11AC20SISO_Ant1_5260

11AC20SISO_Ant1_5280

11AC20SISO_Ant1_5320

11AC20SISO_Ant1_5500

11AC20SISO_Ant1_5580

11AC20SISO_Ant1_5700

11AC40SISO_Ant1_5270

11AC40SISO_Ant1_5310

11AC40SISO_Ant1_5510

11AC40SISO_Ant1_5550

11AC40SISO_Ant1_5670

11AX20SISO_Ant1_5260

11AX20SISO_Ant1_5280

11AX20SISO_Ant1_5320

11AX20SISO_Ant1_5500

11AX20SISO_Ant1_5580

11AX20SISO_Ant1_5700

11AX40SISO_Ant1_5270

11AX40SISO_Ant1_5310

11AX40SISO_Ant1_5510

11AX40SISO_Ant1_5550

11AX40SISO_Ant1_5670

For U-NII-2C straddle channel:

11A_Ant1_5720

11N20SISO_Ant1_5720

11N40SISO_Ant1_5710

11AC20SISO_Ant1_5720

11AC40SISO_Ant1_5710

11AX20SISO_Ant1_5720

11AX40SISO_Ant1_5710

10. Maximum Output Power

10.1. Block Diagram of Test Setup

Same as section 8.1

10.2. Limits

FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
Conducted Output Power	☐ Outdoor Access Point: 1 W (30 dBm)	5150-5250
	☐ Indoor Access Point: 1 W (30 dBm)	
	☐ Fixed Point-To-Point Access Points: 1 W (30 dBm)	
	☒ Client Devices: 250 mW (24 dBm)	
	Shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.	5250-5350 5470-5725
	Shall not exceed 1 Watt (30 dBm).	5725-5850

Note: The above limits are based upon the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

10.3. Test Procedure

(1) Connect each EUT's antenna output to power meter by RF cable and attenuator

(2) Add each antenna port's results to get the total output power of EUT.

10.4. Test Result

Test Mode	Ant.	Freq. (MHz)	Channel Power (dBm)	DC Factor (dBm)	Result (dBm)	Limit (dBm)	Verdict
11A	Ant1	5260	9.59	0.09	9.68	23.12	PASS
		5280	10.00	0.13	10.13	23.15	PASS
		5320	7.99	0.09	8.08	23.16	PASS
		5500	8.32	0.13	8.45	23.14	PASS
		5580	7.33	0.31	7.64	23.13	PASS
		5700	8.09	0.09	8.18	23.14	PASS
11N20SISO	Ant1	5260	9.43	0.13	9.56	23.42	PASS
		5280	9.83	0.33	10.16	23.41	PASS
		5320	7.70	0.10	7.80	23.42	PASS
		5500	8.14	0.10	8.24	23.44	PASS
		5580	7.34	0.13	7.47	23.42	PASS
		5700	8.00	0.33	8.33	23.43	PASS
11N40SISO	Ant1	5270	7.97	0.27	8.24	24	PASS
		5310	8.28	0.63	8.91	24	PASS
		5510	7.85	0.64	8.49	24	PASS
		5550	7.01	0.27	7.28	24	PASS
		5670	6.74	0.20	6.94	24	PASS
11AC20SISO	Ant1	5260	8.12	0.13	8.25	23.43	PASS
		5280	8.53	0.10	8.63	23.42	PASS
		5320	8.68	0.10	8.78	23.42	PASS
		5500	8.33	0.13	8.46	23.41	PASS
		5580	7.40	0.13	7.53	23.43	PASS
		5700	6.44	0.13	6.57	23.45	PASS
11AC40SISO	Ant1	5270	8.14	0.20	8.34	24	PASS
		5310	8.43	0.26	8.69	24	PASS
		5510	8.06	0.26	8.32	24	PASS
		5550	7.42	0.26	7.68	24	PASS
		5670	6.76	0.26	7.02	24	PASS
11AX20SISO	Ant1	5260	8.19	0.13	8.32	23.71	PASS
		5280	8.54	0.17	8.71	23.72	PASS
		5320	8.77	0.17	8.94	23.74	PASS
		5500	8.39	0.17	8.56	23.74	PASS
		5580	7.47	0.17	7.64	23.65	PASS
		5700	6.56	0.13	6.69	23.73	PASS
11AX40SISO	Ant1	5270	8.14	0.24	8.38	24	PASS
		5310	8.39	0.33	8.72	24	PASS
		5510	8.01	0.33	8.34	24	PASS
		5550	7.30	0.24	7.54	24	PASS
		5670	6.70	0.76	7.46	24	PASS

For U-NII-2C straddle channel:

Test Mode	Ant.	Freq. (MHz)	Channel Power (dBm)	DC Factor (dBm)	Result (dBm)	Limit (dBm)	Verdict
11A	Ant1	5720_UNII-2C	8.33	0.13	8.46	≤23.98	PASS
		5720_UNII-3	1.57	0.13	1.7	≤30.00	PASS
11N20SISO	Ant1	5720_UNII-2C	7.95	0.10	8.05	≤23.98	PASS
		5720_UNII-3	1.66	0.10	1.76	≤30.00	PASS
11N40SISO	Ant1	5710_UNII-2C	8.37	0.63	9	≤23.98	PASS
		5710_UNII-3	-3.3	0.63	-2.67	≤30.00	PASS

11AC20SISO	Ant1	5720_UNII-2C	7.93	0.32	8.25	≤23.98	PASS
		5720_UNII-3	1.41	0.32	1.73	≤30.00	PASS
11AC40SISO	Ant1	5710_UNII-2C	8.85	0.26	9.11	≤23.98	PASS
		5710_UNII-3	-2.72	0.26	-2.46	≤30.00	PASS
11AX20SISO	Ant1	5720_UNII-2C	7.81	0.17	7.98	≤23.98	PASS
		5720_UNII-3	1.79	0.17	1.96	≤30.00	PASS
11AX40SISO	Ant1	5710_UNII-2C	8.55	0.76	9.31	≤23.98	PASS
		5710_UNII-3	-2.85	0.76	-2.09	≤30.00	PASS

11. Power Spectral Density

11.1. Block Diagram of Test Setup

Same as section 8.1

11.2. Limits

CFR 47 FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
Power Spectral Density	☐ Outdoor Access Point: 17 dBm/MHz ☐ Indoor Access Point: 17 dBm/MHz ☐ Fixed Point-To-Point Access Points: 17 dBm/MHz ☒ Client Devices: 11 dBm/MHz	5150-5250
	11 dBm/MHz	5250-5350 5470-5725
	30 dBm/500 kHz	5725-5850

Note: The above limits are based upon the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

11.3. Test Procedure

The transmitter output was connected to a spectrum analyzer. Power density was measured by spectrum analyzer with 1MHz RBW and 3MHz VBW.

Connect the UUT to the spectrum analyzer and use the following settings:

5150 MHz~5250 MHz, 5250 MHz~5350 MHz, 5470 MHz~5725 MHz

Center Frequency	The centre frequency of the channel under test
Detector	RMS
RBW	1MHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

5725 MHz-5850 MHz

Center Frequency	The centre frequency of the channel under test
Detector	RMS
RBW	500 kHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

Note:

1. For UNII-3, according to KDB publication 789033 D02 General U-NII Test Procedures New Rules v02r01, section II.F.5., it is acceptable to set RBW at 1 MHz and VBW at 3 MHz if the spectrum analyzer does not have 500 kHz RBW.

2. The value measured with RBW=1MHz is to be added with 10log(500kHz/1MHz) which is - 3dB. For example, if the measured value is +30 dBm using RBW=500kHz (that is +30 dBm/500kHz), then the converted value will be +33 dBm/1MHz.

3. Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

11.4. Test Result

Test Mode	Ant.	Freq. (MHz)	Result (dBm/MHz)	Limit (dBm/MHz)	Verdict
11A	Ant1	5260	-1.53	≤11.00	PASS
		5280	-1.1	≤11.00	PASS
		5320	-3.12	≤11.00	PASS
		5500	-2.71	≤11.00	PASS
		5580	-3.53	≤11.00	PASS
		5700	-2.91	≤11.00	PASS
11N20SISO	Ant1	5260	-1.96	≤11.00	PASS
		5280	-1.27	≤11.00	PASS
		5320	-3.38	≤11.00	PASS
		5500	-3.11	≤11.00	PASS
		5580	-4.25	≤11.00	PASS
		5700	-2.9	≤11.00	PASS
11N40SISO	Ant1	5270	-6.21	≤11.00	PASS
		5310	-5.66	≤11.00	PASS
		5510	-5.76	≤11.00	PASS
		5550	-7.32	≤11.00	PASS
		5670	-7.7	≤11.00	PASS
11AC20SISO	Ant1	5260	-3.31	≤11.00	PASS
		5280	-2.75	≤11.00	PASS
		5320	-2.68	≤11.00	PASS
		5500	-3.03	≤11.00	PASS
		5580	-3.79	≤11.00	PASS
		5700	-4.63	≤11.00	PASS
11AC40SISO	Ant1	5270	-6.39	≤11.00	PASS
		5310	-5.85	≤11.00	PASS
		5510	-6.31	≤11.00	PASS
		5550	-7.01	≤11.00	PASS
		5670	-7.54	≤11.00	PASS
11AX20SISO	Ant1	5260	-3.4	≤11.00	PASS
		5280	-2.9	≤11.00	PASS
		5320	-2.74	≤11.00	PASS
		5500	-3.2	≤11.00	PASS
		5580	-4.23	≤11.00	PASS
		5700	-4.58	≤11.00	PASS
11AX40SISO	Ant1	5270	-6.19	≤11.00	PASS
		5310	-6.01	≤11.00	PASS
		5510	-6.36	≤11.00	PASS
		5550	-7.3	≤11.00	PASS
		5670	-7.13	≤11.00	PASS

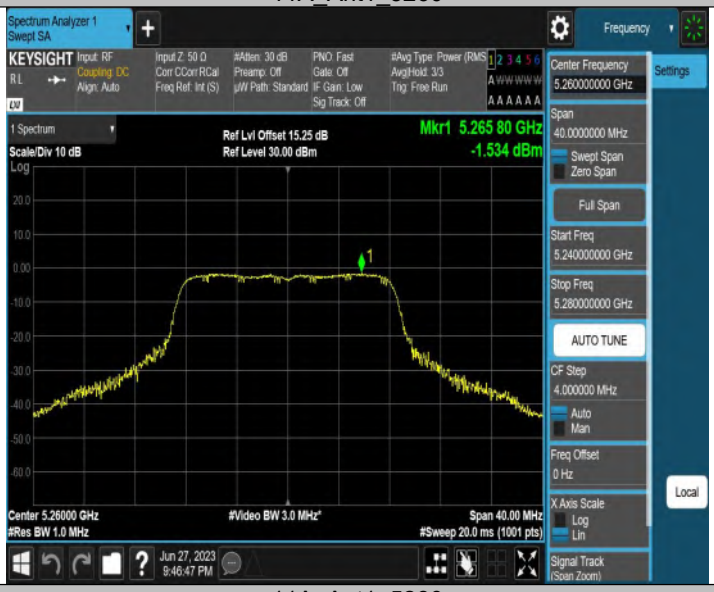
For U-NII-2C straddle channel:

Test Mode	Ant.	Freq. (MHz)	Result (dBm/MHz)	Limit (dBm/MHz)	Verdict
11A	Ant1	5720_UNII-2C	2.46	≤11.00	PASS
		5720_UNII-3	-0.17	≤30.00	PASS
11N20SISO	Ant1	5720_UNII-2C	2.22	≤11.00	PASS
		5720_UNII-3	-0.27	≤30.00	PASS
11N40SISO	Ant1	5710_UNII-2C	-0.92	≤11.00	PASS
		5710_UNII-3	-4.06	≤30.00	PASS
11AC20SISO	Ant1	5720_UNII-2C	2.4	≤11.00	PASS
		5720_UNII-3	-0.56	≤30.00	PASS
11AC40SISO	Ant1	5710_UNII-2C	-0.89	≤11.00	PASS
		5710_UNII-3	-4.03	≤30.00	PASS
11AX20SISO	Ant1	5720_UNII-2C	2.14	≤11.00	PASS
		5720_UNII-3	-0.71	≤30.00	PASS
11AX40SISO	Ant1	5710_UNII-2C	-0.57	≤11.00	PASS
		5710_UNII-3	-3.93	≤30.00	PASS

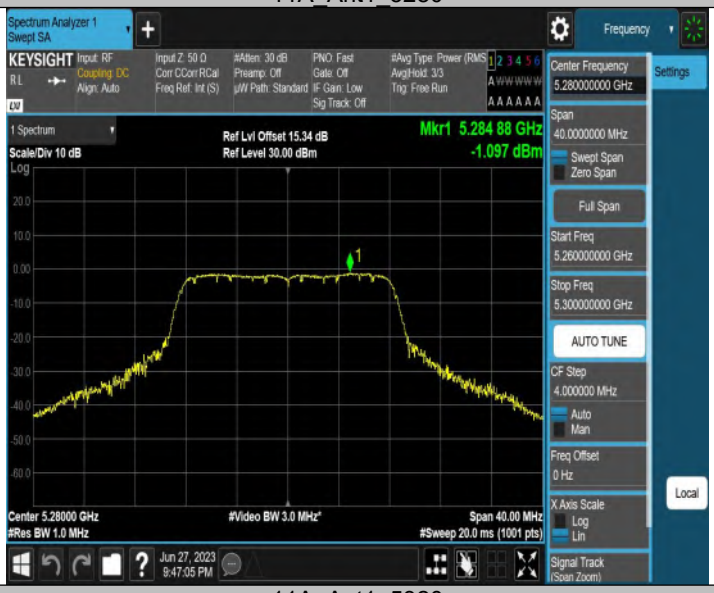
Note: 1.The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.
2.The Duty Cycle Factor and RBW Factor is compensated in the graph.

