

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	250mW
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:	AC120V/60Hz
Test Mode:	(5180-5240MHz); (5745-5825MHz)		

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	4.85	24	Pass
NVNT	a	5200	5.22	24	Pass
NVNT	a	5240	5.08	24	Pass
NVNT	n20	5180	3.99	24	Pass
NVNT	n20	5200	4.19	24	Pass
NVNT	n20	5240	3.37	24	Pass
NVNT	n40	5190	2.10	24	Pass
NVNT	n40	5230	2.19	24	Pass
NVNT	ac20	5180	3.87	24	Pass
NVNT	ac20	5200	4.08	24	Pass
NVNT	ac20	5240	3.45	24	Pass
NVNT	ac40	5190	2.73	24	Pass
NVNT	ac40	5230	2.07	24	Pass
NVNT	ac80	5210	1.98	24	Pass

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5745	6.49	30	Pass
NVNT	a	5785	5.37	30	Pass
NVNT	a	5825	4.48	30	Pass
NVNT	n20	5745	5.33	30	Pass
NVNT	n20	5785	4.42	30	Pass
NVNT	n20	5825	3.41	30	Pass
NVNT	n40	5755	4.41	30	Pass
NVNT	n40	5795	3.61	30	Pass
NVNT	ac20	5745	5.57	30	Pass
NVNT	ac20	5785	4.44	30	Pass
NVNT	ac20	5825	3.43	30	Pass
NVNT	ac40	5755	4.66	30	Pass
NVNT	ac40	5795	3.57	30	Pass
NVNT	ac80	5775	3.78	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.

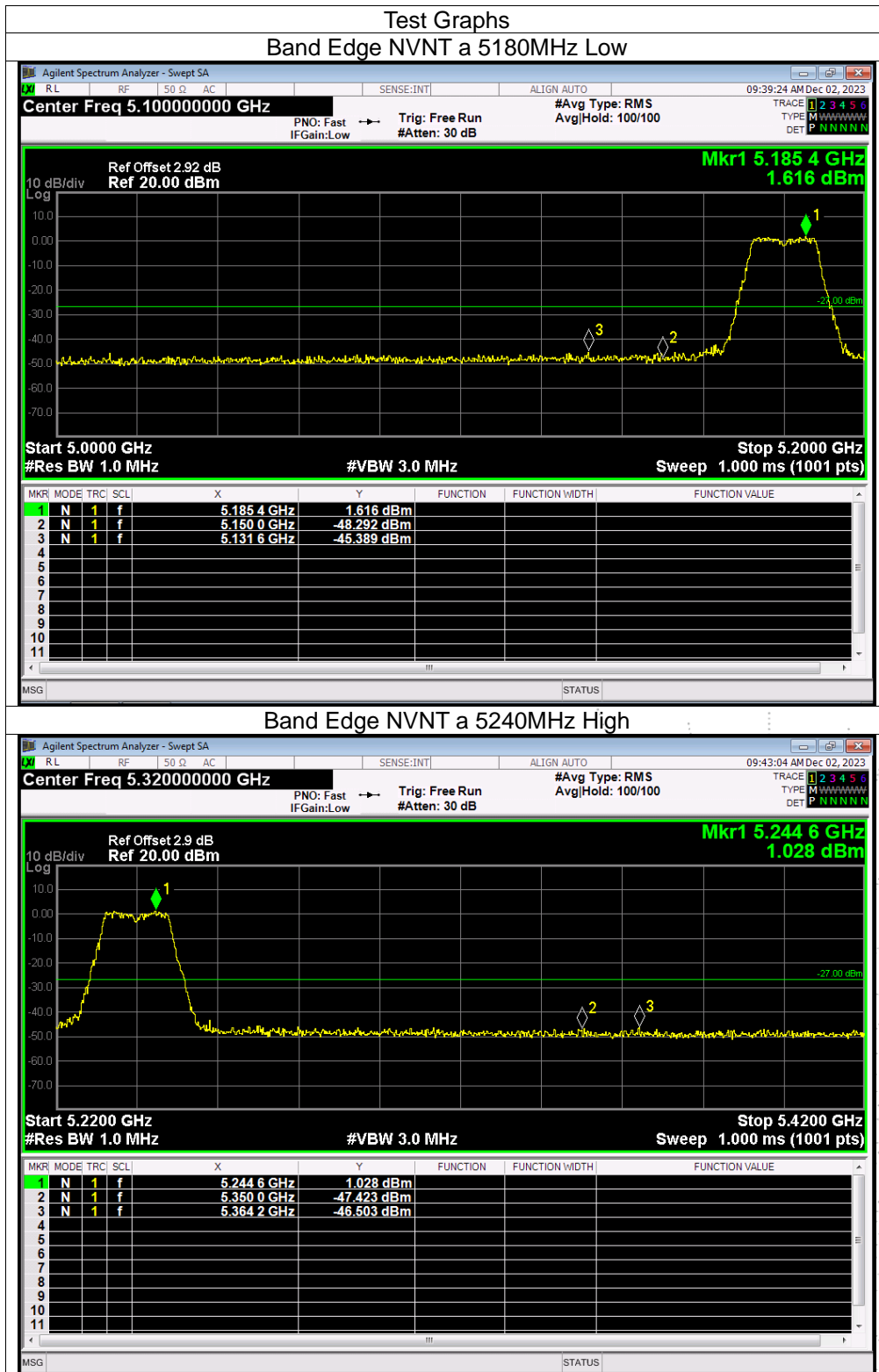
11.3 Test procedure

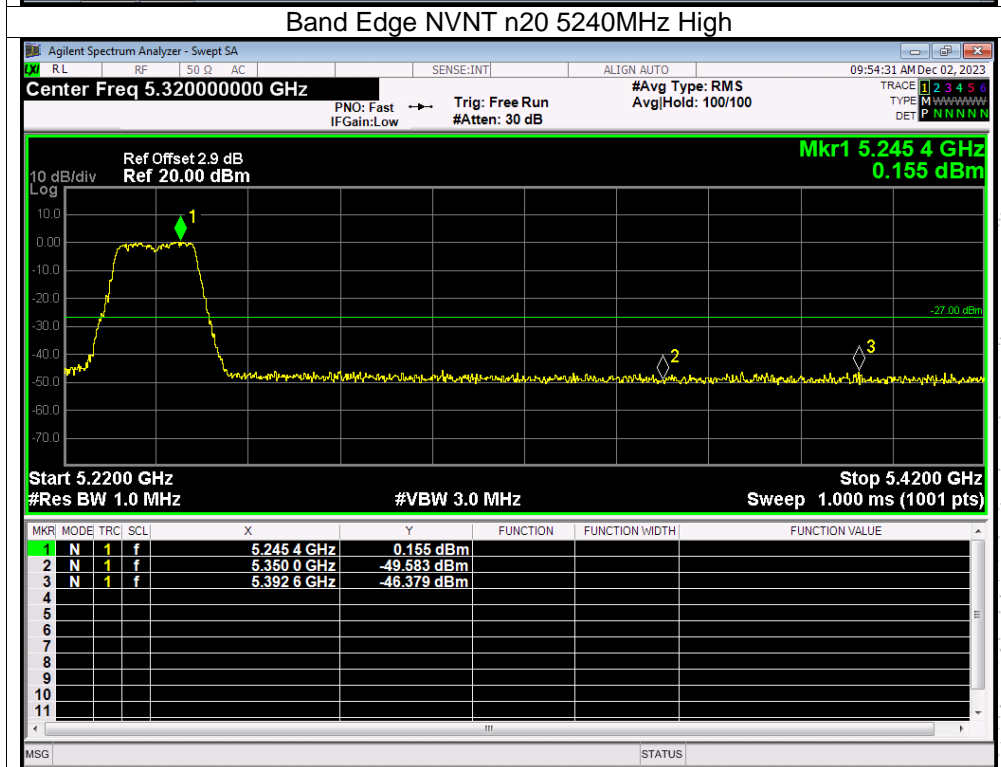
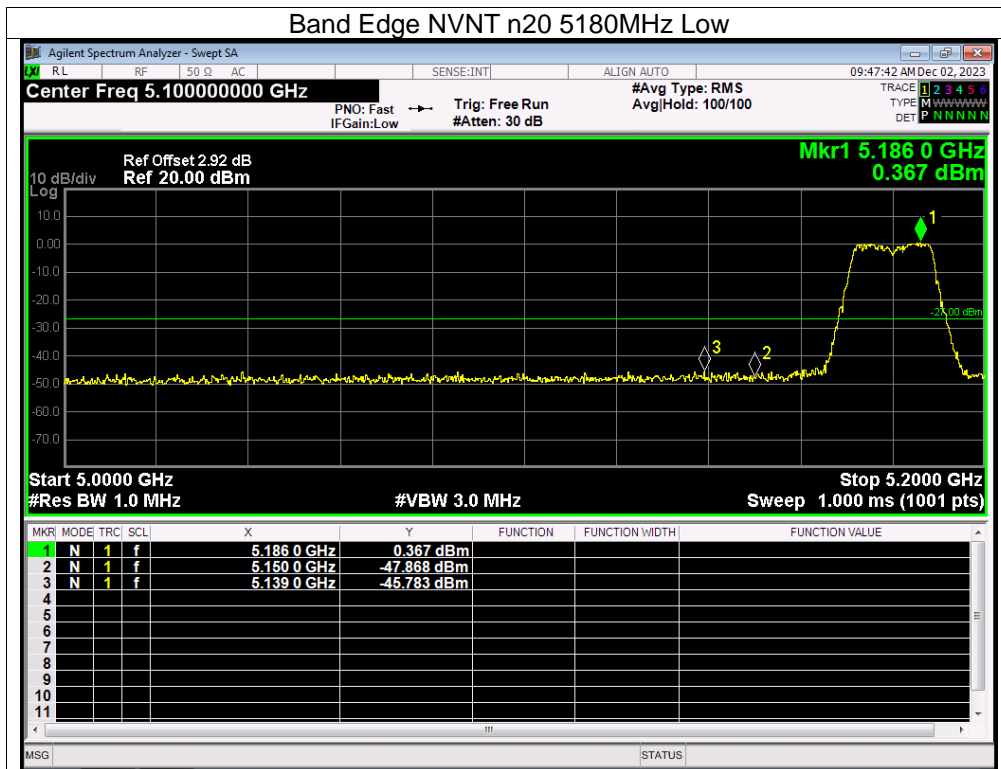
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

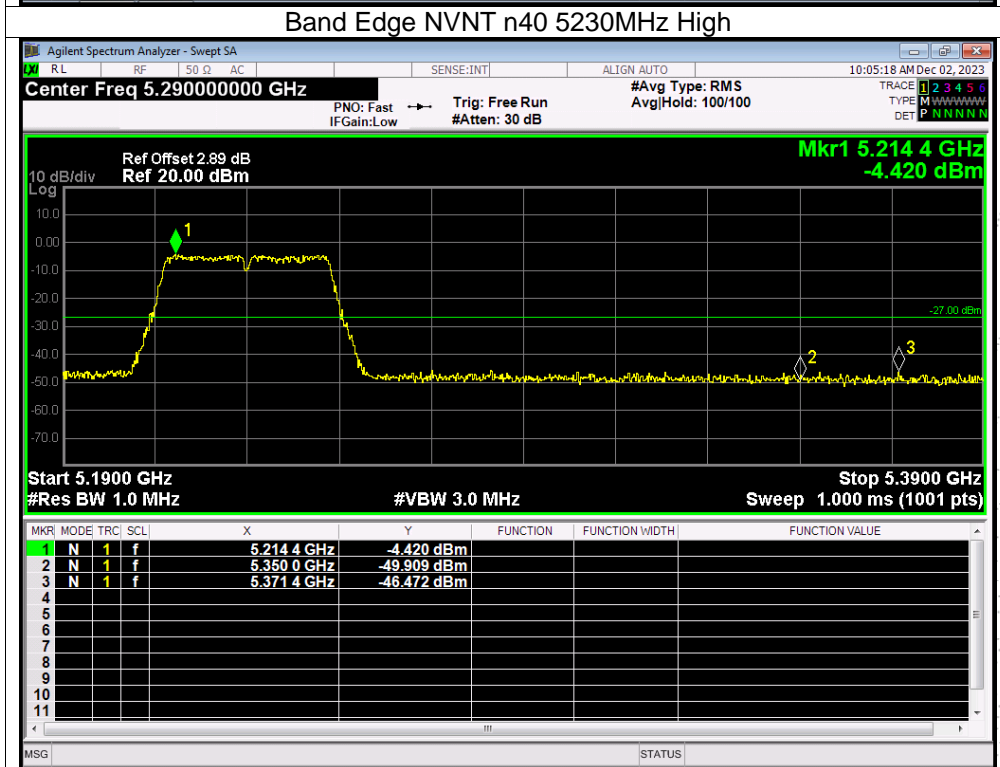
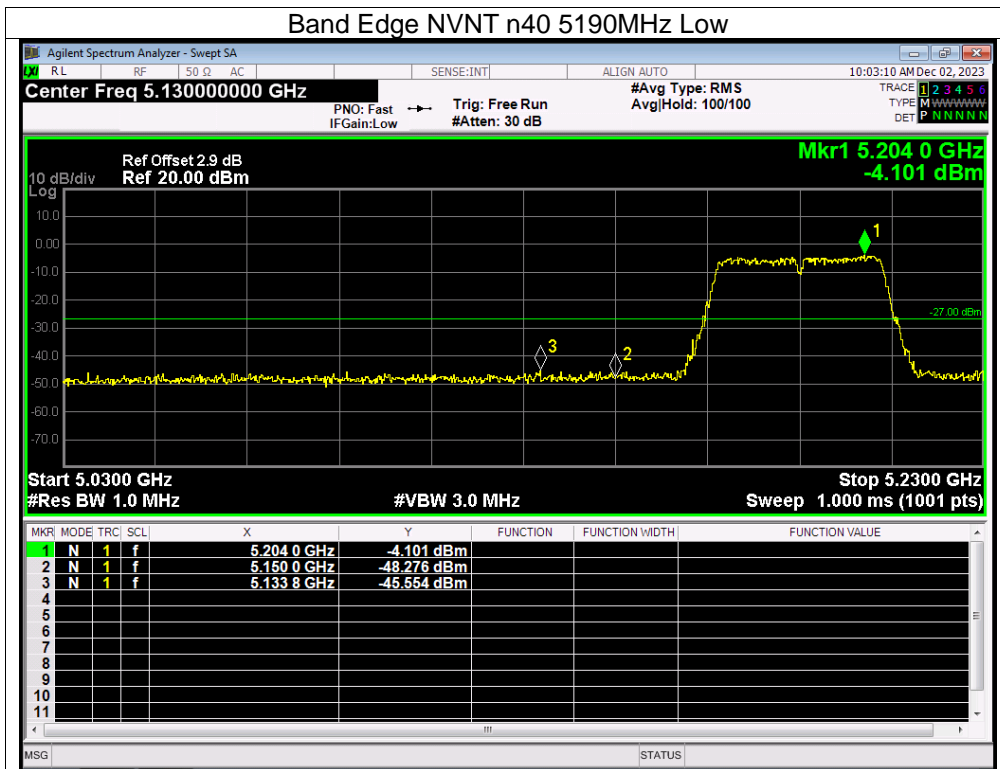
11.4 EUT operating Conditions

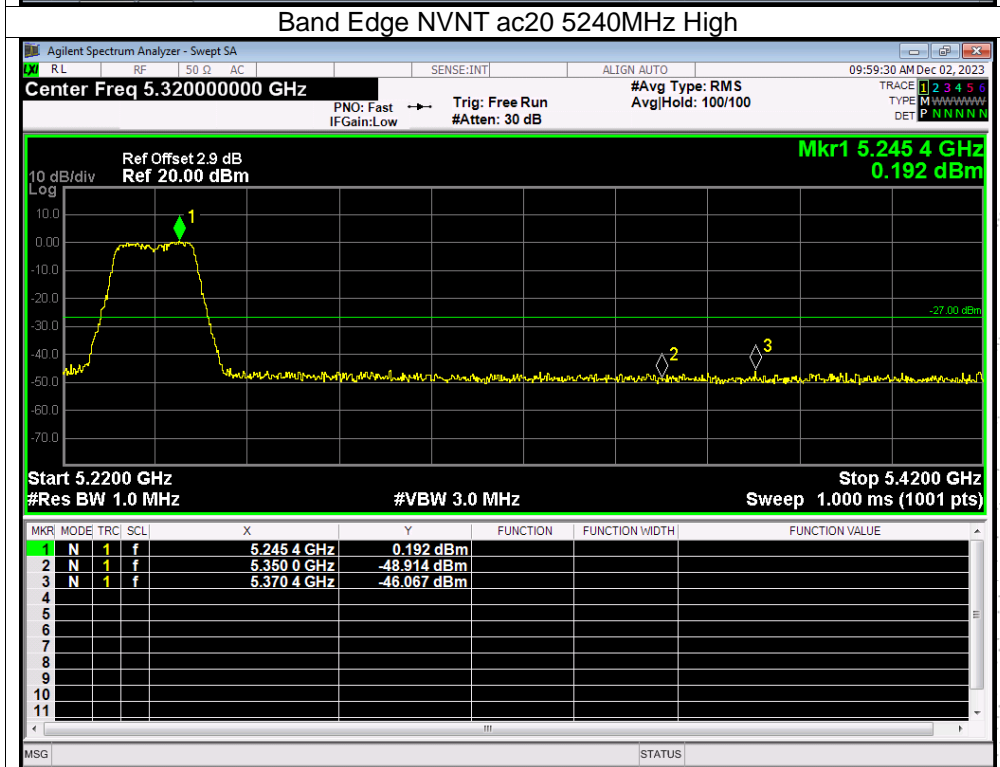
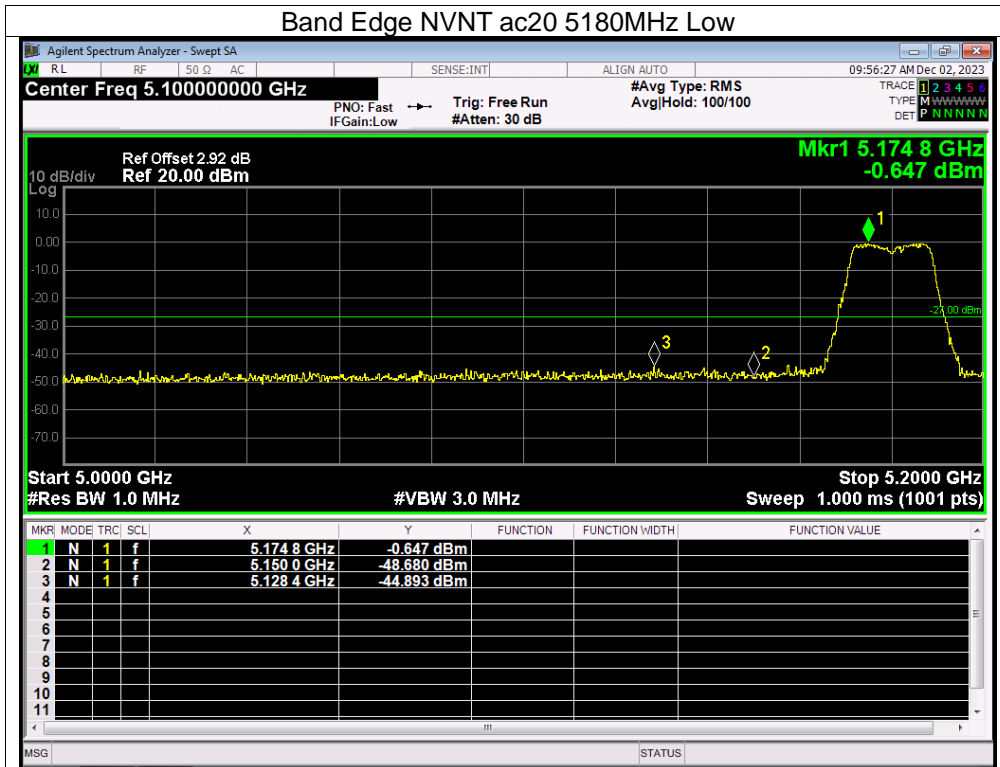
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data

