

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

## Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency : 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	120.00	5180.0140	5180	0.0140	2.7100
		V max (V)	138.00	5180.0172	5180	0.0172	3.3151
		V min (V)	102.00	5180.0105	5180	0.0105	2.0345
Limits				5150-5250 MHz			
Result				Complies			

## Temperature vs. Frequency Stability

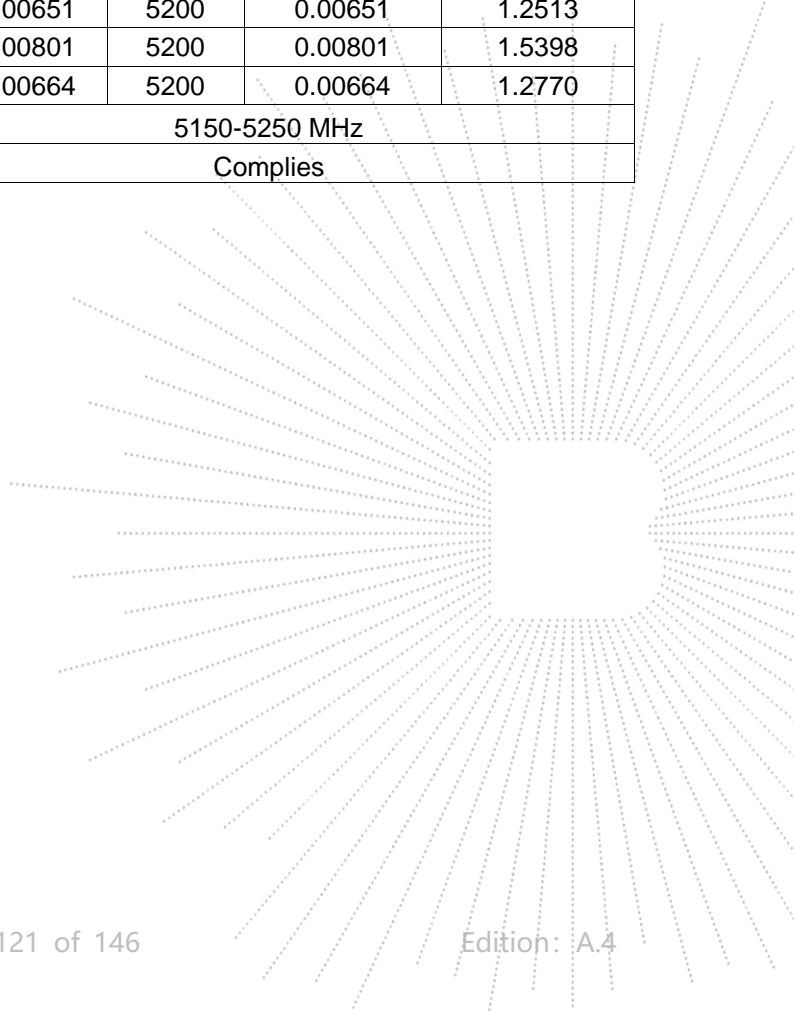
TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	AC 120V	T (°C)	-20	5180.0109	5180	0.0109	2.1044
		T (°C)	-10	5180.0053	5180	0.0053	1.0239
		T (°C)	0	5180.0052	5180	0.0052	0.9944
		T (°C)	10	5180.0014	5180	0.0014	0.2767
		T (°C)	20	5180.0094	5180	0.0094	1.8112
		T (°C)	30	5180.0051	5180	0.0051	0.9816
		T (°C)	40	5180.0104	5180	0.0104	2.0095
		T (°C)	50	5180.0037	5180	0.0037	0.7198
		T (°C)	60	5180.0003	5180	0.0003	0.0528
		T (°C)	70	5180.0050	5180	0.0050	0.9608
Limits				5150-5250 MHz			
Result				Complies			

## Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T <sub>nom</sub> (°C)	20	V nom (V)	120.00	5200.0047	5200	0.0047	0.9068
		V max (V)	138.00	5200.0087	5200	0.0087	1.6636
		V min (V)	102.00	5200.0121	5200	0.0121	2.3327
Limits				5725-5850 MHz			
Result				Complies			

## Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V <sub>nom</sub> (V)	AC 120V	T (°C)	-20	5200.00090	5200	0.00090	0.1724
		T (°C)	-10	5200.00625	5200	0.00625	1.2023
		T (°C)	0	5200.00560	5200	0.00560	1.0774
		T (°C)	10	5200.00034	5200	0.00034	0.0647
		T (°C)	20	5200.01271	5200	0.01271	2.4436
		T (°C)	30	5200.00345	5200	0.00345	0.6637
		T (°C)	40	5200.00337	5200	0.00337	0.6472
		T (°C)	50	5200.00651	5200	0.00651	1.2513
		T (°C)	60	5200.00801	5200	0.00801	1.5398
		T (°C)	70	5200.00664	5200	0.00664	1.2770
Limits				5150-5250 MHz			
Result				Complies			

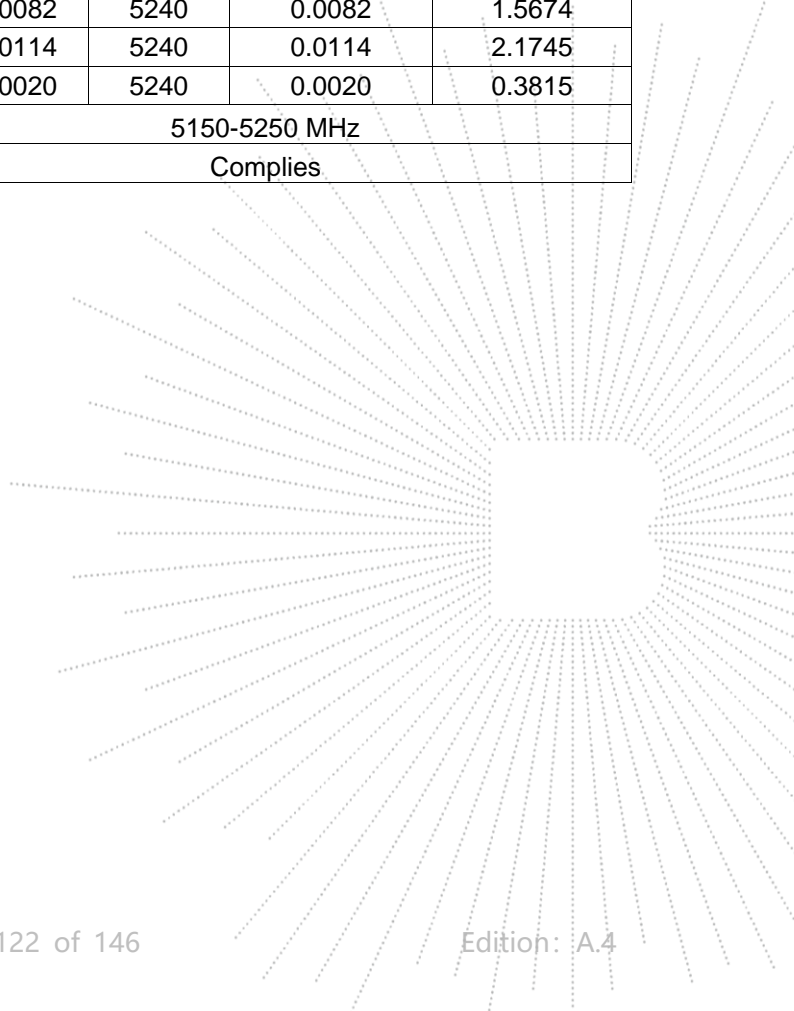


## Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	120.00	5240.0134	5240	0.0134	2.5555
		V max (V)	138.00	5240.0069	5240	0.0069	1.3196
		V min (V)	102.00	5240.0053	5240	0.0053	1.0043
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)	AC 120V	T (°C)	-20	5240.0028	5240	0.0028	0.5253
		T (°C)	-10	5240.0086	5240	0.0086	1.6332
		T (°C)	0	5240.0091	5240	0.0091	1.7282
		T (°C)	10	5240.0035	5240	0.0035	0.6658
		T (°C)	20	5240.0053	5240	0.0053	1.0155
		T (°C)	30	5240.0112	5240	0.0112	2.1444
		T (°C)	40	5240.0049	5240	0.0049	0.9271
		T (°C)	50	5240.0082	5240	0.0082	1.5674
		T (°C)	60	5240.0114	5240	0.0114	2.1745
		T (°C)	70	5240.0020	5240	0.0020	0.3815
Limits				5150-5250 MHz			
Result				Complies			



Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Hzst Mode :	TX Frequency(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	5745.00508	5745	0.00508	0.8846
		V max (V)	138.00	5745.00611	5745	0.00611	1.0643
		V min (V)	102.00	5745.00417	5745	0.00417	0.7261
Limits				5725-5850 MHz			
Result				Complies			

**Temperature vs. Frequency Stability**

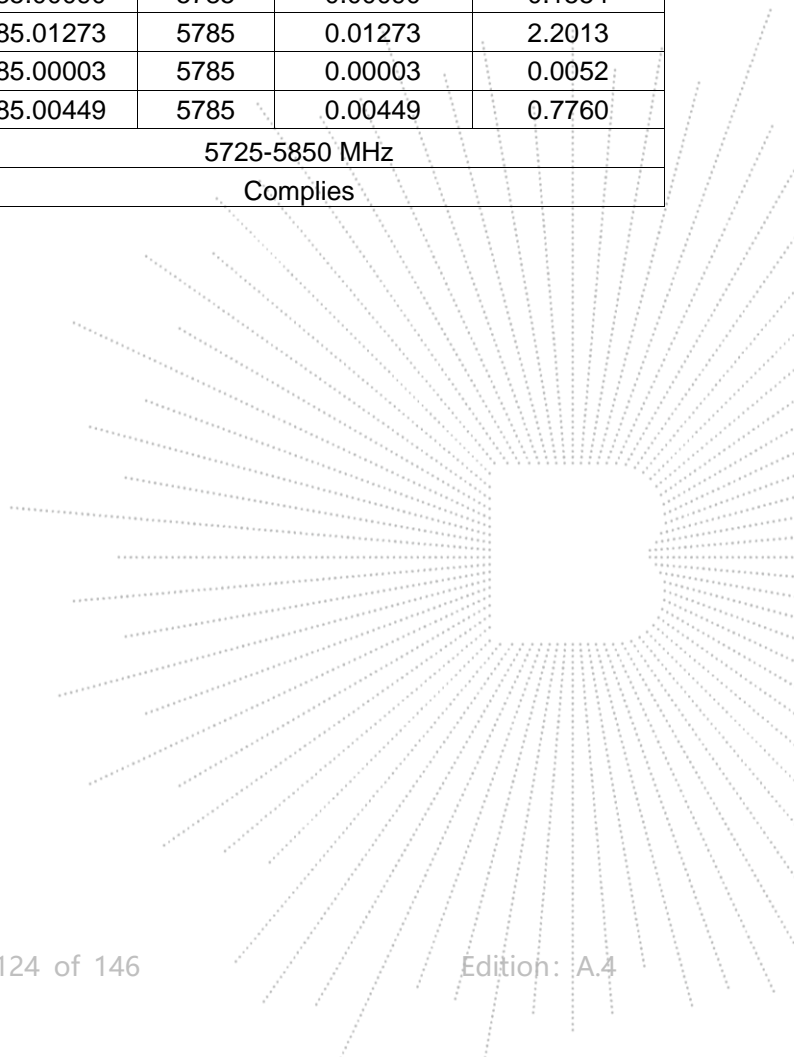
TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	AC 120V	T (°C)	-20	5745.00982	5745	0.00982	1.7085
		T (°C)	-10	5745.00329	5745	0.00329	0.5722
		T (°C)	0	5745.01138	5745	0.01138	1.9804
		T (°C)	10	5745.00966	5745	0.00966	1.6814
		T (°C)	20	5745.00644	5745	0.00644	1.1209
		T (°C)	30	5745.01027	5745	0.01027	1.7876
		T (°C)	40	5745.00191	5745	0.00191	0.3327
		T (°C)	50	5745.00083	5745	0.00083	0.1436
		T (°C)	60	5745.01105	5745	0.01105	1.9237
		T (°C)	70	5745.00250	5745	0.00250	0.4352
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	5785.00565	5785	0.00565	0.9765
		V max (V)	138.00	5785.01351	5785	0.01351	2.3353
		V min (V)	102.00	5785.00096	5785	0.00096	0.1663
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)	AC 120V	T (°C)	-20	5785.00812	5785	0.00812	1.4034
		T (°C)	-10	5785.00313	5785	0.00313	0.5411
		T (°C)	0	5785.01183	5785	0.01183	2.0444
		T (°C)	10	5785.00982	5785	0.00982	1.6979
		T (°C)	20	5785.00542	5785	0.00542	0.9369
		T (°C)	30	5785.01075	5785	0.01075	1.8585
		T (°C)	40	5785.00090	5785	0.00090	0.1554
		T (°C)	50	5785.01273	5785	0.01273	2.2013
		T (°C)	60	5785.00003	5785	0.00003	0.0052
		T (°C)	70	5785.00449	5785	0.00449	0.7760
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	5825.00908	5825	0.00908	1.5581
		V max (V)	138.00	5825.01259	5825	0.01259	2.1618
		V min (V)	102.00	5825.00812	5825	0.00812	1.3932
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)	AC 120V	T (°C)	-20	5825.00125	5825	0.00125	0.2152
		T (°C)	-10	5825.00675	5825	0.00675	1.1579
		T (°C)	0	5825.01194	5825	0.01194	2.0495
		T (°C)	10	5825.00360	5825	0.00360	0.6176
		T (°C)	20	5825.01285	5825	0.01285	2.2058
		T (°C)	30	5825.00543	5825	0.00543	0.9330
		T (°C)	40	5825.00221	5825	0.00221	0.3789
		T (°C)	50	5825.00072	5825	0.00072	0.1234
		T (°C)	60	5825.00597	5825	0.00597	1.0250
		T (°C)	70	5825.00822	5825	0.00822	1.4107
Limits				5725-5850 MHz			
Result				Complies			

