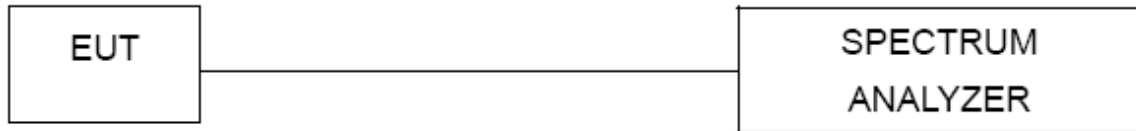


11. Out Of Band Emissions

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

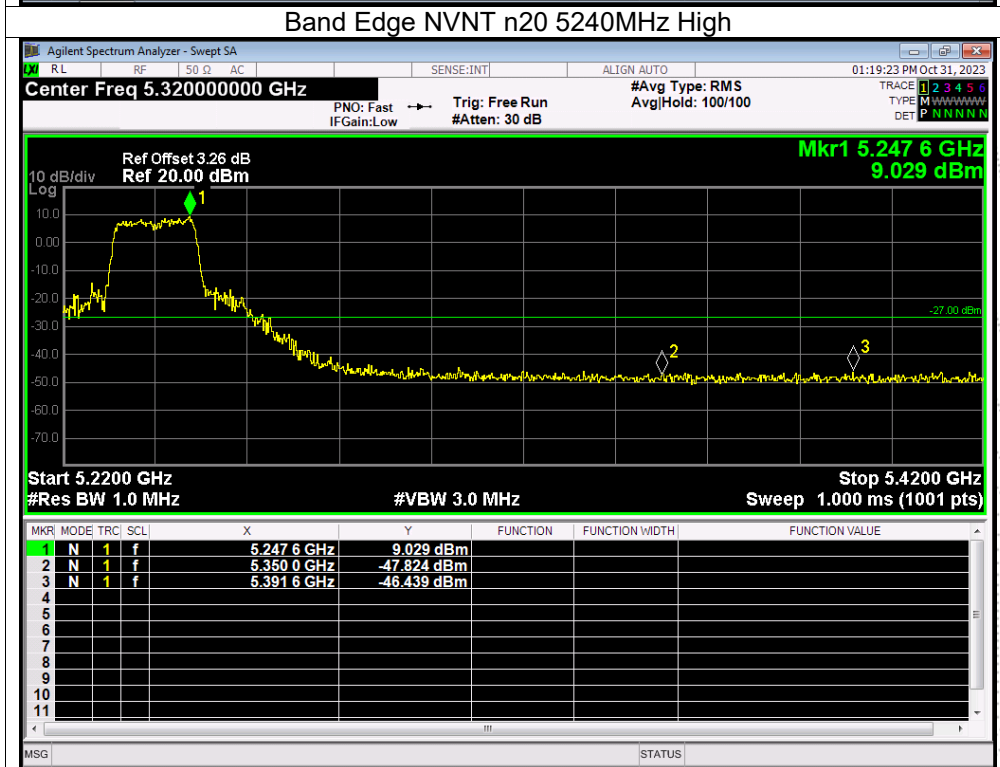
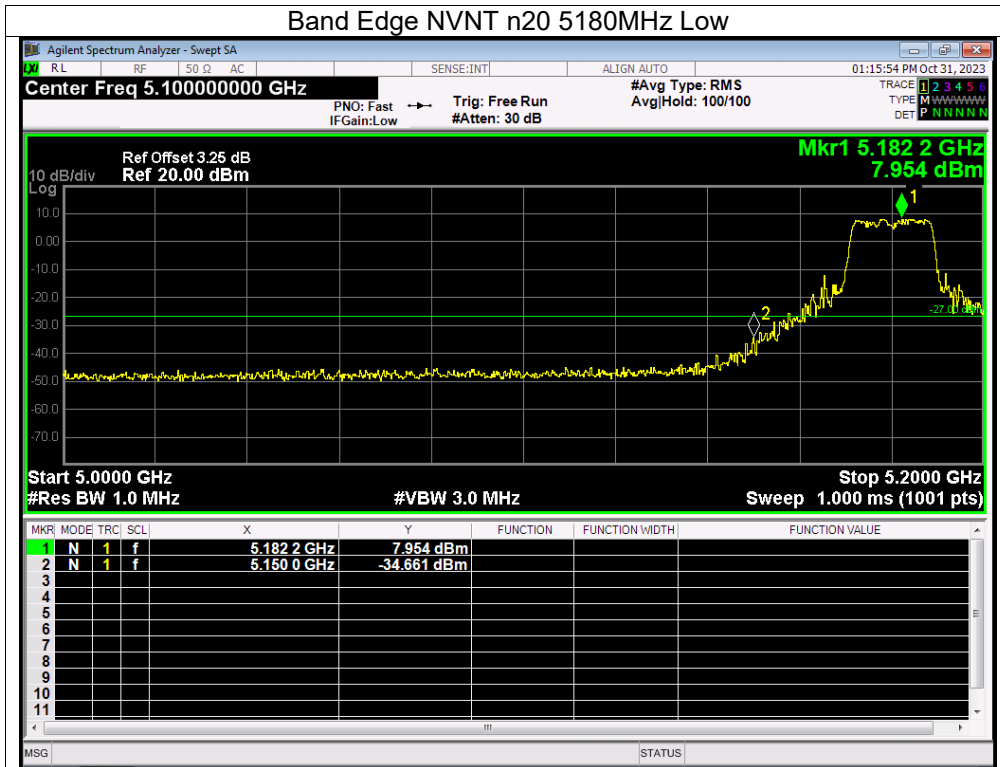
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then 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.

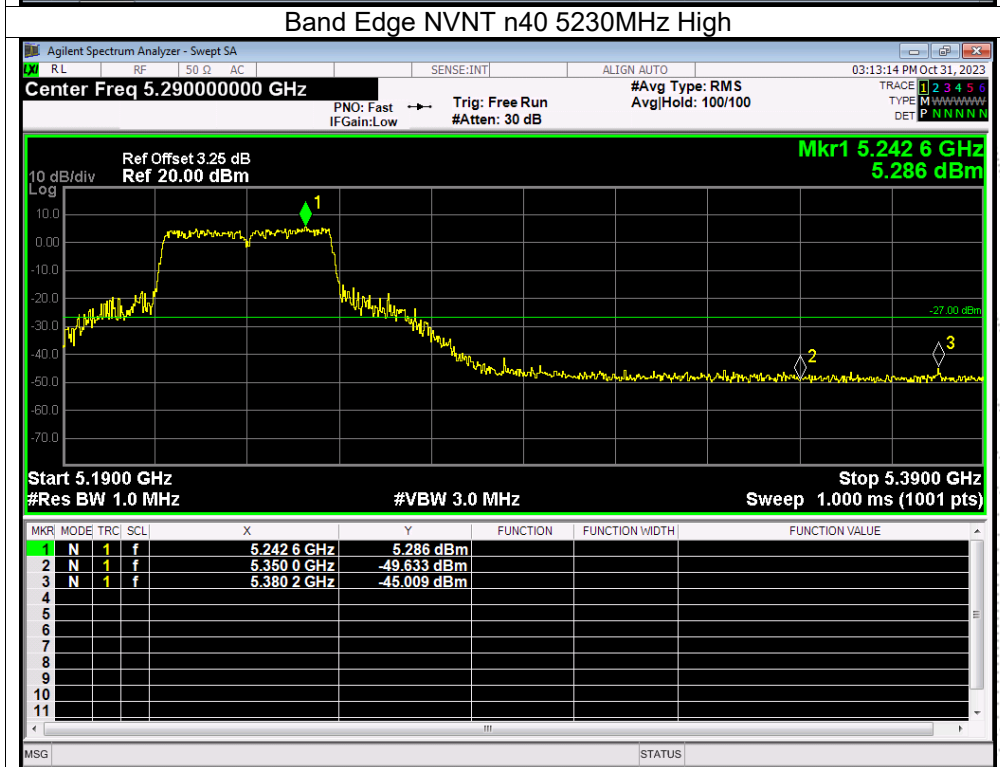
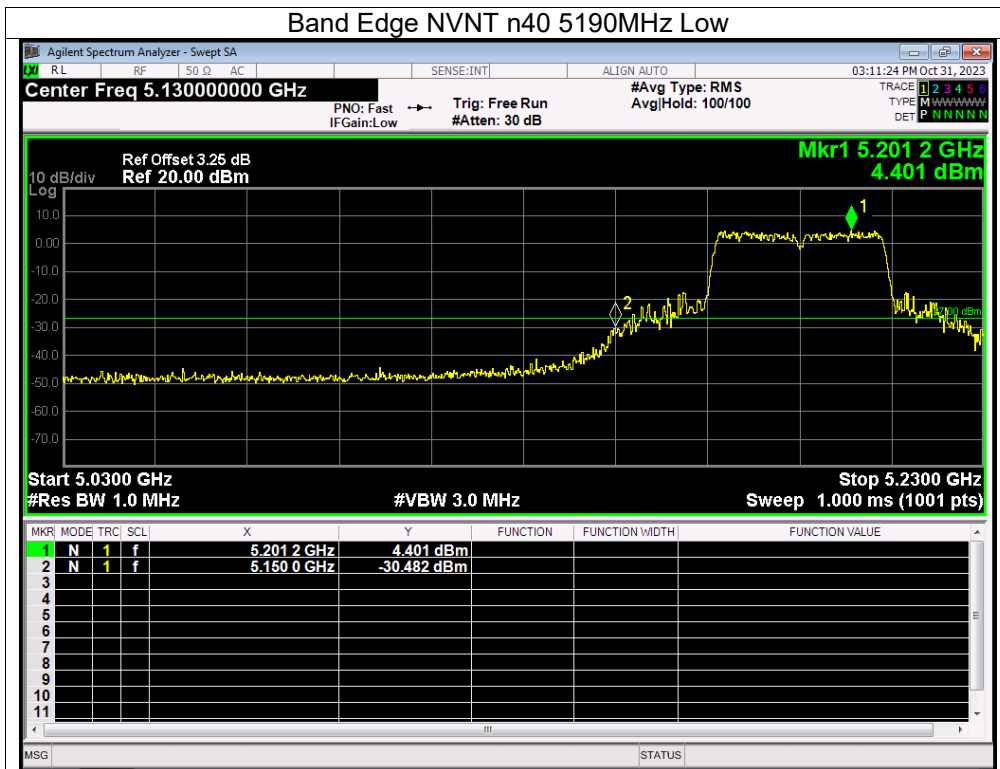
11.4 EUT Operating Conditions

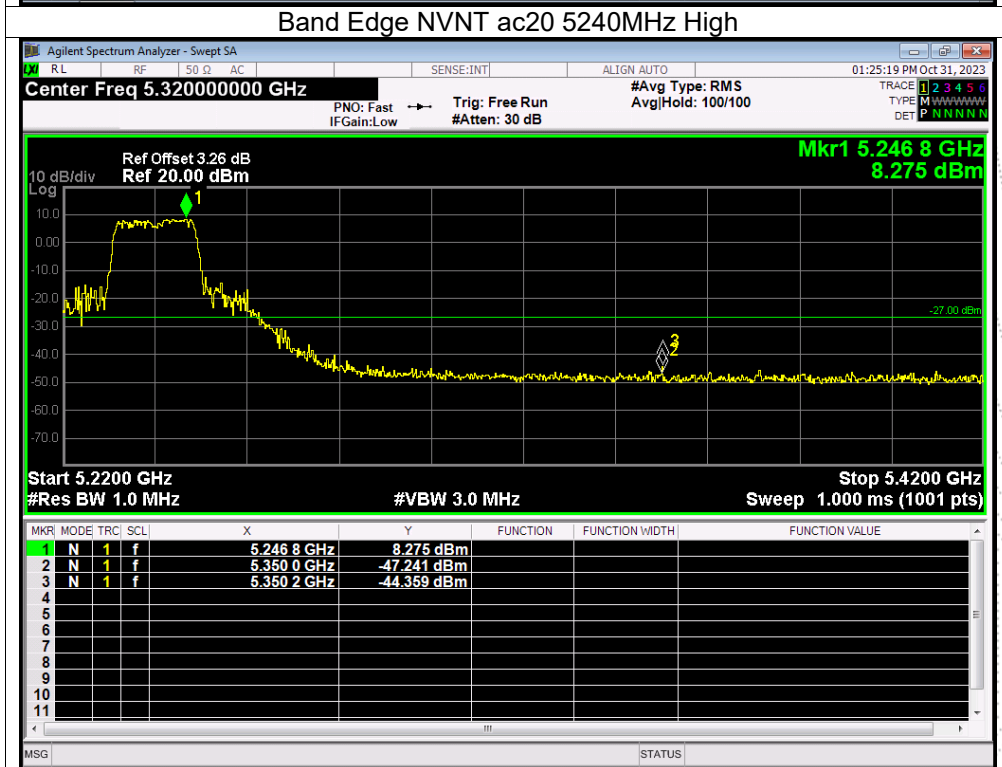
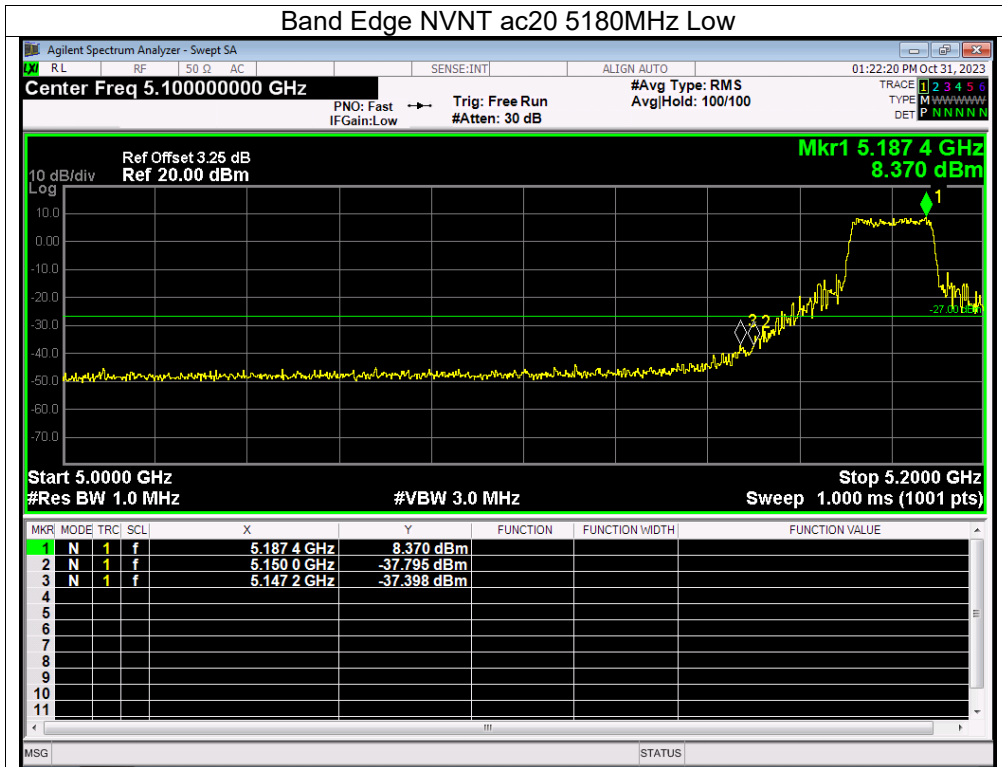
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data

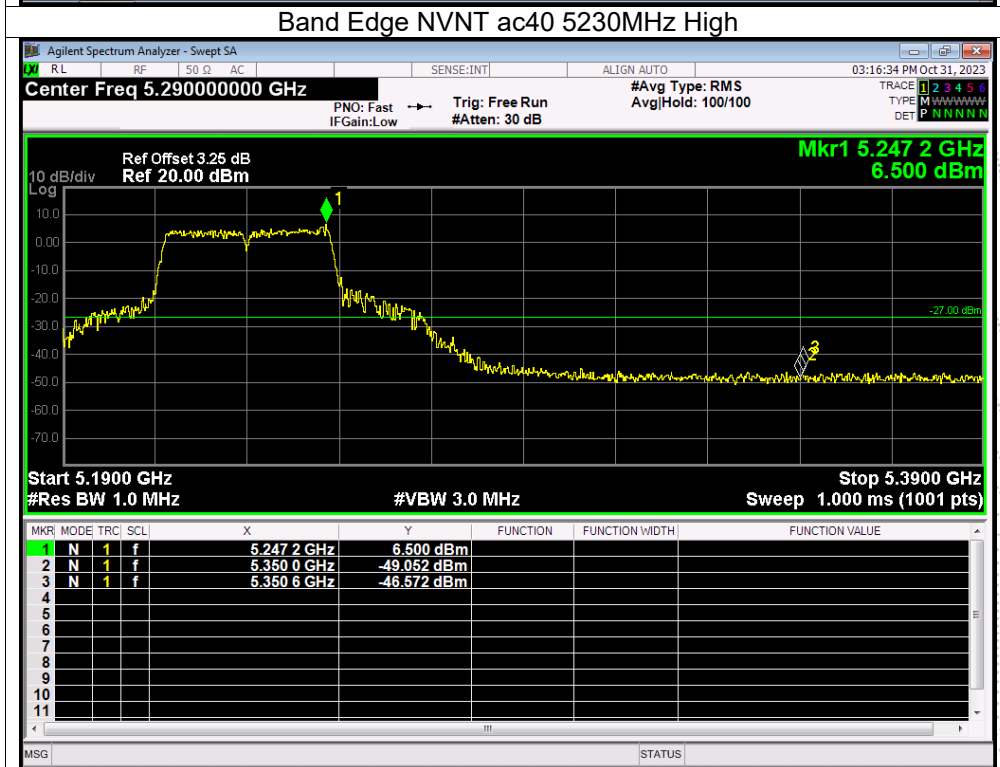
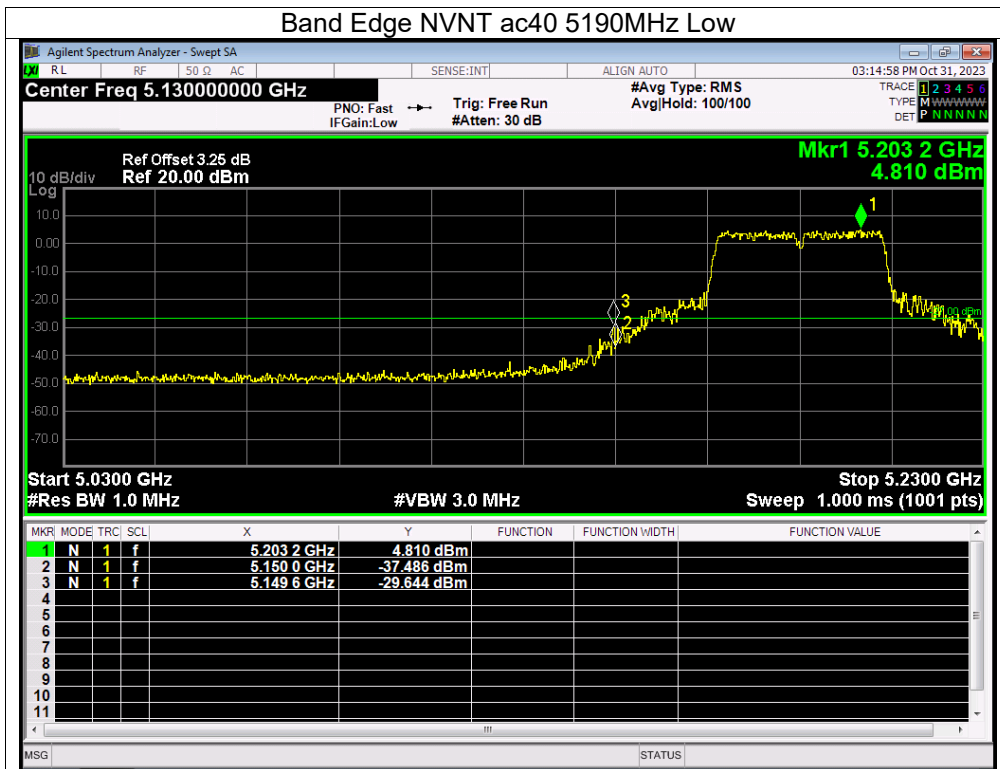
11.5 Test Result

