TEST REPORT

Report No:	TW2501162-04E
Applicant:	DMR Technologies
Product:	Agricultural unmarmed drone
Model No:	Field Ranger X50, Field Ranger
Trademark:	N/A
Test Standards:	FCC Part 15 Subpart E, Paragraph 15.407
Test result:	It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15 Subpart C, Paragraph 15.407 regulations for the evaluation of electromagnetic compatibility

Approved By

Terry Tang

Manager

Dated: February 10, 2025

Results appearing herein relate only to the sample tested
The technical reports is issued errors and omissions exempt and is subject to withdrawal at

SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com

Special Statement:

FCC-Registration No.: 744189

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

CAB identifier: CN0033

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Test Report Conclusion

Content

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1.0 **General Details**

1.1 Test Lab Details

Name: SHENZHEN TIMEWAY TESTING LABORATORIES.

Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Telephone: (755) 83448688

Fax: (755) 83442996

Site Listed with Federal Communications commission (FCC)

Registration Number:744189

For 3m Anechoic Chamber

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A

For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: DMR Technologies

Address: 2050 15th St., Detroit, MI 48216

1.3 Description of EUT

Product:	Agricultural unmarmed drone
Manufacturer:	DMR Technologies
Address:	2050 15th St., Detroit, MI 48216
Trademark:	N/A
Additional Trademark:	N/A
Model Number:	Field Ranger X50
Additional Model Number: Field Ranger	
Hardware Version:	2.0
Software Version:	V6.7.2.0
Battery:	DC76.5V, 30000mAh Li-ion battery
Type of Modulation	OFDM
Frequency List:	5750MHz, 5780MHz, 5800MHz, 5820MHz
Antenna:	Integral antennas used. The gain of the antennas is 1.87dBi maximum for each. (Get from the antenna specification provided the applicant)
Frequency Selection	By software

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1.4 Submitted Sample:2 Samples

1.5 Test Duration

2025-01-21 to 2025-02-20

1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions below 1GHz Uncertainty =4.7dB

Radiated Emissions above 1GHz Uncertainty =6.0dB

Conducted Power Uncertainty =6.0dB

Occupied Channel Bandwidth Uncertainty =5%

Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.7 Test Engineer

The sample tested by

Print Name: Andy Xia

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2.0 Test Equipment					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2024-07-12	2025-07-11
LISN	R&S	EZH3-Z5	100294	2024-07-12	2025-07-11
LISN	R&S	EZH3-Z5	100253	2024-07-12	2025-07-11
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2024-07-12	2025-07-11
Loop Antenna	EMCO	6507	00078608	2022-07-18	2025-07-17
Spectrum	R&S	FSIQ26	100292	2024-07-12	2025-07-11
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2022-07-18	2025-07-17
Horn Antenna	R&S	BBHA 9120D	9120D-631	2022-07-18	2025-07-17
Power meter	Anritsu	ML2487A	6K00003613	2024-07-12	2025-07-11
Power sensor	Anritsu	MA2491A	32263	2024-07-12	2025-07-11
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2022-07-18	2025-07-17
9*6*6 Anechoic	--	--	N/A	2022-07-26	2025-07-25
EMI Test Receiver	RS	ESVB	826156/011	2024-07-12	2025-07-11
EMI Test Receiver	RS	ESCS 30	834115/006	2024-07-12	2025-07-11
Spectrum	HP/Agilent	E4407B	MY50441392	2024-07-12	2025-07-11
Spectrum	RS	FSP	1164.4391.38	2024-07-12	2025-07-11
RF Cable	Zhengdi	ZT26-NJ-NJ-8M/FA	--	2024-07-12	2025-07-11
RF Cable	Zhengdi	7m	--	2024-07-12	2025-07-11
Pre-Amplifier	Schwarebeck	BBV9743	#218	2024-07-12	2025-07-11
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2024-07-12	2025-07-11
LISN	SCHAFFNER	NNB42	00012	2024-07-12	2025-07-11
ESPI Test Receiver	R&S	ESPI 3	100379	2024-07-12	2025-07-11
LISN	R&S	EZH3-Z5	100294	2024-07-12	2025-07-11

2.2 Automation Test Software

For Conducted Emission Test

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

For Radiated Emissions

Name	Version
EMI Test Software BL410-EV18.91	V18.905
EMI Test Software BL410-EV18.806 High Frequency	V18.06

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3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.407	Conducted Emission Test	N/A	N/A
FCC Part 15 Subpart E Paragraph 15.407 (b1/4/5/6/7), Part 15.205 and Part 15.209	Undesirable Emission and Restrict band	Pass	Complies
FCC Part 15, Paragraph 15.407 (a1/2/3)	Peak Transmit Power	Pass	Complies
FCC Part 15, Paragraph 15.407 (a)(6)	Peak Power Excursion	Pass	Complies
FCC Part 15, Paragraph 15.407 (a/1/2/3)	Peak Power Spectral Density	Pass	Complies
FCC Part 15, Paragraph 15.407(g)	Frequency Stability	Pass	Complies

3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.407, ANSI C63.10 :2013 and ANSI C63.4 :2014
789033 D02 General UNII Test Procedures New Rules v01r04

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.

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5.0 Duty Cycle

10M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	a	5750	Ant1	29.92	5.24	0.35
		5780		29.9	5.24	0.35
		5820		29.92	5.24	0.35
		5750	Ant2	29.92	5.24	0.35
		5780		29.9	5.24	0.35
		5820		29.9	5.24	0.35

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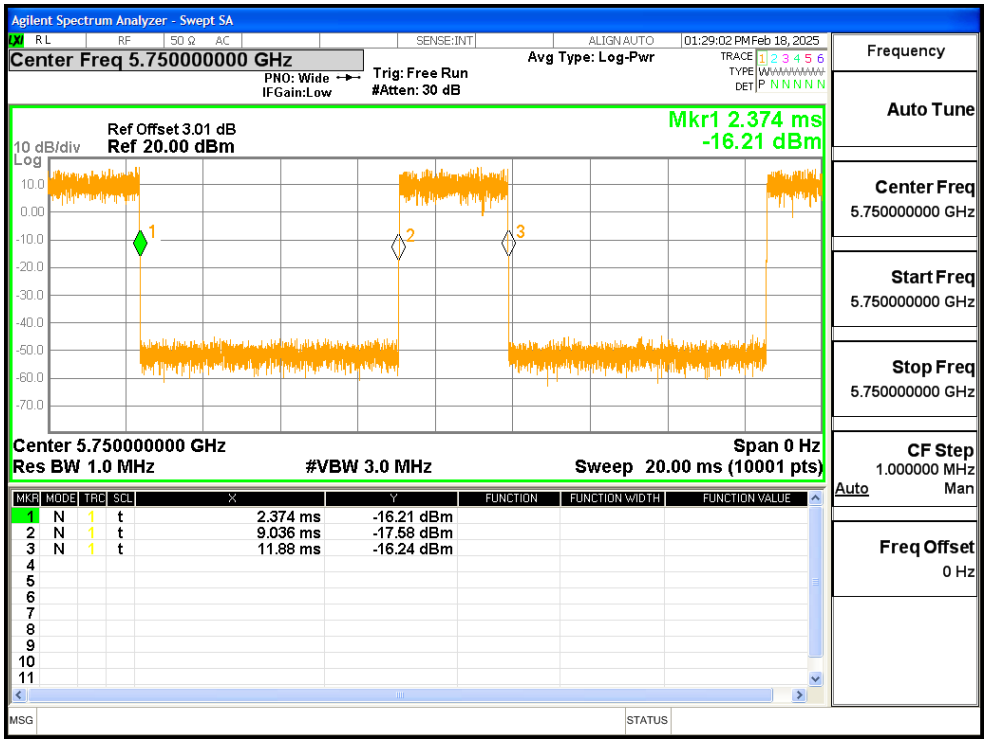
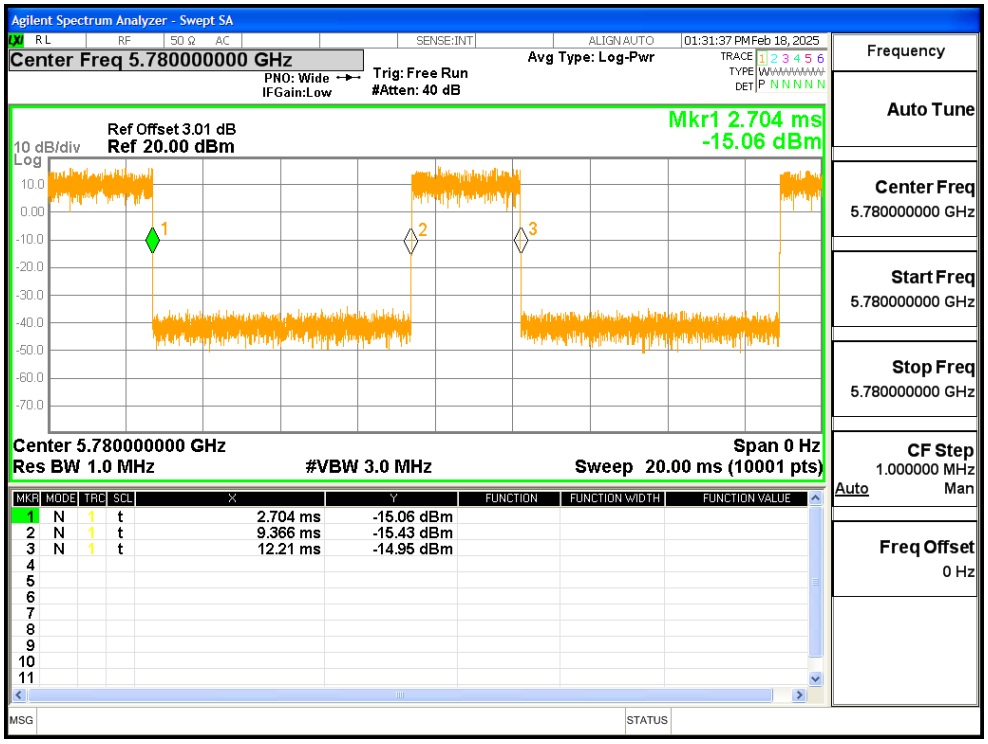
Test Graphs
Duty Cycle NVNT a 5750MHz Ant1



Duty Cycle NVNT a 5780MHz Ant1



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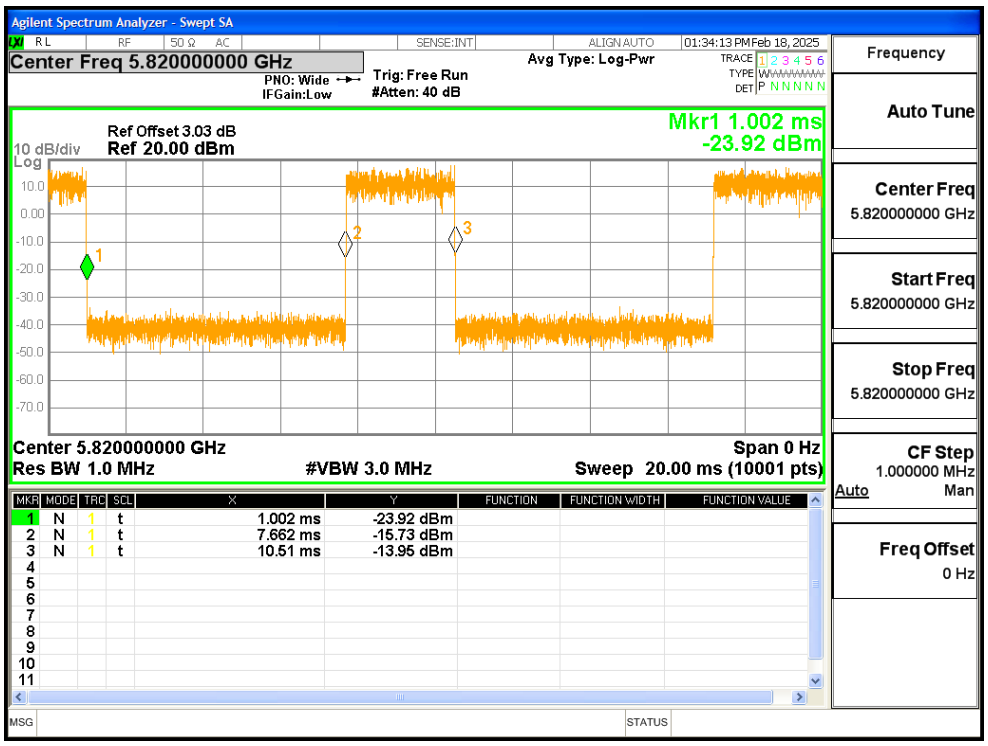
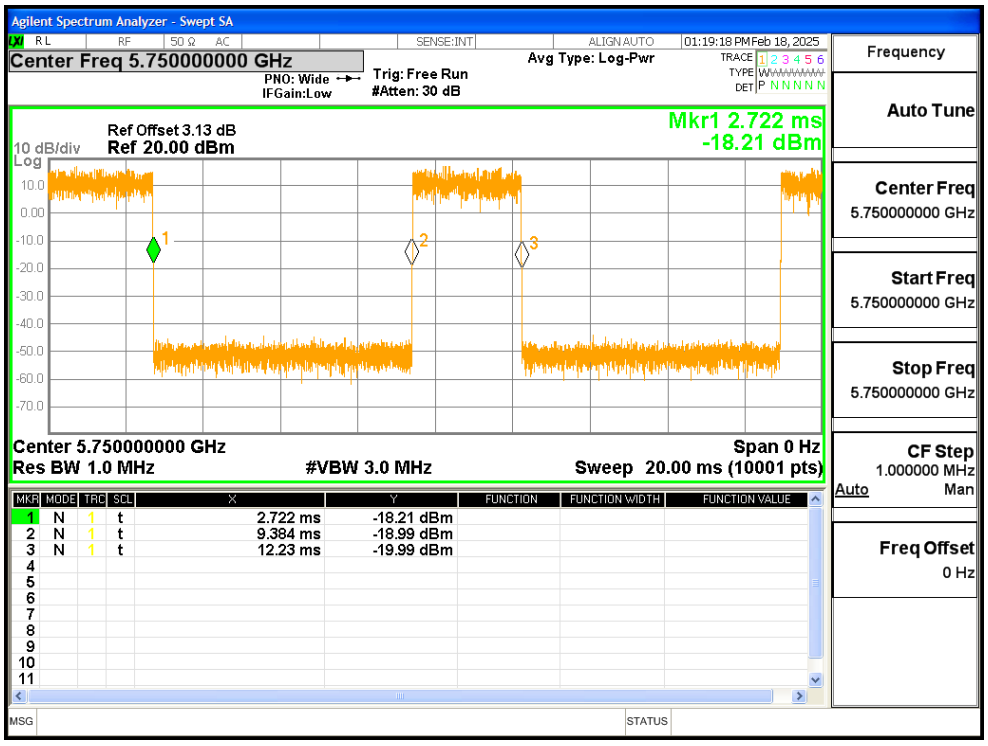
Duty Cycle NVNT a 5820MHz Ant1



Duty Cycle NVNT a 5750MHz Ant2



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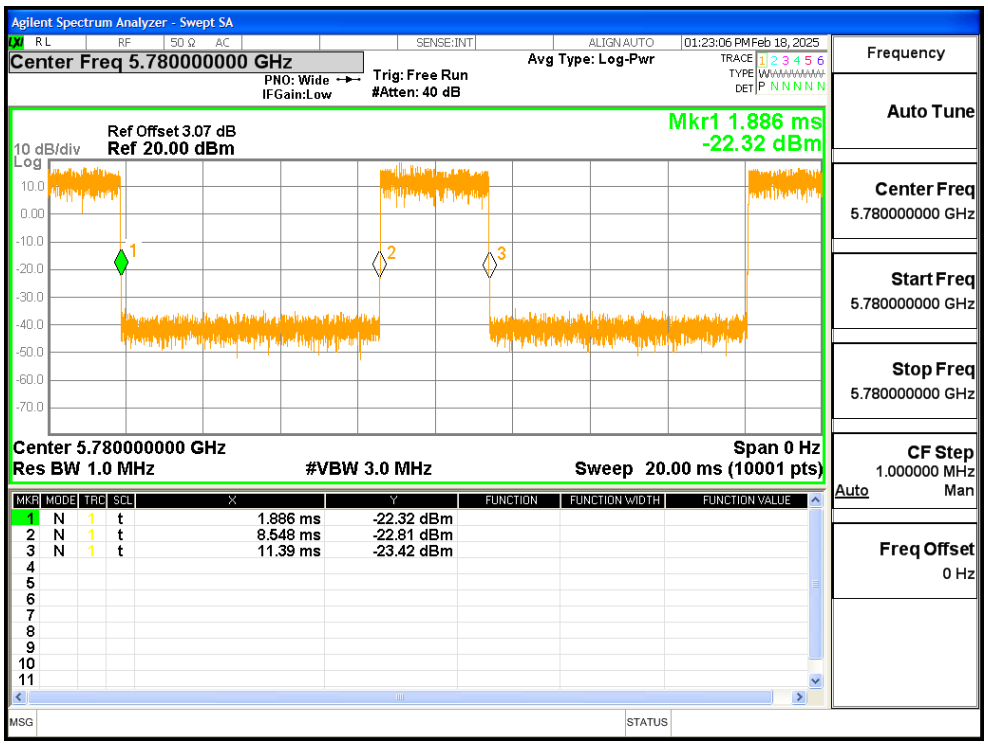
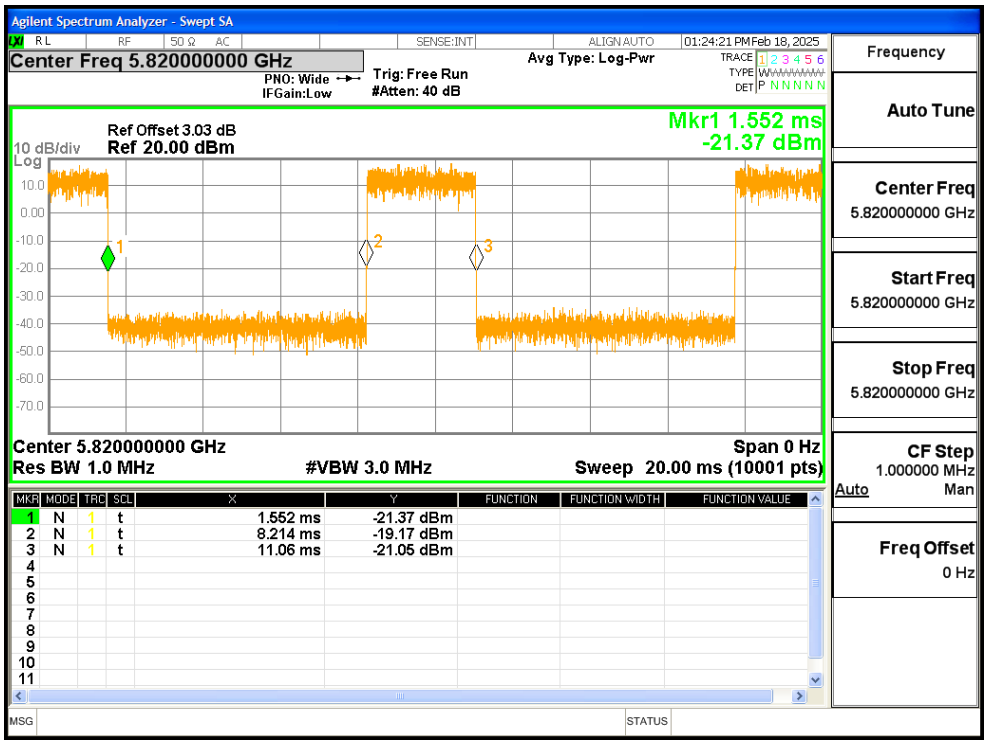
Duty Cycle NVNT a 5780MHz Ant2



Duty Cycle NVNT a 5820MHz Ant2



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20M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	a	5750	Ant1	29.92	5.24	0.35
		5780		29.92	5.24	0.35
		5820		29.9	5.24	0.35
		5750	Ant2	29.92	5.24	0.35
		5780		29.9	5.24	0.35
		5820		29.92	5.24	0.35

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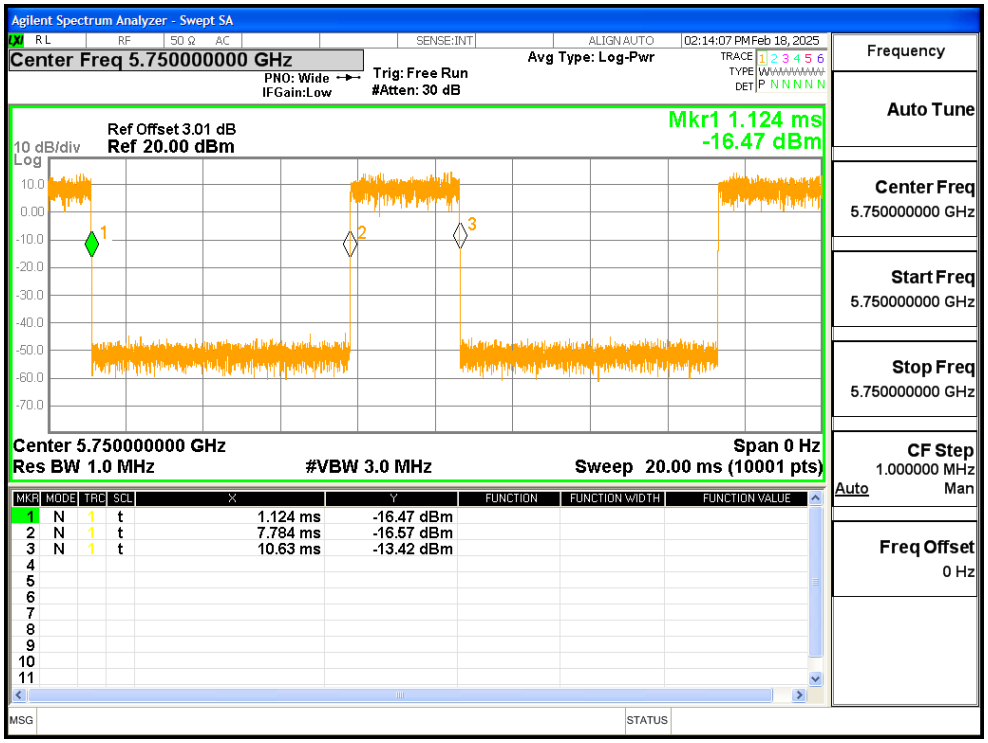
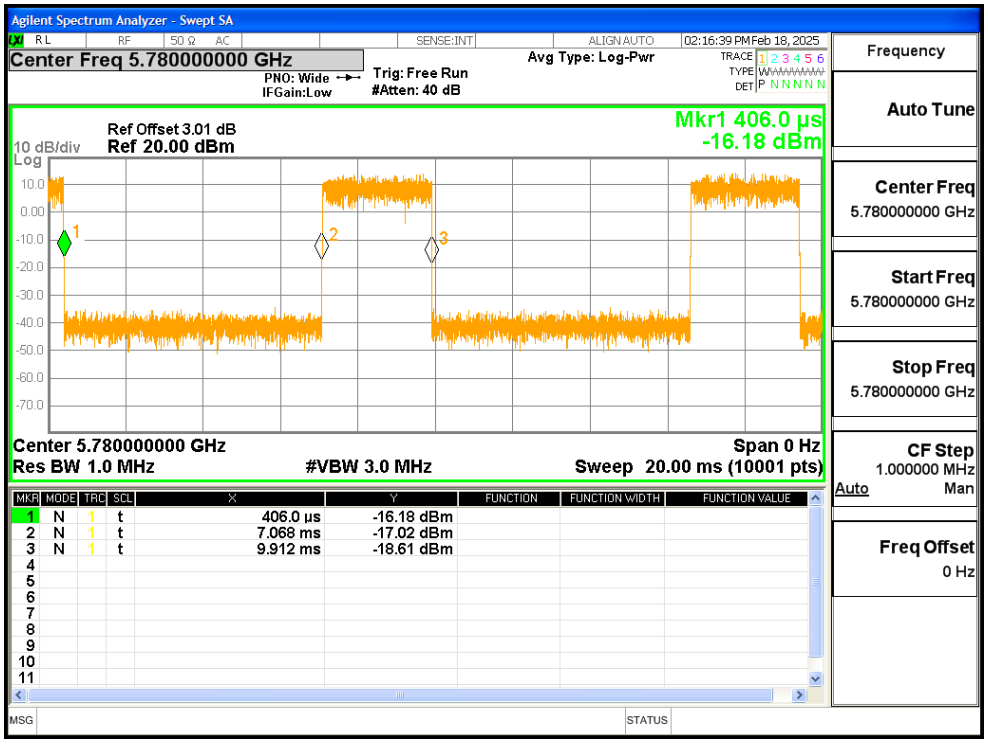
Test Graphs

Duty Cycle NVNT a 5750MHz Ant1



Duty Cycle NVNT a 5780MHz Ant1



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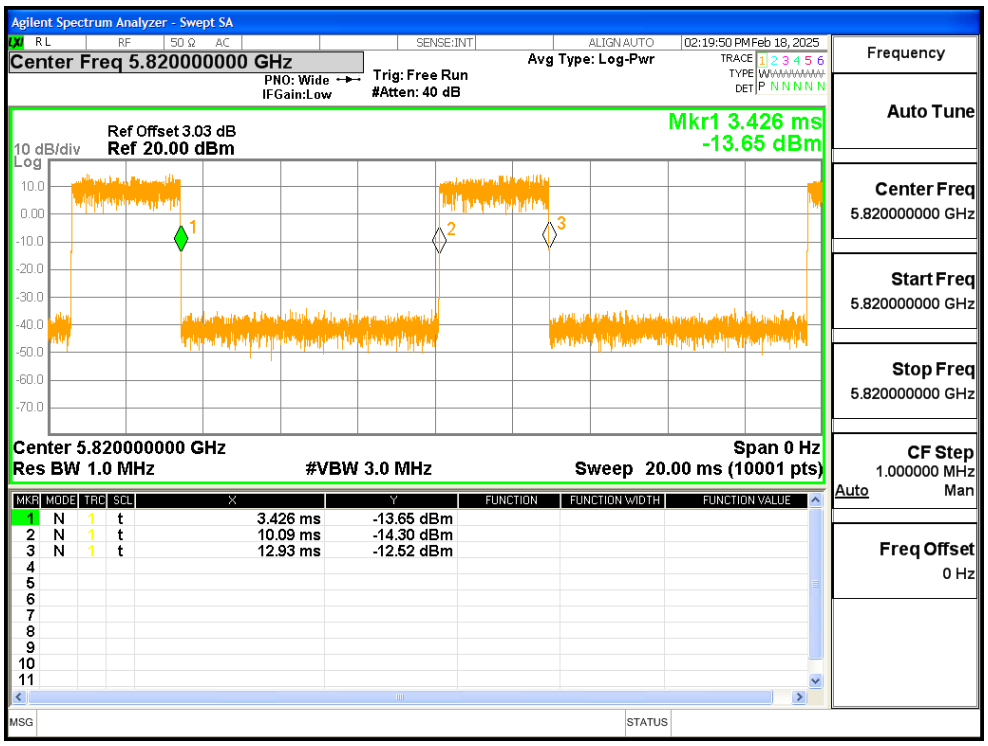
Duty Cycle NVNT a 5820MHz Ant1



Duty Cycle NVNT a 5750MHz Ant2

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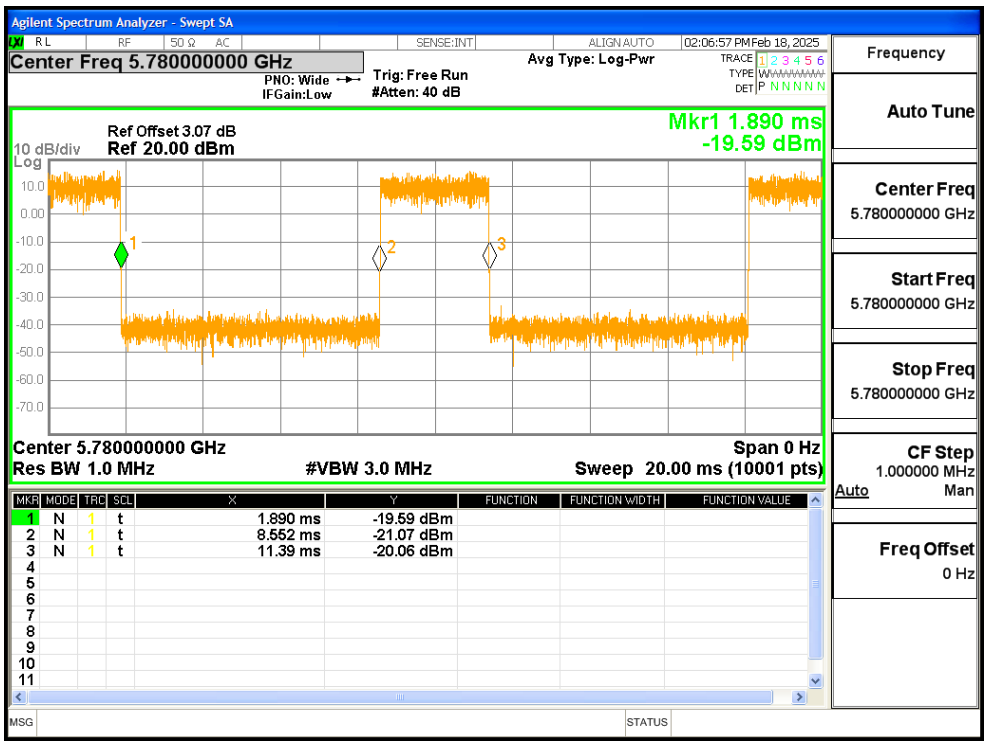
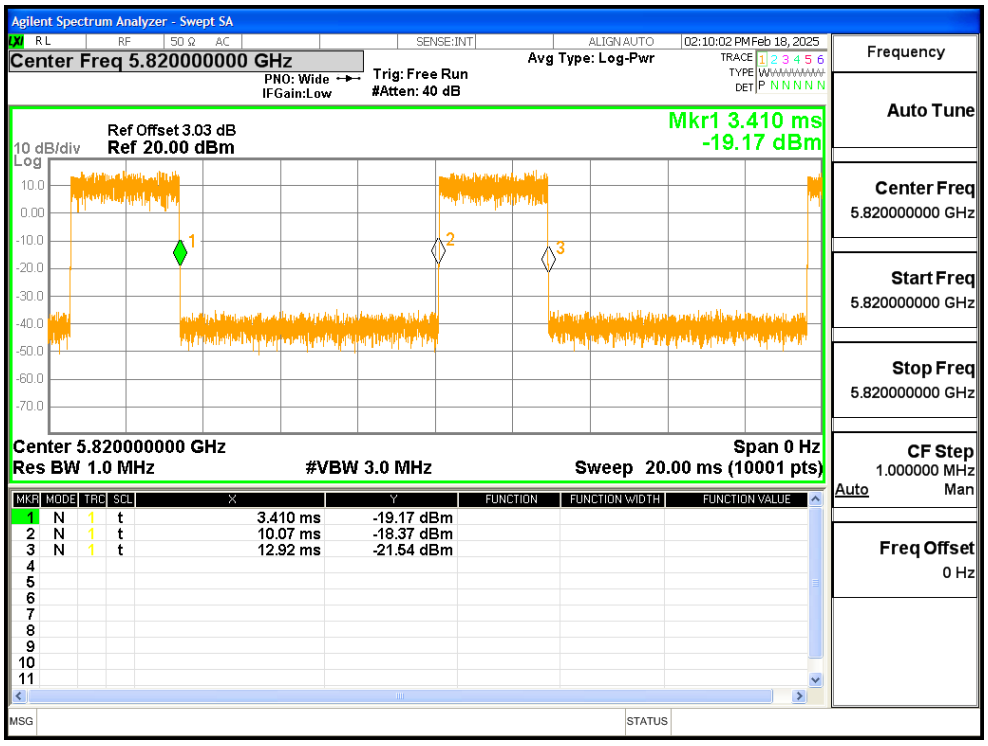
Duty Cycle NVNT a 5780MHz Ant2



Duty Cycle NVNT a 5820MHz Ant2



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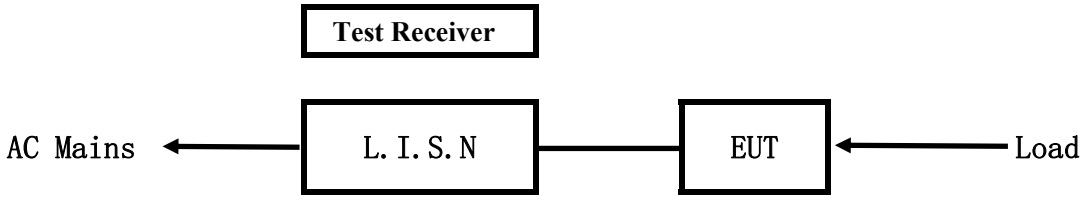
6. Power Line Conducted Emission Test

6.1 Schematics of the test



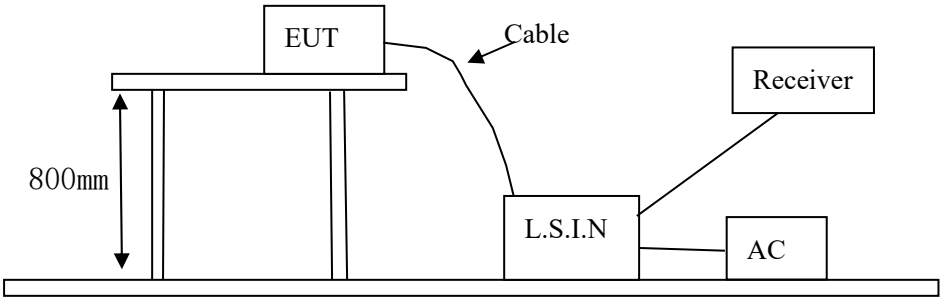
EUT: Equipment Under Test

6.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013.The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10–2013.

Test Voltage: N/A

Block diagram of Test setup



6.3 Configuration of the EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model	FCC ID
Agricultural unmarmed drone	DMR Technologies	Field Ranger X50, Field Ranger	2BM3J-X50

B. Internal Device

Device	Manufacturer	Model	Rating

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C. Peripherals

Device	Manufacturer	Model	Rating
N/A			

6.4 EUT Operating Condition

Operating condition is according to ANSI C63.10 -2013.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

6.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ～ 0.50	66.0～56.0*	56.0～46.0*
0.50 ～ 5.00	56.0	46.0
5.00 ～ 30.00	60.0	50.0

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The tighter limit shall apply at the transition frequencies

6.6 Test Results N/A

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

Note: EUT not directly or in-directly connected to the AC power source. so this test item not applicable.

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7 Undesirable Emission and Restrict band

7.1 Test Method and test Procedure:

(1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway Laboratory. This site is on file with the FCC laboratory division, Registration No.744189

(2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.

(3) The frequency spectrum from 30 MHz to 40 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=1MHz, VBW=3MHz and PK detector.
Measurements were made at 3 meters.

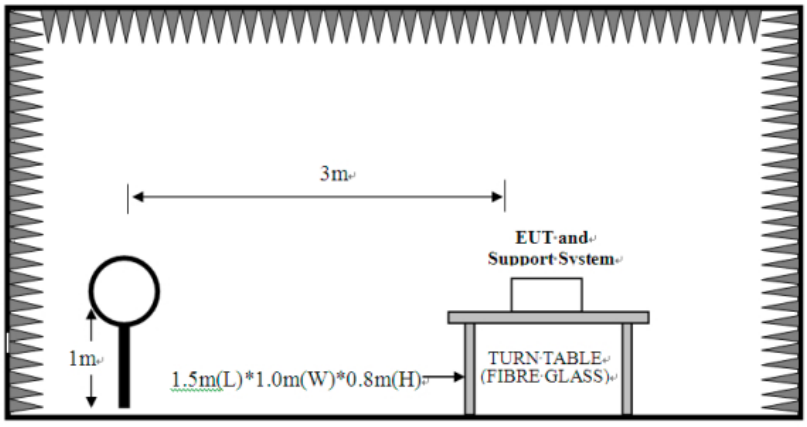
(4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

(5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "**QP**" in the data table.

(6) The antenna polarization: Vertical polarization and Horizontal polarization.

Block diagram of Test setup

For radiated emissions from 9kHz to 30MHz



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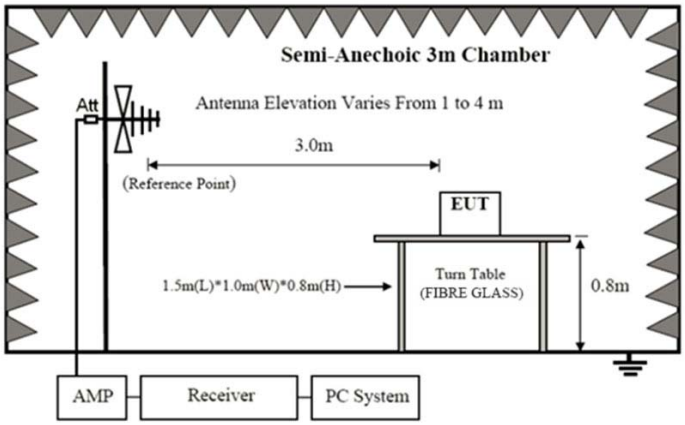
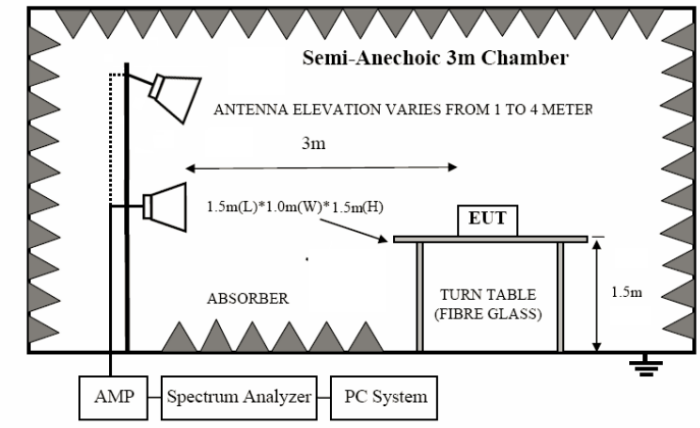
For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



7.2 Configuration of The EUT

Same as section 5.3 of this report

7.3 EUT Operating Condition

Same as section 5.4 of this report.

7.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

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Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

(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 EIRP of -27dBm/MHz

(2) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27dBm/MHz.

Note: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the higher limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

Note: 1. RE tests are all in MIMO mode
2. Only the worst case was recorded in the test report.

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Test result

General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Horizontal (30MHz----1000MHz)

EUT set Condition: **Keeping Transmitting**

Results: **Pass**

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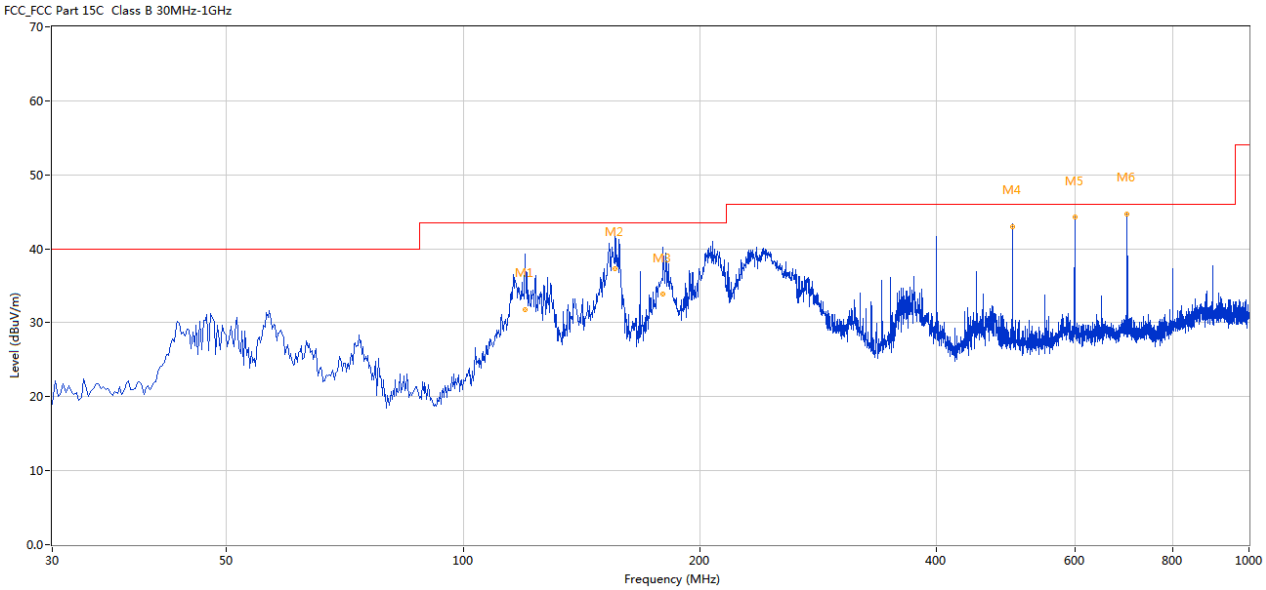
Test Figure:

H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1*	119.945	31.72	-8.70	43.5	11.78	QP	111.00	150	Horizontal	Pass
2*	156.068	37.33	-10.38	43.5	6.17	QP	199.00	150	Horizontal	Pass
3*	179.585	33.93	-8.93	43.5	9.57	QP	71.00	150	Horizontal	Pass
4*	500.090	43.04	-2.34	46.0	2.96	QP	83.00	150	Horizontal	Pass
5*	599.975	44.23	0.09	46.0	1.77	QP	77.00	150	Horizontal	Pass
6*	699.860	44.70	0.83	46.0	1.30	QP	100.00	150	Horizontal	Pass

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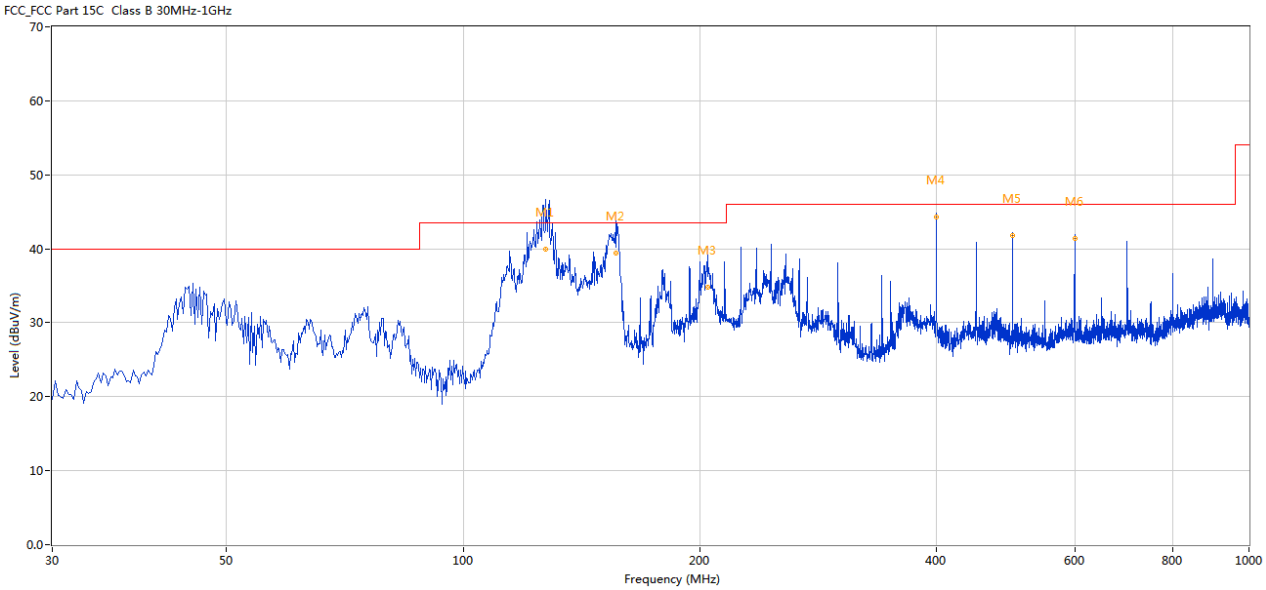
Test Figure:

V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1*	127.461	39.94	-8.99	43.5	3.56	QP	255.00	150	Vertical	Pass
2*	156.311	39.38	-10.39	43.5	4.12	QP	29.00	150	Vertical	Pass
3*	204.556	34.79	-8.08	43.5	8.71	QP	118.00	150	Vertical	Pass
4*	399.963	44.26	-2.94	46.0	1.74	QP	90.00	150	Vertical	Pass
5*	499.848	41.78	-2.33	46.0	4.22	QP	260.00	150	Vertical	Pass
6*	599.975	41.40	0.09	46.0	4.60	QP	149.00	150	Vertical	Pass

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Operation Mode: Keeping Transmitting-10M Bandwidth

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
5750.00	96.03（PK）	V	Fundamental Frequency
5750.00	85.18（PK）	H	
11500	--	V	74(Peak)/ 54(AV)
11500	--	H	74(Peak)/ 54(AV)
17250	--	H/V	74(Peak)/ 54(AV)
23000	--	H/V	74(Peak)/ 54(AV)
28750	--	H/V	74(Peak)/ 54(AV)
34500	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit
2. Remark “---” means that the emissions level is too low to be measured

Operation Mode: Keeping Transmitting-10M Bandwidth

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
5780.00	94.56（PK）	V	Fundamental Frequency
5780.00	83.34（PK）	H	
11560	--	V	74(Peak)/ 54(AV)
11560	--	H	74(Peak)/ 54(AV)
17340	--	H/V	74(Peak)/ 54(AV)
23120	--	H/V	74(Peak)/ 54(AV)
28900	--	H/V	74(Peak)/ 54(AV)
34680	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit
2. Remark “---” means that the emissions level is too low to be measured

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Operation Mode: Keeping Transmitting-10M Bandwidth

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
5820.00	97.27（PK）	V	Fundamental Frequency
5820.00	85.98（PK）	H	
11640	--	V	74(Peak)/ 54(AV)
11640	--	H	74(Peak)/ 54(AV)
17460	--	H/V	74(Peak)/ 54(AV)
23280	--	H/V	74(Peak)/ 54(AV)
29100	--	H/V	74(Peak)/ 54(AV)
34920	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “---” means that the emissions level is too low to be measured

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Restricted band Measurement				
EUT	Agricultural unmarmed drone		Test Mode:	5750MHz-10M Bandwidth
Mode	Keeping Transmitting		Input Voltage	DC76.5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
5725	PK (dBμV/m)	52.5 (PK)	Limit	-17dBm/MHz
	EIRP (dBm)	-42.7		
Polarity	Vertical		--	--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:
EIRP[dBm] = E[dBμV/m] - 95.2
For Example, if E[dBμV/m]= 52.5dBμV/m,
EIRP[dBm] = E[dBμV/m] - 95.2=52.5-95.2=-42.7dBm
2. RBW=1MHz, VBW=3MHz

Restricted band Measurement				
EUT	Agricultural unmarmed drone		Test Mode:	5750MHz-10M Bandwidth
Mode	Keeping Transmitting		Input Voltage	DC76.5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
5725	PK (dBμV/m)	47.7(PK)	Limit	-17dBm/MHz
	EIRP (dBm)	-47.5		
Polarity	Horizontal		--	--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:
EIRP[dBm] = E[dBμV/m] - 95.2
For Example, if E[dBμV/m]= 47.7dBμV/m,
EIRP[dBm] = E[dBμV/m] - 95.2=47.7-95.2=-47.5dBm
2. RBW=1MHz, VBW=3MHz

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Restricted band Measurement				
EUT	Agricultural unmarmed drone		Test Mode:	5820MHz-10M Bandwidth
Mode	Keeping Transmitting		Input Voltage	DC76.5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
5850	PK (dBμV/m)	56.8(PK)	Limit	-17dBm/MHz
	EIRP (dBm)	-38.4		
Polarity	Vertical		--	--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:
EIRP[dBm] = E[dBμV/m] - 95.2
For Example, if E[dBμV/m]= 56.8dBμV/m,
EIRP[dBm] = E[dBμV/m] - 95.2=56.8-95.2=-38.4dBm
2. RBW=1MHz, VBW=3MHz

Restricted band Measurement				
EUT	Agricultural unmarmed drone		Test Mode:	5820MHz-10M Bandwidth
Mode	Keeping Transmitting		Input Voltage	DC76.5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
5850	PK (dBμV/m)	53.6 (PK)	Limit	-17dBm/MHz
	EIRP (dBm)	-41.6		
Polarity	Horizontal		--	--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:
EIRP[dBm] = E[dBμV/m] - 95.2
For Example, if E[dBμV/m]= 53.6dBμV/m,
EIRP[dBm] = E[dBμV/m] - 95.2=53.6 -95.2=-41.6dBm
2. RBW=1MHz, VBW=3MHz

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Restricted band Measurement				
EUT	Agricultural unmarmed drone		Test Mode:	5750MHz-20M Bandwidth
Mode	Keeping Transmitting		Input Voltage	DC76.5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
5725	PK (dBμV/m)	51.2 (PK)	Limit	-17dBm/MHz
	EIRP (dBm)	-44.0		
Polarity	Vertical		--	--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:
EIRP[dBm] = E[dBμV/m] - 95.2
For Example, if E[dBμV/m]= 51.2dBμV/m,
EIRP[dBm] = E[dBμV/m] - 95.2=51.2-95.2=-44.0dBm
2. RBW=1MHz, VBW=3MHz

Restricted band Measurement				
EUT	Agricultural unmarmed drone		Test Mode:	5750MHz-20M Bandwidth
Mode	Keeping Transmitting		Input Voltage	DC76.5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
5725	PK (dBμV/m)	48.4(PK)	Limit	-17dBm/MHz
	EIRP (dBm)	-46.8		
Polarity	Horizontal		--	--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:
EIRP[dBm] = E[dBμV/m] - 95.2
For Example, if E[dBμV/m]= 48.4dBμV/m,
EIRP[dBm] = E[dBμV/m] - 95.2=48.4-95.2=-46.8dBm
2. RBW=1MHz, VBW=3MHz

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Restricted band Measurement				
EUT	Agricultural unmarmed drone		Test Mode:	5820MHz-20M Bandwidth
Mode	Keeping Transmitting		Input Voltage	DC76.5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
5850	PK (dBμV/m)	51.0 (PK)	Limit	-17dBm/MHz
	EIRP (dBm)	-44.2		
Polarity	Vertical		--	--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:
EIRP[dBm] = E[dBμV/m] - 95.2
For Example, if E[dBμV/m]= 51.0dBμV/m,
EIRP[dBm] = E[dBμV/m] - 95.2=51.0-95.2= -44.2dBm
2. RBW=1MHz, VBW=3MHz

Restricted band Measurement				
EUT	Agricultural unmarmed drone		Test Mode:	5820MHz-20M Bandwidth
Mode	Keeping Transmitting		Input Voltage	DC76.5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
5850	PK (dBμV/m)	46.2 (PK)	Limit	-17dBm/MHz
	EIRP (dBm)	-49.0		
Polarity	Horizontal		--	--

Remark: 1. According to KDB 789033 D02 General UNII Test Procedures New Rules v01 section G) d) (ii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows:
EIRP[dBm] = E[dBμV/m] - 95.2
For Example, if E[dBμV/m]= 46.2dBμV/m,
EIRP[dBm] = E[dBμV/m] - 95.2=46.2-95.2=-49.0dBm
2. RBW=1MHz, VBW=3MHz

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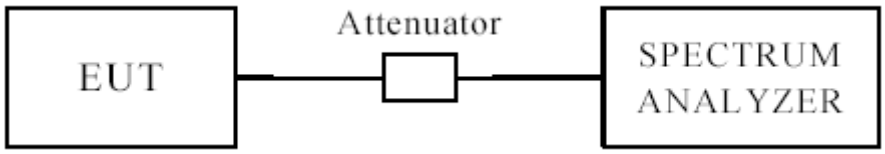
8.0 Emission Bandwidth

8.1 Test Setup



8.3 Test Procedure for Emission Bandwidth

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set VBW> RBW
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

8.4 Test Procedure for Minimum Bandwidth for the Band 5725-5850MHz

1. Set RBW = 100 kHz.
2. Set VBW≥ 3 × RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

8.5 Test Procedure for 99% Bandwidth

1. Set center frequency to the nominal EUT channel center frequency
2. Set span = 1.5 times to 5.0 times OBW
3. Set RBW= 1% TO 5% of the OBW
4. Set VBW≥ 3 × RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Other, peak detection and max mode (until trace stabilizes) shall be used.
6. Use the 99% power bandwidth function of the instrument

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8.6 Test Result

-6dB Bandwidth

10M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	a	5750	Ant1	9.354	0.5	Pass
		5780		9.356	0.5	Pass
		5820		9.31	0.5	Pass
		5750	Ant2	9.401	0.5	Pass
		5780		9.445	0.5	Pass
		5820		9.431	0.5	Pass

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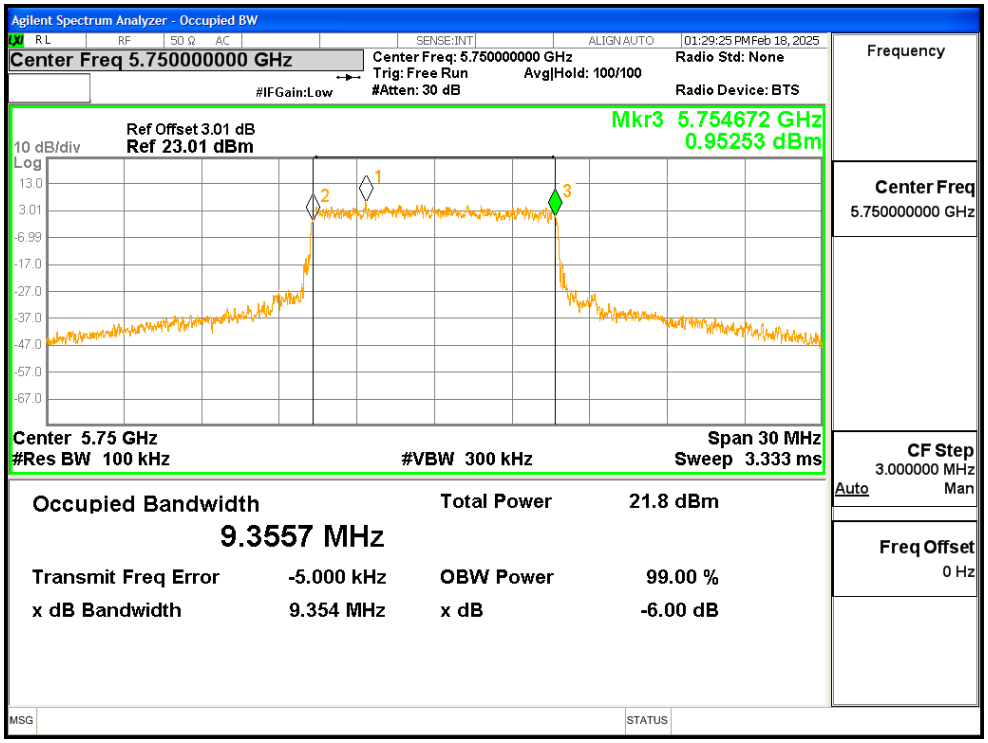
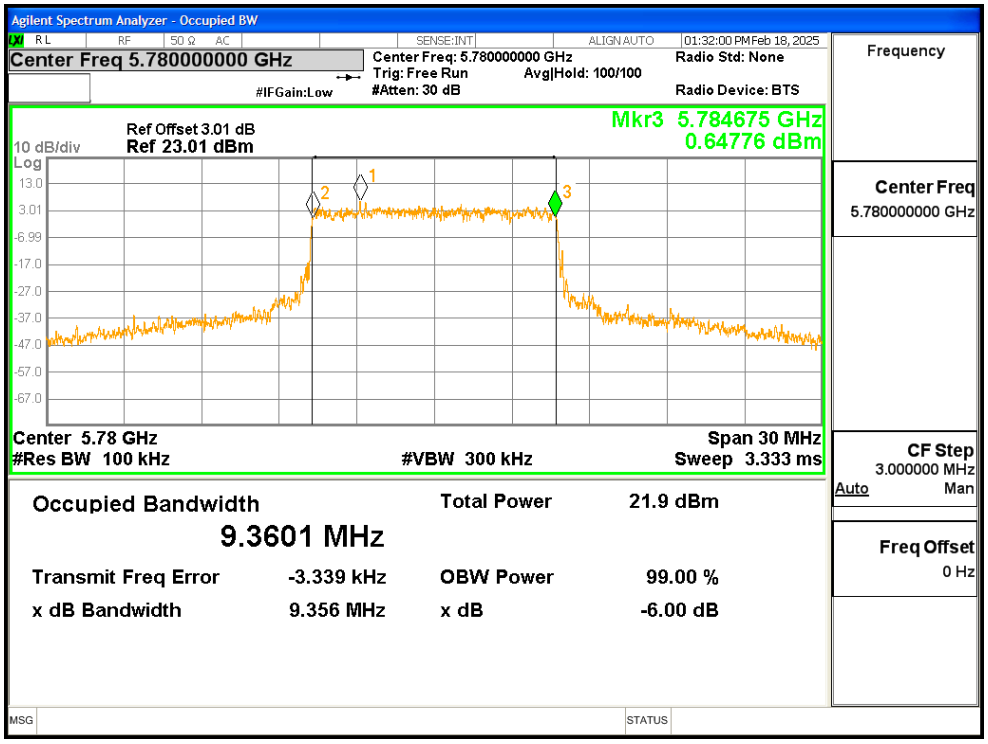
Test Graphs

-6dB Bandwidth NVNT a 5750MHz Ant1



-6dB Bandwidth NVNT a 5780MHz Ant1



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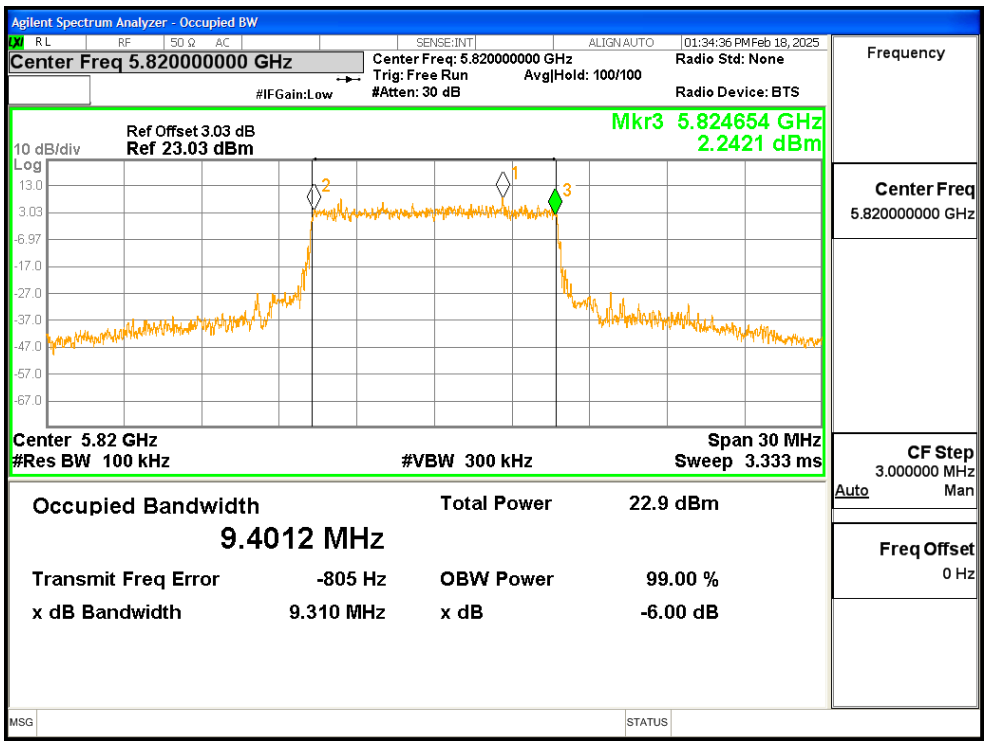
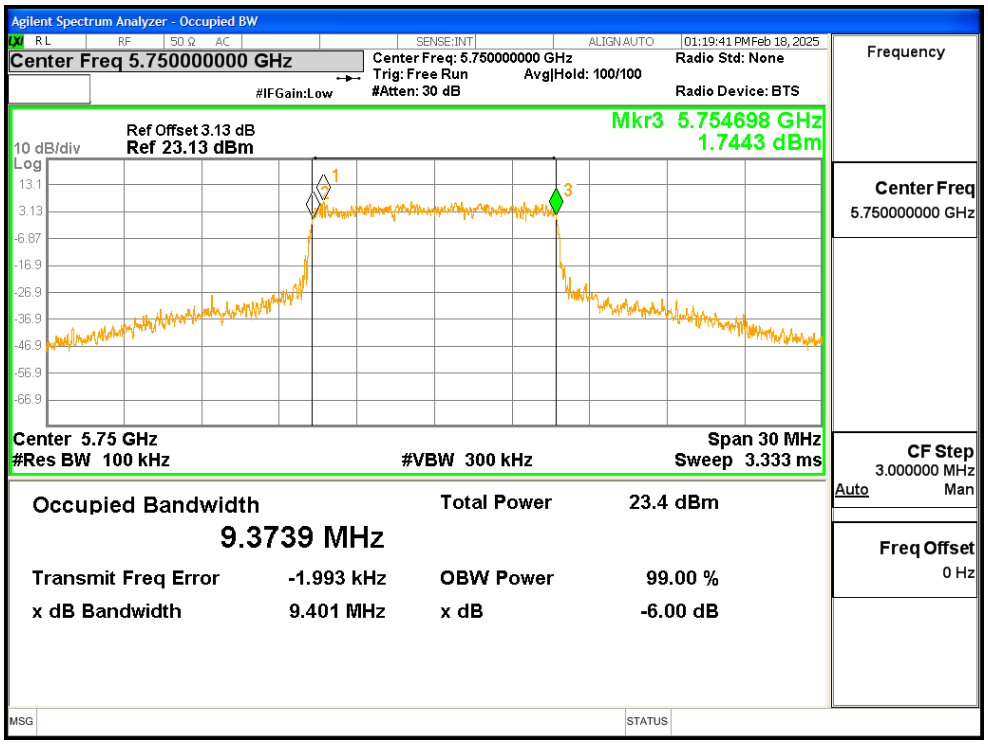
-6dB Bandwidth NVNT a 5820MHz Ant1



-6dB Bandwidth NVNT a 5750MHz Ant2



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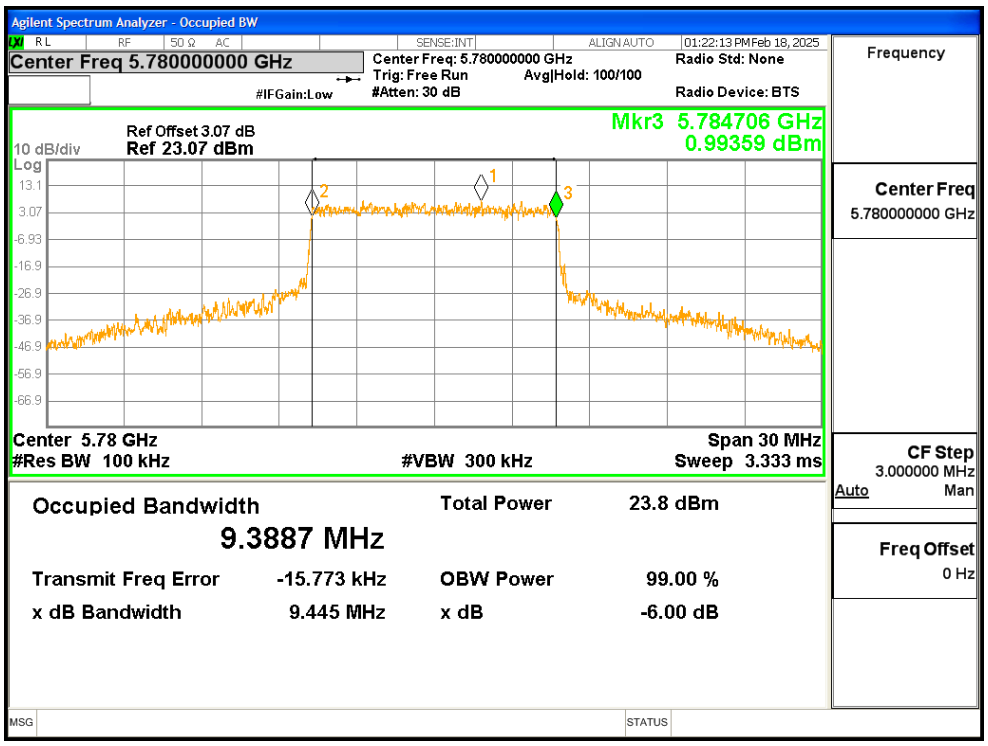
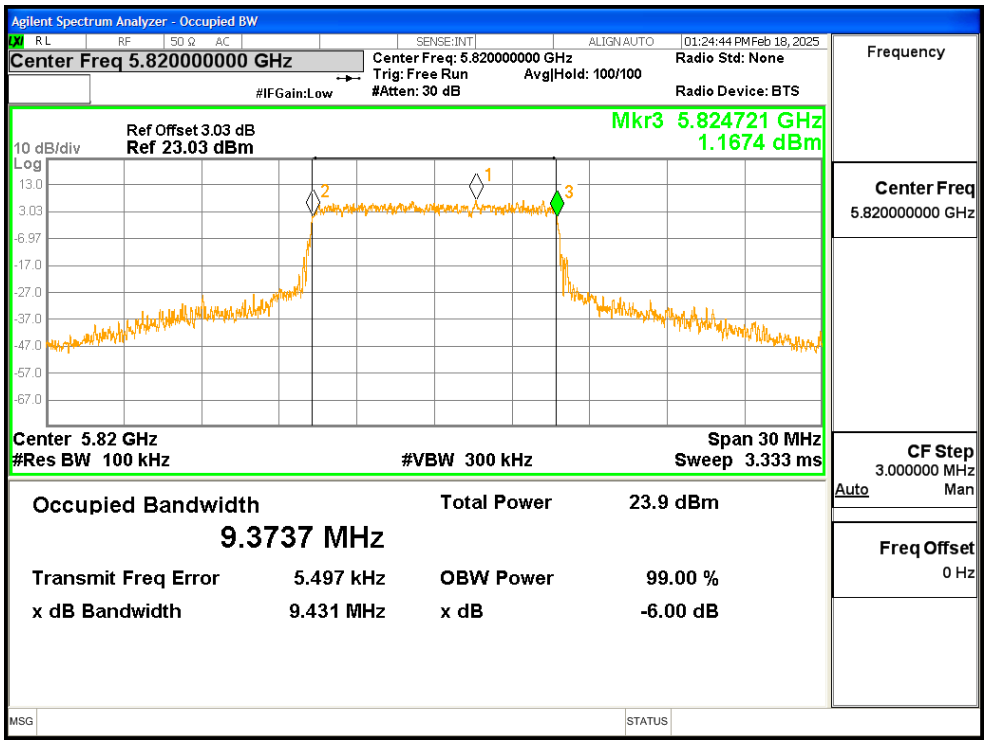
-6dB Bandwidth NVNT a 5780MHz Ant2



-6dB Bandwidth NVNT a 5820MHz Ant2



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20M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	a	5750	Ant1	18.83	0.5	Pass
		5780		18.84	0.5	Pass
		5820		18.71	0.5	Pass
		5750	Ant2	18.89	0.5	Pass
		5780		18.86	0.5	Pass
		5820		18.70	0.5	Pass

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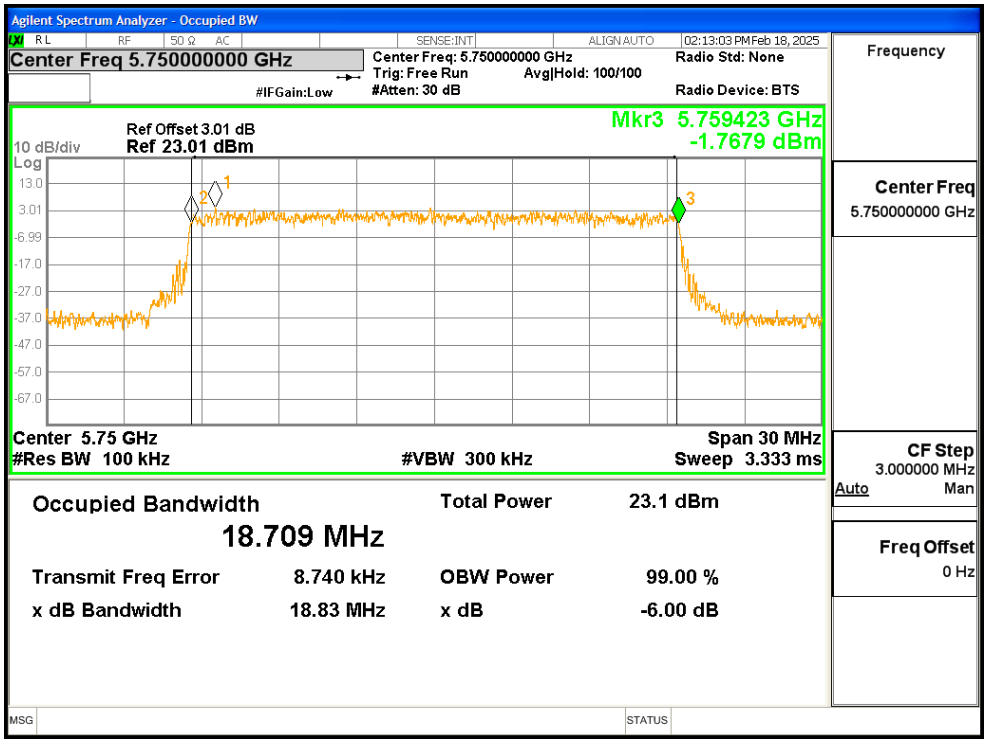
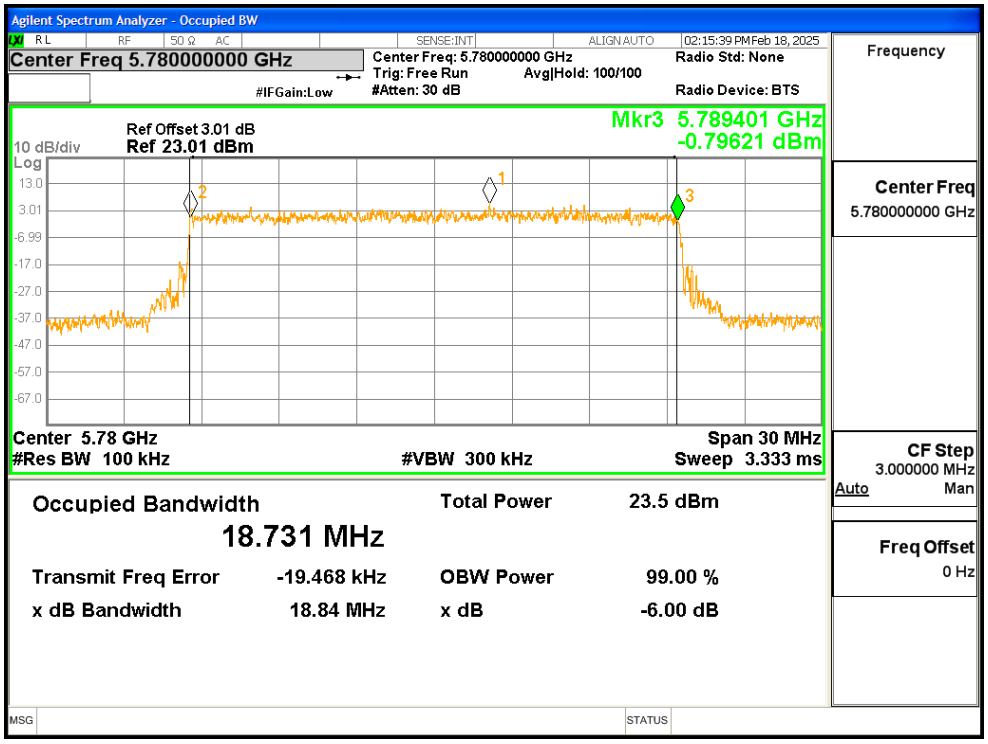
Test Graphs

-6dB Bandwidth NVNT a 5750MHz Ant1



-6dB Bandwidth NVNT a 5780MHz Ant1



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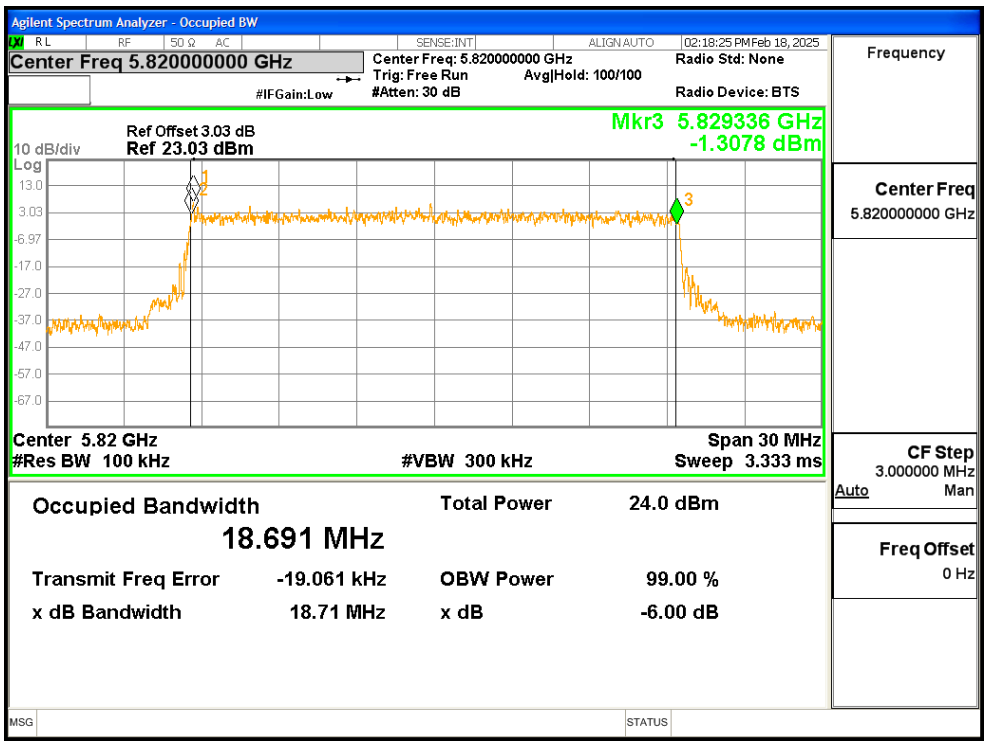
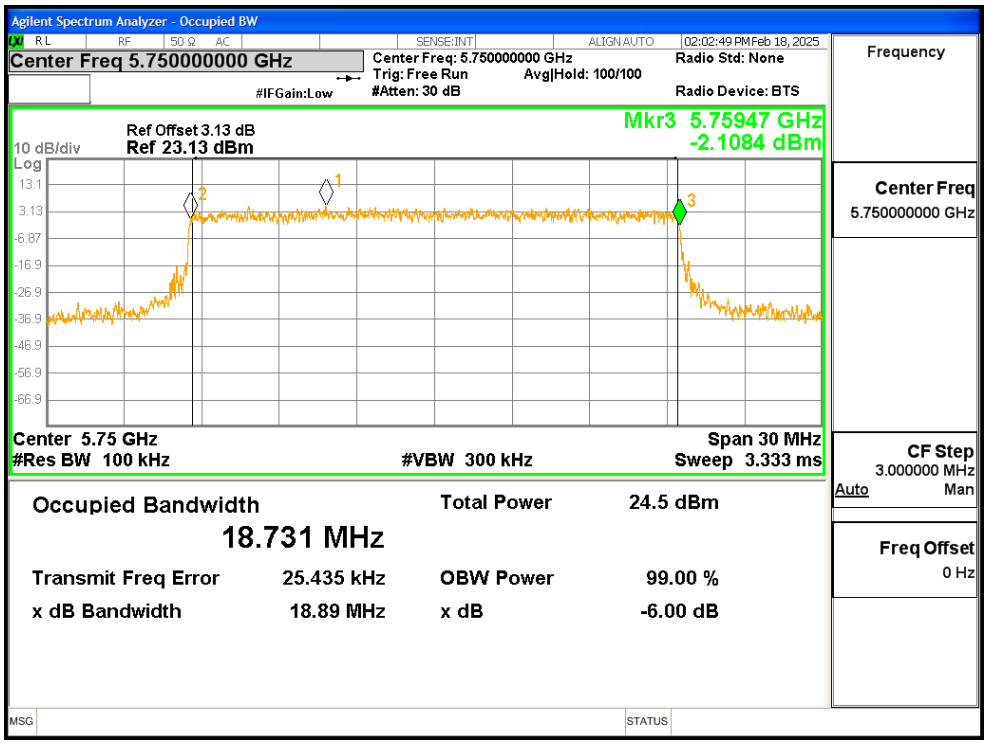
-6dB Bandwidth NVNT a 5820MHz Ant1



-6dB Bandwidth NVNT a 5750MHz Ant2



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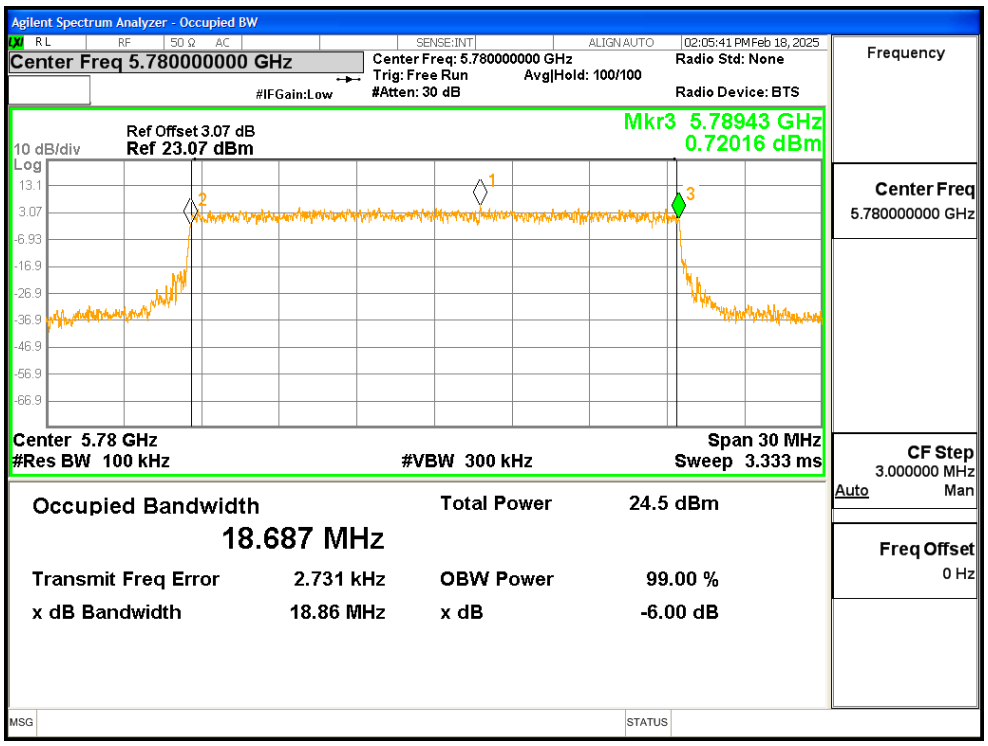
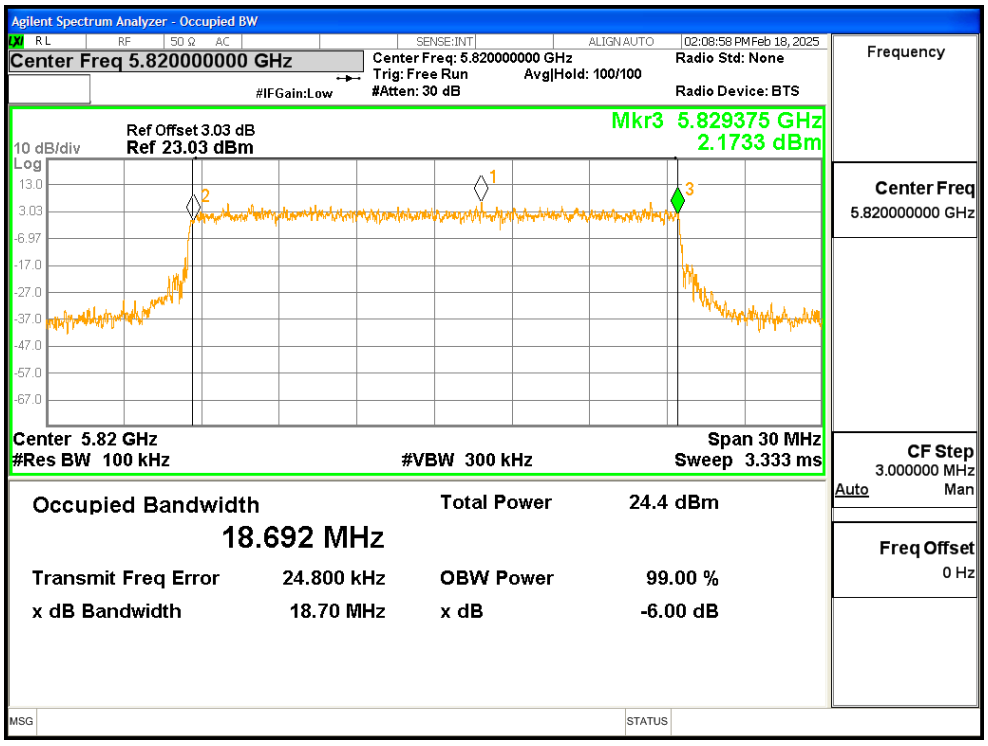
-6dB Bandwidth NVNT a 5780MHz Ant2



-6dB Bandwidth NVNT a 5820MHz Ant2



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Occupied Channel Bandwidth

10M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	a	5750	Ant1	9.39
		5780		9.373
		5820		9.448
		5750	Ant2	9.428
		5780		9.444
		5820		9.461

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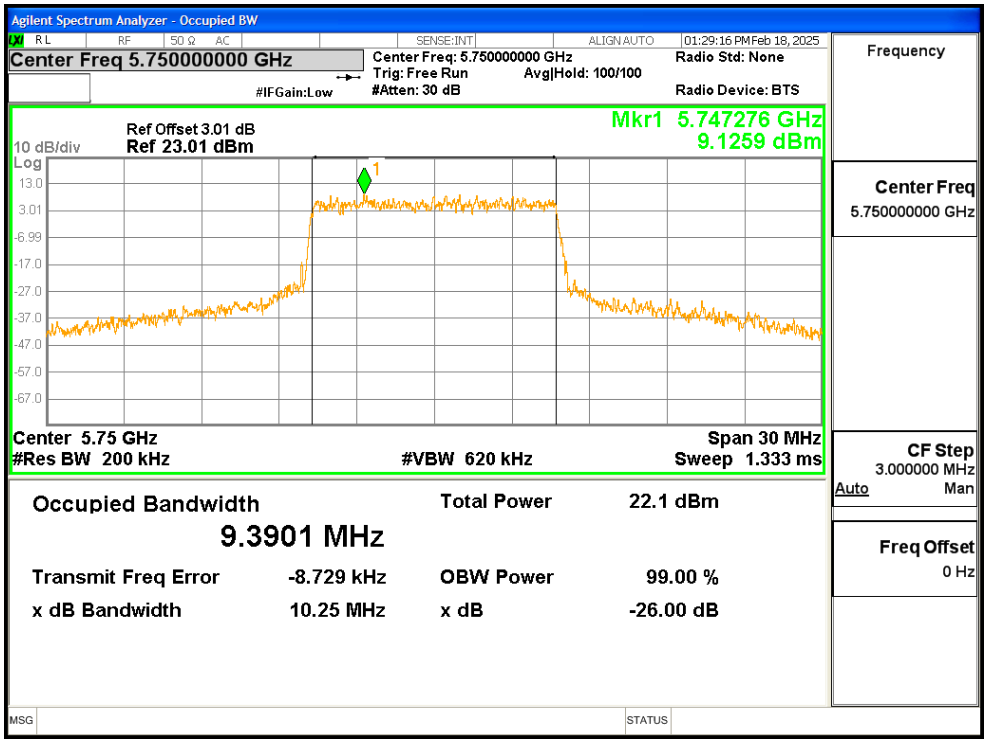
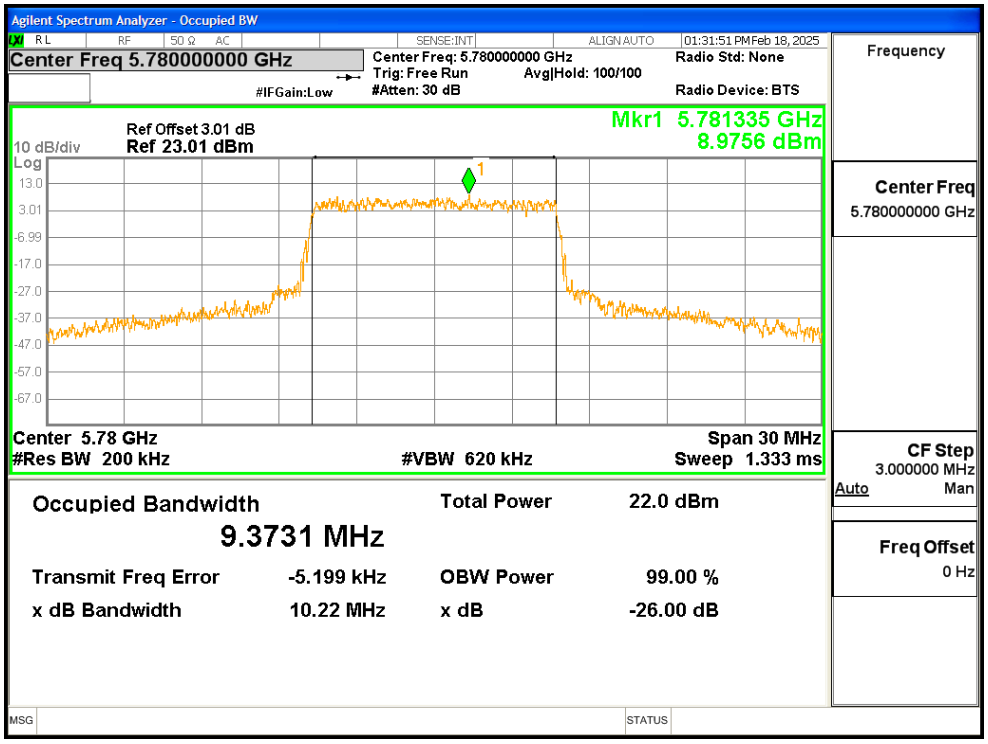
Test Graphs
OBW NVNT a 5750MHz Ant1



OBW NVNT a 5780MHz Ant1



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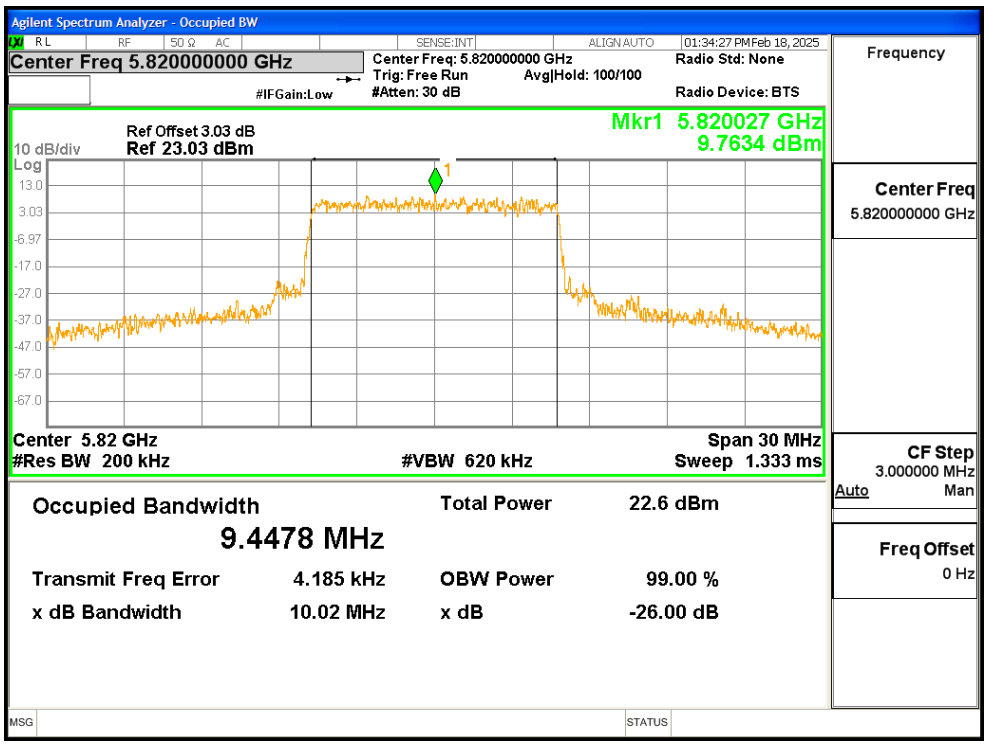
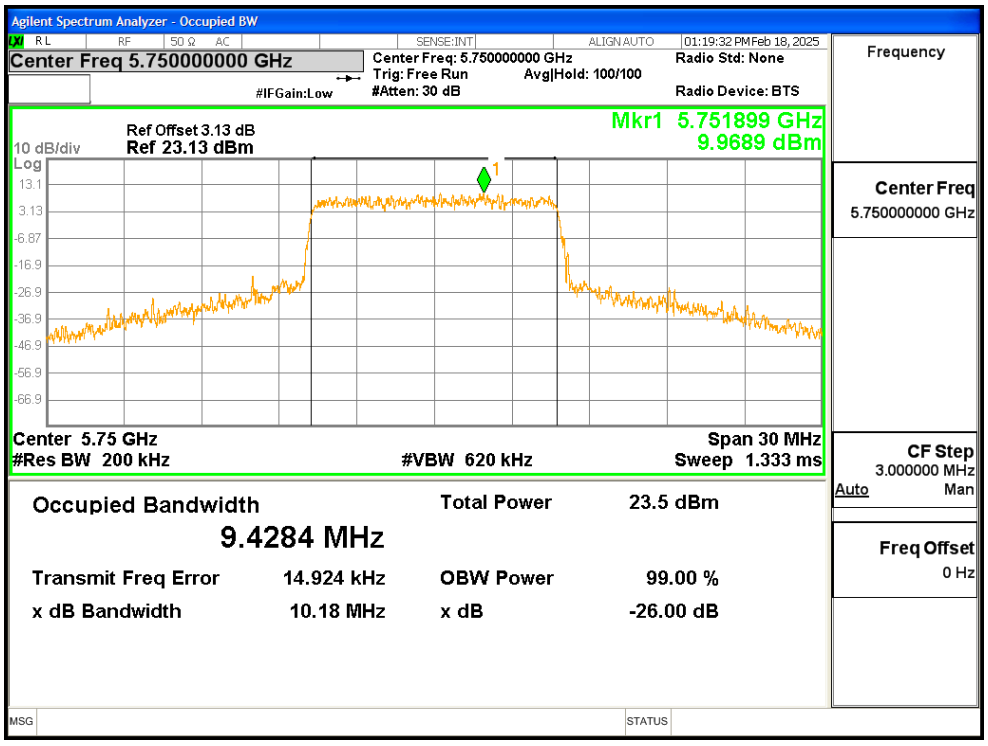
OBW NVNT a 5820MHz Ant1



OBW NVNT a 5750MHz Ant2



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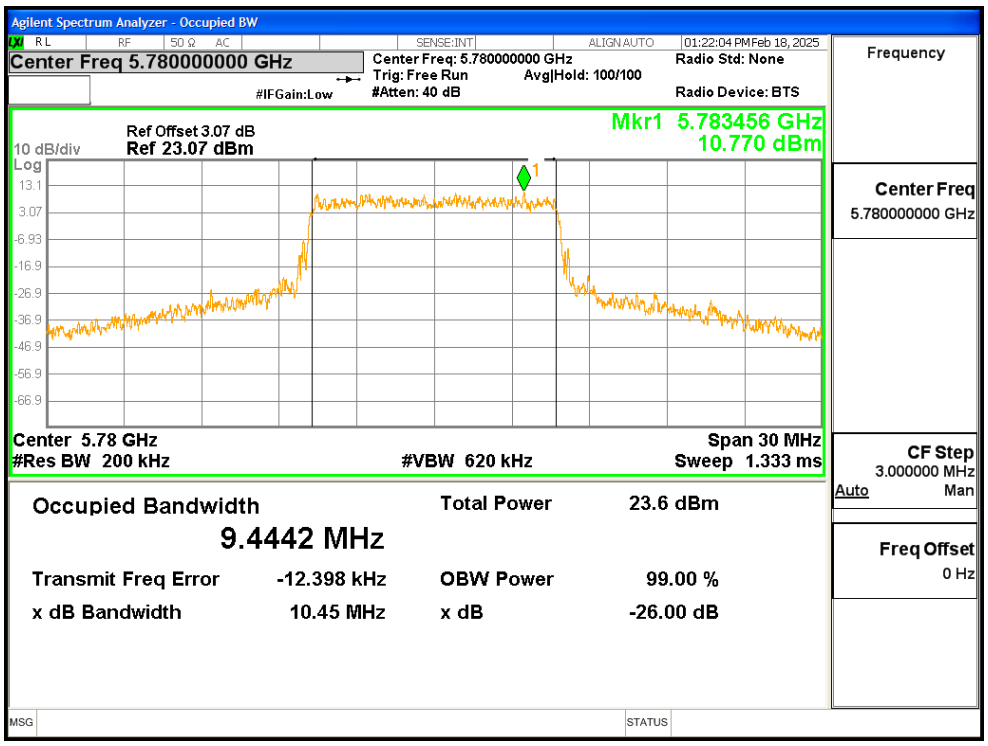
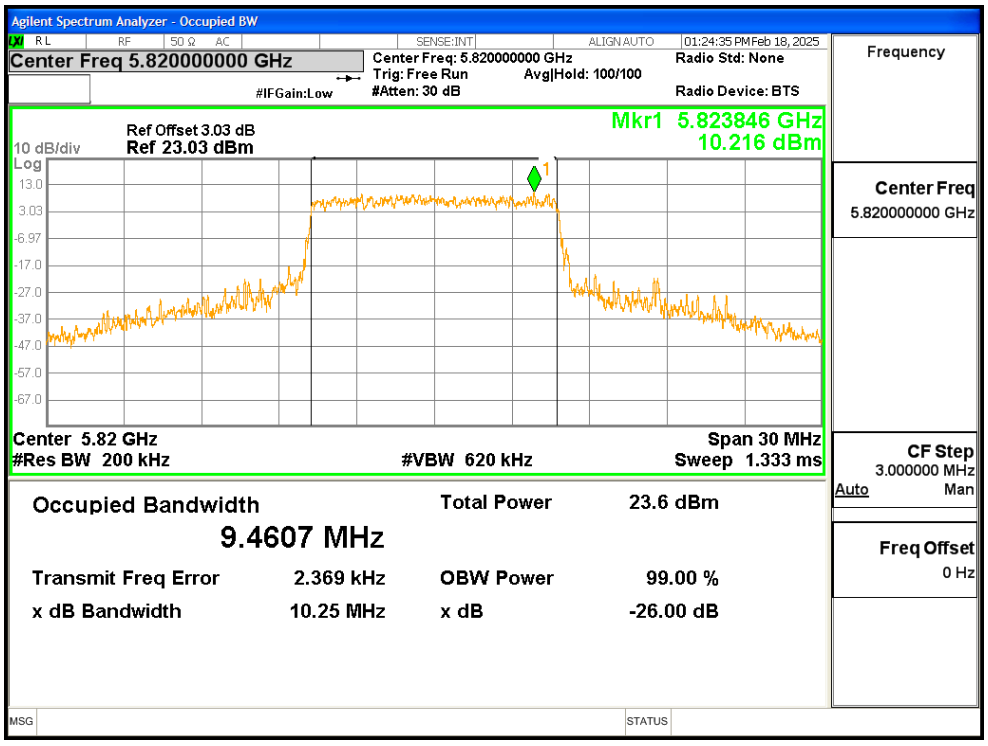
OBW NVNT a 5780MHz Ant2



OBW NVNT a 5820MHz Ant2



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20M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	a	5750	Ant1	18.661
		5780		18.722
		5820		18.761
		5750	Ant2	18.692
		5780		18.734
		5820		18.730

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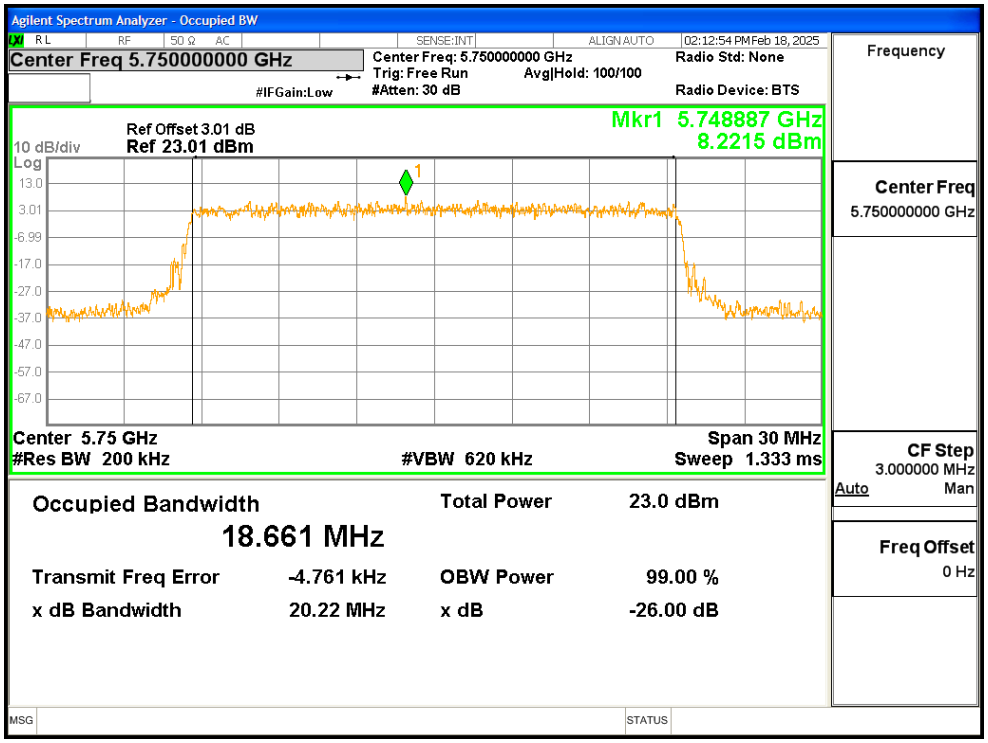
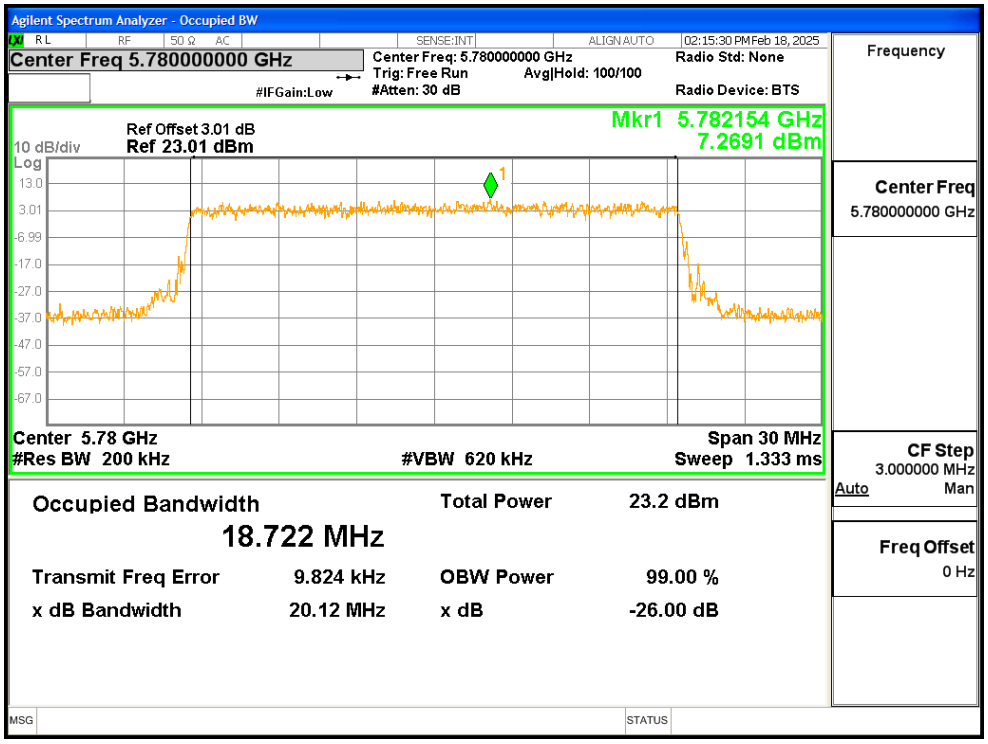
Test Graphs

OBW NVNT a 5750MHz Ant1



OBW NVNT a 5780MHz Ant1



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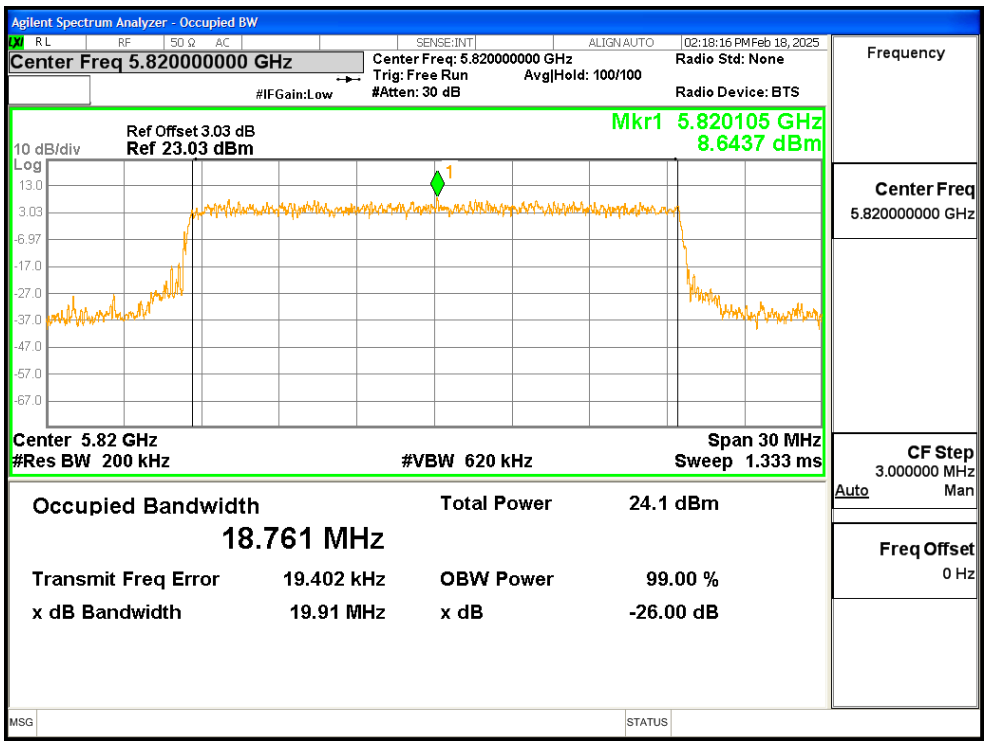
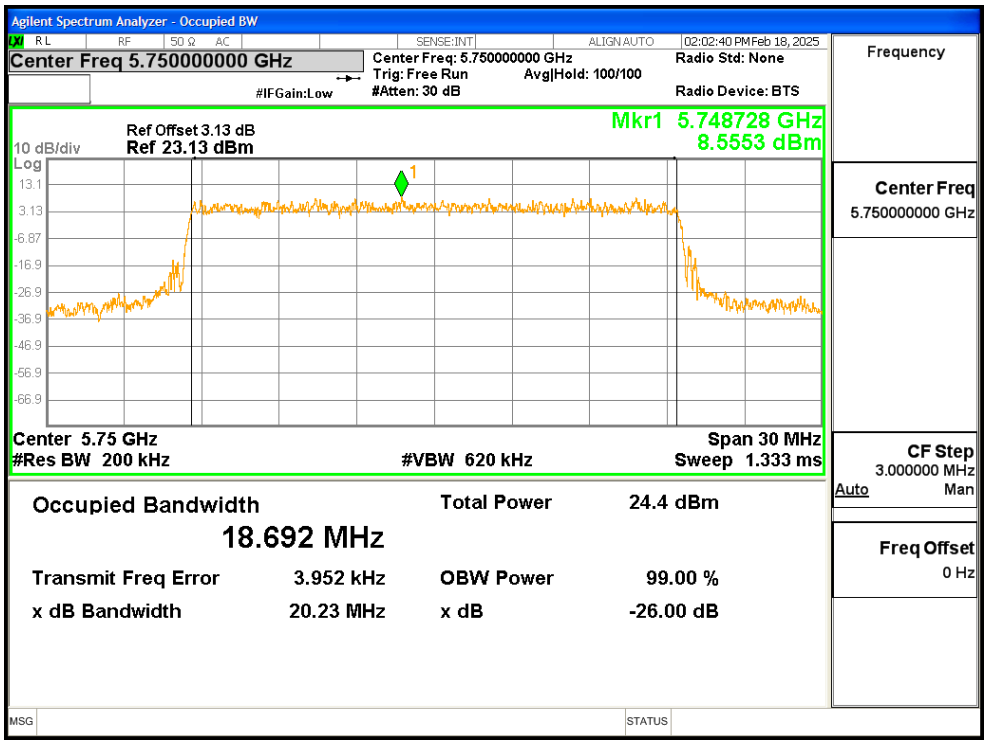
OBW NVNT a 5820MHz Ant1



OBW NVNT a 5750MHz Ant2



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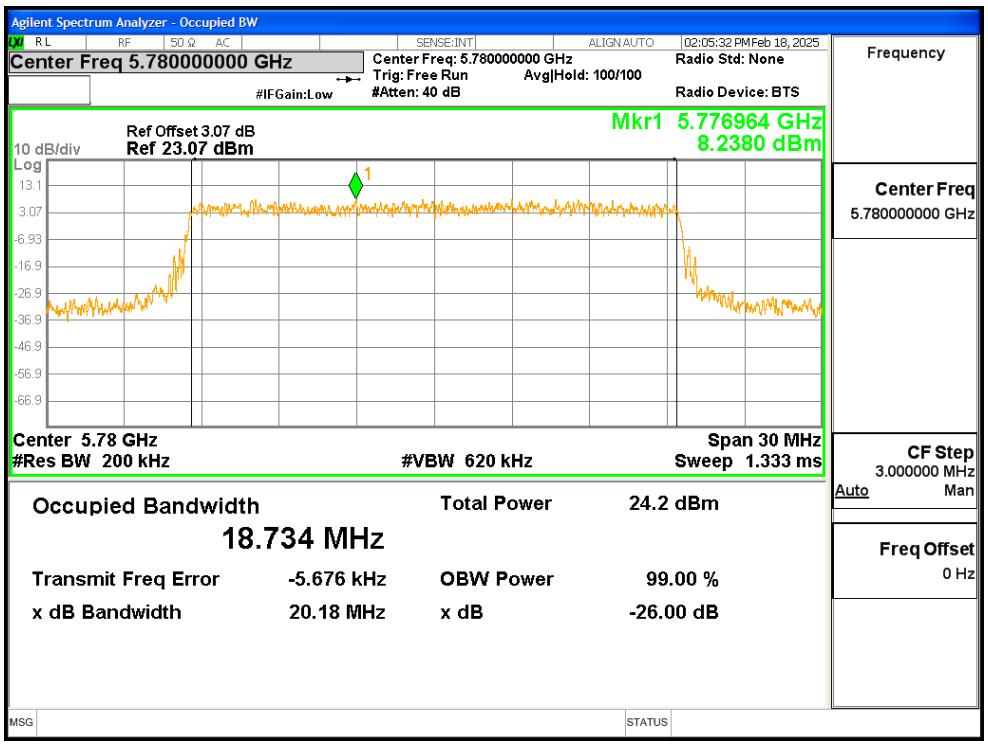
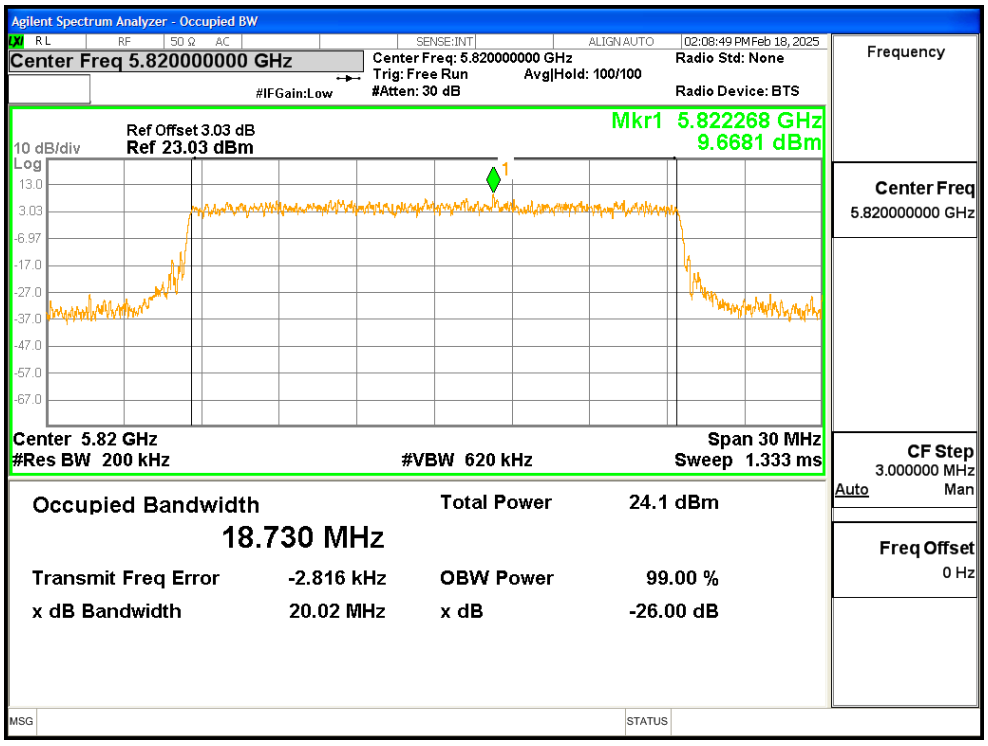
OBW NVNT a 5780MHz Ant2



OBW NVNT a 5820MHz Ant2



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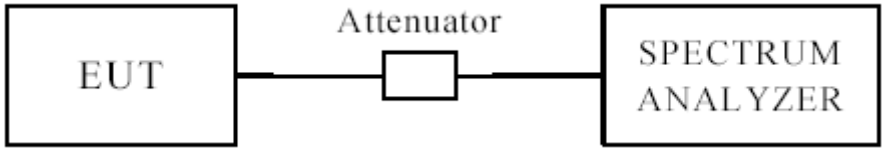
9.0 Peak Transmit Power Measurement

9.1 Test Setup



9.2 Limits of Peak Transmit Power Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) ≦(Max. e.i.r.p 125mW (21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
		Mobile and Portable client device	250mW (24 dBm)
U-NII-2A	--		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C	--		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

9.3 Test Procedure

The RF power output was measured with a Spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate centre frequency.

Note: the average power was measured

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9.4Test Results

10M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5750	Ant1	11.32	5.24	16.56	30	Pass
		5780		10.78	5.24	16.02	30	Pass
		5820		12.04	5.24	17.28	30	Pass
		5750	Ant2	12.02	5.24	17.26	30	Pass
		5780		12.22	5.24	17.46	30	Pass
		5820		12.55	5.24	17.79	30	Pass

EUT	Agricultural unmarmed drone				Model		Field Ranger X50	
Mode	10M Bandwidth				Test Voltage		DC76.5V	
Temperature	24 deg. C,				Humidity		56% RH	
Frequency (MHz)	Ant 1 Power		Ant 2 Power		Total Max. Power Output -MIMO (dBm)	Power Limit (dBm)	Pass/ Fail	
	dBm	mW	dBm	mW				
5750	16.56	45.29	17.26	53.21	19.93	30	Pass	
5780	16.02	39.99	17.46	55.72	19.81	30	Pass	
5820	17.28	53.46	17.79	60.12	20.55	30	Pass	

Note: 1. The result basic equation calculation as follow:

Average Power Output = AV Power Reading + Cable loss + Attenuator

2. The worse case was recorded

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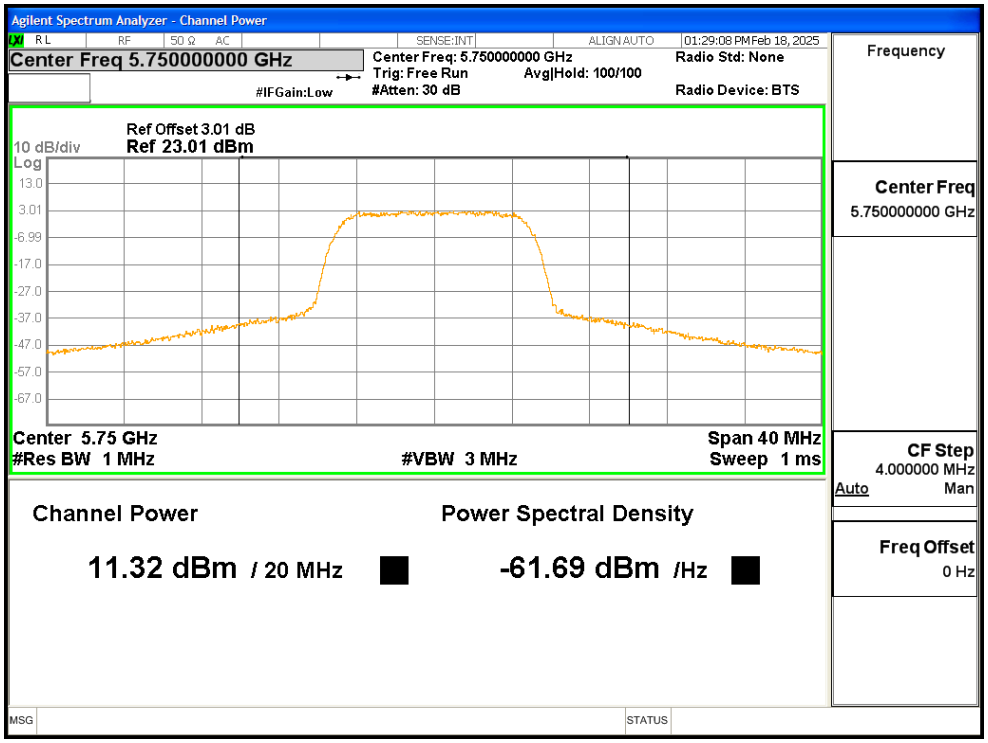
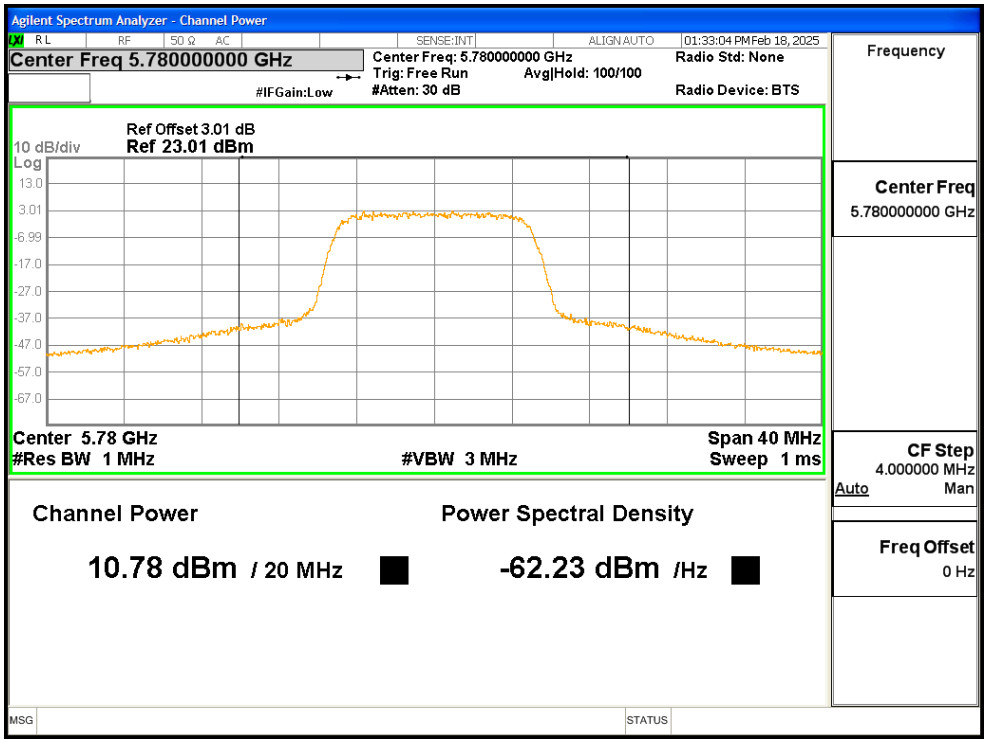
Test Graphs
Power NVNT a 5750MHz Ant1



Power NVNT a 5780MHz Ant1



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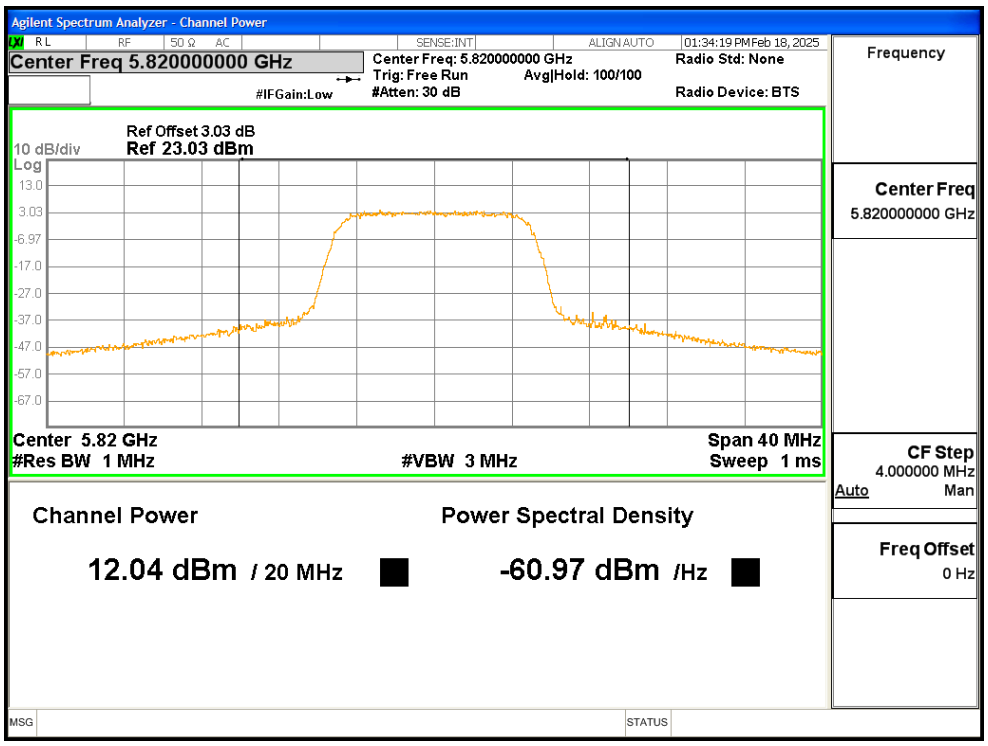
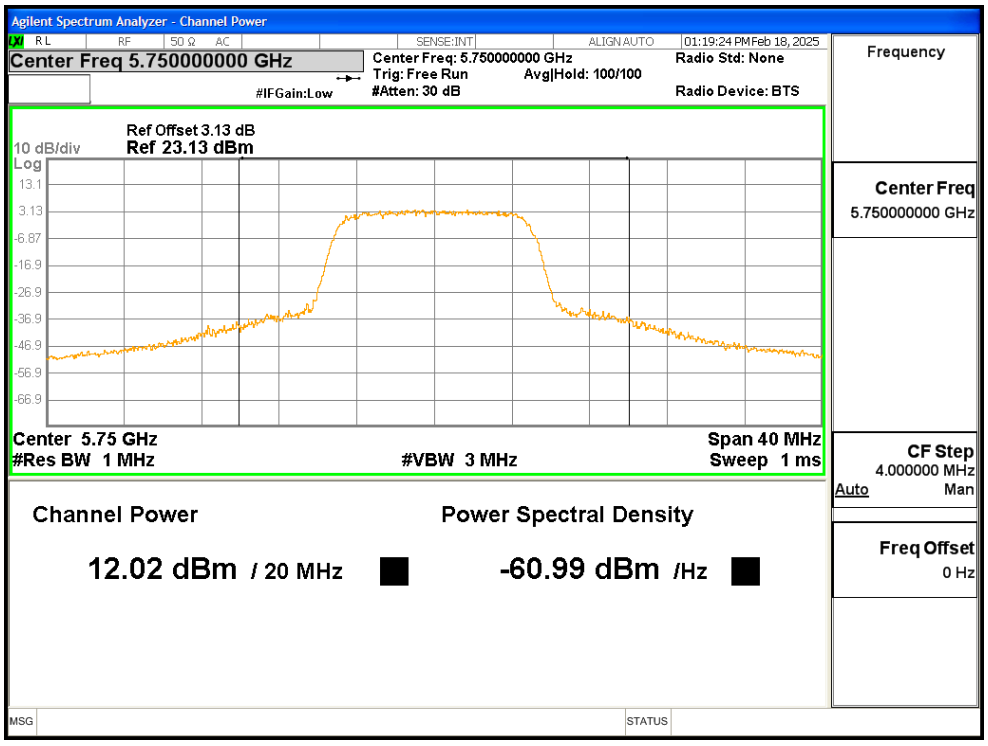
Power NVNT a 5820MHz Ant1



Power NVNT a 5750MHz Ant2



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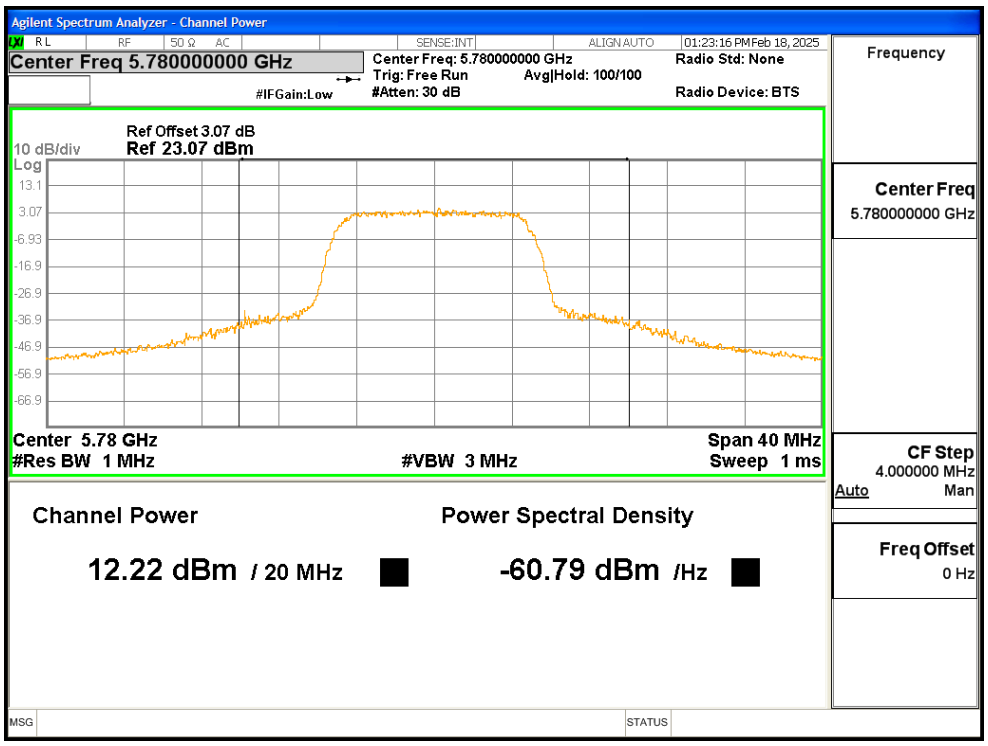
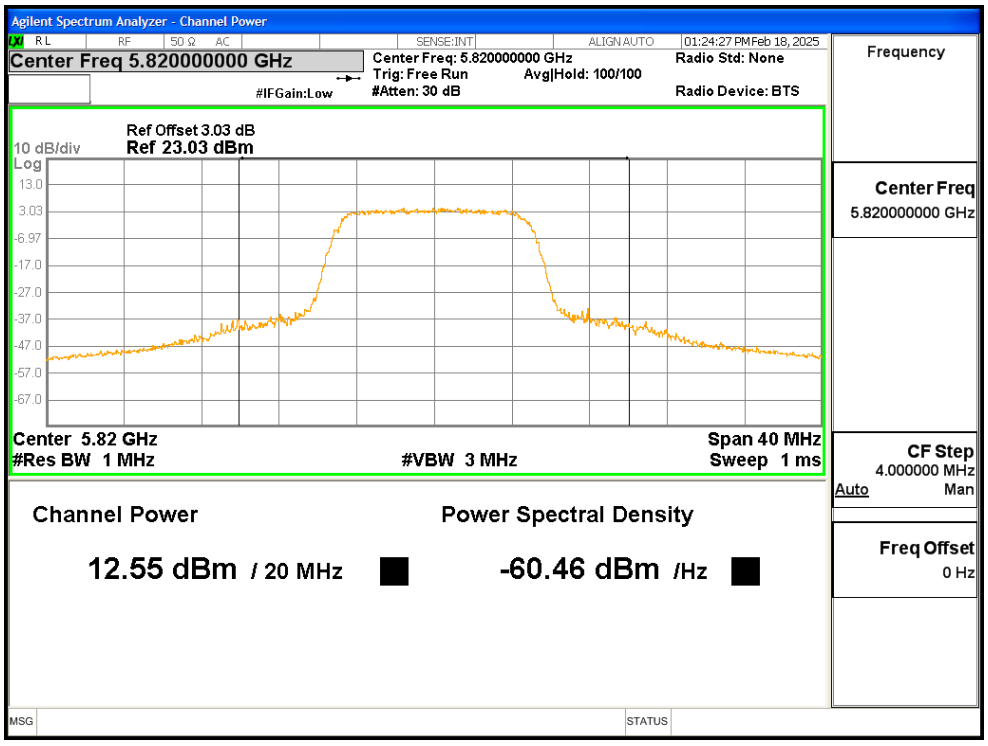
Power NVNT a 5780MHz Ant2



Power NVNT a 5820MHz Ant2



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20M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5750	Ant1	11.53	5.24	16.77	30	Pass
		5780		11.78	5.24	17.02	30	Pass
		5820		12.35	5.24	17.59	30	Pass
		5750	Ant2	13.1	5.24	18.34	30	Pass
		5780		12.87	5.24	18.11	30	Pass
		5820		13.1	5.24	18.34	30	Pass

EUT	Agricultural unmarmed drone			Model		Field Ranger X50		
Mode	10M Bandwidth			Test Voltage		DC76.5V		
Temperature	24 deg. C,			Humidity		56% RH		
Frequency (MHz)	Ant 1 Power		Ant 2 Power		Total Max. Power Output -MIMO (dBm)	Power Limit (dBm)	Pass/ Fail	
	dBm	mW	dBm	mW				
5750	16.77	47.53	18.34	68.23	20.64	30	Pass	
5780	17.02	50.35	18.11	64.71	20.61	30	Pass	
5820	17.59	57.41	18.34	68.23	20.99	30	Pass	

Note: 1. The result basic equation calculation as follow:

Power Output = Power Reading + Cable loss + Attenuator

2. The worse case was recorded

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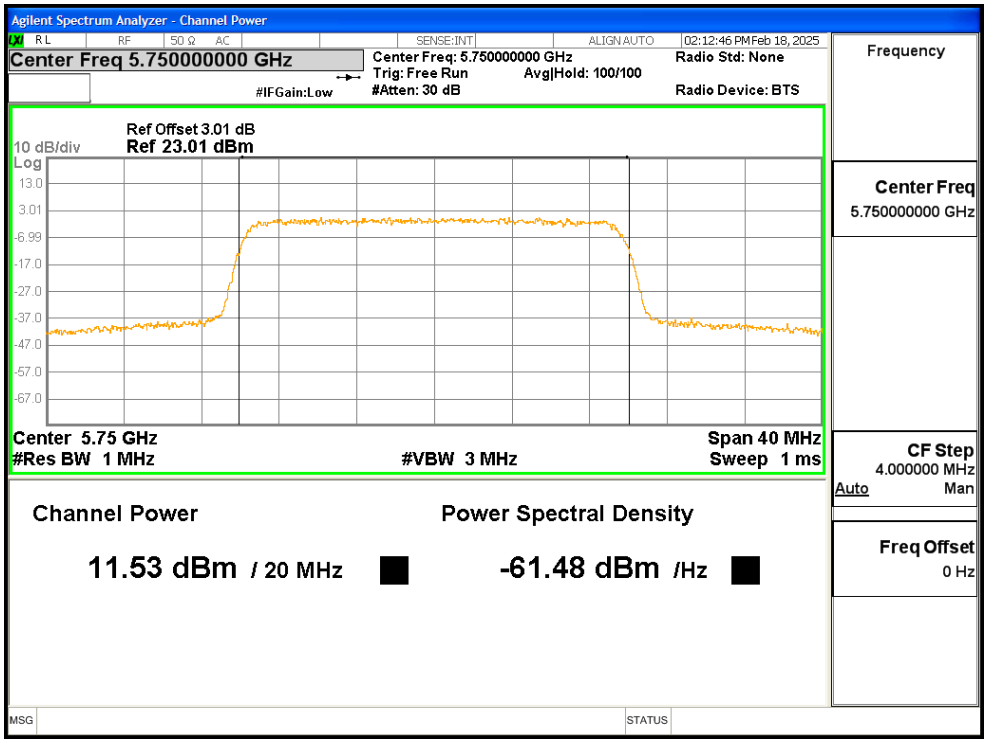
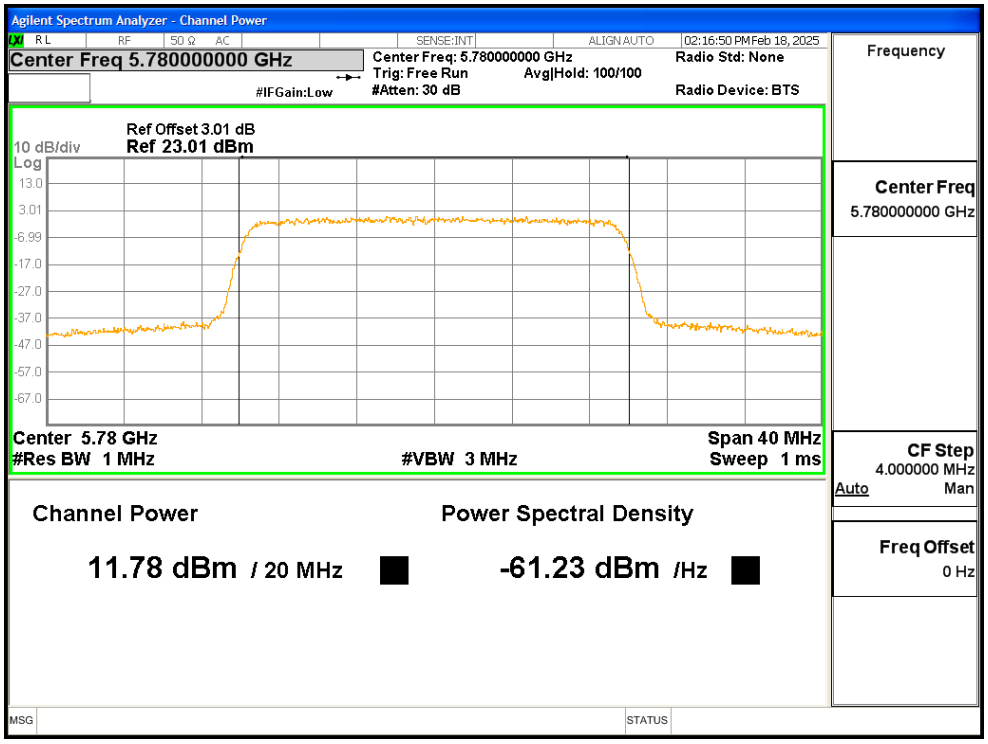
Test Graphs
Power NVNT a 5750MHz Ant1



