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

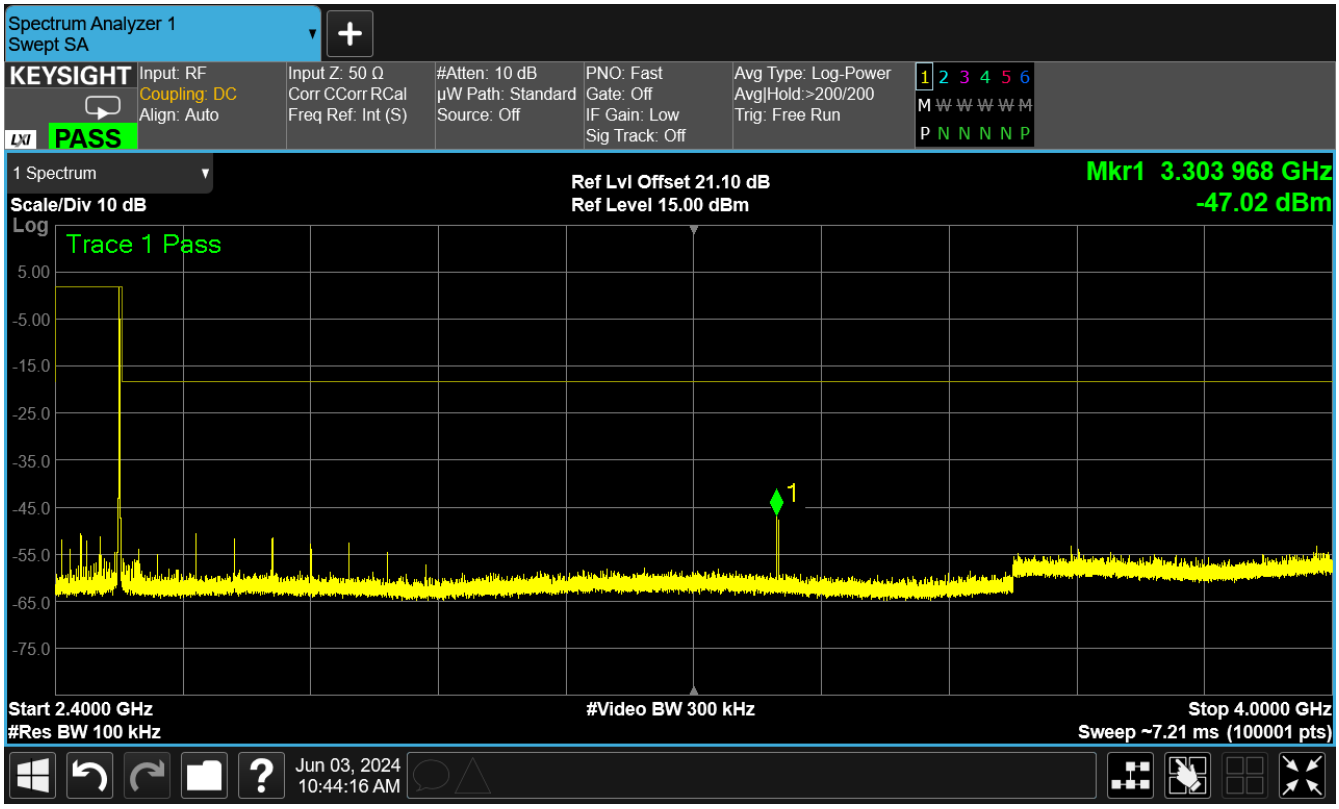

Figure 55: GFSK (1Mbps) High Channel, Conducted Spurious – Plot 4

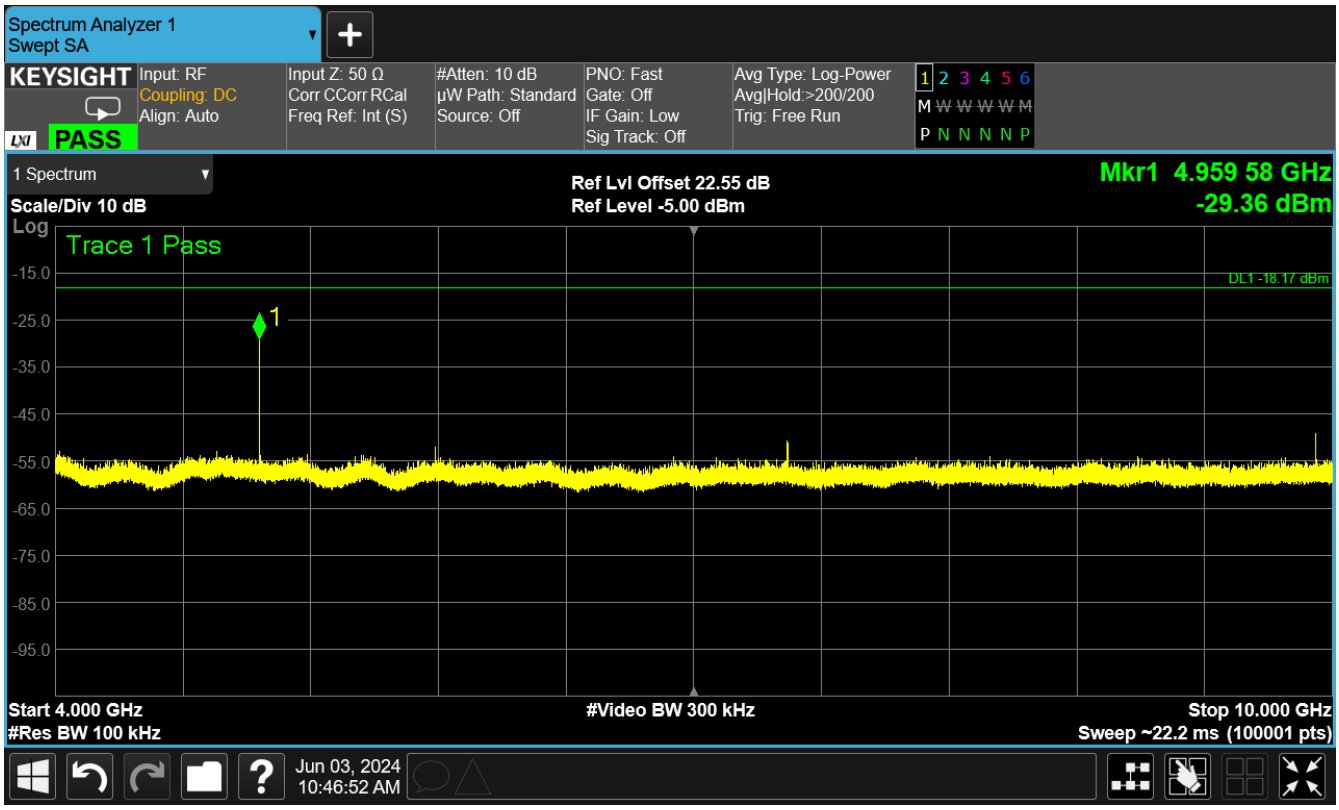

Figure 56: GFSK (1Mbps) High Channel, Conducted Spurious – Plot 5

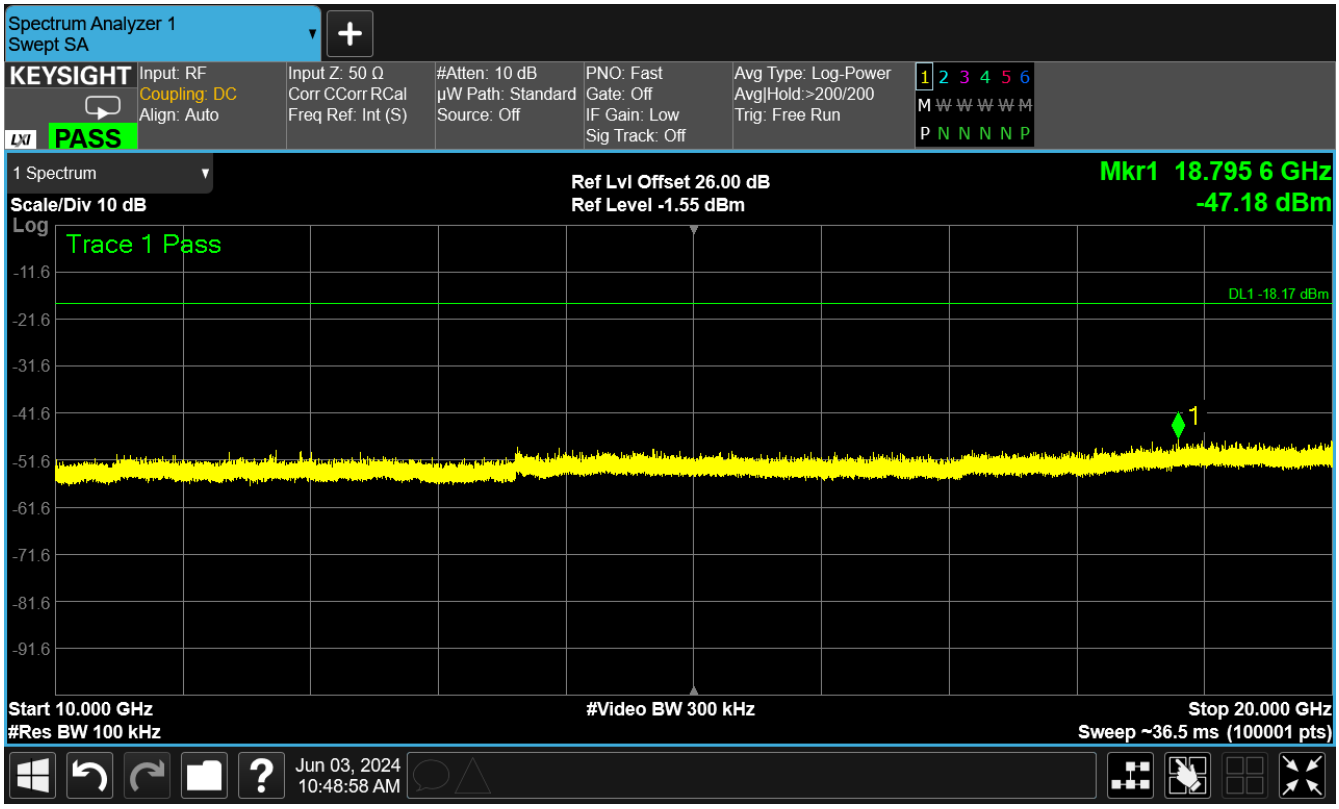

Figure 57: GFSK (1Mbps) High Channel, Conducted Spurious – Plot 6

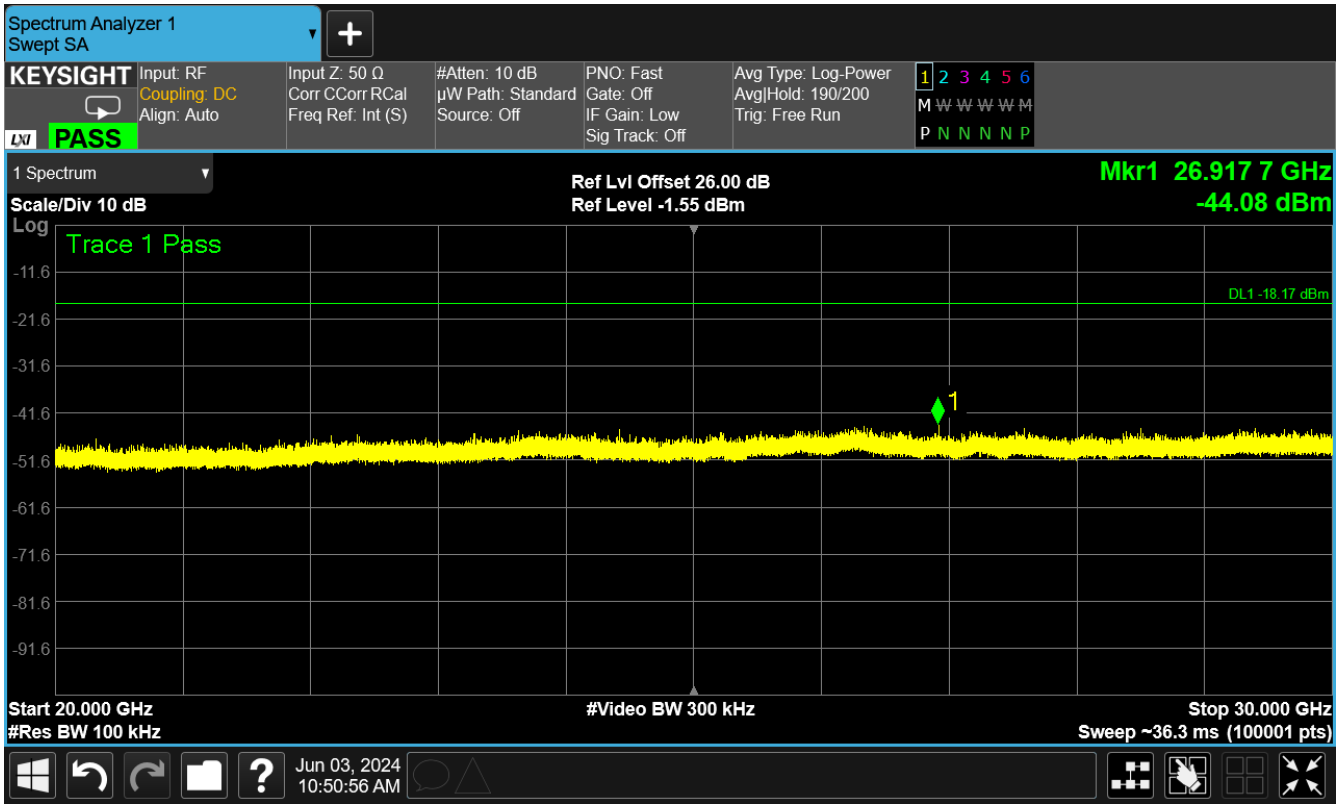

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Figure 58: π/4DQPSK (2Mbps) Low Channel, Conducted Spurious – Plot 1

