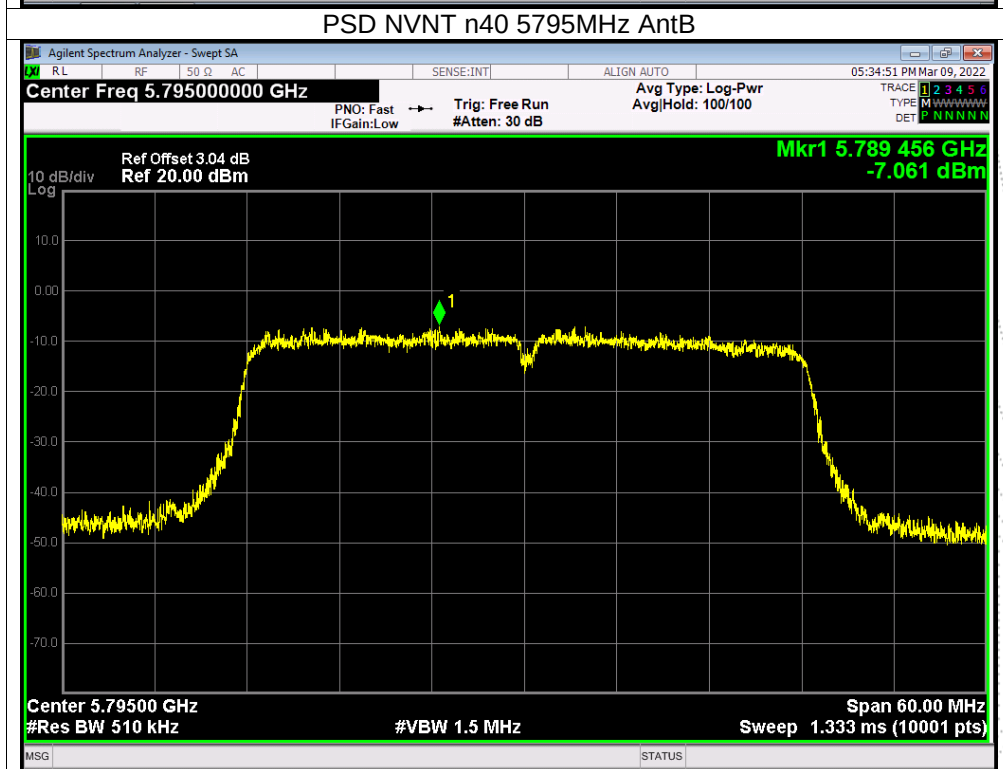
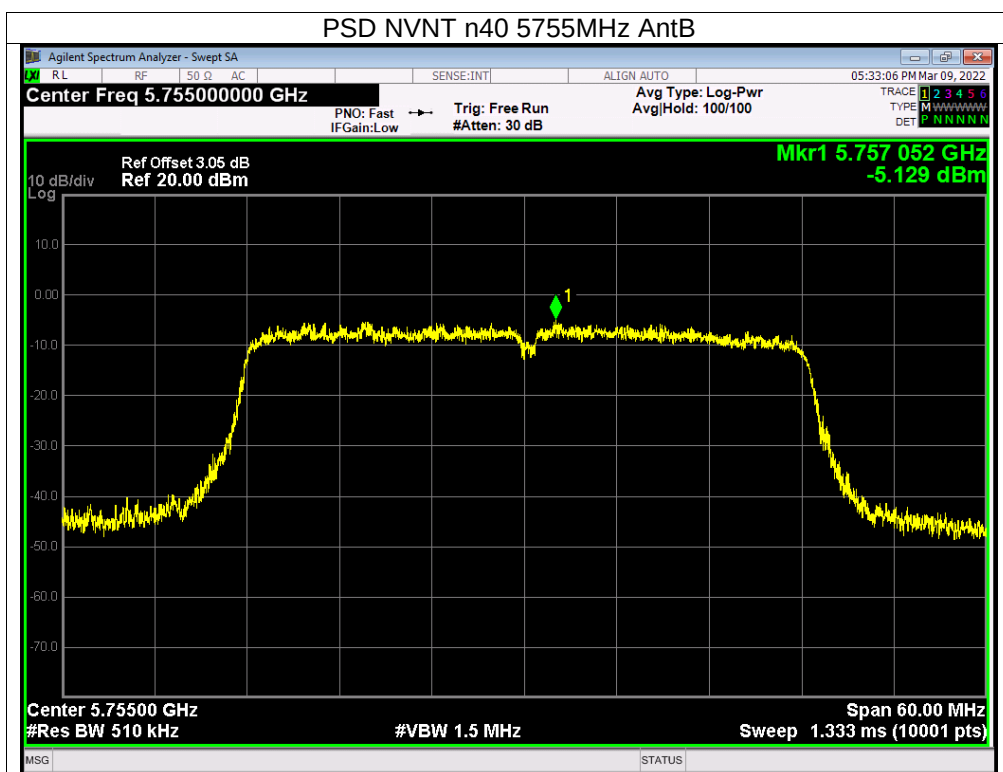
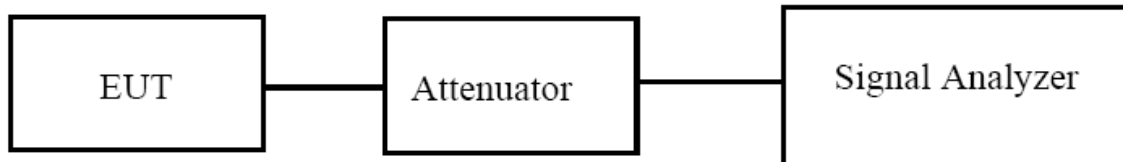




9. 26dB & 6dB & 99% Emission Bandwidth

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 :	AC 120V/60Hz
Test Mode :	TX Frequency U-NII-1 (5180-5240MHz)		

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

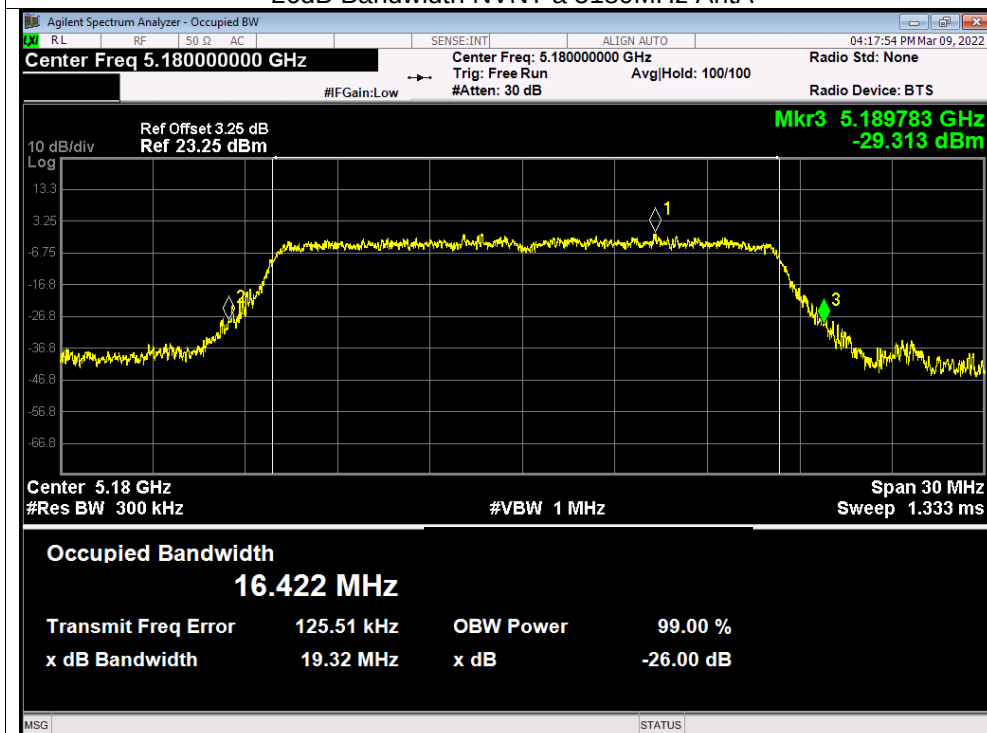
Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Limit MHz	Result
			ANT A	ANT A		
802.11a	CH36	5180	16.371	19.315	N/A	Pass
	CH40	5200	16.377	19.435	N/A	Pass
	CH48	5240	16.379	19.462	N/A	Pass
802.11 n20	CH36	5180	17.435	19.542	N/A	Pass
	CH40	5200	17.442	19.757	N/A	Pass
	CH48	5240	17.453	19.609	N/A	Pass
802.11 n40	CH 38	5190	36.026	39.2	N/A	Pass
	CH 46	5230	36.013	39.128	N/A	Pass

Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Limit MHz	Result
			ANT B	ANT B		
802.11a	CH36	5180	16.412	19.32	N/A	Pass
	CH40	5200	16.401	19.399	N/A	Pass
	CH48	5240	16.432	19.324	N/A	Pass
802.11 n20	CH36	5180	17.426	19.625	N/A	Pass
	CH40	5200	17.474	19.726	N/A	Pass
	CH48	5240	17.438	19.722	N/A	Pass
802.11 n40	CH 38	5190	35.994	38.981	N/A	Pass
	CH 46	5230	36.007	39.064	N/A	Pass

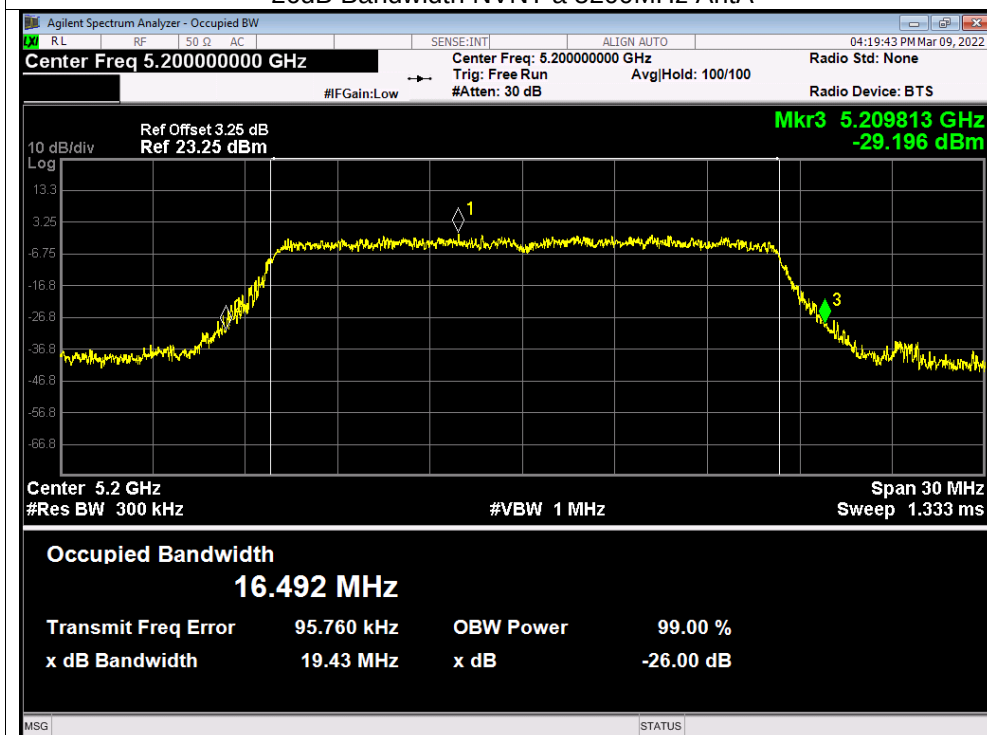
-26dB Bandwidth

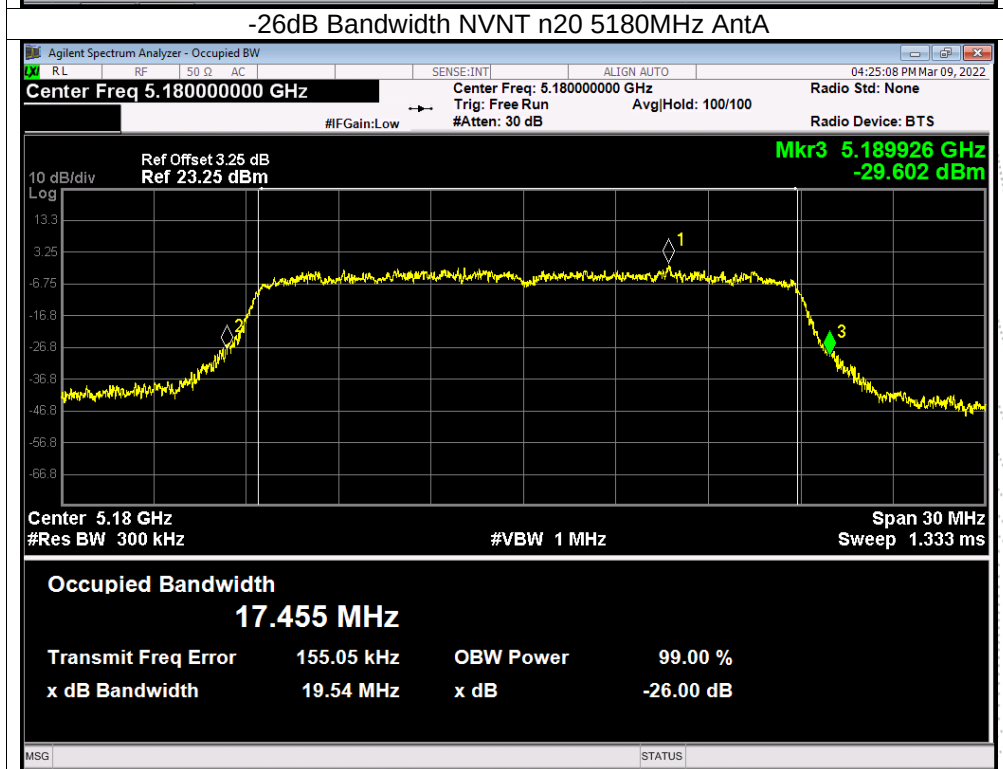
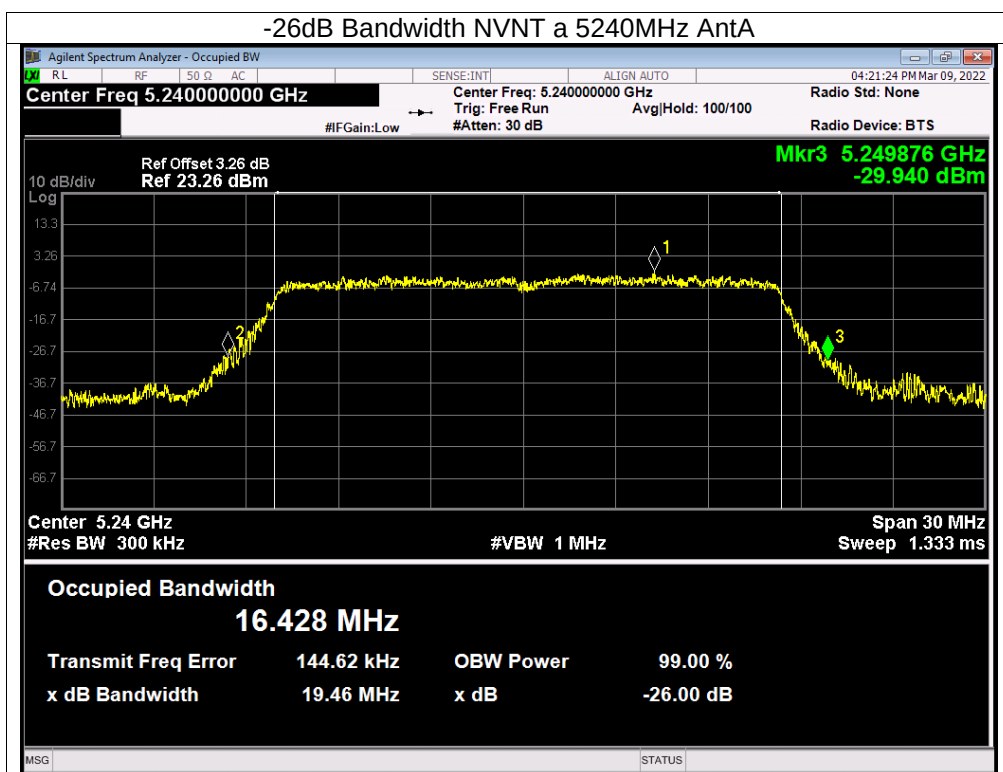
Test Graphs

