



Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640
Fax: +86-755-26648637
Website: www.cqa-cert.com

Report Template Version: V05
Report Template Revision Date: 2018-07-06

Test Report

Report No.: CQASZ20231102142E-03
Applicant: Guangzhou Havit Technology Co.,LTD
Address of Applicant: ROOM 1307,13F,PHASE 2 B,C BUILDING OF POLY WORLD TRADE CENTER,NO.1000,XINGANG EAST ROAD,HAIZHU,GUANGDONG,China 510000
Equipment Under Test (EUT):
Product: Projector
Model No.: PJ209 PRO, PJ209, PJ202 PRO, PJ205 PRO, PJ206 PRO, PJ207, PJ207 PRO, PJ208, PJ210 PRO, PJ211, PJ211 PRO, PJ212, PJ212 PRO, PJ216 PRO, PJ217, PJ217 PRO, PJ218 PRO, PJ219 PRO
Test Model No.: PJ209 PRO
Brand Name: HAVIT
FCC ID: 2AI6I-PJ209PRO
Standards: 47 CFR Part 15, Subpart E
KDB 789033 D02 General UNII Test Procedures New Rules v02r01
Date of Receipt: 2023-11-28
Date of Test: 2023-11-28 to 2023-12-25
Date of Issue: 2023-12-28
Test Result: **PASS***

*In the configuration tested, the EUT complied with the standards specified above.

Tested By: Lewis Zhou
(Lewis Zhou)

Reviewed By: Timo Lei
(Timo Lei)

Approved By: Jack Ai
(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20231102142E-03	Rev.01	Initial report	2023-12-28

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013; KDB789033	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart E Section 15.207	ANSI C63.10-2013; KDB789033	PASS
Maximum Conducted Output Power	47 CFR Part 15 Subpart C Section 15.407 (a)	ANSI C63.10-2013; KDB789033	PASS
Emission Bandwidth	47 CFR Part 15 Subpart C Section 15.407 (a)(e)	ANSI C63.10-2013; KDB789033	PASS
Maximum Power Spectral Density	47 CFR Part 15 Subpart E Section 15.407 (a)	ANSI C63.10-2013; KDB789033	PASS
Band Edge Measurements	47 CFR Part 15 Subpart C Section 15.209 & 15.407(b)	ANSI C63.10-2013; KDB789033	PASS
Frequency stability	47 CFR Part 15 Subpart E Section 15.407 (g)	ANSI C63.10-2013; KDB789033	PASS
Operation in the absence of information to the transmit	47 CFR Part 15 Subpart E Section 15.407 (c)	47 CFR Part 15 Subpart E	PASS
Radiated Spurious Emissions	47 CFR Part 15 Subpart E Section 15.407 (b)	ANSI C63.10-2013; KDB789033	PASS

Remark:

The tested sample(s) and the sample information are provided by the client.

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radiated Frequency.

CH: In this whole report CH means channel.

Volt: In this whole report Volt means Voltage.

Temp: In this whole report Temp means Temperature.

Humid: In this whole report Humid means humidity.

Press: In this whole report Press means Pressure.

N/A: In this whole report not application

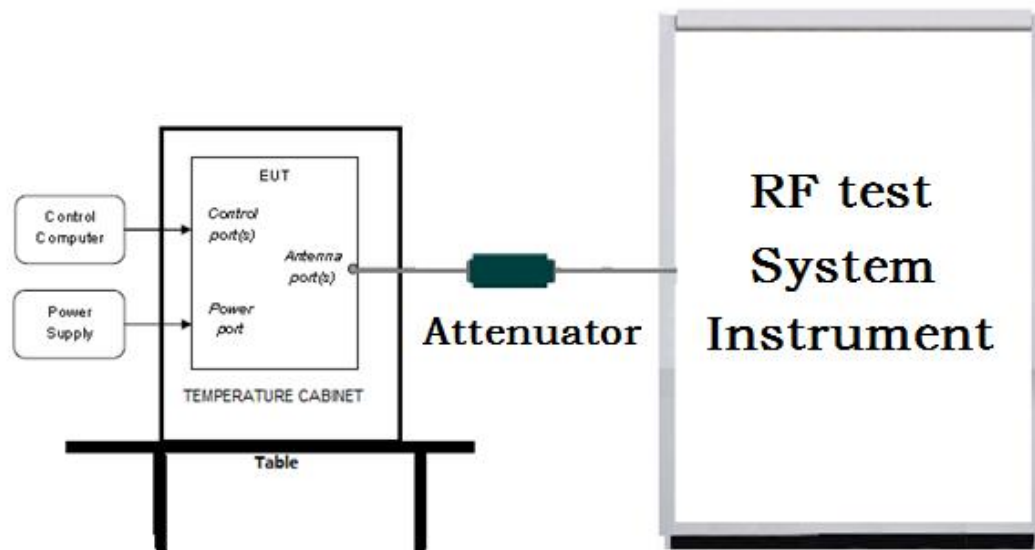
3 Content

	Page
1 VERSION	2
2 TEST SUMMARY	3
3 CONTENT	4
4 TEST REQUIREMENT	5
4.1 TEST SETUP	5
4.1.1 For Conducted test setup	5
4.1.2 For Radiated Emissions test setup	5
4.1.3 For Conducted Emissions test setup	6
4.2 TEST ENVIRONMENT	6
4.3 TEST CONDITION	7
5 GENERAL INFORMATION	9
5.1 CLIENT INFORMATION	9
5.2 GENERAL DESCRIPTION OF EUT	9
5.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	10
5.4 DESCRIPTION OF SUPPORT UNITS	11
5.5 TEST LOCATION	12
5.6 TEST FACILITY	12
5.7 DEVIATION FROM STANDARDS	12
5.8 ABNORMALITIES FROM STANDARD CONDITIONS	12
5.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER	12
5.10 MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2)	12
6 EQUIPMENT LIST	13
7 RADIO TECHNICAL REQUIREMENTS SPECIFICATION	14
Appendix A): Emission Bandwidth	15
Appendix B): Maximum Conduct Output Power	31
Appendix C): Maximum Power Spectral Density	34
Appendix D): Band Edge Measurements	50
7.1.1 Test Result B1/2/3	52
7.1.2 Test Result B4	52
7.1.3 Test Graphs B1/2/3	54
7.1.4 Test Graphs B4	59
Appendix E): Frequency Stability	64
Appendix F): Antenna Requirement	66
Appendix G): Operation in the absence of information to the transmit	67
Appendix H): AC Power Line Conducted Emission	68
Appendix I): Restricted bands around fundamental frequency (Radiated Emission)	71
Appendix J): Radiated Spurious Emissions	77
8 PHOTOGRAPHS - EUT TEST SETUP	84
8.1 RADIATED SPURIOUS EMISSION	84
8.2 CONDUCTED EMISSION	85
9 PHOTOGRAPHS - EUT CONSTRUCTIONAL DETAILS	86

