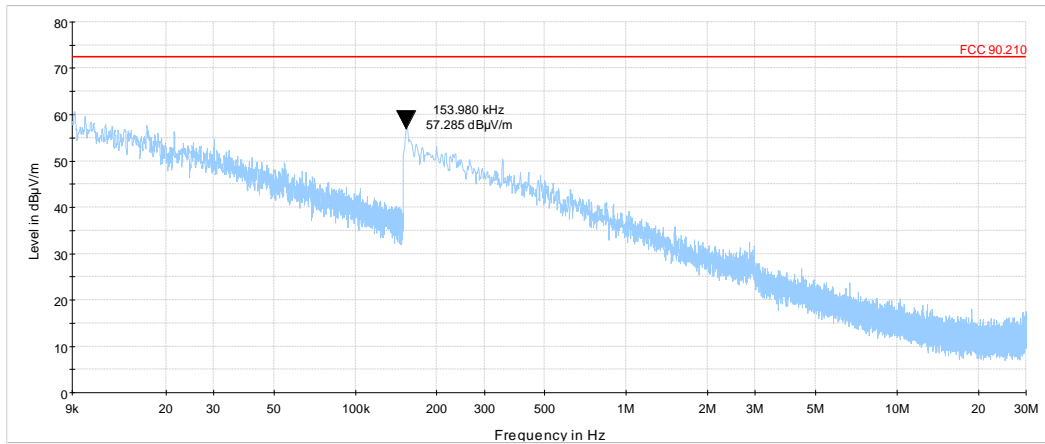




<b>Test specification: Section 90.210, Radiated spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 04-Jan-24			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 47 %	<b>Air Pressure:</b> 1018 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

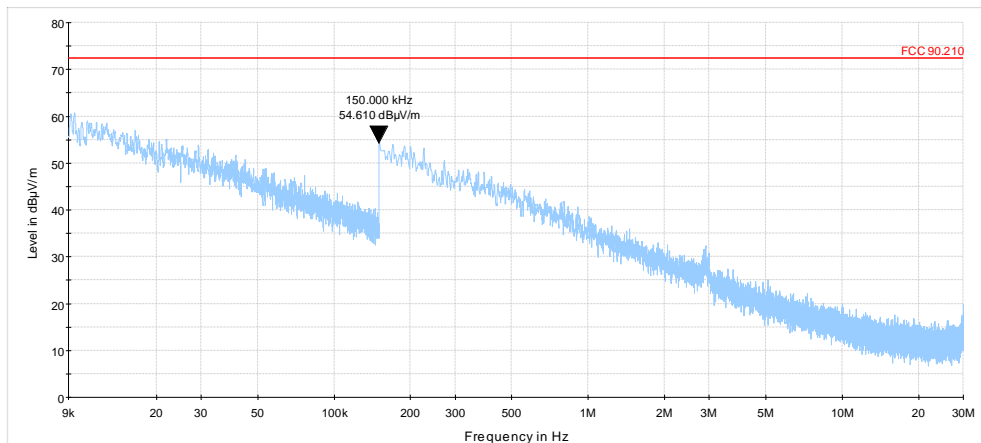
**Plot 7.4.1 Radiated emission measurements in 9 kHz - 30 MHz range**

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Low  
 TEST DISTANCE: 3 m



**Plot 7.4.2 Radiated emission measurements in 9 kHz - 30 MHz range**

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Mid  
 TEST DISTANCE: 3 m

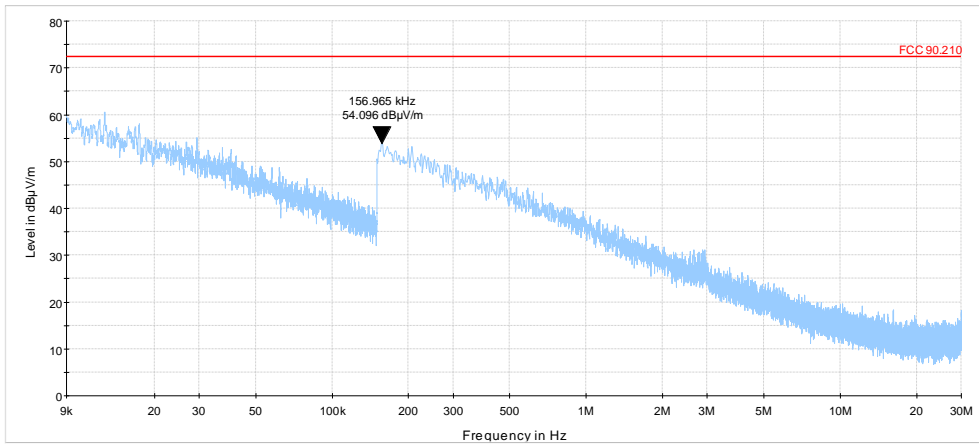




<b>Test specification: Section 90.210, Radiated spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 04-Jan-24			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 47 %	<b>Air Pressure:</b> 1018 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Plot 7.4.3 Radiated emission measurements in 9 kHz - 30 MHz range