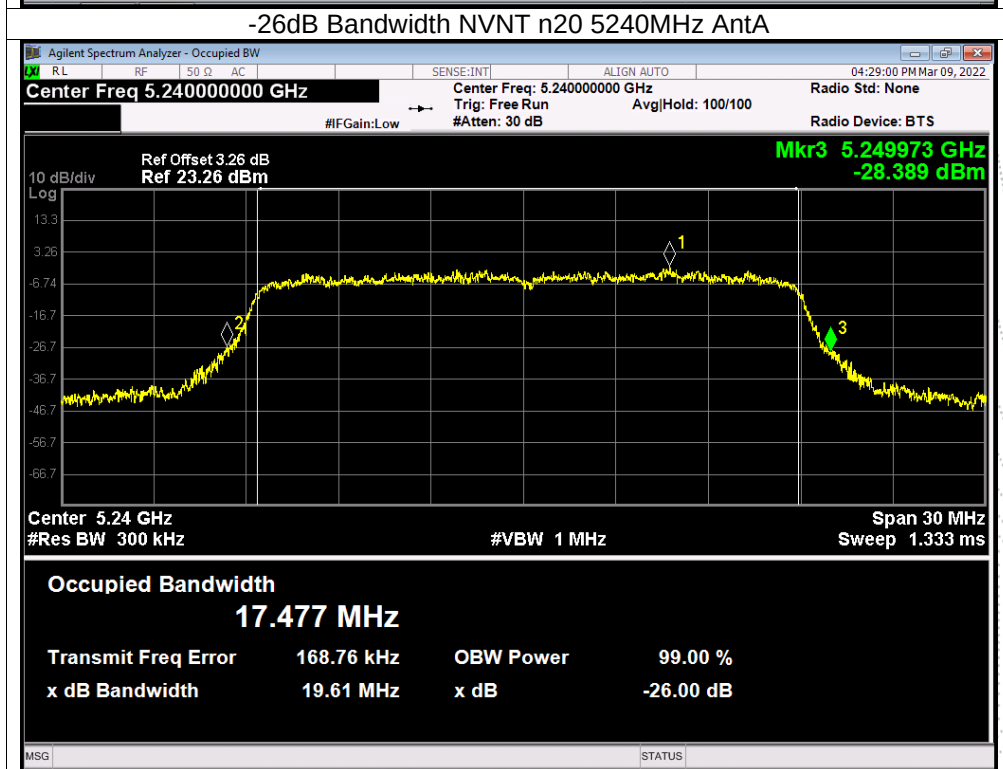
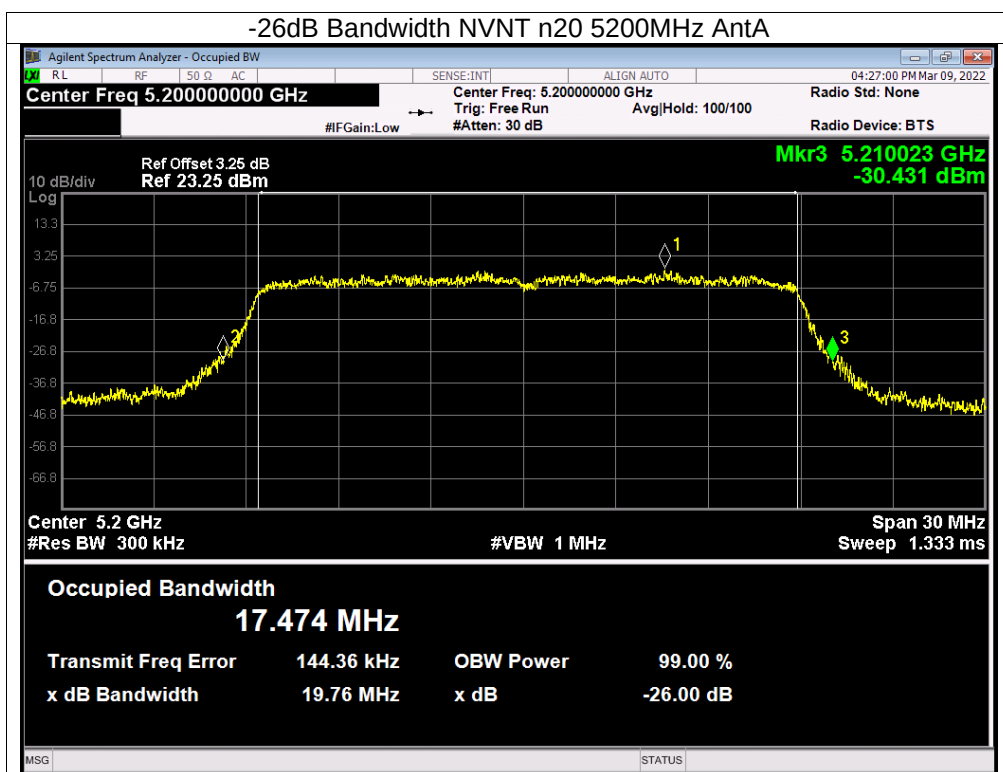
-26dB Bandwidth NVNT a 5180MHz AntA

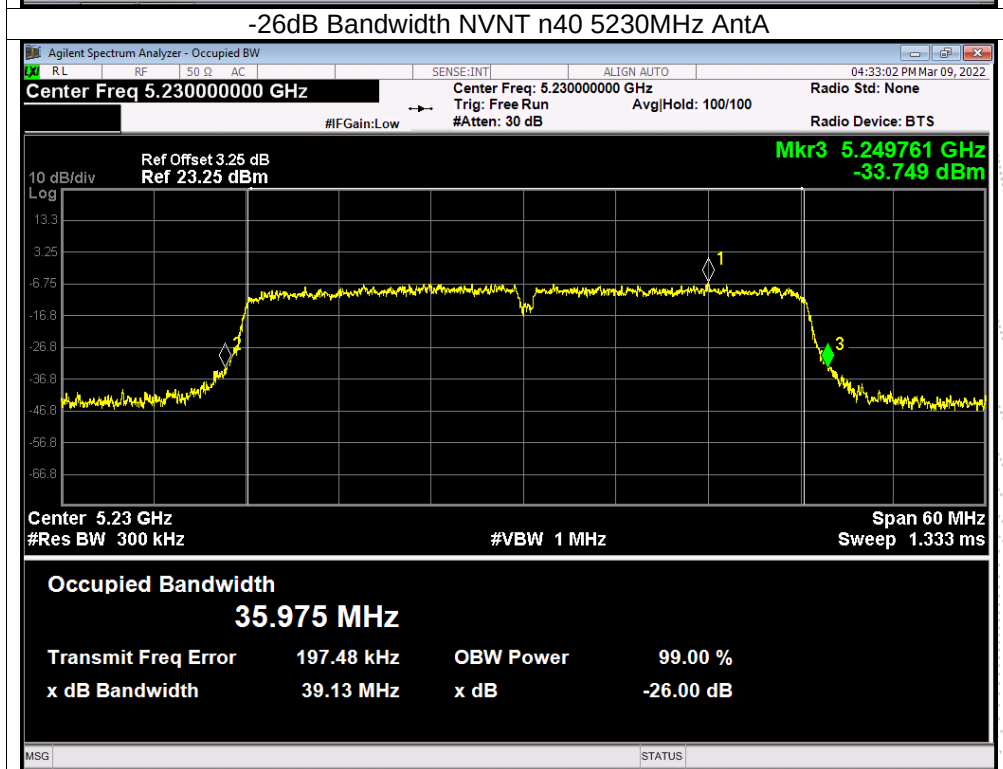
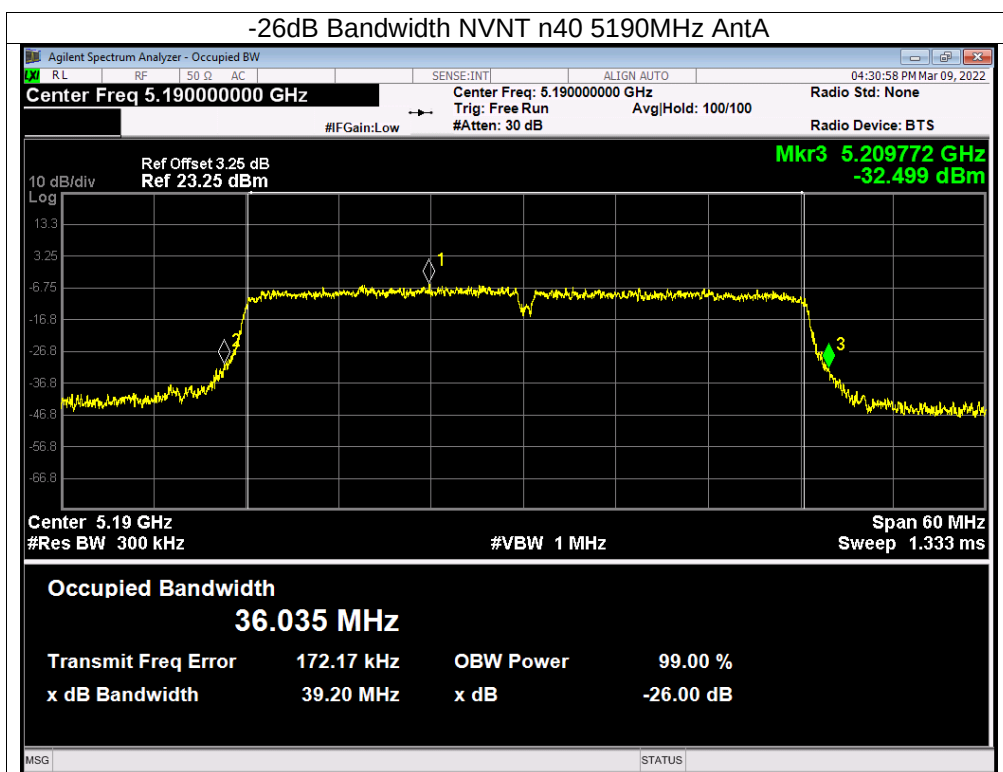


-26dB Bandwidth NVNT a 5200MHz AntA





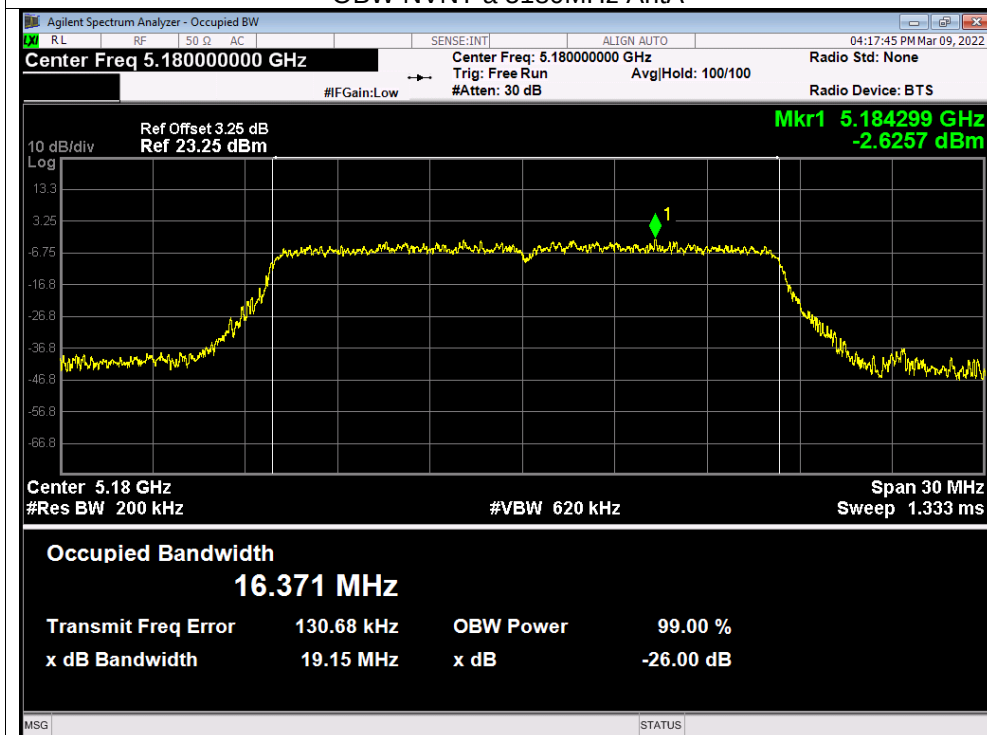




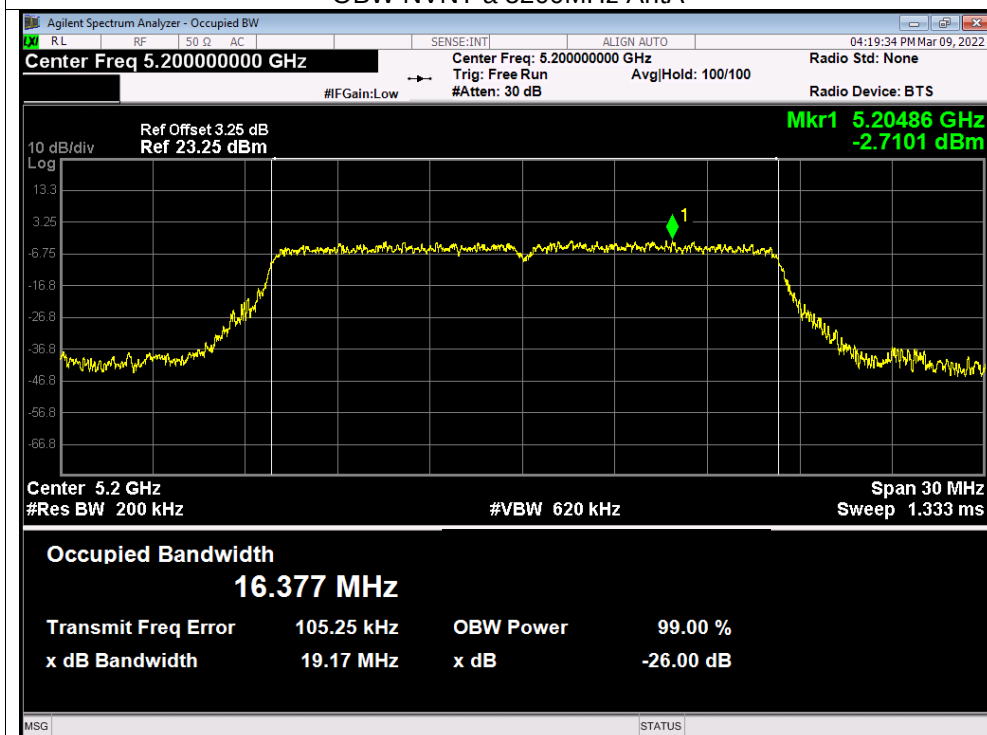
99% OBW

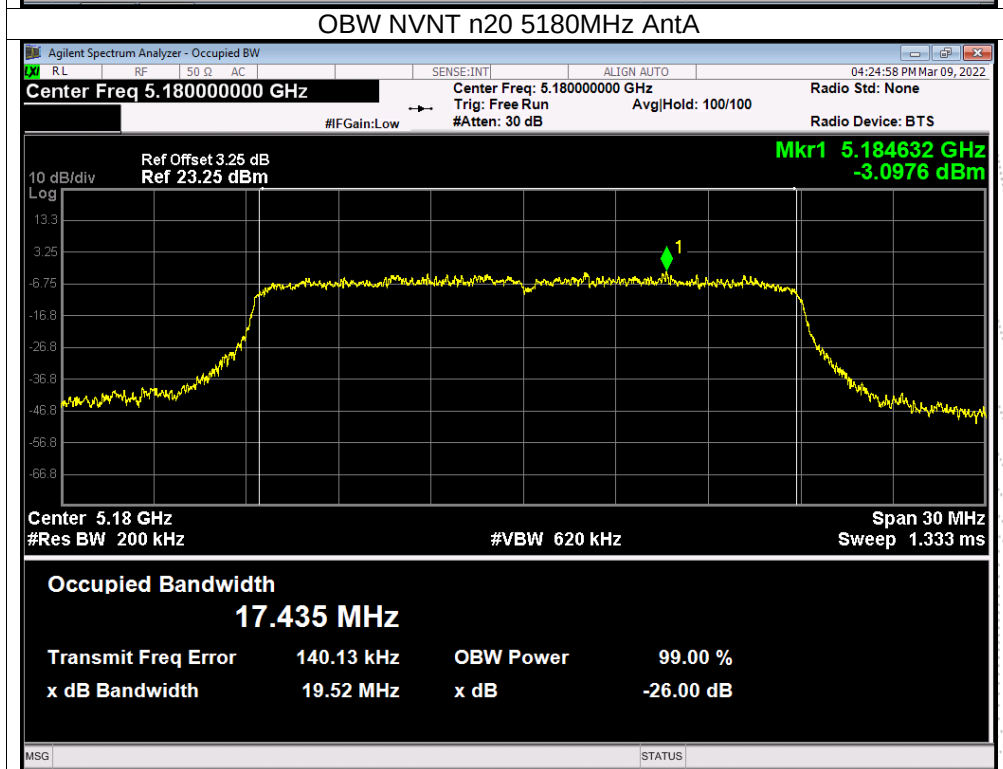
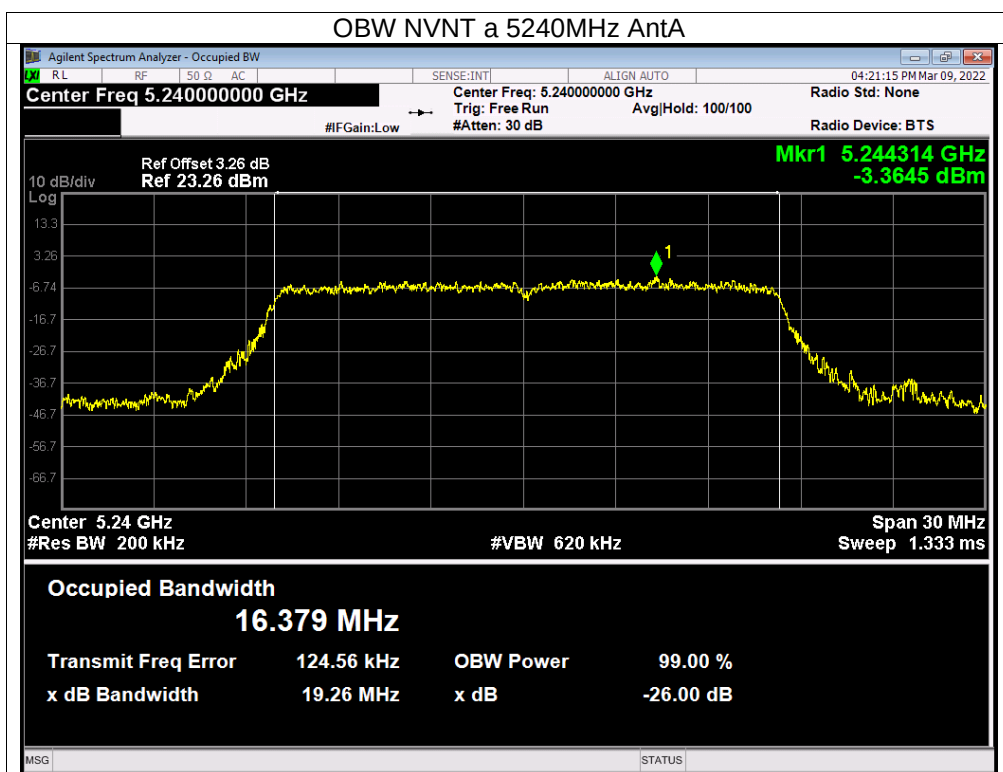
Test Graphs