## 14. Duty Cycle Of Test Signal

### 14.1 Standard Requirement

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

### 14.2 Formula

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

### 14.3 Test Procedure

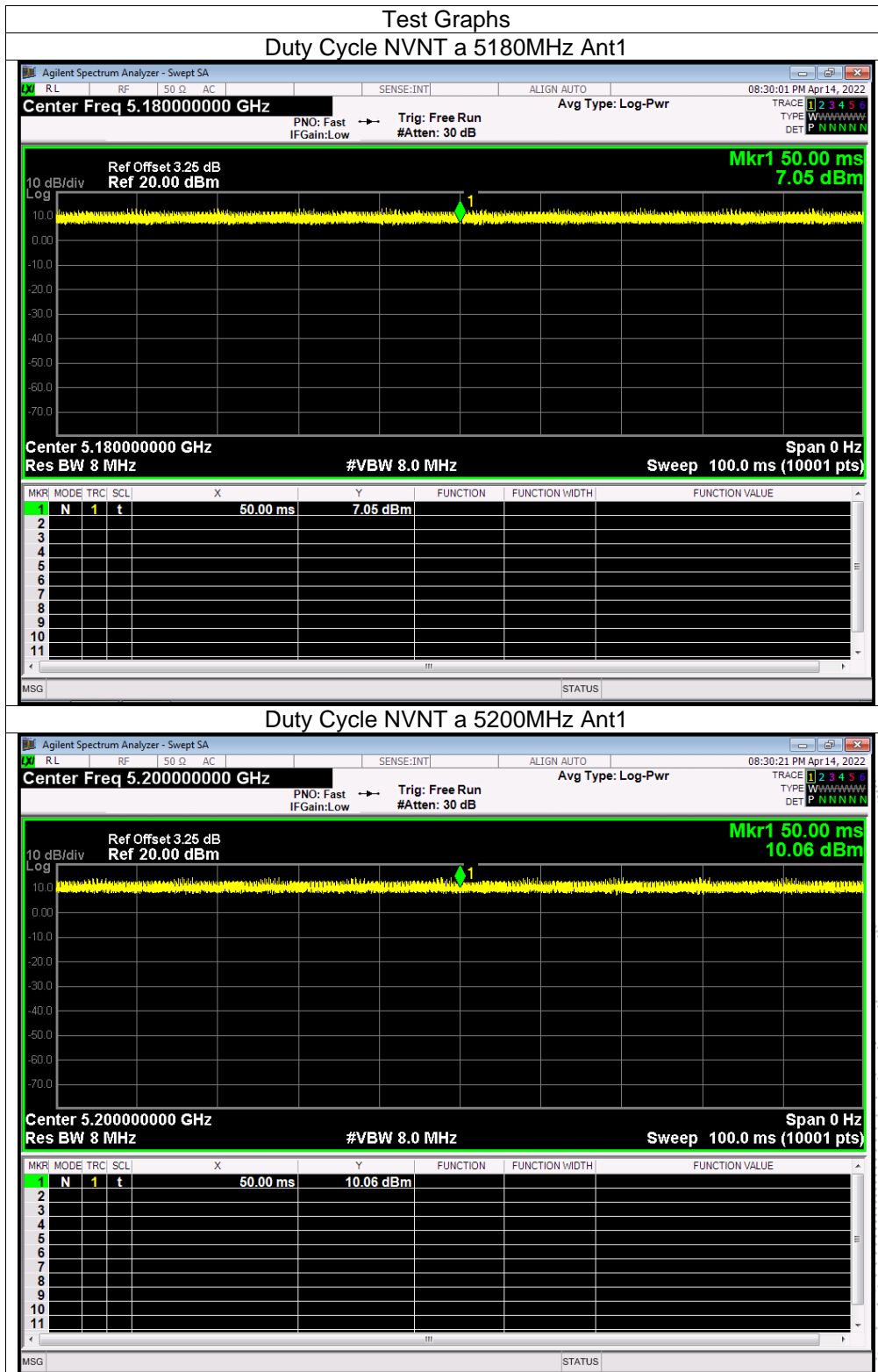
1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

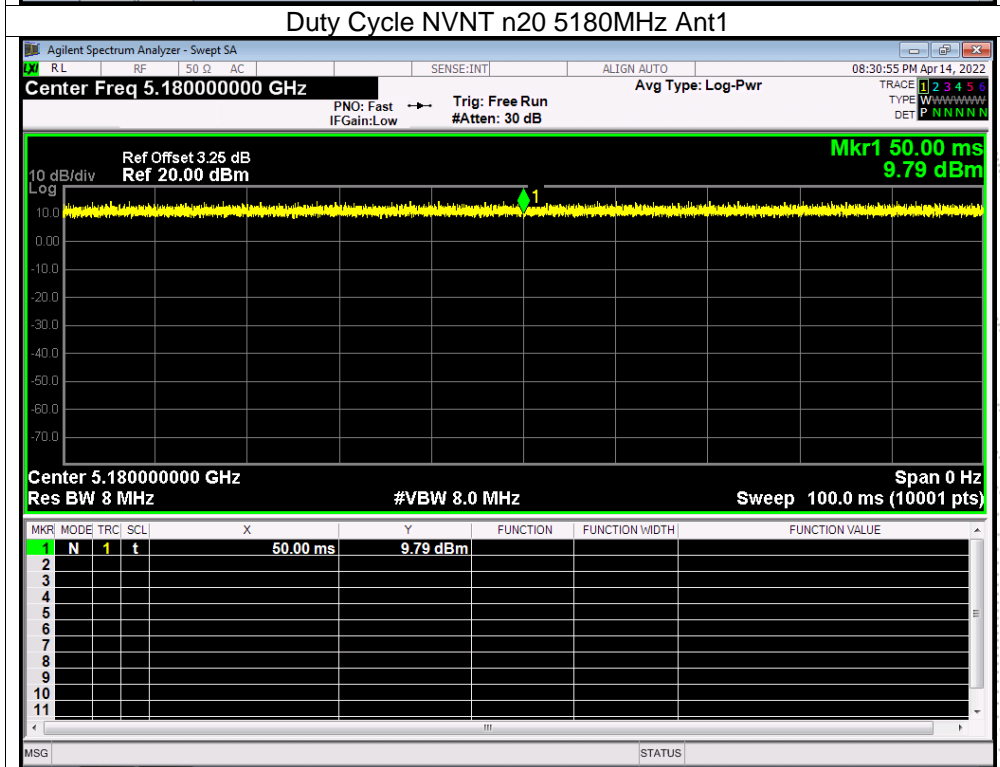
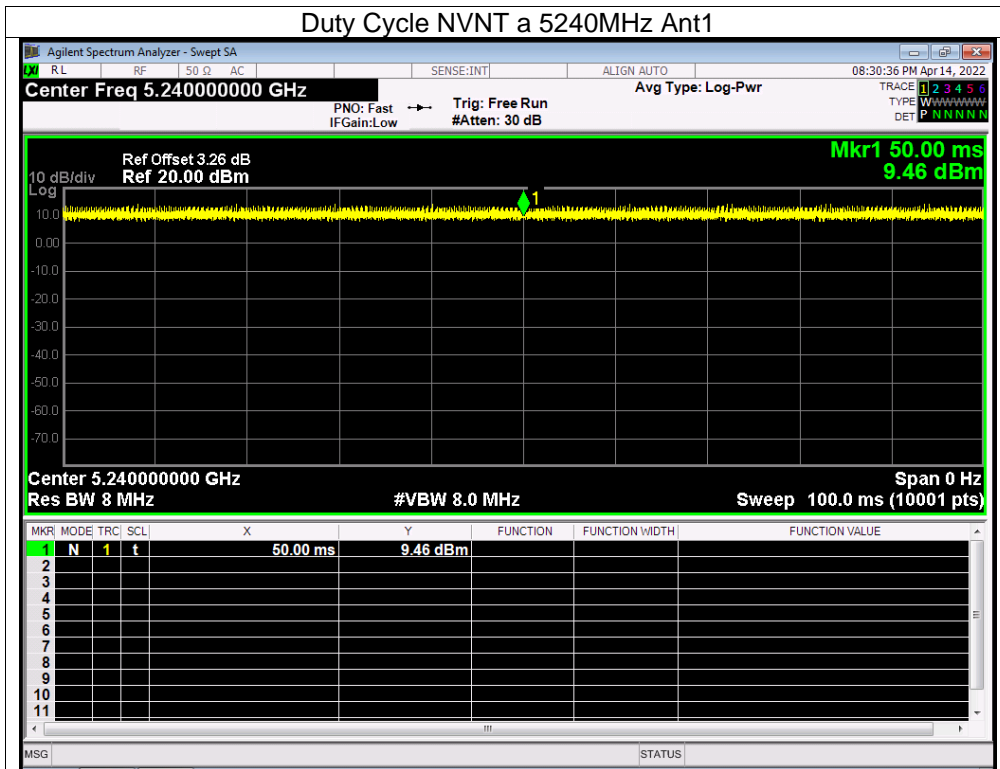
### 14.4 Test Result

