

Test specification:	Section 90.1215, Maximum output power			
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	26-Dec-23	verdict: PASS		
Temperature: 24 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa	Power: 48 VDC	
Remarks:				

Plot 7.1.18 Peak spectral power density at mid frequency

CHANNEL SF ANTENNA CH Modulation:		50 MHz 1 16QAM			
	KEYSIGHT Input: RF L Coupling: DC Align: Auto	Input Z: 50 Ω Corr Freq Ref: Int (S)			
	1 Spectrum V Scale/Div 10 dB		Ref LvI Offset 40.00 dB Ref Level 41.00 dBm		Mkr1 4.947 40 GHz 14.04 dBm
	31.0				
	21.0	1			
	11.0				TRIG LVL
	1.00				
	-9.00				
	-29.0				
	-39.0				
	-49.0				
	Center 4.96500 GHz #Res BW 1.0 MHz		∦Video BW 3.0 MHz*		Span 50.00 MHz #Sweep 1.00 s (1001 pts)
		Dec 26, 2023			



Test specification:	Section 90.1215, Maximum output power			
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	26-Dec-23	verdict: PASS		
Temperature: 24 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa	Power: 48 VDC	
Remarks:				

Plot 7.1.19 Peak spectral power density at mid frequency

CHANNEL SF ANTENNA CH Modulation:		50 MHz 1 64QAM			
	KEYSIGHT Input: RF L Coupling: DC Align: Auto	Input Z: 50 Ω Atten: 20 dB Corr Source: Off Freq Ref: Int (S)	PNO: Fast Avg Type: Power (RM Gate: Off Avg Hold:>100/100 IF Gain: Low Trig: RF Burst Sig Track: Off	S) 1 2 3 4 5 6 M M W W W W A P N N N N	
	1 Spectrum V Scale/Div 10 dB Log		Ref LvI Offset 40.00 dB Ref Level 41.00 dBm	Mkr	1 4.946 95 GHz 13.88 dBm
	31.0				
	21.0				
	-9.00				
	-19.0				
	-39.0				
	-49.0		#Video BW 3.0 MHz*		Span 50.00 MHz
		Dec 26, 2023		#Sw	



Test specification:	Section 90.1215, Maximum output power			
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	26-Dec-23	verdict:	PASS	
Temperature: 24 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa	Power: 48 VDC	
Remarks:				

Plot 7.1.20 Peak spectral power density at mid frequency

CHANNEL SP ANTENNA CH Modulation:		50 MHz 1 256QAM			
	KEYSIGHT Input: RF L Coupling: DC Align: Auto	Input Z: 50 Ω Atten: 20 dB Corr Source: Off Freq Ref: Int (S)	PNO: Fast Avg Type: Power (R) Gate: Off Avg Hold:>100/100 IF Gain: Low Trig: RF Burst Sig Track: Off	MS) 1 2 3 4 5 6 M M W W W W A P N N N N	
	1 Spectrum v Scale/Div 10 dB		Ref LvI Offset 40.00 dB Ref Level 41.00 dBm	Mi	kr1 4.950 70 GHz 13.86 dBm
	31.0				
	21.0	▲1			
	11.0				
	-9.00				
	-19.0				
	-39.0				
	-49.0				
	Center 4.96500 GHz #Res BW 1.0 MHz		#Video BW 3.0 MHz*	#	Span 50.00 MHz Sweep 1.00 s (1001 pts)
		P Dec 26, 2023			



Test specification:	Section 90.1215, Maximum output power			
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	26-Dec-23	verdict:	PASS	
Temperature: 24 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa	Power: 48 VDC	
Remarks:				

Plot 7.1.21 Peak spectral power density at mid frequency

CHANNEL SP ANTENNA CH Modulation:		50 MHz 2 QPSK				
	KEYSIGHT Input: RF L Coupling: DC Align: Auto	Input Ζ: 50 Ω Atten: 20 dt Corr Source: Off Freq Ref: Int (S)	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	rer (RMS) 1 2 3 4 5 6 100 M M W W W A P N N N N		
	1 Spectrum V Scale/Div 10 dB		Ref Lvi Offset 40.00 dB Ref Level 41.00 dBm		Mkr1 4.947 30 GHz 13.96 dBm	
	Log					
	21.0					
	11.0				TRIG LVL	
	1.00					
	-9.00					
	-19.0					
	-39.0					
	-49.0					
	Center 4.96500 GHz #Res BW 1.0 MHz		#Video BW 3.0 MHz*		Span 50.00 MHz #Sweep 1.00 s (1001 pts)	
		Dec 26, 2023				



Test specification:	Section 90.1215, Maximum output power			
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	26-Dec-23	verdict: PASS		
Temperature: 24 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa	Power: 48 VDC	
Remarks:			·	

