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ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47CFR part 96

FOR:

Airspan Networks Inc.
LTE Base Station Radio
Models:AirVelocity 1500 3550-3700MHz (B48)
FCC ID:PIDAV1500

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

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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:	LTE Base Station Radio
Product type:	Transceiver
Model(s):	AirVelocity 1500 3550-3700MHz (B48)
Serial number:	E2DA330108C2
Hardware version:	A9
Software release:	SR-16.50
Receipt date	04-Apr-19

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:	32229
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	04-Apr-19
Test completed:	14-Apr-19
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)(1), 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

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.

This test report supersedes the previously issued test report identified by Doc ID:AIRRAD_FCC.32229.Rev2

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	April 14, 2019	
Reviewed by:	Mrs. S Peysahov Sheynin test engineer EMC & Radio	November 26 2019	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	November 26 2019	

6 EUT description

6.1 General information

The EUT, Mobile Digital station, AirVelocity 1500 3550-3700 MHz, Band 48, is part of a LTE 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 AirVelocity's transceiver/receiver (up to 64 QAM modulation, data rate up to 95 Mbps) equipped with a 9 dBi internal antenna. The Advanced Antenna Techniques 2x2 MIMO are supported. The maximum RF output power (not including antenna gain) is 20.20 dBm for 9 dBi and it can be reduced by software.
The AirVelocity 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 LTE UE from relocating to another subscriber premises without authorization.
AV1500 equipment defined as Category A CBSD (Citizens Broadband Radio Service Device).
Antennas 1/2 arrange one sector while antenna 1 is cross polarized to antenna 2 and antennas 3/4 arrange another sector while antenna 3 is cross polarized to antenna 4. The transmitter output signals are completely uncorrelated. The sectors are working on different non overlapping frequency channels.
The sectors are either non overlapping by operation on different frequency channeles or by different sectors coverage without overlapping of antenna beams.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Control	Ethernet	EUT	PoE	1	FTP	20

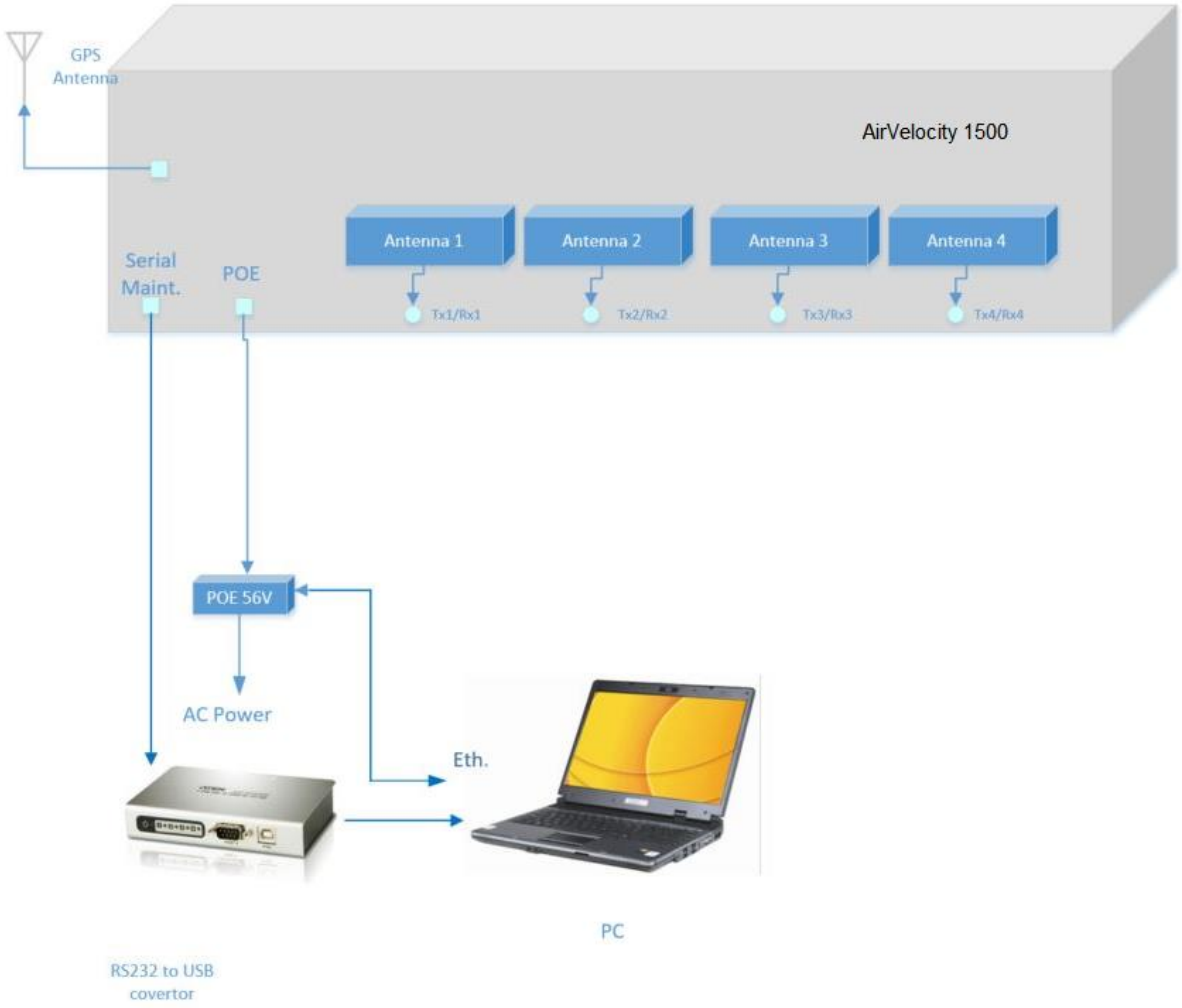
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	Dell	E7450	8TYRP32
USB to RS-232 convertor	ATEN	UC2324	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
Maximum rated output power	At transmitter 50 Ω RF output connector (per port) @10 MHz CBW: 20.20 dBm At transmitter 50 Ω RF output connector (per port) @20 MHz CBW: 22.93 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
External	MTI Wireless Edge Ltd.	MT-402022/CD/A	9 dBi