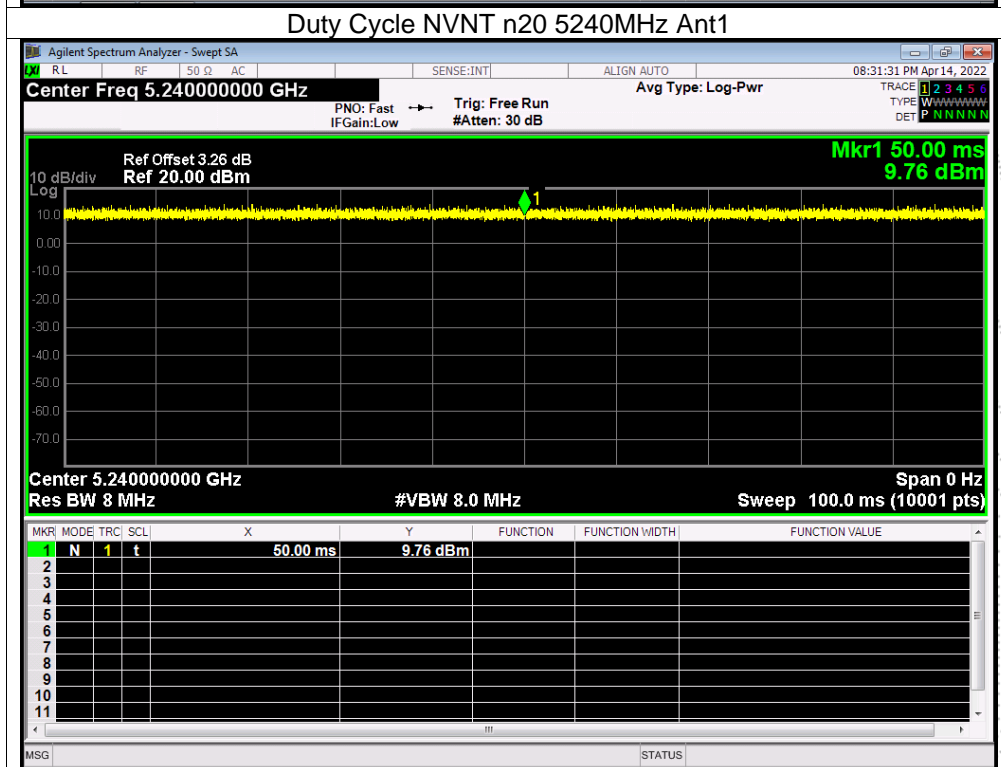
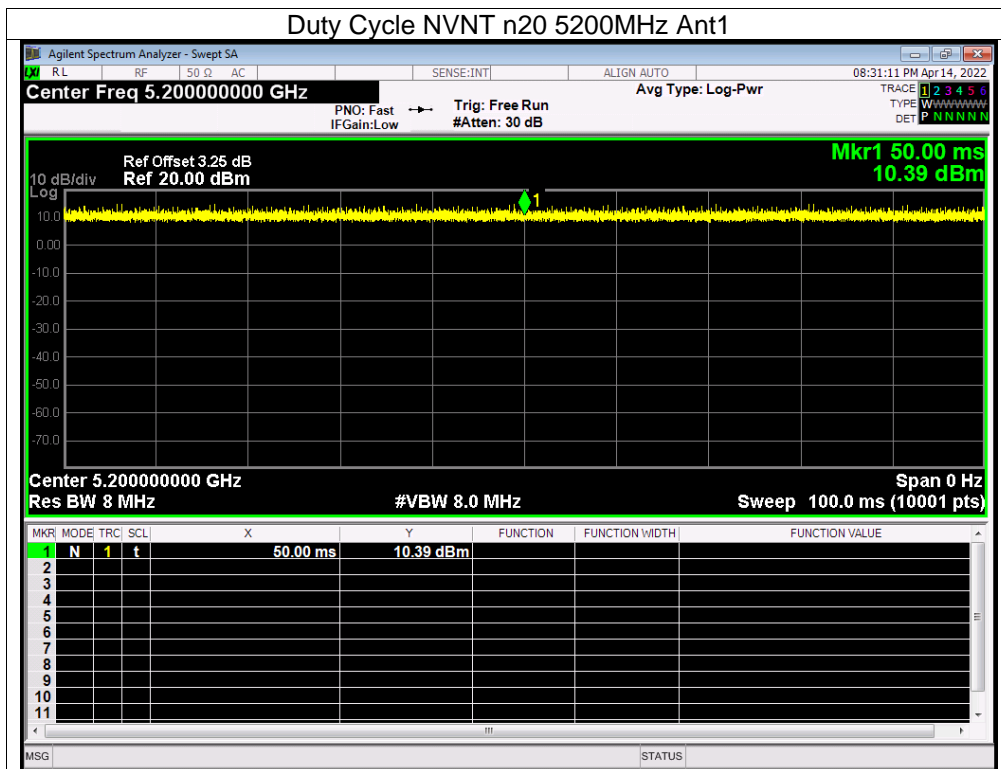
#### 5.1G

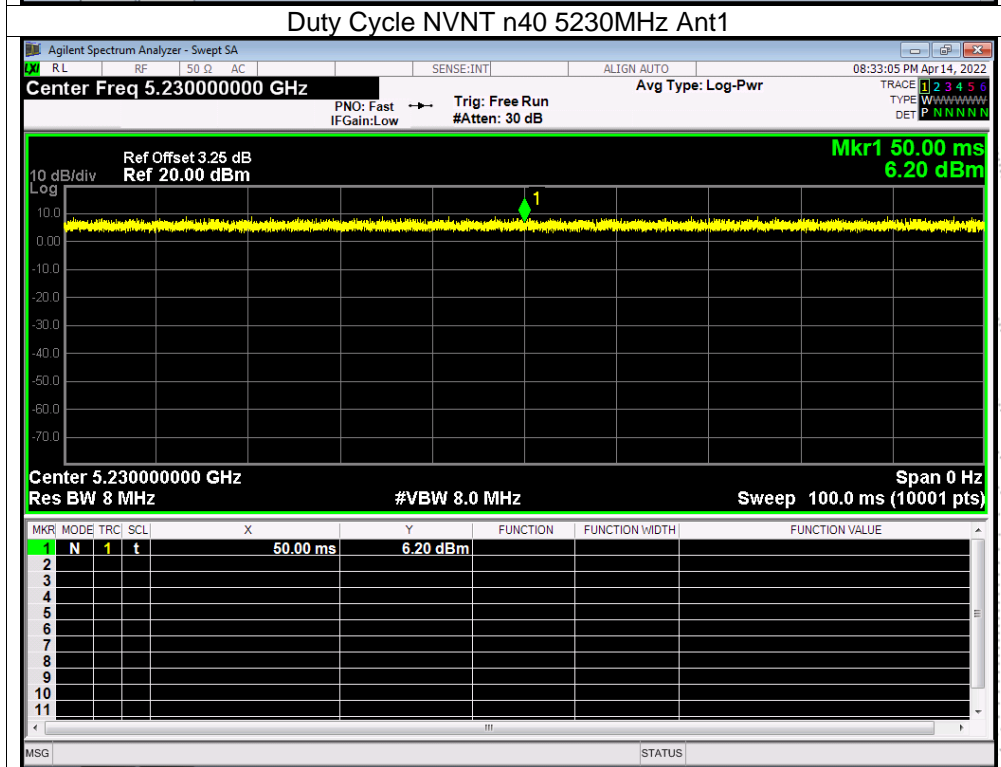
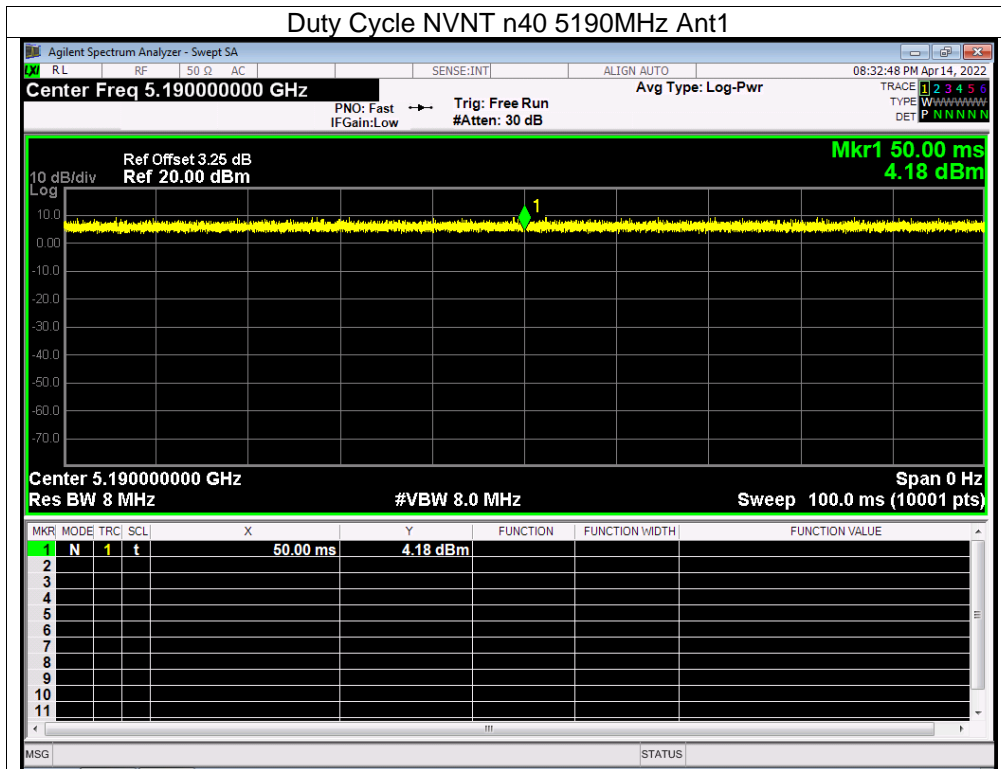
Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	a	5180	100	0	0
NVNT	a	5200	100	0	0
NVNT	a	5240	100	0	0
NVNT	n20	5180	100	0	0
NVNT	n20	5200	100	0	0
NVNT	n20	5240	100	0	0
NVNT	n40	5190	100	0	0
NVNT	n40	5230	100	0	0
NVNT	ac20	5180	100	0	0
NVNT	ac20	5200	100	0	0
NVNT	ac20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

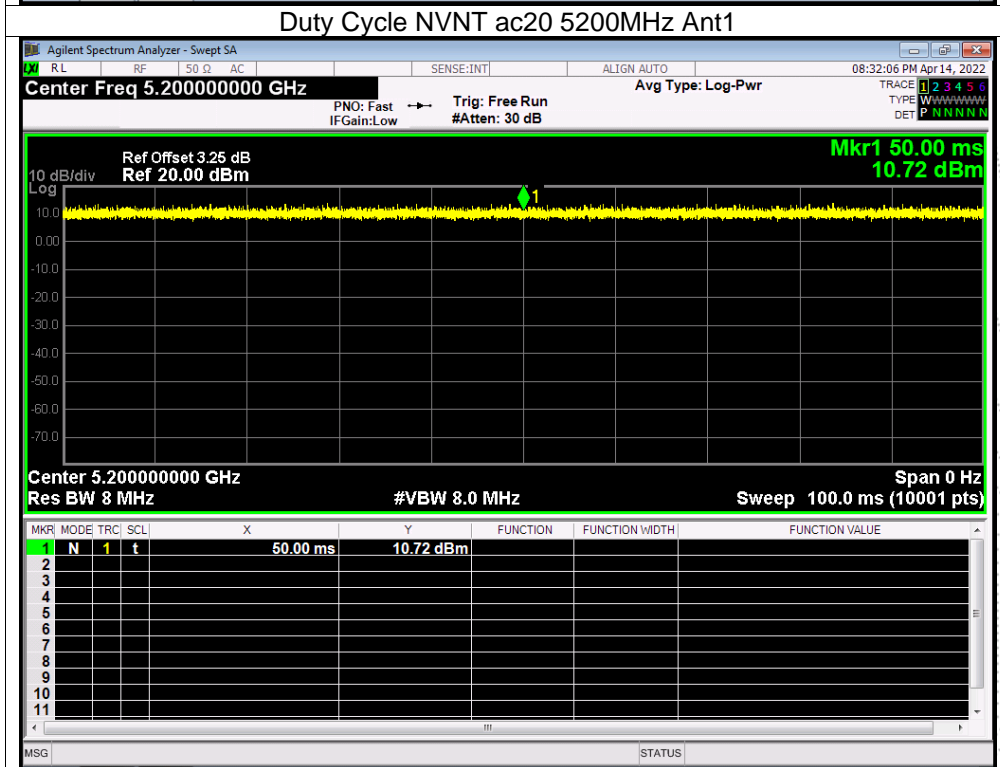
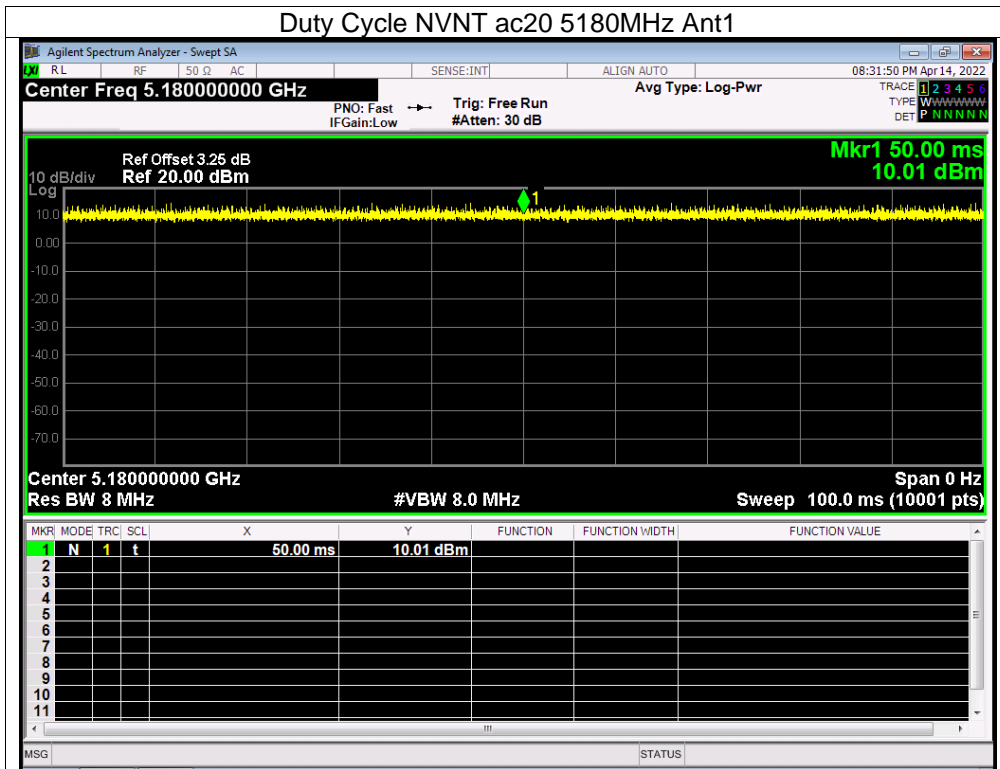