Plot 7.1.22 Peak spectral power density at mid frequency

CHANNEL SF ANTENNA CH Modulation:		50 MHz 2 16QAM			
	KEYSIGHT Input: RF L Coupling: DC Align: Auto	Input Z: 50 Ω Atten: 20 dt Corr Source: Off Freq Ref: Int (S)	B PNO: Fast Avg Type: Power (F Gate: Off Avg Hold:>100/100 IF Gain: Low Trig: RF Burst Sig Track: Off	MSMS 1 2 3 4 5 6 M M W W W W W A P N N N	
	1 Spectrum V Scale/Div 10 dB		Ref Lvi Offset 40.00 dB Ref Level 41.00 dBm	Mkr1 4.946 95 GH 14.08 dB	
	31.0				
	21.0				
	11.0			TRIG L'	
	-9.00				
	-19.0				
	-39.0				
	-49.0				
	Center 4.96500 GHz #Res BW 1.0 MHz	Dec 26, 2023	#Video BW 3.0 MHz*	Span 50.00 Mi #Sweep 1.00 s (1001 pi	
		Pec 26, 2023			



Test specification:	Section 90.1215, Maximum output power			
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	26-Dec-23	verdict: PASS		
Temperature: 24 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa	Power: 48 VDC	
Remarks:				

Plot 7.1.23 Peak spectral power density at mid frequency

CHANNEL SP ANTENNA CH Modulation:		50 MHz 2 64QAM				
	KEYSIGHT Input: RF L Coupling: DC Align: Auto	Input Ζ: 50 Ω Atten: 20 dB Corr Source: Off Freq Ref: Int (S)	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	AS) 1 2 3 4 5 6 M M W W W W A P N N N N		
	1 Spectrum V Scale/Div 10 dB		Ref Lvi Offset 40.00 dB Ref Level 41.00 dBm	Mk	r1 4.946 95 GHz 14.20 dBm	
	31.0					
	21.0					
	11.0				TRIG LVL	
	-9.00					
	-19.0				Laurenser	
	-39.0					
	-49.0					
	Center 4.96500 GHz #Res BW 1.0 MHz		#Video BW 3.0 MHz*	#\$	Span 50.00 MHz Sweep 1.00 s (1001 pts)	
		Dec 26, 2023				



Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date(s):	26-Dec-23		
Temperature: 24 °C	Relative Humidity: 39 %	Air Pressure: 1018 hPa	Power: 48 VDC
Remarks:			

Plot 7.1.24 Peak spectral power density at mid frequency

CHANNEL SP ANTENNA CH Modulation:			50 MHz 2 256QAM				
	KEYSIGHT Input: RF L Coupling: DC Align: Auto	Input Z: 50 Ω Atten: 20 Corr Source: C Freq Ref: Int (S)		Avg Type: Power (RM Avg Hold:>100/100 Trig: RF Burst	6) 1 2 3 4 5 6 M M ₩ ₩ ₩ ₩ A P N N N N		
	1 Spectrum v Scale/Div 10 dB		Ref LvI Offset 40 Ref Level 41.00			Mkr1 4.9	950 05 GHz 14.06 dBm
	31.0						
	21.0	1					
	11.0						TRIG LVL
	-9.00						
	-19.0						L
	-39.0						
	-49.0						
	Center 4.96500 GHz #Res BW 1.0 MHz		#Video BW 3.0	MHz*			5pan 50.00 MHz .00 s (1001 pts)
		P Dec 26, 2023					

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Dec-23	verdict.	PASS
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1. The test results are provided in Table 7.2.2 and the associated plots.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency,	Modulation envelope reference points*,	Maximum allowed bandwidth,
MHz	%	MHz
4940.0 - 4990.0	99	

* - Modulation envelope reference points are provided in terms of attenuation below the 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 EUT was set to transmit the unmodulated carrier and the reference peak power level was measured.
- 7.2.2.3 The EUT was set to transmit the normally modulated carrier.
- **7.2.2.4** The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup





Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Dec-23	verdict:	PASS
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC
Remarks:	-		

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: RESOLUTION BANDWIDTH: VIDEO BANDWIDTH: MODULATION ENVELOPE RE	FERENCE POINTS:	Peak hold 1 – 5% of the OBW > RBW 99%		
Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
Channel spacing 10 MHz				
Modulation QPSK				
4945.0	8.623	NA	NA	Pass
4965.0	8.628	NA	NA	Pass
4985.0	8.638	NA	NA	Pass
Modulation 16QAM				
4945.0	8.643	NA	NA	Pass
4965.0	8.640	NA	NA	Pass
4985.0	8.645	NA	NA	Pass
Modulation 64QAM				
4945.0	8.639	NA	NA	Pass
4965.0	8.645	NA	NA	Pass
4985.0	8.643	NA	NA	Pass
Modulation 256QAM				
4945.0	8.627	NA	NA	Pass
4965.0	8.624	NA	NA	Pass
4985.0	8.626	NA	NA	Pass