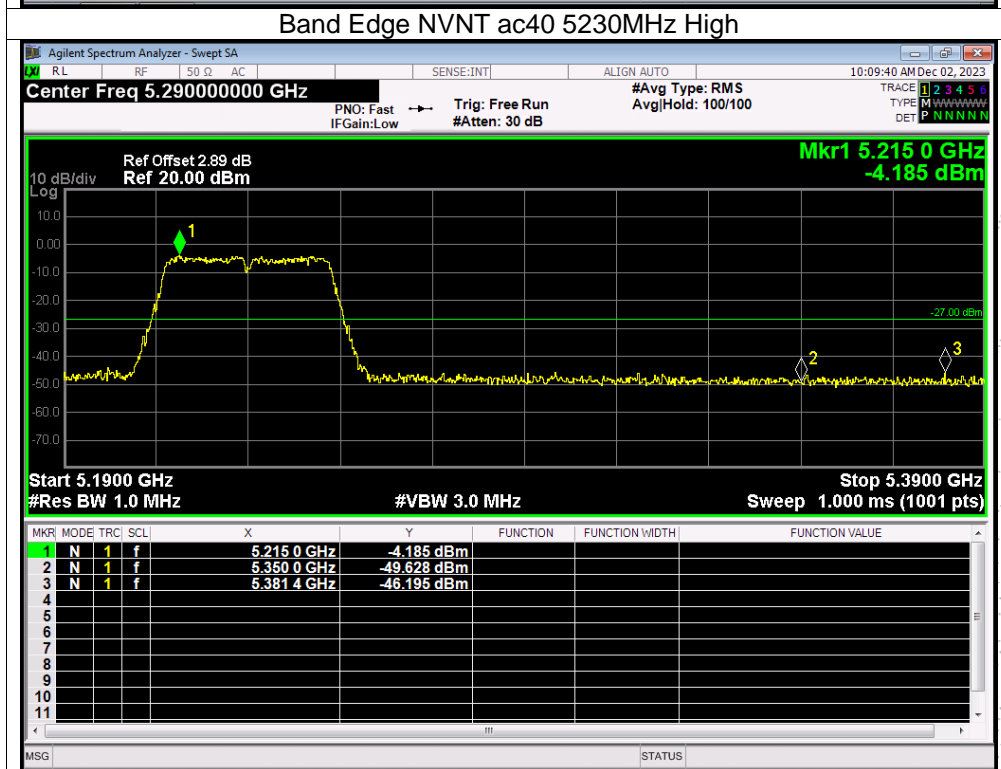
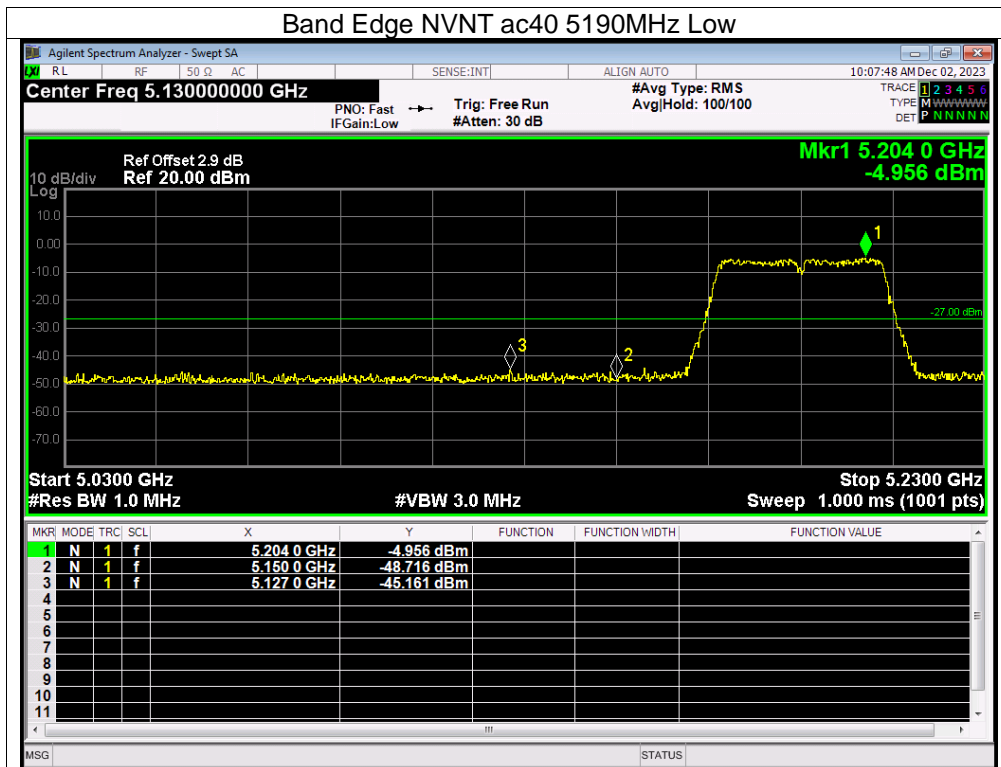
11.5 Test Result

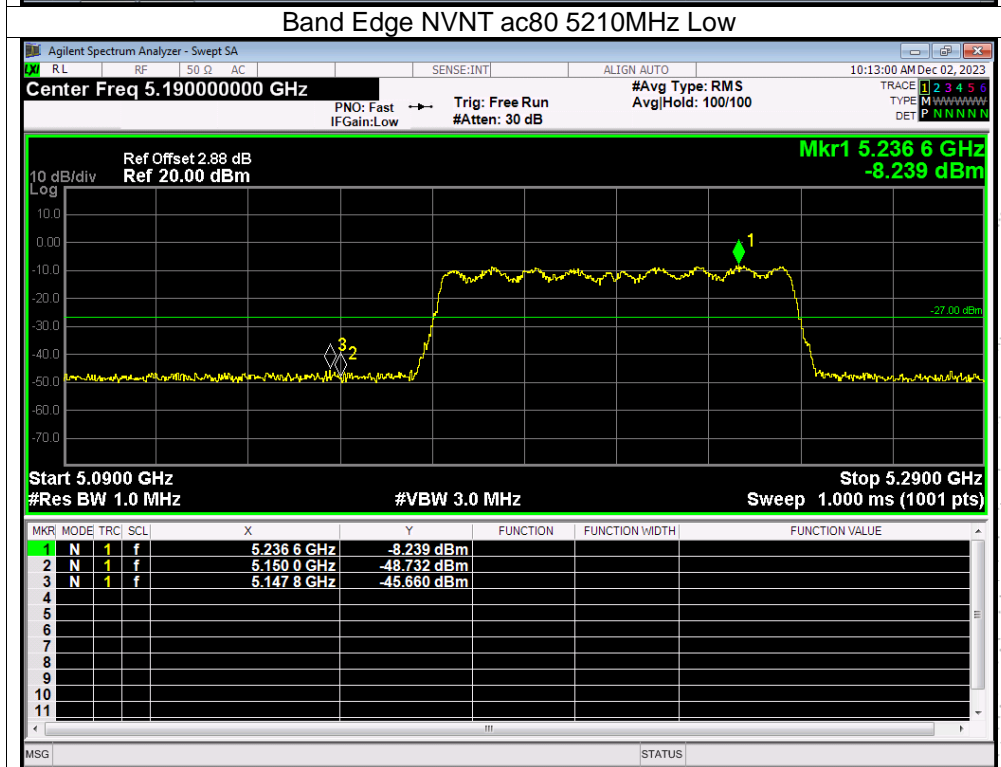
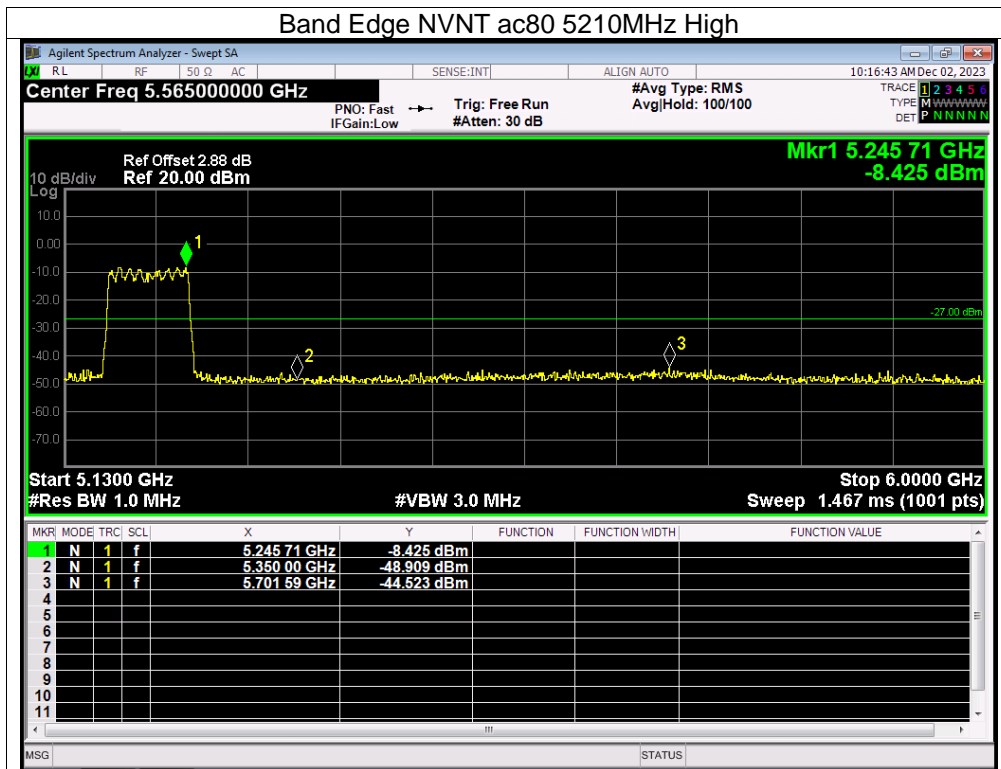


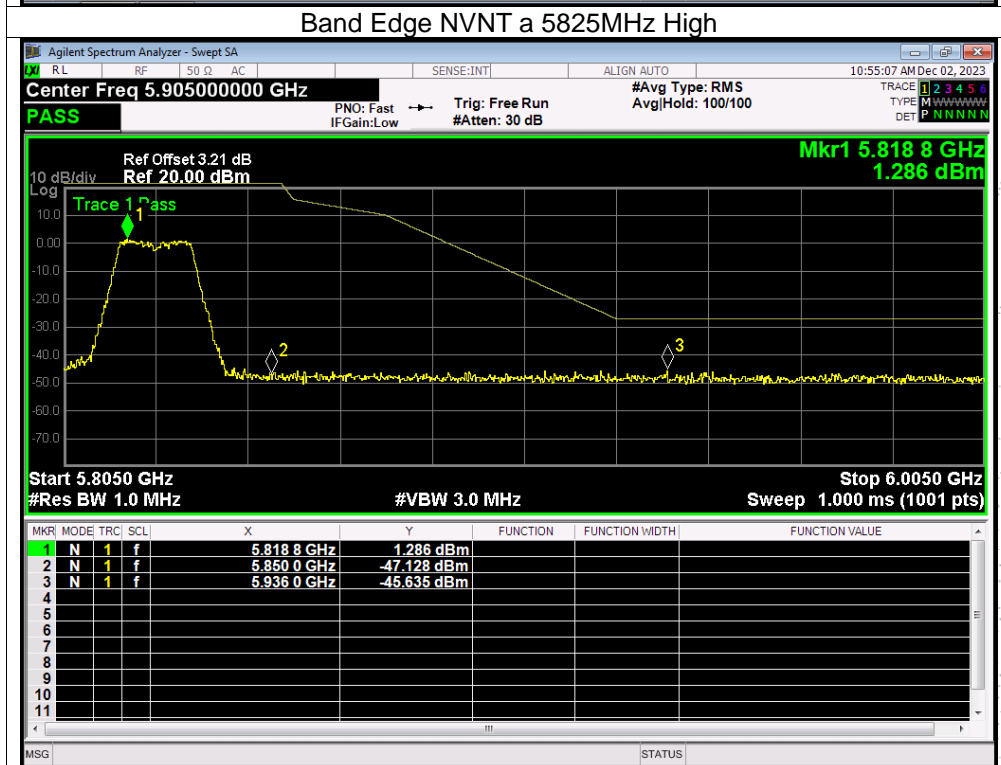
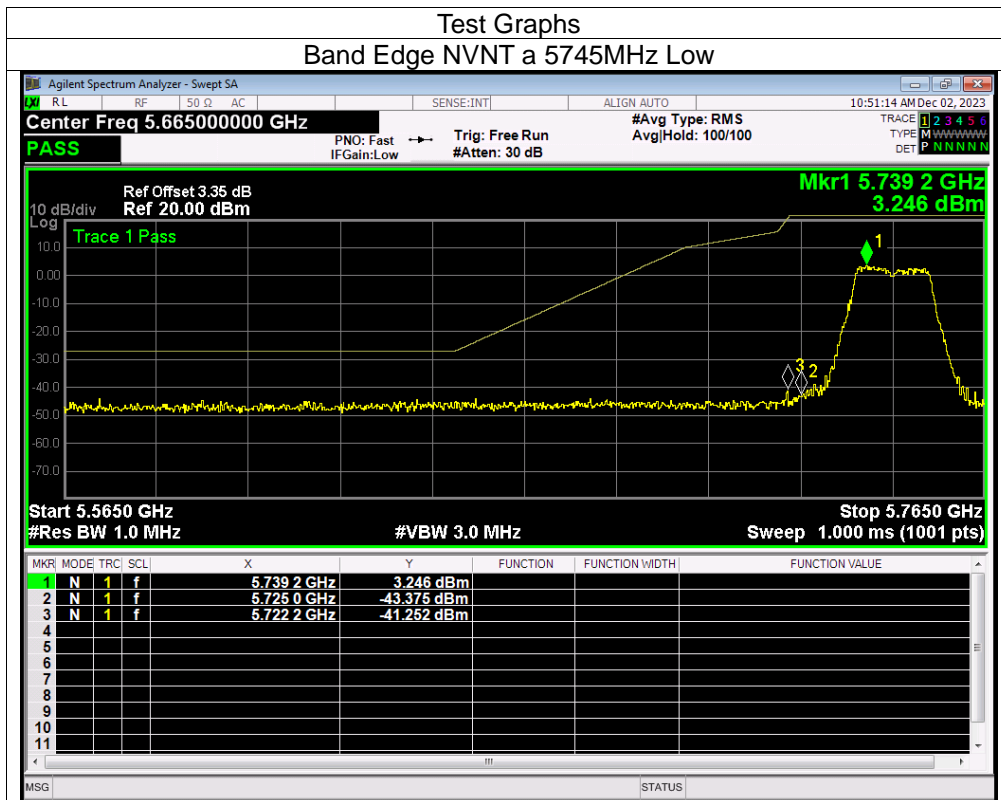


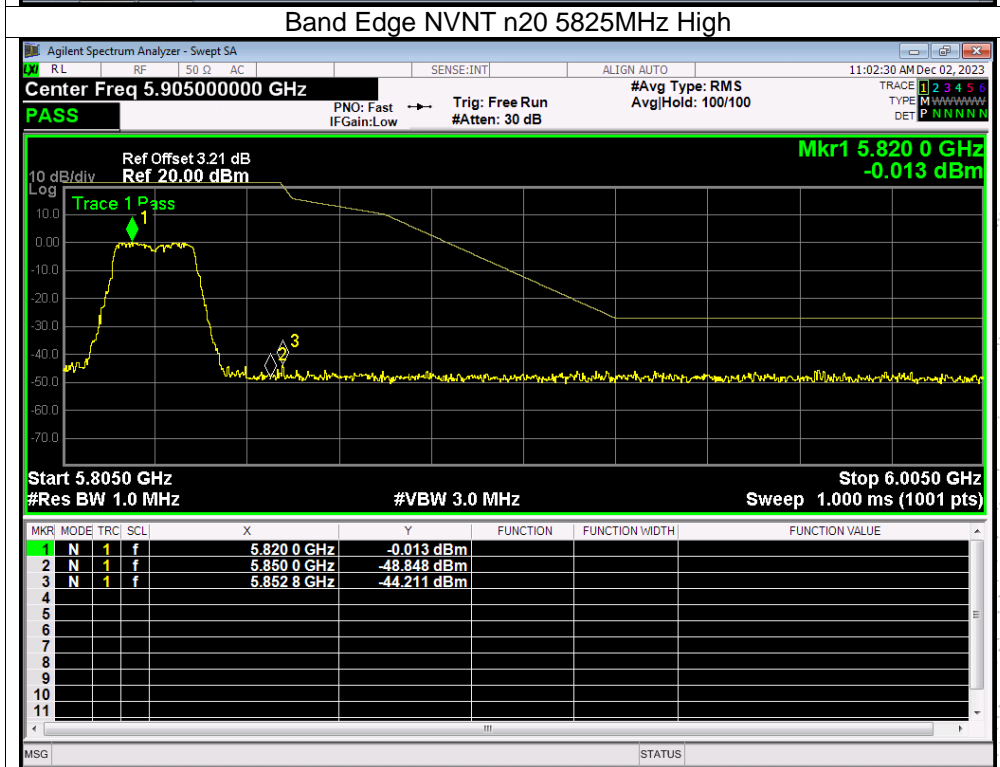
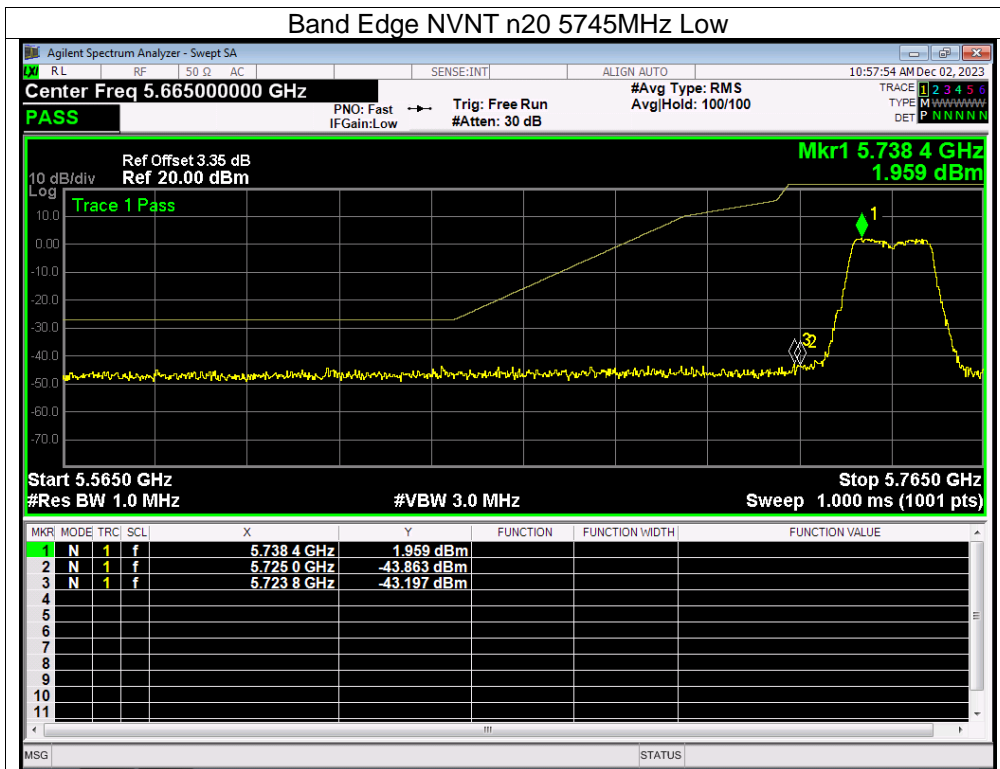


