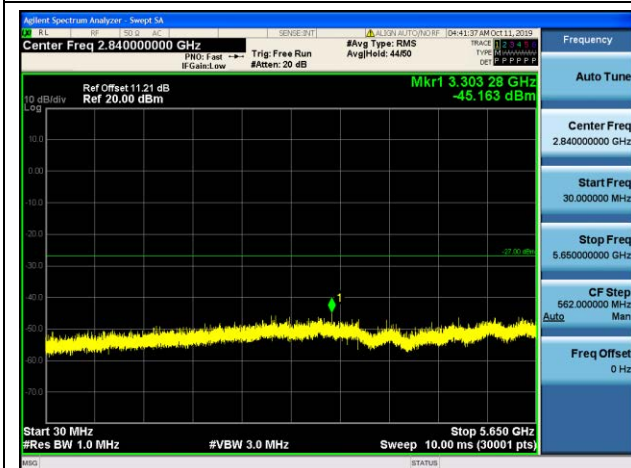




11n20

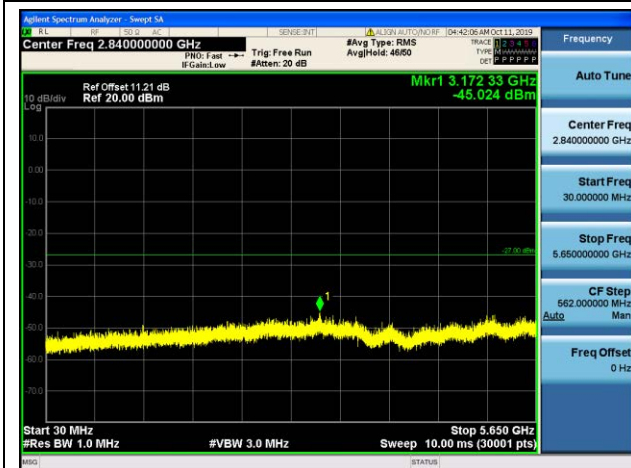
Low channel



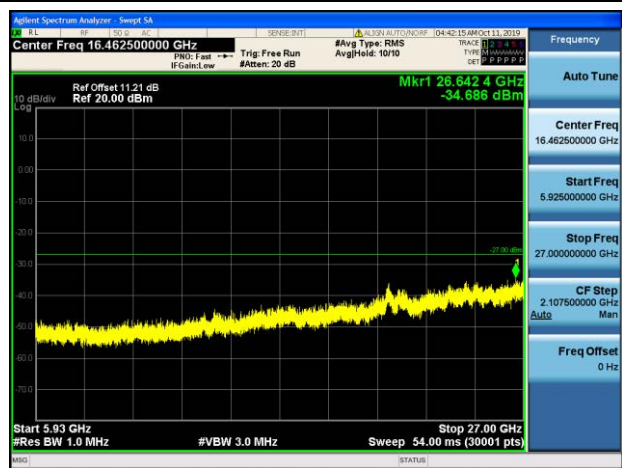
Low channel



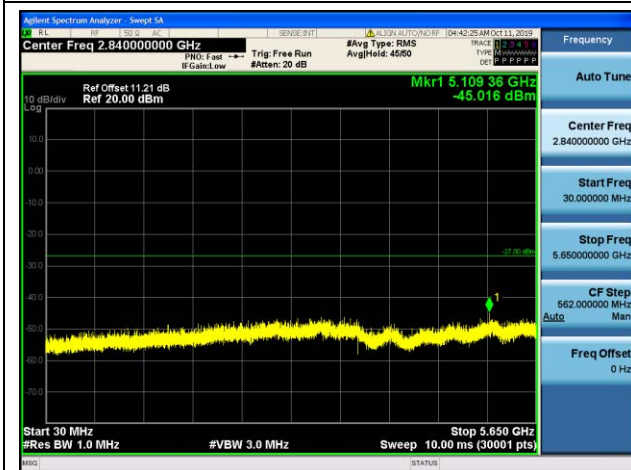
Middle channel



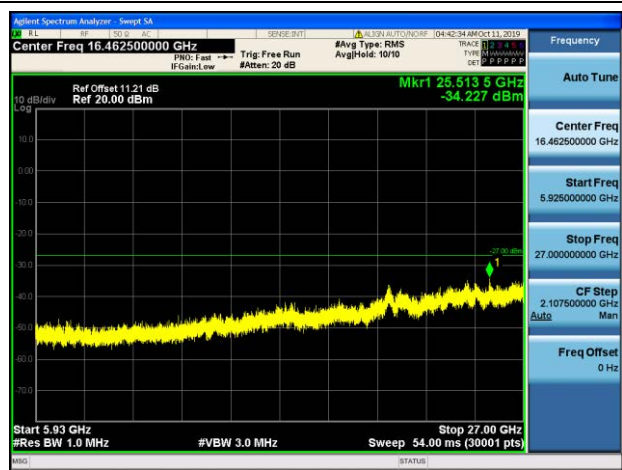
Middle channel

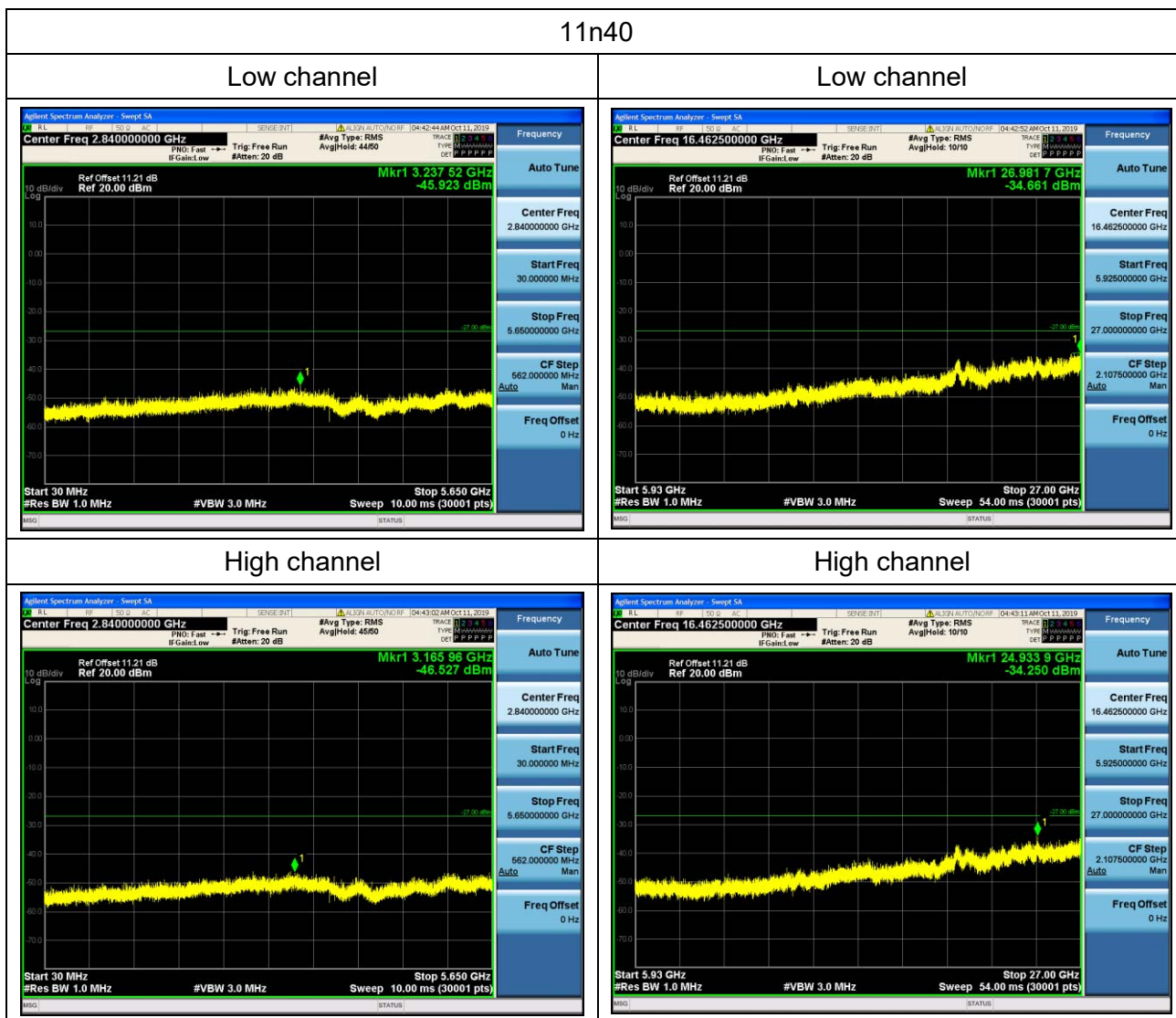


High channel



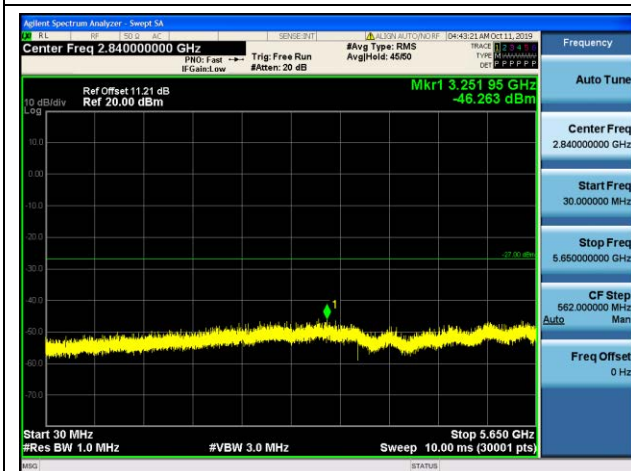
High channel



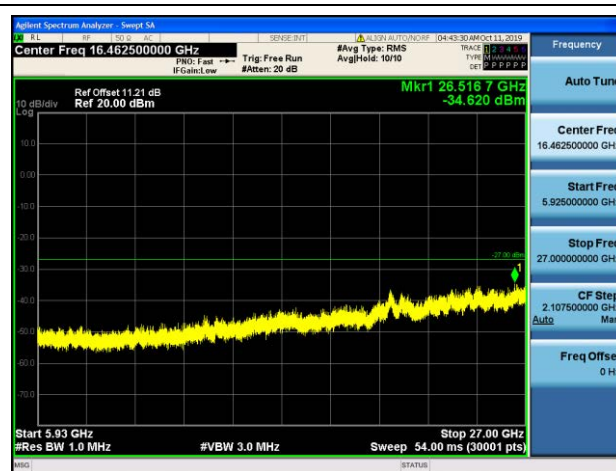


11ac20

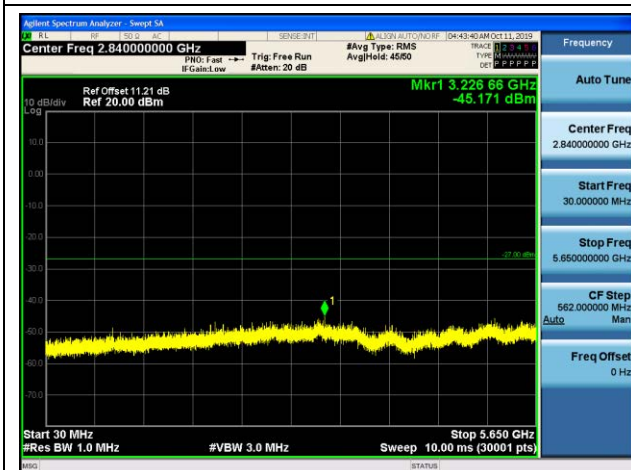
Low channel



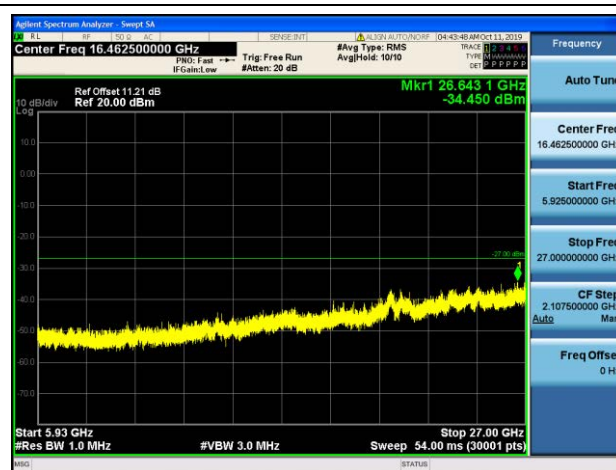
Low channel



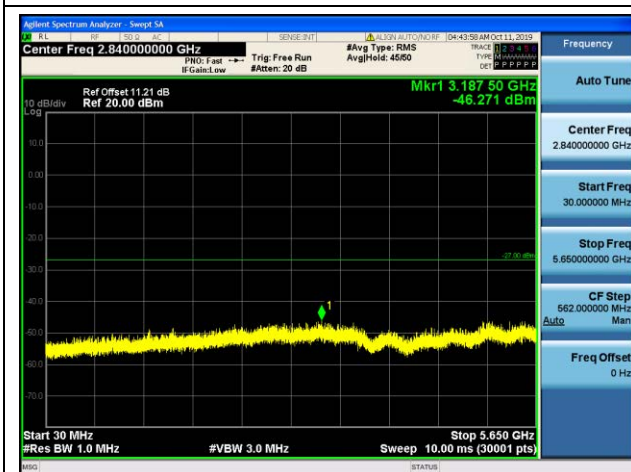
Middle channel



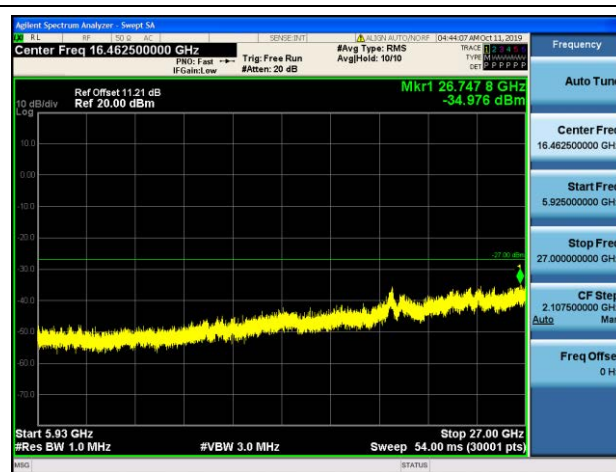
Middle channel



High channel



High channel

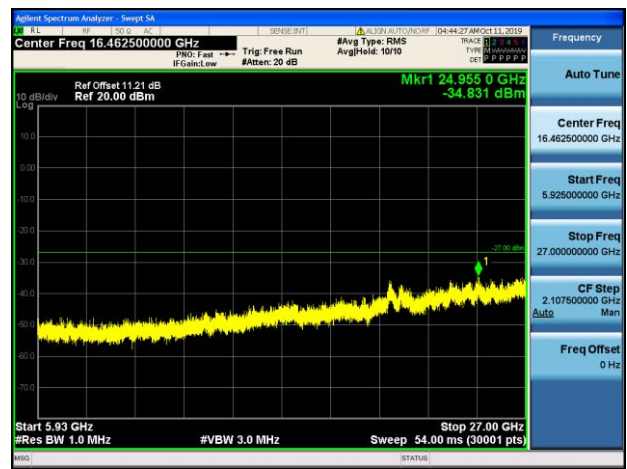


11ac40

Low channel



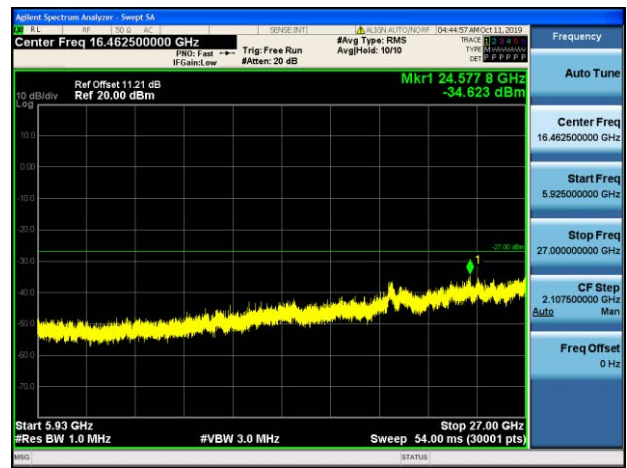
Low channel



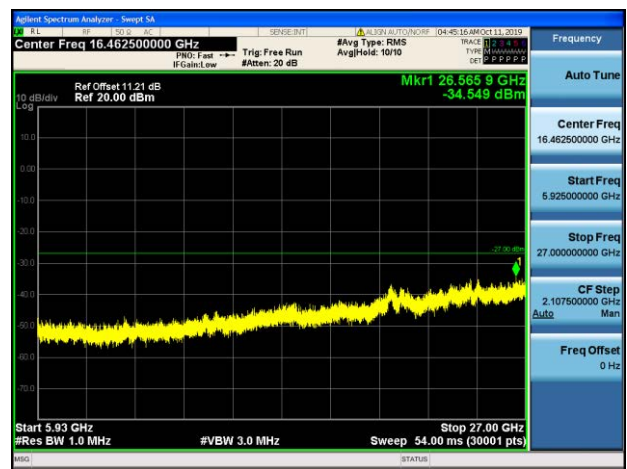
High channel



