

Test specification:		Section 15.215(c), Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Verdict: PASS	
Date(s):			
19-Jun-18 - 27-Jun-18			
Temperature: 24.2 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: -48 VDC
Remarks:			

## 7.2 Occupied bandwidth test

### 7.2.1 General

This test was performed to verify that the 20 dB bandwidth of the emissions was contained within the standard specified frequency band according to FCC §15.215 requirements. Specification test limits are given in Table 7.2.1.

**Table 7.2.1 Occupied bandwidth limits**

Assigned frequency range, MHz	Modulation envelope reference points
57000 - 66000	99%

NOTE: Modulation envelope reference points provided in terms of attenuation below unmodulated carrier.

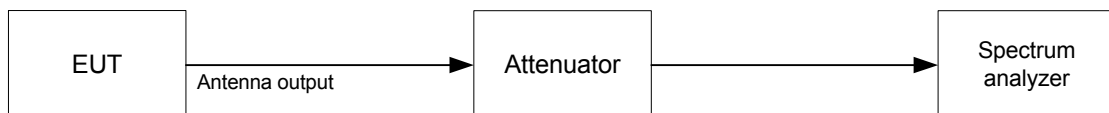
### 7.2.2 Test procedure

**7.2.2.1** The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

**7.2.2.2** The spectrum analyzer sweep time and bandwidth were set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

**7.2.2.3** The peak of emission was measured. The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.2.2 and associated plots.

**Figure 7.2.1 Occupied bandwidth test setup**





<b>Test specification:</b> <b>Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> <b>PASS</b>	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

Table 7.2.2 Occupied bandwidth test results

OPERATING FREQUENCY RANGE: 57000 –66000 MHz  
DETECTOR USED: Peak hold  
RESOLUTION BANDWIDTH: See table below  
VIDEO BANDWIDTH: 3 x RBW  
MODULATION ENVELOPE REFERENCE POINTS: 99 %

Frequency, MHz	RBW, kHz	Occupied bandwidth 99 %, MHz	OBW limit, MHz	Verdict
<b>Emission Bandwidth 50 MHz</b>				
<b>Modulation 2QAM</b>				
57025.0	1000.0	47.457	NA	Comply
61500.0	1000.0	47.347	NA	Comply
65975.0	1000.0	47.427	NA	Comply
<b>Modulation 128QAM</b>				
57025.0	1000.0	47.395	NA	Comply
61500.0	1000.0	47.459	NA	Comply
65975.0	1000.0	47.305	NA	Comply
<b>Emission Bandwidth 100 MHz</b>				
<b>Modulation 2QAM</b>				
57050.0	2000.0	94.829	NA	Comply
61500.0	2000.0	94.686	NA	Comply
65950.0	2000.0	94.737	NA	Comply
<b>Modulation 256QAM</b>				
57050.0	2000.0	94.771	NA	Comply
61500.0	2000.0	95.124	NA	Comply
65950.0	2000.0	94.751	NA	Comply
<b>Emission Bandwidth 250 MHz</b>				
<b>Modulation 2QAM</b>				
57125.0	5000.0	240.15	NA	Comply
61500.0	5000.0	240.47	NA	Comply
65875.0	5000.0	240.99	NA	Comply
<b>Modulation 256QAM</b>				
57125.0	5000.0	239.31	NA	Comply
61500.0	5000.0	239.70	NA	Comply
65875.0	5000.0	239.33	NA	Comply
<b>Emission Bandwidth 500 MHz</b>				
<b>Modulation 2QAM</b>				
57250.0	8000.0	469.98	NA	Comply
61500.0	8000.0	470.45	NA	Comply
65750.0	8000.0	470.95	NA	Comply
<b>Modulation 64QAM</b>				
57250.0	8000.0	472.96	NA	Comply
61500.0	8000.0	472.30	NA	Comply
65750.0	8000.0	474.64	NA	Comply

## Reference numbers of test equipment used

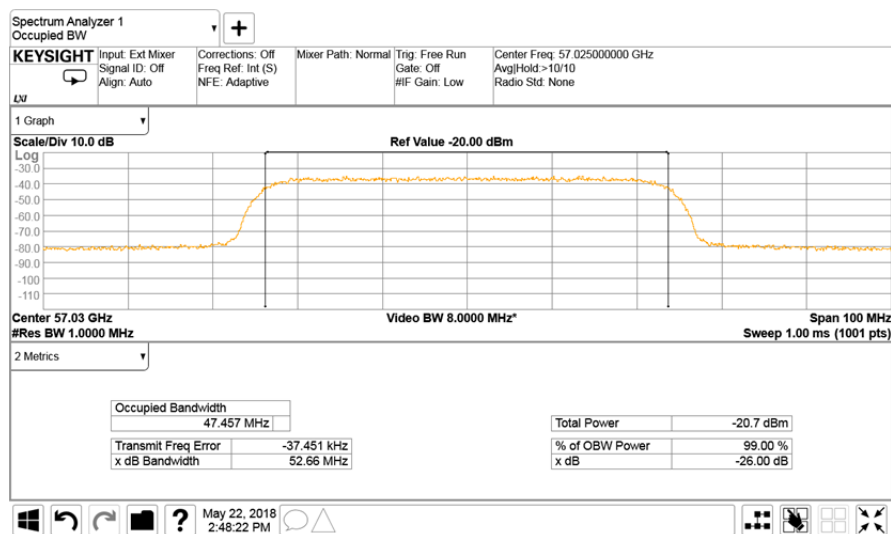
HL 3903	HL 5376	HL 5380						
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Full description is given in Appendix A.

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

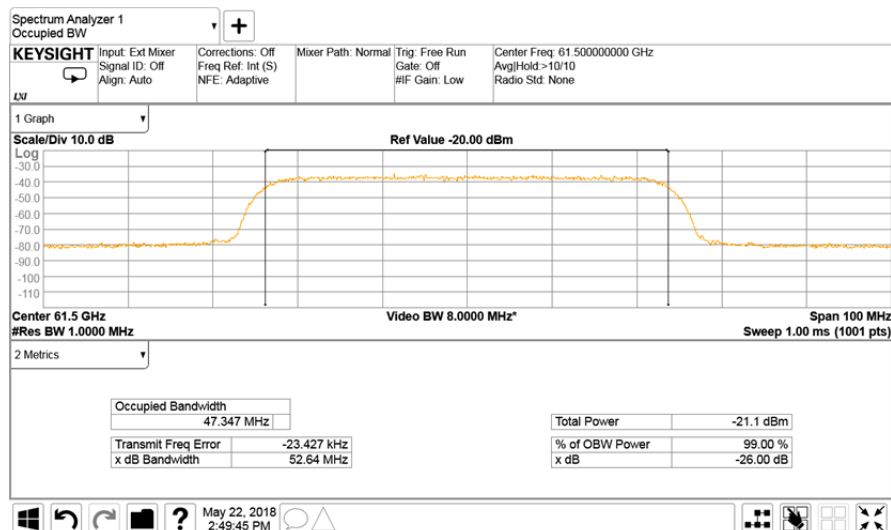
**Plot 7.2.1 Occupied bandwidth test result at Low frequency**

<b>MODULATION:</b>	2QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>CARRIER FREQUENCY:</b>	57025 MHz



**Plot 7.2.2 Occupied bandwidth test result at Mid frequency**

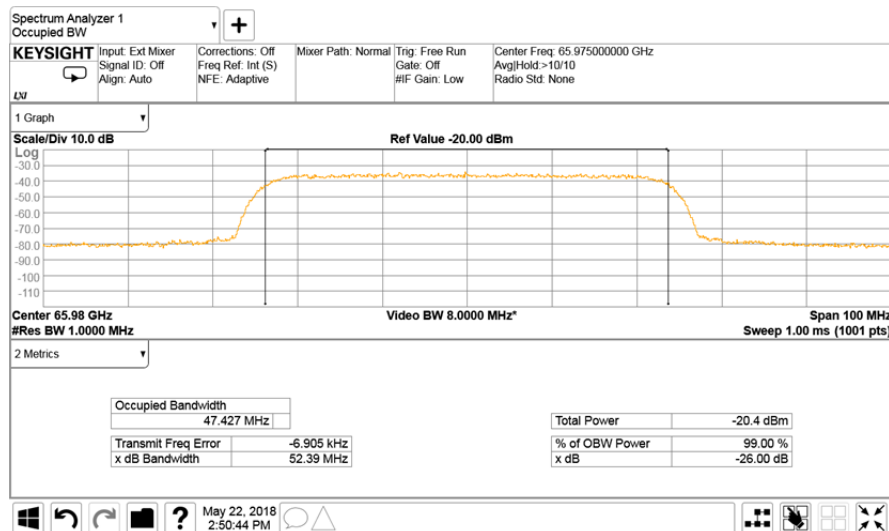
<b>MODULATION:</b>	2QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at mid frequency</b>	61500 MHz