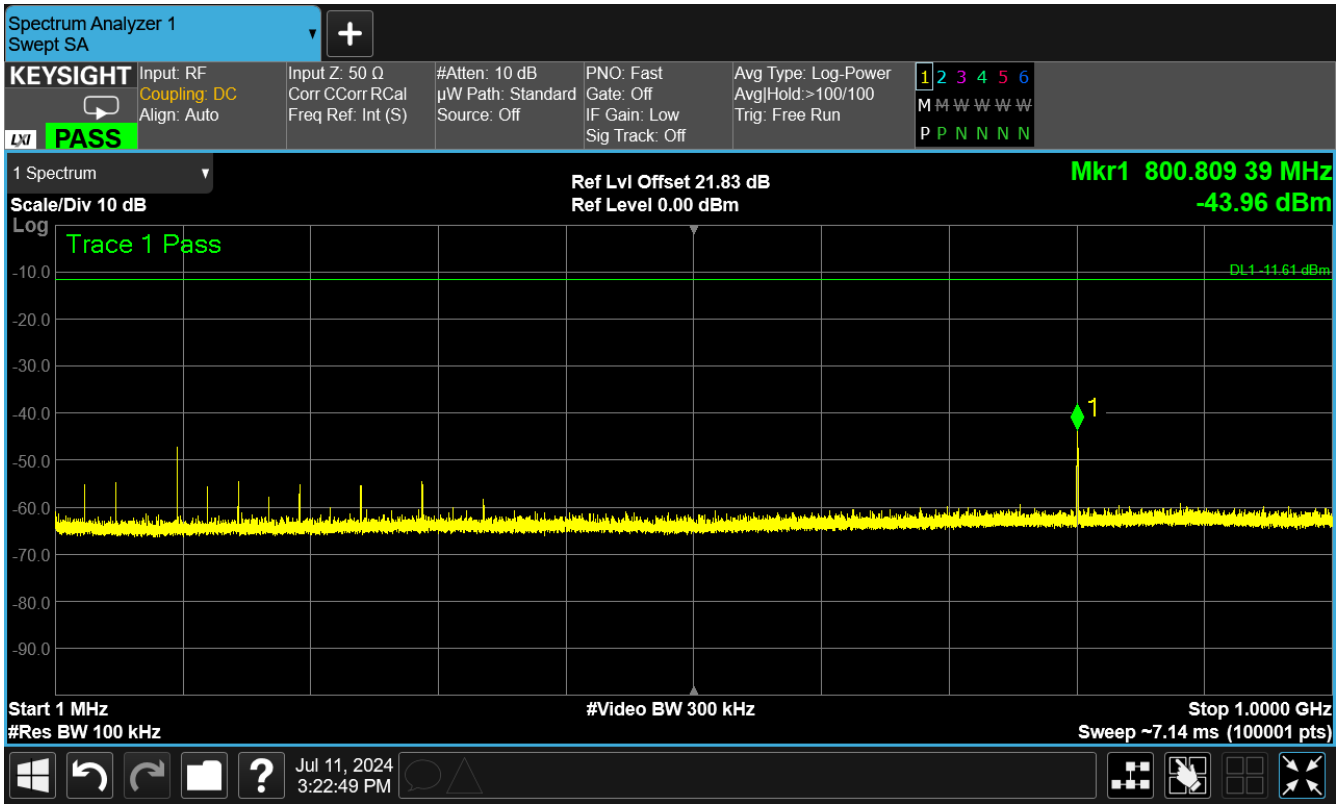

Figure 59: π/4DQPSK (2Mbps) Low Channel, Conducted Spurious – Plot 2

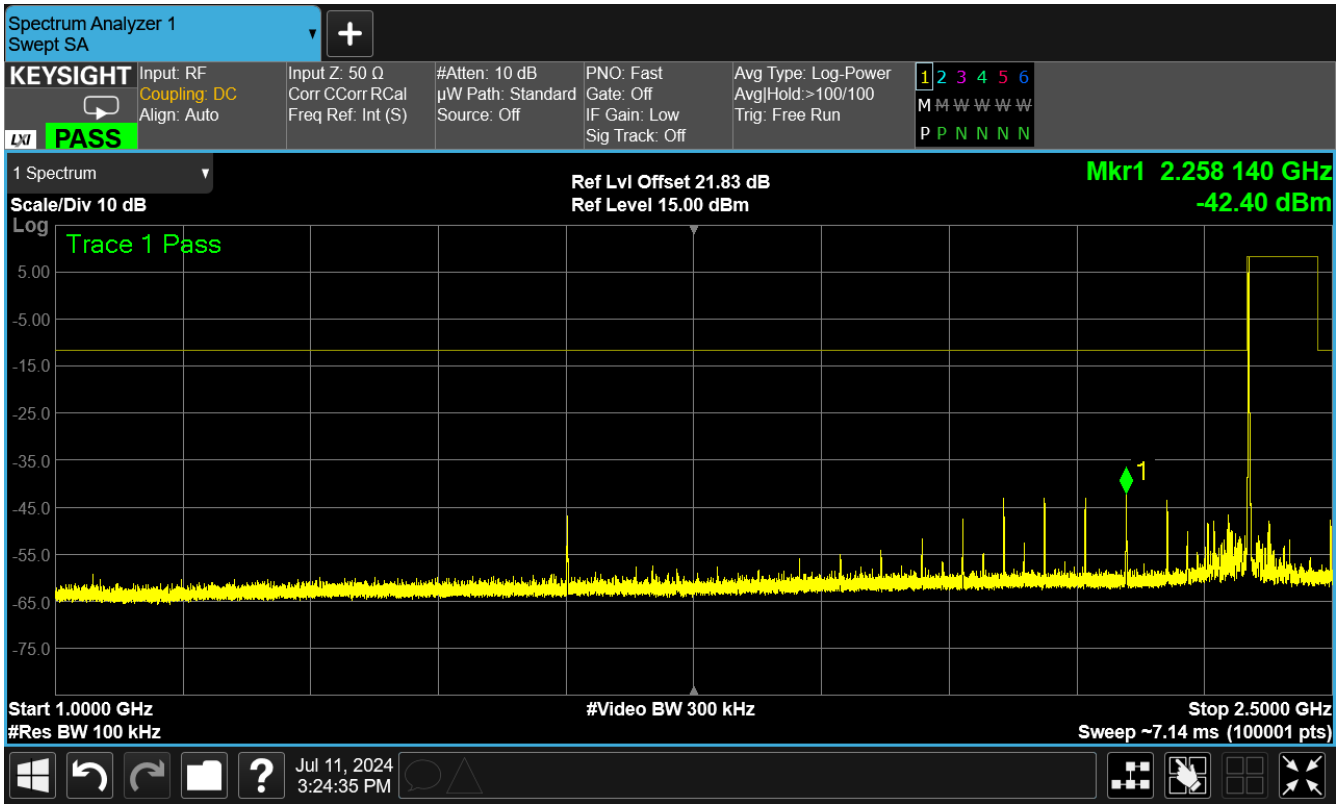

Figure 60: π/4DQPSK (2Mbps) Low Channel, Conducted Spurious – Plot 3

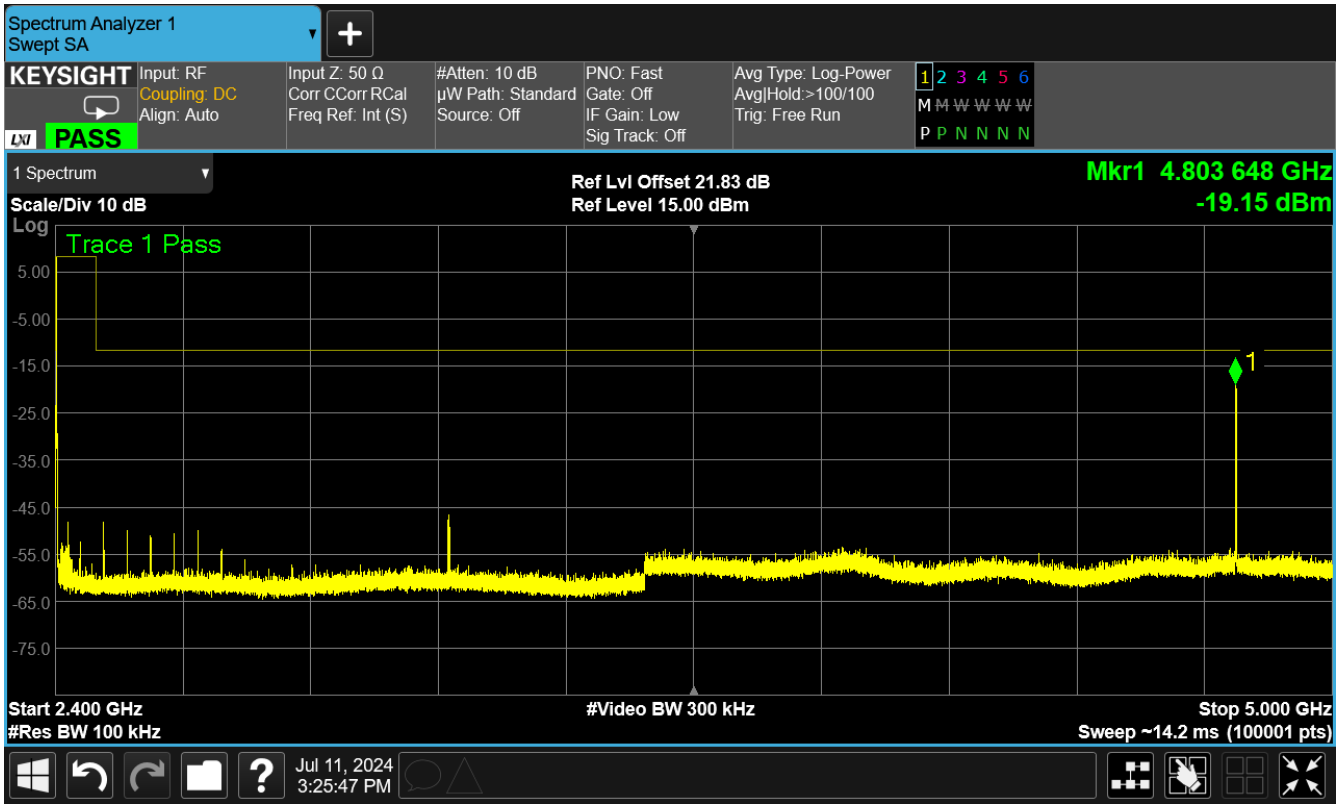

Figure 61: π/4DQPSK (2Mbps) Low Channel, Conducted Spurious – Plot 4

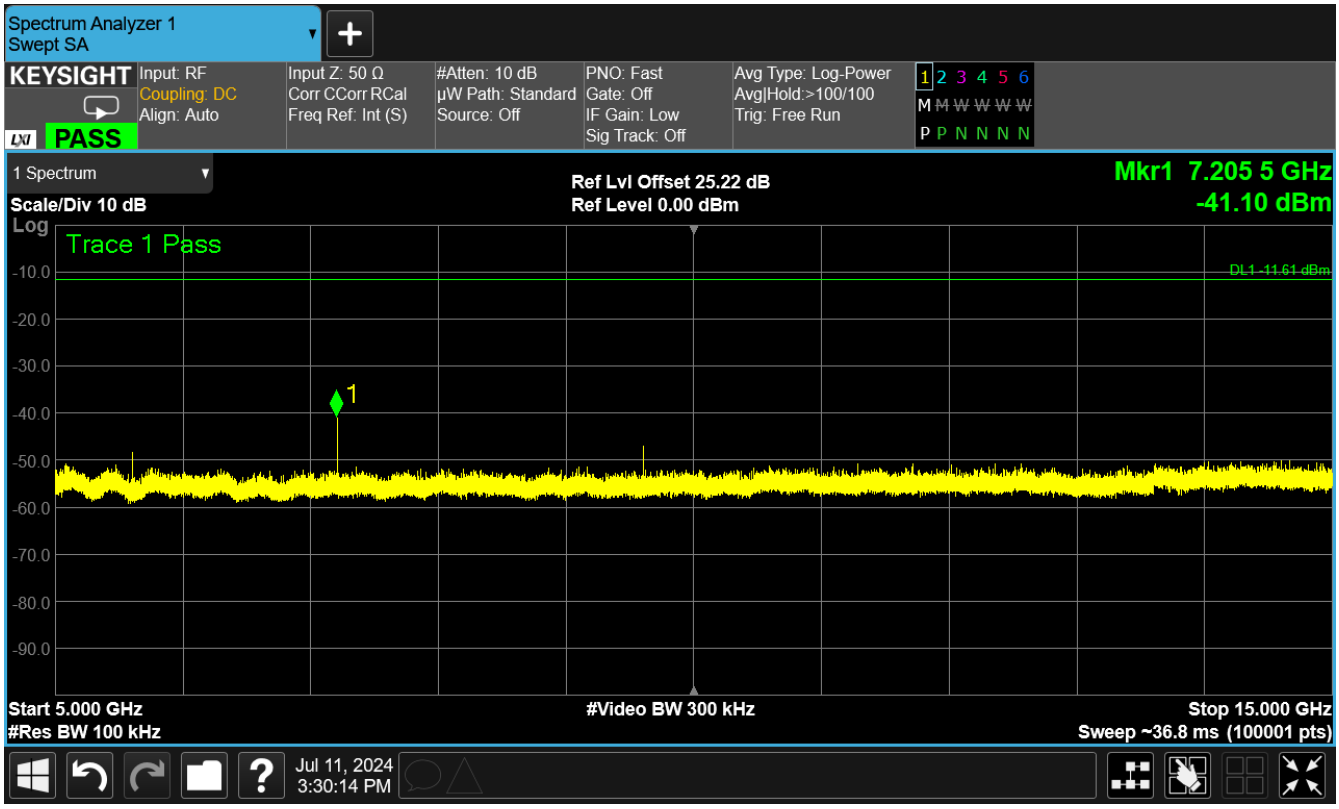

Figure 62: π/4DQPSK (2Mbps) Low Channel, Conducted Spurious – Plot 5

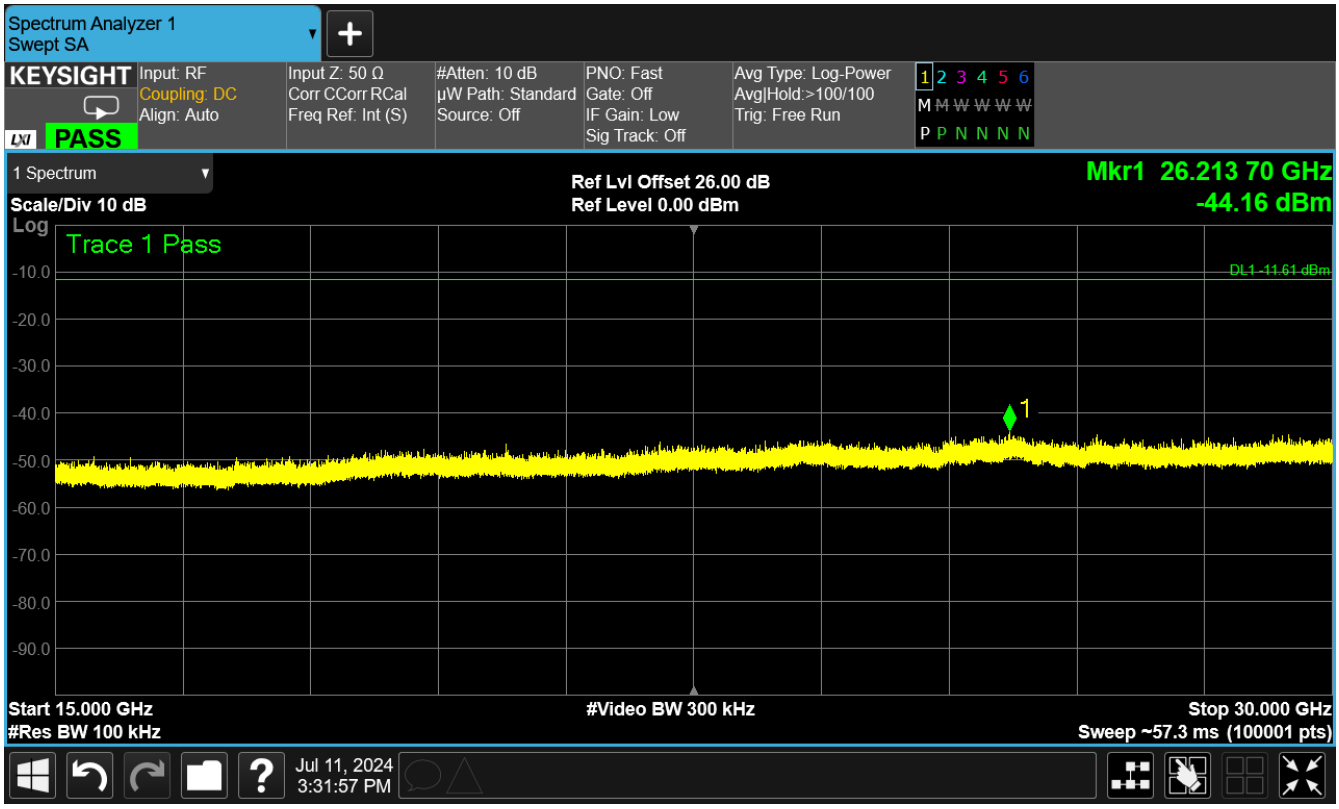

Figure 63: π/4DQPSK (2Mbps) Low Channel, Conducted Spurious – Plot 6

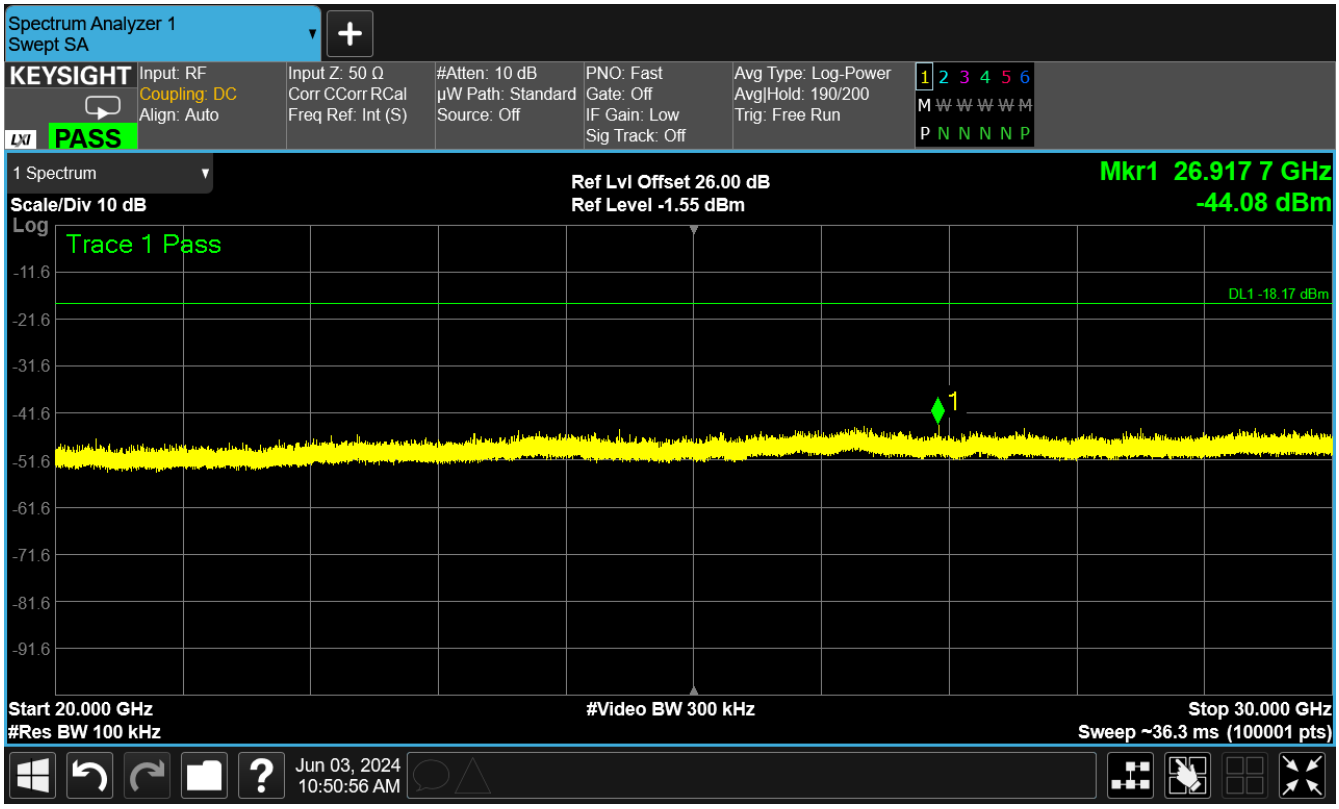

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Figure 64: π/4DQPSK (2Mbps) Center Channel, Conducted Spurious – Plot 1

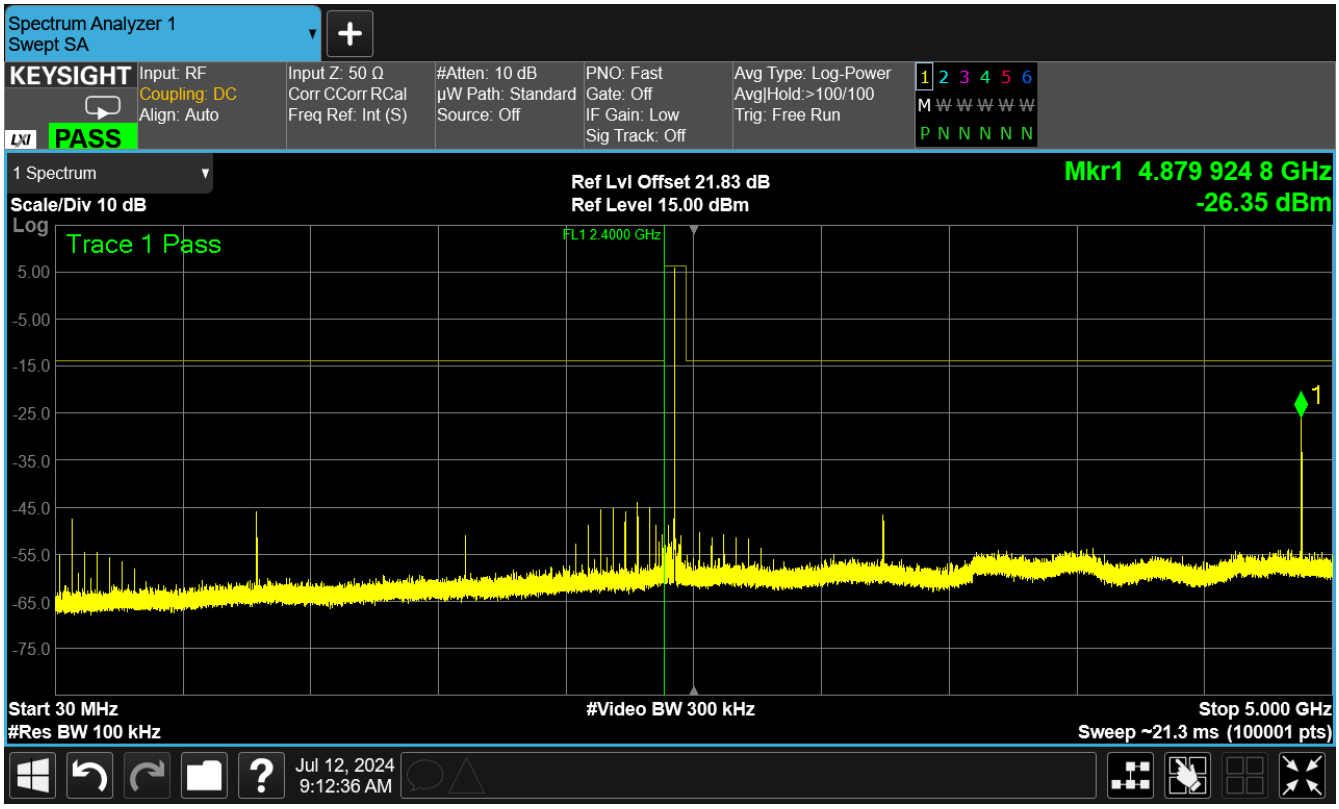

Figure 65: π/4DQPSK (2Mbps) Center Channel, Conducted Spurious – Plot 2

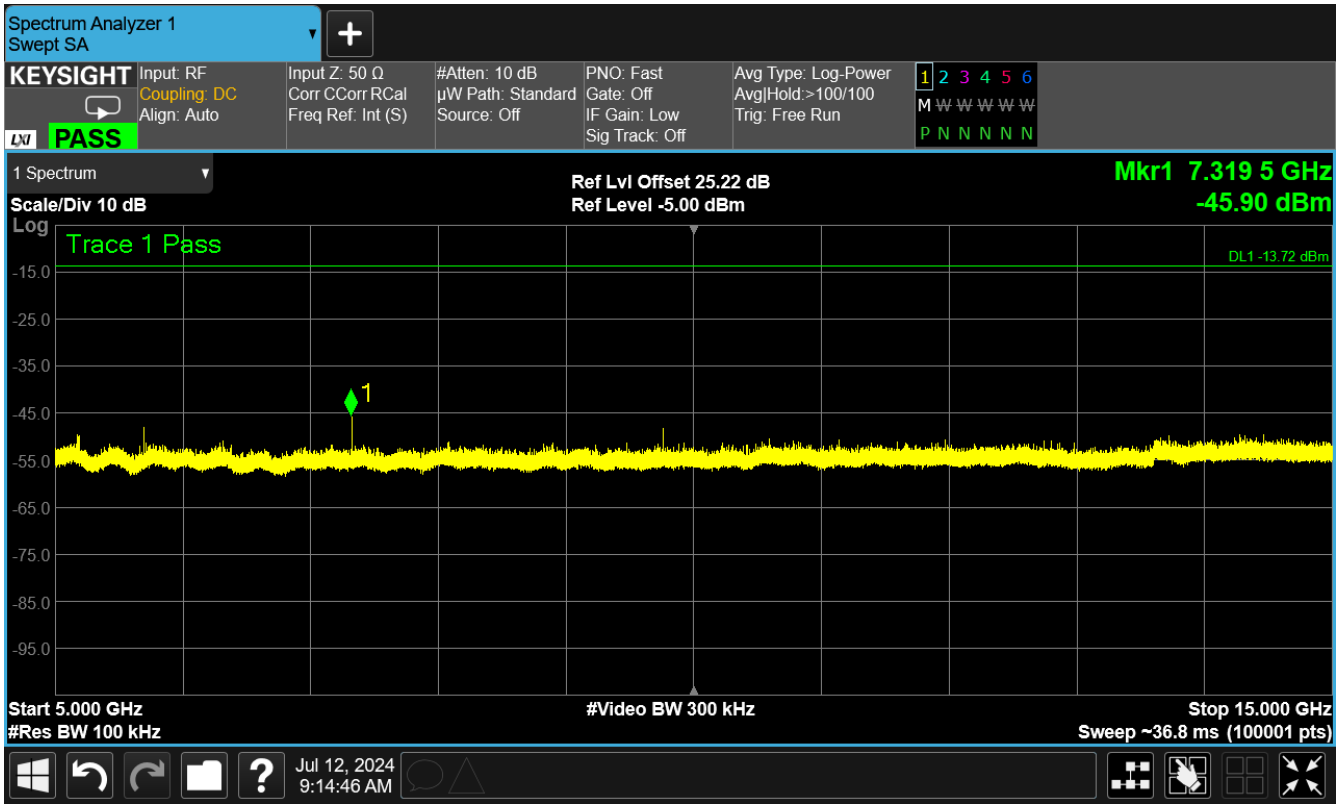

Figure 66: π/4DQPSK (2Mbps) Center Channel, Conducted Spurious – Plot 3

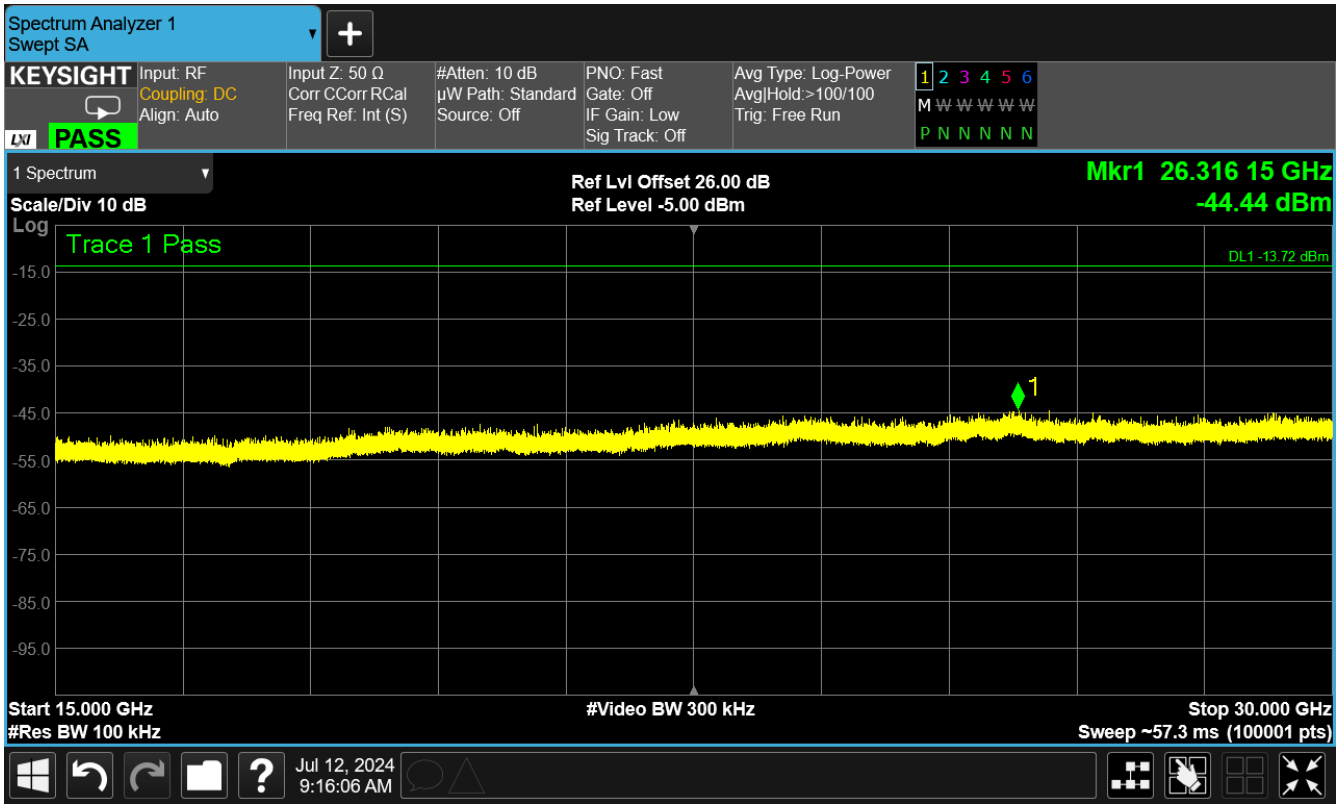

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Figure 67: π/4DQPSK (2Mbps) High Channel, Conducted Spurious – Plot 1