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
TEST DISTANCE: 3 m

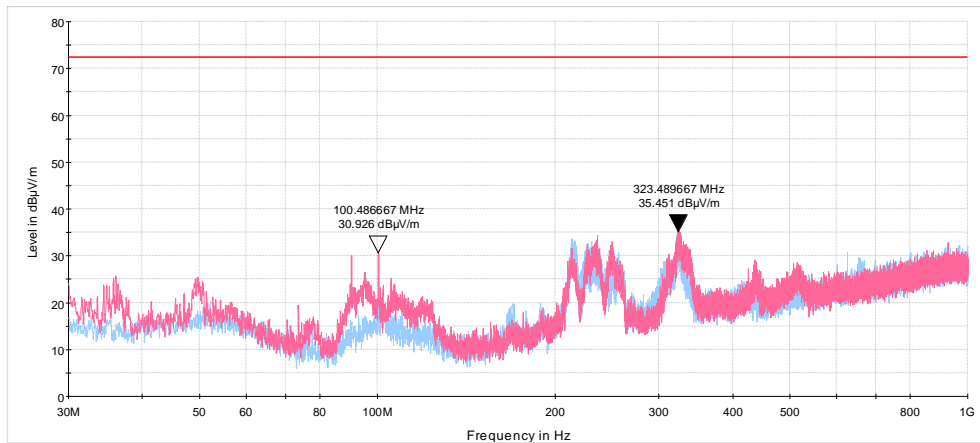




<b>Test specification: Section 90.210, Radiated spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 04-Jan-24			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 47 %	<b>Air Pressure:</b> 1018 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

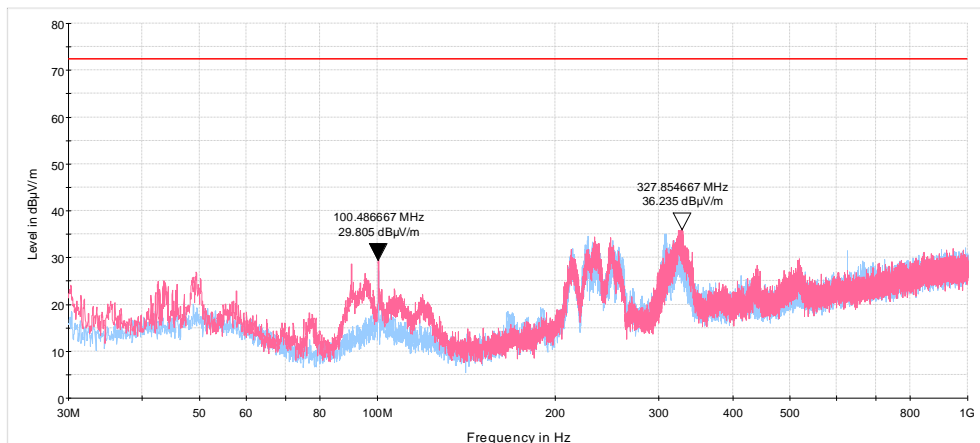
**Plot 7.4.4 Radiated emission measurements in 30 - 1000 MHz range**

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



**Plot 7.4.5 Radiated emission measurements in 30 - 1000 MHz range**

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m

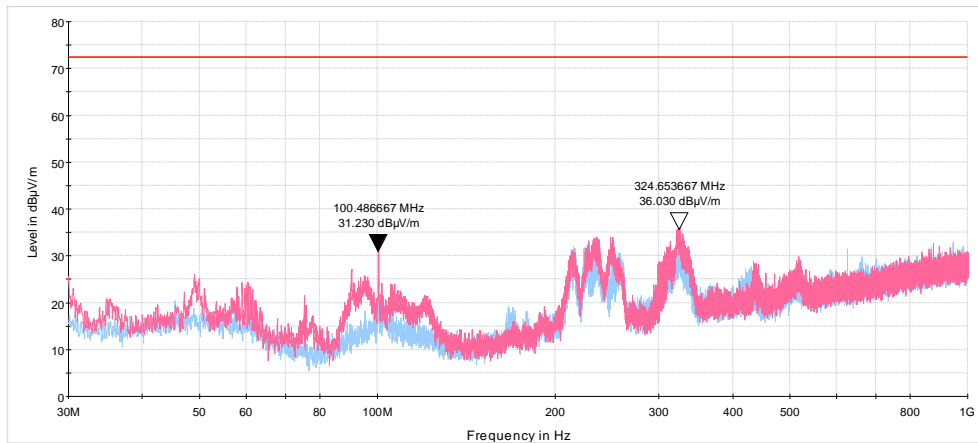




<b>Test specification: Section 90.210, Radiated spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 04-Jan-24			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 47 %	<b>Air Pressure:</b> 1018 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

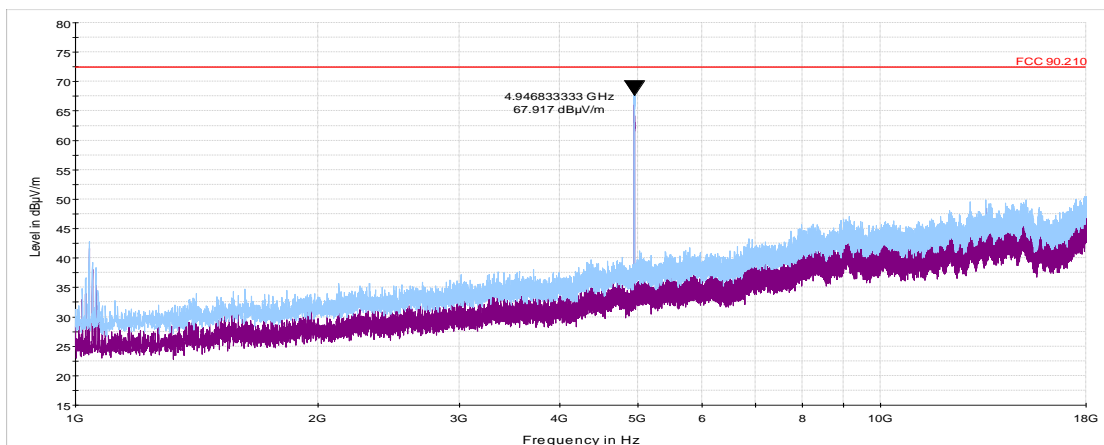
**Plot 7.4.6 Radiated emission measurements in 30 - 1000 MHz range**

