

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	1W
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:	DC 12V
Test Mode:	(5180-5240MHz); (5745-5825MHz)		

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	4.19	24	Pass
NVNT	a	5200	3.17	24	Pass
NVNT	a	5240	5.88	24	Pass
NVNT	n20	5180	3.71	24	Pass
NVNT	n20	5200	3.75	24	Pass
NVNT	n20	5240	3.41	24	Pass
NVNT	n40	5190	3.06	24	Pass
NVNT	n40	5230	2.51	24	Pass
NVNT	ac20	5180	4.14	24	Pass
NVNT	ac20	5200	4.08	24	Pass
NVNT	ac20	5240	3.97	24	Pass
NVNT	ac40	5190	2.85	24	Pass
NVNT	ac40	5230	2.54	24	Pass
NVNT	ac80	5210	4.09	24	Pass

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5745	4.63	30	Pass
NVNT	a	5785	4.28	30	Pass
NVNT	a	5825	3.64	30	Pass
NVNT	n20	5745	4.34	30	Pass
NVNT	n20	5785	4	30	Pass
NVNT	n20	5825	3.37	30	Pass
NVNT	n40	5755	3.64	30	Pass
NVNT	n40	5795	3.07	30	Pass
NVNT	ac20	5745	4.57	30	Pass
NVNT	ac20	5785	4.1	30	Pass
NVNT	ac20	5825	3.09	30	Pass
NVNT	ac40	5755	3.31	30	Pass
NVNT	ac40	5795	2.77	30	Pass
NVNT	ac80	5775	5.95	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.

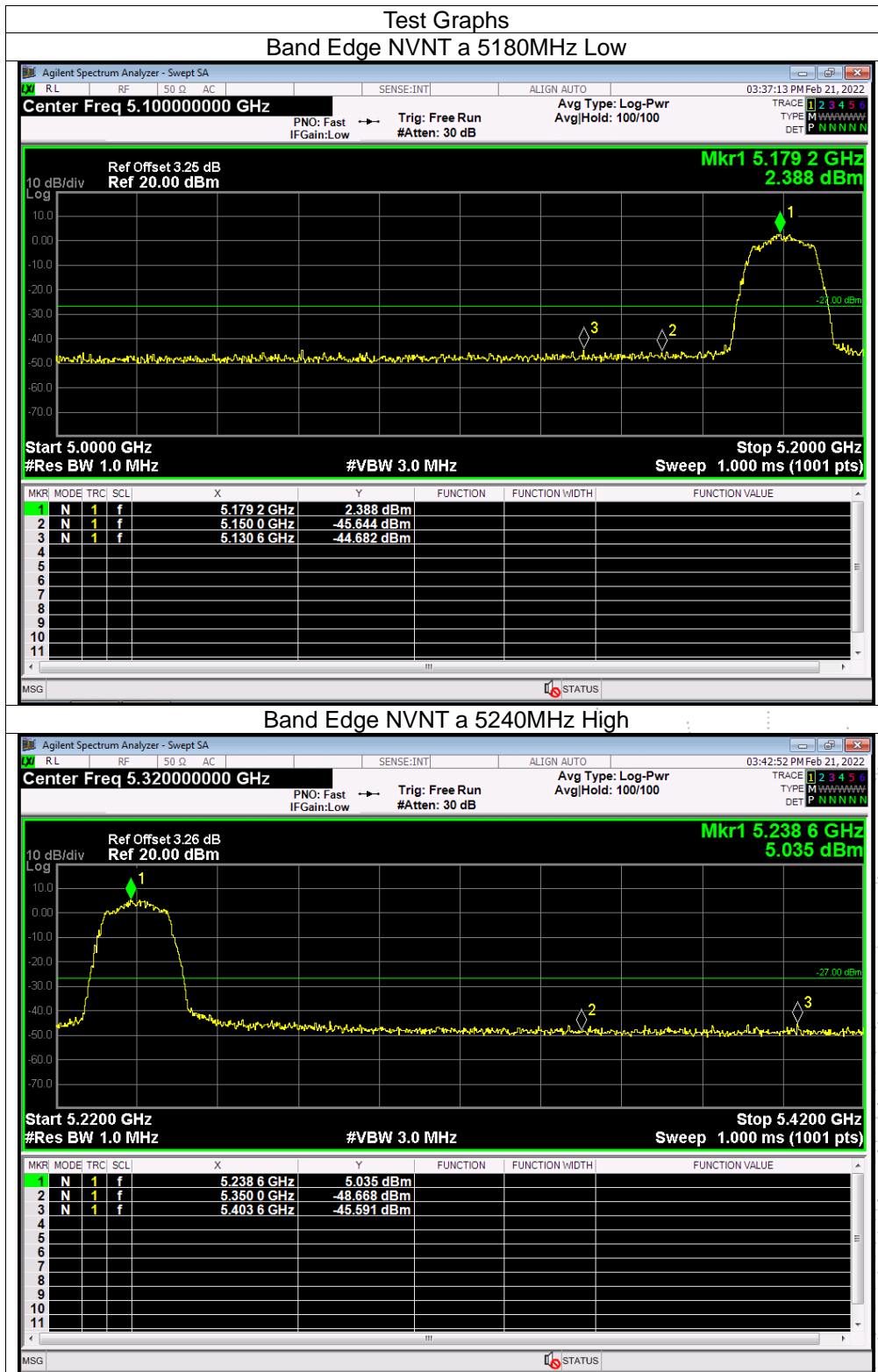
11.3 Test procedure

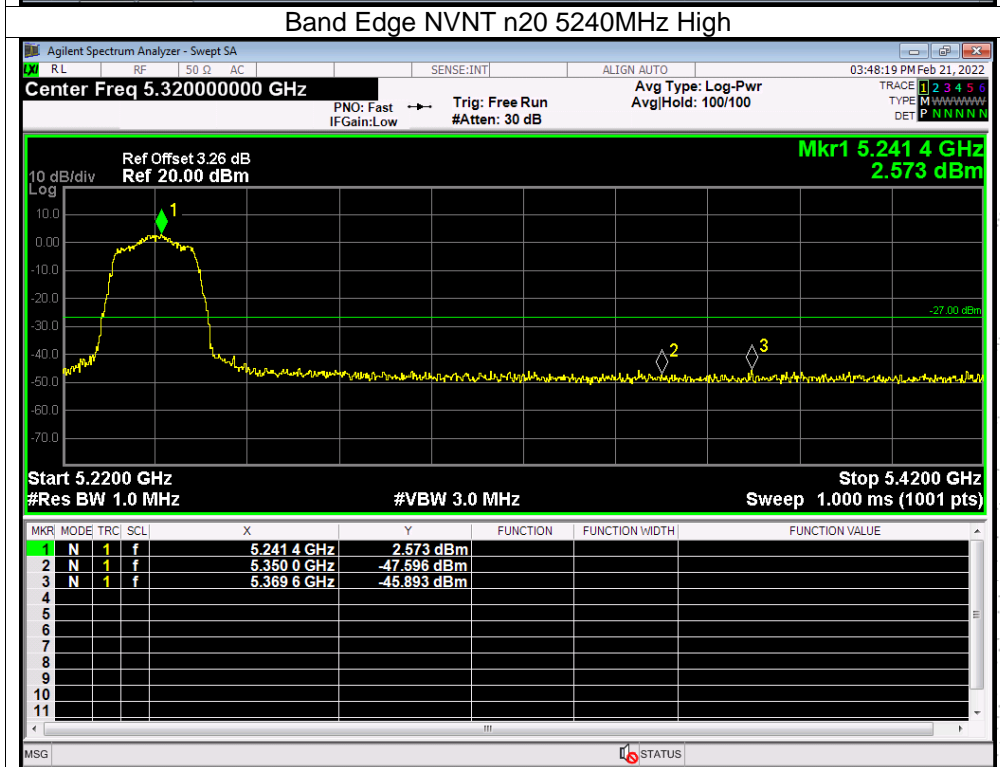
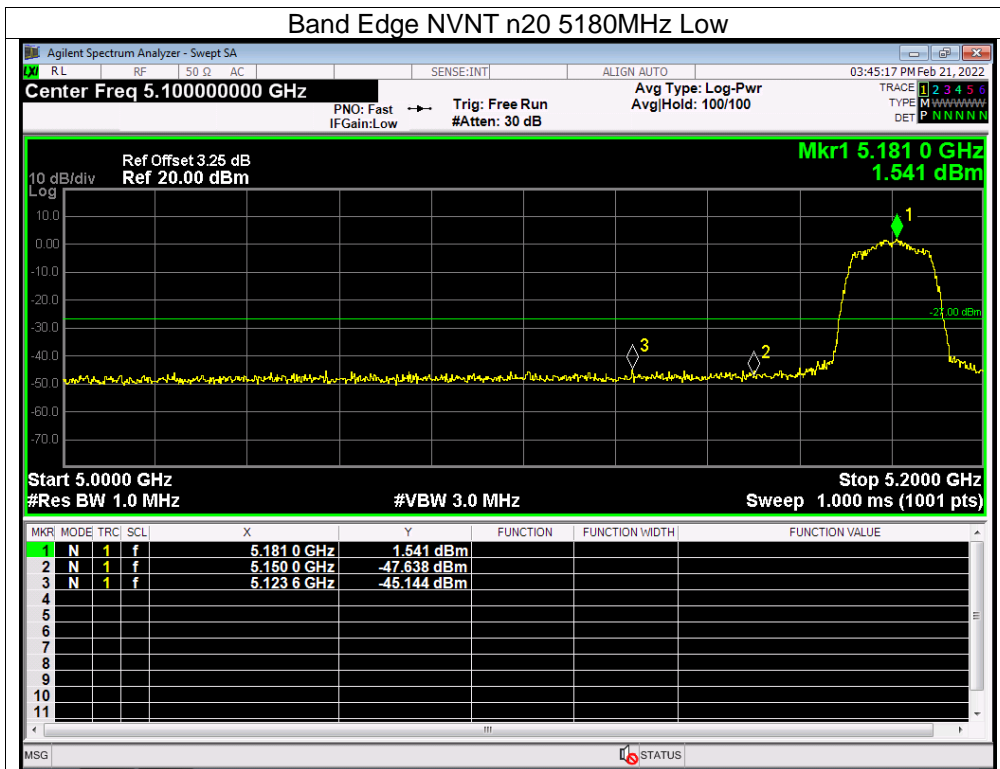
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

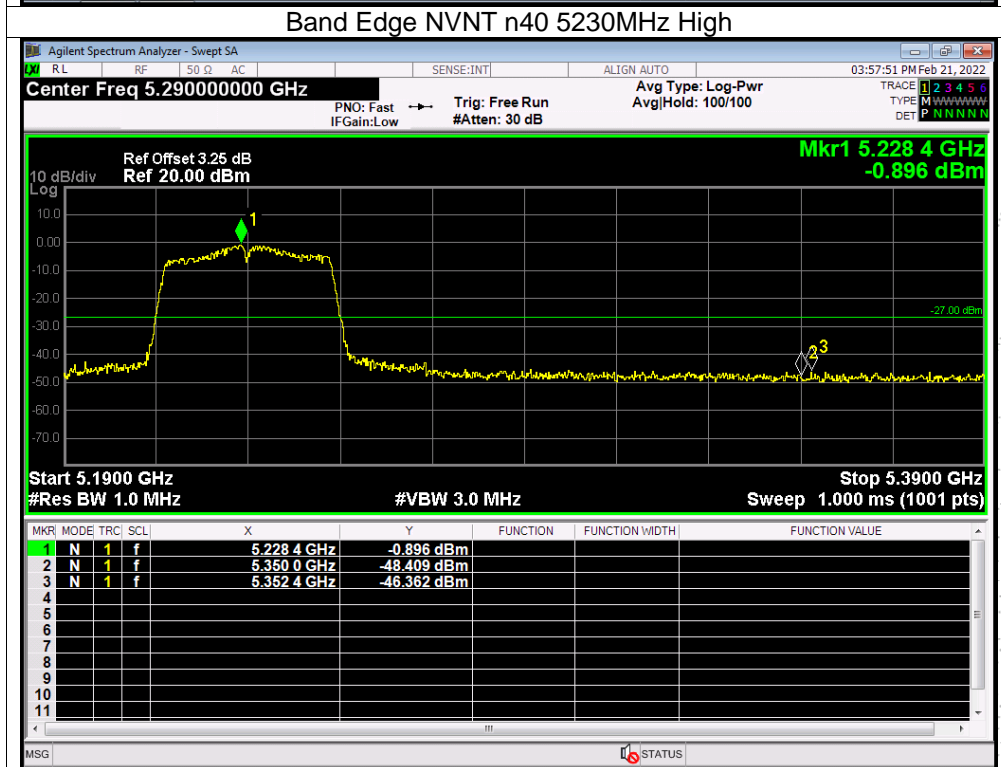
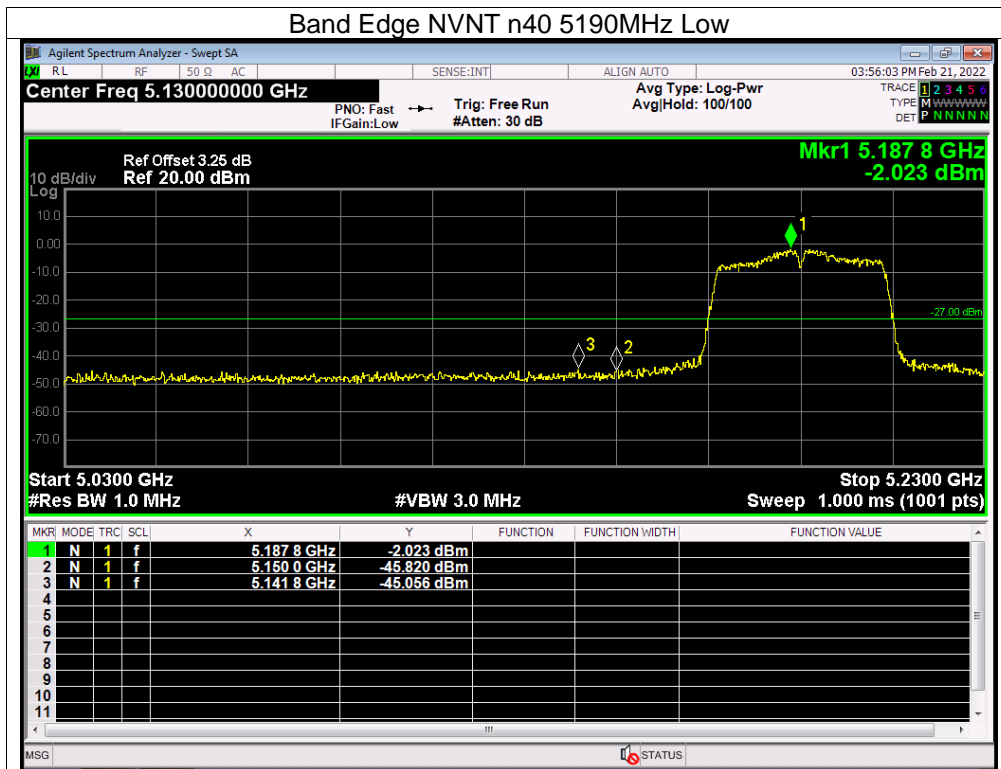
11.4 EUT operating Conditions

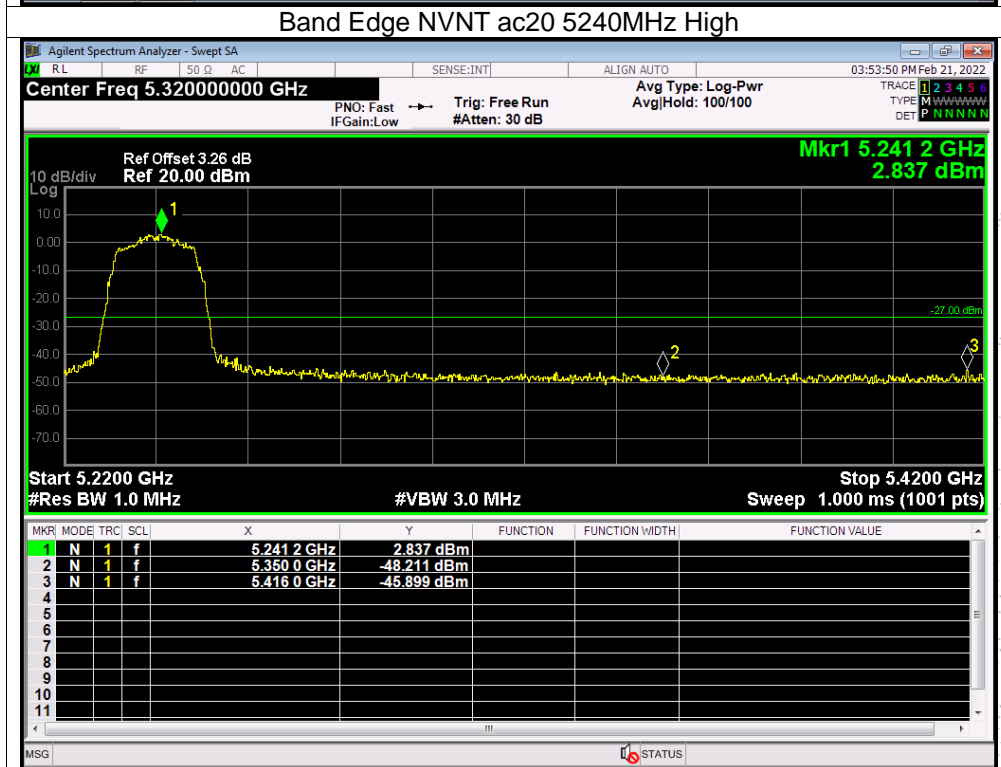
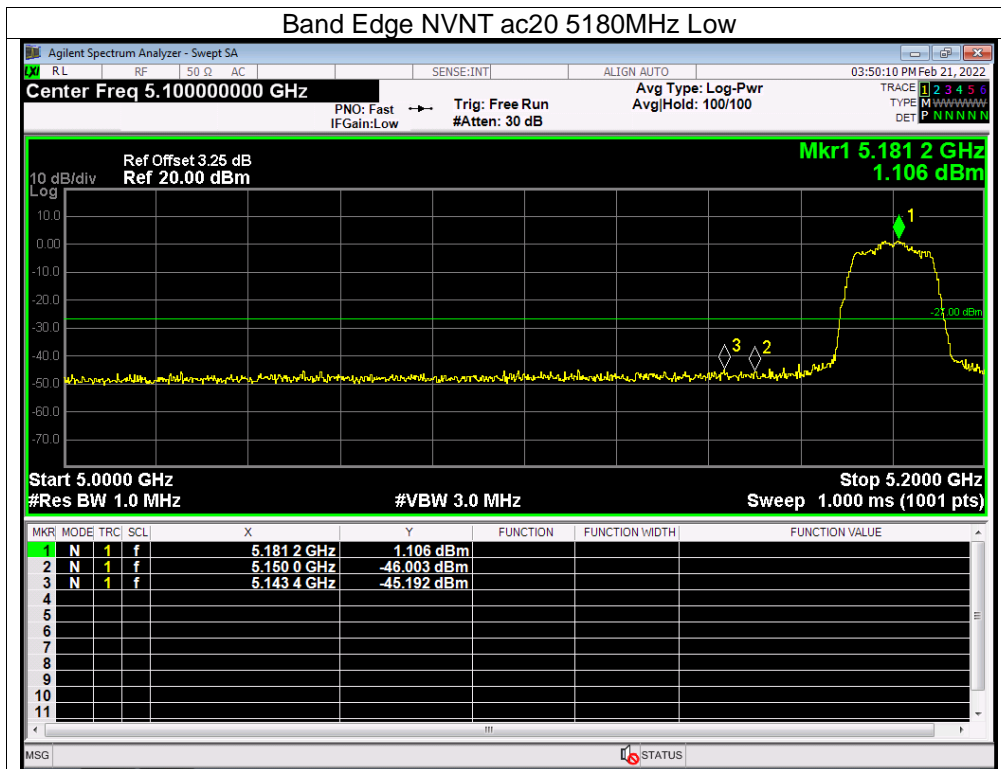
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data

