



ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47CFR part 27

FOR:

Airspan Networks Inc.

LTE Base Station

Model: AirHarmony 4400, 2.5GHz (B41)

FCC ID:PIDH4K425

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

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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
Product type: Transceiver
Model(s): AirHarmony 4400, 2.5 GHz (B41)
Serial number: D3EF0BCE3180
Hardware version: B3
Software release: 14_15_20_071
Receipt date 27-Feb-17

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: 29264
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 20-Feb-17
Test completed: 22-Mar-17
Test specification(s): FCC 47CFR part 27



5 Tests summary

Test	Status
Transmitter characteristics	
Section 27.50(h), Peak output power at RF antenna connector	Pass
Section 27.50(h)(4), Spectral power density	Pass
Section 27.53(m)(2), Band edge emissions at RF antenna connector	Pass
Section 2.1049, Occupied bandwidth	Pass

The product was approved under FCC ID:PIDH4K425 for operation in 3 bands: 2498.5 – 2687.5 MHz, 2620.5 – 2687.5 MHz, 2498.5 – 2565.5 MHz with 5 MHz, 10 MHz and 20 MHz channel bandwidth.

The relevant tests to support 40 MHz channel bandwidth and submit Application for Class II permissive changes certification were done.

The bandwidth change is software controlled, no hardware change was made.

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.29264.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	February 22, 2017	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	March 6, 2017	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	March 22, 2017	



6 EUT description

6.1 General information

The EUT, Base station radio, AirHarmony 4400 2.5GHz (B41), 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 AirHarmony's transceiver/receiver (Up to 64 QAM modulation, data rate up to 190 Mbps) uses OFDM and operating in TDD mode, equipped with 18 dBi external antenna. Advanced Antenna Techniques 2x4 MIMO are supported (the detailed description provided in the Operational description exhibit in Application for certification). The maximum total RF output power (not including antenna gain) is 46.2 dBm for 18 dBi antenna and it can be reduced by software.

The AirHarmony is installed outdoors and typically is mounted on a pole. 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.

The EUT, AirHarmony 4400 2.5GHz (B41), comes in range of three frequency band variants that can be installed with different external Cavity filters. Frequency bands are 2496 – 2690 MHz, 2618 – 2690 MHz and 2496 – 2568 MHz. The external Cavity filters are designed specifically for AirHarmony 4400 deployments. The installation and replacement of the external filters can be performed by licensed installer only according installation procedure.

6.2 Ports and lines

Port Type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Power	AC power	EUT	AC mains	1	Unshielded	3
Signal	GPS	EUT	GPS external antenna	1	Coax	3
Signal	Eth. POE	EUT	Laptop	1	FTP	3
Signal	Eth. POE	EUT	Open circuit	1	FTP	3
Signal	Eth.	EUT	Open circuit	2	FTP	3
RF	RF Link (Tx/Rx)	EUT	Antenna (via filter)	4	Coax	1
Signal*	Serial*	Not connected	Not connected	1	NA	NA

*for maintenance only

6.3 Support and test equipment

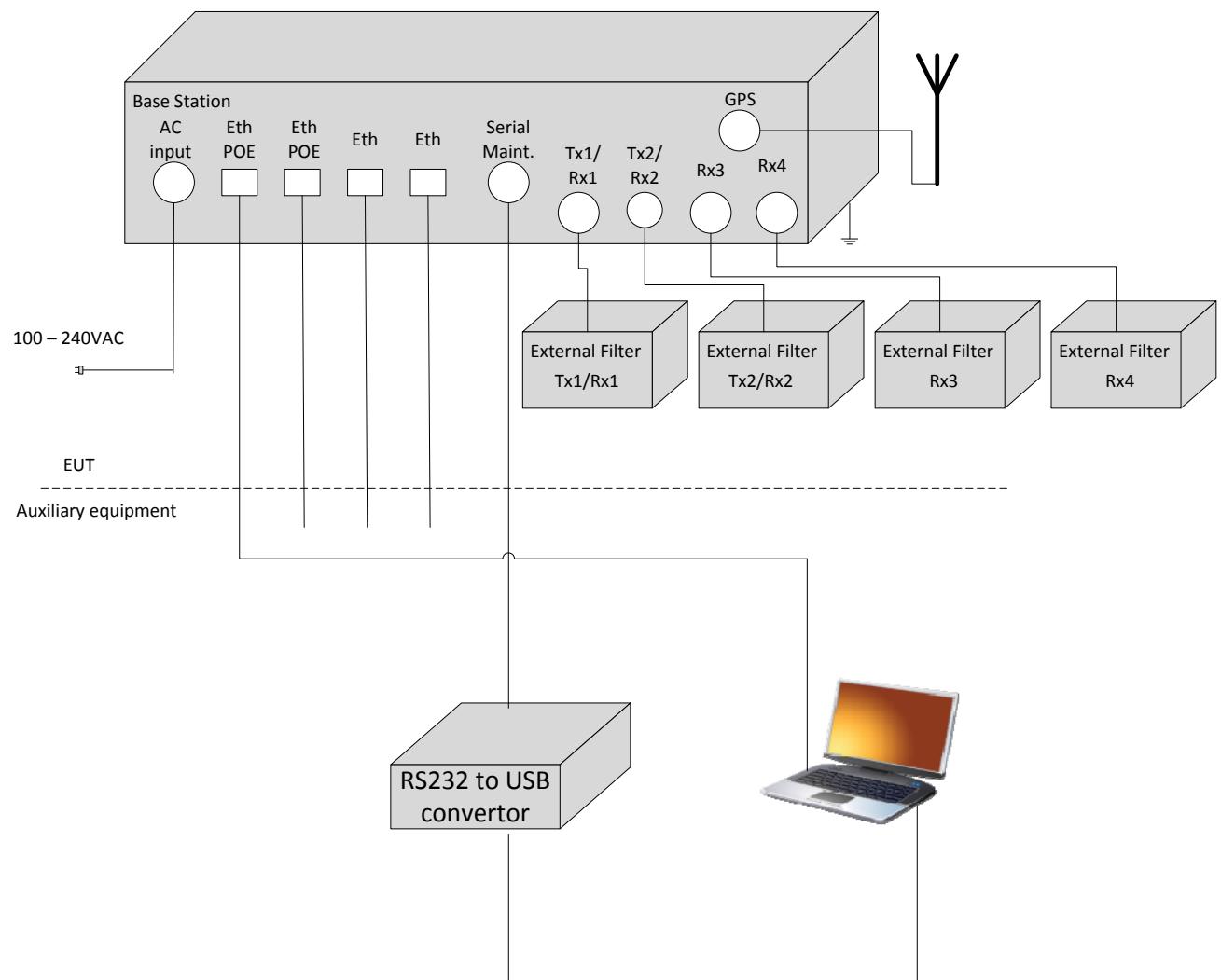
Description	Manufacturer	Model number	Serial number
Laptop	Dell	E7450	8TYRP32

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					
V fixed	Always at a distance more than 2 m from all people					
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	2496.0 – 2690.0 MHz (full band)					
Operating frequency (full bands)	2516.0 – 2670.0 MHz for 40 MHz OBW					
RF channel spacing	40 MHz					
Maximum rated output power	At transmitter 50 Ω RF output connector (aggregate power of both RF chains)			45.82 dBm		
Is transmitter output power variable?		No				
		V Yes	continuous variable			
			stepped variable with step size	0.25 dB		
			minimum RF power	-30 dBm		
				maximum RF power at antenna connector		
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	ALPHA Wireless Ltd	AW3007	18 dBi			
External	ALPHA Wireless Ltd	AW3008	17 dBi			
External sector	Cobham Antenna Systems	SA12-2.5-DS/1915	11 dBi			
Transmitter aggregate data rate/s, MBps						
Transmitter 26dBc power bandwidth 40 MHz		Type of modulation				
		QPSK	16QAM	64QAM		
		46.8 MBps	90.8 MBps	190 MBps		
Type of multiplexing	TDD					
Modulating test signal (baseband)	PRBS					
Maximum transmitter duty cycle in normal use	75%					
Transmitter power source						
		Nominal rated voltage				
DC		Nominal rated voltage				
V AC mains	Nominal rated voltage	120 VAC	Frequency			
Common power source for transmitter and receiver	V	yes	no			



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Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	20-Feb-17 - 21-Feb-17		
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz			

7 Transmitter tests according to 47CFR part 27

7.1 Occupied bandwidth test in 2498.5-2687.5 MHz band

7.1.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Occupied bandwidth limits

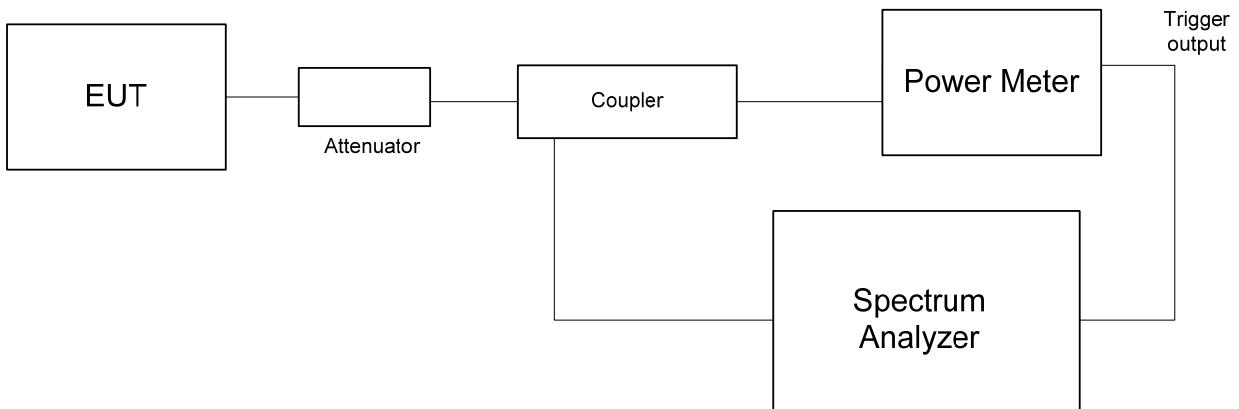
Assigned frequency, MHz	Modulation envelope reference points*, %	Maximum allowed bandwidth, kHz
2496.0 – 2690.0 MHz	99%	NA

* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

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 set to transmit the normal modulated signal and actual channel width was measured at the 26 dBc modulation envelope reference points.
- 7.1.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.1.2 and the associated plots.

Figure 7.1.1 Occupied bandwidth test setup





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Test specification: Section 2.1049, Occupied bandwidth				
Test procedure: 47 CFR, Section 2.1049				
Test mode: Compliance				Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17				
Temperature: 23.2 °C		Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz				

Table 7.1.2 Occupied bandwidth test results

DETECTOR USED:

Peak

RESOLUTION BANDWIDTH:

≥390 kHz

MODULATION ENVELOPE REFERENCE POINTS:

99%

EBW:

40 MHz

Carrier frequency, MHz	OBW 26 dBc, MHz	OBW 99%, MHz	Limit, kHz	Verdict
QPSK				
2516.0	39.965	37.412	NA	Pass
2594.0	39.796	37.434	NA	Pass
2670.0	39.812	37.428	NA	Pass
64QAM				
2516.0	39.975	37.428	NA	Pass
2594.0	39.998	37.346	NA	Pass
2670.0	39.877	37.339	NA	Pass

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3818	HL 3901			
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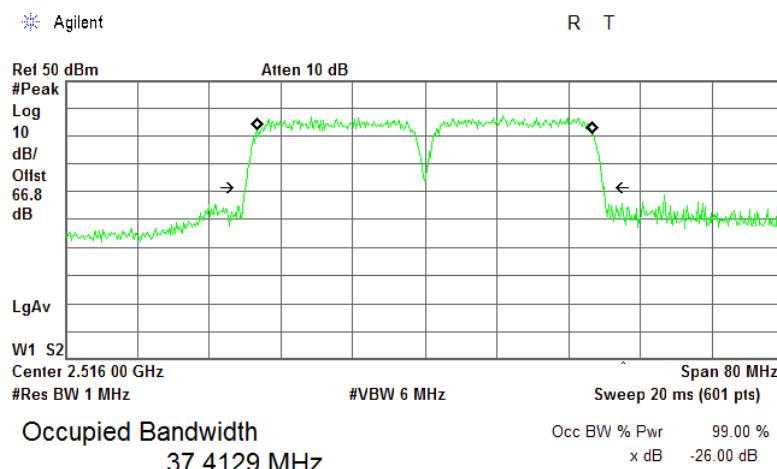
Full description is given in Appendix A.



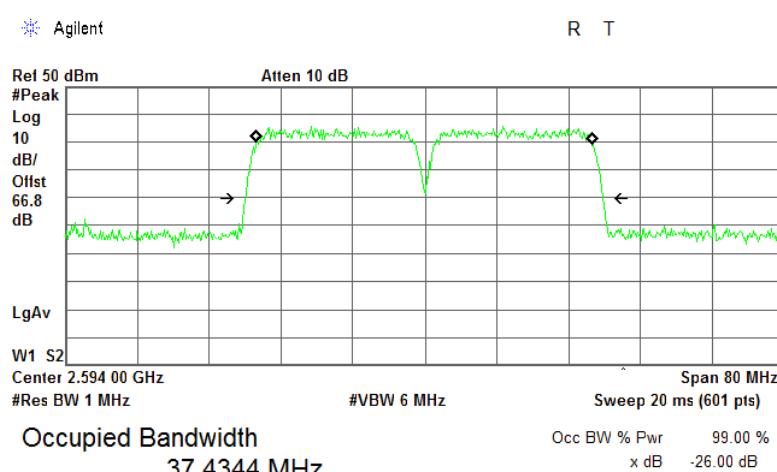
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Test specification: Section 2.1049, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz			

Plot 7.1.1 Occupied bandwidth test results at low frequency, 40 MHz EBW, QPSK



Plot 7.1.2 Occupied bandwidth test results at mid frequency, 40 MHz EBW, QPSK





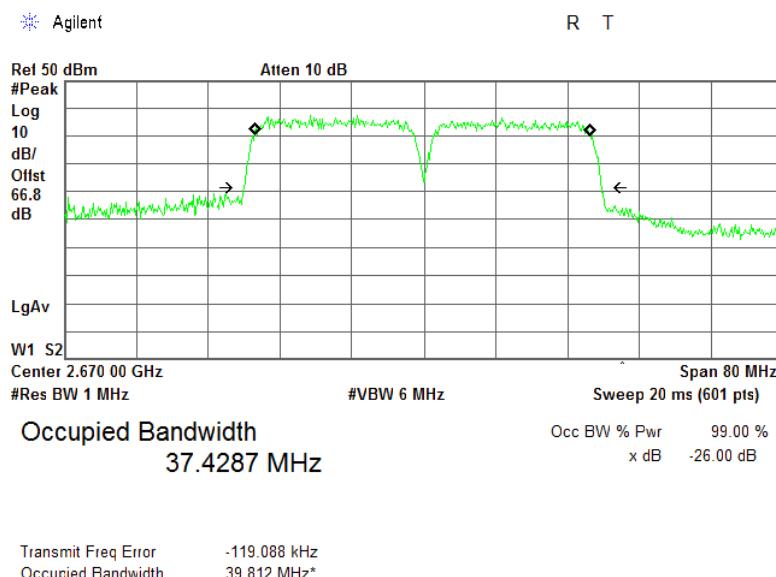
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Report ID: AIRRAD_FCC.29264_rev1.docx

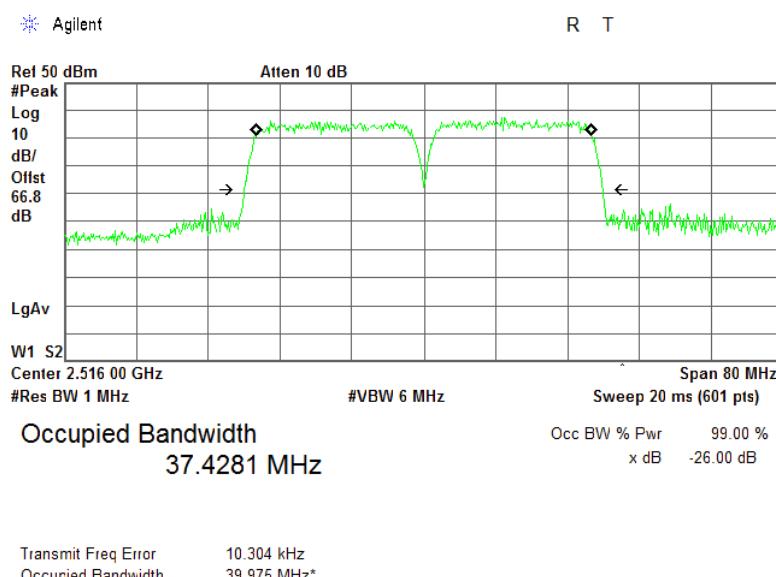
Date of Issue: 22-Mar-17

Test specification: Section 2.1049, Occupied bandwidth		
Test procedure: 47 CFR, Section 2.1049		
Test mode: Compliance	Verdict: PASS	
Date(s): 20-Feb-17 - 21-Feb-17		
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		

Plot 7.1.3 Occupied bandwidth test results at high frequency, 40 MHz EBW, QPSK



Plot 7.1.4 Occupied bandwidth test results at low frequency, 40 MHz EBW, 64QAM

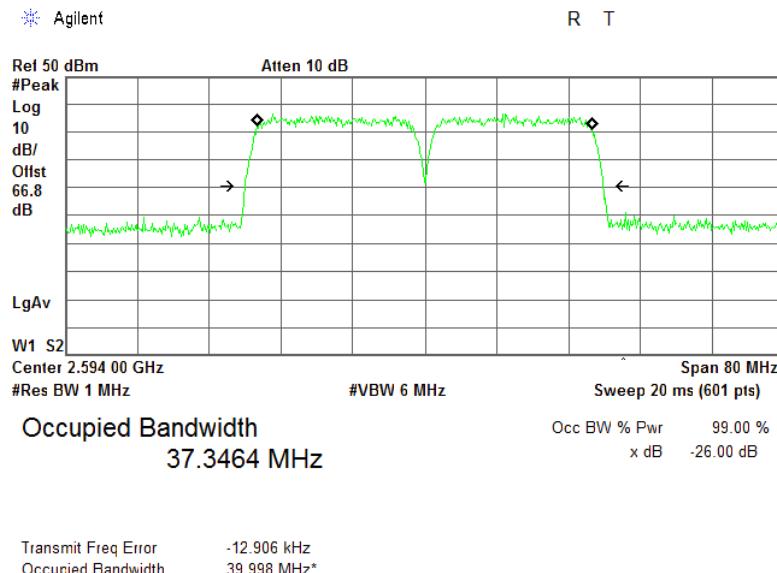




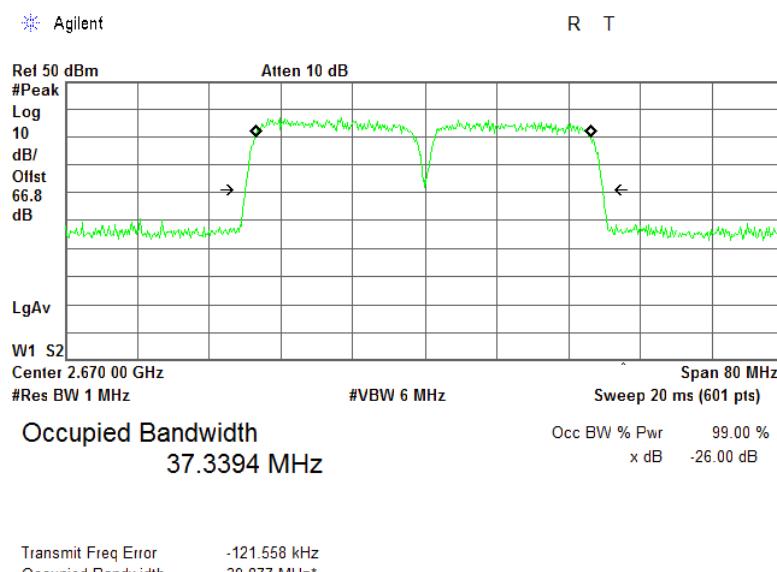
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Test specification: Section 2.1049, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz			

Plot 7.1.5 Occupied bandwidth test results at mid frequency, 40 MHz EBW, 64QAM



Plot 7.1.6 Occupied bandwidth test results at high frequency, 40 MHz EBW, 64QAM





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Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	21-Mar-17		
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

7.2 Occupied bandwidth test in 2498.5-2565.5 MHz band

7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

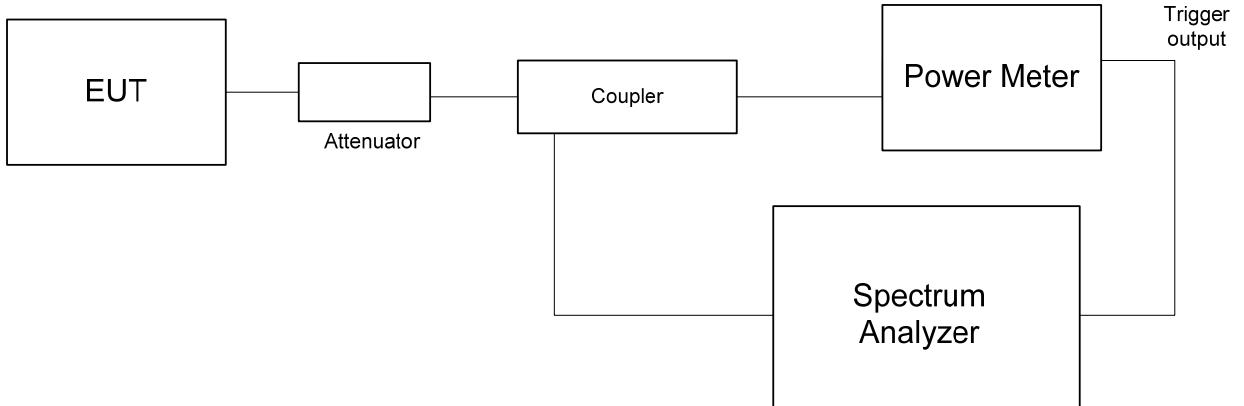
Assigned frequency, MHz	Modulation envelope reference points*, %	Maximum allowed bandwidth, kHz
2496.0 – 2572.0 MHz	99%	NA

* - 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 normal modulated signal and actual channel width was measured at the 26 dBc modulation envelope reference points.
- 7.2.2.3 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





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Test specification: Section 2.1049, Occupied bandwidth				
Test procedure: 47 CFR, Section 2.1049				
Test mode: Compliance				Verdict: PASS
Date(s): 21-Mar-17				
Temperature: 23.2 °C		Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz				

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Peak
RESOLUTION BANDWIDTH: ≥ 390 kHz
MODULATION ENVELOPE REFERENCE POINTS: 99%
EBW: 40 MHz

Carrier frequency, MHz	OBW 26 dBc, MHz	OBW 99%. MHz	Limit, kHz	Verdict
QPSK				
2516.0	39.786	37.396	NA	Pass
2537.0	39.777	37.407	NA	Pass
2548.0	39.860	37.380	NA	Pass
64QAM				
2516.0	39.975	37.428	NA	Pass
2537.0	38.625	37.271	NA	Pass
2548.0	39.654	37.381	NA	Pass

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3818	HL 3901			
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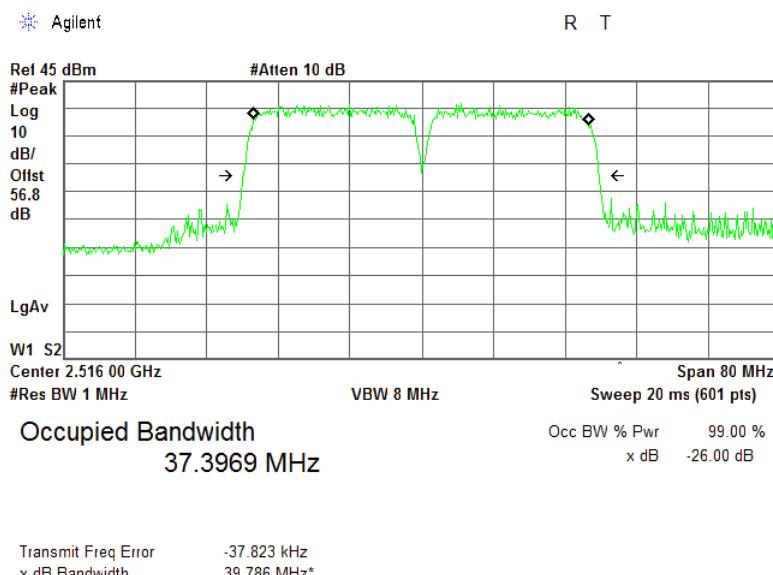
Full description is given in Appendix A.



