2. Maximum Conducted Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.407 (a)

Test Method: KDB 789033 D02 II E

Limit:

Frequency band(MHz)	Limit
5150-5250	≤1W(30dBm) for master device
	≤250mW(24dBm) for client device
5250-5350	≤250mW(24dBm) for client device or 11dBm+10logB*
5470-5725	≤250mW(24dBm) for client device or 11dBm+10logB*
5725-5850	≤1W(30dBm)
Remark:	* Where B is the 26dB emission bandwidth in MHz. The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Test Procedure:

Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

(1) Set RBW = 1 MHz.

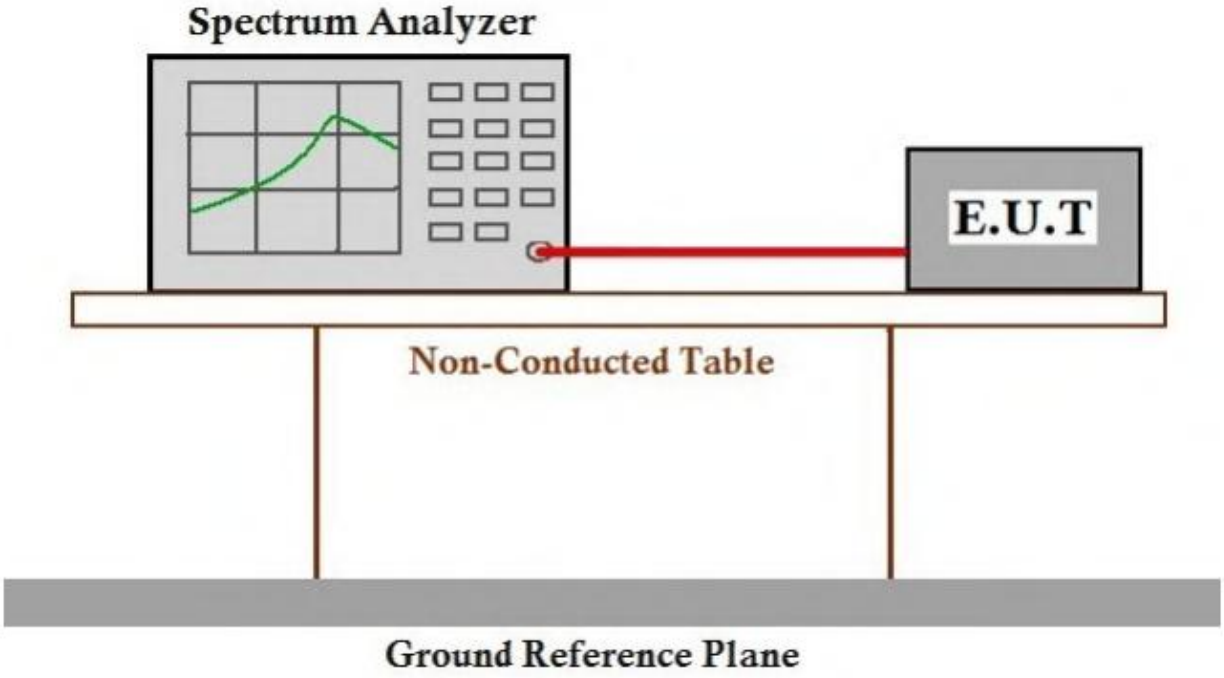
(2) Set VBW ≥ 3 MHz.

(3) Detector = power average

(4) Sweep time = auto.

(5) Add duty cycle to the measured average power.

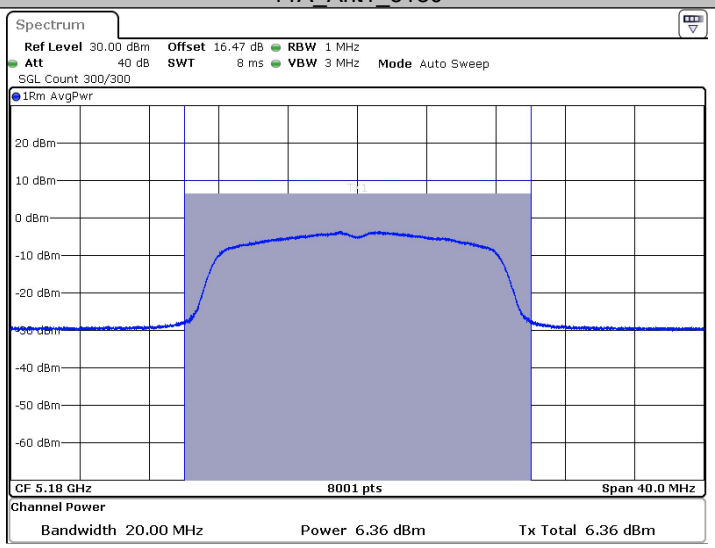
Test Setup Diagram



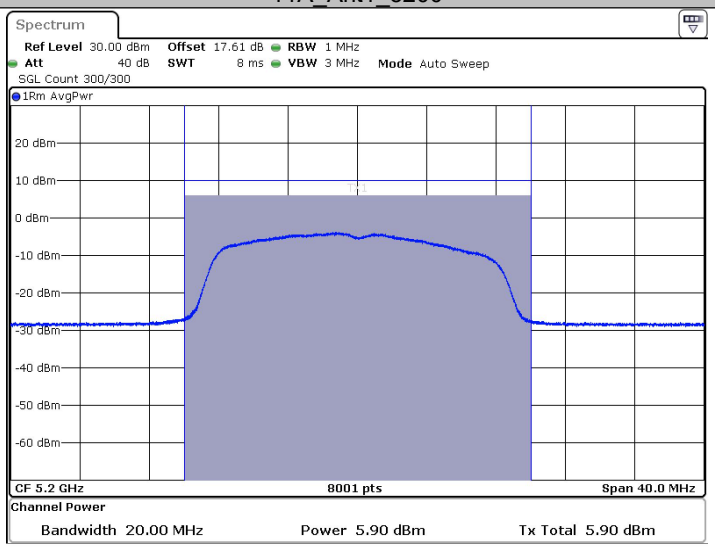
Measurement Data

Test Mode	Antenna	Freq(MHz)	Channel Powert [dBm]	DC Factor [dBm]	Result [dBm]	Limit [dBm]	Verdict
11A	Ant1	5180	5.52	0.84	**6.36**	≤23.98	PASS
		5200	3.92	1.98	5.90	≤23.98	PASS
		5240	3.02	0.66	3.68	≤23.98	PASS
		5745	0.03	0.98	1.01	≤30.00	PASS
		5785	2.62	0.61	3.23	≤30.00	PASS
		5825	-1.75	0.63	-1.12	≤30.00	PASS
11N20SISO	Ant1	5180	4.06	1.75	5.81	≤23.98	PASS
		5200	4.08	0.65	4.73	≤23.98	PASS
		5240	2.21	1.86	4.07	≤23.98	PASS
		5745	1.52	1.92	3.44	≤30.00	PASS
		5785	3.41	0.71	4.12	≤30.00	PASS
		5825	-1.47	0.62	-0.85	≤30.00	PASS