High channel



11ac80

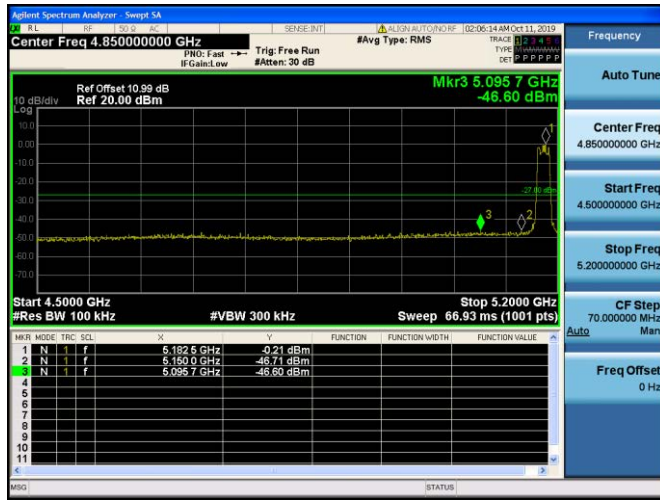




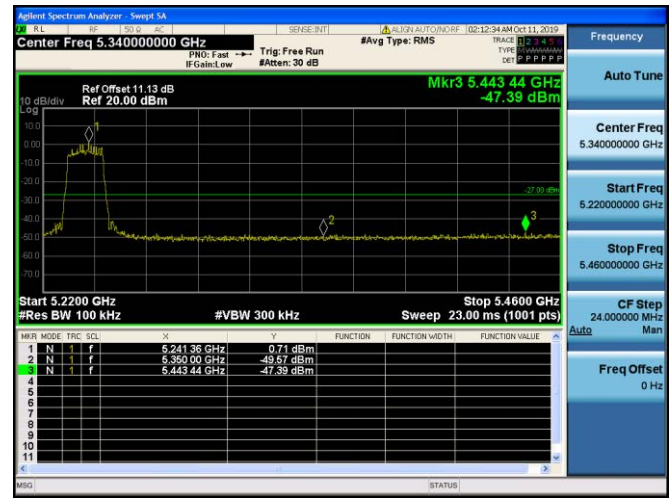
Conduction Band edge For U-NiI-1

11a

Band edge-Left

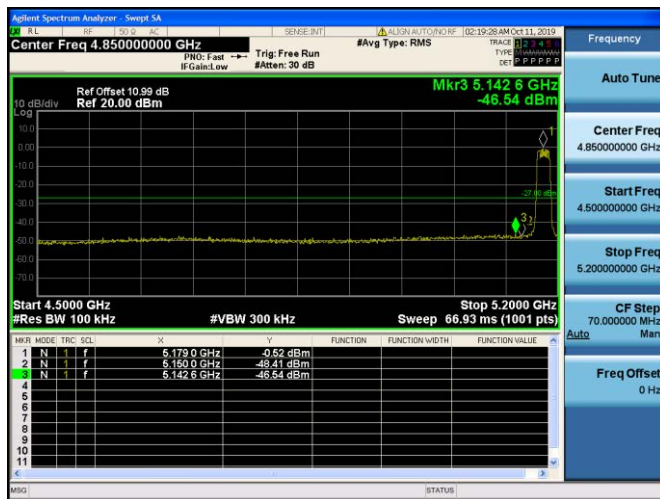


Band edge-Right

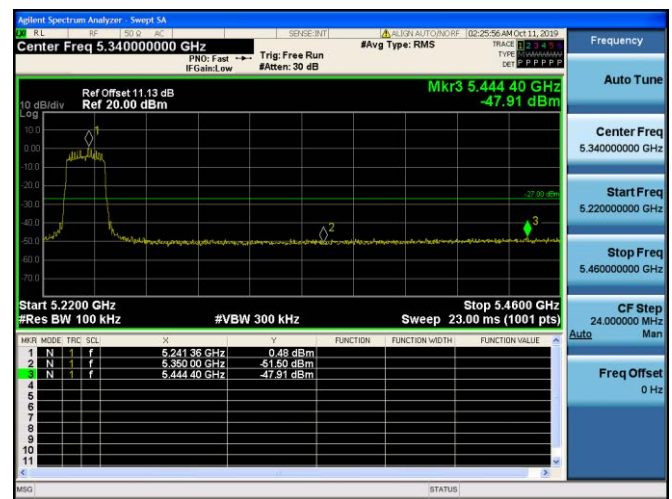


11n20

Band edge-Left

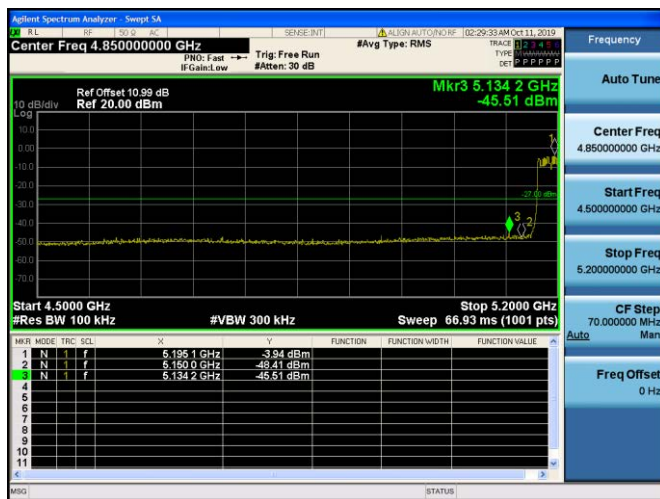


Band edge-Right

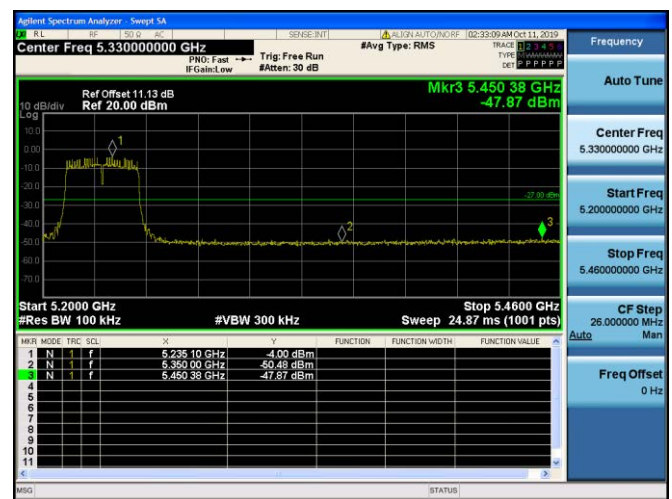


11n40

Band edge-Left



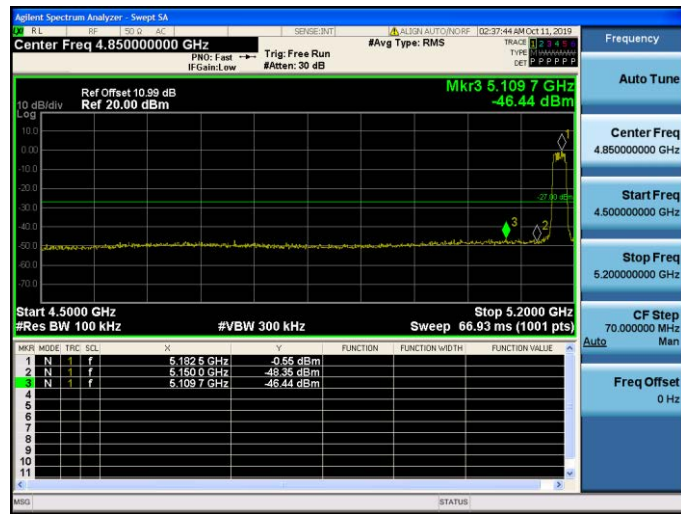
Band edge-Right





11ac20

Band edge-Left

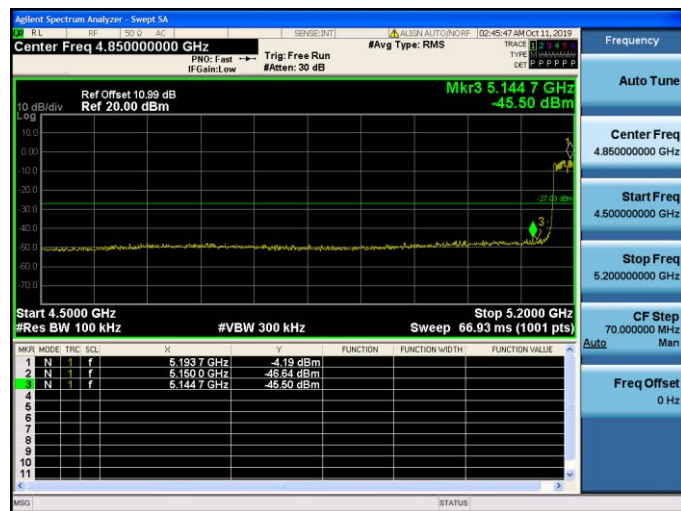


Band edge-Right

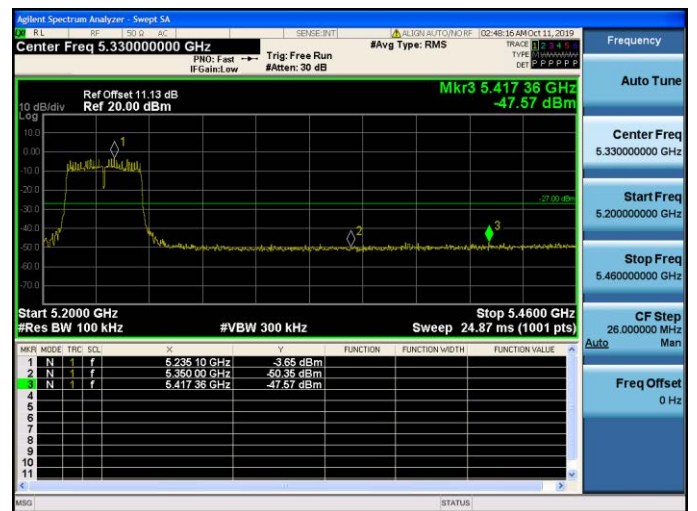


11ac40

Band edge-Left

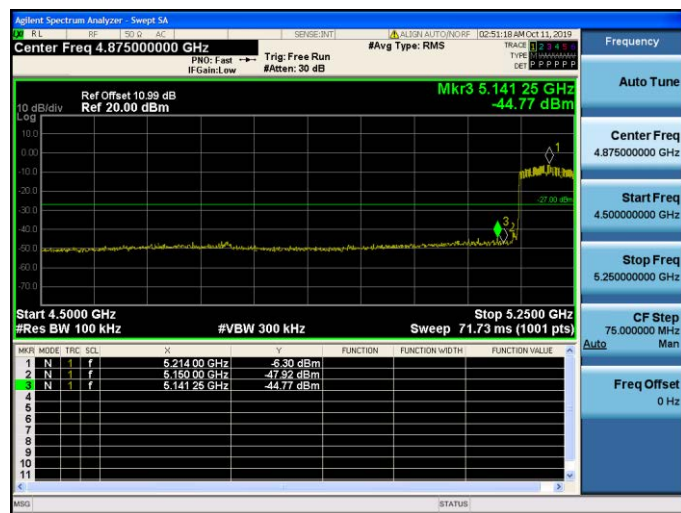


Band edge-Right

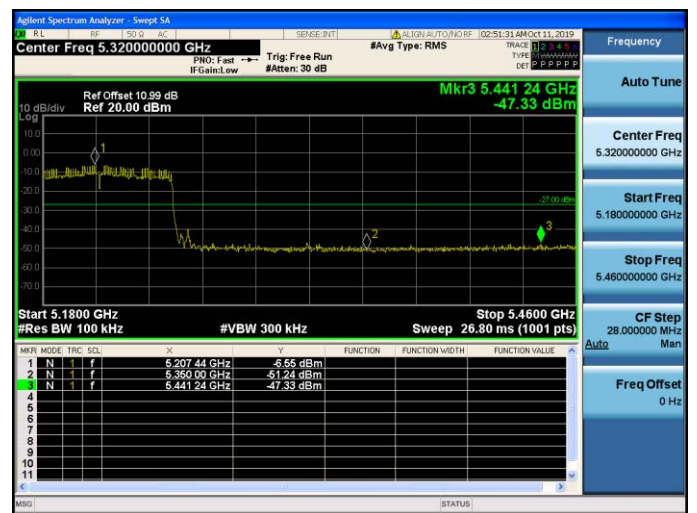


11ac80

Band edge-Left



Band edge-Right





Conduction Band edge For U-NII-3

11a

Band edge-Left

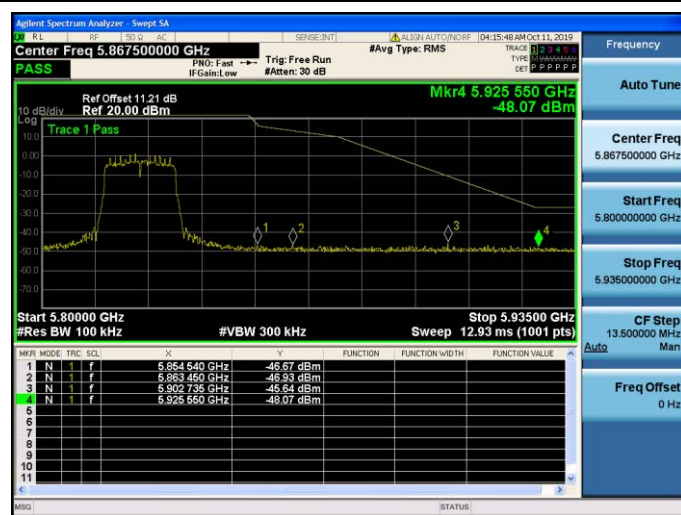