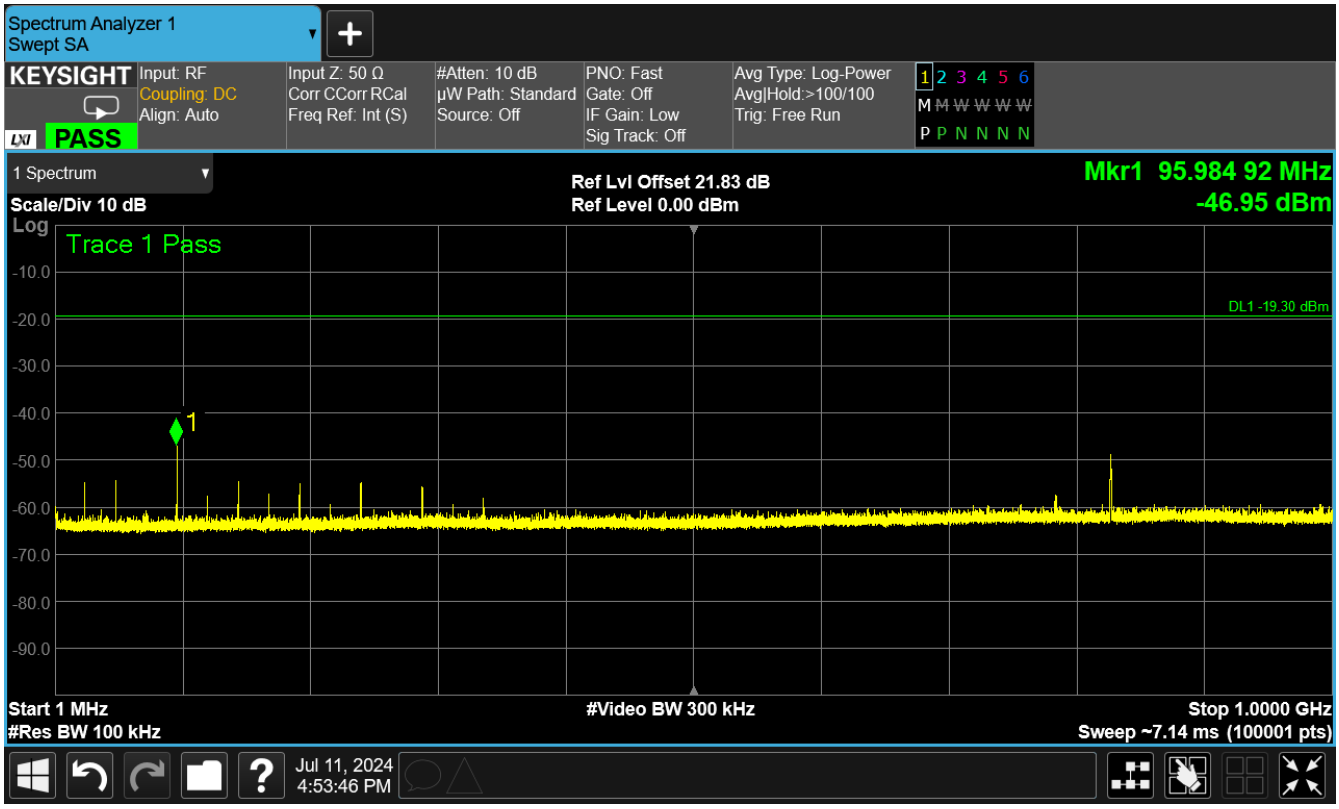

Figure 68: π/4DQPSK (2Mbps) High Channel, Conducted Spurious – Plot 2

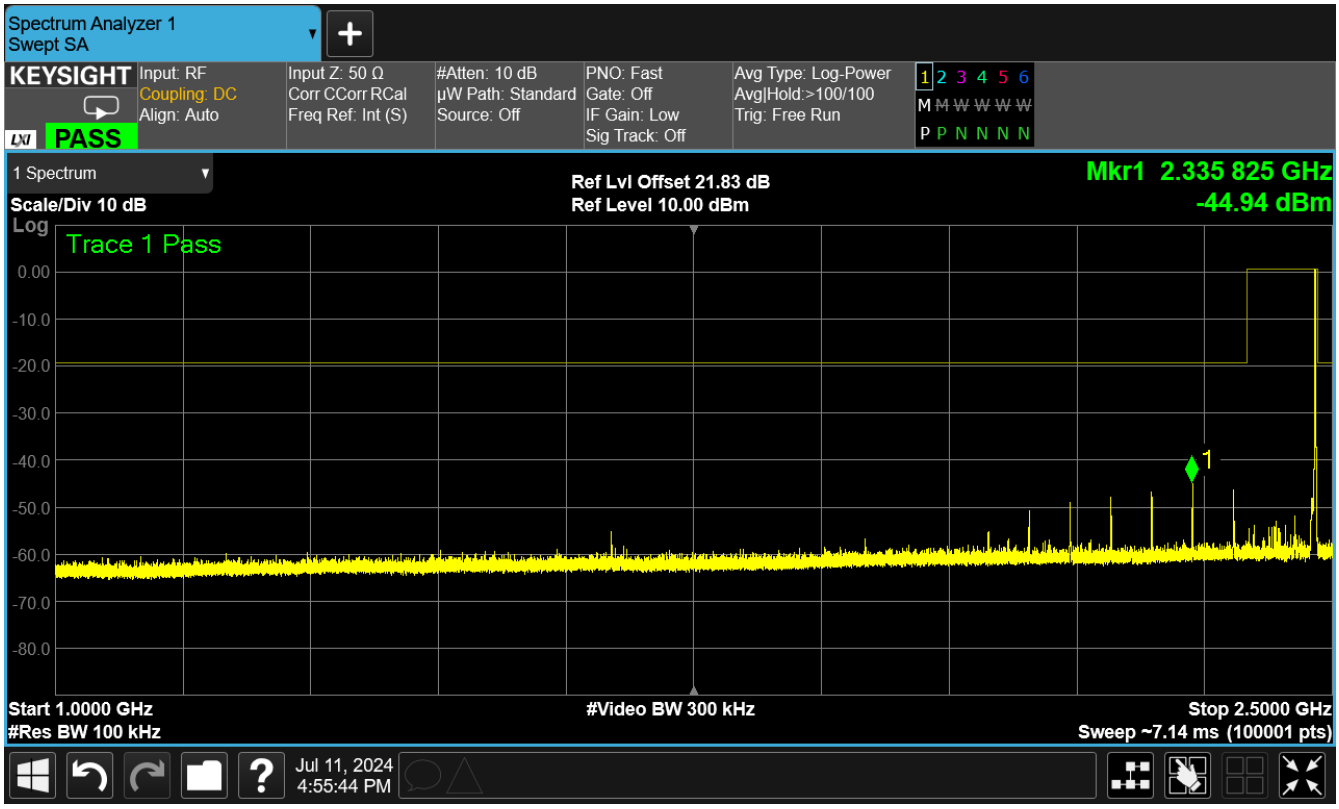

Figure 69: π/4DQPSK (2Mbps) High Channel, Conducted Spurious – Plot 3

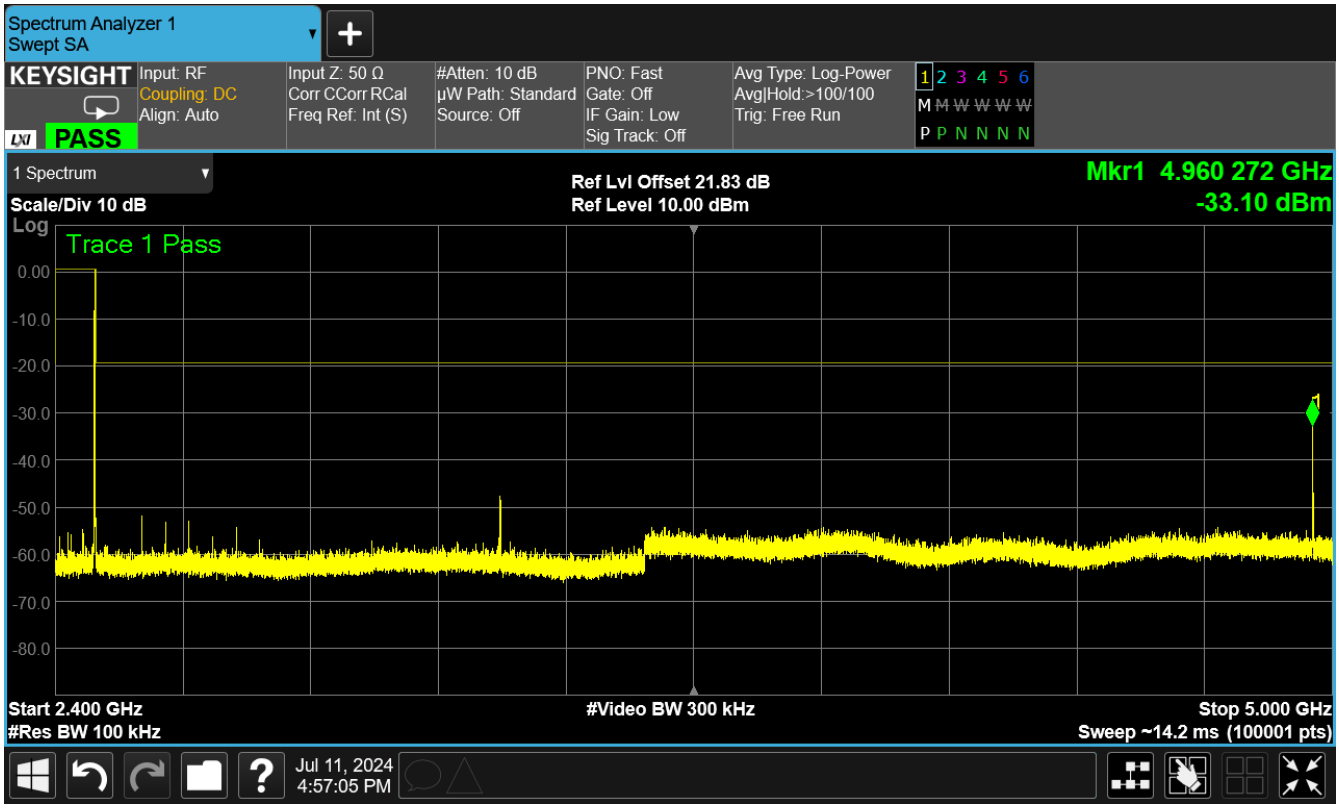

Figure 70: π/4DQPSK (2Mbps) High Channel, Conducted Spurious – Plot 4

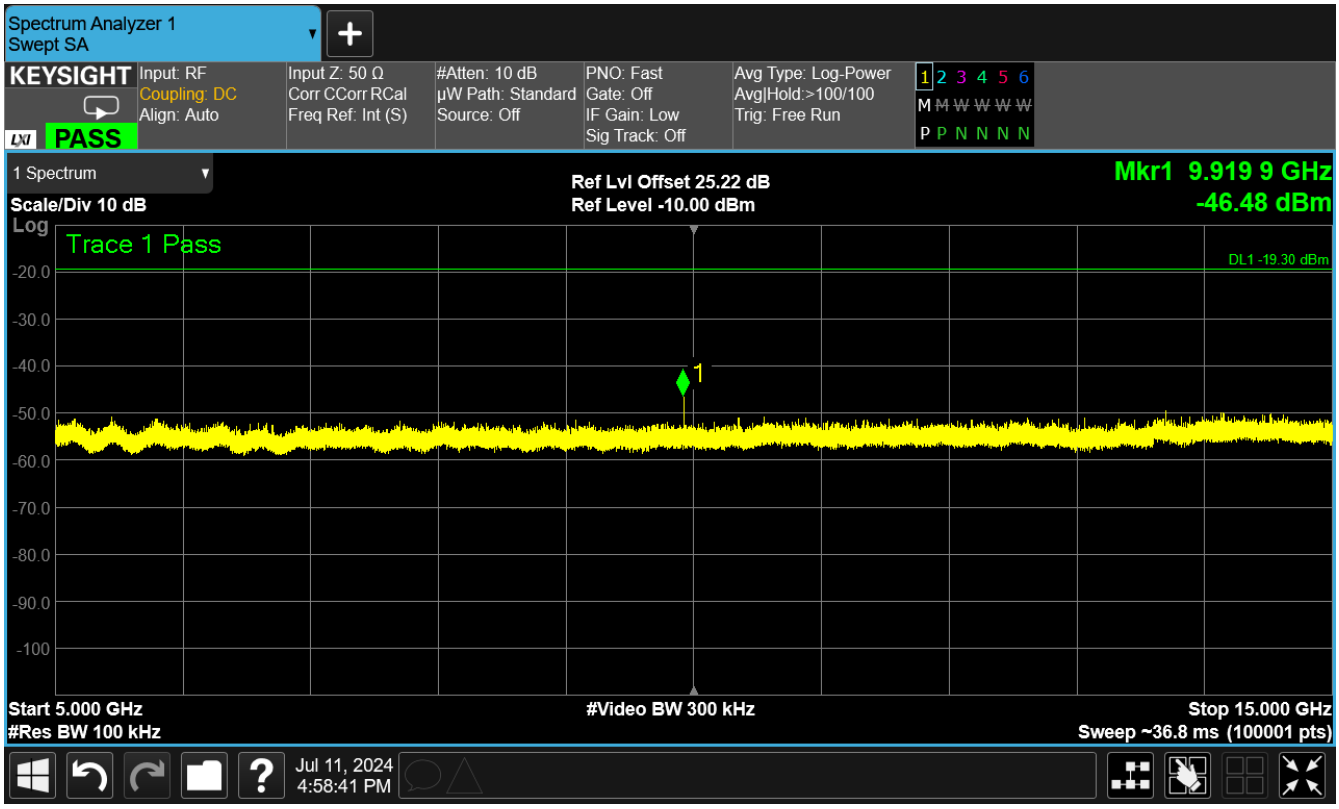

Figure 71: π/4DQPSK (2Mbps) High Channel, Conducted Spurious – Plot 5

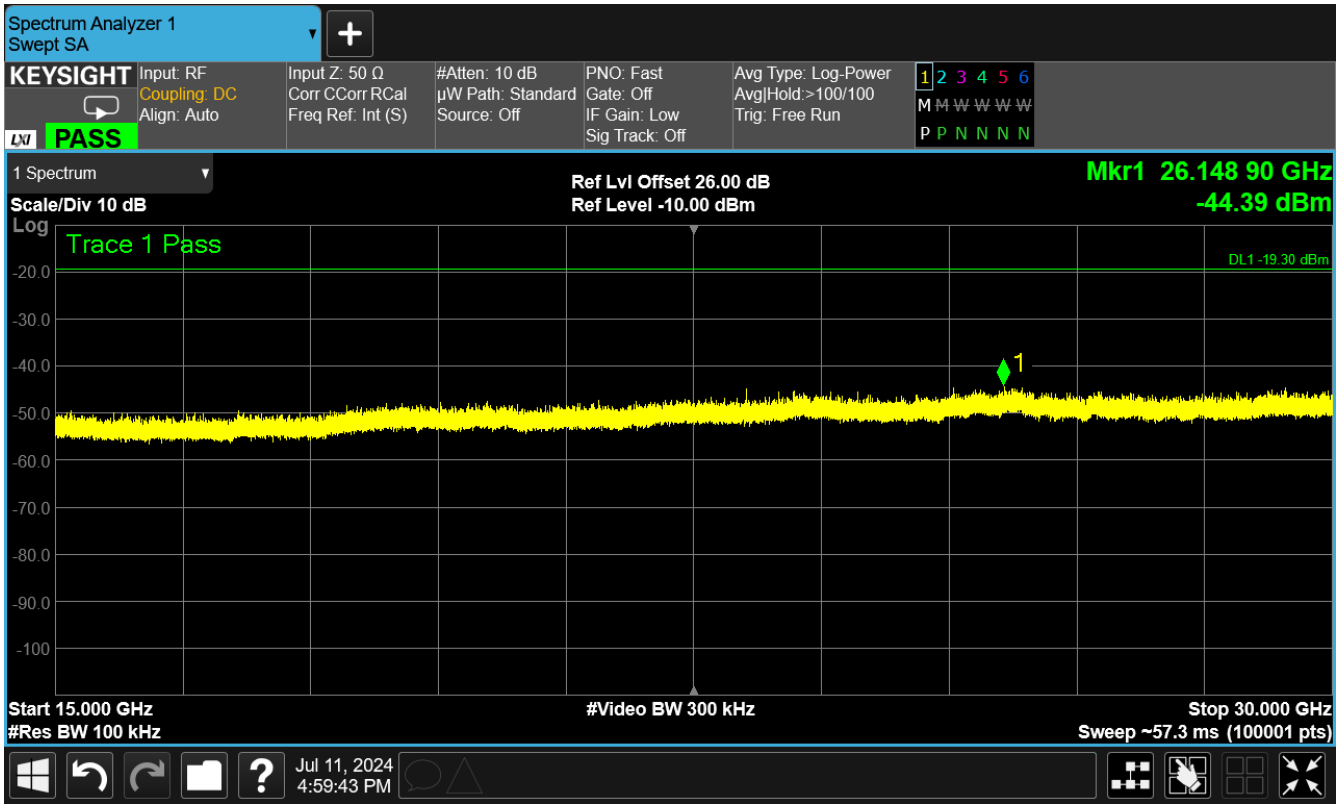

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Figure 72: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 1

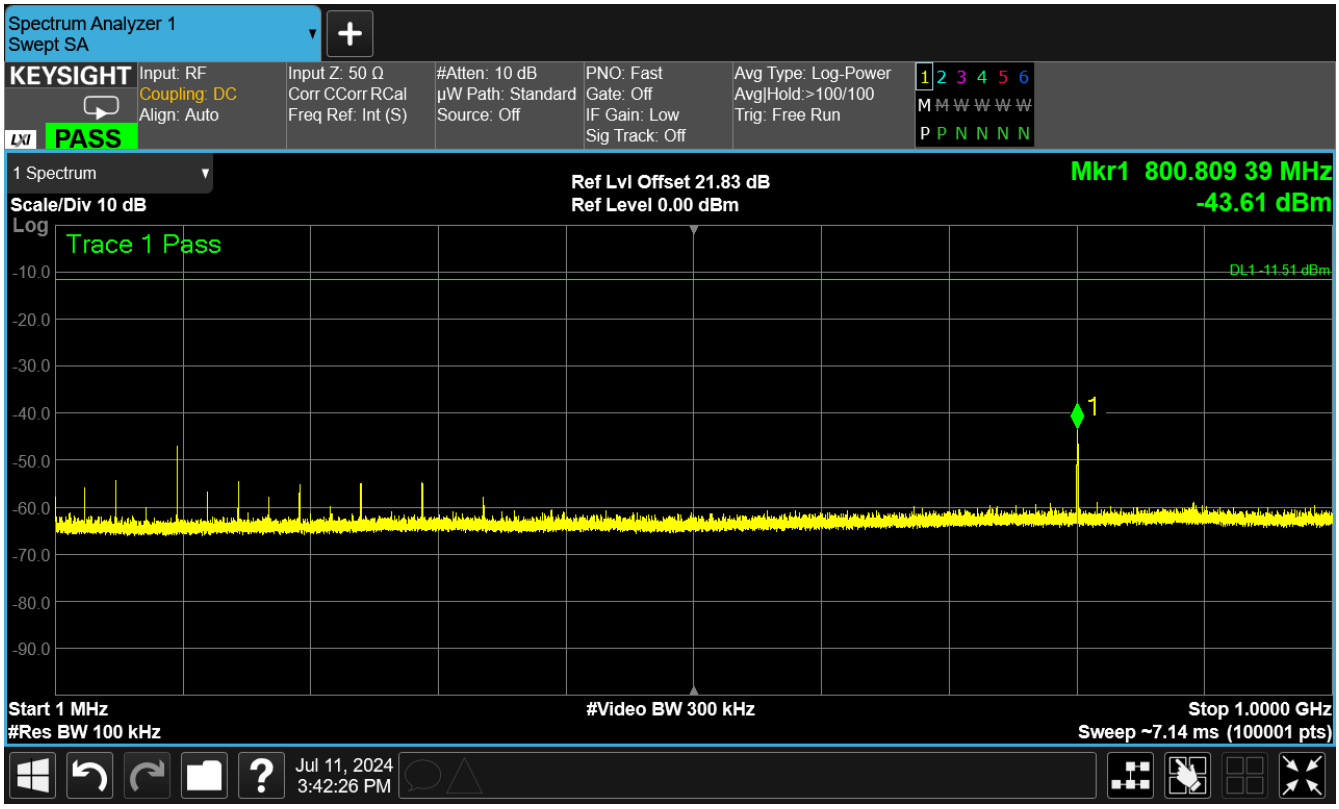

Figure 73: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 2

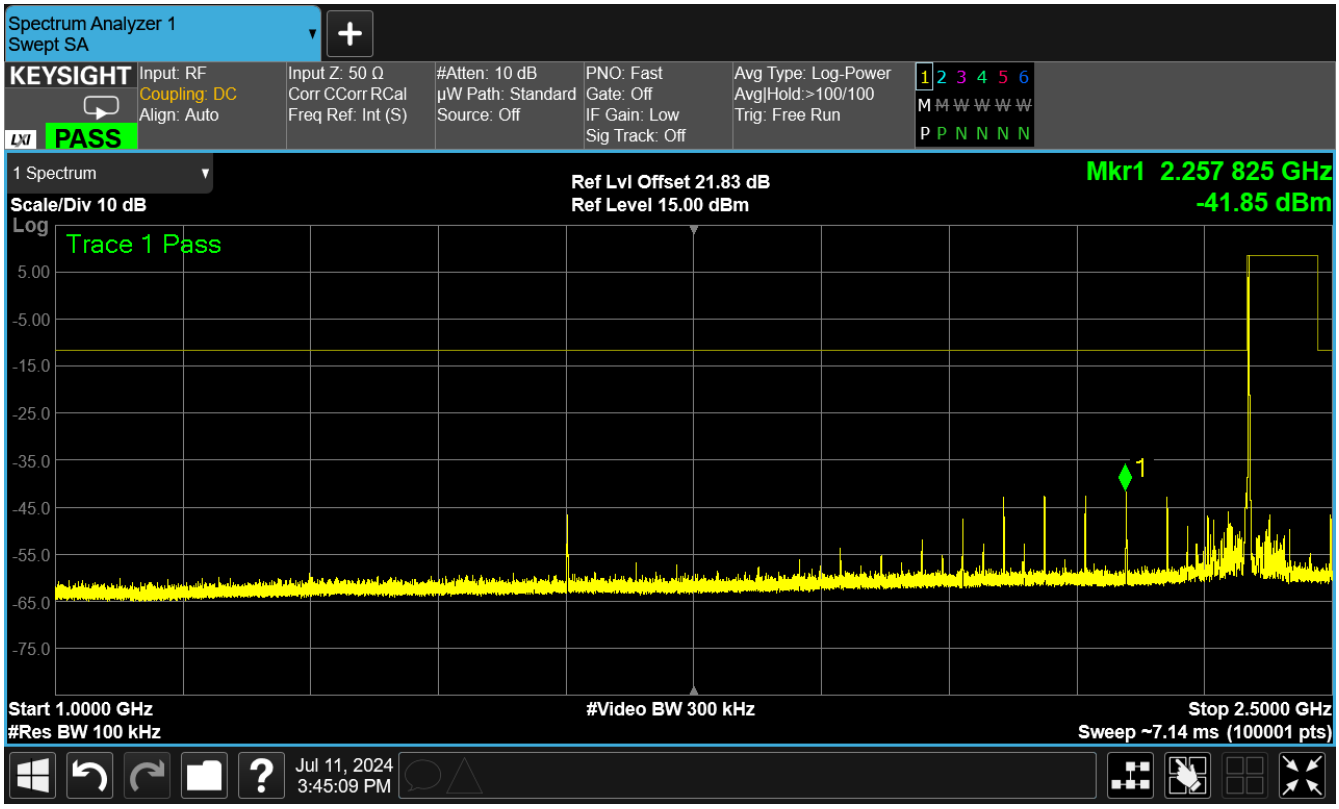

Figure 74: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 3

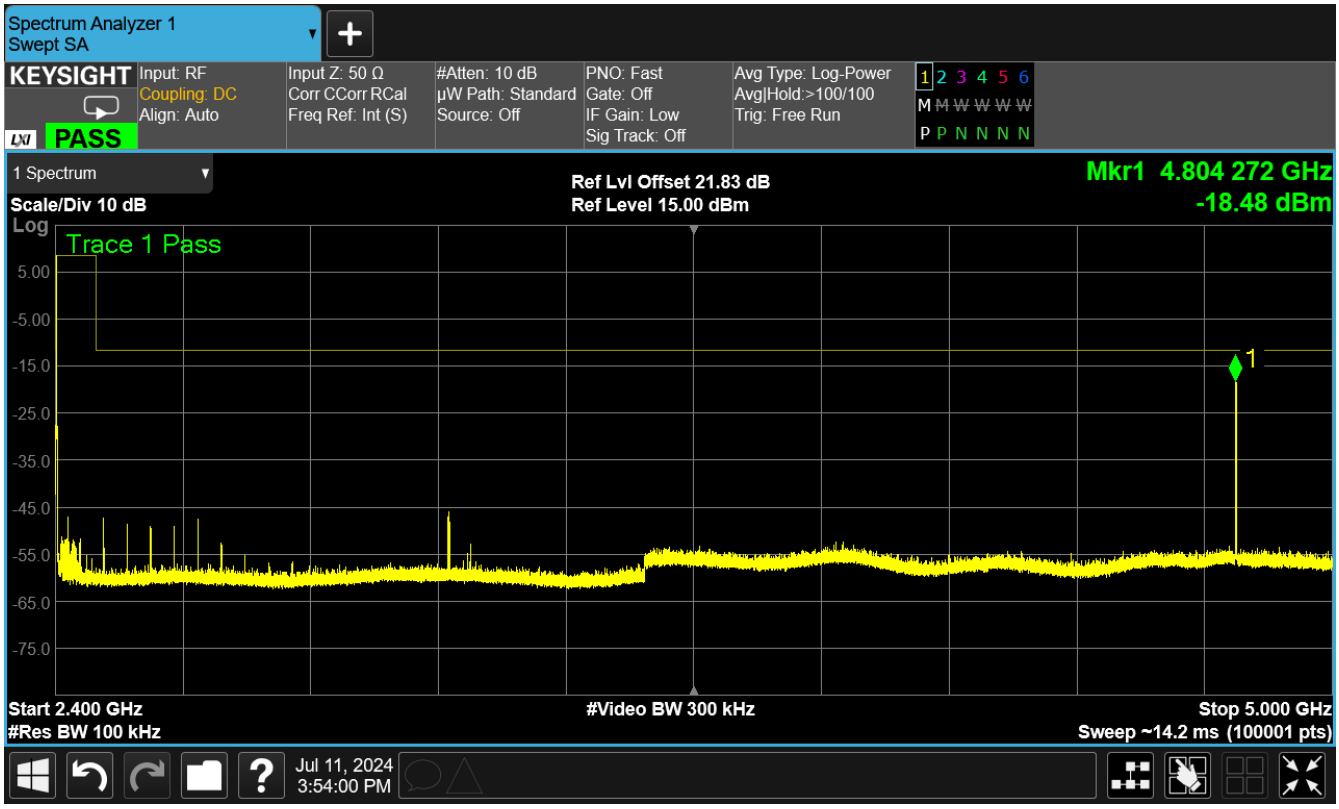

Figure 75: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 4

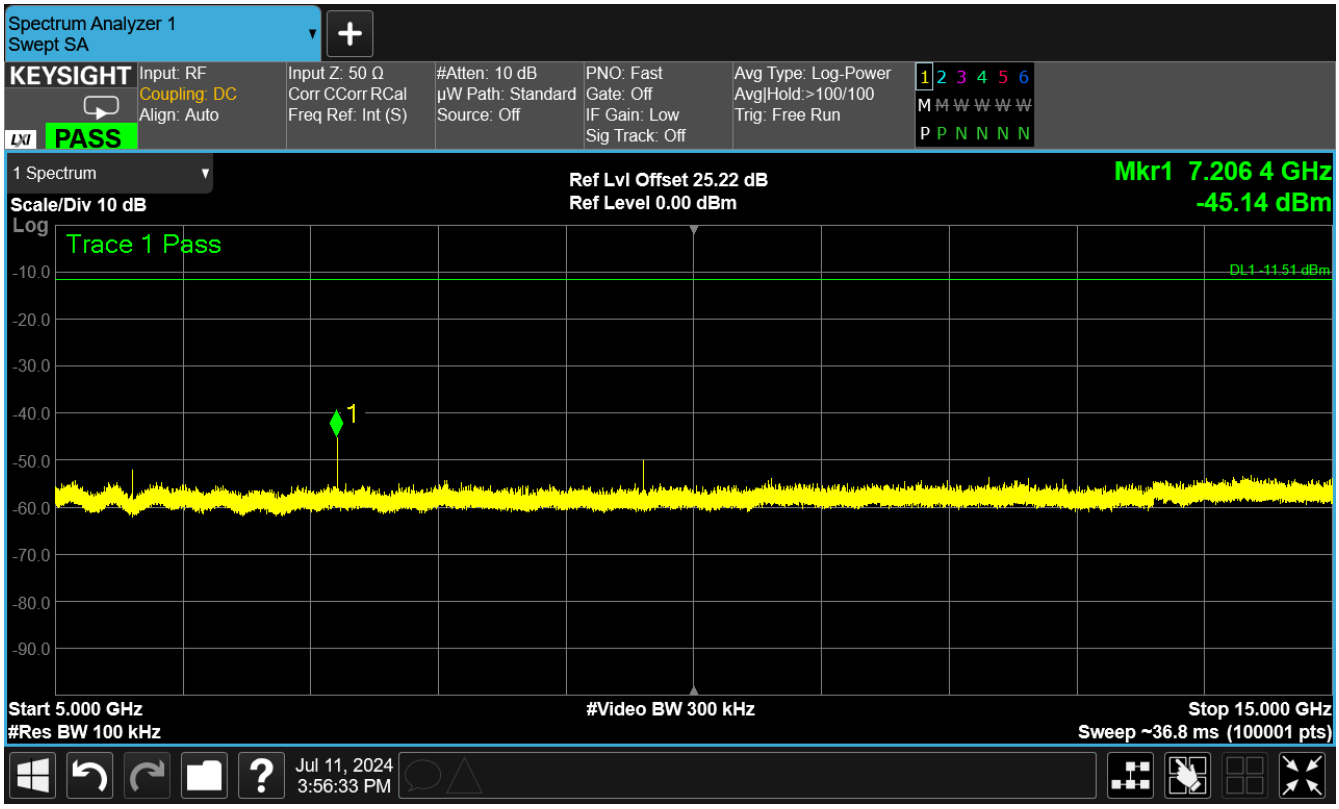

Figure 76: 8DPSK (3Mbps) Low Channel, Conducted Spurious – Plot 5

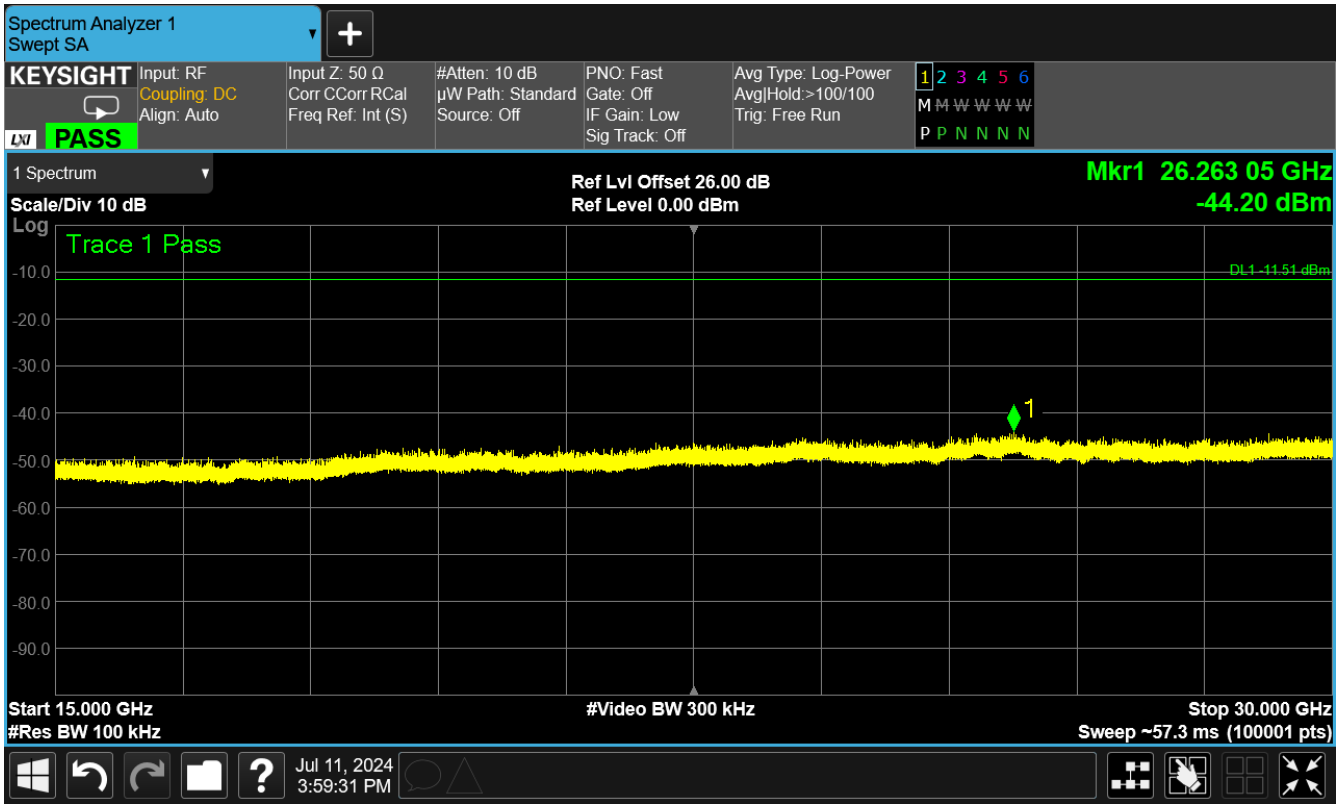

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Figure 77: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 1