4 Test Requirement

4.1 Test setup

4.1.1 For Conducted test setup



4.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

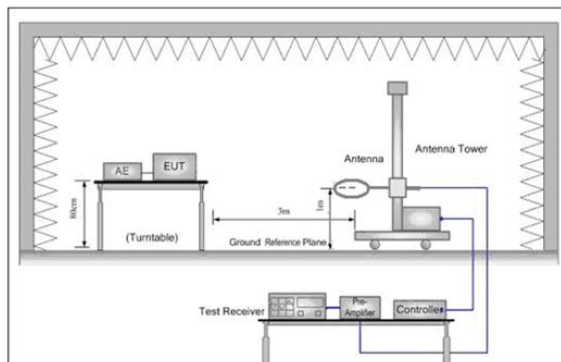


Figure 1. Below 30MHz

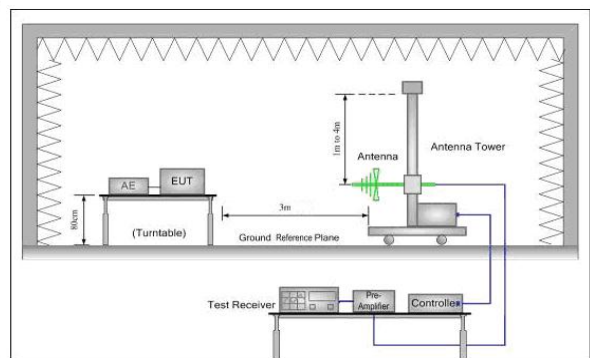


Figure 2. 30MHz to 1GHz

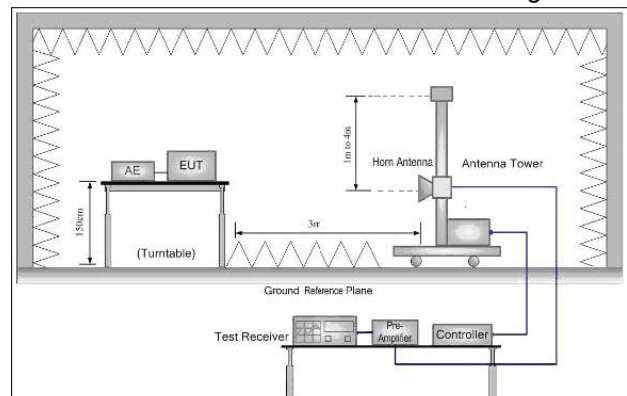
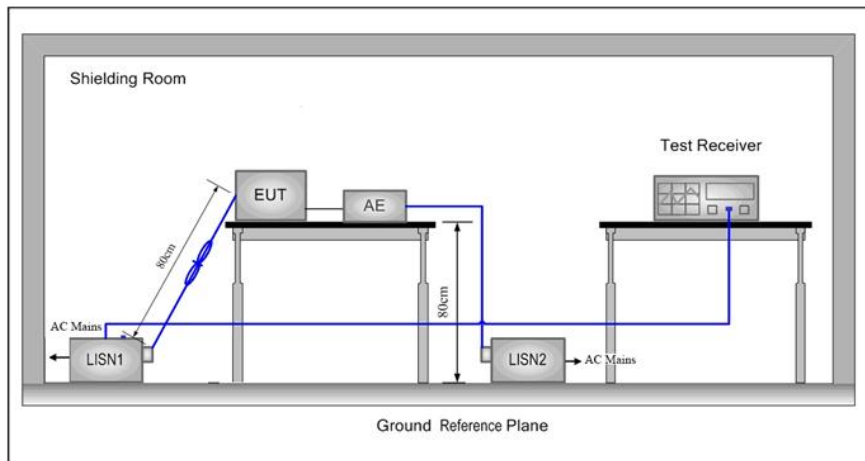


Figure 3. Above 1GHz

4.1.3 For Conducted Emissions test setup

Conducted Emissions setup



4.2 Test Environment

Operating Environment:		
Conducted Emissions:		
Temperature:	25.6 °C	
Humidity:	60 % RH	
Atmospheric Pressure:	1009 mbar	
Radiated Emissions:		
Temperature:	25.5 °C	
Humidity:	54 % RH	
Atmospheric Pressure:	1009mbar	
Radio conducted item test (RF Conducted test room):		
Temperature:	25.3 °C	
Humidity:	50 % RH	
Atmospheric Pressure:	1009 mbar	
Test Condition	Temperature (°C)	Voltage (V)
TN/VN	+0 to +50	7.6
TL/VL	0	6.84
TH/VL	50	6.84
TL/VH	0	8.36
TH/VH	50	8.36
Remark:		
1)The EUT just work in such extreme temperature of 0 °C to 50 °C and the extreme voltage of 6.84V to 8.36V, so here the EUT is tested in the temperature of 0 °C to 50 °C and the voltage of 6.84V to 8.36V.		
2)VN: Normal Voltage; TN: Normal Temperature;		
TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;		
VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.		

4.3 Test Condition

Test channel:

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
802.11a/n/ac(20M)	5150MHz ~5250 MHz	Channel 36	Channel 40	Channel 48
		5180MHz	5200MHz	5240MHz
802.11n/ac(40M)	5150MHz ~5250 MHz	Channel 38	N/A	Channel 46
		5190MHz	N/A	5230MHz
802.11a/n/ac(20M)	5725MHz ~5850 MHz	Channel 149	Channel 157	Channel 165
		5745MHz	5785MHz	5825MHz
802.11n/ac(40M)	5725MHz ~5850 MHz	Channel 151	N/A	Channel 159
		5755MHz	N/A	5795MHz

Run Software:

管理员: C:\WINDOWS\system32\cmd.exe
— □ ×

```
adb get-state           - prints: offline | bootloader | device
adb get-serialno        - prints: <serial-number>
adb status-window       - continuously print device status for a specified device
adb remount             - remounts the /system partition on the device read-write
adb reboot [bootloader|recovery] - reboots the device, optionally into the bootloader or recovery program
adb reboot-bootloader   - reboots the device into the bootloader
adb root                - restarts the adbd daemon with root permissions
adb usb                 - restarts the adbd daemon listening on USB
adb tcpip <port>        - restarts the adbd daemon listening on TCP on the specified port

networking:
adb ppp <tty> [parameters] - Run PPP over USB.
Note: you should not automatically start a PPP connection.
<tty> refers to the tty for PPP stream. Eg. dev:/dev/omap_csmtt1
[parameters] - Eg. defaultroute debug dump local notty usepeerdns

adb sync notes: adb sync [ <directory> ]
<localdir> can be interpreted in several ways:

- If <directory> is not specified, both /system and /data partitions will be updated.
- If it is "system" or "data", only the corresponding partition
  is updated.

environmental variables:
ADB_TRACE           - Print debug information. A comma separated list of the following values
                    1 or all, adb, sockets, packets, rxw, usb, sync, sysdeps, transport, jdwp
ANDROID_SERIAL      - The serial number to connect to. -s takes priority over this if given.
ANDROID_LOG_TAGS    - When used with the logcat option, only these debug tags are printed.

C:\Users\RF>
```

Test mode:

Pre-scan under all rate at lowest channel for Ant1

Through Pre-scan, 6Mbps is the worst case of 802.11a (20M); MCS0 is the worst case of 802.11n (20M); MCS0 is the worst case of 802.11ac (20M); MCS0 is the worst case of 802.11n(40M); MCS0 is the worst case of 802.11ac (40M).

