FCC & ISED CANADA CERTIFICATION TEST REPORT

FOR THE

CMCR001, BLUETOOTH SPEAKER

FCC ID: YJ7CMCR001BB

IC ID: 9082A-CMCR001B

WLL REPORT # 18287-01 REV 1

Prepared for:

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Testing Certificate AT-1448

FCC & ISED Canada Certification Test Report

for the

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August 14, 2023

WLL Report# 18287-01 Rev 1

Prepared by:

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Abstract

This report has been prepared on behalf of Stanley Black & Decker, Inc.to support the attached application for a 2.4GHz Bluetooth Transmitter. The test report and application are submitted for a Frequency Hopping Spread Spectrum (FHSS) Transmitter under Part 15.247 of the FCC Rules and under Innovation Science and Economic Development (ISED) Canada RSS-247, Issue 2 (2/2017). This test Report documents the test configuration and test results for the Stanley Black & Decker, Inc., CMCR001. The information provided in this report is only applicable to the device herein documented, as the EUT.

The radiated emissions portion of the testing was performed in the Free-space Anechoic Chamber Test-site (FACT) 3m Chamber of Washington Laboratories, Ltd., located at 4840 Winchester Boulevard, Suite #5. Frederick, MD 21703. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD.

Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent test laboratory. The Washington Laboratories, Ltd. ISED Canada number is 3035A.

The Stanley Black & Decker, Inc., CMCR001 complies with the requirements for a FHSS Bluetooth Transmitter under Part 15.247 of the FCC Rules and under Innovation Science and Economic Development (ISED) Canada RSS-247, Issue 2 (2/2017).

Revision History	Description of Change	Date
Rev 0	Initial Release	August 14, 2023
Rev 1	Change Ant. Gain from .76 to .45 dBi	November 10, 2023

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1 Introduction

1.1 Compliance Statement

The Stanley Black & Decker, Inc., CMCR001 complies with the requirements for a FHSS Bluetooth Transmitter under Part 15.247 of the FCC Rules and under Innovation Science and Economic Development (ISED) Canada RSS-247, Issue 2 (2/2017).

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with C63.10 "ANSI Procedures for Compliance Testing of Unlicensed Wireless Devices". The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation. Table 1 provides the series and results of testing for compliance with for a FHSS device; full test results are shown in subsequent report sub-sections.

1.3 Testing Algorithm

The CMCR001, Bluetooth Speaker was provided to the test laboratory, in two sample configurations: (1) a conducted (at the antenna port) sample and (2) a wireless radiated (PCB trace antenna) sample. The EUT low, center, and high channels were tunable through the support laptop's interface. Prior to all testing, the transmitter power was adjusted [via software] to the maximum allowable setting withing the support software, indicated by a numerical value of "8". This setting achieved the reported peak transmit output power denoted in Table 2. The EUT was tested in a manner that produced the worst-case emission levels, which are provided in the test results data section(s) of this report.

1.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Frederick, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent test laboratory. The Washington Laboratories, Ltd. ISED Canada number is 3035A.

1.5 Contract Information

Customer:	Stanley Black & Decker, Inc.
Purchase Order Number:	M865023a
Quotation Number:	74164

1.6 Test and Support Personnel

Washington Laboratories, LTD	Ryan Mascaro and Thuan Ta
Customer Representative	Kirwan Magdamo

1.7 Test Dates

8/1/2023 to 8/10/2023 (also see Section 4 of this report)

Table 1: Certification Testing Summary and Compliance Results

FCC Rule Part	ISED Canada Rule Part	Test Description	Result
15.247(b)(1)	RSS-247; 5.4(b)	Transmit Output Power	Pass
15.247(a)(1) 2.1049	RSS-247; 5.1(a)	Channel Occupied Bandwidth	Pass
15.247(a)(1)(iii)	RSS-247; 5.1(d)	Number of Channels Used	Pass
15.247(a)(1)(iii)	RSS-247; 5.1(d)	Time of Occupancy (Dwell Time)	Pass
15.247(a)(1)	RSS-247; 5.1(b)	Channel Carrier Separation	Pass
15.247(d) DA 00-705	RSS-247; 5.5	Bandedge Compliance (20dB)	Pass
15.247(d)	RSS-247; 5.5	Conducted Spurious Emissions	Pass
15.205(a) 15.209(a)	RSS-Gen; 8.9 RSS-Gen; 8.10	General Field Strength Requirements	Pass
15.203	RSS-Gen; 6.8	Antenna Requirement	Pass †
15.207	RSS-Gen; 8.8	AC Powerline Conducted Emissions	Pass

† the EUT employs a custom PCB trace antenna that cannot be removed. The EUT does not have an antenna connector.

2 Test Results

2.1 Transmitter Output Power

For frequency hopping systems operating in the 2400 MHz to 2483.5 MHz band, that employ at least 75 non-overlapping hopping channels, the maximum conducted output power (measured at the antenna port) shall not exceed 30 dBm (1 Watt). Additionally, ISED Canada requires that the EIRP shall not exceed 4 Watts, except as provided in RSS-247, Section 5.4(e).

2.1.1 Measurement Method and Results

This test was performed as specified in ANSI C63.10 (2013), Section 7.8.5.

The EUT was configured in a fully-modulated mode, with the hopping stopped.

The EUT employs a PCB trace antenna with a maximum gain of +0.45 dBi.

4.51 + .45 = 4.96 dBm EIRP (calculated), which is far below the 4W limit.

Table 2: Transmitter Output Power – Test Results

Modulation	Mode (Data Rate)	Frequency (MHz)	Peak Power (dBm)
GFSK	DH5 (1Mbps)	2402 MHz	4.40
		2441 MHz	4.27
		2480 MHz	4.00
π/4DQPSK	2DH5 (2Mbps)	2402 MHz	4.34
		2441 MHz	4.23
		2480 MHz	3.96
8DPSK	3DH5 (3Mbps)	2402 MHz	4.51
		2441 MHz	4.37
		2480 MHz	4.10

Figure 1: GFSK (1Mbps) – Low Channel, Peak Power Output

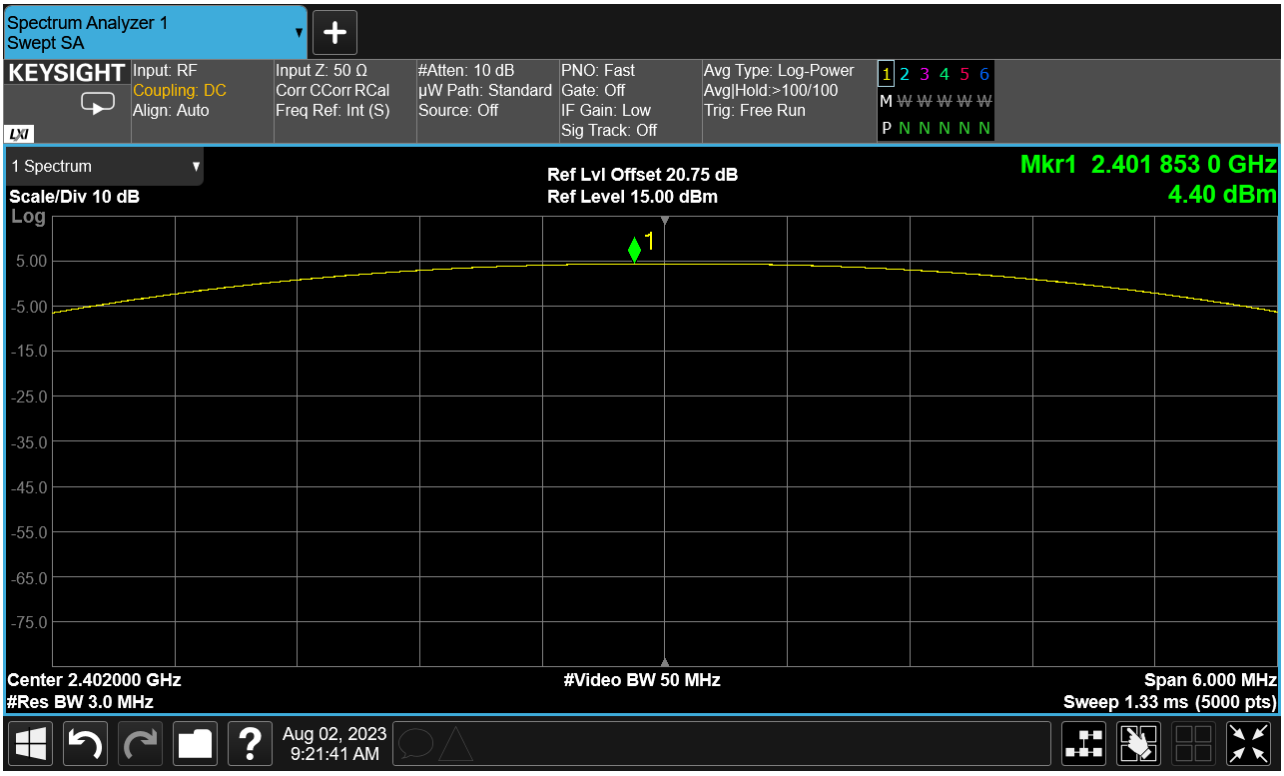


Figure 2: GFSK (1Mbps) – Center Channel, Peak Power Output

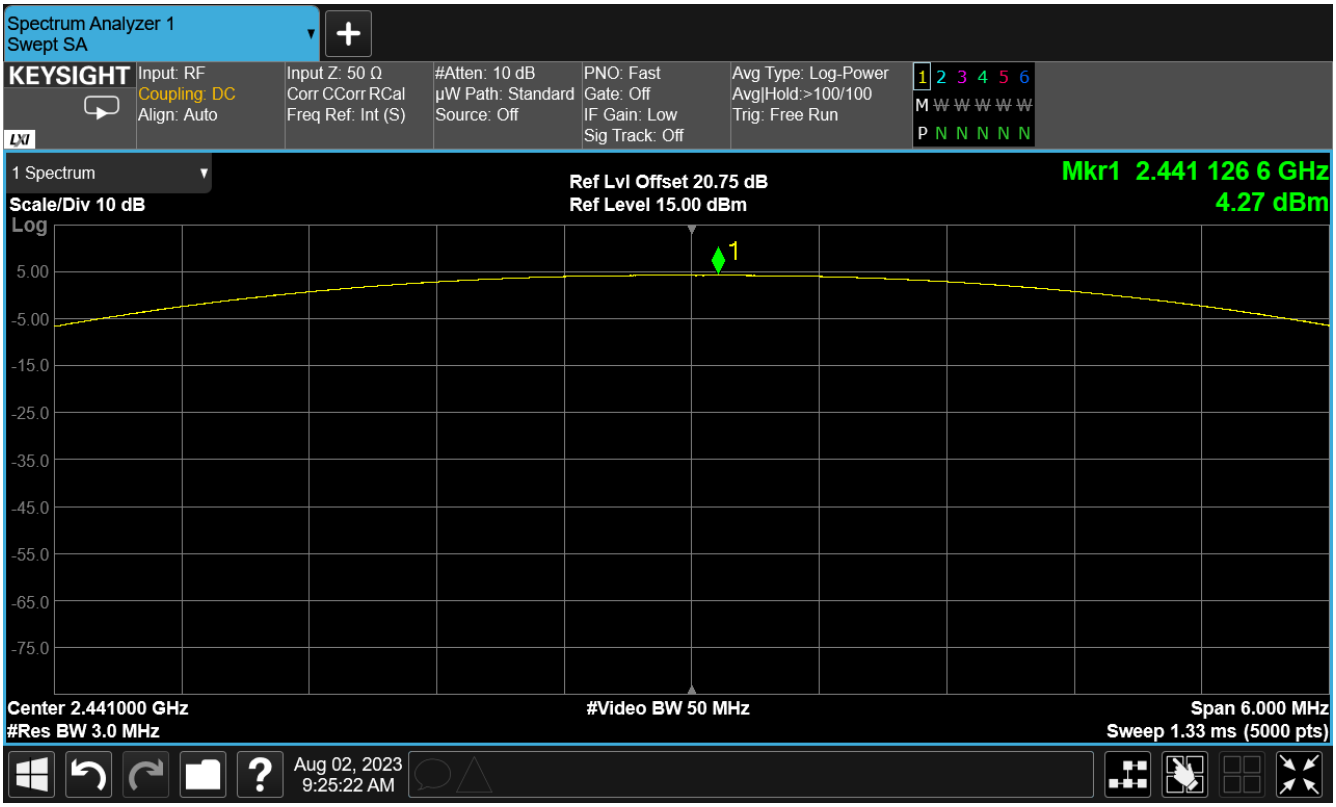


Figure 3: GFSK (1Mbps) – High Channel, Peak Power Output

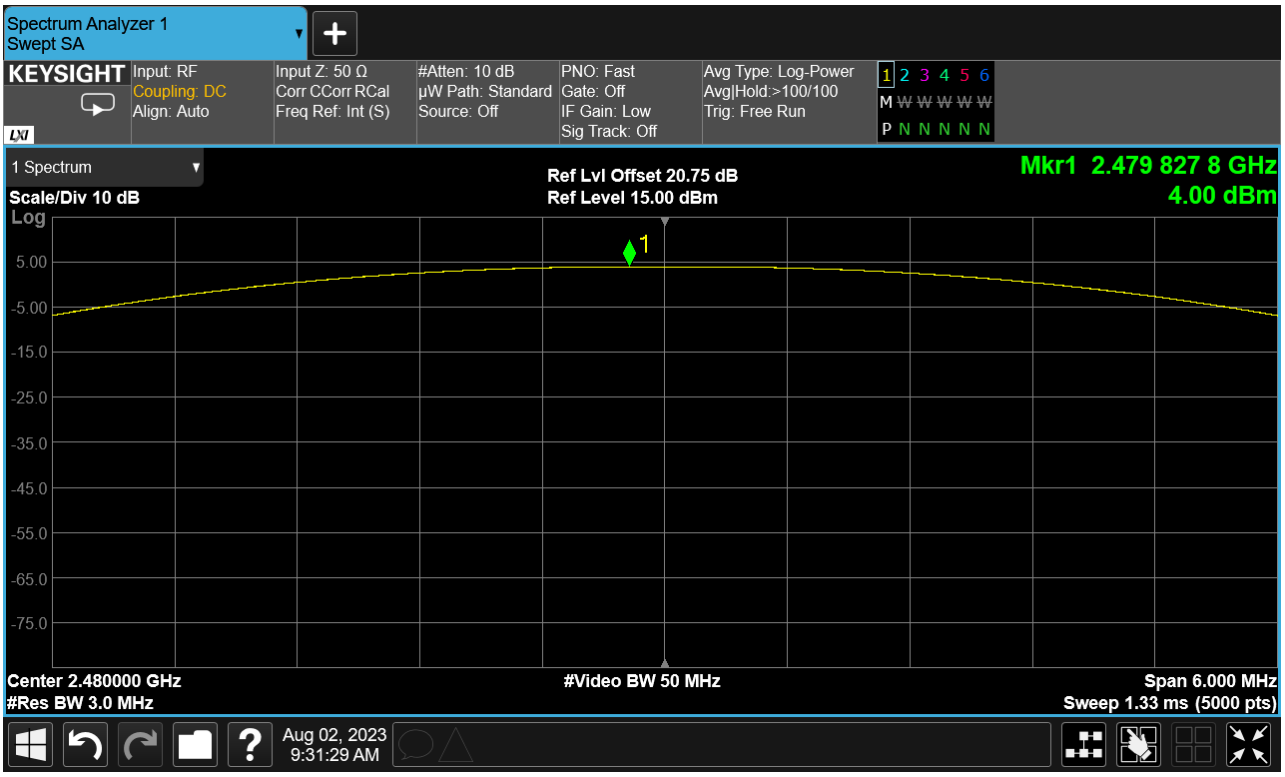


Figure 4: π/4DQPSK (2Mbps) – Low Channel, Peak Power Output

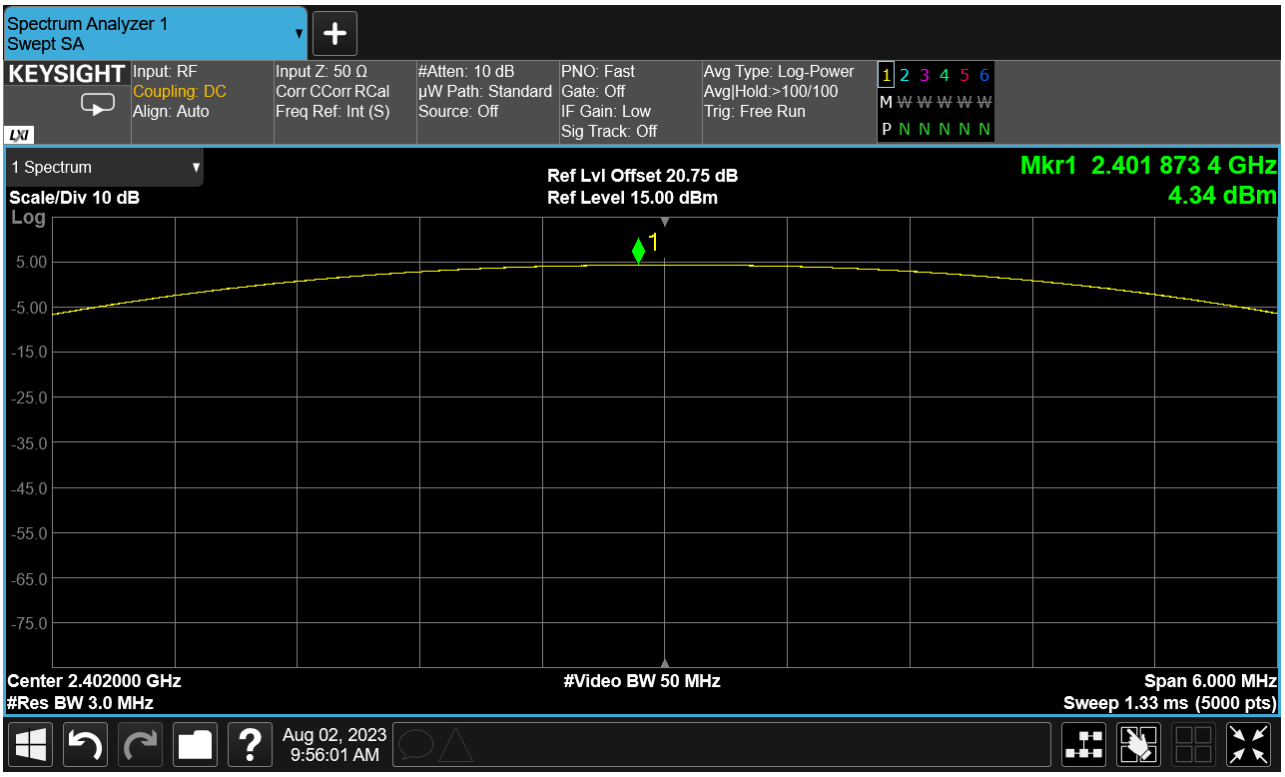


Figure 5: π/4DQPSK (2Mbps) – Center Channel, Peak Power Output

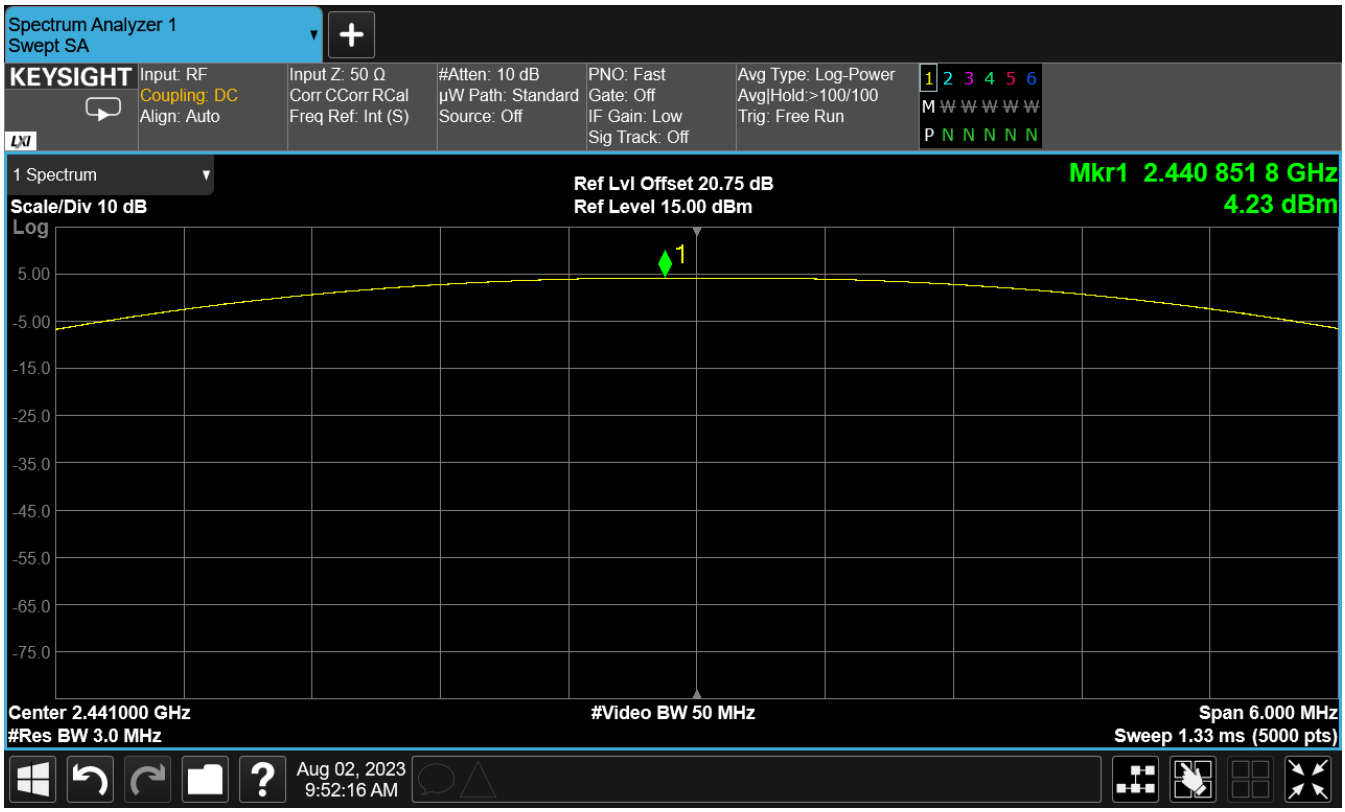


Figure 6: π/4DQPSK (2Mbps) – High Channel, Peak Power Output

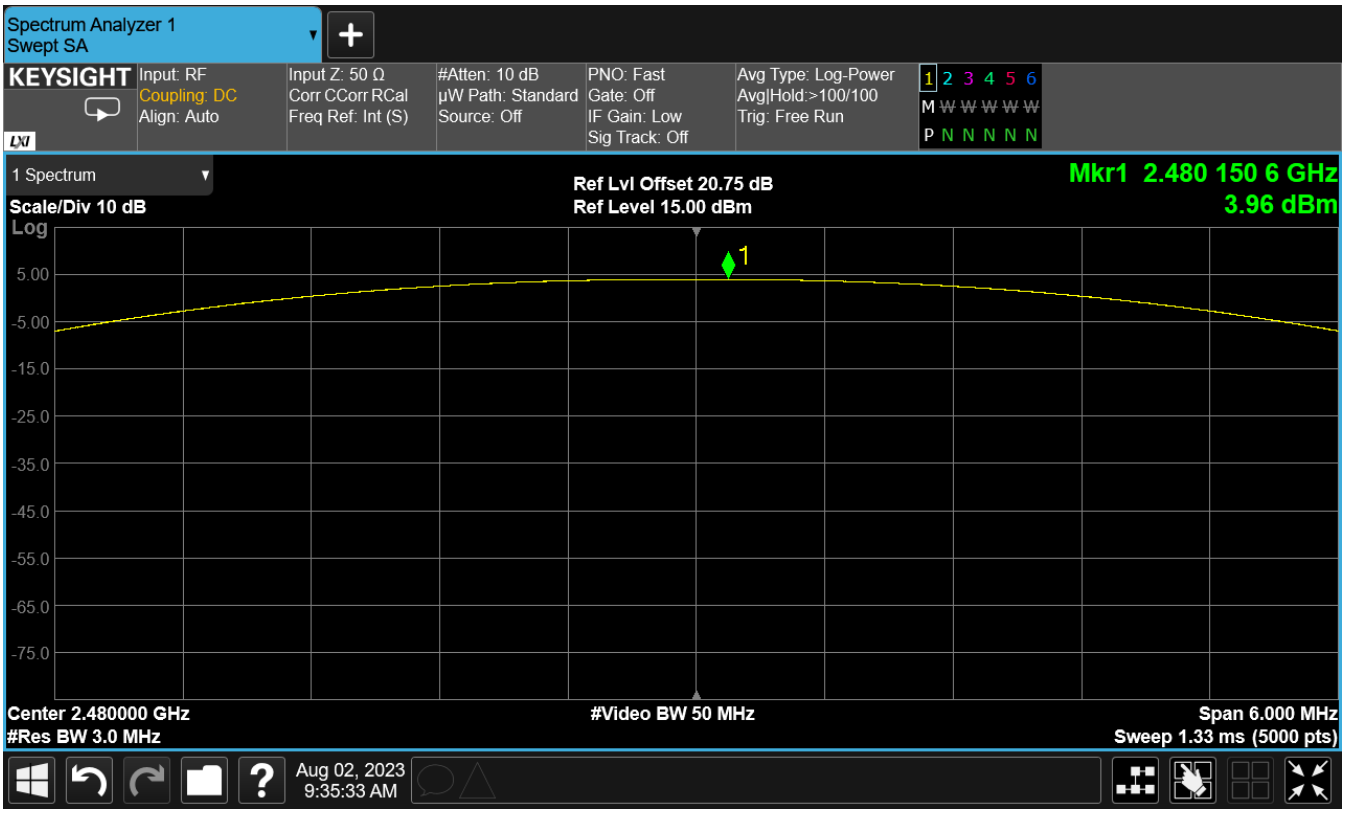


Figure 7: 8DPSK (3Mbps) – Low Channel, Peak Power Output

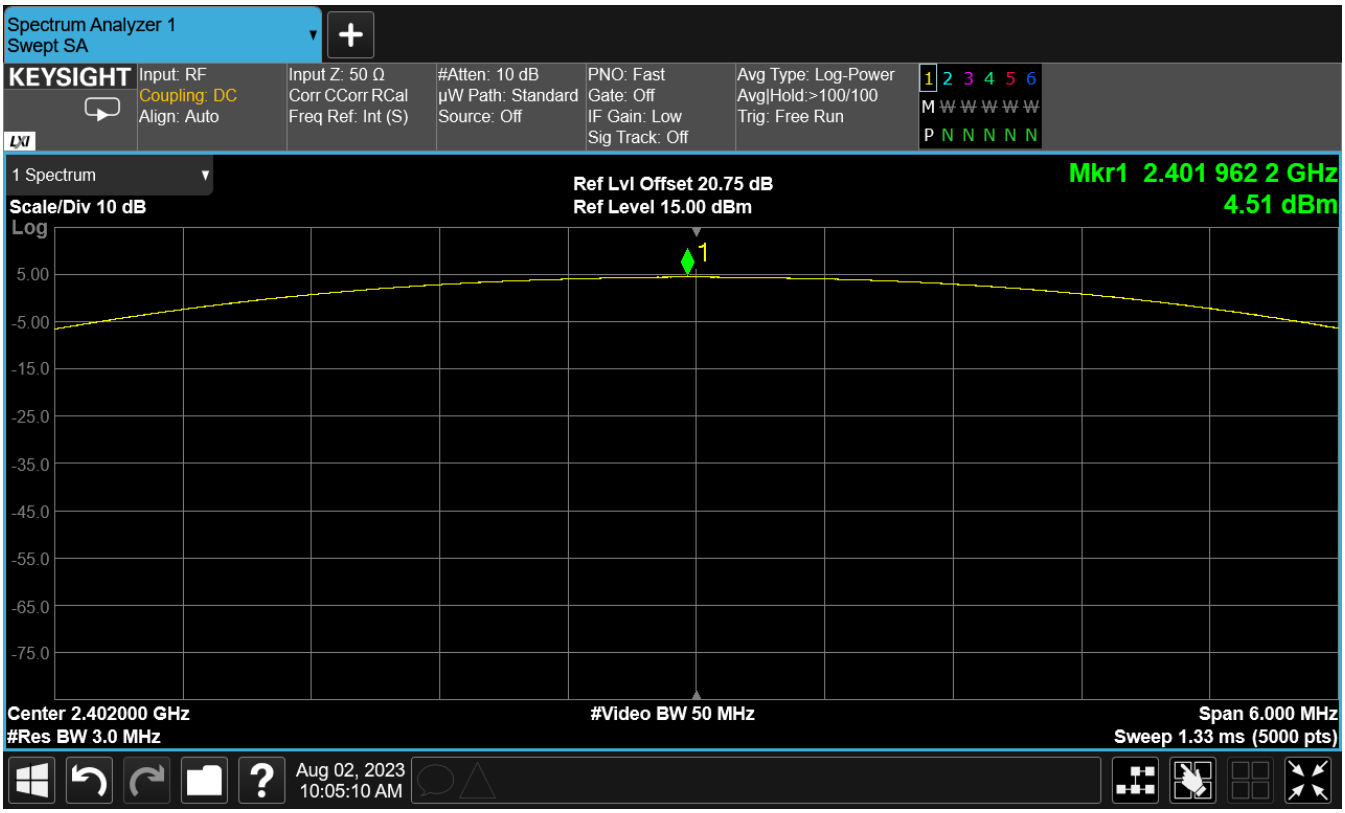


Figure 8: 8DPSK (3Mbps) – Center Channel, Peak Power Output

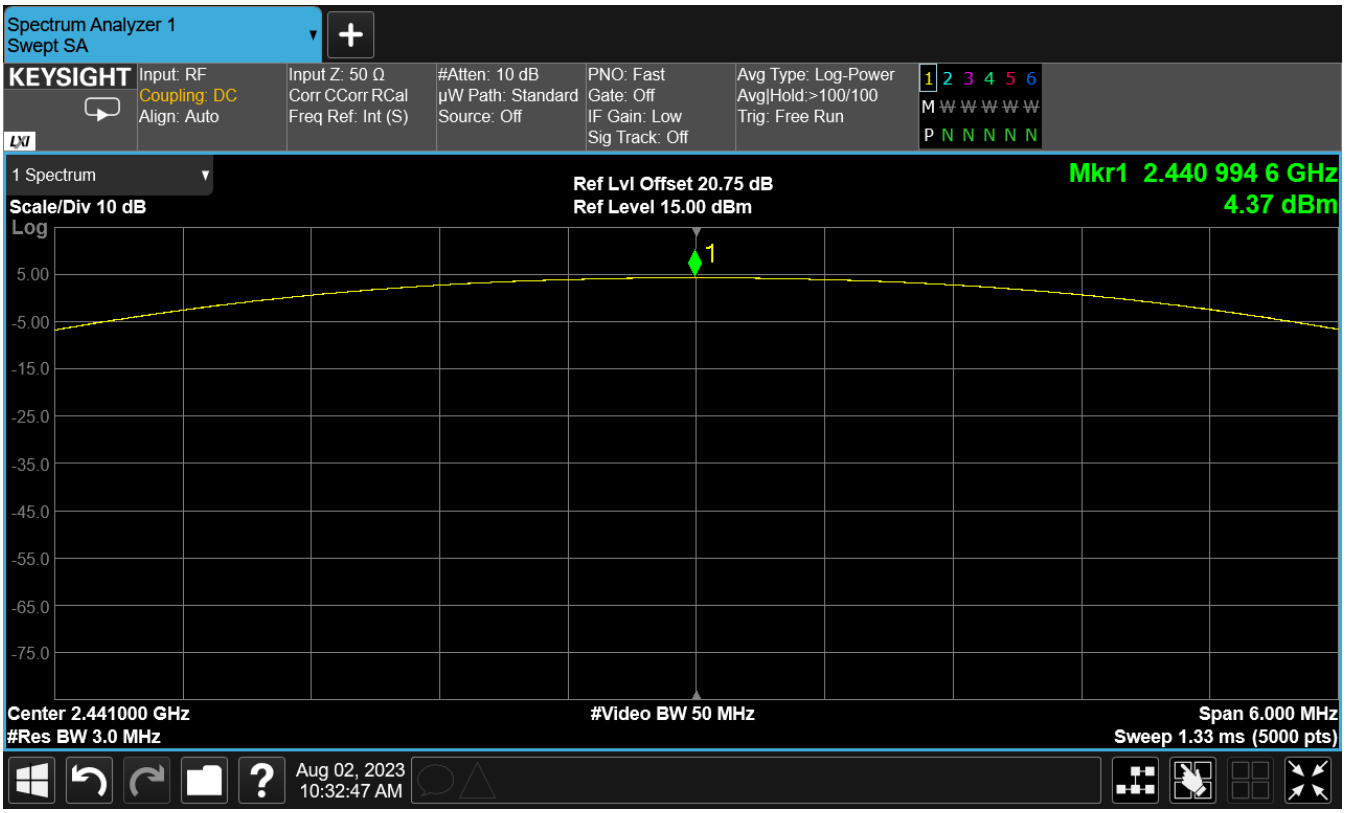
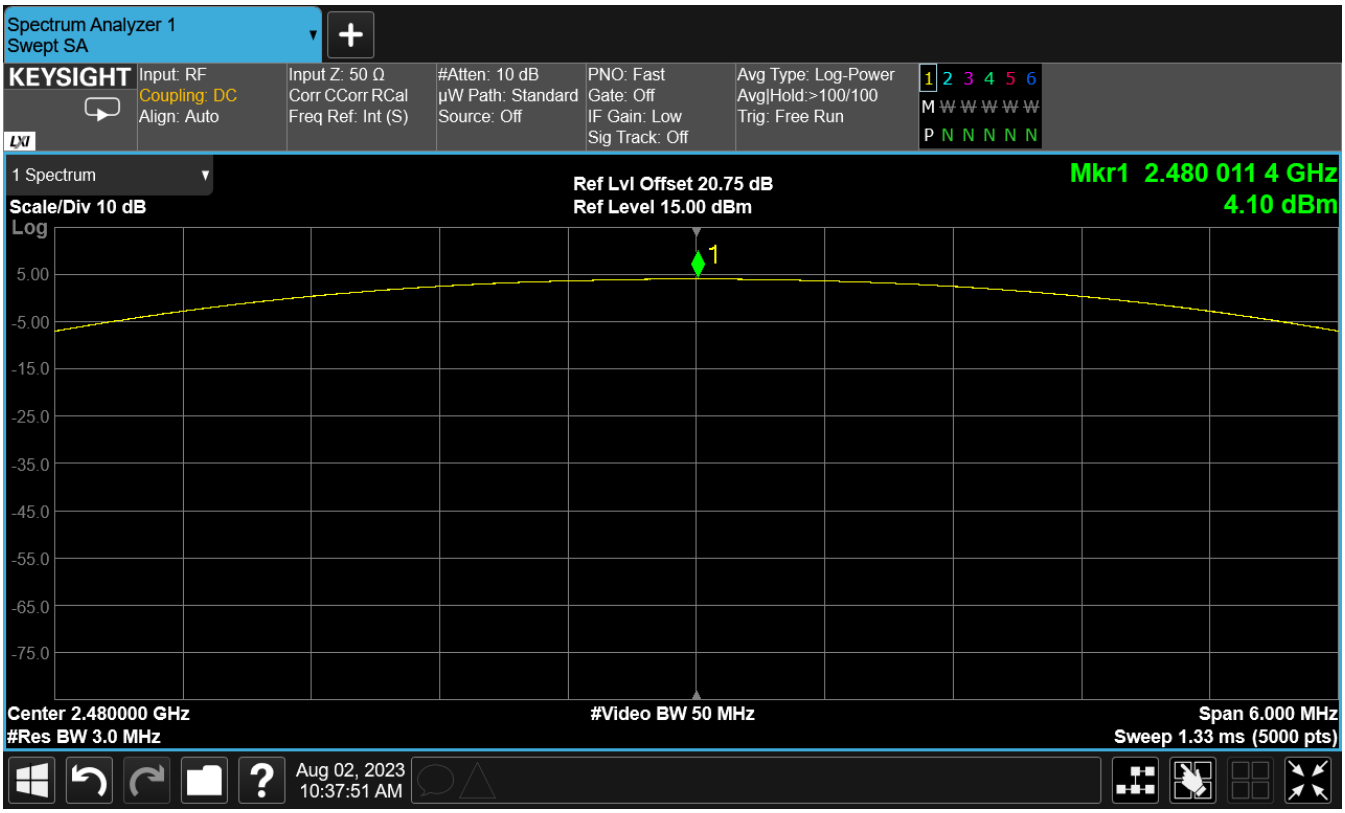


Figure 9: 8DPSK (3Mbps) – High Channel, Peak Power Output



2.2 Channel Occupied Bandwidth

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400 MHz to 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, provided the systems operate with an output power no greater than 125 mW.

The occupied bandwidth of a frequency hopping channel is the 20dB emission bandwidth, measured with the hopping stopped. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

2.2.1 Measurement Method and Results

This test was performed as specified in ANSI C63.10 (2013), Section 6.9.2

The EUT was configured in a fully-modulated mode, with the hopping stopped.