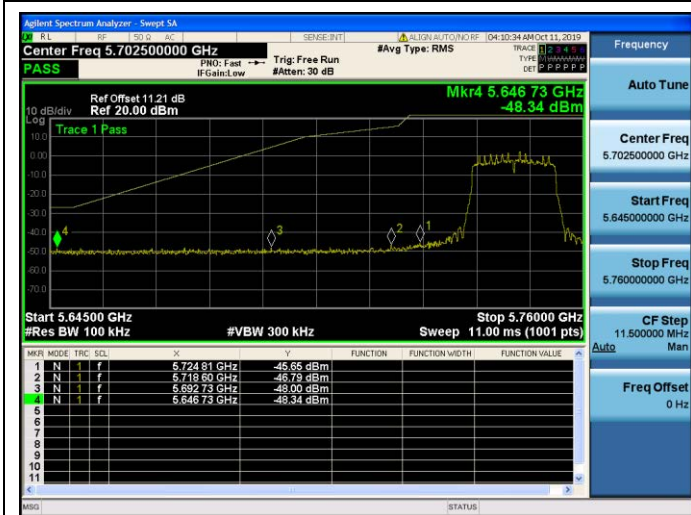
Band edge-Right



11n20

Band edge-Left

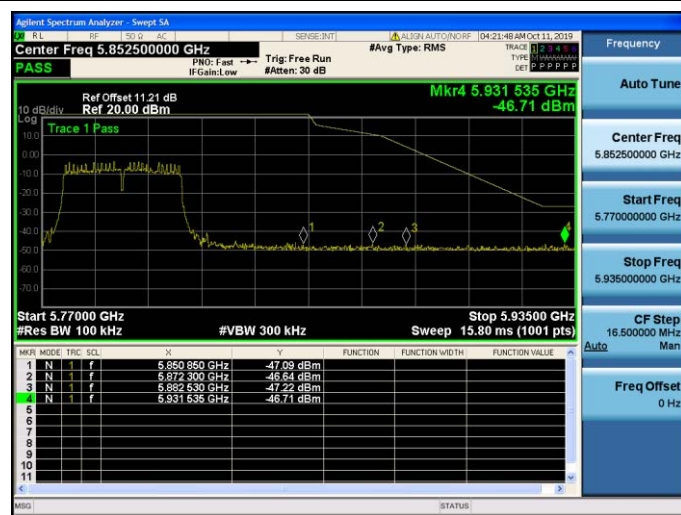
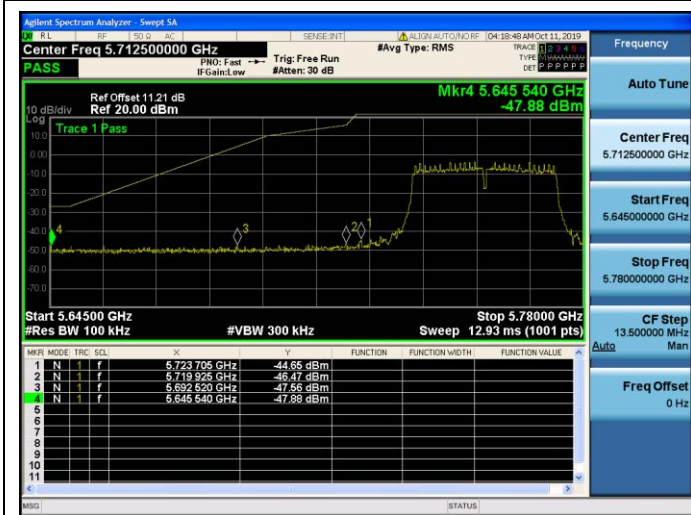
Band edge-Right



11n40

Band edge-Left

Band edge-Right





11ac20

Band edge-Left

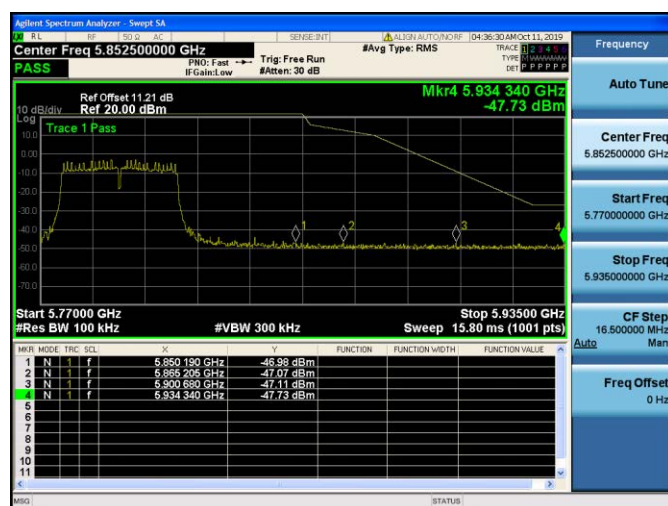
Band edge-Right



11ac40

Band edge-Left

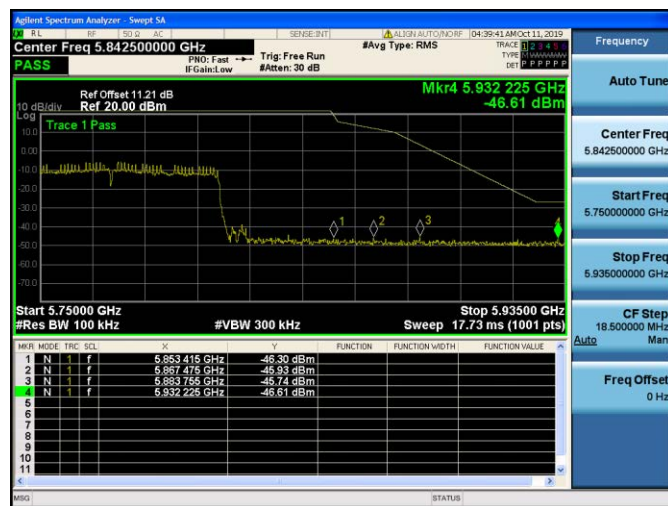
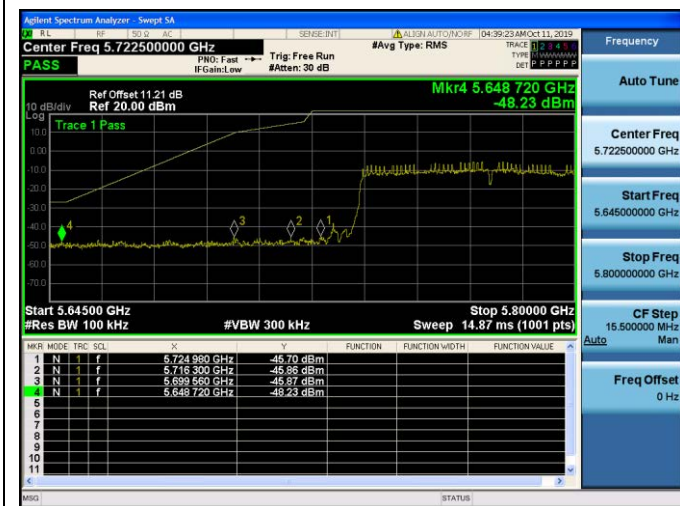
Band edge-Right



11ac80

Band edge-Left

Band edge-Right





5.8 Power spectral density

5.8.1 Limit

For the band 5.15-5.25 GHz

For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.25-5.35 GHz and 5.47-5.725 GHz

The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz

The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.8.2 Test procedure

For U-NII-1

1. Set analyzer center frequency to NII channel center frequency.
2. Set the RBW $\geq 1\text{MHz}$.
3. Set the VBW $\geq 3 \times \text{RBW}$.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level.

For U-NII-3

1. Set analyzer center frequency to NII channel center frequency.
2. Set the RBW $\geq 510\text{kHz}$.
3. Set the VBW $\geq 3 \times \text{RBW}$.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level.



5.8.3 Test setup





5.8.4 Test results

Note1: For FCC standard, if transmitting antennas of directional gain greater than 6 dBi are used, all band of the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note 2: Transmitting antennas of directional gain in Band I(5150 MHz to 5250 MHz) is 6.01 dBi

Formulas: Directional gain = G_{ANT} + Array Gain, Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB, $N_{SS} = 1$, G_{ANT} set equal to the gain of the antenna having the highest gain.

Note 3: The total PSD method used the sum spectra maxima across the outputs.