Transmitter aggregate data rate/s, Mbps

Transmitter 26dBc power bandwidth	Type of modulation		
	QPSK	16QAM	64QAM
10 MHz	10.7	22.7	47.3
20 MHz	23.4	45.4	95

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	
V	DC	**Nominal rated voltage**	56 VDC		
	AC mains	**Nominal rated voltage**		Frequency	

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

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):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
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	
	W/10 MHz	dBm/10 MHz
3550 - 3700	1.0	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

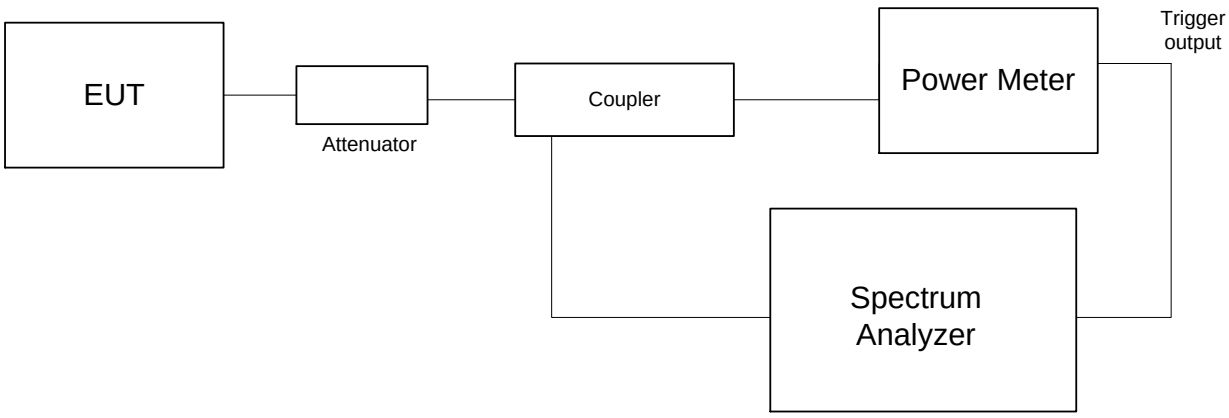
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

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):	14-Apr-19		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1010 hPa	**Power:** 56 VDC
Remarks:			

Table 7.1.3 Maximum EIRP test results

ASSIGNED FREQUENCY RANGE: 3550.0 – 3700.0 MHz
DETECTOR USED: Average
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	Chain RF#3, dBm	Chain RF#4, dBm					
Modulation QPSK									
3555.0	19.77	19.84	19.59	19.89	9.0	28.89	30.0	-1.11	Pass
3625.0	20.07	19.77	19.51	19.79	9.0	29.07	30.0	-0.93	Pass
3695.0	19.87	19.75	19.44	19.90	9.0	28.90	30.0	-1.10	Pass
Modulation 16QAM									
3555.0	19.68	19.68	19.29	19.80	9.0	28.80	30.0	-1.20	Pass
3625.0	19.51	19.81	19.20	19.58	9.0	28.81	30.0	-1.19	Pass
3695.0	19.71	19.80	19.34	19.78	9.0	28.80	30.0	-1.20	Pass
Modulation 64QAM									
3555.0	20.20	19.82	19.22	19.86	9.0	29.20	30.0	-0.80	Pass
3625.0	19.93	19.57	19.87	19.73	9.0	28.93	30.0	-1.07	Pass
3695.0	19.81	19.63	19.78	20.14	9.0	29.14	30.0	-0.86	Pass

* - EIRP = Max SA reading (Chains #1&2 and #3&4) + Antenna gain
** Margin = EIRP, dBm – specification limit.

CHANNEL SPACING: 20 MHz

Frequency, MHz	RF Output power				Antenna gain, dBi	Total EIRP, dBm*	EIRP**, dBm/10 MHz	Limit, dBm/10 MHz	Margin, dB***	Verdict
	Chain RF#1, dBm	Chain RF#2, dBm	Chain RF#3, dBm	Chain RF#4, dBm						
Modulation QPSK										
3560.0	22.54	22.81	22.93	22.59	9.0	31.93	29.48	30.0	-0.52	Pass
3625.0	21.57	21.71	21.28	21.09	9.0	30.71	28.26	30.0	-1.74	Pass
3690.0	21.32	21.67	21.32	21.56	9.0	30.67	28.22	30.0	-1.78	Pass
Modulation 16QAM										
3560.0	22.74	22.68	22.79	22.56	9.0	31.79	29.34	30.0	-0.66	Pass
3625.0	21.48	21.59	20.91	21.55	9.0	30.59	28.14	30.0	-1.86	Pass
3690.0	21.65	21.73	20.98	21.60	9.0	30.73	28.28	30.0	-1.72	Pass
Modulation 64QAM										
3560.0	22.73	22.43	22.68	22.59	9.0	31.73	29.28	30.0	-0.72	Pass
3625.0	21.50	21.77	22.37	21.51	9.0	31.37	28.92	30.0	-1.08	Pass
3690.0	21.60	21.53	21.07	21.71	9.0	30.71	28.26	30.0	-1.74	Pass

* - Total EIRP = Max SA reading (Chains #1&2and #3&4) + Antenna gain
** - EIRP dBm/10MHz = Total EIRP, dBm + 10*log[10 MHz/OBW(MHz) =
Max SA reading – 2.45 dB + Antenna gain
*** - 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):	14-Apr-19		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1010 hPa	**Power:** 56 VDC
Remarks:			

Table 7.1.4 Peak spectral power density test results

ASSIGNED FREQUENCY RANGE: 3550.0 – 3700.0 MHz
DETECTOR USED: Average
VIDEO BANDWIDTH: ≥ Resolution bandwidth
NUMBER OF CHAINS: 4

