

## 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.<sup>1</sup> 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  $\pm 2$  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  $\geq 3$  MHz.

(iv) Number of points in sweep  $\geq 2$  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.

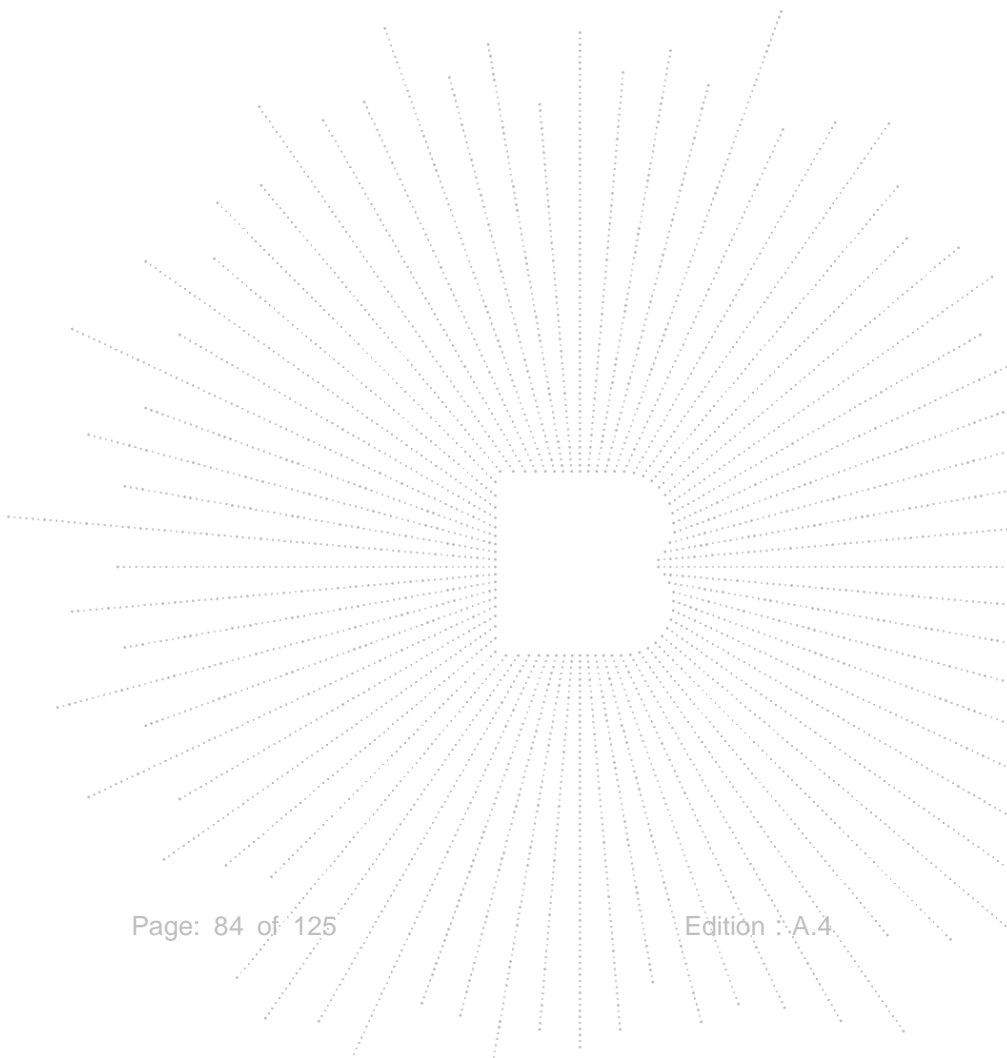
(vii) If transmit duty cycle  $< 98$  percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle  $\geq 98$  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	10.93	24	Pass
NVNT	a	5200	10.94	24	Pass
NVNT	a	5240	11.13	24	Pass
NVNT	n20	5180	8.83	24	Pass
NVNT	n20	5200	8.87	24	Pass
NVNT	n20	5240	9.16	24	Pass
NVNT	n40	5190	7.42	24	Pass
NVNT	n40	5230	6.68	24	Pass
NVNT	ac20	5180	9	24	Pass
NVNT	ac20	5200	9.12	24	Pass
NVNT	ac20	5240	9.04	24	Pass
NVNT	ac40	5190	7.52	24	Pass
NVNT	ac40	5230	6.57	24	Pass
NVNT	ac80	5210	6.54	24	Pass

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5745	9.57	30	Pass
NVNT	a	5785	9.69	30	Pass
NVNT	a	5825	9.58	30	Pass
NVNT	n20	5745	8.8	30	Pass
NVNT	n20	5785	7.32	30	Pass
NVNT	n20	5825	7.19	30	Pass
NVNT	n40	5755	7.69	30	Pass
NVNT	n40	5795	7.38	30	Pass
NVNT	ac20	5745	7.45	30	Pass
NVNT	ac20	5785	7.26	30	Pass
NVNT	ac20	5825	7.1	30	Pass
NVNT	ac40	5755	7.7	30	Pass
NVNT	ac40	5795	7.42	30	Pass
NVNT	ac80	5775	7.03	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

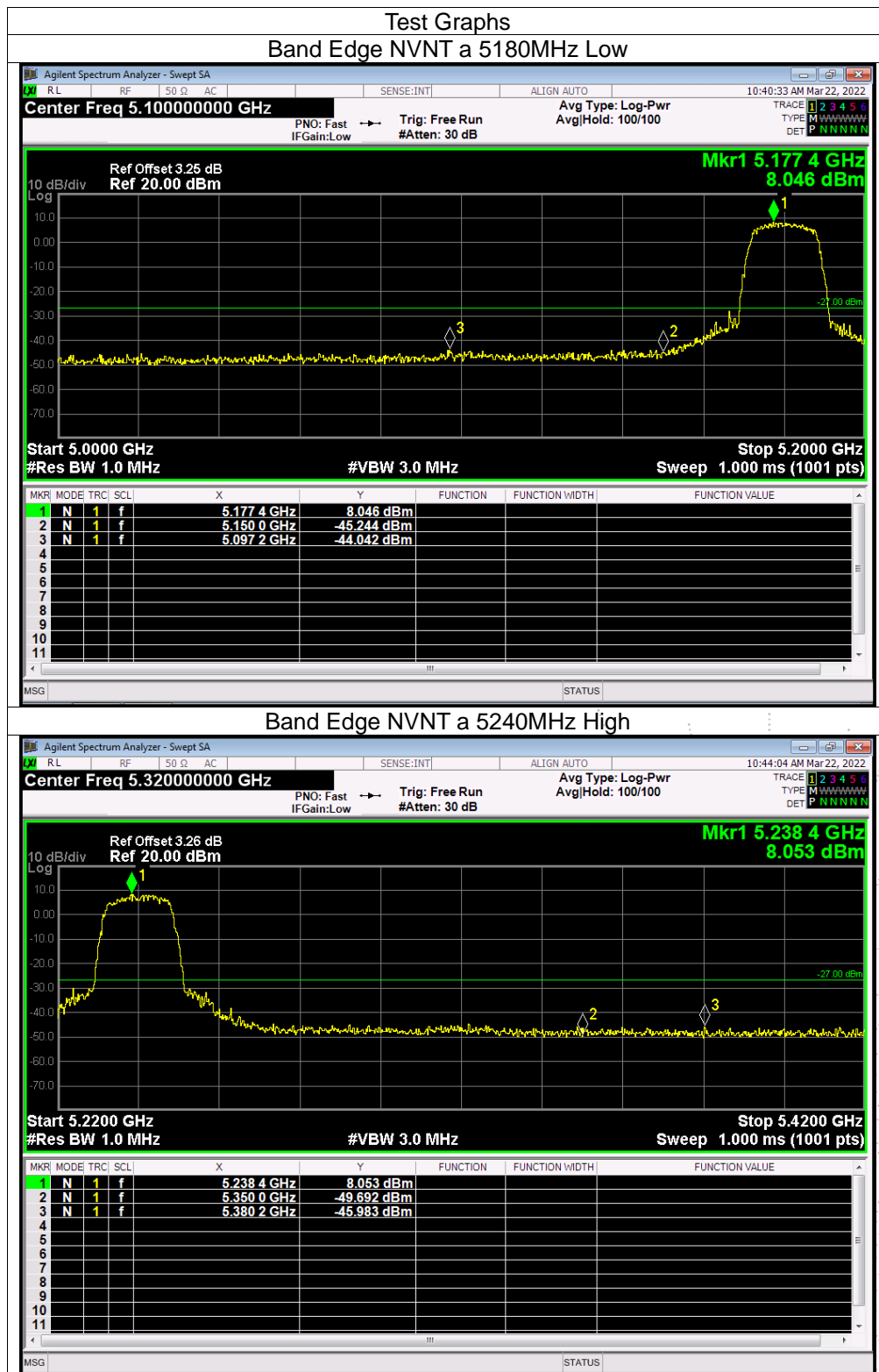
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

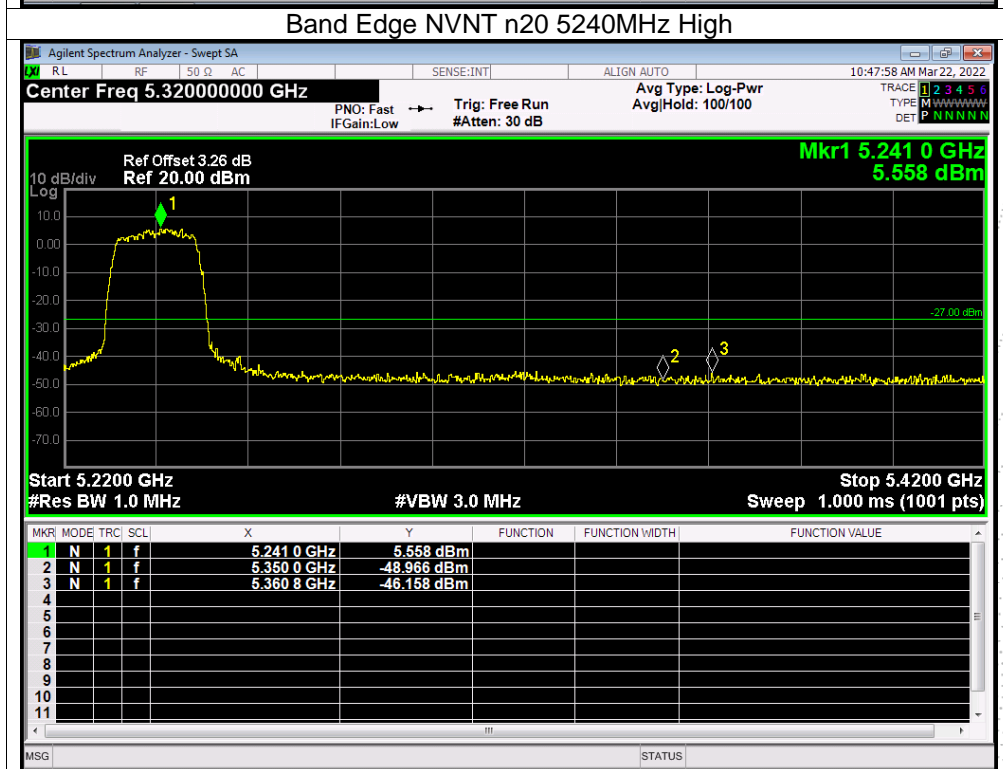
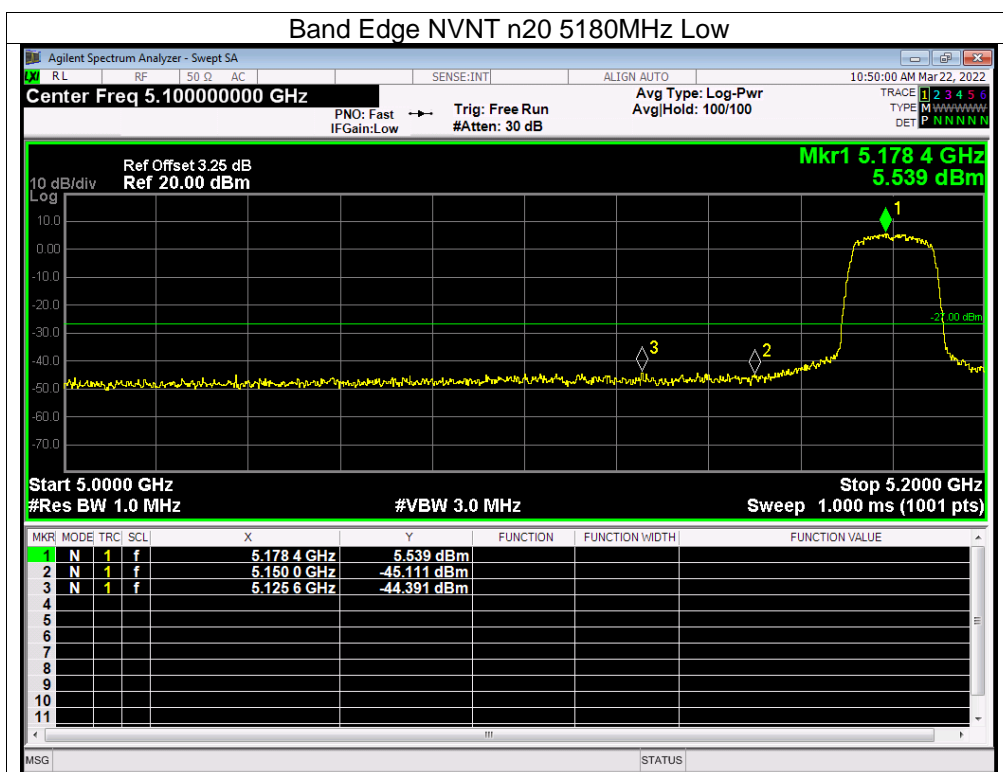
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data

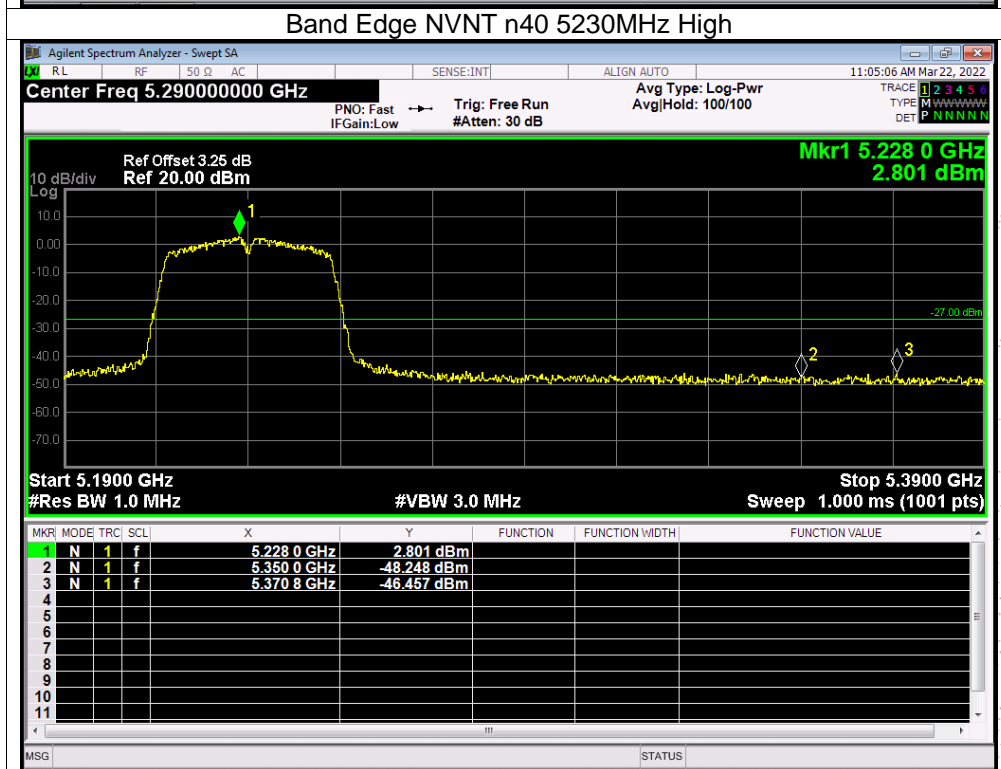
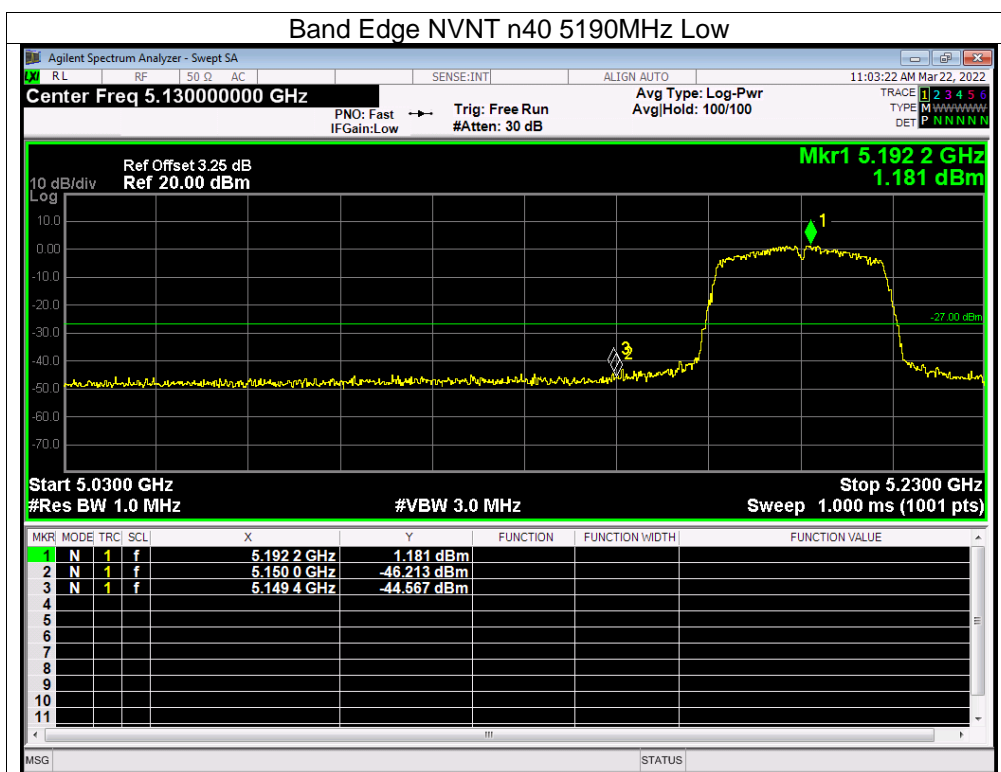