For U-NII-1

Mode	Channel	Frequency(MHz)	Measurement PSD (dBm/MHz)		Total PSD of antennas	Limit (dBm/MHz)	Result
			ANTA	ANTB			
11a	CH149	5745	4.724	2.64	6.82	11	Pass
11a	CH157	5785	5.247	3.001	7.28	11	Pass
11a	CH165	5825	4.347	3.909	7.14	11	Pass
11n (HT20)	CH149	5745	3.046	2.176	5.64	10.99	Pass
11n (HT20)	CH157	5785	3.794	2.17	6.07	10.99	Pass
11n (HT20)	CH165	5825	3.694	2.553	6.17	10.99	Pass
11n (HT40)	CH151	5755	-1.354	-1.549	1.56	10.99	Pass
11n (HT40)	CH159	5795	-1.023	-2.559	1.29	10.99	Pass
11ac (HT20)	CH149	5745	3.013	2.108	5.59	10.99	Pass
11ac (HT20)	CH157	5785	4.242	2.125	6.32	10.99	Pass
11ac (HT20)	CH165	5825	4.521	2.32	6.57	10.99	Pass
11ac (HT40)	CH151	5755	0.452	-2.046	2.39	10.99	Pass
11ac (HT40)	CH159	5795	0.804	-0.855	3.06	10.99	Pass
11ac (HT80)	CH159	5795	-1.972	-4.134	0.09	10.99	Pass



