

TEST REPORT

FCC ID: 2ADYY-K16SAA

Product: Laptop Computer

Model No.: K16SAA

Trade Mark: TECNO

Report No.: WSCT-ANAB-R&E240700030A-BT

Issued Date: 12 August 2024

Issued for:

TECNO MOBILE LIMITED

FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI
STREET FOTAN NT HONGKONG

Issued By:

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1. Test Certification

Product: Laptop Computer

Model No.: K16SAA

Additional Model: TECNO

Applicant: TECNO MOBILE LIMITED

Address: FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25
SHAN MEI STREET FOTAN NT HONGKONG

Manufacturer: TECNO MOBILE LIMITED

Address: FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25
SHAN MEI STREET FOTAN NT HONGKONG

Date of Test: 11 July 2024 to 12 August 2024

Applicable Standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

The above equipment has been tested by World Standardization Certification & Testing Group(Shenzhen)Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Wang Xiang

(Wang Xiang)

Checked By:

Chen Xu

(Chen Xu)

Approved By:

Li Huaibi

(Li Huaibi)

Date:

12 August 2024

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(1) §2.1046	PASS
20dB Occupied Bandwidth	§15.247 (a)(1) §2.1049	PASS
Carrier Frequencies Separation	§15.247 (a)(1)	PASS
Hopping Channel Number	§15.247 (a)(1)	PASS
Dwell Time	§15.247 (a)(1)	PASS
Radiated Emission	§15.205/§15.209 §2.1053, §2.1057	PASS
Band Edge	§15.247(d) §2.1051, §2.1057	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

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3. EUT Description

Product Name:	Laptop Computer
Model :	K16SAA
Trade Mark:	TECNO
Operation Frequency:	2402MHz~2480MHz
Channel Separation:	1MHz
Number of Channel:	79
Modulation Type:	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Modulation Technology:	FHSS
Antenna Type:	Integral Antenna
Antenna Gain:	3.46dBi
Operating Voltage:	Adapter1: E065-1R200325VU INPUT: 100-240V~50/60Hz, 1.5A OUTPUT: 20.0V --- 3.25A Rechargeable Li-ion Polymer Battery: K16S Nominal Voltage: 11.55V Rated Capacity: 6060mAh Rated nergy: 70.00Wh Limited Charge Voltage: 13.2V
Remark:	N/A.

Configuration differences

Configuration/ Processor	Camera
K16SAA (i5)	1M(Shengtai)
K16SAA (i7)	1M(Visual Era)
Note: The prototypes of both configurations have been tested, and the K16SAA (i7) has the worst test result, which is the main test model reported	

Operation Frequency each of channel for GFSK, $\pi/4$ -DQPSK, 8DPSK

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
...	...	...	...	...	...	...	...
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
...	...	...	...	...	...	...	...
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz	-	-

Remark: Channel 0, 39 & 78 have been tested for GFSK, $\pi/4$ -DQPSK, 8DPSK modulation mode.

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4. Genera Information

4.1. Test environment and mode

Operating Environment:

Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar

Test Mode:

Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations with Fully-charged battery
-------------------	--

The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
Adapter	E065-1R200325VU	/	/	TECNO

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

All measurement facilities used to collect the measurement data are located at **World Standardization Certification & Testing Group (Shenzhen) Co., Ltd. Building A-B, Baoli'an Industrial Park, No.58 and 60, Tangtou Avenue, Shiyao Street, Bao'an District, Shenzhen City, Guangdong Province, China**

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 32. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.2. ACCREDITATIONS

ANAB - Certificate Number: AT-3951

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (ANAB). Certification Number: AT-3951

5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Duty Cycle and Tx-Sequence and Tx-Gap	$\pm 1\%$
2	Dwell Time and Minimum Frequency Occupation	$\pm 1.2\%$
3	Medium Utilisation Factor	$\pm 1.3\%$
4	Occupied Channel Bandwidth	$\pm 2.4\%$
5	Transmitter Unwanted Emission in the out-of Band	$\pm 1.3\%$
6	Transmitter Unwanted Emissions in the Spurious Domain	$\pm 2.5\%$
7	Receiver Spurious Emissions	$\pm 2.5\%$
8	Conducted Emission Test	$\pm 3.2\text{dB}$
9	RF power, conducted	$\pm 0.16\text{dB}$
10	Spurious emissions, conducted	$\pm 0.21\text{dB}$
11	All emissions, radiated(<1GHz)	$\pm 4.7\text{dB}$
12	All emissions, radiated(>1GHz)	$\pm 4.7\text{dB}$
13	Temperature	$\pm 0.5^\circ\text{C}$
14	Humidity	$\pm 2.0\%$

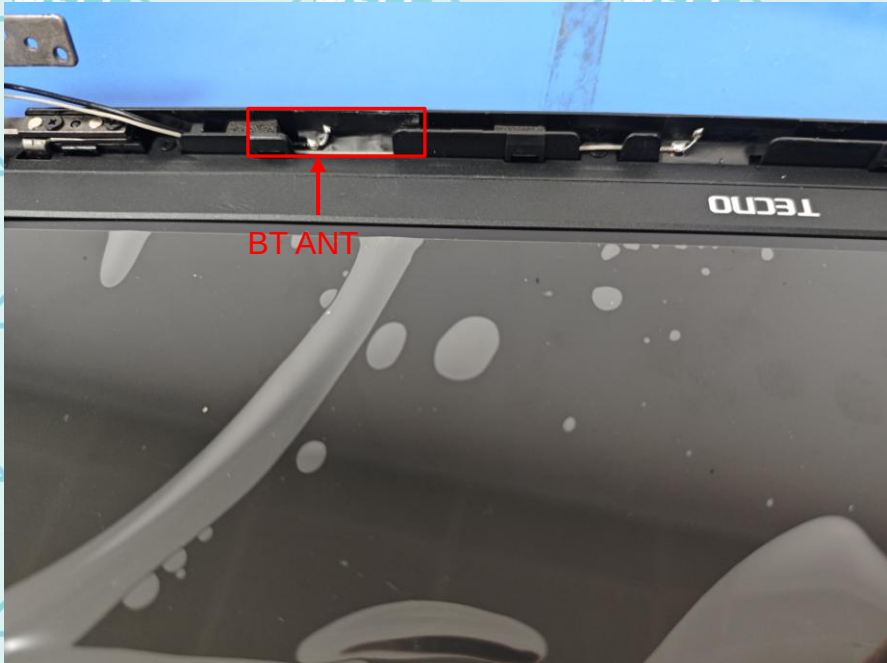
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5.4. MEASUREMENT INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	Calibration Date	Calibration Due.
Test software	--	EZ-EMC	CON-03A	-	-
Test software	--	MTS8310	--	-	--
EMI Test Receiver	R&S	ESCI	100005	11/05/2023	11/04/2024
LISN	AFJ	LS16	16010222119	11/05/2023	11/04/2024
LISN(EUT)	Mestec	AN3016	04/10040	11/05/2023	11/04/2024
Universal Radio Communication Tester	R&S	CMU 200	1100.0008.02	11/05/2023	11/04/2024
Coaxial cable	Megalon	LMR400	N/A	11/05/2023	11/04/2024
GPIO cable	Megalon	GPIO	N/A	11/05/2023	11/04/2024
Spectrum Analyzer	R&S	FSU	100114	11/05/2023	11/04/2024
Pre Amplifier	H.P.	HP8447E	2945A02715	11/05/2023	11/04/2024
Pre-Amplifier	CDSI	PAP-1G18-38	--	11/05/2023	11/04/2024
Bi-log Antenna	SCHWARZBECK	VULB9168	01488	11/05/2023	11/04/2024
9*6*6 Anechoic	--	--	--	11/05/2023	11/04/2024
Horn Antenna	COMPLIANCE ENGINEERING	CE18000	--	11/05/2023	11/04/2024
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-631	11/05/2023	11/04/2024
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	11/05/2023	11/04/2024
System-Controller	CCS	N/A	N/A	N.C.R	N.C.R
Turn Table	CCS	N/A	N/A	N.C.R	N.C.R
Antenna Tower	CCS	N/A	N/A	N.C.R	N.C.R
RF cable	Murata	MXHQ87WA3000	-	11/05/2023	11/04/2024
Loop Antenna	EMCO	6502	00042960	11/05/2023	11/04/2024
Horn Antenna	SCHWARZBECK	BBHA 9170	1123	11/05/2023	11/04/2024
Power meter	Anritsu	ML2487A	6K00003613	11/05/2023	11/04/2024
Power sensor	Anritsu	MX248XD	--	11/05/2023	11/04/2024
Spectrum Analyzer	Keysight	N9010B	MY60241089	11/05/2023	11/04/2024

6. Test Results and Measurement Data

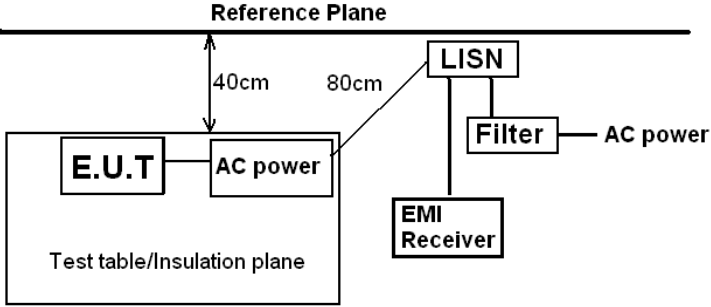
6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The Bluetooth antenna is a Integral Antenna. it meets the standards, and the best case gain of the antenna is 3.46dBi.	
	

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6.2. Conducted Emission

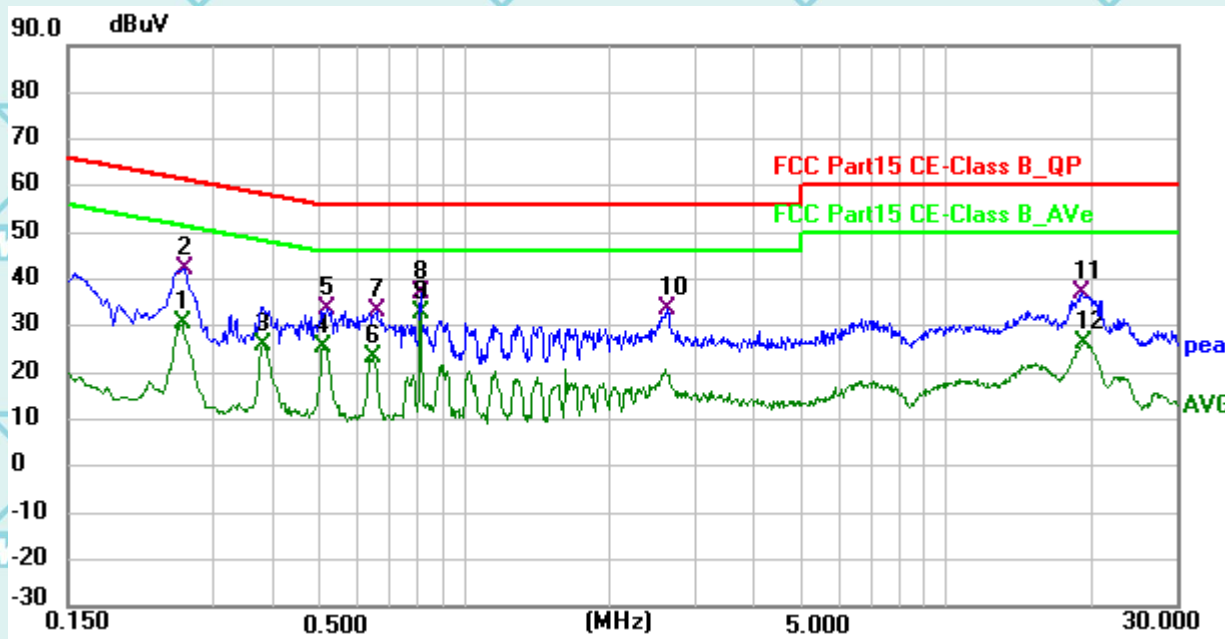
6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207		
Test Method:	ANSI C63.10:2014		
Frequency Range:	150 kHz to 30 MHz		
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto		
Limits:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
Test Setup:	 Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m		
Test Mode:	Refer to item 4.1		
Test Procedure:	1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2014 on conducted measurement.		
Test Result:	PASS		

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6.2.2. Test data(worst case)