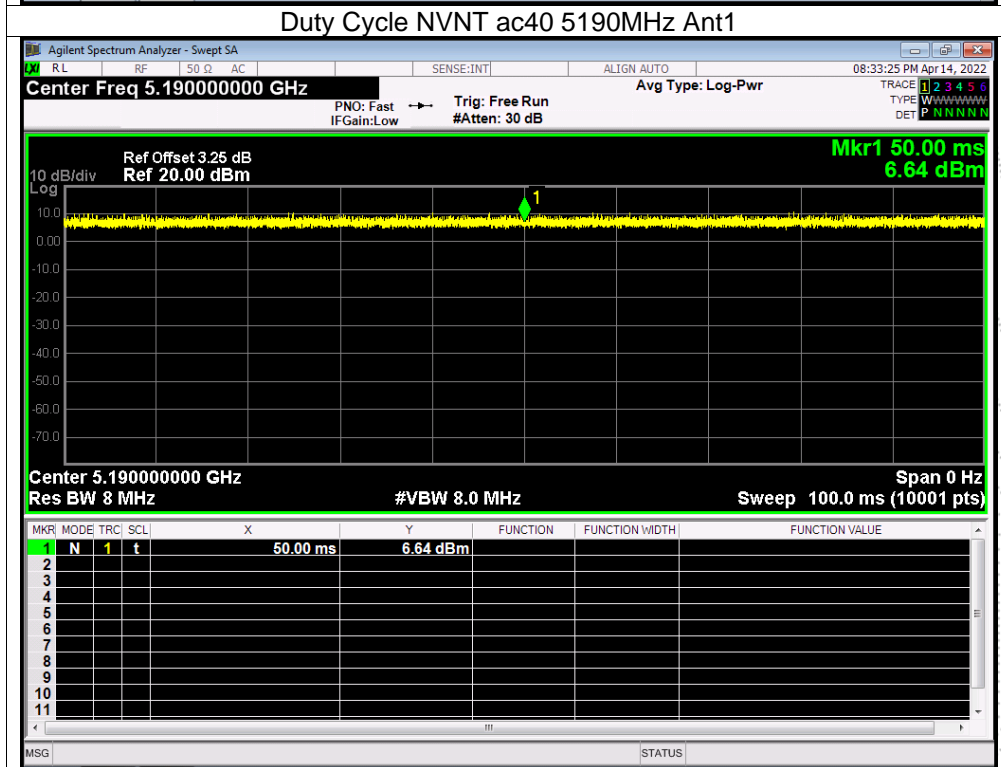
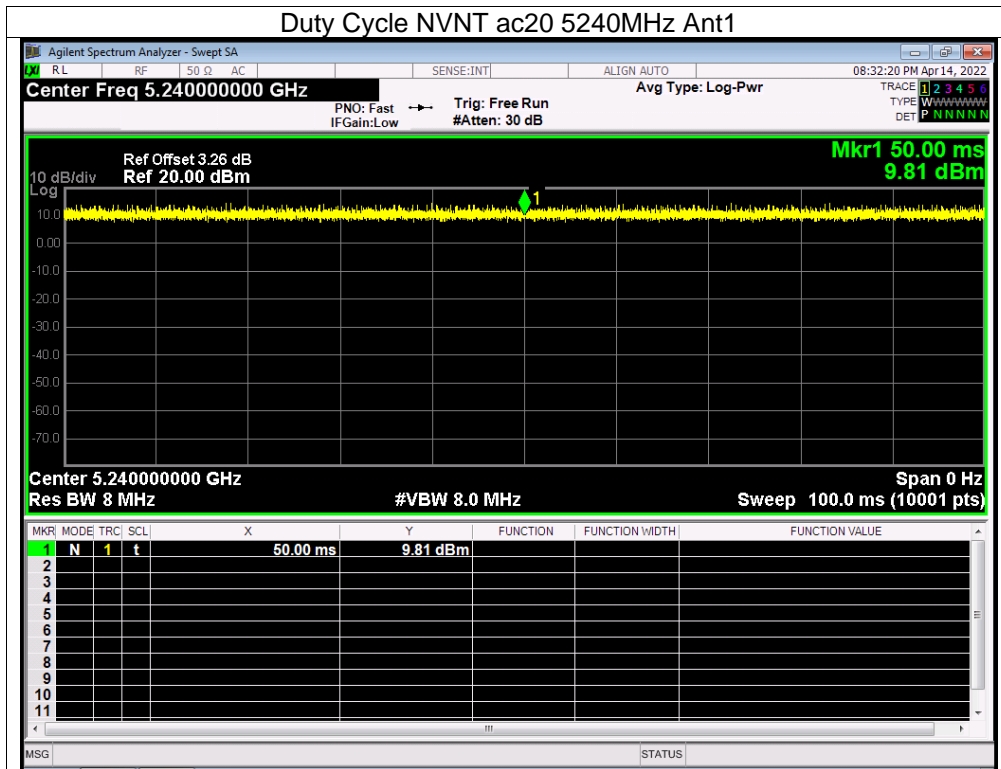


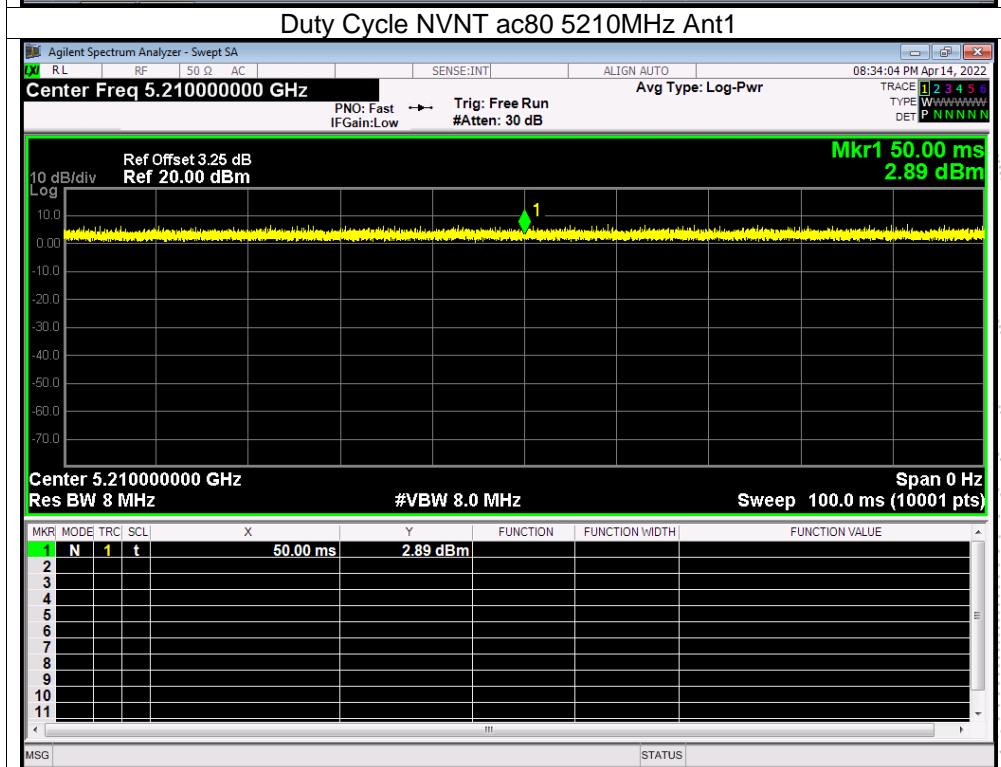
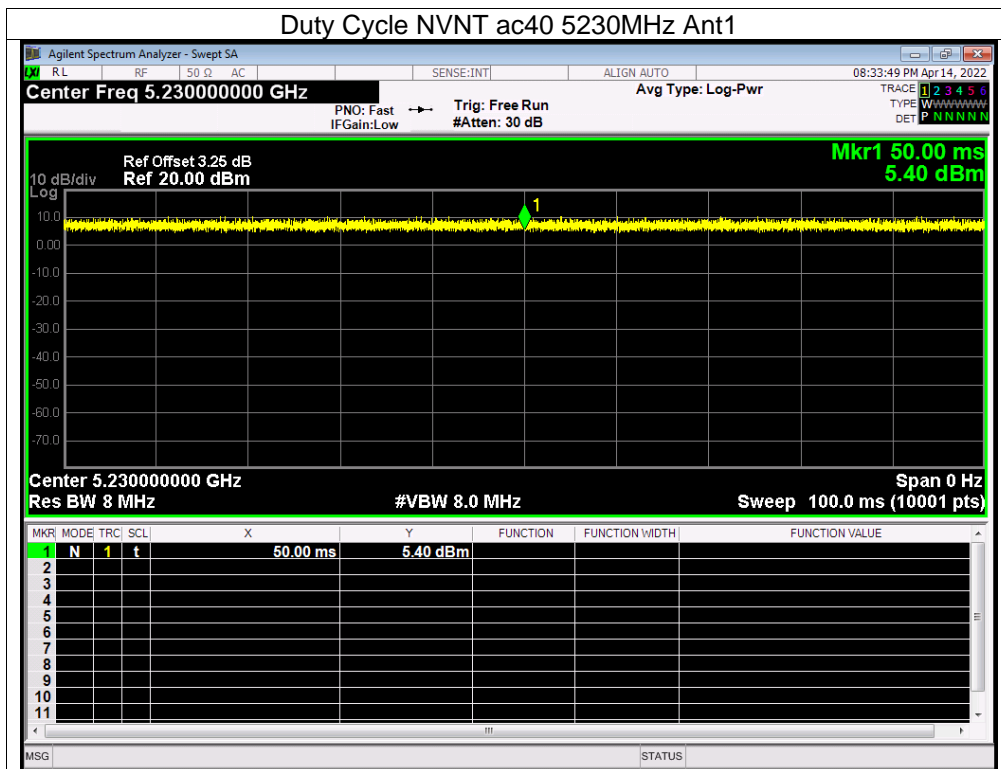