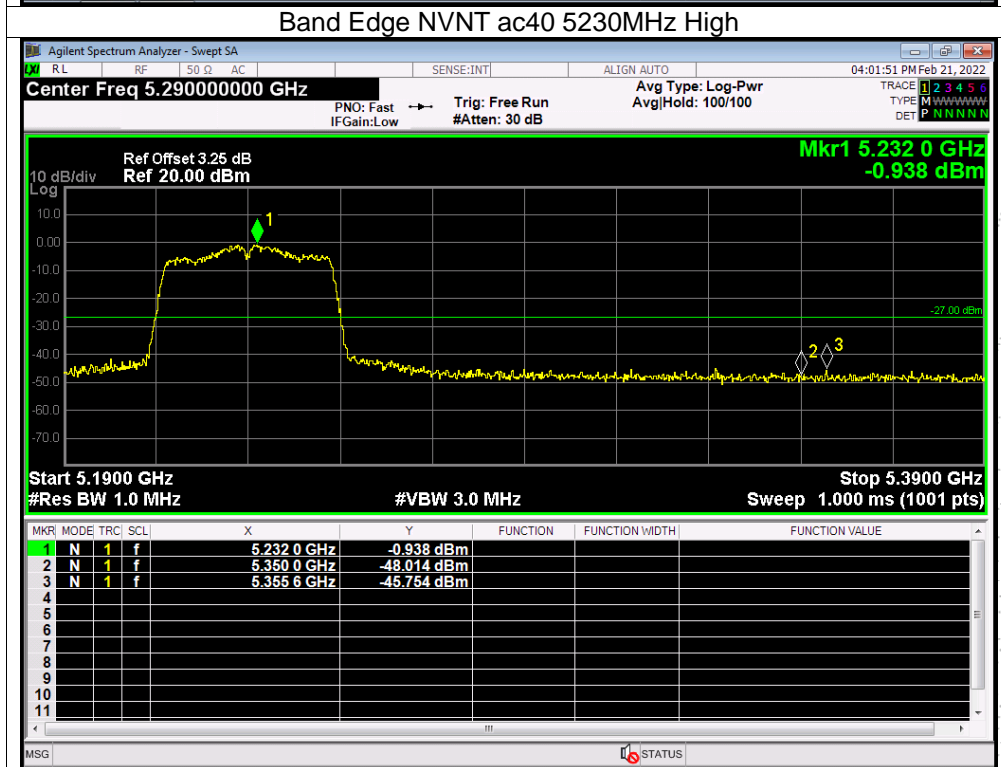
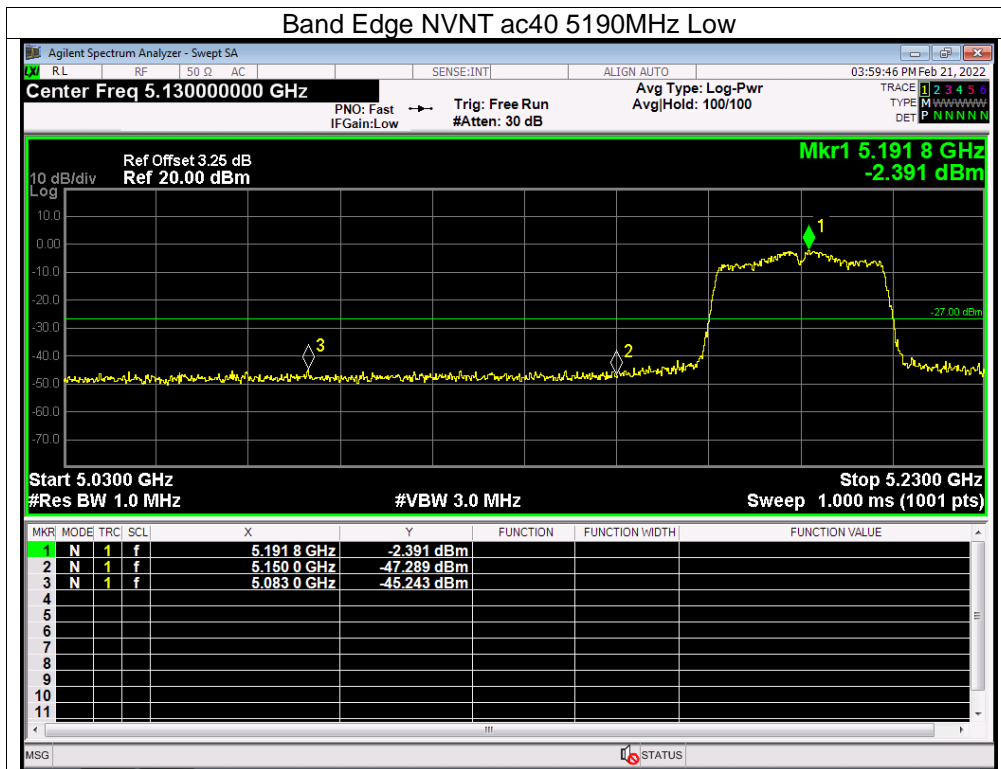
11.5 Test Result

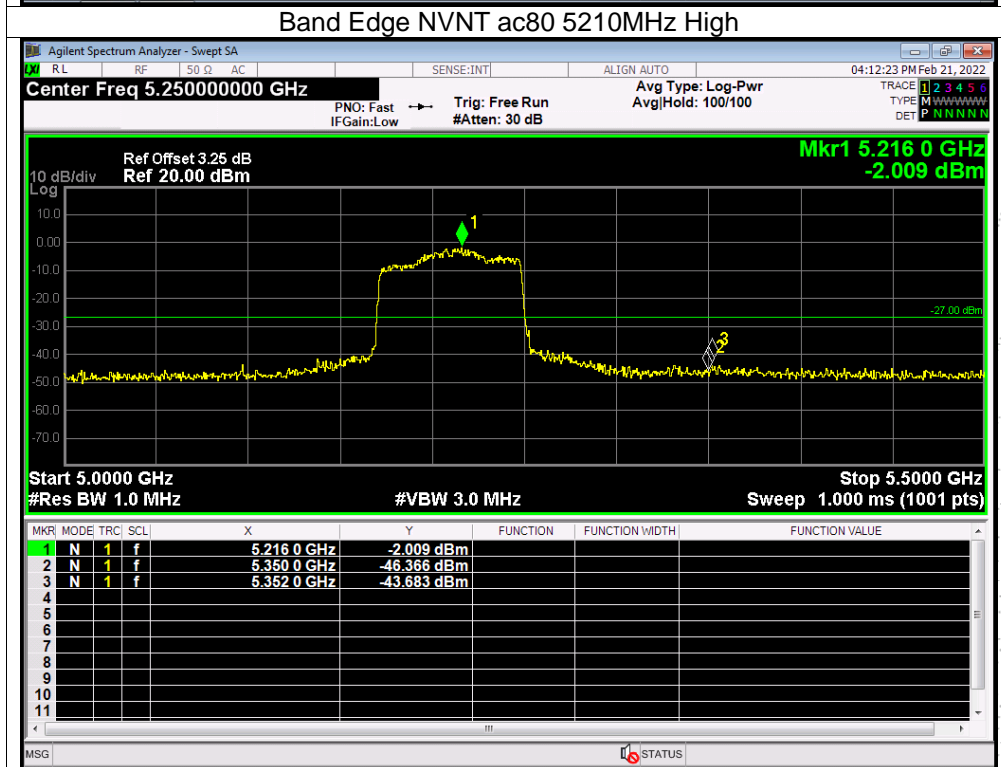
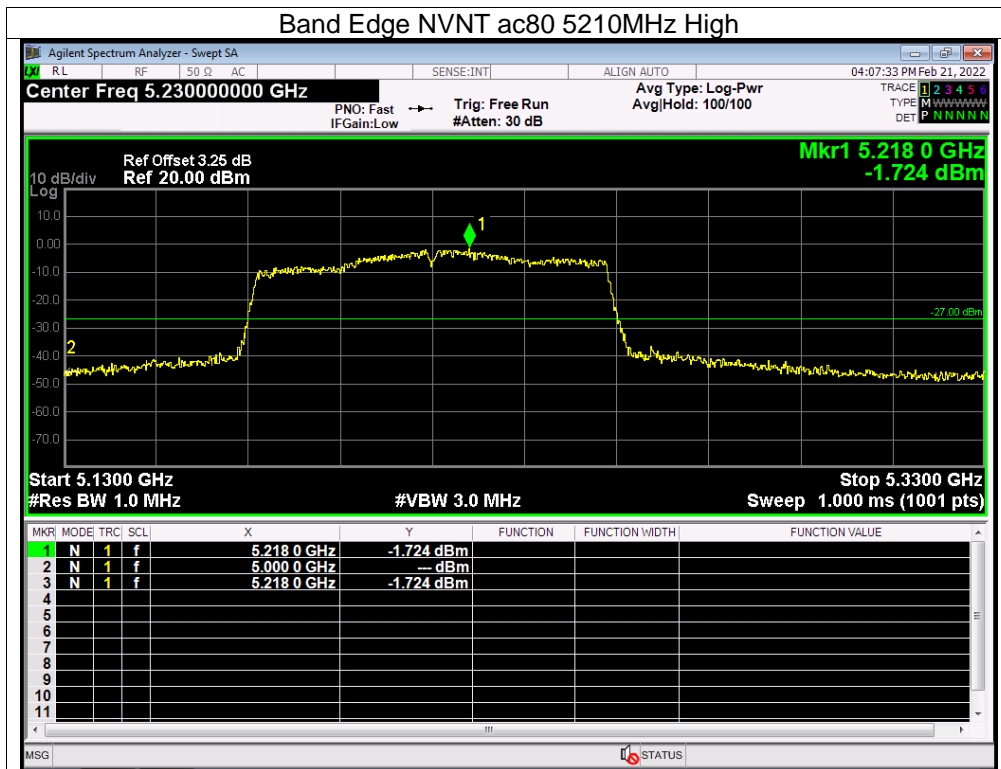


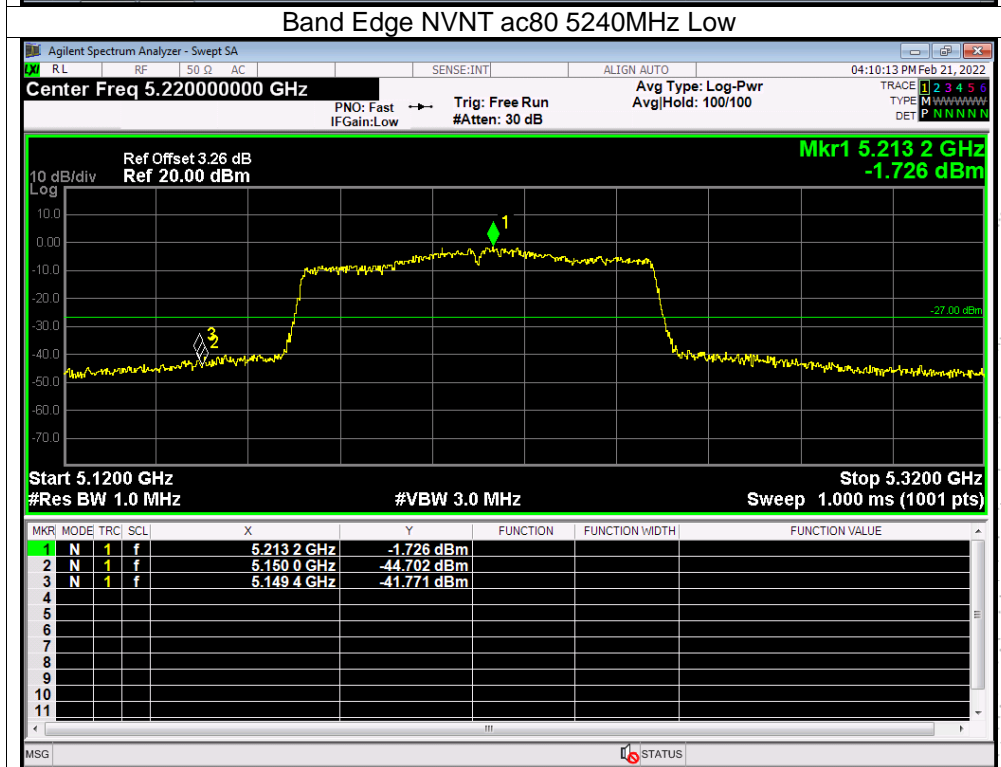
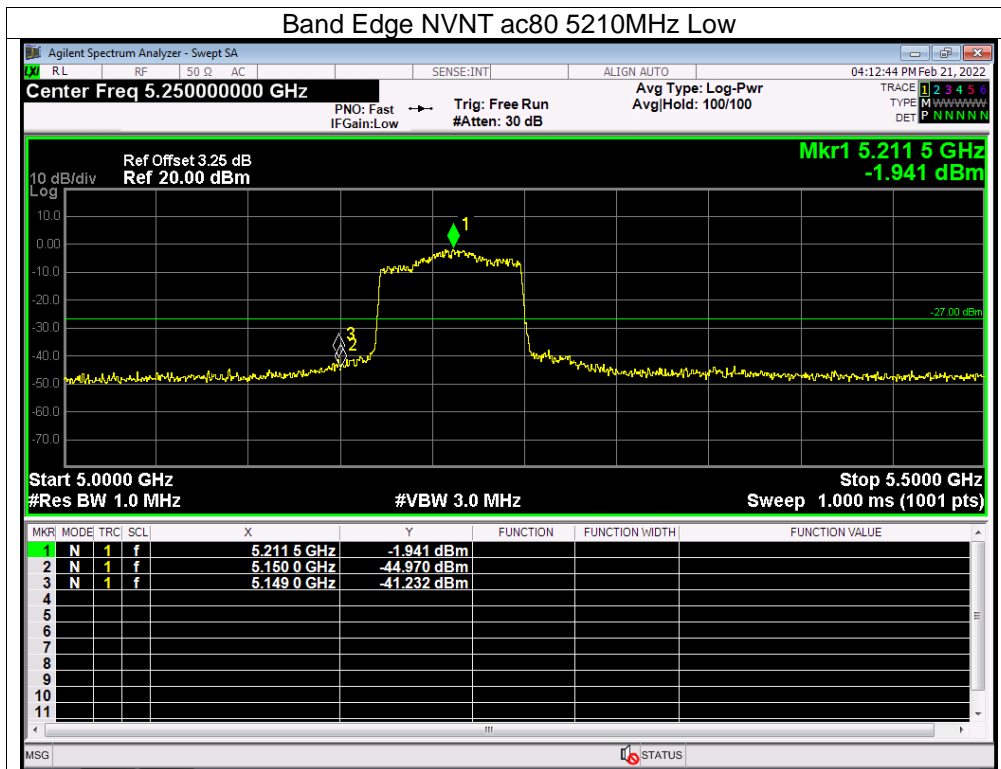


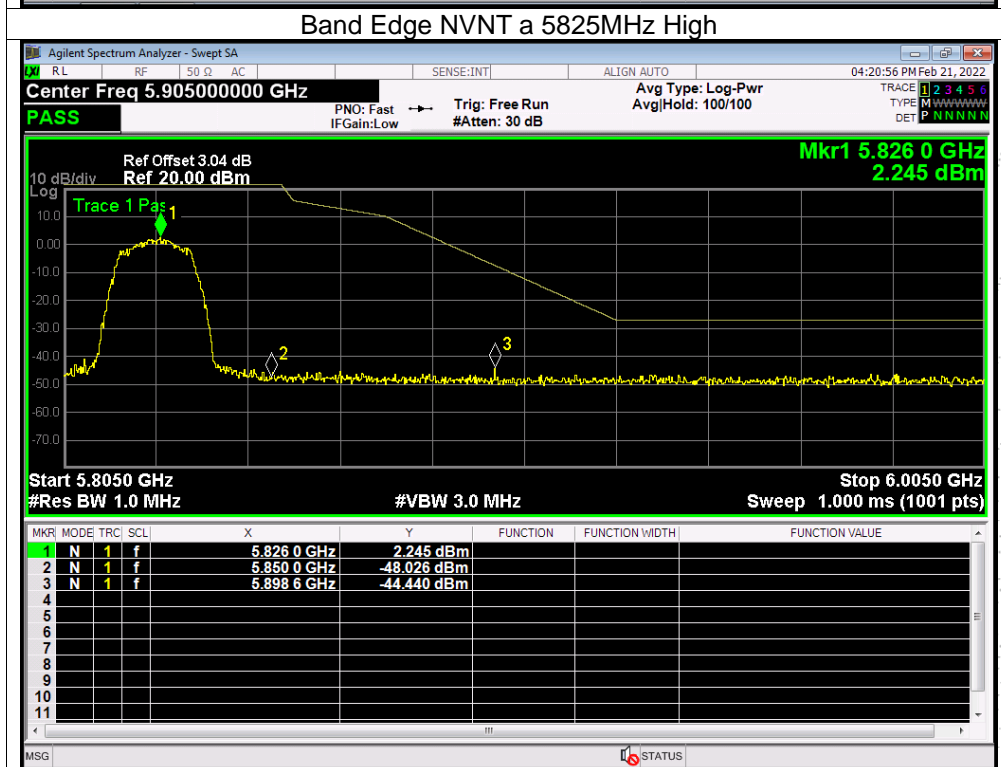
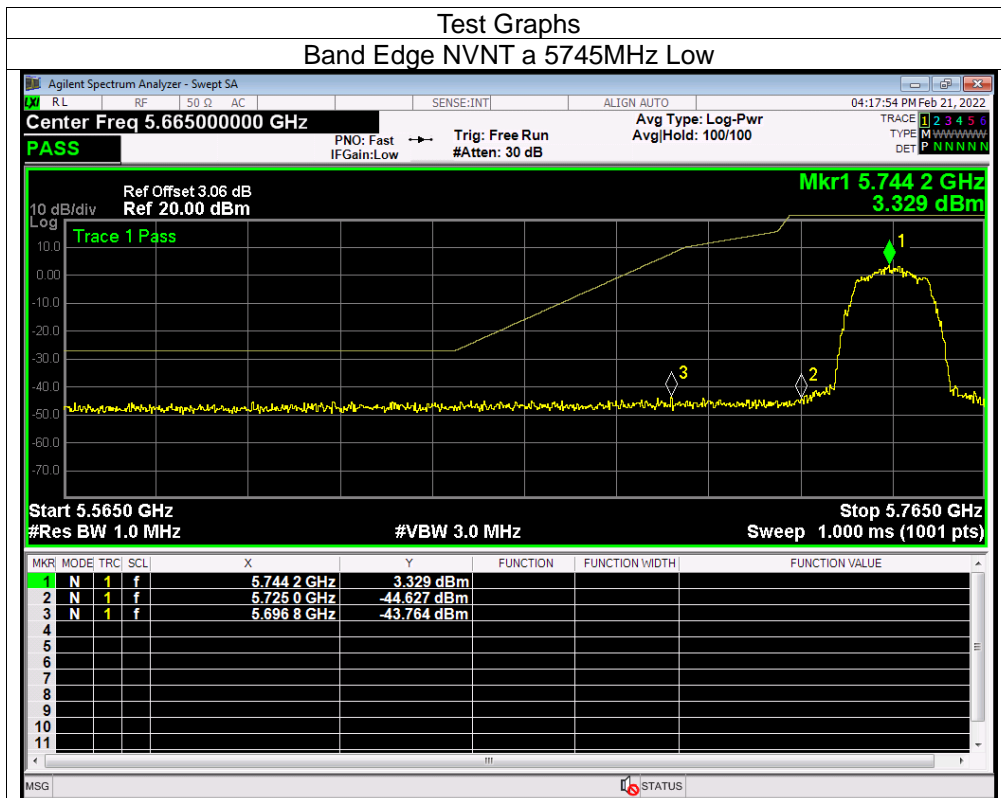