Frequency, MHz	SA reading				Antenna gain, dBi	Total PSD*, dBm/ MHz	Limit, dBm/ MHz	Margin, dB**	Verdict
	Chain RF#1, dBm	Chain RF#2, dBm	Chain RF#3, dBm	Chain RF#4, dBm					
Channel Spacing 10 MHz									
Modulation QPSK									
3555.0	8.12	8.18	8.18	8.26	9.0	19.89	20.0	-0.11	Pass
3625.0	8.03	8.35	7.89	8.28	9.0	19.98	20.0	-0.02	Pass
3695.0	8.14	8.18	8.11	7.99	9.0	19.81	20.0	-0.19	Pass
Modulation 16QAM									
3555.0	7.99	8.26	7.82	8.02	9.0	19.89	20.0	-0.11	Pass
3625.0	8.13	8.34	7.49	8.19	9.0	19.97	20.0	-0.03	Pass
3695.0	8.17	8.07	7.94	8.28	9.0	19.91	20.0	-0.09	Pass
Modulation 64QAM									
3555.0	8.36	8.32	8.16	7.93	9.0	19.99	20.0	-0.01	Pass
3625.0	8.18	8.12	8.13	8.06	9.0	19.81	20.0	-0.19	Pass
3695.0	8.29	8.33	8.06	8.31	9.0	19.96	20.0	-0.04	Pass
Channel Spacing 20 MHz									
Modulation QPSK									
3560.0	8.32	8.19	8.11	8.04	9.0	19.95	20.0	-0.05	Pass
3625.0	8.15	7.92	8.00	8.14	9.0	19.78	20.0	-0.22	Pass
3690.0	8.26	8.2	8.16	8.17	9.0	19.89	20.0	-0.11	Pass
Modulation 16QAM									
3560.0	8.33	8.27	8.23	8.12	9.0	19.96	20.0	-0.04	Pass
3625.0	8.12	8.34	8.04	8.26	9.0	19.97	20.0	-0.03	Pass
3690.0	8.24	8.25	8.12	8.12	9.0	19.88	20.0	-0.12	Pass
Modulation 64QAM									
3560.0	8.07	8.25	8.35	8.07	9.0	19.98	20.0	-0.02	Pass
3625.0	8.31	8.36	8.16	8.32	9.0	19.99	20.0	-0.01	Pass
3690.0	8.34	8.06	8.02	8.18	9.0	19.97	20.0	-0.03	Pass

* - Total PSD = Max SA reading (Chains #1&2 or chains #3&4) + Antenna Gain + Duty Cycle Factor
** - Margin = Total PSD, dBm – specification limit.

Reference numbers of test equipment used

HL 3301	HL 3433	HL 3442	HL 3787	HL 5376	HL 5409		

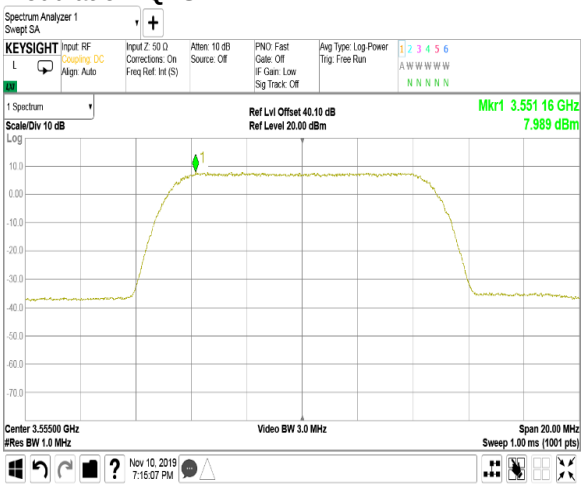
Full description is given in Appendix A.

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):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

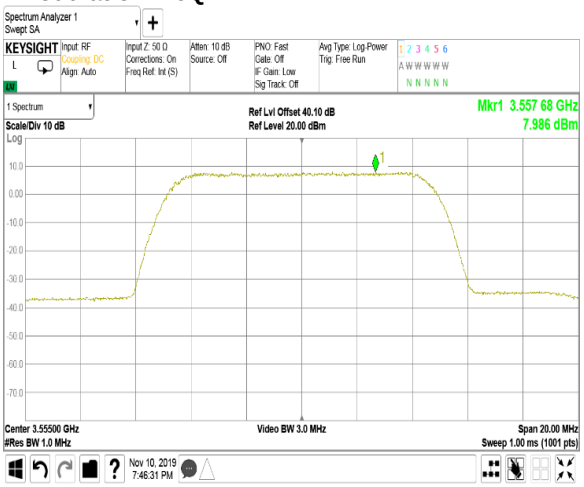
Plot 7.1.1 Peak spectral power density at low frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 1

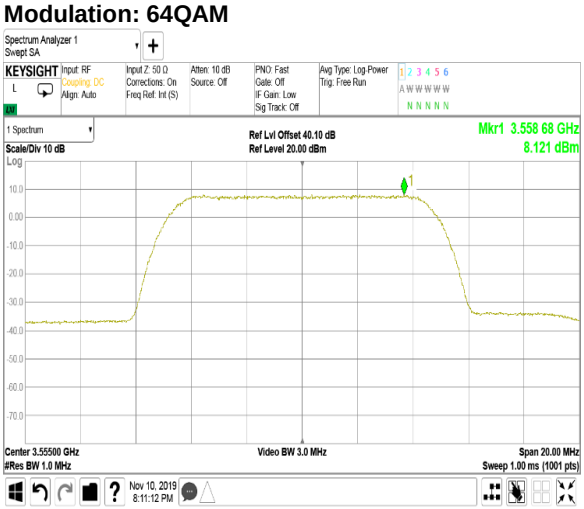
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

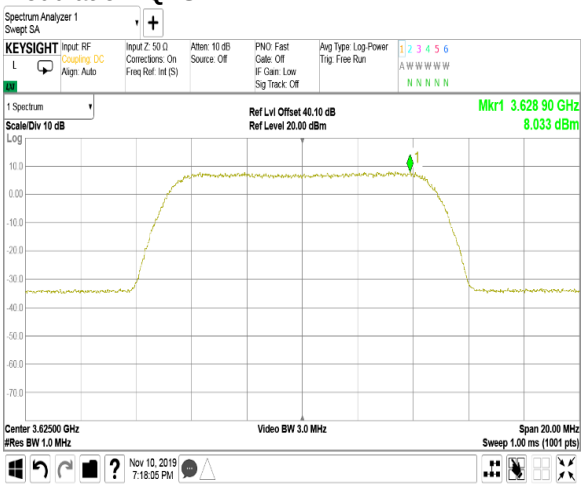


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

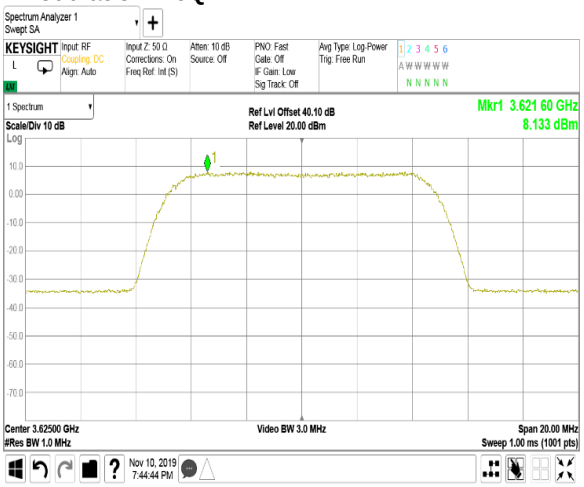
Plot 7.1.2 Peak spectral power density at mid frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 1