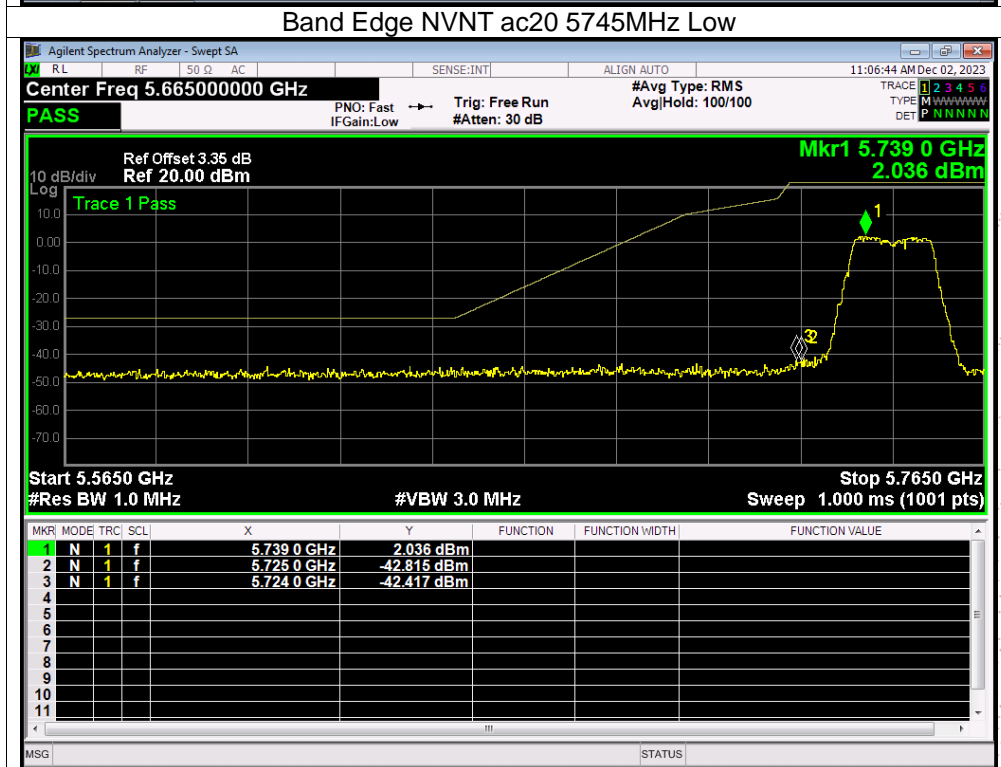
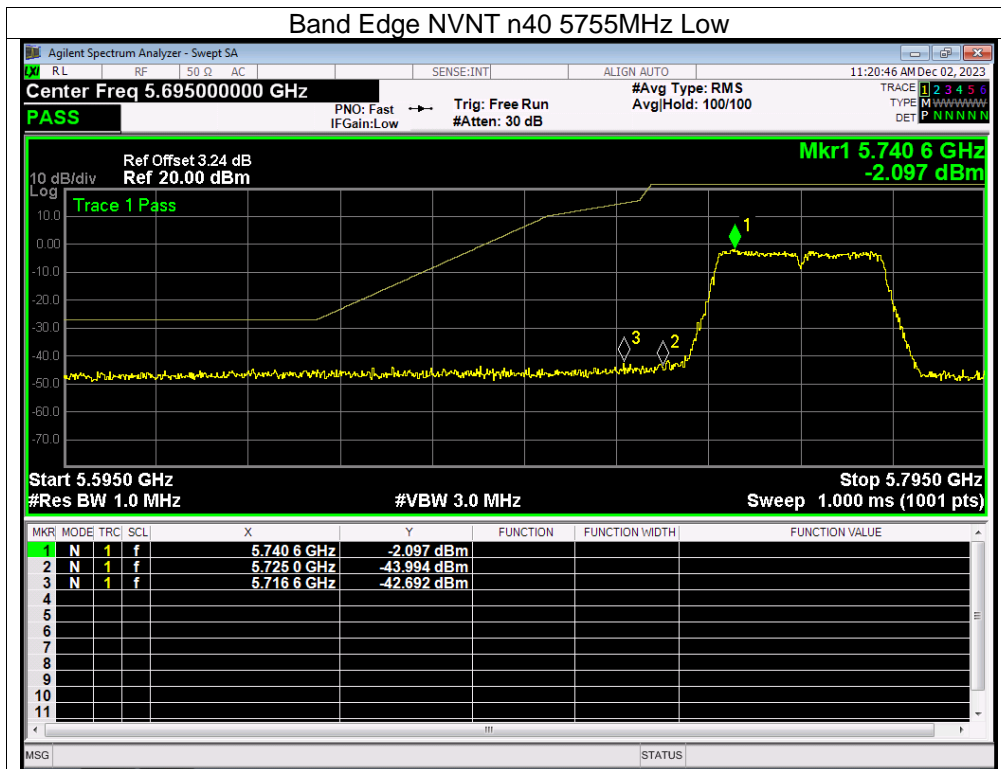


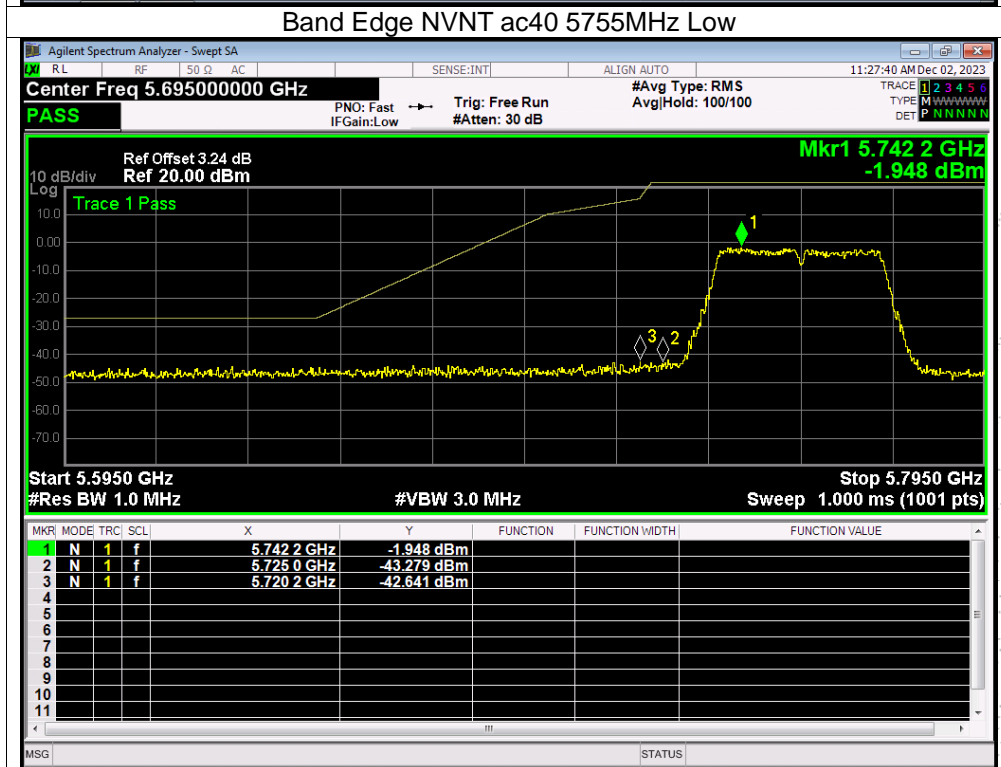
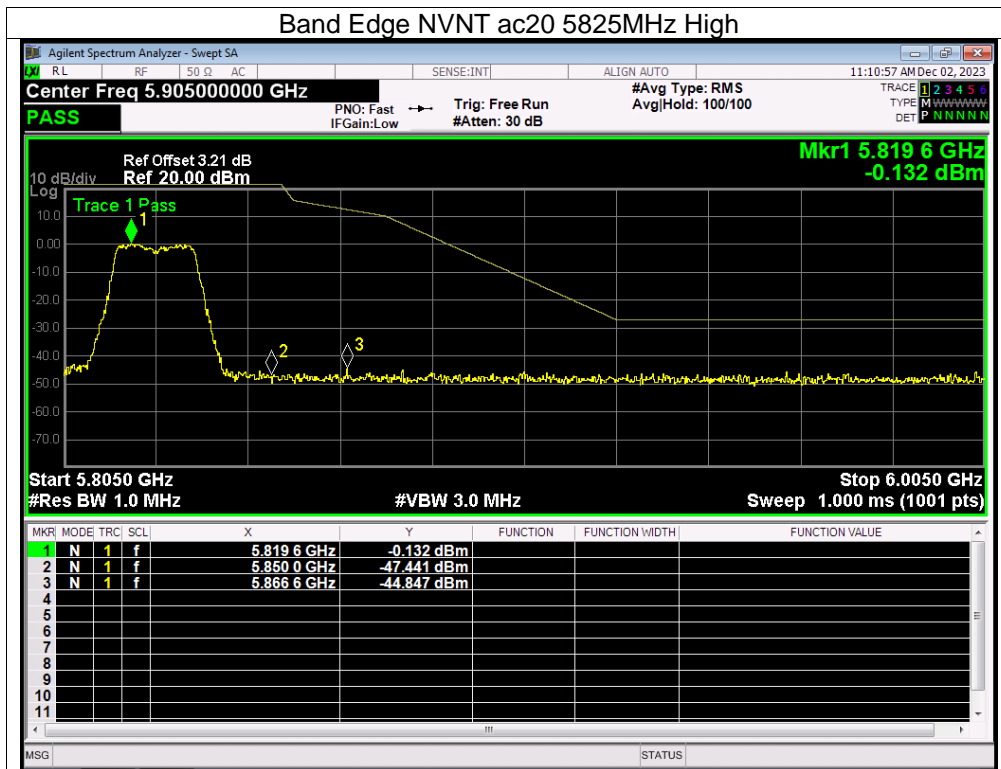


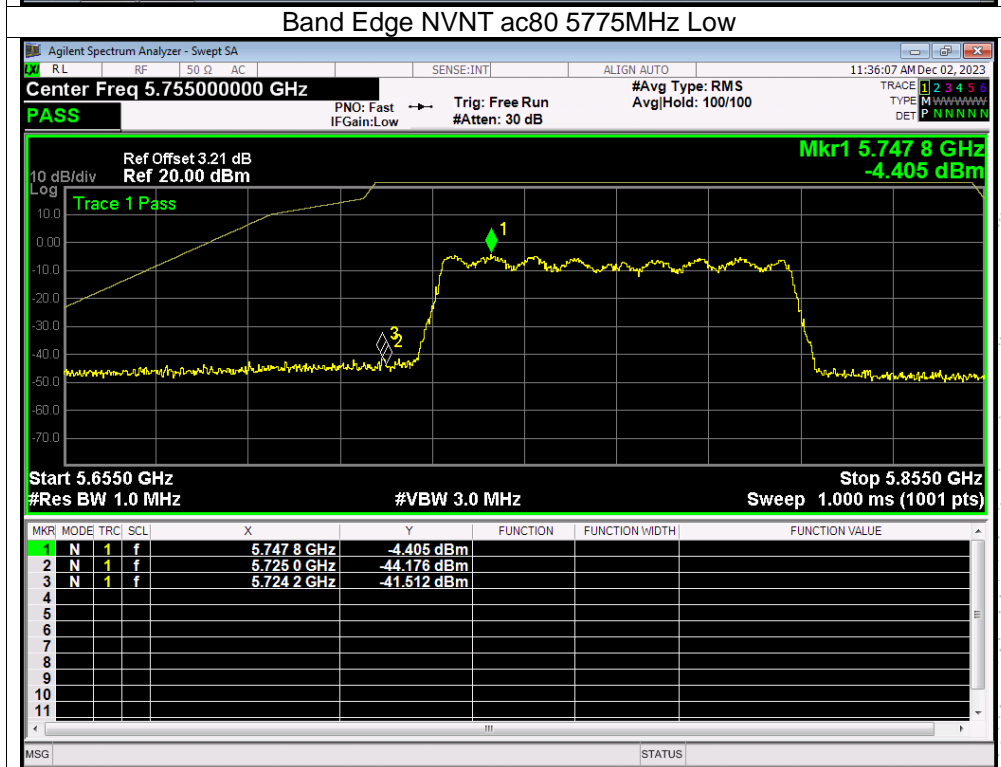
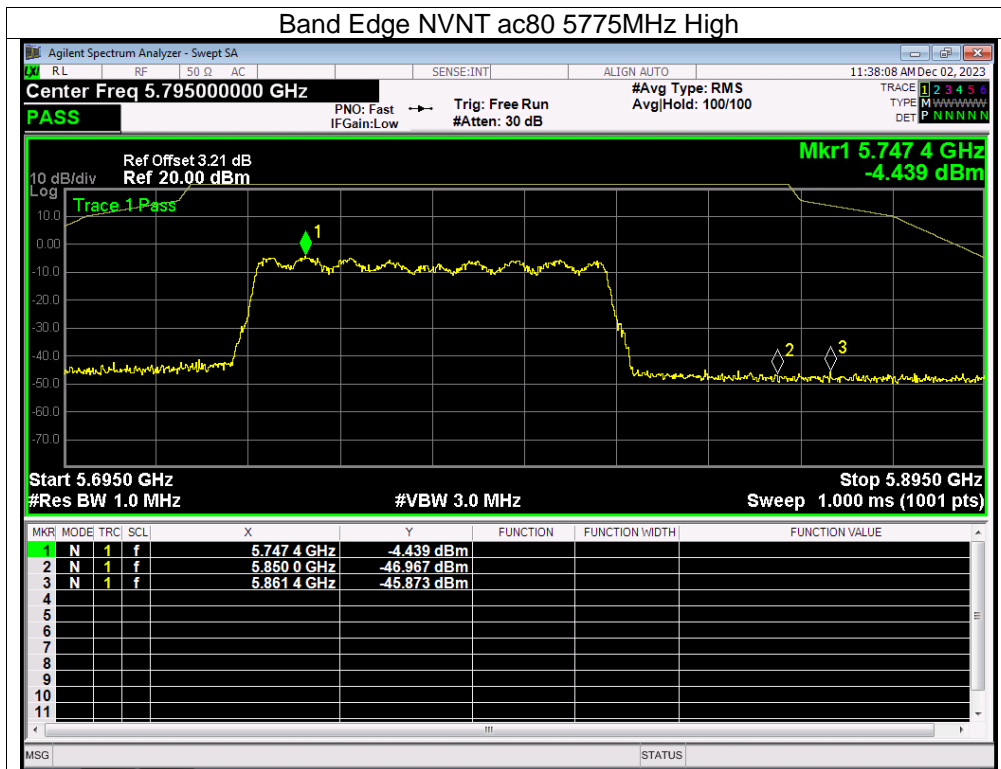






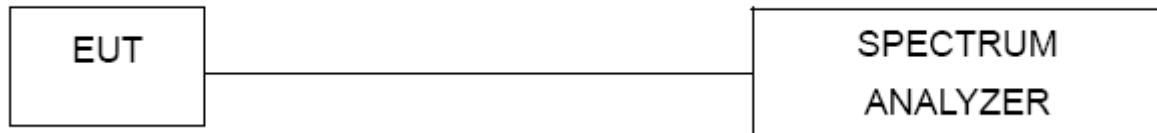






12. Spurious RF Conducted Emissions

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.

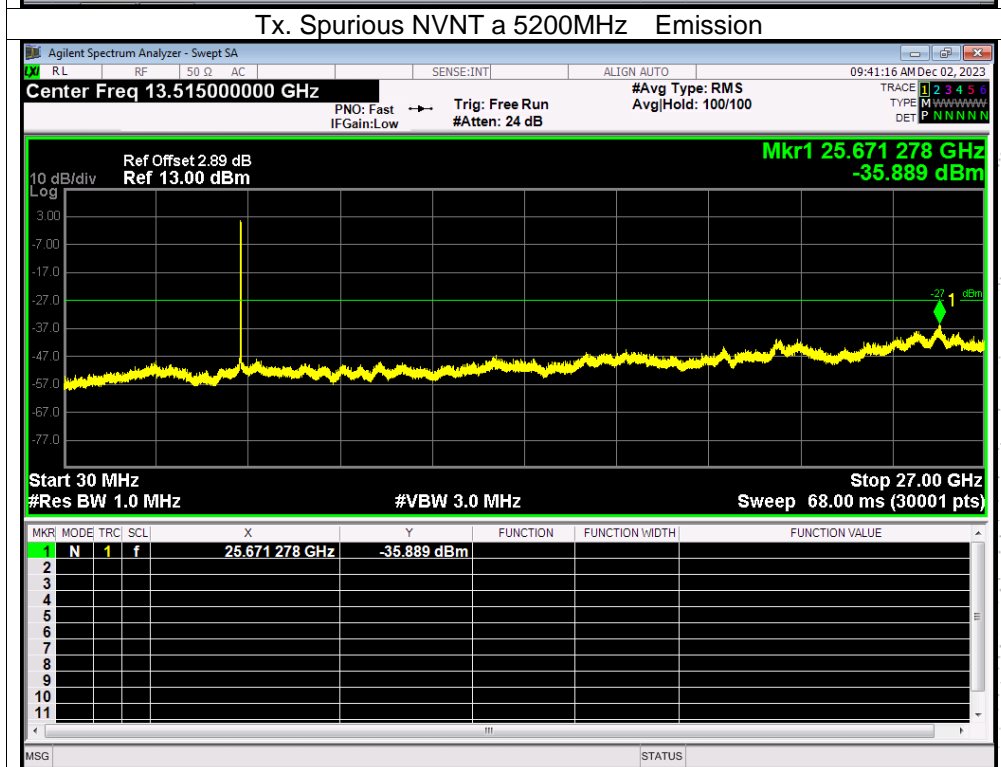
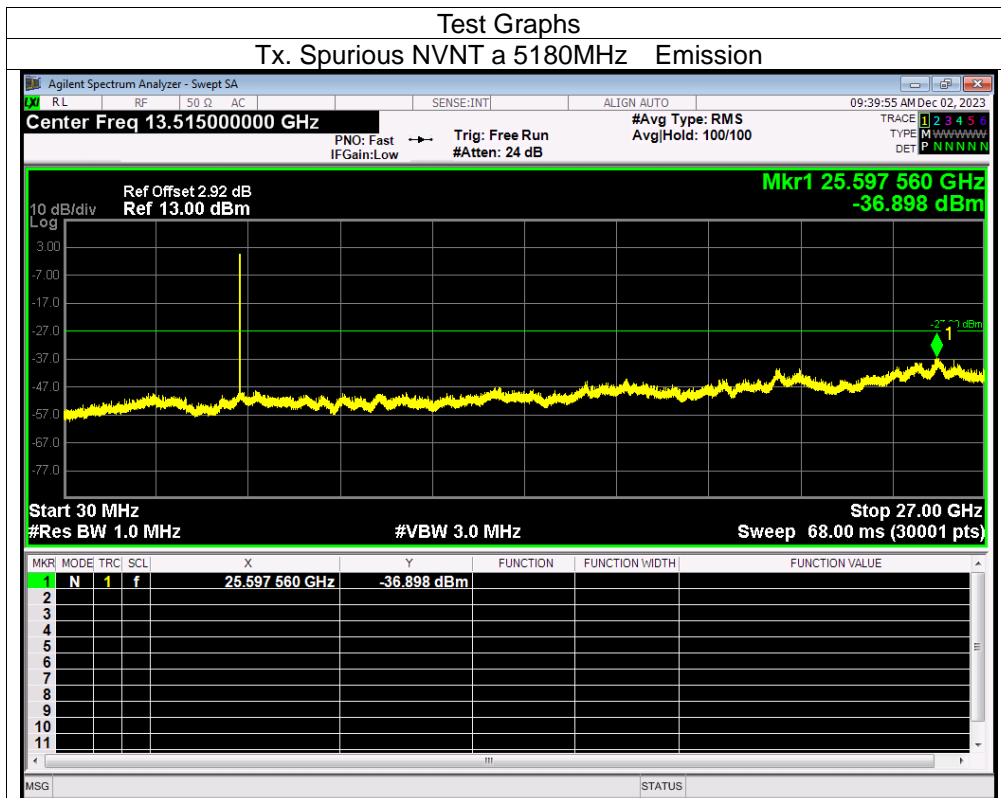
12.3 Test procedure