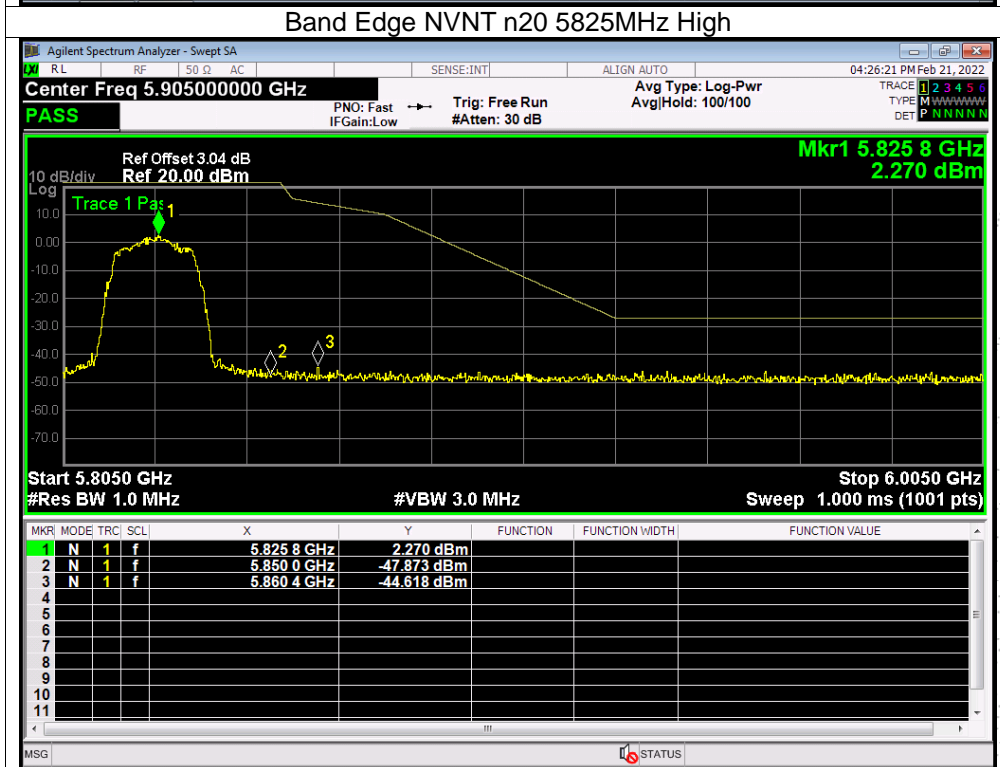
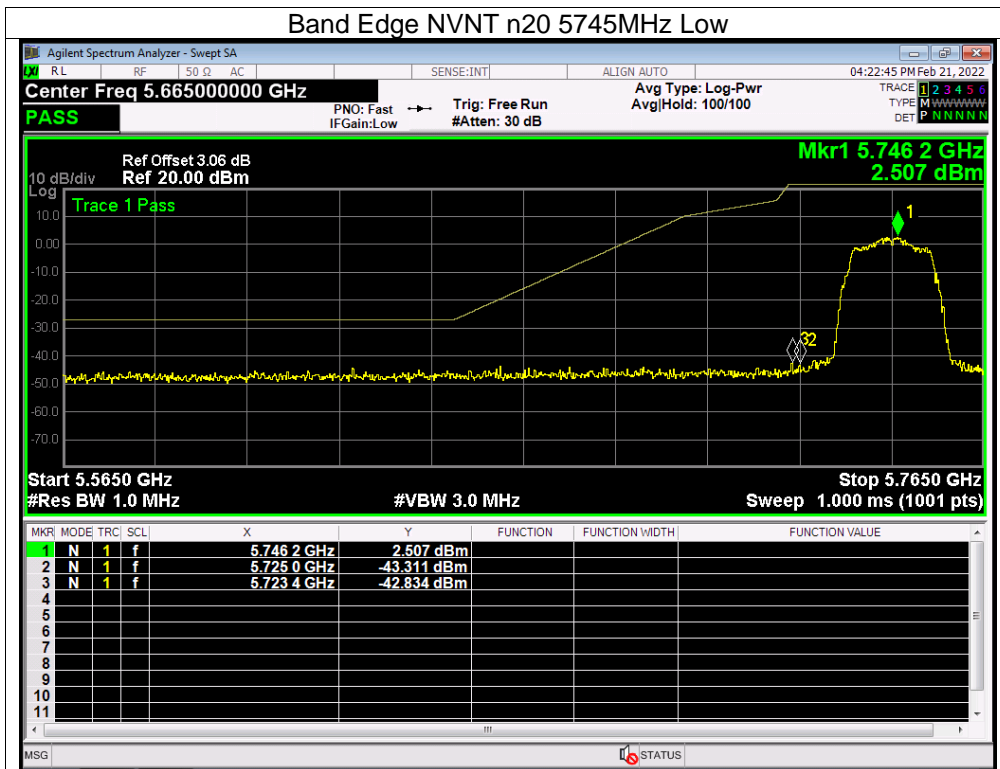


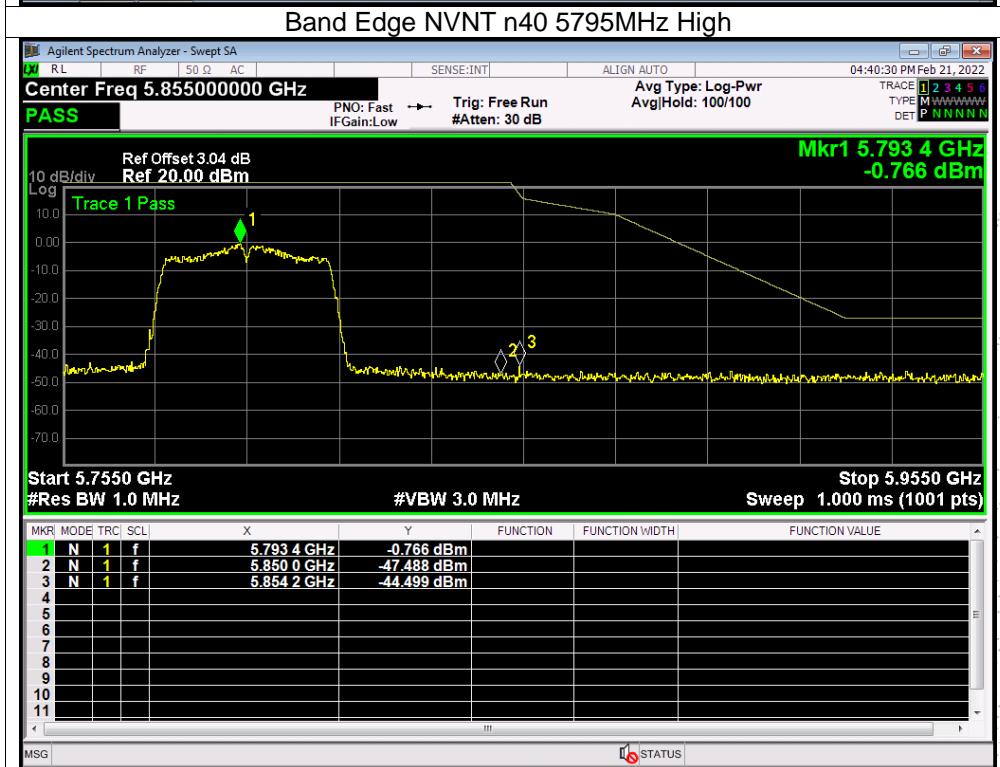
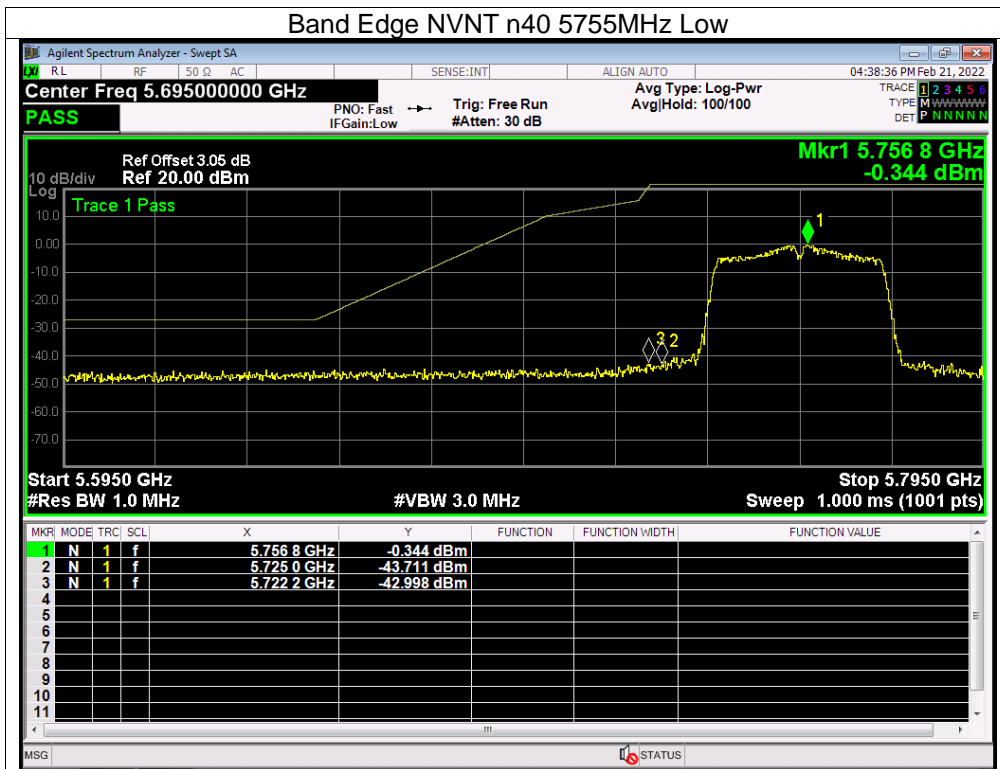


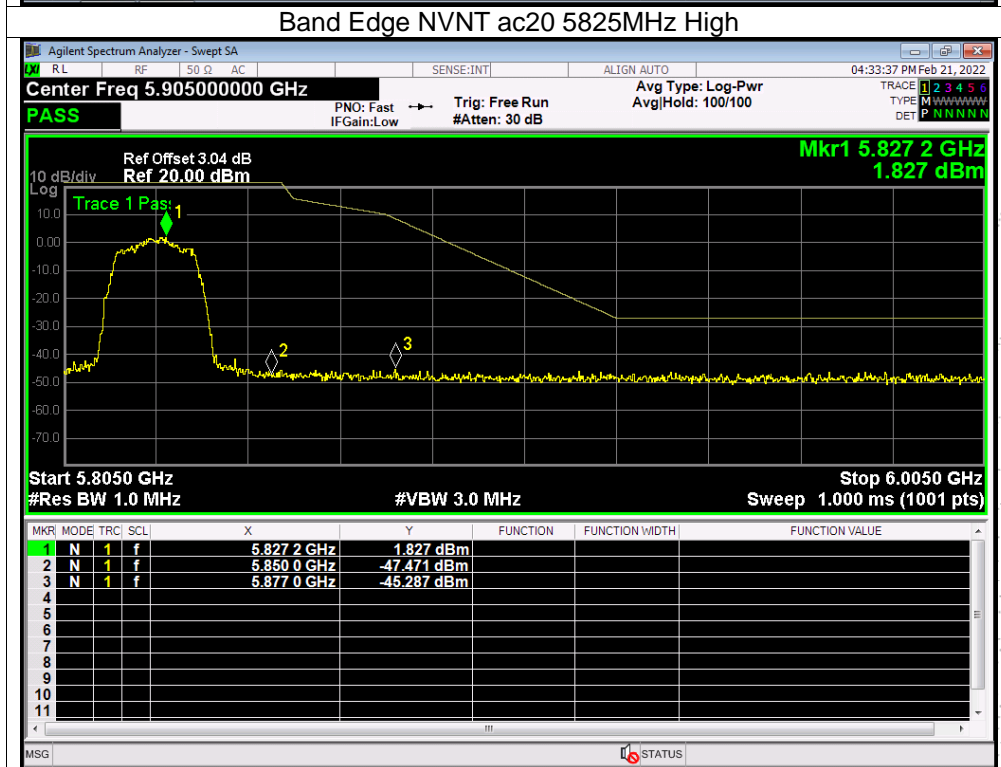
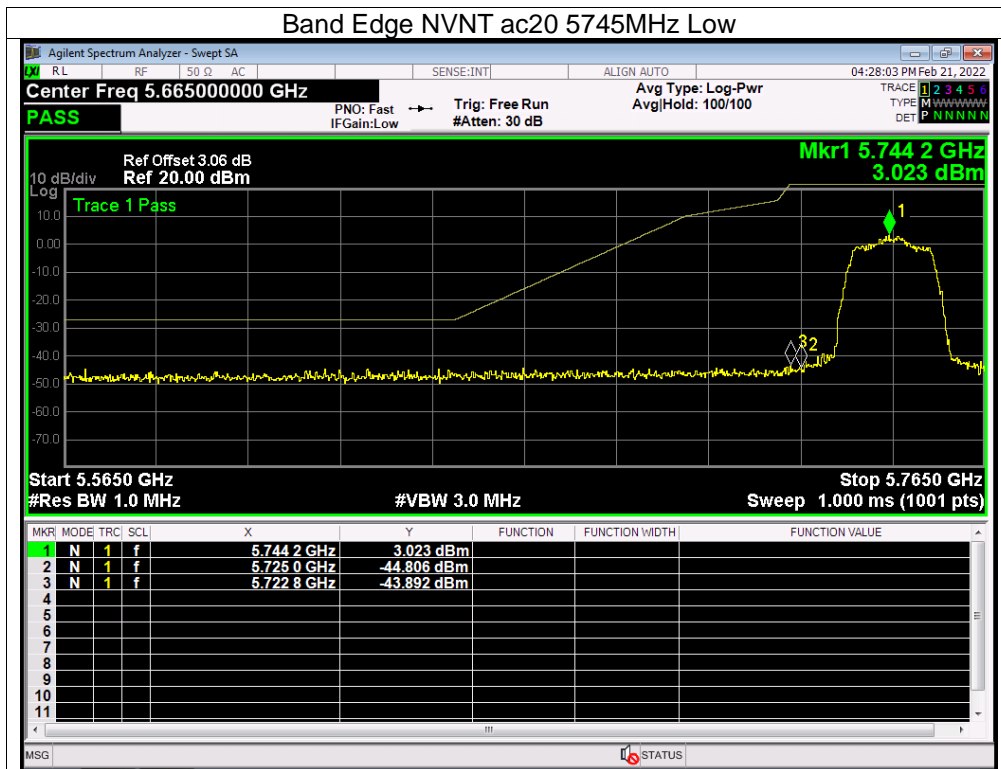


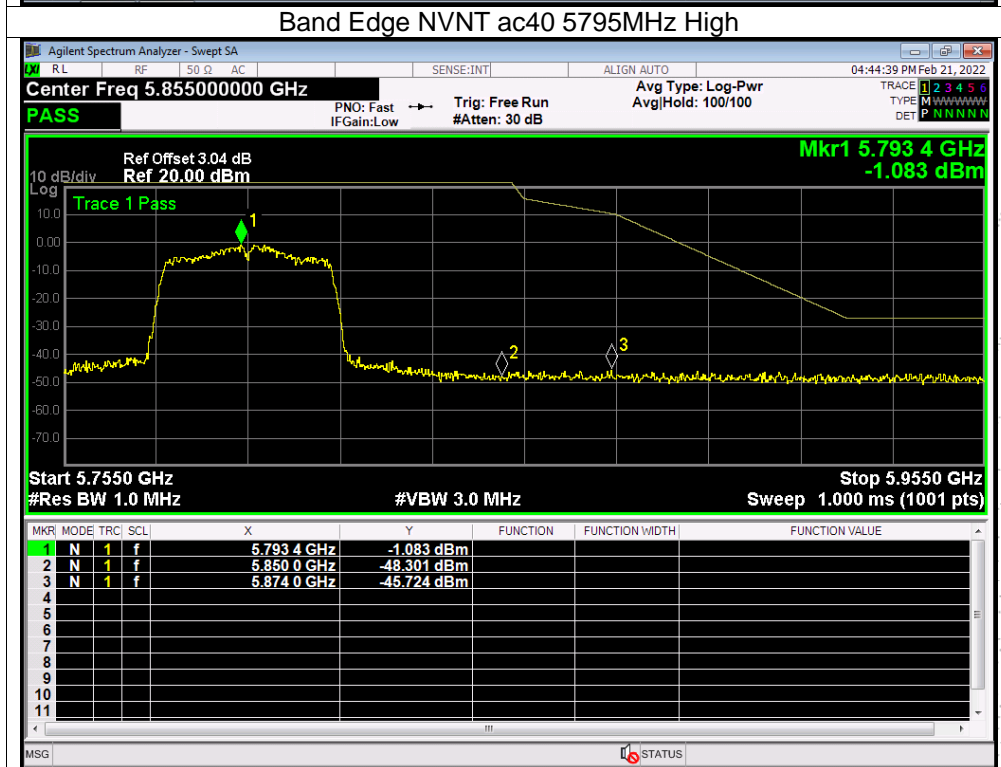
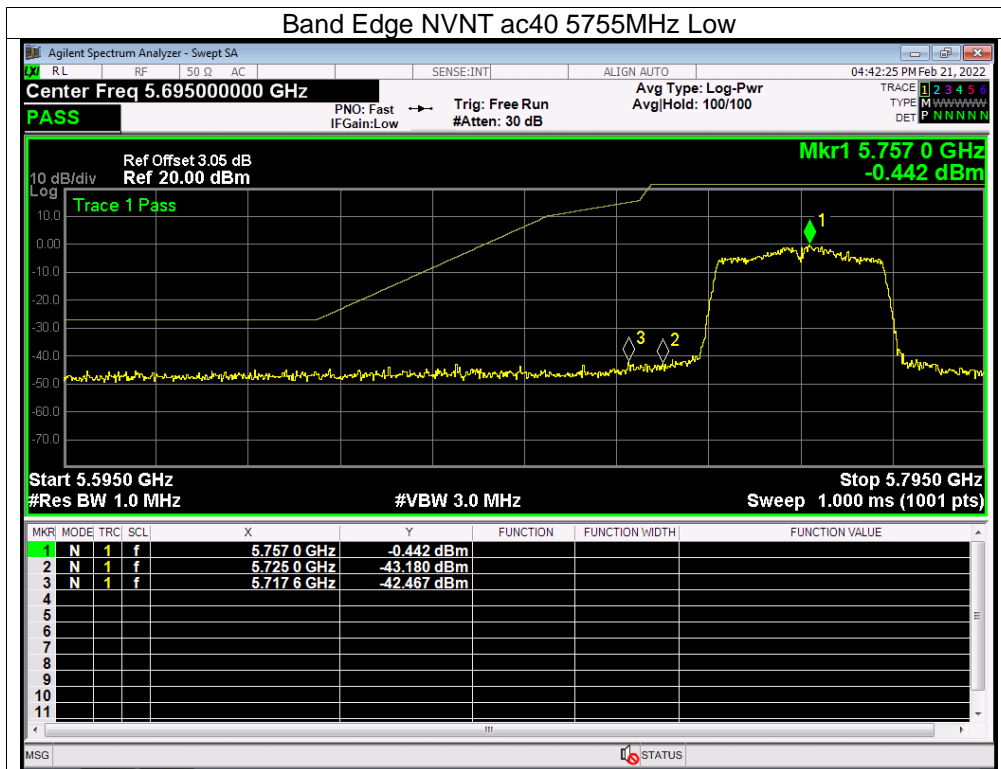