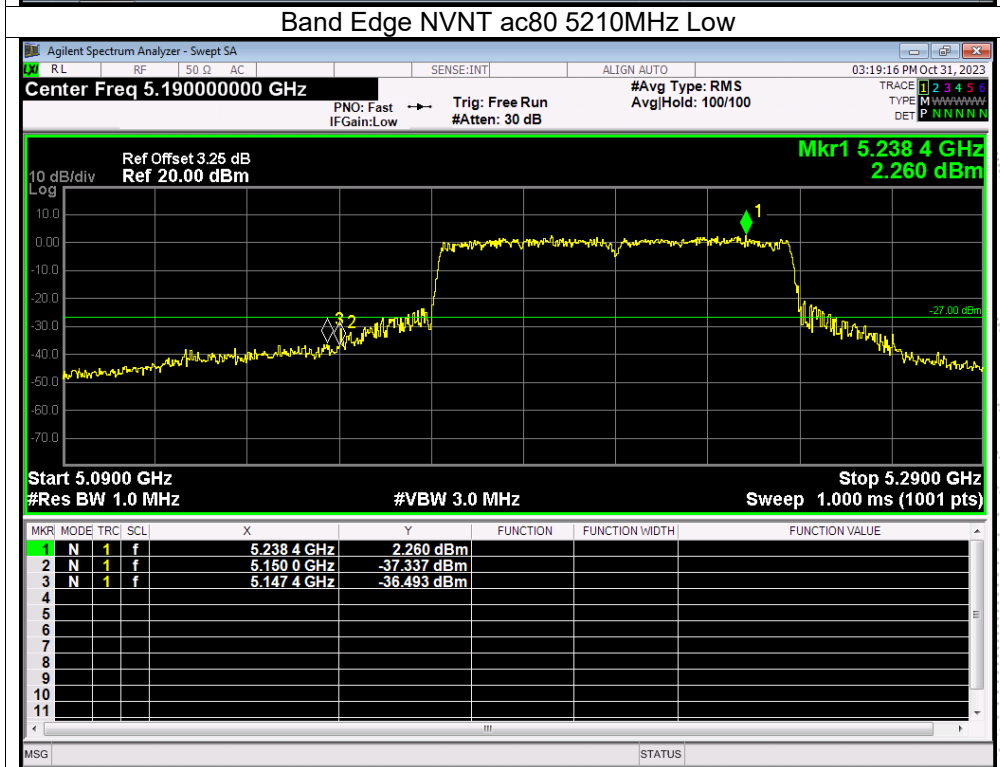
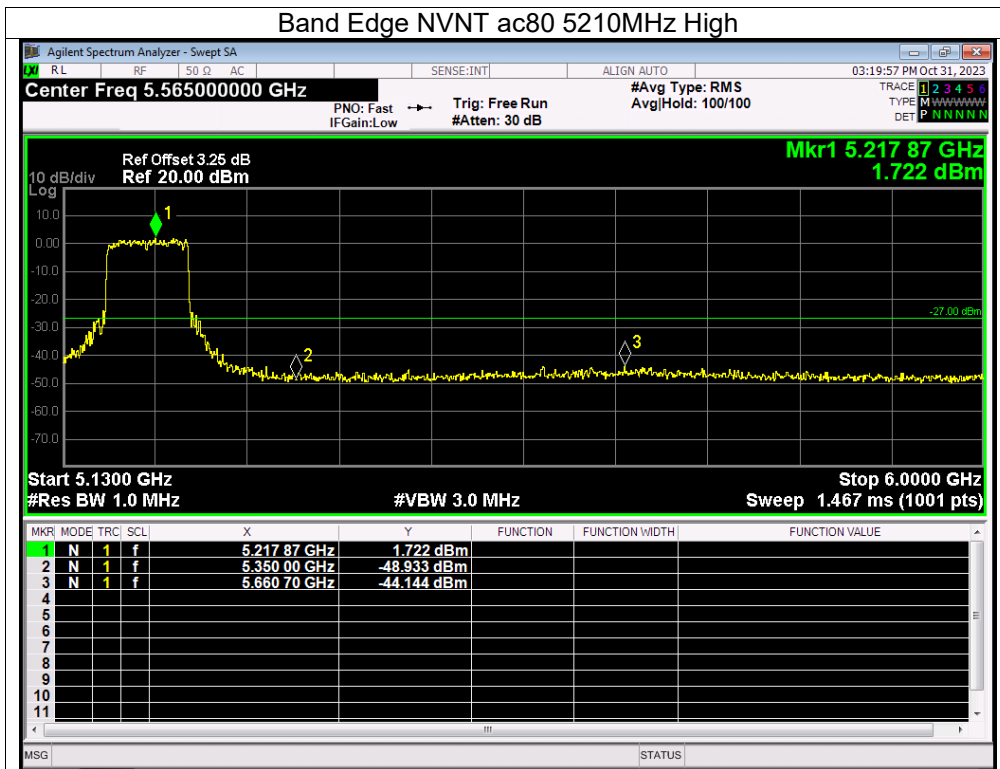


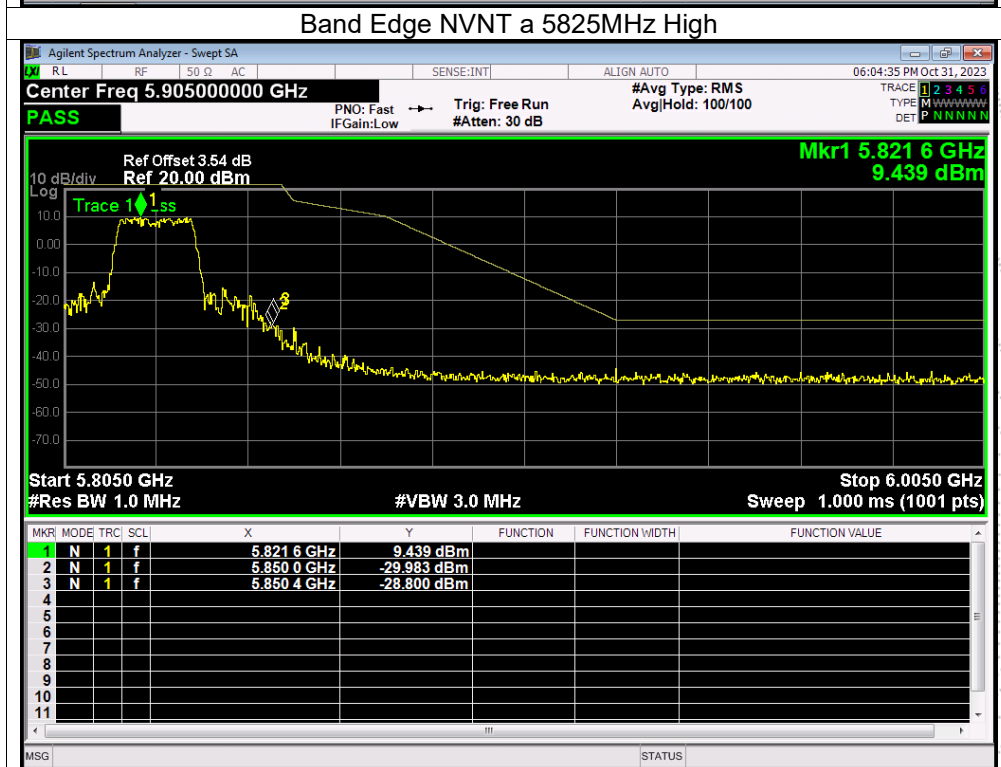
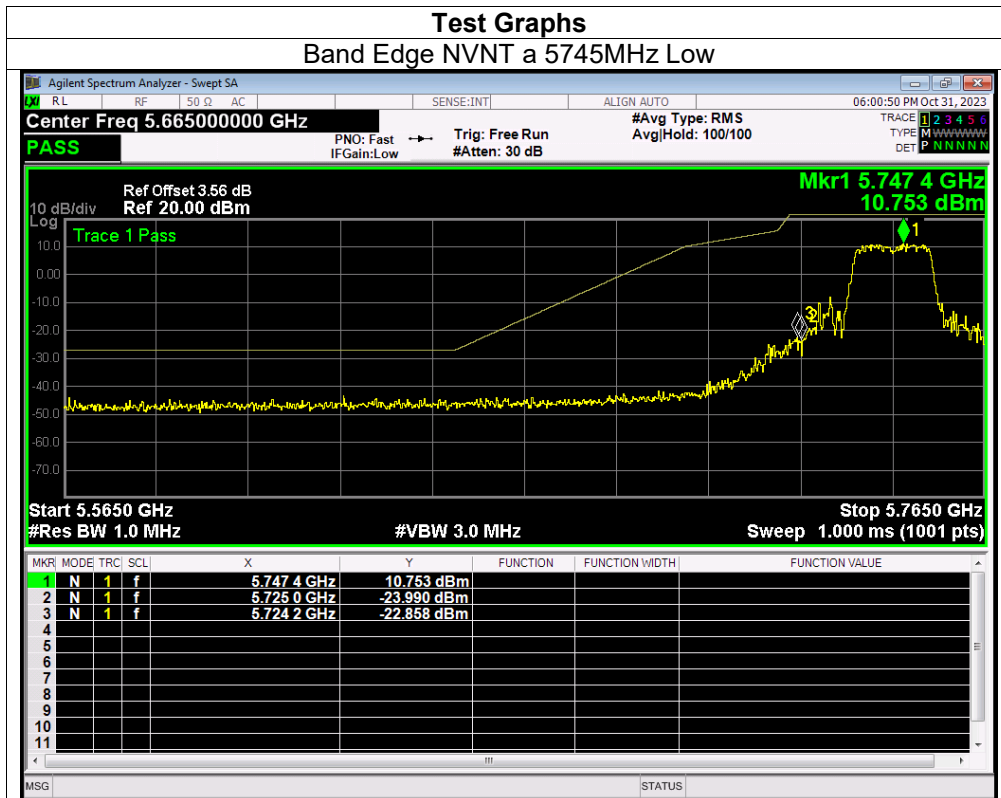


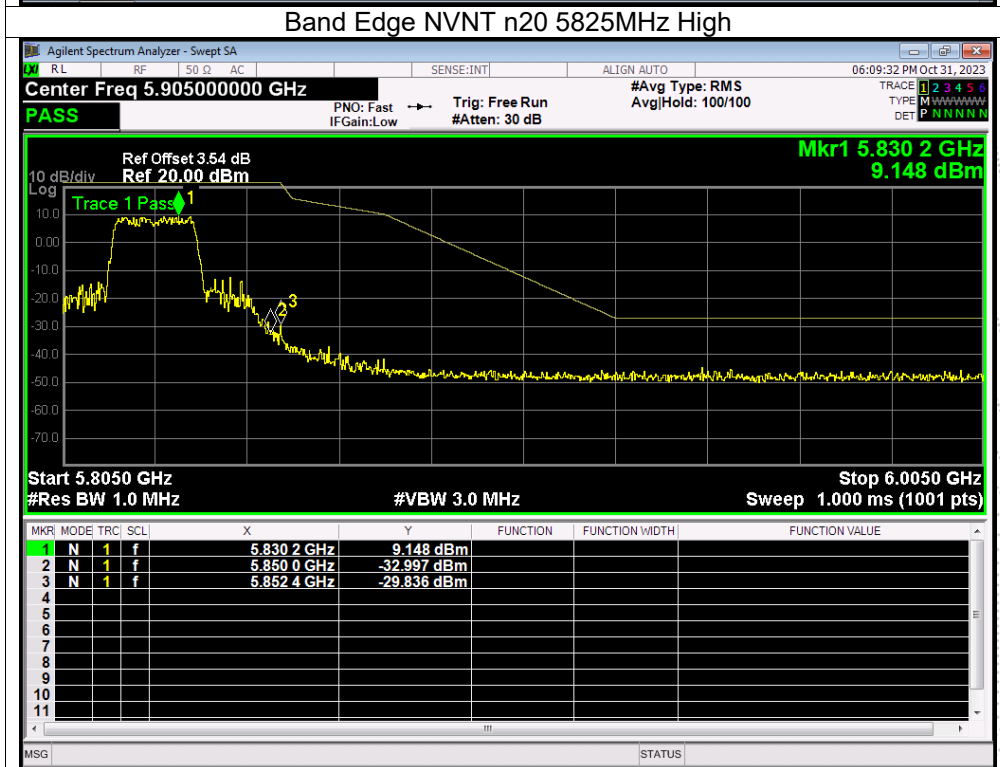
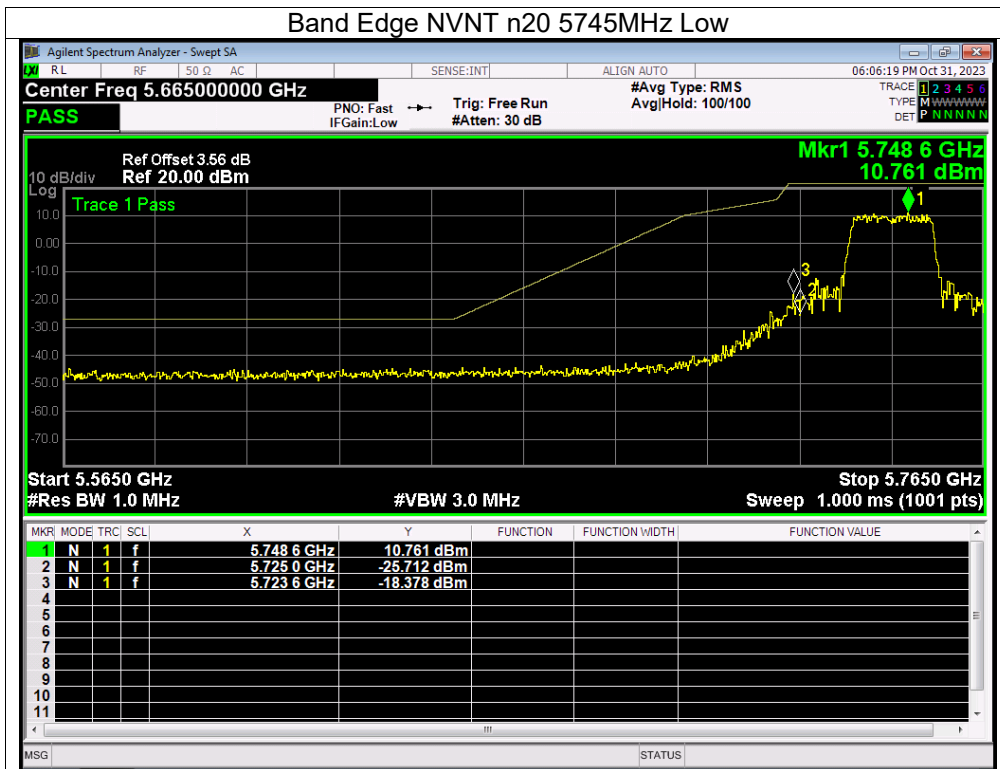


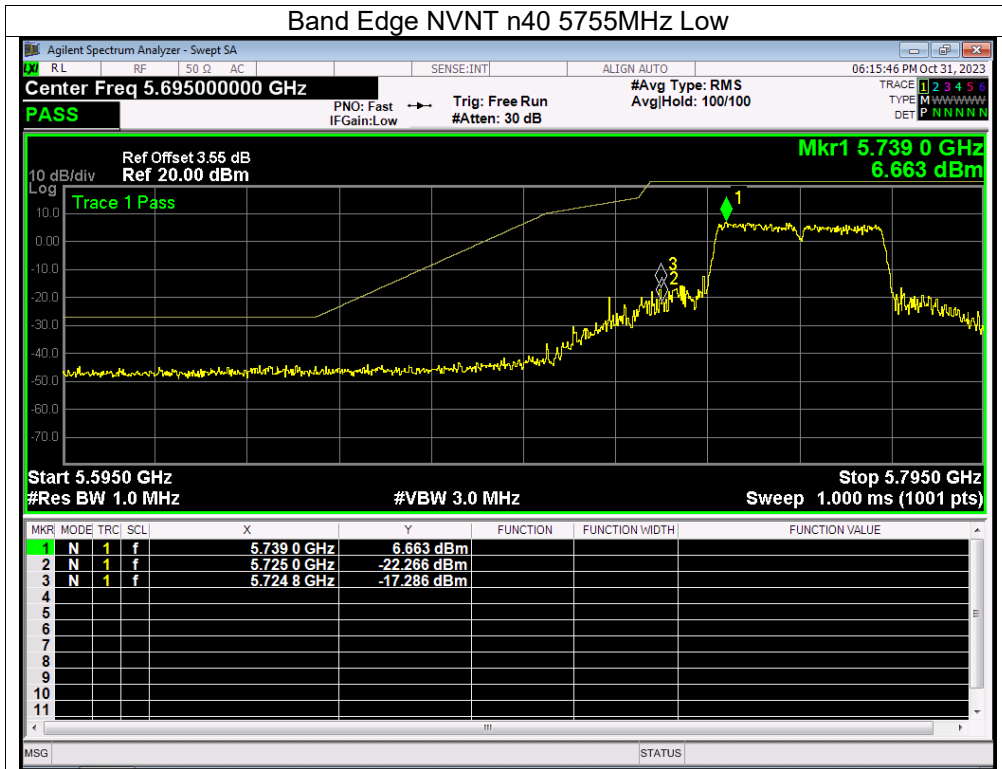


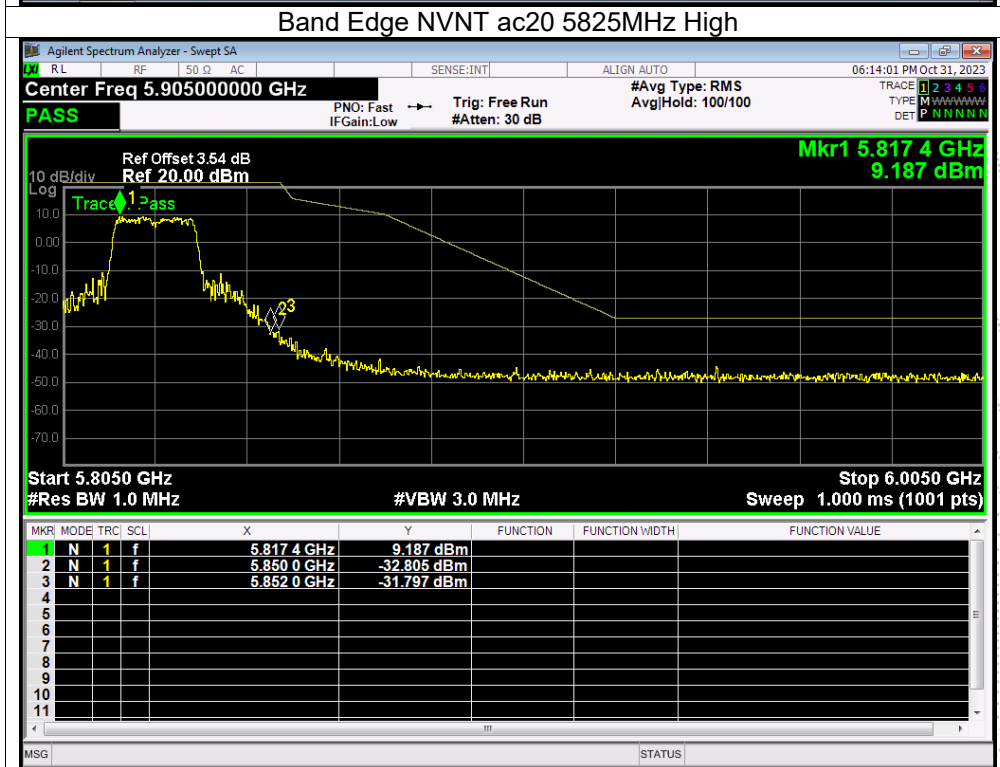
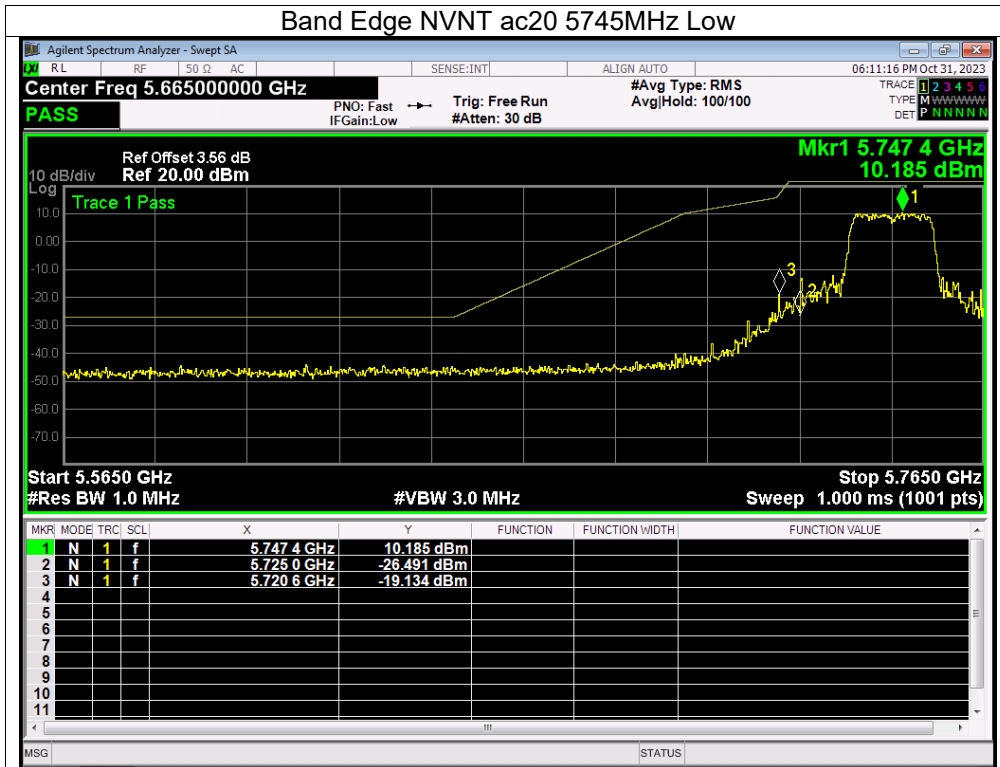