Table 3: Channel Occupied Bandwidth – Test Results

Modulation	Mode (Data Rate)	Frequency (MHz)	20dB Bandwidth	99% Bandwidth
GFSK	DH5 (1Mbps)	2402	937.8 kHz	881.85 kHz
		2441	936.4 kHz	872.43 kHz
		2480	937.0 kHz	863.60 kHz
π/4DQPSK	2DH5 (2Mbps)	2402	1.268 MHz	1.169 MHz
		2441	1.268 MHz	1.167 MHz
		2480	1.269 MHz	1.168 MHz
8DPSK	3DH5 (3Mbps)	2402	1.243 MHz	1.155 MHz
		2441	1.243 MHz	1.154 MHz
		2480	1.244 MHz	1.155 MHz

Figure 10: GFSK (1Mbps) – Low Channel, Occupied Bandwidth

Figure 11: GFSK (1Mbps) – Center Channel, Occupied Bandwidth

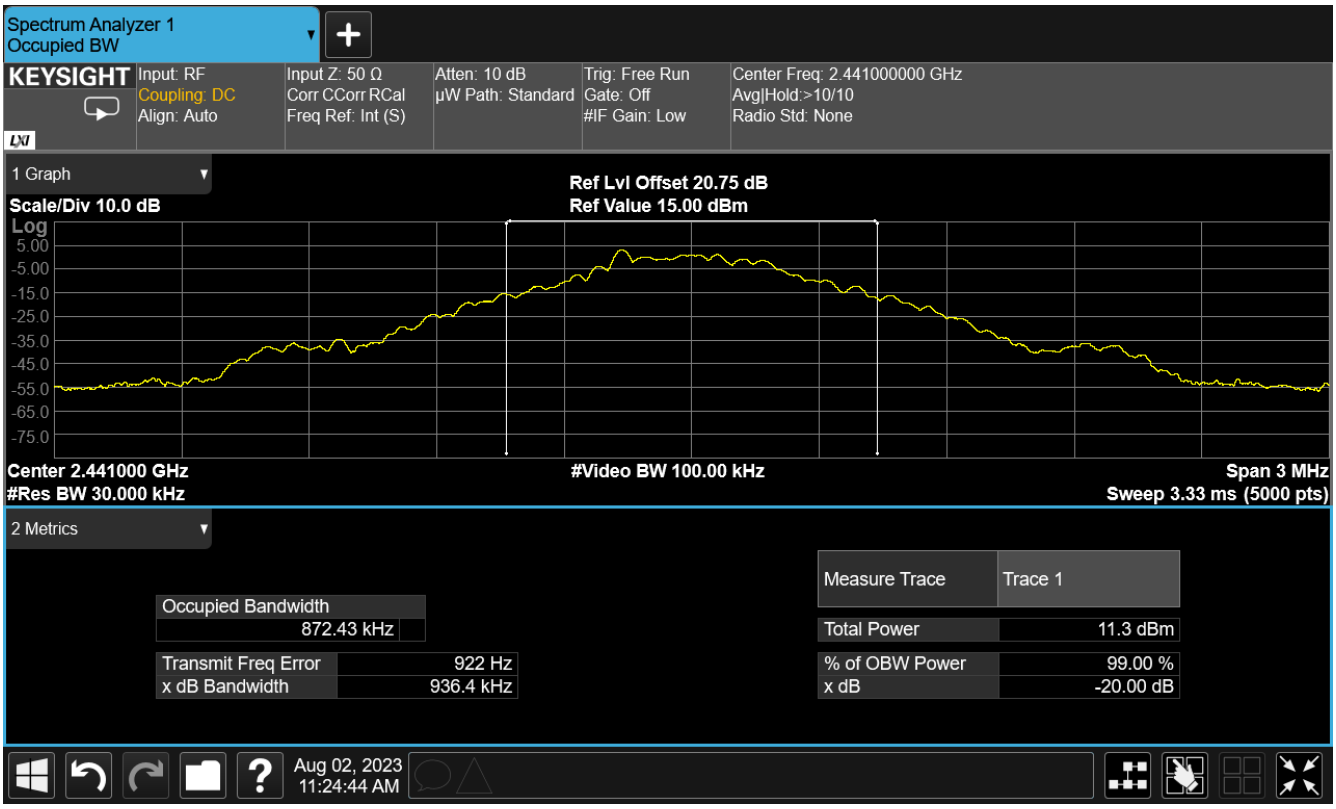


Figure 12: GFSK (1Mbps) – High Channel, Occupied Bandwidth

Figure 13: π/4DQPSK (2Mbps) – Low Channel, Occupied Bandwidth

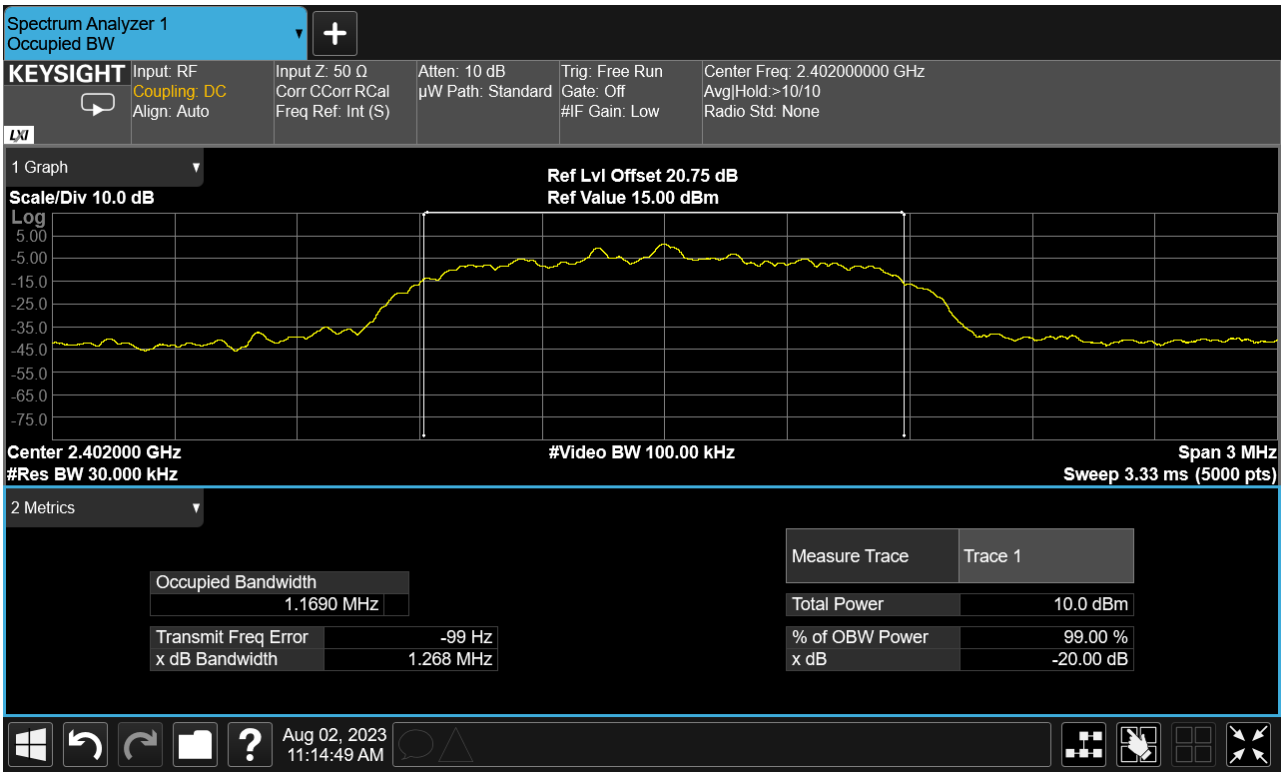


Figure 14: π/4DQPSK (2Mbps) – Center Channel, Occupied Bandwidth

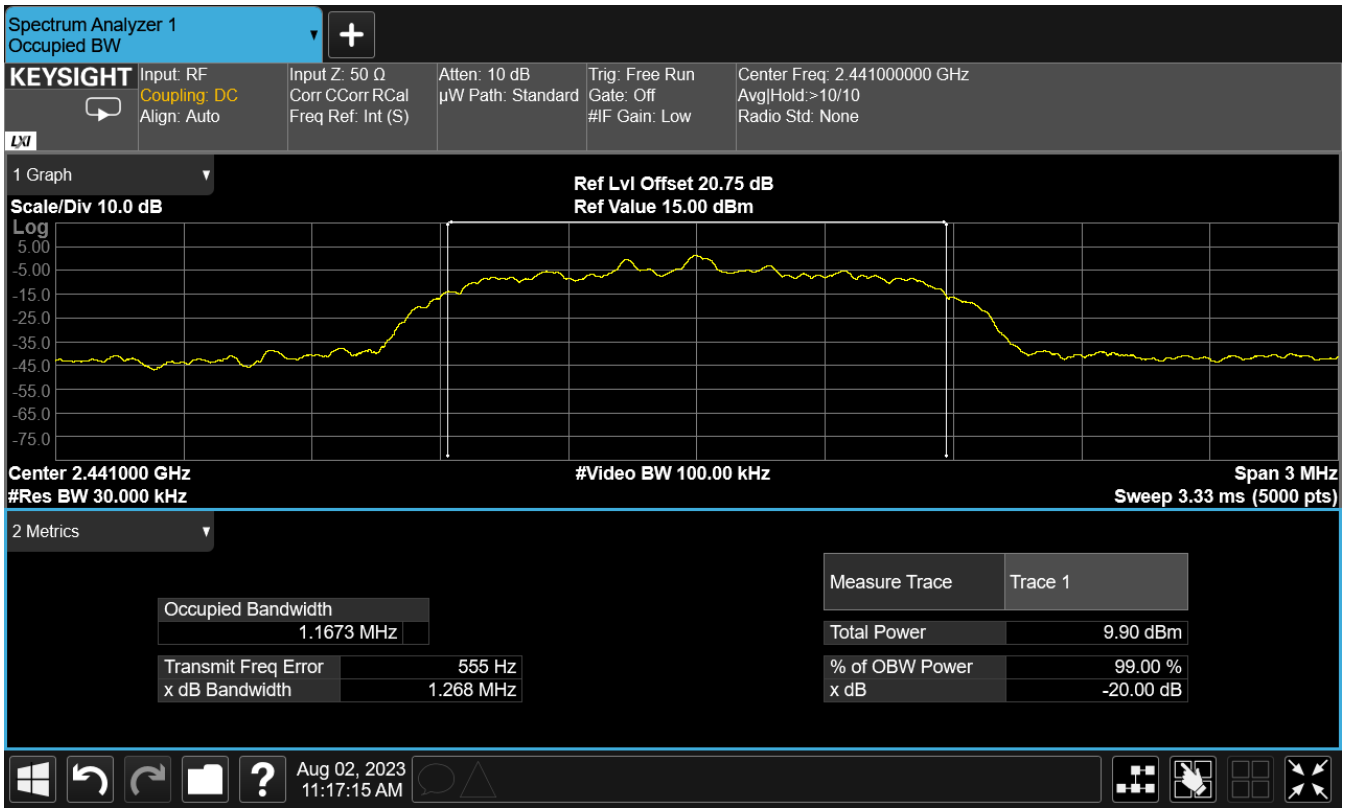


Figure 15: π/4DQPSK (2Mbps) – High Channel, Occupied Bandwidth

Figure 16: 8DPSK (3Mbps) – Low Channel, Occupied Bandwidth

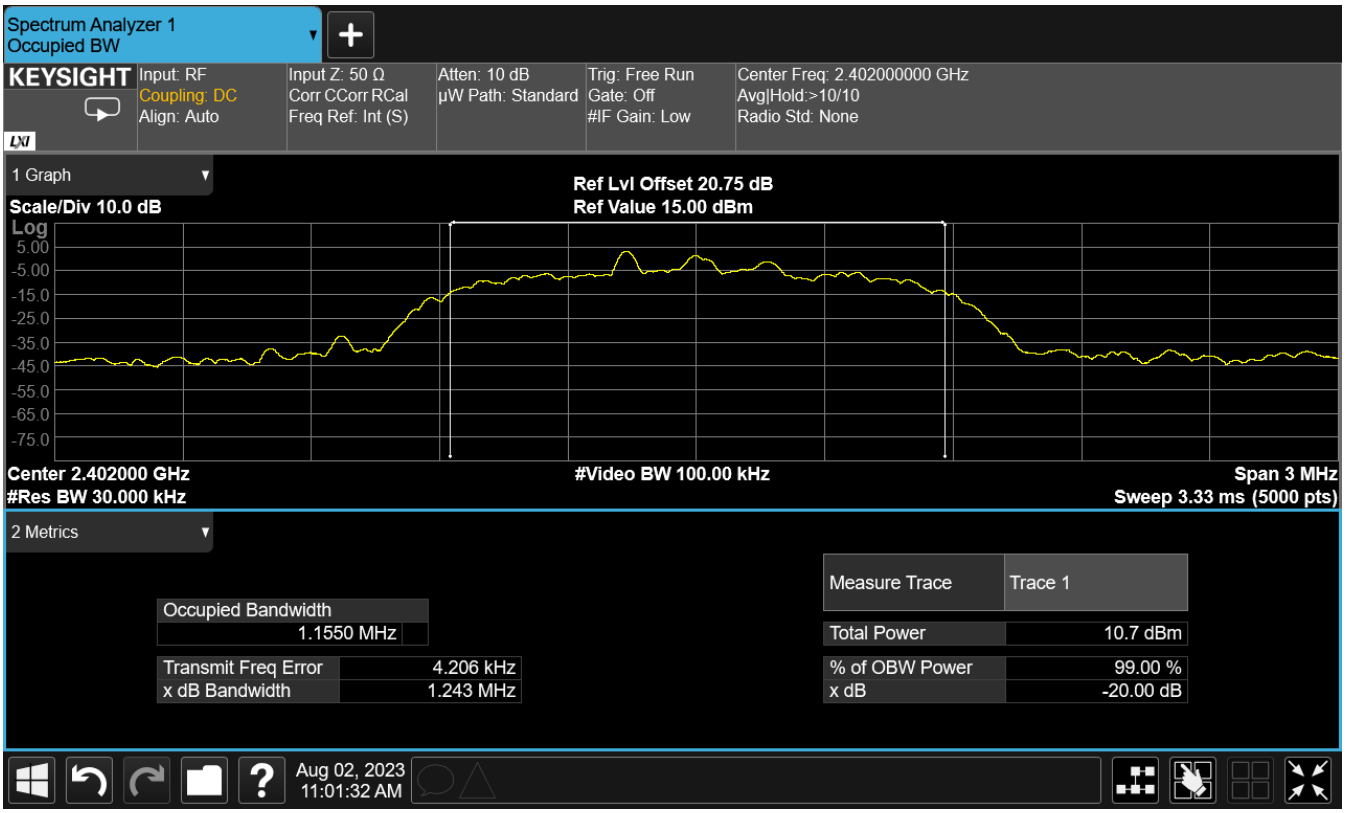


Figure 17: 8DPSK (3Mbps) – Center Channel, Occupied Bandwidth

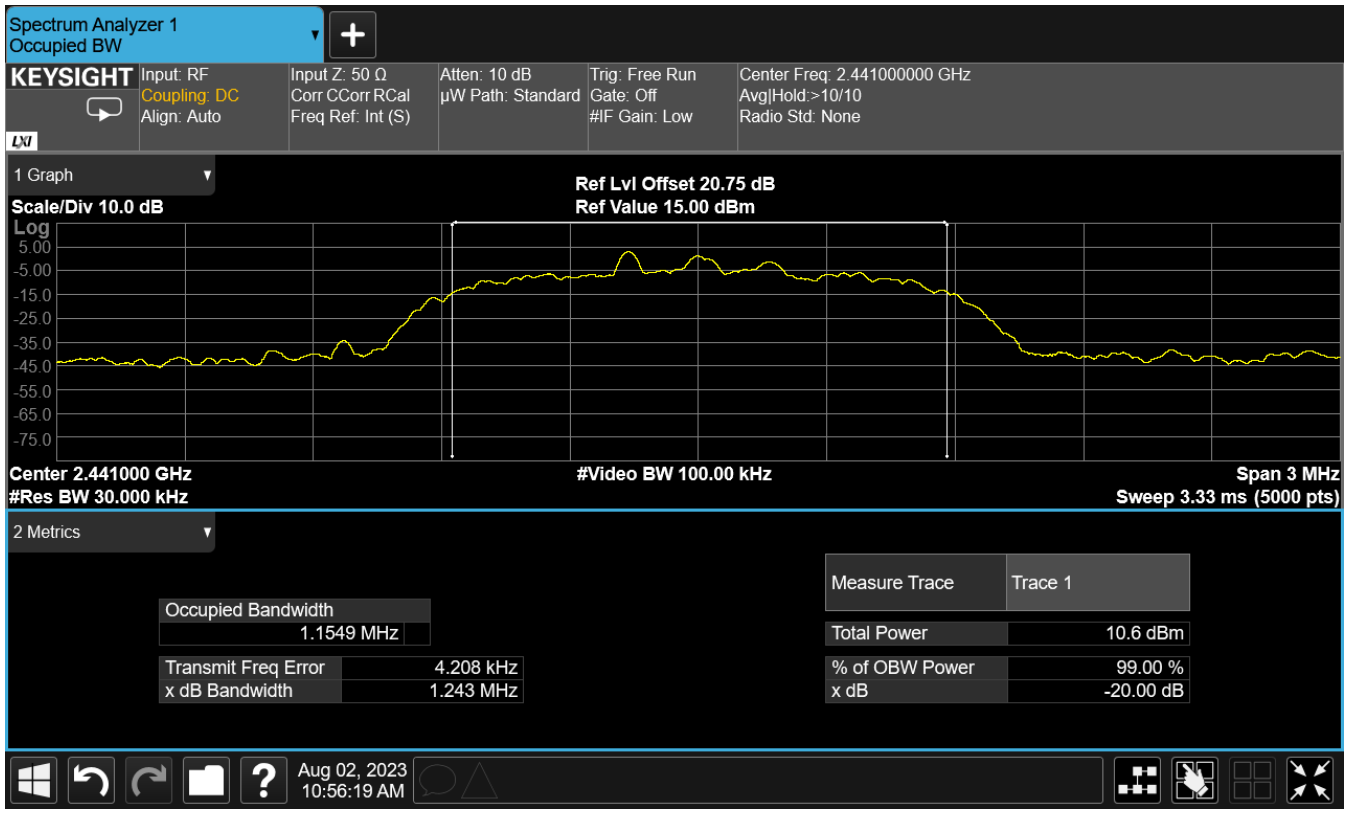
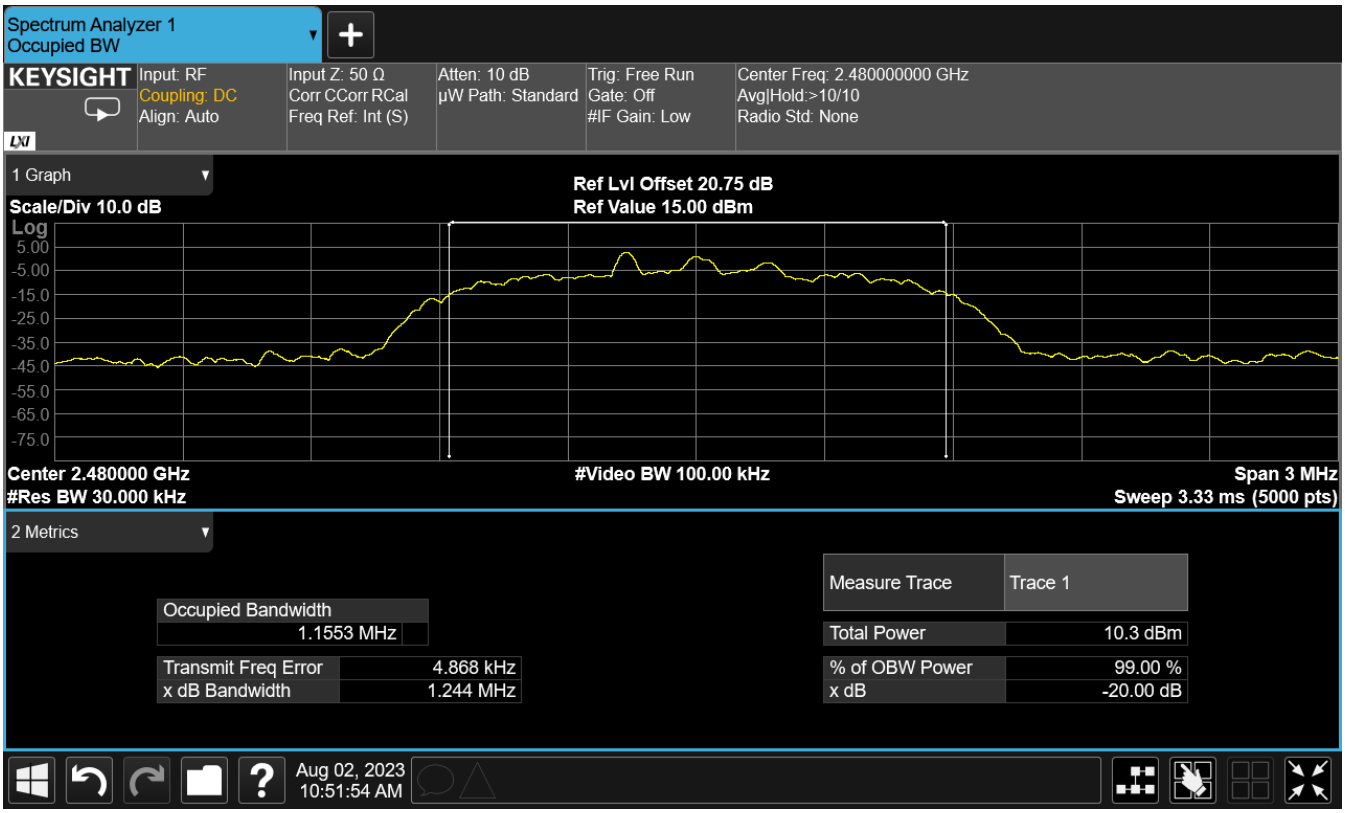


Figure 18: 8DPSK (3Mbps) – High Channel, Occupied Bandwidth



2.3 Number of Channels Used

Frequency hopping systems in the 2400 MHz to 2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 400 ms within a period of 400 ms multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

2.3.1 Measurement Method and Results

This test was performed as specified in ANSI C63.10 (2013), Section 7.8.1 and 7.8.3

The EUT was configured in a fully-modulated mode, with the hopping enabled.

Table 4: Number of Channels Used – Test Results

Modulation	Mode (Data Rate)	EUT Channels Used	Requirement
GFSK	DH5 (1Mbps)	79 Channels	15 Channels
π/4DQPSK	2DH5 (2Mbps)	79 Channels	15 Channels
8DPSK	3DH5 (3Mbps)	79 Channels	15 Channels

Figure 19: GFSK (1Mbps) – Number of Channels Used, Plot 1

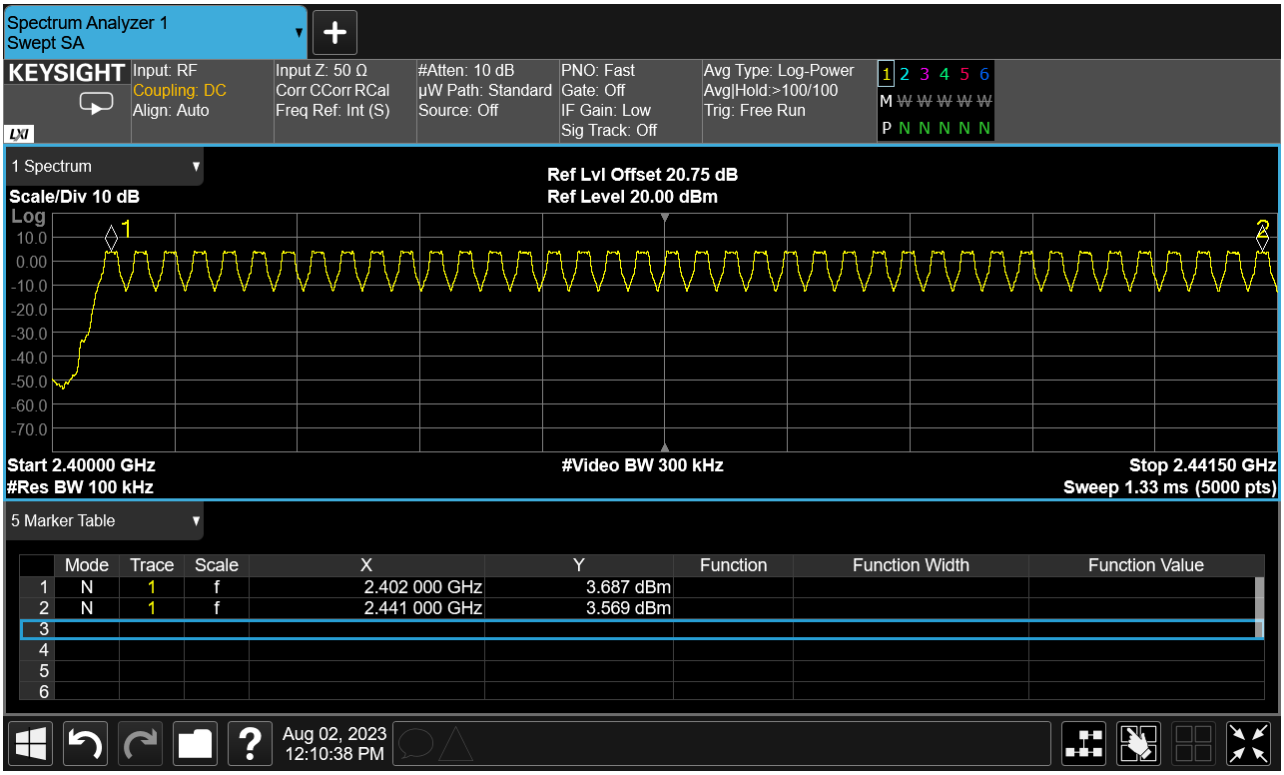


Figure 20: GFSK (1Mbps) – Number of Channels Used, Plot 2

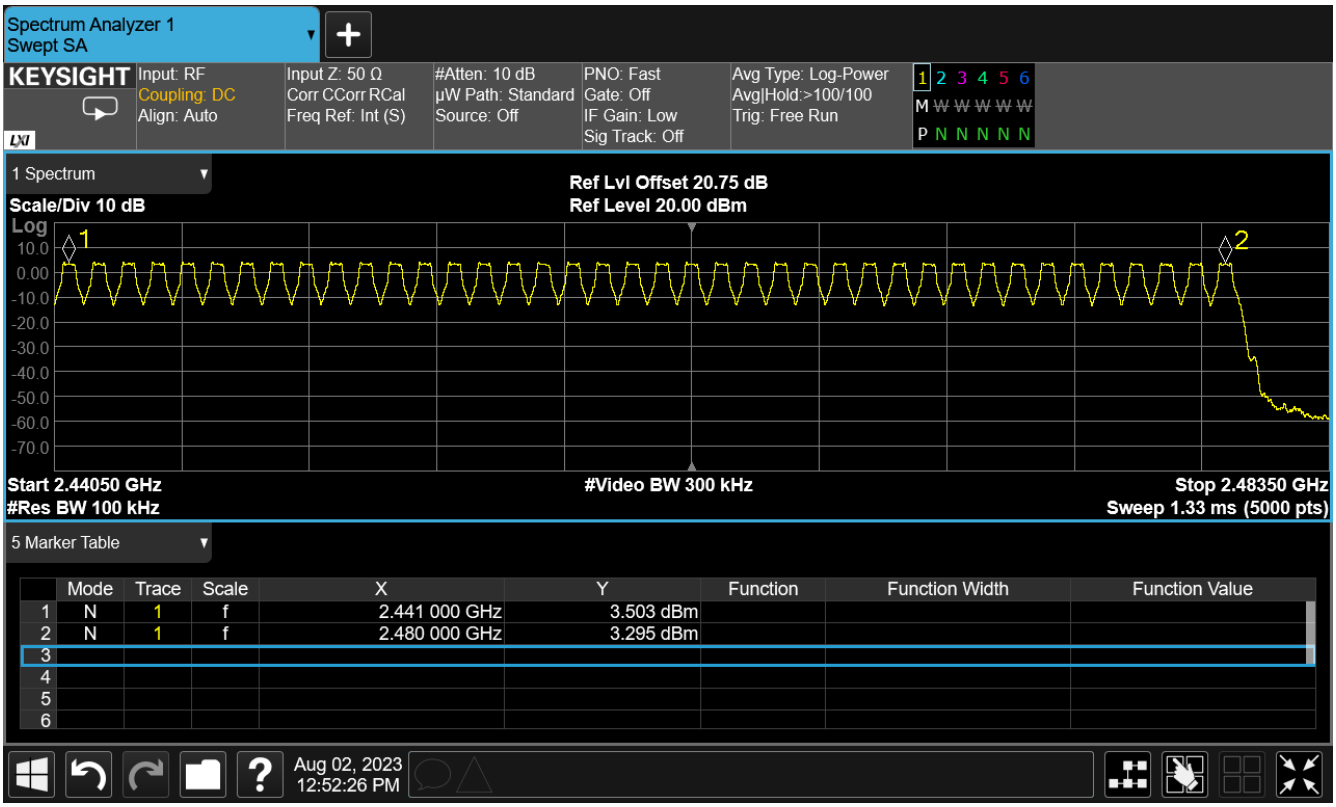


Figure 21: π/4DQPSK (2Mbps) – Number of Channels Used, Plot 1

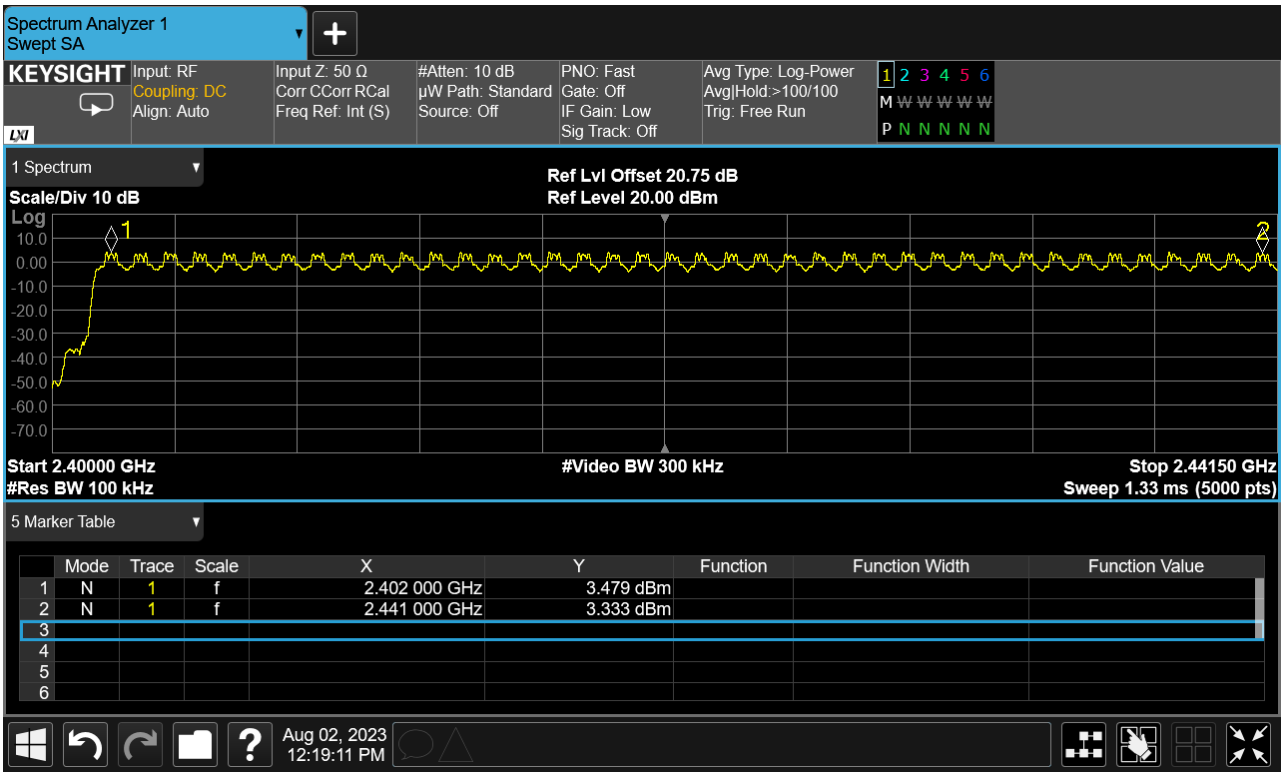


Figure 22: π/4DQPSK (2Mbps) – Number of Channels Used, Plot 2

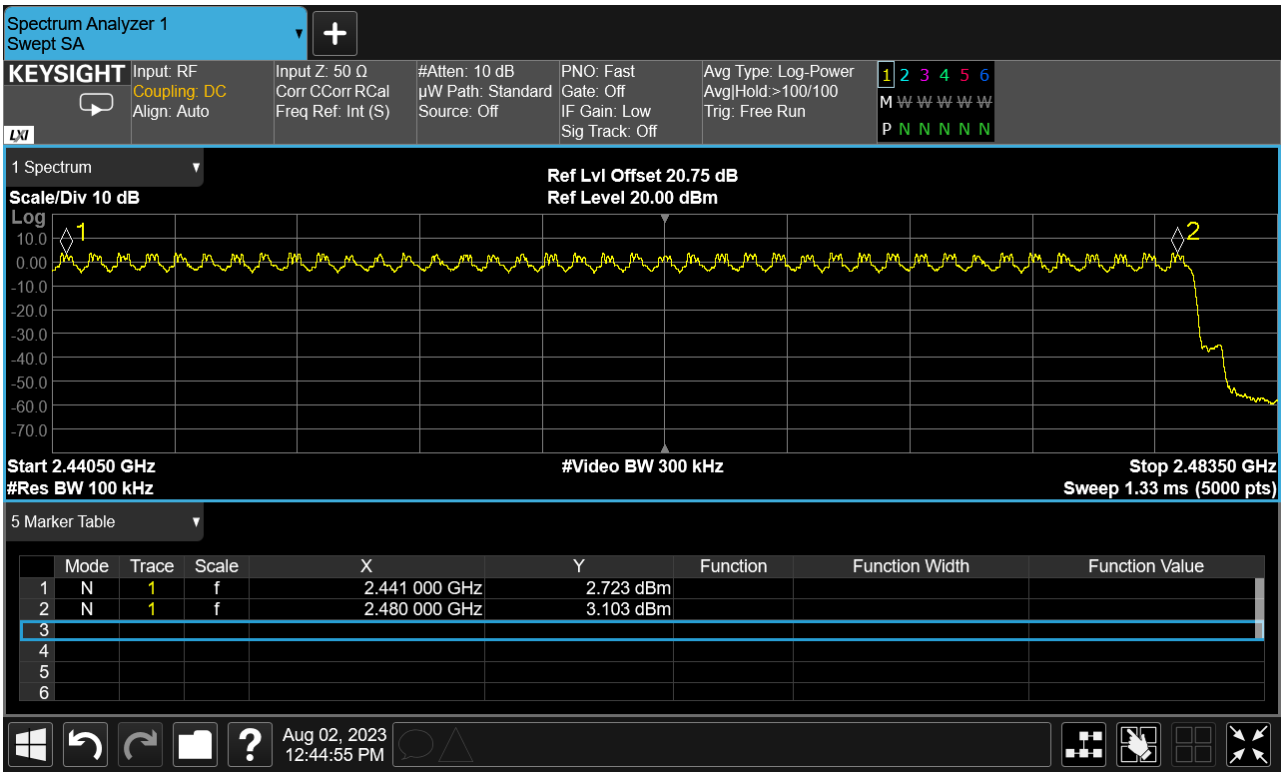


Figure 23: 8DPSK (3Mbps) – Number of Channels Used, Plot 1

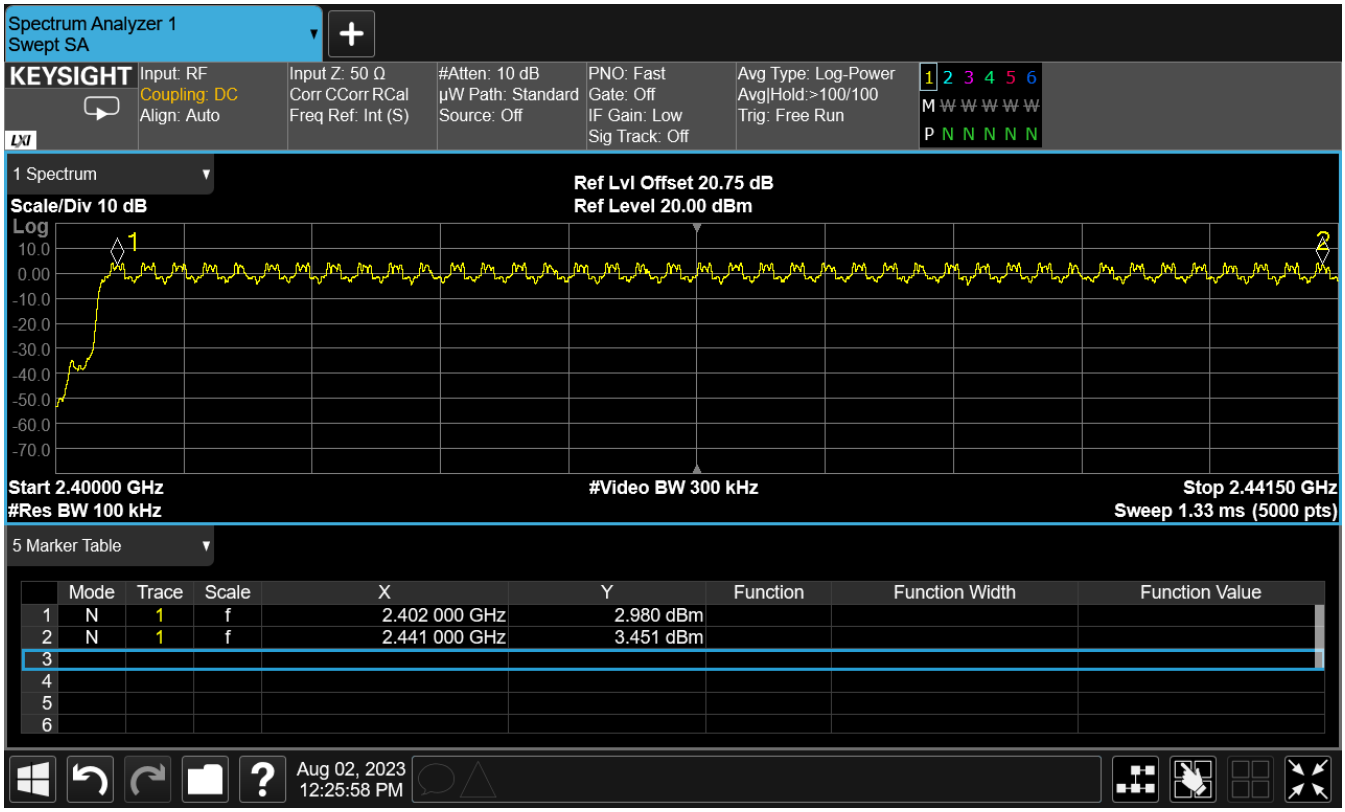
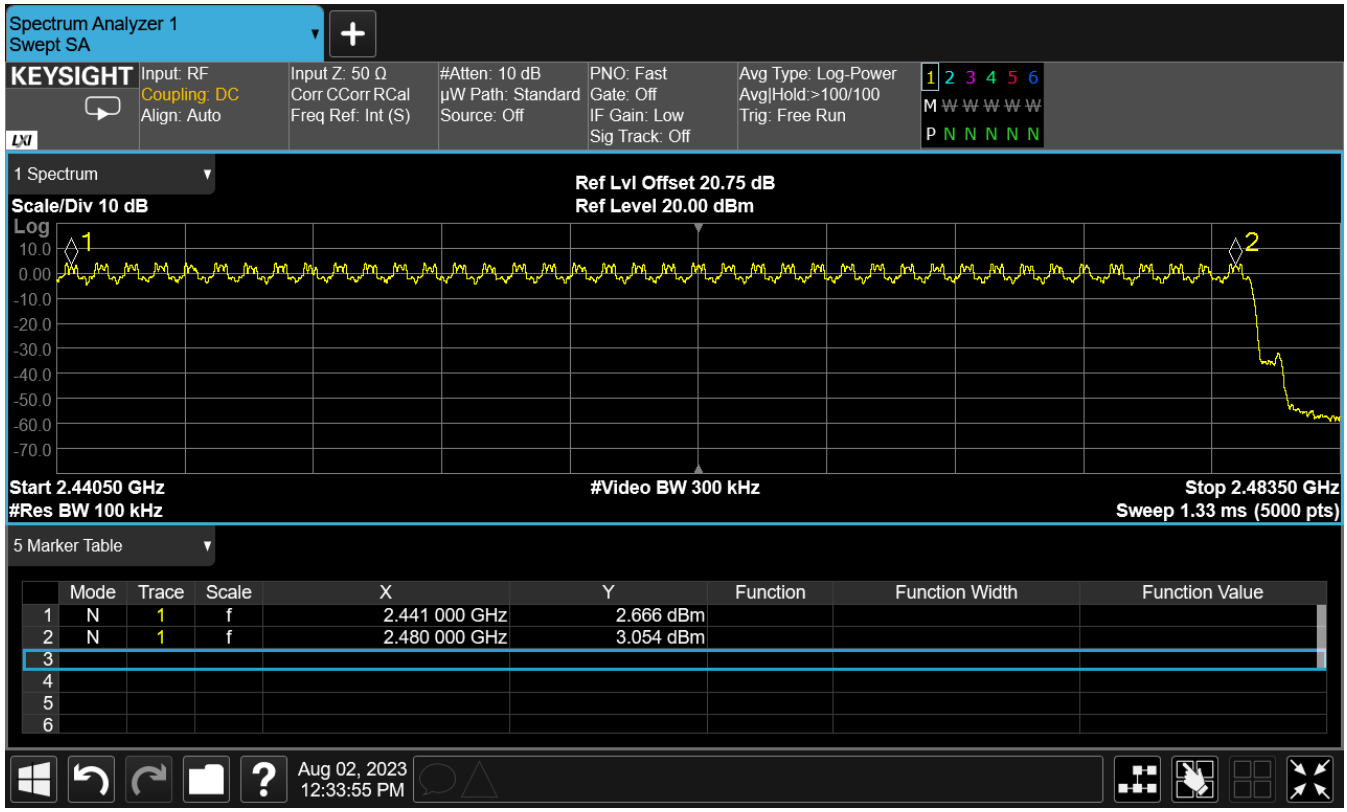


Figure 24: 8DPSK (3Mbps) – Number of Channels Used, Plot 2



2.4 Time of Occupancy (Dwell Time)

Frequency hopping systems in the 2400 MHz to 2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 400 ms within a period of 400 ms multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

2.4.1 Measurement Method and Results

This test was performed as specified in ANSI C63.10 (2013), Section 7.8.4.

