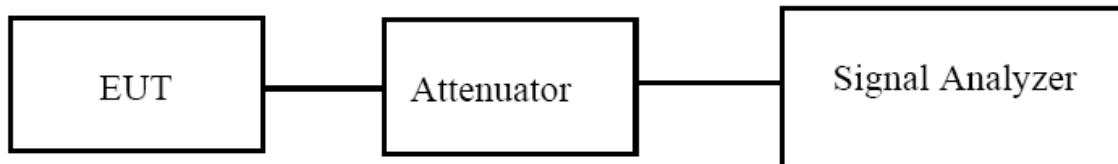


9. 26dB & 6dB & 99% Emission Bandwidth

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

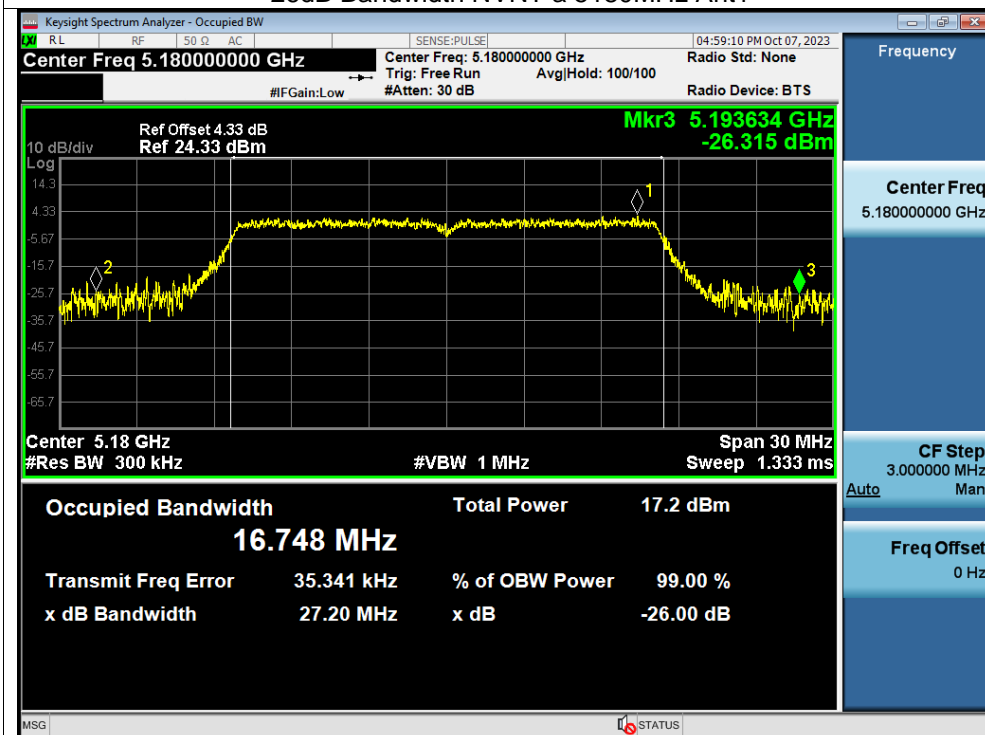
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	DC 3.8V
Test Mode:	(5180-5240MHz)		

Condition	Mode	Frequency (MHz)	-26 dB Bandwidth (MHz)	Verdict
NVNT	a	5180	27.197	Pass
NVNT	a	5200	26.659	Pass
NVNT	a	5240	26.373	Pass
NVNT	n20	5180	28.218	Pass
NVNT	n20	5200	27.924	Pass
NVNT	n20	5240	27.914	Pass
NVNT	n40	5190	46.618	Pass
NVNT	n40	5230	48.864	Pass
NVNT	ac20	5180	28.105	Pass
NVNT	ac20	5200	25.826	Pass
NVNT	ac20	5240	29.165	Pass
NVNT	ac40	5190	45.454	Pass
NVNT	ac40	5230	46.273	Pass
NVNT	ac80	5210	78.259	Pass

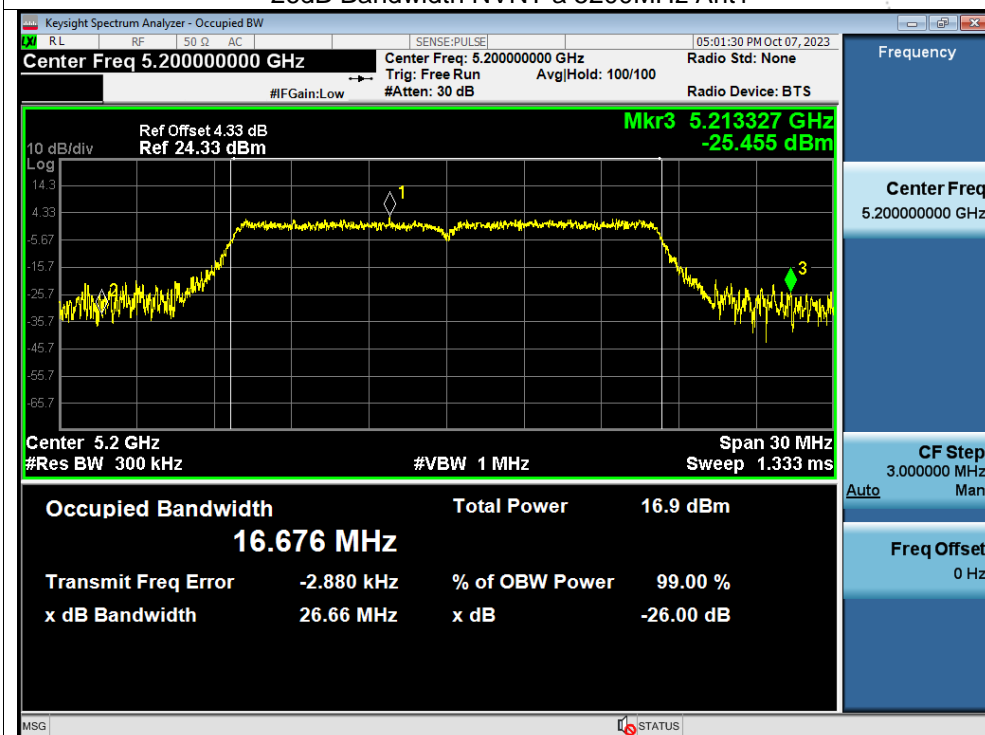
Condition	Mode	Frequency (MHz)	99% OBW (MHz)
NVNT	a	5180	16.555
NVNT	a	5200	16.567
NVNT	a	5240	16.572
NVNT	n20	5180	17.617
NVNT	n20	5200	17.609
NVNT	n20	5240	17.611
NVNT	n40	5190	36.301
NVNT	n40	5230	36.289
NVNT	ac20	5180	17.587
NVNT	ac20	5200	17.589
NVNT	ac20	5240	17.602
NVNT	ac40	5190	36.311
NVNT	ac40	5230	36.241
NVNT	ac80	5210	75.462

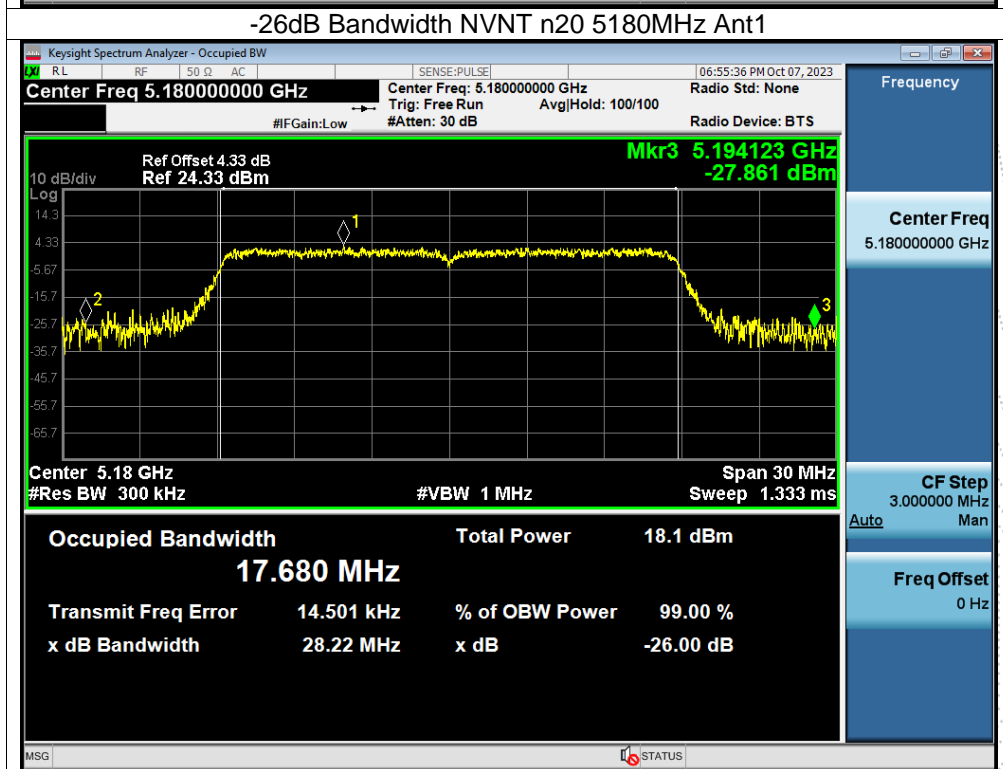
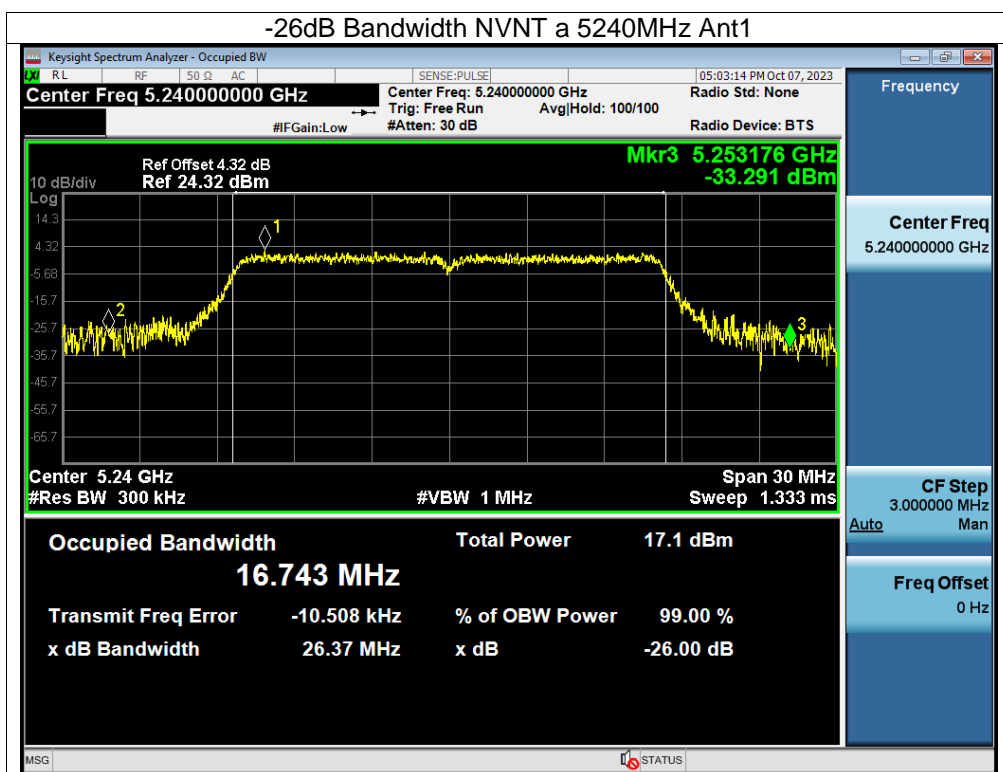
Test Graphs

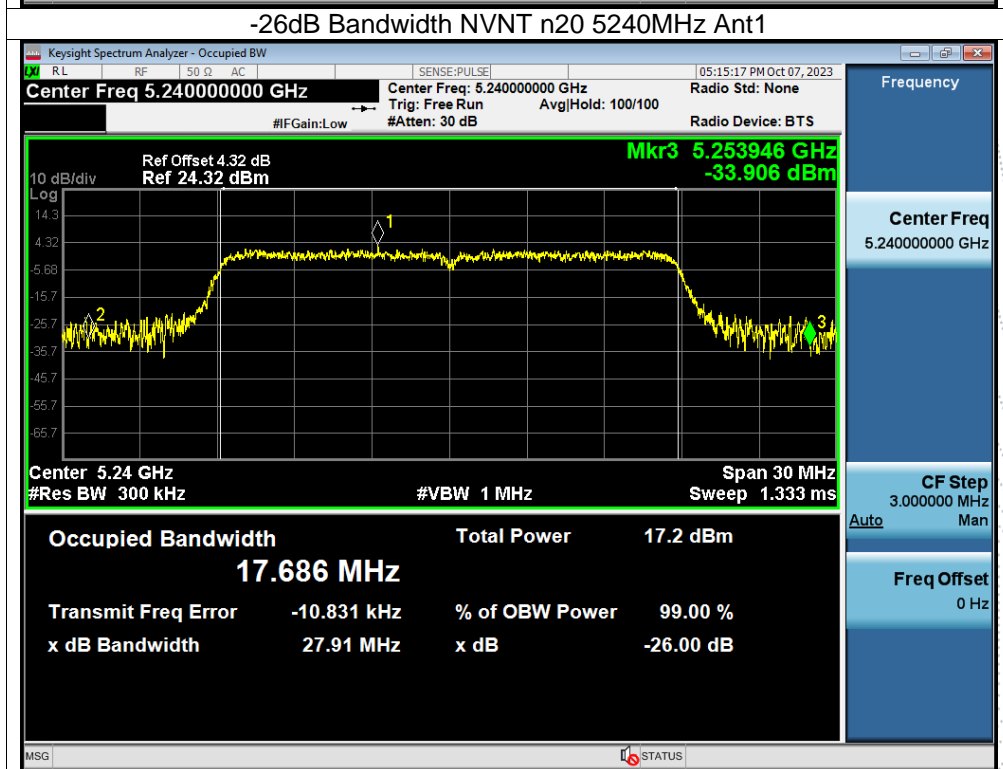
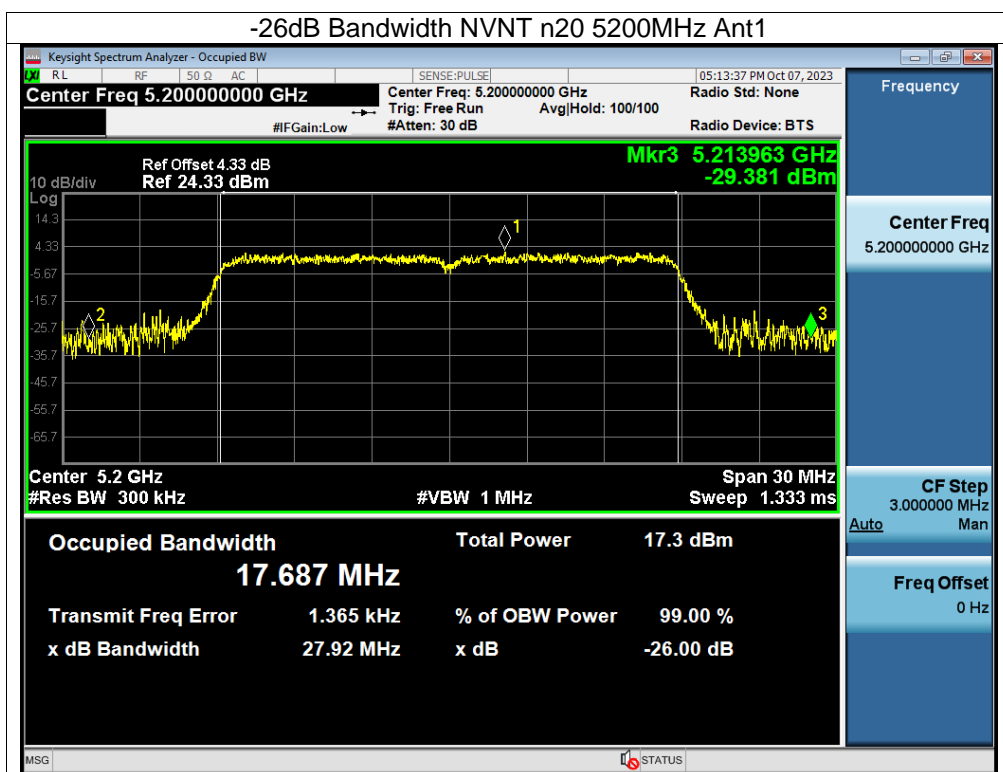
-26dB Bandwidth NVNT a 5180MHz Ant1

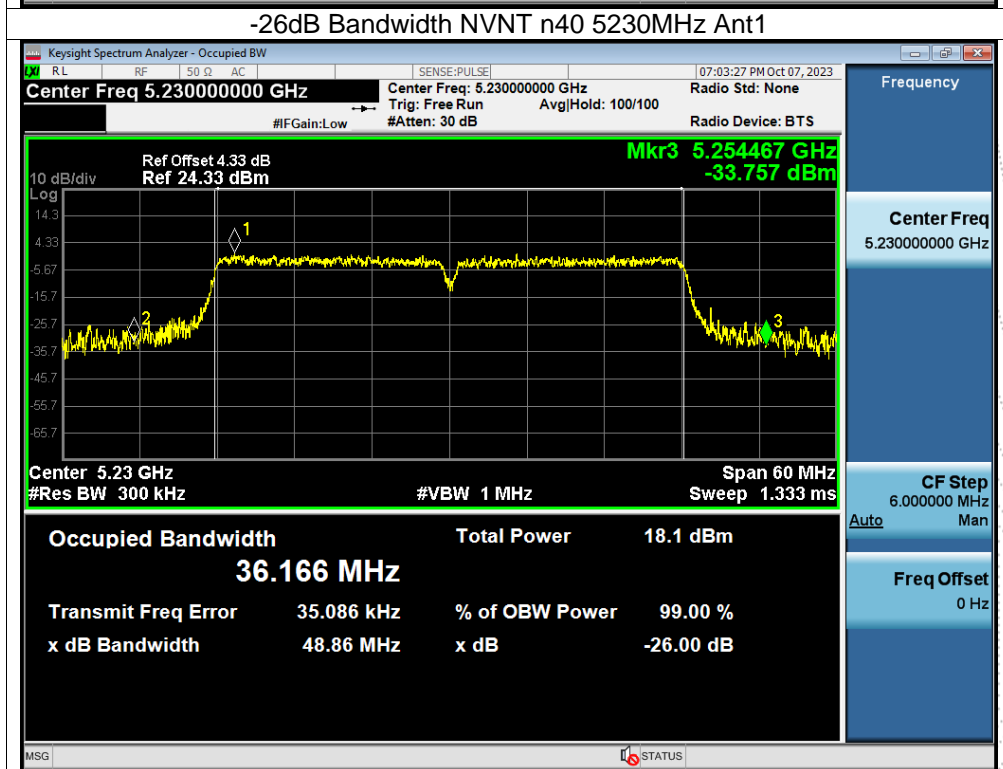
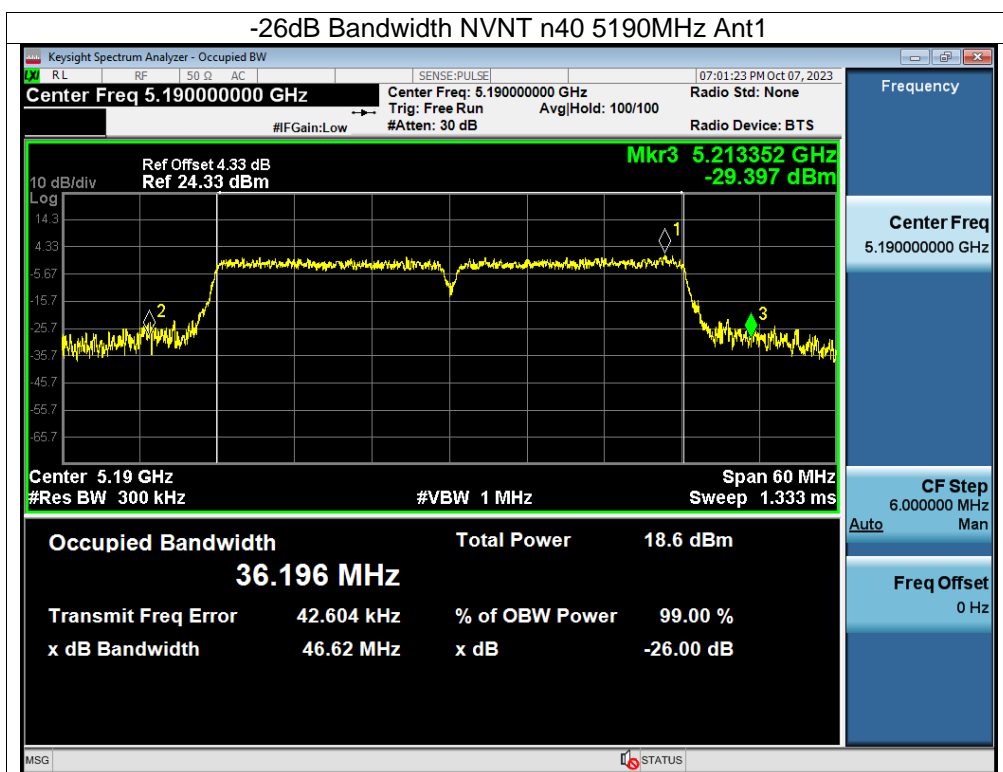