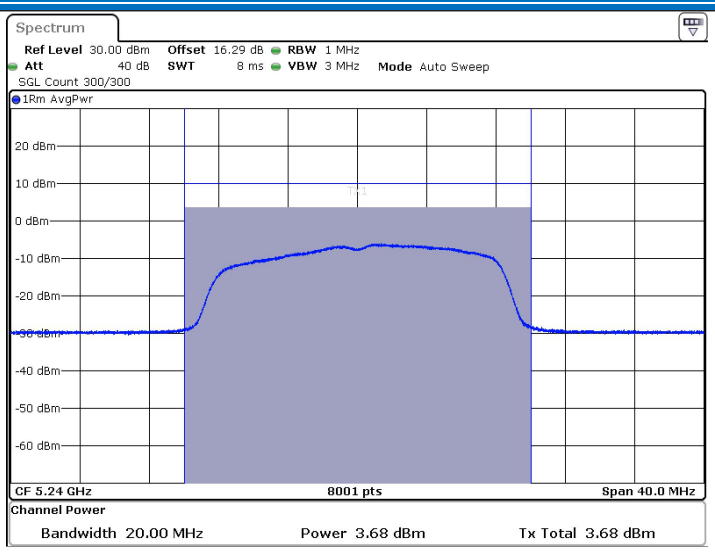
11A_Ant1_5180



11A_Ant1_5200

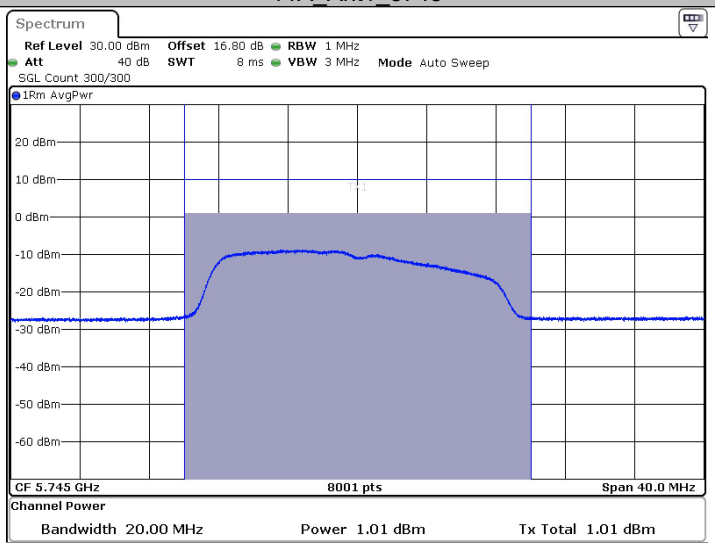


11A_Ant1_5240



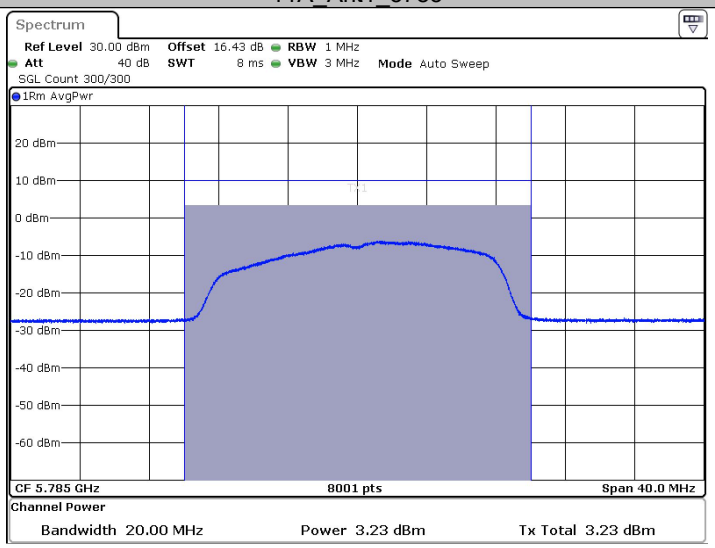
Date: 31.DEC.2024 20:27:00

11A_Ant1_5745



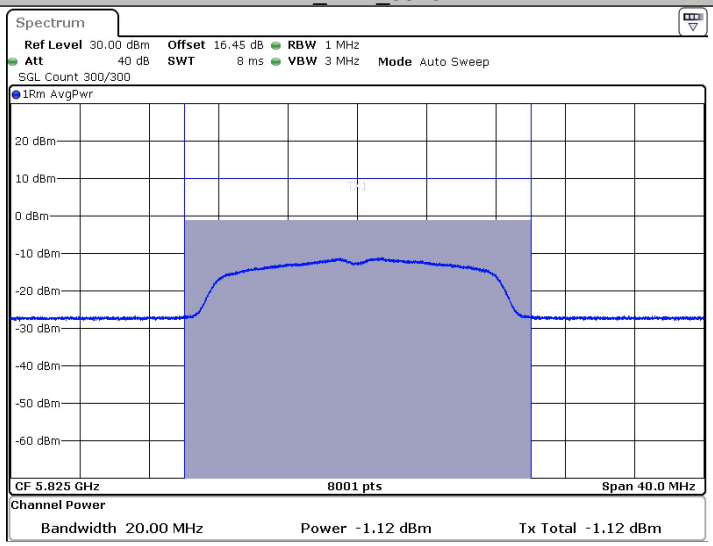
Date: 31.DEC.2024 20:29:06

11A_Ant1_5785

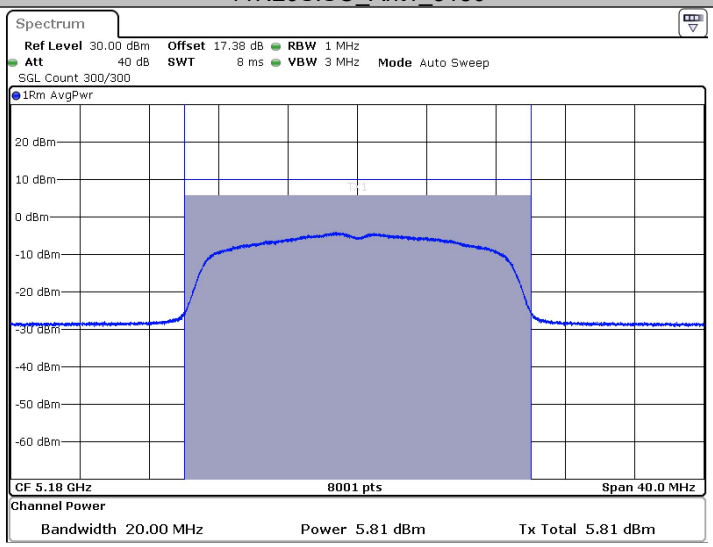


Date: 31.DEC.2024 20:30:59

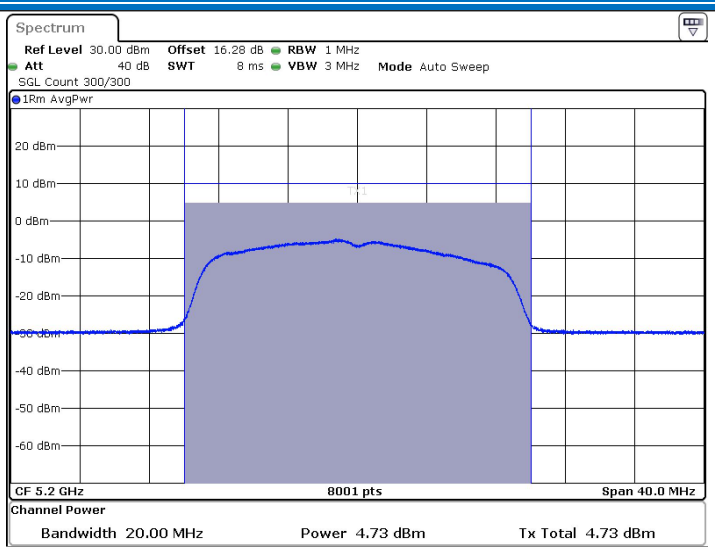
11A_Ant1_5825



11N20SISO_Ant1_5180

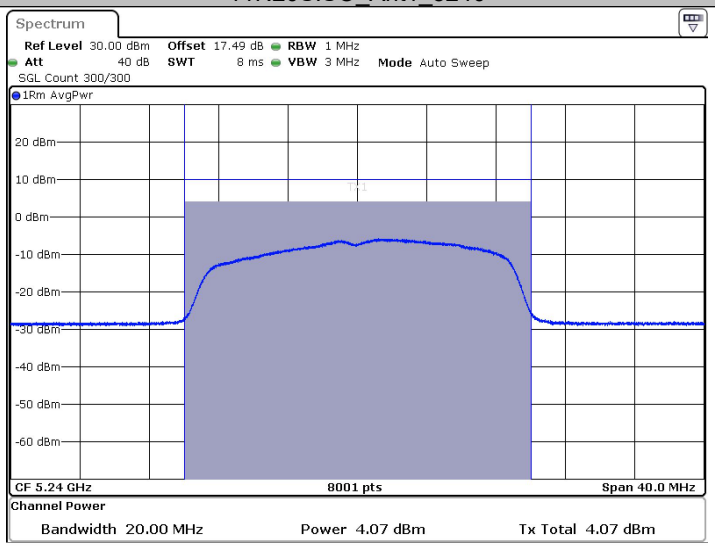


11N20SISO_Ant1_5200



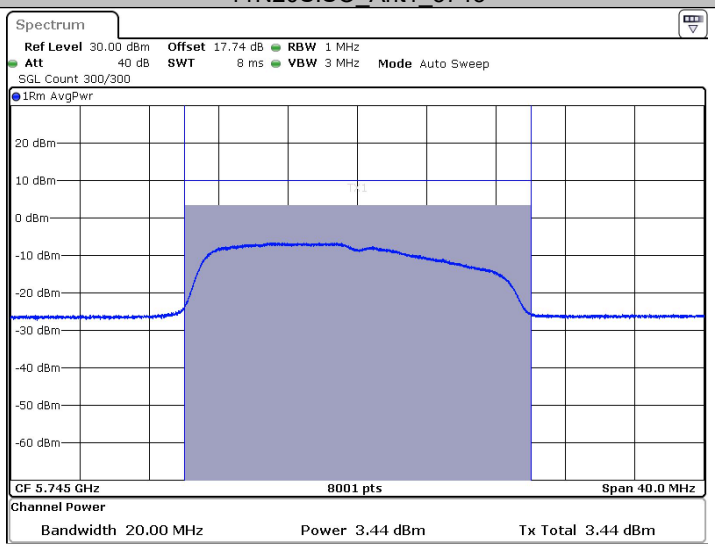
Date: 31.DEC.2024 20:37:27

11N20SISO_Ant1_5240



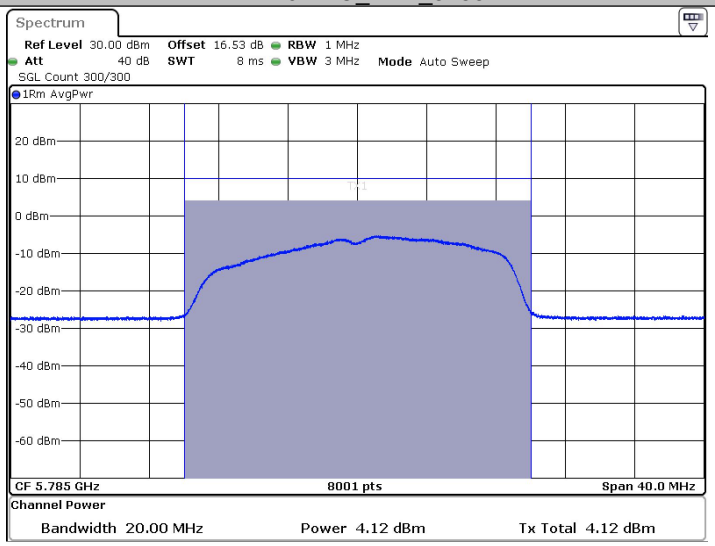
Date: 31.DEC.2024 20:42:43

11N20SISO_Ant1_5745



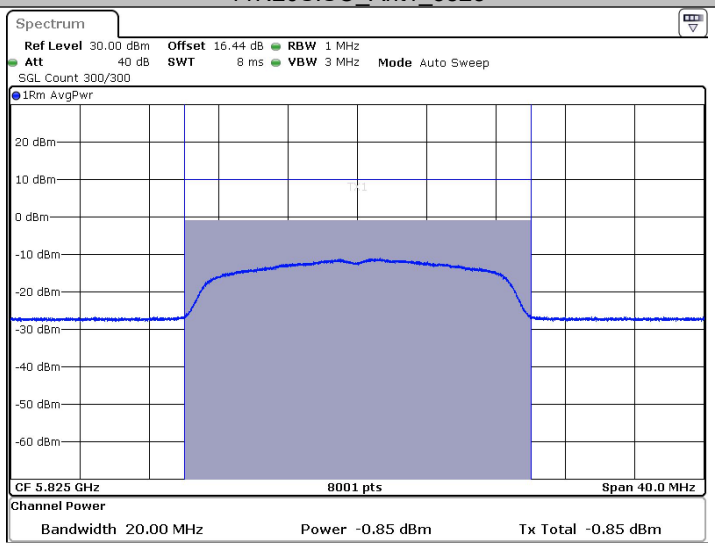
Date: 31.DEC.2024 20:45:33

11N20SISO_Ant1_5785



Date: 31.DEC.2024 20:48:34

11N20SISO_Ant1_5825



Date: 31.DEC.2024 20:52:20

Appendix C): Maximum Power Spectral Density

Test Requirement 47 CFR Part 15, Subpart C 15.407 (a)

Test Method: KDB 789033 D02 II F

Test Procedure:

For 5150-5725MHz:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on operation frequency individually.
3. Set RBW = 1MHz.