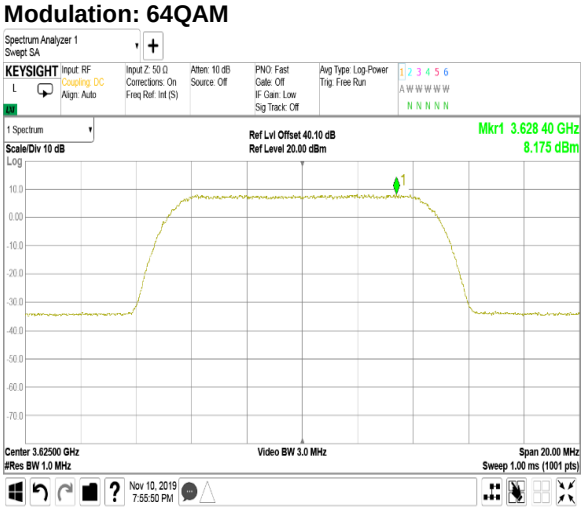
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

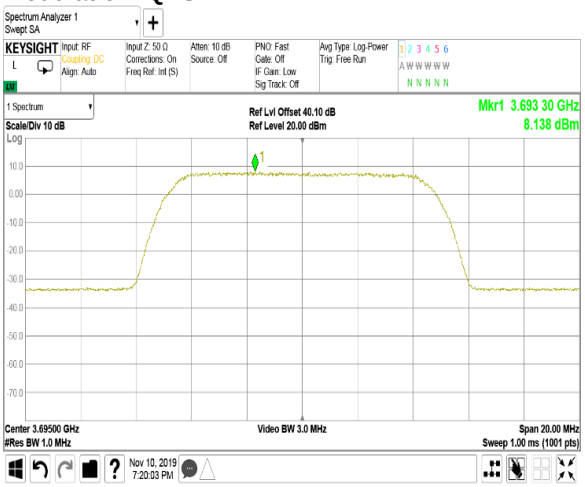


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

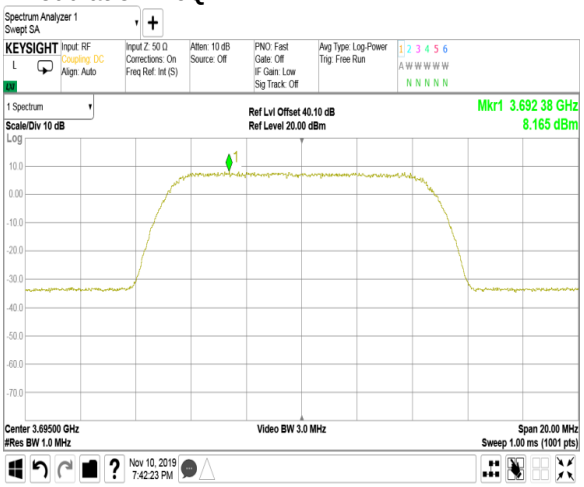
Plot 7.1.3 Peak spectral power density at high frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 1

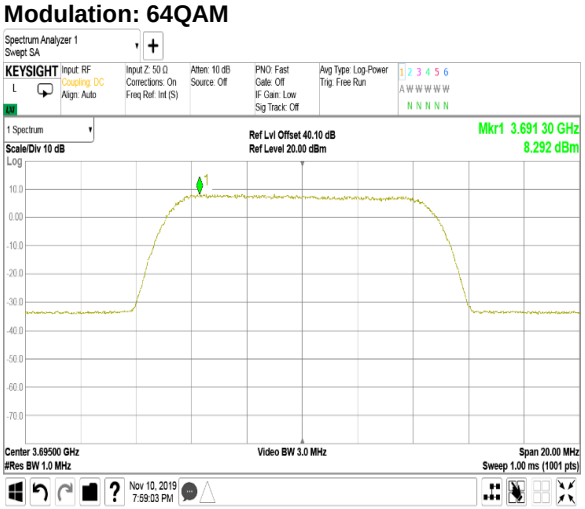
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

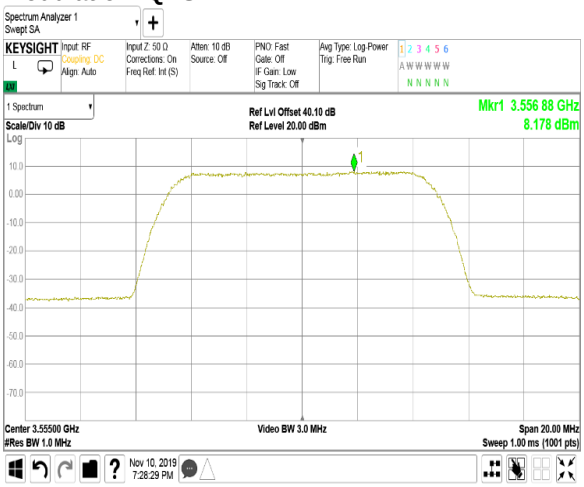


Test specification:	**Section 96.41(b), Maximum EIRP and maximum power spectral density**		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1010 hPa	**Power:** 56 VDC
Remarks:			