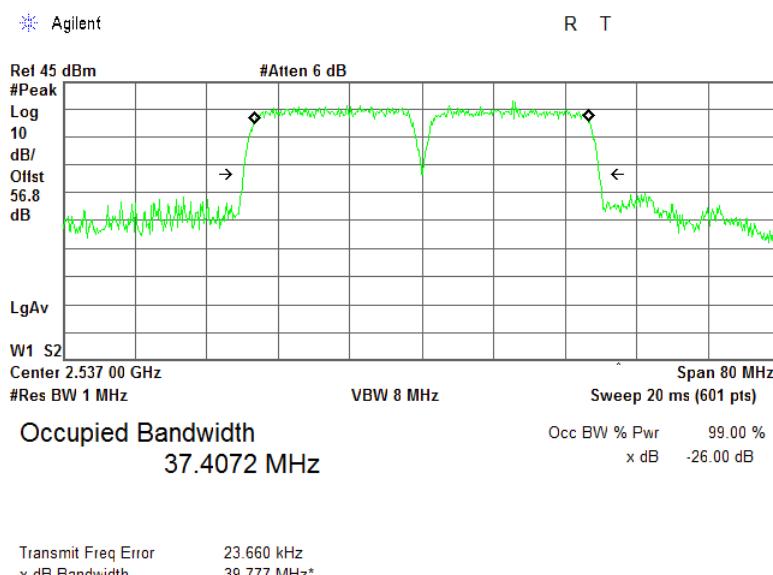
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Test specification: Section 2.1049, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance			Verdict: PASS
Date(s): 21-Mar-17			
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.2.1 Occupied bandwidth test results at low frequency, 40 MHz EBW, QPSK



Plot 7.2.2 Occupied bandwidth test results at mid frequency, 40 MHz EBW, QPSK

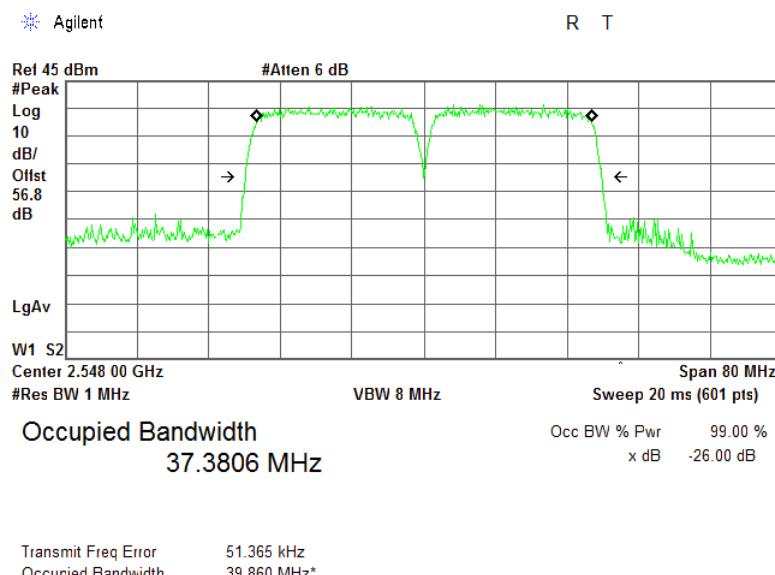




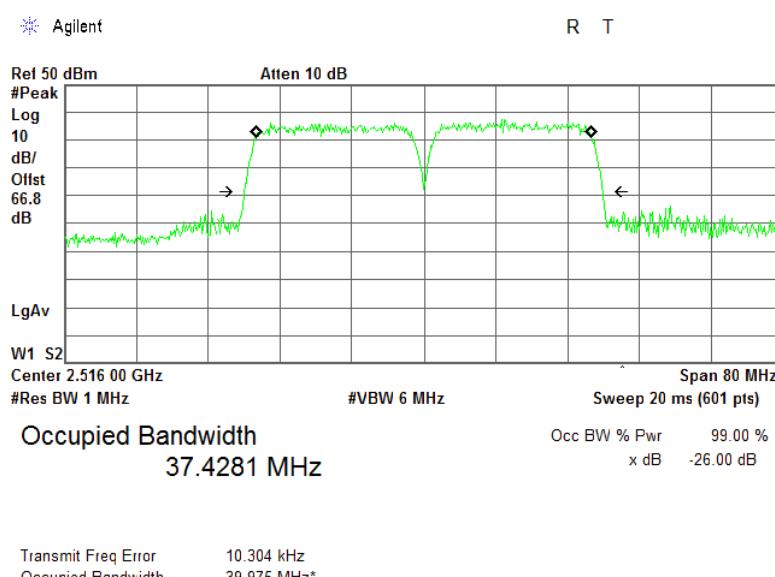
HERMON LABORATORIES

Test specification: Section 2.1049, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance			Verdict: PASS
Date(s): 21-Mar-17			
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.2.3 Occupied bandwidth test results at high frequency, 40 MHz EBW, QPSK



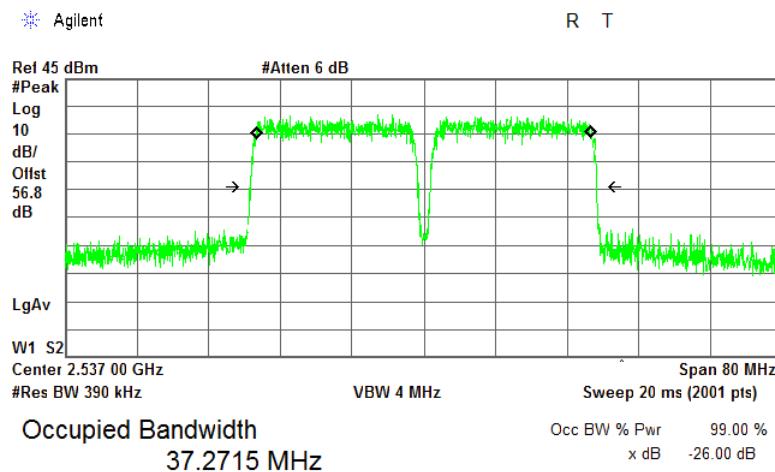
Plot 7.2.4 Occupied bandwidth test results at low frequency, 40 MHz EBW, 64QAM



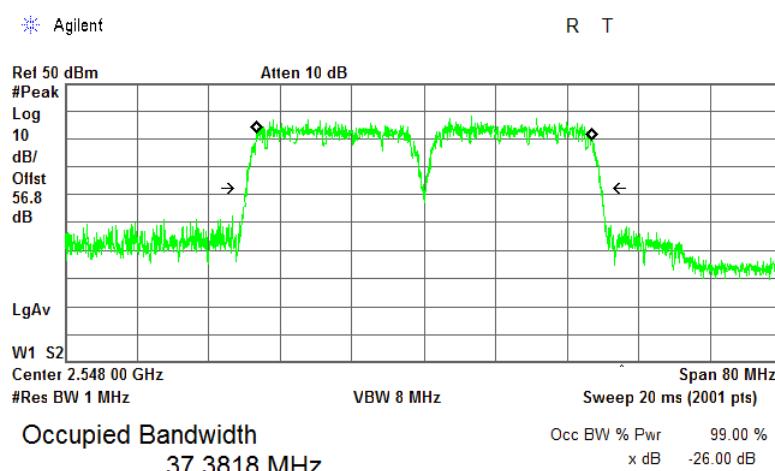


Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	21-Mar-17		
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.2.5 Occupied bandwidth test results at mid frequency, 40 MHz EBW, 64QAM



Plot 7.2.6 Occupied bandwidth test results at high frequency. 40 MHz EBW. 64QAM





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Test specification: Section 2.1049, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance			Verdict: PASS
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

7.3 Occupied bandwidth test in 2620.5 – 2687.5 MHz band

7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Occupied bandwidth limits

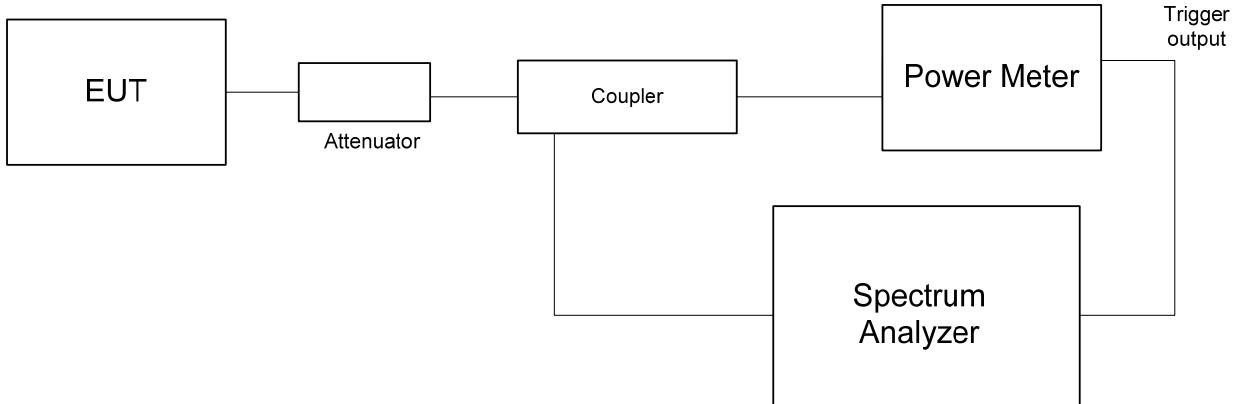
Assigned frequency, MHz	Modulation envelope reference points*, %	Maximum allowed bandwidth, kHz
2614.0 – 2690.0 MHz	99%	NA

* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

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 EUT was set to transmit the normal modulated signal and actual channel width was measured at the 26 dBc modulation envelope reference points.
- 7.3.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.3.2 and the associated plots.

Figure 7.3.1 Occupied bandwidth test setup





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Test specification: Section 2.1049, Occupied bandwidth				
Test procedure: 47 CFR, Section 2.1049				
Test mode: Compliance				Verdict: PASS
Date(s): 22-Feb-17				
Temperature: 23.1 °C		Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz				

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED:

Peak

RESOLUTION BANDWIDTH:

≥390 kHz

MODULATION ENVELOPE REFERENCE POINTS:

99%

EBW:

40 MHz

Carrier frequency, MHz	OBW 26 dBc, MHz	OBW 99%, MHz	Limit, kHz	Verdict
QPSK				
2638.0	39.822	37.354	NA	Pass
2653.5	39.813	37.453	NA	Pass
2670.0	39.694	37.466	NA	Pass
64QAM				
2638.0	38.691	37.315	NA	Pass
2653.5	39.700	37.356	NA	Pass
2670.0	39.546	37.394	NA	Pass

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 4274	HL 4575			
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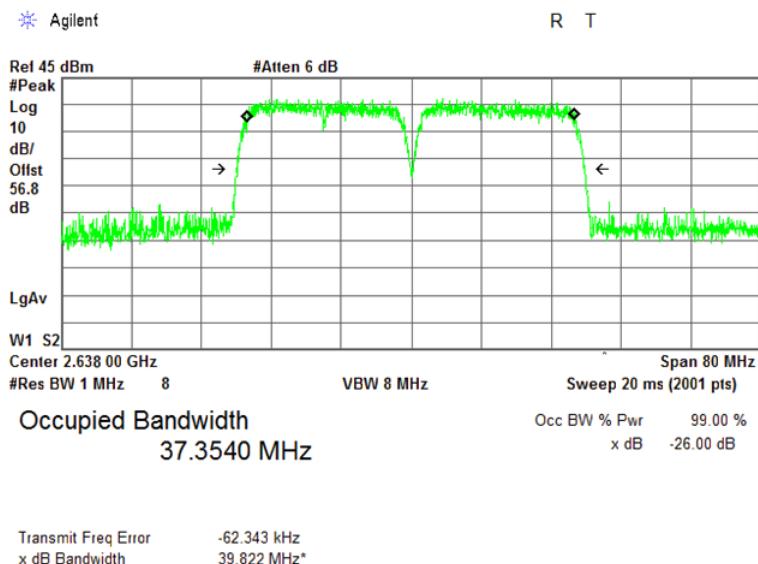
Full description is given in Appendix A.



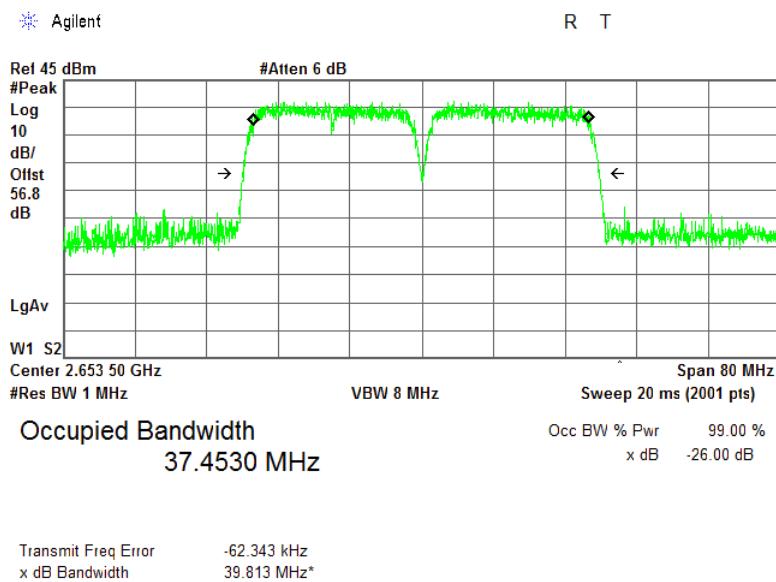
HERMON LABORATORIES

Test specification: Section 2.1049, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance			Verdict: PASS
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.3.1 Occupied bandwidth test results at low frequency, 40 MHz EBW, QPSK



Plot 7.3.2 Occupied bandwidth test results at mid frequency, 40 MHz EBW, QPSK

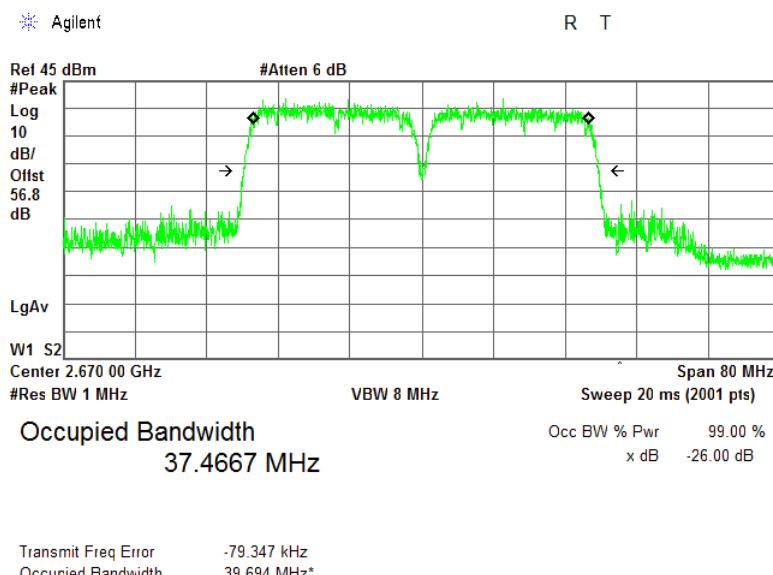




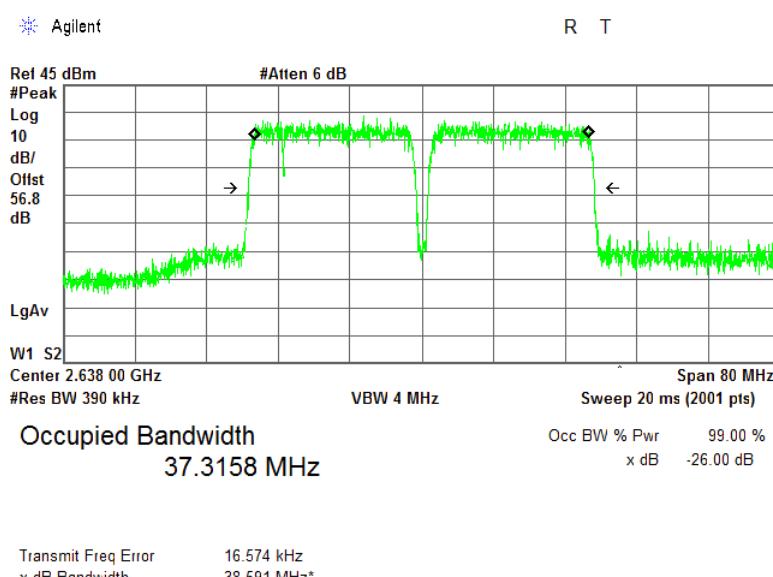
HERMON LABORATORIES

Test specification: Section 2.1049, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance			Verdict: PASS
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.3.3 Occupied bandwidth test results at high frequency, 40 MHz EBW, QPSK



Plot 7.3.4 Occupied bandwidth test results at low frequency, 40 MHz EBW, 64QAM

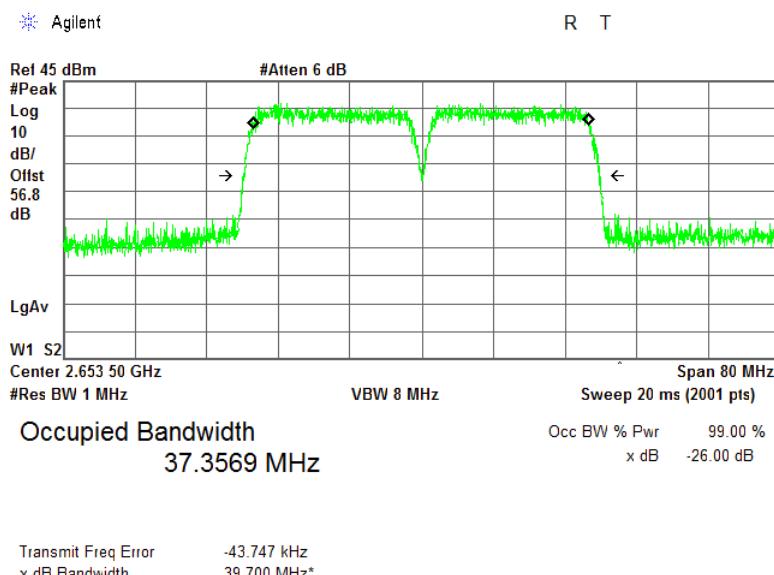




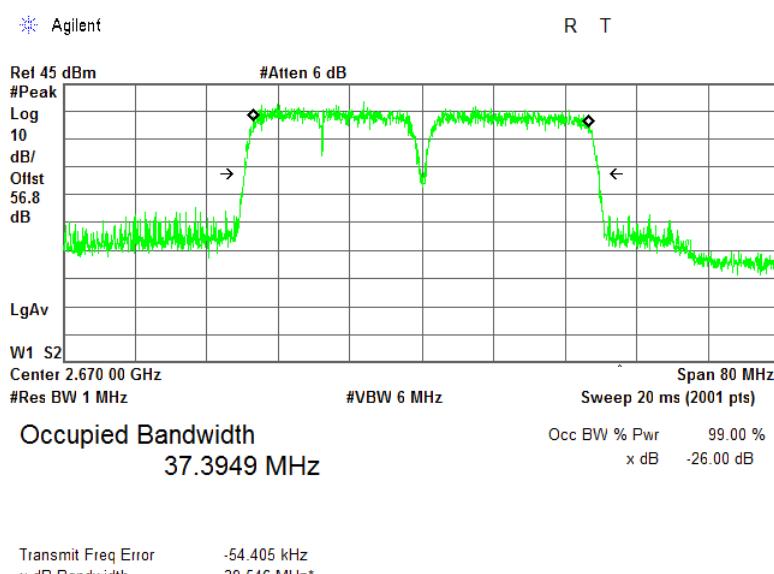
HERMON LABORATORIES

Test specification: Section 2.1049, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance			Verdict: PASS
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.3.5 Occupied bandwidth test results at mid frequency, 40 MHz EBW, 64QAM



Plot 7.3.6 Occupied bandwidth test results at high frequency, 40 MHz EBW, 64QAM





HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz			

7.4 Maximum output power test in 2498.5-2687.5 MHz band

7.4.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Maximum output power limits

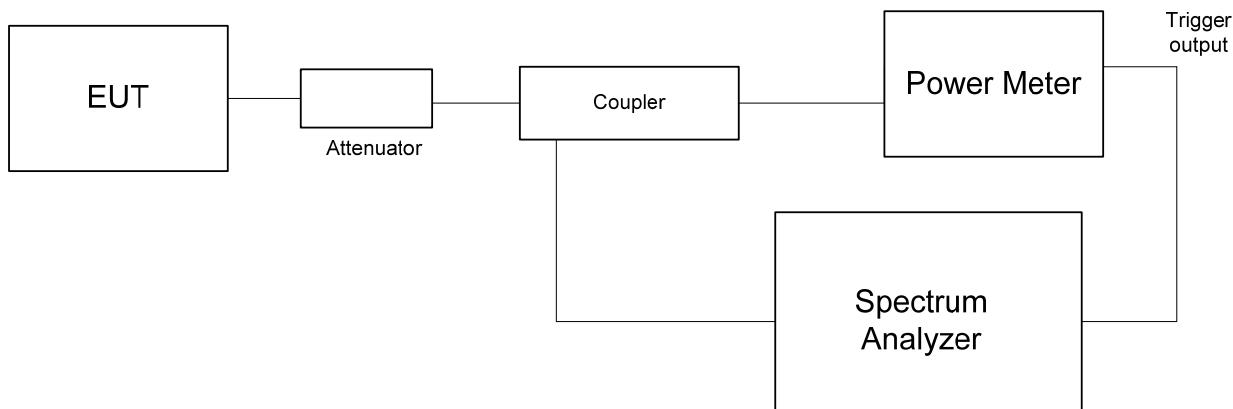
Transmitter type	Assigned frequency range, MHz	Maximum peak output power dBm
Main, booster and base stations	2496.0 – 2690.0	$63 + 10\log(X/Y) + 10\log(360/\text{beamwidth})$
		Maximum peak power density dBm/100 kHz
		$EIRP + 10\log(0.1/Y)$

*- X is the actual channel width in MHz (occupied bandwidth), Y is either
 1) 6 MHz if prior to transition or the station is in the MBS following transition or
 2) 5.5 MHz if the station is in the LBS and UBS following transition, and
 3) beamwidth is the total horizontal plane beam width of the individual transmitting antenna for the station or any sector measured at the half-power points.

7.4.2 Test procedure

- 7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.
- 7.4.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.
- 7.4.2.3 The average output power was measured with power meter as provided in Table 7.4.2.
- 7.4.2.4 The power spectral density was measured with spectrum analyzer as provided in Table 7.4.3.
- 7.4.2.5 The test results are provided in the tables below and associated plots.