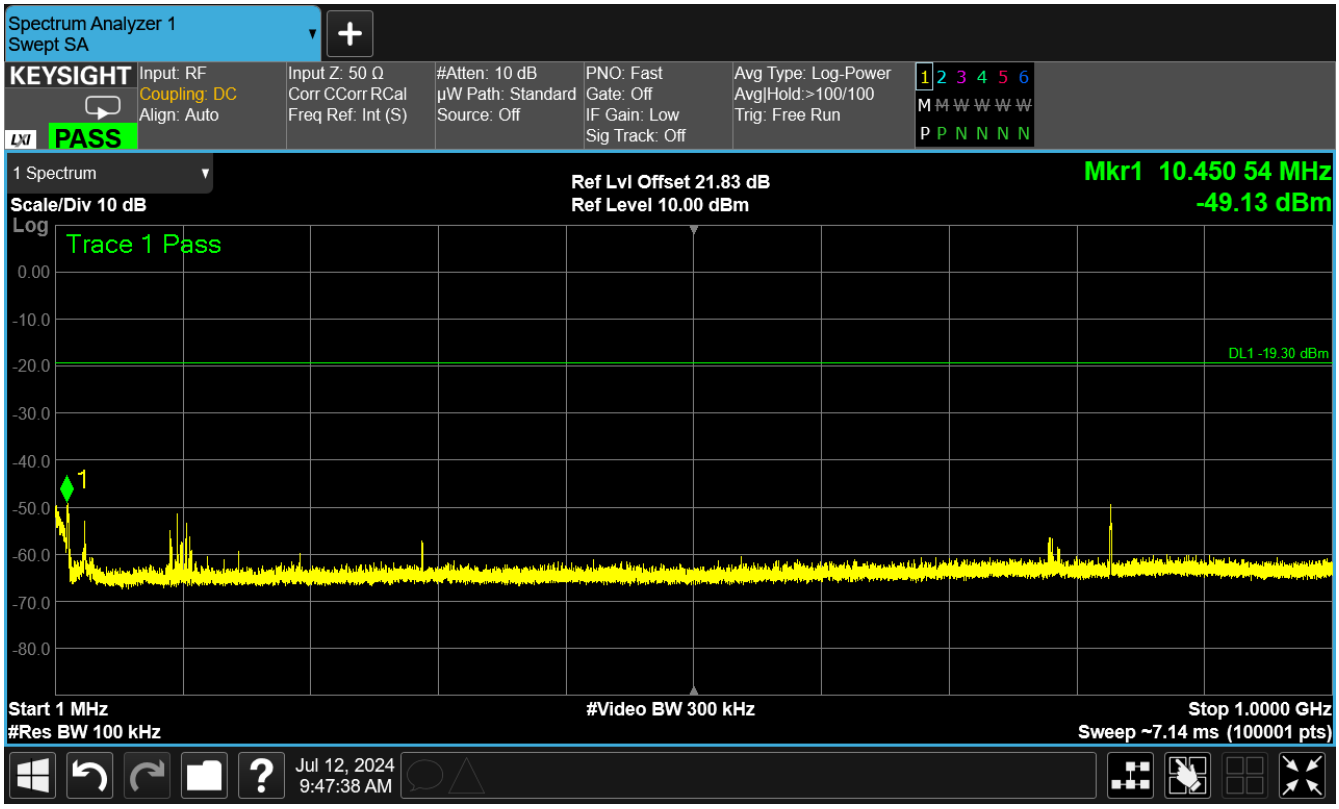


Figure 78: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 2

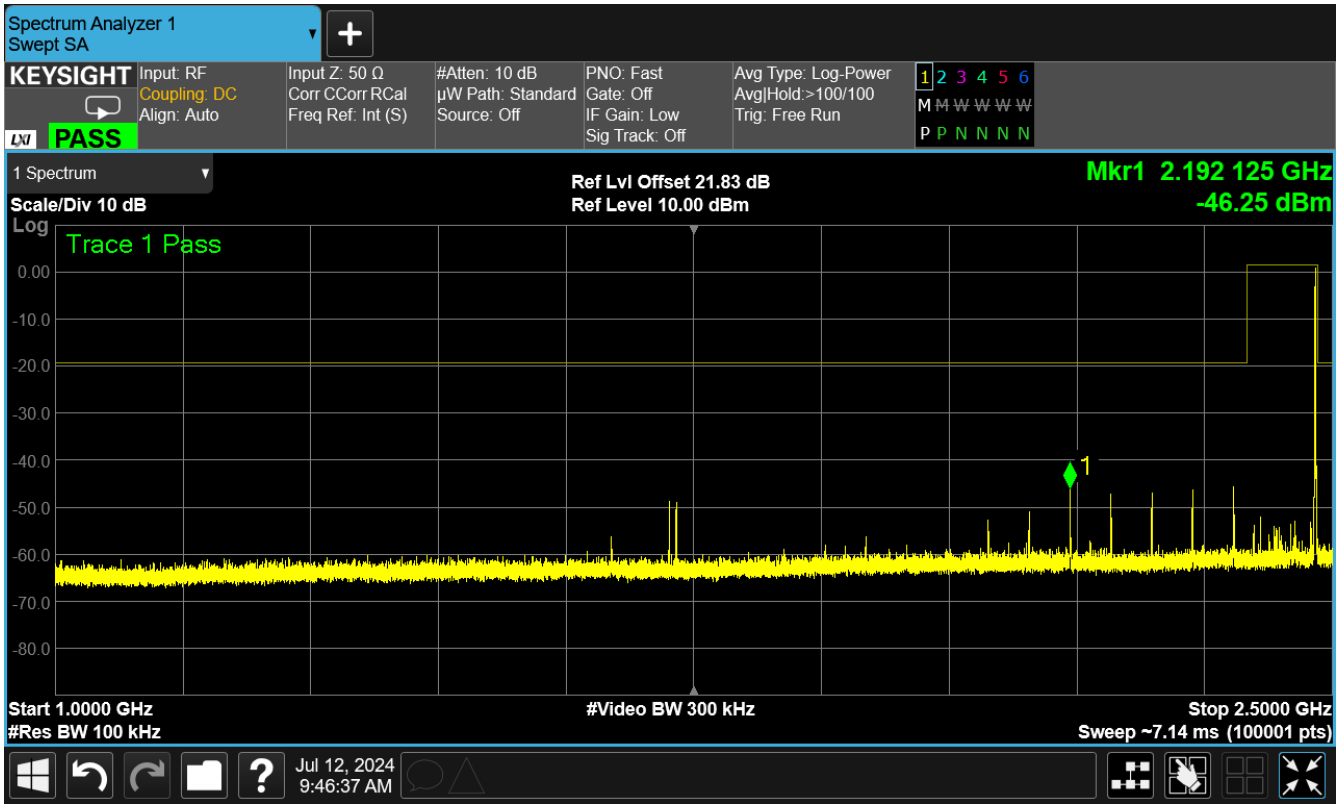


Figure 79: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 3

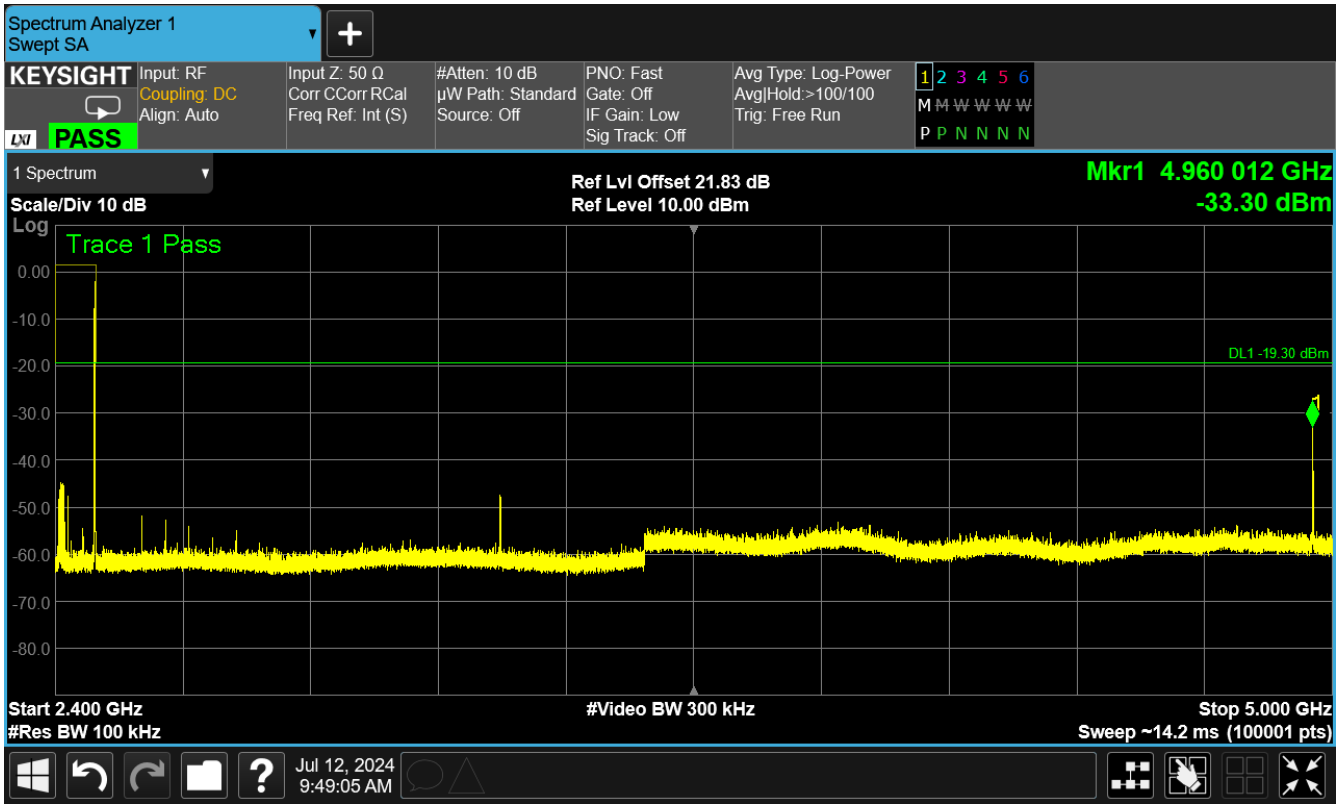


Figure 80: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 4

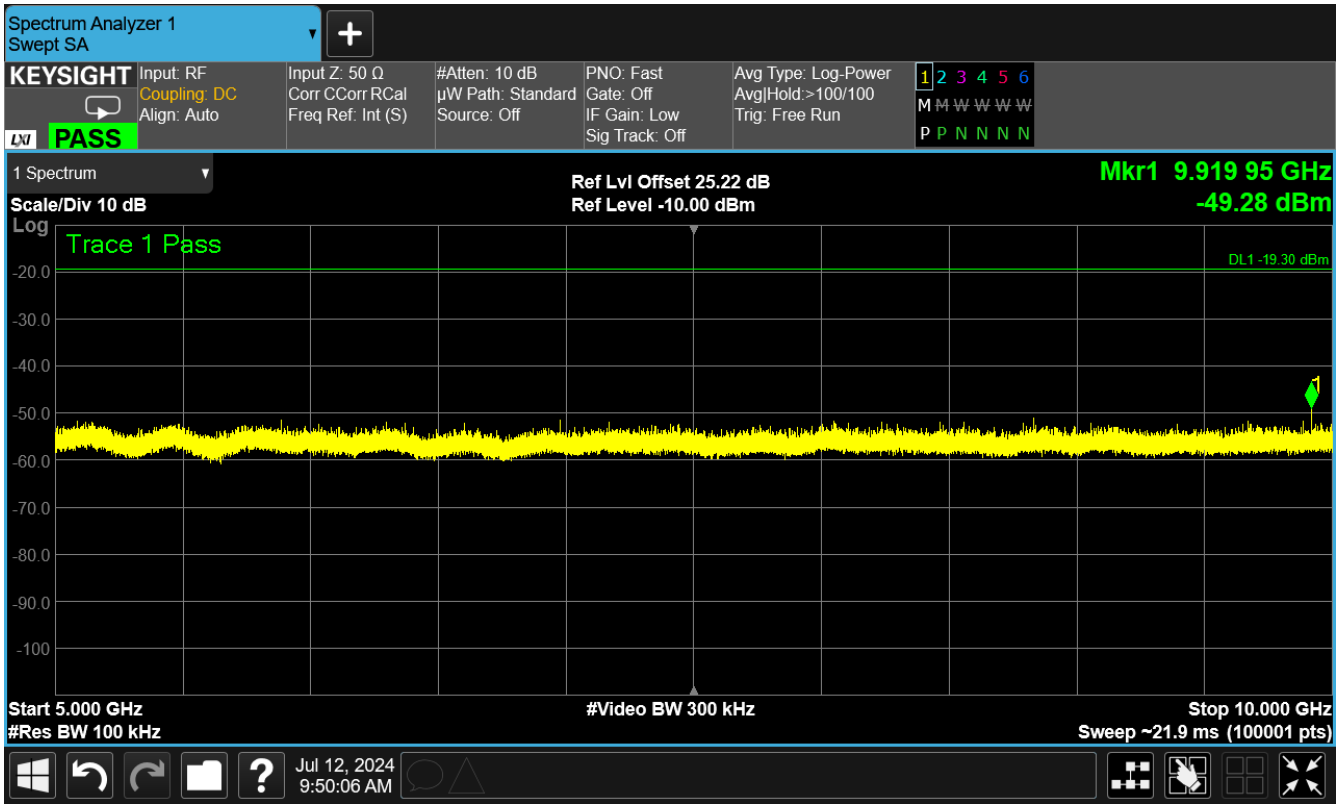


Figure 81: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 5

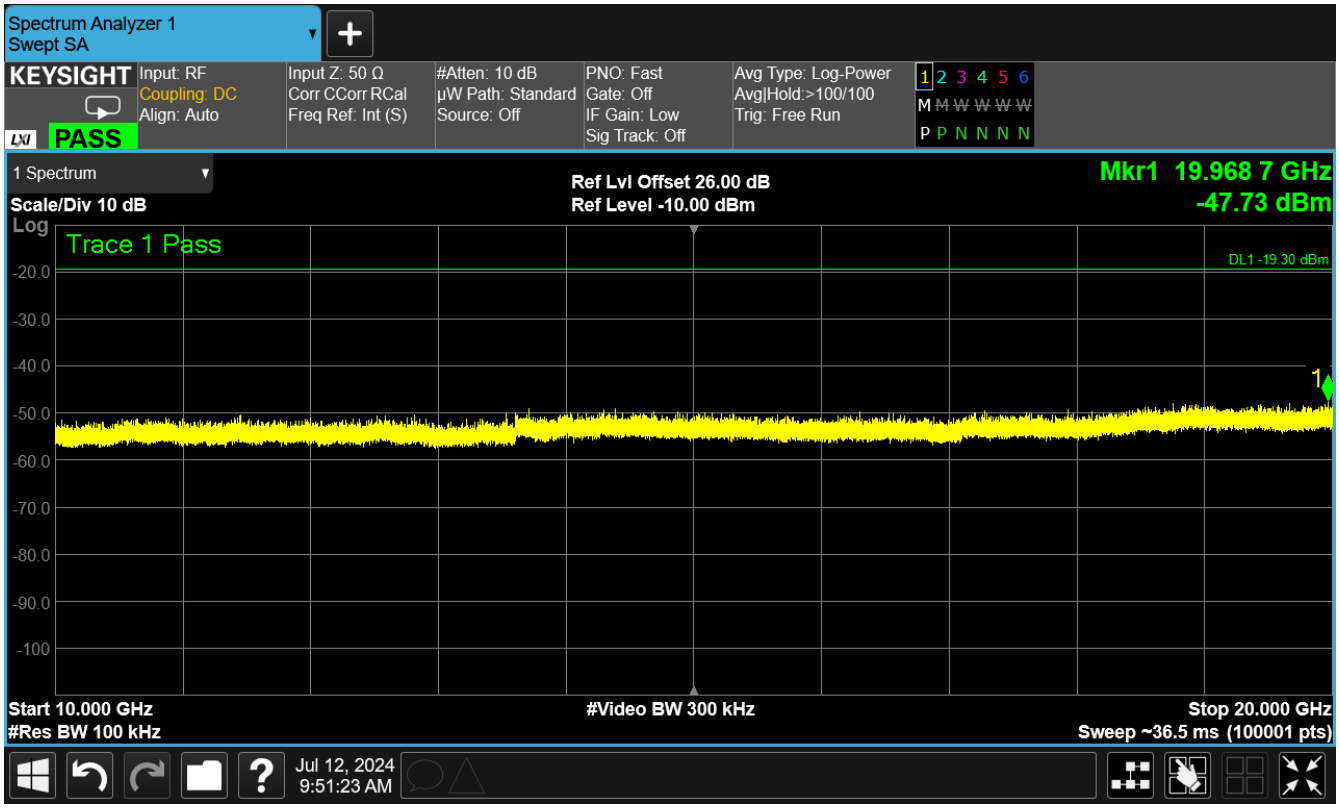
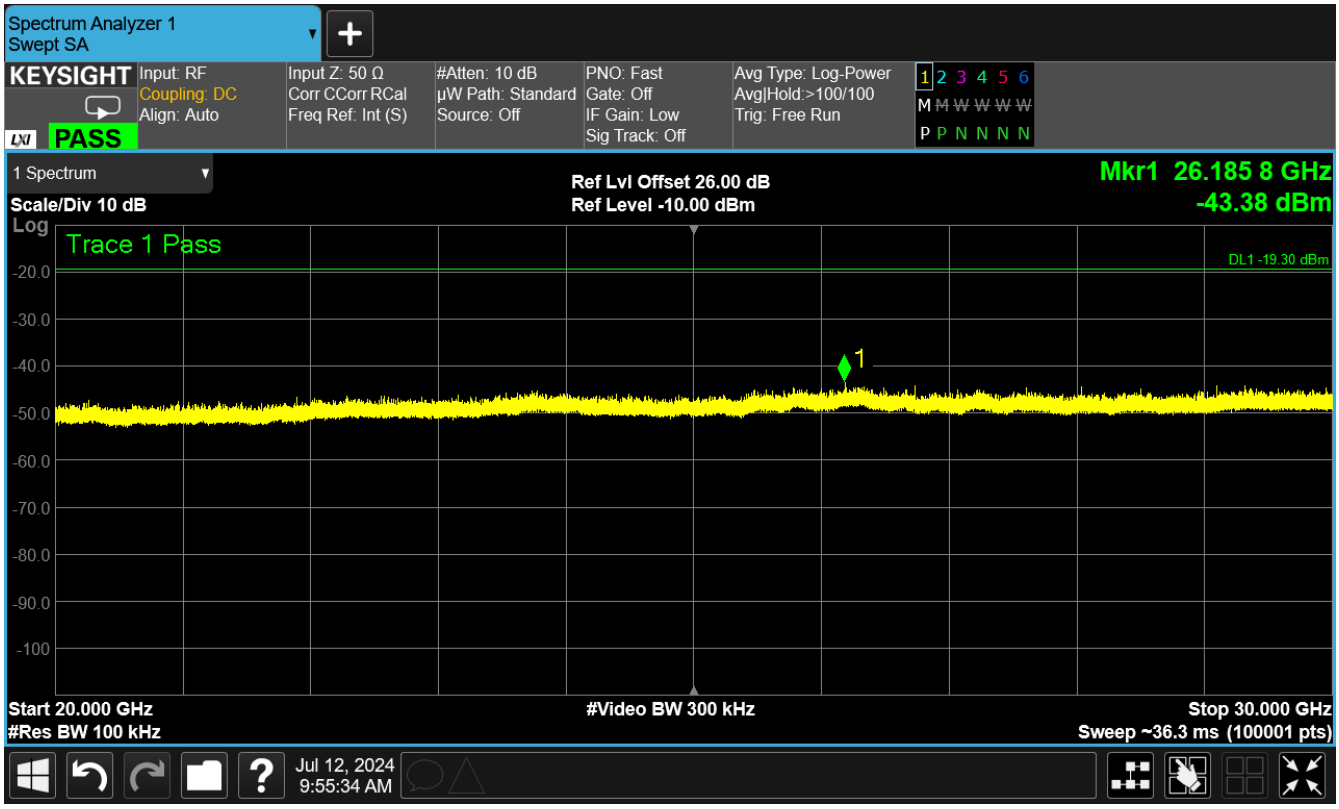


Figure 82: 8DPSK (3Mbps) High Channel, Conducted Spurious – Plot 6



3.8 Conducted Unwanted Receiver Emissions

For a license-exempt radio apparatus RSS-GEN, 7.4 requires the spurious emissions from the receiver at any discrete frequency, measured at the antenna port by the antenna-conducted method, shall not exceed 2 nW in the frequency range 30-1000 MHz and 5 nW above 1 GHz.

3.8.1 Measurement Method

This test was performed in accordance with Clause 11.11.3 of ANSI C63.10-2020.

3.8.2 Test Data

The EUT test data is provided below.

The transmitter was disabled via test software.

The EUT was configured in a receive only mode.

The receiver was set to sweep the 2.4GHz ISM band, in an active receiver mode.