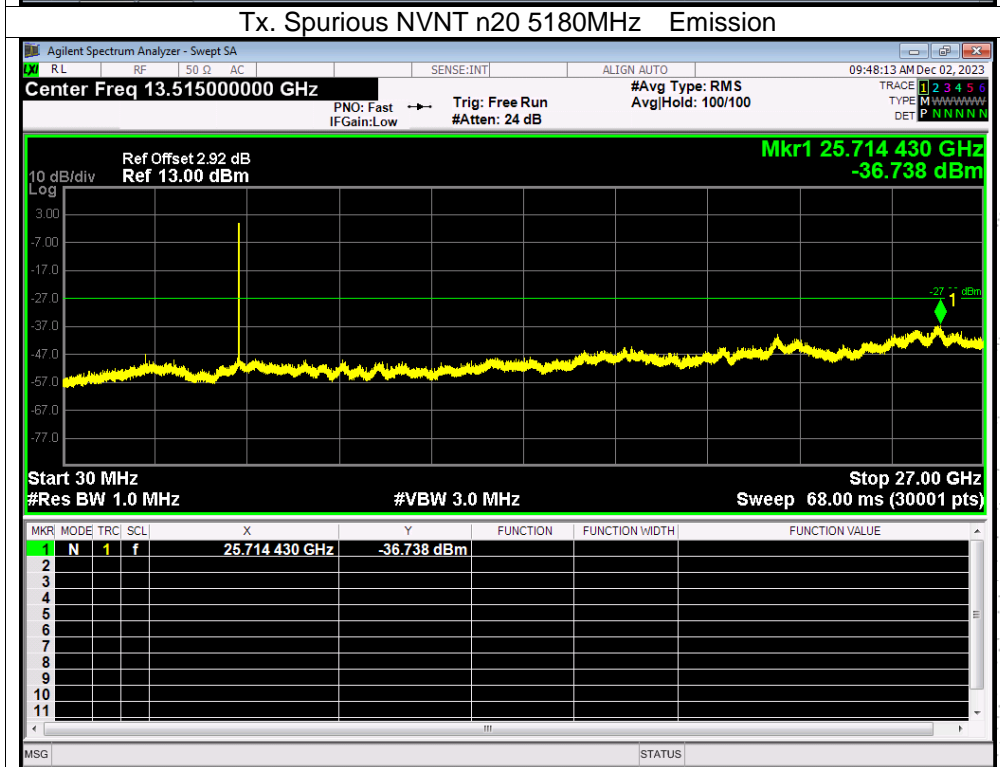
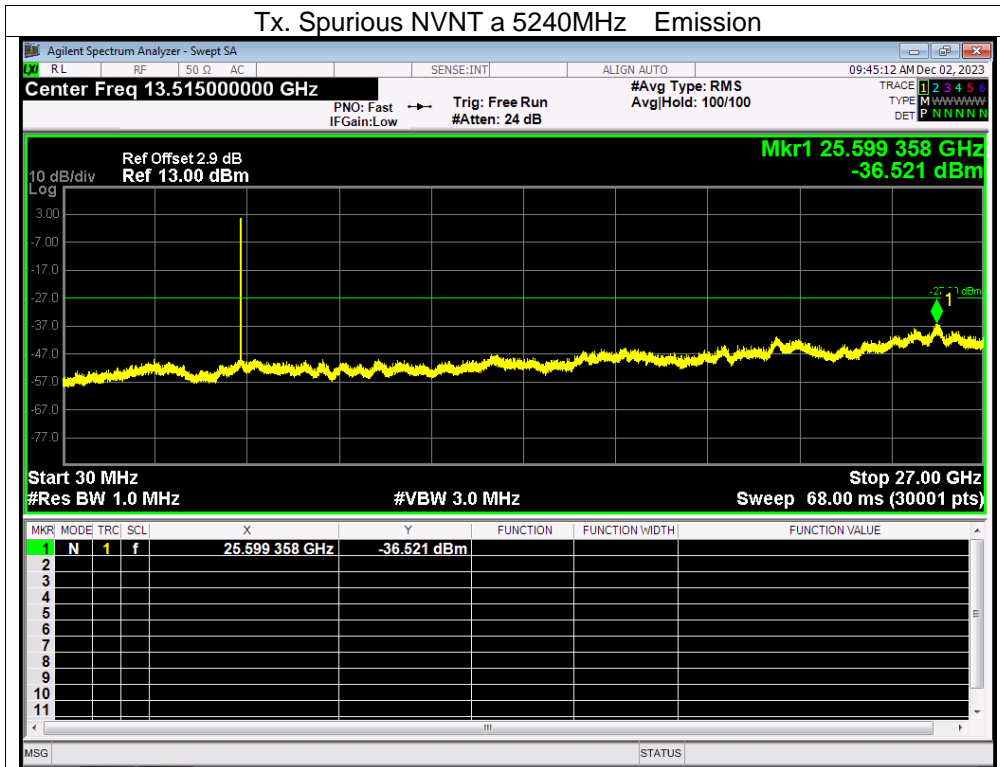
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

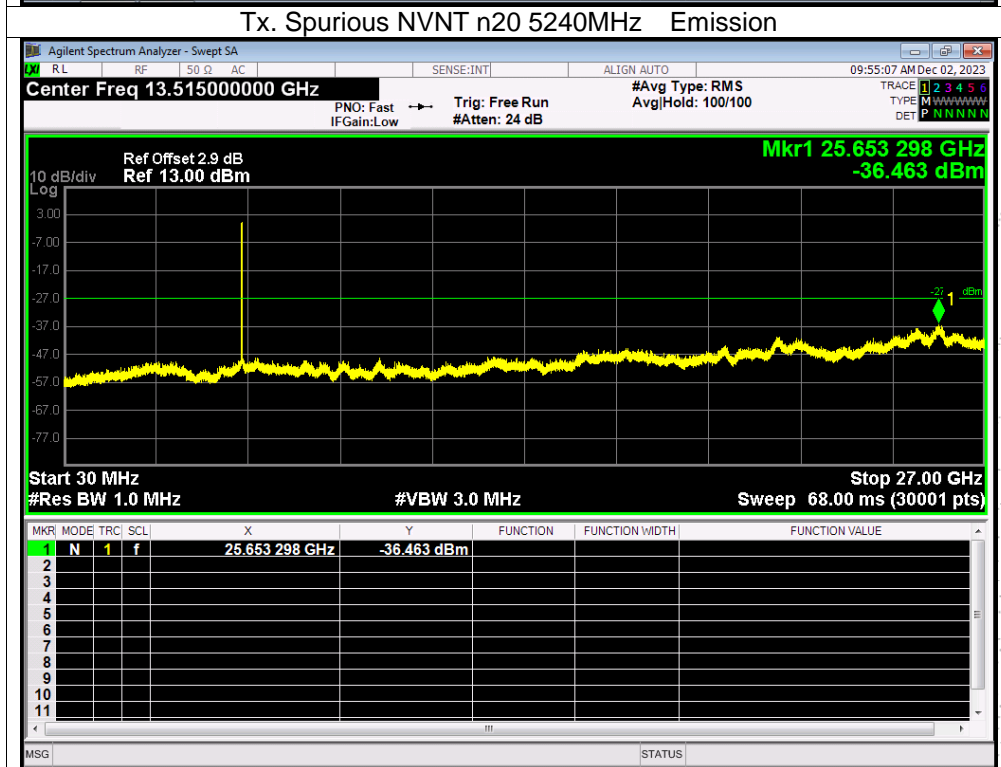
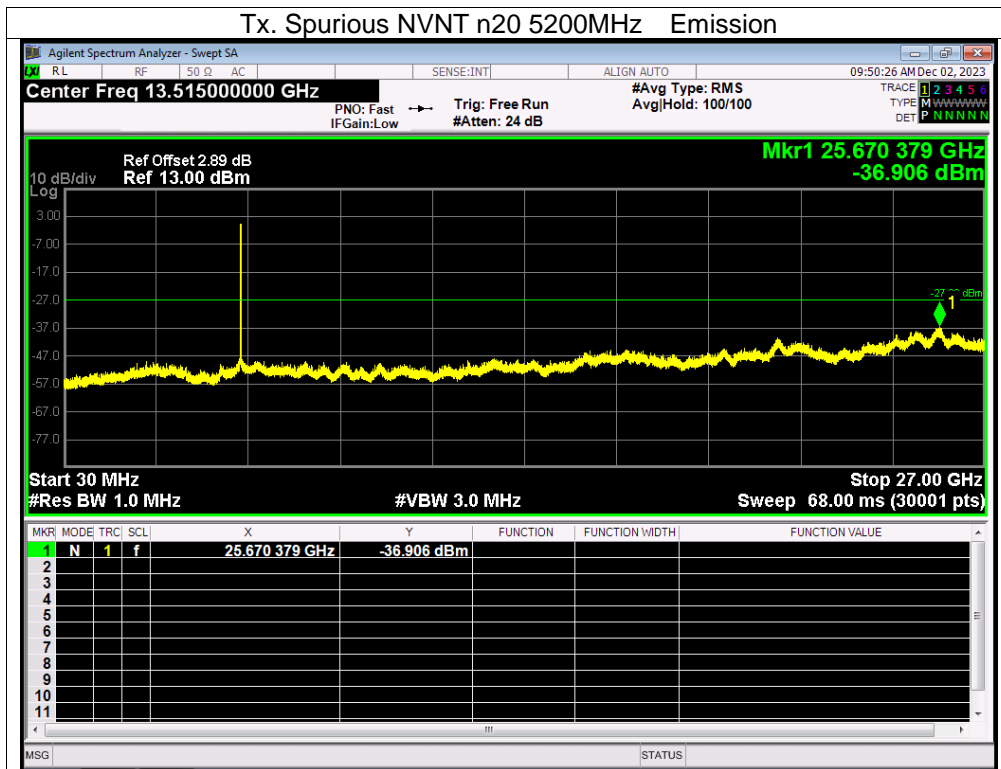
12.4 Test Result

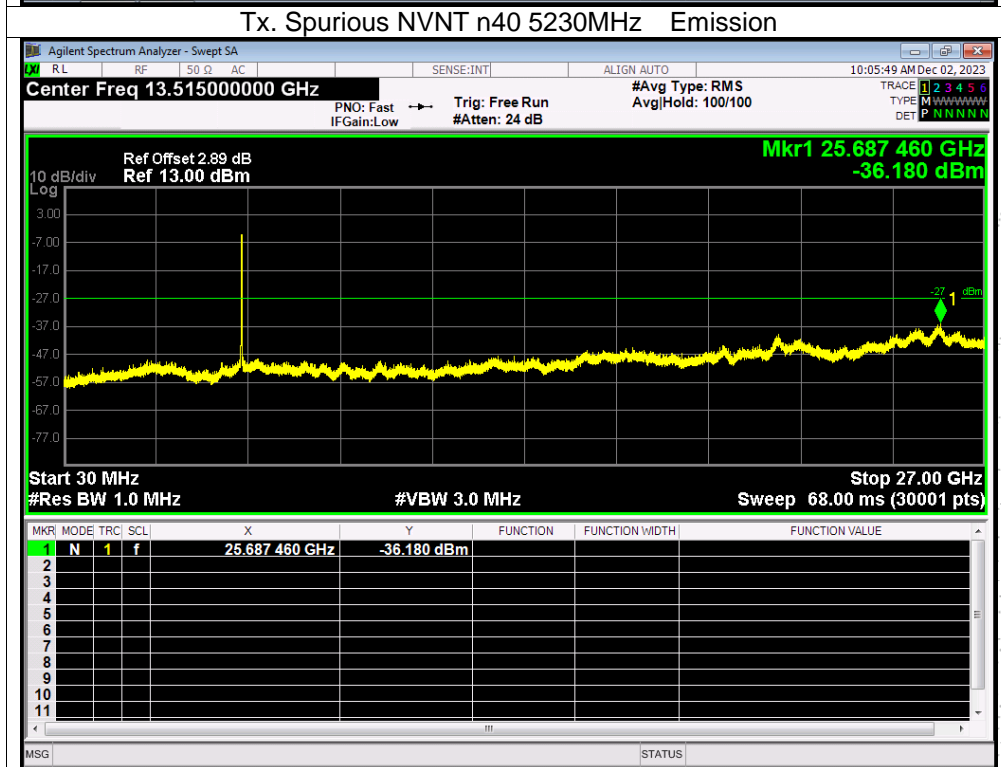
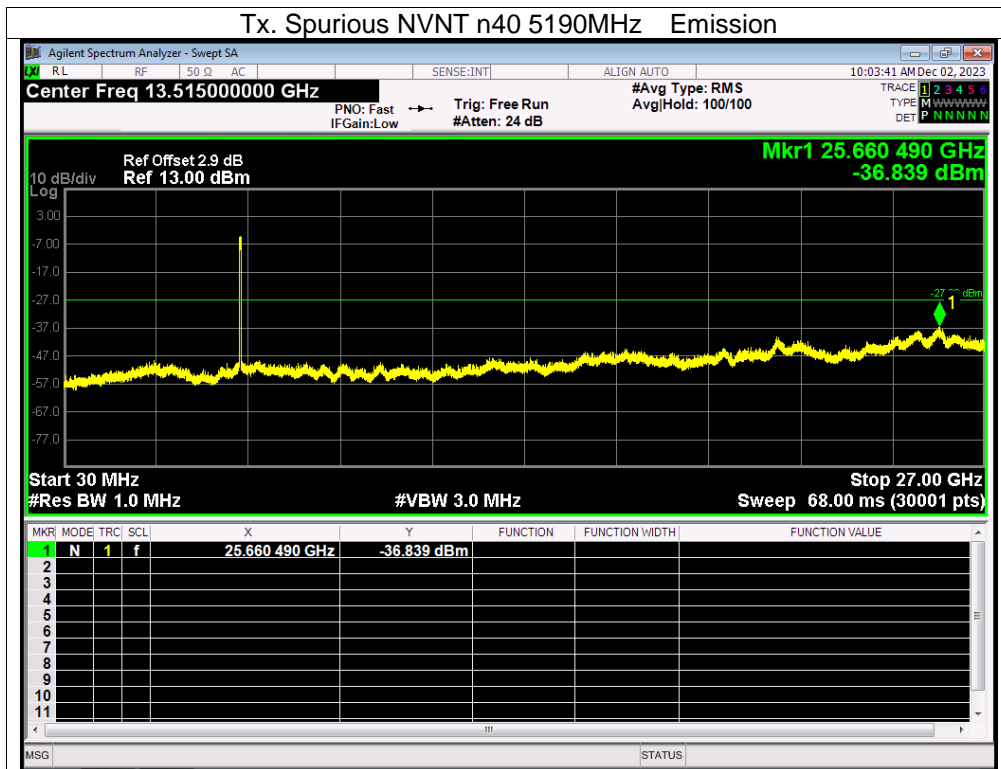
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

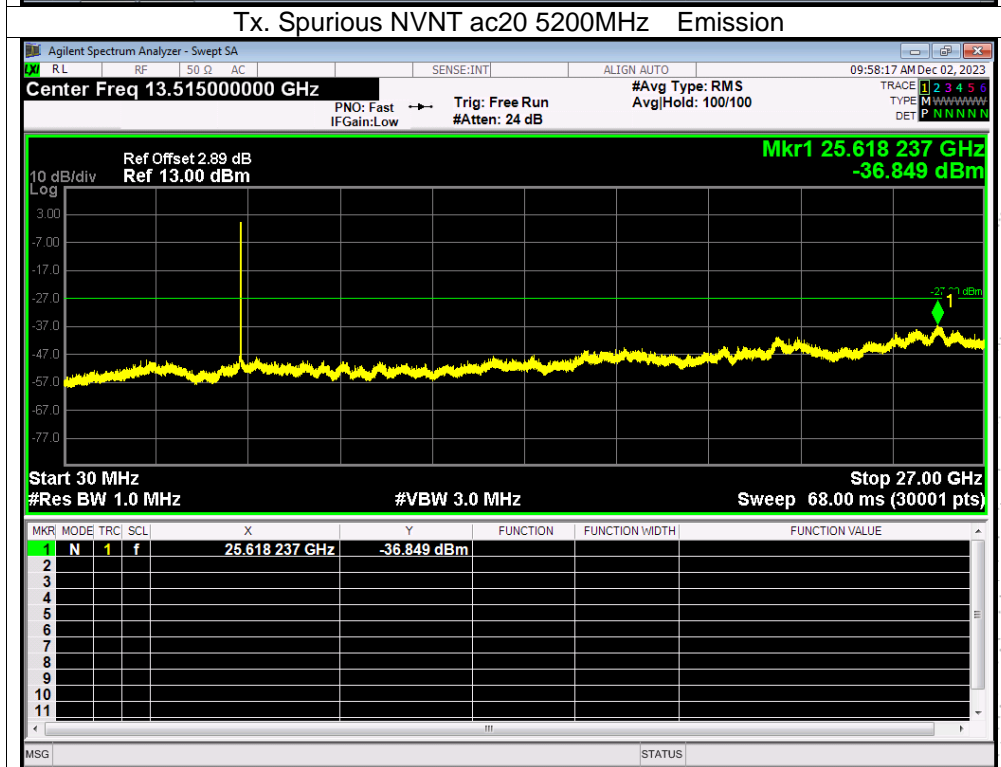
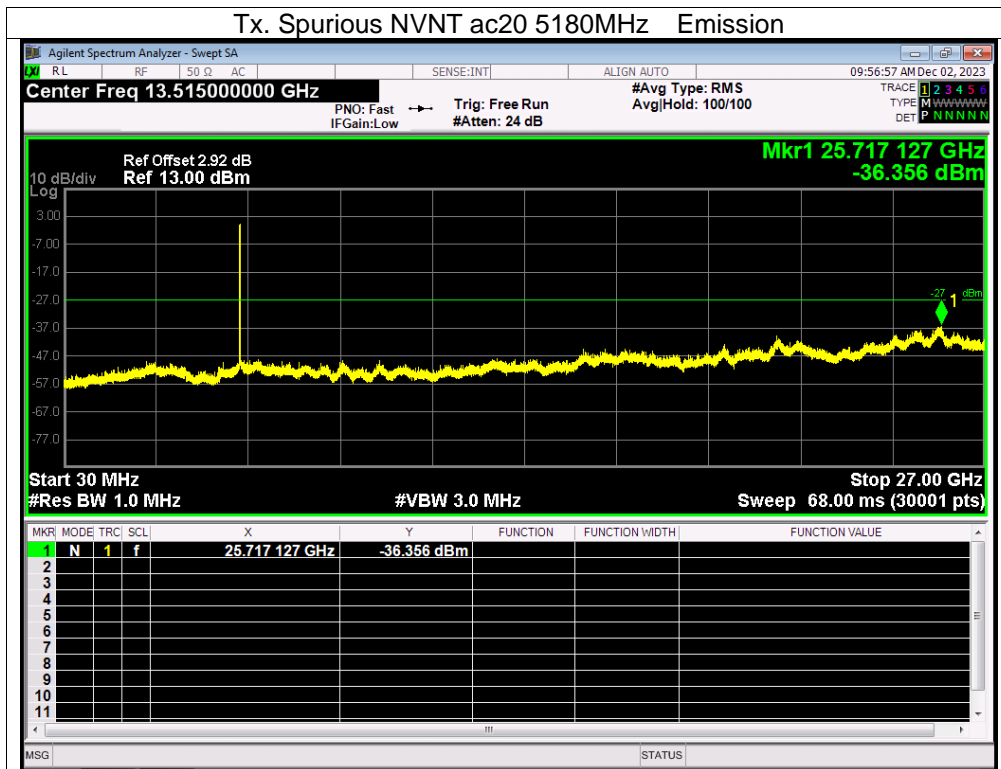
About: 26.5GHz-40GHz, The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

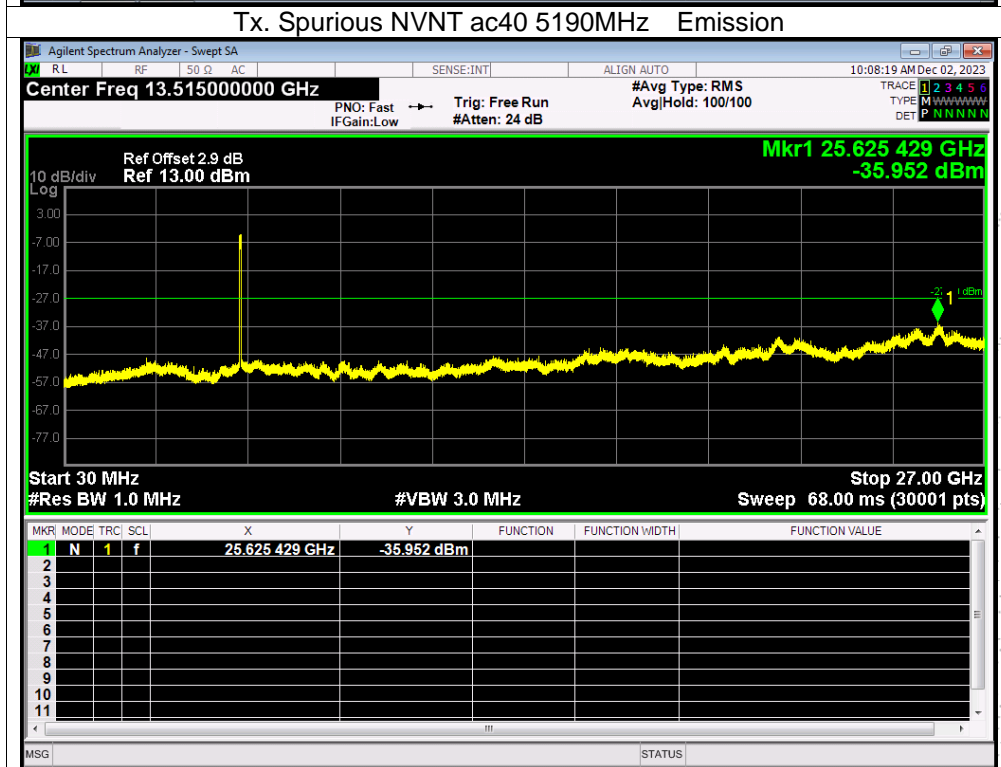
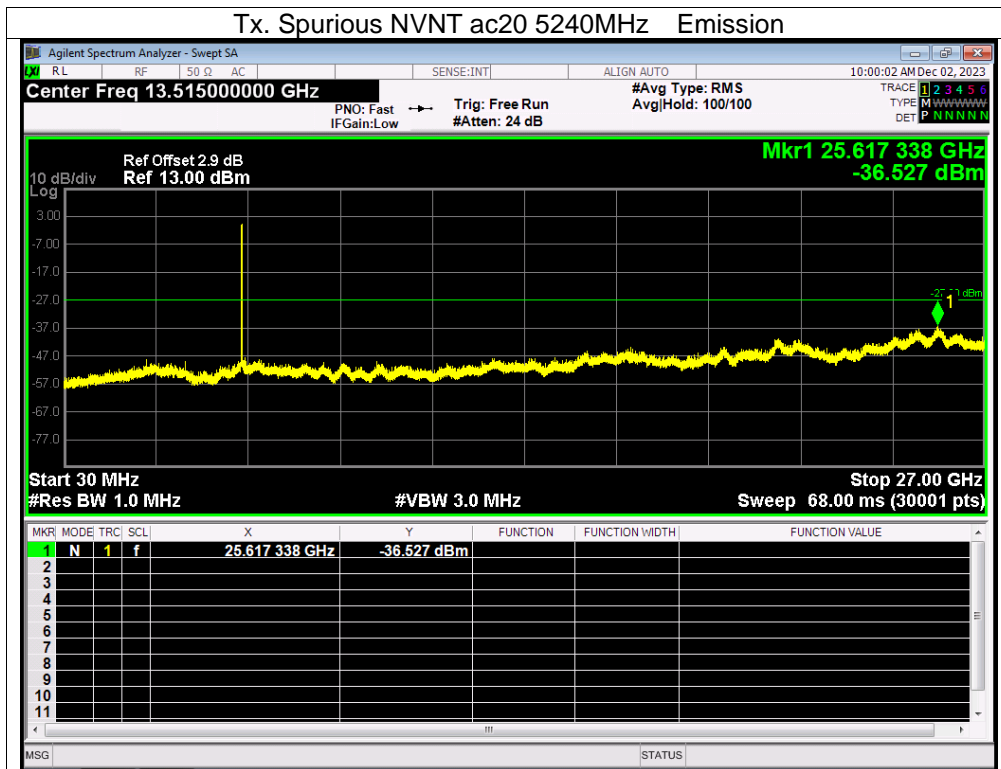


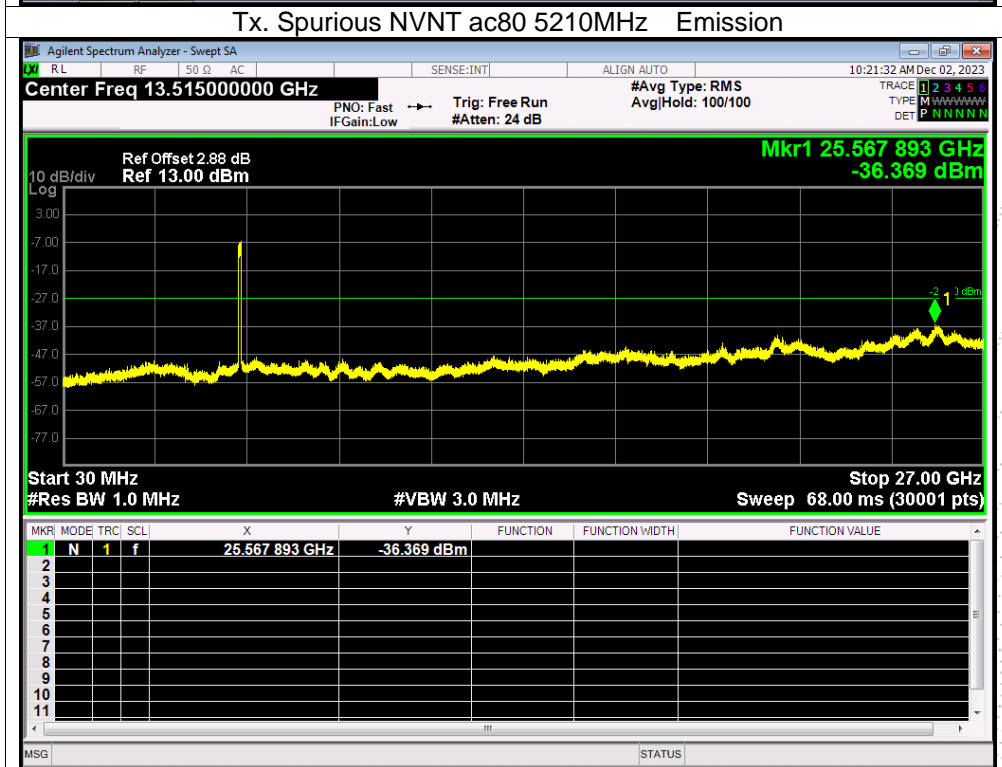
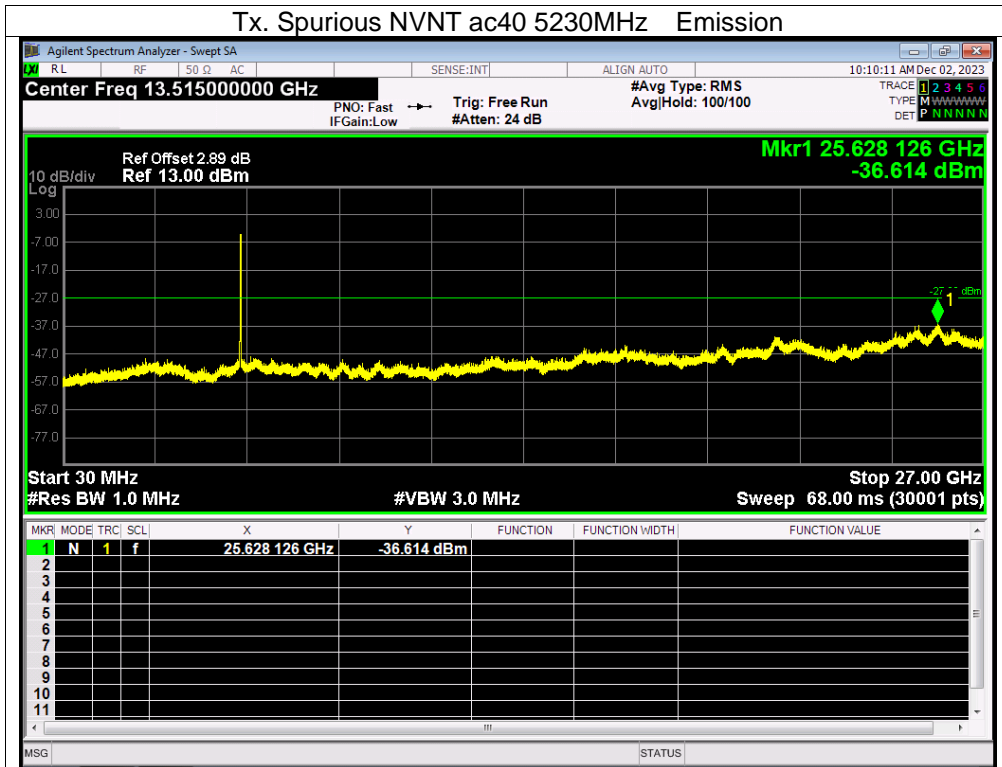


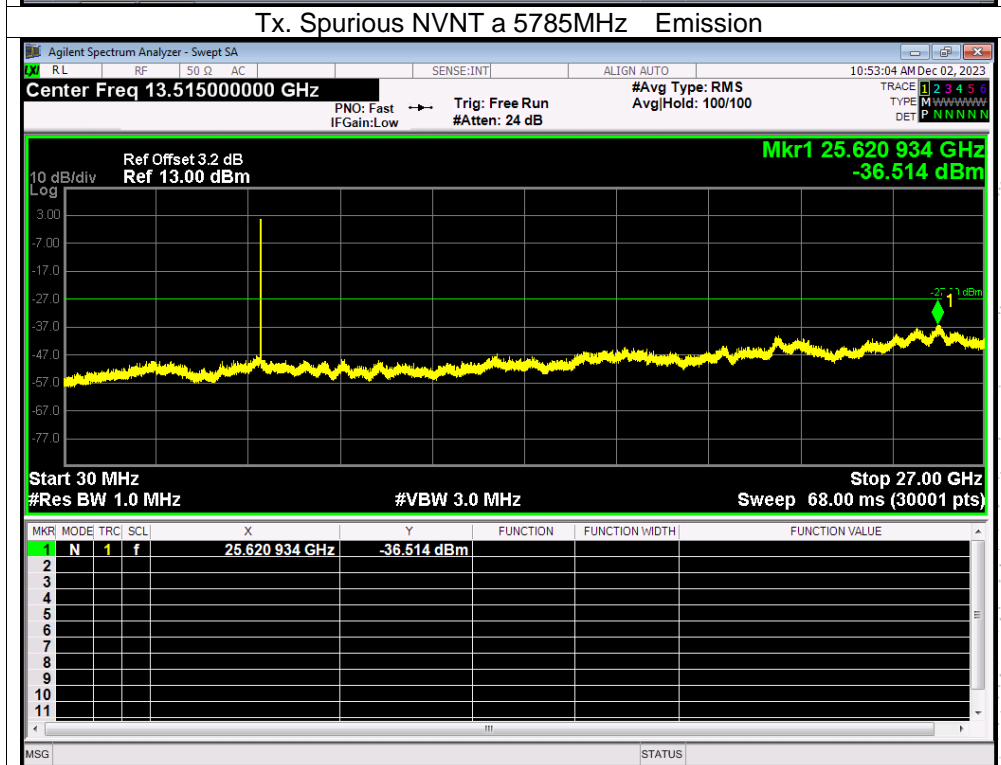
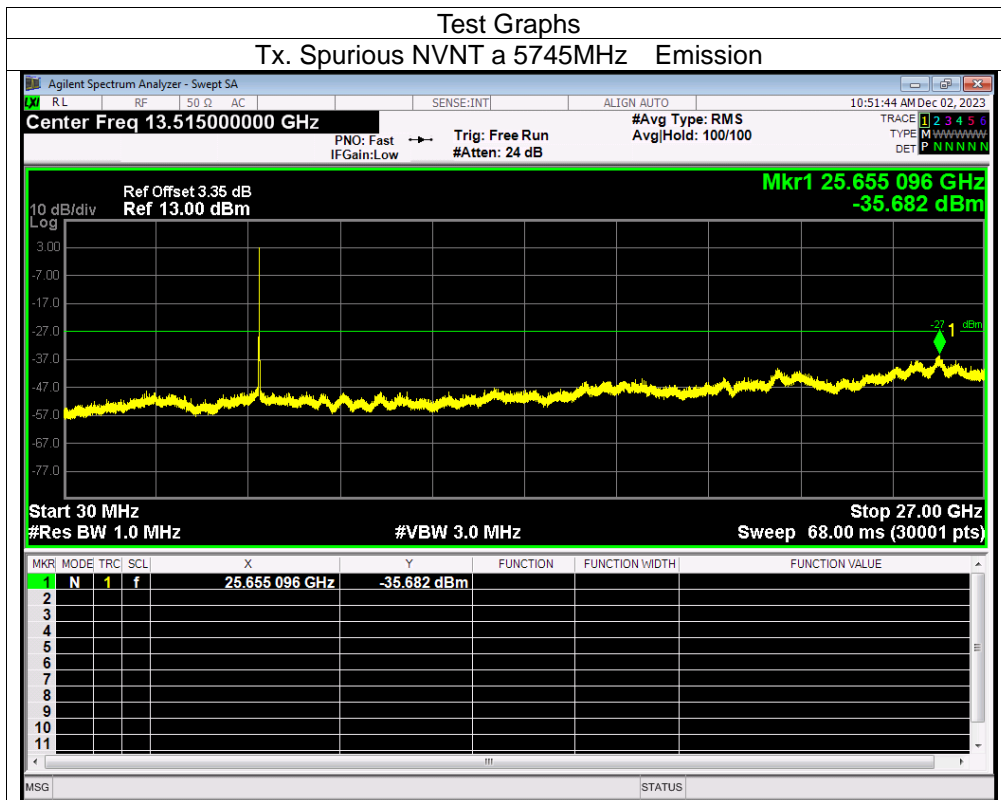


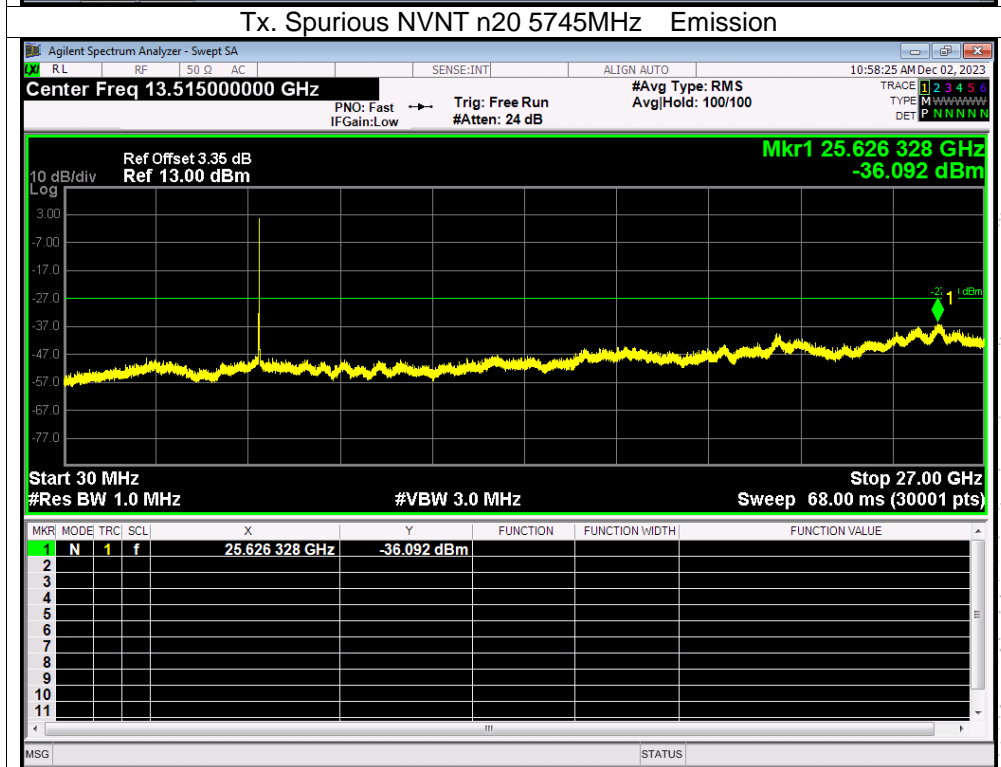
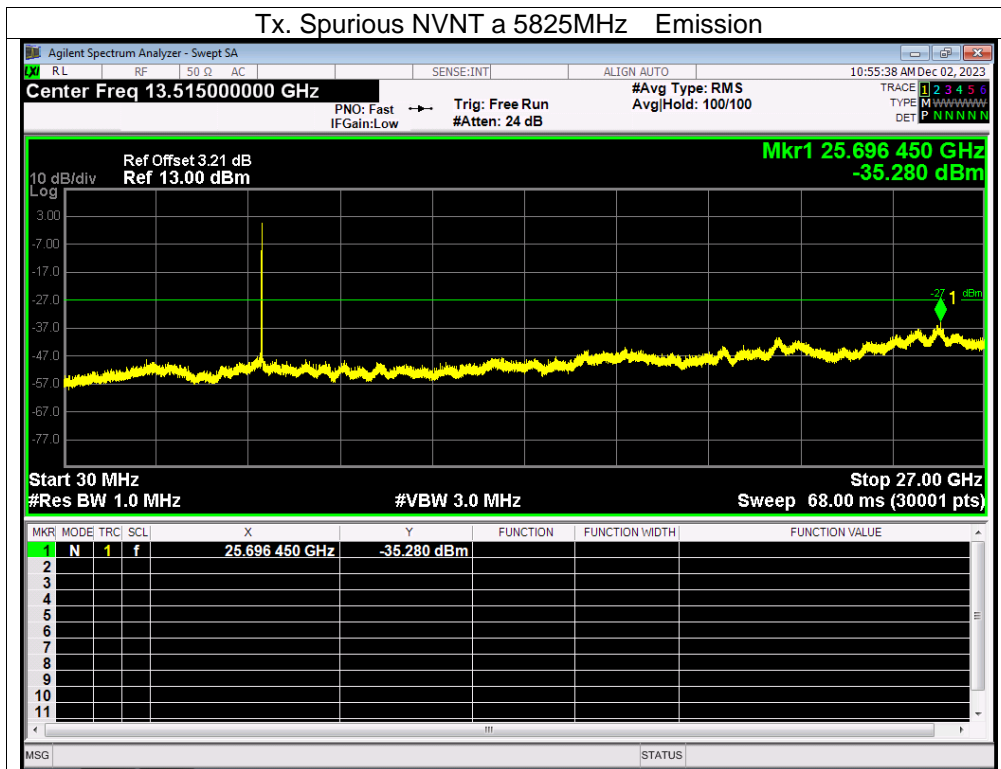


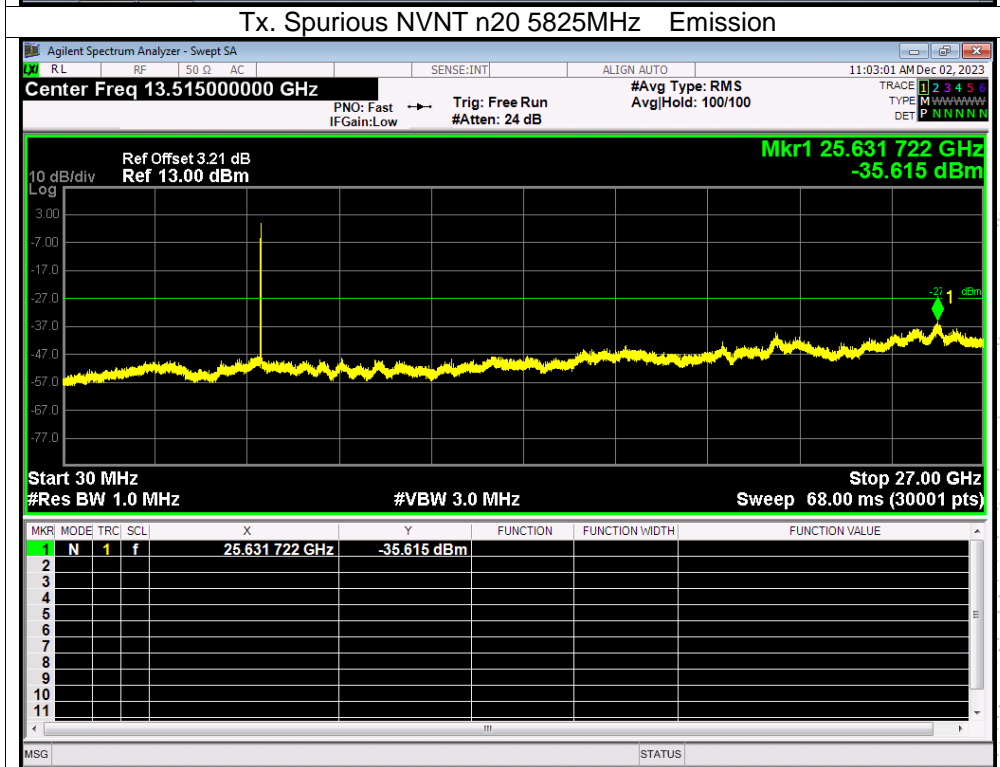
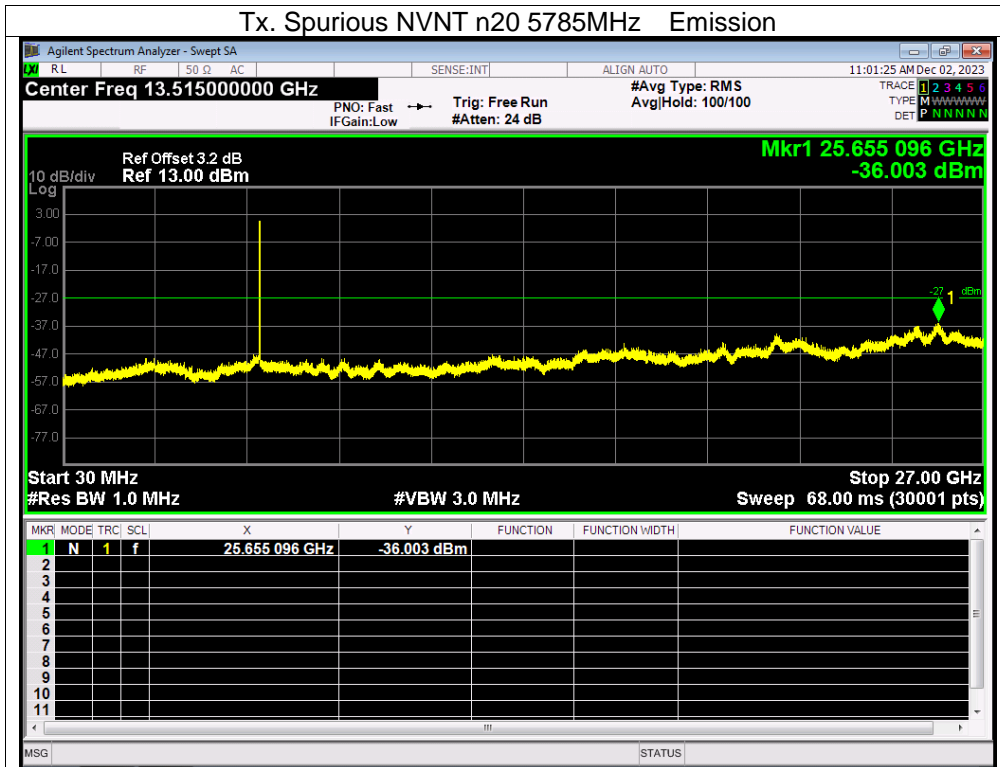


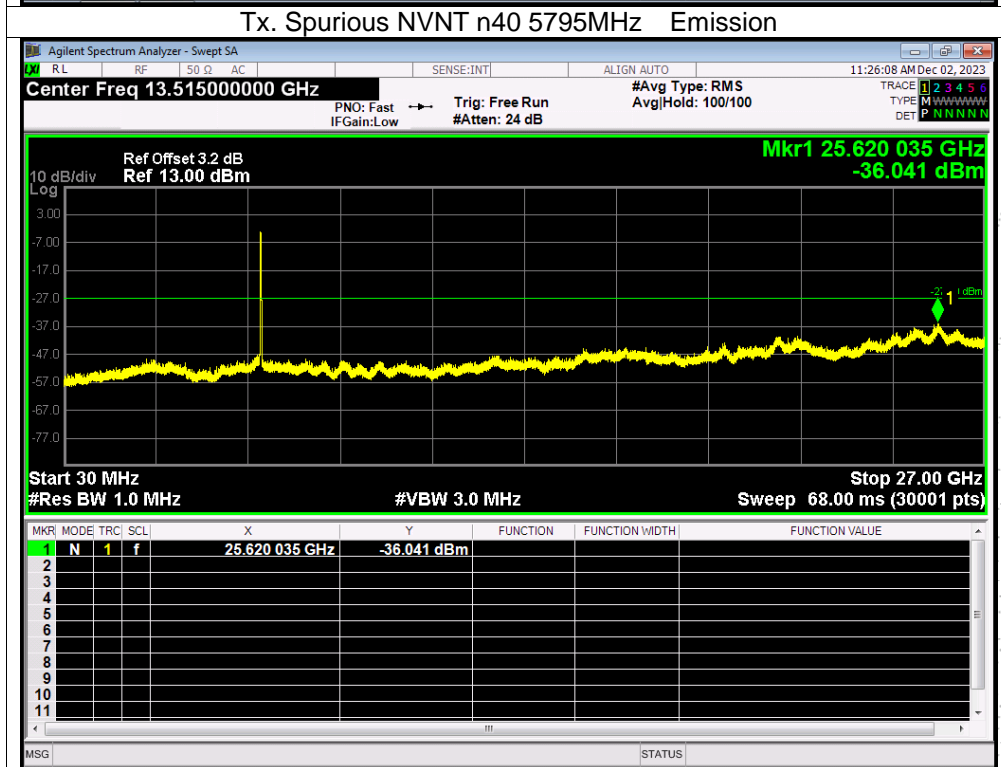
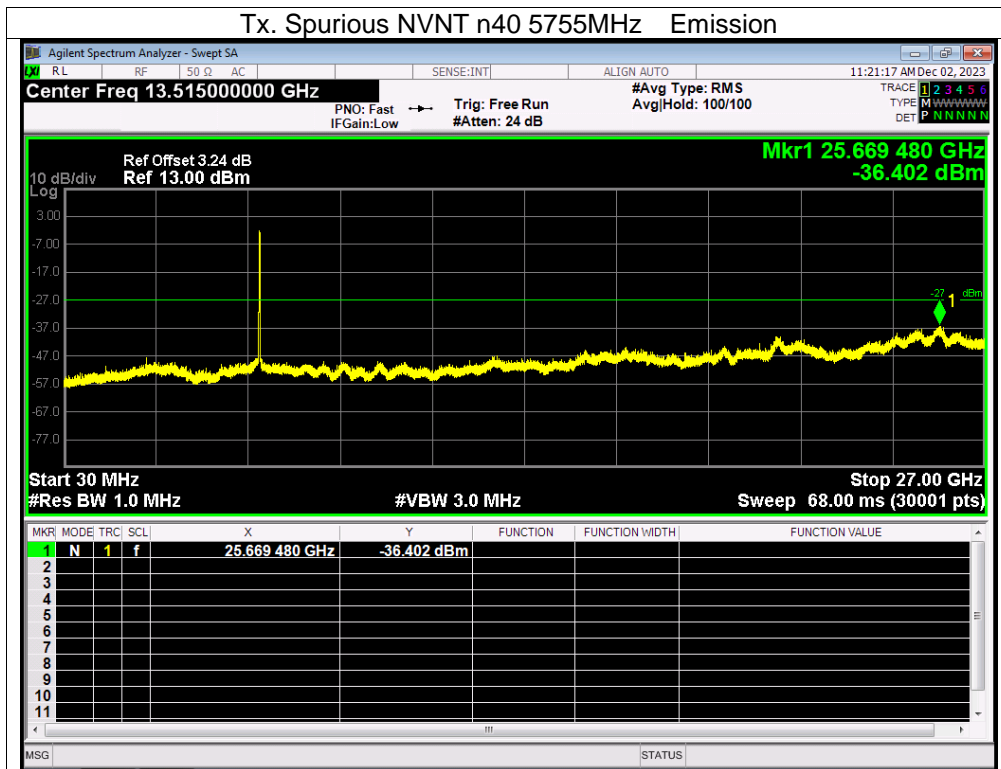


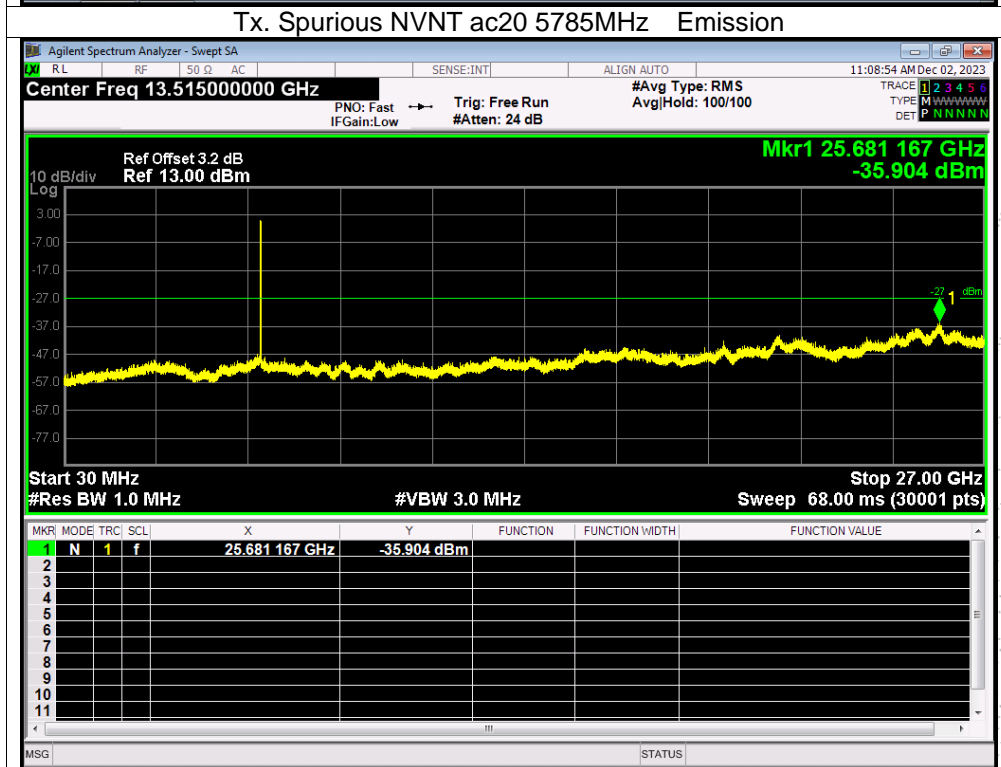
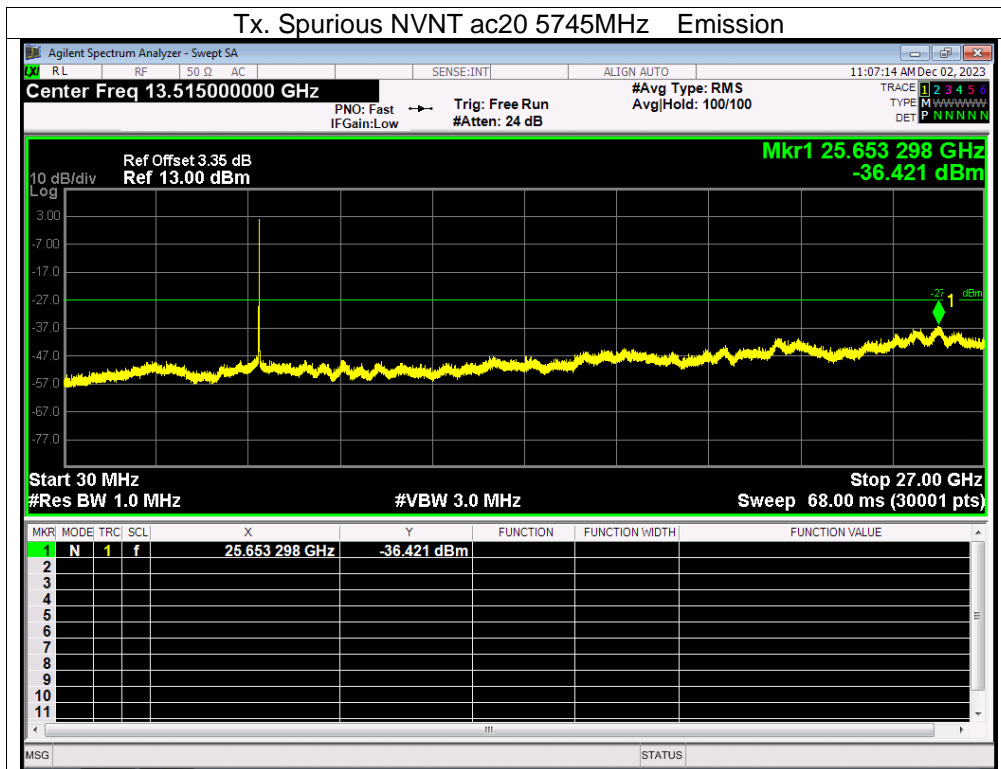


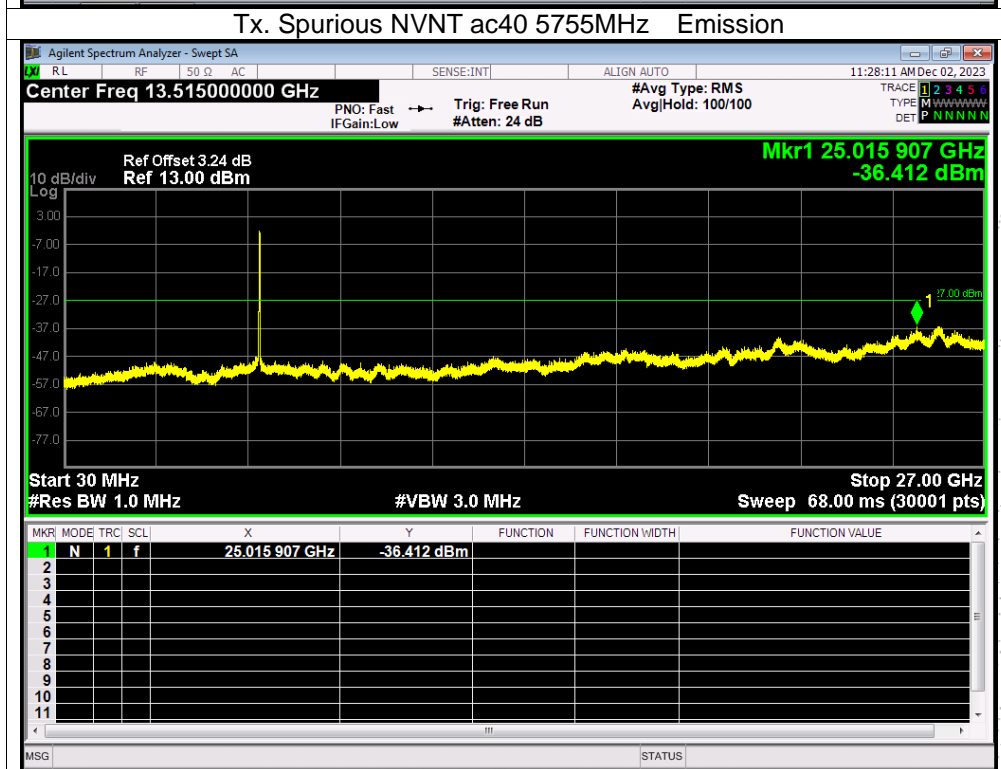
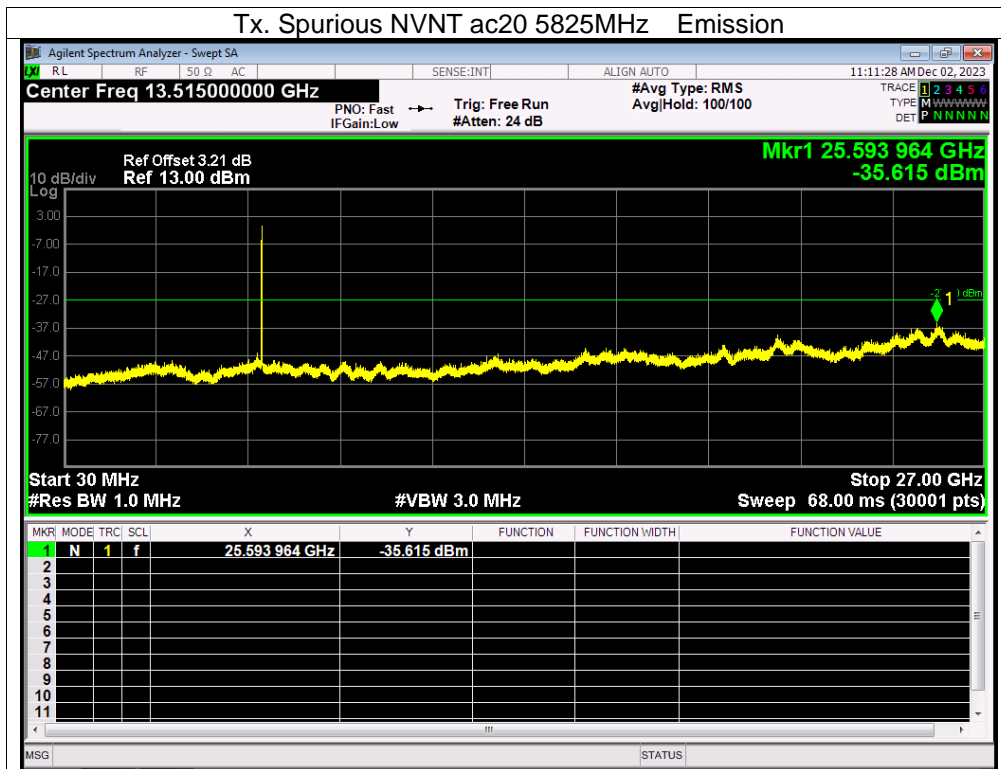


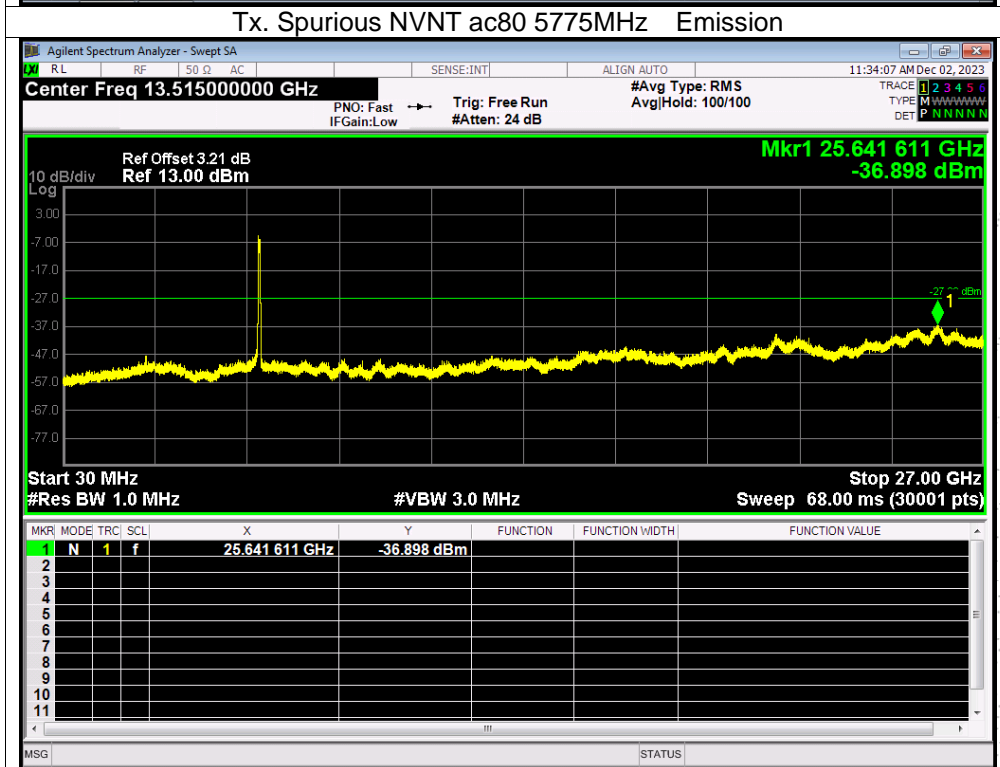
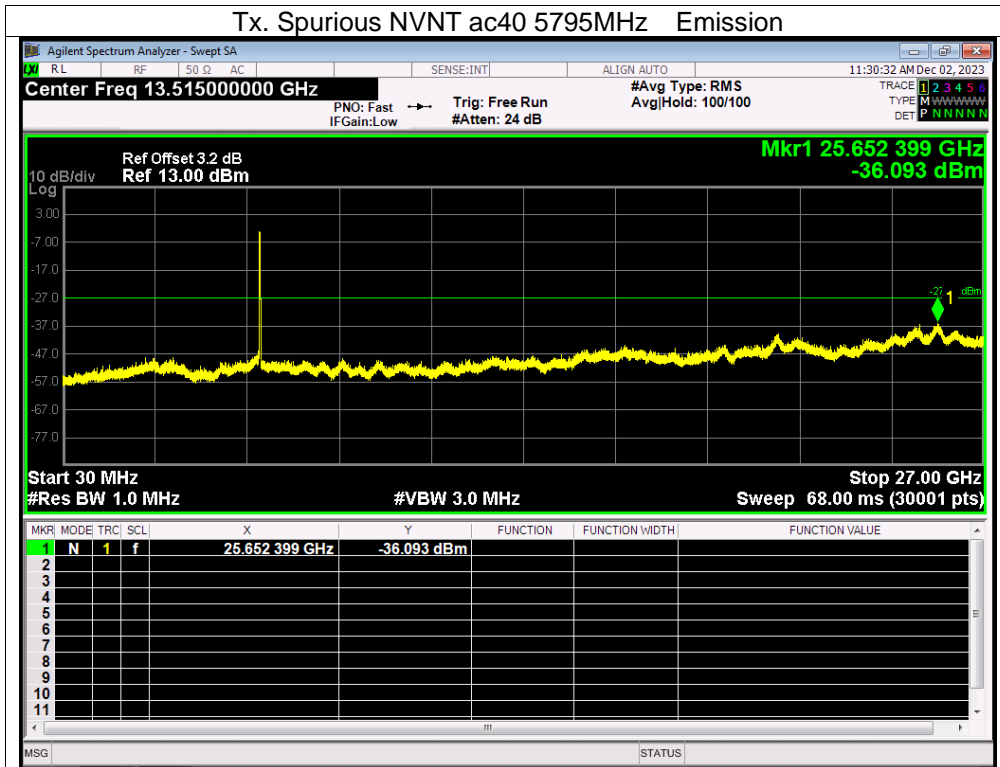












13. Frequency Stability Measurement

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 7.6V
Test Mode:	TX (5.1G) Mode 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)	7.6	5180.0089	5180	0.0089	1.7181
		V max (V)	8.74	5180.0070	5180	0.0070	1.3514
		V min (V)	6.46	5180.0133	5180	0.0133	2.5676
Limits				5150-5250 MHz			
Result				Complies			

Temperature vs. Frequency Stability

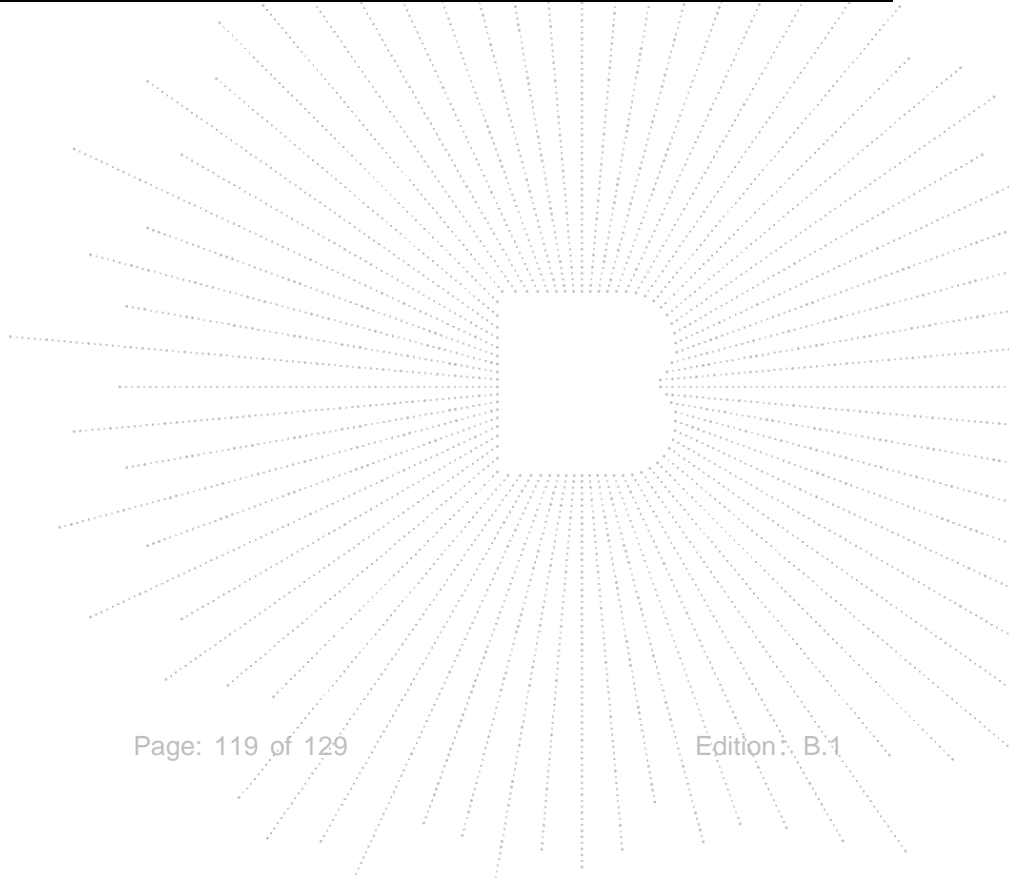
TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	7.6	T (°C)	-20	5180.0050	5180	0.0050	0.9653
		T (°C)	-10	5180.0125	5180	0.0125	2.4131
		T (°C)	0	5180.0070	5180	0.0070	1.3514
		T (°C)	10	5180.0076	5180	0.0076	1.4672
		T (°C)	20	5180.0120	5180	0.0120	2.3166
		T (°C)	30	5180.0042	5180	0.0042	0.8108
		T (°C)	40	5180.0089	5180	0.0089	1.7181
		T (°C)	50	5180.0121	5180	0.0121	2.3359
		T (°C)	60	5180.0075	5180	0.0075	1.4479
		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)	7.6	5200.0117	5200	0.0117	2.2500
		V max (V)	8.74	5200.0050	5200	0.0050	0.9615
		V min (V)	6.46	5200.0065	5200	0.0065	1.2500
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)	7.6	T (°C)	-20	5200.01260	5200	0.01260	2.4231
		T (°C)	-10	5200.00050	5200	0.00050	0.0962
		T (°C)	0	5200.00920	5200	0.00920	1.7692
		T (°C)	10	5200.00940	5200	0.00940	1.8077
		T (°C)	20	5200.00480	5200	0.00480	0.9231
		T (°C)	30	5200.00200	5200	0.00200	0.3846
		T (°C)	40	5200.00740	5200	0.00740	1.4231
		T (°C)	50	5200.00150	5200	0.00150	0.2885
		T (°C)	60	5200.00950	5200	0.00950	1.8269
		T (°C)	70	5200.00850	5200	0.00850	1.6346
Limits				5150-5250 MHz			
Result				Complies			

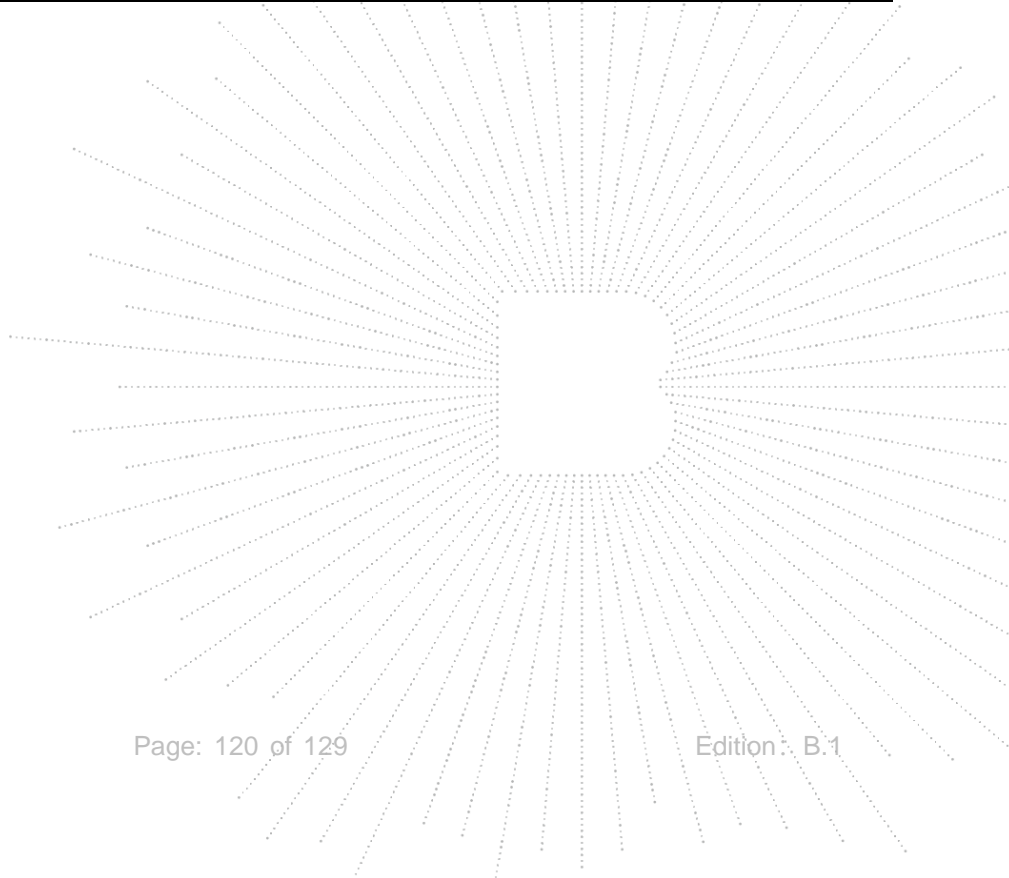


Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	7.6	5240.0122	5240	0.0122	2.3282
		V max (V)	8.74	5240.0071	5240	0.0071	1.3550
		V min (V)	6.46	5240.0055	5240	0.0055	1.0496
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)	7.6	T (°C)	-20	5240.0055	5240	0.0055	1.0496
		T (°C)	-10	5240.0128	5240	0.0128	2.4427
		T (°C)	0	5240.0115	5240	0.0115	2.1947
		T (°C)	10	5240.0033	5240	0.0033	0.6298
		T (°C)	20	5240.0135	5240	0.0135	2.5763
		T (°C)	30	5240.0084	5240	0.0084	1.6031
		T (°C)	40	5240.0118	5240	0.0118	2.2519
		T (°C)	50	5240.0115	5240	0.0115	2.1947
		T (°C)	60	5240.0098	5240	0.0098	1.8702
		T (°C)	70	5240.0043	5240	0.0043	0.8206
Limits				5150-5250 MHz			
Result				Complies			



Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	DC 7.6V
Test Mode:	TX (5.8G) Mode Frequency U-NII-3 (5745-5825MHz)		

Voltage vs. Frequency Stabilit

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	7.6	5745.01300	5745	0.01300	2.2628
		V max (V)	8.74	5745.00350	5745	0.00350	0.6092
		V min (V)	6.46	5745.00930	5745	0.00930	1.6188
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

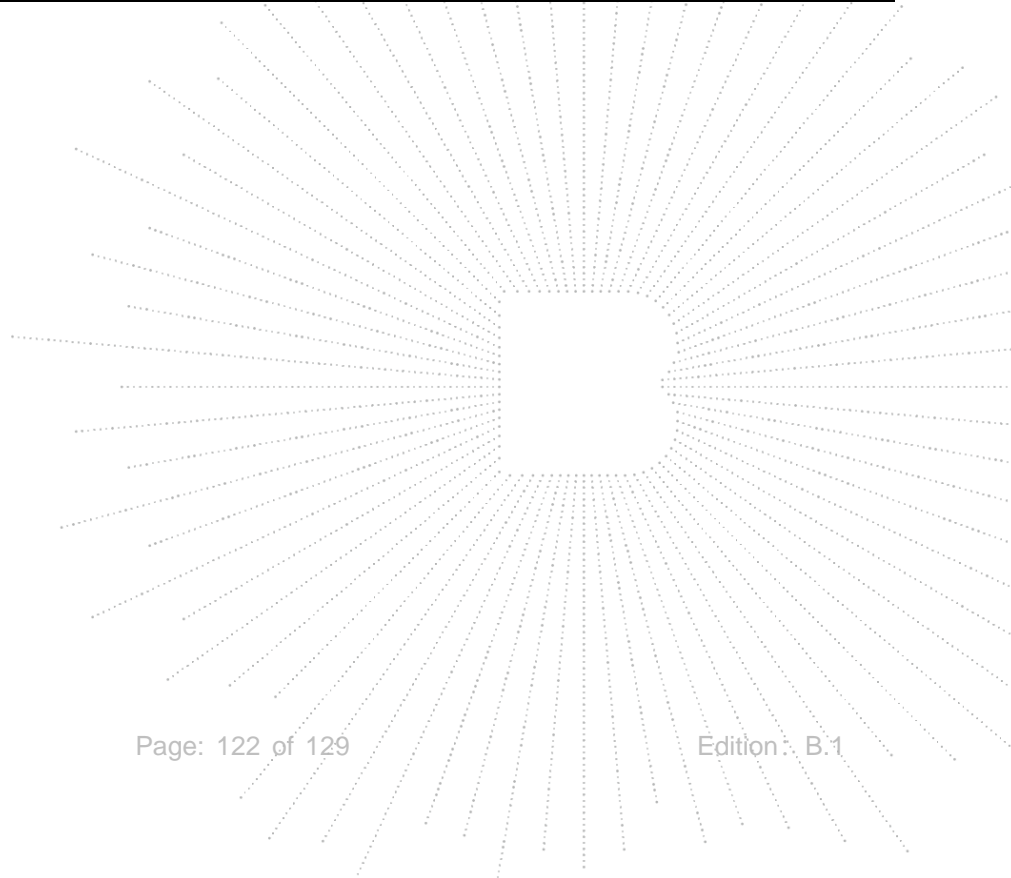
TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	7.6	T (°C)	-20	5745.00910	5745	0.00910	1.5840
		T (°C)	-10	5745.00820	5745	0.00820	1.4273
		T (°C)	0	5745.01300	5745	0.01300	2.2628
		T (°C)	10	5745.00660	5745	0.00660	1.1488
		T (°C)	20	5745.01230	5745	0.01230	2.1410
		T (°C)	30	5745.01120	5745	0.01120	1.9495
		T (°C)	40	5745.00040	5745	0.00040	0.0696
		T (°C)	50	5745.00820	5745	0.00820	1.4273
		T (°C)	60	5745.00420	5745	0.00420	0.7311
		T (°C)	70	5745.00380	5745	0.00380	0.6614
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)	7.6	5785.01120	5785	0.01120	1.9360
		V max (V)	8.74	5785.00620	5785	0.00620	1.0717
		V min (V)	6.46	5785.00510	5785	0.00510	0.8816
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)	7.6	T (°C)	-20	5785.01090	5785	0.01090	1.8842
		T (°C)	-10	5785.00140	5785	0.00140	0.2420
		T (°C)	0	5785.00810	5785	0.00810	1.4002
		T (°C)	10	5785.00990	5785	0.00990	1.7113
		T (°C)	20	5785.00660	5785	0.00660	1.1409
		T (°C)	30	5785.01020	5785	0.01020	1.7632
		T (°C)	40	5785.00230	5785	0.00230	0.3976
		T (°C)	50	5785.00260	5785	0.00260	0.4494
		T (°C)	60	5785.00260	5785	0.00260	0.4494
		T (°C)	70	5785.00440	5785	0.00440	0.7606
Limits				5725-5850 MHz			
Result				Complies			