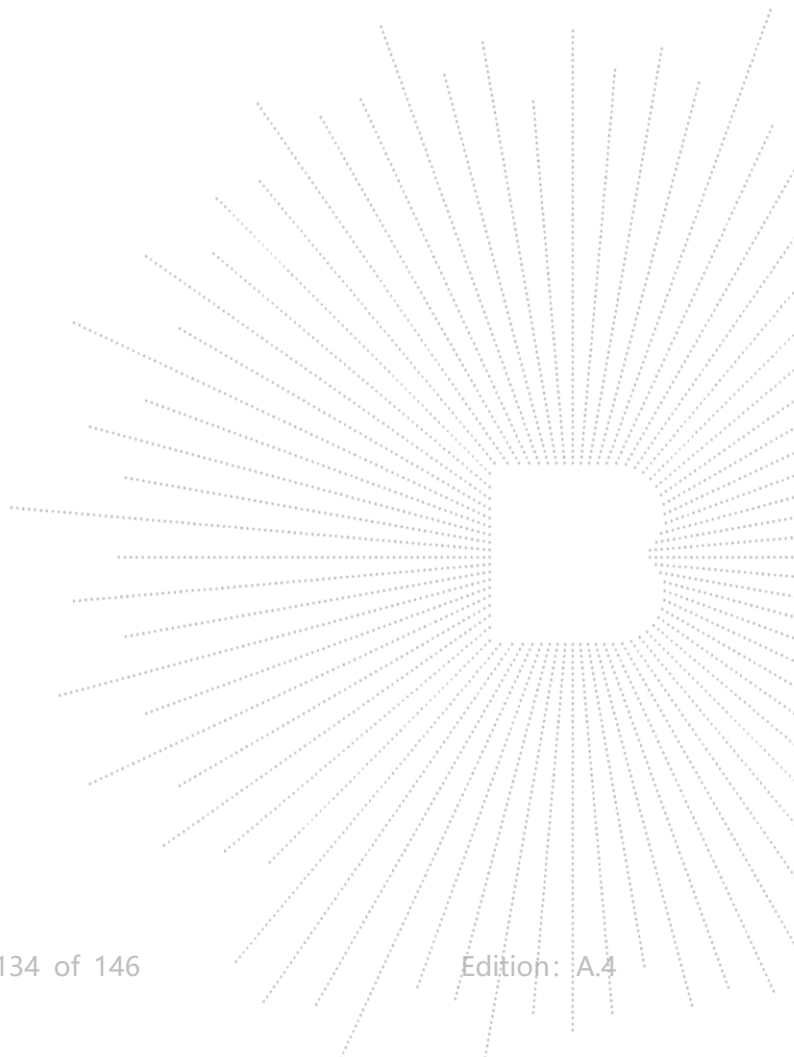




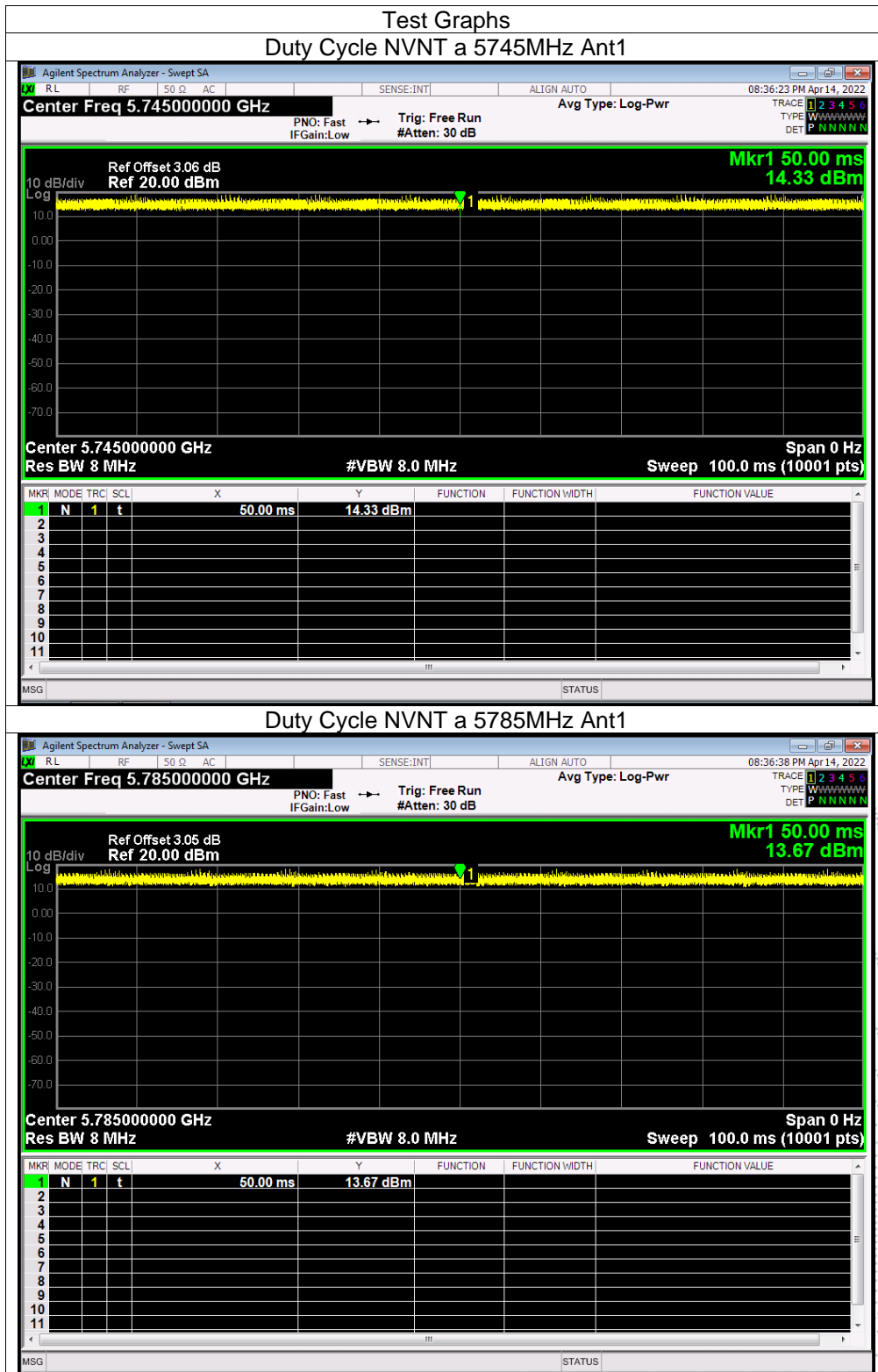


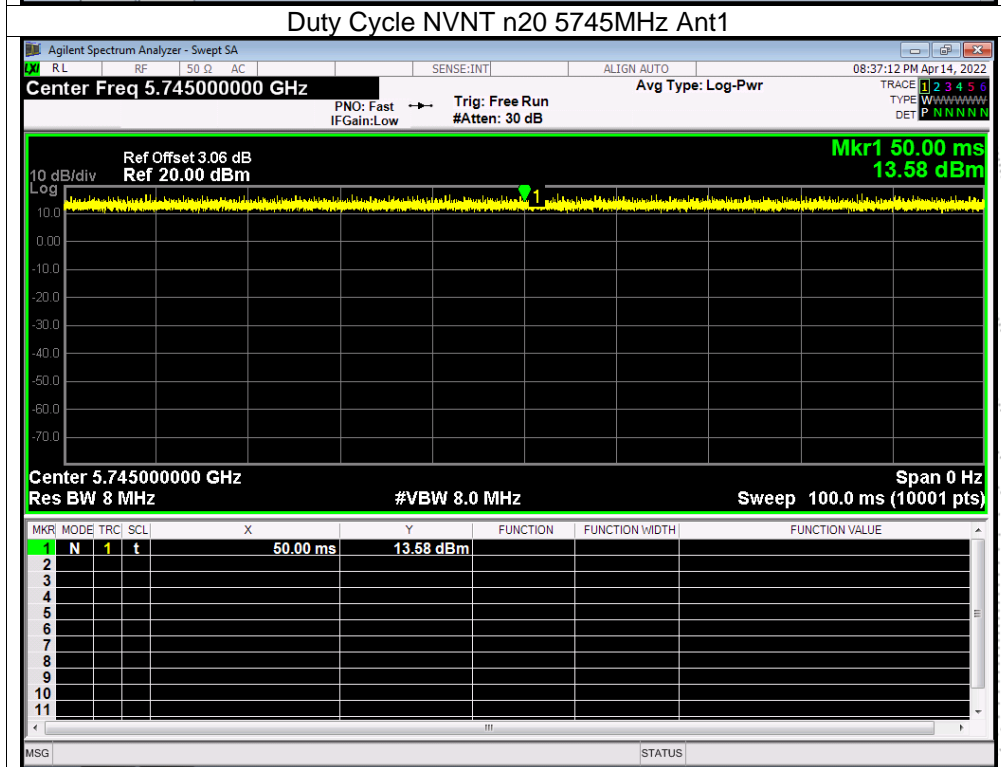
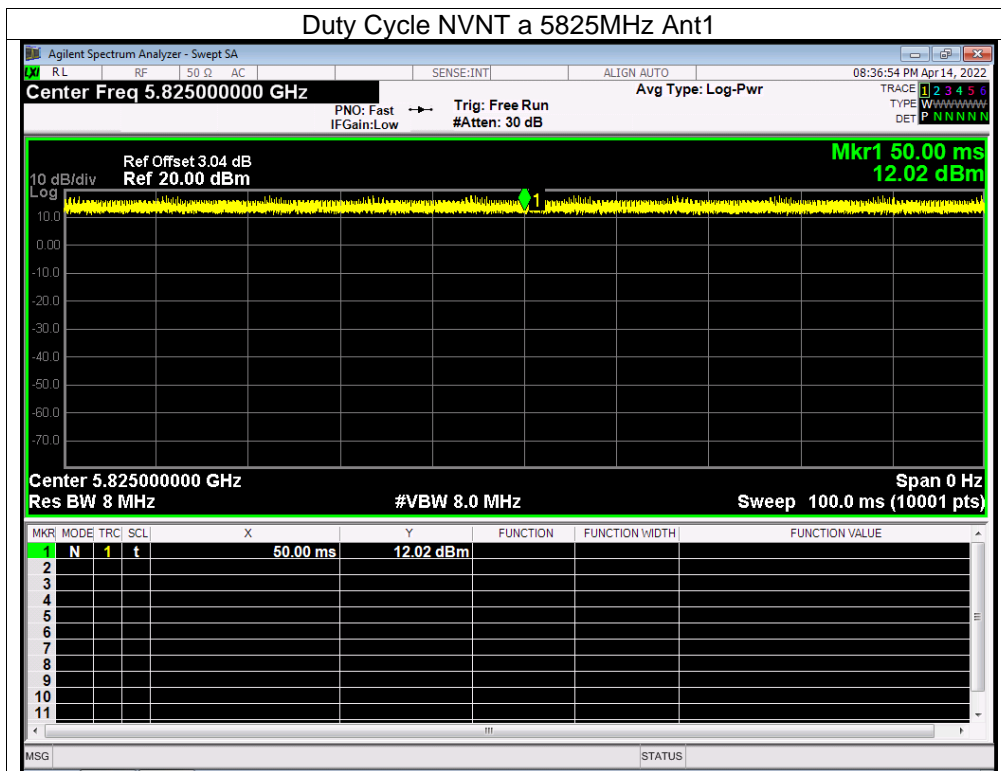
**5.8G**

