

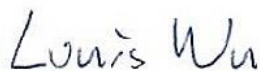


FCC RADIO TEST REPORT

FCC ID : A4RG9FPL
Equipment : Phone
Model Name : G9FPL, G0B96
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Standard : FCC Part 15 Subpart C §15.247

The product was received on Nov. 18, 2022 and testing was performed from Nov. 25, 2022 to Dec. 30, 2022. We, Sporton International Inc. Wensan Laboratory, 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 from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.



Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description.....	5
1.1 Product Feature of Equipment Under Test.....	5
1.2 Product Specification of Equipment Under Test.....	6
1.3 Modification of EUT	7
1.4 Testing Location	8
1.5 Applicable Standards.....	8
2 Test Configuration of Equipment Under Test.....	9
2.1 Carrier Frequency Channel	9
2.2 Test Mode.....	10
2.3 Connection Diagram of Test System.....	11
2.4 Support Unit used in test configuration and system	12
2.5 EUT Operation Test Setup	12
2.6 Measurement Results Explanation Example.....	12
3 Test Result.....	13
3.1 Number of Channel Measurement	13
3.2 Hopping Channel Separation Measurement	18
3.3 Dwell Time Measurement.....	31
3.4 20dB and 99% Bandwidth Measurement	36
3.5 Output Power Measurement.....	61
3.6 Conducted Band Edges Measurement.....	62
3.7 Conducted Spurious Emission Measurement	79
3.8 Radiated Band Edges and Spurious Emission Measurement	104
3.9 AC Conducted Emission Measurement.....	108
3.10 Antenna Requirements.....	110
4 List of Measuring Equipment	111
5 Uncertainty of Evaluation.....	112
Appendix A. Conducted Test Results	
Appendix B. AC Conducted Emission Test Result	
Appendix C. Radiated Spurious Emission	
Appendix D. Radiated Spurious Emission Plots	
Appendix E. Duty Cycle Plots	
Appendix F. Setup Photographs	



History of this test report

Report No.	Version	Description	Issue Date
FR262403-04A	01	Initial issue of report	Feb. 23, 2023
FR262403-04A	02	1. Revise Antenna Directional Gain 2. Revise Product Specification of Equipment Under Test 3. Revise Appendix D 4. Revise Comments and Explanations	Mar. 08, 2023

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(1)	Number of Channels	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	Pass	-
3.4	2.1049	99% Occupied Bandwidth	Reporting only	-
3.5	15.247(b)(1) 15.247(b)(4)	Peak Output Power	Pass	-
3.6	15.247(d)	Conducted Band Edges	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	12.21 dB under the limit at 954.500 MHz
3.9	15.207	AC Conducted Emission	Pass	16.49 dB under the limit at 1.394 MHz
3.10	15.203	Antenna Requirement	Pass	-

Declaration of Conformity:

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- The measurement uncertainty please refer to report "Uncertainty of Evaluation".

Comments and Explanations:

- The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.
- The G9FPL and G0B96 are 100% identical in Hardware / Software to each other, and only have different model names for separate marketing purposes. The test samples are all model G9FPL.

Reviewed by: William Chen

Report Producer: Doris Chen



1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Phone
Model Name	G9FPL, G0B96
FCC ID	A4RG9FPL
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/5G NR/NFC/GNSS/UWB/ WPT Client WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE

Remark: The above EUT's information was declared by manufacturer.

EUT Information List	
S/N	Performed Test Item
2A311FDHS00011	RF Conducted Measurement
2B021FDHS00023	Radiated Spurious Emission
2B021FDHS0002Y	Conducted Emission

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard		
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	<Ant. 3> Bluetooth BR(1Mbps): 20.50 dBm (0.1012 W) Bluetooth EDR (2Mbps): 20.49 dBm (0.1119 W) Bluetooth EDR (3Mbps): 20.45 dBm (0.1109 W) <Ant. 4> Bluetooth BR(1Mbps): 20.70 dBm (0.1175 W) Bluetooth EDR (2Mbps): 20.81 dBm (0.1205 W) Bluetooth EDR (3Mbps): 20.05 dBm (0.1012 W) MIMO <Ant. 3+4> Bluetooth BR(1Mbps): 20.94 dBm (0.1242 W) Bluetooth EDR (2Mbps): 20.08 dBm (0.1019 W) Bluetooth EDR (3Mbps): 20.46 dBm (0.1112 W)	
99% Occupied Bandwidth	<Ant. 3> Bluetooth BR(1Mbps): 0.906 MHz Bluetooth EDR (2Mbps): 1.181 MHz Bluetooth EDR (3Mbps): 1.160 MHz <Ant. 4> Bluetooth BR(1Mbps): 0.908 MHz Bluetooth EDR (2Mbps): 1.181 MHz Bluetooth EDR (3Mbps): 1.161 MHz MIMO <Ant. 3+4> Bluetooth BR(1Mbps): 0.906 MHz Bluetooth EDR (2Mbps): 1.181 MHz Bluetooth EDR (3Mbps): 1.161 MHz	
Antenna Type / Gain <Open Mode>	<Ant. 3> : Coupling feed Antenna with gain -3.20 dBi <Ant. 4> : IFA Antenna with gain -2.10 dBi	
Antenna Type / Gain <Close Mode>	<Ant. 3> : Coupling feed Antenna with gain -4.30 dBi <Ant. 4> : IFA Antenna with gain -4.70 dBi	
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK	
Antenna Function Description		

Remark:

1. MIMO Ant. 3+4 Directional Gain is a calculated result from MIMO Ant. 3 and MIMO Ant. 4. The formula used in calculation is documented in section 1.2.1.
2. Power of MIMO Ant. 3 + Ant. 4 is a calculated result from sum of the power MIMO Ant. 3 and MIMO Ant. 4.
3. The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.2.1 Antenna Directional Gain

<For CDD Mode>

Follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)ii)

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows:

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

G_{ANT} is set equal to the gain of the antenna having the highest gain.

The directional gain "DG" is calculated as following table.

			DG	Power
			for	Limit
	Ant. 3	Ant. 4	Power	Reduction
	(dBi)	(dBi)	(dBi)	(dB)
Bluetooth	-3.20	-2.10	-2.10	0.00

Calculation example:

If a device has two antenna, $G_{ANT1} = -3.20\text{dBi}$; $G_{ANT2} = -2.10\text{dBi}$

Directional gain of power measurement = $\max(-3.20, -2.10) + 0 = -2.10\text{ dBi}$

Power limit reduction = Composite gain – 6dBi, (min = 0)

Note: The antenna gain is from both open mode and close mode with highest number.

1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No. CO05-HY(TAF Code: 1190)
Remark	The Conducted Emission test item subcontracted to Sporton International Inc. EMC & Wireless Communications Laboratory.

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No. TH05-HY, 03CH16-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW3786

1.5 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. 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

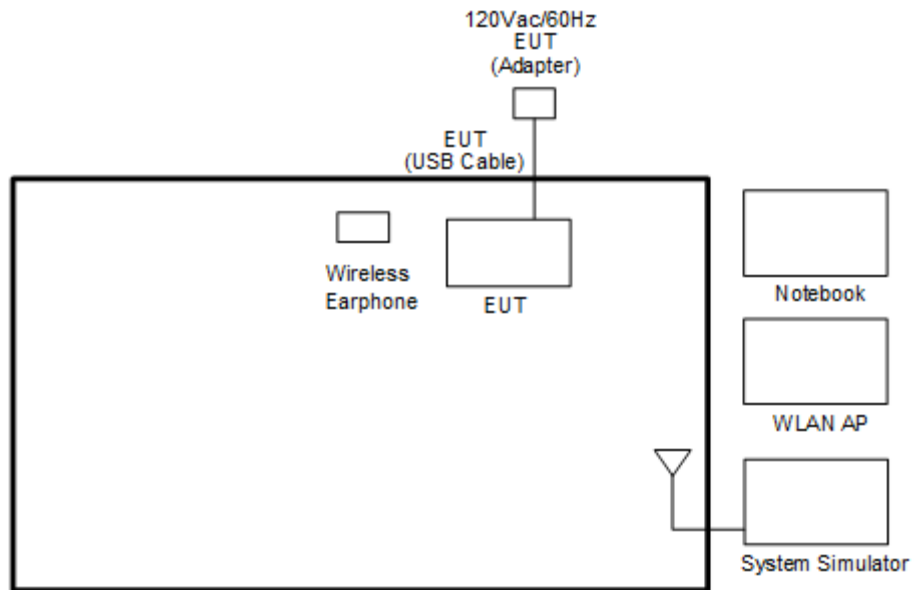
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT (open and close) and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and accessory (Adapter or Earphone) and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst plane, and the worst mode of radiated spurious emissions is Bluetooth 2Mbps 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.

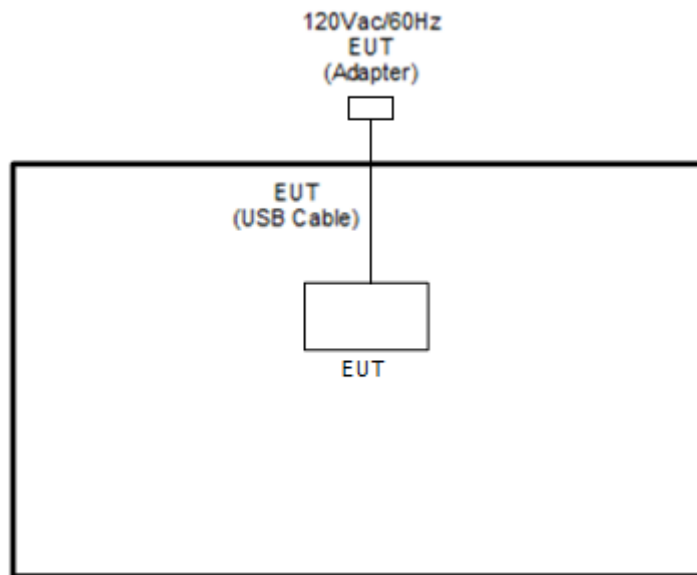
Summary table of Test Cases			
Test Item	Data Rate / Modulation		
Conducted Test Cases	Bluetooth BR 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
	Mode 1: CH00_2402 MHz	Mode 4: CH00_2402 MHz	Mode 7: CH00_2402 MHz
	Mode 2: CH39_2441 MHz	Mode 5: CH39_2441 MHz	Mode 8: CH39_2441 MHz
	Mode 3: CH78_2480 MHz	Mode 6: CH78_2480 MHz	Mode 9: CH78_2480 MHz
Radiated Test Cases	Bluetooth EDR 2Mbps n/4-DQPSK		
	Mode 1: CH00_2402 MHz		
	Mode 2: CH39_2441 MHz		
	Mode 3: CH78_2480 MHz		
AC Conducted Emission	Mode 1 :GSM850 Idle + WLAN (2.4GHz) Link + Bluetooth Link + USB Cable 1 (Charging from AC Adapter 1)		
Remark:			
1. For Radiated Test Cases, the worst mode data rate 2Mbps was reported only since the highest RF output power in the preliminary tests. The conducted spurious emissions and conducted band edge measurement for other data rates were not worse than 2Mbps, and no other significantly frequencies found in conducted spurious emission.			
2. For Radiated Test Cases, the tests were performed with AC Adapter 2 and USB Cable 2.			
3. During the preliminary test, both charging modes (Adapter mode and WPT client mode) were verified. It is determined that the adaptor mode is the worst case for official test.			

2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



<Bluetooth Tx Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	Wireless Earphone	Google	G1007/G1008	A4RG1007/ A4RG1008	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude 3420	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility "Cmd Version 1.0.39" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

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 4.2 dB and 10 dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\
 &= 4.2 + 10 = 14.2 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 Number of Channel Measurement

Limits of Number of Hopping Frequency

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

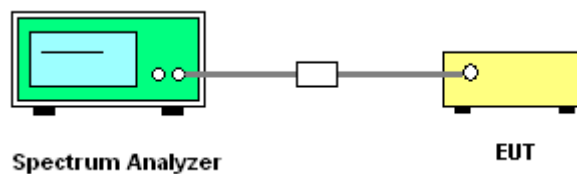
Measuring Instruments

Please refer to the measuring equipment list in this test report.

Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation;
RBW = 300 kHz; 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.