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



**Plot 7.4.7 Radiated emission measurements in 1000 – 18000 MHz range**

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m

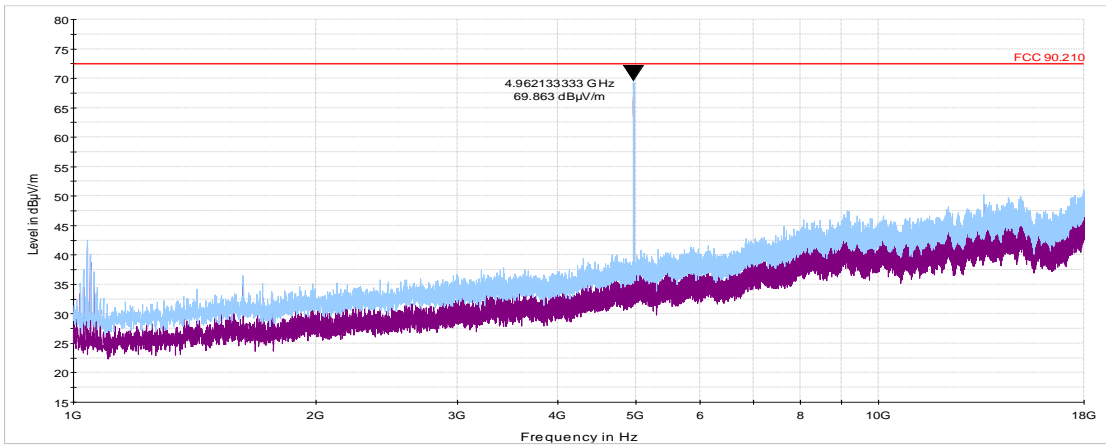




<b>Test specification: Section 90.210, Radiated spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 04-Jan-24			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 47 %	<b>Air Pressure:</b> 1018 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

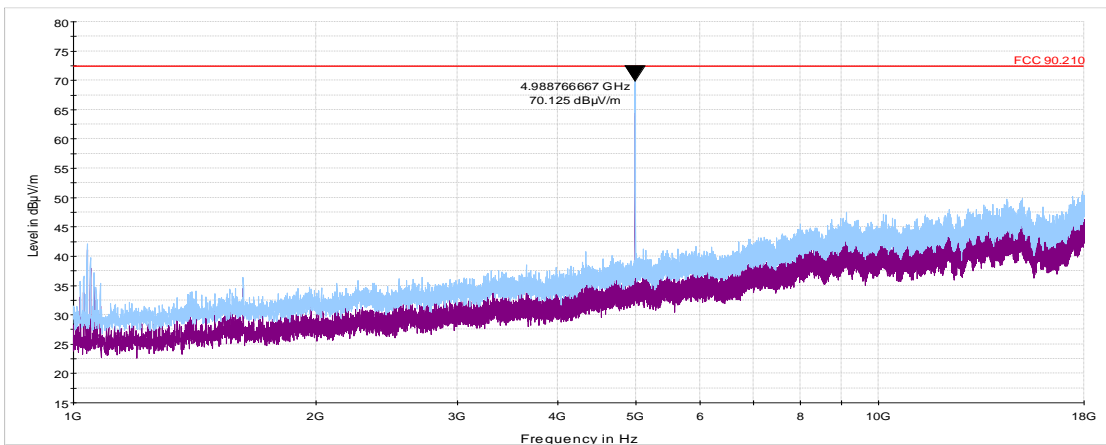
**Plot 7.4.8 Radiated emission measurements in 1000 – 18000 MHz range**

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Mid  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



**Plot 7.4.9 Radiated emission measurements in 1000 – 18000 MHz range**

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m

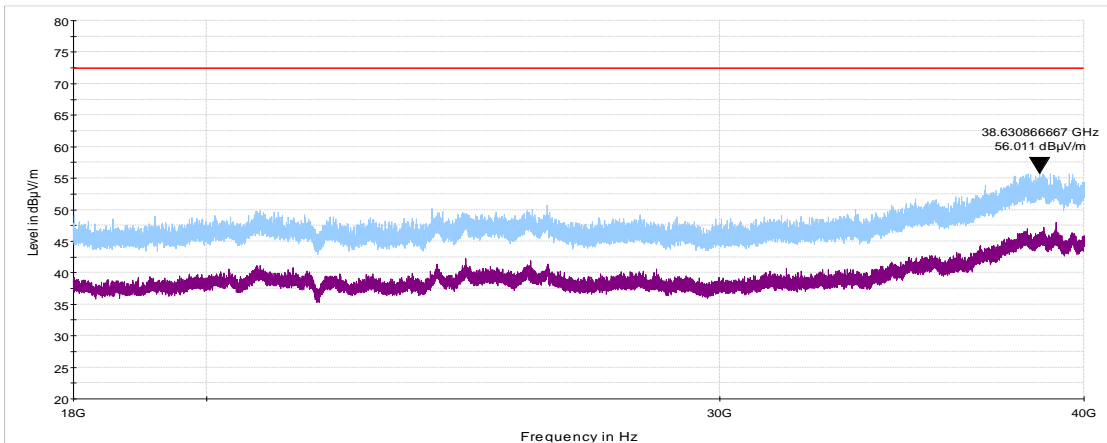




<b>Test specification: Section 90.210, Radiated spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 04-Jan-24			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 47 %	<b>Air Pressure:</b> 1018 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