Test plots

For U-NII-1

ANT A

11a CH36



11a CH44



11a CH48



11n20 CH36

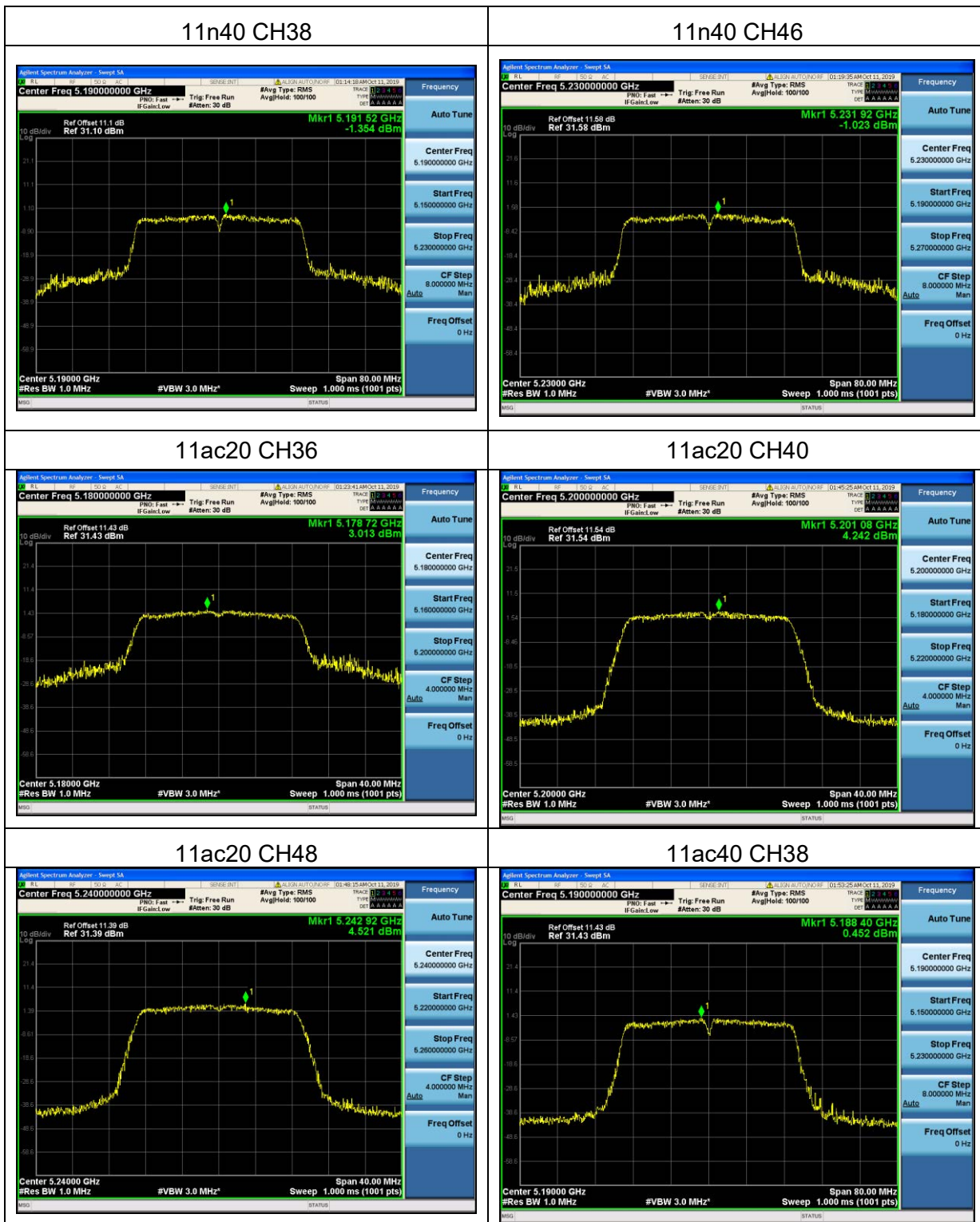


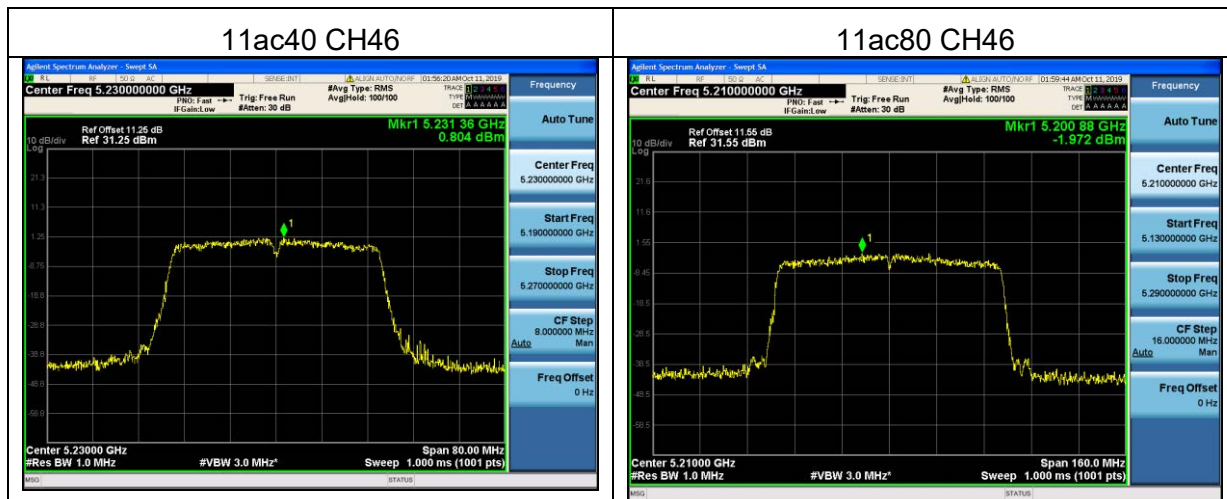
11n20 CH44



11n20 CH48

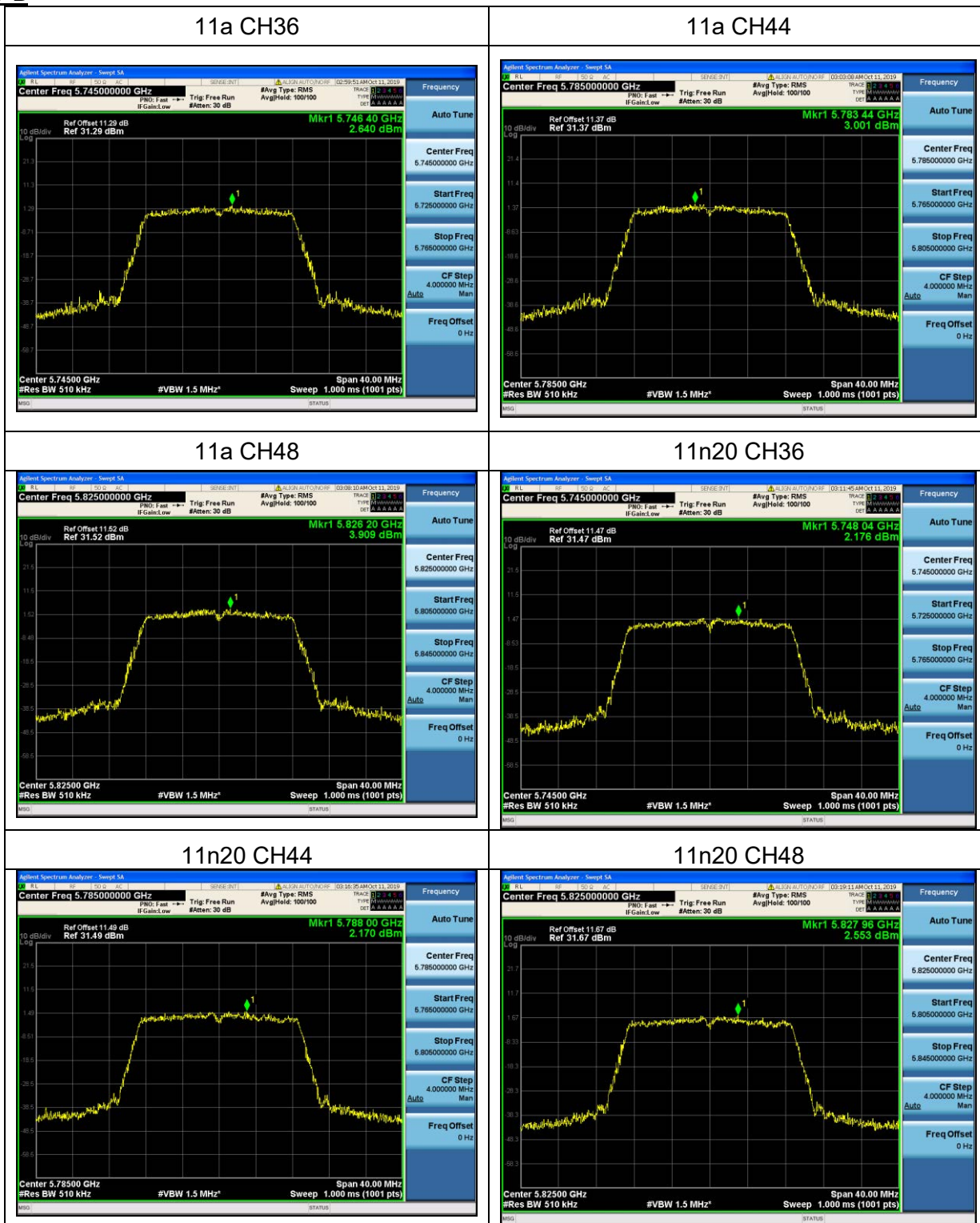






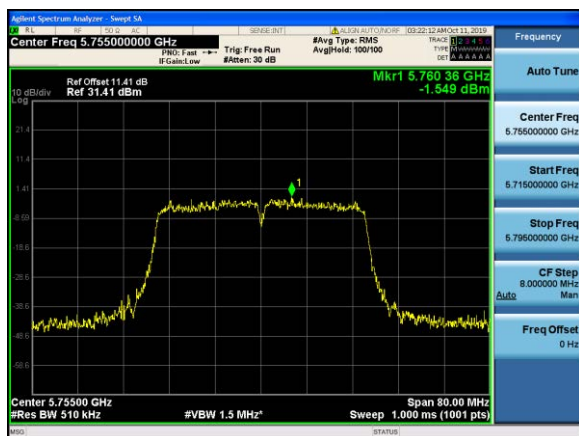


ANT B





11n40 CH38



11n40 CH46



11ac20 CH36



11ac20 CH40

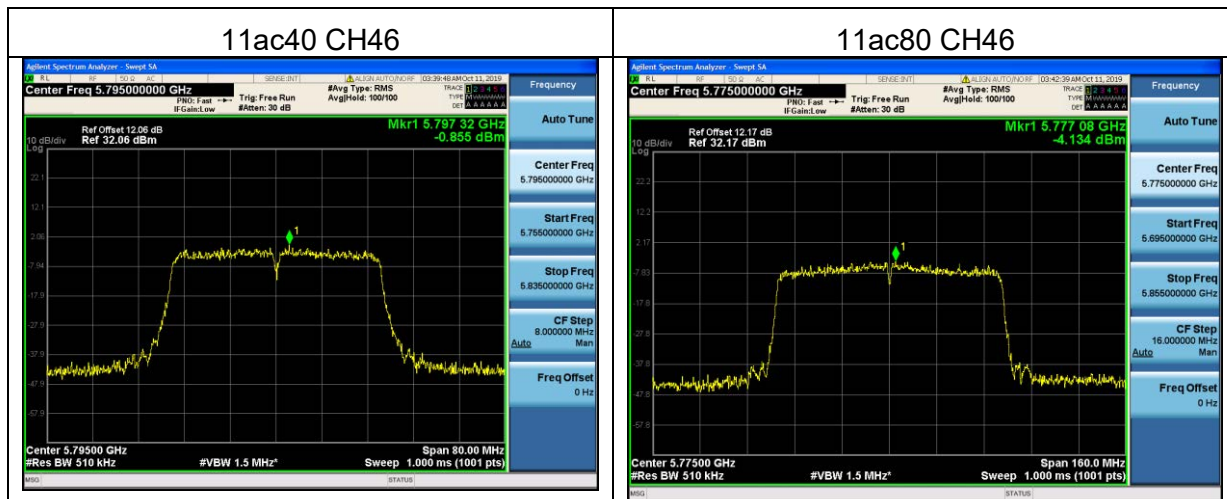


11ac20 CH48



11ac40 CH38





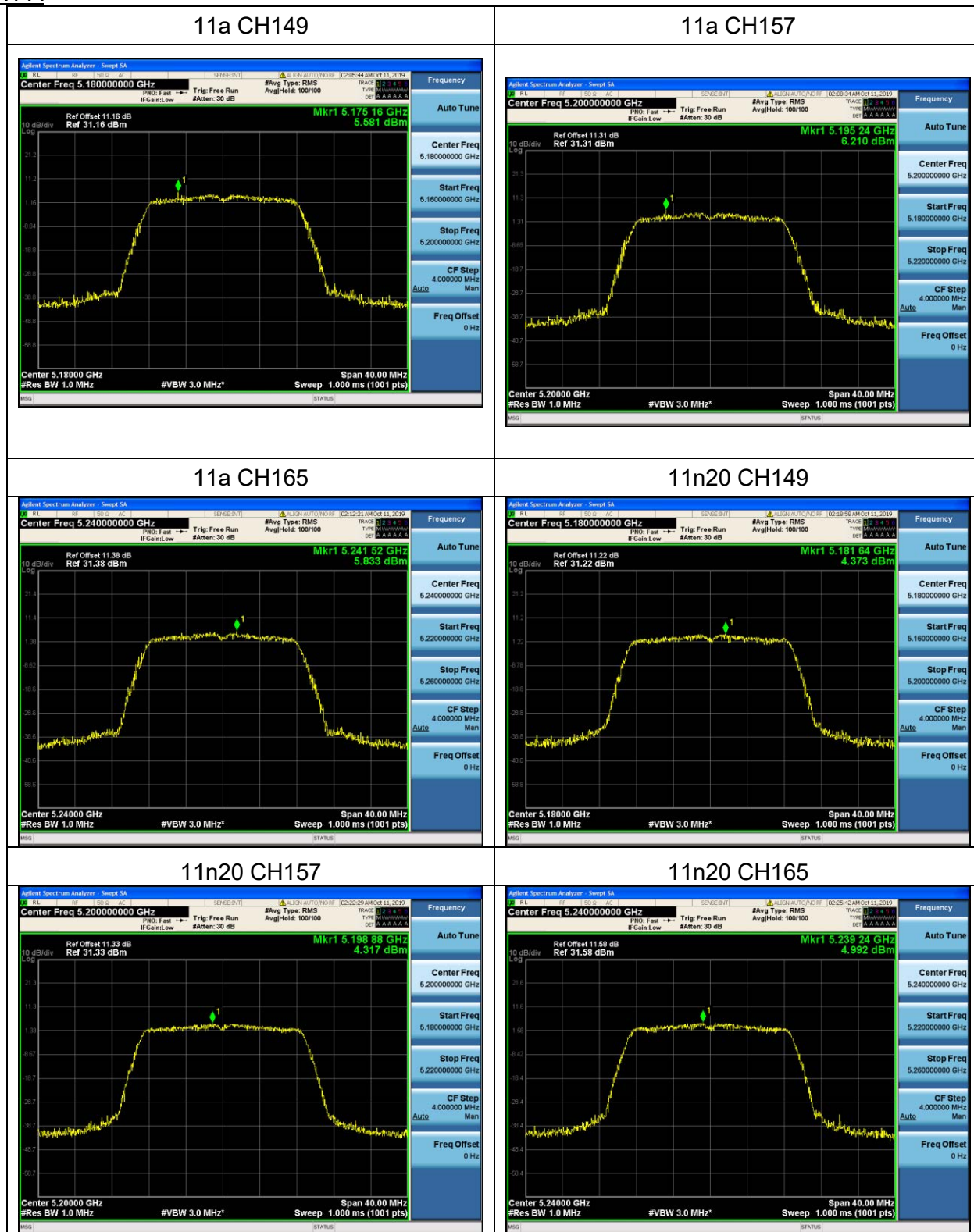
For U-NII-3

Mode	Channel	Frequency (MHz)	PSD (dBm/510kHz)		PSD (dBm/500kHz)		Total PSD of antennas	Limit (dBm/500kHz)	Result
			ANTA	ANTB	ANTA	ANTB			
11a	CH149	5745	5.581	5.342	3.544	3.354	8.47	30	Pass
11a	CH157	5785	6.210	4.533	4.096	2.784	8.46	30	Pass
11a	CH165	5825	5.833	4.357	3.756	2.674	8.17	30	Pass
11n20	CH149	5745	4.373	4.656	2.683	2.864	7.52	29.99	Pass
11n20	CH157	5785	4.317	3.812	2.649	2.358	7.08	29.99	Pass
11n20	CH165	5825	4.992	4.396	3.095	2.698	7.71	29.99	Pass
11n40	CH151	5755	0.582	0.226	1.121	1.033	3.41	29.99	Pass
11n40	CH159	5795	1.418	-1.180	1.359	0.747	3.32	29.99	Pass
11ac20	CH149	5745	4.560	4.654	2.802	2.863	7.61	29.99	Pass
11ac20	CH157	5785	4.718	3.882	2.905	2.397	7.33	29.99	Pass
11ac20	CH165	5825	4.572	3.695	2.809	2.296	7.16	29.99	Pass
11ac40	CH151	5755	0.878	0.405	1.200	1.076	3.65	29.99	Pass
11ac40	CH159	5795	1.419	-0.900	1.359	0.797	3.42	29.99	Pass
11ac80	CH159	5795	-0.870	-3.042	0.802	0.487	1.18	29.99	Pass
Note: If the measurement is X dBm/510kHz, thus $X \text{ dBm/510kHz} = (10^{X/10}) * (500 / 510) \text{ dBm/500kHz}$									