Test Setup

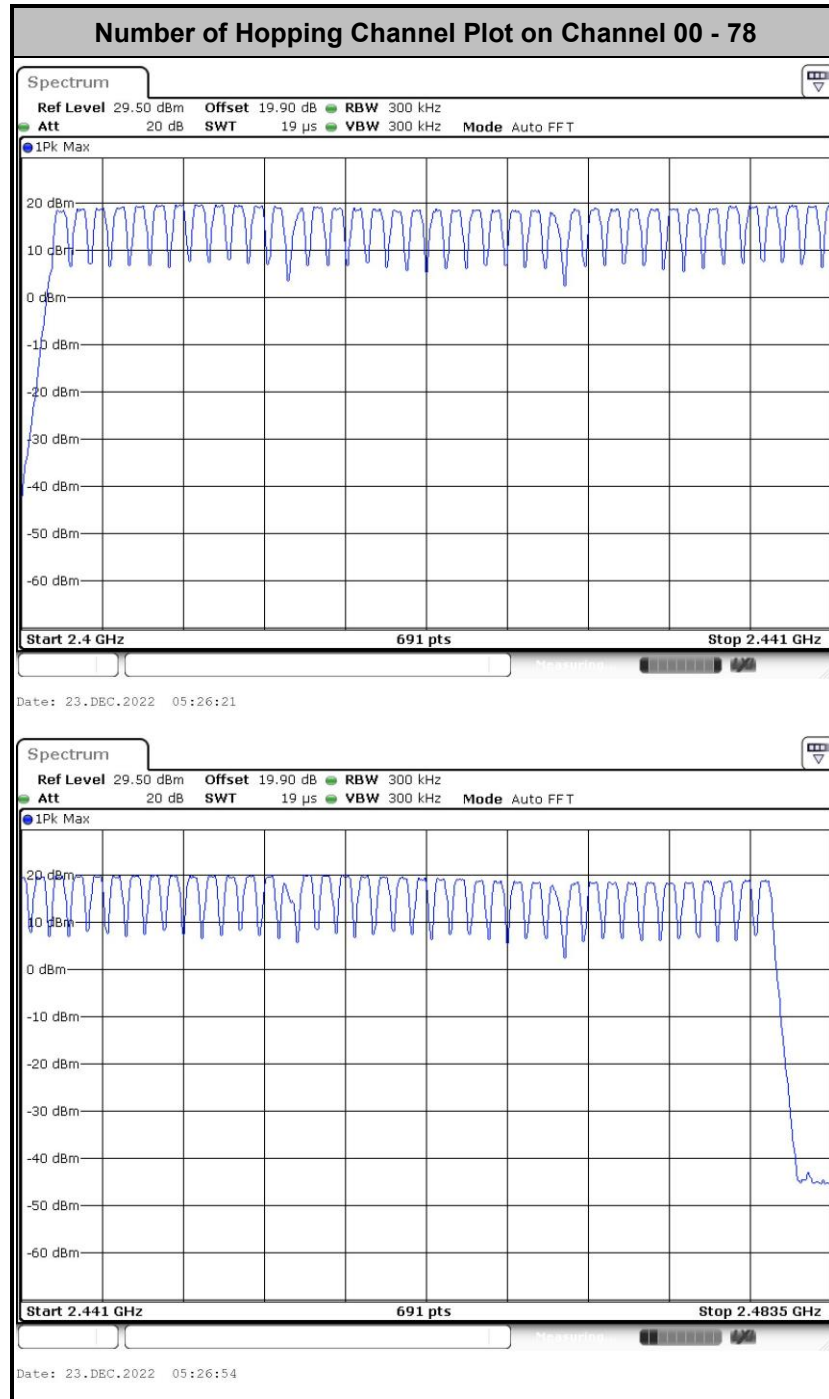




Test Result of Number of Hopping Frequency

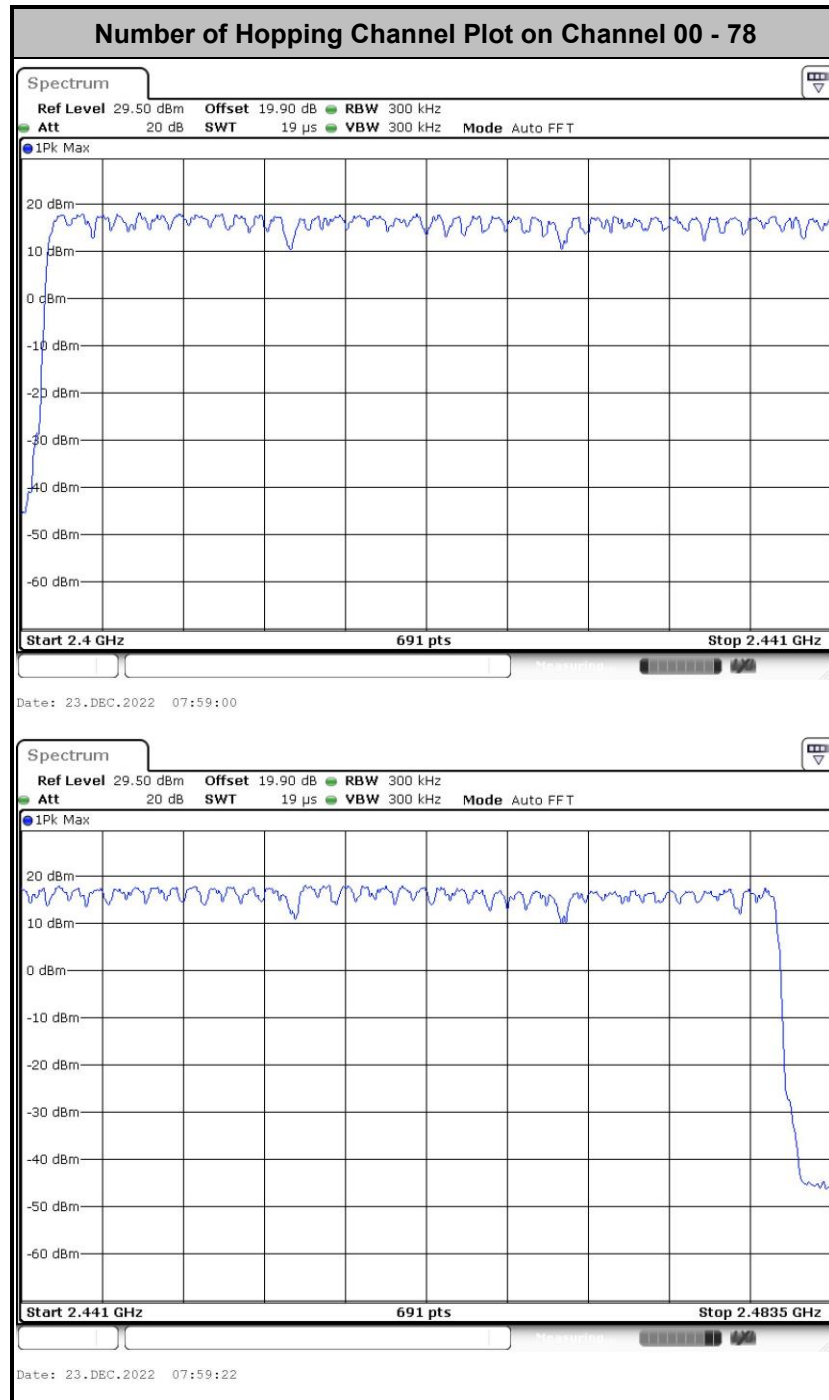
Please refer to Appendix A.

<Ant. 3>



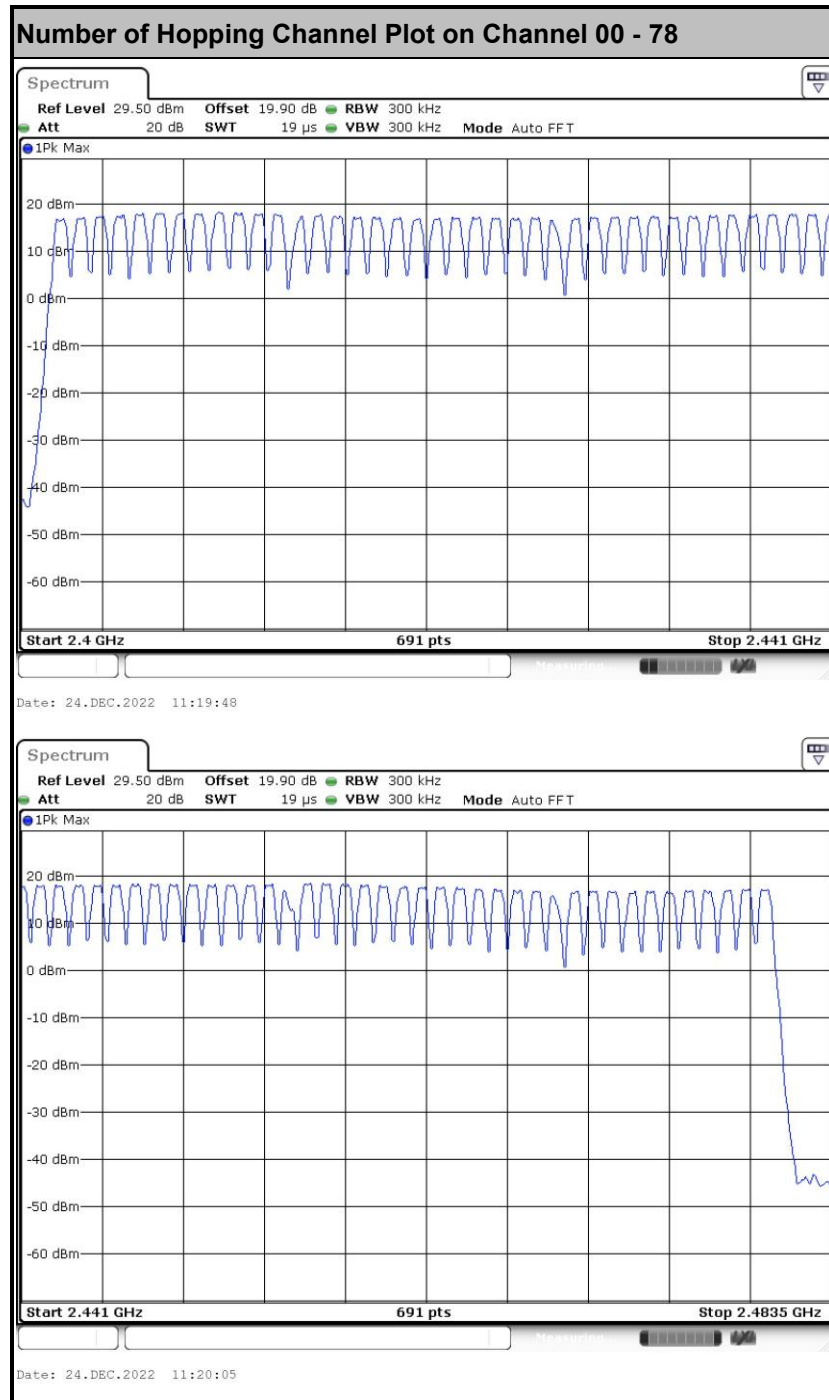


<Ant. 4>



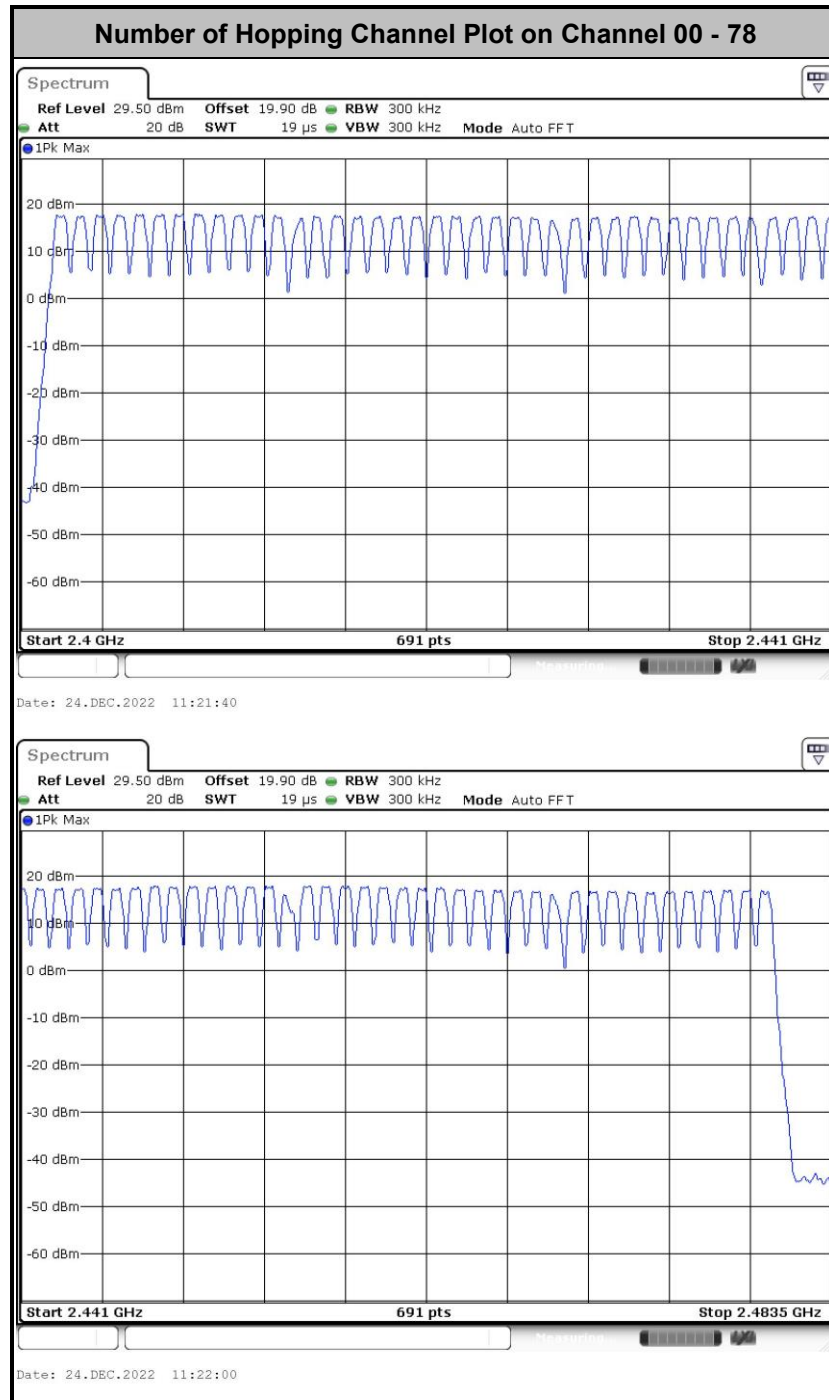


MIMO <Ant. 3>





MIMO <Ant. 4>



3.2 Hopping Channel Separation Measurement

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.

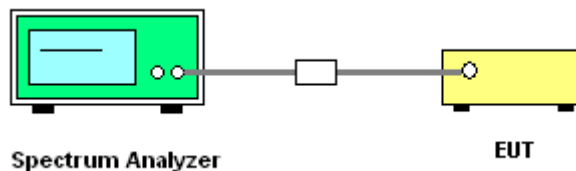
Measuring Instruments

Please refer to the measuring equipment list in this test report.

Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to 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 = 300 kHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

Test Setup



Test Result of Hopping Channel Separation

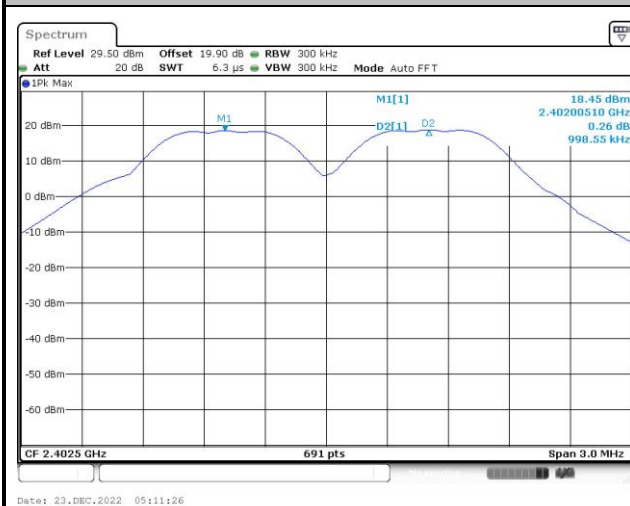
Please refer to Appendix A.



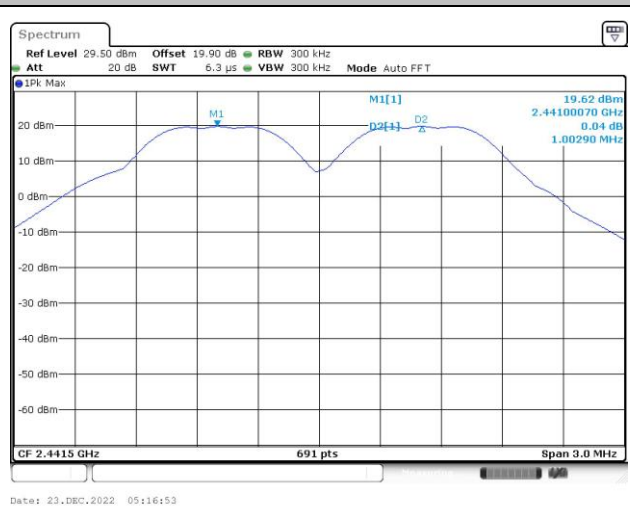
<Ant. 3>

<1Mbps>

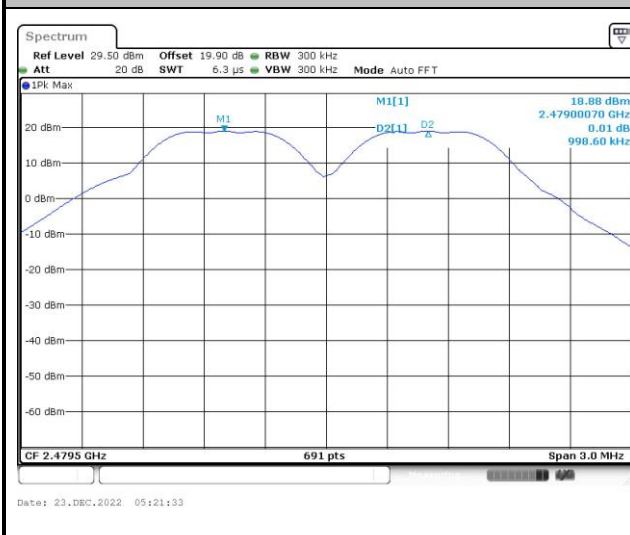
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