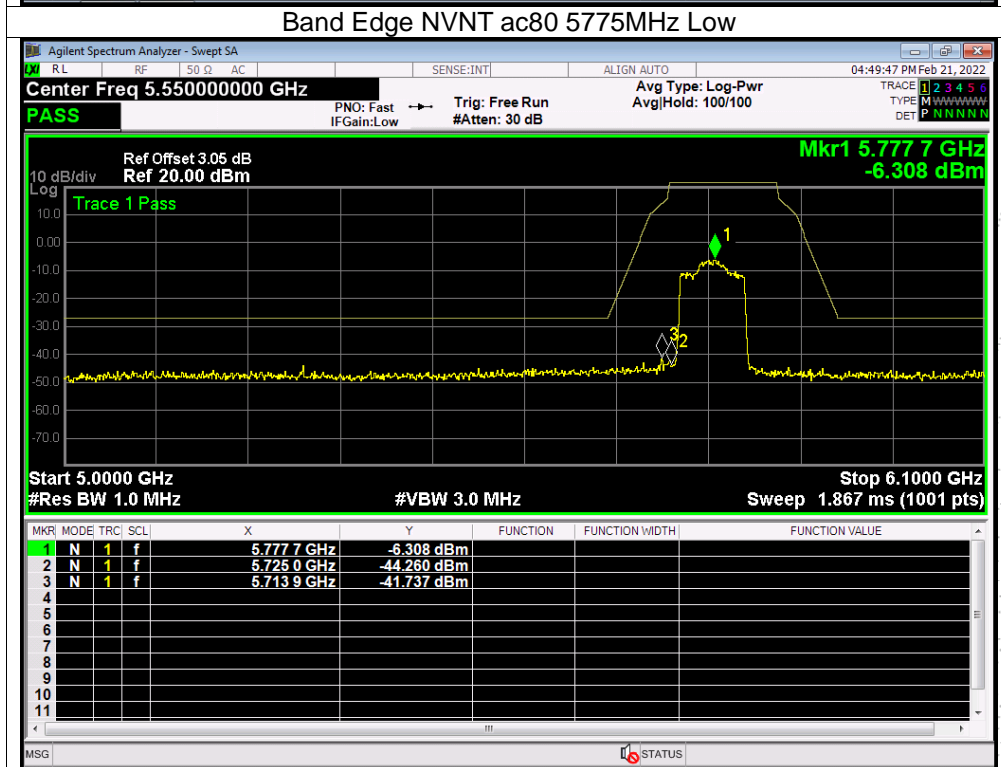
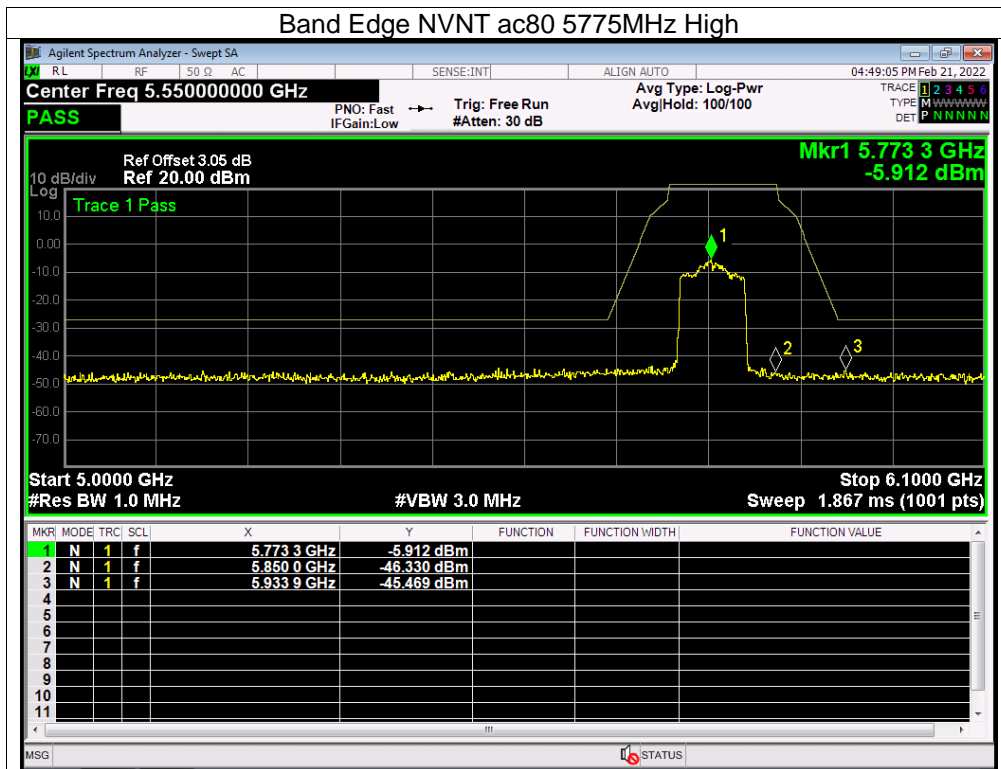












12. Spurious RF Conducted Emissions

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

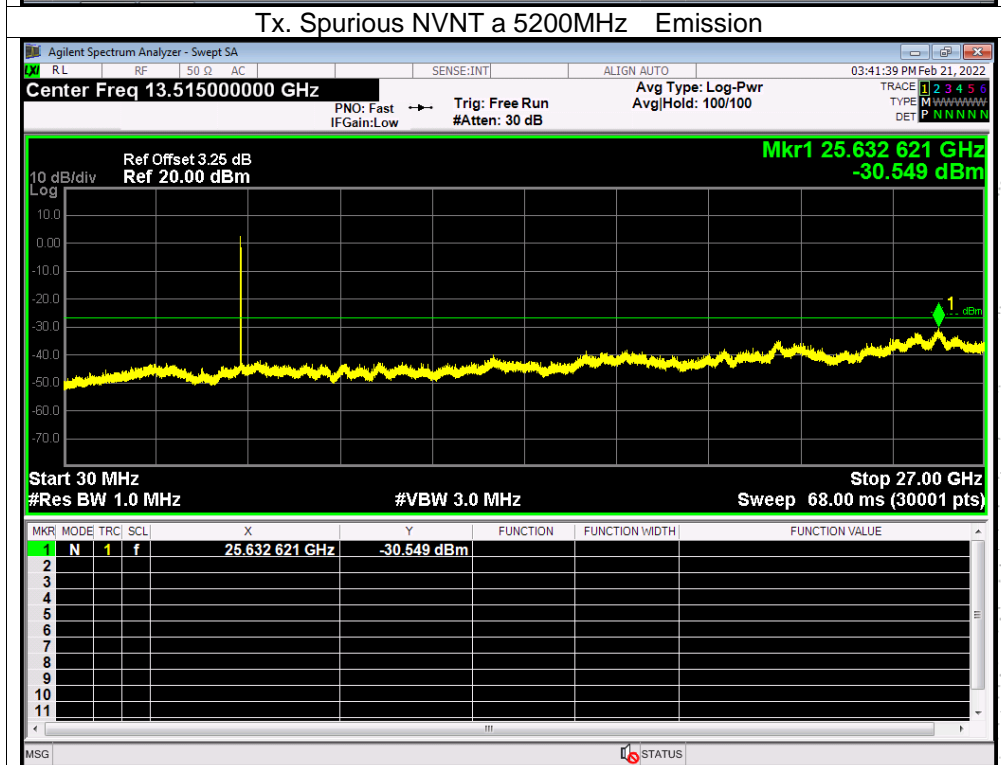
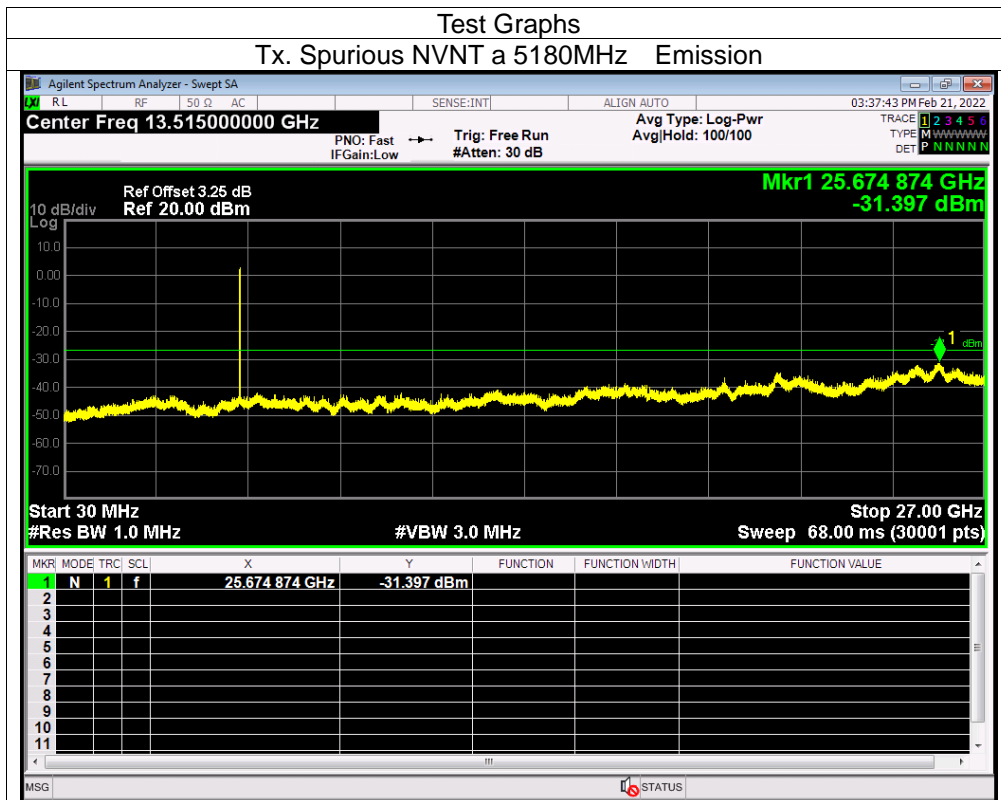
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

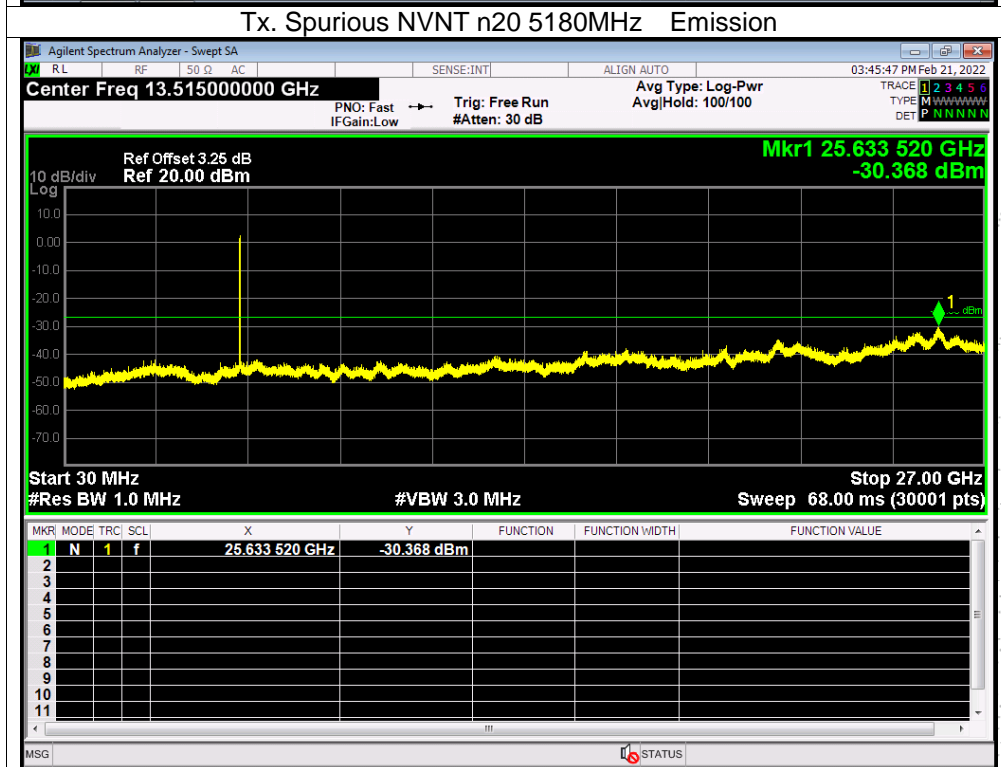
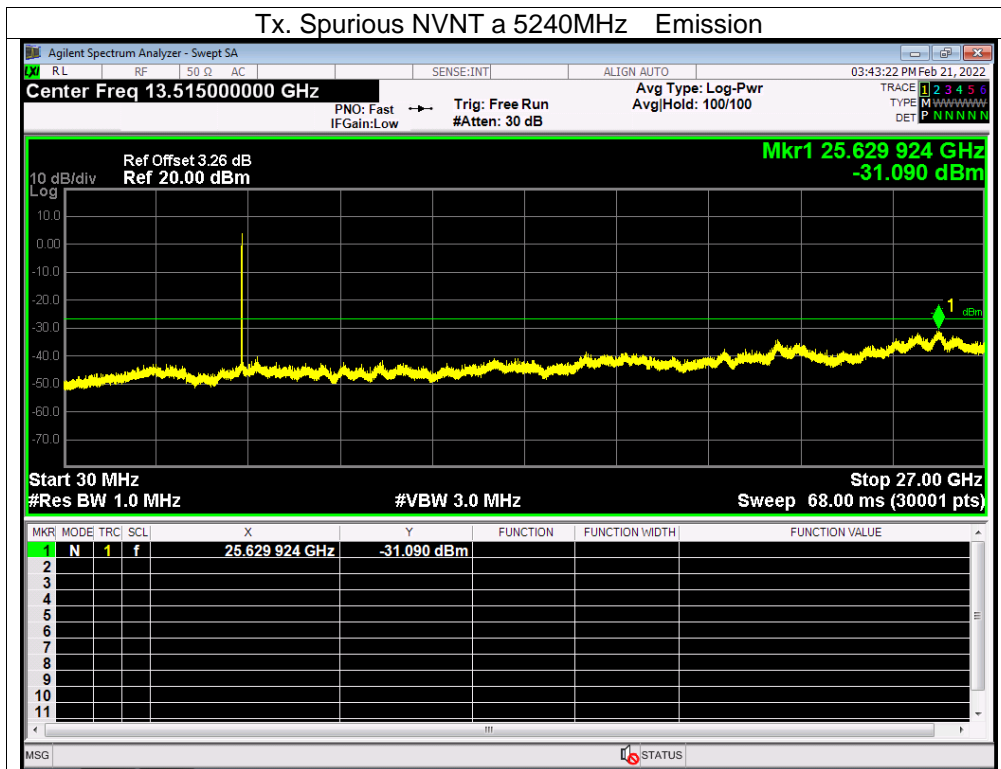
12.4 Test Result

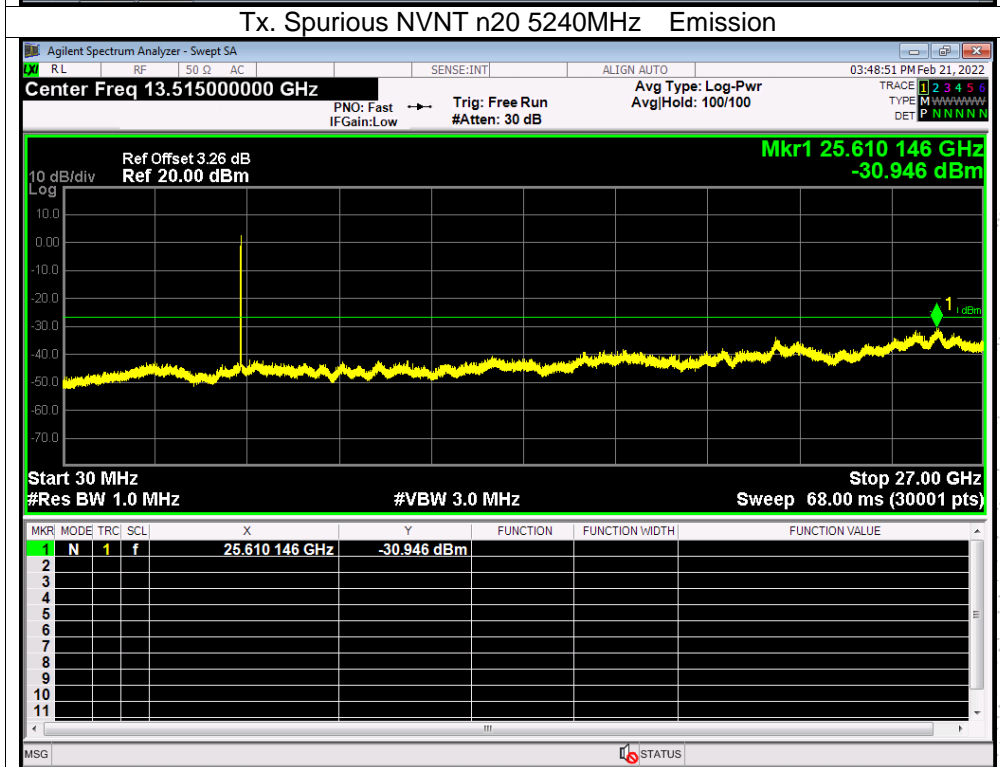
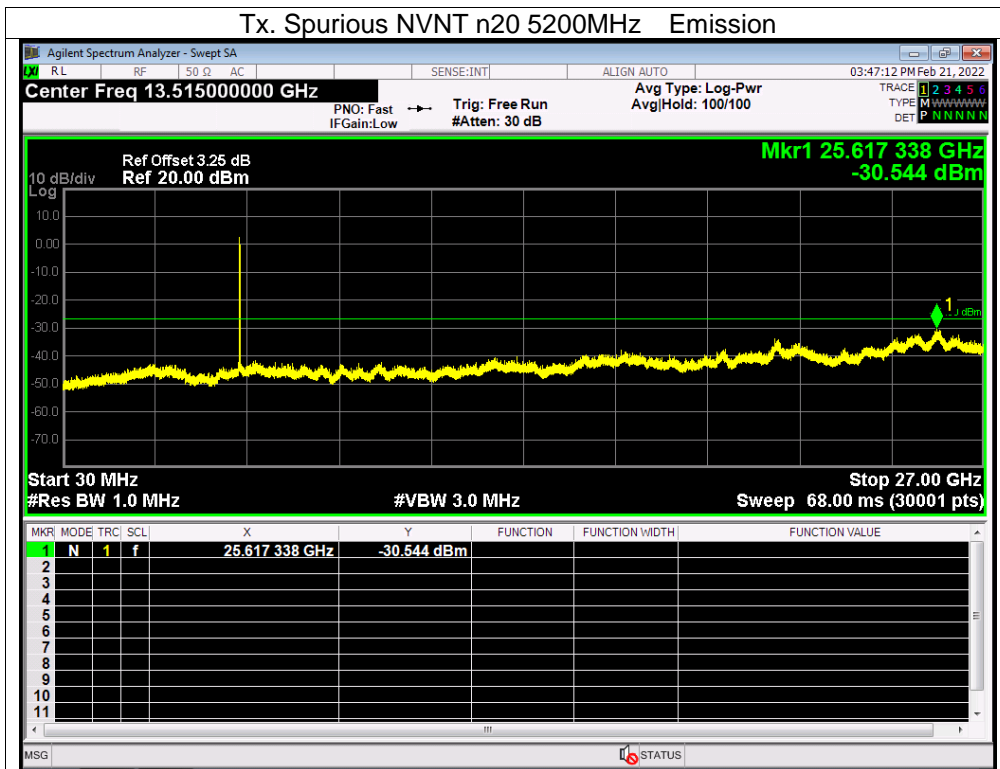
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