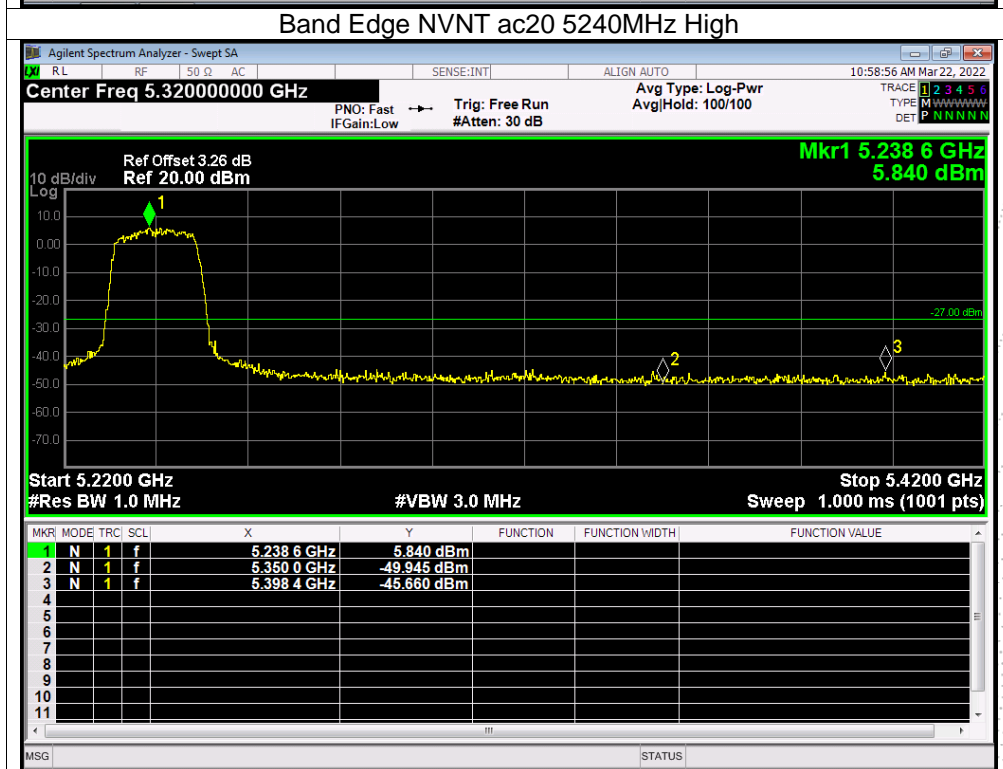
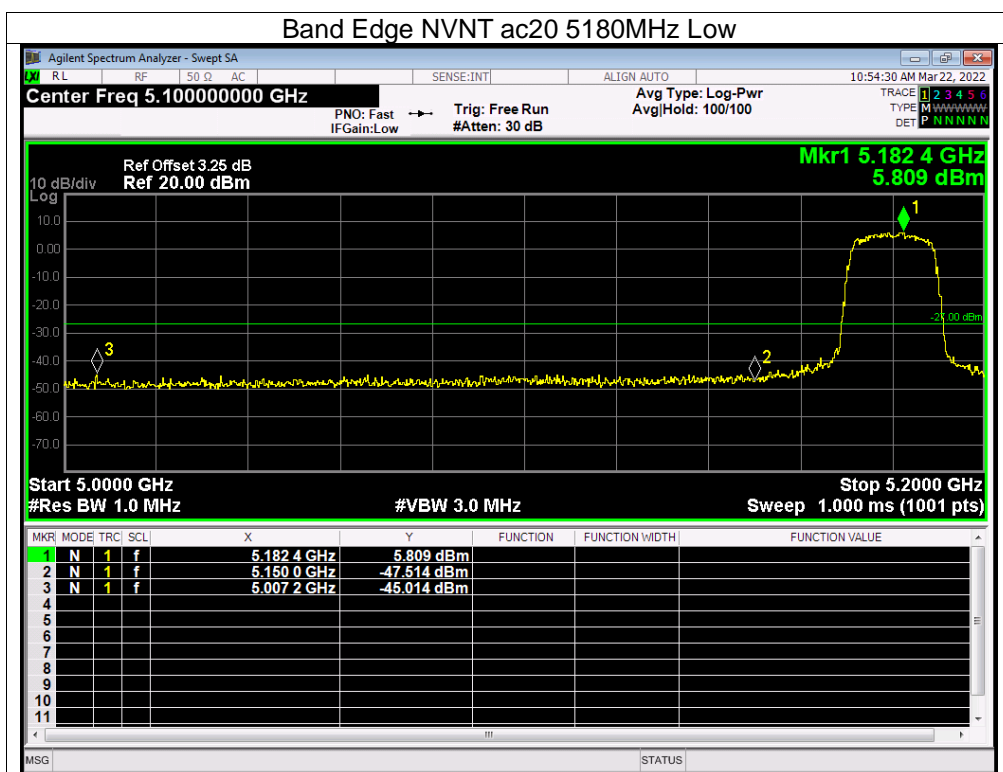
## 11.5 Test Result

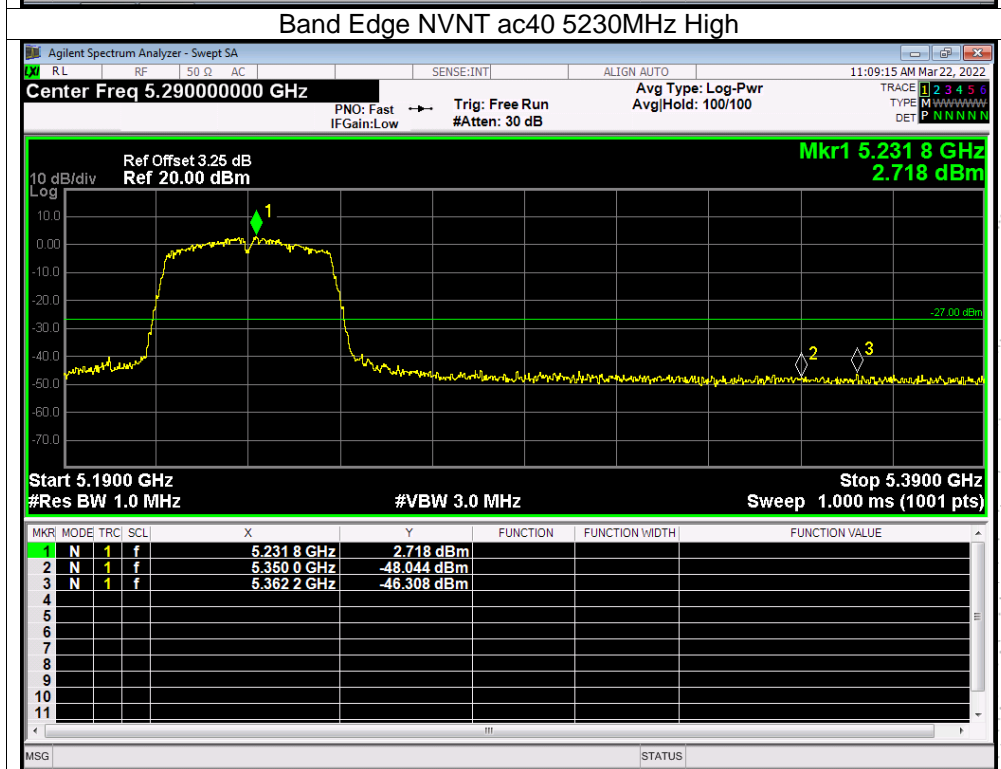
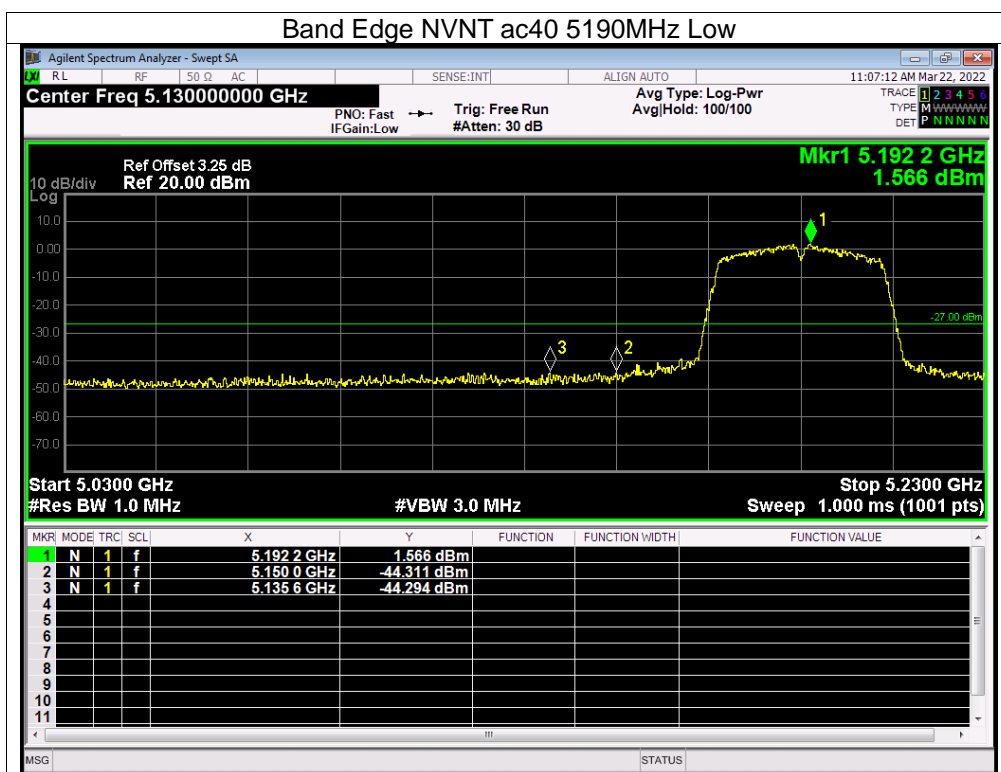


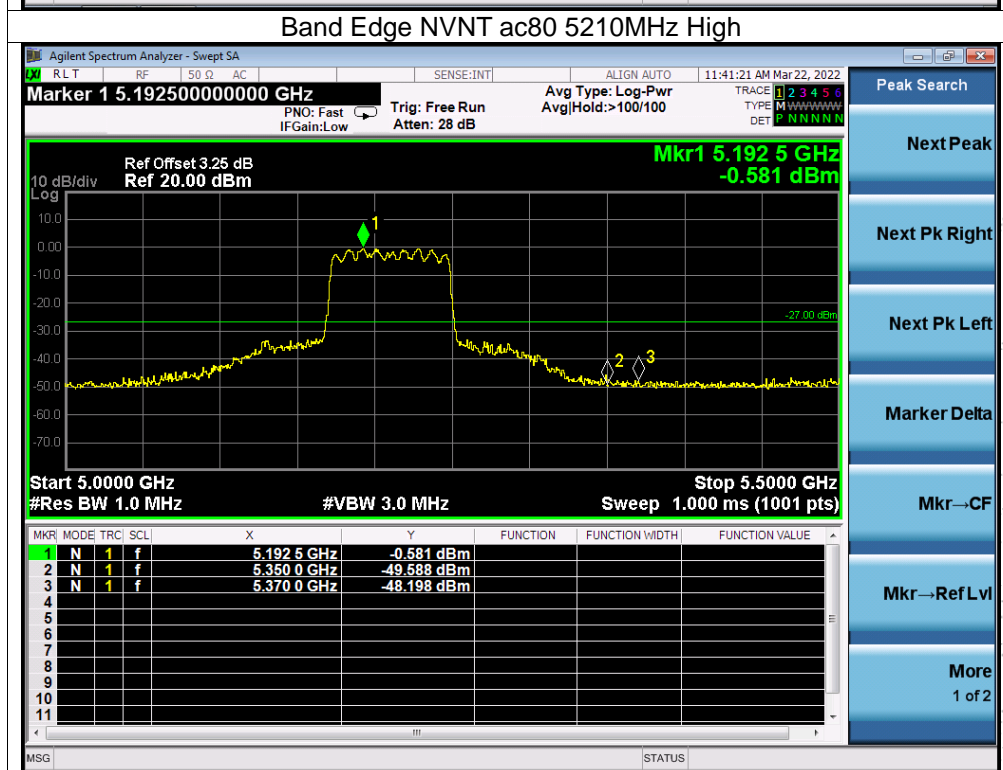
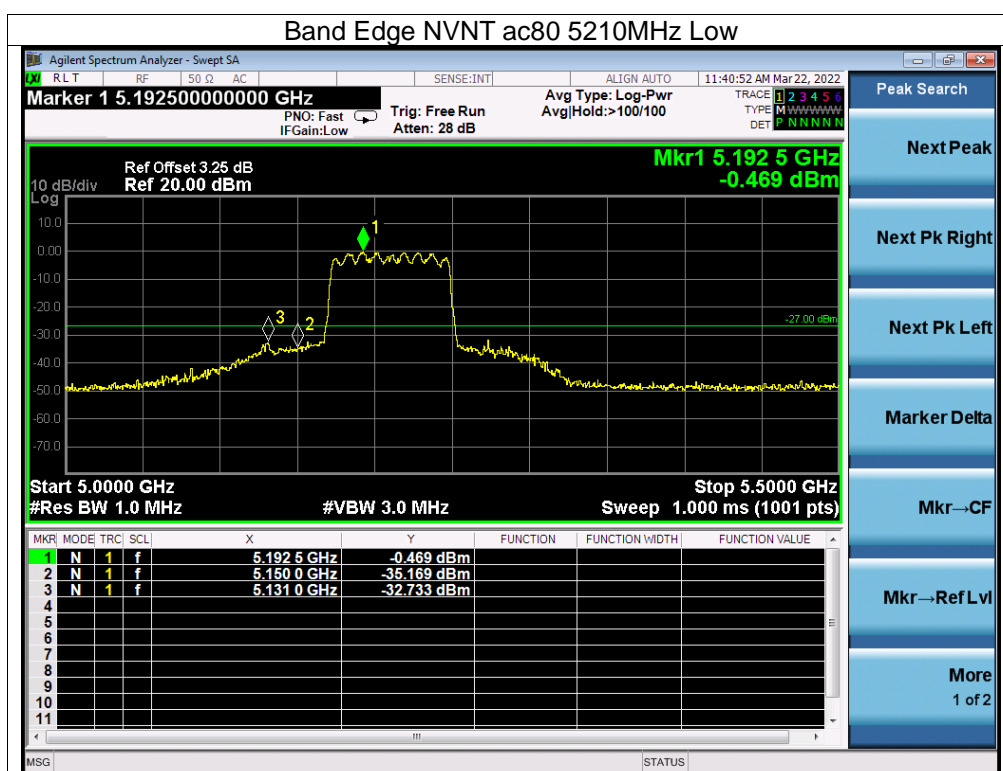