Carrier frequency, MHz Occupied bandwidth, Mł		Limit, MHz	Margin, MHz	Verdict
Channel spacing 25 MHz				
Modulation QPSK				
4952.5	18.390	NA	NA	Pass
4967.5	18.382	NA	NA	Pass
4977.5	18.371	NA	NA	Pass
Modulation 16QAM				
4952.5	18.432	NA	NA	Pass
4967.5	18.434	NA	NA	Pass
4977.5	18.416	NA	NA	Pass
Modulation 64QAM				
4952.5	18.439	NA	NA	Pass
4967.5	18.429	NA	NA	Pass
4977.5	18.430	NA	NA	Pass
Modulation 256QAM				
4952.5	18.393	NA	NA	Pass
4967.5	18.384	NA	NA	Pass
4977.5	18.378	NA	NA	Pass



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Dec-23	verdict.	PASS
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC
Remarks:			

Table 1.1.7.2.3 Occupied bandwidth test results (continuation)

DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	1 – 5% of the OBW
VIDEO BANDWIDTH:	> RBW
MODULATION ENVELOPE REFERENCE POINTS:	99%

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
Channel spacing 50 MHz				
Modulation QPSK				
4965.0	38.277	NA	NA	Pass
Modulation 16QAM				
4965.0	38.331	NA	NA	Pass
Modulation 64QAM				
4965.0	38.327	NA	NA	Pass
Modulation 256QAM				
4965.0	38.302	NA	NA	Pass

Reference numbers of test equipment used

[HL 5376	HL 5933						
E	Full description is given in Appendix A							

Full description is given in Appendix A



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Dec-23	verdict:	PASS
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC
Remarks:	-		

Plot 7.2.1 Occupied bandwidth test result at low frequency

Effects BW 240.00 kHz #Sweep 20.0 mis (1001 pts) #Res. BW 240.00 kHz #Sweep 20.0 mis (1001 pts) #Res. BW 240.00 kHz #Sweep 20.0 mis (1001 pts) #Res. BW 240.00 kHz #Sweep 20.0 mis (1001 pts) #Res. BW 240.00 kHz #Sweep 20.0 mis (1001 pts) #Res. BW 240.00 kHz #Sweep 20.0 mis (1001 pts) #Sweep 20.0 mis (1001 pts)	CHANNEL SPACING: ANTENNA PORT:	10 1	MHz	
Rt Compto Compt Compt Compt				The Free Run Conter Free: 4.945000000 GHz
Scale Div 100 dB Not Vice 30.00 dB Not Vice 30.00 dB Span 10 dB Not Vice 30.00 dB	Cate Off Avg Hold	d>10/10	Coupling: DC Corr	
1 1	Scale/Div 10.0 dB Ref Value 30.00 dB	Scale/Div		
Occupied Bandwidth Occupied Bandwidth 6.6320 MHz Total Power 27.1 dBm Transmit Freq Enror -28.6340 MHz % of OBW Power 59.00 %	100 000 000 000 000 000 000 000	100 100 100 100 100 100 100 100 100 100		#Video BW 1.000 MHz* Span 10 M SSwep 200 mHz
	Occupied Bandwidth 8.6232 MHz Treammit Frequencies 28.634 MHz X dB Bandwidth 9.439 MHz	Total Power 27.1 dBm % of OBW Power 99.00 % x dB -26.00 dB	8.6430 MHz Transmit Freq Error	% of OBW Power 99.00 % x dB -26.00 dB Loce

Modulation: 64QAM

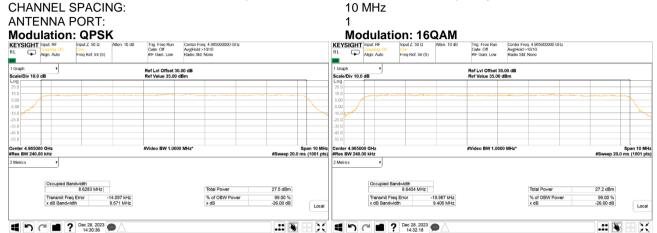
Modulation: 256QAM

REYSIGH		Input Z: 50 Ω Corr Freq Ref: Int (S)	Alten: 10 dB	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 4.945000000 GH Avg Hold>10/10 Radio Std: None	z		RL	/Sight	Input. RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr Freq Ref: Int (S)	Alten: 10 dB	Trig. Free Run Cate: Off #IF Gain: Low	Center Fri Avg[Hold: Radio Std		Hz			
1 Graph Scale/Div 10	• 0 dB			Ref Lvi Offset 3 Ref Value 30.00					e/Div 10.0	dB			Ref Lvi Offset Ref Value 30.0						
Log 20.0 10.0 -10.0 -20.0 -30.0 -40.0								Log 20.0 10.0 -10.0 -20.0 -30.0 -40.0	_			ka,,							- ward
-50.0 -60.0 Center 4.945 #Res BW 244 2 Metrics				#Video BW 1.000	0 MHz*	#Sweep 20.	Span 10 MHz 0 ms (1001 pts)		er 4.94500 BW 240.0				#Video BW 1.0	000 MHz*			#Sweep 20.0	Span ms (1)	10 MHz 001 pts)
	Occupied B Transmit Fr x dB Bandw	8.6385 MHz	33.880 KHz 9.392 MHz		Total Power % of OBW Powe x dB	26.9 dBm er 99.00 % -26.00 dB	Local			Occupied Ba Transmit Fre x dB Bandwin	8.6265 MHz	-25.642 kHz 9.461 MHz			Total Power % of OBW Pov x dB	ver	27.0 dBm 99.00 % -26.00 dB	(Local
4 h	C 🔳 (Dec 28, 2023 14:26:34				.:: 💽)	4	5	c 🔳 ?	Dec 28, 2023 14:27:46							88	X