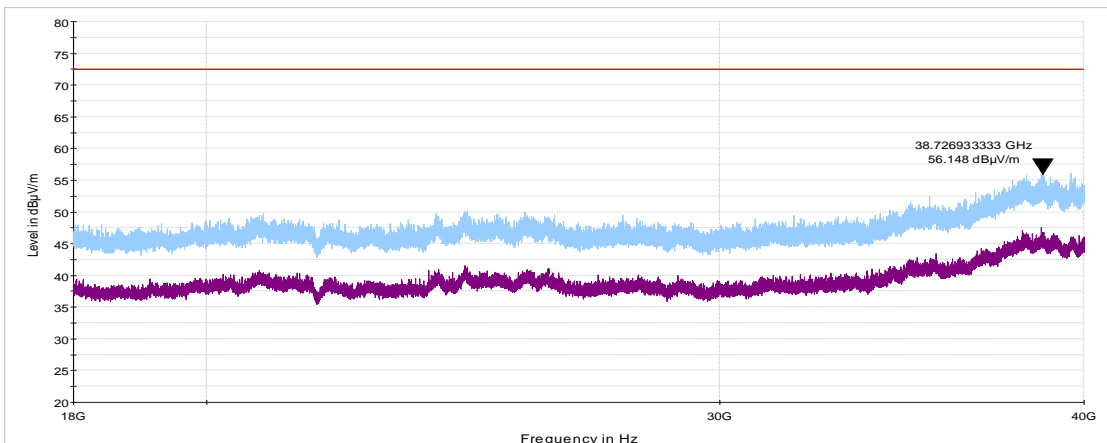
**Plot 7.4.10 Radiated emission measurements in 18000 – 40000 MHz range**

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



**Plot 7.4.11 Radiated emission measurements in 18000 – 40000 MHz range**

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Mid  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m

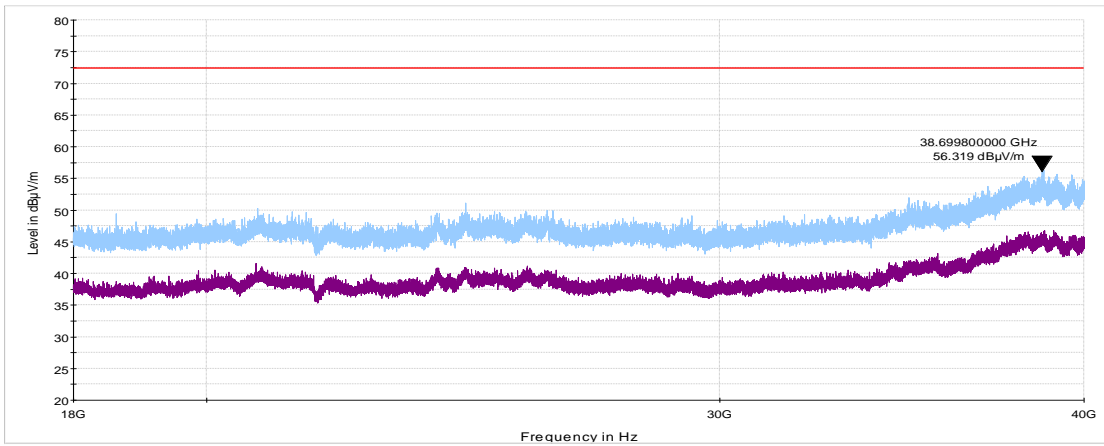




<b>Test specification: Section 90.210, Radiated spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 04-Jan-24			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 47 %	<b>Air Pressure:</b> 1018 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Plot 7.4.12 Radiated emission measurements in 18000 – 40000 MHz range

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m





<b>Test specification: Section 90.210, Conducted spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

## 7.5 Spurious emissions at RF antenna connector test

### 7.5.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Spurious emission limits

Frequency, MHz	Spurious emission, dBm
0.009 – 10th harmonic*	-25

\* - spurious emission limits do not apply to the in band emission within  $\pm 150\%$  of the authorized bandwidth from the carrier; investigated in course of emission mask testing. The high frequency is the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower

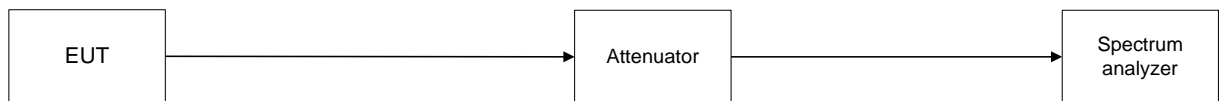
### 7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

7.5.2.2 The EUT was adjusted to produce maximum available for end user RF output power.

7.5.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2, Table 7.5.3 and Table 7.5.4 and the associated plots.