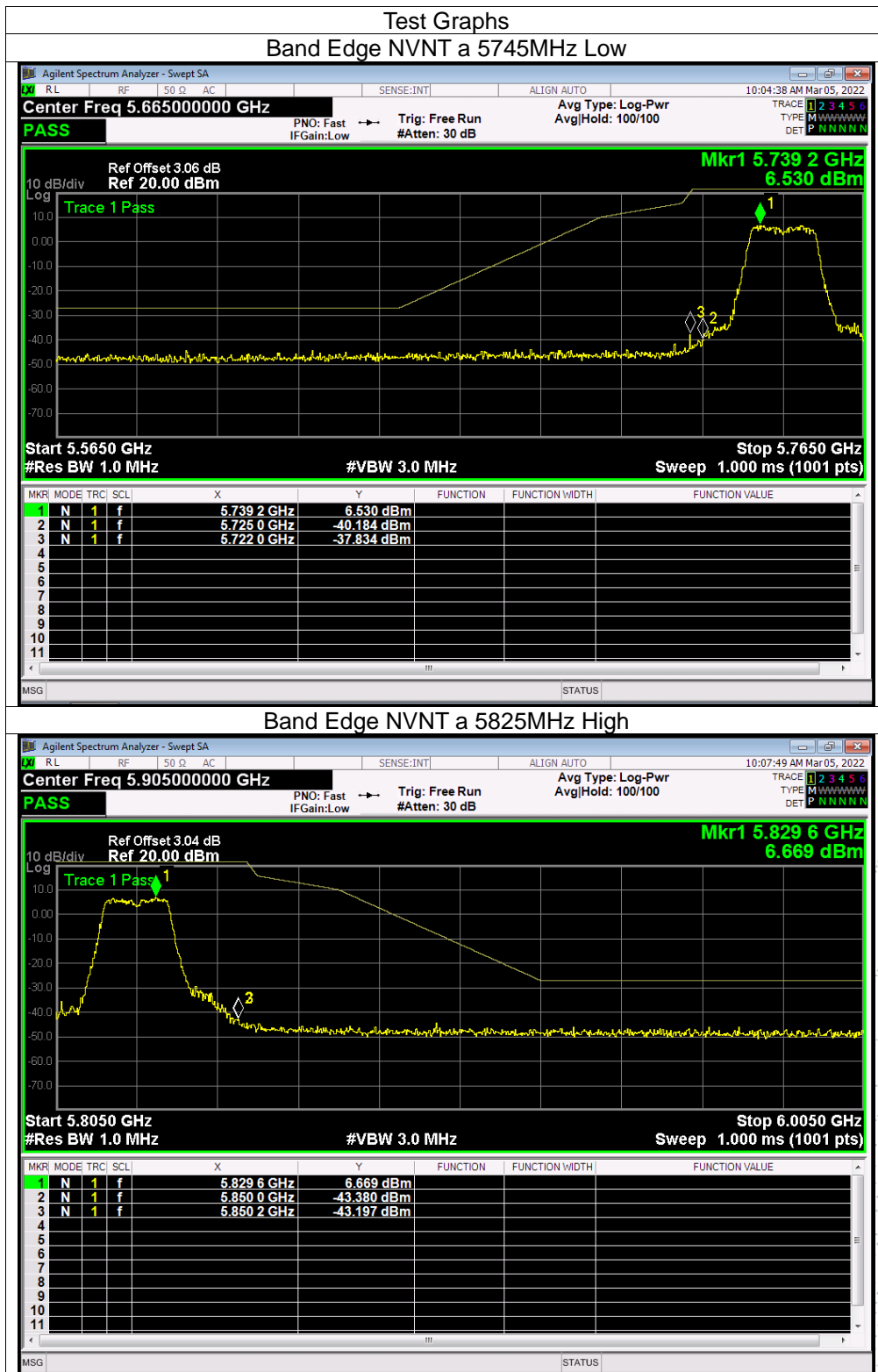


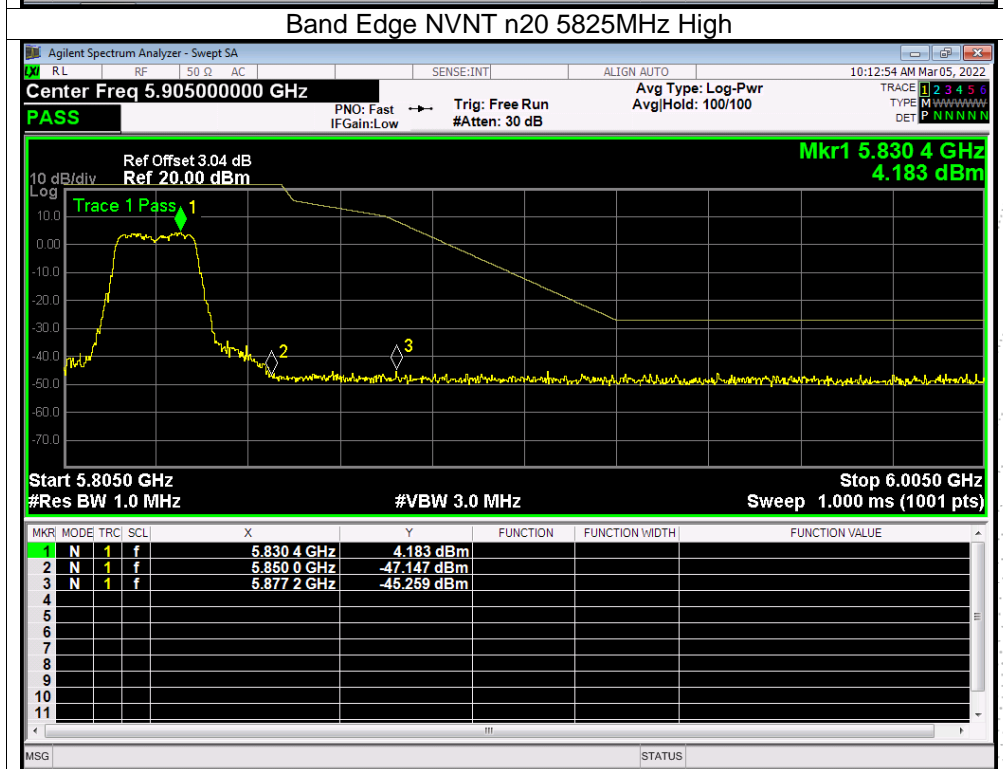
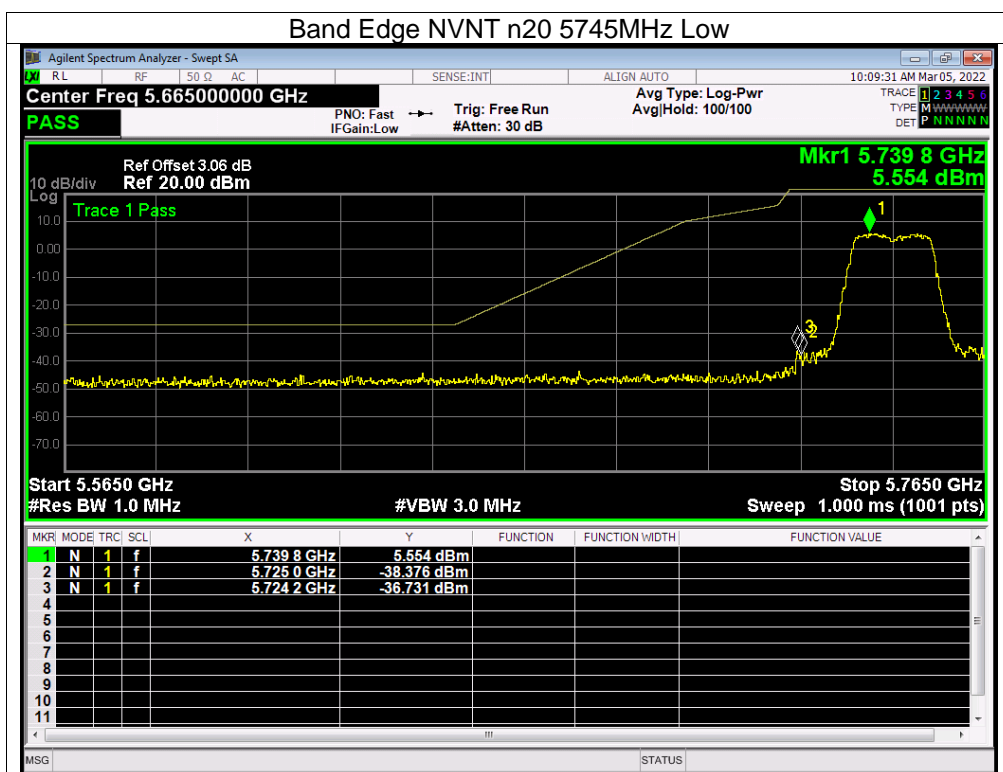


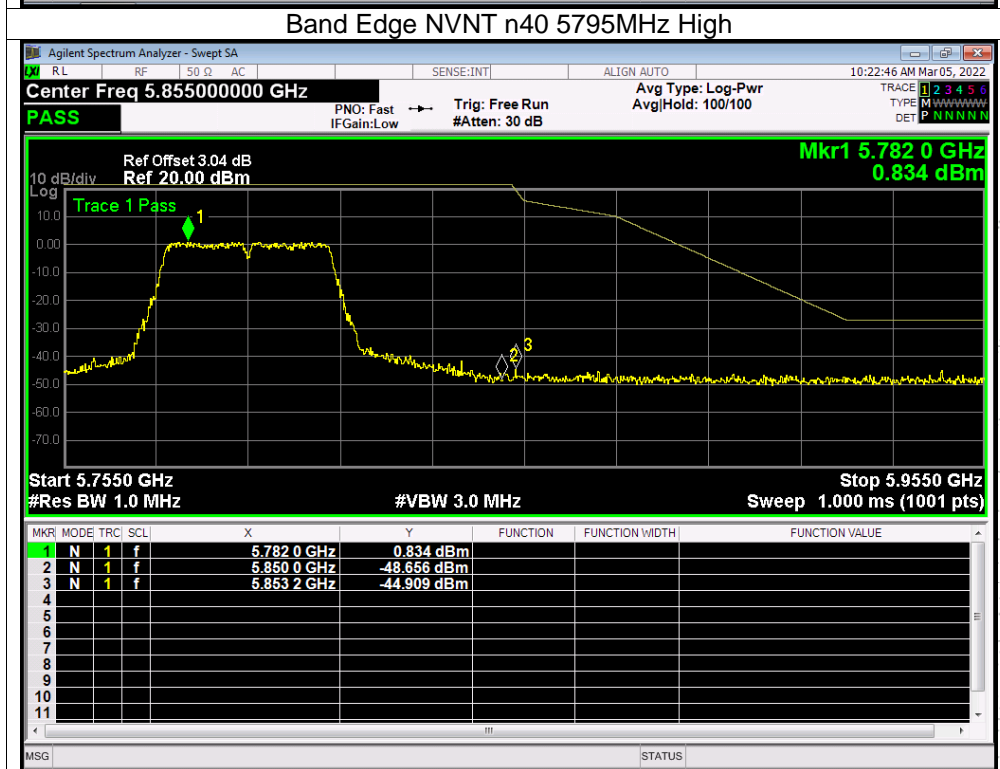
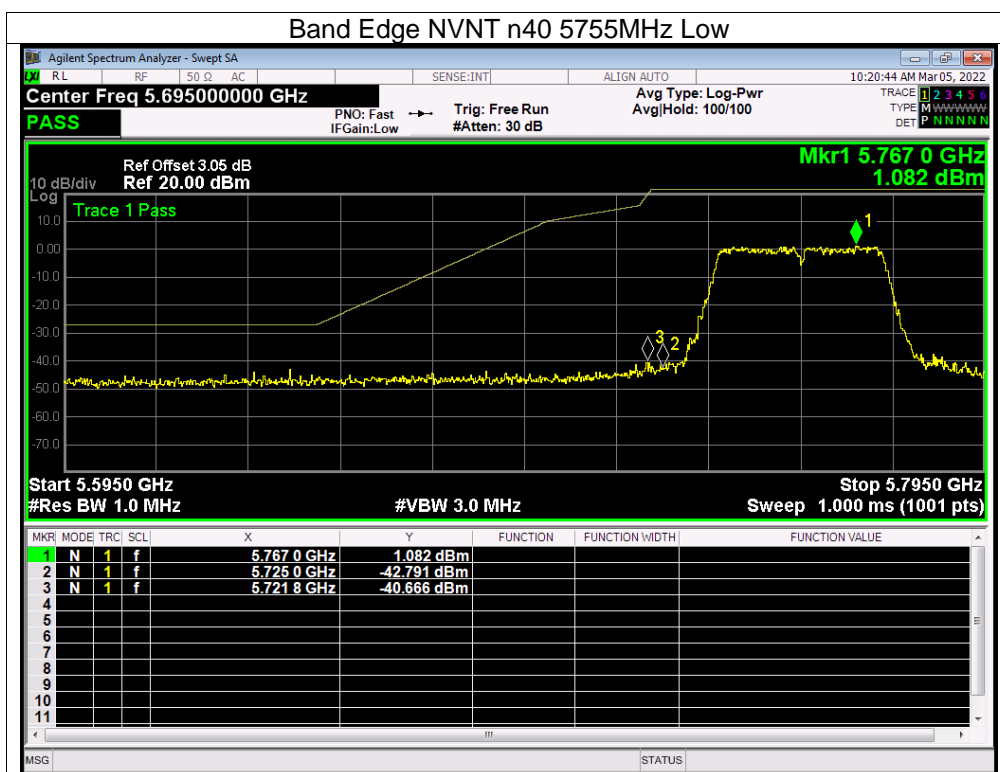




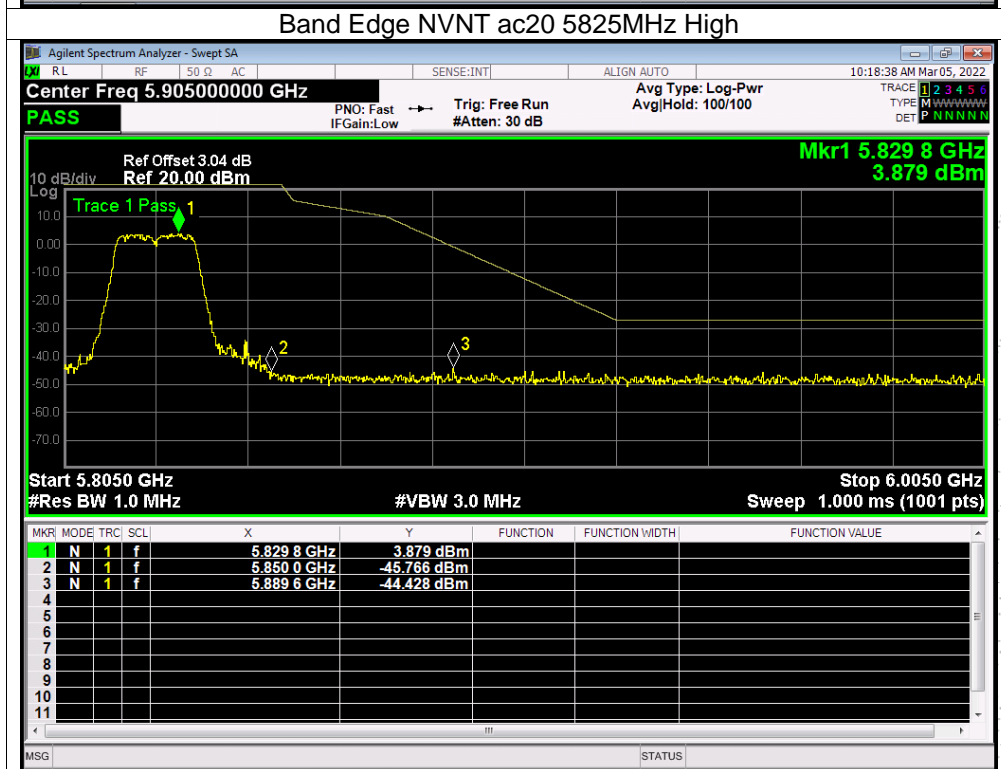
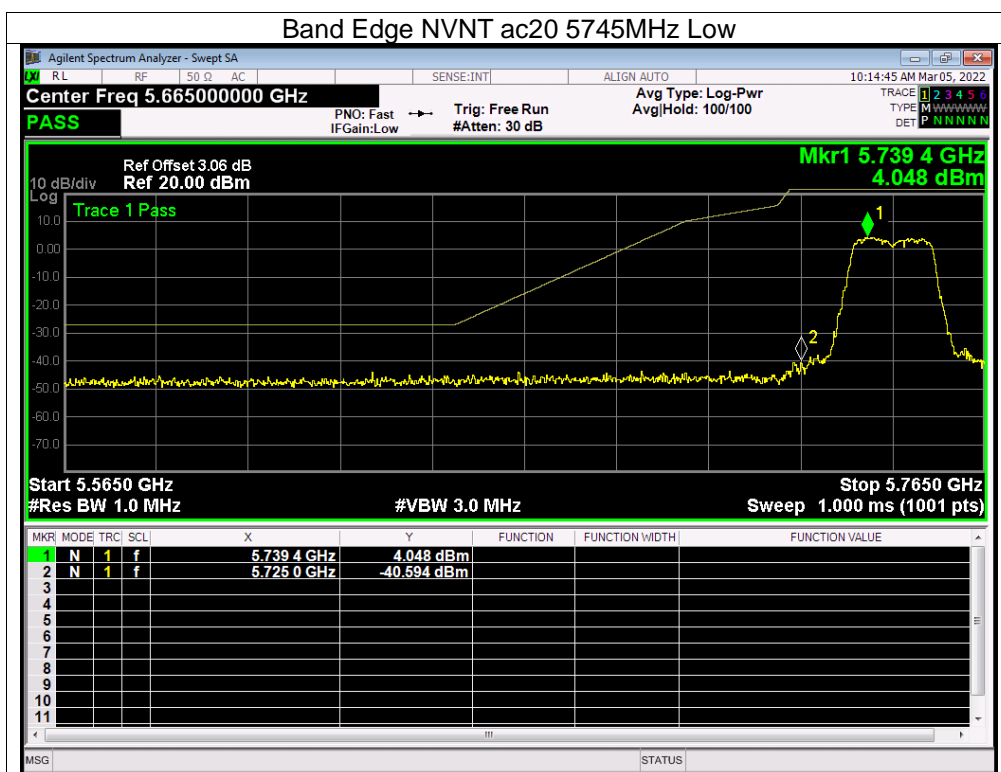


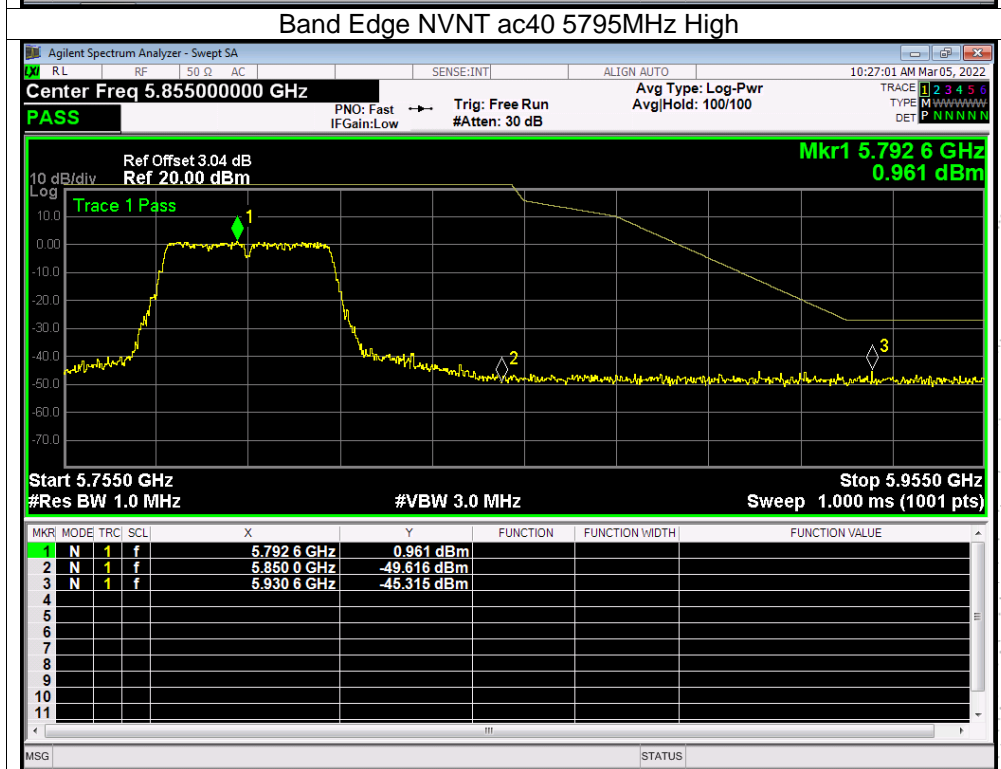
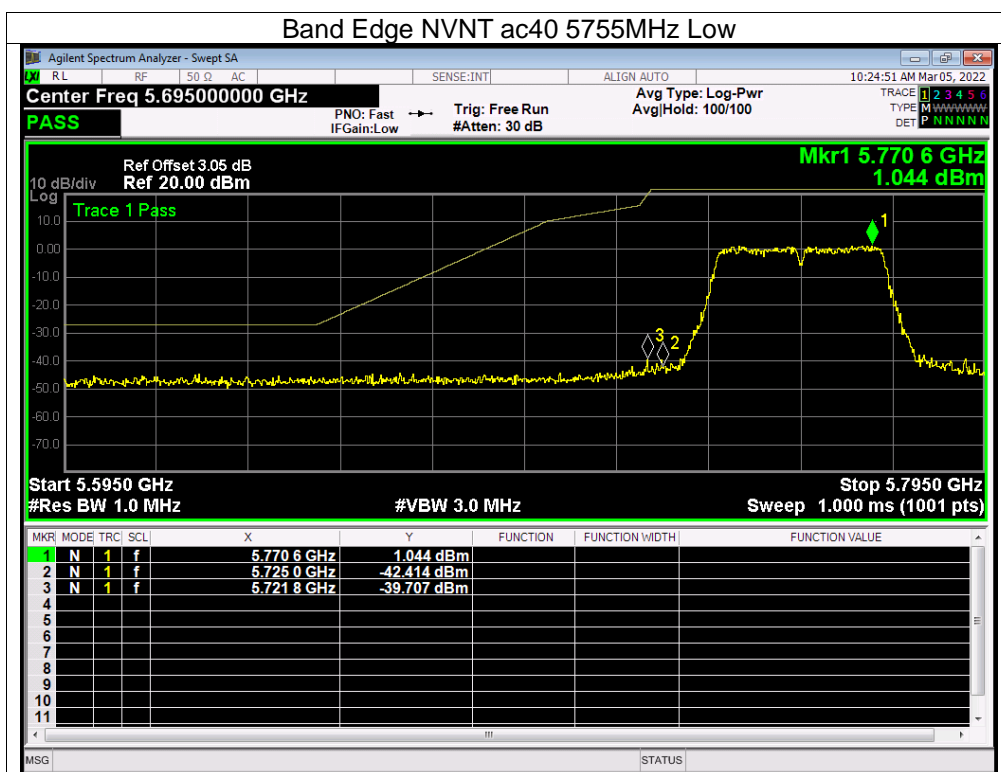