The EUT was configured in a fully-modulated mode, with the hopping enabled.

The limits prescribed in this section shall be defined as follows:

79_{CHAN} * 0.4 second = 31.6 second period

Time of Occupancy Limit = 0.4s/31.6s

A multiplier factor of 6.32 shall be employed to extrapolate the total average time of occupancy of any channel over a 31.6 second period. This factor is based on a 5 second transmitter evaluation.

5 * 6.32 = 31.6

Table 5: Time of Occupancy – Test Results

Modulation	Transmissions in 5 seconds	Transmissions in 31.6 seconds	Single Transmission Period	EUT Occupancy Dwell	Occupancy Limit
GFSK	14	89	2.91 ms	258.9 ms	400 ms
π/4DQPSK	16	101	2.95 ms	297.9 ms	400 ms
8DPSK	16	101	2.95 ms	297.9 ms	400 ms

Figure 25: GFSK Transmitter 5-Second Evaluation (Hopping)

* in this case, it appears that there may only be seven full-power transmitter hops; however, after further investigation there are actually 14 individual transmitter hops in a given 5-second evaluation period. See next plot for detailed measurement.

Figure 26: GFSK Transmitter Evaluation (Hopping) – Single Dwell Time

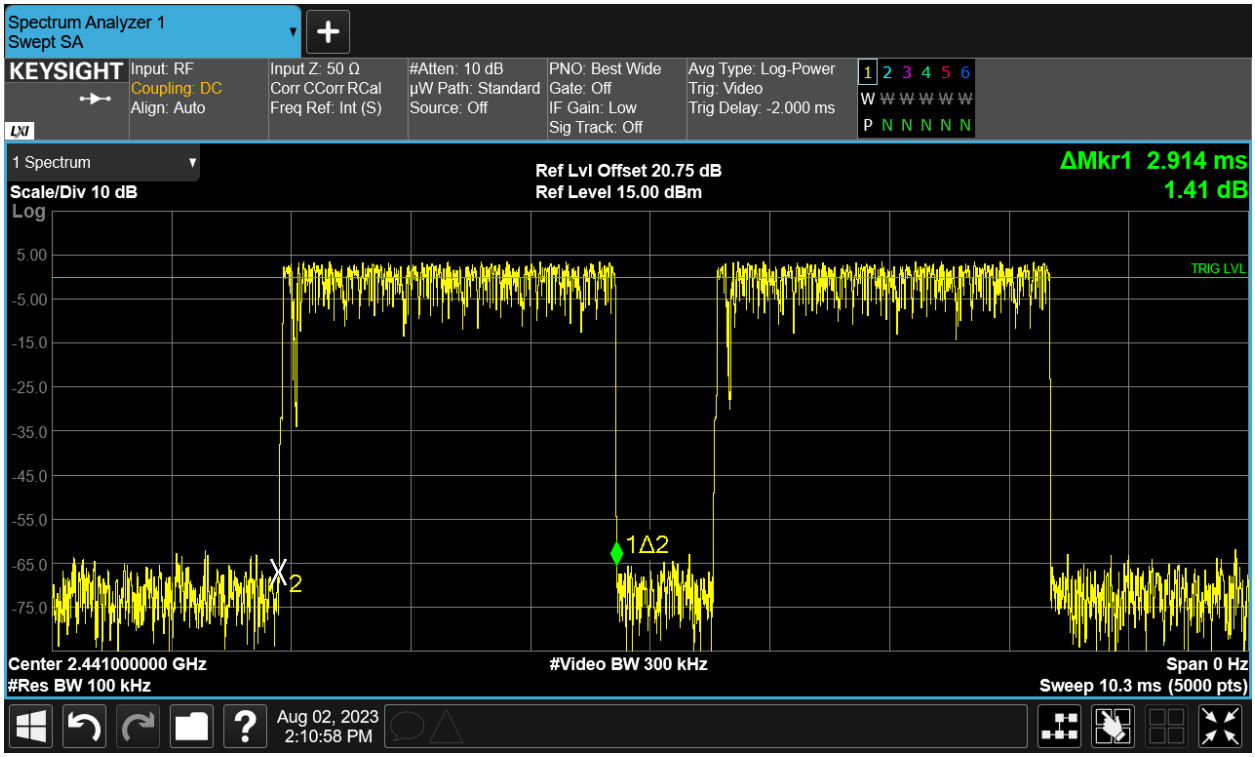
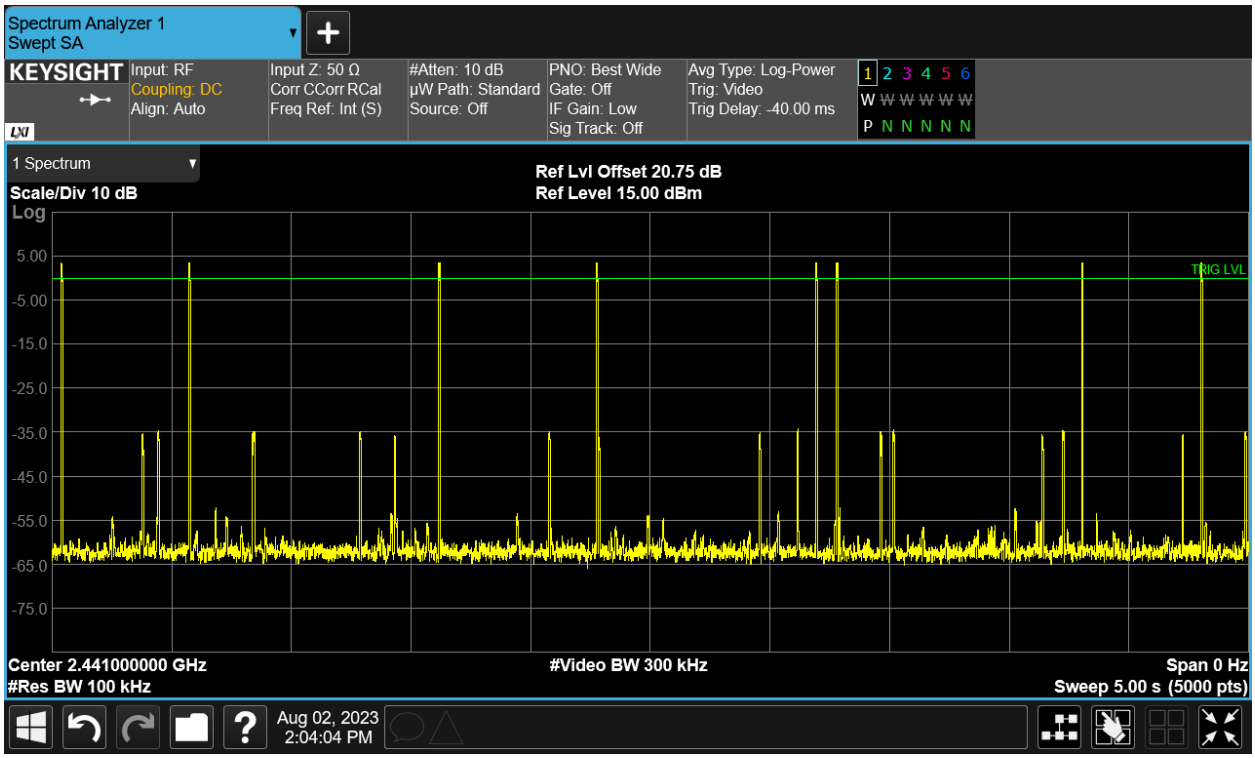


Figure 27: π/4DQPSK Transmitter 5-Second Evaluation (Hopping)

* in this case, it appears that there may only be eight full-power transmitter hops; however, after further investigation there are actually 16 individual transmitter hops in a given 5-second evaluation period. See next plot for detailed measurement.

Figure 28: π/4DQPSK Transmitter Evaluation (Hopping) – Single Dwell Time

Figure 29: 8DPSK Transmitter 5-Second Evaluation (Hopping)



* in this case, it appears that there may only be eight full-power transmitter hops; however, after further investigation there are actually 16 individual transmitter hops in a given 5-second evaluation period. See next plot for detailed measurement.

Figure 30: 8DPSK Transmitter Evaluation (Hopping) – Single Dwell Time

2.5 Channel Carrier Separation

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400 MHz to 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, provided the systems operate with an output power no greater than 125 mW. Each frequency must be used equally on the average by each transmitter.

2.5.1 Measurement Method and Results

This test was performed as specified in ANSI C63.10 (2013), Section 7.8.2

The EUT was configured in a fully-modulated mode, with the hopping stopped.

The minimum separation requirement is based on two-thirds of the 20 dB bandwidth.

The EUT was evaluated at the low, center, and high channels, and a few other random channels that the transmitter employs. All of the hopping channel carriers are separated by exactly 1.0 MHz, regardless of the modulation or mode.

Table 6: Channel Carrier Separation – Test Results

Modulation	Mode (Data Rate)	20dB Bandwidth	Minimum Separation Requirement	EUT Carrier Separation
GFSK	DH5 (1Mbps)	937.8 kHz	625.2 kHz	1.0 MHz
π/4DQPSK	2DH5 (2Mbps)	1.269 MHz	846.0 kHz	1.0 MHz
8DPSK	3DH5 (3Mbps)	1.244 MHz	829.3 kHz	1.0 MHz

Figure 31: GFSK (1Mbps) – Channel Separation

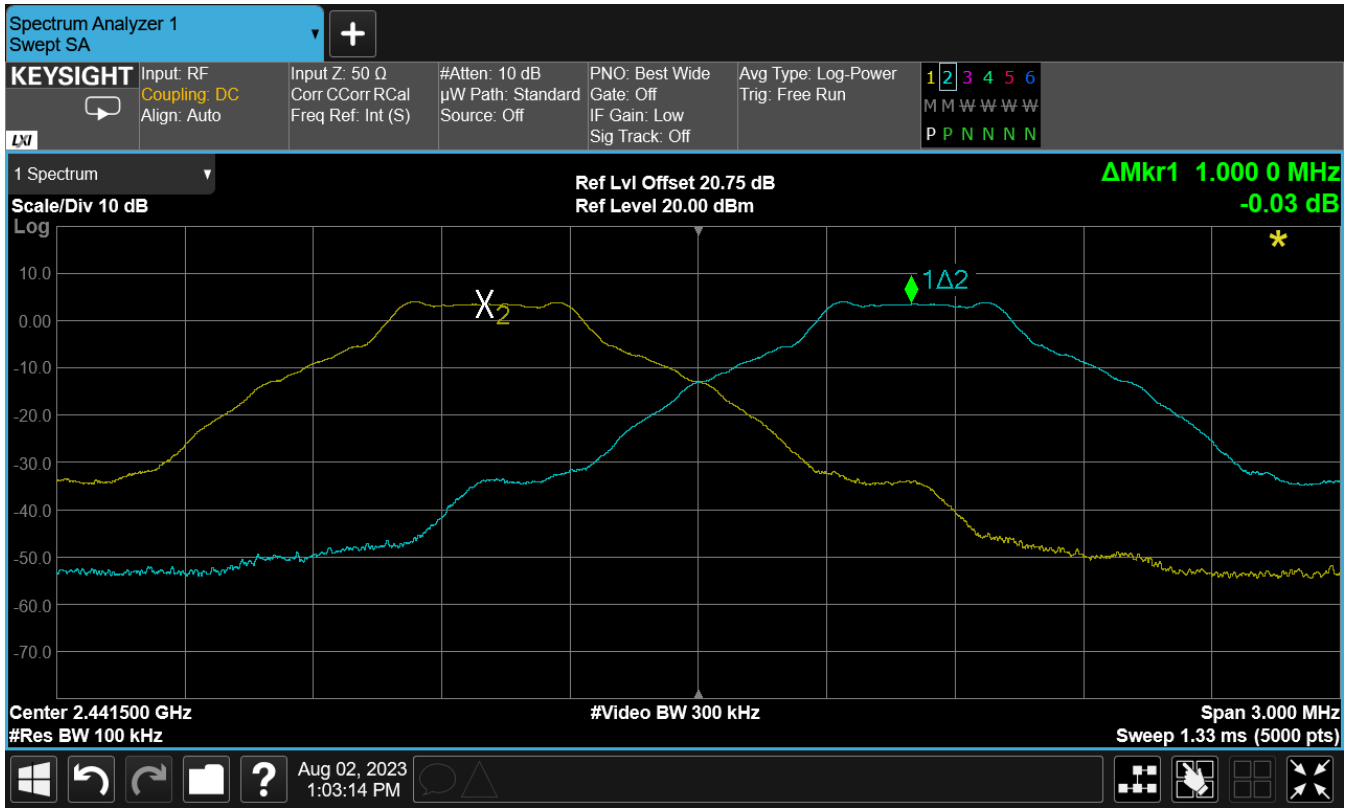


Figure 32: π/4DQPSK (2Mbps) – Channel Separation

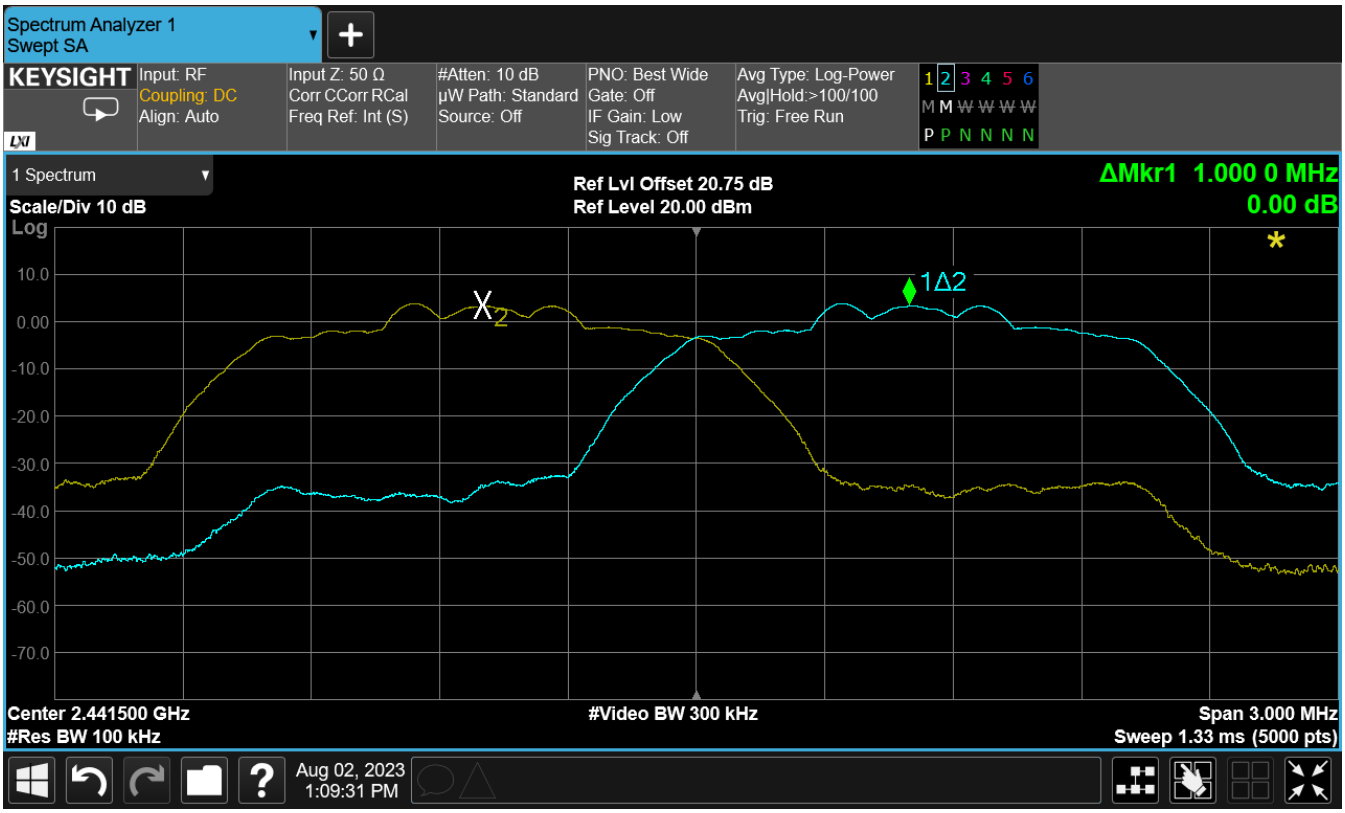
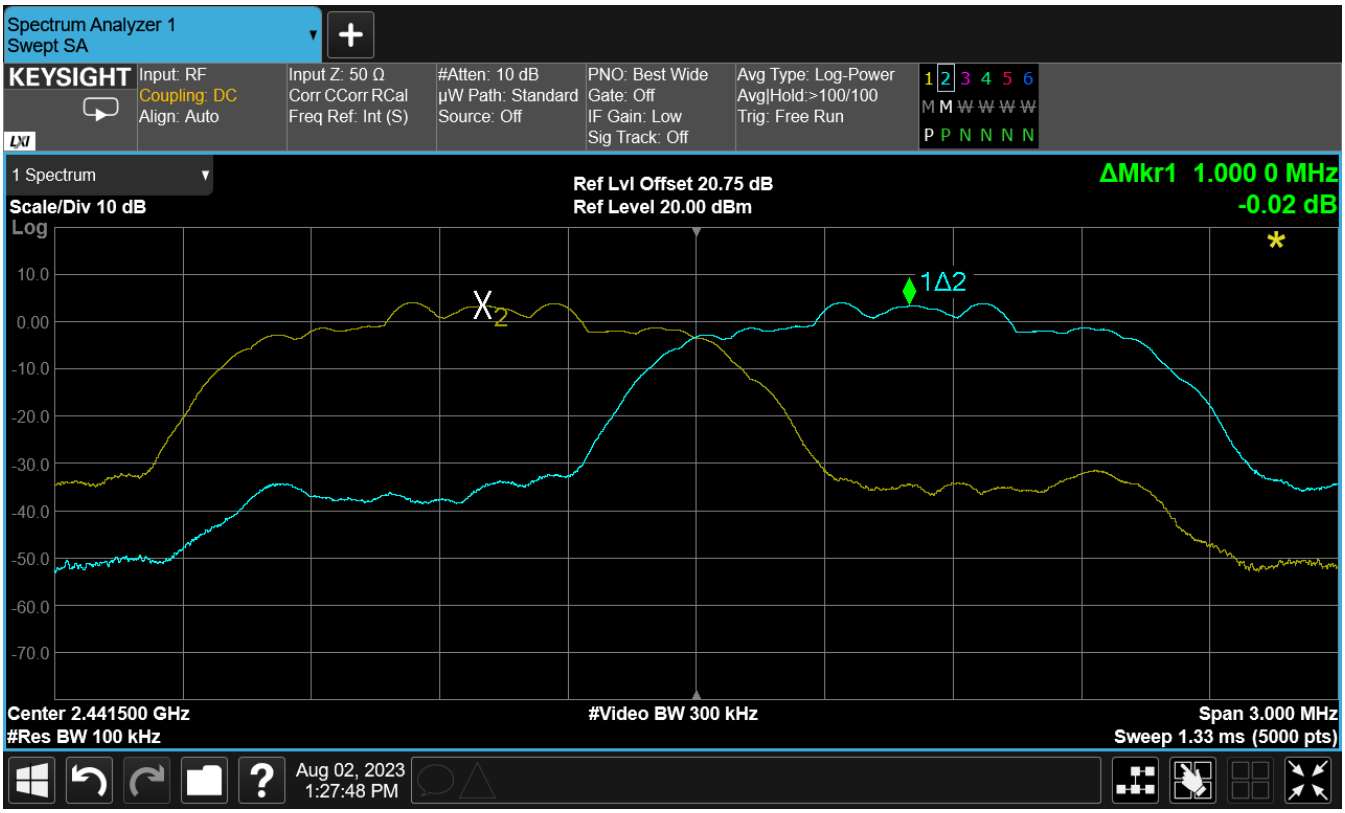


Figure 33: 8DPSK (3Mbps) – Channel Separation



2.6 Bandedge Compliance (Antenna Port Conducted)

In any 100 kHz bandwidth, outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

2.6.1 Measurement Method and Results

This test was performed as specified in ANSI C63.10 (2013), Section 7.8.1 and 7.8.6.

The EUT was configured in a fully-modulated mode, with the hopping enabled.

Table 7: Bandedge Compliance – Test Results

Modulation	Mode (Data Rate)	Low Channel (2402 MHz)	High Channel (2480 MHz)
GFSK	DH5 (1Mbps)	54.61 dB	62.57 dB
π/4DQPSK	2DH5 (2Mbps)	55.78 dB	61.17 dB
8DPSK	3DH5 (3Mbps)	56.62 dB	62.75 dB