11.5. Original Test Data

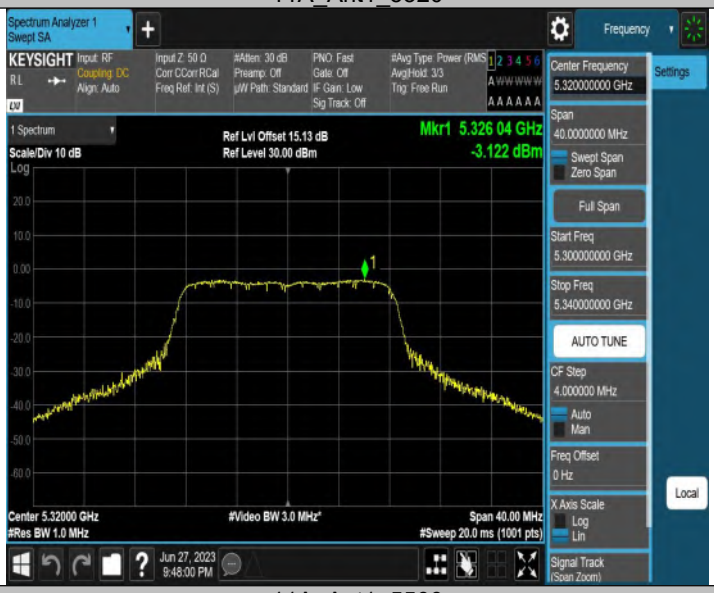
11A_Ant1_5260



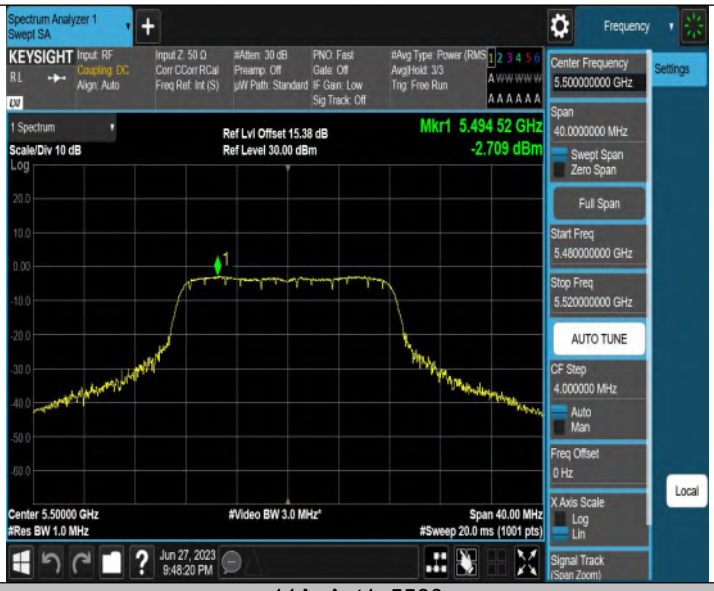
11A_Ant1_5280



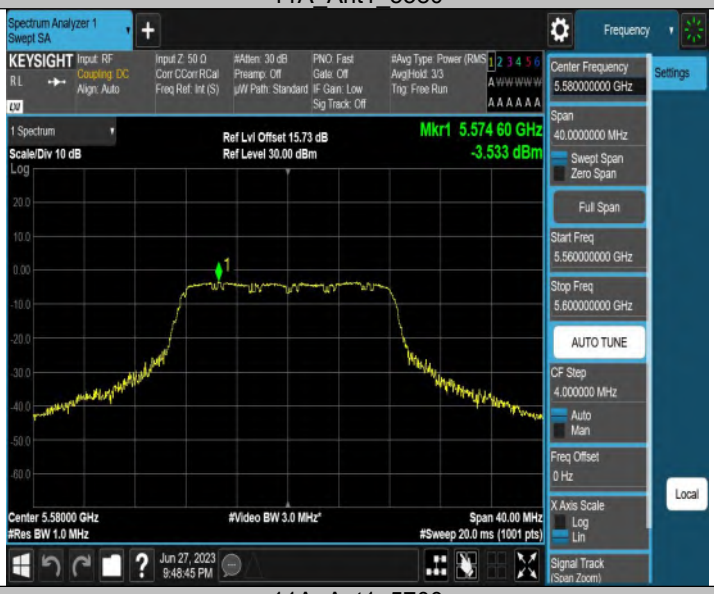
11A_Ant1_5320



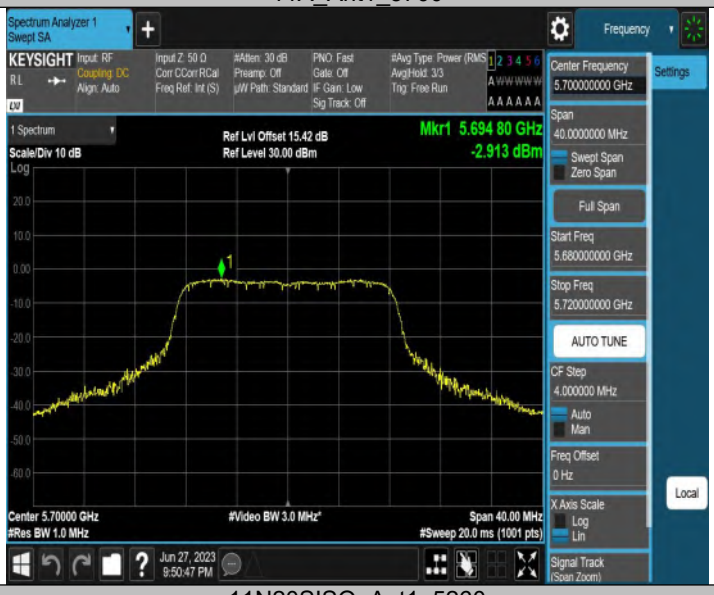
11A_Ant1_5500



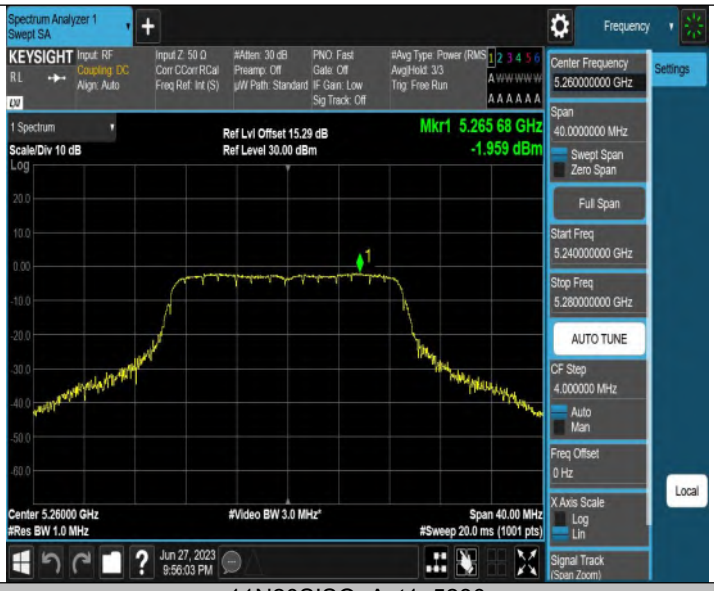
11A_Ant1_5580



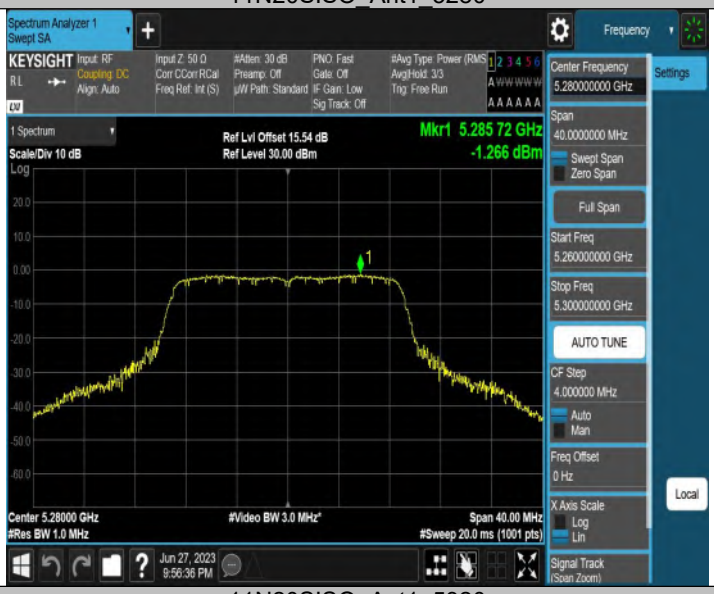
11A_Ant1_5700



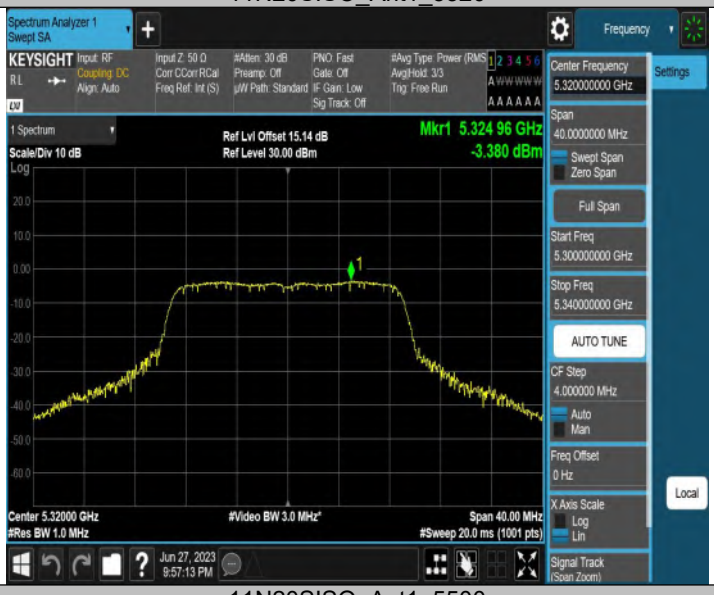
11N20SISO_Ant1_5260



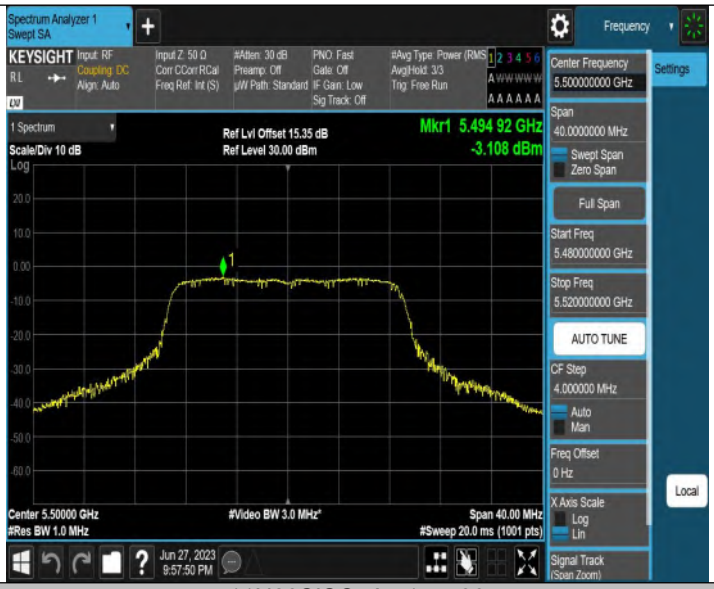
11N20SISO_Ant1_5280



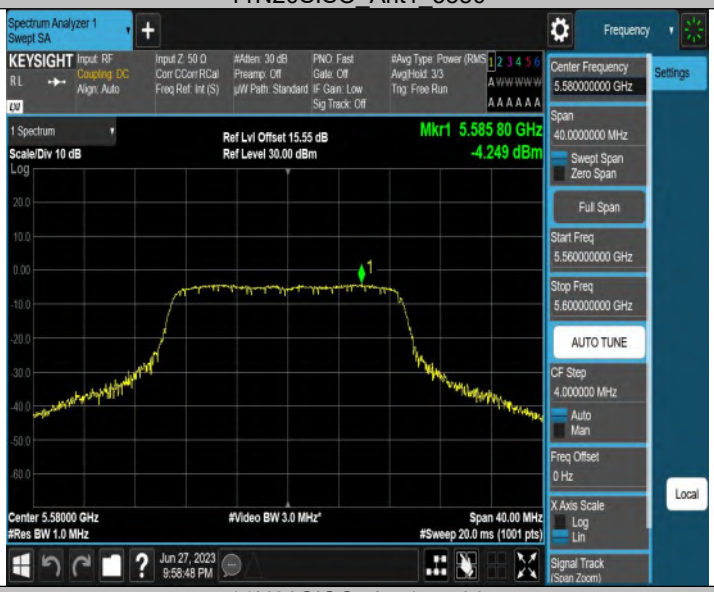
11N20SISO_Ant1_5320



11N20SISO_Ant1_5500

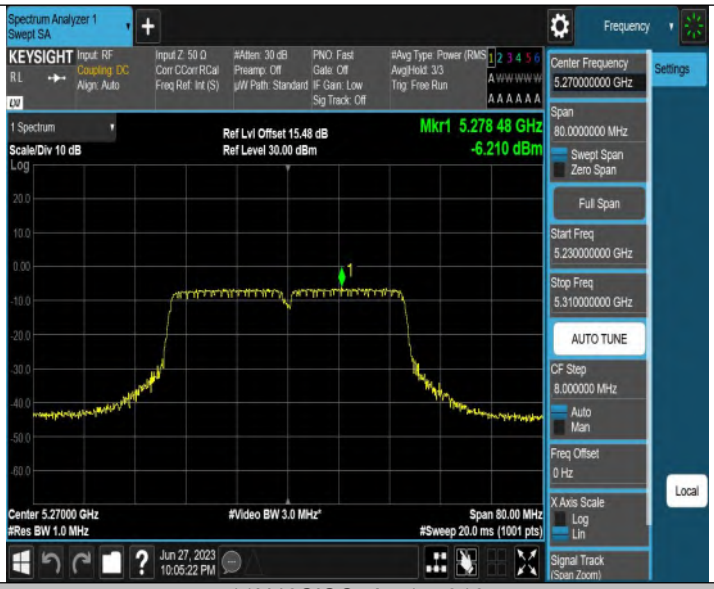


11N20SISO_Ant1_5580

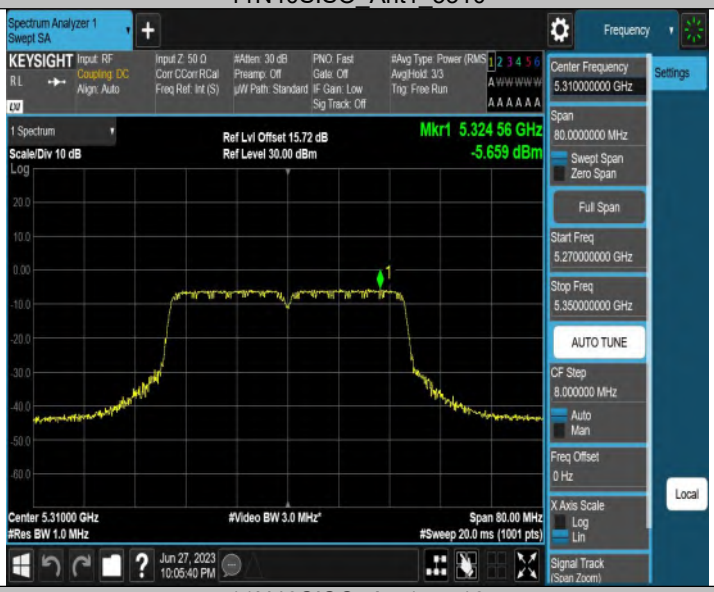


11N20SISO_Ant1_5700

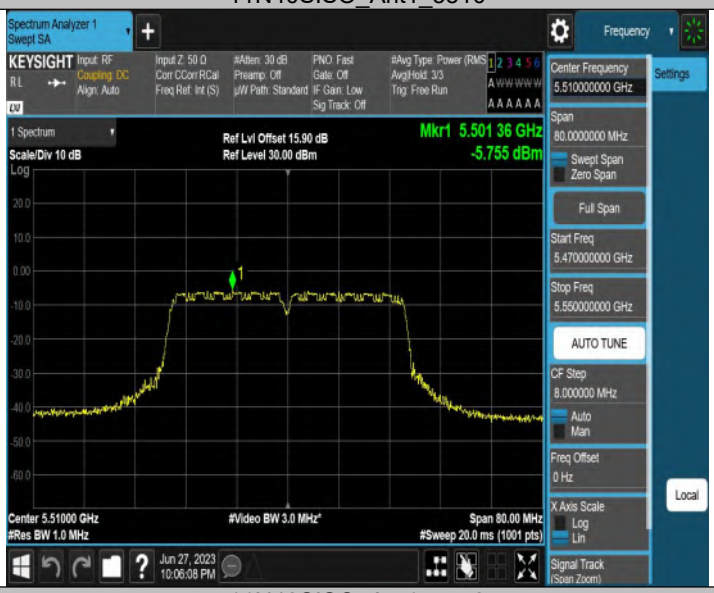
11N40SISO_Ant1_5270