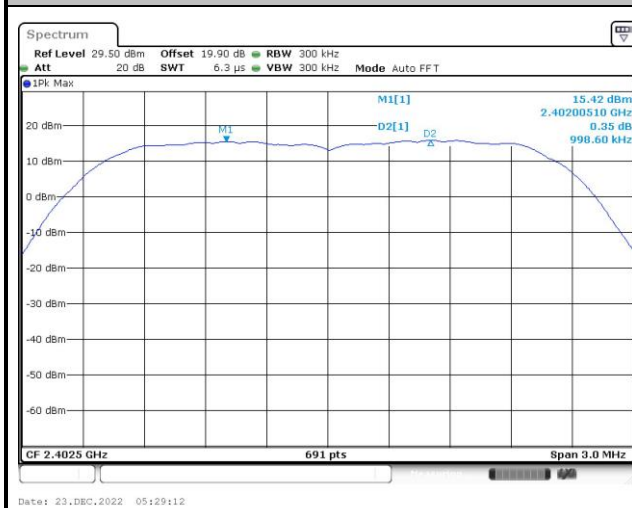


N/A

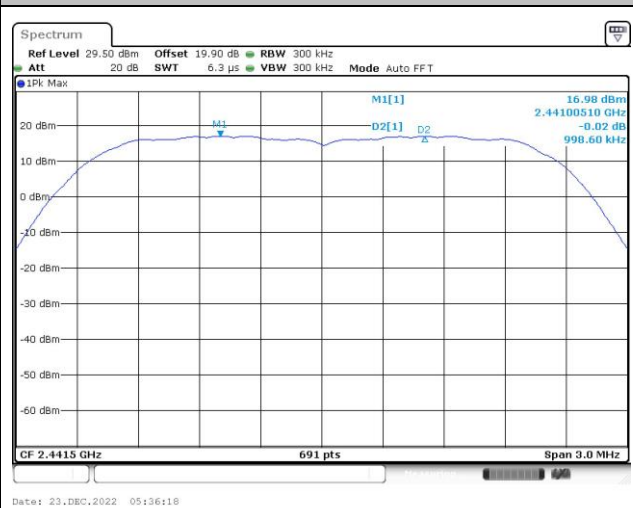


<2Mbps>

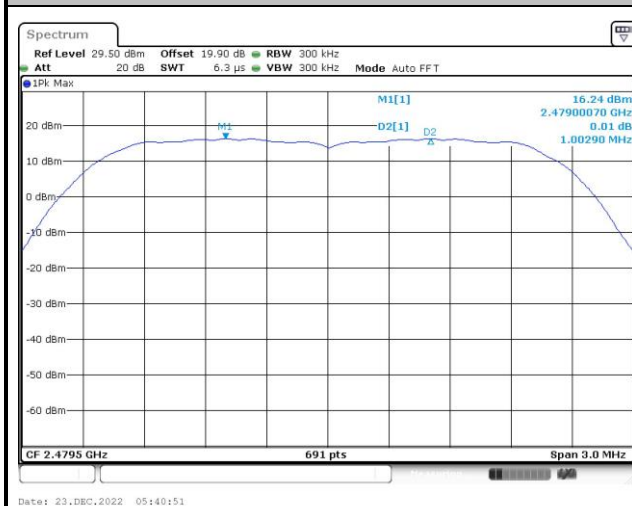
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

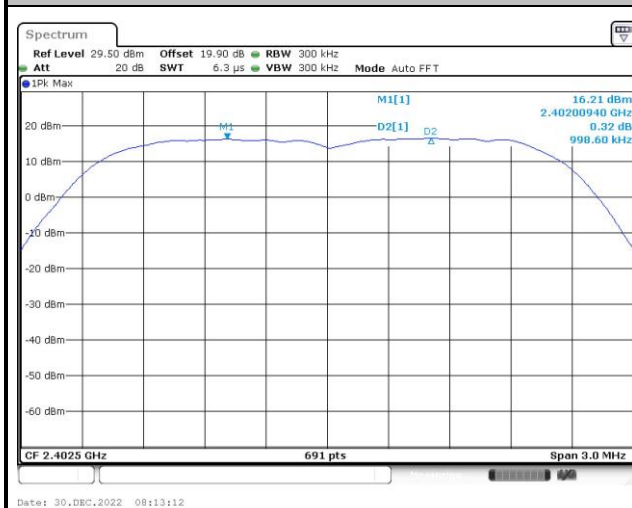


N/A

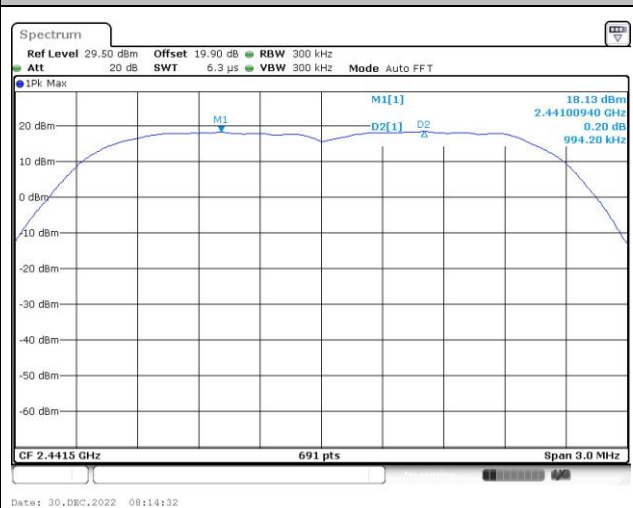


<3Mbps>

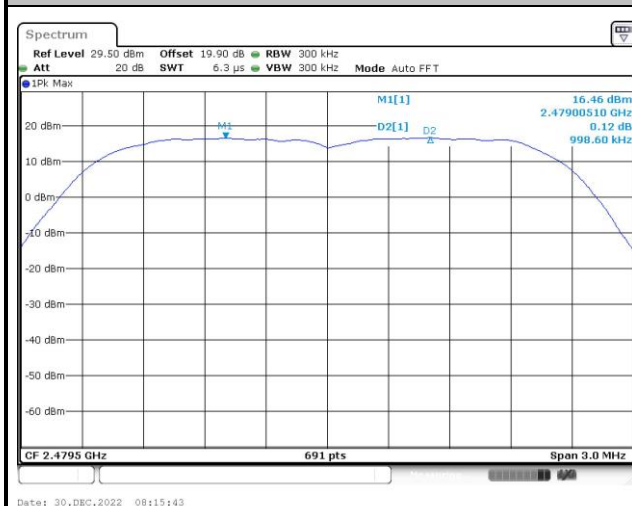
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



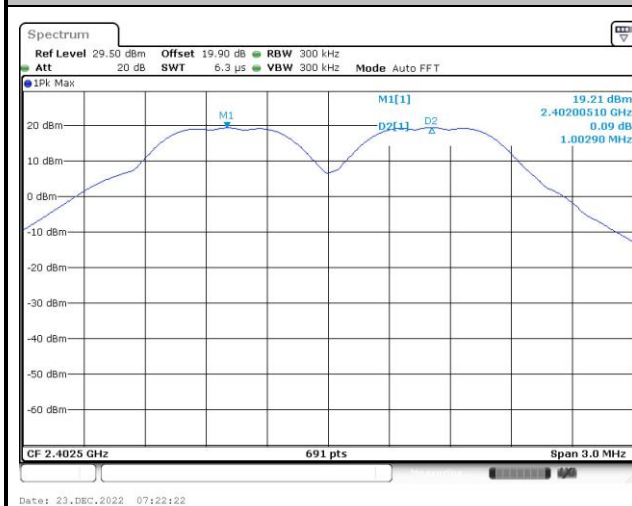
N/A



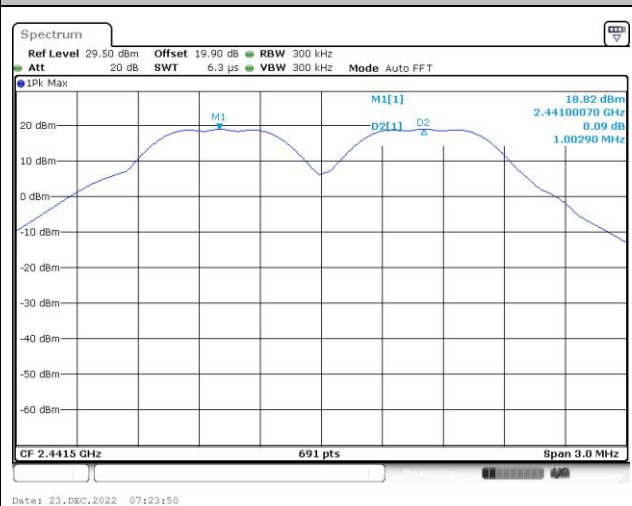
<Ant. 4>

<1Mbps>

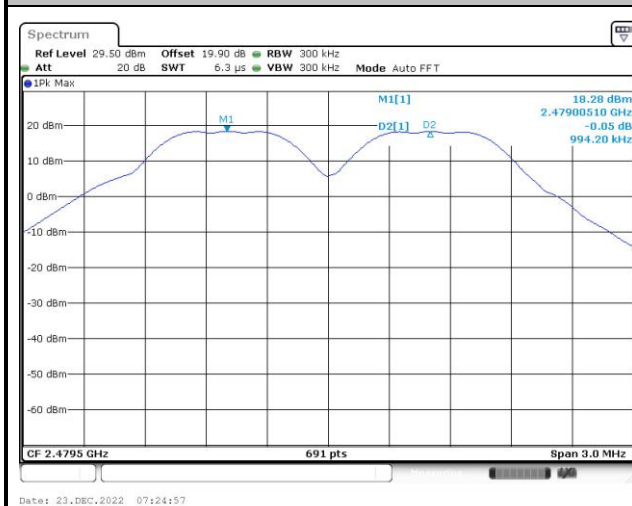
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

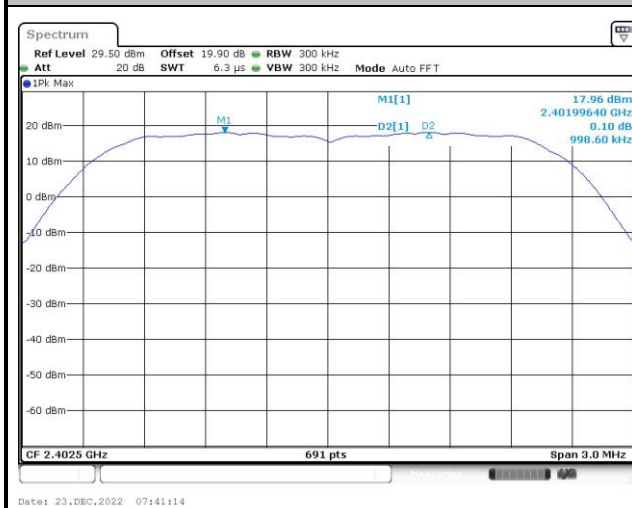


N/A

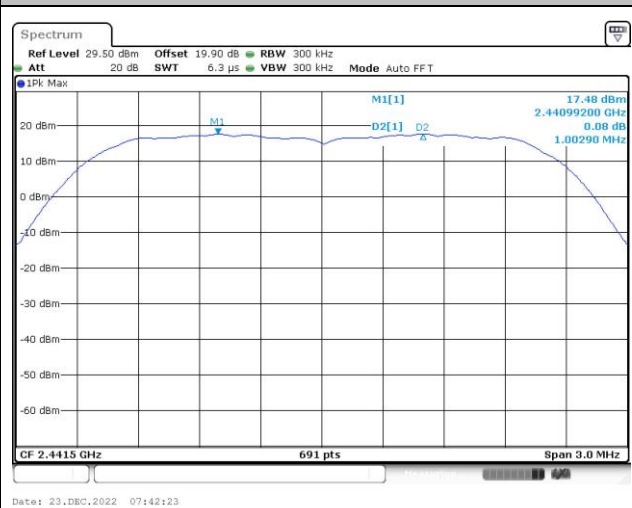


<2Mbps>

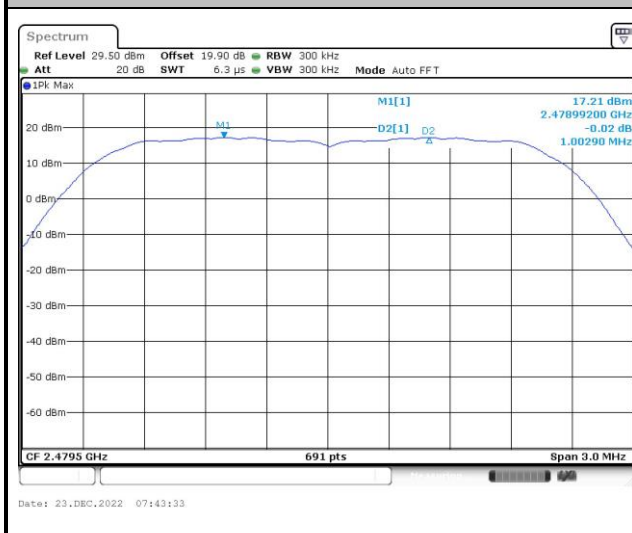
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

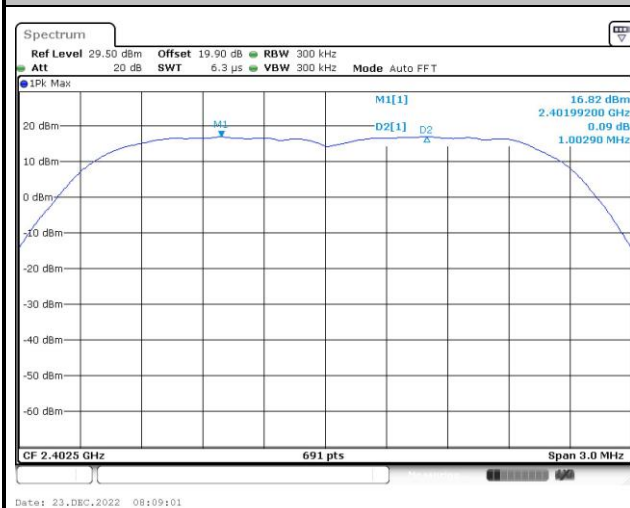


N/A

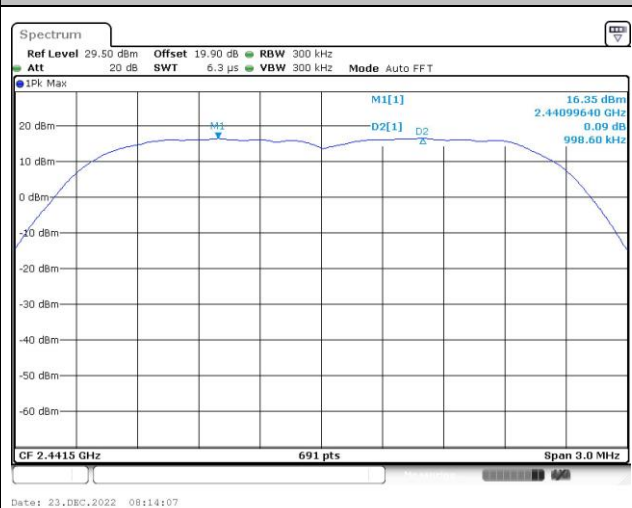


<3Mbps>

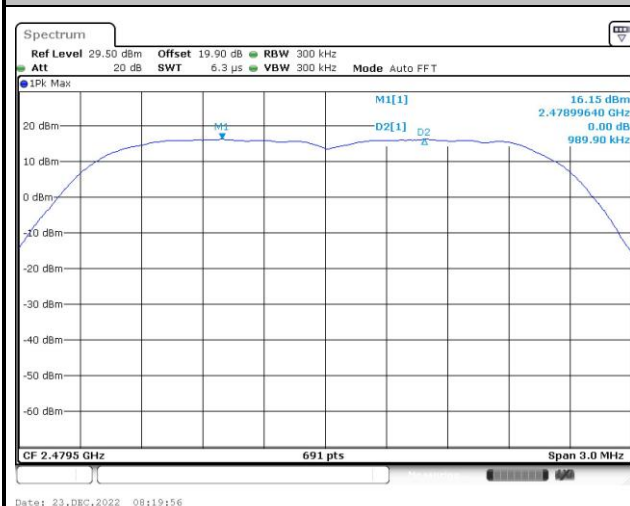
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