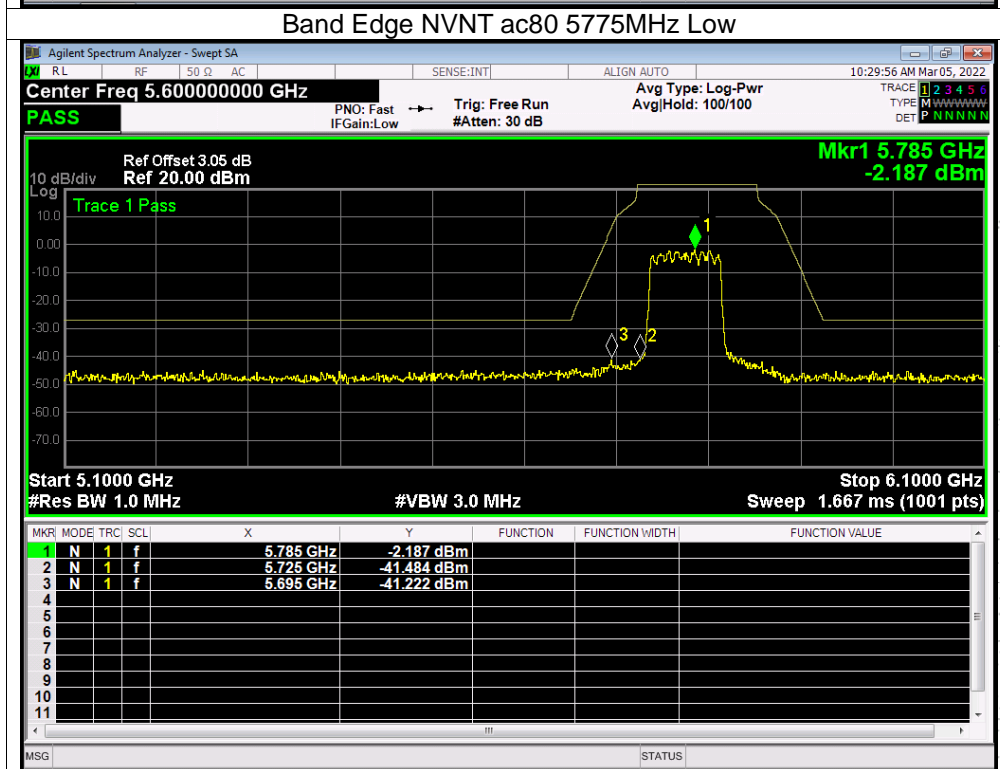
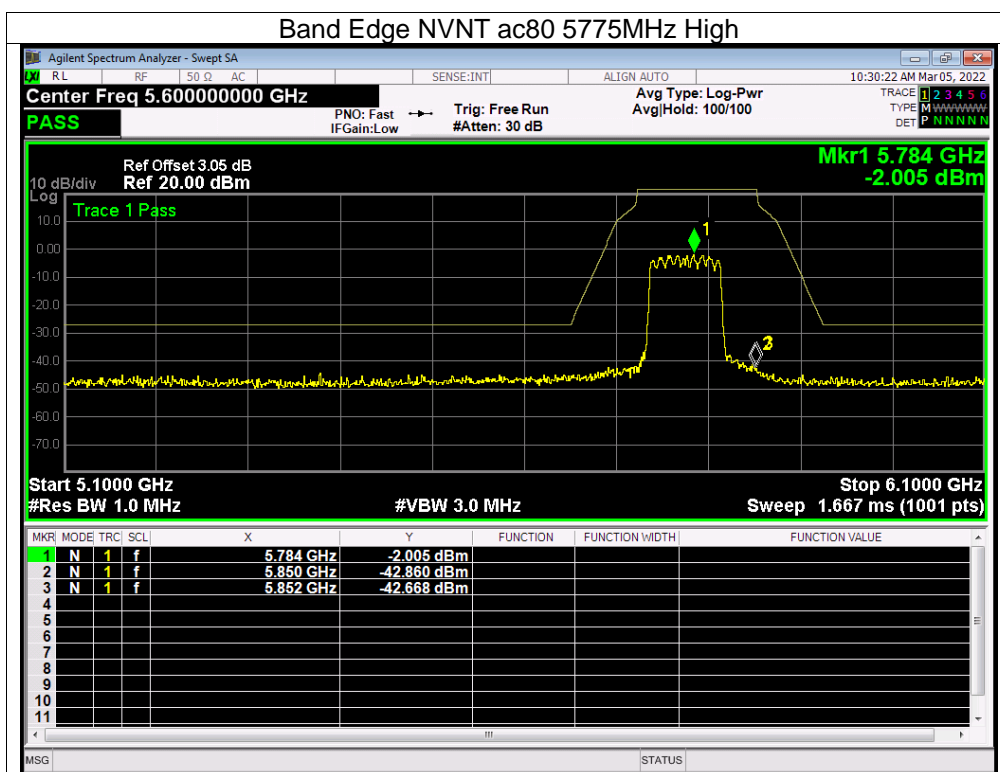












## 12. Spurious RF Conducted Emissions

### 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

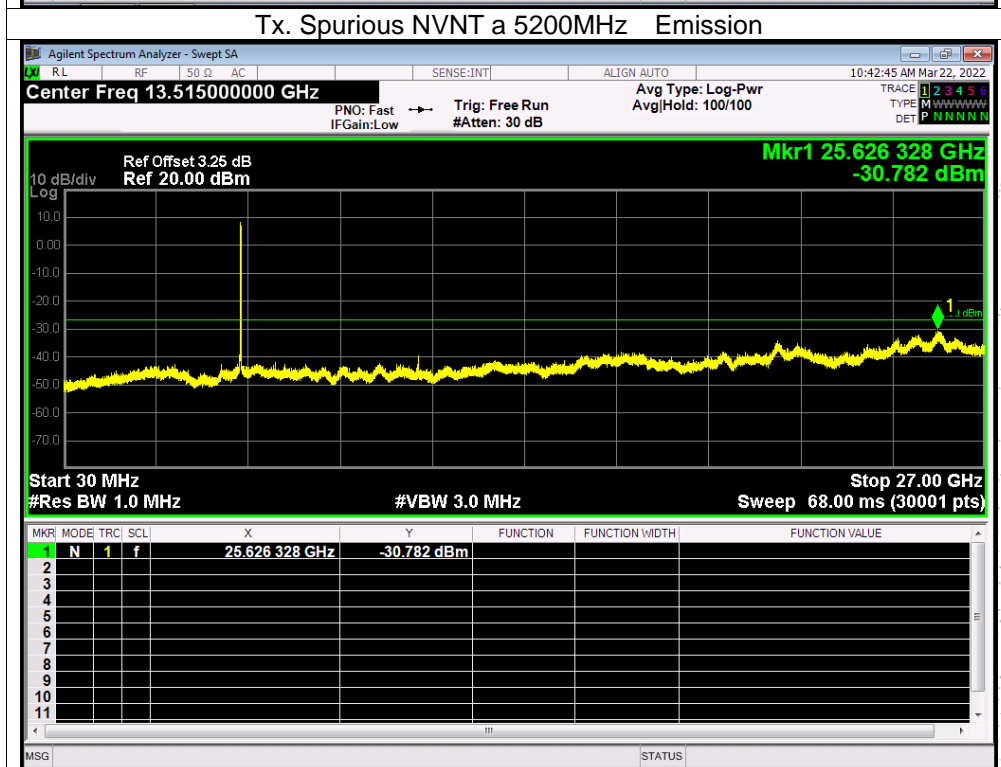
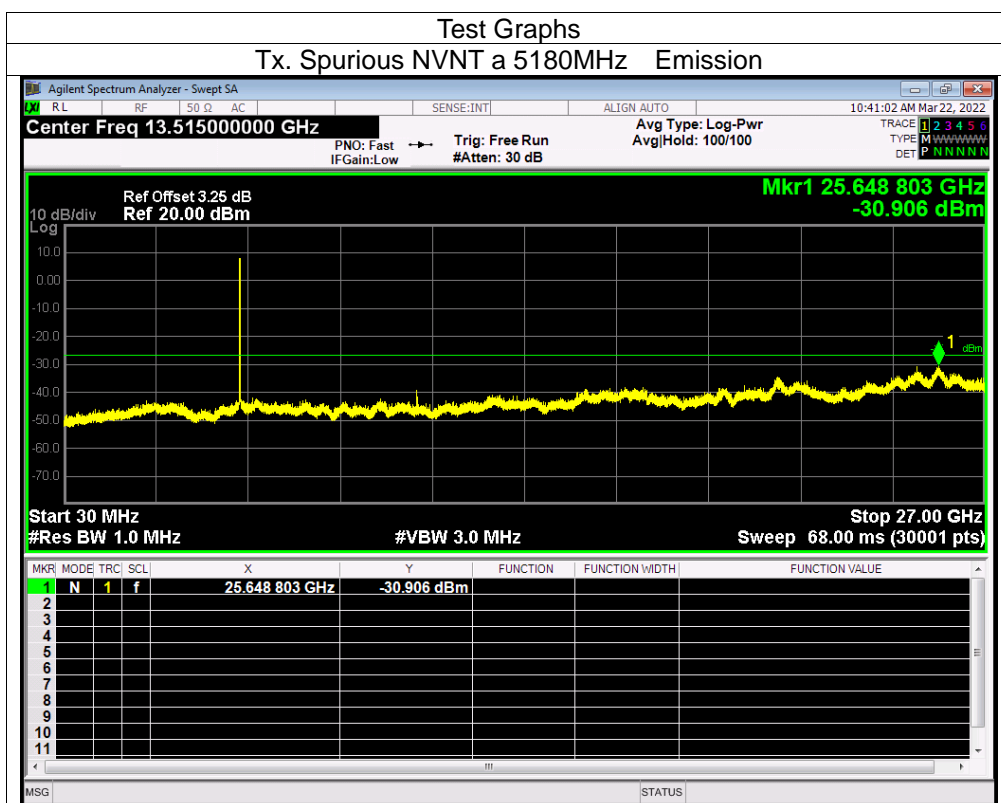
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

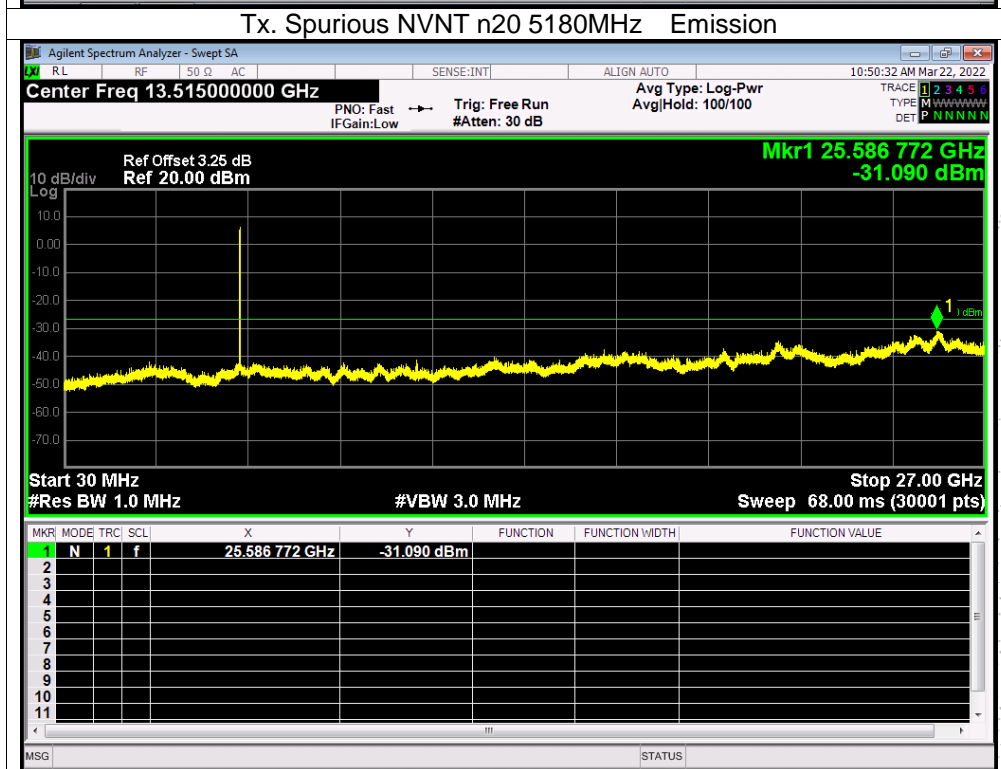
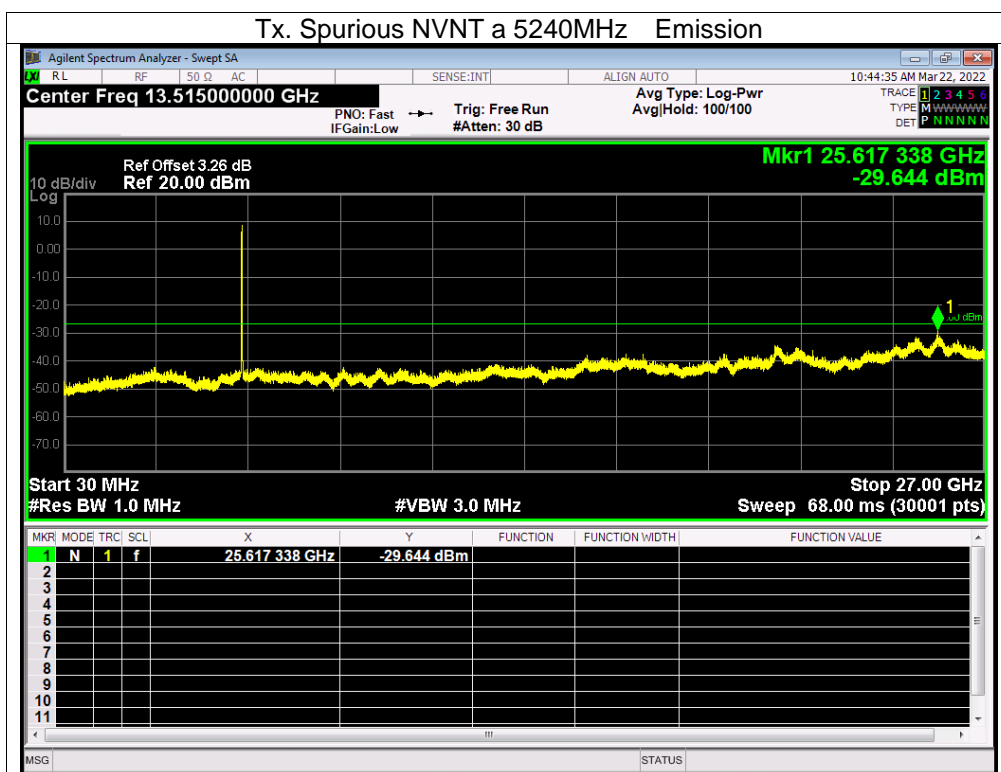
### 12.4 Test Result

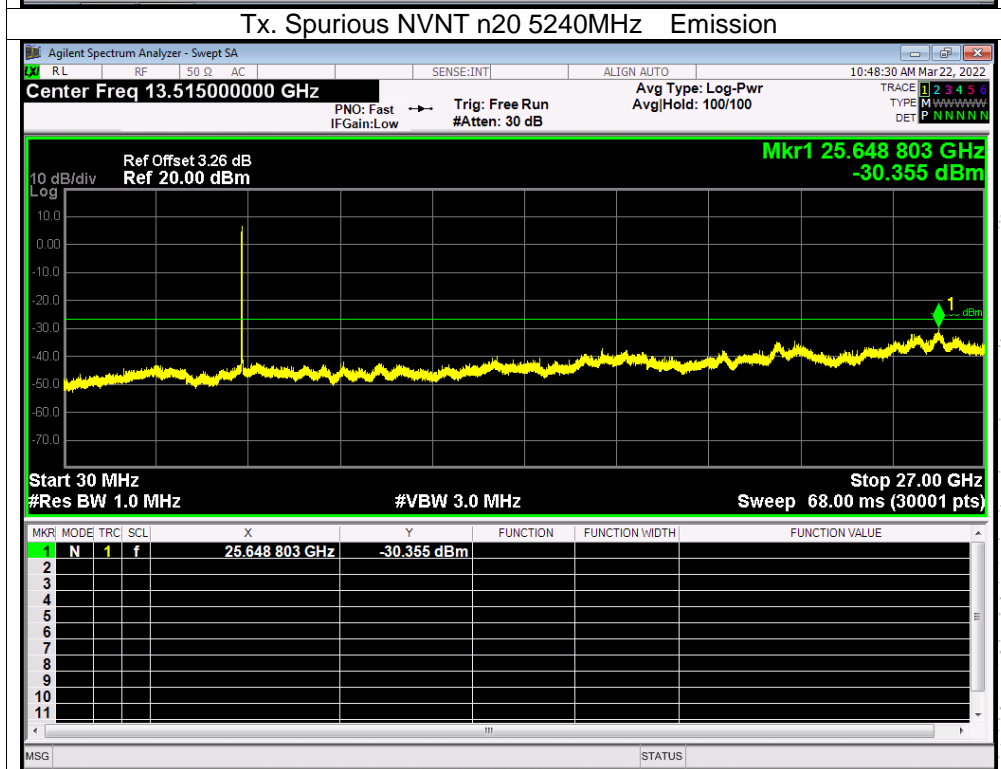
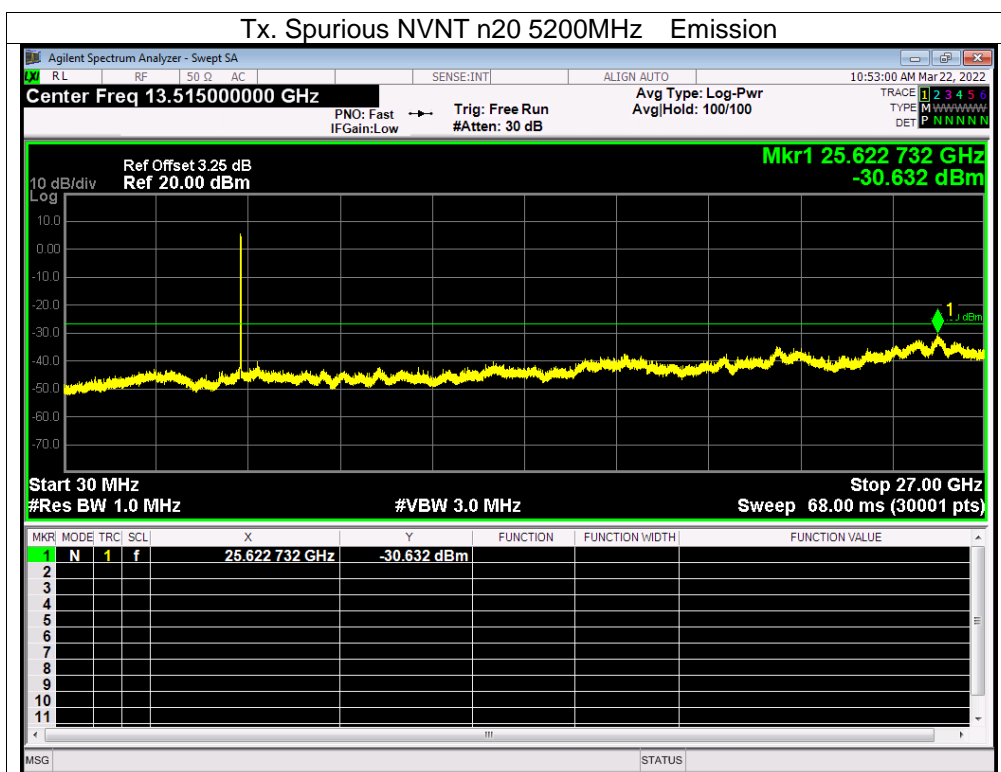
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.

