HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

Hermon Laboratories Ltd.
P.O. Box 23, Binyamina 3055001, Israel
Tel. +972 4628 8001
Fax. +972 4628 8277
E-mail: mail@hermonlabs.com

TEST REPORT

ACCORDING TO: FCC 47CFR part 96

FOR:

Airspan Networks Inc.
AirSpan Indoor 5G NR Base station
Models: AirStar 1200 5G, 3.55-3.7GHz (n48) PoE
AirStar 1900 5G, 3.55-3.7GHz (n48) PoE
FCC ID: PIDAST1200

Table of contents

1 Applicant information ... 3
2 Equipment under test attributes ... 3
3 Manufacturer information ... 3
4 Test details ... 3
5 Tests summary ... 4
6 EUT description ... 5
6.1 General information ... 5
6.2 Ports and lines ... 5
6.3 Support and test equipment ... 5
6.4 Changes made in the EUT ... 5
6.5 Test configuration ... 6
6.6 Transmitter characteristics ... 7
6.7 Table of calculations for the MAX EIRP at frequency range 3550 – 3700 MHz ... 8
7 Transmitter tests according to 47CFR part 96 ... 9
7.1 Maximum EIRP and maximum power spectral density ... 9
7.2 Peak-to-average power ratio (PAPR) test ... 34
7.3 Occupied bandwidth test ... 50
7.4 Emission outside the fundamental test ... 71
7.5 Radiated spurious emission measurements ... 97
7.6 Spurious emissions at RF antenna connector test ... 108
7.7 Frequency stability test ... 151
8 APPENDIX A Test equipment and ancillaries used for tests ... 153
9 APPENDIX B Test equipment correction factors ... 154
10 APPENDIX C Measurement uncertainties ... 159
11 APPENDIX D Test laboratory description ... 160
12 APPENDIX E Specification references ... 160
13 APPENDIX F Manufacturer's declaration ... 161
14 APPENDIX G Abbreviations and acronyms ... 162

1 Applicant information

Client name:	Airspan Networks Inc.
Address:	777 Yamato, Road Suite 310 Boca Raton, FL 33431, USA
Telephone:	+1 561 893 8670
Fax:	+1 561 893 8671
E-mail:	zlevi@airspan.com
Contact name:	Mr. Zion Levi

2 Equipment under test attributes

Product name:	AirSpan Indoor 5G NR Base station
Product type:	Transceiver
Model(s):	AirStar 1200 5G, 3.55-3.7GHz (n48) PoE*
Serial number:	ECCA61015CA0
Hardware version:	02
Software release:	SR 19.00
Receipt date	01-Feb-22

*According to manufacturer's declaration provided in Appendix F the AirStar 1200 5G, 3.55-3.7GHz (n48) PoE is full identical to AirStar 1900 5G, 3.55-3.7GHz (n48) PoE and the reason for name change is only marketing description. Therefore, only the model AirStar 1200 5G, 3.55-3.7GHz (n48) PoE 4256220 was tested.

3 Manufacturer information

Manufacturer name:	Airspan Networks Inc.
Address:	777 Yamato, Road Suite 310 Boca Raton, FL 33431, USA
Telephone:	+1 561 893 8670
Fax:	+1 561 893 8671
E-Mail:	zlevi@airspan.com
Contact name:	Mr. Zion Levi

4 Test details

Project ID:	44706
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	07-Feb-22
Test completed:	17-Feb-22
Test specification(s):	FCC 47CFR part 96

5 Tests summary

Test	Status
Transmitter characteristics	
Section 96.41(b), Maximum EIRP and maximum power spectral density	Pass
Section 96.41(g), Peak-to- average power ratio	Pass
Section 2.1049, Occupied bandwidth	Pass
Section 96.41(e), Emission mask	Pass
Section 96.41(e)(2), Radiated spurious emissions	Pass
Section 96.41(e)(3), Conducted spurious emissions	Pass
Section 2.1055, Frequency stability	Pass

This test report supersedes the previously issued test report identified by Doc ID: AIRRAD_FCC.44706_Rev1

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. A. Morozov, test engineer, EMC & Radio	07-Feb-22 – 17-Feb-22	
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	09-May-22	
Approved by:	Mr. S. Samokha, technical manager, EMC & Radio	09-May-22	

6 EUT description

Note: The following data in this clause is provided by the customer and represents his sole responsibility

6.1 General information

The EUT is a Mobile Digital station, AirStar 1200 3550-3700MHz (N48), is part of a 5G broadband fixed cellular wireless access system. The system provides a radio link between an end-user (a subscriber) and a network to give high-speed data access.
The AirStar 1200's transceiver/receiver (Up to 256 QAM modulation, data rate up to 190 Mbps) equipped with a 8.7dBi Internal antenna. Advanced Antenna Techniques 2x2 MIMO are supported. The maximum RF output power (not including antenna gain) is 27.04 dBm for 8.7dBi and it can be reduced by software.
The AirStar is installed indoors. The Subscriber transmits and receives traffic to and from the base station respectively. The transceiver provides subscribers with "always-on" Internet, high speed data only, or data and voice (VoIP) services and is configured with a unique base station reference number, preventing the 5G UE from relocating to another subscriber premises without authorization.

Note: AirStar 1200 equipment defined as Category A CBSD (Citizens Broadband Radio Service Device) per FCC part 96 section 96.3(2).
Antennas 1/2 arrange one sector while antenna 1 is cross polarized to antenna 2. The transmitter output signals are completely uncorrelated.

This device supports 5G-NR TDD n48 band and the partial n77/n78 bands matching n48 band.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Power	POE	EUT	POE 56V	1	RG45	>3m
Signal	RS232*	EUT	Laptop	1	RG45	>3m
Signal	SFP port	EUT	SFP Adapter	1	Optic cable	>3m
Signal	DC power 48VDC**	EUT	VDC	1	NA	NA

* For maintenance
**Optionally

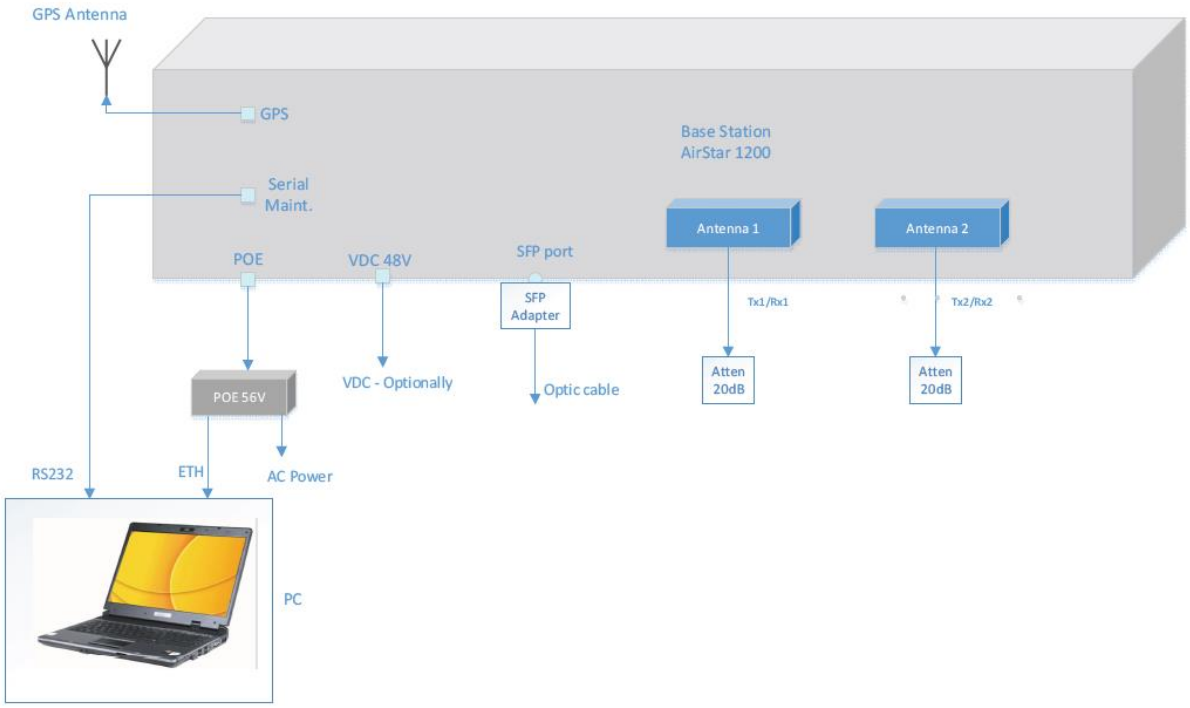
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
PC	DELL	Latitude E7440	NA
POE adapter	PHIHONG	POE90U-1BT	NA
SFP adapter	Advice	SFP-10G-SMA40	NA
RF attenuator 20db	Mini-circuits	VAT-20+	NA

6.4 Changes made in the EUT

No changes were implemented in the EUT during testing.

6.5 Test configuration



6.6 Transmitter characteristics

Type of equipment	
V	Stand-alone (Equipment with or without its own control provisions)
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)
	Plug-in card (Equipment intended for a variety of host systems)

Intended use		Condition of use
	fixed	Always at a distance more than 2 m from all people
V	mobile	Always at a distance more than 20 cm from all people
	portable	May operate at a distance closer than 20 cm to human body

Assigned frequency range	3550.0 – 3700.0 MHz
Operating frequency (full bands)	3555.0 – 3695.0 MHz
RF channel spacing	10 MHz, 20 MHz, 40 MHz
Maximum rated output power	At transmitter 50 Ω RF output connector (per port) 27.04 dBm

Is transmitter output power variable?		No		
	V	Yes		continuous variable
			V	stepped variable with step size 0.25 dB
				minimum RF power -30 dBm
				maximum RF power at antenna connector dBm

Antenna connection				
unique coupling	**V**	standard connector	Integral	**V** with temporary RF connector
				without temporary RF connector

Antenna/s technical characteristics

Type	Manufacturer	Model number	Gain
Internal	Airspan Networks	AW3867-1_2	8.7 dBi

Transmitter aggregate data rate/s, Mbps

Transmitter 26dBc power bandwidth	Type of modulation			
	QPSK	16QAM	64QAM	256QAM
10 MHz	10.7	22.7	47.3	71.5
20 MHz	23.4	45.4	95.0	143.0
40 MHz	46.8	90.8	190.0	285.0

Type of multiplexing	TDD
Modulating test signal (baseband)	PRBS
Maximum transmitter duty cycle in normal use	0.74

Transmitter power source					
		Nominal rated voltage		Battery type	
	DC	**Nominal rated voltage**			
V	AC mains	**Nominal rated voltage**	48 VAC	Frequency	

Common power source for transmitter and receiver	**V**	yes	no

6.7 Table of calculations for the MAX EIRP at frequency range 3550 – 3700 MHz

Antenna configuration	Antenna Vendor	Antenna Model Number	Antenna Peak Gain (dBi)	Signal Bandwidth (MHz)	Maximum Conducted Power (dBm)	EIRP (dBm/10MHz)	EIRP per Bandwidth (dBm)	Operational Category
1	Airspan Networks	AW3867-1_2	8.7	10.0	21.29	29.99	29.99	A
				20.0	23.88	29.97	32.58	
				40.0	27.04	29.97	35.74	

Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

7 Transmitter tests according to 47CFR part 96

7.1 Maximum EIRP and maximum power spectral density

7.1.1 General

This test was performed to measure the maximum EIRP and maximum spectral power density at the transmitter RF antenna connector. Specification test limits are given in Table 7.1.1, Table 7.1.2.

Table 7.1.1 Maximum EIRP limits

Assigned frequency range, MHz	EIRP dBm/10 MHz
3550 - 3700	30.0

Table 7.1.2 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, MHz	Peak spectral power density, dBm
3550 - 3700	1.0	20.0

7.1.2 Test procedure

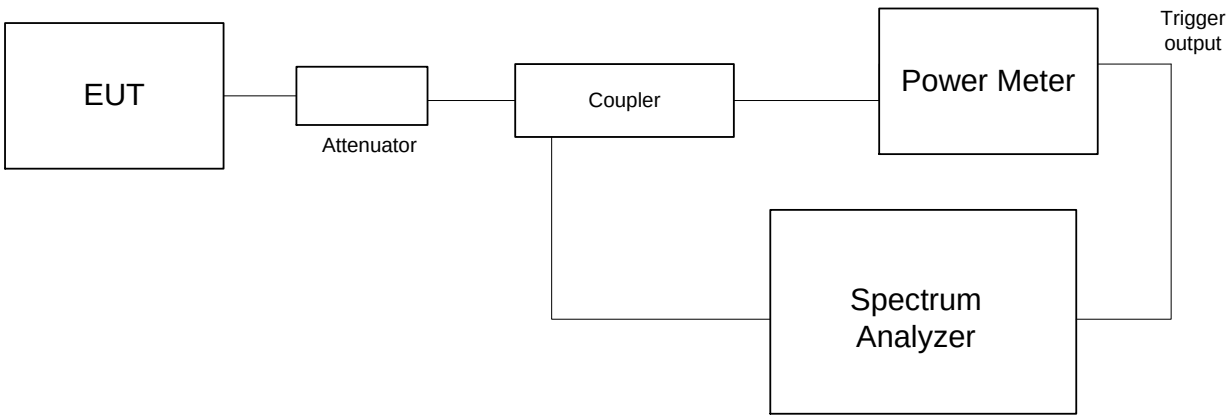
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

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

7.1.2.3 The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in average mode with resolution bandwidth set to 1.0 MHz, video bandwidth wider than resolution bandwidth, sweep time and sufficient number of sweeps was allowed for trace stabilization.

7.1.2.4 Spectrum analyzer was set in average mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in Table 7.1.3, Table 7.1.4 and the associated plots.

Figure 7.1.1 Maximum EIRP and power spectral density test setup



Test specification:	**Section 96.41(b), Maximum EIRP and maximum power spectral density**		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1011 hPa	**Power:** 48 VAC
Remarks:			

Table 7.1.3 Maximum EIRP test results

ASSIGNED FREQUENCY RANGE: 3550.0 – 3700.0 MHz
DETECTOR USED: Average (gated)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
CHANNEL SPACING: 10 MHz

Frequency, MHz	RF Output power		Antenna gain, dBi	EIRP*, dBm/10 MHz	Limit, dBm/10 MHz	Margin, dB**	Verdict
	Chain RF#1, dBm	Chain RF#2, dBm					
Modulation QPSK							
3555.0	21.29	21.00	8.7	29.99	30.0	-0.01	Pass
3625.0	21.25	21.20	8.7	29.95	30.0	-0.05	Pass
3695.0	21.25	20.66	8.7	29.95	30.0	-0.05	Pass
Modulation 16QAM							
3555.0	21.17	21.14	8.7	29.87	30.0	-0.13	Pass
3625.0	21.15	20.56	8.7	29.85	30.0	-0.15	Pass
3695.0	20.78	20.97	8.7	29.67	30.0	-0.33	Pass
Modulation 64QAM							
3555.0	21.11	21.07	8.7	29.81	30.0	-0.19	Pass
3625.0	21.14	20.91	8.7	29.84	30.0	-0.16	Pass
3695.0	20.84	21.10	8.7	29.80	30.0	-0.20	Pass
Modulation 256QAM							
3555.0	20.97	21.10	8.7	29.80	30.0	-0.20	Pass
3625.0	21.07	20.91	8.7	29.77	30.0	-0.23	Pass
3695.0	21.23	20.67	8.7	29.93	30.0	-0.07	Pass

*- EIRP = Max SA reading (Chains #1&2) - 10*log[OBW(MHz) / 10 MHz]] + Antenna gain =
Max SA reading + Antenna gain: The transmitter output signal are completely uncorrelated, antennas 1/2 is one sector.
** - Margin = EIRP, dBm – specification limit.

Test specification:	**Section 96.41(b), Maximum EIRP and maximum power spectral density**		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1011 hPa	**Power:** 48 VAC
Remarks:			

Table 7.1.4 Maximum EIRP test results (continue)

ASSIGNED FREQUENCY RANGE: 3550.0 – 3700.0 MHz
DETECTOR USED: Average (gated)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
CHANNEL SPACING: 20 MHz

Frequency, MHz	RF Output power		Antenna gain, dBi	EIRP*, dBm/20 MHz	EIRP*, dBm/10 MHz	Limit, dBm/10 MHz	Margin, dB**	Verdict
	Chain RF#1, dBm	Chain RF#2, dBm						
Modulation QPSK								
3560.0	23.36	23.88	8.70	32.58	29.97	30.0	-0.03	Pass
3625.0	23.87	23.81	8.70	32.57	29.96	30.0	-0.04	Pass
3690.0	23.75	23.48	8.70	32.45	29.84	30.0	-0.16	Pass
Modulation 16QAM								
3560.0	23.64	23.67	8.70	32.37	29.76	30.0	-0.24	Pass
3625.0	23.83	23.24	8.70	32.53	29.92	30.0	-0.08	Pass
3690.0	23.42	23.48	8.70	32.18	29.57	30.0	-0.43	Pass
Modulation 64QAM								
3560.0	23.74	23.86	8.70	32.56	29.95	30.0	-0.05	Pass
3625.0	23.82	23.48	8.70	32.52	29.91	30.0	-0.09	Pass
3690.0	23.40	23.58	8.70	32.28	29.67	30.0	-0.33	Pass
Modulation 256QAM								
3560.0	23.56	23.55	8.70	32.26	29.65	30.0	-0.35	Pass
3625.0	23.72	23.32	8.70	32.42	29.81	30.0	-0.19	Pass
3690.0	23.38	23.71	8.70	32.41	29.80	30.0	-0.20	Pass

*- EIRP = Max SA reading (Chains #1&2) - 10*log[OBW(MHz) / 10 MHz]] + Antenna gain = Max SA reading – 2.61 dB + Antenna gain: The transmitter output signal are completely uncorrelated, antennas 1/2 is one sector.

** - Margin = EIRP, dBm – specification limit.

Test specification:	**Section 96.41(b), Maximum EIRP and maximum power spectral density**		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1011 hPa	**Power:** 48 VAC
Remarks:			

Table 7.1.5 Maximum EIRP test results (continue)

ASSIGNED FREQUENCY RANGE: 3550.0 – 3700.0 MHz
DETECTOR USED: Average (gated)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
CHANNEL SPACING: 40 MHz

Frequency, MHz	RF Output power		Antenna gain, dBi	EIRP*, dBm/40 MHz	EIRP*, dBm/10 MHz	Limit, dBm/10 MHz	Margin, dB**	Verdict
	Chain RF#1, dBm	Chain RF#2, dBm						
Modulation QPSK								
3570.0	27.03	26.95	8.70	35.73	29.96	30.0	-0.04	Pass
3625.0	27.04	26.90	8.70	35.74	29.97	30.0	-0.03	Pass
3680.0	25.50	26.08	8.70	34.78	29.01	30.0	-0.99	Pass
Modulation 16QAM								
3570.0	26.73	26.40	8.70	35.43	29.66	30.0	-0.34	Pass
3625.0	26.99	26.76	8.70	35.69	29.92	30.0	-0.08	Pass
3680.0	25.43	26.01	8.70	34.71	28.94	30.0	-1.06	Pass
Modulation 64QAM								
3570.0	26.72	26.36	8.70	35.42	29.65	30.0	-0.35	Pass
3625.0	26.95	26.74	8.70	35.65	29.88	30.0	-0.12	Pass
3680.0	25.43	26.02	8.70	34.72	28.95	30.0	-1.05	Pass
Modulation 256QAM								
3570.0	27.01	26.39	8.70	35.71	29.94	30.0	-0.06	Pass
3625.0	26.96	26.85	8.70	35.66	29.89	30.0	-0.11	Pass
3680.0	25.41	26.01	8.70	34.71	28.94	30.0	-1.06	Pass

*- EIRP = Max SA reading (Chains #1&2) - 10*log[OBW(MHz) / 10 MHz]] + Antenna gain = Max SA reading – 5.77 dB + Antenna gain: The transmitter output signal are completely uncorrelated, antennas 1/2 is one sector.

** - Margin = EIRP, dBm – specification limit.

Test specification:	**Section 96.41(b), Maximum EIRP and maximum power spectral density**		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1011 hPa	**Power:** 48 VAC
Remarks:			

Table 7.1.6 Peak spectral power density test results

ASSIGNED FREQUENCY RANGE: 3550.0 – 3700.0 MHz
DETECTOR USED: Average (gated)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
NUMBER OF CHAINS: 2
CHANNEL SPACING: 10 MHz

Frequency, MHz	SA Reading, dBm/MHz		Antenna gain, dBi	Total PSD*, dBm/ MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Chain RF#1	Chain RF#2					
Modulation QPSK							
3555	11.16	11.01	8.7	19.86	20.0	-0.14	Pass
3625	11.29	11.15	8.7	19.99	20.0	-0.01	Pass
3695	11.17	10.61	8.7	19.87	20.0	-0.13	Pass
Modulation 16QAM							
3555	11.28	11.25	8.7	19.98	20.0	-0.02	Pass
3625	11.23	10.69	8.7	19.93	20.0	-0.07	Pass
3695	10.78	11.00	8.7	19.70	20.0	-0.30	Pass
Modulation 64QAM							
3555	11.24	11.25	8.7	19.95	20.0	-0.05	Pass
3625	11.22	10.80	8.7	19.92	20.0	-0.08	Pass
3695	10.78	11.14	8.7	19.84	20.0	-0.16	Pass
Modulation 256QAM							
3555	11.06	10.94	8.7	19.76	20.0	-0.24	Pass
3625	11.16	11.00	8.7	19.86	20.0	-0.14	Pass
3695	11.23	10.80	8.7	19.93	20.0	-0.07	Pass

* - Total PSD = Max SA reading (Chains #1&2) + Antenna Gain: The transmitter output signal are completely uncorrelated, antennas 1/2 is one sector
** - Margin = Total PSD, dBm – specification limit.

Test specification:	**Section 96.41(b), Maximum EIRP and maximum power spectral density**		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1011 hPa	**Power:** 48 VAC
Remarks:			

Table 7.1.7 Peak spectral power density test results (continue)

ASSIGNED FREQUENCY RANGE: 3550.0 – 3700.0 MHz
DETECTOR USED: Average (gated)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
NUMBER OF CHAINS: 2
CHANNEL SPACING: 20 MHz

Frequency, MHz	SA Reading, dBm/MHz		Antenna gain, dBi	Total PSD*, dBm/ MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Chain RF#1	Chain RF#2					
Modulation QPSK							
3560.0	10.01	10.51	8.7	19.21	20.0	-0.79	Pass
3625.0	10.53	10.48	8.7	19.23	20.0	-0.77	Pass
3690.0	10.26	9.85	8.7	18.96	20.0	-1.04	Pass
Modulation 16QAM							
3560.0	10.41	10.44	8.7	19.14	20.0	-0.86	Pass
3625.0	10.57	10.19	8.7	19.27	20.0	-0.73	Pass
3690.0	9.98	10.14	8.7	18.84	20.0	-1.16	Pass
Modulation 64QAM							
3560.0	10.51	10.67	8.7	19.37	20.0	-0.63	Pass
3625.0	10.57	10.30	8.7	19.27	20.0	-0.73	Pass
3690.0	9.91	10.14	8.7	18.84	20.0	-1.16	Pass
Modulation 256QAM							
3560.0	10.30	10.37	8.7	19.07	20.0	-0.93	Pass
3625.0	10.49	10.27	8.7	19.19	20.0	-0.81	Pass
3690.0	9.94	10.27	8.7	18.97	20.0	-1.03	Pass

* - Total PSD = Max SA reading (Chains #1&2) + Antenna Gain: The transmitter output signal are completely uncorrelated, antennas 1/2 is one sector

** - Margin = Total PSD, dBm – specification limit.

Test specification:	**Section 96.41(b), Maximum EIRP and maximum power spectral density**		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1011 hPa	**Power:** 48 VAC
Remarks:			

Table 7.1.8 Peak spectral power density test results (continue)

ASSIGNED FREQUENCY RANGE: 3550.0 – 3700.0 MHz
DETECTOR USED: Average (gated)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
NUMBER OF CHAINS: 2
CHANNEL SPACING: 40 MHz

Frequency, MHz	SA Reading, dBm/MHz		Antenna gain, dBi	Total PSD*, dBm/ MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Chain RF#1	Chain RF#2					
Modulation QPSK							
3570.0	10.57	10.26	8.7	19.27	20.0	-0.73	Pass
3625.0	10.70	10.61	8.7	19.40	20.0	-0.60	Pass
3680.0	10.57	10.26	8.7	18.49	20.0	-1.51	Pass
Modulation 16QAM							
3570.0	10.50	10.18	8.7	19.20	20.0	-0.80	Pass
3625.0	10.62	10.67	8.7	19.37	20.0	-0.63	Pass
3680.0	9.16	9.82	8.7	18.52	20.0	-1.48	Pass
Modulation 64QAM							
3570.0	10.46	10.16	8.7	19.16	20.0	-0.84	Pass
3625.0	10.50	10.73	8.7	19.43	20.0	-0.57	Pass
3680.0	9.17	9.79	8.7	18.49	20.0	-1.51	Pass
Modulation 256QAM							
3570.0	10.58	10.14	8.7	19.28	20.0	-0.72	Pass
3625.0	10.51	10.41	8.7	19.21	20.0	-0.79	Pass
3680.0	9.01	9.82	8.7	18.52	20.0	-1.48	Pass

* - Total PSD = Max SA reading (Chains #1&2) + Antenna Gain: The transmitter output signal are completely uncorrelated, antennas 1/2 is one sector
** - Margin = Total PSD, dBm – specification limit.

Reference numbers of test equipment used

HL 3301	HL 3302	HL 4355	HL 4366	HL 6143			

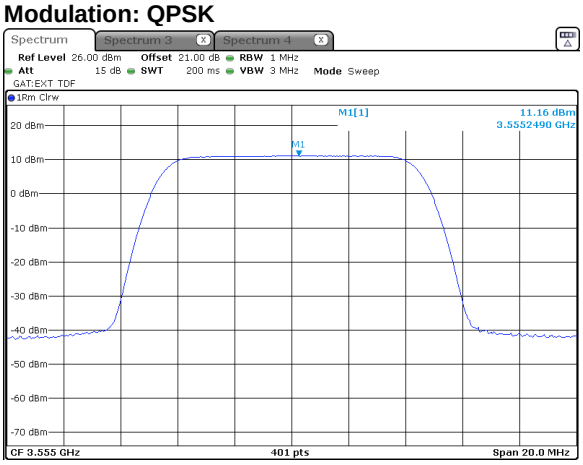
Full description is given in Appendix A.

Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

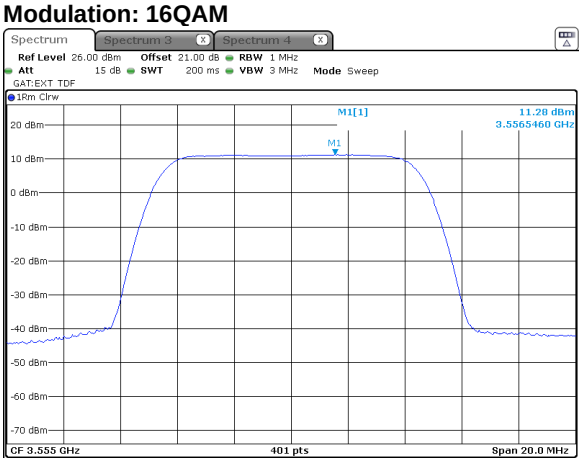
Plot 7.1.1 Peak spectral power density at low frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 1

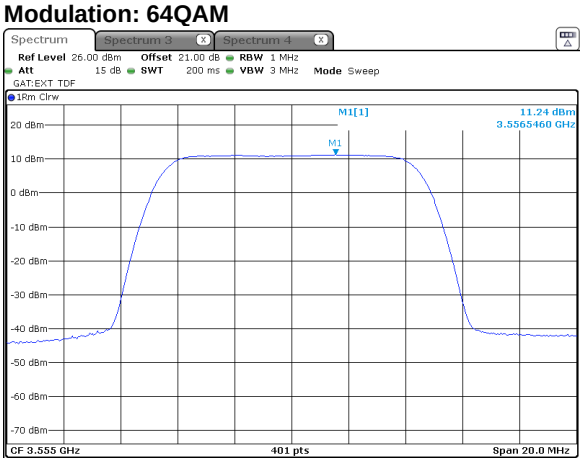
Modulation: QPSK



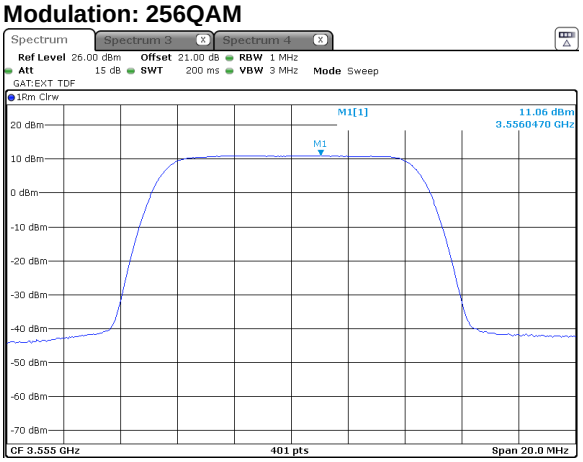
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

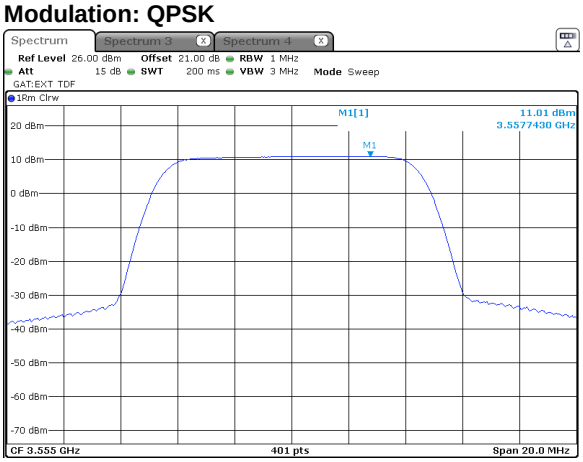


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

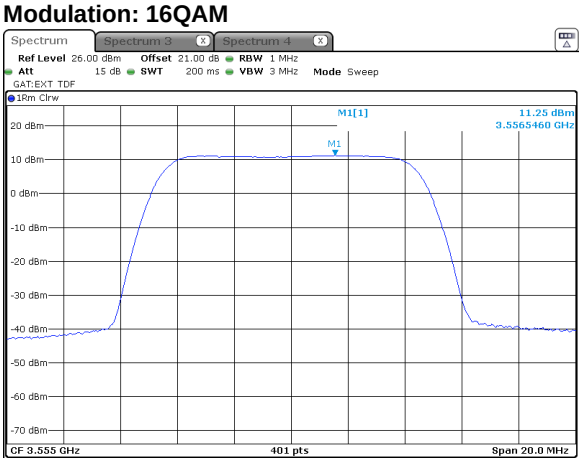
Plot 7.1.2 Peak spectral power density at low frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 2

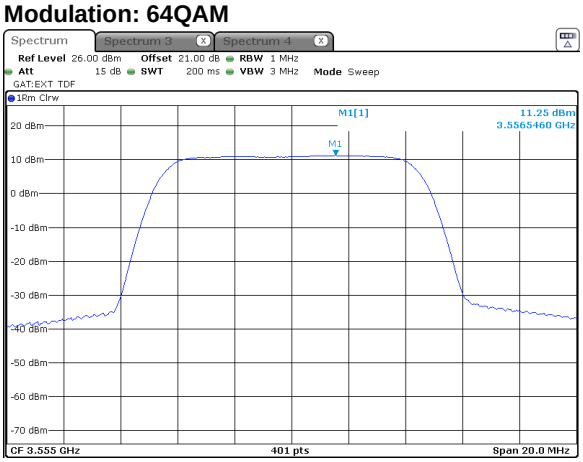
Modulation: QPSK



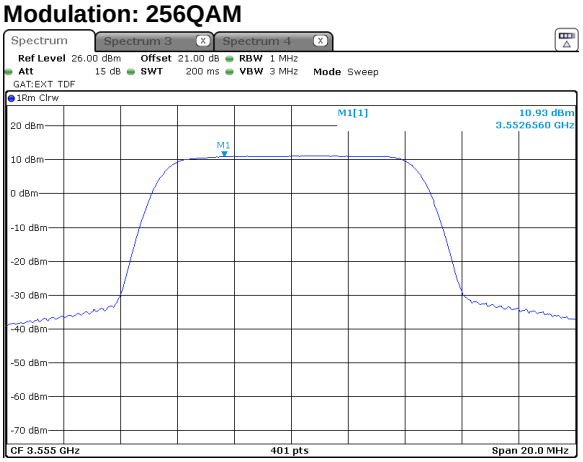
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

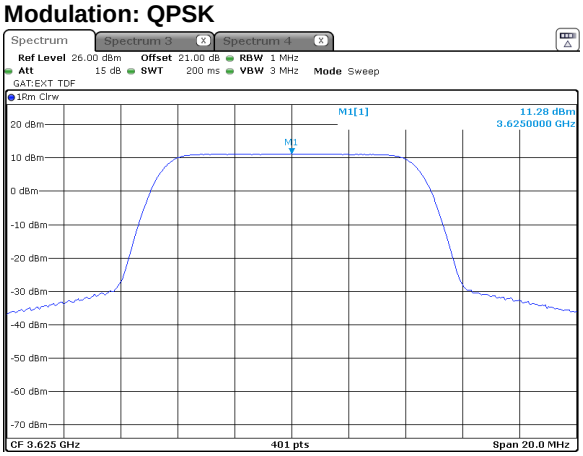


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

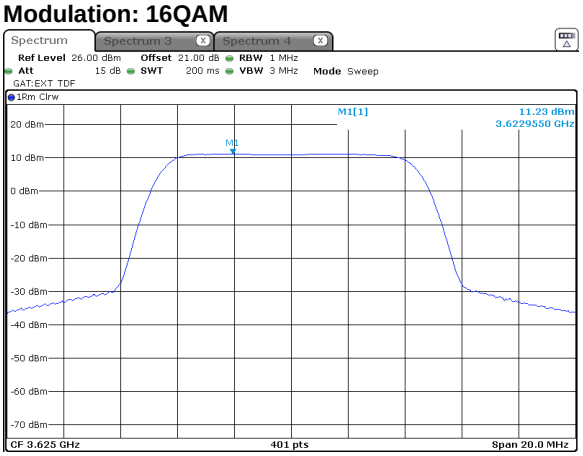
Plot 7.1.3 Peak spectral power density at mid frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 1

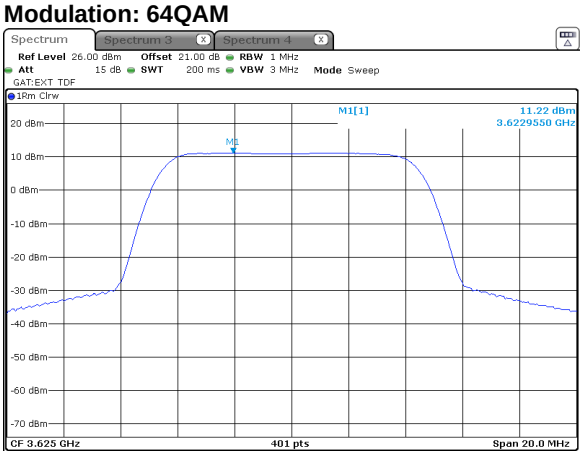
Modulation: QPSK



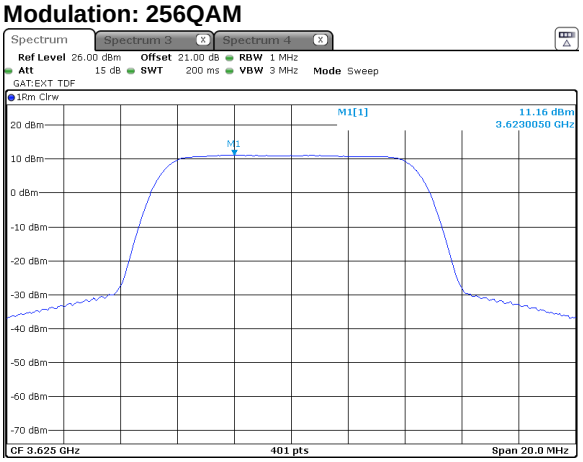
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

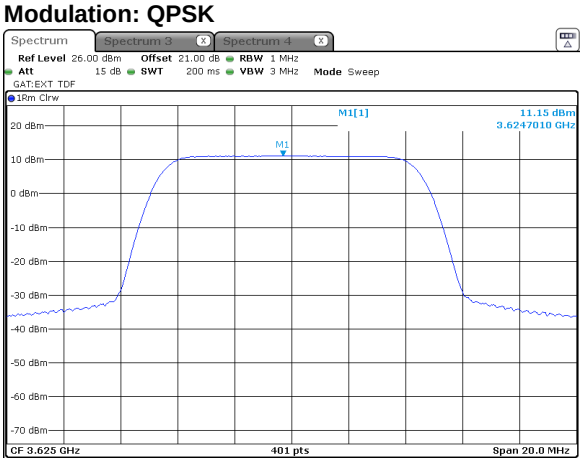


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

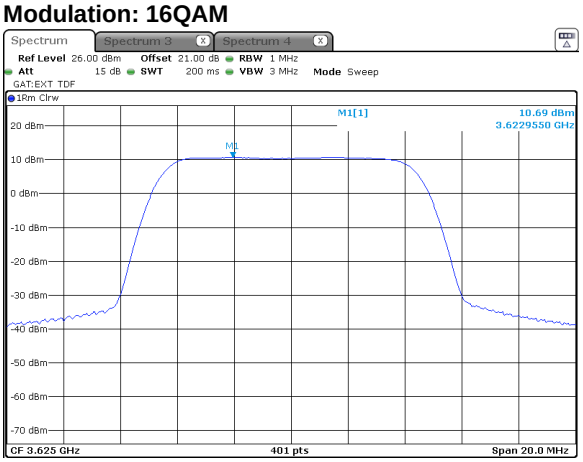
Plot 7.1.4 Peak spectral power density at mid frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 2

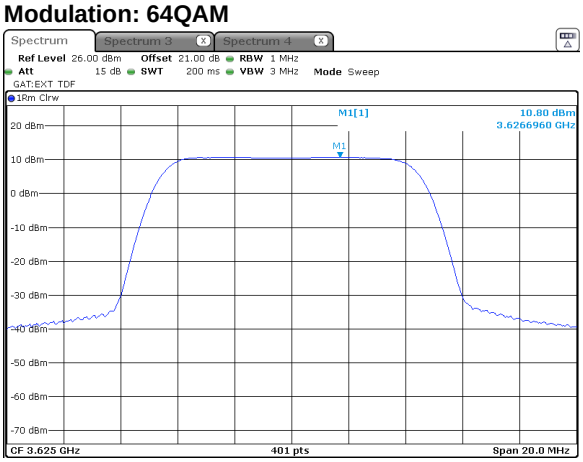
Modulation: QPSK



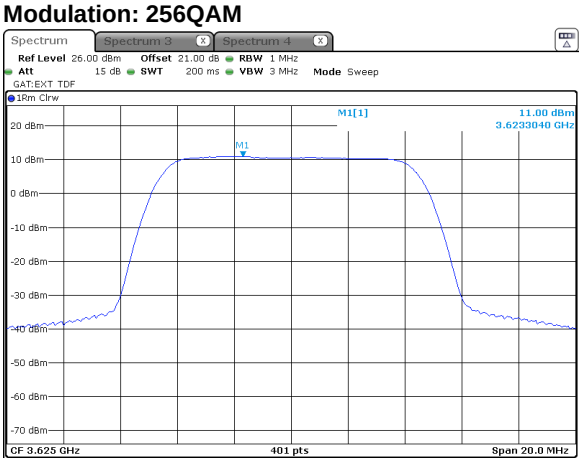
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

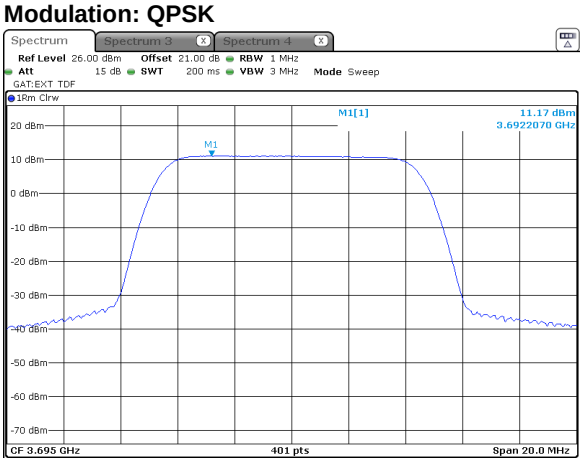


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

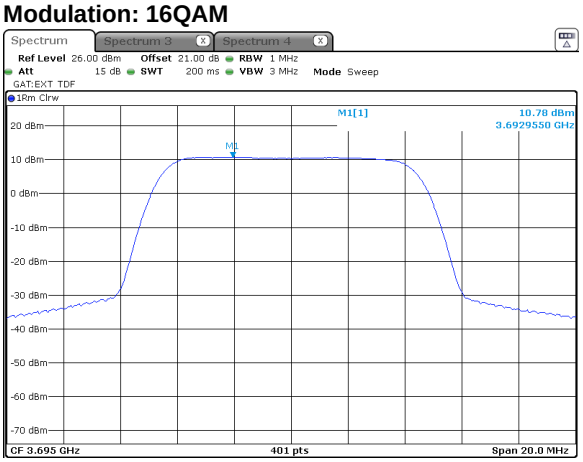
Plot 7.1.5 Peak spectral power density at high frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 1

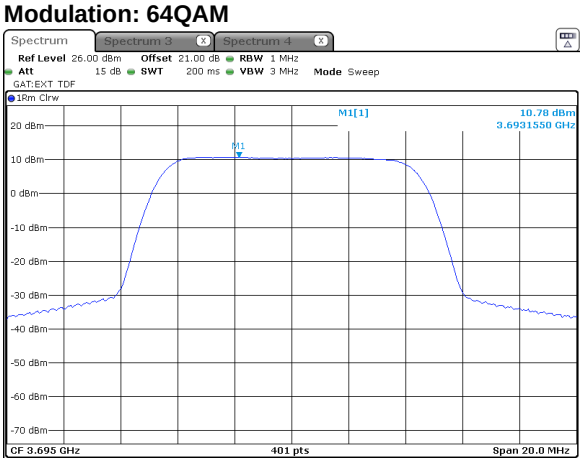
Modulation: QPSK



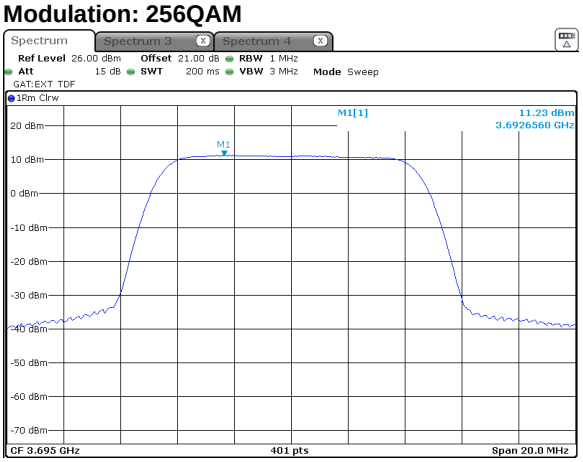
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

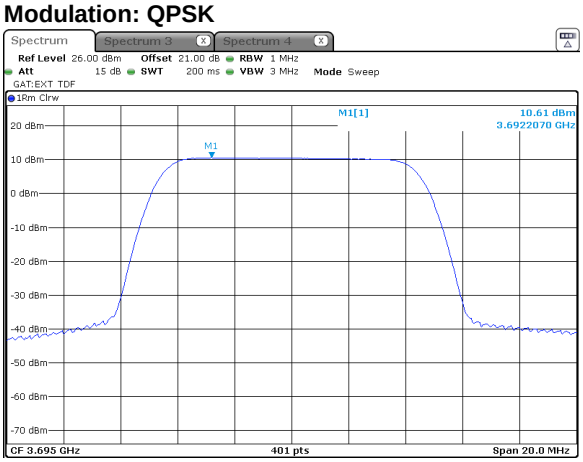


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

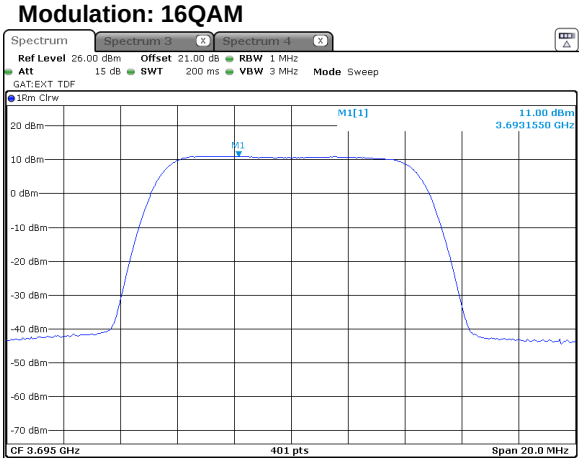
Plot 7.1.6 Peak spectral power density at high frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 2

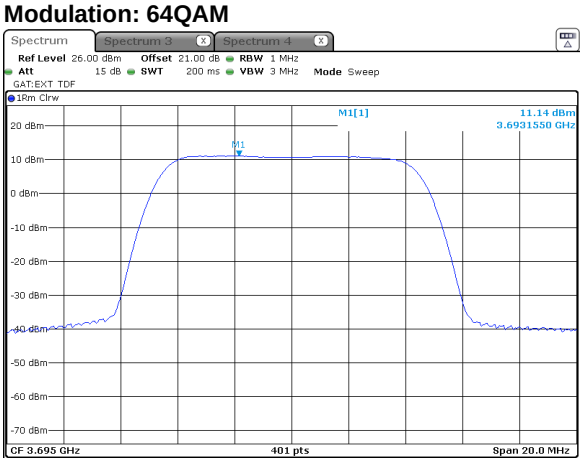
Modulation: QPSK



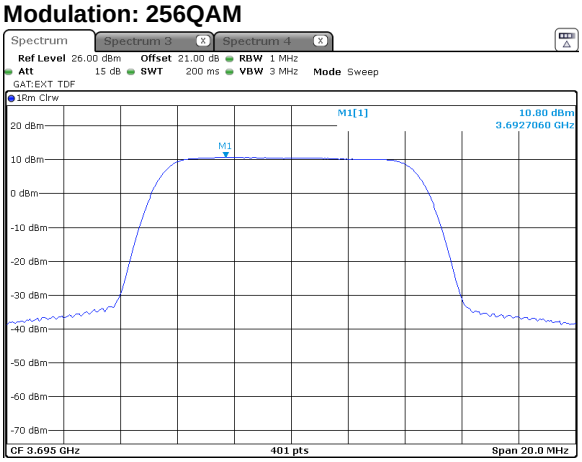
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

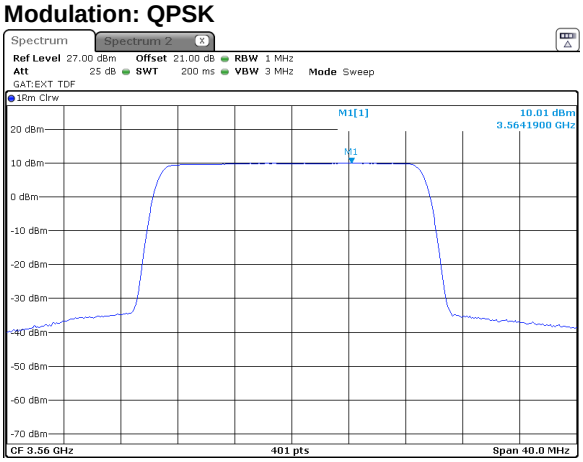


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

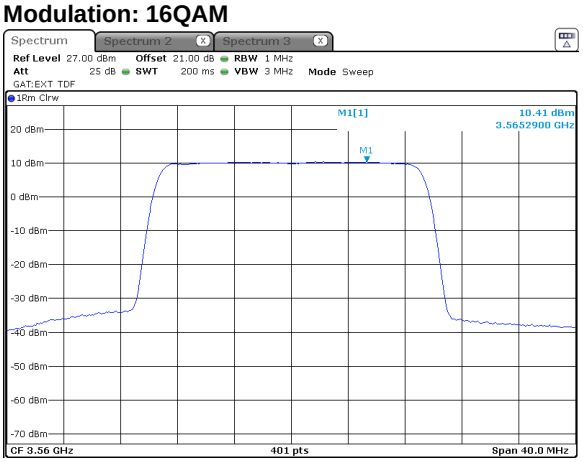
Plot 7.1.7 Peak spectral power density at low frequency

CHANNEL SPACING: 20 MHz
ANTENNA CHAIN: 1

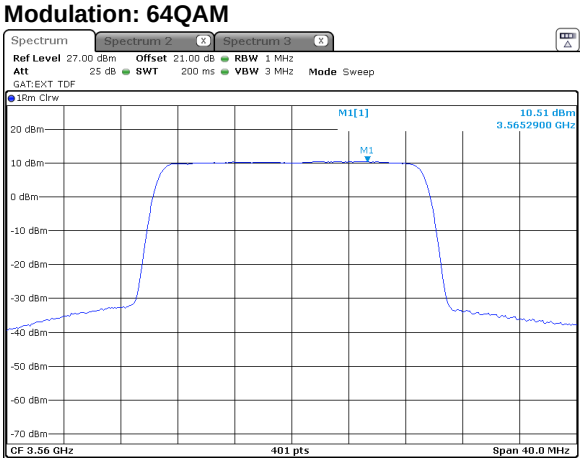
Modulation: QPSK



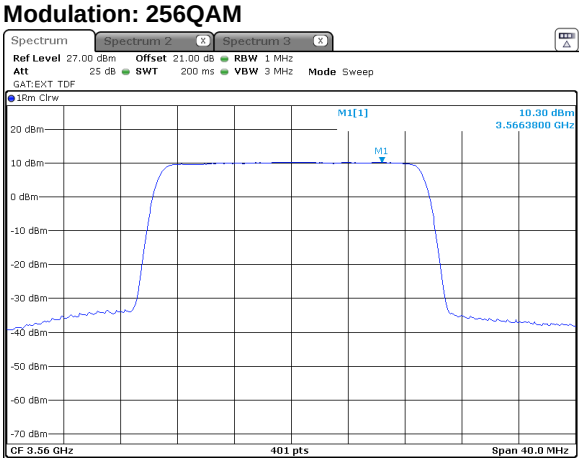
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

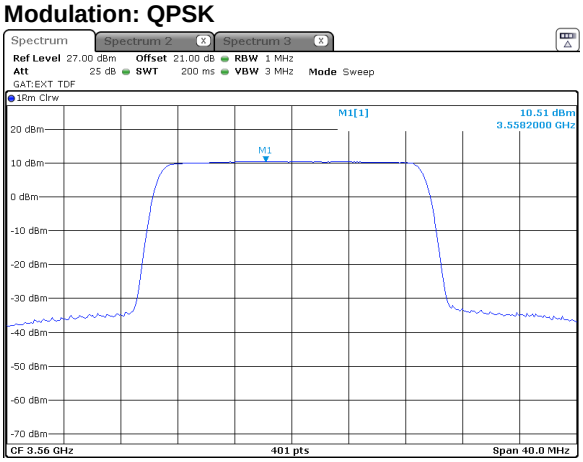


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

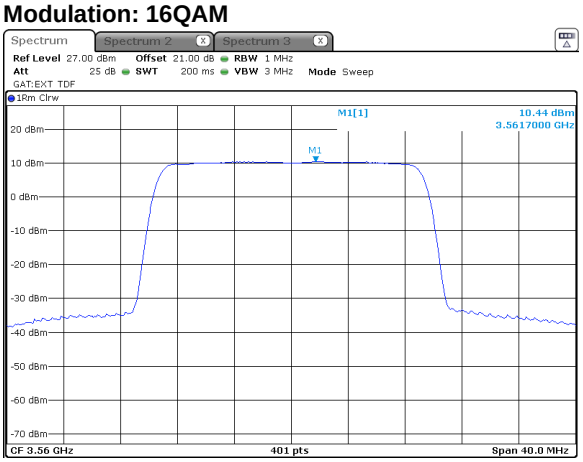
Plot 7.1.8 Peak spectral power density at low frequency

CHANNEL SPACING: 20 MHz
ANTENNA CHAIN: 2

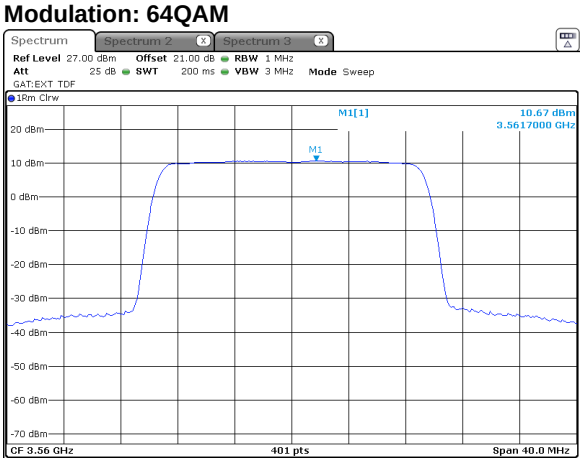
Modulation: QPSK



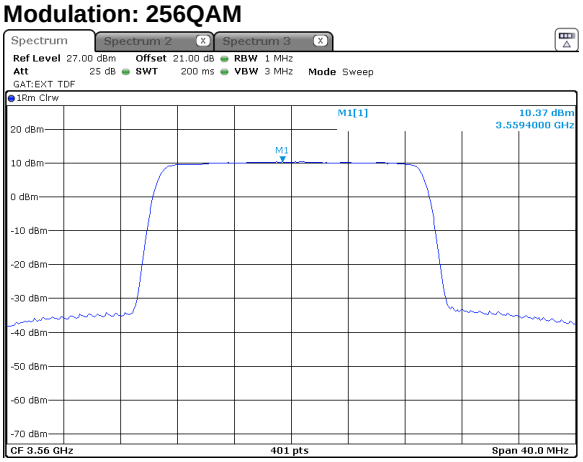
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

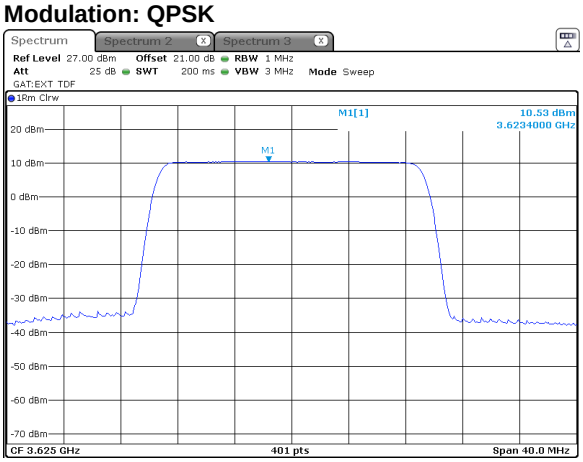


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

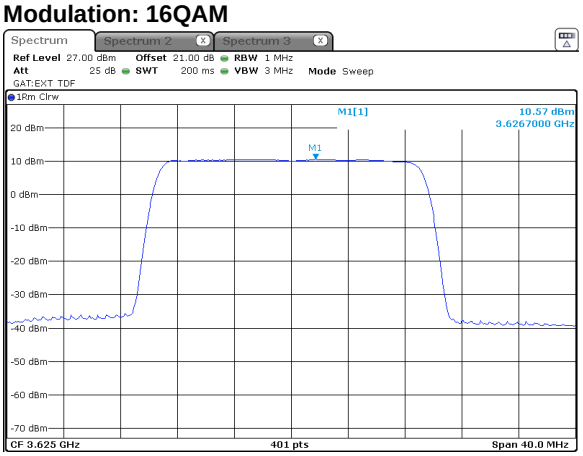
Plot 7.1.9 Peak spectral power density at mid frequency

CHANNEL SPACING: 20 MHz
ANTENNA CHAIN: 1

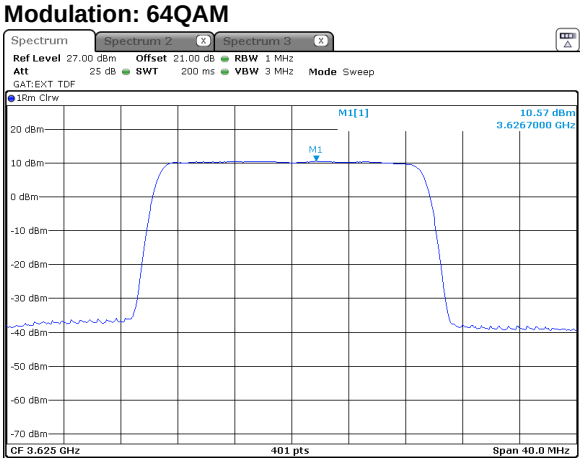
Modulation: QPSK



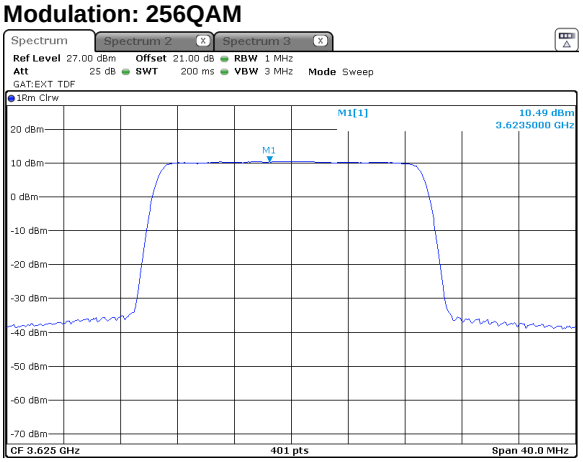
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

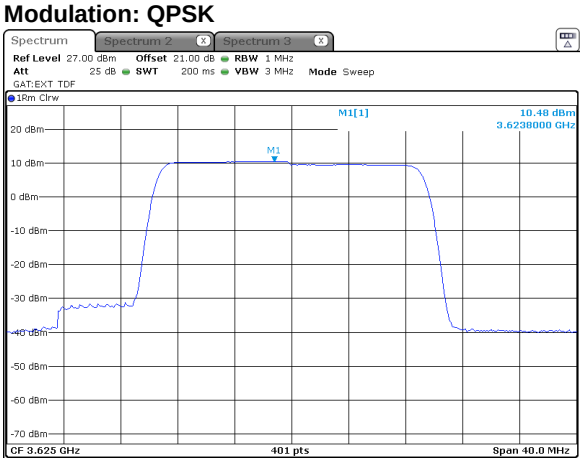


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

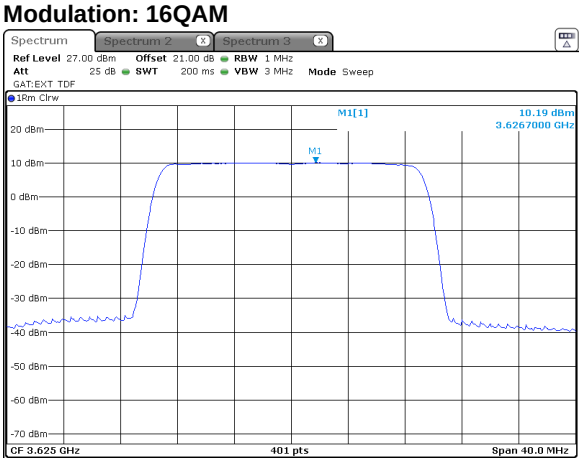
Plot 7.1.10 Peak spectral power density at mid frequency

CHANNEL SPACING: 20 MHz
ANTENNA CHAIN: 2

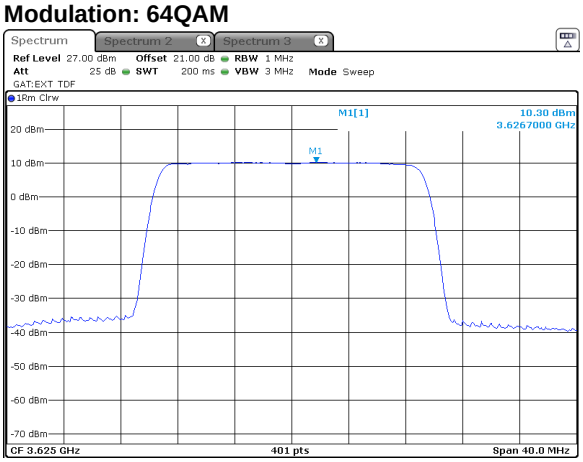
Modulation: QPSK



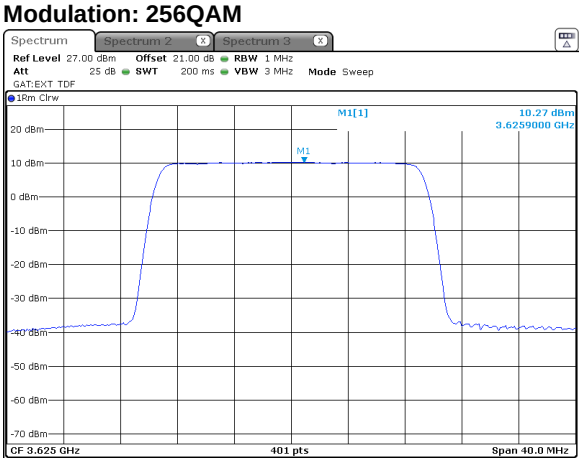
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

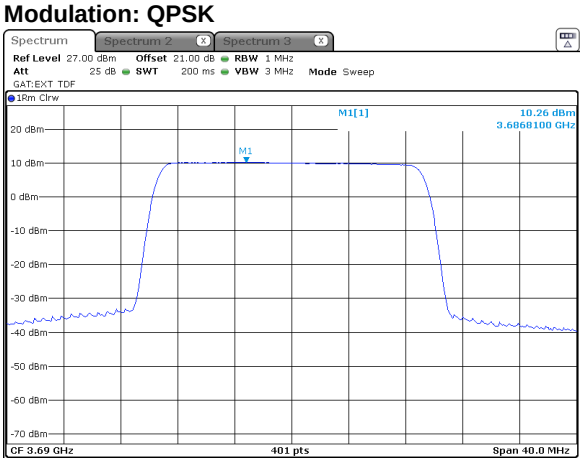


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

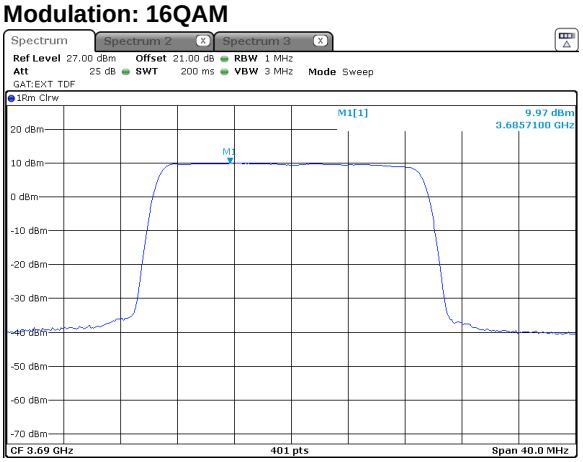
Plot 7.1.11 Peak spectral power density at high frequency

CHANNEL SPACING: 20 MHz
ANTENNA CHAIN: 1

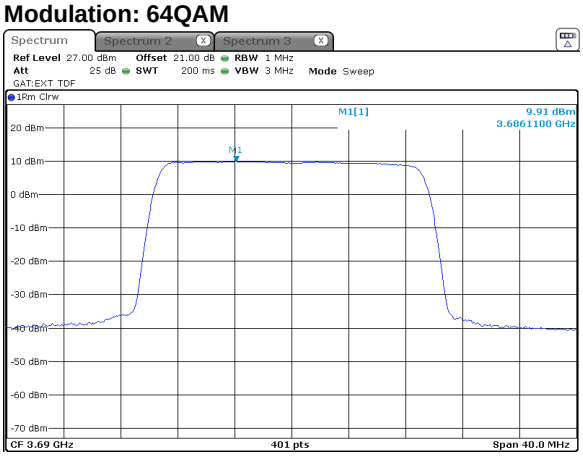
Modulation: QPSK



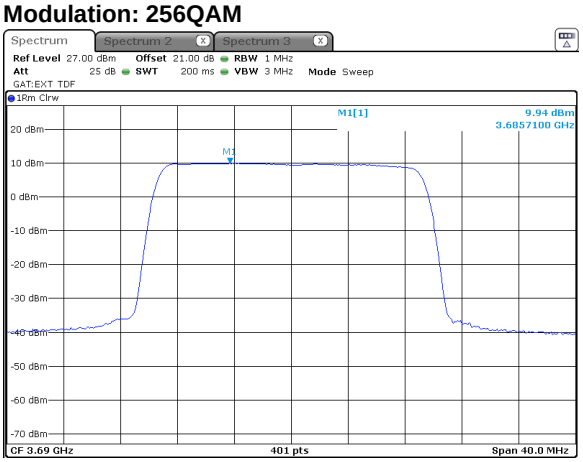
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

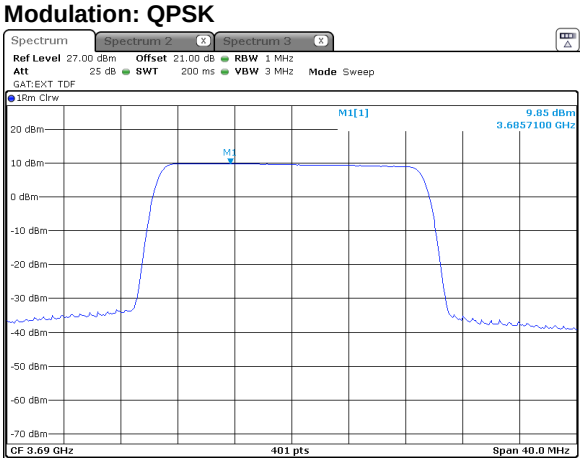


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

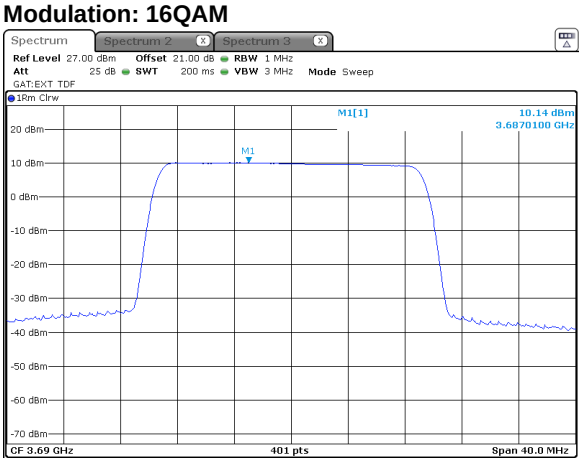
Plot 7.1.12 Peak spectral power density at high frequency

CHANNEL SPACING: 20 MHz
ANTENNA CHAIN: 2

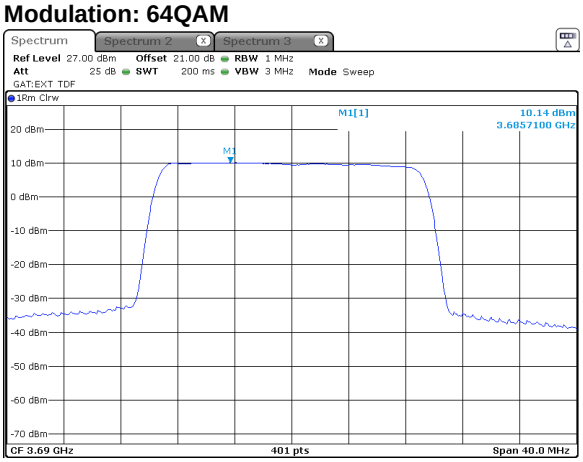
Modulation: QPSK



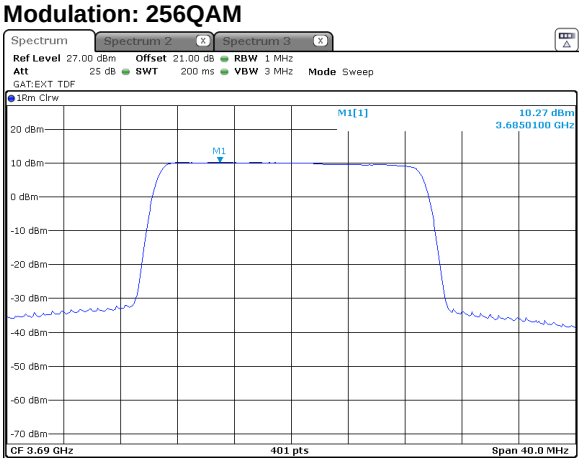
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

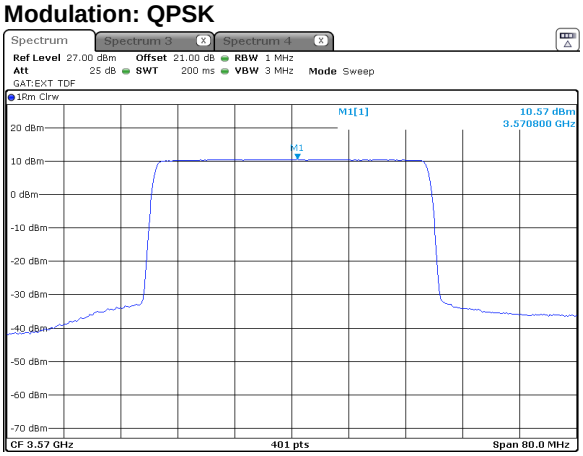


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

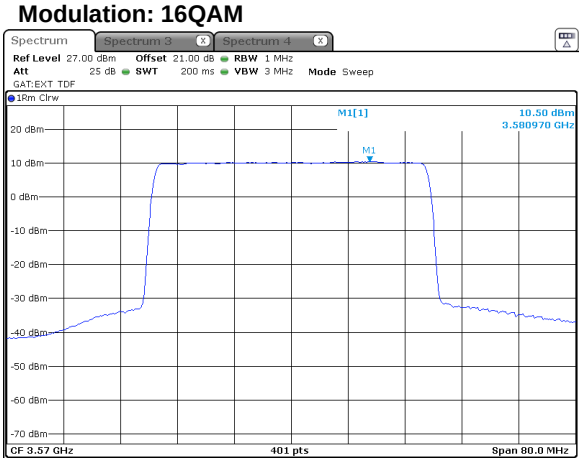
Plot 7.1.13 Peak spectral power density at low frequency

CHANNEL SPACING: 40 MHz
ANTENNA CHAIN: 1

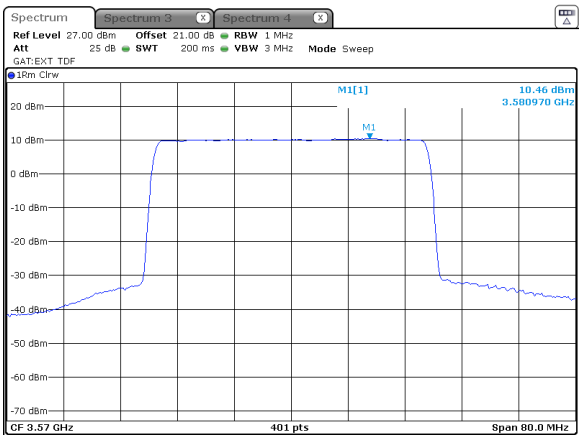
Modulation: QPSK



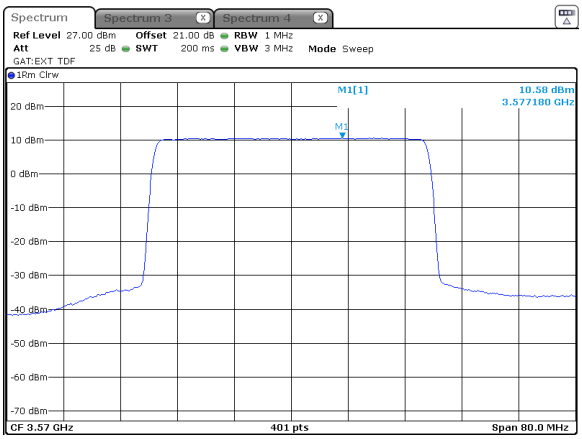
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

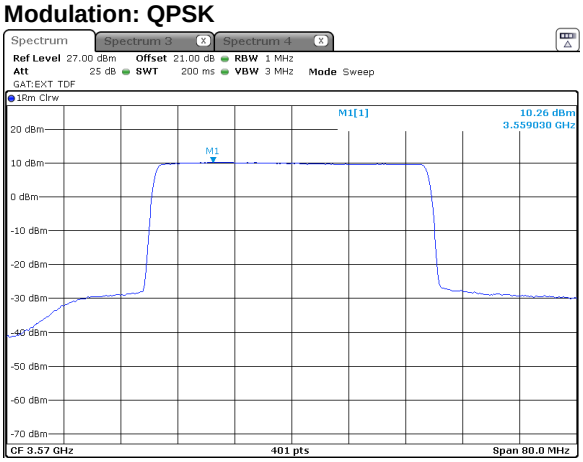


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

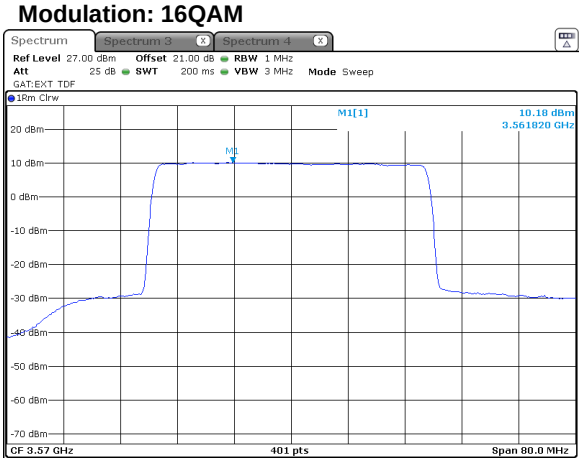
Plot 7.1.14 Peak spectral power density at low frequency

CHANNEL SPACING: 40 MHz
ANTENNA CHAIN: 2

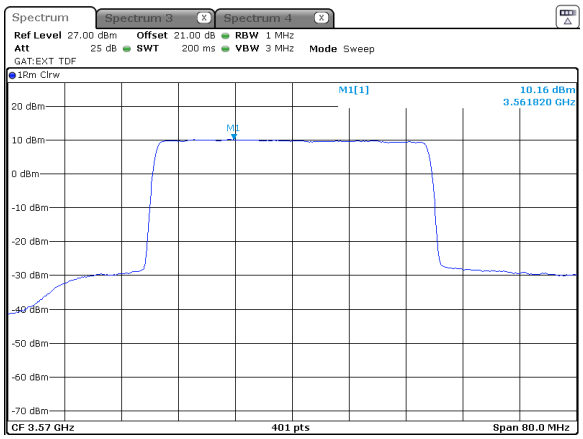
Modulation: QPSK



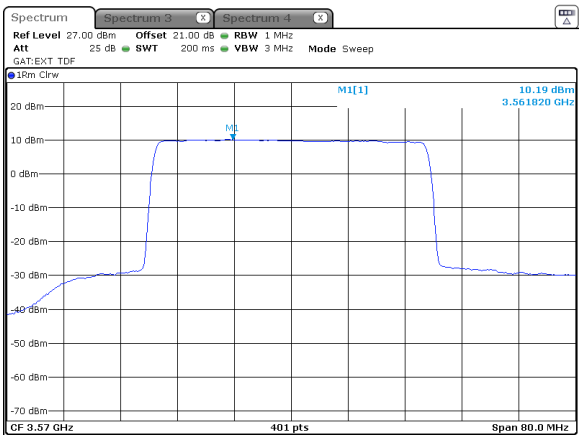
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

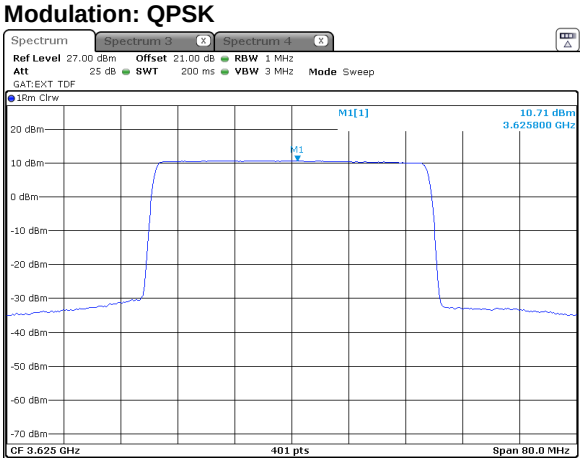


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

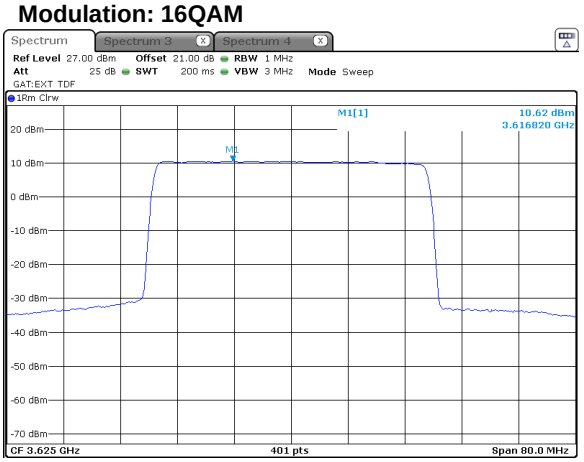
Plot 7.1.15 Peak spectral power density at mid frequency

CHANNEL SPACING: 40 MHz
ANTENNA CHAIN: 1

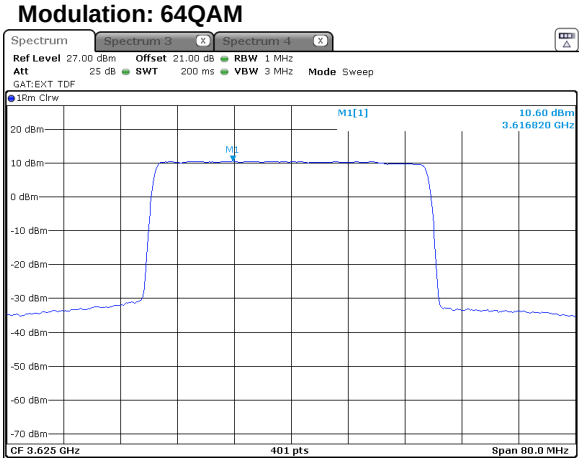
Modulation: QPSK



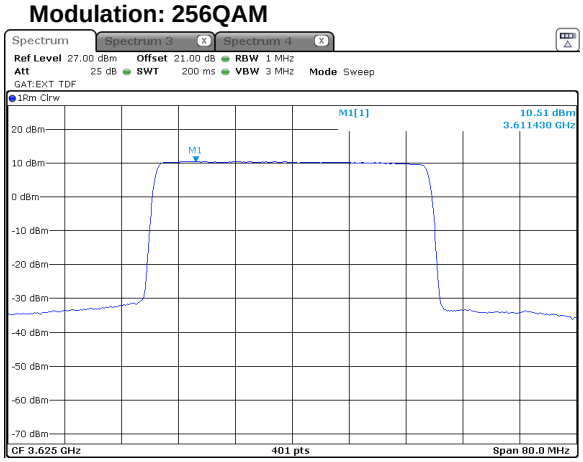
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

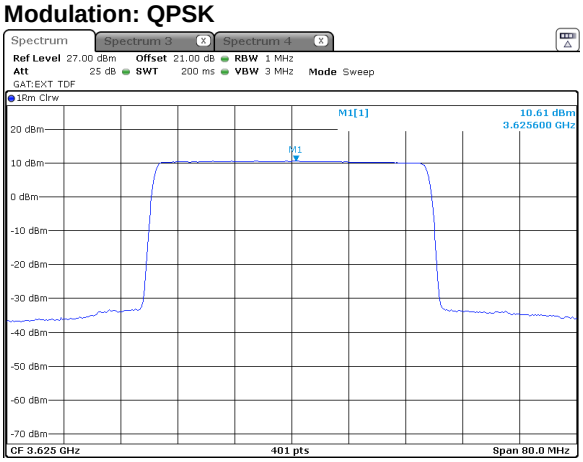


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

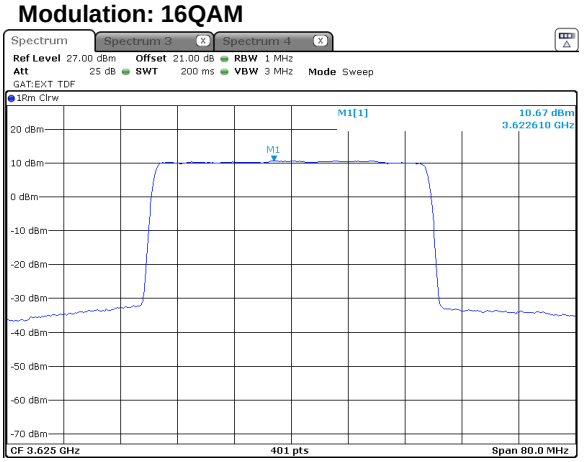
Plot 7.1.16 Peak spectral power density at mid frequency

CHANNEL SPACING: 40 MHz
ANTENNA CHAIN: 2

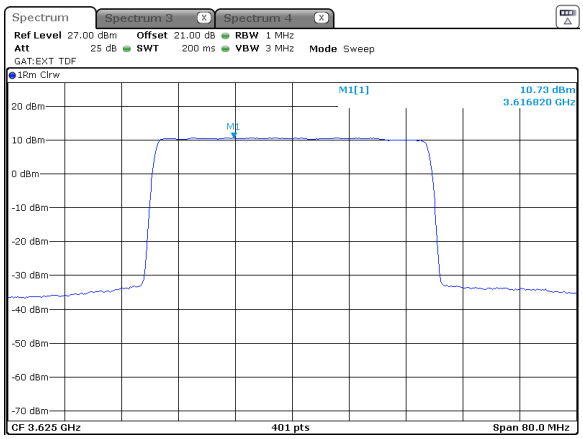
Modulation: QPSK



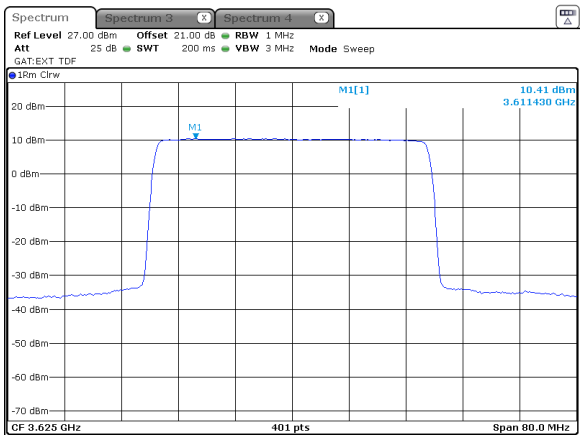
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

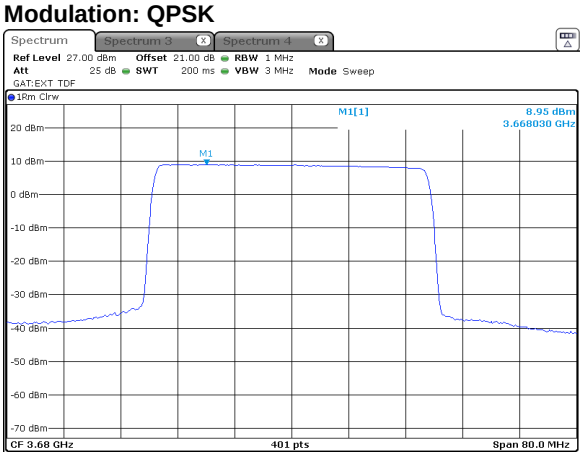


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

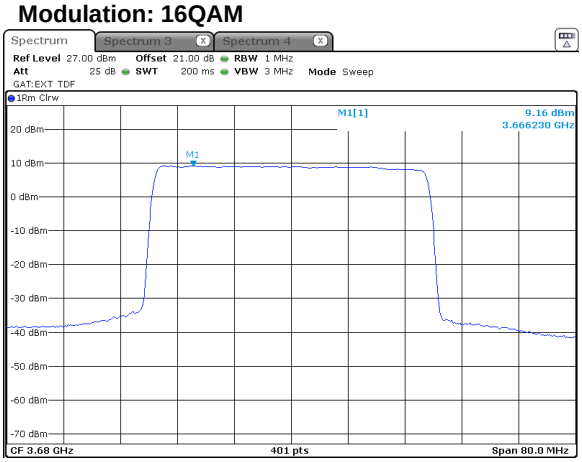
Plot 7.1.17 Peak spectral power density at high frequency

CHANNEL SPACING: 40 MHz
ANTENNA CHAIN: 1

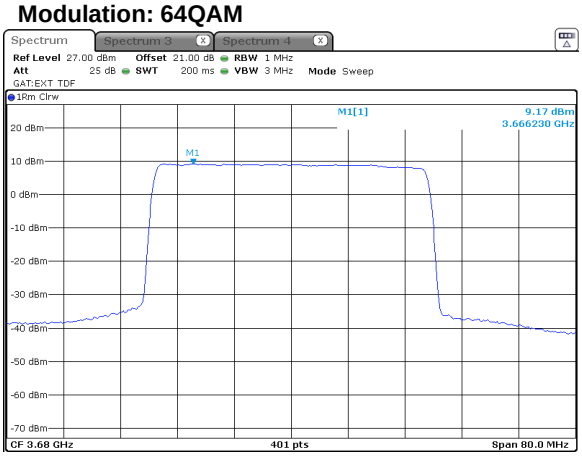
Modulation: QPSK



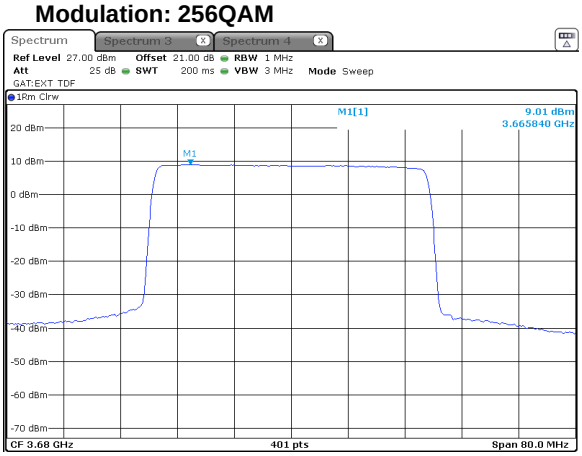
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

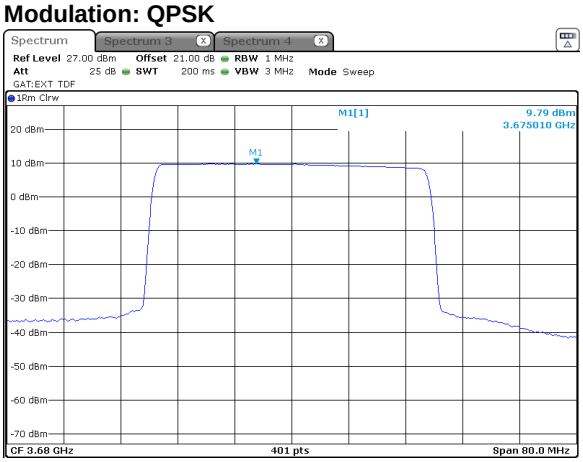


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	07-Feb-22		
Temperature: 24 ºC	Relative Humidity: 55 %	Air Pressure: 1011 hPa	Power: 48 VAC
Remarks:			

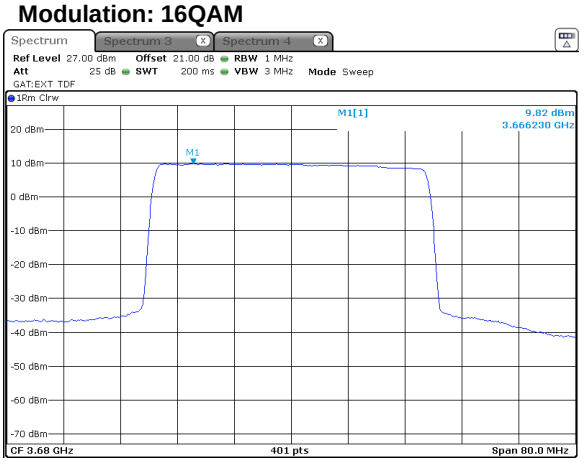
Plot 7.1.18 Peak spectral power density at high frequency

CHANNEL SPACING: 40 MHz
ANTENNA CHAIN: 2

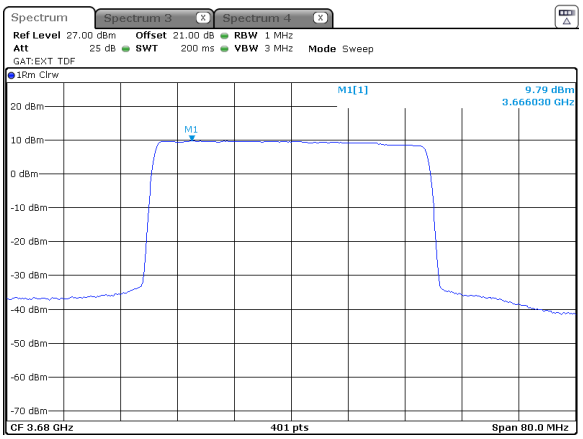
Modulation: QPSK



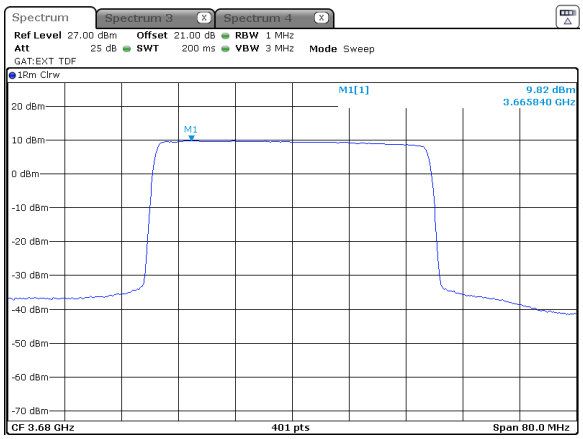
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM



Test specification:	Section 96.41(g), Peak-to- average power ratio		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 48 VAC
Remarks:			

7.2 Peak-to-average power ratio (PAPR) test

7.2.1 General

This test was performed to measure the peak to average power ratio at RF antenna connector. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak-to-average power ratio limits

Assigned frequency range, MHz	Peak to average power ratio limit	
	Probability, %	dB
3550.0 – 3700.0	0.1	13.0

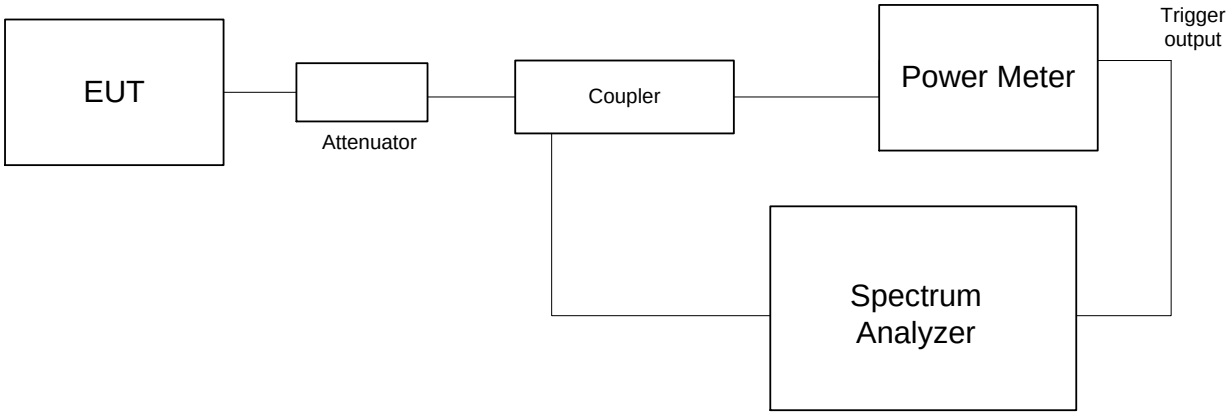
7.2.2 Test procedure

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 adjusted to produce maximum available to the end user RF output power.

7.2.2.3 The peak to average power ratio was measured with power meter as provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Peak-to-average power ratio test setup



Test specification:	**Section 96.41(g), Peak-to- average power ratio**		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1010 hPa	**Power:** 48 VAC
Remarks:			

Table 7.2.2 Peak-to-average power ratio test results

OPERATING FREQUENCY RANGE: 3550 – 3700 MHz
DETECTOR USED: Peak/Average
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Carrier frequency, MHz	Peak to average ratio, dB	Limit, dBm	Margin, dB	Verdict
Channel spacing 10 MHz				
Modulation QPSK				
3555.0	8.67	13.0	-4.33	Pass
3625.0	8.81	13.0	-4.19	Pass
3695.0	8.75	13.0	-4.25	Pass
Modulation 16QAM				
3555.0	8.43	13.0	-4.57	Pass
3625.0	8.55	13.0	-4.45	Pass
3695.0	8.52	13.0	-4.48	Pass
Modulation 64QAM				
3555.0	8.43	13.0	-4.57	Pass
3625.0	8.55	13.0	-4.45	Pass
3695.0	8.52	13.0	-4.48	Pass
Modulation 256QAM				
3555.0	8.43	13.0	-4.57	Pass
3625.0	8.52	13.0	-4.48	Pass
3695.0	8.49	13.0	-4.51	Pass

Test specification:	**Section 96.41(g), Peak-to- average power ratio**		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1010 hPa	**Power:** 48 VAC
Remarks:			

Table 7.2.3 Peak-to-average power ratio test results (continue)

OPERATING FREQUENCY RANGE: 3550 – 3700 MHz
DETECTOR USED: Peak/Average
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Channel spacing 20 MHz				
Modulation QPSK				
3560.0	8.58	13.0	-4.42	Pass
3625.0	8.46	13.0	-4.54	Pass
3690.0	8.52	13.0	-4.48	Pass
Modulation 16QAM				
3560.0	8.14	13.0	-4.86	Pass
3625.0	8.12	13.0	-4.88	Pass
3690.0	8.53	13.0	-4.47	Pass
Modulation 64QAM				
3560.0	8.17	13.0	-4.83	Pass
3625.0	8.23	13.0	-4.77	Pass
3690.0	8.23	13.0	-4.77	Pass
Modulation 256QAM				
3560.0	8.26	13.0	-4.74	Pass
3625.0	8.32	13.0	-4.68	Pass
3690.0	8.32	13.0	-4.68	Pass

Test specification:	**Section 96.41(g), Peak-to- average power ratio**		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1010 hPa	**Power:** 48 VAC
Remarks:			

Table 7.2.4 Peak-to-average power ratio test results (continue)

OPERATING FREQUENCY RANGE: 3550 – 3700 MHz
DETECTOR USED: Peak/Average
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Channel spacing 40 MHz				
Modulation QPSK				
3570.0	9.50	13.0	-3.50	Pass
3625.0	9.46	13.0	-3.54	Pass
3680.0	9.44	13.0	-3.56	Pass
Modulation 16QAM				
3570.0	9.35	13.0	-3.65	Pass
3625.0	9.32	13.0	-3.68	Pass
3680.0	9.25	13.0	-3.75	Pass
Modulation 64QAM				
3570.0	9.36	13.0	-3.64	Pass
3625.0	9.30	13.0	-3.70	Pass
3680.0	9.24	13.0	-3.76	Pass
Modulation 256QAM				
3570.0	9.36	13.0	-3.64	Pass
3625.0	9.32	13.0	-3.68	Pass
3680.0	9.22	13.0	-3.78	Pass

Reference numbers of test equipment used

HL 3301	HL 3302	HL 4355	HL 4366	HL 6143			

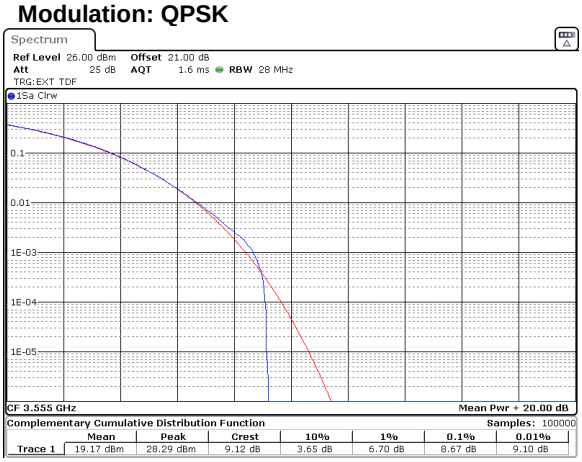
Full description is given in Appendix A.

Test specification:	Section 96.41(g), Peak-to- average power ratio		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 48 VAC
Remarks:			

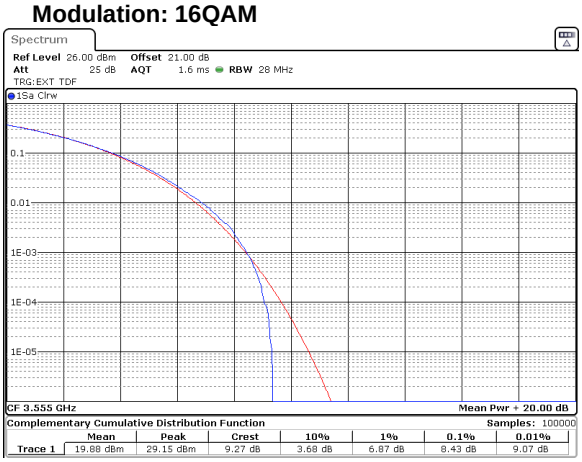
Plot 7.2.1 Peak-to-average power ratio test results at low frequency

CHANNEL SPACING: 10 MHz
ANTENNA PORT: 1

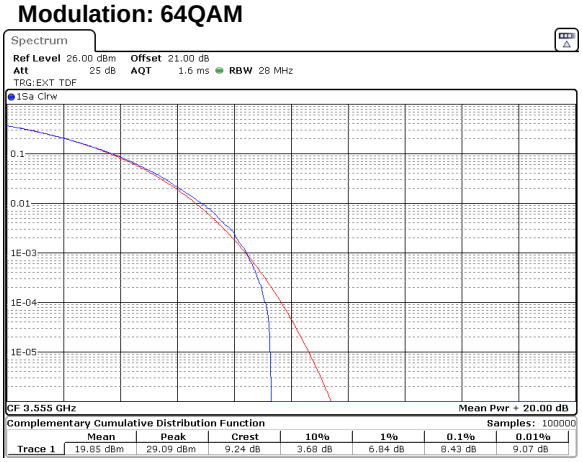
Modulation: QPSK



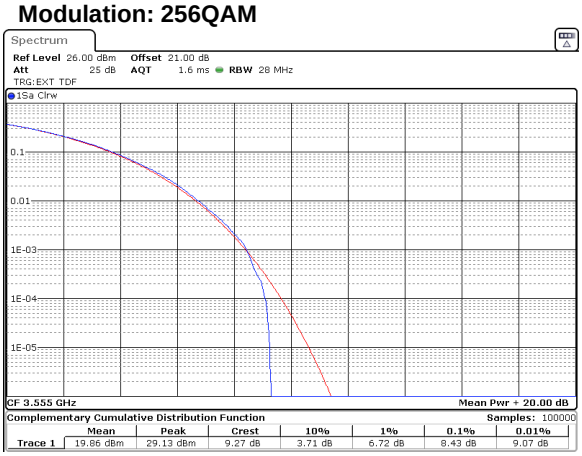
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

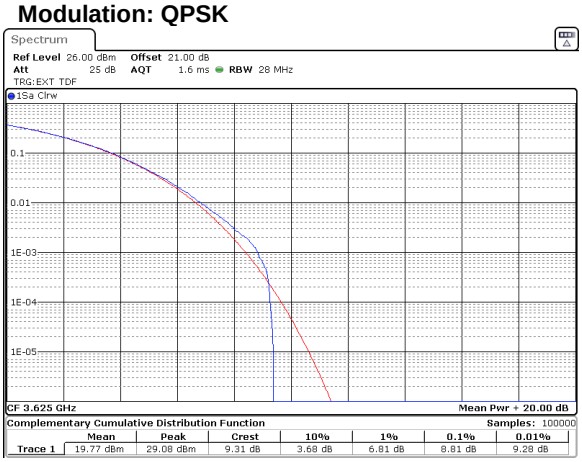


Test specification:	Section 96.41(g), Peak-to- average power ratio		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 48 VAC
Remarks:			

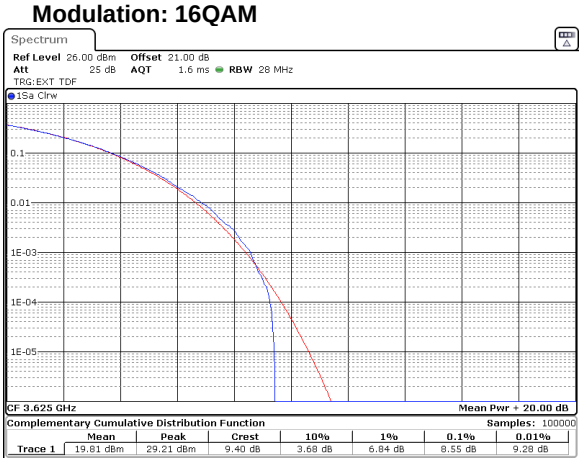
Plot 7.2.2 Peak-to-average power ratio test results at mid frequency

CHANNEL SPACING: 10 MHz
ANTENNA PORT: 1

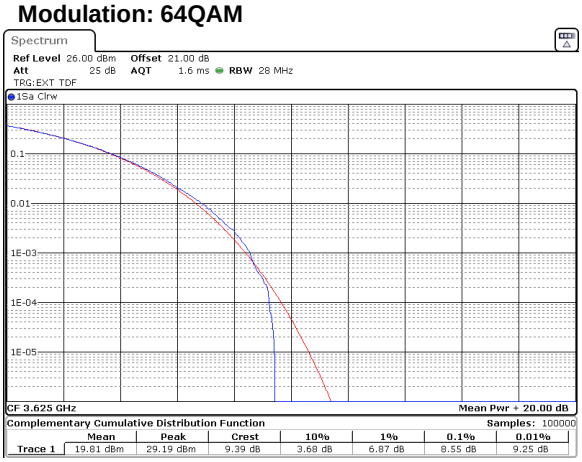
Modulation: QPSK



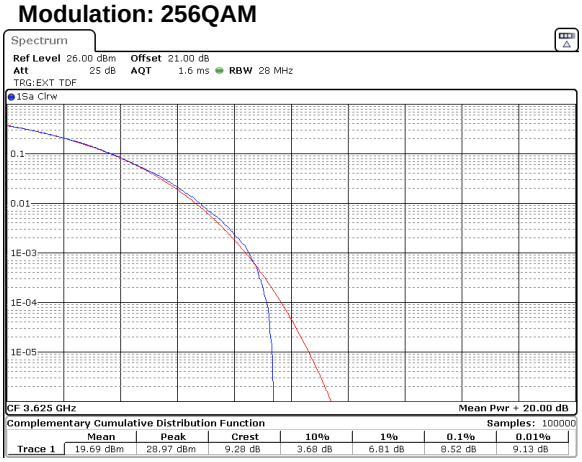
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

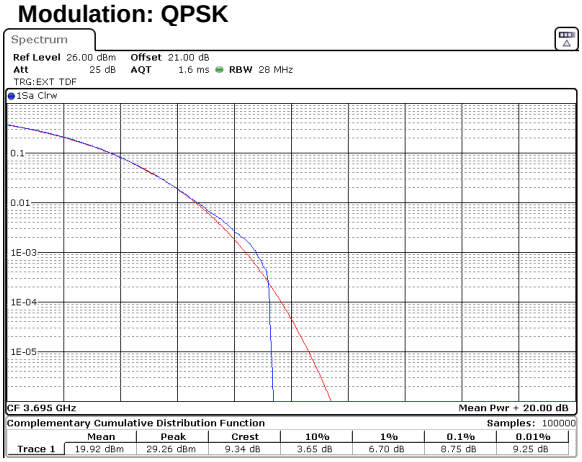


Test specification:	Section 96.41(g), Peak-to- average power ratio		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 48 VAC
Remarks:			

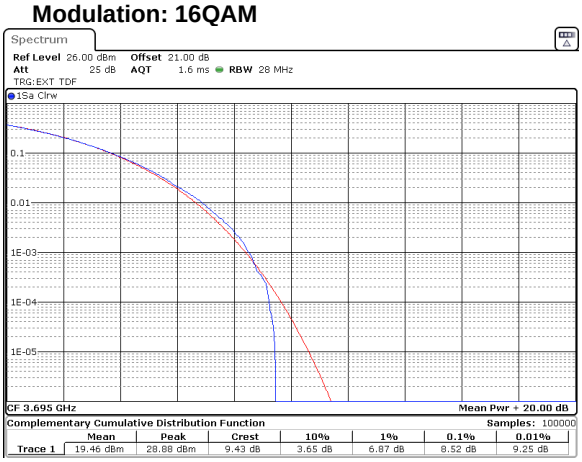
Plot 7.2.3 Peak-to-average power ratio test results at high frequency

CHANNEL SPACING: 10 MHz
ANTENNA PORT: 1

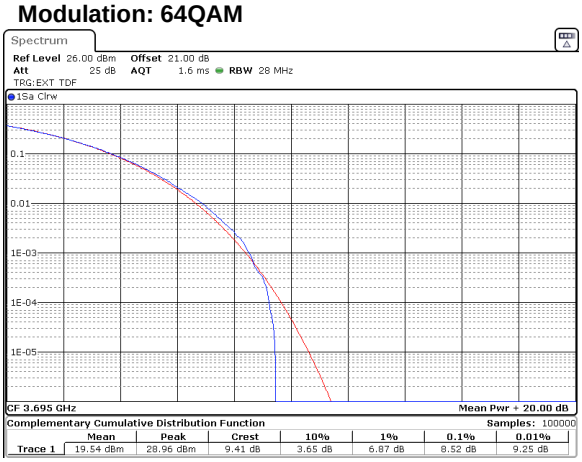
Modulation: QPSK



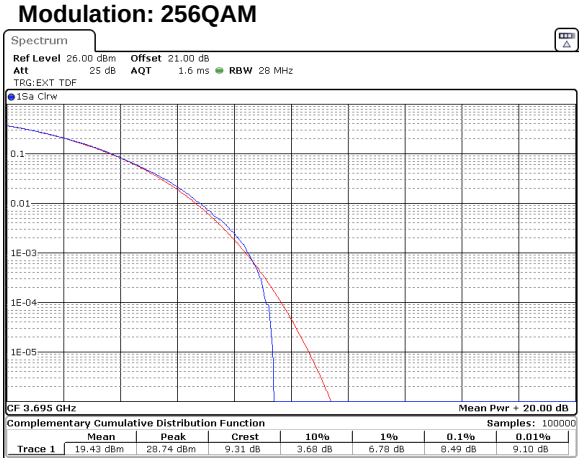
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

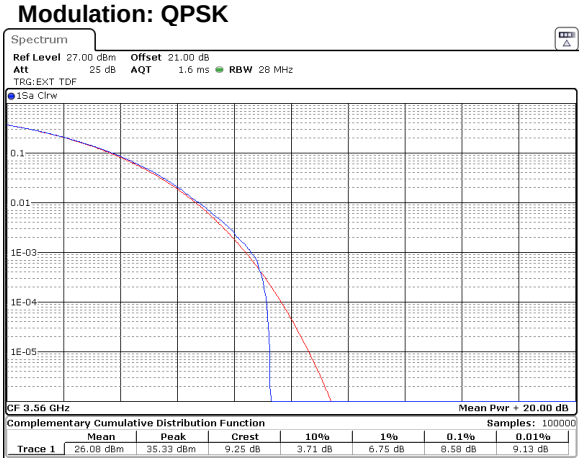


Test specification:	Section 96.41(g), Peak-to- average power ratio		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 48 VAC
Remarks:			

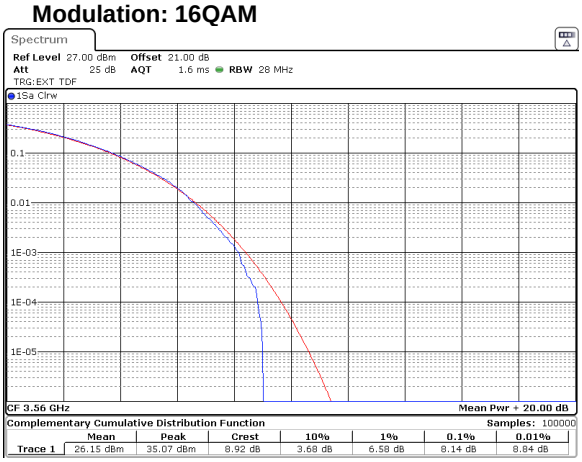
Plot 7.2.4 Peak-to-average power ratio test results at low frequency

CHANNEL SPACING: 20 MHz
ANTENNA PORT: 1

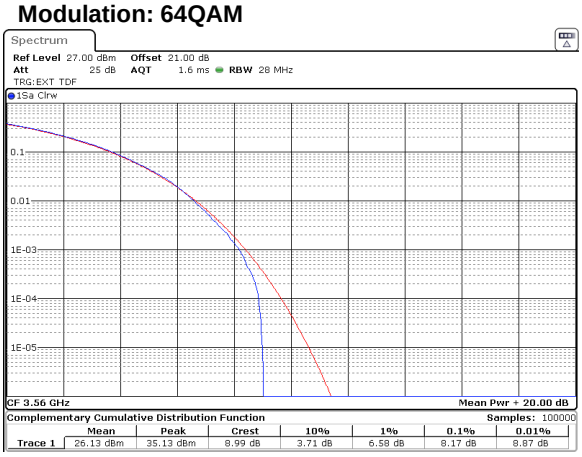
Modulation: QPSK



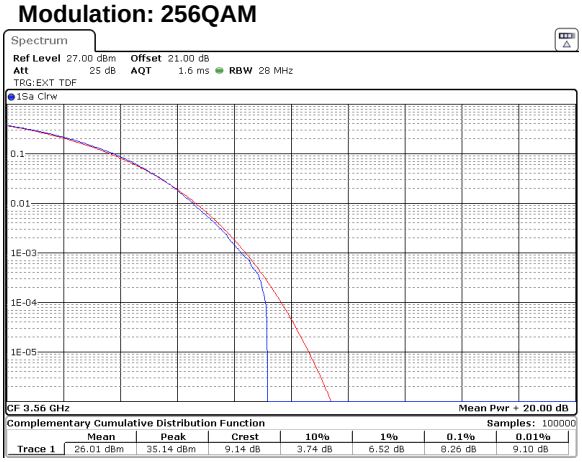
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

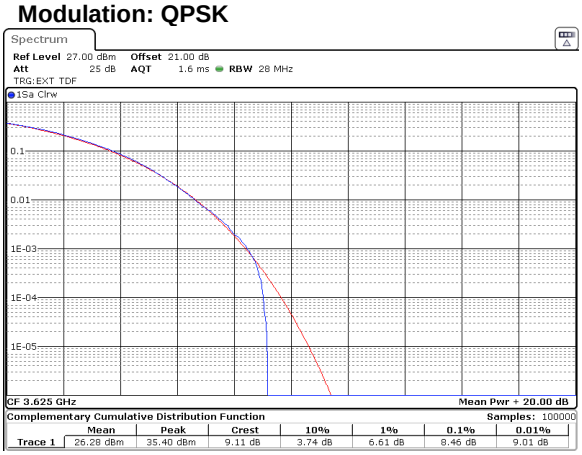


Test specification:	Section 96.41(g), Peak-to- average power ratio		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 48 VAC
Remarks:			

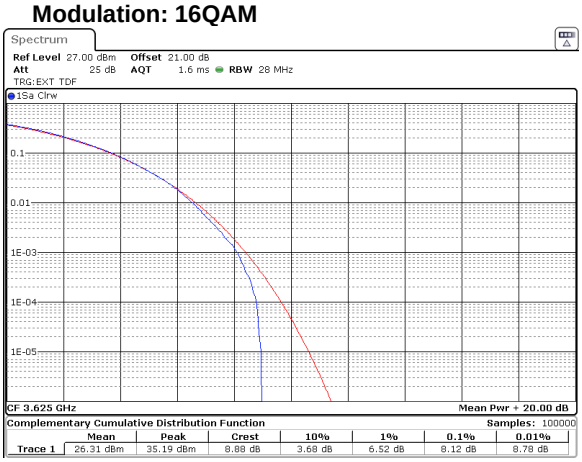
Plot 7.2.5 Peak-to-average power ratio test results at mid frequency

CHANNEL SPACING: 20 MHz
ANTENNA PORT: 1

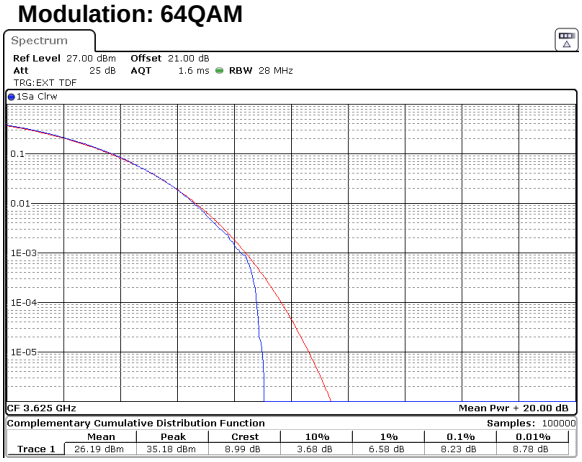
Modulation: QPSK



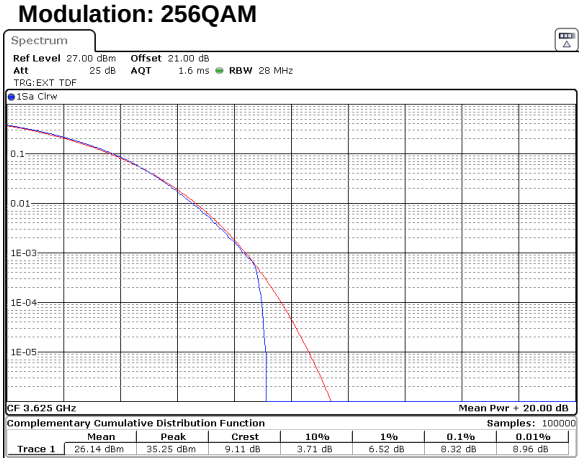
Modulation: 16QAM



Modulation: 64QAM



Modulation: 256QAM

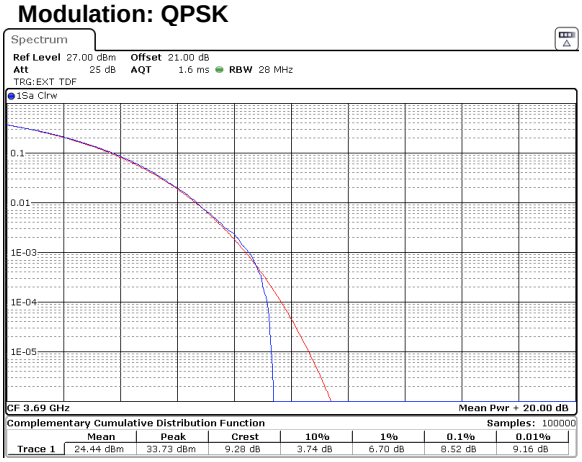


Test specification:	Section 96.41(g), Peak-to- average power ratio		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 48 VAC
Remarks:			

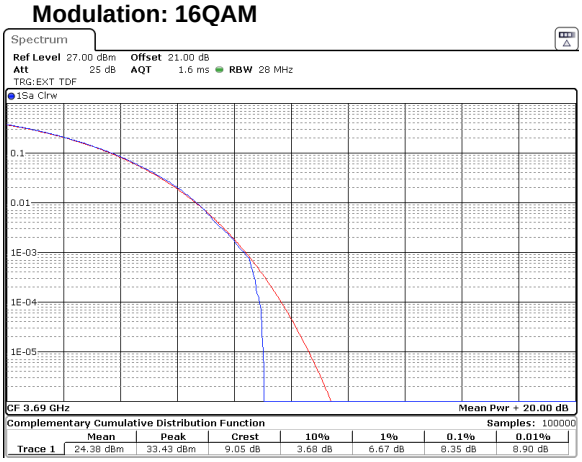
Plot 7.2.6 Peak-to-average power ratio test results at high frequency

CHANNEL SPACING: 20 MHz
ANTENNA PORT: 1

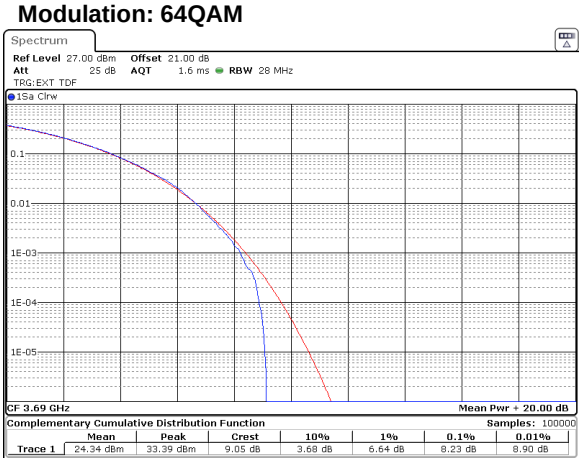
Modulation: QPSK



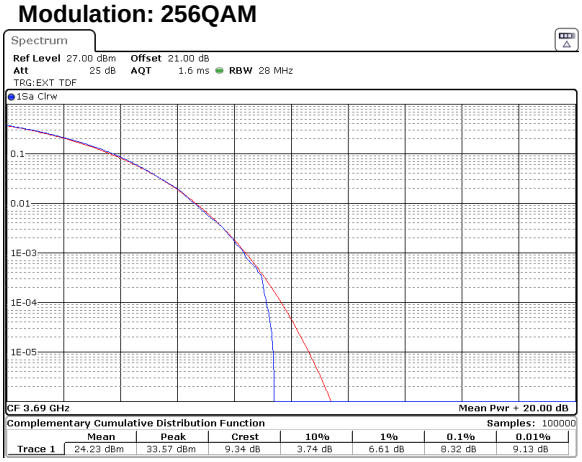
Modulation: 16QAM



Modulation: 64QAM



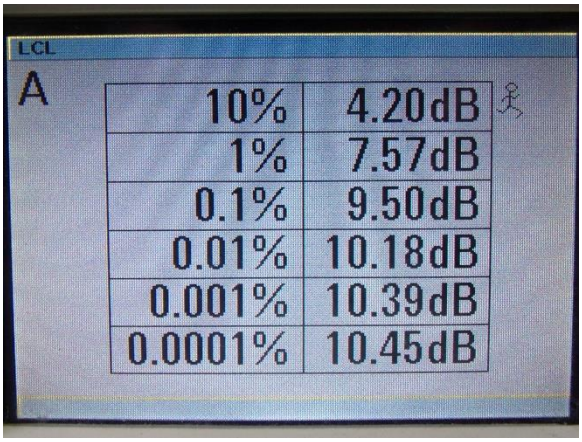
Modulation: 256QAM

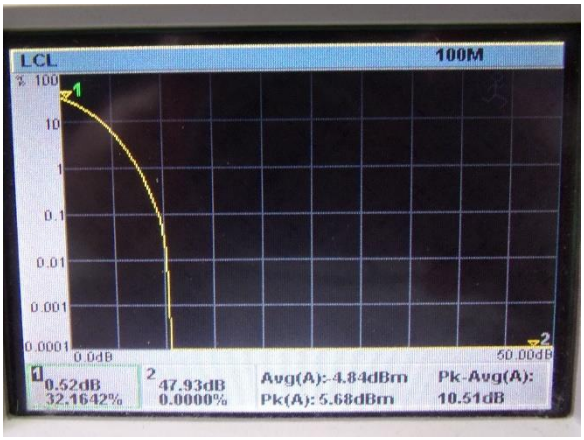


Test specification:	Section 96.41(g), Peak-to- average power ratio		
Test procedure:	Section 96.41(g)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-22		
Temperature: 24.3. ºC	Relative Humidity: 48 %	Air Pressure: 1010 hPa	Power: 48 VAC
Remarks:			

Plot 7.2.7 Peak-to-average power ratio test results at low frequency

CHANNEL SPACING: 40 MHz
ANTENNA PORT: 1
Modulation: QPSK





Modulation: 16QAM