<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

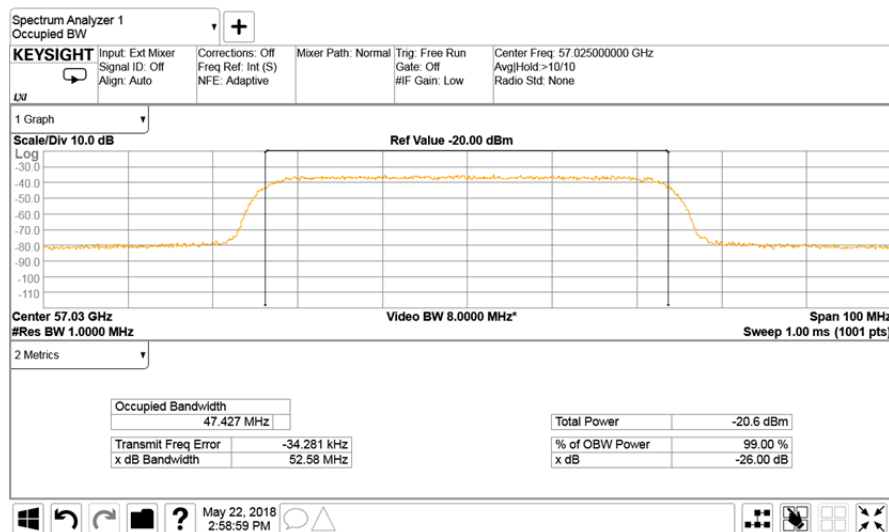
Plot 7.2.3 Occupied bandwidth test result at High frequency

<b>MODULATION:</b>	2QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at High frequency</b>	65975 MHz



Plot 7.2.4 Occupied bandwidth test result at Low frequency

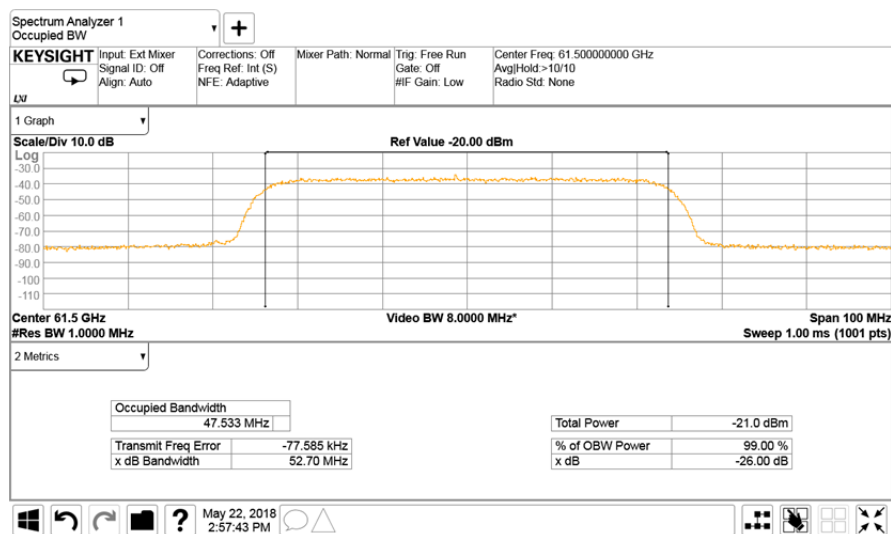
<b>MODULATION:</b>	4QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at low frequency</b>	57025MHz



<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

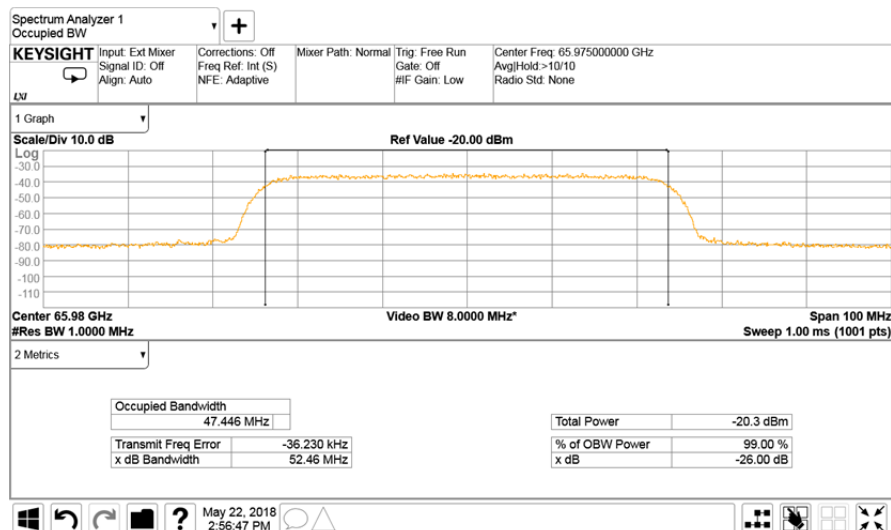
**Plot 7.2.5 Occupied bandwidth test result at Mid frequency**

<b>MODULATION:</b>	4QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at mid frequency</b>	61500 MHz



**Plot 7.2.6 Occupied bandwidth test result at High frequency**

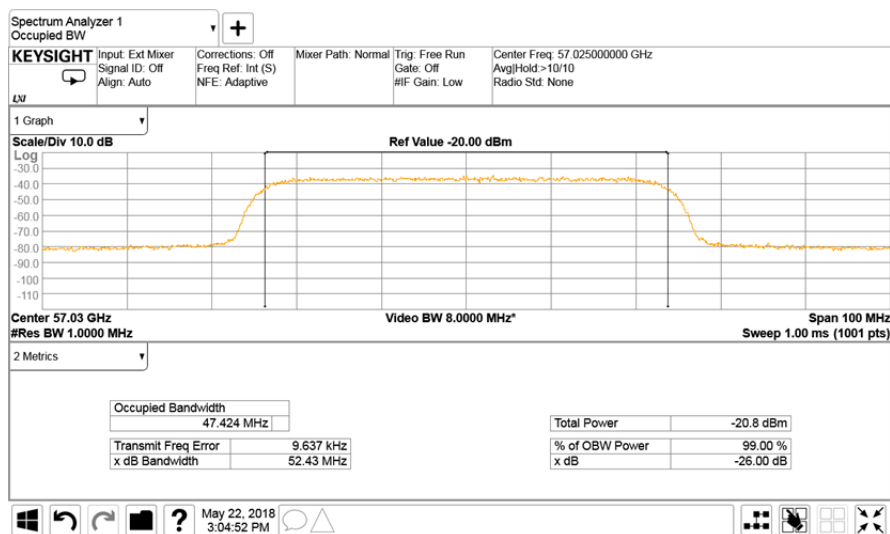
<b>MODULATION:</b>	4QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at High frequency</b>	65975 MHz



<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

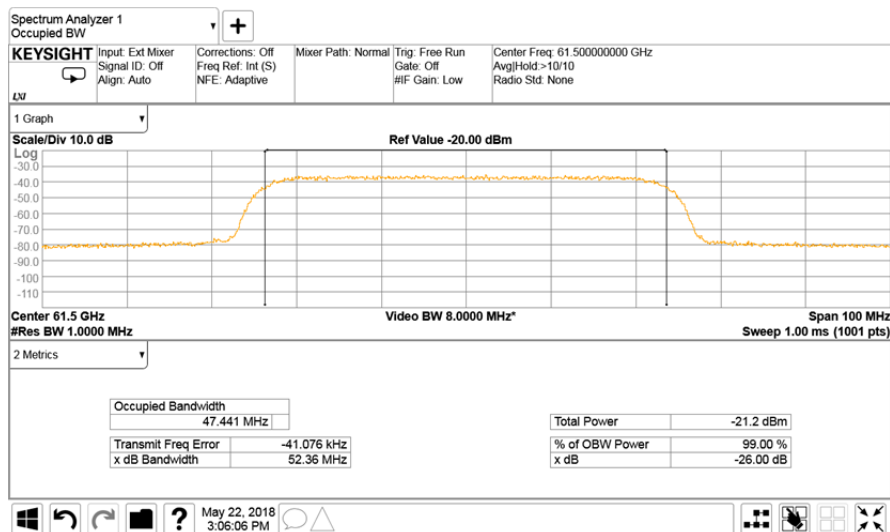
Plot 7.2.7 Occupied bandwidth test result at Low frequency