5 General Information

5.1 Client Information

Applicant:	Guangzhou Havit Technology Co.,LTD
Address of Applicant:	ROOM 1307,13F,PHASE 2 B,C BUILDING OF POLY WORLD TRADE CENTER,NO.1000,XINGANG EAST ROAD,HAIZHU,GUANGDONG,China 510000
Manufacturer:	Guangzhou Havit Technology Co.,LTD
Address of Manufacturer:	ROOM 1307,13F,PHASE 2 B,C BUILDING OF POLY WORLD TRADE CENTER,NO.1000,XINGANG EAST ROAD,HAIZHU,GUANGDONG,China 510000
Factory:	Guangzhou Havit Technology Co.,LTD
Address of Factory:	ROOM 1307,13F,PHASE 2 B,C BUILDING OF POLY WORLD TRADE CENTER,NO.1000,XINGANG EAST ROAD,HAIZHU,GUANGDONG,China 510000

5.2 General Description of EUT

Product Name:	Projector
Model No.:	PJ209 PRO, PJ209, PJ202 PRO, PJ205 PRO, PJ206 PRO, PJ207, PJ207 PRO, PJ208, PJ210 PRO, PJ211, PJ211 PRO, PJ212, PJ212 PRO, PJ216 PRO, PJ217, PJ217 PRO, PJ218 PRO, PJ219 PRO
Test Model No.:	PJ209 PRO
Trade Mark:	HAVIT
Software Version:	PJ209 PRO
Hardware Version:	20231122-105508
EUT Power Supply:	Power supply AC100V~240V
EUT Supports Radios application:	2.4GHz: Wi-Fi: 802.11b/g/n(HT20): 2412MHz~2462MHz; 802.11n(HT40): 2422MHz~2452MHz 5GHz: Wi-Fi: U-NII-1: 5.15-5.25GHz; U-NII-3: 5.725-5.850GHz
EUT Type:	Client devices

5.3 Product Specification subjective to this standard

Operation Frequency:	IEEE 802.11a/n/ac(20M): 5180MHz ~5240 MHz IEEE802.11n/ac(40M): 5180MHz ~5240 MHz IEEE 802.11a/n/ac(20M): 57245MHz ~5825 MHz IEEE802.11n/ac(40M): 5745MHz ~5825 MHz
Channel Numbers:	IEEE 802.11a/n/ac(20M): 5180MHz ~5240MHz/ 4 channel IEEE 802.11n/ac(40M): 5180MHz ~5240MHz/ 2 channel IEEE 802.11a/n/ac(20M): 5745MHz ~5825MHz/ 5 channel IEEE 802.11n/ac(40M): 5745MHz ~5825MHz/ 2 channel
Type of Modulation:	OFDM
Sample Type:	☒ Mobile ☐ Portable
Test Software of EUT:	adb
Antenna Type:	FPC antenna
Antenna gain:	4.63dBi@5GHz: Wi-Fi: U-NII-1, 4.63dBi@5GHz: Wi-Fi: U-NII-3
Cable loss:	1.0 dB

Operation Frequency each of channel

For 802.11a/n/ac(20M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
36	5180MHz	44	5220MHz
40	5200MHz	48	5240MHz
For 802.11a/n/ac(20M) Operation in the 5725MHz ~5850 MHz band			
Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz	NA	NA

For 802.11n/ac(40M) Operation in the 5150MHz ~5250 MHz band			
Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz
For 802.11n/ac(40M) Operation in the 5725MHz ~5850 MHz band			
Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

5.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Certification	Supplied by
/	/	/	/	/

5.5 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua New District, Shenzhen, Guangdong, China

5.6 Test Facility

• **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen 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.:522263

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

5.9 Other Information Requested by the Customer

None.

5.10 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	3×10^{-8}
2	RF power, conducted	0.86dB
3	Radiated Spurious emission test	5.12dB (Below 1GHz)
		4.6dB (Above 1GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.8°C
6	Humidity test	2.0%
7	DC power voltages	0.5%
8	Bandwidth	0.1%

6 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2023/09/08	2024/09/07
Spectrum analyzer	R&S	FSU26	CQA-038	2023/09/08	2024/09/07
Spectrum analyzer	R&S	FSU40	CQA-075	2023/09/08	2024/09/07
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2023/09/08	2024/09/07
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2023/09/08	2024/09/07
Preamplifier	EMCI	EMC184055SE	CQA-089	2023/09/08	2024/09/07
Loop antenna	Schwarzbeck	FMZB1516	CQA-060	2021/09/16	2024/09/15
Bilog Antenna	R&S	HL562	CQA-011	2021/09/16	2024/09/15
Horn Antenna	R&S	HF906	CQA-012	2021/09/16	2024/09/15
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2021/09/16	2024/09/15
Coaxial Cable (Above 1GHz)	CQA	N/A	C007	2023/09/08	2024/09/07
Coaxial Cable (Below 1GHz)	CQA	N/A	C013	2023/09/08	2024/09/07
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2023/09/08	2024/09/07
Antenna Connector	CQA	RFC-01	CQA-080	2023/09/08	2024/09/07
Power Sensor	KEYSIGHT	U2021XA	CQA-30	2023/09/08	2024/09/07
N1918A Power Analysis Manager Power Panel	Agilent	N1918A	CQA-074	2023/09/08	2024/09/07
Power meter	R&S	NRVD	CQA-029	2023/09/08	2024/09/07
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2023/09/08	2024/09/07
EMI Test Receiver	R&S	ESR7	CQA-005	2023/09/08	2024/09/07
LISN	R&S	ENV216	CQA-003	2023/09/08	2024/09/07
Coaxial cable	CQA	N/A	CQA-C009	2023/09/08	2024/09/07
DC power	KEYSIGHT	E3631A	CQA-028	2023/09/08	2024/09/07

Test software:

	Manufacturer	Software brand
Radiated Emissions test software	Tonscend	JS1120-3
Conducted Emissions test software	Audix	e3
RF Conducted test software	Audix	e3

7 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15E	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
3	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01	Guidelines for compliance testing of unlicensed national information infrastructure (U-NII) device part 15, subpart E

Appendix A): Emission Bandwidth

26dB Emission bandwidth

Test Requirement: 47 CFR Part 15, Subpart C 15.407 (a)

Test Method: KDB 789033 D02 II C 1

6 dB bandwidth (5.725-5.85 GHz band)

Test Requirement 47 CFR Part 15, Subpart C 15.407 (e)