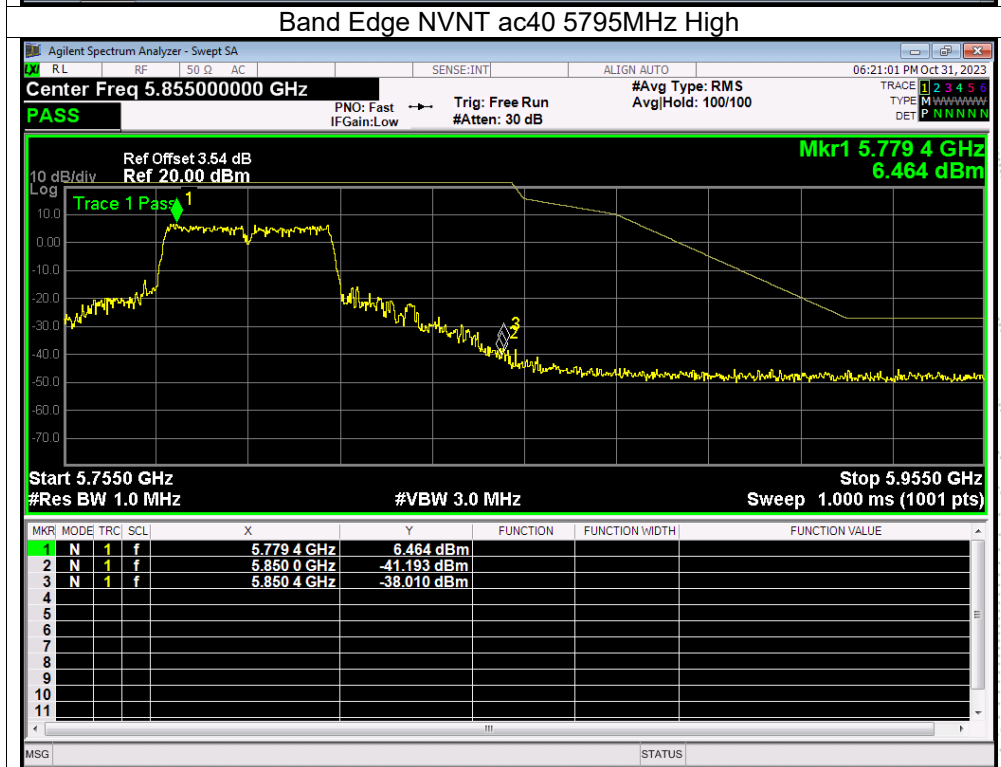
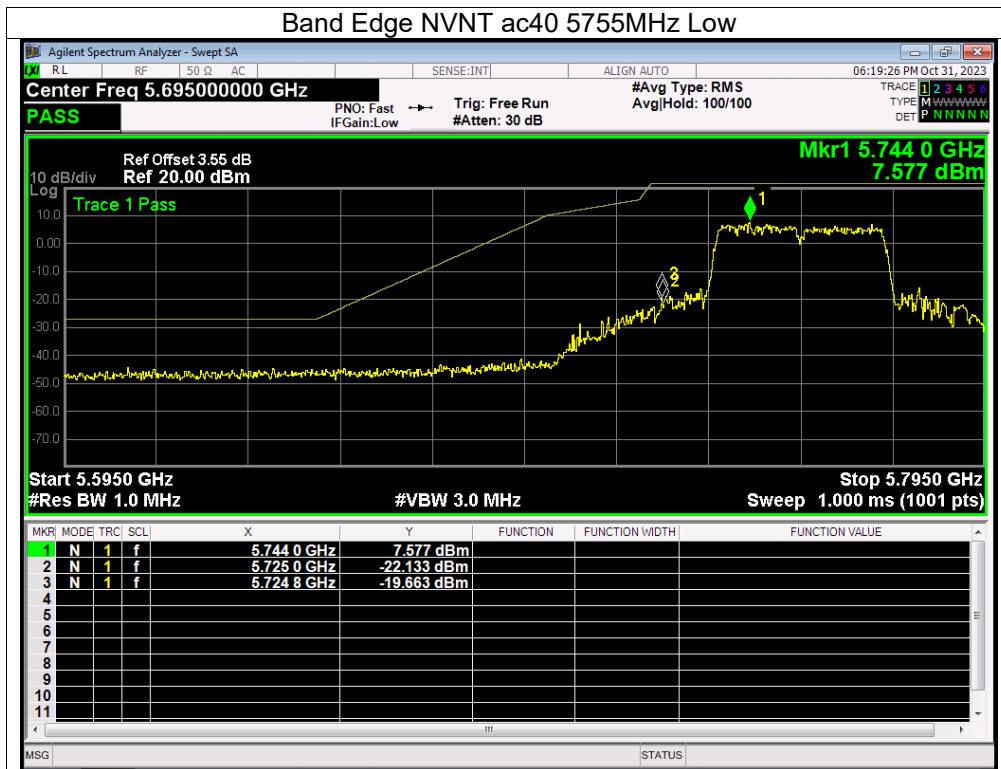


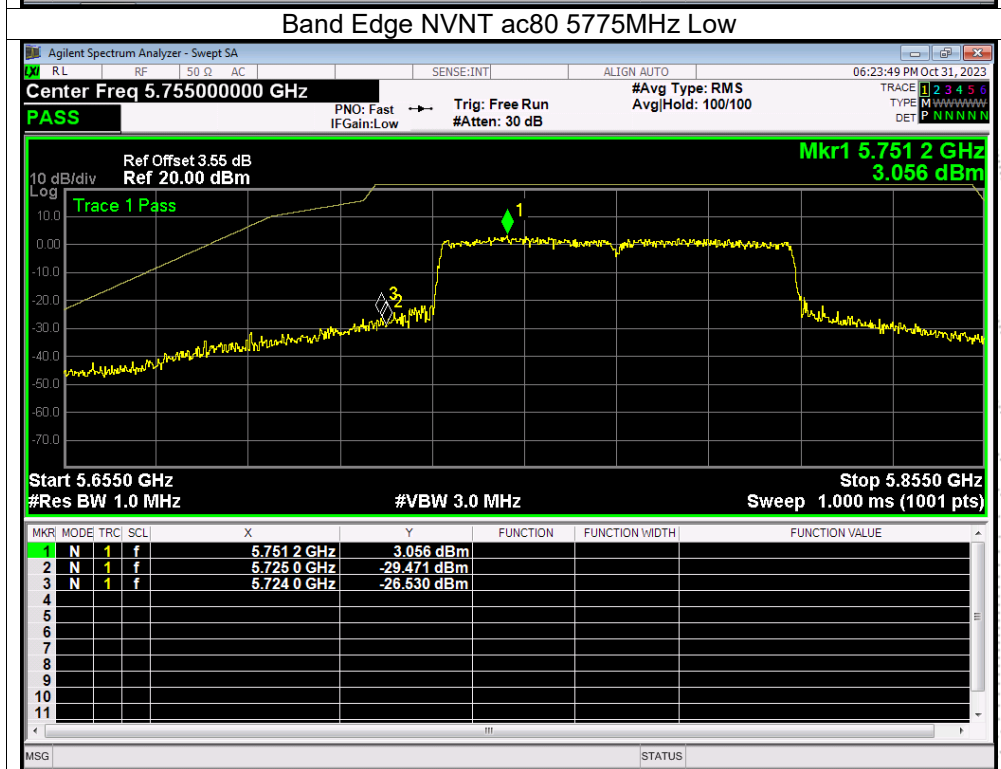
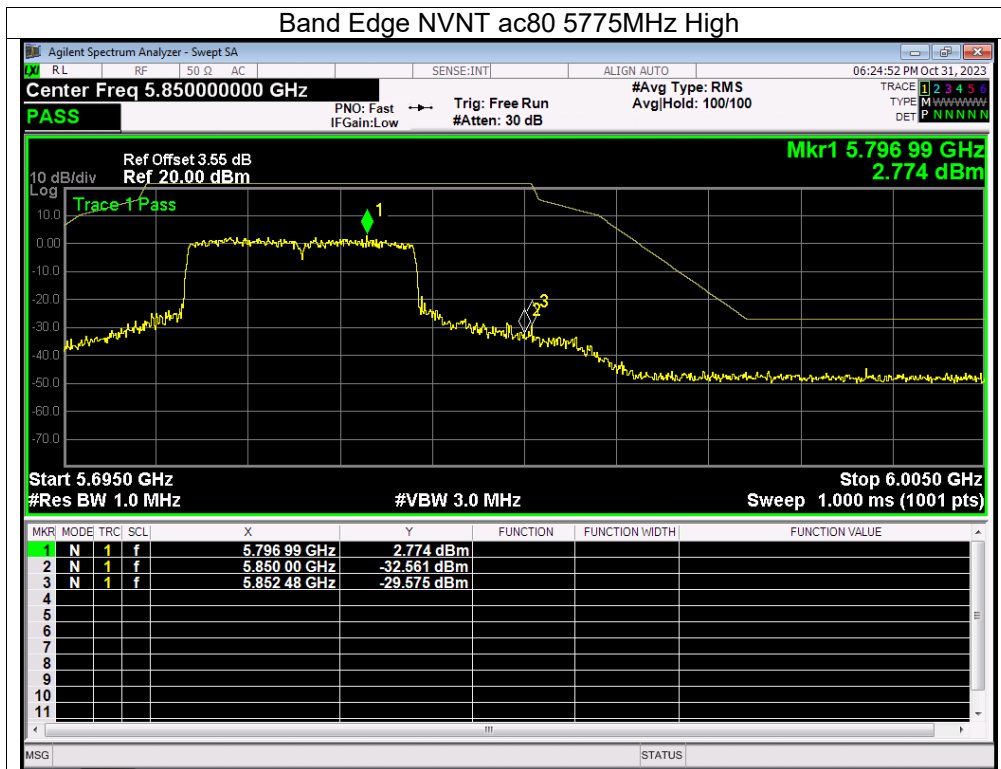












12. Spurious RF Conducted Emissions

12.1 Block Diagram Of Test Setup



12.2 Limit

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) For transmitters operating in the 5.725-5.85 GHz band (i) 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..

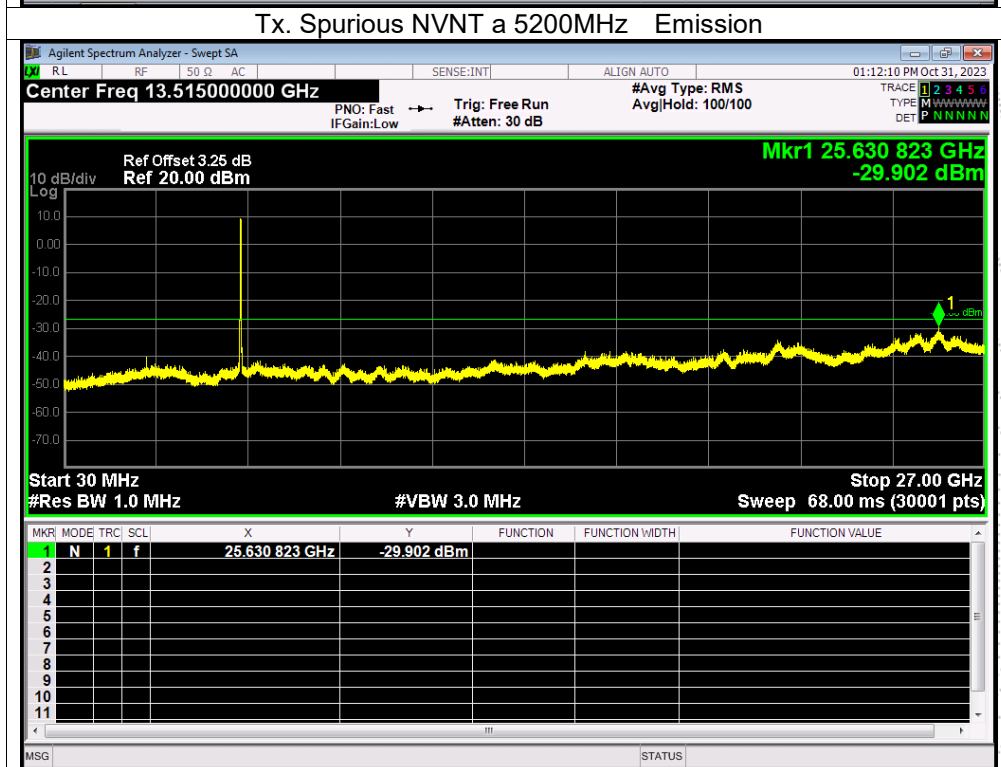
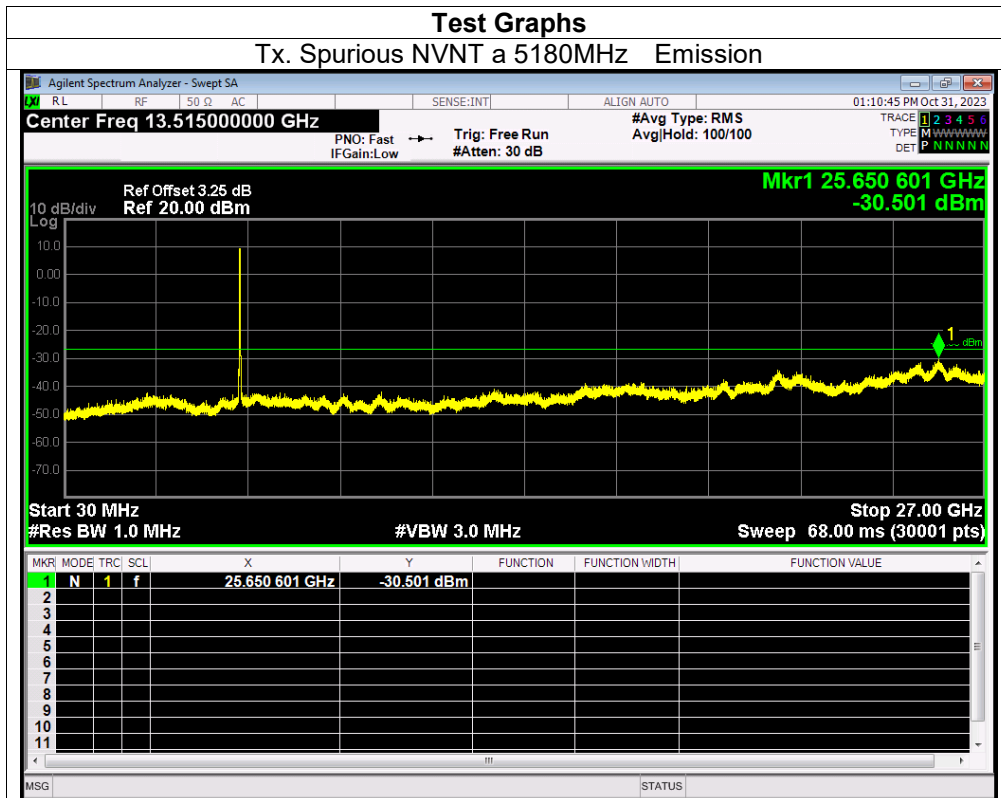
12.3 Test Procedure

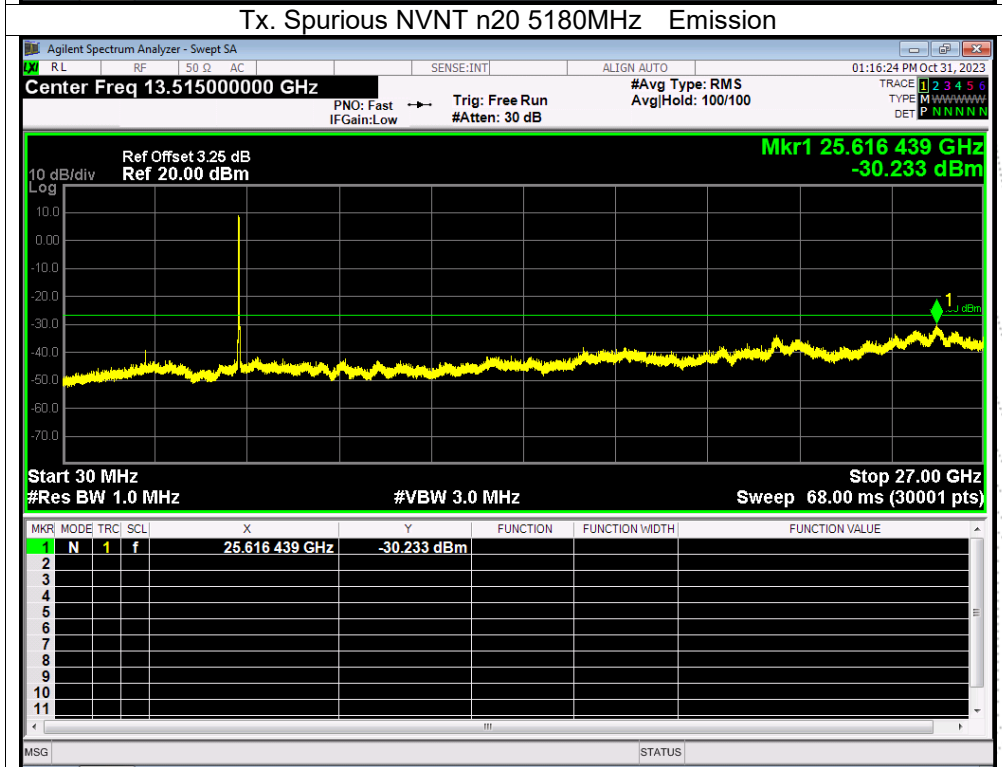
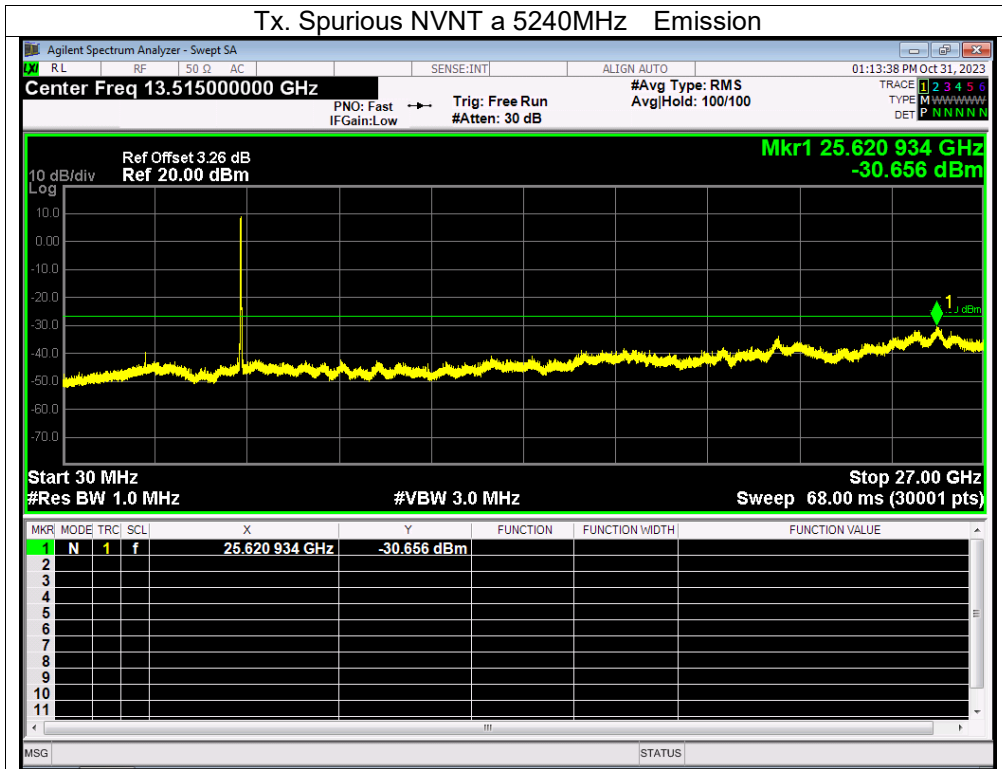
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then 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.

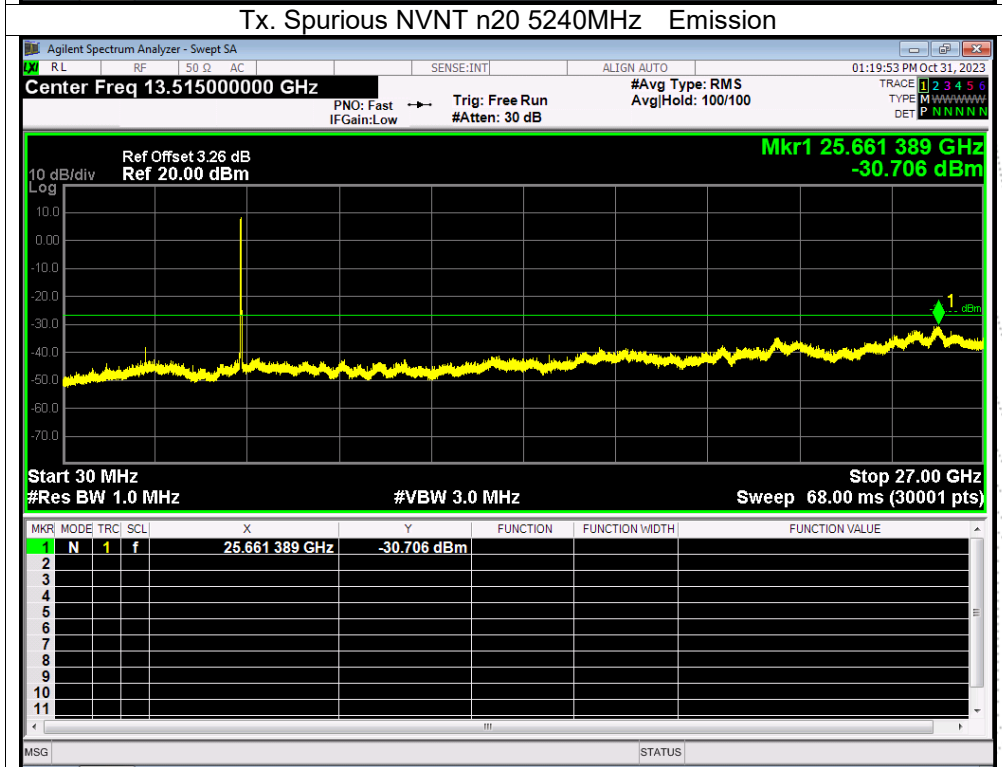
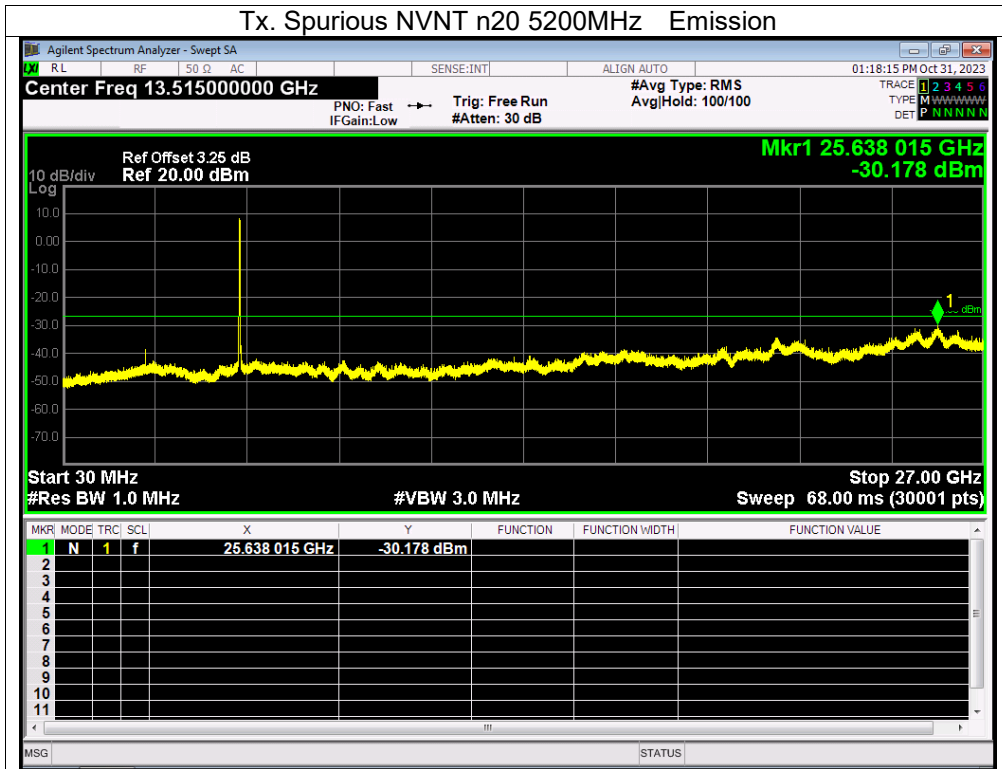
12.4 Test Result