Figure 34: GFSK (1Mbps) – Lower Band Edge

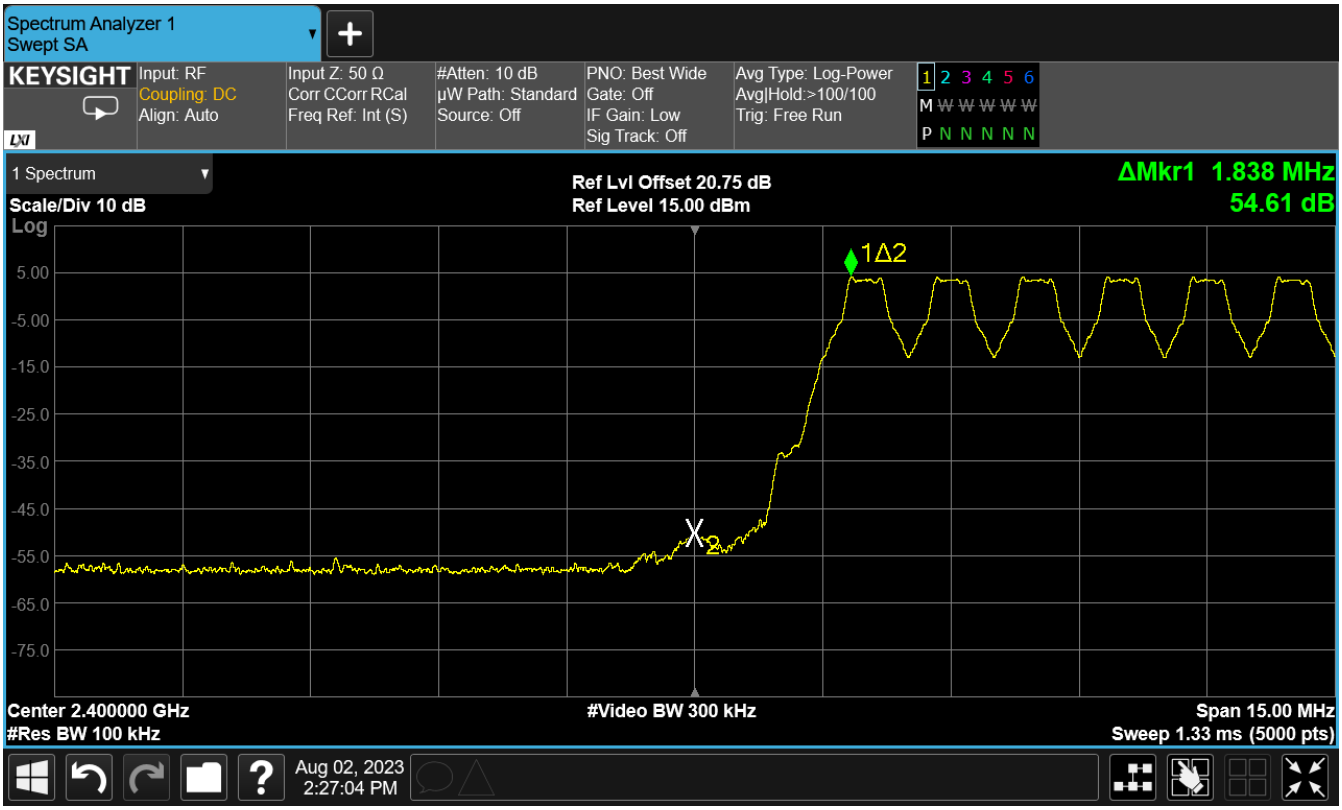


Figure 35: GFSK (1Mbps) – Upper Band Edge

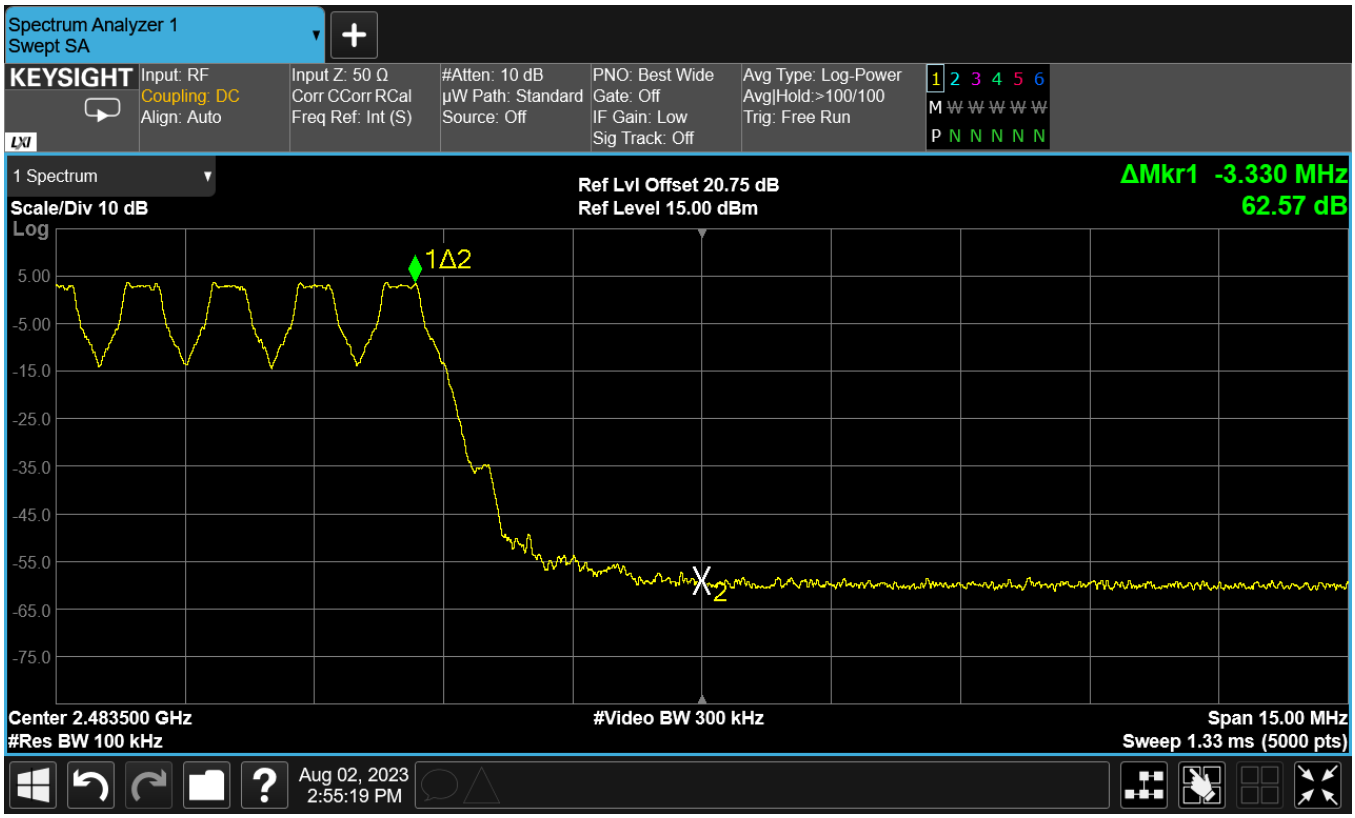


Figure 36: π/4DQPSK (2Mbps) – Lower Band Edge

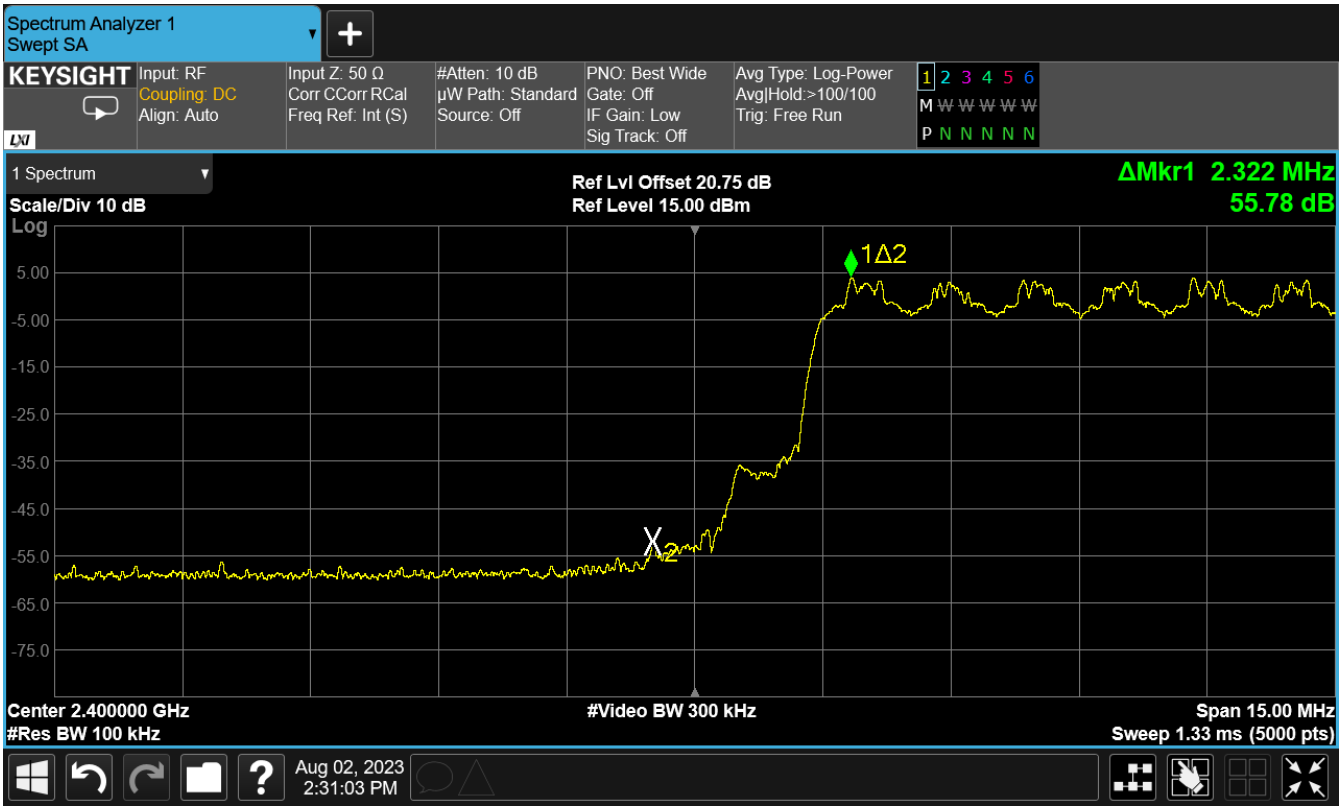


Figure 37: π/4DQPSK (2Mbps) – Upper Band Edge

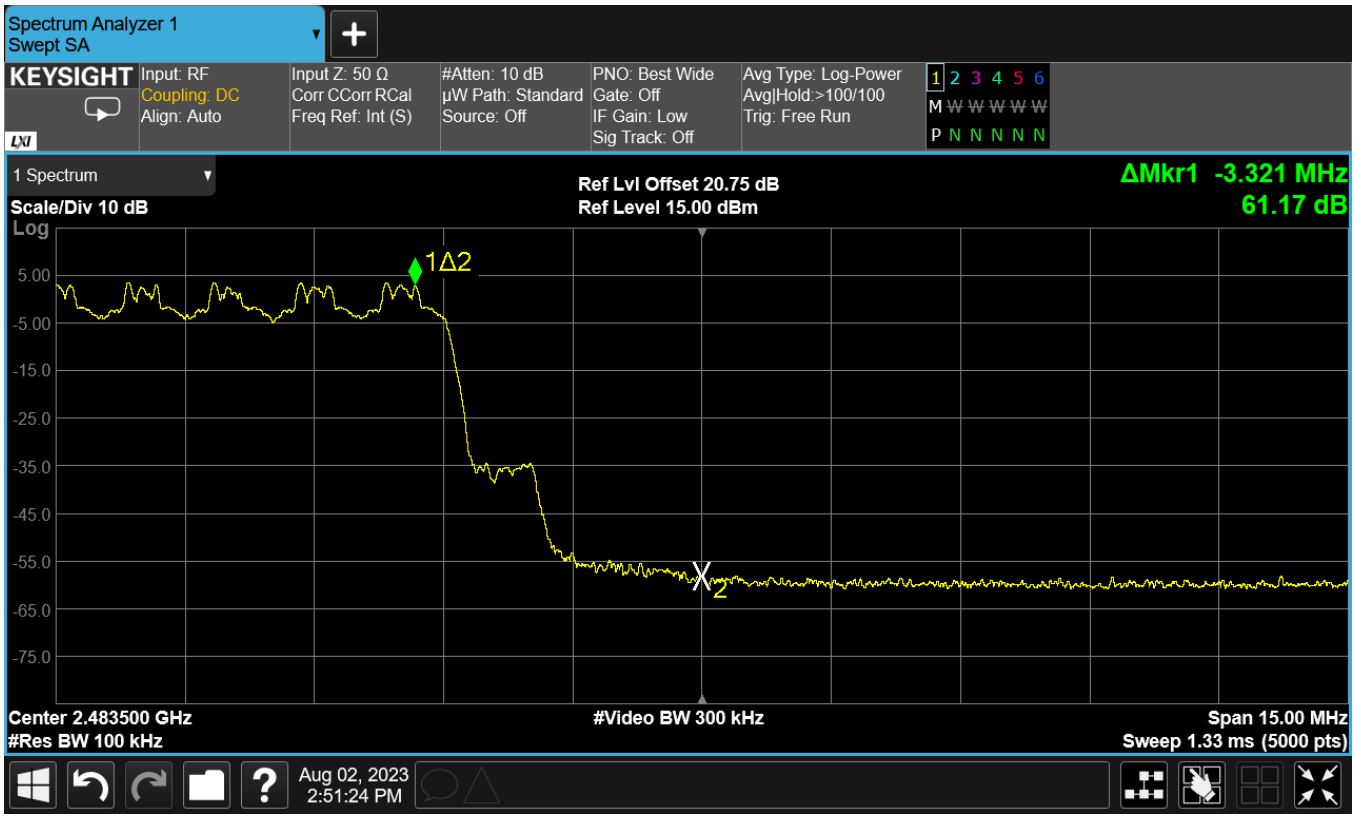


Figure 38: 8DPSK (3Mbps) – Lower Band Edge

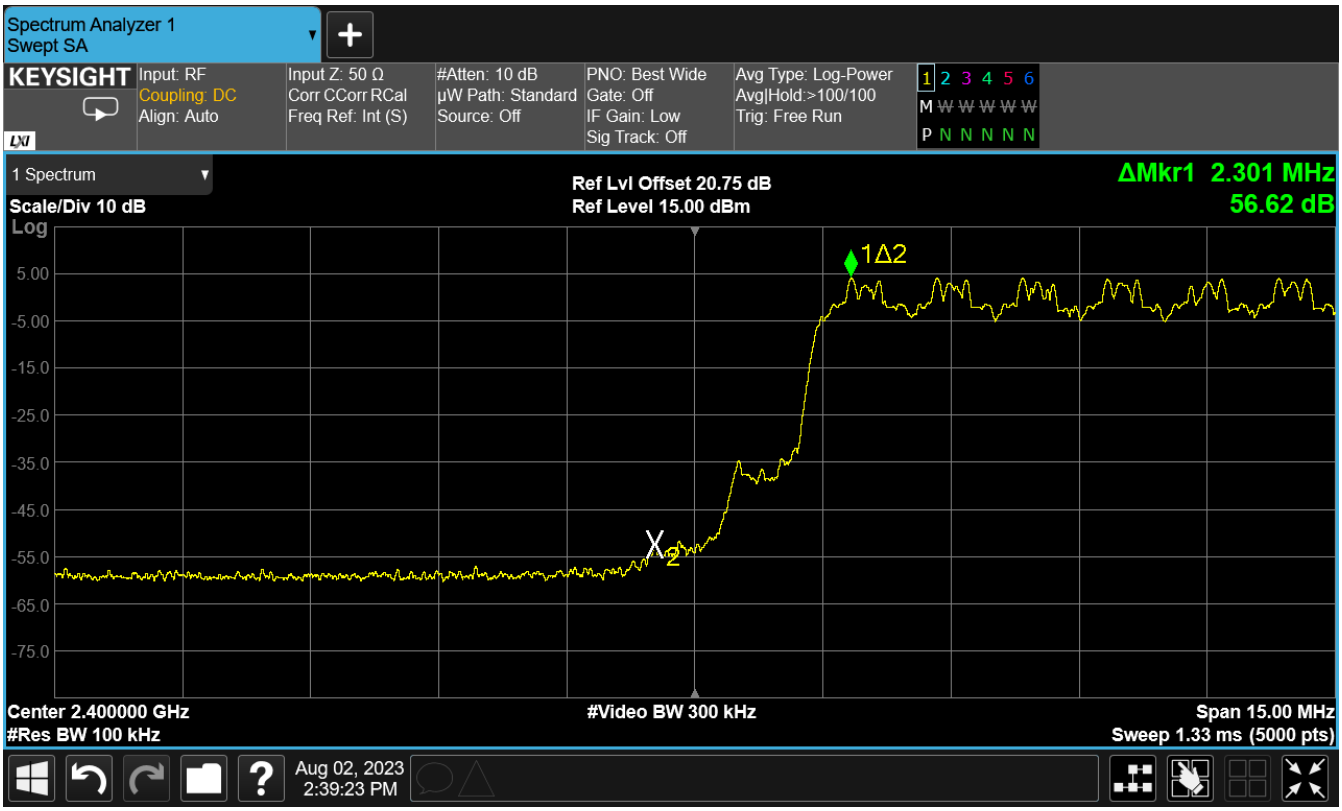
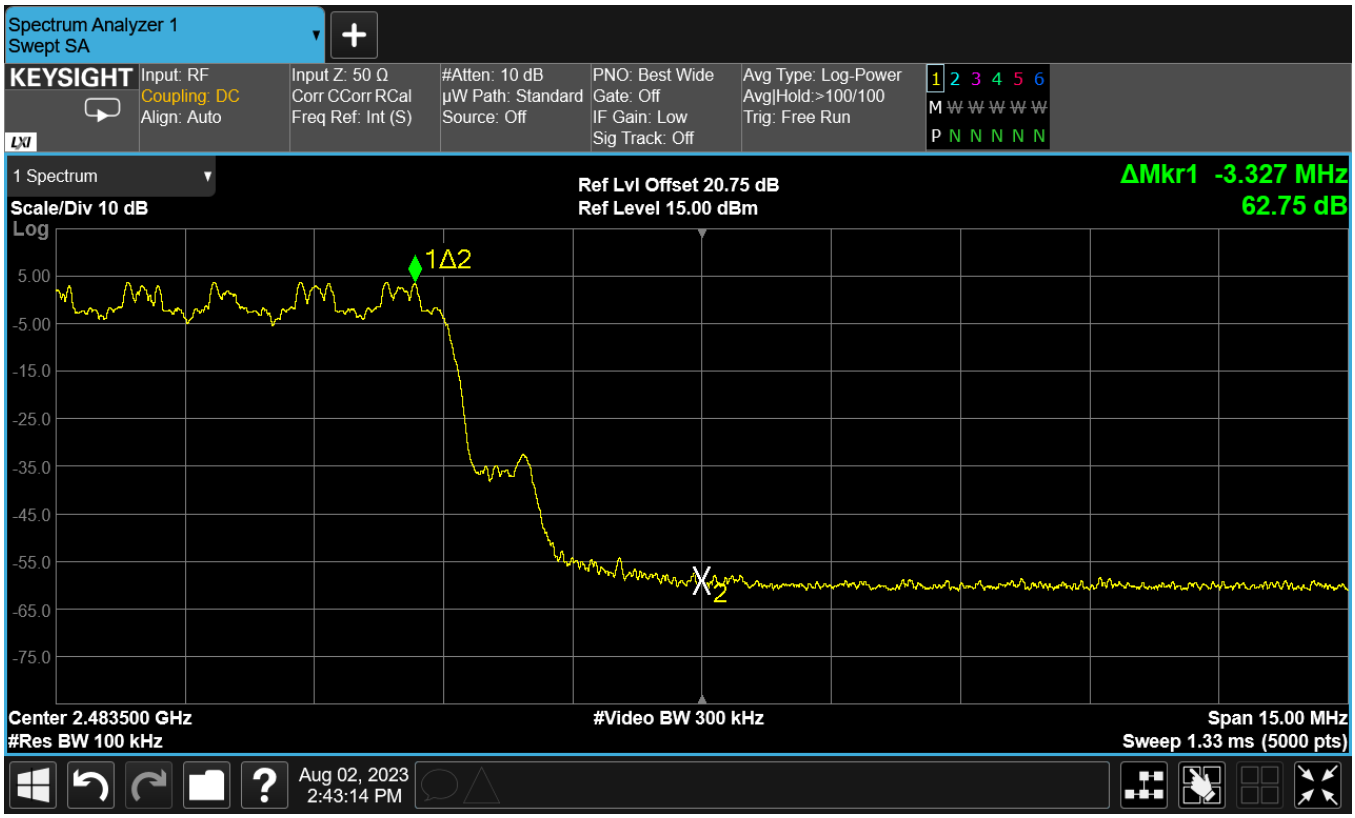


Figure 39: 8DPSK (3Mbps) – Upper Band Edge



2.7 Conducted Spurious Emissions

In any 100 kHz bandwidth, outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

2.7.1 Measurement Method and Results

This test was performed as specified in ANSI C63.10 (2013), Section 7.8.8 and 11.11.

The EUT was configured in a fully-modulated mode, with the hopping stopped.

The amplitude of the EUT carrier frequency was measured to determine the emissions limit (20 dB below the carrier frequency amplitude). The emissions outside of the allocated frequency band were then scanned from 30 MHz to 25 GHz, to include the 10th harmonic of the fundamental

The reduced testing procedures outlined in ANSI C63.10 (2013), Section 5.6.2 and 5.6.2.2 were also employed. The spurious emission test data correlating to the center channel of all three modulation modes is provided below. The worst-case mode (3Mbps/8DPSK) was utilized to provide the spurious emission test data for the low and high channels.

The EUT complies with the requirements for spurious emissions at the antenna port.

The final test data is provided in the following plots.