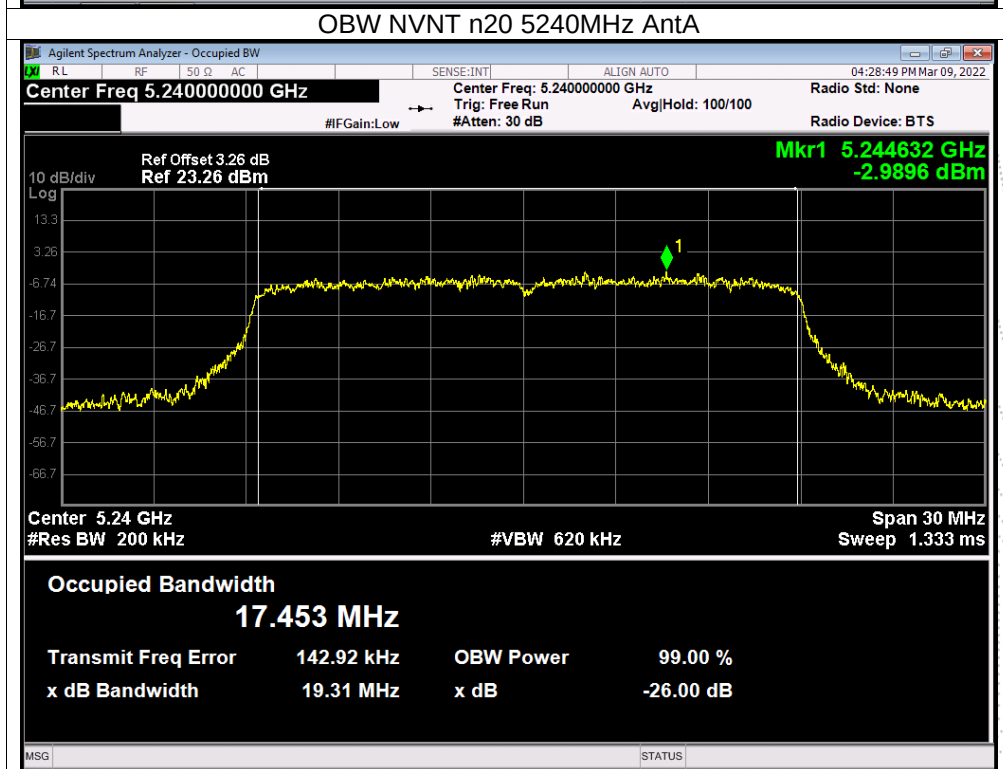
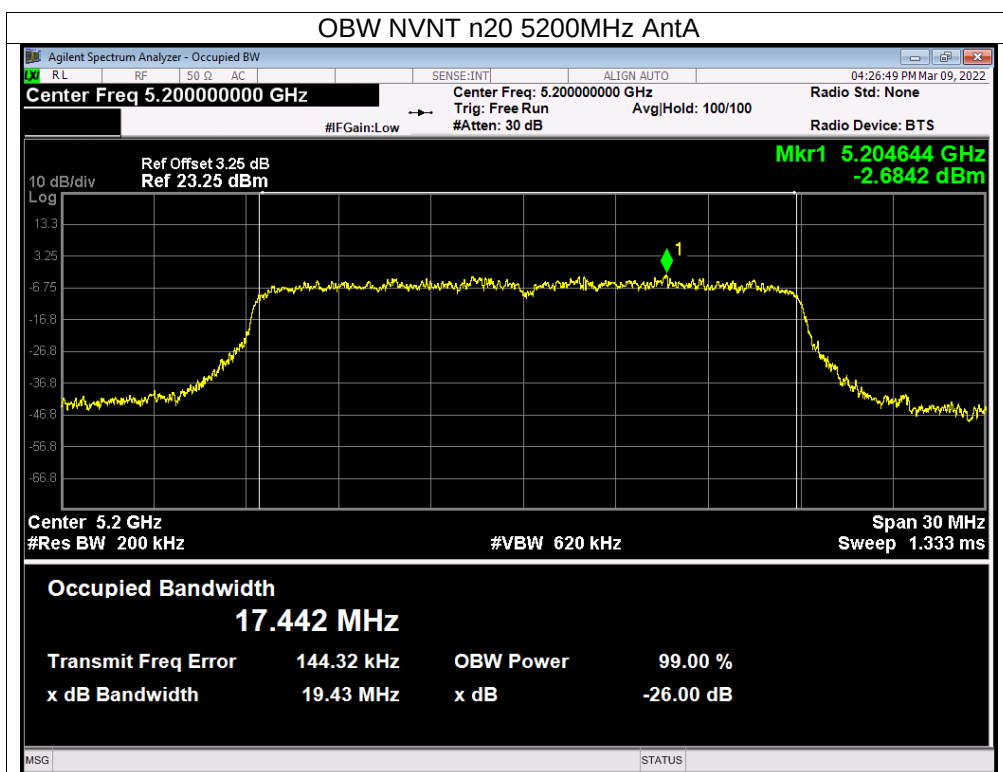
OBW NVNT a 5180MHz AntA

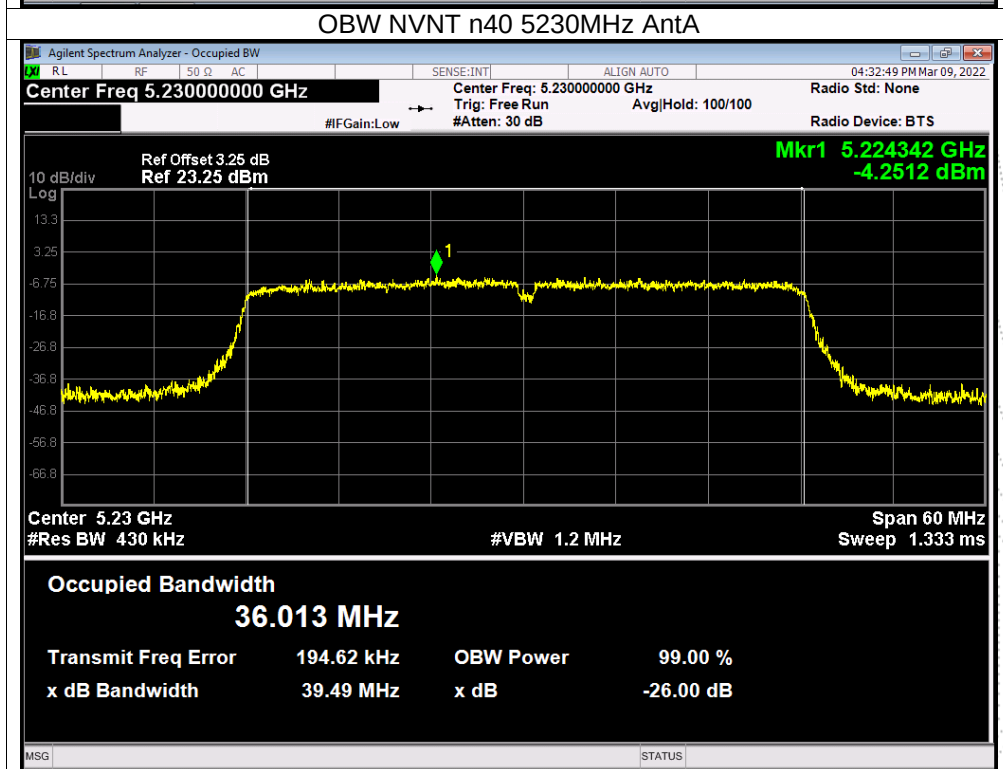
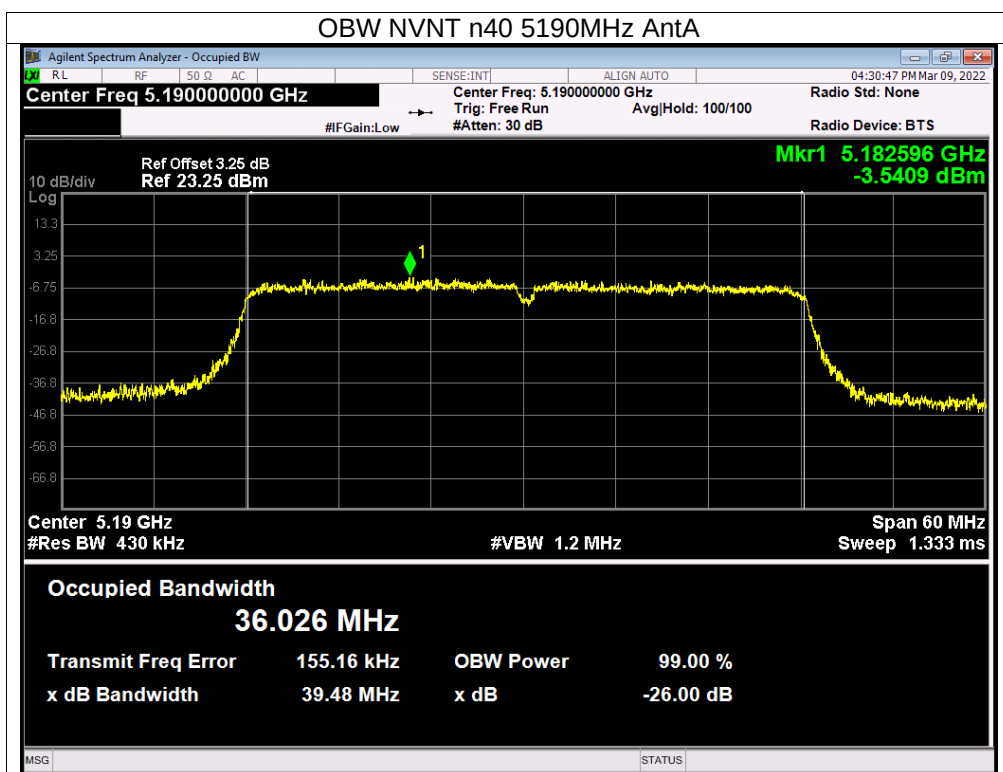


OBW NVNT a 5200MHz AntA









Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX Frequency U-NII-2 (5260-5320MHz)		

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

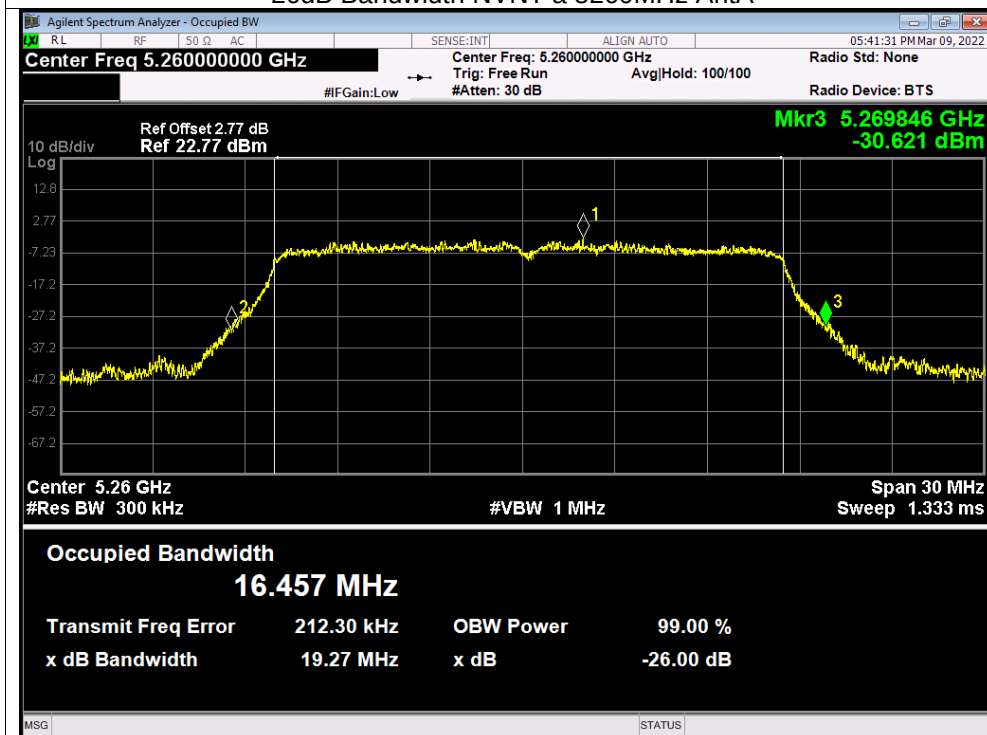
Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Limit MHz	Result
			ANT A	ANT A		
802.11a	CH52	5260	16.385	19.268	N/A	Pass
	CH56	5280	16.375	19.228	N/A	Pass
	CH64	5320	16.331	19.11	N/A	Pass
802.11 n20	CH52	5260	17.415	19.419	N/A	Pass
	CH56	5280	17.469	19.714	N/A	Pass
	CH64	5320	17.47	19.586	N/A	Pass
802.11 n40	CH54	5270	35.944	38.959	N/A	Pass
	CH62	5310	36.018	39.025	N/A	Pass

Mode	Channel	Frequency (MHz)	99% bandwidth (MHz)	26dB bandwidth (MHz)	Limit MHz	Result
			ANT B	ANT B		
802.11a	CH52	5260	16.415	19.206	N/A	Pass
	CH56	5280	16.404	19.021	N/A	Pass
	CH64	5320	16.394	19.159	N/A	Pass
802.11 n20	CH52	5260	17.442	19.656	N/A	Pass
	CH56	5280	17.448	19.774	N/A	Pass
	CH64	5320	17.465	19.902	N/A	Pass
802.11 n40	CH54	5270	35.99	38.93	N/A	Pass
	CH62	5310	36.019	38.986	N/A	Pass

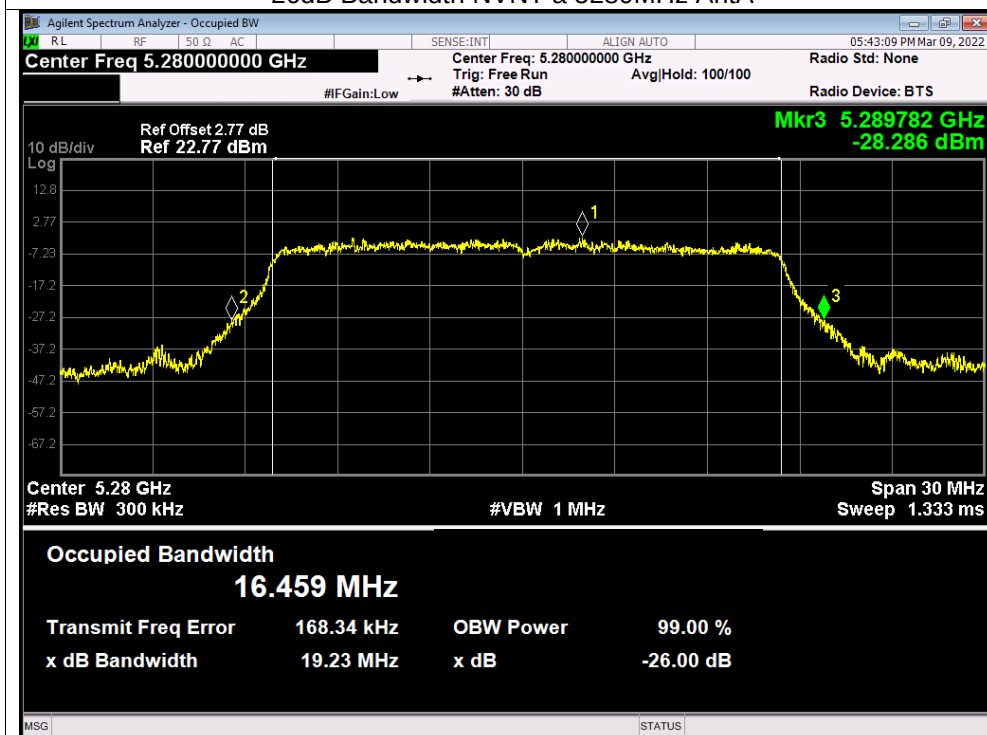
-26dB Bandwidth

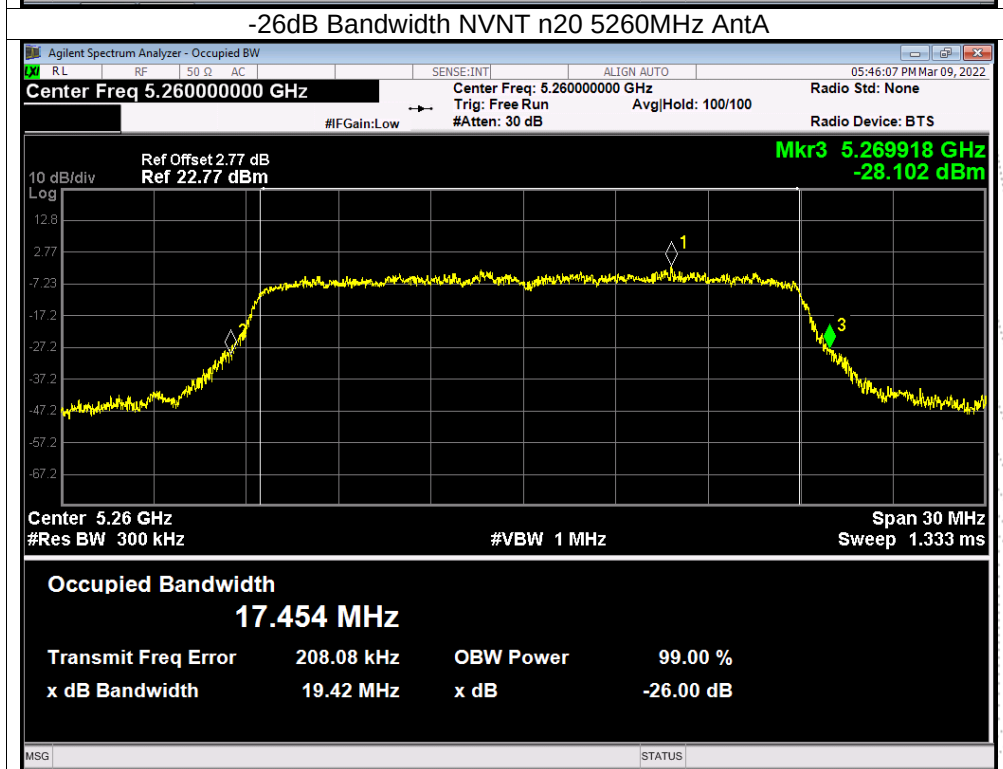
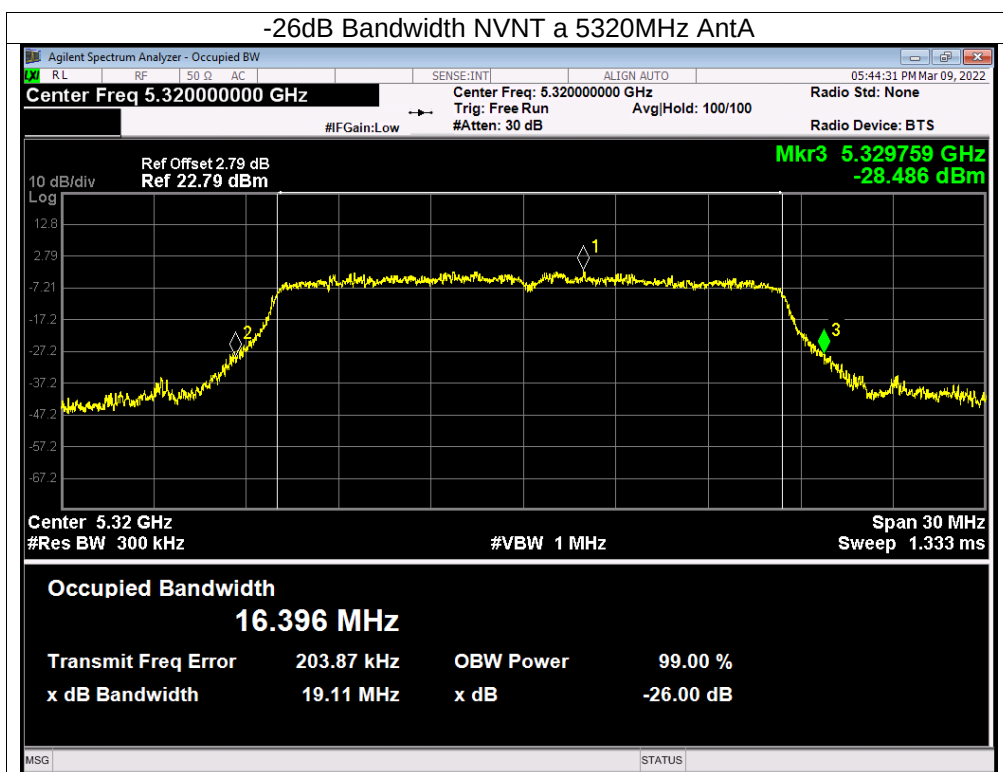
Test Graphs