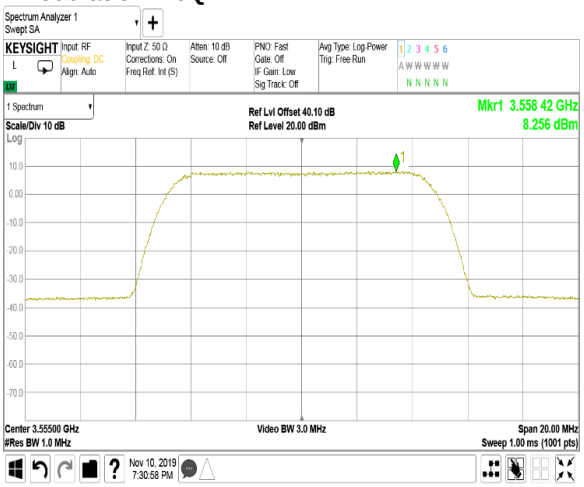
Plot 7.1.4 Peak spectral power density at low frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 2

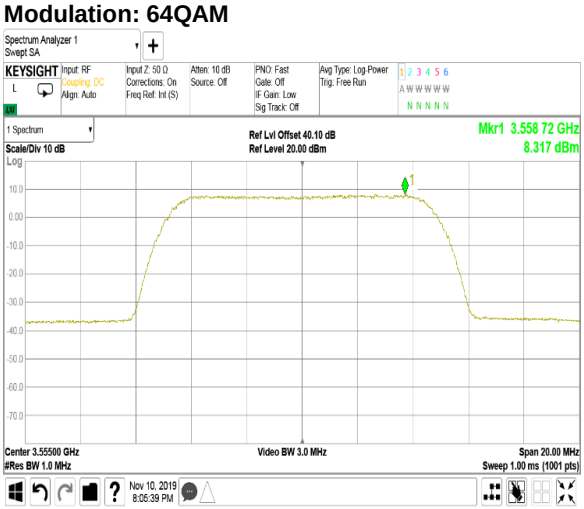
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

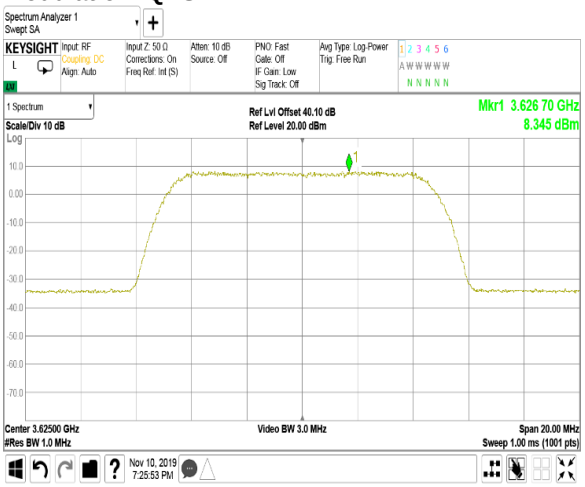


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

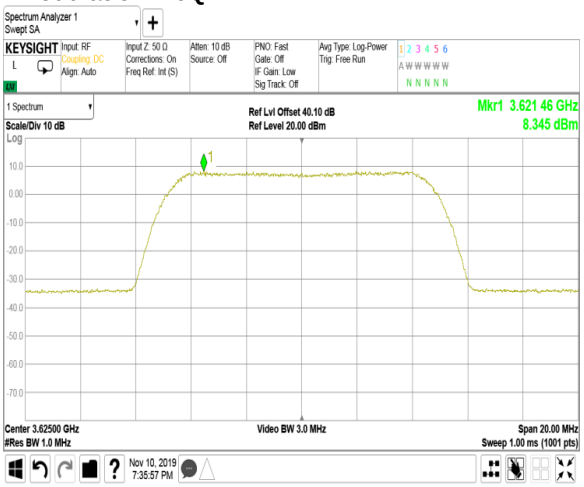
Plot 7.1.5 Peak spectral power density at mid frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 2

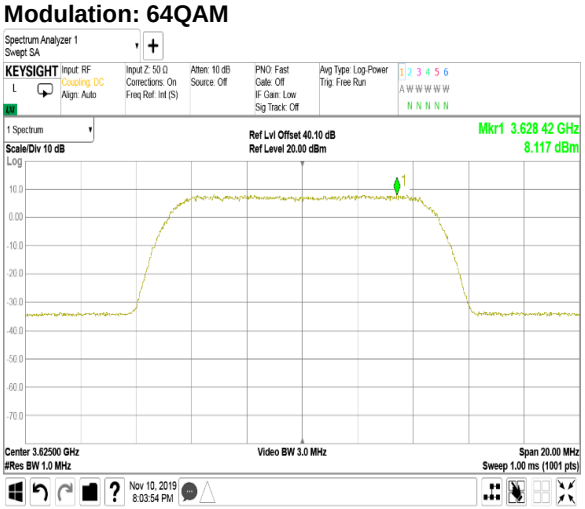
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

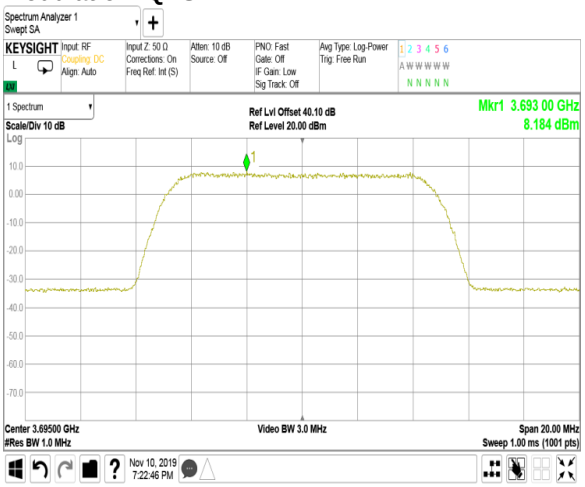


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

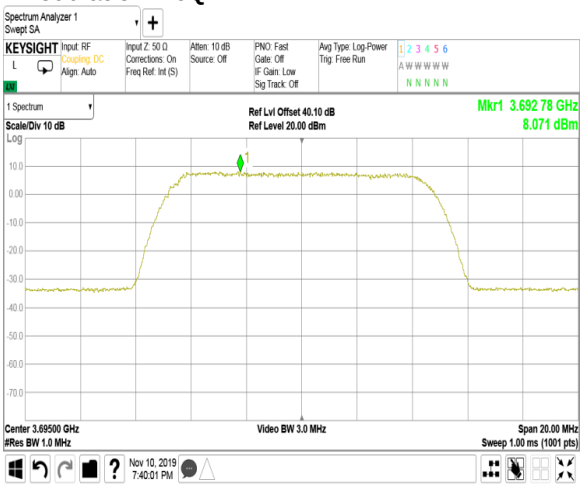
Plot 7.1.6 Peak spectral power density at high frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 2