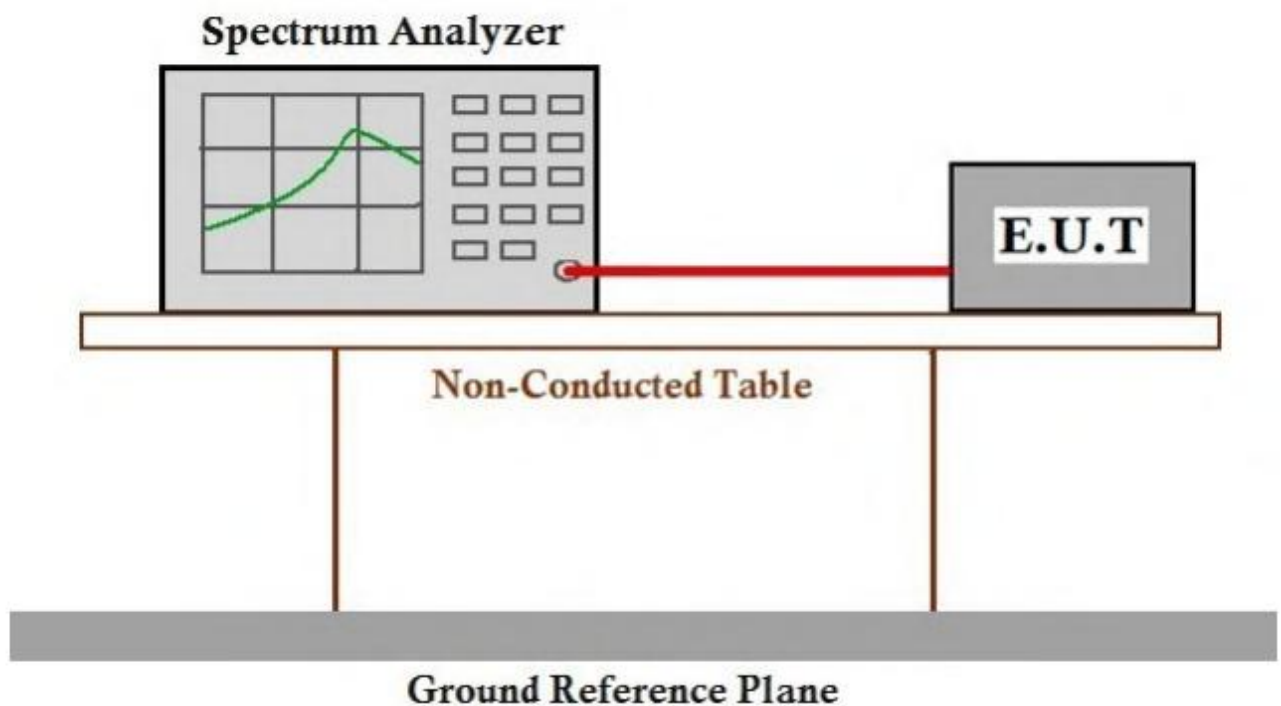
Test Method: KDB 789033 D02 II C 2

Limit: ≥ 500 kHz

Test Procedure:

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- 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%.

Test Setup Diagram



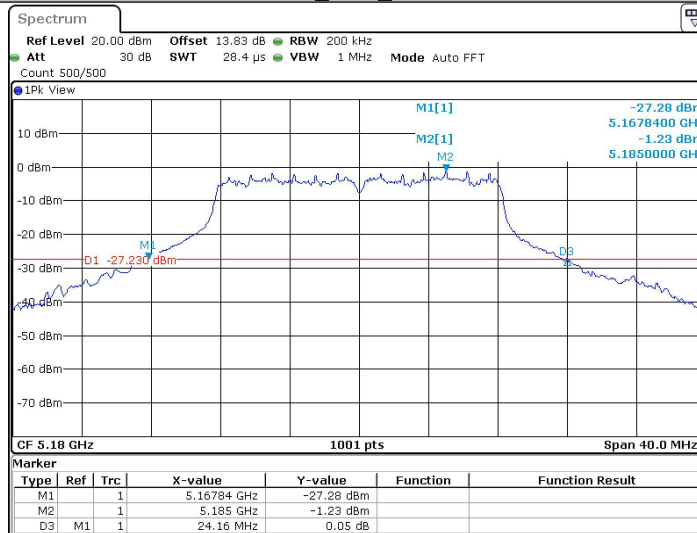
Result Table

TestMode	Freq(MHz)	26db EBW [MHz]	FL[MHz]	FH[MHz]
11A	5180	24.16	5167.84	5192.00
	5200	22.76	5188.16	5210.92
	5240	23.04	5228.32	5251.36
	5745	23.56	5733.04	5756.60
	5785	23.84	5773.00	5796.84
	5825	24.40	5812.80	5837.20
11N20SISO	5180	24.00	5168.64	5192.64
	5200	23.48	5188.16	5211.64
	5240	23.52	5228.60	5252.12
	5745	23.84	5733.16	5757.00
	5785	23.80	5773.12	5796.92
	5825	23.56	5813.64	5837.20
11N40SISO	5190	45.28	5167.60	5212.88
	5230	45.52	5207.36	5252.88
	5755	46.96	5731.40	5778.36
	5795	46.96	5771.56	5818.52
11AC20SISO	5180	23.72	5168.36	5192.08
	5200	24.44	5187.52	5211.96
	5240	23.92	5228.24	5252.16
	5745	25.20	5732.92	5758.12
	5785	24.36	5772.72	5797.08
	5825	23.92	5813.08	5837.00
11AC40SISO	5190	40.00	5169.92	5209.92
	5230	46.00	5206.88	5252.88
	5755	45.92	5731.48	5777.40
	5795	48.80	5771.48	5820.28

TestMode	Freq(MHz)	6db EBW [MHz]	Limit[MHz]	Verdict
11A	5745	16.44	0.5	PASS
	5785	16.28	0.5	PASS
	5825	16.40	0.5	PASS
11N20SISO	5745	17.68	0.5	PASS
	5785	17.64	0.5	PASS
	5825	17.64	0.5	PASS
11N40SISO	5755	36.32	0.5	PASS
	5795	36.32	0.5	PASS
11AC20SISO	5745	17.56	0.5	PASS
	5785	17.56	0.5	PASS
	5825	17.60	0.5	PASS
11AC40SISO	5755	36.32	0.5	PASS
	5795	36.08	0.5	PASS

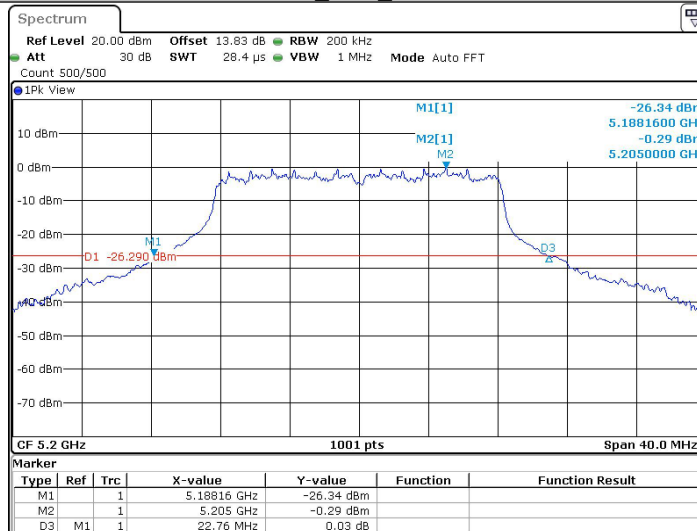
Test Graph

11A_Ant1_5180



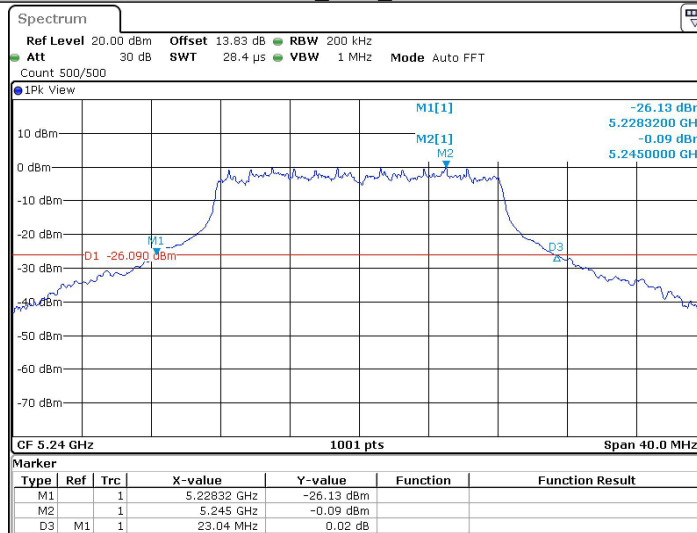
Date: 11 DEC 2023 14:23:21

11A_Ant1_5200



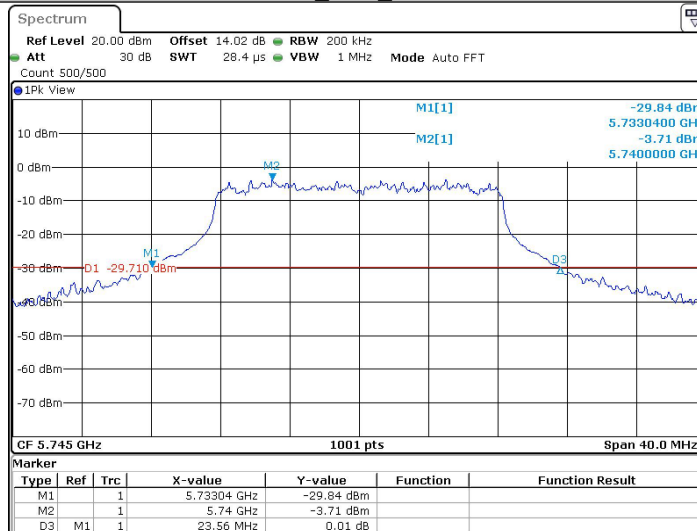
Date: 11 DEC 2023 14:26:37

11A_Ant1_5240



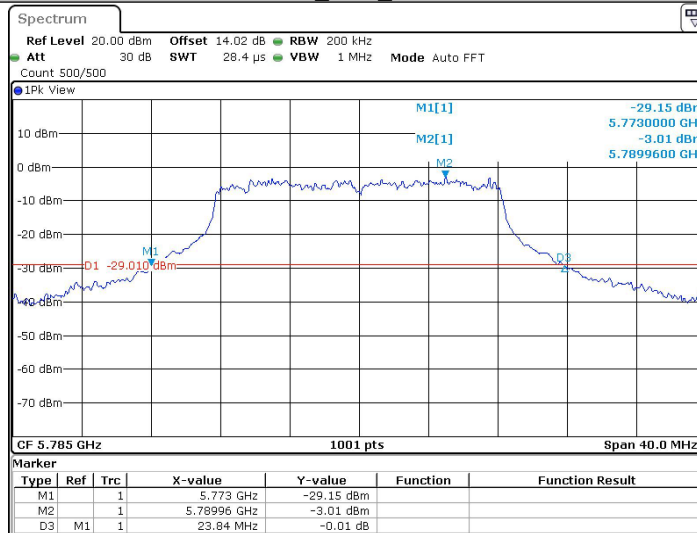
Date: 11 DEC 2023 14:29:06

11A_Ant1_5745



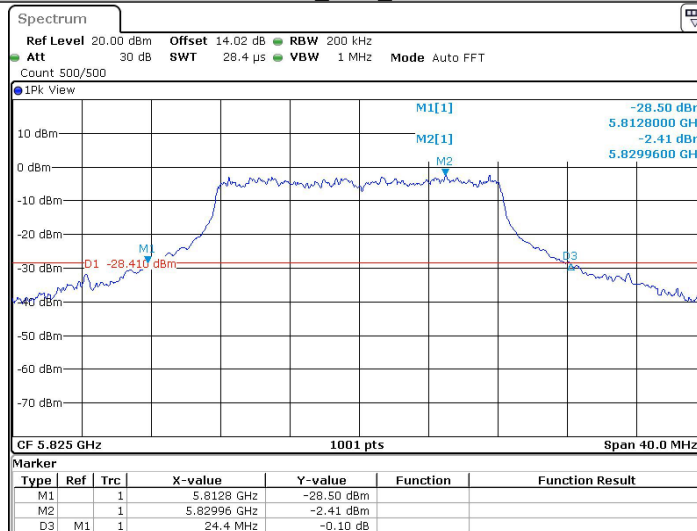
Date: 11 DEC 2023 14:32:31

11A_Ant1_5785



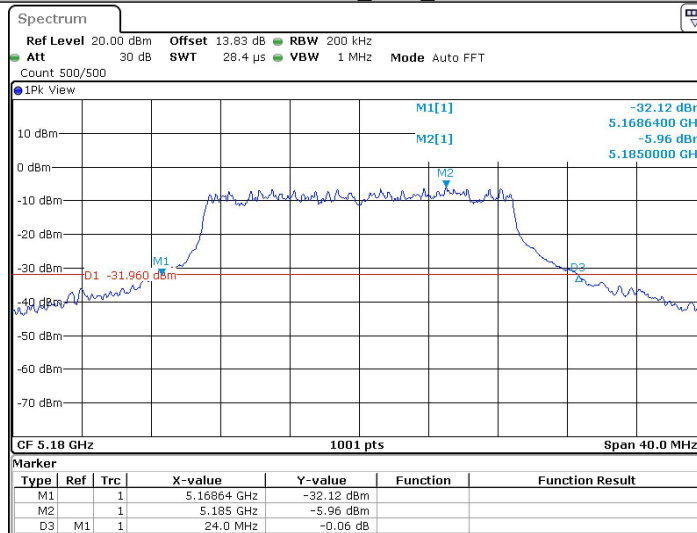
Date: 11 DEC 2023 14:36:49

11A_Ant1_5825



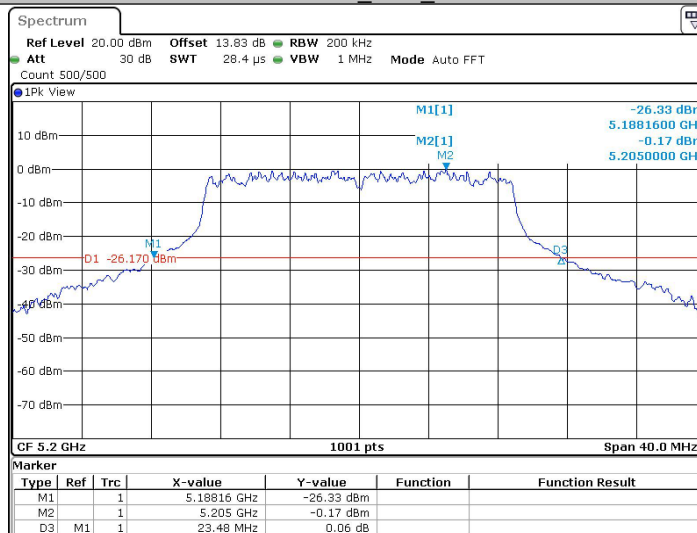
Date: 11 DEC 2023 14:38:30

11N20SISO_Ant1_5180