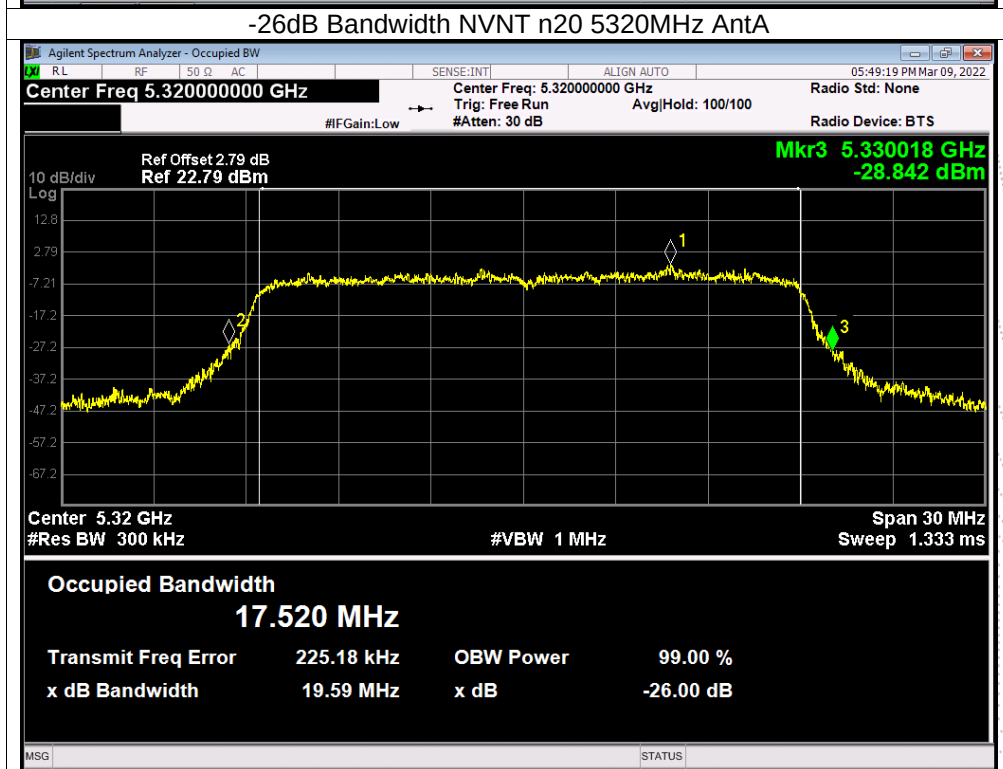
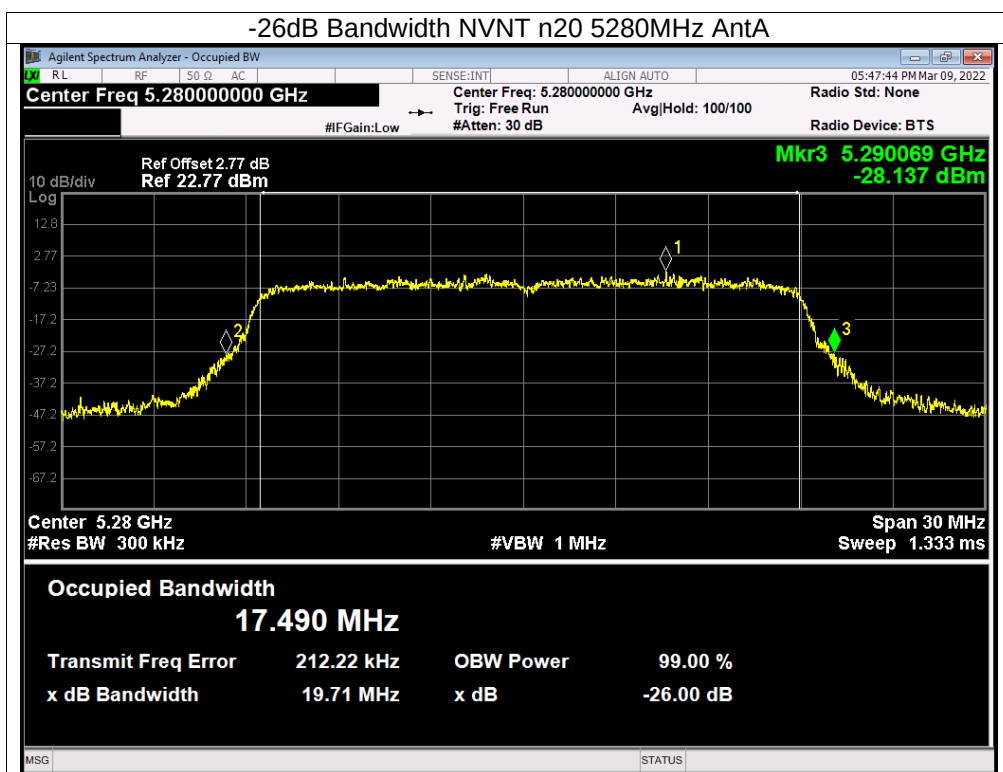
-26dB Bandwidth NVNT a 5260MHz AntA

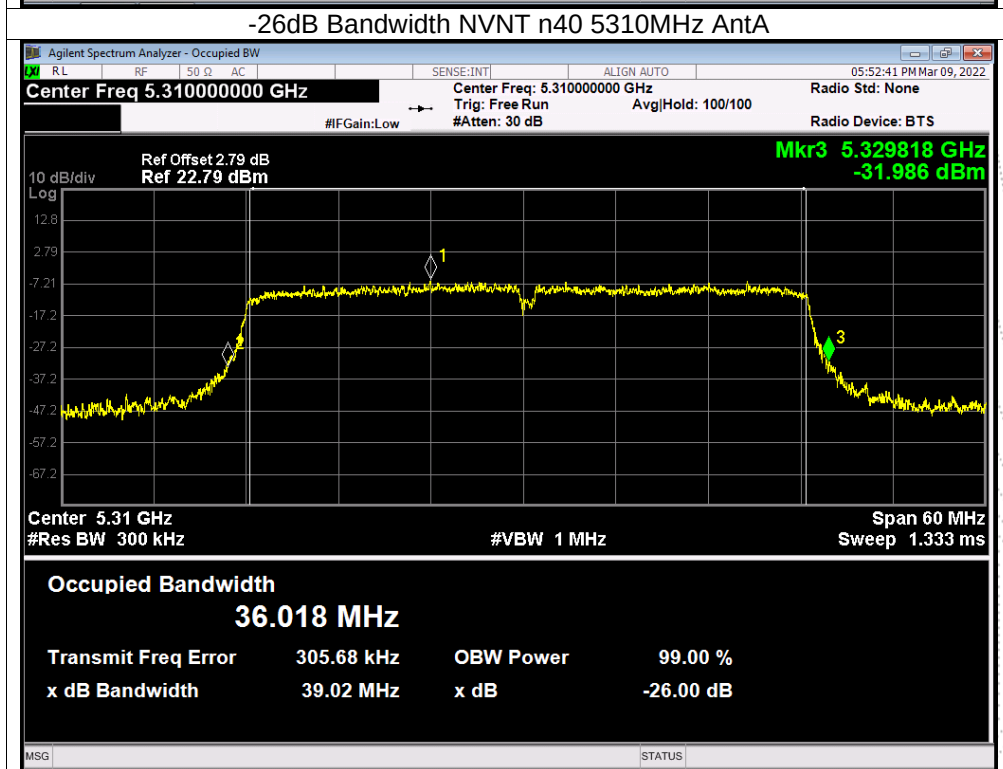
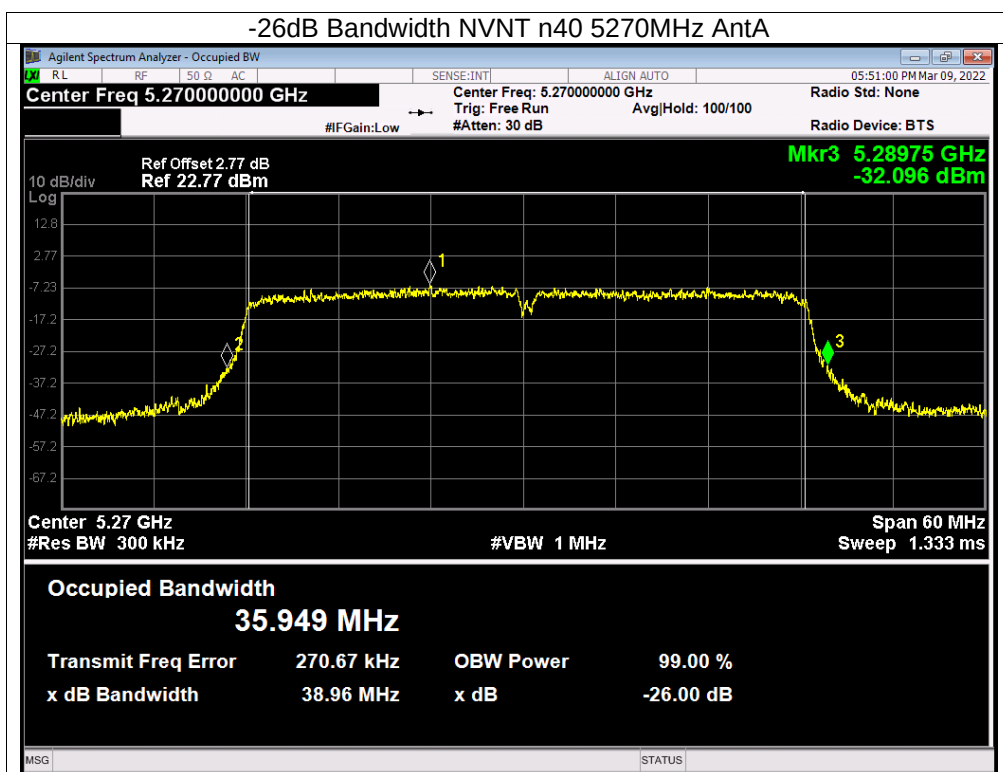


