Certificate #4312.01

TEST REPORT

Product Name:	Compact Hotel Phone
Trade Mark:	GRANDSTREAM
Model No. / HVIN:	GHP621W / GHP621WM1
Add. Model No. / HVIN:	GHP620W / GHP620WM1
Report Number:	24072512886RFC-2
Test Standards:	FCC 47 CFR Part 15 Subpart E RSS-247 Issue 3 RSS-Gen Issue 5
FCC ID:	YZZGHP62XWM1
IC:	11964A-GHP62XWM1
Test Result:	PASS
Date of Issue:	November 15, 2024

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor, Boston, MA 02215, USA

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by: David Chen
David Chen
Senior Project Engineer

Reviewed by: Henry Lu
Henry Lu
Team Leader

Approved by: Robben Chen
Robben Chen
Assistant Manager

Date: November 15, 2024

UnionTrust Laboratories UnionTrust *Certified*

Version

Version No.	Date	Description
V1.0	November 15, 2024	Original

CONTENTS

1. GENERAL INFORMATION 4
   1.1 CLIENT INFORMATION 4
   1.2 EUT INFORMATION 4
      1.2.1 GENERAL DESCRIPTION OF EUT 4
      1.2.2 DESCRIPTION OF ACCESSORIES 5
   1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD 5
   1.4 OTHER INFORMATION 7
   1.5 DESCRIPTION OF SUPPORT UNITS 7
   1.6 TEST LOCATION 8
   1.7 TEST FACILITY 8
   1.8 DEVIATION FROM STANDARDS 8
   1.9 ABNORMALITIES FROM STANDARD CONDITIONS 8
   1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER 8
   1.11 MEASUREMENT UNCERTAINTY 9
2. TEST SUMMARY 10
3. EQUIPMENT LIST 11
4. TEST CONFIGURATION 12
   4.1 ENVIRONMENTAL CONDITIONS FOR TESTING 12
      4.1.1 NORMAL OR EXTREME TEST CONDITIONS 12
      4.1.2 RECORD OF NORMAL ENVIRONMENT AND TEST SAMPLE 12
   4.2 TEST CHANNELS 13
   4.3 EUT TEST STATUS 13
   4.4 PRE-SCAN 14
   4.5 TEST SETUP 14
      4.5.1 FOR RADIATED EMISSIONS TEST SETUP 14
      4.5.2 FOR CONDUCTED EMISSIONS TEST SETUP 16
      4.5.3 FOR CONDUCTED RF TEST SETUP 16
   4.6 SYSTEM TEST CONFIGURATION 17
   4.7 DUTY CYCLE 18
5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION 63
   5.1 REFERENCE DOCUMENTS FOR TESTING 63
   5.2 ANTENNA REQUIREMENT 63
   5.3 26 DB BANDWIDTH & OCCUPIED BANDWIDTH 64
   5.4 6 DB BANDWIDTH & OCCUPIED BANDWIDTH 65
   5.5 MAXIMUM CONDUCTED OUTPUT POWER OR E.I.R.P 66
   5.6 PEAK POWER SPECTRAL DENSITY 72
   5.7 RADIATED EMISSIONS AND BAND EDGE MEASUREMENT 75
   5.8 DYNAMIC FREQUENCY SELECTION 124
   5.9 AC POWER LINE CONDUCTED EMISSION 128

APPENDIX A RF TEST DATA 131
   A.1 EMISSION BANDWIDTH 131
   A.2 OCCUPIED CHANNEL BANDWIDTH 168
   A.3 MIN EMISSION BANDWIDTH 215
   A.4 MAXIMUM POWER SPECTRAL DENSITY 229
   A.5 DFS DETECTION THRESHOLDS 279
   A.6 CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME 282
   A.7 NON-OCCUPANCY PERIOD 285

APPENDIX 1 PHOTOS OF TEST SETUP 288
APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS 288

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks, Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor, Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor, Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Compact Hotel Phone		
Model No. / HVIN:	GHP621W / GHP621WM1		
Add. Model No. / HVIN:	GHP620W / GHP620WM1		
DUT Stage:	Identical Prototype		
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	IEEE 802.11b/g/n/ax	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac/ax
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n/ac/ax
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac/ax
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac/ax
Sample Received Date:	July 25, 2024		
Sample Tested Date:	August 6, 2024 to October 12, 2024		

Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.

1.2.2 Description of Accessories

Adapter (1)	
Model No.:	DCT06W120050US-D0
Input:	100-240V~50/60Hz 200mA
Output:	12.0V⎓0.5A
DC Cable	1.8 Meter, Unshielded without ferrite
Manufacture:	Zhuzhou Dachuan Electronic Technology Co., Ltd.
SN:	00997US240327502519

Adapter (2)	
Model No.:	RD1200500-C55-123MGD
Input:	100-240V~50/60Hz 250mA Max
Output:	12.0V⎓0.5A
DC Cable	1.8 Meter, Unshielded without ferrite
Manufacture:	SHENZHEN RUIDE ELECTRONIC INDUSTRIAL CO., LTD
SN:	N/A

Adapter (3)	
Model No.:	GQ06-120050-ZU
Input:	100-240V~50/60Hz 0.3 A Max
Output:	12.0V⎓0.5A
DC Cable	1.8 Meter, Unshielded without ferrite
Manufacture:	Dong Guan City GangQi Electronic Co., Ltd
SN:	N/A

Cable	
Description:	Phone Cord
Cable Type:	Unshielded without ferrite
Length:	2.5 Meter

Others
1x Handset, 1x Base Stand

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Bands:	5150 MHz to 5250 MHz (U-NII-1)
	5250 MHz to 5350 MHz (U-NII-2A)
	5470 MHz to 5725 MHz (U-NII-2C)
	5725 MHz to 5850 MHz (U-NII-3)
Frequency Ranges:	5180 MHz to 5240 MHz
	5260 MHz to 5320 MHz
	5500 MHz to 5720 MHz
	5745 MHz to 5825 MHz
Support Standards:	IEEE 802.11a/n/ac/ax
TPC Function:	Not Support
DFS Operational mode:	Slave without radar Interference detection function
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)

	IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)				
	IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)				
	IEEE 802.11ax:OFDM/ OFDMA Note 1 (1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK)				
Channel Spacing:	IEEE 802.11a/n-HT20/ac-VHT20/ax-HE20: 20 MHz				
	IEEE 802.11n-HT40/ac-VHT40/ax-HE40: 40 MHz				
Data Rate:	IEEE 802.11a: Up to 54 Mbps				
	IEEE 802.11n-HT20: Up to MCS7				
	IEEE 802.11n-HT40: Up to MCS7				
	IEEE 802.11ac-VHT20: Up to MCS8				
	IEEE 802.11ac-VHT40: Up to MCS9				
	IEEE 802.11ax-HE20/HE40: Up to MCS11				
Number of Channels:	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20/ax-HE20 2 for IEEE 802.11n-HT40)/ac-VHT40/ax-HE40				
	5250 MHz to 5350 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20/ax-HE20 2 for IEEE 802.11n-HT40)/ac-VHT40/ax-HE40				
	5470 MHz to 5725 MHz: 12 for IEEE 802.11a/n-HT20/ac-VHT20/ax-HE20 6 for IEEE 802.11n-HT40/ac-VHT40/ax-HE40				
	5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20/ac-VHT20/ax-HE20 2 for IEEE 802.11n-HT40/ac-VHT40/ax-HE40				
Antenna Type:	Dipole Antenna				
Antenna Gain: (Provided by the customer)	5150 MHz to 5250 MHz: 5.32 dBi				
	5250 MHz to 5350 MHz: 5.32 dBi				
	5470 MHz to 5725 MHz: 5.32 dBi				
	5725 MHz to 5850 MHz: 5.32 dBi				
Maximum conducted output power (dBm):		**U-NII-1**	**U-NII-2A**	**U-NII-2C**	**U-NII-3**
	IEEE 802.11a:	15.00	15.87	10.47	12.63
	IEEE 802.11n-HT20:	14.84	15.80	10.54	12.82
	IEEE 802.11n-HT40:	16.78	16.06	10.45	11.51
	IEEE 802.11ac-VHT20	15.02	16.49	10.83	11.47
	IEEE 802.11ac-VHT40	17.07	16.61	11.00	11.50
	IEEE 802.11ax-HE20	14.84	16.82	10.85	13.35
	IEEE 802.11ax-HE40	16.96	15.72	10.39	12.02
Maximum EIRP (dBm):		**U-NII-1**	**U-NII-2A**	**U-NII-2C**	**U-NII-3**
	IEEE 802.11a:	20.32	21.19	15.79	17.95
	IEEE 802.11n-HT20:	20.16	21.12	15.86	18.14
	IEEE 802.11n-HT40:	22.10	21.38	15.77	16.83
	IEEE 802.11ac-VHT20	20.34	21.81	16.15	16.79
	IEEE 802.11ac-VHT40	22.39	21.93	16.32	16.82
	IEEE 802.11ax-HE20	20.16	22.14	16.17	18.67
	IEEE 802.11ax-HE40	22.28	21.04	15.71	17.34
Normal Test Voltage:	12Vdc				
Note 1: For IEEE 802.11ax, the device not support partial RU mode.					

1.4 OTHER INFORMATION

Operation Frequency Each of Channel				
	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
IEEE 802.11a, IEEE 802.11n-HT20, IEEE 802.11ac-VHT20 IEEE 802.11ax-HE20	f = 5000 + 5k, k = 32 + 4n			f = 5000 + 5k, k = 145 + 4n
	n = 1,…, 4	n = 5,…, 8	n = 17,…, 27	n = 1,…, 5
IEEE 802.11n-HT40, IEEE 802.11ac-VHT40 IEEE 802.11ax-HE40	f = 5000 + 5k, k = 30 + 8n			f = 5000 + 5k, k = 143 + 8n
	n = 1, 2	n = 1,…, 5	n = 9,…, 13	n = 1, 2
Note: **f** is the operating frequency (MHz); **k** is the operating channel.				

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	FCC ID	Supplied by
Notebook	Lenovo	B40-80	MP12NEQ6	N/A	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	N/A	UnionTrust
Wireless Home Router	SAGEMCOM	FAST5280	253703944	VW3FAST5280	UnionTrust
Key-Press Attenuator	Huaxin	KT2.5-90/1S-2S	UTTL-EN023	N/A	UnionTrust
4 Way Divider	WOKEN	0120A040560002D	UTTL-EN028	N/A	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.1 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9kHz-150kHz	±3.2 dB
2	Conducted emission 150kHz-30MHz	±2.7 dB
3	Radiated emission 9kHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB
8	Conducted spurious emissions	± 2.7 dB
9	RF Power, Conducted	± 0.68 dB
10	Occupied Bandwidth	± 1.86 %
11	Radio Frequency	± 6.4×10^{-8}
12	Transmission Time	± 0.19 %

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart E Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203 FCC 47 CFR Part 15 Subpart E Section 15.407(a)(1) (2) RSS-Gen Issue 5, Section 6.8	N/A	PASS
26 dB emission bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(2)(5) RSS-247 Issue 3 Section 6.2.1.2	KDB 789033 D02 v02r01 Section C.1	PASS
6 dB bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (e) RSS-247 Issue 3 Section 6.2.4.1	KDB 789033 D02 v02r01 Section C.2	PASS
Occupied Bandwidth	RSS-Gen Issue 5, Section 6.7	RSS-Gen Issue 5, section 6.7	PASS
Maximum conducted output power or e.i.r.p	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3) RSS-247 Issue 3 Section 6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	KDB 789033 D02 v02r01 Section E.3.a (Method PM)	PASS
Peak Power Spectral Density	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3) RSS-247 Issue 3 Section 6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	KDB 789033 D02 v02r01 Section F	PASS
Radiated Emissions and Band Edge Measurement	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(2)(3)(4)(6) FCC 47 CFR Part 15 Subpart C Section 15.209/205 RSS-247 Issue 3 Section 6.2.1.2/6.2.2.2/6.2.3.2/6.2.4.2	KDB 789033 D02 v02r01 Section G.3, G.4, G.5, and G.6	PASS
Dynamic Frequency Selection	FCC 47 CFR Part 15 Subpart E Section 15.407 (h) RSS-247 Issue 3 Section 6.3	KDB 905462 D03 Client Without DFS New Rules v01r02	PASS
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(6) FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013, Section 6.2.	PASS
Disclaimer and Explanations: The declared of product specification and data (e.g. antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.			

For Dynamic Frequency Selection

Test Case	Result
Channel Availability Check Time	N/A Note 1
U-NII Detection Bandwidth	N/A Note 1
Channel Closing Transmission Time	PASS
Channel Move Time	PASS
DFS Detection Threshold	N/A Note 1
Non- Occupancy Period	N/A Note 1
Note: 1) The EUT is slave, NA In this whole report not applicable.	

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☑	3m SAC	ETS-LINDGREN	3m	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☑	Receiver	R&S	ESIB26	100114	27-Oct-2023	26-Oct-2024
☑	Spectrum Analyzer	R&S	FSV40-N	101653	29-Mar-2024	28-Mar-2025
☑	Loop Antenna	ETS-LINDGREN	6502	00202525	30-Oct-2023	29-Oct-2024
☑	Broadband Antenna	ETS-LINDGREN	3142E	00201566	30-Oct-2023	29-Oct-2024
☑	6dB Attenuator	Talent	RA6A5-N-18	18103001	30-Oct-2023	29-Oct-2024
☑	Preamplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
☑	Band Rejection Filter (5150MHz~5880MHz)	Micro-Tronics	BRM50716	G186	27-Oct-2023	26-Oct-2024
☑	Double-Ridged Waveguide Horn Antenna	ETS-LINDGREN	3117-PA	00201541	01-Apr-2024	31-Mar-2025
☑	Pre-amplifier	ETS-Lindgren	00118385	00201874	31-Oct-2023	30-Oct-2024
☑	Double-Ridged Waveguide Horn Antenna	ETS-LINDGREN	3116C-PA	00202652	30-Oct-2023	29-Oct-2024
☑	Pre-amplifier	ETS-Lindgren	00118384	00202652	30-Oct-2023	29-Oct-2024
☑	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☑	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☑	Receiver	R&S	ESR7	1316.3003K07-101181-K3	27-Oct-2023	26-Oct-2024
☑	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	27-Oct-2023	26-Oct-2024
☑	LISN	R&S	ESH2-Z5	860014/024	27-Oct-2023	26-Oct-2024
☑	LISN	ETS-Lindgren	3816/2SH	00201088	27-Oct-2023	26-Oct-2024
☑	Test Software	EZ-EMC	EZ-CON	Software Version: EMC-CON 3A1.1		

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☑	EXA Spectrum Analyzer	KEYSIGHT	N9020A	MY51286807	27-Oct-2023	26-Oct-2024
☑	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	27-Oct-2023	26-Oct-2024
☑	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	27-Oct-2023	26-Oct-2024

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	12	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temp. (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
26 dB emission bandwidth	22.6	48.8	100.2	S202407253994-ZJA02/4	Allen Zhou
6 dB bandwidth					
Occupied Bandwidth					
Maximum conducted output power					
Peak Power Spectral Density					
Dynamic Frequency Selection					
Radiated Emissions and Band Edge Measurement	25.6	55.7	100.4	S202407253994-ZJA03/4	Fire Huo
AC Power Line Conducted Emission	23.0	48.9	100.2	S202407253994-ZJA01/4	Linson Xie

4.2 TEST CHANNELS

Mode	Tx/Rx Frequency	Test RF Channel Lists			
		Lowest(L)	Middle(M)	Highest(H)	Straddle band
IEEE 802.11a IEEE 802.11n-HT20 IEEE 802.11ac-VHT20 IEEE 802.11ax-HE20	5150 MHz to 5250 MHz	Channel 36	Channel 44	Channel 48	--
		5180 MHz	5220 MHz	5240 MHz	--
	5250 MHz to 5350 MHz	Channel 52	Channel 60	Channel 64	--
		5260 MHz	5300 MHz	5320 MHz	--
	5470 MHz to 5725 MHz	Channel 100	Channel 116	Channel 140	Channel 144
		5500 MHz	5580 MHz	5700 MHz	5720 MHz
	5725 MHz to 5850 MHz	Channel 149	Channel 157	Channel 165	--
		5745 MHz	5785 MHz	5825 MHz	--
IEEE 802.11n-HT40 IEEE 802.11ac-VHT40 IEEE 802.11ax-HE40	5150 MHz to 5250 MHz	Channel 38	--	Channel 46	--
		5190 MHz	--	5230 MHz	--
	5250 MHz to 5350 MHz	Channel 54	--	Channel 62	--
		5270 MHz	--	5310 MHz	--
	5470 MHz to 5725 MHz	Channel 102	Channel 110	Channel 134	Channel 142
		5510 MHz	5550 MHz	5670 MHz	5710 MHz
	5725 MHz to 5850 MHz	Channel 151	--	Channel 159	--
		5755 MHz	--	5795 MHz	--

4.3 EUT TEST STATUS

Mode	Tx/Rx Function	Description
IEEE 802.11a/n/ac/ax	1Tx/1Rx	1. Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

Power Setting				
	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
IEEE 802.11a	13	15	11	15
IEEE 802.11n-HT20	13	15	11	15
IEEE 802.11n-HT40	15	15	11	15
IEEE 802.11ac-VHT20	13	15	11	15
IEEE 802.11ac-VHT40	15	15	11	15
IEEE 802.11ax-HE20	13	16	11	16
IEEE 802.11ax-HE40	15	15	11	15

Test Software
Test software name: Commands

4.4 PRE-SCAN

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Following data rate was (were) selected for the final test as listed below

Mode	Worst-case data rates
IEEE 802.11a	6 Mbps
IEEE 802.11n-HT20	MCS0
IEEE 802.11n-HT40	MCS0
IEEE 802.11ac-VHT20	MCS0
IEEE 802.11ac-VHT40	MCS0
IEEE 802.11ax-HE20	MCS0
IEEE 802.11ax-HE40	MCS0

4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

Figure 1. Below 30MHz

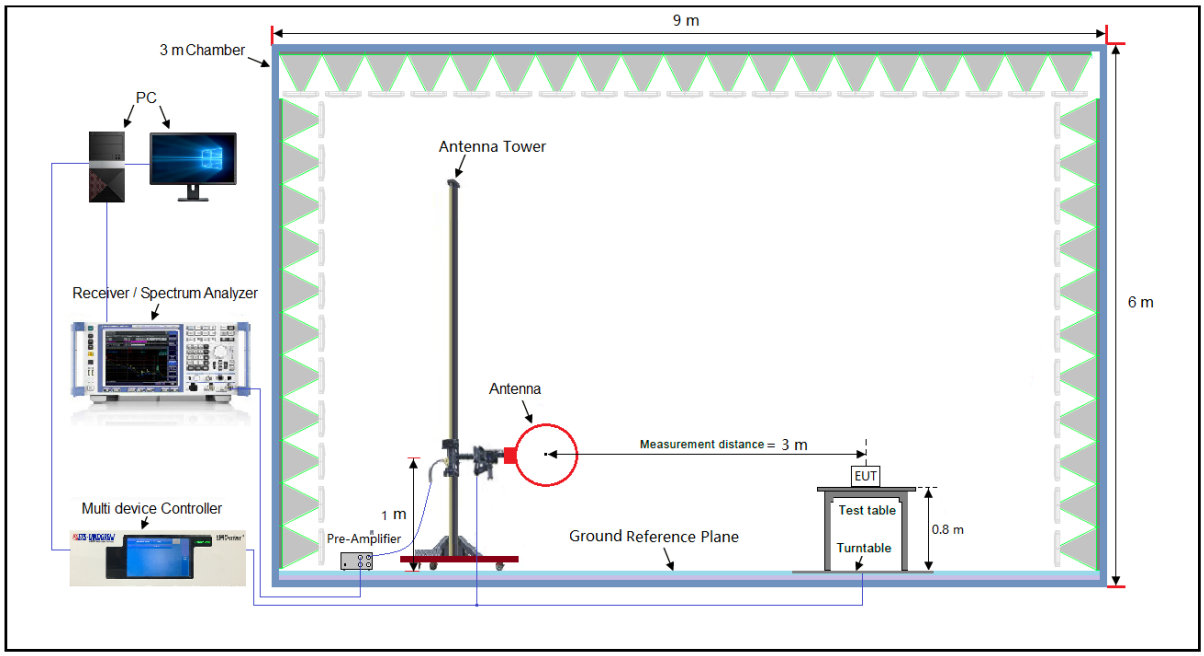


Figure 2. 30MHz to 1GHz

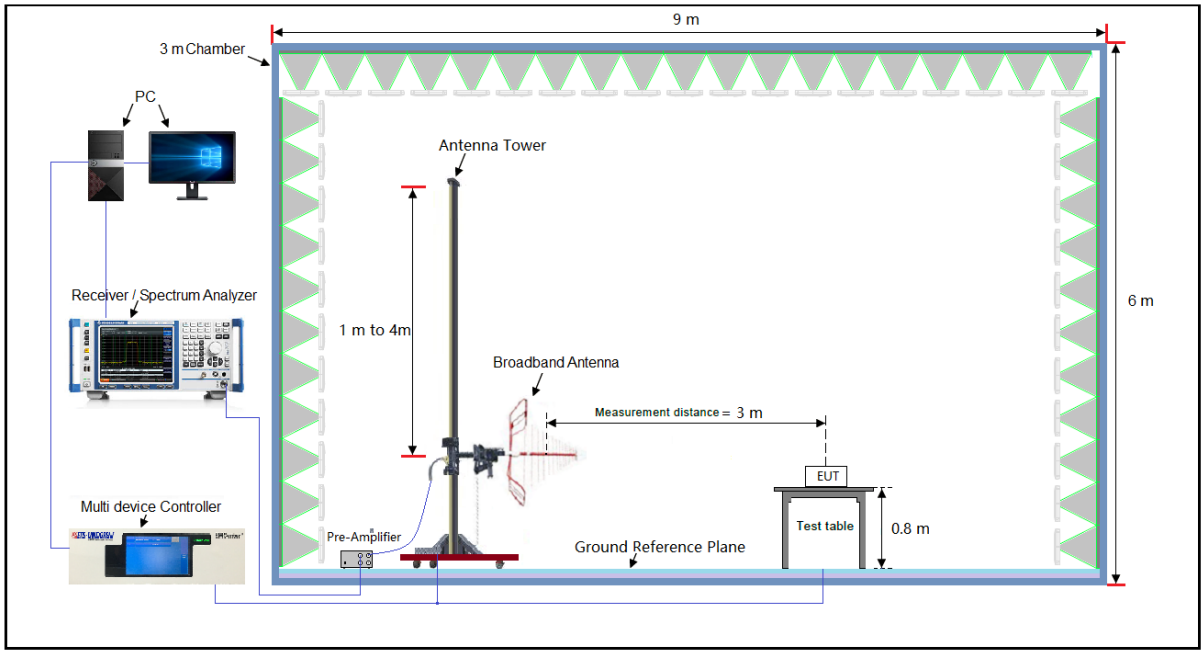
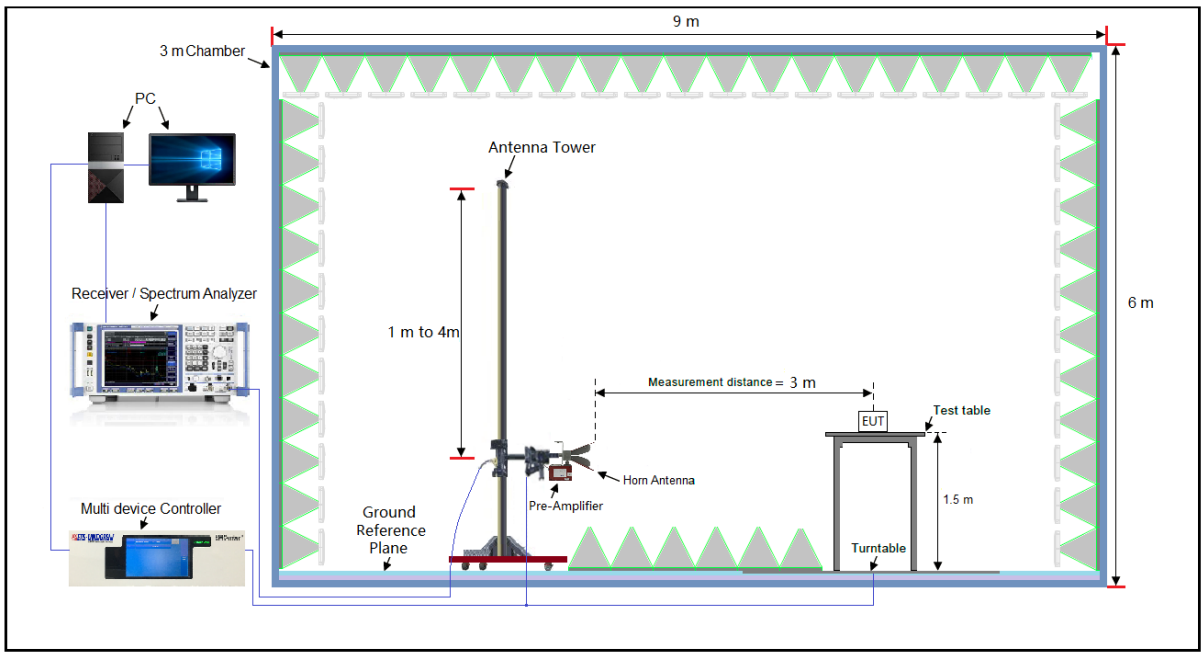
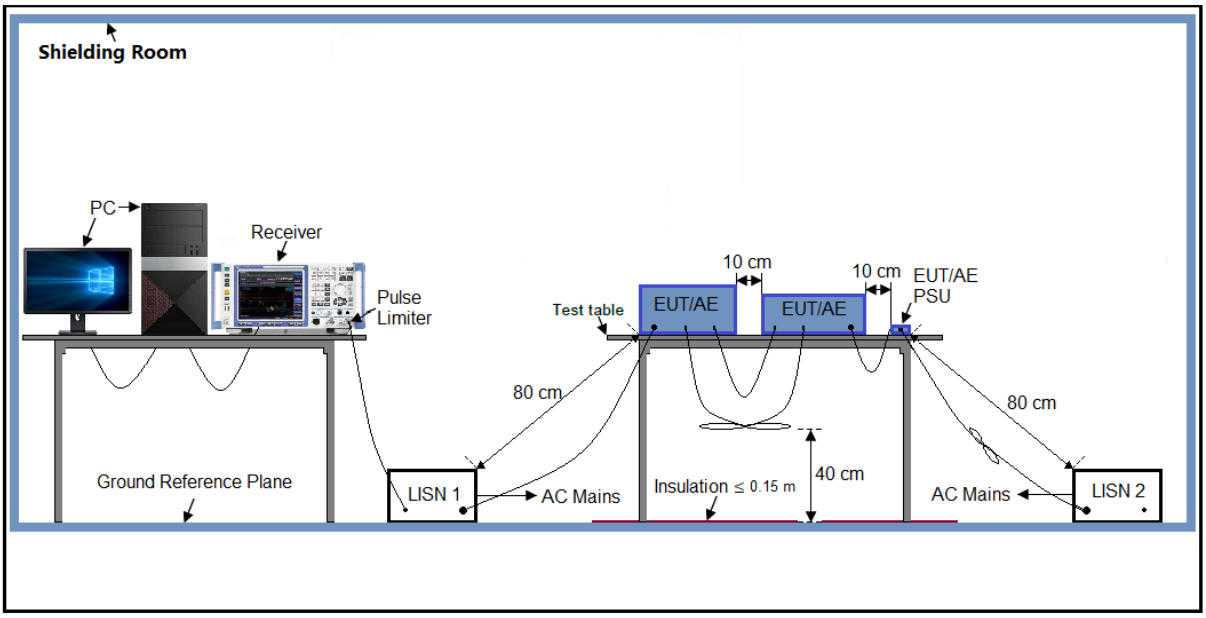


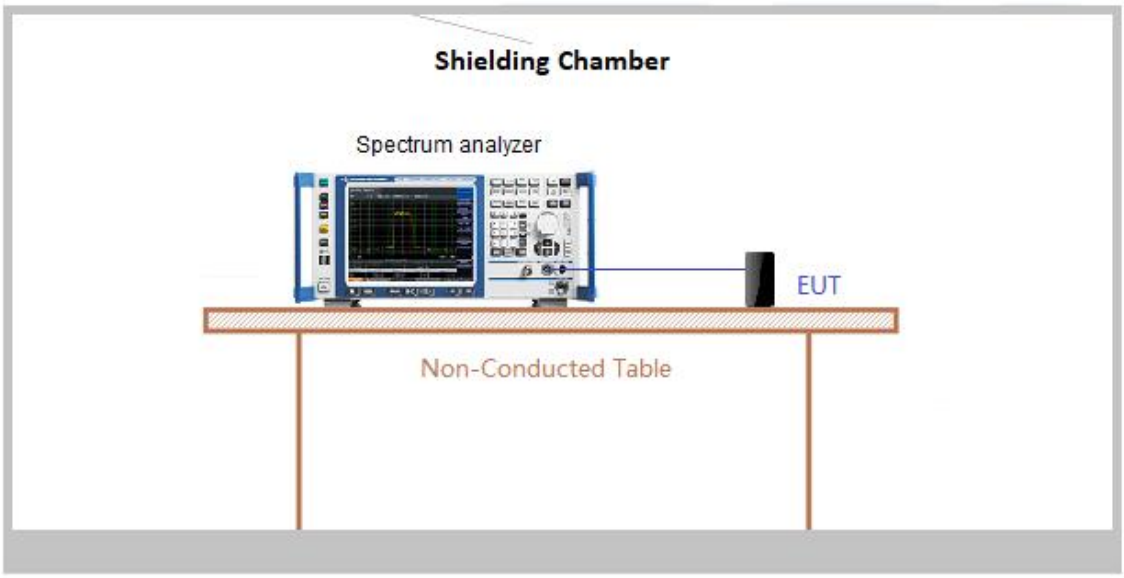
Figure 3. Above 1GHz



4.5.2 For Conducted Emissions test setup



4.5.3 For Conducted RF test setup



Normal Environment

4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.7 DUTY CYCLE

Test Procedure: ANSI C63.10-2013 Clause 12.2.

