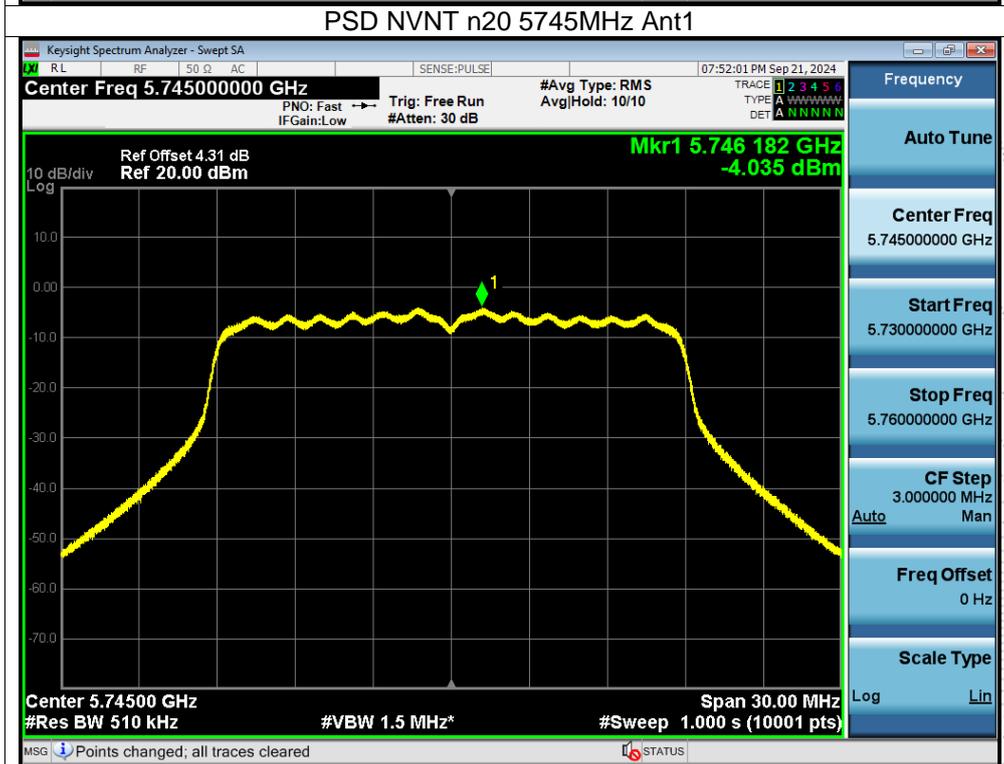
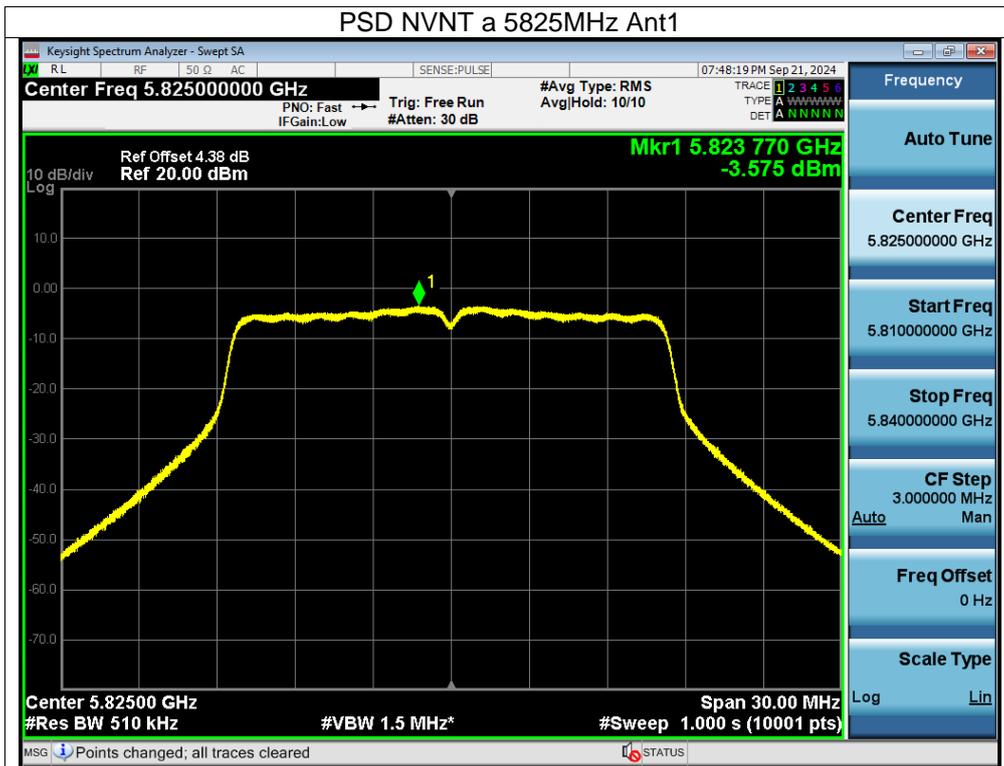
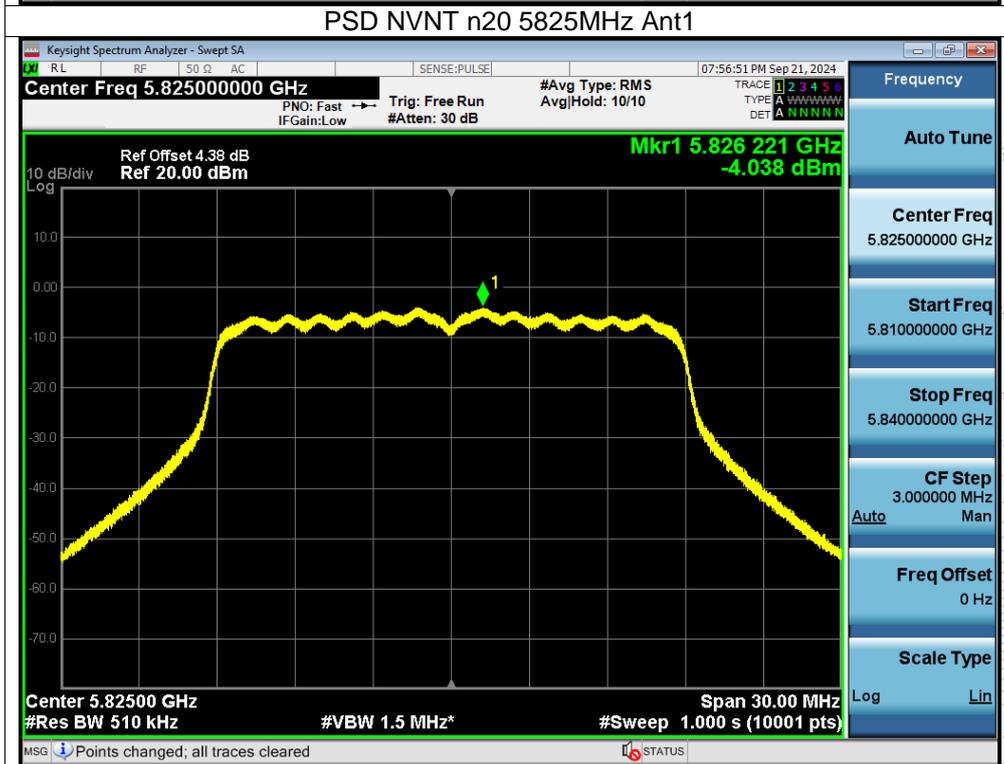
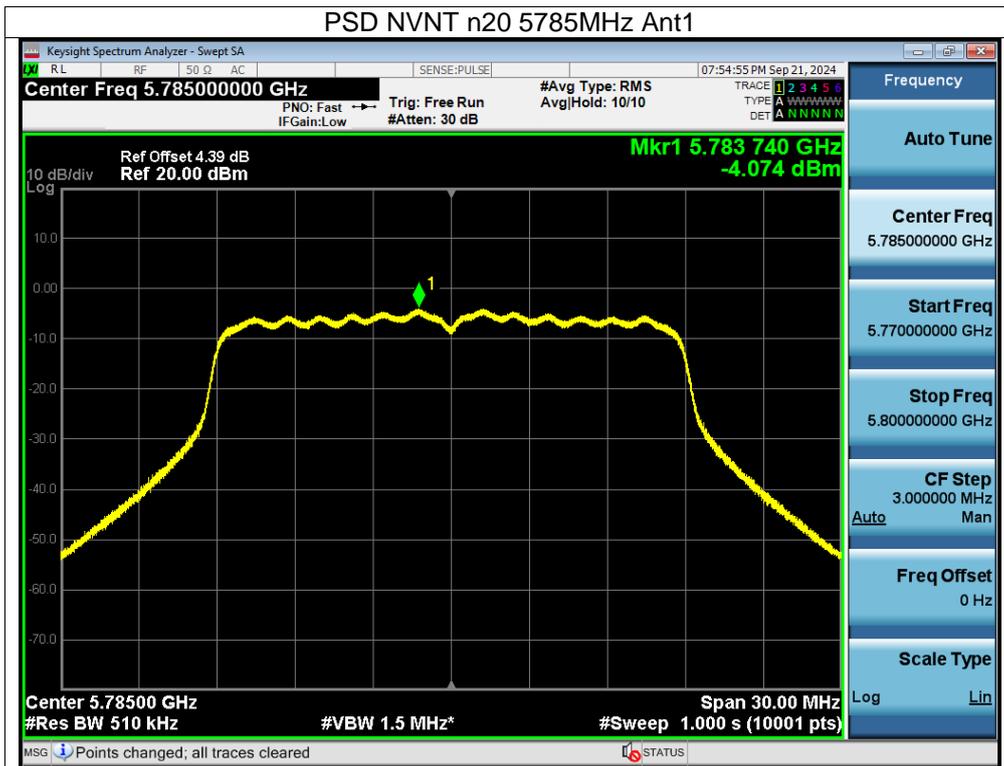
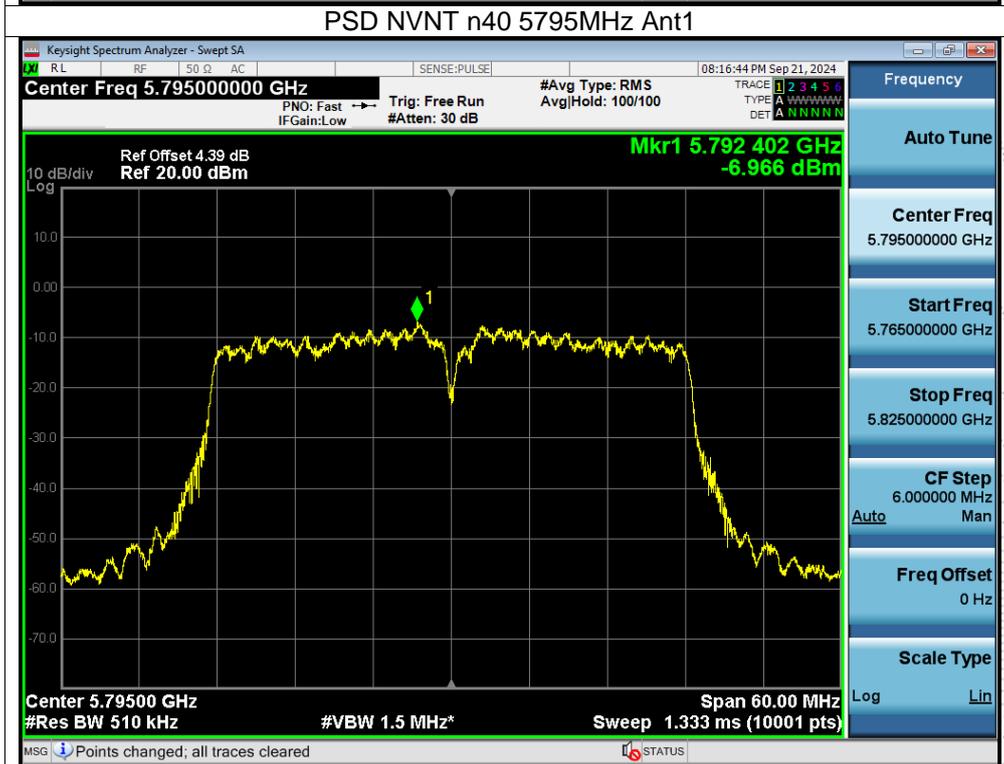
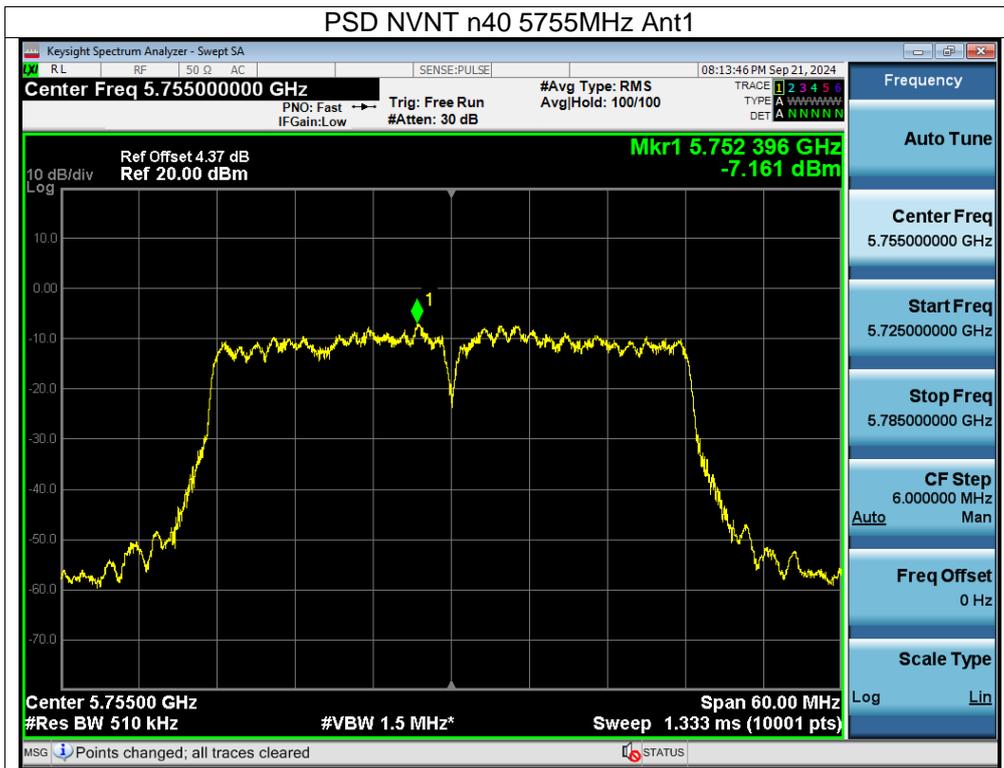


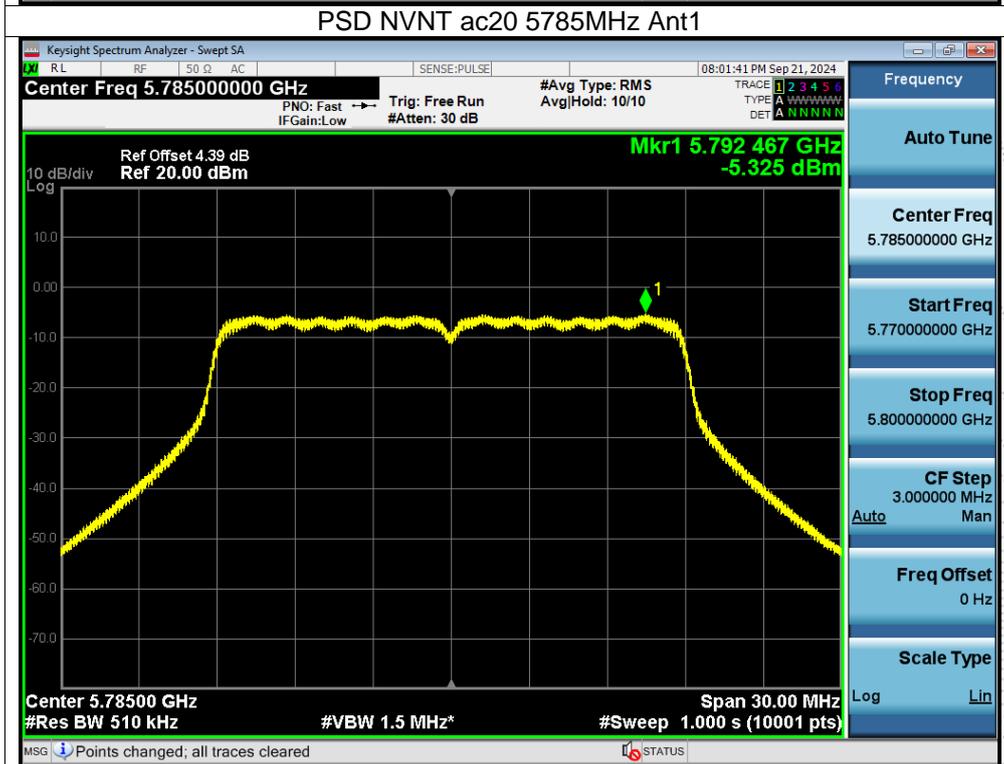
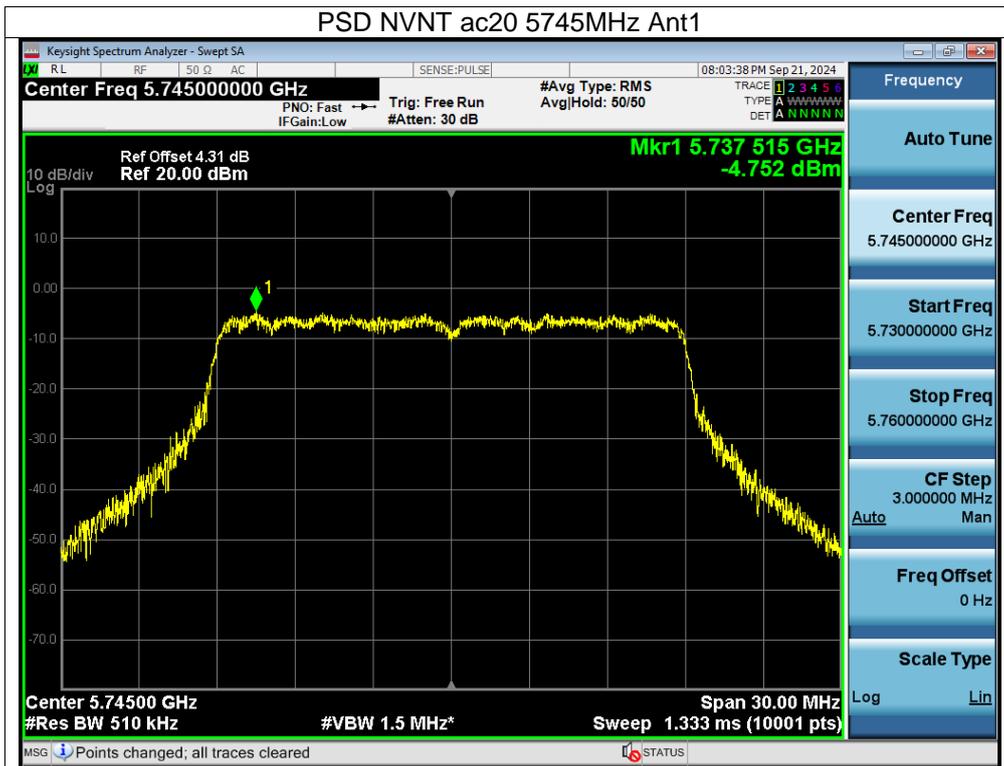
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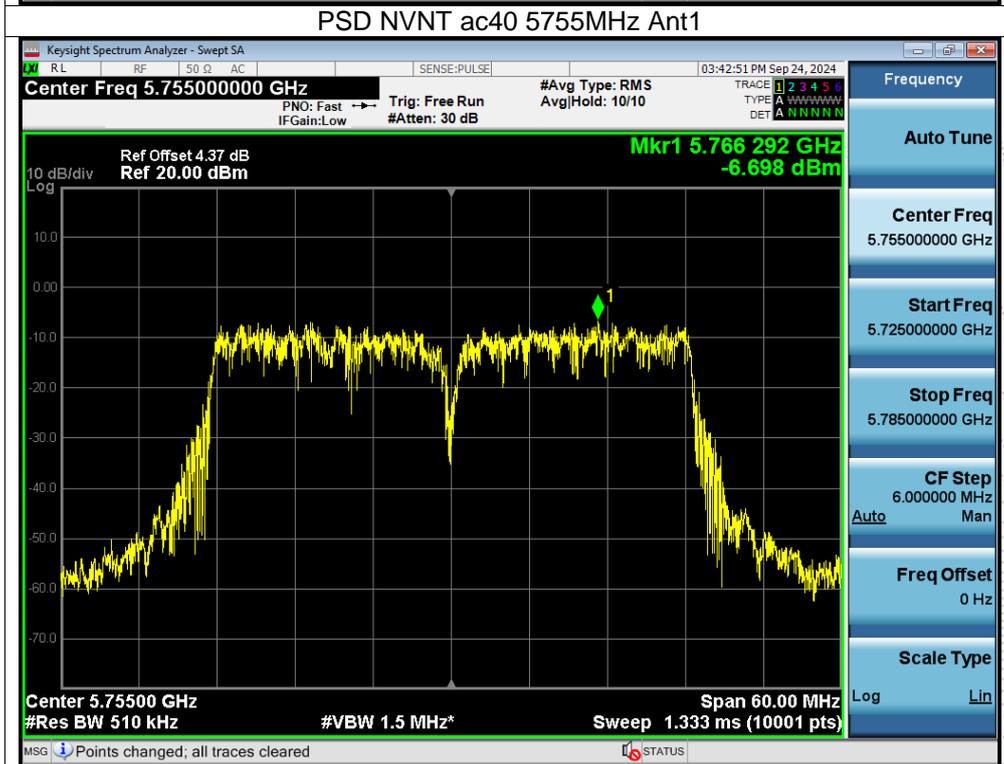
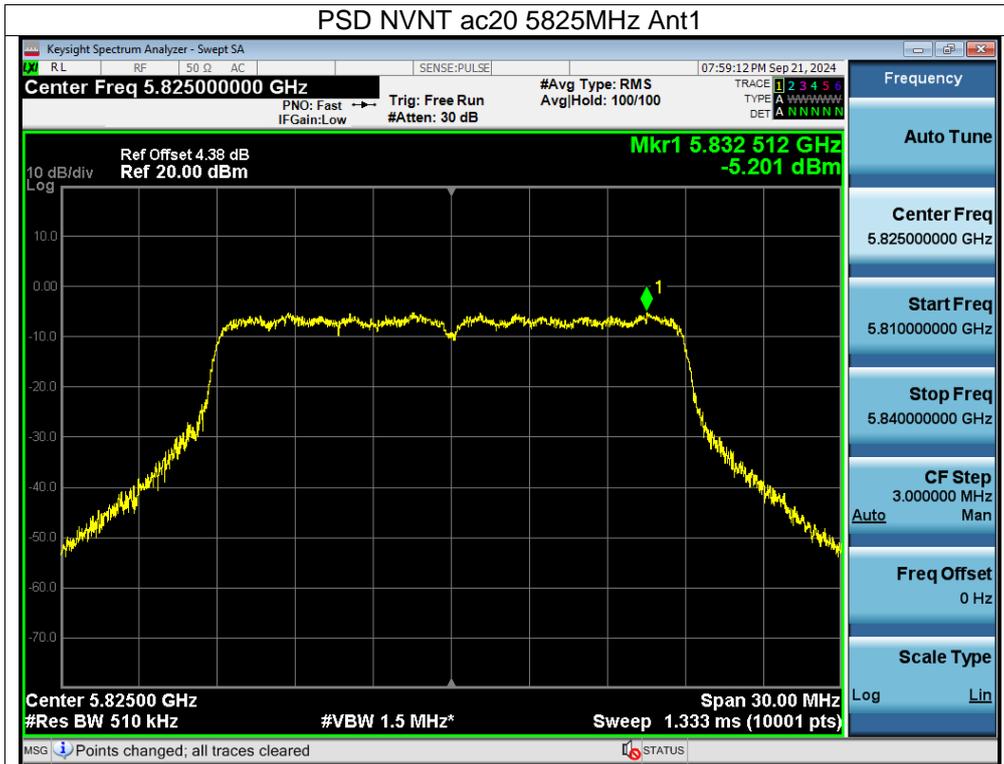


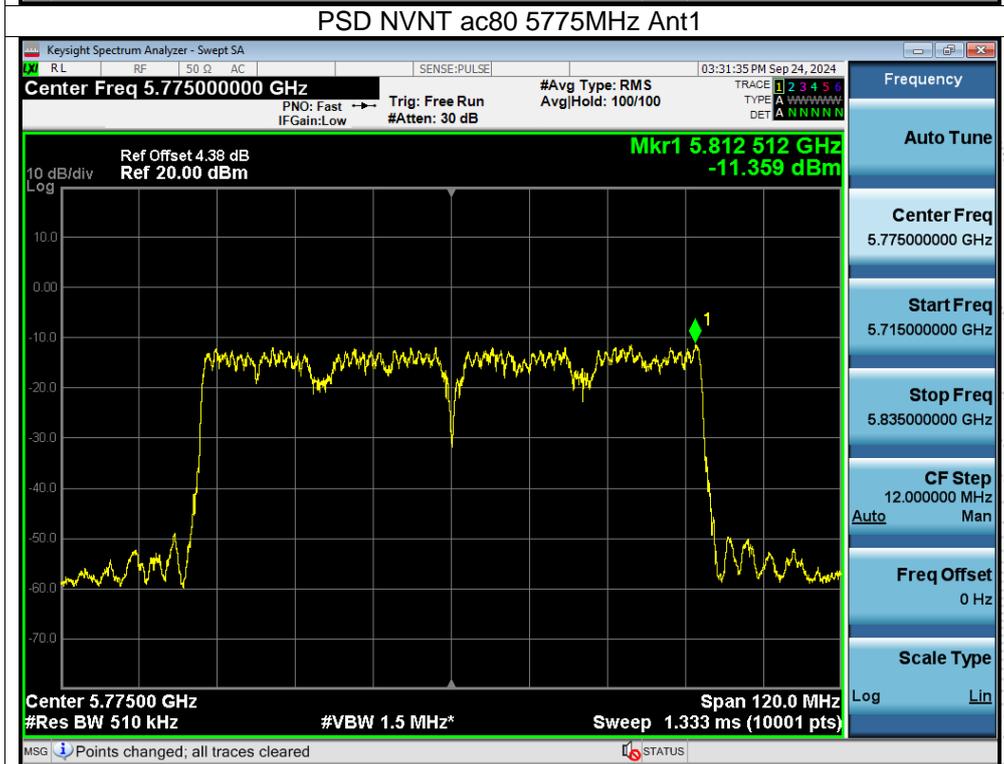
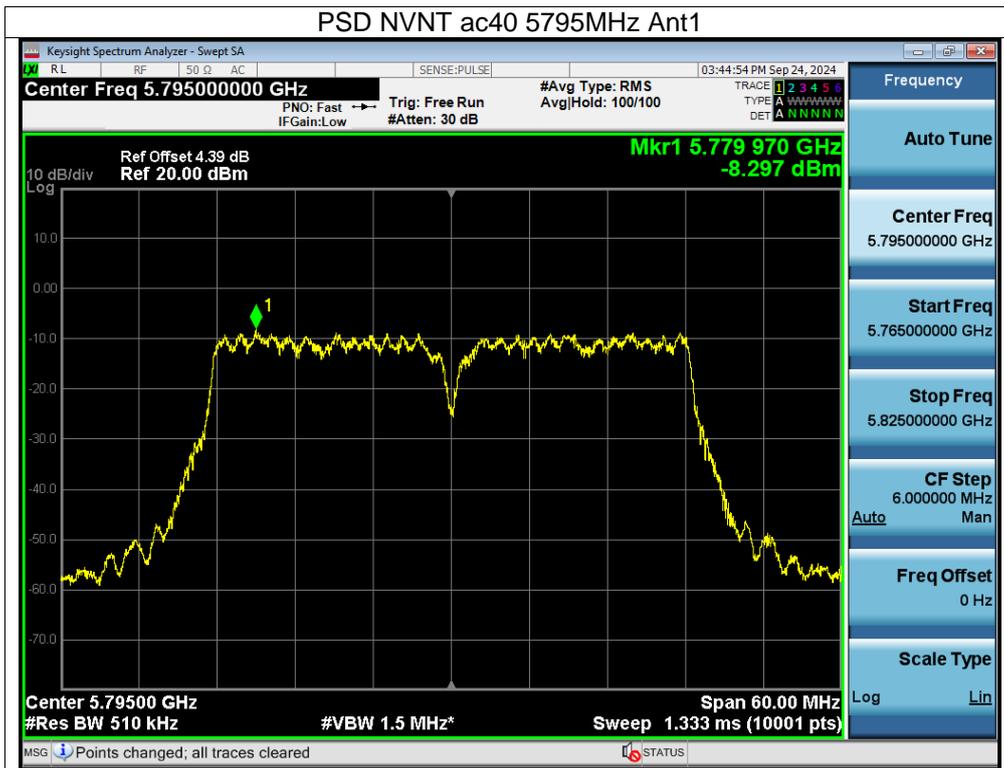