-26dB Bandwidth NVNT a 5280MHz AntA





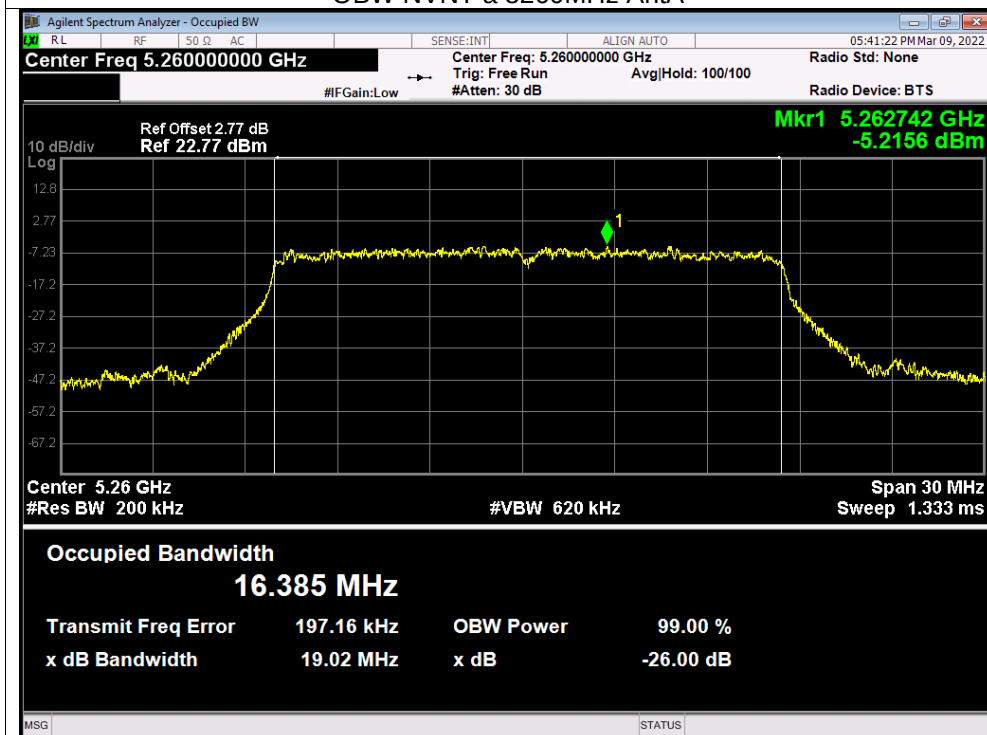




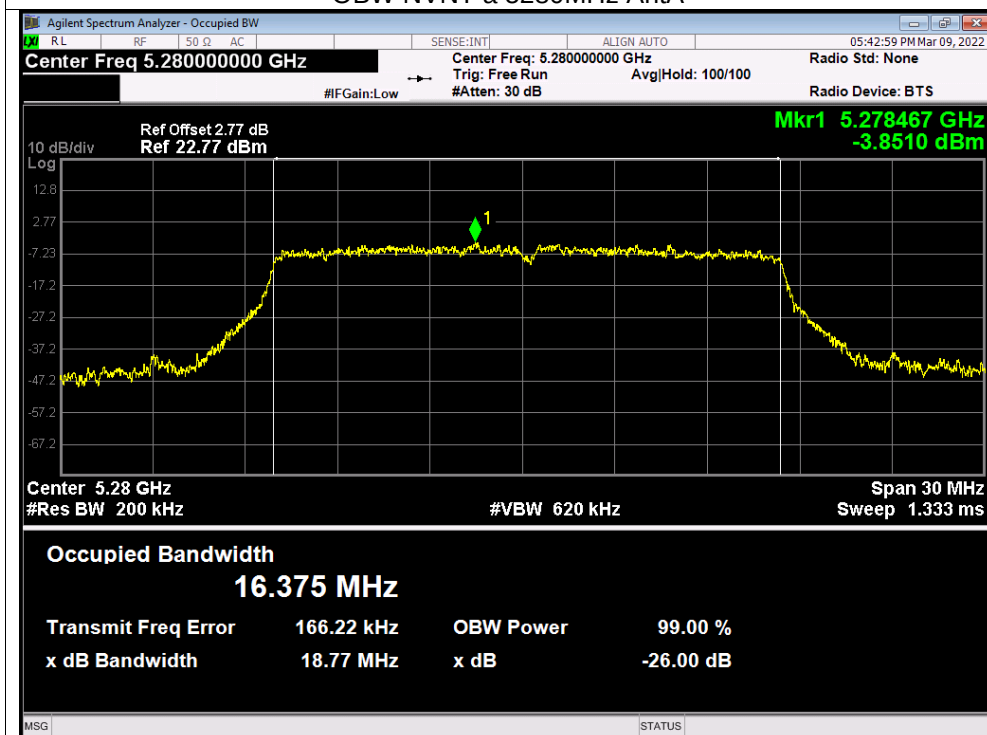
99% OBW

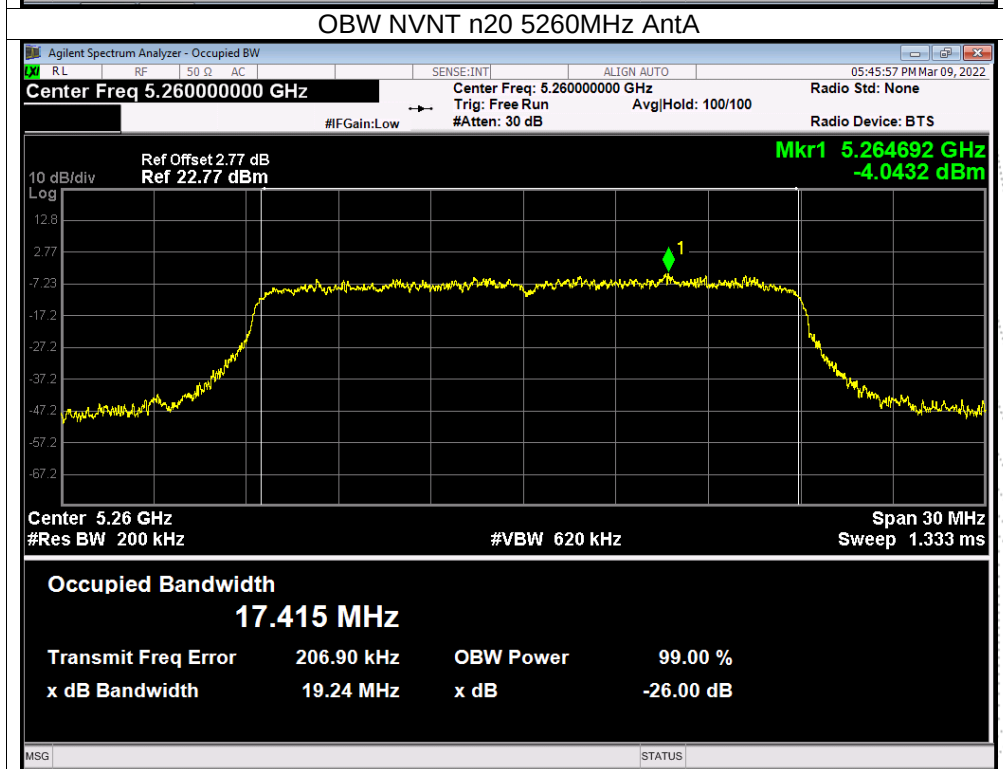
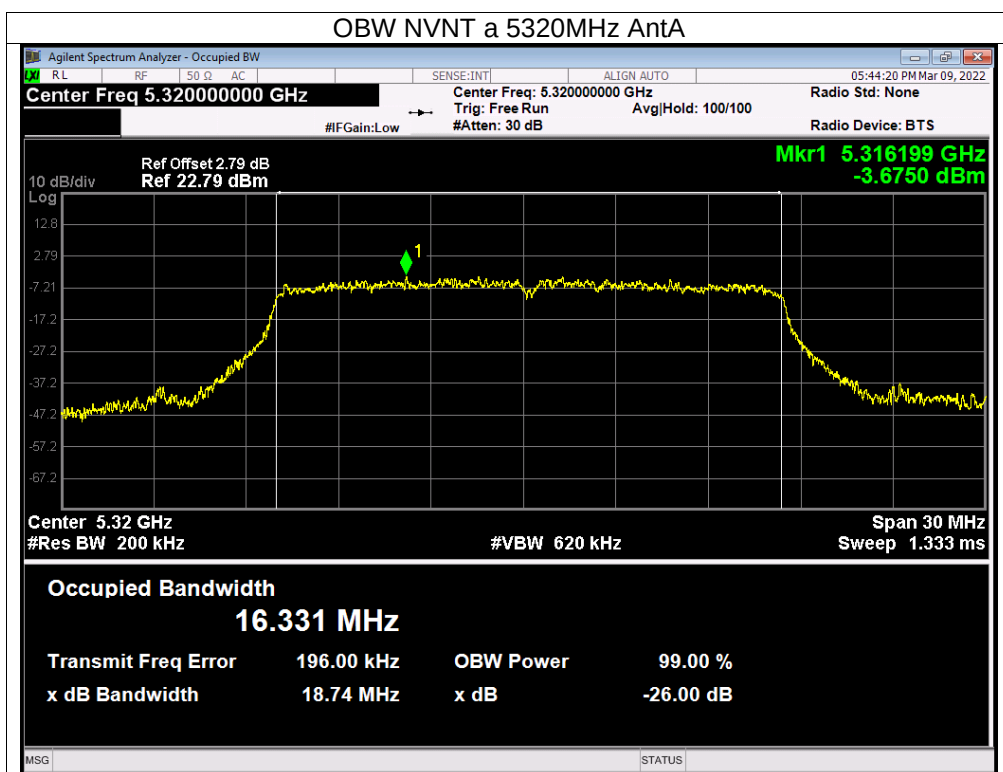
Test Graphs

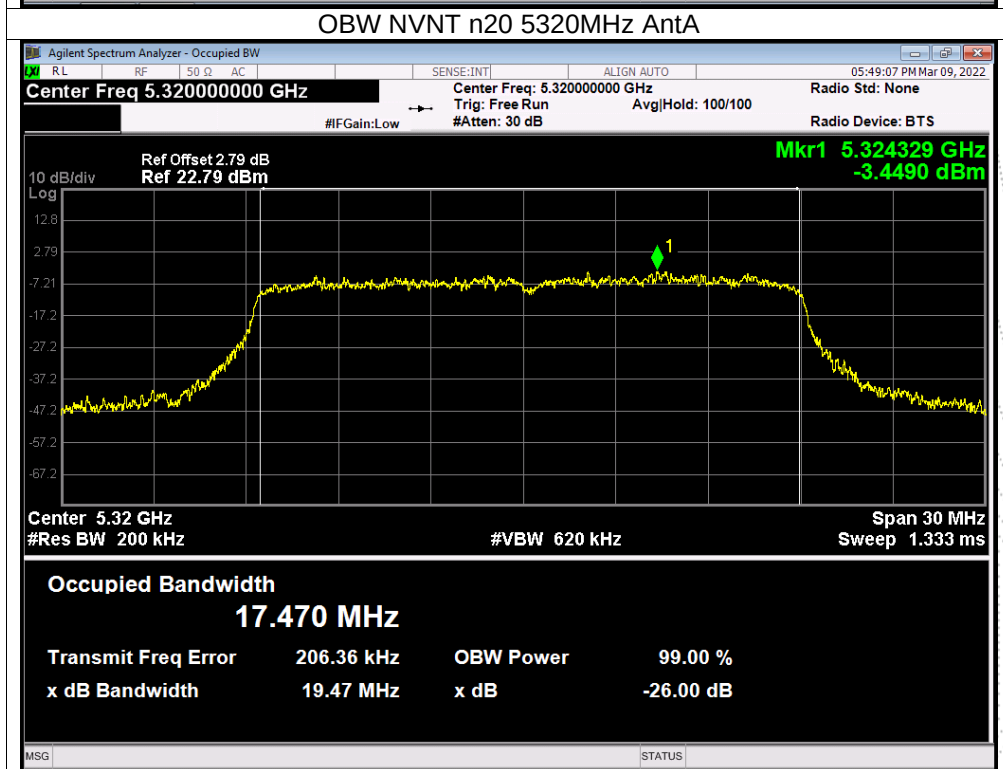
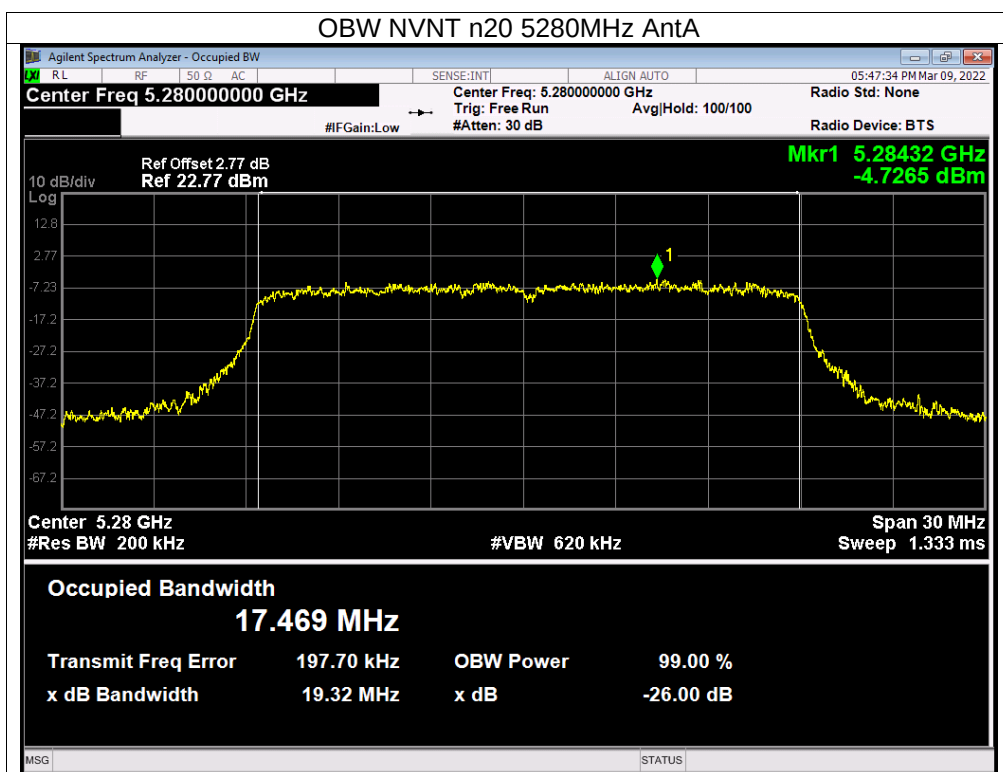
OBW NVNT a 5260MHz AntA

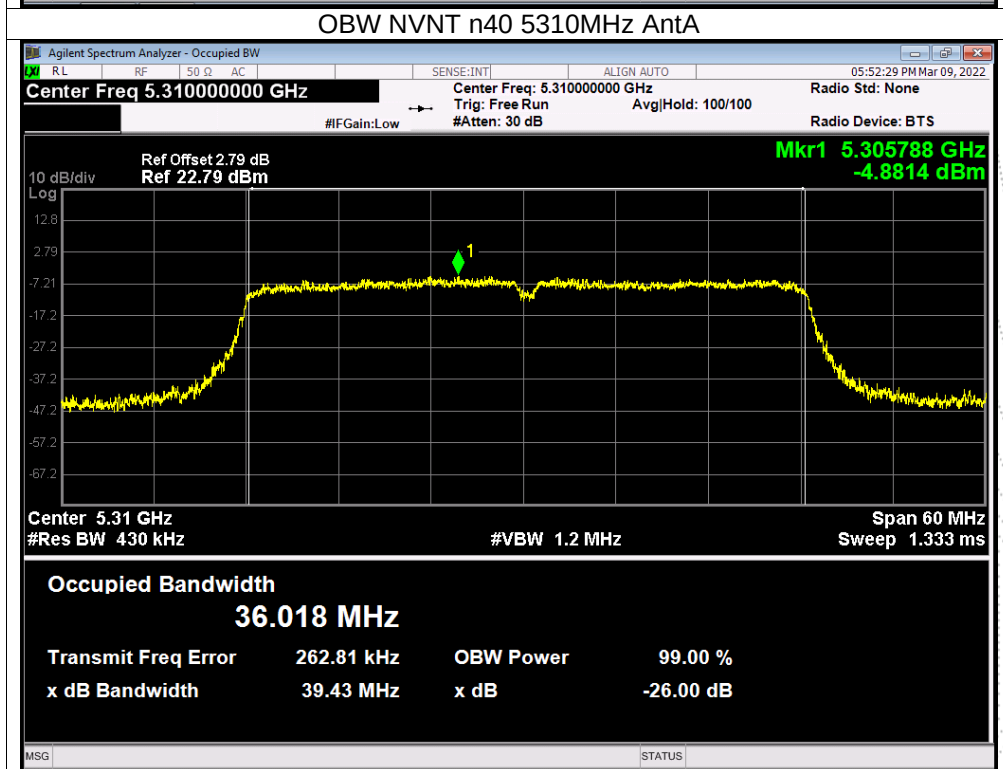
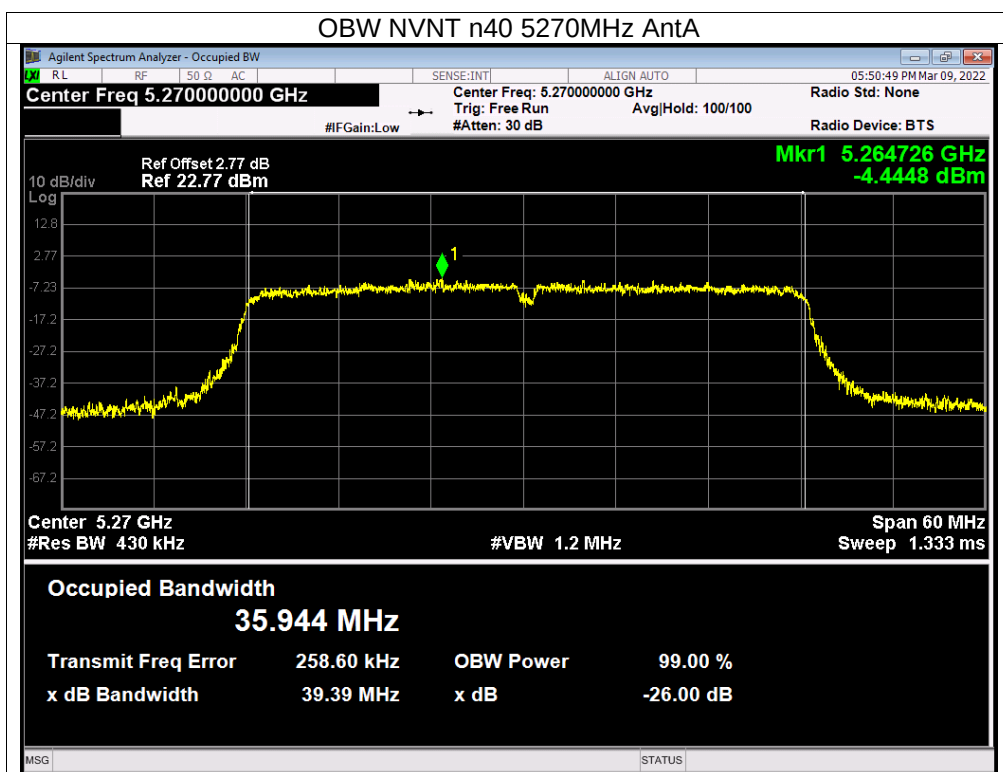


OBW NVNT a 5280MHz AntA









Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX Frequency U-NII-3(5745-5825MHz)		

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

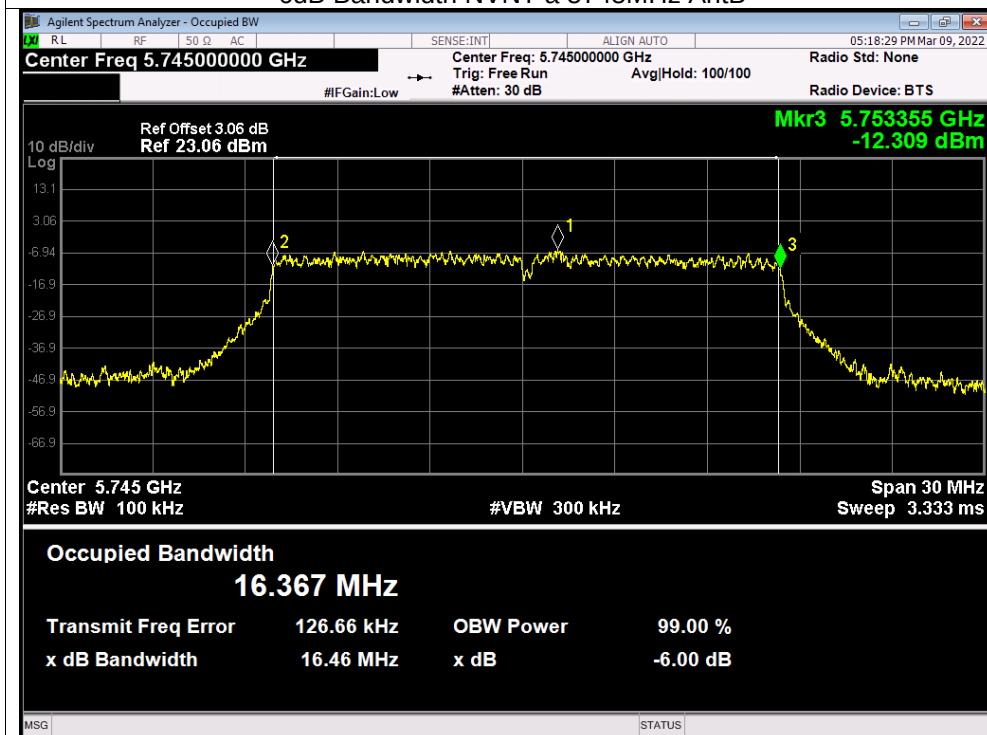
Mode	Channel	Frequency (MHz)	99% bandwidth(M Hz)	6dB bandwidth (MHz)	Limit MHz	Result
			ANT A	ANT A		
802.11a	CH149	5745	16.413	16.406	≥500	Pass
	CH157	5785	3.698	3.423	≥500	Pass
	CH165	5825	16.434	16.438	≥500	Pass
802.11 n20	CH149	5745	17.475	17.597	≥500	Pass
	CH157	5785	17.468	17.6	≥500	Pass
	CH165	5825	17.423	17.506	≥500	Pass
802.11 n40	CH151	5755	36.041	36.351	≥500	Pass
	CH159	5795	36.015	36.347	≥500	Pass

Mode	Channel	Frequency (MHz)	99% bandwidth(M Hz)	6dB bandwidth (MHz)	Limit MHz	Result
			ANT B	ANT B		
802.11a	CH149	5745	16.415	16.456	≥500	Pass
	CH157	5785	16.403	16.433	≥500	Pass
	CH165	5825	16.392	16.426	≥500	Pass
802.11 n20	CH149	5745	17.428	17.508	≥500	Pass
	CH157	5785	17.414	17.04	≥500	Pass
	CH165	5825	17.436	17.595	≥500	Pass
802.11 n40	CH151	5755	35.934	36.356	≥500	Pass
	CH159	5795	35.949	35.998	≥500	Pass