Figure 7.5.1 Spurious emission test setup







<b>Test specification: Section 90.210, Conducted spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Table 7.5.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: QPSK (worst case variant)  
 MODULATING SIGNAL: PRBS  
 CHANNEL SPACING: 10 MHz  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission*, dBm	Total Spurious emission**, dBm	Limit, dBm	Margin, dB***	Verdict
<b>Low carrier frequency</b>									
4904.0	-31.63	Included	Included	1000	-31.63	-28.63	-25.0	-3.63	Pass
5008.0	-30.15	Included	Included	1000	-30.15	-27.15	-25.0	-2.15	Pass
<b>Mid carrier frequency</b>									
4888.6	-32.05	Included	Included	1000	-32.05	-29.05	-25.0	-4.05	Pass
4892.4	-33.13	Included	Included	1000	-33.13	-30.15	-25.0	-5.15	Pass
29156.5	-39.55	Included	Included	1000	-39.55	-36.55	-25.0	-11.55	Pass
<b>High carrier frequency</b>									
2884.7	-33.05	Included	Included	1000	-33.05	-30.05	-25.0	-5.05	Pass
5034.0	-30.29	Included	Included	1000	-30.29	-27.29	-25.0	-3.29	Pass
26083.5	-39.24	Included	Included	1000	-39.24	-36.24	-25.0	-11.24	Pass
31714.0	-39.84	Included	Included	1000	-39.84	-36.84	-25.0	-11.84	Pass

\* - SA Reading over 1 chain = Max SA reading (Chains #1 or chains #2)

\*\* - Total emission = Maximum emission per chain + 10\*log(N)

\*\*\* - Margin = Spurious emission – specification limit.



<b>Test specification: Section 90.210, Conducted spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Table 7.5.3 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 4942.5 – 4987.5 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: QPSK (worst case variant)  
 MODULATING SIGNAL: PRBS  
 CHANNEL SPACING: 25 MHz  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission*, dBm	Total Spurious emission**, dBm	Limit, dBm	Margin, dB***	Verdict
<b>Low carrier frequency</b>									
4927.5	-30.07	Included	Included	1000	-30.07	-27.07	-25.0	-2.07	Pass
27083.0	-39.60	Included	Included	1000	-39.60	-36.60	-25.0	-11.60	Pass
<b>Mid carrier frequency</b>									
4927.5	-30.62	Included	Included	1000	-30.62	-27.62	-25.0	-2.62	Pass
<b>High carrier frequency</b>									
4927.5	-31.45	Included	Included	1000	-31.45	-28.45	-25.0	-3.45	Pass
26.151.5	-39.69	Included	Included	1000	-39.69	-36.69	-25.0	-11.69	Pass

\* - SA Reading over 1 chain = Max SA reading (Chains #1 or chains #2)  
 \*\* - Total emission = Maximum emission per chain + 10\*log(N)  
 \*\* - Margin = Spurious emission – specification limit.



<b>Test specification: Section 90.210, Conducted spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

**Table 7.5.4 Spurious emission test results**

ASSIGNED FREQUENCY RANGE: 4942.5 – 4987.5 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: QPSK (worst case variant)  
 MODULATING SIGNAL: PRBS  
 CHANNEL SPACING: 50 MHz  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission*, dBm	Total Spurious emission**, dBm	Limit, dBm	Margin, dB***	Verdict
<b>Low carrier frequency</b>									
No spurious emissions were found									
<b>Mid carrier frequency</b>									
4455.4	-36.68	Included	Included	1000	-36.73	-33.73	-25.0	-8.73	Pass
4474.5	-37.10	Included	Included	1000	-37.10	-34.10	-25.0	-9.10	Pass
4583.7	-38.35	Included	Included	1000	-38.35	-36.35	-25.0	-11.35	Pass
4915.0	-32.65	Included	Included	1000	-32.65	-29.65	-25.0	-4.65	Pass
5015.0	-34.76	Included	Included	1000	-34.76	-31.76	-25.0	-6.76	Pass
31576.5	-39.37	Included	Included	1000	-39.37	-36.37	-25.0	-11.37	Pass
<b>High carrier frequency</b>									
No spurious emissions were found									

\* - SA Reading over 1 chain = Max SA reading (Chains #1 or chains #2)  
 \*\* - Total emission = Maximum emission per chain + 10\*log(N)  
 \*\*\* - Margin = Spurious emission – specification limit.

**Reference numbers of test equipment used**

HL 3357	HL 5376	HL 5596	HL 5636	HL 3818	HL 5626		
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Full description is given in Appendix A.