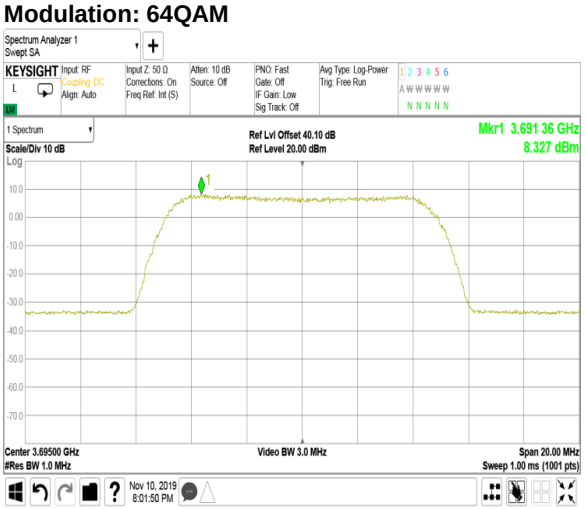
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

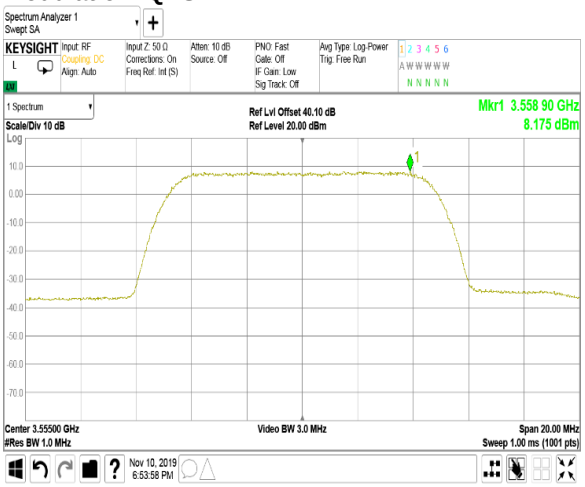


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

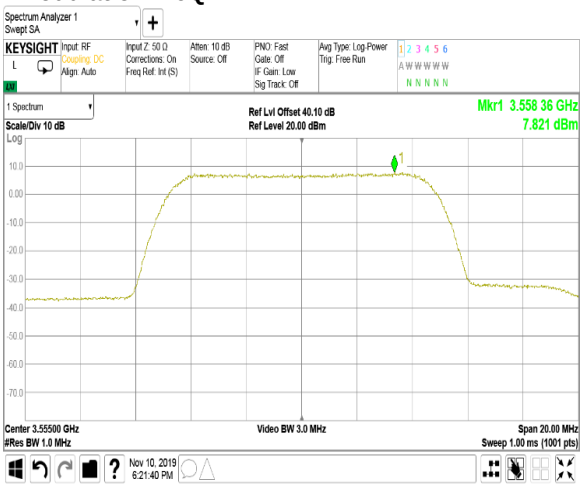
Plot 7.1.7 Peak spectral power density at low frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 3

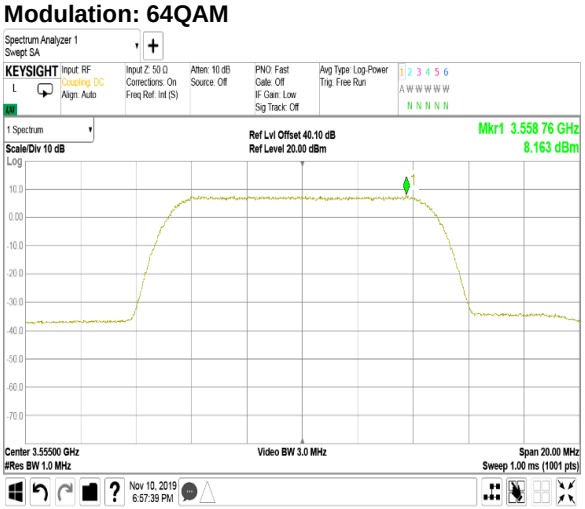
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

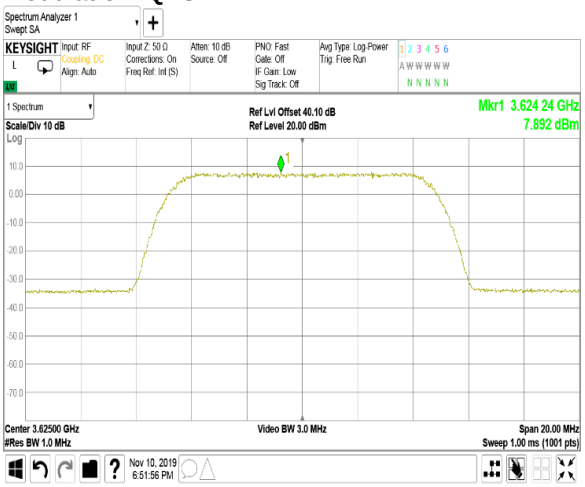


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

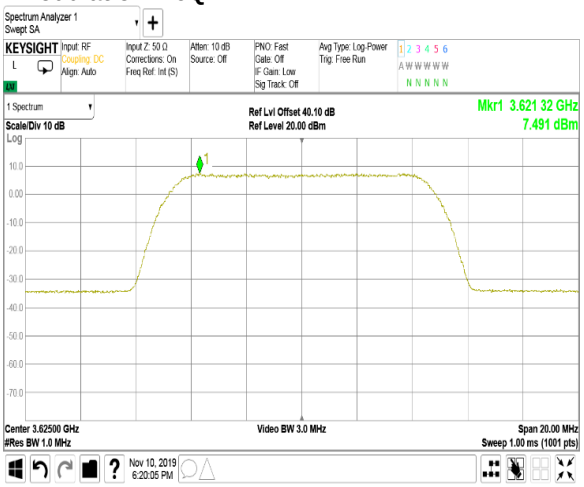
Plot 7.1.8 Peak spectral power density at mid frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 3