Figure 40: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 1

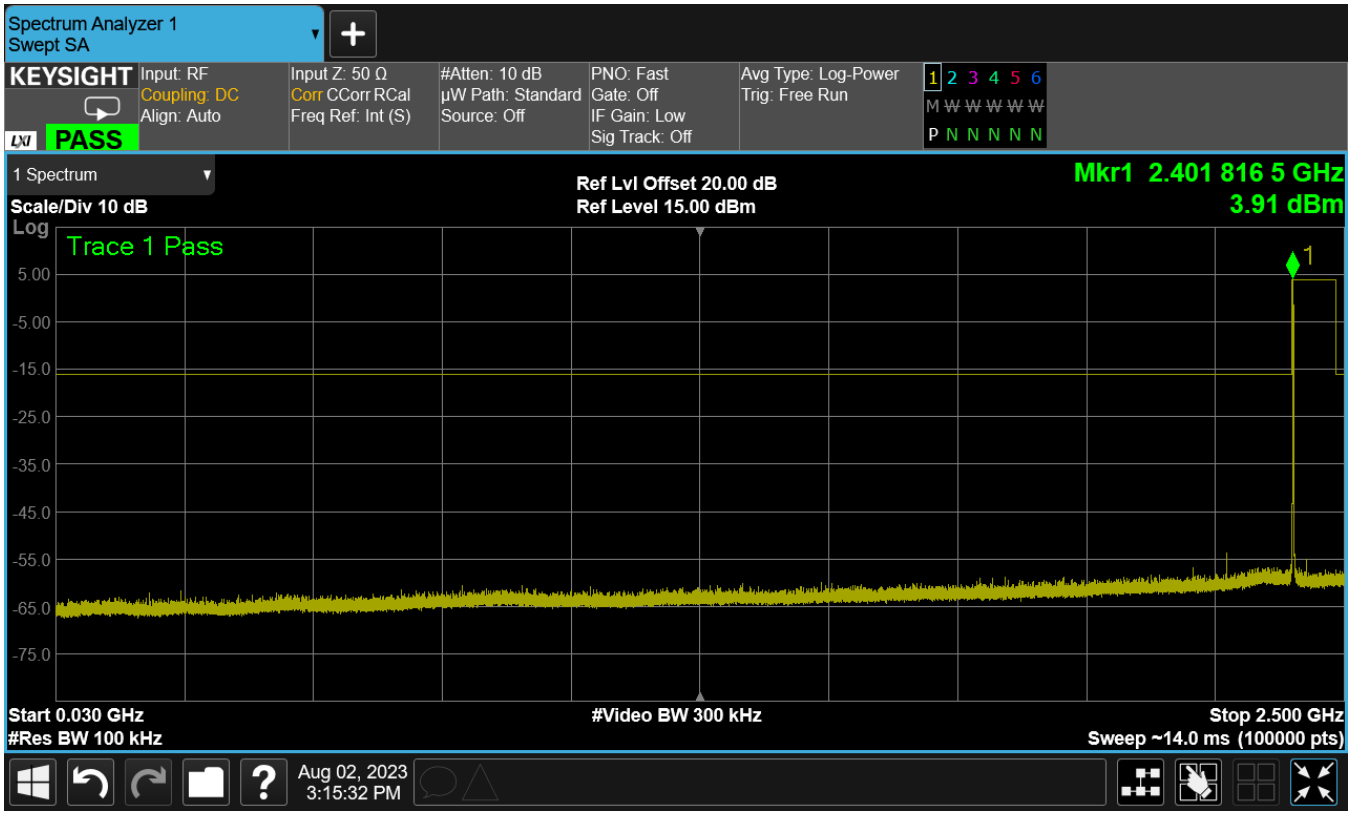


Figure 41: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 2

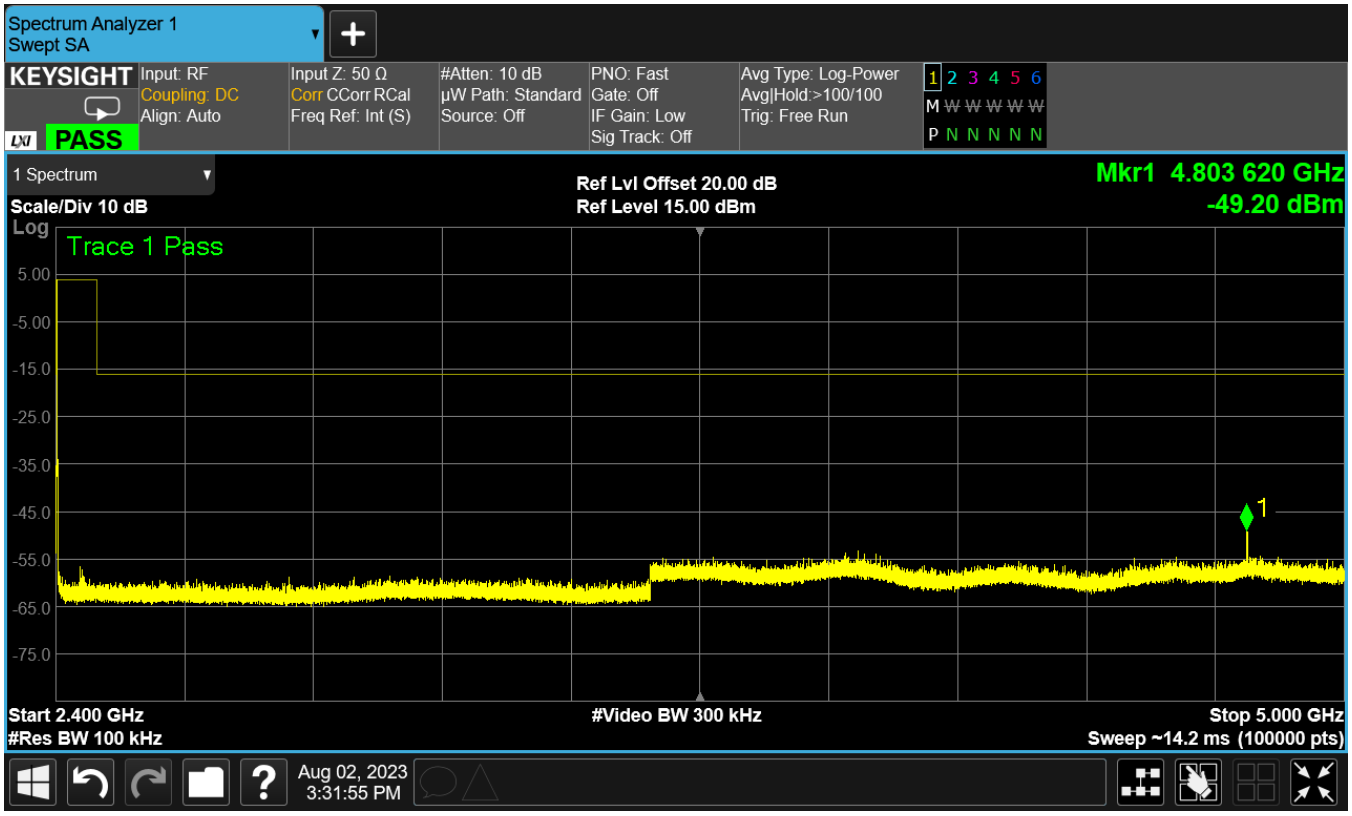


Figure 42: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 3

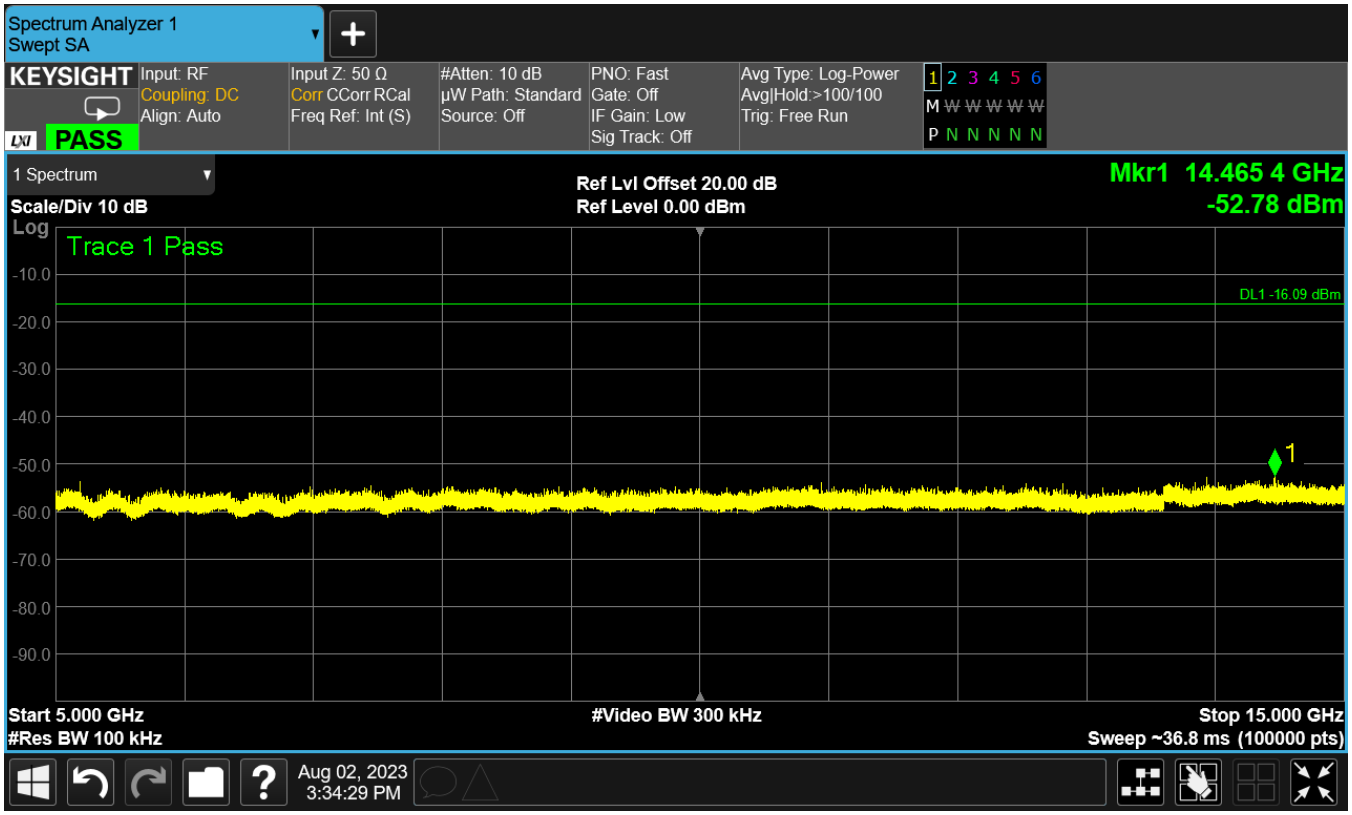


Figure 43: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 4

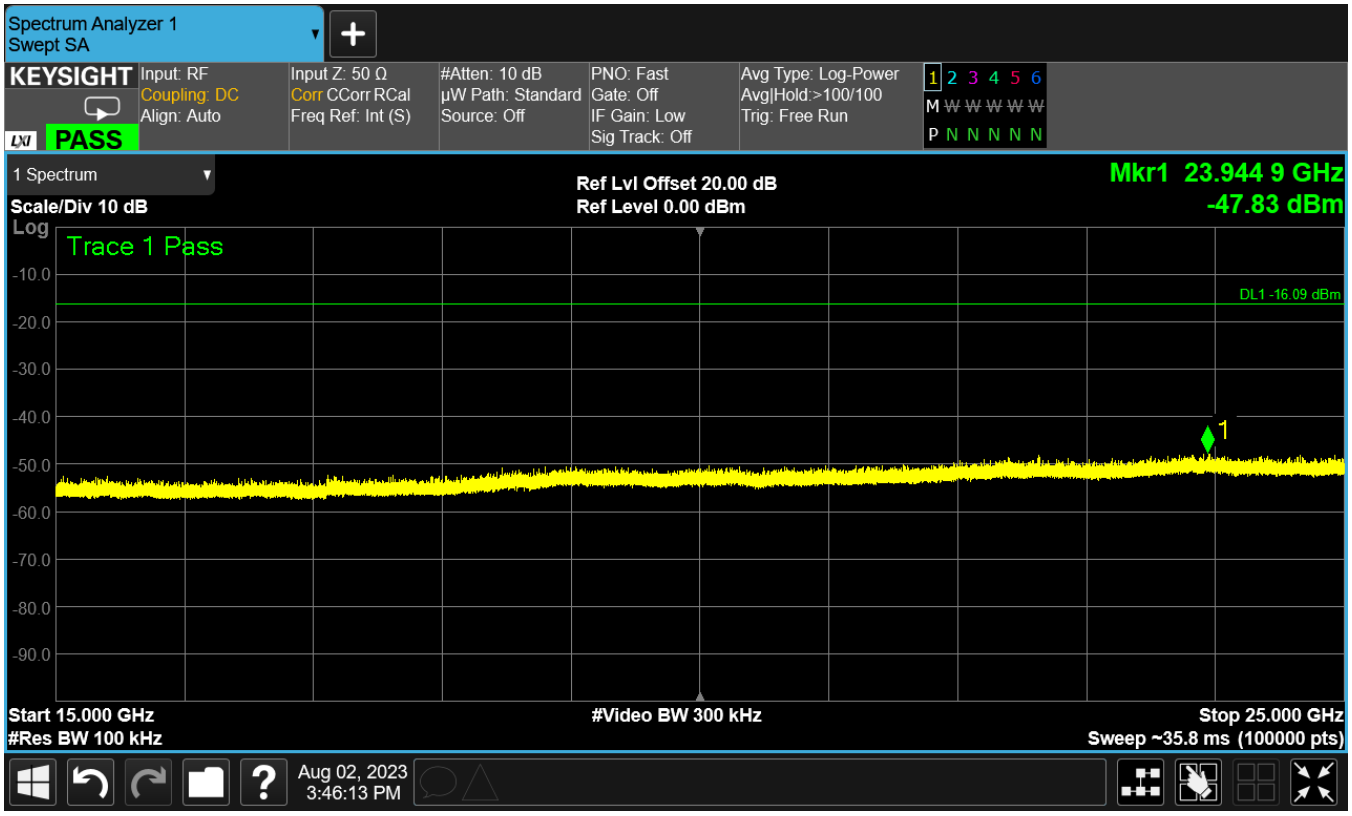


Figure 44: 8DPSK (3Mbps) Center Channel, Conducted Spurious – Plot 1

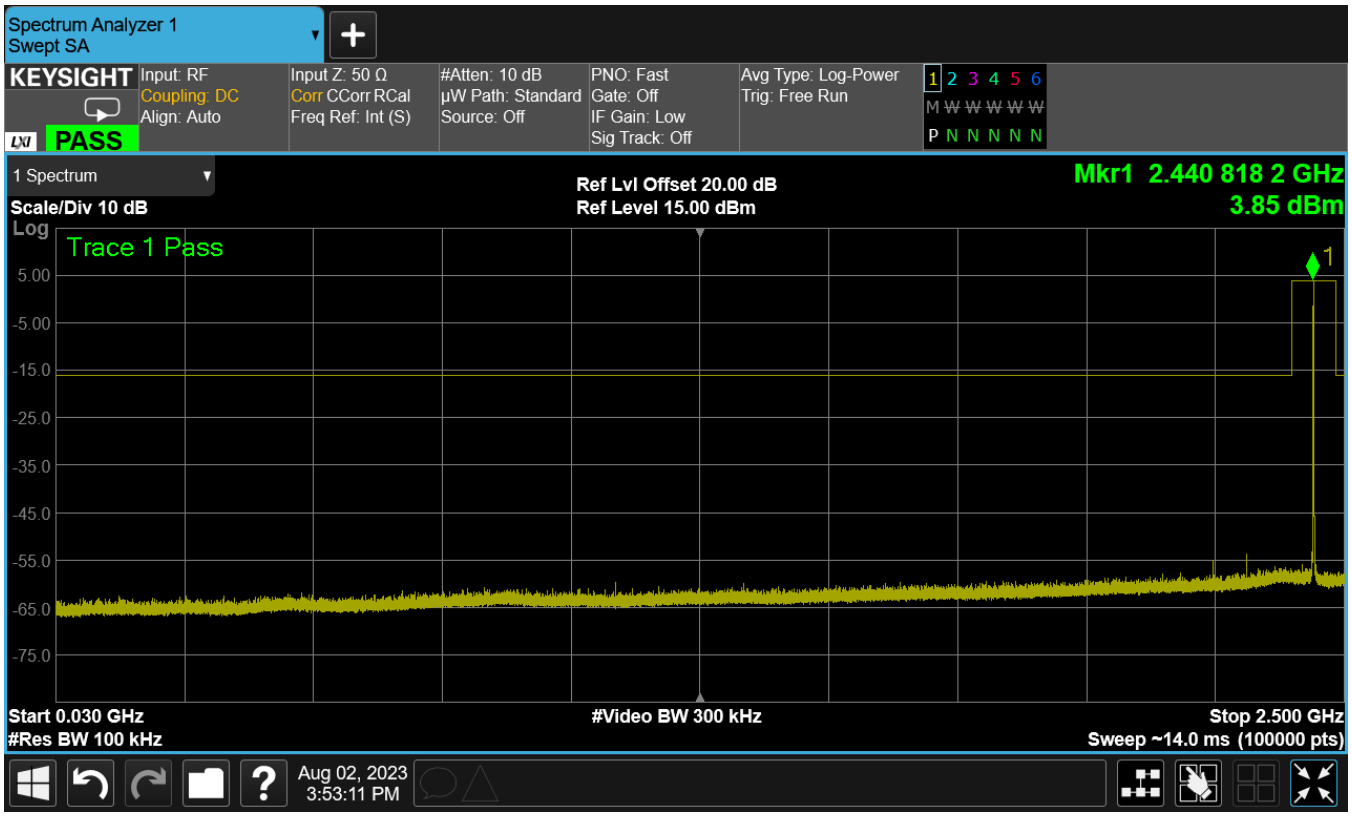


Figure 45: 8DPSK (3Mbps) Center Channel, Conducted Spurious – Plot 2

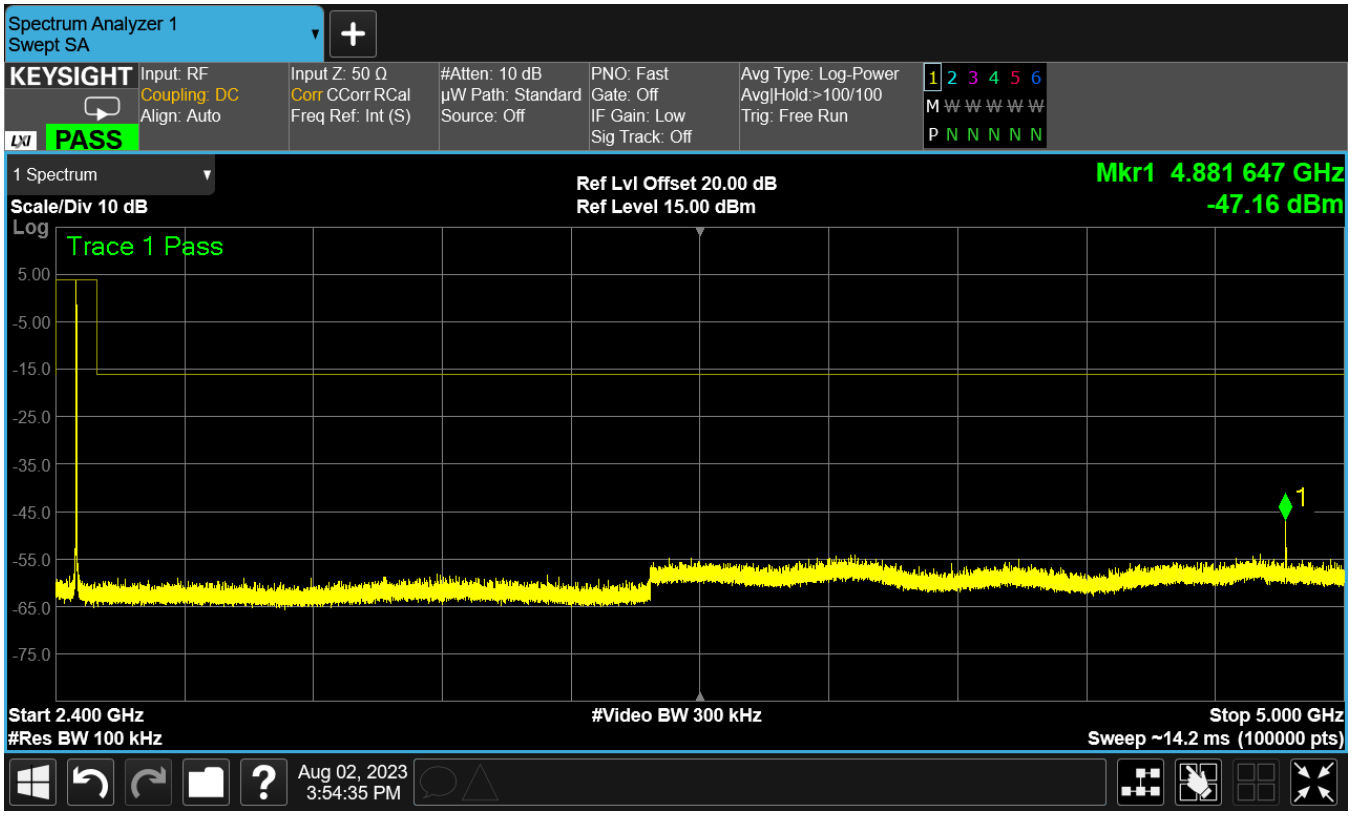


Figure 46: 8DPSK (3Mbps) Center Channel, Conducted Spurious – Plot 3

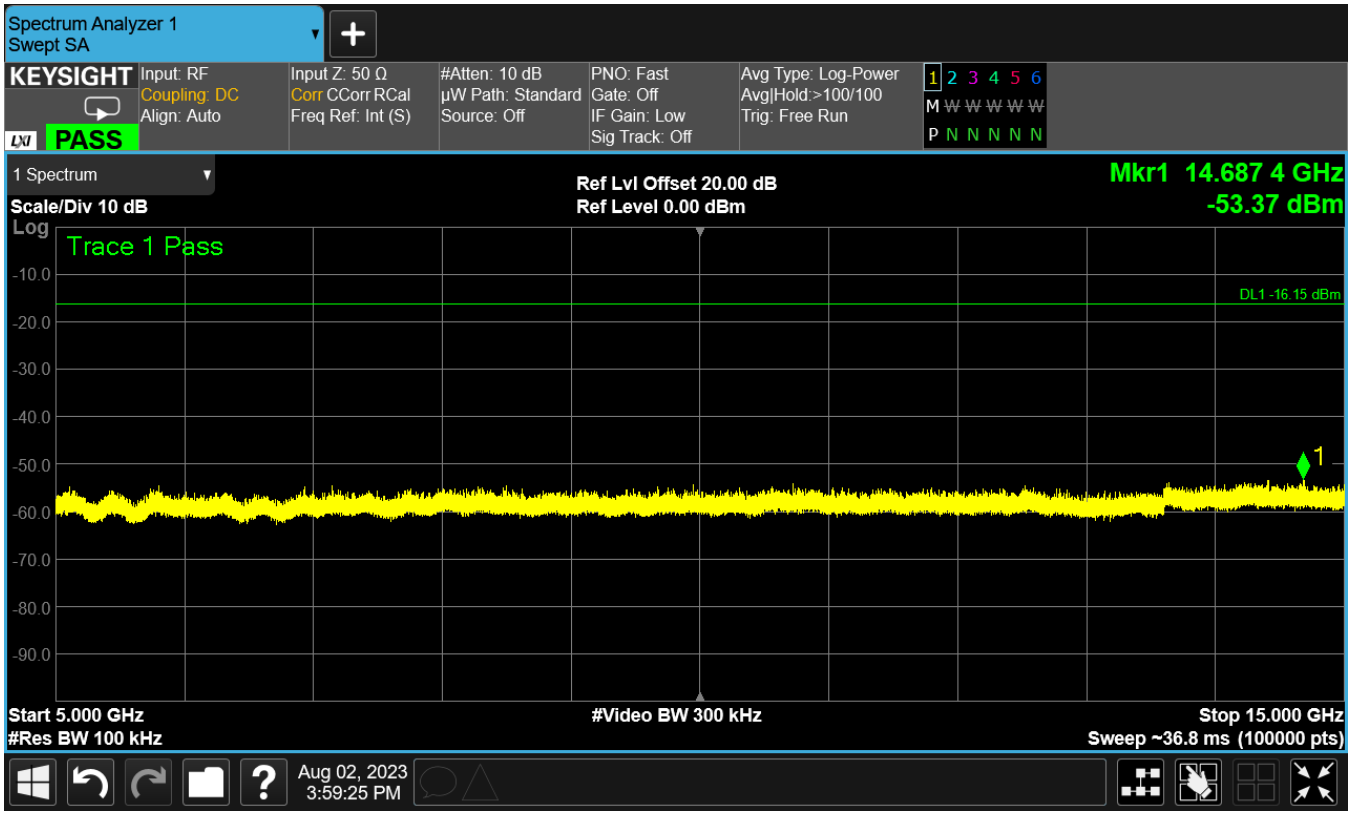


Figure 47: 8DPSK (3Mbps) Center Channel, Conducted Spurious – Plot 4

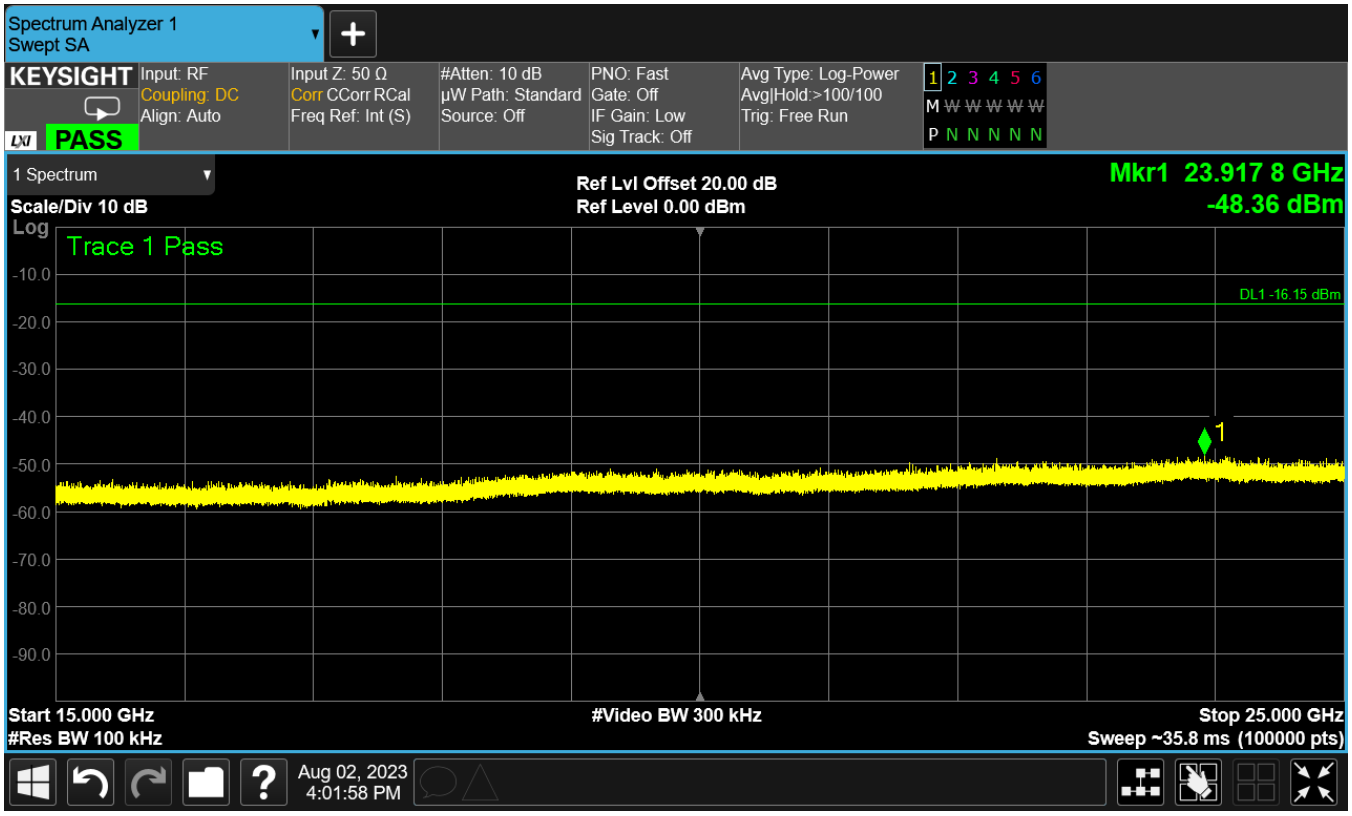


Figure 48: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 1

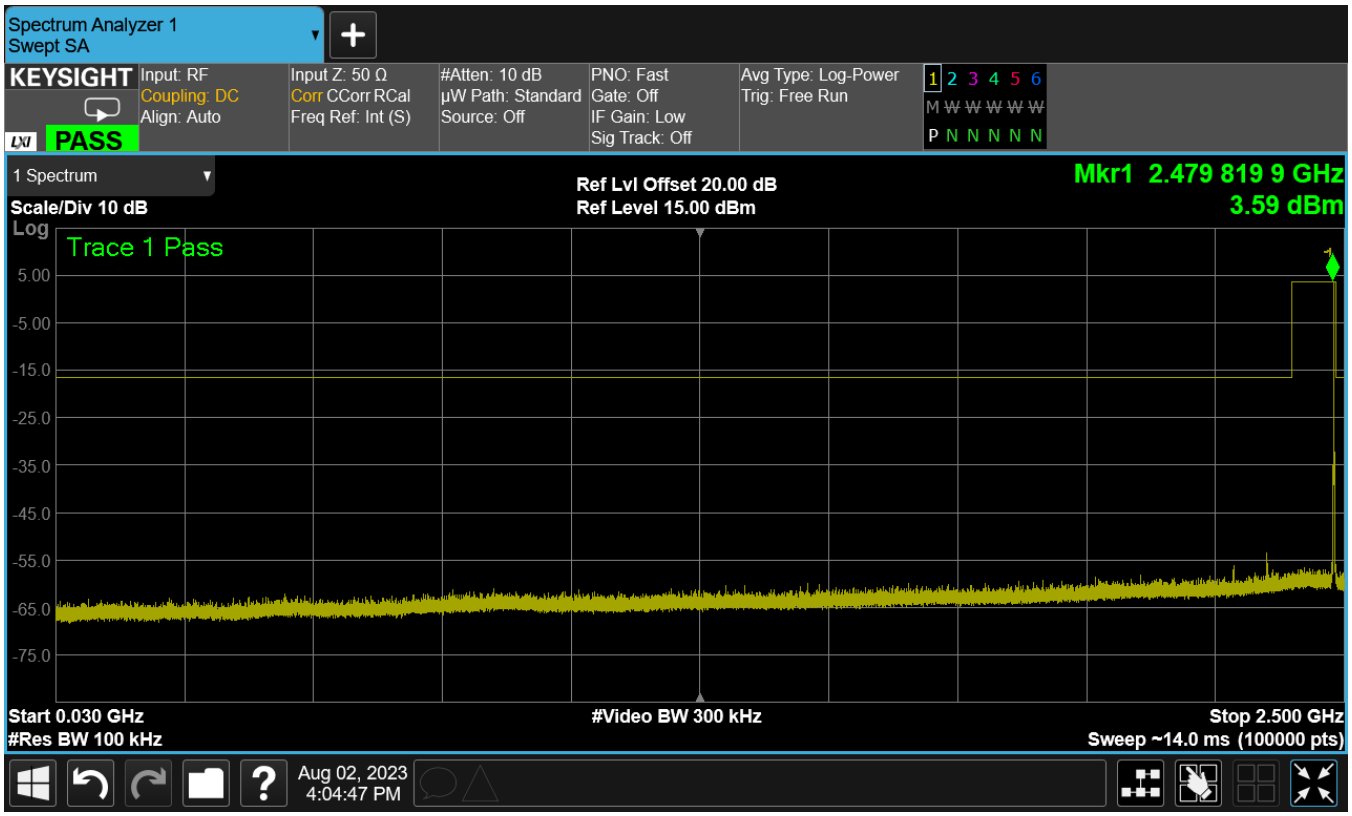


Figure 49: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 2

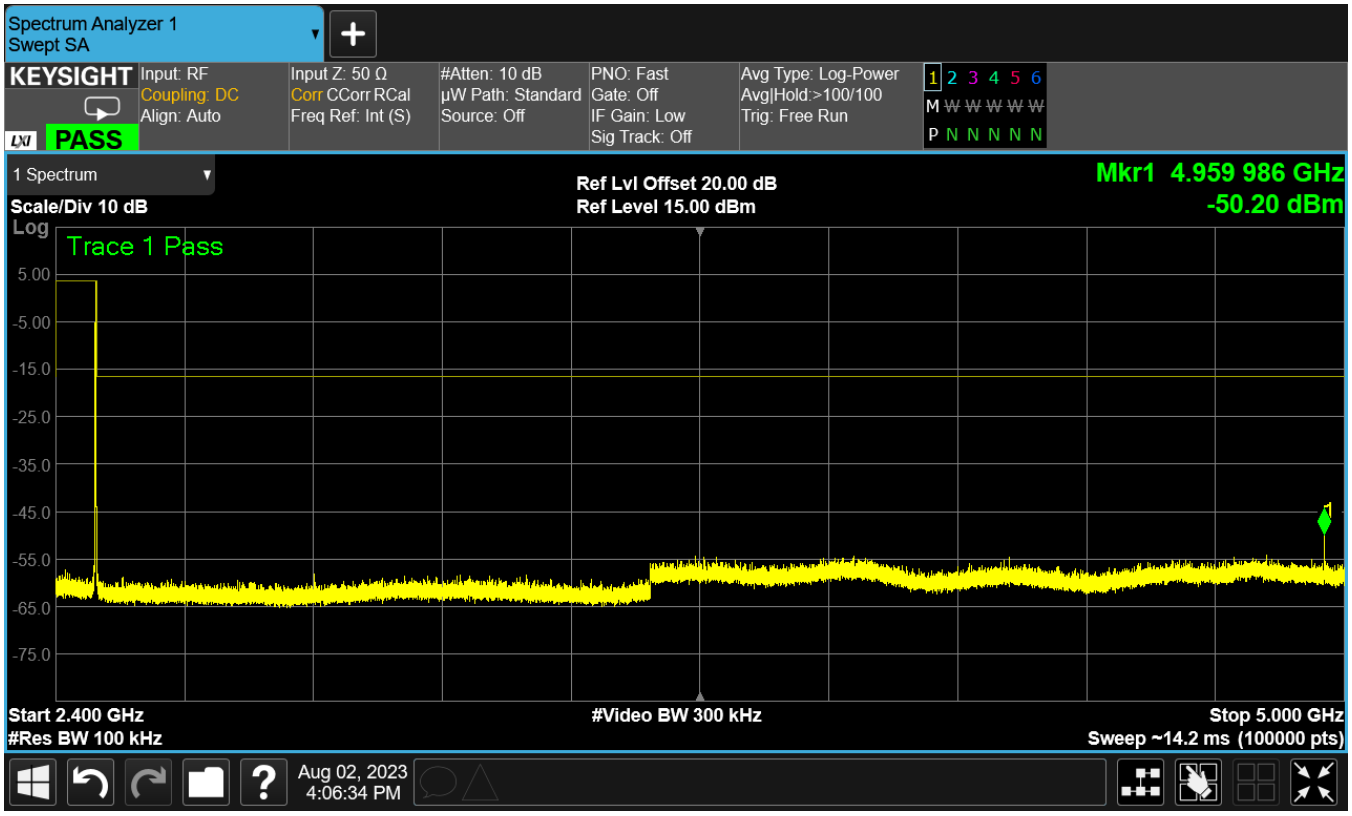


Figure 50: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 3

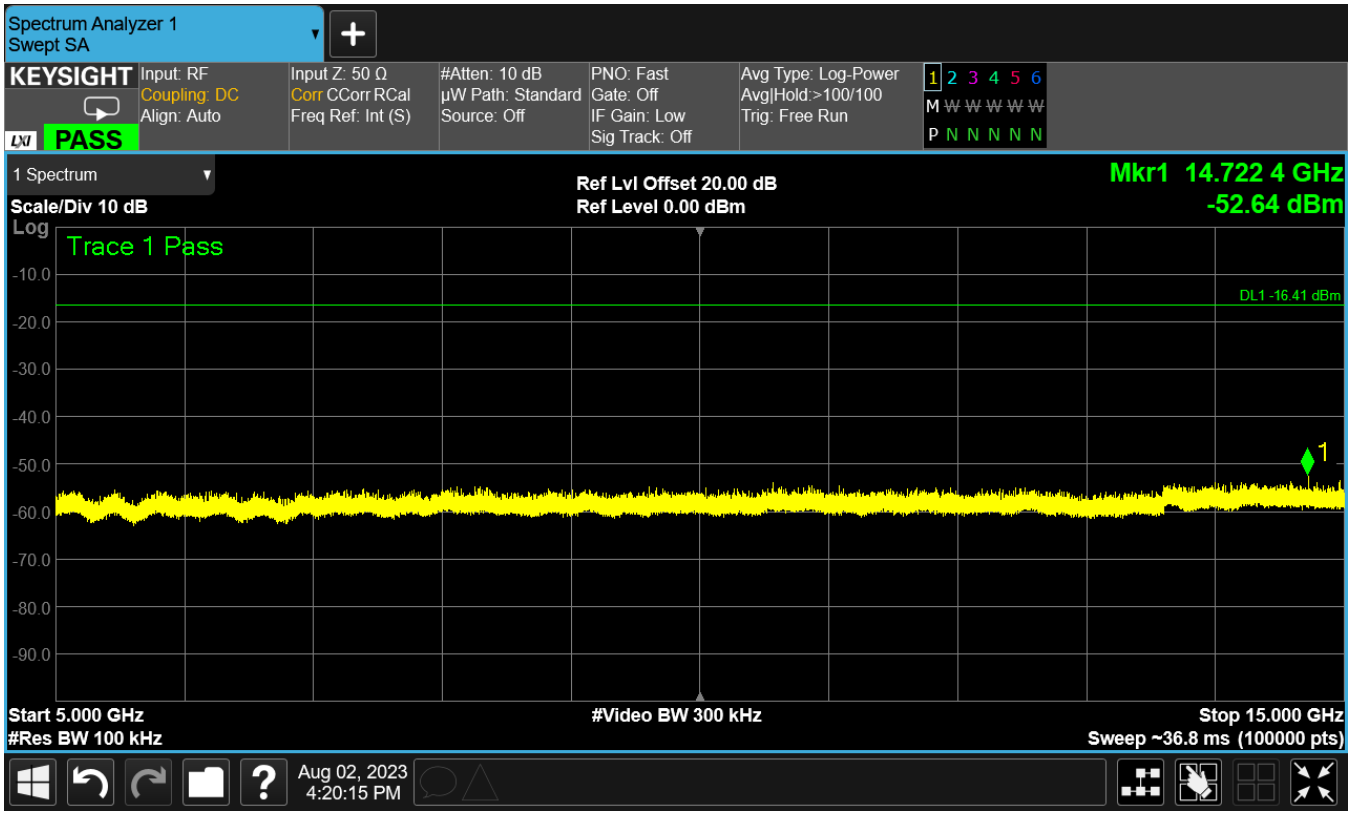


Figure 51: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 4

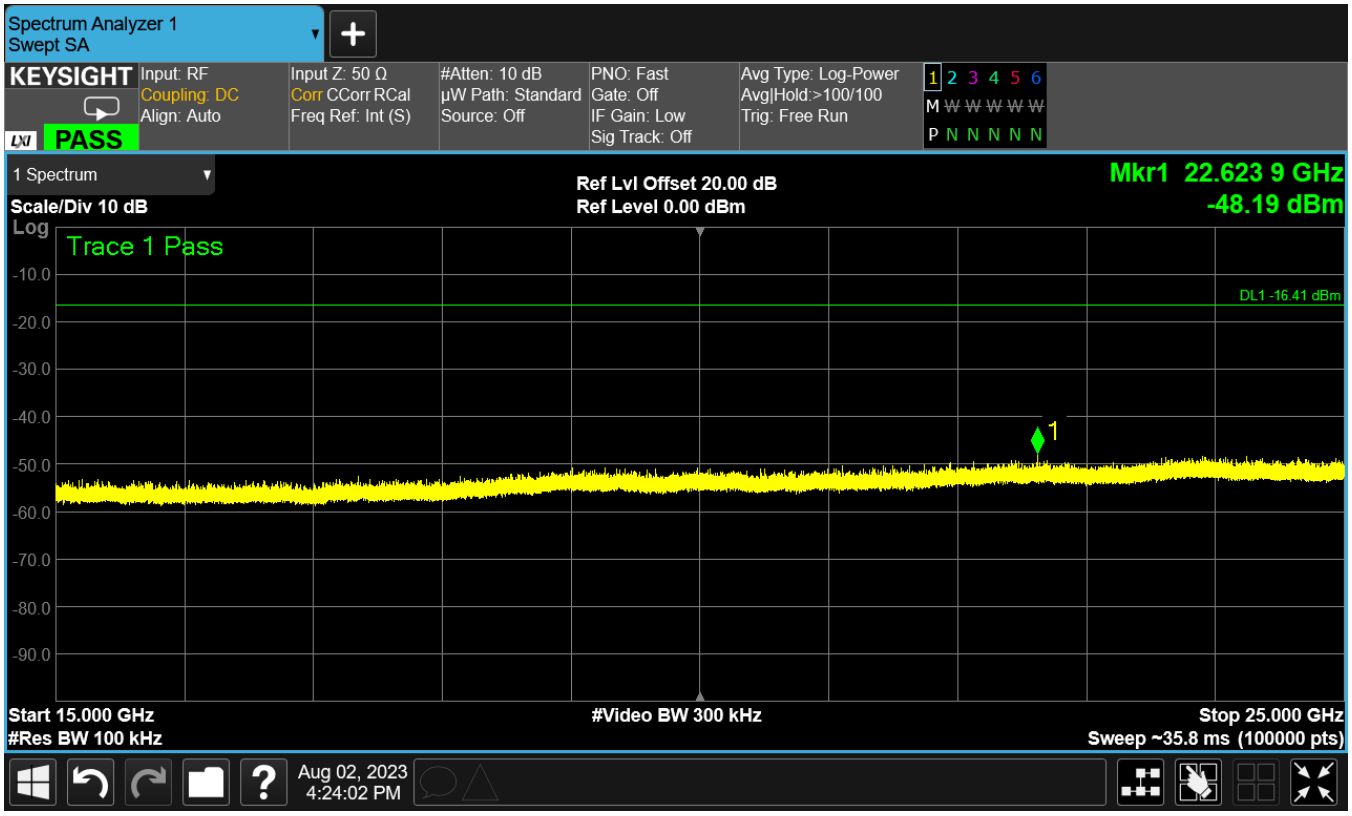


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Figure 52: GFSK (1Mbps) Center Channel, Conducted Spurious – Plot 1

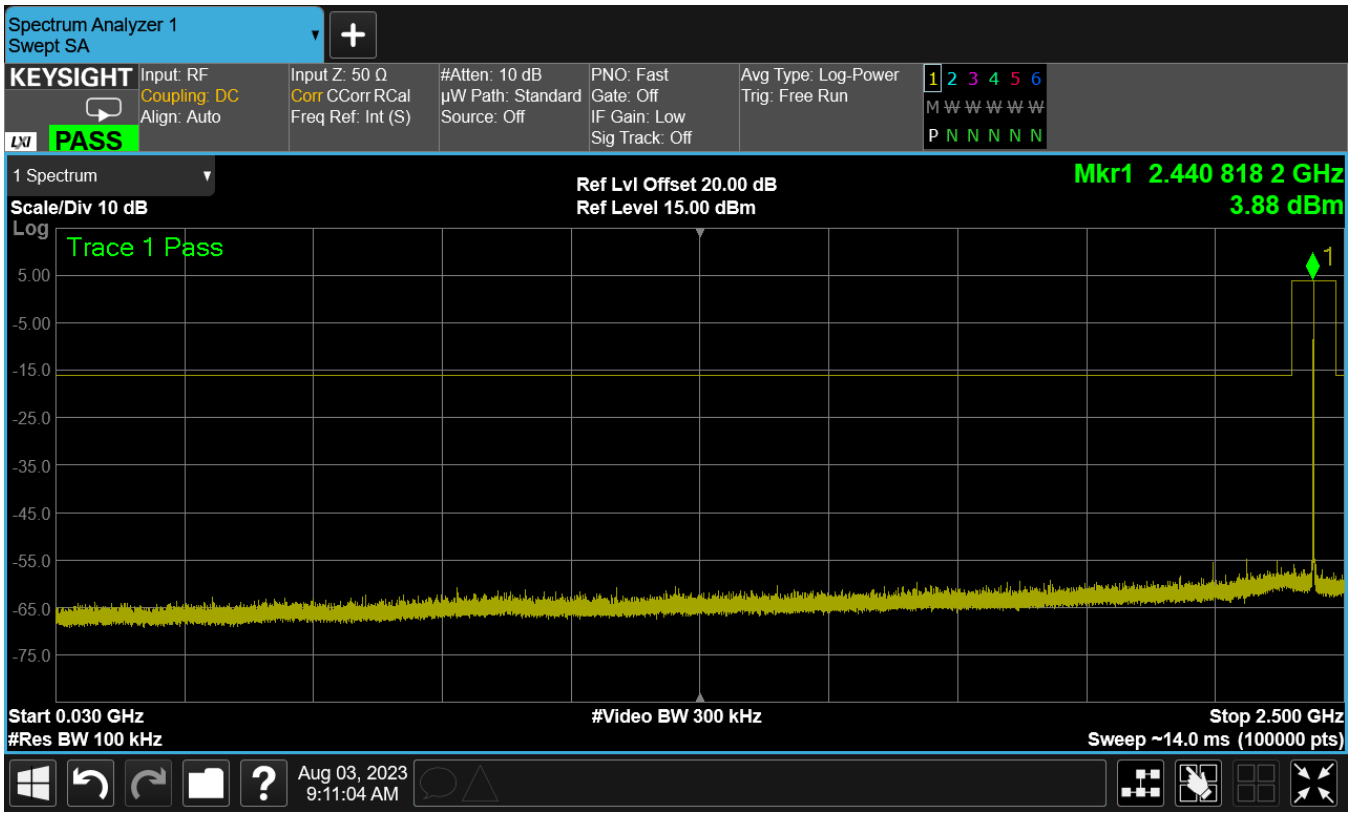


Figure 53: GFSK (1Mbps) Center Channel, Conducted Spurious – Plot 2

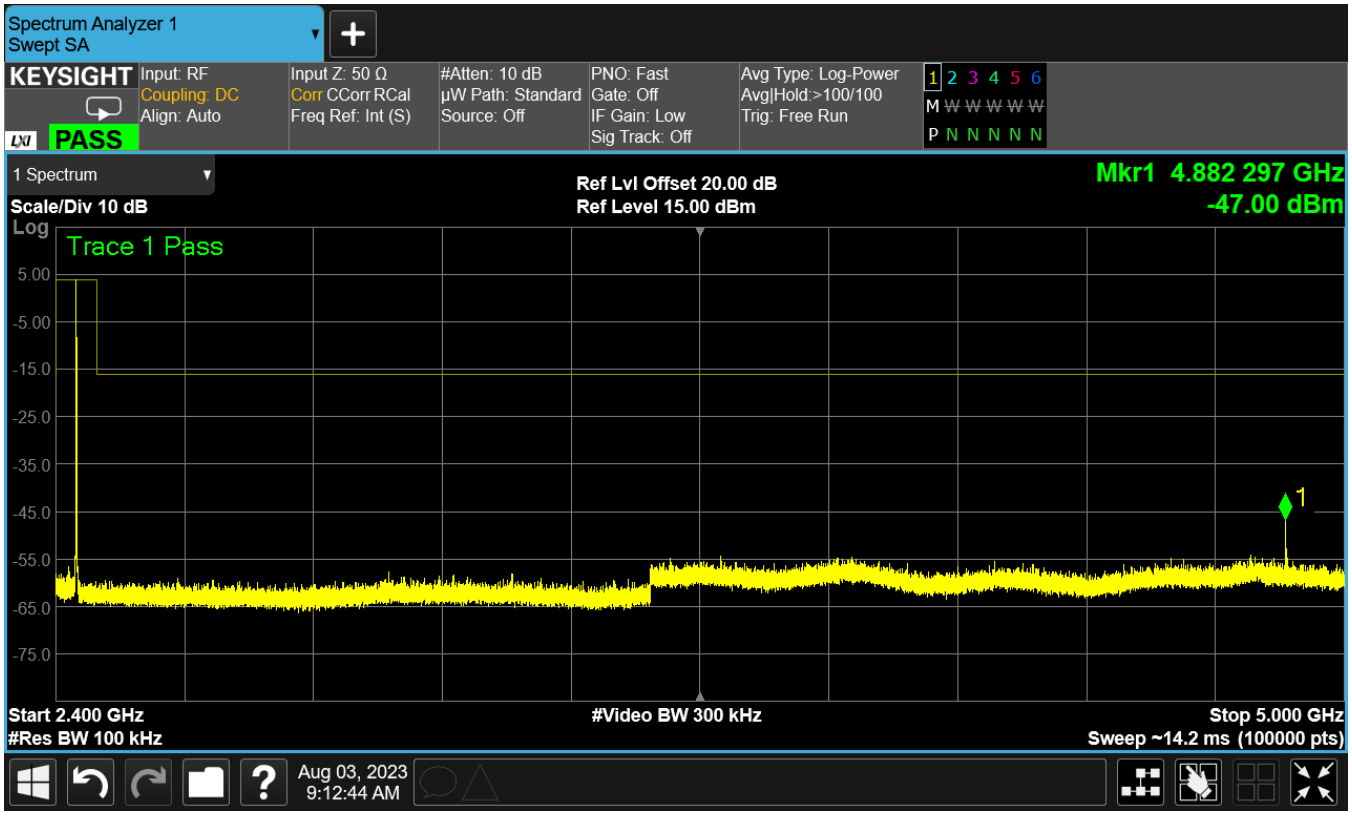


Figure 54: GFSK (1Mbps) Center Channel, Conducted Spurious – Plot 3

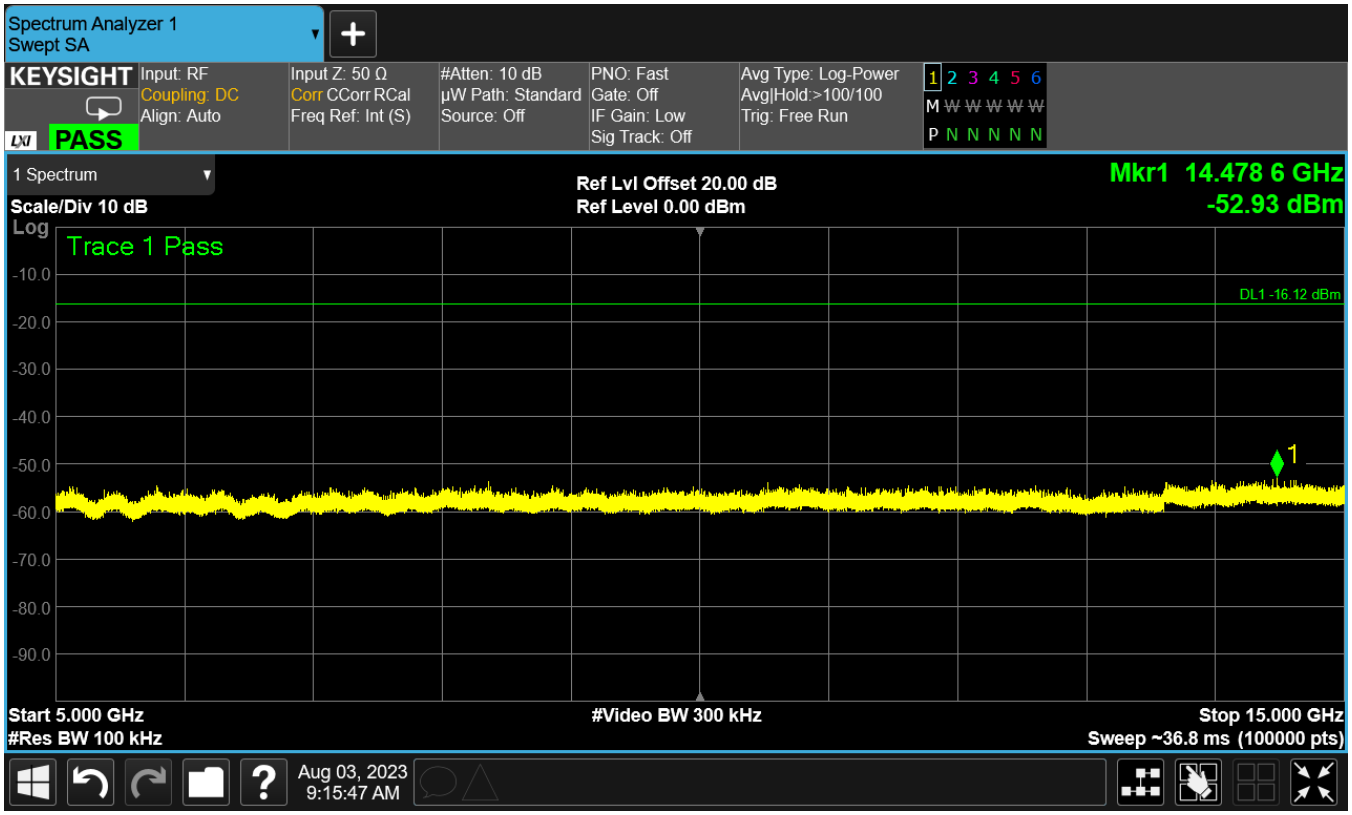


Figure 55: GFSK (1Mbps) Center Channel, Conducted Spurious – Plot 4

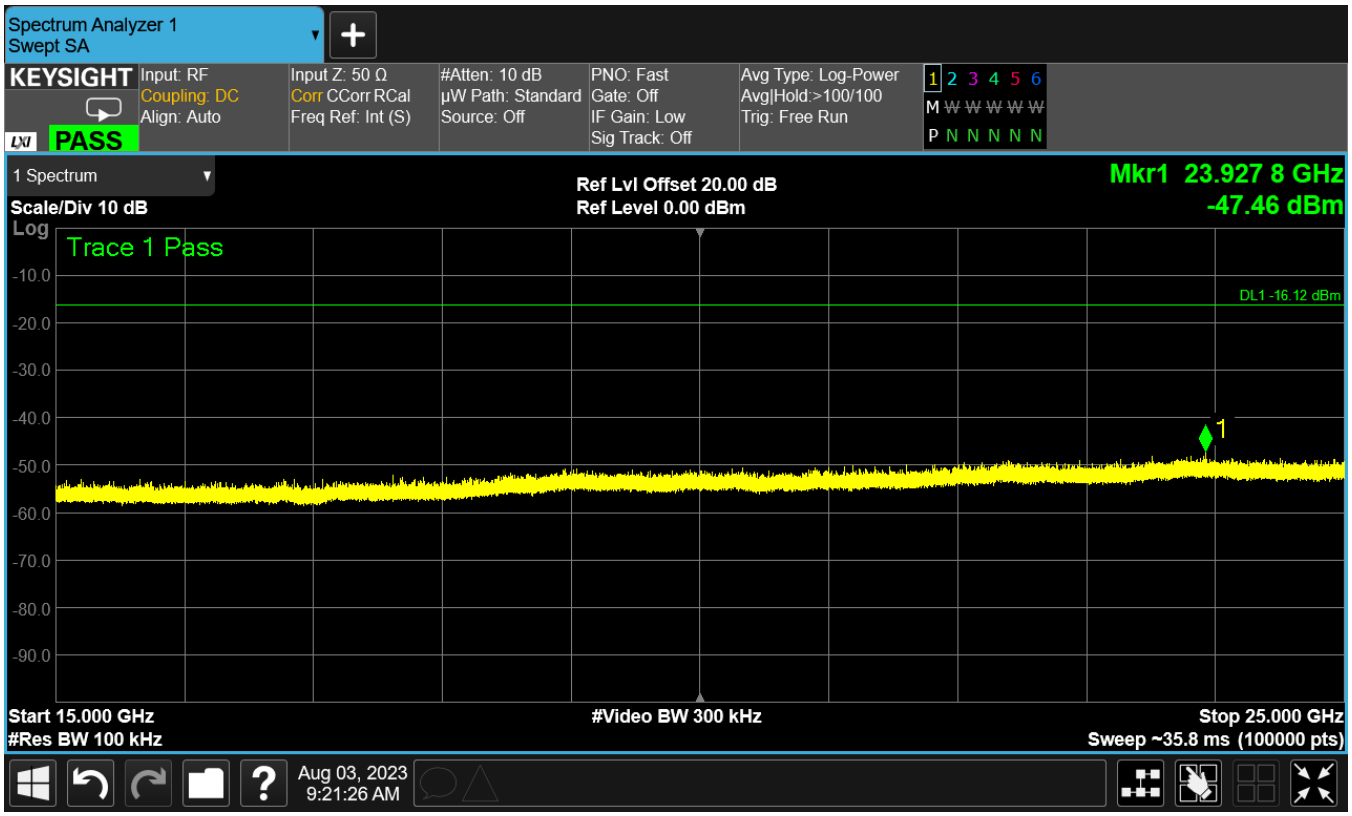


Figure 56: π/4DQPSK (2Mbps) Center Channel, Conducted Spurious – Plot 1

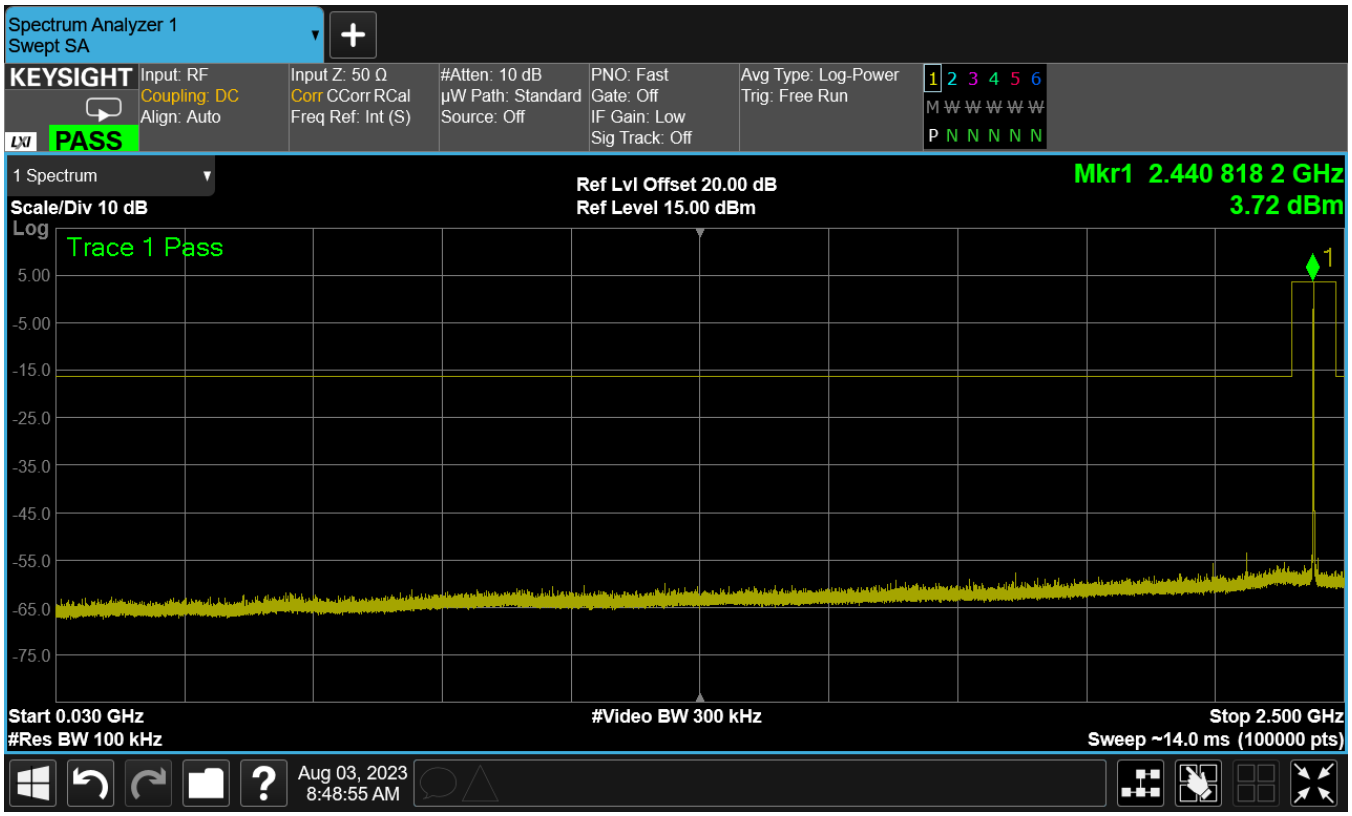


Figure 57: π/4DQPSK (2Mbps) Center Channel, Conducted Spurious – Plot 2

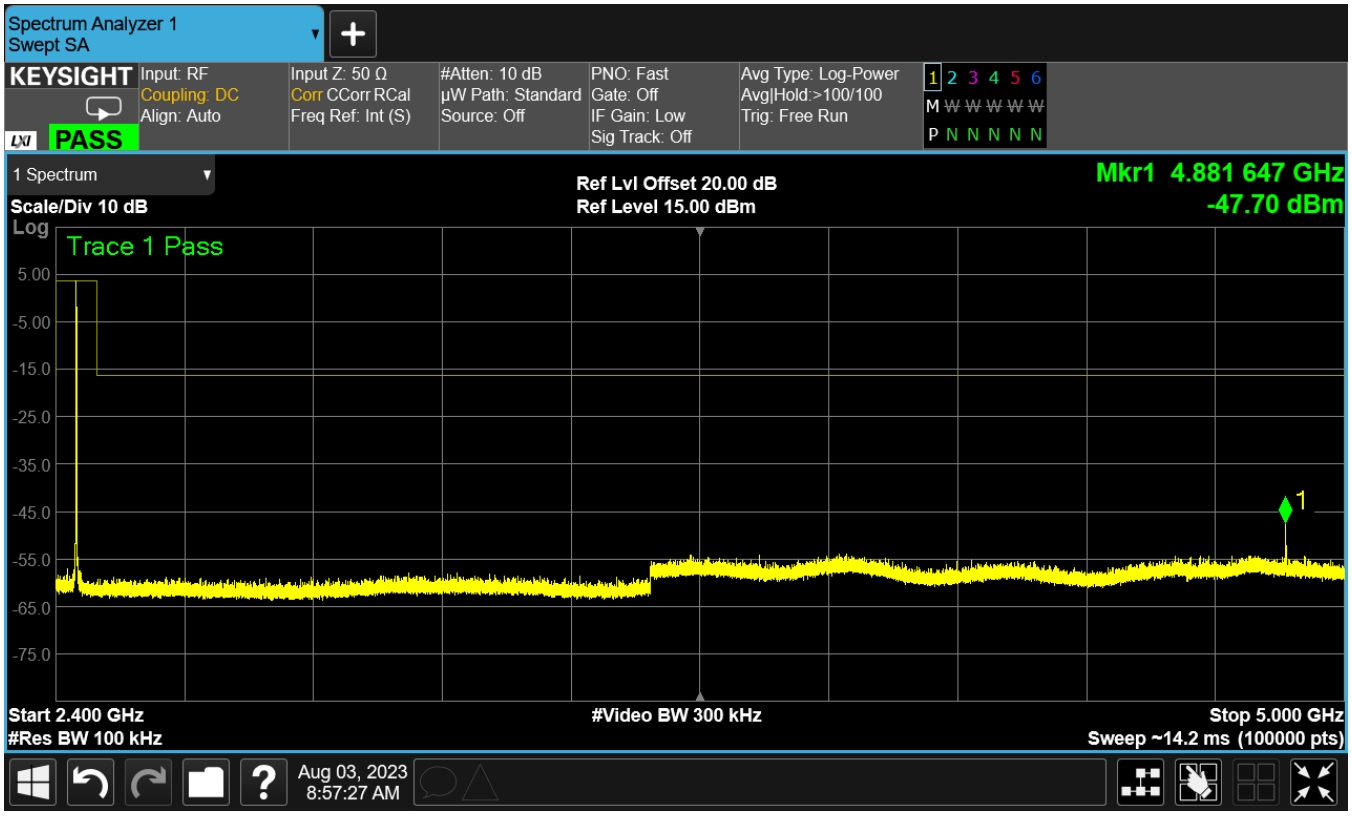


Figure 58: π/4DQPSK (2Mbps) Center Channel, Conducted Spurious – Plot 3

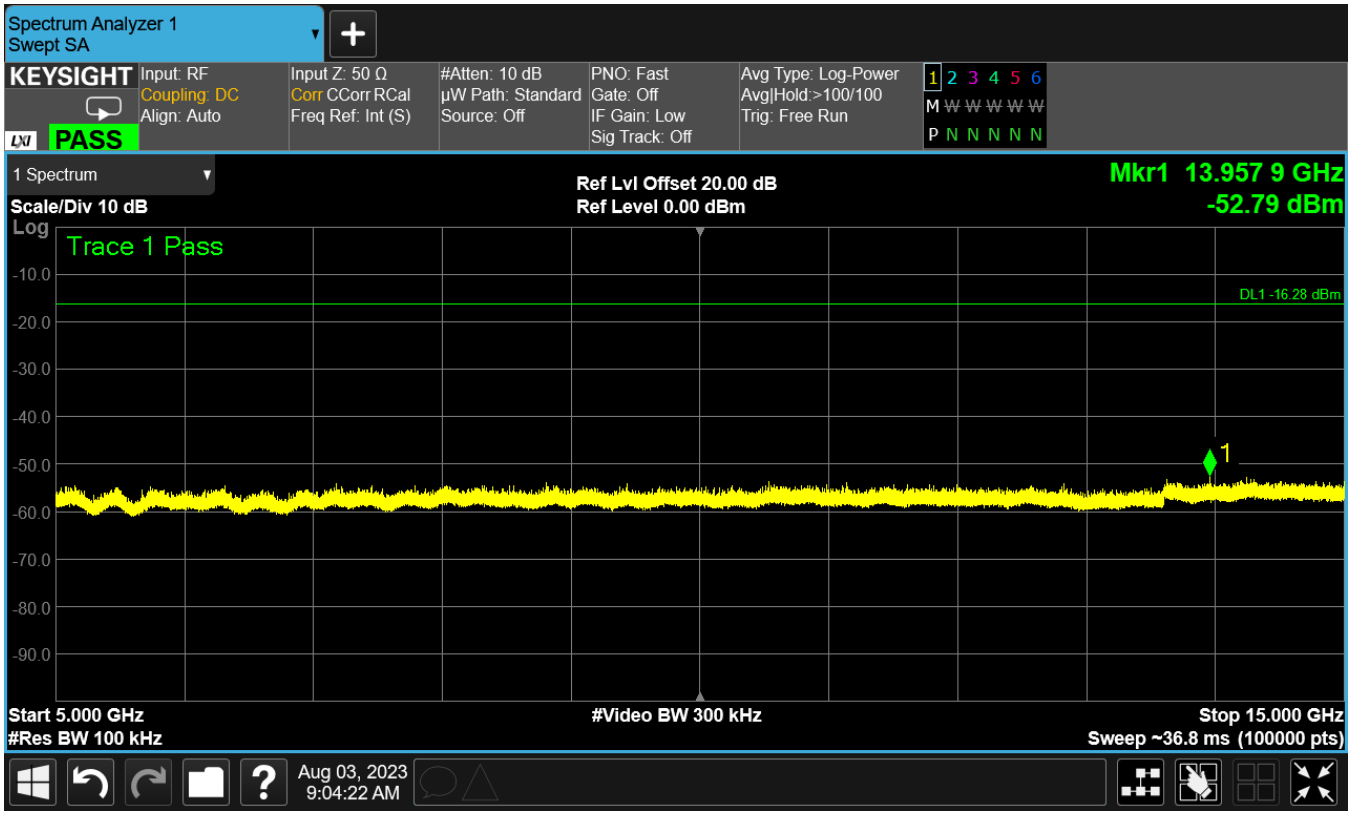
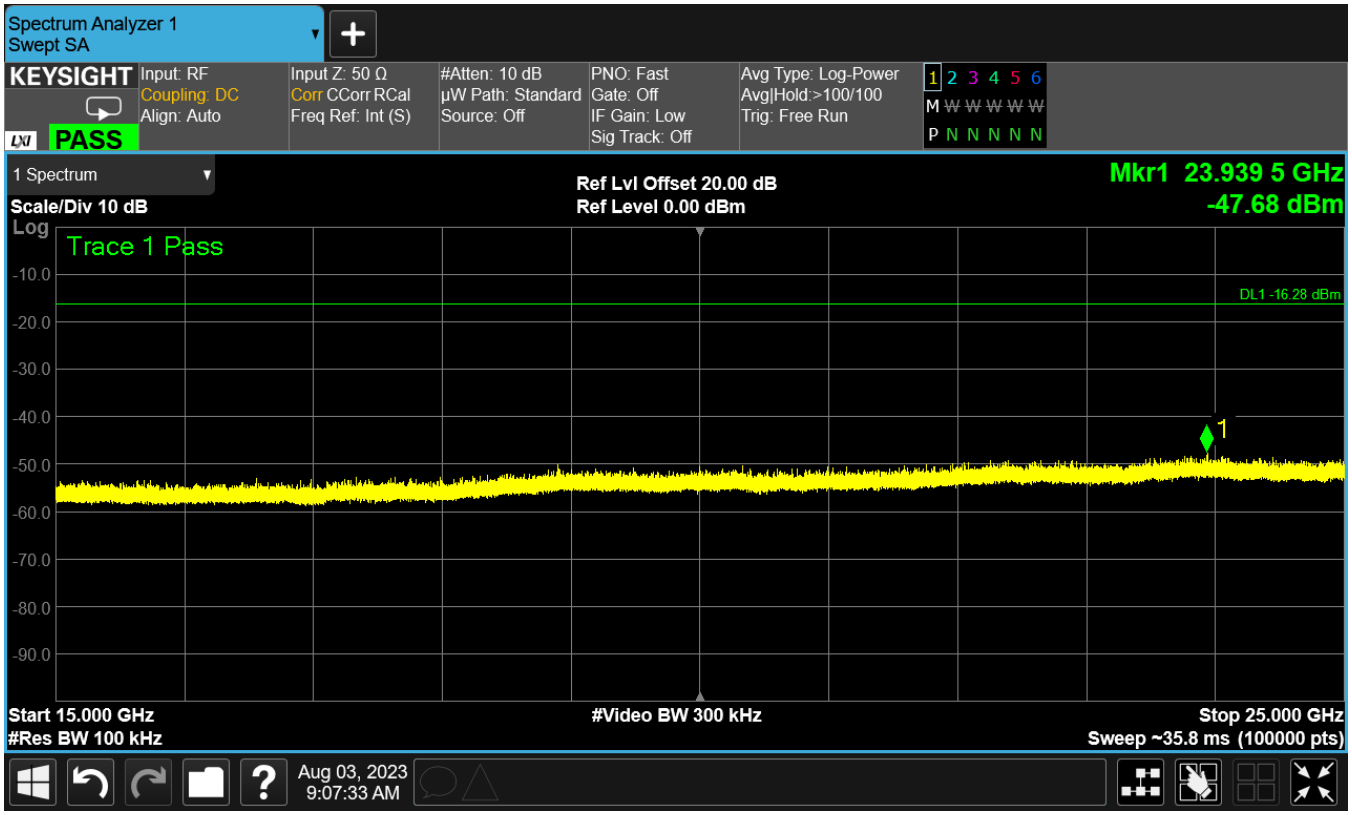