Figure 7.4.1 Peak output power test setup





HERMON LABORATORIES

Test specification: Section 27.50, Peak output power								
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1							
Test mode:	Compliance						Verdict:	PASS
Date(s):	20-Feb-17 - 21-Feb-17							
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa			Power: 120 VAC			
Remarks: Operation in full band 2498.5-2687.5 MHz								

Table 7.4.2 Peak output power test results

DETECTOR USED:

Average within Tx burst

DUTY CYCLE:

55%

EBW:

40 MHz

Carrier frequency, MHz	Power Meter reading RF#1, dBm	Power Meter reading RF#2, dBm	Total RF power**, dBm	Antenna gain, dBi	Total EIRP*, dBm	Limit***, dBm	Margin, dB	Verdict
QPSK								
2516.0	42.20	42.25	45.23	18.0	63.23	69.68	-6.46	Pass
2594.0	42.65	42.41	45.53	18.0	63.53	69.93	-6.40	Pass
2670.0	42.29	42.30	45.30	18.0	63.30	69.73	-6.44	Pass
64QAM								
2516.0	42.71	42.78	45.75	18.0	63.75	69.68	-5.94	Pass
2594.0	42.67	42.87	45.77	18.0	63.77	69.92	-6.15	Pass
2670.0	42.37	42.22	45.30	18.0	63.30	69.72	-6.43	Pass
QPSK								
2516.0	42.20	42.25	45.23	17.0	62.23	68.27	-6.04	Pass
2594.0	42.65	42.41	45.53	17.0	62.53	68.52	-5.99	Pass
2670.0	42.29	42.30	45.30	17.0	62.30	68.32	-6.02	Pass
64QAM								
2516.0	42.71	42.78	45.75	17.0	62.75	68.27	-5.52	Pass
2594.0	42.67	42.87	45.77	17.0	62.77	68.51	-5.74	Pass
2670.0	42.37	42.22	45.30	17.0	62.30	68.31	-6.01	Pass
QPSK								
2516.0	42.20	42.25	45.23	11.0	56.23	69.68	-13.46	Pass
2594.0	42.65	42.41	45.53	11.0	56.53	69.93	-13.40	Pass
2670.0	42.29	42.30	45.30	11.0	56.30	69.73	-13.44	Pass
64QAM								
2516.0	42.71	42.78	45.75	11.0	56.75	69.68	-12.94	Pass
2594.0	42.67	42.87	45.77	11.0	56.77	69.92	-13.15	Pass
2670.0	42.37	42.22	45.30	11.0	56.30	69.72	-13.43	Pass

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi

** - Total RF power , dBm = $10^{\log[10^{(Power RF\#1 / 10)} + 10^{(Power RF\#2 / 10)}]}$

*** - See Table 7.4.5.

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302					
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Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: Section 27.50, Peak output power							
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1					
Test mode:	Compliance		Verdict:				PASS
Date(s):	20-Feb-17 - 21-Feb-17						
Temperature: 23.2 °C	Relative Humidity: 48 %		Air Pressure: 1019 hPa	Power: 120 VAC			
Remarks: Operation in full band 2498.5-2687.5 MHz							

Table 7.4.3 Power spectral density test results

DETECTOR USED: Average gated
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 CHANNEL BANDWIDTH: 40 MHz
 DUTY CYCLE: 55%
 NUMBER OUTPUTS: N=2

Carrier frequency, MHz	SA reading*, RF #1 or RF#2 dBm/100kHz	Total PSD dBm/100kHz	Antenna gain, dBi	Total EIRP PSD**, dBm/100kHz	Limit***, dBm	Margin, dB	Verdict
QPSK							
2516.0	18.76	21.76	18.0	39.76	43.20	-3.44	Pass
2594.0	18.37	21.37	18.0	39.37	43.70	-4.33	Pass
2670.0	18.21	21.21	18.0	39.21	43.30	-4.09	Pass
64 QAM							
2516.0	19.18	22.18	18.0	40.18	43.20	-3.02	Pass
2594.0	19.03	22.03	18.0	40.03	43.69	-3.66	Pass
2670.0	18.67	21.67	18.0	39.67	43.29	-3.62	Pass
QPSK							
2516.0	18.76	21.76	17.0	38.76	41.78	-3.02	Pass
2594.0	18.37	21.37	17.0	38.37	42.29	-3.92	Pass
2670.0	18.21	21.21	17.0	38.21	41.88	-3.67	Pass
64 QAM							
2516.0	19.18	22.18	17.0	39.18	41.79	-2.61	Pass
2594.0	19.03	22.03	17.0	39.03	42.28	-3.25	Pass
2670.0	18.67	21.67	17.0	38.67	41.87	-3.20	Pass
QPSK							
2516.0	18.76	21.76	11.0	32.76	43.20	-10.44	Pass
2594.0	18.37	21.37	11.0	32.37	43.70	-11.33	Pass
2670.0	18.21	21.21	11.0	32.21	43.30	-11.09	Pass
64 QAM							
2516.0	19.18	22.18	11.0	33.18	43.20	-10.02	Pass
2594.0	19.03	22.03	11.0	33.03	43.69	-10.66	Pass
2670.0	18.67	21.67	11.0	32.67	43.29	-10.62	Pass

* SA reading including attenuation, cable loss and Duty Cycle correction factor

** Total EIRP PSD, dBm/100kHz = SA reading Max (dBm/100kHz,RF#1or RF#2)+ 3 dB + Antenna Gain, dBi

*** See Table 7.4.6.

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3818	HL 3901			
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Full description is given in Appendix A.



HERMON LABORATORIES

Report ID: AIRRAD_FCC.29264_rev1.docx

Date of Issue: 22-Mar-17

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz			

Table 7.4.4 Post- transition frequency channels assignment

Channel	OBW, MHz	Peak power limit, dBm	Power density limit, dBm/100kHz
40 MHz 4 Channels QPSK 46.4 Mbps			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	37.412	63+10log(OBW/44.5)+10log(360/beamwidth)	EIRP+10log(0.1/22.5)
2594.0 MHz EBS A4+B4+C4+D4+G4+F4+E4	37.434	63+10log(OBW/42.0)+10log(360/beamwidth)	EIRP+10log(0.1/24.0)
2670.0 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	37.428	63+10log(OBW/44.0)+10log(360/beamwidth)	EIRP+10log(0.1/22.0)
40 MHz 4 Channels 64QAM 190 Mbps			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	37.428	63+10log(OBW/44.5)+10log(360/beamwidth)	EIRP+10log(0.1/22.5)
2594.0 MHz EBS A4+B4+C4+D4+G4+F4+E4	37.346	63+10log(OBW/42.0)+10log(360/beamwidth)	EIRP+10log(0.1/24.0)
2670.0 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	37.339	63+10log(OBW/44.0)+10log(360/beamwidth)	EIRP+10log(0.1/22.0)

Table 7.4.5 EIRP limits

Channel	Channel BW, MHz	Peak power limit, dBm	
		17 dBi, 90° beamwidth	18 dBi, 65°beamwidth 11 dBi, 65°beamwidth
40 MHz Dual Channel QPSK			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	44.5	68.27	69.68
2594.0 MHz EBS A4+B4+C4+D4+G4+F4+E4	42.0	68.52	69.93
2670.0 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	44.0	68.32	69.73
40 MHz Dual Channel 64 QAM			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	44.5	68.27	69.68
2594.0 MHz EBS A4+B4+C4+D4+G4+F4+E4	42.0	68.51	69.92
2670.0 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	44.0	68.31	69.72



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Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %		Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		Power: 120 VAC	

Table 7.4.6 Peak power density limits

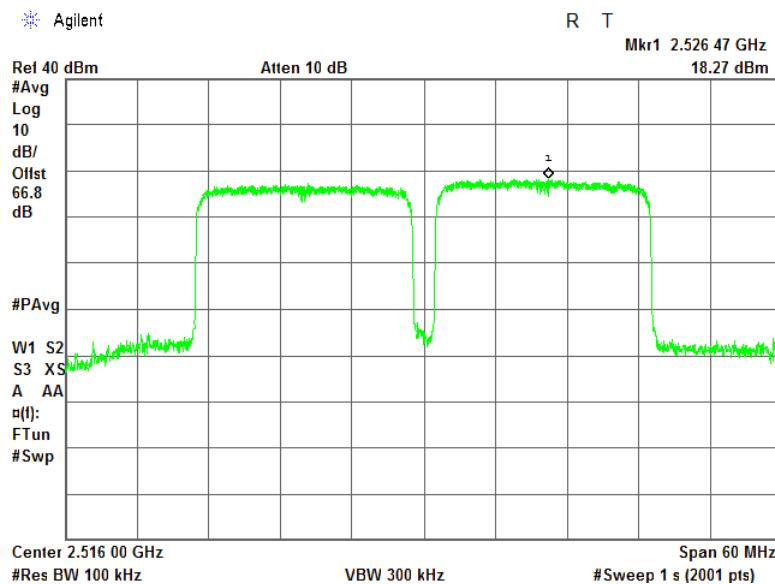
Channel	Channel BW, MHz	Peak power density, dBm/100kHz	
		17 dBi, 90° beamwidth	18 dBi, 65°beamwidth 11 dBi, 65°beamwidth
40 MHz Dual Channel QPSK			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	44.5	41.78	43.20
2594.0 MHz EBS A4+B4+C4+D4+G4+F4+E4	42.0	42.29	43.70
2670.0 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	44.0	41.88	43.30
40 MHz Dual Channel 64 QAM			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	44.5	41.79	43.20
2594.0 MHz EBS A4+B4+C4+D4+G4+F4+E4	42.0	42.29	43.69
2670.0 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	44.0	41.88	43.29



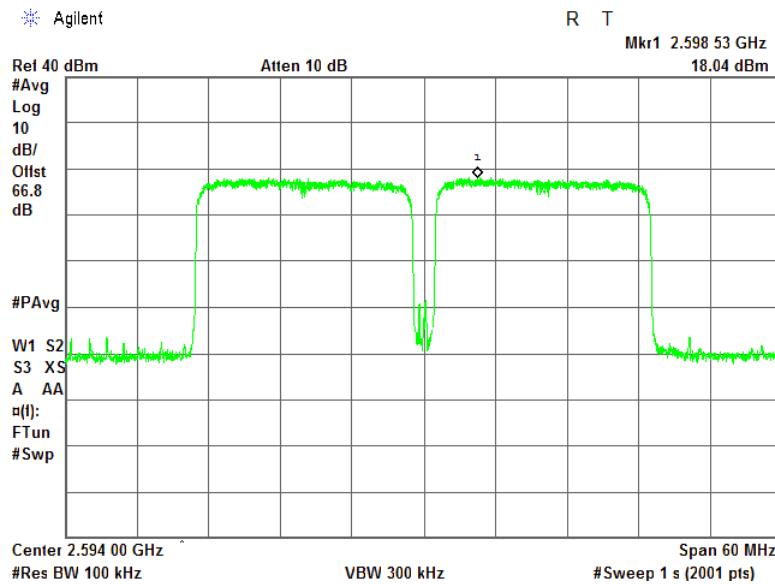
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %		Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		Power: 120 VAC	

Plot 7.4.1 Peak output power test results at low frequency, 40 MHz, QPSK RF # 1



Plot 7.4.2 Peak output power test results at mid frequency, 40 MHz, QPSK RF # 1

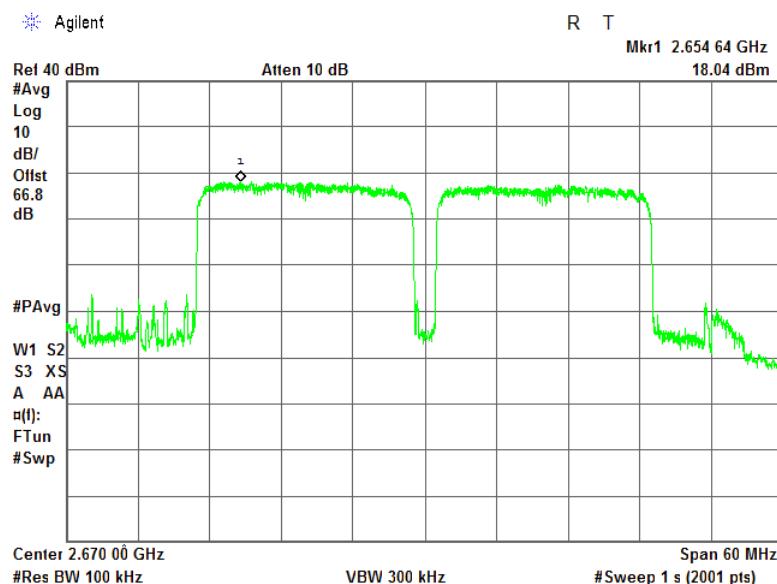




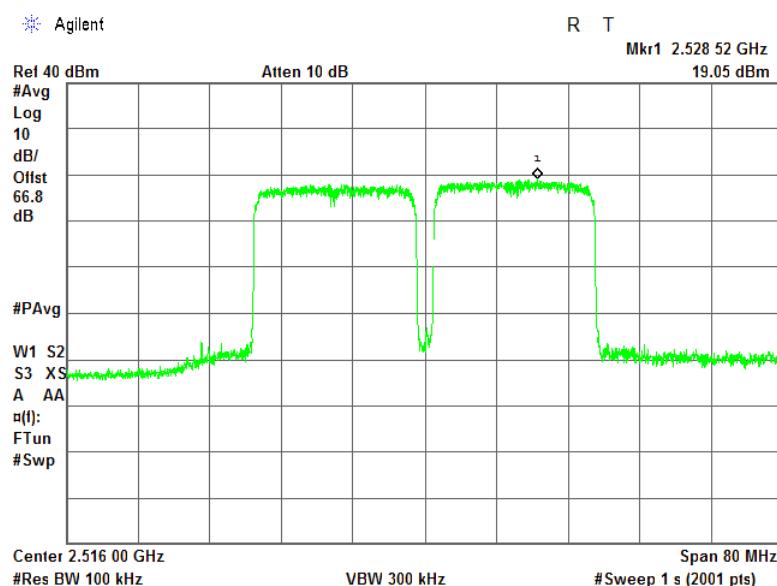
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %		Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		Power: 120 VAC	

Plot 7.4.3 Peak output power test results at high frequency, 40 MHz, QPSK RF # 1



Plot 7.4.4 Peak output power test results at low frequency, 40 MHz, 64QAM RF # 1

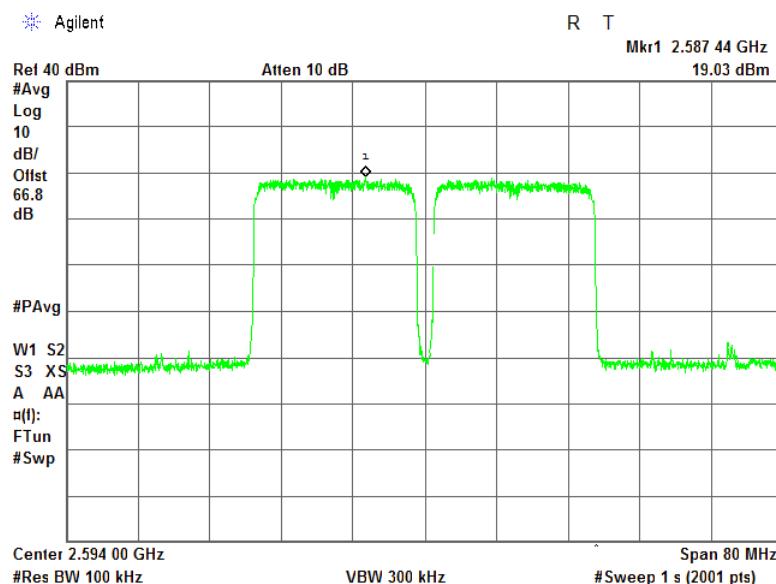




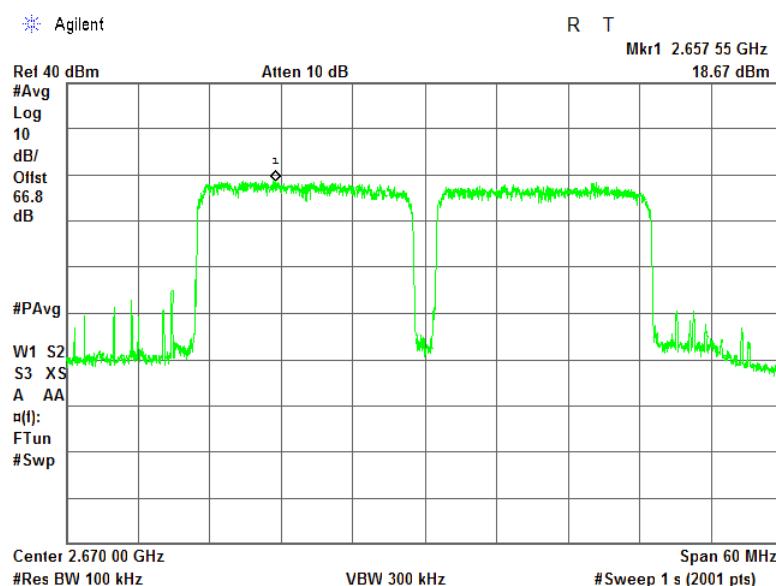
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Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %		Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		Power: 120 VAC	

Plot 7.4.5 Peak output power test results at mid frequency, 40 MHz, 64QAM RF # 1



Plot 7.4.6 Peak output power test results at high frequency, 40 MHz, 64QAM RF # 1

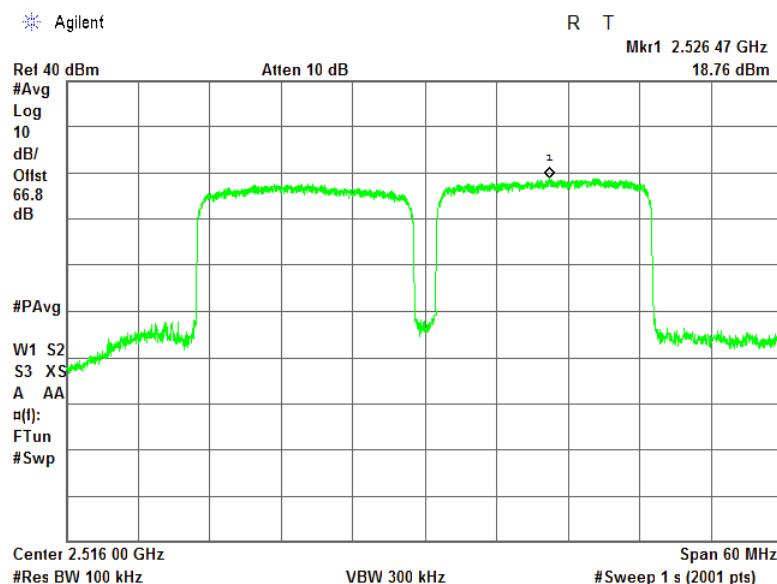




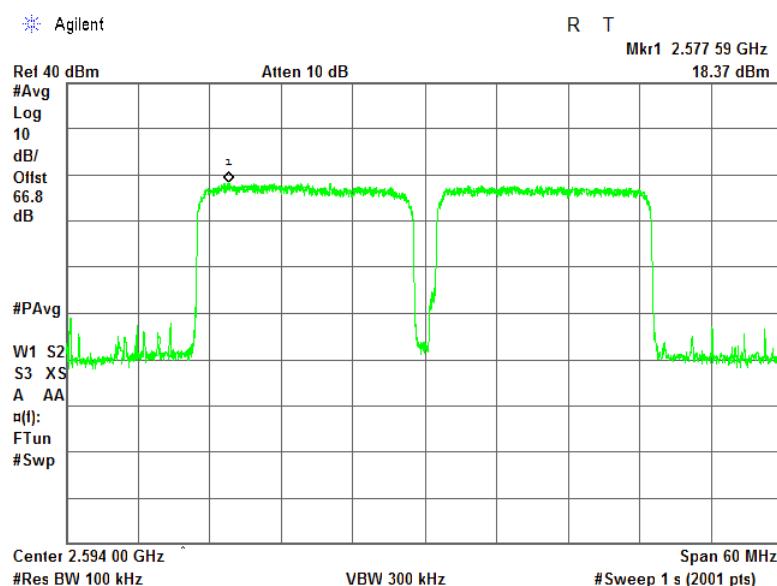
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %		Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		Power: 120 VAC	

Plot 7.4.7 Peak output power test results at low frequency, 40 MHz, QPSK RF # 2



Plot 7.4.8 Peak output power test results at mid frequency, 40 MHz, QPSK RF # 2

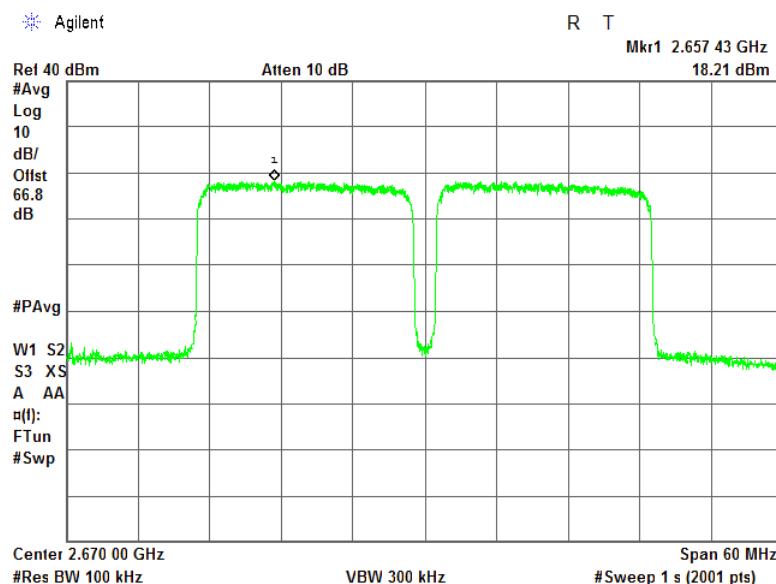




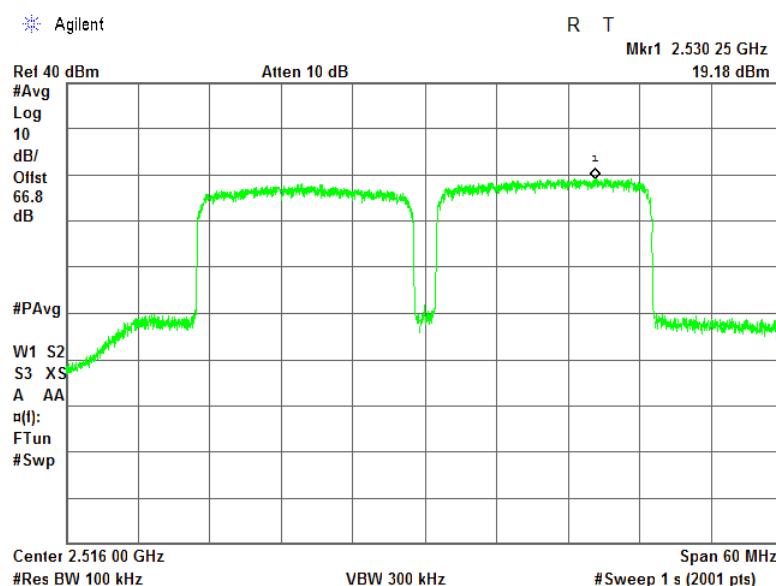
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %		Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		Power: 120 VAC	

Plot 7.4.9 Peak output power test results at high frequency, 40 MHz, QPSK RF # 2



Plot 7.4.10 Peak output power test results at low frequency, 40 MHz, 64QAM RF # 2

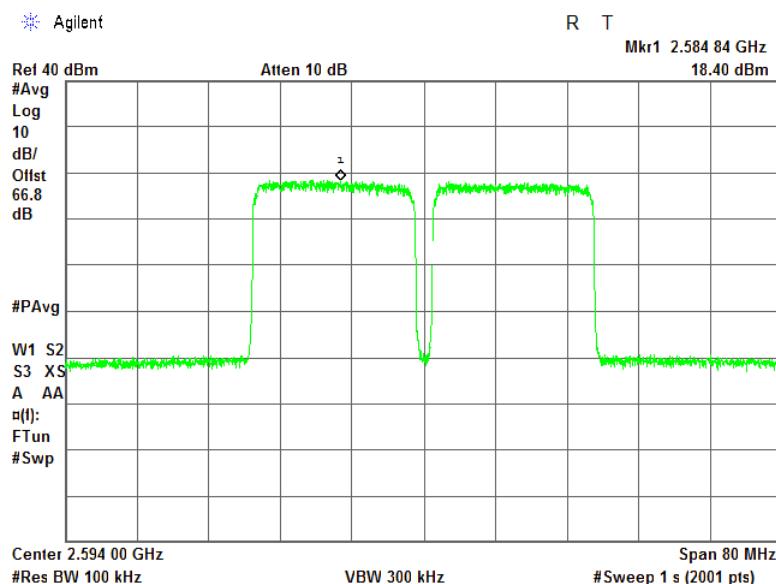




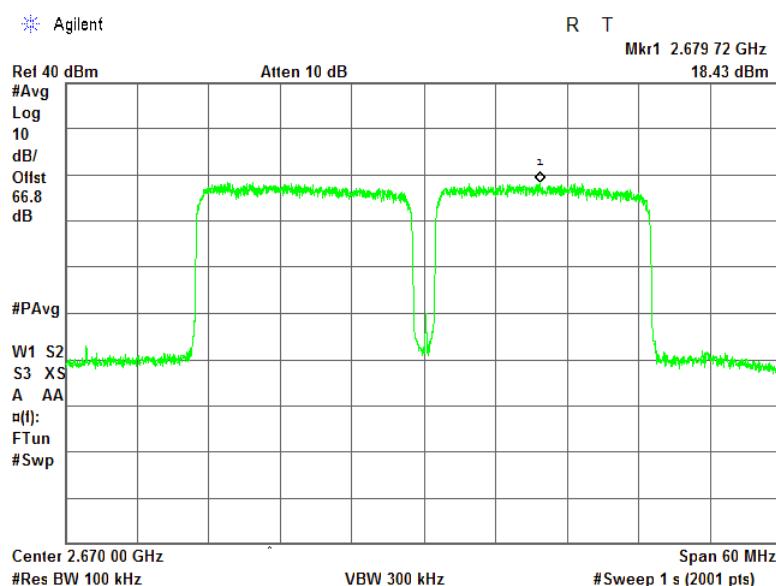
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %		Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		Power: 120 VAC	

Plot 7.4.11 Peak output power test results at mid frequency, 40 MHz, 64QAM RF # 2



Plot 7.4.12 Peak output power test results at high frequency, 40 MHz, 64QAM RF # 2





HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046, TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	21-Feb-17 - 22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

7.5 Maximum output power test in 2498.5-2565.5 MHz band

7.5.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Maximum output power limits

Transmitter type	Assigned frequency range, MHz	Maximum peak output power dBm
Main, booster and base stations	2496.0 – 2572.0	$63 + 10\log(X/Y) + 10\log(360/\text{beamwidth})$
		Maximum peak power density dBm/100 kHz
		$EIRP + 10\log(0.1/Y)$

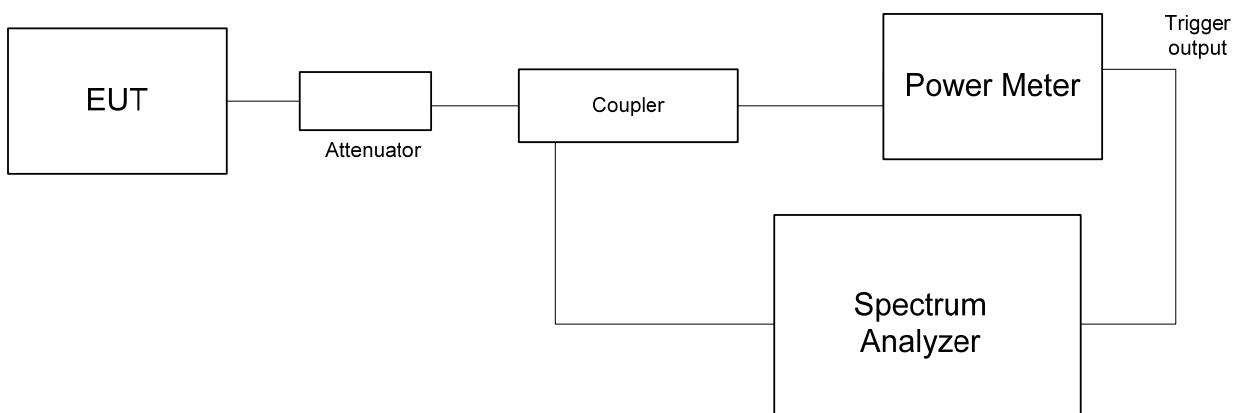
*- X is the actual channel width in MHz (occupied bandwidth), Y is either

- 1) 6 MHz if prior to transition or the station is in the MBS following transition or
- 2) 5.5 MHz if the station is in the LBS and UBS following transition, and
- 3) beamwidth is the total horizontal plane beam width of the individual transmitting antenna for the station or any sector measured at the half-power points.