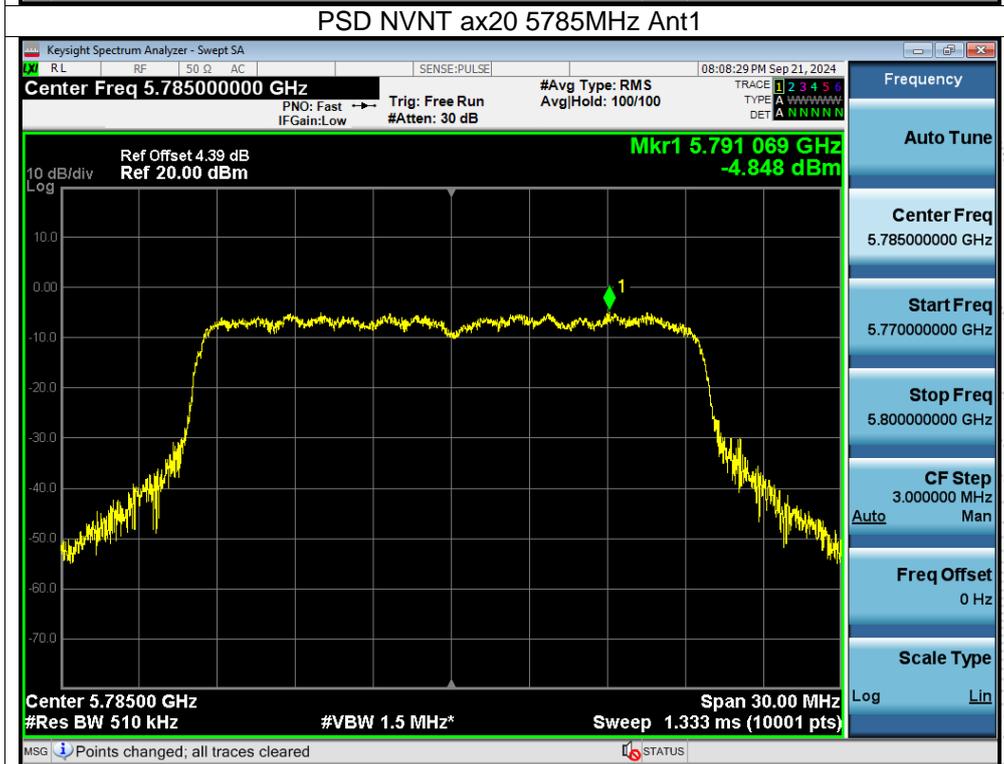
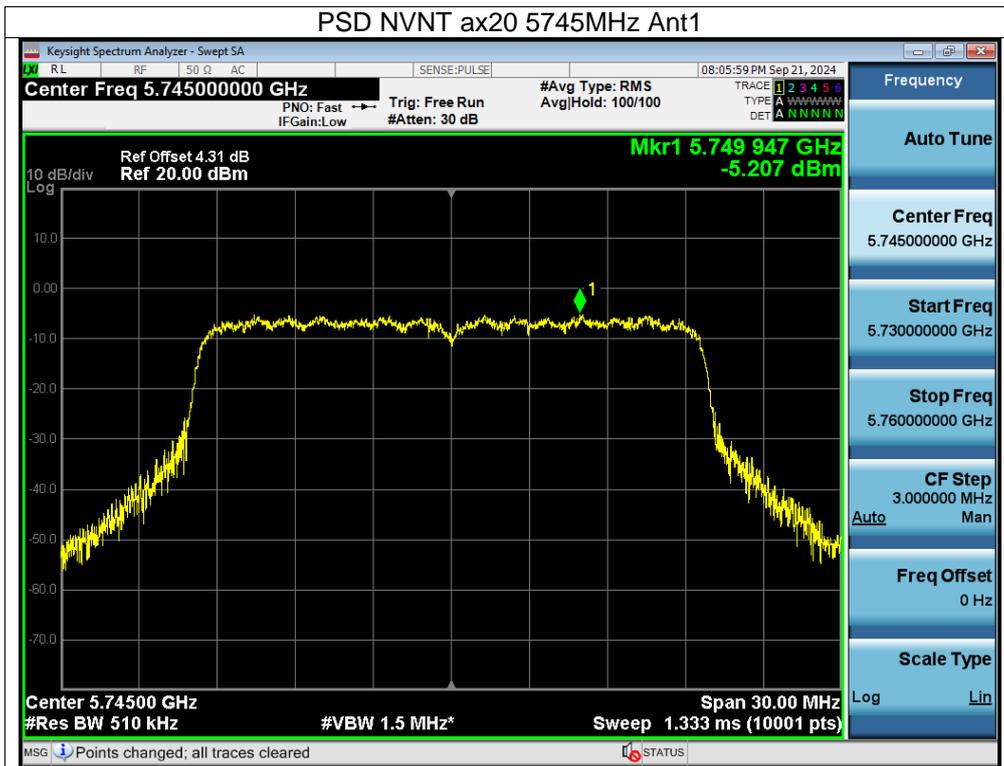


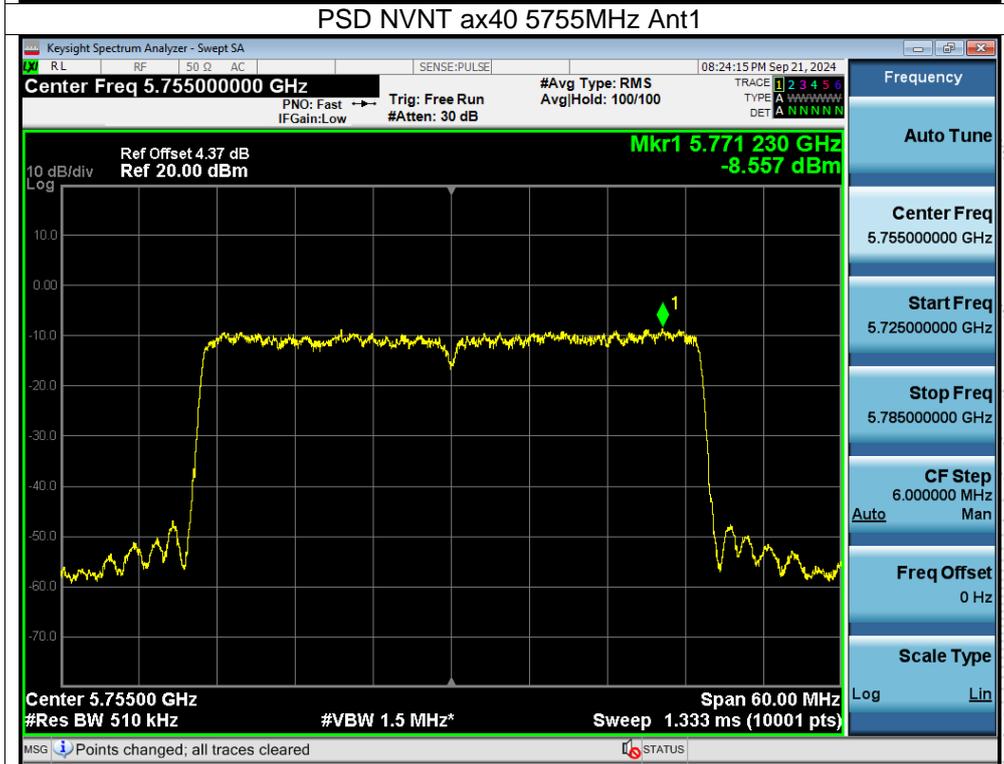
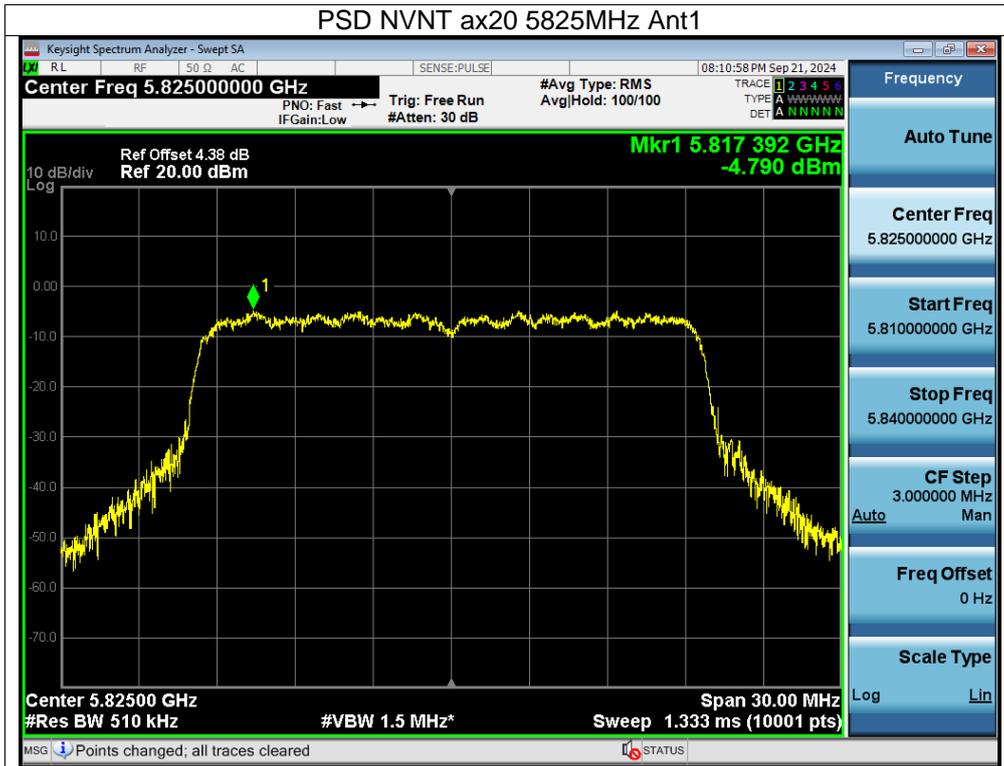


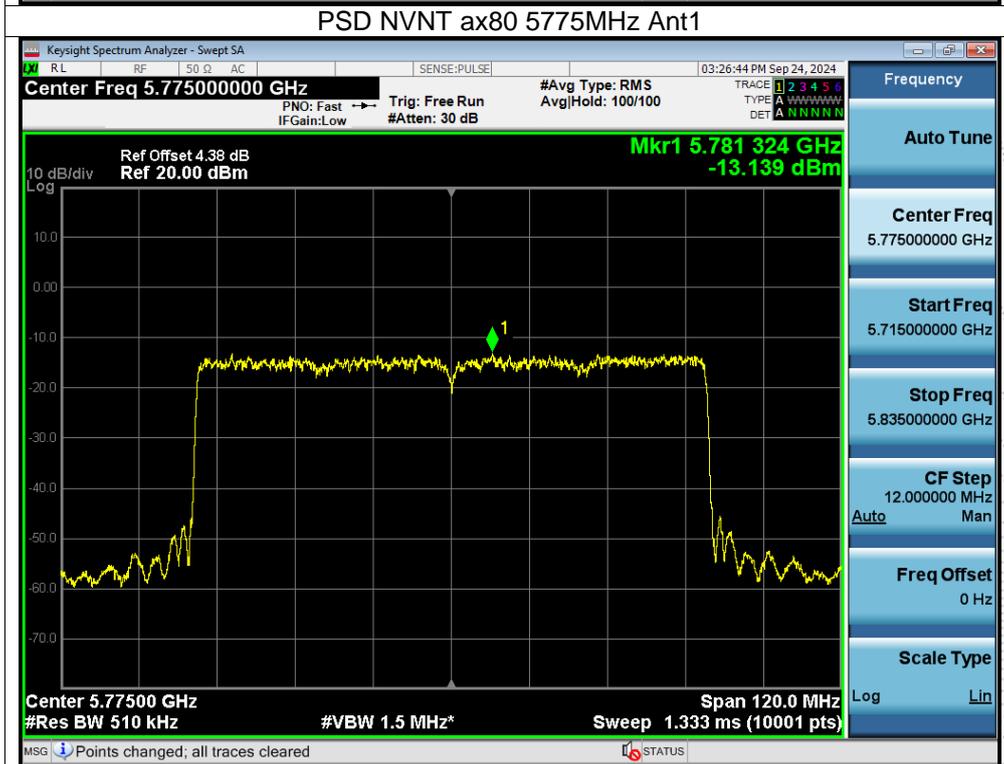
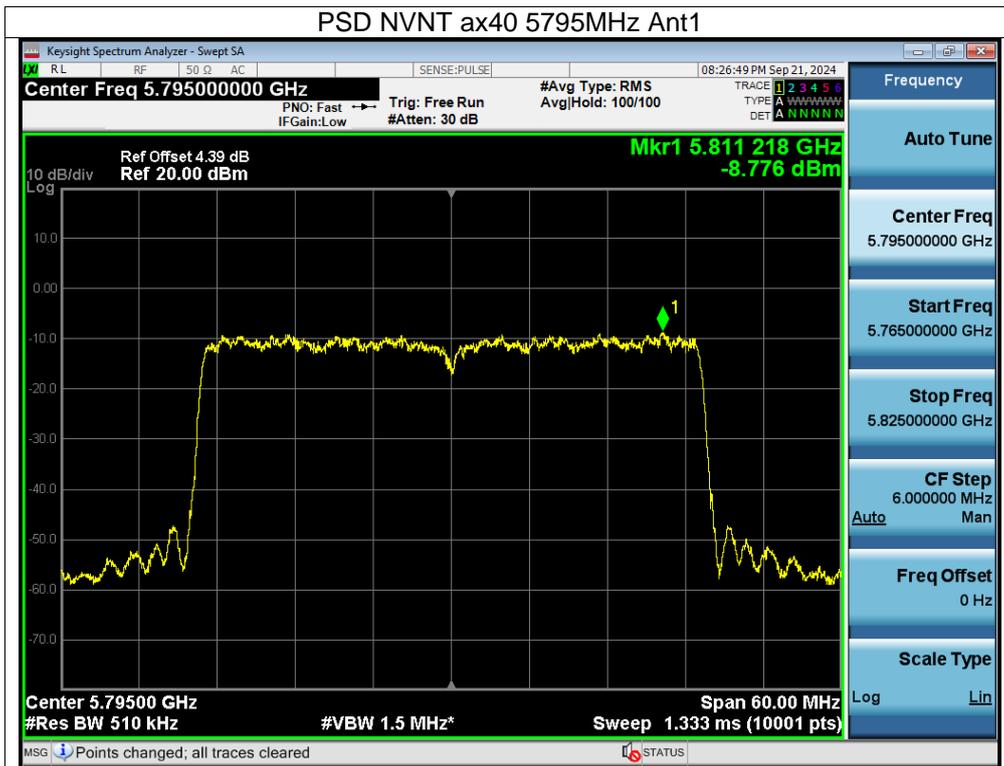






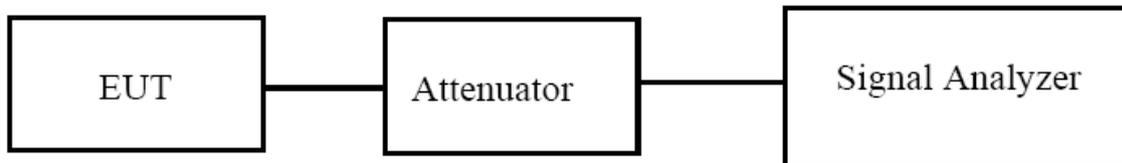






## 9. 26dB & 6dB & 99% Emission Bandwidth

### 9.1 Block Diagram Of Test Setup



### 9.2 Limit

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

### 9.3 Test Procedure

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW  $\geq 3 \cdot$  RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

### 9.4 EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

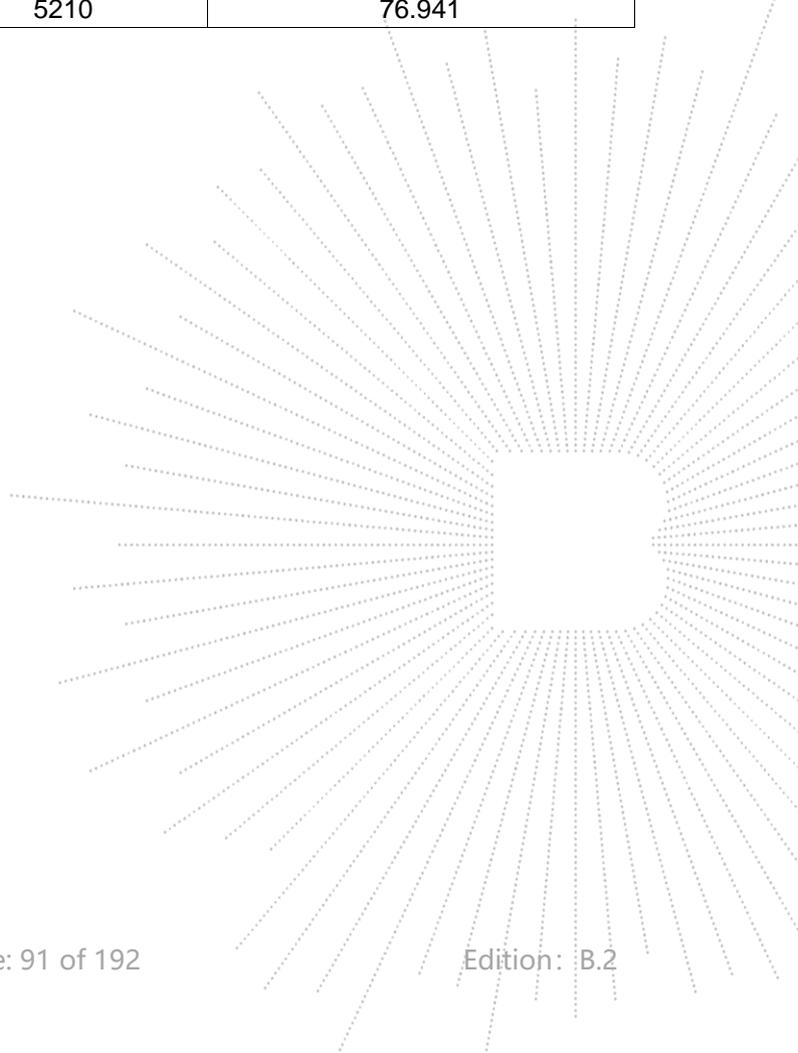
### 9.5 Test Result

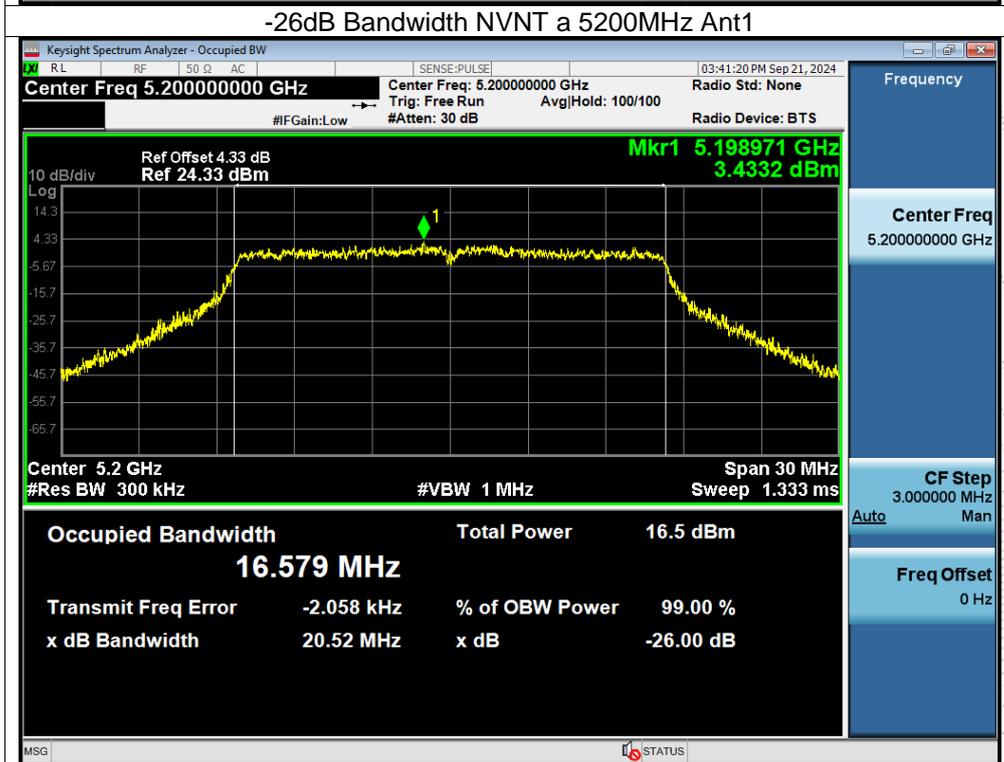
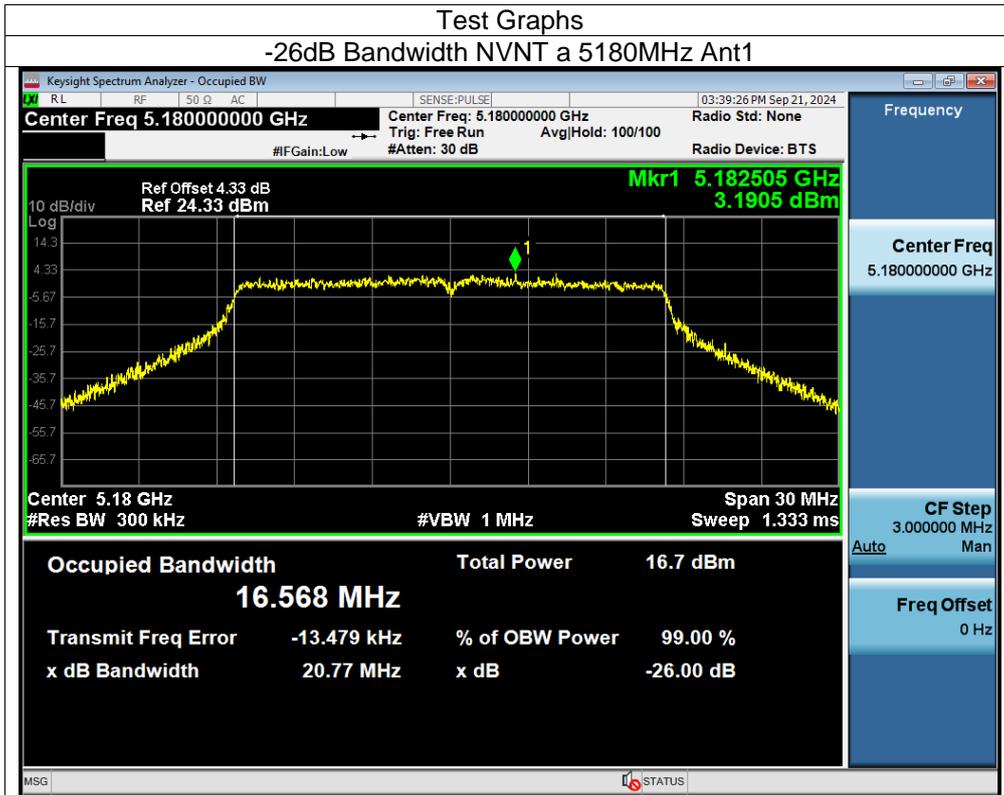
Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

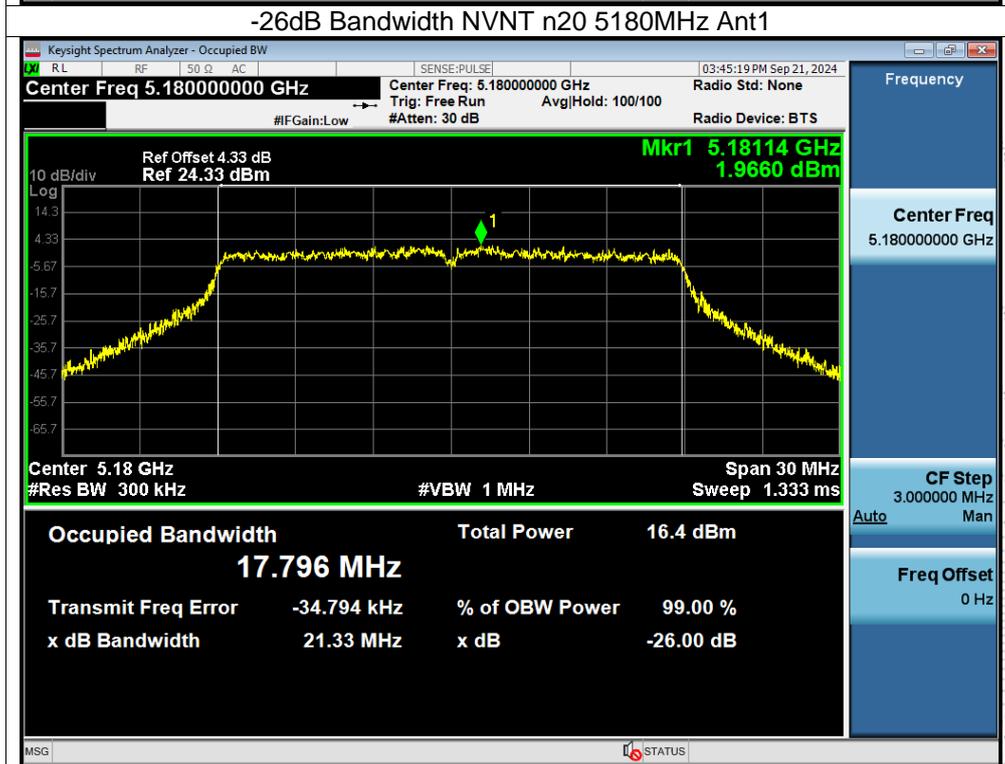
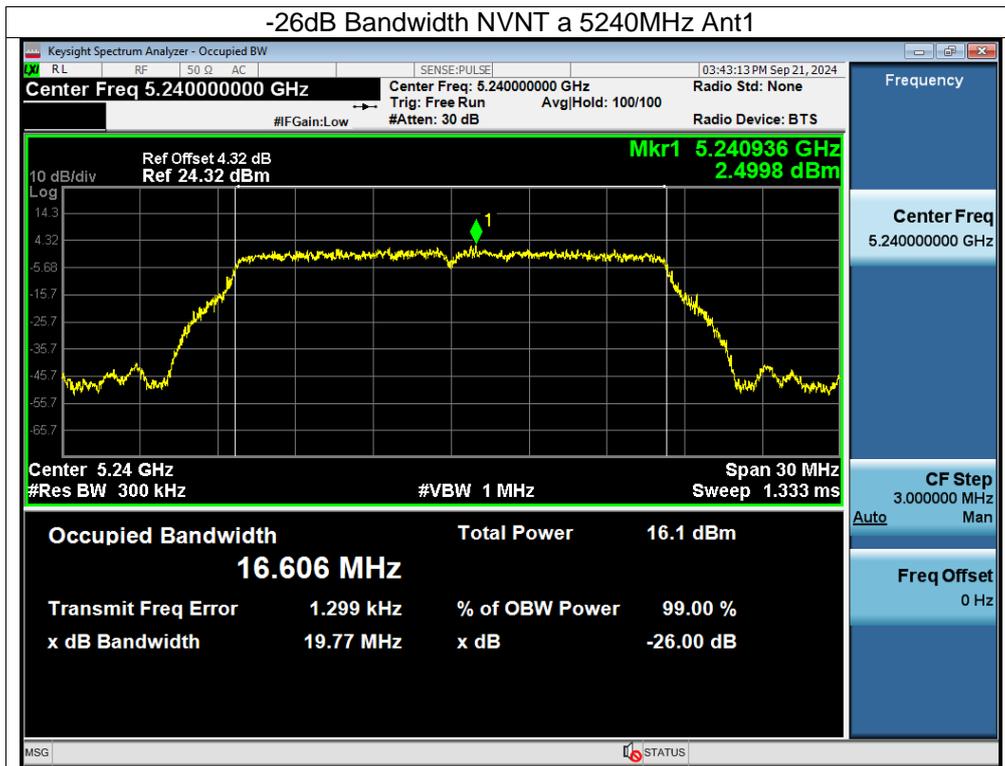
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120/60Hz
Test Mode:	(5180-5240MHz)		