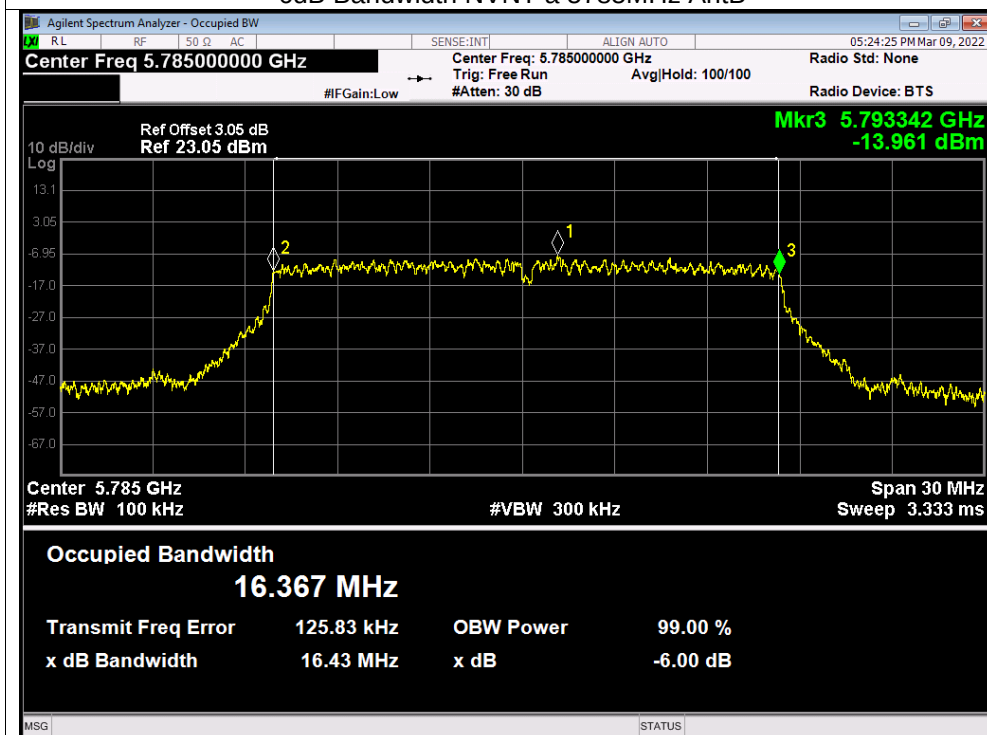
-6dB Bandwidth

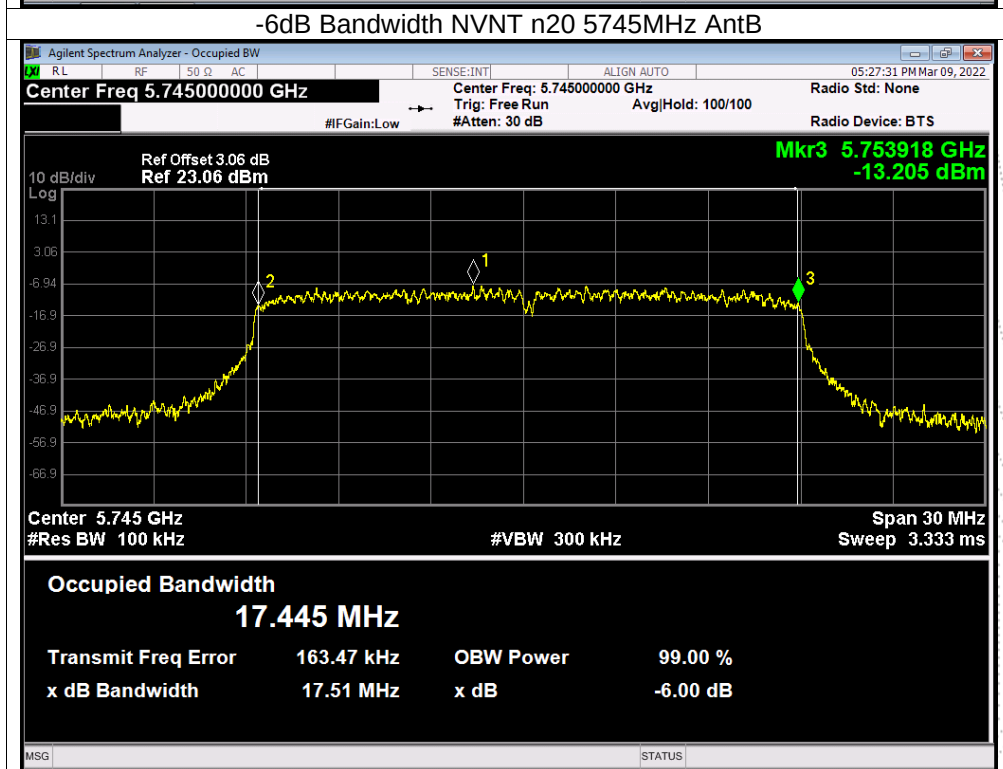
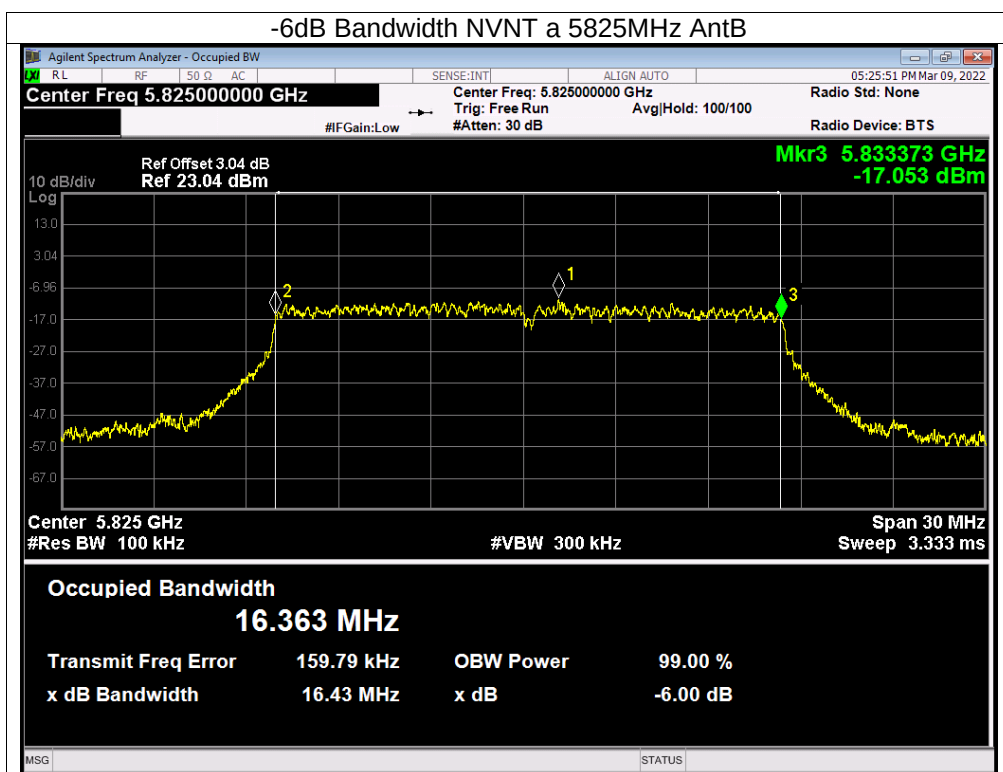
Test Graphs

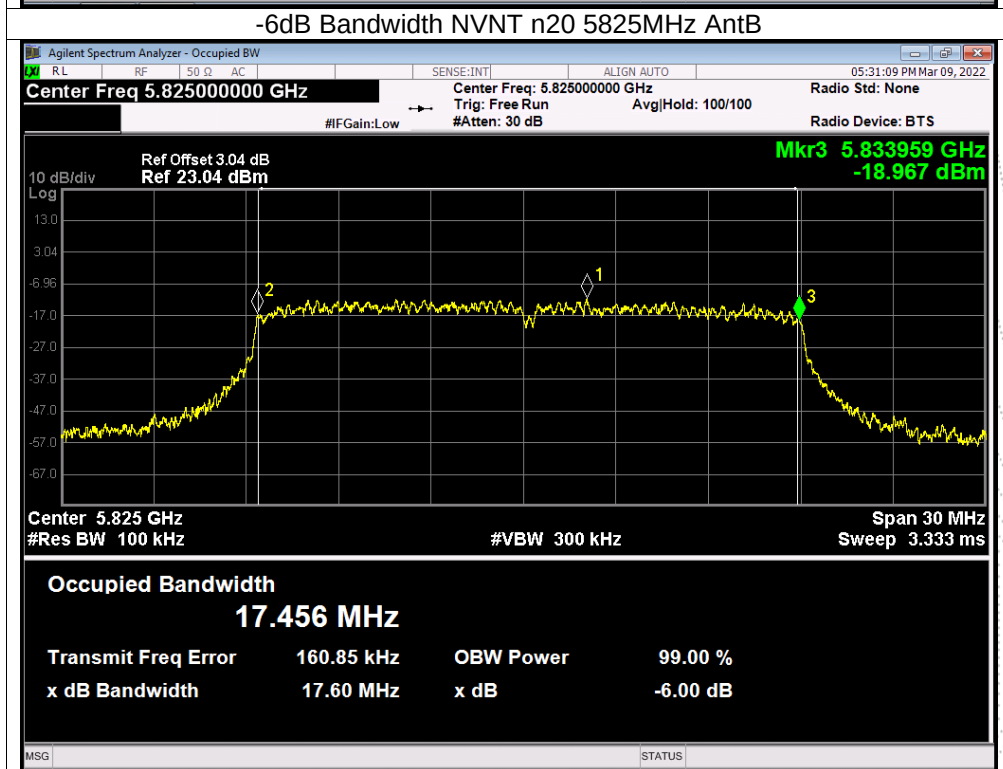
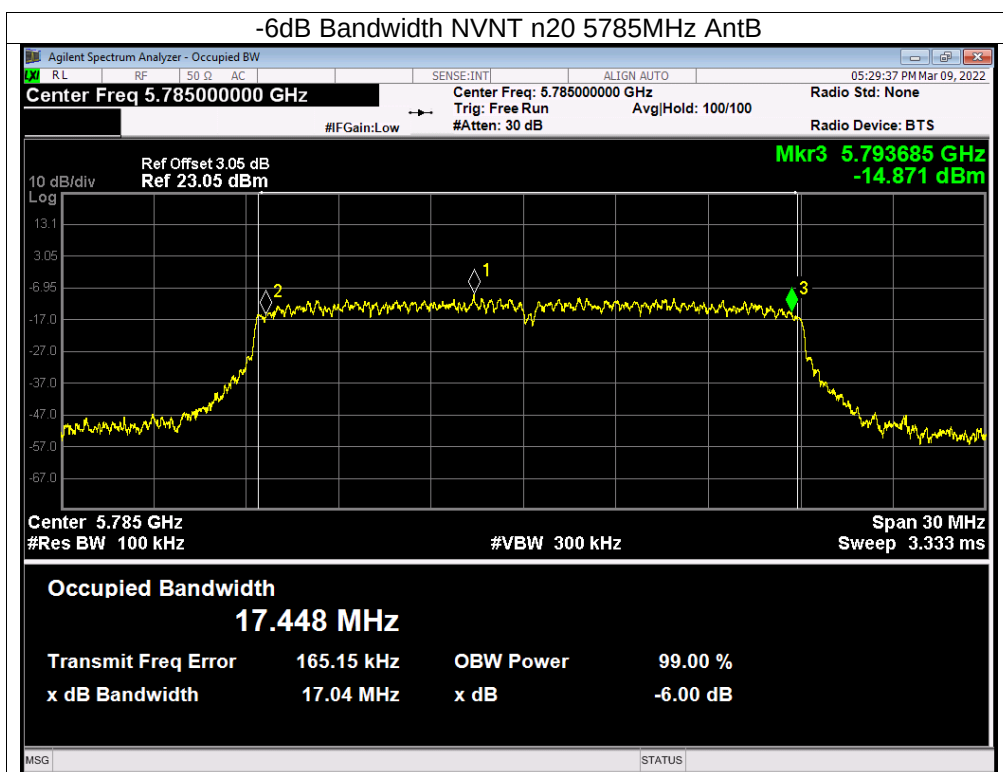
-6dB Bandwidth NVNT a 5745MHz AntB

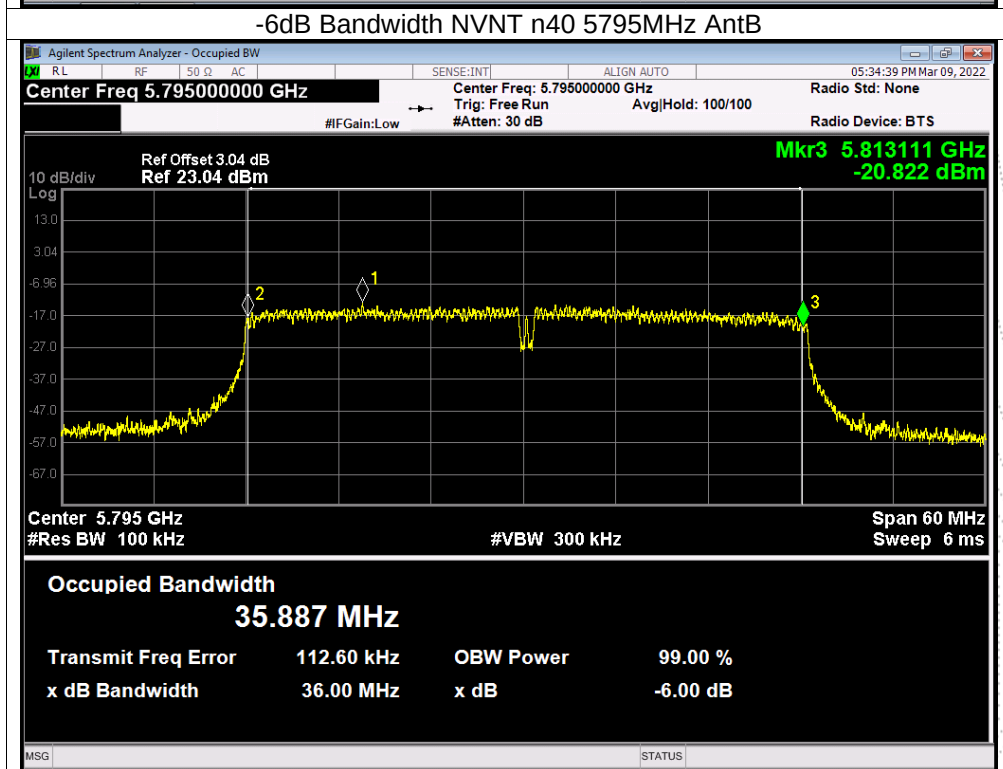
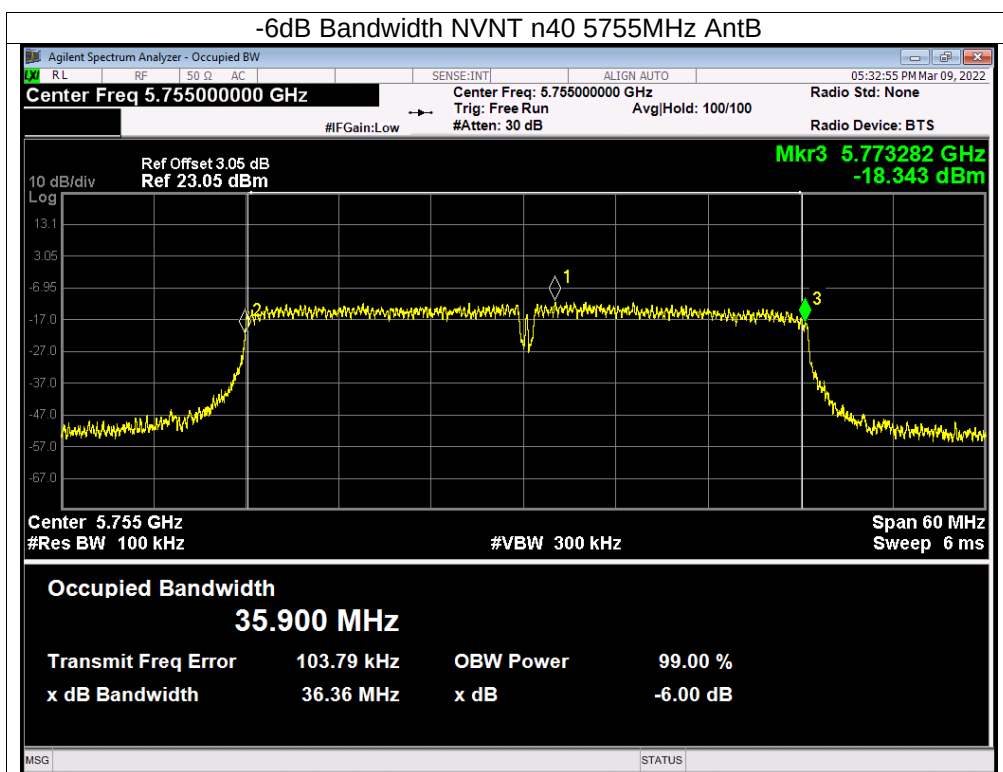