Figure 83: Conducted Unwanted Receiver Emissions, Plot 1

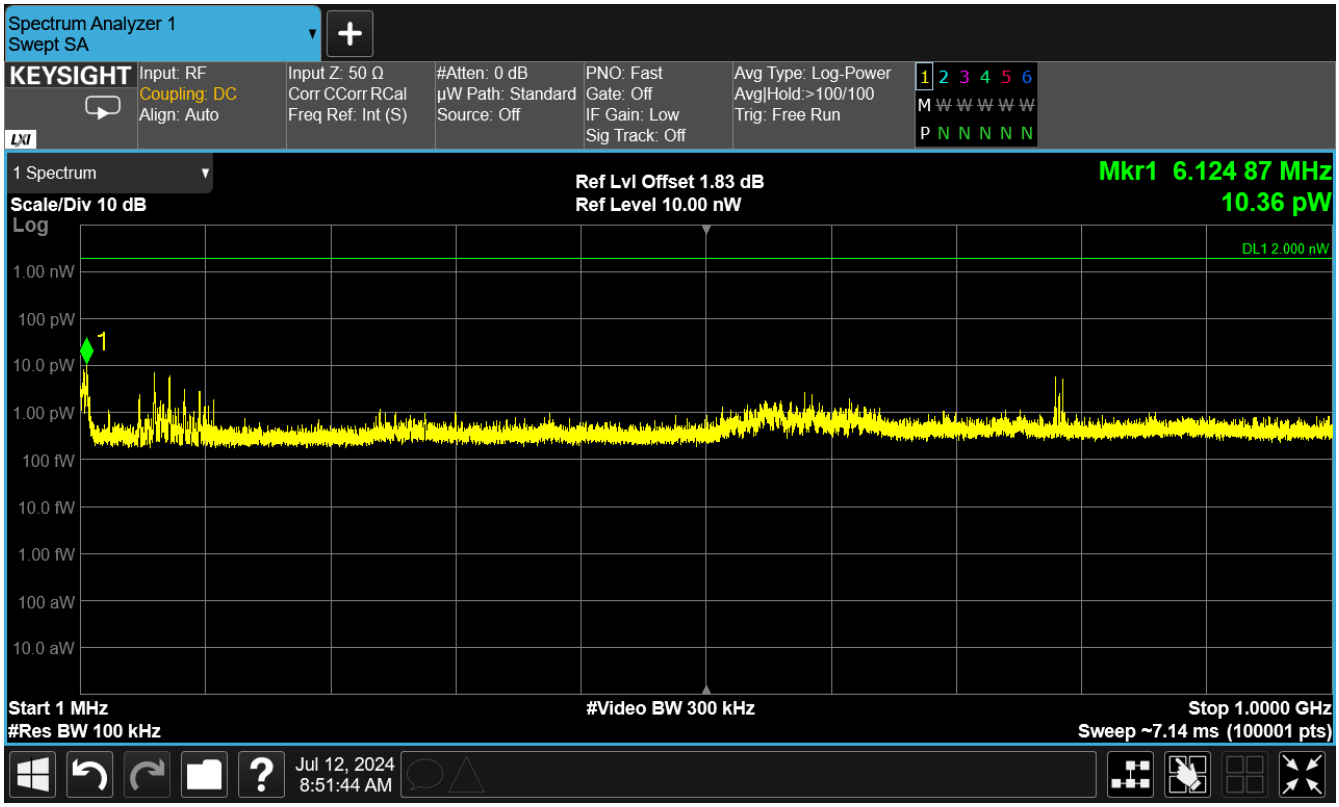


Figure 84: Conducted Unwanted Receiver Emissions, Plot 2

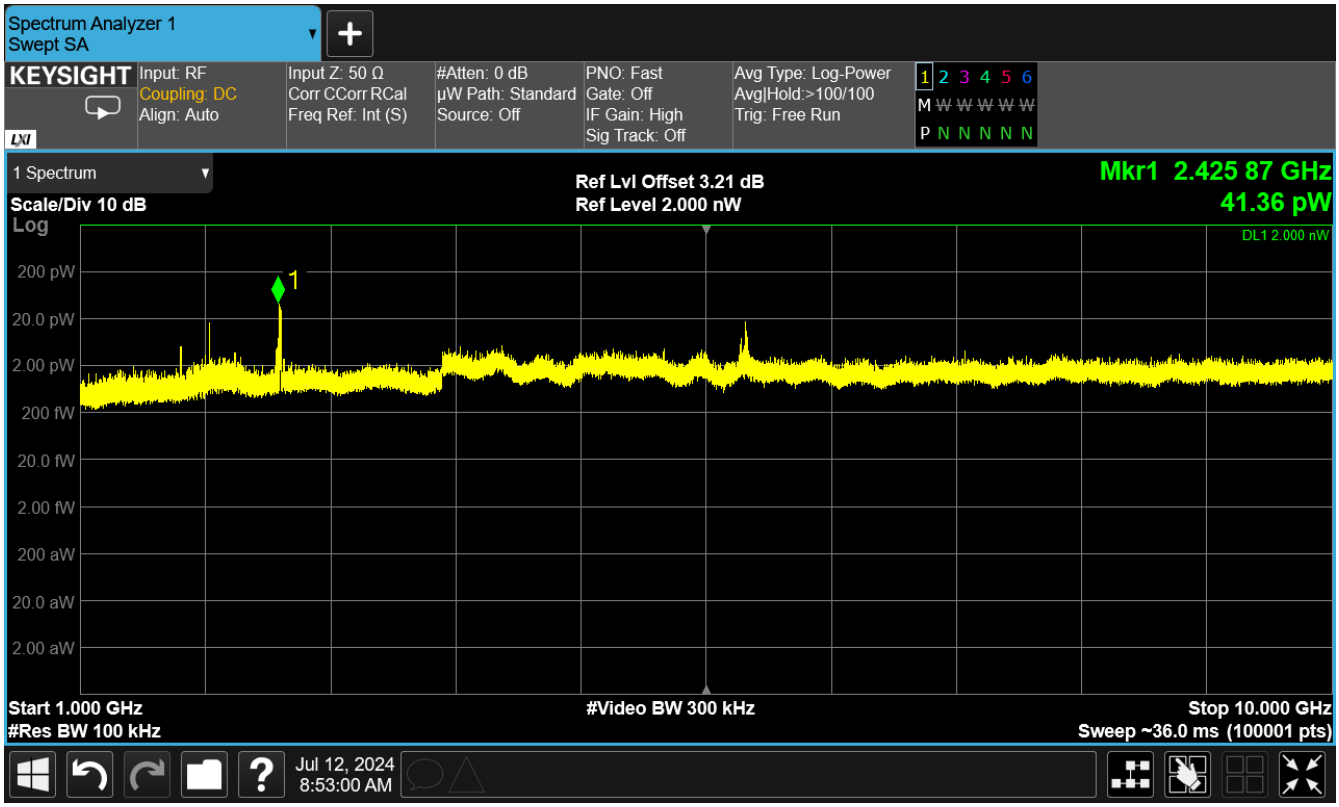


Figure 85: Conducted Unwanted Receiver Emissions, Plot 3

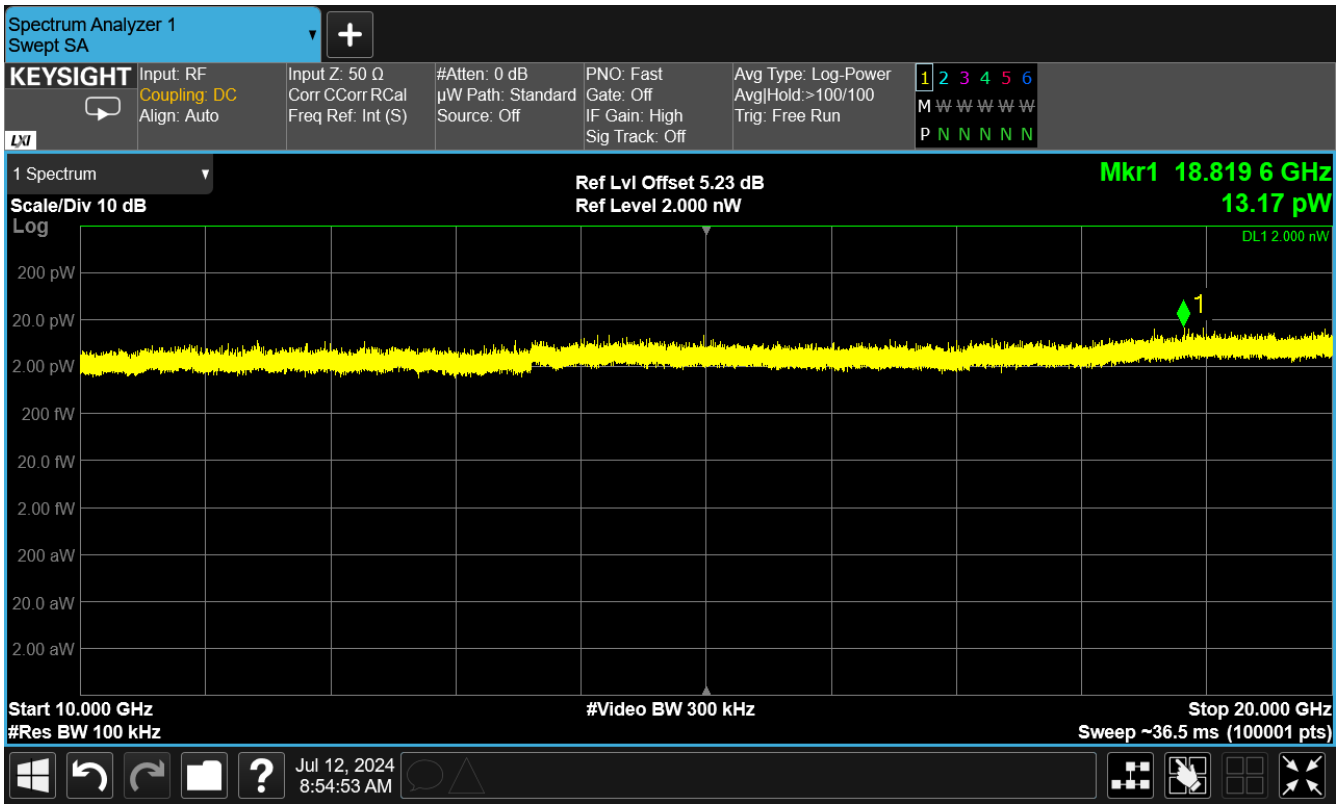
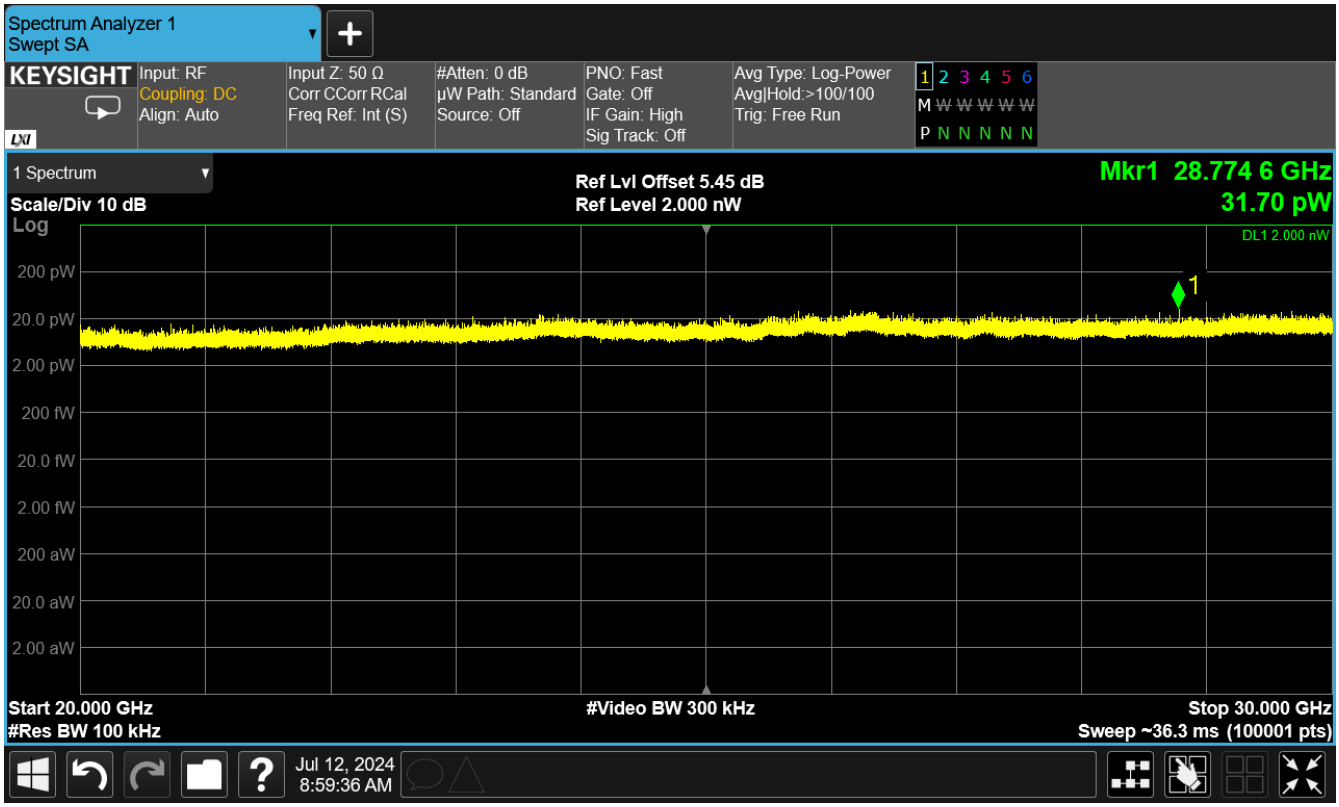


Figure 86: Conducted Unwanted Receiver Emissions, Plot 4



3.9 General Field Strength Requirements – Radiated Emissions

3.9.1 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)

3.9.2 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 26.5 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 capabilities within the computer's bios. For measurements of frequencies below 1000 MHz, the laptop and the AC/DC power supply were shielded from the test site via the use of EMF/EMI Faraday Blankets. Due to the shielding effectiveness of these protective materials, the support laptop did not adversely impact the 3m radiated emissions testing.

3.9.3 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:	20 °C
Relative Humidity:	55 %

3.9.4 Measurement Method and Results

Prior to testing, the EUT was investigated for the worst-case setup configuration. The EUT's primary power source was varied between the AC mains cord and the DeWalt battery pack. In this case, the EUT emissions are worse-case when the EUT is coupled to the public mains network. As such, the EUT was powered by 120VAC, 60Hz during this test. When powered by the battery, the EUT does not create any emissions that are worse than the emission reported below.

Additionally, the EUT auxiliary port(s) and USB port(s) [on the side of the chassis] were investigated for unwanted emissions. A near field investigation demonstrated that populating these ports had no impact on the EUT emissions. That is, the results of this test are unchanged whether the AUX ports are used/populated. These ports do not cause the EUT to radiate any emission that is worse that the emissions reported below.

The EUT was tested while positioned in the worst-case orientation, based on a three-axes (orthogonal plane) evaluation of the fundamental field strength at 3-meters. The EUT position that produced the highest TX field strength, was maintained.

For testing of frequencies from 30MHz to 1GHz, the EUT production sample was used. The wireless BT link was exercised by pairing the speaker to a smartphone and streaming music. The smartphone companion was kept behind the receive antenna in the corner of the chamber, and it was confirmed (through a quick investigation) that the support peripheral did not adversely impact the result of the test.

For testing of frequencies above 1GHz, the EUT was configured in a fully-modulated mode, with the hopping stopped, to dwell on the appropriate test channel.

The frequency range of 30 MHz to 26.5 GHz was investigated.

There were no emissions detected in the frequency range of 7 GHz to 26.5 GHz.

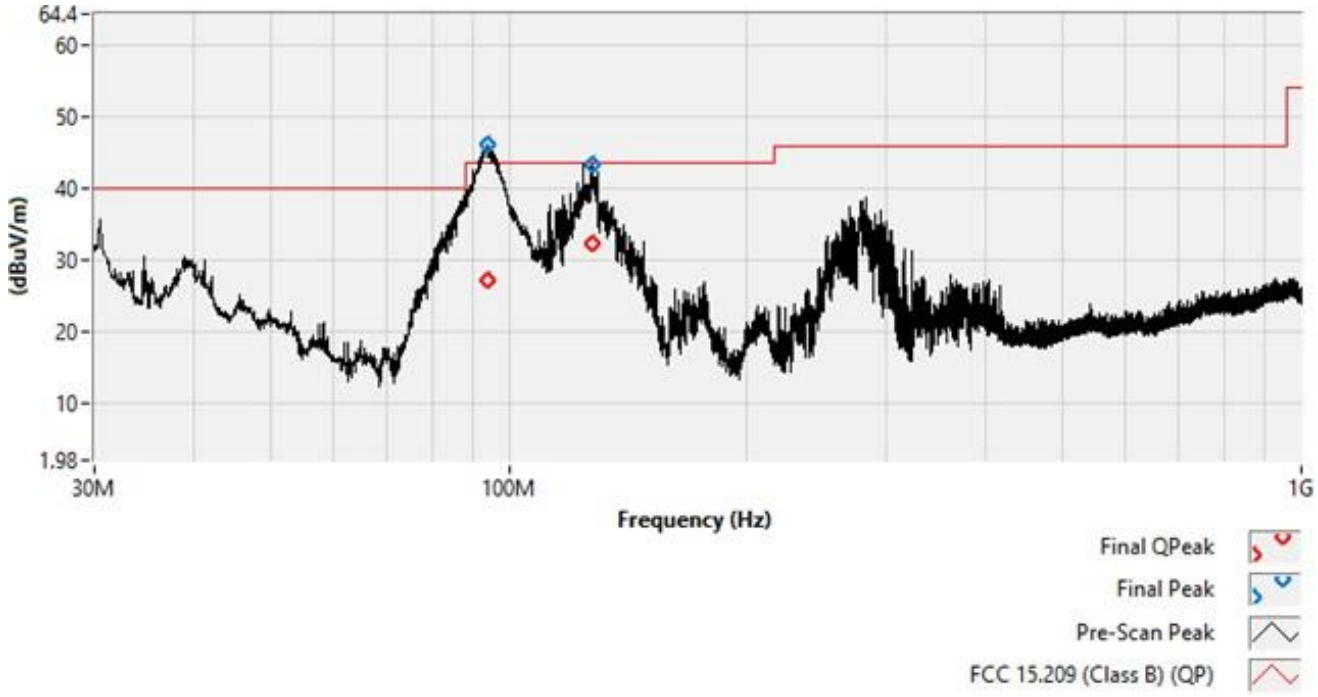
The EUT complies with the requirements this section.

Table 12: Radiated Emissions Test Data, 30 MHz to 1000 MHz

Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
93.906	Peak	46.224	--	--	130	Vert, 200
	QP	27.103	43.5	-16.397	130	Vert, 200
127.390	Peak	43.364	--	--	180	Vert, 150
	QP	32.186	43.5	-11.314	180	Vert, 150
260.003	Peak	46.251	--	--	90	Horiz, 200
	QP	38.215	46	-7.785	90	Horiz, 200
273.624	Peak	46.476	--	--	90	Horiz, 200
	QP	36.574	46	-9.426	90	Horiz, 200
286.886	Peak	46.605	--	--	90	Horiz, 105
	QP	38.379	46	-7.621	90	Horiz, 105
300.447	Peak	46.083	--	--	90	Horiz, 105
	QP	35.933	46	-10.067	90	Horiz, 105

The data provided in Table 8 (30MHz to 1GHz) shall also serve to satisfy the digital unwanted emissions requirements and receiver emission requirements for both the FCC and ISED Canada. The plots provided on the following page, represent the 3m emissions test data that correlate to the tabular data provided in Table 8.

Digital and Receiver Emissions, Pre-scan and Final Data (Vertical)



Digital and Receiver Emissions, Pre-scan and Final Data (Horizontal)

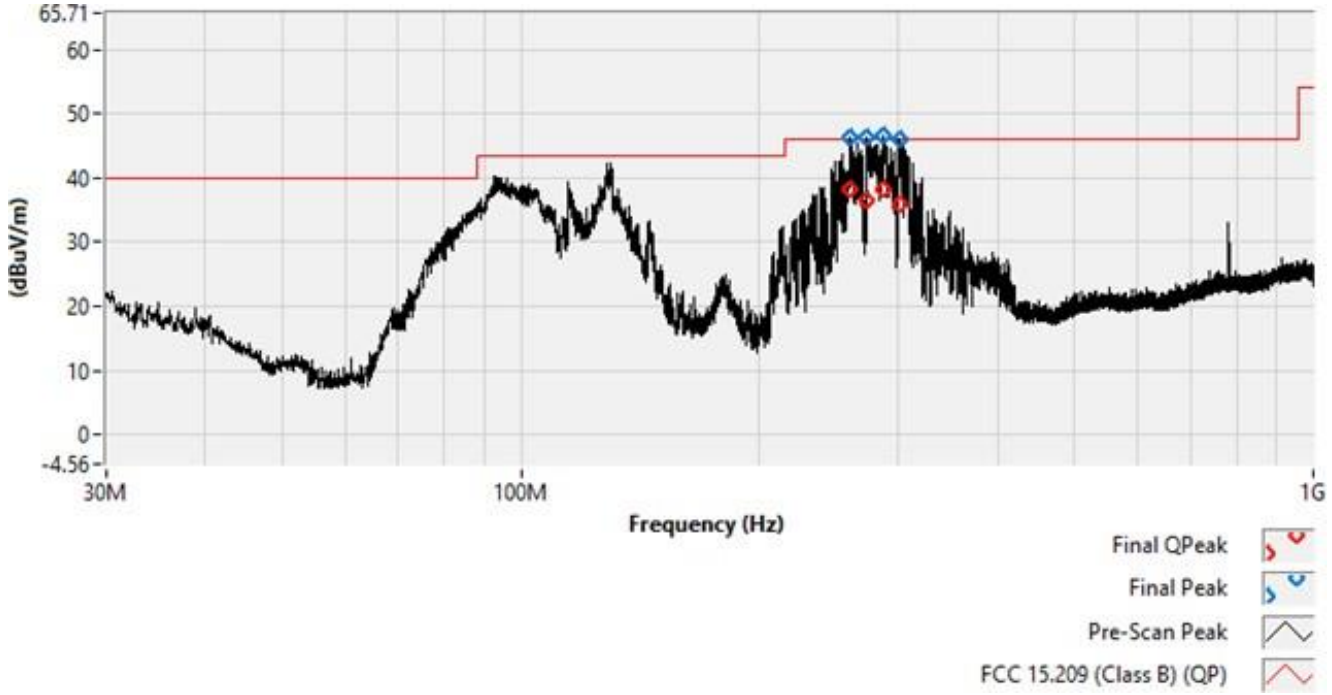


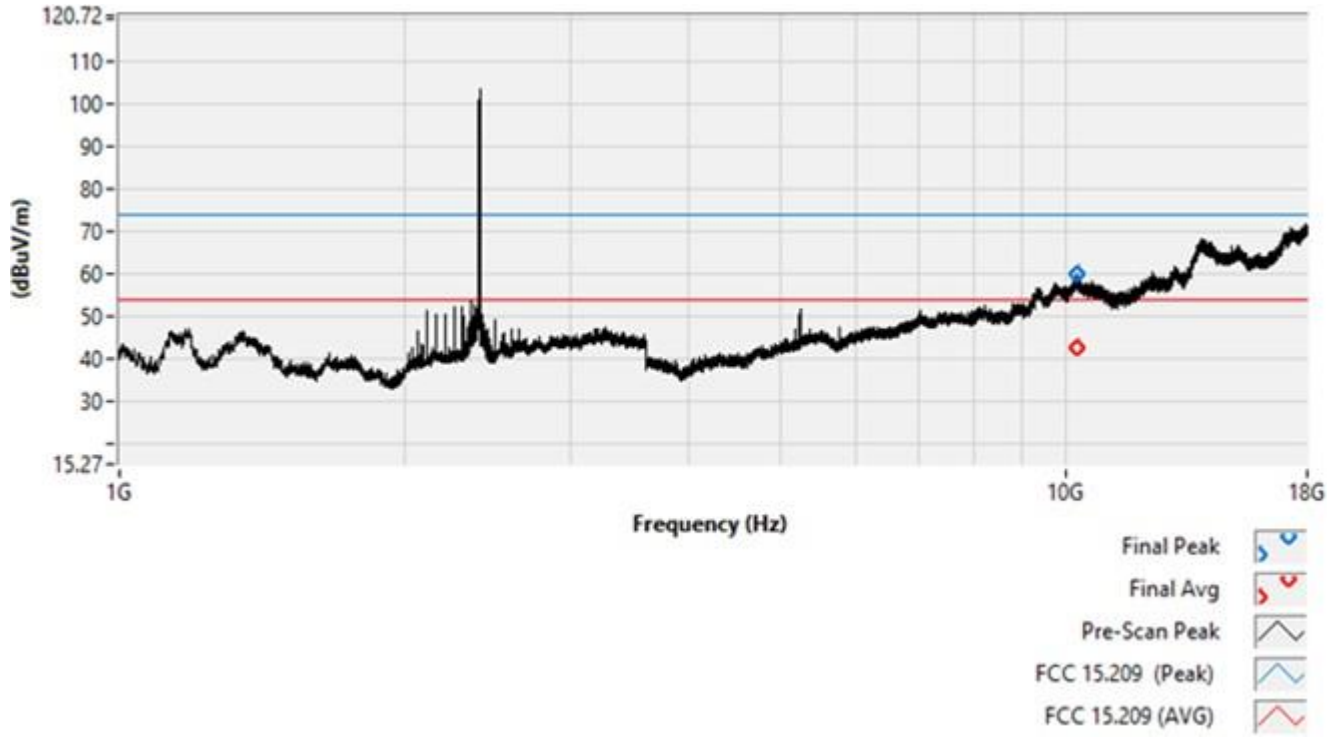
Table 13: Low Channel, 1Mbps (GFSK) Radiated Test Data, 1 GHz to 26.5 GHz

Frequency (GHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2.390 †	Peak	50.281	74	-23.719	165	Horiz, 155
	AVG	32.959	54	-21.041	165	Horiz, 155
2.402	Peak	104.776	--	--	165	Horiz, 155
	AVG	--	--	--	165	Horiz, 155
10.289 ‡	Peak	59.967	74	-14.033	285	Vert, 160
	AVG	42.423	54	-11.577	285	Vert, 160
14.011 ‡	Peak	69.123	74	-4.877	165	Horiz, 155
	AVG	52.622	54	-1.378	165	Horiz, 155
17.350 ‡	Peak	67.910	74	-6.090	165	Horiz, 155
	AVG	52.610	54	-1.390	165	Horiz, 155
24.331 ‡	Peak	65.336	74	-8.664	165	Horiz, 155
	AVG	49.740	54	-4.260	165	Horiz, 155

† restricted bandedge

‡ ambient (noise floor)