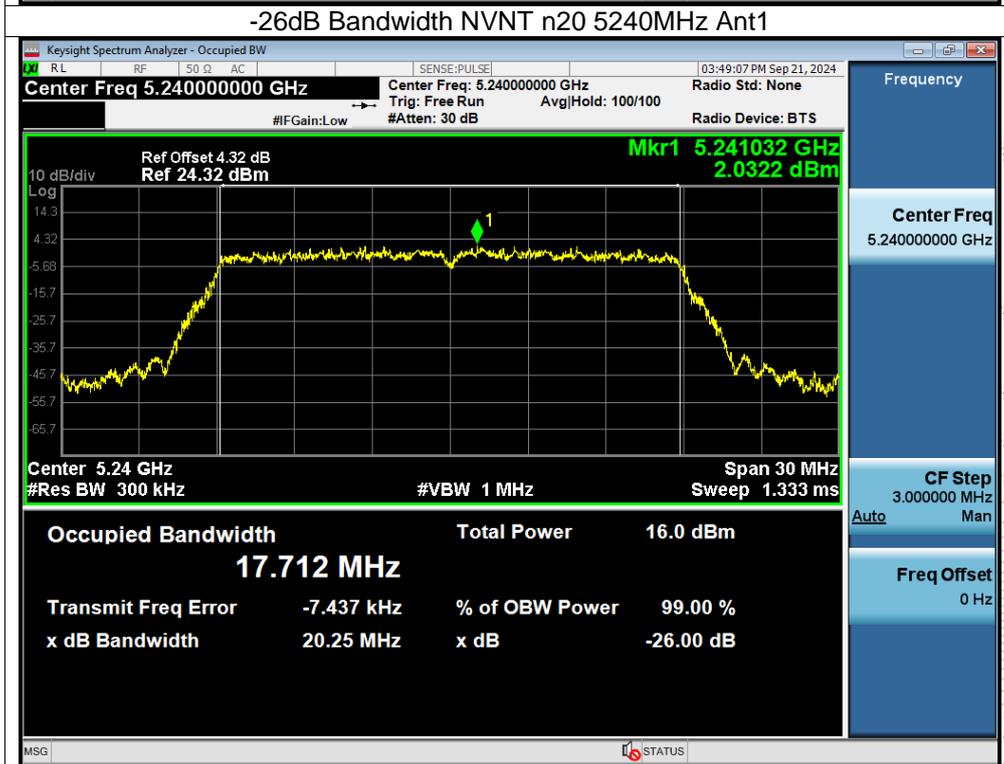
Condition	Mode	Frequency (MHz)	-26 dB Bandwidth (MHz)	Verdict
NVNT	a	5180	20.774	Pass
NVNT	a	5200	20.519	Pass
NVNT	a	5240	19.766	Pass
NVNT	n20	5180	21.325	Pass
NVNT	n20	5200	21.313	Pass
NVNT	n20	5240	20.249	Pass
NVNT	n40	5190	39.693	Pass
NVNT	n40	5230	39.067	Pass
NVNT	ac20	5180	21.523	Pass
NVNT	ac20	5200	22.094	Pass
NVNT	ac20	5240	20.439	Pass
NVNT	ac40	5190	40.36	Pass
NVNT	ac40	5230	40.826	Pass
NVNT	ac80	5210	79.245	Pass
NVNT	ax20	5180	22.22	Pass
NVNT	ax20	5200	22.221	Pass
NVNT	ax20	5240	20.011	Pass
NVNT	ax40	5190	39.356	Pass
NVNT	ax40	5230	39.577	Pass
NVNT	ax80	5210	79.211	Pass

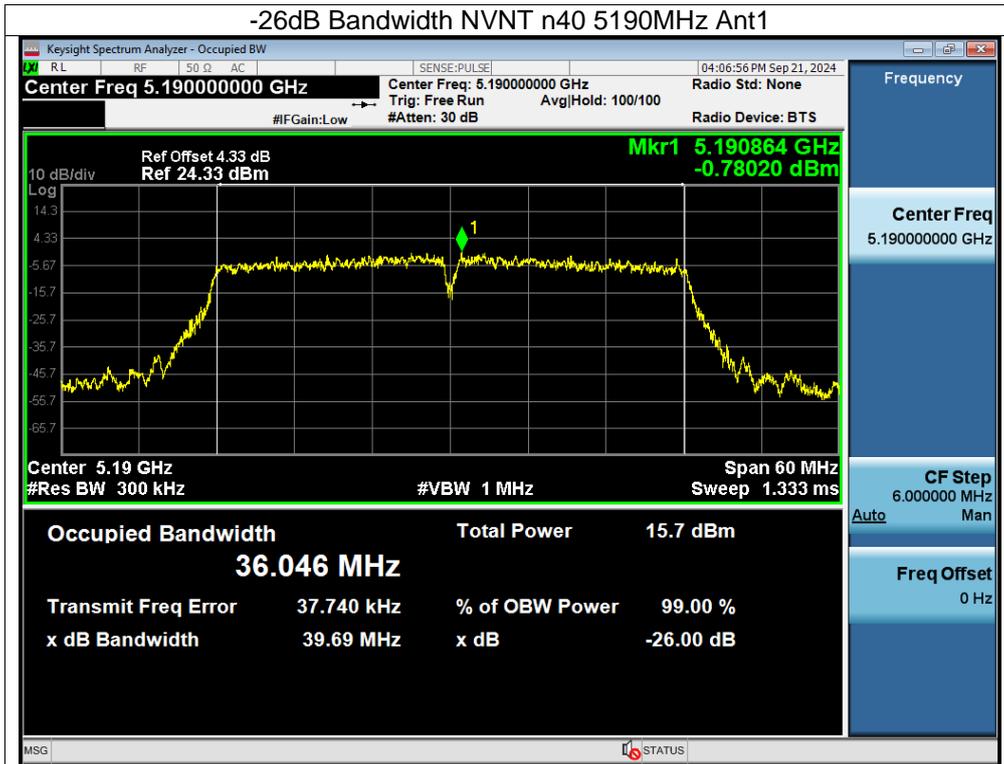
Condition	Mode	Frequency (MHz)	99% OBW (MHz)
NVNT	a	5180	16.472
NVNT	a	5200	16.467
NVNT	a	5240	16.447
NVNT	n20	5180	17.661
NVNT	n20	5200	17.632
NVNT	n20	5240	17.629
NVNT	n40	5190	36.137
NVNT	n40	5230	36.023
NVNT	ac20	5180	17.757
NVNT	ac20	5200	17.764
NVNT	ac20	5240	17.762
NVNT	ac40	5190	36.469
NVNT	ac40	5230	36.409
NVNT	ac80	5210	75.902
NVNT	ax20	5180	18.961
NVNT	ax20	5200	19.012
NVNT	ax20	5240	18.959
NVNT	ax40	5190	37.892
NVNT	ax40	5230	37.909
NVNT	ax80	5210	76.941

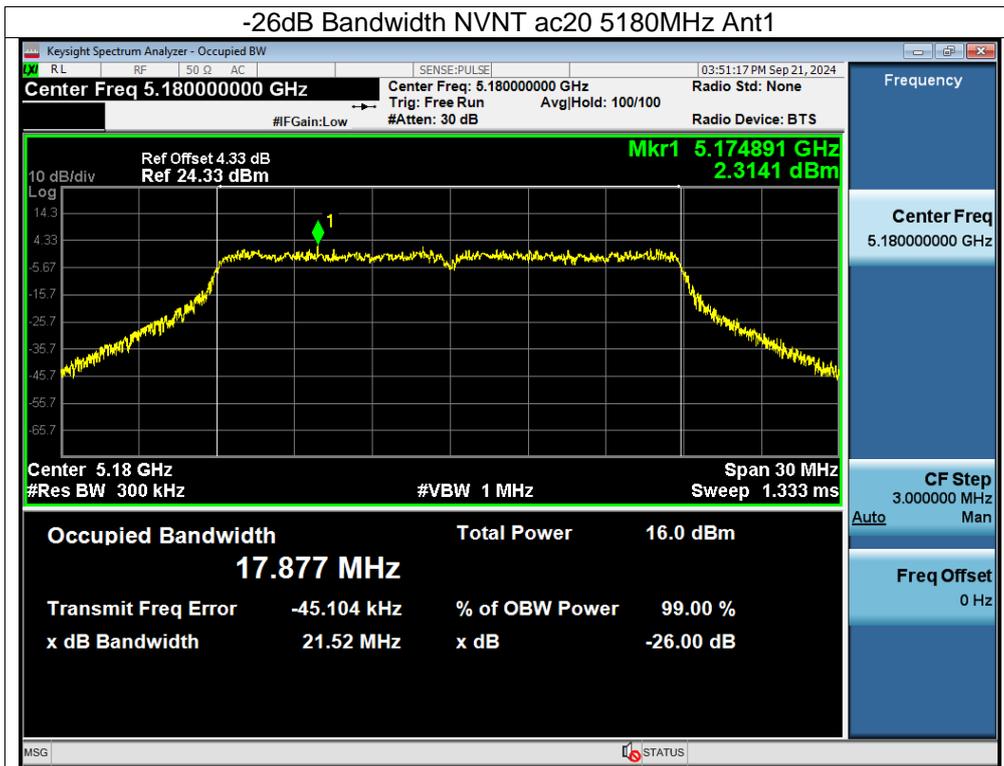


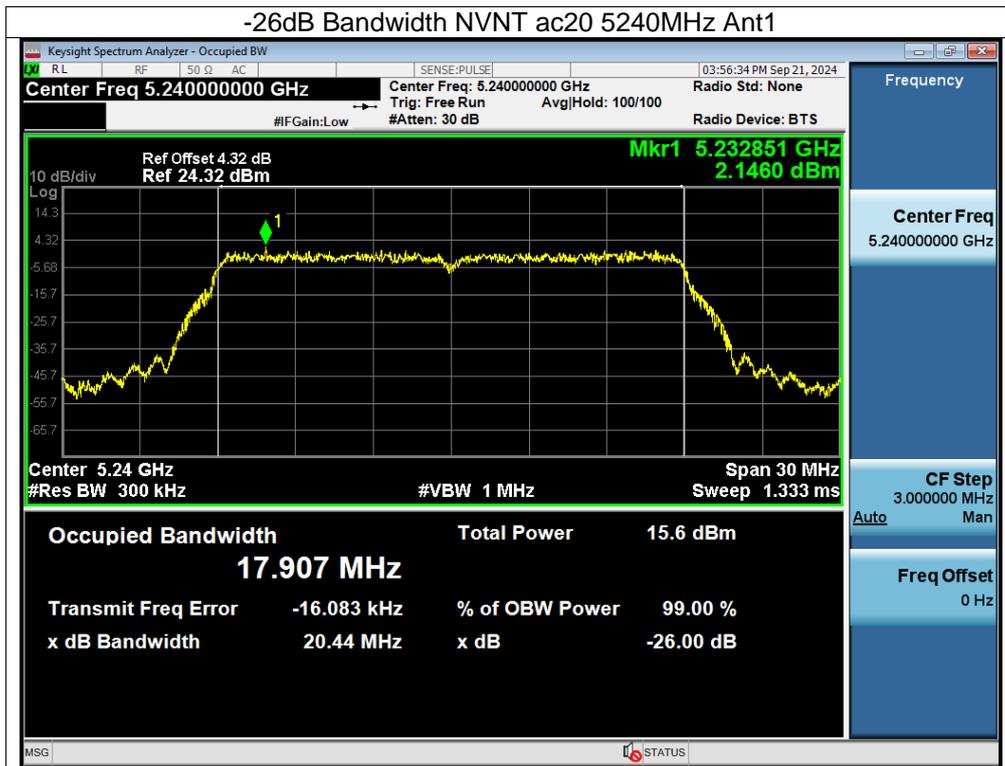


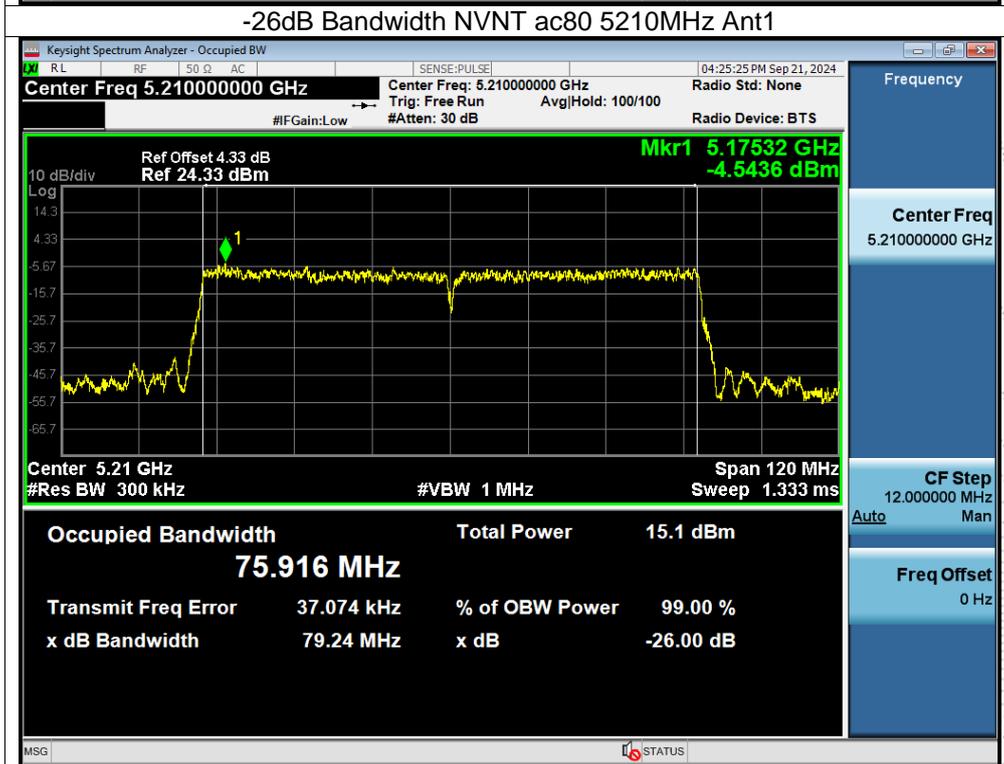
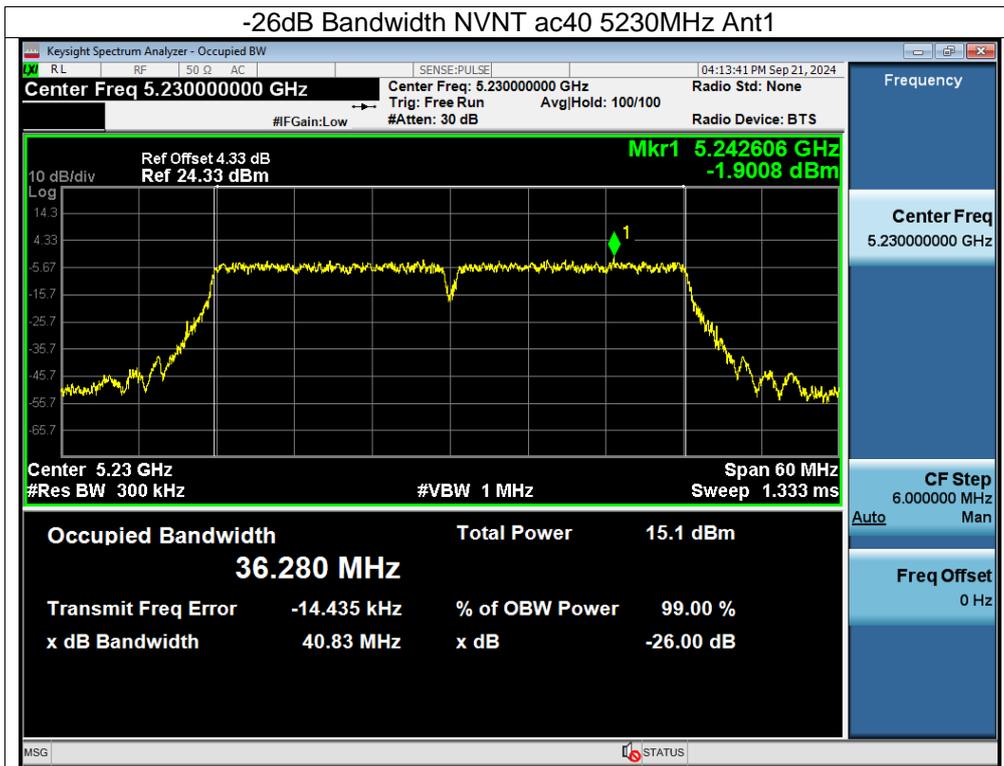


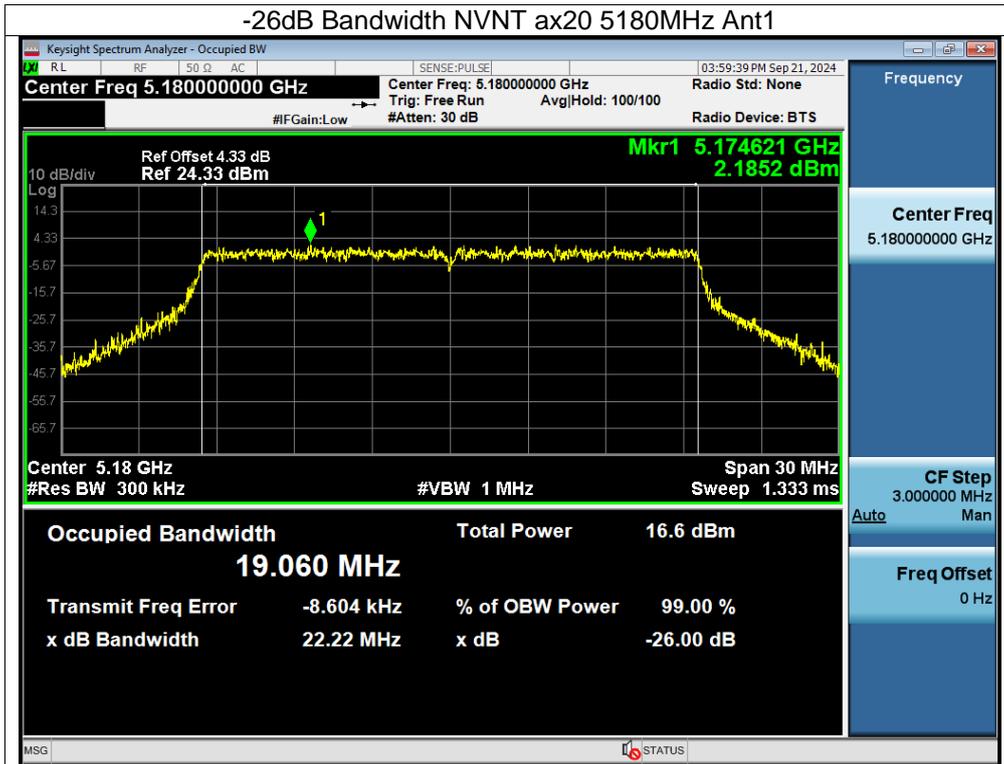


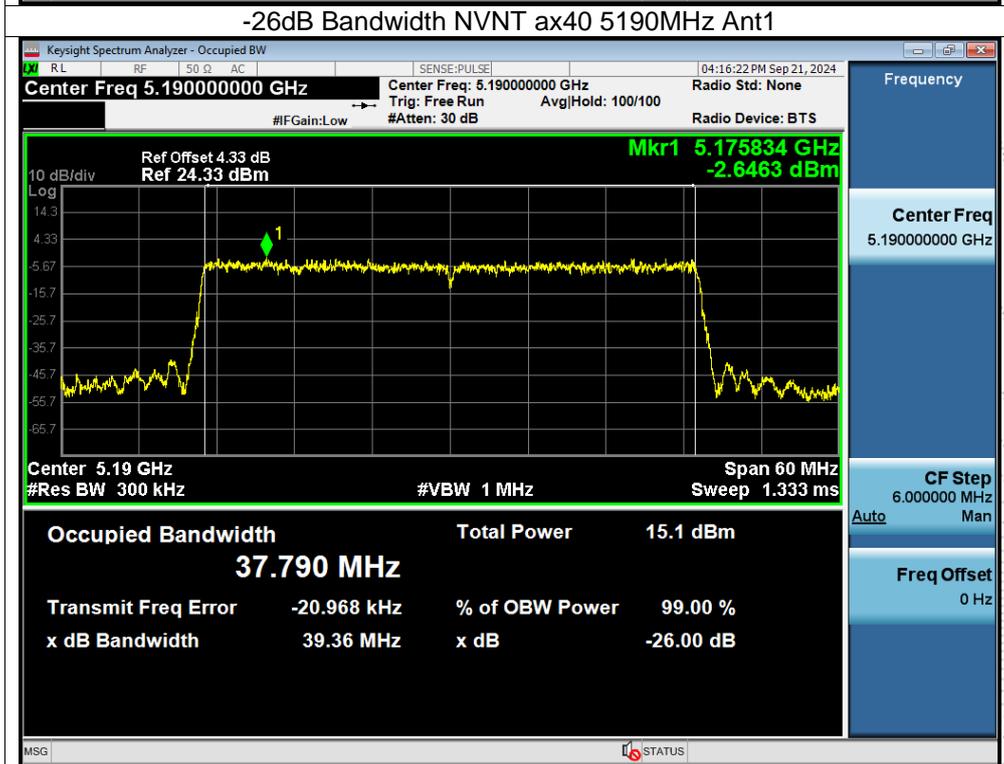
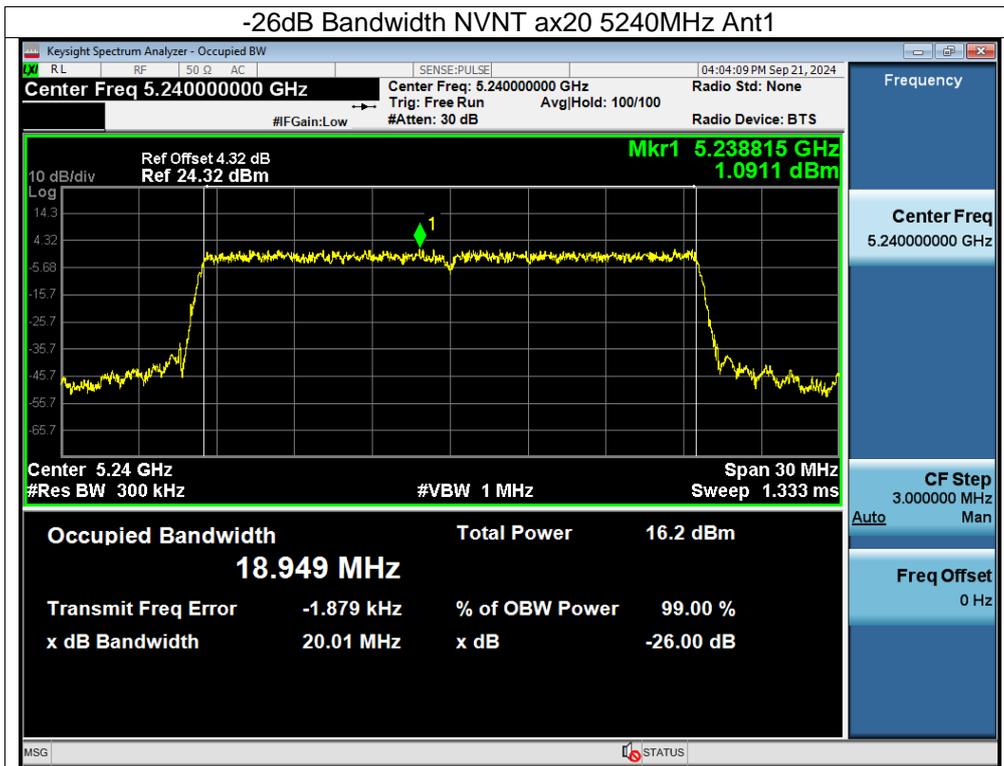


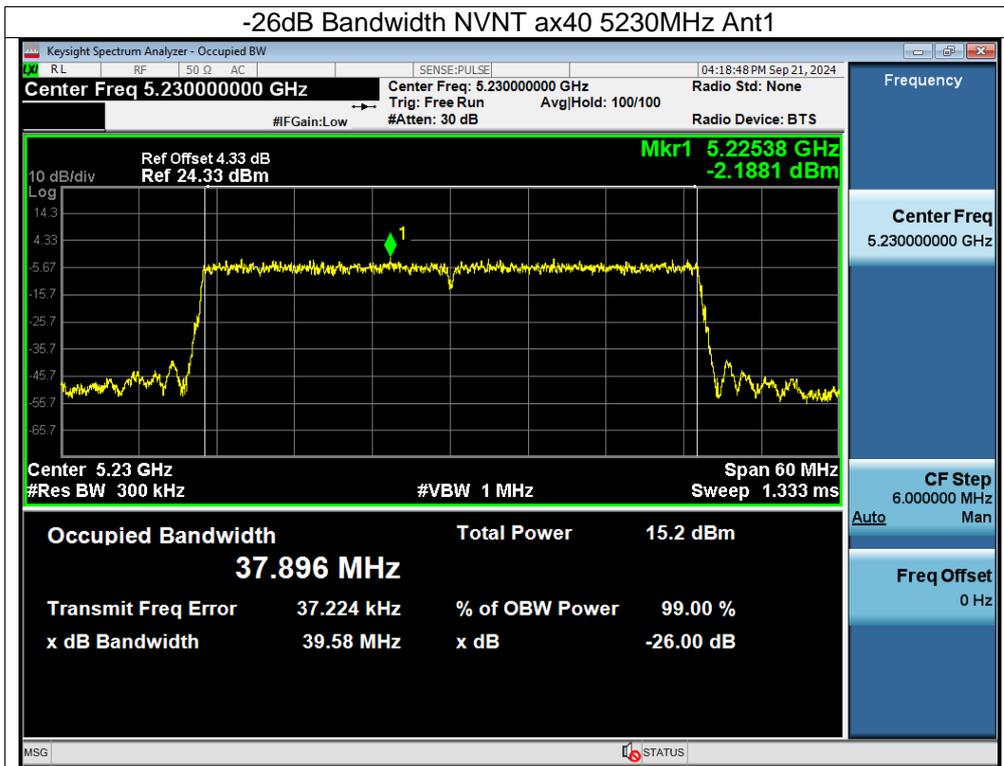


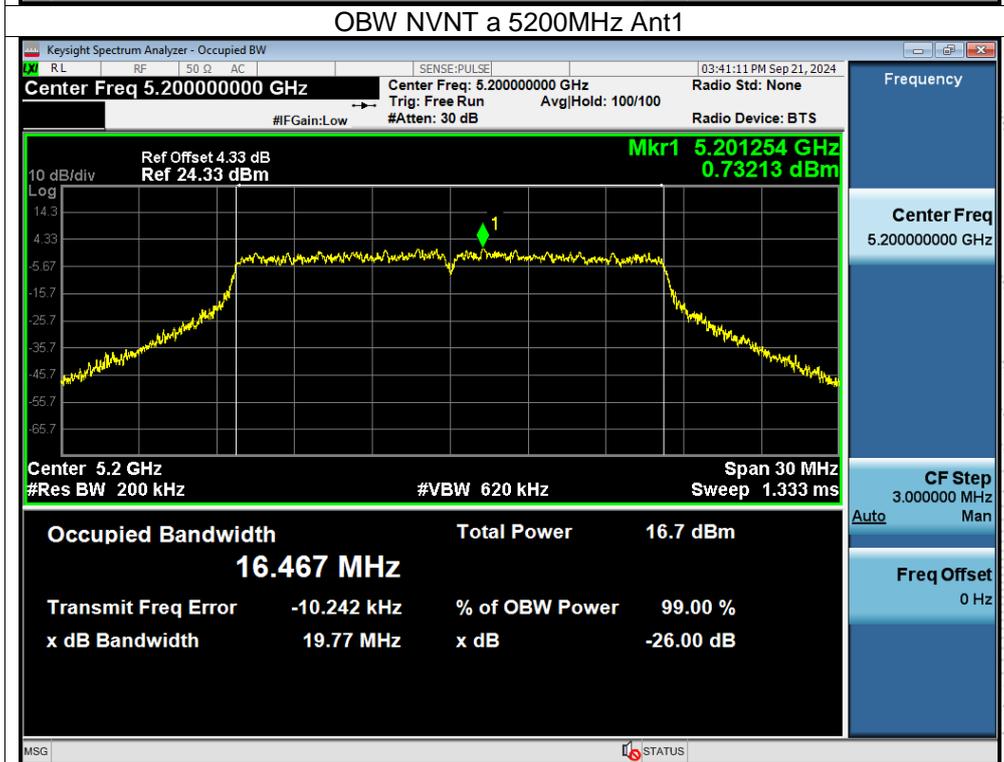
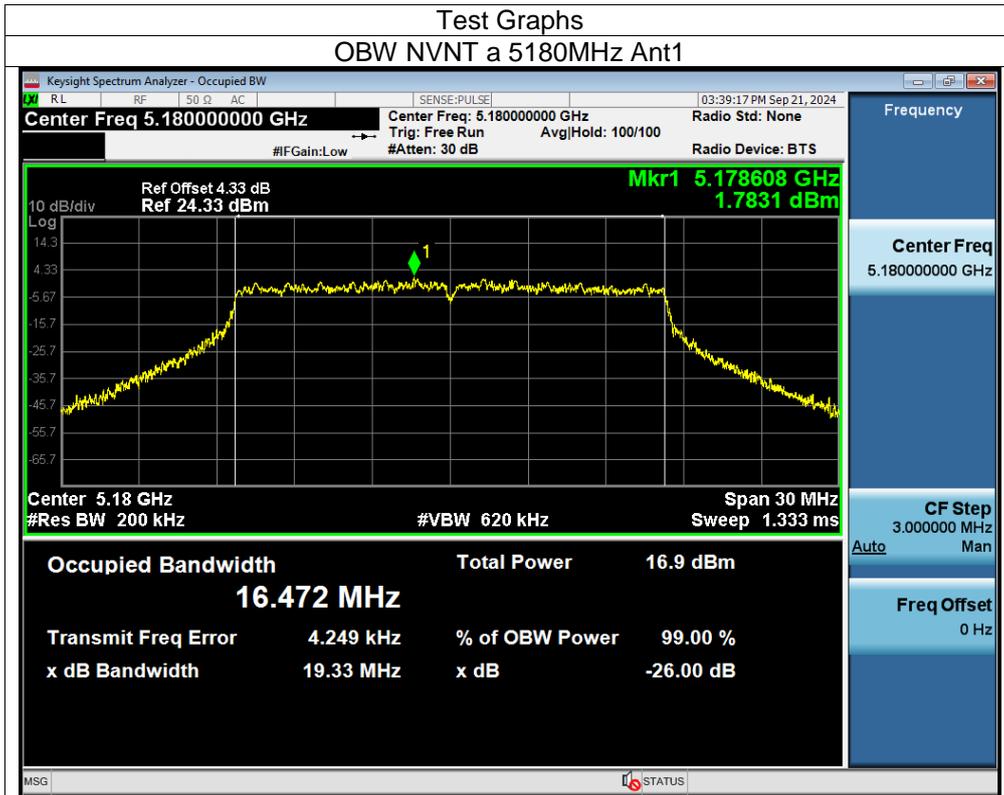


