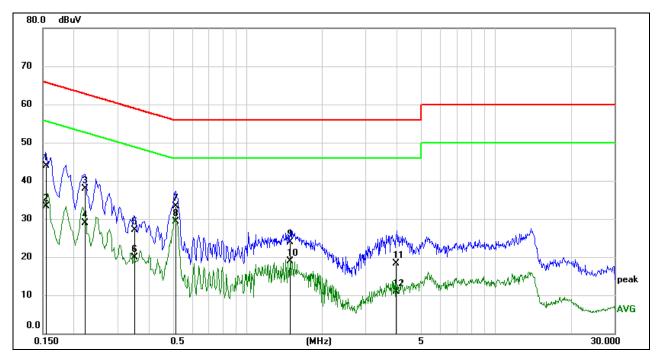


# LINE L RESULTS (UNII-2C BAND LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	( <b>dB</b> )	(dBuV)	(dBuV)	( <b>dB</b> )	
1	0.1556	34.36	9.59	43.95	65.70	-21.75	QP
2	0.1556	23.69	9.59	33.28	55.70	-22.42	AVG
3	0.2219	28.37	9.57	37.94	62.75	-24.81	QP
4	0.2219	19.35	9.57	28.92	52.75	-23.83	AVG
5	0.3517	17.58	9.44	27.02	58.92	-31.90	QP
6	0.3517	10.55	9.44	19.99	48.92	-28.93	AVG
7	0.5101	23.95	9.32	33.27	56.00	-22.73	QP
8	0.5101	20.08	9.32	29.40	46.00	-16.60	AVG
9	1.4871	14.28	9.62	23.90	56.00	-32.10	QP
10	1.4871	9.33	9.62	18.95	46.00	-27.05	AVG
11	3.9770	8.76	9.60	18.36	56.00	-37.64	QP
12	3.9770	1.31	9.60	10.91	46.00	-35.09	AVG

Note: 1. Result = Reading + Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).

4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes had been tested, but only the worst data was recorded in the report.



# **10. FREQUENCY STABILITY**

# <u>LIMITS</u>

The frequency of the carrier signal shall be maintained within band of operation.

# TEST PROCEDURE

1. The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between 0  $^{\circ}$ C ~ 70  $^{\circ}$ C (declared by customer).

2. The temperature was incremented by 10 °C intervals and the unit allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

3. The primary supply voltage is varied from 85 % to 115 % of the nominal value for non handcarried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

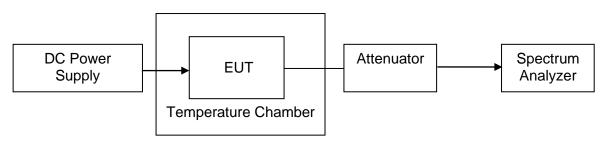
Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	10 kHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

Connect the EUT to the spectrum analyser and use the following settings:

4. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and record the operating frequency at startup, and at 2 minutes, 5minutes, and 10 minutes after the EUT is energized.

5. Allow the trace to stabilize, find the peak value of the power envelope and record the frequency, then calculated the frequency drift.

# TEST SETUP





# TEST ENVIRONMENT

	Normal Test Conditions	Extreme Test Conditions	
Relative Humidity	20 % - 75 %	/	
Atmospheric Pressure	100 kPa ~102 kPa	/	
Tomporaturo	T <sub>N</sub> (Normal Temperature):	T <sub>L</sub> (Low Temperature): 0 °C	
Temperature	25.1 °C	T <sub>H</sub> (High Temperature): 70 °C	
	$\lambda$ (Normal ) (altage): AC 120 $\lambda$	V <sub>L</sub> (Low Voltage): AC 102 V	
Supply Voltage	V <sub>N</sub> (Normal Voltage): AC 120 V	V <sub>H</sub> (High Voltage): DC 138 V	

#### **RESULTS**

Please refer to Appendix E.

# 11. DYNAMIC FREQUENCY SELECTION

# APPLICABILITY OF DFS REQUIREMENTS

A U-NII network will employ a DFS function to detect signals from radar systems and to avoid co-channel operation with these systems. This applies to the 5250-5350 MHz and/or 5470-5725 MHz bands.

Within the context of the operation of the DFS function, a U-NII device will operate in either Master Mode or Client Mode. U-NII devices operating in Client Mode can only operate in a network controlled by a U-NII device operating in Master Mode.

	Operational Mode				
Requirement	Master	Client Without	Client With Radar		
		Radar Detection	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 1: Applicability of DFS Requirements Prior to Use of a Channel

#### Table 2: Applicability of DFS requirements during normal operation

	Operatior	Operational Mode			
Requirement	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 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.



# <u>LIMITS</u>

(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	-62 dBm					
power spectral density < 10 dBm/MHz	-02 UDITI					
EIRP < 200 milliwatt that do not meet the						
power	-64 dBm					
spectral density requirement						
Note 1: This is the level at the input of the receiver assuming a 0 dBi 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.		
	200 milliseconds + an aggregate of 60		
Channel Closing Transmission Time	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.