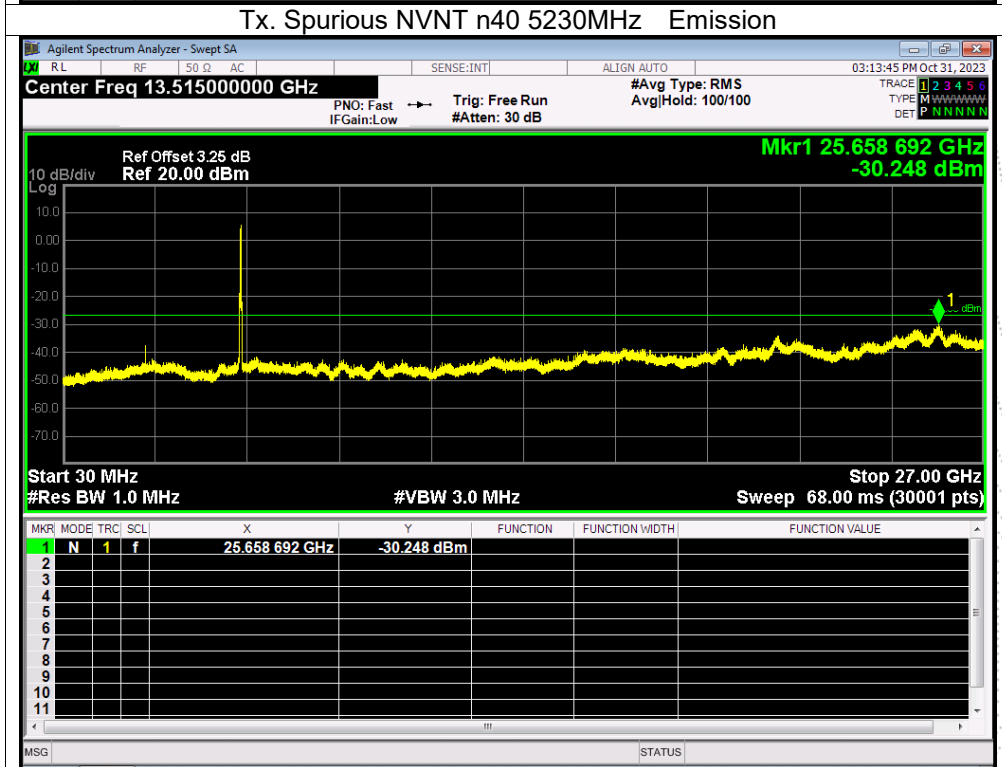
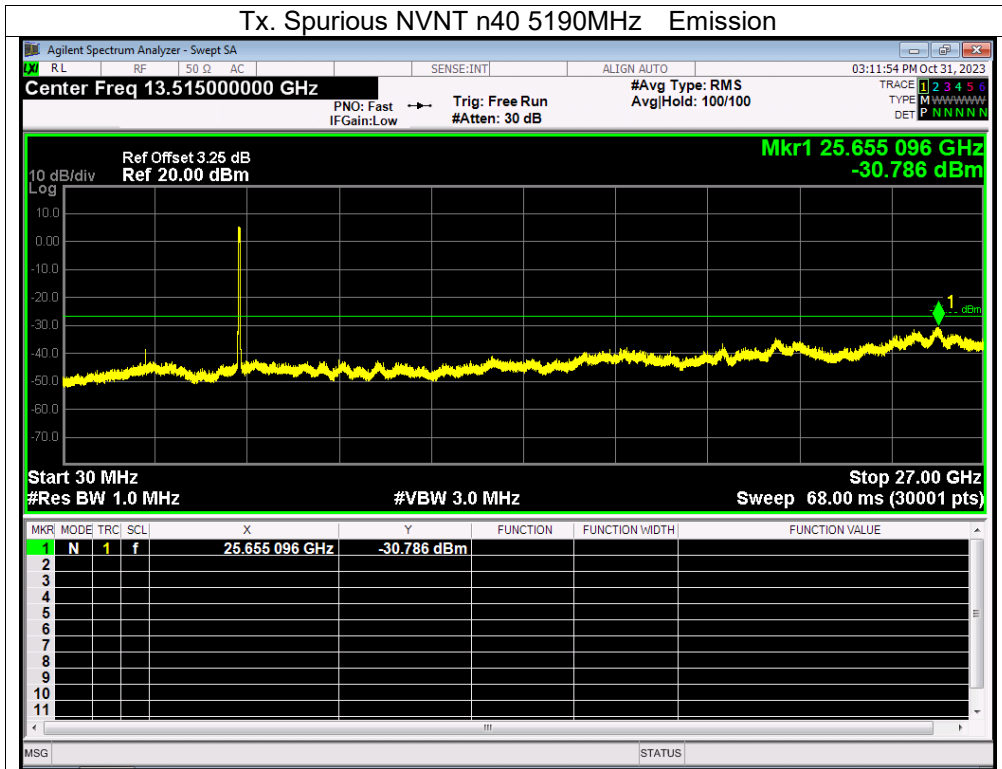
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.

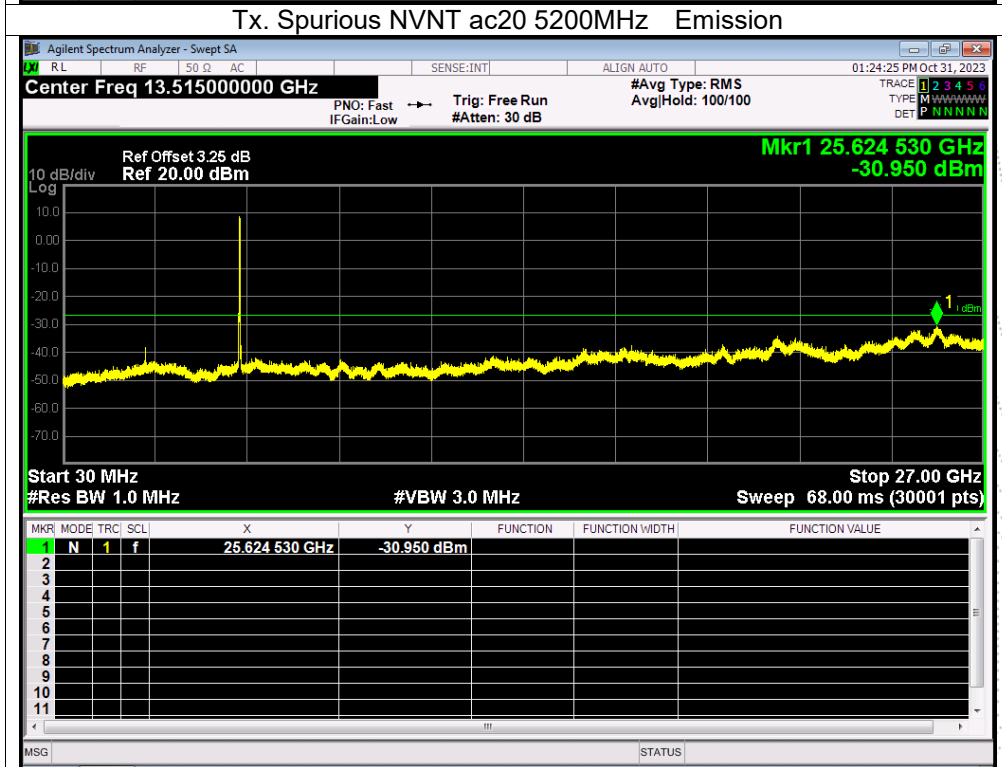
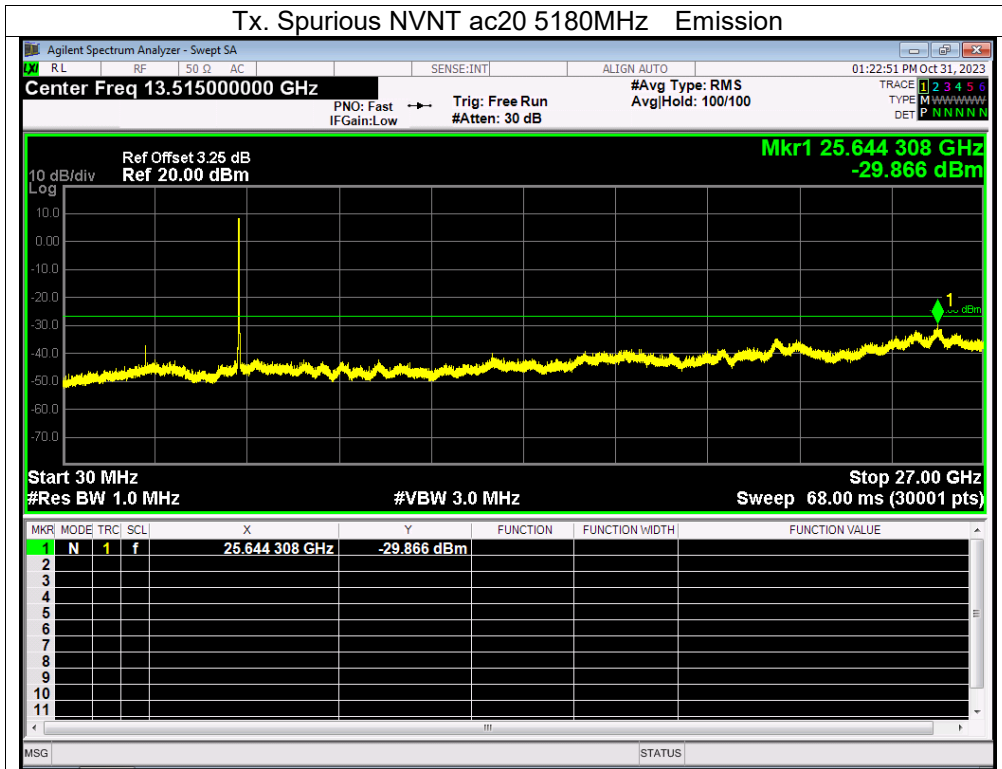
About: 26.5GHz-40GHz, The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

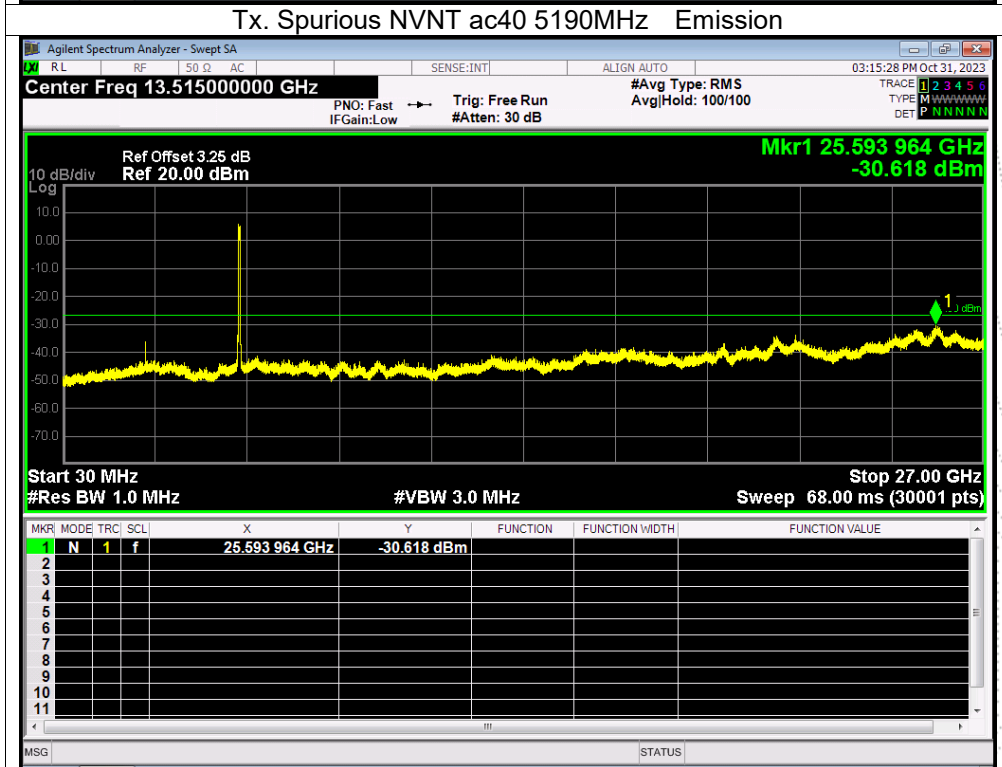
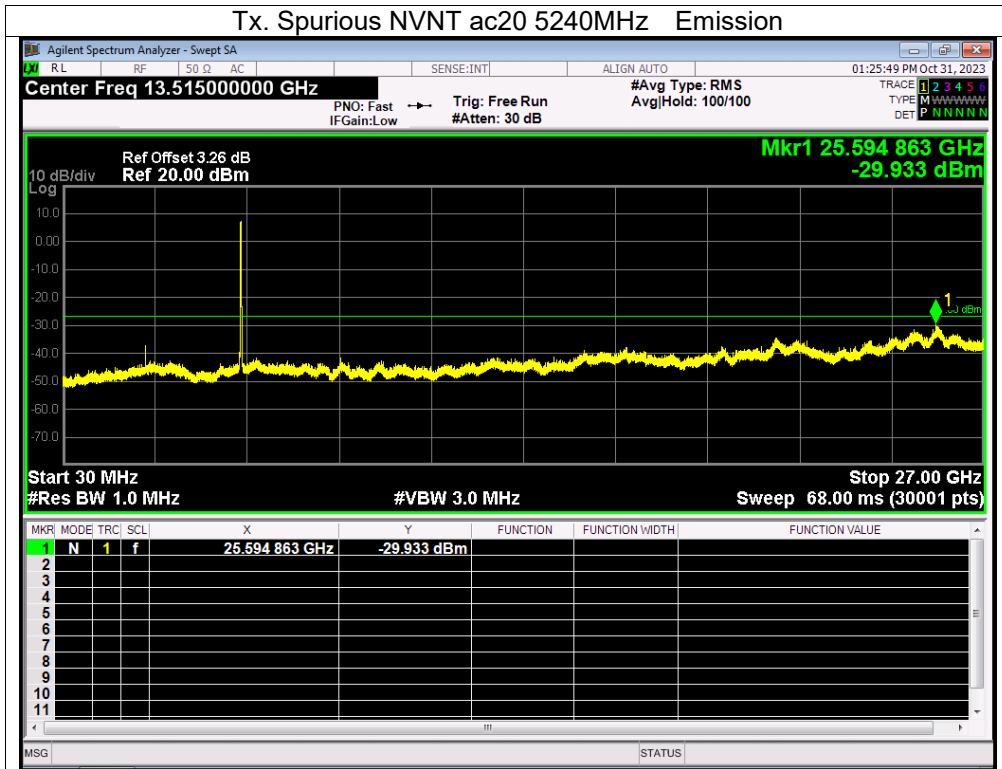


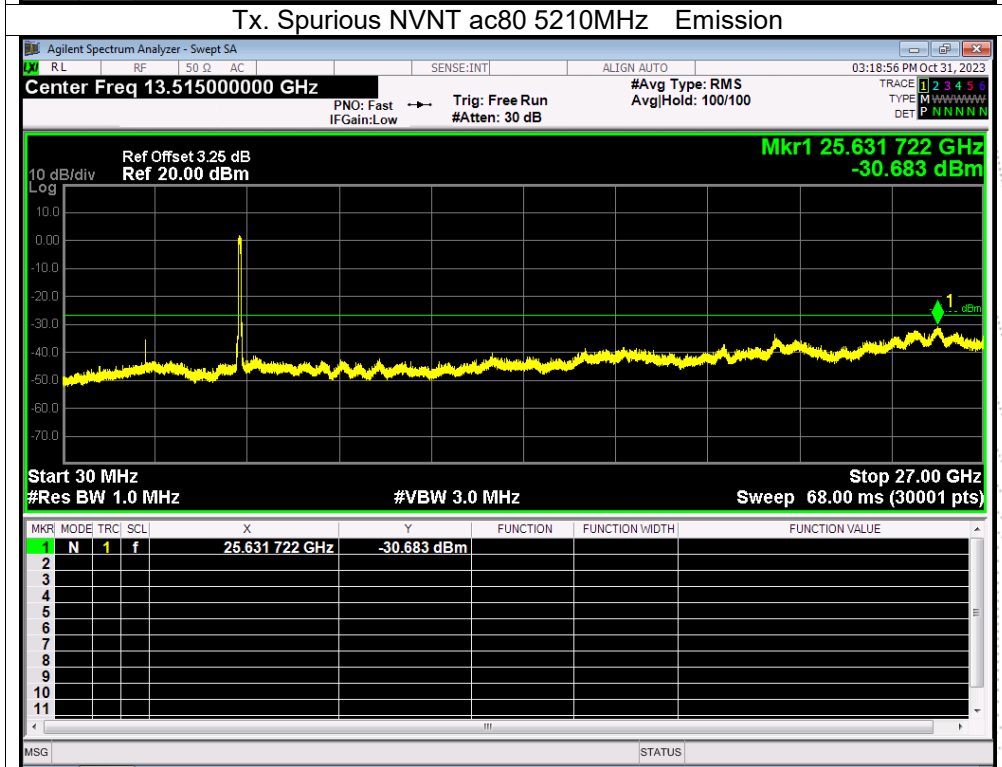
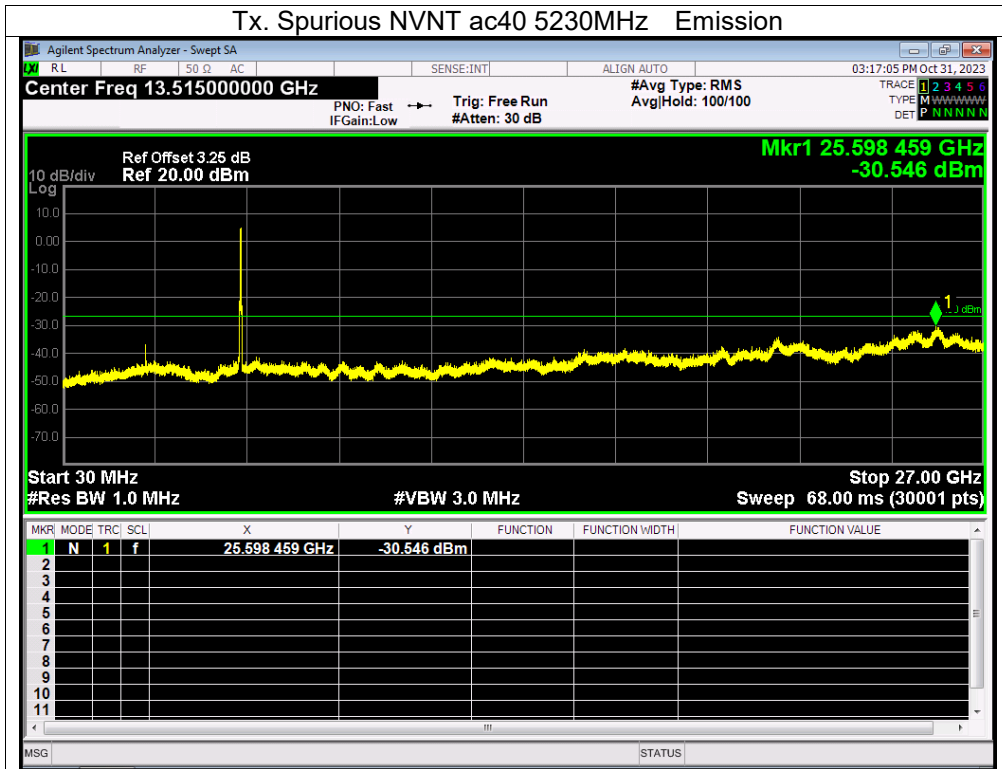