4. Set the VBW ≥3*RBW. Detector = Peak. Trace mode = max hold.

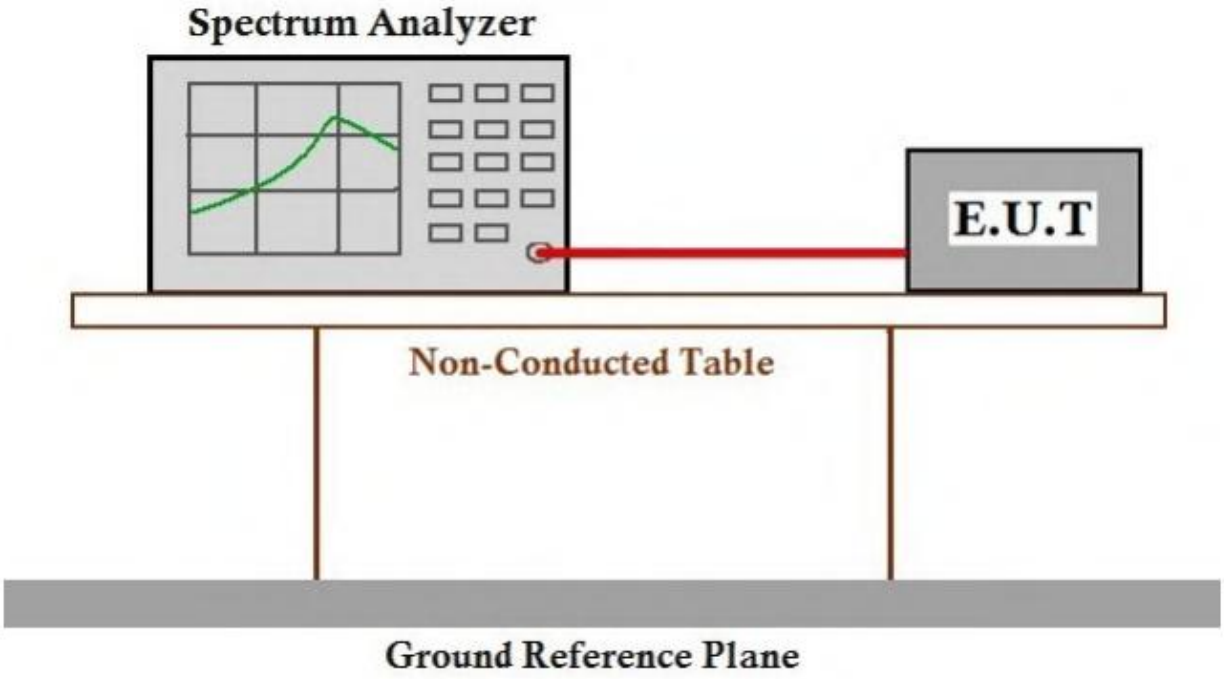
For 5725-5850MHz:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on operation frequency individually.
3. Set RBW = 500KHz.
4. Set the VBW ≥3*RBW. Detector = Peak. Trace mode = max hold.

Limit:

Frequency band(MHz)	Limit
5150-5250	≤17dBm in 1MHz for master device
	≤11dBm in 1MHz for client device
5250-5350	≤11dBm in 1MHz for client device
5470-5725	≤11dBm in 1MHz for client device
5725-5850	≤30dBm in 500 kHz
Remark:	The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test.

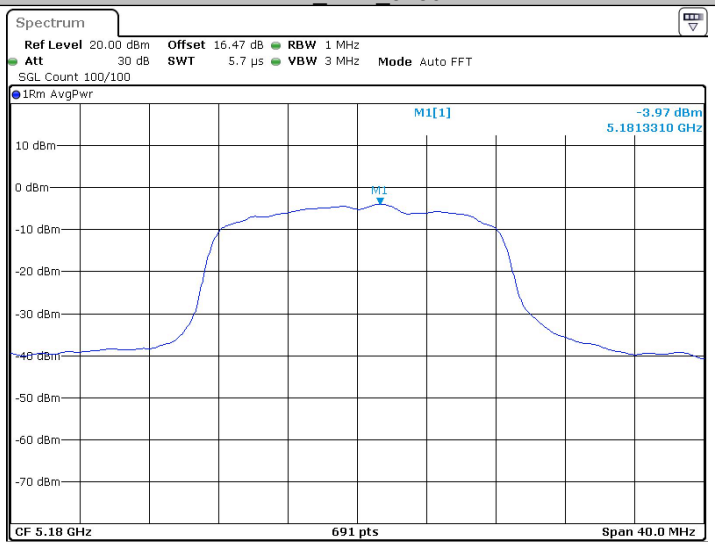
Test Setup Diagram


Spectrum Analyzer
E.U.T
Non-Conducted Table
Ground Reference Plane

Result Table

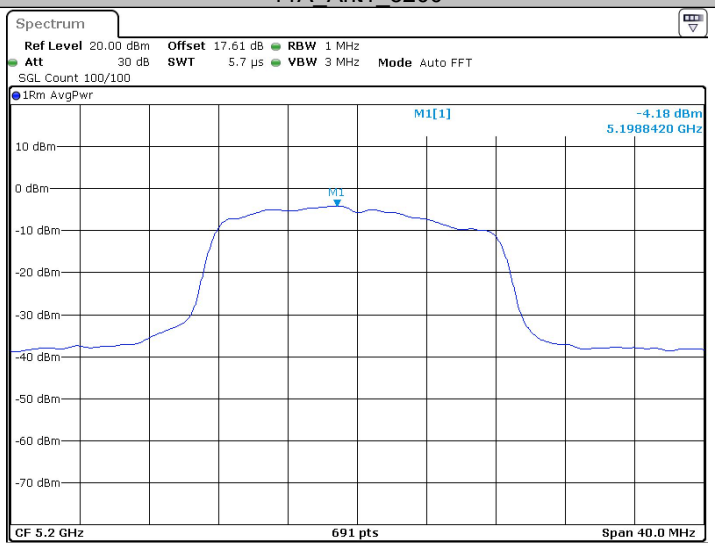
TestMode	Freq(MHz)	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	5180	-3.97	≤11.00	PASS
	5200	-4.18	≤11.00	PASS
	5240	-6.25	≤11.00	PASS
	5745	-11.58	≤30.00	PASS
	5785	-8.20	≤30.00	PASS
	5825	-13.83	≤30.00	PASS
11N20SISO	5180	-3.11	≤11.00	PASS
	5200	-5.72	≤11.00	PASS
	5240	-6.08	≤11.00	PASS
	5745	-9.17	≤30.00	PASS
	5785	-7.97	≤30.00	PASS
	5825	-13.97	≤30.00	PASS