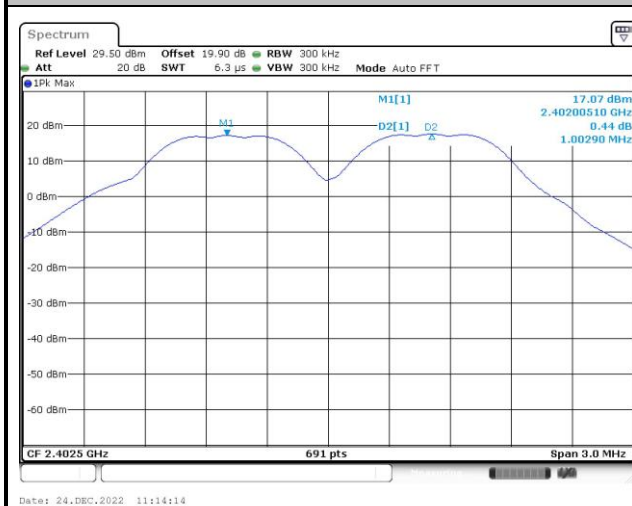
N/A



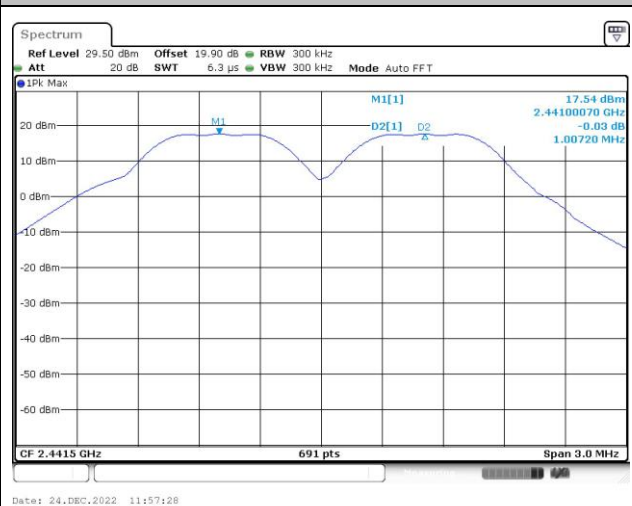
MIMO <Ant. 3>

<1Mbps>

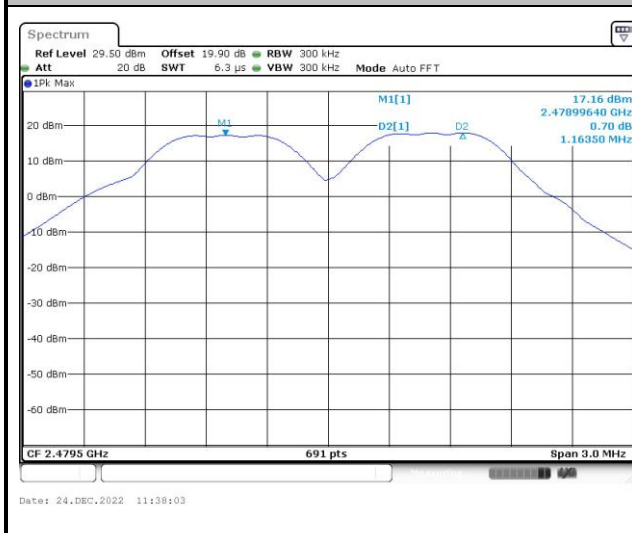
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

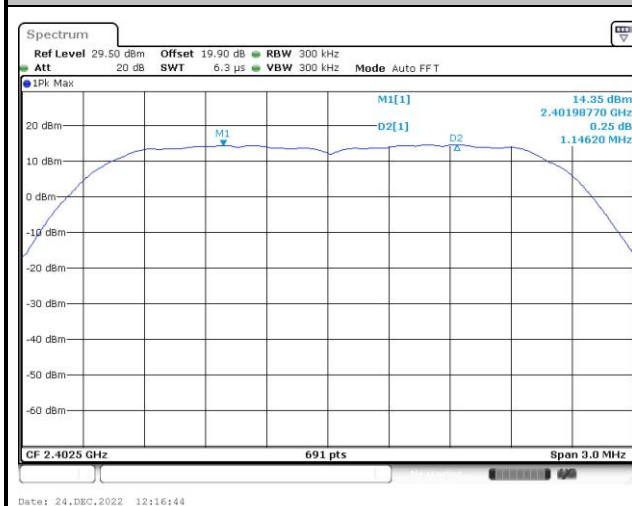


N/A

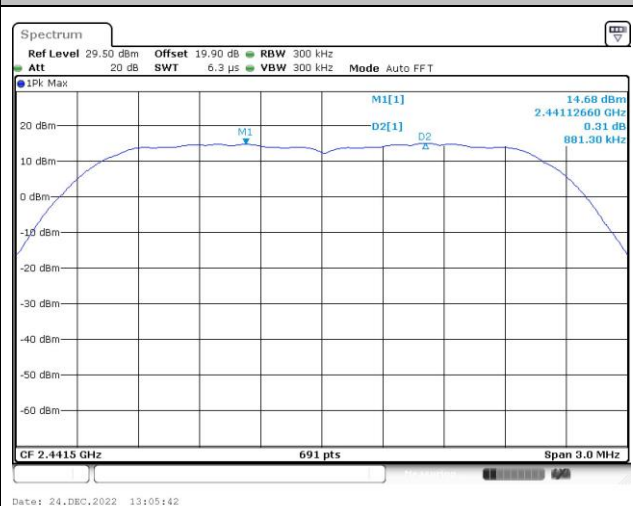


<2Mbps>

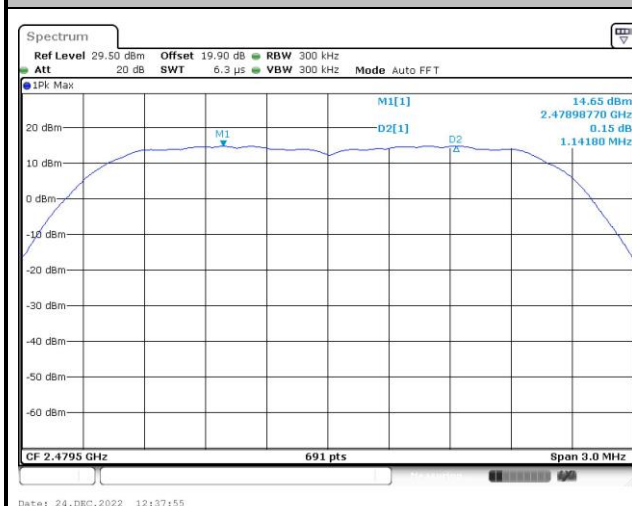
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

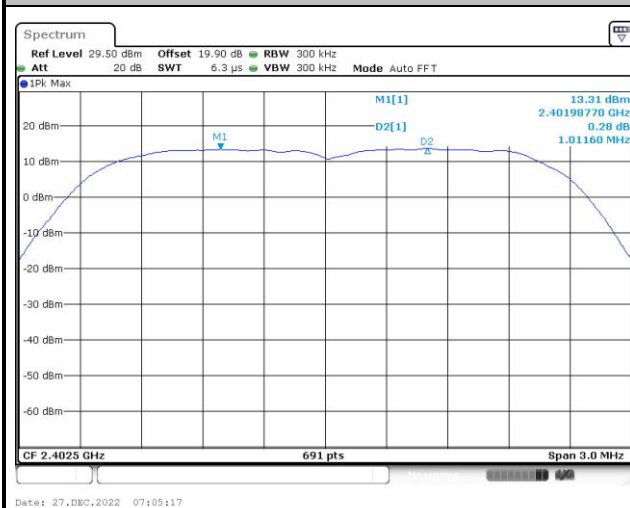


N/A

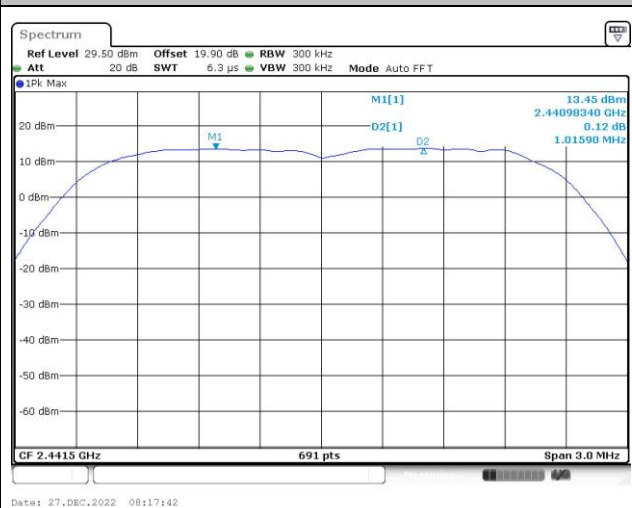


<3Mbps>

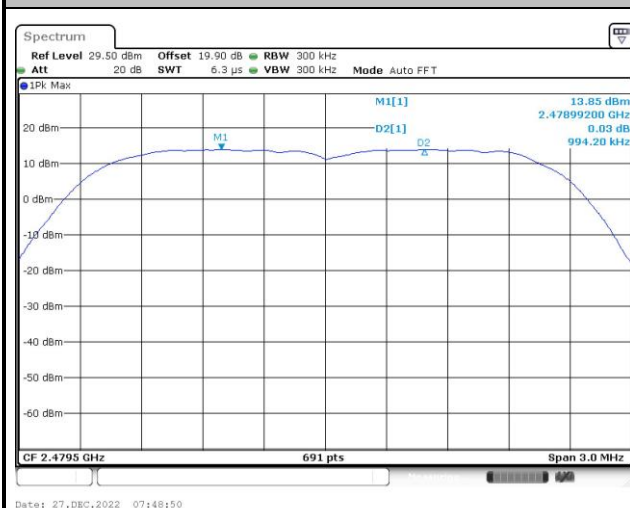
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



N/A



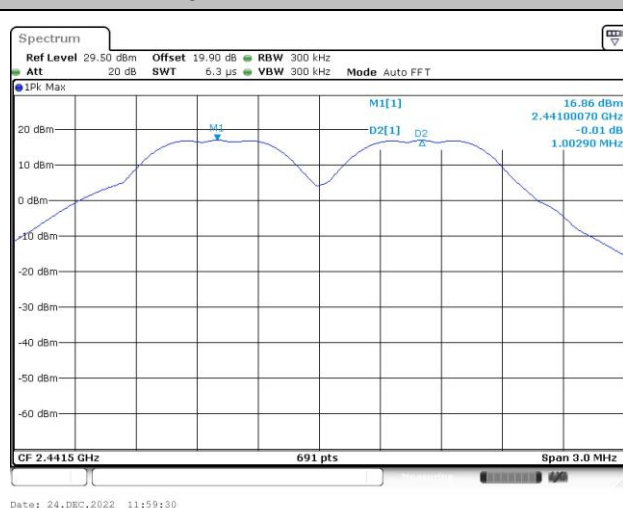
MIMO <Ant. 4>

<1Mbps>

Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

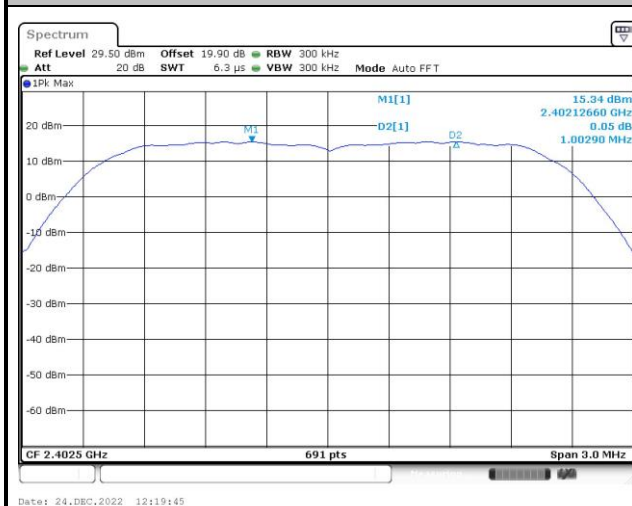


N/A

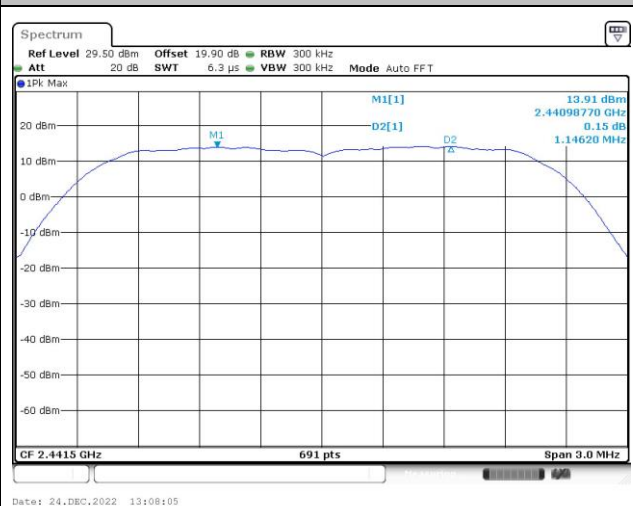


<2Mbps>

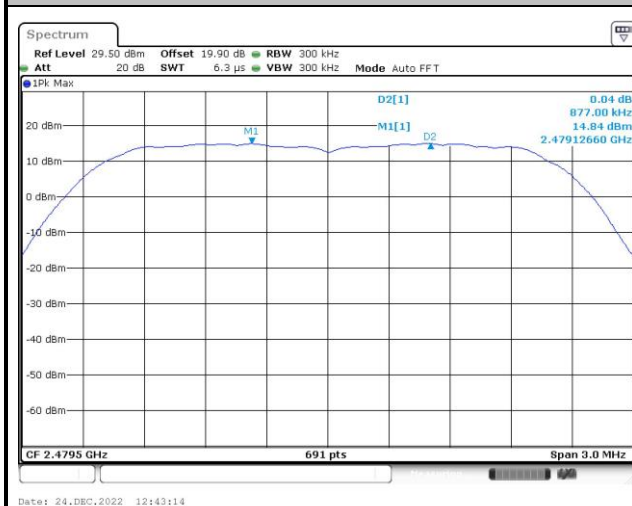
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

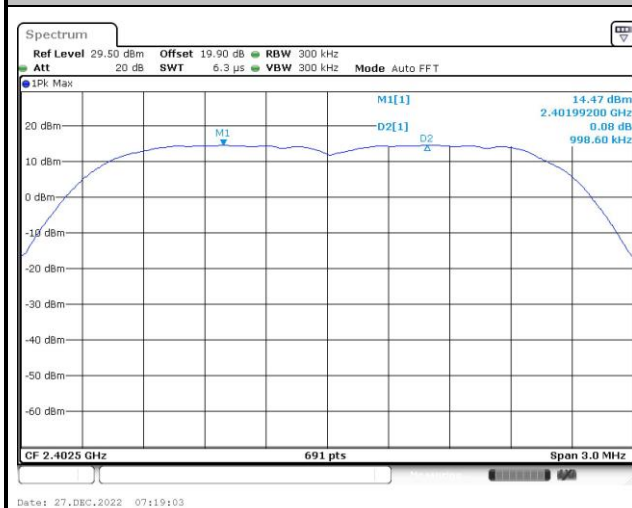


N/A

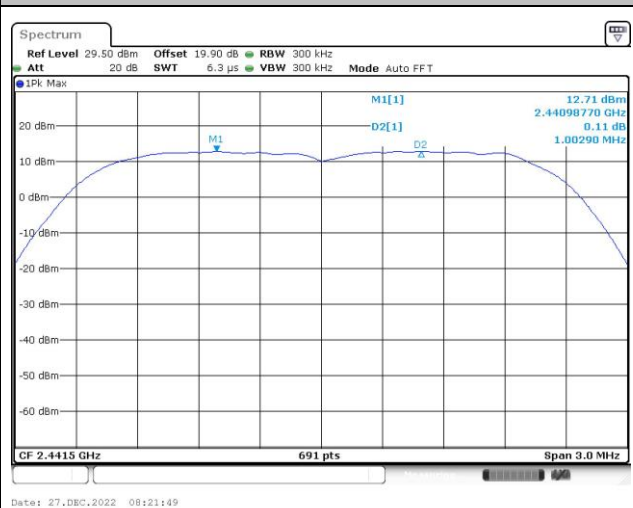


<3Mbps>

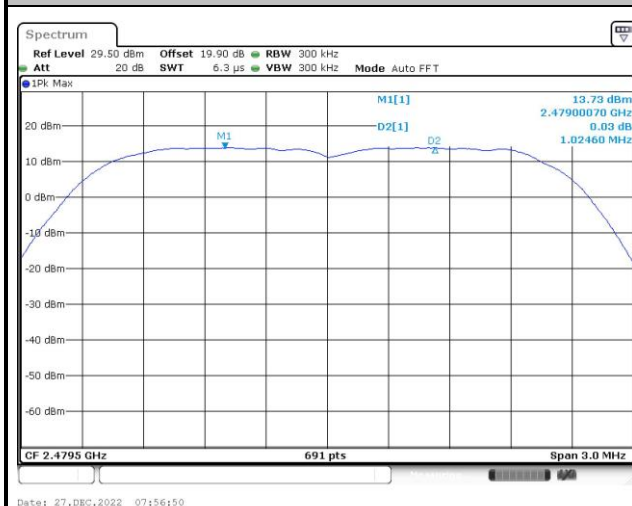
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



N/A

3.3 Dwell Time Measurement

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.