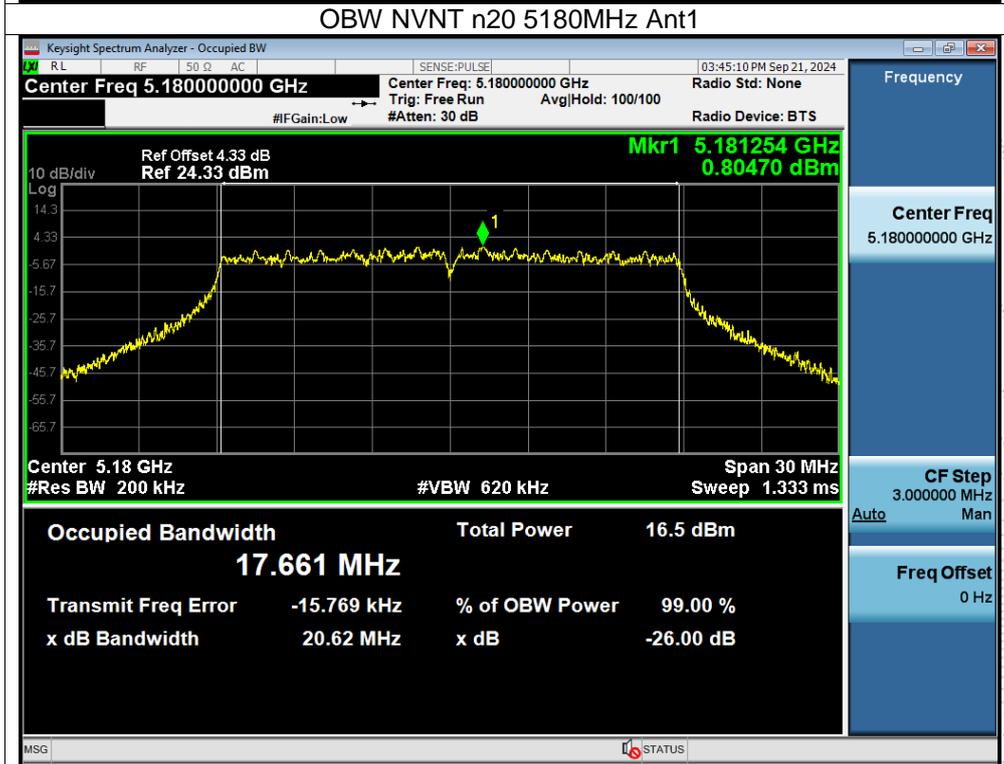
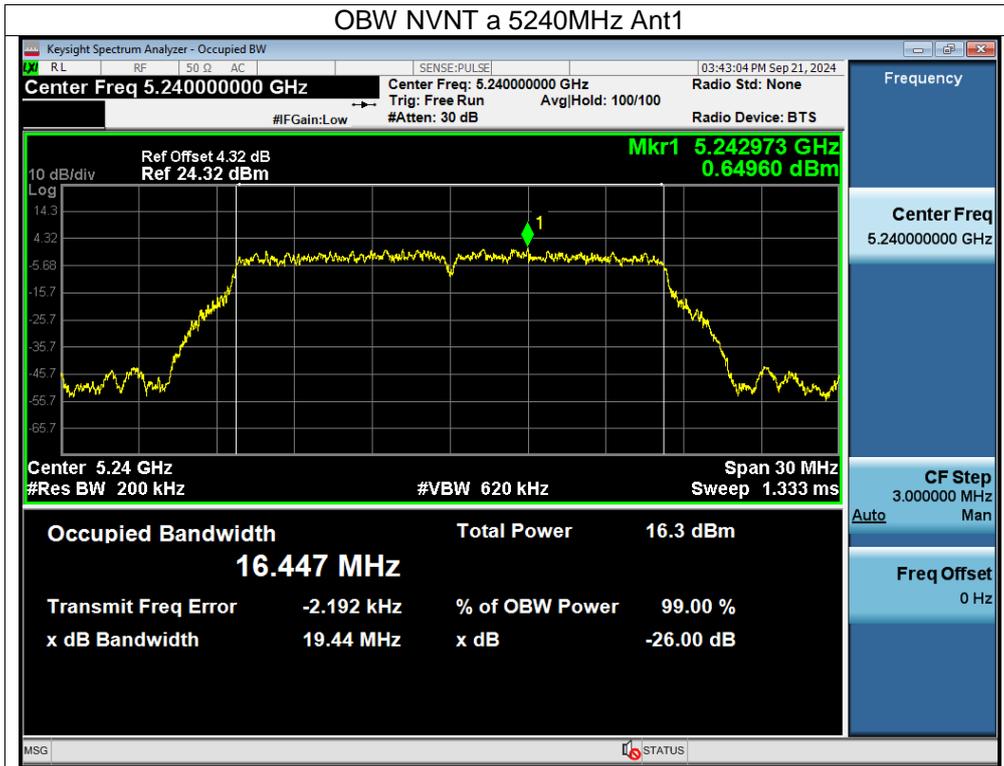


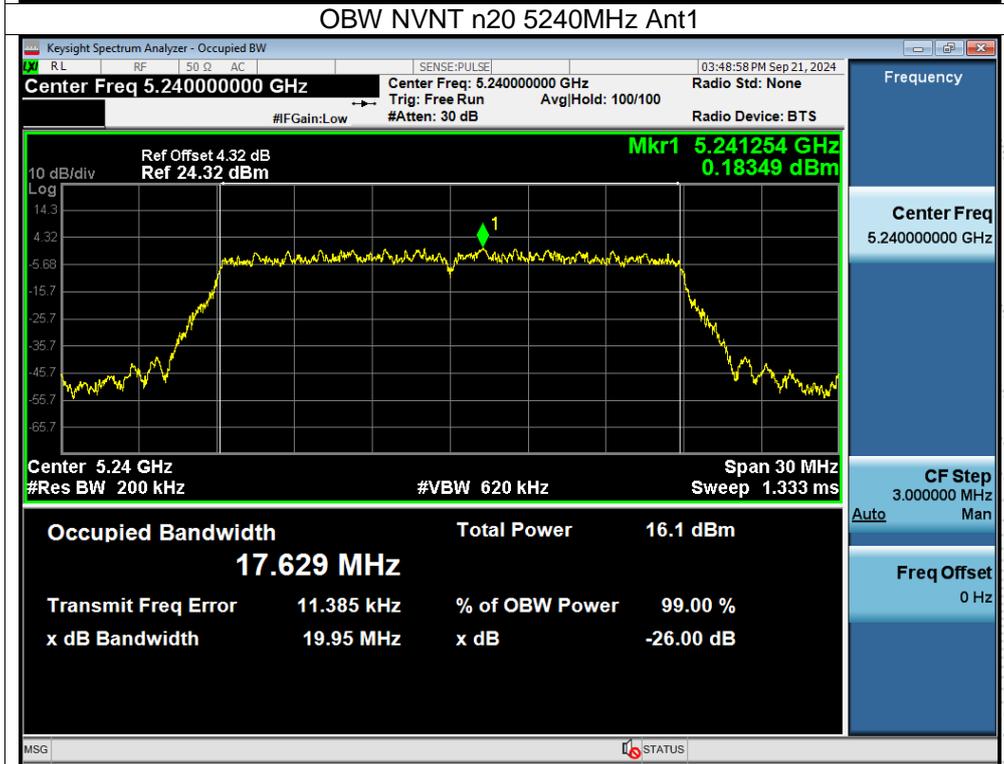
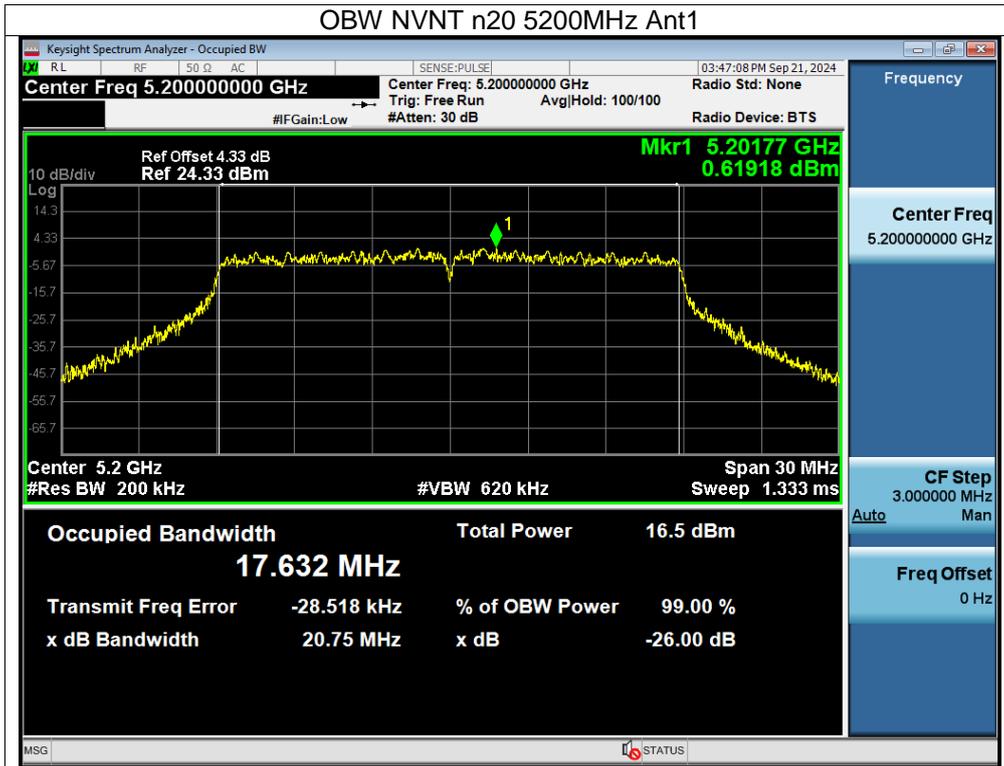


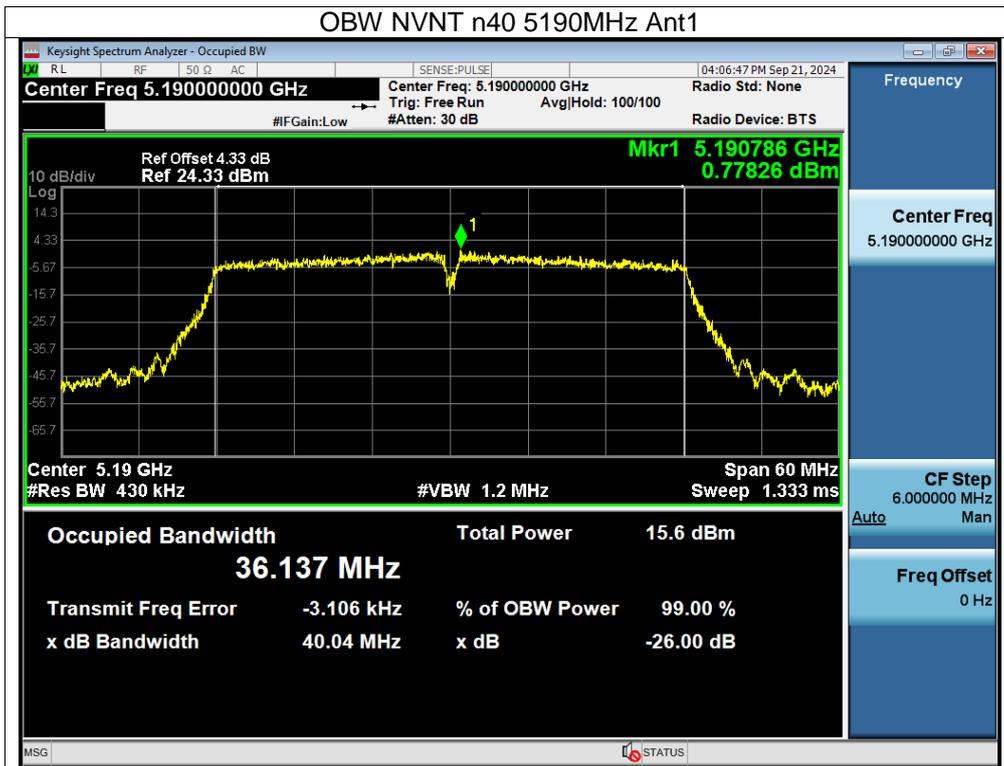


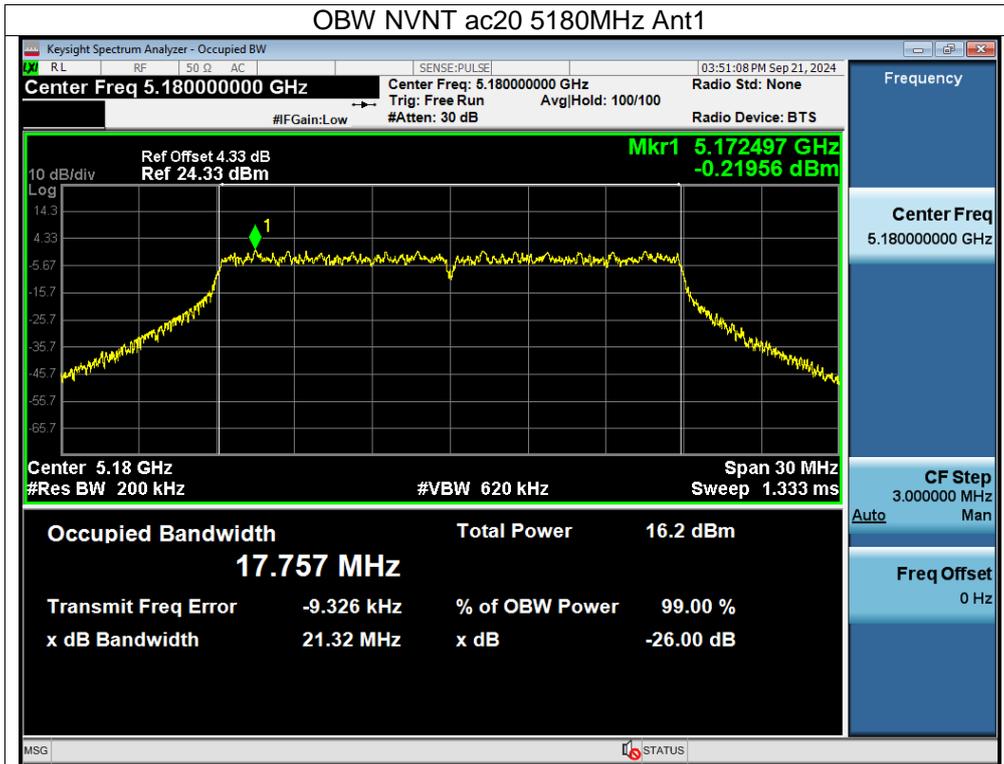


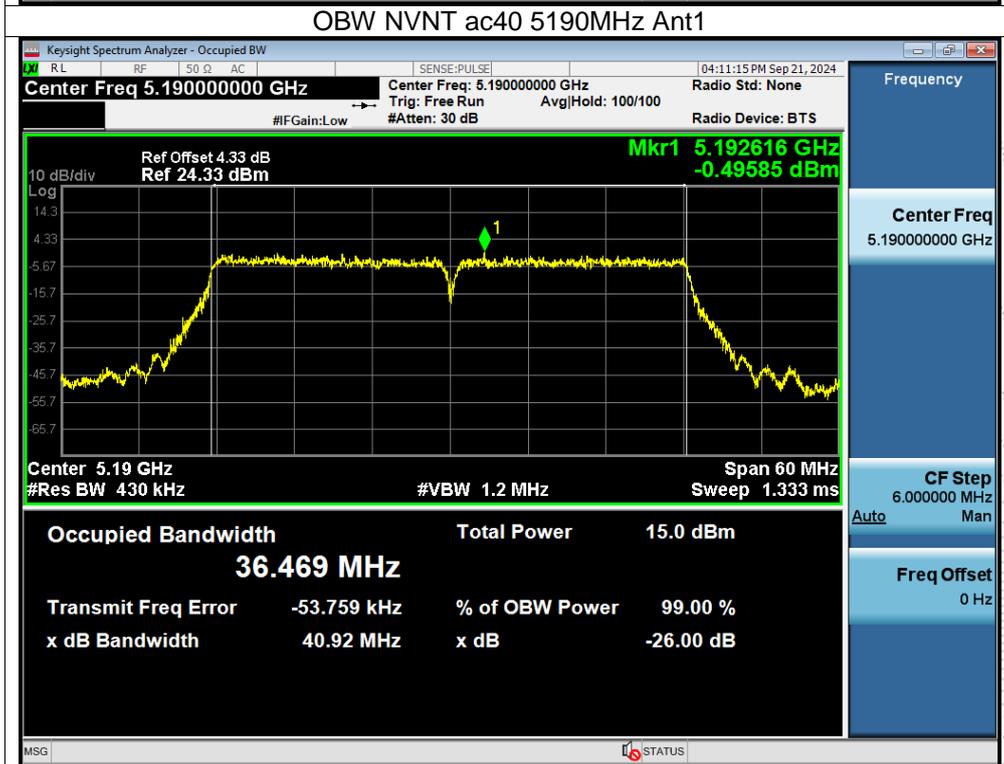
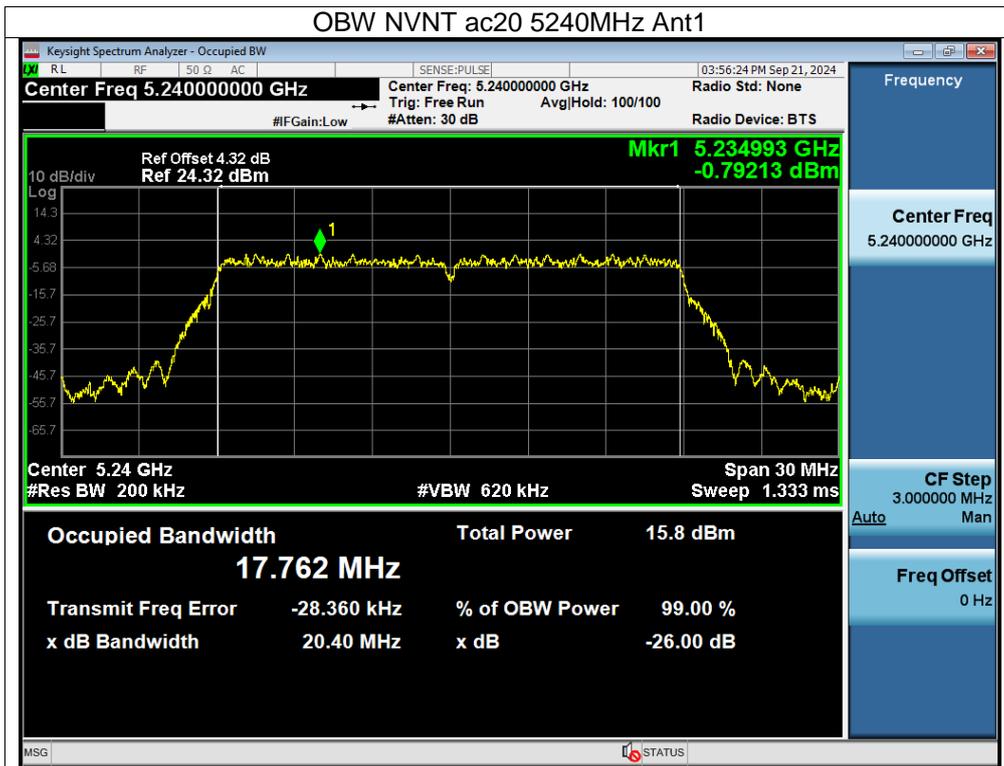


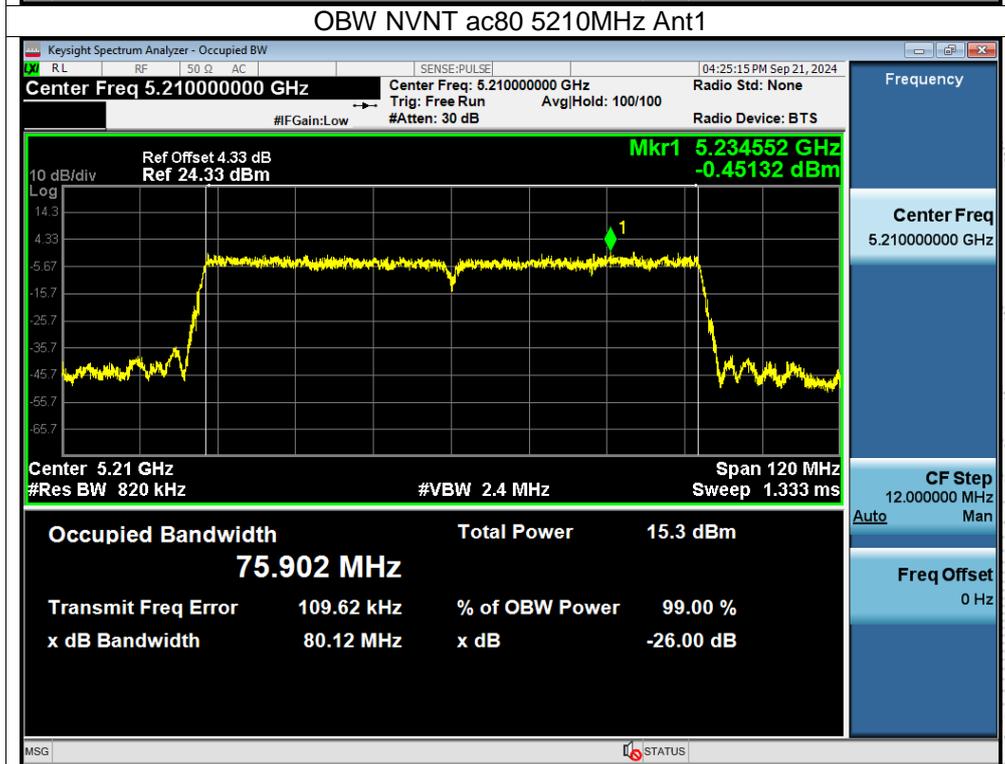
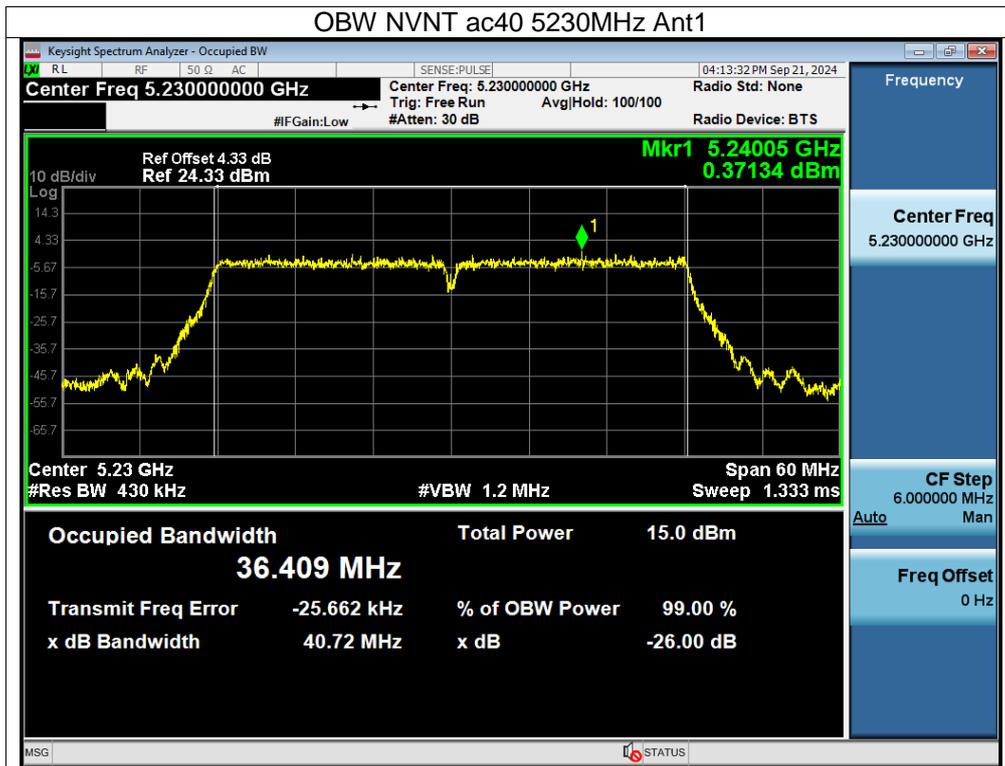


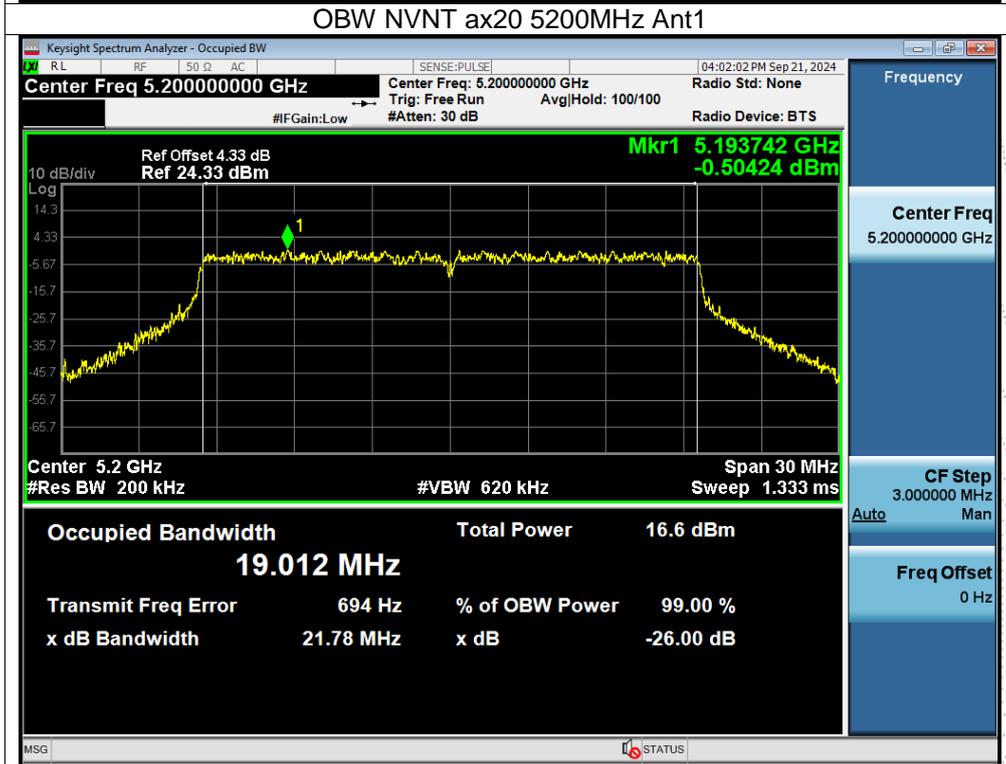
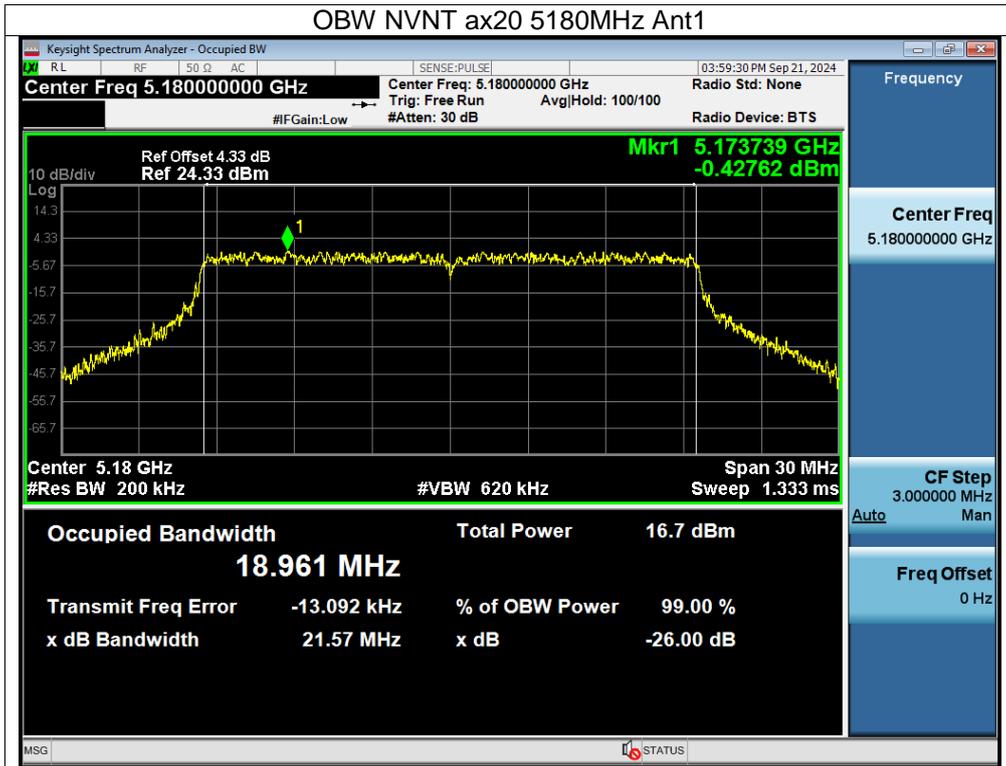