-6dB Bandwidth NVNT a 5785MHz AntB





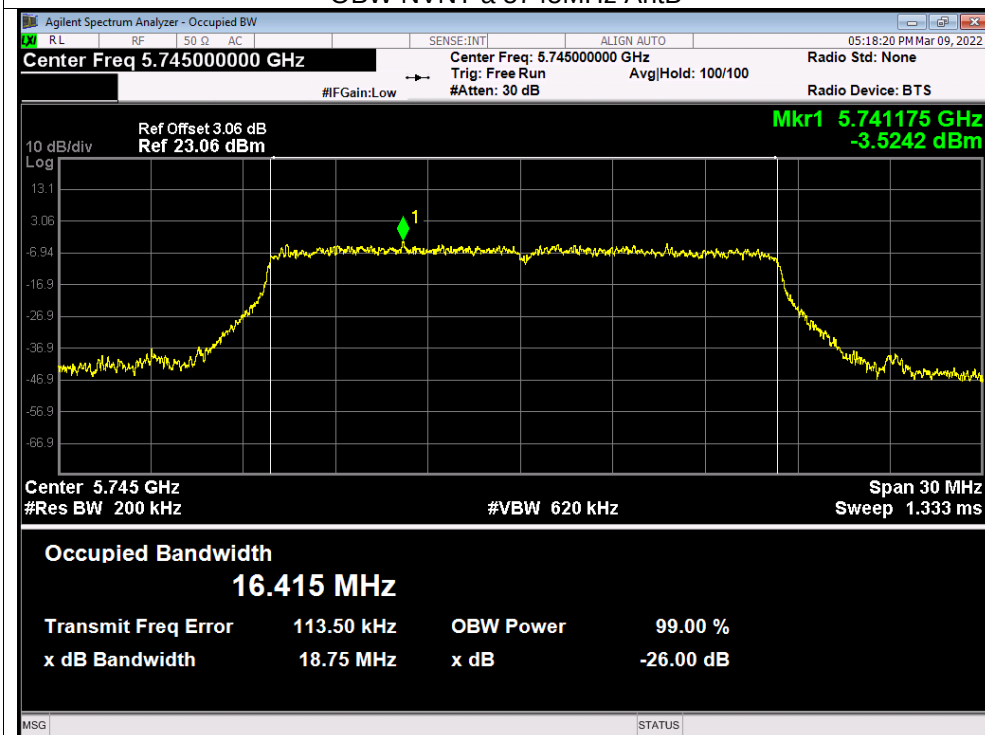




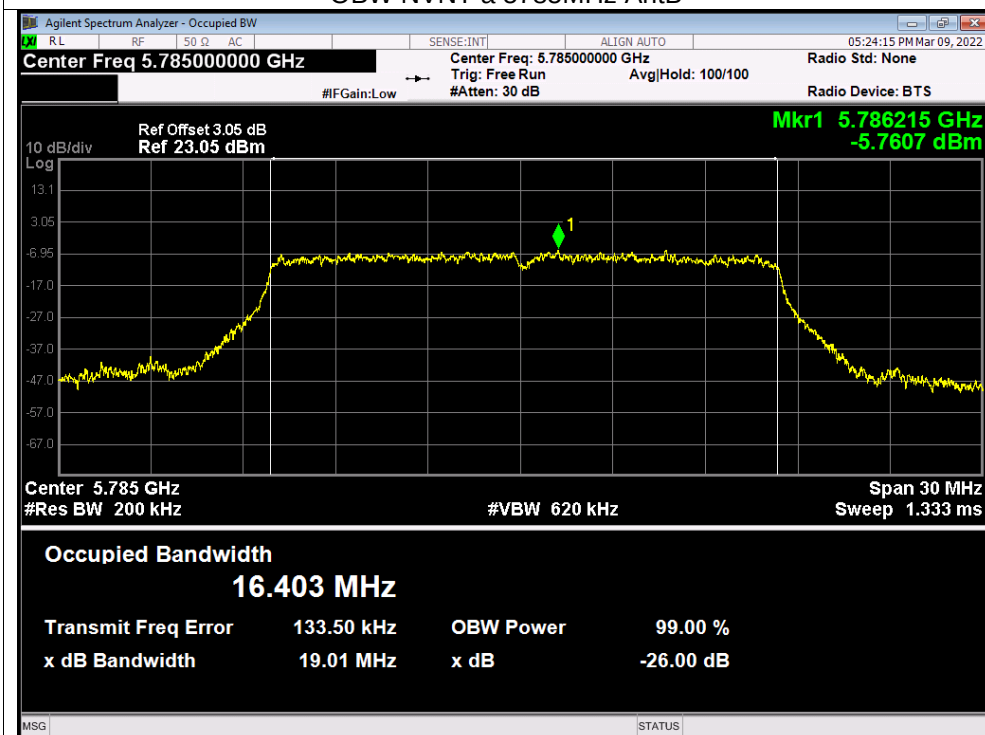
99% OBW

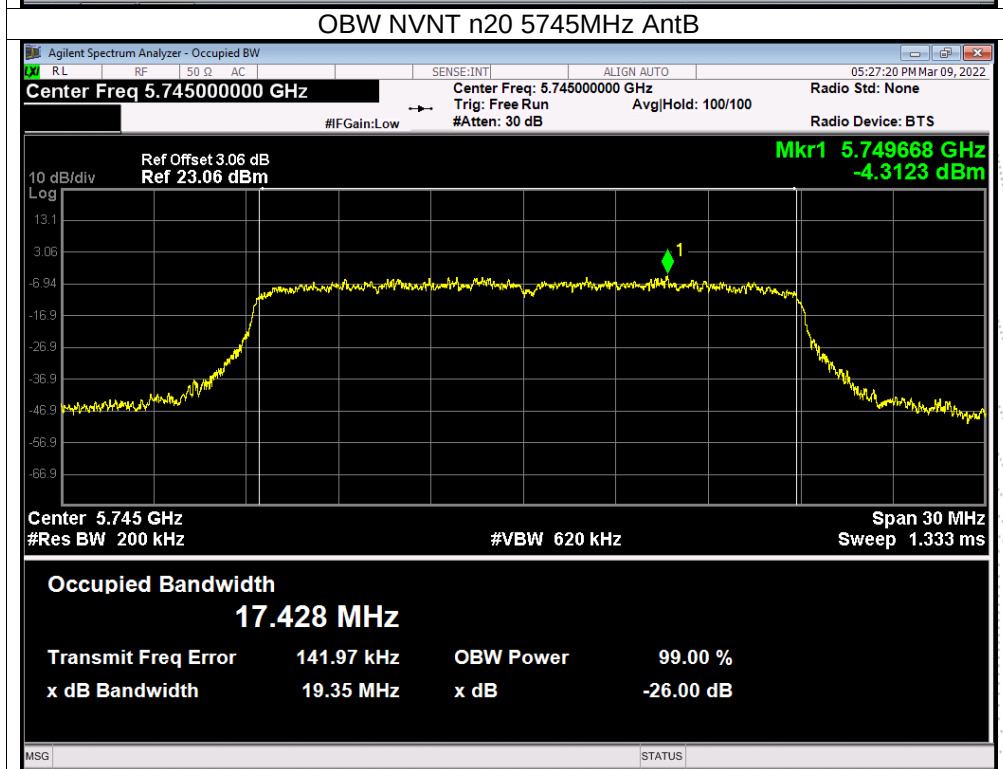
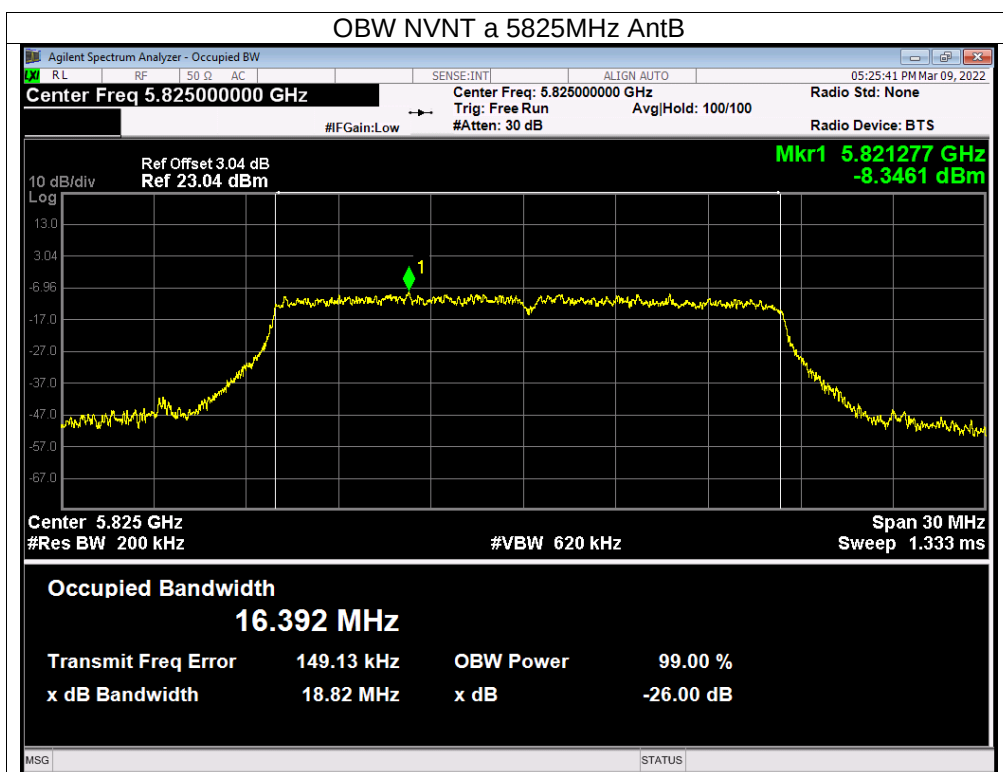
Test Graphs

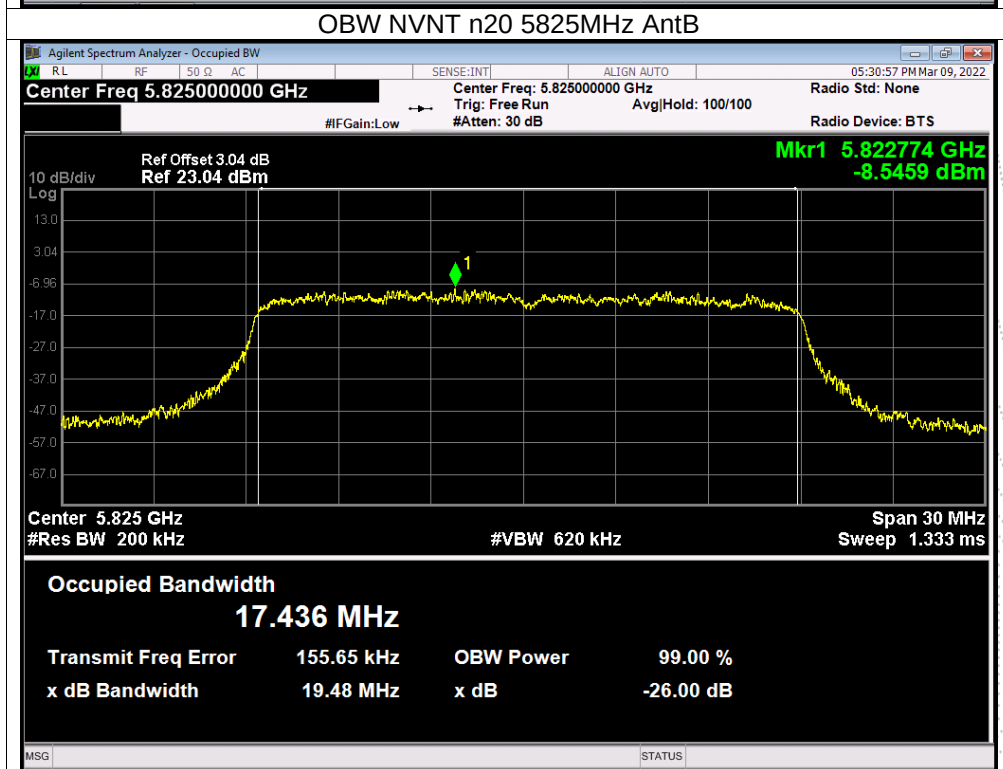
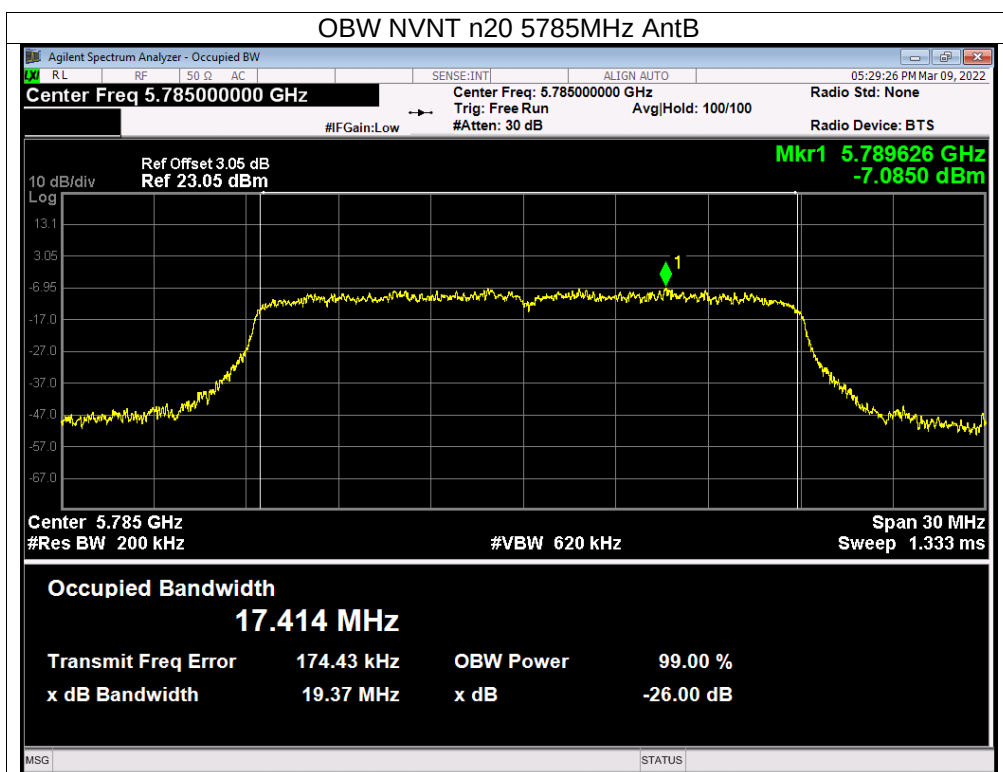
OBW NVNT a 5745MHz AntB

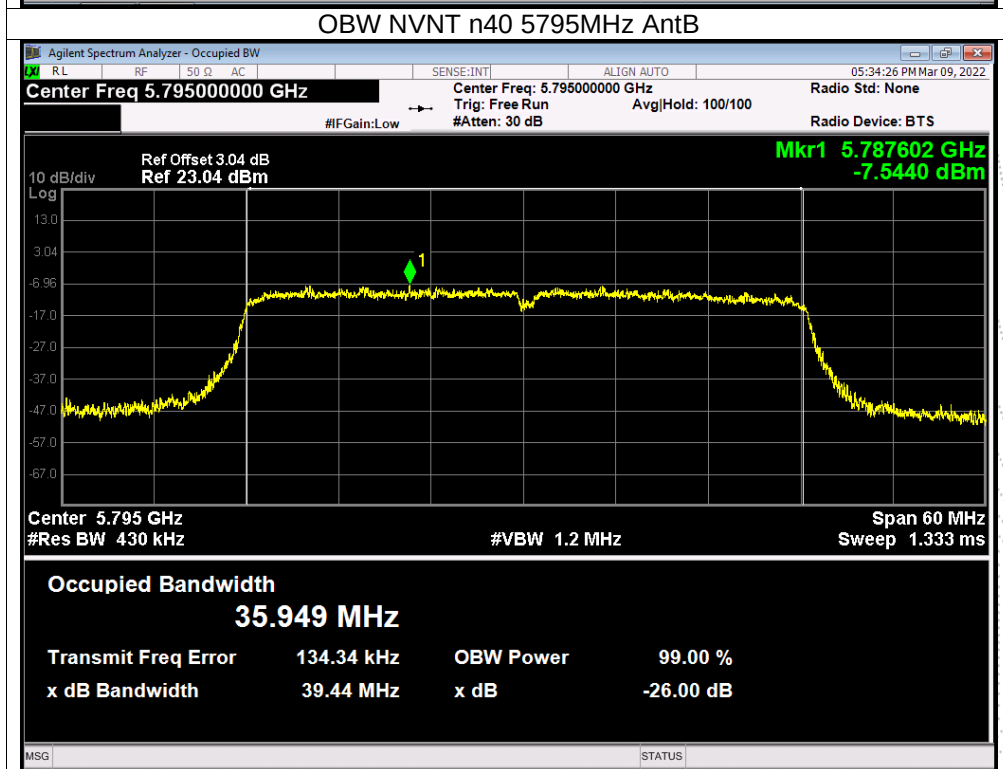
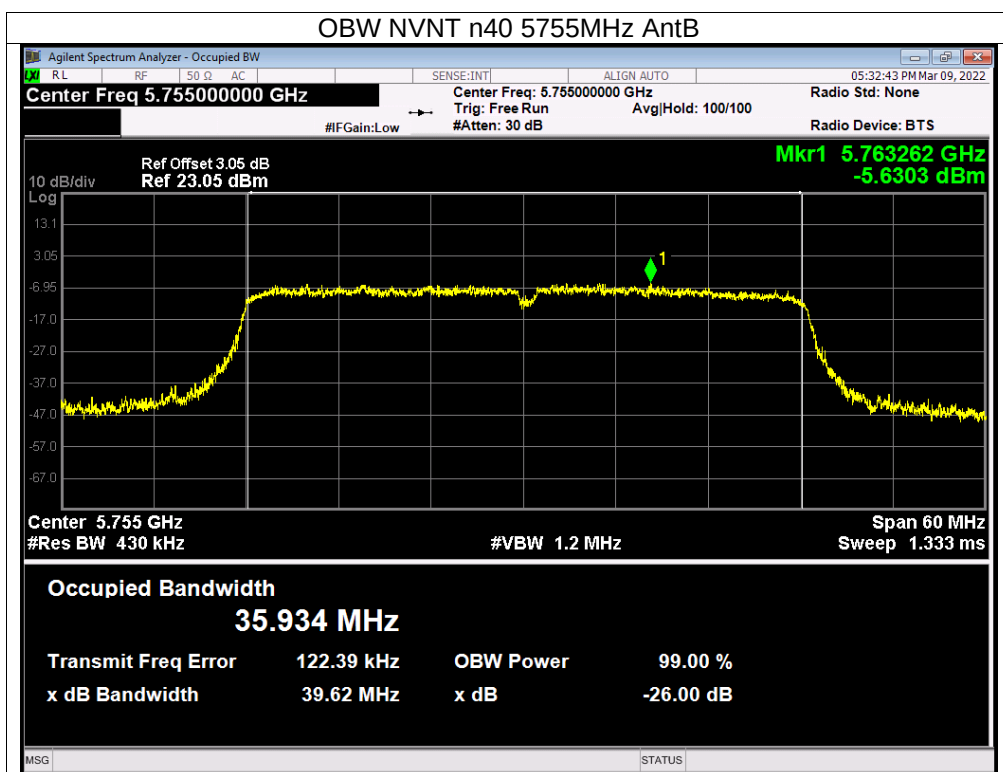


OBW NVNT a 5785MHz AntB









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 $\geq$ 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 ± 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.