Test specification:	Section 90.209, Occupied	Section 90.209, Occupied bandwidth						
Test procedure:	47 CFR, Section 2.1049							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	28-Dec-23	verdict:	PA33					
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC					
Remarks:								

Plot 7.2.2 Occupied bandwidth test result at mid frequency



Modulation: 64QAM

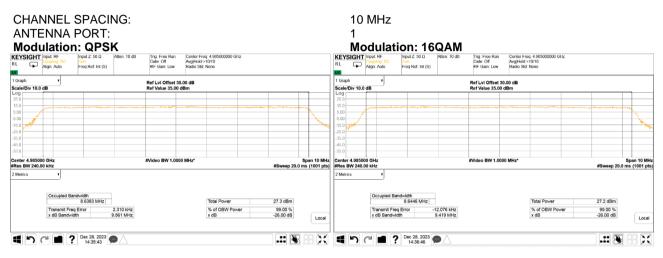
Modulation: 256QAM

			mou	ulation.	ZJUQAN				
EYSIGHT Input RF Input Z: 50 Ω Atten: 10 dB Couping DC Corr Align: Auto Freq Ref. Int (S)	Trig, Free Run Center Freq. 4.965000000 GHz Celer Off Avg Held - 10110 #F Gain: Low Radio Std. None			oupling: DC Corr	t 50 Ω Alten: 10 dB lef: Int (S)	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 4.965000000 GHz Avg[Hold=10/10 Radio Std: None		
ale/Div 10.0 dB	Ref Lvi Offset 30.00 dB Ref Value 35.00 dBm		1 Graph Scale/Div 10.0 d	в		Ref Lvi Offset 30. Ref Value 35.00 d			
			Log 25.0 5.00 -5.00 -5.00 -5.00 -25.0 -35.0 -45.0						
0	#Video BW 1.0000 MHz* #Sweep	Span 10 MHz	-55.0 Center 4.965000 #Res BW 240.00 2 Metrics			#Video BW 1.000) MHz*	#Sweep 20.0	Span 10 M ns (1001 ;
Occupied Bandwidth 8.6449 MHz Transmit Freq Error -24.369 kHz x dB Bandwidth 9.328 MHz	Total Power 27.4 dBr % of OBW Power 59.00 % x dB -26.00 dB	16		Occupied Bandwidth 8.624 Transmit Freq Error x dB Bandwidth	40 MHz -13.796 kHz 9.467 MHz		Total Power % of OBW Power x dB	27.3 dBm 99.00 % -26.00 dB	Loc
■ ? Dec 28, 2023			4 50	Dec :	28, 2023			.:: 😽	



Test specification:	Section 90.209, Occupied	l bandwidth	
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Dec-23	verdict:	PA33
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC
Remarks:			