<b>MODULATION:</b>	8QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at low frequency</b>	57025MHz



Plot 7.2.8 Occupied bandwidth test result at Mid frequency

<b>MODULATION:</b>	8QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at mid frequency</b>	61500 MHz



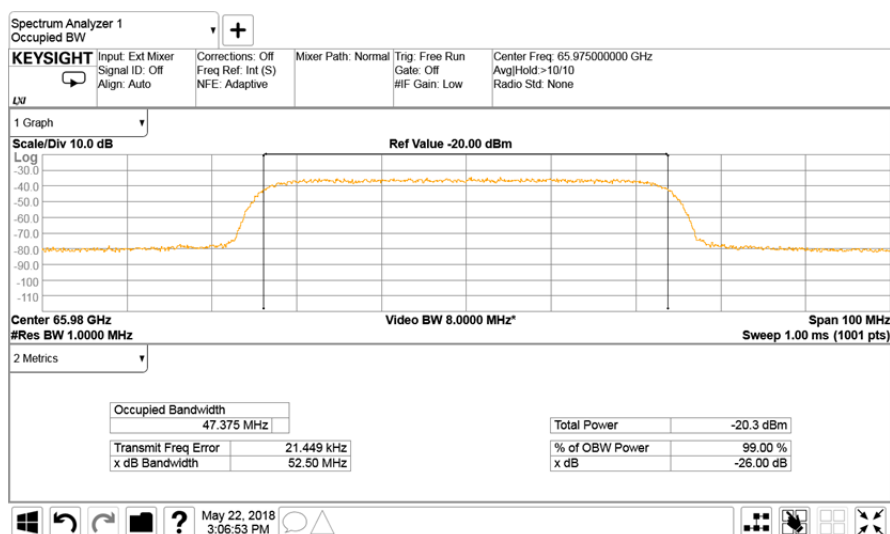


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

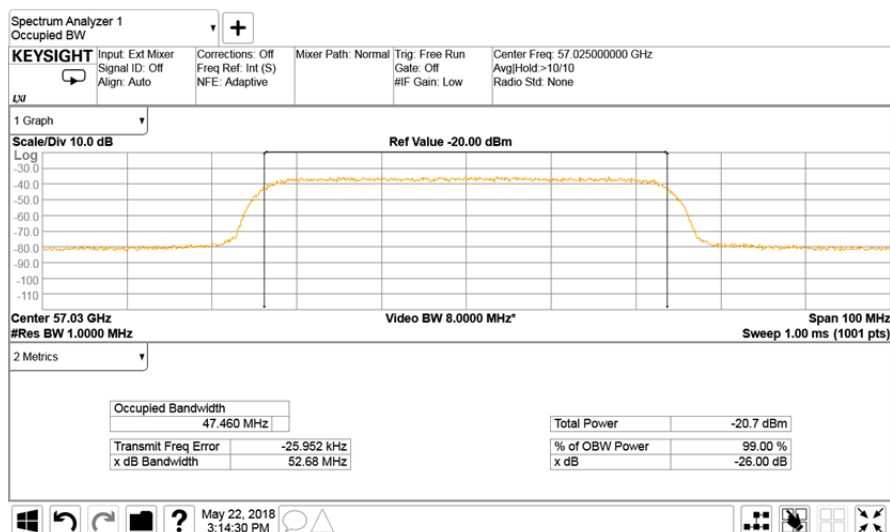
Plot 7.2.9 Occupied bandwidth test result at High frequency

MODULATION:	8QAM
EMISSION BANDWIDTH:	50 MHz
at High frequency	65975 MHz



Plot 7.2.10 Occupied bandwidth test result at Low frequency

MODULATION:	16QAM
EMISSION BANDWIDTH:	50 MHz
at low frequency	57025 MHz



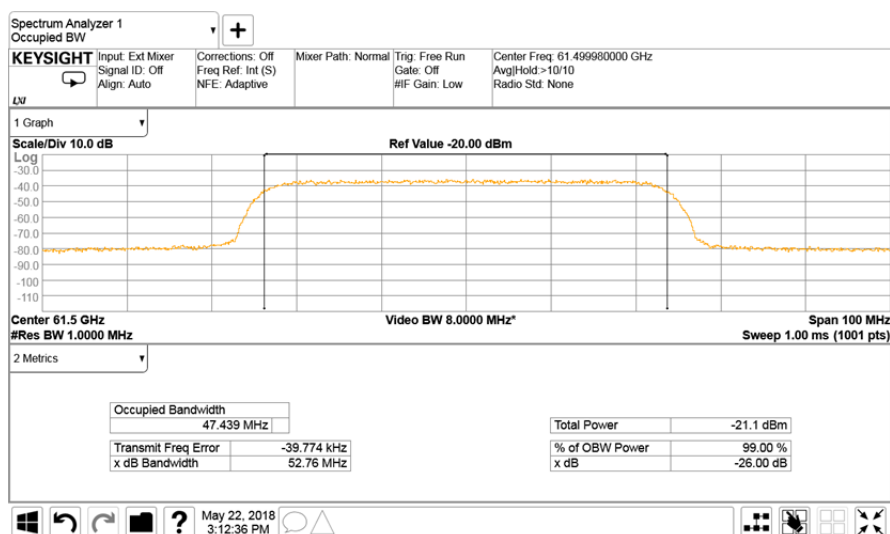


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

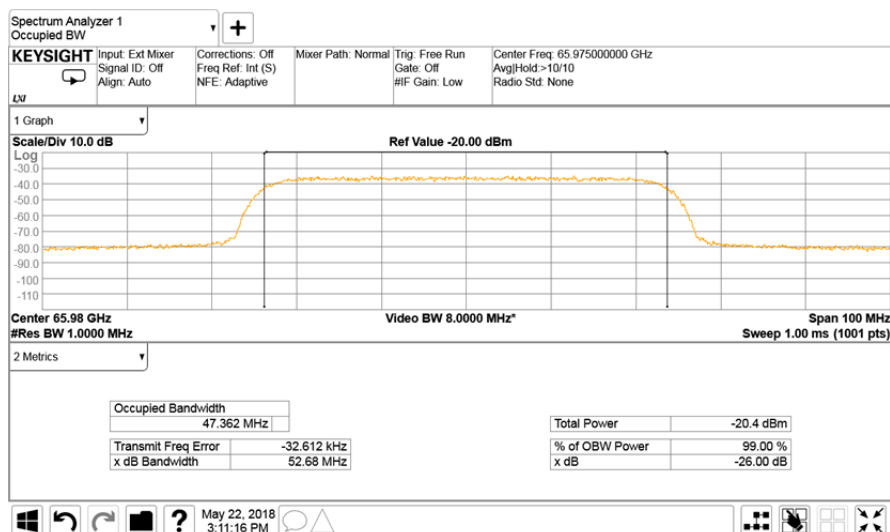
Plot 7.2.11 Occupied bandwidth test result at Mid frequency

MODULATION:	16QAM
EMISSION BANDWIDTH:	50 MHz
at mid frequency	61500 MHz



Plot 7.2.12 Occupied bandwidth test result at High frequency

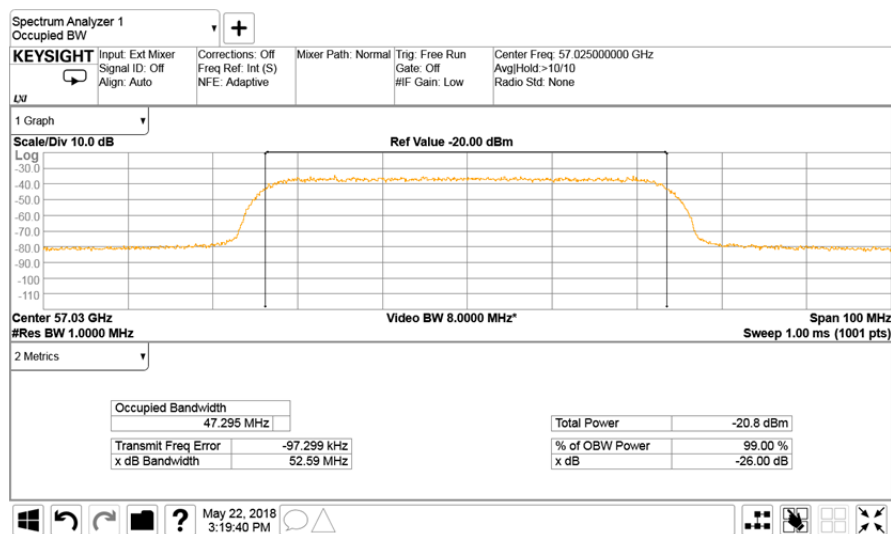
MODULATION:	16QAM
EMISSION BANDWIDTH:	50 MHz
at High frequency	65975 MHz