Test plots

For U-NII-3

ANT A

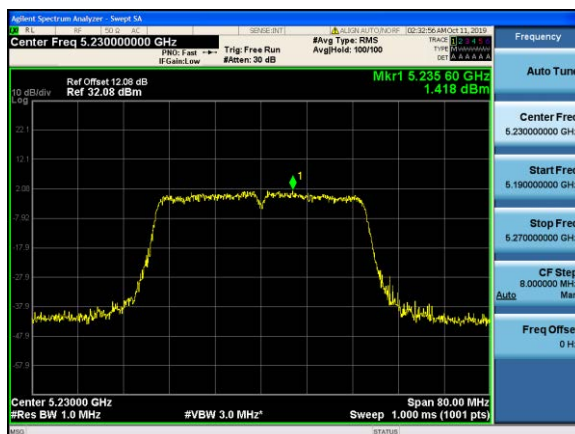




11n40 CH151



11n40 CH159



11ac20 CH149



11ac20 CH157

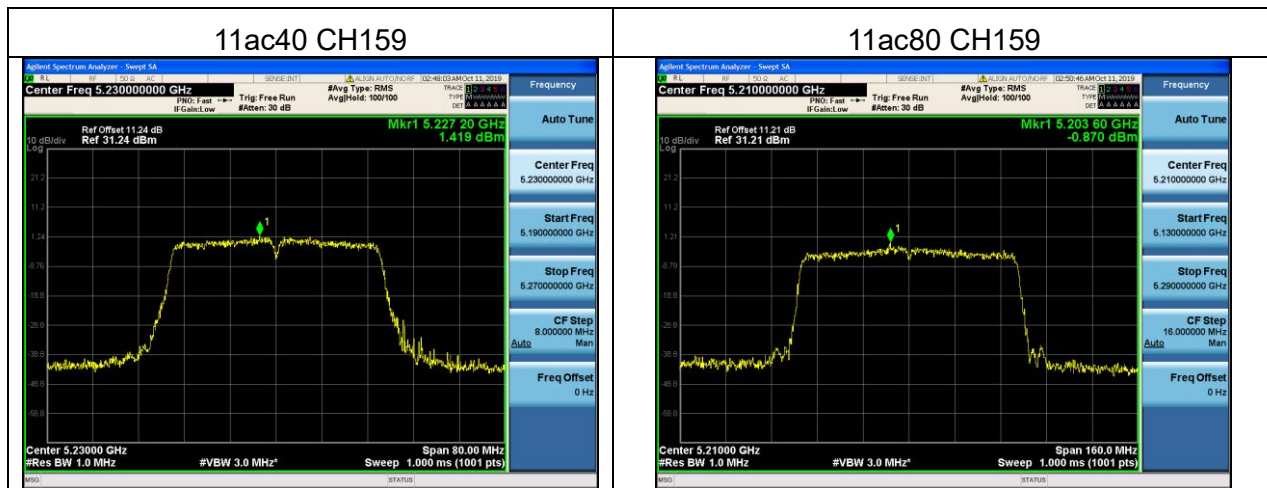


11ac20 CH165



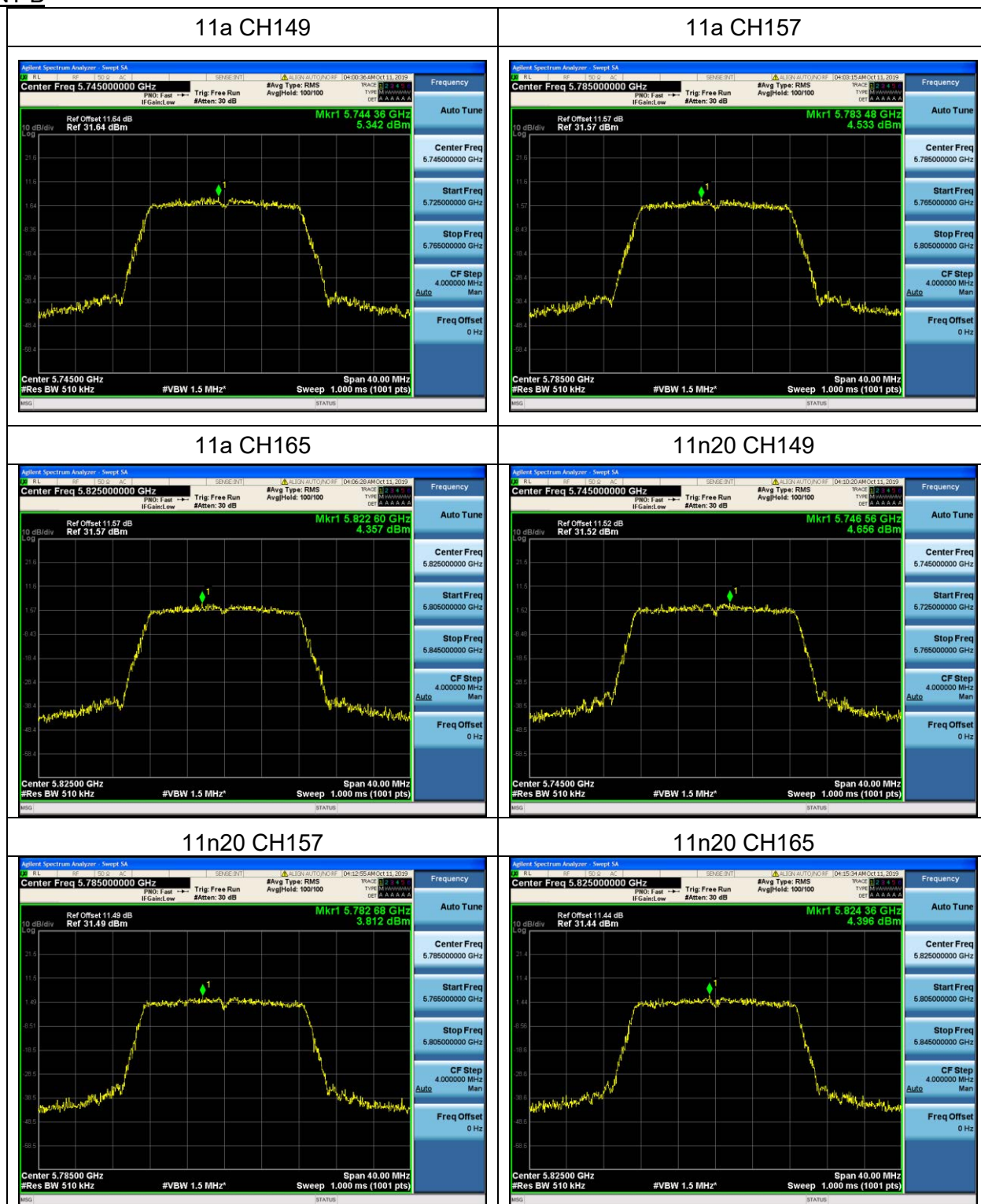
11ac40 CH151







ANT B





11n40 CH151



11n40 CH159



11ac20 CH149



11ac20 CH157

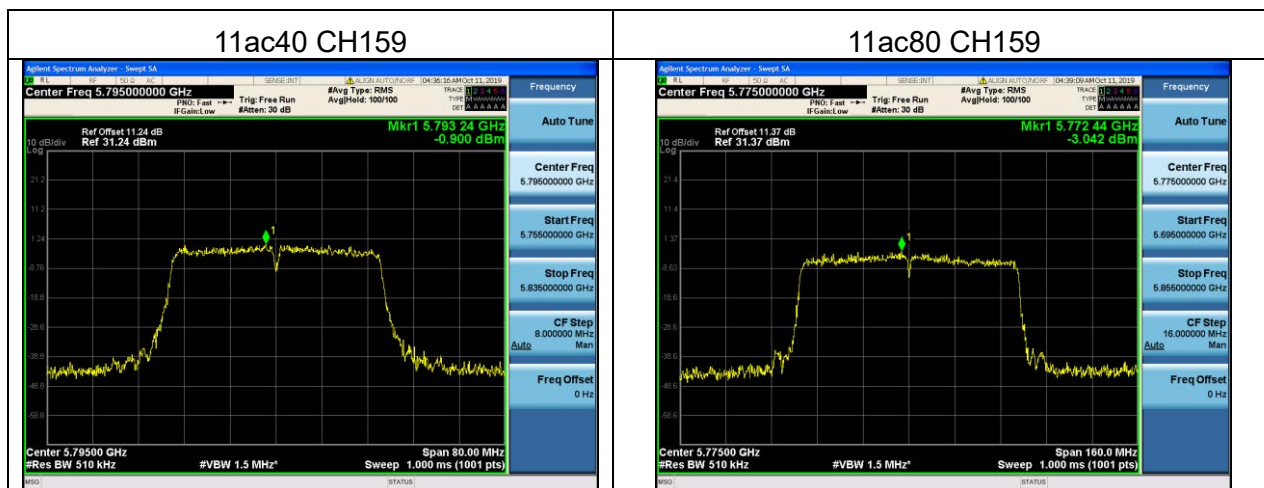


11ac20 CH165



11ac40 CH151







5.9 Frequency Stability Measurement

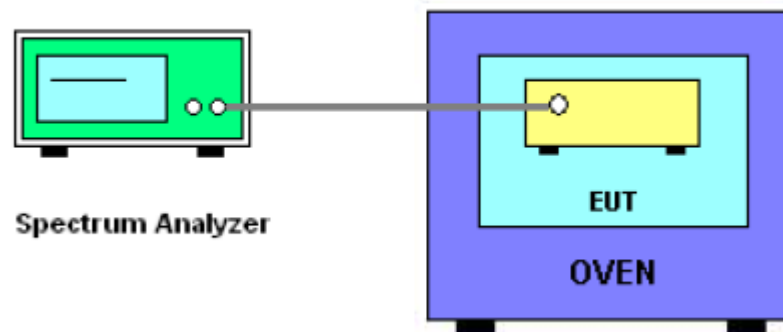
5.9.1 Limit

Manufactures 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.

5.9.2 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and max hold settings.
5. f_c is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 10^6$ ppm and the limit is less than ± 20 ppm (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is $-20^{\circ}\text{C} \sim 70^{\circ}\text{C}$.

5.9.3 Test Setup Layout



5.9.4 EUT Operation during Test

The EUT was programmed to be in continuously un-modulation transmitting mode.



5.9.5 TEST RESULTS

Note1: The antenna A and antenna B have been tested. The report only shows the worst antenna. The worst case is ANT B.