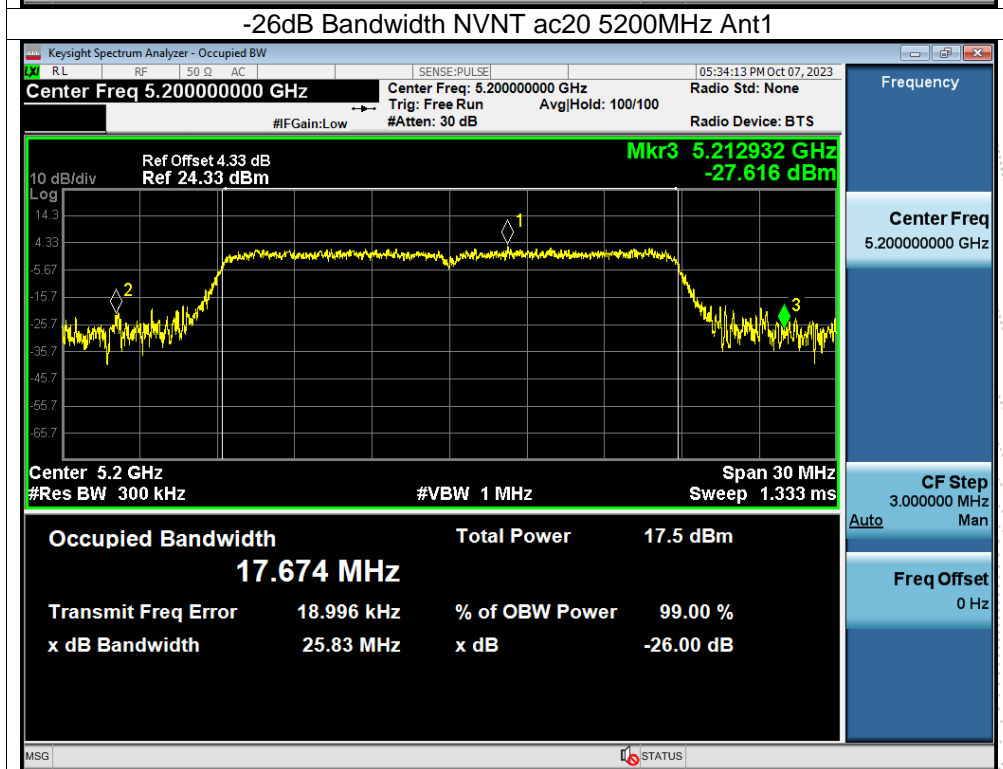
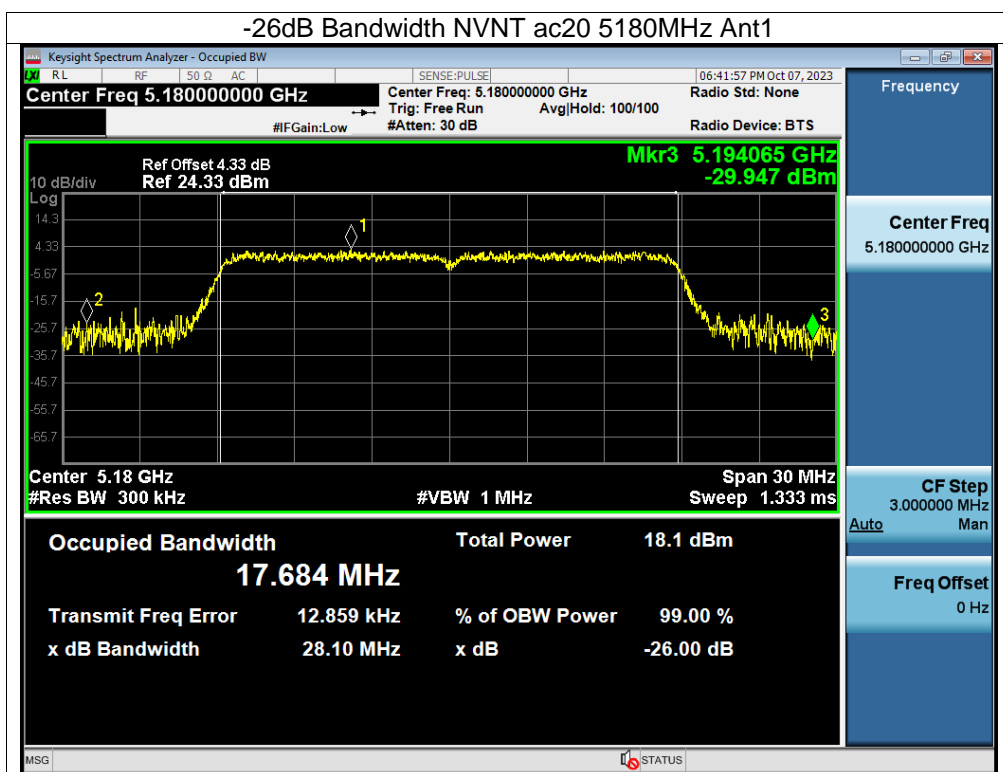
-26dB Bandwidth NVNT a 5200MHz Ant1

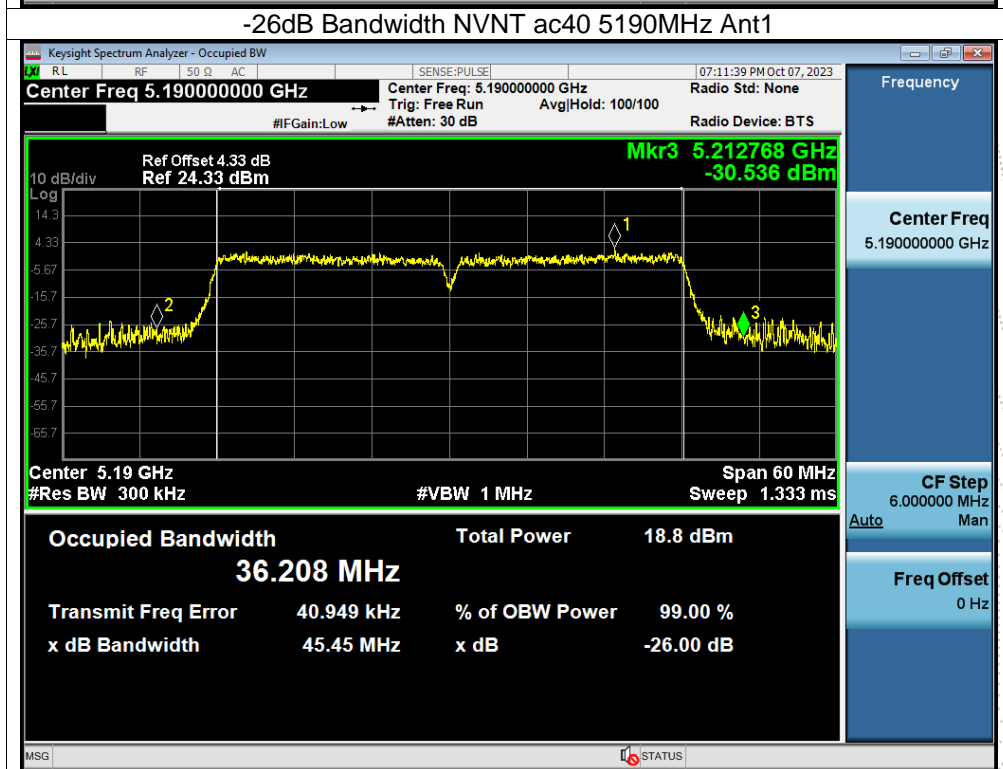
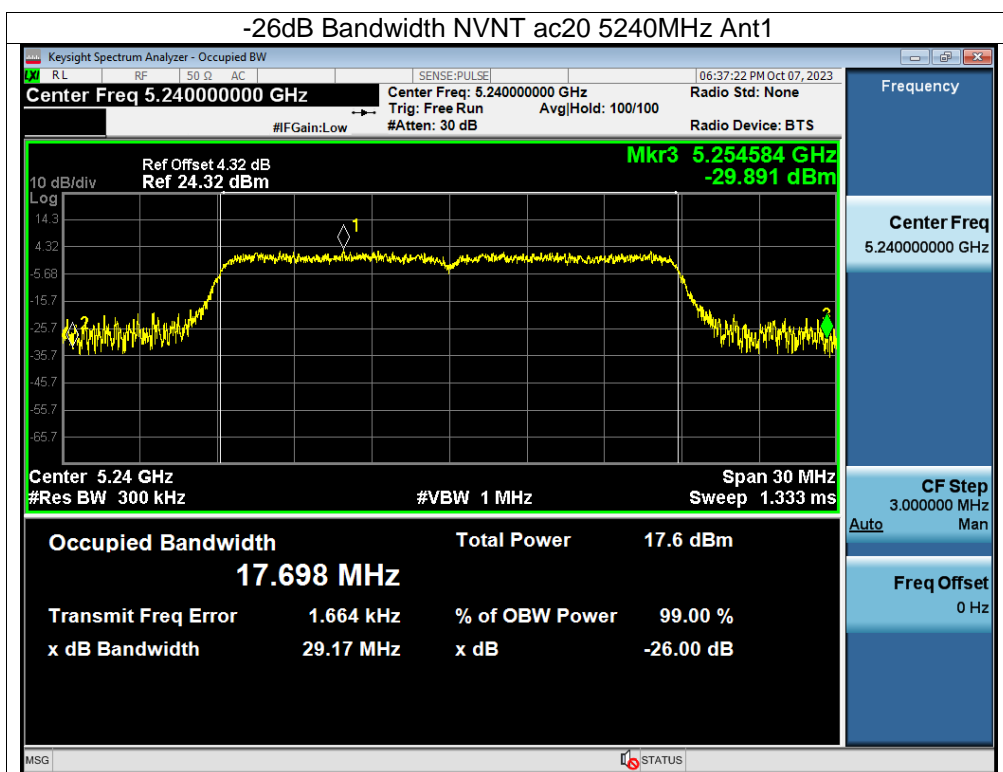


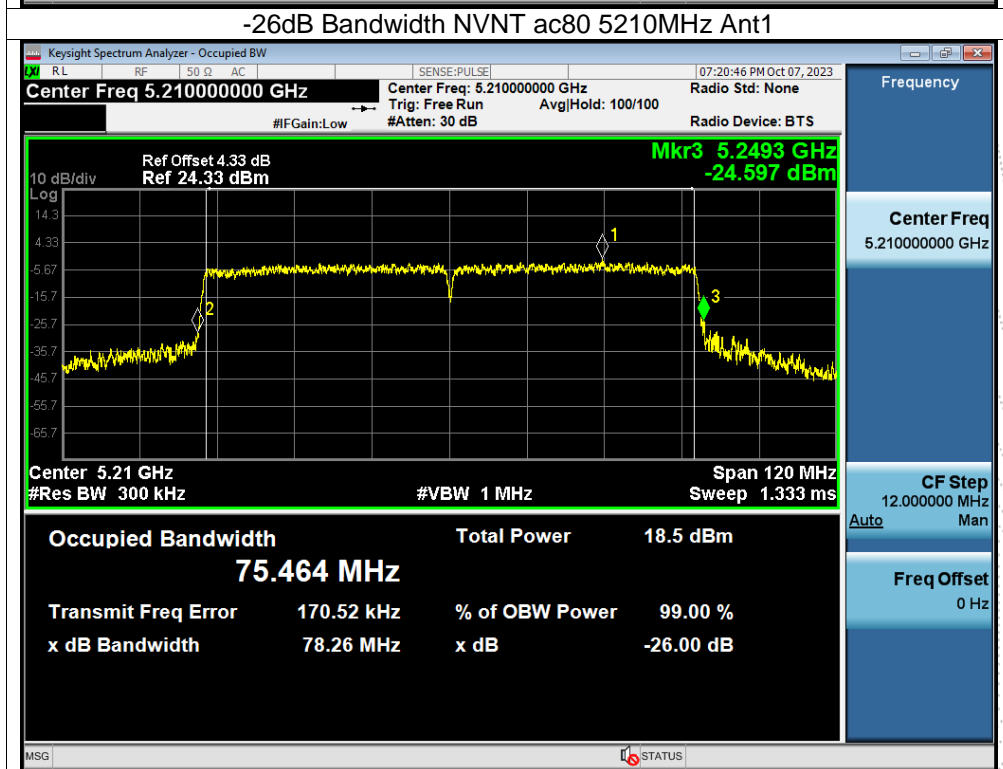
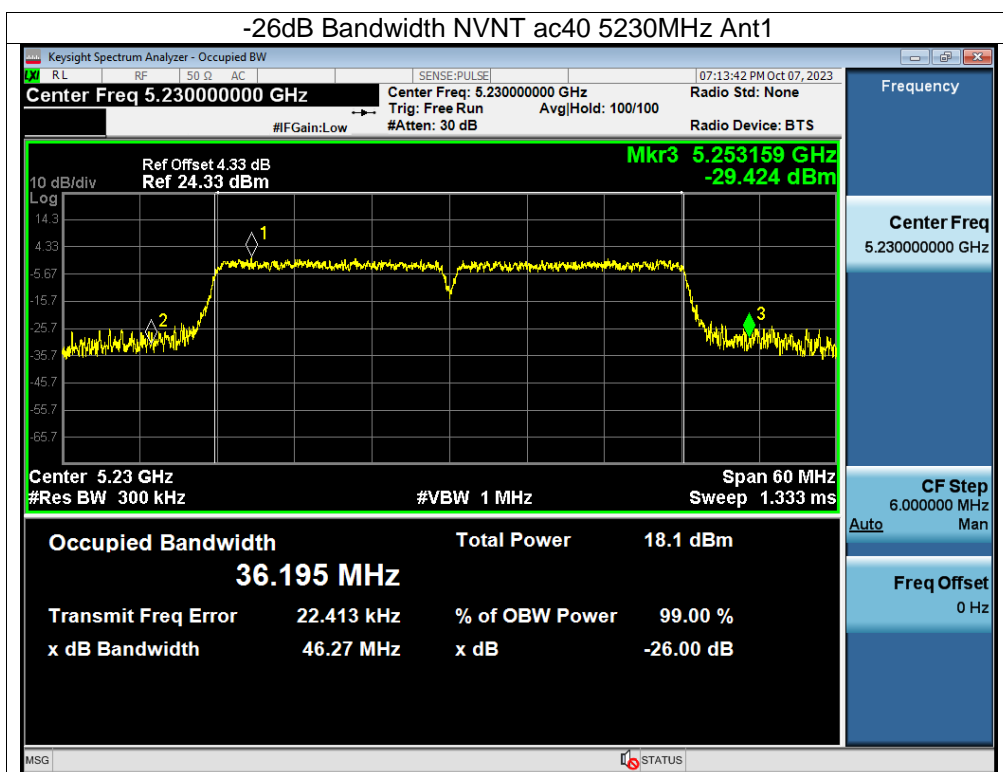