Power NVNT a 5780MHz Ant1



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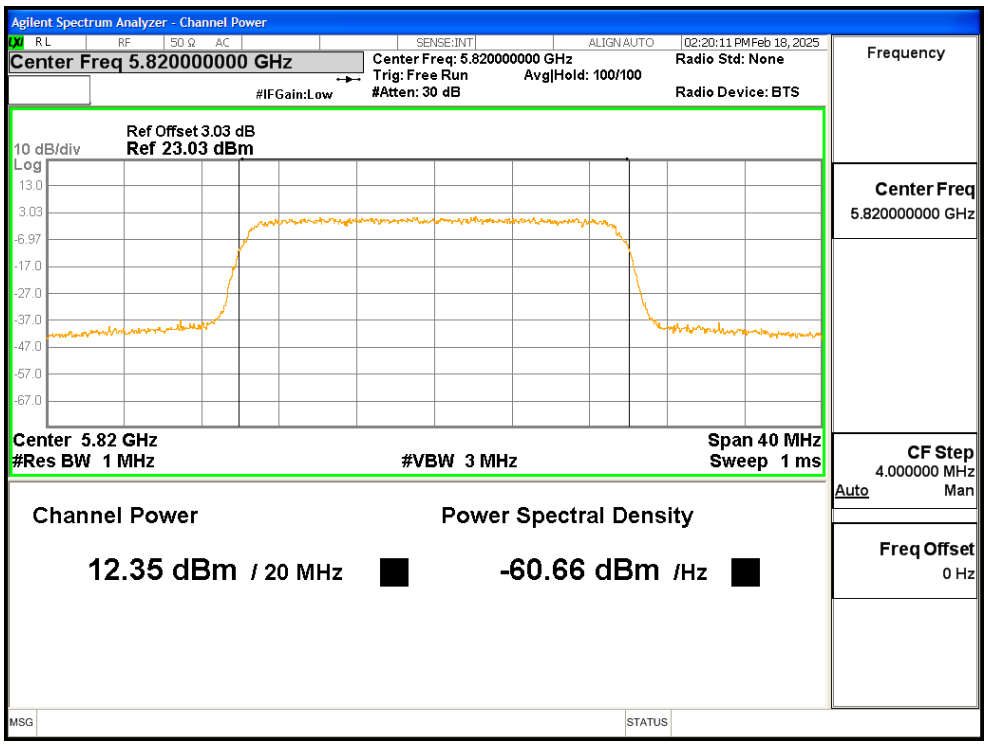
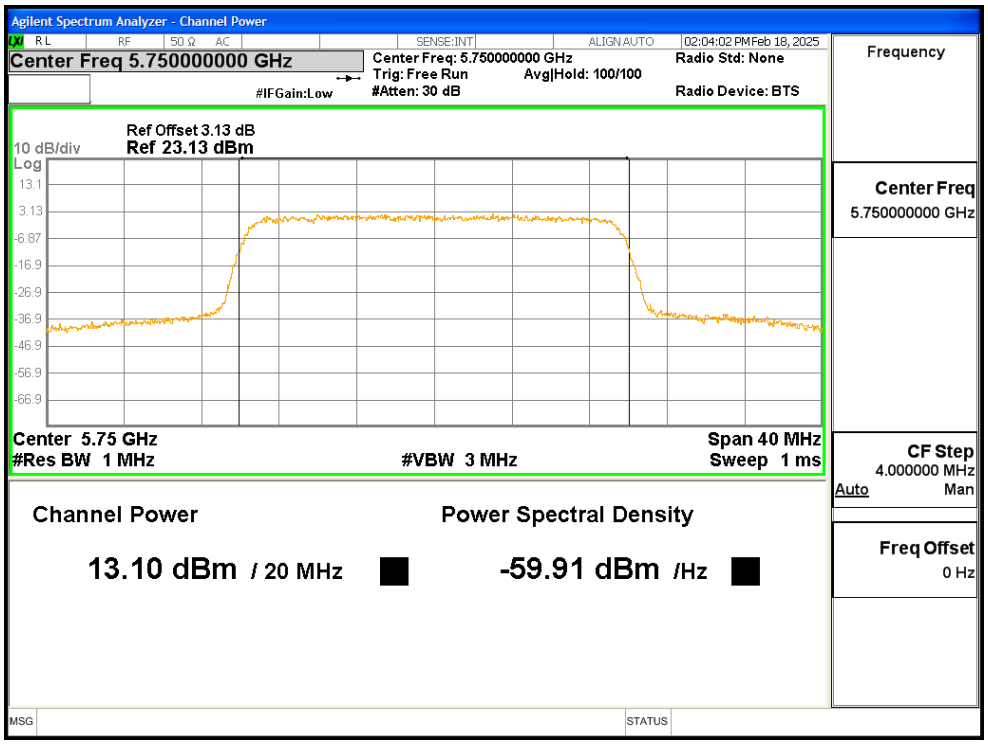
Power NVNT a 5820MHz Ant1



Power NVNT a 5750MHz Ant2



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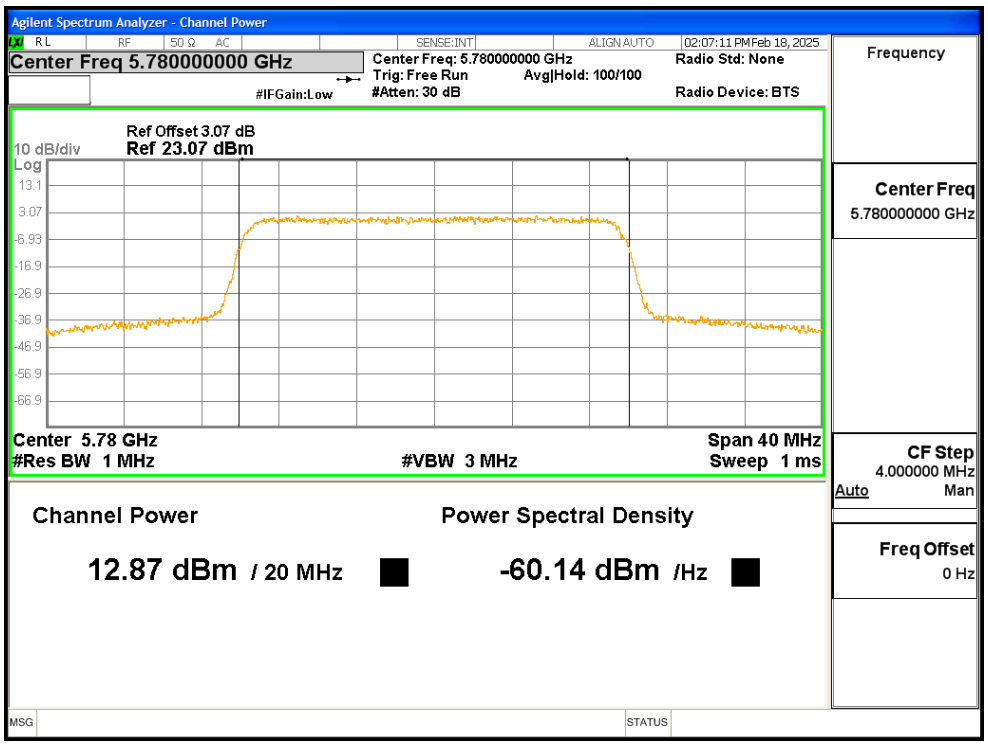
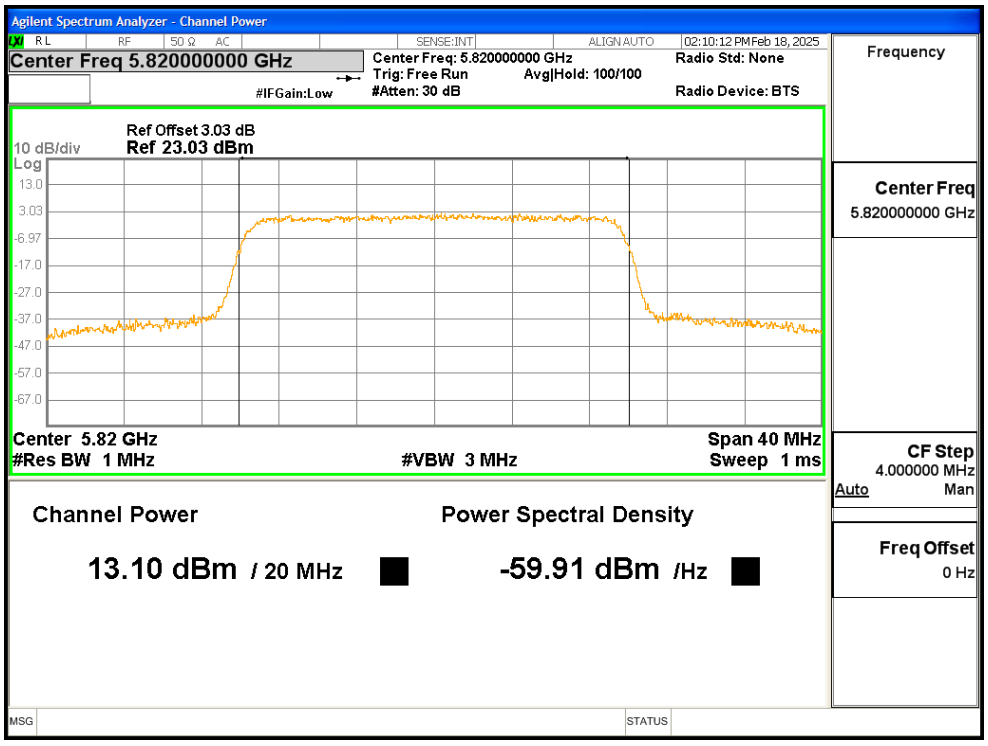
Power NVNT a 5780MHz Ant2



Power NVNT a 5820MHz Ant2



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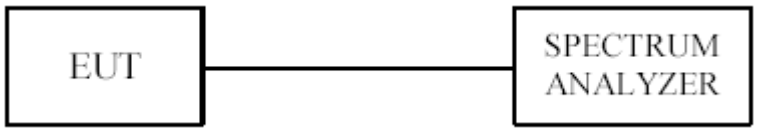
10. Power Spectral Density Measurement

10.1 Test Setup



10.2 Limits of Power Spectral Density Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
		Mobile and Portable client device	11dBm/MHz
U-NII-2A	--		11dBm/MHz
U-NII-2C	--		11dBm/MHz
U-NII-3	√		30dBm/500kHz

10.3 Test Procedure

1. The EUT was directly connected to the spectrum analyzer
2. Set the RBW = 510kHz
3. Set the VBW =1.5MHz
4. Set the span to encompass the entire emissions bandwidth (EBW) of the signal
5. Detector = RMS
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

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10.4Test Result

10M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm)	Duty Factor (dB)	Total PSD (dBm)	Limit (dBm)	Verdict
NVNT	a	5750	Ant1	0.5	5.24	5.74	30	Pass
		5780		0.95	5.24	6.19	30	Pass
		5820		1.16	5.24	6.4	30	Pass
		5750	Ant2	2.17	5.24	7.41	30	Pass
		5780		1.95	5.46	7.41	30	Pass
		5820		1.78	5.24	7.02	30	Pass

EUT	Agricultural unmarmed drone	Model	Field Ranger X50
Mode	10M Bandwidth	Test Voltage	DC76.5V
Temperature	24 deg. C,	Humidity	56% RH

Frequency (MHz)	Ant 1 PSD	Ant 2 PSD	Total Max. Power PSD -MIMO (dBm/510kHz)	PSD Limit (dBm/500kHz)	Pass/ Fail
	dBm/510kHz	dBm/510kHz			
5750	5.74	7.41	9.67	30	Pass
5780	6.19	7.41	9.85	30	Pass
5820	6.4	7.02	9.73	30	Pass

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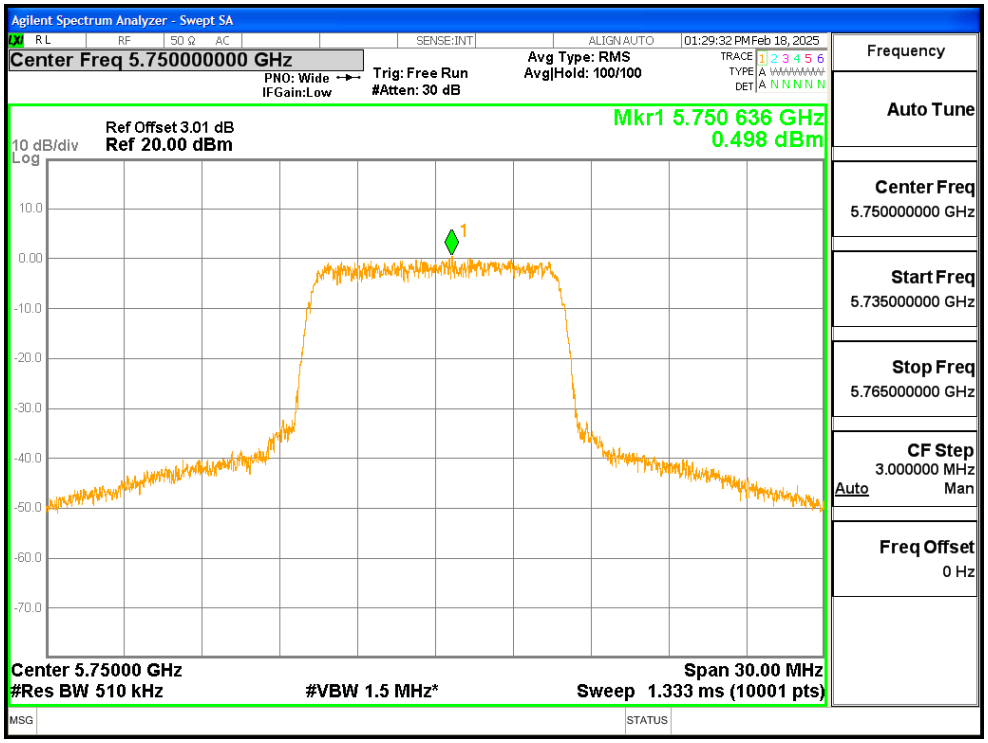
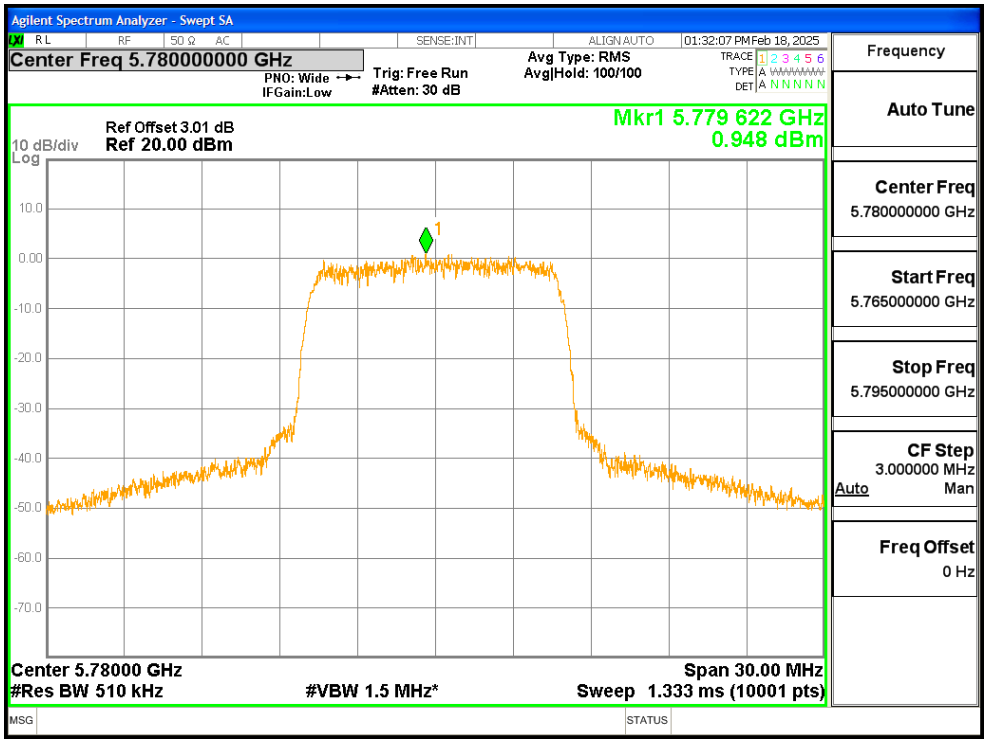
Test Graphs
PSD NVNT a 5750MHz Ant1



PSD NVNT a 5780MHz Ant1



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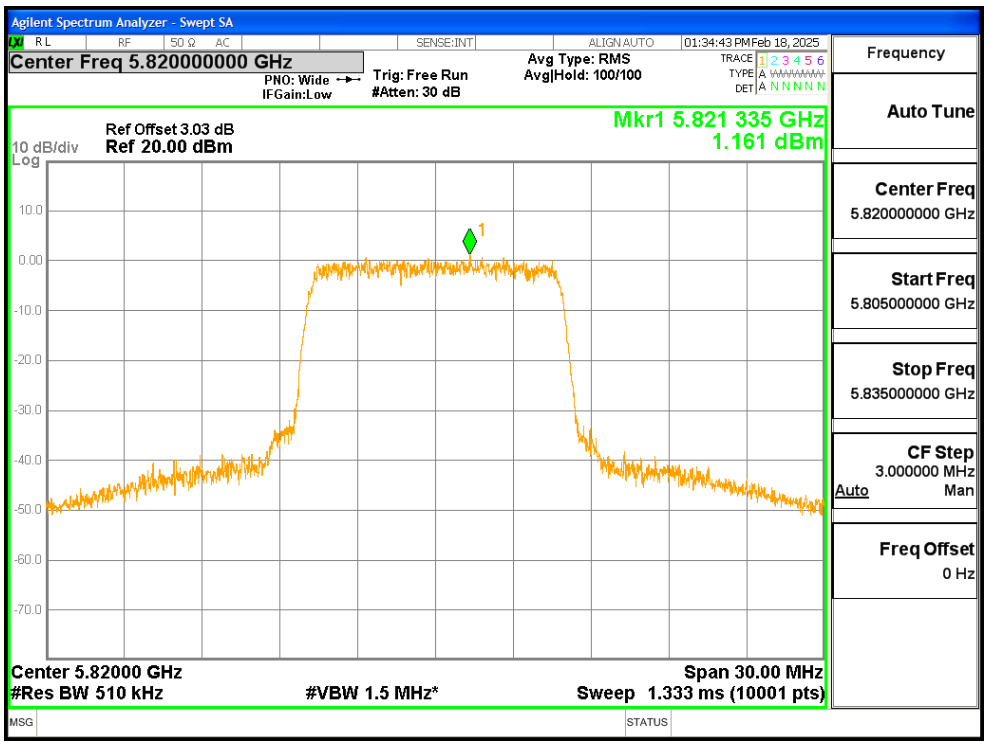
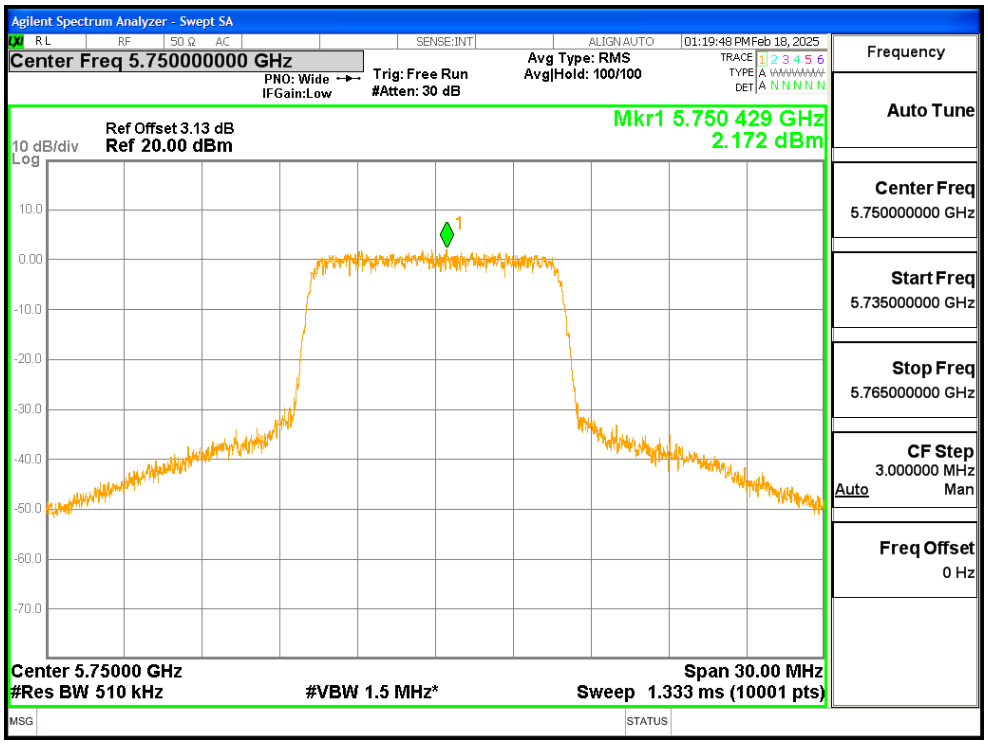
PSD NVNT a 5820MHz Ant1



PSD NVNT a 5750MHz Ant2



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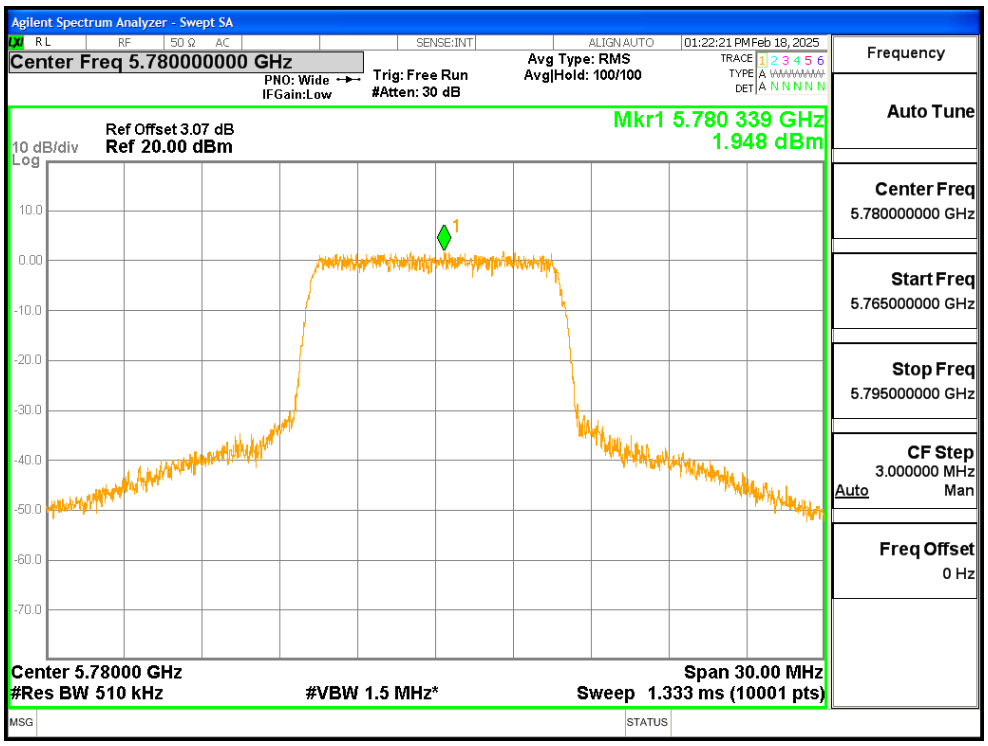
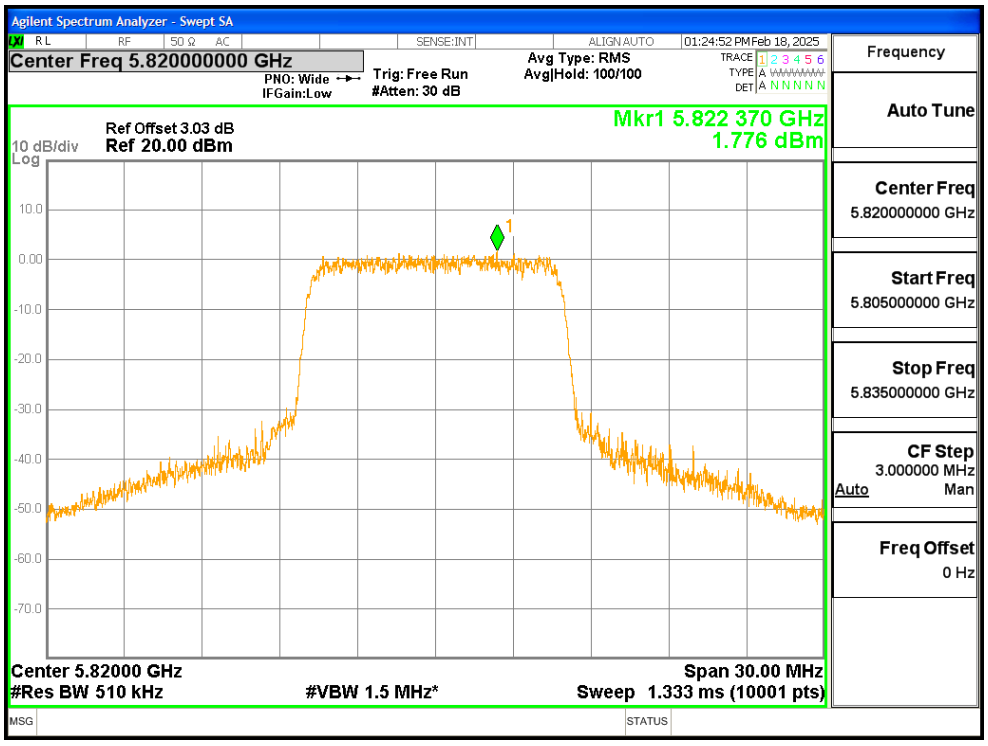
PSD NVNT a 5780MHz Ant2