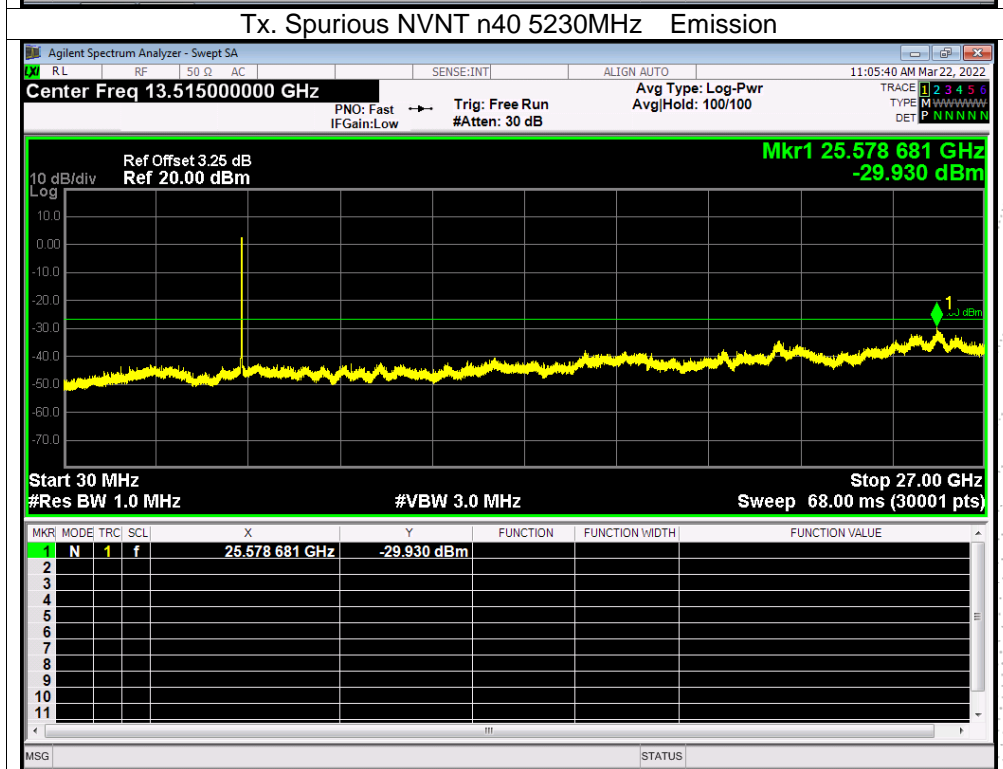
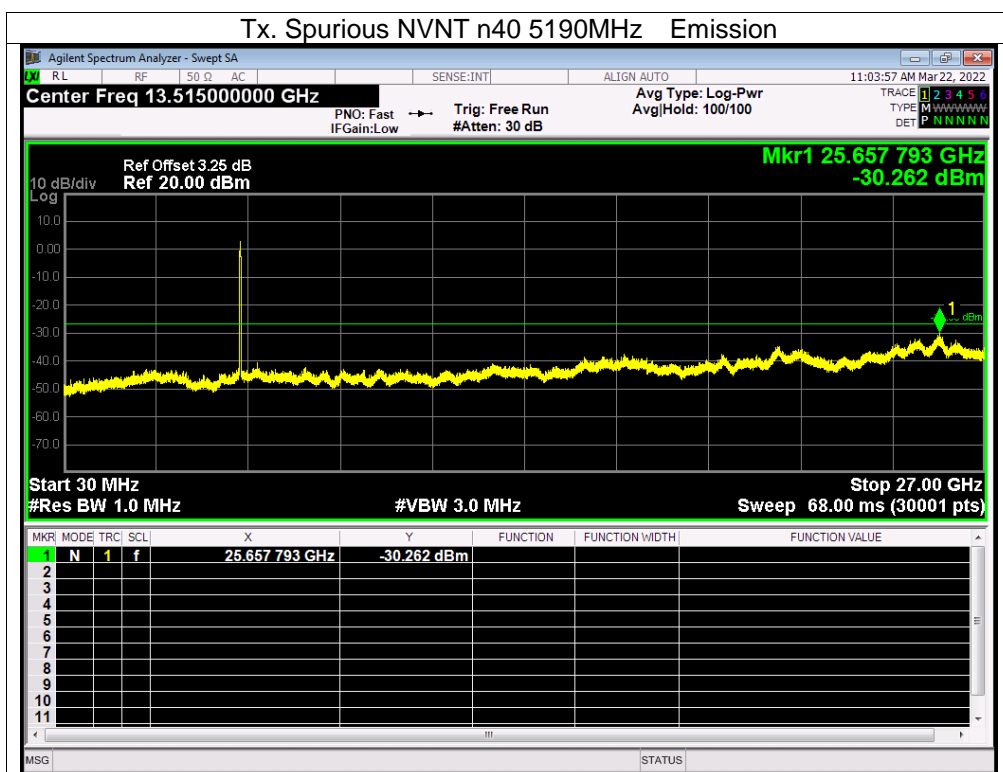
About: 26.5GHz-40GHz, The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

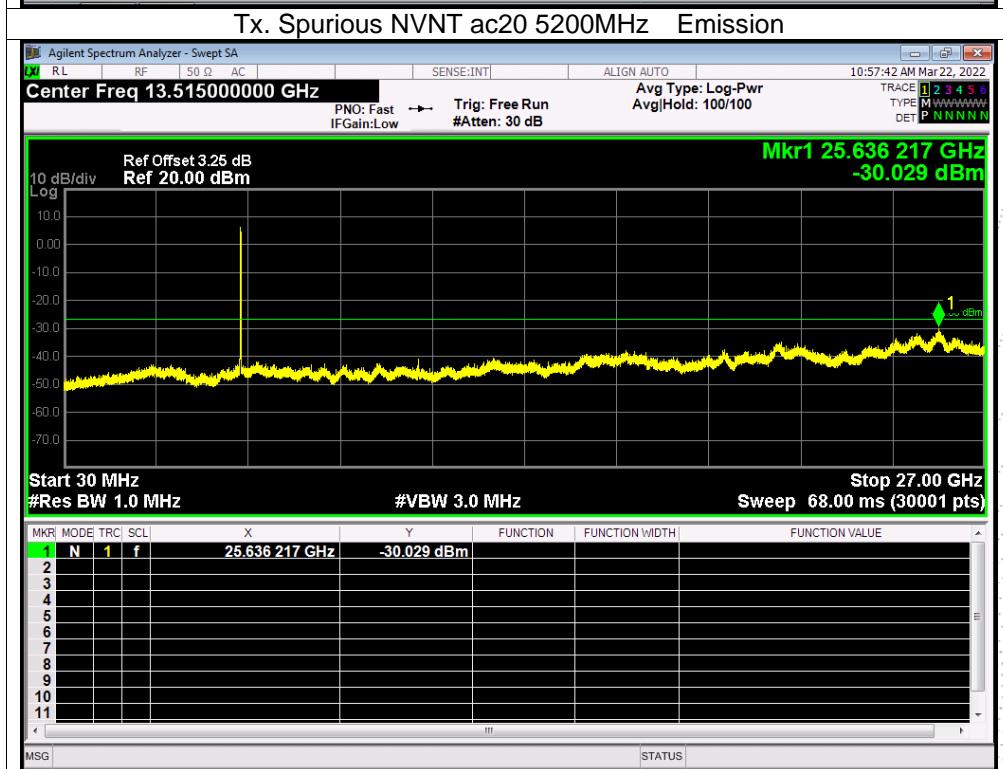
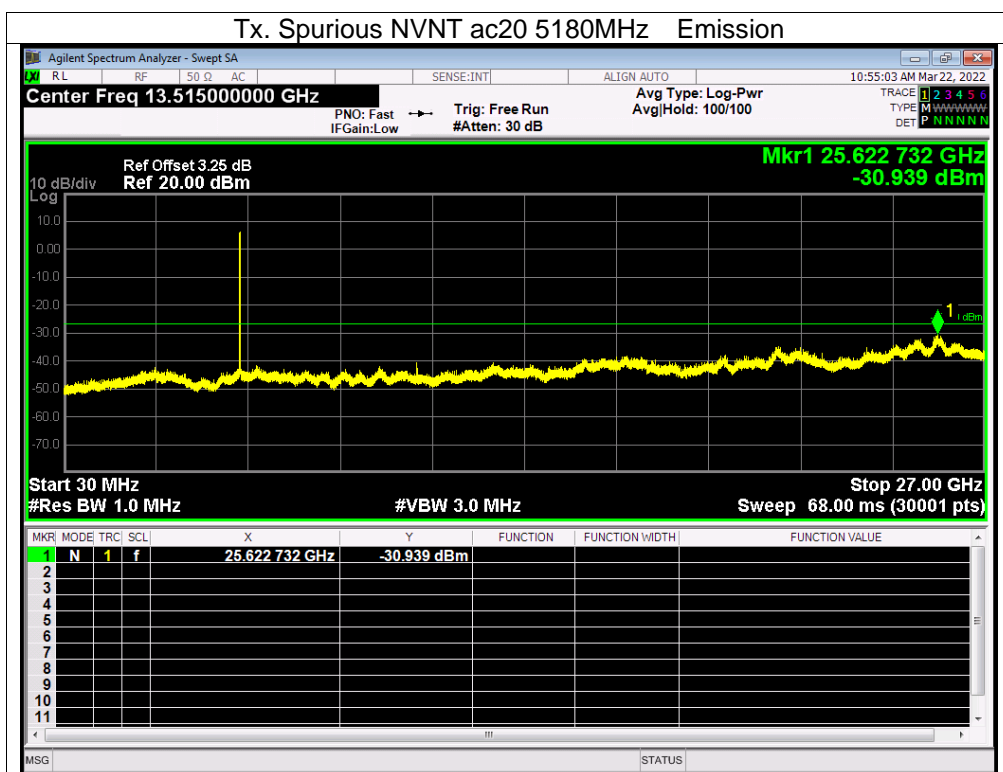


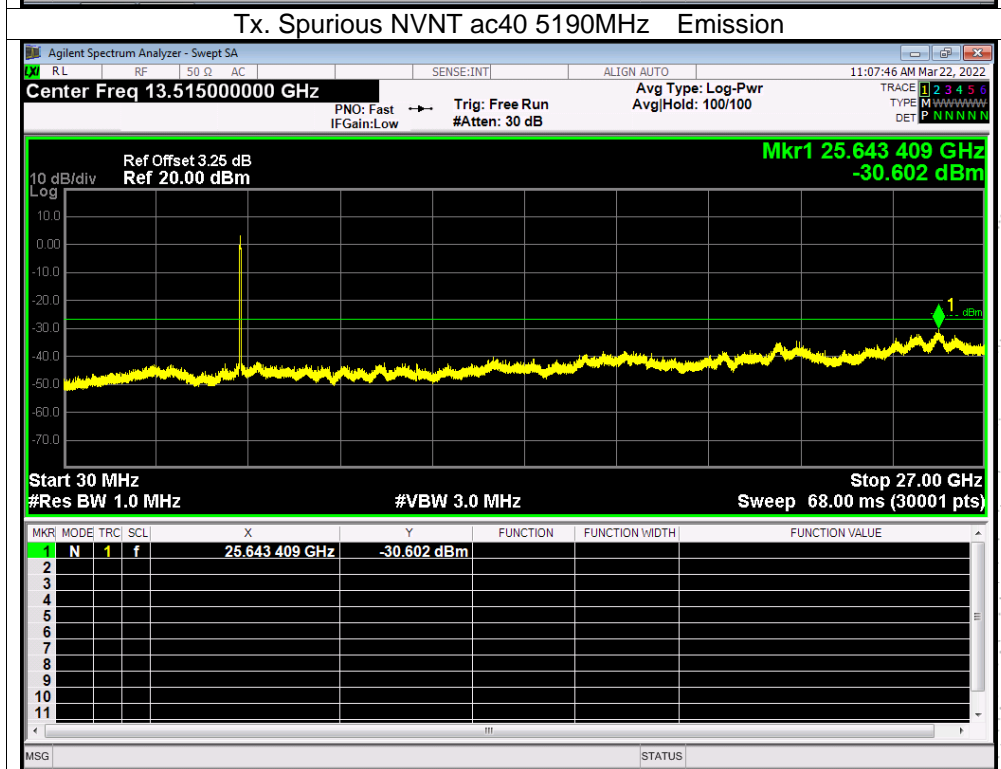
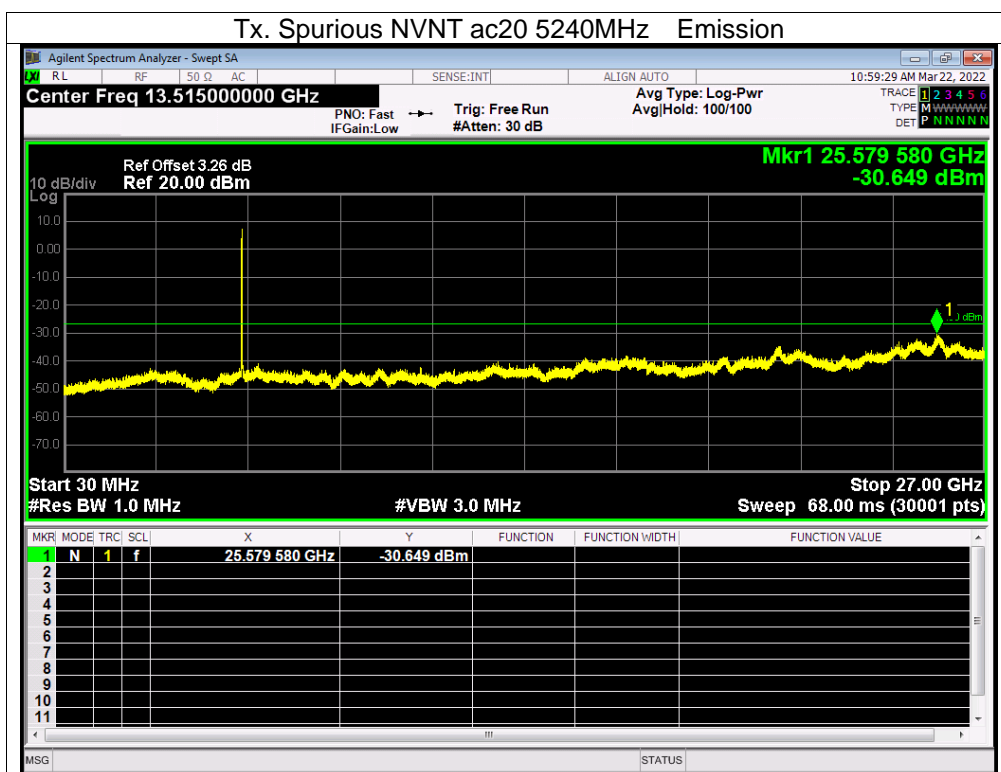