7.5.2 Test procedure

- 7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.
- 7.5.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.
- 7.5.2.3 The average output power was measured with power meter as provided in Table 7.5.2.
- 7.5.2.4 The power spectral density was measured with spectrum analyzer as provided in Table 7.5.3.
- 7.5.2.5 The test results are provided in the tables below and associated plots.

Figure 7.5.1 Peak output power test setup





HERMON LABORATORIES

Test specification: Section 27.50, Peak output power								
Test procedure:		47 CFR, Section 2.1046, TIA/EIA-603-D, Section 2.2.1						
Test mode:		Compliance				Verdict:		PASS
Date(s):		21-Feb-17 - 22-Feb-17						
Temperature: 23.1 °C		Relative Humidity: 47 %		Air Pressure: 1016 hPa		Power: 120 VAC		
Remarks: Operation in low band 2498.5 – 2565.5 MHz								

Table 7.5.2 Peak output power test results

DETECTOR USED:

Average within Tx burst

DUTY CYCLE:

55%

EBW:

40 MHz

Carrier frequency, MHz	Power Meter reading RF#1, dBm	Power Meter reading RF#2, dBm	Total RF power**, dBm	Antenna gain, dBi	Total EIRP*, dBm	Limit***, dBm	Margin, dB	Verdict
QPSK								
2516.0	42.63	42.48	45.56	18.0	63.56	69.68	-6.12	Pass
2537.0	42.67	42.33	45.50	18.0	63.50	69.73	-6.23	Pass
2548.0	42.56	42.44	45.50	18.0	63.50	69.73	-6.23	Pass
64QAM								
2516.0	42.65	42.47	45.56	18.0	63.56	69.68	-6.12	Pass
2537.0	42.48	42.56	45.52	18.0	63.52	69.71	-6.19	Pass
2548.0	42.46	42.66	45.56	18.0	63.56	69.73	-6.16	Pass
QPSK								
2516.0	42.63	42.48	45.56	17.0	62.56	68.27	-5.71	Pass
2537.0	42.67	42.33	45.50	17.0	62.52	68.32	-5.80	Pass
2548.0	42.56	42.44	45.50	17.0	62.50	68.31	-5.81	Pass
64QAM								
2516.0	42.65	42.47	45.56	17.0	62.58	68.27	-5.69	Pass
2537.0	42.48	42.56	45.52	17.0	62.52	68.30	-5.78	Pass
2548.0	42.46	42.66	45.56	17.0	62.58	68.31	-5.74	Pass
QPSK								
2516.0	42.63	42.48	45.56	11.0	56.56	69.68	-13.12	Pass
2537.0	42.67	42.33	45.50	11.0	56.50	69.73	-13.23	Pass
2548.0	42.56	42.44	45.50	11.0	56.50	69.73	-13.23	Pass
64QAM								
2516.0	42.65	42.47	45.56	11.0	56.56	69.68	-13.12	Pass
2537.0	42.48	42.56	45.52	11.0	56.52	69.71	-13.19	Pass
2548.0	42.46	42.66	45.56	11.0	56.56	69.73	-13.16	Pass

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi

** - Total RF power , dBm = $10 \cdot \log[10^4(\text{Power RF#1} / 10) + 10^4(\text{Power RF#2} / 10)]$ *** - See Table 7.5.5. **Error! Reference source not found.****Reference numbers of test equipment used**

HL 2214	HL 3301	HL 3302					
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Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: Section 27.50, Peak output power							
Test procedure:		47 CFR, Section 2.1046, TIA/EIA-603-D, Section 2.2.1					
Test mode:		Compliance				Verdict:	
Date(s):		21-Feb-17 - 22-Feb-17		Verdict:		PASS	
Temperature: 23.1 °C		Relative Humidity: 47 %		Air Pressure: 1016 hPa		Power: 120 VAC	
Remarks: Operation in low band 2498.5 – 2565.5 MHz							

Table 7.5.3 Power spectral density test results

DETECTOR USED: Average gated
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 CHANNEL BANDWIDTH: 40 MHz
 DUTY CYCLE: 55%
 NUMBER OUTPUTS: N=2

Carrier frequency, MHz	SA reading*, RF #1 or RF#2 dBm/100kHz	Total PSD dBm/100kHz	Antenna gain, dBi	Total EIRP PSD**, dBm/100kHz	Limit***, dBm	Margin, dB	Verdict
QPSK							
2516.0	17.59	20.59	18.0	38.59	43.19	-4.60	Pass
2537.0	18.56	21.56	18.0	39.56	43.29	-3.73	Pass
2548.0	18.21	21.21	18.0	39.21	43.29	-4.08	Pass
64 QAM							
2516.0	18.73	21.73	18.0	39.73	43.20	-3.47	Pass
2537.0	18.72	21.72	18.0	39.72	43.28	-3.56	Pass
2548.0	18.57	21.57	18.0	39.57	43.29	-3.72	Pass
QPSK							
2516.0	17.59	20.59	17.0	37.59	41.78	-4.19	Pass
2537.0	18.56	21.56	17.0	38.56	41.88	-3.32	Pass
2548.0	18.21	21.21	17.0	38.21	41.88	-3.67	Pass
64 QAM							
2516.0	18.73	21.73	17.0	38.73	41.79	-3.06	Pass
2537.0	18.72	21.72	17.0	38.72	41.88	-3.16	Pass
2548.0	18.57	21.57	17.0	38.57	41.88	-3.31	Pass
QPSK							
2516.0	17.59	20.59	11.0	31.59	43.19	-11.60	Pass
2537.0	18.56	21.56	11.0	32.56	43.29	-10.73	Pass
2548.0	18.21	21.21	11.0	32.21	43.29	-11.08	Pass
64 QAM							
2516.0	18.73	21.73	11.0	32.73	43.20	-10.47	Pass
2537.0	18.72	21.72	11.0	32.72	43.28	-10.56	Pass
2548.0	18.57	21.57	11.0	32.57	43.29	-10.72	Pass

* SA reading including attenuation, cable loss and Duty Cycle correction factor

** Total EIRP PSD, dBm/100kHz = SA reading Max (dBm/100kHz,RF#1 or RF#2) + 10*log(N) dB + Antenna Gain, dBi

*** See Table 7.5.6.

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3818	HL 3901			
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Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure:	47 CFR, Section 2.1046, TIA/EIA-603-D, Section 2.2.1		
Test mode:	Compliance		Verdict: PASS
Date(s):	21-Feb-17 - 22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Table 7.5.4 Post- transition frequency channels assignment

Channel	OBW, MHz	Peak power limit, dBm	Power density limit, dBm/100kHz
40 MHz 4 Channels QPSK 46.4 Mbps			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	37.396	$63+10\log(\text{OBW}/44.5)+10\log(360/\text{beamwidth})$	EIRP+10log(0.1/22.5)
2537.0 MHz EBS A3+B1+B2+B3+C1+C2+C3+D1	37.407	$63+10\log(\text{OBW}/44.0)+10\log(360/\text{beamwidth})$	EIRP+10log(0.1/24.0)
2548.0 MHz EBS B2+B3+C1+C2+C3+D1+D2+D3	37.380	$63+10\log(\text{OBW}/44.0)+10\log(360/\text{beamwidth})$	EIRP+10log(0.1/22.0)
40 MHz 4 Channels 64QAM 190 Mbps			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	37.428	$63+10\log(\text{OBW}/44.5)+10\log(360/\text{beamwidth})$	EIRP+10log(0.1/22.5)
2537.0 MHz EBS A3+B1+B2+B3+C1+C2+C3+D1	37.271	$63+10\log(\text{OBW}/44.0)+10\log(360/\text{beamwidth})$	EIRP+10log(0.1/24.0)
2548.0 MHz EBS B2+B3+C1+C2+C3+D1+D2+D3	37.381	$63+10\log(\text{OBW}/44.0)+10\log(360/\text{beamwidth})$	EIRP+10log(0.1/22.0)

Table 7.5.5 EIRP limits

Channel	Channel BW, MHz	Peak power limit, dBm	
		17 dBi, 90° beamwidth	18 dBi, 65°beamwidth 11 dBi, 65°beamwidth
40 MHz Dual Channel QPSK			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	44.5	68.27	69.68
2537.0 MHz EBS A3+B1+B2+B3+C1+C2+C3+D1	44.0	68.32	69.73
2548.0 MHz EBS B2+B3+C1+C2+C3+D1+D2+D3	44.0	68.31	69.73
40 MHz Dual Channel 64 QAM			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	44.5	68.27	69.68
2537.0 MHz EBS A3+B1+B2+B3+C1+C2+C3+D1	44.0	68.31	69.71
2548.0 MHz EBS B2+B3+C1+C2+C3+D1+D2+D3	44.0	68.31	69.73



HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 21-Feb-17 - 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Table 7.5.6 Peak power density limits

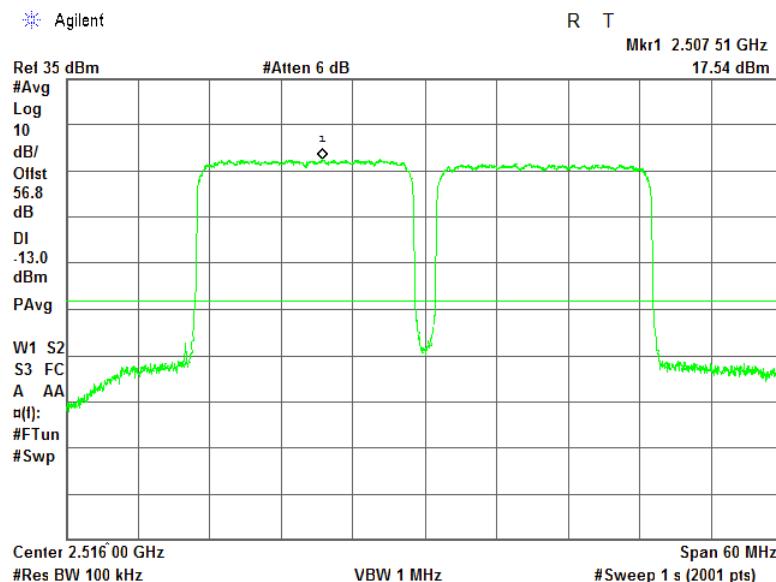
Channel	Channel BW, MHz	Peak power density, dBm/100kHz	
		17 dBi, 90° beamwidth	18 dBi, 65°beamwidth 11 dBi, 65°beamwidth
40 MHz Dual Channel QPSK			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	44.5	41.78	44.12
2537.0 MHz EBS A3+B1+B2+B3+C1+C2+C3+D1	44.0	41.88	43.29
2548.0 MHz EBS B2+B3+C1+C2+C3+D1+D2+D3	44.0	41.88	43.29
40 MHz Dual Channel 64 QAM			
2516.0 MHz BRS1+EBS A1+A2+A3+B1+B2+B3+C1	44.5	41.79	43.19
2537.0 MHz EBS A3+B1+B2+B3+C1+C2+C3+D1	44.0	41.87	43.28
2548.0 MHz EBS B2+B3+C1+C2+C3+D1+D2+D3	44.0	41.88	43.29



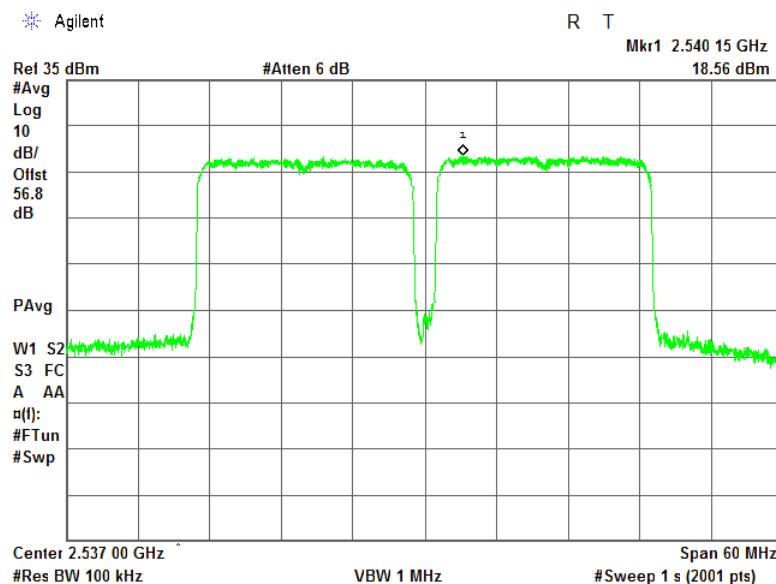
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 21-Feb-17 - 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.5.1 Peak power spectral density test results at low frequency, 40 MHz, QPSK RF#1



Plot 7.5.2 Peak power spectral density test results at mid frequency, 40 MHz, QPSK RF#1

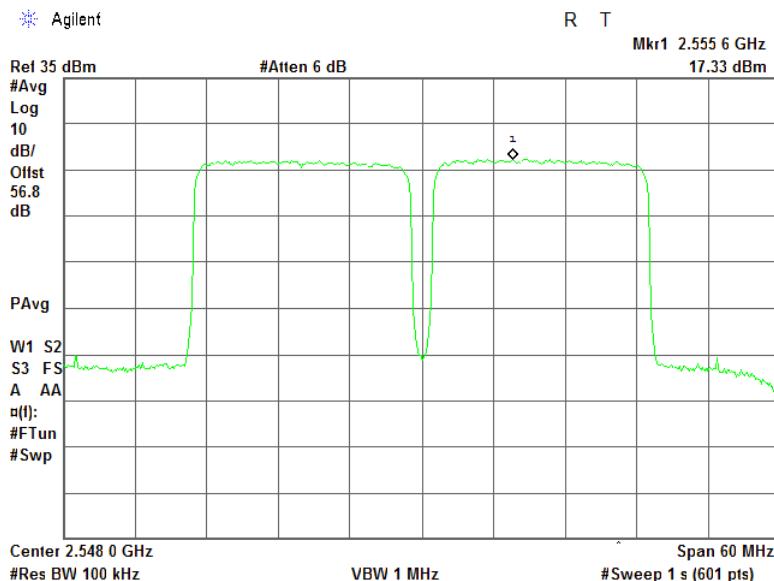




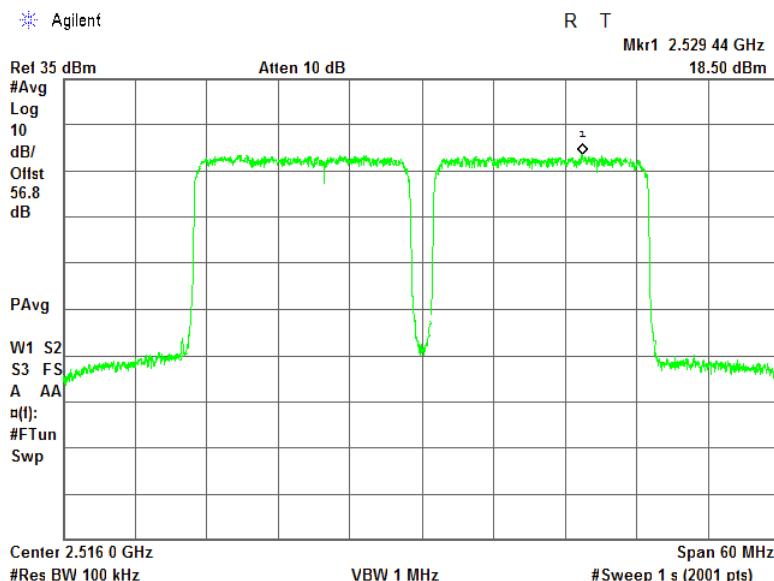
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	21-Feb-17 - 22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.5.3 Peak power spectral density test results at high frequency, 40 MHz, QPSK RF#1



Plot 7.5.4 Peak power spectral density test results at low frequency, 40 MHz, 64QAM RF#1

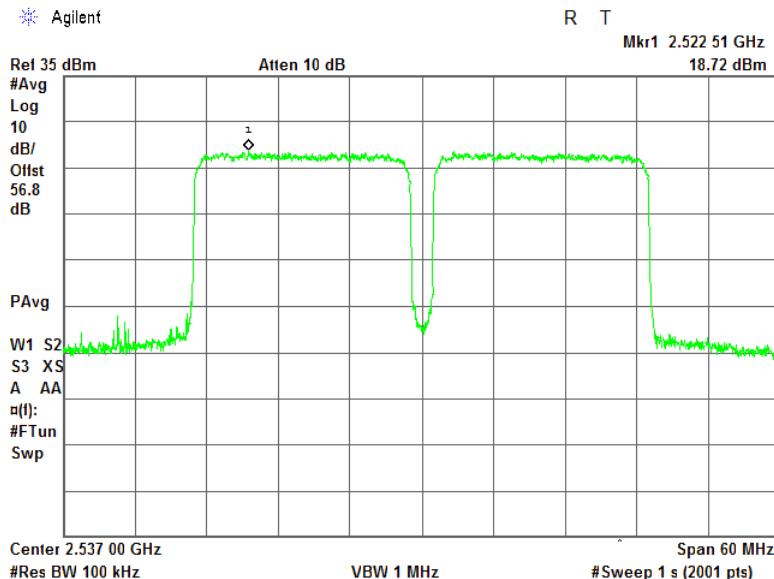




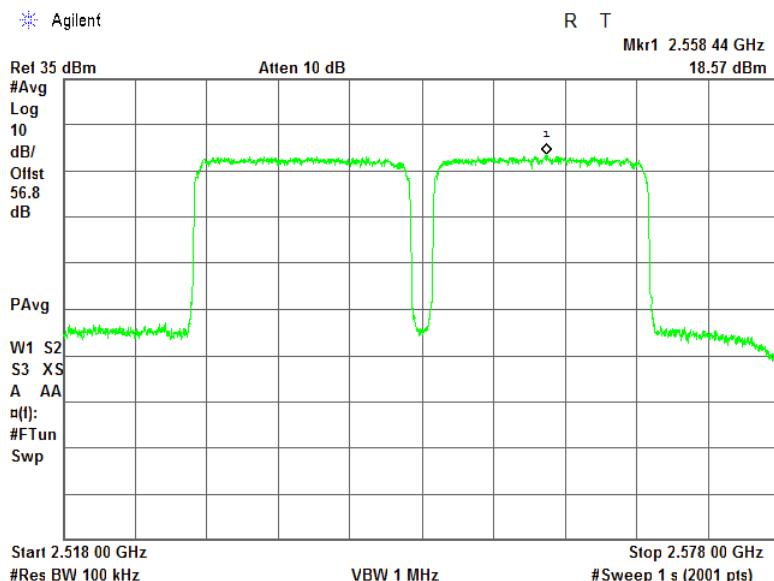
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 21-Feb-17 - 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.5.5 Peak power spectral density test results at mid frequency, 40 MHz, 64QAM RF#1



Plot 7.5.6 Peak power spectral density test results at high frequency, 40 MHz, 64QAM RF#1

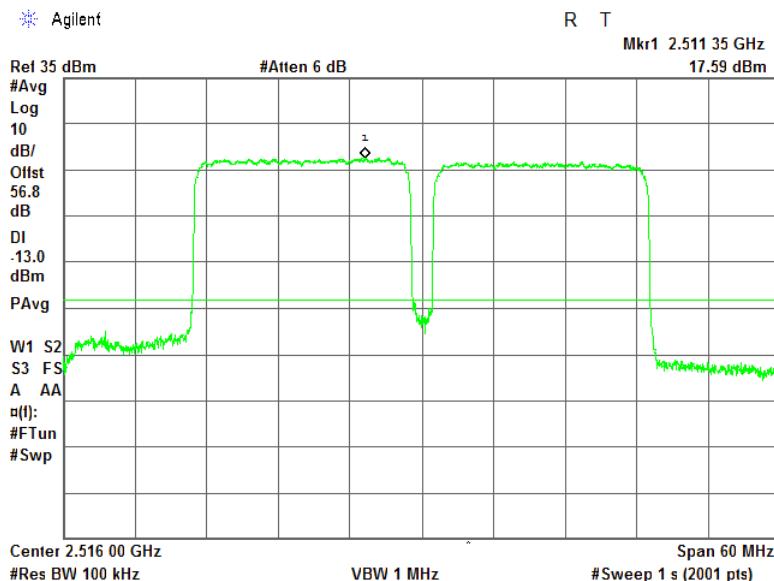




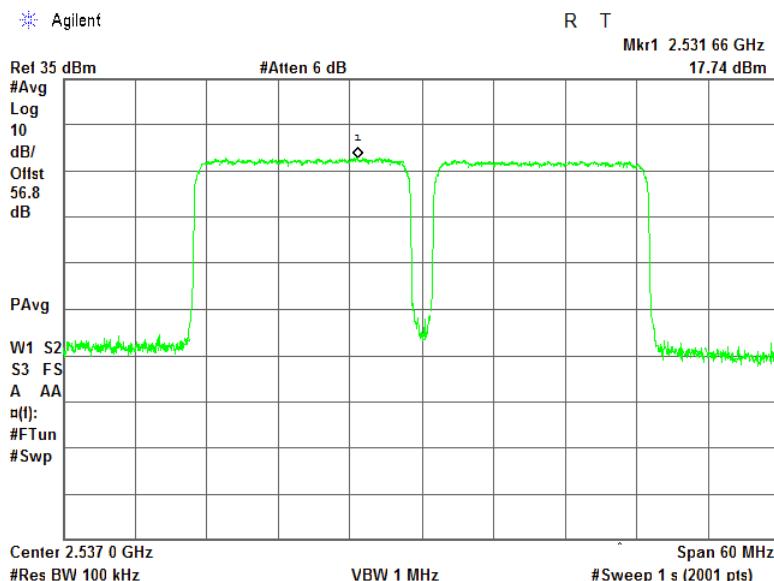
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	21-Feb-17 - 22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.5.7 Peak power spectral density test results at low frequency, 40 MHz, QPSK RF#2



Plot 7.5.8 Peak power spectral density test results at mid frequency, 40 MHz, QPSK RF#2