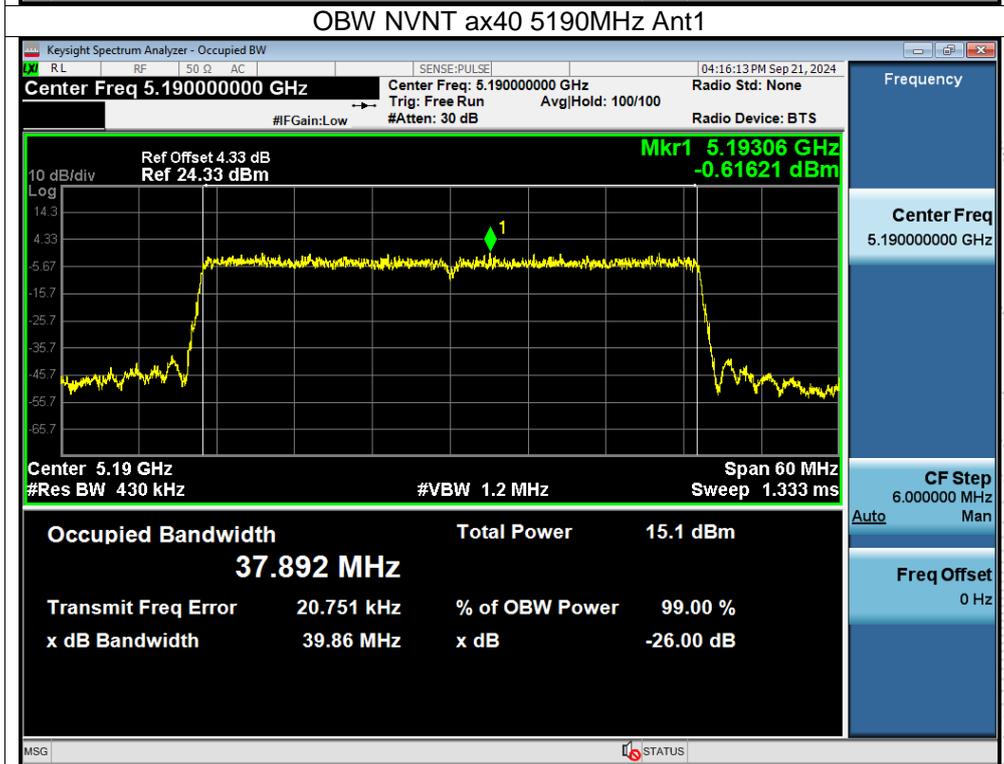
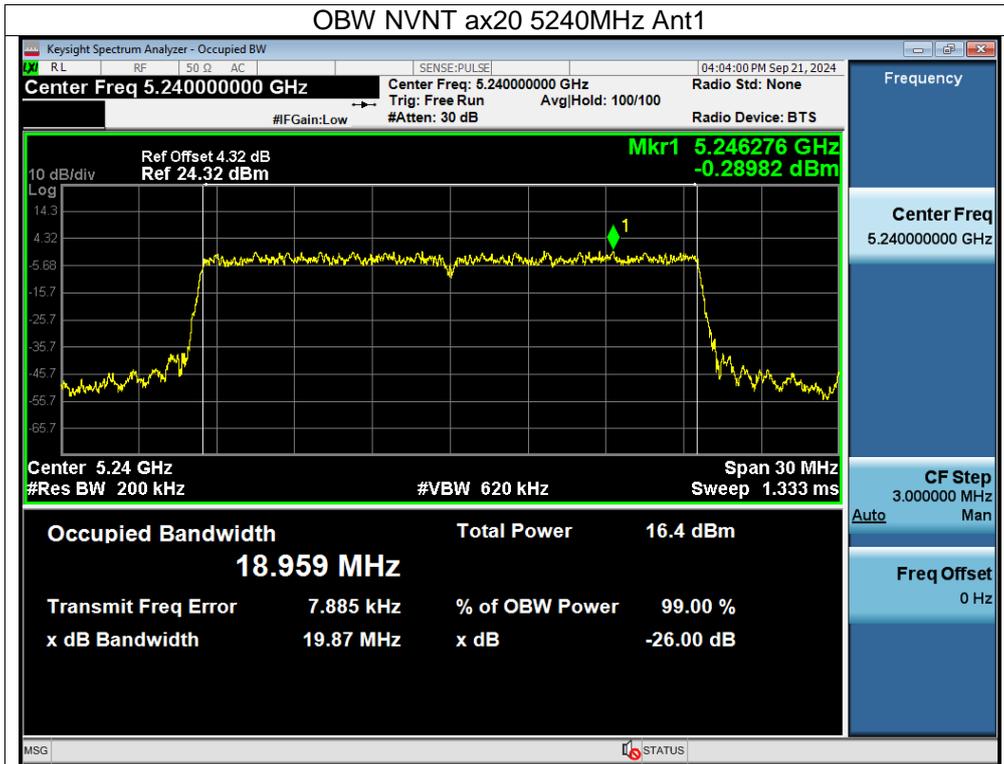


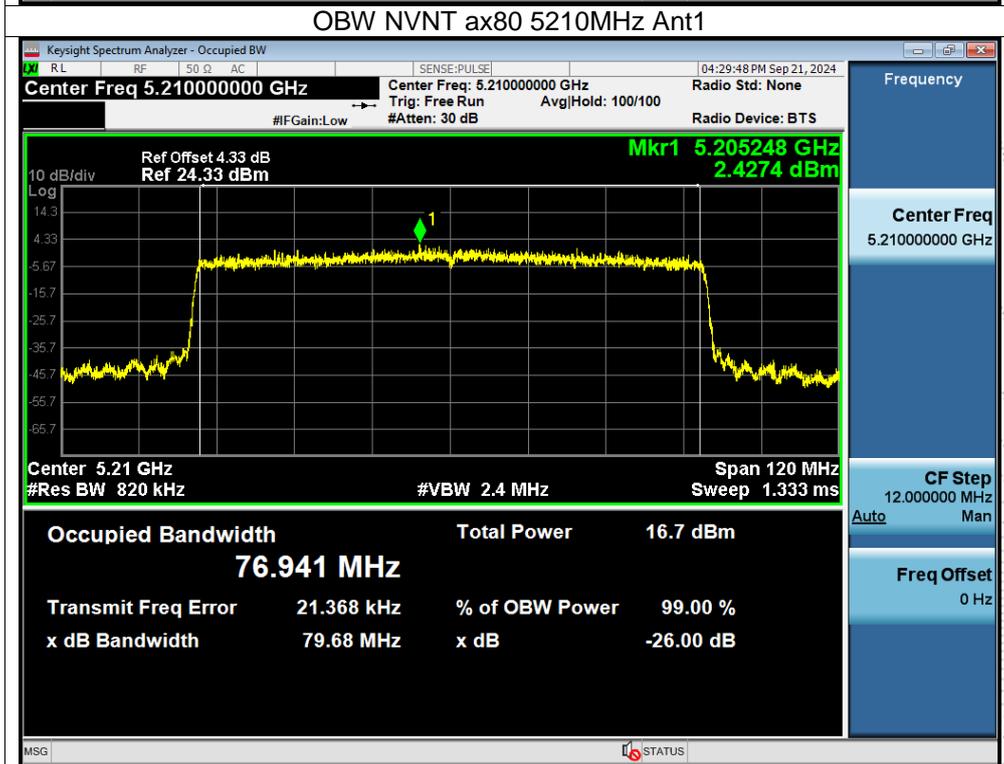
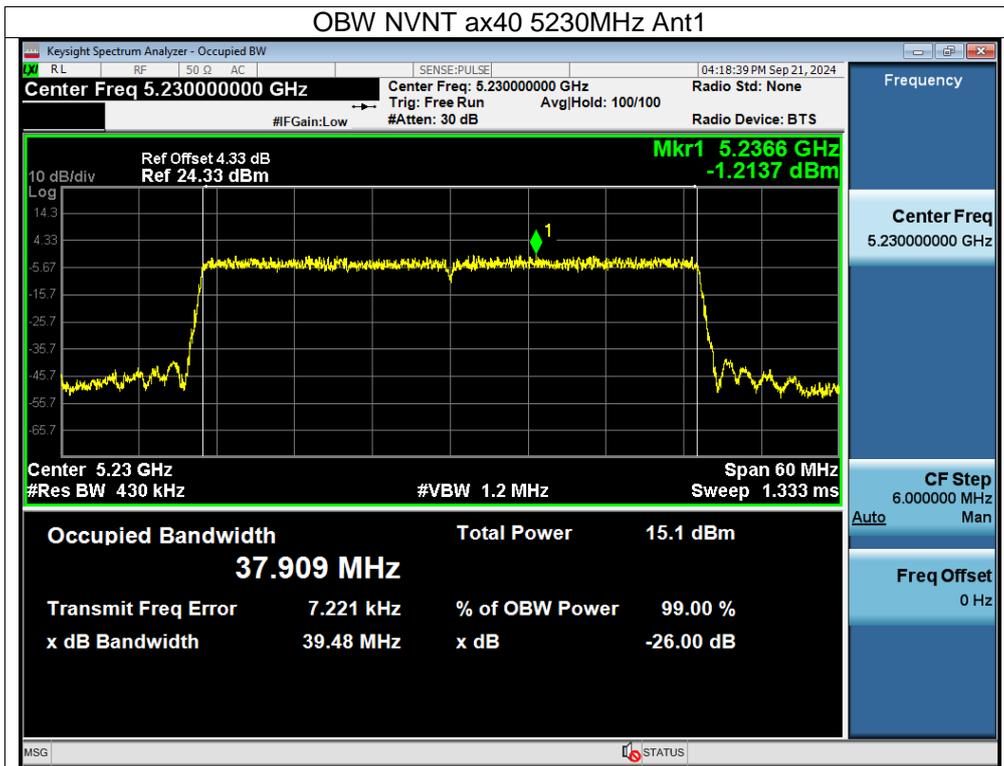








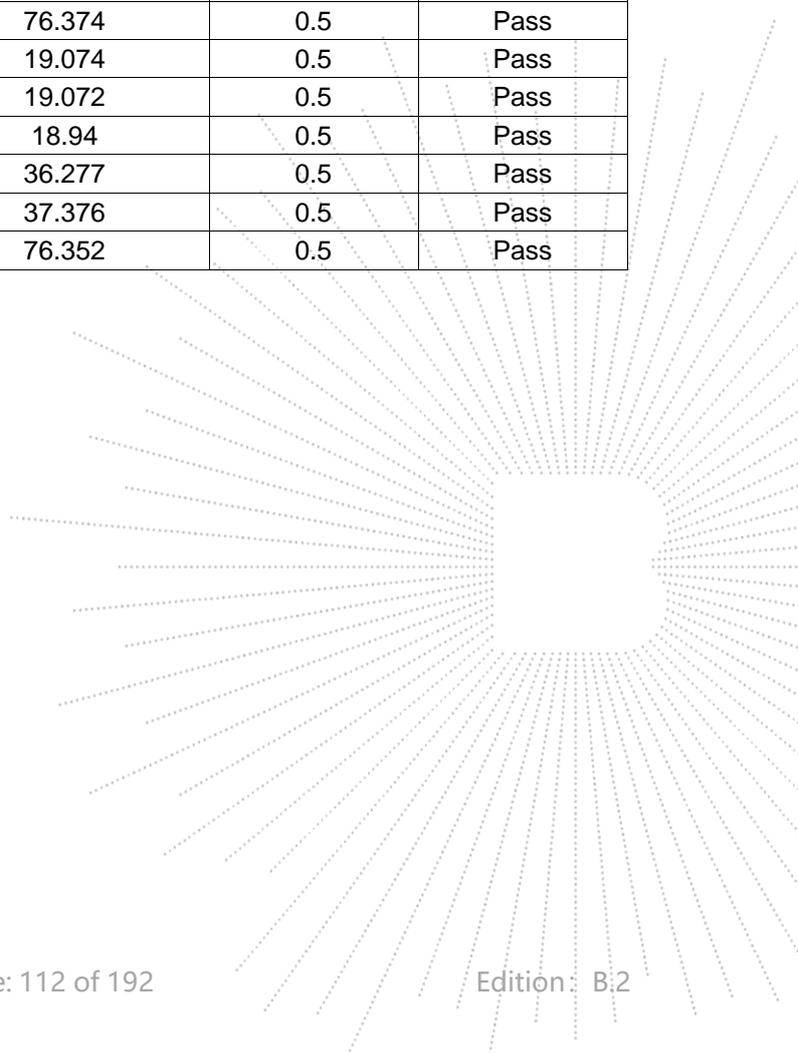




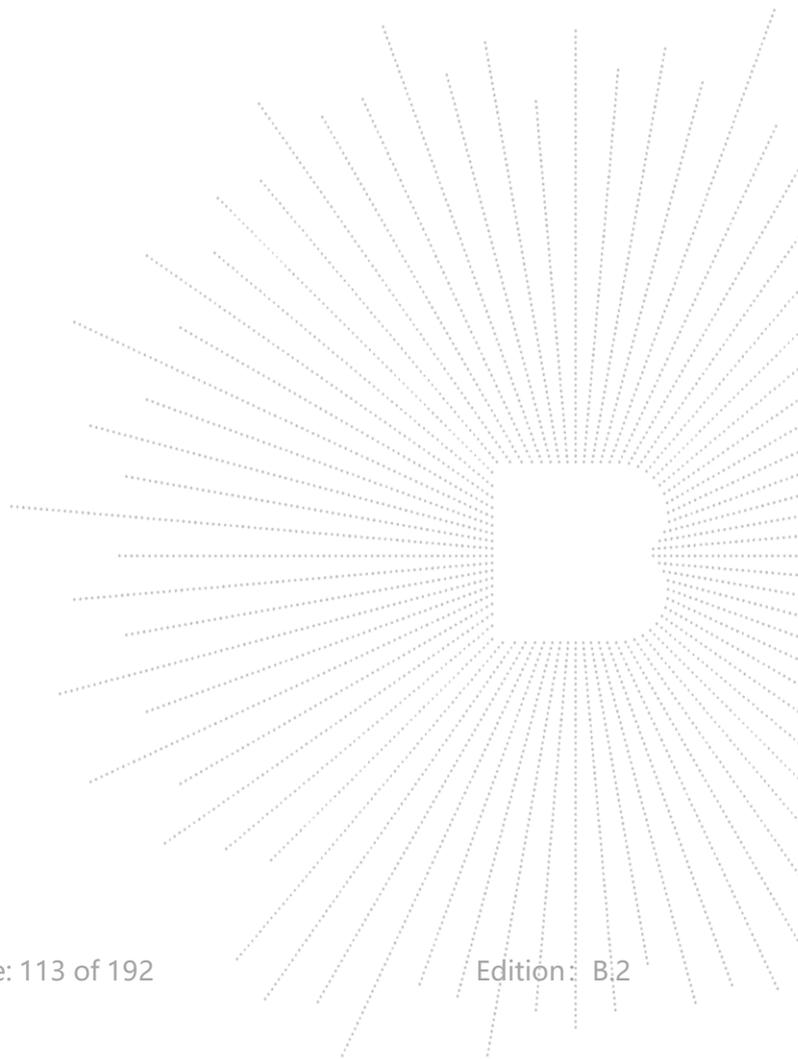
Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

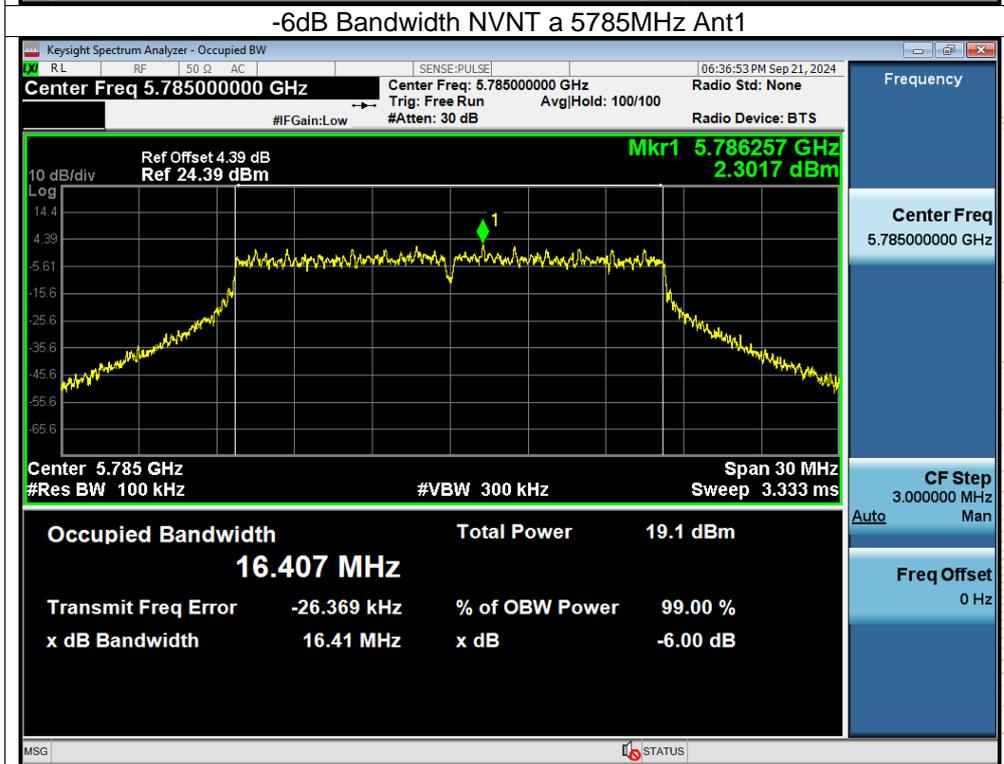
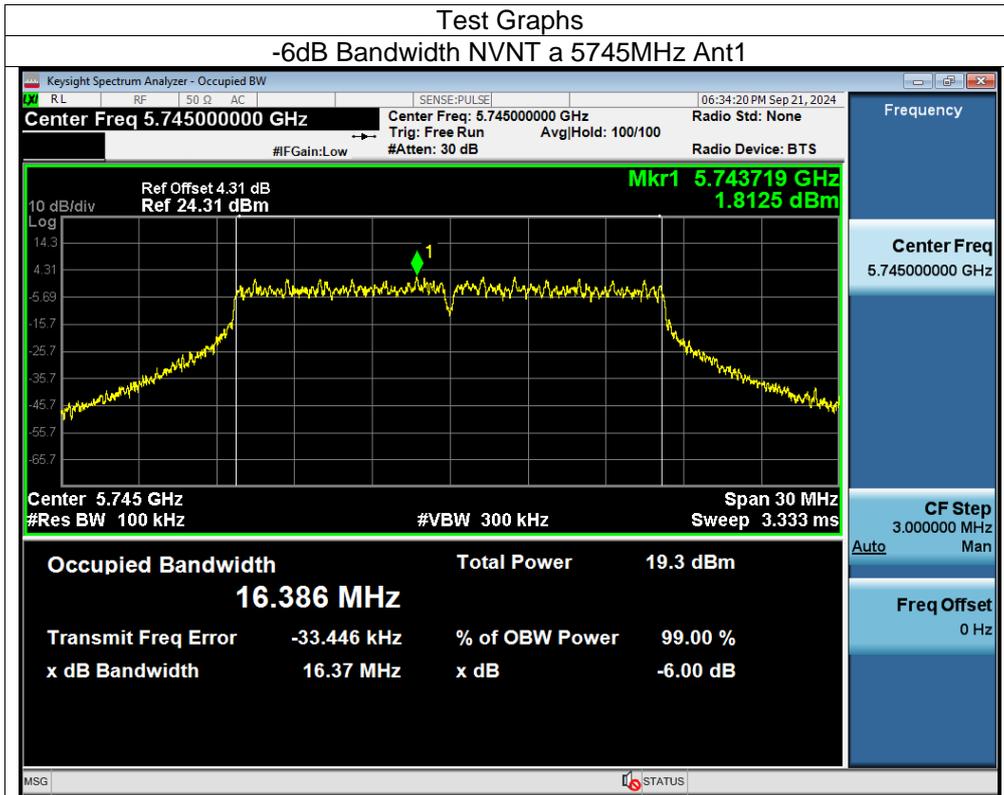
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120/60Hz
Test Mode:	(5745-5825MHz)		

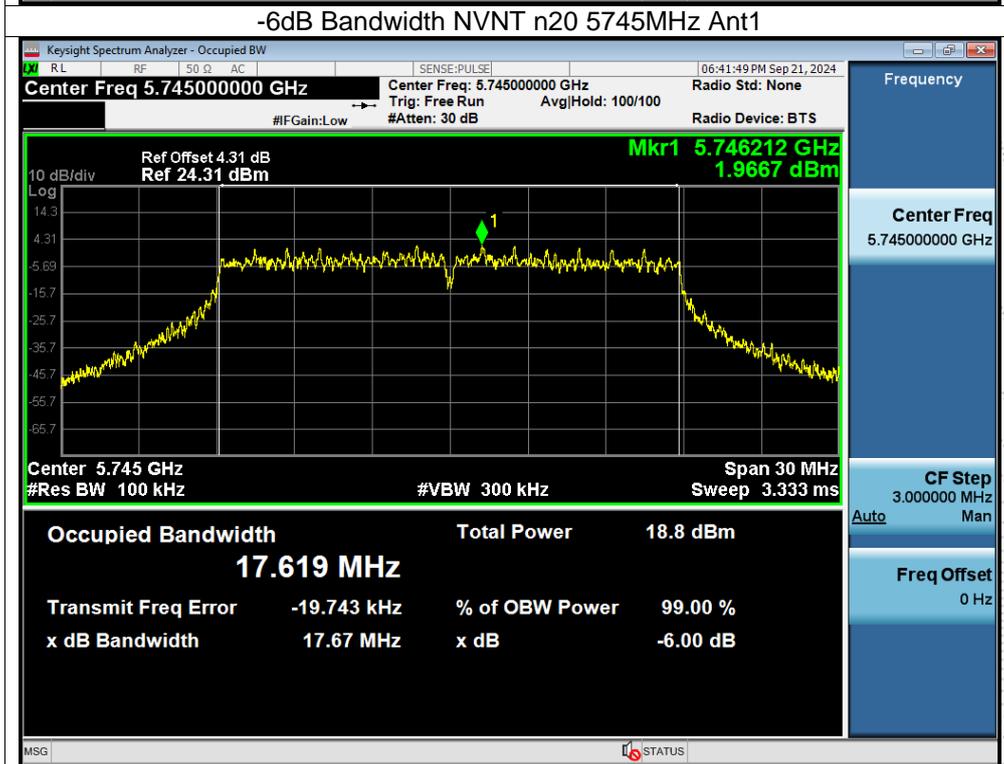
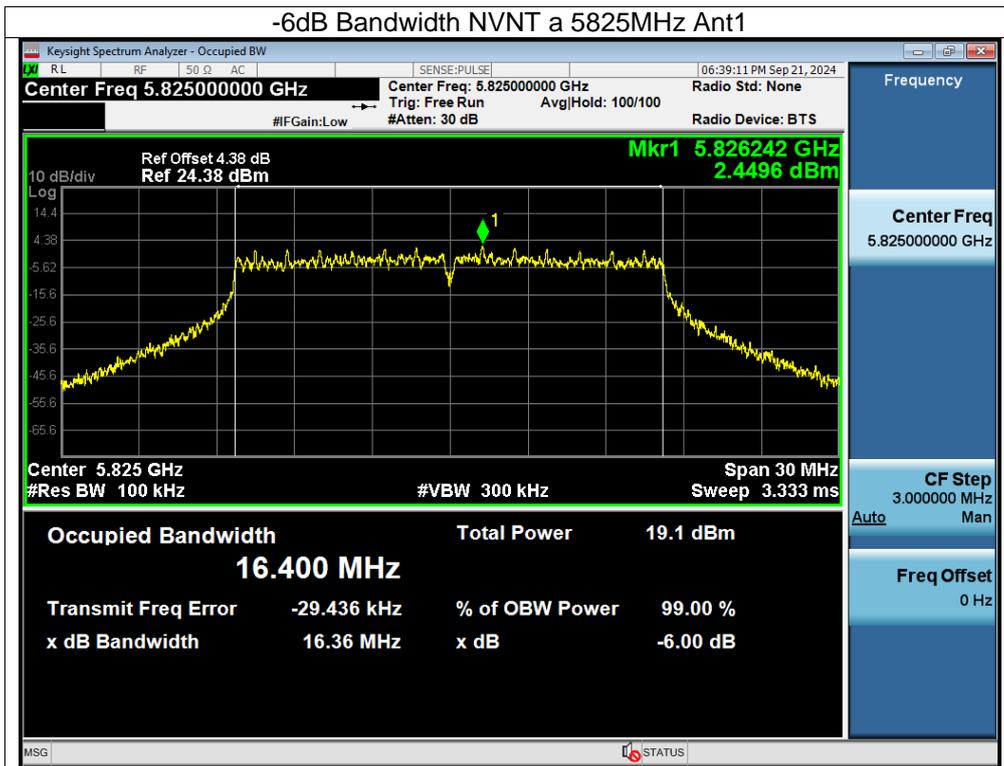
Condition	Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	a	5745	16.367	0.5	Pass
NVNT	a	5785	16.413	0.5	Pass
NVNT	a	5825	16.361	0.5	Pass
NVNT	n20	5745	17.668	0.5	Pass
NVNT	n20	5785	17.64	0.5	Pass
NVNT	n20	5825	17.636	0.5	Pass
NVNT	n40	5755	35.765	0.5	Pass
NVNT	n40	5795	35.126	0.5	Pass
NVNT	ac20	5745	17.711	0.5	Pass
NVNT	ac20	5785	17.698	0.5	Pass
NVNT	ac20	5825	17.712	0.5	Pass
NVNT	ac40	5755	36.422	0.5	Pass
NVNT	ac40	5795	36.451	0.5	Pass
NVNT	ac80	5775	76.374	0.5	Pass
NVNT	ax20	5745	19.074	0.5	Pass
NVNT	ax20	5785	19.072	0.5	Pass
NVNT	ax20	5825	18.94	0.5	Pass
NVNT	ax40	5755	36.277	0.5	Pass
NVNT	ax40	5795	37.376	0.5	Pass
NVNT	ax80	5775	76.352	0.5	Pass

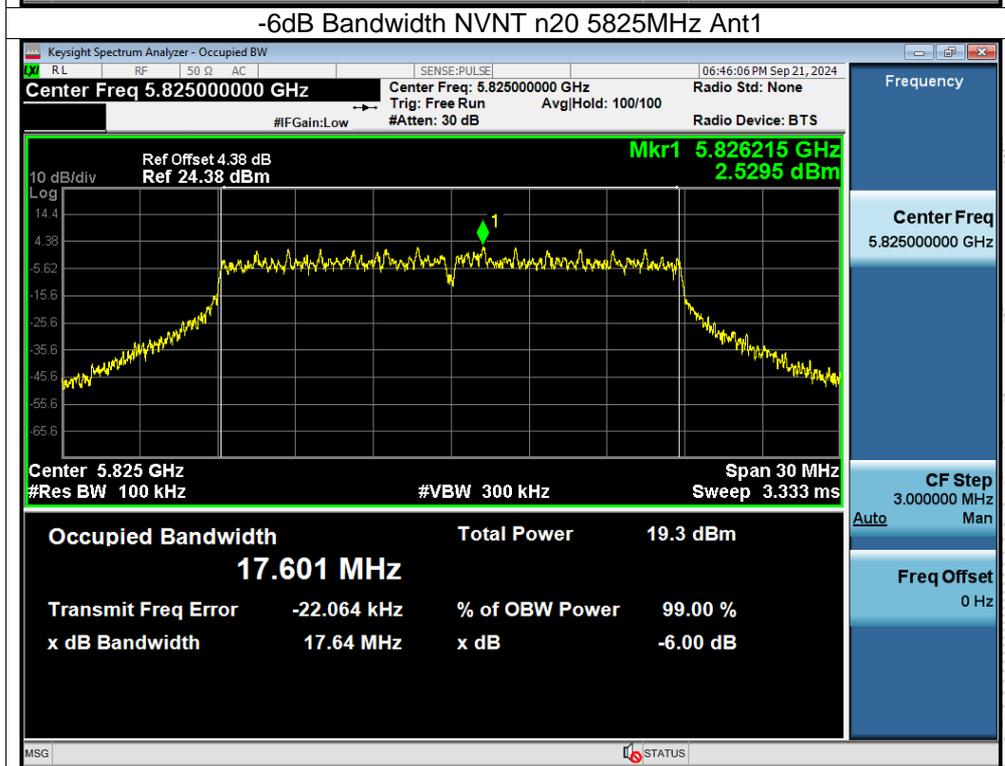
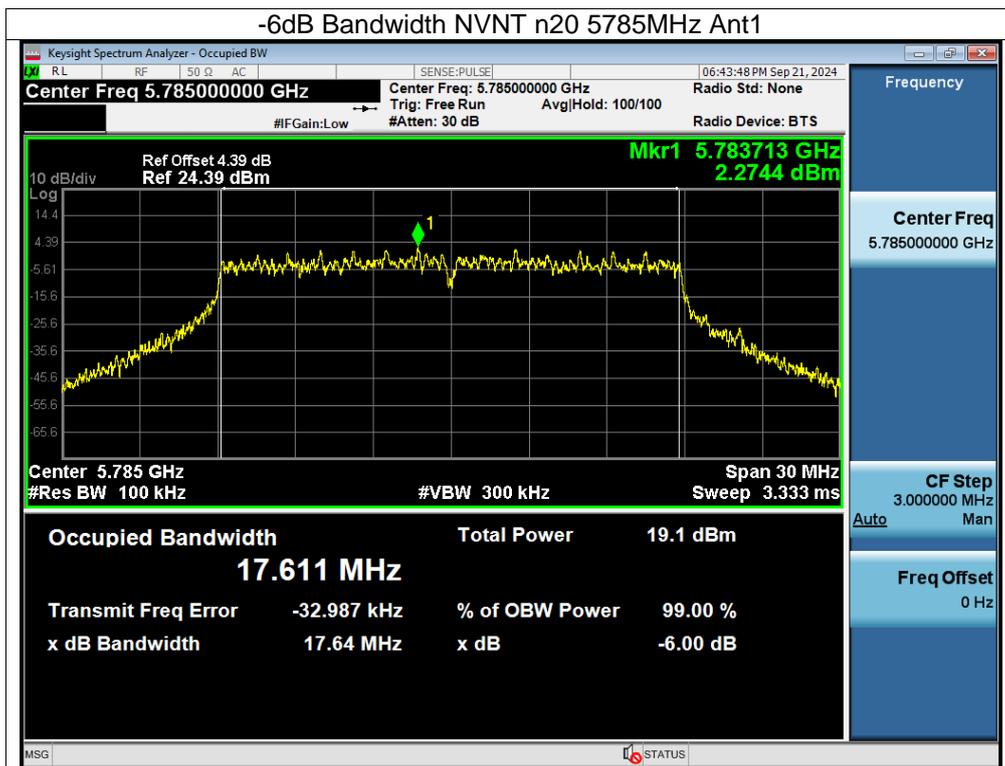