Figure 59: π/4DQPSK (2Mbps) Center Channel, Conducted Spurious – Plot 4



2.8 General Field Strength Requirements – Radiated Emissions

2.8.1 Requirements

Compliance Standard: FCC Part 15.205 and 15.209

FCC Compliance Limits		
Frequency Range	**3m Limit**	
30 – 88 MHz	100 µV/m (QP)	
88 – 216 MHz	150 µV/m (QP)	
216 – 960 MHz	200 µV/m (QP)	
> 960 MHz	500 µV/m (AVG)	5000 µV/m (Peak)

2.8.2 Test Procedure Summary

The requirements of FCC Part 15, RSS-Gen, and ICES-003 call for the EUT to be placed on a 1m X 1.5m non-conductive motorized turntable at a height of 80cm for radiated testing of frequencies up to 1000 MHz, and a height of 1.5m for testing of frequencies above 1000 MHz. Please note that the radiated emissions measured during this testing, were performed at a distance of 3-meters.

An initial pre-scan of the EUT was performed to identify any emissions that exceed, or come within 6dB of, the applicable limit. This pre-scan was performed a with the employment of a spectrum analyzer peak detector function. The highest amplitude (worst-case) emissions noted during the pre-scan were selected for final compliance measurements.

The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Broadband log periodic and double-ridged horn antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The output of the antenna was connected to the input of the spectrum analyzer and the emissions in the frequency range of 30 MHz to 25 GHz were evaluated. The EUT peripherals were placed on the table in accordance with ANSI C63.4. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The detector function was set to quasi-peak for measurements below 1 GHz. The measurement bandwidth of the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth. For measurements above 1 GHz, both the peak and the average levels are recorded, using a measurement bandwidth of 1 MHz. For average measurements, a video bandwidth setting of 10 Hz was used, in the case of video averaging; otherwise, an EMI AVG detector shall be employed.

To ensure that the support laptop did not interfere with radiated measurements of frequencies above 1GHz, the applicant has completely disabled the WiFi & BT capabilities within the computer's bios. For measurements of frequencies below 1000 MHz, the was shielded from the test site via the use of EMF/EMI Faraday Blankets. Overall, the support laptop, and power supply, did not impact the 3m radiated emissions testing due to the shielding effectiveness of these protective materials.

2.8.3 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antenna(s) and other measurement equipment. These factors include the antenna factor ((AF)(in dB/m)), cable loss factors ((CF)(in dB)), and the pre-amplifier gain [if applicable] ((G)(in dB)). These correction values are algebraically added to the raw Spectrum Analyzer Voltage (in dBµV) to obtain the corrected radiated electric field, which shall be the final corrected logarithm amplitude ((Corr. Meas.)(in dBµV/m)). This logarithm amplitude is then compared to the FCC limit, which has been converted to a unit of log in dBµV/m.

Example:

Spectrum Analyzer Voltage:	VdBµV (SA)
Antenna Correction Factor:	AFdB/m
Cable Correction Factor:	CFdB
Pre-Amplifier Gain (if applicable):	GdB
Electric Field:	EdBµV/m = V dBµV (SA) + AFdB/m + CFdB - GdB
To convert from linear units of measure:	dBuV/m = 20LOG(uV/m)
To convert FCC limits, based on $D_{Measure}$:	3m Limit = 10m Limit + 20LOG(10/3)

Environmental Conditions During Radiated Emissions Testing

Ambient Temperature:	22.2 °C
Relative Humidity:	50 %

2.8.4 Measurement Method and Results

The reduced testing procedures outlined in ANSI C63.10 (2013), Section 5.6.2 and 5.6.2.2 were employed. The radiated spurious emission test data correlating to the center channel of all three modulation modes is provided below. The worst-case mode, with regard to peak power output, (8DPSK/3Mbps) was utilized to provide the radiated spurious emission test data for the low and high channels.

For testing below 1000 MHz, the EUT was configured in a normal production mode, with the BT portion paired to a companion device. The digital portion was exercised by streaming music from the companion device to the EUT and playing music through the EUT speakers during the test.

For testing above 1000 MHz, the EUT was configured in a fully-modulated mode, with the hopping stopped. The BT portion was controlled by the applicant's software and the appropriate channels, modes, and data rates were elected as necessary.

The EUT was tested while positioned in the worst-case orientation, based the three-axes orthogonal plane evaluation of the fundamental field strength at 3-meters.

The EUT complies with the requirements this section.

There were no emissions detected from the EUT above 5000 MHz.

Table 8: Radio Fundamental, EUT Axis Evaluation (8DPSK, Low Channel)

Frequency (MHz)	Ant. Polarity (H/V)	Corr. Meas. (dBuV/m)	Turn Table (degree)	Antenna Height (cm)	Detector	EUT Orientation
2402.00	V	99.00	100	175	Peak	X-Axis
2402.00	V	94.30	265	185	Peak	Y-Axis
2402.00	V	90.66	210	175	Peak	Z-Axis
2402.00	H	97.22	35	175	Peak	X-Axis
2402.00	H	90.99	100	170	Peak	Y-Axis
2402.00	H	98.01	210	165	Peak	Z-Axis

Table 9: Radiated Emissions Test Data – 30 MHz to 1000 MHz

Frequency (MHz)	Detector	Corr. Meas. (dBuV/m)	QP Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
50.661	Peak	34.724	40	-5.276	90	Vert, 100

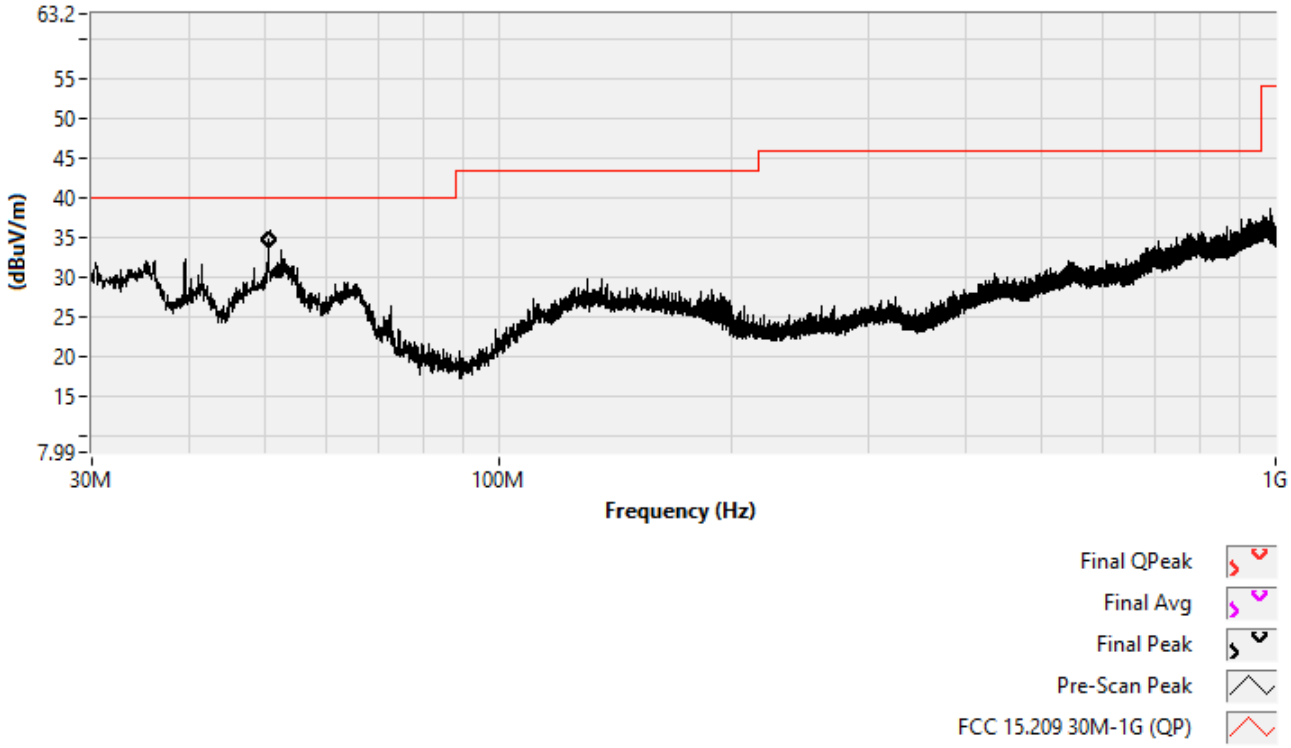
As previously mentioned, for measurements of frequencies below 1000 MHz, the EUT was configured in a normal production mode, with the BT portion paired to a companion device. The digital portion was exercised by streaming music from the companion device to the EUT and playing music through the EUT speakers during the test.

Prior to testing below 1000 MHz, it was confirmed that changing the modulation type, data rate, and/or carrier center frequency, had no impact on the emissions in the frequency range of 30 MHz to 1000 MHz.

The plots provided on the following page, represent the 3m radiated emissions test data that correlate to the tabular data provided in Table 9.

In this case, thousands of points were collected, and all Peak emissions meet the QP limits of FCC Rule Part 15.209 and 15.205.

Pre-scan and Final Data (Vertical) – Worst Case Emissions < 1000 MHz



Pre-scan and Final Data (Horizontal) – Worst Case Emissions < 1000 MHz

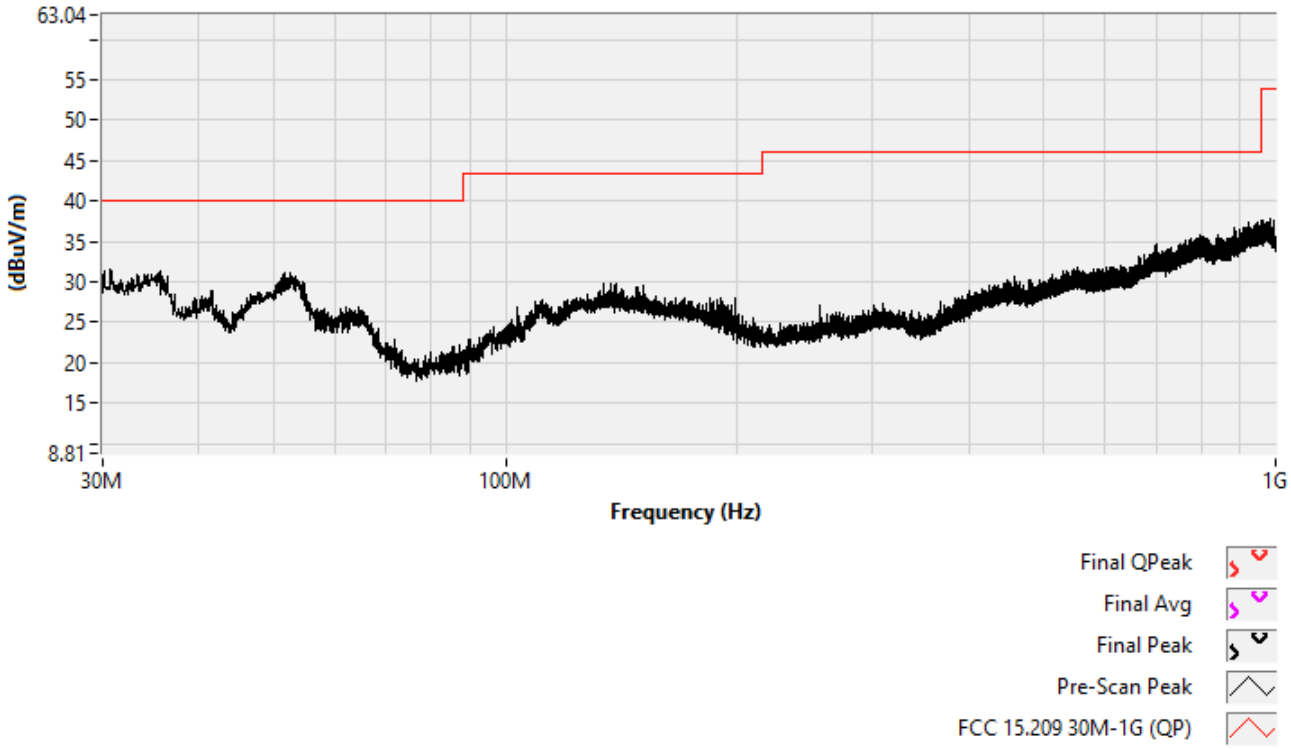


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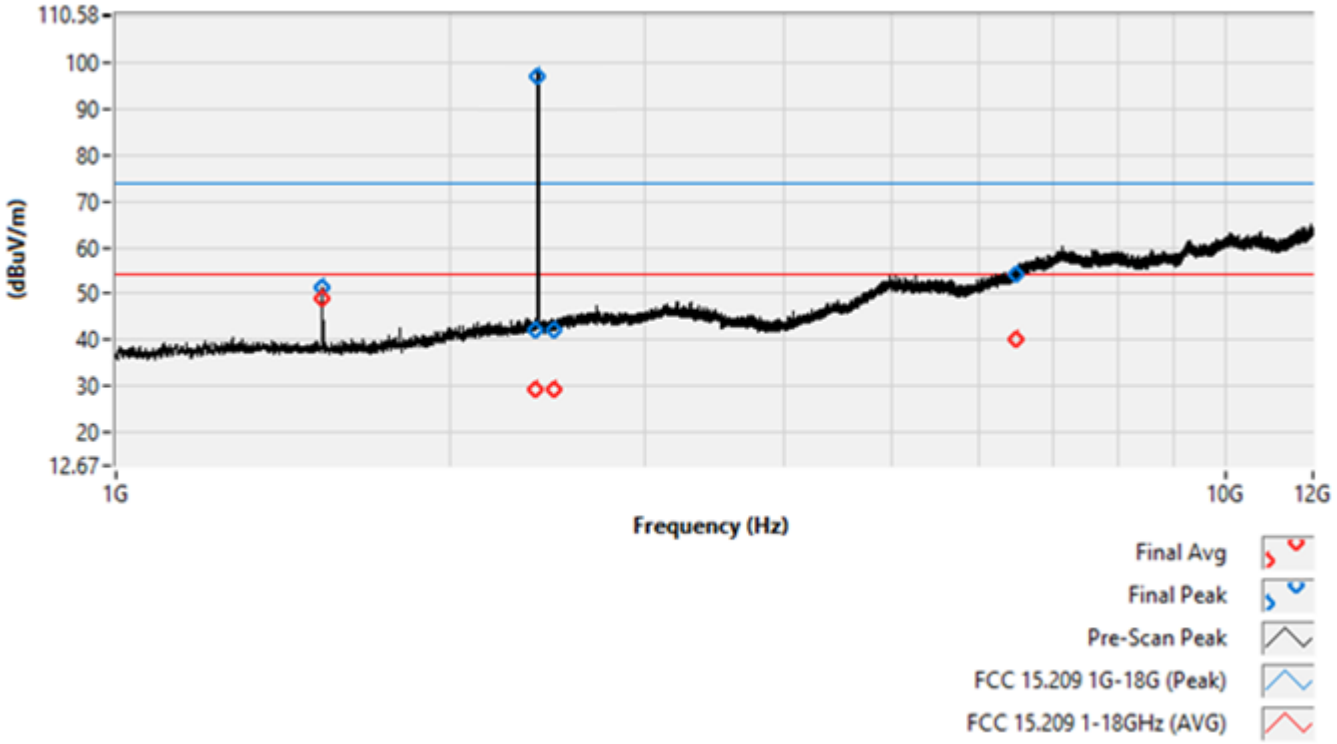
Table 10: Radiated Emissions Test Data – 1 GHz to 25 GHz (3Mbps, Low Channel)

Frequency (GHz)	Detector	Corr. Meas. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
1.536	Peak	51.312	74	-22.688	100	Vert, 175
	AVG	48.756	54	-5.244	100	Vert, 175
2.390	Peak	42.224	74	-31.776	100	Vert, 175
	AVG	28.994	54	-25.006	100	Vert, 175
2.402	Peak	98.990	--	--	100	Vert, 175
	AVG	--	--	--	--	--
2.4835	Peak	42.036	74	-31.964	100	Vert, 175
	AVG	29.287	54	-24.713	100	Vert, 175
6.479	Peak	53.997	74	-20.003	100	Vert, 175
	AVG	40.056	54	-13.944	100	Vert, 175
11.984	Peak	65.561	74	-8.439	35	Horiz, 175
	AVG	50.150	54	-3.850	35	Horiz, 175

The plots provided on the following page, represent the 3m radiated emissions test data that correlate to the tabular data provided in Table 10. (3DH5, Low Channel).

Pre-scan and Final Data (Vertical) – 8DPSK, Low Channel



Pre-scan and Final Data (Horizontal) – 8DPSK, Low Channel

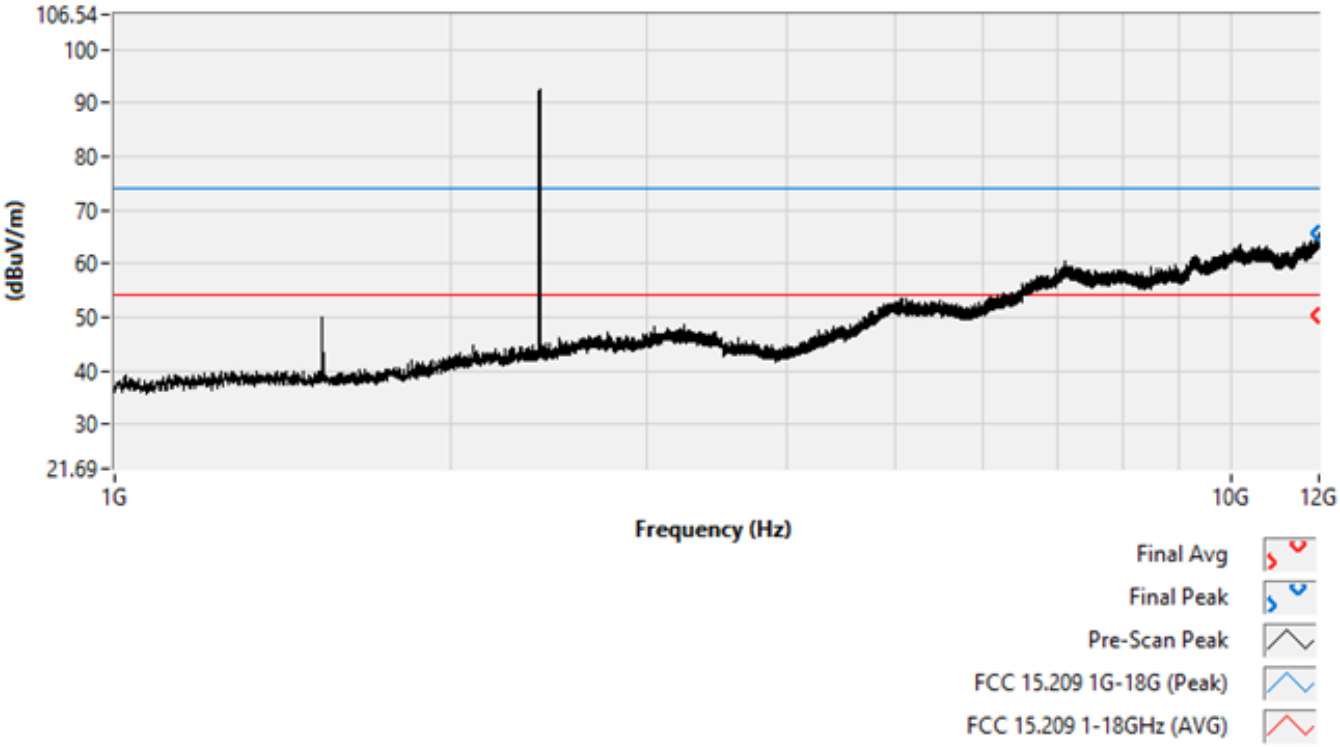
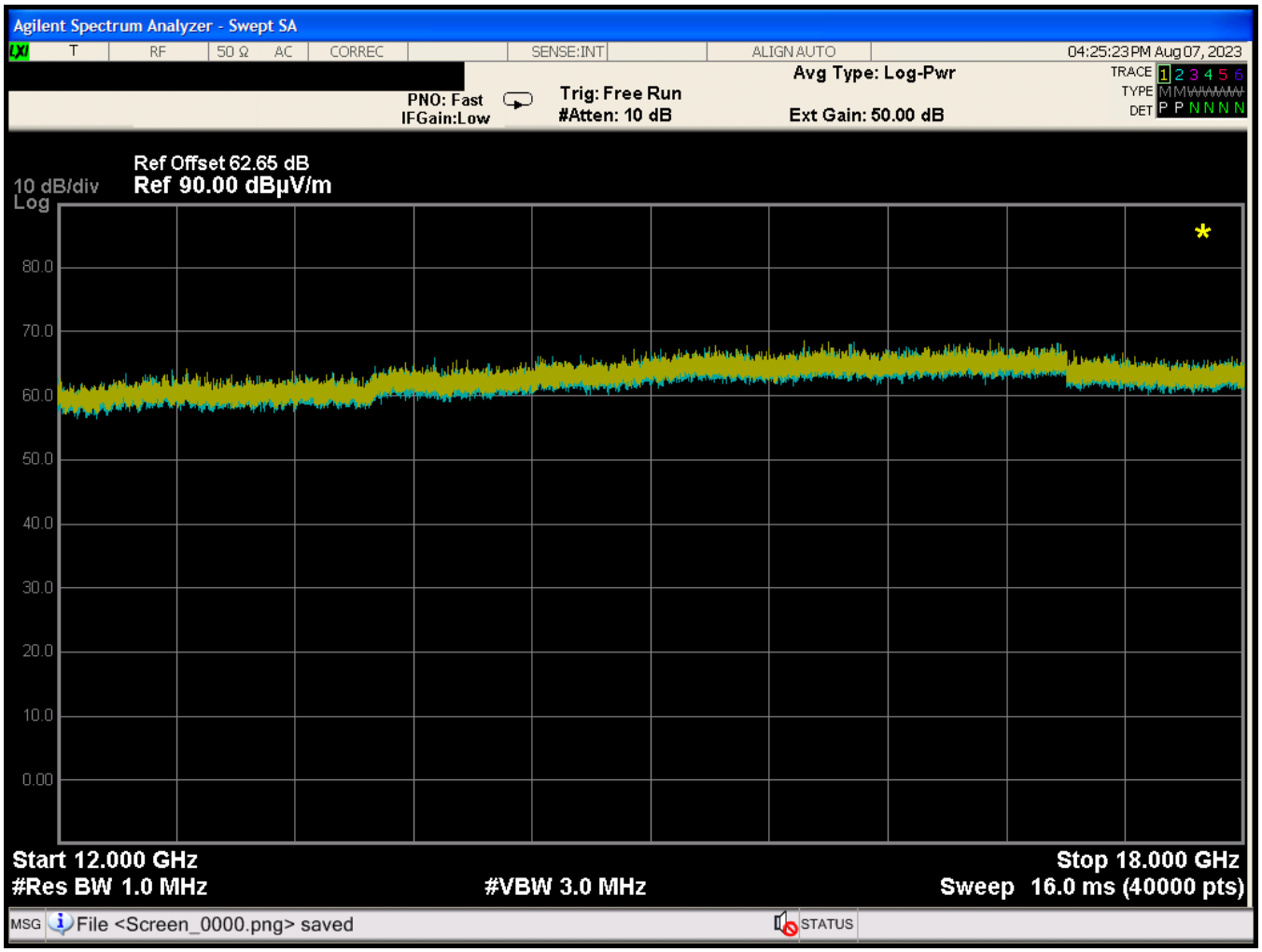


Figure 60: 8DPSK (3Mbps) Low Channel – 12 GHz to 18 GHz (Corrected Field Strength)

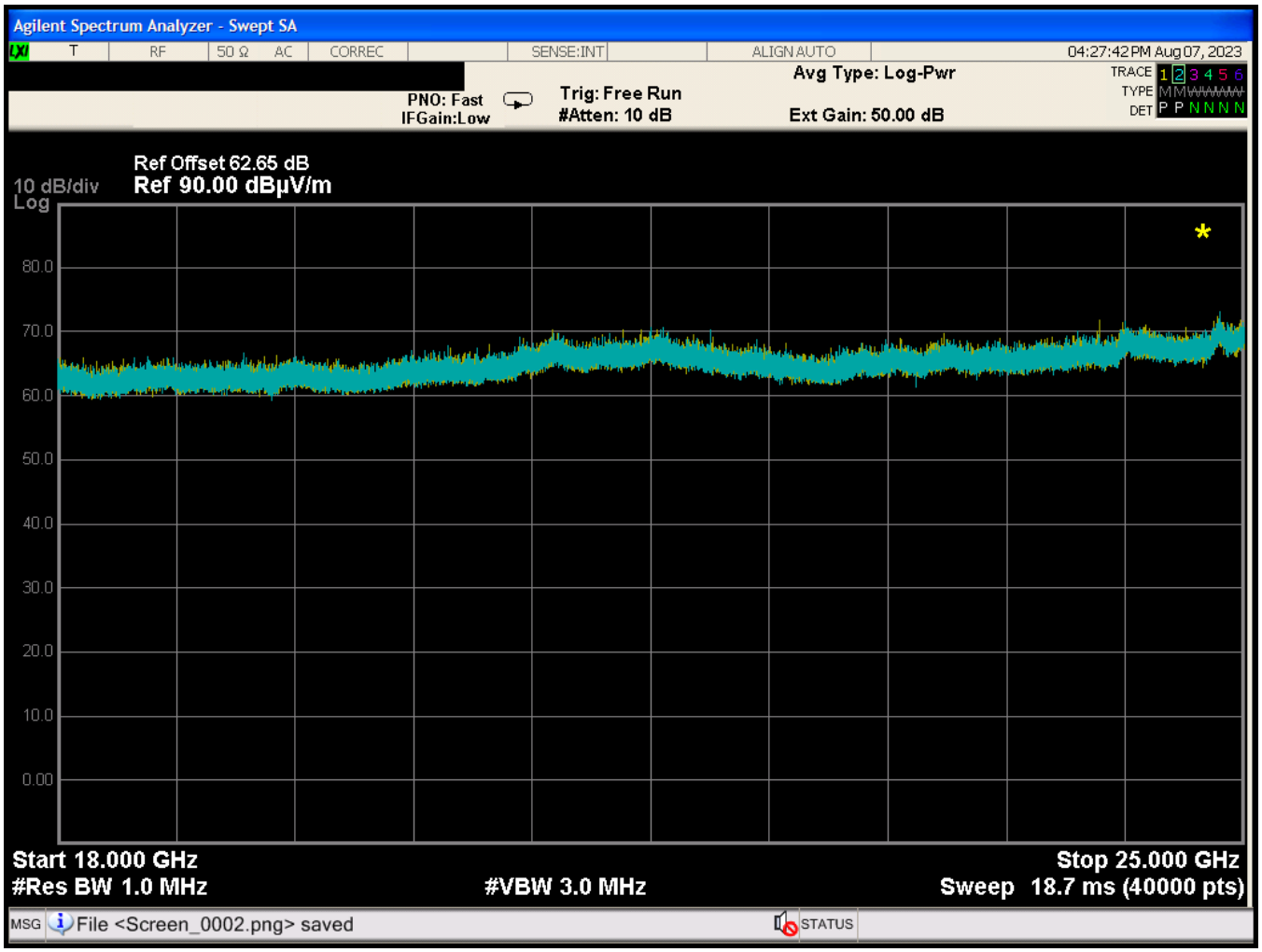


No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

Figure 61: 8DPSK (3Mbps) Low Channel – 18 GHz to 25 GHz (Corrected Field Strength)



No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

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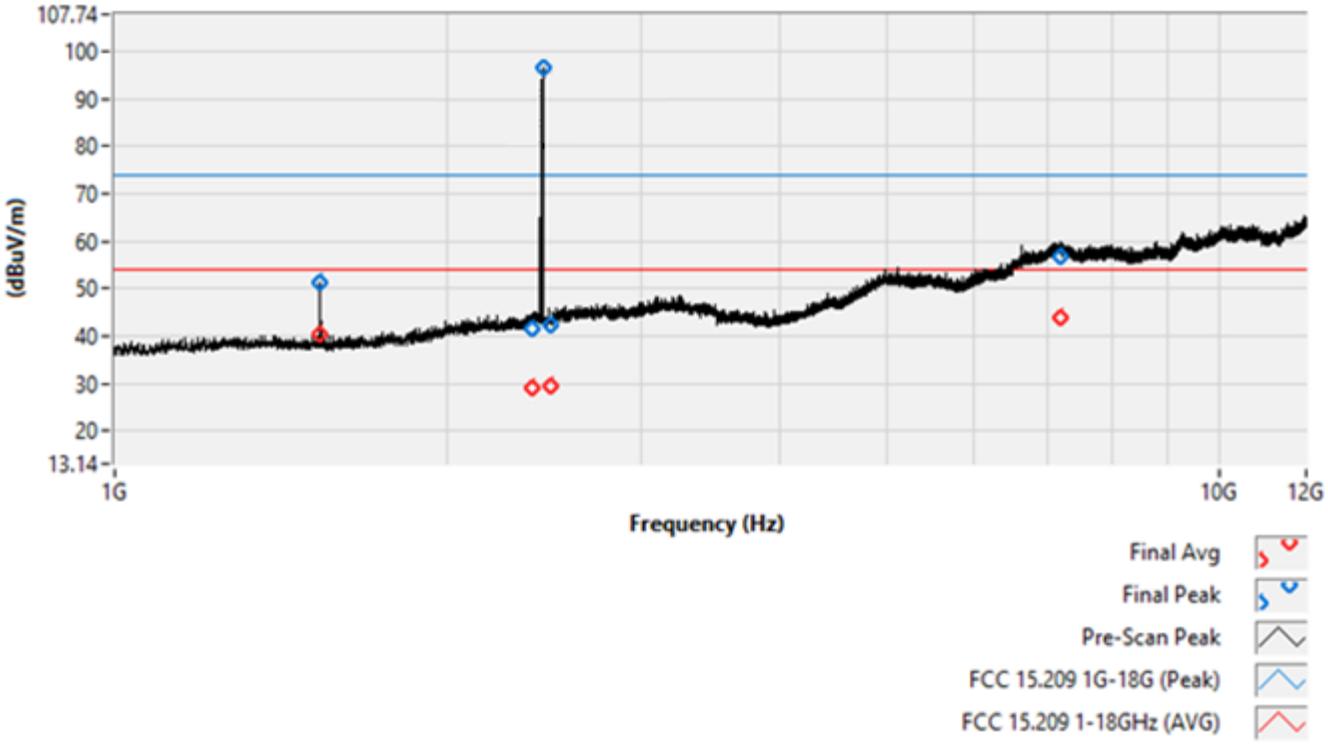
Table 11: Radiated Emissions Test Data – 1 GHz to 25 GHz (3Mbps, Center Channel)

Frequency (GHz)	Detector	Corr. Meas. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
1.536	Peak	51.165	74	-22.835	100	Vert, 175
	AVG	40.283	54	-13.717	100	Vert, 175
2.390	Peak	41.658	74	-32.342	100	Vert, 175
	AVG	28.912	54	-25.088	100	Vert, 175
2.441	Peak	97.500	--	--	100	Vert, 175
	AVG	--	--	--	--	--
2.4835	Peak	42.507	74	-31.493	100	Vert, 175
	AVG	29.624	54	-24.376	100	Vert, 175
7.200	Peak	56.626	74	-17.374	100	Vert, 175
	AVG	43.875	54	-10.125	100	Vert, 175
11.990	Peak	65.579	74	-8.421	35	Horiz, 175
	AVG	49.630	54	-4.370	35	Horiz, 175

The plots provided on the following page, represent the 3m radiated emissions test data that correlate to the tabular data provided in Table 11. (3DH5, Center Channel).