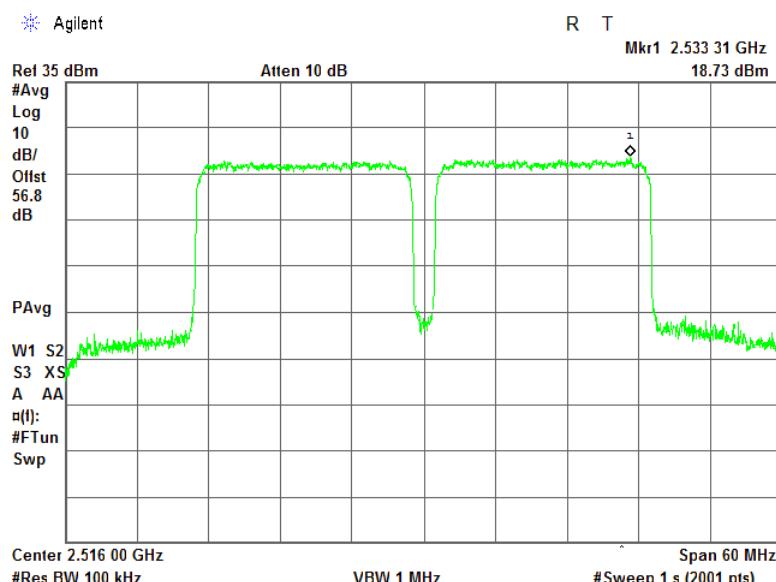
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	21-Feb-17 - 22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.5.9 Peak power spectral density test results at high frequency, 40 MHz, QPSK RF#2



Plot 7.5.10 Peak power spectral density test results at low frequency, 40 MHz, 64QAM RF#2

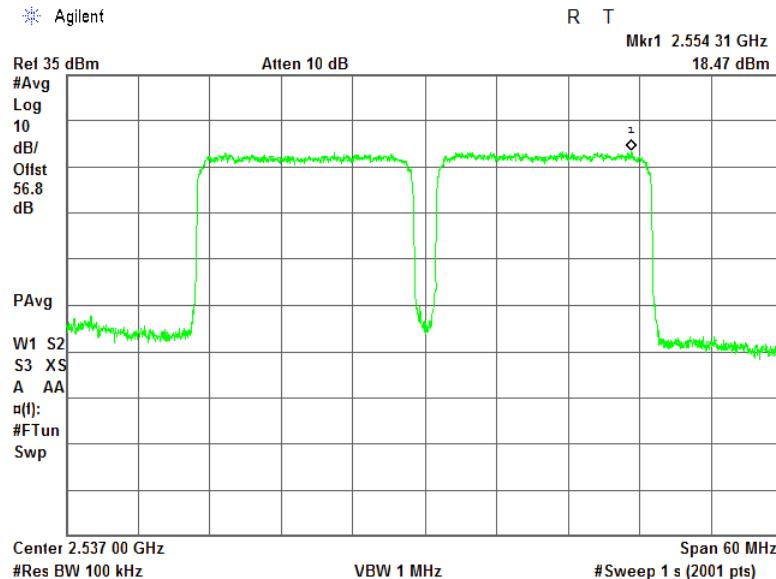




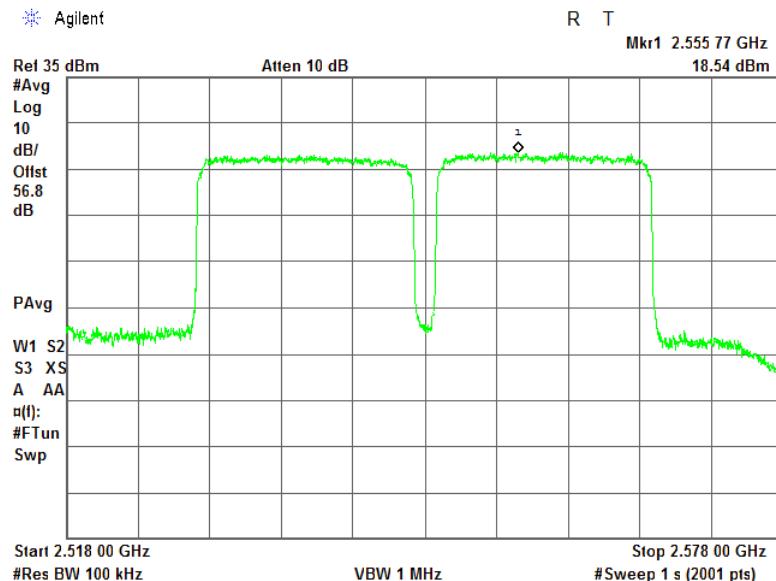
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	21-Feb-17 - 22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.5.11 Peak power spectral density test results at mid frequency, 40 MHz, 64QAM RF#2



Plot 7.5.12 Peak power spectral density test results at high frequency, 40 MHz, 64QAM RF#2





HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

7.6 Maximum output power test in 2620.5 – 2687.5 MHz band

7.6.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Maximum output power limits

Transmitter type	Assigned frequency range, MHz	Maximum peak output power dBm
Main, booster and base stations	2618.0 – 2690.0	$63 + 10\log(X/Y) + 10\log(360/\text{beamwidth})$
		Maximum peak power density dBm/100 kHz
		$EIRP + 10\log(0.1/Y)$

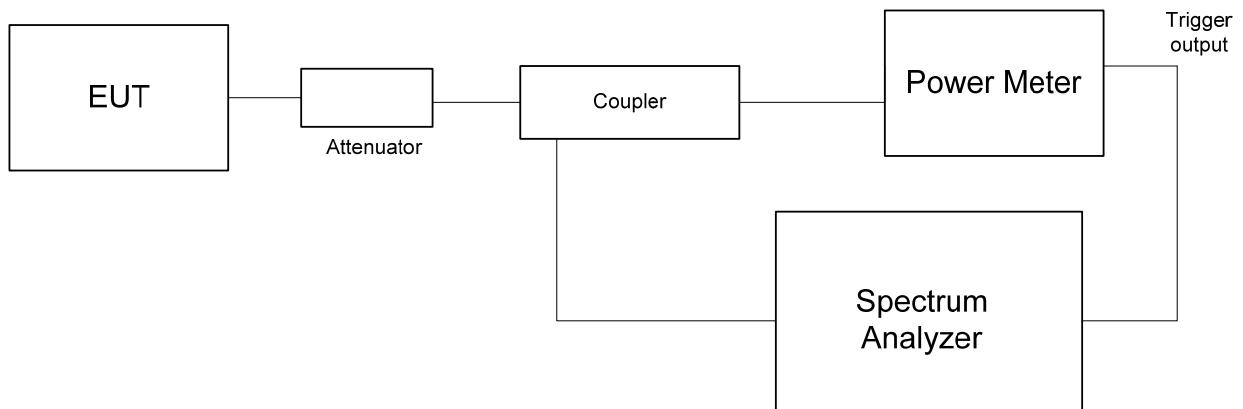
*- X is the actual channel width in MHz (occupied bandwidth), Y is either

- 1) 6 MHz if prior to transition or the station is in the MBS following transition or
- 2) 5.5 MHz if the station is in the LBS and UBS following transition, and
- 3) beamwidth is the total horizontal plane beam width of the individual transmitting antenna for the station or any sector measured at the half-power points.

7.6.2 Test procedure

- 7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and its proper operation was checked.
- 7.6.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.
- 7.6.2.3 The average output power was measured with power meter as provided in Table 7.6.2.
- 7.6.2.4 The power spectral density was measured with spectrum analyzer as provided in Table 7.6.3.
- 7.6.2.5 The test results are provided in the tables below and associated plots.

Figure 7.6.1 Peak output power test setup





HERMON LABORATORIES

Test specification: Section 27.50, Peak output power										
Test procedure:		47 CFR, Section 2.1046, TIA/EIA-603-D, Section 2.2.1								
Test mode:	Compliance				Verdict:		PASS			
Date(s):	22-Feb-17									
Temperature: 23.1 °C	Relative Humidity: 47 %		Air Pressure: 1016 hPa		Power: 120 VAC					
Remarks: Operation in high band 2620.5 – 2687.5 MHz										

Table 7.6.2 Peak output power test results

DETECTOR USED:

Average within Tx burst

DUTY CYCLE:

55%

EBW:

40 MHz

Carrier frequency, MHz	Power Meter reading RF#1, dBm	Power Meter reading RF#2, dBm	Total RF power**, dBm	Antenna gain, dBi	Total EIRP*, dBm	Limit***, dBm	Margin, dB	Verdict
QPSK								
2638.0	42.73	42.89	45.82	18.0	63.82	69.67	-5.85	Pass
2653.5	42.57	42.49	45.54	18.0	63.56	69.73	-6.18	Pass
2670.0	42.62	42.36	45.50	18.0	63.50	69.74	-6.23	Pass
64QAM								
2638.0	42.59	42.83	45.72	18.0	63.74	69.67	-5.93	Pass
2653.5	42.87	42.65	45.77	18.0	63.77	69.72	-5.95	Pass
2670.0	42.69	42.48	45.60	18.0	63.61	69.73	-6.12	Pass
QPSK								
2638.0	42.73	42.89	45.82	17.0	62.82	68.26	-5.44	Pass
2653.5	42.57	42.49	45.54	17.0	62.54	68.32	-5.78	Pass
2670.0	42.62	42.36	45.50	17.0	62.50	68.32	-5.82	Pass
64QAM								
2638.0	42.59	42.83	45.72	17.0	62.72	68.26	-5.53	Pass
2653.5	42.87	42.65	45.77	17.0	62.77	68.31	-5.54	Pass
2670.0	42.69	42.48	45.60	17.0	62.60	68.31	-5.72	Pass
QPSK								
2638.0	42.73	42.89	45.82	11.0	56.82	69.67	-12.85	Pass
2653.5	42.57	42.49	45.54	11.0	56.56	69.73	-13.18	Pass
2670.0	42.62	42.36	45.50	11.0	56.50	69.74	-13.23	Pass
64QAM								
2638.0	42.59	42.83	45.72	11.0	56.74	69.67	-12.93	Pass
2653.5	42.87	42.65	45.77	11.0	56.77	69.72	-12.95	Pass
2670.0	42.69	42.48	45.60	11.0	56.61	69.73	-13.12	Pass

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi

** - Total RF power , dBm = $10^{\log(10^{Power\ RF\#1/10} + 10^{Power\ RF\#2/10}))}$

*** - See Table 7.6.5.

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302					
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Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: Section 27.50, Peak output power							
Test procedure:		47 CFR, Section 2.1046, TIA/EIA-603-D, Section 2.2.1					
Test mode: Compliance						Verdict: PASS	
Date(s): 22-Feb-17							
Temperature: 23.1 °C		Relative Humidity: 47 %		Air Pressure: 1016 hPa		Power: 120 VAC	
Remarks: Operation in high band 2620.5 – 2687.5 MHz							

Table 7.6.3 Power spectral density test results

DETECTOR USED: Average gated
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 CHANNEL BANDWIDTH: 40 MHz
 DUTY CYCLE: 55%
 NUMBER OUTPUTS: N=2

Carrier frequency, MHz	SA reading*, RF #1 or RF#2 dBm/100kHz	Total PSD dBm/100kHz	Antenna gain, dBi	Total EIRP PSD**, dBm/100kHz	Limit***, dBm	Margin, dB	Verdict
QPSK							
2638.0	18.61	21.61	18.0	39.61	43.19	-3.58	Pass
2653.5	18.75	21.75	18.0	39.75	43.30	-3.55	Pass
2670.0	18.76	21.76	18.0	39.76	43.30	-3.54	Pass
64 QAM							
2638.0	18.73	21.73	18.0	39.73	43.19	-3.46	Pass
2653.5	18.88	21.88	18.0	39.88	43.29	-3.41	Pass
2670.0	18.99	21.99	18.0	39.99	43.29	-3.30	Pass
QPSK							
2638.0	18.61	21.61	17.0	38.61	41.78	-3.17	Pass
2653.5	18.75	21.75	17.0	38.77	41.89	-3.12	Pass
2670.0	18.76	21.76	17.0	38.76	41.89	-3.13	Pass
64 QAM							
2638.0	18.73	21.73	17.0	38.75	41.77	-3.03	Pass
2653.5	18.88	21.88	17.0	38.88	41.88	-2.99	Pass
2670.0	18.99	21.99	17.0	39.01	41.88	-2.87	Pass
QPSK							
2638.0	18.61	21.61	11.0	32.61	43.19	-10.58	Pass
2653.5	18.75	21.75	11.0	32.75	43.30	-10.55	Pass
2670.0	18.76	21.76	11.0	32.76	43.30	-10.54	Pass
64 QAM							
2638.0	18.73	21.73	11.0	32.73	43.19	-10.46	Pass
2653.5	18.88	21.88	11.0	32.88	43.29	-10.41	Pass
2670.0	18.99	21.99	11.0	32.99	43.29	-10.30	Pass

* SA reading including attenuation, cable loss and Duty Cycle correction factor

** Total EIRP PSD, dBm/100kHz = SA reading Max (dBm/100kHz,RF#1 or RF#2) + 3 dB + Antenna Gain, dBi

*** See Table 7.6.6.

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3818	HL 3901			
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Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure:	47 CFR, Section 2.1046, TIA/EIA-603-D, Section 2.2.1		
Test mode:	Compliance		Verdict: PASS
Date(s):	22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %		Air Pressure: 1016 hPa
Remarks: Operation in high band 2620.5 – 2687.5 MHz		Power: 120 VAC	

Table 7.6.4 Post - transition frequency channels assignment

Channel	OBW, MHz	Peak power limit, dBm	Power density limit, dBm/100kHz
40 MHz 4 Channels QPSK 46.4 Mbps			
2638.0 MHz BRS Ch2A+BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1	37.354	63+10log(OBW/44.5)+ 10log(360/beamwidth)	EIRP+10log(0.1/22.5)
2653.5 MHz BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1+H2+H3	37.453	63+10log(OBW/44.0)+ 10log(360/beamwidth)	EIRP+10log(0.1/24.0)
2670 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	37.466	63+10log(OBW/44.0)+ 10log(360/beamwidth)	EIRP+10log(0.1/22.0)
40 MHz 4 Channels 64QAM 190 Mbps			
2638.0 MHz BRS Ch2A+BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1	37.315	63+10log(OBW/44.5)+ 10log(360/beamwidth)	EIRP+10log(0.1/22.5)
2653.5 MHz BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1+H2+H3	37.356	63+10log(OBW/44.0)+ 10log(360/beamwidth)	EIRP+10log(0.1/24.0)
2670 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	37.394	63+10log(OBW/44.0)+ 10log(360/beamwidth)	EIRP+10log(0.1/22.0)

Table 7.6.5 EIRP limits

Channel	Channel BW, MHz	Peak power limit, dBm	
		17 dBi, 90° beamwidth	18 dBi, 65°beamwidth 11 dBi, 65°beamwidth
40 MHz Dual Channel QPSK			
2638.0 MHz BRS Ch2A+BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1	44.5	68.26	69.67
2653.5 MHz BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1+H2+H3	44	68.32	69.73
2670 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	44	68.32	69.74
40 MHz Dual Channel 64 QAM			
2638.0 MHz BRS Ch2A+BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1	44.5	68.26	69.67
2653.5 MHz BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1+H2+H3	44	68.31	69.72
2670 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	44	68.31	69.73



HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %		Air Pressure: 1016 hPa
Remarks: Operation in high band 2620.5 – 2687.5 MHz		Power: 120 VAC	

Table 7.6.6 Peak power spectral density limits

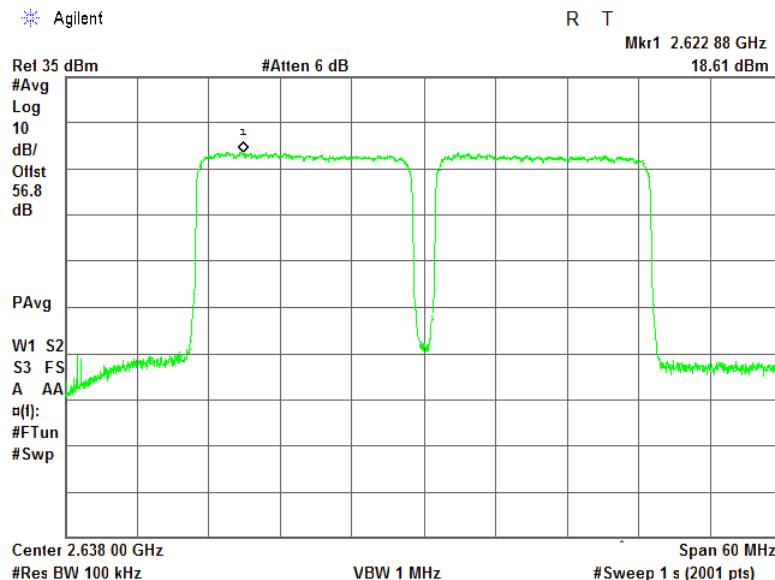
Channel	Channel BW, MHz	Peak power density, dBm/100kHz	
		17 dBi, 90° beamwidth	18 dBi, 65°beamwidth 11 dBi, 65°beamwidth
40 MHz Dual Channel QPSK			
2638.0 MHz BRS Ch2A+BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1	44.5	41.78	43.19
2653.5 MHz BRS/EBS E2+E3+F1+F2+F3+BRS H1+H2+H3	44	41.89	43.30
2670 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	44	41.89	43.30
40 MHz Dual Channel 64 QAM			
2638.0 MHz BRS Ch2A+BRS/EBS E1+E2+E3+F1+F2+F3+BRS H1	44.5	41.77	43.19
2653.5 MHz BRS/EBS E2+E3+F1+F2+F3+BRS H1+H2+H3	44	41.88	43.29
2670 MHz BRS/EBS F2+F3+BRS H1+H2+H3+EBS G1+G2+G3	44	41.88	43.29



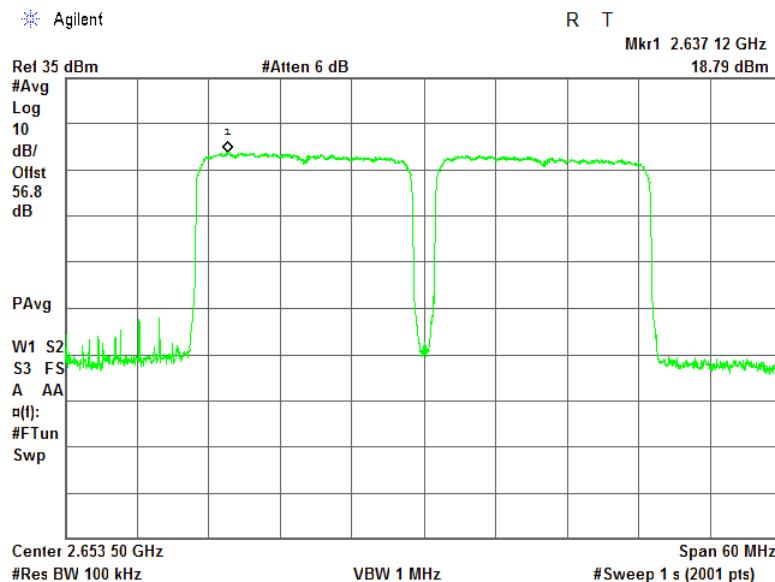
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.6.1 Peak power spectral density test results at low frequency, 40 MHz, QPSK RF#1



Plot 7.6.2 Peak power spectral density test results at mid frequency, 40 MHz, QPSK RF#1

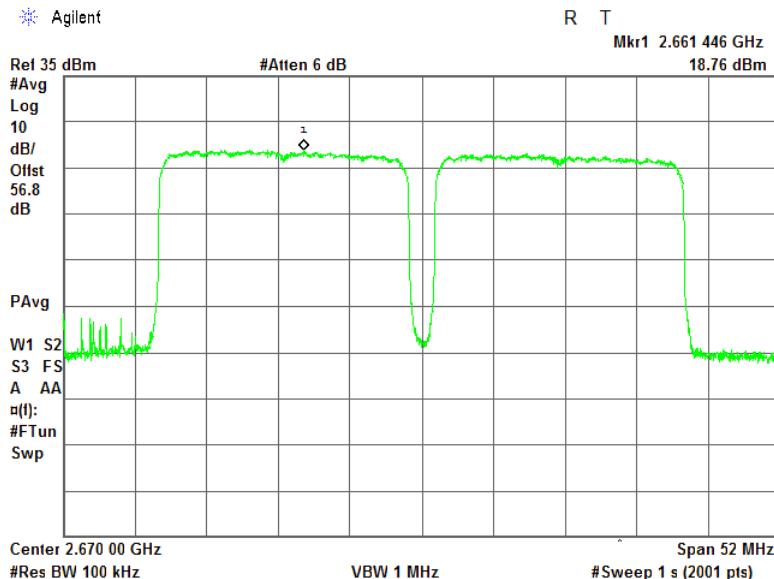




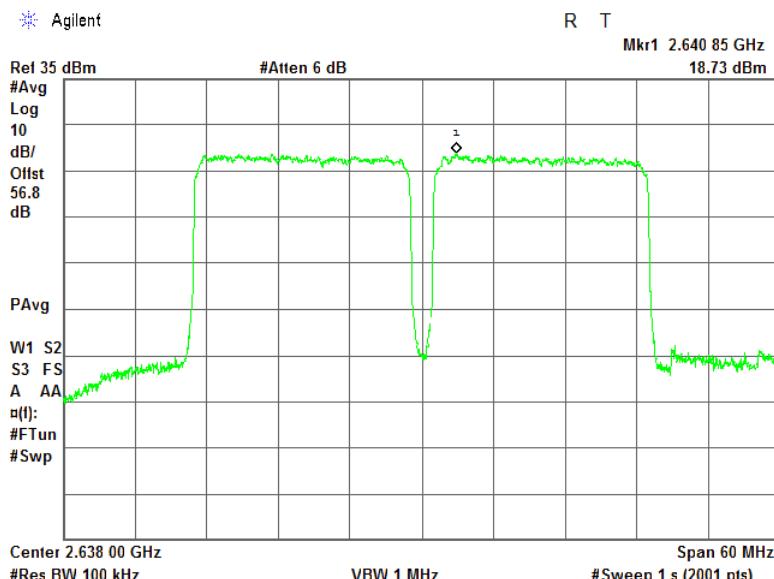
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.6.3 Peak power spectral density test results at high frequency, 40 MHz, QPSK RF#1



Plot 7.6.4 Peak power spectral density test results at low frequency, 40 MHz, 64QAM RF#1

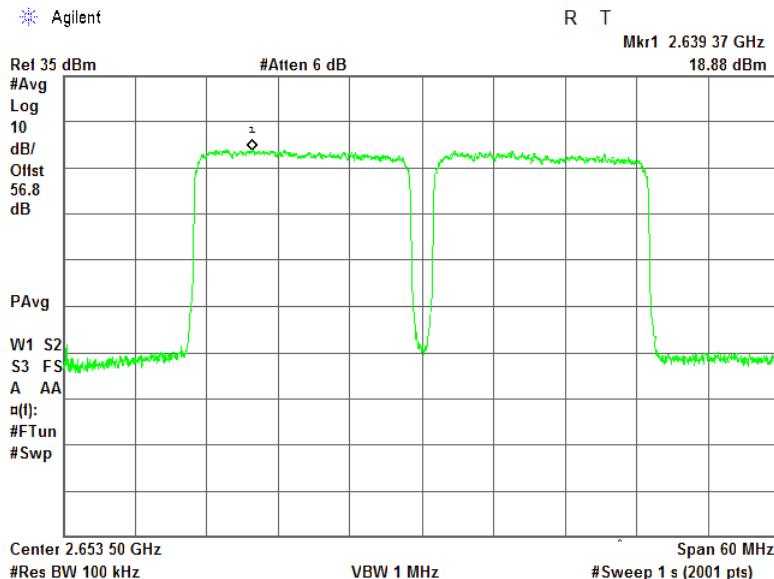




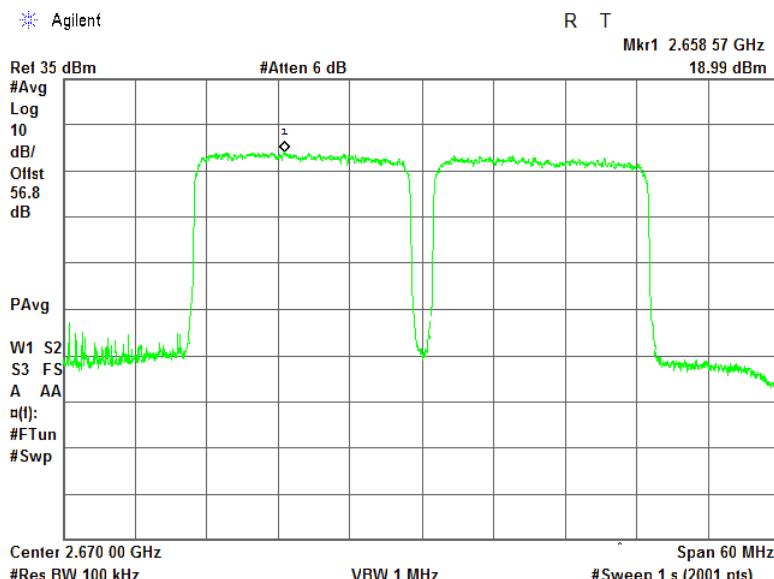
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.6.5 Peak power spectral density test results at mid frequency, 40 MHz, 64QAM RF#1