PSD NVNT a 5820MHz Ant2



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20M Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm)	Duty Factor (dB)	Total PSD (dBm)	Limit (dBm)	Verdict
NVNT	a	5750	Ant1	-1.34	5.24	3.9	30	Pass
		5780		-0.55	5.46	4.91	30	Pass
		5820		0.12	5.46	5.58	30	Pass
		5750	Ant2	-0.13	5.46	5.33	30	Pass
		5780		-0.04	5.46	5.42	30	Pass
		5820		-0.41	5.46	5.05	30	Pass

EUT	Agricultural unmarmed drone	Model	Field Ranger X50
Mode	20M Bandwidth	Test Voltage	DC76.5V
Temperature	24 deg. C,	Humidity	56% RH

Frequency (MHz)	Ant 1 PSD	Ant 2 PSD	Total Max. Power PSD -MIMO (dBm/510kHz)	PSD Limit (dBm/500kHz)	Pass/ Fail
	dBm/510kHz	dBm/510kHz			
5750	3.9	5.33	7.68	30	Pass
5780	4.91	5.42	8.18	30	Pass
5820	5.58	5.05	8.33	30	Pass

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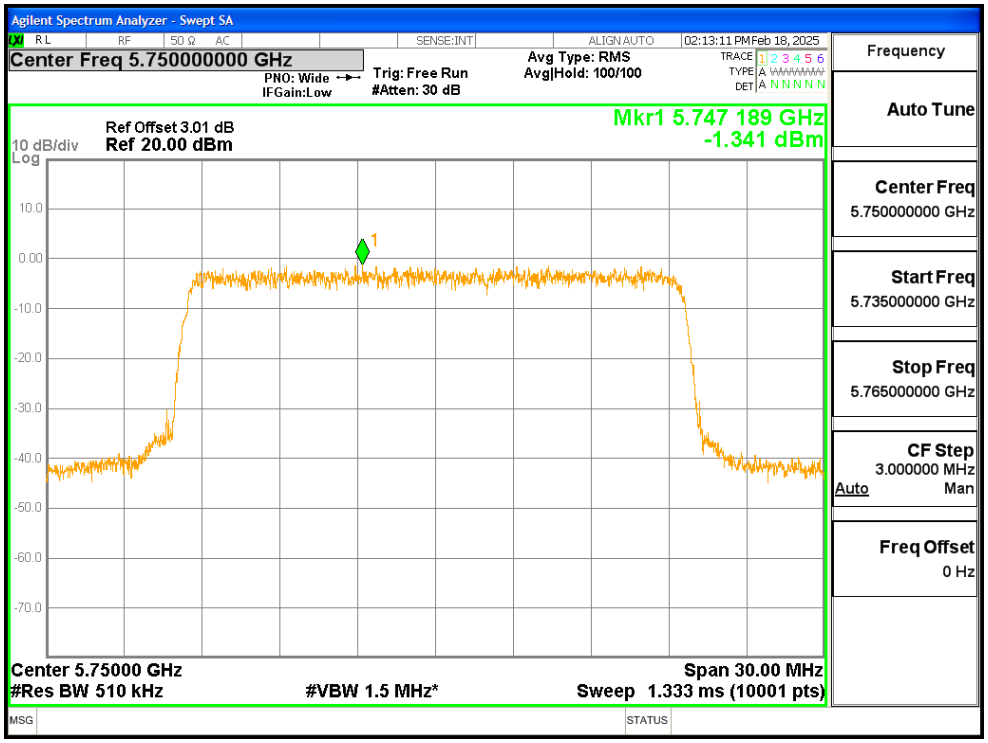
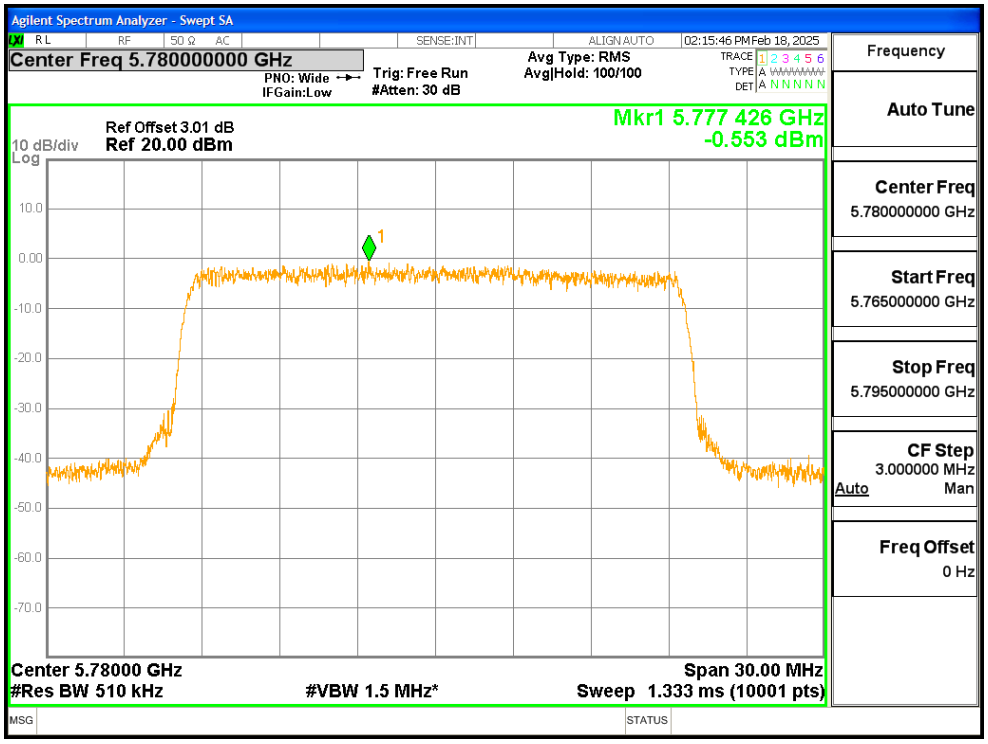
Test Graphs
PSD NVNT a 5750MHz Ant1



PSD NVNT a 5780MHz Ant1



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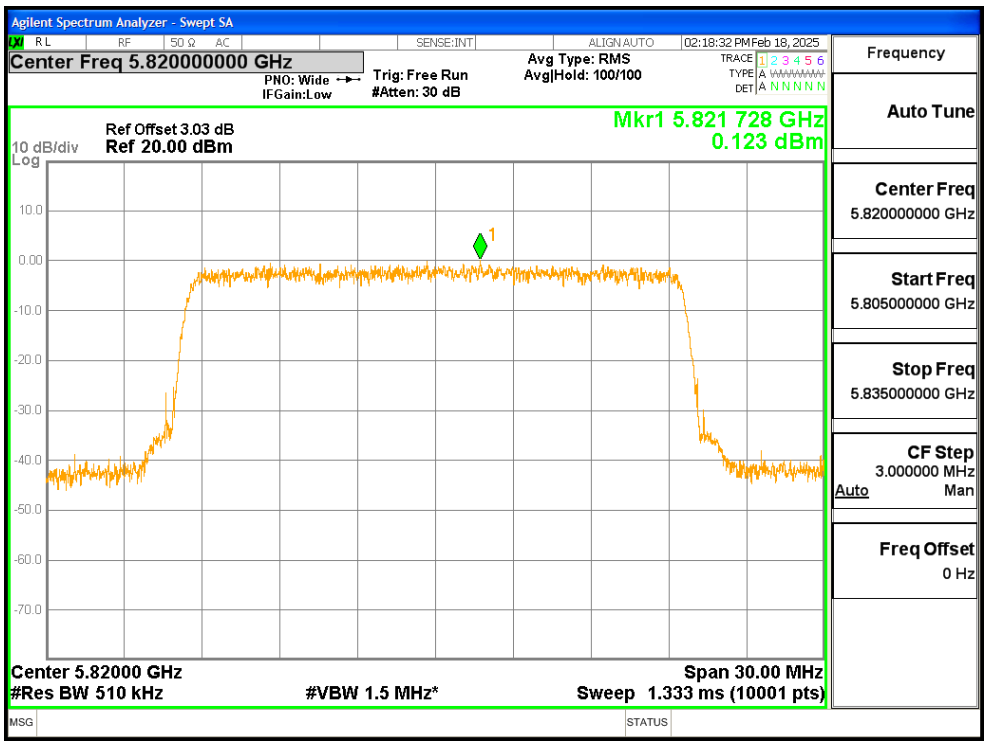
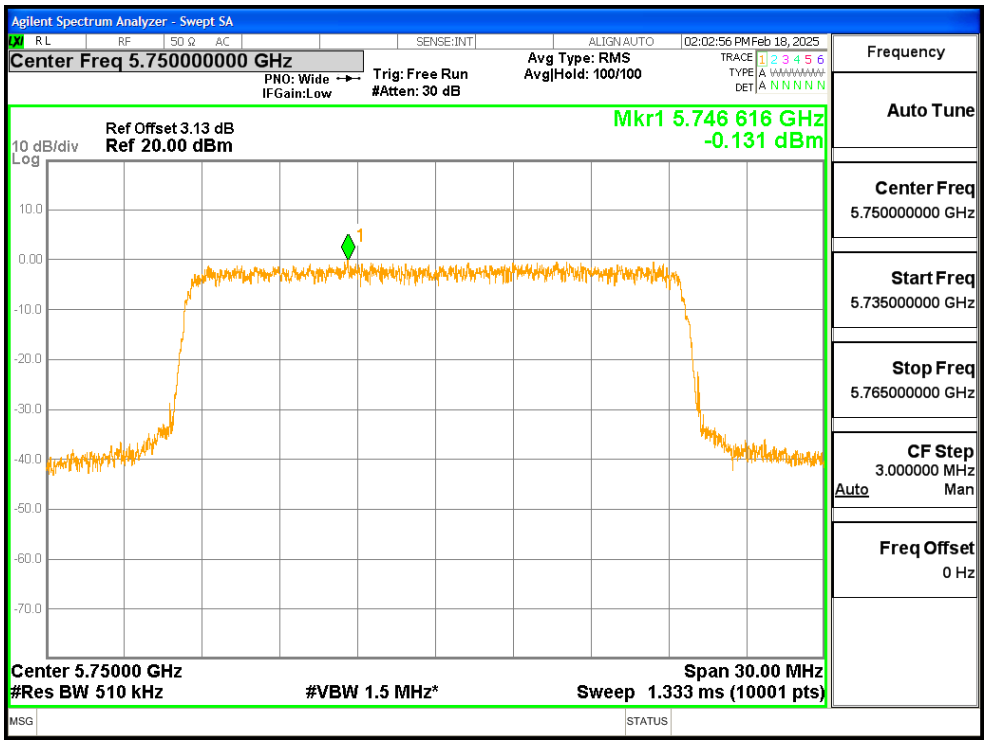
PSD NVNT a 5820MHz Ant1



PSD NVNT a 5750MHz Ant2



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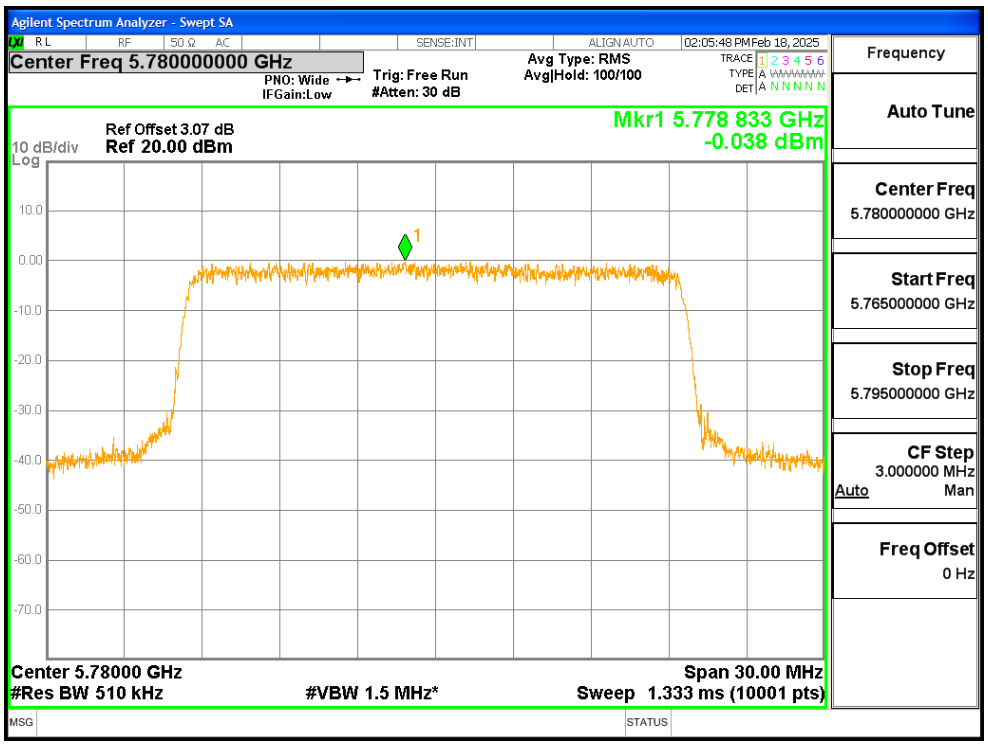
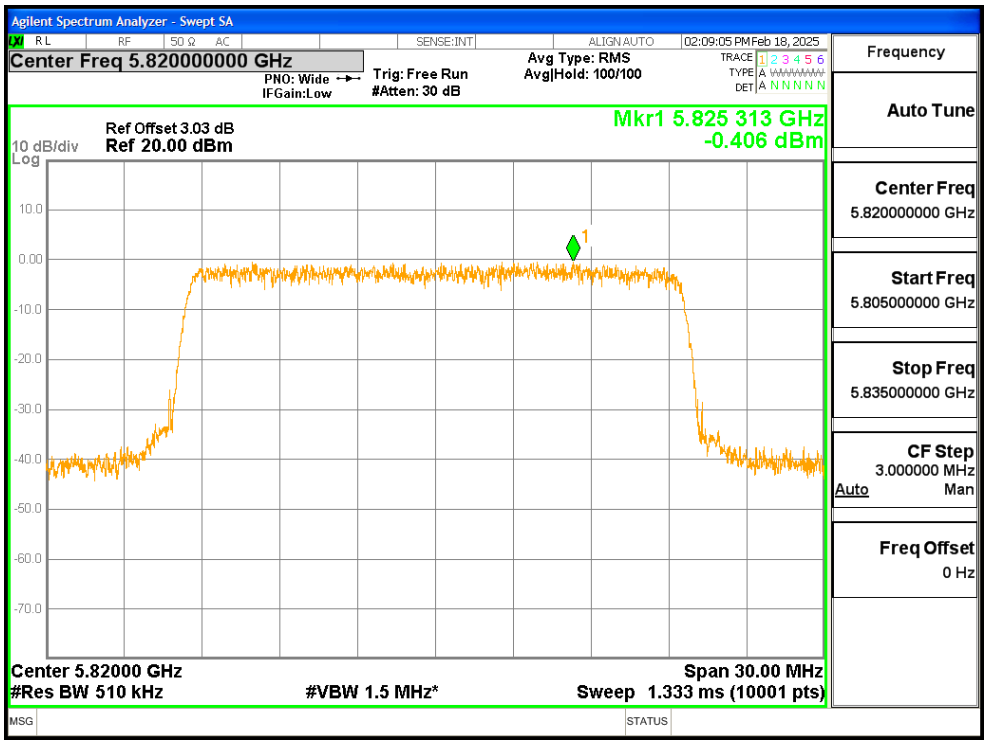
PSD NVNT a 5780MHz Ant2



PSD NVNT a 5820MHz Ant2



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11.0 Frequency Stability

11.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within +/- 0.02% of the operating frequency over a temperature variation of –30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees

11.2 Test Procedure

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

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11.3 Test Result

Middle Channel: 5780MHz

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
76.5V	5780.0367
65.0V	5780.0378
88.0V	5780.0364
Max. Deviation (MHz)	0.0378
Max. Deviation (ppm)	6.54

Rated Temperature: 20℃

Temperature vs. Frequency Stability

Temperature（℃）	Measurement Frequency (MHz)
-30	5780.0376
-20	5780.0358
-10	5780.0386
0	5780.0354
10	5780.0363
20	5780.0379
30	5780.0384
40	5780.0376
50	5780.0367
Max. Deviation (MHz)	0.0386
Max. Deviation (ppm)	6.68

Rated working voltage: 76.5V

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12.0 Antenna Requirement

12.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the mount in dB that the directional gain of the antenna exceeds 6 dBi.

12.2 Antenna Connected construction

Integral antennas used. The gain of the antennas is 1.87dBi maximum for each one. (Get from the antenna specification provided the applicant)

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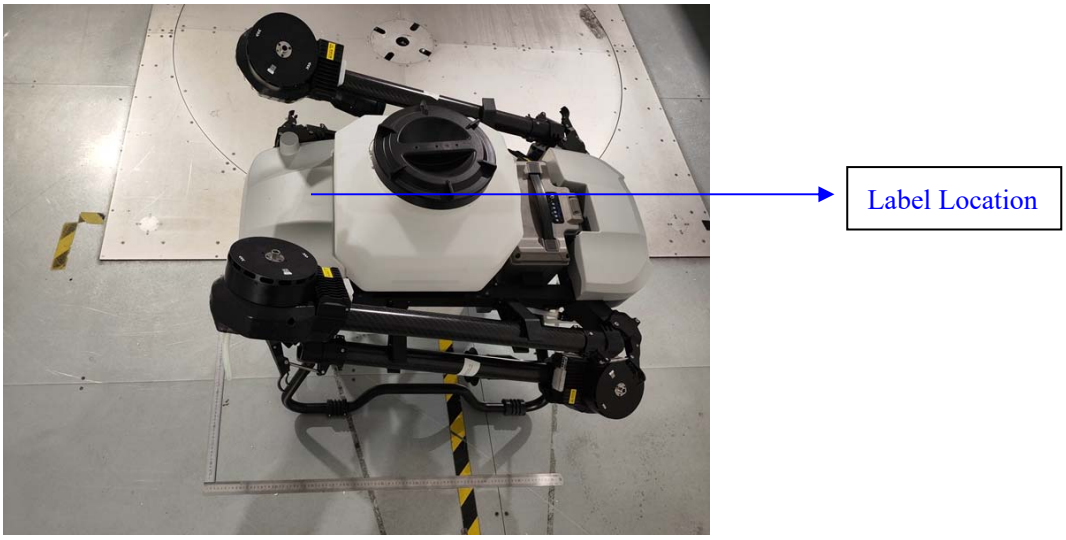
13.0 FCC ID Label

FCC ID: 2BM3J-X50

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:



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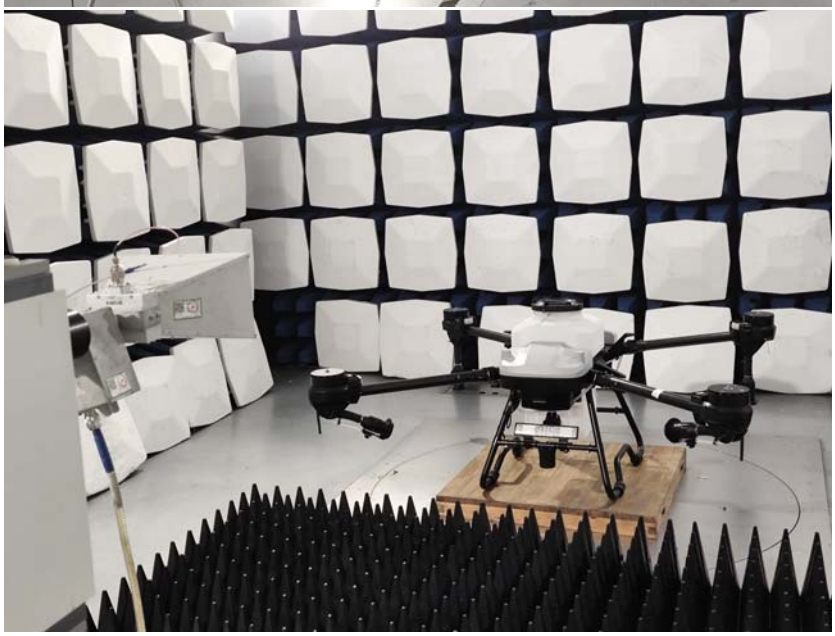
14.0 Photo of testing

Conducted Emission Test Setup:

N/A

Radiated Emission Test Setup:



Photos of EUT

Please see test report TW2501162-01E

--End of the report--

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