11A_Ant1_5180



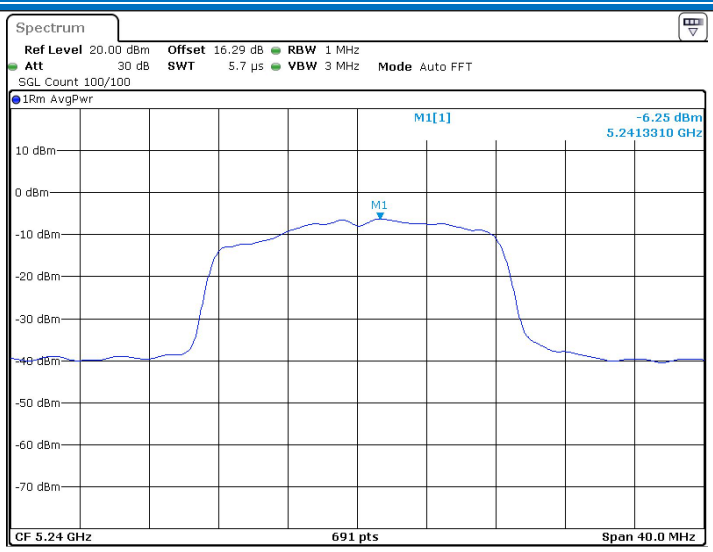
Date: 31.DEC.2024 20:20:13

11A_Ant1_5200



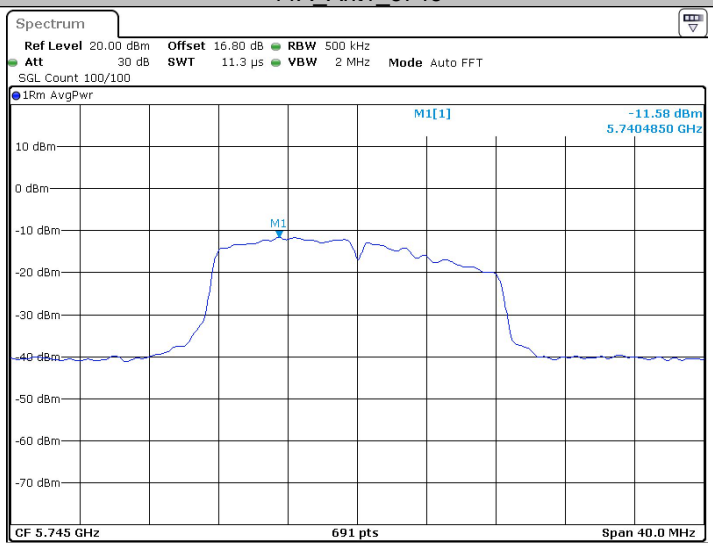
Date: 31.DEC.2024 20:22:48

11A_Ant1_5240



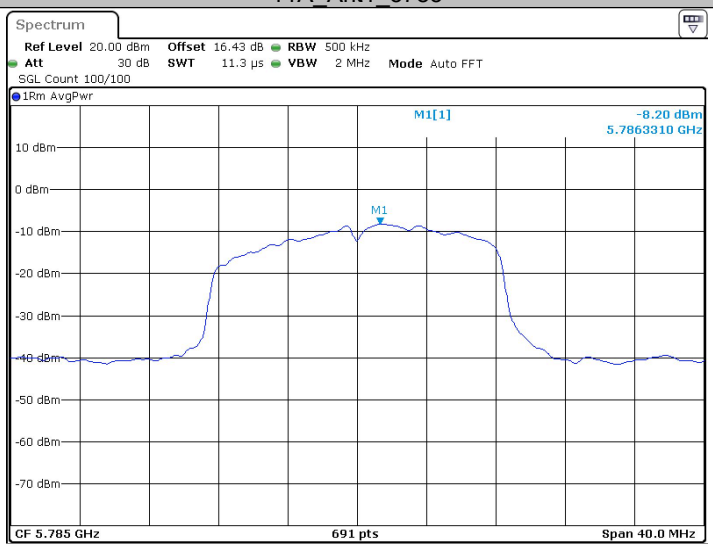
Date: 31.DEC.2024 20:27:06

11A_Ant1_5745



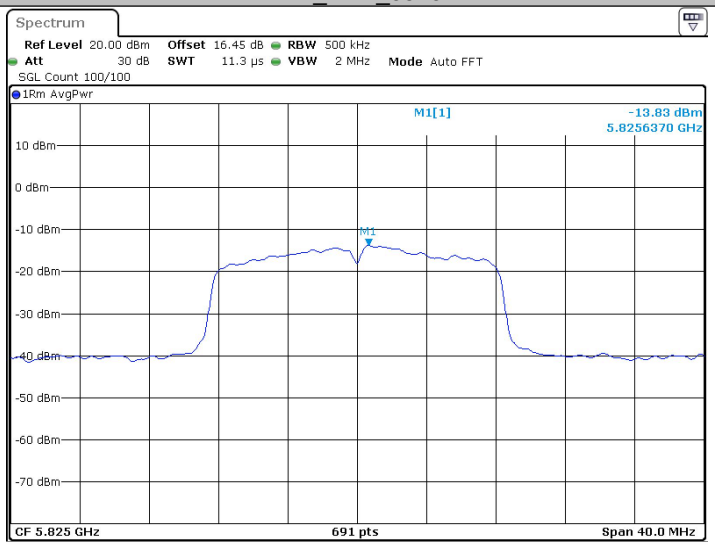
Date: 31.DEC.2024 20:29:12

11A_Ant1_5785



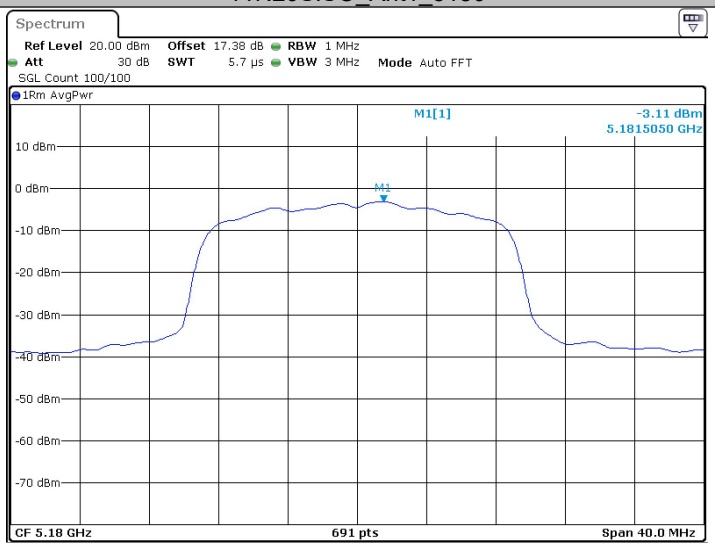
Date: 31.DEC.2024 20:31:06

11A_Ant1_5825



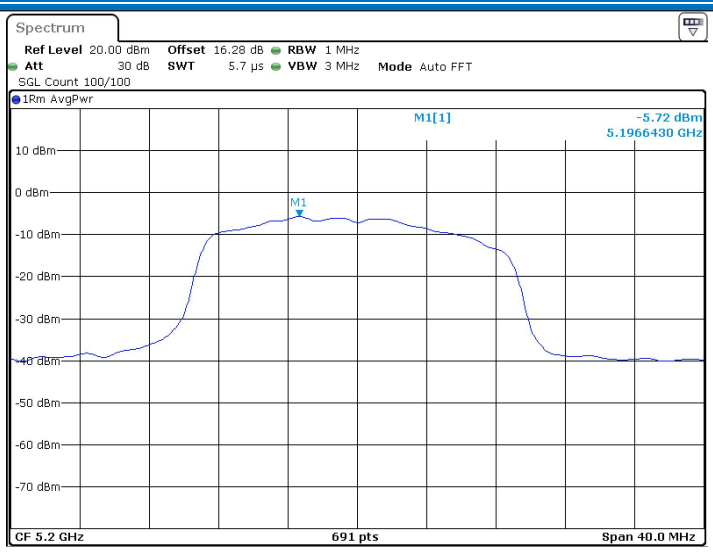
Date: 31.DEC.2024 20:32:21

11N20SISO_Ant1_5180



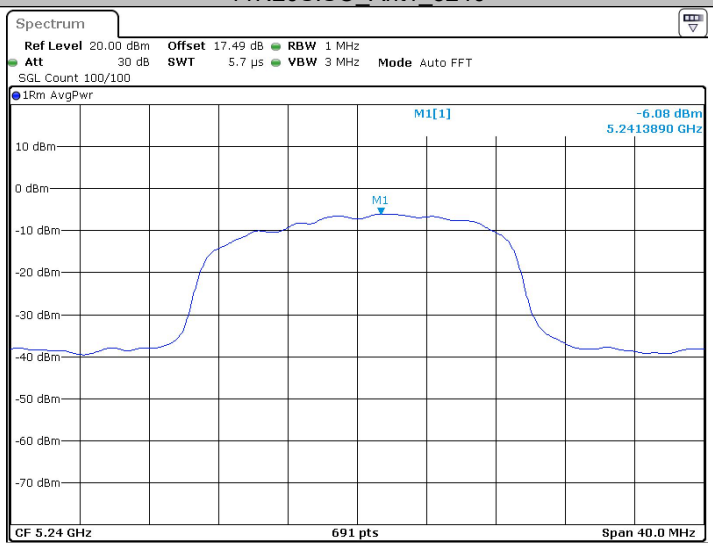
Date: 31.DEC.2024 20:34:26

11N20SISO_Ant1_5200



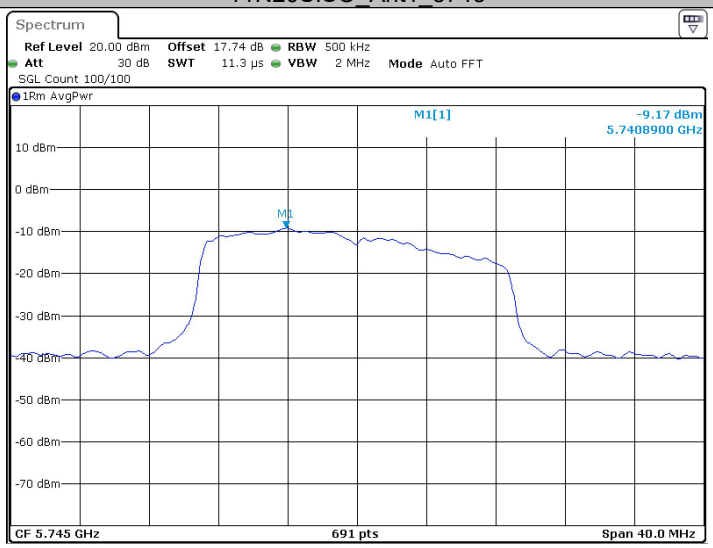
Date: 31.DEC.2024 20:37:33

11N20SISO_Ant1_5240



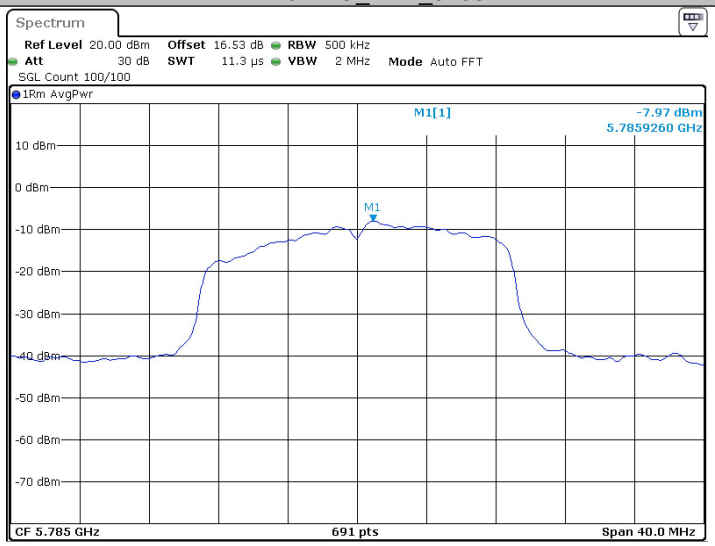
Date: 31.DEC.2024 20:42:49

11N20SISO_Ant1_5745



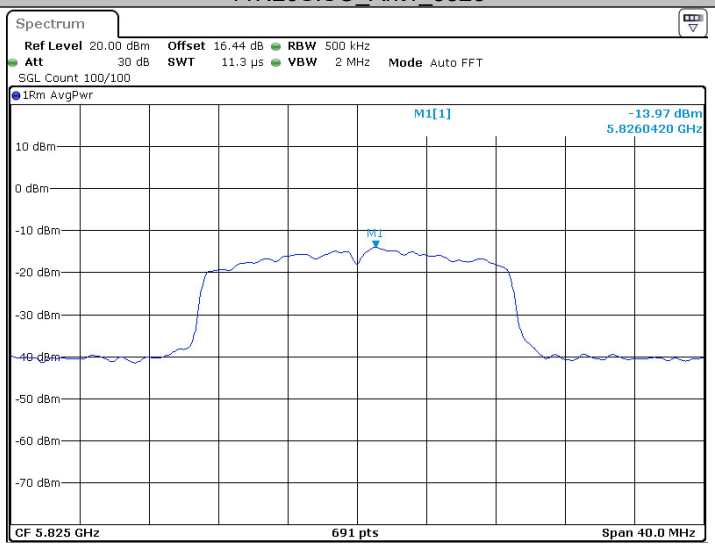
Date: 31.DEC.2024 20:45:39

11N20SISO_Ant1_5785



Date: 31.DEC.2024 20:48:40

11N20SISO_Ant1_5825



Date: 31.DEC.2024 20:52:25

Appendix D): Band Edge Measurements

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.407(b)