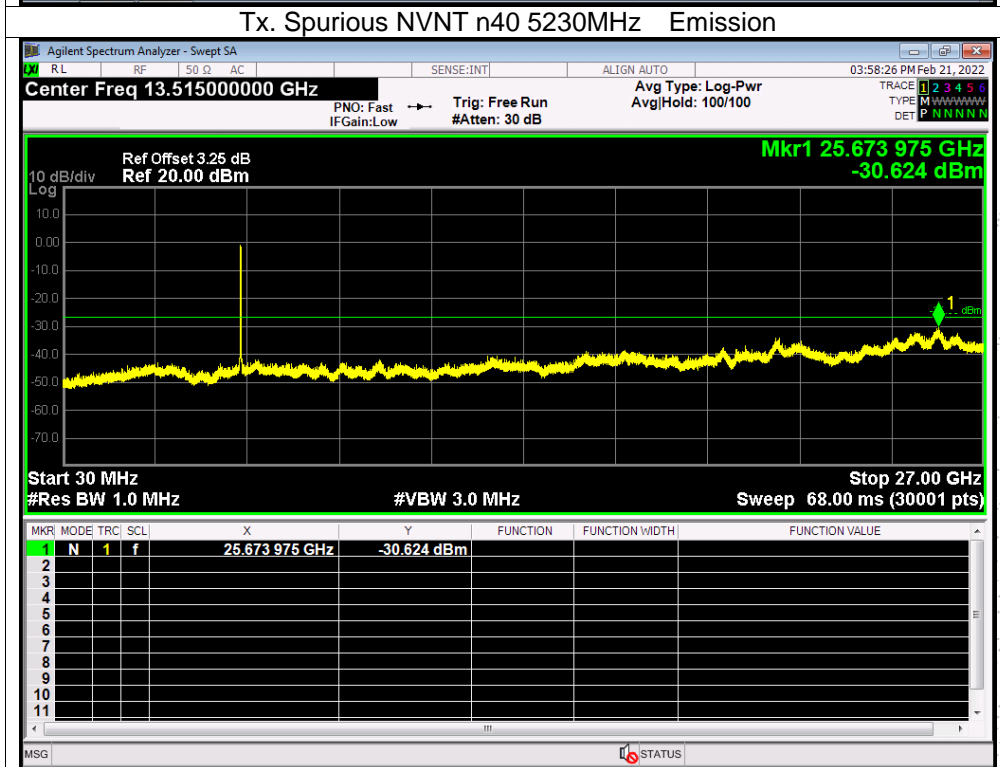
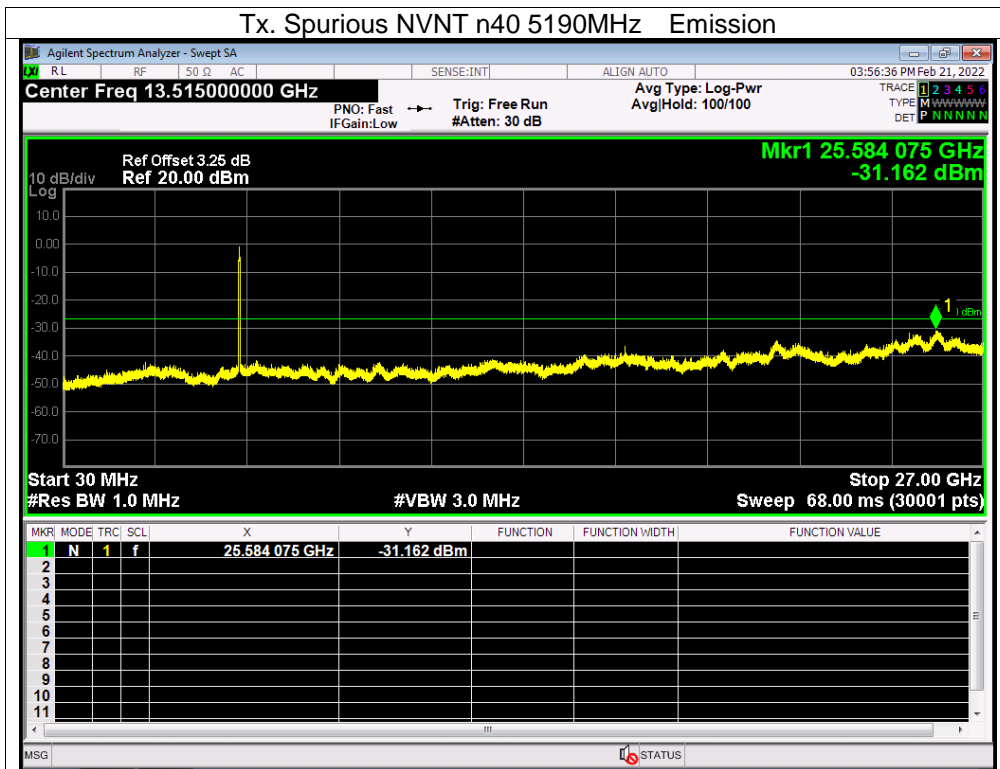
About: 26.5GHz-40GHz, The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

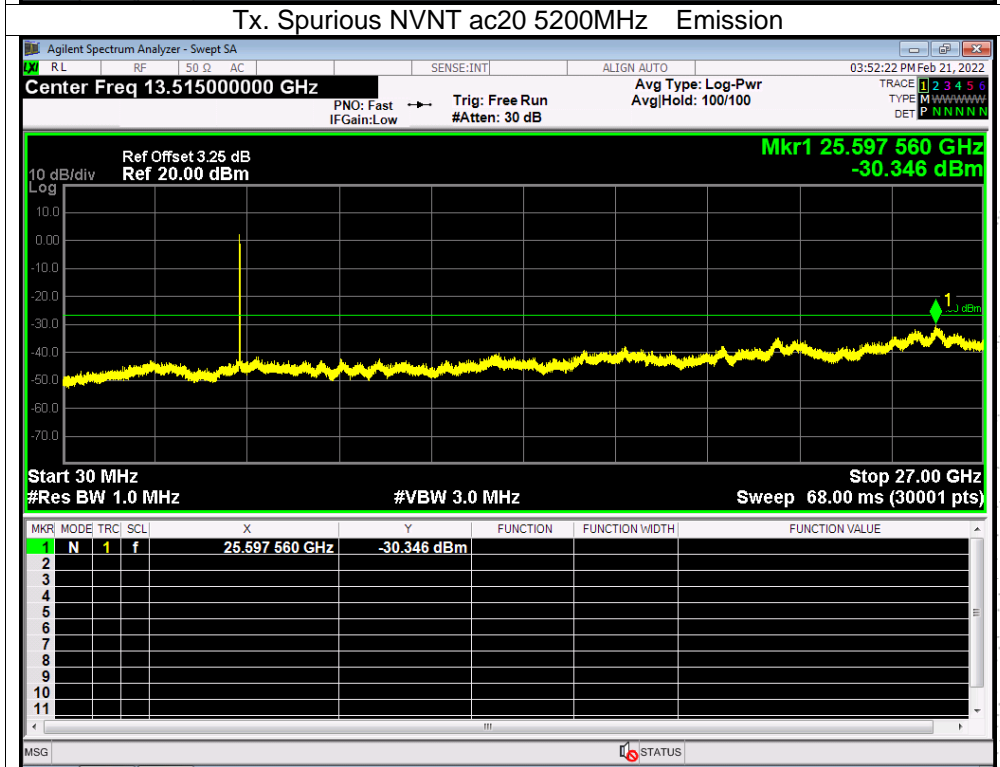
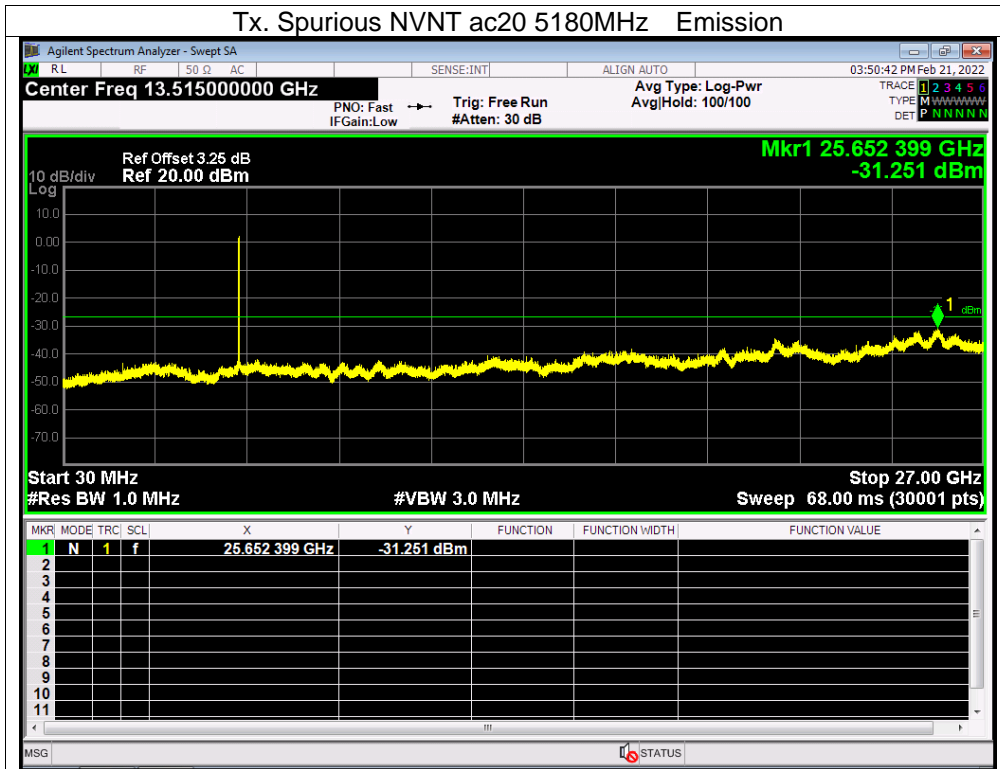
Note: A(B) Represent the value of antenna A and B, The worst data is Antenna B, only shown Antenna B Plot.

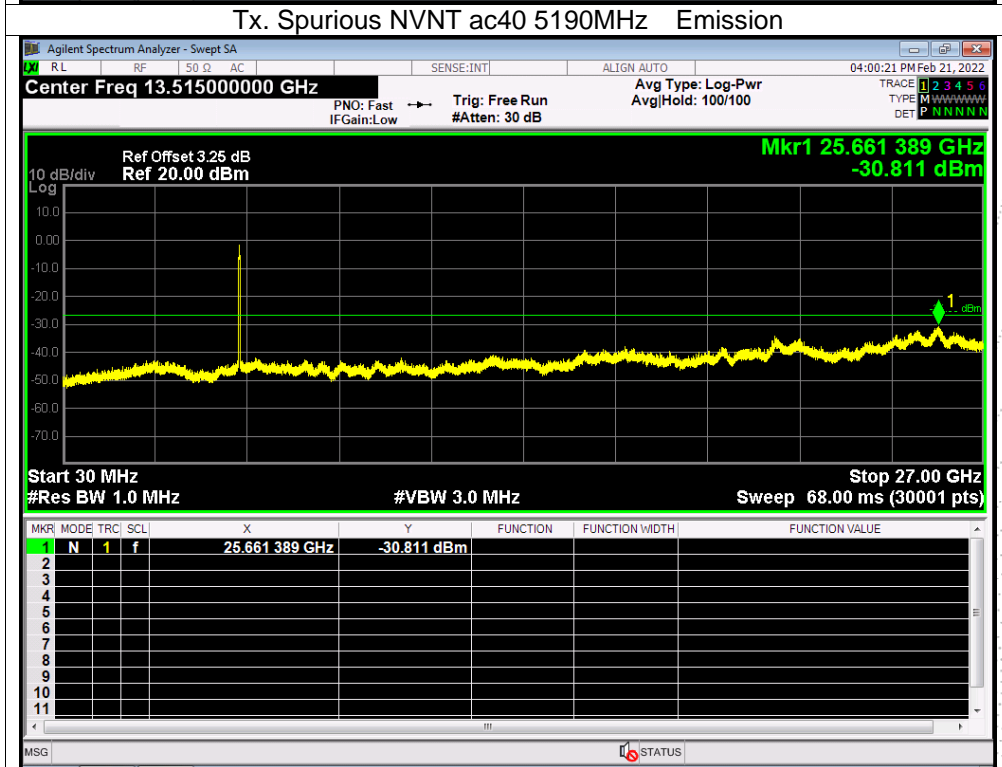
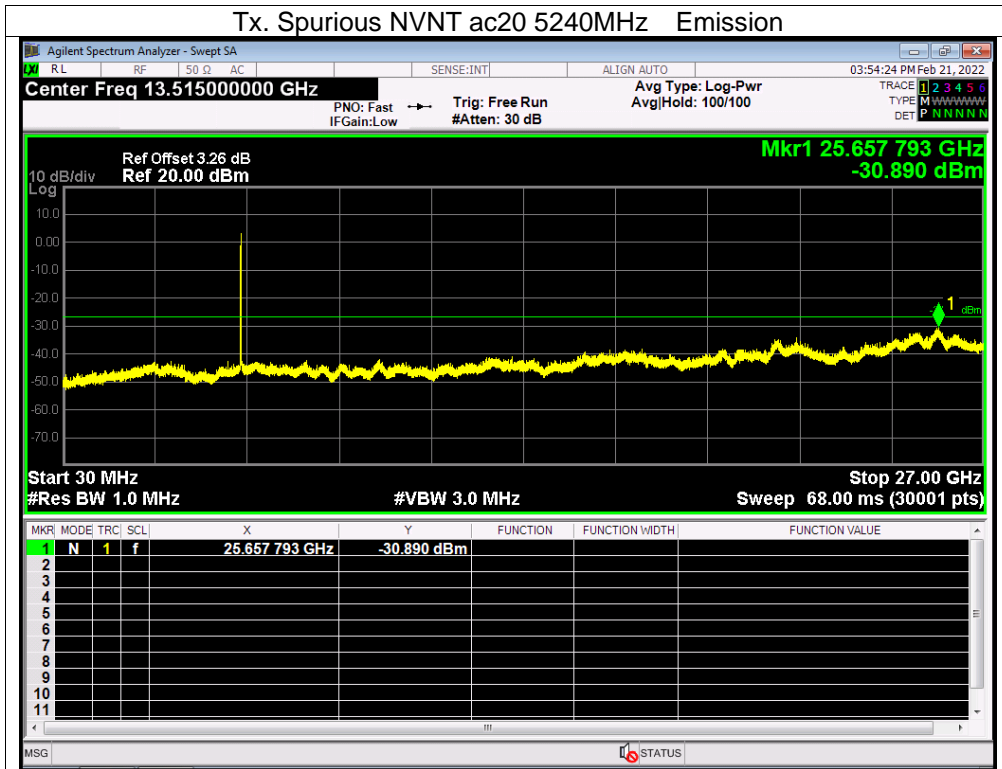


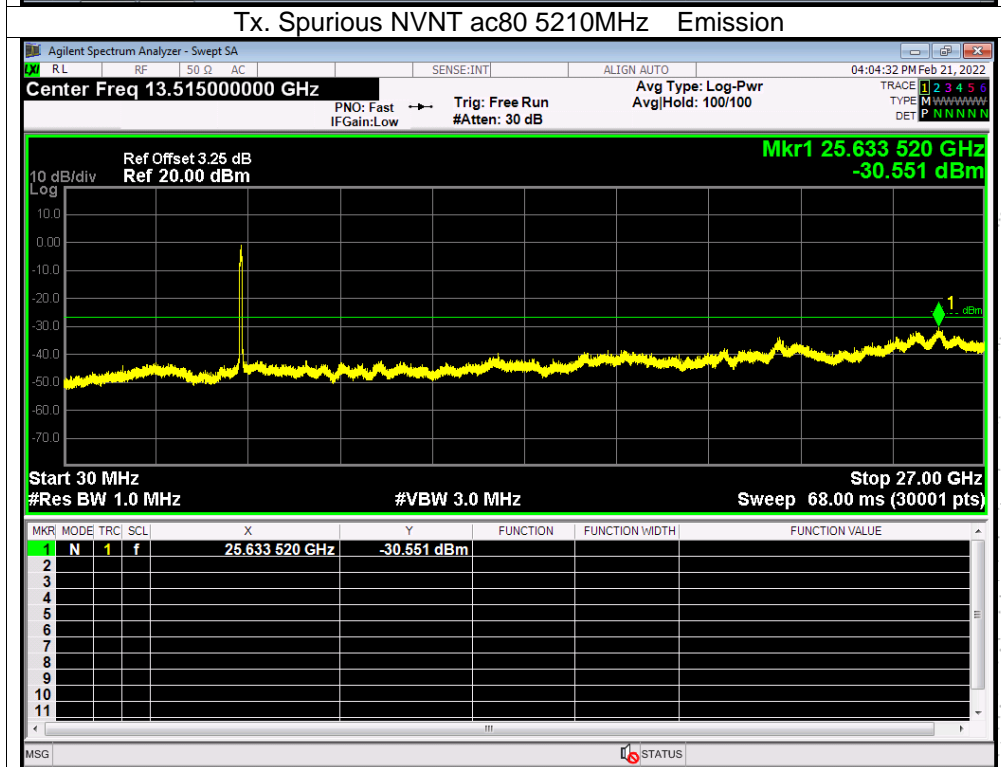
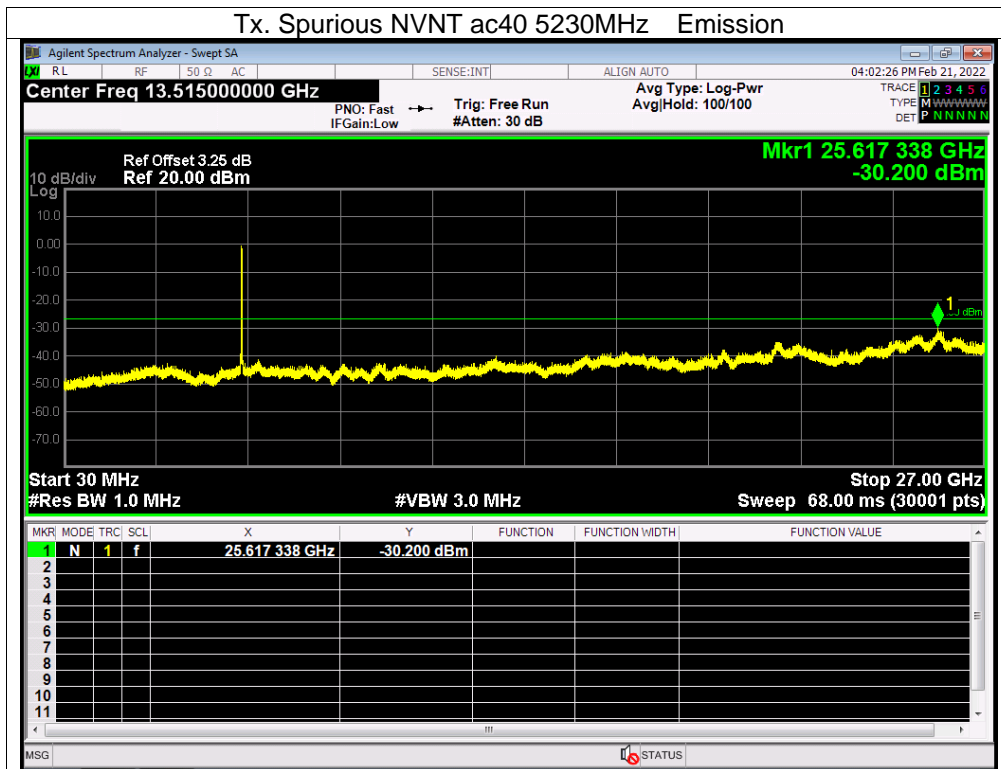


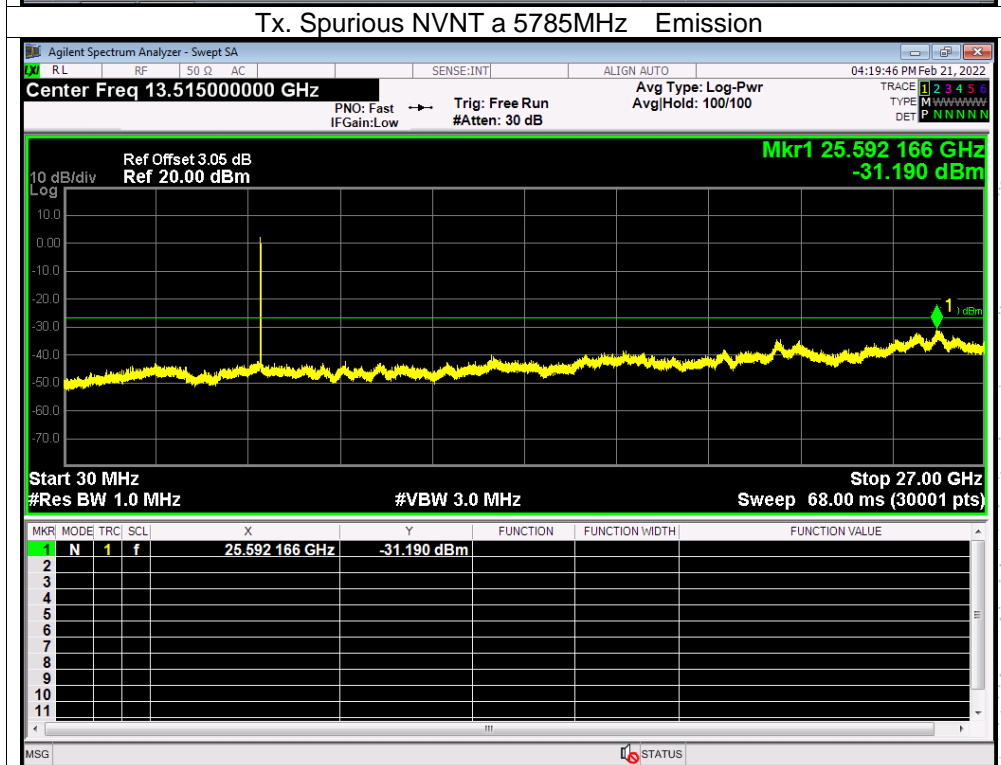
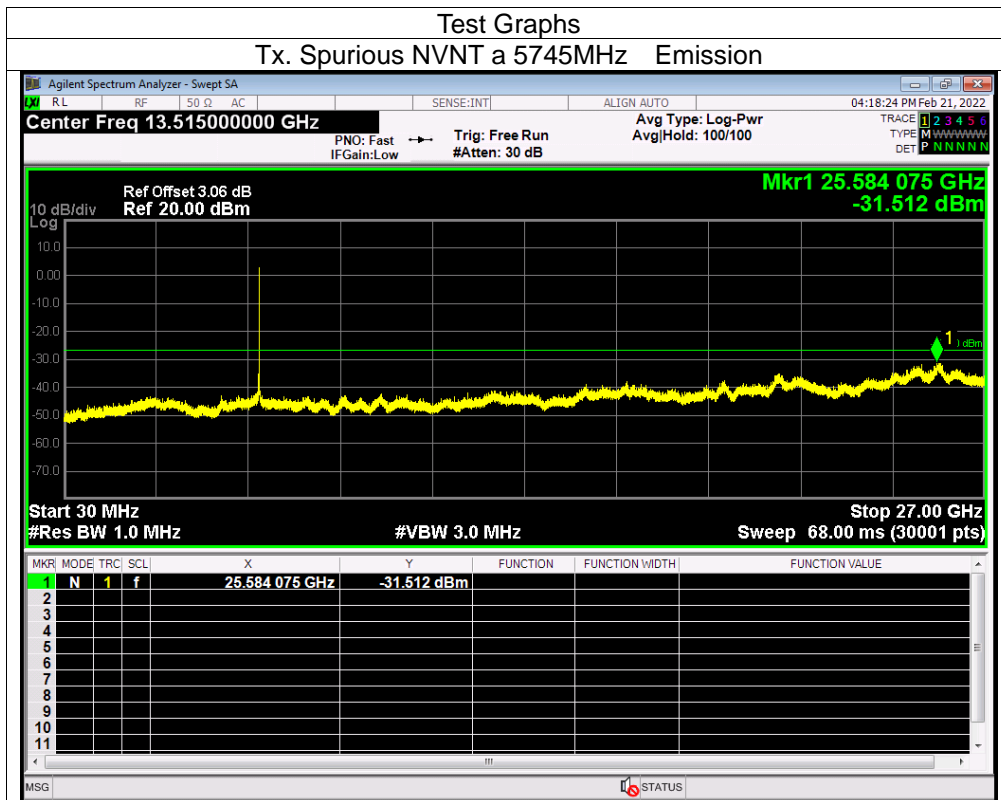


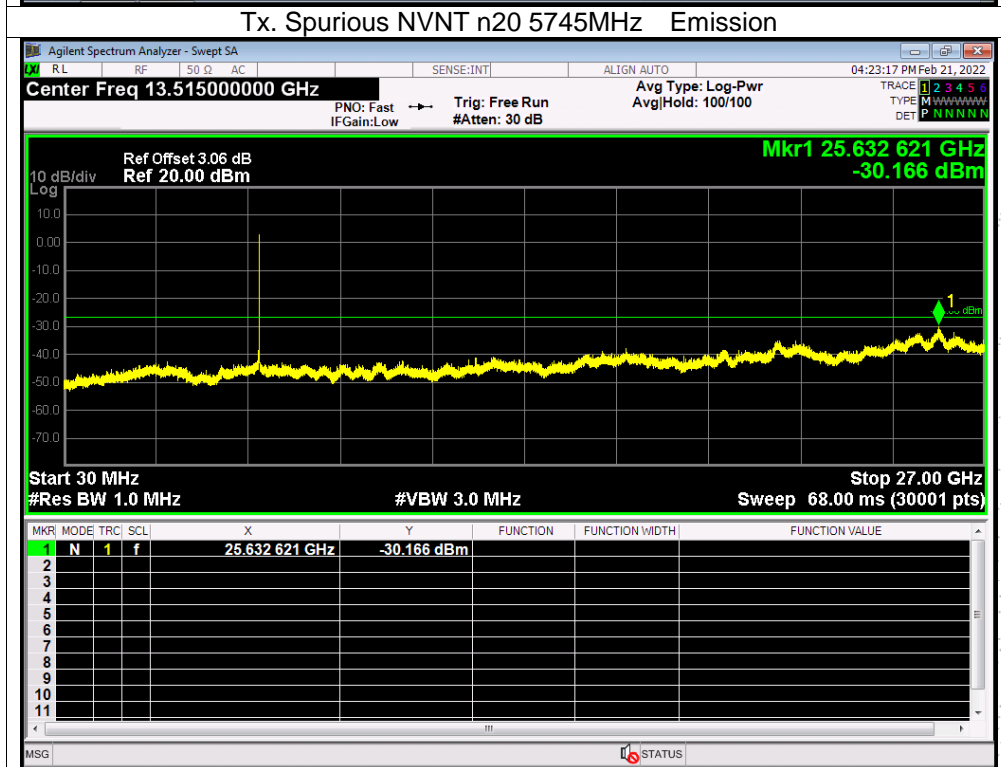
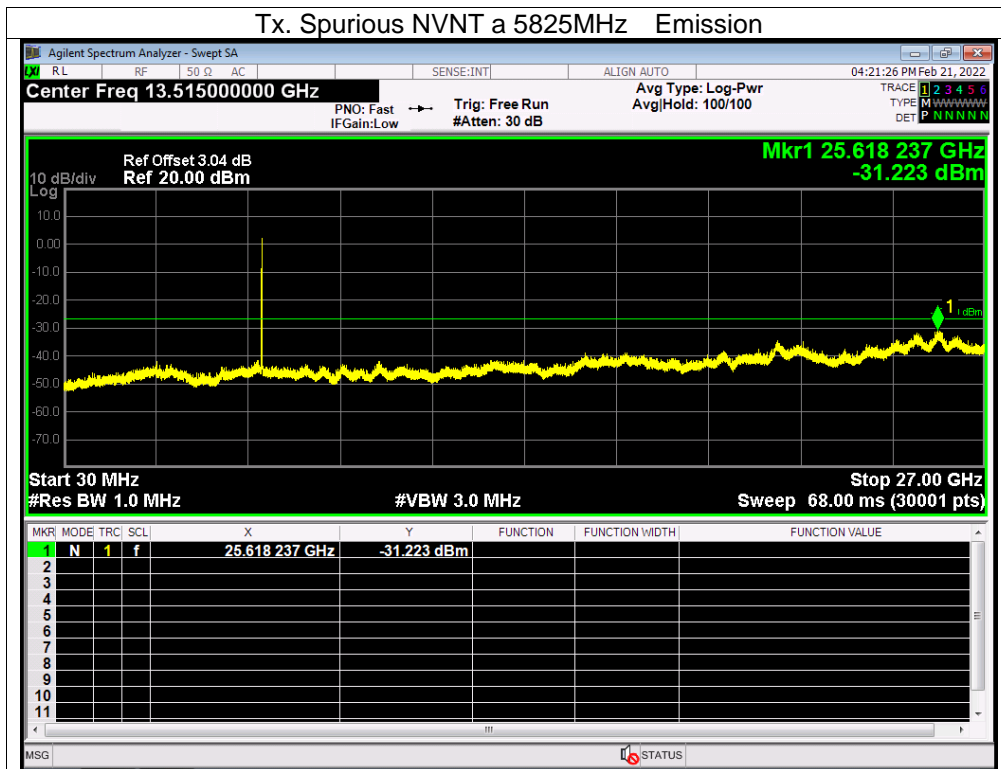


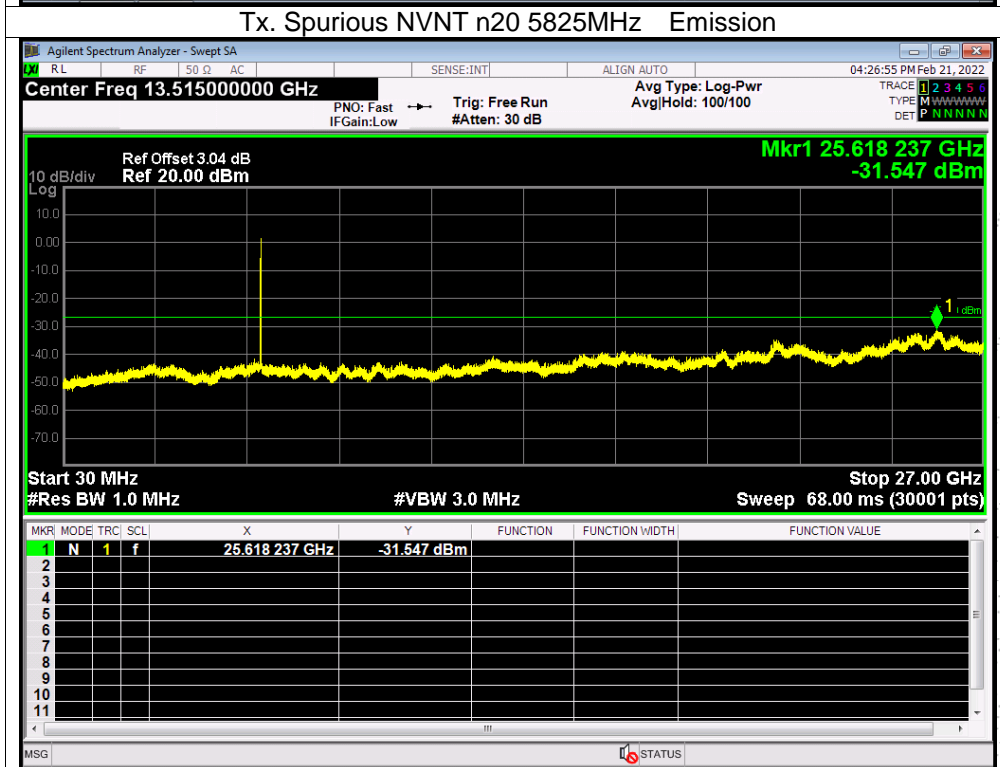
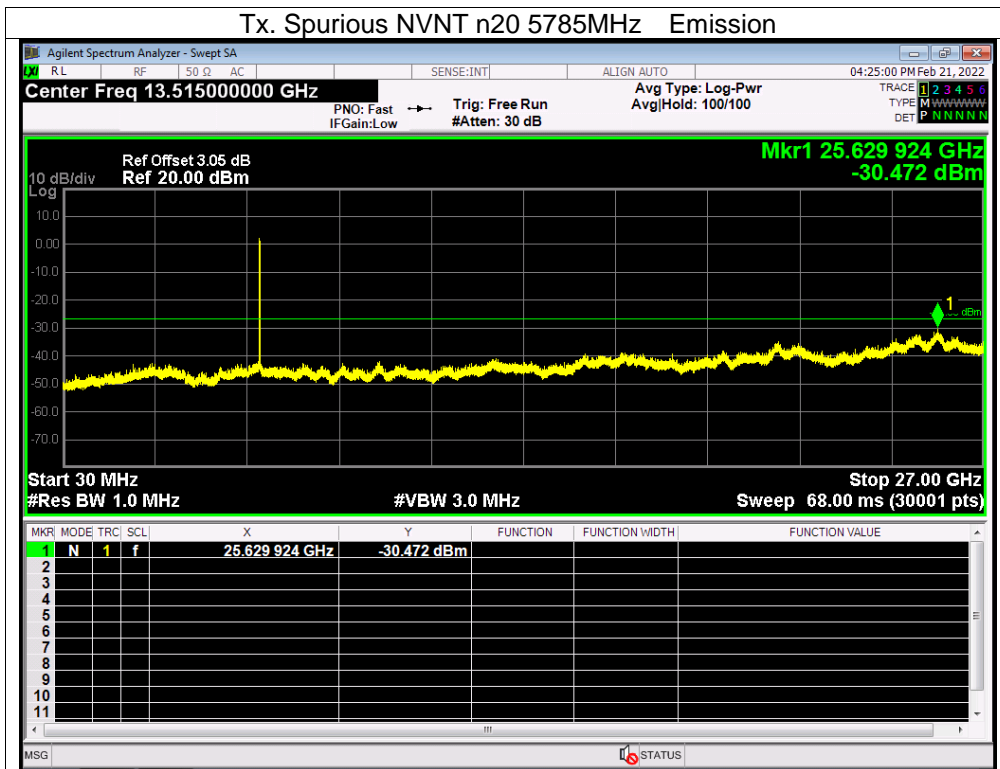


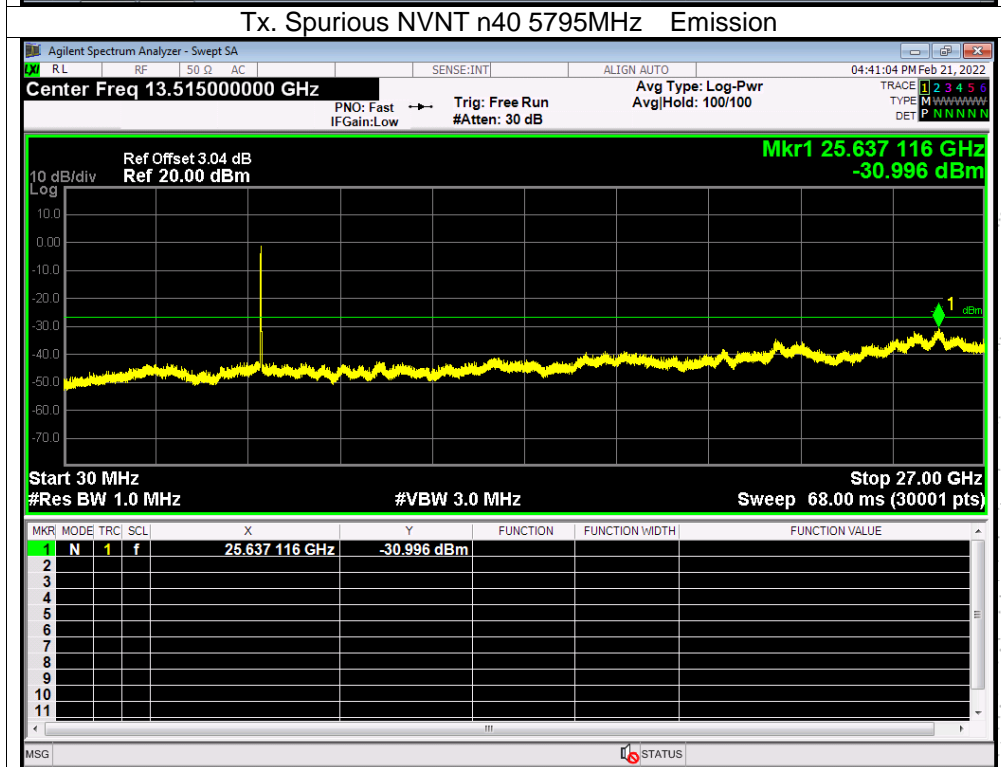
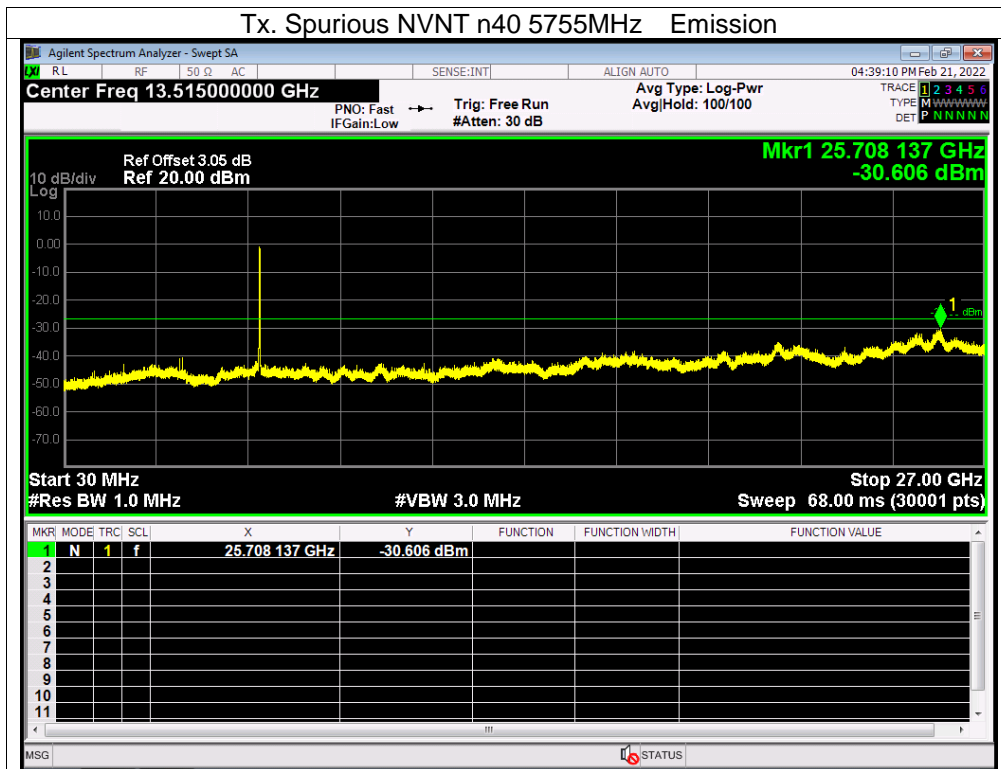