Pre-scan and Final Data (Vertical) – 8DPSK, Center Channel



Pre-scan and Final Data (Horizontal) – 8DPSK, Center Channel

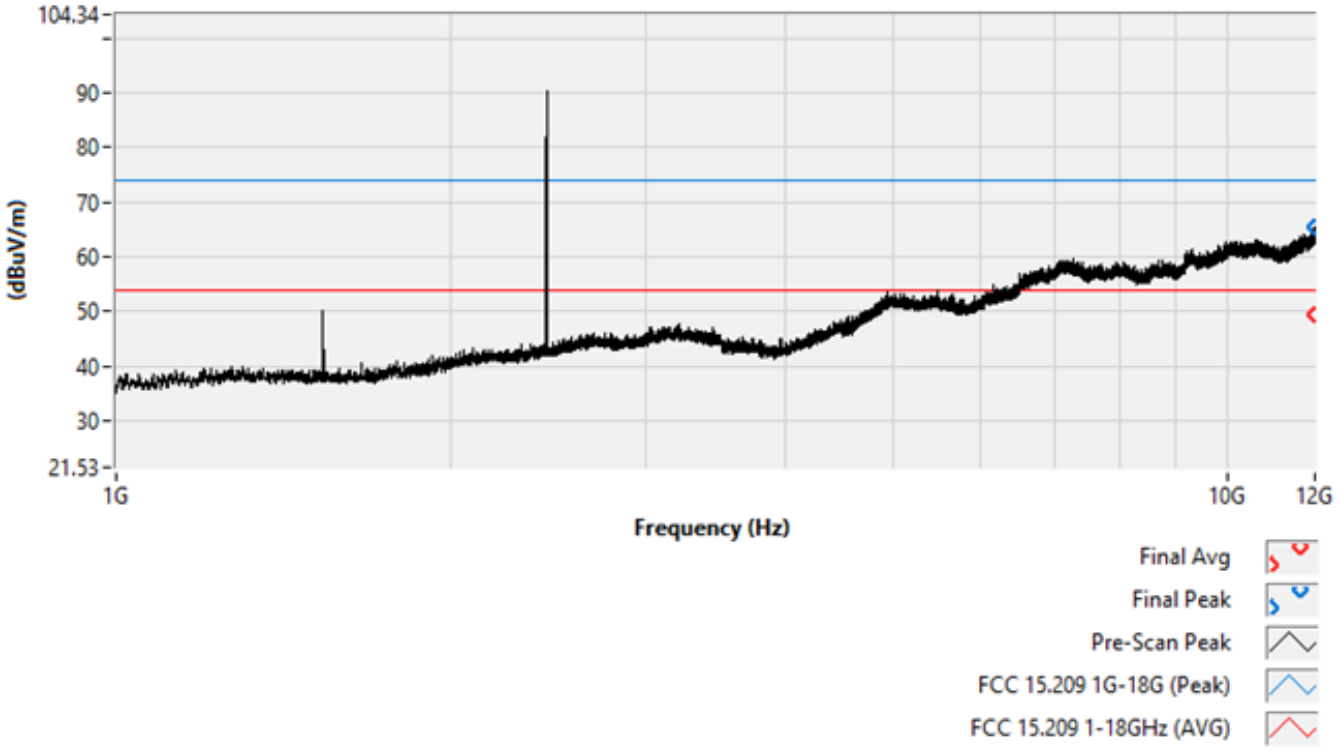
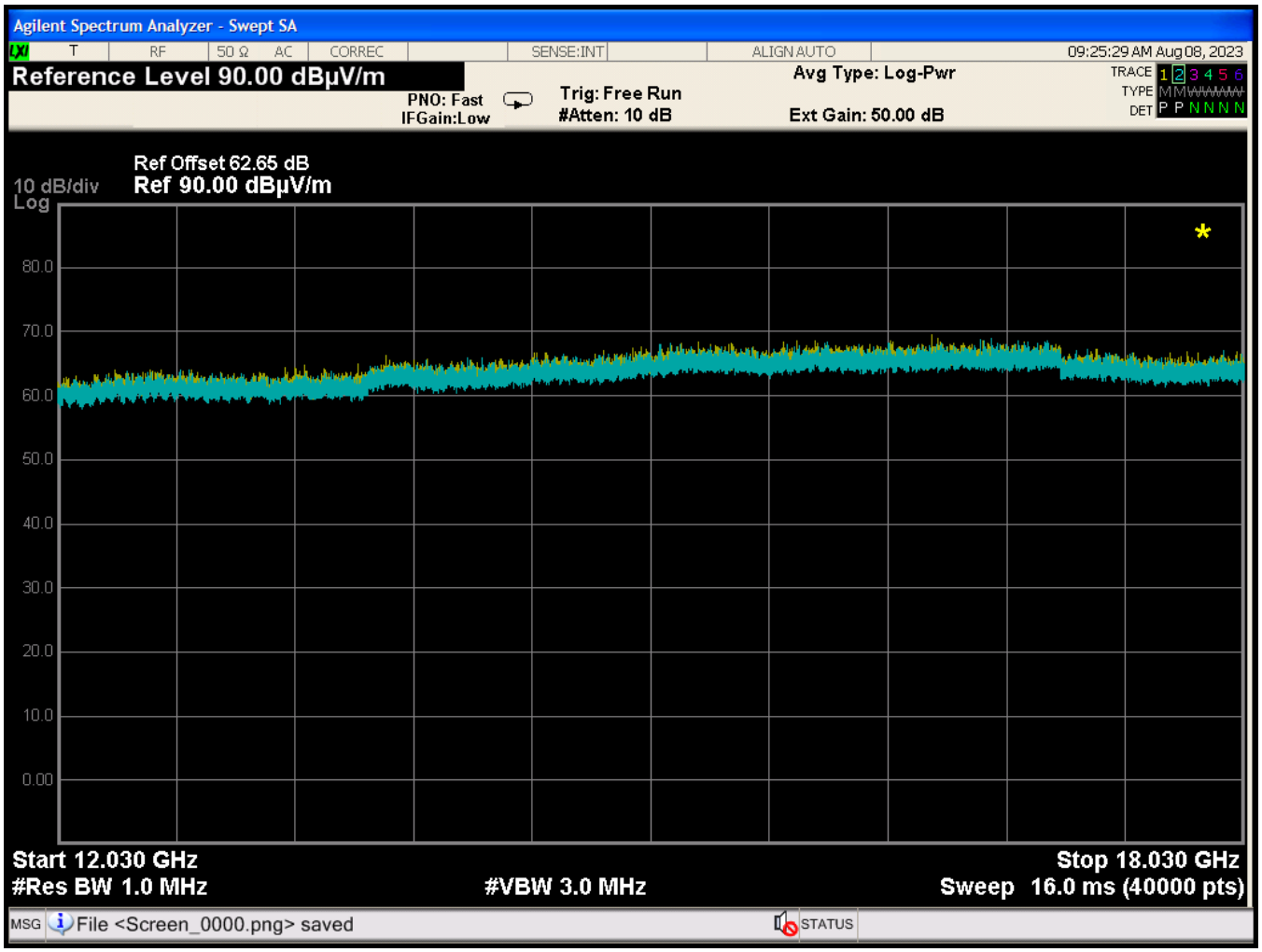


Figure 62: 8DPSK (3Mbps) Center Channel – 12 GHz to 18 GHz (Corrected Field Strength)

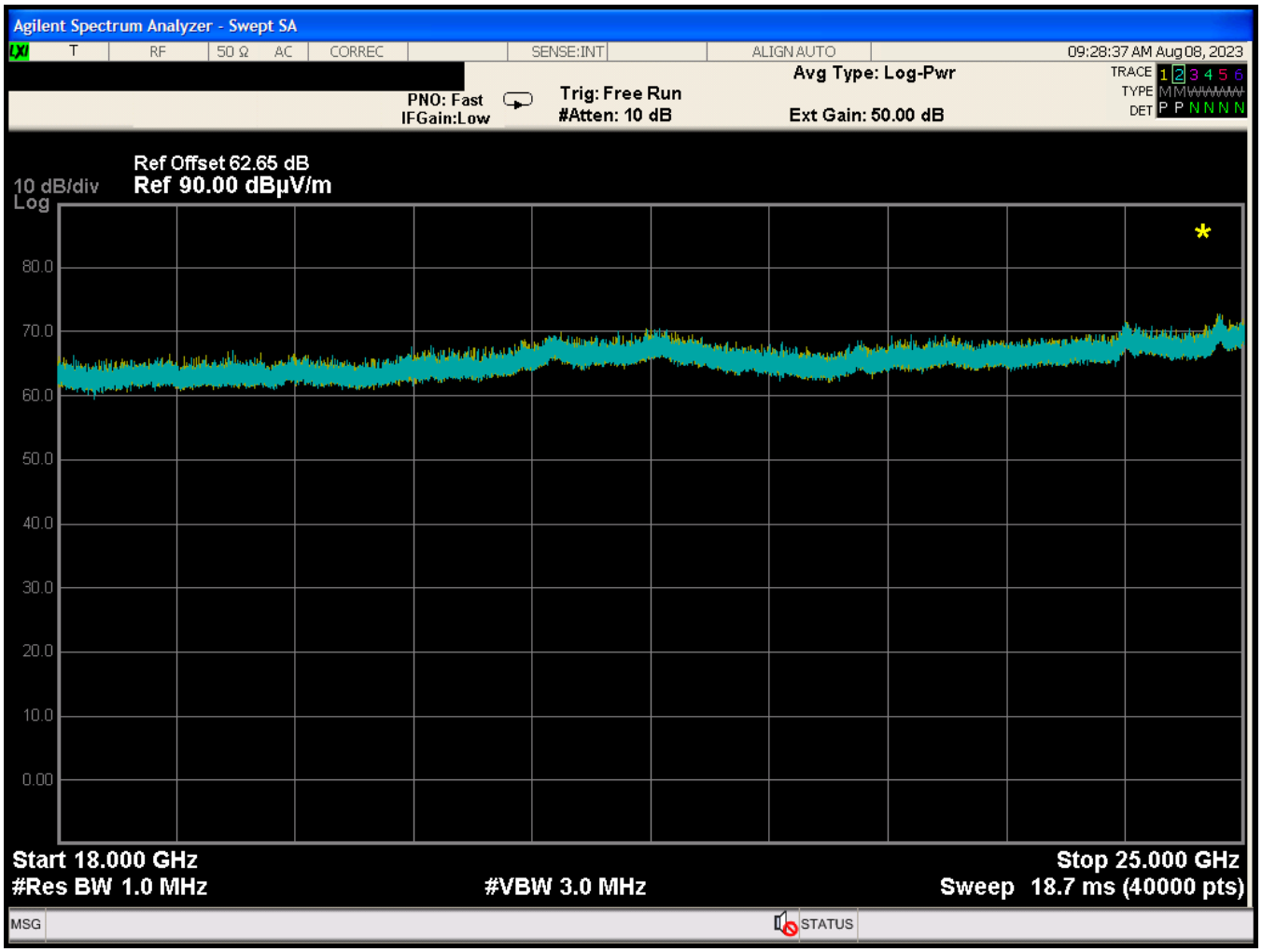


No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

Figure 63: 8DPSK (3Mbps) Center Channel – 18 GHz to 25 GHz (Corrected Field Strength)



No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

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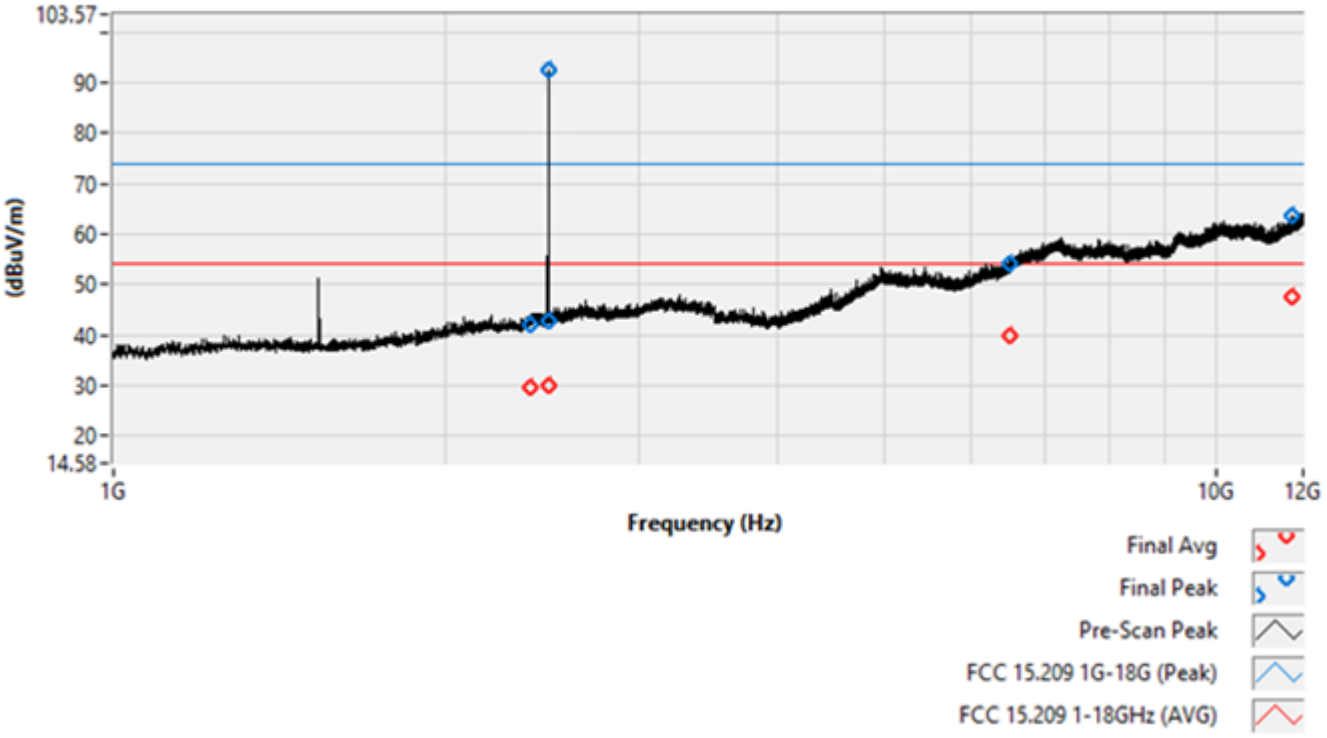
Table 12: Radiated Emissions Test Data – 1 GHz to 25 GHz (3Mbps, High Channel)

Frequency (GHz)	Detector	Corr. Meas. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
1.536	Peak	54.023	74	-19.977	35	Horiz, 175
	AVG	52.265	54	-1.735	35	Horiz, 175
2.390	Peak	41.922	74	-32.078	100	Vert, 175
	AVG	29.412	54	-24.588	100	Vert, 175
2.480	Peak	92.204	--	--	100	Vert, 175
	AVG	--	--	--	--	--
2.4835	Peak	42.784	74	-31.216	100	Vert, 175
	AVG	29.920	54	-24.080	100	Vert, 175
6.516	Peak	53.999	74	-20.001	100	Vert, 175
	AVG	39.816	54	-14.184	100	Vert, 175
11.728	Peak	63.487	74	-10.513	100	Vert, 175
	AVG	47.439	54	-6.561	100	Vert, 175

The plots provided on the following page, represent the 3m radiated emissions test data that correlate to the tabular data provided in Table 12. (3DH5, High Channel).

Pre-scan and Final Data (Vertical) – 8DPSK, High Channel



Pre-scan and Final Data (Horizontal) – 8DPSK, High Channel

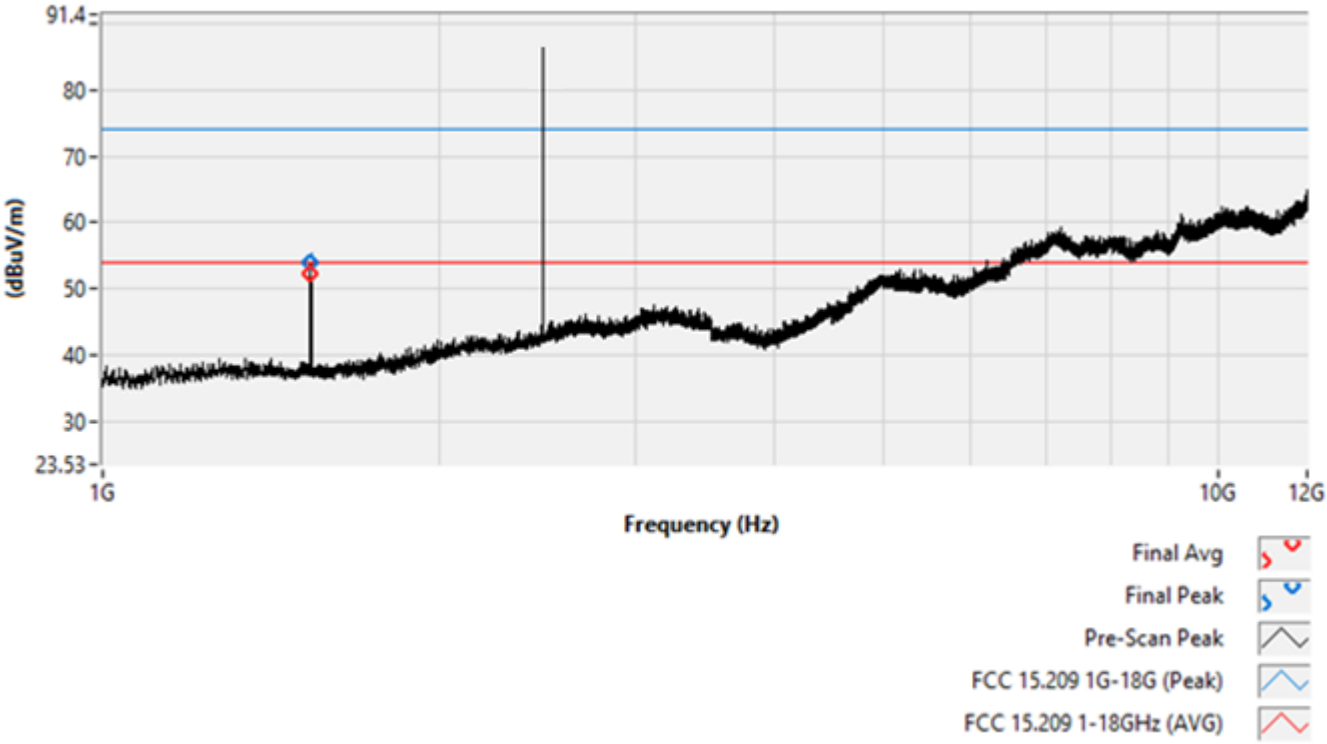
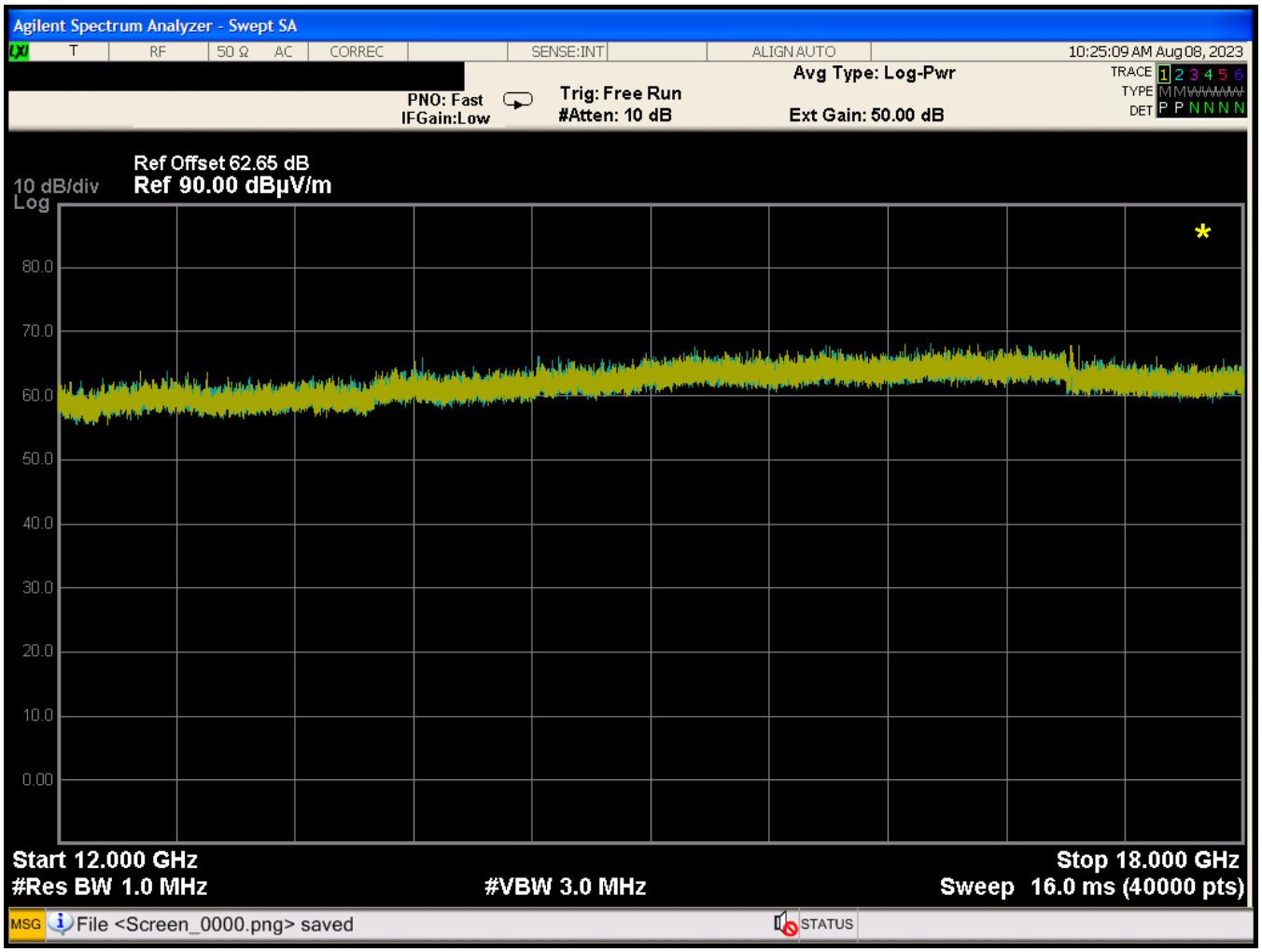


Figure 64: 8DPSK (3Mbps) High Channel – 12 GHz to 18 GHz (Corrected Field Strength)

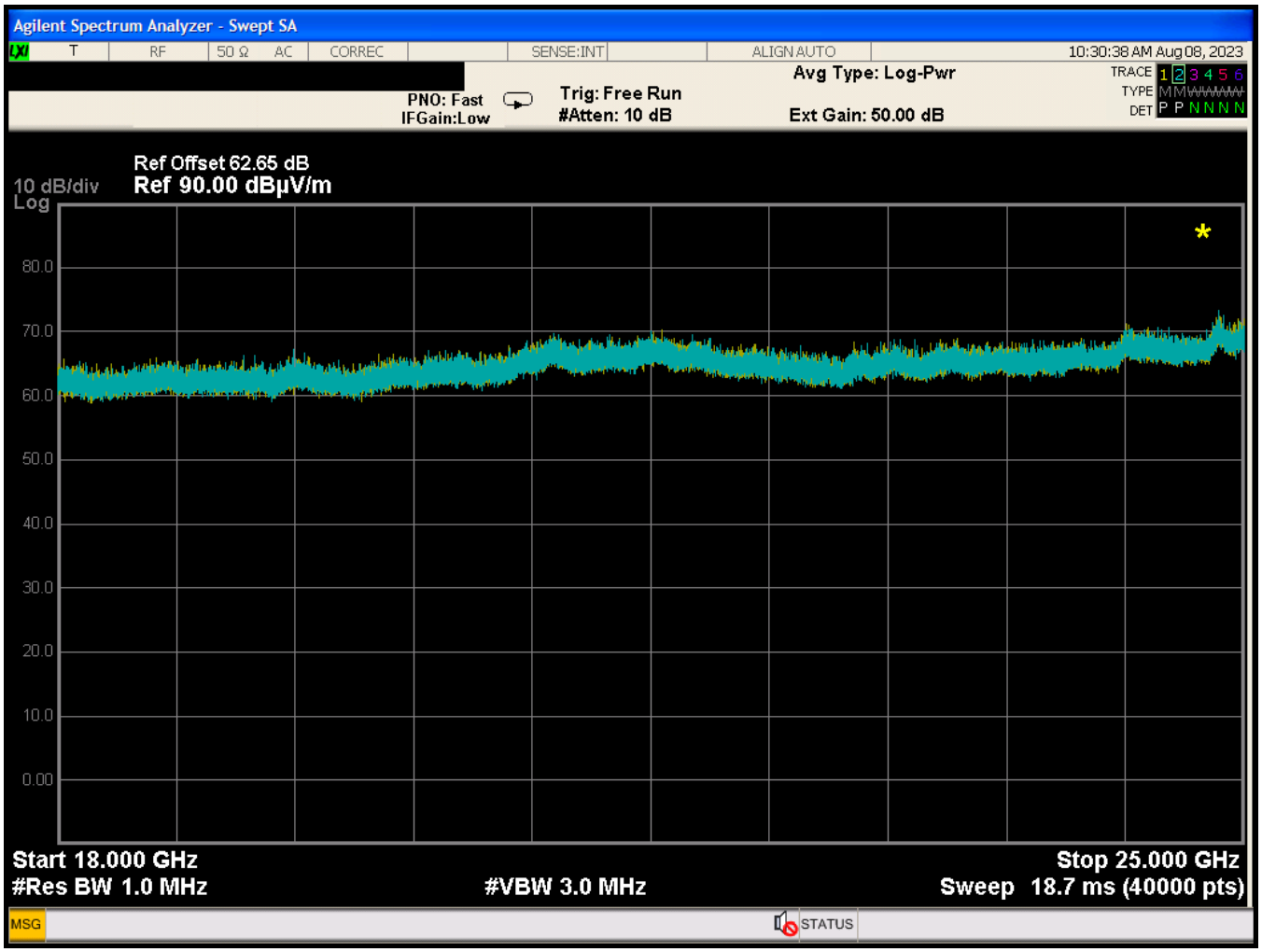


No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

Figure 65: 8DPSK (3Mbps) High Channel – 18 GHz to 25 GHz (Corrected Field Strength)



No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

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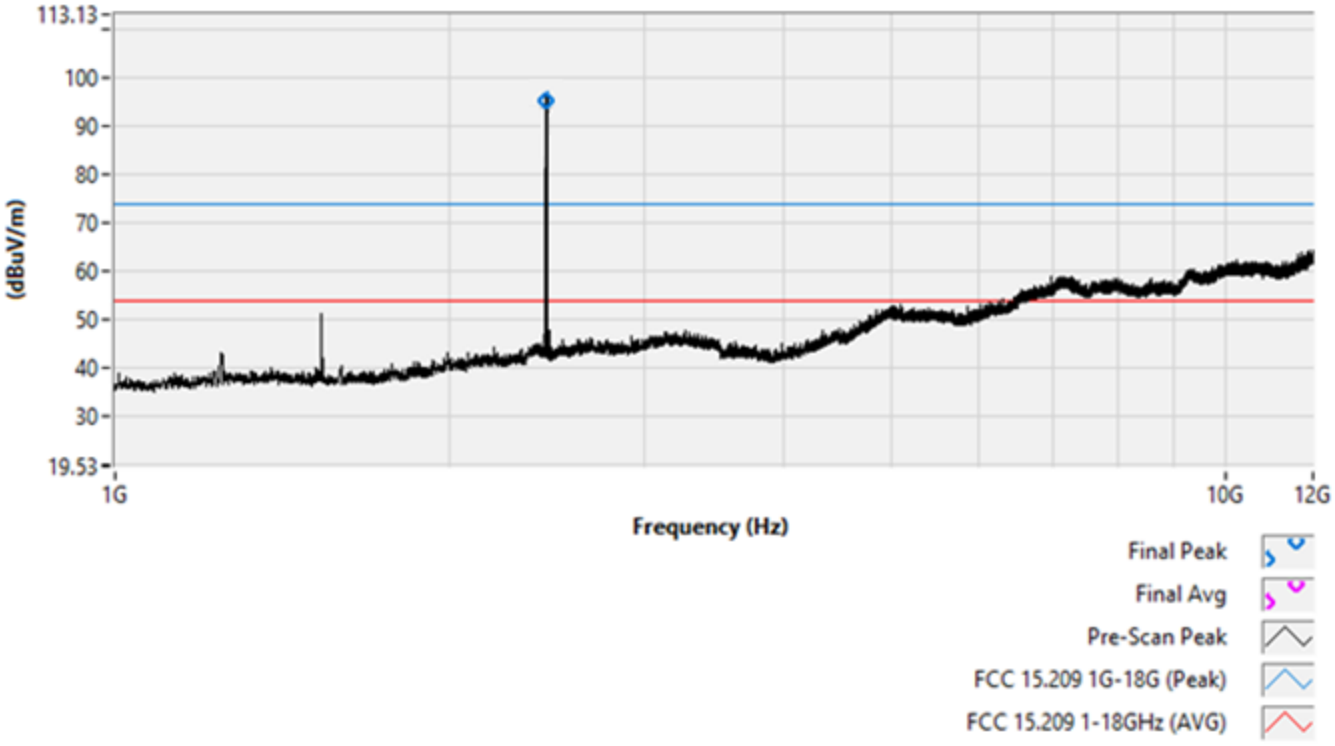
Table 13: Radiated Emissions Test Data – 1 GHz to 25 GHz (1Mbps, Center Channel)

Frequency (GHz)	Detector	Corr. Meas. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
1.536	Peak	53.941	74	-20.059	100	Horiz, 165
	AVG	52.301	54	-1.699	100	Horiz, 165
2.390	Peak	41.482	74	-32.518	100	Horiz, 165
	AVG	28.560	54	-25.440	100	Horiz, 165
2.441	Peak	95.137	--	--	110	Vert, 170
	AVG	--	--	--	--	--
2.4835	AVG	41.588	54	-32.412	100	Horiz, 165
	Peak	29.064	74	-24.936	100	Horiz, 165
10.503	AVG	63.218	54	-10.782	100	Horiz, 165
	Peak	46.590	74	-7.410	100	Horiz, 165

The plots provided on the following page, represent the 3m radiated emissions test data that correlate to the tabular data provided in Table 13. (DH5, Center Channel)

Pre-scan and Final Data (Vertical) – GFSK, Center Channel



Pre-scan and Final Data (Horizontal) – GFSK, Center Channel

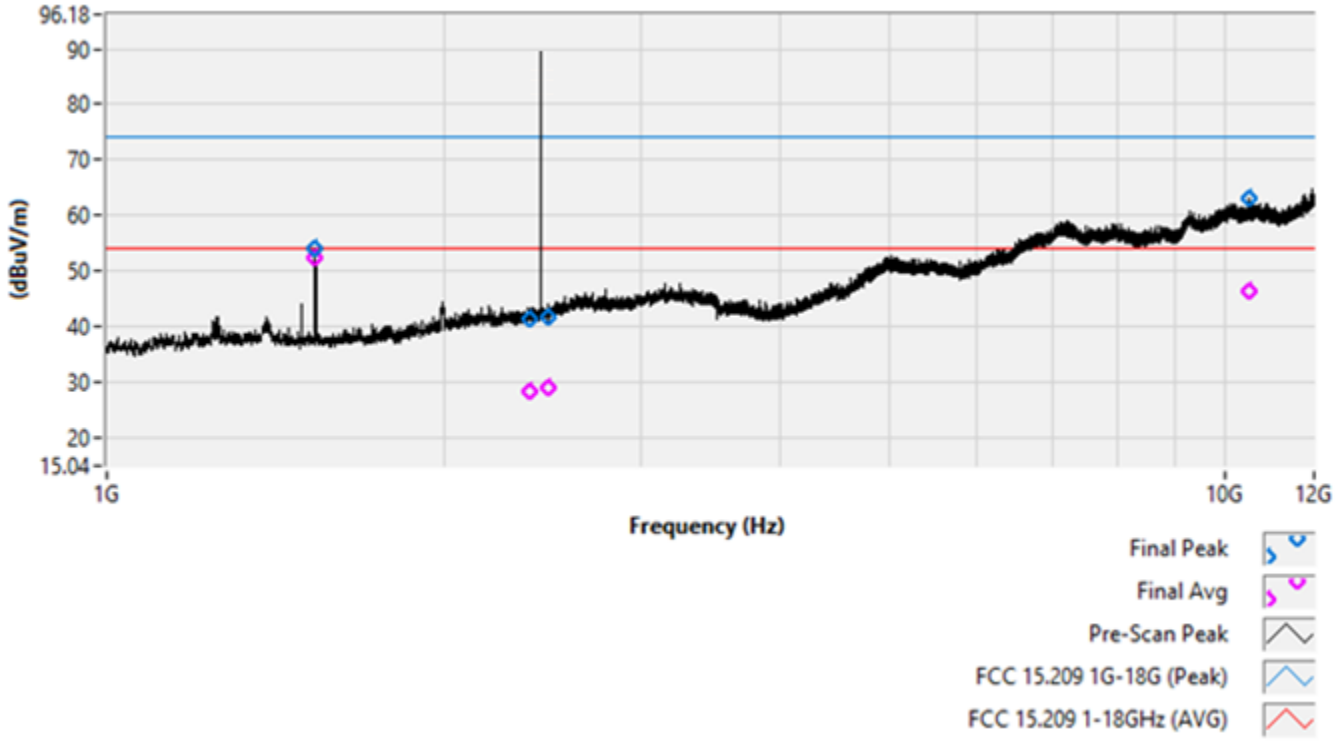
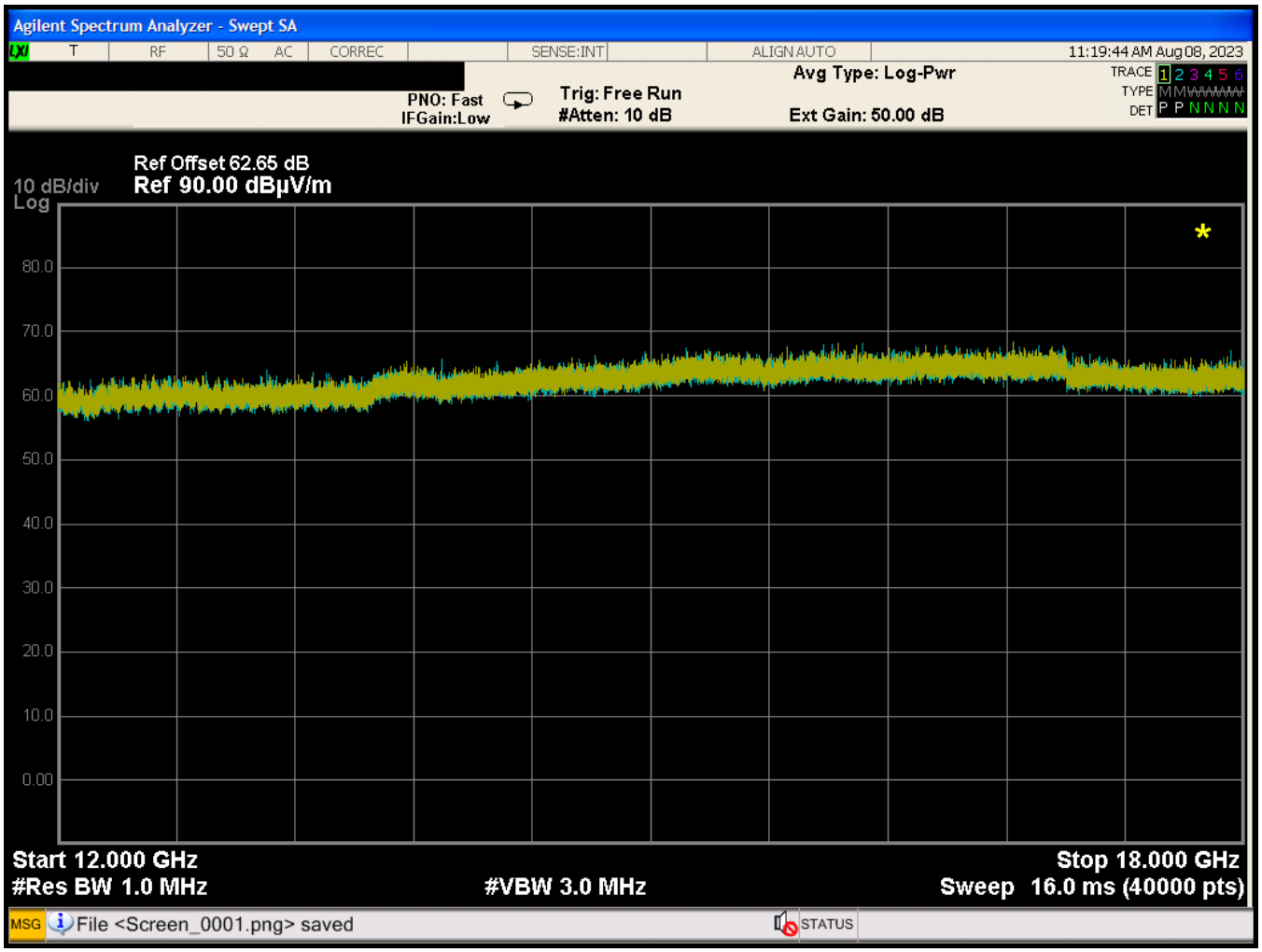


Figure 66: GFSK (1Mbps) Center Channel – 12 GHz to 18 GHz (Corrected Field Strength)