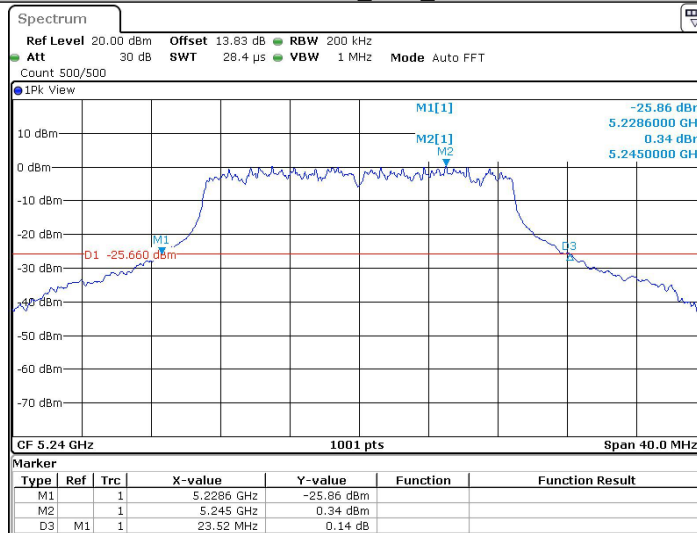
Date: 11 DEC 2023 14:41:29

11N20SISO_Ant1_5200



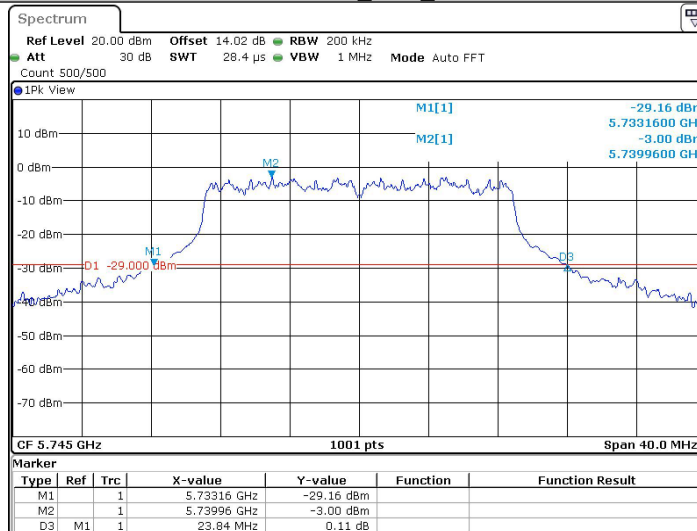
Date: 11 DEC 2023 14:47:09

11N20SISO_Ant1_5240



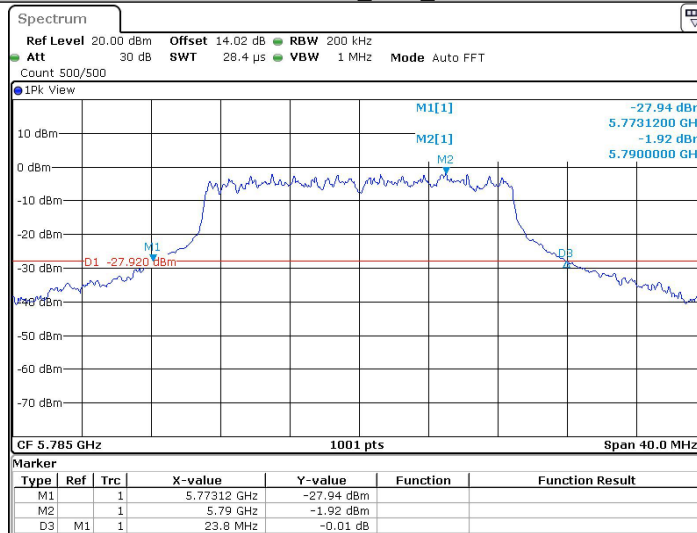
Date: 11 DEC 2023 14:49:51

11N20SISO_Ant1_5745



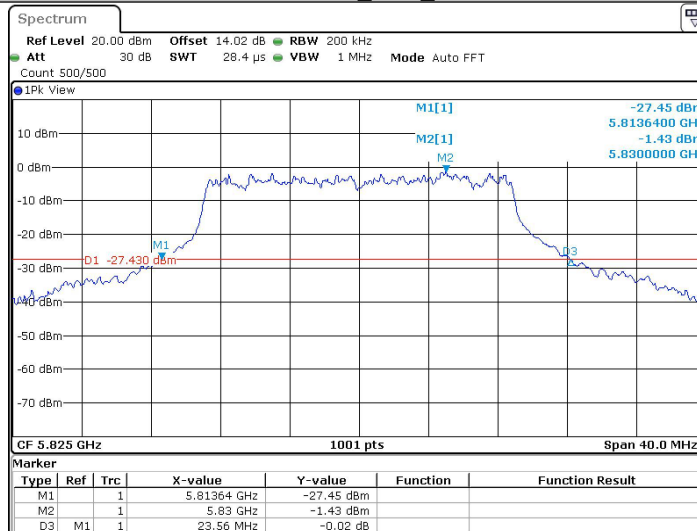
Date: 11 DEC 2023 15:09:57

11N20SISO_Ant1_5785



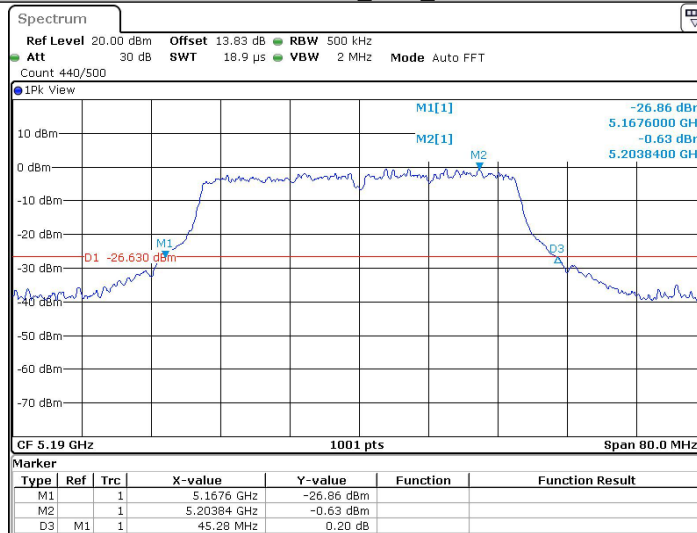
Date: 11 DEC. 2023 15:15:01

11N20SISO_Ant1_5825



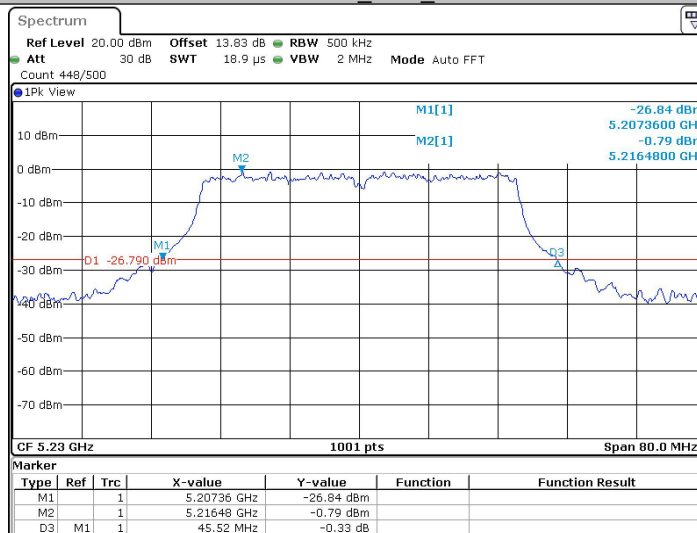
Date: 11 DEC. 2023 15:16:40

11N40SISO_Ant1_5190



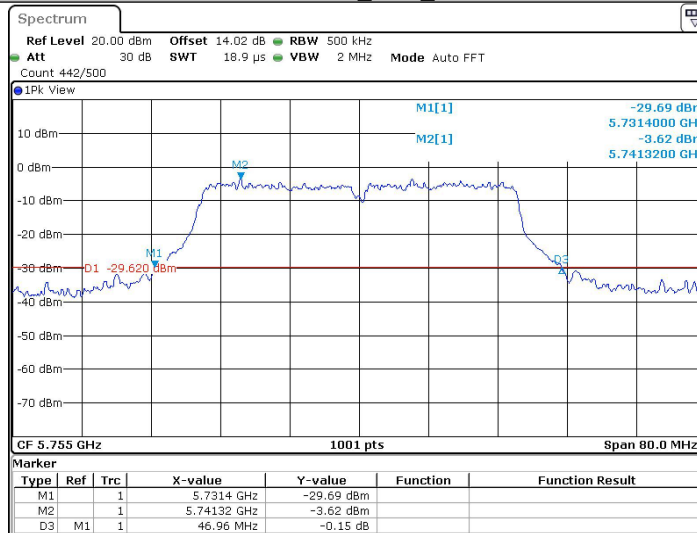