<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

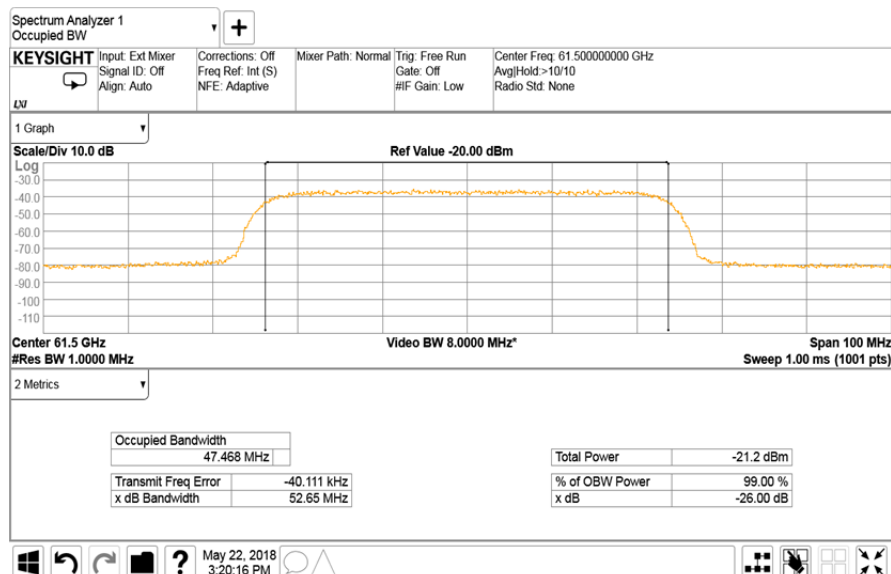
Plot 7.2.13 Occupied bandwidth test result at Low frequency

<b>MODULATION:</b>	32QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at low frequency</b>	57025 MHz



Plot 7.2.14 Occupied bandwidth test result at Mid frequency

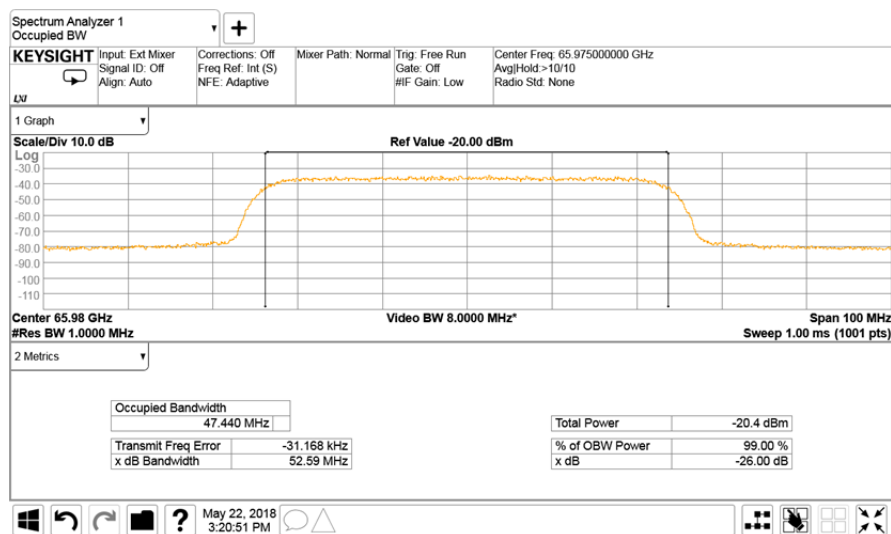
<b>MODULATION:</b>	32QAM
<b>EMISSION BANDWIDTH:</b>	50 MHz
<b>at mid frequency</b>	61500 MHz



Test specification:		Section 15.215(c), Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Verdict: PASS	
Date(s):			
19-Jun-18 - 27-Jun-18			
Temperature: 24.2 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: -48 VDC
Remarks:			

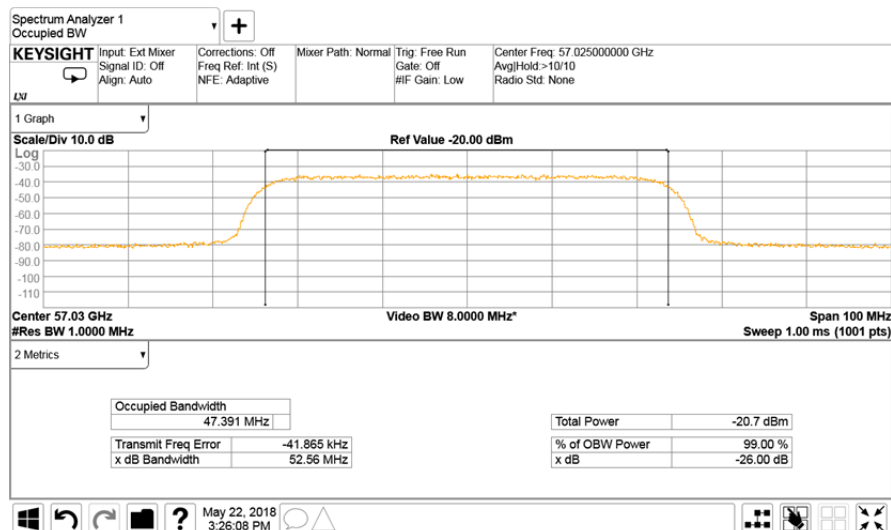
Plot 7.2.15 Occupied bandwidth test result at High frequency

MODULATION:	32QAM
EMISSION BANDWIDTH:	50 MHz
at High frequency	65975 MHz



Plot 7.2.16 Occupied bandwidth test result at Low frequency

MODULATION:	64QAM
EMISSION BANDWIDTH:	50 MHz
at low frequency	57025 MHz



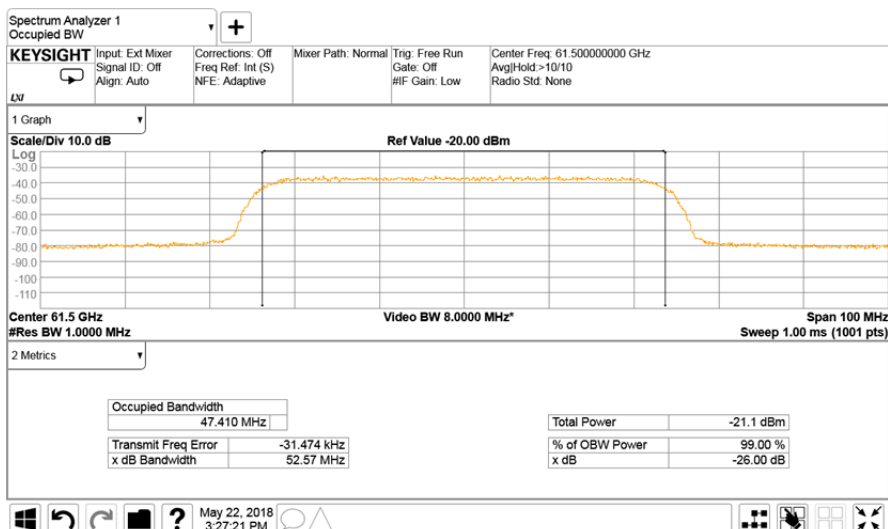


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

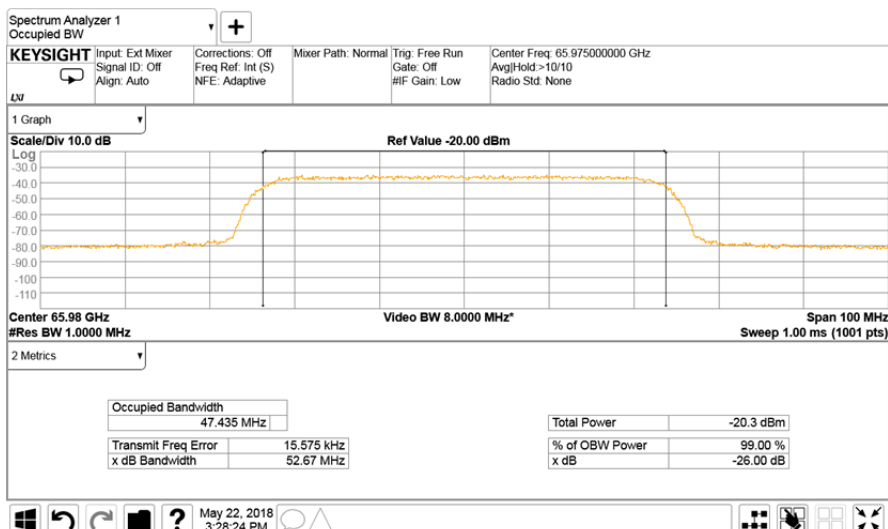
Plot 7.2.17 Occupied bandwidth test result at Mid frequency

MODULATION:	64QAM
EMISSION BANDWIDTH:	50 MHz
at mid frequency	61500 MHz



Plot 7.2.18 Occupied bandwidth test result at High frequency

MODULATION:	64QAM
EMISSION BANDWIDTH:	50 MHz
at High frequency	65975 MHz



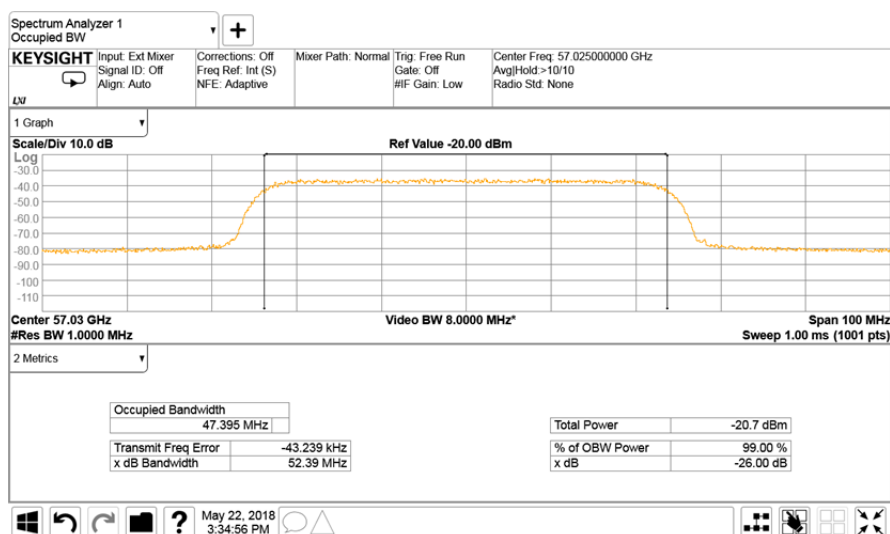


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

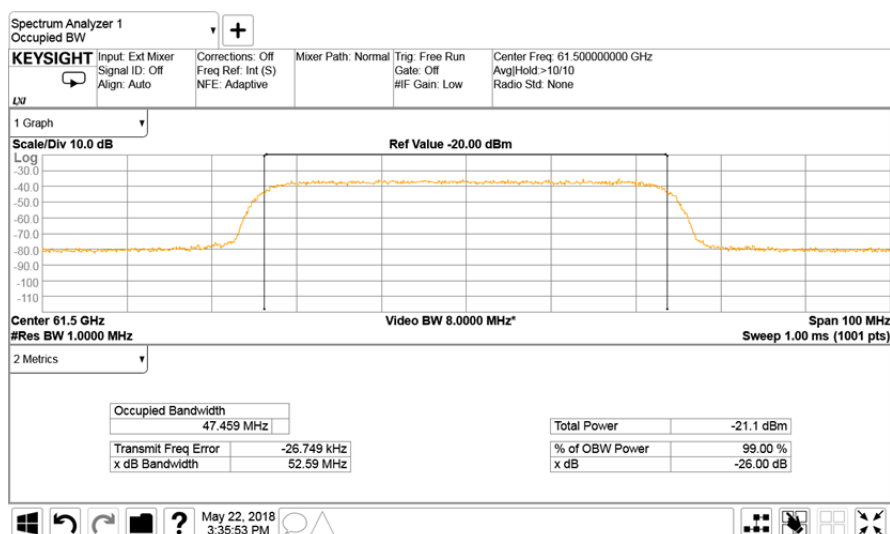
Plot 7.2.19 Occupied bandwidth test result at Low frequency

MODULATION:	128QAM
EMISSION BANDWIDTH:	50 MHz
at low frequency	57025 MHz



Plot 7.2.20 Occupied bandwidth test result at Mid frequency

MODULATION:	128QAM
EMISSION BANDWIDTH:	50 MHz
at mid frequency	61500 MHz



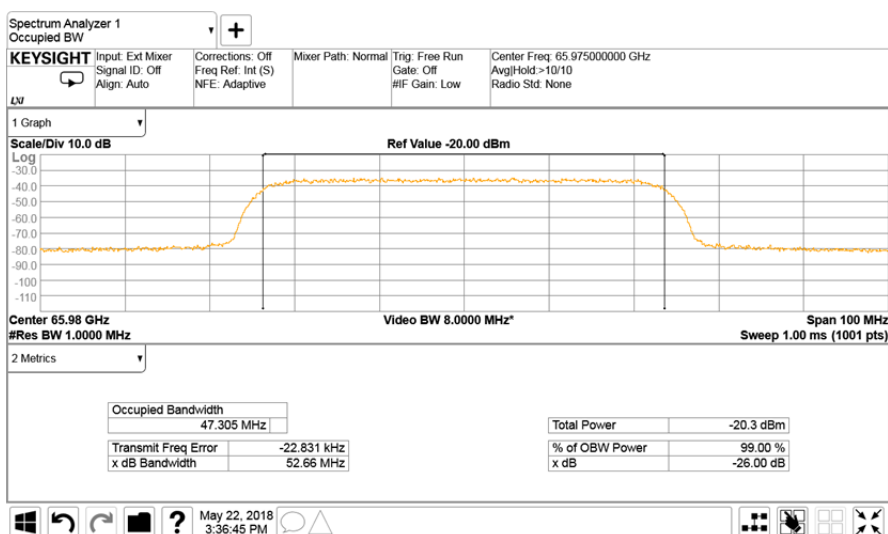


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

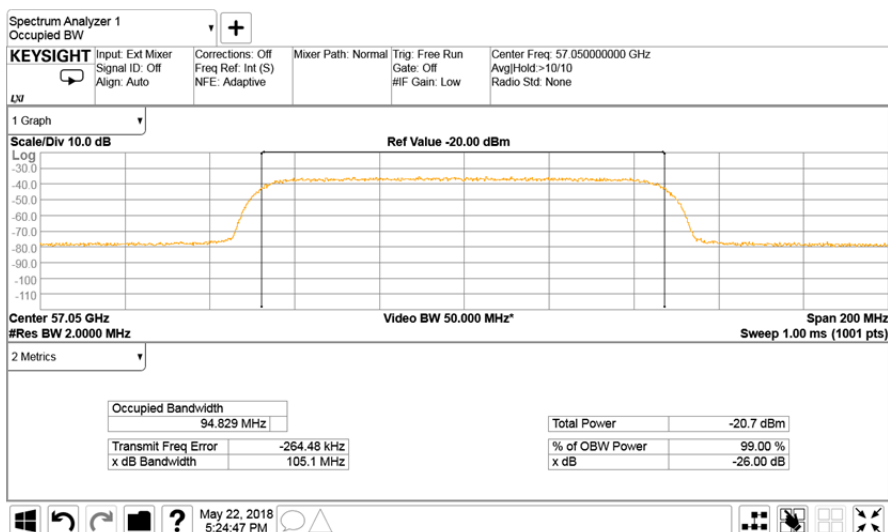
Plot 7.2.21 Occupied bandwidth test result at High frequency

MODULATION:	128QAM
EMISSION BANDWIDTH:	50 MHz
at High frequency	65975 MHz



Plot 7.2.22 Occupied bandwidth test result at Low frequency

MODULATION:	2QAM
EMISSION BANDWIDTH:	100 MHz
at low frequency	57050 MHz



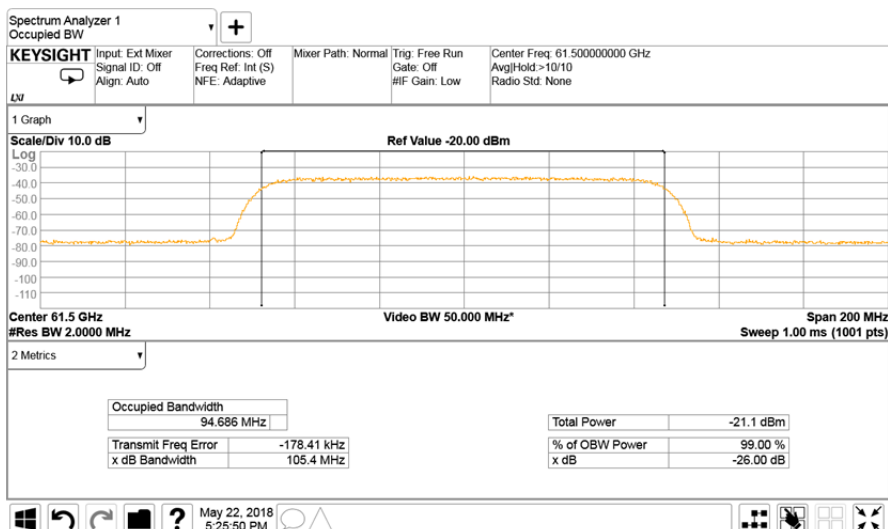


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

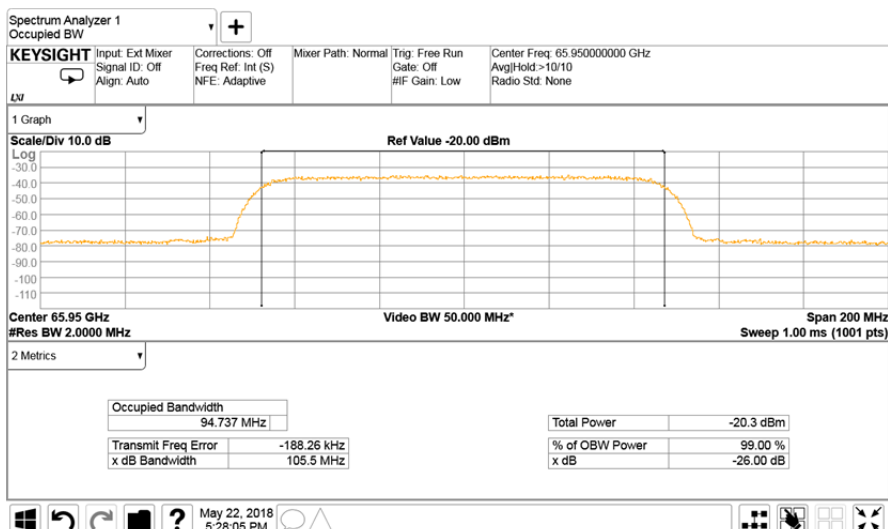
Plot 7.2.23 Occupied bandwidth test result at Mid frequency

MODULATION:	2QAM
EMISSION BANDWIDTH:	100 MHz
at mid frequency	61500 MHz



Plot 7.2.24 Occupied bandwidth test result at High frequency

MODULATION:	2QAM
EMISSION BANDWIDTH:	100 MHz
at High frequency	65950 MHz



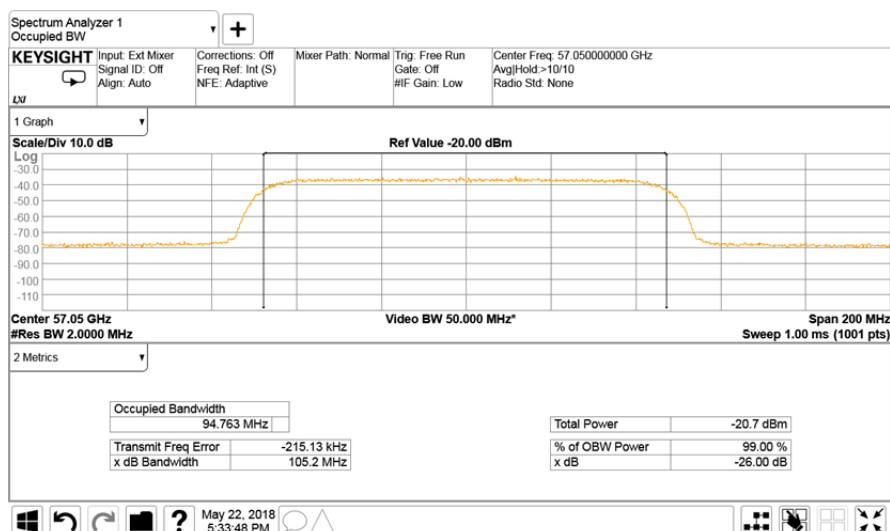


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

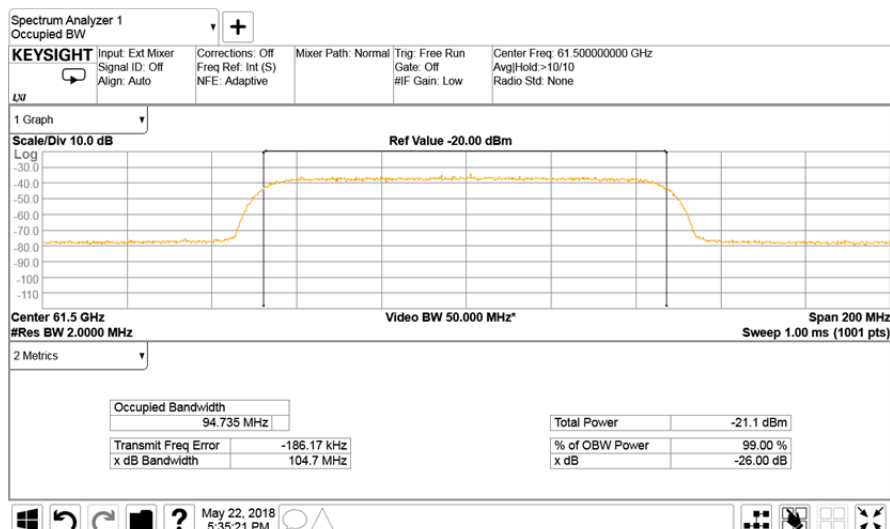
Plot 7.2.25 Occupied bandwidth test result at Low frequency

MODULATION:	4QAM
EMISSION BANDWIDTH:	100 MHz
at low frequency	57050 MHz



Plot 7.2.26 Occupied bandwidth test result at Mid frequency

MODULATION:	4QAM
EMISSION BANDWIDTH:	100 MHz
at mid frequency	61500 MHz



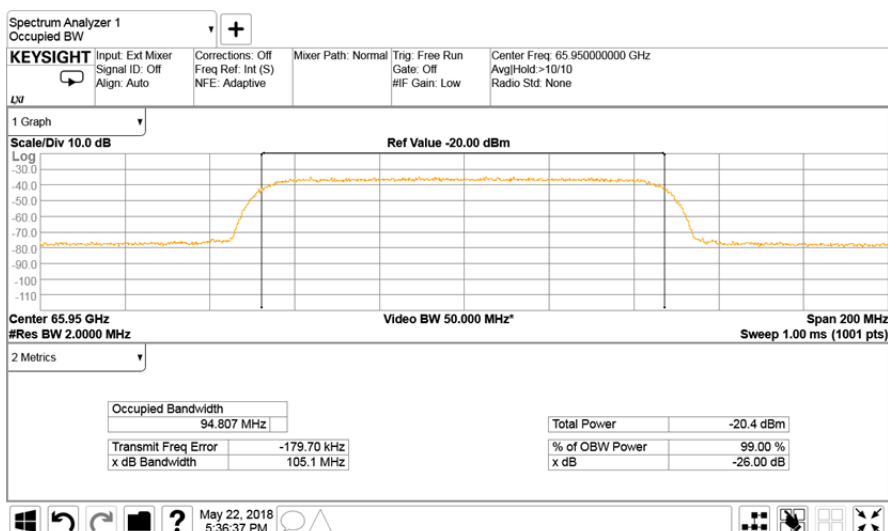


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

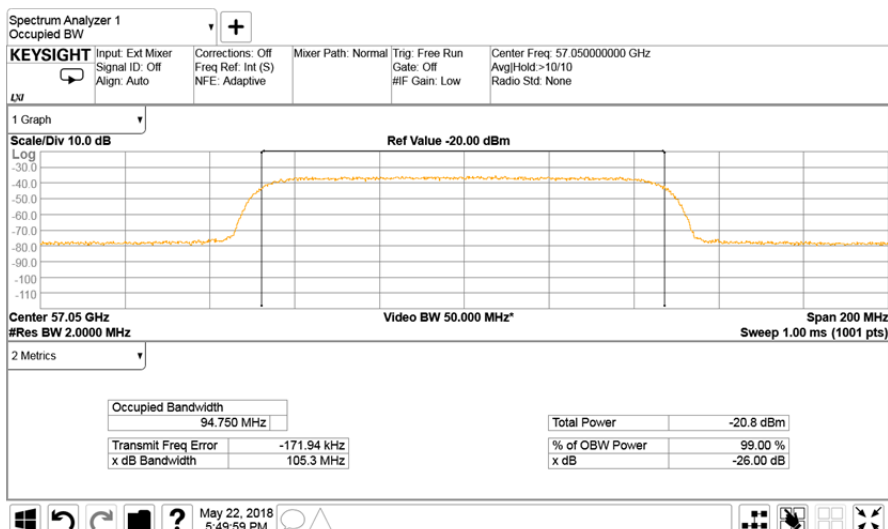
Plot 7.2.27 Occupied bandwidth test result at High frequency

MODULATION:	4QAM
EMISSION BANDWIDTH:	100 MHz
at High frequency	65950 MHz



Plot 7.2.28 Occupied bandwidth test result at Low frequency

MODULATION:	8QAM
EMISSION BANDWIDTH:	100 MHz
at low frequency	57050 MHz



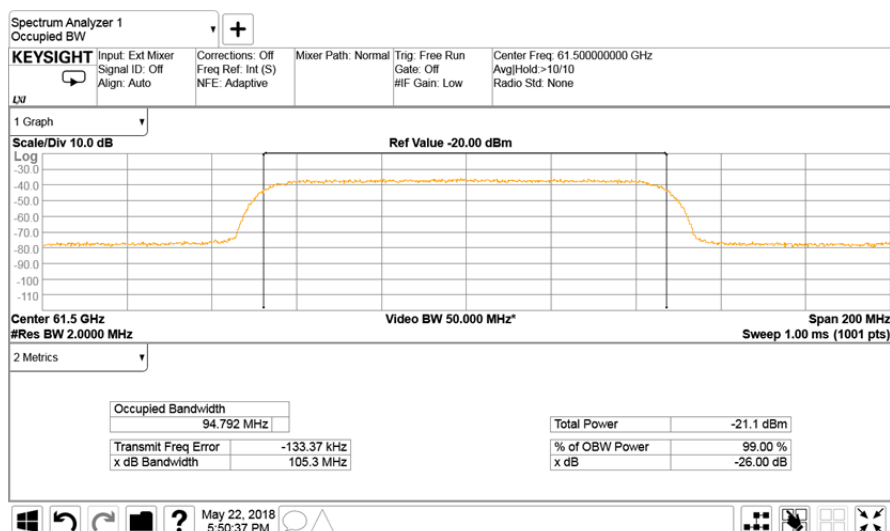


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

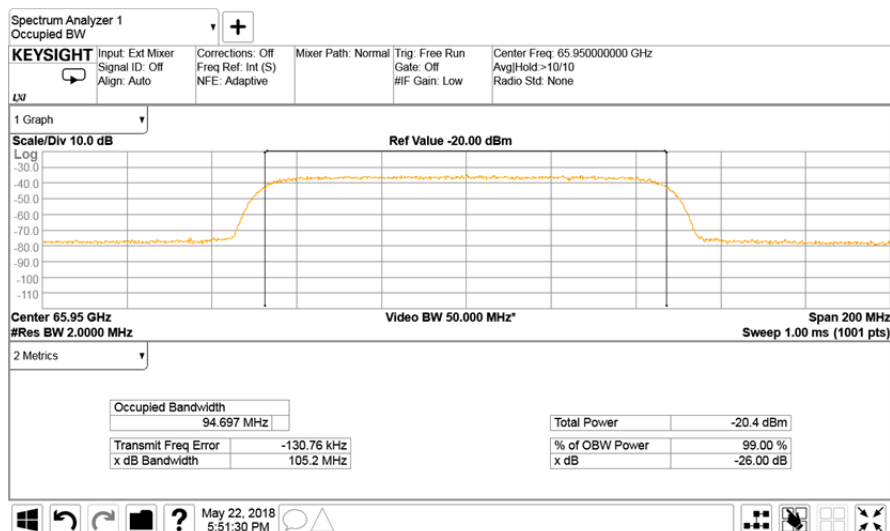
Plot 7.2.29 Occupied bandwidth test result at Mid frequency

MODULATION:	8QAM
EMISSION BANDWIDTH:	100 MHz
at mid frequency	61500 MHz



Plot 7.2.30 Occupied bandwidth test result at High frequency

MODULATION:	8QAM
EMISSION BANDWIDTH:	100 MHz
at High frequency	65950 MHz



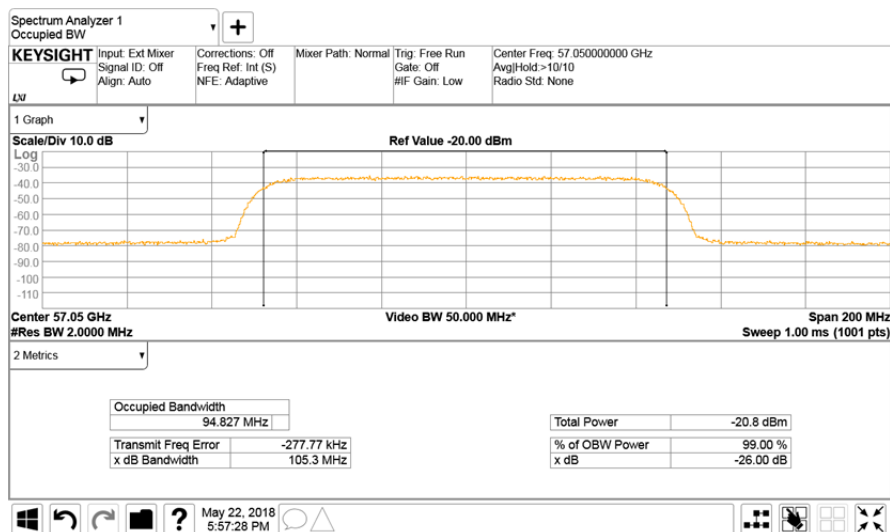


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

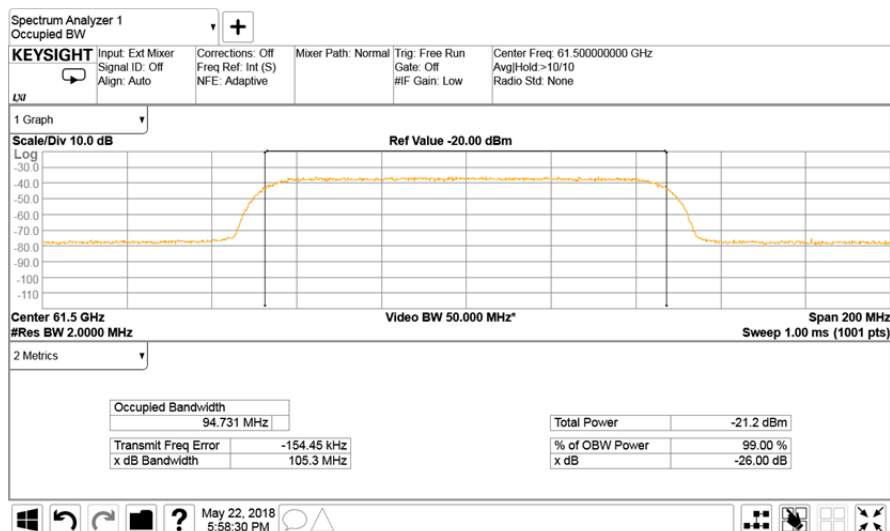
Plot 7.2.31 Occupied bandwidth test result at Low frequency

MODULATION:	16QAM
EMISSION BANDWIDTH:	100 MHz
at low frequency	57050 MHz



Plot 7.2.32 Occupied bandwidth test result at Mid frequency

MODULATION:	16QAM
EMISSION BANDWIDTH:	100 MHz
at mid frequency	61500 MHz



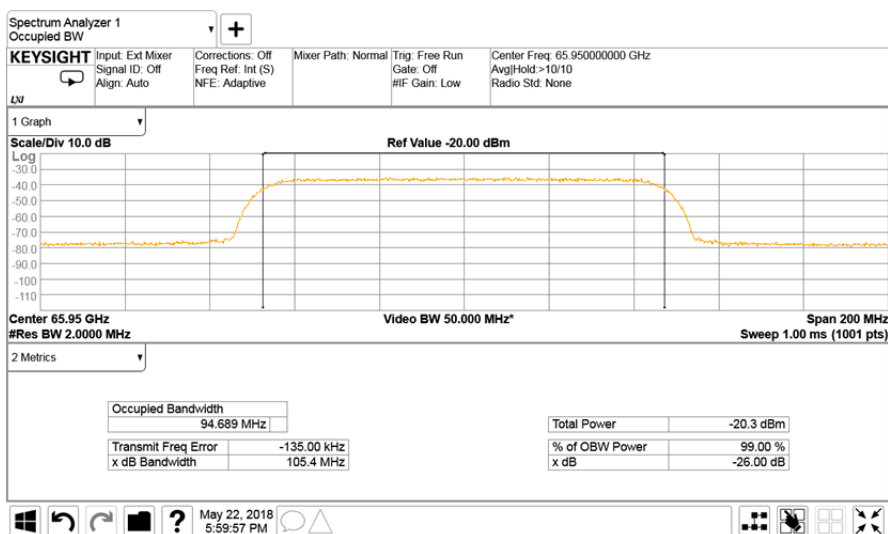


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

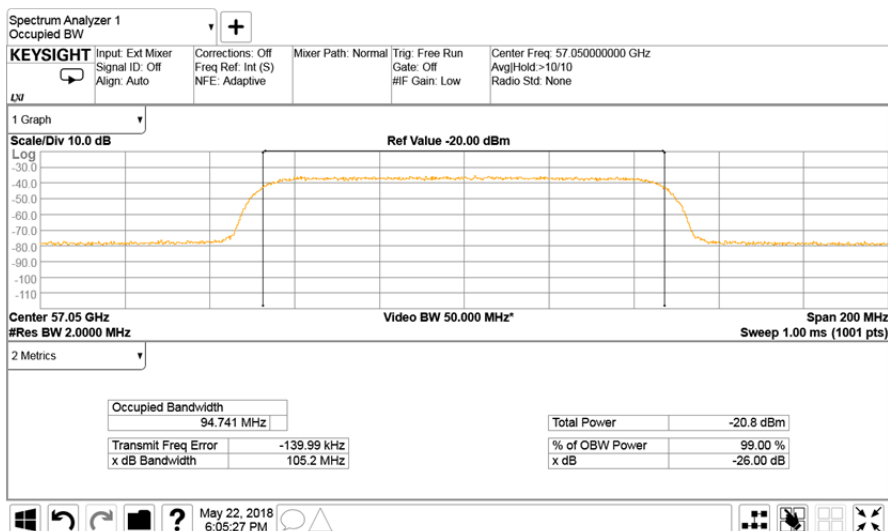
Plot 7.2.33 Occupied bandwidth test result at High frequency

MODULATION:	16QAM
EMISSION BANDWIDTH:	100 MHz
at High frequency	65950 MHz



Plot 7.2.34 Occupied bandwidth test result at Low frequency

MODULATION:	32QAM
EMISSION BANDWIDTH:	100 MHz
at low frequency	57050 MHz



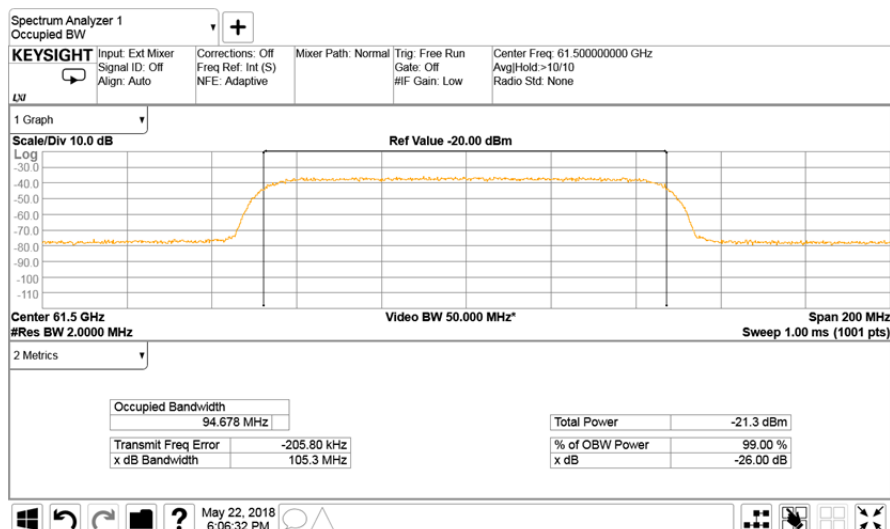


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

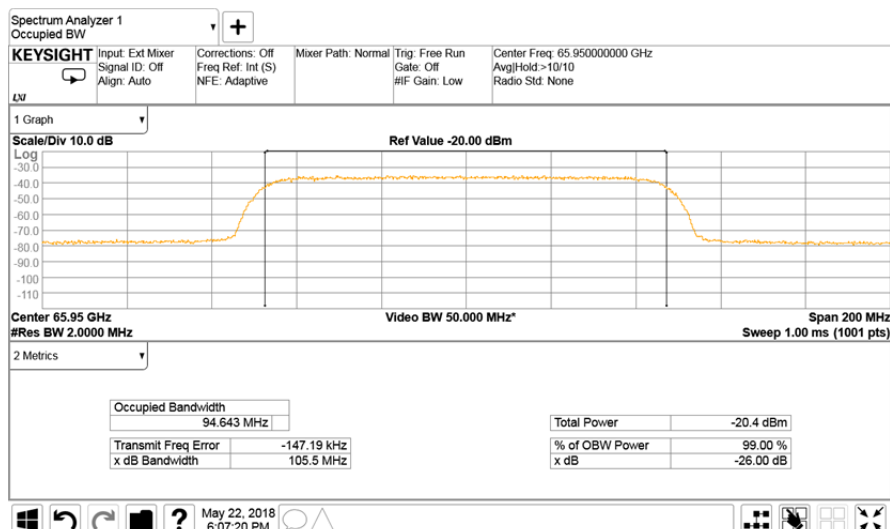
Plot 7.2.35 Occupied bandwidth test result at Mid frequency

MODULATION:	32QAM
EMISSION BANDWIDTH:	100 MHz
at mid frequency	61500 MHz



Plot 7.2.36 Occupied bandwidth test result at High frequency

MODULATION:	32QAM
EMISSION BANDWIDTH:	100 MHz
at High frequency	65950 MHz



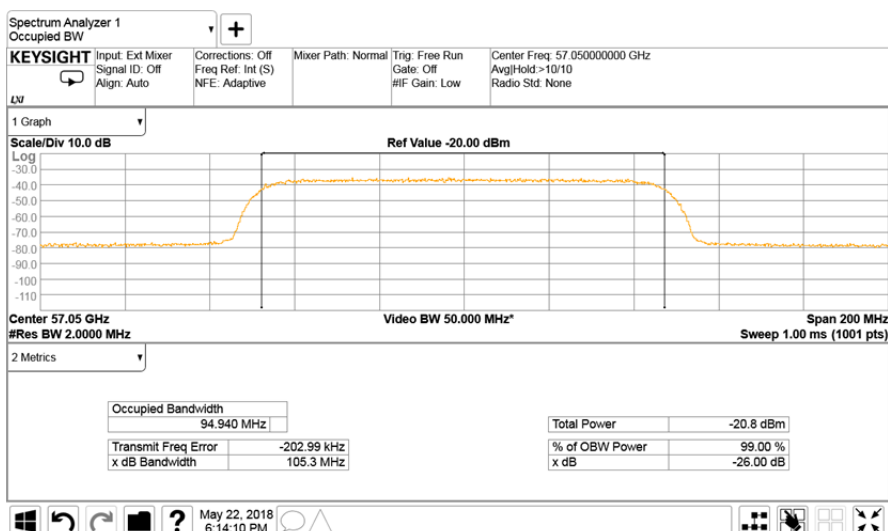


HERMON LABORATORIES

<b>Test specification: Section 15.215(c), Occupied bandwidth</b>			
<b>Test procedure:</b> 47 CFR, Section 2.1049, ANSI C63.10, Section 9.3			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 19-Jun-18 - 27-Jun-18			
<b>Temperature:</b> 24.2 °C	<b>Relative Humidity:</b> 48 %	<b>Air Pressure:</b> 1009 hPa	<b>Power:</b> -48 VDC
<b>Remarks:</b>			

Plot 7.2.37 Occupied bandwidth test result at Low frequency

MODULATION:	64QAM
EMISSION BANDWIDTH:	100 MHz
at low frequency	57050 MHz



Plot 7.2.38 Occupied bandwidth test result at Mid frequency

MODULATION:	64QAM
EMISSION BANDWIDTH:	100 MHz
at mid frequency	61500 MHz