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



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

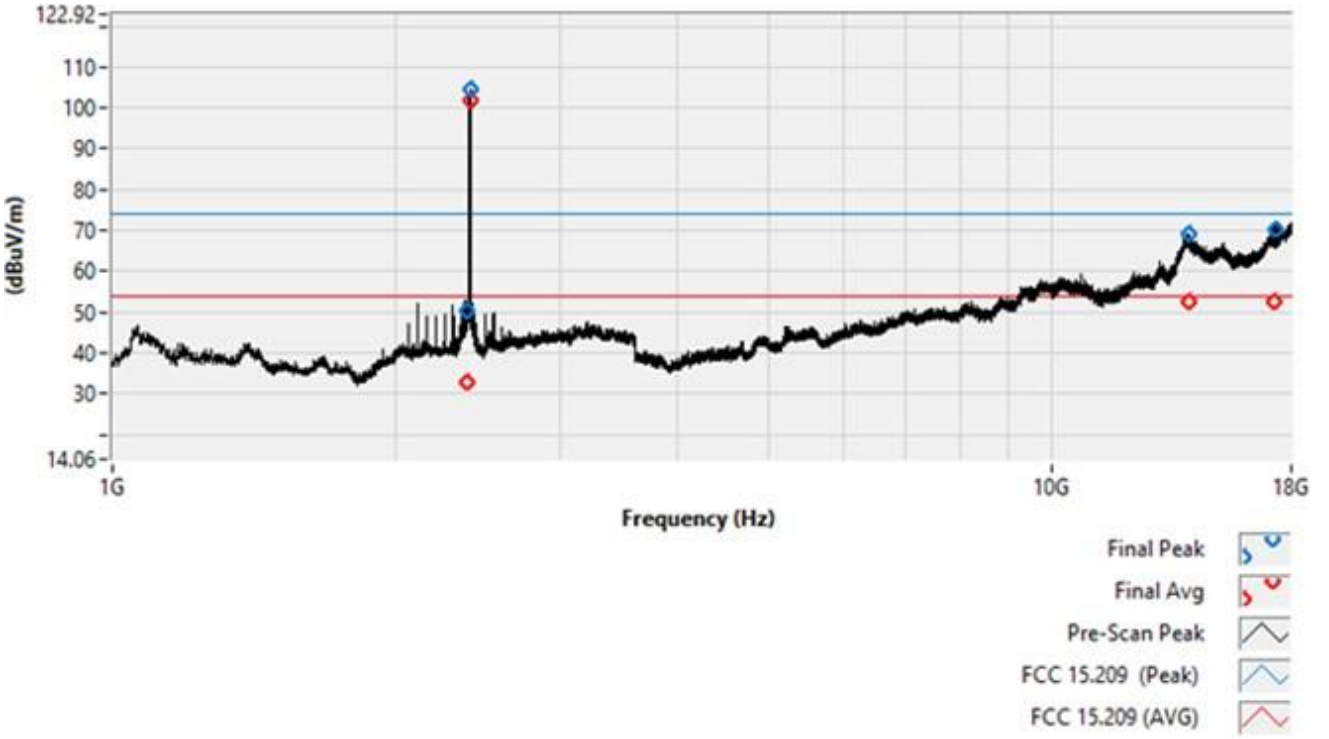
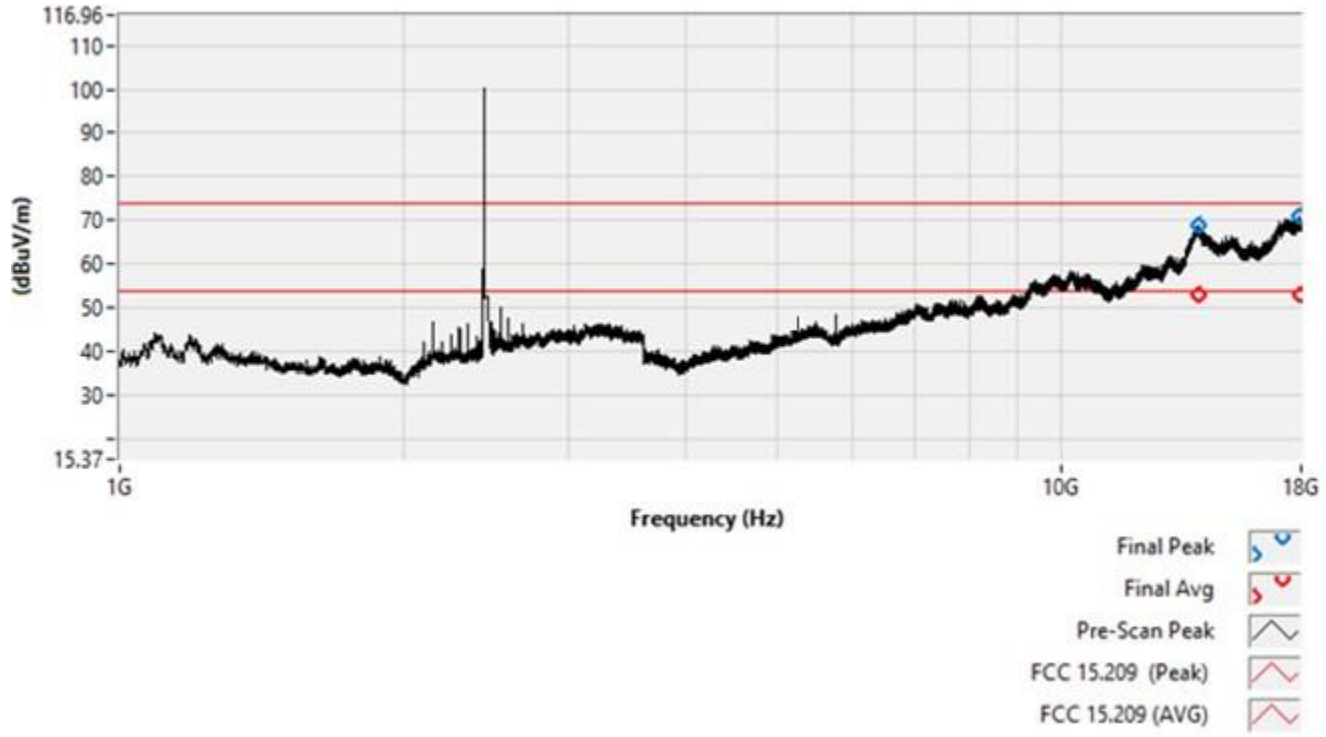


Table 14: Center Channel, 1Mbps (GFSK) Radiated Test Data, 1 GHz to 26.5 GHz

Frequency (GHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2.392	Peak	54.392	74	-19.608	300	Horiz, 165
	AVG	42.736	54	-11.264	300	Horiz, 165
2.440	Peak	102.45	--	--	265	Horiz, 165
	AVG	--	--	--	265	Horiz, 165
10.267 ‡	Peak	59.217	74	-14.783	265	Horiz, 165
	AVG	41.980	54	-12.020	265	Horiz, 165
13.992 ‡	Peak	68.782	74	-5.218	290	Vert, 145
	AVG	52.938	54	-1.062	290	Vert, 145
17.952 ‡	Peak	70.965	74	-3.035	290	Vert, 145
	AVG	53.008	54	-0.992	290	Vert, 145

‡ ambient (noise floor)

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



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

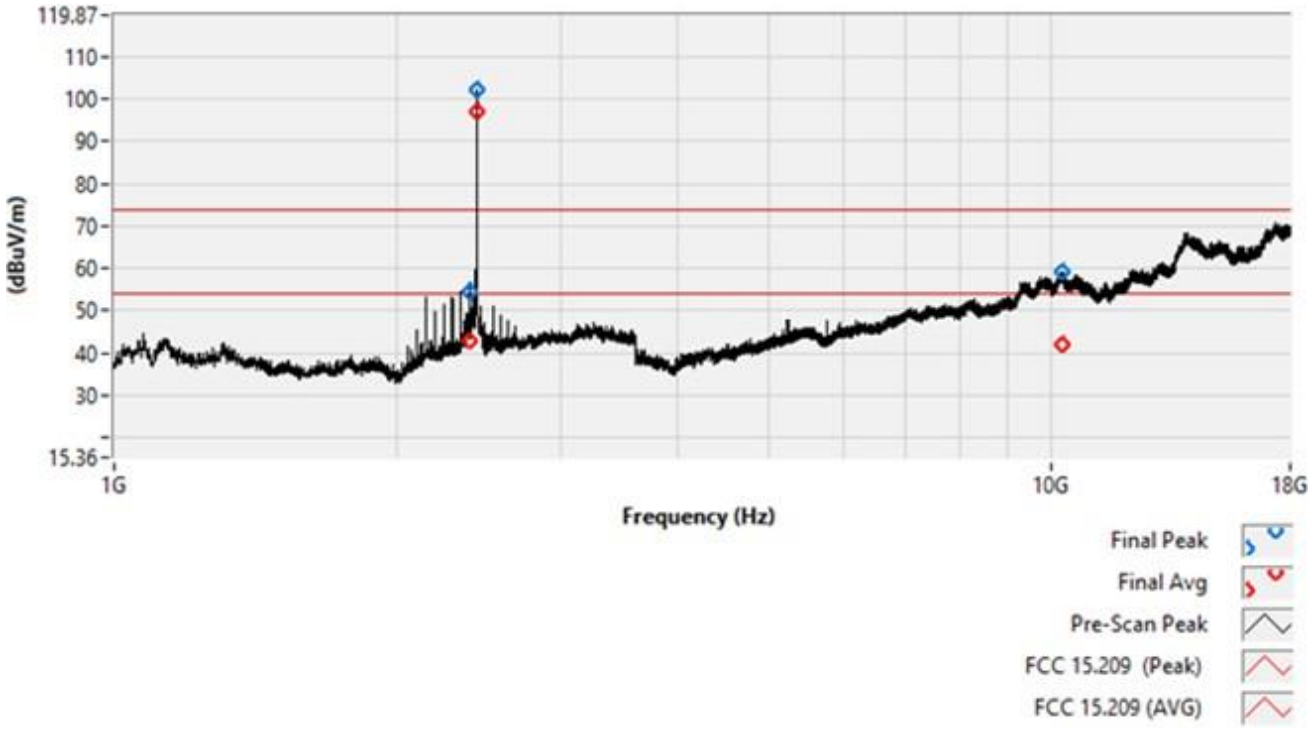


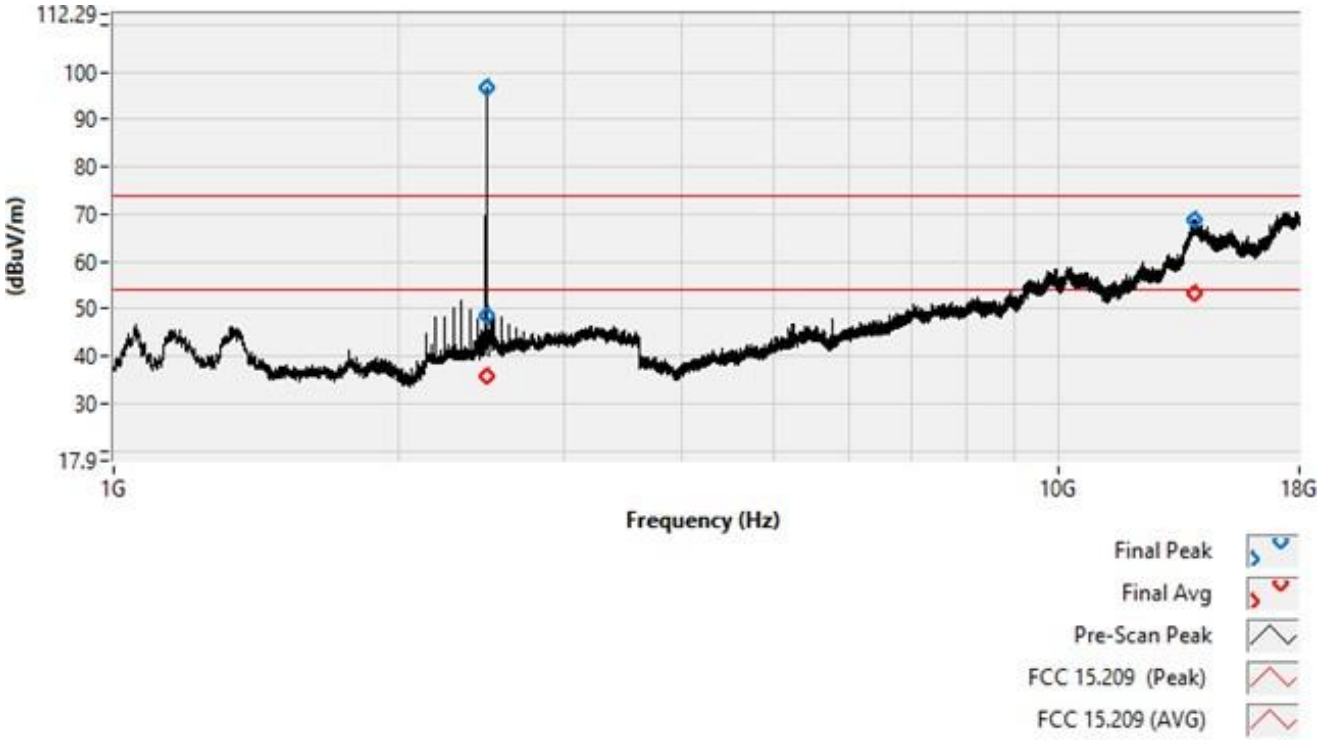
Table 15: High Channel, 1Mbps (GFSK) Radiated Test Data, 1 GHz to 26.5 GHz

Frequency (GHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2.480	Peak	96.564	--	--	290	Vert, 150
	AVG	--	--	--	290	Vert, 150
2.4835 †	Peak	48.629	74	-25.371	290	Vert, 150
	AVG	35.631	54	-18.369	290	Vert, 150
2.603	Peak	51.672	74	-22.328	115	Horiz, 150
	AVG	38.154	54	-15.846	115	Horiz, 150
10.255 ‡	Peak	59.208	74	-14.792	115	Horiz, 150
	AVG	41.022	54	-12.978	115	Horiz, 150
13.968 ‡	Peak	68.847	74	-5.153	290	Vert, 150
	AVG	53.031	54	-0.969	290	Vert, 150
25.607 ‡	Peak	66.210	74	-7.790	285	Vert, 160
	AVG	49.991	54	-4.009	285	Vert, 160

† restricted bandedge

‡ ambient (noise floor)

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



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

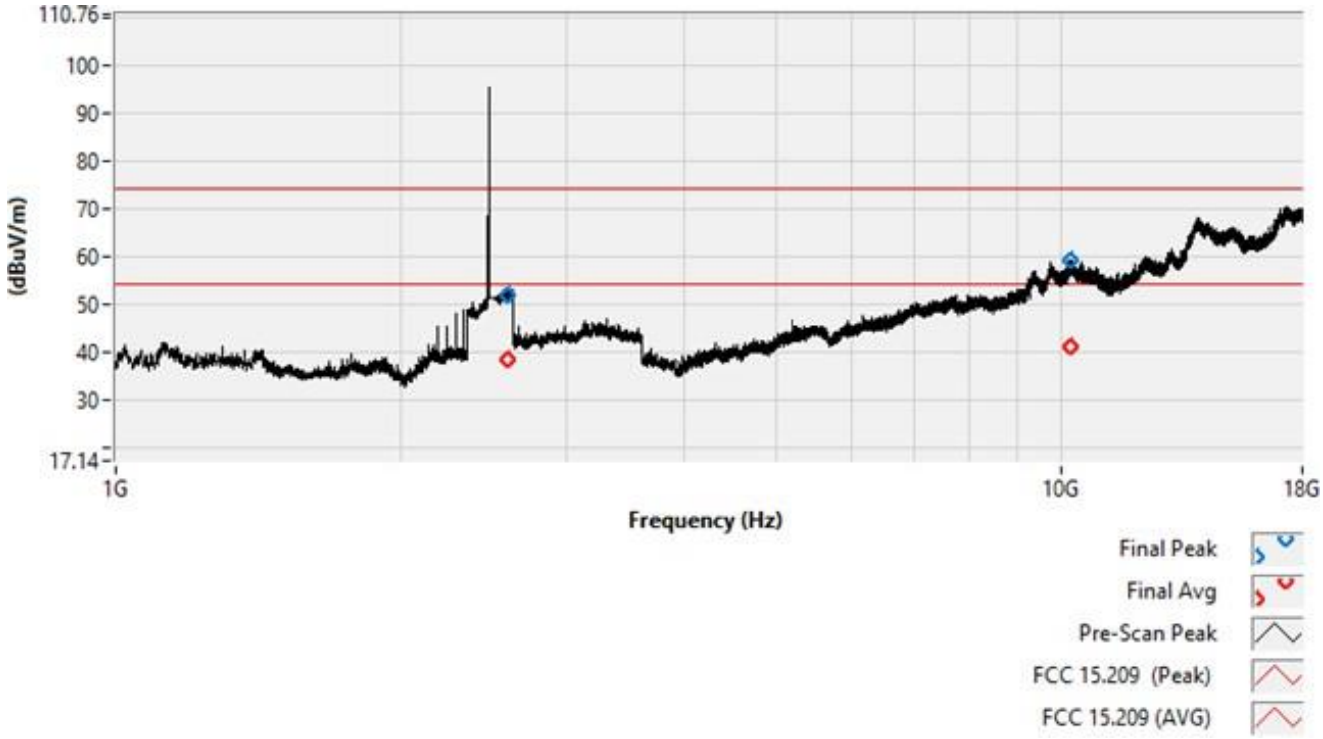
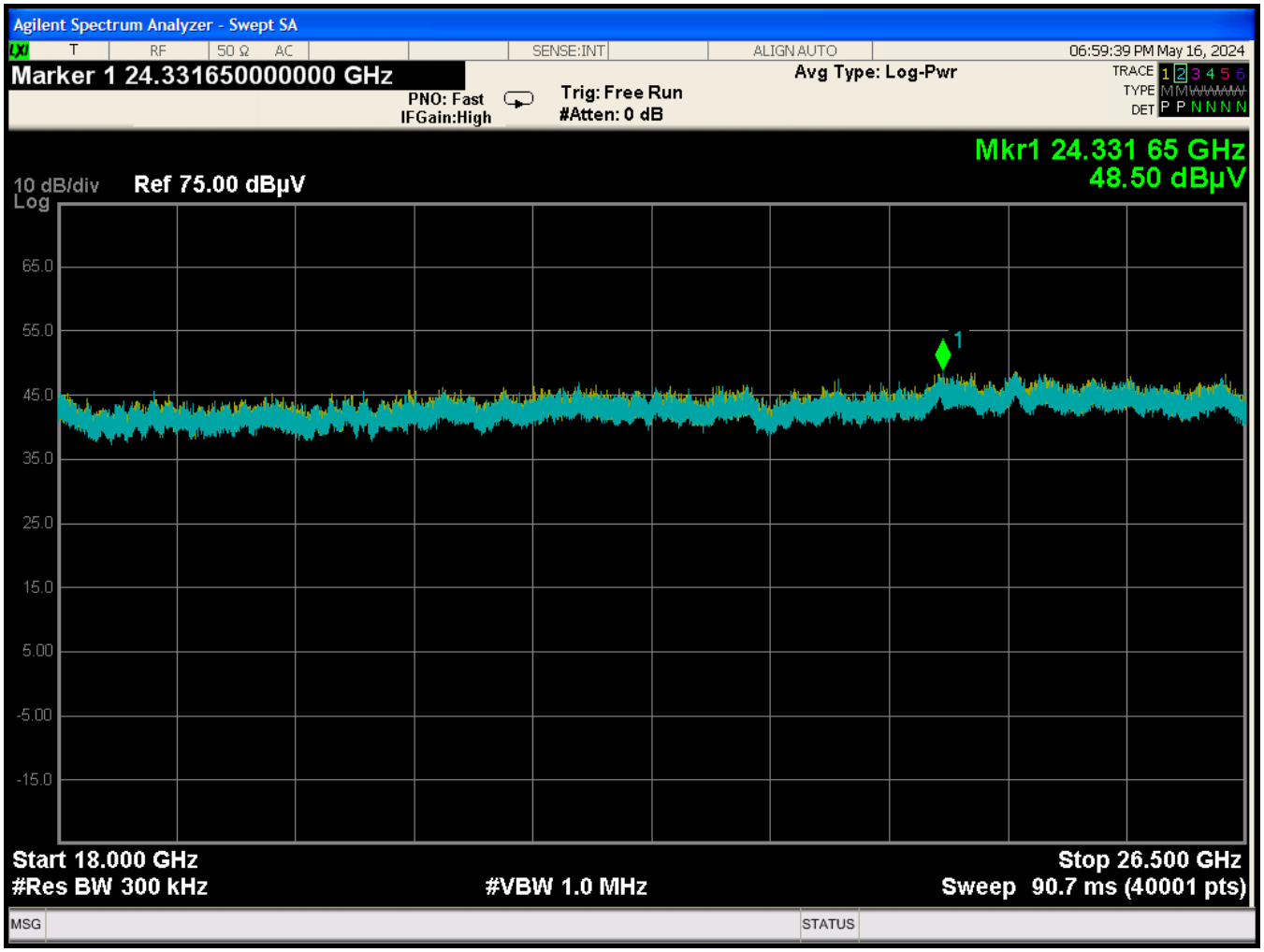


Figure 87: Low Channel, 1Mbps (GFSK) Radiated Test Data, 1 GHz to 26.5 GHz

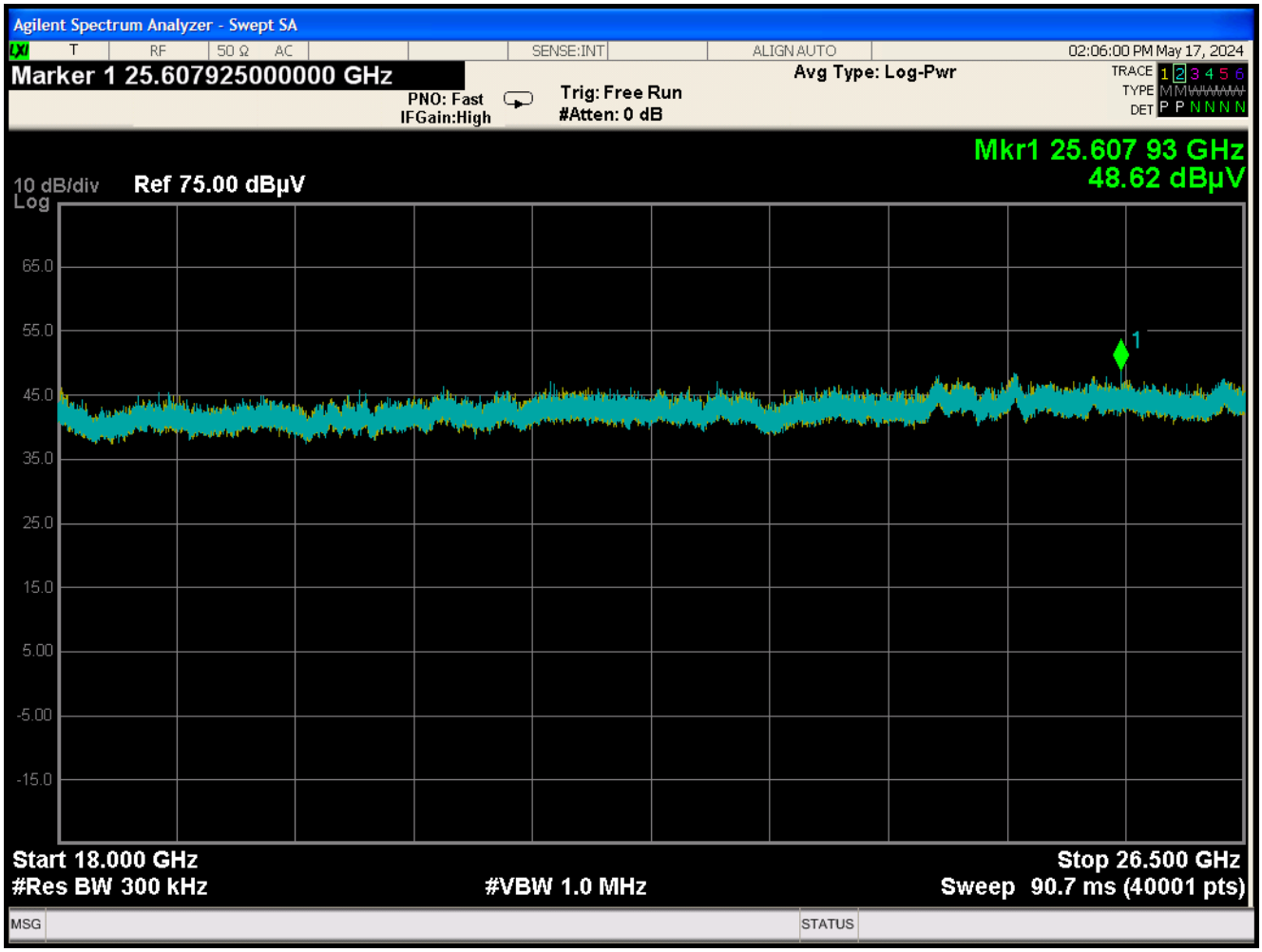


Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

Figure 88: High Channel, 1Mbps (GFSK) Radiated Test Data, 1 GHz to 26.5 GHz



Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

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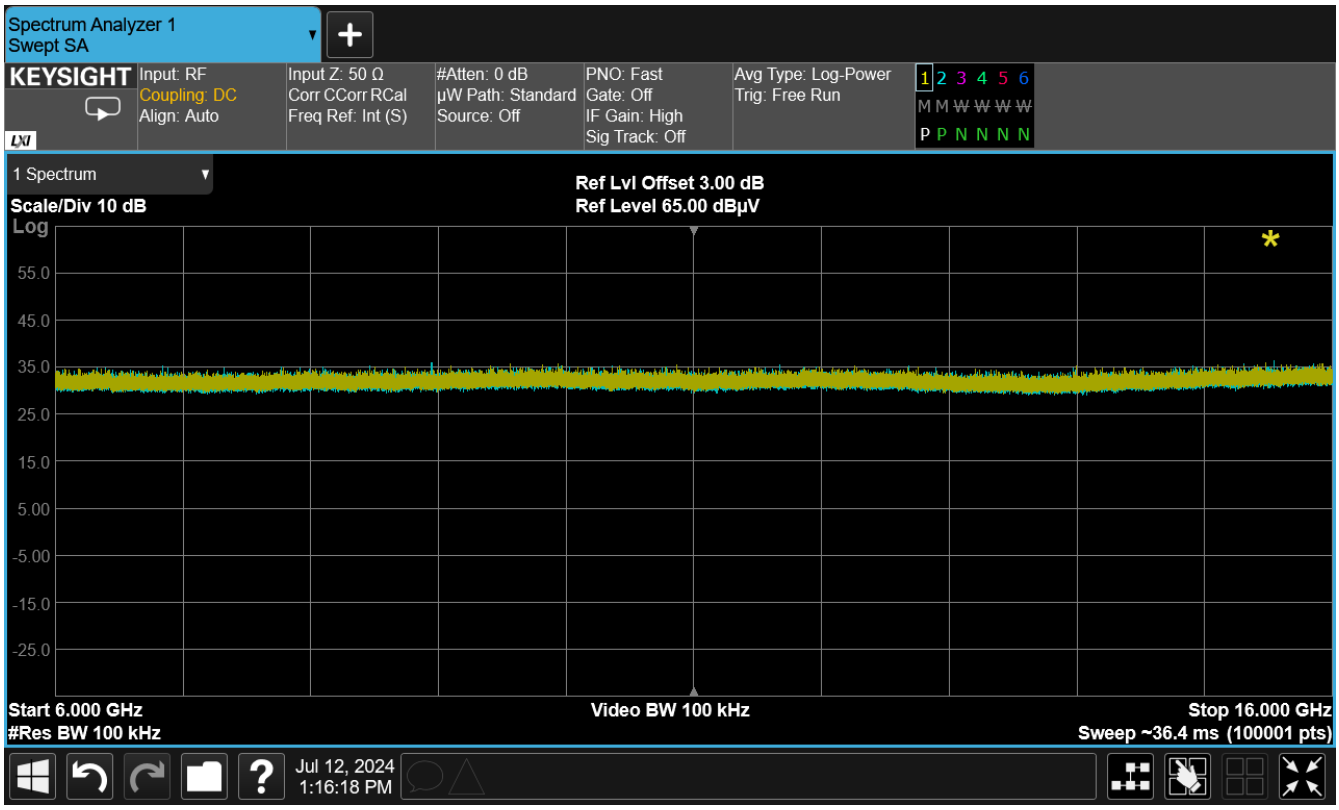
Table 16: Low Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 1 GHz to 30 GHz