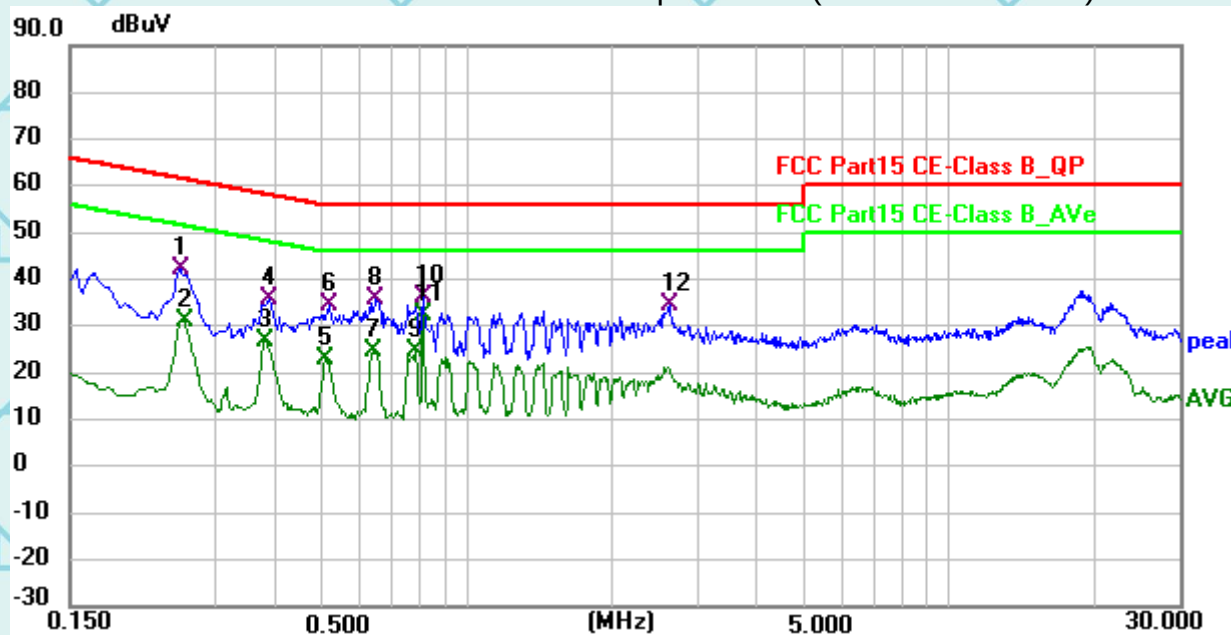
Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)
The worst mode is GFSK



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2580	9.77	20.66	30.43	51.50	-21.07	AVG
2	0.2625	21.48	20.65	42.13	61.35	-19.22	QP
3	0.3795	5.33	20.58	25.91	48.29	-22.38	AVG
4	0.5100	5.16	20.51	25.67	46.00	-20.33	AVG
5	0.5190	13.13	20.51	33.64	56.00	-22.36	QP
6	0.6450	2.76	20.53	23.29	46.00	-22.71	AVG
7	0.6540	12.64	20.53	33.17	56.00	-22.83	QP
8	0.8115	16.66	20.59	37.25	56.00	-18.75	QP
9 *	0.8115	12.00	20.59	32.59	46.00	-13.41	AVG
10	2.6295	12.87	20.60	33.47	56.00	-22.53	QP
11	19.0860	16.64	20.24	36.88	60.00	-23.12	QP
12	19.3245	6.10	20.25	26.35	50.00	-23.65	AVG

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Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2535	21.66	20.66	42.32	61.64	-19.32	QP
2	0.2580	10.57	20.66	31.23	51.50	-20.27	AVG
3	0.3795	6.28	20.58	26.86	48.29	-21.43	AVG
4	0.3885	15.08	20.58	35.66	58.10	-22.44	QP
5	0.5100	2.63	20.51	23.14	46.00	-22.86	AVG
6	0.5144	13.80	20.51	34.31	56.00	-21.69	QP
7	0.6404	3.92	20.53	24.45	46.00	-21.55	AVG
8	0.6493	15.11	20.53	35.64	56.00	-20.36	QP
9	0.7799	4.20	20.57	24.77	46.00	-21.23	AVG
10	0.8114	15.65	20.59	36.24	56.00	-19.76	QP
11 *	0.8114	11.84	20.59	32.43	46.00	-13.57	AVG
12	2.6295	13.97	20.60	34.57	56.00	-21.43	QP

Note1:

Freq. = Emission frequency in MHz

Reading level (dBuV) = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dBuV) = Reading level (dBuV) + Corr. Factor (dB)

Limit (dBuV) = Limit stated in standard

Margin (dB) = Measurement (dBuV) - Limits (dBuV)

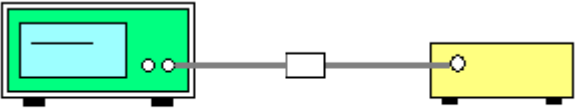
Q.P.=Quasi-Peak AVG=average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

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6.3. Conducted Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2014
Limit:	Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
Test Result:	PASS

6.3.2. Test Data

GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	8.80	20.97	PASS
Middle	8.94	20.97	PASS
Highest	8.23	20.97	PASS

Pi/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	9.44	20.97	PASS
Middle	9.91	20.97	PASS
Highest	8.79	20.97	PASS

8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	9.71	20.97	PASS
Middle	9.27	20.97	PASS
Highest	9.04	20.97	PASS

Test plots as follows:

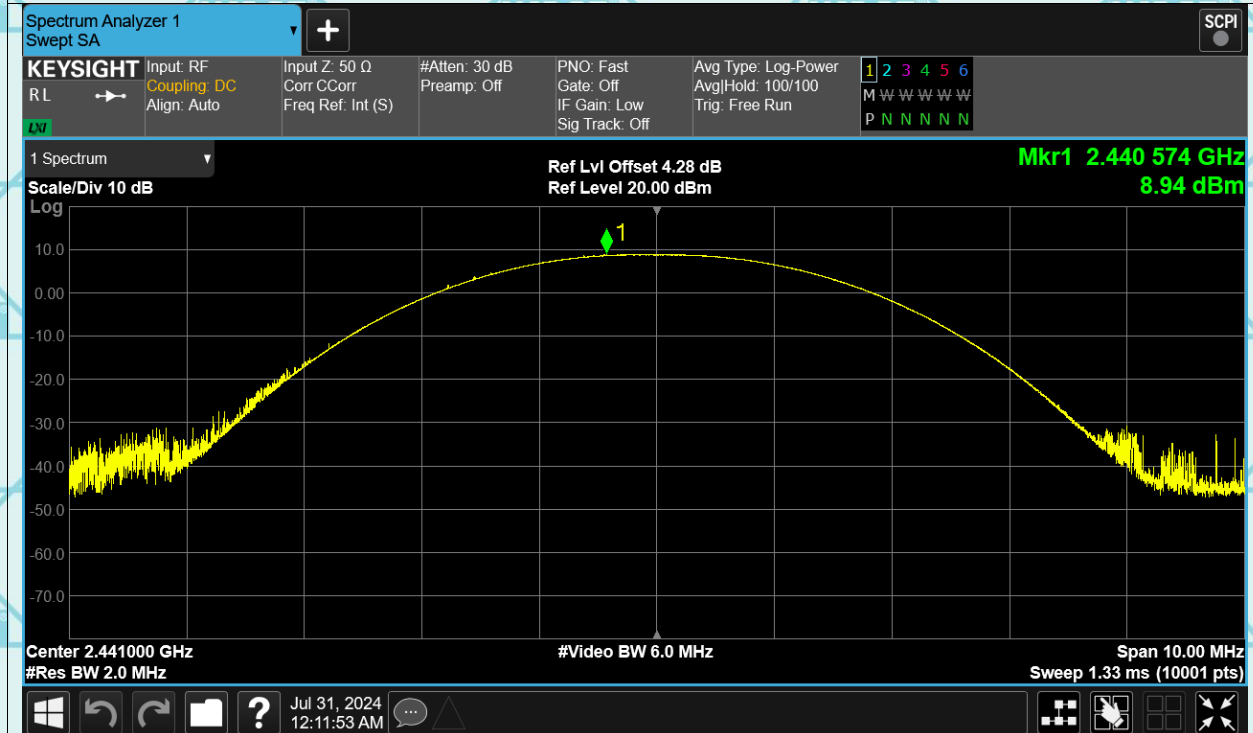
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Test Graphs

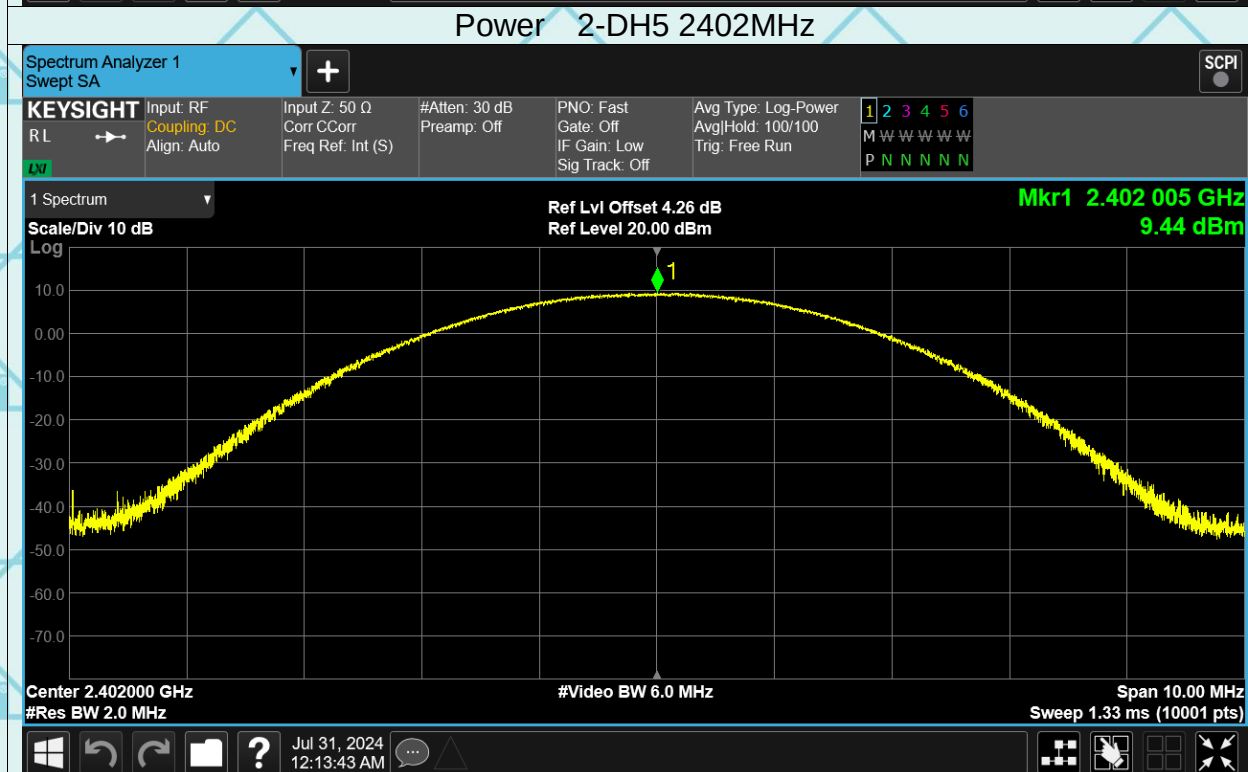
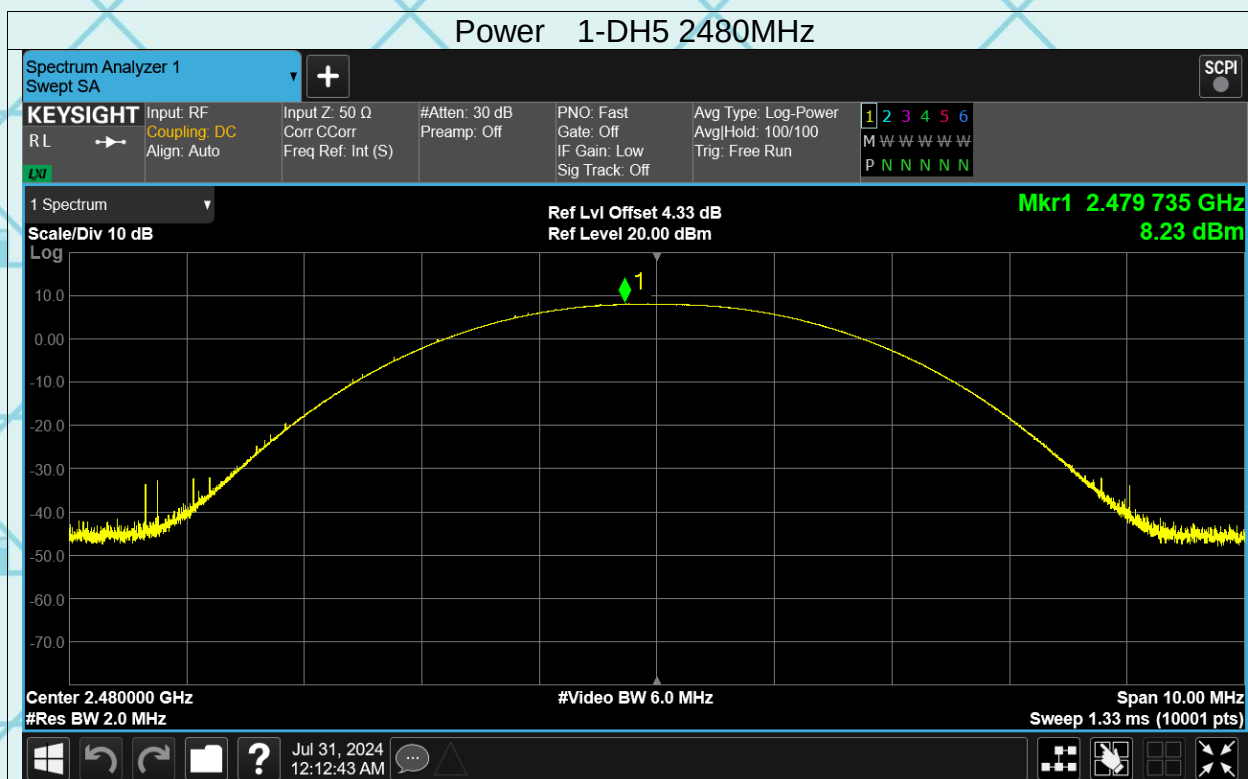
Power 1-DH5 2402MHz