Plot 7.6.6 Peak power spectral density test results at high frequency, 40 MHz, 64QAM RF#1

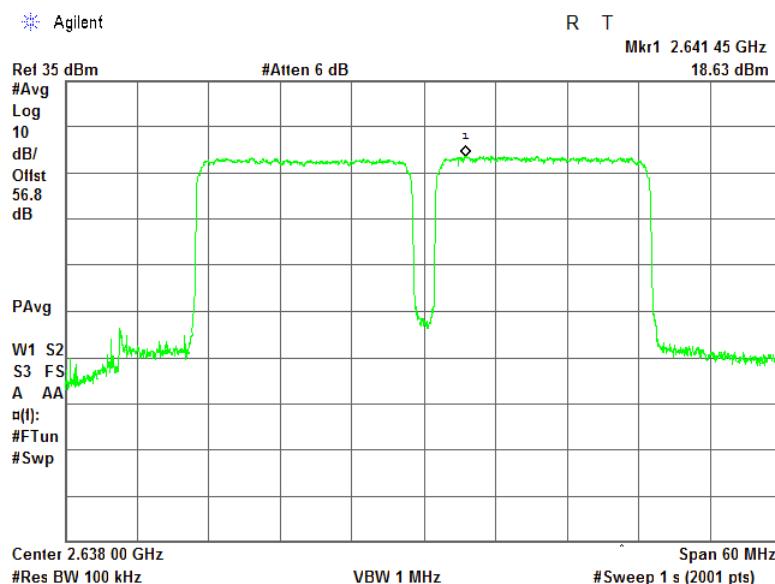




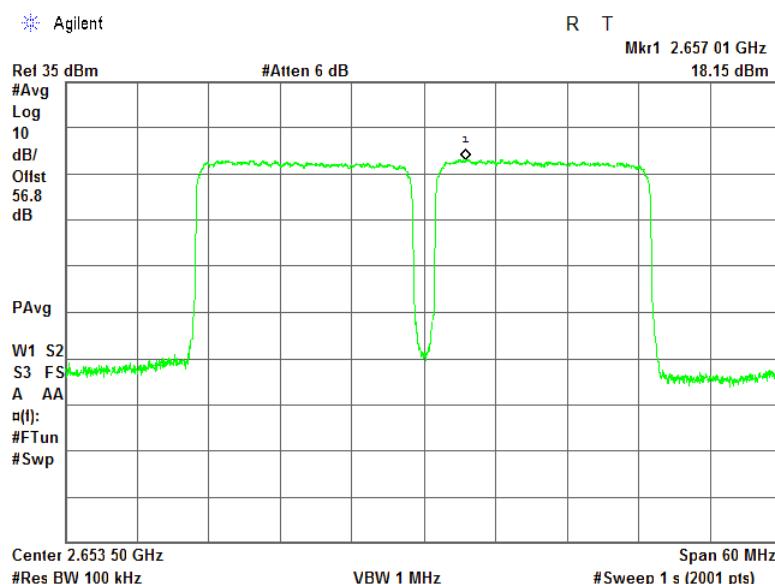
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance			Verdict: PASS
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.6.7 Peak power spectral density test results at low frequency, 40 MHz, QPSK RF#2



Plot 7.6.8 Peak power spectral density test results at mid frequency, 40 MHz, QPSK RF#2

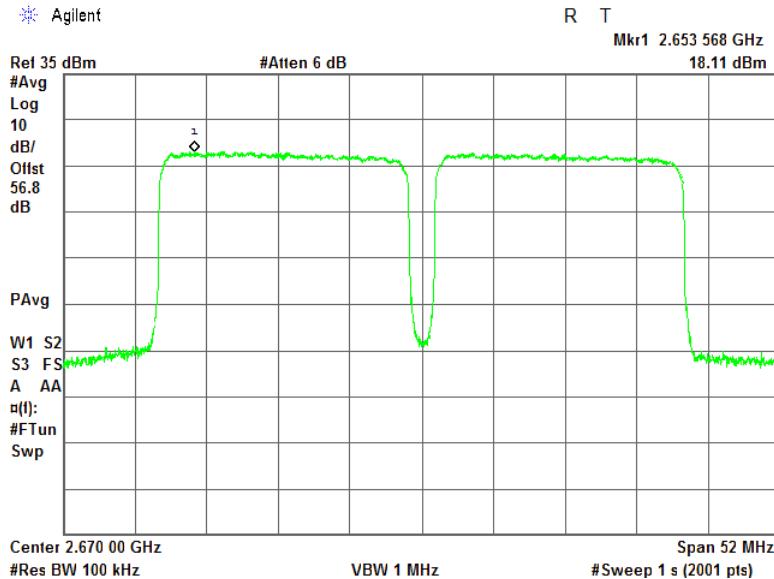




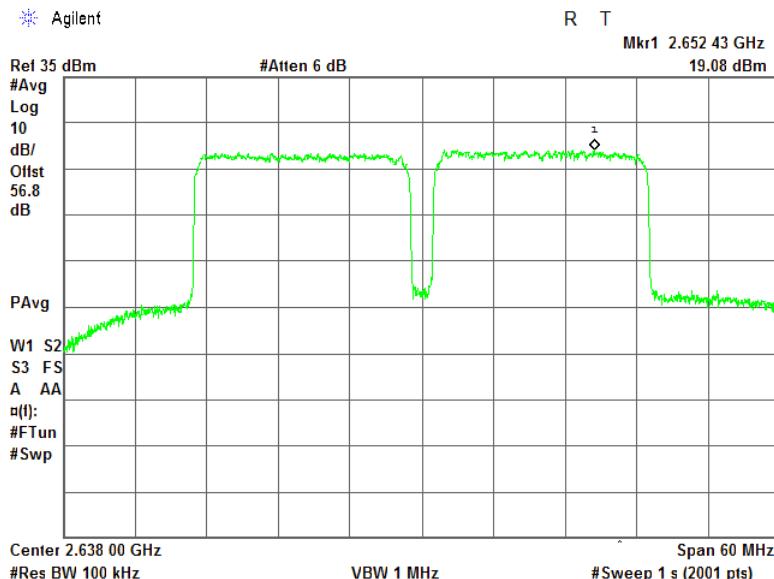
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.6.9 Peak power spectral density test results at high frequency, 40 MHz, QPSK RF#2



Plot 7.6.10 Peak power spectral density test results at low frequency, 40 MHz, 64QAM RF#2

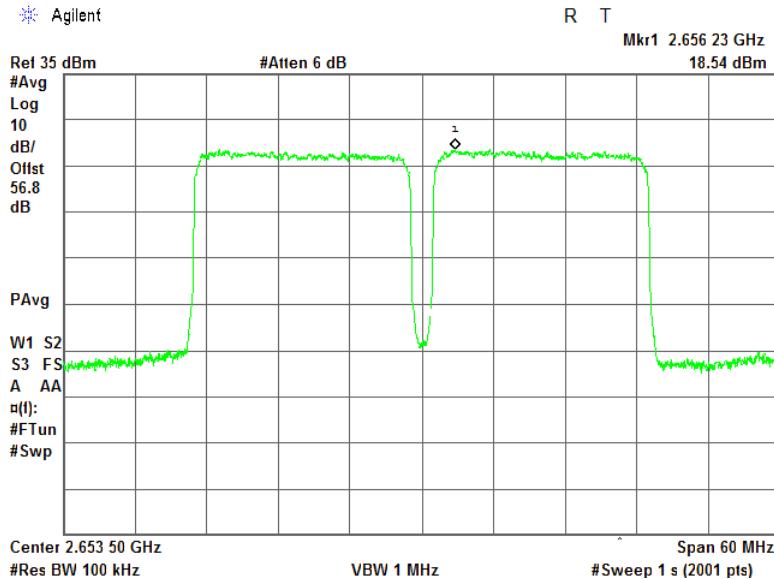




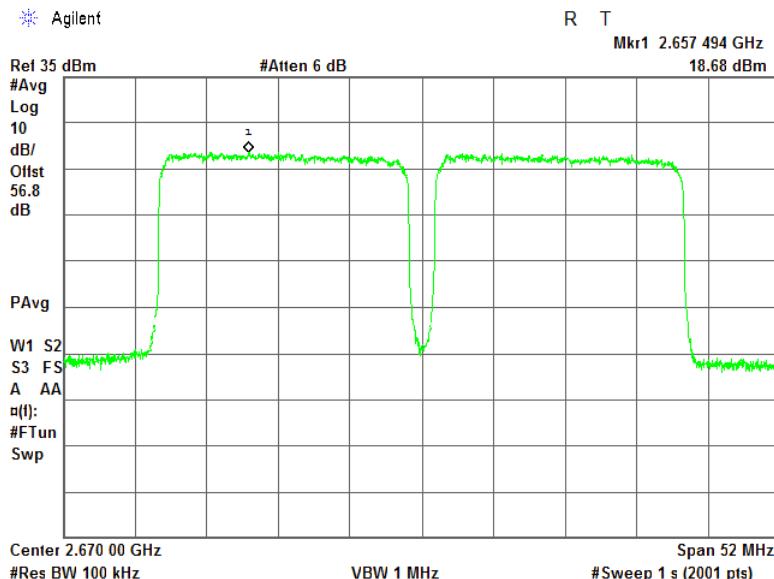
HERMON LABORATORIES

Test specification: Section 27.50, Peak output power			
Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date(s):	22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.6.11 Peak power spectral density test results at mid frequency, 40 MHz, 64QAM RF#2



Plot 7.6.12 Peak power spectral density test results at high frequency, 40 MHz, 64QAM RF#2





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance		Verdict: PASS	
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C		Relative Humidity: 48 %	Air Pressure: 1019 hPa
Power: 120 VAC			
Remarks: Operation in full band 2498.5-2687.5 MHz			

7.7 Band edge emissions at RF connector test in 2498.5-2687.5 MHz band

7.7.1 General

This test was performed to measure spurious emissions at the channel edge at the RF antenna connector. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Spurious emission limits at band edges

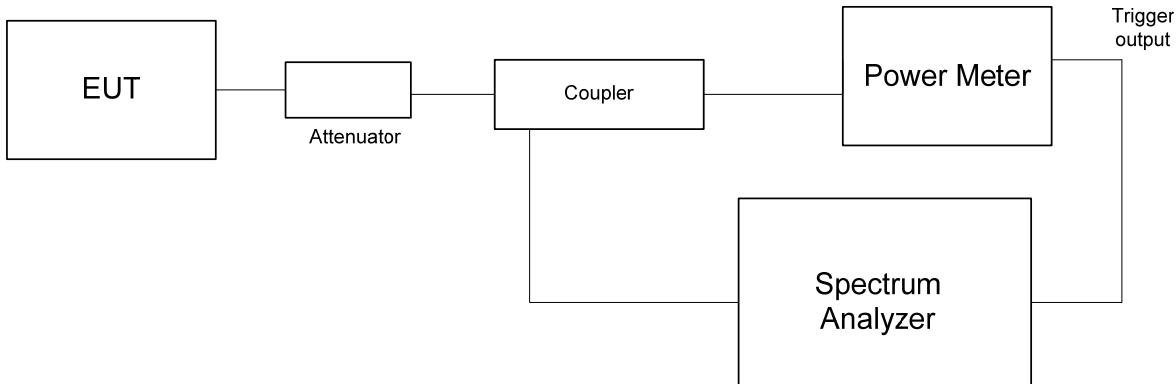
Channel	Frequency range	Attenuation below carrier, dBc	Limit, dBm
Channel bandwidth 40 MHz			
2516.0	2496.0 – 2536.0	43+ 10*Log (P*)	-13.0
2594.0	2572.0 – 2614.0	43+ 10*Log (P*)	-13.0
2670.0	2646.0 – 2690.0	43+ 10*Log (P*)	-13.0

* - P is transmitter output power in Watts

7.7.2 Test procedure

- 7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and its proper operation was checked.
- 7.7.2.2 The spurious emission was measured with spectrum analyzer as provided in Table 7.7.2 to Table 7.7.3 and the associated plots.

Figure 7.7.1 Spurious emission test setup for single output





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions							
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13						
Test mode:	Compliance				Verdict:	PASS	
Date(s):	20-Feb-17 - 21-Feb-17						
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa			Power: 120 VAC		
Remarks: Operation in full band 2498.5-2687.5 MHz							

Table 7.7.2 Spurious emission at the low band edge test results

DETECTOR USED:	Average ≥ Resolution bandwidth						
VIDEO BANDWIDTH:	40 MHz						
EBW:	N=2						
NUMBER OF OUTPUTS:							
Frequency MHz	Frequency offset, ± MHz	Low band edge, dBm	RBW, kHz	Integration BW, kHz	Total low band edge*, dBm	Limit, dBm	Verdict
QPSK							
2516.0	20.0	-17.51	300	1000	-14.51	-13.0	Pass
	21.5	-18.36	300	1000	-15.36	-13.0	
2594.0	22.5	-16.96	300	1000	-13.96	-13.0	Pass
	23.5	-16.97	300	1000	-13.97	-13.0	
2670.0	24.5	-18.55	300	1000	-15.55	-13.0	Pass
	25.5	-19.23	300	1000	-16.23	-13.0	
64QAM							
2516.0	20.0	-16.40	390	NA	-13.40	-13.0	Pass
	21.5	-16.54	300	1000	-13.54	-13.0	
2594.0	22.5	-18.38	300	1000	-15.38	-13.0	Pass
	23.5	-18.70	300	1000	-15.70	-13.0	
2670.0	24.5	-18.99	390	NA	-15.99	-13.0	Pass
	25.5	-19.67	300	1000	-16.67	-13.0	

* - Total low band edge = Low Band Edge + 10log(N)

Table 7.7.3 Spurious emission at the high band edge test results

DETECTOR USED:	Average ≥ Resolution bandwidth						
VIDEO BANDWIDTH:	40MHz						
EBW:	N=2						
NUMBER OF OUTPUTS:							
Frequency MHz	Frequency offset, ± MHz	High band edge, dBm	RBW, kHz	Integration BW, kHz	Total high band edge*, dBm	Limit, dBm	Verdict
QPSK							
2516.0	20.5	-18.13	300	1000	-15.13	-13.0	Pass
	21.5	-18.48	300	1000	-15.48	-13.0	
2594.0	20.5	-19.29	300	1000	-16.29	-13.0	Pass
	21.5	-19.78	300	1000	-16.78	-13.0	
2670.0	20.5	-18.51	300	1000	-15.51	-13.0	Pass
	21.5	-18.69	300	1000	-15.69	-13.0	
64QAM							
2516.0	20.5	-16.47	300	1000	-13.47	-13.0	Pass
	21.5	-16.41	300	1000	-13.41	-13.0	
2594.0	20.5	-19.18	300	1000	-16.18	-13.0	Pass
	21.5	-19.37	300	1000	-16.37	-13.0	
2670.0	20.5	-19.00	390	NA	-16.00	-13.0	Pass
	21.5	-18.85	300	1000	-15.85	-13.0	

* - Total high band edge = High Band Edge + 10log(N)

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3818	HL 4575			
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Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz			

Plot 7.7.1 Spurious emission at band edges test results at low carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

MODULATION:

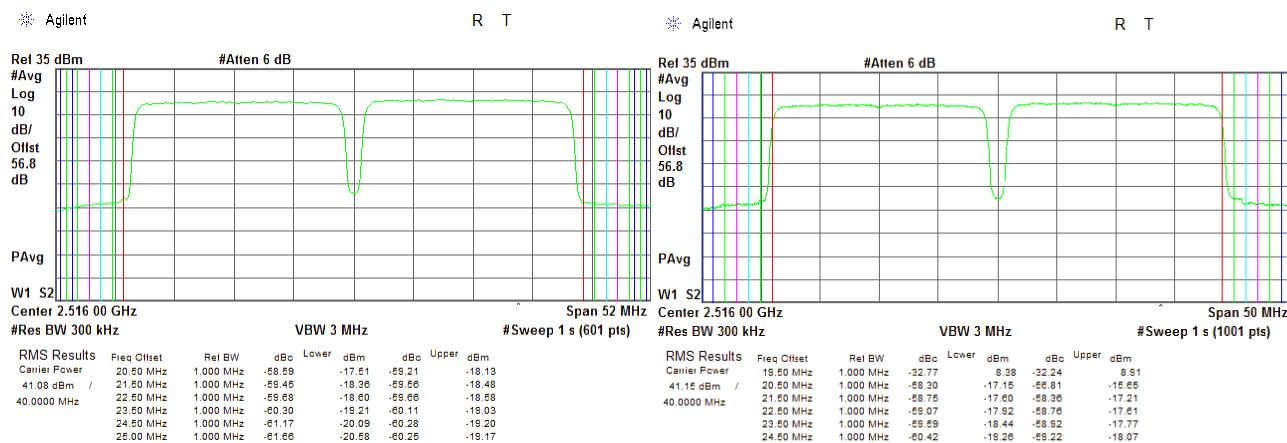
QPSK

MODULATING SIGNAL:

PRBS

BIT RATE:

46.8 Mbps





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions				
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13				
Test mode: Compliance			Verdict: PASS	
Date(s): 20-Feb-17 - 21-Feb-17				
Temperature: 23.2 °C		Relative Humidity: 48 %	Air Pressure: 1019 hPa	
Remarks: Operation in full band 2498.5-2687.5 MHz				

Plot 7.7.2 Spurious emission at band edges test results at mid carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

MODULATION:

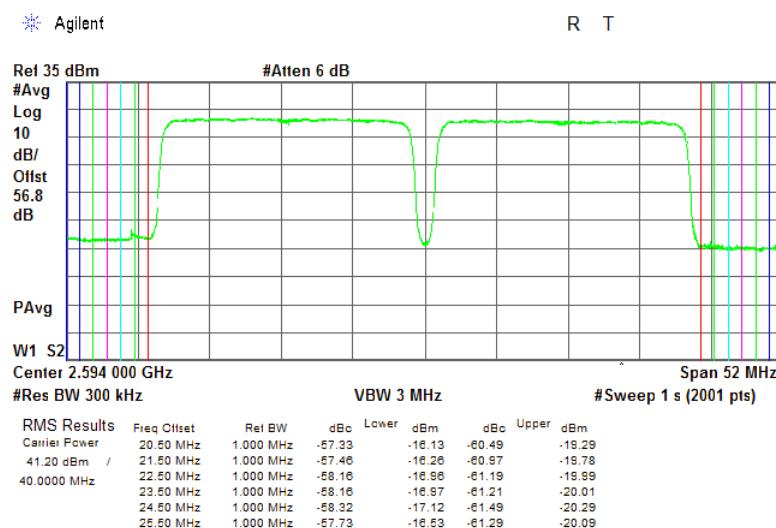
QPSK

MODULATING SIGNAL:

PRBS

BIT RATE:

46.8 Mbps

**Plot 7.7.3 Spurious emission at band edges test results at high carrier frequency, 40 MHz EBW**

DETECTOR USED:

Average

MODULATION:

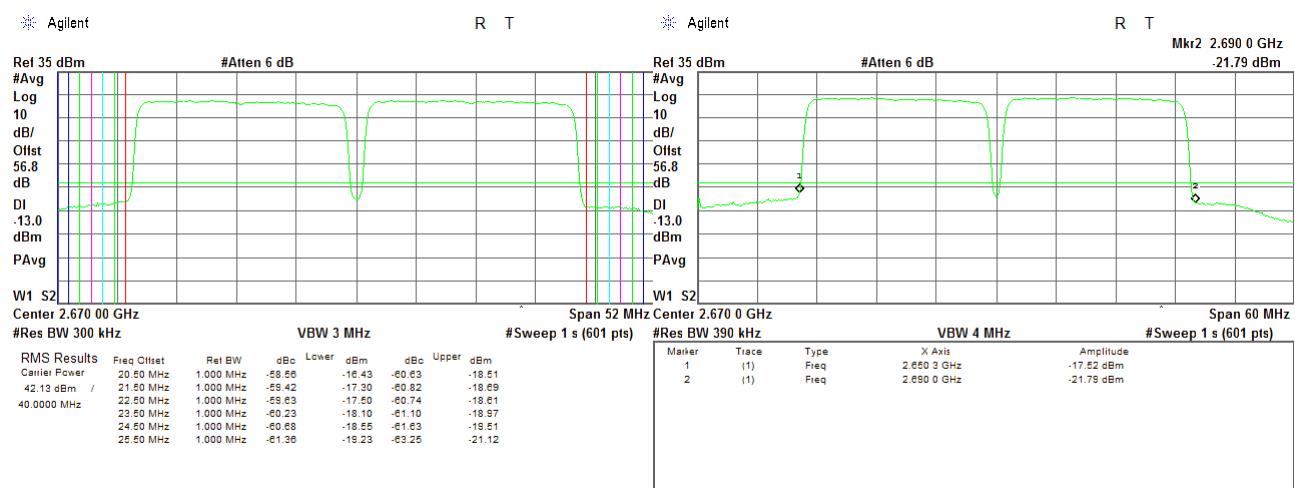
QPSK

MODULATING SIGNAL:

PRBS

BIT RATE:

46.8 Mbps





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance			Verdict: PASS
Date(s): 20-Feb-17 - 21-Feb-17			
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz			

Plot 7.7.4 Spurious emission at band edges test results at low carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

MODULATION:

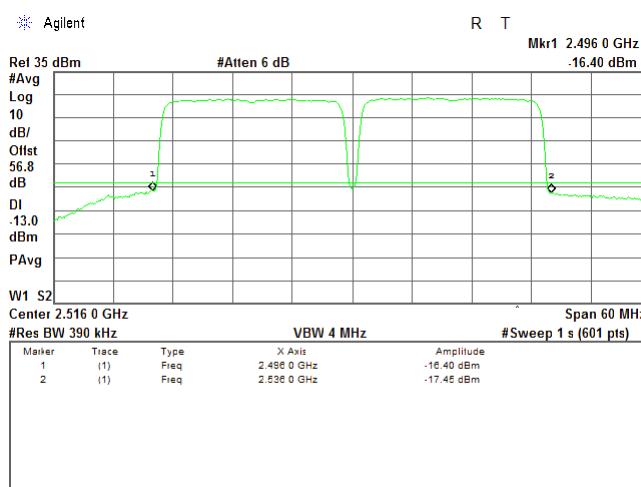
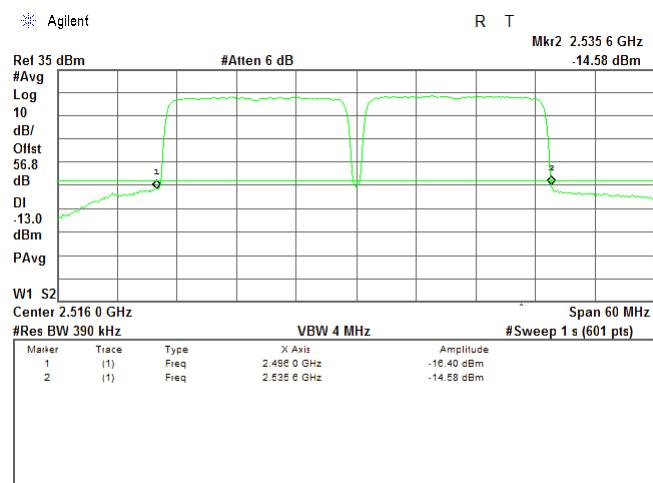
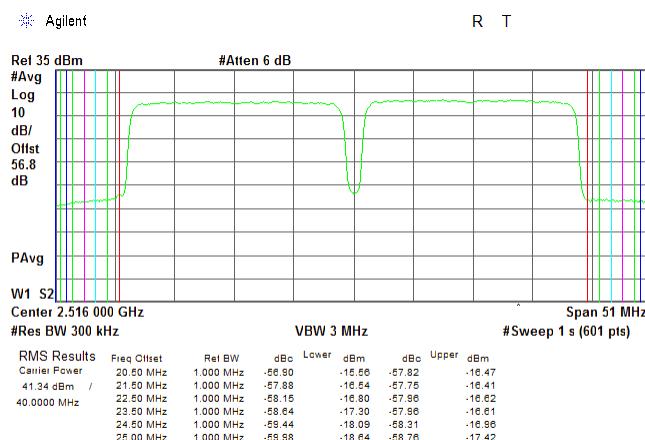
64QAM