Date: 11 DEC. 2023 15:21:45

11N40SISO_Ant1_5230



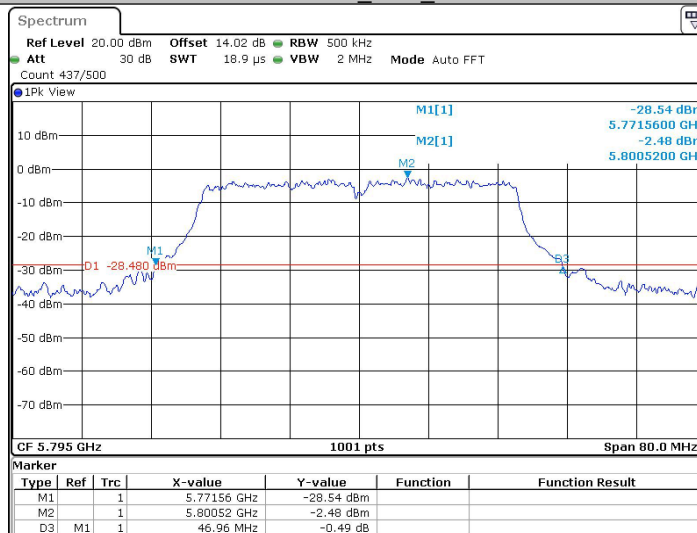
Date: 11 DEC. 2023 15:24:38

11N40SISO_Ant1_5755



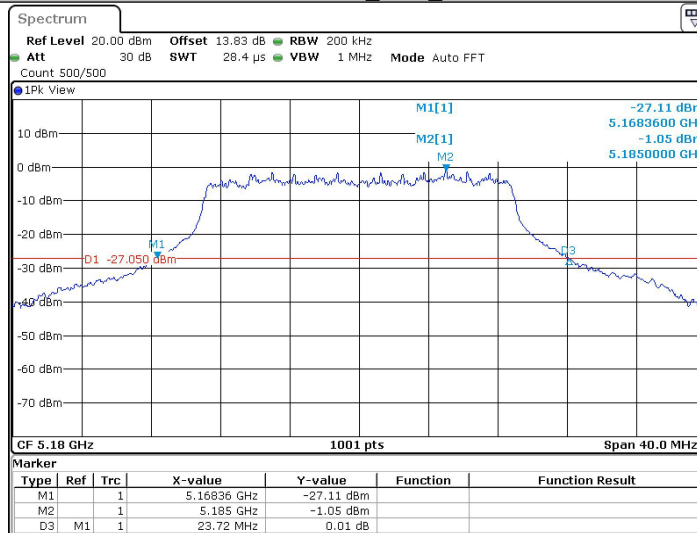
Date: 11 DEC. 2023 15:27:52

11N40SISO_Ant1_5795



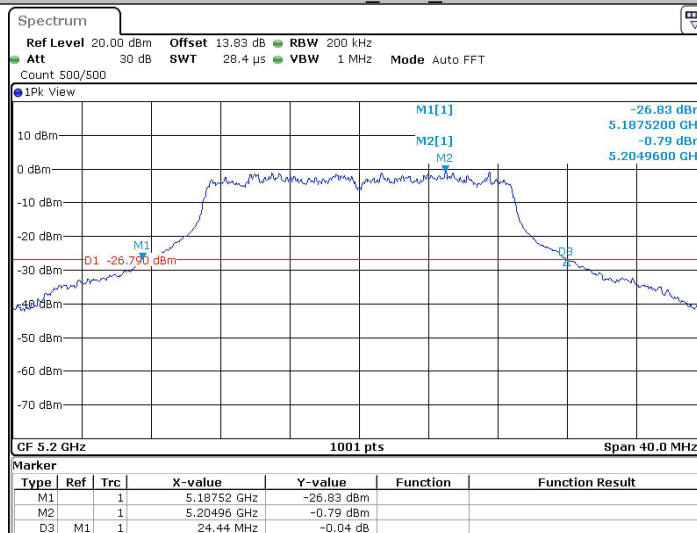
Date: 11 DEC. 2023 15:31:08

11AC20SISO_Ant1_5180



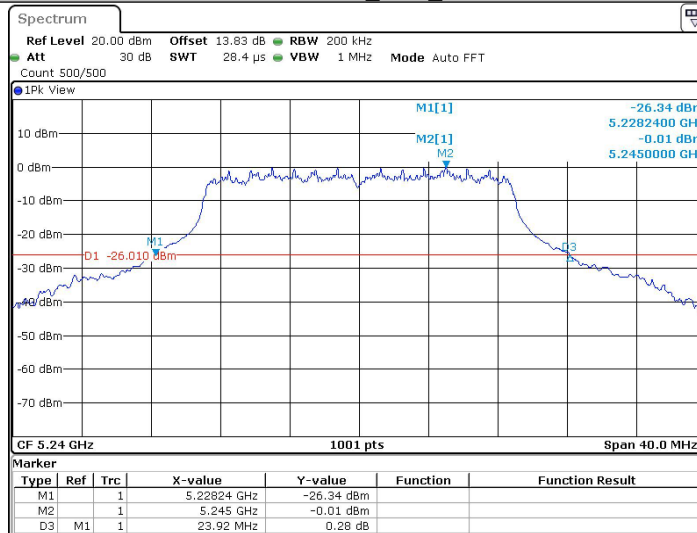
Date: 11 DEC. 2023 18:27:16

11AC20SISO_Ant1_5200



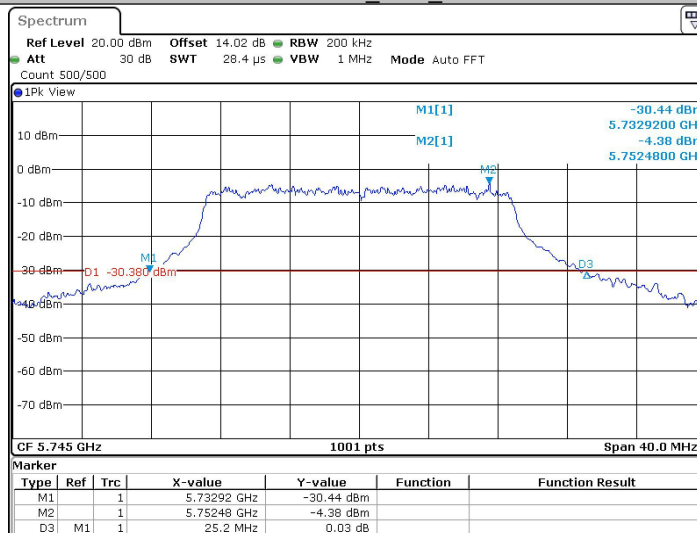
Date: 11 DEC. 2023 15:39:40

11AC20SISO_Ant1_5240



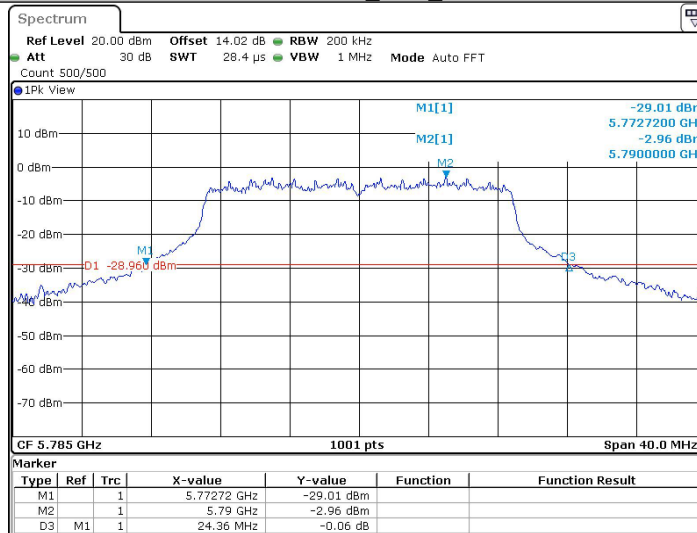