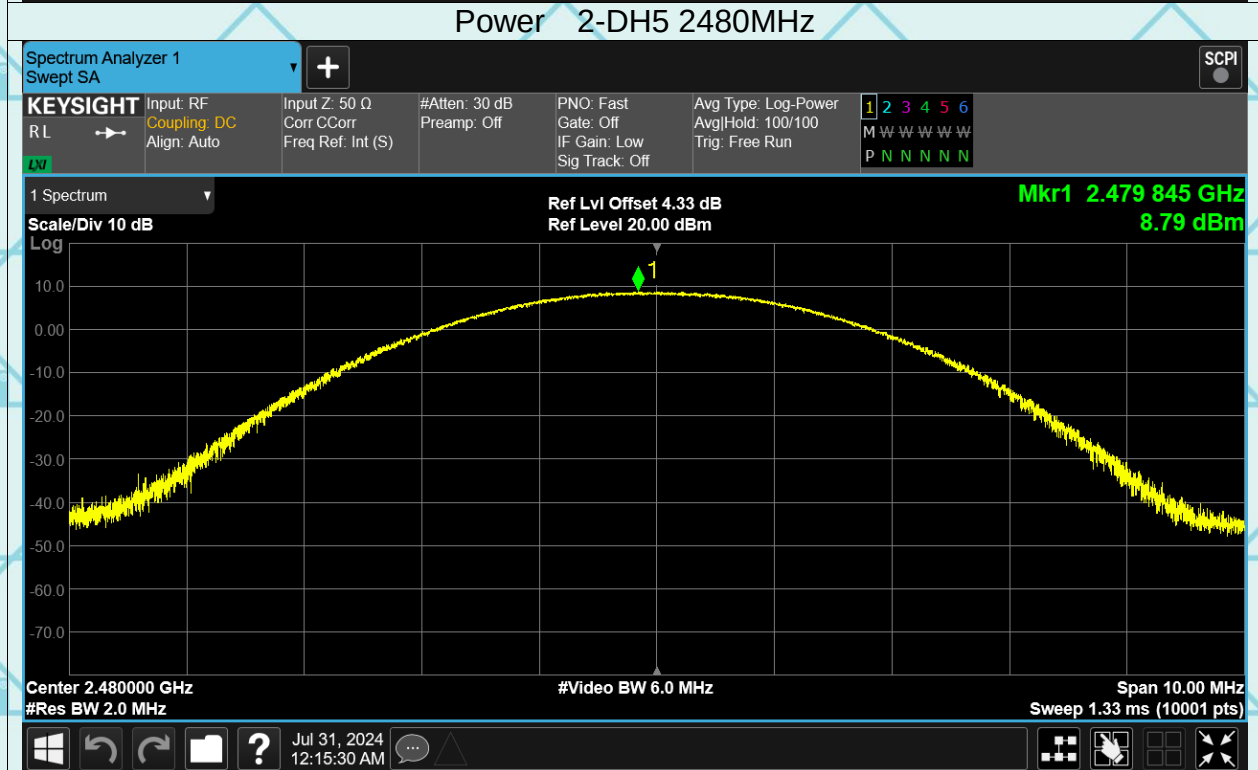
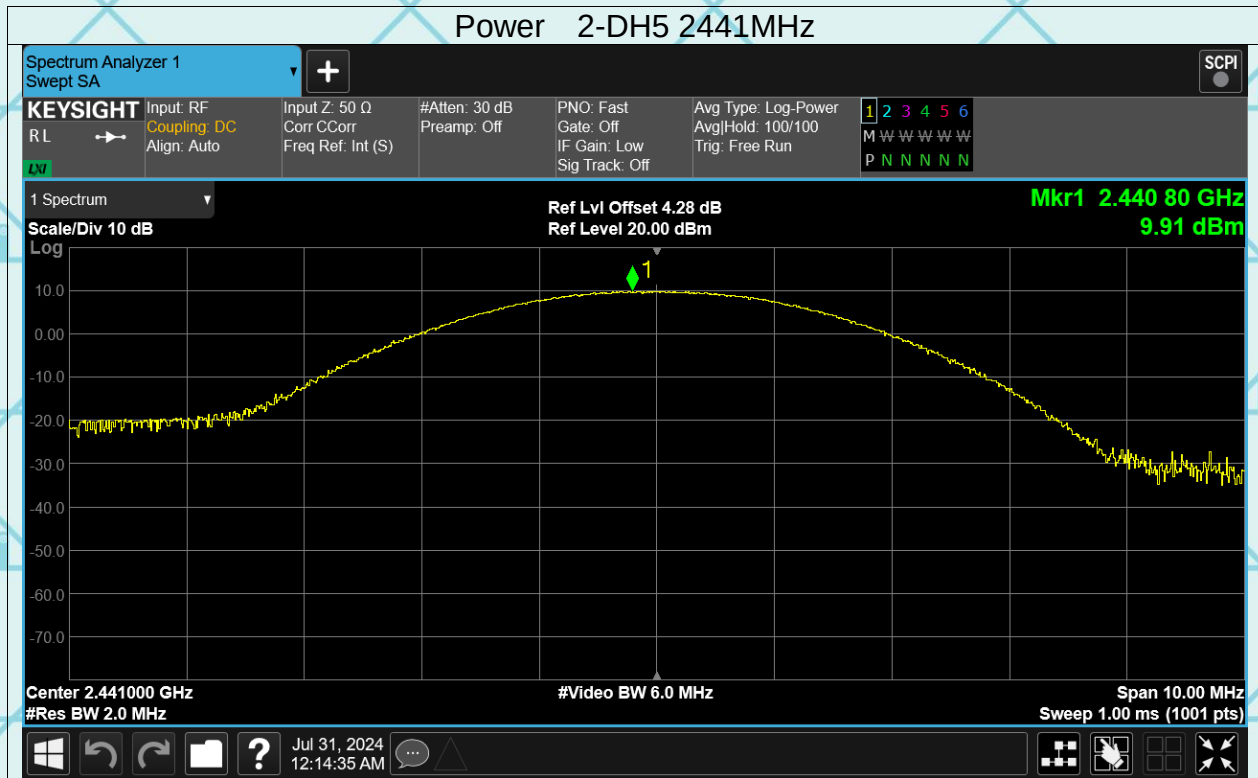
Power 1-DH5 2441MHz



