



FCC RF Test Report

APPLICANT : ASUSTeK COMPUTER INC.
EQUIPMENT : ASUS Phone(Mobile Phone)
BRAND NAME : ASUS
MODEL NAME : ASUS_AI2401_E
FCC ID : MSQAI2401
STANDARD : FCC Part 15 Subpart C § 15.247
CLASSIFICATION : (DSS) Spread Spectrum Transmitter
TEST DATE(S) : Nov. 02, 2023 ~ Jan. 03, 2024

We, Sporton International Inc. (ShenZhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (ShenZhen), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia



Sporton International Inc. (ShenZhen)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China



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APPENDIX A. CONDUCTED TEST RESULTS

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR391308A	Rev. 01	Initial issue of report	Jan. 18, 2024



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	-	Report only	-
3.4	-	99% Bandwidth	-	Report only	-
3.5	15.247(b)(1)	Peak Output Power	≤ 125 mW	Pass	-
3.6	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 7.55 dB at 51.340 MHz
3.9	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 12.02 dB at 0.150 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Conformity Assessment Condition:

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
- The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.



1 General Description

1.1 Applicant

ASUSTeK COMPUTER INC.

1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

1.2 Manufacturer

ASUSTeK COMPUTER INC.

1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	ASUS Phone(Mobile Phone)
Brand Name	ASUS
Model Name	ASUS_AI2401_E
FCC ID	MSQAI2401
IMEI Code	Conducted: 356313810100997/356313810101003 Conduction: 356313810100831/356313810100849 Radiation: 356313810100815/356313810100823 for Sample 1 350619900100671/350619900100689 for Sample 2
HW Version	R2.0
SW Version	Android 14
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are four SKUs of EUT for this project. The differences between them are summary below, According to the difference, we evaluate SKU1 to perform full test and SKU2 is verified worse case for RSE testing.

Sample list				
	SKU1	SKU2	SKU3	SKU4
Model name	ASUS_AI2401_E	ASUS_AI2401_E	ASUS_AI2401_E	ASUS_AI2401_E
Config.	US(Pro)	US(Enrty)	US(Pro)	US(Enrty)
RF module board	US(Pro)	US(Enrty)	US(Pro)	US(Enrty)
LCD+Touch front frame	AI2401 FRONT CASE ASSY	AI2401 FRONT CASE ASSY	AI2401 FRONT CASE ASSY	AI2401 FRONT CASE ASSY
DDR	16G(HYNIX) HYNIX / H58G76BK8HX095	16G(Micron) Micron / MT62F2G64D8ZA-023 WT:C	16G(HYNIX) HYNIX / H58G76BK8HX095	16G(Micron) Micron / MT62F2G64D8ZA-023 WT:C
UFS	1TB(Samsung) Samsung / KLUGGARHHD-B0G1	512G(HYNIX) (UFS4.0) HYNIX / HN8T274EJKX130	1TB(Samsung) Samsung / KLUGGARHHD-B0G1	512G(HYNIX) (UFS4.0) HYNIX / HN8T274EJKX130
MB	AI2401_MB	AI2401_MB	AI2401_MB	AI2401_MB
Back cover	WW Pro(Mini LED)	WW Entry(LGF)	WW Pro(Mini LED)	WW Entry(LGF)



Battery	SCUD / C21P2301	SCUD / C21P2301	SCUD / C21P2301	SCUD / C21P2301
Main 50+13M	SHINETECH / DDN03B	RAYPRUS / CASDJ-000A	RAYPRUS / CASDJ-000A	SHINETECH / DDN03B
Tele 32M	Kunshan Q-TECH / C3HS01	SHINETECH / DHG01B	SHINETECH / DHG01B	Kunshan Q-TECH / C3HS01
Front 32M	TSPRECISION / TVHF3046	RAYPRUS / CASG-000A	RAYPRUS / CASG-000A	TSPRECISION / TVHF3046
PCB	COMPEQ	COMPEQ	COMPEQ	COMPEQ
CPU	QUALCOMM SM-8650 MPSP1629	QUALCOMM SM-8650 MPSP1629	QUALCOMM SM-8650 MPSP1629	QUALCOMM SM-8650 MPSP1629
WPC antenna	ASAP	INPAQ	INPAQ	ASAP
NFC antenna	ASAP	INPAQ	INPAQ	ASAP
WWAN/WLAN /BT/GPS antenna	INPAQ	ASAP	ASAP	INPAQ

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	<p><SISO Ant.5> Bluetooth BR(1Mbps) : 19.85 dBm (0.0966 W) Bluetooth EDR (2Mbps) : 19.25 dBm (0.0841 W) Bluetooth EDR (3Mbps) : 19.44 dBm (0.0879 W)</p> <p><SISO Ant.4> Bluetooth BR(1Mbps) : 19.38 dBm (0.0867 W) Bluetooth EDR (2Mbps) : 18.84 dBm (0.0766 W) Bluetooth EDR (3Mbps) : 19.24 dBm (0.0839 W)</p> <p><SISO Ant.6> Bluetooth BR(1Mbps) : 17.28 dBm (0.0535 W) Bluetooth EDR (2Mbps) : 16.54 dBm (0.0451 W) Bluetooth EDR (3Mbps) : 17.12 dBm (0.0515 W)</p> <p><MIMO Ant.5+4> Bluetooth BR(1Mbps) : 18.70 dBm (0.0741 W) Bluetooth EDR (2Mbps) : 18.29 dBm (0.0675 W) Bluetooth EDR (3Mbps) : 18.47 dBm (0.0703 W)</p> <p><MIMO Ant.5+6> Bluetooth BR(1Mbps) : 17.66 dBm (0.0583 W) Bluetooth EDR (2Mbps) : 17.10 dBm (0.0513 W) Bluetooth EDR (3Mbps) : 17.38 dBm (0.0547 W)</p>
99% Occupied Bandwidth	<p><SISO Ant.5> Bluetooth BR(1Mbps) : 0.849 MHz Bluetooth EDR (2Mbps) : 1.189 MHz Bluetooth EDR (3Mbps) : 1.183 MHz</p> <p><SISO Ant.4> Bluetooth BR(1Mbps) : 0.851 MHz Bluetooth EDR (2Mbps) : 1.179 MHz Bluetooth EDR (3Mbps) : 1.183 MHz</p> <p><SISO Ant.6> Bluetooth BR(1Mbps) : 0.851 MHz Bluetooth EDR (2Mbps) : 1.181 MHz Bluetooth EDR (3Mbps) : 1.183 MHz</p>



	<MIMO Ant.5+4> Bluetooth BR(1Mbps) : 0.965 MHz Bluetooth EDR (2Mbps) : 1.207 MHz Bluetooth EDR (3Mbps) : 1.197 MHz <MIMO Ant.5+6> Bluetooth BR(1Mbps) : 0.969 MHz Bluetooth EDR (2Mbps) : 1.203 MHz Bluetooth EDR (3Mbps) : 1.203 MHz
Antenna Type / Gain	<Ant.4>: PIFA Antenna with gain -3.82 dBi <Ant.5>: PIFA Antenna with gain -3.60 dBi <Ant.6>: PIFA Antenna with gain -4.88 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

Note:

1. For SISO & MIMO mode, the whole testing has assessed MIMO mode to cover SISO mode.
2. MIMO mode only support CDD mode.
3. The device supports Bluetooth BR/EDR MIMO Ant.5+4 for Normal mode and switch to MIMO Ant.5+6 for Camera mode.

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	CO01-SZ TH01-SZ	CN1256	421272

Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City, Guangdong Province 518103 People's Republic of China TEL: +86-755-86066985		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH04-SZ	CN1256	421272



1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	27	2429	54	2456
	1	2403	28	2430	55	2457
	2	2404	29	2431	56	2458
	3	2405	30	2432	57	2459
	4	2406	31	2433	58	2460
	5	2407	32	2434	59	2461
	6	2408	33	2435	60	2462
	7	2409	34	2436	61	2463
	8	2410	35	2437	62	2464
	9	2411	36	2438	63	2465
	10	2412	37	2439	64	2466
	11	2413	38	2440	65	2467
	12	2414	39	2441	66	2468
	13	2415	40	2442	67	2469
	14	2416	41	2443	68	2470
	15	2417	42	2444	69	2471
	16	2418	43	2445	70	2472
	17	2419	44	2446	71	2473
	18	2420	45	2447	72	2474
	19	2421	46	2448	73	2475
	20	2422	47	2449	74	2476
	21	2423	48	2450	75	2477
	22	2424	49	2451	76	2478
	23	2425	50	2452	77	2479
	24	2426	51	2453	78	2480
	25	2427	52	2454	-	-
	26	2428	53	2455	-	-



2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases were recorded in this report, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

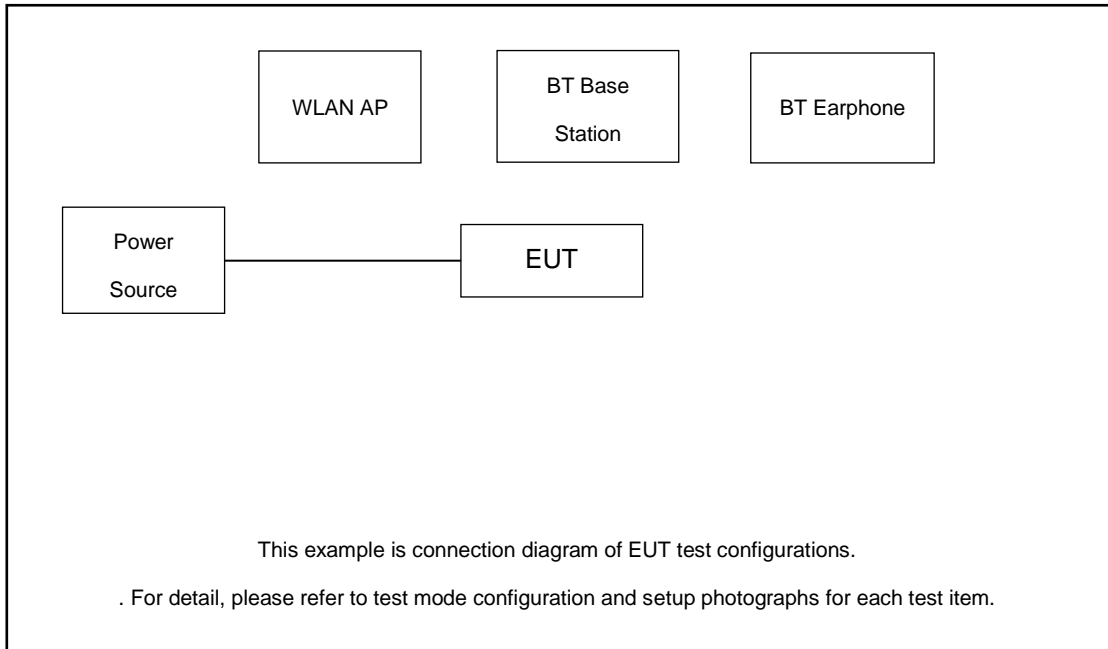
The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth BR 1Mbps GFSK	Bluetooth EDR 2Mbps π/4-DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated Test Cases	Bluetooth BR 1Mbps GFSK		
	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz		
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable 1(Charging from Adapter 1) + Battery		
Remark: <ol style="list-style-type: none"> For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission. For Radiated Test Cases, The tests were performed with Adapter 1, Battery, Earphone and USB Cable 1. 			

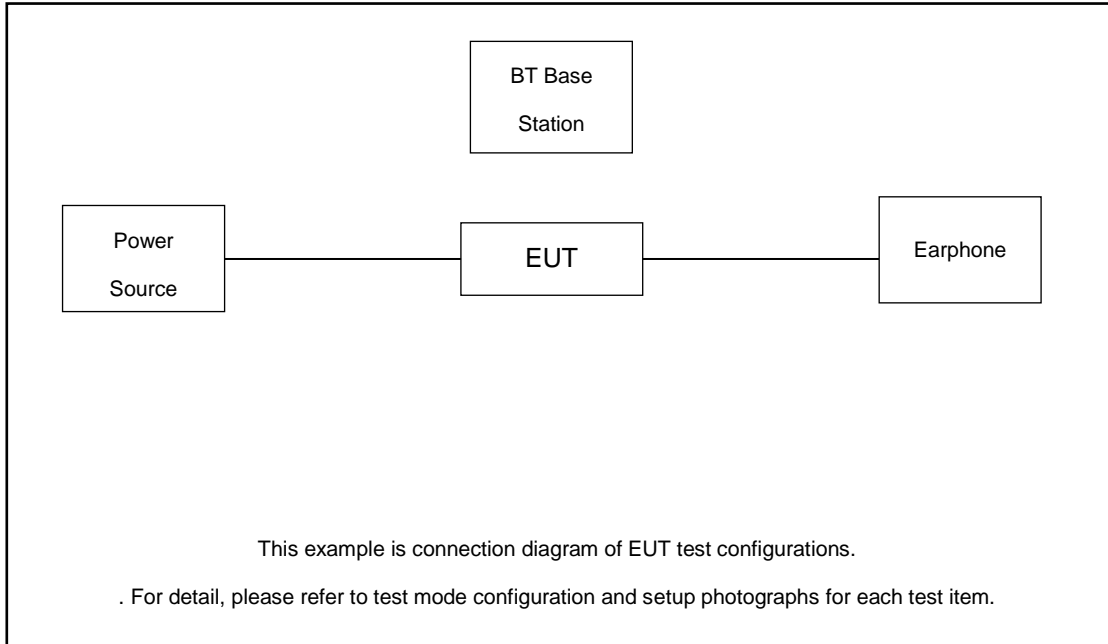
Co-location mode
Bluetooth CH78 (Ant 5+4) TX + 5G NR n30_Link Bluetooth CH78 (Ant 5+6) TX + 5G NR n30_Link

2.3 Connection Diagram of Test System

AC Conducted Emission:



Radiated Emission:



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	BT Base Station	R&S	CBT	N/A	N/A	Unshielded, 1.8m
2.	Base Station(LTE)	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8m
3.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8m
4.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Bluetooth Earphone	Samsung	EO-MG900	PYAHS-107W	N/A	N/A

2.5 EUT Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 1.90 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 1.90 + 10 = 11.90 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

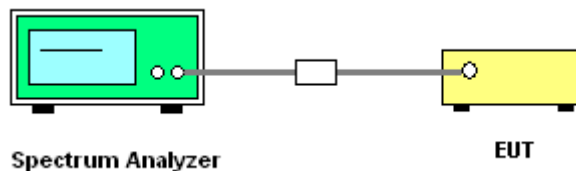
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW = 300kHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

3.1.4 Test Setup

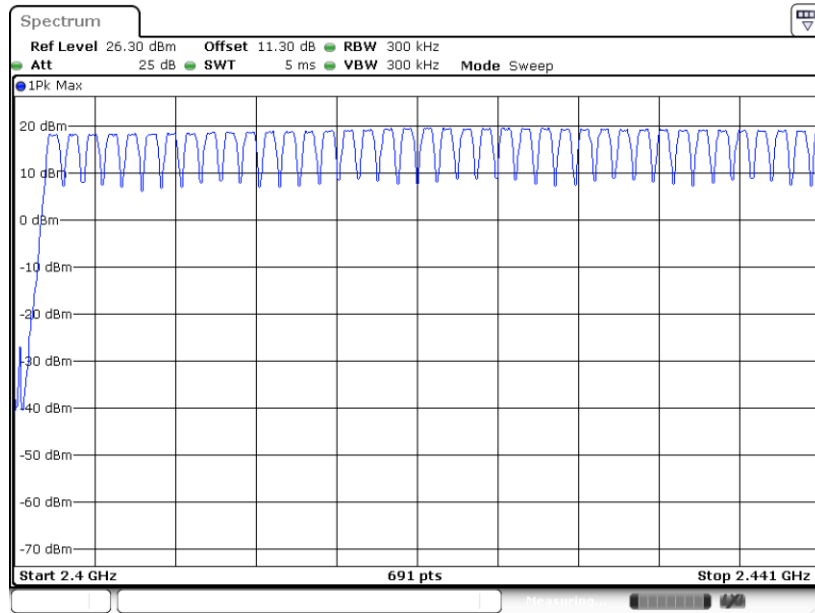


3.1.5 Test Result of Number of Hopping Frequency

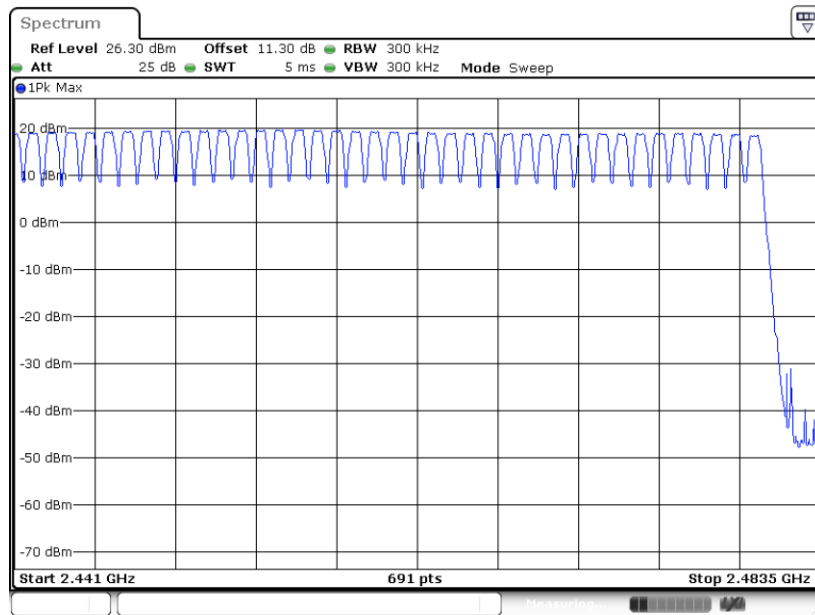
Please refer to Appendix A.



Number of Hopping Channel Plot on Channel 00 - 78



Date: 5.DEC.2023 00:02:03



Date: 5.DEC.2023 00:02:27

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels;
RBW = 300kHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Hopping Channel Separation

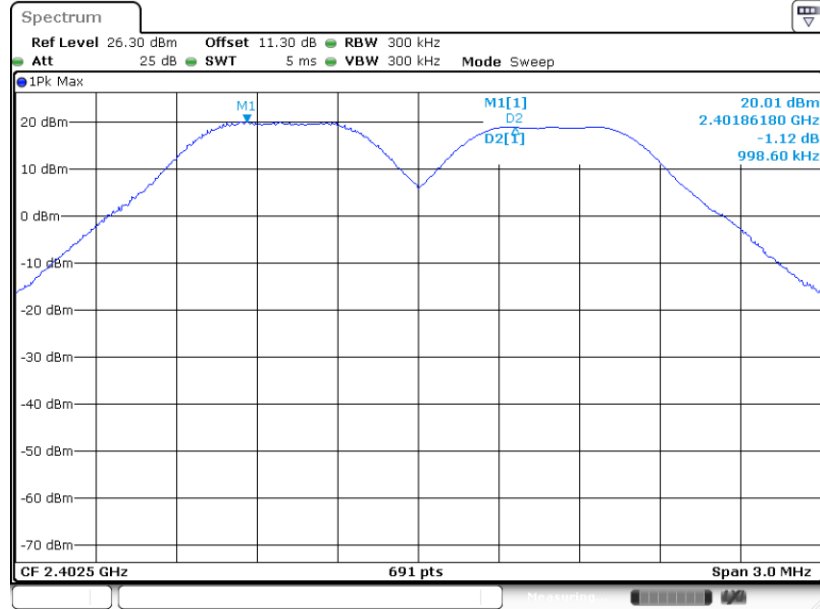
Please refer to Appendix A.