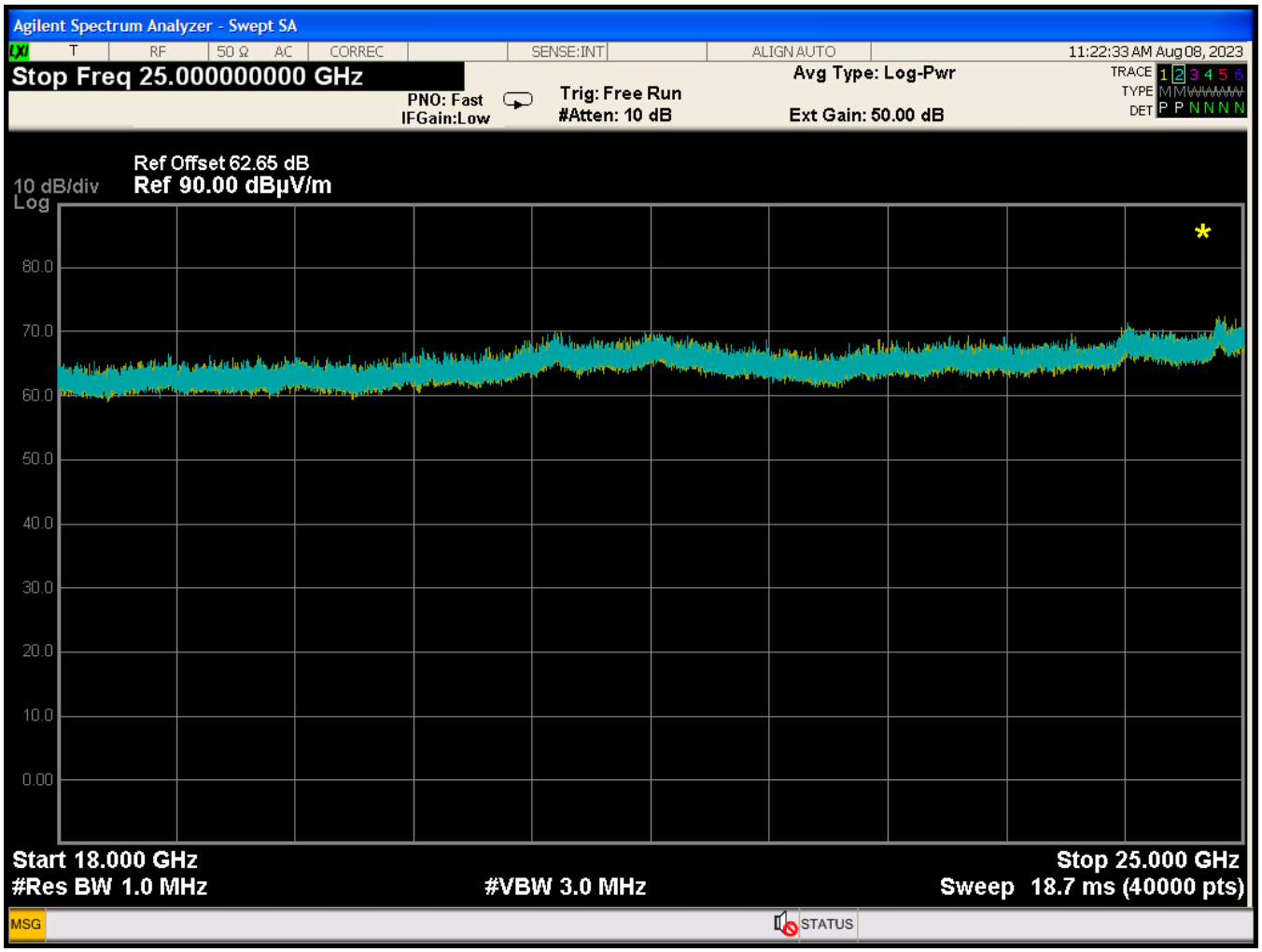


No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

Figure 67: GFSK (1Mbps) Center Channel – 18 GHz to 25 GHz (Corrected Field Strength)



No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

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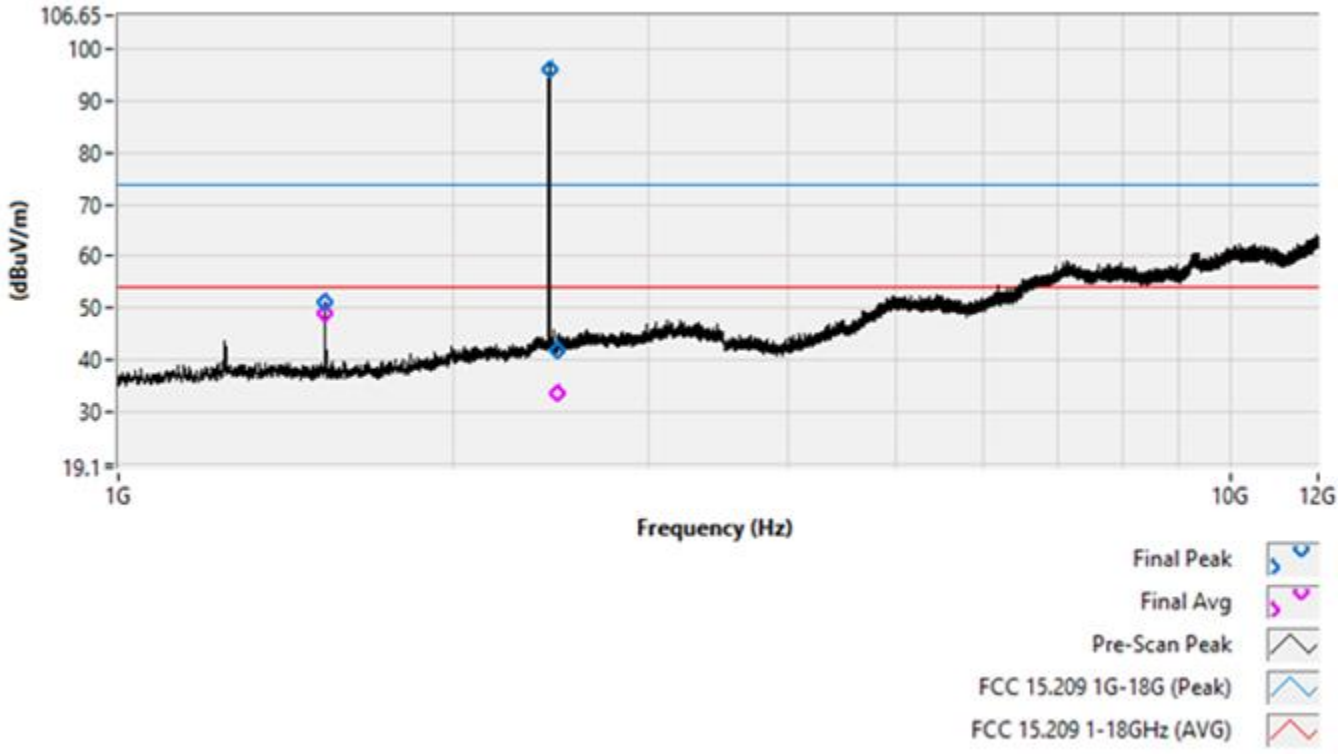
Table 14: Radiated Emissions Test Data – 1 GHz to 25 GHz (2Mbps, Center Channel)

Frequency (GHz)	Detector	Corr. Meas. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
1.536	Peak	51.216	74	-22.784	100	Vert, 175
	AVG	49.080	54	-4.920	100	Vert, 175
2.390	Peak	42.342	74	-31.658	35	Horiz, 175
	AVG	28.911	54	-25.089	35	Horiz, 175
2.441	Peak	95.990	--	--	100	Vert, 165
	AVG	--	--	--	--	--
2.4835	Peak	41.644	74	-32.356	100	Vert, 175
	AVG	33.691	54	-20.309	100	Vert, 175
11.614	Peak	63.139	74	-10.861	35	Horiz, 175
	AVG	46.758	54	-7.242	35	Horiz, 175

The plots provided on the following page, represent the 3m radiated emissions test data that correlate to the tabular data provided in Table 14. (2DH5, Center Channel)

Pre-scan and Final Data (Vertical) – π/4DQPSK, Center Channel



Pre-scan and Final Data (Horizontal) – π/4DQPSK, Center Channel

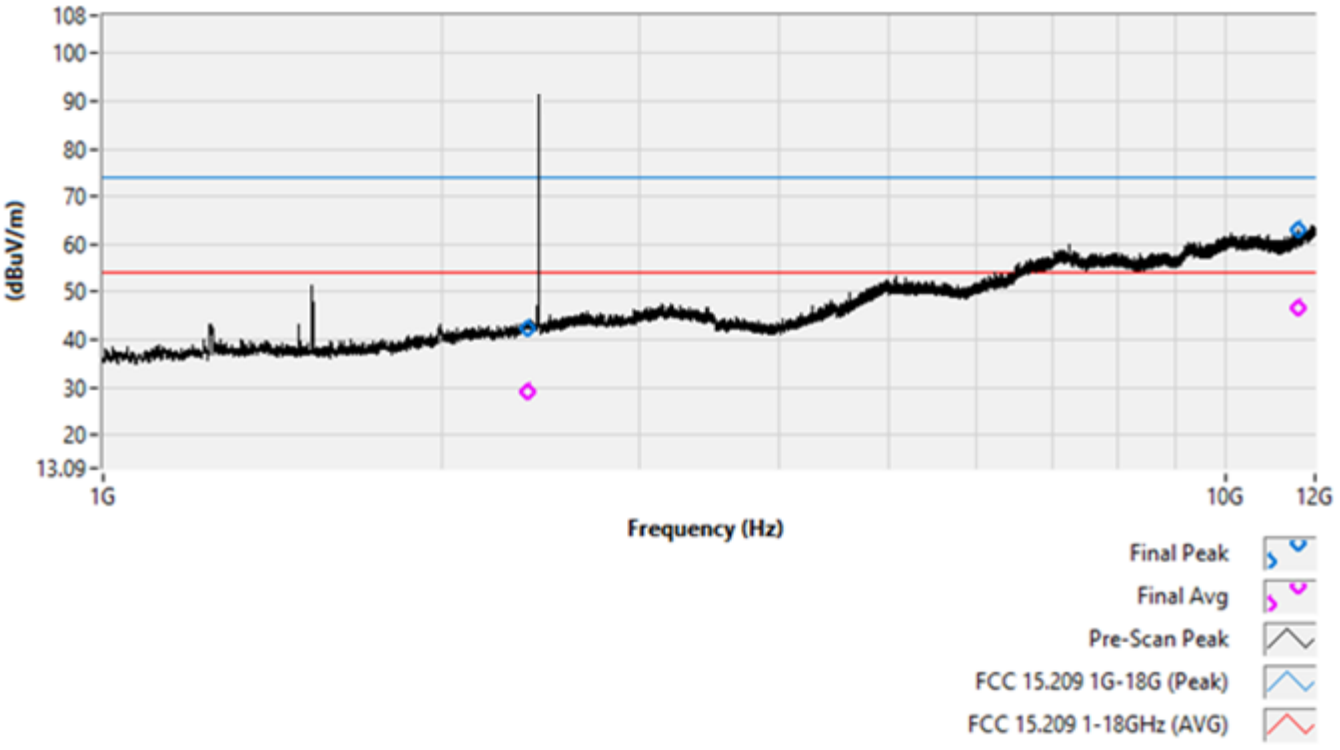
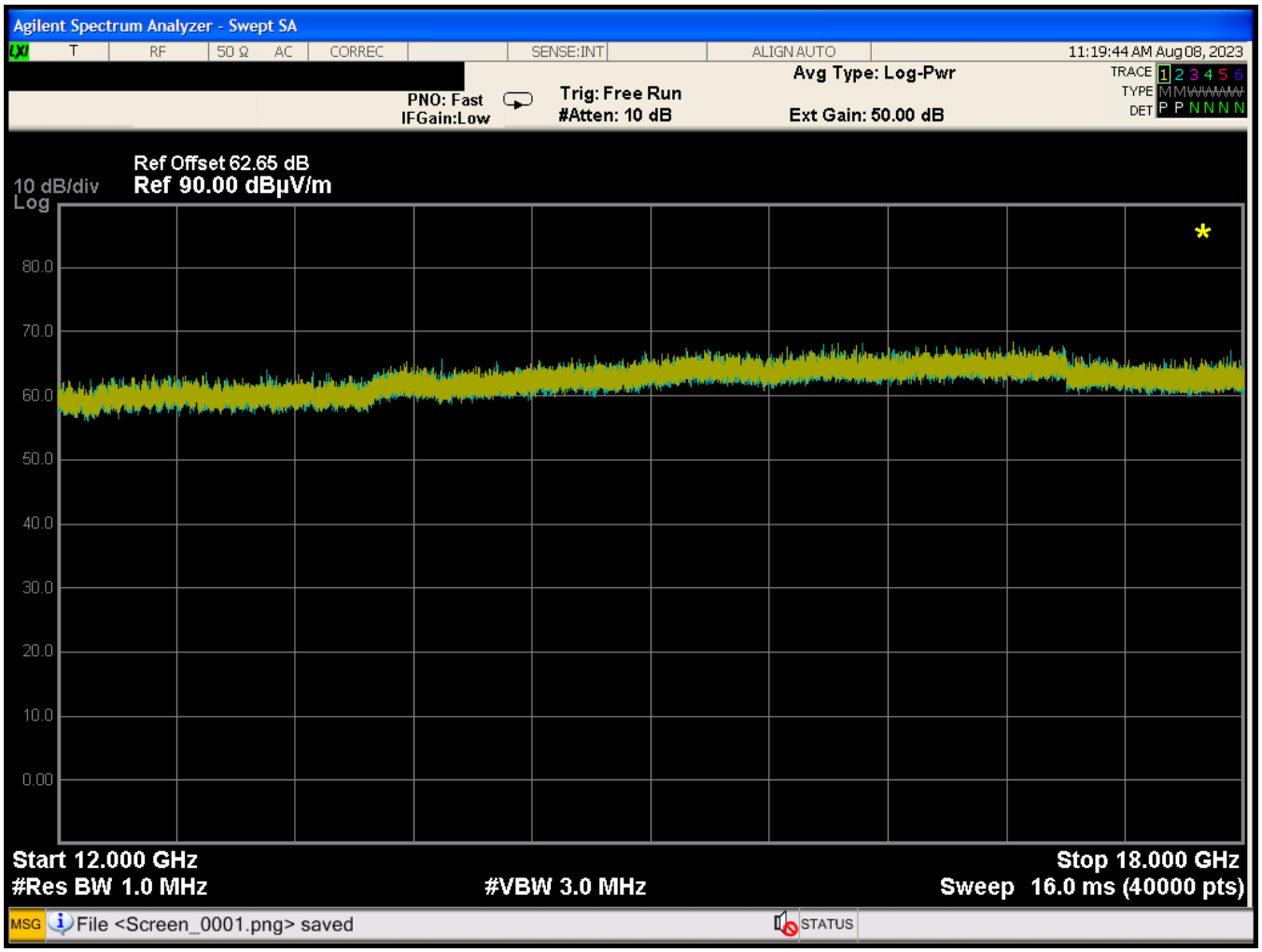


Figure 68: π/4DQPSK (2Mbps) Center Channel – 12 GHz to 18 GHz (Corrected Field Strength)

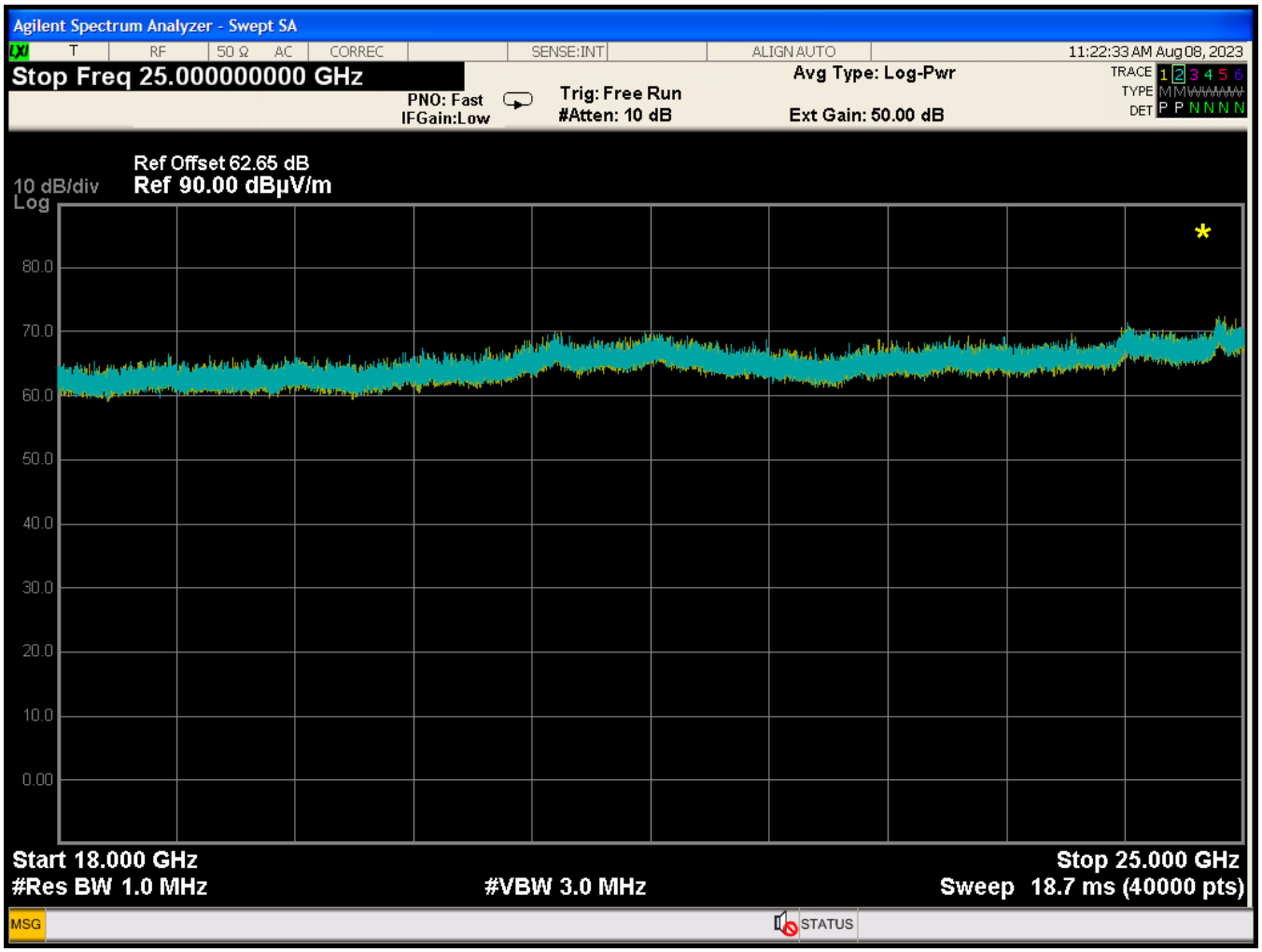


No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

Figure 69: π/4DQPSK (2Mbps) Center Channel – 18 GHz to 25 GHz (Corrected Field Strength)



No EUT emissions detected.

Trace 1 = Ambient

Trace 2 = EUT Transmit Enabled

2.9 AC Powerline Conducted Emissions

2.9.1 Requirements

Compliance Standard: FCC Part 15.207

FCC Compliance Limits				
Frequency Range	~~Class A Digital Device~~		Class B Digital Device	
	~~Quasi-peak~~	~~Average~~	Quasi-peak	Average
0.15 – 0.5 MHz	~~79 dBµV~~	~~66 dBµV~~	66 to 56 dBµV	56 to 46 dBµV
0.5 – 5 MHz	~~79 dBµV~~	~~66 dBµV~~	56 dBµV	46 dBµV
0.5 – 30 MHz	~~73 dBµV~~	~~60 dBµV~~	60 dBµV	50 dBµV

2.9.2 Test Procedure

The requirements of FCC Part 15 and ICES-003 call for the EUT to be placed on an 80cm-high 1 X 1.5-meter non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω/50 µH Line Impedance Stabilization Network bonded to a 3 X 2-meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power was supplied to the peripherals through a second LISN. The peripherals were placed on the table in accordance with ANSI C63.4. Power and data cables were moved about to obtain maximum emissions.

The 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 150 kHz to 30 MHz were measured. The detector function was set to quasi-peak, peak, or average as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. For average measurements, the post-detector filter was set to 10 Hz.

These emissions must meet the limits specified in §15.207 for quasi-peak and average measurements.

Environmental Conditions During Conducted Emissions Testing

Ambient Temperature:	22.2 °C
Relative Humidity:	49 %

2.9.3 Conducted Data Reduction and Reporting

The comparison between the Conducted emissions level and the FCC limit is calculated as shown in the following example:

Spectrum Analyzer Voltage: VdBµV(raw)

LISN Correction Factor: LISN dB

Cable Correction Factor: CF dB

Voltage: VdBµV = V dBµV (raw) + LISN dB + CF dB

2.9.4 Test Data

The EUT complies with the Class B Conducted Emissions requirements.

The Conducted Emissions test data is provided in the table below.

The EUT was coupled directly to the AC mains network via the EUT power cable.

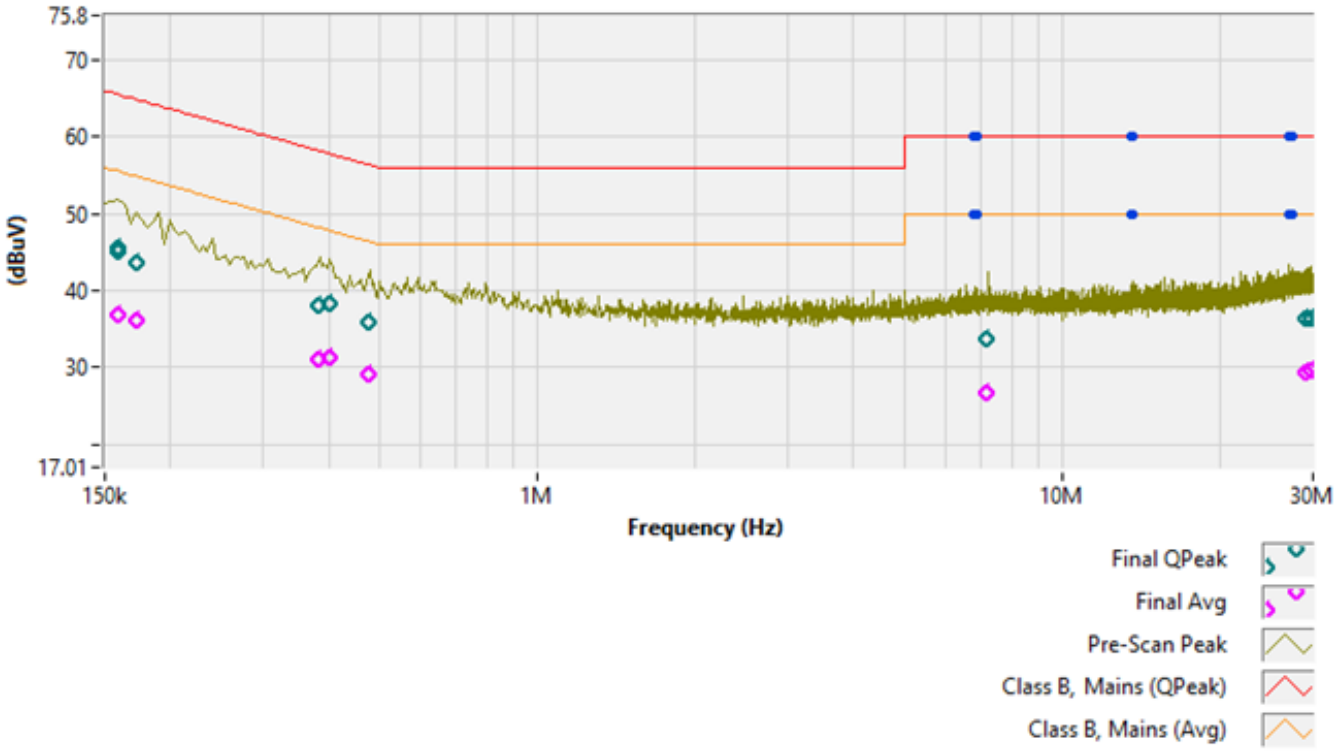
During this test, the EUT was configured in a normal production mode, with the BT portion paired to a companion device. The digital portion was exercised by streaming music from the companion device to the EUT and playing music through the EUT speakers during the test.

Prior to this testing, it was confirmed that changing the modulation type, data rate, and/or carrier center frequency, had no impact on the AC powerline emissions.

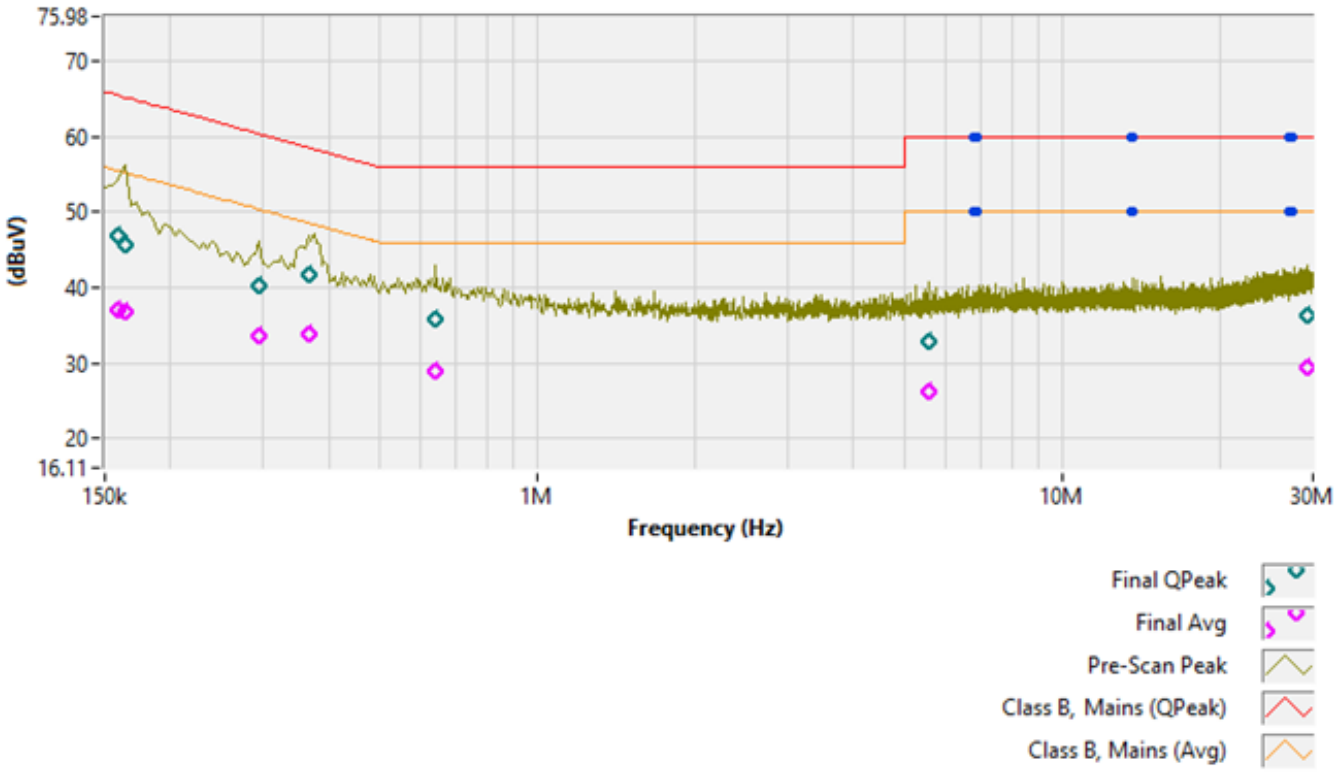
Table 15: AC Powerline Conducted Emissions Test Data

120VAC, 60Hz – Neutral (TX On)				
Frequency (MHz)	**Detector**	**Corr. Meas. (dBuV)**	**Limit (dBuV)**	**Delta (dB)**
0.159	QP	45.071	65.51	-20.444
	AVG	36.804	55.51	-18.711
0.172	QP	43.692	64.86	-21.170
	AVG	36.064	54.86	-18.799
0.384	QP	38.147	58.19	-20.049
	AVG	31.148	48.19	-17.048
0.402	QP	38.249	57.80	-19.553
	AVG	31.347	47.80	-16.455
0.475	QP	35.869	56.42	-20.556
	AVG	29.040	46.42	-17.384
7.180	QP	33.719	60.00	-26.281
	AVG	26.806	50.00	-23.194
120VAC, 60Hz – Phase/Line (TX On)				
Frequency (MHz)	**Detector**	**Corr. Meas. (dBuV)**	**Limit (dBuV)**	**Delta (dB)**
0.159	QP	46.971	65.51	-18.545
	AVG	37.065	55.51	-18.451
0.163	QP	45.719	65.28	-19.564
	AVG	36.778	55.28	-18.506
0.294	QP	40.175	60.40	-20.232
	AVG	33.616	50.40	-16.791
0.366	QP	41.783	58.58	-16.804
	AVG	33.818	48.58	-14.768
0.640	QP	35.841	56.00	-20.159
	AVG	28.819	46.00	-17.181
5.550	QP	32.927	60.00	-27.073
	AVG	26.089	50.00	-23.911

Pre-scan and Final Data (Neutral) – Transmit Enabled



Pre-scan and Final Data (Phase/Line) – Transmit Enabled



3 Equipment Under Test

3.1 EUT Identification & Description

The Stanley Black & Decker, Inc., CMCR001 is a Bluetooth speaker audio system that operates in the 2.4 GHz ISM band. The CMCR001 employs Bluetooth 5.2 Simplex mode (BDR/EDR). The EUT does not support BLE. The CMCR001 is primarily powered by 120VAC, 60Hz; however, the EUT can also be powered by an external Craftsman re-chargeable Li-ion battery. Please know that the EUT is not sold with an external battery. The battery is not provided with the EUT at the consumer point-of-sale. The EUT is not capable of charging the battery.

3.2 Test Configuration

For the purposes of testing, the EUT was provided in two sample configurations. (1) ability to set fixed transmit frequency via +5 VDC USB interface and (2) Normal/production (powered by AC mains). For conducted antenna port testing, and radiated emissions testing above 1000 MHz, the BT radio portion was powered by +5VDC via the support laptop. This USB interface allowed for the command and control of the BT radio channels, power, and modulation schemes. The manufacturer provided a testing software application on the support laptop for control of the BT radio. When the software tool was used, the EUT was set to transmit at its maximum possible output power. This is indicated by a Transmitter Gain Setting of "8".

Figure 70: EUT Testing Configuration (Example Only)

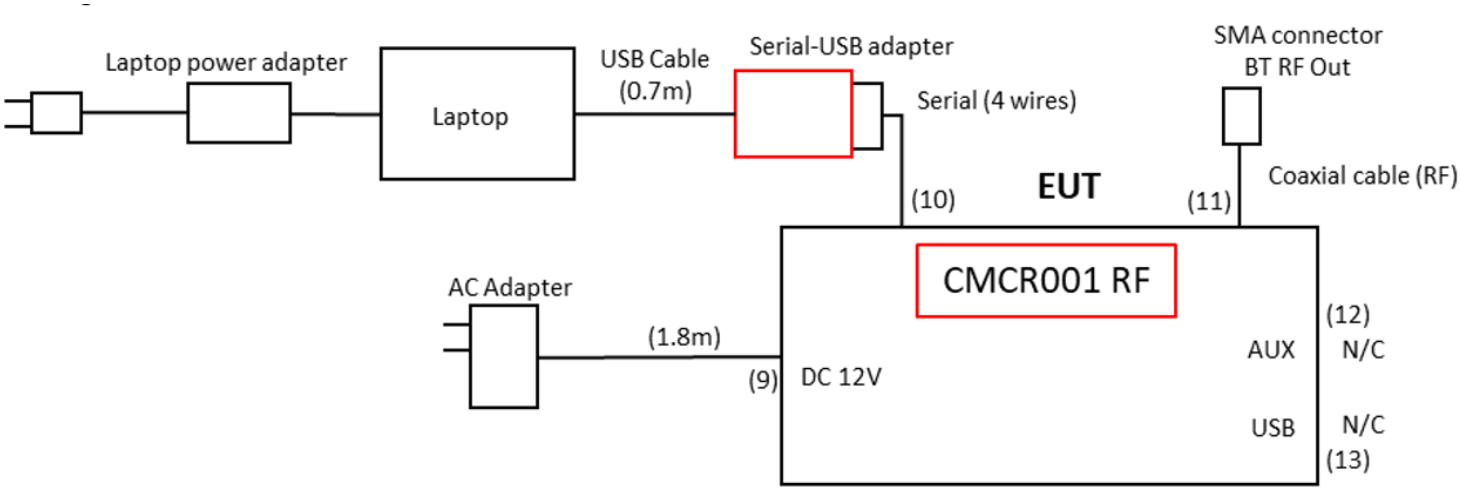


Table 16: Radio Device Summary

Manufacturer and Applicant:	Stanley Black & Decker, Inc.
FCC ID:	YJ7CMCR001B
IC ID:	9082A-CMCR001B
HVIN:	FN2C
Serial Number of Unit Tested:	See Table 17
FCC Rule Part:	§15.247
TX Frequency Range:	2402 MHz – 2480 MHz
Maximum Peak Output Power:	4.51 dBm (2.8 mW)
Modulation:	GFSK, π/4DQPSK, 8DPSK
Date Rate:	1Mbps, 2Mbps, 3Mbps
Number of Channels:	79
FCC Emission Designator:	1M24F1D (recommended or TCB to correct)
ISED Emission Designator:	1M15F1D (recommended or TCB to correct)
Keying:	Automatic
Type of Information:	BT V5.2 (A2DP, AVRCP, HFP)
Pulsed Transmitter:	No
Antenna Manufacturer:	Dongguan Finemost Electronics Co., Ltd.
Antenna Type:	PCB Trace, “Meander Line” (Peak Gain: +0.45 dBi)
Antenna Connector:	N/A
Calculated EIRP:	+4.96 dBm (based on actual gain)
Measured EIRP from F/S:	99.0 dBuV/m + 20LOG(3) – 104.7 = 3.84 dBm (EIRP)
Interface Cables:	See Table 19
Software/Firmware:	Actions BT Tool v2.22 (TX Gain Setting: “8”)
EUT Power Source & Voltage:	120 VAC, 1PH, 60 Hz
ISED – RSS-102, Annex A:	+0.0067 W/m^2 @ 20cm (calculated)
Highest TX Spurious Emission:	4.882 GHz (Conducted) -47.00 dBm (Peak) (Noise Floor)
	1.536 GHz (3m Radiated) 52.301 dBuV/m (AVG)

Table 17: System Configuration List

Name / Description	Model Number	Part Number	Serial Number	Rev. #
CMCR001 RF	CMCR001	N/A	08395	N/A
AC adapter for CMCR001	GQ36-1200270-AU	N/A	N/A	N/A
CMCR001U EMC	CMCR001	N/A	082396	N/A
AC adapter for CMCR001	GQ36-1200270-AU	N/A	N/A	N/A
CMCR001 RF	CMCR001	N/A	08395	N/A
AC adapter for CMCR001	GQ36-1200270-AU	N/A	N/A	N/A

Table 18: Support Equipment

Name / Description	Manufacturer	Model Number	Customer Calibration Data
Laptop	Lenovo ThinkPad	W510, Type 4391-G18 R9-F5D87 11/07	N/A
Laptop power supply	Lenovo	N/A	N/A
USB to serial adapter	N/A (red PCB adapter)	N/A	N/A
USB A to mini-USB	N/A (for USB to serial)	N/A	N/A

Table 19: Cable Configuration

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded	Termination Box ID & Port ID
1	CMCR001 RF 12VDC	DC power supply	1	1.8	No	LISN 120VAC
2	CMCR001 RF Serial	Serial-USB adapter (red)	1	0.7	Yes	N/A
3	CMCR001 RF (RF out)	Coax with SMA connector (instead of internal antenna)	1	N/A	Yes	SA EMC Receiver
4	CMCR001 RF AUX	Not tested at this time	0	N/A	N/A	N/A
5	CMCR001 RF USB	Not tested at this time	0	N/A	N/A	N/A
6	CMCR001 EMC 12VDC	DC power supply	1	1.8	No	LISN 120VAC
7	CMCR001 EMC AUX	Not tested at this time	0	N/A	N/A	N/A
8	CMCR001 EMC USB	Not tested at this time	0	N/A	N/A	N/A

3.3 Measurements

3.3.1 References

ANSI C63.2 (1/2016) Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 (1/2014) American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

ANSI C63.10 (6/2013) American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

3.4 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm\sqrt{\frac{a^2}{div_a{}^2} + \frac{b^2}{div_b{}^2} + \frac{c^2}{div_c{}^2} + ...}$$

Where:

uc	= standard uncertainty
a, b, c,..	= individual uncertainty elements
Diva, b, c	= the individual uncertainty element divisor based on the probability distribution
Divisor	= 1.732 for rectangular distribution
Divisor	= 2 for normal distribution
Divisor	= 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where:

U = expanded uncertainty

k = coverage factor

k ≤ 2 for 95% coverage (ANSI/NCSL Z540-2 Annex G)

uc = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 20 below.

Table 20: Expanded Uncertainty List

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15	± 2.63 dB
Radiated Emissions	CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15	± 4.55 dB

4 Test Equipment

Table 21: Test Equipment List

Test Name:	**Conducted RF Emissions**	Test Dates: 8/1/2023 – 8/3/2023	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00933	KEYSIGHT	EXA SPECTRUM ANALYZER	12/5/2024
00869	MINI-CIRCUITS	HF COAXIAL CABLE, SMA	12/28/2023
N/A	WEINSCHEL, 54A-20	3.5MM, 20DB ATTN. S/N: J9924	6/14/2024

Test Name:	**3-meter Radiated Emissions**	Test Completion Date: 8/9/2023	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00933	KEYSIGHT	EXA SPECTRUM ANALYZER	12/5/2024
00823	AGILENT, N9010A	EXA SPECTRUM ANALYZER	6/7/2024
00644	SUNOL SCIENCES CORP.	BICONALOG ANTENNA	11/7/2024
00626	ARA, DRG-118/A	HORN ANTENNA	6/19/2024
00977	JUNKOSHA, MWX322	ARMORED COAX. CABLE	12/28/2023
00806	MINI-CIRCUITS	SMA COAXIAL CABLE	12/28/2023
00834	ULTIFLEX, UFA 2108	SMA COAXIAL CABLE	12/28/2023
00276	ELECTRO-METRICS	RF PRE-AMPLIFIER	5/9/2024
00066	B&Z (HP), BZ-01002650	PRE-AMPLIFIER	5/24/2024
00742	PENN ENG., WR284	WAVEGUIDE PASS FILTER	6/27/2025
00281	ITC. 21A-3A1	WAVEGUIDE PASS FILTER	6/27/2025
00721	WEINSCHEL, DS109	TUNABLE ATTENUATOR	Cal. Before Use
N/A	NARDA, 4779-3	SMA, 3DB ATTN. S/N: 9801	6/14/2024

Test Name:	**AC Mains Powerline Emissions**	Test Completion Date: 8/3/2023	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00823	AGILENT, N9010A	EXA SPECTRUM ANALYZER	6/7/2024
00895	HP, 11947A	TRANSIENT LIMITER	2/14/2024
00125	SOLAR, LISN	8028-50-TS-24-BNC	5/25/2024
00126	SOLAR, LISN	8028-50-TS-24-BNC	5/25/2024
00330	WLL, BNC CABLE	CE SITE 1 CABLE	5/24/2024

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