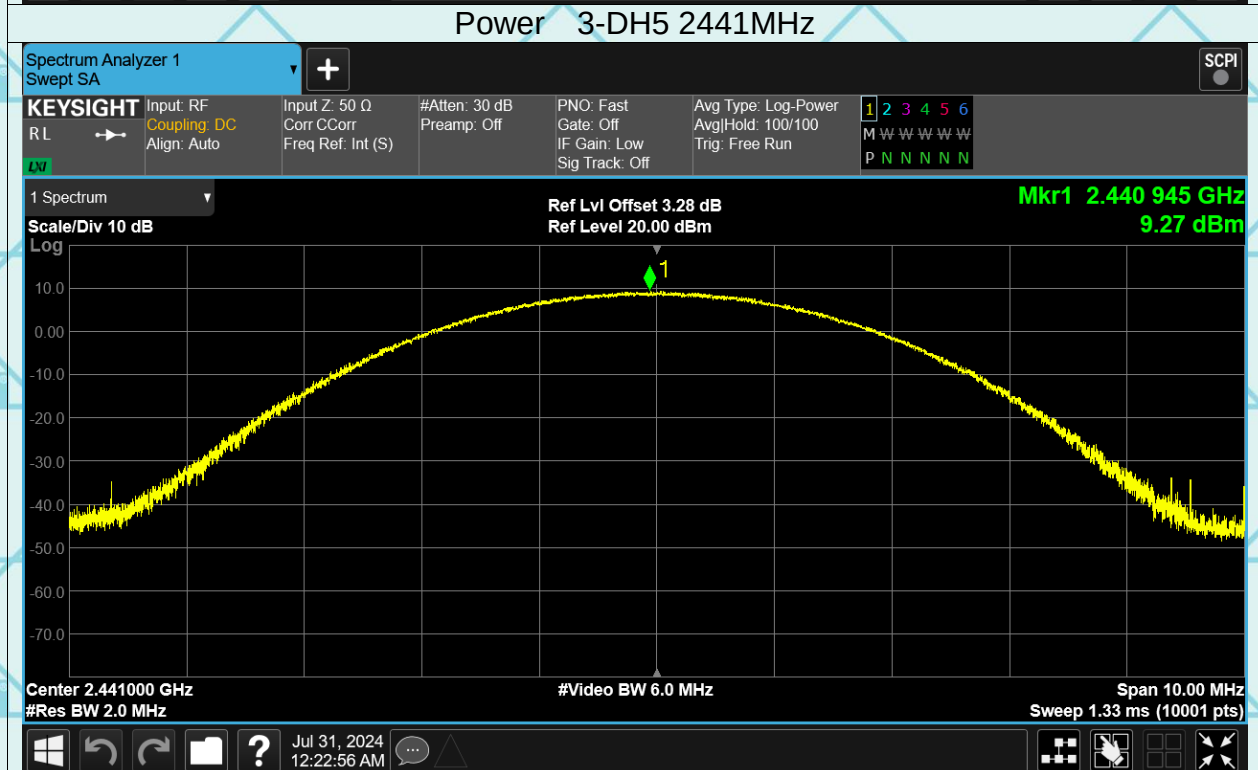
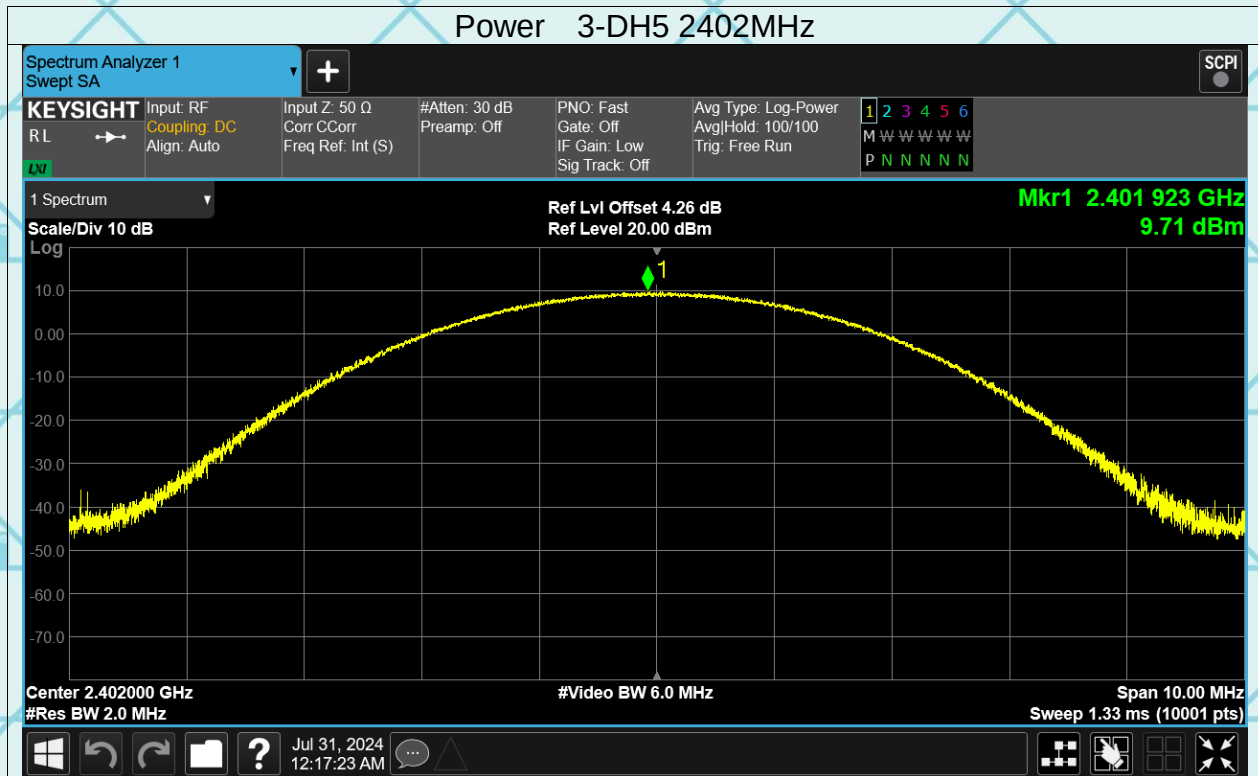
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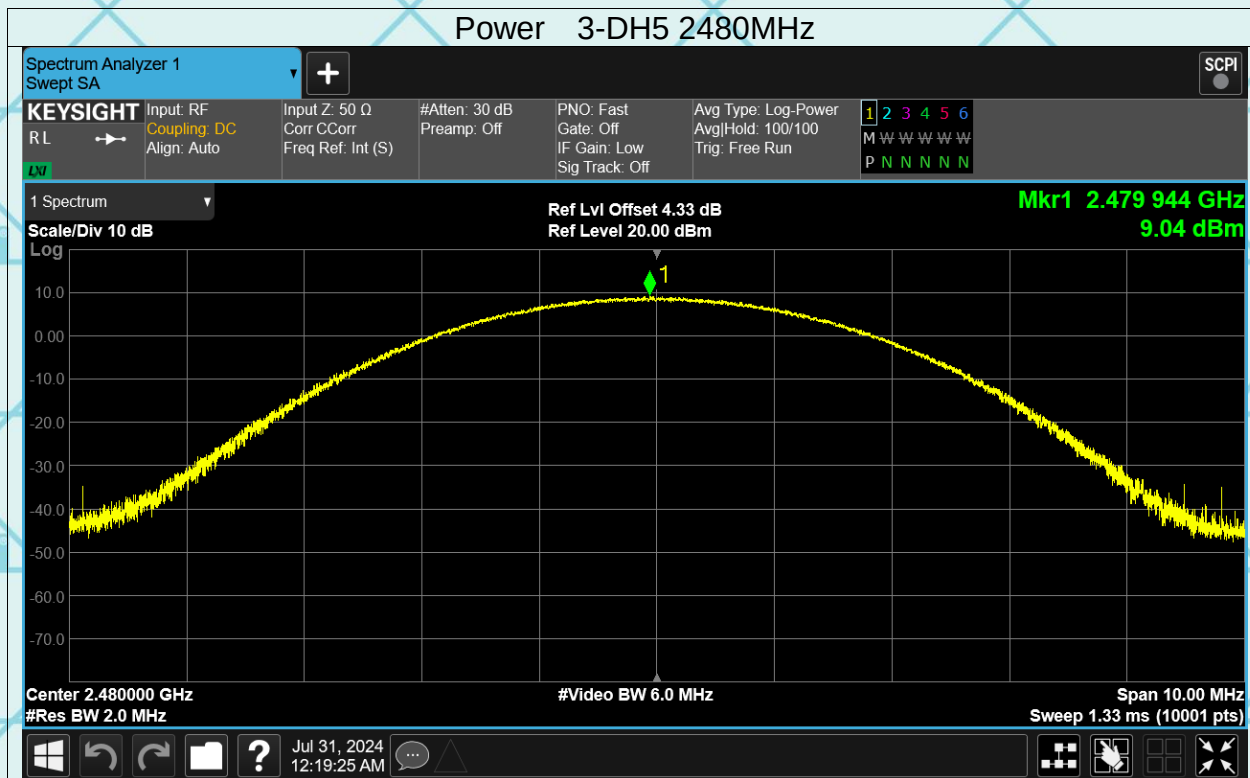
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6.4. 20dB Occupy Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2014
Limit:	N/A
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows ANSI C63.10:2014 Measurement Guidelines. 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; $1\% \leq RBW \leq 5\%$ of the 20 dB bandwidth; $VBW \geq 3RBW$; Sweep = auto; Detector function = peak; Trace = max hold. 5. Measure and record the results in the test report.
Test Result:	PASS

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6.4.2. Test data

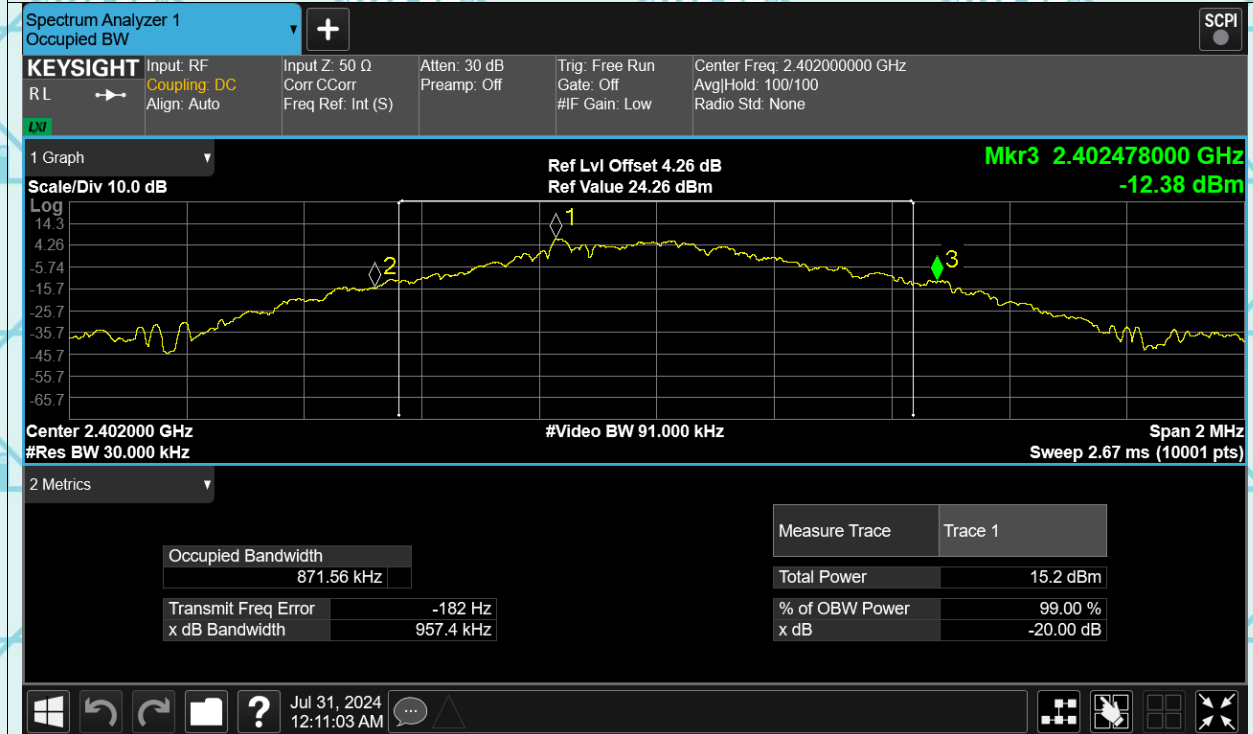
Test channel	-20dB Occupy Bandwidth (MHz)			
	GFSK	$\pi/4$ -DQPSK	8DPSK	Conclusion
Lowest	0.957	1.284	1.305	PASS
Middle	1.034	1.283	1.292	PASS
Highest	0.939	1.285	1.313	PASS

Test plots as follows:

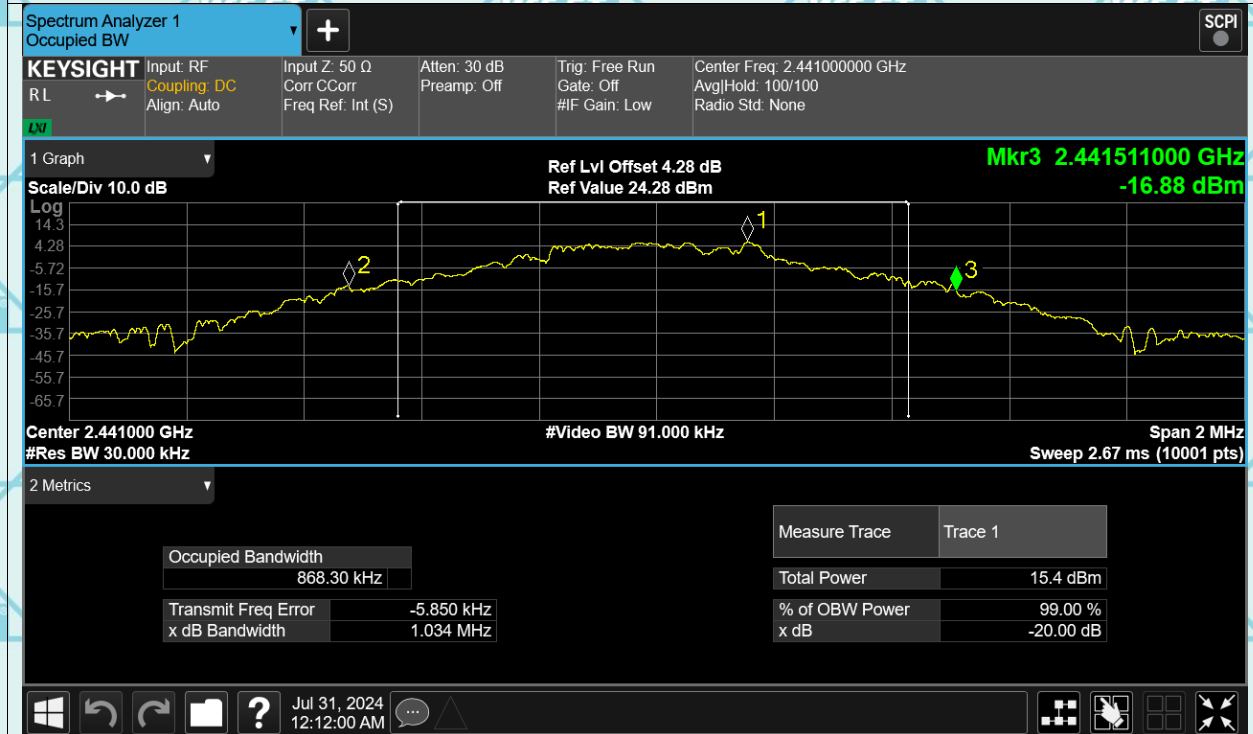
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Test Graphs