ANT B

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5180.0120	5180	0.0120	-2.3166
		V max (V)	13.20	5180.0187	5180	0.0187	-3.6100
		V min (V)	10.80	5180.0123	5180	0.0123	-2.3745
Limits				within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5180.0127	5180	0.0127	-2.4517
		T (°C)	-10	5180.0135	5180	0.0135	-2.6062
		T (°C)	0	5180.0114	5180	0.0114	-2.2008
		T (°C)	10	5180.0132	5180	0.0132	-2.5483
		T (°C)	20	5180.0130	5180	0.0130	-2.5097
		T (°C)	30	5180.0137	5180	0.0137	-2.6448
		T (°C)	40	5180.0150	5180	0.0150	-2.8958
		T (°C)	50	5180.0147	5180	0.0147	-2.8378
		T (°C)	60	5180.0141	5180	0.0141	-2.7220
		T (°C)	70	5180.0136	5180	0.0136	-2.6255
Limits				within 5150-5250MHz			
Result				Complies			



Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5200.0118	5200	0.0118	-2.2692
		V max (V)	13.20	5200.0170	5200	0.0170	-3.2692
		V min (V)	10.80	5200.0120	5200	0.0120	-2.3077
Limits				within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5200.0160	5200	0.0160	-3.0769
		T (°C)	-10	5200.0128	5200	0.0128	-2.4615
		T (°C)	0	5200.0170	5200	0.0170	-3.2692
		T (°C)	10	5200.0134	5200	0.0134	-2.5769
		T (°C)	20	5200.0147	5200	0.0147	-2.8269
		T (°C)	30	5200.0142	5200	0.0142	-2.7308
		T (°C)	40	5200.0140	5200	0.0140	-2.6923
		T (°C)	50	5200.0134	5200	0.0134	-2.5769
		T (°C)	60	5200.0129	5200	0.0129	-2.4808
		T (°C)	70	5200.0121	5200	0.0121	-2.3269
Limits				within 5150-5250MHz			
Result				Complies			



Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5240.0110	5240	0.0110	-2.0992
		V max (V)	13.20	5240.0126	5240	0.0126	-2.4046
		V min (V)	10.80	5240.0144	5240	0.0144	-2.7481
Limits				within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5240.0110	5240	0.0110	-2.0992
		T (°C)	-10	5240.0136	5240	0.0136	-2.5954
		T (°C)	0	5240.0124	5240	0.0124	-2.3664
		T (°C)	10	5240.0122	5240	0.0122	-2.3282
		T (°C)	20	5240.0142	5240	0.0142	-2.7099
		T (°C)	30	5240.0138	5240	0.0138	-2.6336
		T (°C)	40	5240.0123	5240	0.0123	-2.3473
		T (°C)	50	5240.0127	5240	0.0127	-2.4237
		T (°C)	60	5240.0135	5240	0.0135	-2.5763
		T (°C)	70	5240.0133	5240	0.0133	-2.5382
Limits				within 5150-5250MHz			
Result				Complies			



Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (° C)	20	V nom (V)	12.00	5745.00692	5745	0.00692	-1.2043
		V max (V)	13.20	5745.00758	5745	0.00758	-1.3186
		V min (V)	10.80	5745.00656	5745	0.00656	-1.1427
Limits				within 5725-5850MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5785.00584	5745	#####	-6963.5935
		T (°C)	-10	5785.00246	5745	#####	-6963.0039
		T (°C)	0	5785.01152	5745	#####	-6964.5816
		T (°C)	10	5785.00532	5745	#####	-6963.5029
		T (°C)	20	5785.01317	5745	#####	-6964.8688
		T (°C)	30	5785.00385	5745	#####	-6963.2460
		T (°C)	40	5785.00388	5745	#####	-6963.2513
		T (°C)	50	5785.00124	5745	#####	-6962.7912
		T (°C)	60	5785.00558	5745	#####	-6963.5470
		T (°C)	70	5785.00614	5745	#####	-6963.6456
Limits				within 5725-5850MHz			
Result				Complies			



Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5785.00416	5785	0.00416	-0.7193
		V max (V)	13.20	5785.00792	5785	0.00792	-1.3686
		V min (V)	10.80	5785.00384	5785	0.00384	-0.6631
Limits				within 5725-5850MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5785.00181	5785	0.00181	-0.3133
		T (°C)	-10	5785.00731	5785	0.00731	-1.2642
		T (°C)	0	5785.00306	5785	0.00306	-0.5293
		T (°C)	10	5785.00825	5785	0.00825	-1.4259
		T (°C)	20	5785.01102	5785	0.01102	-1.9053
		T (°C)	30	5785.00824	5785	0.00824	-1.4247
		T (°C)	40	5785.01328	5785	0.01328	-2.2950
		T (°C)	50	5785.00189	5785	0.00189	-0.3265
		T (°C)	60	5785.00698	5785	0.00698	-1.2072
		T (°C)	70	5785.00677	5785	0.00677	-1.1703
Limits				within 5725-5850MHz			
Result				Complies			



Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5825.00502	5825	0.00502	-0.8612
		V max (V)	13.20	5825.01203	5825	0.01203	-2.0646
		V min (V)	10.80	5825.00802	5825	0.00802	-1.3774
Limits				within 5725-5850MHz			
Result				Complies			

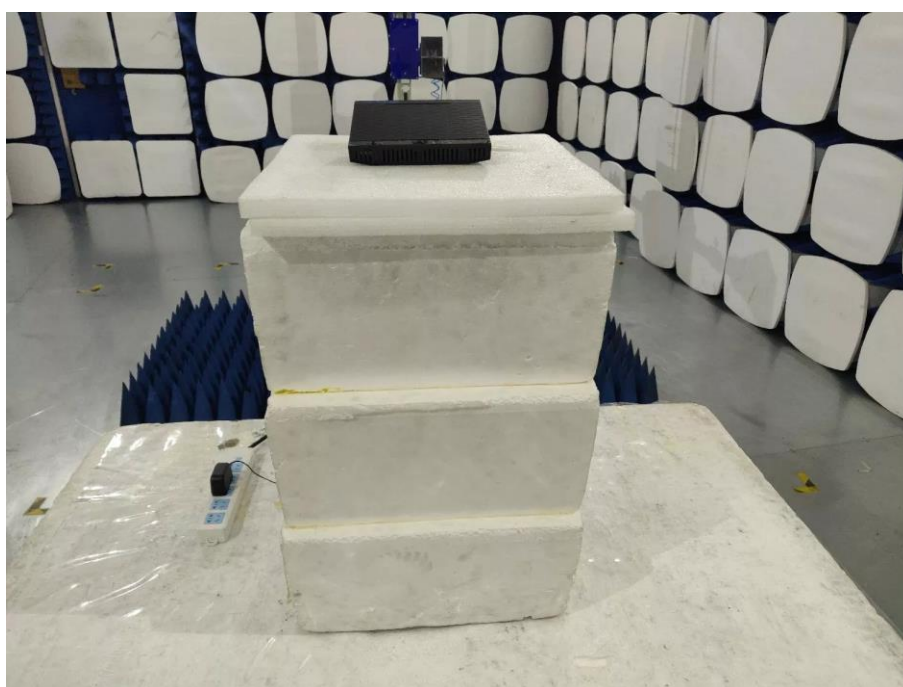
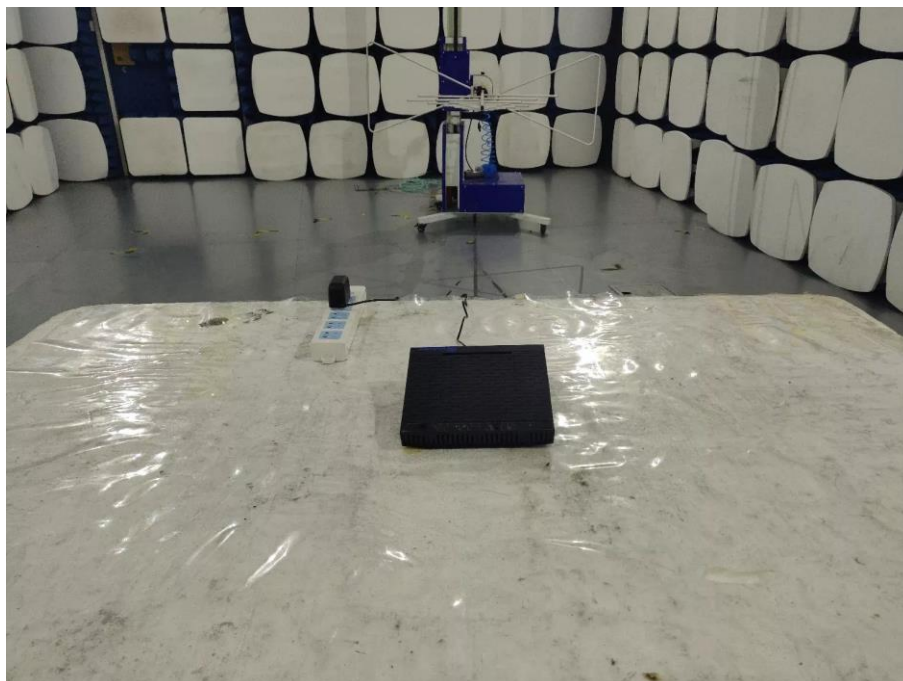
Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5825.00528	5825	0.00528	-0.9063
		T (°C)	-10	5825.00406	5825	0.00406	-0.6970
		T (°C)	0	5825.00353	5825	0.00353	-0.6062
		T (°C)	10	5825.00705	5825	0.00705	-1.2108
		T (°C)	20	5825.01247	5825	0.01247	-2.1402
		T (°C)	30	5825.00986	5825	0.00986	-1.6920
		T (°C)	40	5825.00145	5825	0.00145	-0.2486
		T (°C)	50	5825.00287	5825	0.00287	-0.4932
		T (°C)	60	5825.00884	5825	0.00884	-1.5179
		T (°C)	70	5825.00542	5825	0.00542	-0.9296
Limits				within 5725-5850MHz			
Result				Complies			



Photographs of the Test Setup

Radiated emission





Conducted emission





Photographs of the EUT

See the APPENDIX 1: EUT PHOTO in the report No.: MTi19091904-1E1-1.

----END OF REPORT----