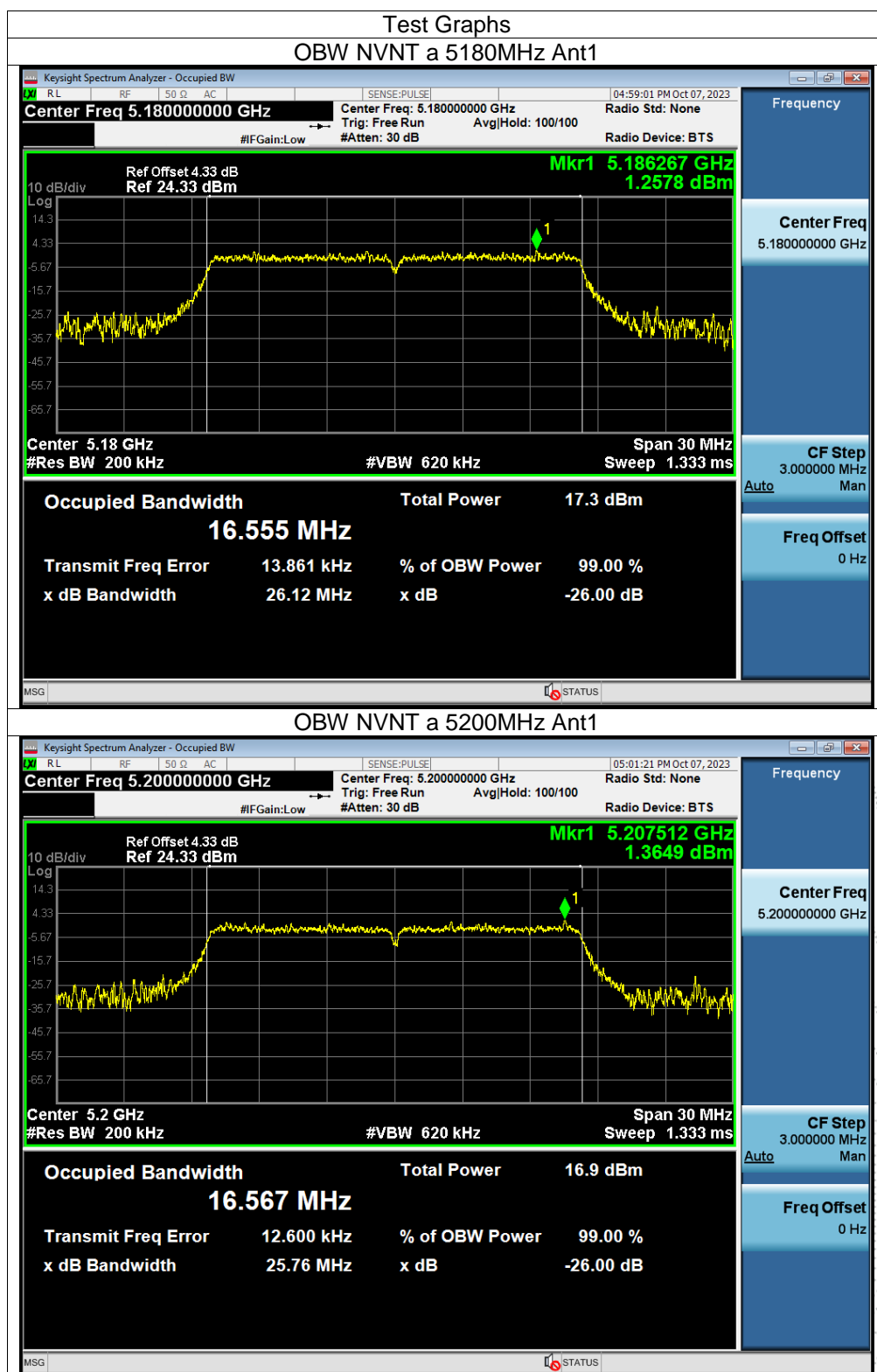


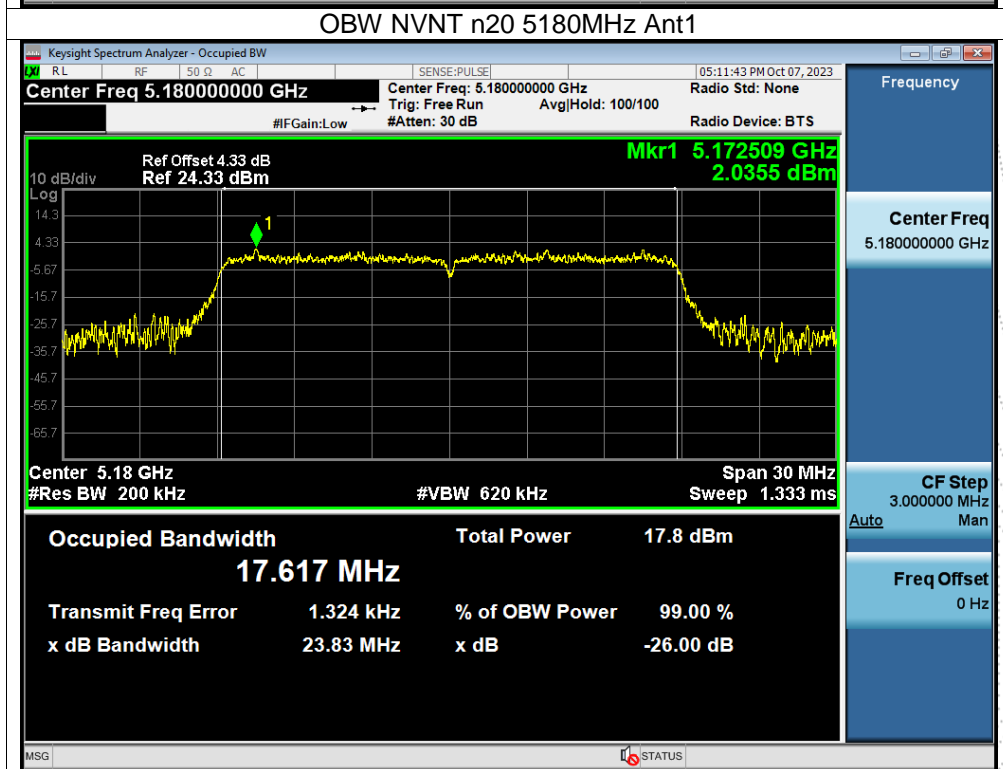
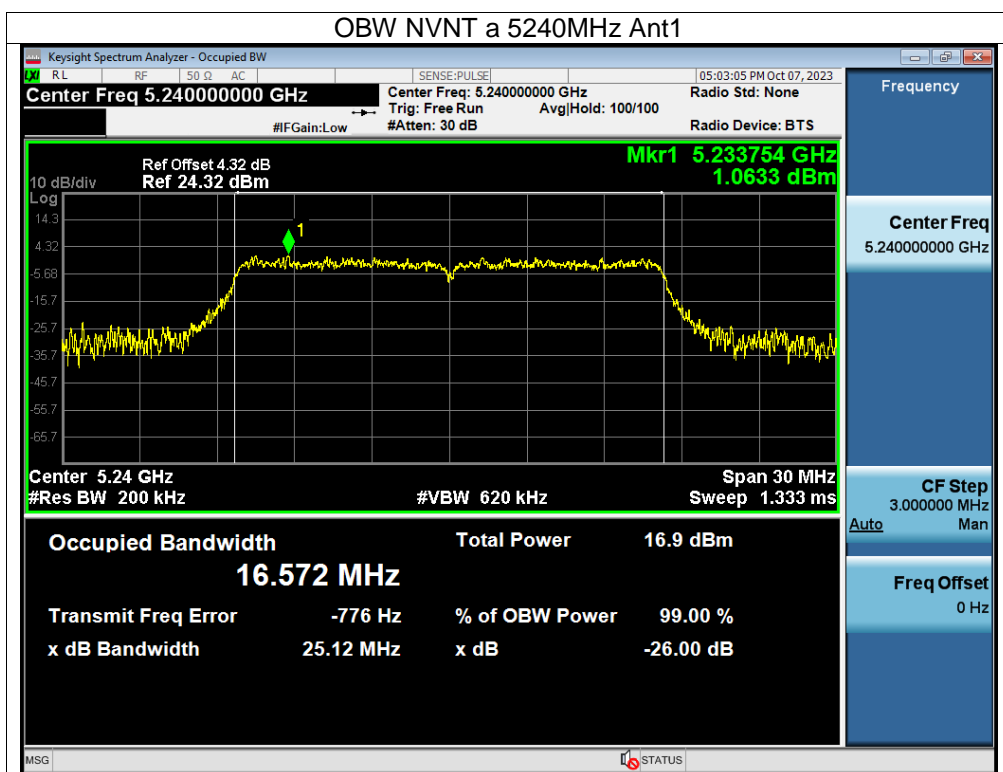


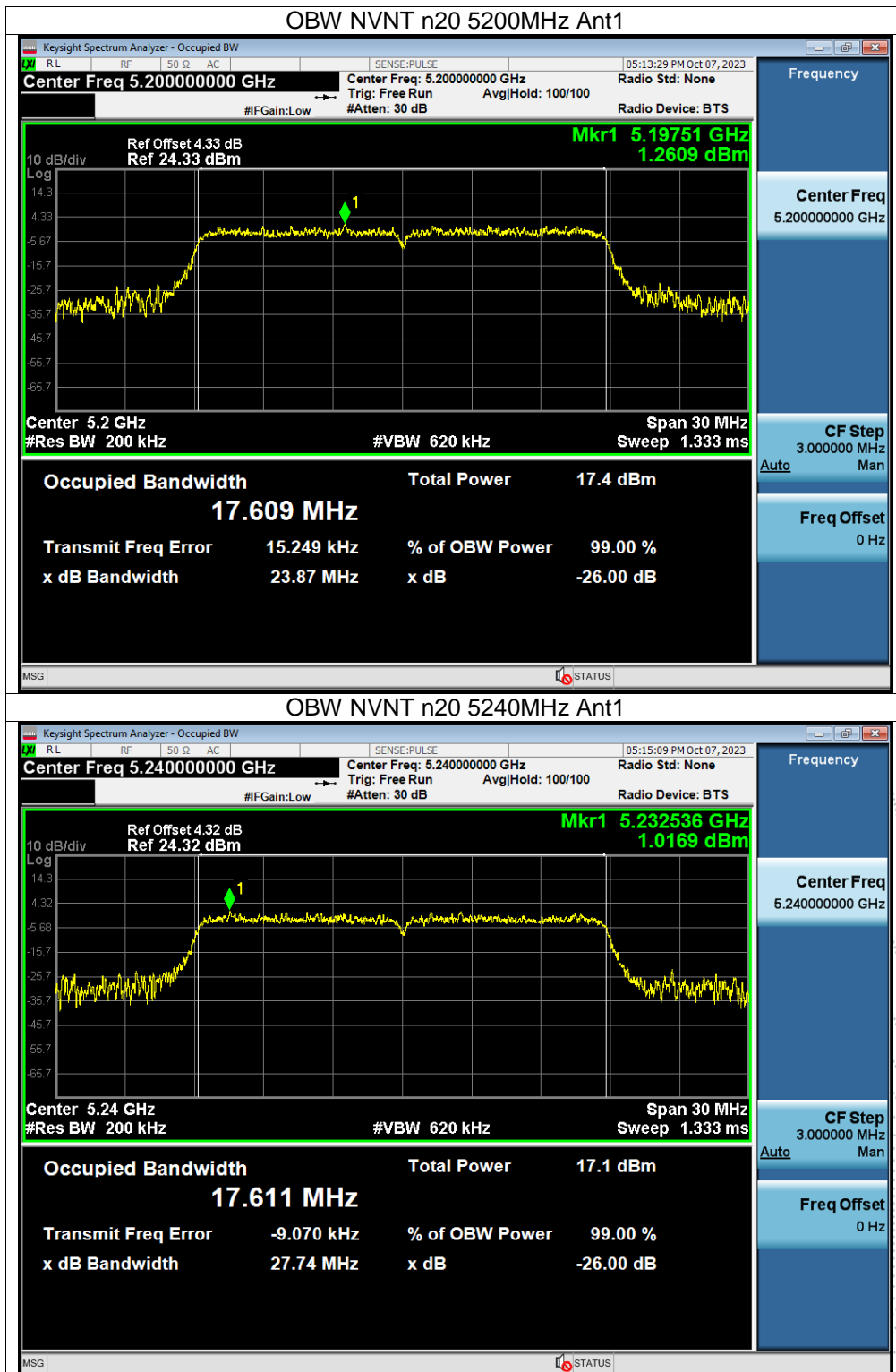


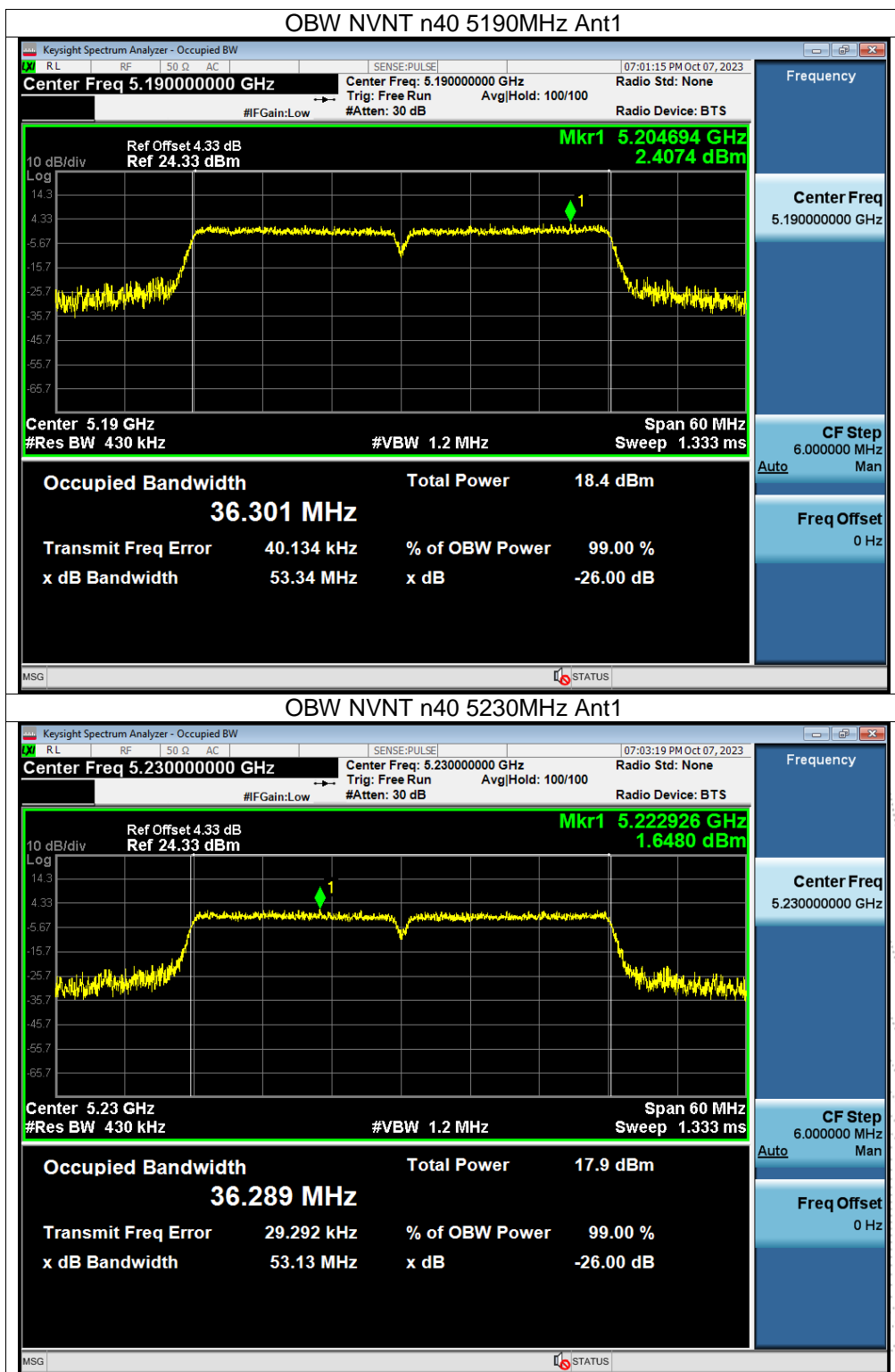


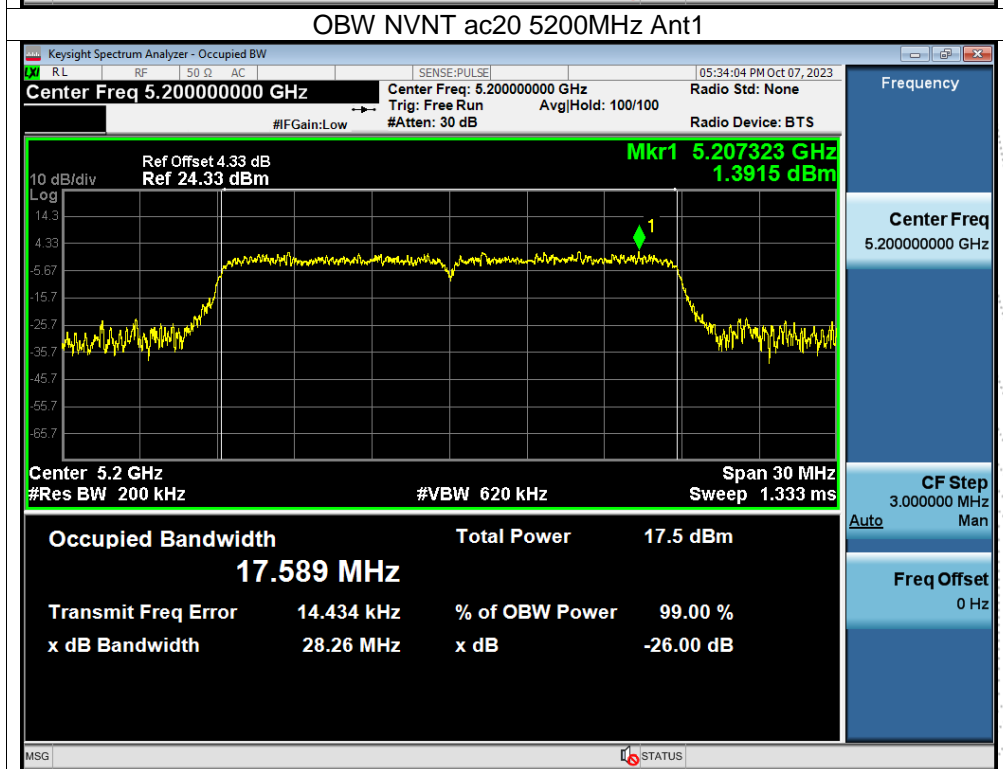
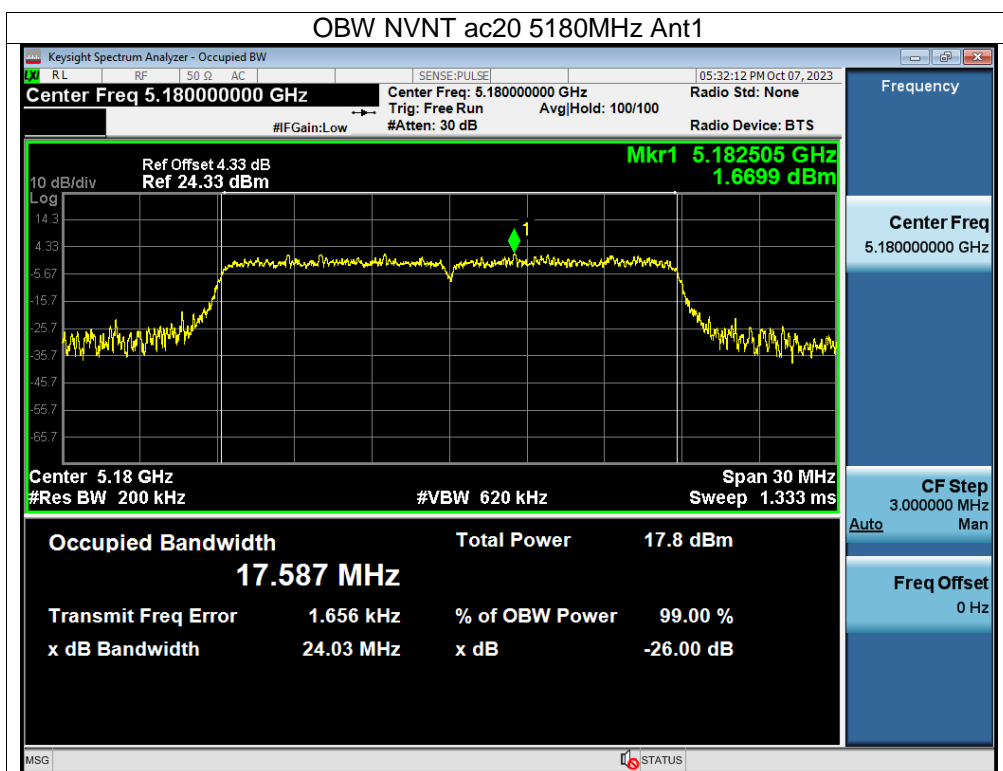


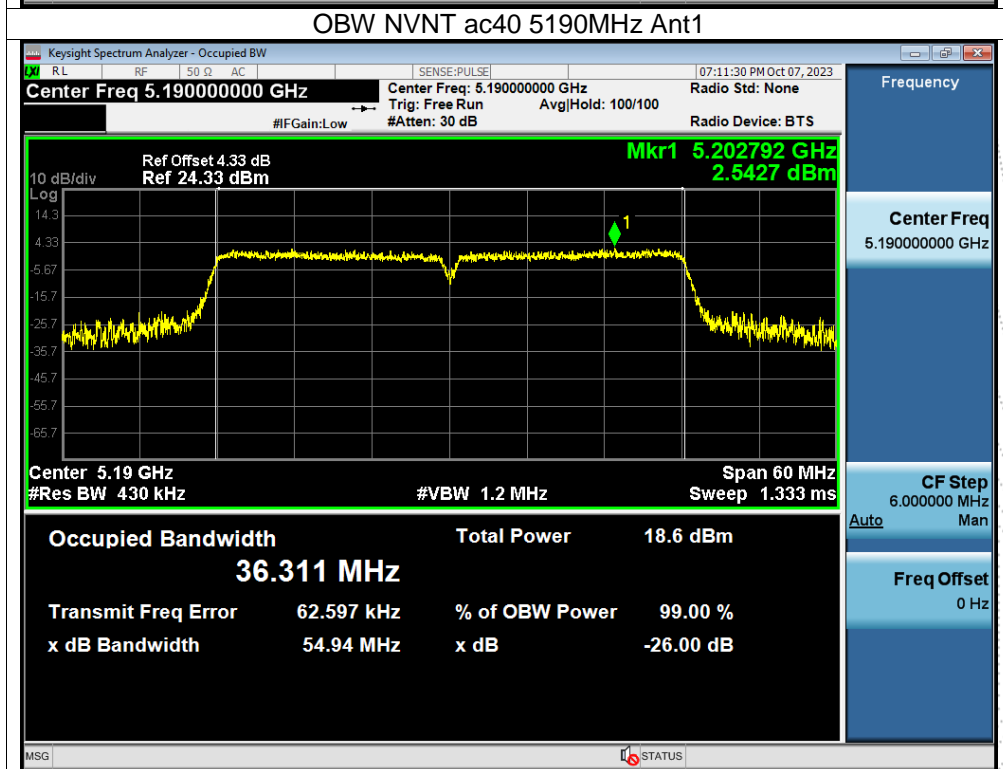
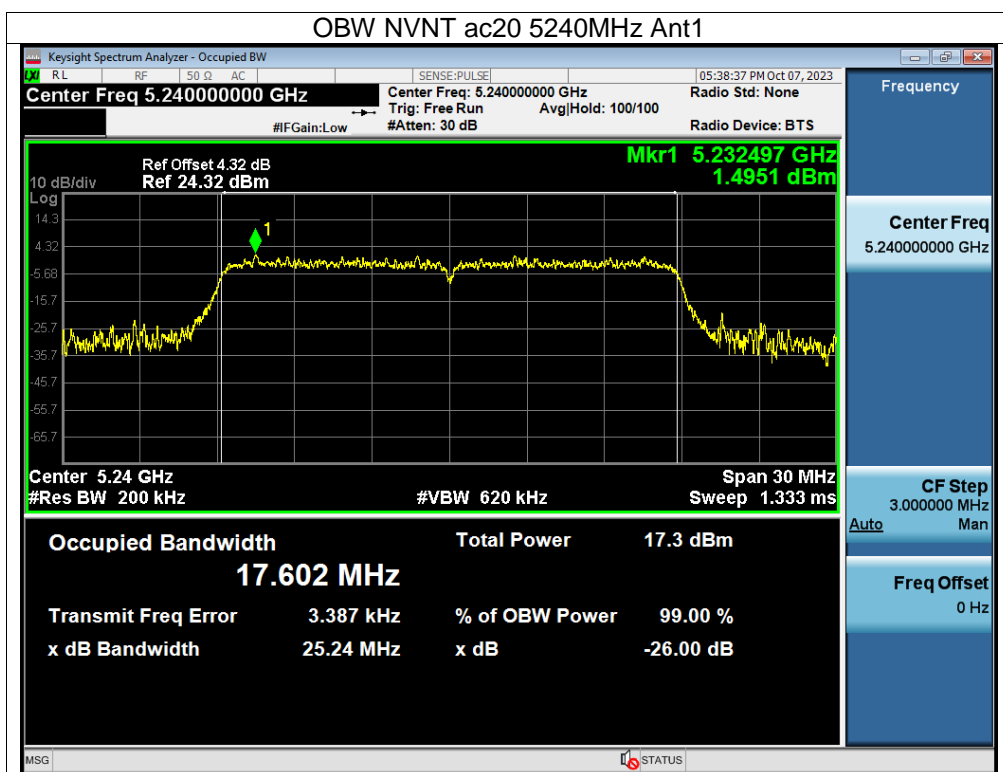