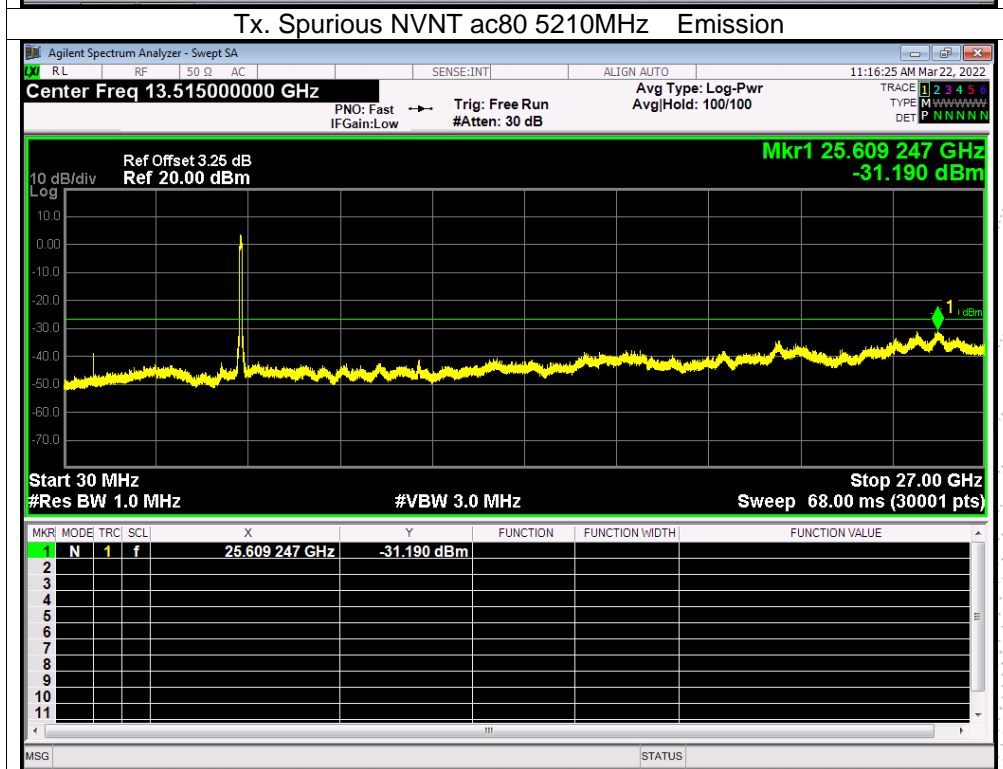
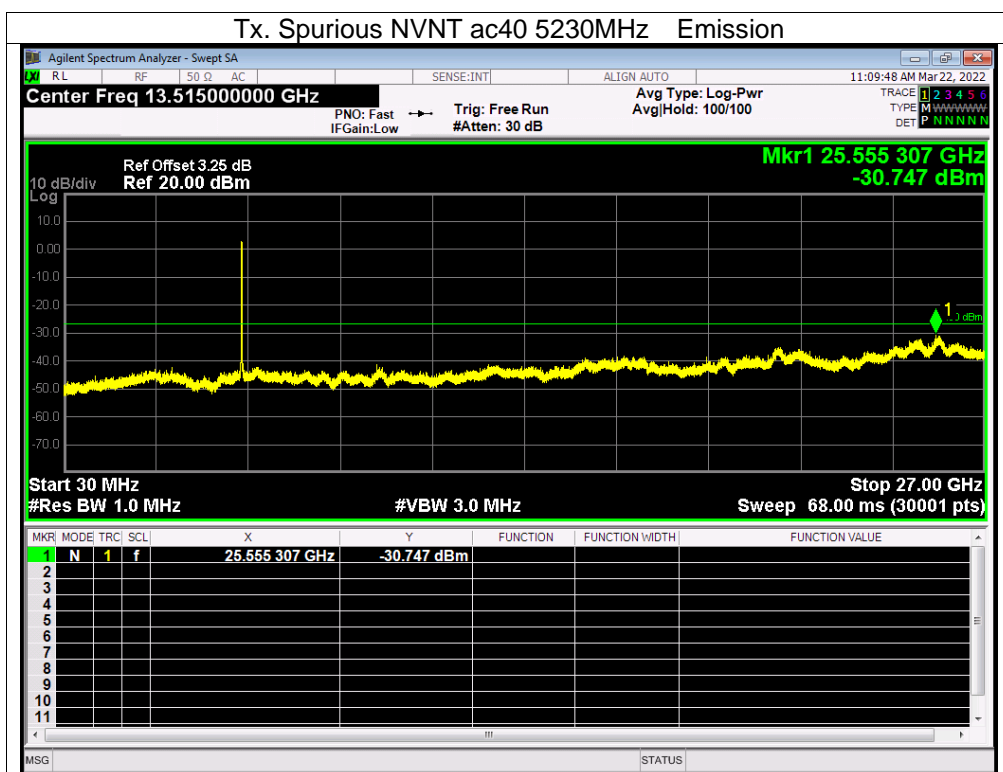


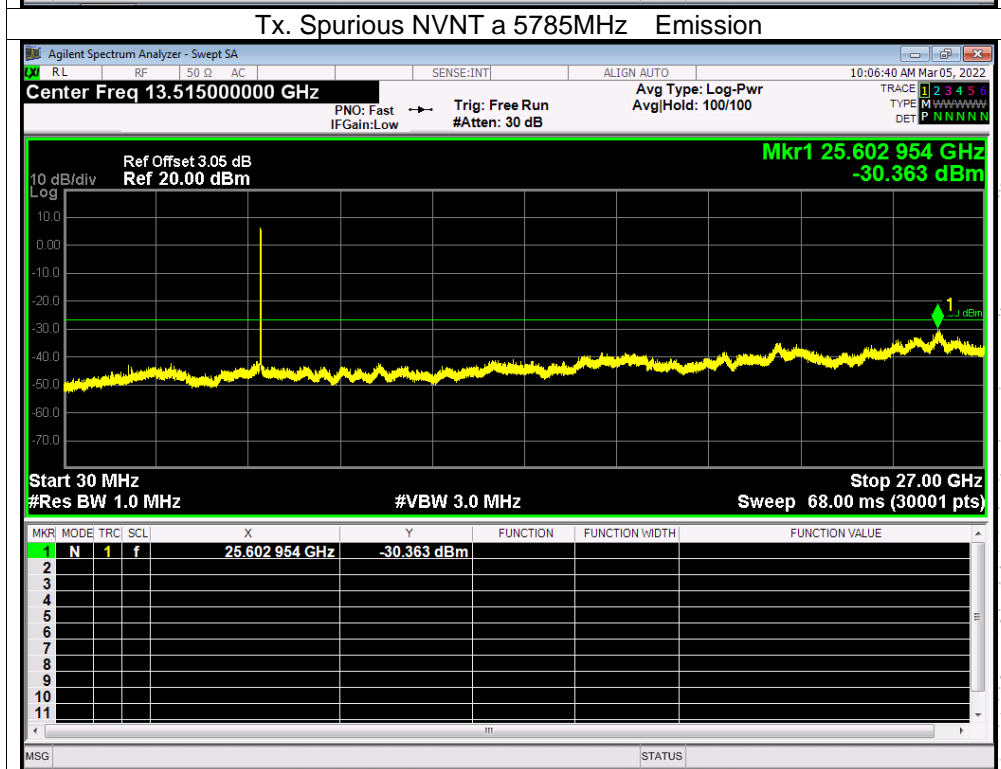
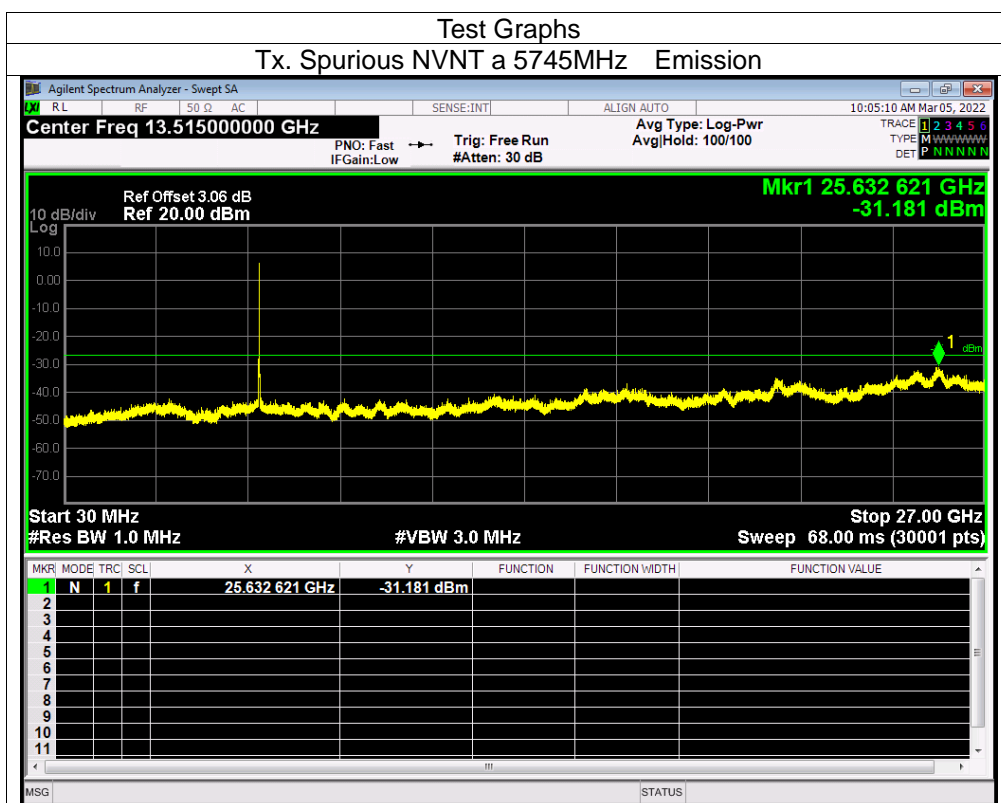


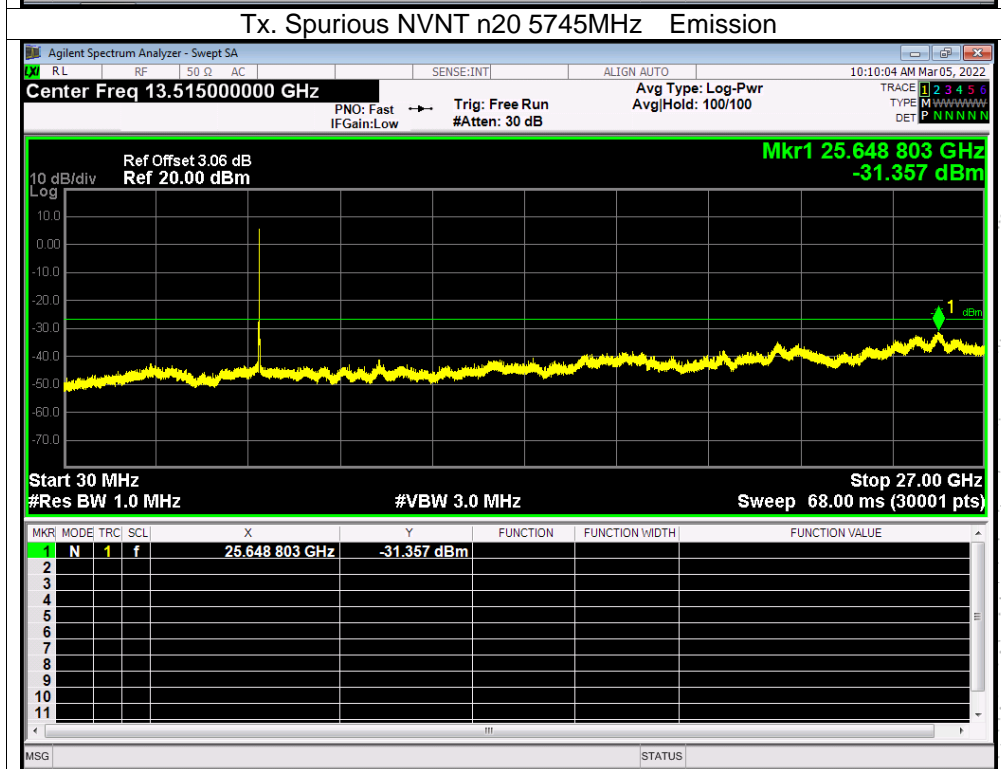
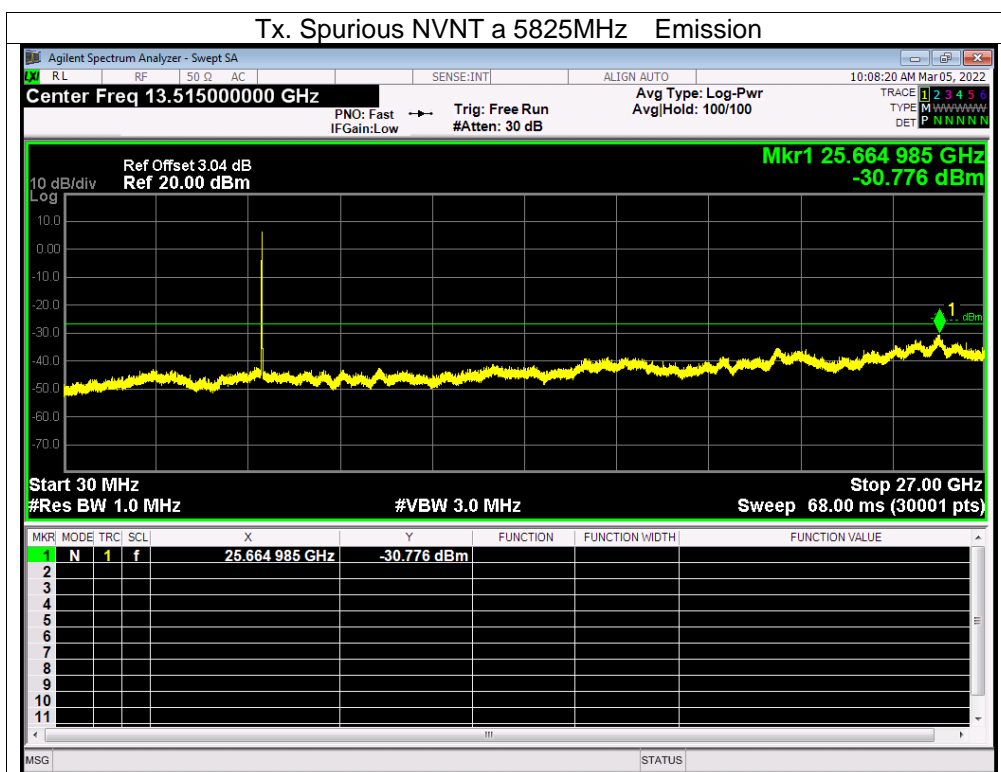


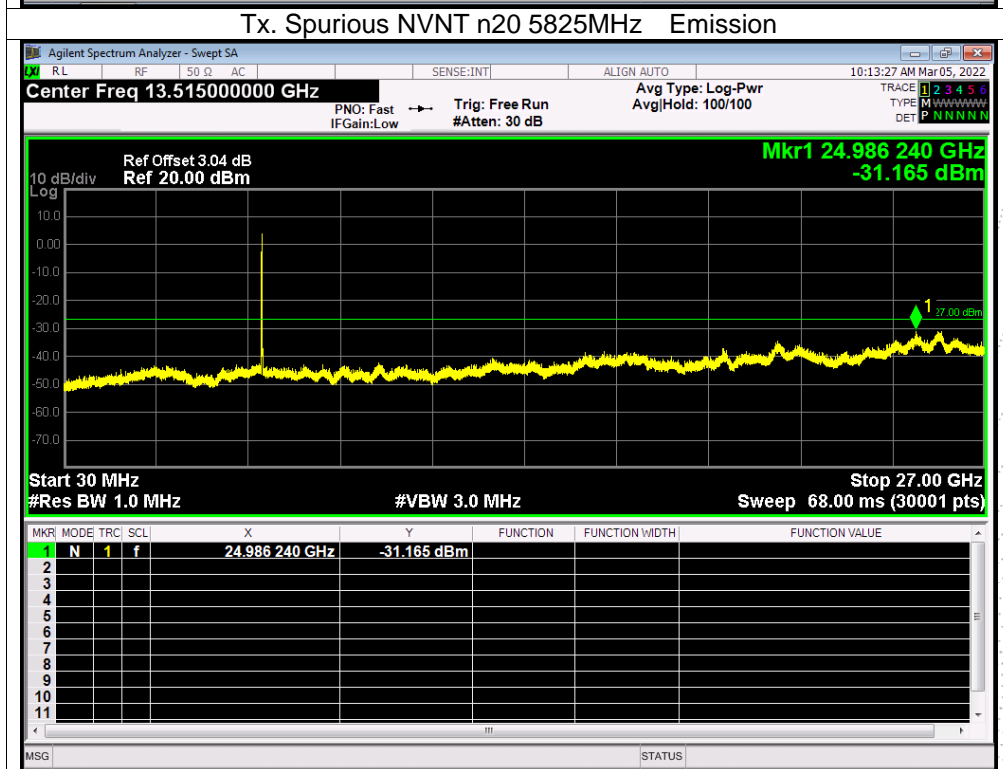
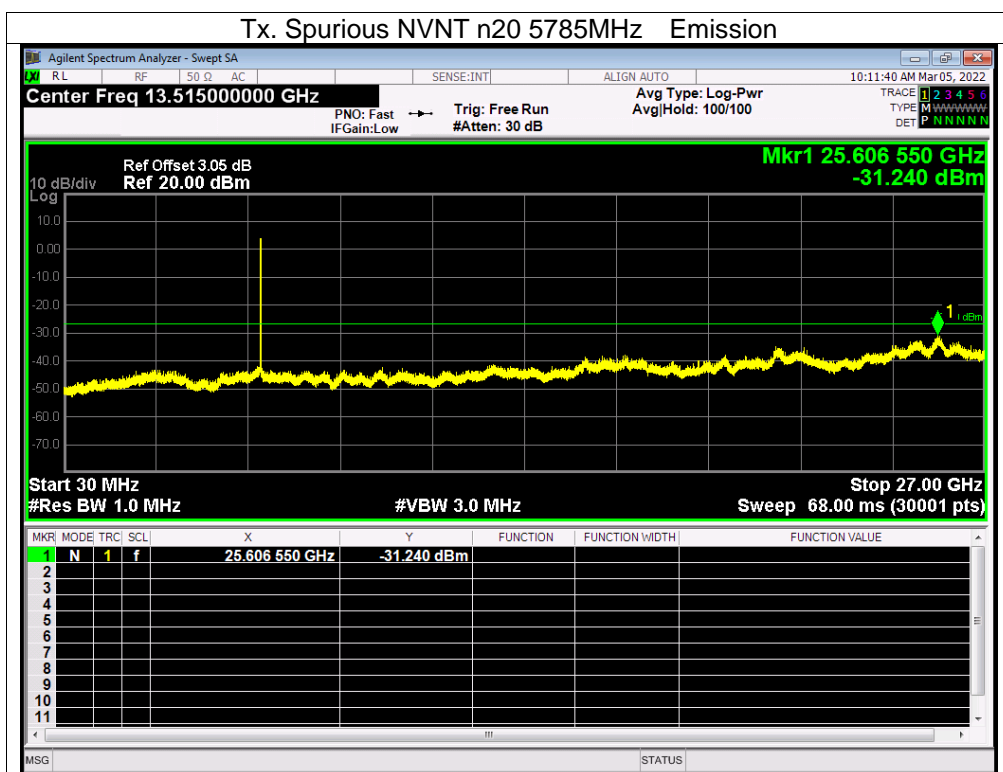