<SISO Ant.5>

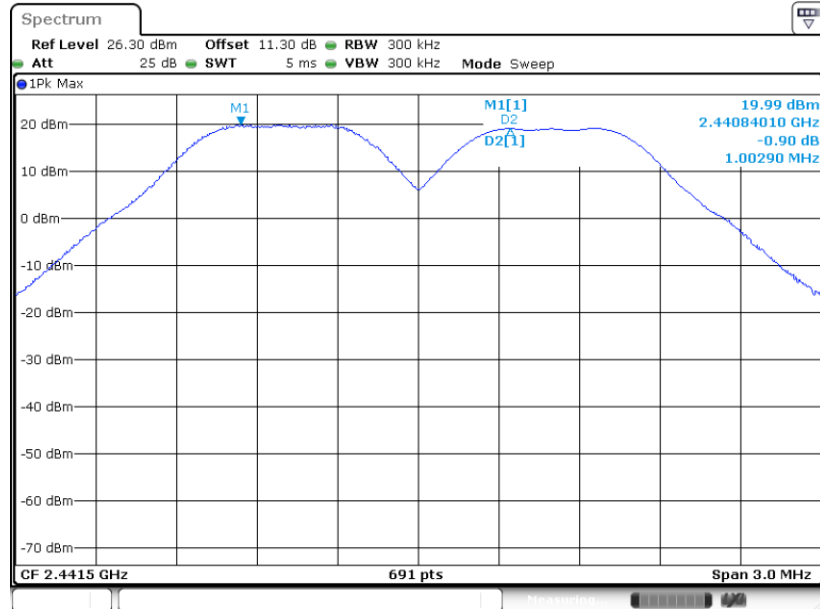
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Channel Separation Plot on Channel 00 - 01



Date: 4 DEC.2023 22:50:53

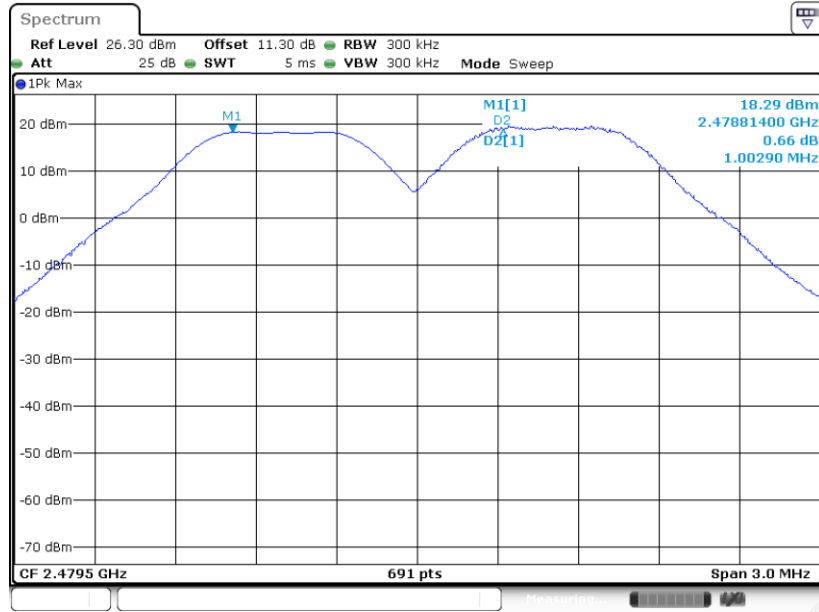
Channel Separation Plot on Channel 39 - 40



Date: 4 DEC.2023 22:56:02



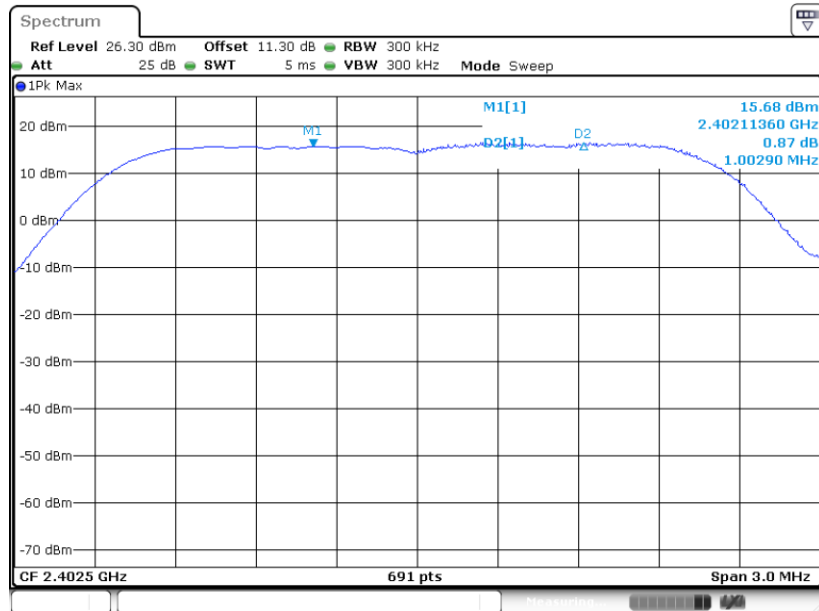
Channel Separation Plot on Channel 77 - 78



Date: 4 DEC.2023 23:00:24

<2Mbps>

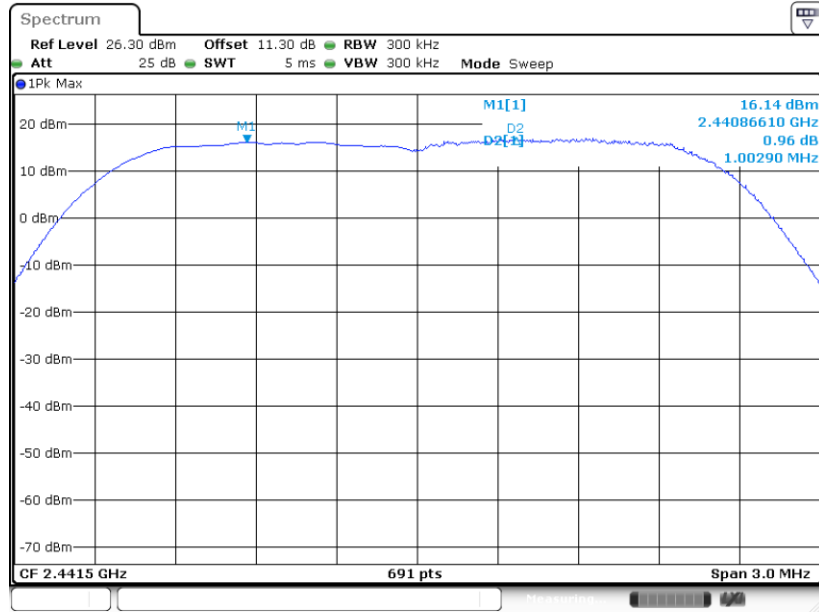
Channel Separation Plot on Channel 00 - 01



Date: 4 DEC.2023 23:12:42

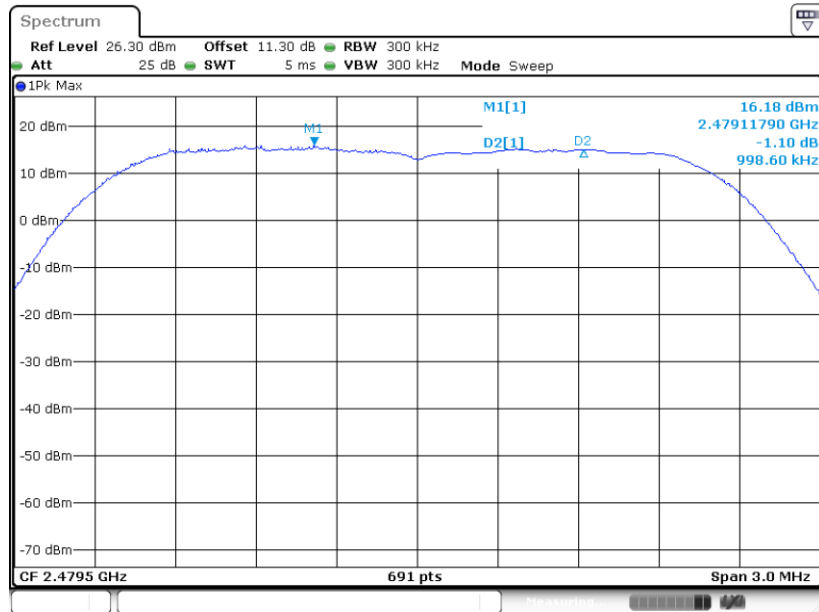


Channel Separation Plot on Channel 39 - 40



Date: 4.DEC.2023 23:17:11

Channel Separation Plot on Channel 77 - 78

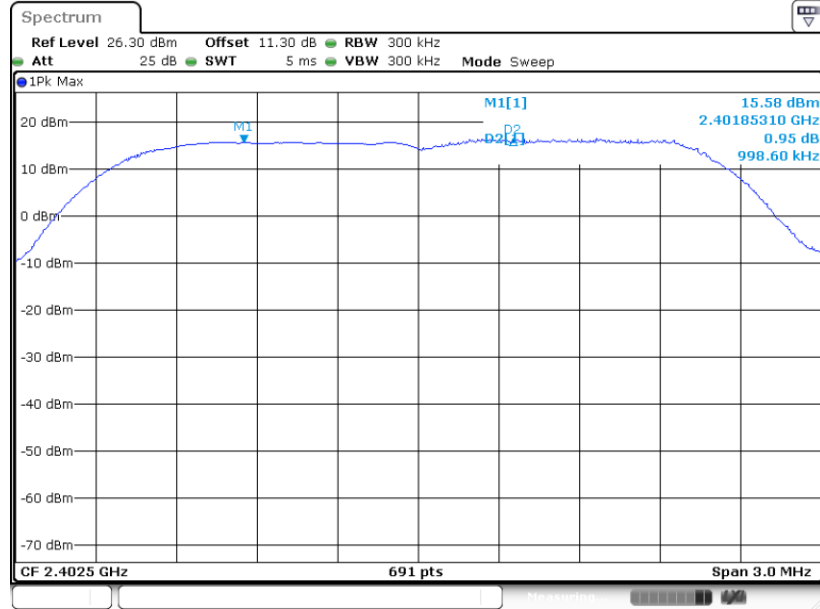


Date: 4.DEC.2023 23:22:34



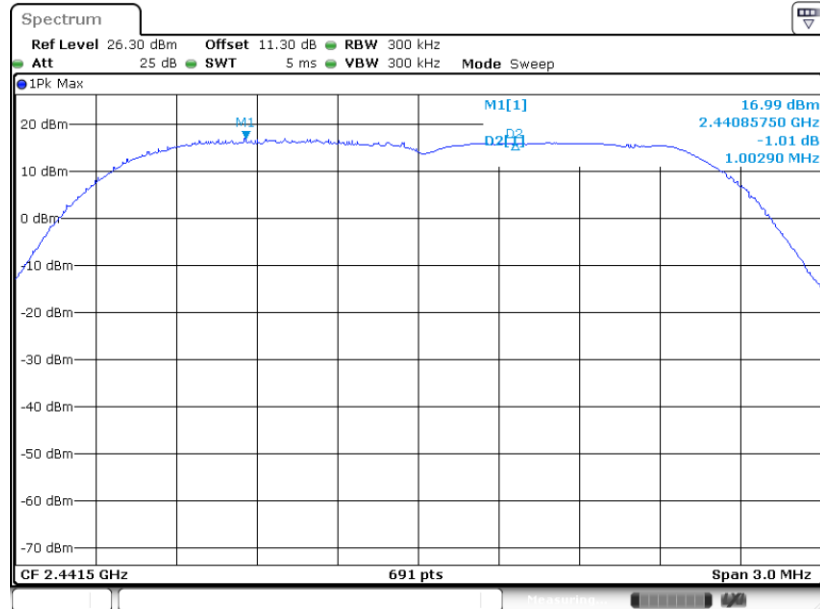
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Channel Separation Plot on Channel 00 - 01



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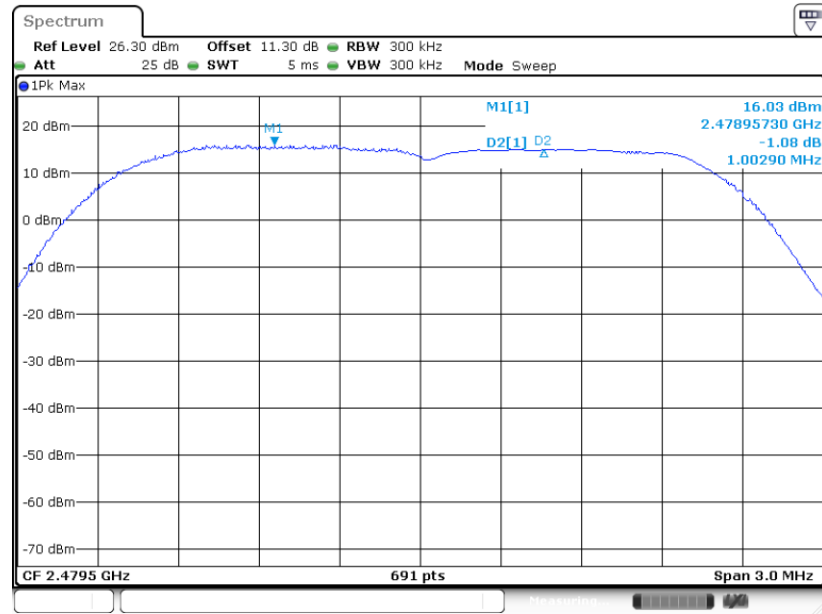
Channel Separation Plot on Channel 39 - 40



Date: 4 DEC.2023 23:47:17



Channel Separation Plot on Channel 77 - 78

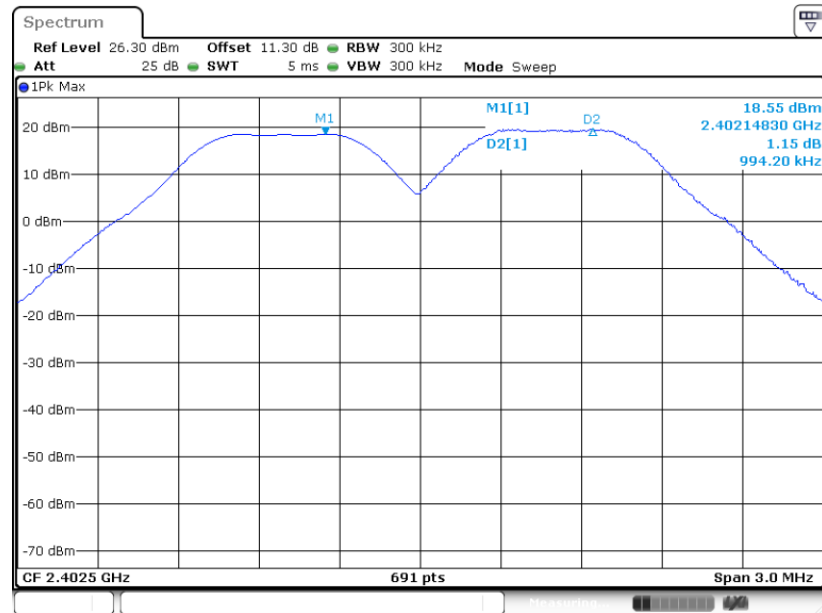


Date: 4.DEC.2023 23:52:18

<SISO Ant.4>

<1Mbps>

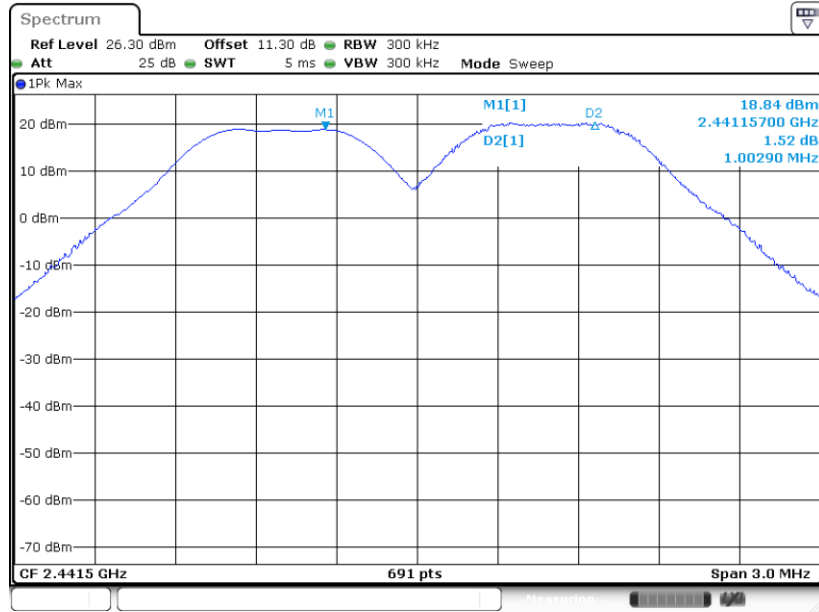
Channel Separation Plot on Channel 00 - 01



Date: 5.DEC.2023 00:51:10

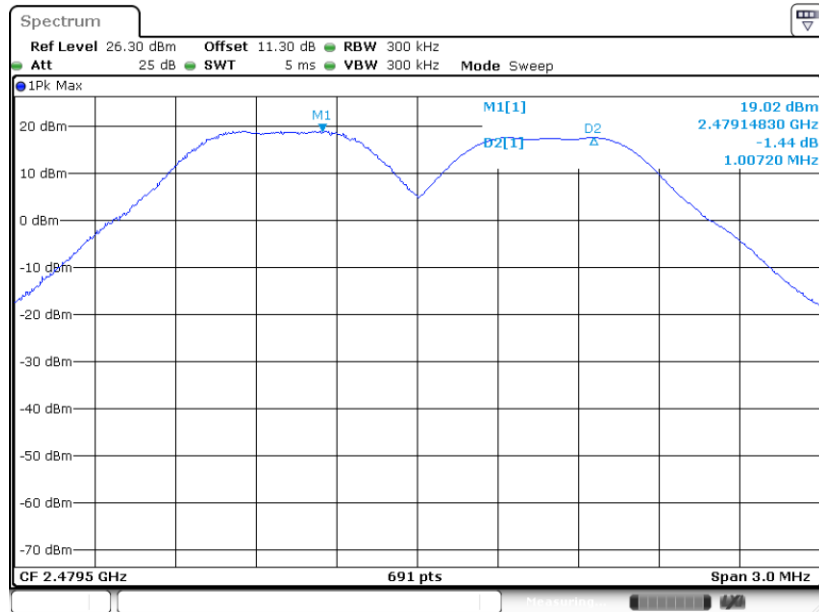


Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 00:55:37

Channel Separation Plot on Channel 77 - 78

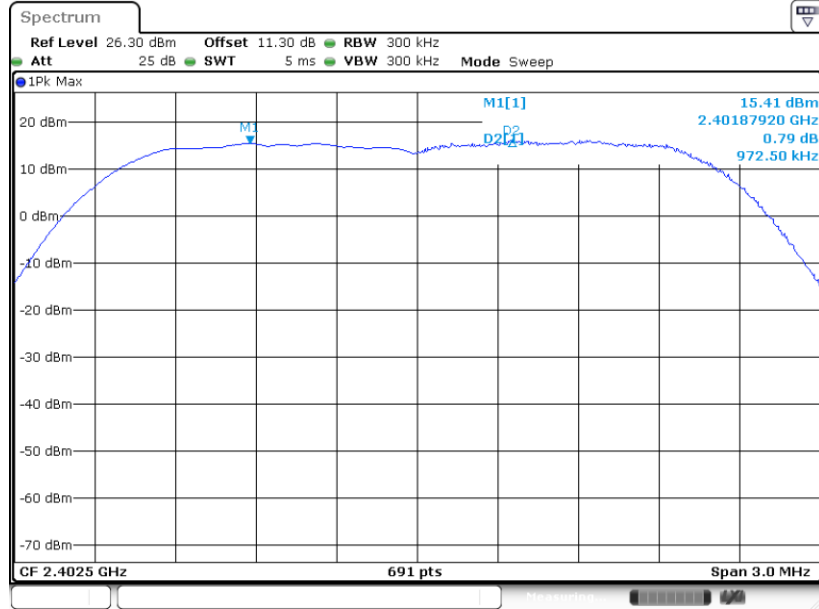


Date: 5 DEC.2023 00:59:36



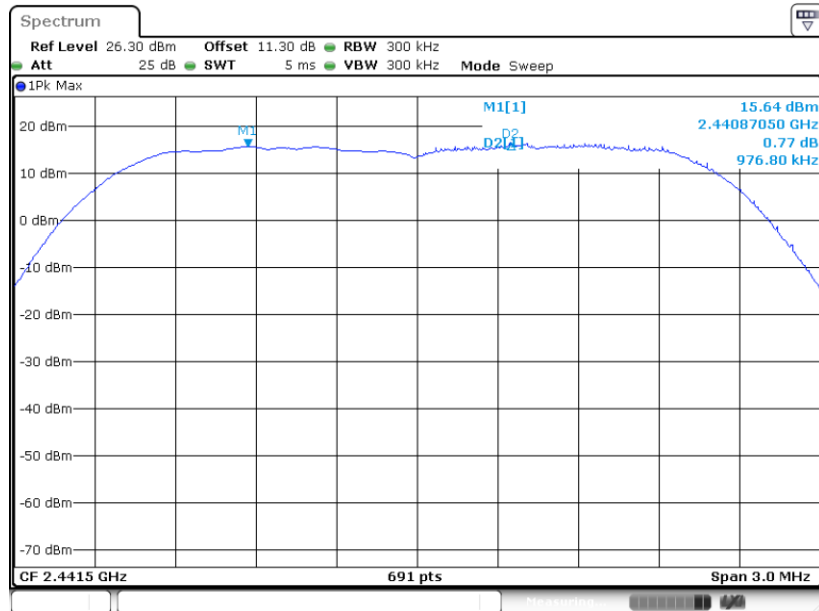
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Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 01:06:25

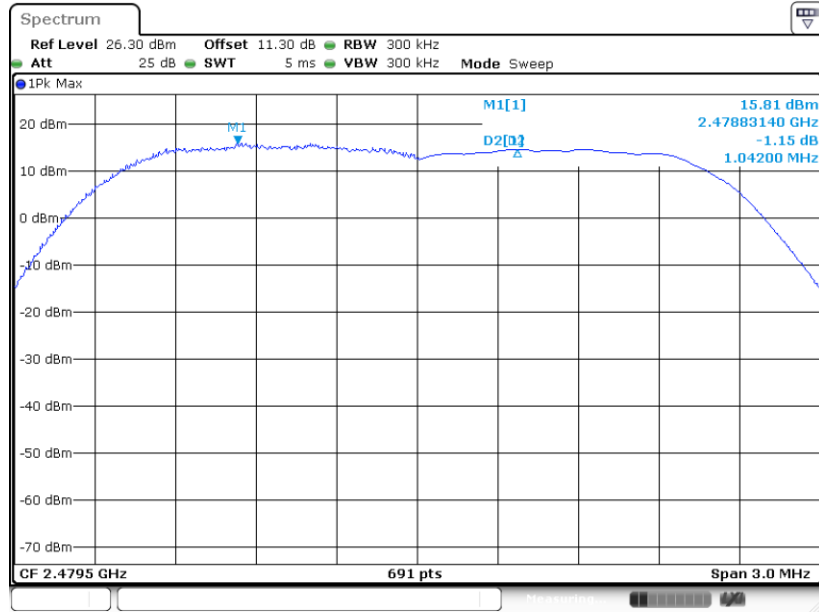
Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 01:11:39