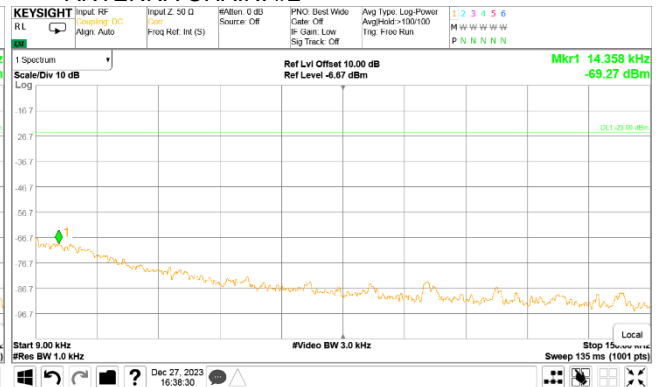
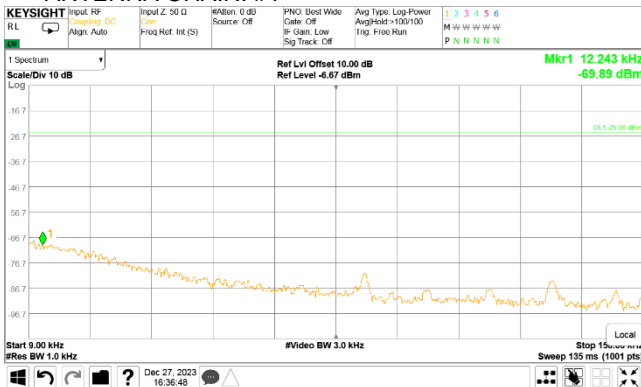
HERMON LABORATORIES

<b>Test specification: Section 90.210, Conducted spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Plot 7.5.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

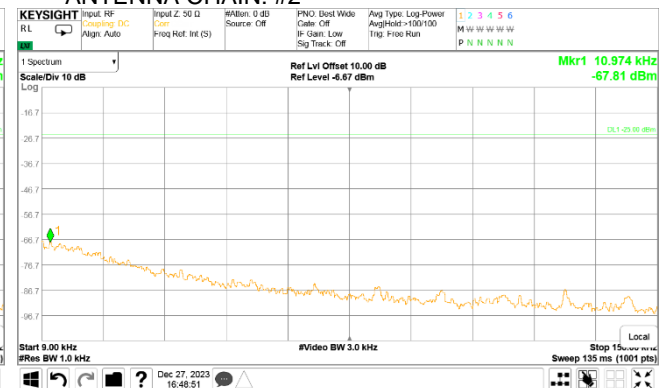
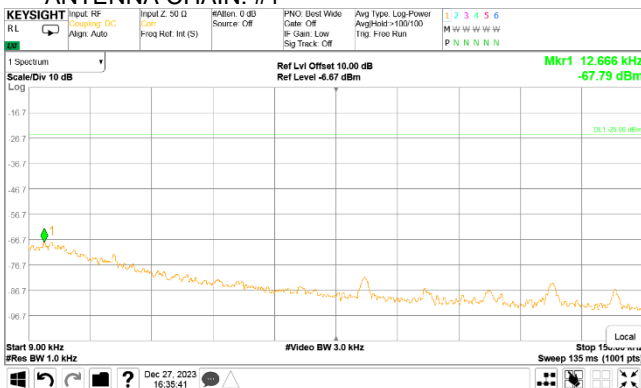
QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2



Plot 7.5.2 Spurious emission measurements in 9 kHz - 150 kHz range at mid carrier frequency

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2



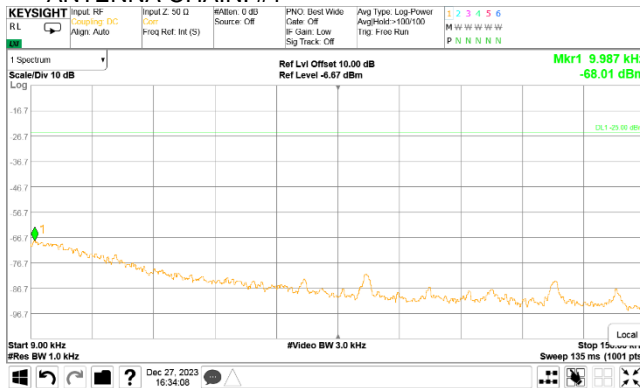


HERMON LABORATORIES

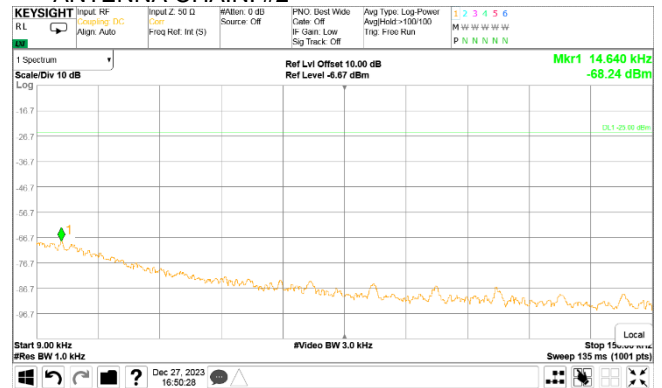
<b>Test specification:</b> Section 90.210, Conducted spurious emissions			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Plot 7.5.3 Spurious emission measurements in 9 kHz - 150 kHz range at high carrier frequency