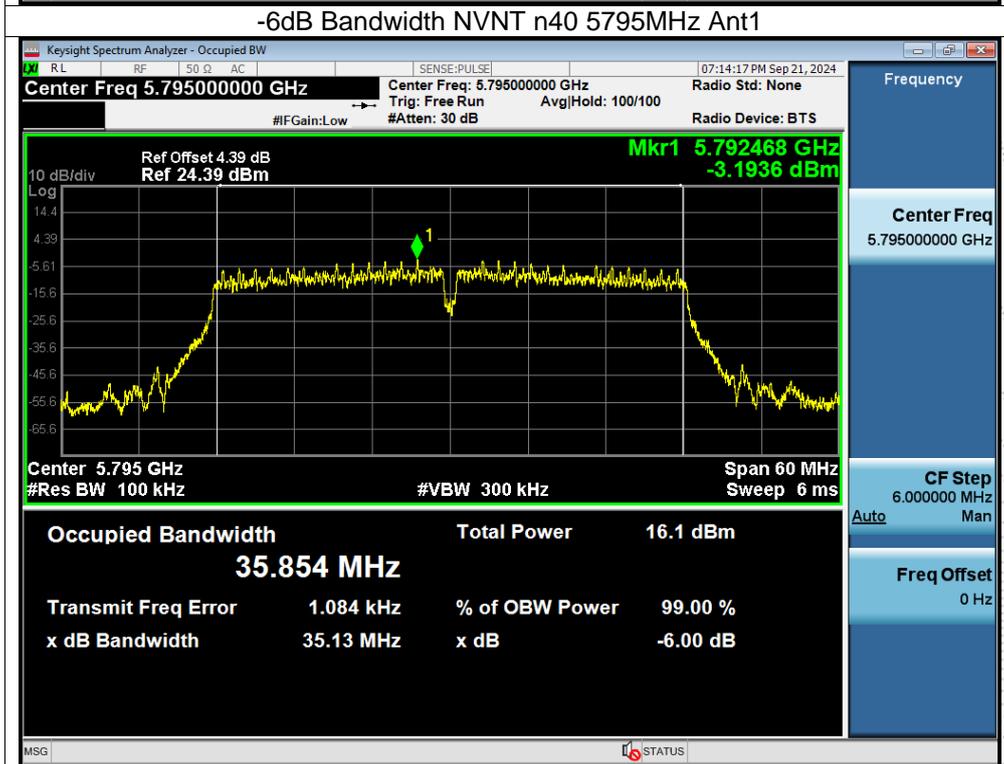
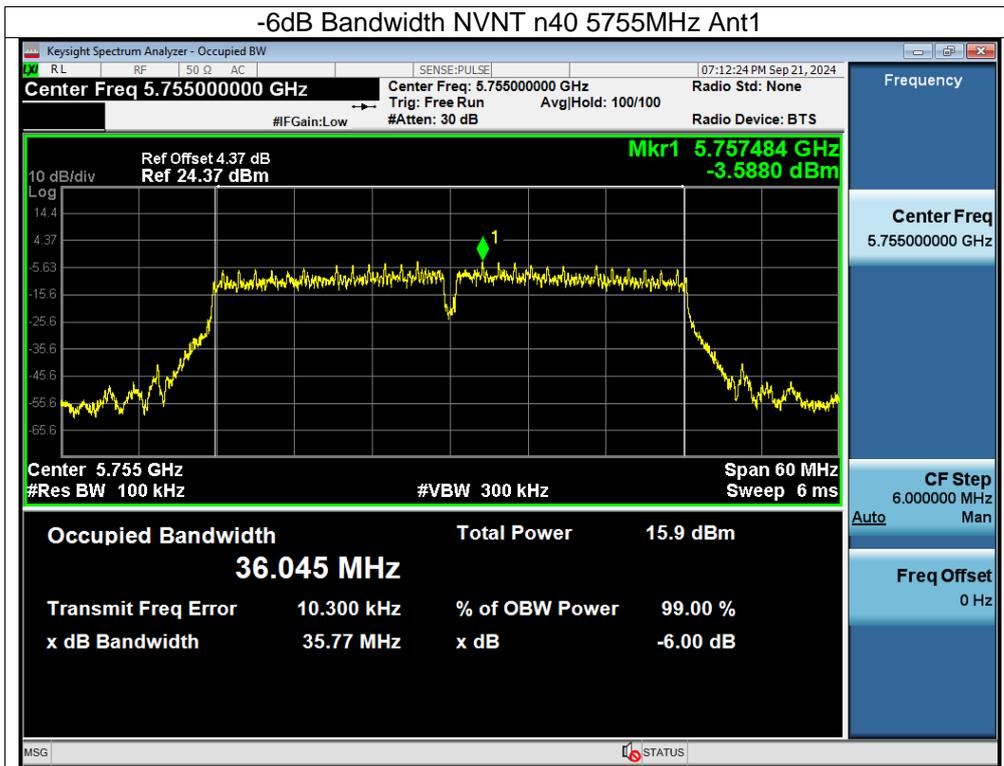
Condition	Mode	Frequency (MHz)	99% OBW (MHz)
NVNT	a	5745	16.432
NVNT	a	5785	16.455
NVNT	a	5825	16.475
NVNT	n20	5745	17.634
NVNT	n20	5785	17.658
NVNT	n20	5825	17.672
NVNT	n40	5755	36.123
NVNT	n40	5795	36.039
NVNT	ac20	5745	17.77
NVNT	ac20	5785	17.756
NVNT	ac20	5825	17.739
NVNT	ac40	5755	36.407
NVNT	ac40	5795	36.436
NVNT	ac80	5775	75.86
NVNT	ax20	5745	19.018
NVNT	ax20	5785	18.973
NVNT	ax20	5825	18.989
NVNT	ax40	5755	37.564
NVNT	ax40	5795	37.643
NVNT	ax80	5775	76.805

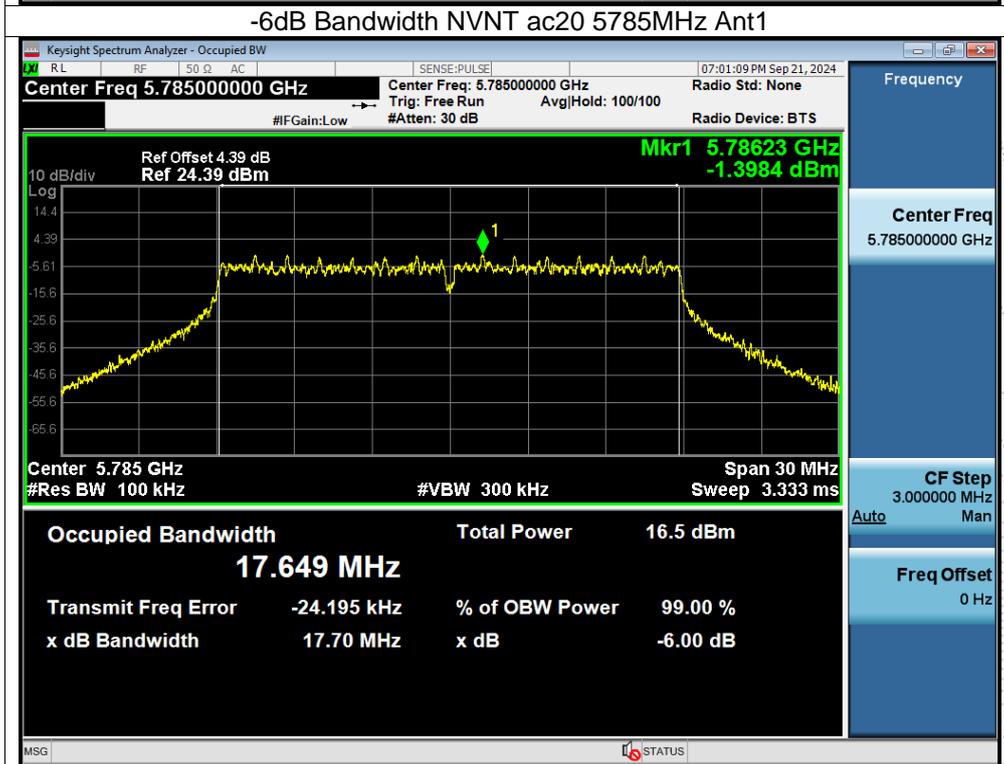
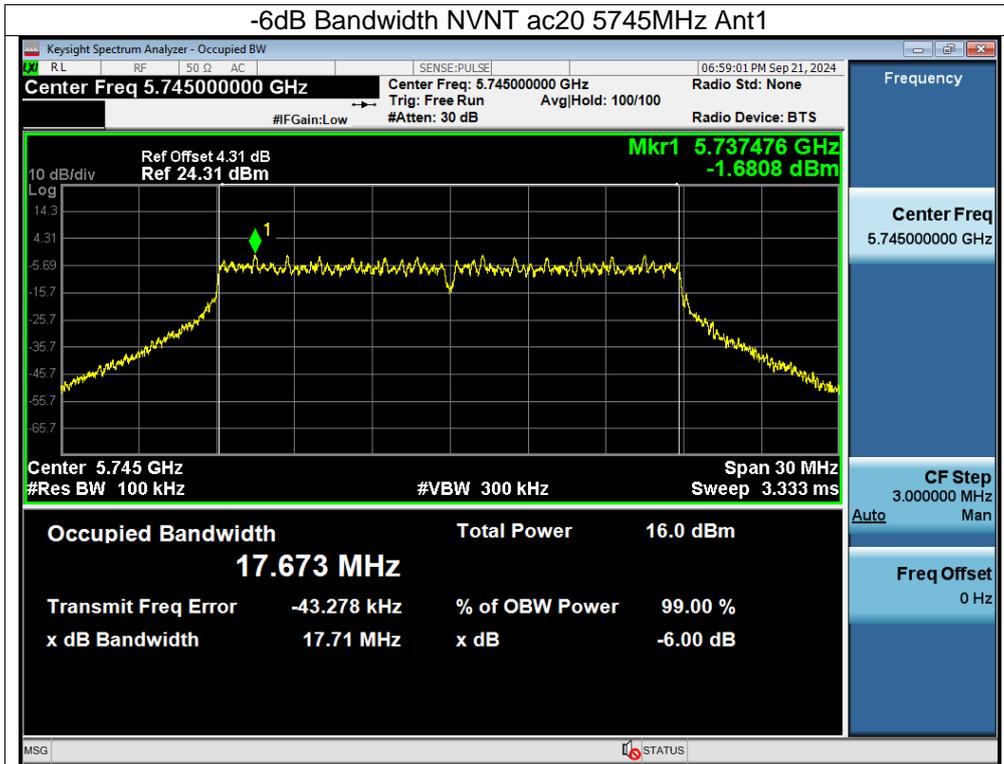


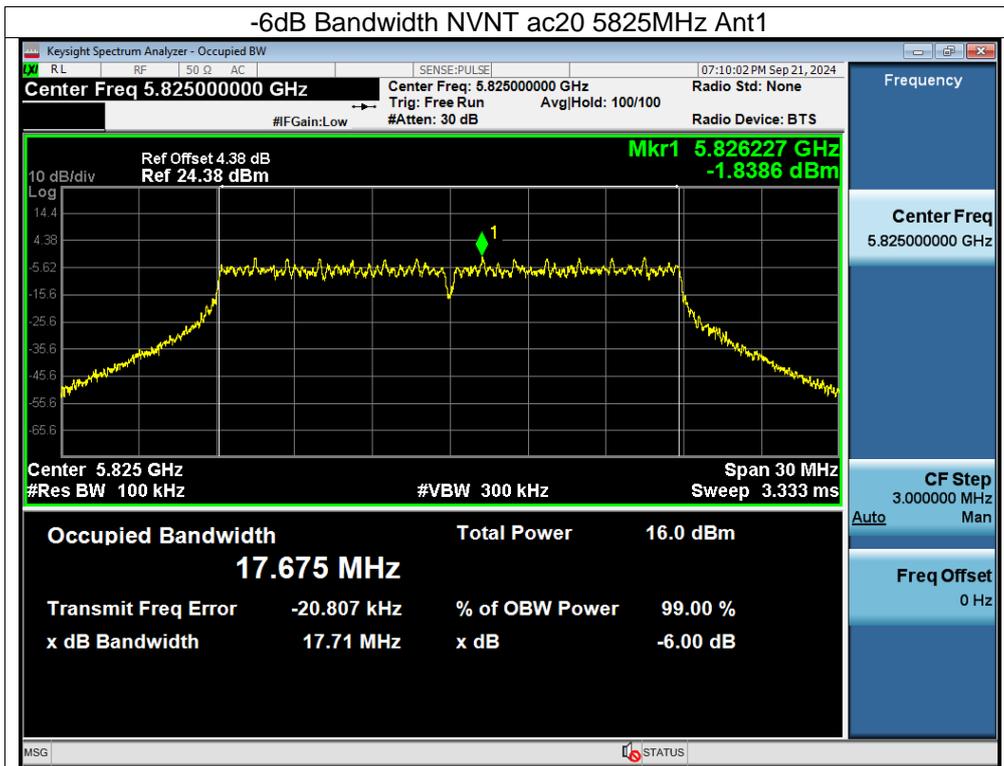


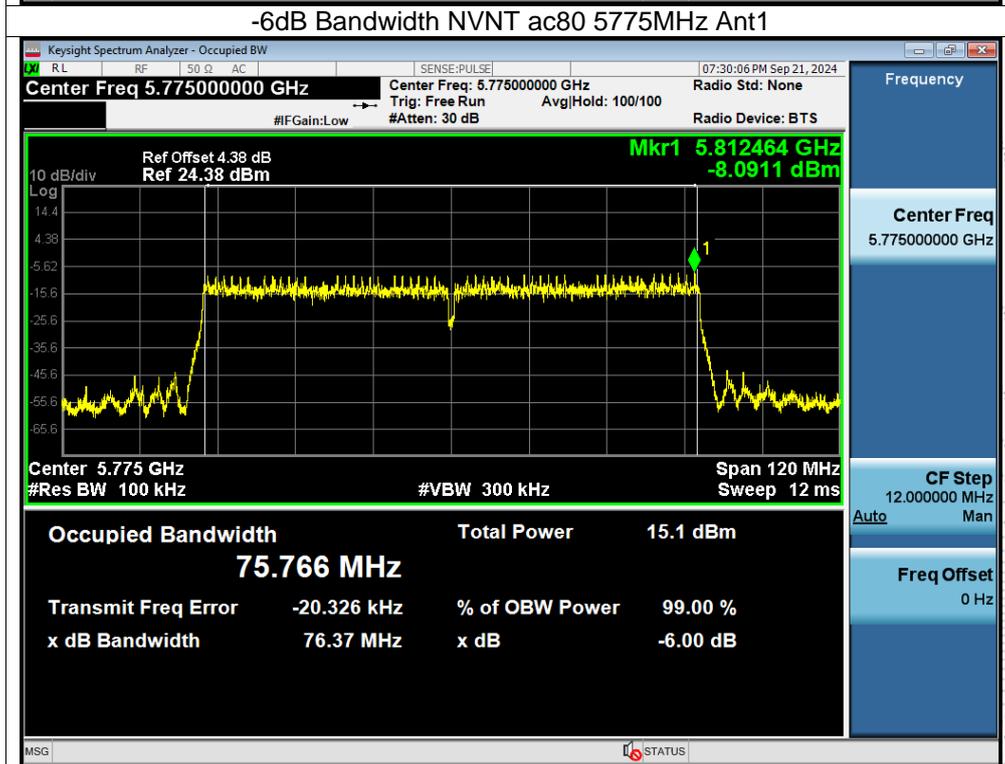
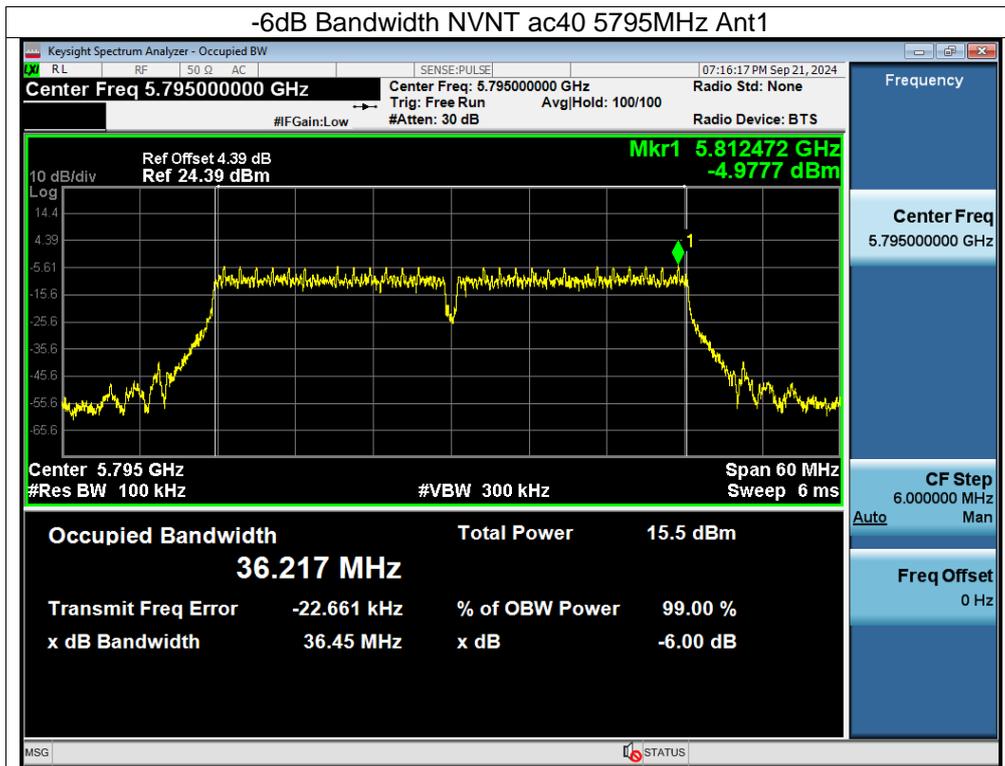


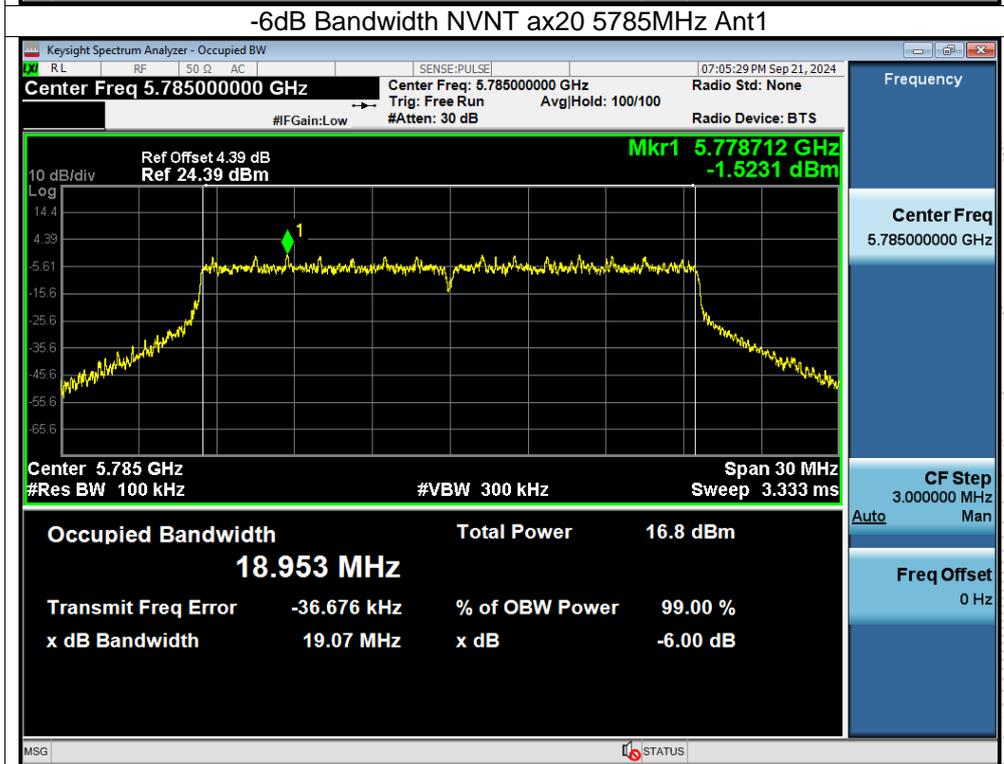
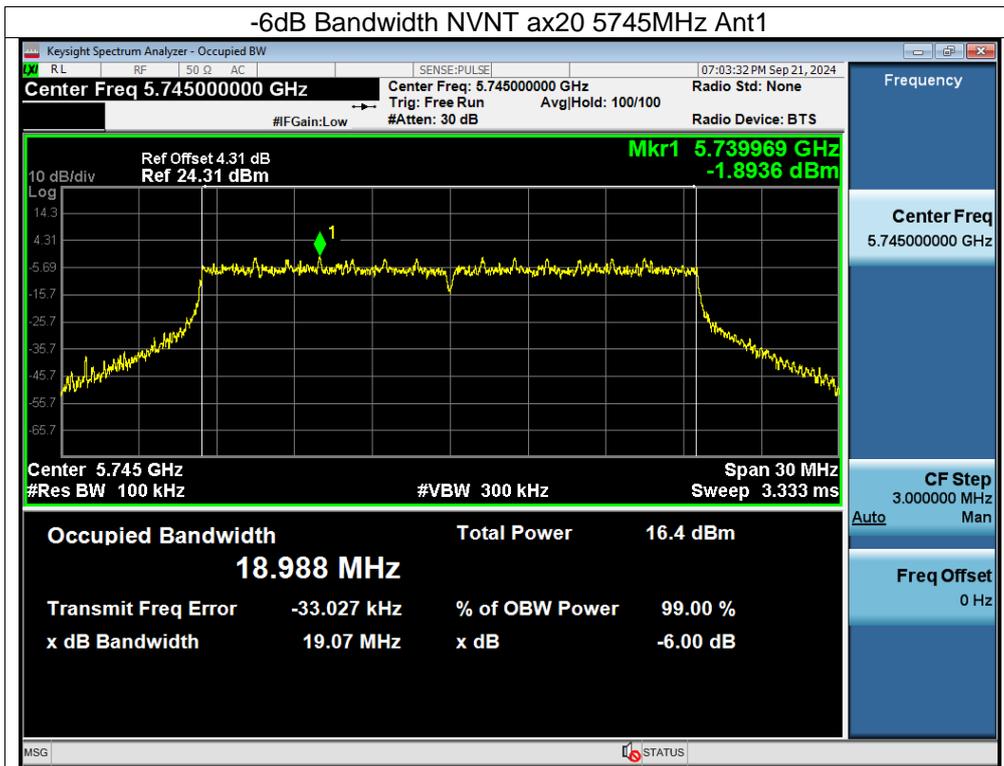


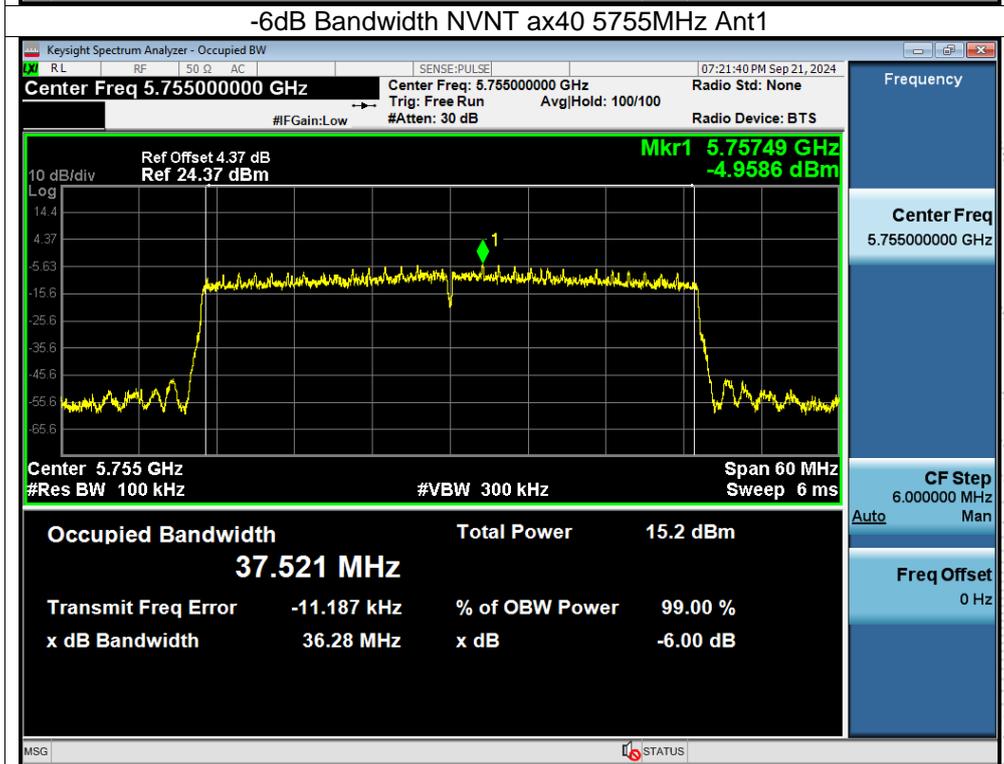
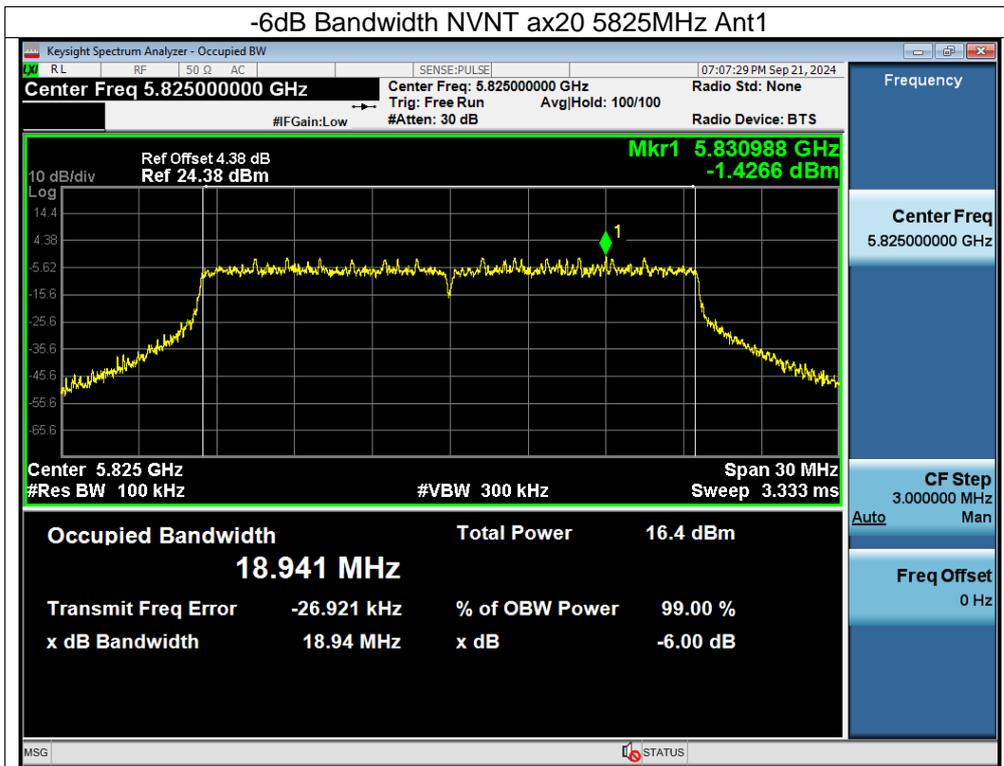