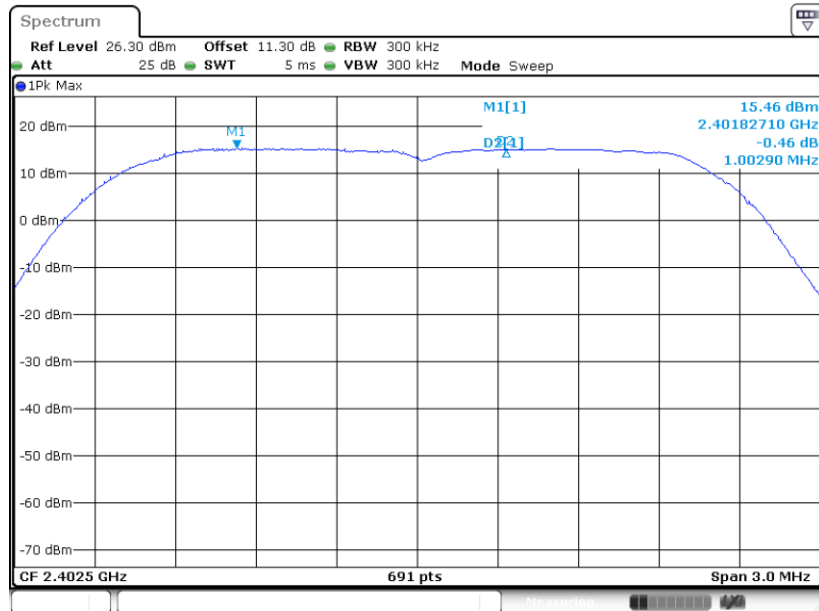
Channel Separation Plot on Channel 77 - 78



Date: 5 DEC.2023 01:17:37

<3Mbps>

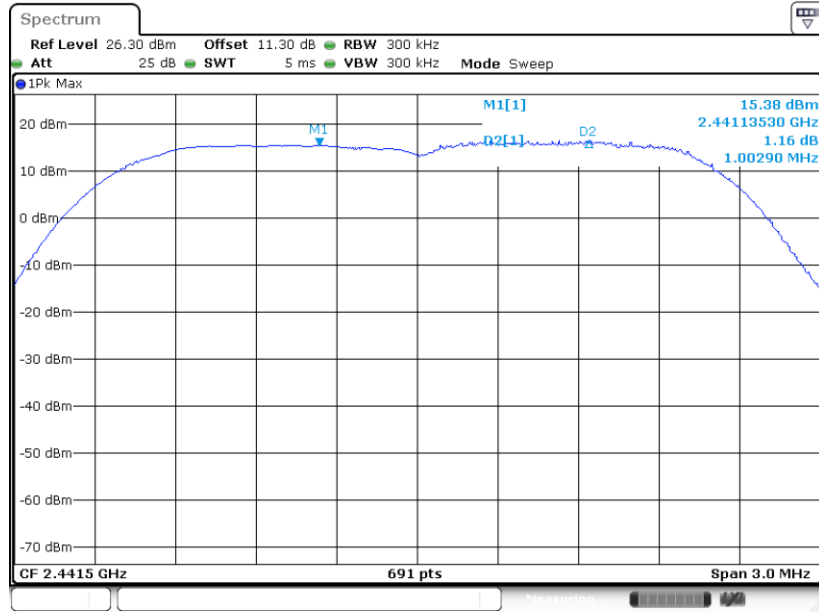
Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 01:28:23

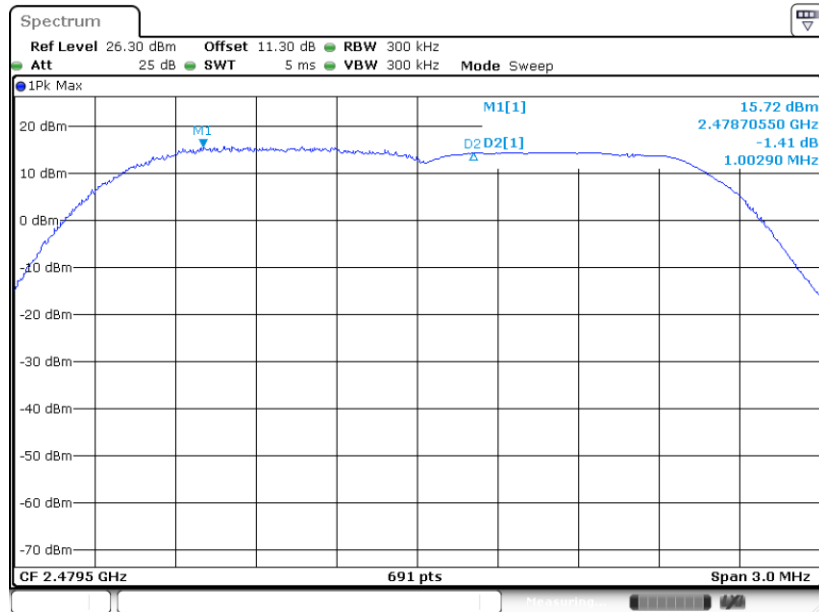


Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 01:32:52

Channel Separation Plot on Channel 77 - 78



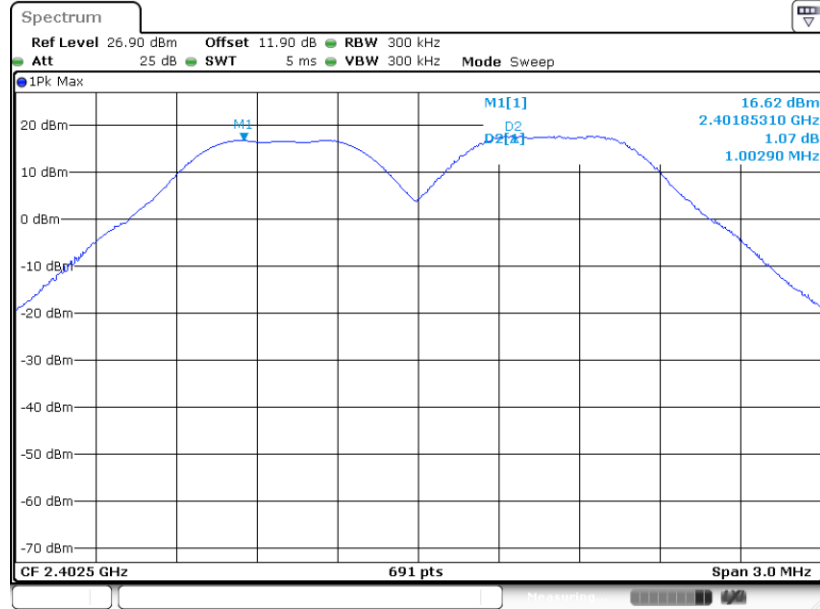
Date: 5 DEC.2023 01:39:28



<SISO Ant.6>

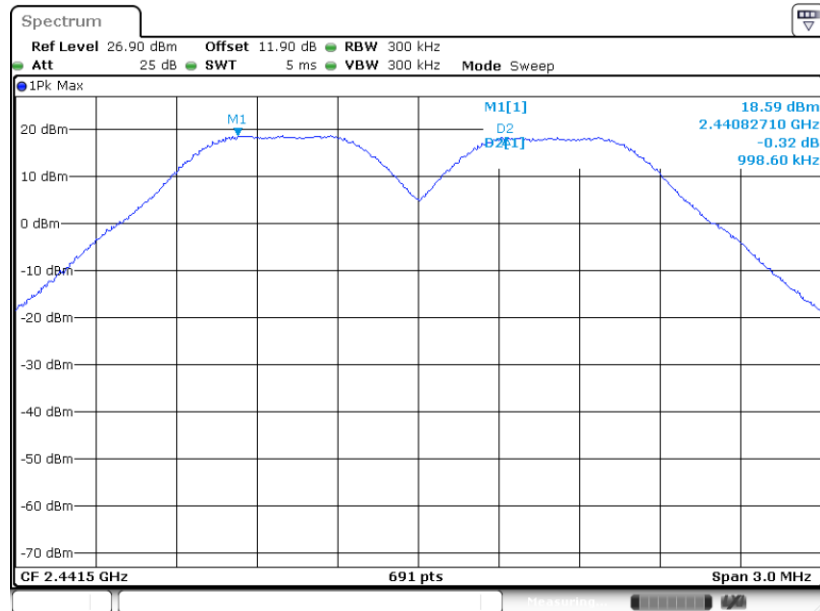
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Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 22:00:56

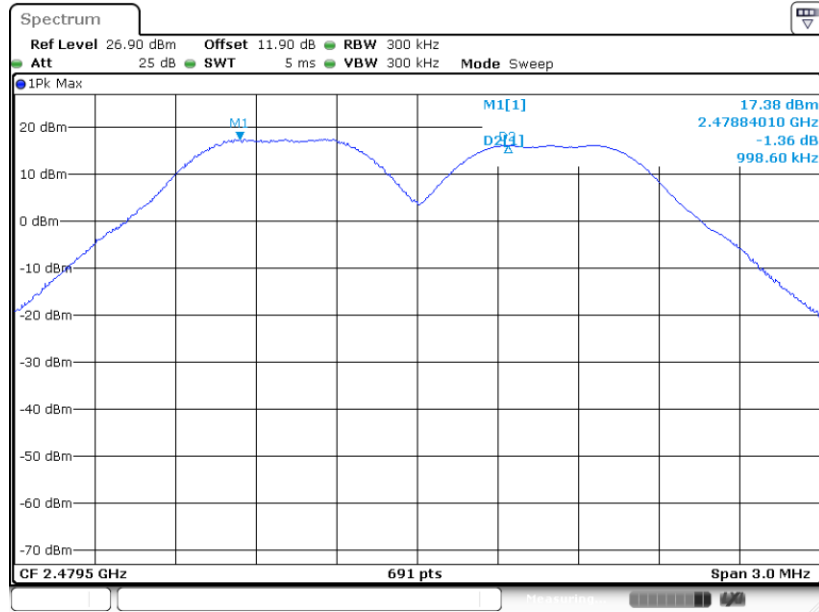
Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 22:06:09



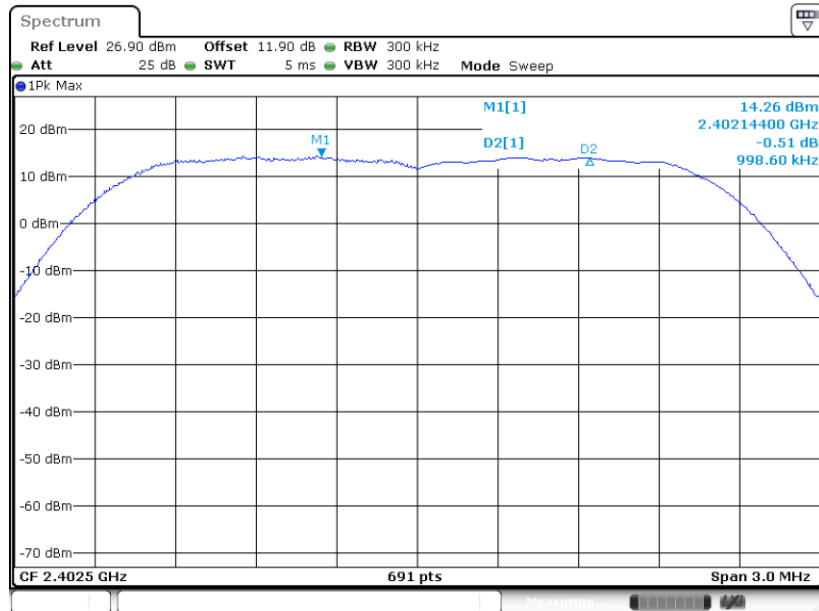
Channel Separation Plot on Channel 77 - 78



Date: 5 DEC.2023 22:14:56

<2Mbps>

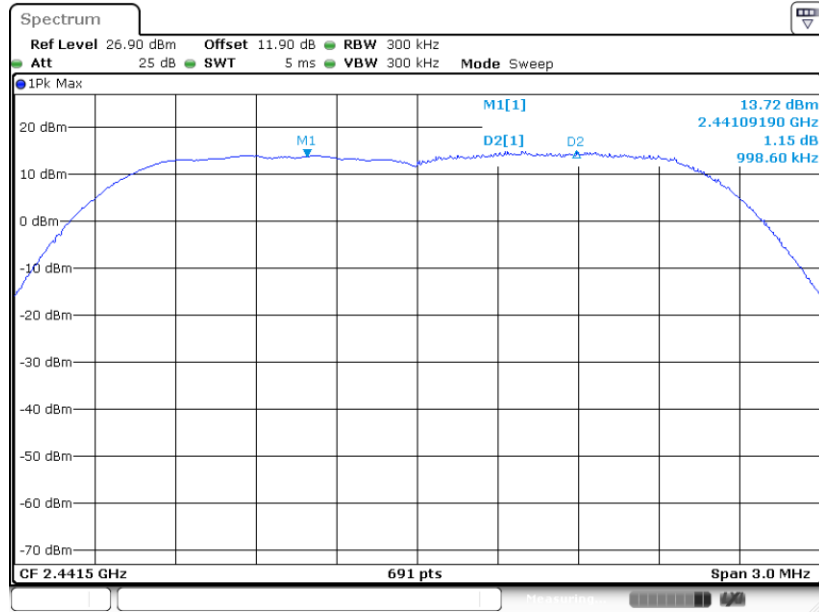
Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 22:24:28

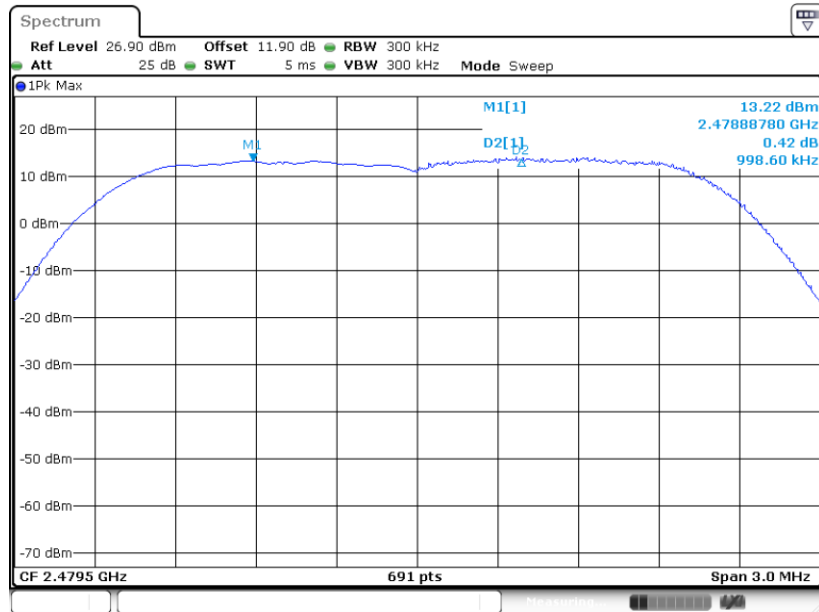


Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 22:29:53

Channel Separation Plot on Channel 77 - 78

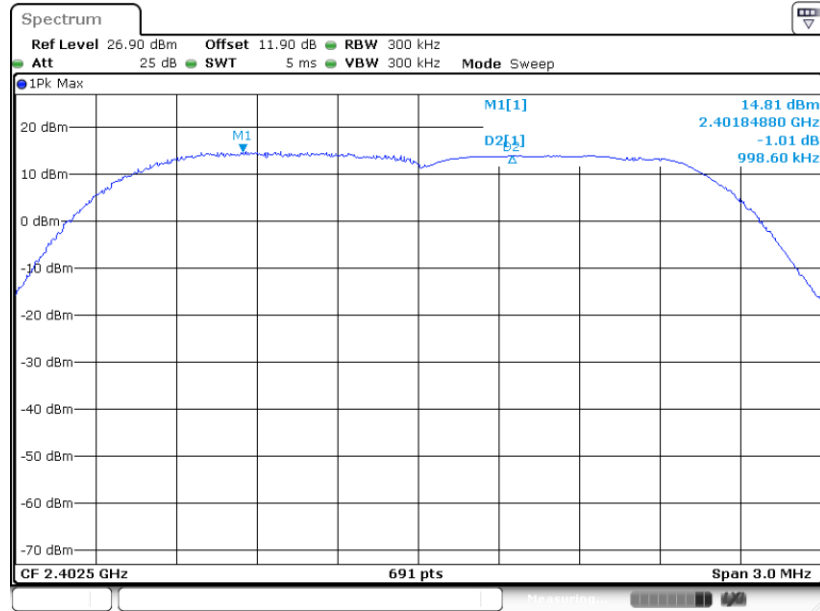


Date: 5 DEC.2023 22:34:19



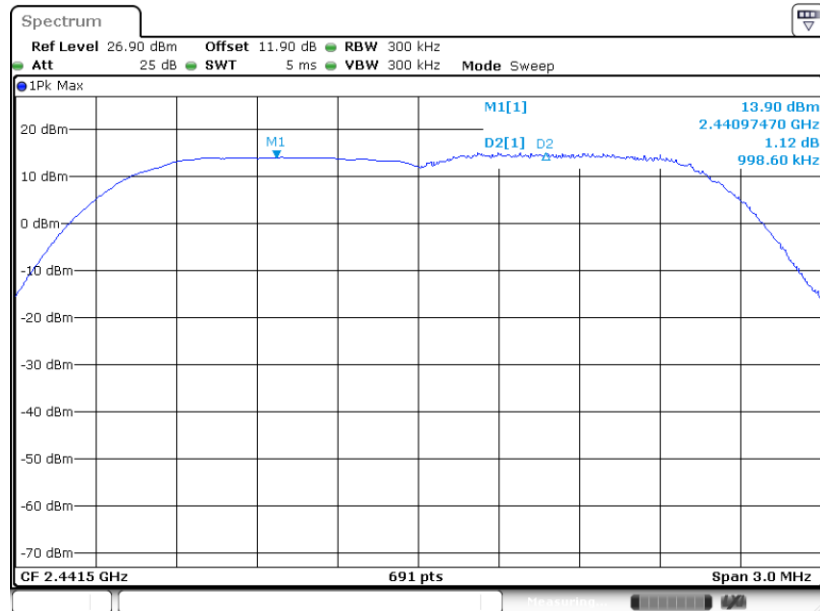
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Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 22:39:54

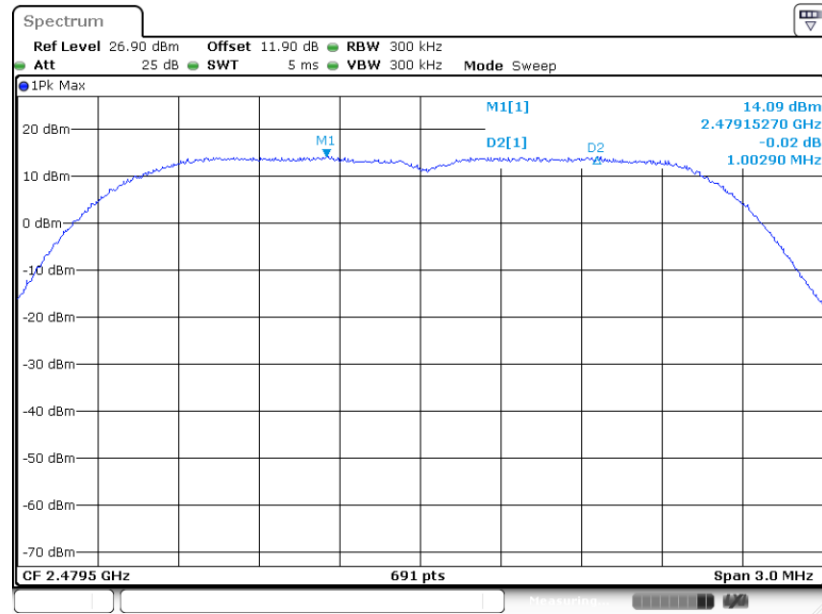
Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 22:38:25



Channel Separation Plot on Channel 77 - 78

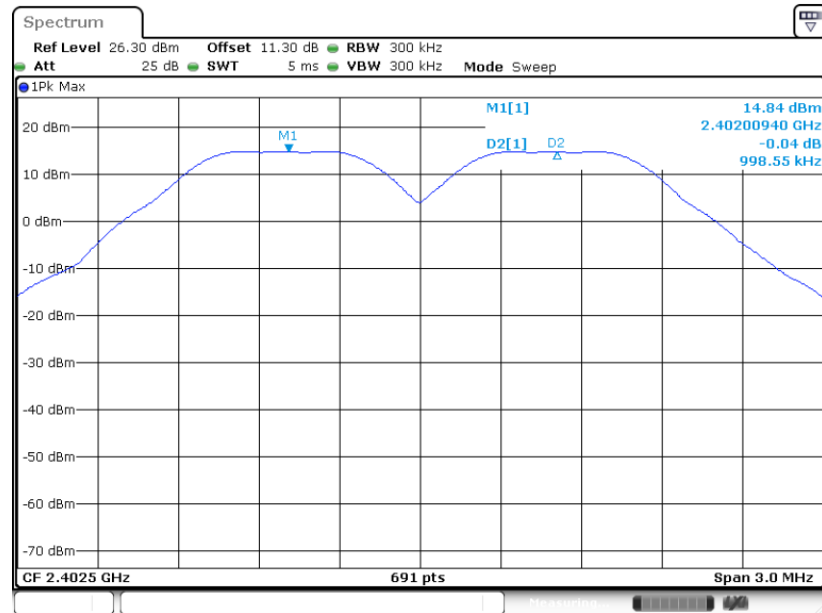


Date: 5.DEC.2023 22:36:31

<MIMO Ant.5+4(5)>

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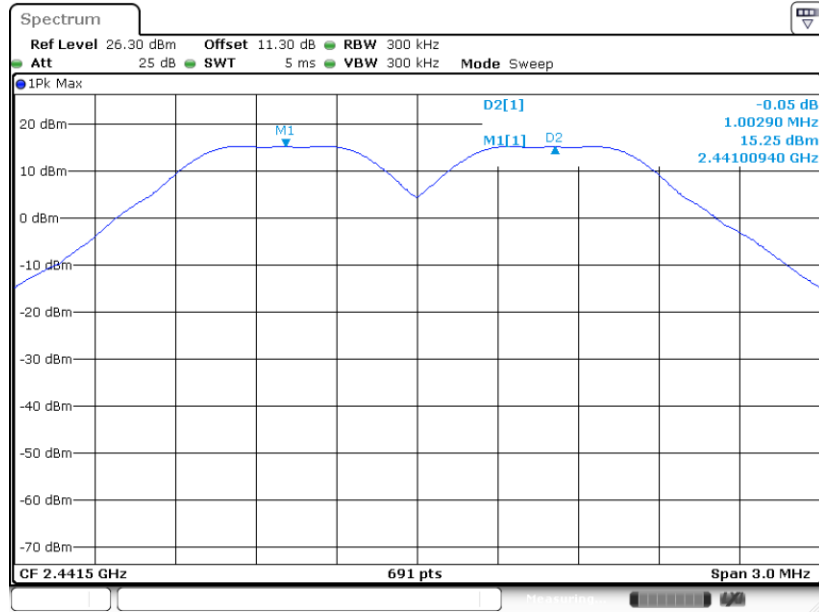
Channel Separation Plot on Channel 00 - 01