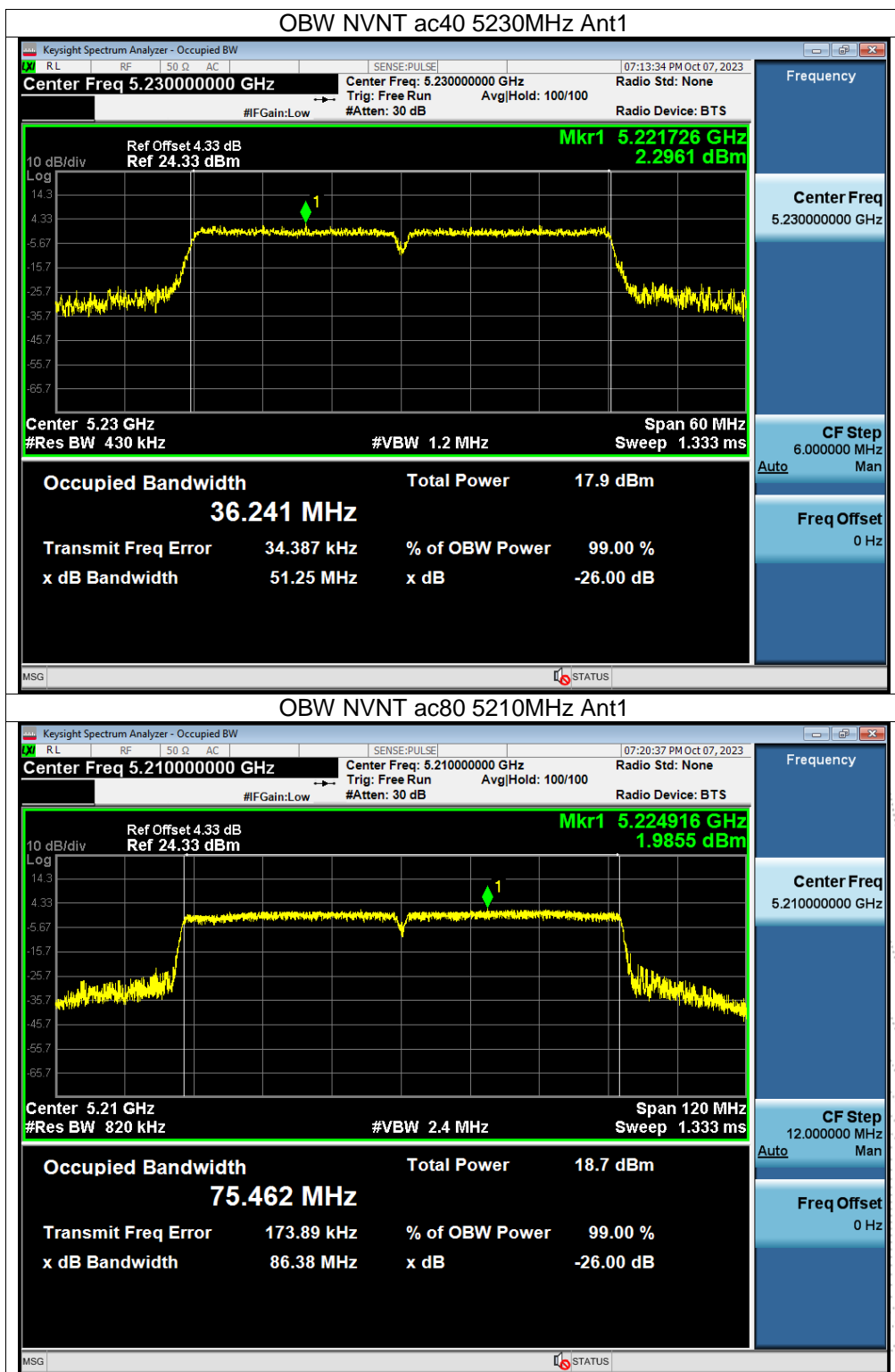








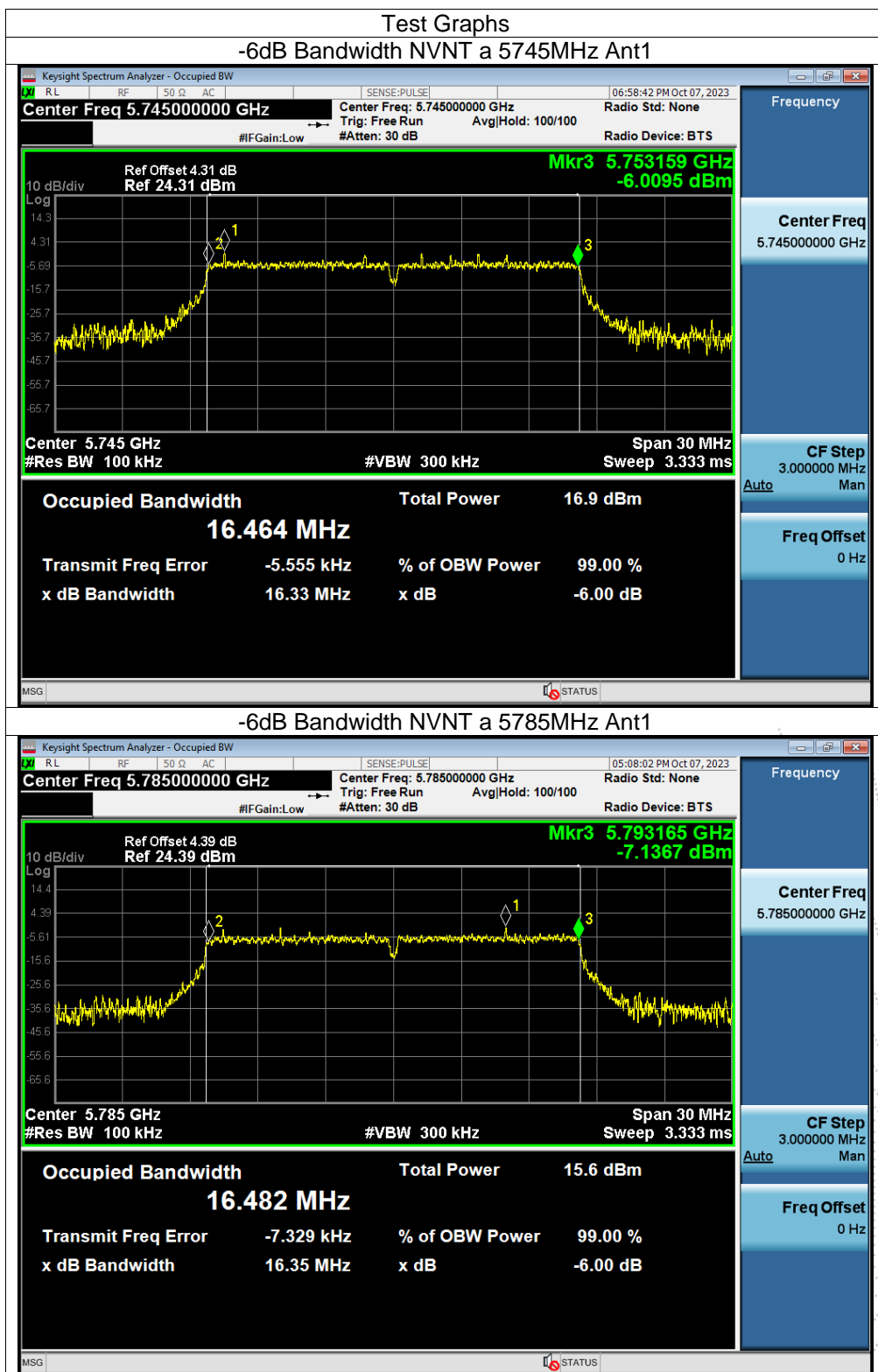


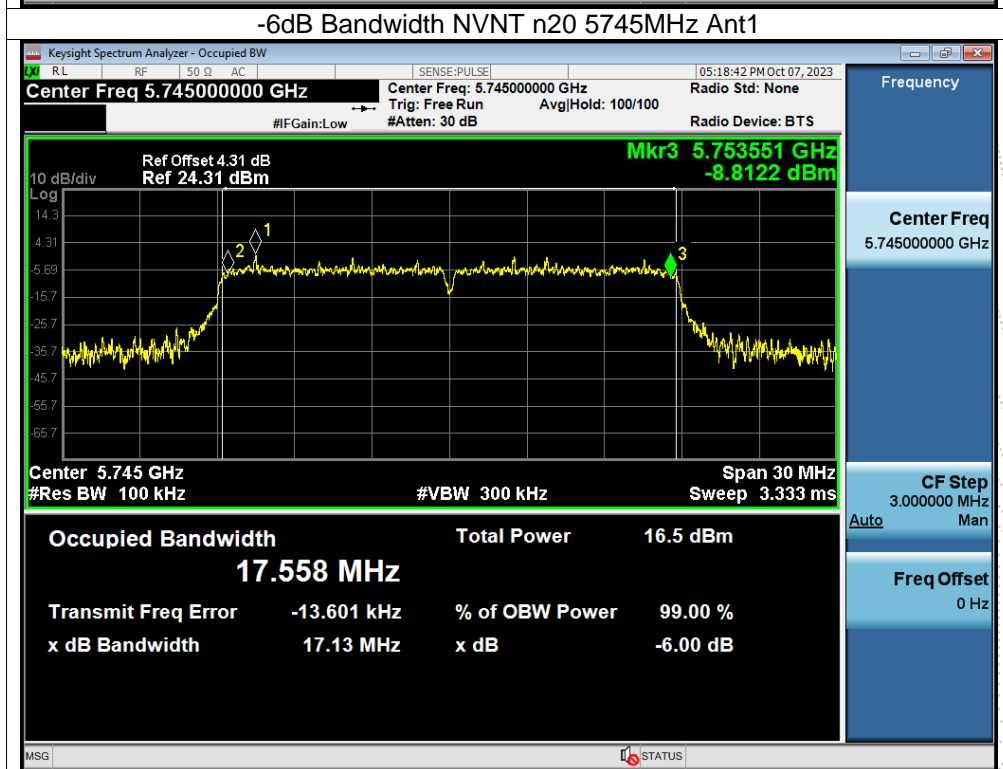
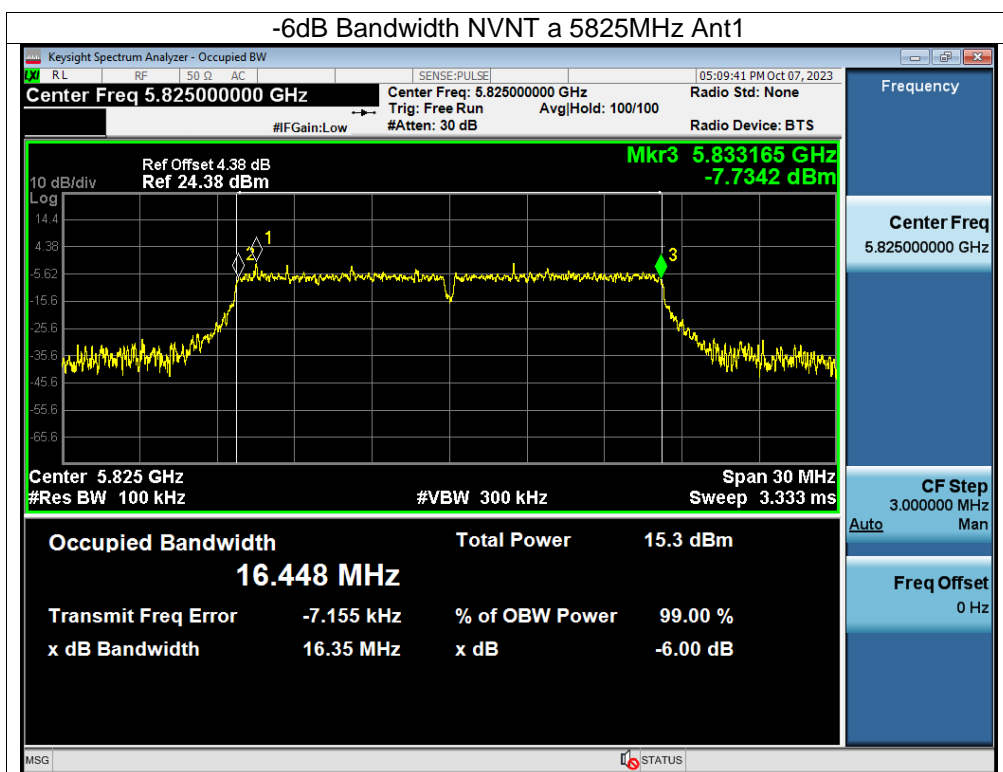


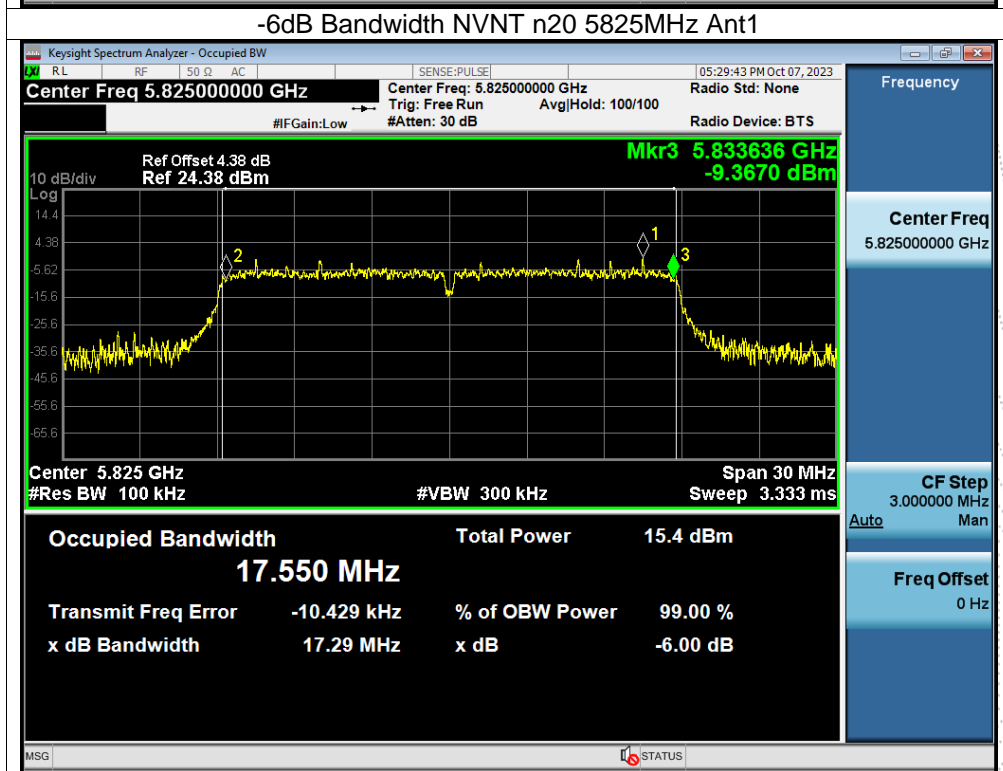
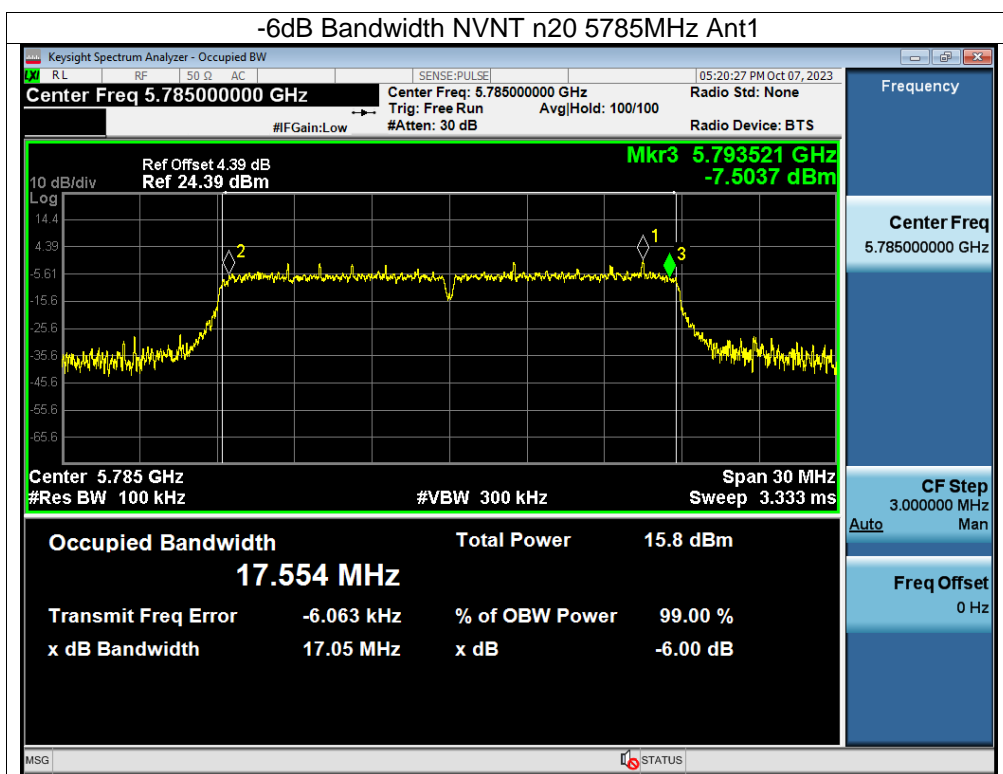
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Pressure:	101KPa	Test Voltage:	DC 3.8V
Test Mode:	(5745-5825MHz)		