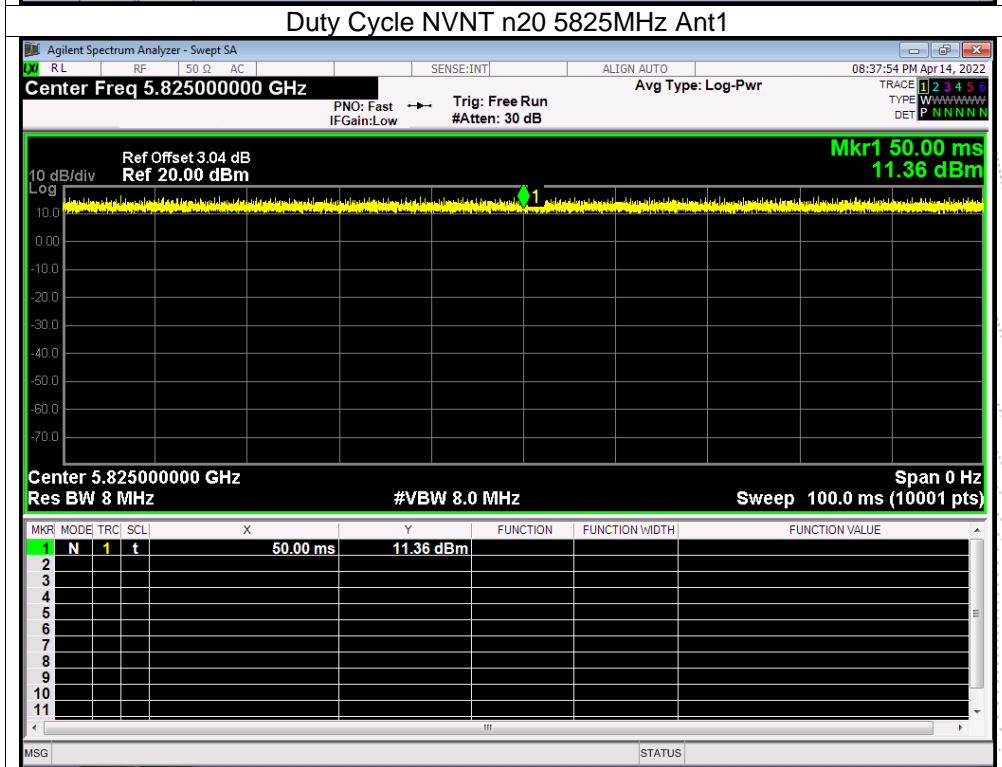
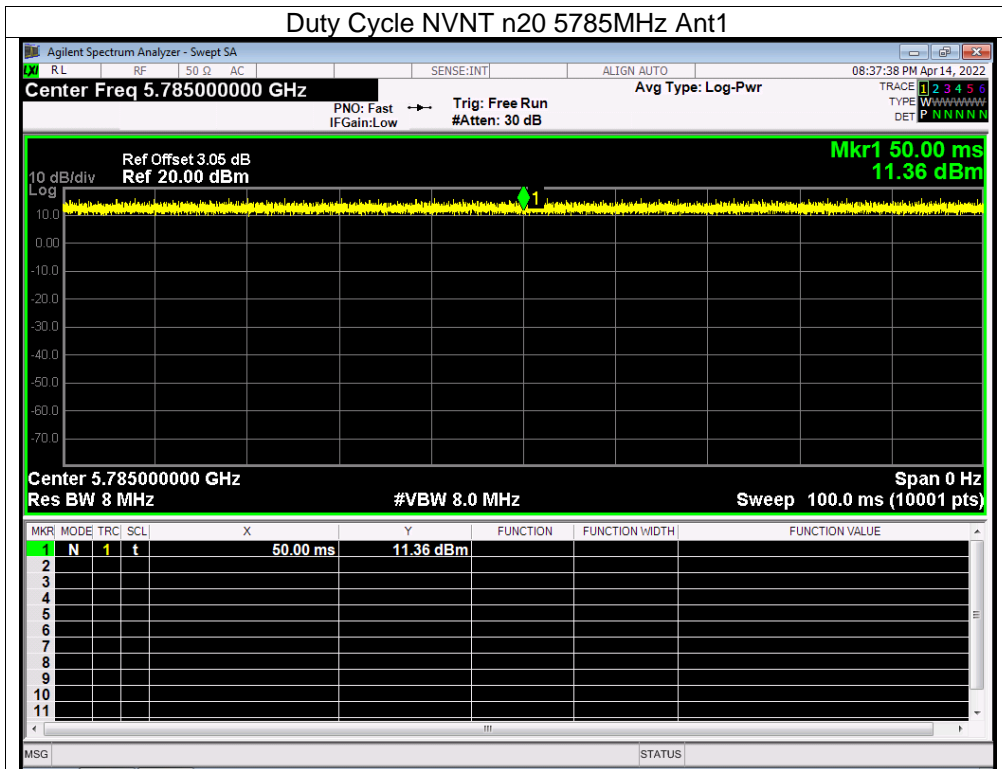
Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	a	5745	100	0	0
NVNT	a	5785	100	0	0
NVNT	a	5825	100	0	0
NVNT	n20	5745	100	0	0
NVNT	n20	5785	100	0	0
NVNT	n20	5825	100	0	0
NVNT	n40	5755	100	0	0
NVNT	n40	5795	100	0	0
NVNT	ac20	5745	100	0	0
NVNT	ac20	5785	100	0	0
NVNT	ac20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

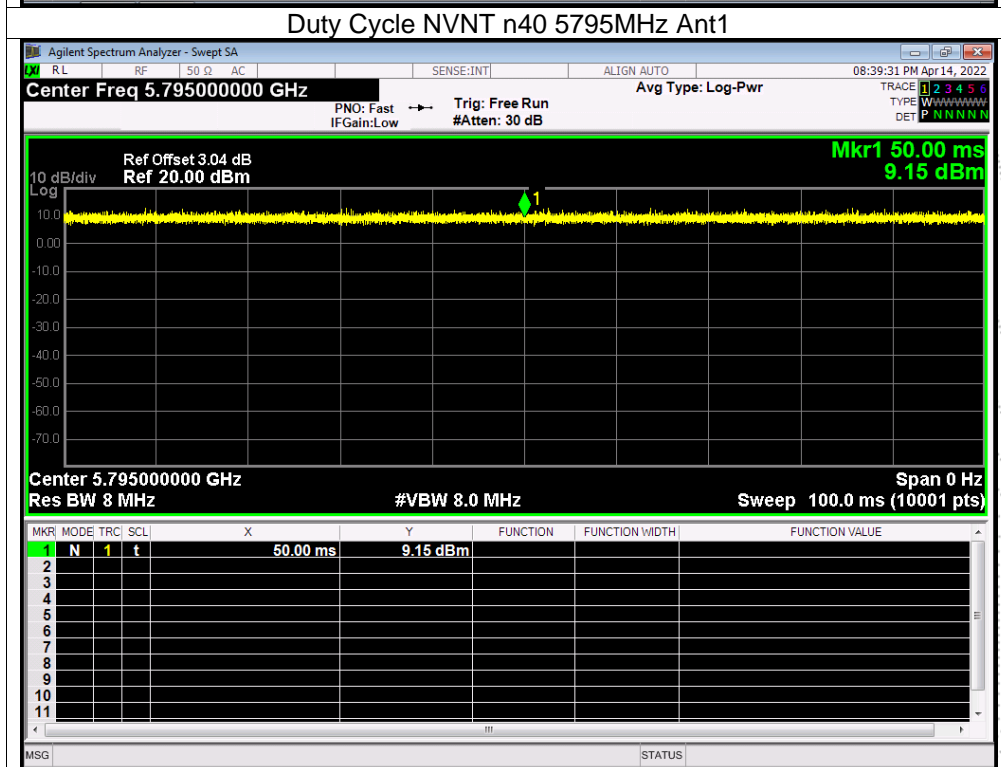
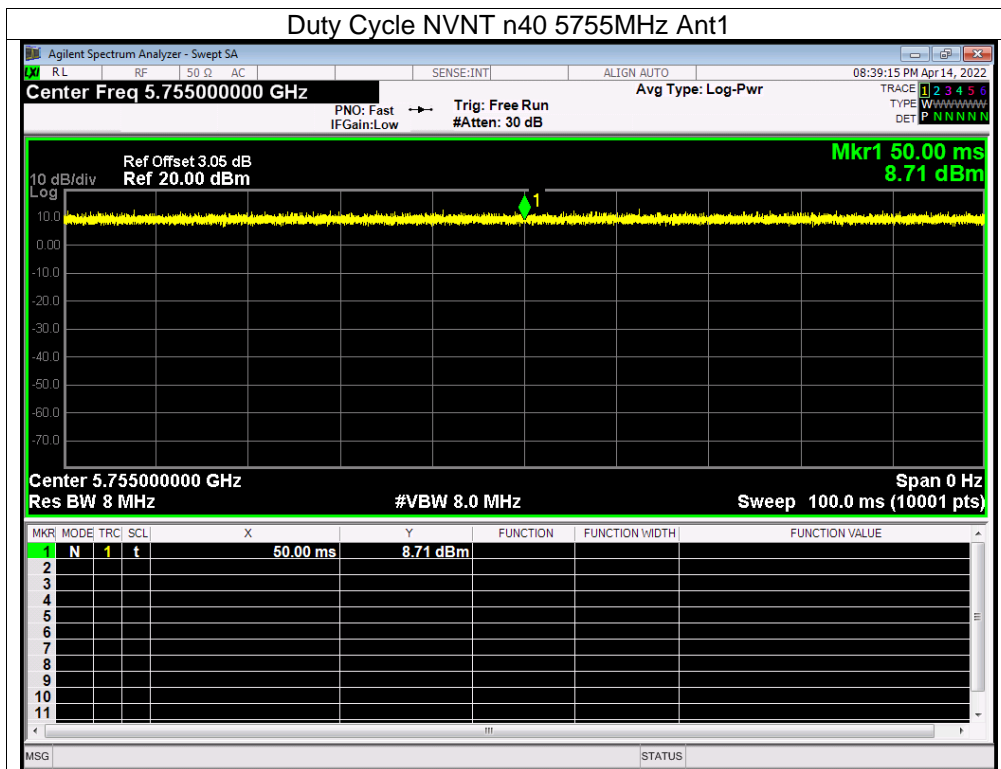


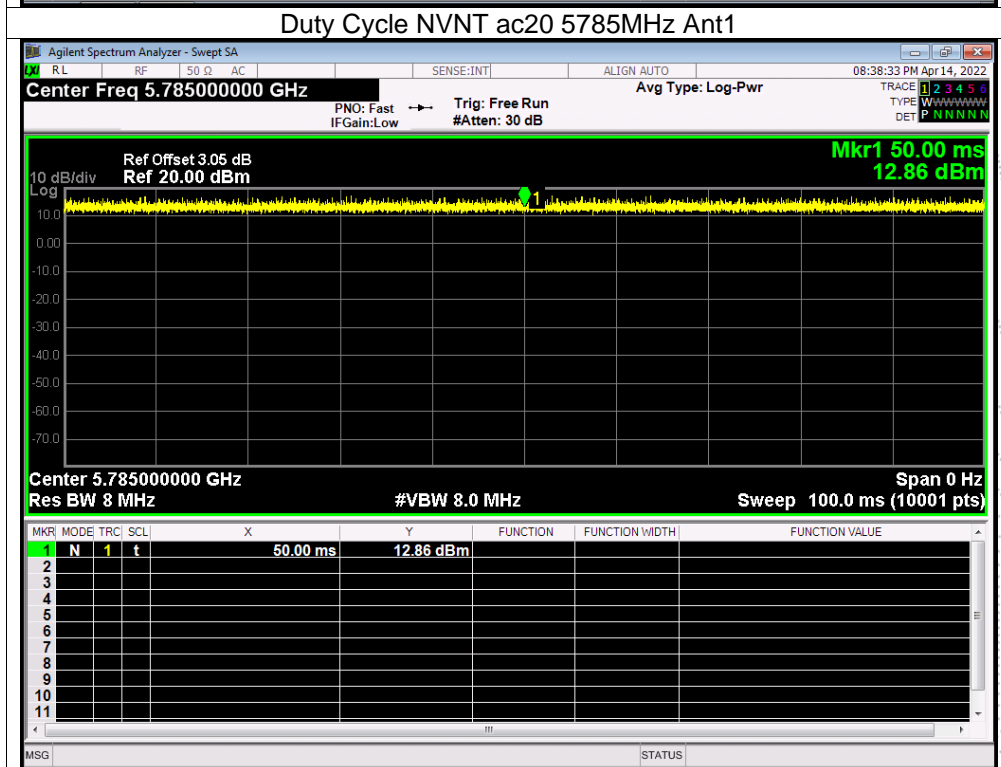
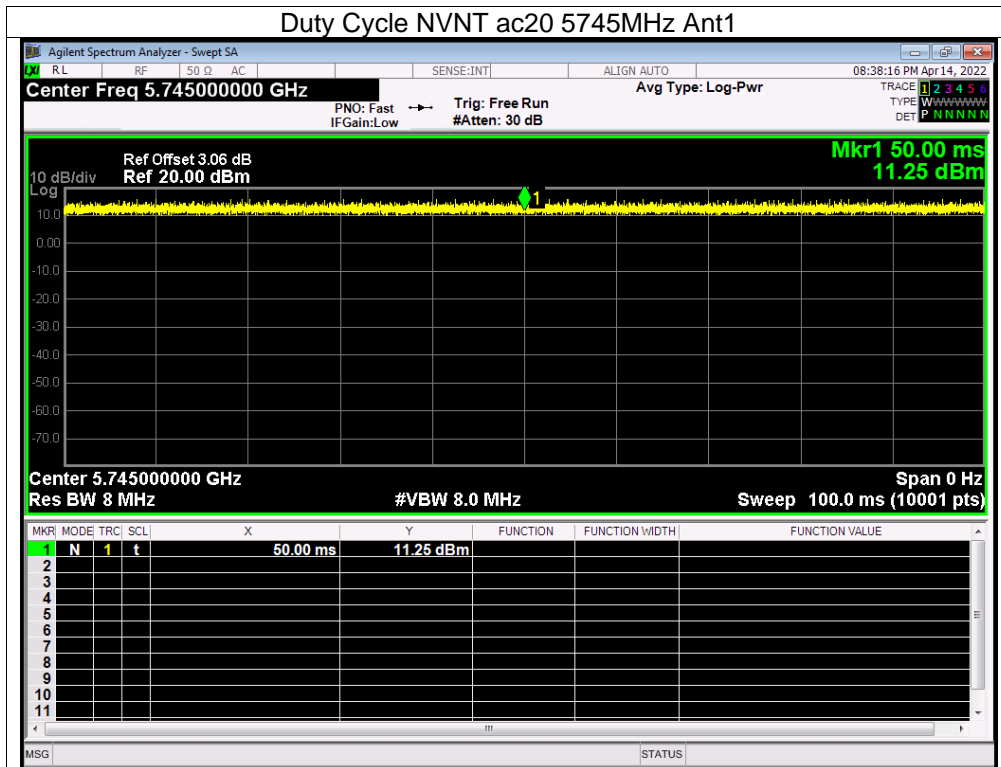