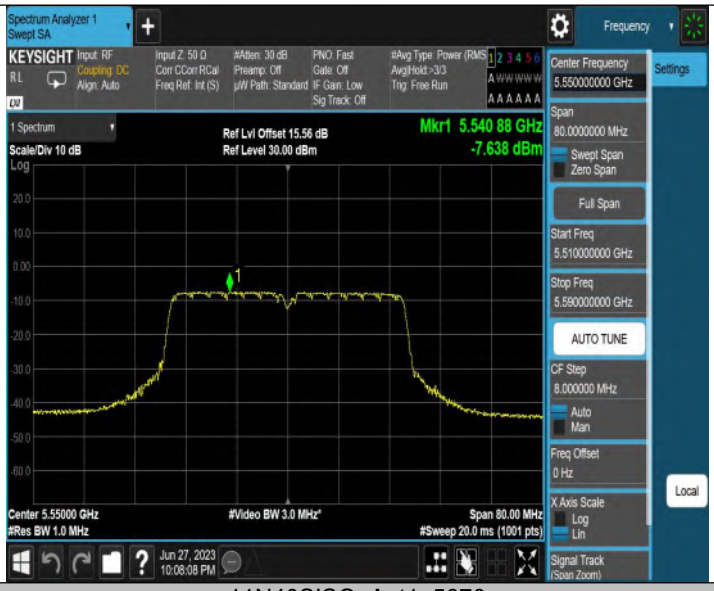
11N40SISO_Ant1_5310



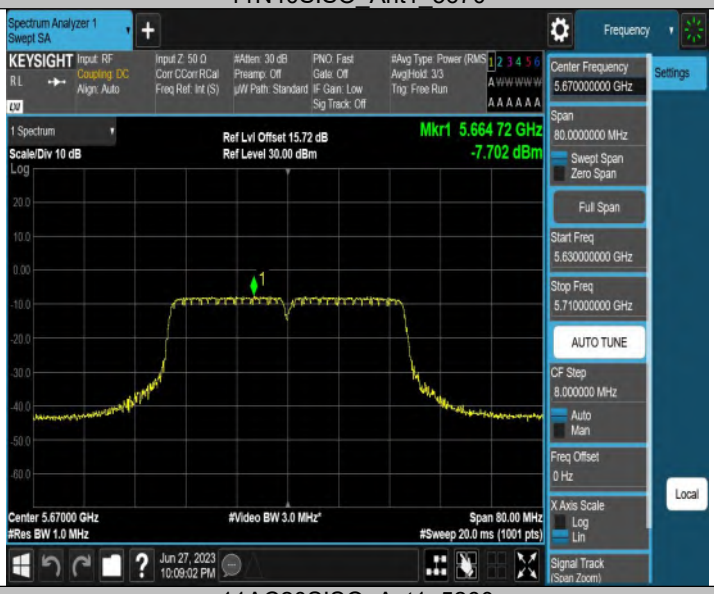
11N40SISO_Ant1_5510



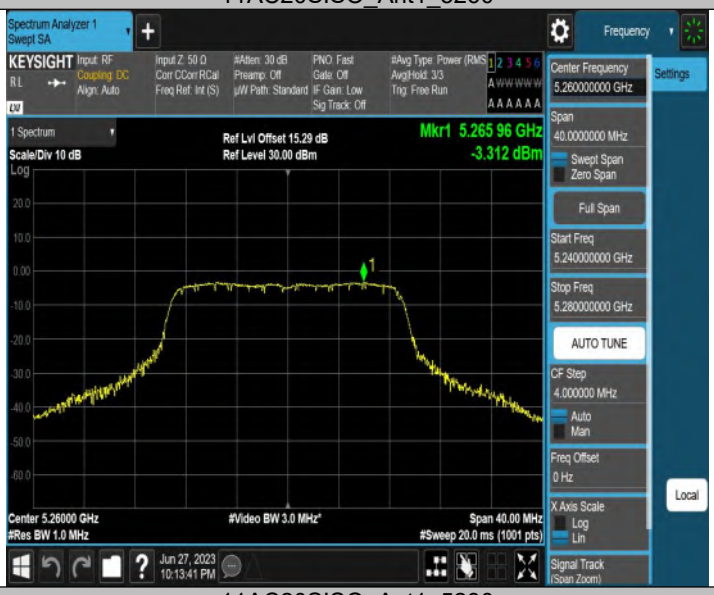
11N40SISO_Ant1_5550



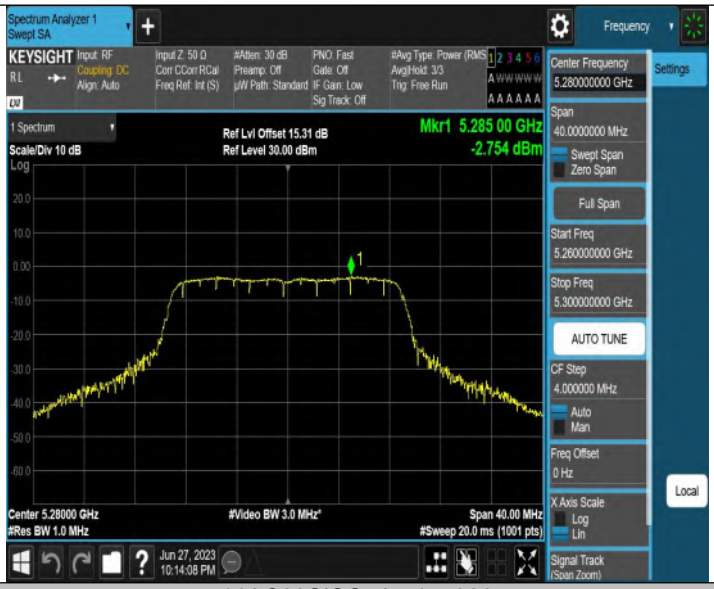
11N40SISO_Ant1_5670



11AC20SISO_Ant1_5260



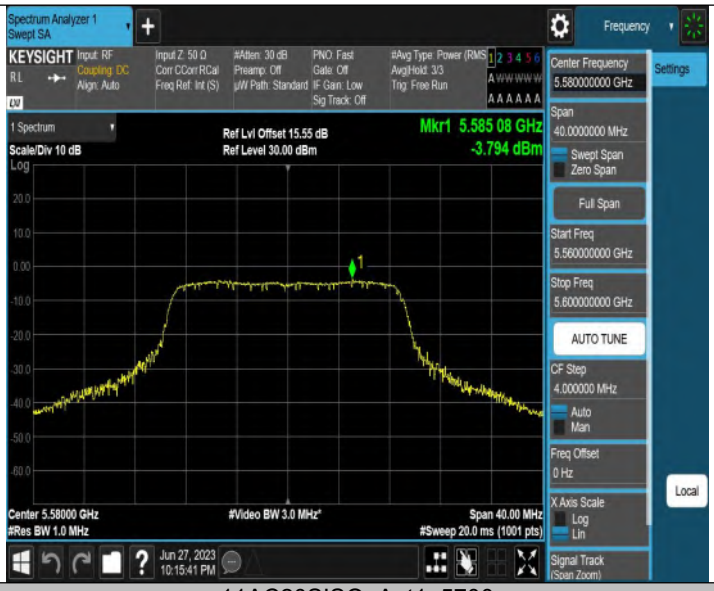
11AC20SISO_Ant1_5280



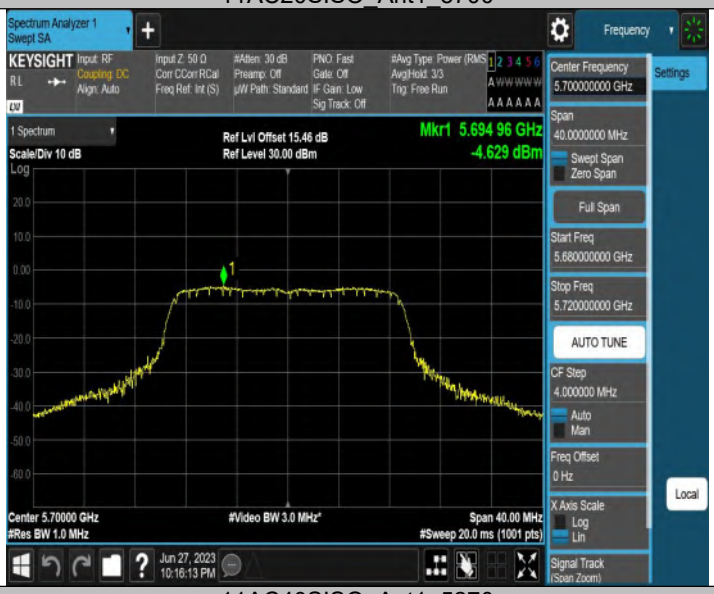
11AC20SISO_Ant1_5320

11AC20SISO_Ant1_5500

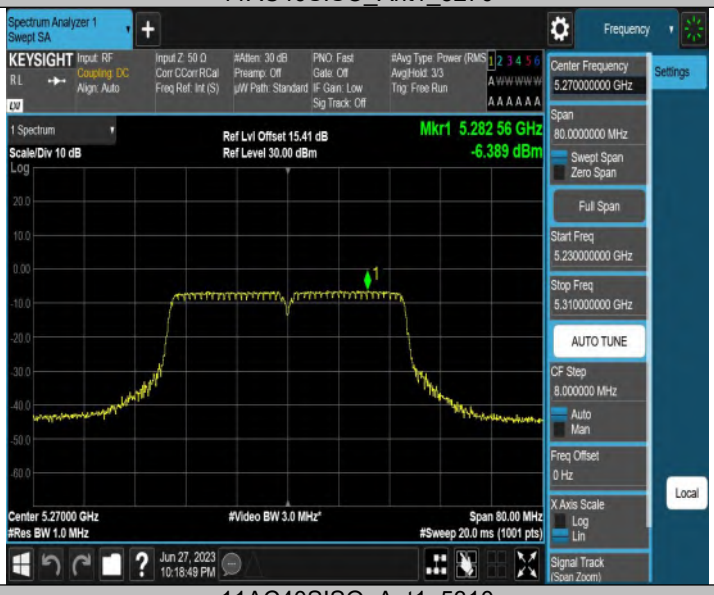
11AC20SISO_Ant1_5580



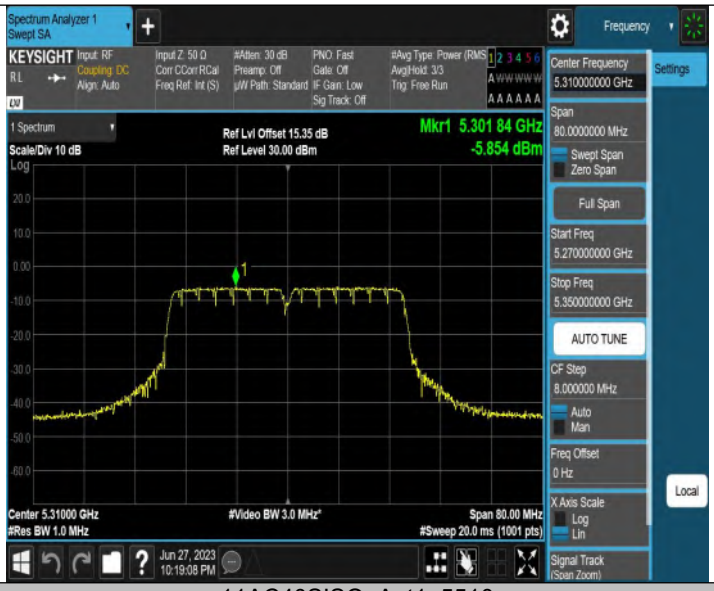
11AC20SISO_Ant1_5700



11AC40SISO_Ant1_5270



11AC40SISO_Ant1_5310



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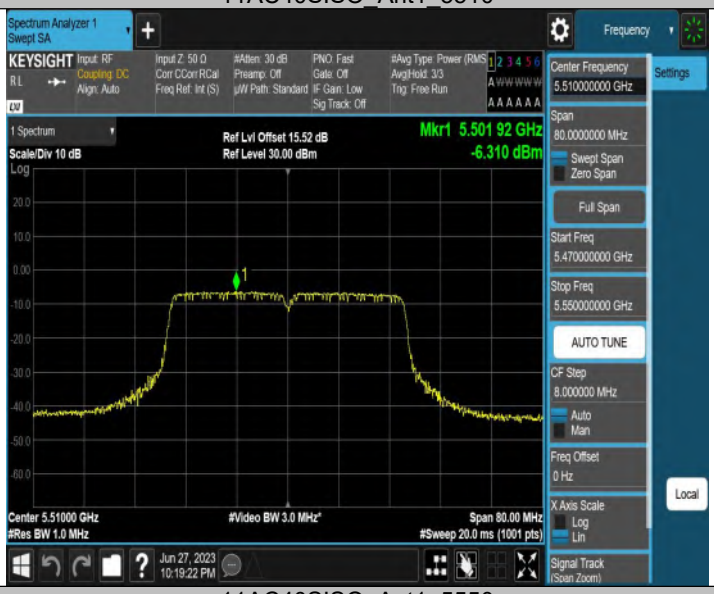
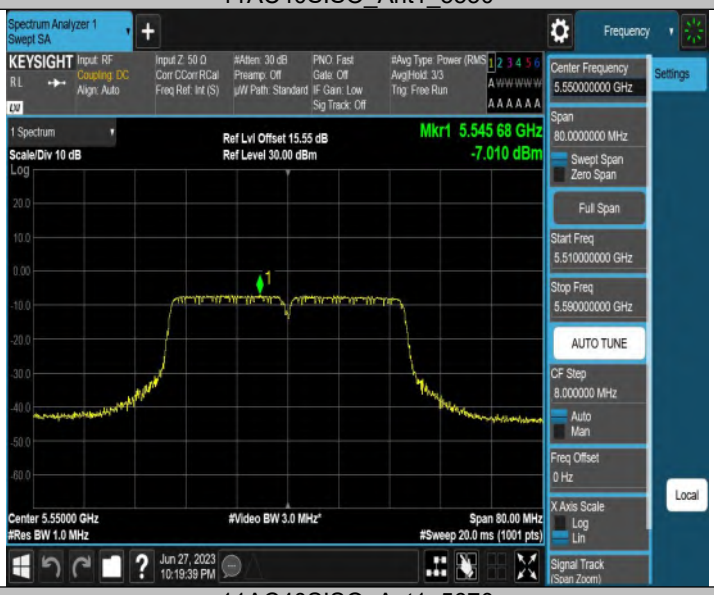
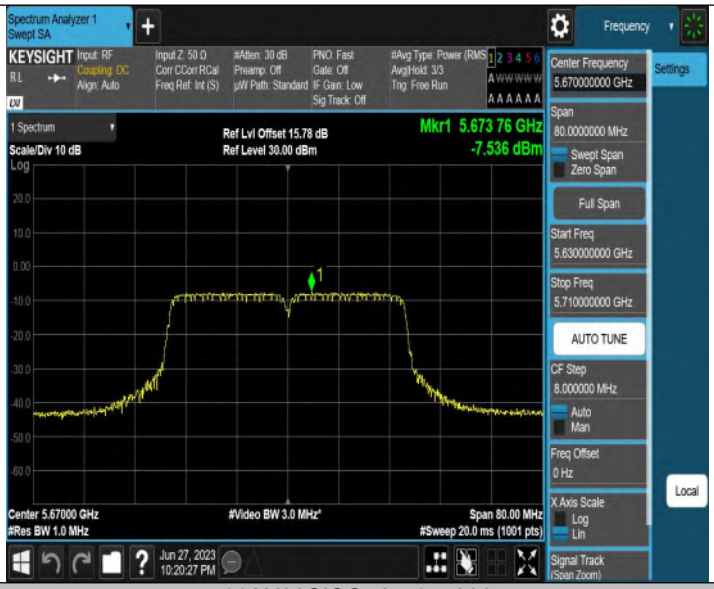


11AC40SISO_Ant1_5550



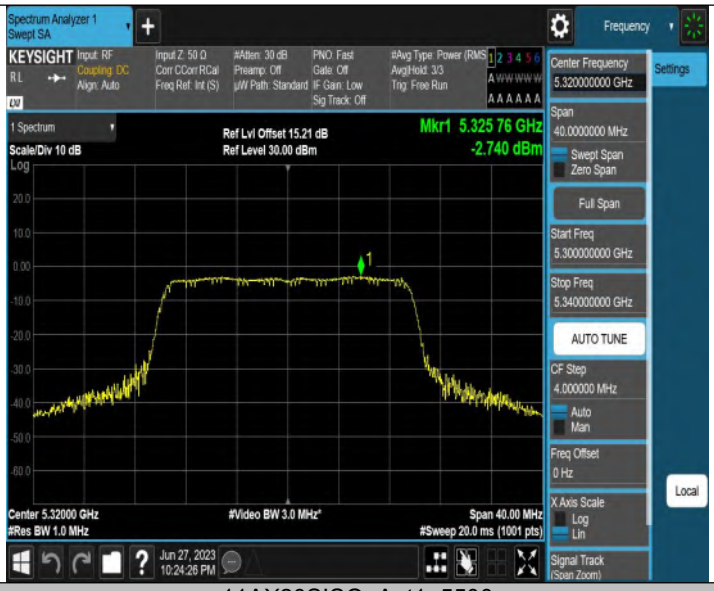
11AC40SISO_Ant1_5670



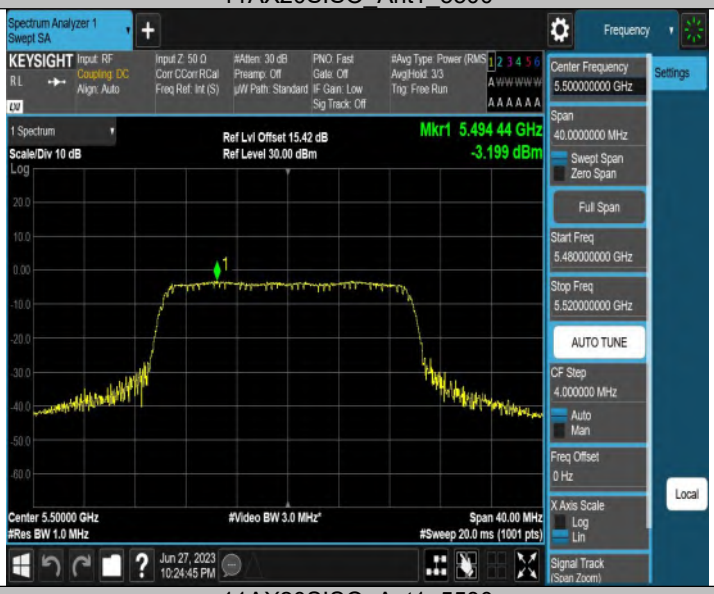
11AX20SISO_Ant1_5260

11AX20SISO_Ant1_5280

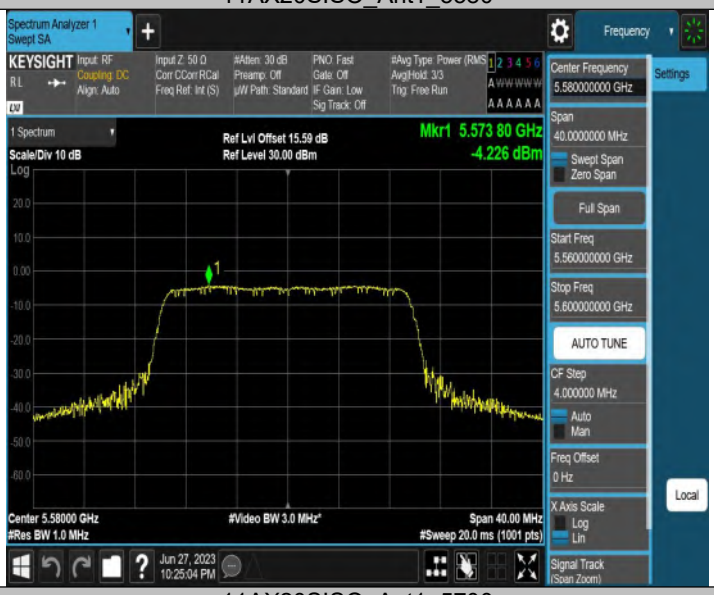
11AX20SISO_Ant1_5320



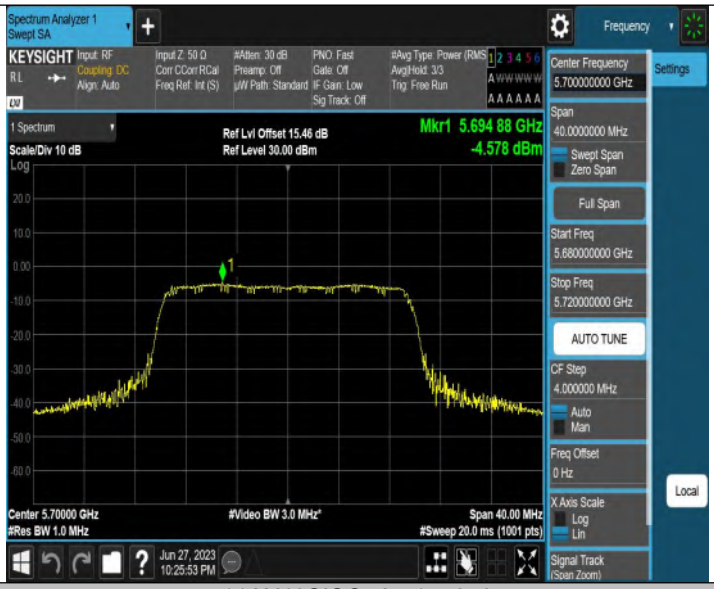
11AX20SISO_Ant1_5500



11AX20SISO_Ant1_5580

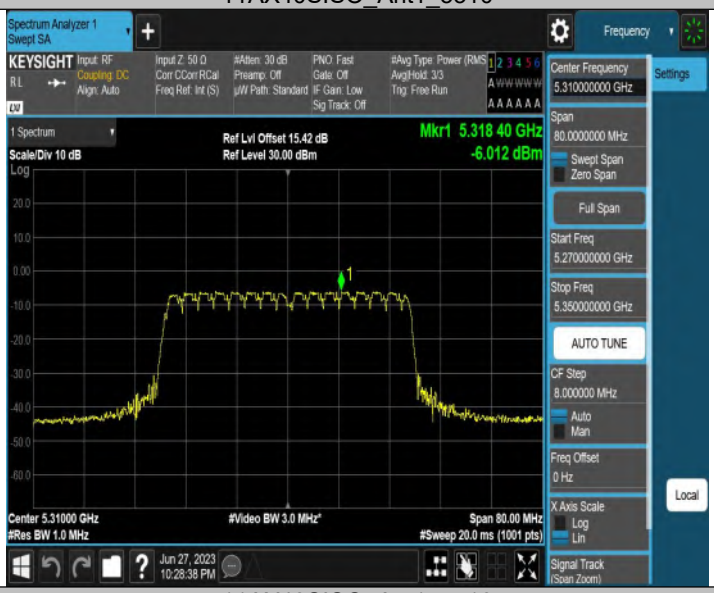


11AX20SISO_Ant1_5700

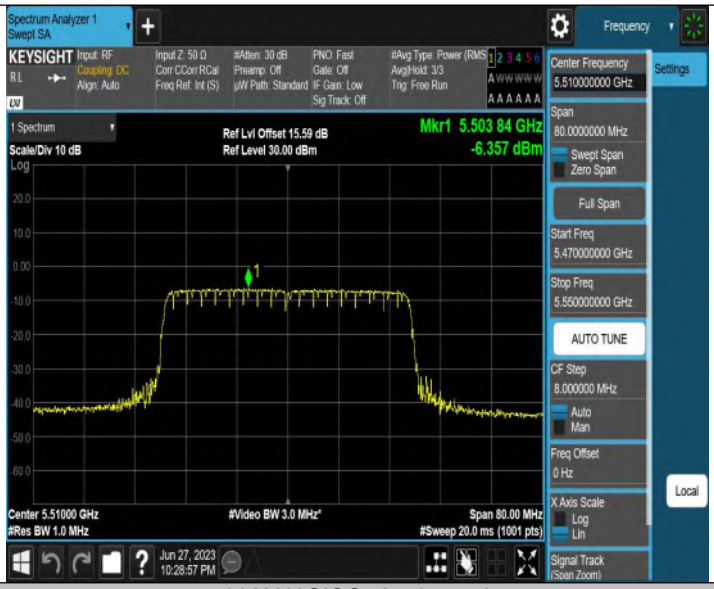


11AX40SISO_Ant1_5270

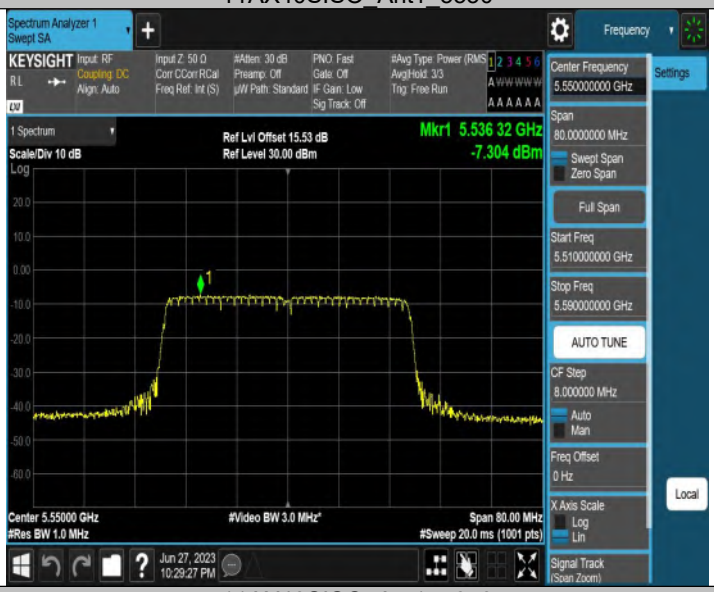
11AX40SISO_Ant1_5310



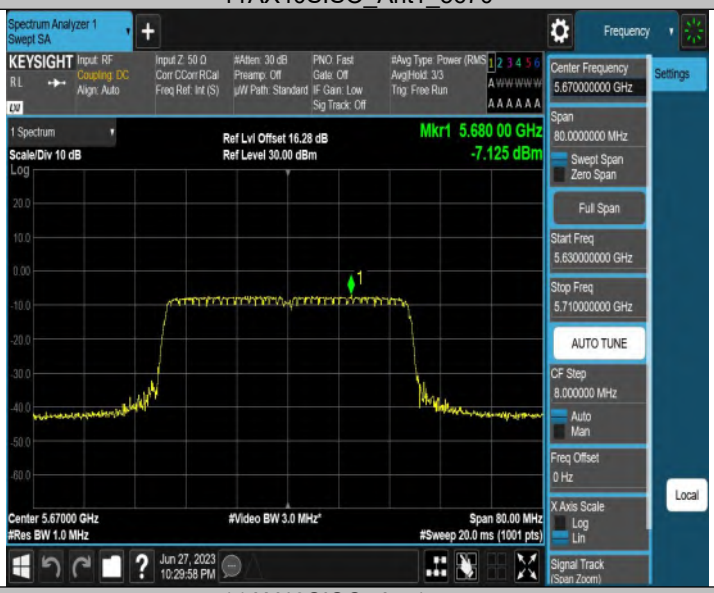
11AX40SISO_Ant1_5510



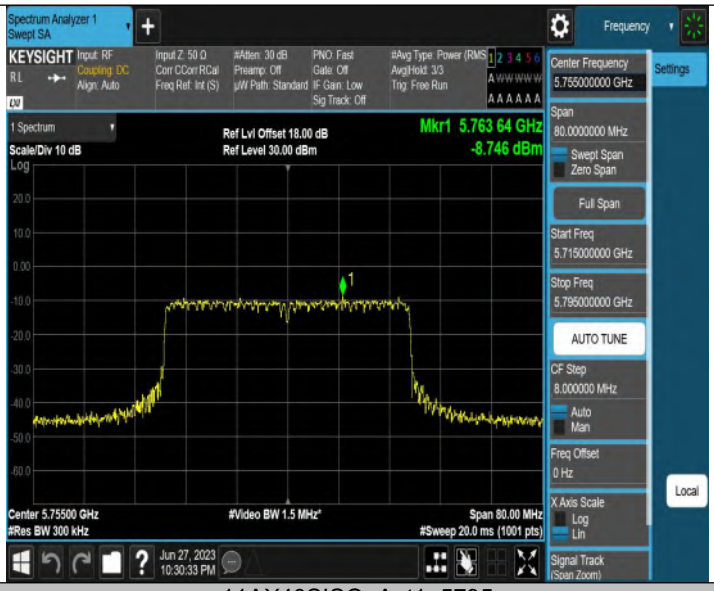
11AX40SISO_Ant1_5550



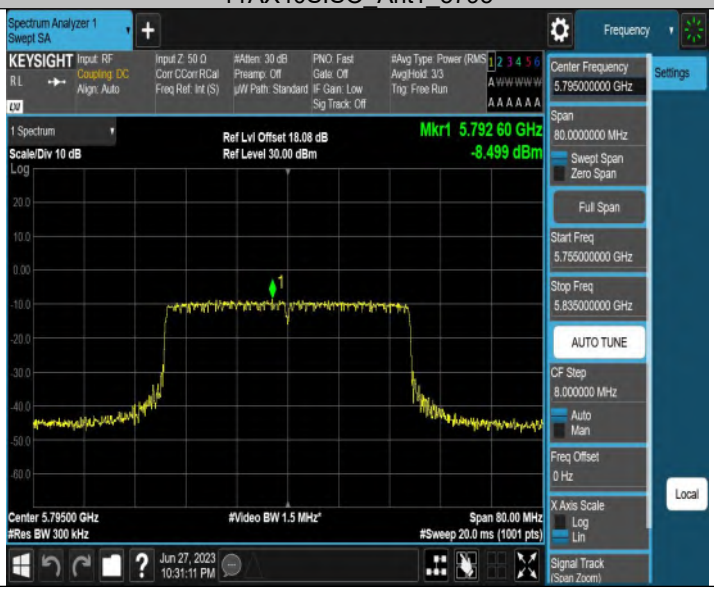
11AX40SISO_Ant1_5670



11AX40SISO_Ant1_5755



11AX40SISO_Ant1_5795



For U-NII-2C straddle channel:

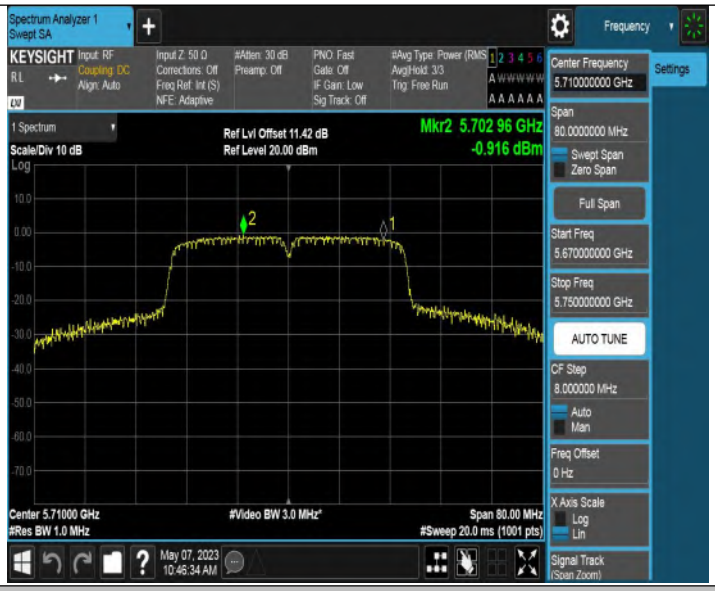
11A_Ant1_5720_UNII-2C

11A_Ant1_5720_UNII-3

11N20SISO_Ant1_5720_UNII-2C

11N20SISO_Ant1_5720_UNII-3

11N40SISO_Ant1_5710_UNII-2C



11N40SISO_Ant1_5710_UNII-3

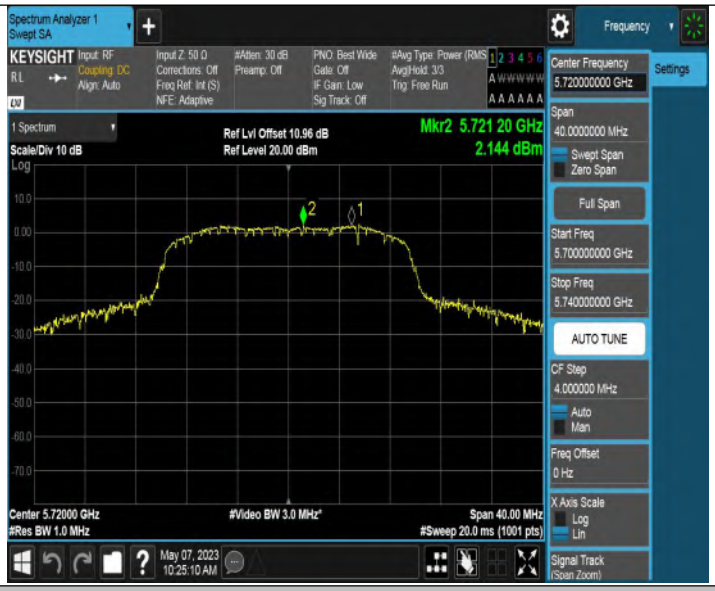
11AC20SISO_Ant1_5720_UNII-2C

11AC20SISO_Ant1_5720_UNII-3

11AC40SISO_Ant1_5710_UNII-2C

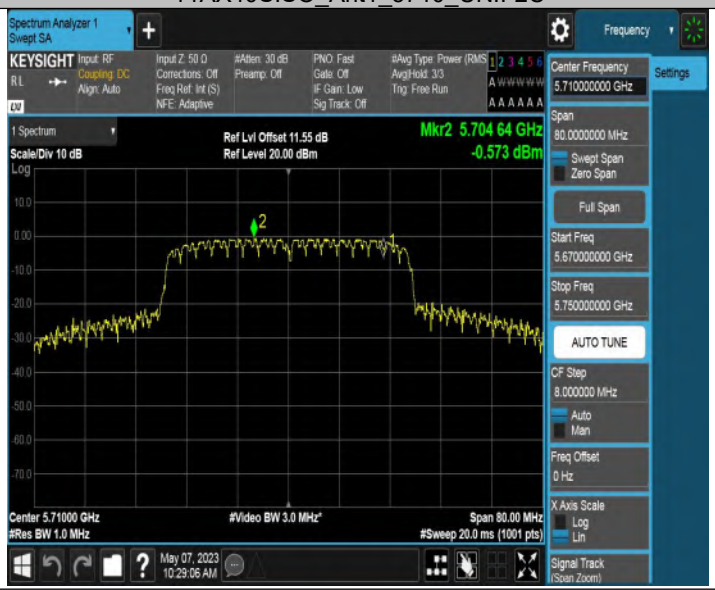
11AC40SISO_Ant1_5710_UNII-3

11AX20SISO_Ant1_5720_UNII-2C

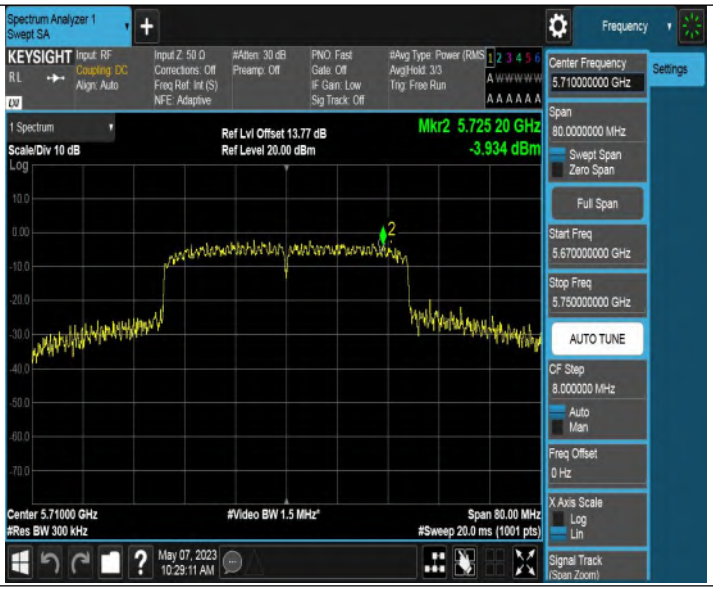


11AX20SISO_Ant1_5720_UNII-3

11AX40SISO_Ant1_5710_UNII-2C



11AX40SISO_Ant1_5710_UNII-3


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
NFE: Adaptive
#Atten: 30 dB
Preamp: Off
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Avg|Hold: 3/3
Trig: Free Run
1 Spectrum
Ref Lvl Offset 13.77 dB
Ref Level 20.00 dBm
Mkr2 5.725 20 GHz
-3.934 dBm
Scale/Div 10 dB
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 5.71000 GHz
#Res BW 300 kHz
#Video BW 1.5 MHz*
Span 80.00 MHz
#Sweep 20.0 ms (1001 pts)
May 07, 2023
10:29:11 AM
Frequency
Settings
Center Frequency
5.710000000 GHz
Span
80.0000000 MHz
Swept Span
Zero Span
Full Span
Start Freq
5.670000000 GHz
Stop Freq
5.750000000 GHz
AUTO TUNE
CF Step
8.000000 MHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)

12. Frequency Stability Measurement

12.1. Block Diagram of Test Setup

Same as section 8.1

12.2. Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

12.3. Test Procedures

(1) To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.

(2) The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10 dB lower than the measured peak value.

(3) The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

12.4. Test Result

Voltage								
Test Mode	Antenna	Frequency[MHz]	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
11A	Ant1	5260	NV	NT	-24000.00	-4.562738	20	PASS
			LV	NT	-24000.00	-4.562738	20	PASS
			HV	NT	-24000.00	-4.562738	20	PASS
		5280	NV	NT	-24000.00	-4.545455	20	PASS
			LV	NT	-24000.00	-4.545455	20	PASS
			HV	NT	-24000.00	-4.545455	20	PASS
		5320	NV	NT	-24000.00	-4.511278	20	PASS
			LV	NT	-24000.00	-4.511278	20	PASS
			HV	NT	-24000.00	-4.511278	20	PASS
		5500	NV	NT	-24000.00	-4.363636	20	PASS
			LV	NT	-24000.00	-4.363636	20	PASS
			HV	NT	-24000.00	-4.363636	20	PASS
		5580	NV	NT	-27000.00	-4.838710	20	PASS
			LV	NT	-27000.00	-4.838710	20	PASS
			HV	NT	-27000.00	-4.838710	20	PASS
		5700	NV	NT	-27000.00	-4.736842	20	PASS
			LV	NT	-27000.00	-4.736842	20	PASS
			HV	NT	-27000.00	-4.736842	20	PASS
11N40SISO	Ant1	5270	NV	NT	-24000.00	-4.554080	20	PASS
			LV	NT	-24000.00	-4.554080	20	PASS
			HV	NT	-24000.00	-4.554080	20	PASS
		5310	NV	NT	-24000.00	-4.519774	20	PASS
			LV	NT	-24000.00	-4.519774	20	PASS
			HV	NT	-24000.00	-4.519774	20	PASS
		5510	NV	NT	-27000.00	-4.900181	20	PASS
			LV	NT	-27000.00	-4.900181	20	PASS
			HV	NT	-27000.00	-4.900181	20	PASS
		5550	NV	NT	-27000.00	-4.864865	20	PASS
			LV	NT	-27000.00	-4.864865	20	PASS
			HV	NT	-27000.00	-4.864865	20	PASS
		5670	NV	NT	-27000.00	-4.761905	20	PASS
			LV	NT	-27000.00	-4.761905	20	PASS

			HV	NT	-27000.00	-4.761905	20	PASS

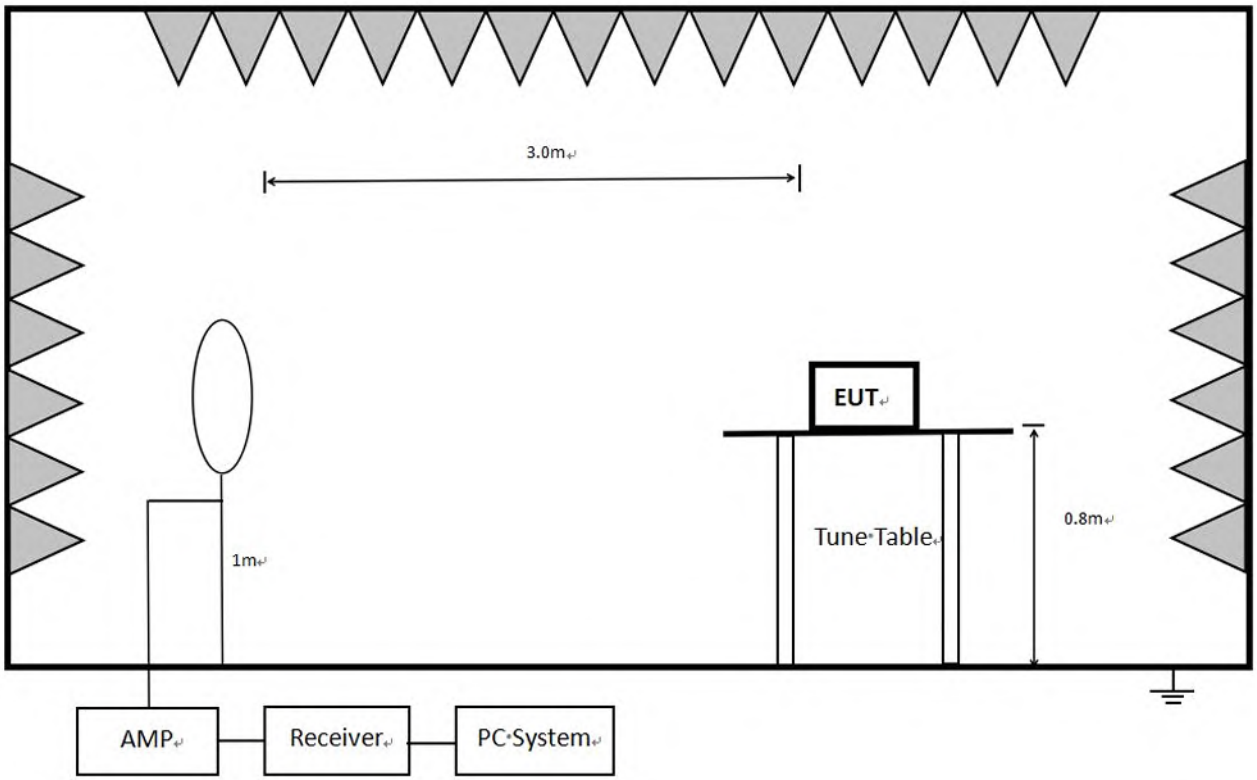
Temperature								
Test Mode	Antenna	Frequency[MHz]	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
11A	Ant1	5260	NV	-30	-24000.00	-4.562738	20	PASS
			NV	-20	-24000.00	-4.562738	20	PASS
			NV	-10	-24000.00	-4.562738	20	PASS
			NV	0	-24000.00	-4.562738	20	PASS
			NV	10	-24000.00	-4.562738	20	PASS
			NV	20	-24000.00	-4.562738	20	PASS
			NV	30	-24000.00	-4.562738	20	PASS
			NV	40	-24000.00	-4.562738	20	PASS
			NV	50	-24000.00	-4.562738	20	PASS
		5280	NV	-30	-24000.00	-4.545455	20	PASS
			NV	-20	-24000.00	-4.545455	20	PASS
			NV	-10	-24000.00	-4.545455	20	PASS
			NV	0	-24000.00	-4.545455	20	PASS
			NV	10	-24000.00	-4.545455	20	PASS
			NV	20	-24000.00	-4.545455	20	PASS
			NV	30	-24000.00	-4.545455	20	PASS
			NV	40	-24000.00	-4.545455	20	PASS
			NV	50	-24000.00	-4.545455	20	PASS
		5320	NV	-30	-24000.00	-4.511278	20	PASS
			NV	-20	-24000.00	-4.511278	20	PASS
			NV	-10	-24000.00	-4.511278	20	PASS
			NV	0	-24000.00	-4.511278	20	PASS
			NV	10	-24000.00	-4.511278	20	PASS
			NV	20	-24000.00	-4.511278	20	PASS
			NV	30	-24000.00	-4.511278	20	PASS
			NV	40	-24000.00	-4.511278	20	PASS
			NV	50	-24000.00	-4.511278	20	PASS
		5500	NV	-30	-24000.00	-4.363636	20	PASS
			NV	-20	-24000.00	-4.363636	20	PASS
			NV	-10	-27000.00	-4.909091	20	PASS
			NV	0	-24000.00	-4.363636	20	PASS
			NV	10	-27000.00	-4.909091	20	PASS
			NV	20	-24000.00	-4.363636	20	PASS
			NV	30	-27000.00	-4.909091	20	PASS
			NV	40	-27000.00	-4.909091	20	PASS
			NV	50	-24000.00	-4.363636	20	PASS
		5580	NV	-30	-27000.00	-4.838710	20	PASS
			NV	-20	-27000.00	-4.838710	20	PASS
			NV	-10	-27000.00	-4.838710	20	PASS
			NV	0	-27000.00	-4.838710	20	PASS
			NV	10	-27000.00	-4.838710	20	PASS
			NV	20	-27000.00	-4.838710	20	PASS
			NV	30	-27000.00	-4.838710	20	PASS
			NV	40	-27000.00	-4.838710	20	PASS
			NV	50	-27000.00	-4.838710	20	PASS
		5700	NV	-30	-27000.00	-4.736842	20	PASS
			NV	-20	-27000.00	-4.736842	20	PASS
			NV	-10	-27000.00	-4.736842	20	PASS
			NV	0	-27000.00	-4.736842	20	PASS
			NV	10	-27000.00	-4.736842	20	PASS
			NV	20	-27000.00	-4.736842	20	PASS
			NV	30	-27000.00	-4.736842	20	PASS
			NV	40	-27000.00	-4.736842	20	PASS
			NV	50	-27000.00	-4.736842	20	PASS
11N40SIS	Ant1	5270	NV	-30	-24000.00	-4.554080	20	PASS

O			NV	-20	-24000.00	-4.554080	20	PASS
			NV	-10	-24000.00	-4.554080	20	PASS
			NV	0	-24000.00	-4.554080	20	PASS
			NV	10	-24000.00	-4.554080	20	PASS
			NV	20	-24000.00	-4.554080	20	PASS
			NV	30	-24000.00	-4.554080	20	PASS
			NV	40	-24000.00	-4.554080	20	PASS
			NV	50	-24000.00	-4.554080	20	PASS
		5310	NV	-30	-24000.00	-4.519774	20	PASS
			NV	-20	-24000.00	-4.519774	20	PASS
			NV	-10	-24000.00	-4.519774	20	PASS
			NV	0	-24000.00	-4.519774	20	PASS
			NV	10	-24000.00	-4.519774	20	PASS
			NV	20	-24000.00	-4.519774	20	PASS
			NV	30	-24000.00	-4.519774	20	PASS
			NV	40	-24000.00	-4.519774	20	PASS
			NV	50	-24000.00	-4.519774	20	PASS
		5510	NV	-30	-27000.00	-4.900181	20	PASS
			NV	-20	-27000.00	-4.900181	20	PASS
			NV	-10	-27000.00	-4.900181	20	PASS
			NV	0	-27000.00	-4.900181	20	PASS
			NV	10	-27000.00	-4.900181	20	PASS
			NV	20	-27000.00	-4.900181	20	PASS
			NV	30	-27000.00	-4.900181	20	PASS
			NV	40	-27000.00	-4.900181	20	PASS
			NV	50	-27000.00	-4.900181	20	PASS
		5550	NV	-30	-27000.00	-4.864865	20	PASS
			NV	-20	-27000.00	-4.864865	20	PASS
			NV	-10	-27000.00	-4.864865	20	PASS
			NV	0	-27000.00	-4.864865	20	PASS
			NV	10	-27000.00	-4.864865	20	PASS
			NV	20	-27000.00	-4.864865	20	PASS
			NV	30	-27000.00	-4.864865	20	PASS
			NV	40	-27000.00	-4.864865	20	PASS
			NV	50	-27000.00	-4.864865	20	PASS
		5670	NV	-30	-27000.00	-4.761905	20	PASS
			NV	-20	-27000.00	-4.761905	20	PASS
			NV	-10	-27000.00	-4.761905	20	PASS
			NV	0	-27000.00	-4.761905	20	PASS
			NV	10	-27000.00	-4.761905	20	PASS
			NV	20	-27000.00	-4.761905	20	PASS
			NV	30	-27000.00	-4.761905	20	PASS
			NV	40	-27000.00	-4.761905	20	PASS
			NV	50	-27000.00	-4.761905	20	PASS