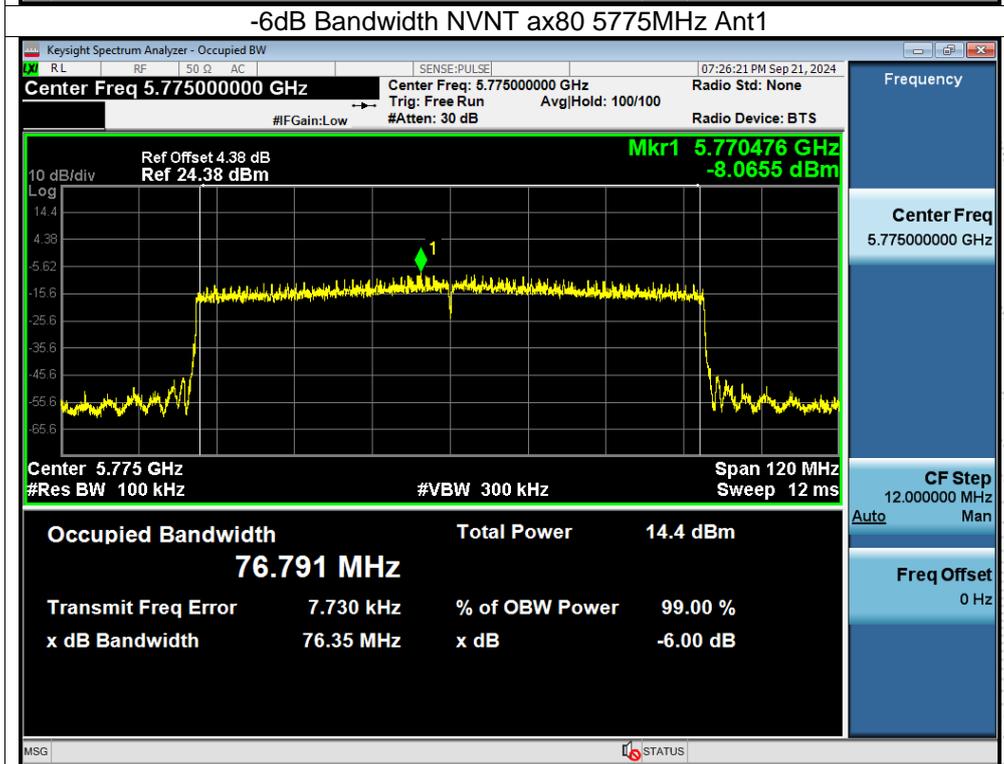
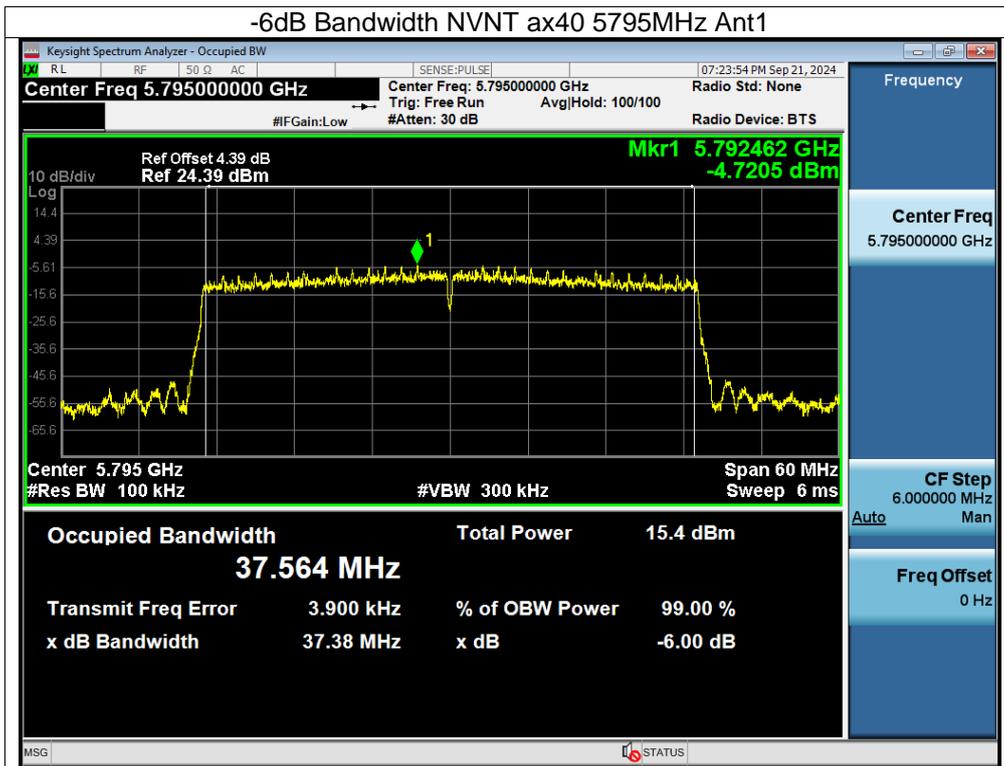


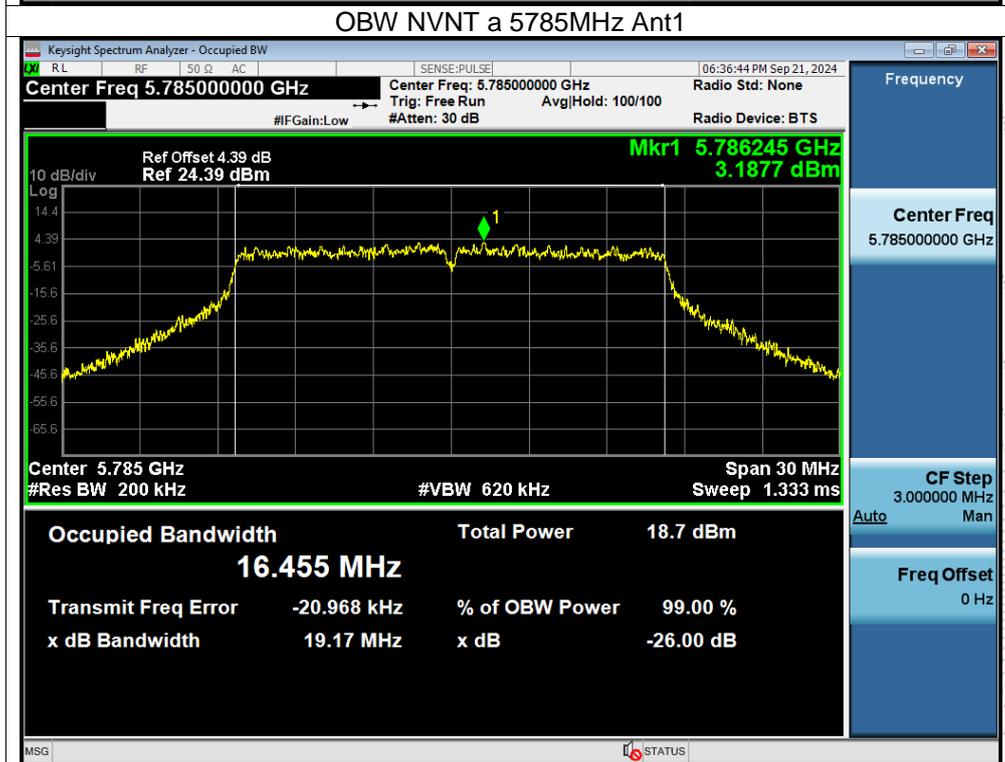
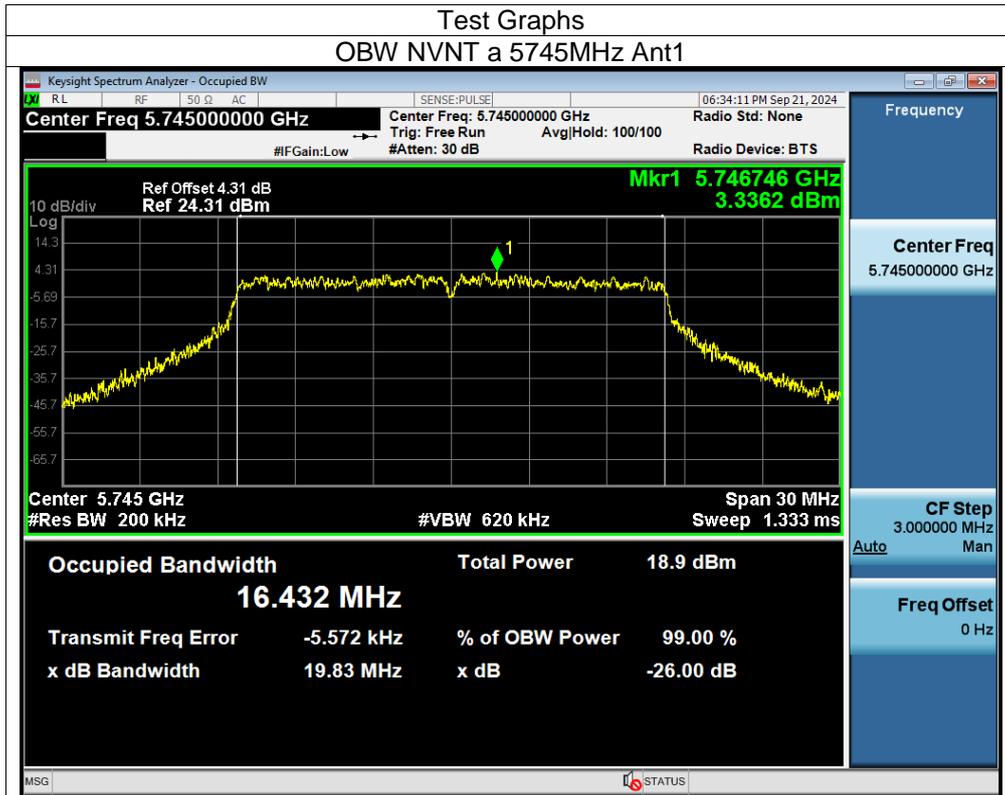


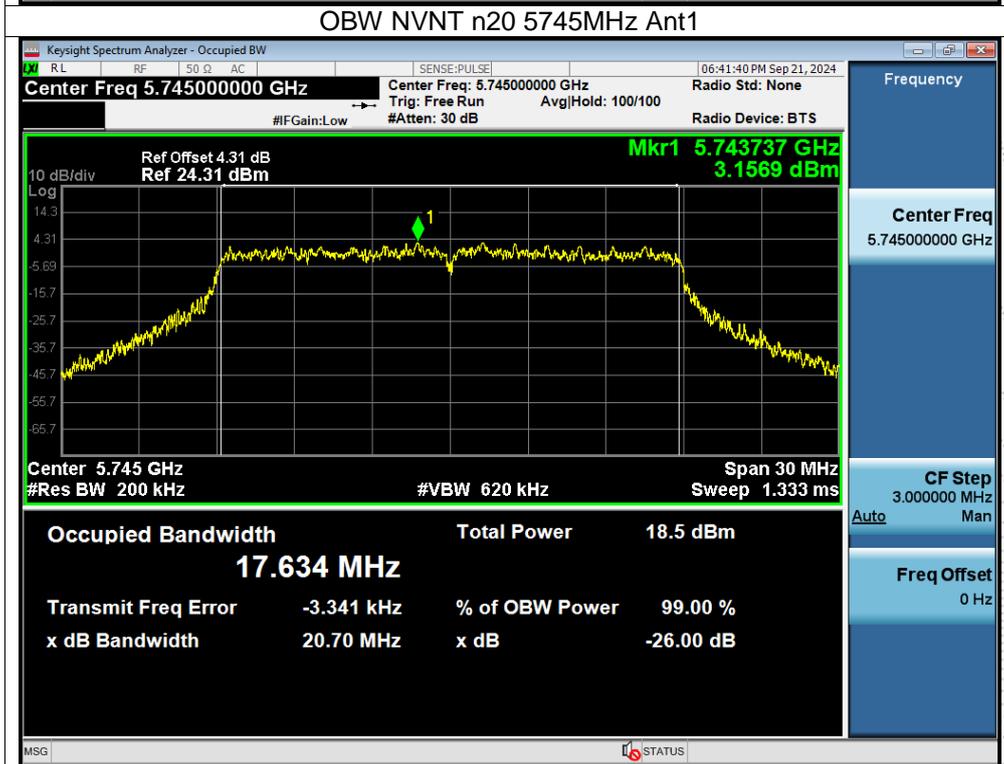
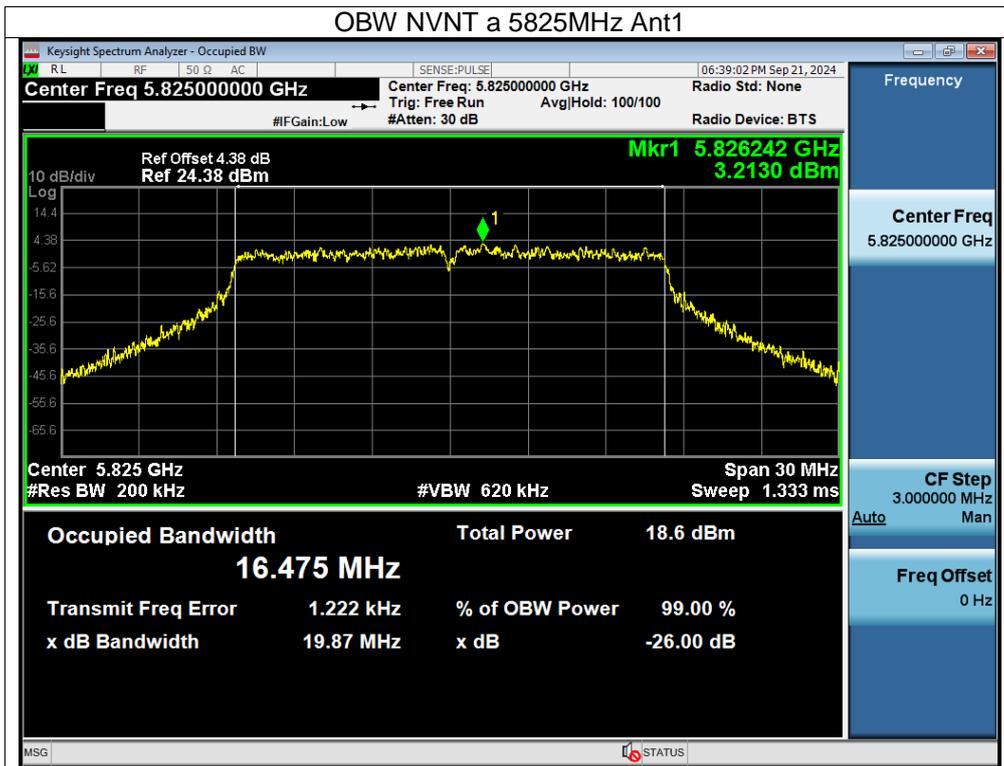


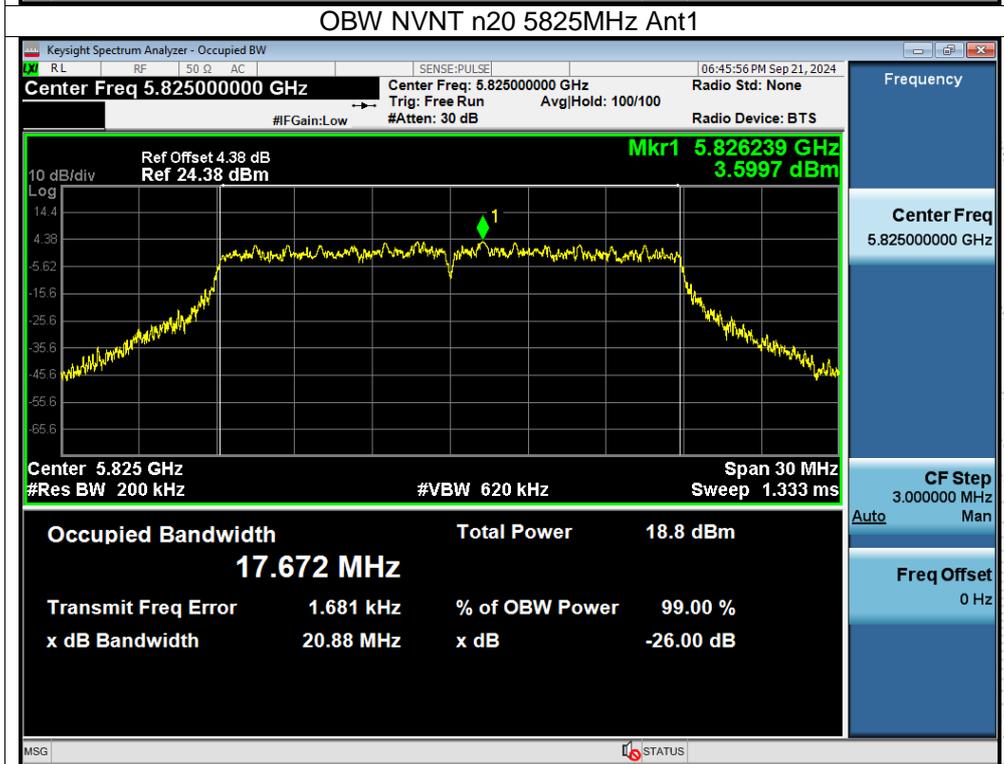
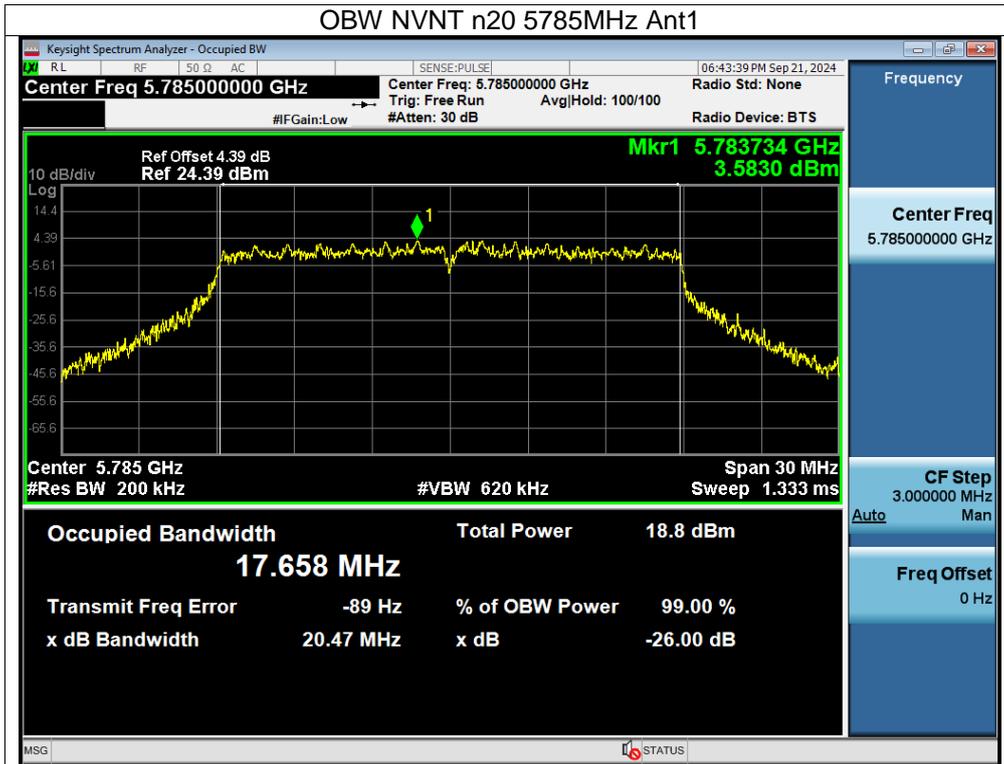


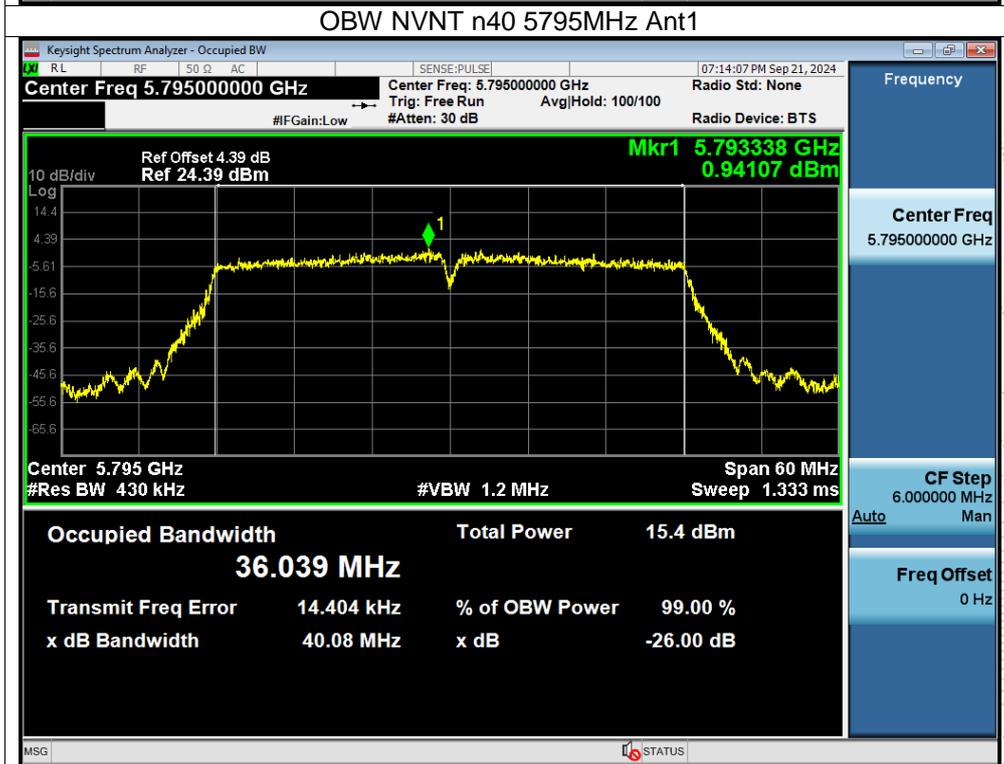
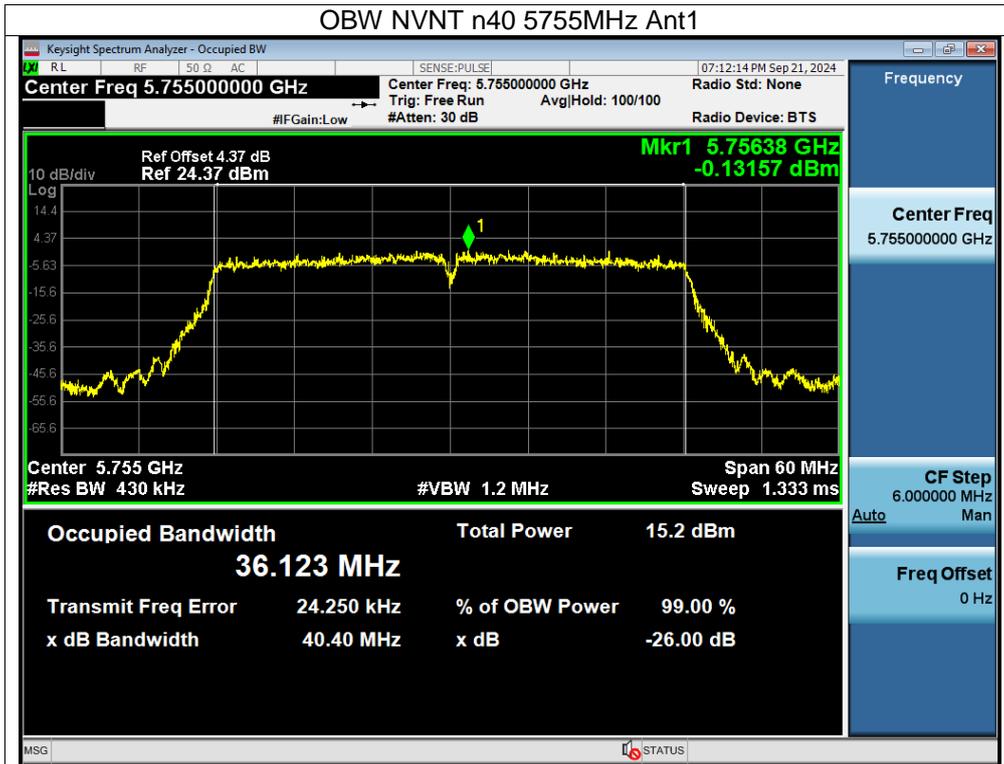


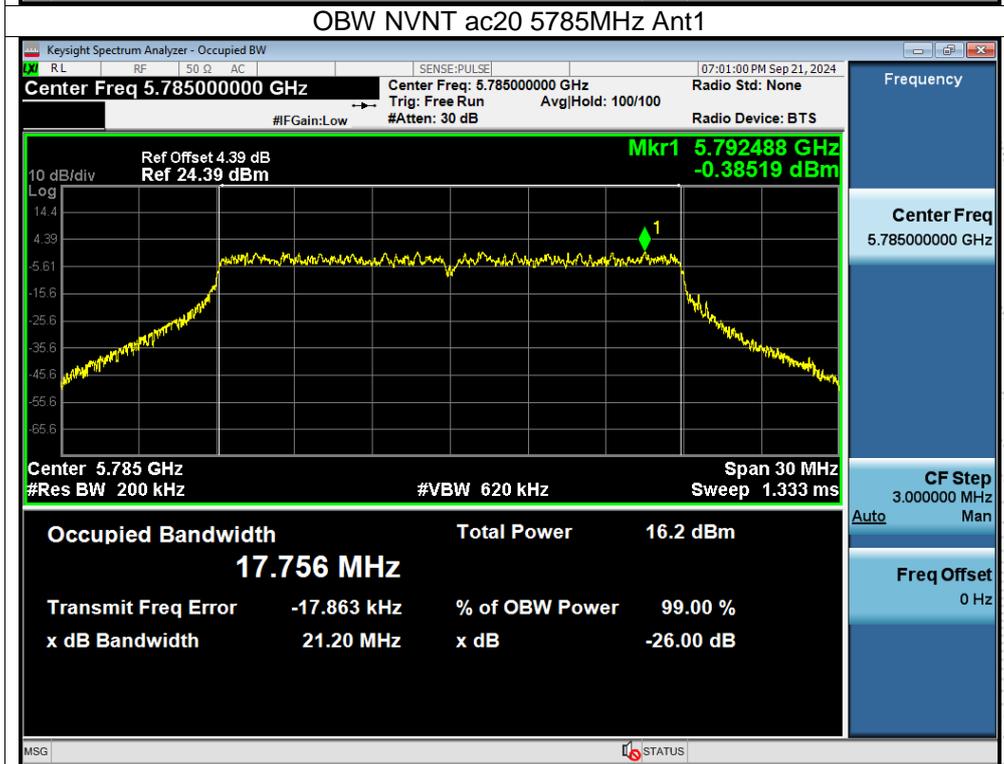
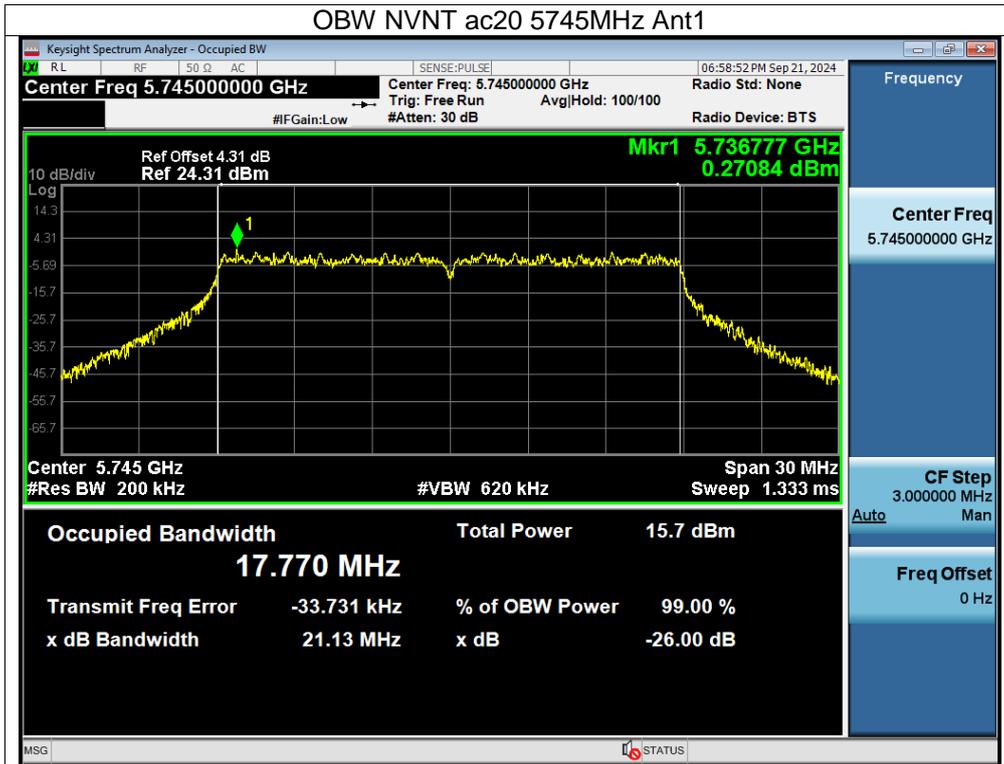