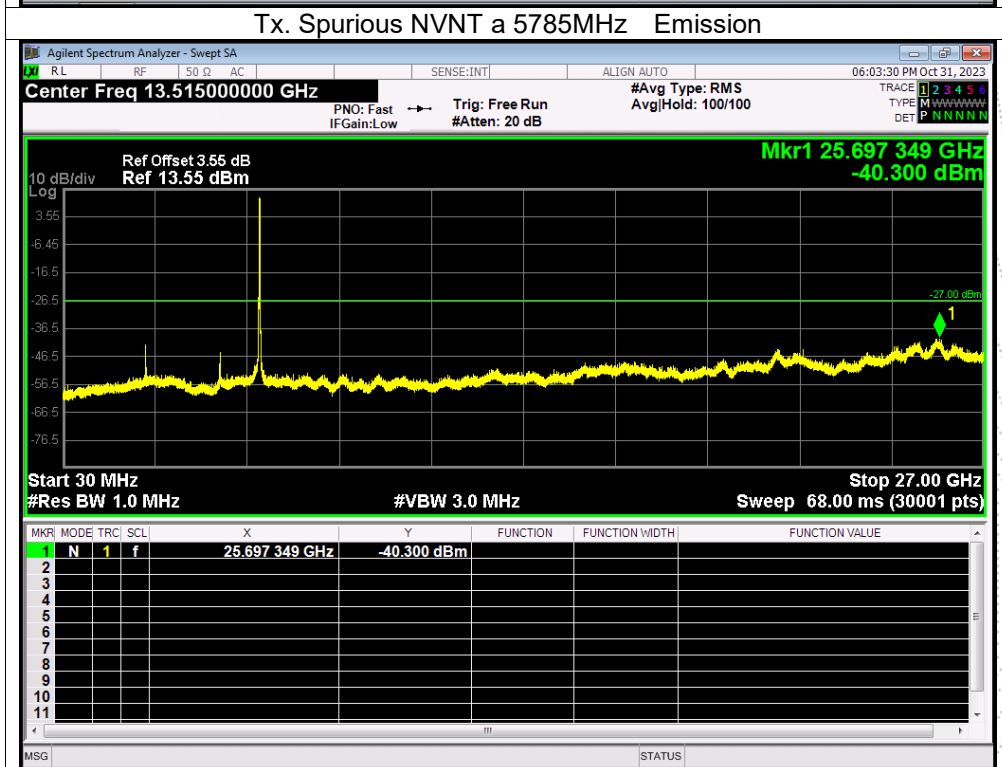
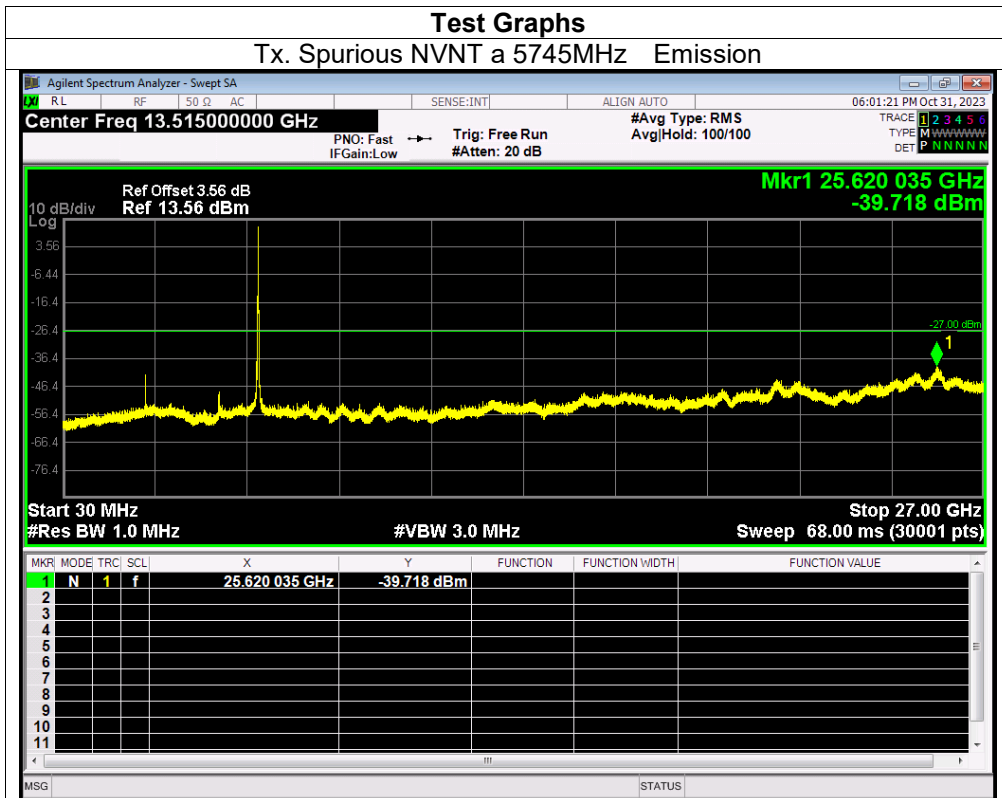


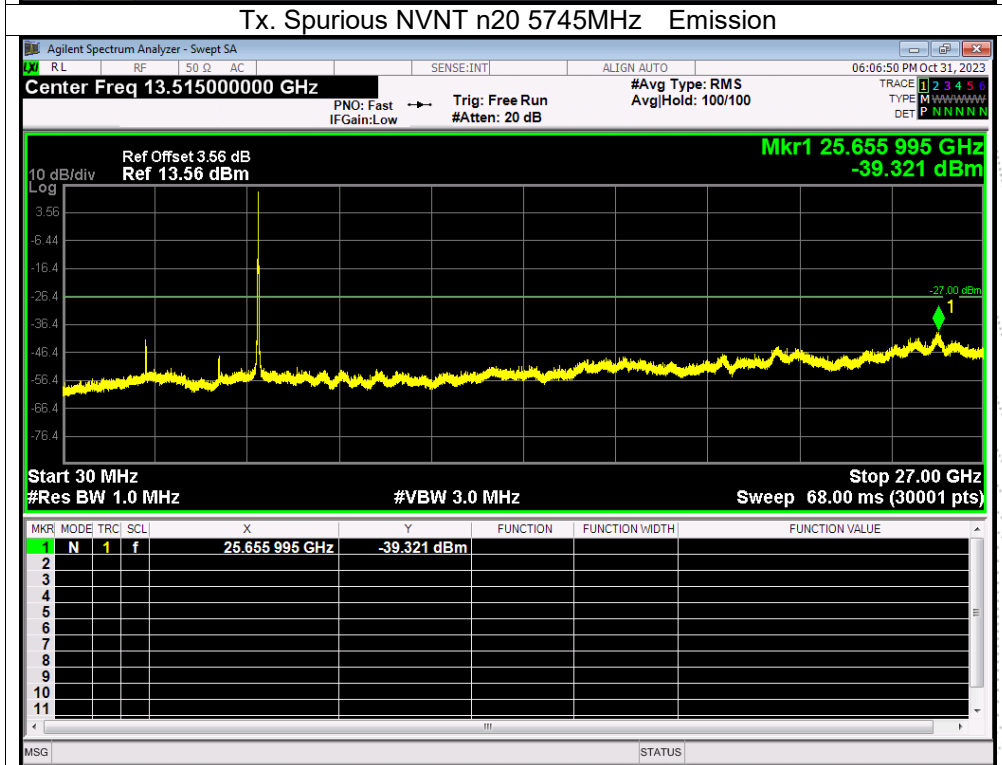
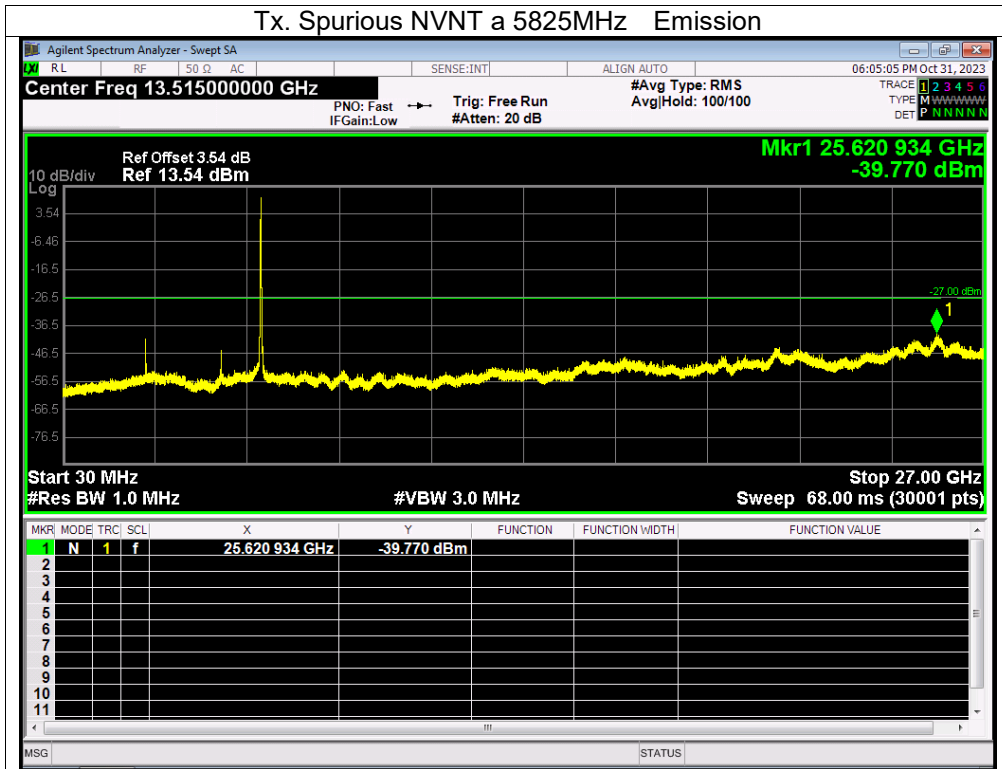


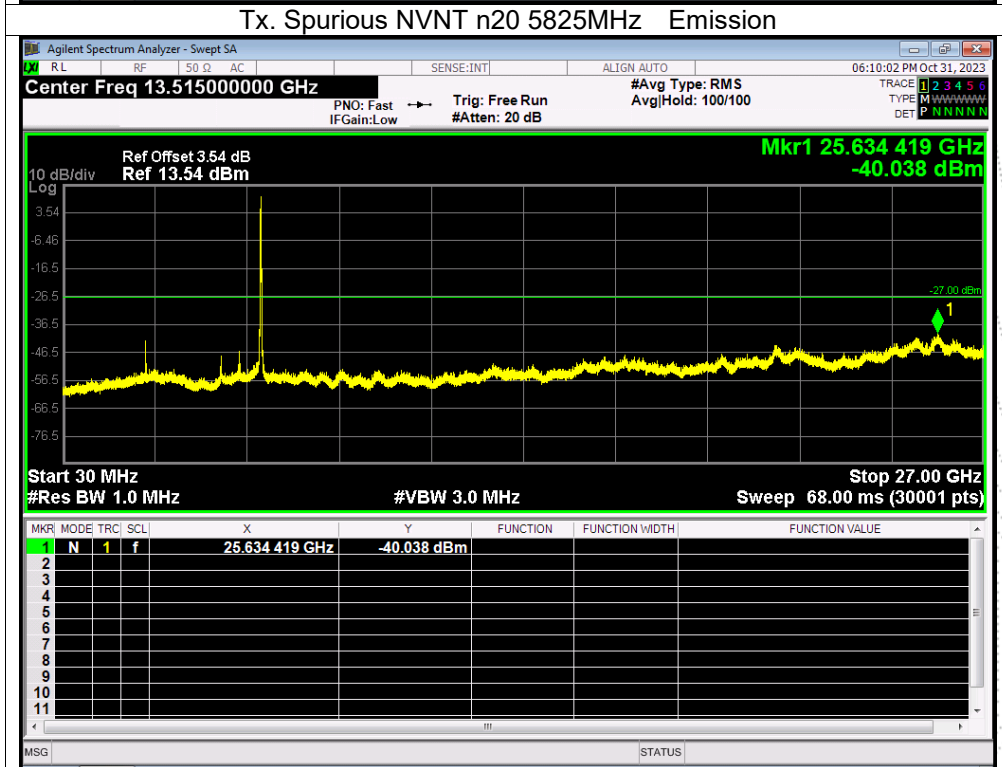
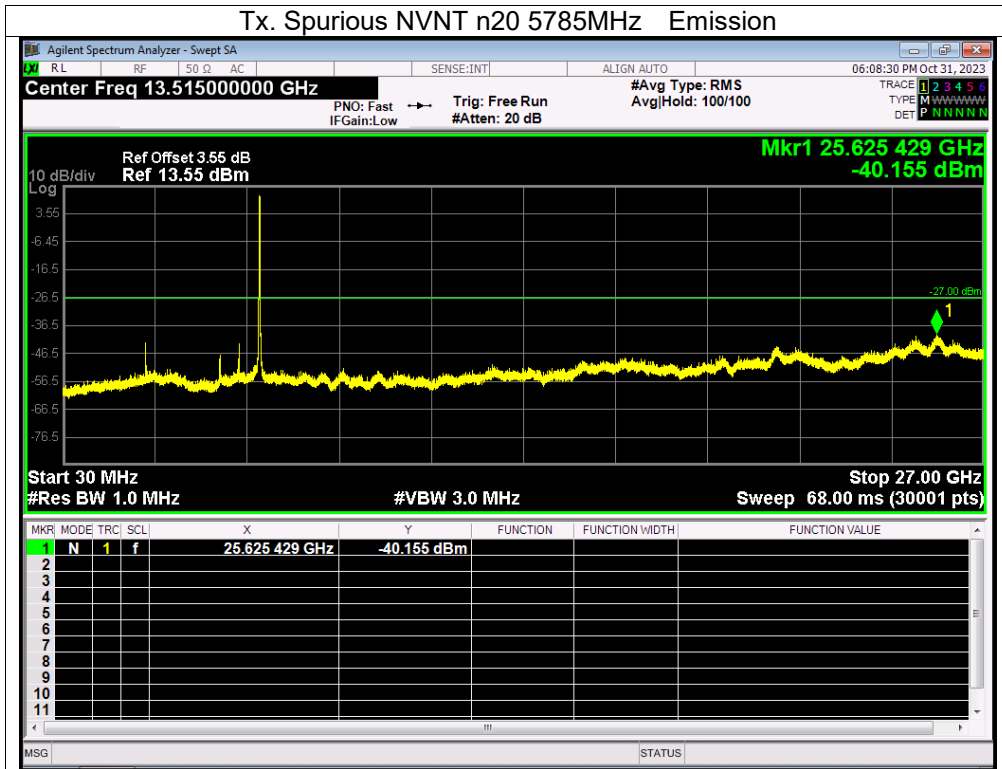


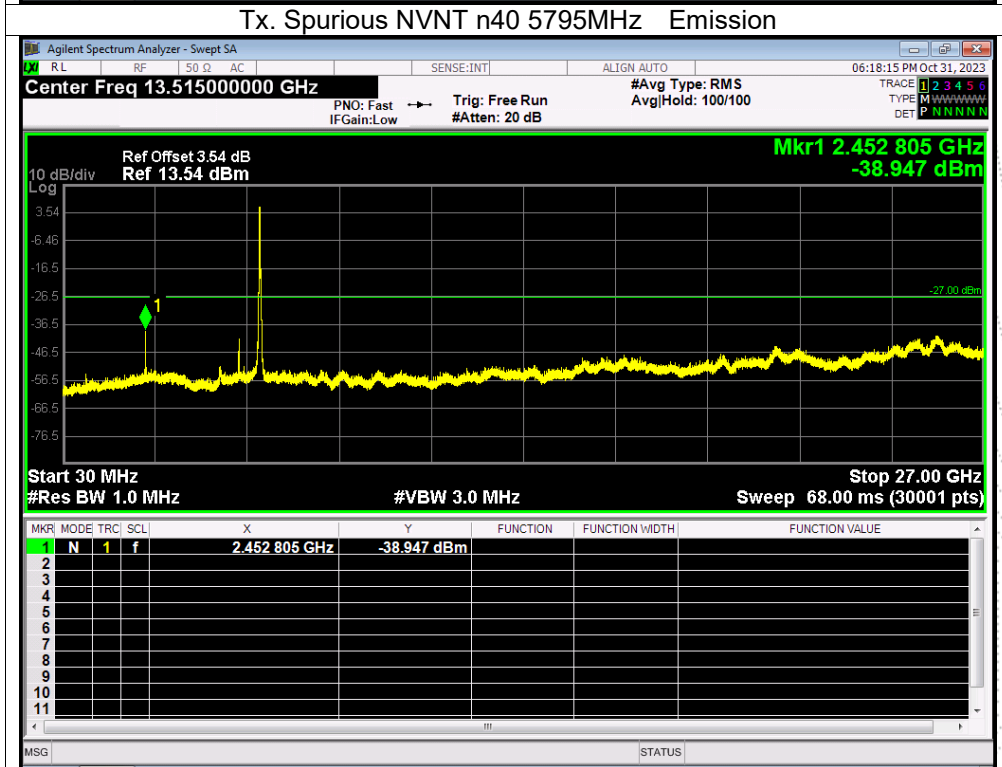
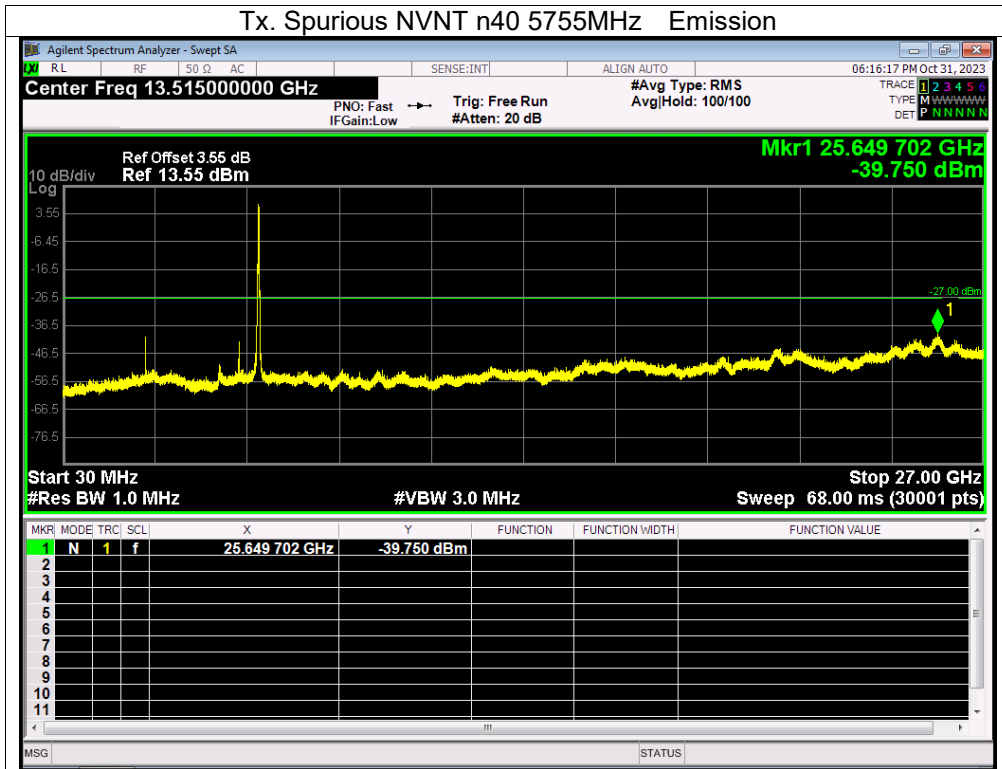


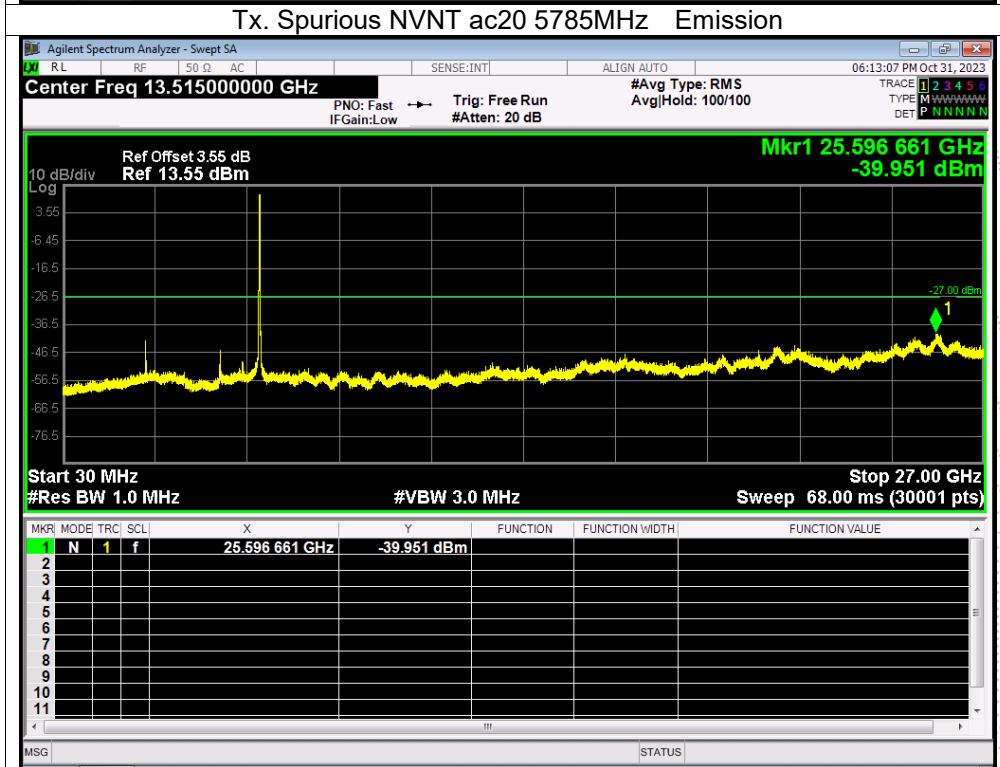
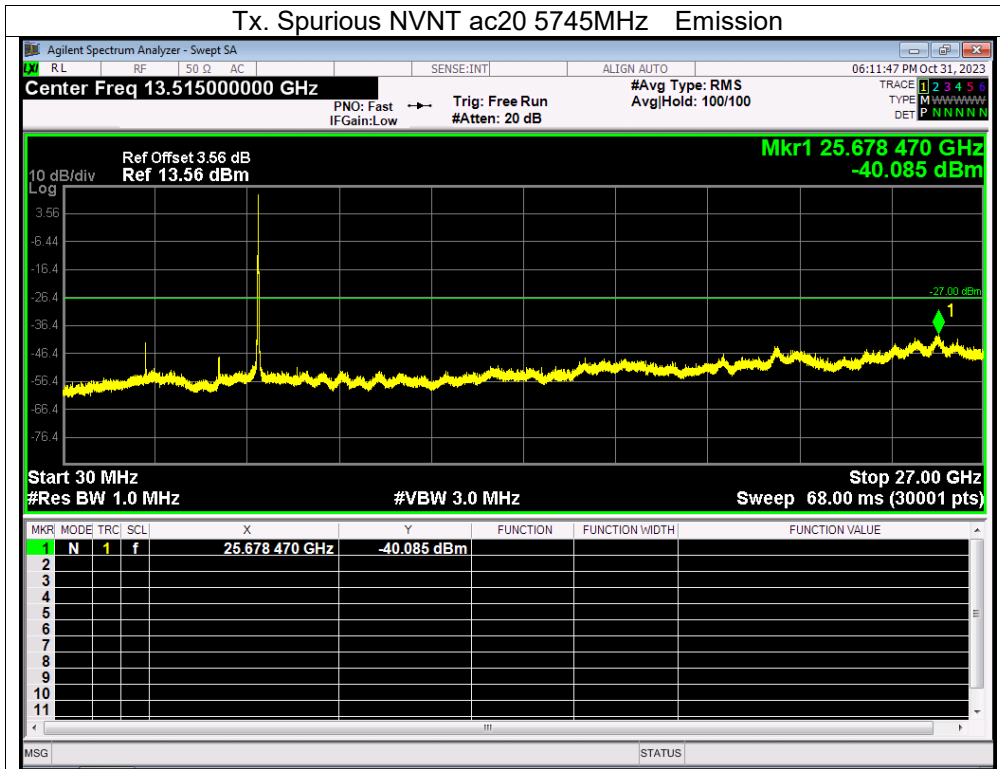


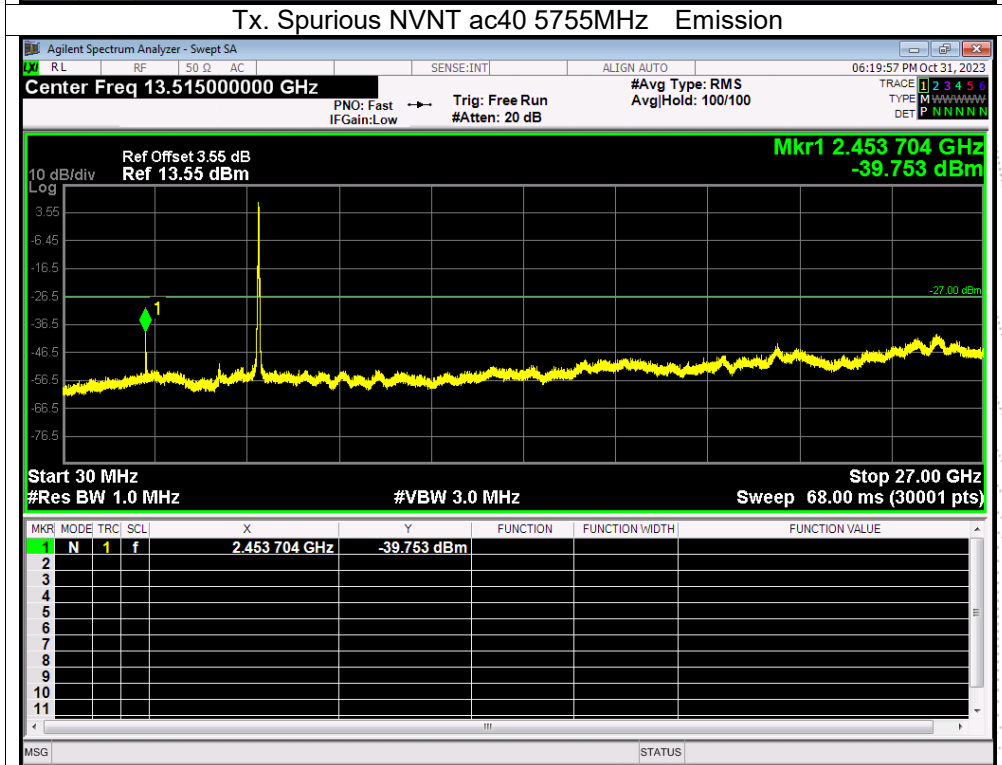
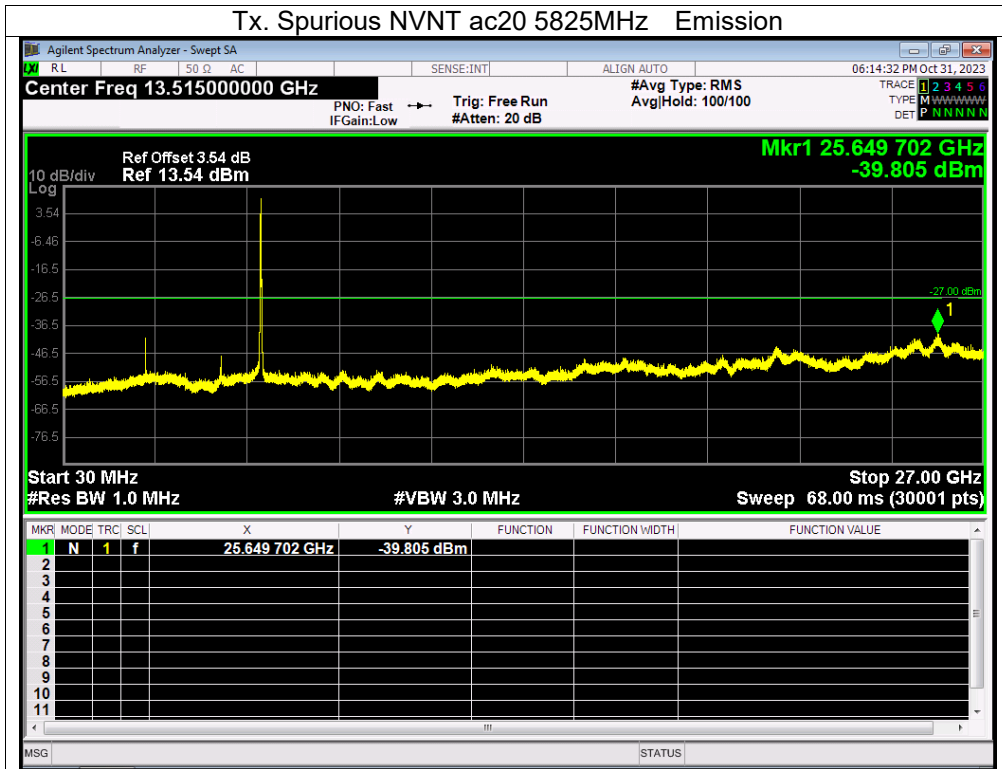


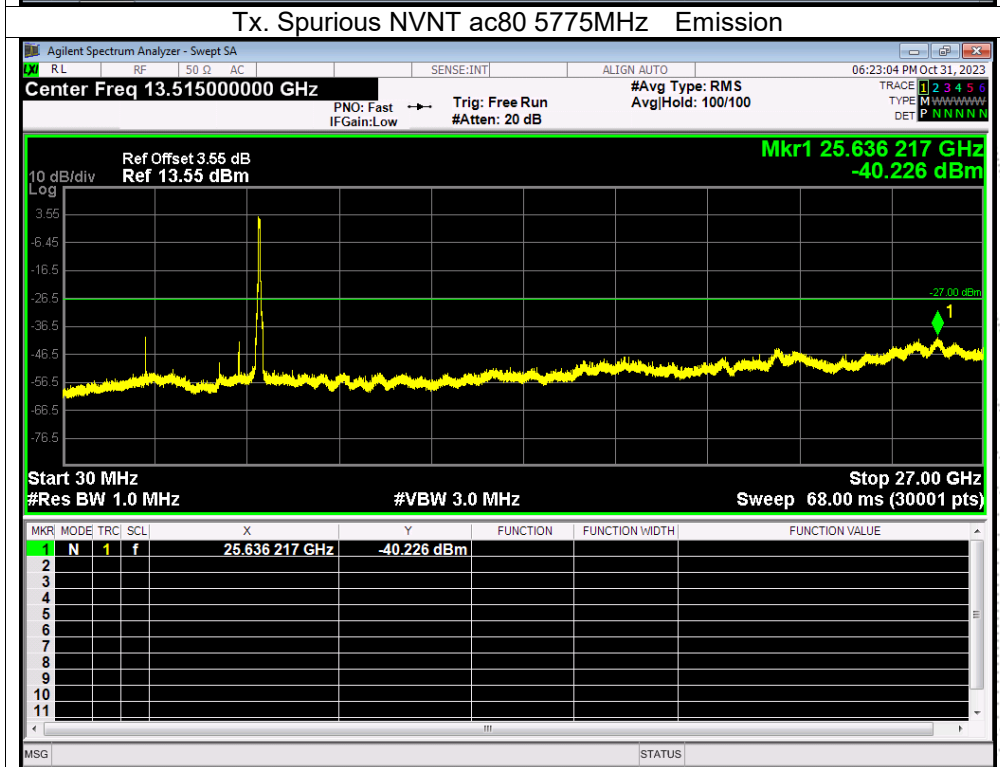
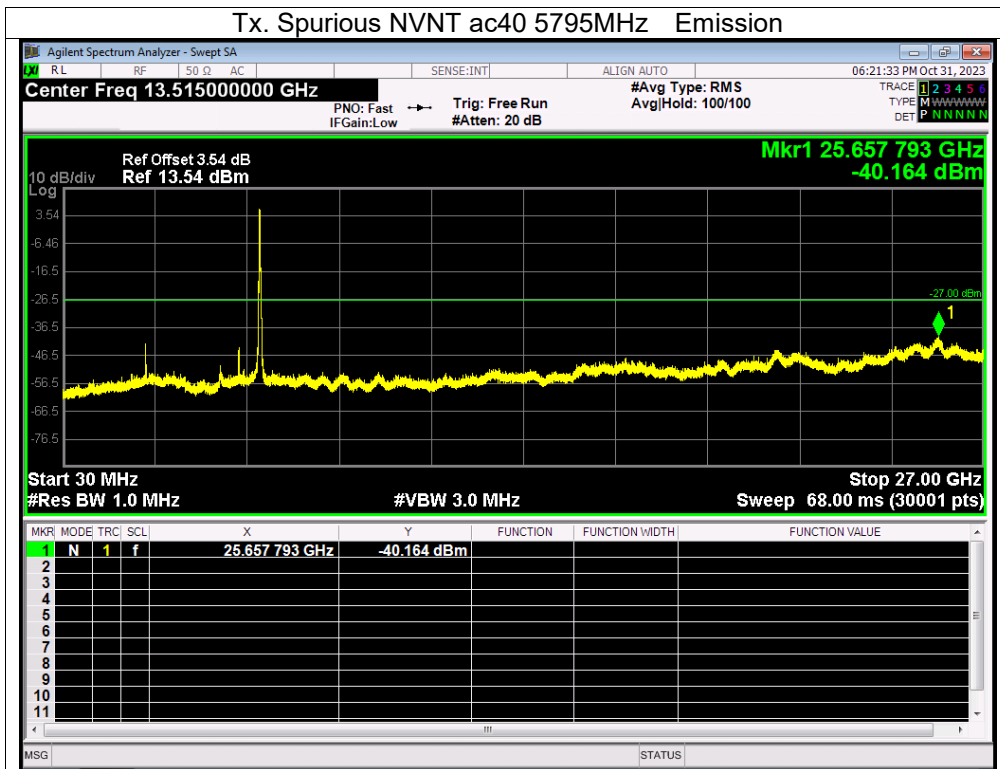












13. Frequency Stability Measurement

13.1 Block Diagram Of Test Setup



13.2 Limit

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

The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification)..

13.3 Test Procedure

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

13.4 Test Result

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101kPa	Test Voltage:	DC 5V
Test Mode:	TX Frequency U-NII-1 (5180-5240MHz)		

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency : 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5180.0133	5180	0.0133	2.5676
		V max (V)	5.75	5180.0065	5180	0.0065	1.2548
		V min (V)	4.25	5180.0015	5180	0.0015	0.2896
Limits				5150-5250 MHz			
Result				Complies			

Temperature vs. Frequency Stability

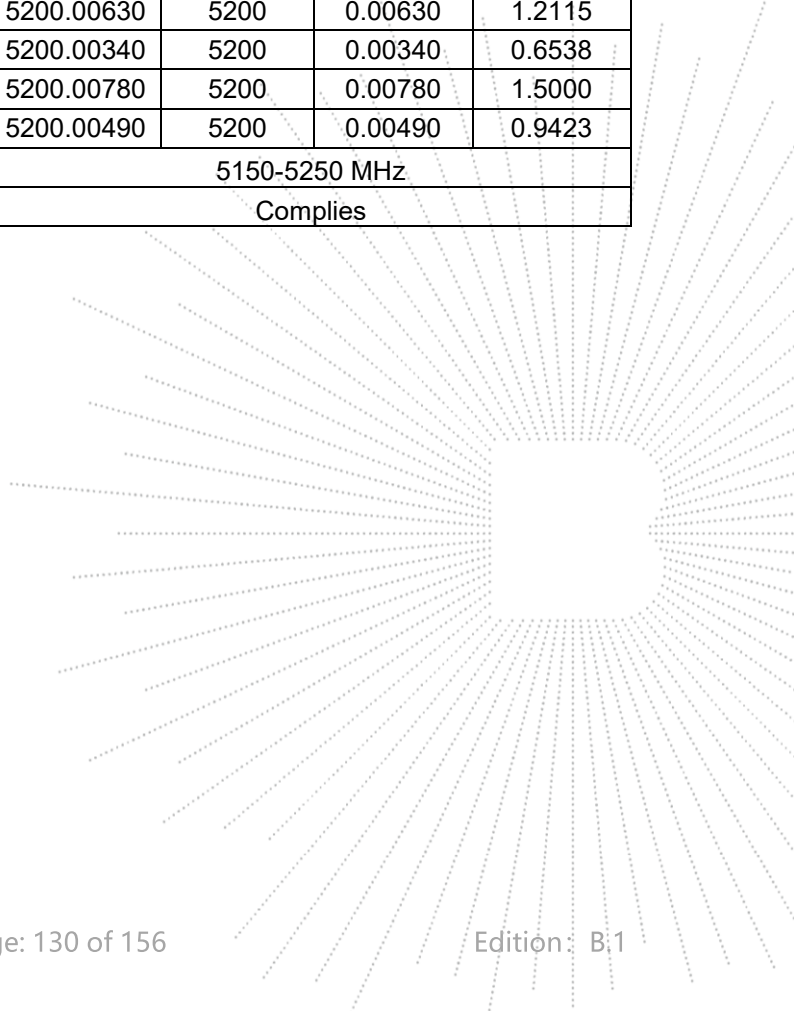
TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	-20	5180.0046	5180	0.0046	0.8880
		T (°C)	-10	5180.0086	5180	0.0086	1.6602
		T (°C)	0	5180.0049	5180	0.0049	0.9459
		T (°C)	10	5180.0130	5180	0.0130	2.5097
		T (°C)	20	5180.0071	5180	0.0071	1.3707
		T (°C)	30	5180.0015	5180	0.0015	0.2896
		T (°C)	40	5180.0103	5180	0.0103	1.9884
		T (°C)	50	5180.0021	5180	0.0021	0.4054
		T (°C)	60	5180.0135	5180	0.0135	2.6062
T (°C)	70	5180.0011	5180	0.0011	0.2124		
Limits				5150-5250 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5200.0031	5200	0.0031	0.5962
		V max (V)	5.75	5200.0043	5200	0.0043	0.8269
		V min (V)	4.25	5200.0025	5200	0.0025	0.4808
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	-20	5200.00820	5200	0.00820	1.5769
		T (°C)	-10	5200.00100	5200	0.00100	0.1923
		T (°C)	0	5200.00290	5200	0.00290	0.5577
		T (°C)	10	5200.00060	5200	0.00060	0.1154
		T (°C)	20	5200.00770	5200	0.00770	1.4808
		T (°C)	30	5200.00400	5200	0.00400	0.7692
		T (°C)	40	5200.00630	5200	0.00630	1.2115
		T (°C)	50	5200.00340	5200	0.00340	0.6538
		T (°C)	60	5200.00780	5200	0.00780	1.5000
		T (°C)	70	5200.00490	5200	0.00490	0.9423
Limits				5150-5250 MHz			
Result				Complies			

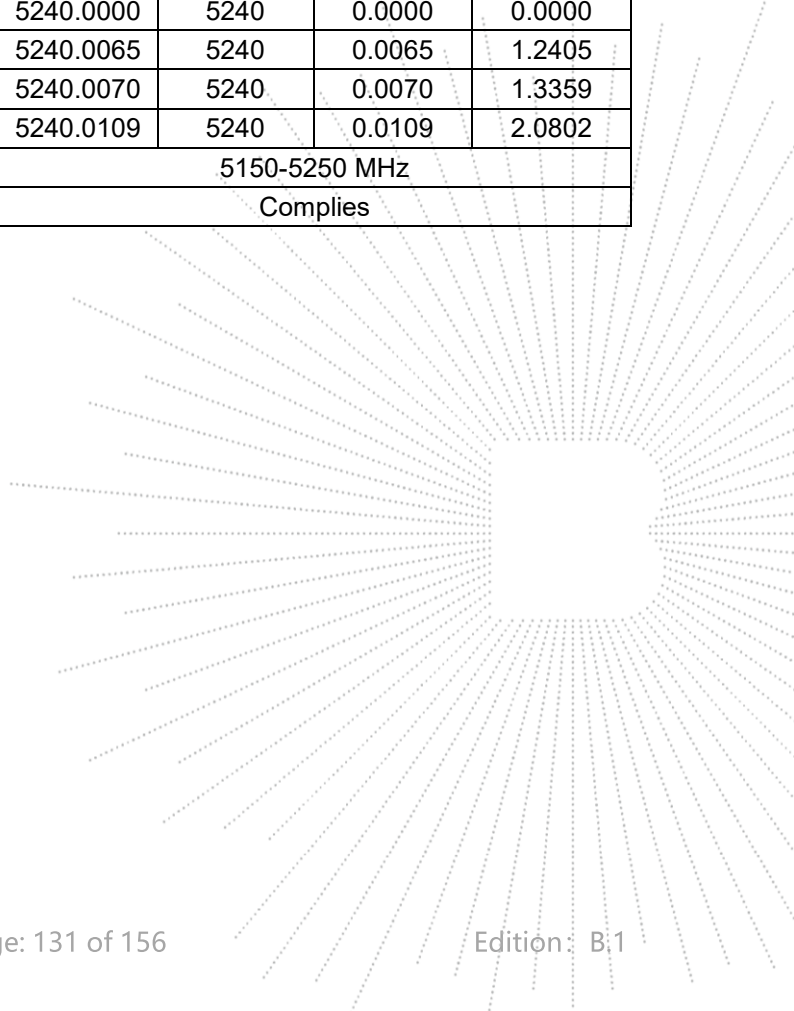


Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5240.0124	5240	0.0124	2.3664
		V max (V)	5.75	5240.0023	5240	0.0023	0.4389
		V min (V)	4.25	5240.0086	5240	0.0086	1.6412
Limits				5150-5250 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	-20	5240.0019	5240	0.0019	0.3626
		T (°C)	-10	5240.0007	5240	0.0007	0.1336
		T (°C)	0	5240.0077	5240	0.0077	1.4695
		T (°C)	10	5240.0045	5240	0.0045	0.8588
		T (°C)	20	5240.0037	5240	0.0037	0.7061
		T (°C)	30	5240.0112	5240	0.0112	2.1374
		T (°C)	40	5240.0000	5240	0.0000	0.0000
		T (°C)	50	5240.0065	5240	0.0065	1.2405
		T (°C)	60	5240.0070	5240	0.0070	1.3359
		T (°C)	70	5240.0109	5240	0.0109	2.0802
Limits				5150-5250 MHz			
Result				Complies			



Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101kPa	Test Voltage:	DC 5V
Test Mode:	TX Frequency(5745-5825MHz)		

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5745.00940	5745	0.00940	1.6362
		V max (V)	5.75	5745.00520	5745	0.00520	0.9051
		V min (V)	4.25	5745.00410	5745	0.00410	0.7137
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	-20	5745.00980	5745	0.00980	1.7058
		T (°C)	-10	5745.00060	5745	0.00060	0.1044
		T (°C)	0	5745.00230	5745	0.00230	0.4003
		T (°C)	10	5745.00220	5745	0.00220	0.3829
		T (°C)	20	5745.01270	5745	0.01270	2.2106
		T (°C)	30	5745.00800	5745	0.00800	1.3925
		T (°C)	40	5745.01010	5745	0.01010	1.7581
		T (°C)	50	5745.00330	5745	0.00330	0.5744
		T (°C)	60	5745.00940	5745	0.00940	1.6362
		T (°C)	70	5745.00980	5745	0.00980	1.7058
Limits				5725-5850 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5785.00340	5785	0.00340	0.5877
		V max (V)	5.75	5785.00340	5785	0.00340	0.5877
		V min (V)	4.25	5785.00100	5785	0.00100	0.1729
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	-20	5785.00850	5785	0.00850	1.4693
		T (°C)	-10	5785.01120	5785	0.01120	1.9360
		T (°C)	0	5785.01080	5785	0.01080	1.8669
		T (°C)	10	5785.00170	5785	0.00170	0.2939
		T (°C)	20	5785.00250	5785	0.00250	0.4322
		T (°C)	30	5785.00190	5785	0.00190	0.3284
		T (°C)	40	5785.00990	5785	0.00990	1.7113
		T (°C)	50	5785.00060	5785	0.00060	0.1037
		T (°C)	60	5785.00590	5785	0.00590	1.0199
		T (°C)	70	5785.01300	5785	0.01300	2.2472
Limits				5725-5850 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5825.01150	5825	0.01150	1.9742
		V max (V)	5.75	5825.01330	5825	0.01330	2.2833
		V min (V)	4.25	5825.00690	5825	0.00690	1.1845
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	-20	5825.00800	5825	0.00800	1.3734
		T (°C)	-10	5825.00370	5825	0.00370	0.6352
		T (°C)	0	5825.01080	5825	0.01080	1.8541
		T (°C)	10	5825.00090	5825	0.00090	0.1545
		T (°C)	20	5825.00190	5825	0.00190	0.3262
		T (°C)	30	5825.00330	5825	0.00330	0.5665
		T (°C)	40	5825.00580	5825	0.00580	0.9957
		T (°C)	50	5825.00190	5825	0.00190	0.3262
		T (°C)	60	5825.00550	5825	0.00550	0.9442
		T (°C)	70	5825.01320	5825	0.01320	2.2661
Limits				5725-5850 MHz			
Result				Complies			

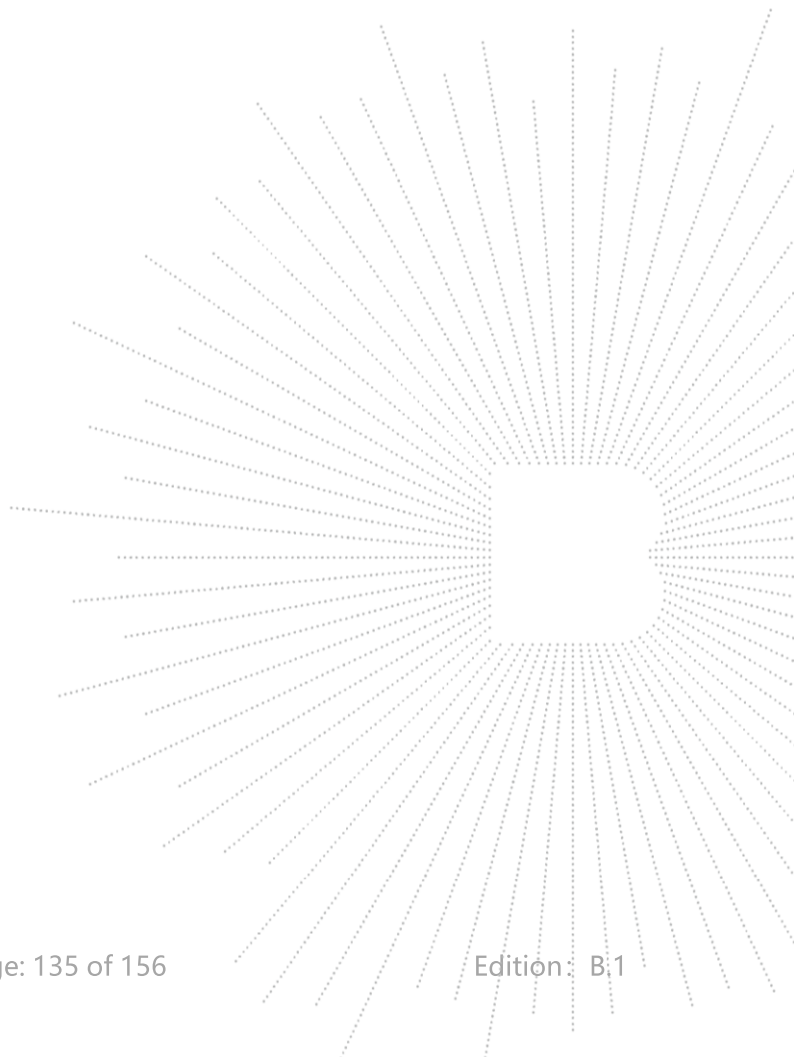
14. Antenna Requirement

14.1 Limit

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

14.2 Test Result

The EUT antenna is Internal antenna (antenna gain: 2.75 dBi). It comply with the standard requirement.



15. Duty Cycle Of Test Signal

15.1 Standard Requirement

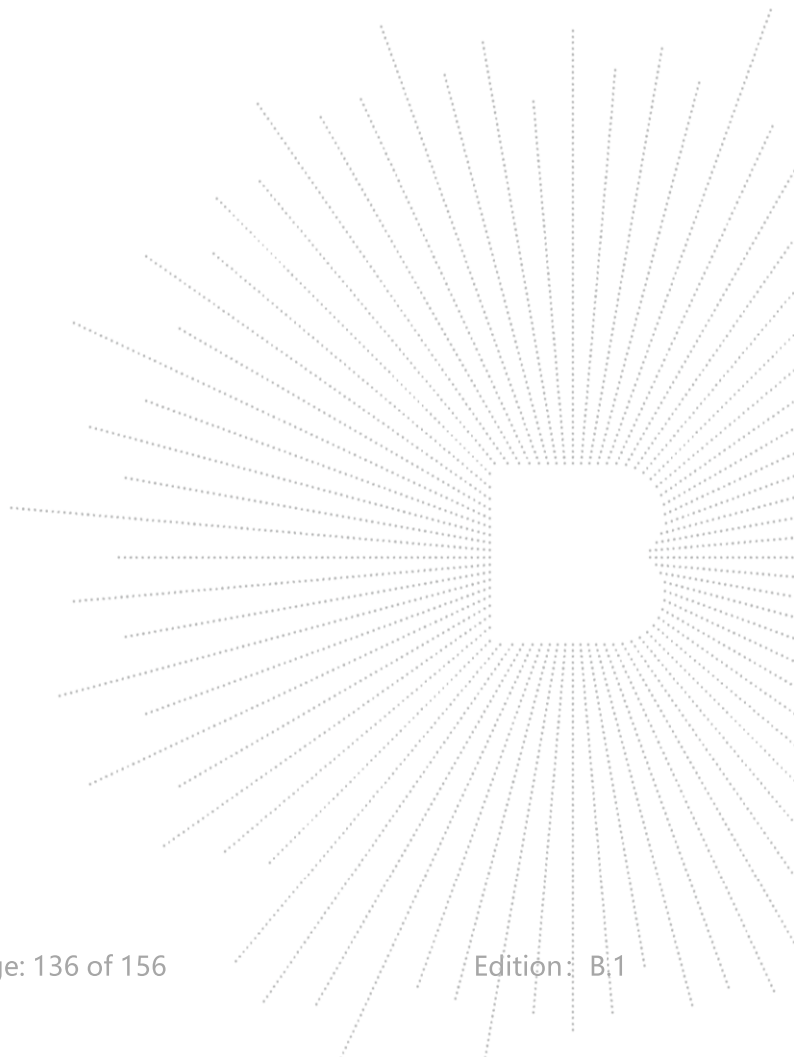
Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle. All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

15.2 Formula

Duty Cycle = $T_{on} / (T_{on} + T_{off})$

15.3 Test Procedure

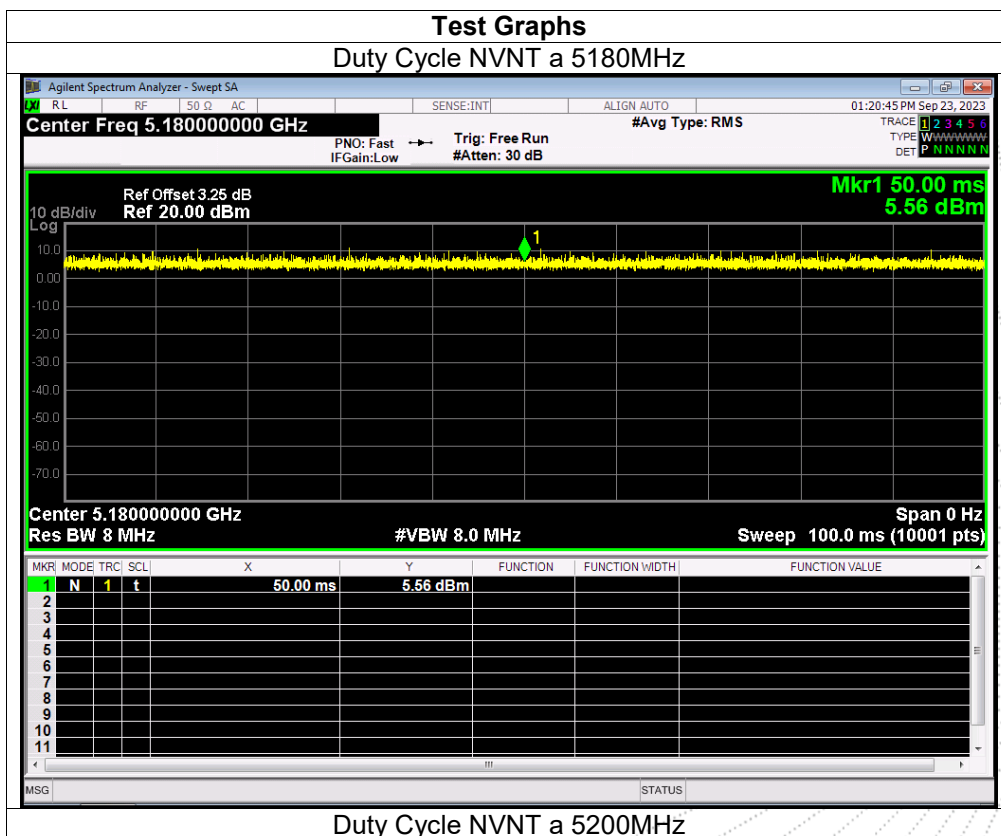
1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

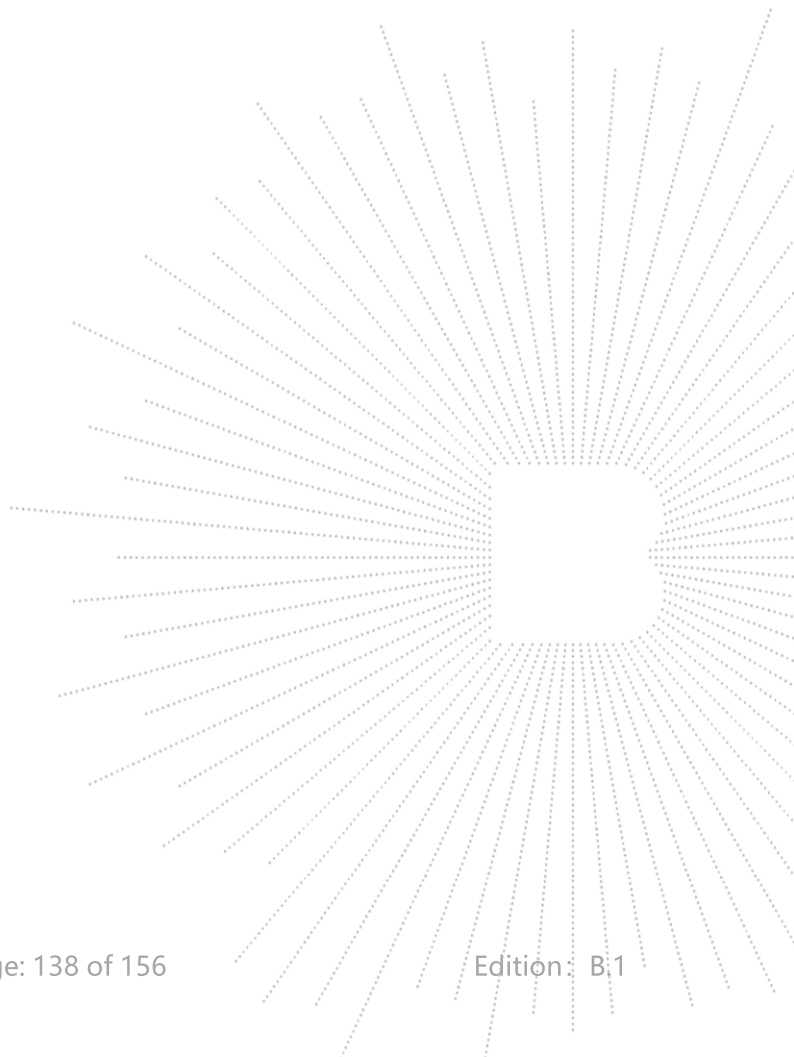
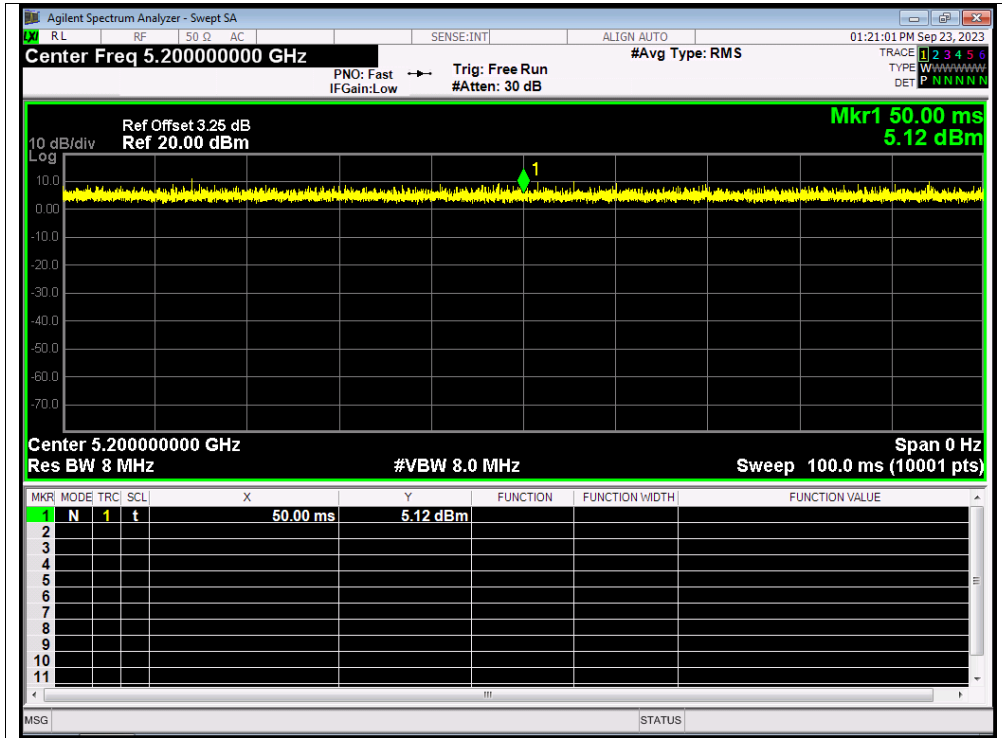


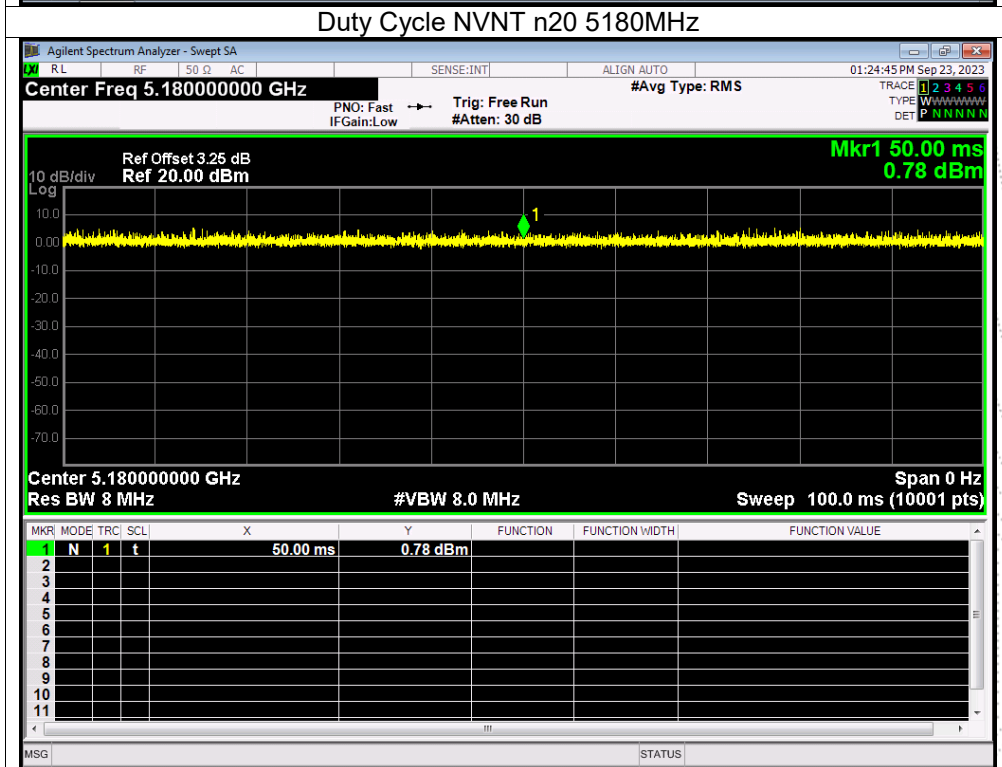
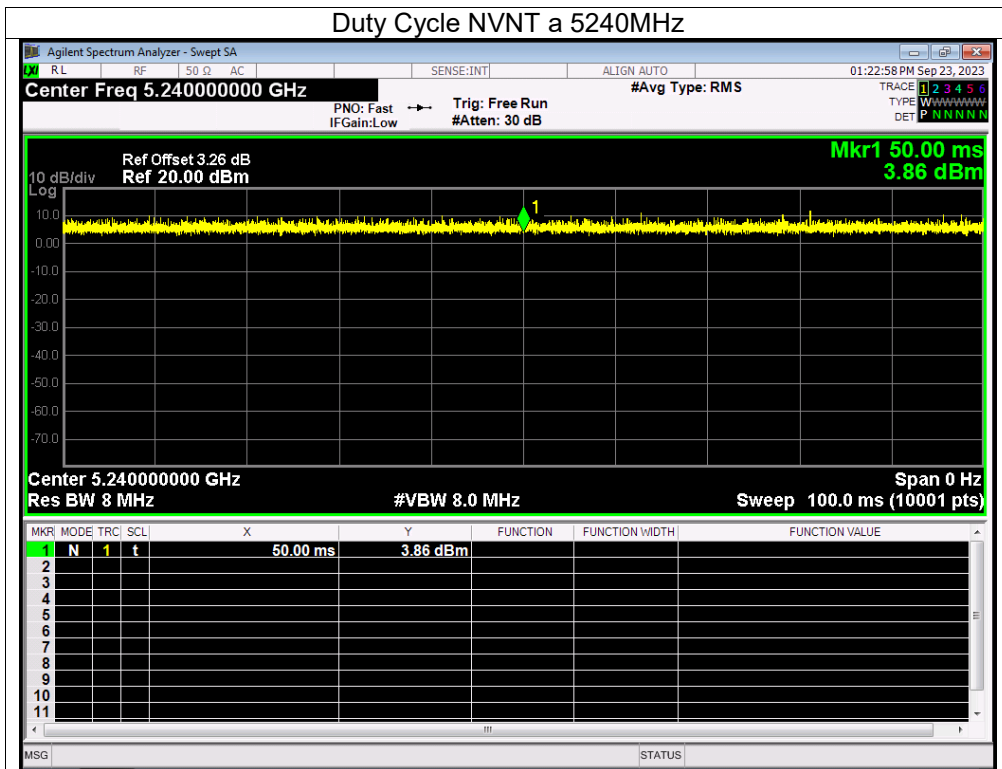
15.4 Test Result

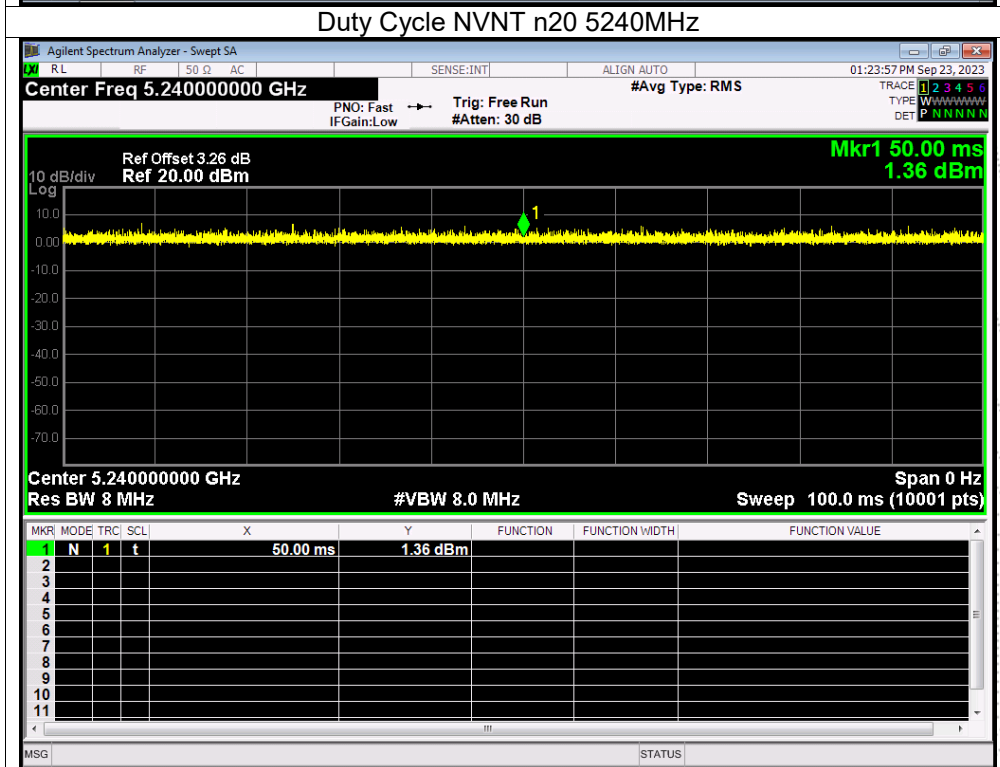
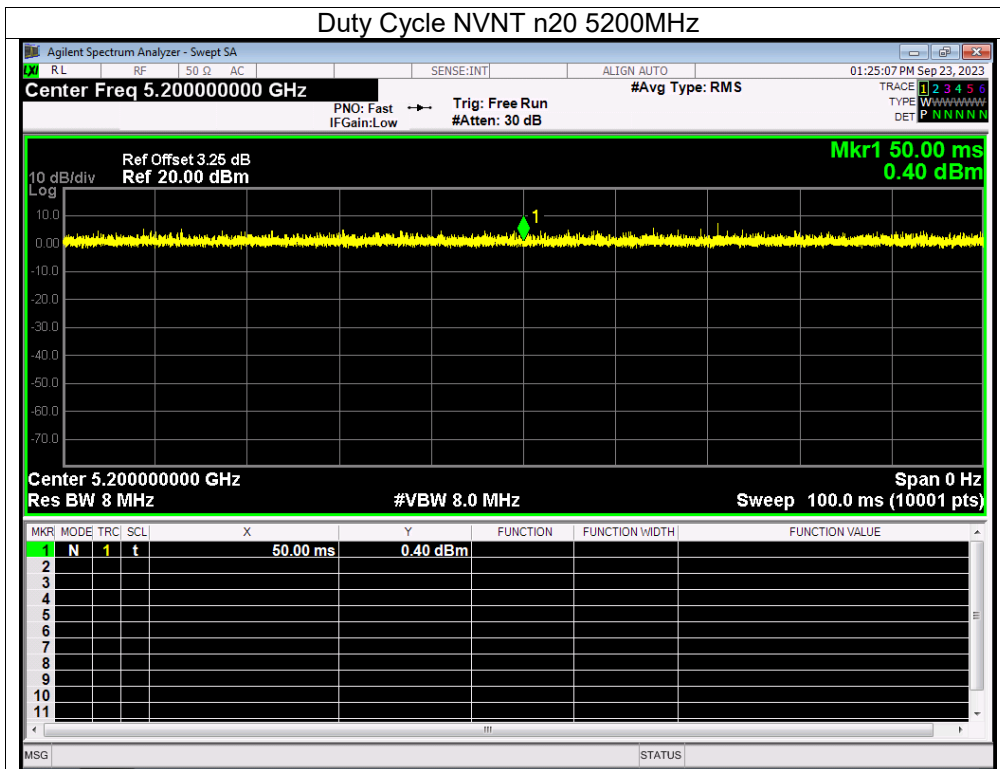
5.1G