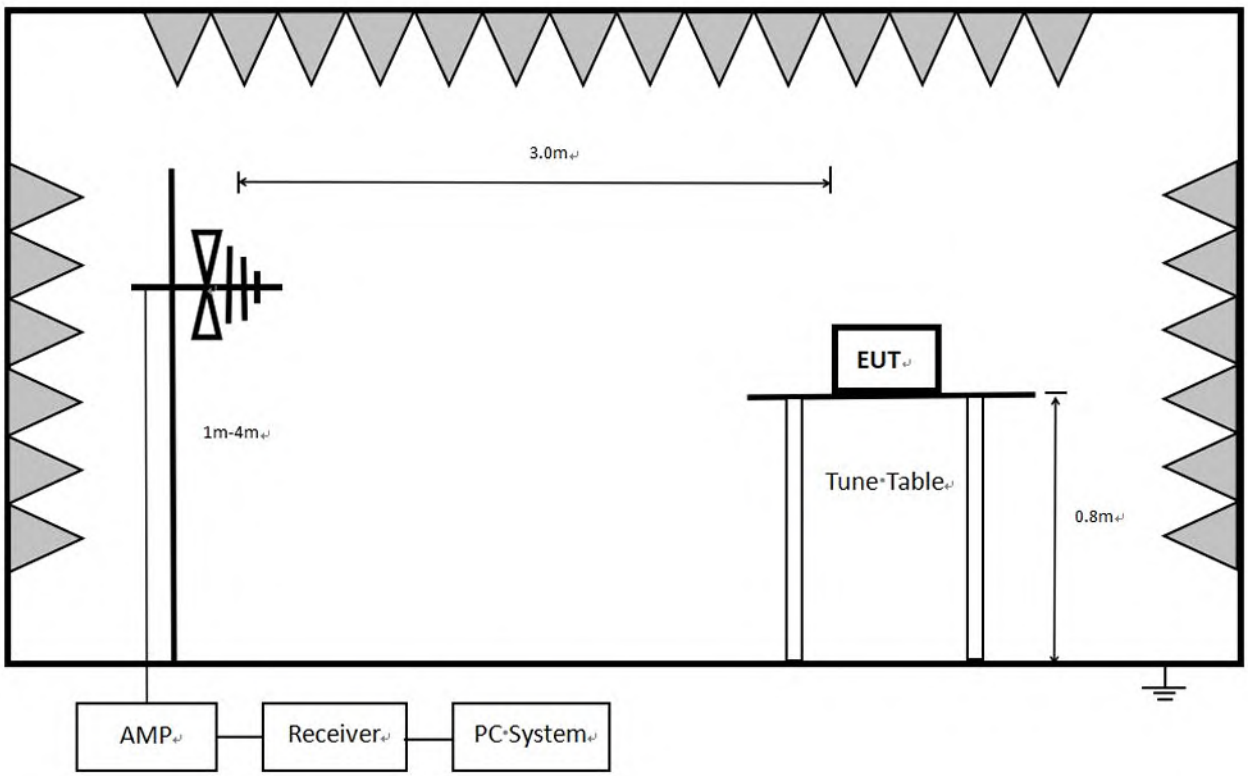
13. Radiated Emission

13.1. Block Diagram of Test Setup

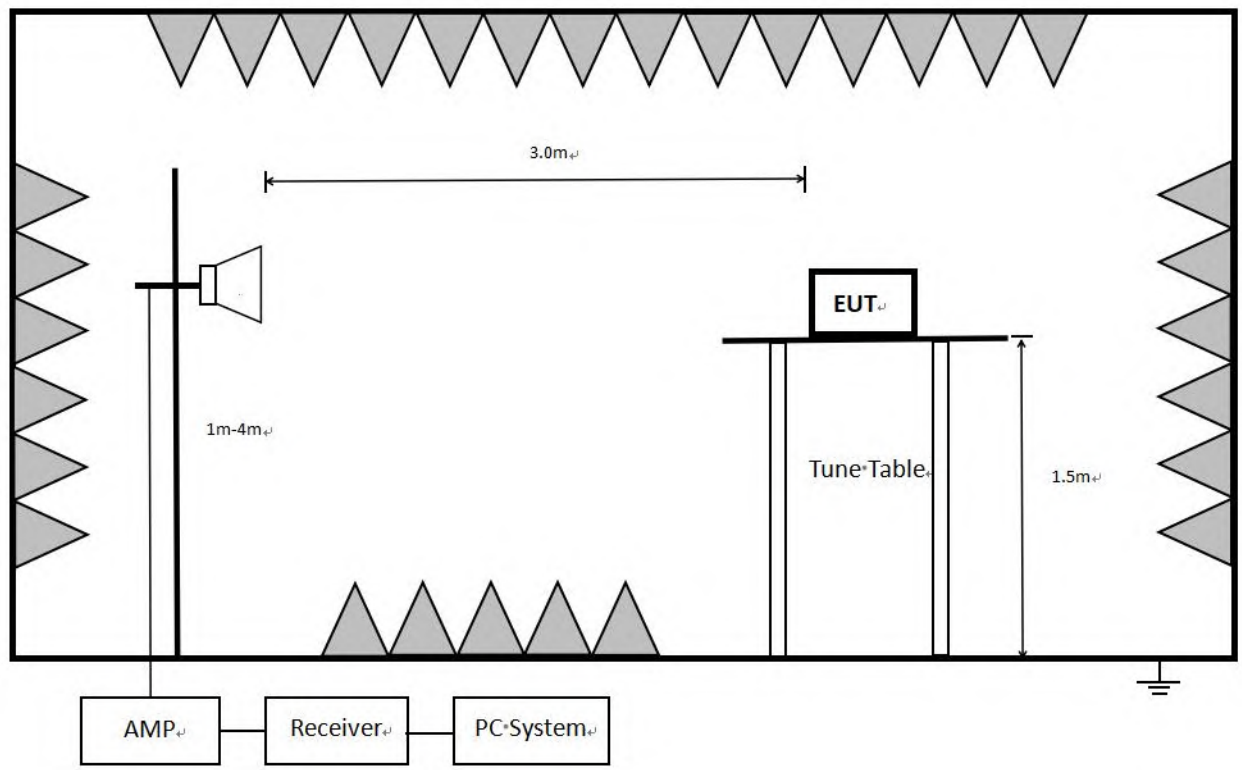
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



In 3 m Anechoic Chamber, test setup diagram for 30 MHz – 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

13.2. Limit

(1) FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2]Above 38.6

(2) FCC 15.209 Limit.

Frequency MHz	Distance Meters	Field strengths limit	
		μV/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

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

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

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

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm / MHz.

(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(6) The provisions of §15.205 apply to intentional radiators operating under this section.

-27 dBm/MHz Limit=95.2+EIRP (dBm)=95.2-27=68.2 dBμV/m

Note:

(1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz.Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$Limit_{3m}(dBuV/m) = Limit_{30m}(dBuV/m) + 40Log(30m/3m)$

(3) Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions or comply with 15.209 limits.

13.3. Test Procedure

Below 30 MHz：

The setting of the spectrum Analyzer

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of 1 meter height antenna tower.

5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KdB 414788.

Below 1 GHz and above 30 MHz：

The setting of the spectrum Analyzer

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1 GHz：

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5m above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for AVG measurements. For the Duty Cycle please refer to clause 8.1.ON TIME AND DUTY CYCLE.

7. Restriction band: Investigated frequency range from 5.15-5.25 GHz, 5250-5350 GHz, 5470-5725 GHz, 5.725-5.85 GHz.

All restriction band should comply with 15.209, other emission should be at least 20 dB below the fundamental.

Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: The EUT does not support simultaneous transmission.

Note 3: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

13.4. Test Result

PASS. (See below detailed test result)

All the emissions except fundamental emission from 9kHz to 40GHz were comply with 15.209 limit.

Note1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz and 18 GHz to 40 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

Note2: For emissions below 1 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with EUT working in 11a mode.

Note3: For below test data, when the limit tabular marked “/” means this frequency point is the fundamental emission and no need comply with this limit.

Note 4: As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit

Note 5: For emissions Above 1 GHz, all mode have been tested, 11a mode is worse case and recorded in report.

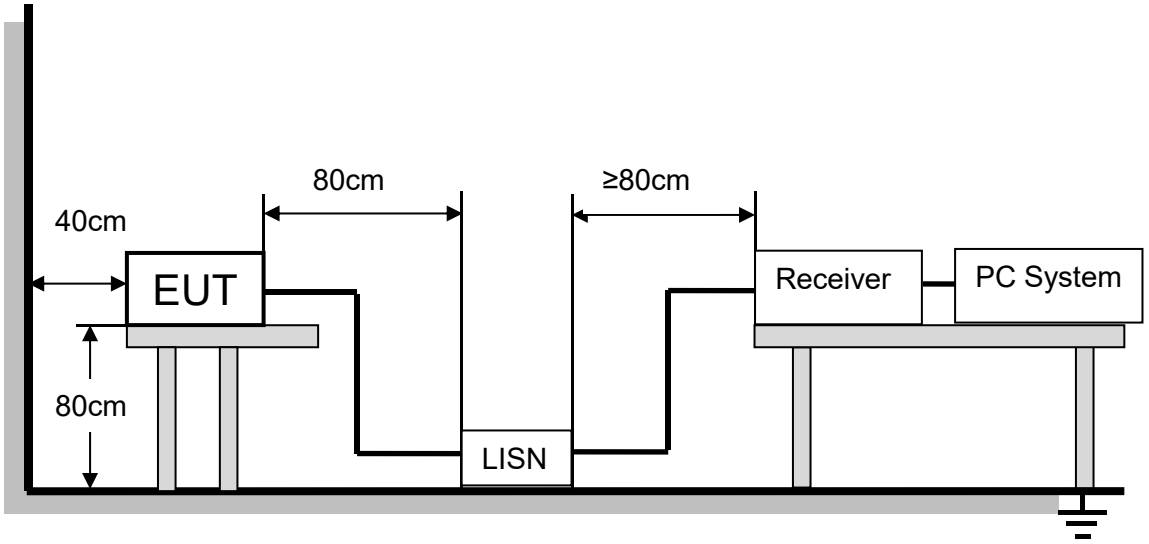
13.5. Original Test Data

Below 1 GHz and above 30 MHz test data Refer to appendix A

Above 1 GHz test data Refer to appendix B

14. AC Power Line Conducted Emissions

14.1. Block Diagram of Test Setup



The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

14.2. Limits

Please refer to CFR 47 FCC §15.207.

Frequency (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

14.3. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

14.4. Test Result

Reference report JCF230411201-004

15. Dynamic Frequency Selection

15.1. 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.

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 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.		

15.2. 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 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.
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.	

15.3. Parameters of Radar Test Waveform

This section provides the parameters for required test waveforms, minimum percentage of successful detection, 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