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

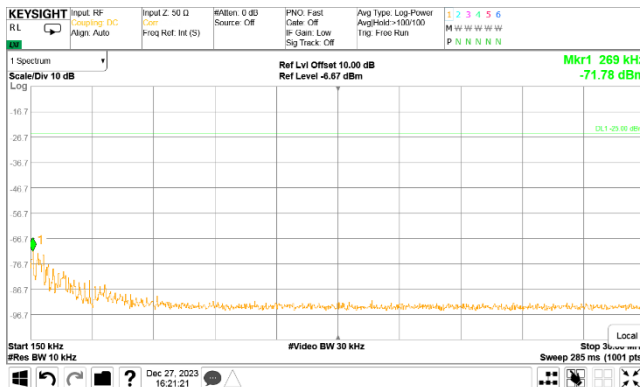


QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2

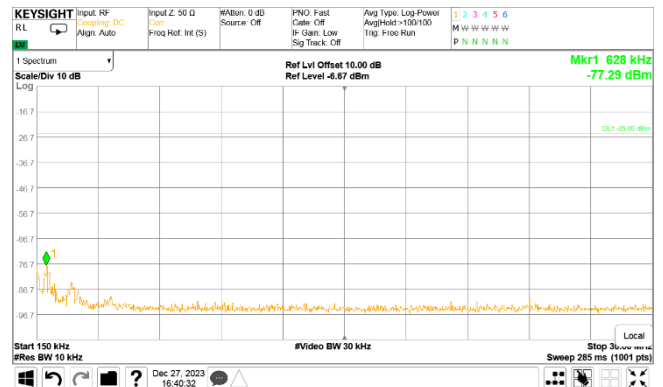


Plot 7.5.4 Spurious emission measurements in 150 kHz – 30 MHz range at low carrier frequency

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1



QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2





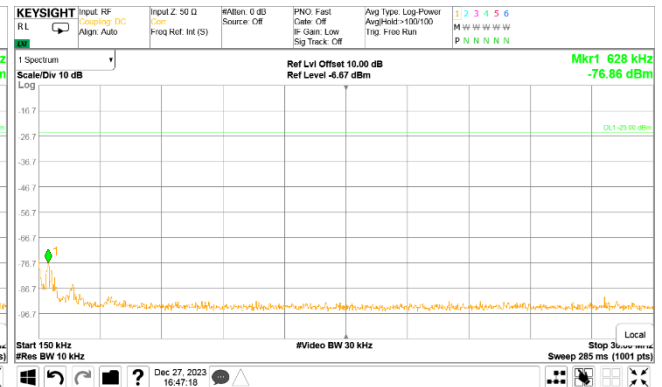
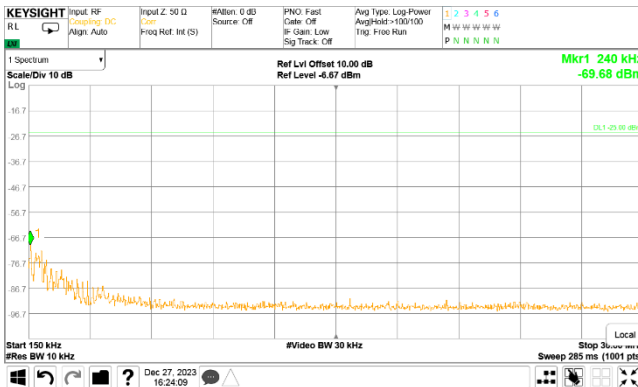
HERMON LABORATORIES

<b>Test specification: Section 90.210, Conducted spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

**Plot 7.5.5 Spurious emission measurements in 150 kHz – 30 MHz range at mid carrier frequency**

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

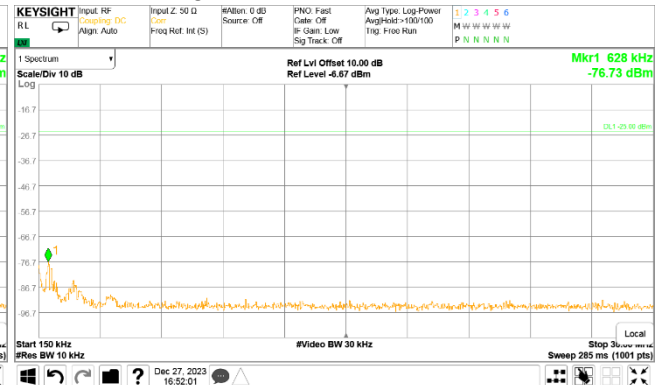
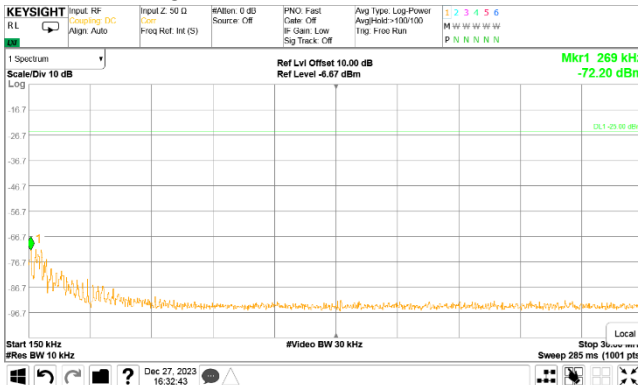
QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2