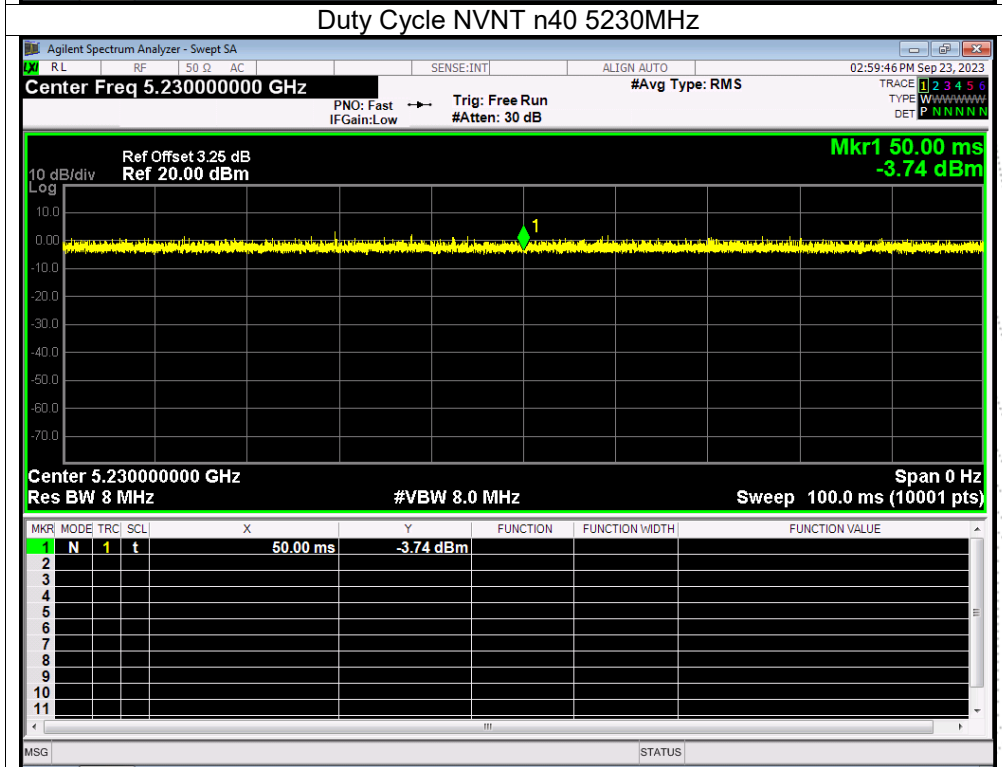
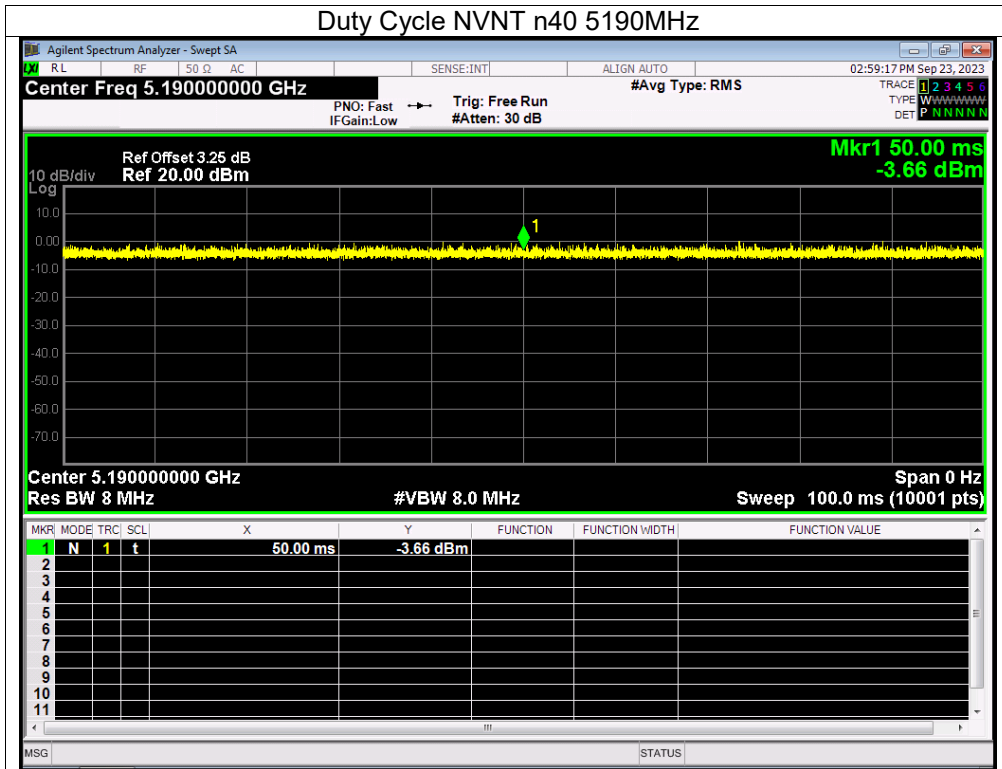
Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	a	5180	100	0	0
NVNT	a	5200	100	0	0
NVNT	a	5240	100	0	0
NVNT	n20	5180	100	0	0
NVNT	n20	5200	100	0	0
NVNT	n20	5240	100	0	0
NVNT	n40	5190	100	0	0
NVNT	n40	5230	100	0	0
NVNT	ac20	5180	100	0	0
NVNT	ac20	5200	100	0	0
NVNT	ac20	5240	100	0	0
NVNT	ac40	5190	100	0	0
NVNT	ac40	5230	100	0	0
NVNT	ac80	5210	100	0	0

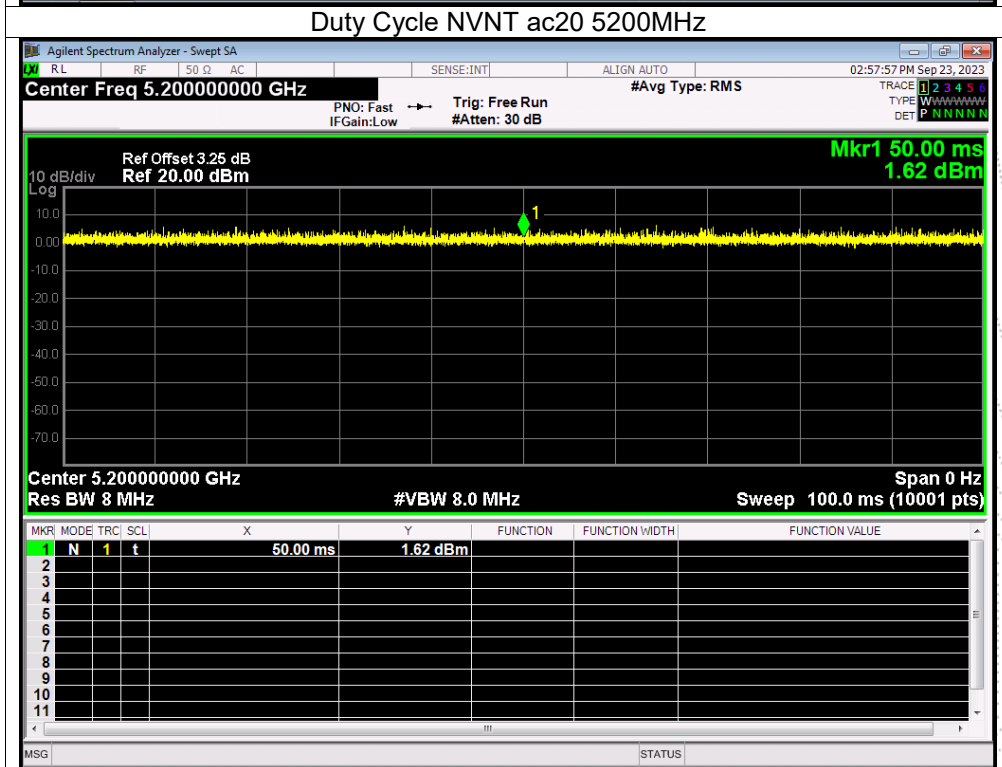
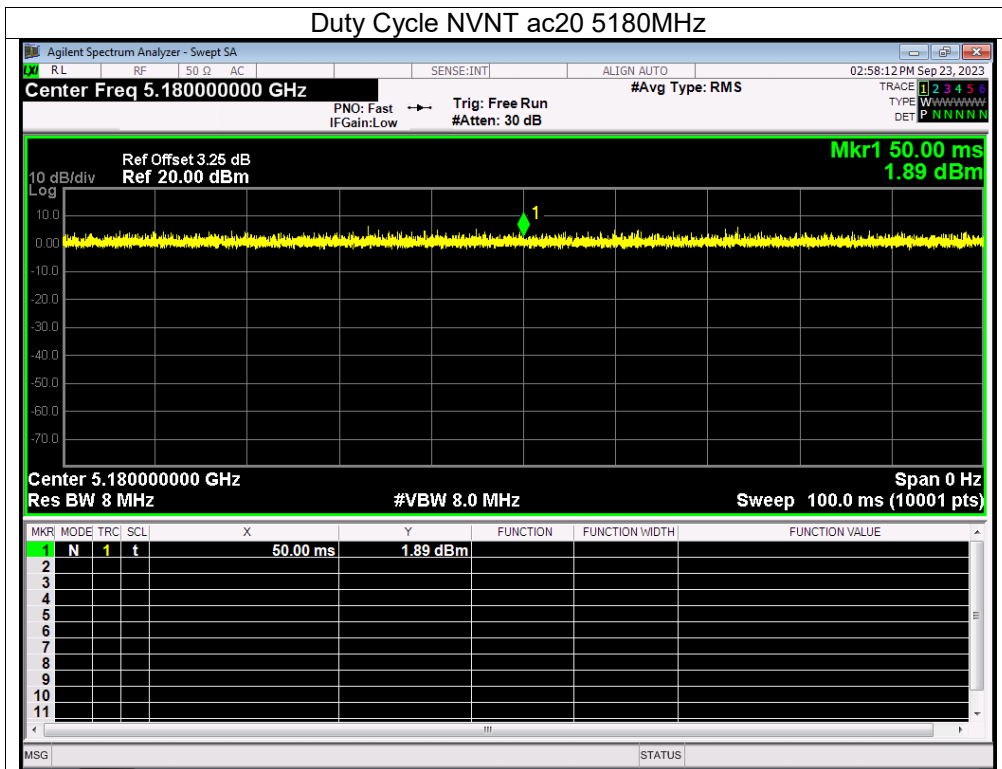


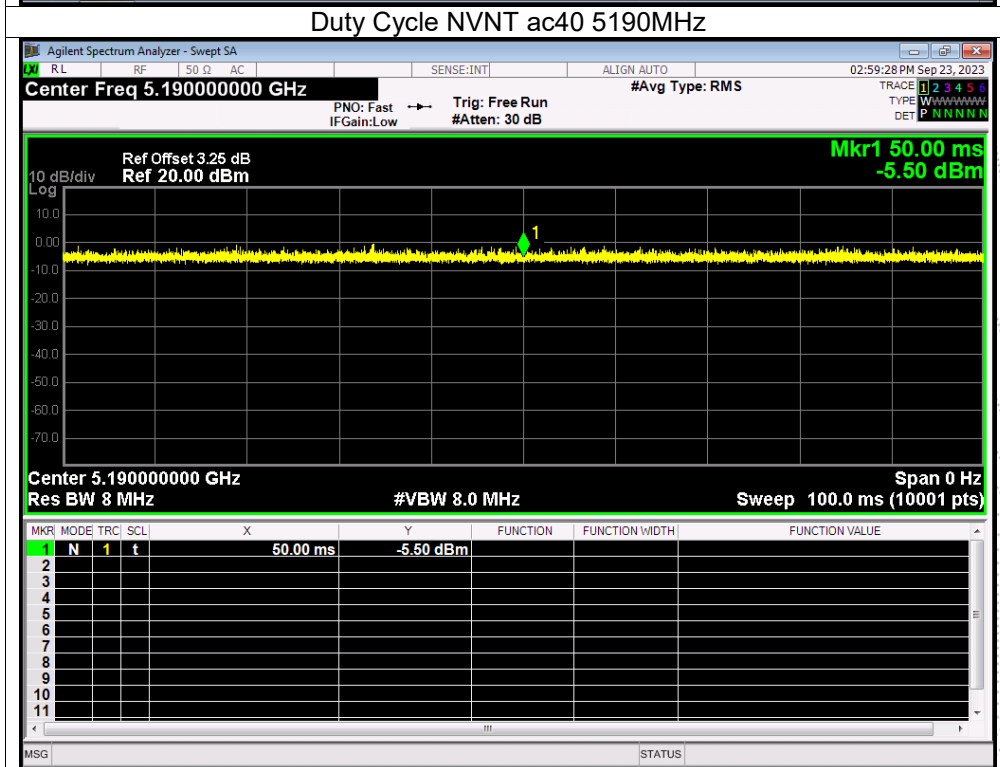
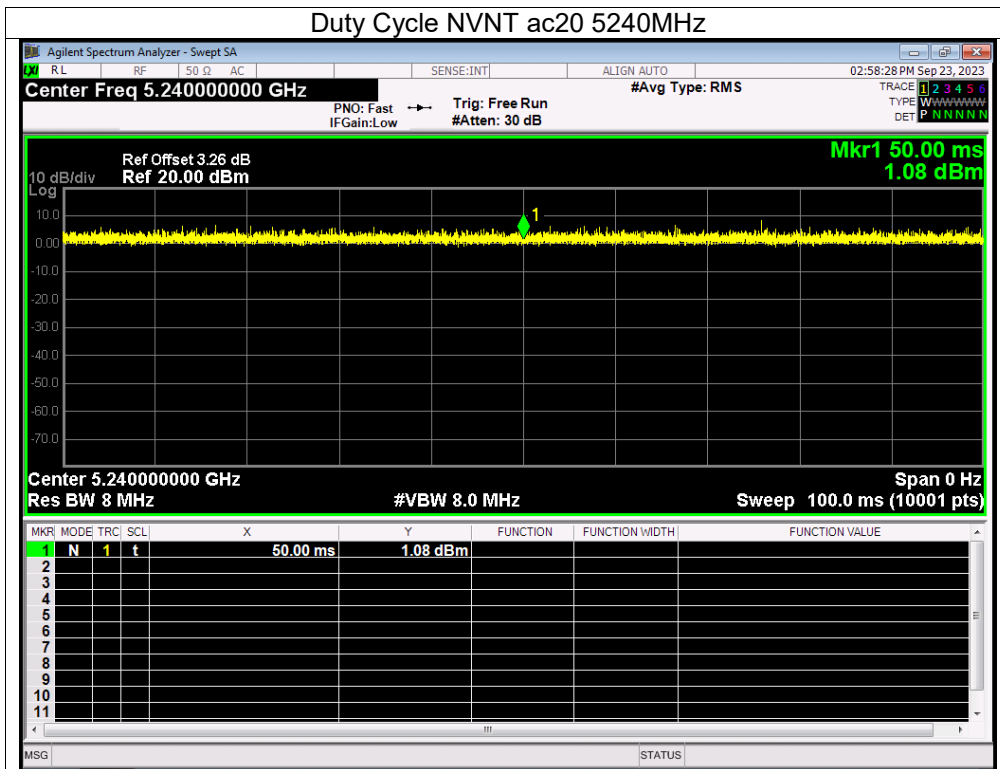


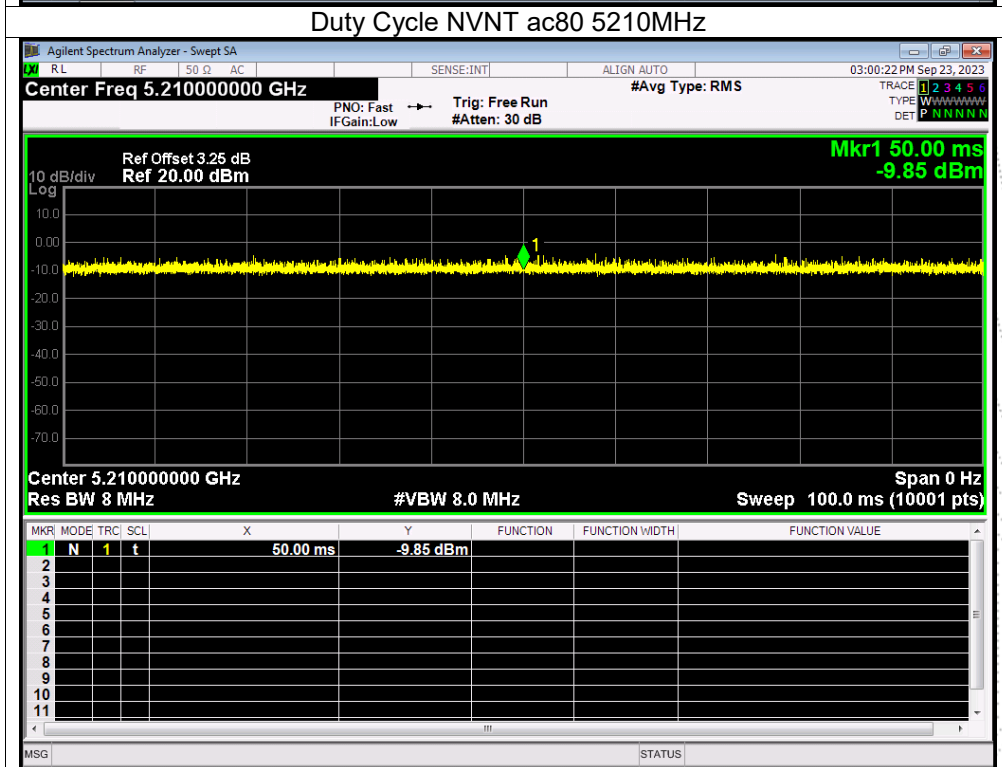
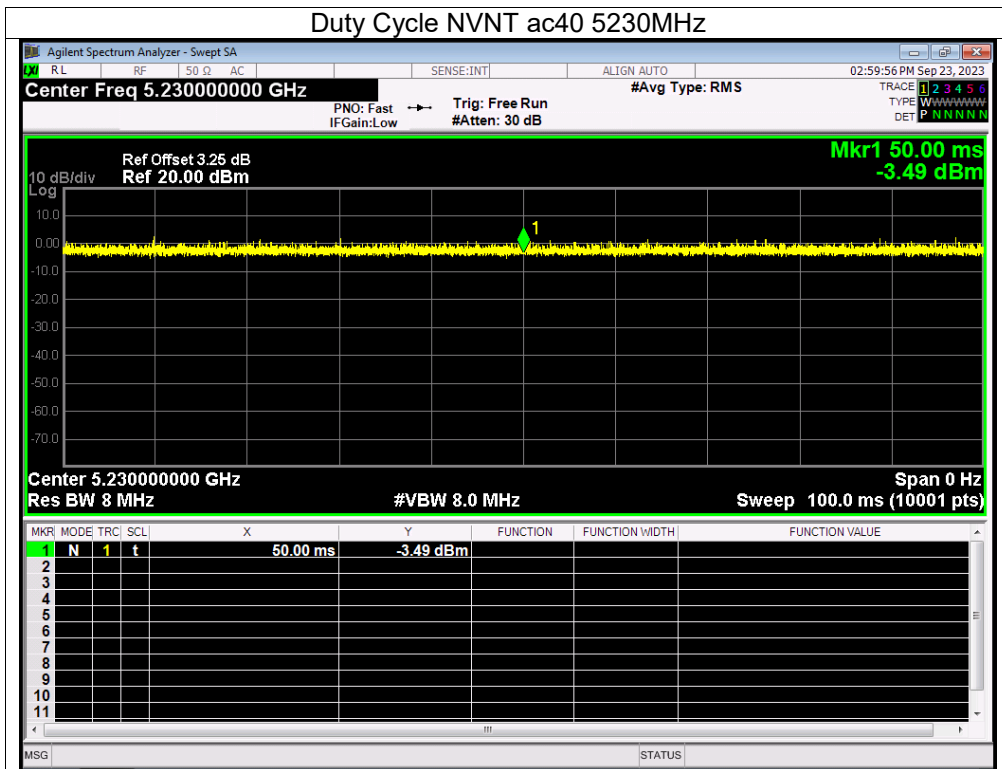












5.8G

Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	a	5745	100	0	0
NVNT	a	5785	100	0	0
NVNT	a	5825	100	0	0
NVNT	n20	5745	100	0	0
NVNT	n20	5785	100	0	0
NVNT	n20	5825	100	0	0
NVNT	n40	5755	100	0	0
NVNT	n40	5795	100	0	0
NVNT	ac20	5745	100	0	0
NVNT	ac20	5785	100	0	0
NVNT	ac20	5825	100	0	0
NVNT	ac40	5755	100	0	0
NVNT	ac40	5795	100	0	0
NVNT	ac80	5775	100	0	0