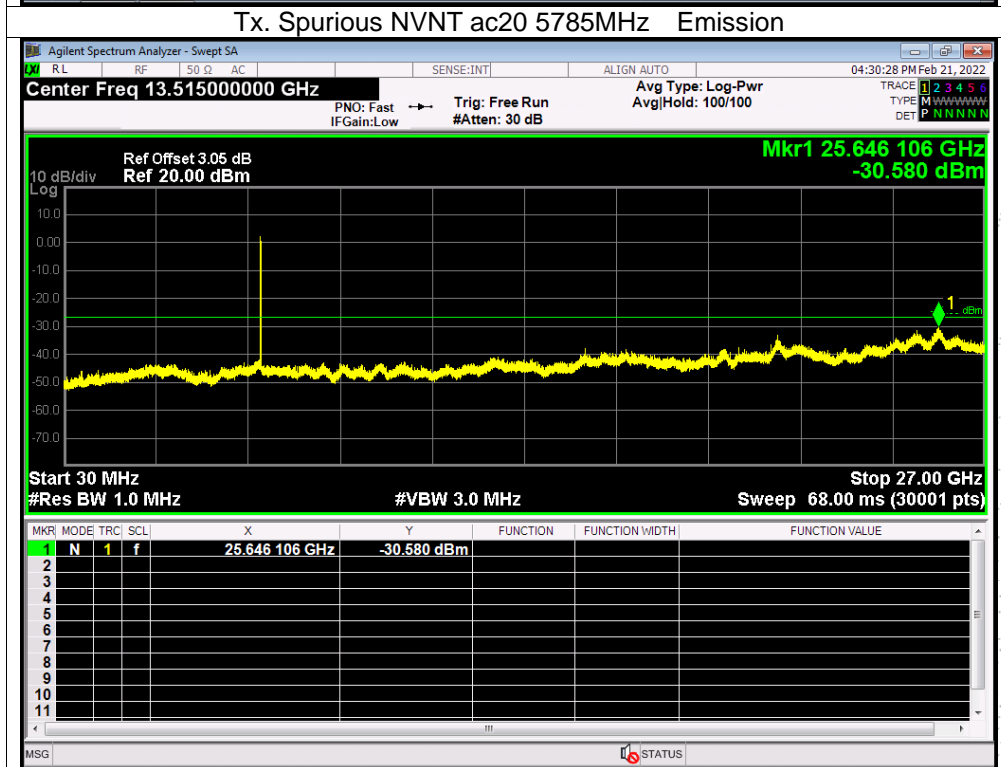
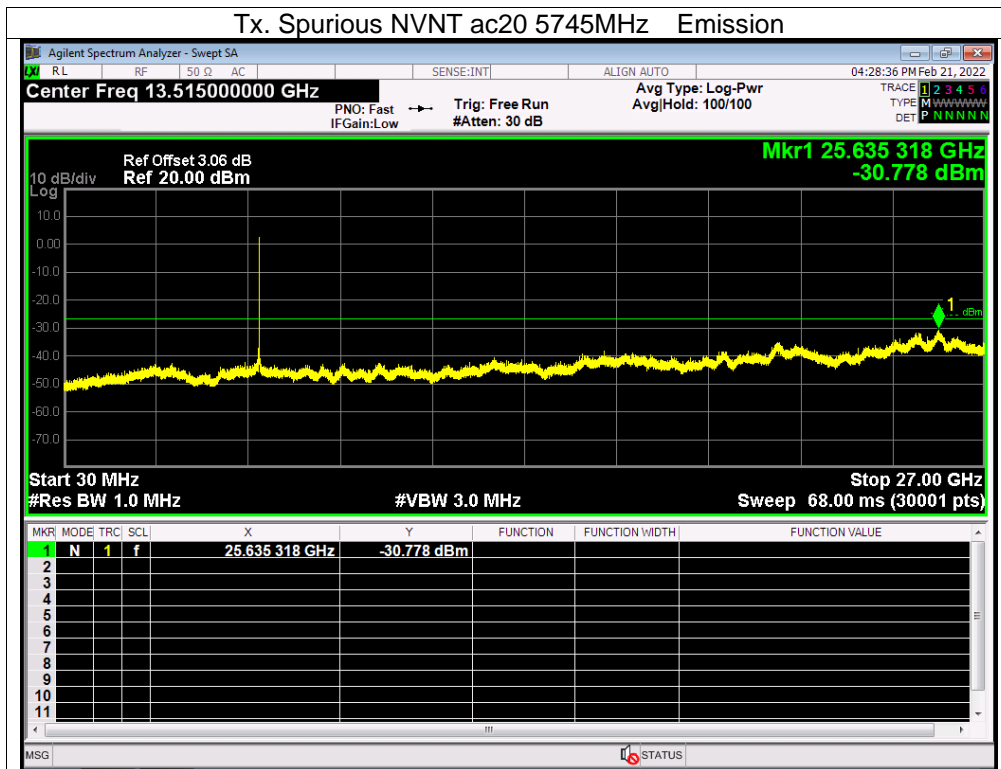


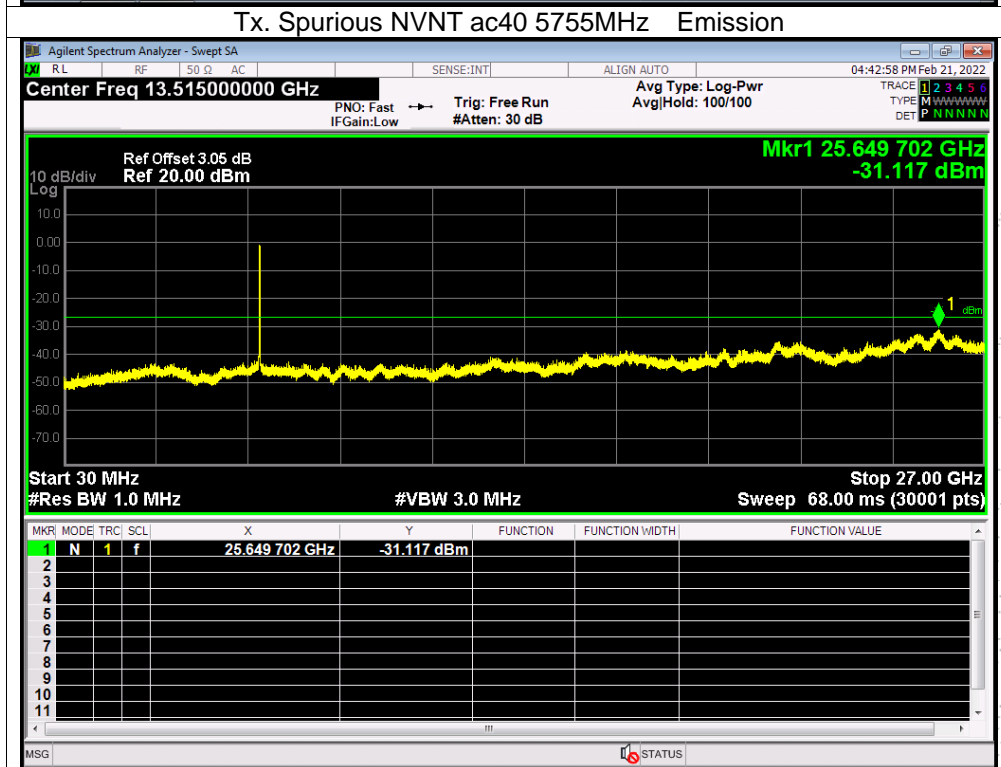
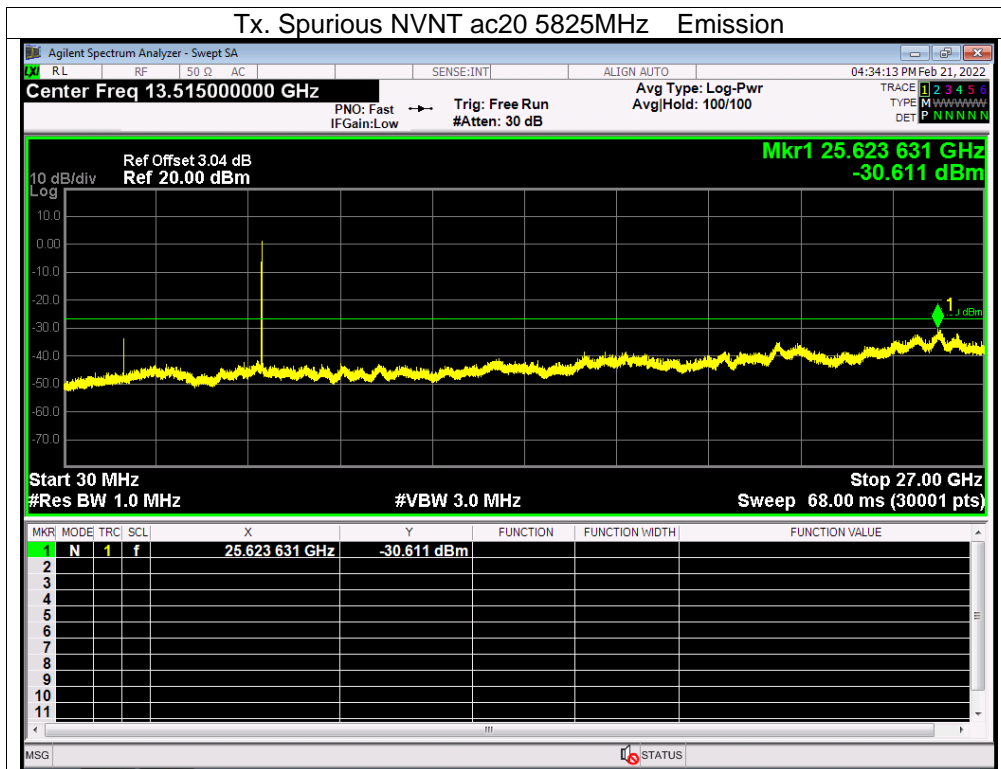


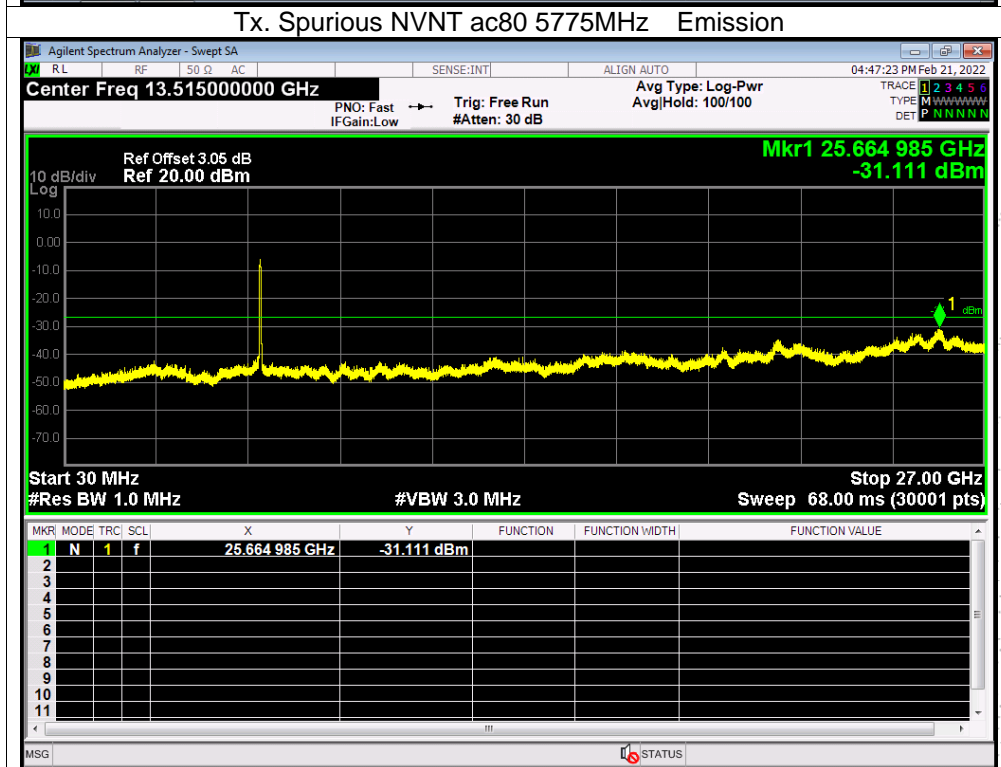
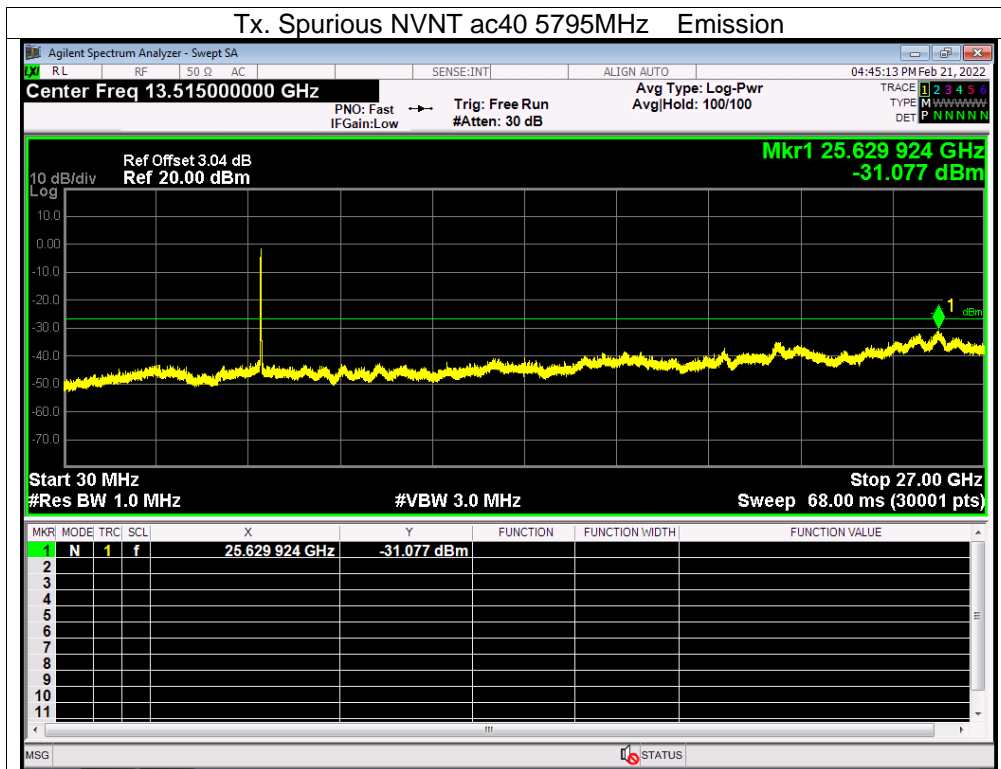






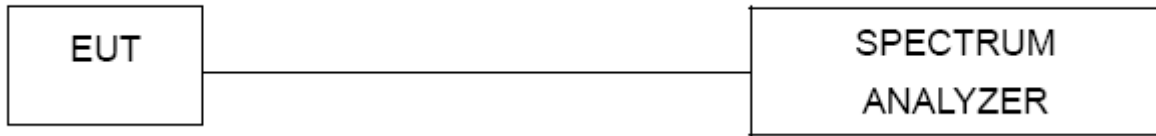






13. Frequency Stability Measurement

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 12V
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)	120.00	5180.0169	5180	0.0169	3.2708
		V max (V)	138.00	5180.0148	5180	0.0148	2.8556
		V min (V)	102.00	5180.0117	5180	0.0117	2.2497
Limits				5150-5250 MHz			
Result				Complies			

Temperature vs. Frequency Stability

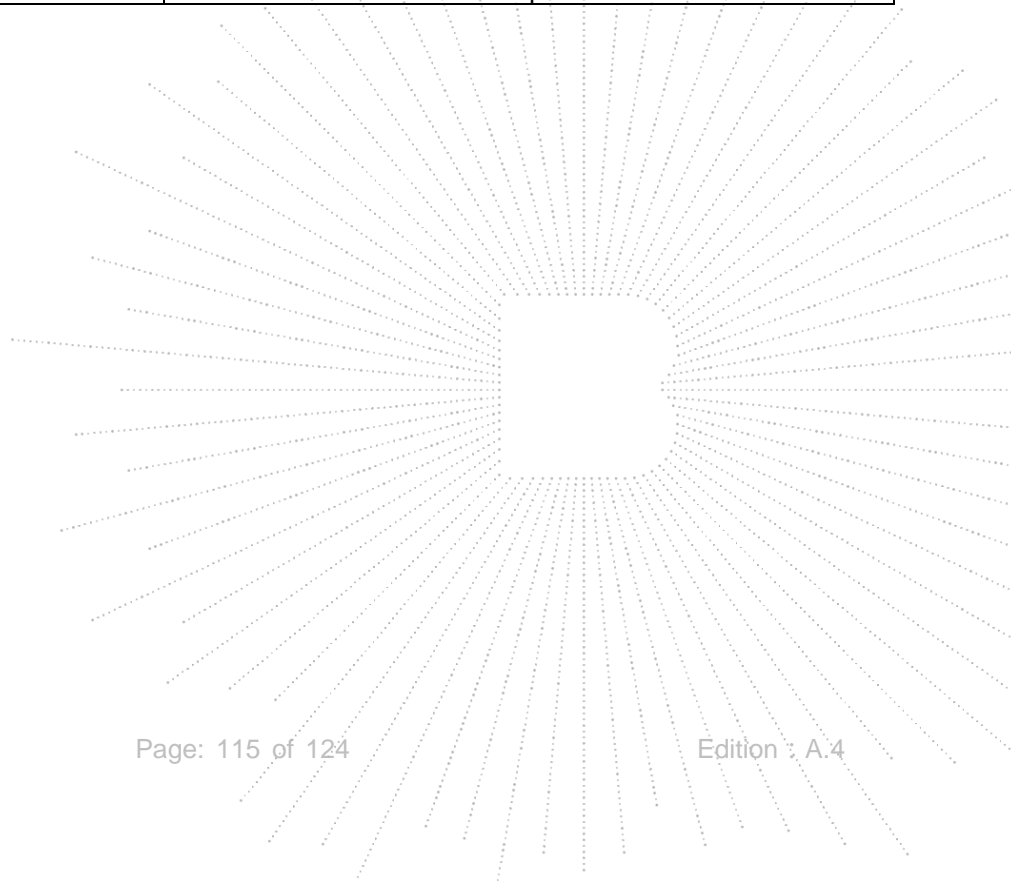
TEST CONDITIONS				Reference Frequency : 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	-20	5180.0062	5180	0.0062	1.1925
		T (°C)	-10	5180.0012	5180	0.0012	0.2313
		T (°C)	0	5180.0063	5180	0.0063	1.2125
		T (°C)	10	5180.0112	5180	0.0112	2.1682
		T (°C)	20	5180.0062	5180	0.0062	1.1912
		T (°C)	30	5180.0015	5180	0.0015	0.2878
		T (°C)	40	5180.0096	5180	0.0096	1.8602
		T (°C)	50	5180.0103	5180	0.0103	1.9962
		T (°C)	60	5180.0034	5180	0.0034	0.6613
		T (°C)	70	5180.0037	5180	0.0037	0.7198
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)	120.00	5200.0068	5200	0.0068	1.3158
		V max (V)	138.00	5200.0102	5200	0.0102	1.9587
		V min (V)	102.00	5200.0081	5200	0.0081	1.5608
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)	120	T (°C)	-20	5200.00665	5200	0.00665	1.2796
		T (°C)	-10	5200.01258	5200	0.01258	2.4198
		T (°C)	0	5200.00483	5200	0.00483	0.9281
		T (°C)	10	5200.00183	5200	0.00183	0.3529
		T (°C)	20	5200.01019	5200	0.01019	1.9601
		T (°C)	30	5200.00275	5200	0.00275	0.5287
		T (°C)	40	5200.01243	5200	0.01243	2.3913
		T (°C)	50	5200.00639	5200	0.00639	1.2280
		T (°C)	60	5200.00305	5200	0.00305	0.5865
		T (°C)	70	5200.01060	5200	0.01060	2.0380
Limits				5150-5250 MHz			
Result				Complies			