Plot 7.2.3 Occupied bandwidth test result at high frequency



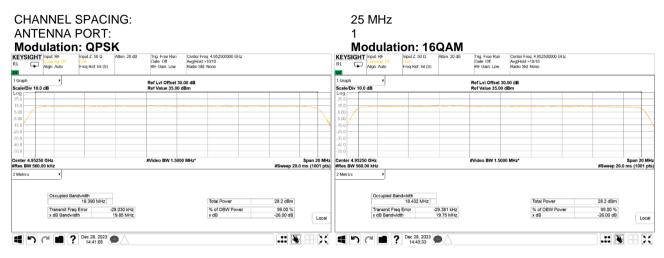
Modulation: 64QAM

	3 Trig: Free Run Center Freq: 4.985000000 GHz Celler Off Avg]Held 10/10 #IF Gain: Low Radio Std: None		KEYSIGHT Input. RF Input.Z: 50 Ω Atten: 10 dB RL Coupling: DC Corr Align: Auto Freq Ref. Int (S)	Trig: Free Run Center Freq: 4.965000000 GHz Cete: Off Avg Hold>10/10 #IF Gain: Low Radio Std. None	
sraph v ale/Div 10.0 dB	Ref Lvi Offset 30.00 dB Ref Value 35.00 dBm		1 Graph Scale/Div 10.0 dB	Ref Lvi Offset 30.00 dB Ref Value 35.00 dBm	
		W	25.0 15.0	anne and an	
		have	5.00 -5.00 -15.0		
			-25.0 -35.0 -45.0 		
er 4.985000 GHz BW 240.00 KHz	#Video BW 1.0000 MHz* #Sweep	Span 10 MHz 20.0 ms (1001 pts)	Center 4.985000 GHz	#Video BW 1.0000 MHz* #Sweep	Span 10 20.0 ms (1001
trics V			2 Metrics		
Occupied Bandwidth 8.6432 MHz	Total Power 27.4 dBn		Occupied Bandwidth 8.6255 MHz	Total Power 27.5 dBm	9
Transmit Freq Error -9.547 kHz x dB Bandwidth 9.407 MHz	% of OBW Power 99.00 % x dB -26.00 dB		Transmit Freq Error -616 Hz x dB Bandwidth 9.397 MHz	% of OBW Power 99.00 % x dB -26.00 dB	
			d la		



Test specification:	Section 90.209, Occupied	l bandwidth	
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Dec-23	verdict:	PA33
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC
Remarks:			

Plot 7.2.4 Occupied bandwidth test result at low frequency



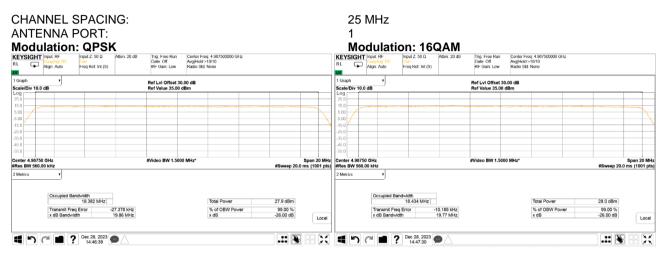
Modulation: 64QAM

YSIGHT Input RF Input Z 50 Ω Atten: 20 d Coupling: DC Corr Align: Auto Freq Ref: Int (S)	B Trig. Free Run Center Freq. 4.952500000 GHz Ceter Off Avg[Hold:>10/10 #IF Gain: Low Radio Std: None		Coupling: DC Align: Auto	Input Z: 50 Ω Alten: 20 dB Corr Freq Ref: Int (S)	Trig: Free Run Center F Cate: Off Avg Hol #IF Gain: Low Radio S	Freq: 4.952500000 GHz d:>10/10 fdt None	
aph v le/Div 10.0 dB	Ref Lvi Offset 30.00 dB Ref Value 35.00 dBm	s	Graph v icale/Div 10.0 dB		Ref Lvi Offset 30.00 dB Ref Value 35.00 dBm		
			-09 25.0				\rightarrow
			15.0 5.00 5.00				
			15.0				
			35.0				_
			45.0				
4.95250 GHz W 560.00 kHz	#Video BW 1.5000 MHz*		enter 4.95250 GHz Res BW 560.00 kHz		#Video BW 1.5000 MHz*	#Sweep 20	Span 20 0.0 ms (100
Occupied Bandwidth 18.439 MHz	Total Power	28.2 dBm	Metrics v	ndwidth 18.393 MHz		Total Power 28.0 dBm	
Transmit Freq Error -25.965 kHz x dB Bandwidth 19.74 MHz	% of OBW Power x dB	99.00 % -26.00 dB	Transmit Free x dB Bandwid	Error -27.684 kHz		% of OBW Power 99.00 % x dB -26.00 dB	L
C E ? Dec 28, 2023			th?)			



Test specification:	Section 90.209, Occupied	Section 90.209, Occupied bandwidth						
Test procedure:	47 CFR, Section 2.1049							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	28-Dec-23	verdict:	PA33					
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC					
Remarks:								

Plot 7.2.5 Occupied bandwidth test result at mid frequency



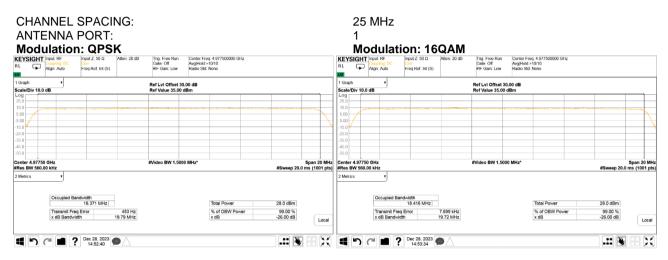
Modulation: 64QAM

YSIGHT Input. RF Coupling: DC Align: Auto	Input Z: 50 Ω Atten: 2 Corr Freq Ref: Int (S)	Cate: Off	Center Freq: 4.967500000 GHz Avg Hold⇒10/10 Radio Std: None			RL	Align	ling DC Co	out Z: 50 Ω rr aq Ref: Int (S)	Atten: 20 dB	Trig: Free Run Gete: Off #IF Gain: Low	Center Freq. 4 Avg Hold>10/ Radio Std. Nor			
aph v le/Div 10.0 dB		Ref Lvi Offset 30.0 Ref Value 35.00 dB					h Div 10.0 dB	•			Ref Lvi Offset 3 Ref Value 35.00				
						Log 25.0 - 15.0 - 5.00 - -5.00 - -5.00 - -5.00 - -5.00 - -35.0 - -35.0 - -45.0 -									
er 4.96750 GHz 5 BW 560.00 kHz trics y		#Video BW 1.5000 #	NHz*	S #Sweep 20.0 m	Span 20 MH Is (1001 pt		4.96750 GHz 3W 560.00 kH				#Video BW 1.50	00 MHz*		#Sweep 20.0	Span 20 ms (1001
Occupied E Transmit Fr x dB Bandy	18.429 MHz eq Error -15.326 k		Total Power % of OBW Power x dB	27.9 dBm 99.00 % -26.00 dB	Local	2 1001	C Ti	ccupied Bandwid 1i ransmit Freq Erro dB Bandwidth	8.384 MHz	15.538 kHz 19.86 MHz			of OBW Power dB	27.8 dBm 99.00 % -26.00 dB	Le
	Pec 28, 2023			.: 😽				1 ? [•]		- ^				.:: 🛯	1001



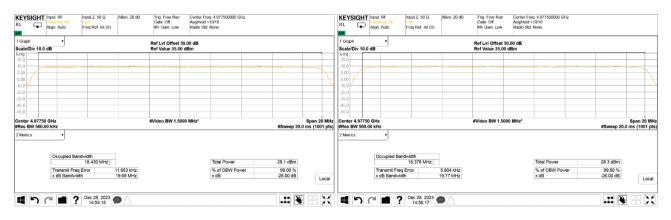
Test specification:	Section 90.209, Occupied	Section 90.209, Occupied bandwidth						
Test procedure:	47 CFR, Section 2.1049							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	28-Dec-23	verdict:	PA33					
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC					
Remarks:								

Plot 7.2.6 Occupied bandwidth test result at high frequency



Modulation: 64QAM

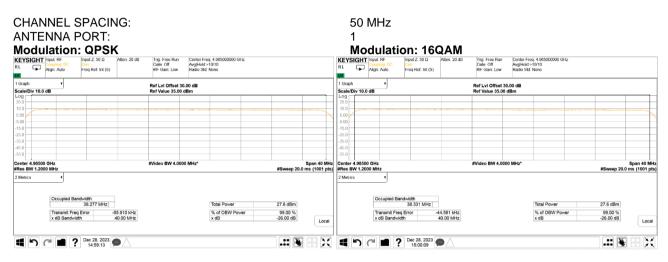
Modulation: 256QAM





Test specification:	Section 90.209, Occupied	Section 90.209, Occupied bandwidth							
Test procedure:	47 CFR, Section 2.1049								
Test mode:	Compliance	Verdict:	PASS						
Date(s):	28-Dec-23	verdict:	PA35						
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 48 VDC						
Remarks:	-								

Plot 7.2.7 Occupied bandwidth test result at mid frequency



Modulation: 64QAM

Modulation: 256QAM

RL F	nput. RF Coupling: DC Nign: Auto	Input Z: 50 Ω Corr Freq Ref: Int (S)	Alten: 20 dB	Trig: Free Run Gete: Off #IF Gain: Low	Center Freq: 4.965000000 GHz Avg Hold>10/10 Radio Std: None			RL	SIGHT	Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr Freq Ref: Int (S)	Alten: 20 dB	Trig: Free Run Cate: Off #IF Gain: Low	Center Fre Avg[Hold⊃ Radio Std		łż.		
1 Graph Scale/Div 10.0 d	r iB			Ref Lvi Offset 3 Ref Value 35.00				1 Graph Ref Lvi Offset 30.00 dB Scale/D/v 10.0 dB Ref Value 35.00 dBm										
Log 25.0 15.0 5.00 -5.00 -15.0								25.0 15.0 5.00 -5.00	_									
-25.0 -35.0 -45.0 -55.0 Center 4.96500 #Res BW 1.2000				#Video BW 4.00	00 MHz*	#Sweep 20.0	Span 40 MHz ms (1001 pts	-25.0 -35.0 -45.0 -55.0 Cente #Res	4.96500 BW 1.200	GHz 0 MHz			#Video BW 4.00	DO MHz*			#Sweep 20.0	Span 40 MHz ms (1001 pts)
2 Metrics	Occupied Ban Transmit Freq x dB Bandwidt	38.327 MHz	36.519 kHz 40.00 MHz		Total Power % of OBW Power x dB	27.6 dBm 99.00 % -26.00 dB	Local	2 Metr		Occupied Ban Transmit Freq x dB Bandwidt	38.302 MHz Error	27.085 kHz 40.00 MHz			Total Power % of OBW Pow x dB	er	27.5 dBm 99.00 % -26.00 dB	Local
470	∍ ∎ ?	Dec 28, 2023 15:01:12						4	5	⊲∎?	Dec 28, 2023 15:02:09							

Test specification:	Section 90.210, Emission mask						
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	27-Dec-23	Verdict: PASS					
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC				
Remarks:	Remarks:						

7.3 Emission mask test

7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1 and Table 7.3.2 and Table 7.3.3.

Table 7.3.1 Emission mask limits for 10 MHz channel bandwidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask M (Occupied bandwidth 10 MHz)	
0 – 4.5 MHz	0***
4.5 – 5.0 MHz	568log(F*/4.5)
5.0 – 5.5 MHz	26+145log(F*/5.0)
5.5 – 10.0 MHz	32+31log(F*/5.5)
10.0 – 15.0 MHz	40+57log(F*/10.0)
More than** 15.0 MHz	50

* - F – frequency in MHz removed from center

** - emission mask includes carrier modulation envelope within \pm 150 % of the authorized bandwidth; the frequency range removed beyond \pm 150 % of the authorized bandwidth from carrier was investigated as spurious emission *** - Zero dB reference measured relative to the highest average power of the fundamental emission measured across designated channel bandwidth

Table 7.3.2 Emission mask limits for 25 MHz channel bandw	vidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask M (Occupied bandwidth 20 MHz)	
0 – 11.25 MHz	0***
11.25 – 12.50 MHz	568log(F*/4.5)
12.50 – 13.75 MHz	26+145log(F*/5.0)
13.75 – 25.00 MHz	32+31log(F*/5.5)
25.00 – 37.50 MHz	40+57log(F*/10.0)
More than** 37.50 MHz	50

* - F - frequency in MHz removed from center

** - emission mask includes carrier modulation envelope within \pm 150 % of the authorized bandwidth; the frequency range removed beyond \pm 150 % of the authorized bandwidth from carrier was investigated as spurious emission *** - Zero dB reference measured relative to the highest average power of the fundamental emission measured across designated channel bandwidth



Test specification:	Section 90.210, Emission mask						
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	27-Dec-23	verdict:	PASS				
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC				
Remarks:							

Table 7.3.3 Emission mask limits for 50 MHz channel bandwidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask M (Occupied bandwidth 40 MHz)	
0 – 22.50 MHz	0***
22.50 – 25.00 MHz	568log(F*/4.5)
25.00 – 27.50 MHz	26+145log(F*/5.0)
27.50 – 50.00 MHz	32+31log(F*/5.5)
50.00 – 75.00 MHz	40+57log(F*/10.0)
More than** 75.00 MHz	50

* - F – frequency in MHz removed from center

** - emission mask includes carrier modulation envelope within \pm 150 % of the authorized bandwidth; the frequency range removed beyond \pm 150 % of the authorized bandwidth from carrier was investigated as spurious emission *** - Zero dB reference measured relative to the highest average power of the fundamental emission measured across designated channel bandwidth

7.3.2 Test procedure

- **7.3.2.1** The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.
- **7.3.2.2** The emission mask was measured with spectrum analyzer with RBW set to 1% of emission bandwidth and VBW = 30 kHz as provided in the associated plots. The test results are provided in the associated plots.

Figure 7.3.1 Emission mask test setup





Test specification:	est specification: Section 90.210, Emission mask							
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	27-Dec-23	verdict:	PASS					
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC					
Remarks:	•							

Table 7.3.4 Emission mask test results at 10 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
4945.0		
4965.0	Emission mask M	Pass
4985.0		

Table 7.3.5 Emission mask test results at 25 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
4952.5		
4967.5	Emission mask M	Pass
4977.5		

Table 7.3.6 Emission mask test results at 50 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
4965.0	Emission mask M	Pass

Reference numbers of test equipment used

	Corone on the mann	sere er teet equi	pinione acca								
	HL 5637	HL 5376	HL 5933								
E											

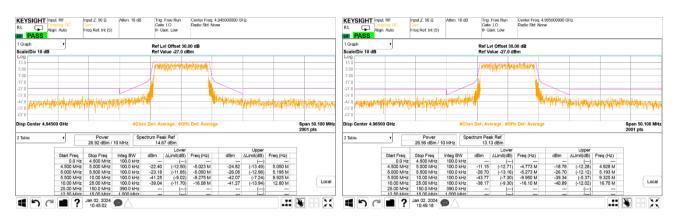
Full description is given in Appendix A.



Test specification:	Section 90.210, Emission mask					
Test procedure:	47 CFR, Sections 2.1051, 2.104	7 and 90.210(m)				
Test mode:	Compliance	Verdict:	PASS			
Date(s):	27-Dec-23	verdict:	PASS			
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC			
Remarks:						

Plot 7.3.1 Emission mask test results at low, mid, high carrier frequency, 10 MHz CBW

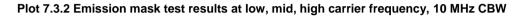
OPERATING FREQUENCY RANGE: DETECTOR USED: MODULATION: MODULATING SIGNAL: TRANSMITTER OUTPUT POWER SETTINGS: ANTENA CHAIN 4945.0 – 4985.0 MHz Peak QPSK PRBS Maximum 1



	input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr Freq Ref: Int (S)	Alten: 10 dB	Cate	Free Run E LO ain: Low	Center Freq. 4 Radio Std: No	4.985000000 G one	iHz		
Graph				Ref L	vi Offset 30.	00 dB				
cale/Div 10 dB					alue -27.0 di					
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57.0 14 19 10 17.0 15 Center 4.98	8500 GHz	Power	Spi	ectrum Pea	ak Ref	's Det: Averag	be Trian Level 1	a seland		Span 50.100 M
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57.0 14 19 10 17.0 15 Center 4.98		26.90 dBm /	10 MHz	ectrum Pea 12.8	ak Ref 35 dBm Lower			Upper		Span 50.100 M
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57.0 14 19 10 17.0 15 Center 4.98	Start Freq	26.90 dBm / Stop Freq 4.500 MHz	10 MHz Spi Integ BW 100.0 kHz	ectrum Pea 12.8 dBm 	ak Ref 85 dBm Lower ∆Limit(dB) ()	Freq (Hz)	dBm	Upper ∆Limit(dB) ()	Freq (Hz)	Span 50.100 M
57.0 14 19 10 17.0 15 Center 4.98	Start Freq 0.0 Hz 4.500 MHz	26.90 dBm / Stop Freq 4.500 MHz 5.000 MHz	10 MHz Integ BW 100.0 kHz 100.0 kHz	ectrum Pea 12.8 dBm -10.81	ak Ref 85 dBm ∆Limit(dB) () (-11.84)	Freq (Hz) 	dBm 	Upper ΔLimit(dB) (1)	Freq (Hz) 	Span 50.100 M
7.0 7.0 sp Center 4.98	Start Freq 0.0 Hz 4.500 MHz 5.000 MHz	26.90 dBm / Stop Freq 4.500 MHz 5.000 MHz 5.500 MHz	10 MHz Integ BW 100.0 kHz 100.0 kHz 100.0 kHz	ectrum Pea 12.8 dBm -10.81 -27.77	ak Ref 85 dBm ∆Limit(dB) () (-11.84) (-11.89)	Freq (Hz) 	dBm 	Upper ΔLimit(dB) (-11.48) (-11.54)	Freq (Hz) 	Span 50.100 M
57.0 14 19 10 17.0 15 Center 4.98	Start Freq 0.0 Hiz 5.500 MHz	26.90 dBm / Stop Freq 4.500 MHz 5.000 MHz 5.500 MHz 10.00 MHz	10 MHz Integ BW 100.0 kHz 100.0 kHz 100.0 kHz 100.0 kHz	dBm 	ak Ref 55 dBm △Limit(dB) (-11.84) (-11.89) (-4.11)	Freq (Hz) 	dBm 	Upper ΔLimit(dB) (-11.48) (-11.54) (-3.31)	Freq (Hz) 	Span 50,100 M 2001 pts
57.0 10 10 40 P	Start Freq 0.0 Hz 4.500 MHz 5.000 MHz 10.00 MHz	26.90 dBm / Stop Freq 4.500 MHz 5.000 MHz 5.500 MHz 10.00 MHz 25.00 MHz	Integ BW 100.0 kHz 100.0 kHz 100.0 kHz 100.0 kHz 100.0 kHz	ectrum Pea 12.8 dBm -10.81 -27.77	ak Ref 55 dBm ΔLower ΔLimit(dB) (-11.84) (-11.89) (-4.11) (-9.72)	Freq (Hz) 	dBm 	Upper ΔLimit(dB) (-11.48) (-11.54) (-13.31) (-10.99)	Freq (Hz) 	Span 50.100 M
57.0 14 19 10 17.0 15 Center 4.98	Start Freq 0.0 Hiz 5.500 MHz	26.90 dBm / Stop Freq 4.500 MHz 5.000 MHz 5.500 MHz 10.00 MHz 25.00 MHz 150.0 MHz	10 MHz Integ BW 100.0 kHz 100.0 kHz 100.0 kHz 100.0 kHz	dBm 	ak Ref 55 dBm △Limit(dB) (-11.84) (-11.89) (-4.11)	Freq (Hz) -4.778 M -5.278 M -9.325 M -16.13 M	dBm 	Upper ΔLimit(dB) (-11.48) (-11.54) (-3.31)	Freq (Hz) 	Span 50,100 M 2001 pts



Test specification:	Section 90.210, Emission mask				
Test procedure:	47 CFR, Sections 2.1051, 2.104	7 and 90.210(m)			
Test mode:	Compliance	Verdict: PASS			
Date(s):	27-Dec-23	verdict:	PASS		
Temperature: 23 °C	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC		
Remarks:					



OPERATING FREQUENCY RANGE: DETECTOR USED: MODULATION: MODULATING SIGNAL: TRANSMITTER OUTPUT POWER SETTINGS: ANTENA CHAIN 4945.0 – 4985.0 MHz Peak 16QAM PRBS Maximum 1