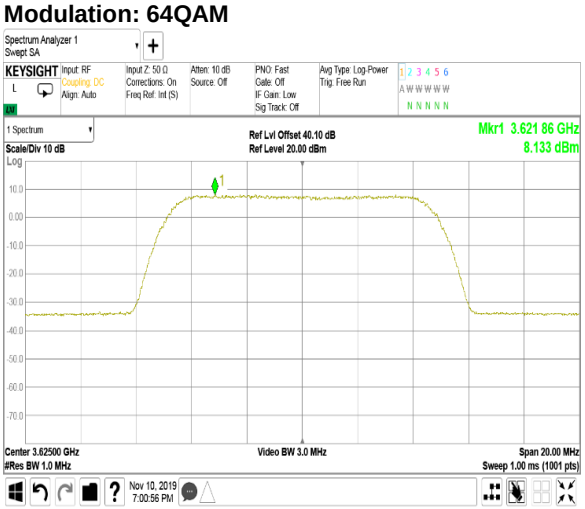
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

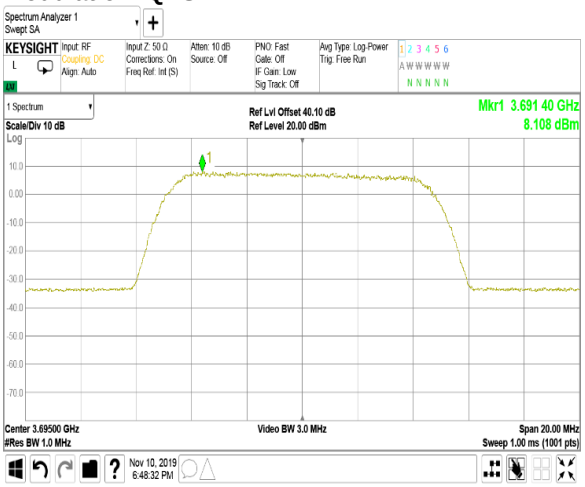


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

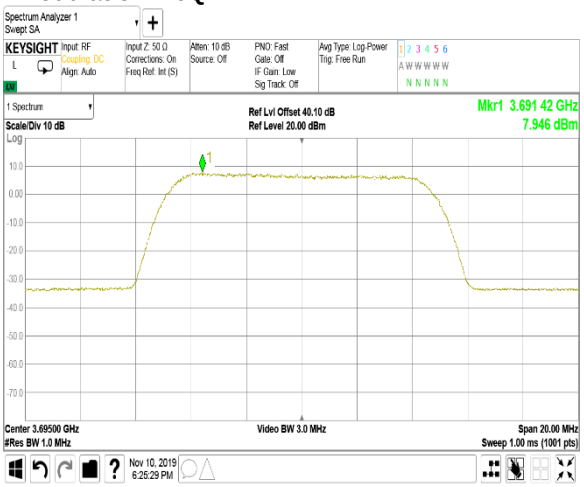
Plot 7.1.9 Peak spectral power density at high frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 3

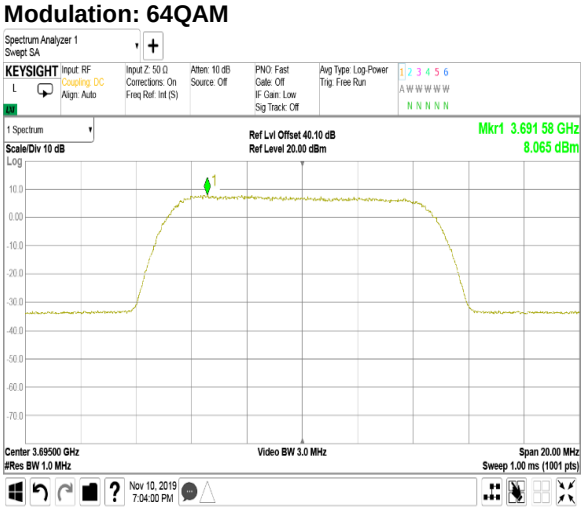
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM



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):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

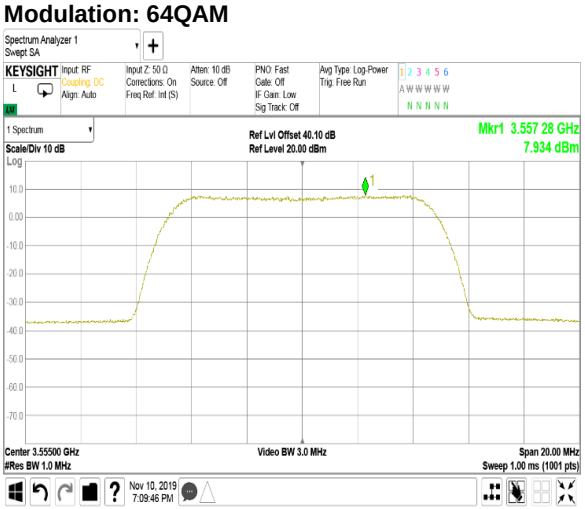
Plot 7.1.10 Peak spectral power density at low frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 4

Modulation: QPSK

Modulation: 16QAM

Modulation: 64QAM

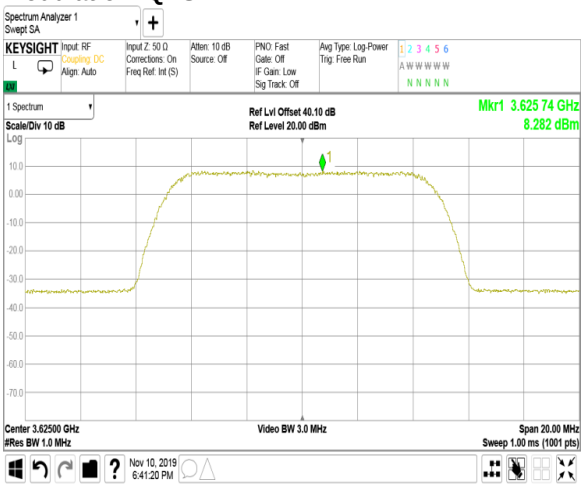


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

Plot 7.1.11 Peak spectral power density at mid frequency

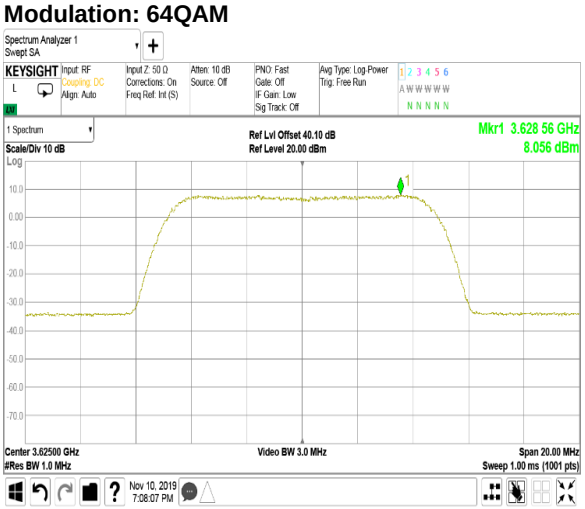
CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 4