Date: 11 DEC 2023 15:42:41

11AC20SISO_Ant1_5745



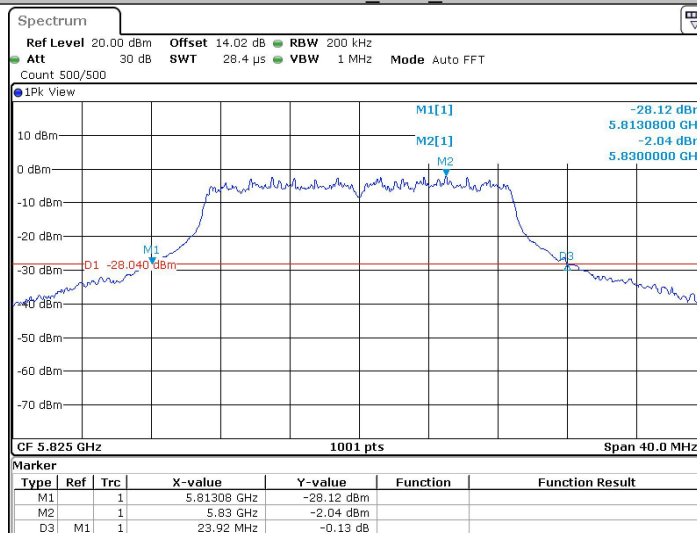
Date: 11 DEC 2023 15:45:28

11AC20SISO_Ant1_5785



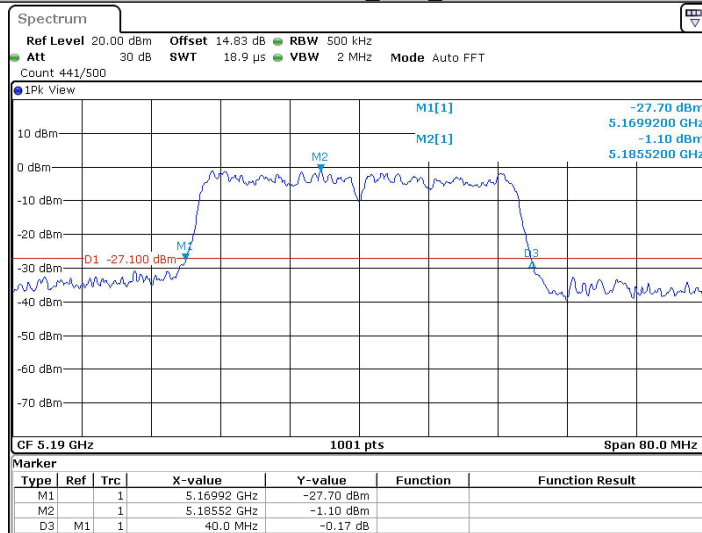
Date: 11 DEC 2023 15:48:03

11AC20SISO_Ant1_5825



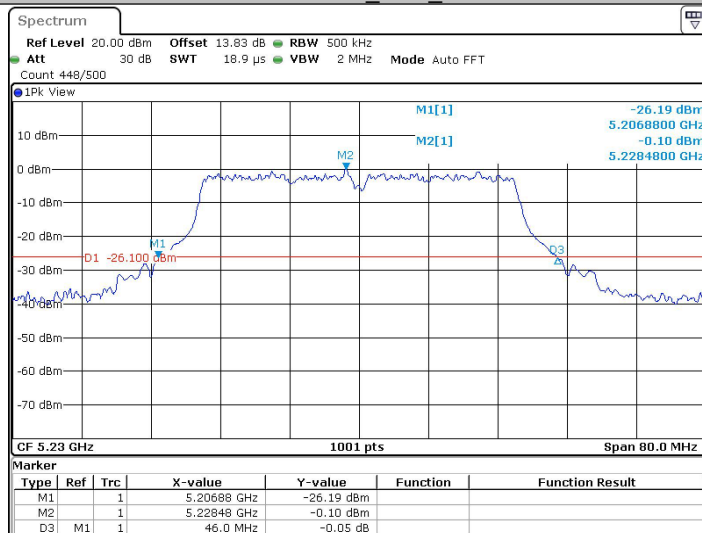
Date: 11 DEC 2023 15:49:38

11AC40SISO_Ant1_5190



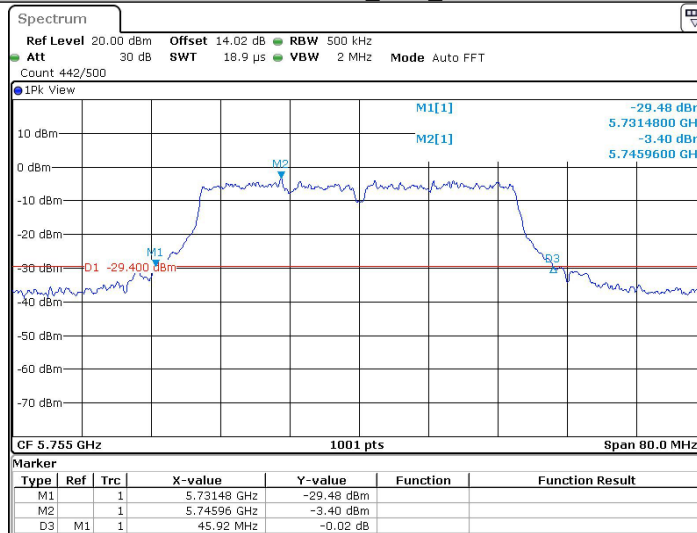
Date: 15 DEC 2023 10:59:14

11AC40SISO_Ant1_5230



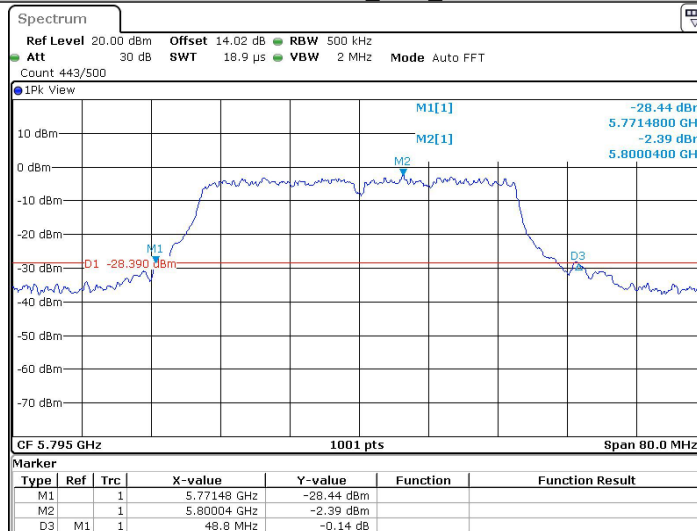
Date: 11 DEC 2023 16:14:56

11AC40SISO_Ant1_5755



Date: 11 DEC 2023 16:17:46

11AC40SISO_Ant1_5795



Date: 11 DEC 2023 16:20:25