-20dB Bandwidth 1-DH5 2402MHz

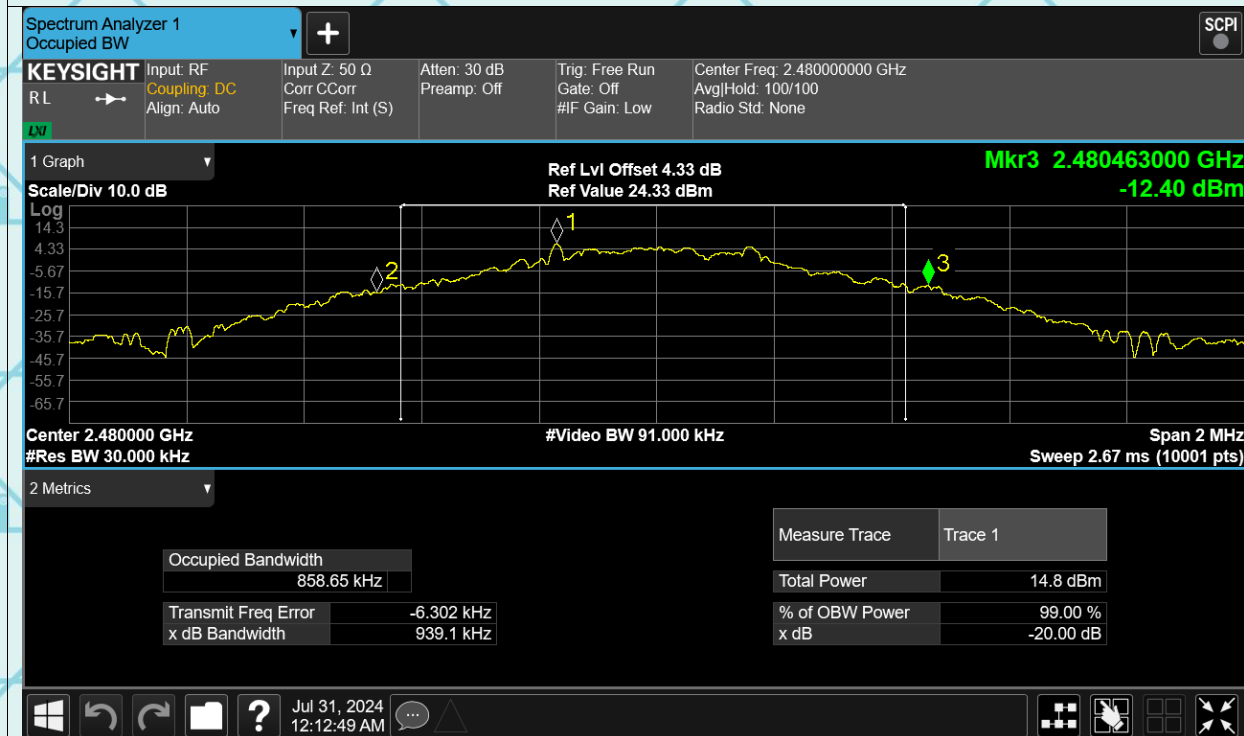


-20dB Bandwidth 1-DH5 2441MHz

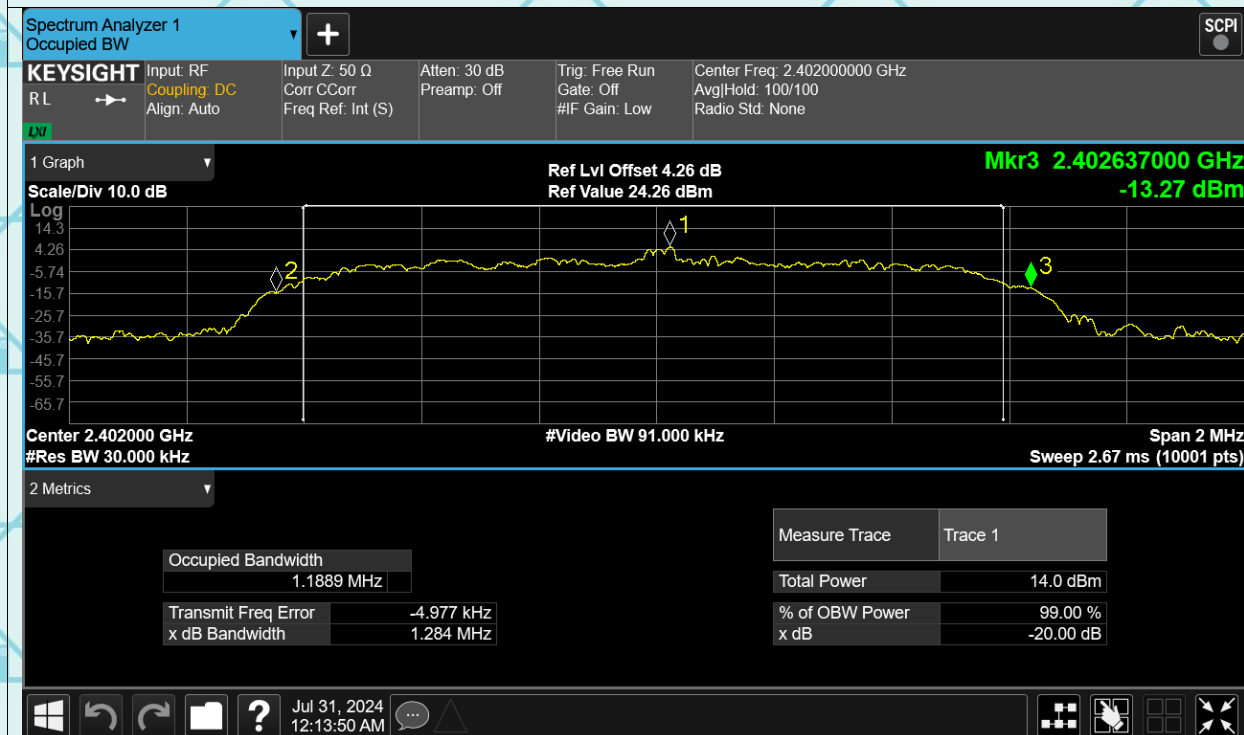


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-20dB Bandwidth 1-DH5 2480MHz

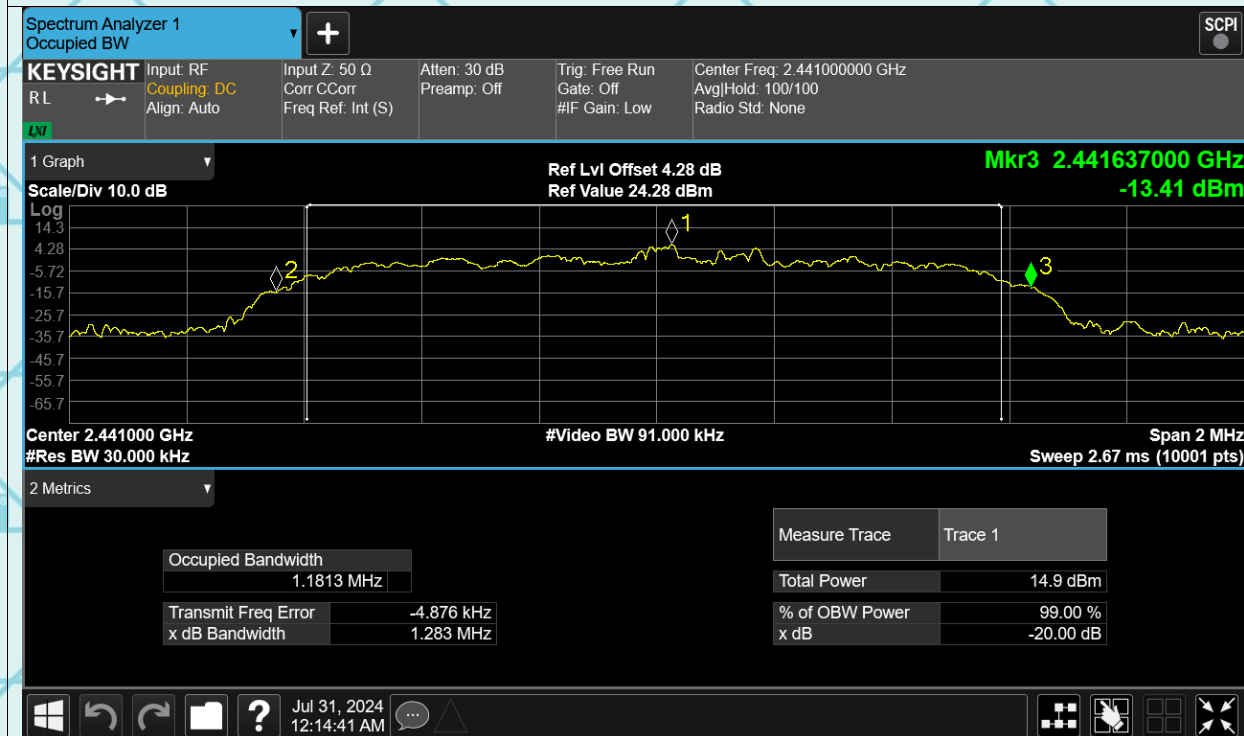


-20dB Bandwidth 2-DH5 2402MHz

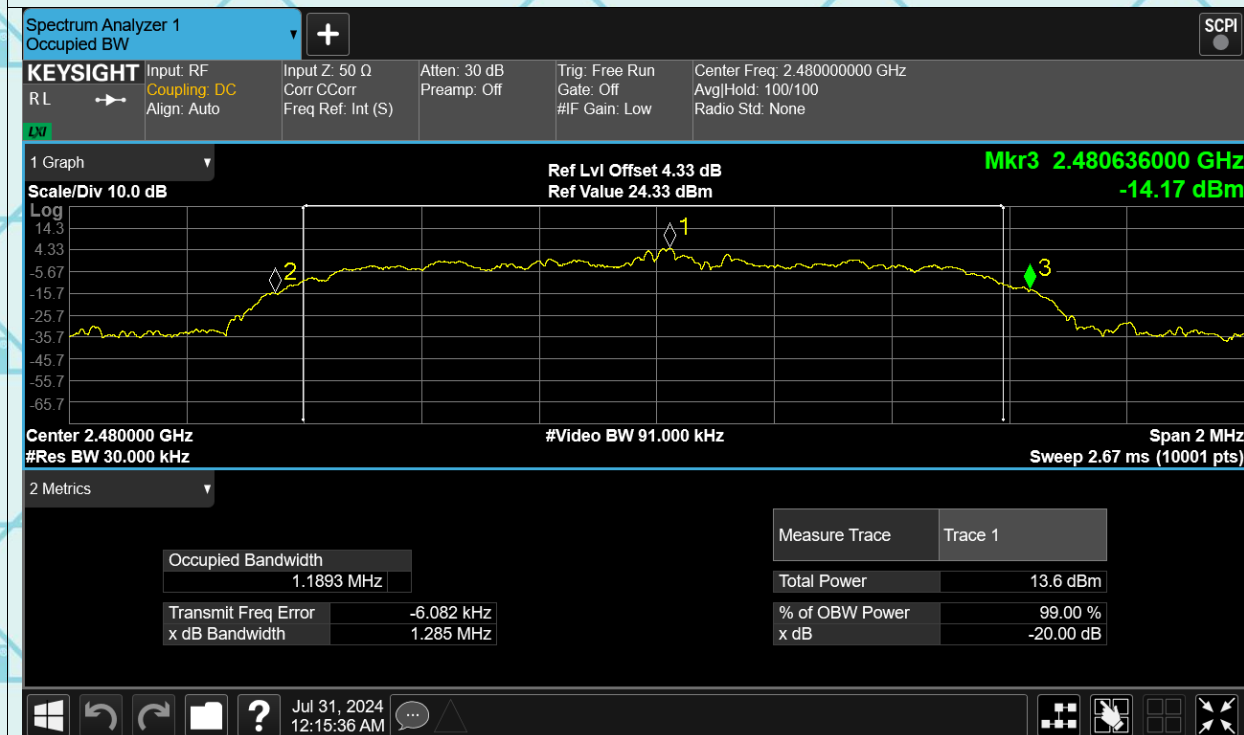


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-20dB Bandwidth 2-DH5 2441MHz