Test Results

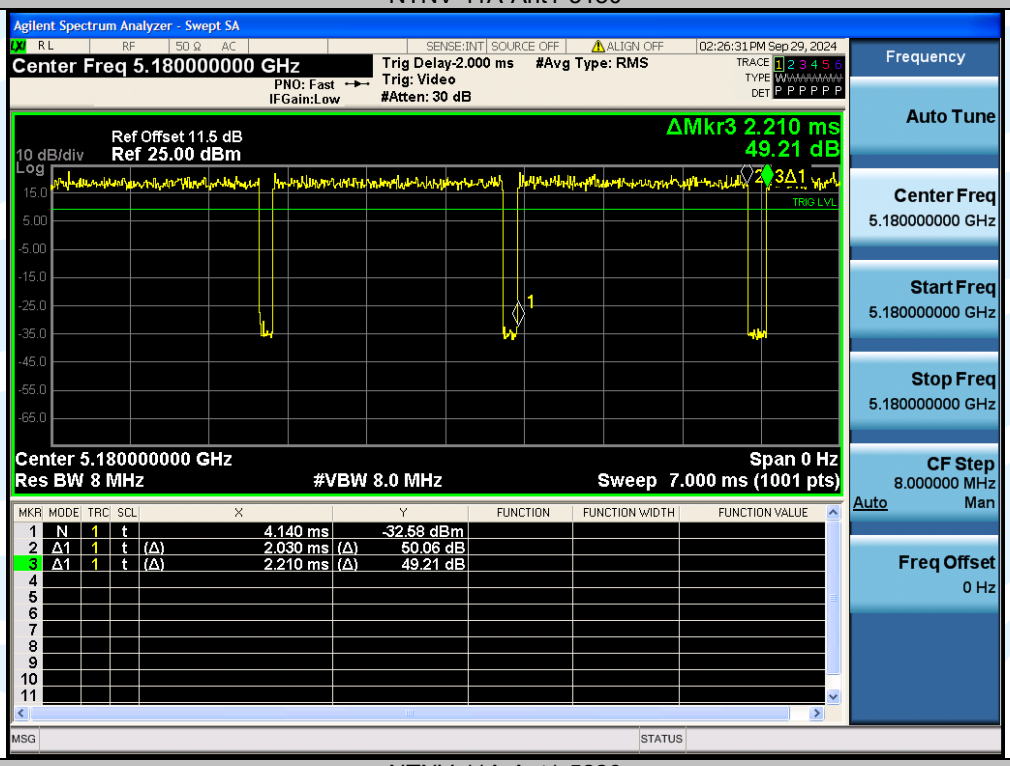
Mode	Data Rates	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/T Minimum VBW (kHz)
IEEE 802.11a	6 Mbps	2.030	2.170	0.94	93.55	0.29	0.49
IEEE 802.11n-HT20	MCS 0	5.090	5.250	0.97	96.95	0.13	0.20
IEEE 802.11n-HT40	MCS 0	4.900	5.100	0.96	96.08	0.17	0.20
IEEE 802.11ac-VHT20	MCS 0	5.100	5.320	0.96	95.86	0.18	0.20
IEEE 802.11ac-VHT40	MCS 0	4.910	5.050	0.97	97.23	0.12	0.20
IEEE 802.11ax-HE20	MCS 0	3.880	4.000	0.97	97.00	0.13	0.26
IEEE 802.11ax-HE40	MCS 0	3.870	3.990	0.97	96.99	0.13	0.26

Remark:

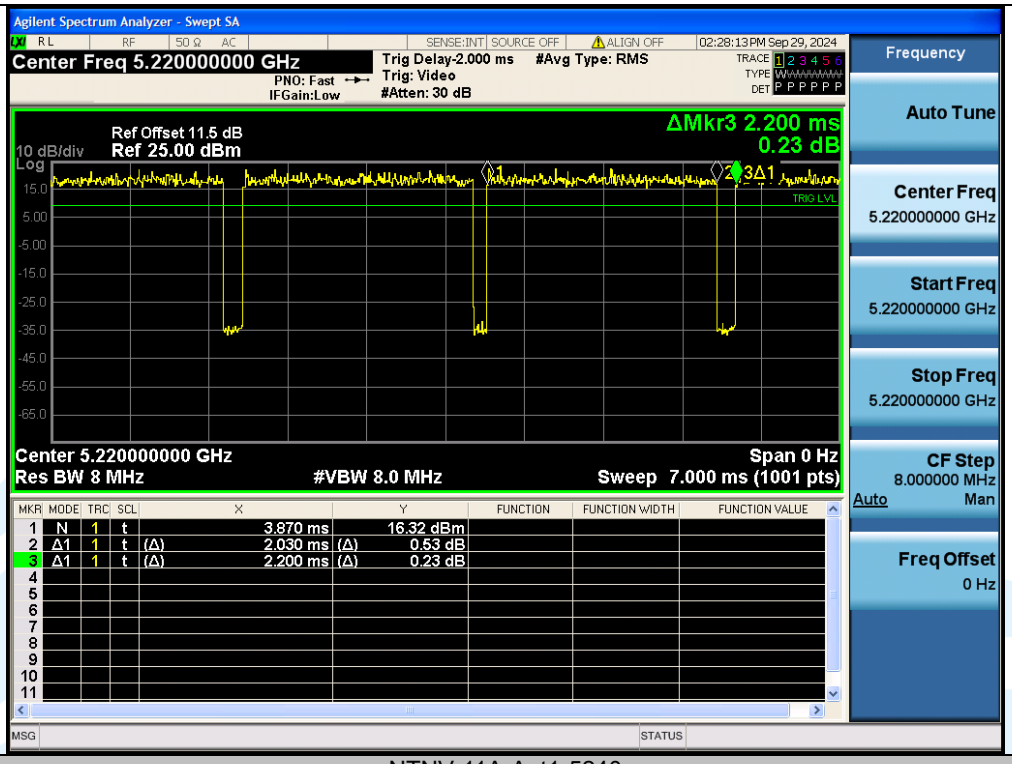
1) Duty cycle= On Time/ Period;
2) Duty Cycle factor = 10 * log(1/ Duty cycle);
3) Average factor = 20 $\log_{10}$ Duty Cycle.