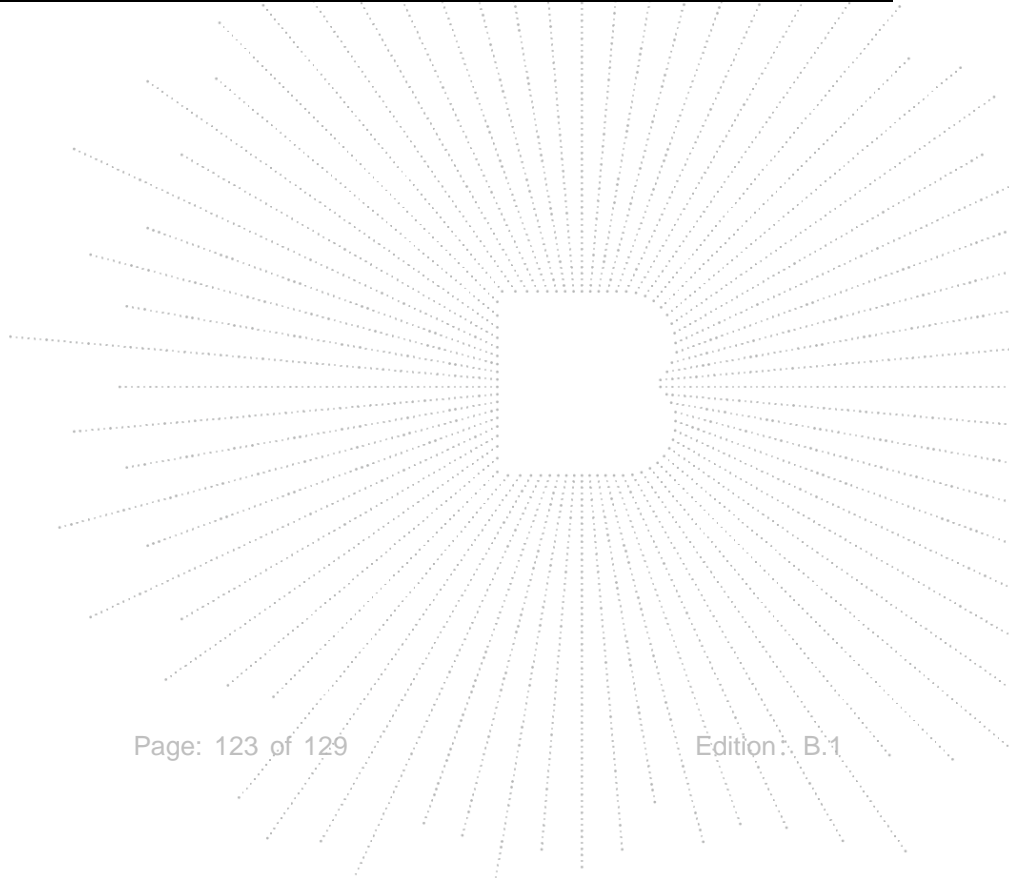


Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	7.6	5825.00080	5825	0.00080	0.1373
		V max (V)	8.74	5825.00390	5825	0.00390	0.6695
		V min (V)	6.46	5825.00950	5825	0.00950	1.6309
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)	7.6	T (°C)	-20	5825.00060	5825	0.00060	0.1030
		T (°C)	-10	5825.00470	5825	0.00470	0.8069
		T (°C)	0	5825.00610	5825	0.00610	1.0472
		T (°C)	10	5825.00190	5825	0.00190	0.3262
		T (°C)	20	5825.00350	5825	0.00350	0.6009
		T (°C)	30	5825.00590	5825	0.00590	1.0129
		T (°C)	40	5825.00090	5825	0.00090	0.1545
		T (°C)	50	5825.01050	5825	0.01050	1.8026
		T (°C)	60	5825.00520	5825	0.00520	0.8927
		T (°C)	70	5825.01220	5825	0.01220	2.0944
Limits				5725-5850 MHz			
Result				Complies			



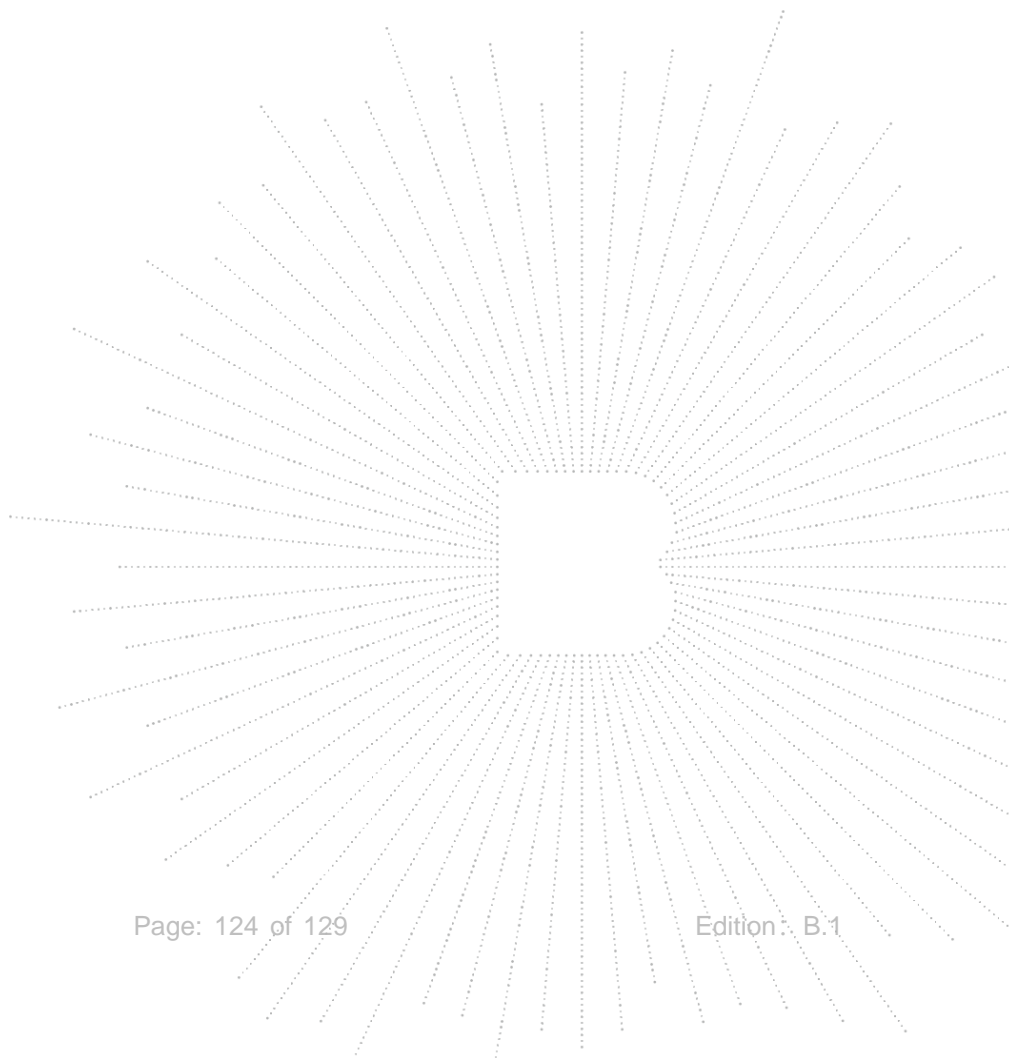
14. Antenna Requirement

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 Antenna

The EUT antenna is FPC antenna, antenna connector type is IPEX, fulfill the requirement of this section.

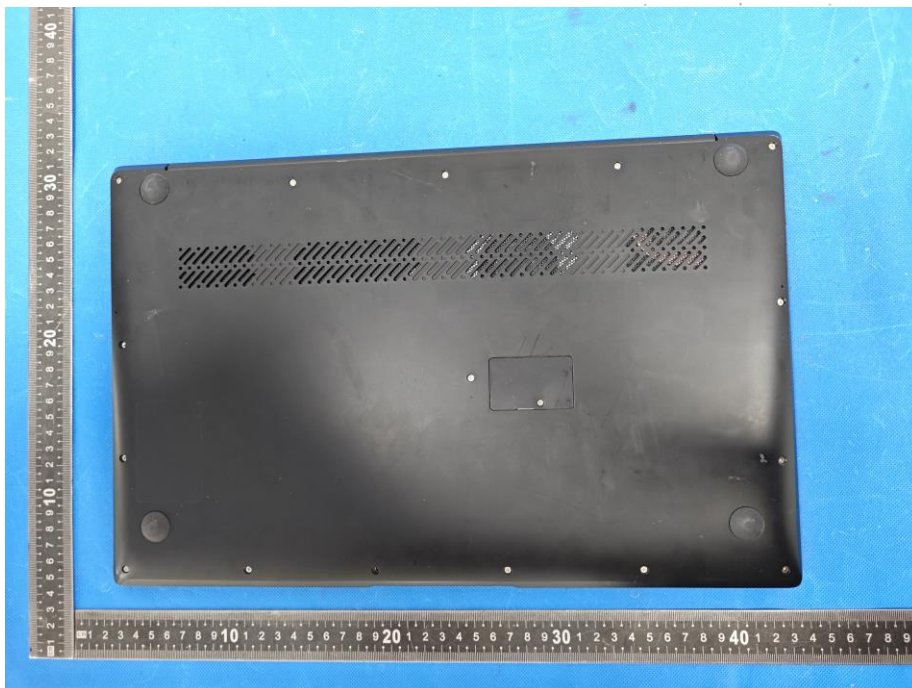


15. EUT Photographs

EUT Photo 1



EUT Photo 2

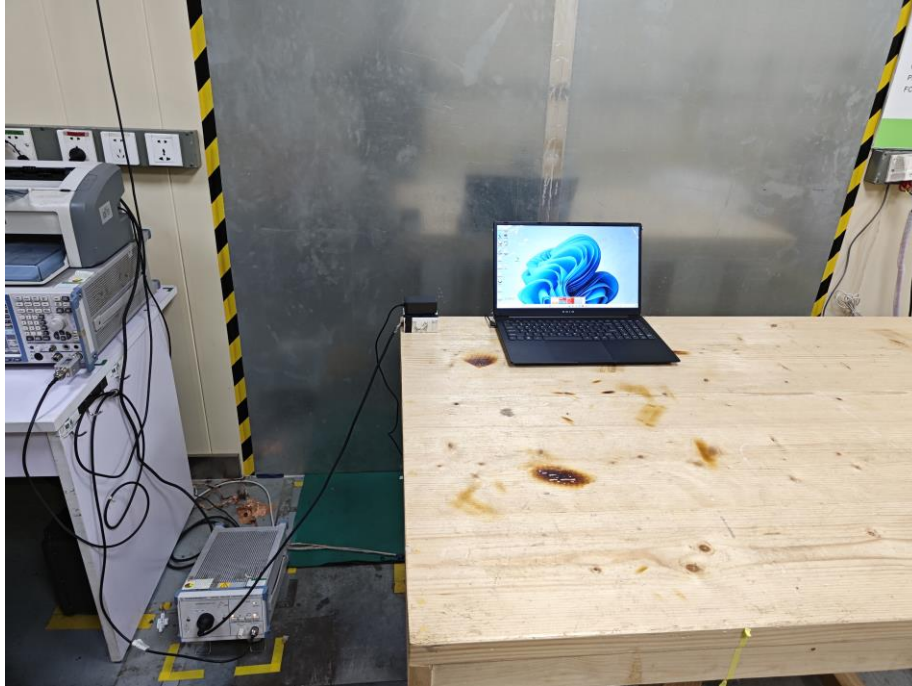


NOTE: Appendix-Photographs Of EUT Constructional Details

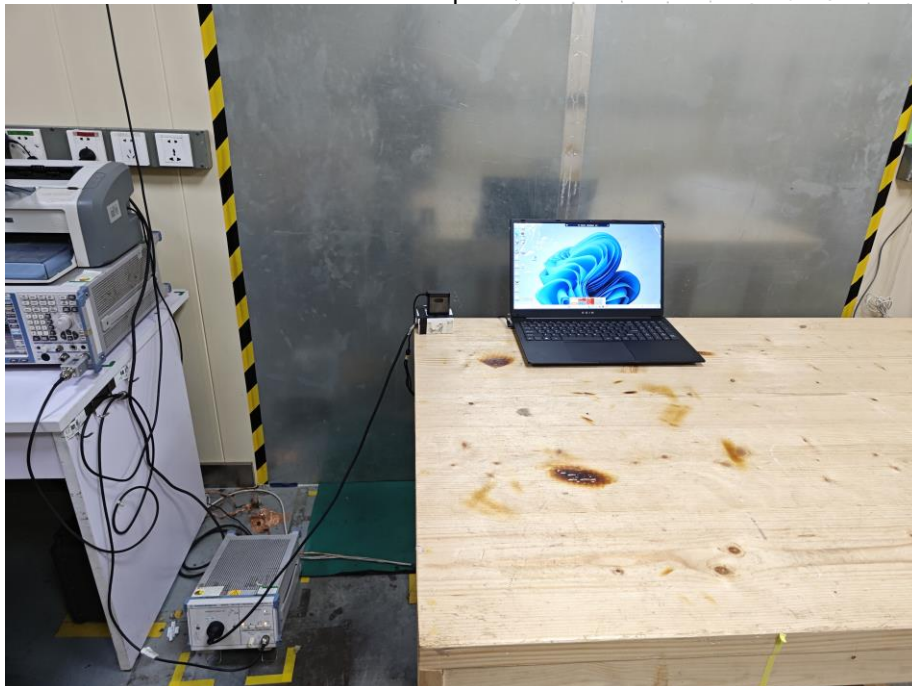
16. EUT Test Setup Photographs

Conducted emissions

Adapter 1



Adapter 2



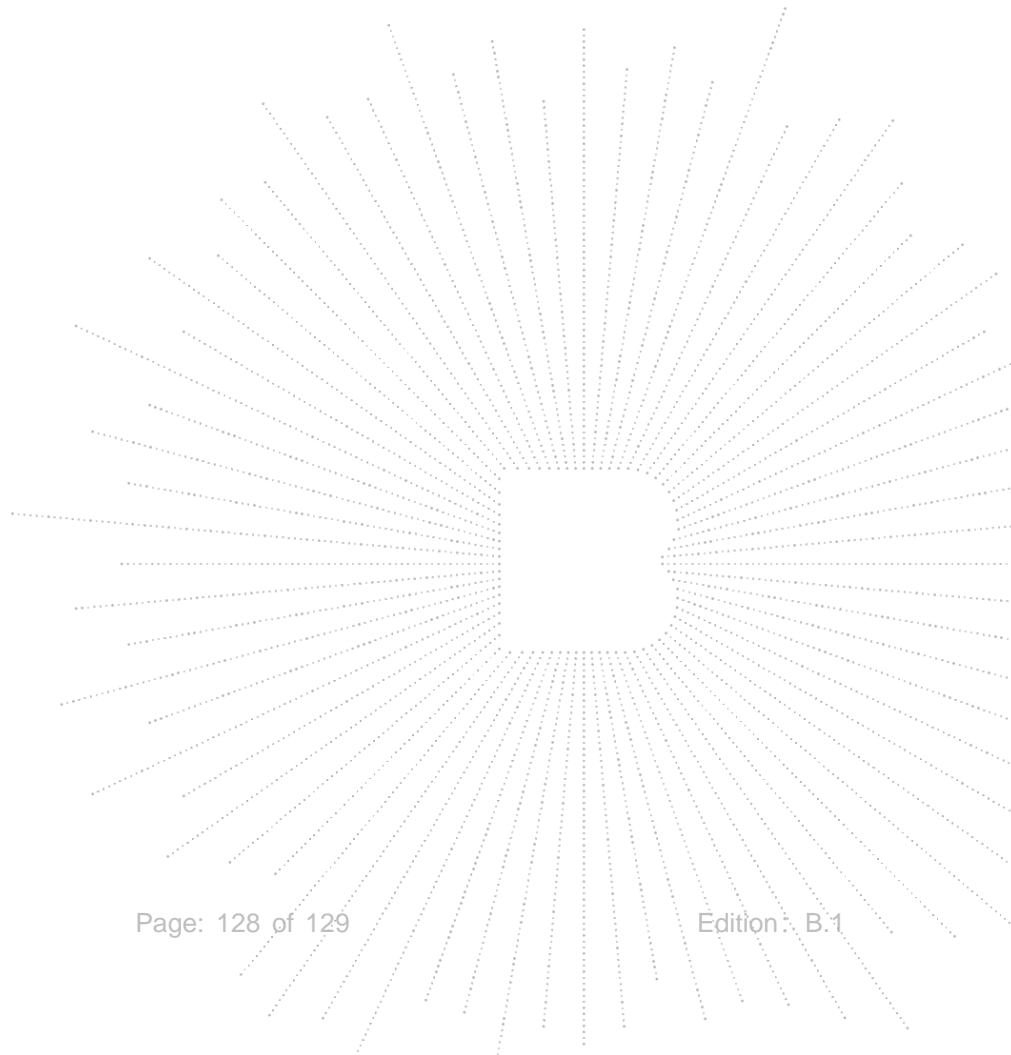
Radiated Measurement Photos

Adapter 1



Adapter 2





STATEMENT

1. The equipment lists are traceable to the national reference standards.
2. The test report can not be partially copied unless prior written approval is issued from our lab.
3. The test report is invalid without the "special seal for inspection and testing".
4. The test report is invalid without the signature of the approver.
5. The test process and test result is only related to the Unit Under Test.
6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.
7. The quality system of our laboratory is in accordance with ISO/IEC17025.
8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:

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P.C.: 518103

FAX: 0755-33229357

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