Date: 5.DEC.2023 10:06:48

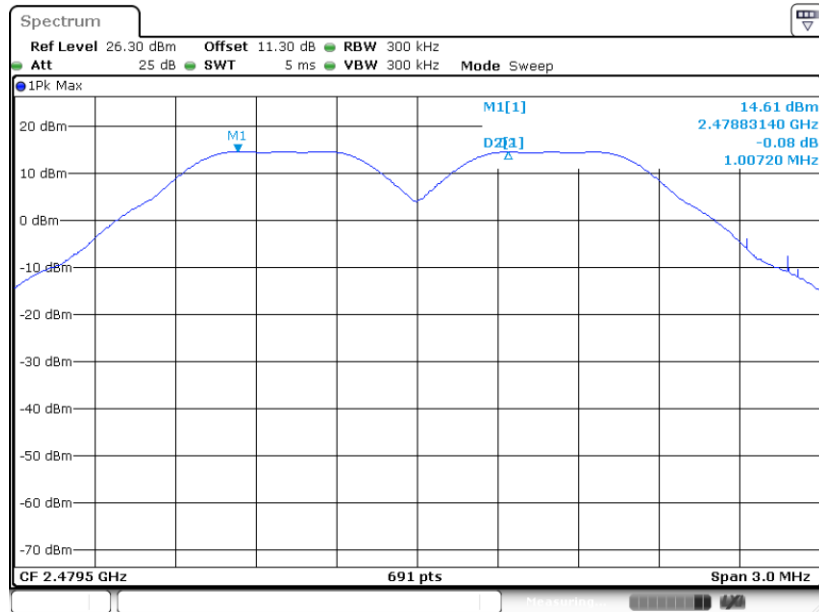


Channel Separation Plot on Channel 39 - 40



Date: 5.DEC.2023 10:10:28

Channel Separation Plot on Channel 77 - 78

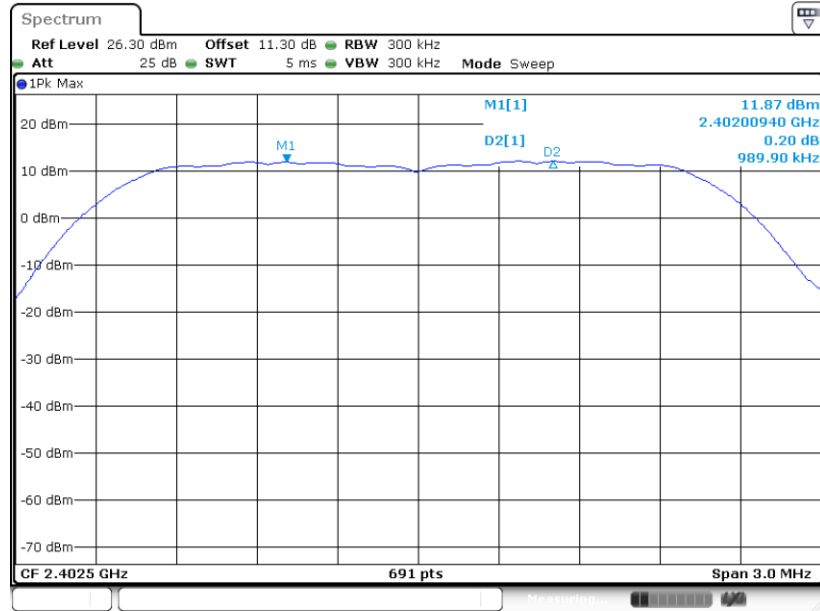


Date: 5.DEC.2023 10:11:58



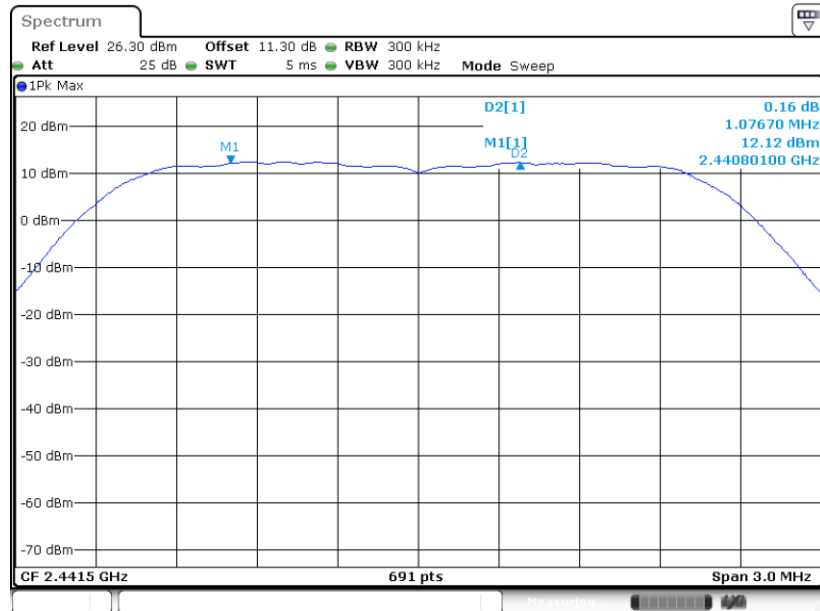
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Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 10:34:08

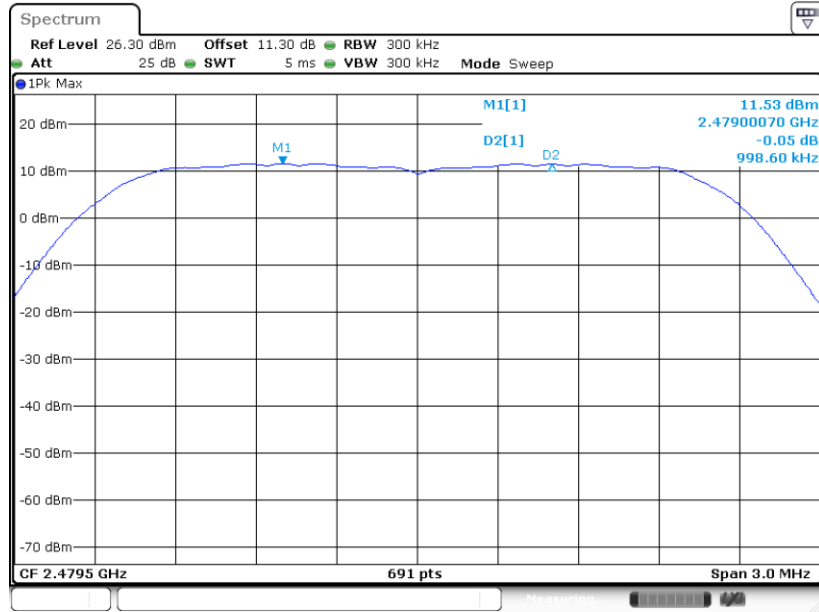
Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 10:51:39



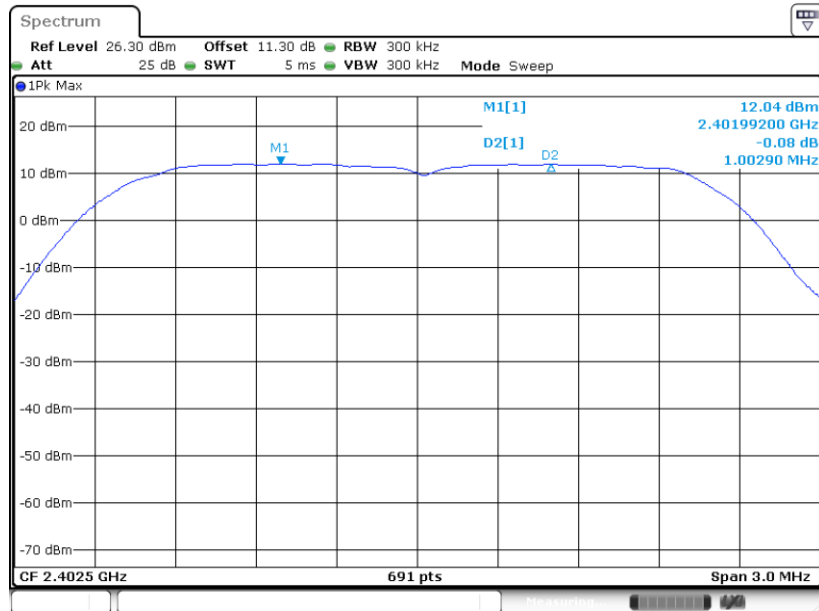
Channel Separation Plot on Channel 77 - 78



Date: 5 DEC.2023 10:53:17

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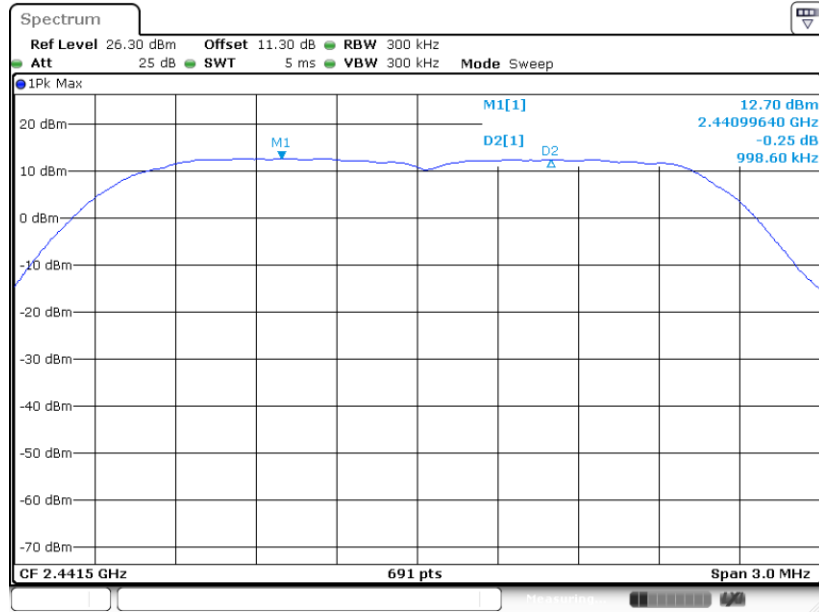
Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 11:32:47

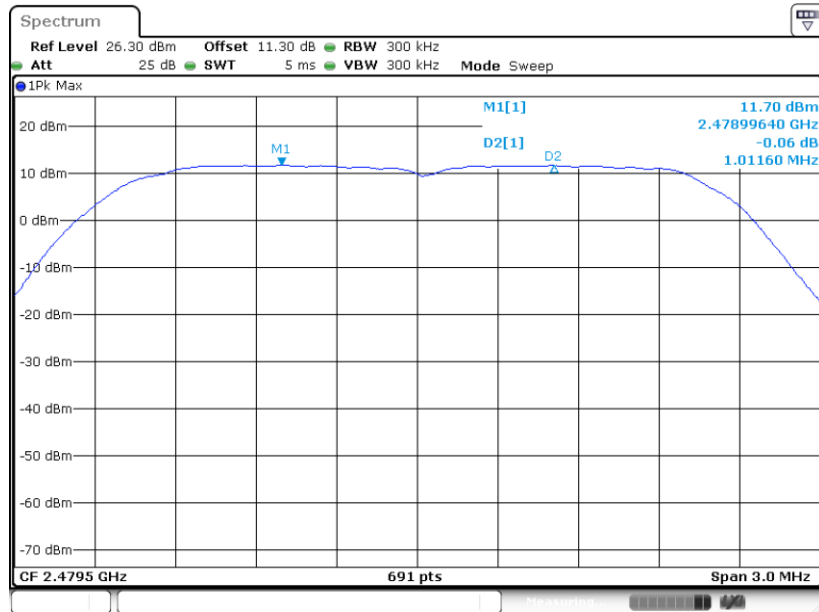


Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 11:45:24

Channel Separation Plot on Channel 77 - 78



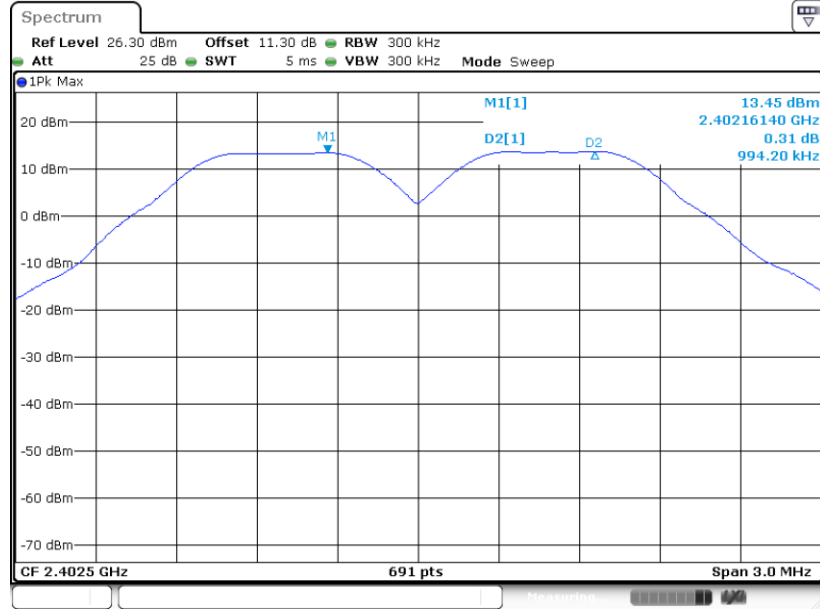
Date: 5 DEC.2023 11:47:56



<MIMO Ant.5+4(4)>

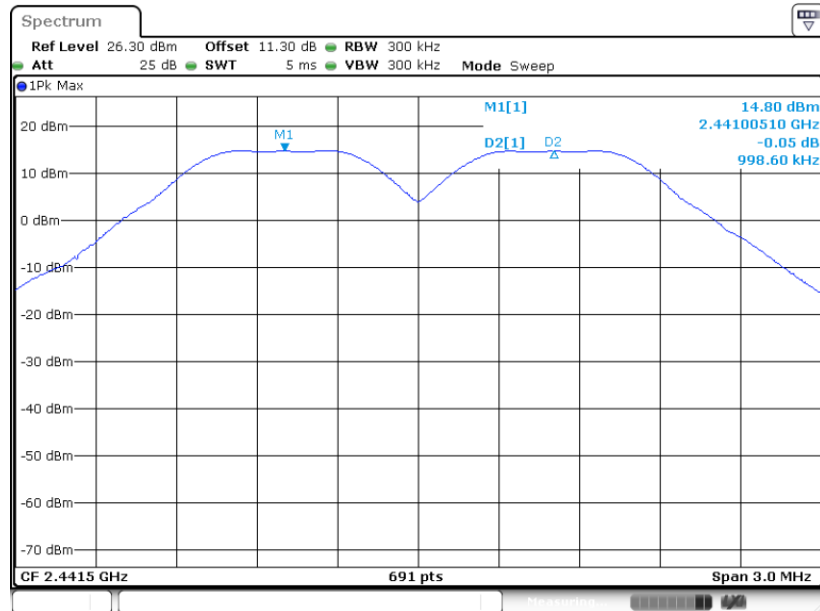
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Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 12:09:28

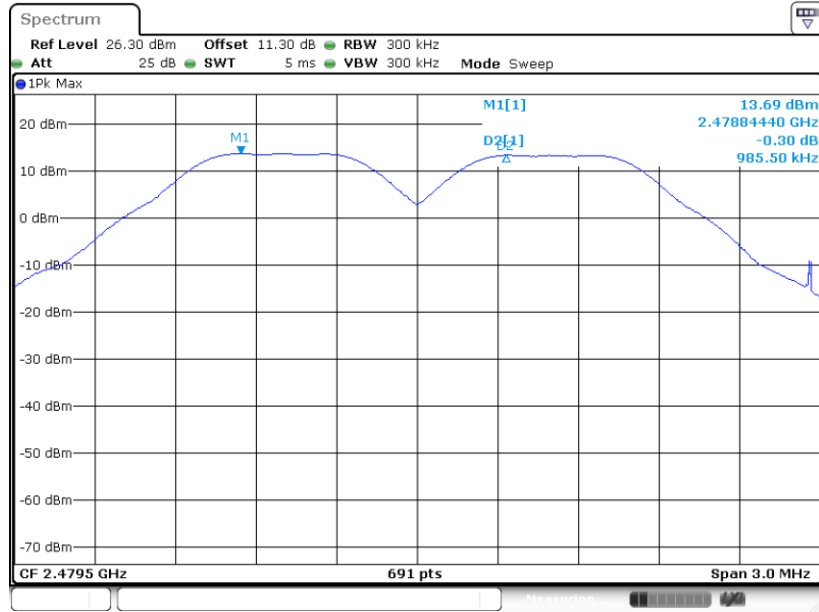
Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 12:10:53



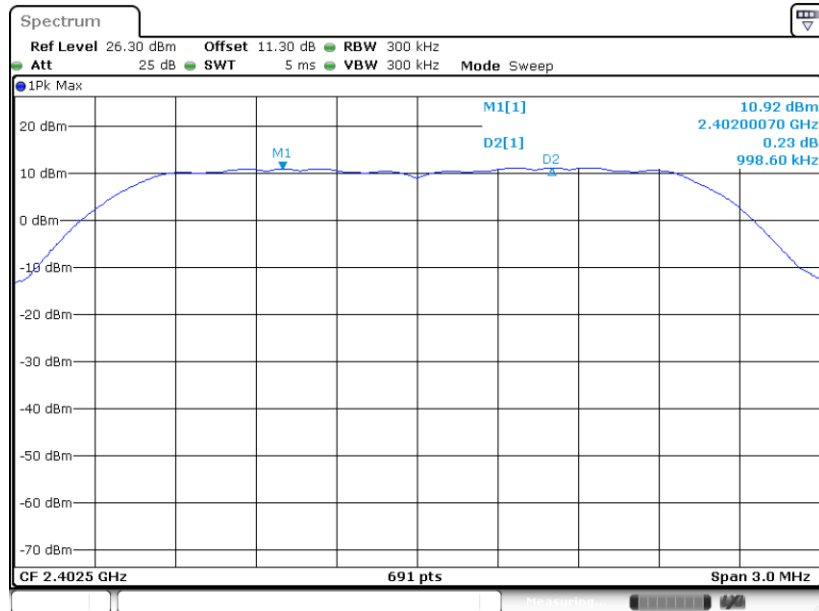
Channel Separation Plot on Channel 77 - 78



Date: 5 DEC.2023 12:12:33

<2Mbps>

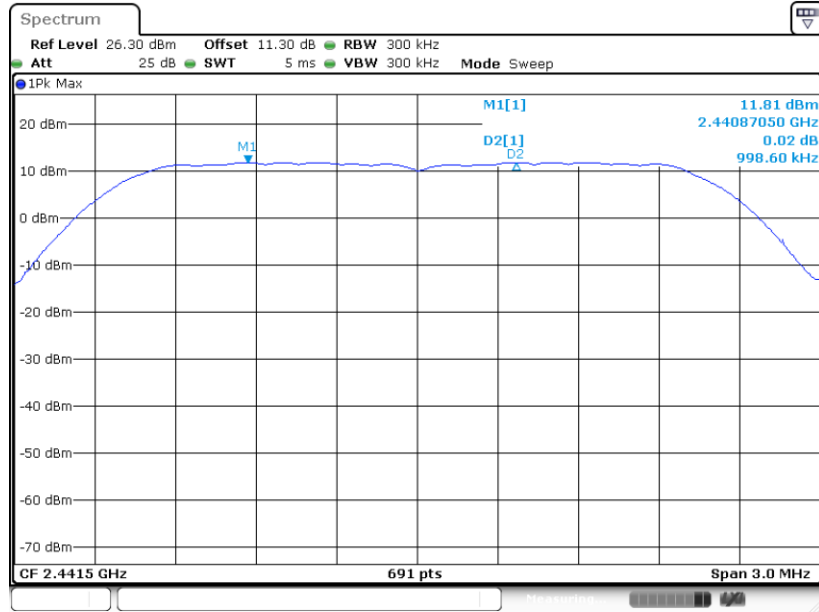
Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 15:33:11