The test plots as follows

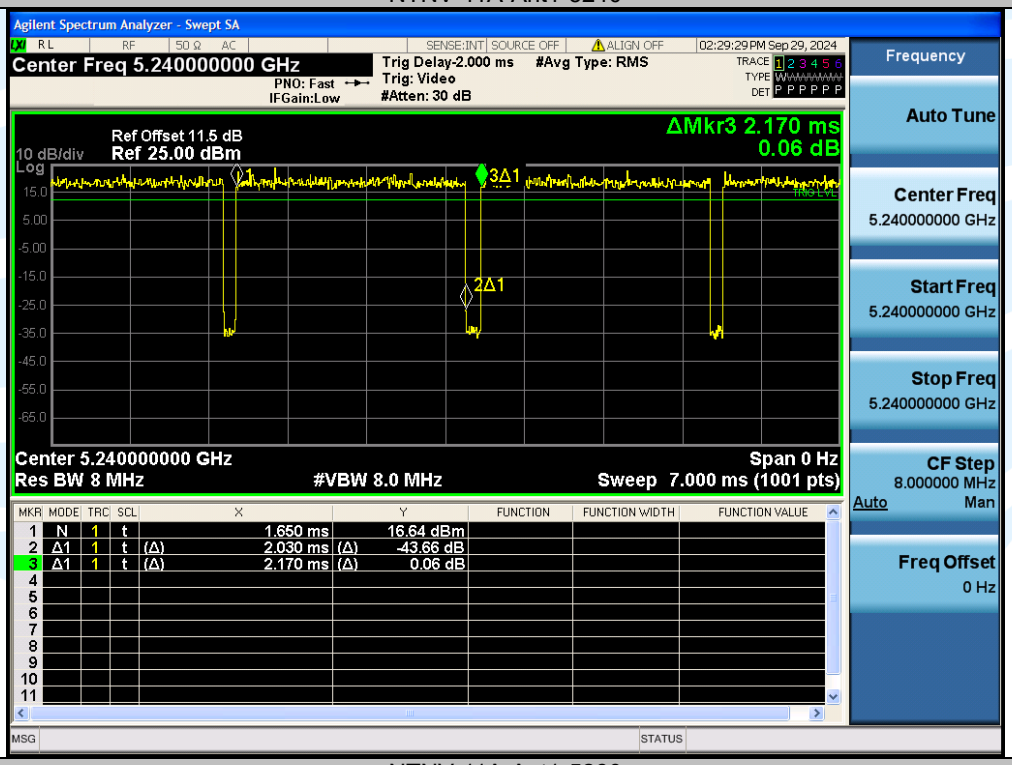
NTNV-11A-Ant1-5180



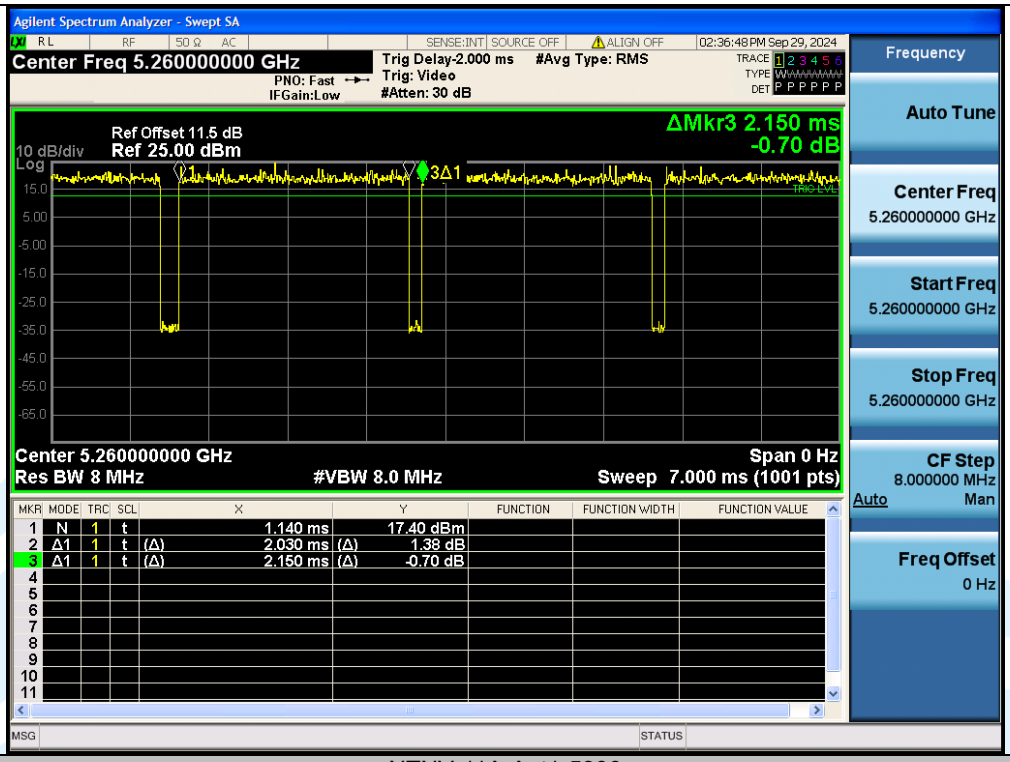
NTNV-11A-Ant1-5220



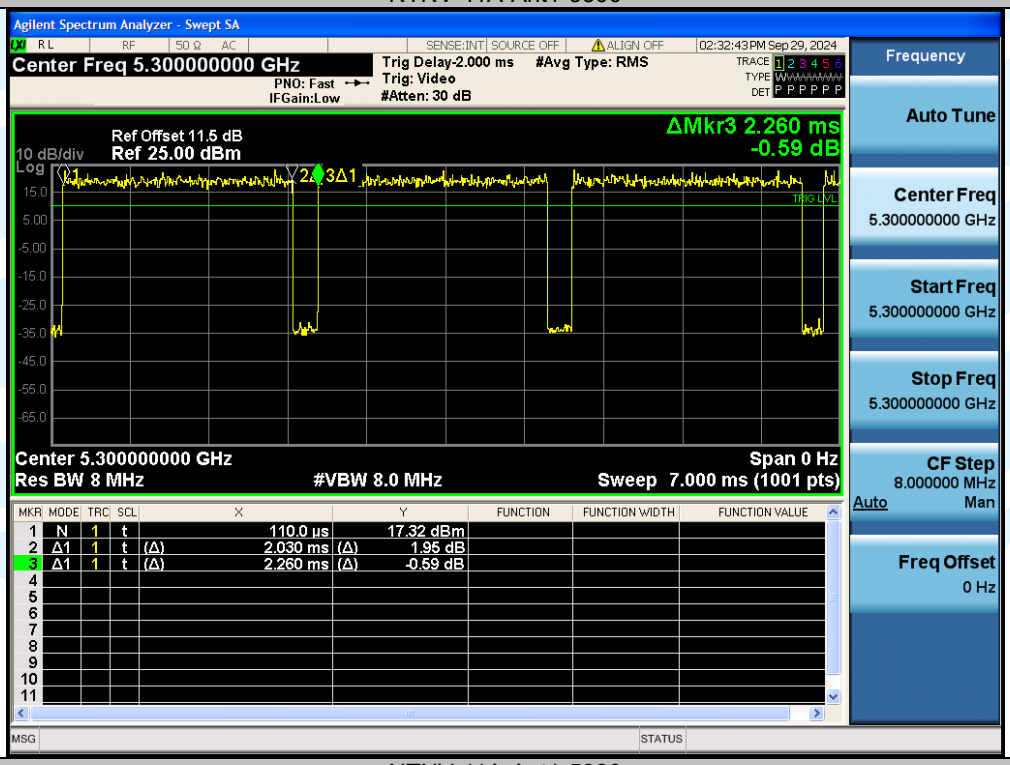
NTNV-11A-Ant1-5240



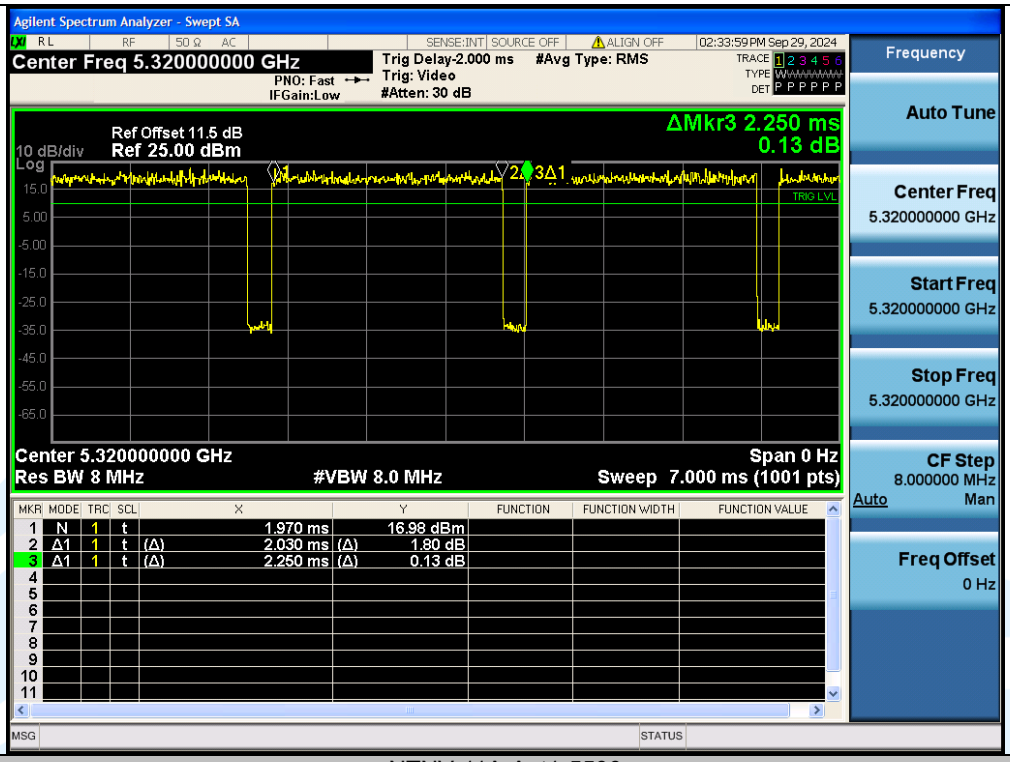
NTNV-11A-Ant1-5260



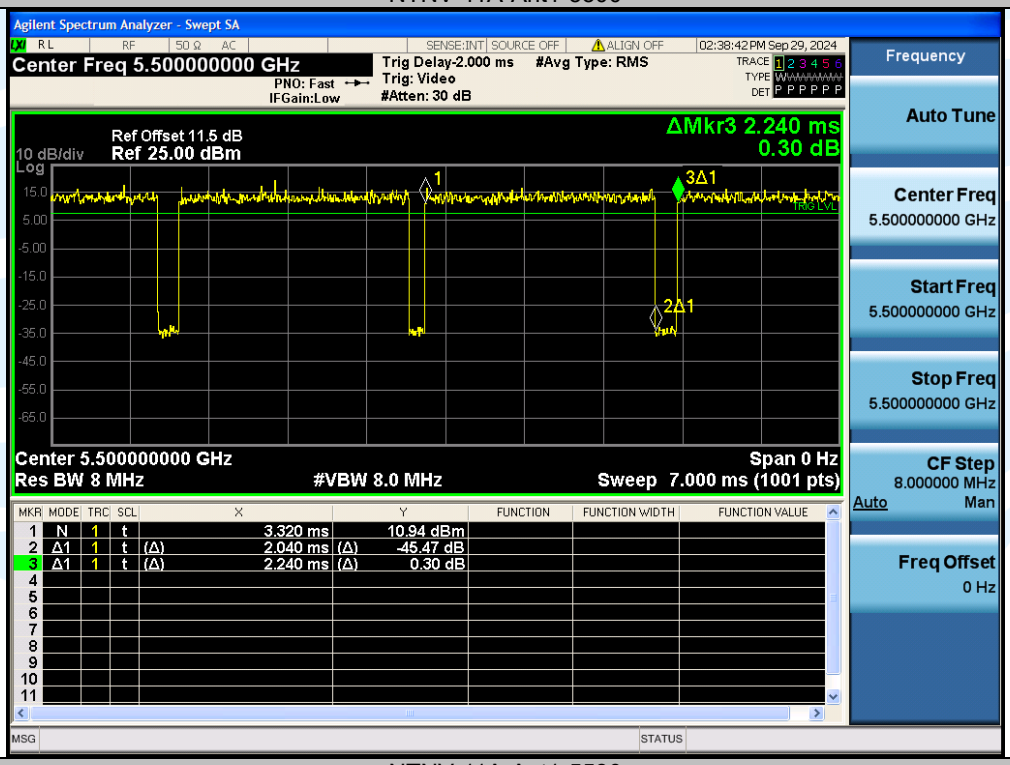
NTNV-11A-Ant1-5300



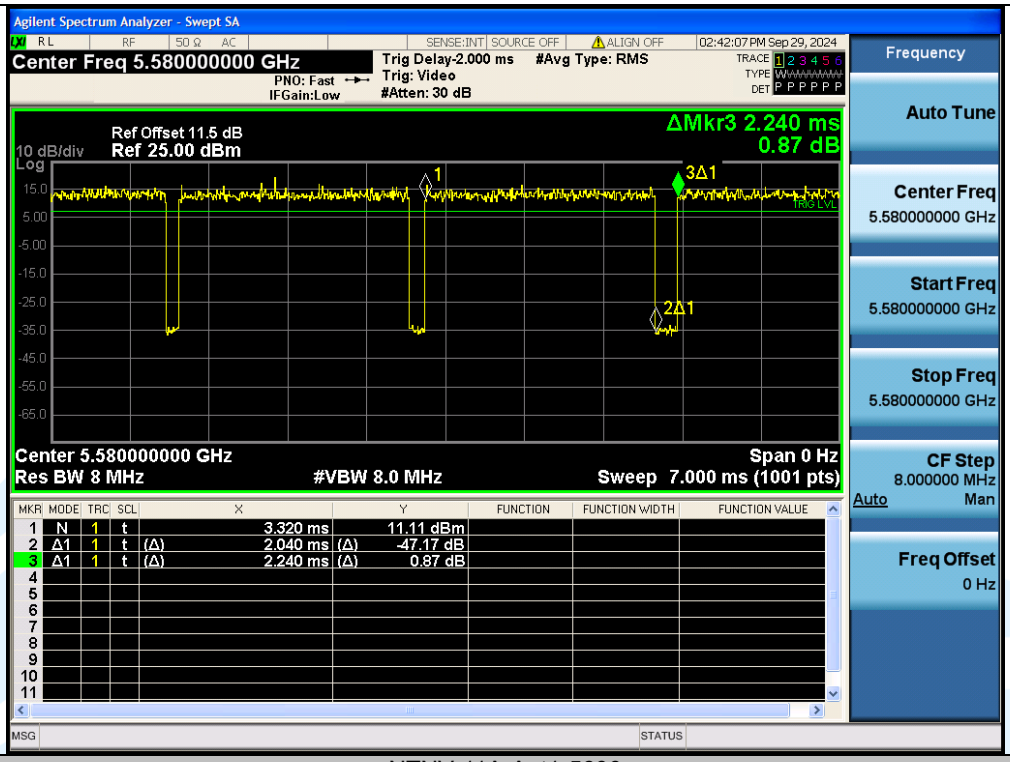
NTNV-11A-Ant1-5320



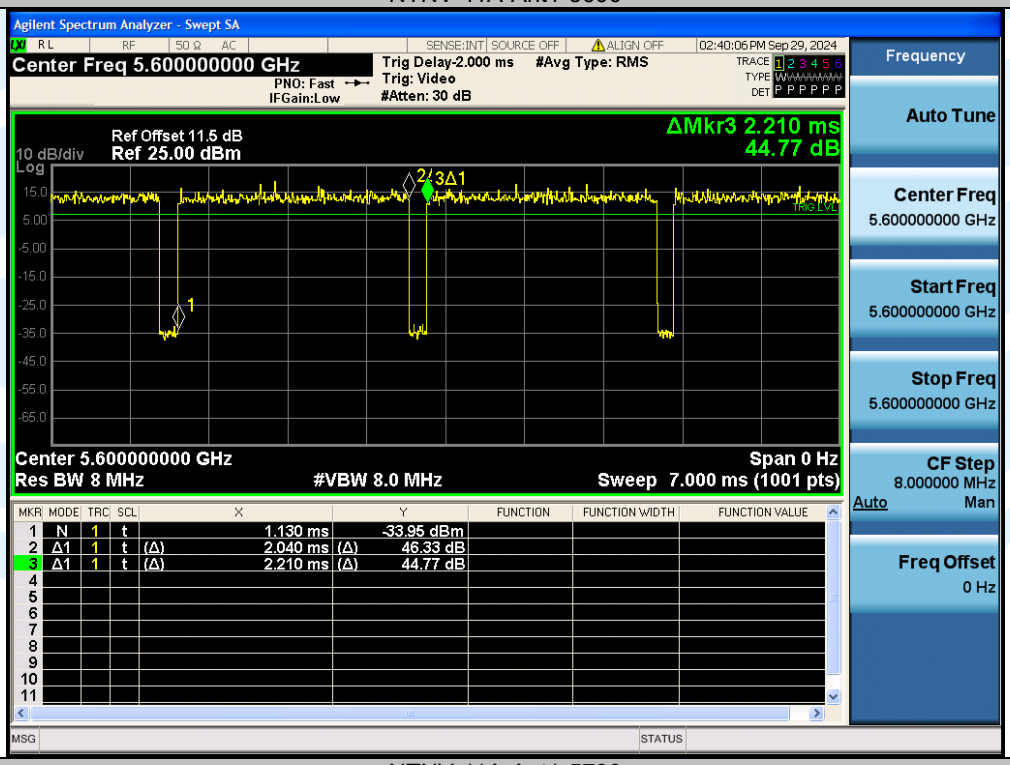
NTNV-11A-Ant1-5500



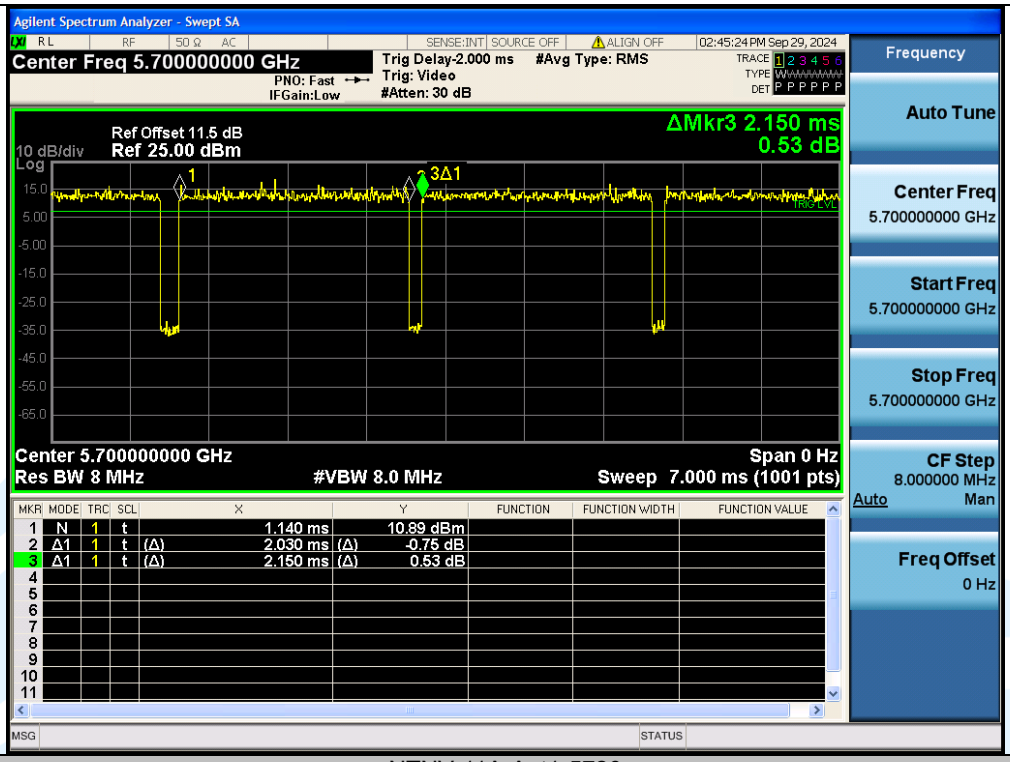
NTNV-11A-Ant1-5580



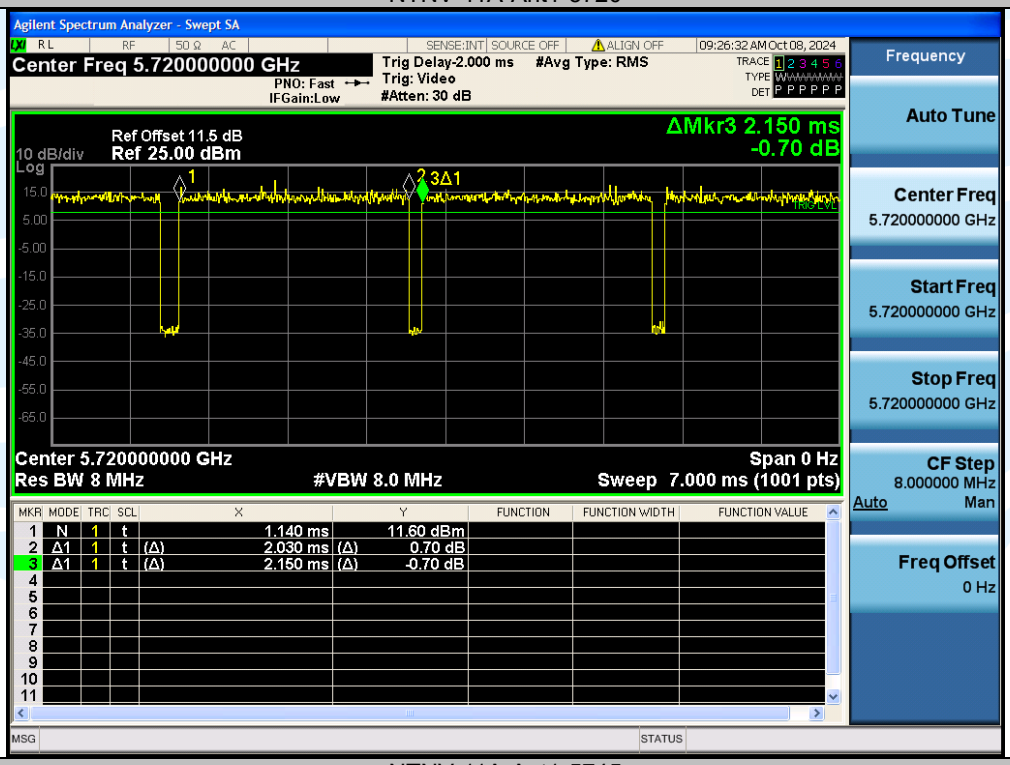
NTNV-11A-Ant1-5600



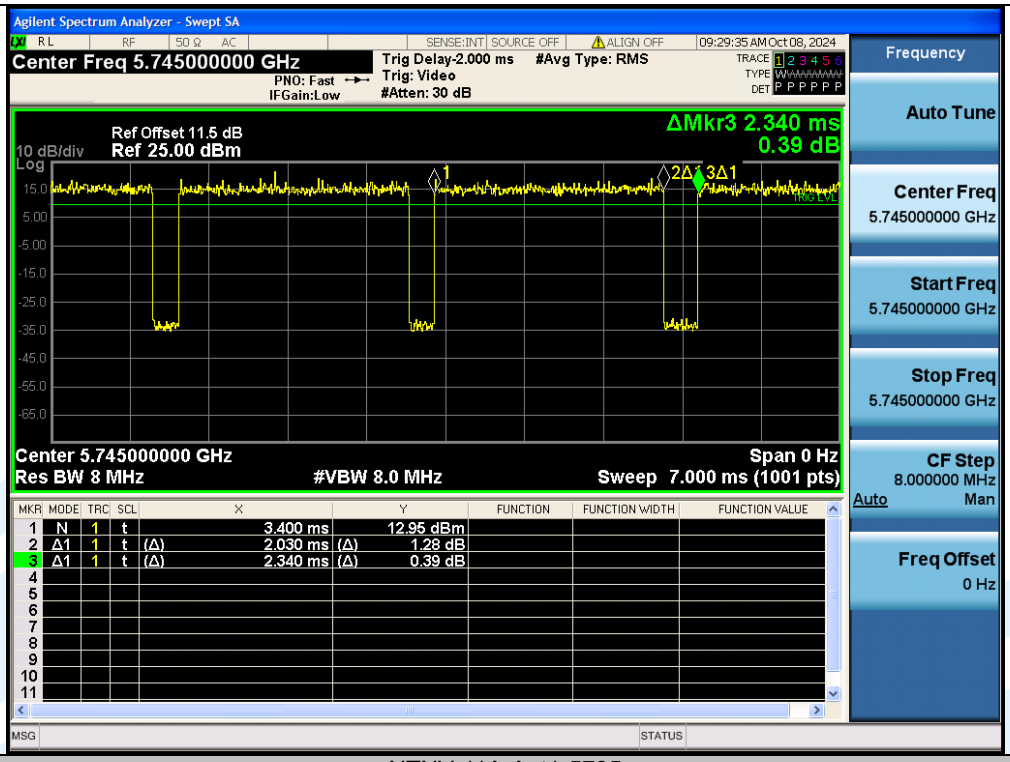
NTNV-11A-Ant1-5700



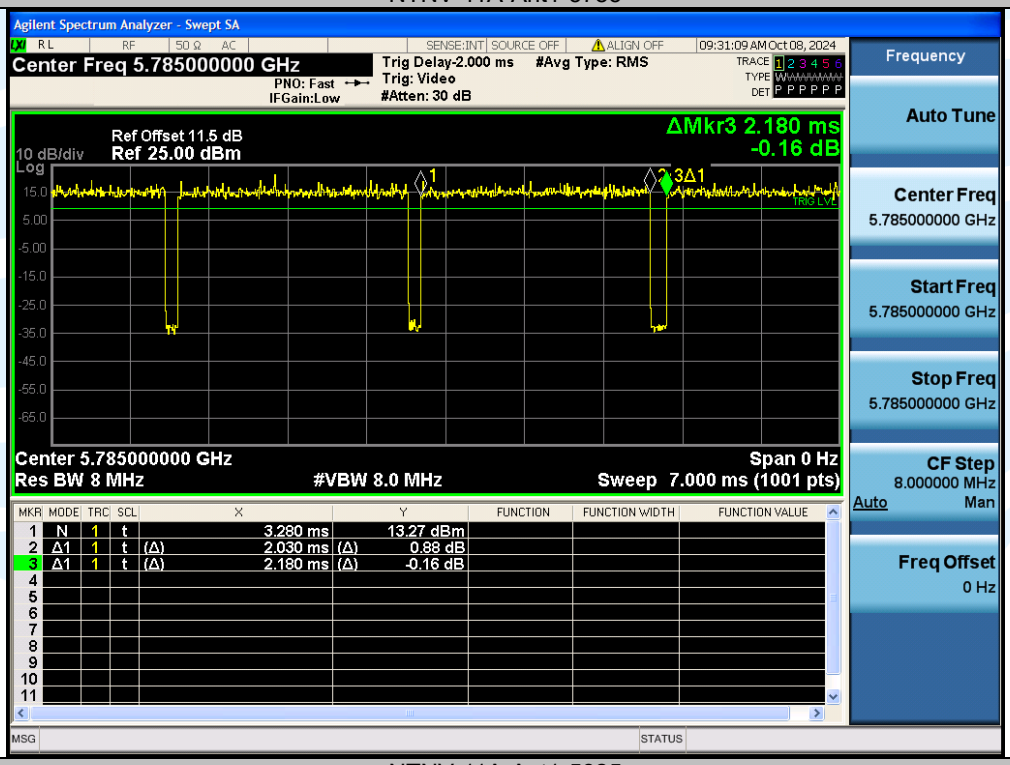
NTNV-11A-Ant1-5720



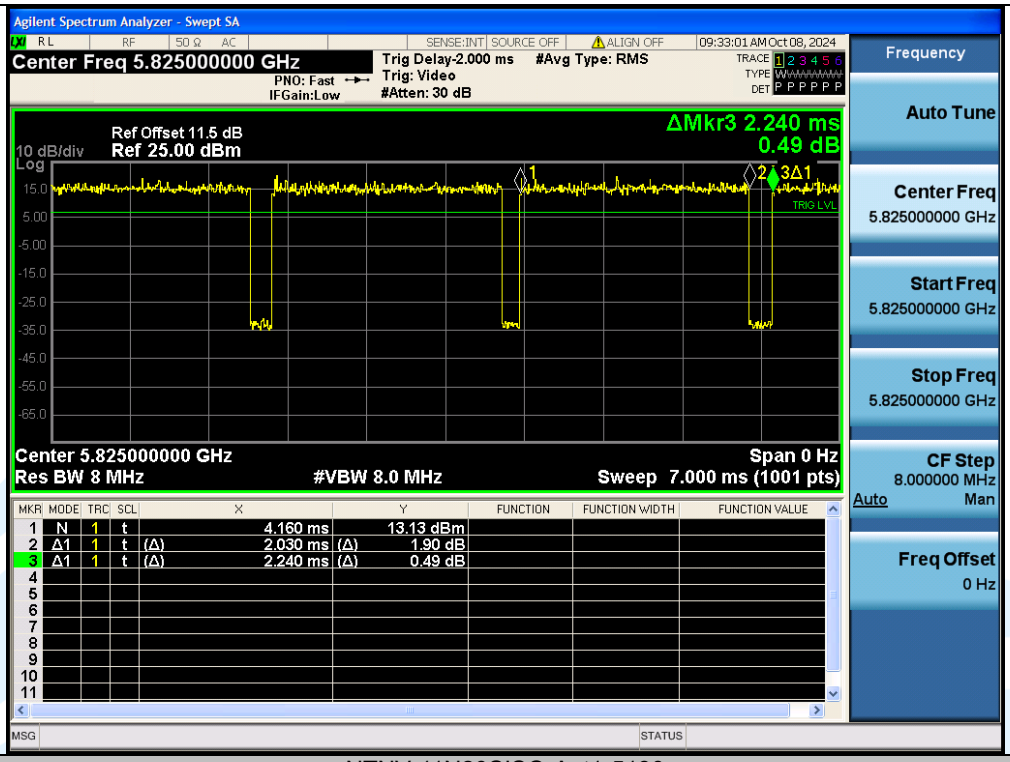
NTNV-11A-Ant1-5745



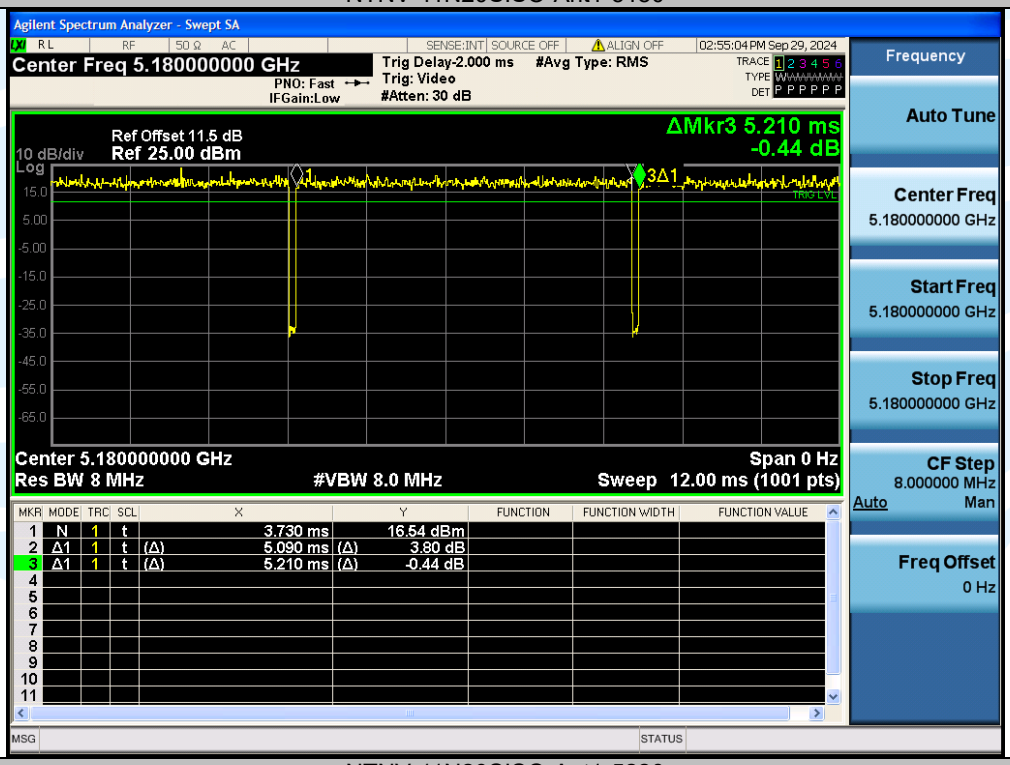
NTNV-11A-Ant1-5785



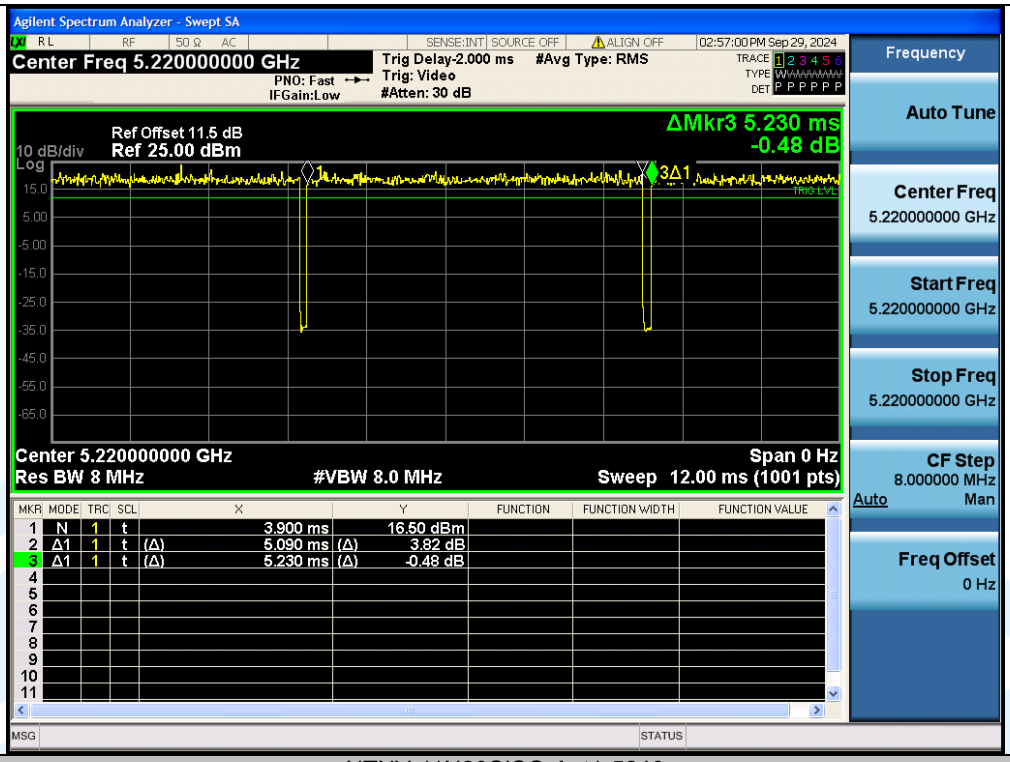
NTNV-11A-Ant1-5825



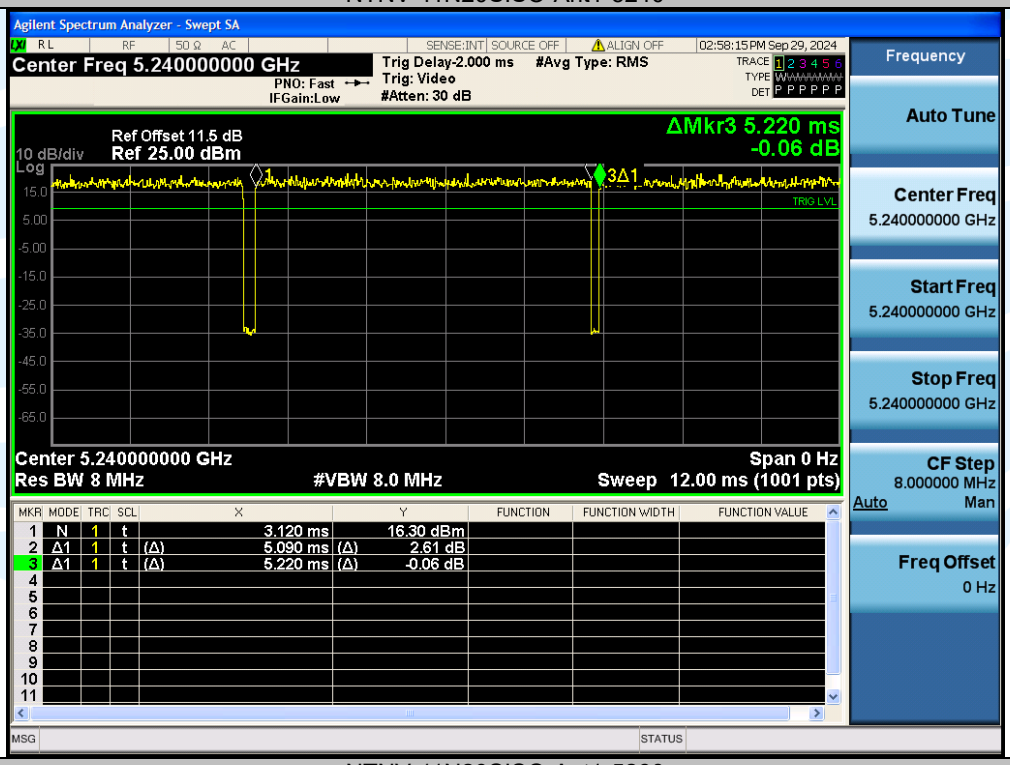
NTNV-11N20SISO-Ant1-5180



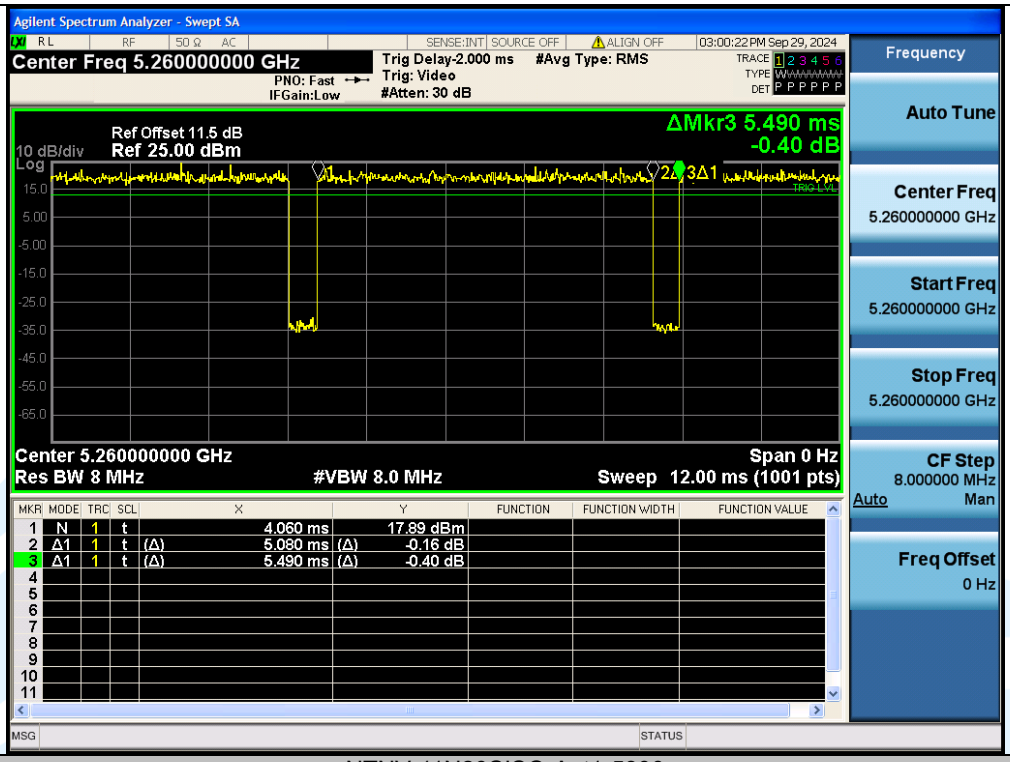
NTNV-11N20SISO-Ant1-5220



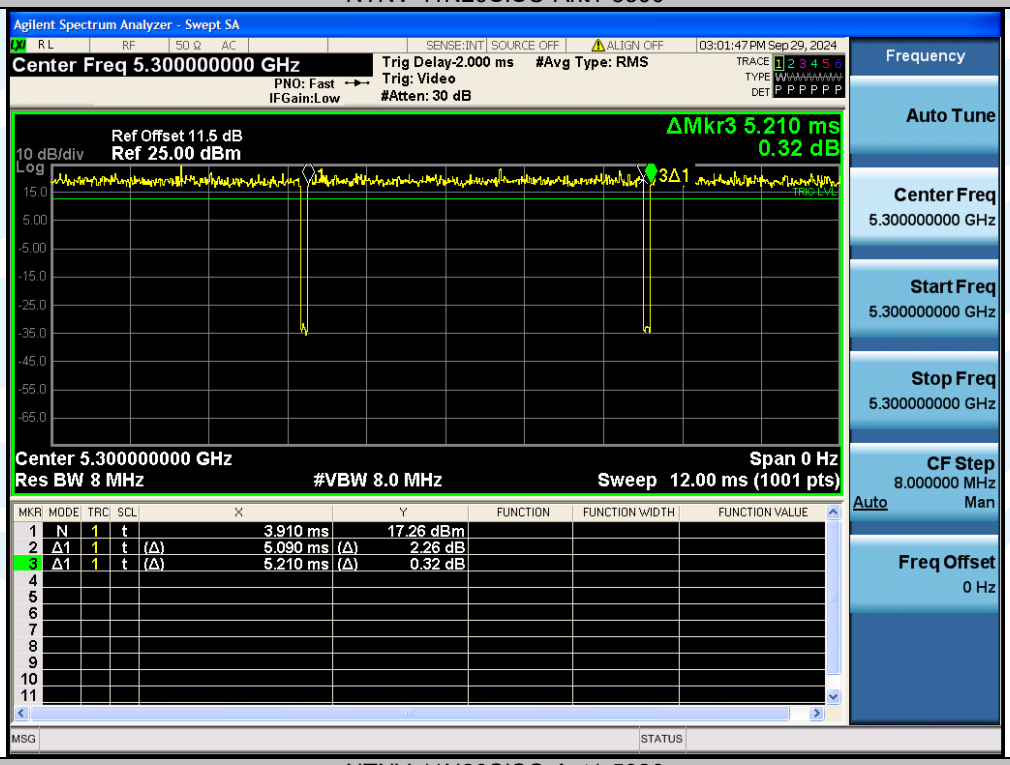
NTNV-11N20SISO-Ant1-5240



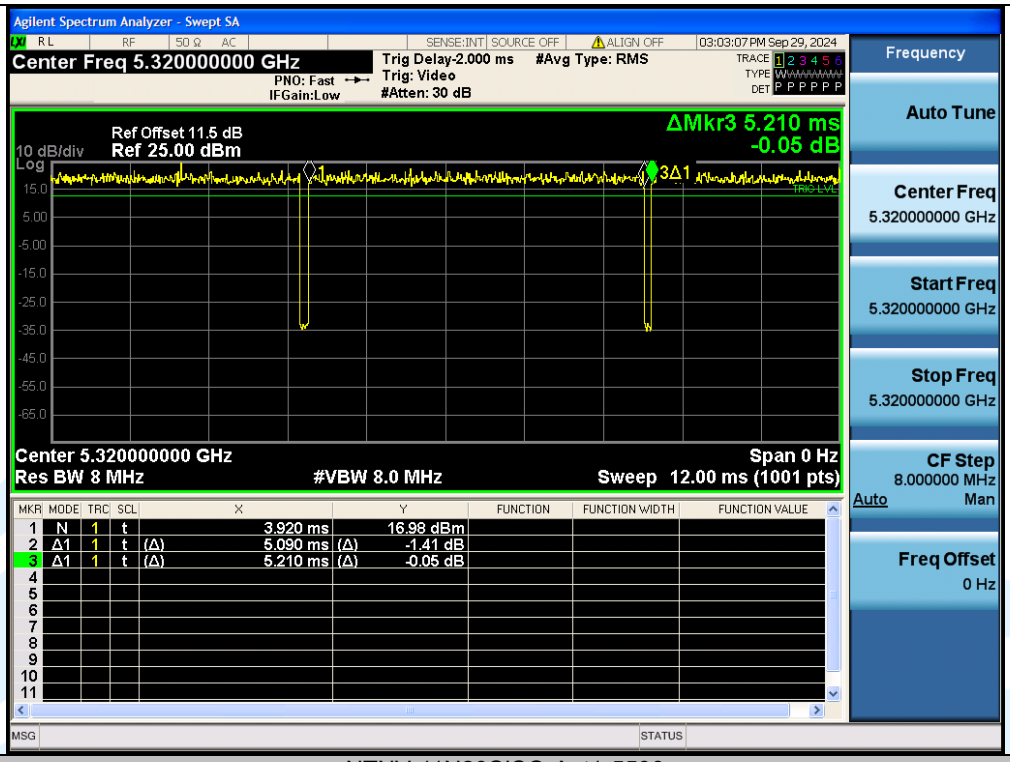
NTNV-11N20SISO-Ant1-5260



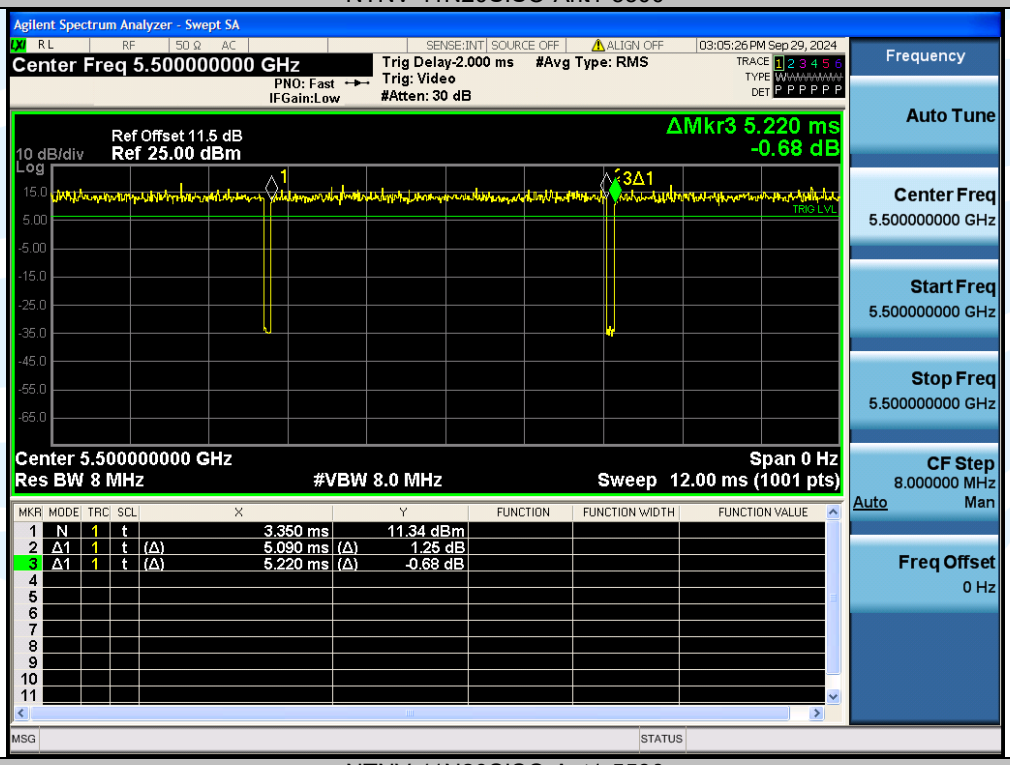
NTNV-11N20SISO-Ant1-5300



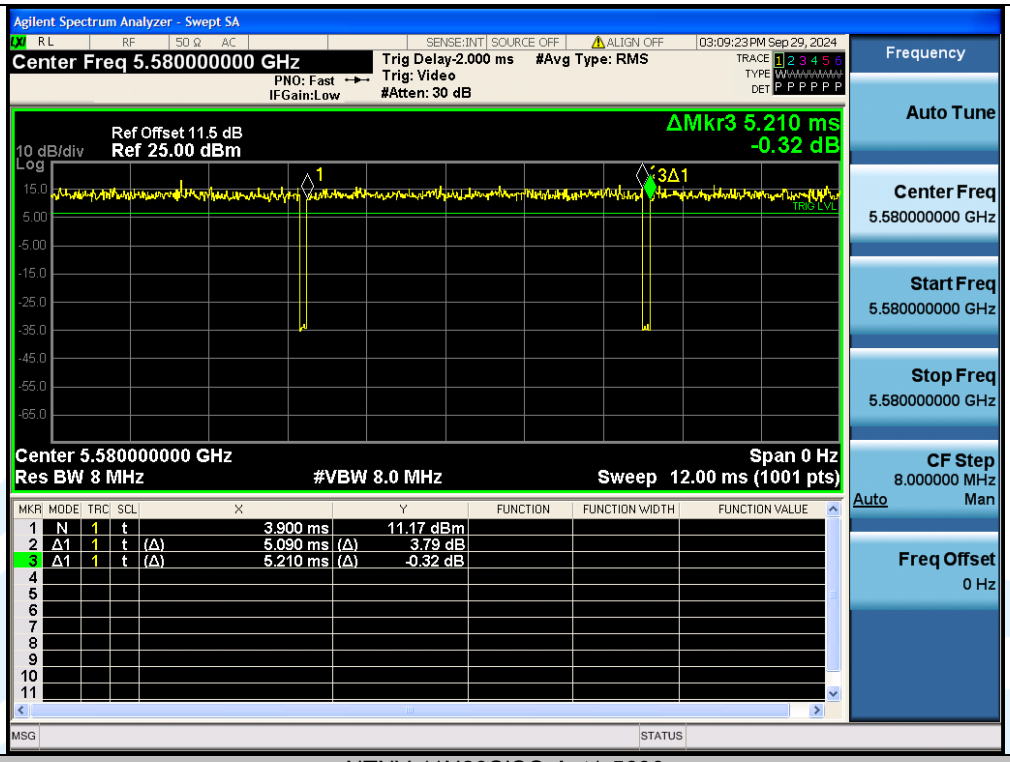
NTNV-11N20SISO-Ant1-5320



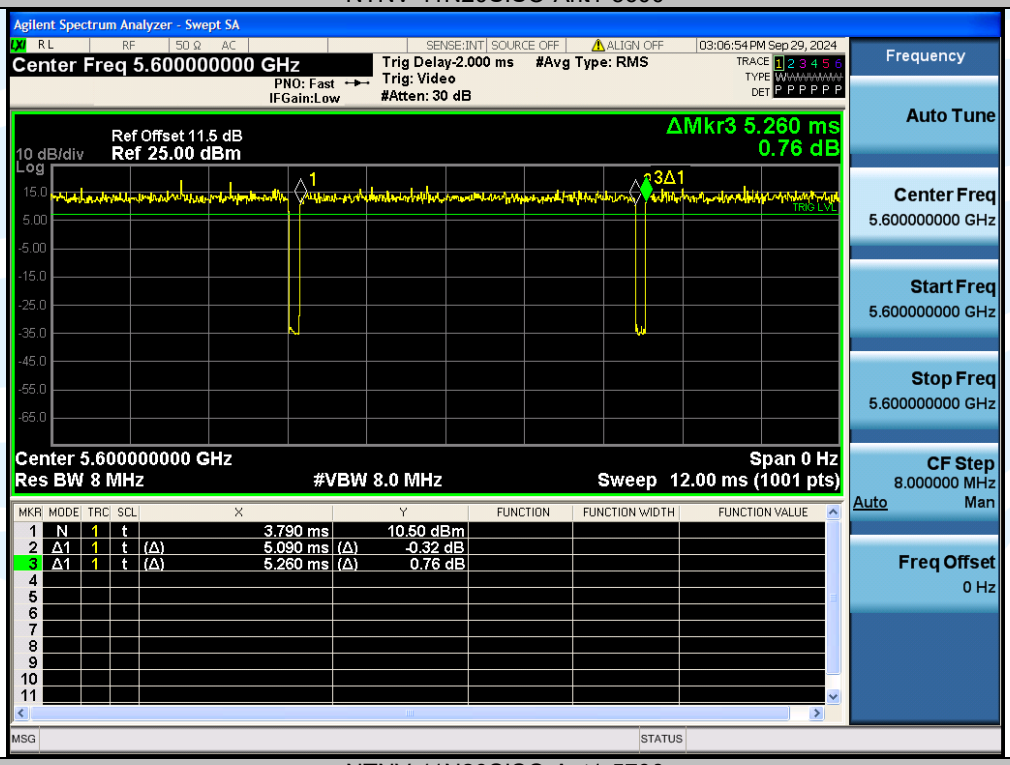
NTNV-11N20SISO-Ant1-5500



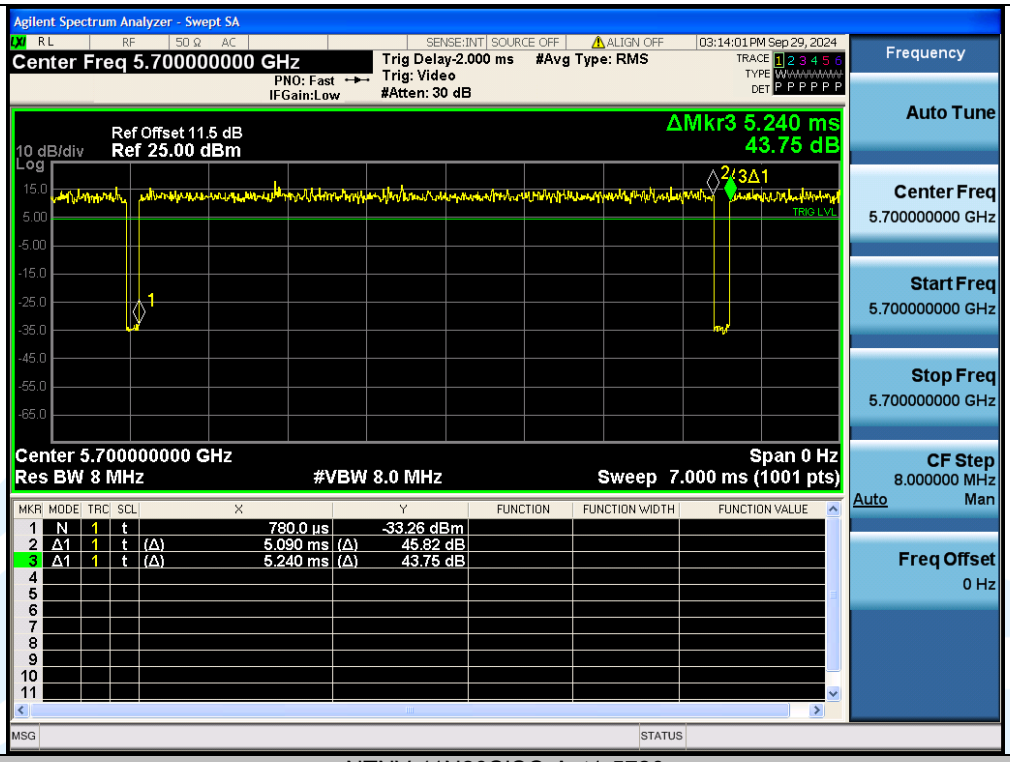
NTNV-11N20SISO-Ant1-5580



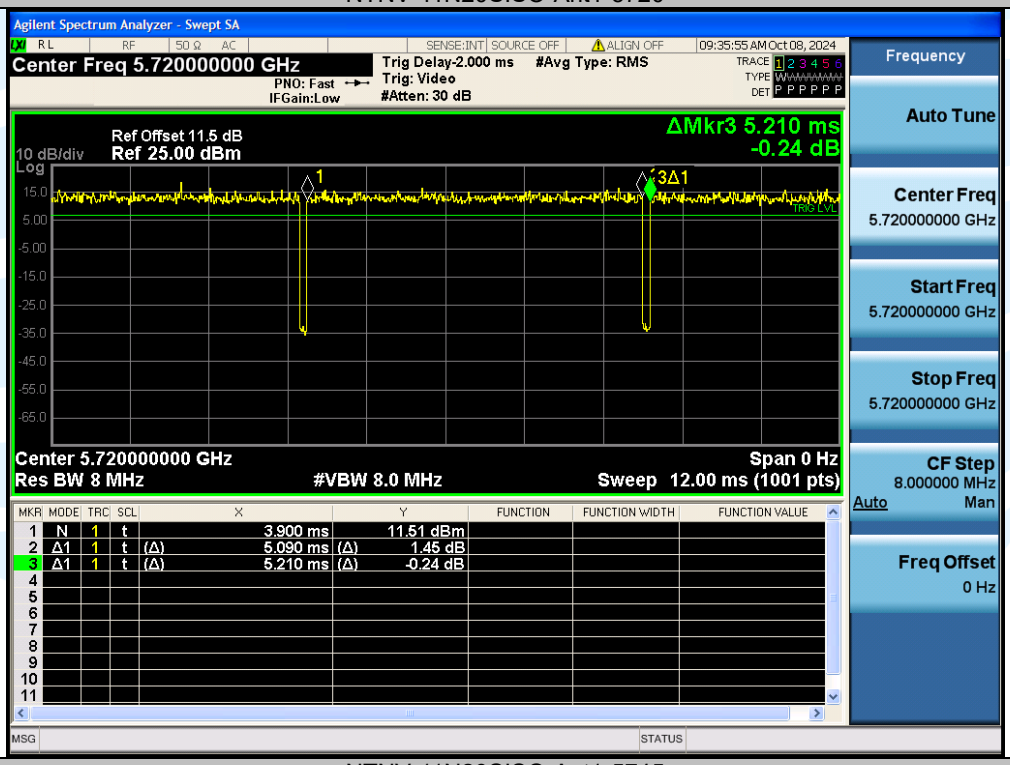
NTNV-11N20SISO-Ant1-5600



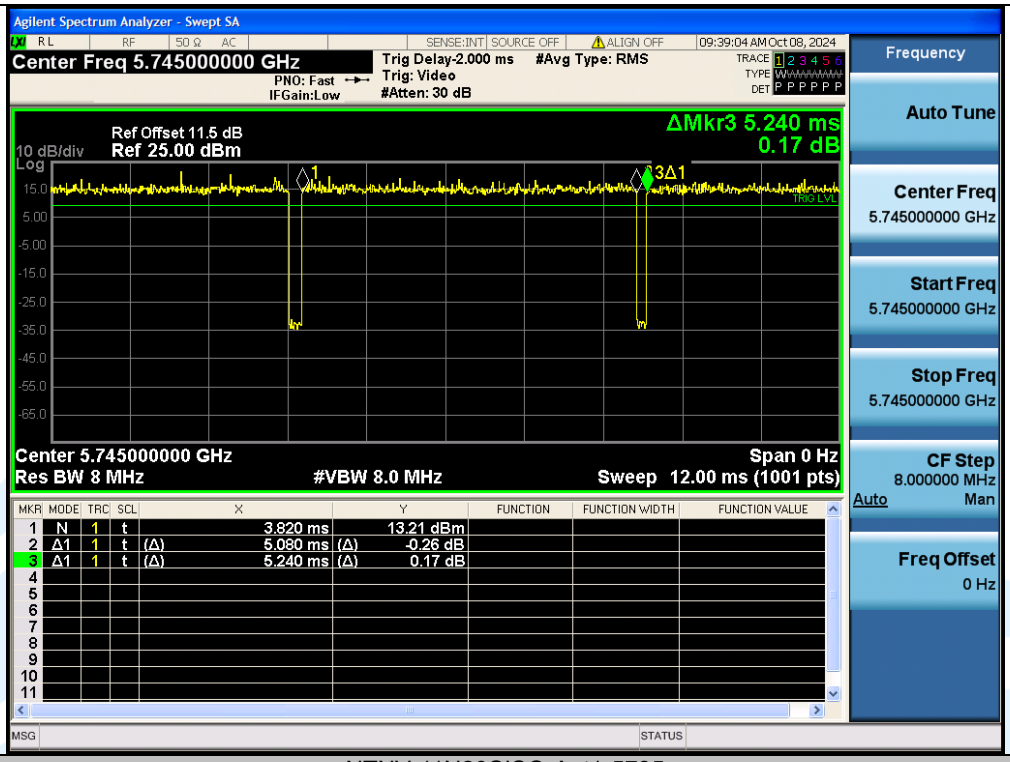
NTNV-11N20SISO-Ant1-5700



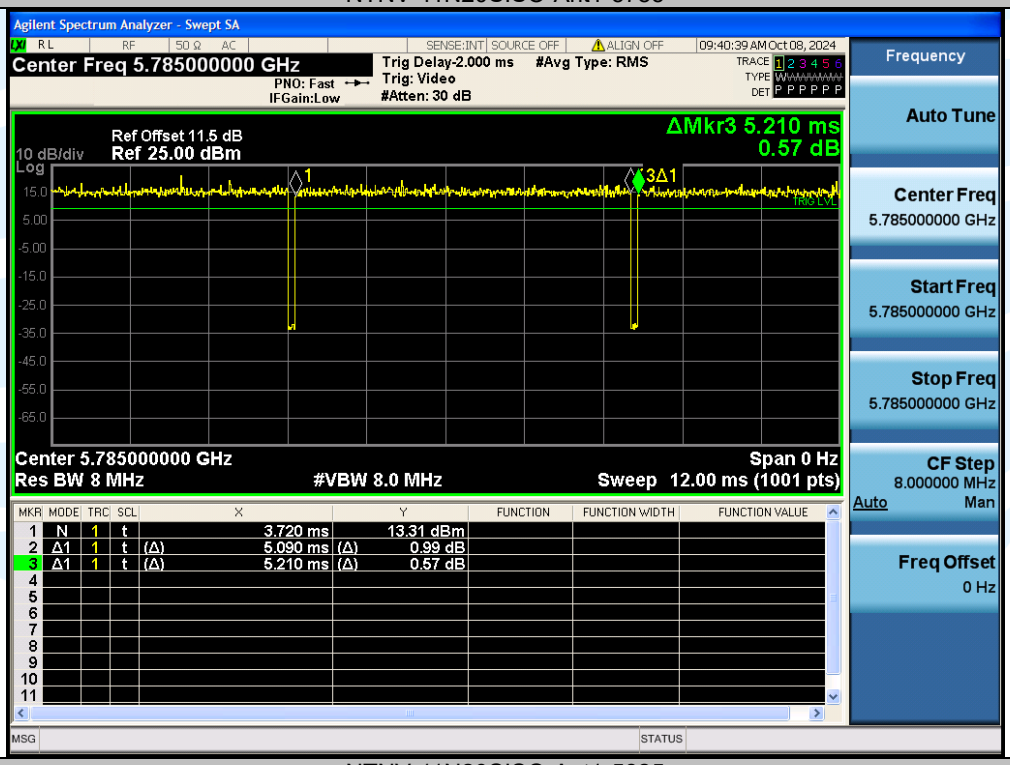
NTNV-11N20SISO-Ant1-5720



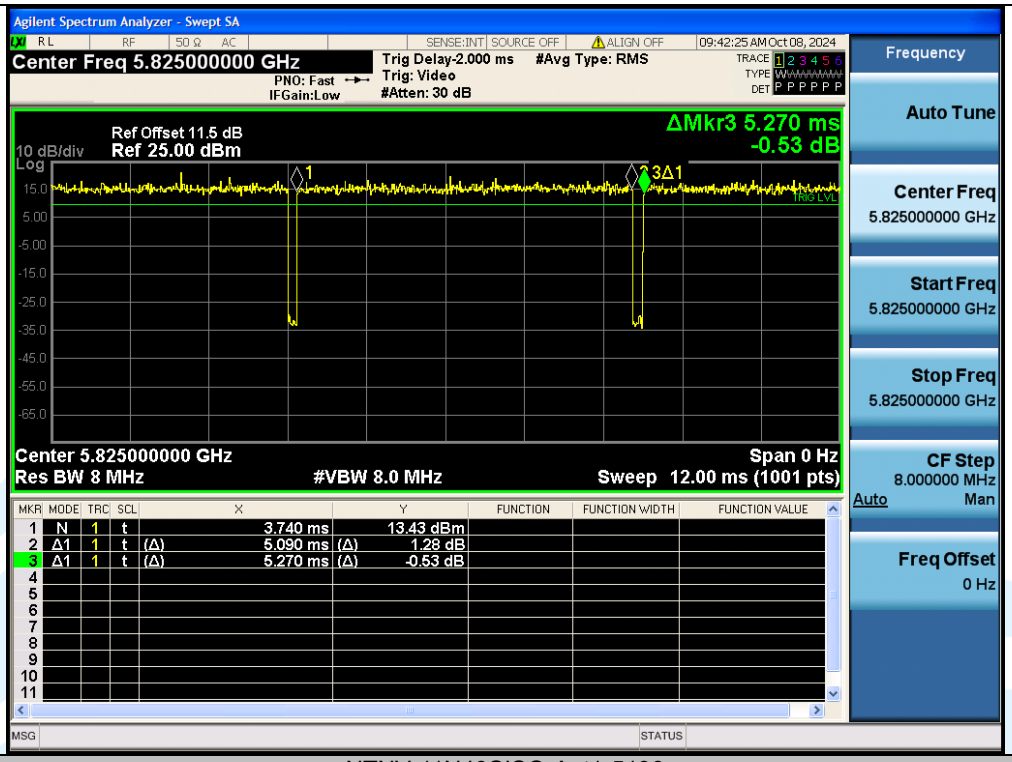
NTNV-11N20SISO-Ant1-5745



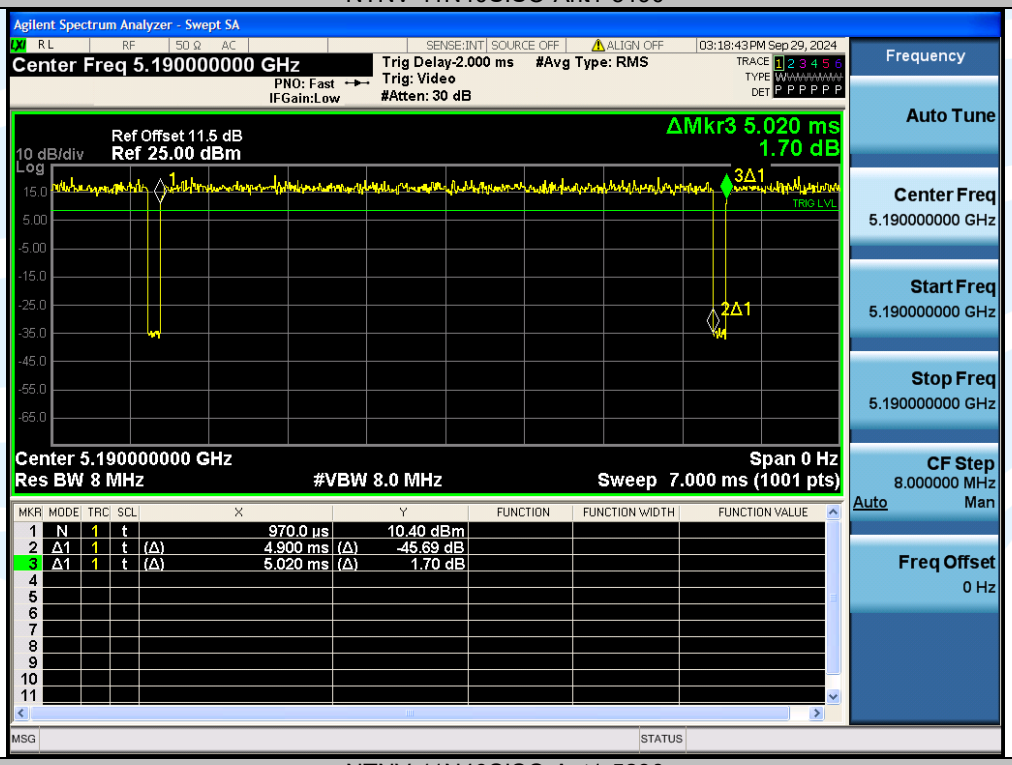
NTNV-11N20SISO-Ant1-5785



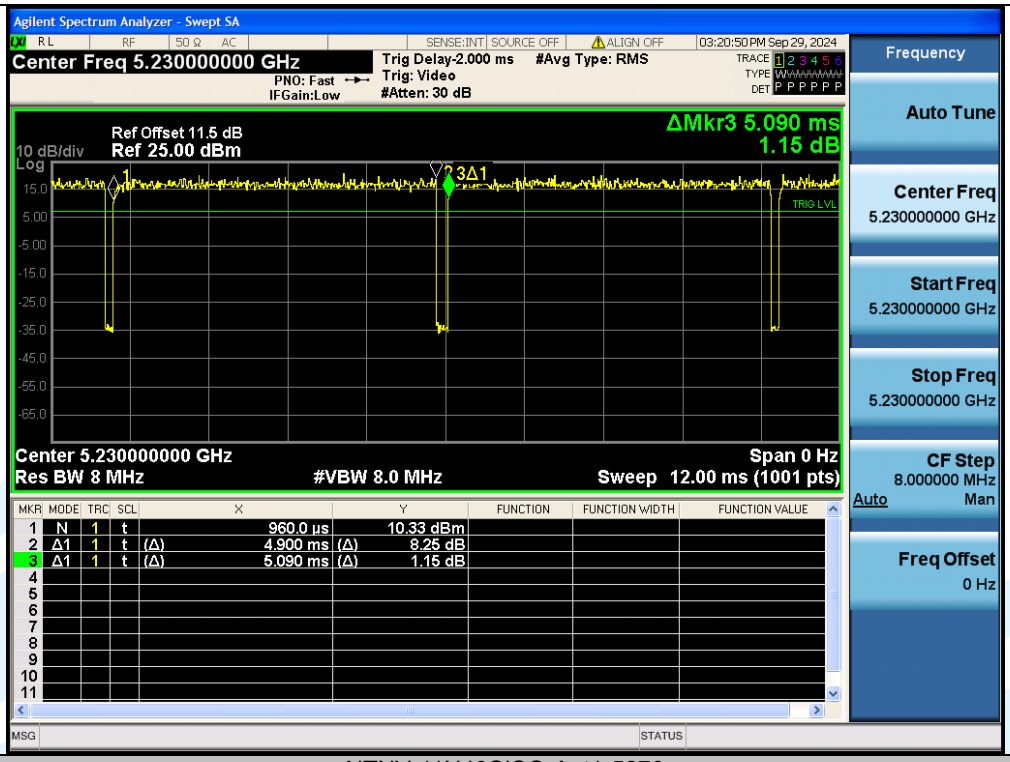
NTNV-11N20SISO-Ant1-5825



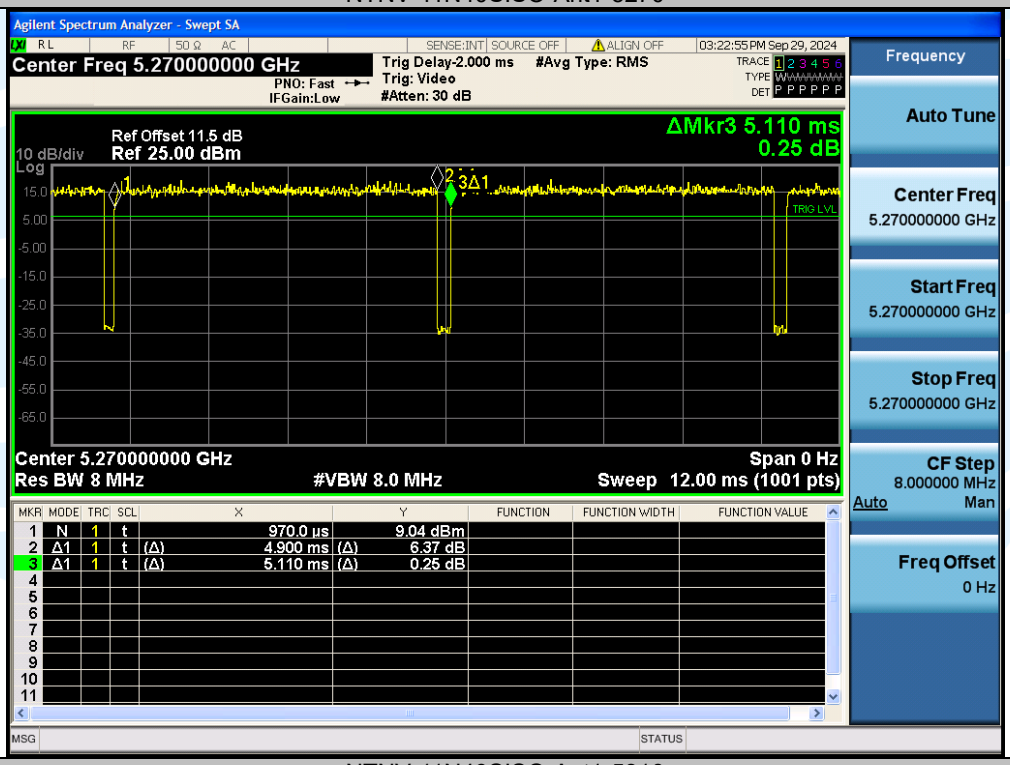
NTNV-11N40SISO-Ant1-5190



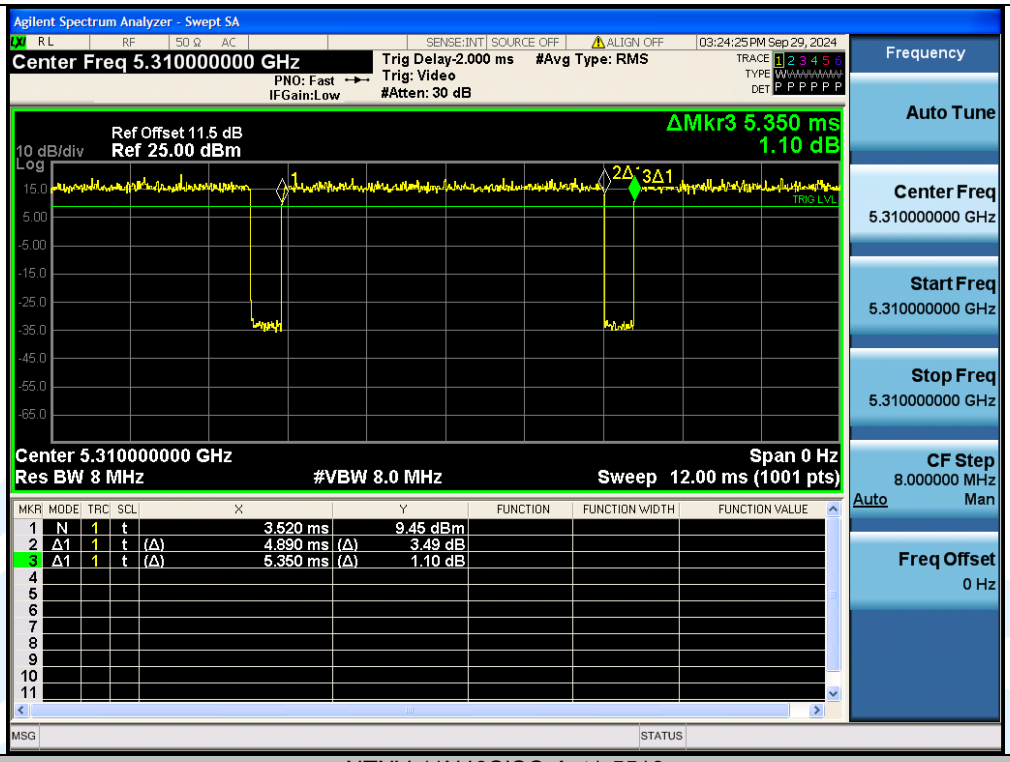
NTNV-11N40SISO-Ant1-5230



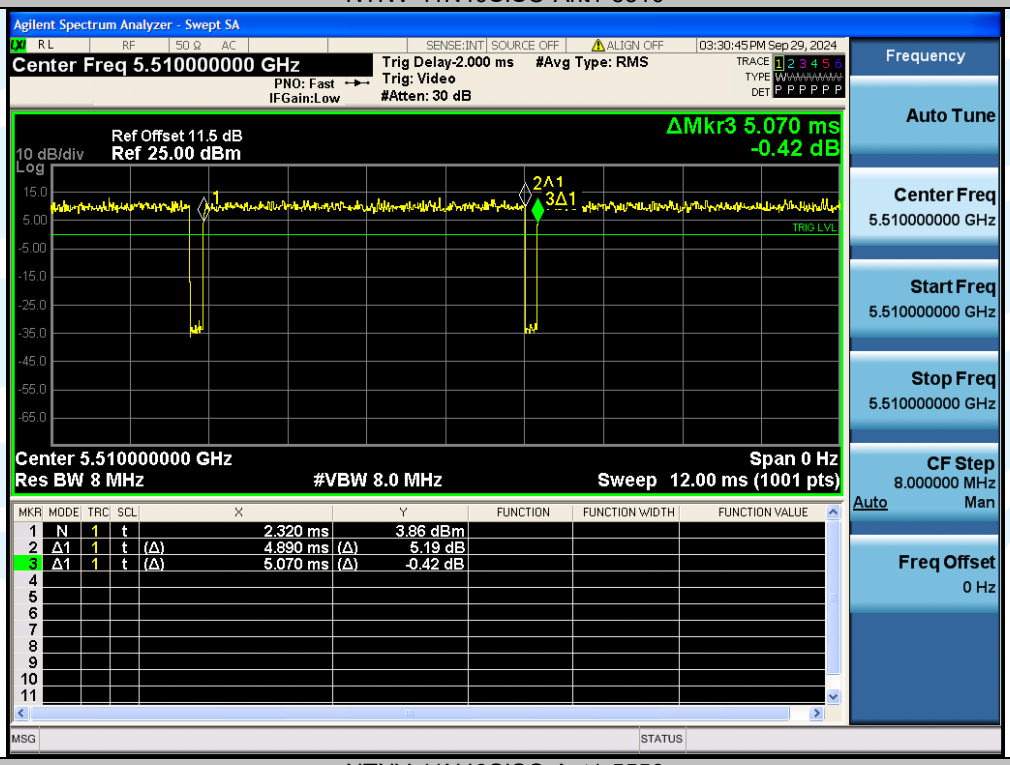
NTNV-11N40SISO-Ant1-5270



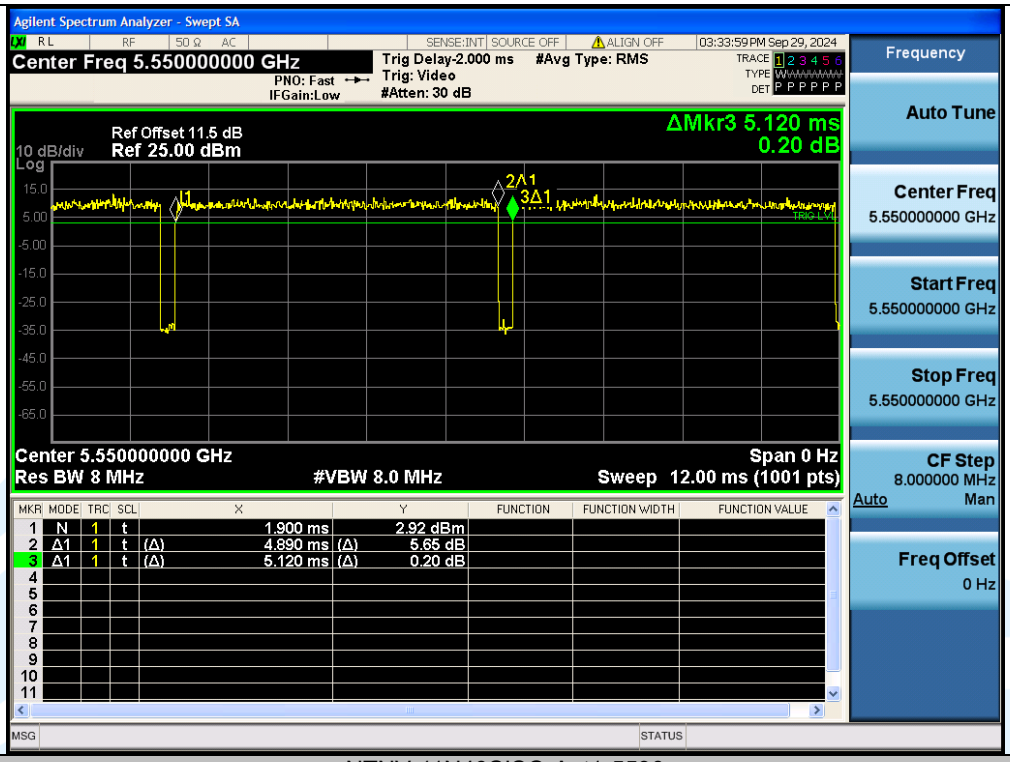
NTNV-11N40SISO-Ant1-5310



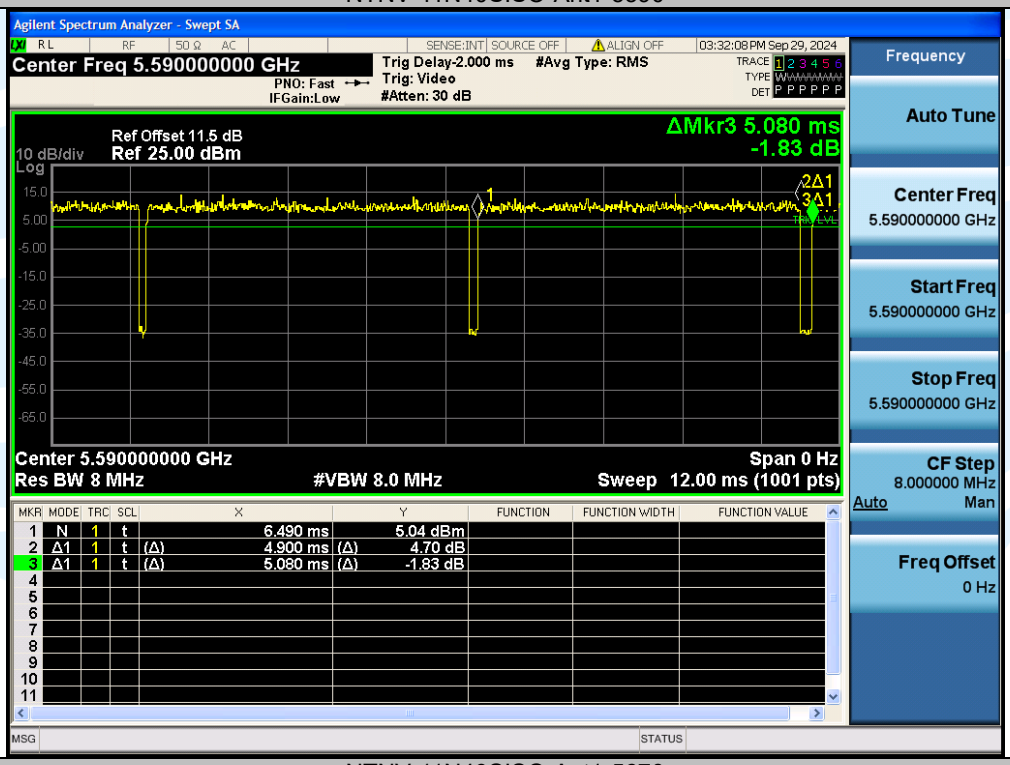
NTNV-11N40SISO-Ant1-5510



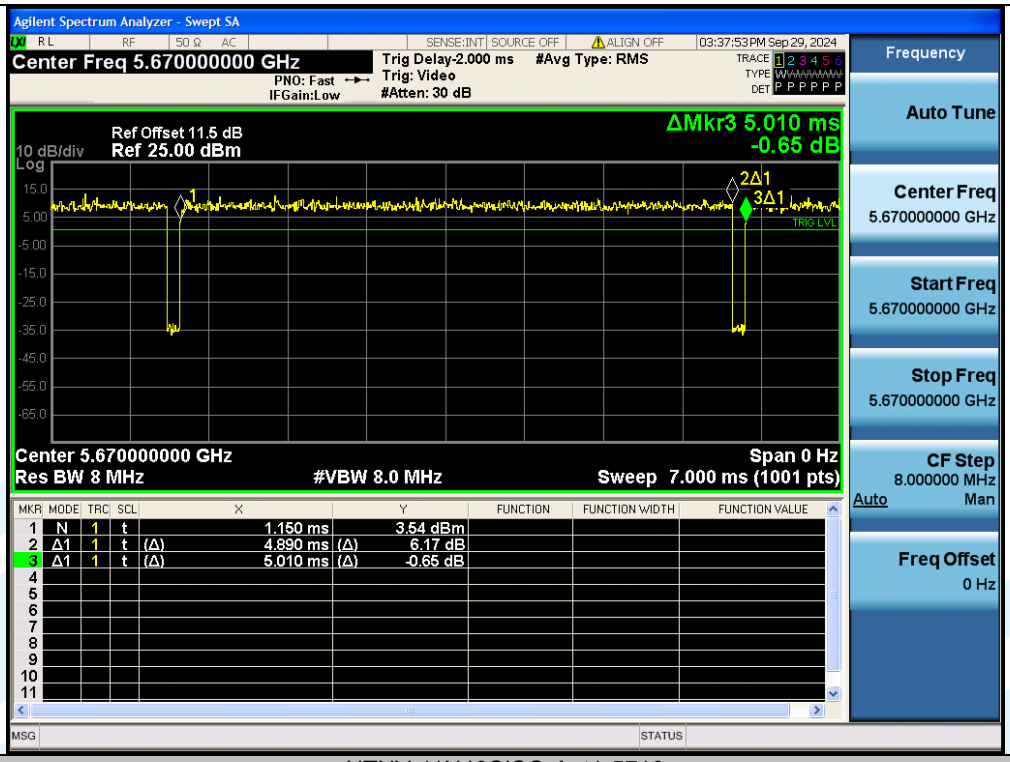
NTNV-11N40SISO-Ant1-5550



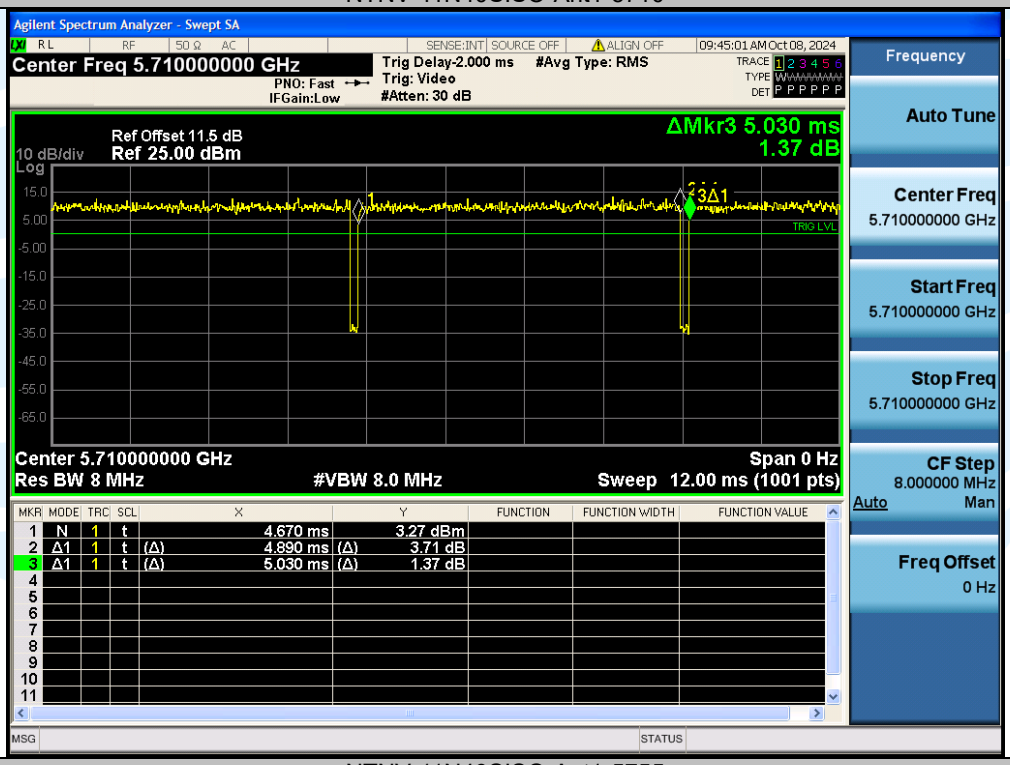
NTNV-11N40SISO-Ant1-5590



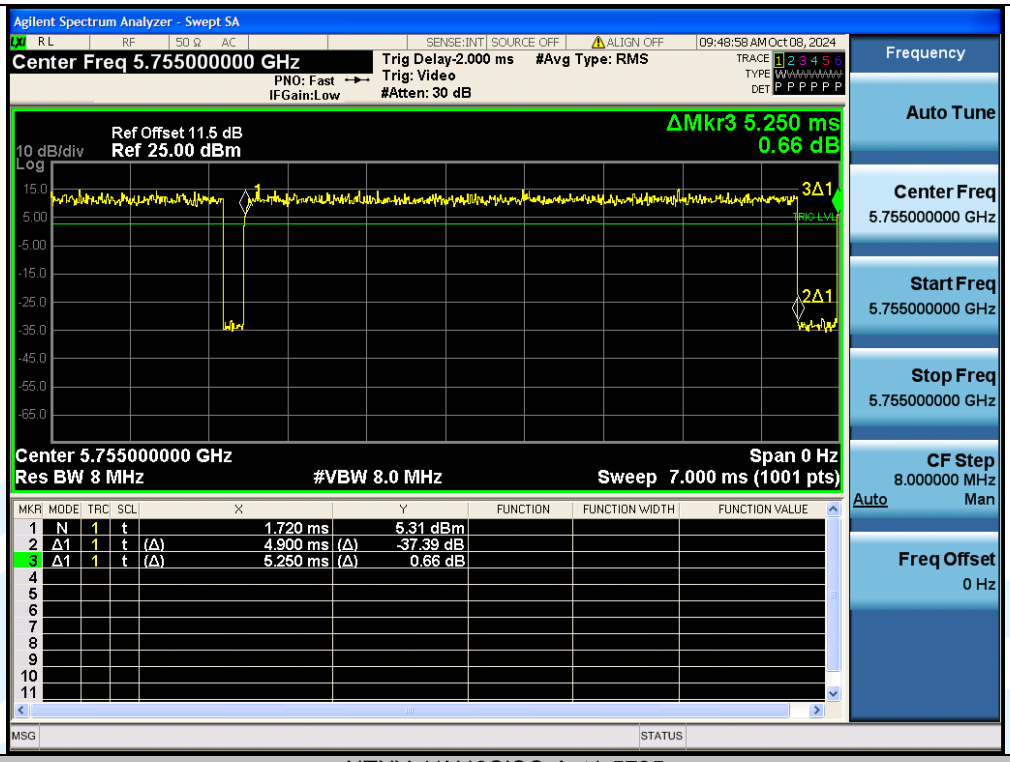
NTNV-11N40SISO-Ant1-5670



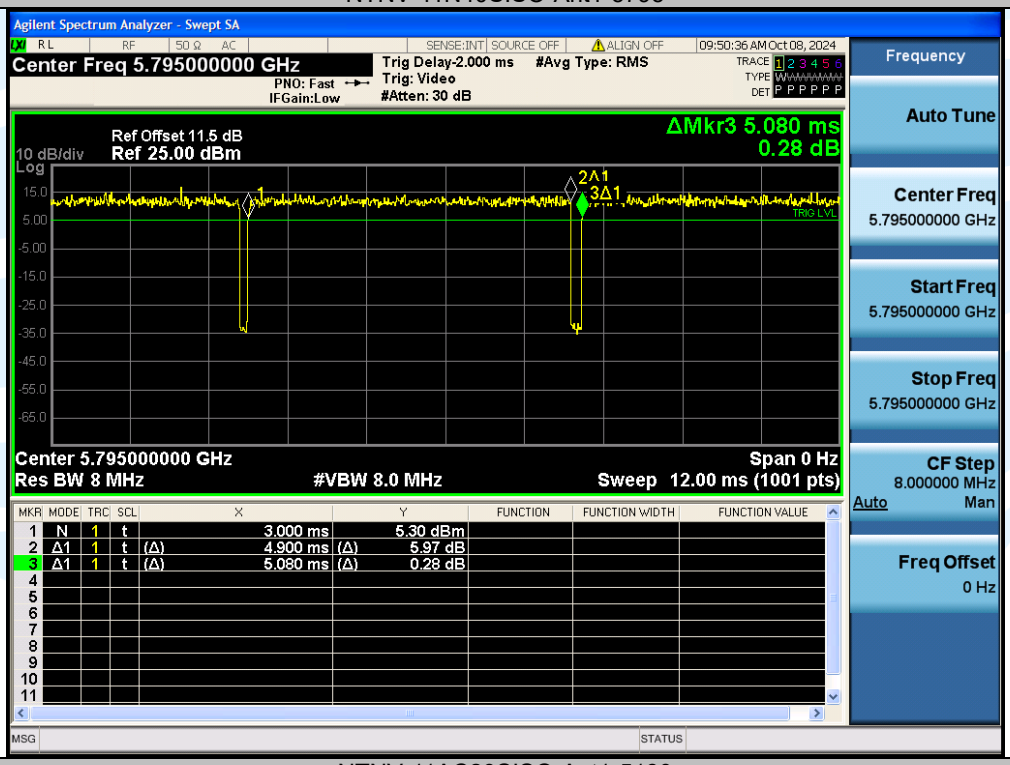
NTNV-11N40SISO-Ant1-5710



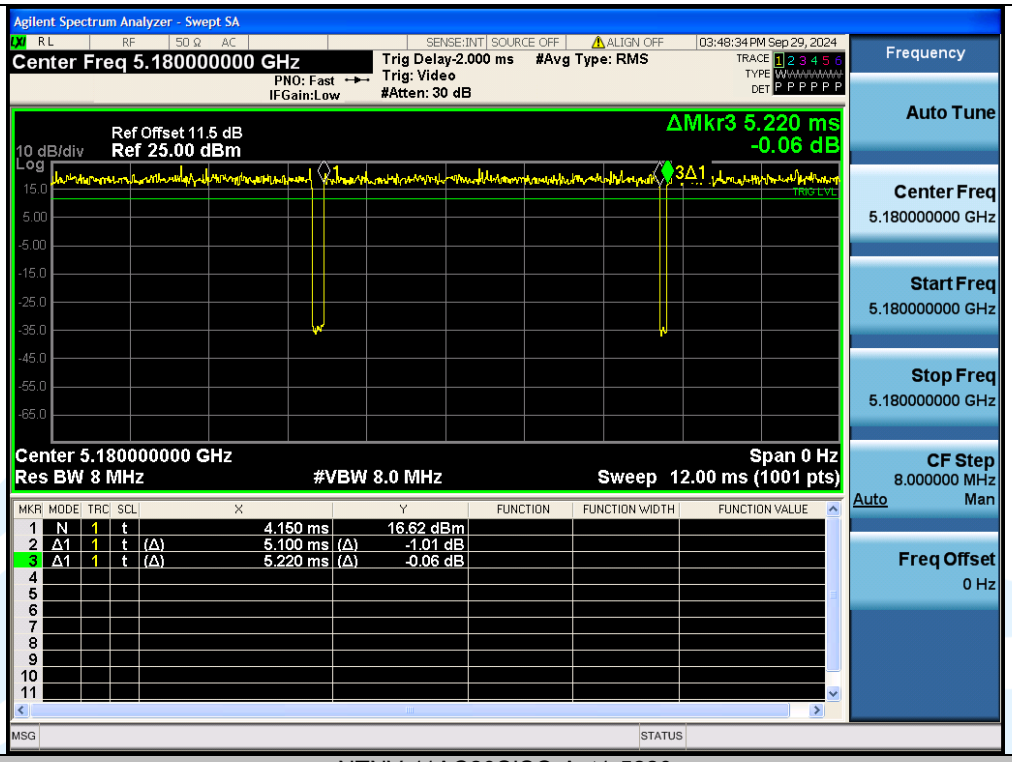
NTNV-11N40SISO-Ant1-5755



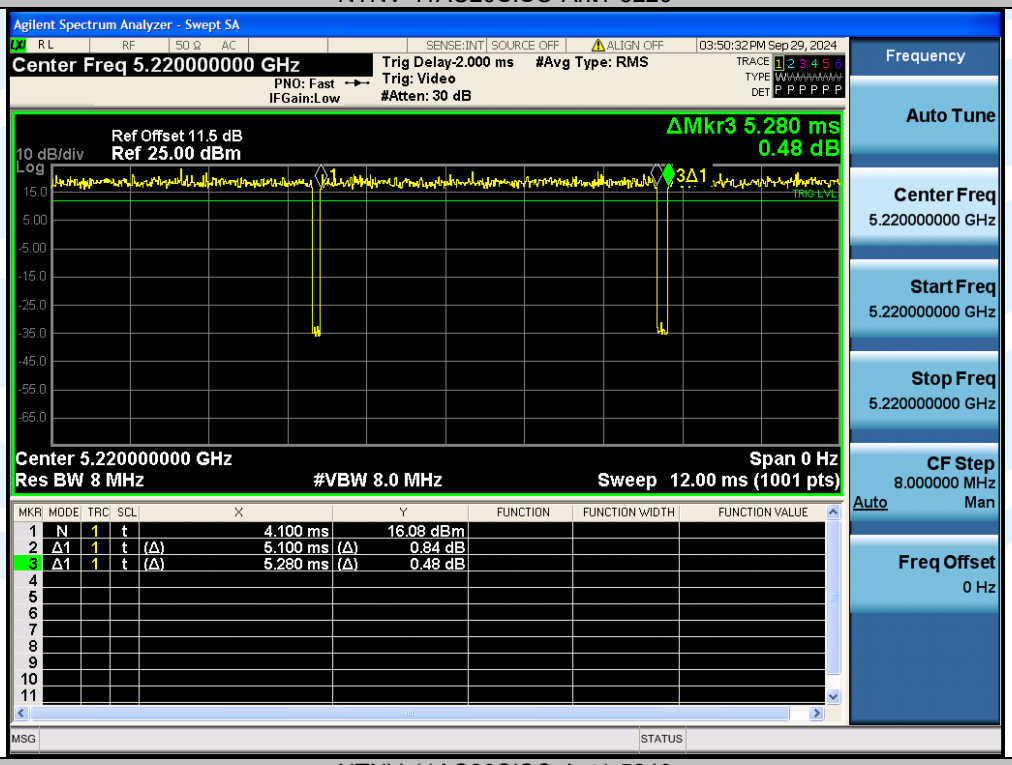
NTNV-11N40SISO-Ant1-5795



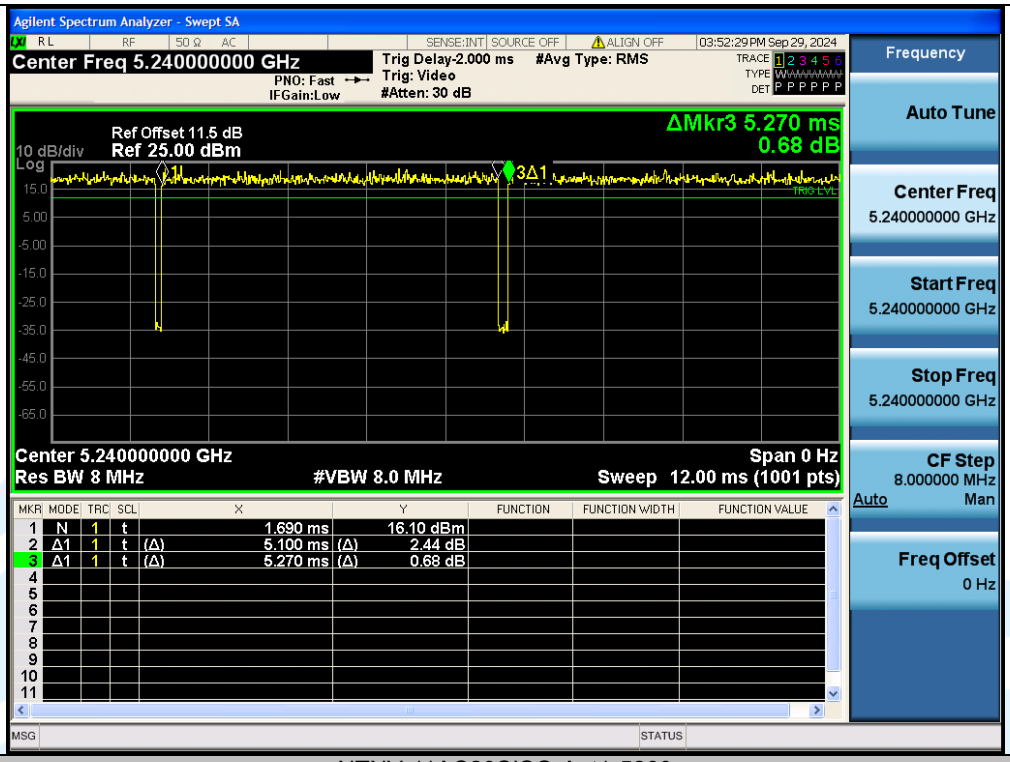
NTNV-11AC20SISO-Ant1-5180



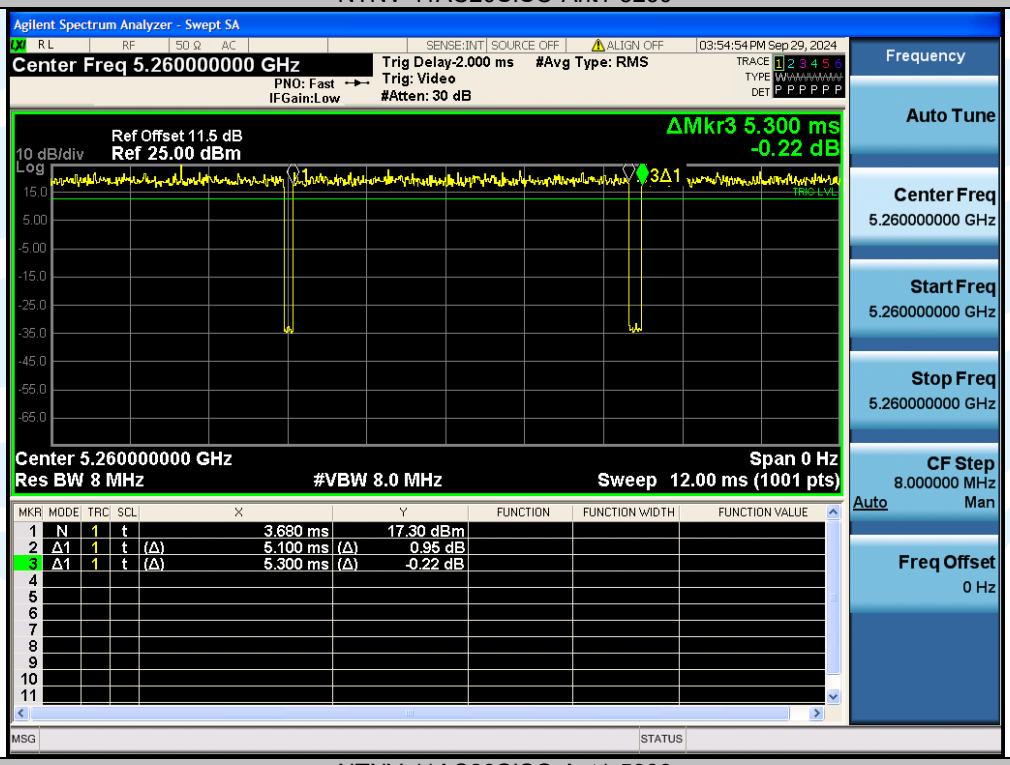
NTNV-11AC20SISO-Ant1-5220



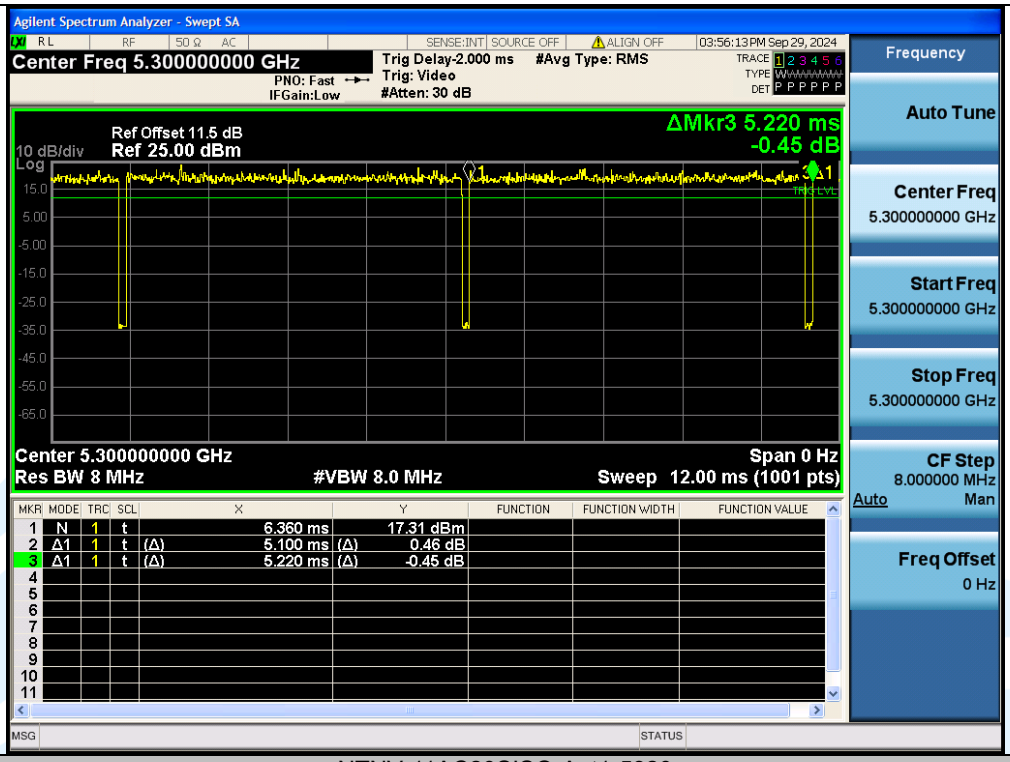
NTNV-11AC20SISO-Ant1-5240



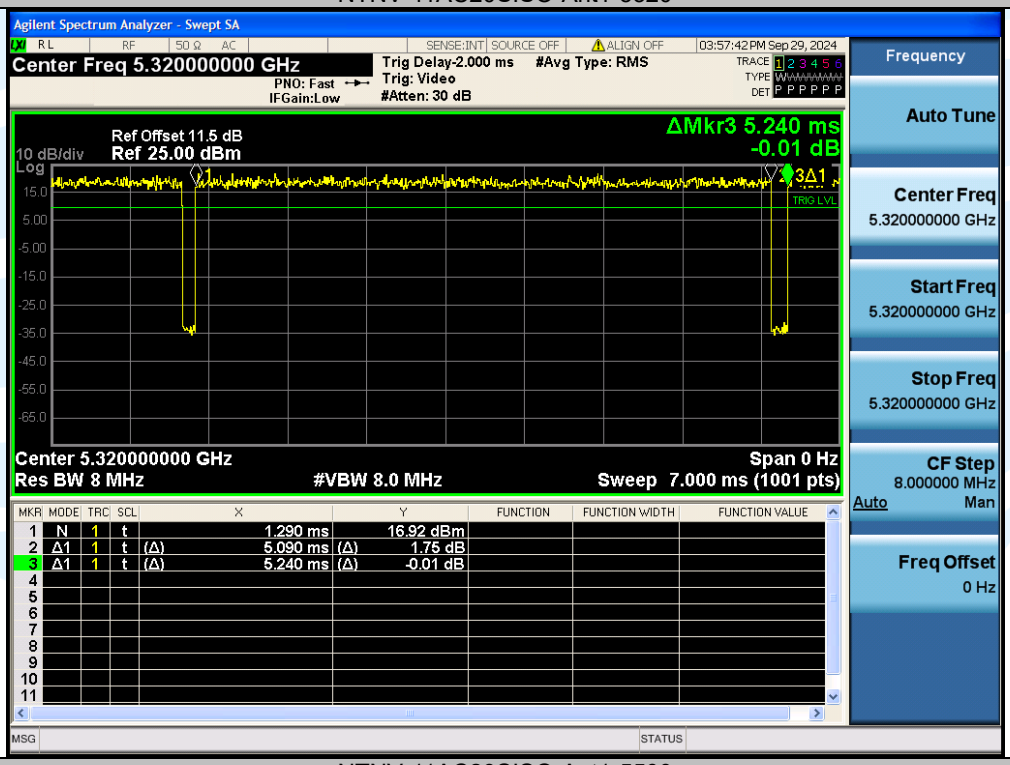
NTNV-11AC20SISO-Ant1-5260



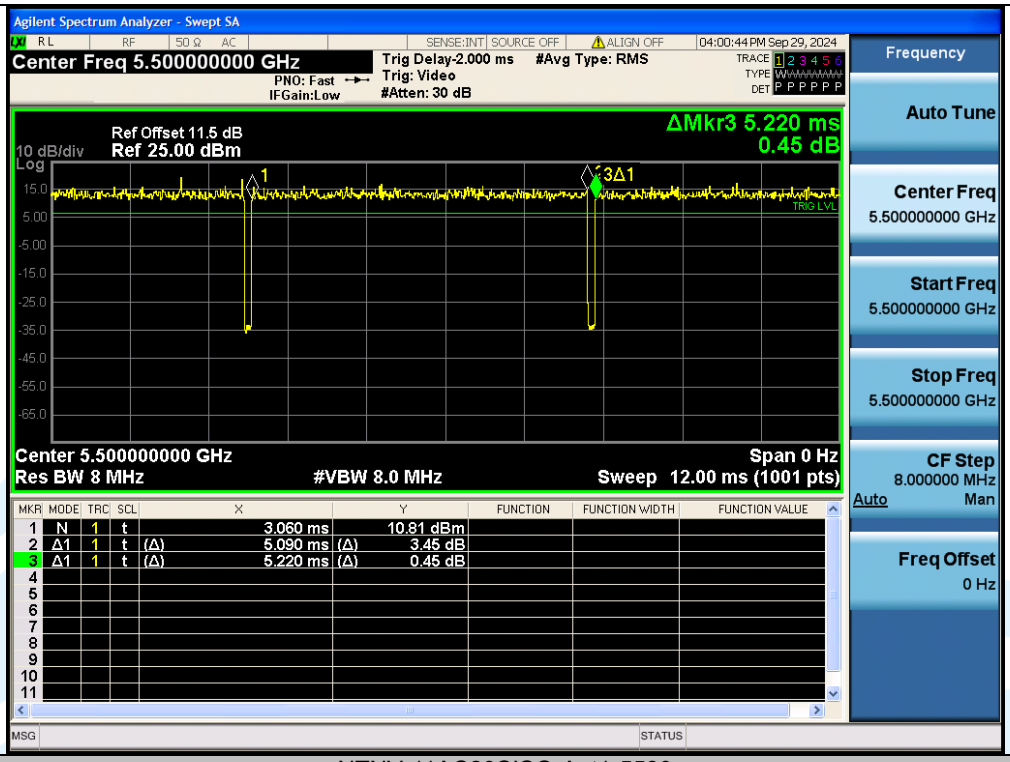
NTNV-11AC20SISO-Ant1-5300



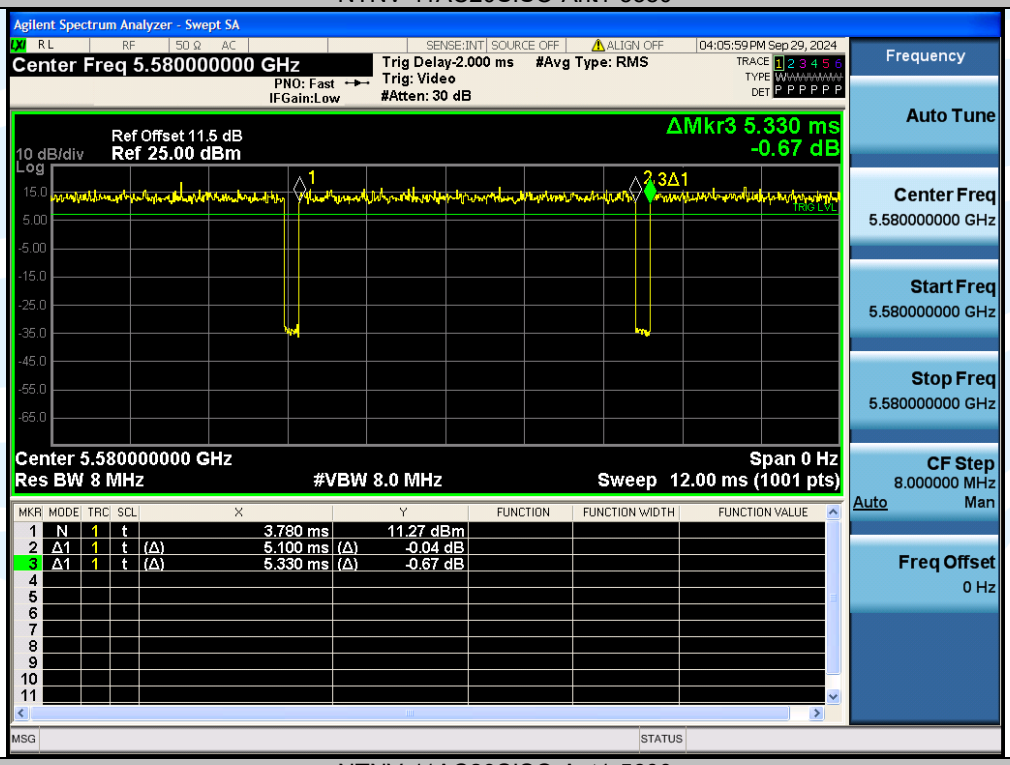
NTNV-11AC20SISO-Ant1-5320



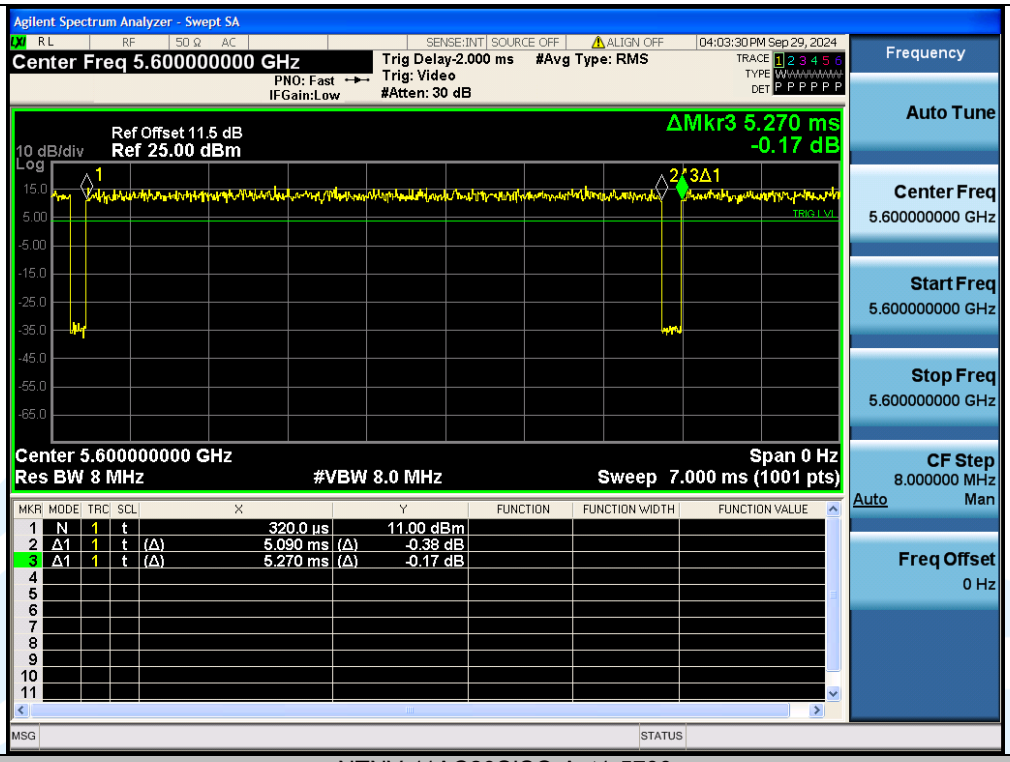
NTNV-11AC20SISO-Ant1-5500



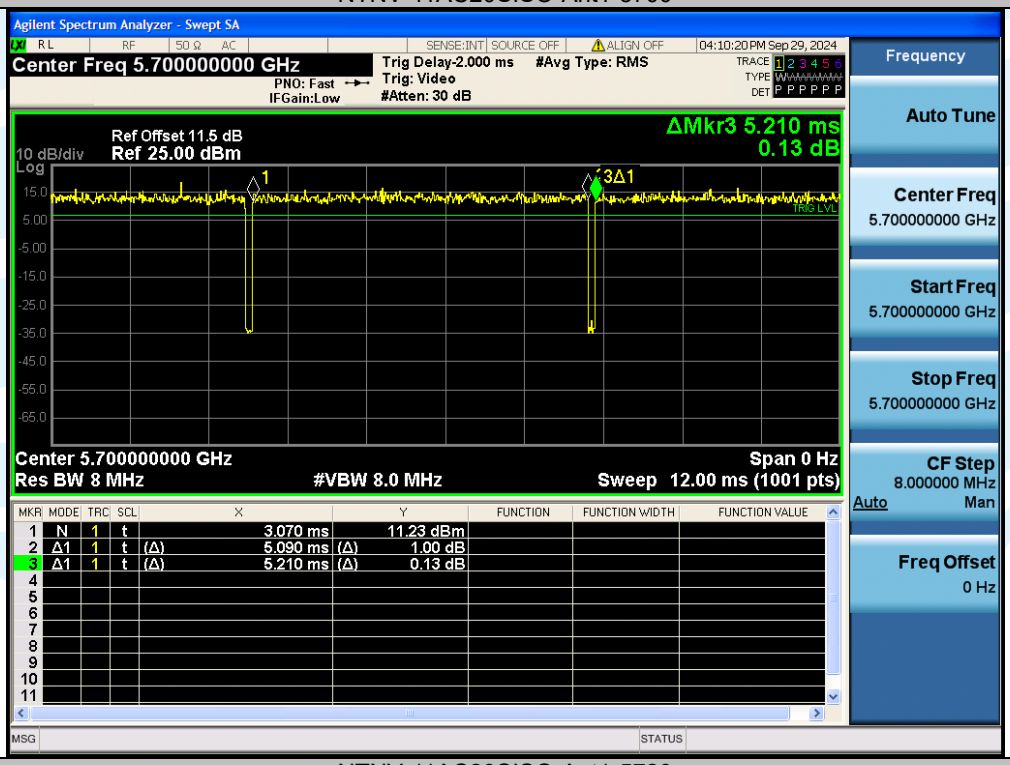
NTNV-11AC20SISO-Ant1-5580



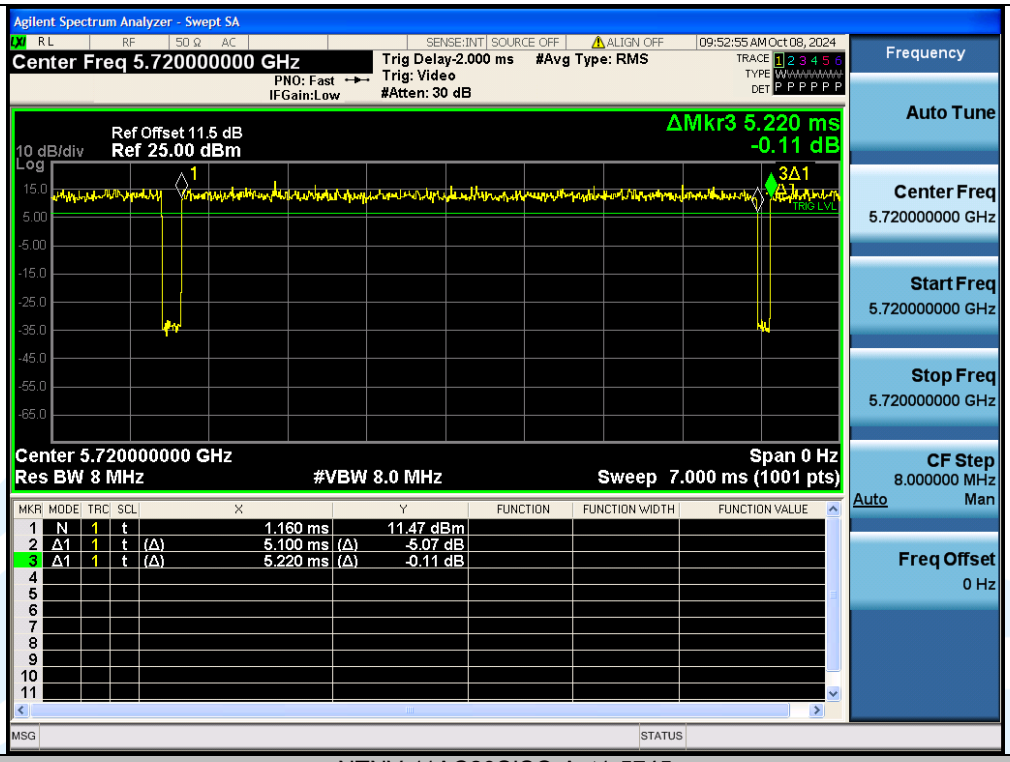
NTNV-11AC20SISO-Ant1-5600



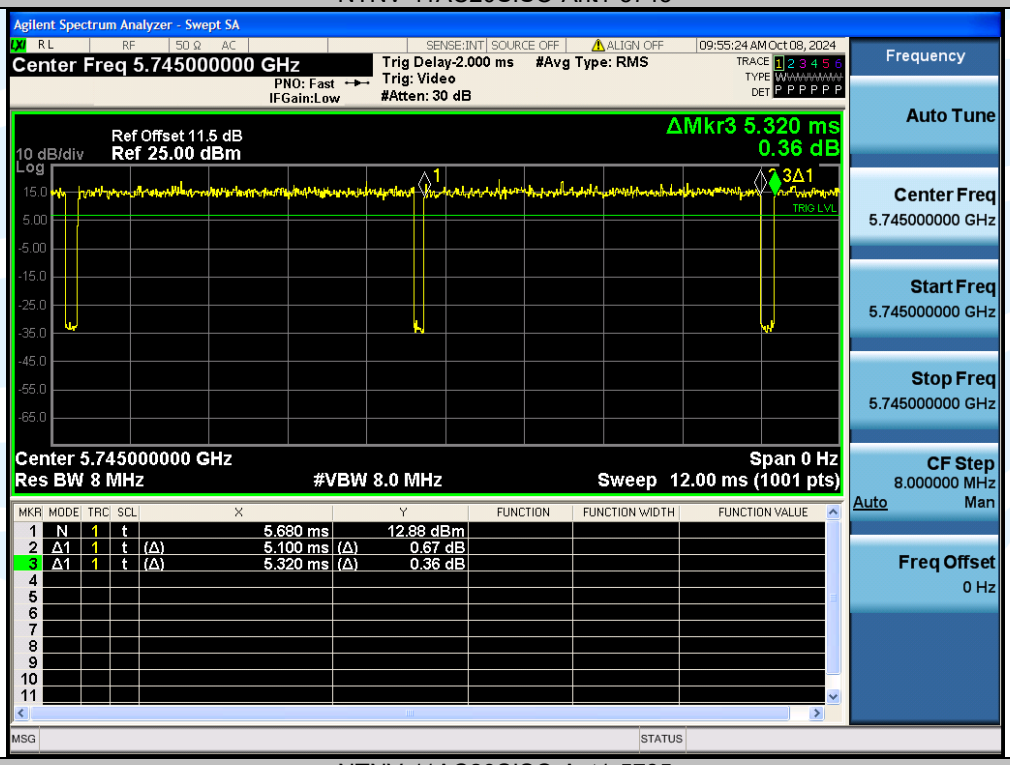
NTNV-11AC20SISO-Ant1-5700



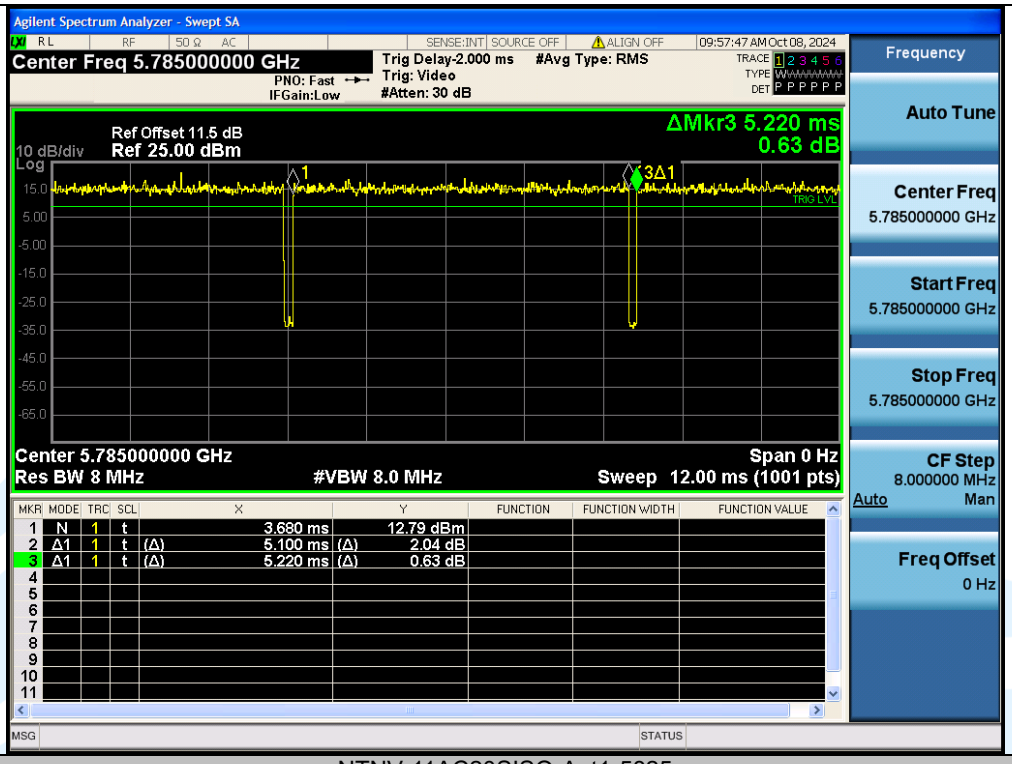
NTNV-11AC20SISO-Ant1-5720



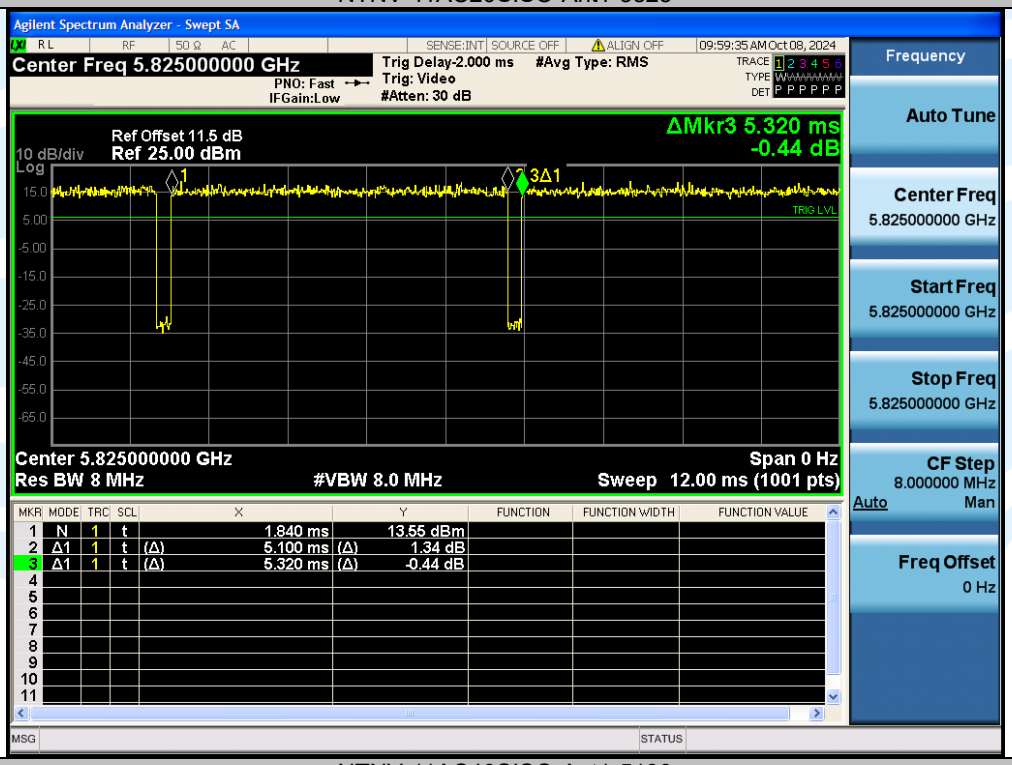
NTNV-11AC20SISO-Ant1-5745



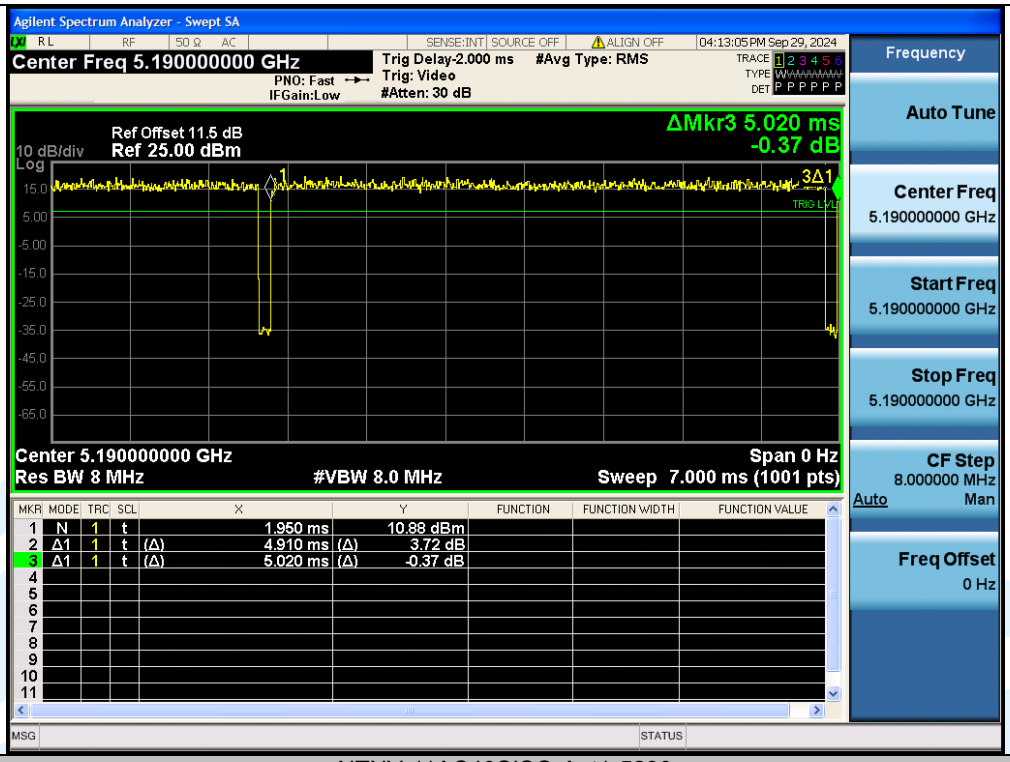
NTNV-11AC20SISO-Ant1-5785



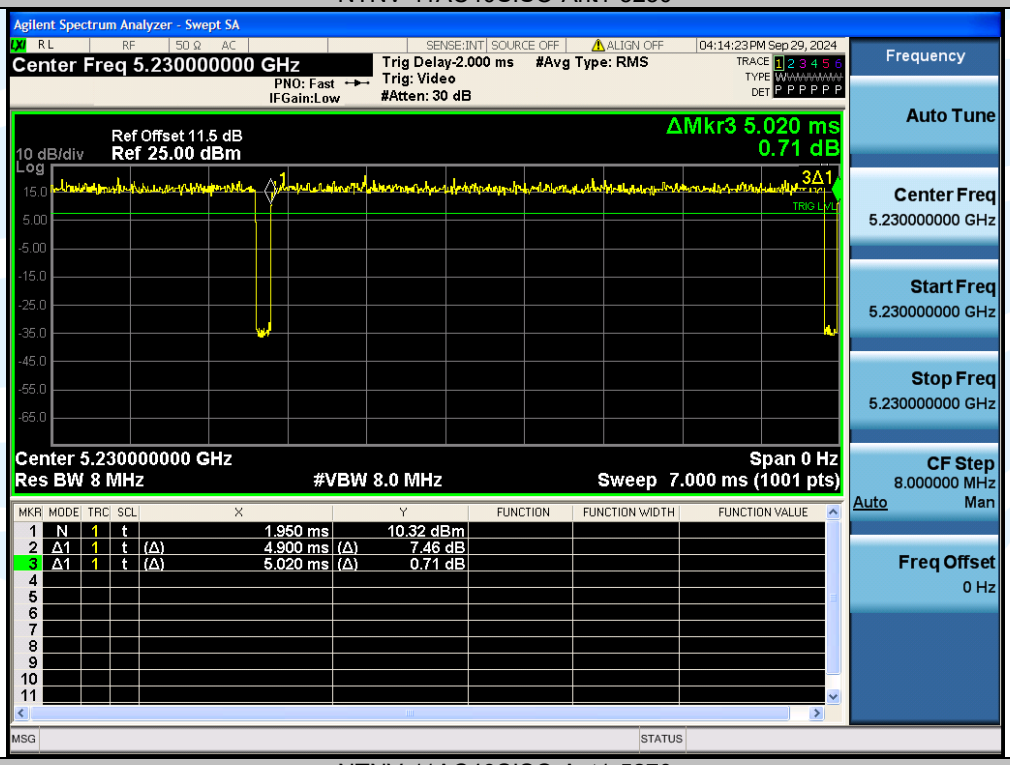
NTNV-11AC20SISO-Ant1-5825



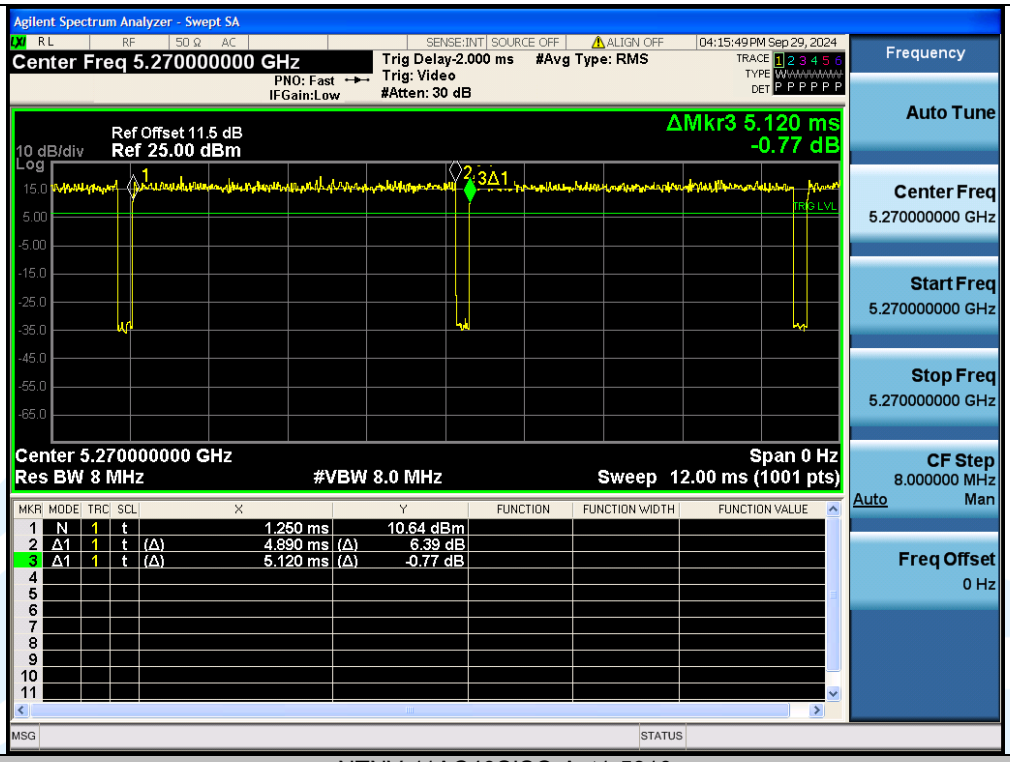
NTNV-11AC40SISO-Ant1-5190



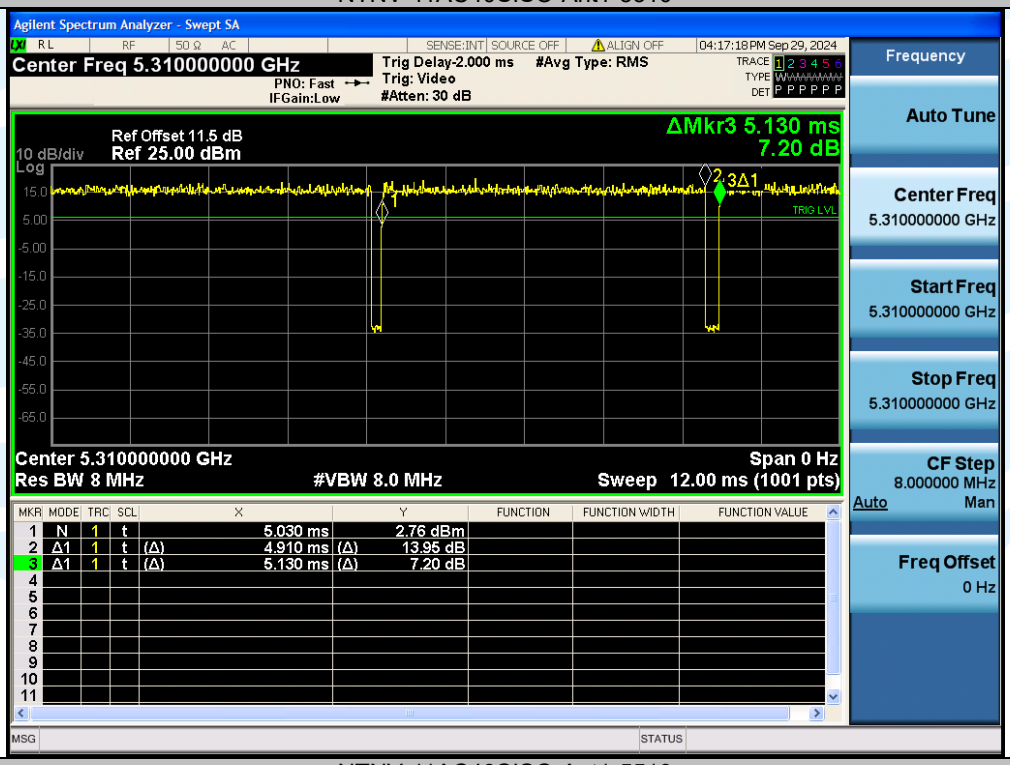
NTNV-11AC40SISO-Ant1-5230



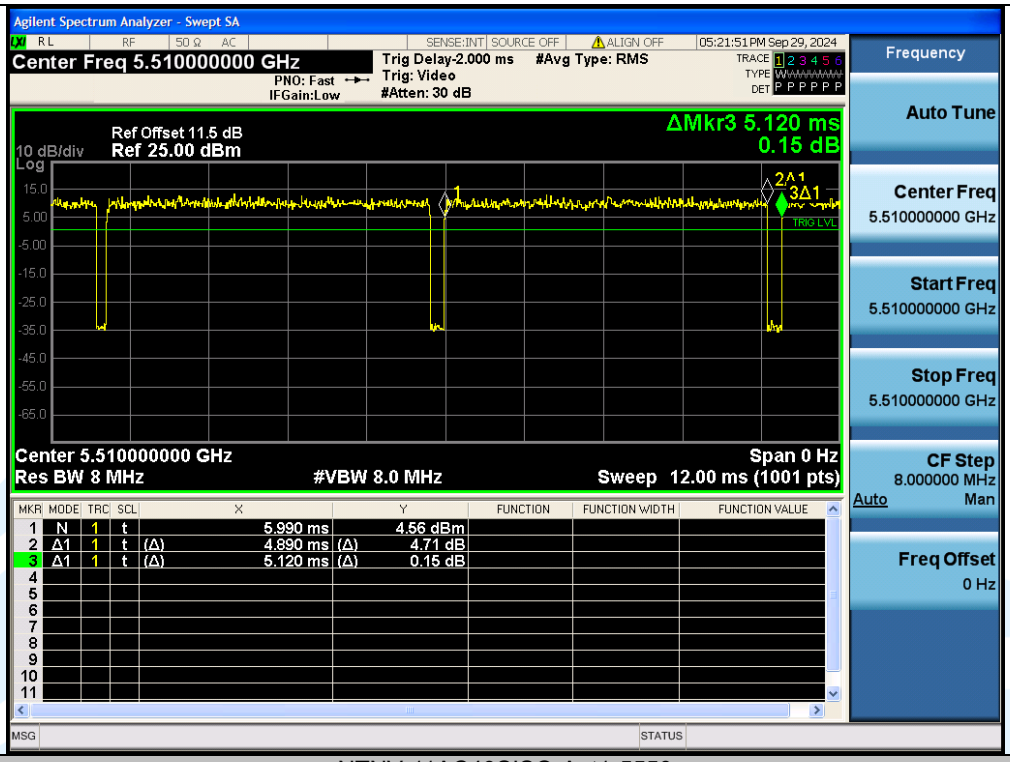
NTNV-11AC40SISO-Ant1-5270



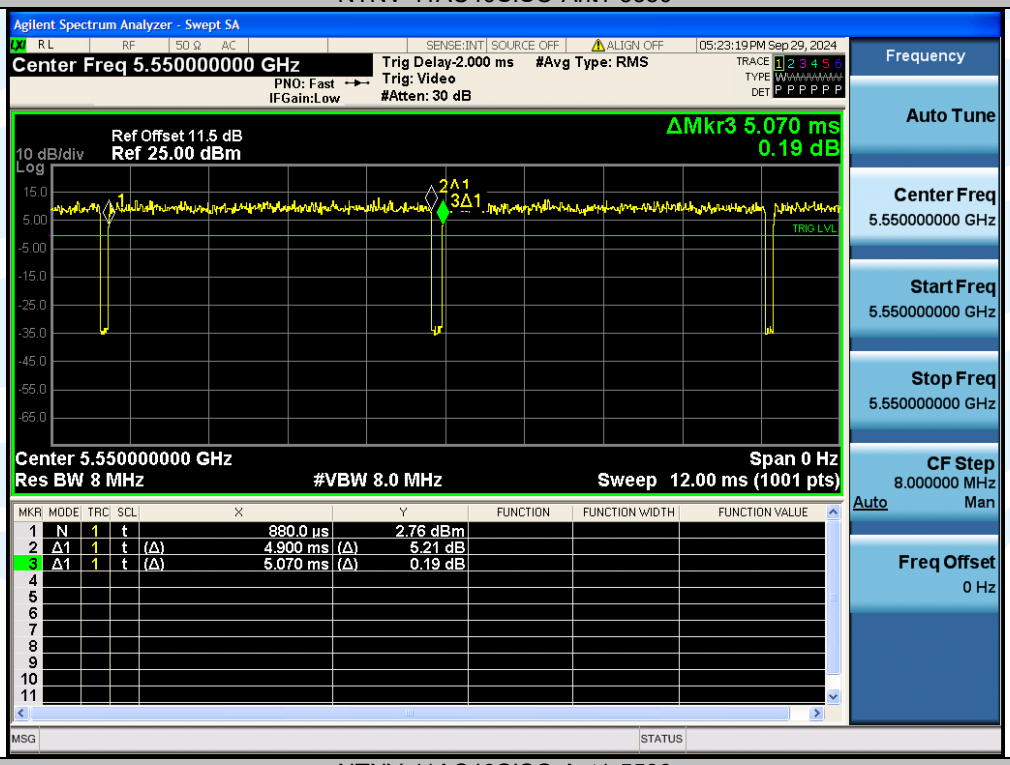
NTNV-11AC40SISO-Ant1-5310



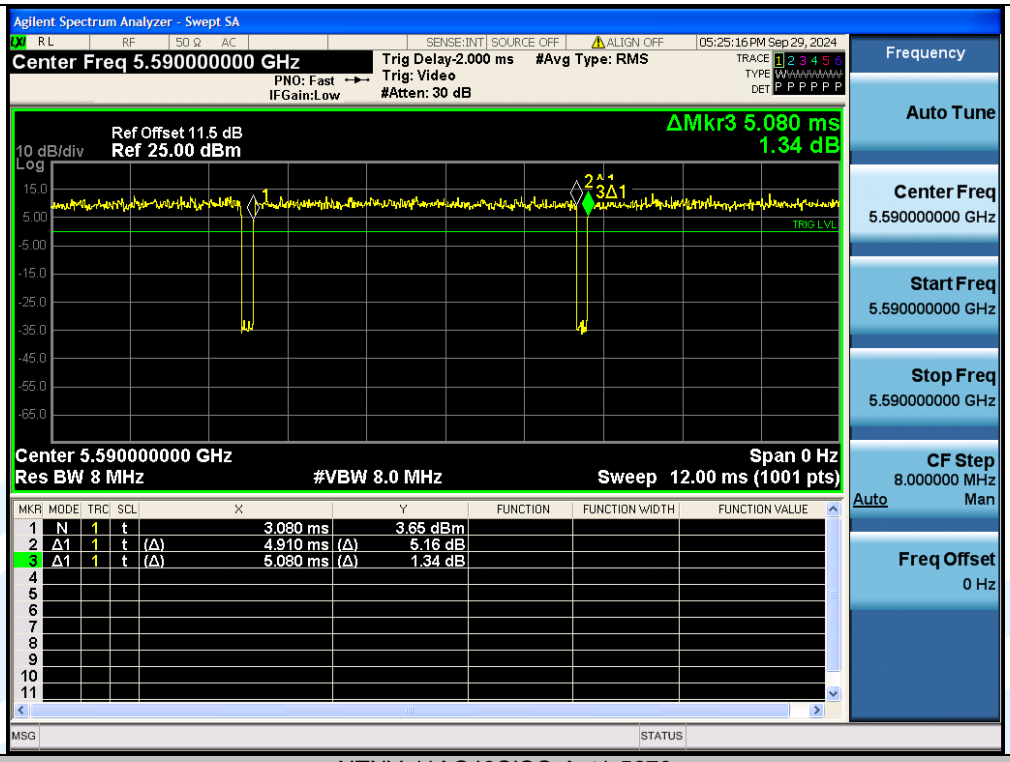
NTNV-11AC40SISO-Ant1-5510



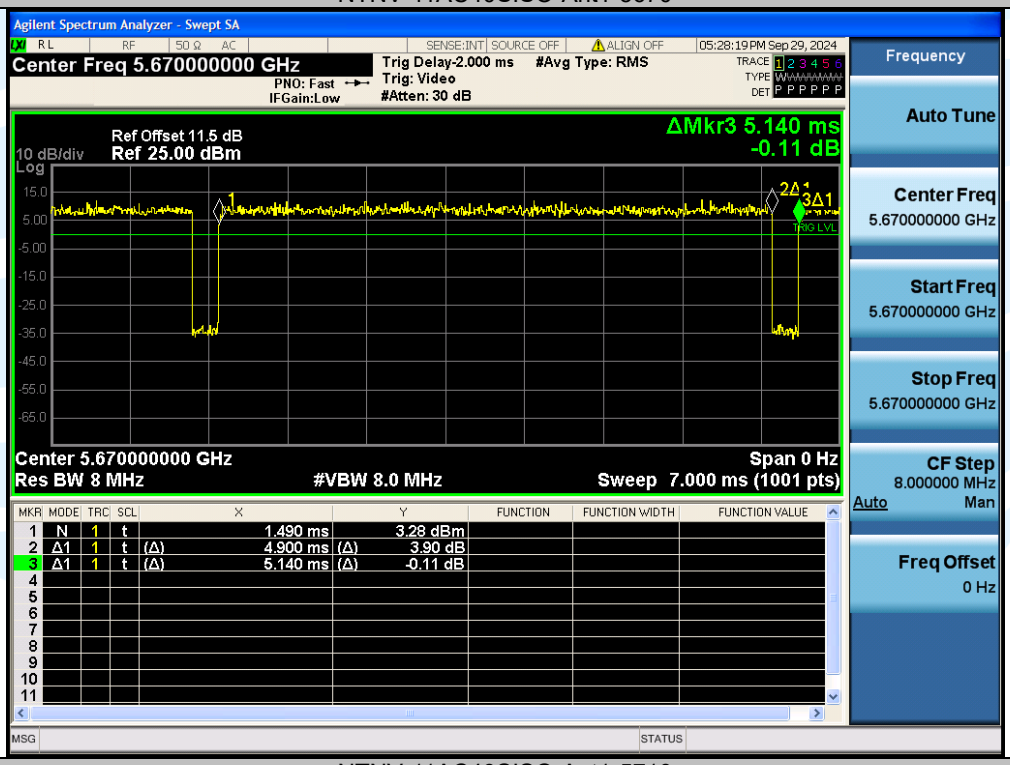
NTNV-11AC40SISO-Ant1-5550



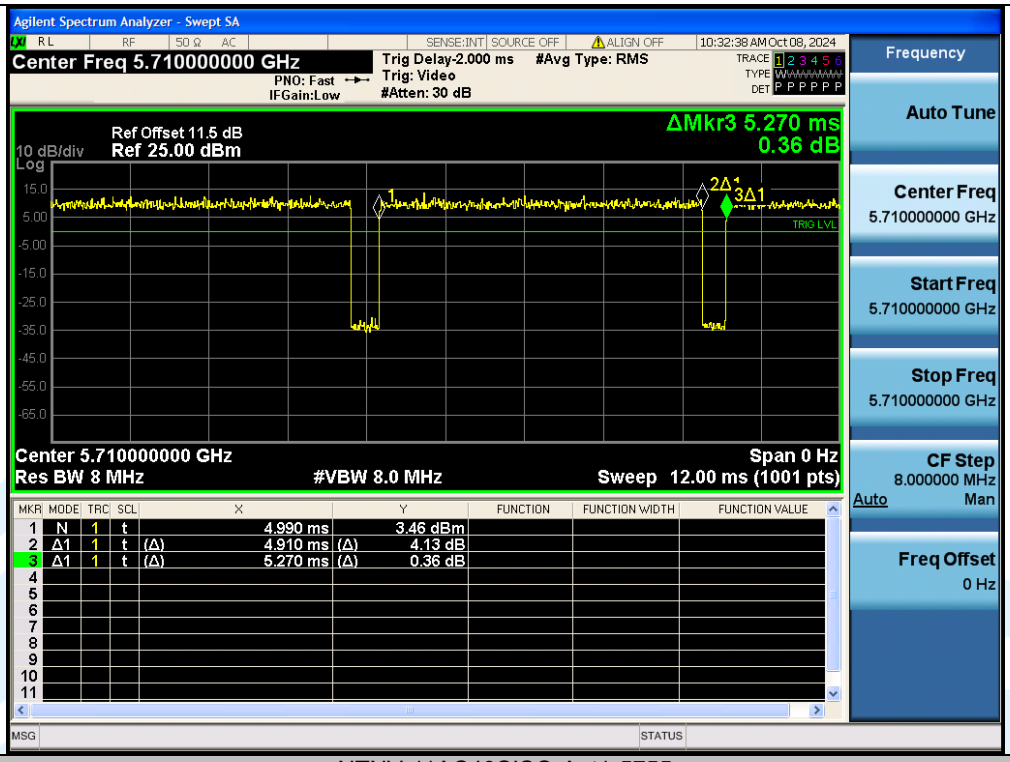
NTNV-11AC40SISO-Ant1-5590



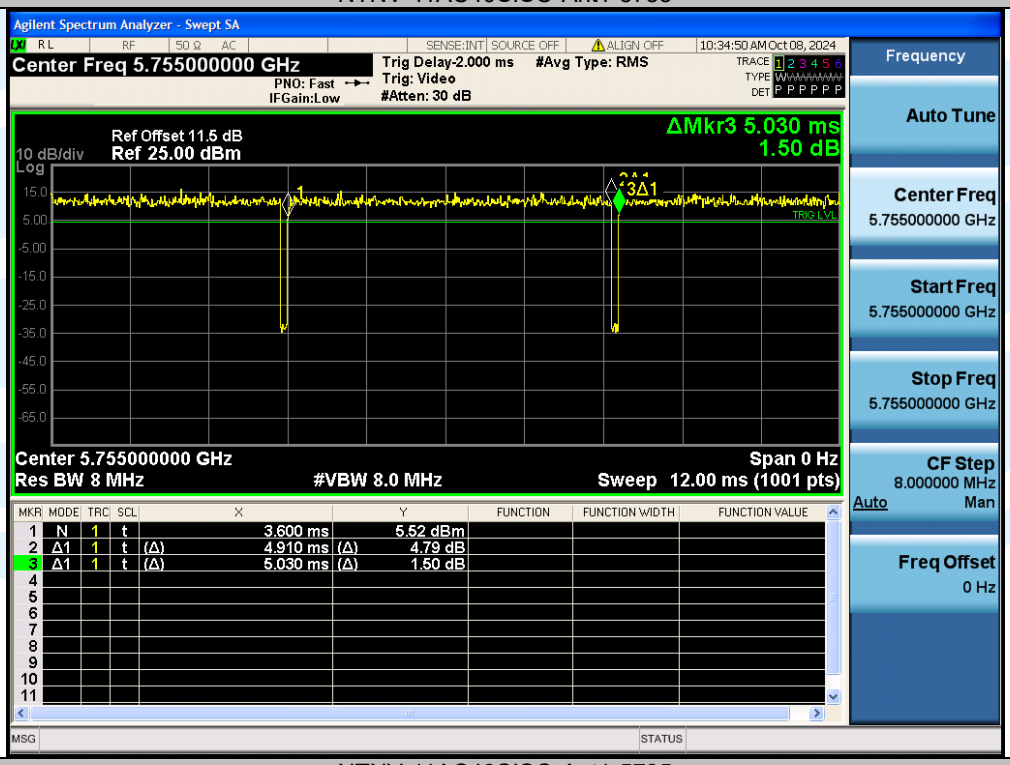
NTNV-11AC40SISO-Ant1-5670



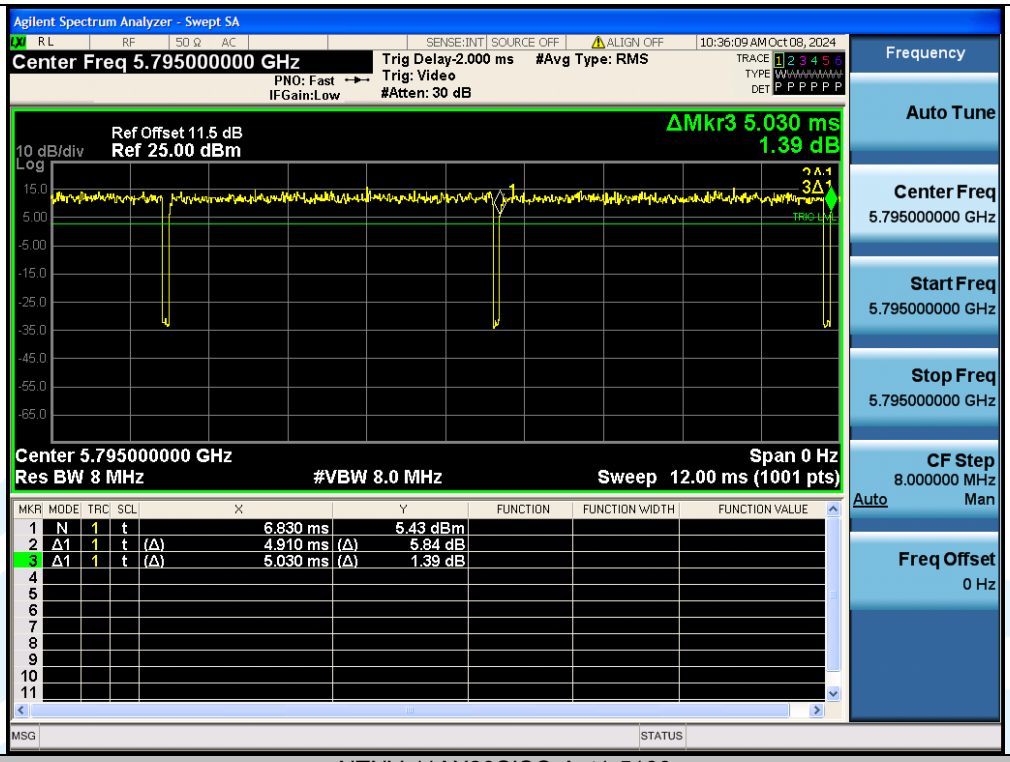
NTNV-11AC40SISO-Ant1-5710



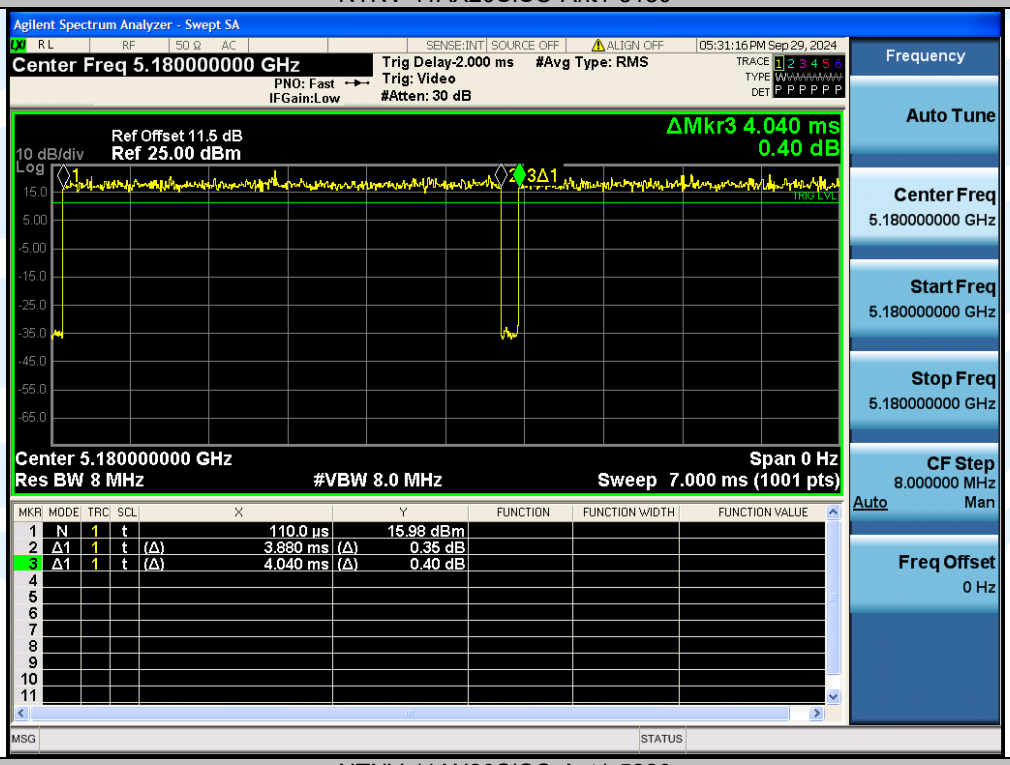
NTNV-11AC40SISO-Ant1-5755



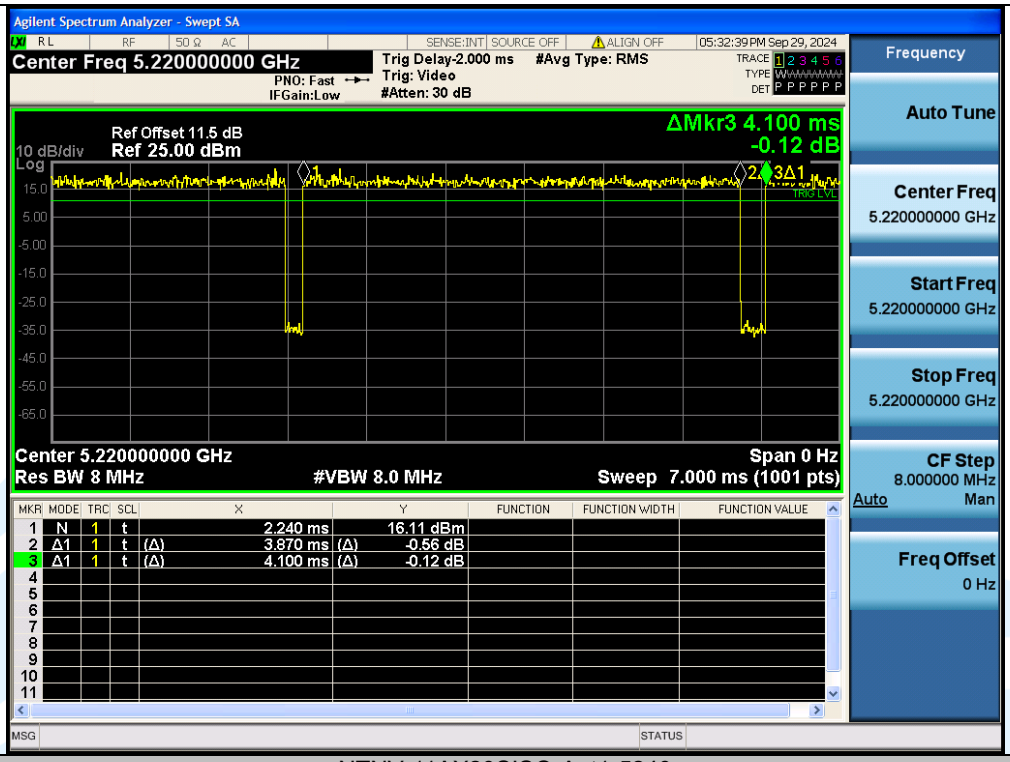
NTNV-11AC40SISO-Ant1-5795



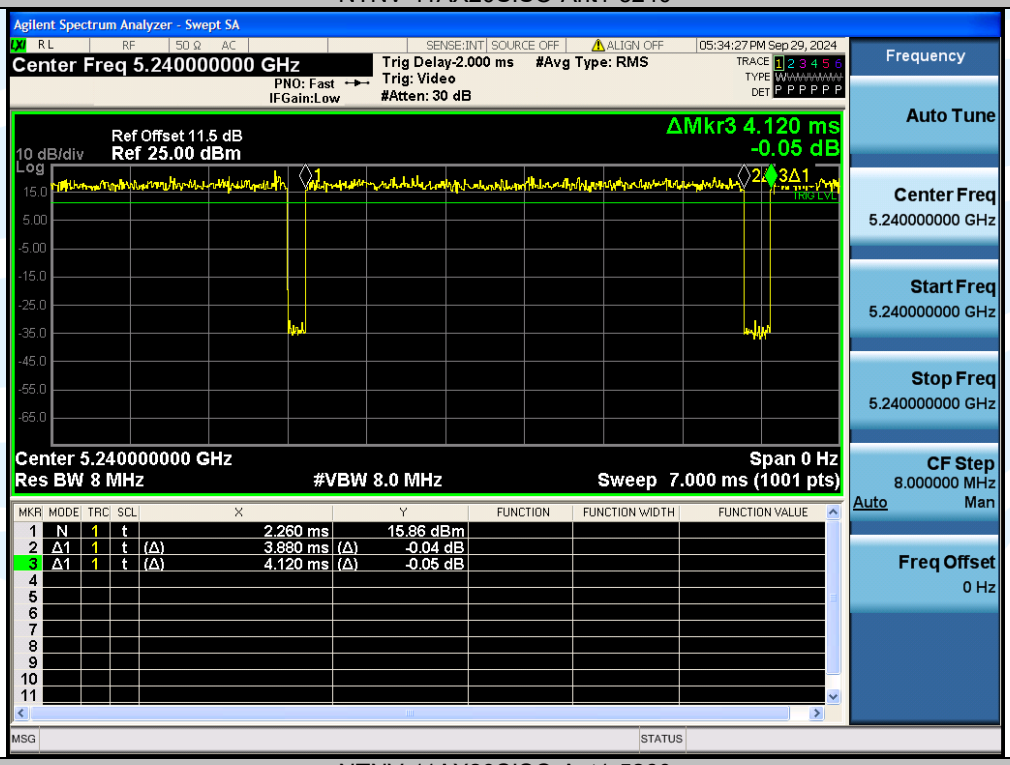
NTNV-11AX20SISO-Ant1-5180



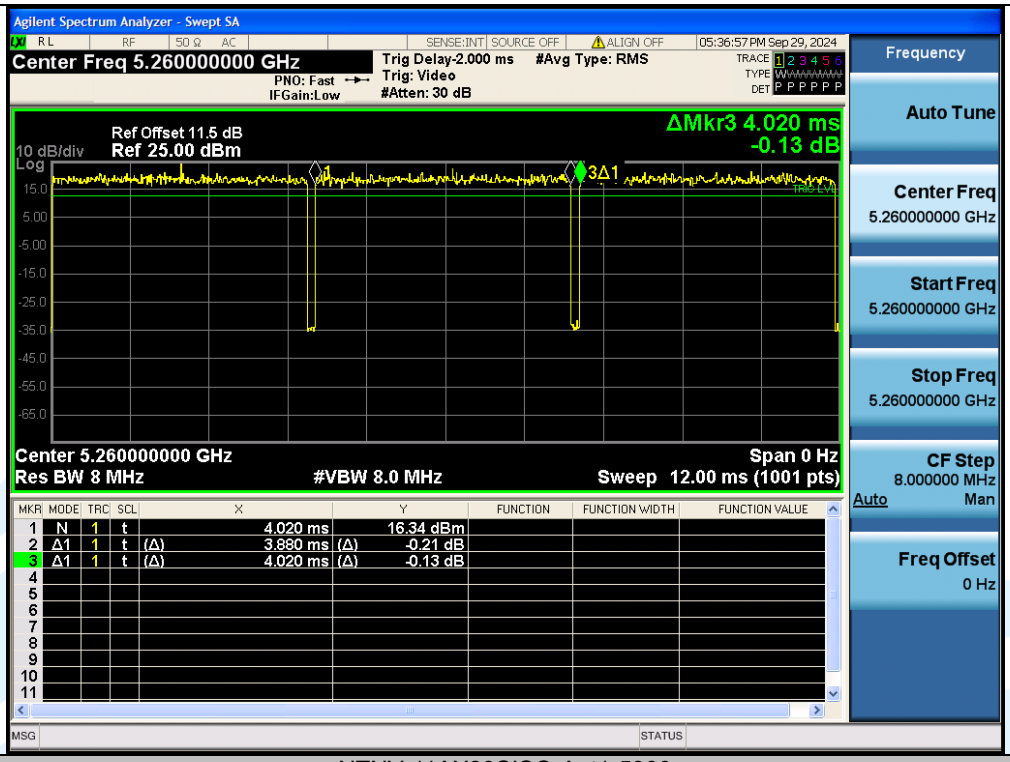
NTNV-11AX20SISO-Ant1-5220



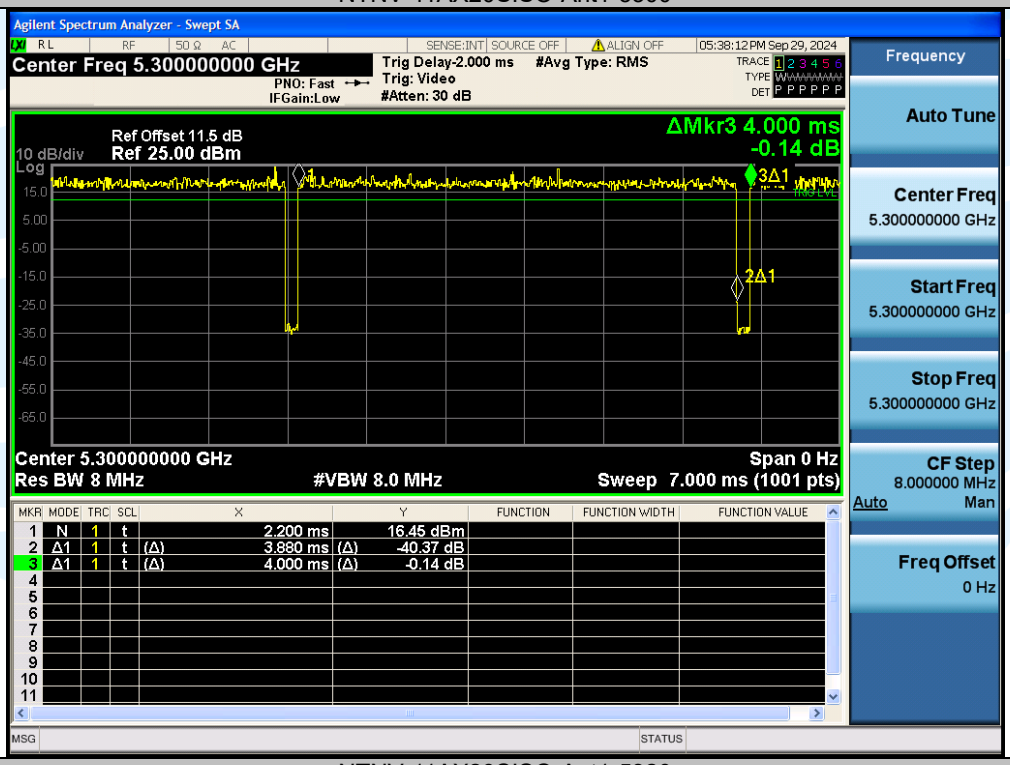
NTNV-11AX20SISO-Ant1-5240



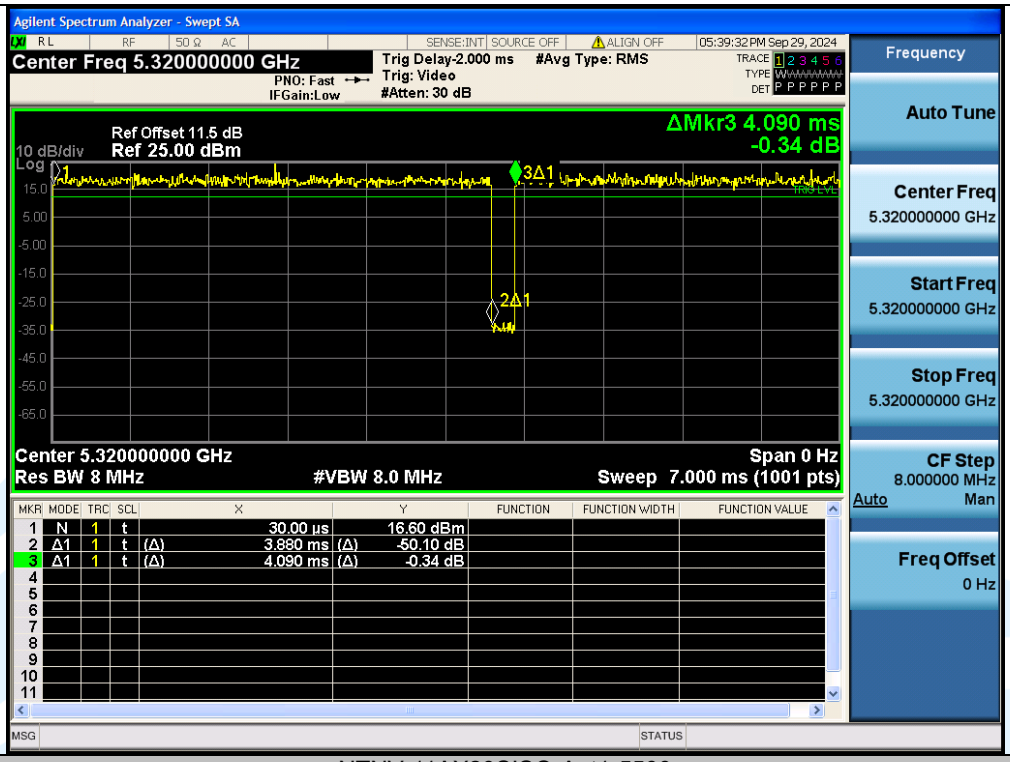
NTNV-11AX20SISO-Ant1-5260



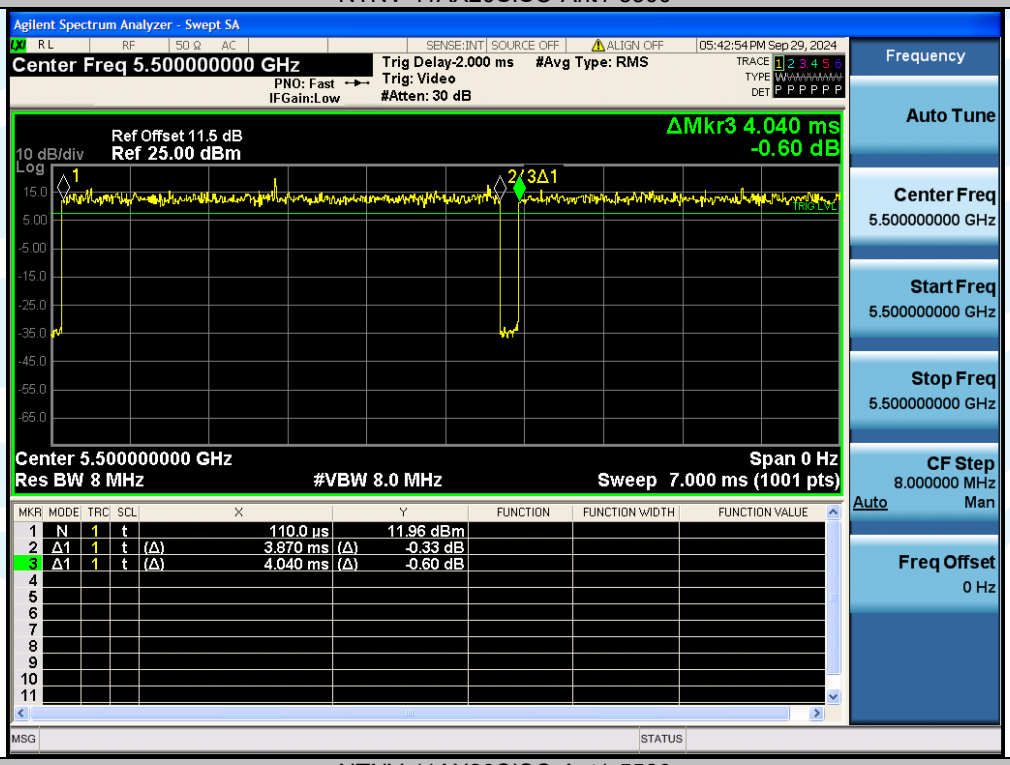
NTNV-11AX20SISO-Ant1-5300



NTNV-11AX20SISO-Ant1-5320



NTNV-11AX20SISO-Ant1-5500



NTNV-11AX20SISO-Ant1-5580