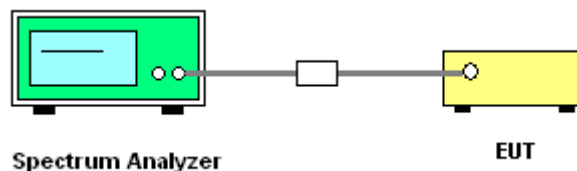
Measuring Instruments

Please refer to the measuring equipment list in this test report.

Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to 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.

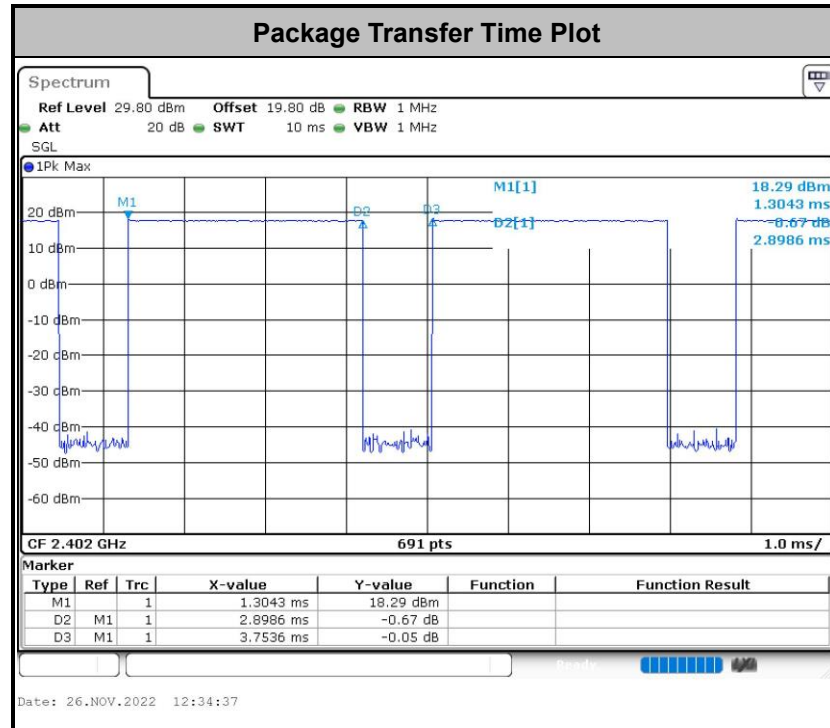
Test Setup



Test Result of Dwell Time

Please refer to Appendix A.

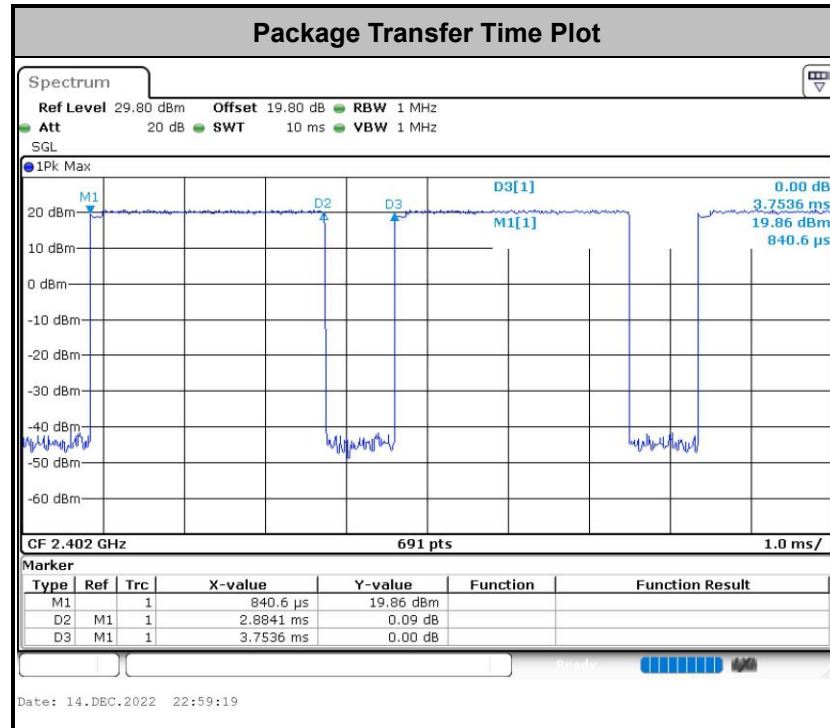
<Ant. 3>



Remark:

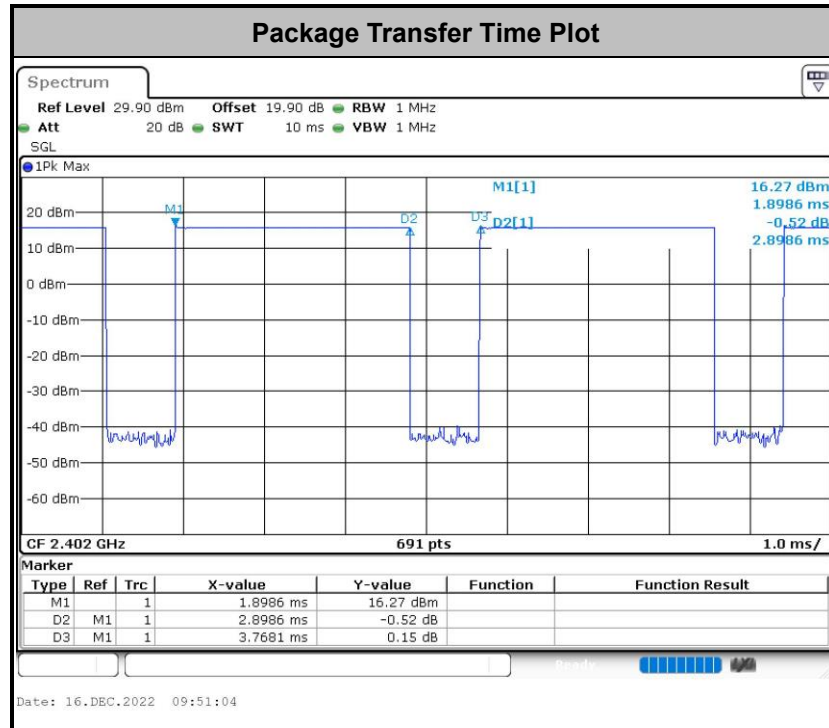
1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 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.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

<Ant. 4>

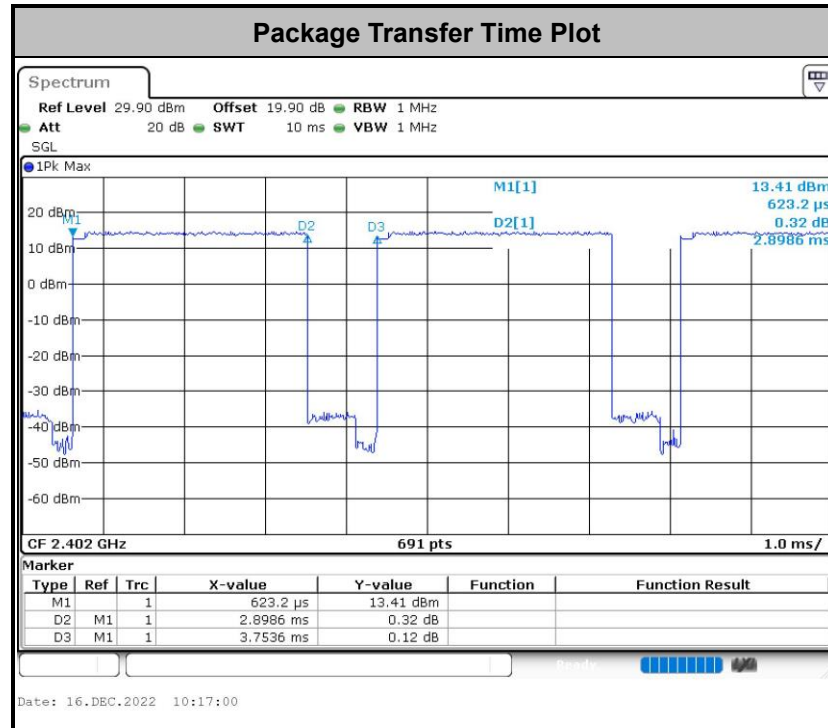


Remark:

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate $(1600 / 6 / 79)$ in Occupancy Time Limit (0.4×79) (s), Hops Over Occupancy Time comes to $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$ hops.
2. 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 (0.4×20) (s), Hops Over Occupancy Time comes to $(800 / 6 / 20) \times (0.4 \times 20) = 53.33$ hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

MIMO <Ant. 3>

Remark:

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate $(1600 / 6 / 79)$ in Occupancy Time Limit (0.4×79) (s), Hops Over Occupancy Time comes to $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$ hops.
2. 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 (0.4×20) (s), Hops Over Occupancy Time comes to $(800 / 6 / 20) \times (0.4 \times 20) = 53.33$ hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

MIMO <Ant. 4>

Remark:

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate $(1600 / 6 / 79)$ in Occupancy Time Limit (0.4×79) (s), Hops Over Occupancy Time comes to $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$ hops.
2. 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 (0.4×20) (s), Hops Over Occupancy Time comes to $(800 / 6 / 20) \times (0.4 \times 20) = 53.33$ hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

3.4 20dB and 99% Bandwidth Measurement

Limit of 20dB and 99% Bandwidth

Reporting only

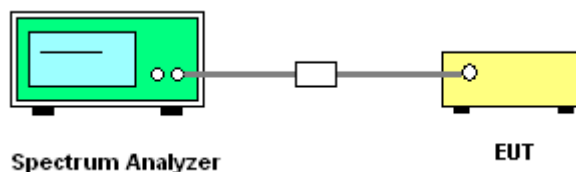
Measuring Instruments

Please refer to the measuring equipment list in this test report.

Test Procedures

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

Test Setup



Test Result of 20dB Bandwidth

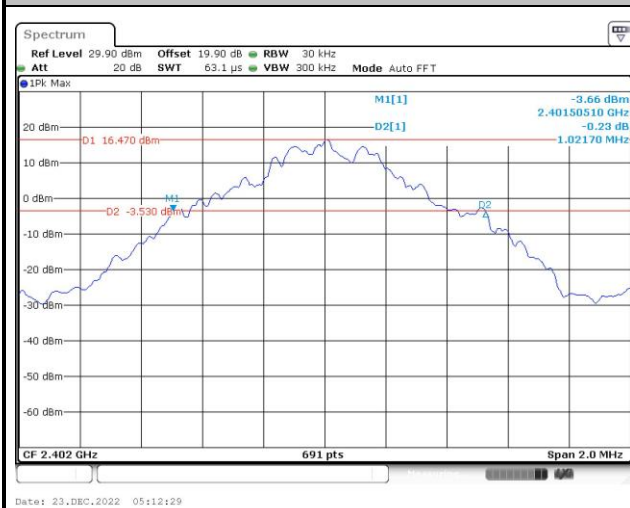
Please refer to Appendix A.



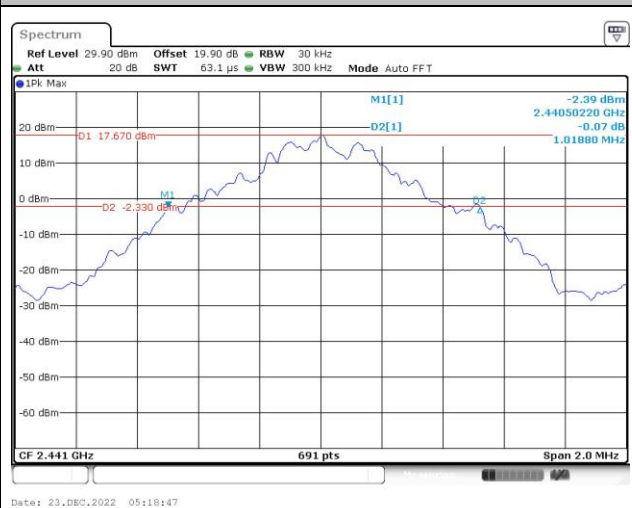
<Ant. 3>

<1Mbps>

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

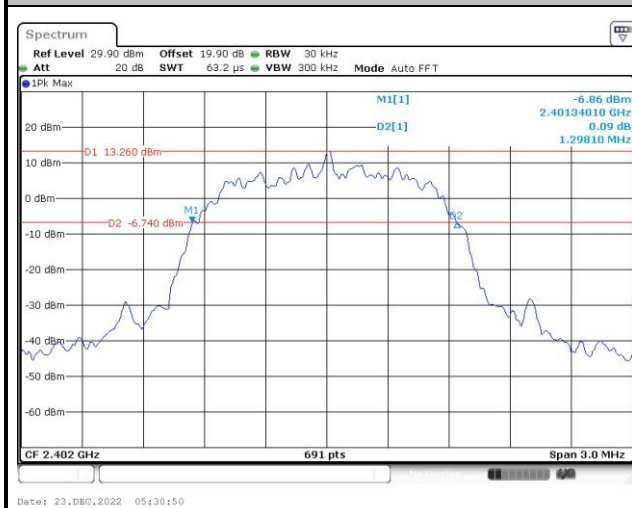


N/A

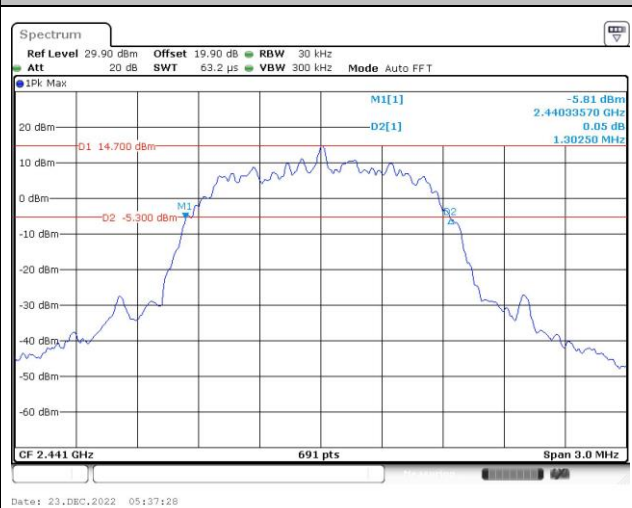


<2Mbps>

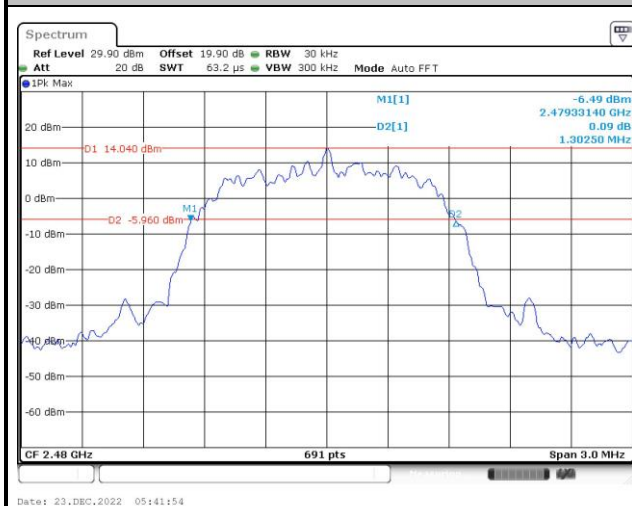
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

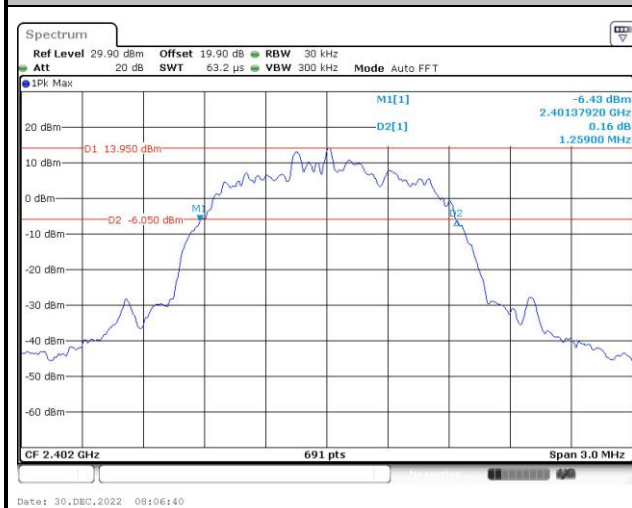


N/A

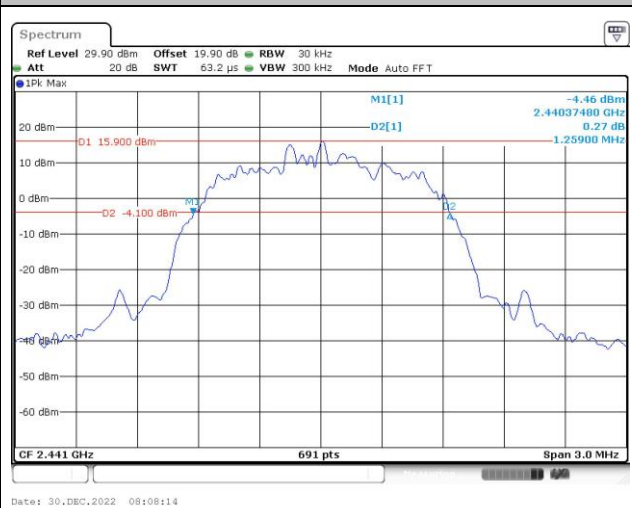


<3Mbps>

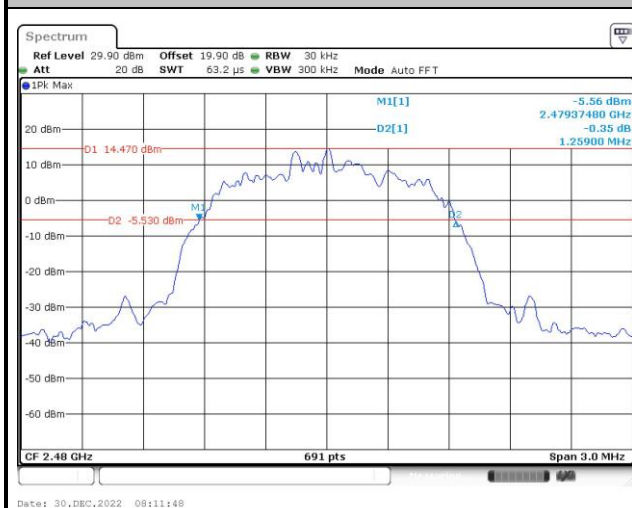
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



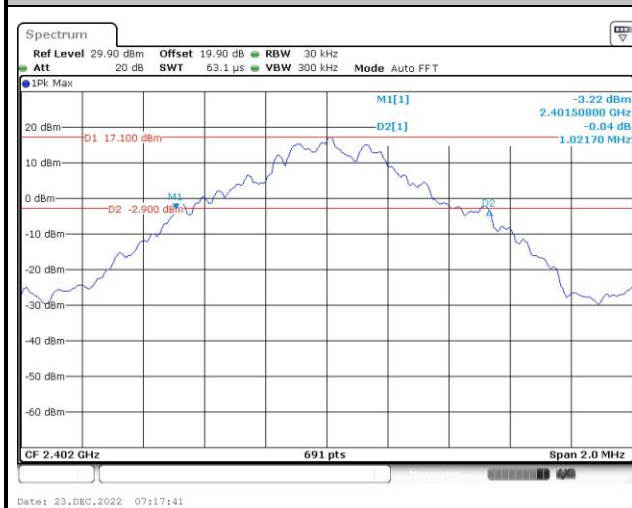
N/A



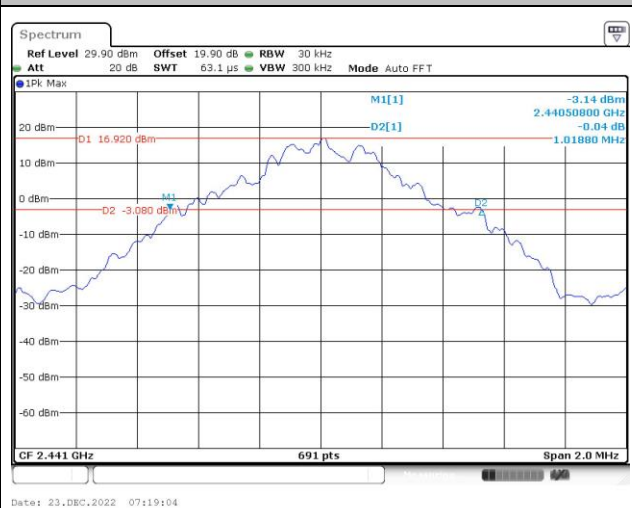
<Ant. 4>

<1Mbps>

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

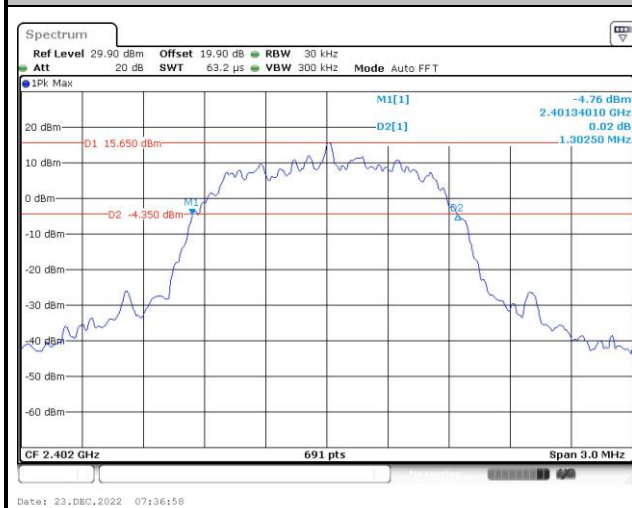


N/A

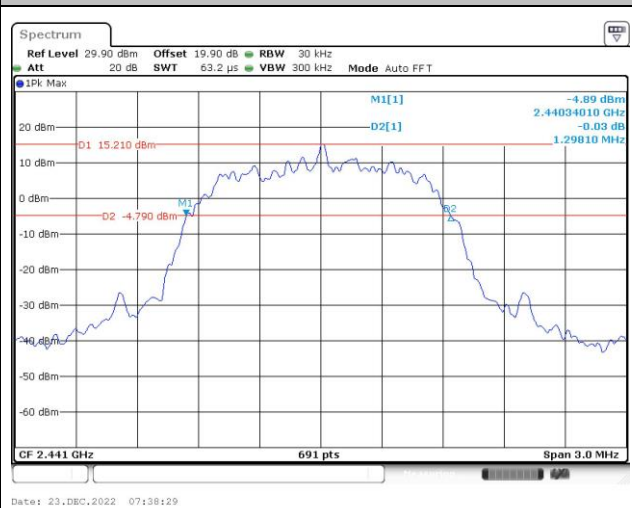


<2Mbps>

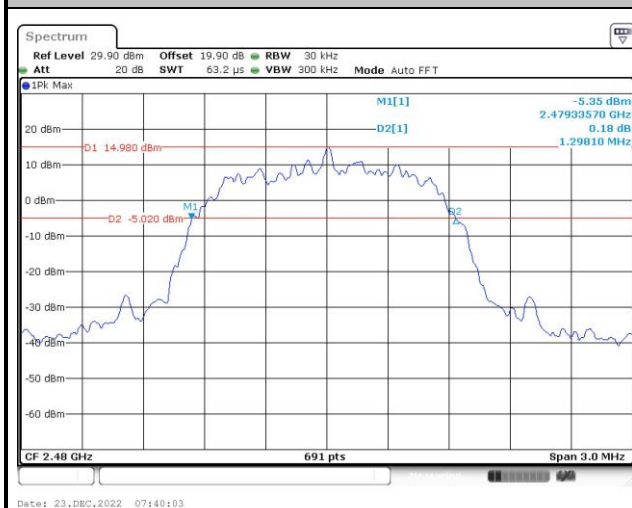
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

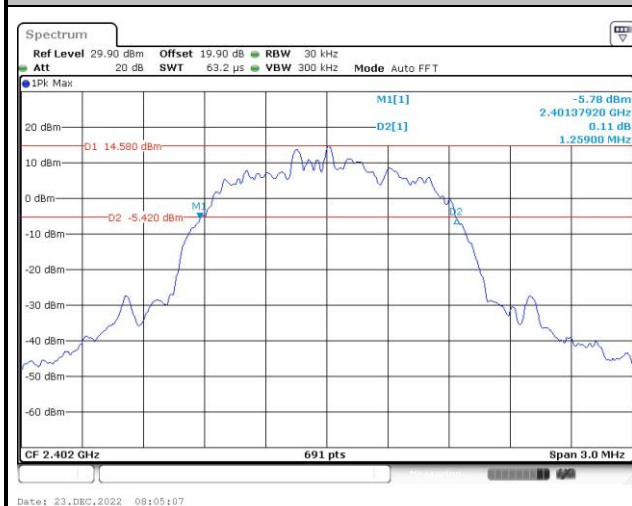


N/A

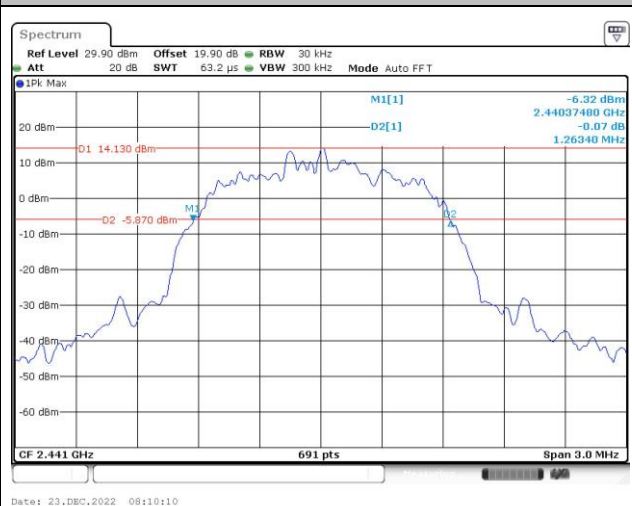


<3Mbps>

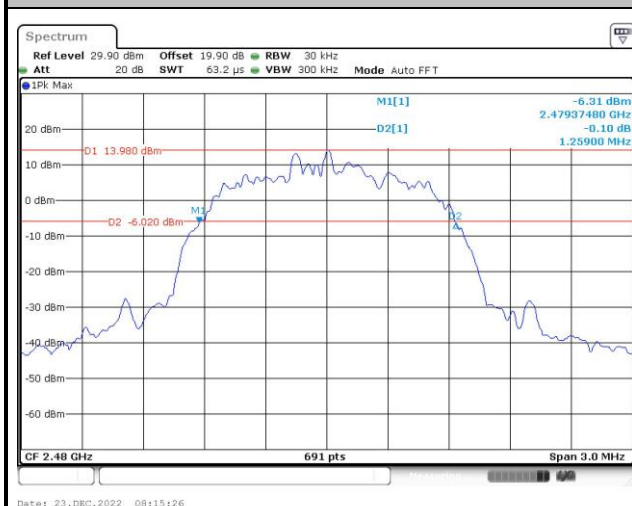
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