MODULATING SIGNAL:

PRBS

BIT RATE:

190 Mbps





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions		
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13		
Test mode: Compliance	Verdict: PASS	
Date(s): 20-Feb-17 - 21-Feb-17		
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa
Remarks: Operation in full band 2498.5-2687.5 MHz		Power: 120 VAC

Plot 7.7.5 Spurious emission at band edges test results at mid carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

MODULATION:

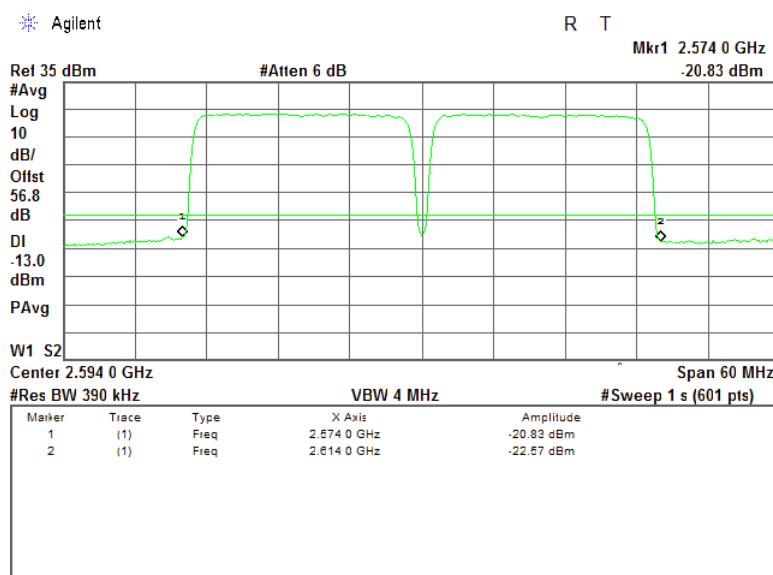
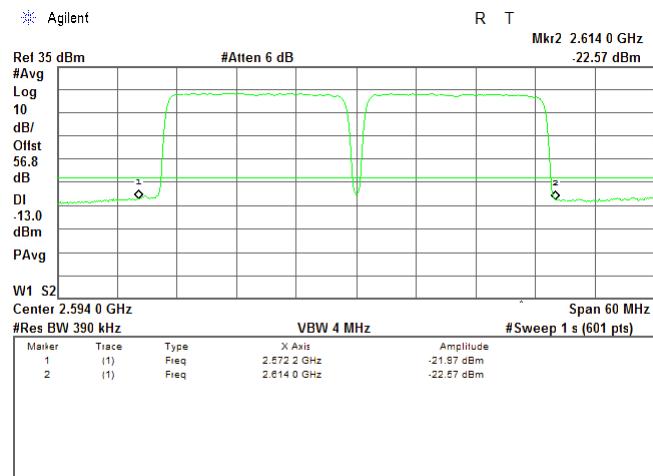
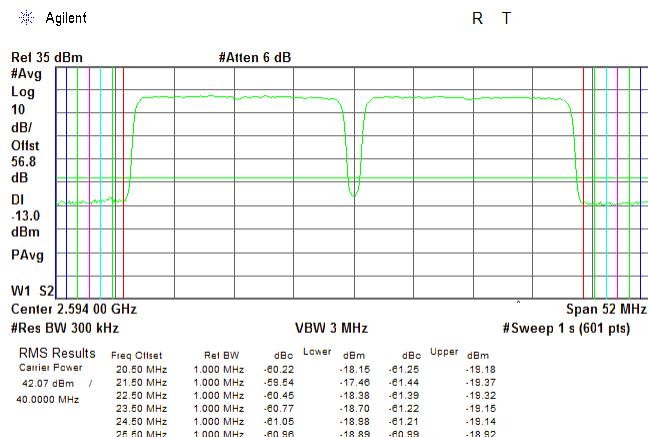
64QAM

MODULATING SIGNAL:

PRBS

BIT RATE:

190 Mbps





Test specification:	Section 27.53, Band edge emissions		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13		
Test mode:	Compliance		
Date(s):	20-Feb-17 - 21-Feb-17		
Temperature: 23.2 °C	Relative Humidity: 48 %	Air Pressure: 1019 hPa	Power: 120 VAC
Remarks: Operation in full band 2498.5-2687.5 MHz			

Plot 7.7.6 Spurious emission at band edges test results at high carrier frequency, 40 MHz EBW

DETECTOR USED:

MODULATION:

MODULATION:

MOD/SEAT
BIT RATE:

Agilent

R T

Average

64QAM

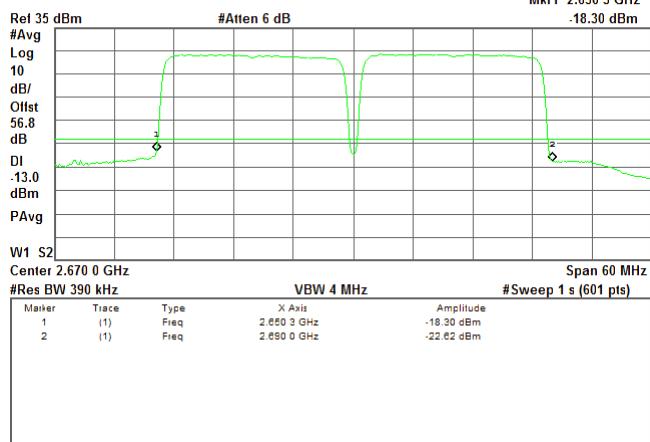
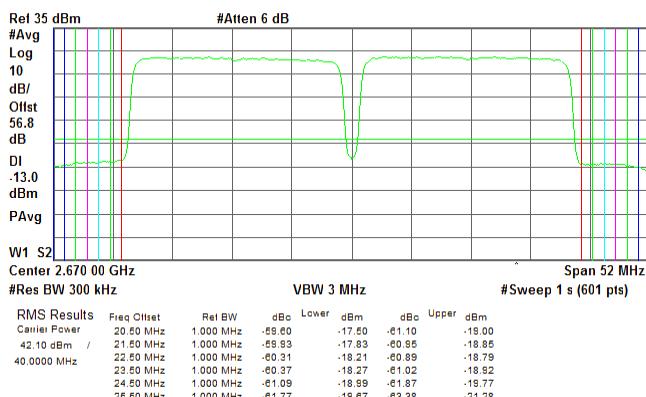
PRBS

190 Mbps

Agilent

R T

Mkr1 2.650 3 GHz





HERMON LABORATORIES

Test specification:	Section 27.53, Band edge emissions		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	21-Feb-17 - 22- Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

7.8 Band edge emissions at RF connector test in 2498.5-2565.5 MHz band

7.8.1 General

This test was performed to measure spurious emissions at the channel edge at the RF antenna connector. Specification test limits are given in Table 7.8.1

Table 7.8.1 Spurious emission limits at band edges

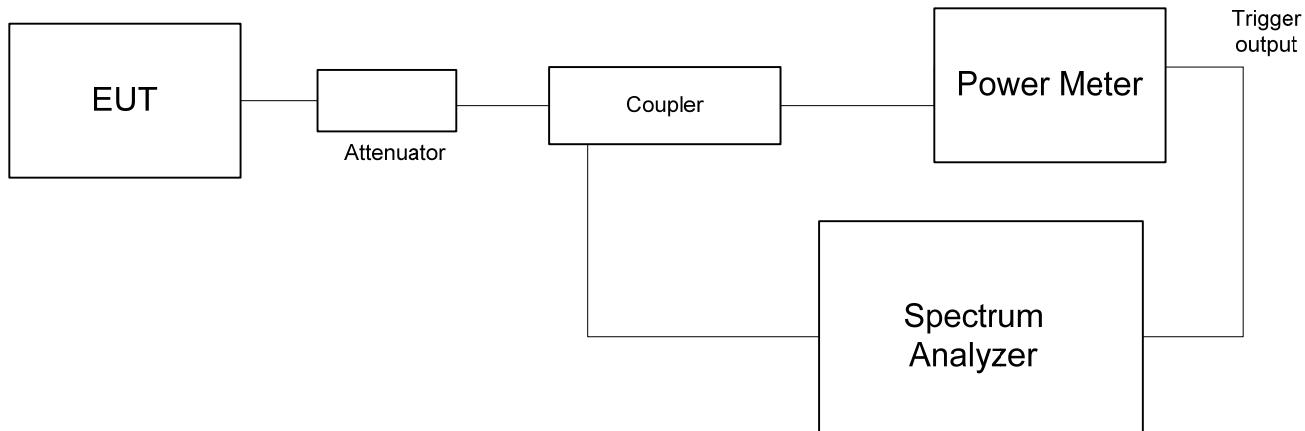
Channel	Frequency range	Attenuation below carrier, dBc	Limit, dBm
Channel bandwidth 40 MHz			
2516.0	2496.0 – 2536.0	43+ 10*Log (P*)	-13.0
2537.0	2513.0 – 2557.0	43+ 10*Log (P*)	-13.0
2548.0	2524.0 – 2568.0	43+ 10*Log (P*)	-13.0

* - P is transmitter output power in Watts

7.8.2 Test procedure

7.8.2.1 The EUT was set up as shown in Figure 7.8.1, energized and its proper operation was checked.
7.8.2.2 The spurious emission was measured with spectrum analyzer as provided in Table 7.8.2, Table 7.8.3 and the associated plots.

Figure 7.8.1 Spurious emission test setup for single output





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions							
Test procedure:		47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13					
Test mode:		Compliance				Verdict:	
Date(s):		21-Feb-17 - 22- Feb-17		Verdict:		PASS	
Temperature: 23.1 °C		Relative Humidity: 47 %		Air Pressure: 1016 hPa		Power: 120 VAC	
Remarks: Operation in low band 2498.5 – 2565.5 MHz							

Table 7.8.2 Spurious emission at the low band edge test results

DETECTOR USED:	Average ≥ Resolution bandwidth 40 MHz N=2						
VIDEO BANDWIDTH:							
EBW:							
NUMBER OF OUTPUTS:							
Frequency MHz	Frequency offset, ± MHz	Low band edge, dBm	RBW, kHz	Integration BW, kHz	Total low band edge*, dBm	Limit, dBm	Verdict
QPSK							
2516.0	20.0	-16.27	300	1000	-13.27	-13.0	Pass
	21.5	-17.09	300	1000	-14.09	-13.0	
2537.0	24.5	-16.90	300	1000	-13.90	-13.0	Pass
	25.5	-16.85	300	1000	-13.85	-13.0	
2548.0	24.5	-17.34	300	1000	-14.34	-13.0	Pass
	25.5	-17.80	300	1000	-14.80	-13.0	
64QAM							
2516.0	20.0	-17.51	390	NA	-14.51	-13.0	Pass
	21.5	-18.36	300	1000	-15.36	-13.0	
2537.0	24.5	-17.10	300	1000	-14.10	-13.0	Pass
	25.5	-17.69	300	1000	-14.69	-13.0	
2548.0	24.5	-18.78	390	NA	-15.78	-13.0	Pass
	25.5	-19.02	300	1000	-16.02	-13.0	

* - Total low band edge = Low Band Edge + 10log(N)

Table 7.8.3 Spurious emission at the high band edge test results

DETECTOR USED:	Average ≥ Resolution bandwidth 40 MHz N=2						
VIDEO BANDWIDTH:							
EBW:							
NUMBER OF OUTPUTS:							
Frequency MHz	Frequency offset, ± MHz	High band edge, dBm	RBW, kHz	Integration BW, kHz	Total high band edge*, dBm	Limit, dBm	Verdict
QPSK							
2516.0	20.5	-18.13	300	1000	-15.13	-13.0	Pass
	21.5	-18.48	300	1000	-15.48	-13.0	
2537.0	20.5	-17.08	300	1000	-14.08	-13.0	Pass
	21.5	-17.12	300	1000	-14.12	-13.0	
2548.0	20.5	-18.57	300	1000	-15.57	-13.0	Pass
	21.5	-19.71	300	1000	-16.71	-13.0	
64QAM							
2516.0	20.5	-18.13	300	1000	-16.21	-13.0	Pass
	21.5	-18.48	300	1000	-16.34	-13.0	
2537.0	20.5	-16.58	300	1000	-13.58	-13.0	Pass
	21.5	-16.64	300	1000	-13.64	-13.0	
2548.0	20.5	-19.02	390	NA	-16.02	-13.0	Pass
	21.5	-19.01	300	1000	-16.01	-13.0	

* - Total high band edge = High Band Edge + 10log(N)

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3818	HL 4575		
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Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance		Verdict: PASS	
Date(s): 21-Feb-17 - 22- Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.8.1 Spurious emission at band edges test results at low carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

MODULATION:

QPSK

MODULATING SIGNAL:

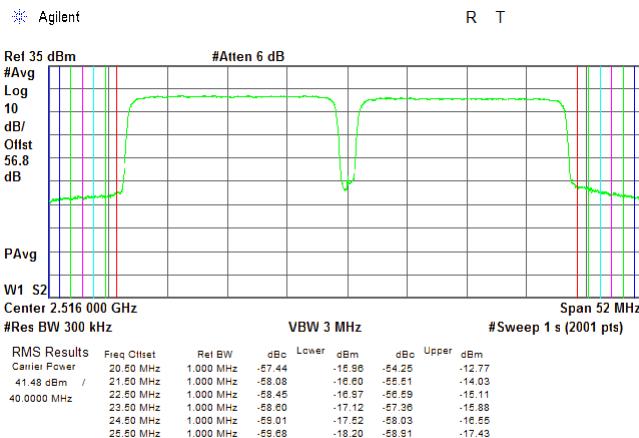
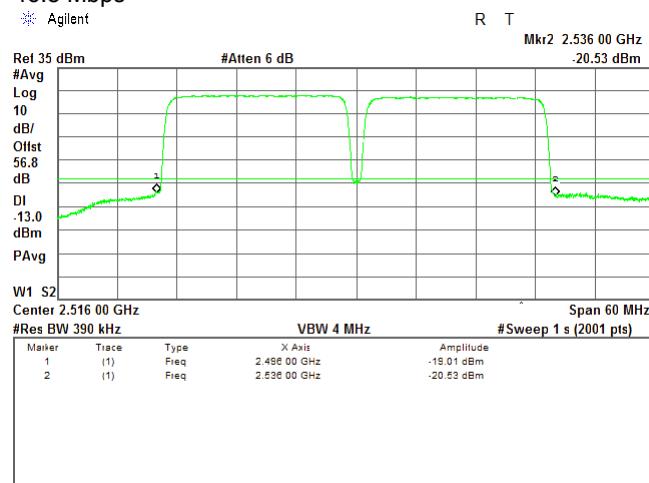
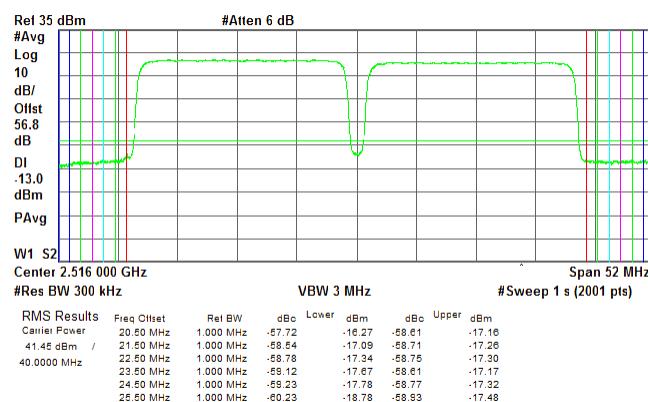
PRBS

BIT RATE:

46.8 Mbps

Agilent

R T





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance		Verdict: PASS	
Date(s):	21-Feb-17 - 22- Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.8.2 Spurious emission at band edges test results at mid carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

MODULATION:

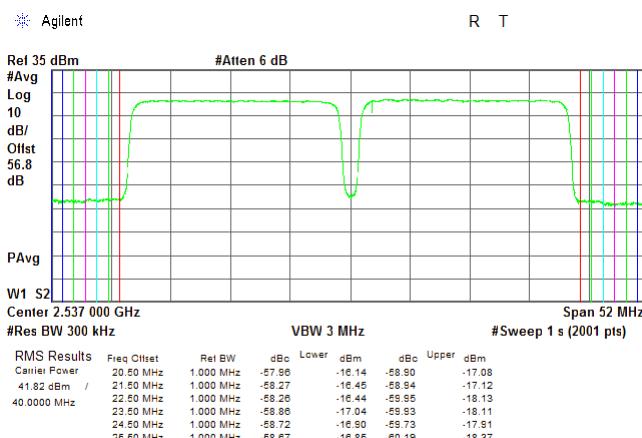
QPSK

MODULATING SIGNAL:

PRBS

BIT RATE:

46.8 Mbps





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance		Verdict: PASS	
Date(s): 21-Feb-17 - 22- Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.8.3 Spurious emission at band edges test results at high carrier frequency, 40 MHz EBW

DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

BIT RATE:

Agilent

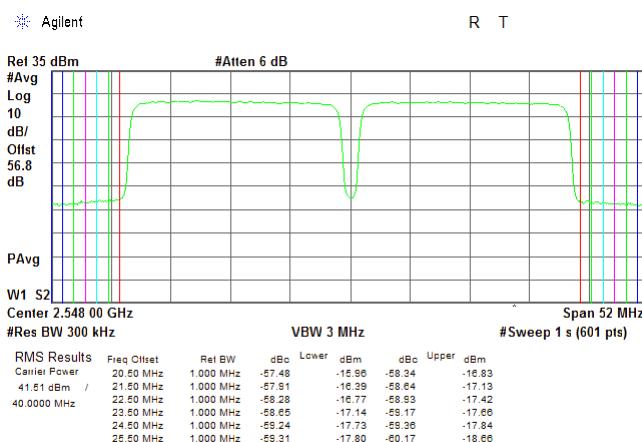
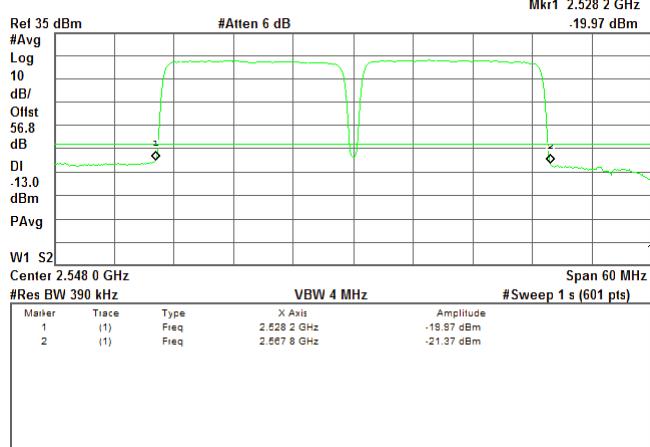
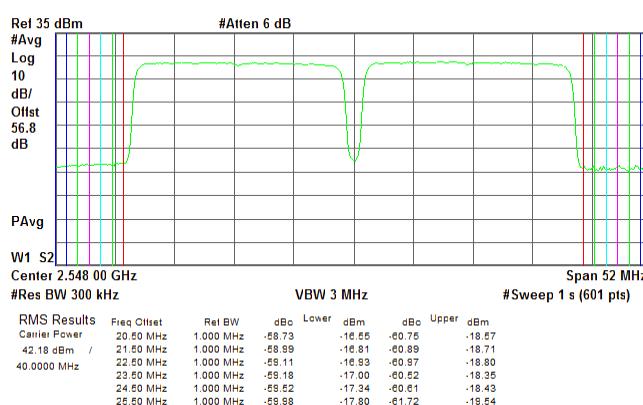
Average

QPSK

PRBS

46.8 Mbps

Agilent





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance		Verdict: PASS	
Date(s): 21-Feb-17 - 22- Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.8.4 Spurious emission at band edges test results at low carrier frequency, 40 MHz EBW

DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

BIT RATE:

Agilent

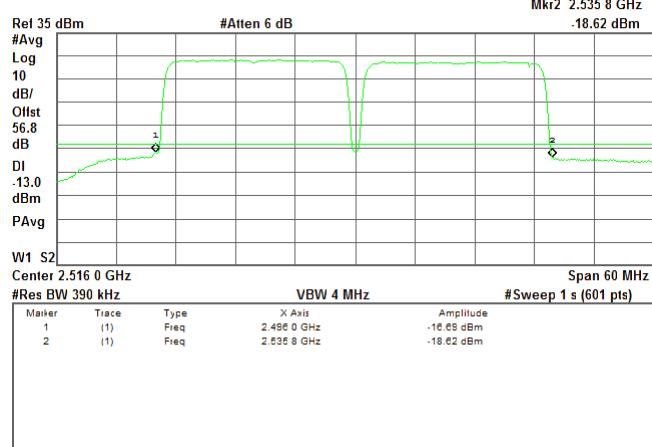
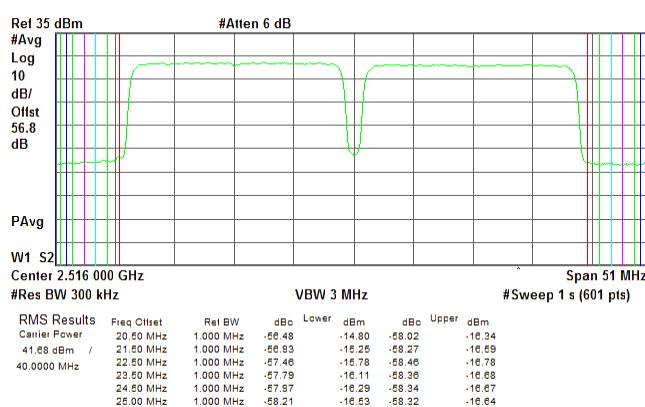
Average

64QAM

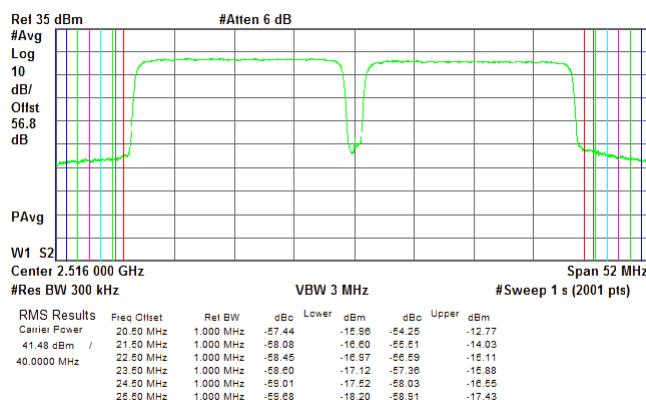
PRBS

190 Mbps

Agilent



Agilent





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance		Verdict: PASS	
Date(s): 21-Feb-17 - 22- Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in low band 2498.5 – 2565.5 MHz			

Plot 7.8.5 Spurious emission at band edges test results at mid carrier frequency, 40 MHz EBW

DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

BIT RATE:

Agilent

R T

Average

64QAM

PRBS

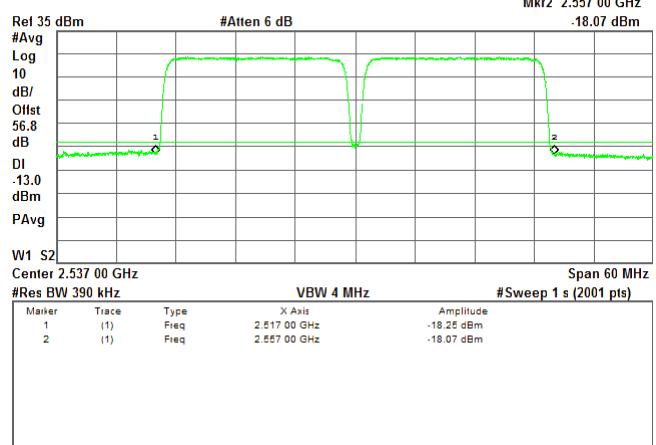
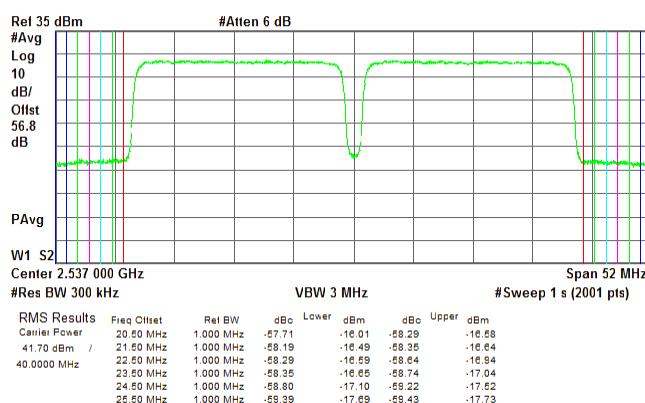
190 Mbps

Agilent

R T

Mkr2 2.557 00 GHz

-18.07 dBm



Plot 7.8.6 Spurious emission at band edges test results at high carrier frequency, 40 MHz EBW RF#1

DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

BIT RATE:

Agilent

R T

Average

64QAM

PRBS

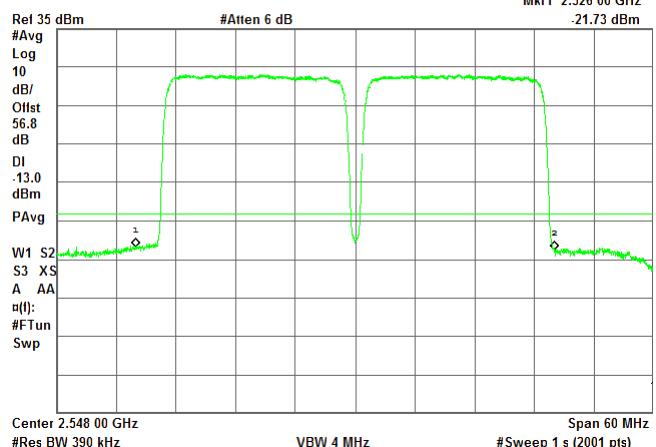
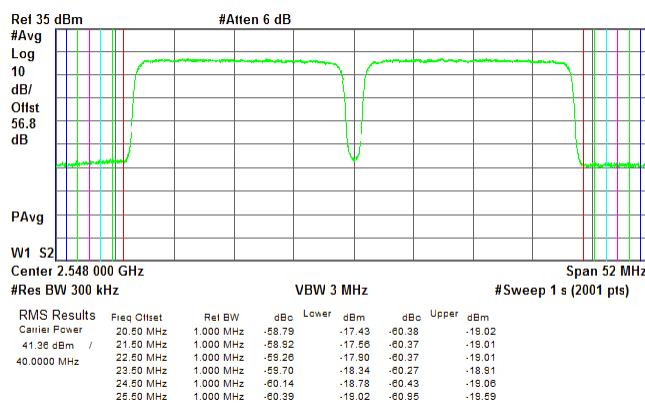
190 Mbps

Agilent

R T

Mkr1 2.526 00 GHz

-21.73 dBm





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13		
Test mode:	Compliance		Verdict: PASS
Date(s):	22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

7.9 Band edge emissions at RF connector test in 2620.5 – 2687.5 MHz band

7.9.1 General

This test was performed to measure spurious emissions at the channel edge at the RF antenna connector. Specification test limits are given in Table 7.9.1.