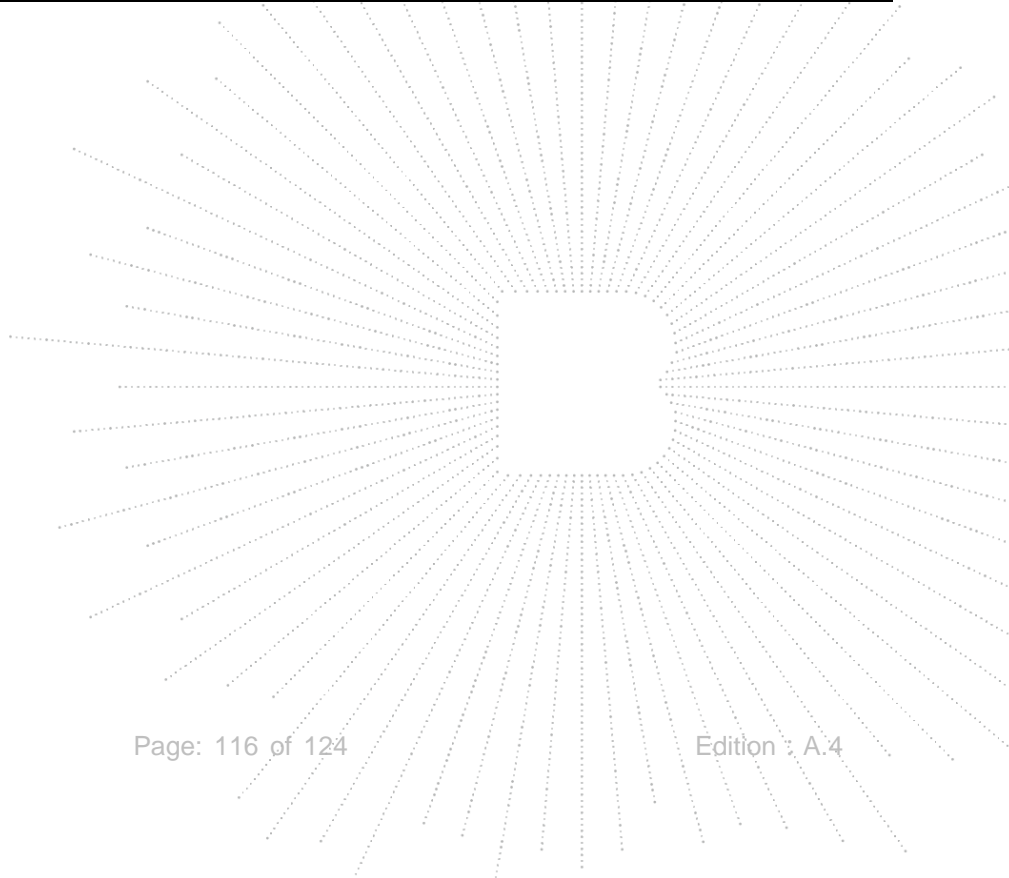


Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	120.00	5240.0034	5240	0.0034	0.6421
		V max (V)	138.00	5240.0057	5240	0.0057	1.0800
		V min (V)	102.00	5240.0083	5240	0.0083	1.5877
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)	120	T (°C)	-20	5240.0005	5240	0.0005	0.0883
		T (°C)	-10	5240.0039	5240	0.0039	0.7478
		T (°C)	0	5240.0052	5240	0.0052	0.9847
		T (°C)	10	5240.0023	5240	0.0023	0.4452
		T (°C)	20	5240.0117	5240	0.0117	2.2339
		T (°C)	30	5240.0038	5240	0.0038	0.7202
		T (°C)	40	5240.0090	5240	0.0090	1.7107
		T (°C)	50	5240.0091	5240	0.0091	1.7310
		T (°C)	60	5240.0063	5240	0.0063	1.2106
		T (°C)	70	5240.0018	5240	0.0018	0.3519
Limits				5150-5250 MHz			
Result				Complies			



Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	DC 12V
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)	120.00	5745.00394	5745	0.00394	0.6864
		V max (V)	138.00	5745.00822	5745	0.00822	1.4301
		V min (V)	102.00	5745.00488	5745	0.00488	0.8487
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)	120	T (°C)	-20	5745.00709	5745	0.00709	1.2347
		T (°C)	-10	5745.00355	5745	0.00355	0.6182
		T (°C)	0	5745.01298	5745	0.01298	2.2597
		T (°C)	10	5745.00321	5745	0.00321	0.5595
		T (°C)	20	5745.00014	5745	0.00014	0.0240
		T (°C)	30	5745.00014	5745	0.00014	0.0241
		T (°C)	40	5745.00390	5745	0.00390	0.6792
		T (°C)	50	5745.00020	5745	0.00020	0.0343
		T (°C)	60	5745.01149	5745	0.01149	1.9999
		T (°C)	70	5745.00639	5745	0.00639	1.1126
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)	120.00	5785.00295	5785	0.00295	0.5094
		V max (V)	138.00	5785.00770	5785	0.00770	1.3317
		V min (V)	102.00	5785.00958	5785	0.00958	1.6554
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

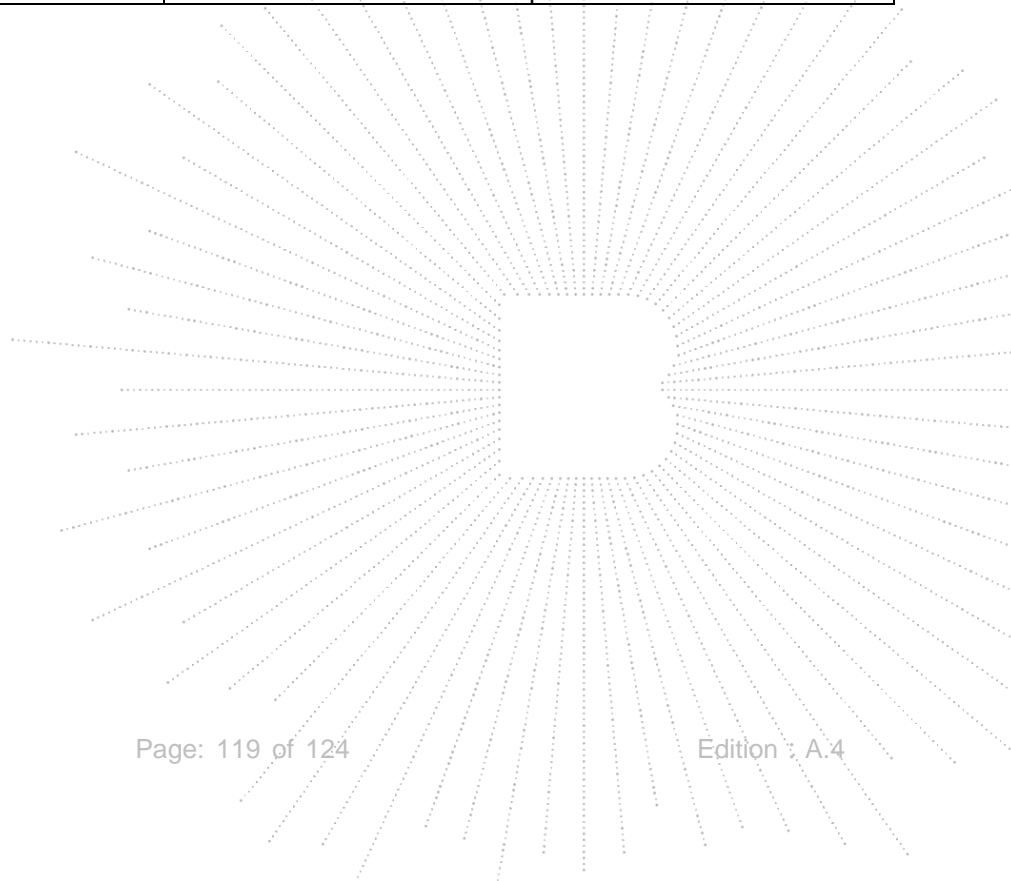
TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	-20	5785.00712	5785	0.00712	1.2307
		T (°C)	-10	5785.01217	5785	0.01217	2.1040
		T (°C)	0	5785.00234	5785	0.00234	0.4037
		T (°C)	10	5785.01286	5785	0.01286	2.2229
		T (°C)	20	5785.00949	5785	0.00949	1.6398
		T (°C)	30	5785.01056	5785	0.01056	1.8247
		T (°C)	40	5785.00501	5785	0.00501	0.8654
		T (°C)	50	5785.00350	5785	0.00350	0.6054
		T (°C)	60	5785.00269	5785	0.00269	0.4651
		T (°C)	70	5785.00654	5785	0.00654	1.1309
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)	120.00	5825.00617	5825	0.00617	1.0592
		V max (V)	138.00	5825.01219	5825	0.01219	2.0934
		V min (V)	102.00	5825.00541	5825	0.00541	0.9292
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)	120	T (°C)	-20	5825.00727	5825	0.00727	1.2473
		T (°C)	-10	5825.00775	5825	0.00775	1.3301
		T (°C)	0	5825.00463	5825	0.00463	0.7948
		T (°C)	10	5825.01211	5825	0.01211	2.0790
		T (°C)	20	5825.00562	5825	0.00562	0.9651
		T (°C)	30	5825.00313	5825	0.00313	0.5375
		T (°C)	40	5825.00099	5825	0.00099	0.1699
		T (°C)	50	5825.01102	5825	0.01102	1.8913
		T (°C)	60	5825.01281	5825	0.01281	2.1991
		T (°C)	70	5825.00666	5825	0.00666	1.1430
Limits				5725-5850 MHz			
Result				Complies			



14. Antenna Requirement

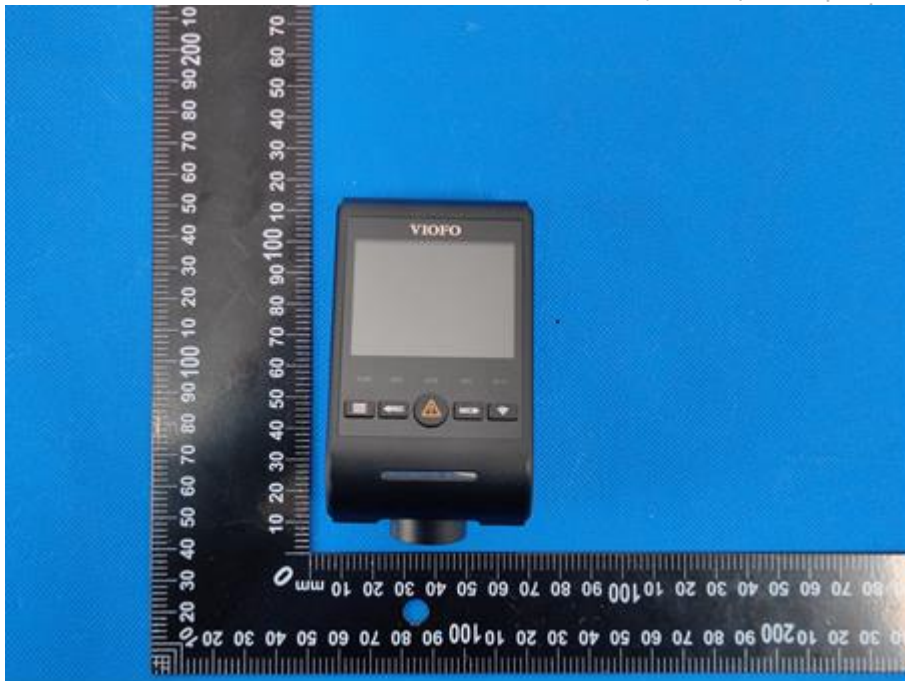
14.1 Limit

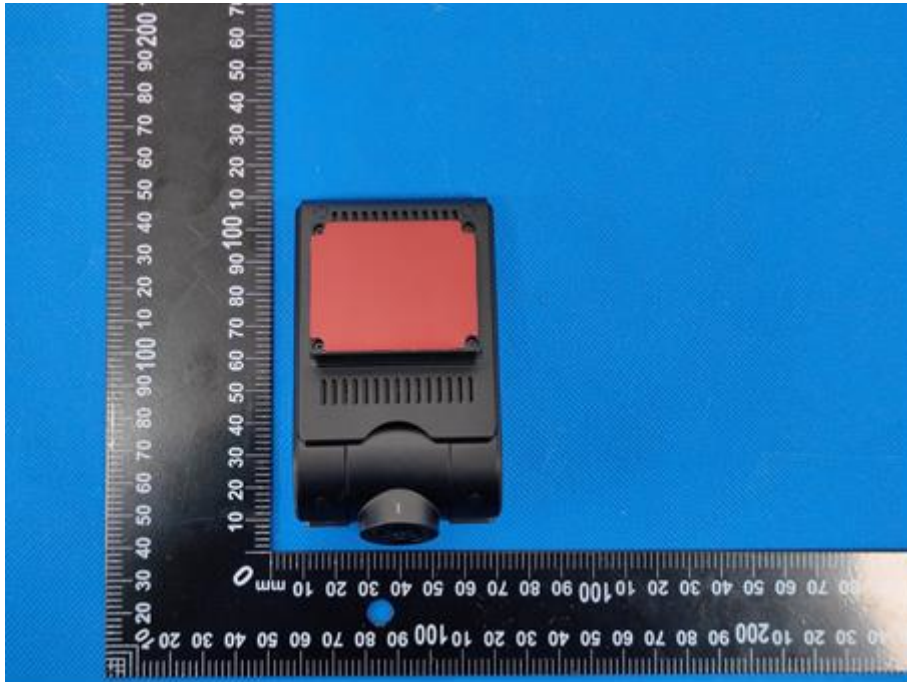
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

14.2 Test Antenna

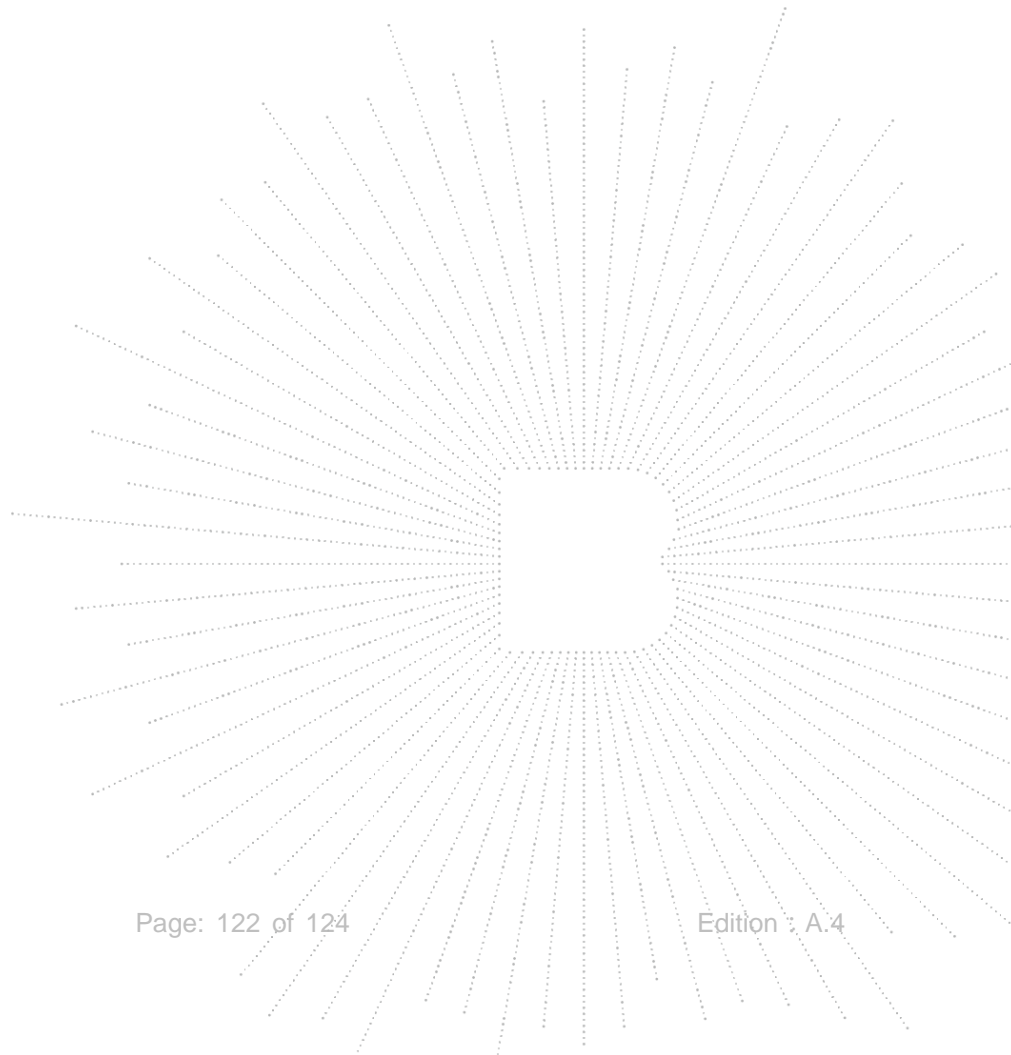
The EUT antenna is FPC antenna (antenna gain:1dBi). It comply with the standard requirement.

15. EUT Photographs



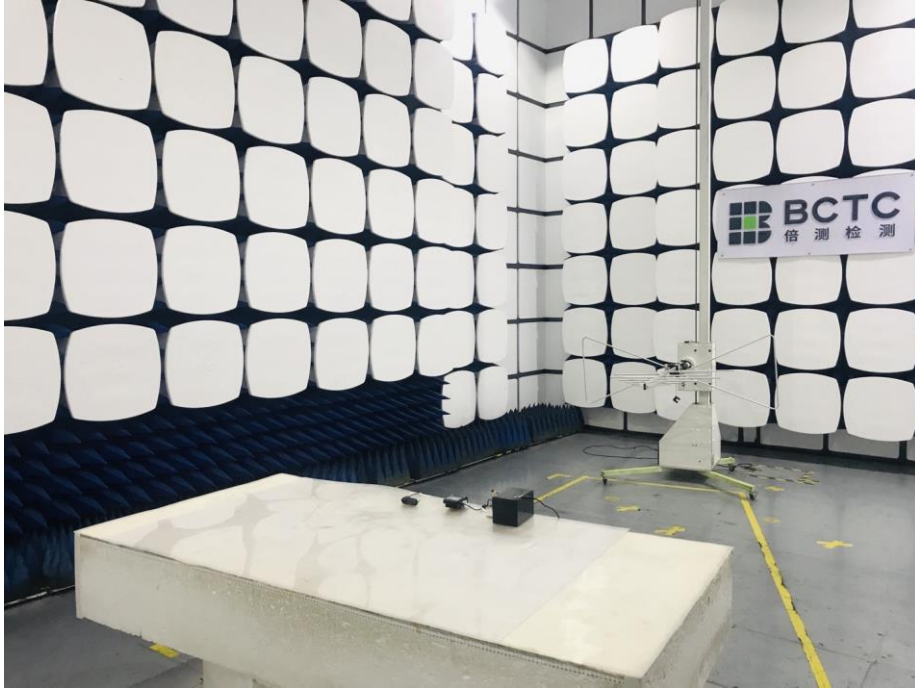


Appendix-Photographs Of EUT Constructional Details



16. EUT Test Setup Photographs

Radiated Measurement Photos



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 stamp of laboratory.
- 4.The test report is invalid without signature of person(s) testing and authorizing.
- 5.The test process and test result is only related to the Unit Under Test.
- 6.The quality system of our laboratory is in accordance with ISO/IEC17025.
- 7.If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:

1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL : 400-788-9558

P.C.: 518103

FAX : 0755-33229357

Website : <http://www.chnbctc.com>

E-Mail : bctc@bctc-lab.com.cn

***** END *****