Test Method: KDB 789033 D02 II G

Test Procedure:

1. The EUT operates at transmitting mode. The operate channel is tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.

2. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

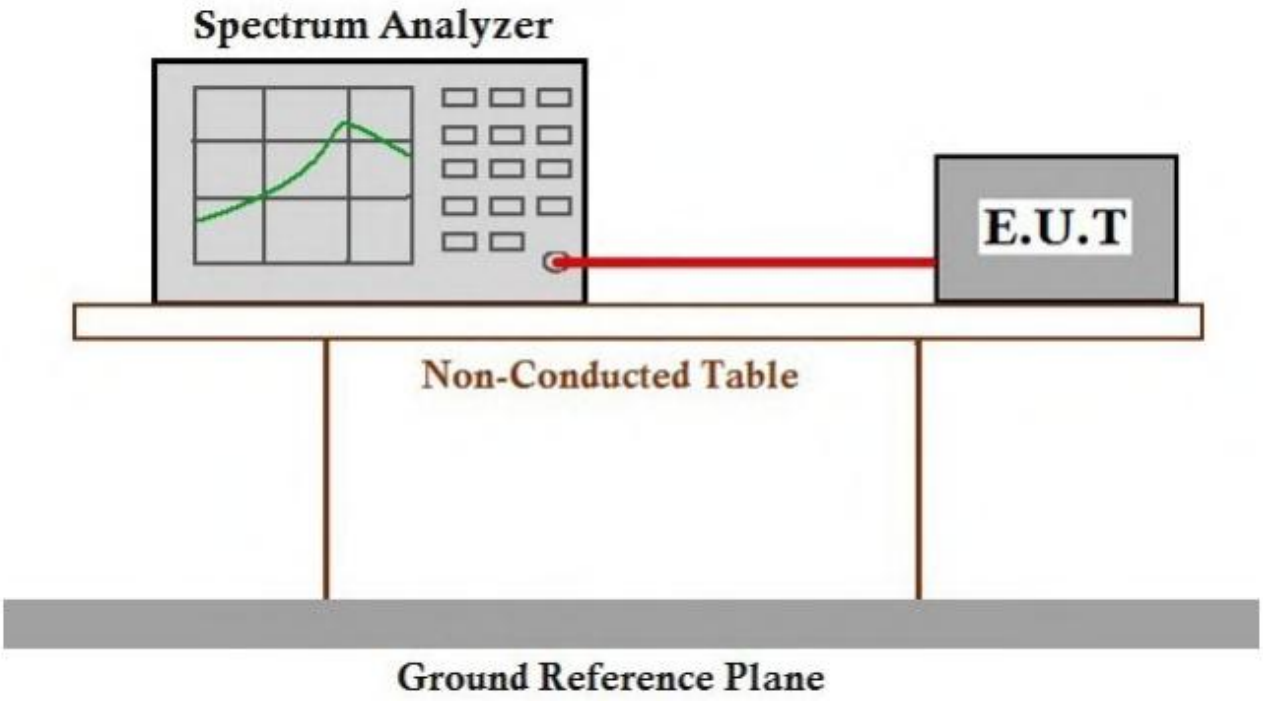
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz ; VBW=1/on time(1KHz) / Sweep=AUTO

Limit:

For transmitters operating in the 5.15-5.25 GHz band:	All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz (68.2dBuV/m).
For transmitters operating in the 5.25-5.35 GHz band:	All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz (68.2dBuV/m).
For transmitters operating in the 5.47-5.725 GHz band:	All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz (68.2dBuV/m).
For transmitters operating in the 5.725-5.85 GHz band:	(i) All emissions shall be limited to a level of −27 dBm/MHz (68.2dBuV/m) at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz (105.2dBuV/m) at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz (110.8dBuV/m) at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz (122.2dBuV/m) at the band edge.