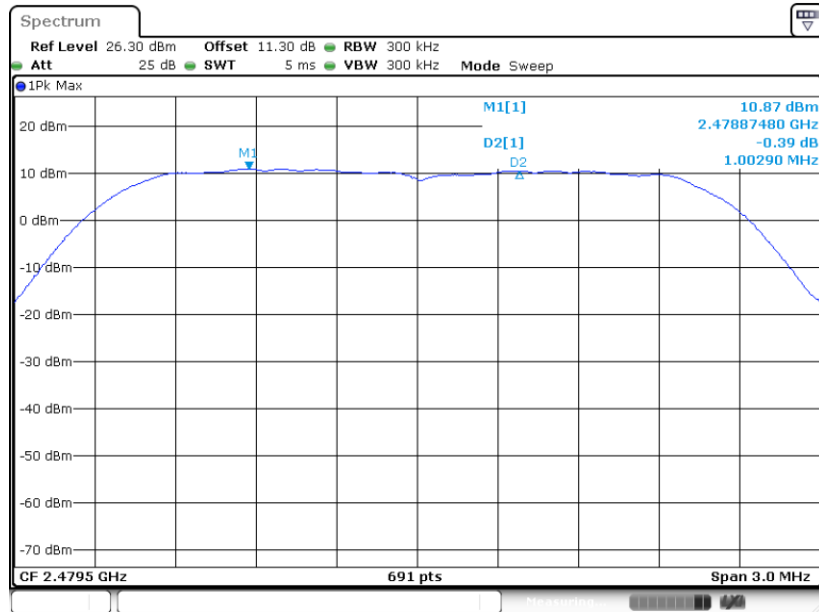


Channel Separation Plot on Channel 39 - 40



Date: 5.DEC.2023 15:36:18

Channel Separation Plot on Channel 77 - 78

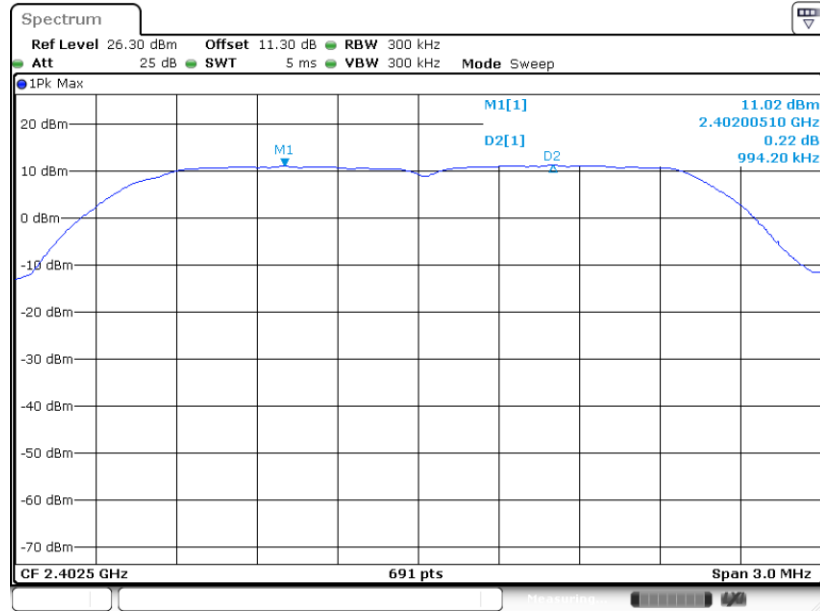


Date: 5.DEC.2023 15:37:49



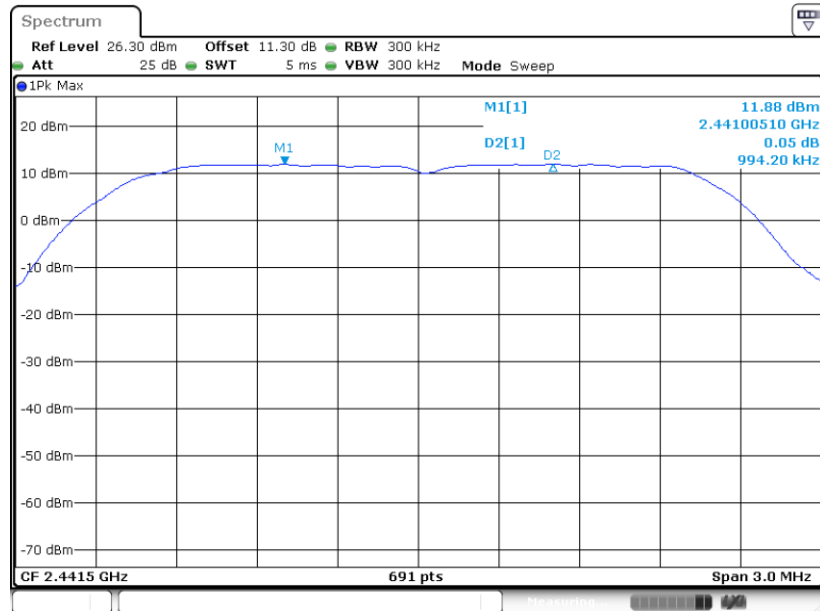
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Channel Separation Plot on Channel 00 - 01



Date: 5 DEC.2023 15:51:57

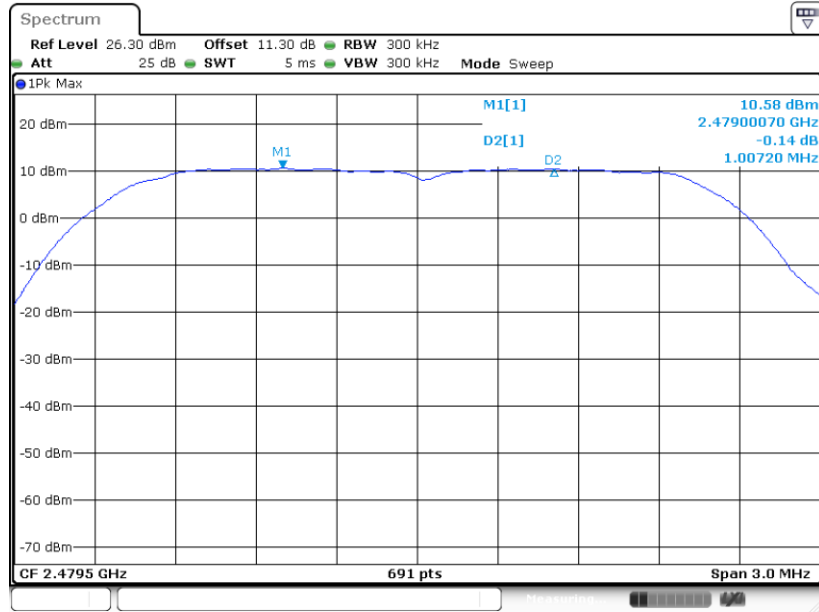
Channel Separation Plot on Channel 39 - 40



Date: 5 DEC.2023 15:55:06



Channel Separation Plot on Channel 77 - 78

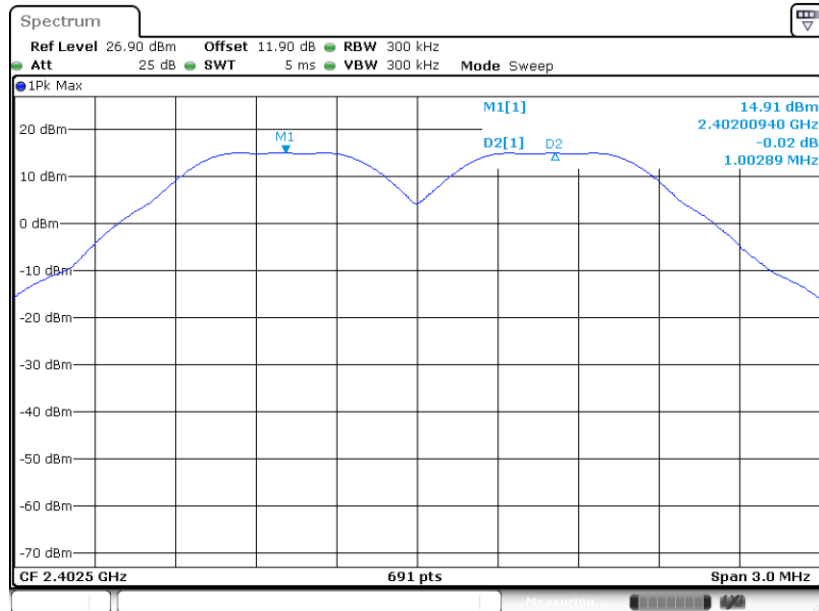


Date: 5 DEC.2023 15:57:24

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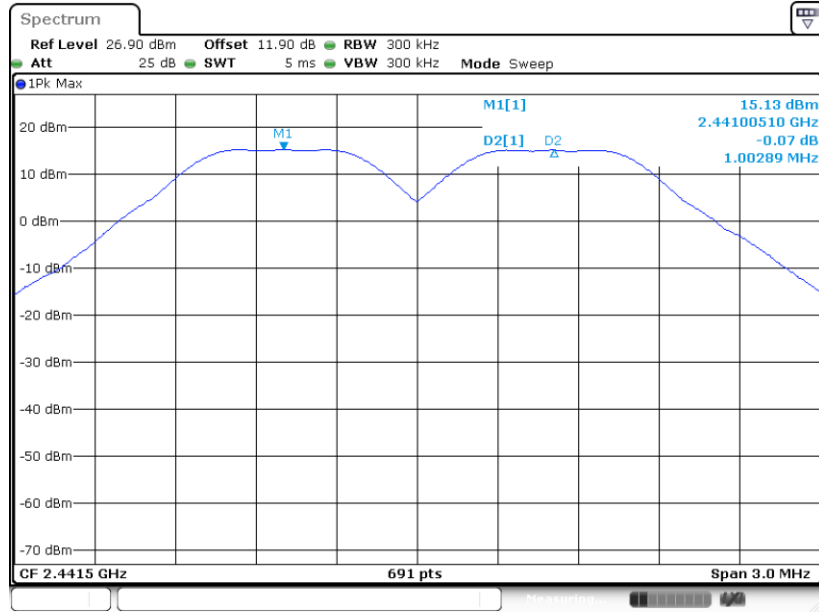
Channel Separation Plot on Channel 00 - 01



Date: 4 DEC.2023 14:19:10

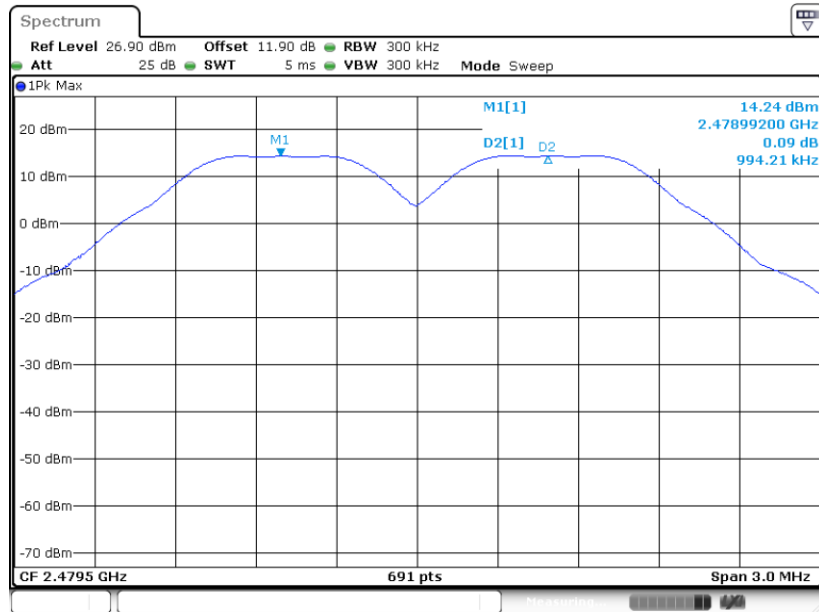


Channel Separation Plot on Channel 39 - 40



Date: 4.DEC.2023 14:21:04

Channel Separation Plot on Channel 77 - 78

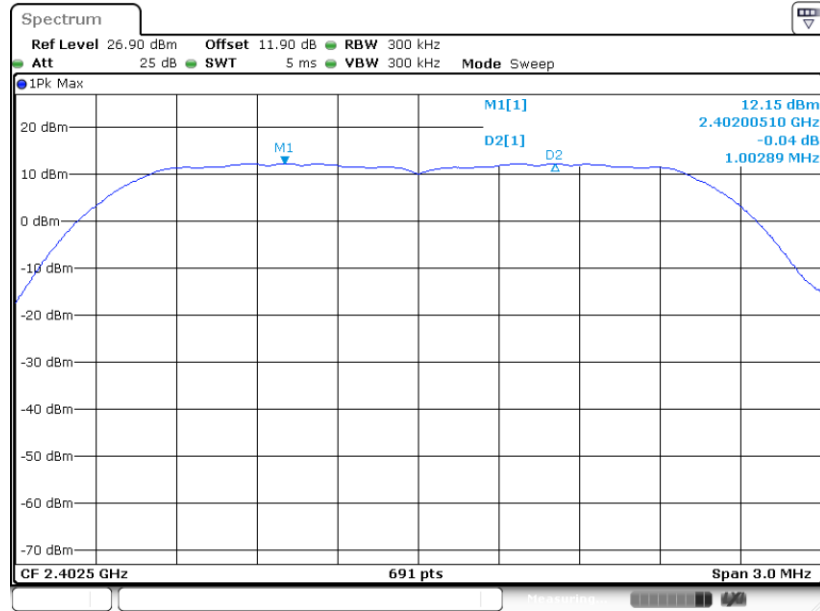


Date: 4.DEC.2023 14:28:03



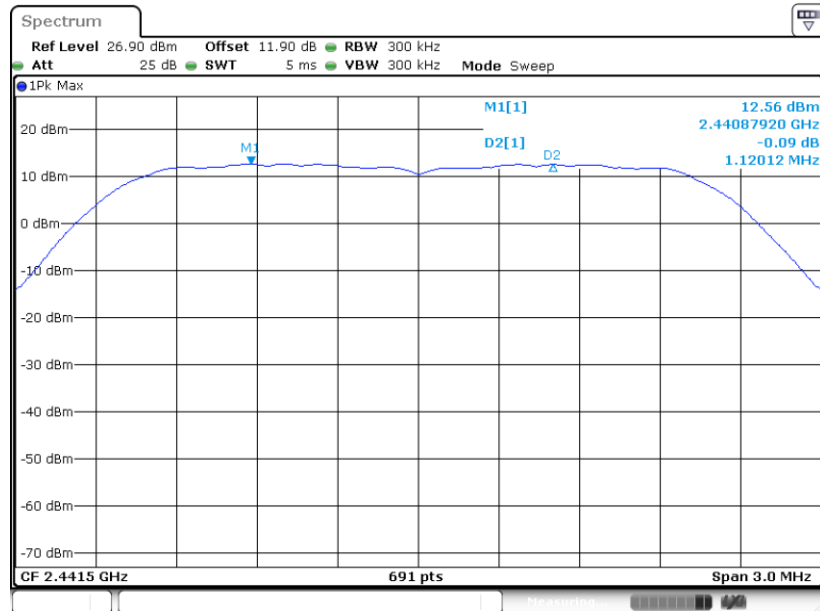
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Channel Separation Plot on Channel 00 - 01



Date: 4.DEC.2023 14:42:16

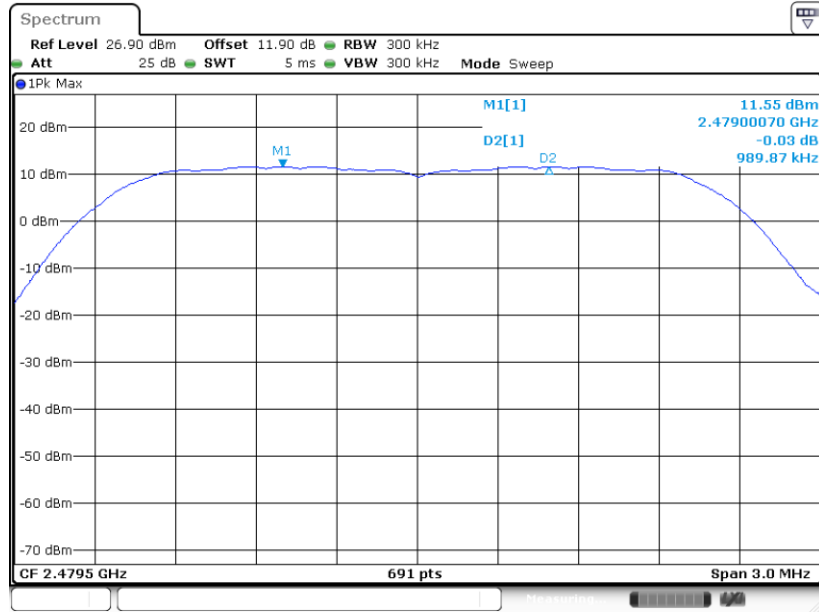
Channel Separation Plot on Channel 39 - 40



Date: 4.DEC.2023 14:43:53



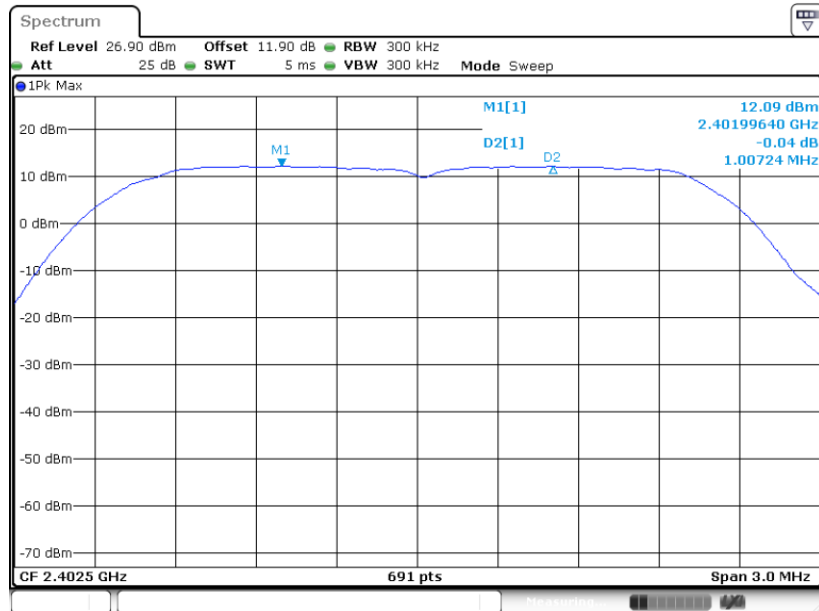
Channel Separation Plot on Channel 77 - 78



Date: 4 DEC.2023 14:45:29

<3Mbps>

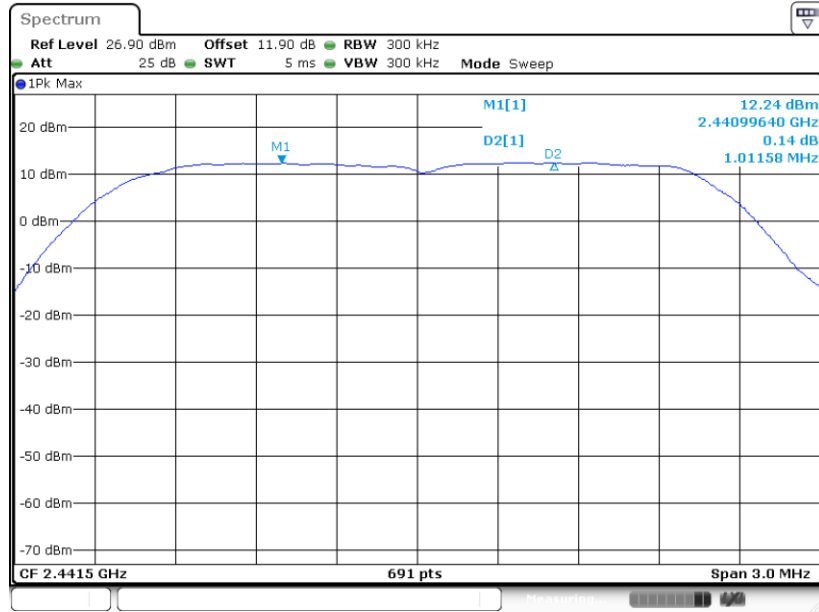
Channel Separation Plot on Channel 00 - 01



Date: 4 DEC.2023 15:01:33

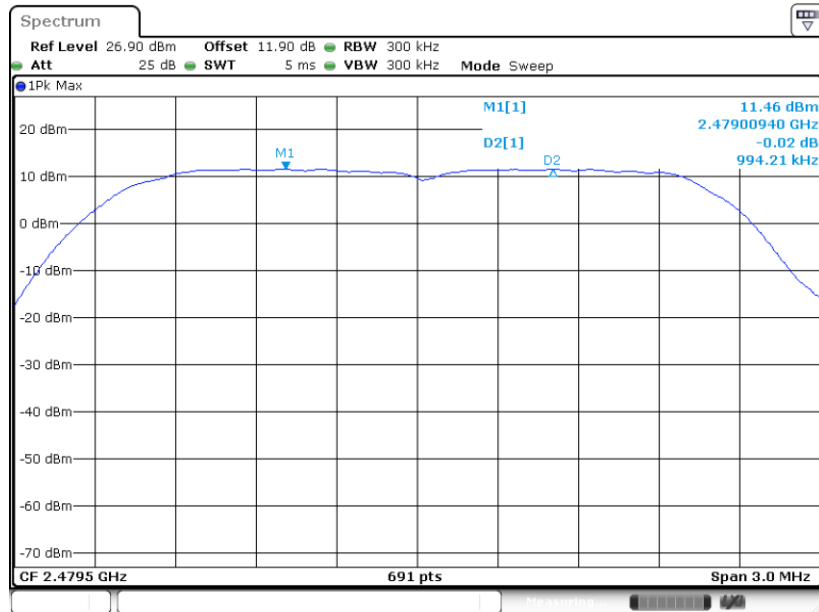


Channel Separation Plot on Channel 39 - 40



Date: 4 DEC.2023 15:02:59

Channel Separation Plot on Channel 77 - 78



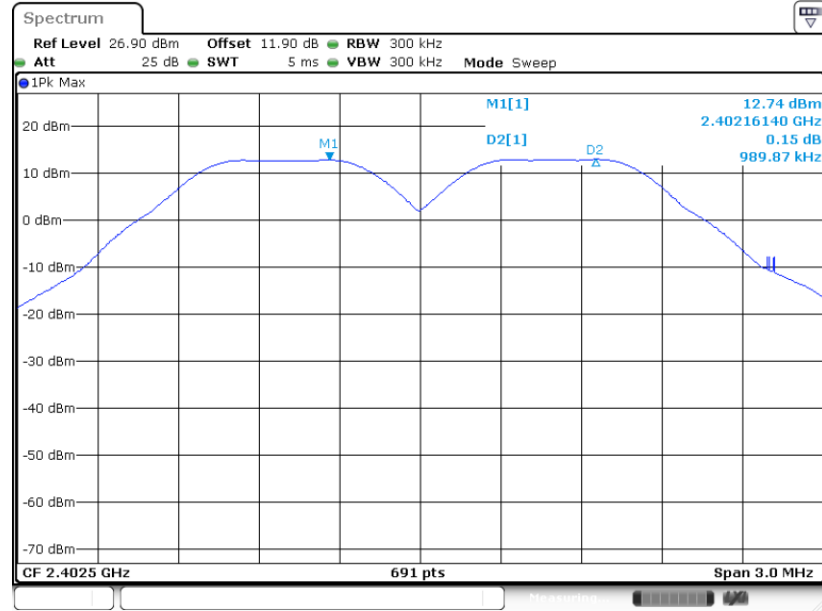
Date: 4 DEC.2023 15:04:33



<MIMO Ant.5+6(6)>

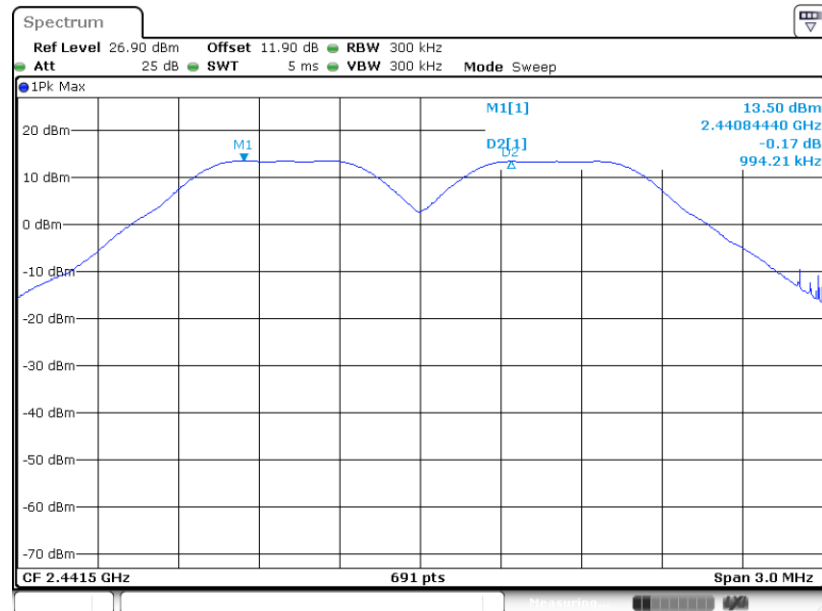
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Channel Separation Plot on Channel 00 - 01



Date: 4 DEC.2023 15:24:33

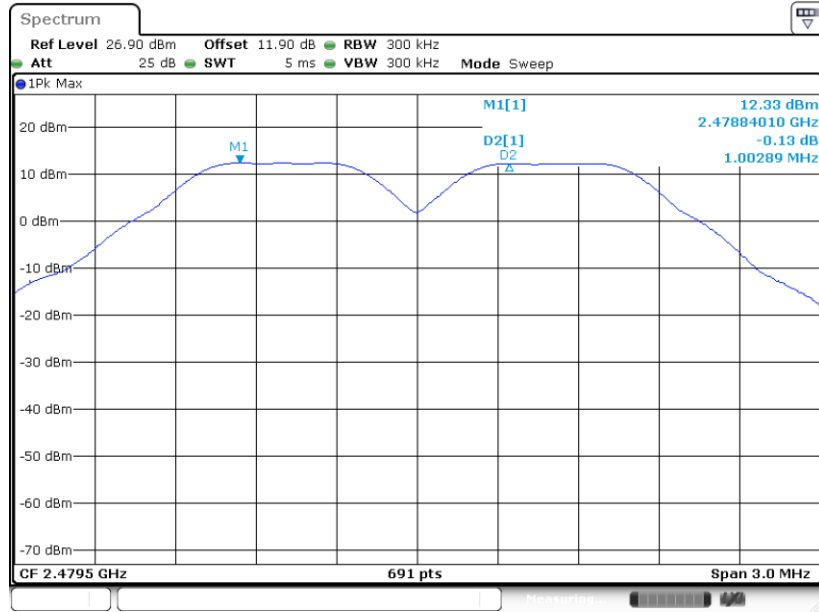
Channel Separation Plot on Channel 39 - 40



Date: 4 DEC.2023 15:26:11



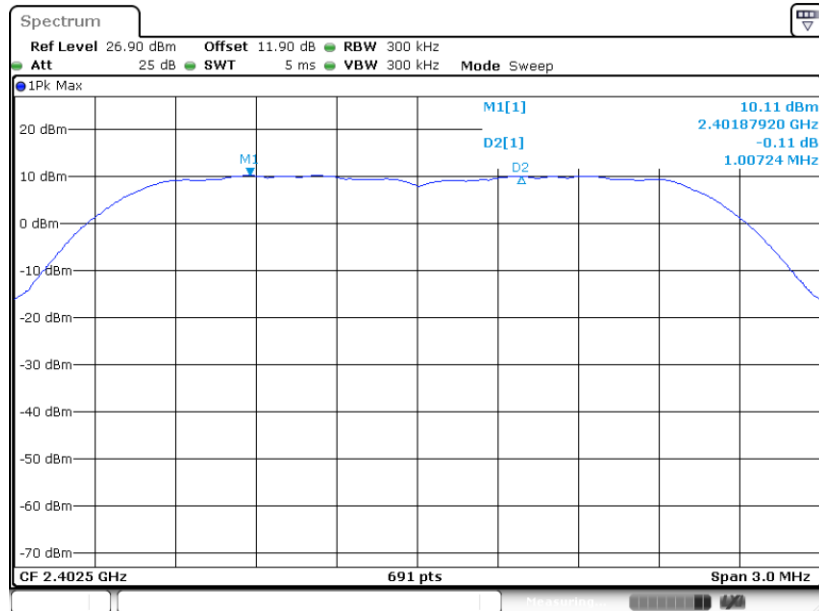
Channel Separation Plot on Channel 77 - 78



Date: 4 DEC.2023 15:27:42

<2Mbps>

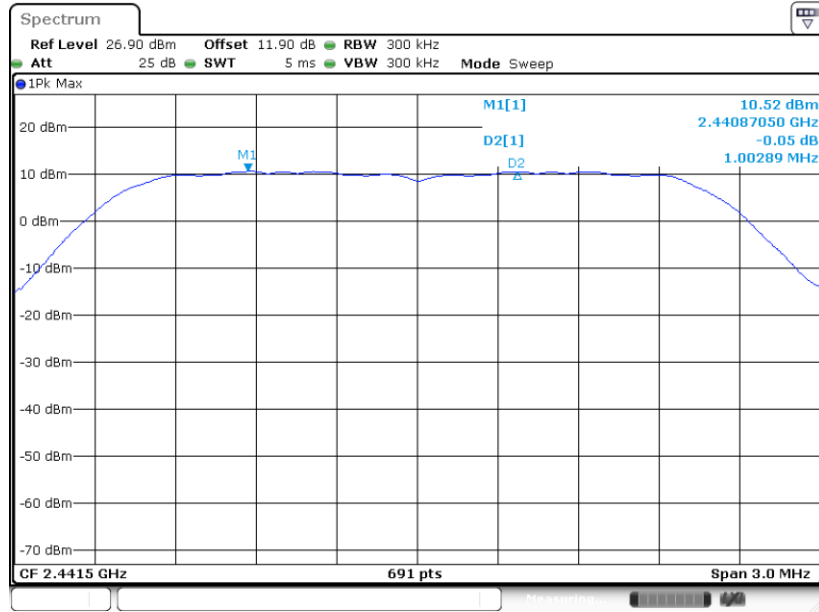
Channel Separation Plot on Channel 00 - 01



Date: 4 DEC.2023 15:40:29

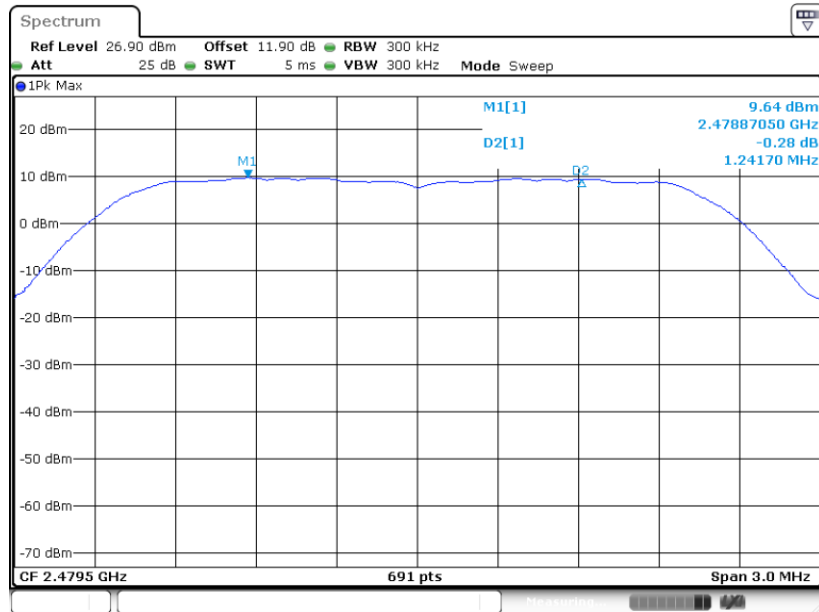


Channel Separation Plot on Channel 39 - 40



Date: 4 DEC.2023 15:47:07

Channel Separation Plot on Channel 77 - 78

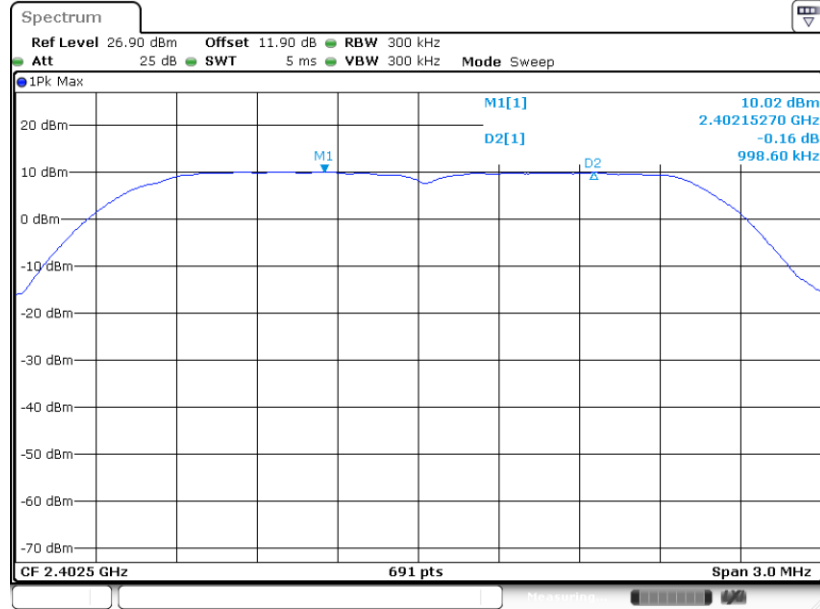


Date: 4 DEC.2023 16:02:52



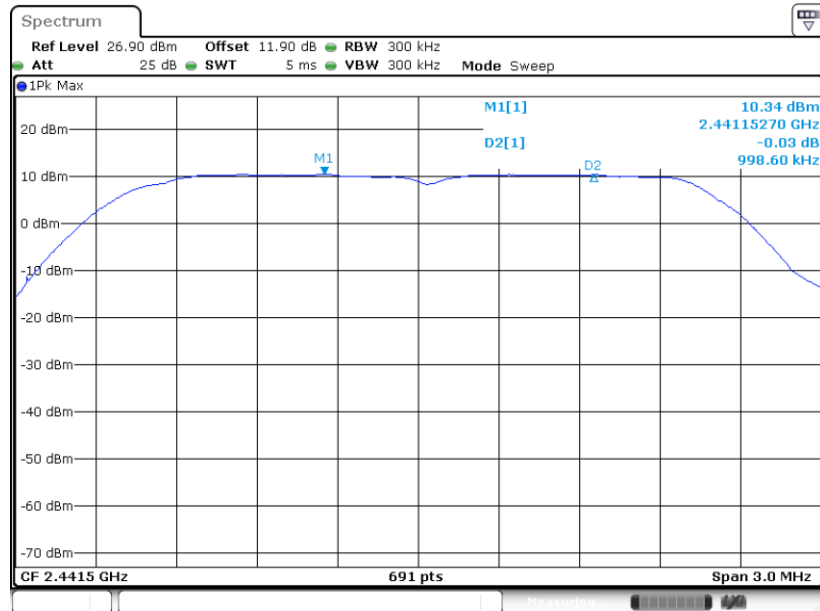
<3Mbps>

Channel Separation Plot on Channel 00 - 01



Date: 4.DEC.2023 16:17:58

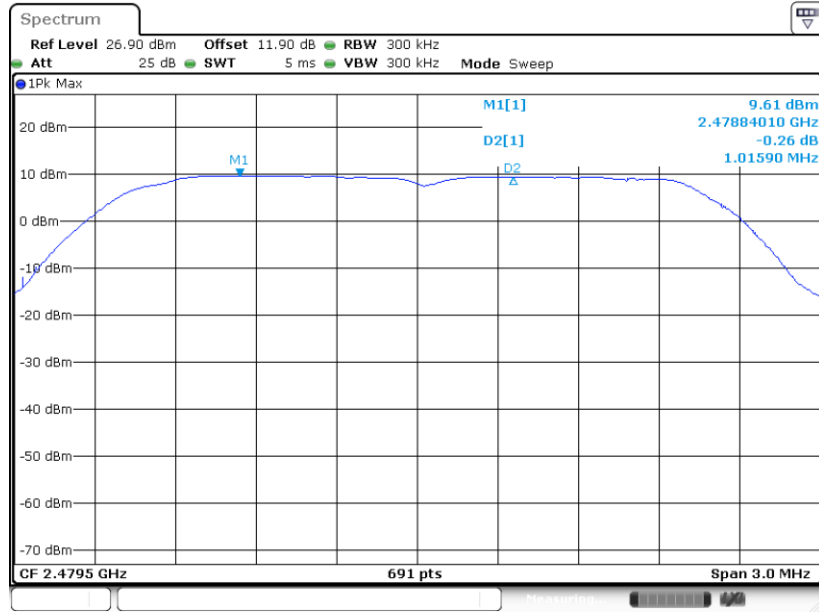
Channel Separation Plot on Channel 39 - 40



Date: 4.DEC.2023 16:19:29



Channel Separation Plot on Channel 77 - 78



Date: 4.DEC.2023 17:28:15

3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

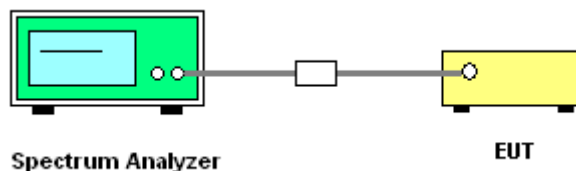
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW \geq RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

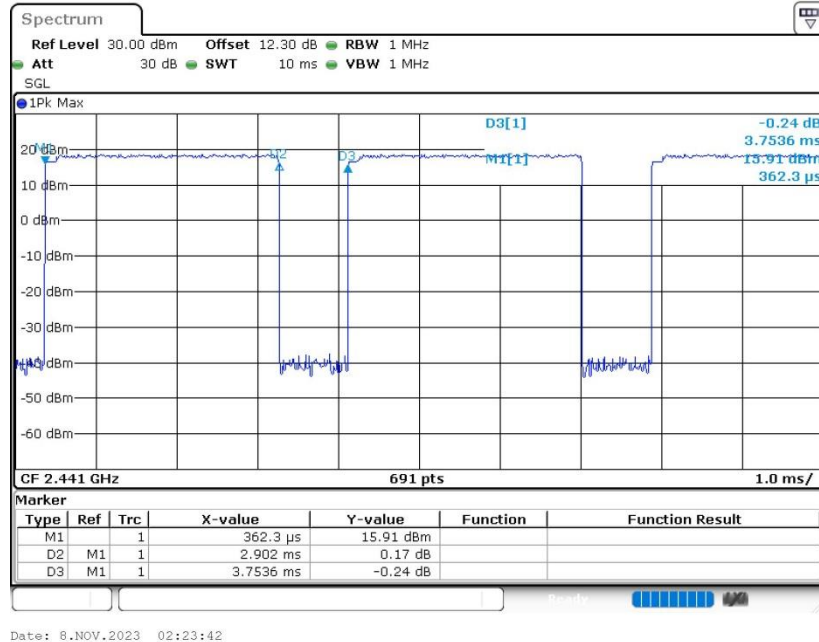
3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

Package Transfer Time Plot



Remark:

- In normal mode, hopping rate is 1600 hops/s with 6 slots (5 Transmit and 1 Receive slot) in 79 hopping channels.
 With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
- In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels.
 With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s), Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.
- Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

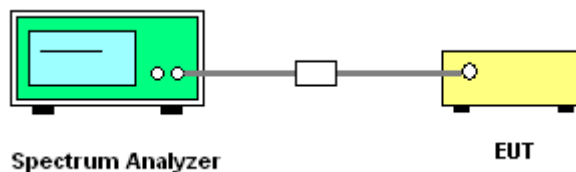
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
The RBW is set to 1% to 5% of the 99% OBW, the VBW is set to 3 times the RBW;
Sweep = auto; Detector function = peak;
Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
The RBW is set to 1% to 5% of the 99% OBW, the VBW is set to 3 times the RBW;
Sweep = auto; Detector function = peak;
Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup



3.4.5 Test Result of 20dB Bandwidth

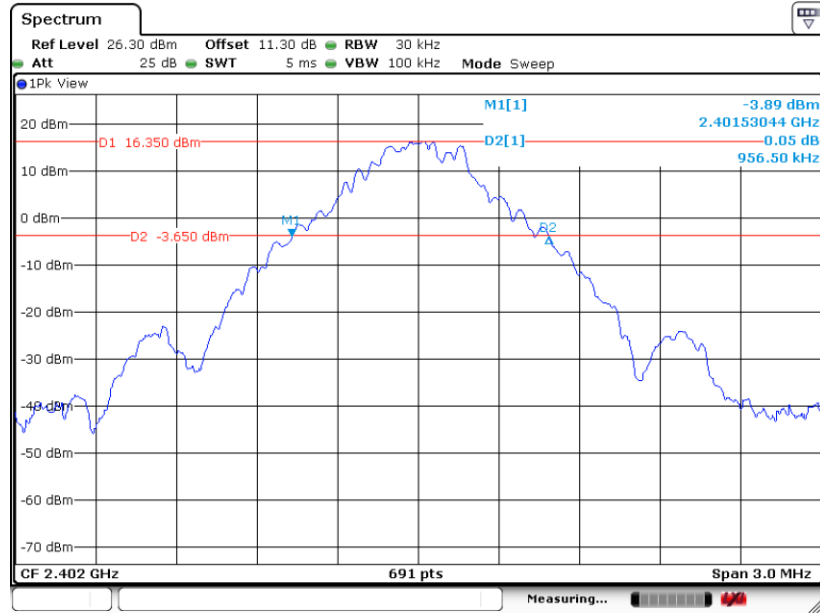
Please refer to Appendix A.



<SISO Ant.5>

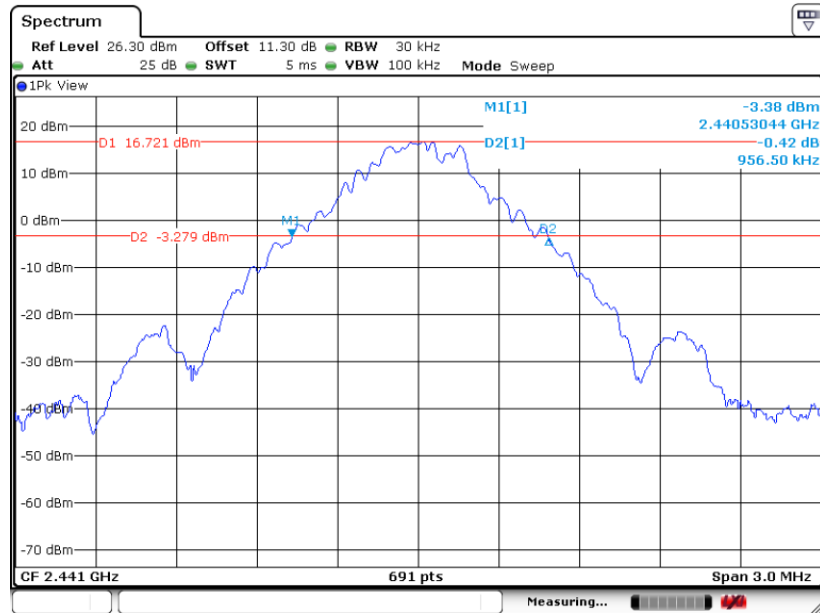
<1Mbps>

20 dB Bandwidth Plot on Channel 00



Date: 4 DEC.2023 22:47:33

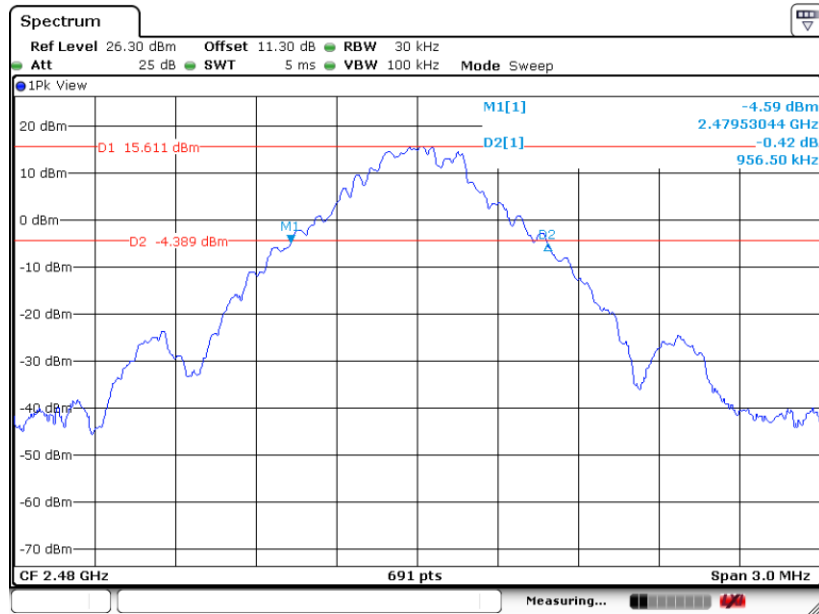
20 dB Bandwidth Plot on Channel 39



Date: 4 DEC.2023 22:52:46



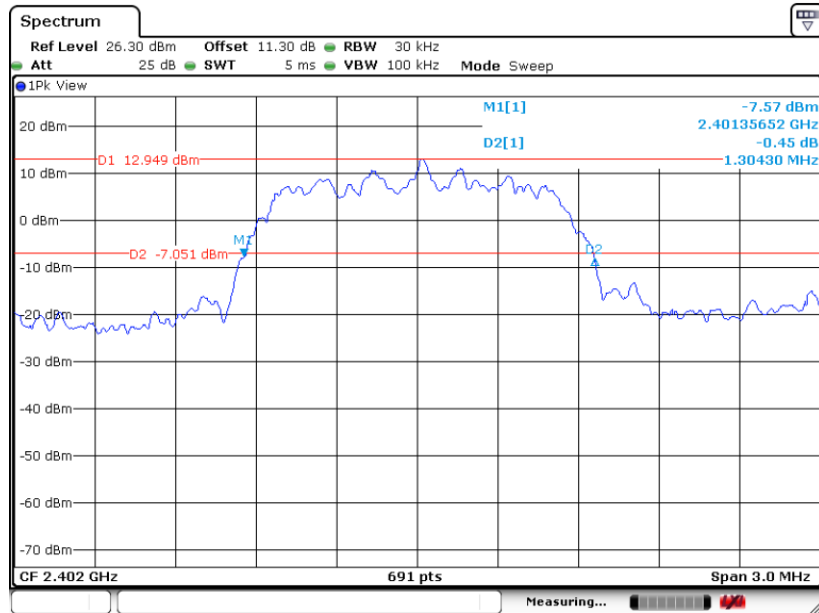
20 dB Bandwidth Plot on Channel 78



Date: 4 DEC.2023 22:57:32

<2Mbps>

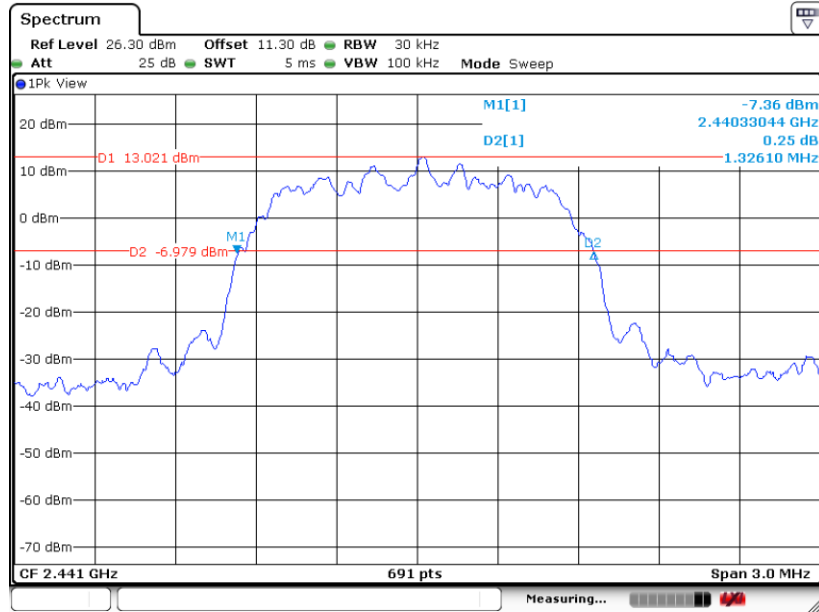
20 dB Bandwidth Plot on Channel 00



Date: 4 DEC.2023 23:09:25

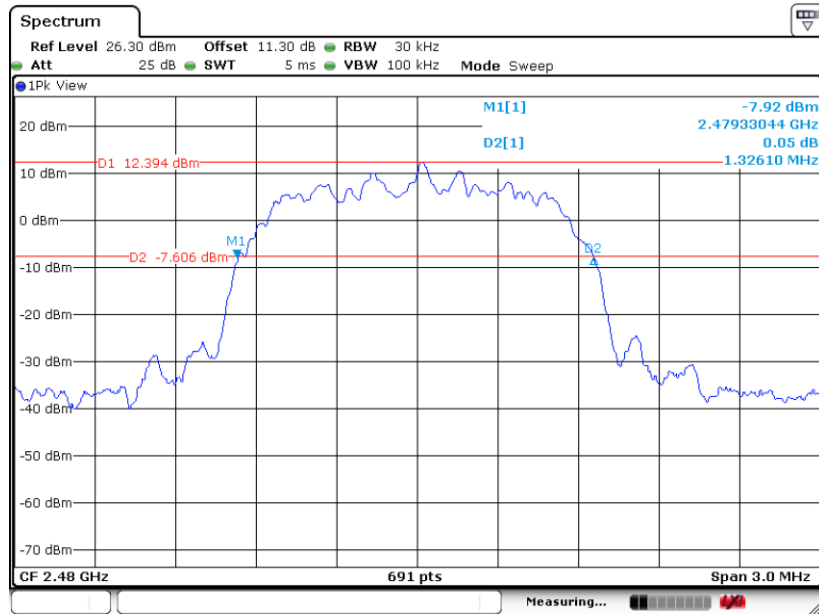


20 dB Bandwidth Plot on Channel 39



Date: 4 DEC.2023 23:14:00

20 dB Bandwidth Plot on Channel 78

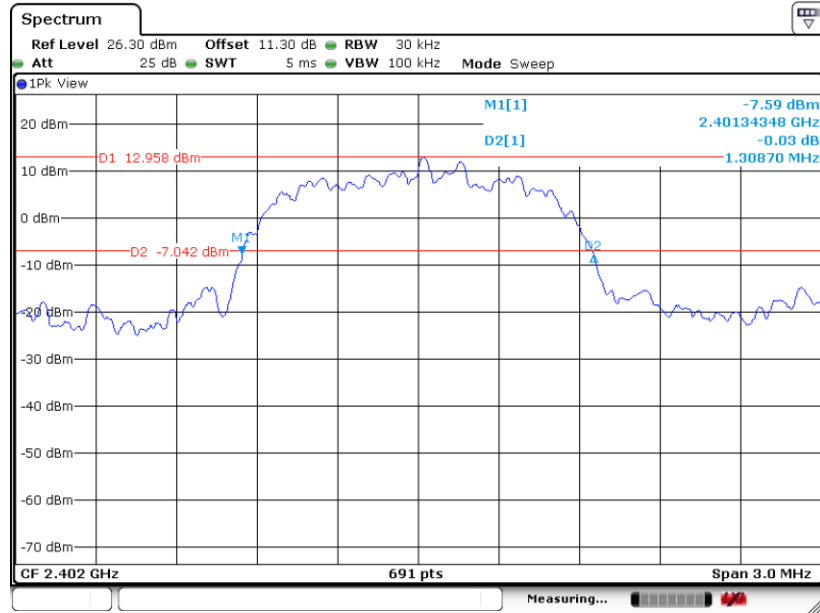


Date: 4 DEC.2023 23:25:29



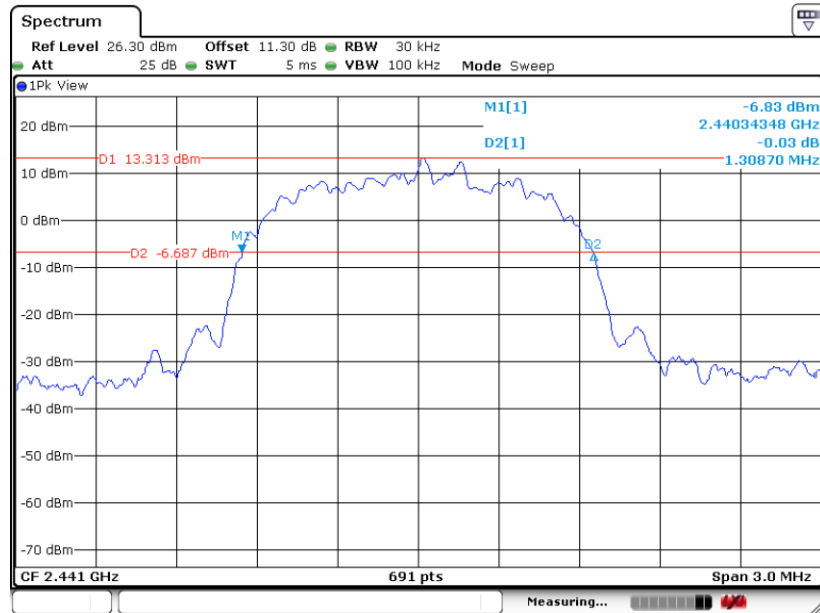
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20 dB Bandwidth Plot on Channel 00



Date: 4 DEC.2023 23:34:22

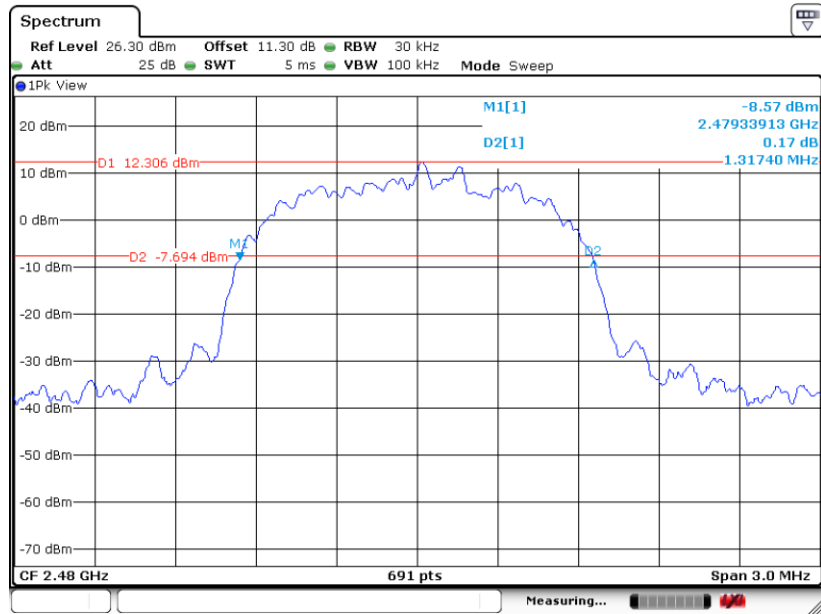
20 dB Bandwidth Plot on Channel 39



Date: 4 DEC.2023 23:39:39



20 dB Bandwidth Plot on Channel 78



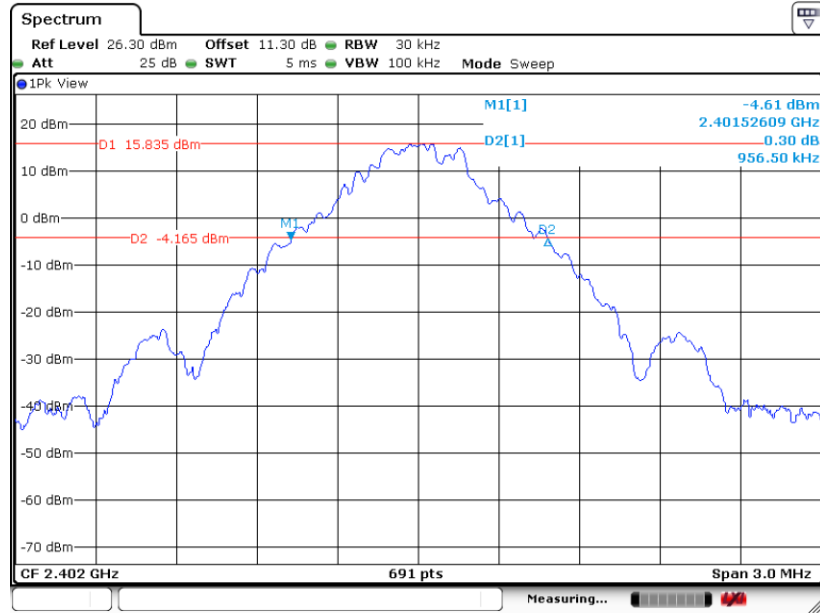
Date: 4.DEC.2023 23:48:43



<SISO Ant.4>

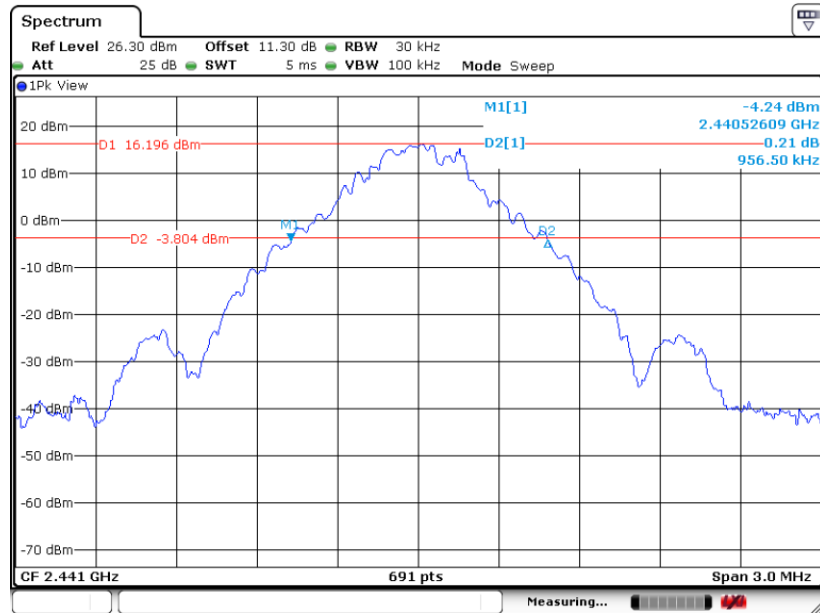
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20 dB Bandwidth Plot on Channel 00



Date: 5 DEC.2023 00:46:31

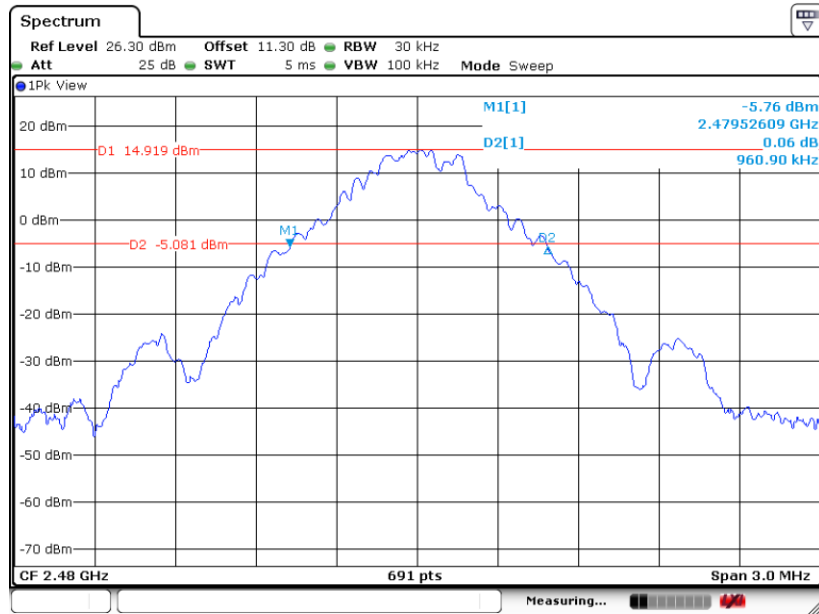
20 dB Bandwidth Plot on Channel 39



Date: 5 DEC.2023 00:52:11



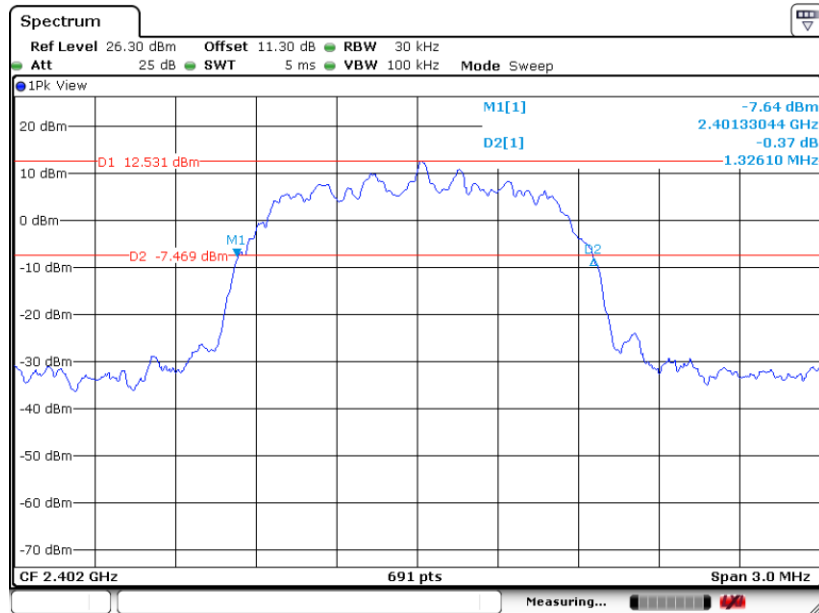
20 dB Bandwidth Plot on Channel 78



Date: 5 DEC.2023 00:56:51

<2Mbps>

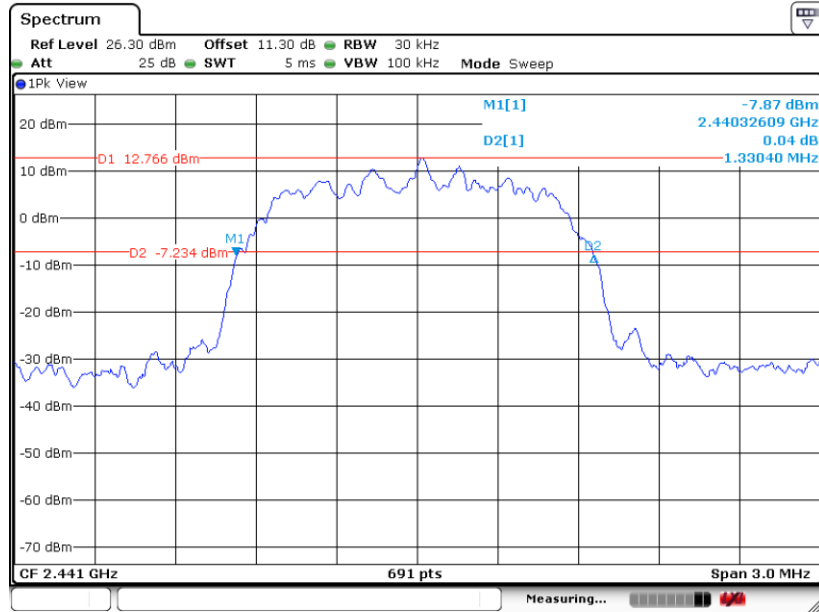
20 dB Bandwidth Plot on Channel 00



Date: 5 DEC.2023 01:02:28

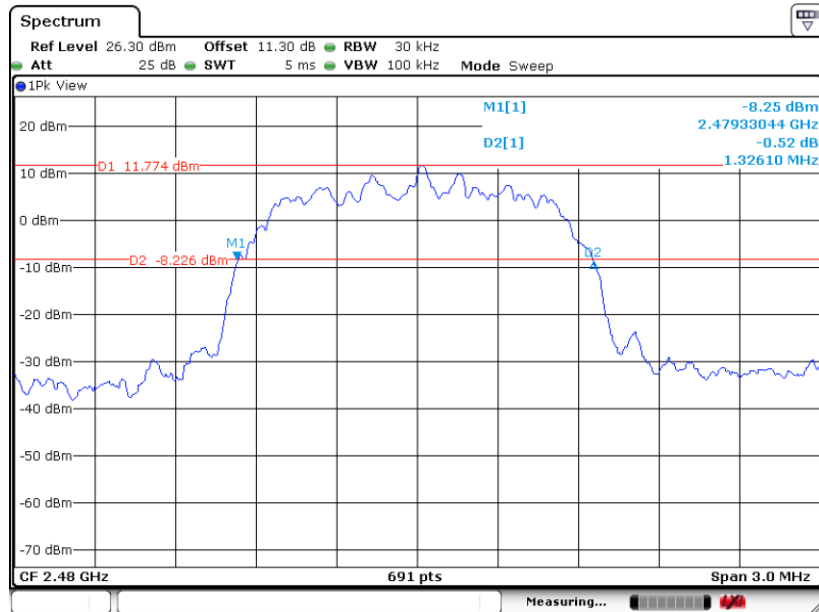


20 dB Bandwidth Plot on Channel 39



Date: 5 DEC.2023 01:08:54

20 dB Bandwidth Plot on Channel 78

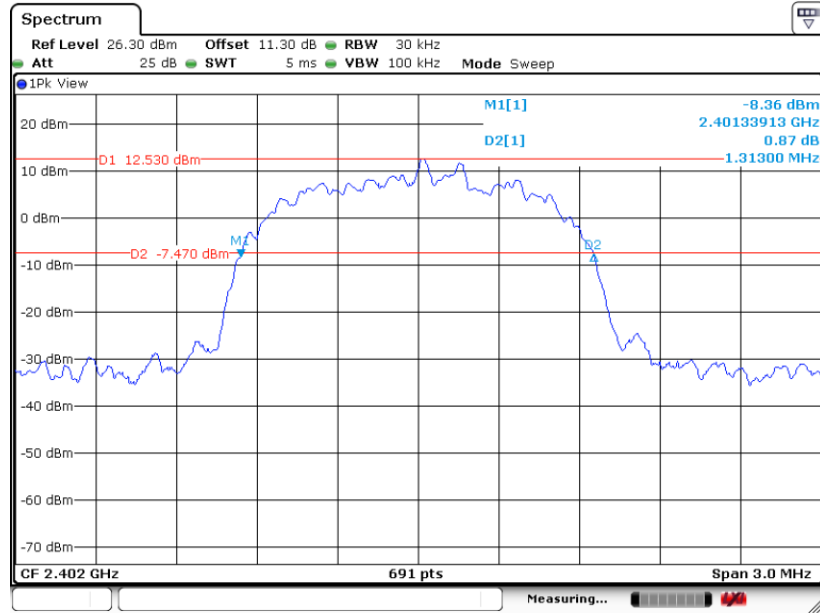


Date: 5 DEC.2023 01:15:26



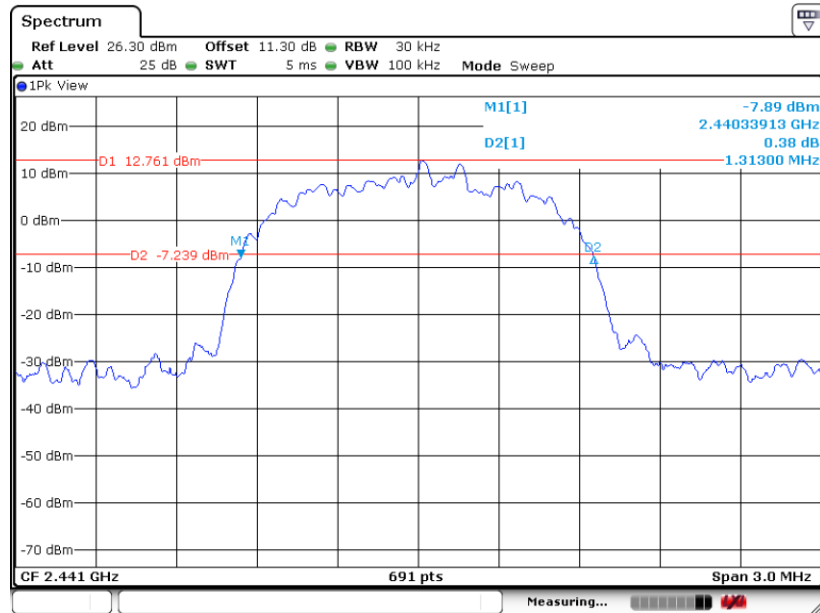
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20 dB Bandwidth Plot on Channel 00



Date: 5 DEC.2023 01:25:26

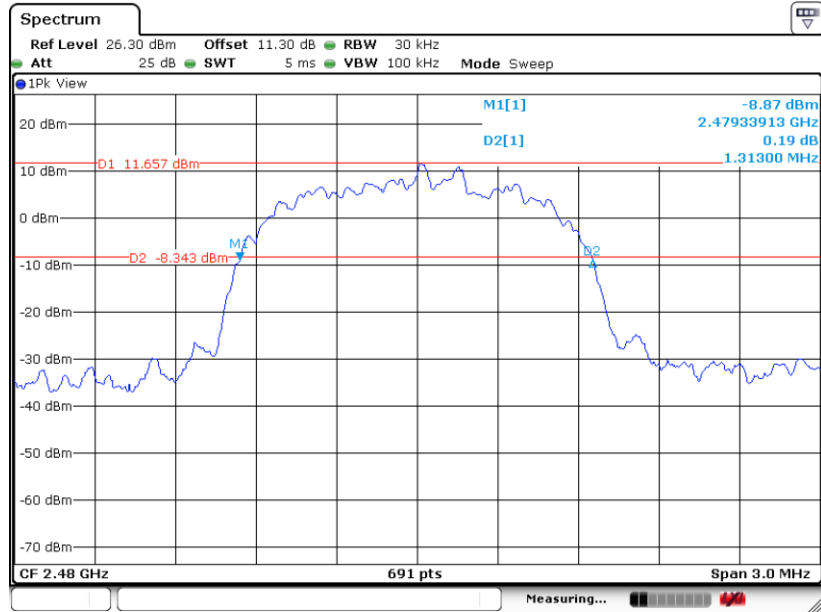
20 dB Bandwidth Plot on Channel 39



Date: 5 DEC.2023 01:29:03



20 dB Bandwidth Plot on Channel 78



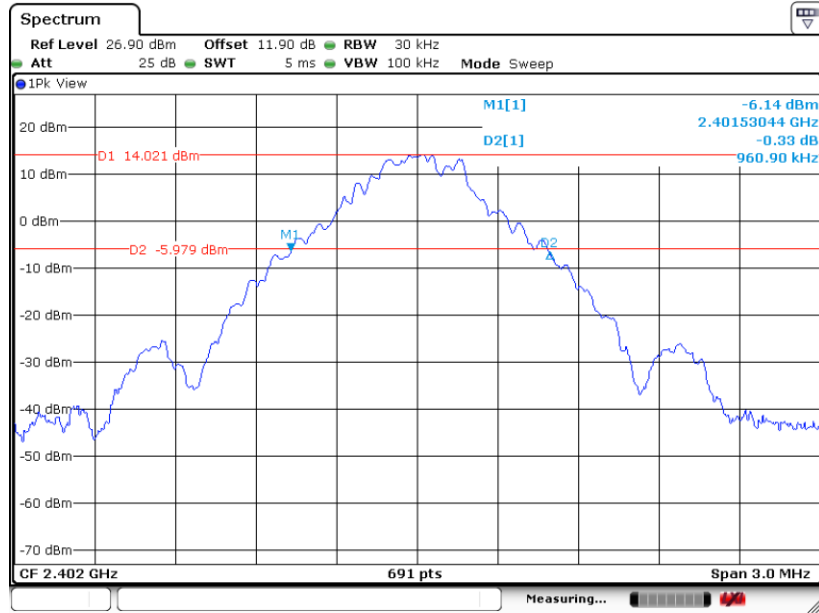
Date: 5.DEC.2023 01:35:50



<SISO Ant.6>

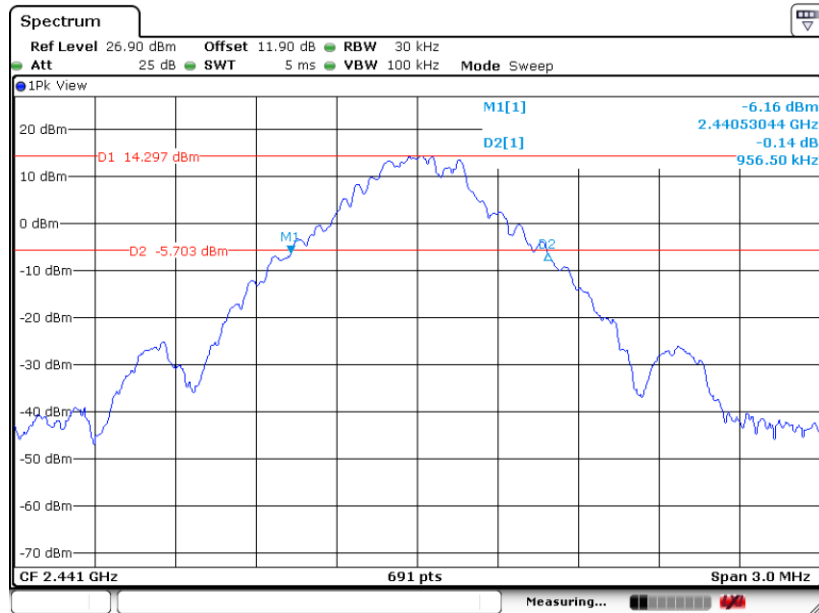
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20 dB Bandwidth Plot on Channel 00



Date: 5 DEC.2023 21:57:11

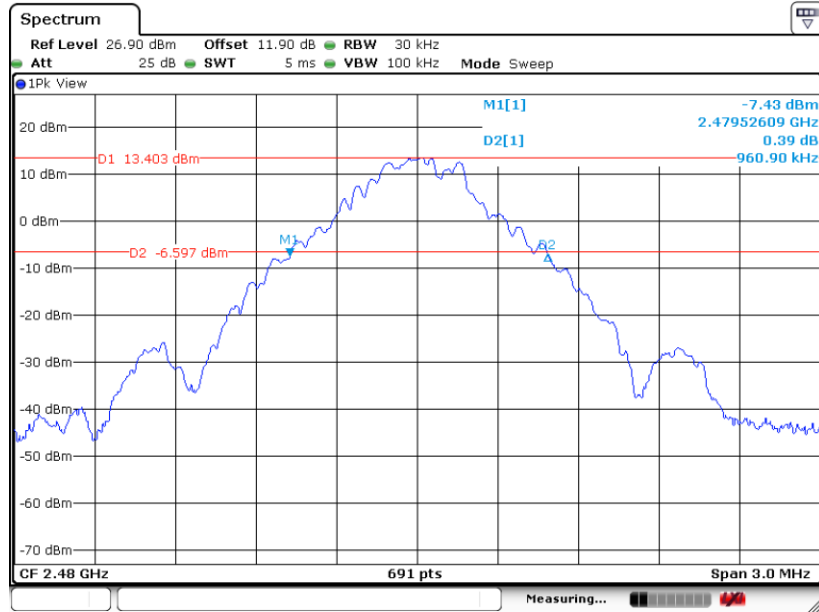
20 dB Bandwidth Plot on Channel 39



Date: 5 DEC.2023 22:01:39



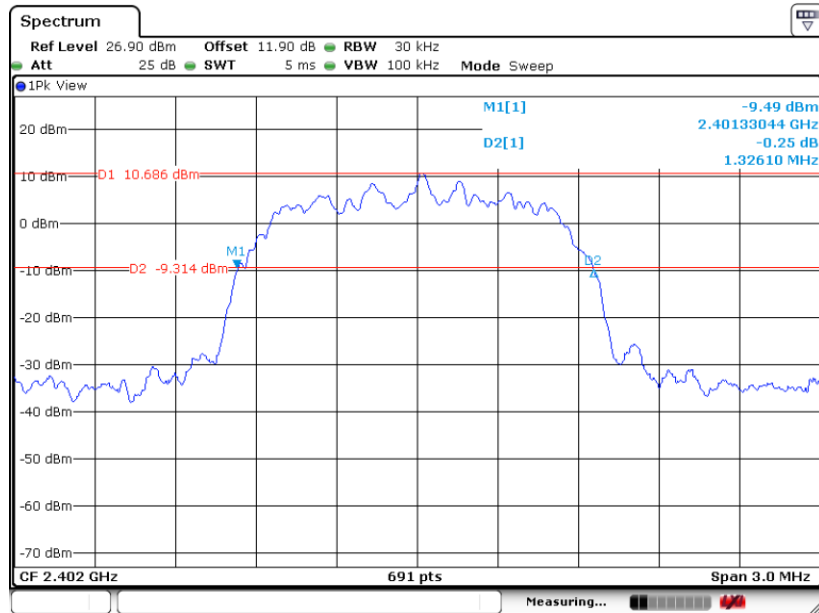
20 dB Bandwidth Plot on Channel 78



Date: 5 DEC.2023 22:09:11

<2Mbps>

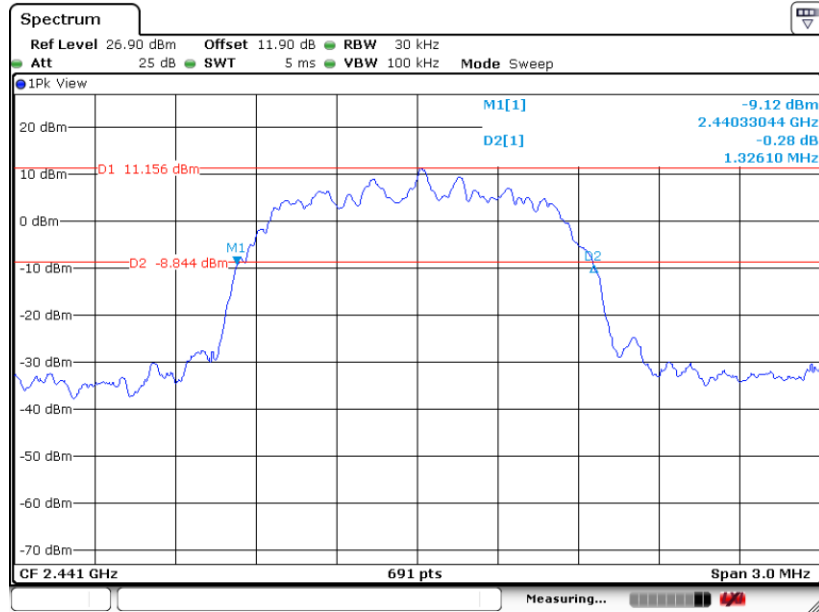
20 dB Bandwidth Plot on Channel 00



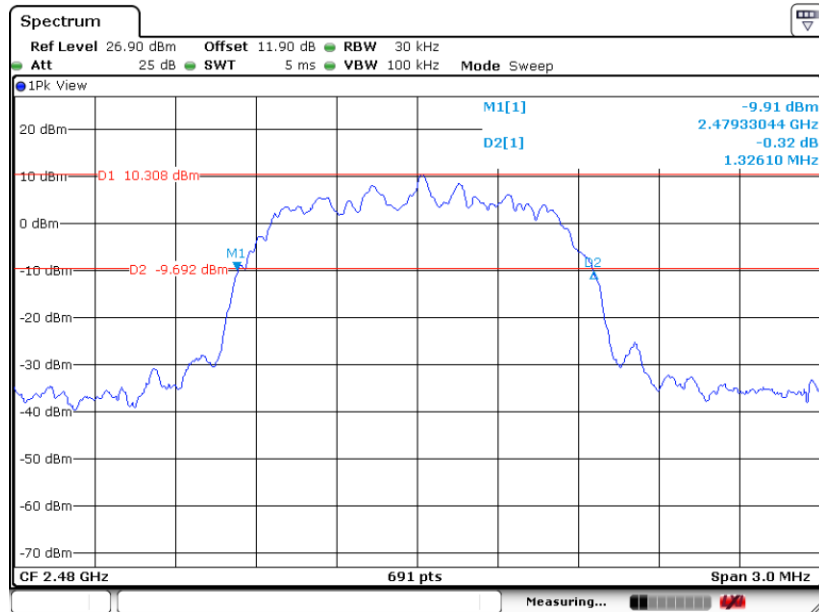
Date: 5 DEC.2023 22:19:05



20 dB Bandwidth Plot on Channel 39



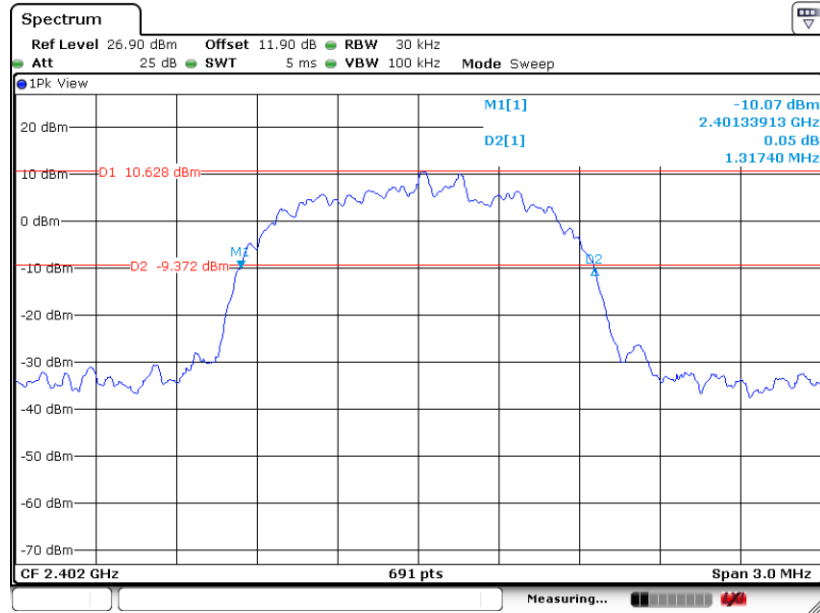
20 dB Bandwidth Plot on Channel 78





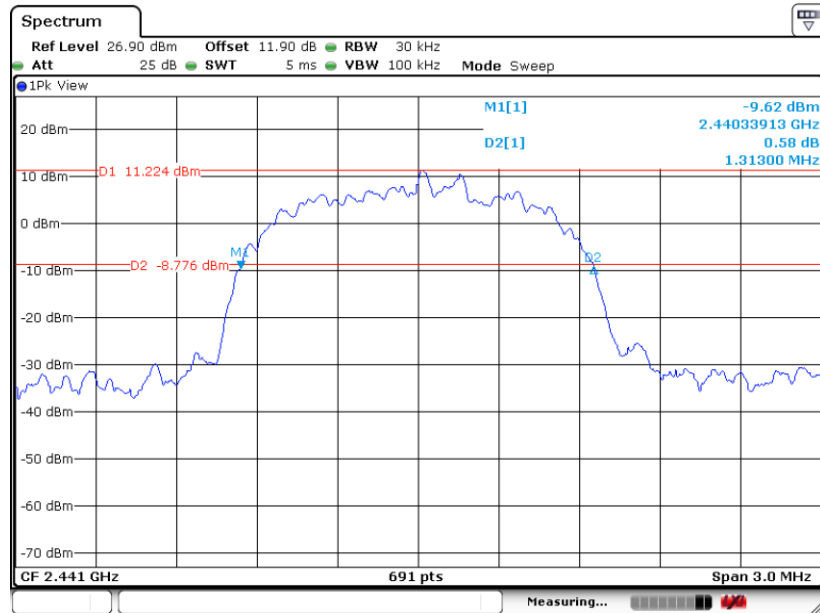
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20 dB Bandwidth Plot on Channel 00



Date: 5 DEC.2023 22:41:07

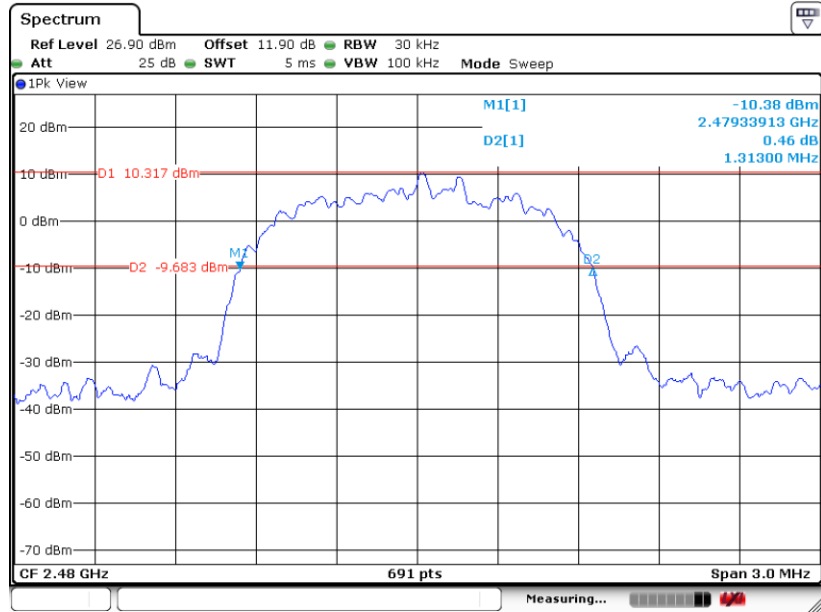
20 dB Bandwidth Plot on Channel 39



Date: 5 DEC.2023 22:45:19



20 dB Bandwidth Plot on Channel 78



Date: 5 DEC.2023 22:48:48