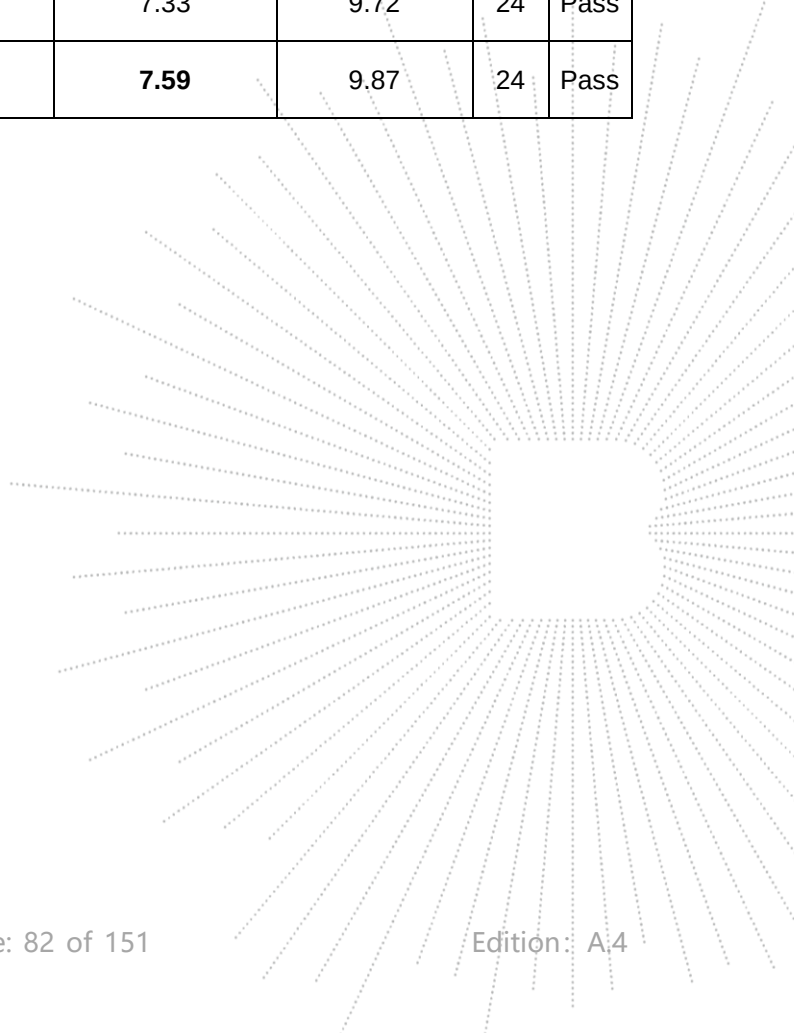
10.5 Test Result

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX (5.1G) Mode Frequency U-NII-1 (5180-5240MHz)		

Test Mode	Test Channel	Frequency	Maximum output power. Antenna port (AV)			LIMIT	Result
		(MHz)	ANT A(dBm)	ANT B(dBm)	Total(dBm)	dBm	
TX 802.11a Mode	CH36	5180	8.22	8.23	/	24	Pass
	CH40	5200	8.94	8.2	/	24	Pass
	CH48	5240	7.49	7.39	/	24	Pass
TX 802.11 n20M Mode	CH36	5180	6.83	7.95	10.44	24	Pass
	CH40	5200	7.69	6.23	10.03	24	Pass
	CH48	5240	7.05	6.69	9.88	24	Pass
TX 802.11 n40M Mode	CH38	5190	6.66	7.25	9.98	24	Pass
	CH46	5230	6.72	6.02	9.39	24	Pass

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX (5.3G) Mode Frequency U-NII-2 (5260-5320MHz)		

Test Mode	Test Channel	Frequency	Maximum output power. Antenna port (AV)			LIMIT	Result
		(MHz)	ANT A(dBm)	ANT B(dBm)	Total(dBm)	dBm	
TX 802.11a Mode	CH52	5260	5.72	6.82	/	24	Pass
	CH56	5280	7.08	6.71	/	24	Pass
	CH64	5320	6.83	7.54	/	24	Pass
TX 802.11 n20M Mode	CH52	5260	5.99	7.02	9.55	24	Pass
	CH56	5280	5.76	7.34	9.63	24	Pass
	CH64	5320	6.68	7.44	10.09	24	Pass
TX 802.11 n40M Mode	CH54	5270	5.99	7.33	9.72	24	Pass
	CH62	5310	5.99	7.59	9.87	24	Pass



Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX (5G) Mode Frequency U-NII-3 (5745-5825MHz)		

Test Mode	Test Channel	Frequency	Maximum output power. Antenna port (AV)			LIMIT	Result
		(MHz)	ANT A(dBm)	ANT B(dBm)	Total(dBm)	dBm	
TX 802.11a Mode	CH 149	5745	5.25	6.78	/	30	Pass
	CH 157	5785	5.01	4.88	/	30	Pass
	CH 165	5825	2.71	2.35	/	30	Pass
TX 802.11 n20M Mode	CH 149	5745	6.37	5.91	9.16	30	Pass
	CH 157	5785	4.51	3.4	7.00	30	Pass
	CH 165	5825	2.98	1.76	5.42	30	Pass
TX 802.11 n40M Mode	CH 151	5755	5.76	5.29	8.54	30	Pass
	CH 159	5795	3.85	2.88	6.40	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.

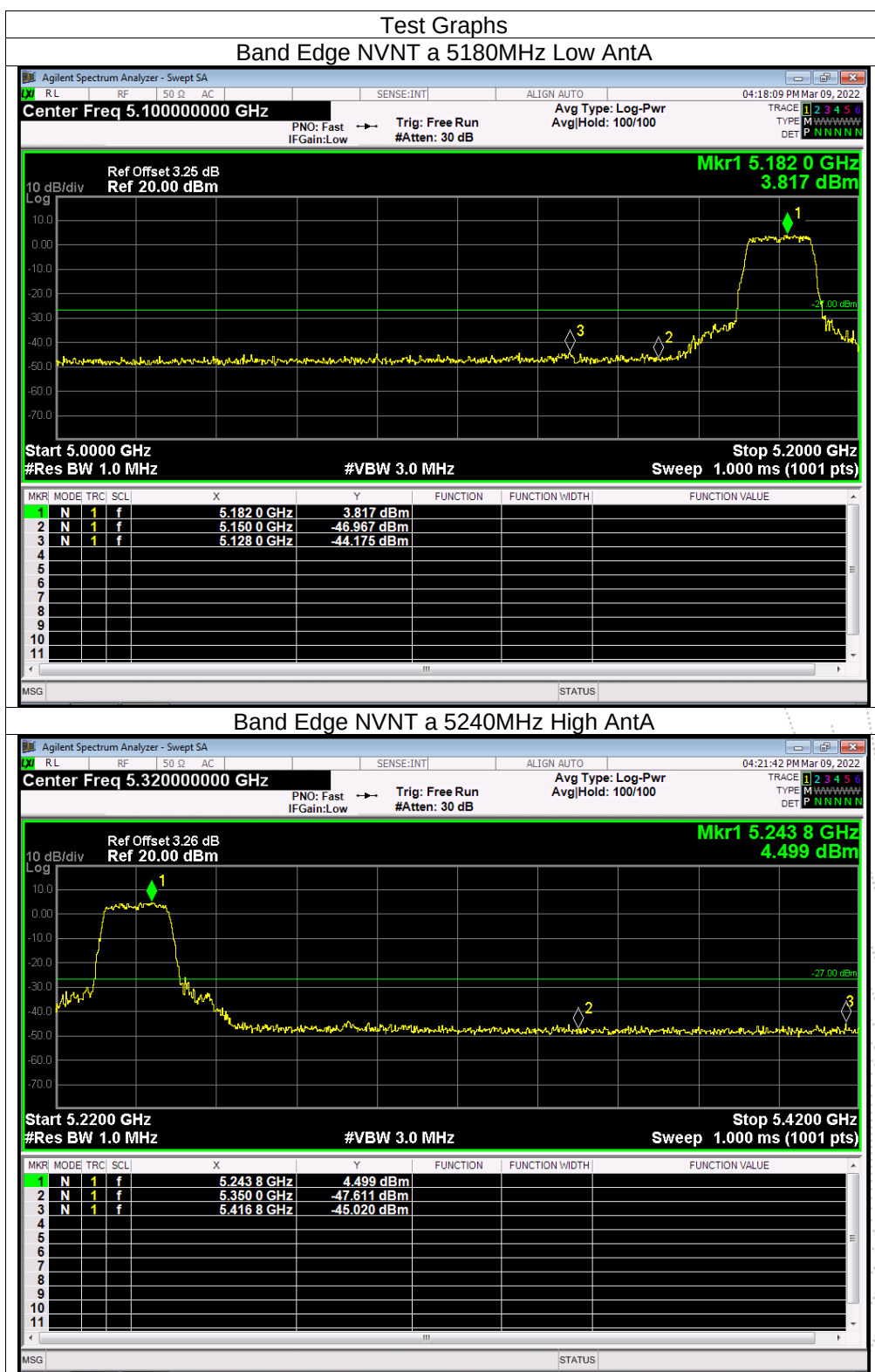
11.4 EUT Operating Conditions

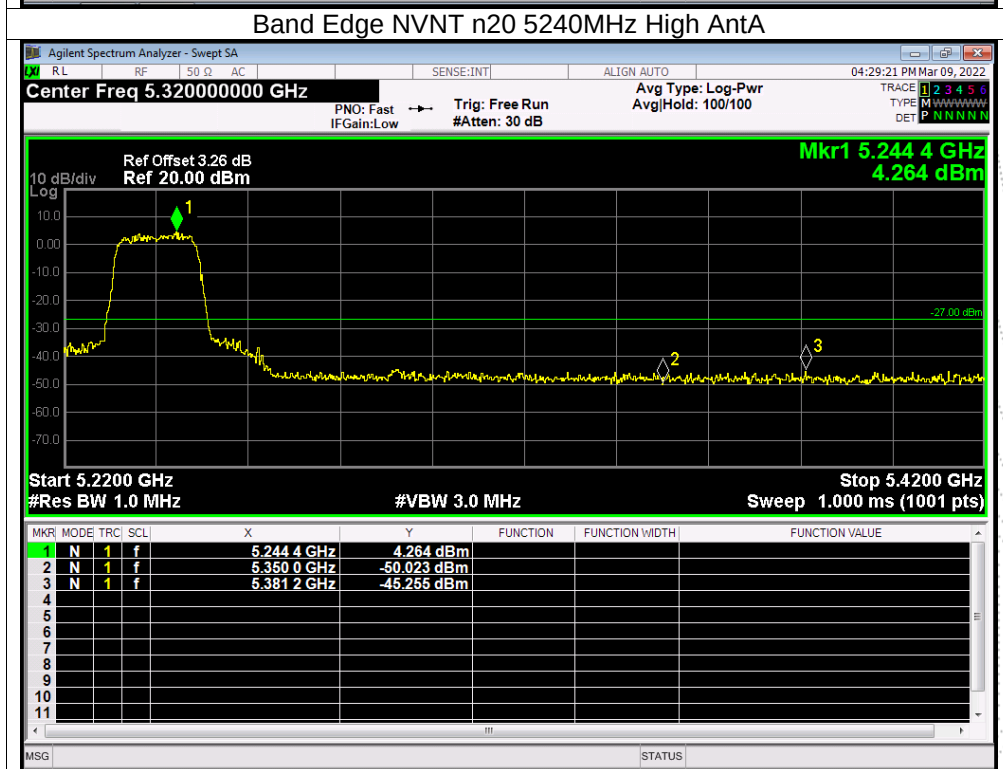
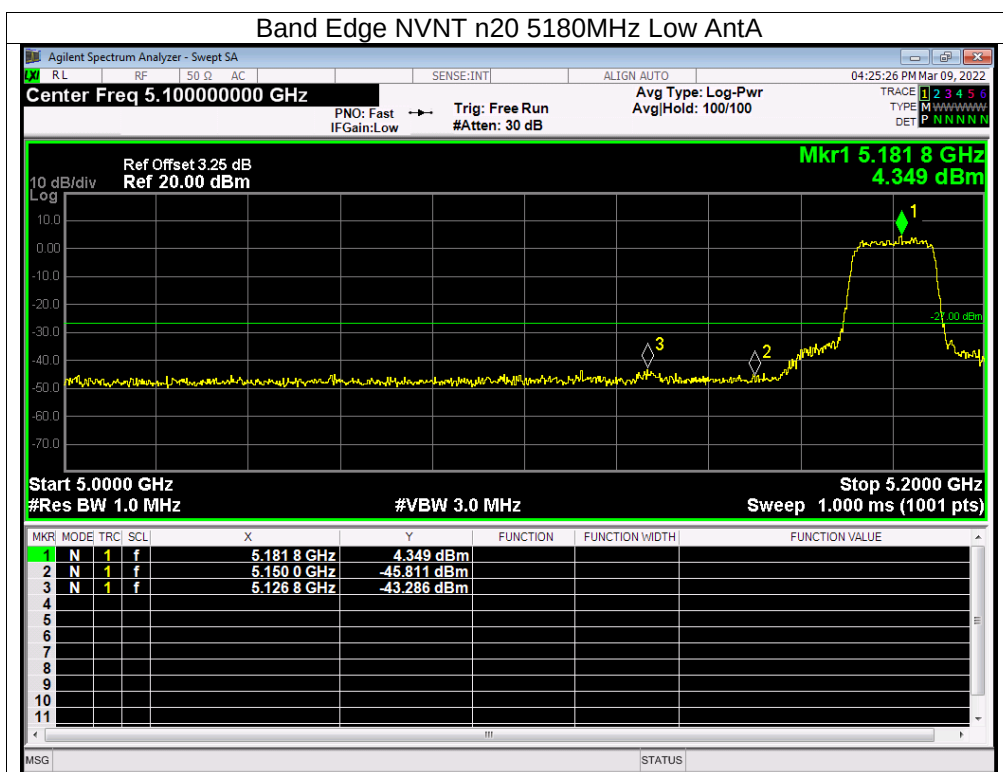
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data

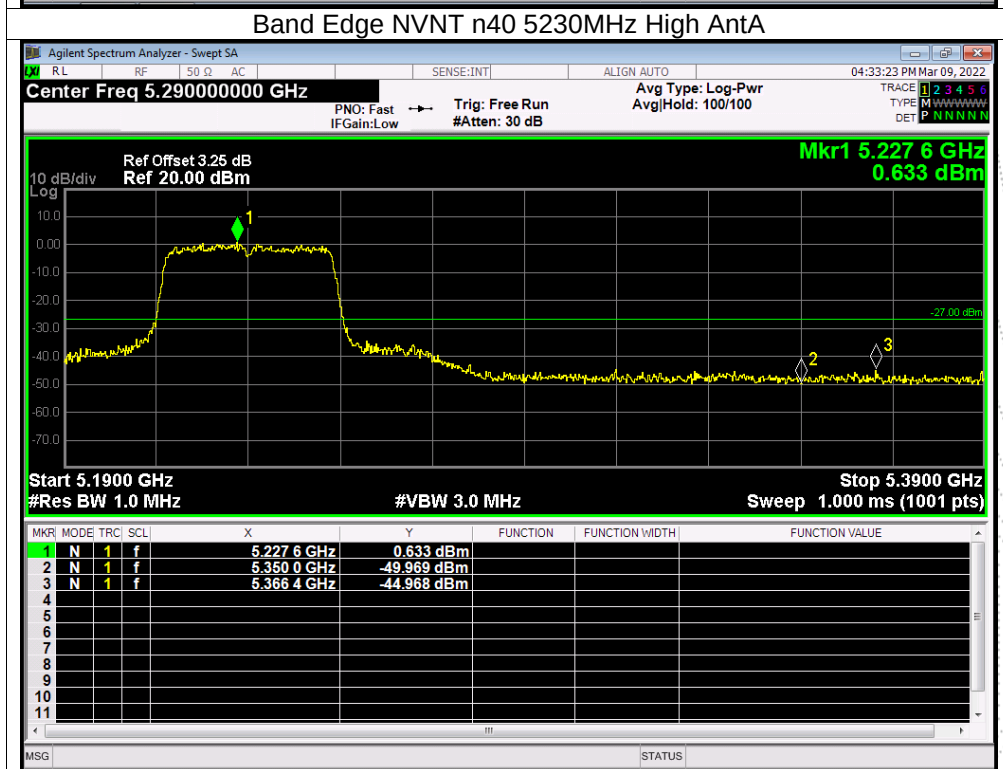
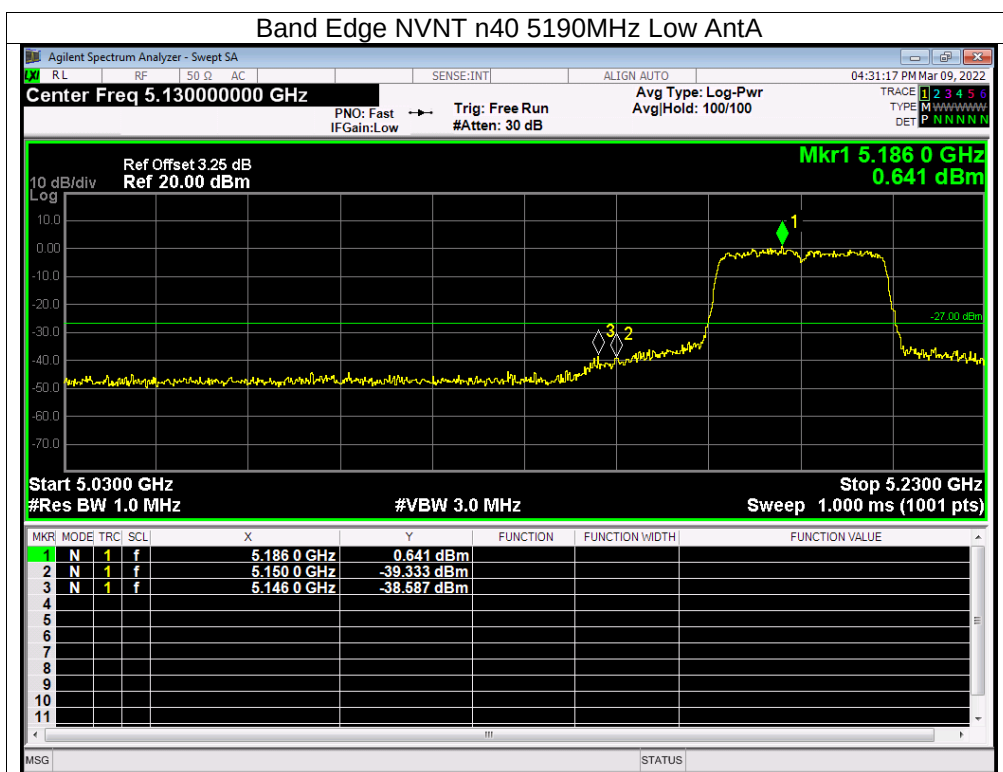
11.5 Test Result

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A.
Plot. Antenna A: 5180-5240MHz







Note: A(B) Represent the value of antenna A and B, The worst data is Antenna B, only shown Antenna B.
Antenna B: 5260-5230MHz