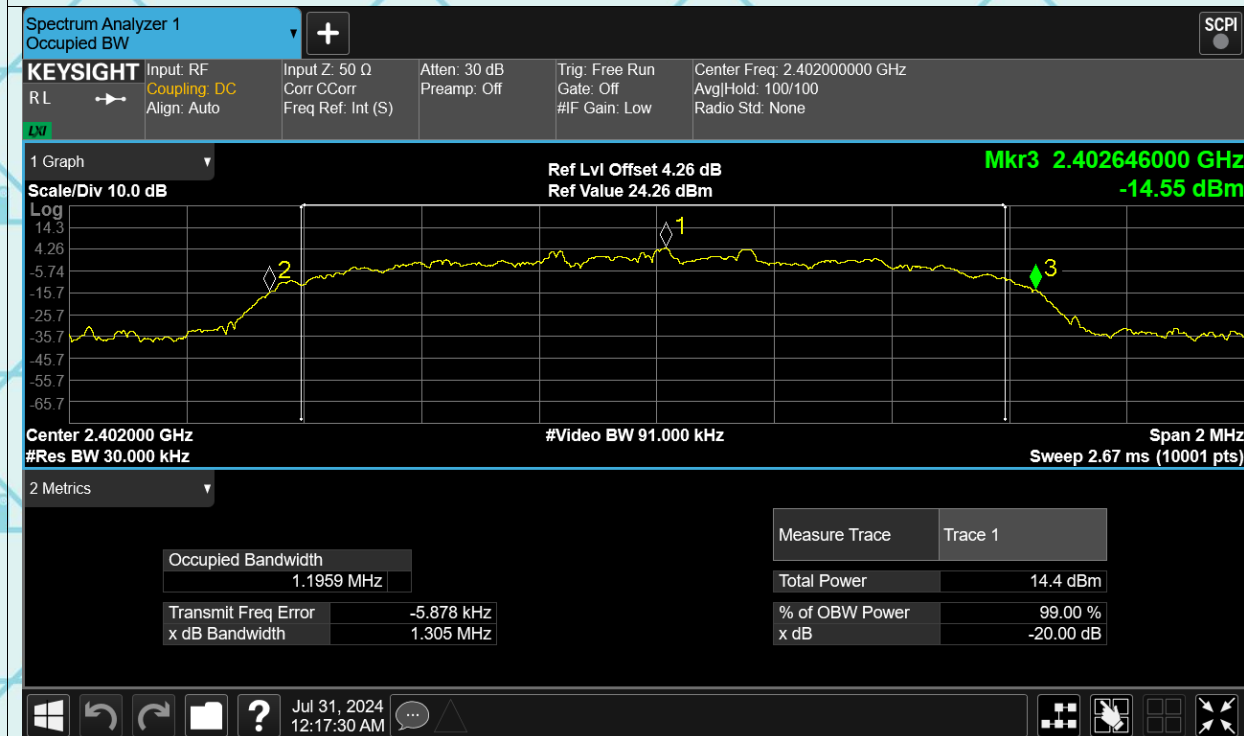


-20dB Bandwidth 2-DH5 2480MHz

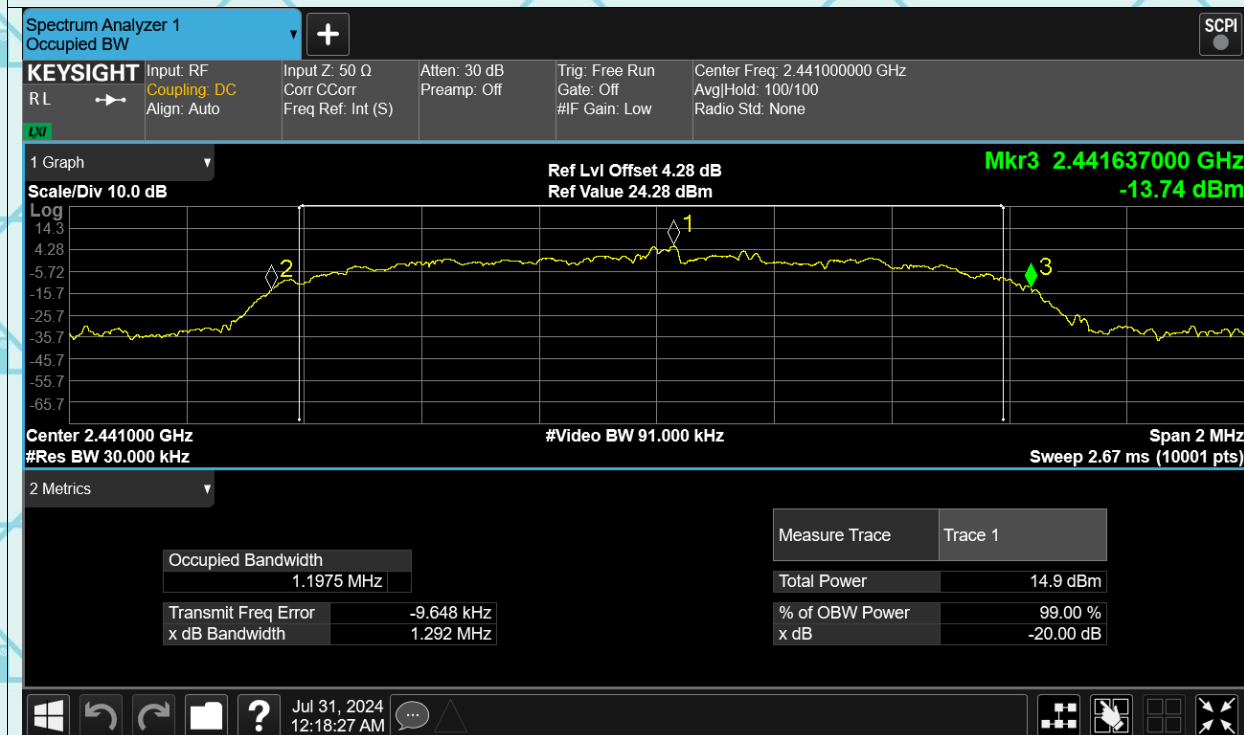


Report No.: WSCT-ANAB-R&E240700030A-BT

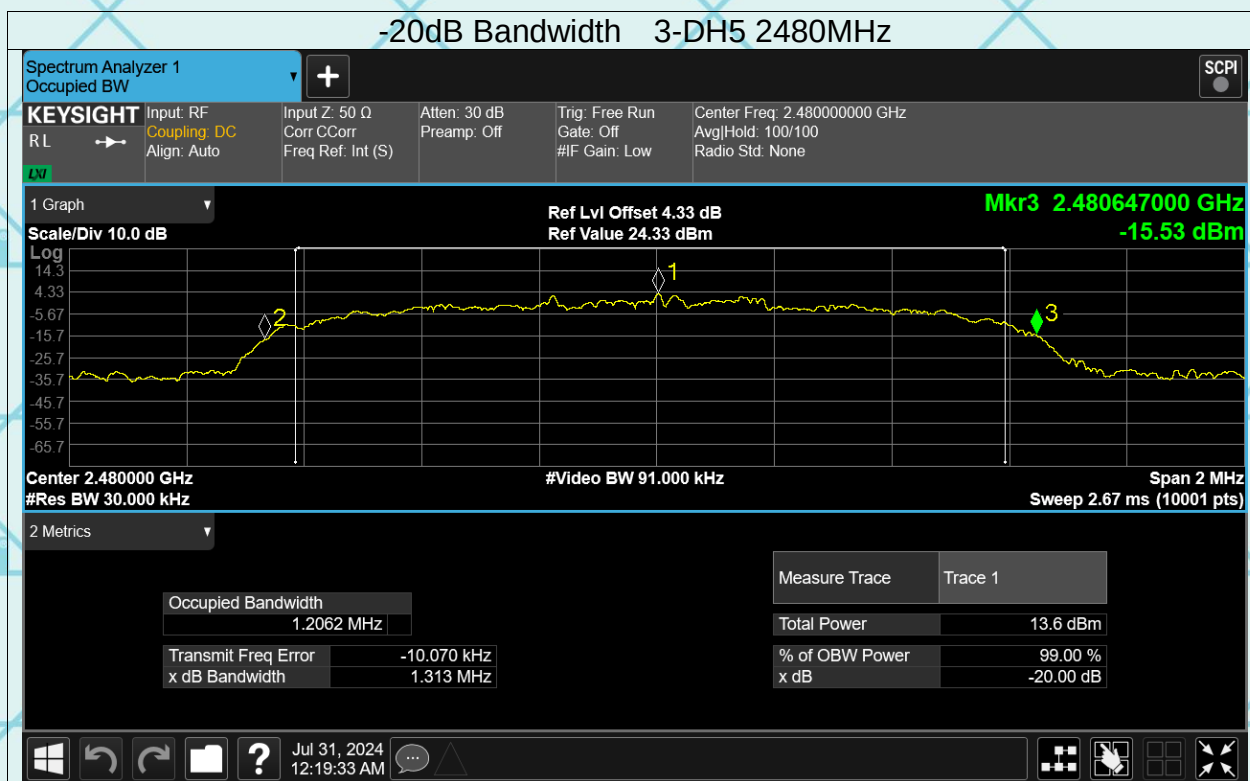
-20dB Bandwidth 3-DH5 2402MHz



-20dB Bandwidth 3-DH5 2441MHz

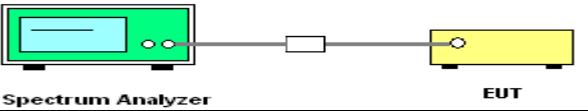


Report No.: WSCT-ANAB-R&E240700030A-BT



6.5. Carrier Frequencies Separation

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2014
Limit:	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.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	1. The testing follows ANSI C63.10:2014 Measurement Guidelines. 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 is set to approximately 30% of the channel spacing, adjust as necessary to best identify the center of each individual channel; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold. 6. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Record the value in report.
Test Result:	PASS

6.5.2. Test data

GFSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	0.994	2/3*20dB BW	PASS
Middle	1.000	2/3*20dB BW	PASS
Highest	1.004	2/3*20dB BW	PASS

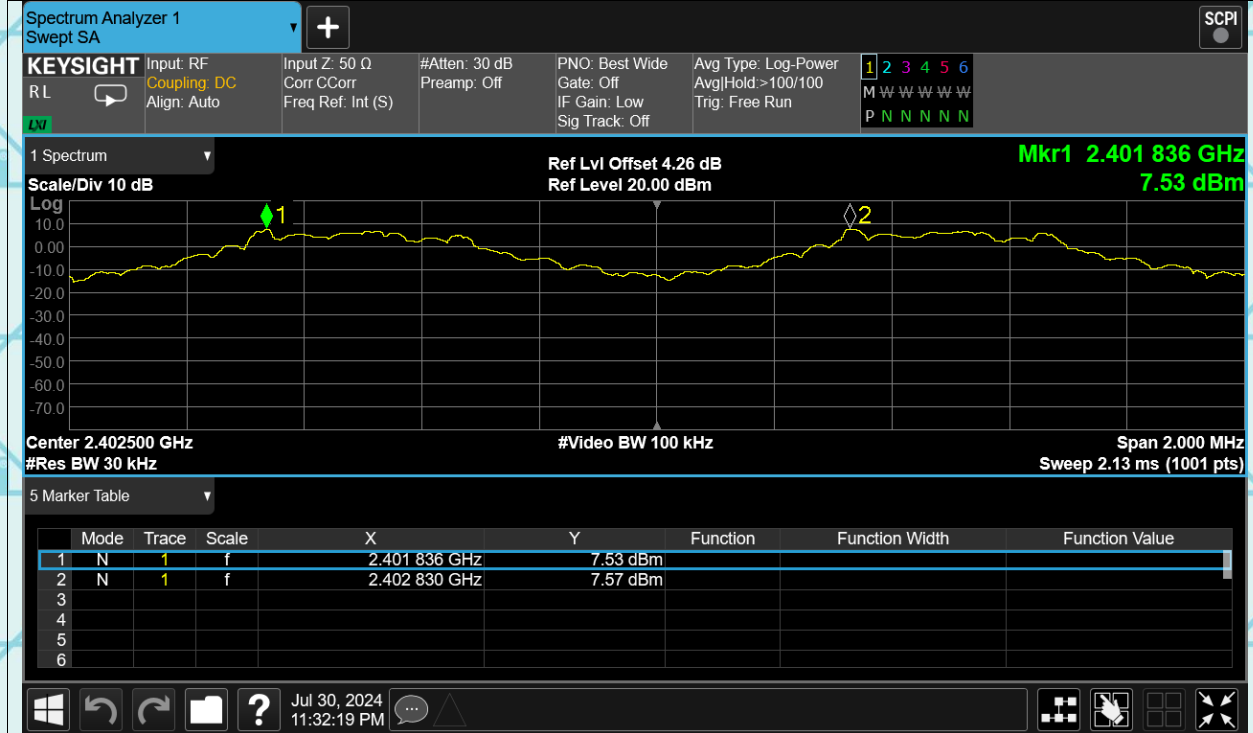
Pi/4 DQPSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	0.994	2/3*20dB BW	PASS
Middle	1.024	2/3*20dB BW	PASS
Highest	0.978	2/3*20dB BW	PASS

8DPSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	0.982	2/3*20dB BW	PASS
Middle	1.002	2/3*20dB BW	PASS
Highest	1.012	2/3*20dB BW	PASS