N/A



MIMO <Ant. 3>

<1Mbps>

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



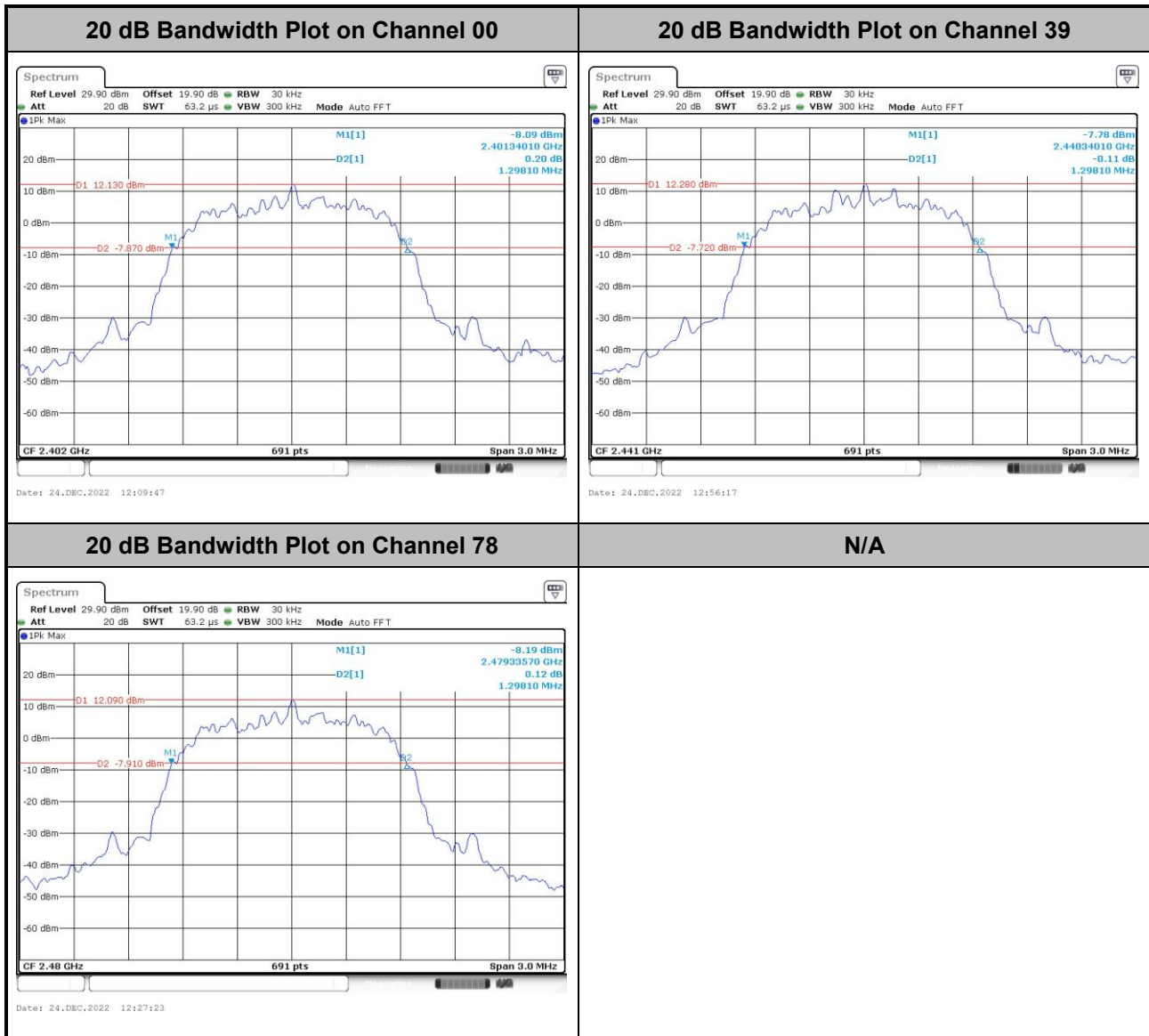
20 dB Bandwidth Plot on Channel 78



N/A



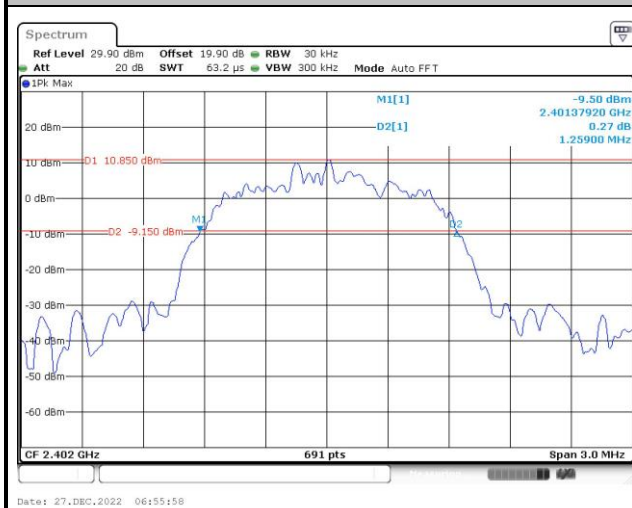
<2Mbps>



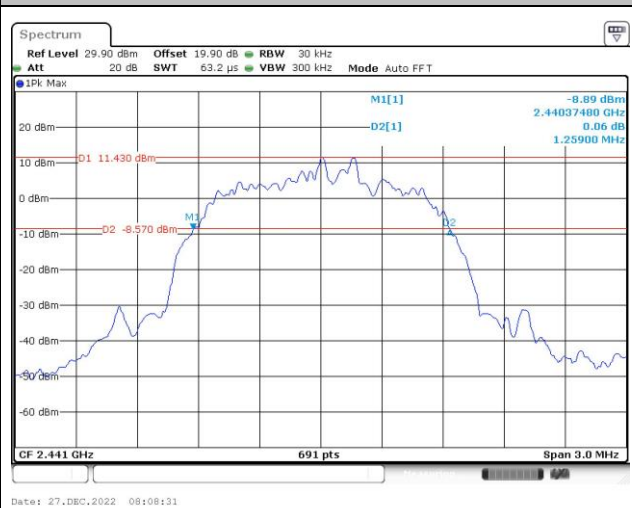


<3Mbps>

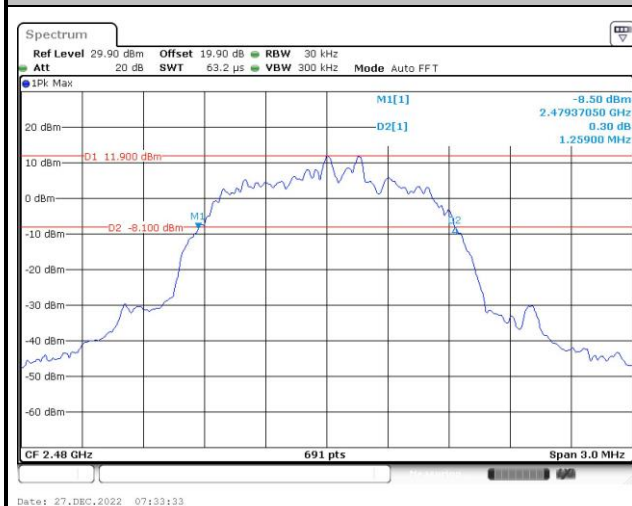
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



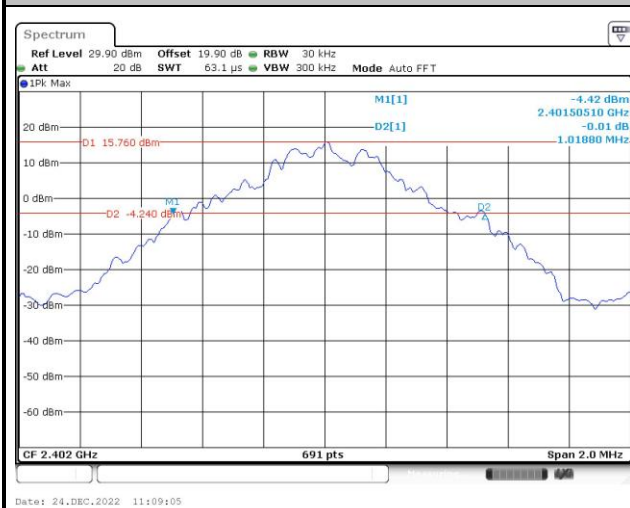
N/A



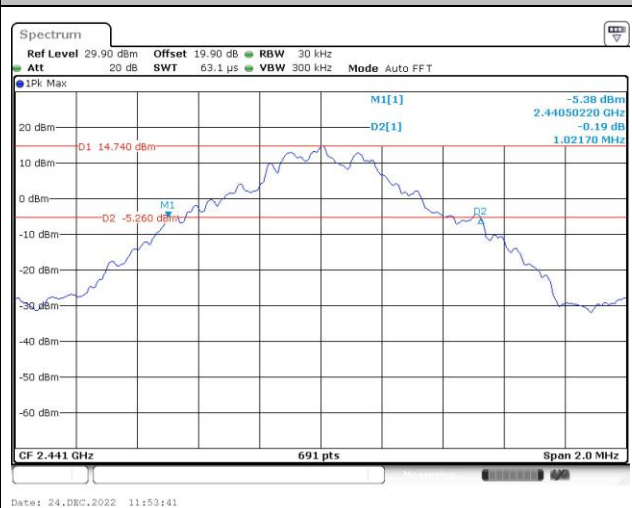
MIMO <Ant. 4>

<1Mbps>

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

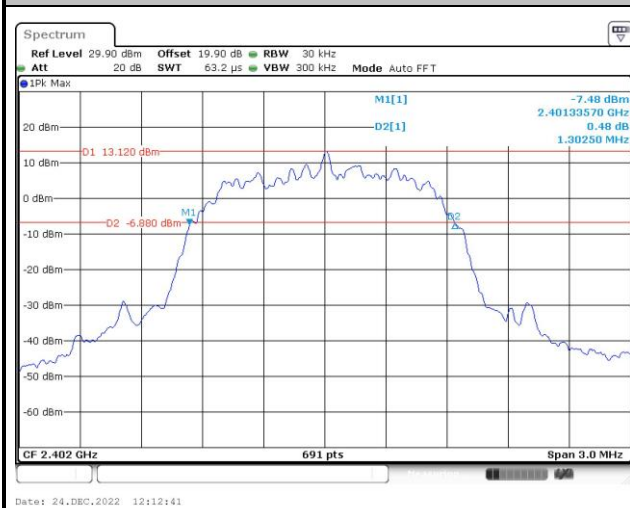


N/A

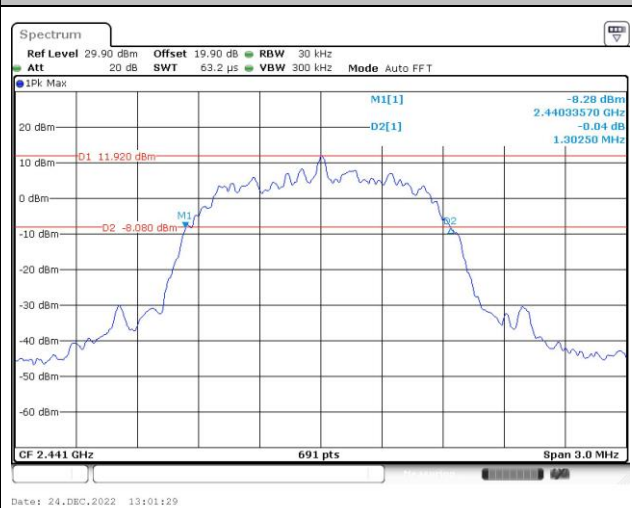


<2Mbps>

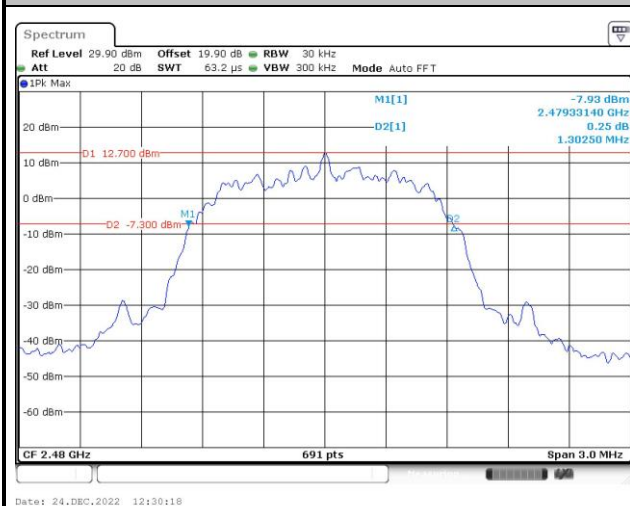
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

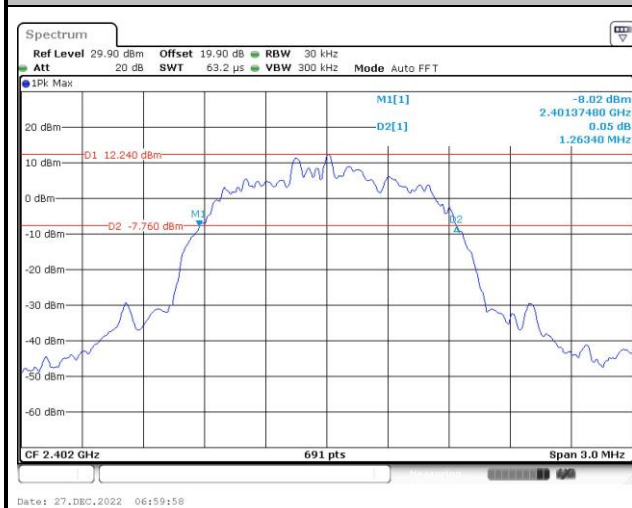


N/A

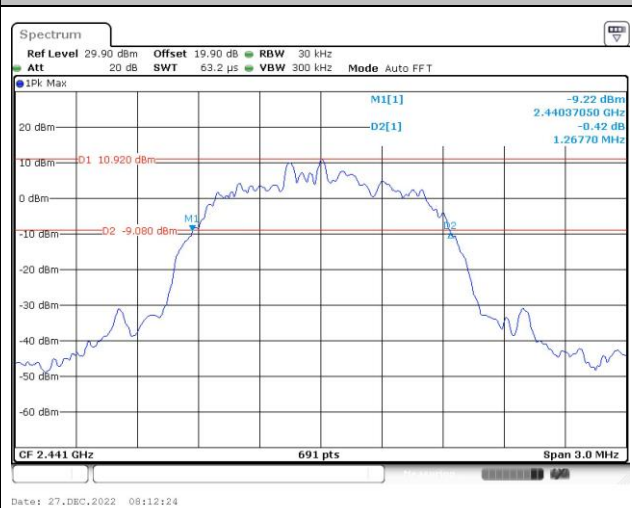


<3Mbps>

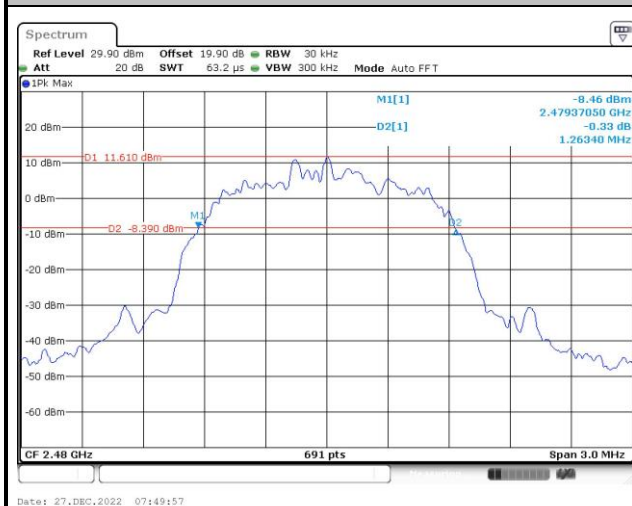
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