Modulation: QPSK



Modulation: 16QAM

Modulation: 64QAM

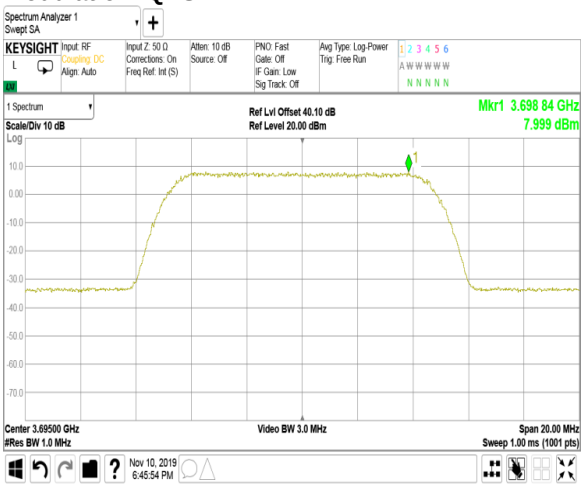


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

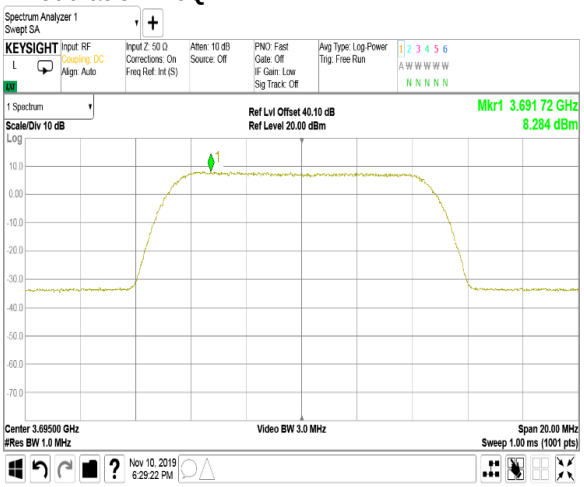
Plot 7.1.12 Peak spectral power density at high frequency

CHANNEL SPACING: 10 MHz
ANTENNA CHAIN: 4

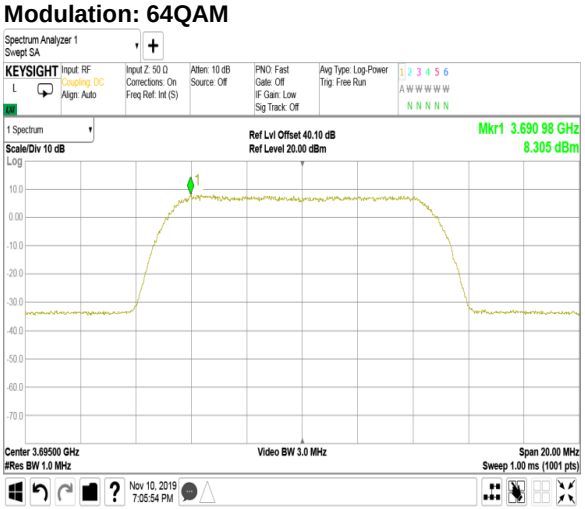
Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM

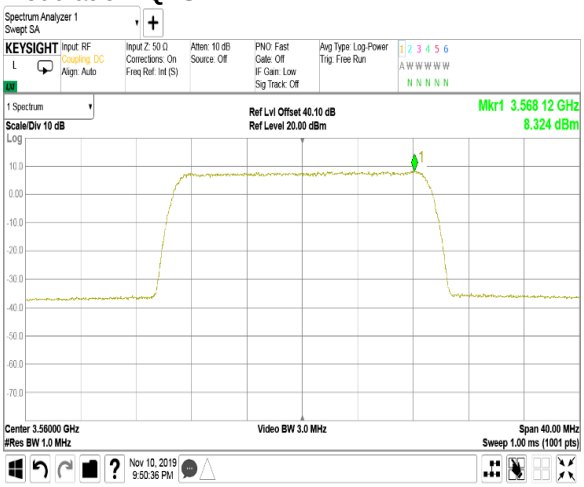


Test specification:	Section 96.41(b), Maximum EIRP and maximum power spectral density		
Test procedure:	Section 96.41(e)(3)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	14-Apr-19		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1010 hPa	Power: 56 VDC
Remarks:			

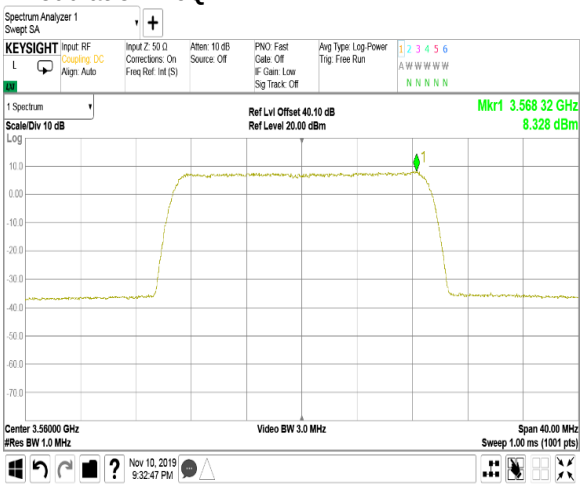
Plot 7.1.13 Peak spectral power density at low frequency within

CHANNEL SPACING: 20 MHz
ANTENNA CHAIN: 1

Modulation: QPSK



Modulation: 16QAM



Modulation: 64QAM