Table 7.9.1 Spurious emission limits at band edges

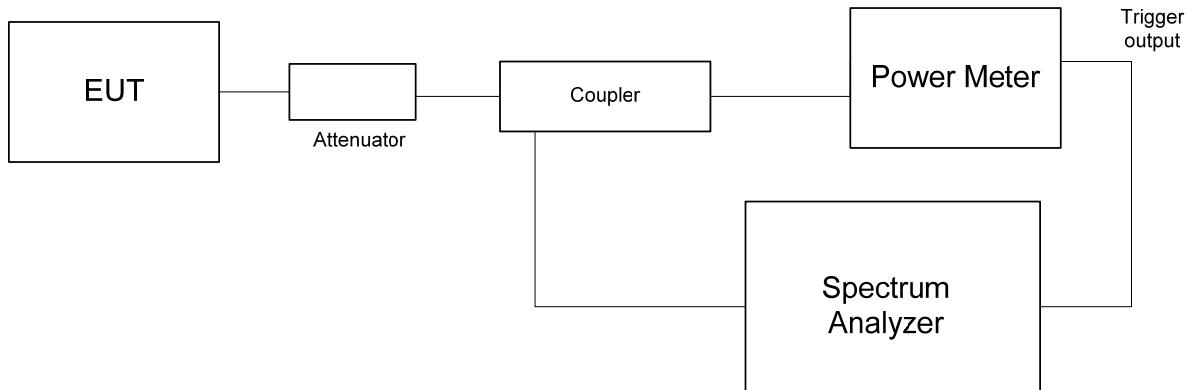
Channel	Frequency range	Attenuation below carrier, dBc	Limit, dBm
Channel bandwidth 40 MHz			
2638.0	2618.0 – 2662.0	43+ 10*Log (P*)	-13.0
2653.5	2629.5 – 2673.5	43+ 10*Log (P*)	-13.0
2670.0	2646.0 – 2690.0	43+ 10*Log (P*)	-13.0

* - P is transmitter output power in Watts

7.9.2 Test procedure

7.9.2.1 The EUT was set up as shown in Figure 7.9.1, energized and its proper operation was checked.
7.9.2.2 The spurious emission was measured with spectrum analyzer as provided in Table 7.9.2, Table 7.9.3 and the associated plots.

Figure 7.9.1 Spurious emission test setup for single output





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Test specification: Section 27.53, Band edge emissions									
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13								
Test mode:	Compliance				Verdict:	PASS			
Date(s):	22-Feb-17								
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa		Power: 120 VAC					
Remarks: Operation in high band 2620.5 – 2687.5 MHz									

Table 7.9.2 Spurious emission at the low band edge test results

DETECTOR USED:

Average

VIDEO BANDWIDTH:

≥ Resolution bandwidth

EBW:

40 MHz

NUMBER OF OUTPUTS:

N=2

Frequency MHz	Frequency offset, ± MHz	Low band edge, dBm	RBW, kHz	Integration BW, kHz	Total low band edge*, dBm	Limit, dBm	Verdict
QPSK							
2638.0	20.0	-16.36	300	1000	-13.36	-13.0	Pass
	21.5	-17.06	300	1000	-14.06	-13.0	
2653.5	24.0	-17.53	300	1000	-14.53	-13.0	Pass
	25.0	-18.11	300	1000	-15.11	-13.0	
2670.0	24.5	-18.16	300	1000	-15.16	-13.0	Pass
	25.5	-18.60	300	1000	-15.60	-13.0	
64QAM							
2638.0	20.0	-17.12	300	1000	-14.12	-13.0	Pass
	21.5	-17.67	300	1000	-14.67	-13.0	
2653.5	24.0	-17.91	300	1000	-13.66	-13.0	Pass
	25.0	-18.03	300	1000	-14.28	-13.0	
2670.0	24.5	-17.18	390	NA	-14.18	-13.0	Pass
	25.5	-17.58	300	1000	-14.58	-13.0	

* - Total low band edge = Low Band Edge + 10log(N)

Table 7.9.3 Spurious emission at the high band edge test results

DETECTOR USED:

Average

VIDEO BANDWIDTH:

≥ Resolution bandwidth

EBW:

40MHz

NUMBER OF OUTPUTS:

N=2

Frequency MHz	Frequency offset, ± MHz	High band edge, dBm	RBW, kHz	Integration BW, kHz	Total high band edge*, dBm	Limit, dBm	Verdict
QPSK							
2638.0	24.5	-18.55	300	1000	-15.55	-13.0	Pass
	25.5	-18.90	300	1000	-15.90	-13.0	
2653.5	20.0	-20.49	390	NA	-17.46	-13.0	Pass
	21.5	-16.62	300	1000	-13.62	-13.0	
2670.0	20.5	-16.90	300	1000	-13.90	-13.0	Pass
	21.5	-17.08	300	1000	-14.08	-13.0	
64QAM							
2638.0	24.5	-19.21	300	1000	-16.21	-13.0	Pass
	25.5	-19.34	300	1000	-16.34	-13.0	
2653.5	20.5	-16.79	300	1000	-13.79	-13.0	Pass
	21.5	-17.52	300	1000	-14.52	-13.0	
2670.0	20.5	-17.49	390	NA	-14.49	-13.0	Pass
	21.5	-17.04	300	1000	-14.04	-13.0	

* - Total high band edge = High Band Edge + 10log(N)

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3818	HL 4575			
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Full description is given in Appendix A.



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Test specification: Section 27.53, Band edge emissions				
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13				
Test mode: Compliance			Verdict: PASS	
Date(s): 22-Feb-17				
Temperature: 23.1 °C		Relative Humidity: 47 %	Air Pressure: 1016 hPa	
Remarks: Operation in high band 2620.5 – 2687.5 MHz				

Plot 7.9.1 Spurious emission at band edges test results at low carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

MODULATION:

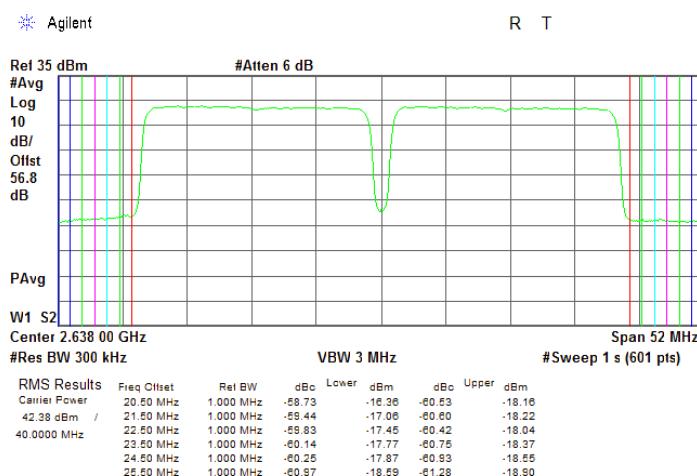
QPSK

MODULATING SIGNAL:

PRBS

BIT RATE:

46.8 Mbps

**Plot 7.9.2 Spurious emission at band edges test results at mid carrier frequency, 40 MHz EBW**

DETECTOR USED:

Average

MODULATION:

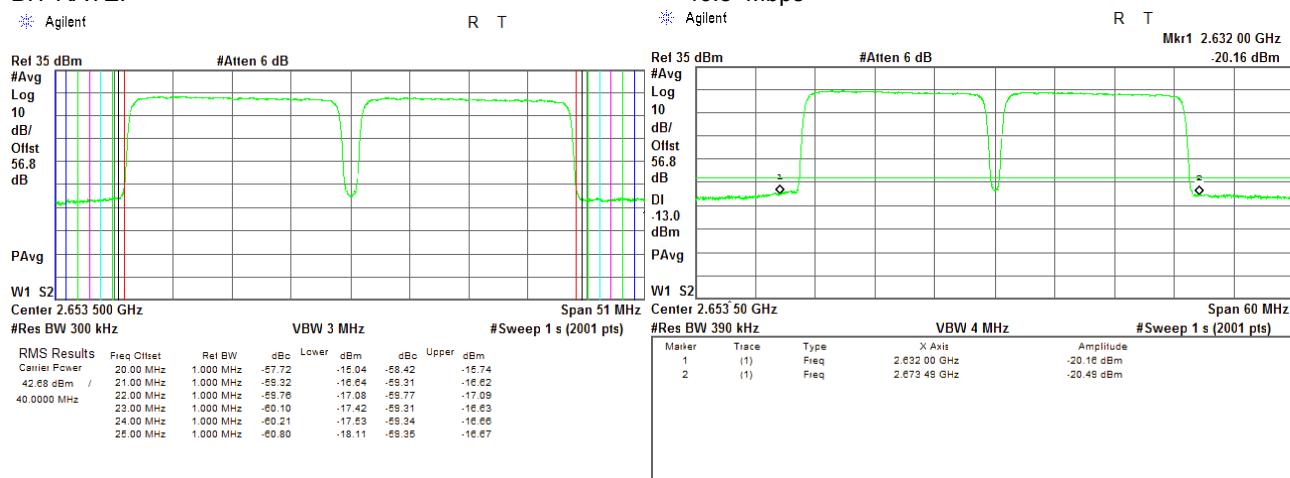
QPSK

MODULATING SIGNAL:

PRBS

BIT RATE:

46.8 Mbps





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance		Verdict: PASS	
Date(s): 22-Feb-17			
Temperature: 23.1 °C		Relative Humidity: 47 %	Air Pressure: 1016 hPa
Remarks: Operation in high band 2620.5 – 2687.5 MHz		Power: 120 VAC	

Plot 7.9.3 Spurious emission at band edges test results at high carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

MODULATION:

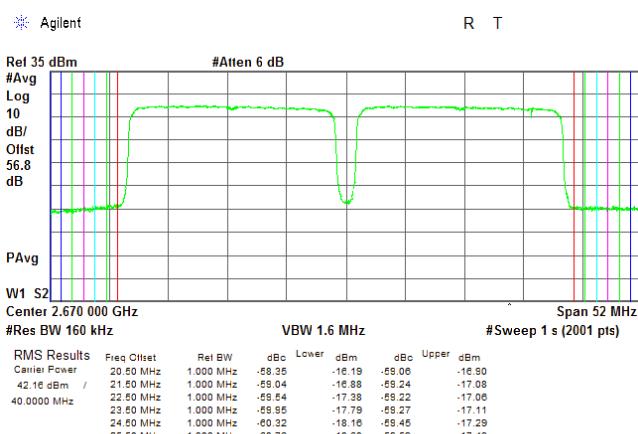
QPSK

MODULATING SIGNAL:

PRBS

BIT RATE:

46.8 Mbps





Test specification:	Section 27.53, Band edge emissions		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13		
Test mode:	Compliance		
Date(s):	22-Feb-17		
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.9.4 Spurious emission at band edges test results at low carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

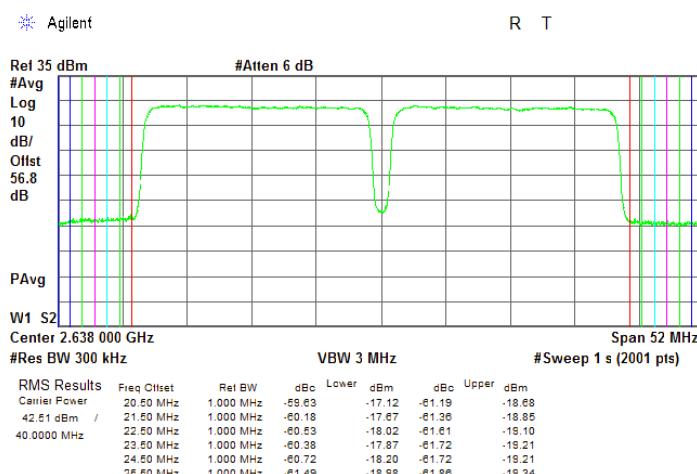
MODULATION:

64QAM

MODULATING SIGNAL:

PRBS

BIT RATE:



Plot 7.9.5 Spurious emission at band edges test results at mid carrier frequency, 40 MHz EBW

DETECTOR USED:

Average

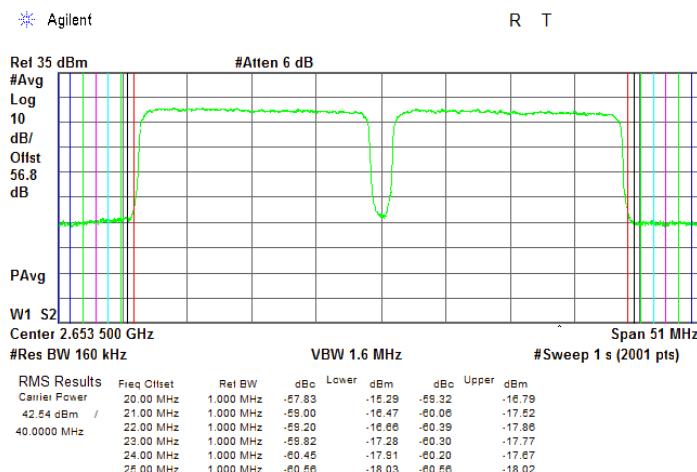
MODULATION:

64QAM

MODULATING SIGNAL:

PRBS

BIT RATE:





HERMON LABORATORIES

Test specification: Section 27.53, Band edge emissions			
Test procedure: 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13			
Test mode: Compliance		Verdict: PASS	
Date(s): 22-Feb-17			
Temperature: 23.1 °C	Relative Humidity: 47 %	Air Pressure: 1016 hPa	Power: 120 VAC
Remarks: Operation in high band 2620.5 – 2687.5 MHz			

Plot 7.9.6 Spurious emission at band edges test results at high carrier frequency, 40 MHz EBW

DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

BIT RATE:

Agilent

R T

Average

64QAM

PRBS

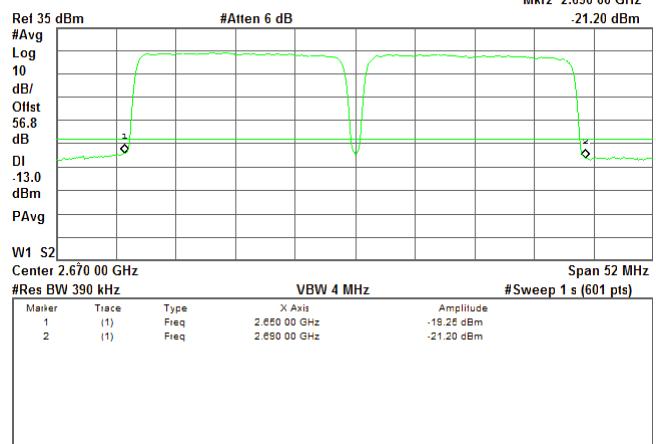
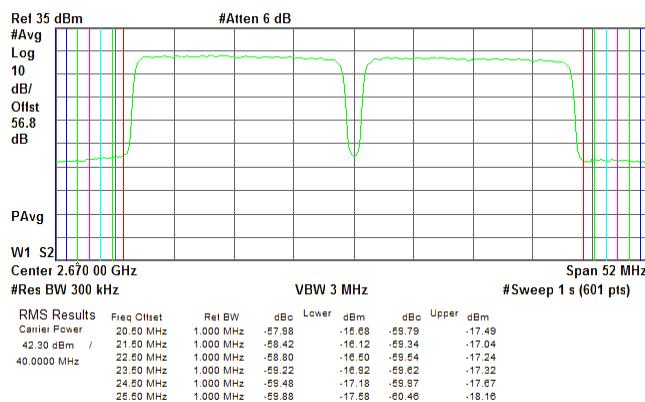
190 Mbps

Agilent

R T

Mkr2 2.690 00 GHz

-21.20 dBm





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Report ID: AIRRAD_FCC.29264_rev1.docx

Date of Issue: 22-Mar-17

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
2214	Directional Coupler 1.7-26.5 GHz	Krytar	2616	31354	16-Sep-15	16-Sep-17
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY451010 57	26-Apr-16	26-Apr-17
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY452405 86	26-Apr-16	26-Apr-17
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	03-May-16	03-May-17
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	20-Feb-17	20-Feb-18
4274	Test Cable , DC-18 GHz, 1.8 m, SMA/M - N/M	Mini-Circuits	CBL-6FT-SMNM+	70047	30-May-16	30-May-17
4575	EXA Signal Analyzer, 9 kHz - 26.5 GHz	Agilent Technologies	N9010A	MY480301 10	17-Feb-17	17-Mar-18



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9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	±8%
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency error	30 – 300 MHz: ± 50.5 Hz (1.68 ppm) 300 – 1000 MHz: ± 168 Hz (0.56 ppm)
Transient frequency behaviour	187 Hz ± 13.9 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.



HERMON LABORATORIES

10 APPENDIX C Test facility description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-869 for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports). The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

47CFR part 27: 2016	Private land mobile radio services
47CFR part 1: 2015	Practice and procedure
47CFR part 2: 2015	Frequency allocations and radio treaty matters; general rules and regulations
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI/TIA/EIA-603-D:2010	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards



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12 APPENDIX E Test equipment correction factors

Cable loss
Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A
HL 3901

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	9500	4.29	21000	6.67
100	0.41	10000	4.40	22000	6.92
500	0.93	10500	4.52	23000	7.00
1000	1.33	11000	4.64	24000	7.18
1500	1.63	11500	4.76	25000	7.29
2000	1.90	12000	4.87	26000	7.55
2500	2.12	12500	4.99	27000	7.70
3000	2.33	13000	5.11	28000	7.88
3500	2.50	13500	5.20	29000	8.02
4000	2.67	14000	5.31	30000	8.15
4500	2.82	14500	5.42	31000	8.35
5000	2.99	15000	5.51	32000	8.40
5500	3.16	15500	5.58	33000	8.62
6000	3.32	16000	5.68	34000	8.73
6500	3.51	16500	5.78	35000	8.78
7000	3.65	17000	5.91	36000	8.94
7500	3.79	17500	5.99	37000	9.21
8000	3.92	18000	6.07	38000	9.37
8500	4.04	19000	6.36	39000	9.45
9000	4.18	20000	6.49	40000	9.52



HERMON LABORATORIES

Cable loss
Test cable, Mini-Circuits, S/N 70047, 18 GHz, 1.8 m, SMA/M - N/M
CBL-6FT-SMNM+, HL 4274

Frequency, MHz	Cable loss, dB						
10	0.07	4800	1.69	9800	2.62	14800	3.42
30	0.11	4900	1.70	9900	2.63	14900	3.39
50	0.14	5000	1.72	10000	2.64	15000	3.38
100	0.21	5100	1.75	10100	2.64	15100	3.40
200	0.26	5200	1.76	10200	2.66	15200	3.41
300	0.30	5300	1.77	10300	2.67	15300	3.40
400	0.37	5400	1.79	10400	2.68	15400	3.39
500	0.44	5500	1.82	10500	2.68	15500	3.41
600	0.49	5600	1.85	10600	2.70	15600	3.44
700	0.54	5700	1.86	10700	2.71	15700	3.46
800	0.58	5800	1.87	10800	2.73	15800	3.45
900	0.63	5900	1.91	10900	2.74	15900	3.47
1000	0.67	6000	1.94	11000	2.76	16000	3.51
1100	0.71	6100	1.97	11100	2.77	16100	3.56
1200	0.75	6200	1.98	11200	2.78	16200	3.55
1300	0.78	6300	1.99	11300	2.79	16300	3.54
1400	0.81	6400	2.02	11400	2.80	16400	3.57
1500	0.85	6500	2.05	11500	2.82	16500	3.62
1600	0.88	6600	2.06	11600	2.83	16600	3.61
1700	0.91	6700	2.06	11700	2.84	16700	3.60
1800	0.94	6800	2.08	11800	2.85	16800	3.62
1900	0.97	6900	2.10	11900	2.87	16900	3.68
2000	1.00	7000	2.12	12000	2.88	17000	3.70
2100	1.03	7100	2.12	12100	2.89	17100	3.68
2200	1.06	7200	2.13	12200	2.90	17200	3.70
2300	1.08	7300	2.16	12300	2.92	17300	3.80
2400	1.11	7400	2.19	12400	2.94	17400	3.84
2500	1.14	7500	2.22	12500	2.95	17500	3.83
2600	1.16	7600	2.23	12600	2.96	17600	3.83
2700	1.19	7700	2.26	12700	2.98	17700	3.86
2800	1.21	7800	2.30	12800	3.00	17800	3.86
2900	1.27	7900	2.33	12900	3.02	17900	3.80
3000	1.29	8000	2.35	13000	3.03	18000	3.79
3100	1.32	8100	2.37	13100	3.06		
3200	1.35	8200	2.41	13200	3.08		
3300	1.37	8300	2.44	13300	3.09		
3400	1.38	8400	2.47	13400	3.10		
3500	1.41	8500	2.48	13500	3.13		
3600	1.43	8600	2.51	13600	3.17		
3700	1.46	8700	2.53	13700	3.17		
3800	1.47	8800	2.55	13800	3.18		
3900	1.49	8900	2.56	13900	3.22		
4000	1.52	9000	2.57	14000	3.26		
4100	1.55	9100	2.58	14100	3.28		
4200	1.56	9200	2.59	14200	3.30		
4300	1.58	9300	2.59	14300	3.35		
4400	1.60	9400	2.60	14400	3.39		
4500	1.63	9500	2.60	14500	3.39		
4600	1.65	9600	2.61	14600	3.39		
4700	1.67	9700	2.61	14700	3.41		



HERMON LABORATORIES

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(µV)	decibel referred to one microvolt
dB(µA)	decibel referred to one microampere
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
k	kilo
kHz	kilohertz
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
µs	microsecond
NA	not applicable
NB	narrow band
NT	not tested
Ω	Ohm
QP	quasi-peak
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
Tx	transmit
V	volt
VA	volt-ampere

END OF DOCUMENT