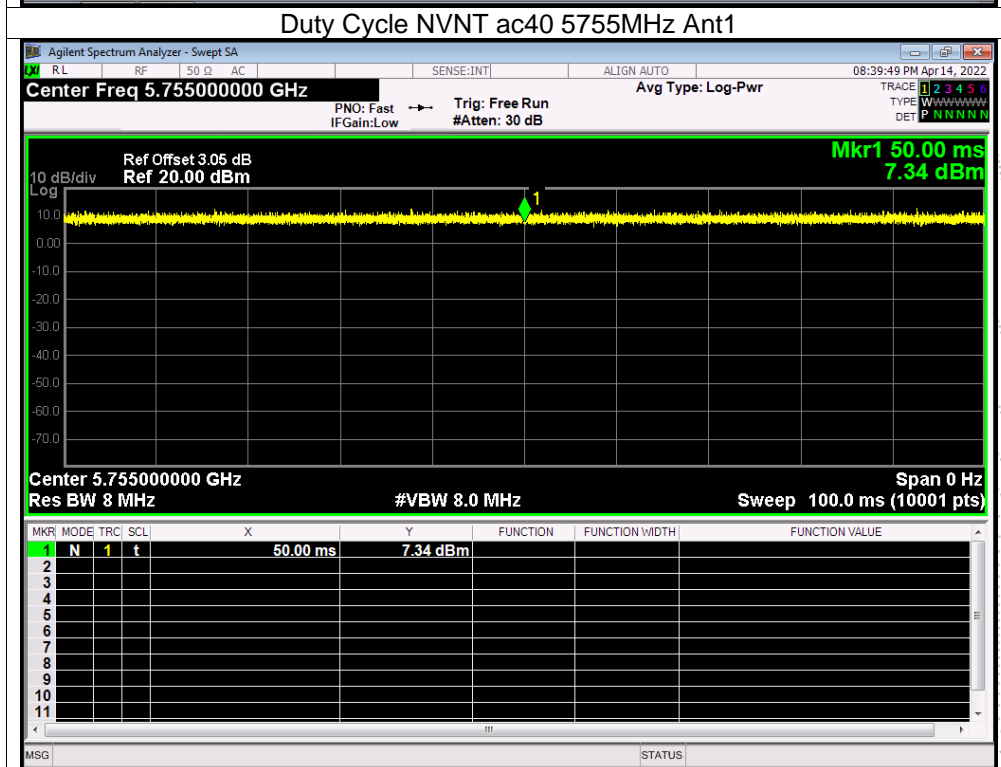
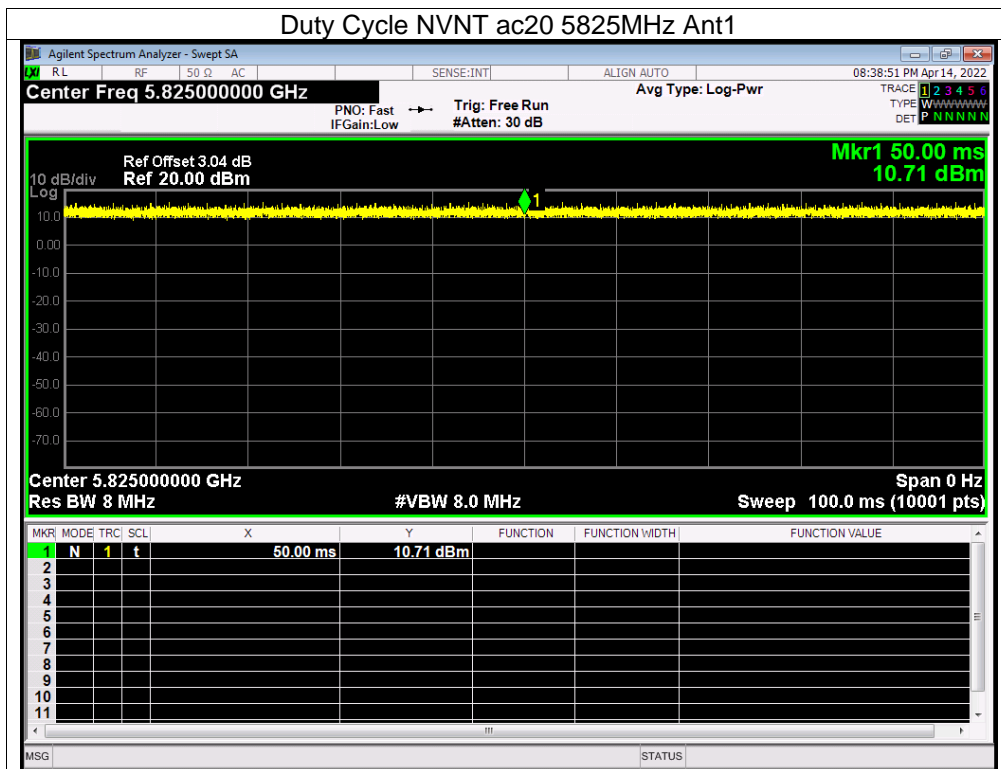


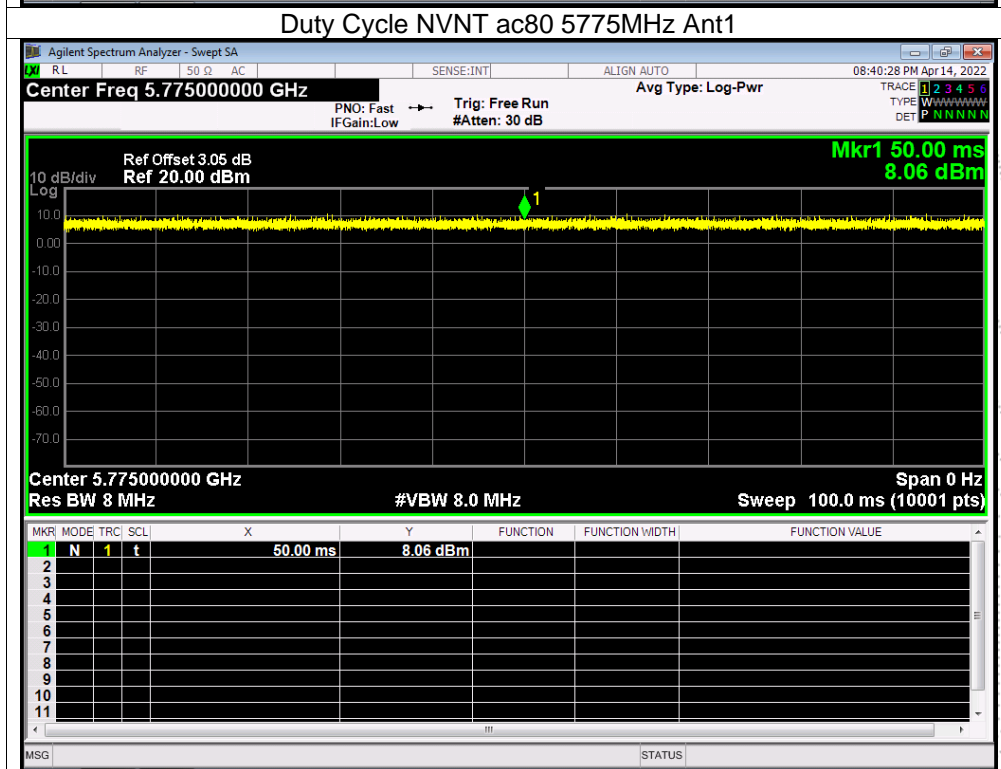
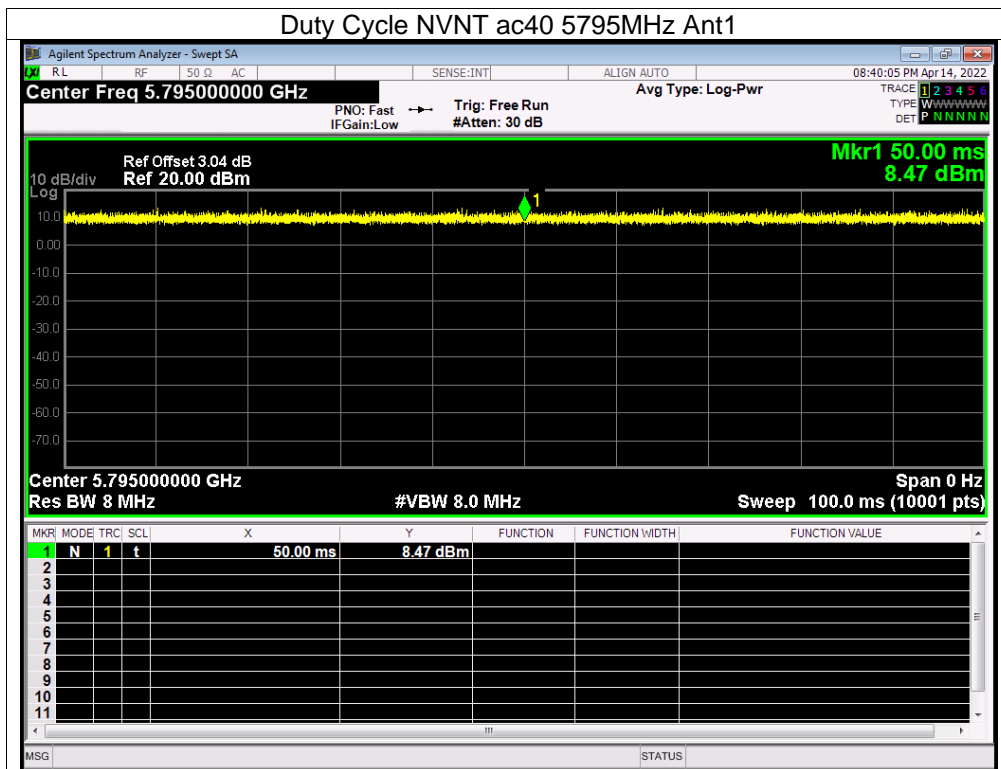