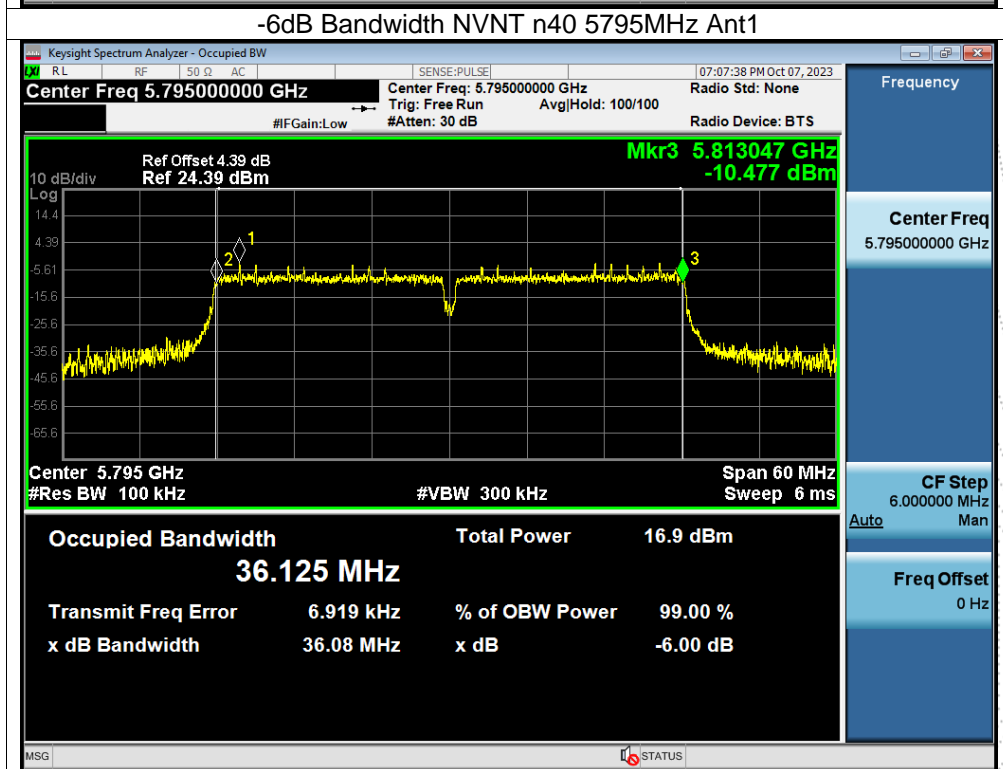
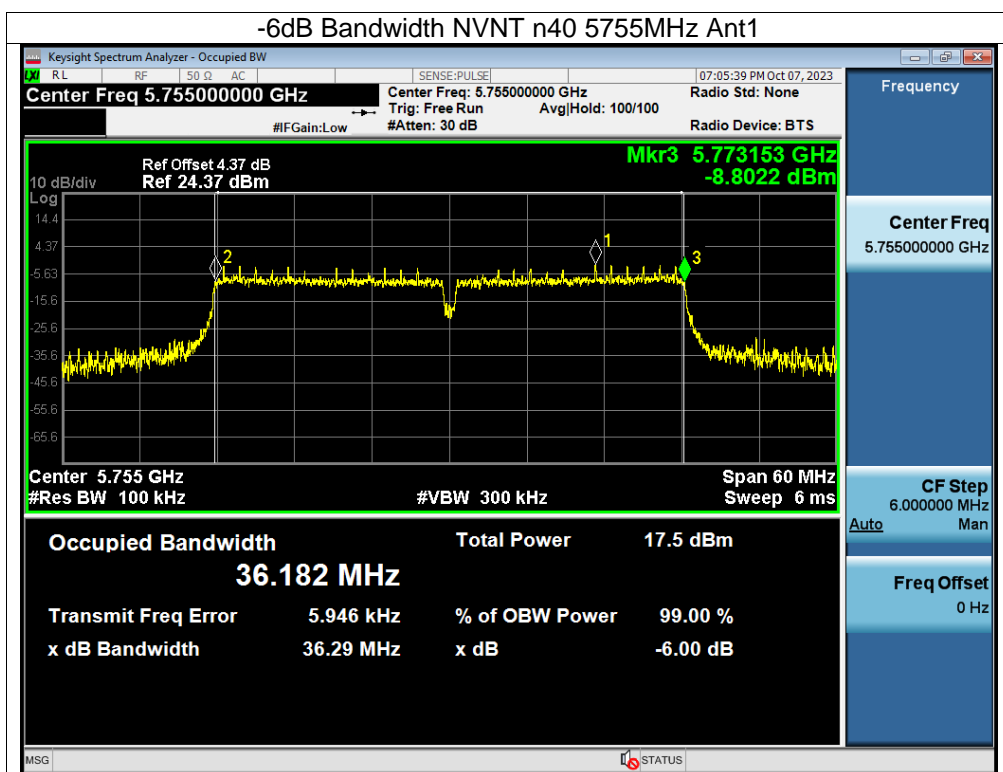
Condition	Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	a	5745	16.329	0.5	Pass
NVNT	a	5785	16.345	0.5	Pass
NVNT	a	5825	16.345	0.5	Pass
NVNT	n20	5745	17.13	0.5	Pass
NVNT	n20	5785	17.054	0.5	Pass
NVNT	n20	5825	17.293	0.5	Pass
NVNT	n40	5755	36.294	0.5	Pass
NVNT	n40	5795	36.08	0.5	Pass
NVNT	ac20	5745	17.532	0.5	Pass
NVNT	ac20	5785	17.332	0.5	Pass
NVNT	ac20	5825	17.522	0.5	Pass
NVNT	ac40	5755	36.075	0.5	Pass
NVNT	ac40	5795	36.038	0.5	Pass
NVNT	ac80	5775	75.176	0.5	Pass

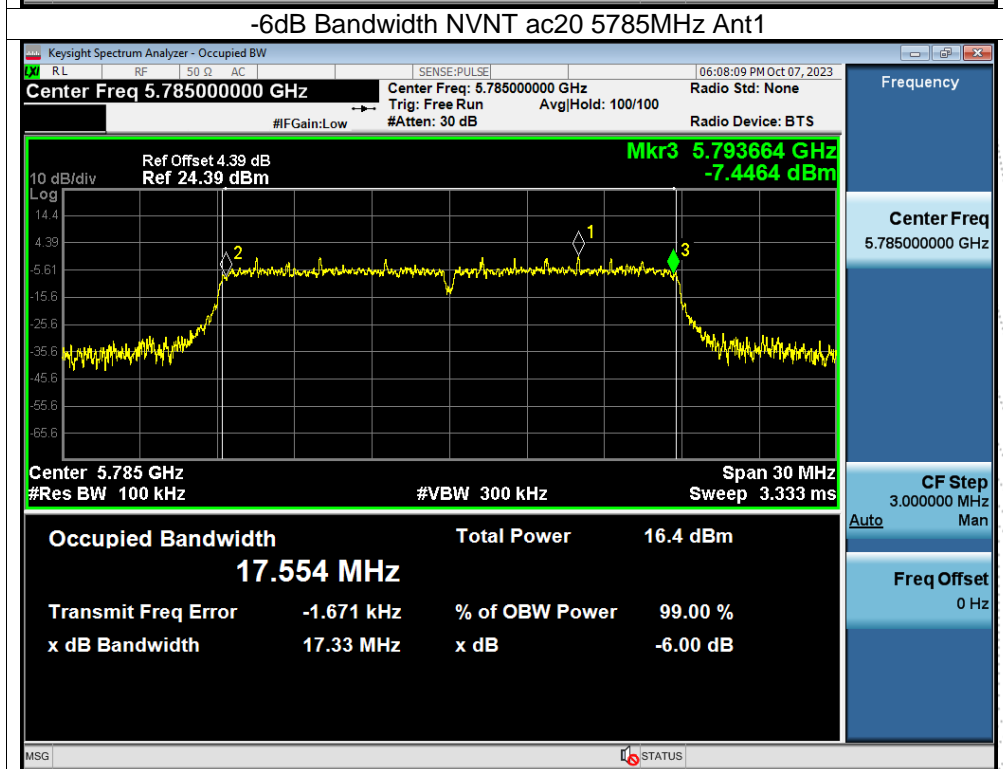
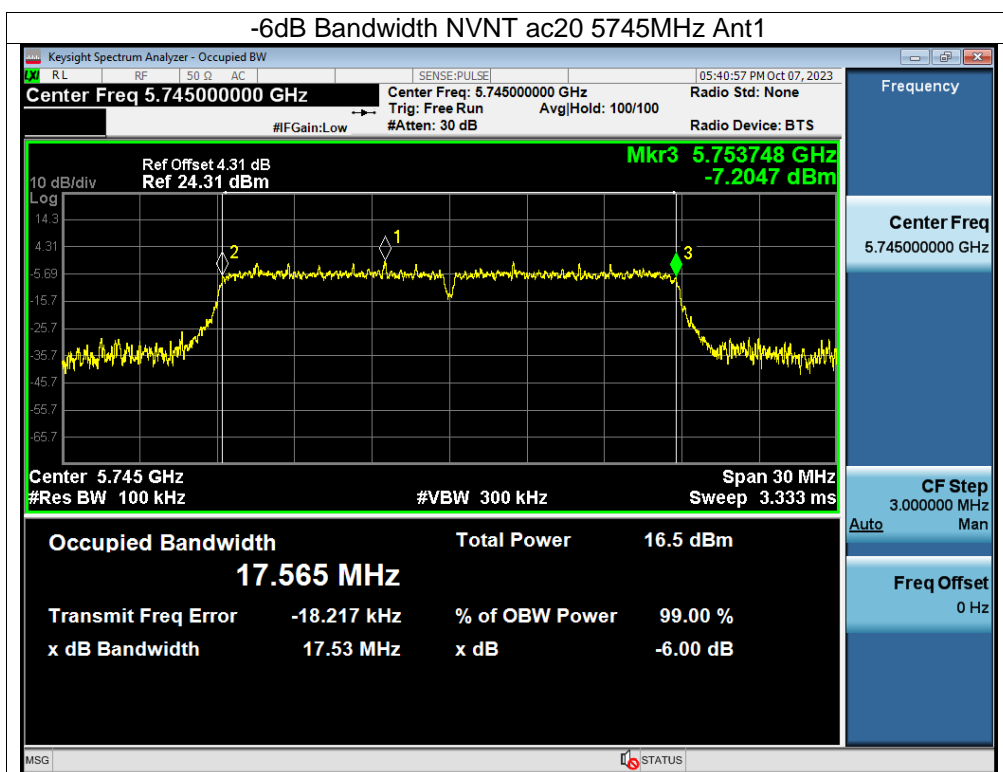
Condition	Mode	Frequency (MHz)	99% OBW (MHz)
NVNT	a	5745	16.551
NVNT	a	5785	16.538
NVNT	a	5825	16.567
NVNT	n20	5745	17.572
NVNT	n20	5785	17.588
NVNT	n20	5825	17.592
NVNT	n40	5755	36.299
NVNT	n40	5795	36.275
NVNT	ac20	5745	17.603
NVNT	ac20	5785	17.591
NVNT	ac20	5825	17.613
NVNT	ac40	5755	36.256
NVNT	ac40	5795	36.284
NVNT	ac80	5775	75.409

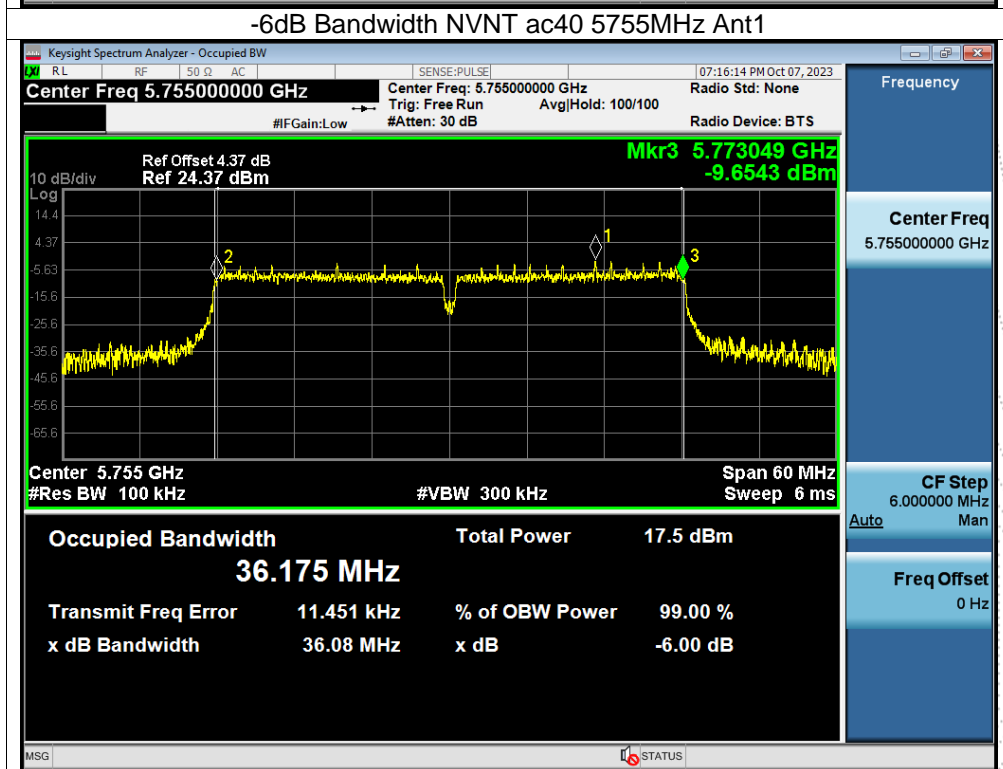
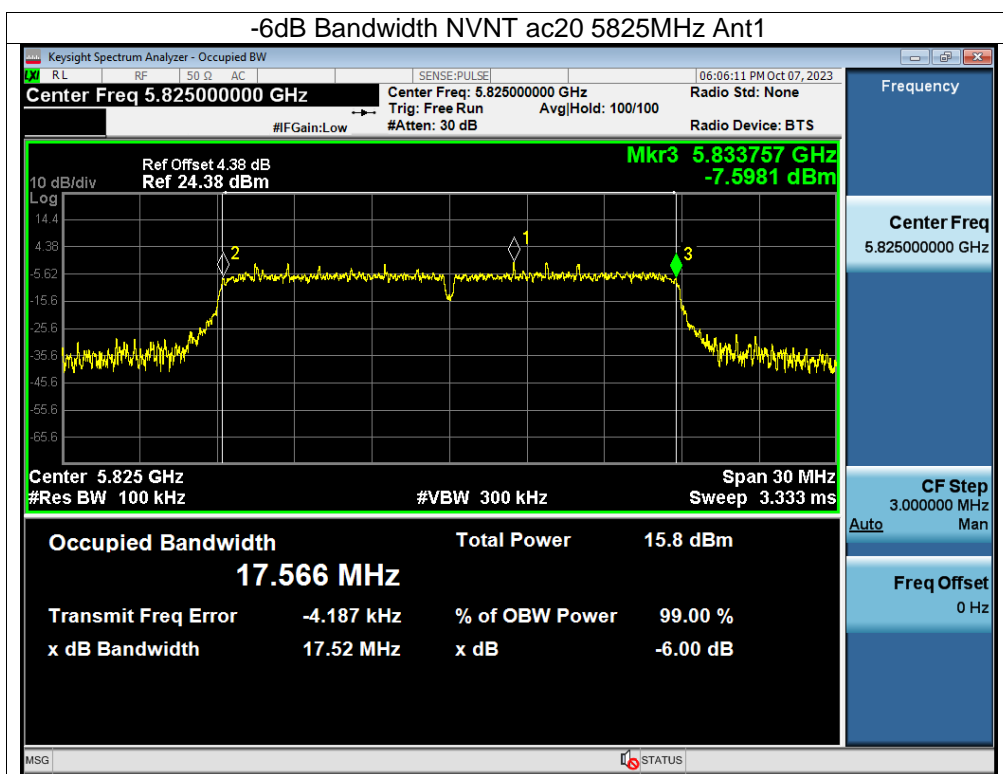


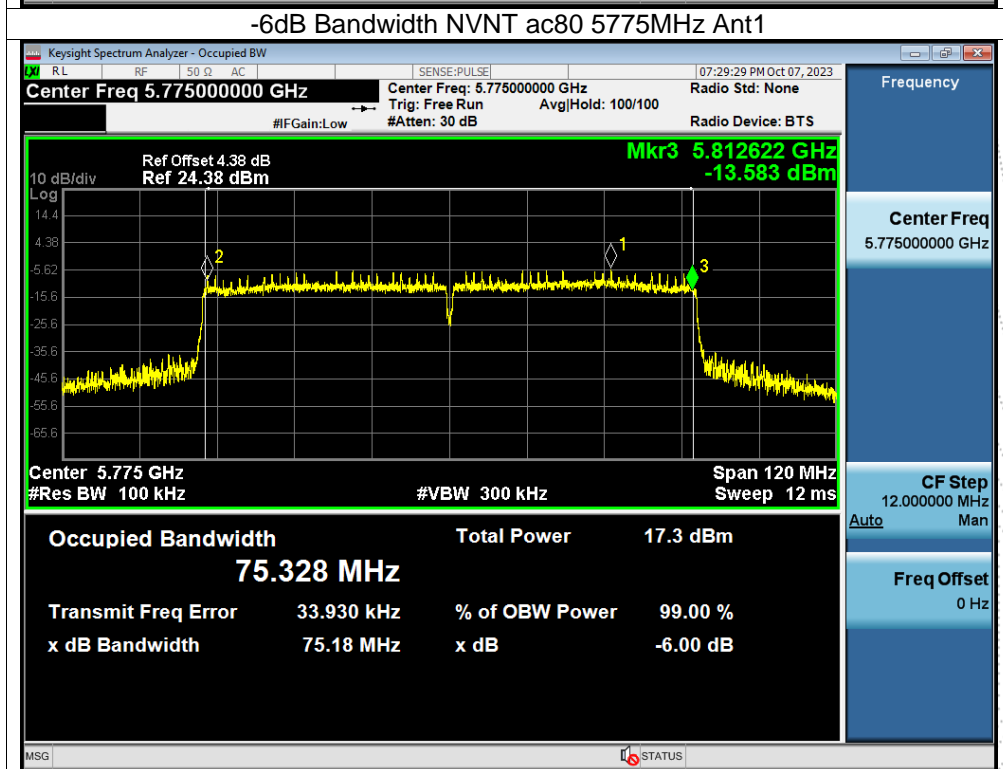
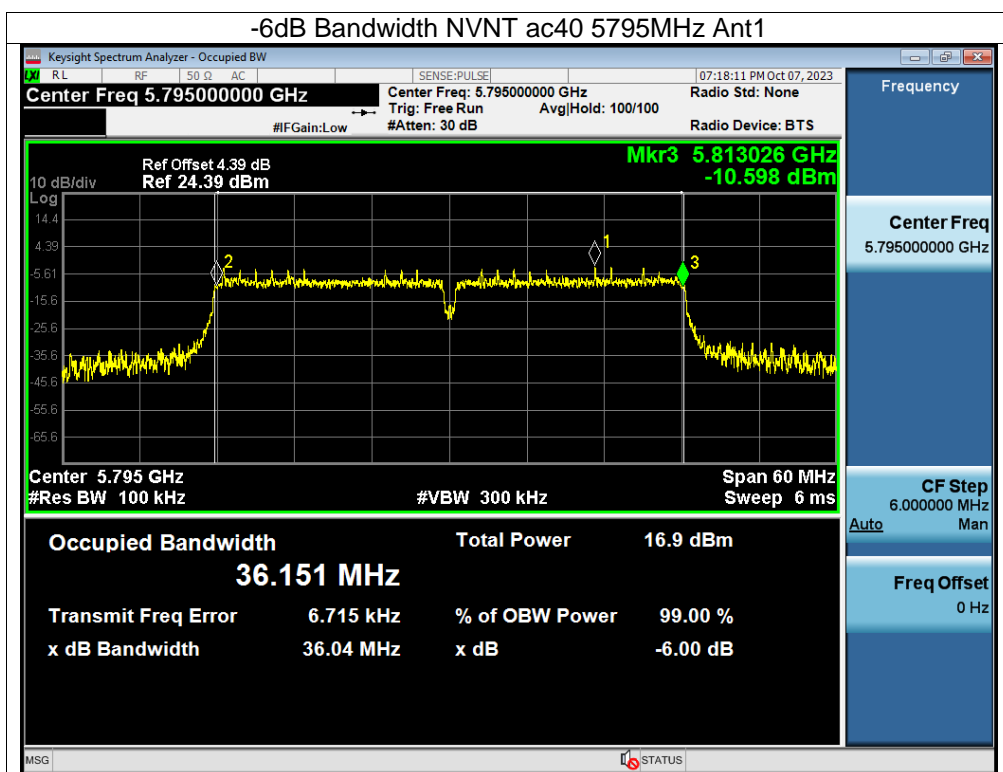


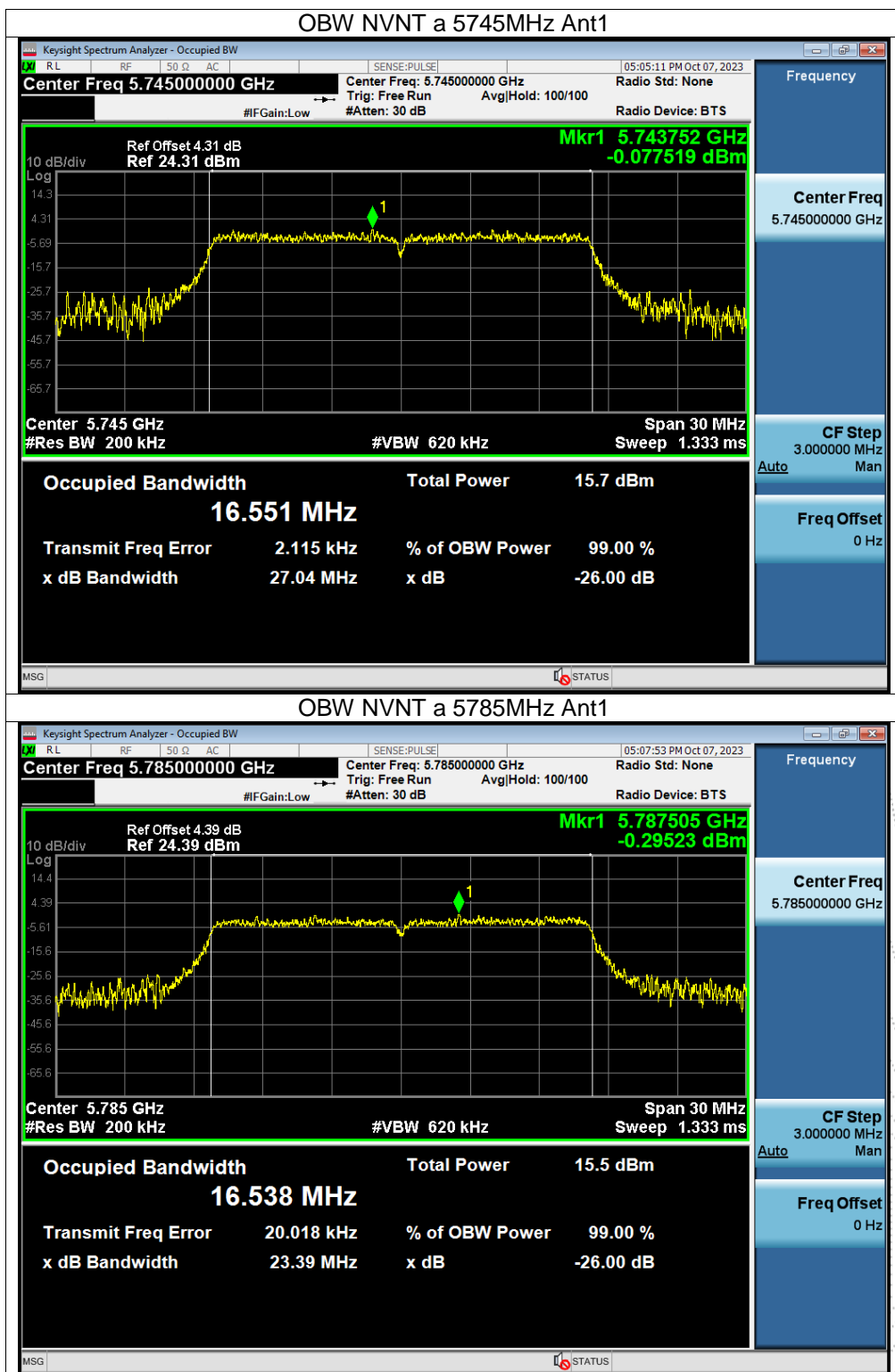


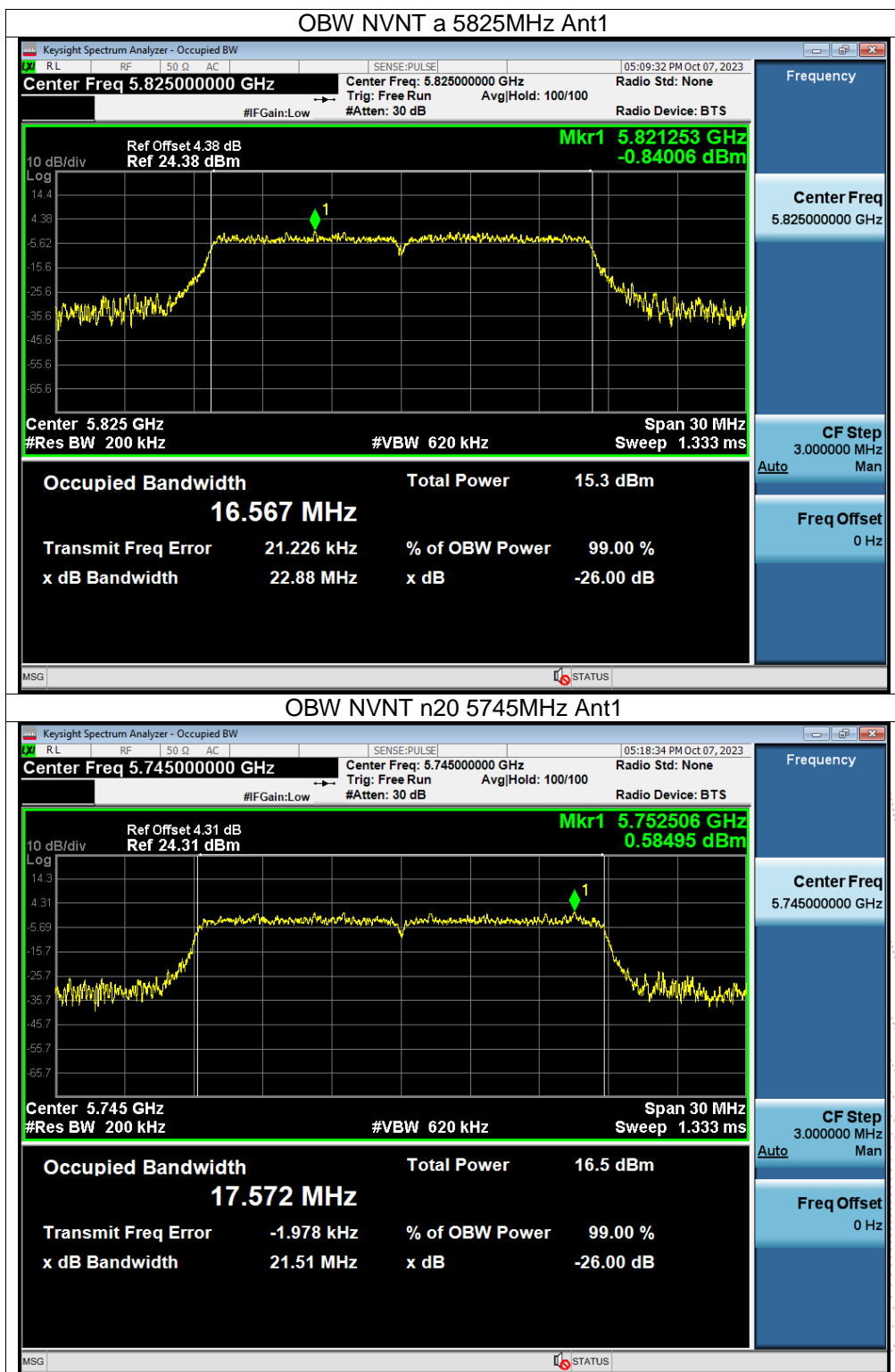


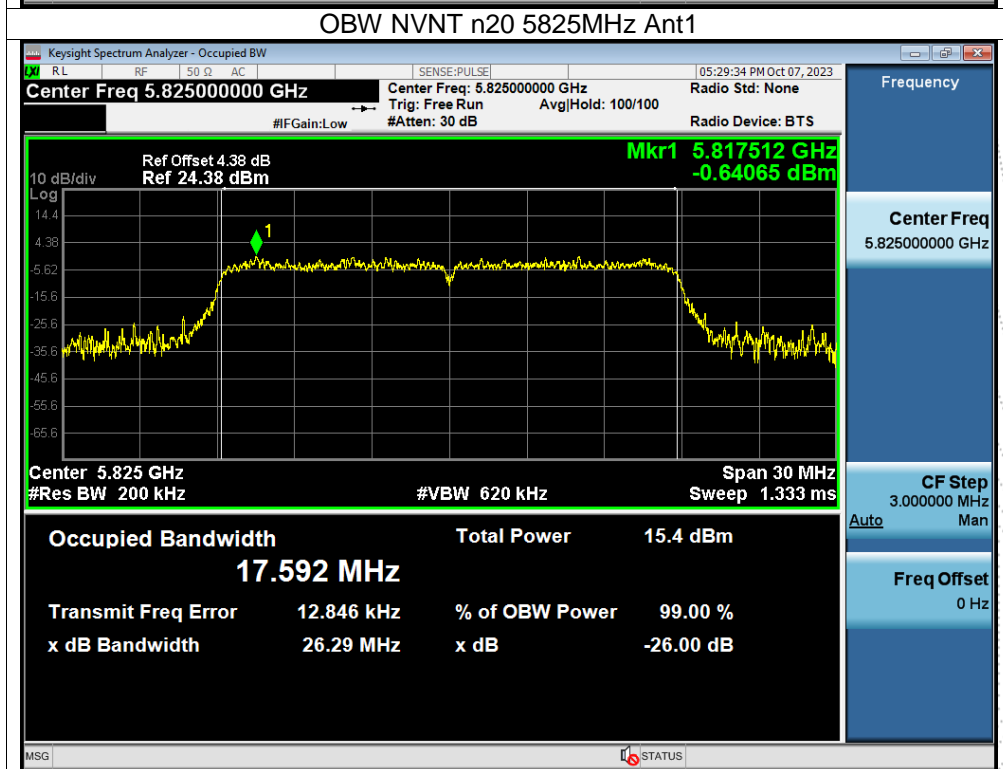
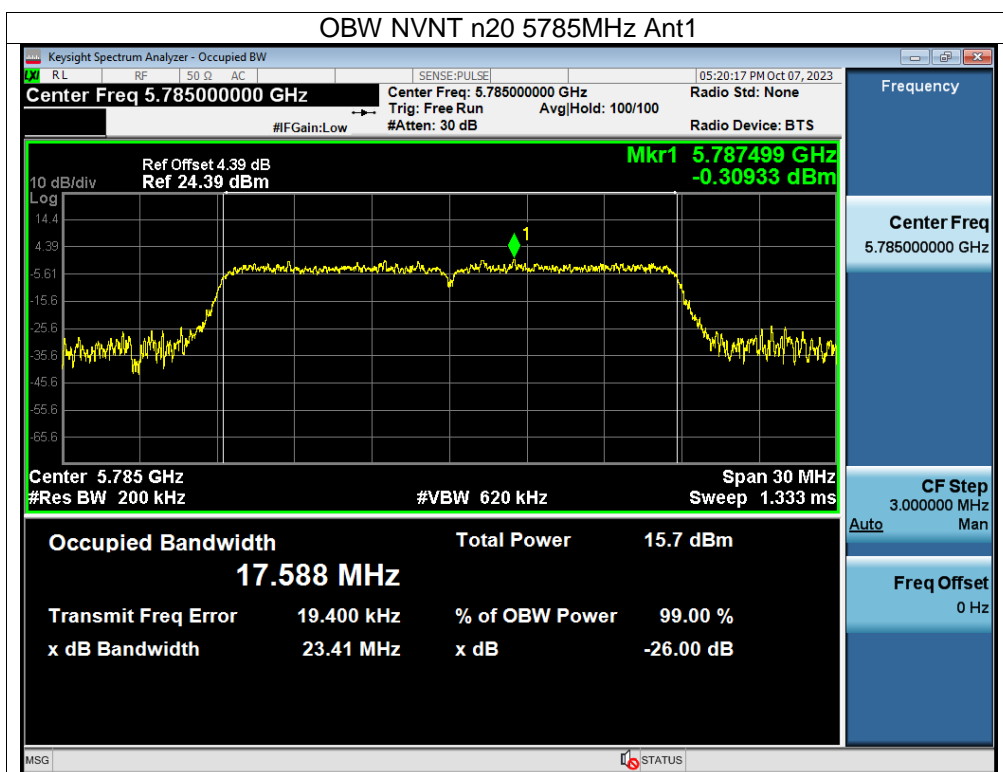


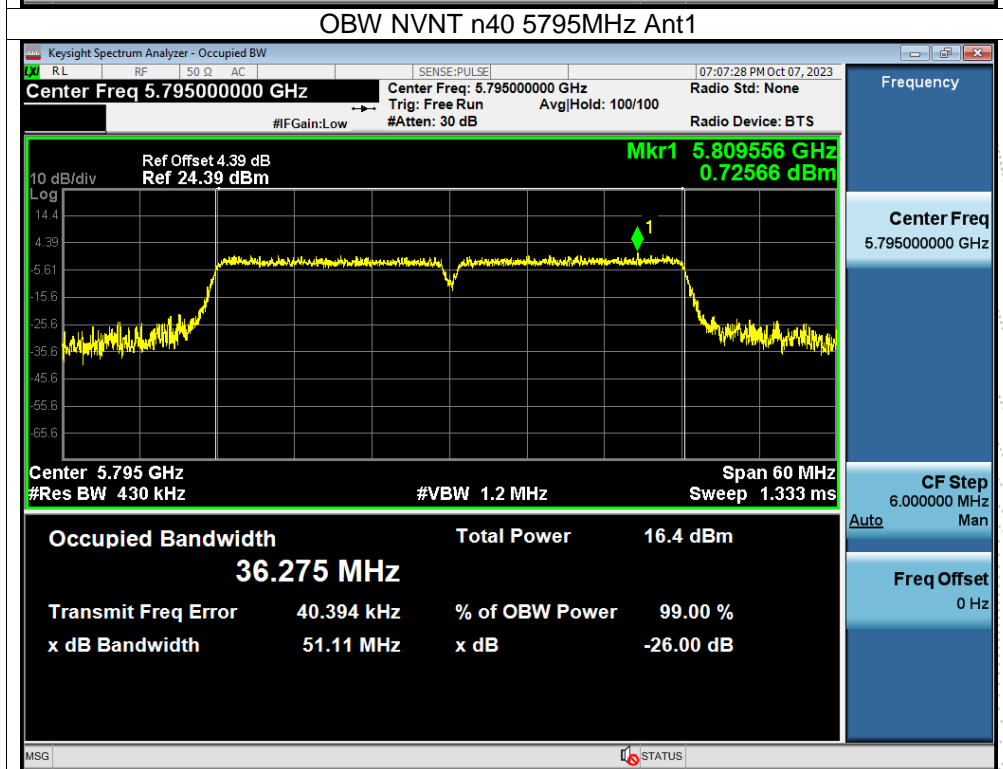
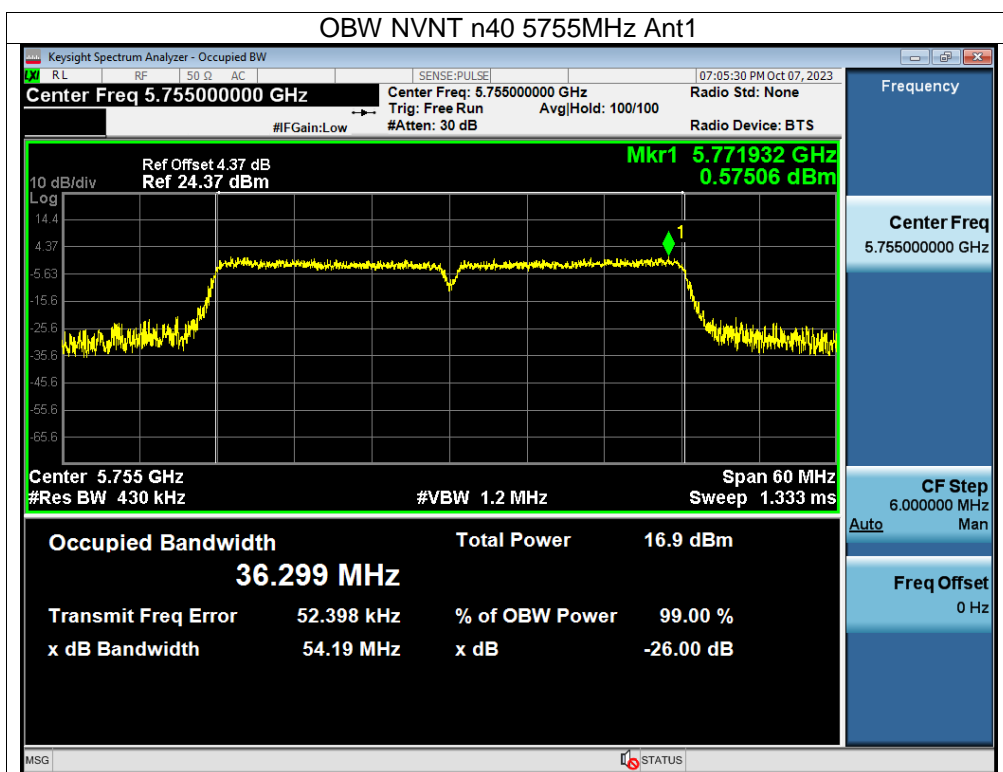


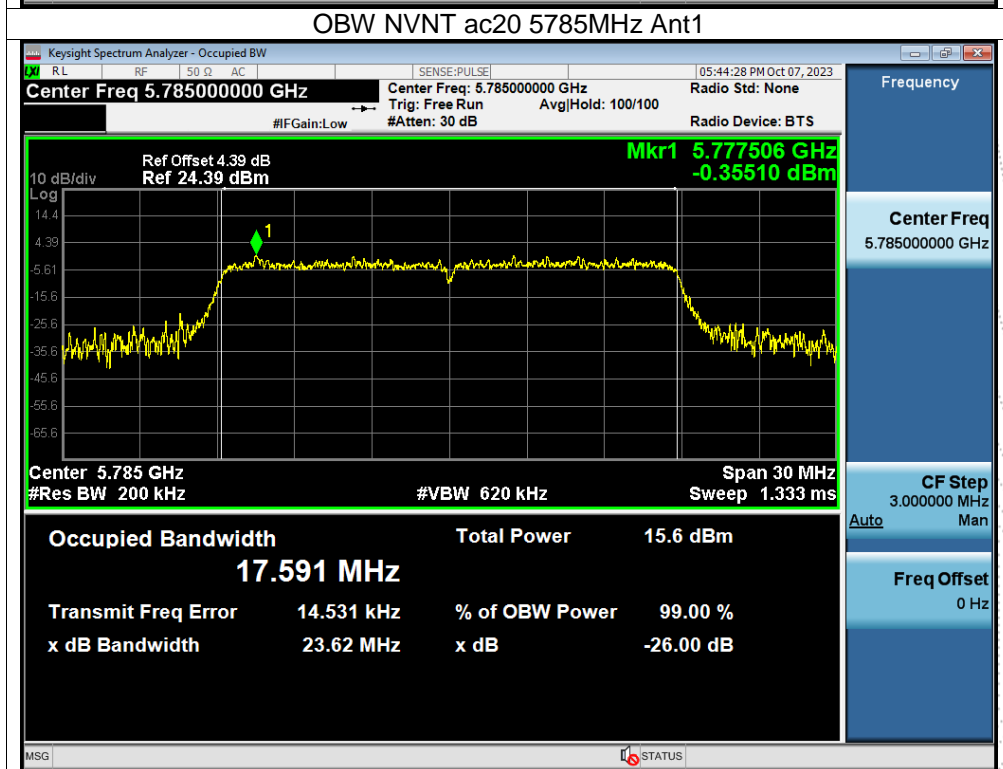
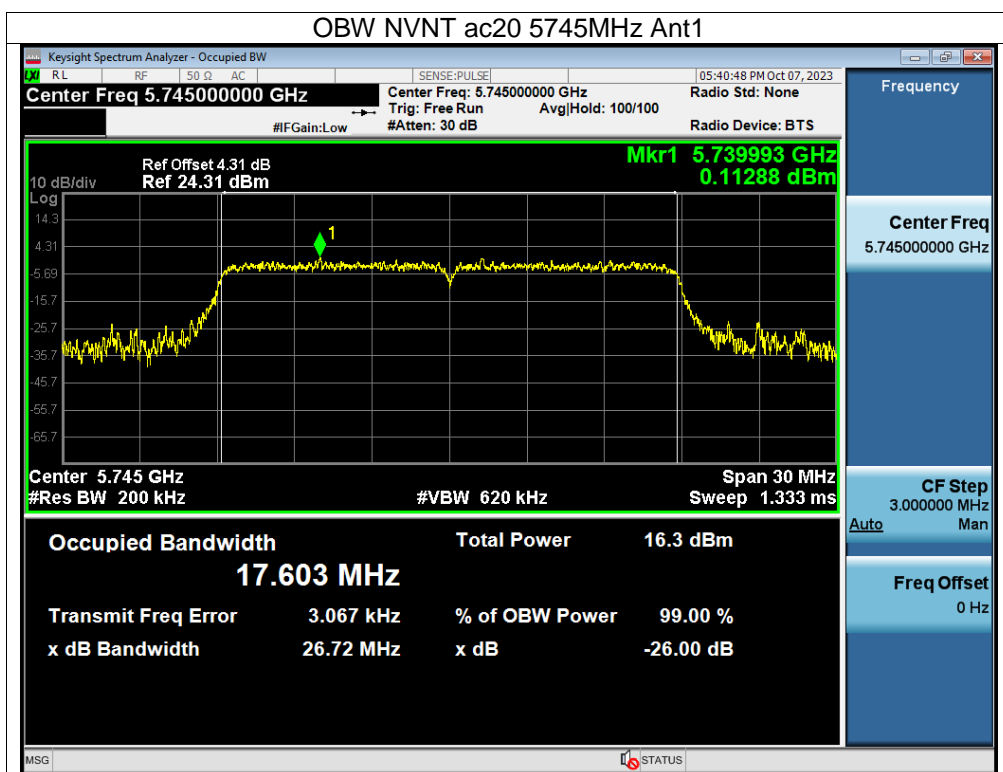


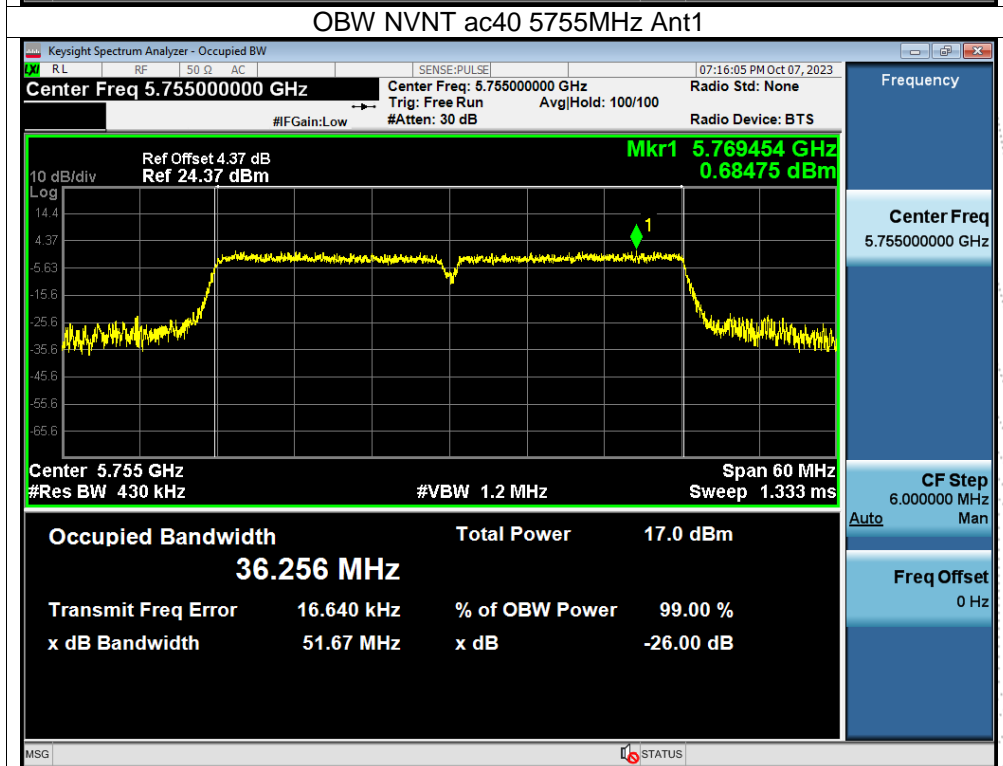
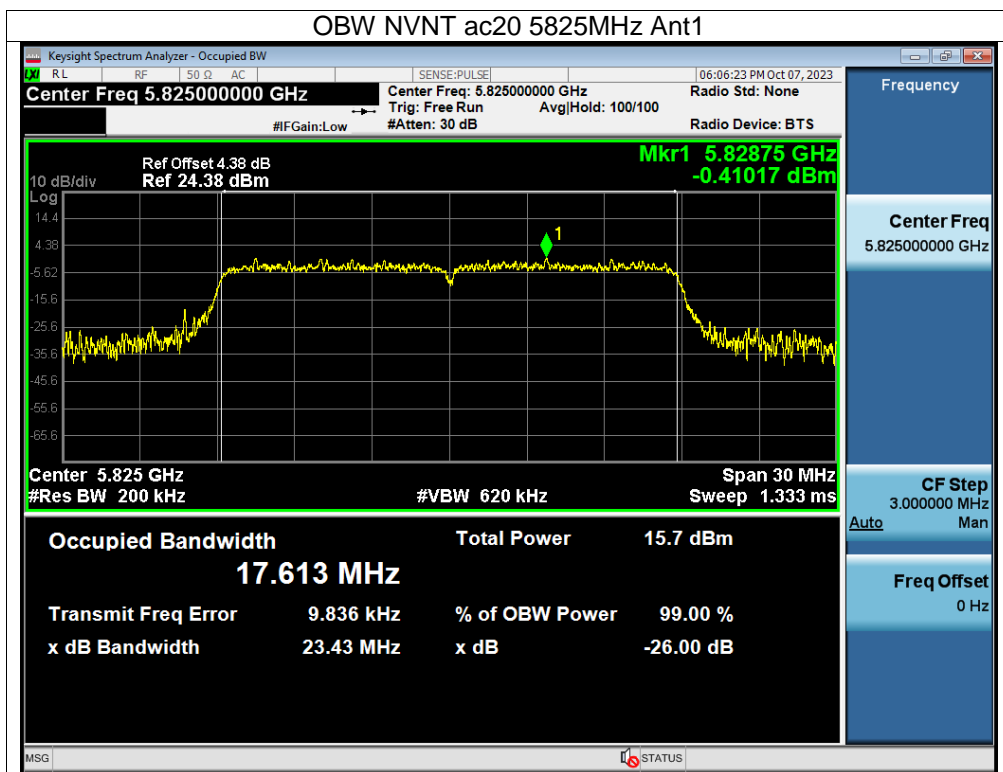


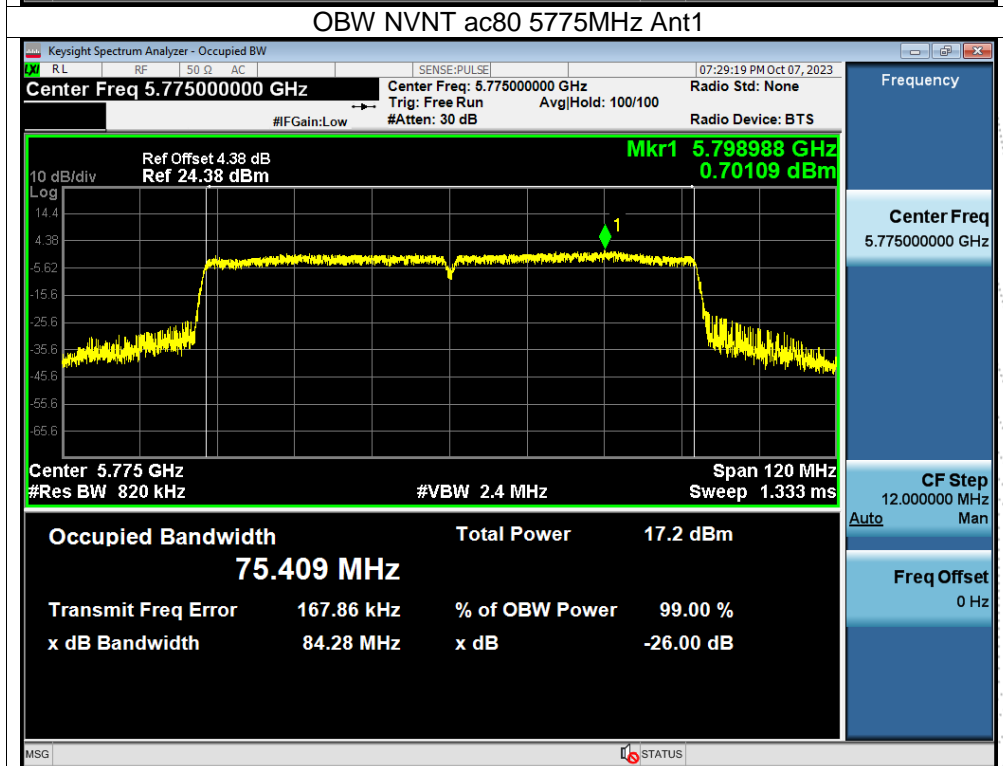
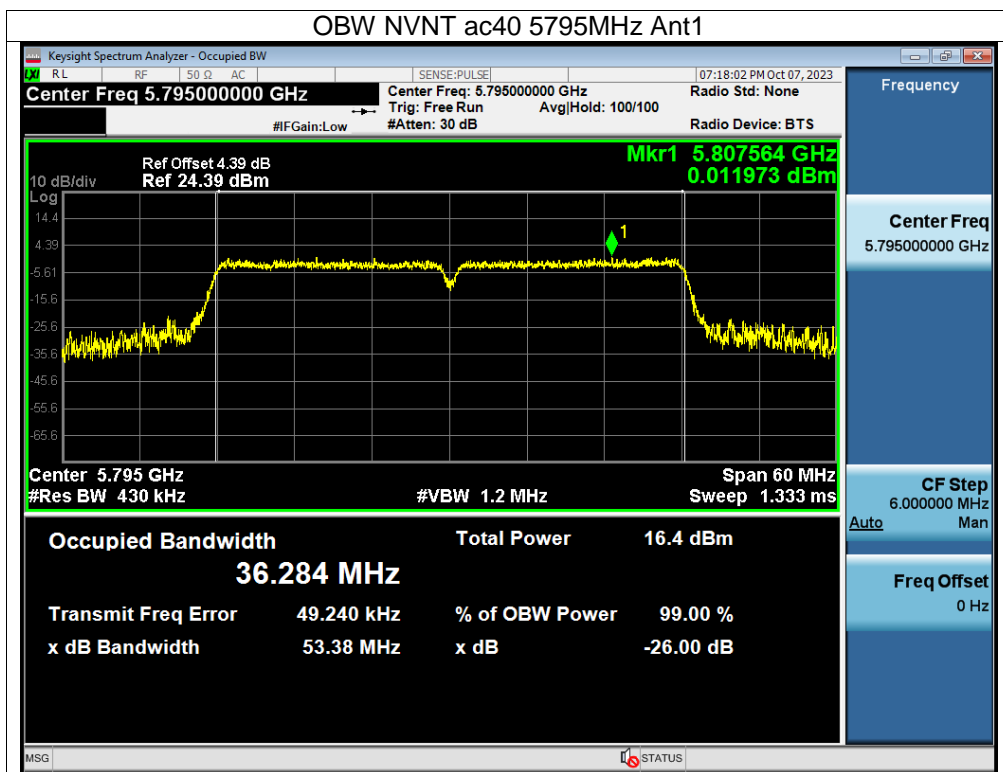












10. Maximum Conducted Output Power

10.1 Block Diagram Of Test Setup



10.2 Limit

According to FCC §15.407

The maximum conducted output power should not exceed:

Frequency Band(MHz)	Limit
5150~5250	0.25W
5250~5350	0.25W
5725~5850	1W

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.¹ 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 ≥ 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 ± 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 ≥ 3 MHz.

(iv) Number of points in sweep ≥ 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.

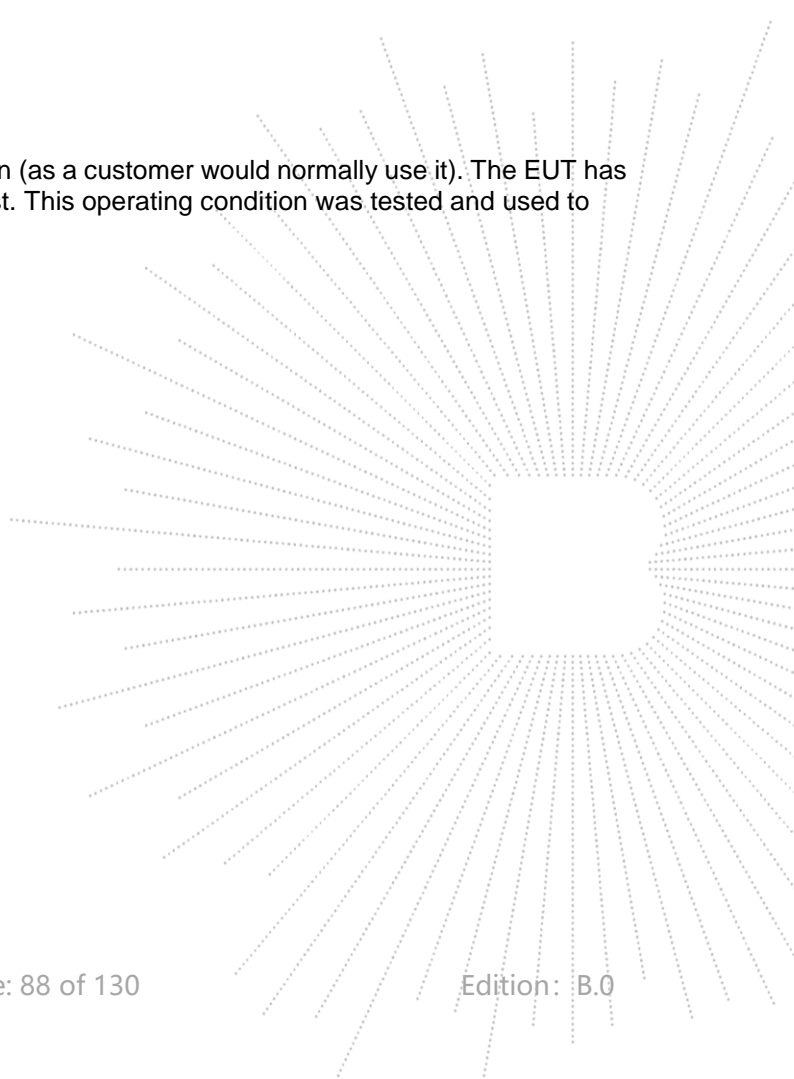
(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 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:	DC 3.8V
Test Mode:	5180-5240MHz		

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	11.47	24	Pass
NVNT	a	5200	11.07	24	Pass
NVNT	a	5240	10.79	24	Pass
NVNT	n20	5180	11.84	24	Pass
NVNT	n20	5200	11.18	24	Pass
NVNT	n20	5240	11.26	24	Pass
NVNT	n40	5190	12.03	24	Pass
NVNT	n40	5230	11.61	24	Pass
NVNT	ac20	5180	11.73	24	Pass
NVNT	ac20	5200	11.55	24	Pass
NVNT	ac20	5240	11.26	24	Pass
NVNT	ac40	5190	12.24	24	Pass
NVNT	ac40	5230	11.60	24	Pass
NVNT	ac80	5210	11.04	24	Pass

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	DC 3.8V
Test Mode:	5745-5825MHz		

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5745	10.48	30	Pass
NVNT	a	5785	9.65	30	Pass
NVNT	a	5825	9.27	30	Pass
NVNT	n20	5745	10.55	30	Pass
NVNT	n20	5785	9.64	30	Pass
NVNT	n20	5825	9.33	30	Pass
NVNT	n40	5755	10.58	30	Pass
NVNT	n40	5795	10.07	30	Pass
NVNT	ac20	5745	10.38	30	Pass
NVNT	ac20	5785	9.7	30	Pass
NVNT	ac20	5825	9.38	30	Pass
NVNT	ac40	5755	10.56	30	Pass
NVNT	ac40	5795	10.05	30	Pass
NVNT	ac80	5775	9.34	30	Pass

11. Out Of Band Emissions

11.1 Block Diagram Of Test Setup



11.2 Limit

According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (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) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

11.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

11.4 EUT Operating Conditions

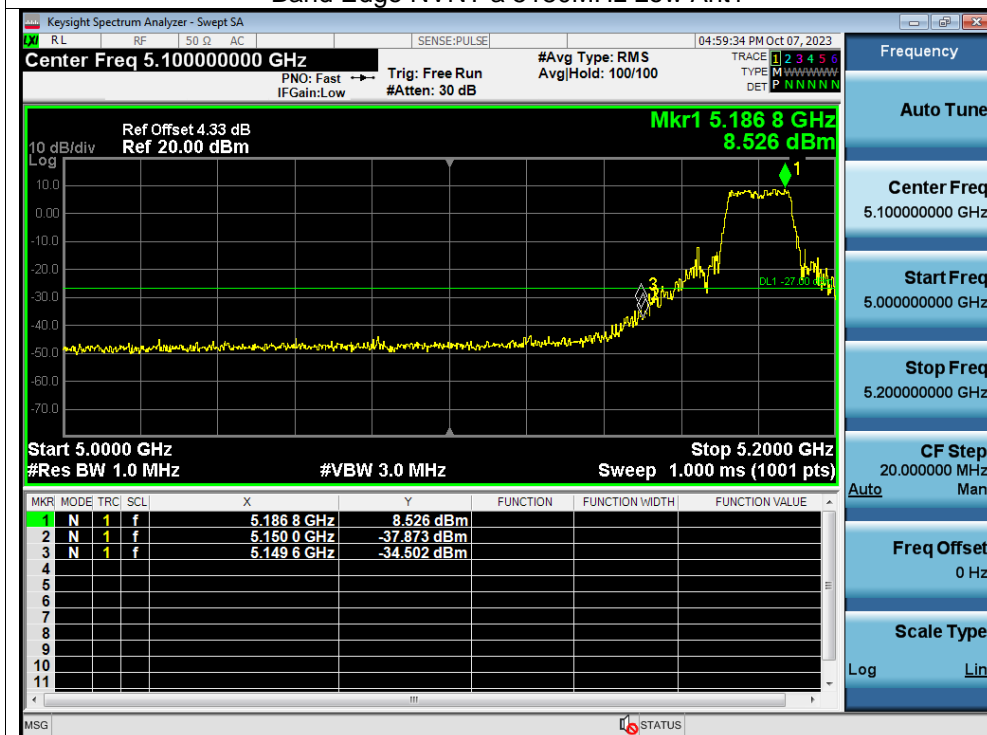
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data

11.5 Test Result

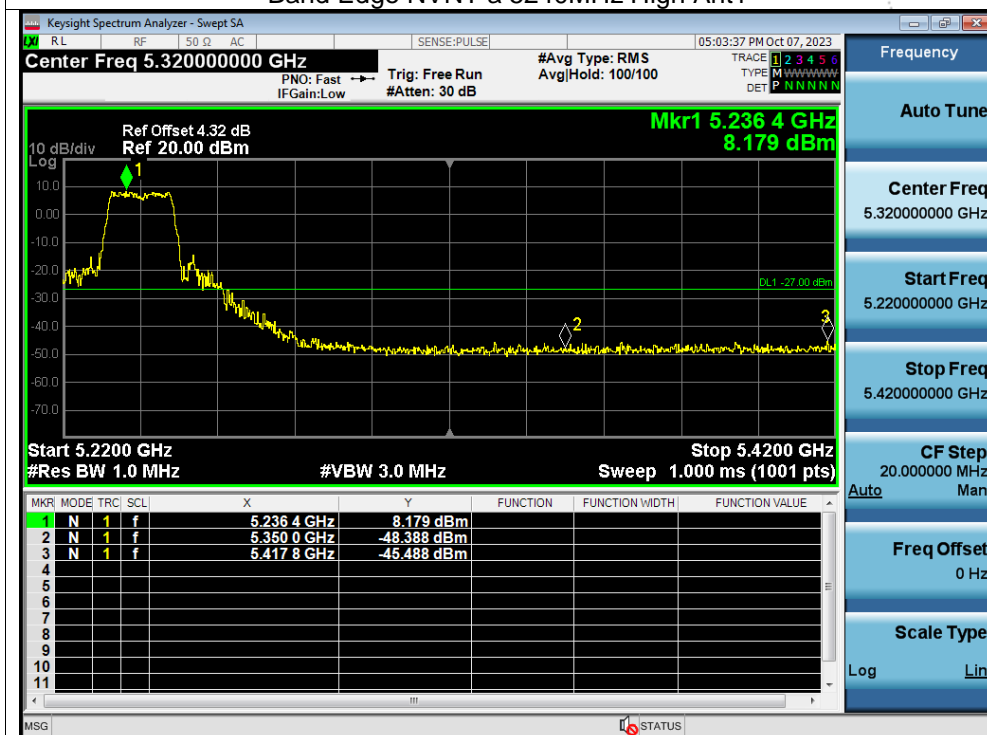
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101kPa	Test Voltage:	DC 3.8V

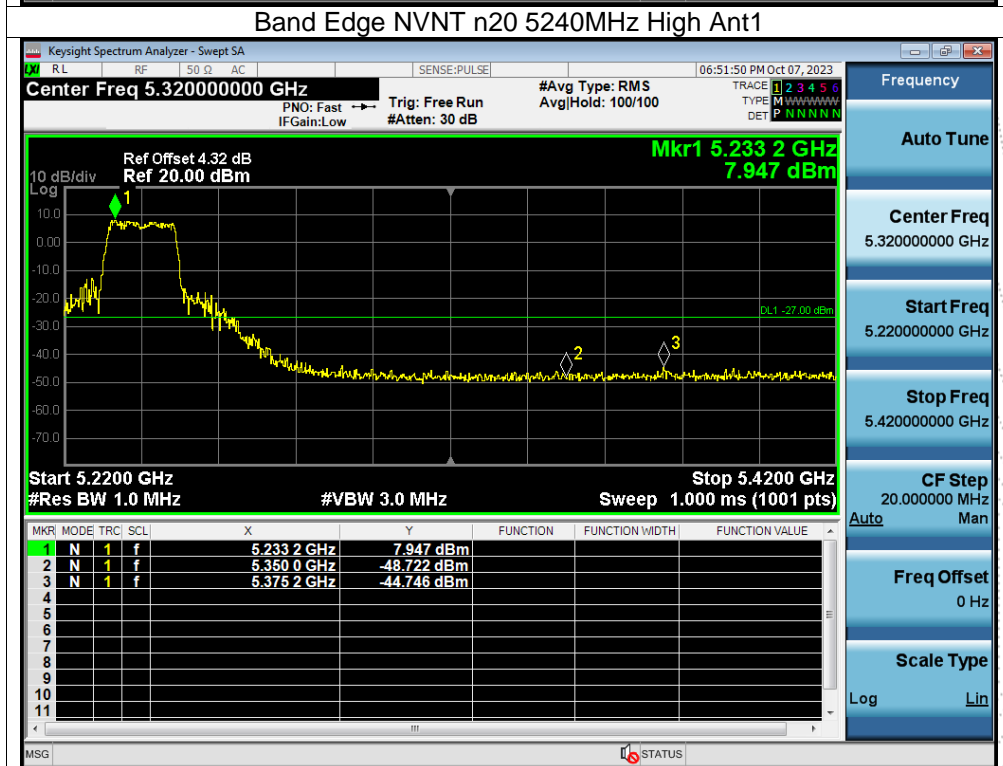
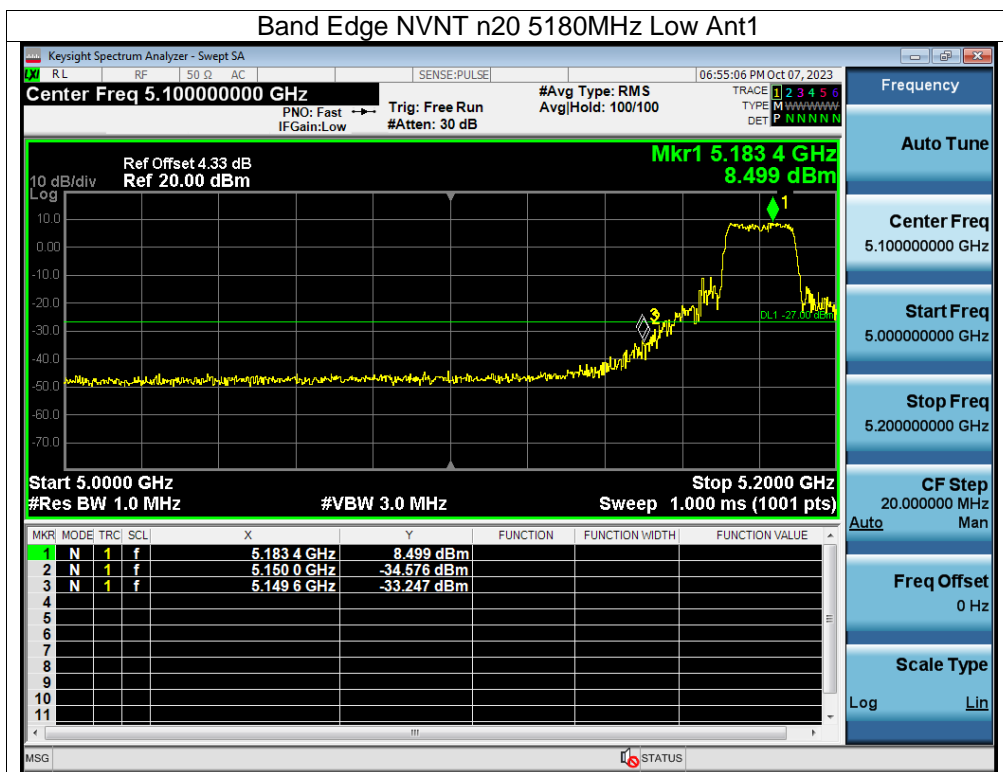
Test Graphs

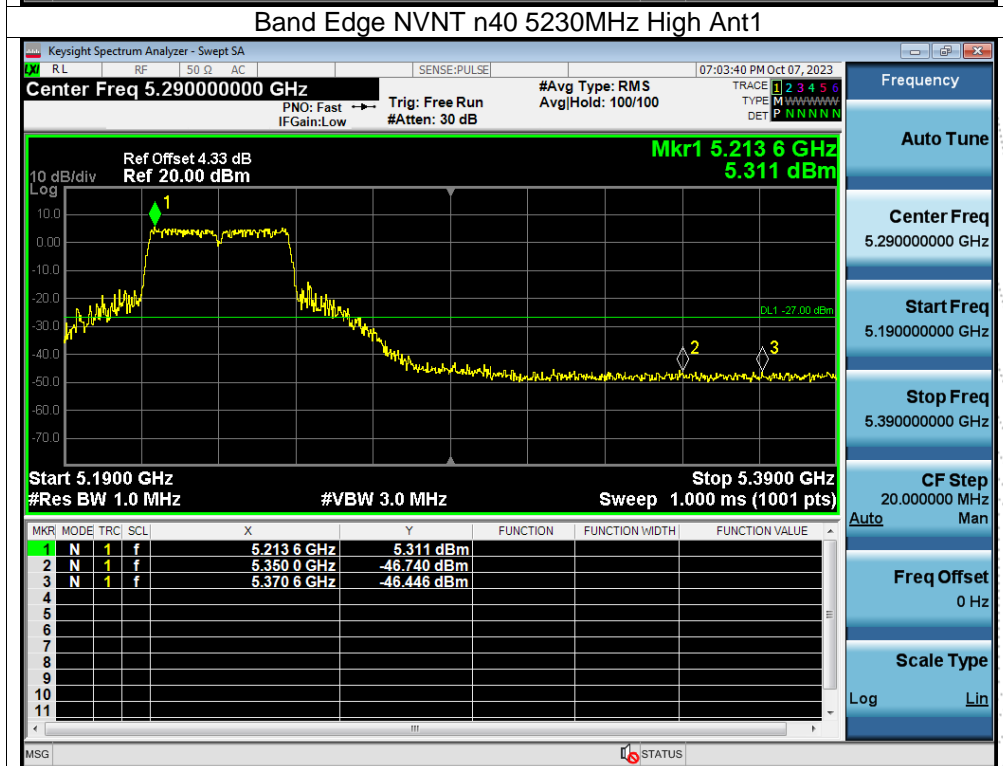
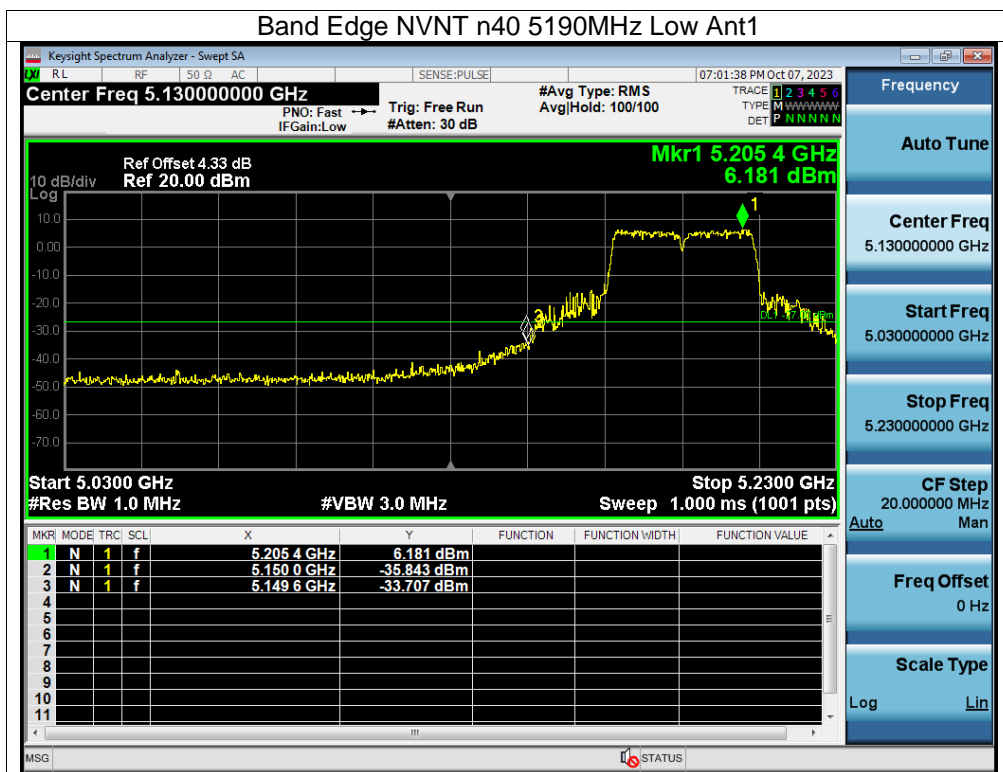
Band Edge NVNT a 5180MHz Low Ant1

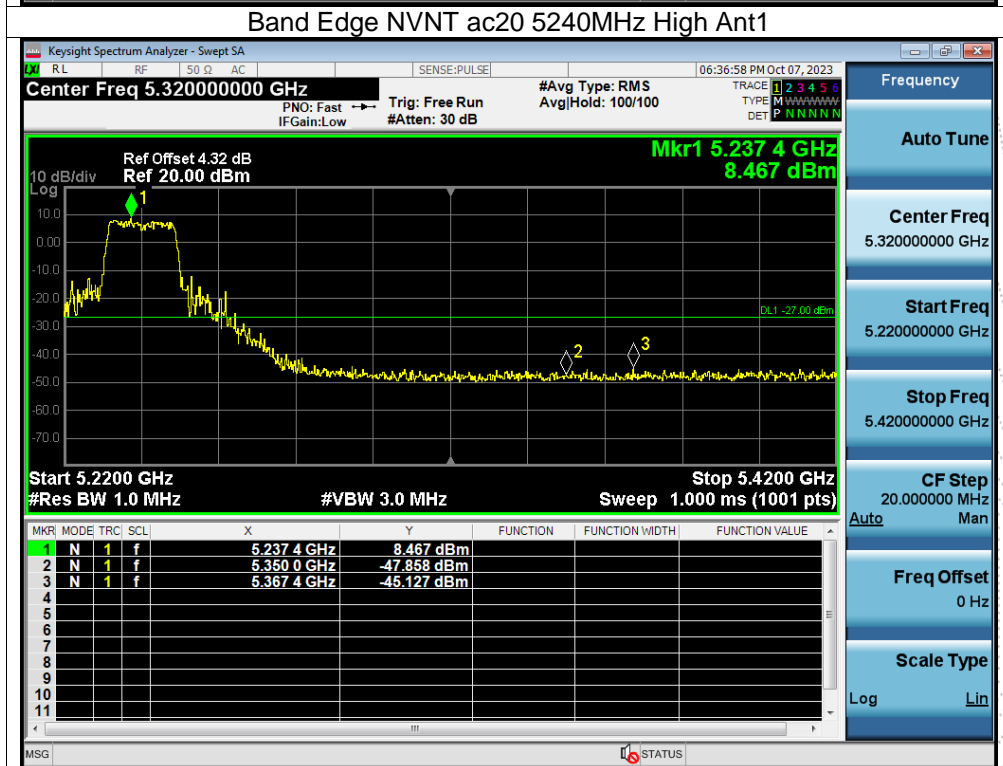
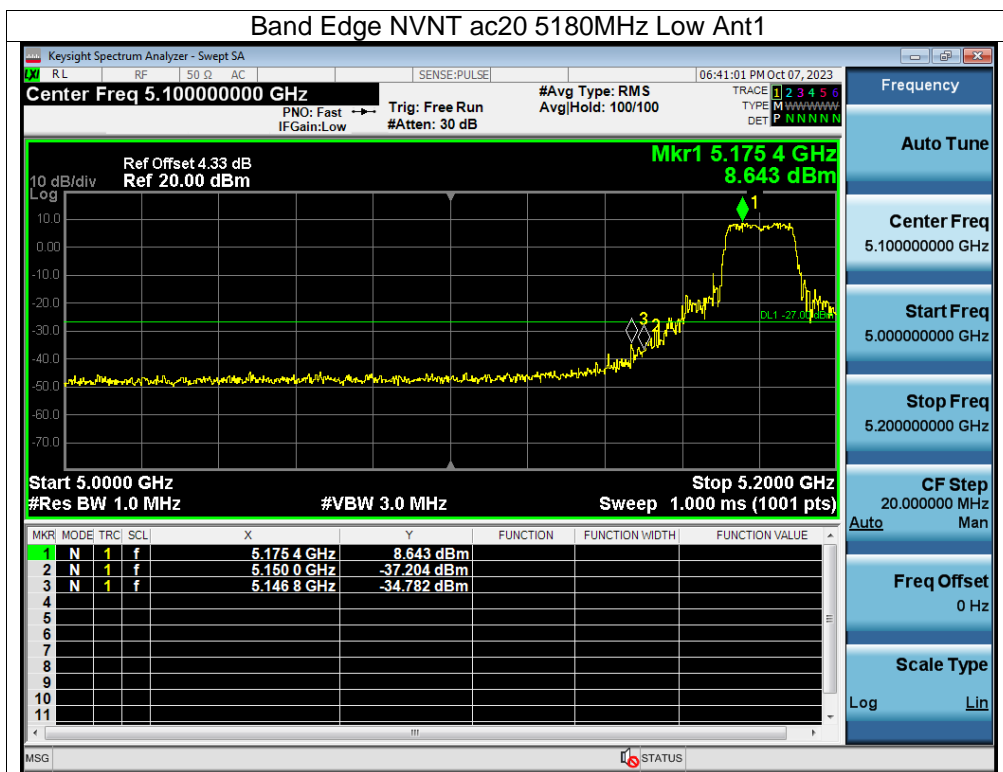


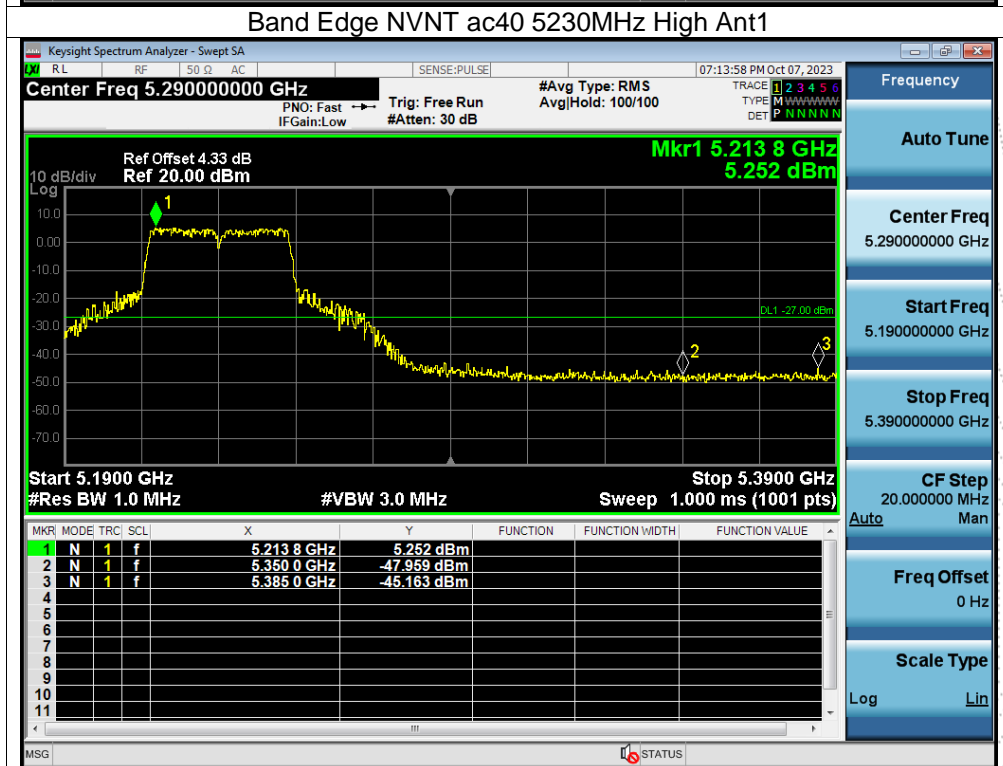
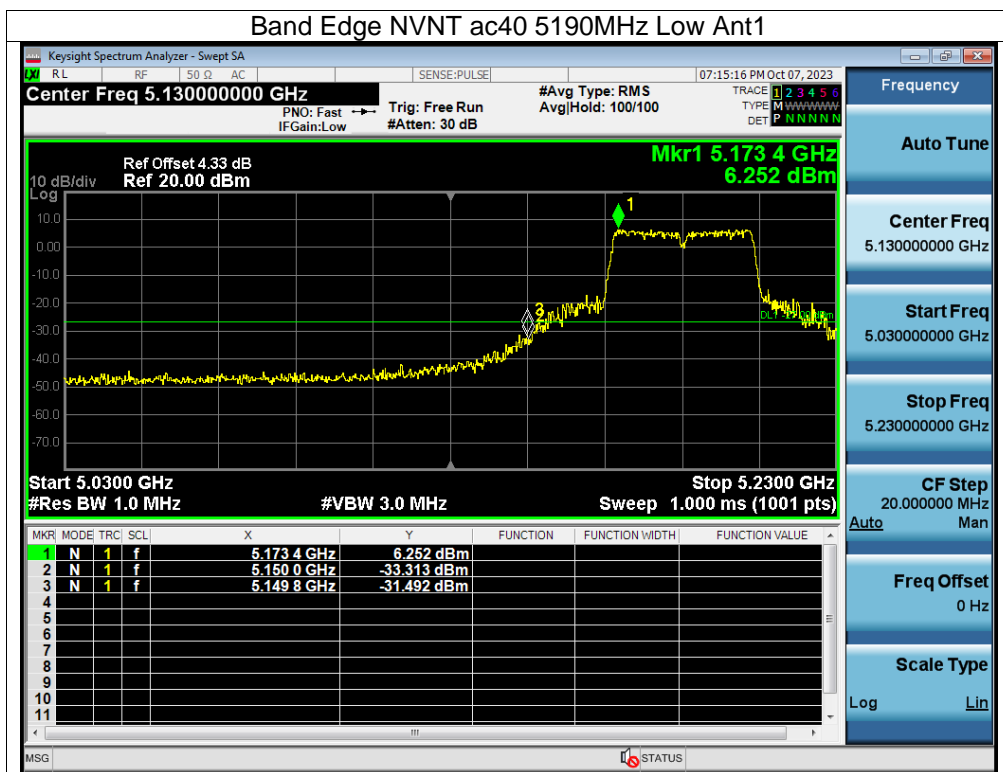
Band Edge NVNT a 5240MHz High Ant1

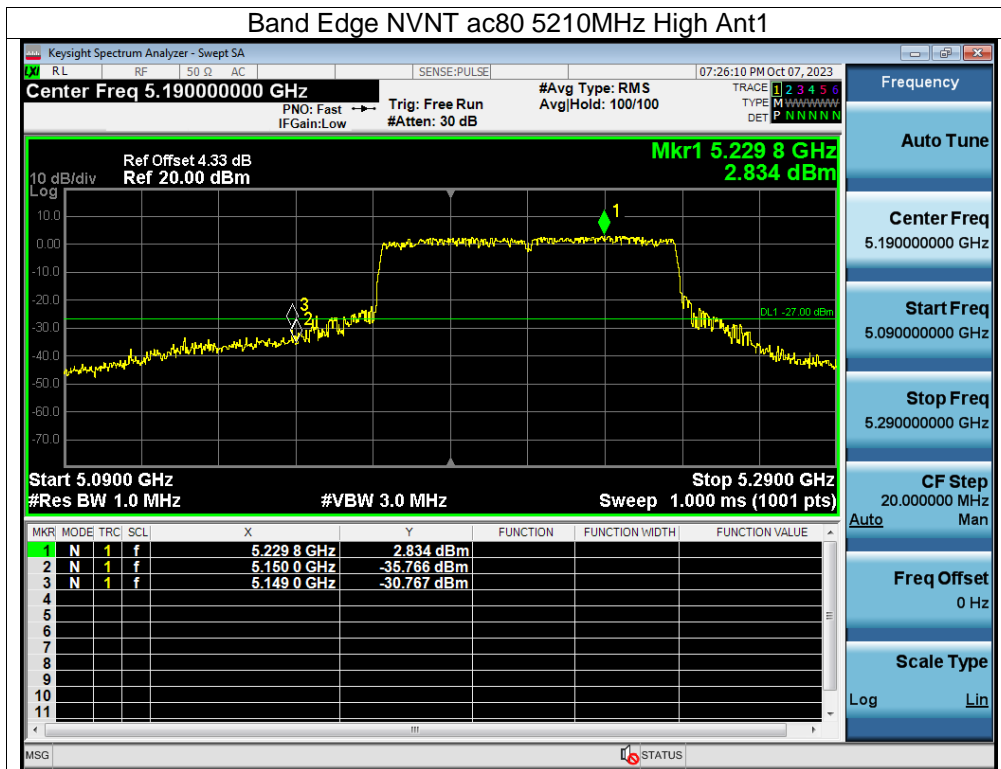












5745-5825MHz