**Plot 7.5.6 Spurious emission measurements in 150 kHz – 30 MHz range at high carrier frequency**

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2





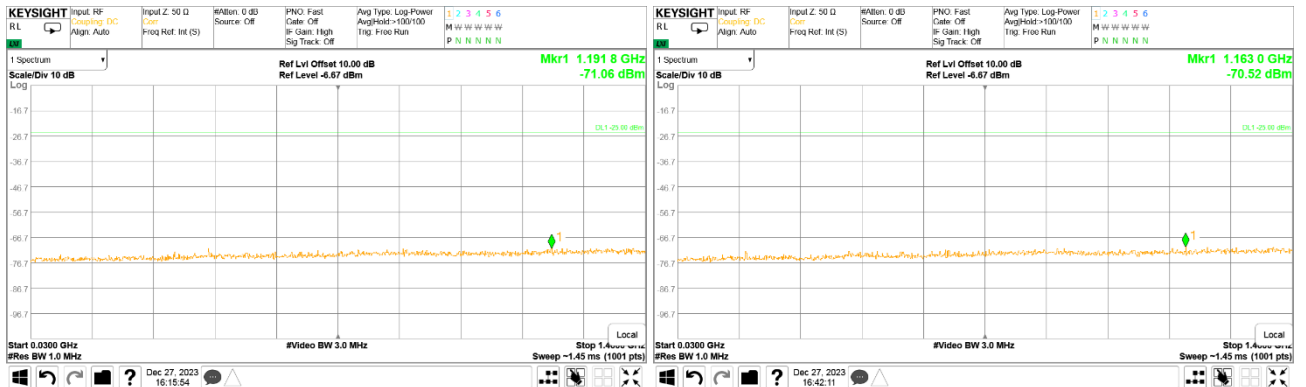
HERMON LABORATORIES

<b>Test specification: Section 90.210, Conducted spurious emissions</b>			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Plot 7.5.7 Spurious emission measurements in 30 - 1400 MHz range at low carrier frequency

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

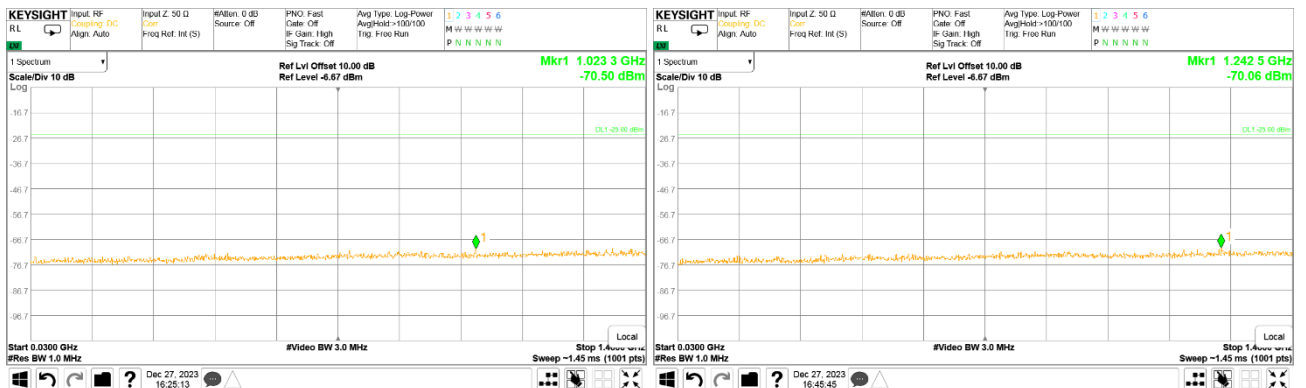
QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2



Plot 7.5.8 Spurious emission measurements in 30 - 1400 MHz range at mid carrier frequency

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2





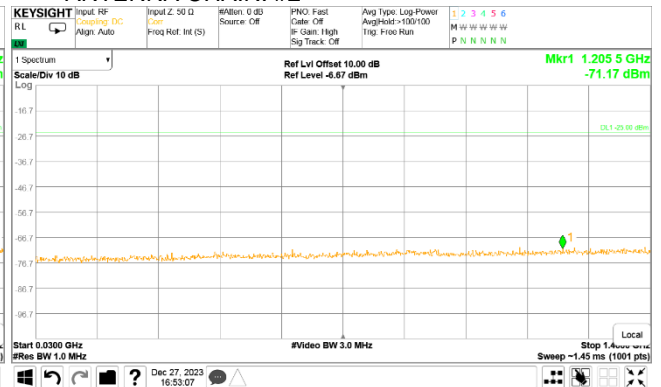
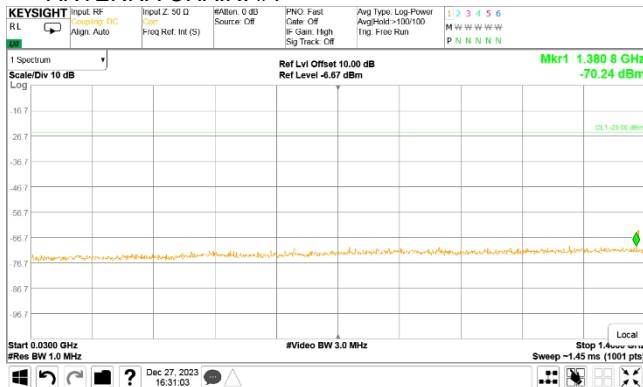
HERMON LABORATORIES

<b>Test specification:</b> Section 90.210, Conducted spurious emissions			
<b>Test procedure:</b> 47 CFR, Sections 2.1051 and 90.210(m)			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 03-Jan-24			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1016 hPa	<b>Power:</b> 48 VDC
<b>Remarks:</b>			

Plot 7.5.9 Spurious emission measurements in 30 - 1400 MHz range at high carrier frequency

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2



Plot 7.5.10 Spurious emission measurements in 1400 - 3000 MHz range at low carrier frequency

MODULATION:  
CHANNEL SPACING:  
ANTENNA CHAIN: #1

QPSK (worst case variant)  
10 MHz  
ANTENNA CHAIN: #2