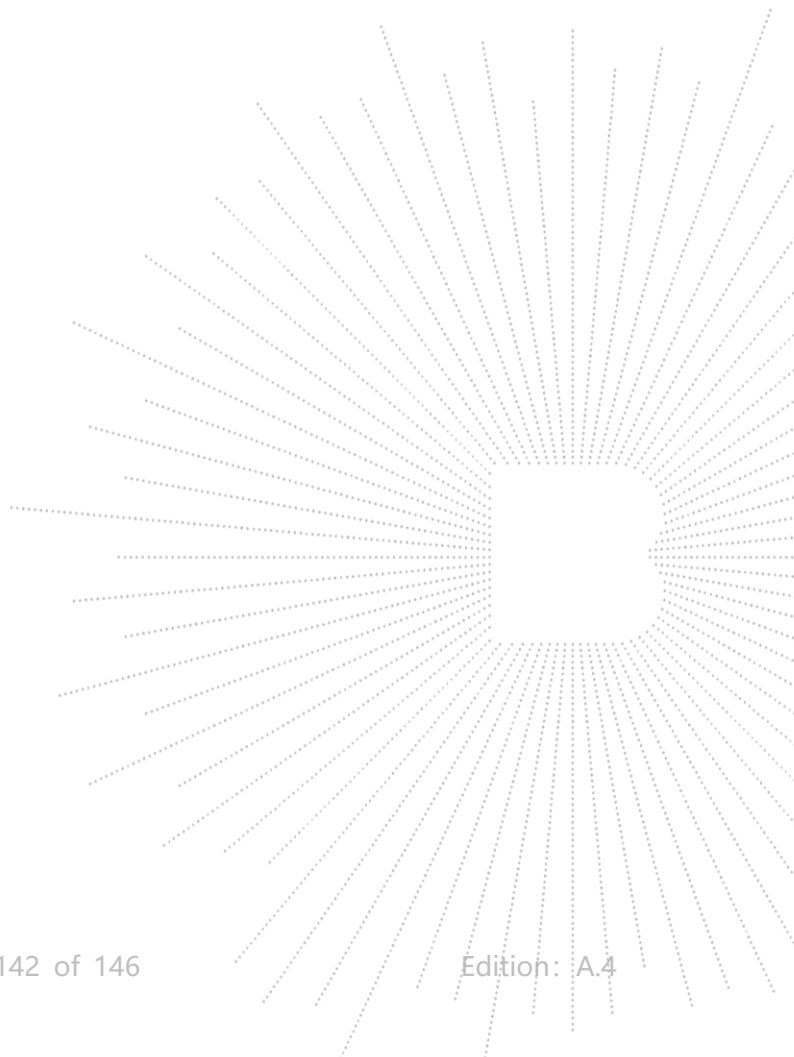
## 15. Antenna Requirement

### 15.1 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.

### 15.2 Test Result

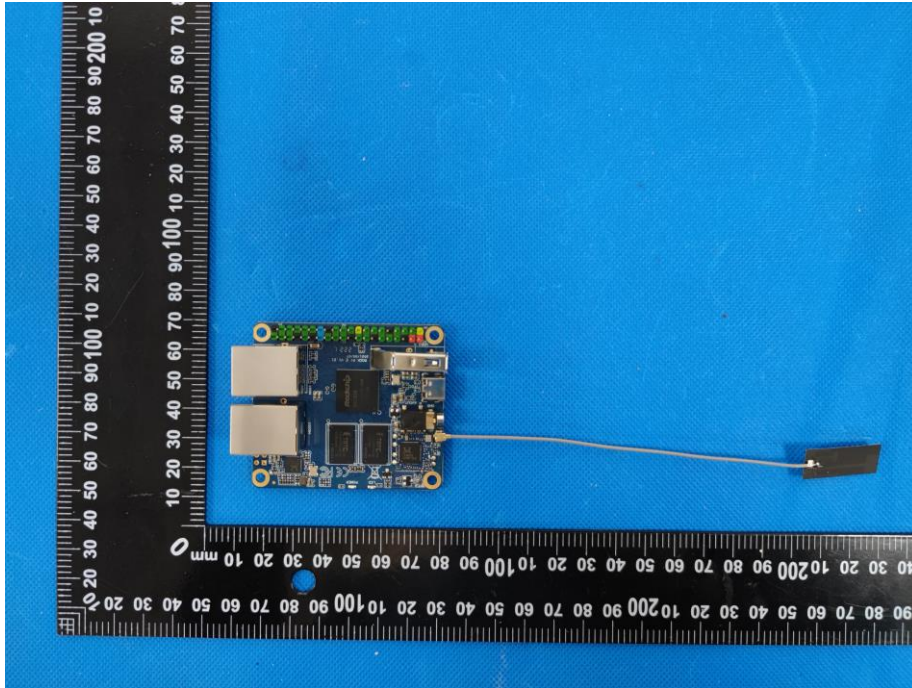
The EUT antenna is FPCB antenna, fulfill the requirement of this section.



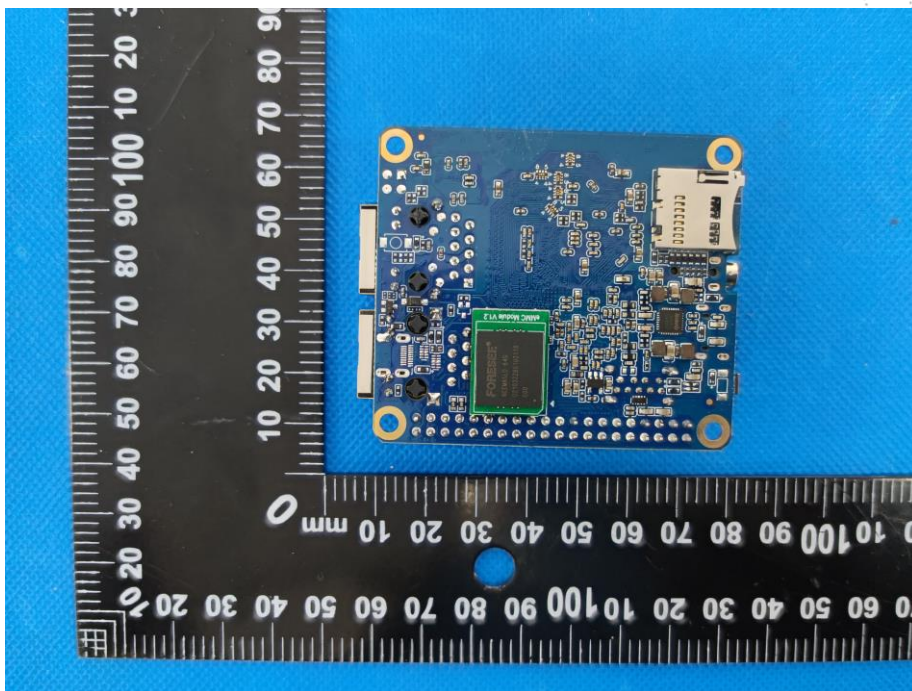


**16. EUT Photographs**

**EUT Photo 1**

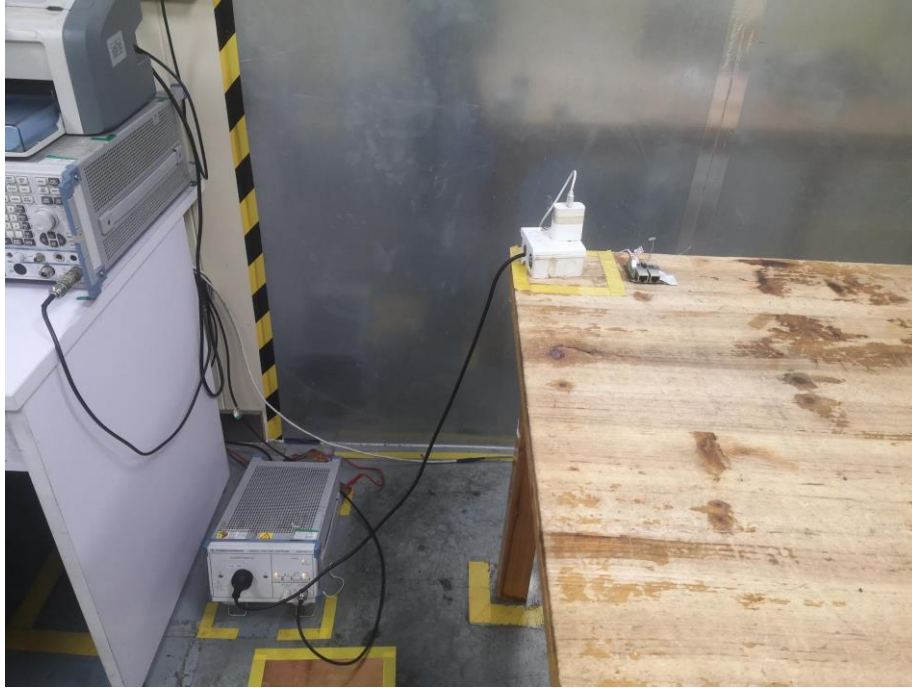


**EUT Photo 2**

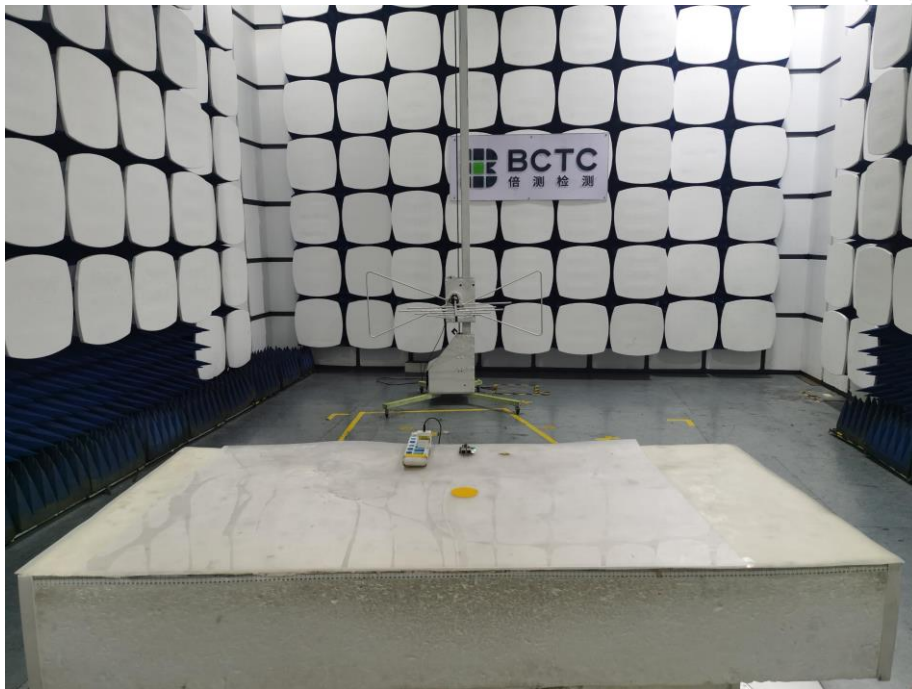


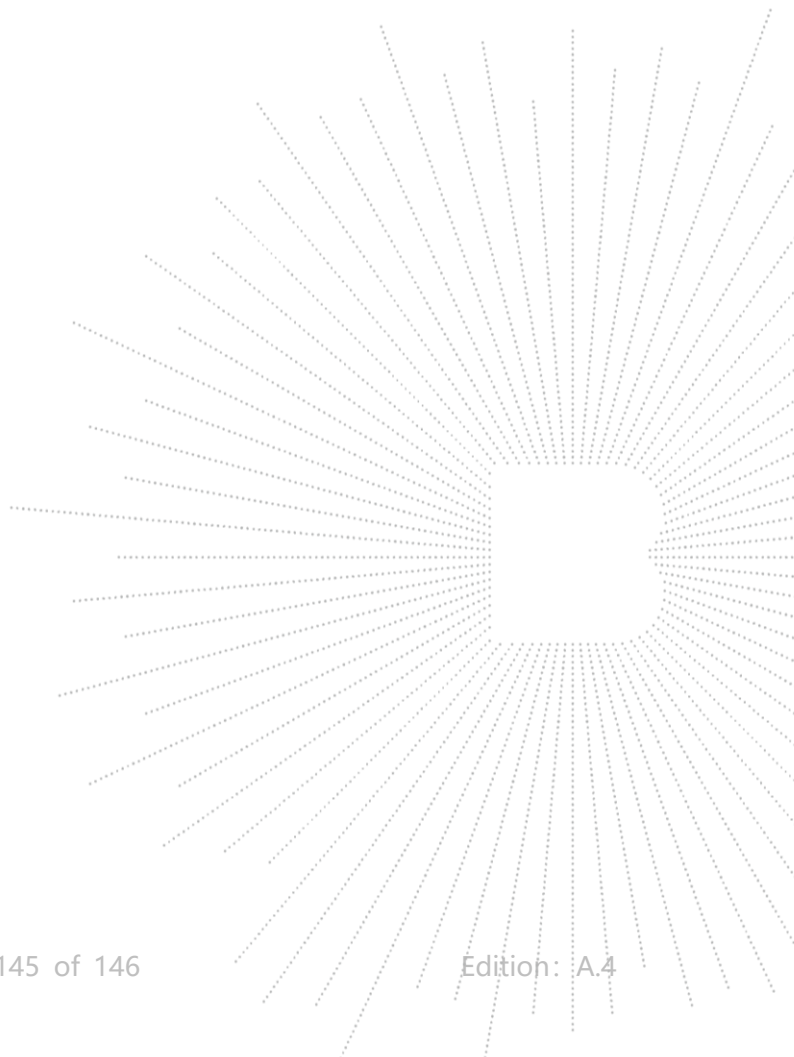
### 17. EUT Test Setup Photographs

#### Conducted Measurement Photo



#### 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](mailto:bctc@bctc-lab.com.cn)

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