Test Setup Diagram



7.1.1 Test Result B1

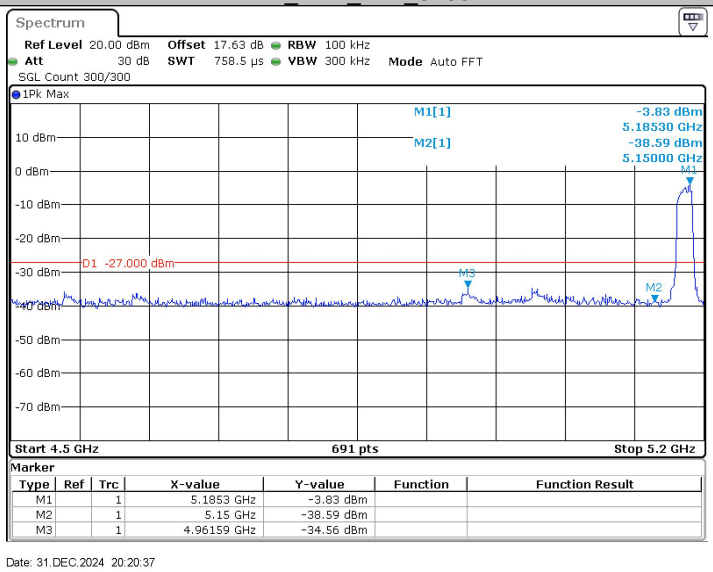
TestMode	ChName	Freq(MHz)	Result[dBm]	Limit[dBm]	Verdict
11A	Low	5180	-34.56	≤-27	PASS
	High	5240	-36.67	≤-27	PASS
11N20SISO	Low	5180	-35	≤-27	PASS
	High	5240	-36.75	≤-27	PASS

7.1.2 Test Result B4

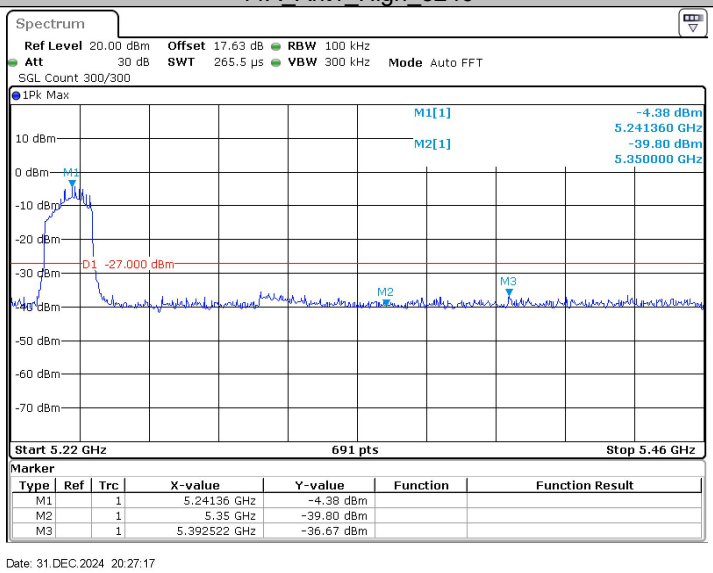
TestMode	ChName	Freq(MHz)	FreqRange [MHz]	Result [dBm]	Limit [dBm]	Verdict
11A	Low	5745	5650~5700	-38.08	≤-26.88	PASS
			5700~5720	-36.68	≤10.51	PASS
			5720~5725	-36.74	≤16.36	PASS
			5760~5650	-36.98	≤-27	PASS
	High	5825	5850~5855	-36.92	≤15.65	PASS
			5855~5875	-34.7	≤10.73	PASS
			5875~5925	-36.44	≤-26.73	PASS
			5925~5935	-35.68	≤-27	PASS
11N20SISO	Low	5745	5650~5700	-38.2	≤-26.88	PASS
			5700~5720	-36.86	≤10.70	PASS
			5720~5725	-36.72	≤17.50	PASS
			5760~5650	-36.78	≤-27	PASS
	High	5825	5850~5855	-37.26	≤15.65	PASS
			5855~5875	-35.62	≤10.46	PASS
			5875~5925	-36.91	≤-26.87	PASS
			5925~5935	-35.16	≤-27	PASS

7.1.3 Test Graphs B1

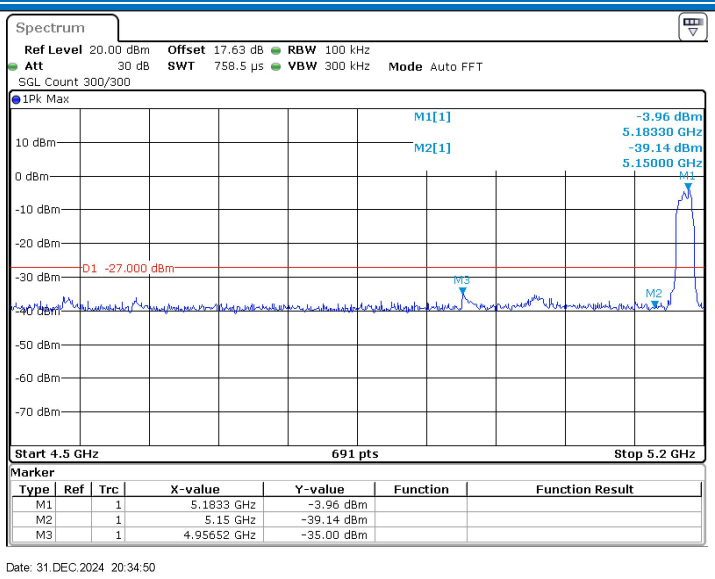
11A_Ant1_Low_5180



11A_Ant1_High_5240



11N20SISO_Ant1_Low_5180

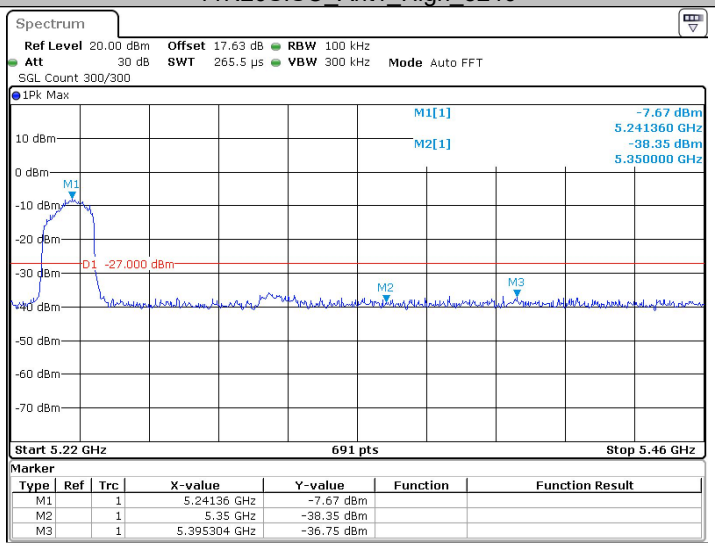


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.1833 GHz	-3.96 dBm		
M2		1	5.15 GHz	-39.14 dBm		
M3		1	4.95652 GHz	-35.00 dBm		

Date: 31.DEC.2024 20:34:50

11N20SISO_Ant1_High_5240



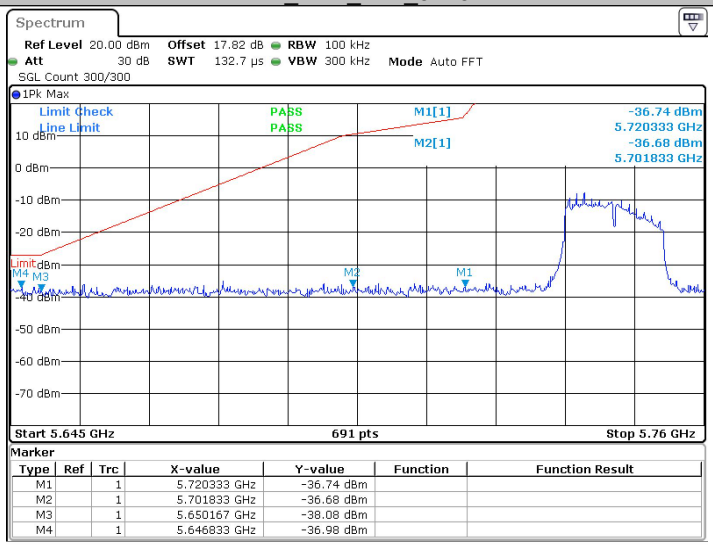
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.24136 GHz	-7.67 dBm		
M2		1	5.35 GHz	-38.35 dBm		
M3		1	5.395304 GHz	-36.75 dBm		