N/A

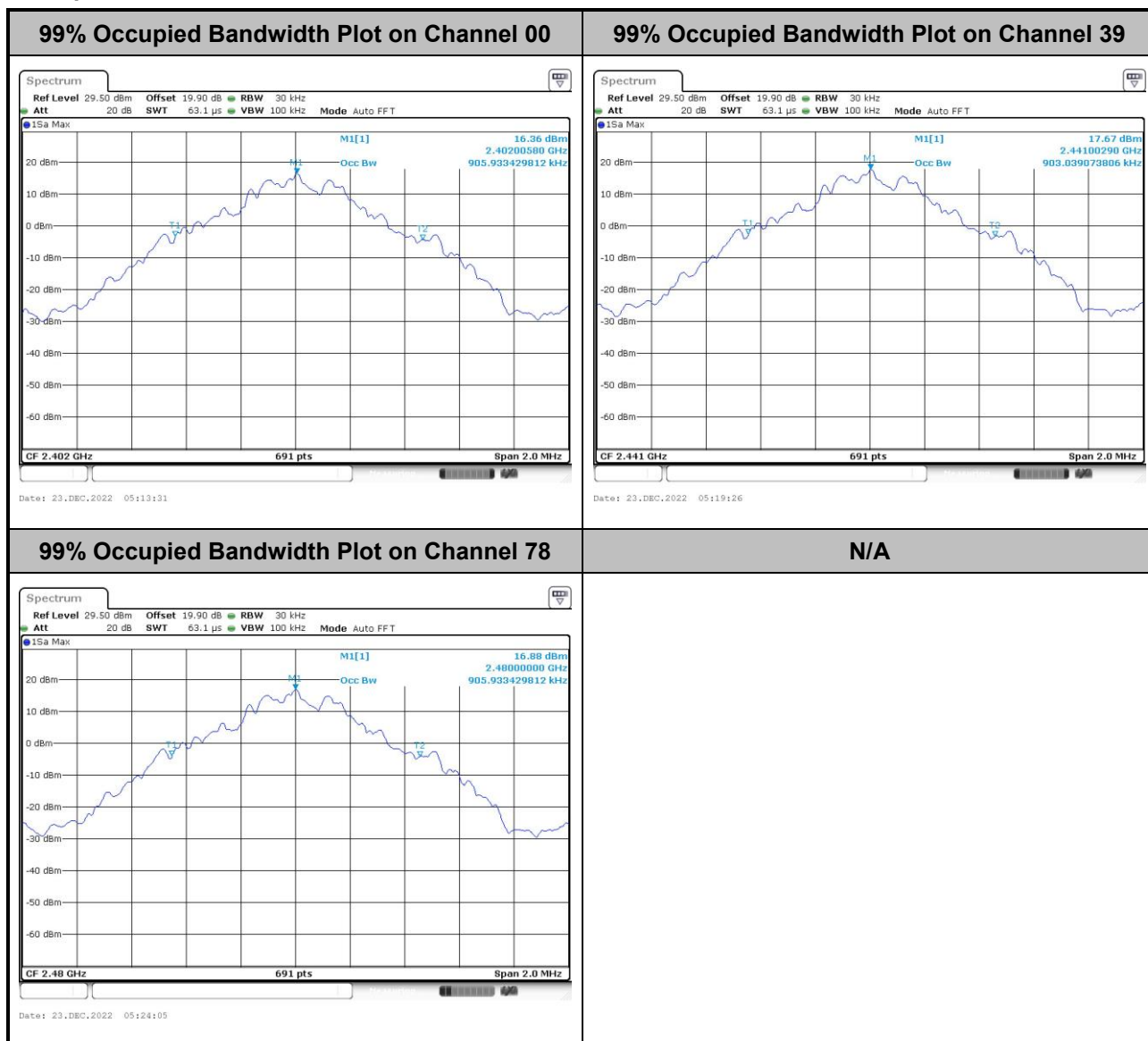


Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

<Ant. 3>

<1Mbps>

**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



<2Mbps>

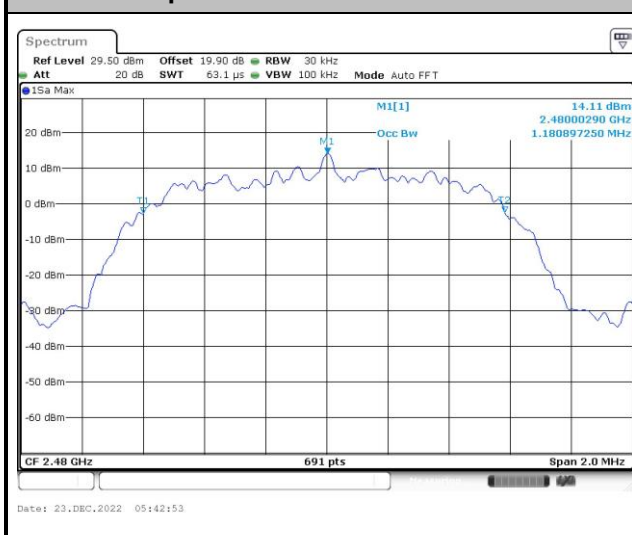
99% Occupied Bandwidth Plot on Channel 00



99% Occupied Bandwidth Plot on Channel 39



99% Occupied Bandwidth Plot on Channel 78



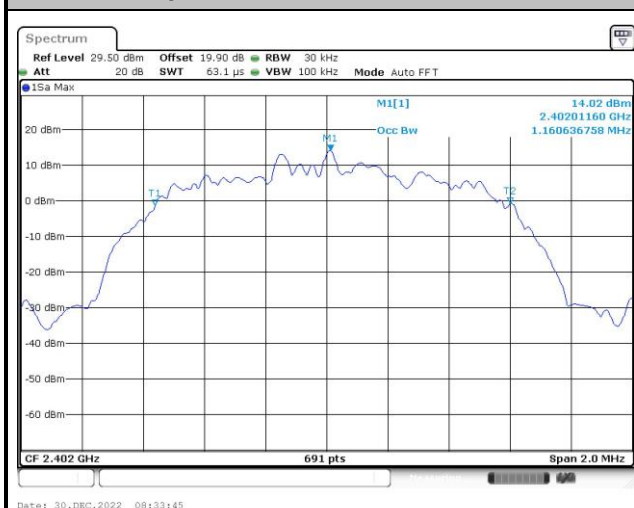
N/A

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

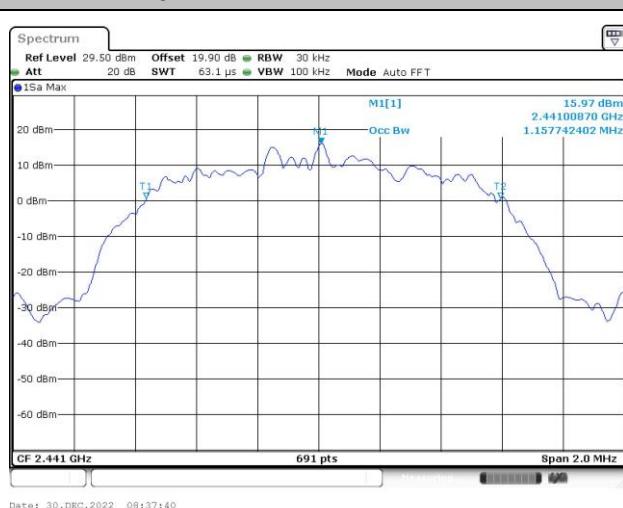


<3Mbps>

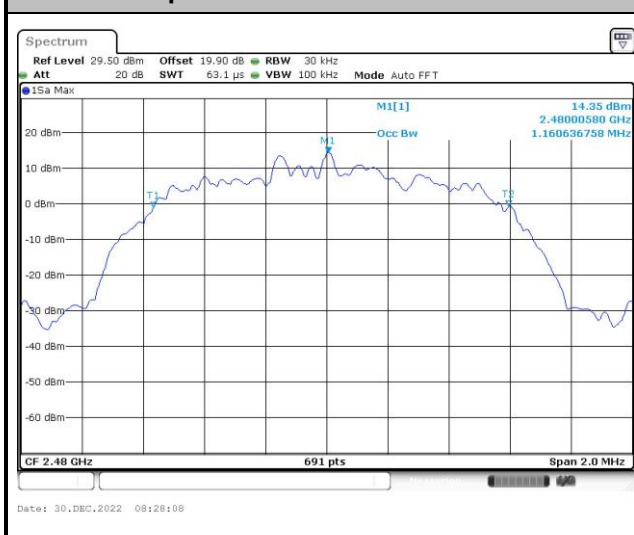
99% Occupied Bandwidth Plot on Channel 00



99% Occupied Bandwidth Plot on Channel 39



99% Occupied Bandwidth Plot on Channel 78



N/A

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



<Ant. 4>

<1Mbps>

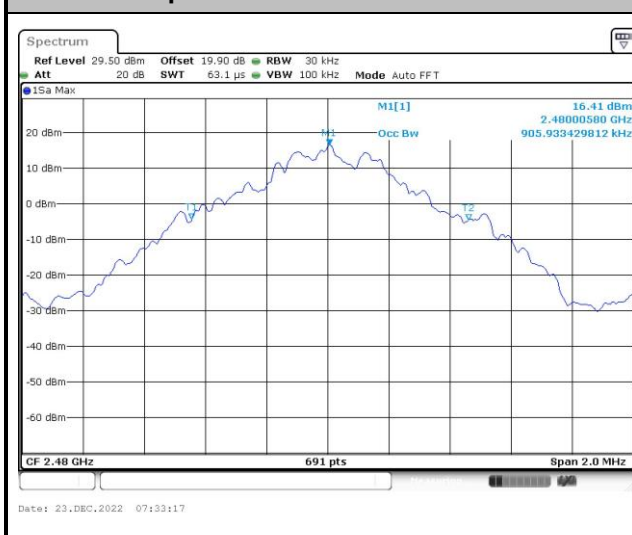
99% Occupied Bandwidth Plot on Channel 00



99% Occupied Bandwidth Plot on Channel 39



99% Occupied Bandwidth Plot on Channel 78

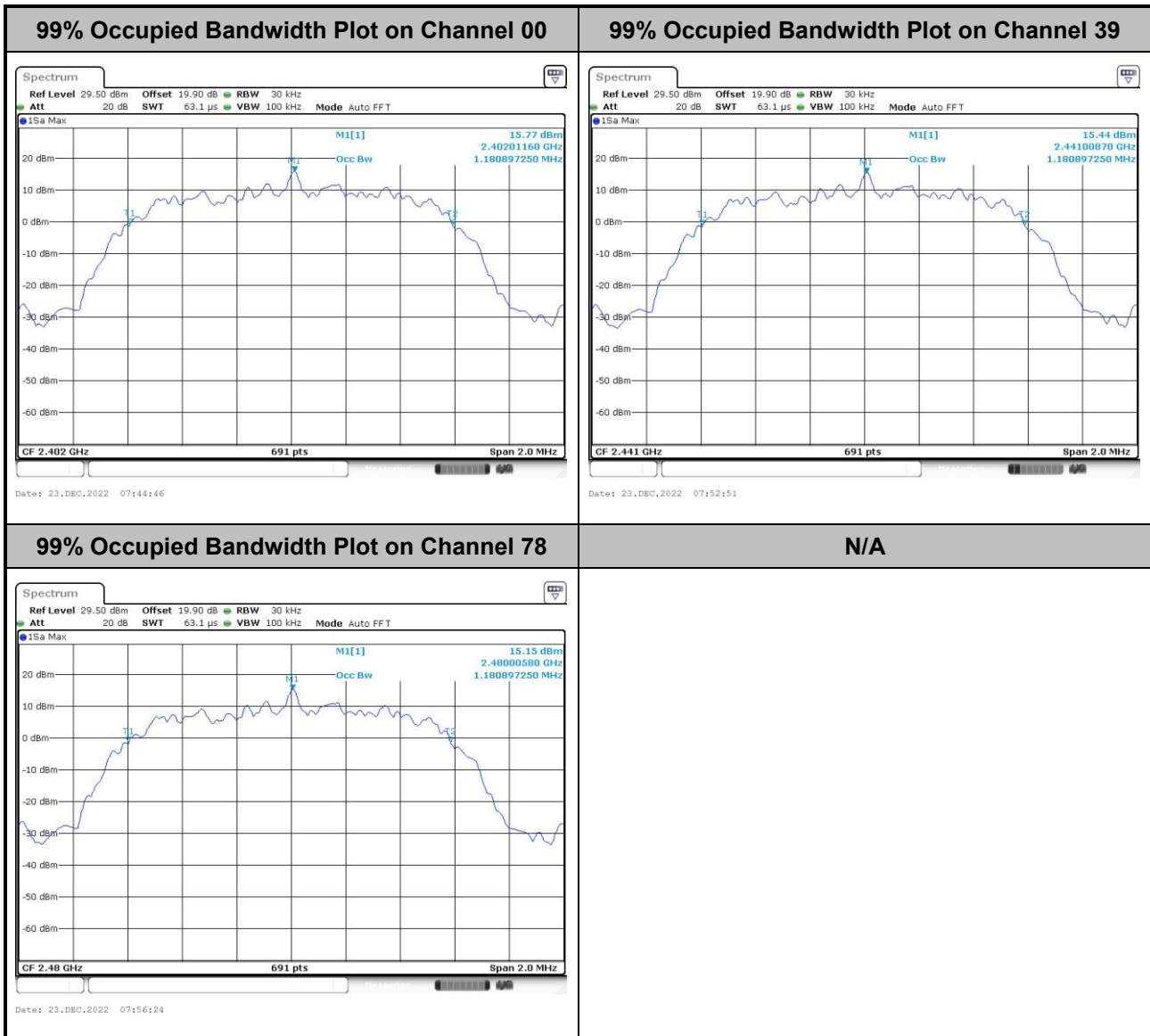


N/A

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



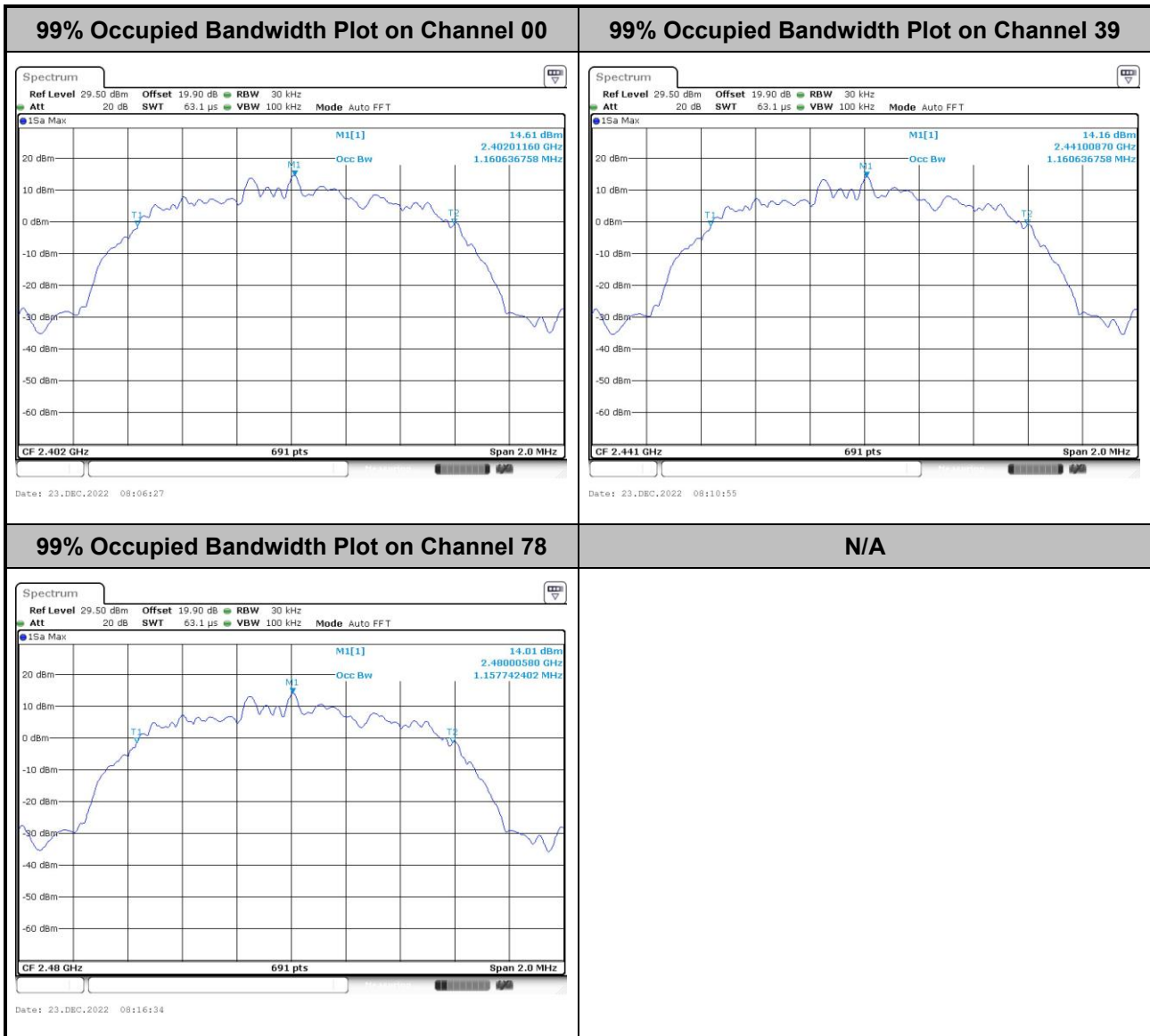
<2Mbps>



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



<3Mbps>



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.