#### PARAMETERS OF 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.

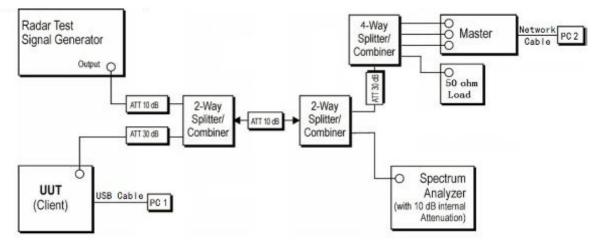
Table 5 Short Pulse Radar Test Waveforms							
Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials		
0	1	1428	18	See Note 1	See Note 1		
1	1	Test A Test B	$\begin{array}{c} \text{Roundup} \left\{ \left( \frac{1}{360} \right) \cdot \\ \left( \frac{19 \cdot 10^6}{\text{PRI}_{\mu \text{sec}}} \right) \right\} \end{array}$	60%	30		
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 (F	adar Types 1-		80%	120			
and ch Test A: 15 ur Test B: 15 ur	nannel closing i nique PRI value nique PRI value	time tests. es randomly sele es randomly sele	e used for the detection ected from the list of 23 F ected within the range of alues selected in Test A	PRI values in Table 5a 518-3066 µsec, with a			

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. Test aggregate is average of the percentage of successful detections of short pulse radar types 1-4.



# TEST SETUP

#### Setup for Client with injection at the Master



#### **TEST ENVIRONMENT**

Temperature	24.1 °C	Relative Humidity	60.5 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

#### <u>RESULTS</u>

Please refer to Appendix F.



# 12. ANTENNA REQUIREMENTS

# APPLICABLE REQUIREMENTS

# Please refer to FCC §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 an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. 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.

# Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

# **RESULTS**

Complies



# 12.1. Appendix A1: Emission Bandwidth 12.1.1. Test Result

Test Mode	Antenna	Channel	26db EBW [MHz]	FL[MHz]	FH[MHz]	Verdict
	Ant1	5180	23.560	5168.200	5191.760	PASS
	Ant2	5180	22.520	5168.720	5191.240	PASS
	Ant1	5200	24.280	5187.480	5211.760	PASS
	Ant2	5200	23.480	5188.280	5211.760	PASS
	Ant1	5240	19.480	5230.320	5249.800	PASS
	Ant2	5240	19.920	5230.080	5250.000	PASS
	Ant1	5260	23.680	5248.200	5271.880	PASS
	Ant2	5260	23.040	5248.720	5271.760	PASS
	Ant1	5280	23.320	5268.040	5291.360	PASS
	Ant2	5280	23.640	5267.440	5291.080	PASS
	Ant1	5320	23.560	5308.160	5331.720	PASS
	Ant2	5320	21.880	5308.800	5330.680	PASS
	Ant1	5500	22.720	5488.280	5511.000	PASS
	Ant2	5500	22.920	5488.360	5511.280	PASS
	Ant1	5580	23.960	5567.480	5591.440	PASS
11A	Ant2	5580	22.640	5568.280	5590.920	PASS
	Ant1	5700	23.520	5688.120	5711.640	PASS
	Ant1 Ant2	5700	22.680	5688.920	5711.600	PASS
	Ant2 Ant1	5700	22.080	5708.320	5731.040	PASS
	Ant2	5720	23.240	5708.480	5731.720	PASS
	Ant2 Ant1	5720_UNII-2C	16.68	5708.320	5725	PASS
	Ant1 Ant2	5720_UNII-2C	16.52	5708.480	5725	PASS
		5720_UNII-2C	6.04	5708.480	5731.040	PASS
	Ant1					
	Ant2	5720_UNII-3	6.72	5725	5731.720	PASS
	Ant1	5745	22.440	5733.320	5755.760	PASS
	Ant2	5745	22.720	5733.160	5755.880	PASS
	Ant1	5785	22.640	5773.480	5796.120	PASS
	Ant2	5785	23.040	5773.240	5796.280	PASS
	Ant1	5825	22.840	5813.280	5836.120	PASS
	Ant2	5825	23.400	5813.360	5836.760	PASS
	Ant1	5180	23.600	5168.240	5191.840	PASS
	Ant2	5180	22.520	5168.480	5191.000	PASS
	Ant1	5200	23.480	5188.160	5211.640	PASS
	Ant2	5200	22.760	5188.520	5211.280	PASS
	Ant1	5240	20.120	5229.920	5250.040	PASS
	Ant2	5240	19.960	5229.920	5249.880	PASS
	Ant1	5260	24.160	5247.560	5271.720	PASS
	Ant2	5260	22.160	5249.240	5271.400	PASS
	Ant1	5280	23.760	5268.120	5291.880	PASS
	Ant2	5280	22.360	5269.320	5291.680	PASS
	Ant1	5320	22.840	5308.240	5331.080	PASS
11N20MIMO	Ant2	5320	22.400	5309.040	5331.440	PASS
	Ant1	5500	23.280	5488.160	5511.440	PASS
	Ant2	5500	23.280	5488.040	5511.320	PASS
	Ant1	5580	23.760	5568.160	5591.920	PASS
	Ant2	5580	23.040	5568.360	5591.400	PASS
	Ant1	5700	23.720	5688.080	5711.800	PASS
	Ant2	5700	23.520	5688.160	5711.680	PASS
	Ant1	5720	24.200	5707.560	5731.760	PASS
	Ant2	5720	22.800	5708.320	5731.120	PASS
	Ant1	5720_UNII-2C	17.44	5707.560	5725	PASS
	Ant2	5720_UNII-2C	16.68	5708.320	5725	PASS
	Ant1	5720_UNII-3	6.76	5725	5731.760	PASS
	Ant2	5720_UNII-3	6.12	5725	5731.120	PASS