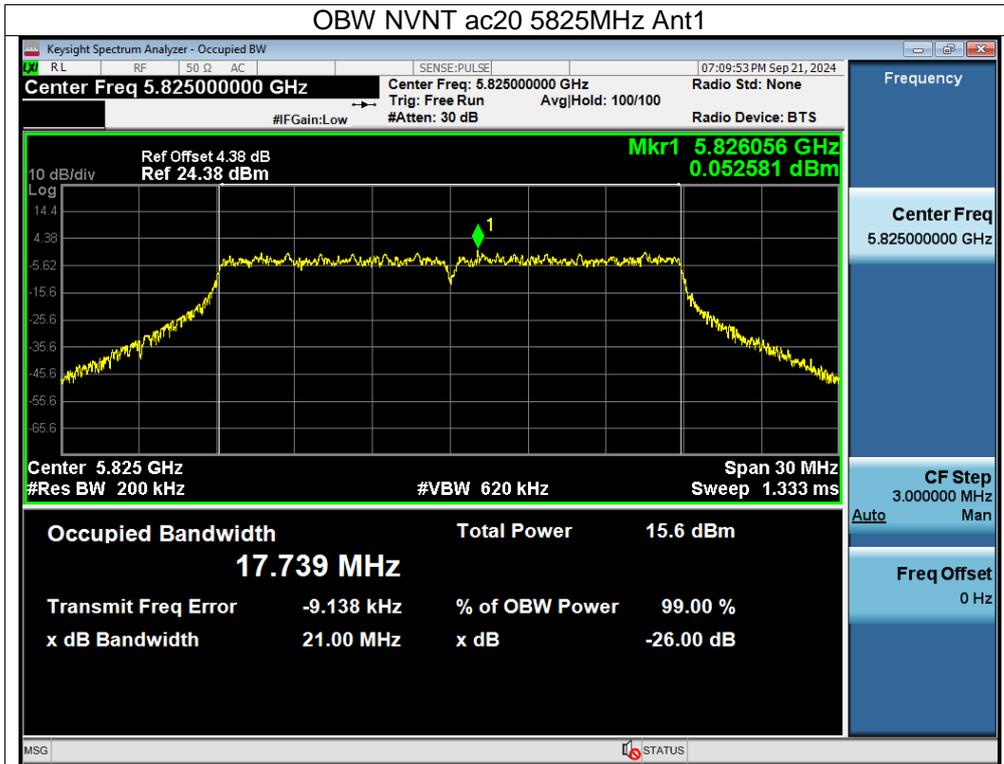


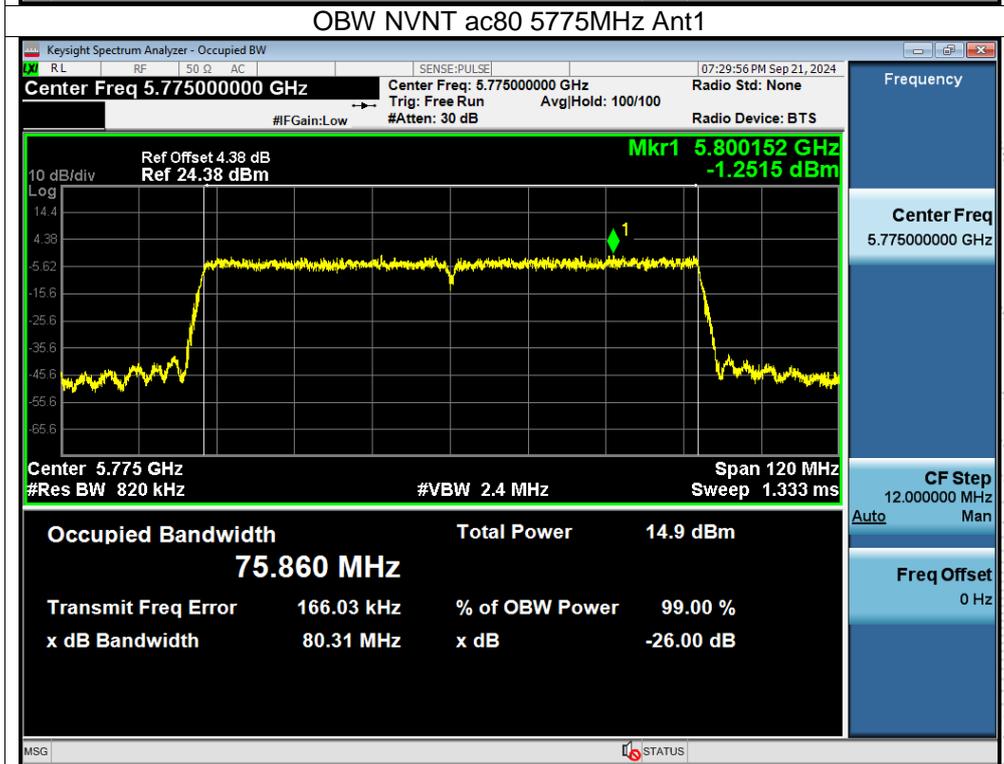
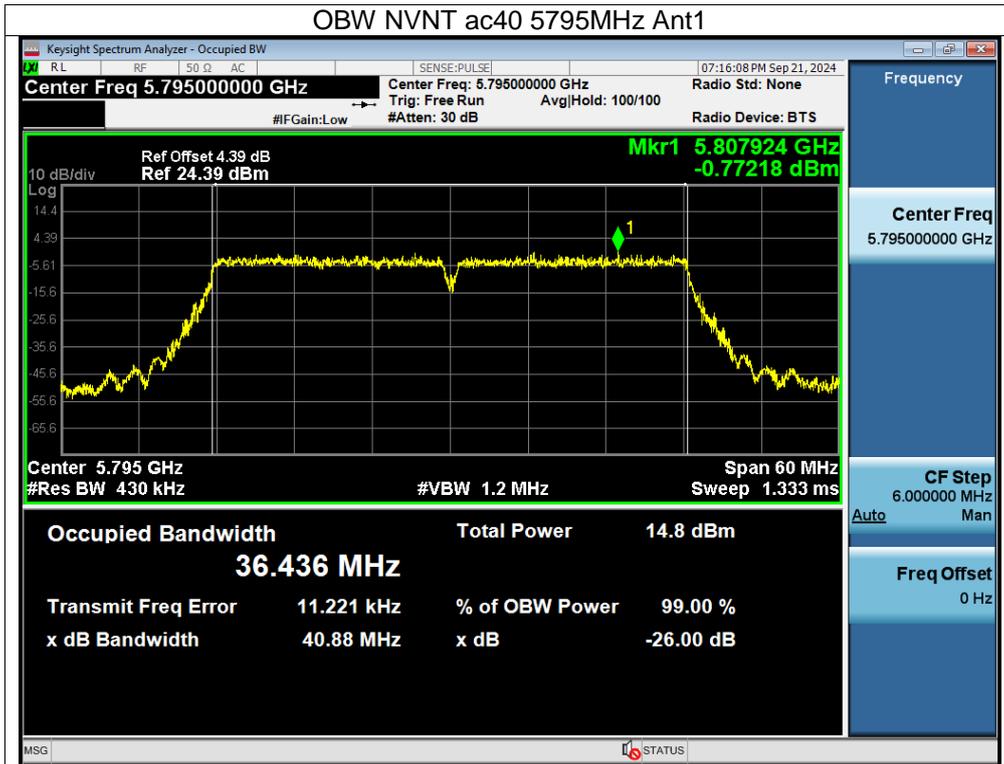


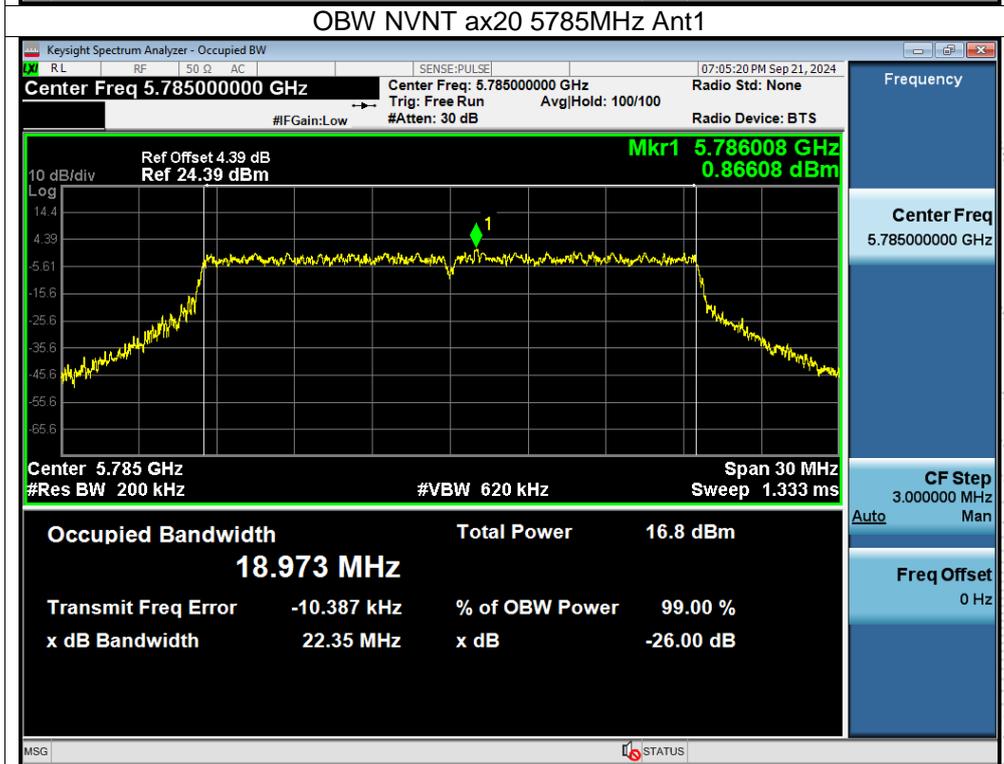
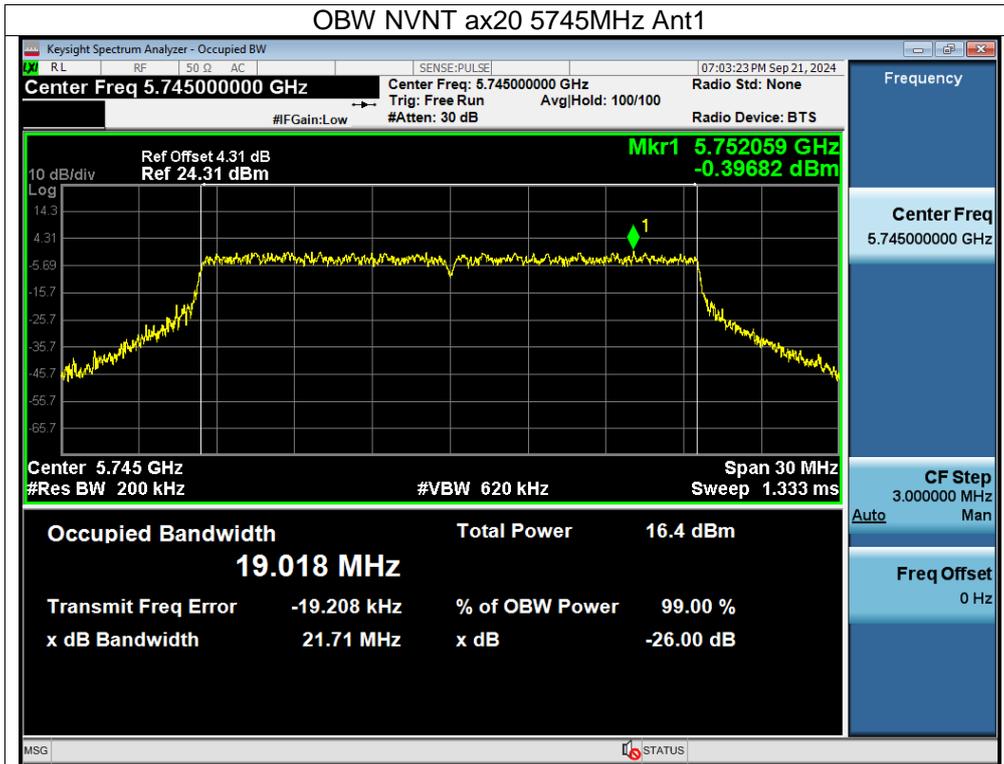


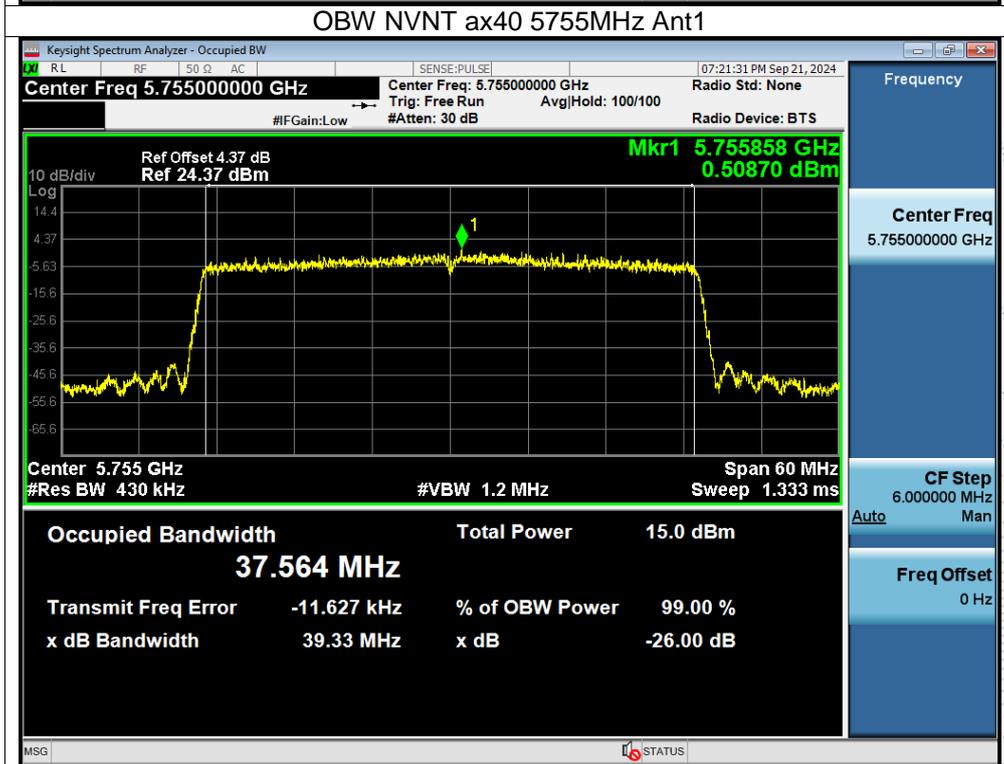
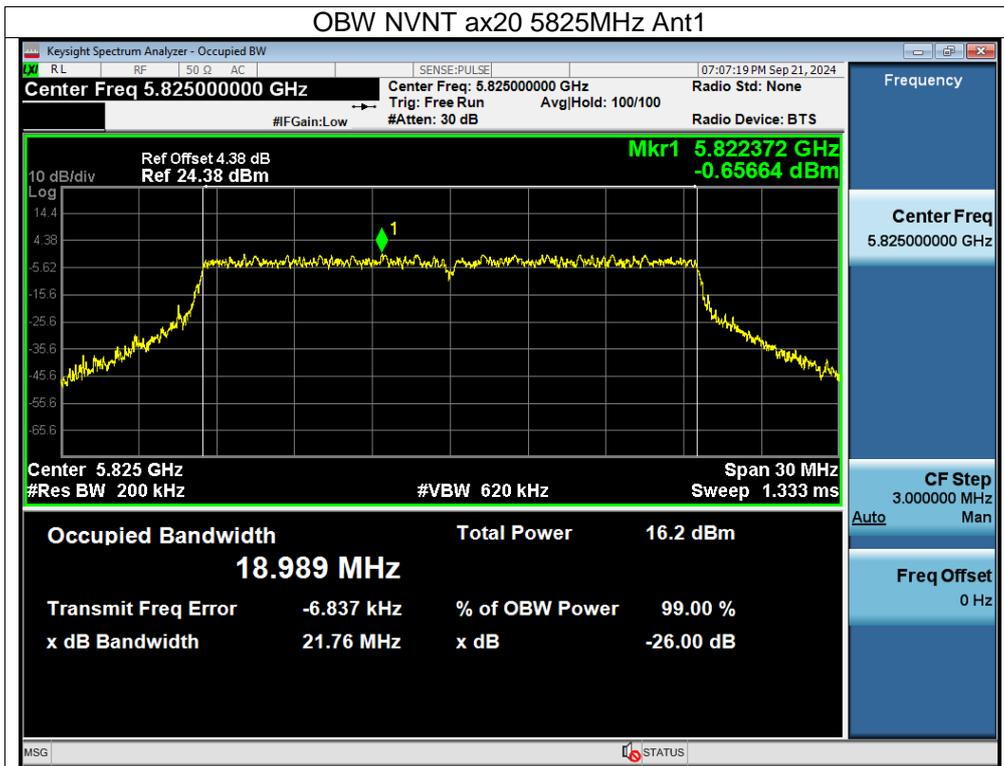


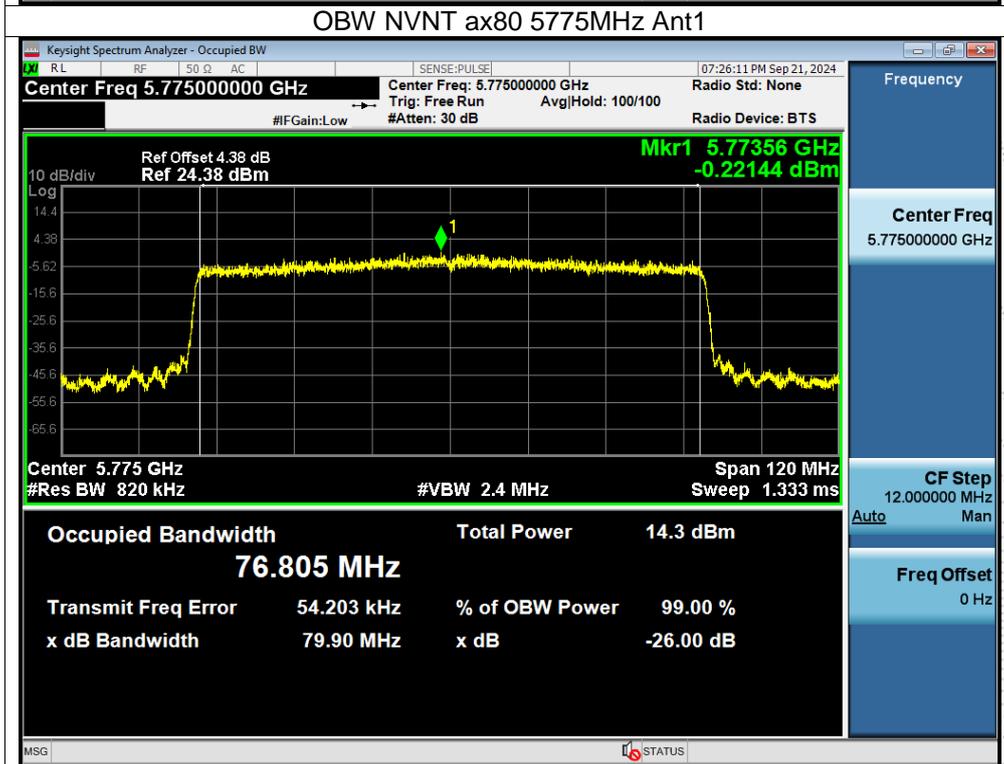
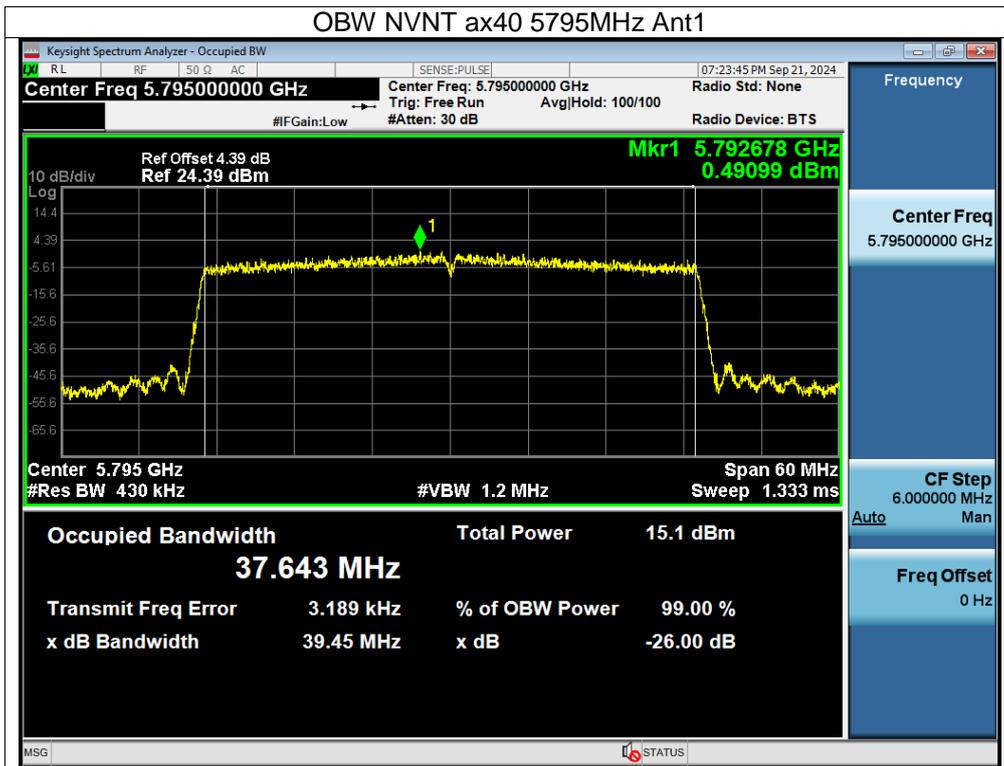












## 10. Maximum Conducted Output Power

### 10.1 Block Diagram Of Test Setup



### 10.2 Limit

#### According to FCC §15.407

■ For the band 5.15-5.25 GHz,

(a) (1) (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(a) (1) (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(a) (1) (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(a) (1) (iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, 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, both the maximum conducted output power and 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 5.25-5.35 GHz and 5.47-5.725 GHz bands

(a) (2) The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition,

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, both the maximum conducted output power and 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

(a) (3) for the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, 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, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations

### 10.3 Test Procedure

Maximum conducted output power may be measured using a spectrum analyzer/EMI receiver or an RF power meter.

#### 1. Device Configuration

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

a) The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

#### 2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)

Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.<sup>1</sup> However, the EBW must be used to determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).

a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

- The EUT transmits continuously (or with a duty cycle  $\geq$  98 percent).
- Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration T of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than  $\pm 2$  percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep): (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW  $\geq 3$  MHz.

(iv) Number of points in sweep  $\geq 2$  Span / RBW. (This ensures that bin-to-bin spacing is  $\leq$  RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

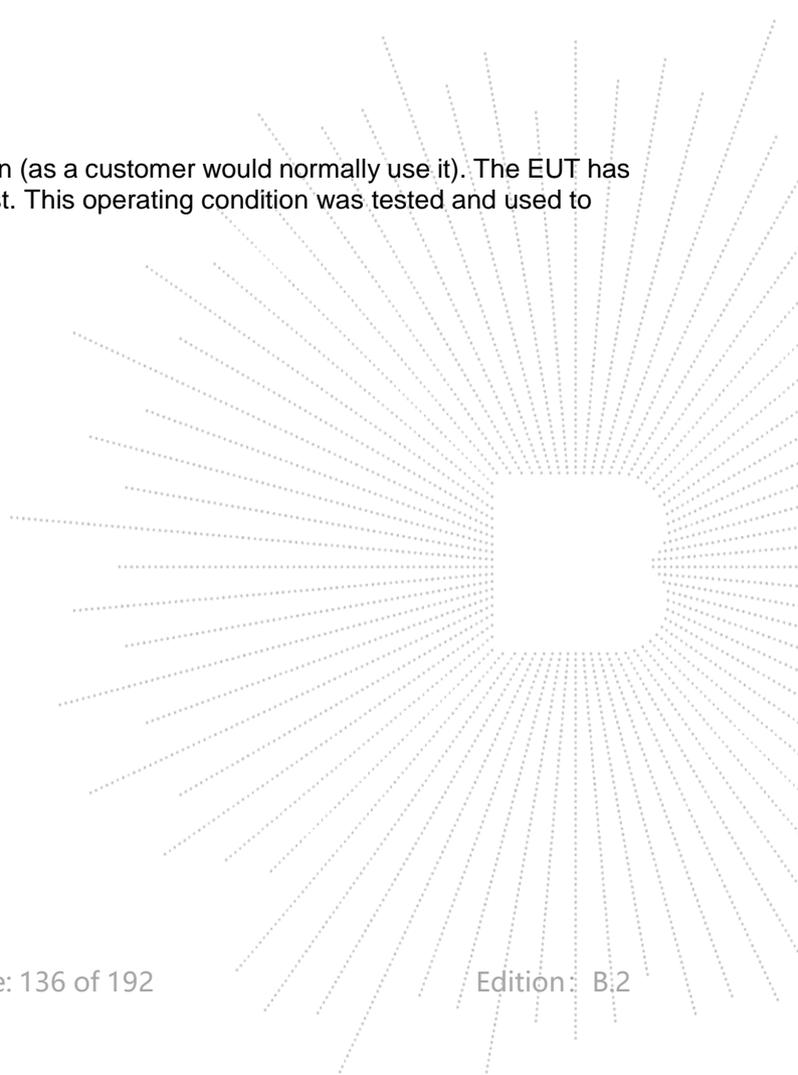
(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle  $\geq 98$  percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum

## 10.4 EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



## 10.5 Test Result

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120/60Hz
Test Mode:	5180-5240MHz		

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)		Limit (dBm)	Verdict
			Ant A	Ant B		
NVNT	a	5180	9.68	9.42	30	Pass
NVNT	a	5200	9.42	9.41	30	Pass
NVNT	a	5240	9.15	9.27	30	Pass
NVNT	n20	5180	8.87	9.03	30	Pass
NVNT	n20	5200	8.71	8.92	30	Pass
NVNT	n20	5240	8.45	8.93	30	Pass
NVNT	n40	5190	7.81	7.82	30	Pass
NVNT	n40	5230	7.9	7.48	30	Pass
NVNT	ac20	5180	8.89	8.45	30	Pass
NVNT	ac20	5200	8.77	8.4	30	Pass
NVNT	ac20	5240	8.4	8.36	30	Pass
NVNT	ac40	5190	7.28	7.21	30	Pass
NVNT	ac40	5230	7.43	7.08	30	Pass
NVNT	ac80	5210	6.83	6.76	30	Pass
NVNT	ax20	5180	8.75	8.47	30	Pass
NVNT	ax20	5200	8.65	8.48	30	Pass
NVNT	ax20	5240	8.4	8.5	30	Pass
NVNT	ax40	5190	7.3	7.22	30	Pass
NVNT	ax40	5230	7.29	7.09	30	Pass
NVNT	ax80	5210	8.87	6.54	30	Pass

**For MIMO**

Operating mode	Channel Freq. (MHz)	Conducted Output Power(dBm)	Limit (dBm)	Verdict
n20	5180	11.96	28.34	Pass
n20	5200	11.83	28.34	Pass
n20	5240	11.71	28.34	Pass
n40	5190	10.83	28.34	Pass
n40	5230	10.71	28.34	Pass
ac20	5180	11.69	28.34	Pass
ac20	5200	11.60	28.34	Pass
ac20	5240	11.39	28.34	Pass
ac40	5190	10.26	28.34	Pass
ac40	5230	10.27	28.34	Pass
ac80	5210	9.81	28.34	Pass
ax20	5180	11.62	28.34	Pass
ax20	5200	11.58	28.34	Pass
ax20	5240	11.46	28.34	Pass
ax40	5190	10.27	28.34	Pass
ax40	5230	10.20	28.34	Pass
ax80	5210	10.87	28.34	Pass

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120/60HZ
Test Mode:	5745-5825MHz		

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)		Limit (dBm)	Verdict
			Ant A	Ant B		
NVNT	a	5745	9.78	9.21	30	Pass
NVNT	a	5785	9.67	9.35	30	Pass
NVNT	a	5825	9.66	9.44	30	Pass
NVNT	n20	5745	8.29	8.53	30	Pass
NVNT	n20	5785	8.67	8.66	30	Pass
NVNT	n20	5825	8.62	8.32	30	Pass
NVNT	n40	5755	7.37	7.64	30	Pass
NVNT	n40	5795	7.62	7.61	30	Pass
NVNT	ac20	5745	8.29	8.49	30	Pass
NVNT	ac20	5785	8.67	8.08	30	Pass
NVNT	ac20	5825	8.19	8.3	30	Pass
NVNT	ac40	5755	7.45	7.23	30	Pass
NVNT	ac40	5795	6.95	7.04	30	Pass
NVNT	ac80	5775	6.27	6.65	30	Pass
NVNT	ax20	5745	8.38	8.52	30	Pass
NVNT	ax20	5785	8.69	8.55	30	Pass
NVNT	ax20	5825	8.25	8.72	30	Pass
NVNT	ax40	5755	7.3	7.84	30	Pass
NVNT	ax40	5795	7.54	7.58	30	Pass
NVNT	ax80	5775	6.35	6.46	30	Pass

**For MIMO**

Operating mode	Channel Freq. (MHz)	Conducted Output Power(dBm)	Limit (dBm)	Verdict
n20	5745	11.42	28.34	Pass
n20	5785	11.68	28.34	Pass
n20	5825	11.48	28.34	Pass
n40	5755	10.52	28.34	Pass
n40	5795	10.63	28.34	Pass
ac20	5745	11.40	28.34	Pass
ac20	5785	11.40	28.34	Pass
ac20	5825	11.26	28.34	Pass
ac40	5755	10.35	28.34	Pass
ac40	5795	10.01	28.34	Pass
ac80	5775	9.47	28.34	Pass
ax20	5745	11.46	28.34	Pass
ax20	5785	11.63	28.34	Pass
ax20	5825	11.50	28.34	Pass
ax40	5755	10.59	28.34	Pass
ax40	5795	10.57	28.34	Pass
ax80	5775	9.42	28.34	Pass