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	Corr. Meas. (uV/m)	Limit (uV/m)	Margin (dB)	Detector	Notes
2390.00	V	175	1.6	320.1	5000.0	-23.9	Peak	BE
2390.00	V	175	1.6	56.3	500.0	-19.0	AVG	BE
2402.00	V	175	1.6	145591.5	--	--	Peak	TX
2402.00	V	175	1.6	--	--	--	--	TX
4804.00	V	175	1.6	466.8	5000.0	-20.6	Peak	
4804.00	V	175	1.6	93.9	500.0	-14.5	AVG	
7206.00	V	175	1.6	997.0	5000.0	-14.0	Peak	AMB
7206.00	V	175	1.6	232.7	500.0	-6.6	AVG	AMB
9608.00	V	175	1.6	1754.9	5000.0	-9.1	Peak	AMB
9608.00	V	175	1.6	381.7	500.0	-2.3	AVG	AMB
2390.00	H	90	1.6	313.1	5000.0	-24.1	Peak	BE
2390.00	H	90	1.6	59.7	500.0	-18.5	AVG	BE
2402.00	H	90	1.6	138731.2	--	--	Peak	TX
2402.00	H	90	1.6	--	--	--	--	TX
4804.00	H	90	1.6	547.1	5000.0	-19.2	Peak	
4804.00	H	90	1.6	98.4	500.0	-14.1	AVG	
7206.00	H	90	1.6	1279.2	5000.0	-11.8	Peak	AMB
7206.00	H	90	1.6	286.4	500.0	-4.8	AVG	AMB
9608.00	H	90	1.6	1729.3	5000.0	-9.2	Peak	AMB
9608.00	H	90	1.6	333.3	500.0	-3.5	AVG	AMB

* this portion of testing was performed on a 3-meter Open Area Test Site

Figure 89: Low Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 6 GHz to 16 GHz

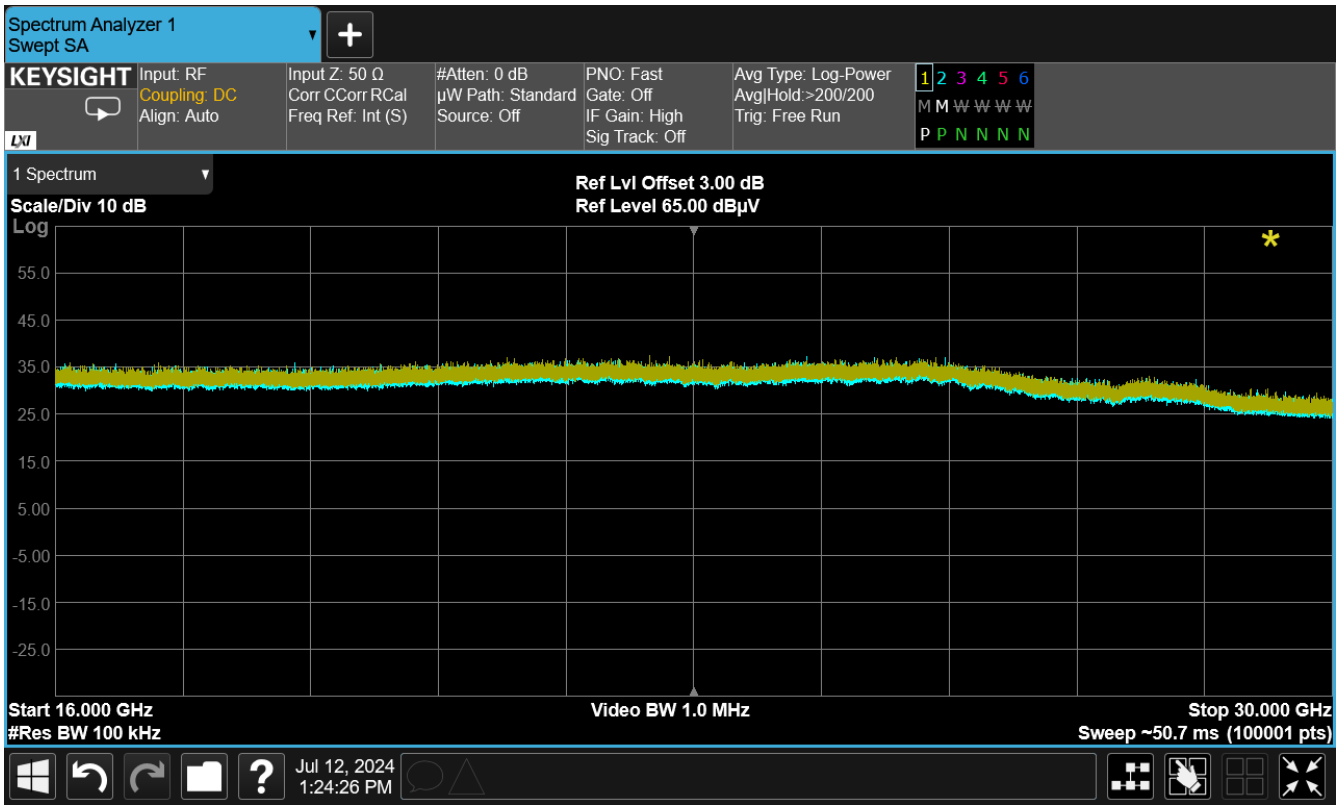


Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

Figure 90: Low Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 16 GHz to 30 GHz



Trace 1 = EUT On

Trace 2 = Ambient

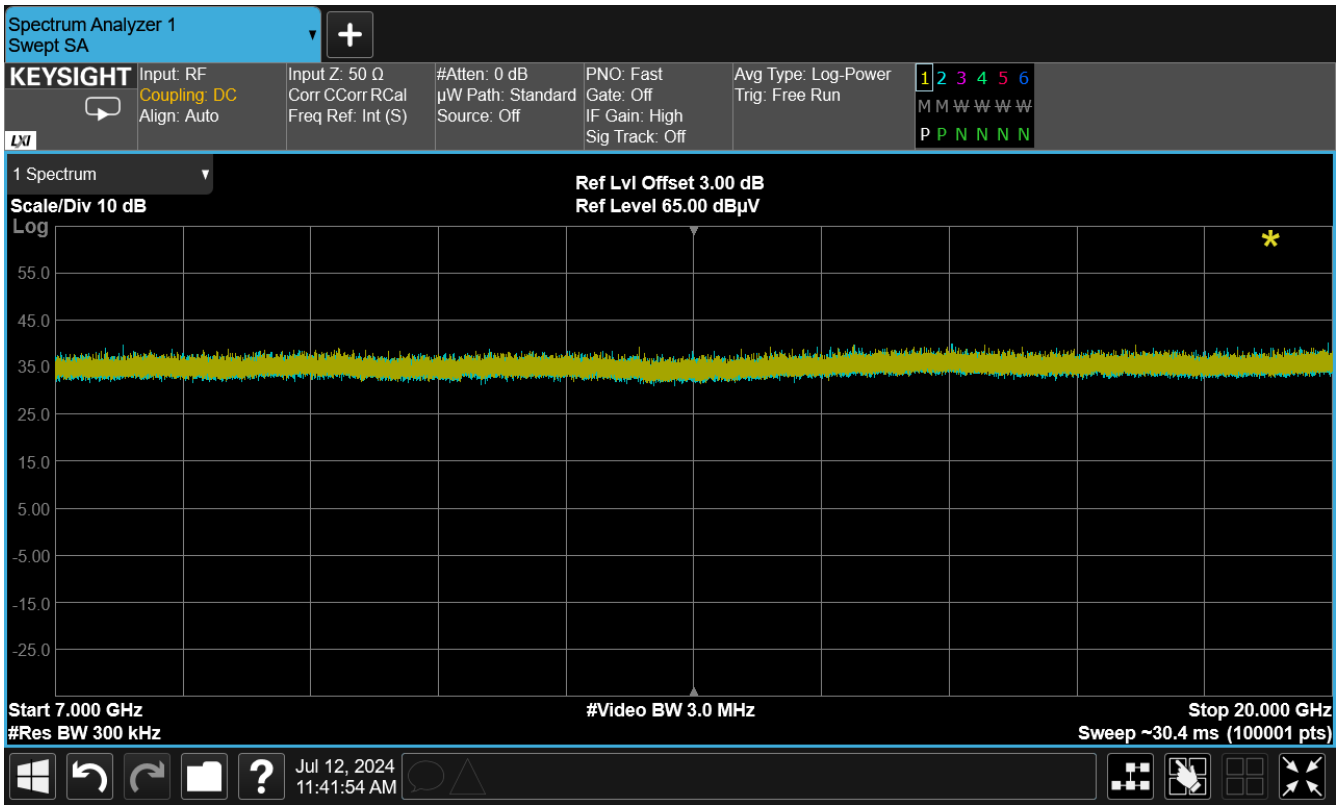
* no emissions detected

Table 17: Center Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 1 GHz to 30 GHz

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	Corr. Meas. (uV/m)	Limit (uV/m)	Margin (dB)	Detector	Notes
1651.40	V	180	1.5	145.7	5000.0	-30.7	Peak	AMB
1651.40	V	180	1.5	25.0	500.0	-26.0	AVG	AMB
2440.00	V	180	1.5	132761.9	--	--	Peak	TX
2440.00	V	180	1.5	--	--	--	--	TX
4880.00	V	180	1.5	635.0	5000.0	-17.9	Peak	Harm.
4880.00	V	180	1.5	96.3	500.0	-14.3	AVG	Harm.
7320.00	V	180	1.5	1284.4	5000.0	-11.8	Peak	AMB
7320.00	V	180	1.5	265.3	500.0	-5.5	AVG	AMB
1651.40	H	250	1.6	138.9	5000.0	-31.1	Peak	AMB
1651.40	H	250	1.6	24.4	500.0	-26.2	AVG	AMB
2440.00	H	250	1.6	137427.5				
2440.00	H	250	1.6					
4880.00	H	250	1.6	617.6	5000.0	-18.2	Peak	Harm.
4880.00	H	250	1.6	102.5	500.0	-13.8	AVG	Harm.
7320.00	H	250	1.6	1207.0	5000.0	-12.3	Peak	AMB
7320.00	H	250	1.6	273.3	500.0	-5.2	AVG	AMB

* this portion of testing was performed on a 3-meter Open Area Test Site

Figure 91: Center Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 7 GHz to 20 GHz

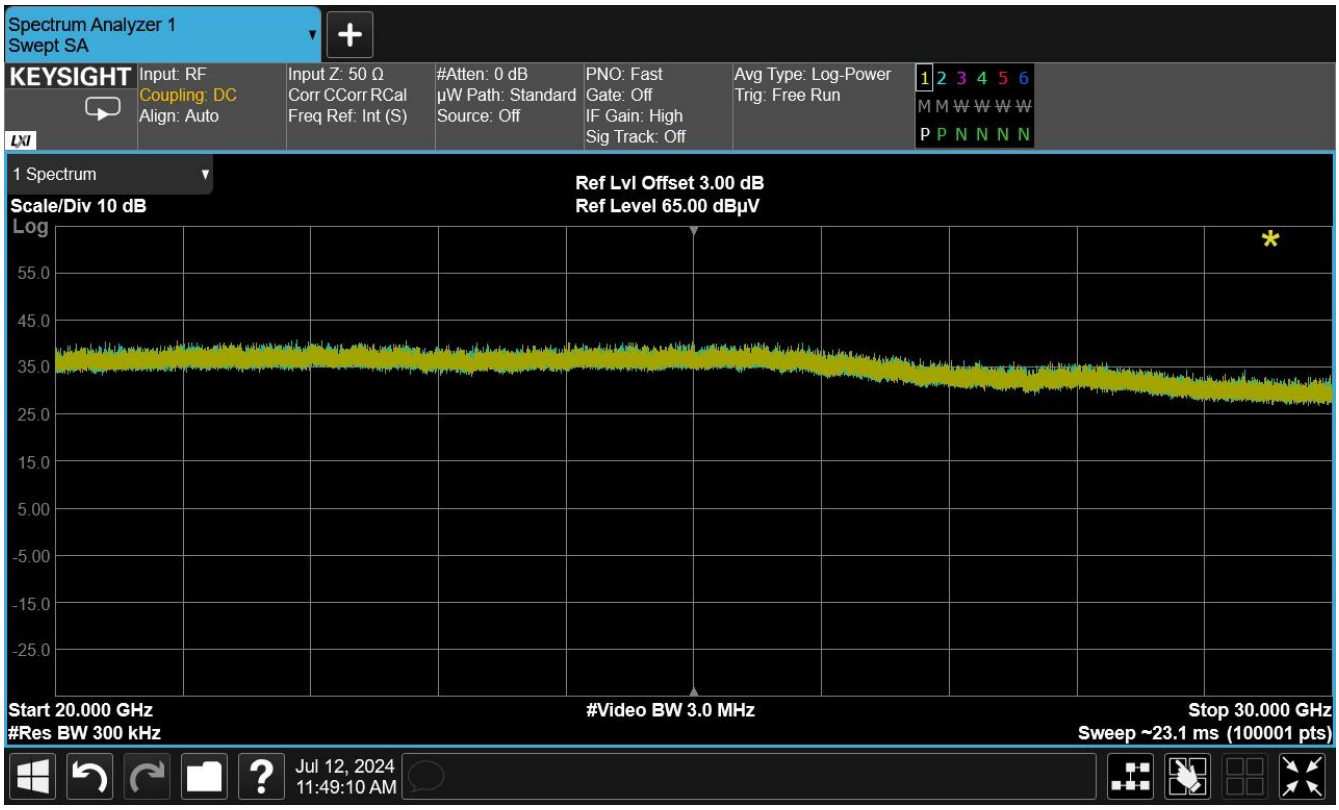


Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

Figure 92: Center Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 20 GHz to 30 GHz



Trace 1 = EUT On

Trace 2 = Ambient

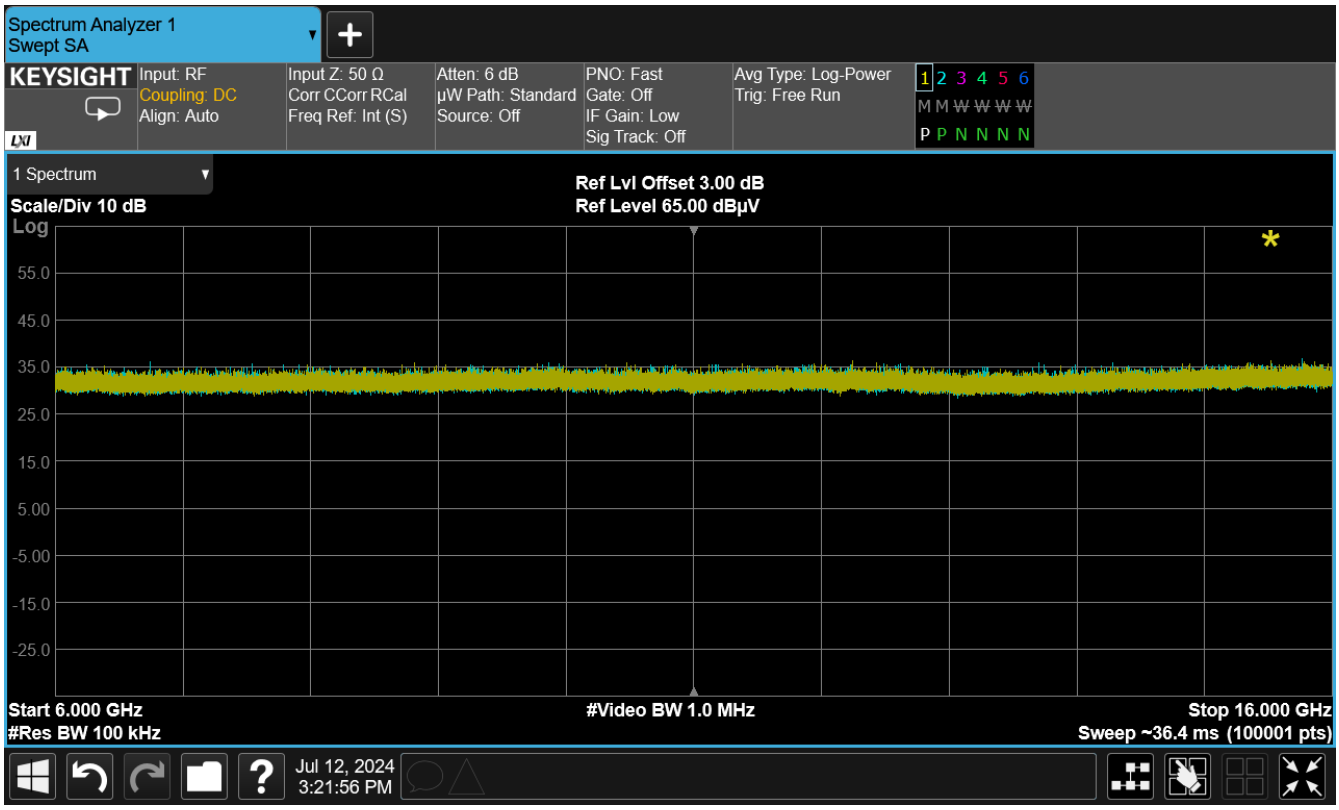
* no emissions detected

Table 18: High Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 1 GHz to 30 GHz

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	Corr. Meas. (uV/m)	Limit (uV/m)	Margin (dB)	Detector	Notes
2480.00	V	175	1.5	106708.2	--	--	Peak	TX
2480.00	V	175	1.5	--	--	--	--	TX
2483.50	V	175	1.5	319.5	5000.0	-23.9	Peak	BE
2483.50	V	175	1.5	48.2	500.0	-40.3	AVG	BE
4960.00	V	175	1.5	459.5	5000.0	-20.7	Peak	
4960.00	V	175	1.5	93.8	500.0	-14.5	AVG	
7440.00	V	175	1.5	1025.9	5000.0	-13.8	Peak	AMB
7440.00	V	175	1.5	223.9	500.0	-7.0	AVG	AMB
9920.00	V	175	1.5	1816.3	5000.0	-8.8	Peak	AMB
9920.00	V	175	1.5	385.7	500.0	-2.3	AVG	AMB
2480.00	H	200	1.5	109602.6	--	--	Peak	TX
2480.00	H	200	1.5	--	--	--	--	TX
2483.50	H	200	1.5	322.5	5000.0	-23.8	Peak	BE
2483.50	H	200	1.5	50.0	500.0	-20.0	AVG	BE
4960.00	H	200	1.5	463.2	5000.0	-20.7	Peak	
4960.00	H	200	1.5	93.5	500.0	-14.6	AVG	
7440.00	H	200	1.5	756.8	5000.0	-16.4	Peak	AMB
7440.00	H	200	1.5	190.1	500.0	-8.4	AVG	AMB
9920.00	H	200	1.5	1559.6	5000.0	-10.1	Peak	AMB
9920.00	H	200	1.5	349.1	500.0	-3.1	AVG	AMB

* this portion of testing was performed on a 3-meter Open Area Test Site

Figure 93: High Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 6 GHz to 16 GHz

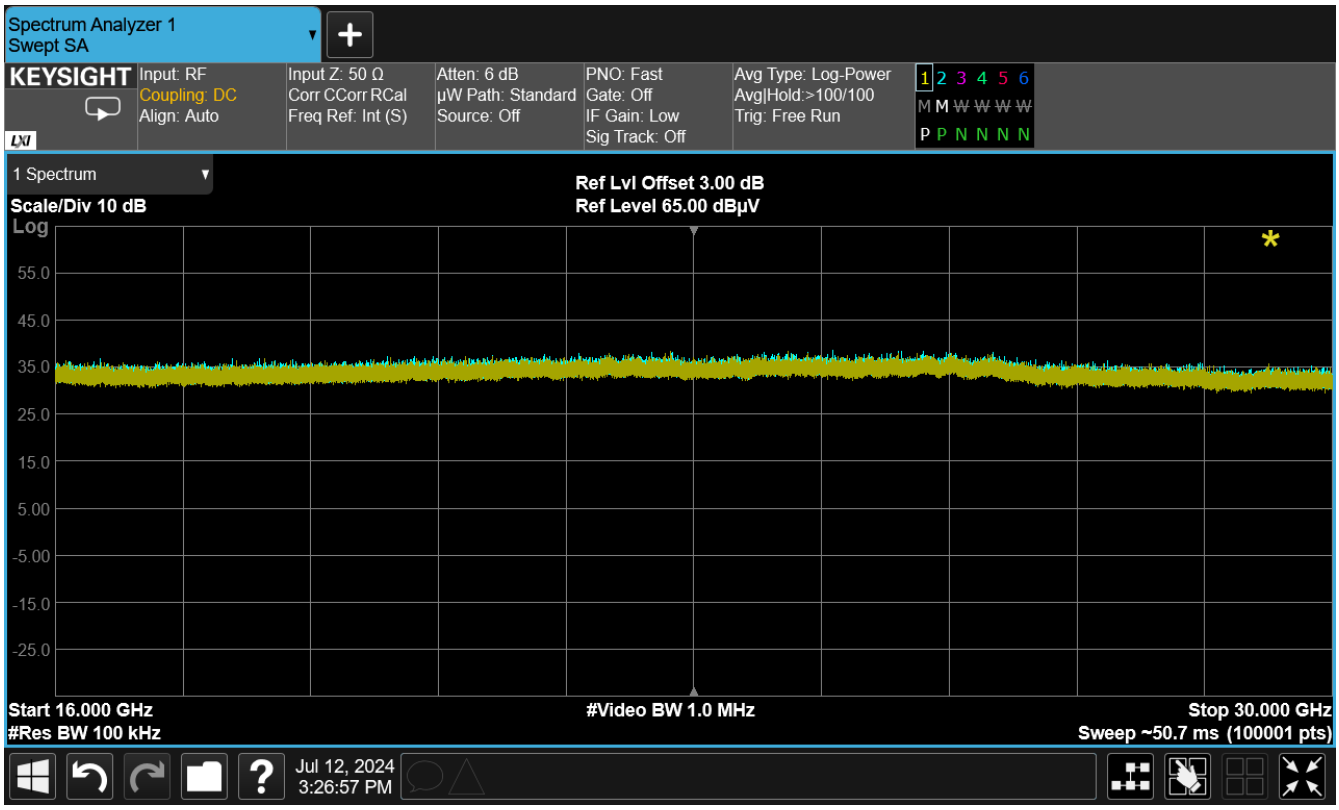


Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

Figure 94: High Channel, 2Mbps (π/4DQPSK) Radiated Test Data, 16 GHz to 30 GHz



Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

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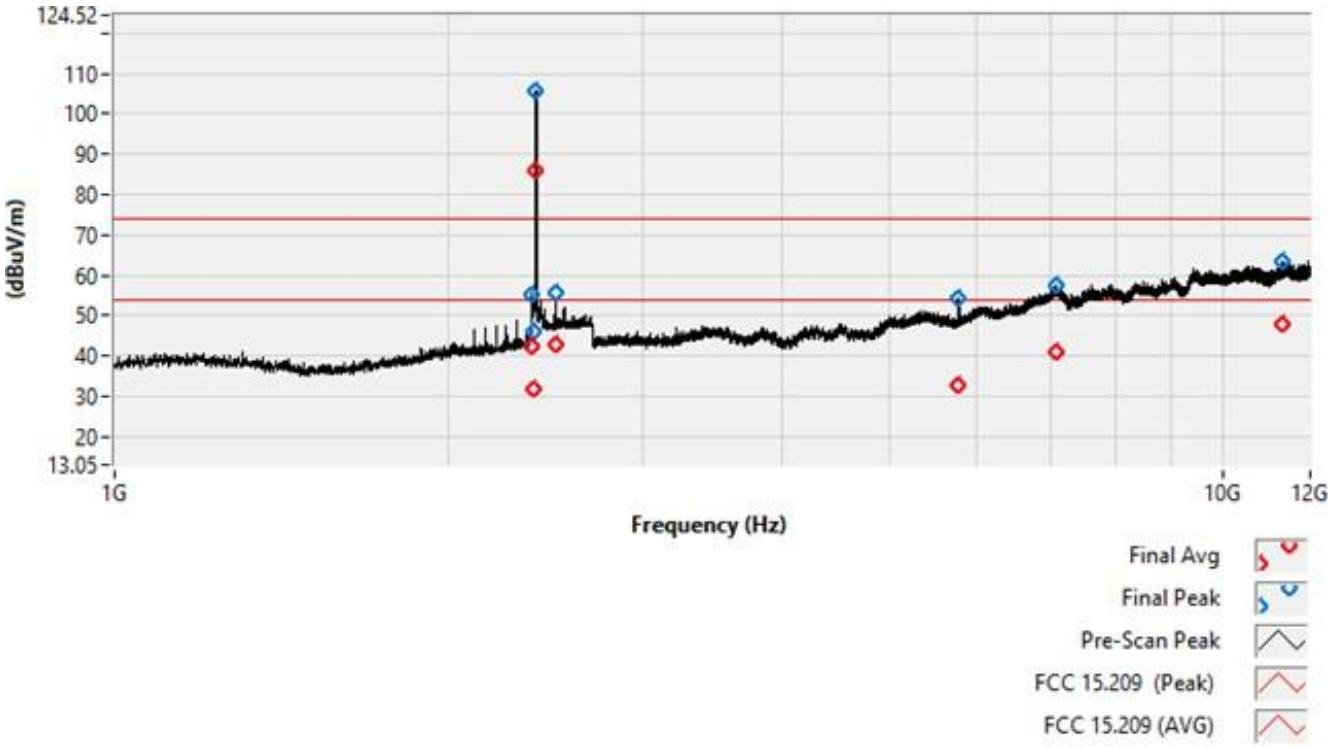
Table 19: Low Channel, 3Mbps (8DPSK) Radiated Test Data, 1 GHz to 26.5 GHz

Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2381.0	Peak	55.177	74	-18.823	25	Vert, 135
	AVG	42.461	54	-11.539	25	Vert, 135
2390.0 †	Peak	46.158	74	-27.842	25	Vert, 135
	AVG	31.632	54	-22.368	25	Vert, 135
2402.0	Peak	105.935			25	Vert, 135
	AVG	85.932			25	Vert, 135
2498.0	Peak	55.911	74	-18.089	25	Vert, 135
	AVG	42.891	54	-11.109	25	Vert, 135
5768.0	Peak	54.192	74	-19.808	25	Vert, 135
	AVG	32.622	54	-21.378	25	Vert, 135
7.082 ‡	Peak	57.463	74	-16.537	25	Vert, 135
	AVG	41.163	54	-12.837	25	Vert, 135
11.328 ‡	Peak	63.328	74	-10.672	25	Vert, 135
	AVG	48.021	54	-5.979	25	Vert, 135
11.965 ‡	Peak	63.495	74	-10.505	25	Vert, 135
	AVG	48.199	54	-5.801	285	Horiz, 155

† restricted bandedge

‡ ambient (noise floor)

(8DPSK) Pre-scan and Final Data (Vertical)



(8DPSK) Pre-scan and Final Data (Horizontal)

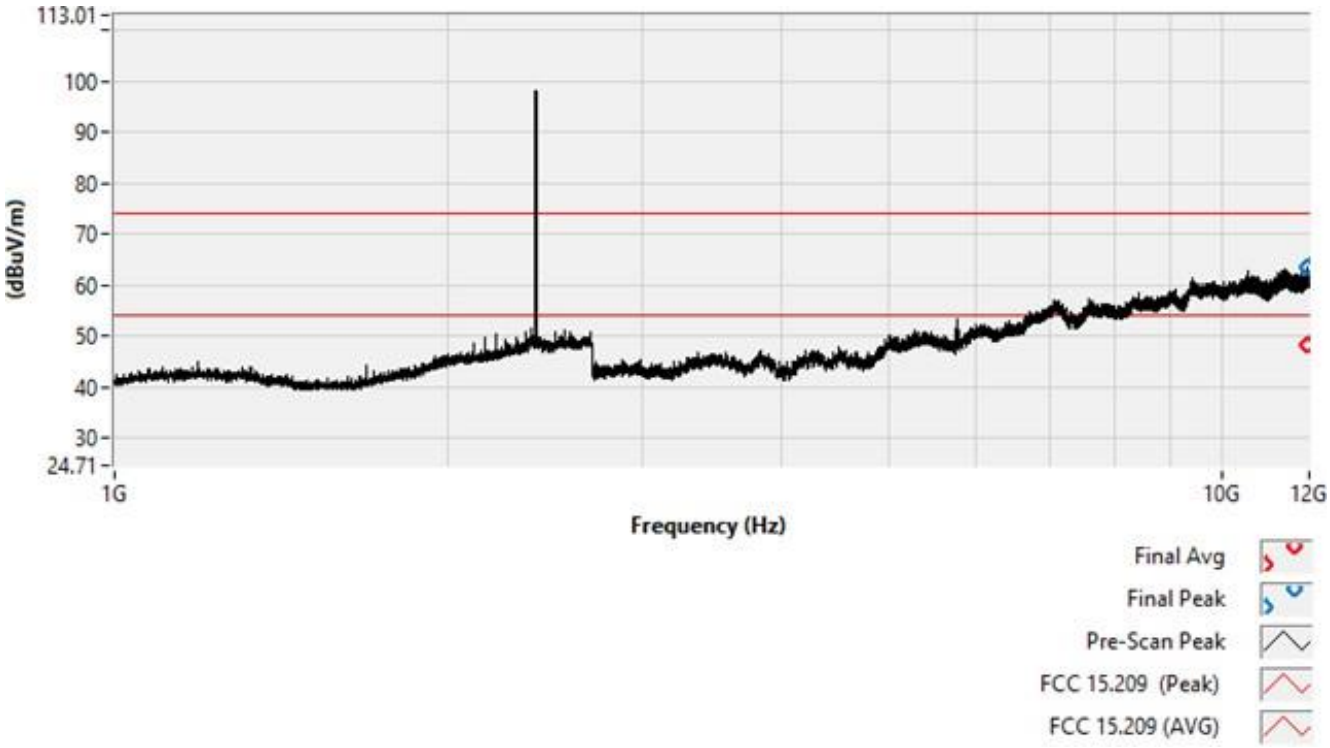
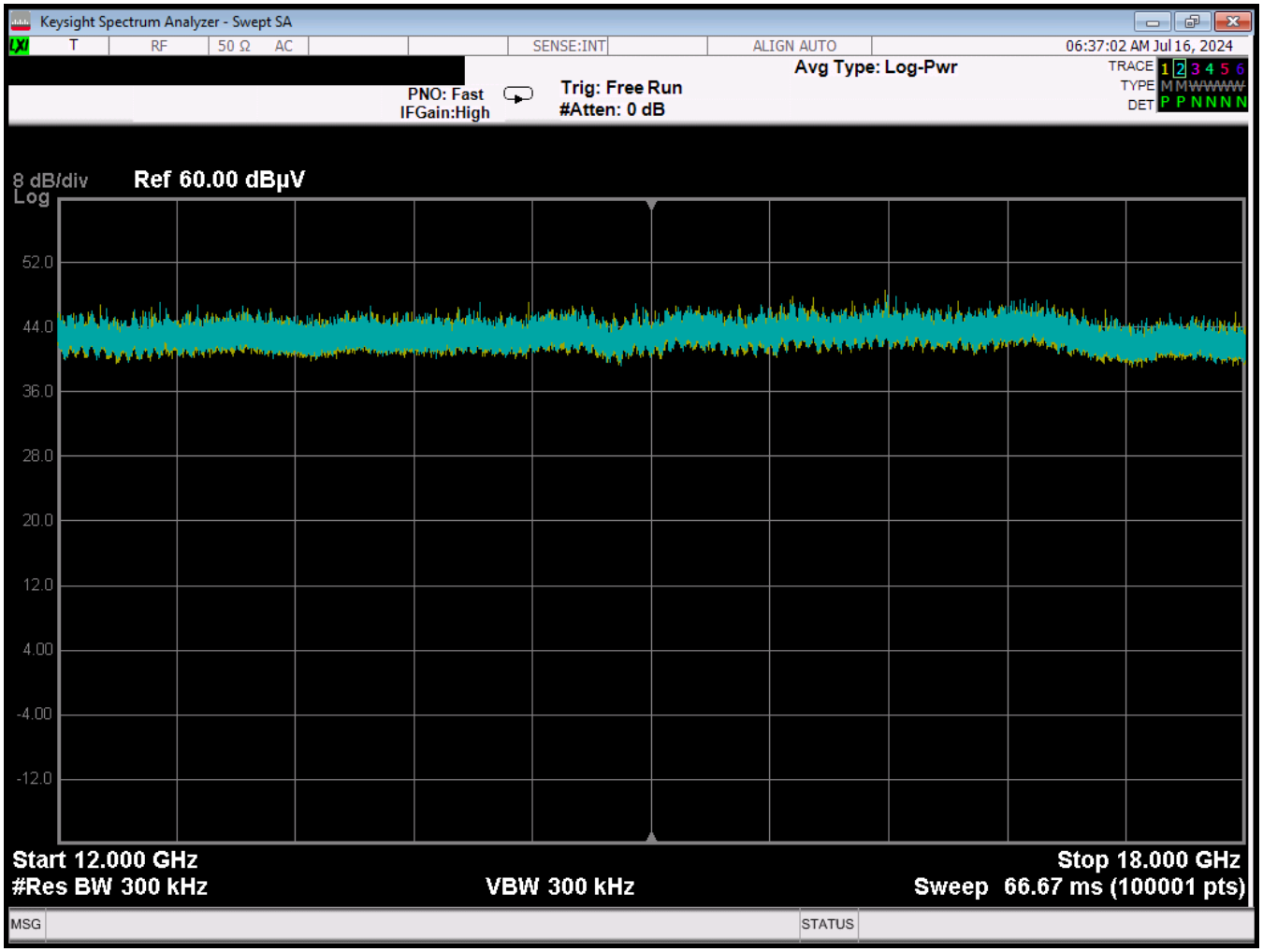


Figure 95: Low Channel, 3Mbps (8DPSK) Radiated Test Data, 12 GHz to 18 GHz

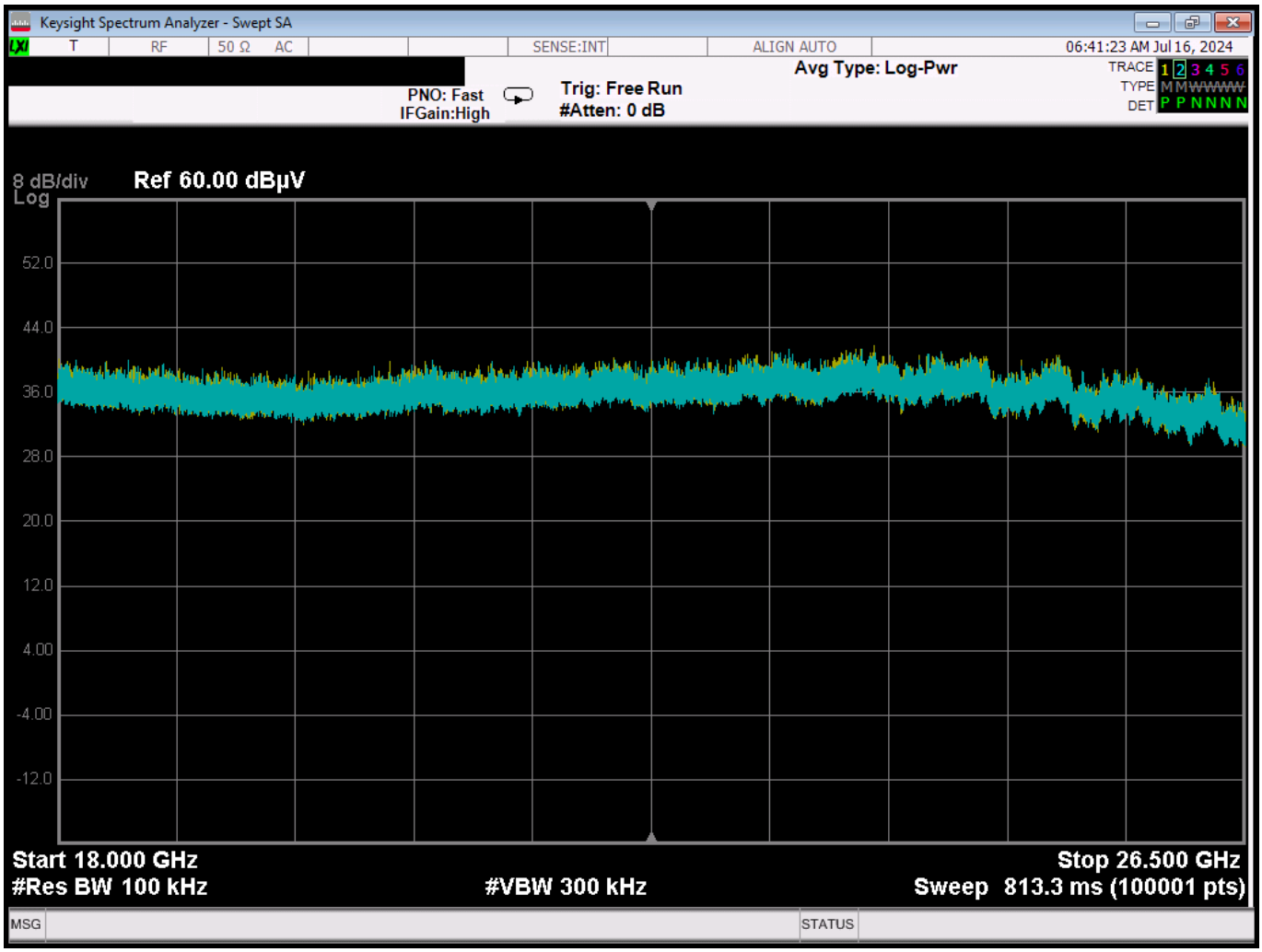


Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

Figure 96: Low Channel, 3Mbps (8DPSK) Radiated Test Data, 18 GHz to 26.5 GHz



Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

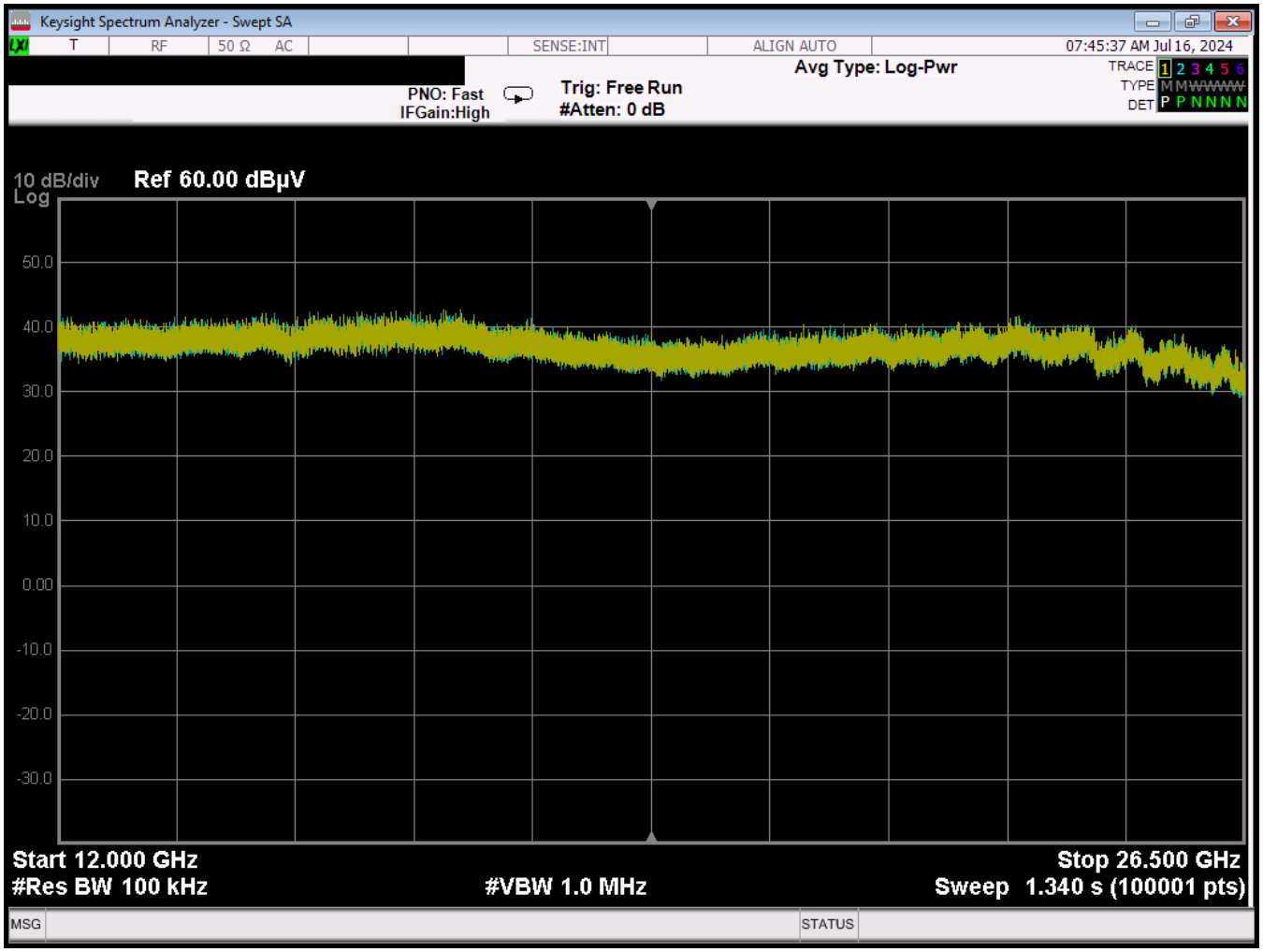
Table 20: High Channel, 3Mbps (8DPSK) Radiated Test Data, 1 GHz to 26.5 GHz

Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2432.0	Peak	58.894	(1) 74	-15.106	180	Vert, 100
	Avg	36.365	(2) 54	-17.635	285	Vert, 168
2480.0	Peak	98.504	(1) 74	24.504	180	Vert, 100
	Avg	87.661	(2) 54	33.661	285	Vert, 168
2483.5 †	Peak	48.098	(1) 74	-25.902	285	Vert, 168
	Avg	31.038	(2) 54	-22.962	285	Vert, 168
7679.0 ‡	Peak	57.277	(1) 74	-16.723	180	Vert, 100
	Avg	42.384	(2) 54	-11.616	285	Vert, 168
9465.0 ‡	Peak	60.955	(1) 74	-13.045	180	Horiz, 100
	Avg	45.105	(2) 54	-8.895	285	Horiz, 168
10553.0 ‡	Peak	62.523	(1) 74	-11.477	180	Horiz, 100
	Avg	47.258	(2) 54	-6.742	285	Horiz, 168
11472.0 ‡	Peak	63.377	(1) 74	-10.623	180	Vert, 100
	Avg	48.397	(2) 54	-5.603	285	Vert, 168

† restricted bandedge

‡ ambient (noise floor)

Figure 97: Low Channel, 3Mbps (8DPSK) Radiated Test Data, 12 GHz to 26.5 GHz



Trace 1 = EUT On

Trace 2 = Ambient

* no emissions detected

3.10 AC Powerline Conducted Emissions

3.10.1 Requirements

Compliance Standard: FCC Part 15.207

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

3.10.2 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:	16 °C
Relative Humidity:	44 %

3.10.3 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

3.10.4 Test Data

The EUT complies with the Class B Conducted Emissions requirements.

The EUT was evaluated in both a TX On mode and in an TX Off mode. Disabling the transmitter had no impact on the emissions.

The EUT can operate by DeWalt battery power. However, the EUT cannot charge the battery.

Also, the EUT cannot be coupled to a public AC mains network and have the battery installed simultaneously. (AC power or battery power, but not both). (and the EUT is not a battery charger).

The worst-case emission test data is provided below.

This data shall also serve to satisfy the digital unwanted emissions requirements for both FCC 15B and ISED Canada.

Table 21: AC Power Conducted Emissions Test Data

NEUTRAL / L1										
Frequency (MHz)	**Level QP (dBµV)**	**Level AVG (dBµV)**	**Cable Loss (dB)**	**LISN Corr (dB)**	**Level QP Corr (dBµV)**	**Level Avg Corr (dBµV)**	**Limit QP (dBµV)**	**Limit AVG (dBµV)**	**Margin QP (dB)**	**Margin AVG (dB)**
0.158	32.8	19.2	9.9	0.6	43.4	29.8	65.6	55.6	-22.2	-22.8
0.165	35.7	18.1	9.9	0.6	46.2	28.6	65.2	55.2	-19.0	-26.6
0.187	36.5	17.0	9.9	0.5	47.0	27.5	64.2	54.2	-17.2	-26.7
0.337	19.2	9.0	9.9	0.4	29.5	19.3	59.3	49.3	-29.8	-30.0
0.476	29.7	17.4	9.9	0.3	40.0	27.7	56.4	46.4	-16.4	-18.7
11.020	8.0	5.0	10.6	0.7	19.4	16.4	60.0	50.0	-40.6	-33.6
PHASE / L2										
Frequency (MHz)	**Level QP (dBµV)**	**Level AVG (dBµV)**	**Cable Loss (dB)**	**LISN Corr (dB)**	**Level QP Corr (dBµV)**	**Level Avg Corr (dBµV)**	**Limit QP (dBµV)**	**Limit AVG (dBµV)**	**Margin QP (dB)**	**Margin AVG (dB)**
0.153	37.9	17.6	9.9	0.5	48.3	28.0	65.8	55.8	-17.5	-27.8
0.170	35.3	16.3	9.9	0.4	45.6	26.6	65.0	55.0	-19.3	-28.3
0.205	30.7	14.6	9.9	0.3	40.9	24.9	63.4	53.4	-22.5	-28.5
0.387	19.2	10.9	9.9	0.3	29.4	21.1	58.1	48.1	-28.7	-27.0
0.489	24.6	14.9	9.9	0.3	34.8	25.1	56.2	46.2	-21.4	-21.1
11.028	11.2	5.0	10.6	0.6	22.5	16.3	60.0	50.0	-37.5	-33.7

4 Measurements

4.1 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 (9/2020) American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

4.2 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 22 below.

Table 22: Expanded Uncertainty List

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

5 Test Equipment

Table 23: Test Equipment List

Test Name:	**Benchtop RF Emissions**	Test Date: 5/13/2024 to 7/15/2024	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00942	AGILENT MXA-N9020A	SPECTRUM ANALYZER	12/19/2024
00942	AGILENT, N9020A	MXA SPECTRUM ANALYZER	12/19/2024
00834	ULTIFLEX, UFA 2108	SMA COAXIAL CABLE	12/26/2024
00885	UTIFLEX, 0-360-100	1METER SMA CABLE	6/25/2025
N/A	WEINSCHEL, WA75	20DB ATTENUATOR, 40GHZ	Cal. Before Use

Test Name:	**Radiated Emissions**	Test Date: 5/16/2024 & 5/17/2024 to 7/15/2024	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00942	AGILENT, N9020A	MXA SPECTRUM ANALYZER	12/19/2024
00644	SUNOL SCIENCES CORP.	BICONALOG ANTENNA	11/14/2024
00425	ARA, DRG-118/A	HORN ANTENNA	11/7/2024
00977	JUNKOSHA, MWX322	ARMORED COAX. CABLE	12/26/2024
00806	MINI-CIRCUITS	SMA COAXIAL CABLE	12/26/2024
00834	ULTIFLEX, UFA 2108	SMA COAXIAL CABLE	12/26/2024
00276	ELECTRO-METRICS	RF PRE-AMPLIFIER	5/19/2025
00066	B&Z (HP), BZ-01002650	PRE-AMPLIFIER	5/19/2025
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

Test Name:	**AC Mains Conducted Emissions**	Test Date: 5/14/2024	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00942	AGILENT, N9020A	MXA SPECTRUM ANALYZER	12/19/2024
00053	HP, 11947A	TRANSIENT LIMITER	1/11/2025
00125	SOLAR, LISN	8028-50-TS-24-BNC	4/18/2025
00126	SOLAR, LISN	8028-50-TS-24-BNC	4/18/2025
00330	WLL, BNC CABLE	CE SITE 1 CABLE	