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T	A		01000	F700 100	F750 000	<b>D</b> 4 6 6
	Ant1	5745	24.280	5732.400	5756.680	PASS
	Ant2	5745	22.840	5733.200	5756.040	PASS
	Ant1	5785	23.560	5773.120	5796.680	PASS
	Ant2	5785	22.920	5773.720	5796.640	PASS
	Ant1	5825	23.080	5813.240	5836.320	PASS
	Ant2	5825	22.320	5813.560	5835.880	PASS
	Ant1	5190	40.480	5169.760	5210.240	PASS
	Ant2	5190	40.080	5169.840	5209.920	PASS
	Ant1	5230	40.880	5209.600	5250.480	PASS
	Ant2	5230	40.080	5210.000	5250.080	PASS
	Ant1	5270	40.480	5250.000	5290.480	PASS
	Ant2	5270	39.760	5250.160	5289.920	PASS
	Ant1	5310	40.320	5289.760	5330.080	PASS
	Ant2	5310	40.480	5289.840	5330.320	PASS
	Ant1	5510	40.880	5489.520	5530.400	PASS
	Ant2	5510	40.240	5489.840	5530.080	PASS
	Ant1	5550	40.960	5529.760	5570.720	PASS
11N40MIMO	Ant2	5550	40.400	5529.920	5570.320	PASS
	Ant1	5670	40.480	5649.840	5690.320	PASS
	Ant2	5670	41.040	5649.520	5690.560	PASS
	Ant1	5710	40.560	5689.680	5730.240	PASS
	Ant2	5710	39.840	5690.080	5729.920	PASS
	Ant1	5710_UNII-2C	35.32	5689.680	5725	PASS
	Ant2	5710_UNII-2C	34.92	5690.080	5725	PASS
	Ant1	5710_UNII-3	5.24	5725	5730.240	PASS
	Ant2	5710_UNII-3	4.92	5725	5729.920	PASS
	Ant1	5755	40.960	5734.680	5775.640	PASS
	Ant2	5755	40.240	5734.920	5775.160	PASS
	Ant1	5795	40.800	5774.600	5815.400	PASS
	Ant2	5795	40.240	5775.000	5815.240	PASS
	Ant1	5210	79.840	5170.160	5250.000	PASS
	Ant2	5210	80.320	5169.840	5250.160	PASS
	Ant1	5290	80.000	5250.160	5330.160	PASS
	Ant2	5290	80.000	5250.000	5330.000	PASS
	Ant1	5530	80.320	5489.840	5570.160	PASS
	Ant2	5530	80.000	5490.000	5570.000	PASS
	Ant1	5610	80.320	5569.840	5650.160	PASS
4440000	Ant2	5610	80.000	5570.000	5650.000	PASS
11AC80MIMO	Ant1	5690	80.000	5650.000	5730.000	PASS
	Ant2	5690	79.840	5650.160	5730.000	PASS
	Ant1	5690_UNII-2C	75	5650.000	5725	PASS
	Ant2	5690_UNII-2C	74.84	5650.160	5725	PASS
	Ant1	5690 UNII-3	5	5725	5730.000	PASS
·	Ant2	5690_UNII-3	5	5725	5730.000	PASS
	Ant1	5775	80.480	5734.840	5815.320	PASS
	Ant2	5775	80.000	5735.160	5815.160	PASS
	Ant1	5180	21.480	5169.320	5190.800	PASS
	Ant2	5180	21.520	5169.320	5190.840	PASS
	Ant1	5200	21.560	5188.800	5210.360	PASS
	Ant2	5200	22.240	5188.360	5210.600	PASS
	Ant1	5240	19.880	5230.040	5249.920	PASS
	Ant2	5240	19.760	5230.120	5249.880	PASS
	Ant1	5260	21.760	5249.040	5270.800	PASS
			22.720	5249.040	5271.760	PASS
		5260				1,100
11AX20MIMO	Ant2	5260 5280				PASS
11AX20MIMO	Ant2 Ant1	5280	21.680	5269.200	5290.880	PASS PASS
11AX20MIMO	Ant2 Ant1 Ant2	5280 5280	21.680 21.920	5269.200 5268.960	5290.880 5290.880	PASS
11AX20MIMO	Ant2 Ant1 Ant2 Ant1	5280 5280 5320	21.680 21.920 22.760	5269.200 5268.960 5308.080	5290.880 5290.880 5330.840	PASS PASS
11AX20MIMO	Ant2 Ant1 Ant2 Ant1 Ant1 Ant2	5280 5280 5320 5320	21.680 21.920 22.760 21.760	5269.200 5268.960 5308.080 5309.040	5290.880 5290.880 5330.840 5330.800	PASS PASS PASS
11AX20MIMO	Ant2 Ant1 Ant2 Ant1	5280 5280 5320	21.680 21.920 22.760	5269.200 5268.960 5308.080	5290.880 5290.880 5330.840	PASS PASS

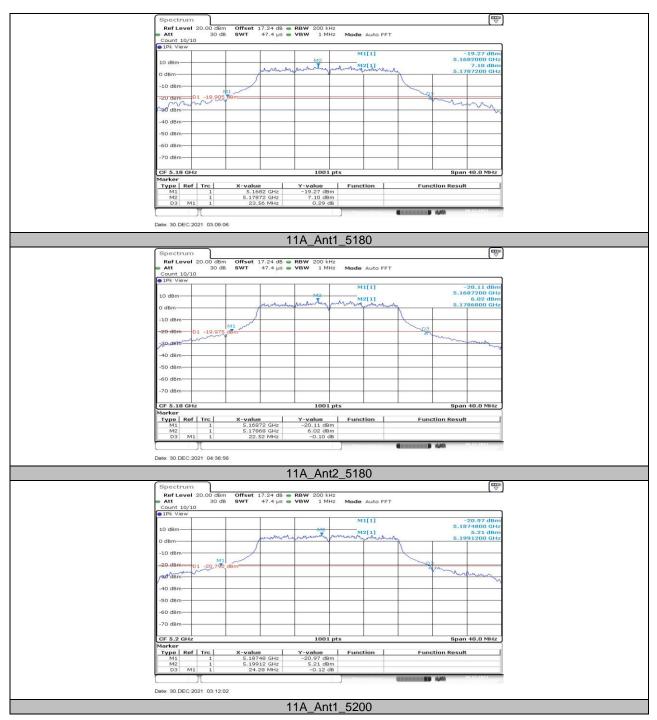


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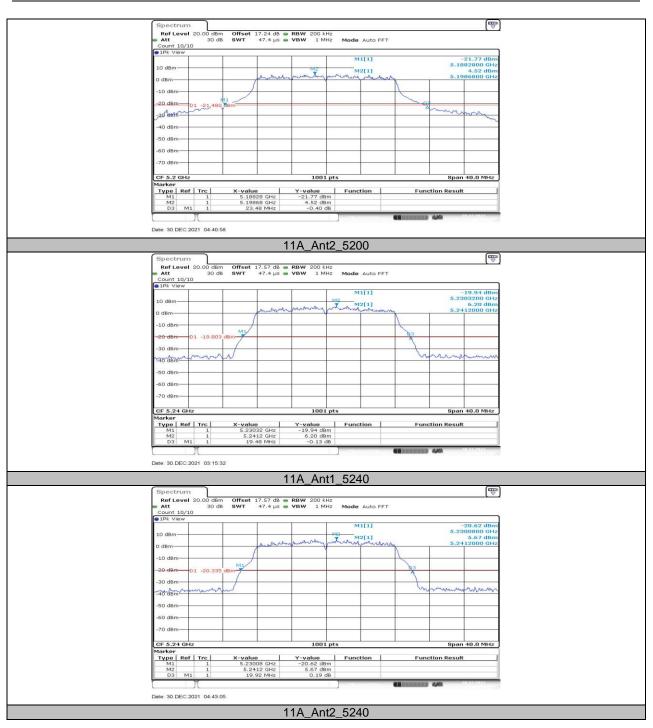
	<b>A</b> (0)		04.440	===== + + =	========	5400
	Ant2	5580	21.440	5569.440	5590.880	PASS
	Ant1	5700	21.040	5689.440	5710.480	PASS
	Ant2	5700	22.680	5688.240	5710.920	PASS
	Ant1	5720	22.120	5708.440	5730.560	PASS
	Ant2	5720	21.080	5709.480	5730.560	PASS
	Ant1	5720_UNII-2C	16.56	5708.440	5725	PASS
	Ant2	5720_UNII-2C	15.52	5709.480	5725	PASS
	Ant1	5720_UNII-3	5.56	5725	5730.560	PASS
	Ant2	5720_UNII-3	5.56	5725	5730.560	PASS
	Ant1	5745	21.240	5734.320	5755.560	PASS
	Ant2	5745	21.200	5734.160	5755.360	PASS
	Ant1	5785	22.120	5774.320	5796.440	PASS
	Ant2	5785	23.440	5773.320	5796.760	PASS
	Ant1	5825	21.840	5814.680	5836.520	PASS
	Ant2	5825	22.480	5813.320	5835.800	PASS
11AX40MIMO	Ant1	5190	39.680	5170.080	5209.760	PASS
	Ant2	5190	39.680	5170.160	5209.840	PASS
	Ant1	5230	39.680	5210.160	5249.840	PASS
	Ant2	5230	39.840	5210.080	5249.920	PASS
	Ant1	5270	39.680	5250.160	5289.840	PASS
	Ant2	5270	39.760	5250.160	5289.920	PASS
	Ant1	5310	39.760	5290.080	5329.840	PASS
	Ant2	5310	39.680	5290.160	5329.840	PASS
	Ant1	5510	39.840	5490.080	5529.920	PASS
	Ant2	5510	39.680	5490.080	5529.760	PASS
	Ant1	5550	39.680	5530.240	5569.920	PASS
	Ant2	5550	39.680	5530.160	5569.840	PASS
	Ant1	5670	39.760	5650.160	5689.920	PASS
	Ant2	5670	39.680	5650.160	5689.840	PASS
	Ant1	5710	39.760	5690.080	5729.840	PASS
	Ant2	5710	39.760	5690.080	5729.840	PASS
	Ant1	5710_UNII-2C	34.92	5690.080	5725	PASS
	Ant2	5710_UNII-2C	34.92	5690.080	5725	PASS
	Ant1	5710_UNII-3	4.84	5725	5729.840	PASS
	Ant2	5710_UNII-3	4.84	5725	5729.840	PASS
	Ant1	5755	39.760	5735.080	5774.840	PASS
	Ant2	5755	39.600	5735.240	5774.840	PASS
	Ant1	5795	39.840	5775.080	5814.920	PASS
	Ant2	5795	39.840	5775.160	5815.000	PASS
	Ant1	5210	80.480	5169.840	5250.320	PASS
11AX80MIMO	Ant2	5210	80.640	5169.680	5250.320	PASS
	Ant1	5290	80.480	5249.840	5330.320	PASS
	Ant2	5290	80.640	5249.840	5330.480	PASS
	Ant1	5530	80.480	5489.840	5570.320	PASS
	Ant2	5530	80.800	5489.680	5570.480	PASS
	Ant1	5610	80.800	5569.520	5650.320	PASS
	Ant2	5610	80.960	5569.520	5650.480	PASS
	Ant1	5690	80.800	5649.680	5730.480	PASS
	Ant2	5690	80.640	5649.680	5730.320	PASS
	Ant1	5690_UNII-2C	75.32	5649.680	5725	PASS
	Ant2	5690_UNII-2C	75.32	5649.680	5725	PASS
	/ 1112					
	Ant1	5690_UNII-3	5.48	5725	5730.480	PASS
		5690_UNII-3 5690_UNII-3	5.48 5.32	5725 5725	5730.480 5730.320	PASS PASS
	Ant1					



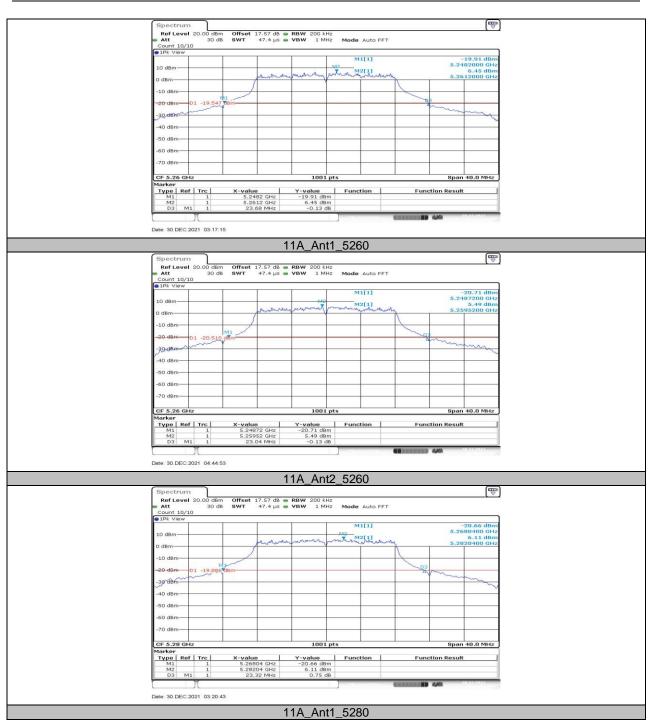
# 12.1.2. Test Graphs



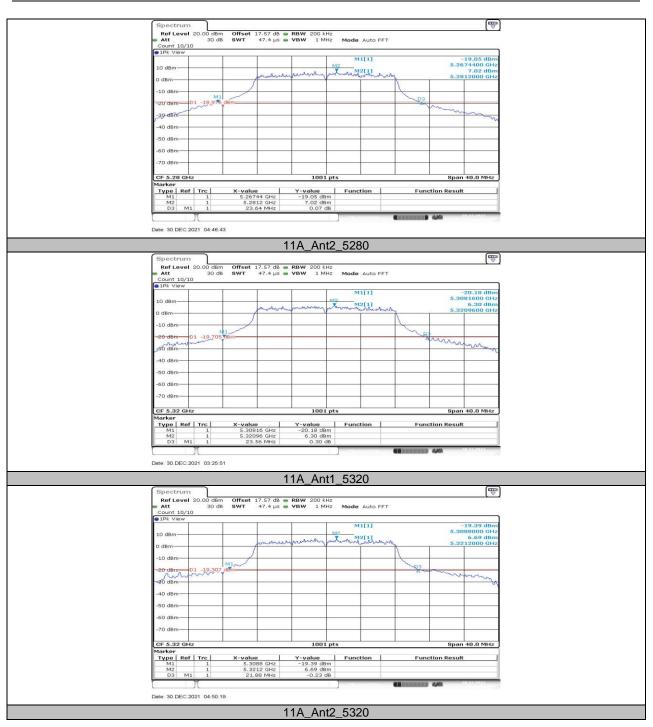




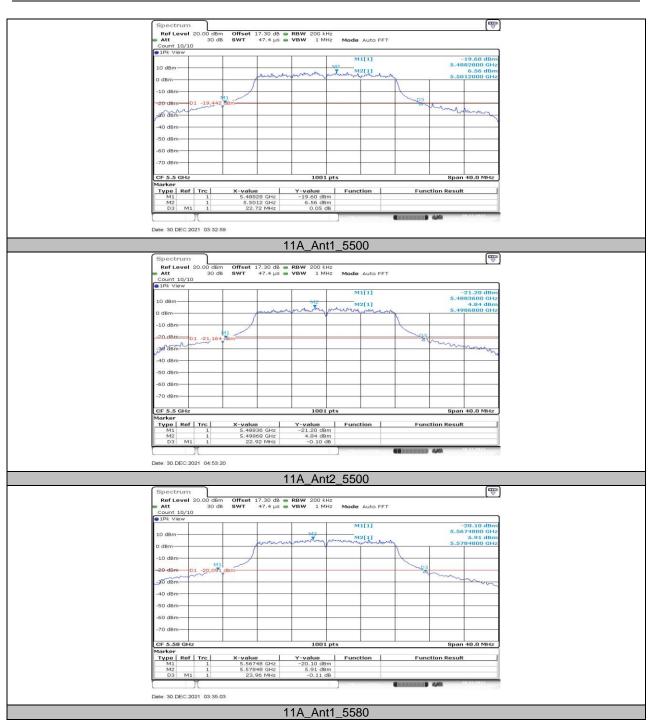




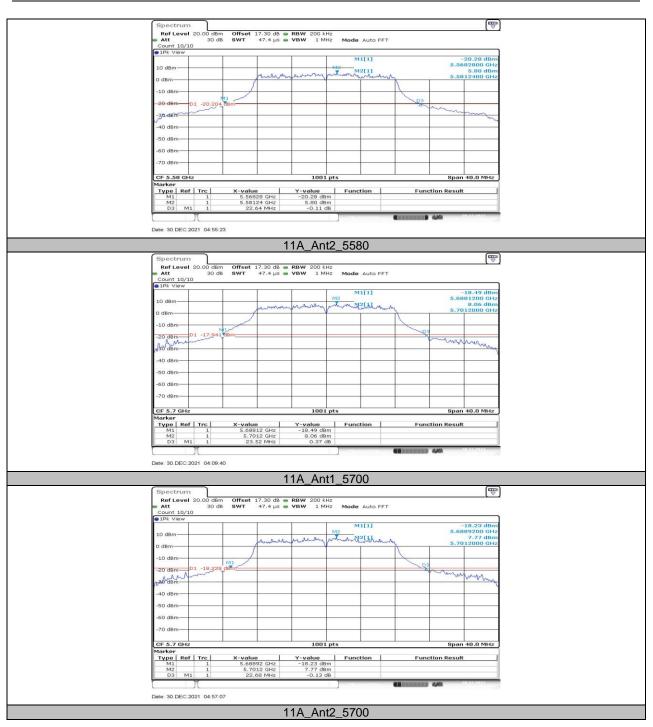




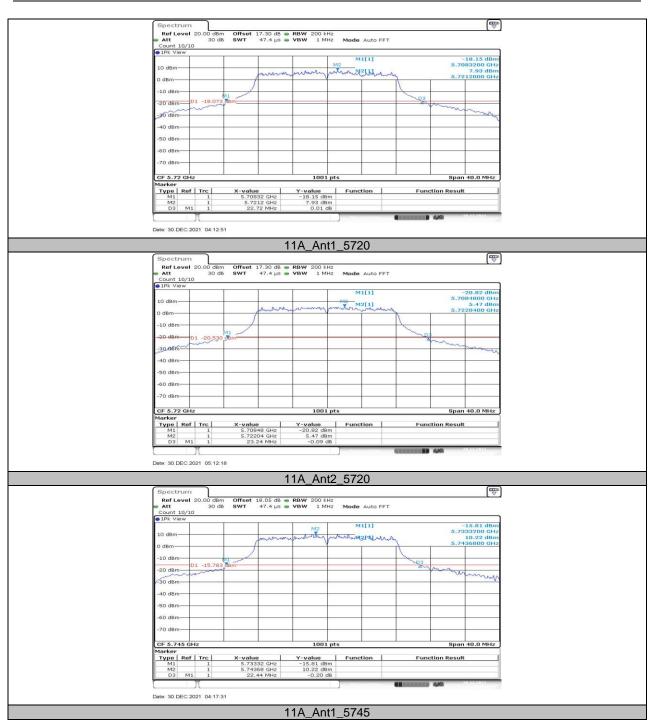




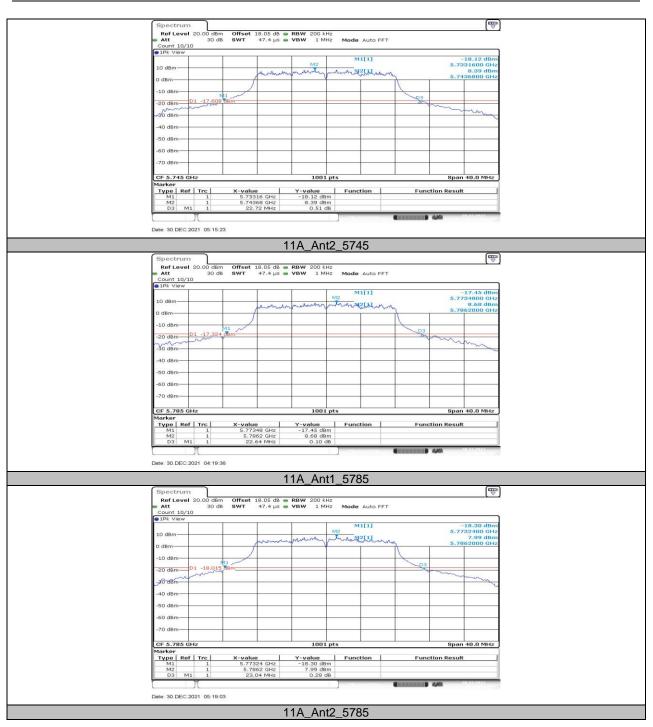




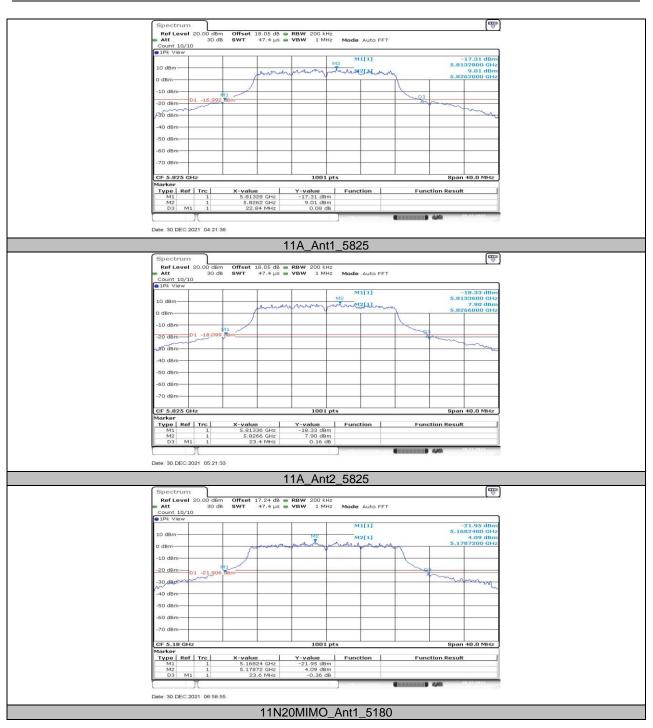