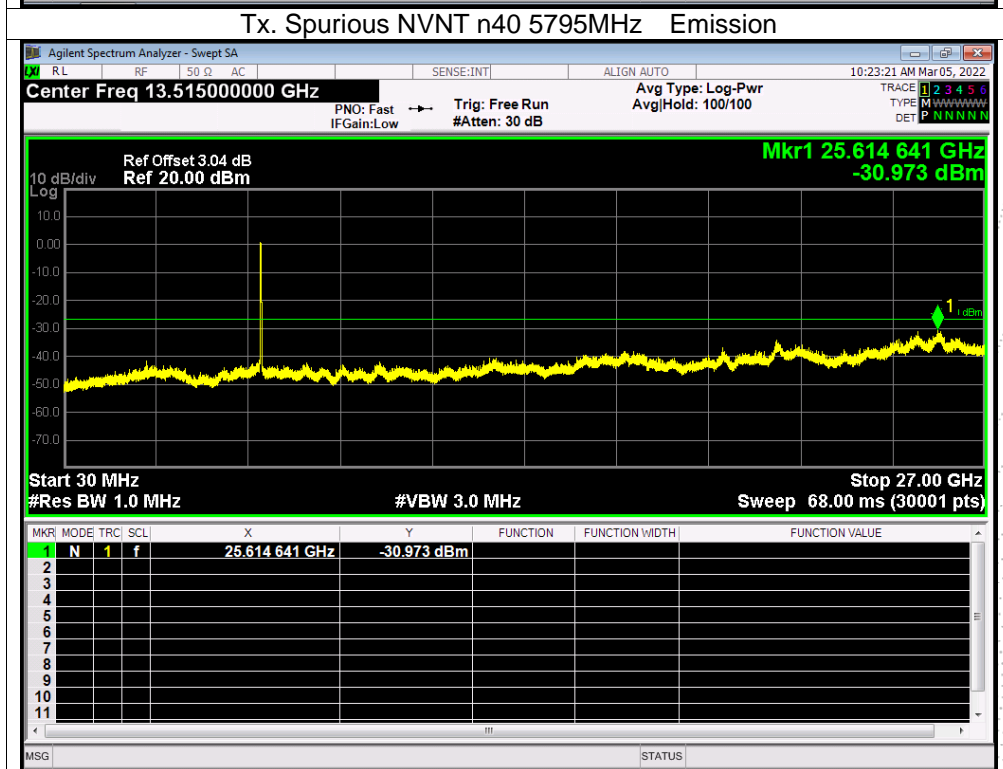
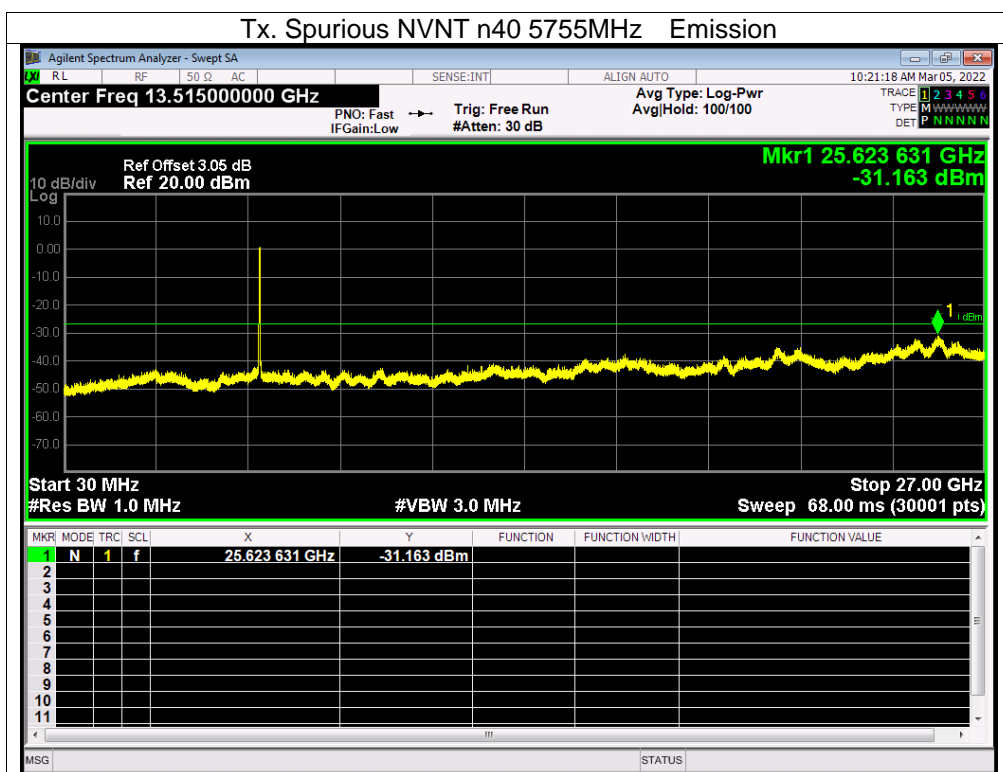


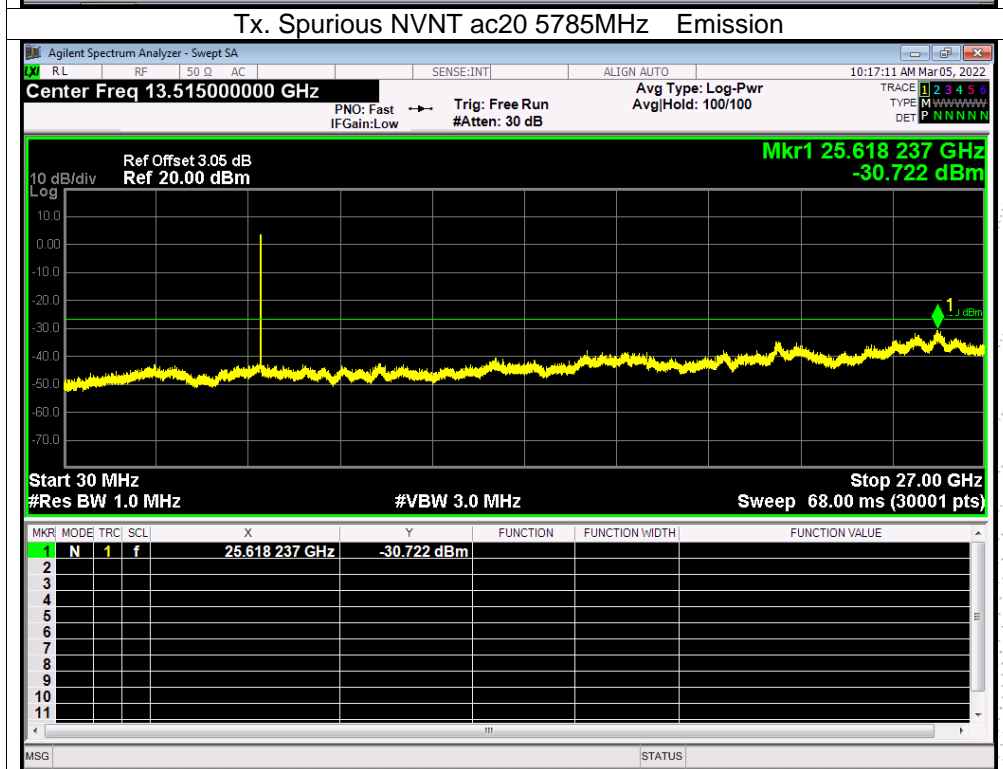
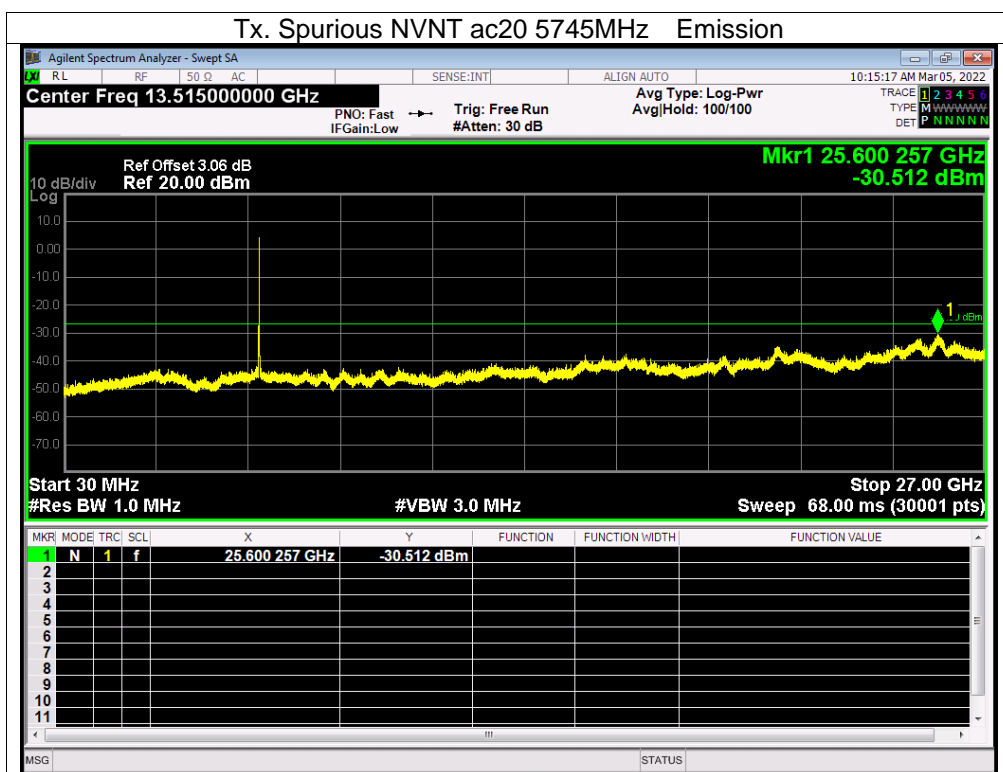




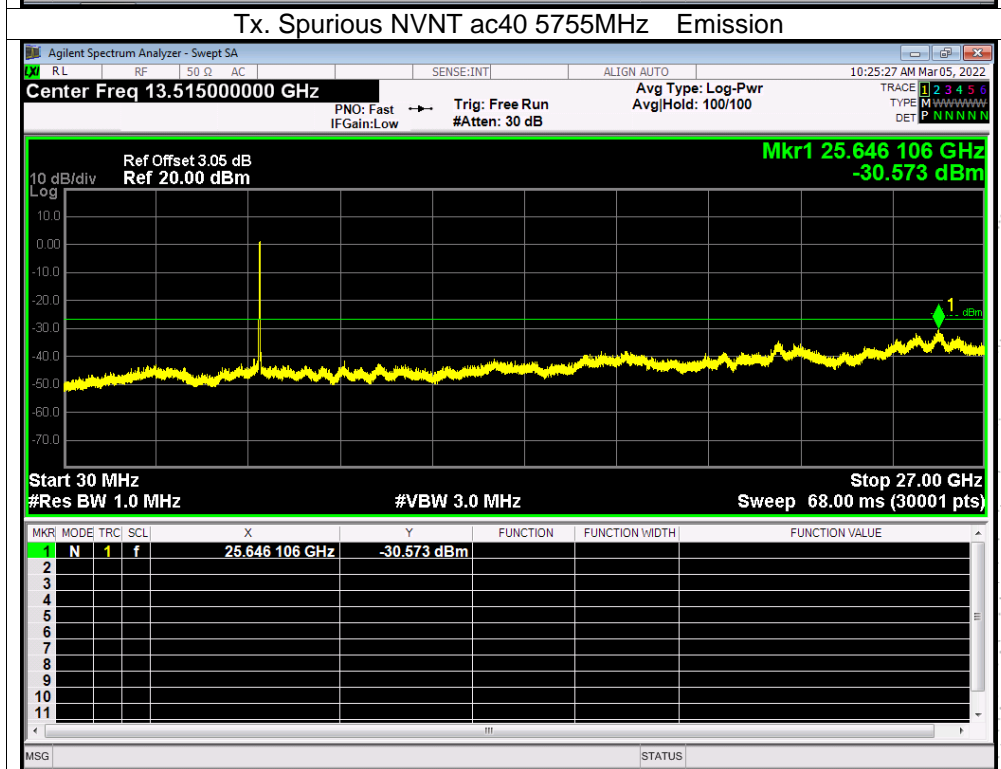
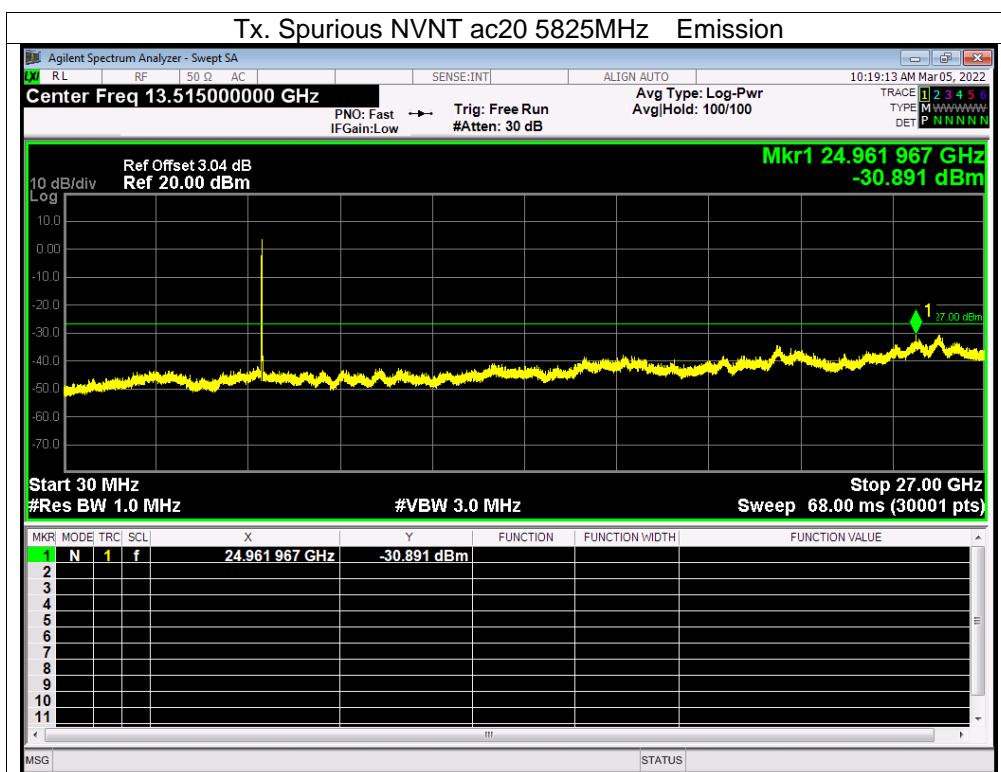


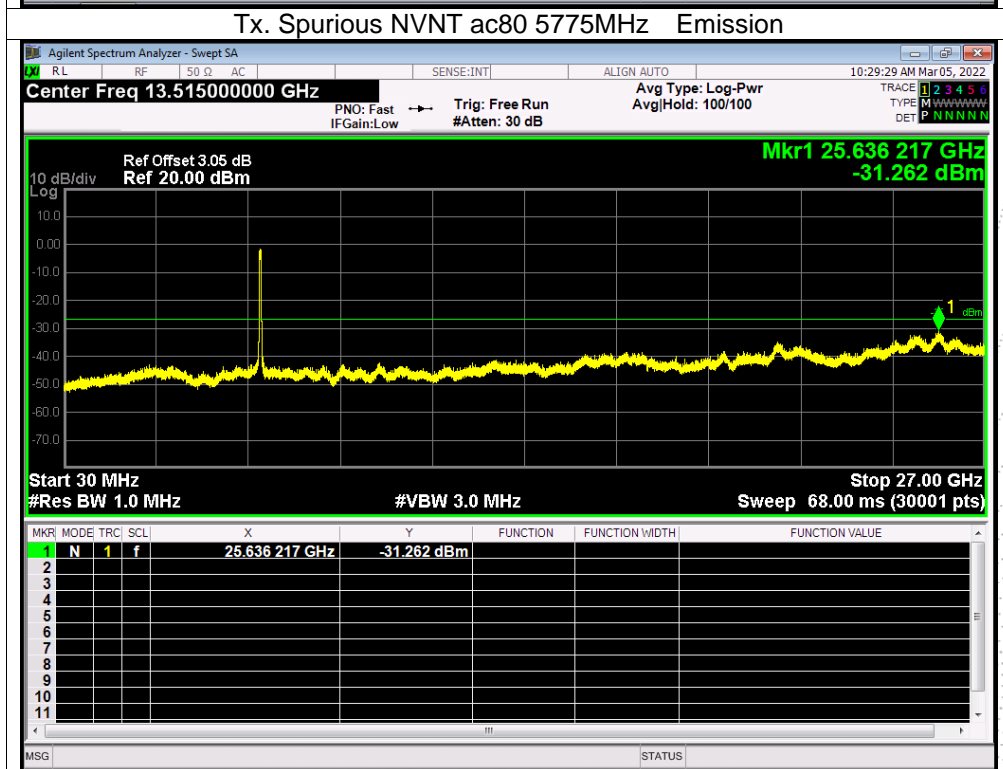
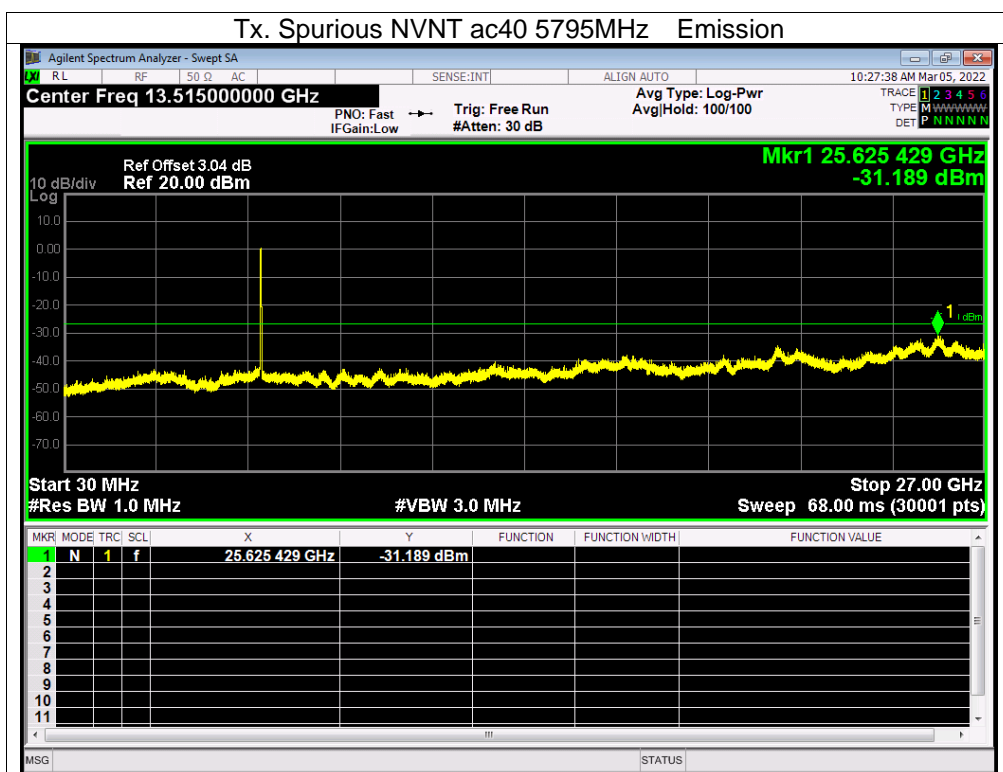












### 13. Frequency Stability Measurement

#### 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  $\pm 20$  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  $\pm 20$  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:	AC120V/60Hz
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	5180.0059	5180	0.0059	1.1421
		V max (V)	138.00	5180.0164	5180	0.0164	3.1730
		V min (V)	102.00	5180.0134	5180	0.0134	2.5940
Limits				5150-5250 MHz			
Result				Complies			