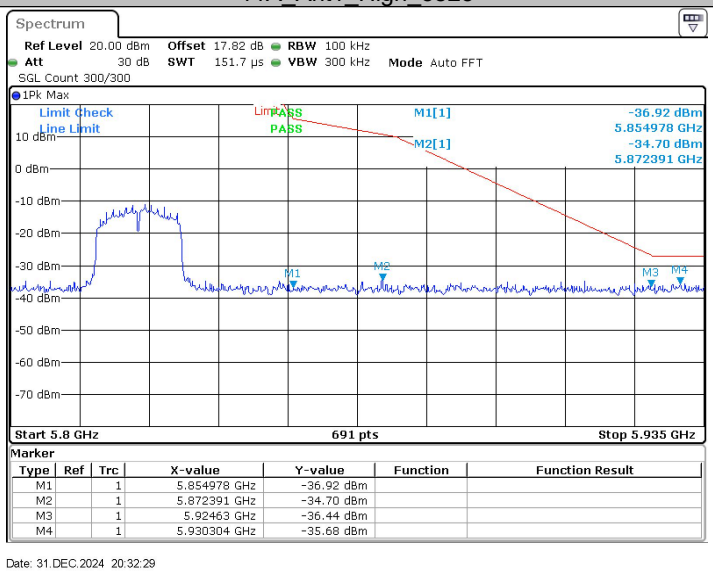
Date: 31.DEC.2024 20:43:00

7.1.4 Test Graphs B4

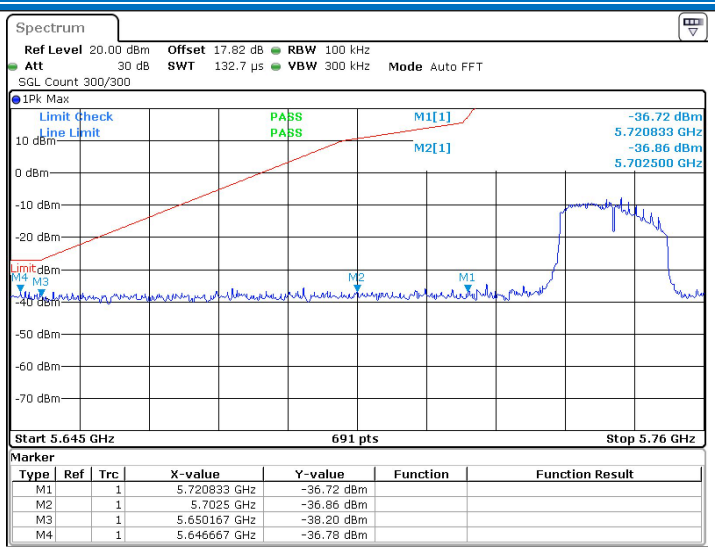
11A_Ant1_Low_5745



11A_Ant1_High_5825

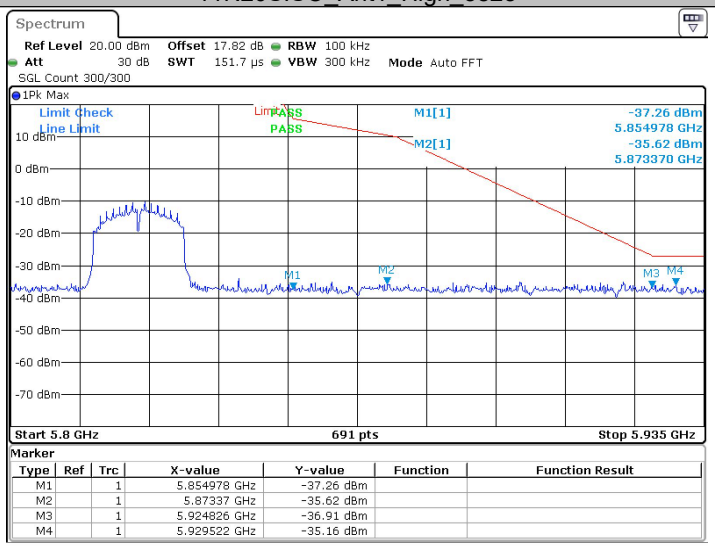


11N20SISO_Ant1_Low_5745



Date: 31.DEC.2024 20:45:47

11N20SISO_Ant1_High_5825



Date: 31.DEC.2024 20:52:34

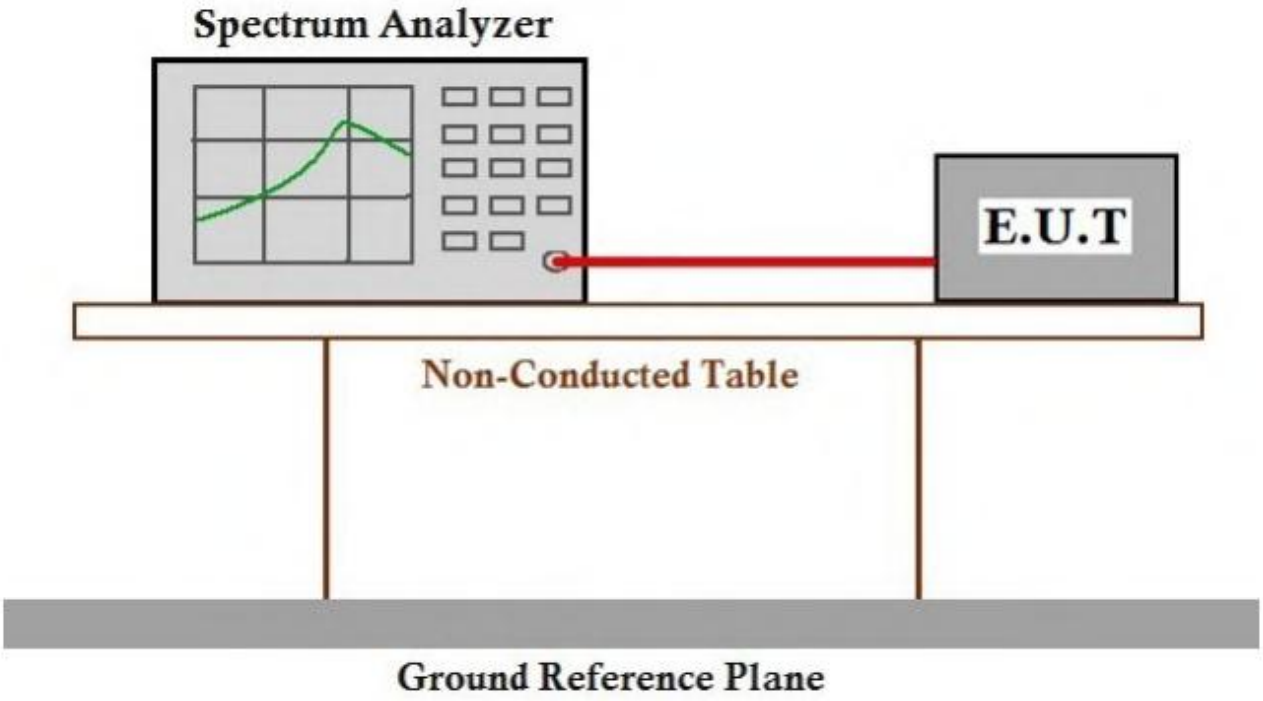
Appendix E): Frequency Stability

Test Requirement 47 CFR Part 15, Subpart C 15.407 (g)

Test Method: ANSI C63.10 (2013) Section 6.8

Limit:The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

Test Setup Diagram



Measurement Data

Frequency Stability Versus Temp.			
Operating Frequency: 5240 MHz			
Temp (℃)	Volta ge	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5240.03	5.72519
40		5240.02	3.81679
30		5240.01	1.90840
20		5240.02	3.81679
10		5240.02	3.81679
0		5240.01	1.90840
-10		5240.02	3.81679
-20		5240.03	5.72519

Frequency Stability Versus Temp.			
Operating Frequency: 5825 MHz			
Temp.	Volta ge	Measured Frequency (MHz)	Frequency Drift (ppm)
TN	VL	5825.00	0.00000
	VN	5825.03	5.15021
	VH	5825.02	3.43347

Note: All the modulation and channels had been tested, but only the worst data recorded in the report.

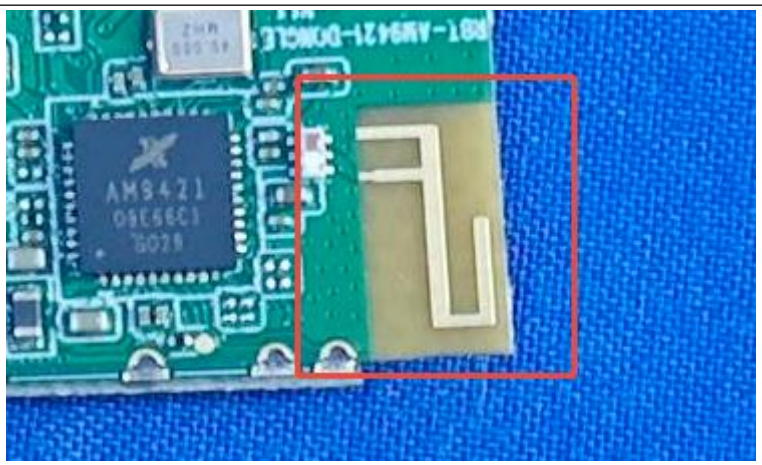
Appendix F): Antenna Requirement

15.203 requirement:

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, 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.