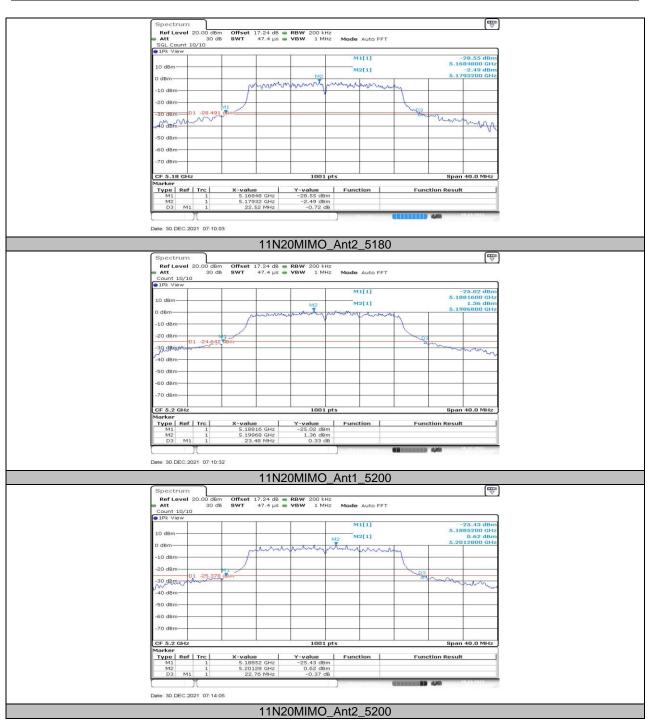






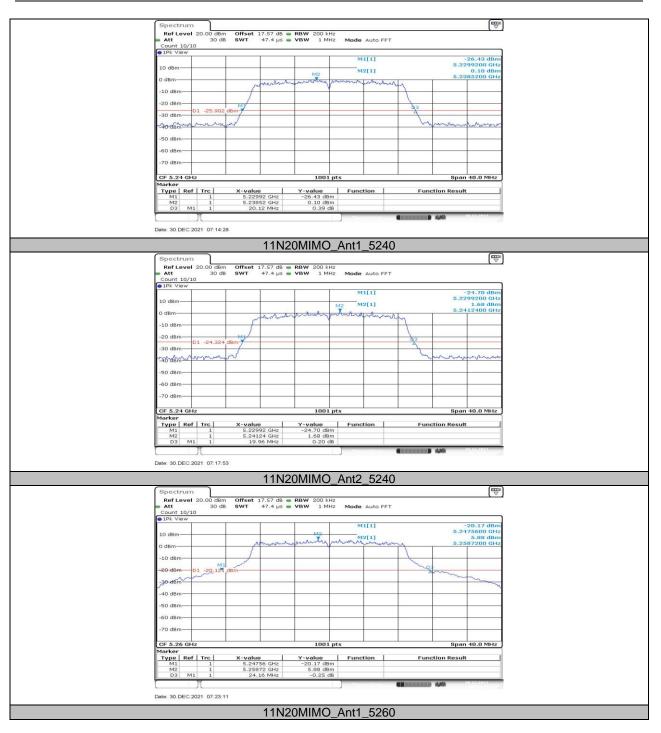




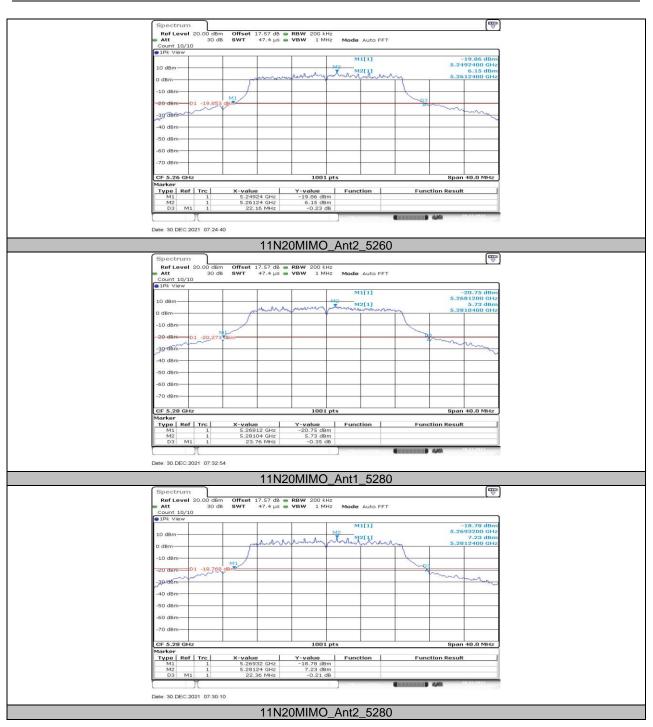




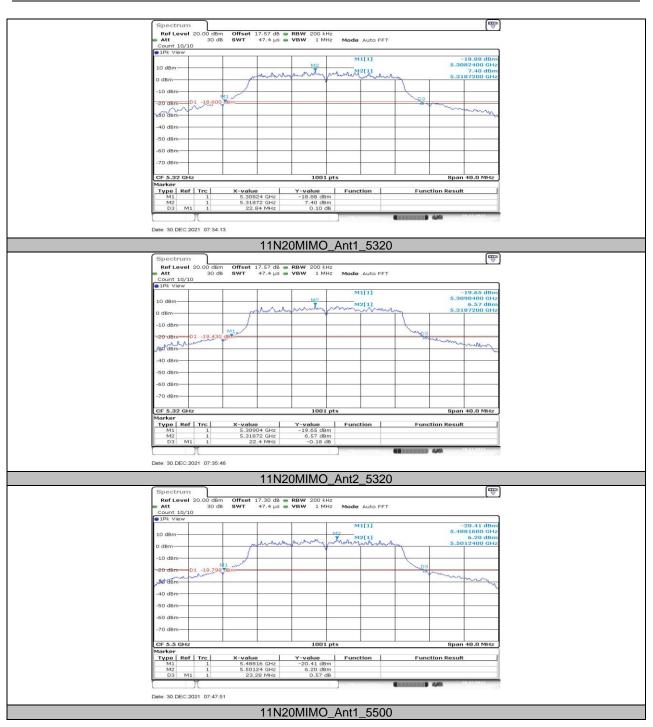
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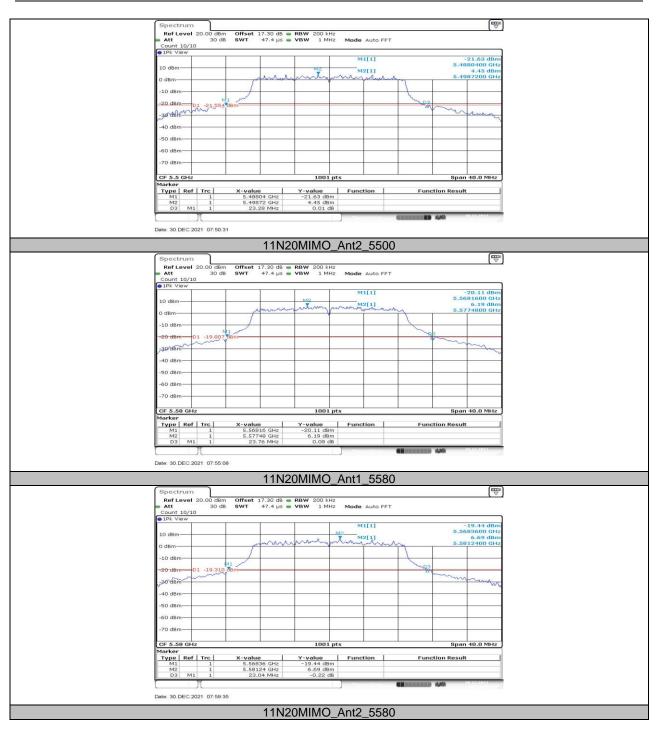








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