#### Temperature vs. Frequency Stability

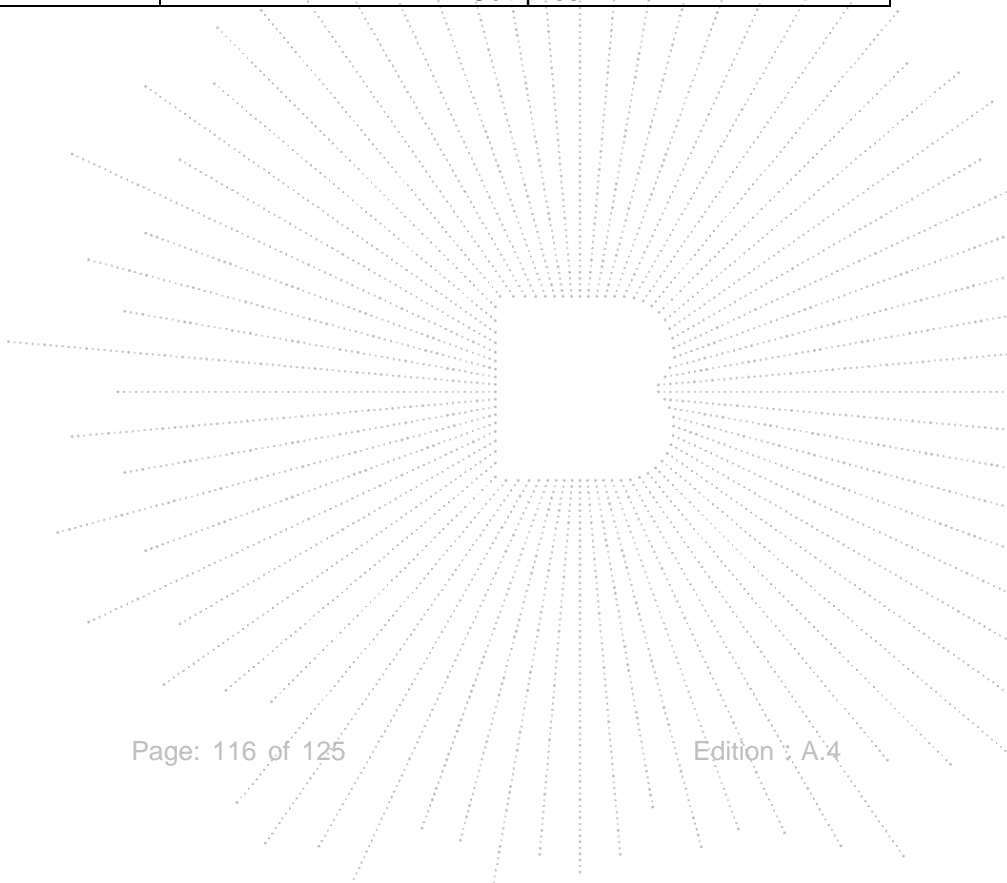
TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	-20	5180.0013	5180	0.0013	0.2415
		T (°C)	-10	5180.0051	5180	0.0051	0.9896
		T (°C)	0	5180.0047	5180	0.0047	0.9161
		T (°C)	10	5180.0026	5180	0.0026	0.5051
		T (°C)	20	5180.0021	5180	0.0021	0.4114
		T (°C)	30	5180.0037	5180	0.0037	0.7121
		T (°C)	40	5180.0023	5180	0.0023	0.4359
		T (°C)	50	5180.0031	5180	0.0031	0.6061
		T (°C)	60	5180.0072	5180	0.0072	1.3883
		T (°C)	70	5180.0049	5180	0.0049	0.9521
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	5200.0129	5200	0.0129	2.4798
		V max (V)	138.00	5200.0045	5200	0.0045	0.8675
		V min (V)	102.00	5200.0091	5200	0.0091	1.7468
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	5200.00768	5200	0.00768	1.4763
		T (°C)	-10	5200.00266	5200	0.00266	0.5106
		T (°C)	0	5200.01019	5200	0.01019	1.9595
		T (°C)	10	5200.00851	5200	0.00851	1.6363
		T (°C)	20	5200.01277	5200	0.01277	2.4561
		T (°C)	30	5200.01018	5200	0.01018	1.9573
		T (°C)	40	5200.00650	5200	0.00650	1.2498
		T (°C)	50	5200.00958	5200	0.00958	1.8428
		T (°C)	60	5200.00965	5200	0.00965	1.8561
		T (°C)	70	5200.01153	5200	0.01153	2.2169
Limits				5150-5250 MHz			
Result				Complies			

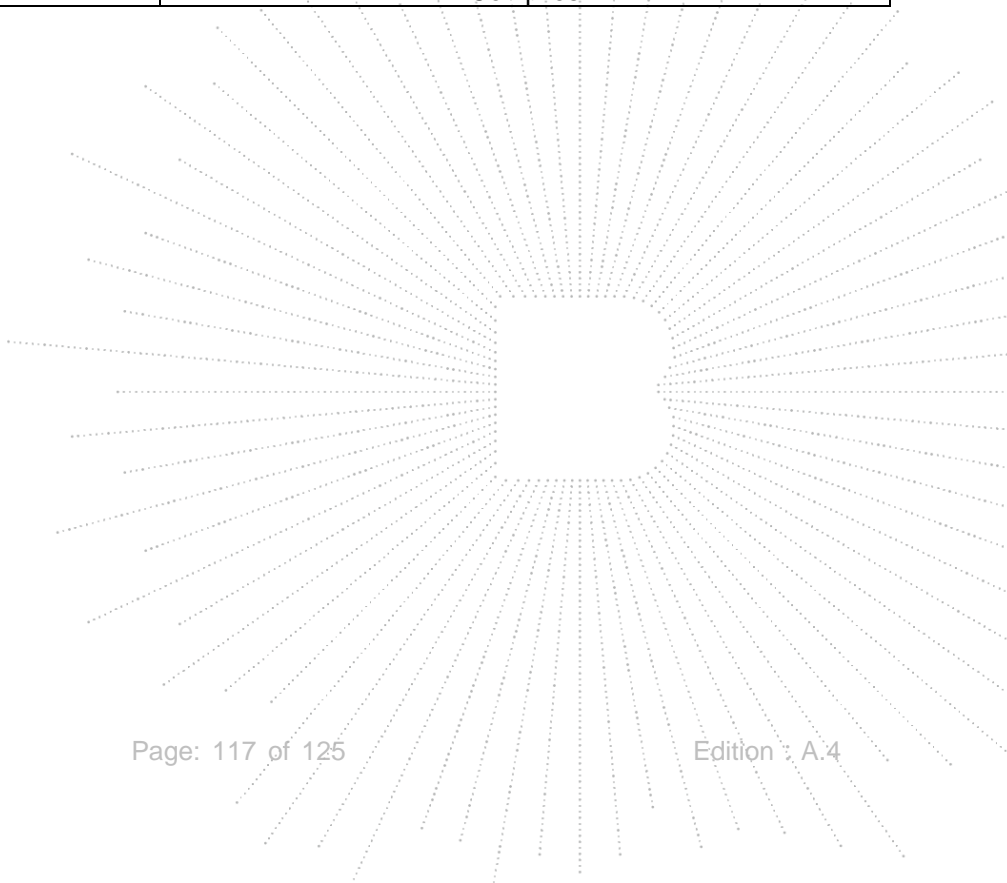


## Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	120.00	5240.0032	5240	0.0032	0.6117
		V max (V)	138.00	5240.0010	5240	0.0010	0.1825
		V min (V)	102.00	5240.0003	5240	0.0003	0.0545
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	5240.0031	5240	0.0031	0.5992
		T (°C)	-10	5240.0084	5240	0.0084	1.5936
		T (°C)	0	5240.0039	5240	0.0039	0.7390
		T (°C)	10	5240.0108	5240	0.0108	2.0693
		T (°C)	20	5240.0091	5240	0.0091	1.7307
		T (°C)	30	5240.0085	5240	0.0085	1.6139
		T (°C)	40	5240.0107	5240	0.0107	2.0508
		T (°C)	50	5240.0068	5240	0.0068	1.3054
		T (°C)	60	5240.0118	5240	0.0118	2.2537
		T (°C)	70	5240.0073	5240	0.0073	1.3853
Limits				5150-5250 MHz			
Result				Complies			



Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz
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	5745.00621	5745	0.00621	1.0815
		V max (V)	138.00	5745.00283	5745	0.00283	0.4922
		V min (V)	102.00	5745.00451	5745	0.00451	0.7848
Limits				5725-5850 MHz			
Result				Complies			

#### Temperature vs. Frequency Stability

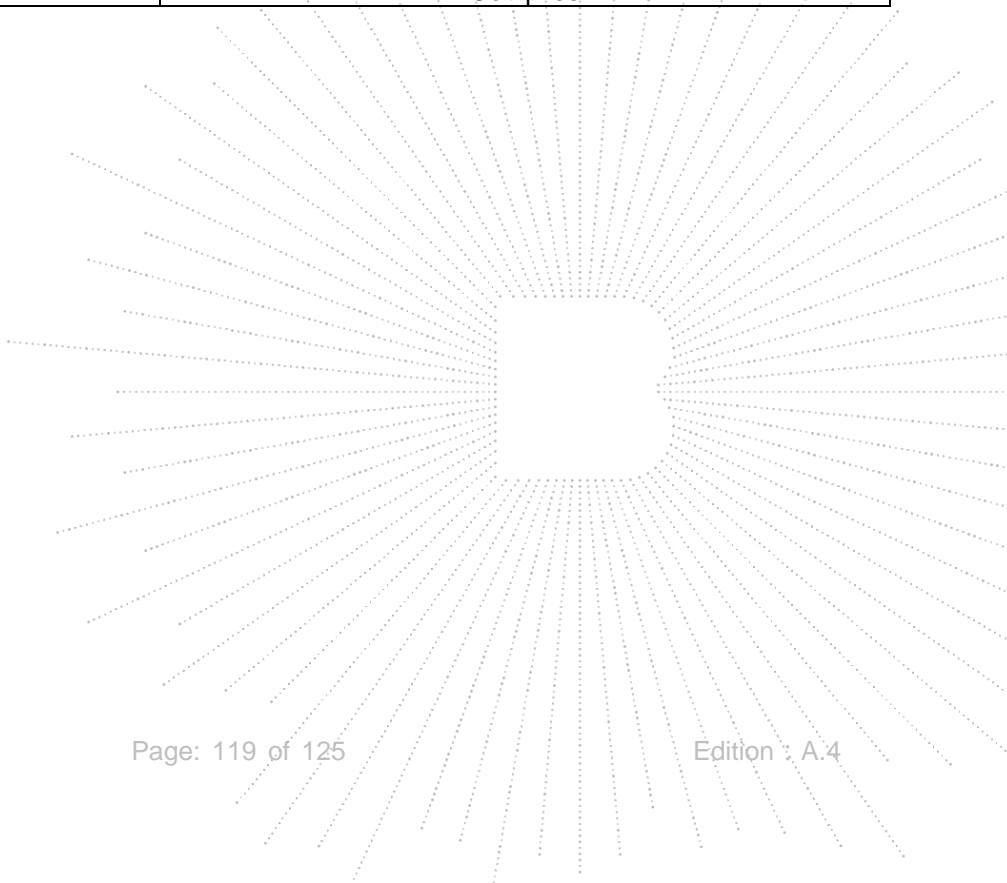
TEST CONDITIONS				Reference Frequency : 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	-20	5745.00705	5745	0.00705	1.2265
		T (°C)	-10	5745.01114	5745	0.01114	1.9394
		T (°C)	0	5745.00692	5745	0.00692	1.2039
		T (°C)	10	5745.00700	5745	0.00700	1.2188
		T (°C)	20	5745.00730	5745	0.00730	1.2715
		T (°C)	30	5745.01332	5745	0.01332	2.3188
		T (°C)	40	5745.00855	5745	0.00855	1.4879
		T (°C)	50	5745.00132	5745	0.00132	0.2291
		T (°C)	60	5745.00256	5745	0.00256	0.4464
		T (°C)	70	5745.00745	5745	0.00745	1.2966
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	5785.00923	5785	0.00923	1.5957
		V max (V)	138.00	5785.00942	5785	0.00942	1.6279
		V min (V)	102.00	5785.00194	5785	0.00194	0.3347
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	5785.00505	5785	0.00505	0.8730
		T (°C)	-10	5785.01328	5785	0.01328	2.2953
		T (°C)	0	5785.00011	5785	0.00011	0.0198
		T (°C)	10	5785.01120	5785	0.01120	1.9363
		T (°C)	20	5785.00339	5785	0.00339	0.5853
		T (°C)	30	5785.00806	5785	0.00806	1.3935
		T (°C)	40	5785.00201	5785	0.00201	0.3476
		T (°C)	50	5785.00914	5785	0.00914	1.5808
		T (°C)	60	5785.00080	5785	0.00080	0.1383
		T (°C)	70	5785.00231	5785	0.00231	0.3997
Limits				5725-5850 MHz			
Result				Complies			



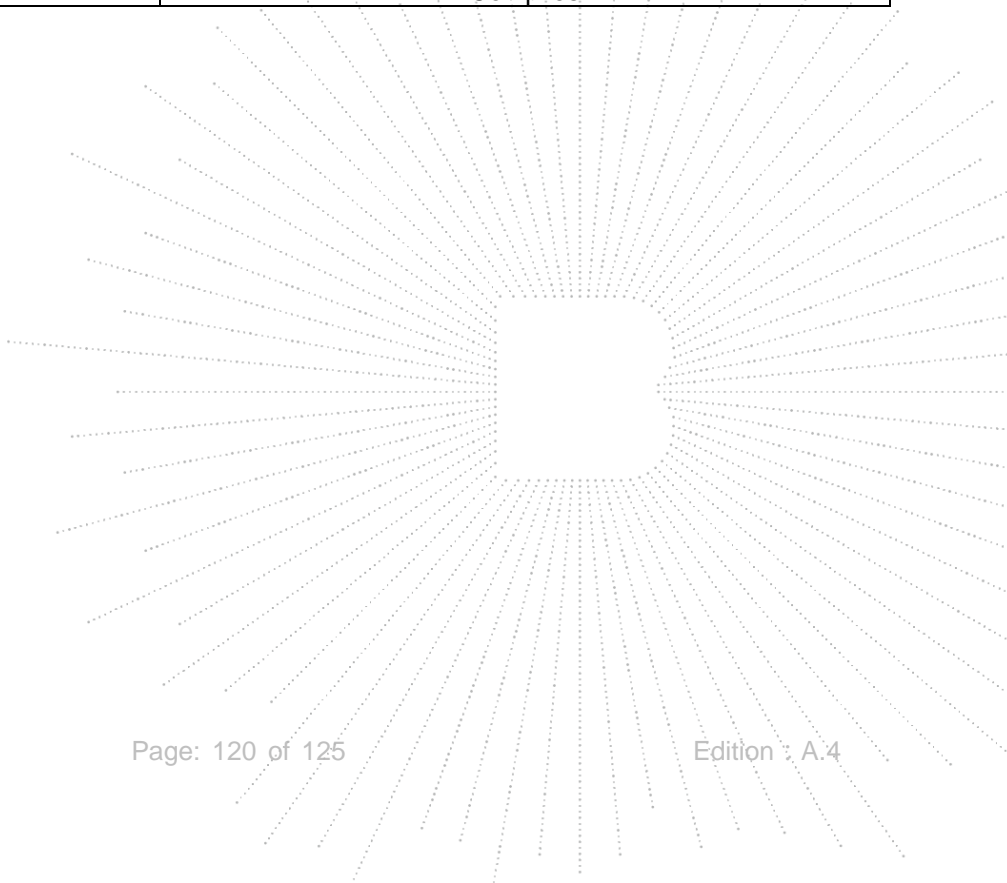


## Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency : 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	120.00	5825.00980	5825	0.00980	1.6830
		V max (V)	138.00	5825.00986	5825	0.00986	1.6919
		V min (V)	102.00	5825.00811	5825	0.00811	1.3925
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	5825.00455	5825	0.00455	0.7812
		T (°C)	-10	5825.00349	5825	0.00349	0.5985
		T (°C)	0	5825.00777	5825	0.00777	1.3341
		T (°C)	10	5825.01154	5825	0.01154	1.9807
		T (°C)	20	5825.00542	5825	0.00542	0.9298
		T (°C)	30	5825.00742	5825	0.00742	1.2740
		T (°C)	40	5825.00640	5825	0.00640	1.0992
		T (°C)	50	5825.00504	5825	0.00504	0.8647
		T (°C)	60	5825.01116	5825	0.01116	1.9162
		T (°C)	70	5825.01126	5825	0.01126	1.9323
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. It comply with the standard requirement.

## 15. EUT Photographs



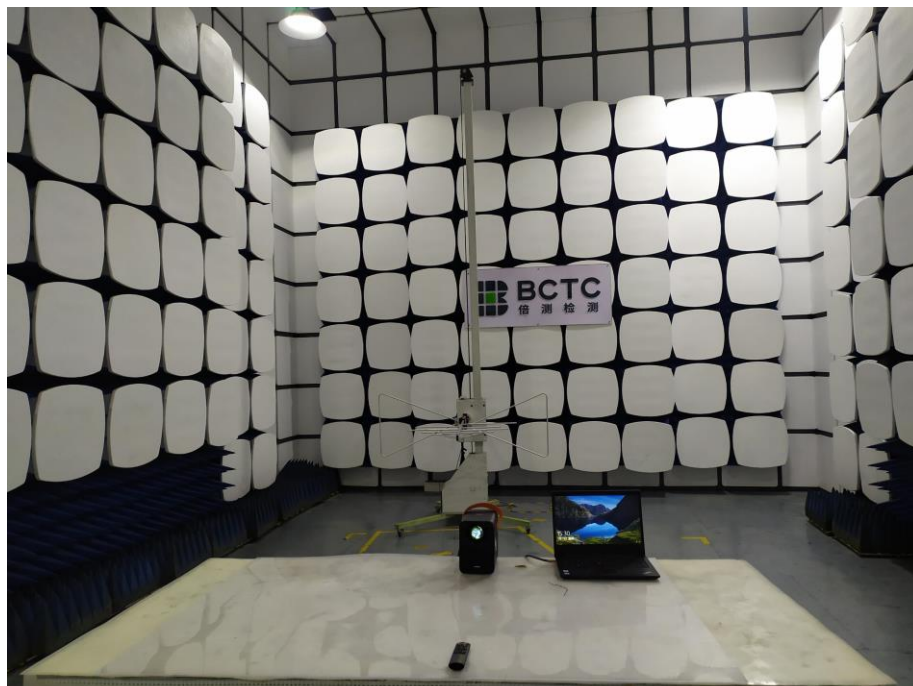
NOTE: Appendix-Photographs Of EUT Constructional Details

## 16. EUT Test Setup Photographs

Conducted emissions



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.

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

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**\*\*\*\*\* END \*\*\*\*\***