15.407(a)(1) (2) requirement:

The conducted output power limit specified in paragraph (a) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (a) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power and the peak power spectral density shall be reduced by the by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:	

The antenna is PCB antenna with ipex connector.The best case gain of the 5G WiFi antenna is 1.76dBi@5GHz: Wi-Fi: U-NII-1, 2.03dBi@5GHz: Wi-Fi: U-NII-3

Appendix G): Operation in the absence of information to the transmit

15.407(c) requirement: 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 signal ling 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.
Operation in the absence of information to the transmit
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 signal of ASK message transmitting from remote device and verify whether it shall resend or discontinue transmission. (manufacturer declare)

Appendix H): AC Power Line Conducted Emission

Test Procedure:	Test frequency range :150KHz-30MHz 1)The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3)The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.
Limit:	

Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

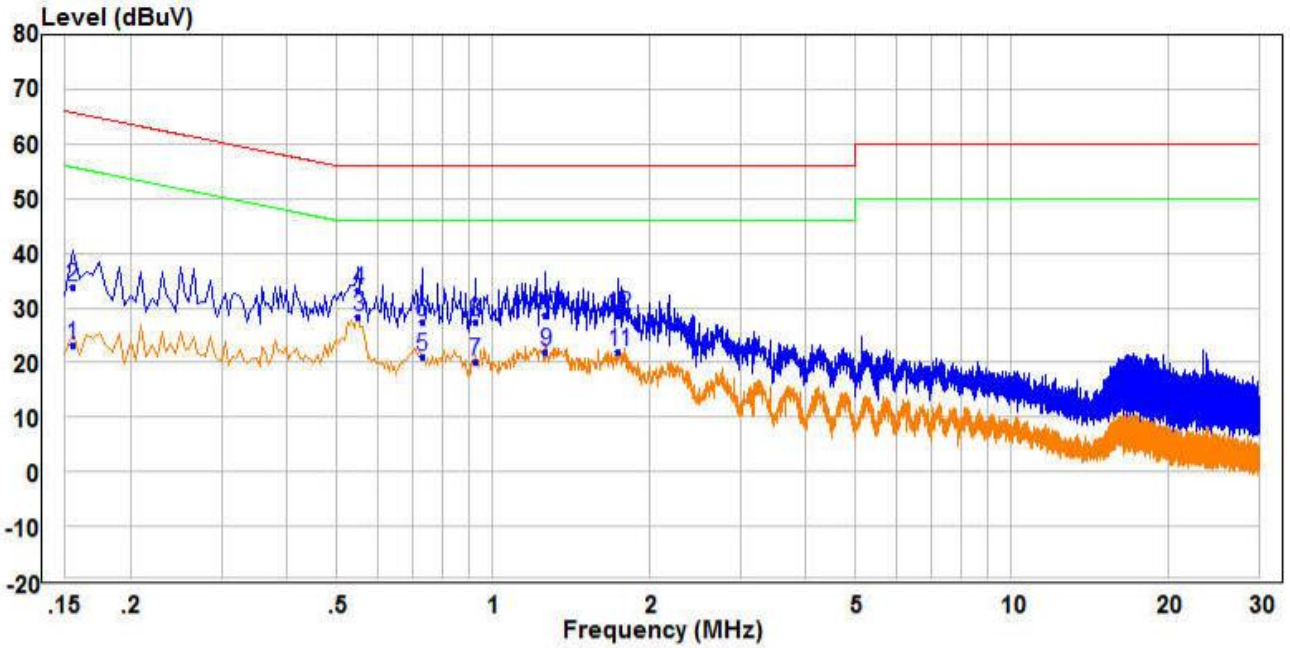
* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.
NOTE : The lower limit is applicable at the transition frequency

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

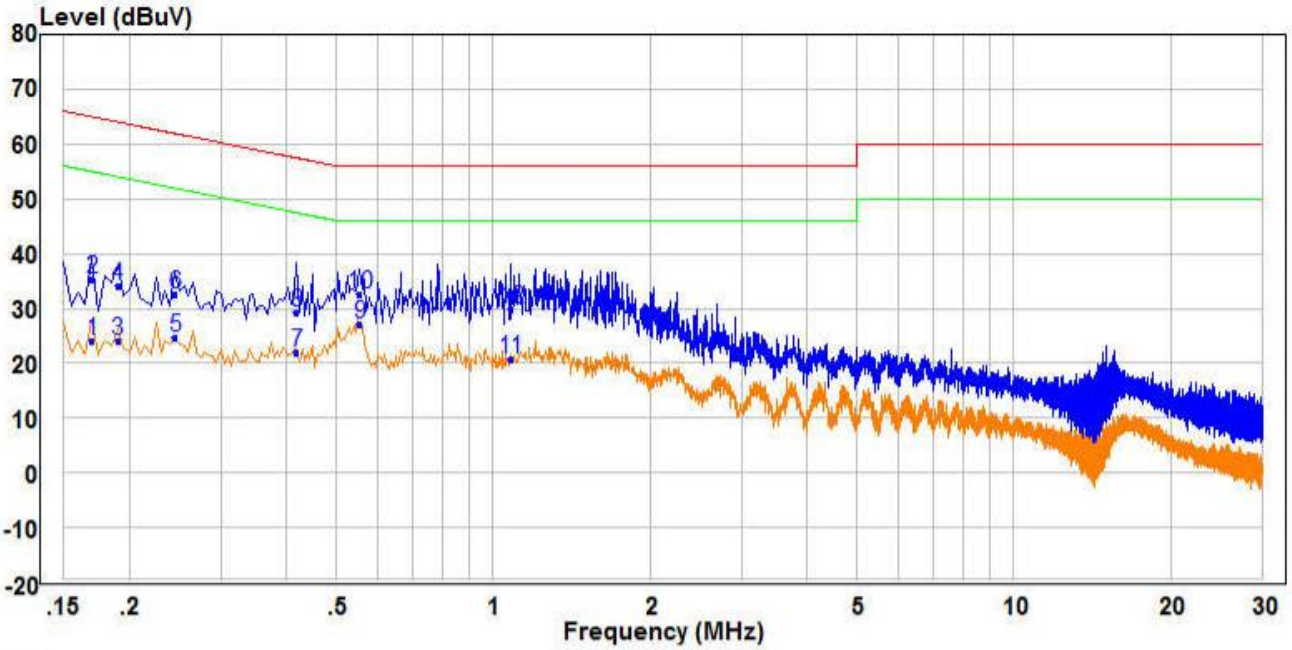
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:



		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.155	13.34	9.69	23.03	55.73	-32.70	Average	Line
2		0.155	23.98	9.69	33.67	65.73	-32.06	QP	Line
3	PP	0.550	18.47	9.75	28.22	46.00	-17.78	Average	Line
4	QP	0.550	23.52	9.75	33.27	56.00	-22.73	QP	Line
5		0.730	11.02	9.88	20.90	46.00	-25.10	Average	Line
6		0.730	17.64	9.88	27.52	56.00	-28.48	QP	Line
7		0.925	10.42	9.75	20.17	46.00	-25.83	Average	Line
8		0.925	17.54	9.75	27.29	56.00	-28.71	QP	Line
9		1.265	11.62	10.35	21.97	46.00	-24.03	Average	Line
10		1.265	18.36	10.35	28.71	56.00	-27.29	QP	Line
11		1.750	10.76	11.27	22.03	46.00	-23.97	Average	Line
12		1.750	17.44	11.27	28.71	56.00	-27.29	QP	Line

Neutral line:



		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.170	14.40	9.66	24.06	54.96	-30.90	Average	Neutral
2		0.170	25.53	9.66	35.19	64.96	-29.77	QP	Neutral
3		0.190	14.34	9.62	23.96	54.04	-30.08	Average	Neutral
4		0.190	24.47	9.62	34.09	64.04	-29.95	QP	Neutral
5		0.245	15.01	9.54	24.55	51.92	-27.37	Average	Neutral
6		0.245	23.11	9.54	32.65	61.92	-29.27	QP	Neutral
7		0.420	12.39	9.62	22.01	47.45	-25.44	Average	Neutral
8		0.420	19.59	9.62	29.21	57.45	-28.24	QP	Neutral
9	PP	0.555	17.40	9.76	27.16	46.00	-18.84	Average	Neutral
10	QP	0.555	22.93	9.76	32.69	56.00	-23.31	QP	Neutral
11		1.080	11.06	9.70	20.76	46.00	-25.24	Average	Neutral
12		1.080	20.13	9.70	29.83	56.00	-26.17	QP	Neutral

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. The 6Mbps of rate of 802.11A_5240 is the worst case, only the worst data recorded in the report.

Appendix I): Restricted bands around fundamental frequency (Radiated Emission)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

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