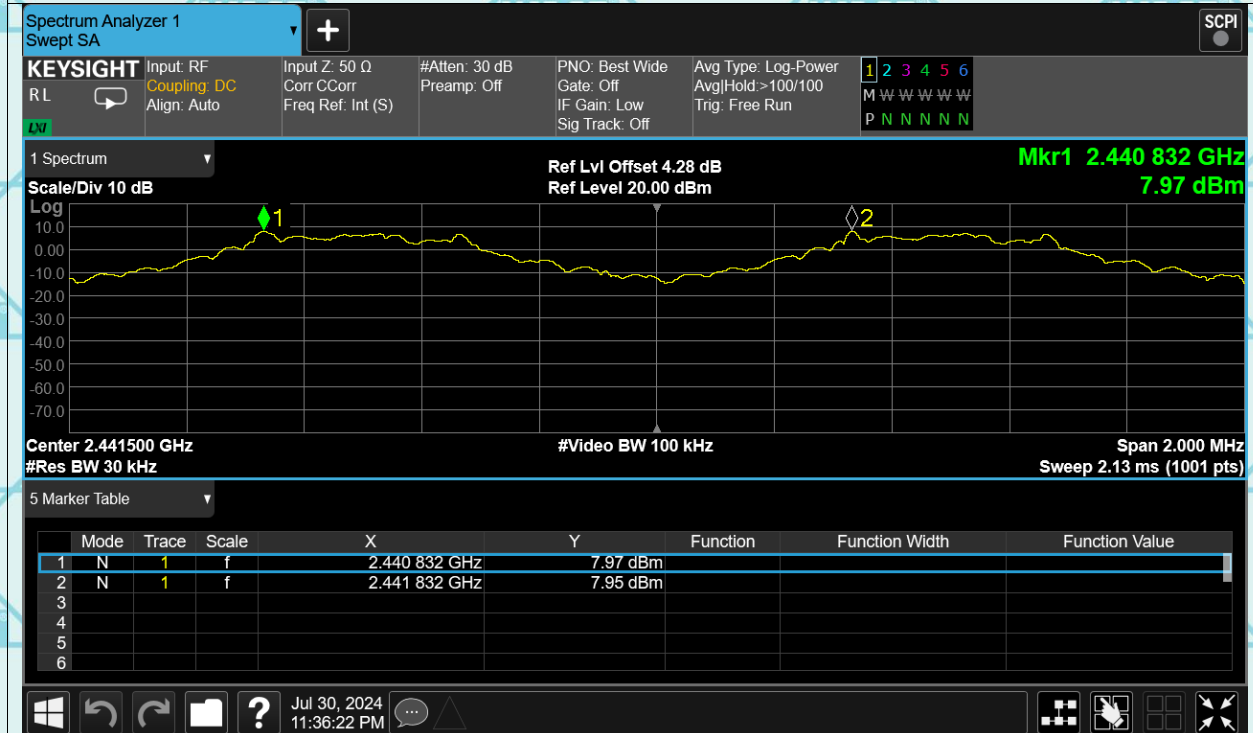
Report No.: WSCT-ANAB-R&E240700030A-BT

Test Graphs

CFS 1-DH5 2402MHz

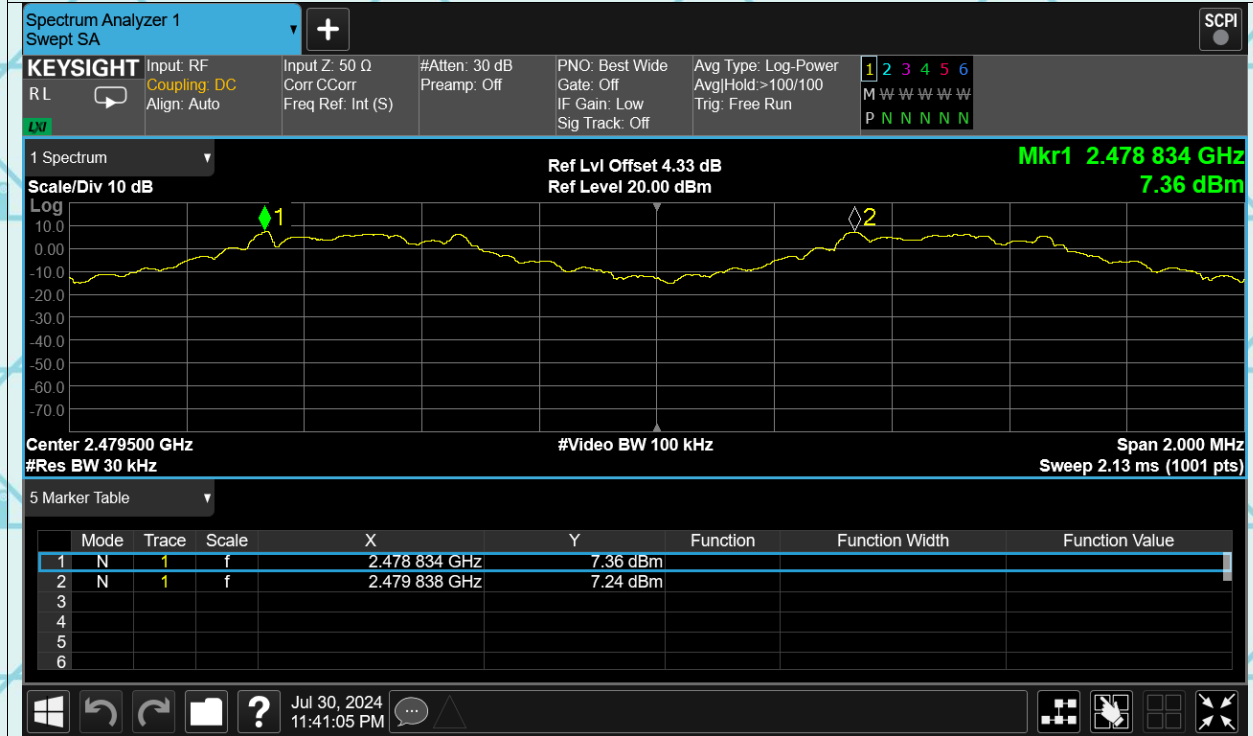


CFS 1-DH5 2441MHz

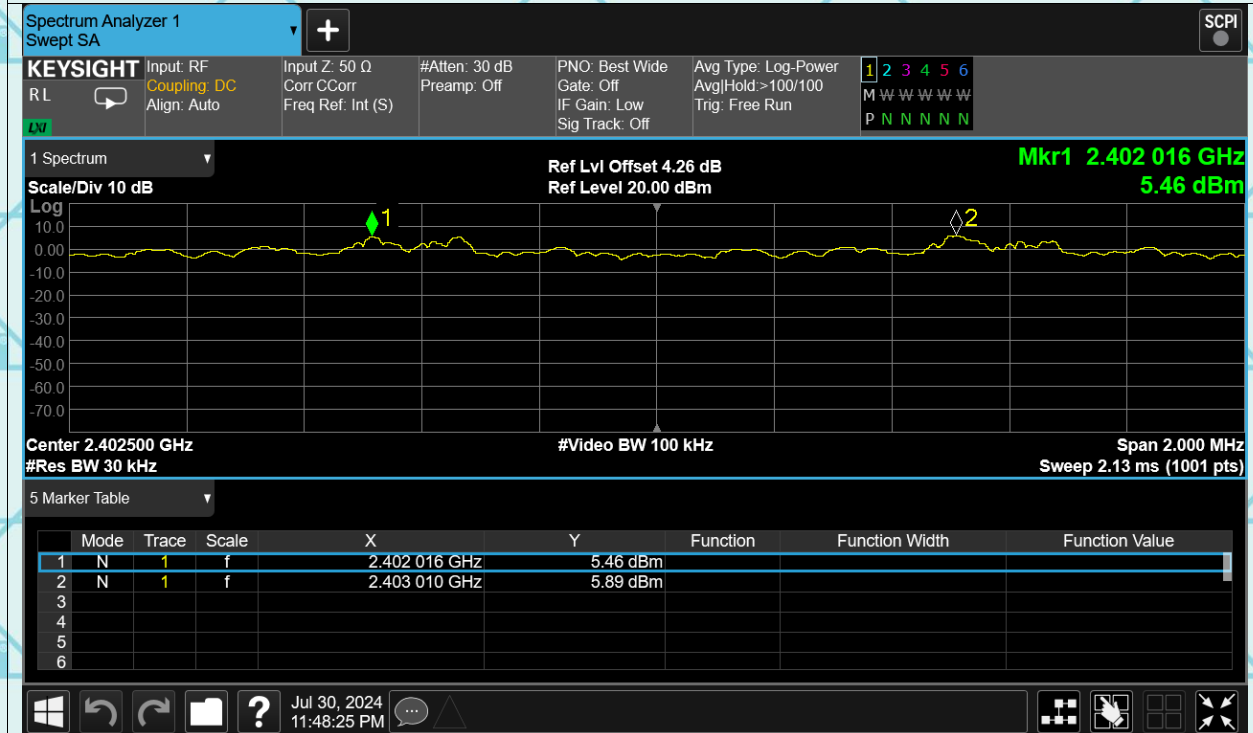


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CFS 1-DH5 2480MHz

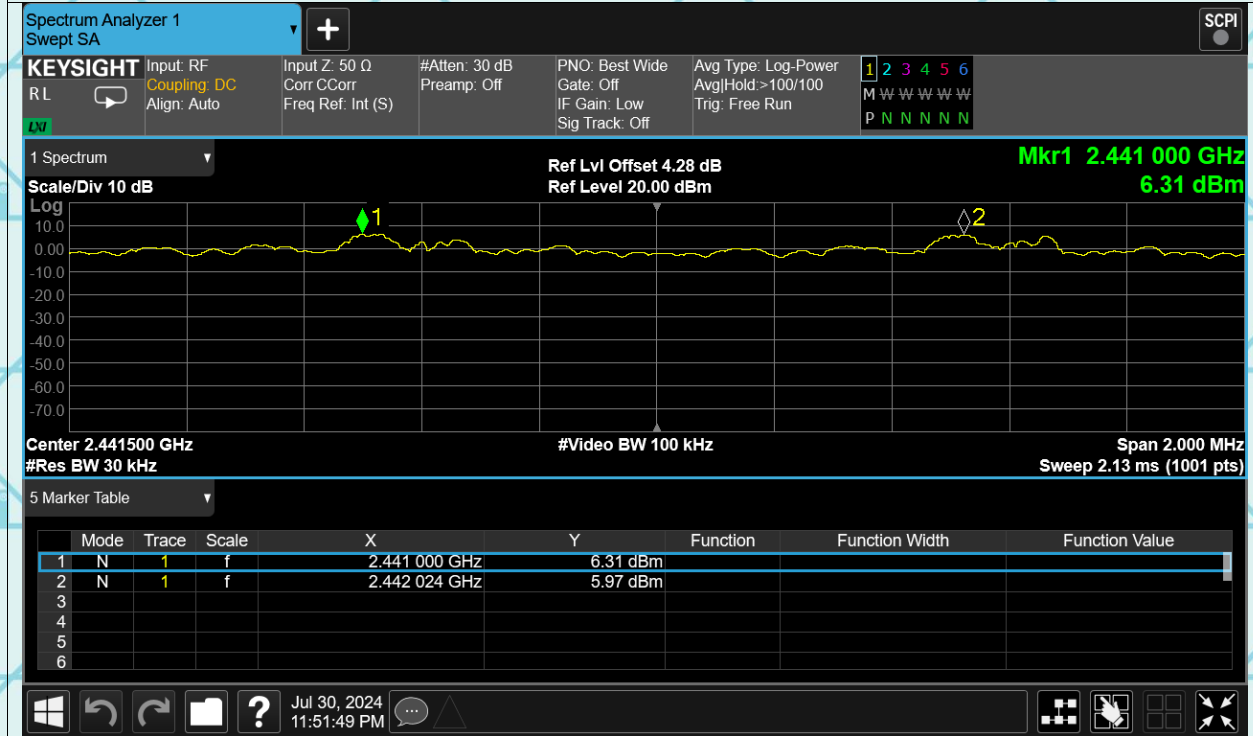


CFS 2-DH5 2402MHz

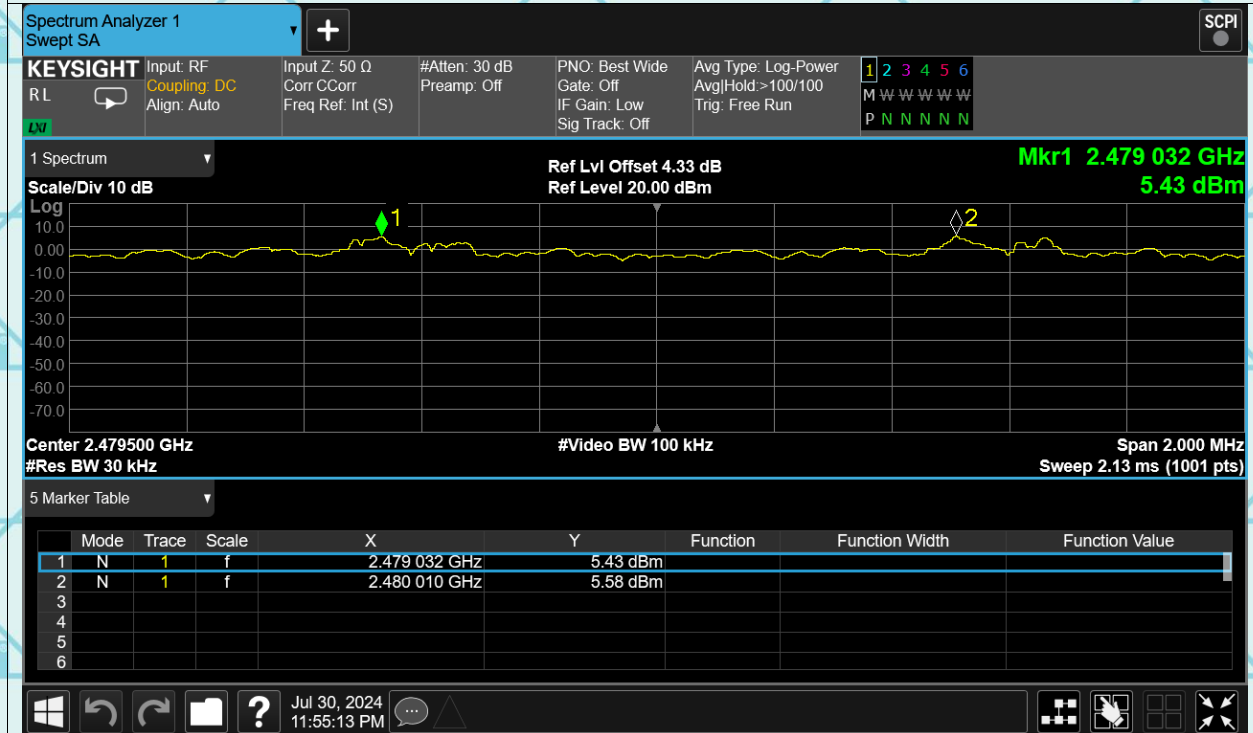


Report No.: WSCT-ANAB-R&E240700030A-BT

CFS 2-DH5 2441MHz

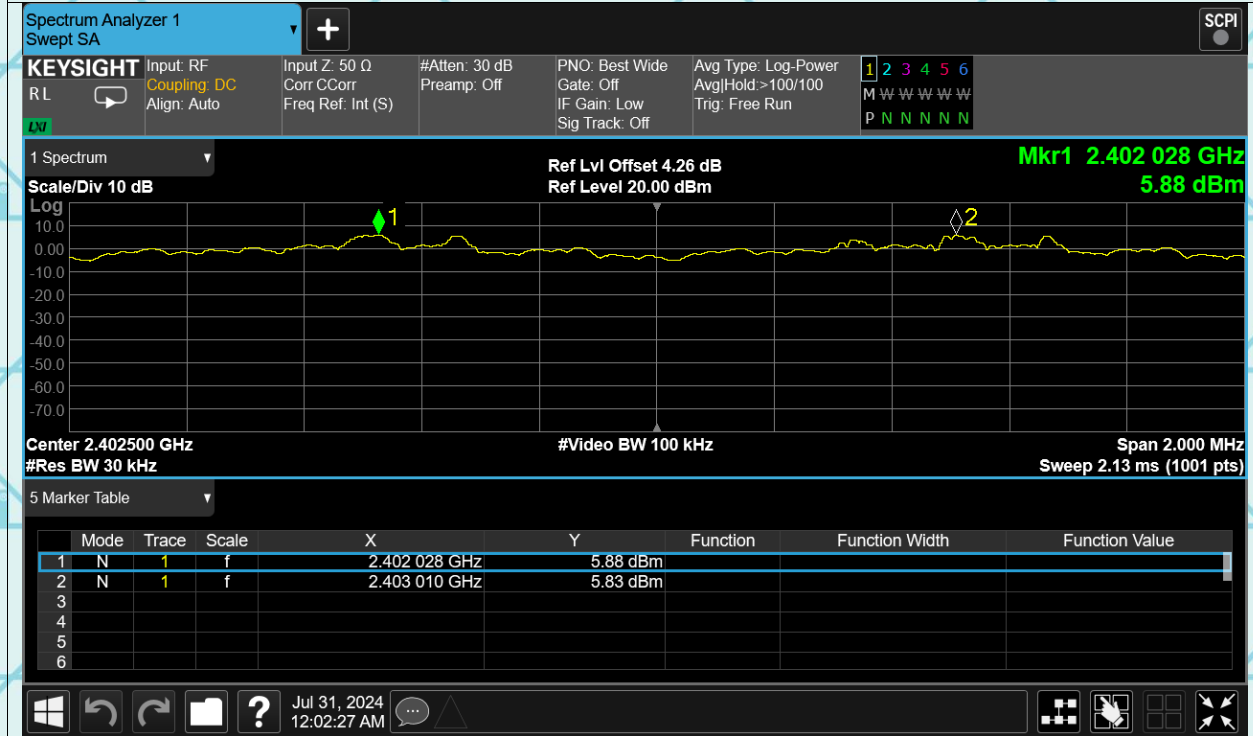


CFS 2-DH5 2480MHz

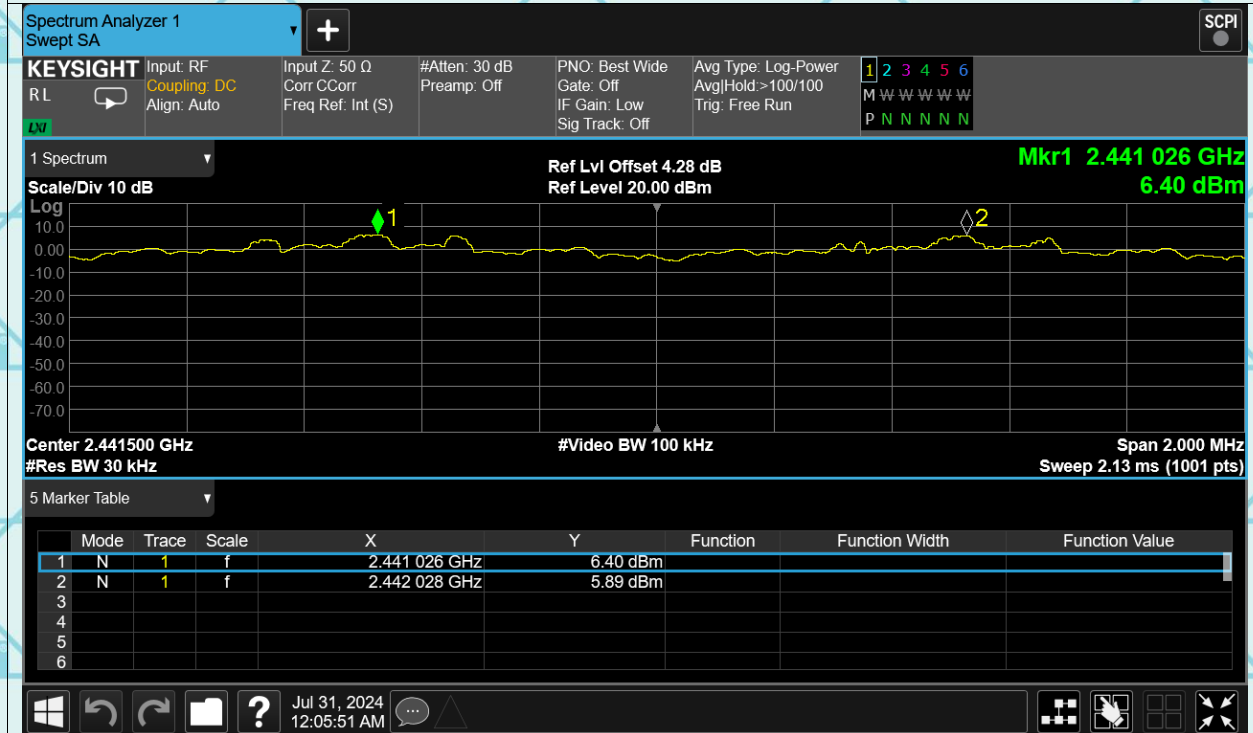


Report No.: WSCT-ANAB-R&E240700030A-BT

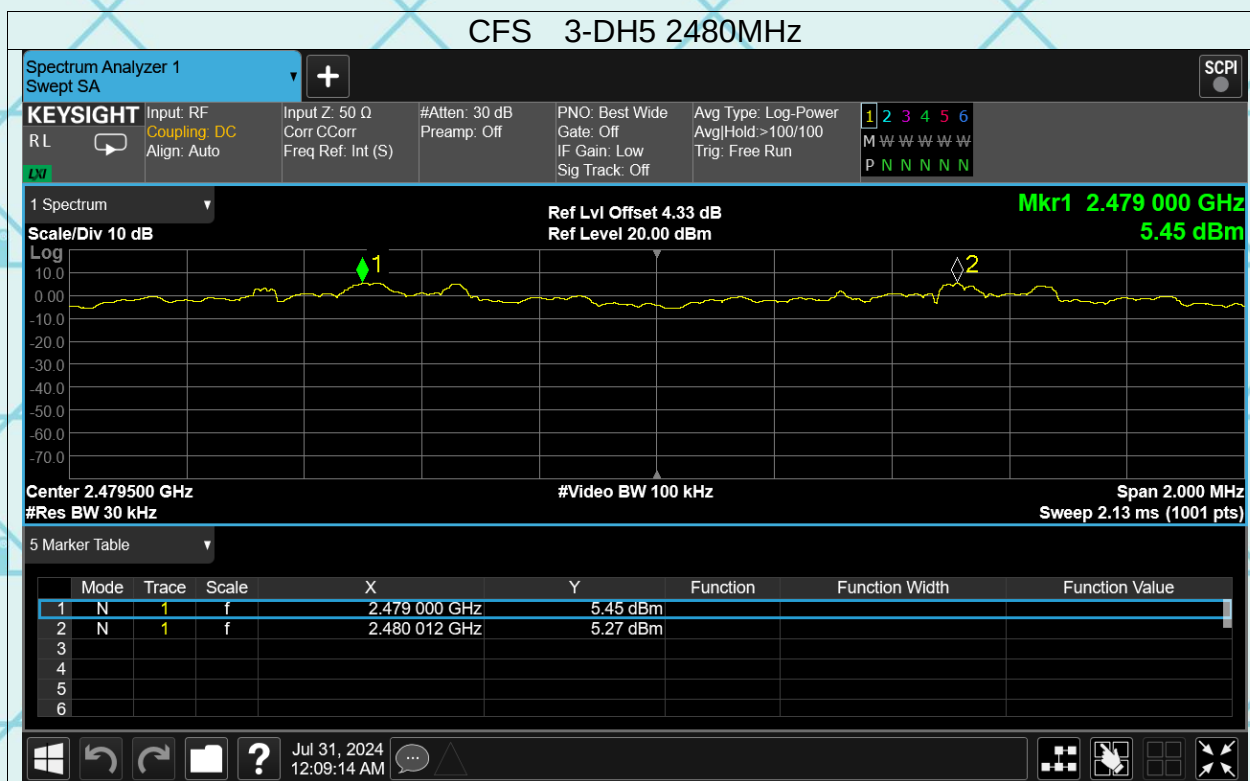
CFS 3-DH5 2402MHz



CFS 3-DH5 2441MHz

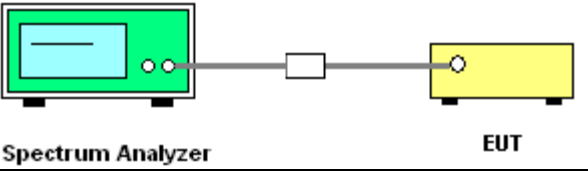


Report No.: WSCT-ANAB-R&E240700030A-BT



6.6. Hopping Channel Number

6.6.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2014
Limit:	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	1. The testing follows ANSI C63.10:2014 Measurement Guidelines. 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; set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller; VBW≥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 in report.
Test Result:	PASS

Report No.: WSCT-ANAB-R&E240700030A-BT

6.6.2. Test data

Mode	Hopping channel numbers	Limit	Result
GFSK, P/4-DQPSK, 8DPSK	79	15	PASS

Test plots as follows: