MHz_Antenna 0



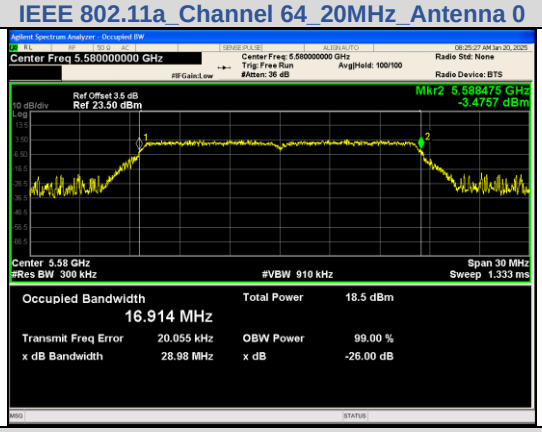
IEEE 802.11a_Channel 56_20MHz_Antenna 0



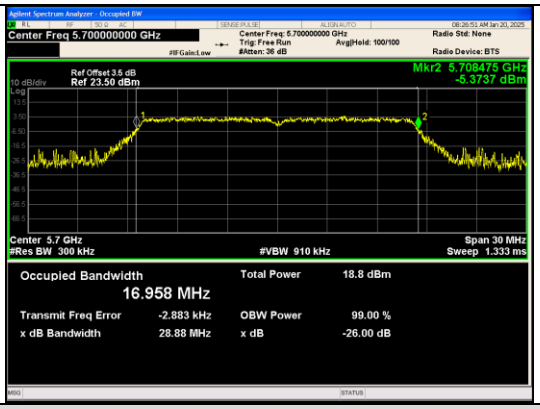
IEEE 802.11a_Channel 64_20MHz_Antenna 0



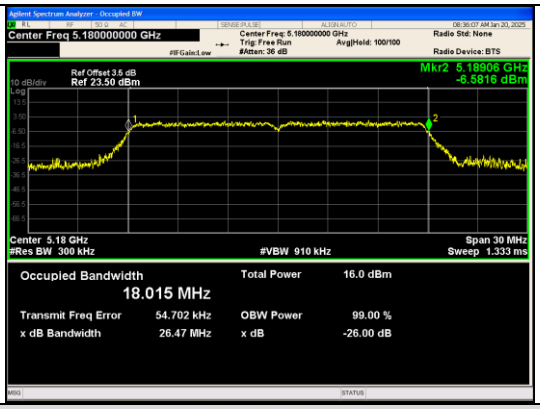
IEEE 802.11a_Channel 100_20MHz_Antenna 0



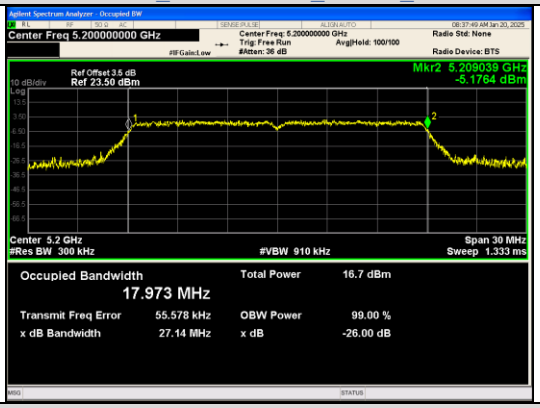
IEEE 802.11a_Channel 116_20MHz_Antenna 0



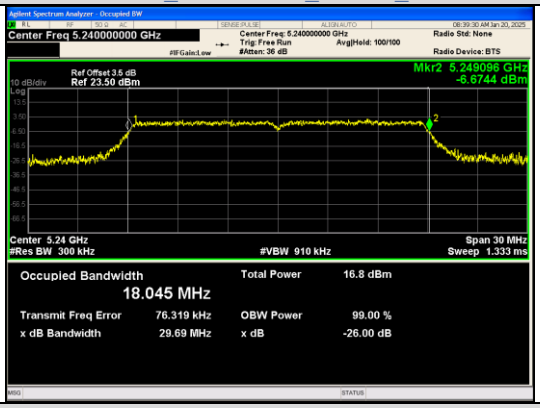
IEEE 802.11a_Channel 140_20MHz_Antenna 0



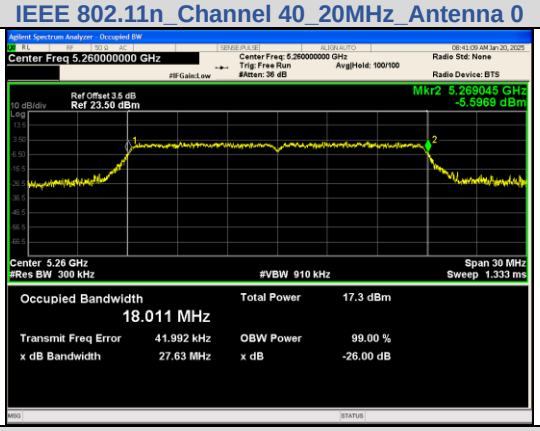
IEEE 802.11n_Channel 36_20MHz_Antenna 0



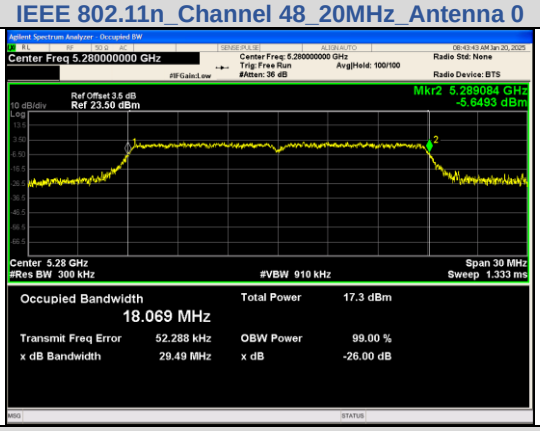
IEEE 802.11n_Channel 40_20MHz_Antenna 0



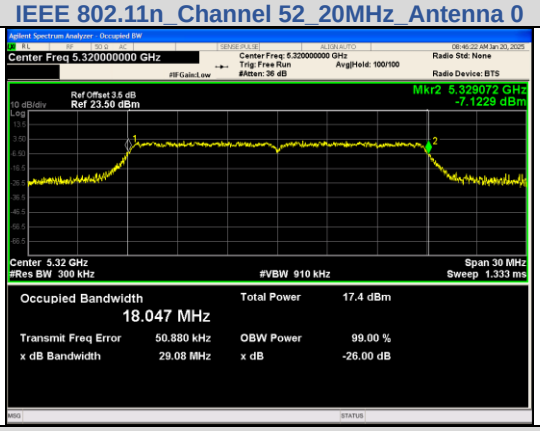
IEEE 802.11n_Channel 48_20MHz_Antenna 0



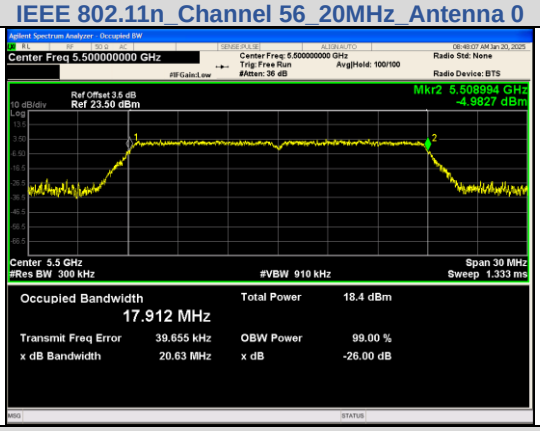
IEEE 802.11n_Channel 52_20MHz_Antenna 0



IEEE 802.11n_Channel 56_20MHz_Antenna 0



IEEE 802.11n_Channel 64_20MHz_Antenna 0



IEEE 802.11n_Channel 100_20MHz_Antenna 0

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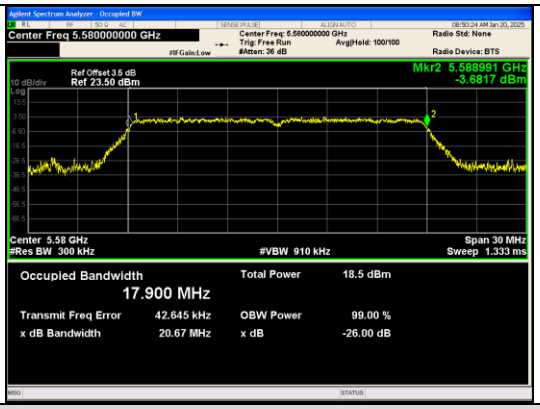
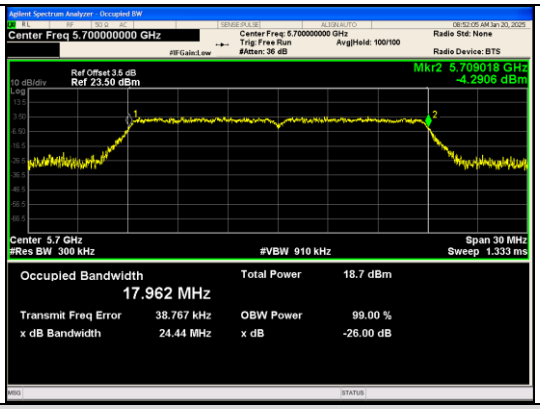
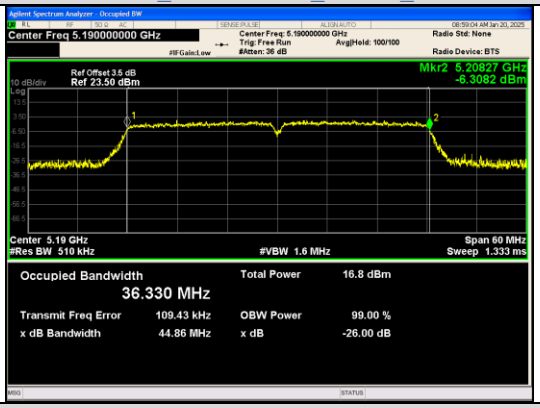


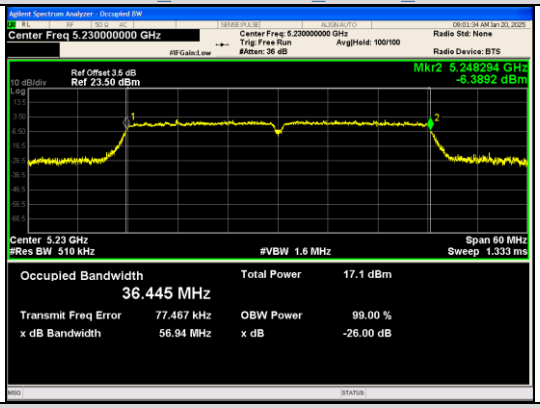
IEEE 802.11n_Channel 116_20MHz_Antenna 0



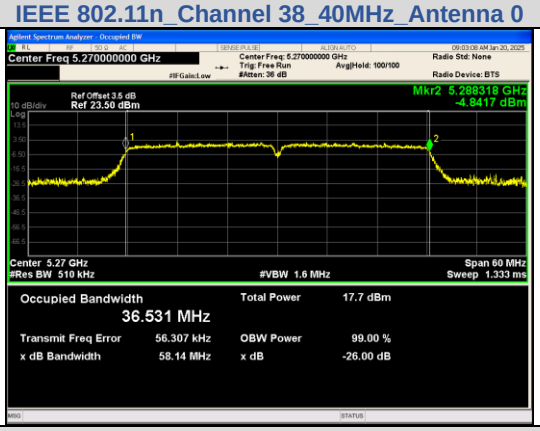
IEEE 802.11n_Channel 140_20MHz_Antenna 0



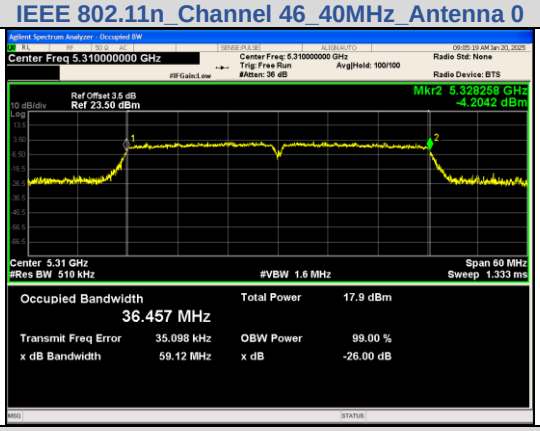
IEEE 802.11n_Channel 38_40MHz_Antenna 0



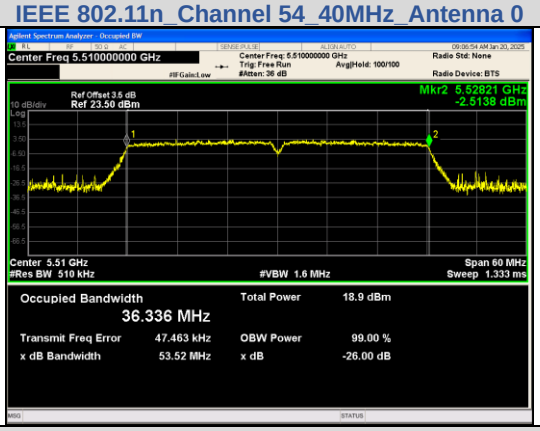
IEEE 802.11n_Channel 46_40MHz_Antenna 0



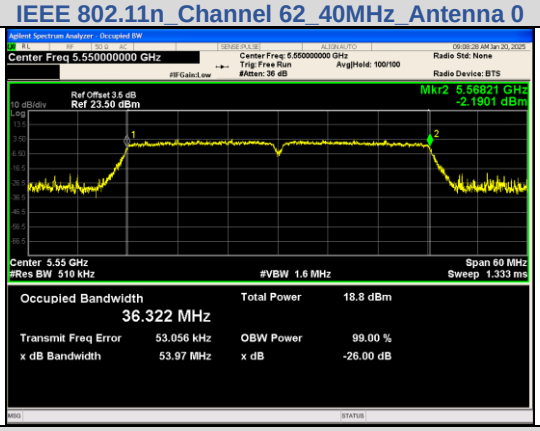
IEEE 802.11n_Channel 54_40MHz_Antenna 0



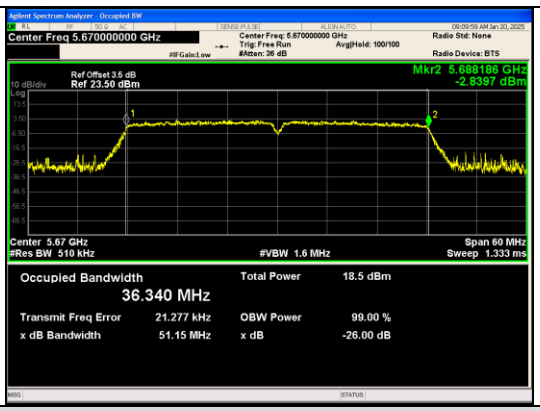
IEEE 802.11n_Channel 62_40MHz_Antenna 0



IEEE 802.11n_Channel 102_40MHz_Antenna 0



IEEE 802.11n_Channel 110_40MHz_Antenna 0



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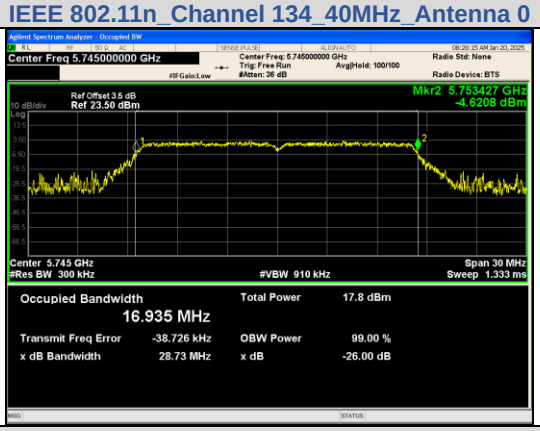
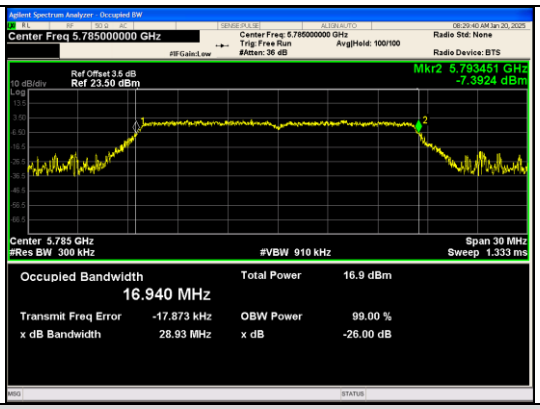
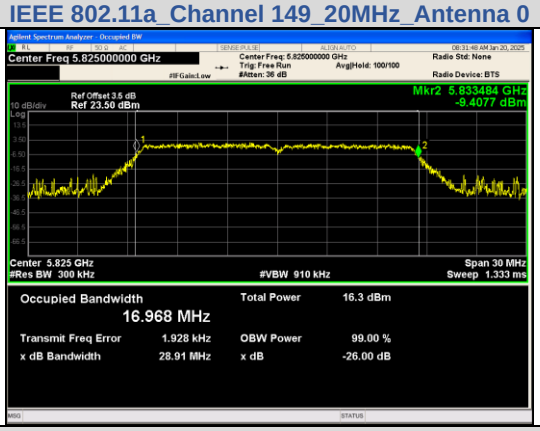


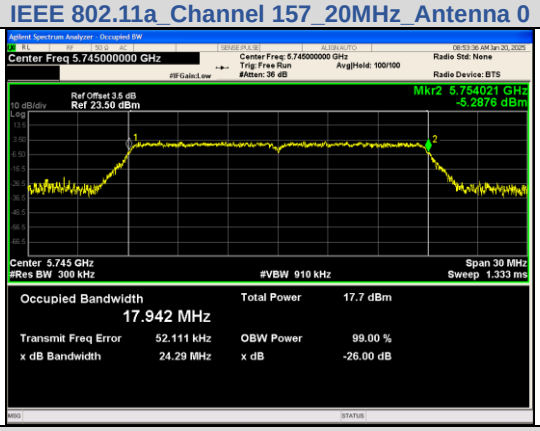
IEEE 802.11a_Channel 149_20MHz_Antenna 0



IEEE 802.11a_Channel 157_20MHz_Antenna 0



IEEE 802.11a_Channel 165_20MHz_Antenna 0



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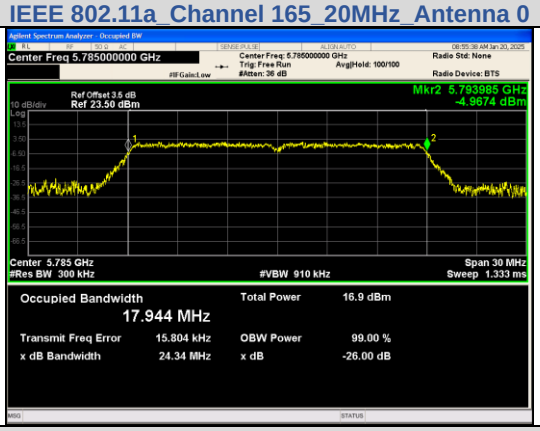

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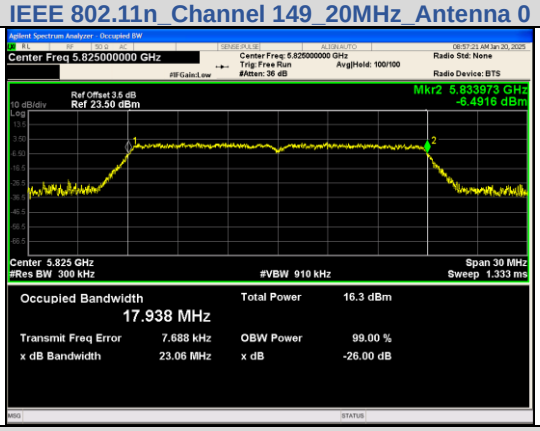

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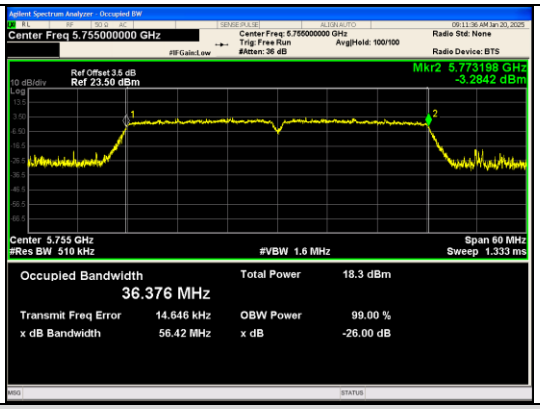

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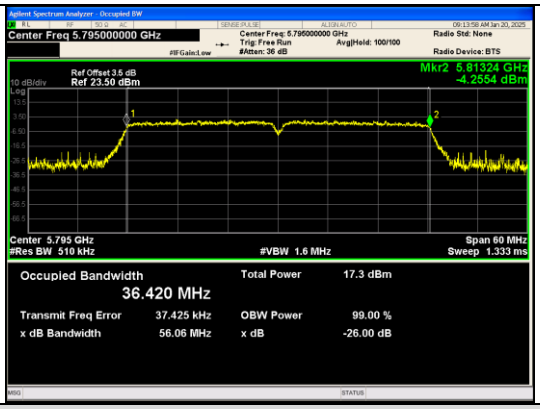

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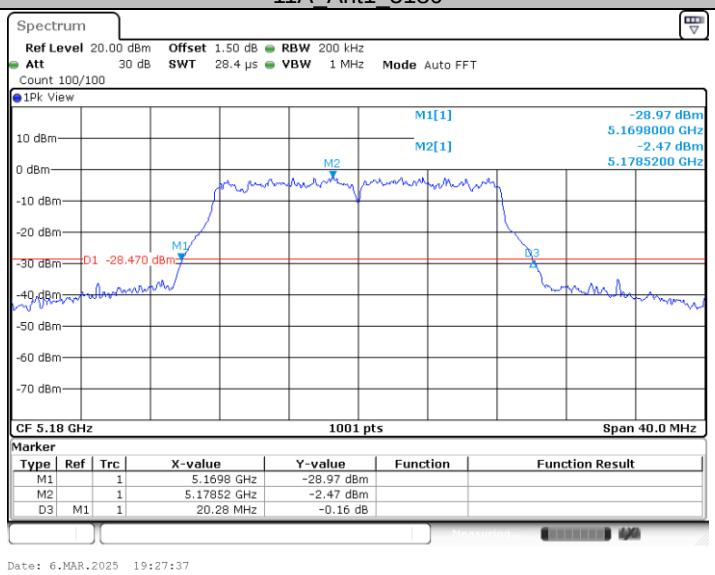
26dB Bandwidth:

11A_Ant1_5180



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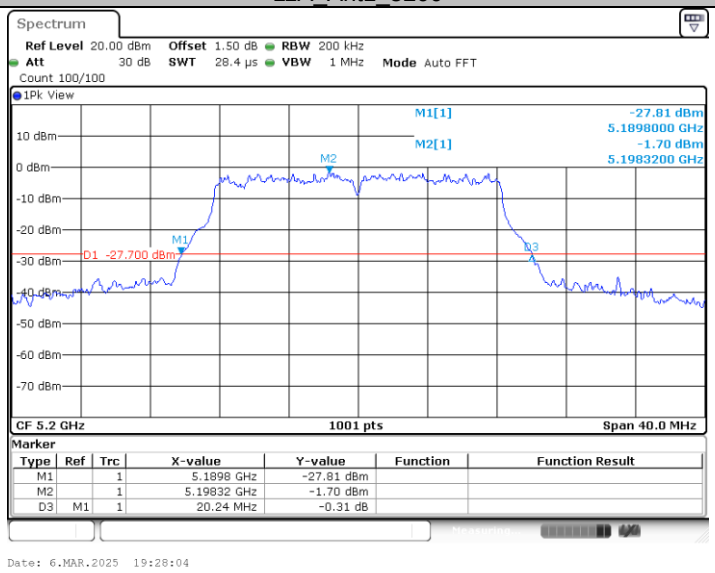

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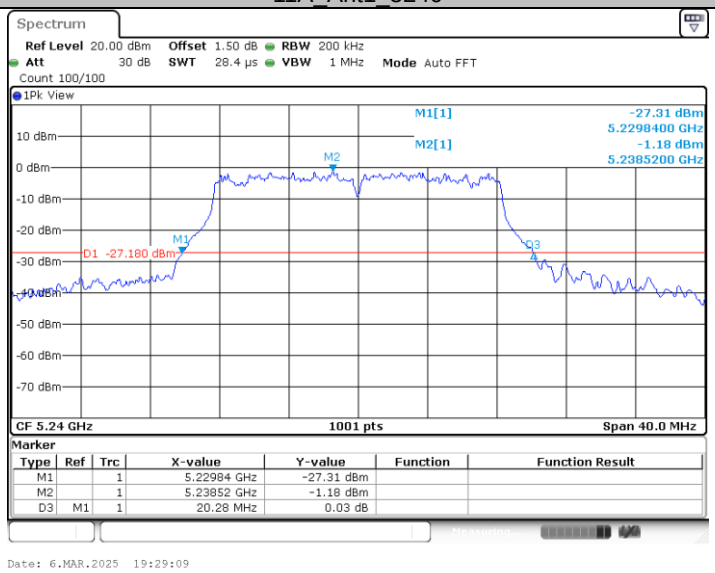

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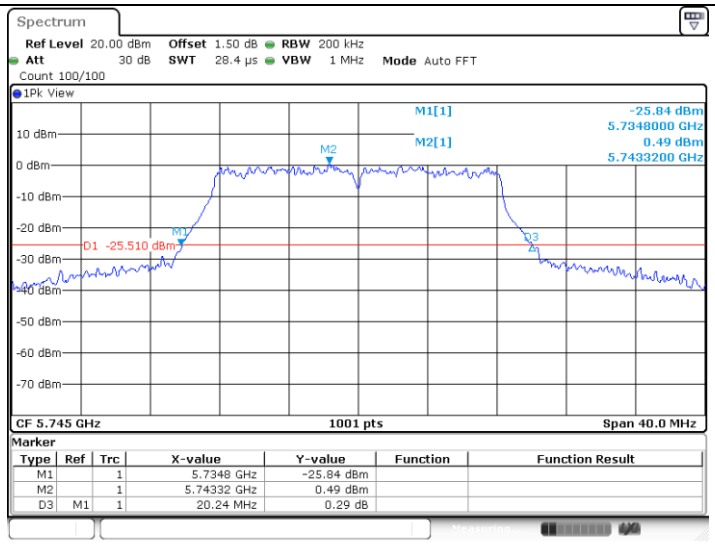
For anti-fake verification, please visit the official website of China Inspection And Testing Society : yz.cnca.cn



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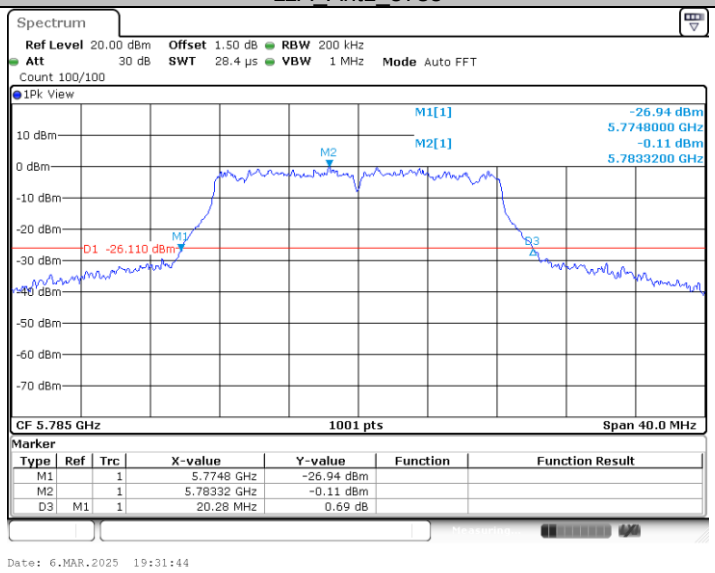

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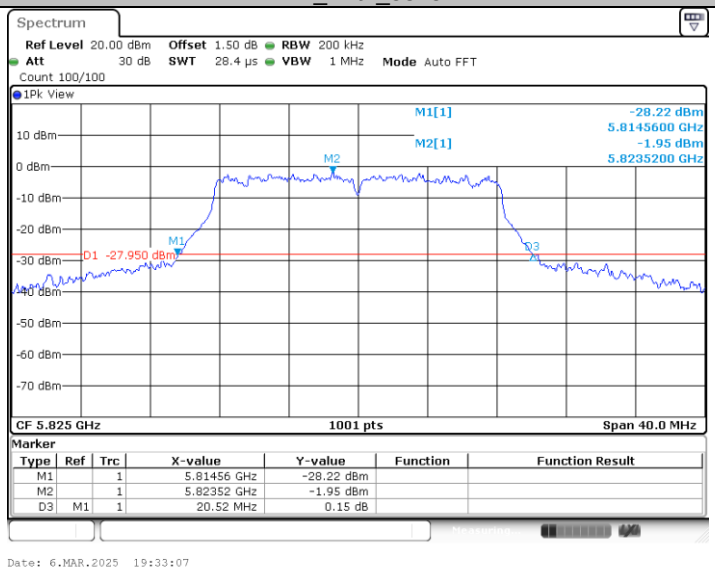
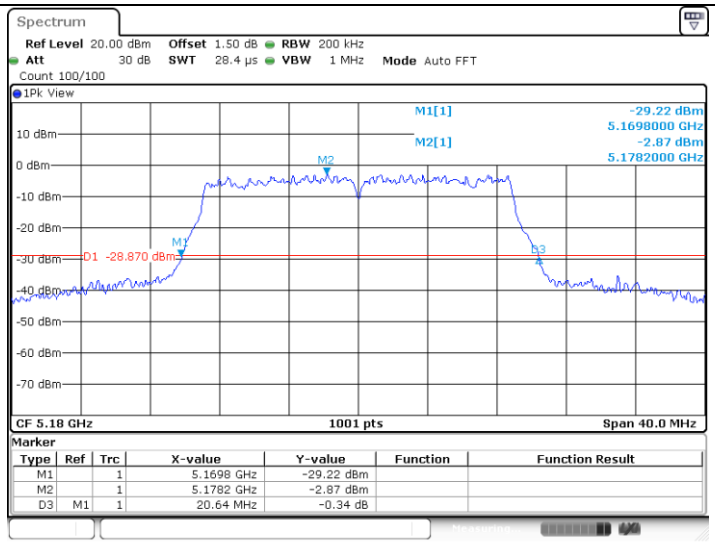


11N20SISO_Ant1_5180

For anti-fake verification, please visit the official website of China Inspection And Testing Society : yz.cnca.cn



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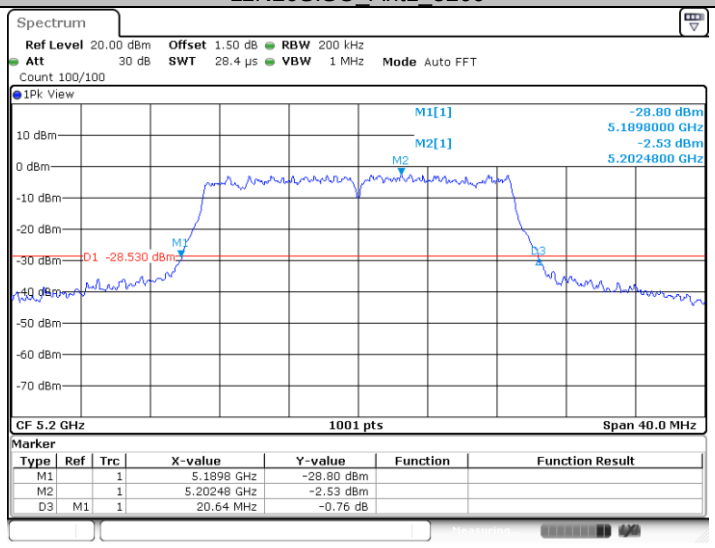

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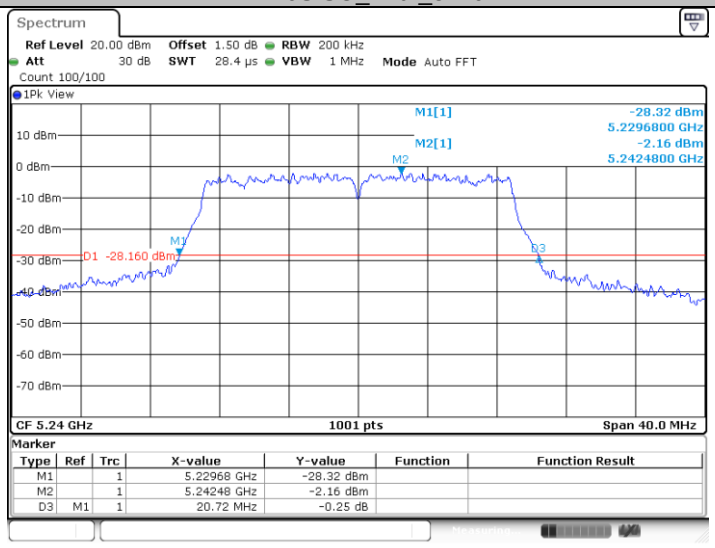
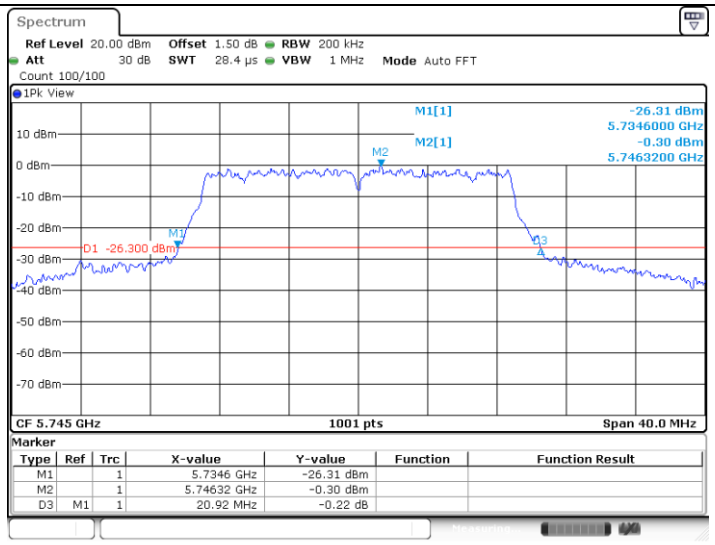
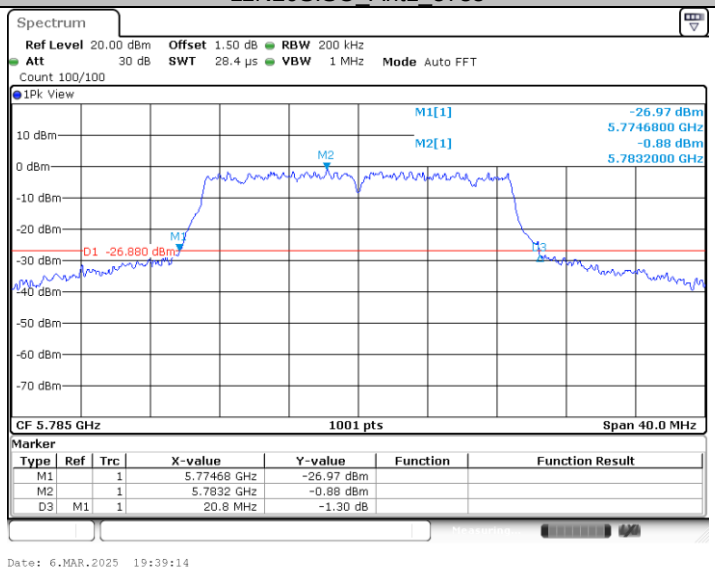


11N20SISO_Ant1_5745

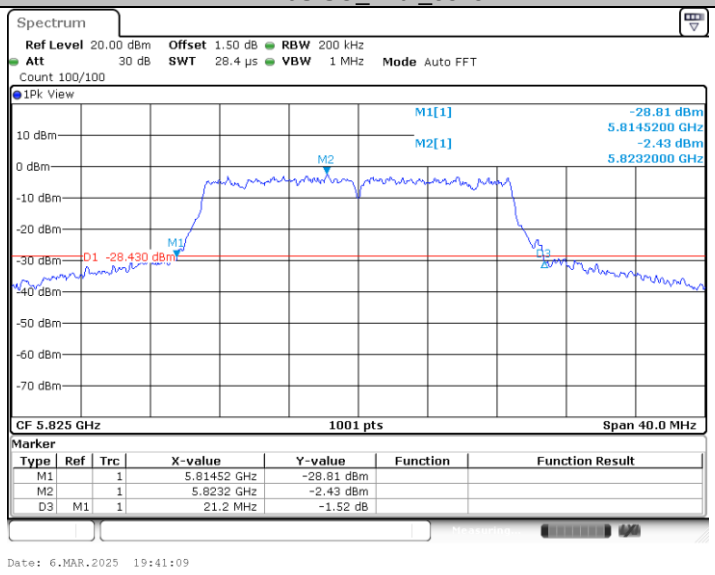
For anti-fake verification, please visit the official website of China Inspection And Testing Society : yz.cnca.cn



11N20SISO_Ant1_5785

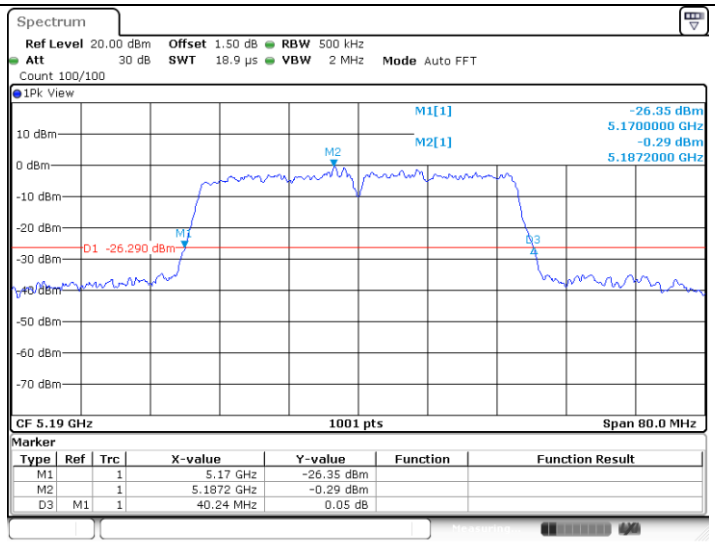


11N20SISO_Ant1_5825

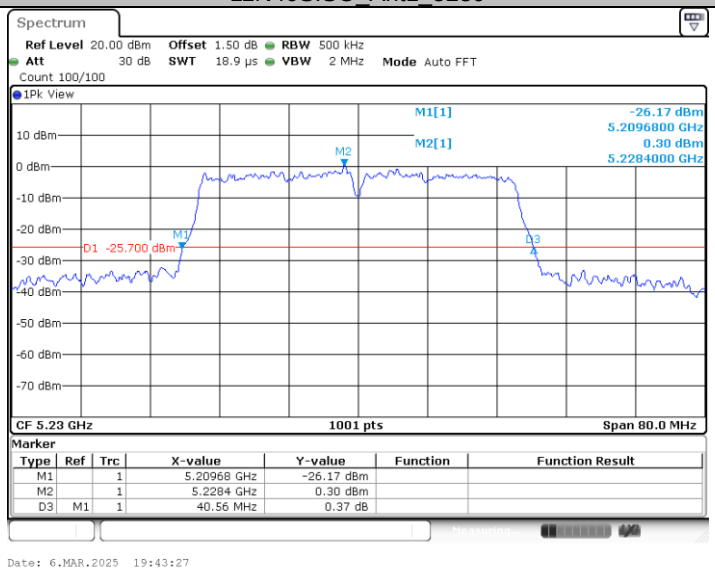


11N40SISO_Ant1_5190

For anti-fake verification, please visit the official website of China Inspection And Testing Society : yz.cnca.cn



11N40SISO_Ant1_5230



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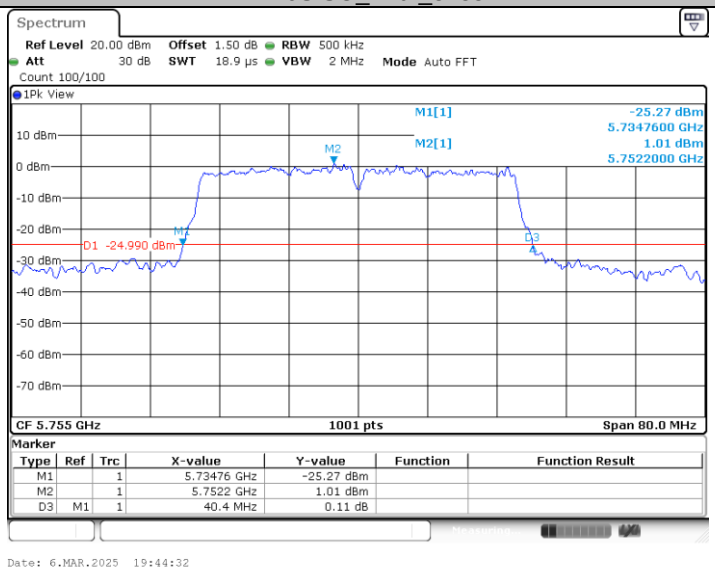
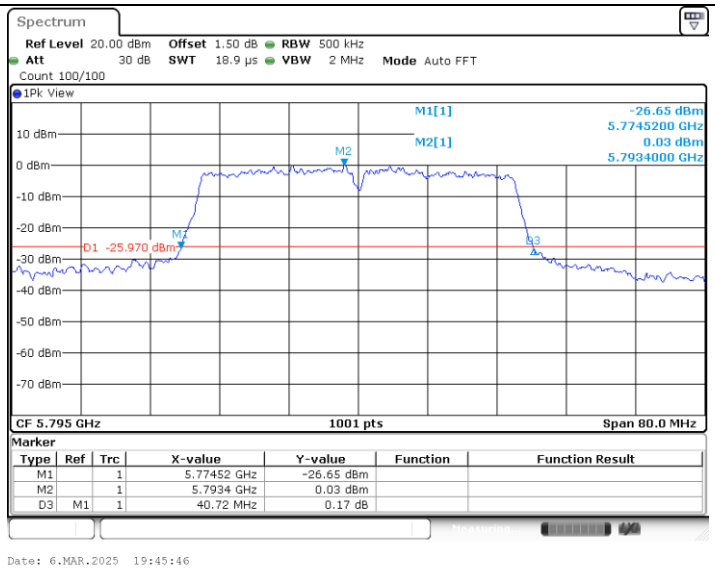


11N40SISO_Ant1_5795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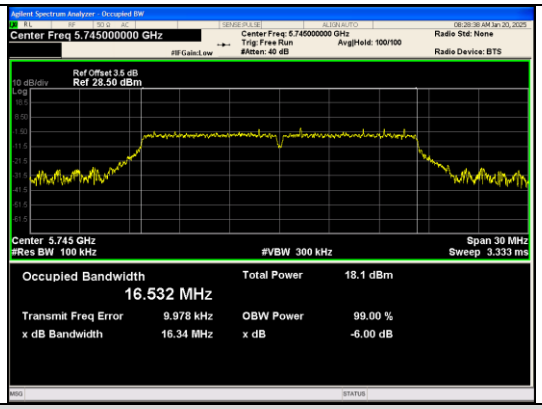
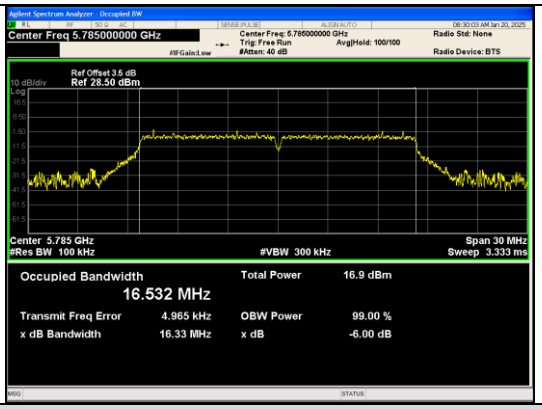
Ref Level 20.00 dBm Offset 1.50 dB RBW 500 kHz
Att 30 dB SWT 18.9 µs VBW 2 MHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -26.65 dBm
5.7745200 GHz
M2[1] 0.03 dBm
5.7934000 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
D1 -25.970 dBm
D3
CF 5.795 GHz
1001 pts
Span 80.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 5.77452 GHz -26.65 dBm
M2 1 5.7934 GHz 0.03 dBm
D3 M1 1 40.72 MHz 0.17 dB
Date: 6.MAR.2025 19:45:46

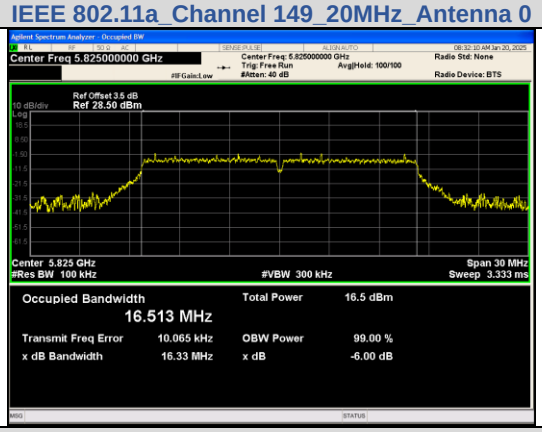
6dB Bandwidth:



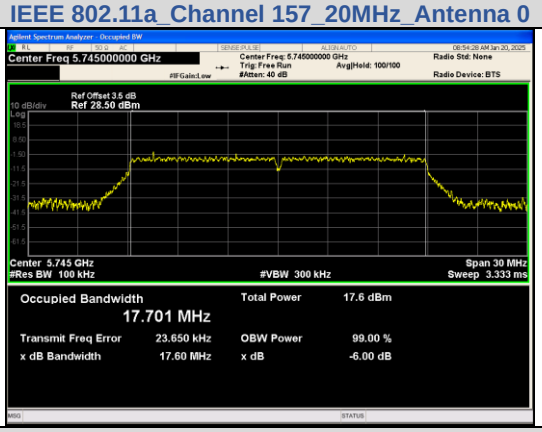
IEEE 802.11a_Channel 149_20MHz_Antenna 0



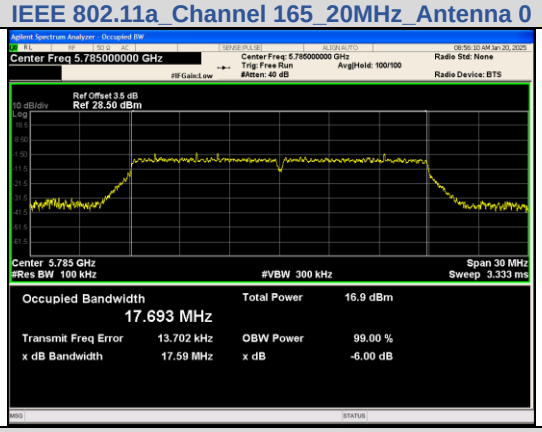
IEEE 802.11a_Channel 157_20MHz_Antenna 0



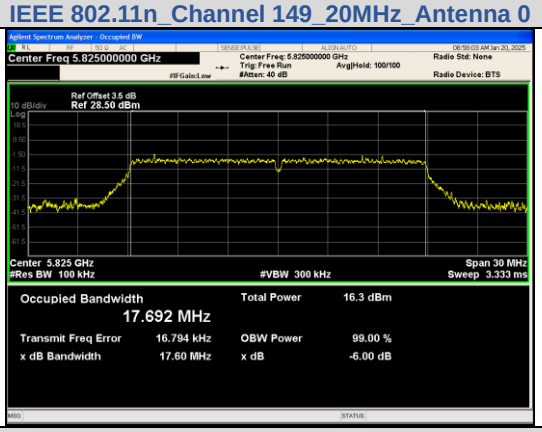
IEEE 802.11a_Channel 165_20MHz_Antenna 0



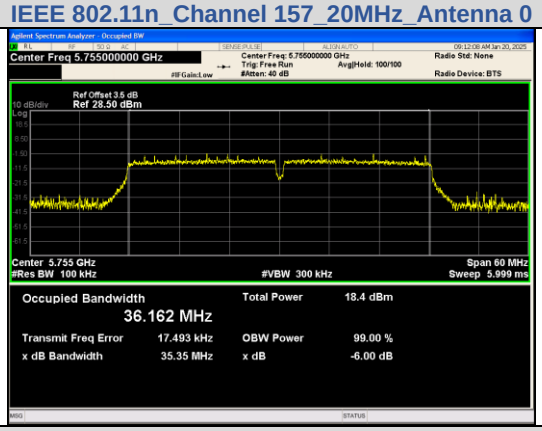
IEEE 802.11n_Channel 149_20MHz_Antenna 0



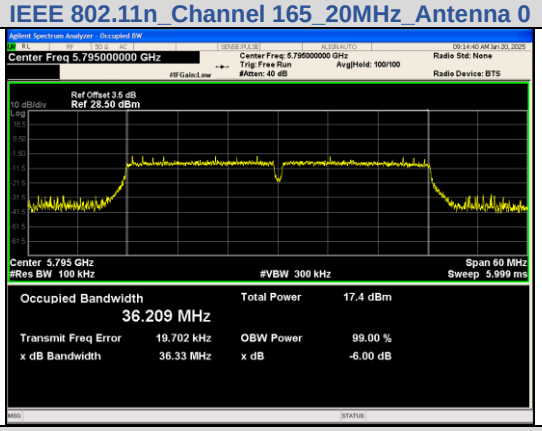
IEEE 802.11n_Channel 157_20MHz_Antenna 0



IEEE 802.11n_Channel 165_20MHz_Antenna 0



IEEE 802.11n_Channel 151_40MHz_Antenna 0



IEEE 802.11n_Channel 159_40MHz_Antenna 0

3.5. Peak Output Power

Limit

FCC CFR Title 47 Part 15 Subpart E Section 15.407(a)

Test Item	Limit	Frequency Range (MHz)
Conducted Output Power	Fixed: 1 Watt (30dBm) Mobile and Portable: 250mW (24dBm)	5150~5250
	250mW (24dBm)	5250~5350
	250mW (24dBm)	5500~5700
	1 Watt (30dBm)	5725~5850

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IC Power&PSD Limit					
Frequency	Type of devices	Maximum Conducted Output Power	EIRP Output Power	Conducted Power Spectral Density	EIRP Power Spectral Density
5150MHz-5250MHz	in vehicles		30mW or 1.76 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)		
	Other Devices		200mW or 10 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)		10dBm/MHz
5250MHz-5350MHz	in vehicles		30mW or 1.76 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)		
	Other Devices	250mW or 11 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)	1W or 17 + 10 ×$\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)	11dBm/Mhz	
5470MHz-5600MHz 5650MHz-5725MHz	ALL Devices	250mW or 11 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)	1W or 17 + 10 ×$\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)	11dBm/Mhz	
5725MHz-5850MHz	ALL Devices	1W		30dBm/500KHz	

Test Configuration

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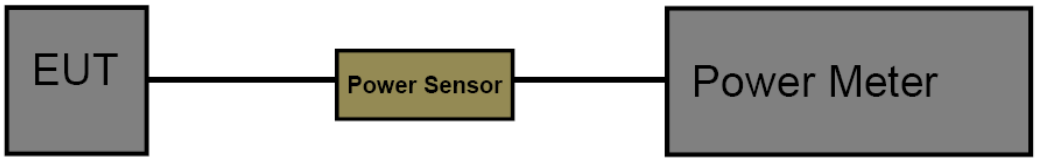

Test Procedure

The measurement is according to section 3 of KDB 789033 D02 General UNII Test Procedures New Rules V02r01.

Test Mode

Please refer to the clause 2.4.

Test Result

Test Mode	Freq(MHz)	Conducted Output Power [dBm]	Limit [dBm]	Verdict
IEEE 802.11a	5180	10.59	≤24	PASS
	5200	11.24	≤24	PASS
	5240	11.49	≤24	PASS
	5745	12.33	≤30	PASS
	5785	11.43	≤30	PASS
	5825	10.87	≤30	PASS
IEEE 802.11n_20	5180	10.47	≤24	PASS
	5200	11.12	≤24	PASS
	5240	11.32	≤24	PASS
	5745	12.17	≤30	PASS
	5785	11.24	≤30	PASS
	5825	10.65	≤30	PASS
IEEE 802.11n_40	5190	11.17	≤24	PASS
	5230	11.46	≤24	PASS
	5755	12.65	≤30	PASS
	5795	11.70	≤30	PASS

3.6. Power Spectral Density

Limit

FCC CFR Title 47 Part 15 Subpart E Section 15.407(a)

For the 5.15~5.25GHz band:

- Outdoor AP

  The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
  If G_{Tx}>6dBi, then PSD =17-(G_{Tx}-6).
- Indoor AP

  The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
  If G_{Tx}>6dBi, then PSD =17-(G_{Tx}-6).
- Point-to-point AP

  The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
  If G_{Tx}>23dBi, then PSD =17-(G_{Tx}-23).
- Client devices

  The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
  If G_{Tx}>6dBi, then PSD =11-(G_{Tx}-6).

For the 5.25~5.35GHz band:

The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
If G_{Tx}>6dBi, then PSD =11-(G_{Tx}-6).

For the 5.47~5.725GHz band:

The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
If G_{Tx}>6dBi, then PSD =11-(G_{Tx}-6).

For the 5.725~5.85GHz band:

- Point-to-multipoint systems (P2M)

  The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz.
  If G_{Tx}>6dBi, then PSD =30-(G_{Tx}-6).
- Point-to-point systems (P2P)

  The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz.

Note: G_{Tx}: EUT Antenna gain.

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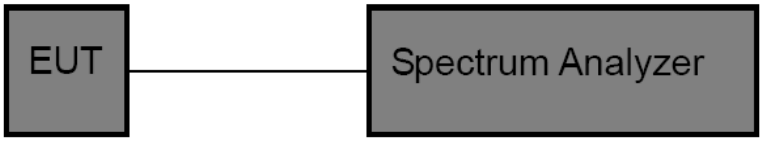
IC Power&PSD Limit					
Frequency	Type of devices	Maximum Conducted Output Power	EIRP Output Power	Conducted Power Spectral Density	EIRP Power Spectral Density
5150MHz-5250MHz	in vehicles		30mW or 1.76 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)		
	Other Devices		200mW or 10 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)		10dBm/MHz
5250MHz-5350MHz	in vehicles		30mW or 1.76 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)		
	Other Devices	250mW or 11 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)	1W or 17 + 10 ×$\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)	11dBm/Mhz	
5470MHz-5600MHz 5650MHz-5725MHz	ALL Devices	250mW or 11 + 10 × $\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)	1W or 17 + 10 ×$\log_{10}$B dBm, whichever is less (B=99% OBW in MHz)	11dBm/Mhz	
5725MHz-5850MHz	ALL Devices	1W		30dBm/500KHz	

Test Configuration



Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement is according to KDB 789033 D02 General UNII Test Procedures New Rules V02r01.

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
(2) Set analyzer center frequency to transmitting frequency.
(3) Set the span to encompass the entire emissions bandwidth (EBW) (alternatively, the entire 99% OBW) of the signal.
(4) RBW=1MHz for devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz RBW=500kHz for devices operating in the band 5.725-5.85 GHz.
(5) Set the VBW to: ≥ 3 RBW
(6) Detector: AVG
(7) Trace: Max Hold and View
(7) Sweep time: auto
(8) Trace average at least 100 traces in power averaging.
(9) User the peak marker function to determine the maximum amplitude level within the RBW. Apply correction to the result if different RBW is used.

NOTE: The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.

Test Mode

Please refer to the clause 2.4.

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Test Result

Test Mode	Freq(MHz)	Conducted PSD [dBm/MHz]	Conducted PSD Limit [dBm/MHz]	Conducted PSD Limit [dBm/500kHz]	Verdict
IEEE 802.11a	5180	-3.25	≤17	/	PASS
	5200	-3.25	≤17	/	PASS
	5240	-2.43	≤17	/	PASS
	5745	-3.70	/	≤30	PASS
	5785	-4.35	/	≤30	PASS
	5825	-5.69	/	≤30	PASS
IEEE 802.11n_20	5180	-4.03	≤17	/	PASS
	5200	-3.73	≤17	/	PASS
	5240	-3.39	≤17	/	PASS
	5745	-4.90	/	≤30	PASS
	5785	-5.10	/	≤30	PASS
	5825	-6.97	/	≤30	PASS
IEEE 802.11n_40	5190	-5.96	≤17	/	PASS
	5230	-5.71	≤17	/	PASS
	5755	-6.58	/	≤30	PASS
	5795	-7.87	/	≤30	PASS

Note: 1.The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.
2.The Duty Cycle Factor and RBW Factor is compensated in the graph.

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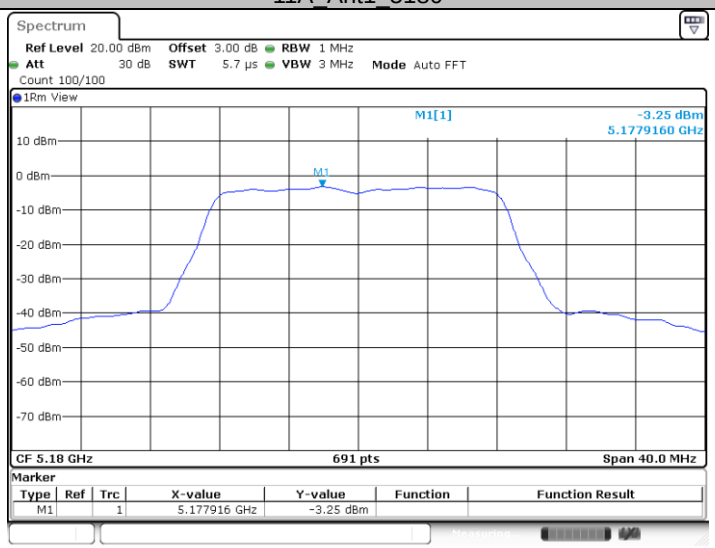
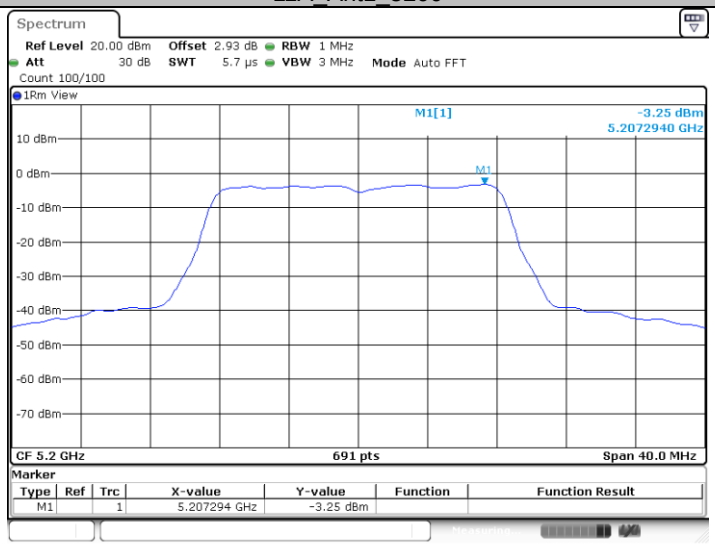
Test Graphs

11A_Ant1_5180



Date: 6.MAR.2025 19:26:37

11A_Ant1_5200



Date: 6.MAR.2025 19:28:49

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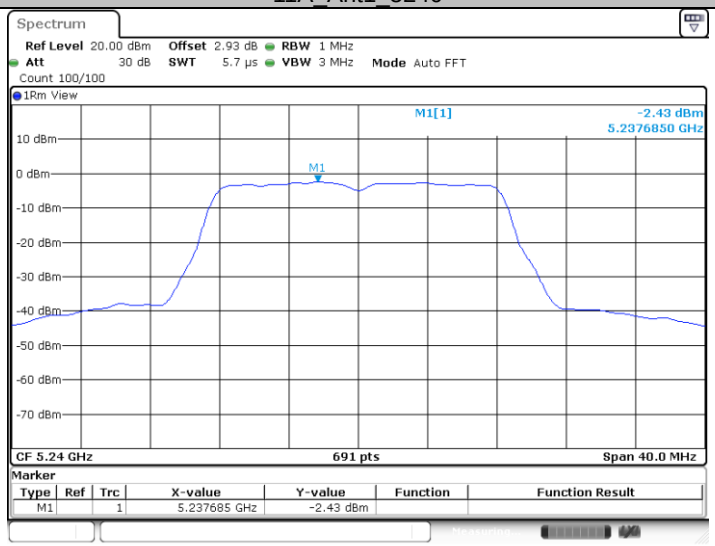

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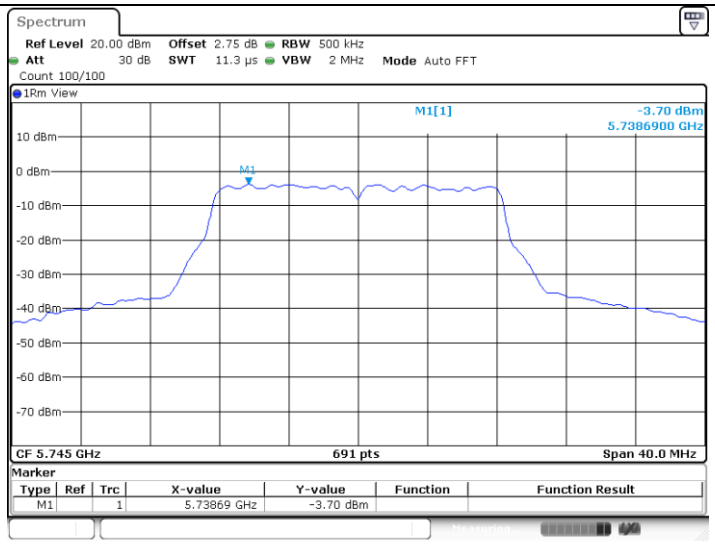

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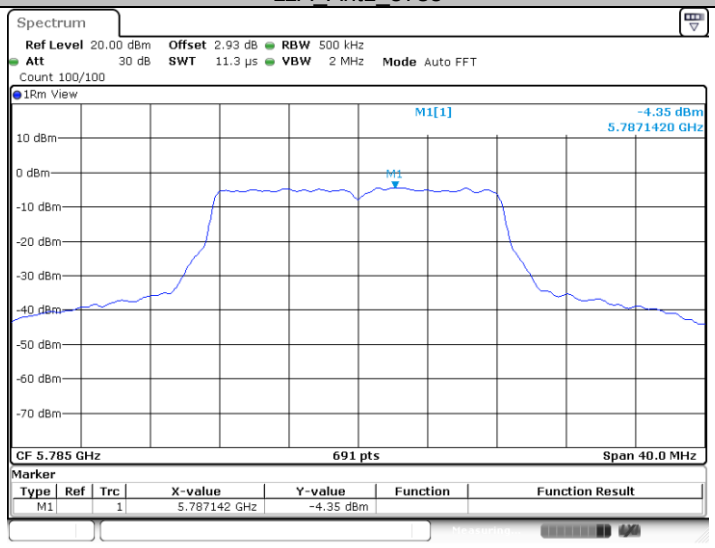

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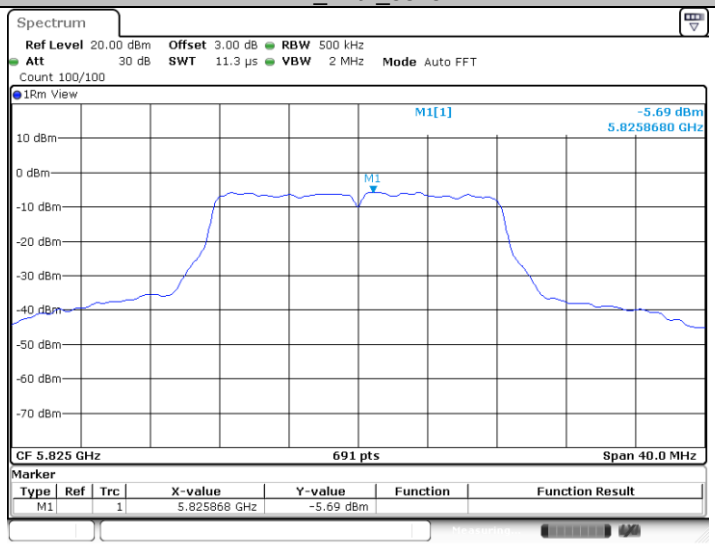
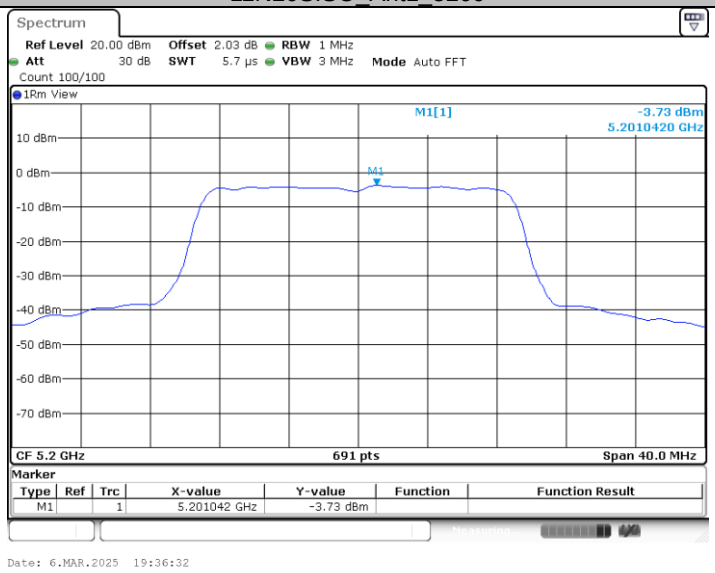


11N20SISO_Ant1_5180

11N20SISO_Ant1_5200



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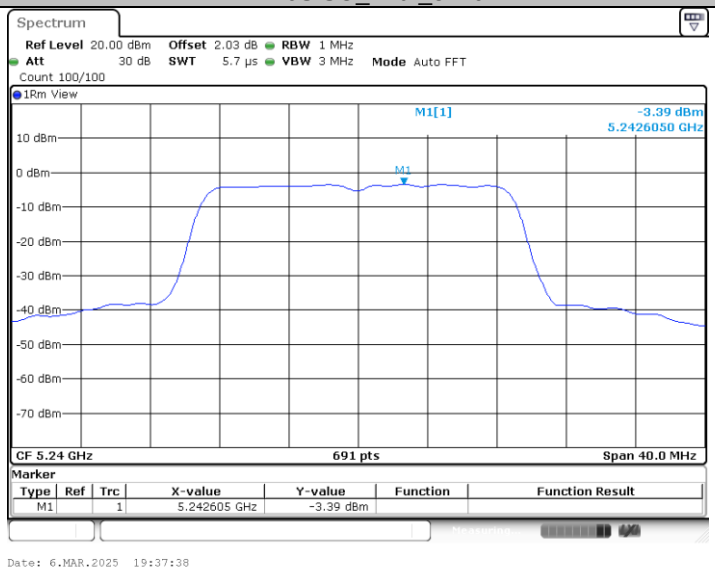
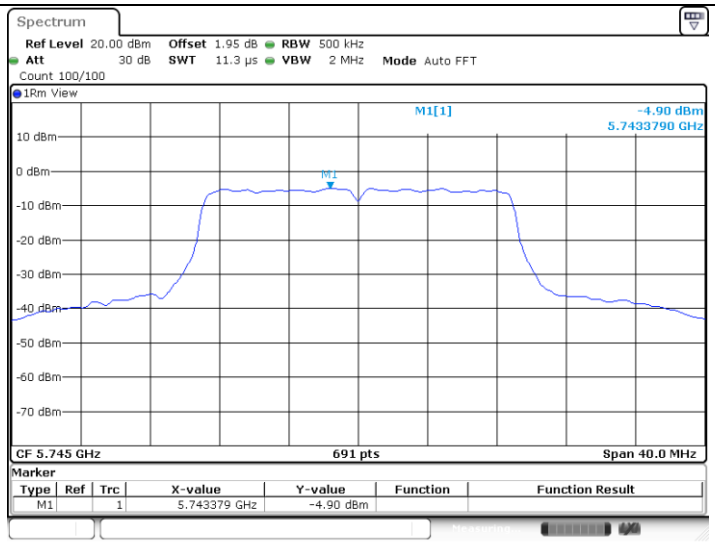


11N20SISO_Ant1_5745

For anti-fake verification, please visit the official website of China Inspection And Testing Society : yz.cnca.cn



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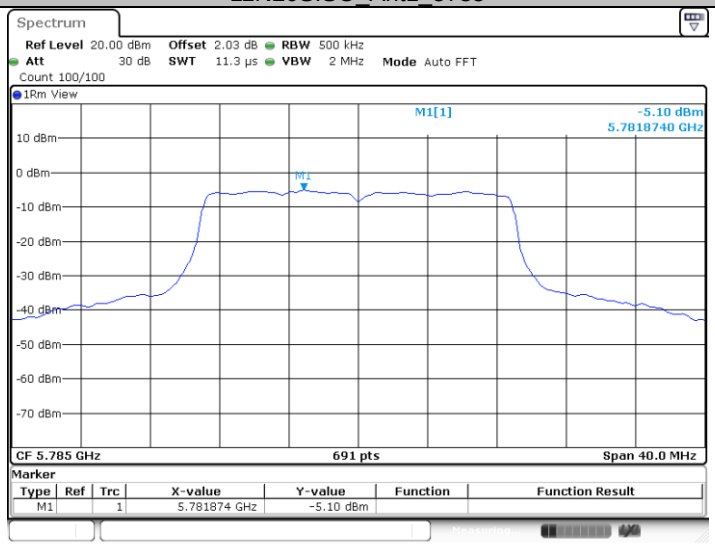

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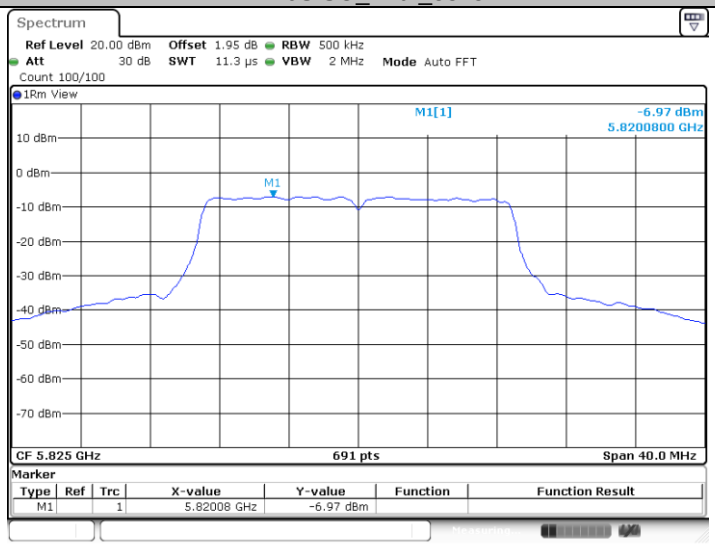

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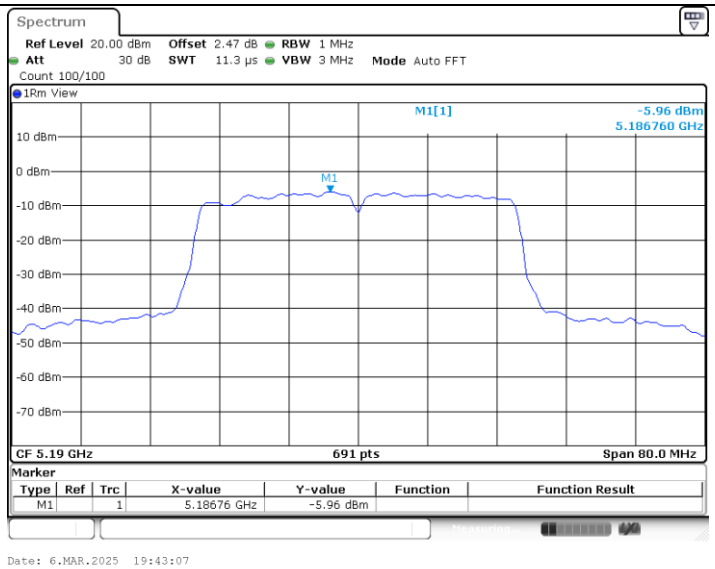
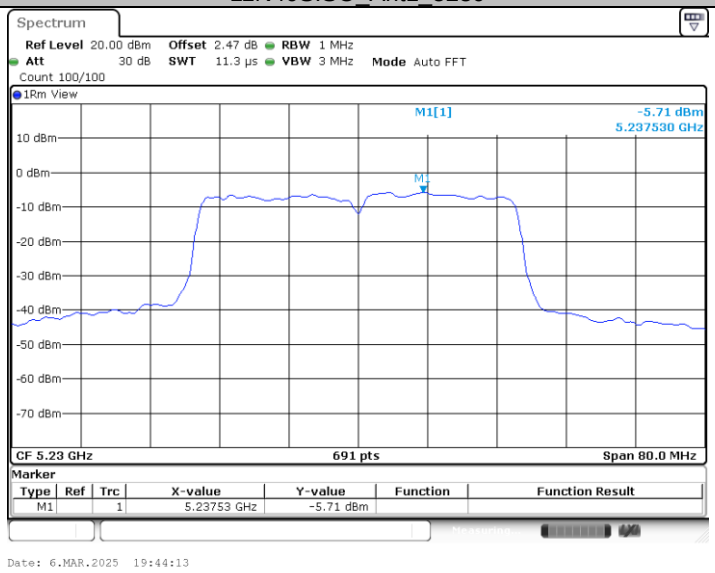
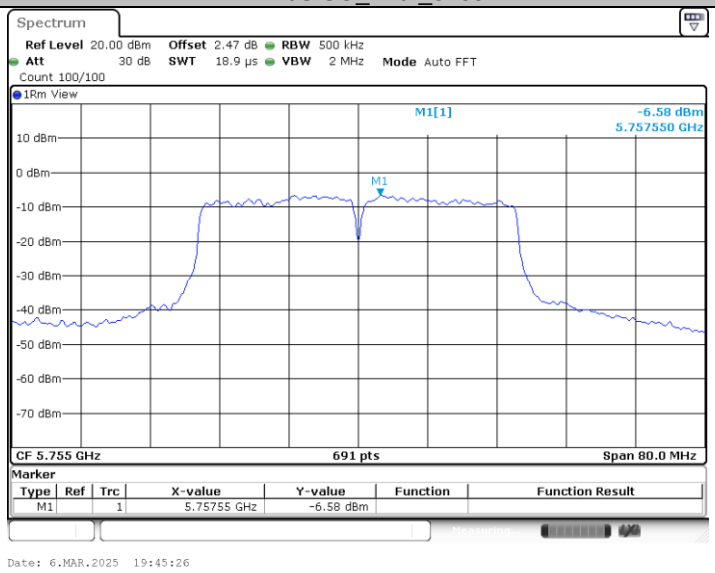


11N40SISO_Ant1_5230



11N40SISO_Ant1_5755



11N40SISO_Ant1_5795

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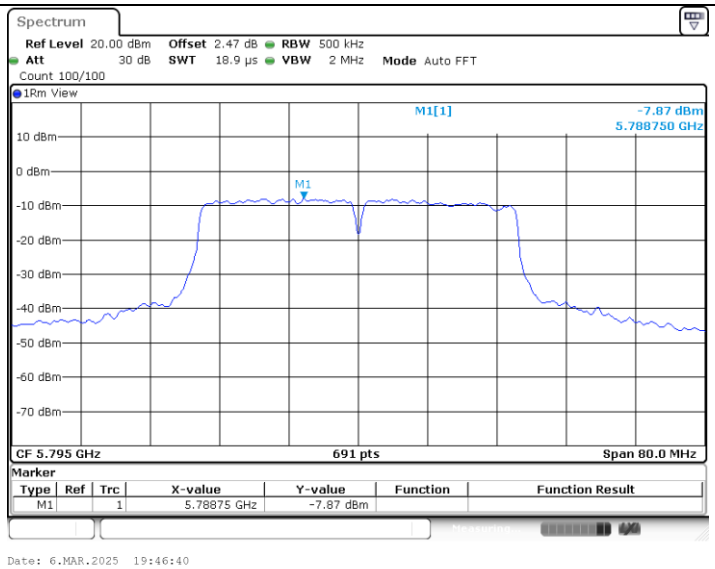
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Att 30 dB SWT 18.9 µs VBW 2 MHz Mode Auto FFT
Count 100/100
1Rm View
M1[1] -7.87 dBm
5.788750 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 5.795 GHz
691 pts
Span 80.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 5.78875 GHz -7.87 dBm
Date: 6.MAR.2025 19:46:40

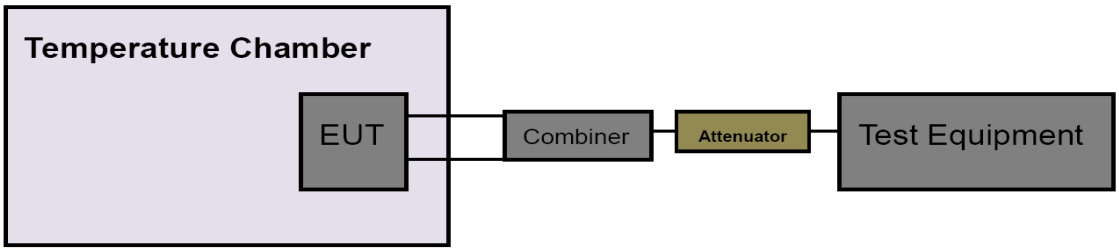
3.7. Frequency Stability

Limit

FCC CFR Title 47 Part 15 Subpart E Section 15.407(g) / RSS-Gen 6.11

Test Item	Limit	Frequency Range (MHz)
Frequency Stability	Specified in the user's manual, the transmitter center frequency tolerance shall be ±20 ppm maximum for the 5 GHz band (IEEE 802.11n specification)	5150~5250
		5250~5350
		5500~5700
		5725~5850

Test Configuration



Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above.

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
(2) Set analyzer center frequency to transmitting frequency.
(3) Set the span to encompass the entire emissions bandwidth (EBW) of the signal.
(4) Set the RBW to: 8MHz, VBW=8MHz with peak detector and max hold settings.
(5) The test extreme voltage is to change the primary supply voltage from 5Vdc percent of the nominal value.
(6) Extreme temperature is -20℃~70℃

NOTE: The EUT was set to continuously transmitting in continuously un-modulation transmitting mode.
NT is Normal Temperature, LT is Lower Temperature, HT is Higher Temperature, NV is Normal Voltage

Test Mode

Please refer to the clause 2.4.

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Test Result

Condition	Mode	Frequency (MHz)	Test Result(MHz)	Result (ppm)	Limit (ppm)	State
NT/NV	IEEE 802.11n_20	5180.0	5180.042570	8.22	±20	PASS
		5200.0	5200.053145	10.22		PASS
		5240.0	5240.055908	10.67		PASS
		5745.0	5744.983356	-2.90		PASS
		5785.0	5784.984293	-2.72		PASS
		5825.0	5824.984543	-2.65		PASS
	IEEE 802.11n_40	5190.0	5190.051033	9.83		PASS
		5230.0	5230.054983	10.51		PASS
		5755.0	5754.983793	-2.82		PASS
		5795.0	5794.984381	-2.70		PASS
LT/NV	IEEE 802.11n_20	5180.0	5180.046057	8.89		PASS
		5200.0	5200.053295	10.25		PASS
		5240.0	5240.051370	9.80		PASS
		5745.0	5744.983418	-2.89		PASS
		5785.0	5784.984431	-2.69		PASS
		5825.0	5824.984581	-2.65		PASS
	IEEE 802.11n_40	5190.0	5190.051220	9.87		PASS
		5230.0	5230.055308	10.58		PASS
		5755.0	5754.983856	-2.81		PASS
		5795.0	5794.984418	-2.69		PASS
HT/NV	IEEE 802.11n_20	5180.0	5180.047457	9.16		PASS
		5200.0	5200.053483	10.29		PASS
		5240.0	5240.046970	8.96		PASS
		5745.0	5744.983431	-2.88		PASS
		5785.0	5784.984456	-2.69		PASS
		5825.0	5824.984581	-2.65		PASS
	IEEE 802.11n_40	5190.0	5190.051458	9.91		PASS
		5230.0	5230.055433	10.60		PASS
		5755.0	5754.983918	-2.79		PASS
		5795.0	5794.984456	-2.68		PASS
-20℃/NV	IEEE 802.11n_20	5180.0	5180.025485	4.92		PASS
		5200.0	5200.036250	6.97		PASS
		5240.0	5240.047415	9.05		PASS
		5745.0	5744.987588	2.16		PASS
		5785.0	5784.989363	1.84		PASS
		5825.0	5824.974142	4.44		PASS
	IEEE 802.11n_40	5190.0	5190.052540	10.12		PASS
		5230.0	5230.050896	9.73		PASS
		5755.0	5754.986354	2.37		PASS
		5795.0	5794.984258	2.72		PASS
-10℃/NV	IEEE 802.11n_20	5180.0	5180.052547	10.14		PASS
		5200.0	5200.053985	10.38		PASS
		5240.0	5240.050214	9.58		PASS
		5745.0	5744.984451	2.71		PASS
		5785.0	5784.984563	2.67		PASS
		5825.0	5824.984965	2.58		PASS
	IEEE 802.11n_40	5190.0	5190.052547	10.12		PASS
		5230.0	5230.055114	10.54		PASS
		5755.0	5754.984695	2.66		PASS
		5795.0	5794.984253	2.72		PASS
0℃/NV	IEEE 802.11n_20	5180.0	5180.048545	9.37		PASS
		5200.0	5200.054120	10.41		PASS
		5240.0	5240.042970	8.20		PASS
		5745.0	5744.983543	-2.86		PASS
		5785.0	5784.984518	-2.68		PASS

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		5825.0	5824.984581	-2.65		PASS
	IEEE 802.11n_40	5190.0	5190.051883	10.00		PASS
		5230.0	5230.055558	10.62		PASS
		5755.0	5754.983993	-2.78		PASS
		5795.0	5794.984531	-2.67		PASS
10℃/NV	IEEE 802.11n_20	5180.0	5180.049257	9.51		PASS
		5200.0	5200.054558	10.49		PASS
		5240.0	5240.038470	7.34		PASS
		5745.0	5744.983568	-2.86		PASS
		5785.0	5784.984643	-2.65		PASS
		5825.0	5824.984568	-2.65		PASS
	IEEE 802.11n_40	5190.0	5190.051970	10.01		PASS
		5230.0	5230.055595	10.63		PASS
		5755.0	5754.984031	-2.77		PASS
		5795.0	5794.984518	-2.67		PASS
20℃/NV	IEEE 802.11n_20	5180.0	5180.049670	9.59		PASS
		5200.0	5200.054758	10.53		PASS
		5240.0	5240.032545	6.21		PASS
		5745.0	5744.983543	-2.86		PASS
		5785.0	5784.984531	-2.67		PASS
		5825.0	5824.984643	-2.64		PASS
	IEEE 802.11n_40	5190.0	5190.052158	10.05		PASS
		5230.0	5230.055633	10.64		PASS
		5755.0	5754.984118	-2.76		PASS
		5795.0	5794.984468	-2.68		PASS
30℃/NV	IEEE 802.11n_20	5180.0	5180.049970	9.65		PASS
		5200.0	5200.054995	10.58		PASS
		5240.0	5240.029519	5.63		PASS
		5745.0	5744.983681	-2.84		PASS
		5785.0	5784.984418	-2.69		PASS
		5825.0	5824.984656	-2.63		PASS
	IEEE 802.11n_40	5190.0	5190.052333	10.08		PASS
		5230.0	5230.055695	10.65		PASS
		5755.0	5754.984206	-2.74		PASS
		5795.0	5794.984518	-2.67		PASS
40℃/NV	IEEE 802.11n_20	5180.0	5180.050545	9.76		PASS
		5200.0	5200.055158	10.61		PASS
		5240.0	5240.027944	5.33		PASS
		5745.0	5744.983656	-2.84		PASS
		5785.0	5784.984381	-2.70		PASS
		5825.0	5824.984681	-2.63		PASS
	IEEE 802.11n_40	5190.0	5190.052870	10.19		PASS
		5230.0	5230.055870	10.68		PASS
		5755.0	5754.984231	-2.74		PASS
		5795.0	5794.984506	-2.67		PASS
50℃/NV	IEEE 802.11n_20	5180.0	5180.050683	9.78		PASS
		5200.0	5200.055895	10.75		PASS
		5240.0	5240.025232	4.82		PASS
		5745.0	5744.983706	-2.84		PASS
		5785.0	5784.984343	-2.71		PASS
		5825.0	5824.984681	-2.63		PASS
	IEEE 802.11n_40	5190.0	5190.053145	10.24		PASS
		5230.0	5230.056108	10.73		PASS
		5755.0	5754.984256	-2.74		PASS
		5795.0	5794.984518	-2.67		PASS
60℃/NV	IEEE 802.11n_20	5180.0	5180.051477	9.94		PASS
		5200.0	5200.053524	10.29		PASS
		5240.0	5240.032251	6.15		PASS
		5745.0	5744.981936	-3.14		PASS

		5785.0	5784.981775	-3.15		PASS
		5825.0	5824.984117	-2.73		PASS
	IEEE 802.11n_40	5190.0	5190.050793	9.79		PASS
		5230.0	5230.054127	10.35		PASS
		5755.0	5754.981254	-3.26		PASS
		5795.0	5794.984155	-2.73		PASS
70℃/NV	IEEE 802.11n_20	5180.0	5180.050857	9.82		PASS
		5200.0	5200.054895	10.56		PASS
		5240.0	5240.029361	5.60		PASS
		5745.0	5744.982874	-2.98		PASS
		5785.0	5784.984152	-2.74		PASS
		5825.0	5824.984485	-2.66		PASS
	IEEE 802.11n_40	5190.0	5190.052946	10.20		PASS
		5230.0	5230.055024	10.52		PASS
		5755.0	5754.984236	-2.74		PASS
		5795.0	5794.983873	-2.78		PASS

3.8. Antenna Requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Result

The directional gain of the antenna is less than 6dBi, please refer to the EUT internal photographs antenna photo.

RSS-Gen Issue 5 Section 6.8
The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power(e.i.r.p.) limits specified in the applicable standard (RSS) for licence-exempt apparatus.

Result

PASS.
The EUT has 1 antenna: a FPC Antenna for 5G WIFI.
Note: ☒Antenna use a permanently attached antenna which is not replaceable.
☐Not using a standard antenna jack or electrical connector for antenna replacement.
☐The antenna has to be professionally installed (please provide method of installation).
Which in accordance to RSS-Gen 6.8, please refer to the internal photos.

3.9. Dynamic Frequency Selection

Requirement

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

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Limit

1. DFS Detection Thresholds

Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

2. DFS Response Requirements

Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

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Table 5 Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu sec}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

For example if in Short Pulse Radar Type 1 Test B a PRI of 3066 µsec is selected, the number of pulses would be Round up $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{3066}\right)\right\}$ = Round up {17.2} = 18.

Table 5a - Pulse Repetition Intervals Values for Test A

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

Table 6 – Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type wave forms, then each additional waveform must also be unique and not repeated from the previous waveforms.

Table 7 – Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each wave form. The hopping sequence is different for each wave form and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250–5724MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

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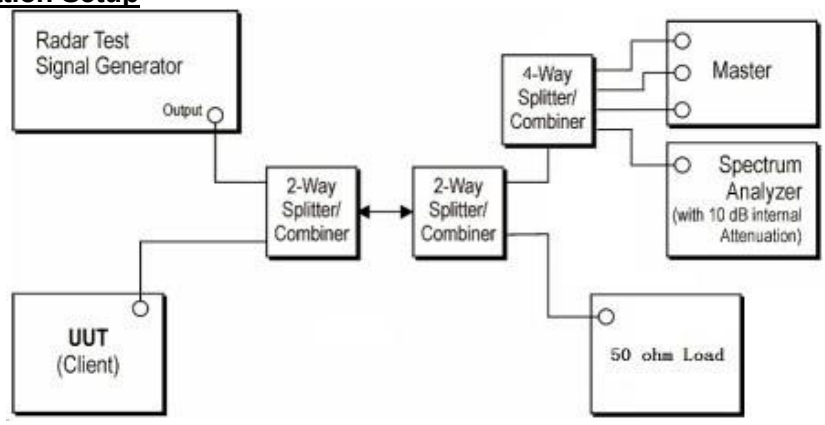
Calibration of Radar Waveform

Radar Waveform Calibration Procedure

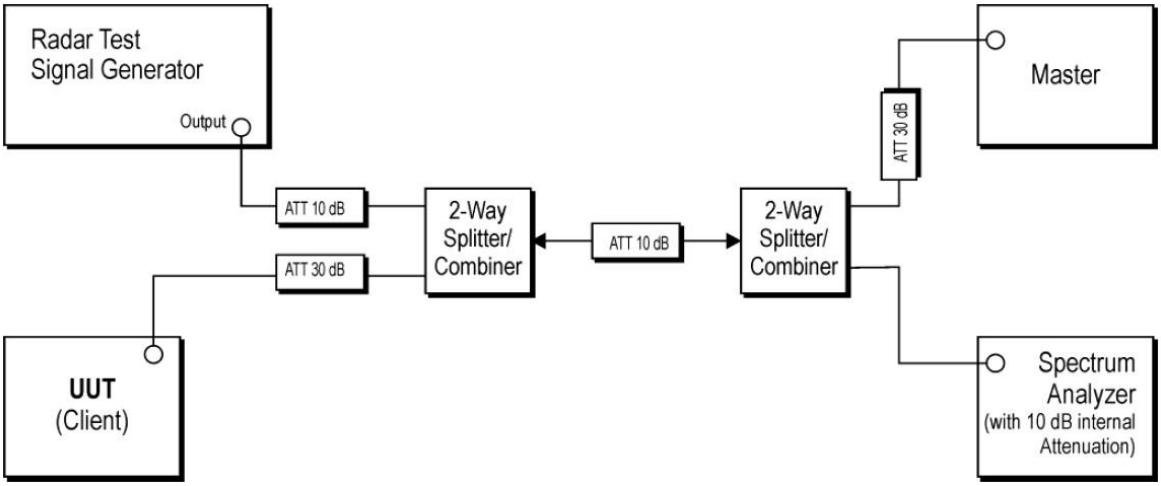
1) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master.
2) The interference Radar Detection Threshold Level is -62dBm + 1.76dBi +1dB = -59.24dBm that had been taken into account the output power range and antenna gain.
3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.
4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was -62dBm + 1.76dBi +1dB = -59.24dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

Conducted Calibration Setup



Test Configuration

Setup for Client with injection at the Master



Radar Waveform Calibration Result

Not Applicable.

Test Procedure

1. The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.
2. The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device
3. A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.
4. EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Media Player Classic Ver. 6.4.8.6 in order to properly load the network for the entire period of the test.
5. When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.
6. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type
7. Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) =S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms)= N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.
8. Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

Test Mode

Please refer to the clause 2.4.

Test Result

Not Applicable.

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

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