

TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart E § 15. 407,
RSS-247 issue 1

FOR:

Siemens Canada Limited
Subscriber unit operating
in 5.8 GHz band

Models: WiN5258

WiN5158-AC

WiN5158-DC

WIN5158-V,

WIN5158-V-GPS,

WIN5158-AC-IS,

WIN5258-IS

IC:4997A-WIN5X58

FCC ID:VG5WIN5X58

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1 Applicant information

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Contact name: Mr. Yair Amran

2 Equipment under test attributes

Product name: Subscriber unit operating in 5.8 GHz band
Model(s): WiN5158-AC
Hardware version: RFID =20
Software release: SS4.3.4624.21
Receipt date 17-Apr-16

3 Manufacturer information

Manufacturer name: Siemens Canada Limited
Address: 300 Applewood Crescent, Unit 1, Concord, Ontario, Canada
Telephone: (905) 482 4558
Fax: (905) 856 1995
E-Mail: Yair.Amran@siemens.com
Contact name: Mr. Yair Amran

4 Test details

Project ID: 28314
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 17-Apr-16
Test completed: 18-Apr-16
Test specification(s): FCC 47CFR part 15 subpart E §15.407 and RSS-247 issue 1

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.407(a)(1-3), RSS-247 section 6.2.4.1, Peak output power	Pass
FCC section 15.407(a)(1-3), RSS-247 section 6.2.4.1, Peak spectral power density	Pass
FCC section 15.407(b), RSS-247 section 6.2.4.2, Conducted out of band emissions	Pass

This test report is an amendment to the test report RUGRAD_FCC.23641_rev4 issued by Hermon Laboratories. The current test report issued for compliance with RSS-247 Issue 1:2015 and the latest FCC part 15 subpart E standard version (for devices using digital modulation techniques in the 5725–5850 MHz bands).

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:SIERAD_28314_SU_rev1.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	April 20, 2016	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	April 21, 2016	
Approved by:	Mr. M. Nikishin, EMC and radio group manager	April 27, 2016	

6 EUT description

6.1 General information

The EUT, WIN5158/WIN5258, is a subscriber unit of WiMAX system, installed at the customer premises. It comprises an Outdoor Unit (ODU) that includes modem, radio, data processing and management components, serving as an efficient platform for a wide range of services. It provides a wireless connection to the base station. Data is fed to the EUT through the RJ-45 port. The EUT is sending the data via wireless connection to the base station. The EUT has one Tx and two Rx connectors - it is MISO (Multi In Single Out) type.

The difference between WIN5158 and WIN5258 is the antenna connectors. The **WIN5258** has internal (on-mechanic) antenna, and it is powered by WIN1010 power adapter unit (48VDC). WIN5149 has external N-Type connectors for antennas. The WIN5158 has 2 sub-models, WIN5158-AC and WIN5158-DC. The **WIN5158-AC** is powered by WIN1010 power adapter unit (48VDC), and the **WIN5158-DC** is powered by car's 12V battery. The "Mobile subscriber unit" is installed in car (vehicular environment); "Fixed subscriber unit" is installed on roofs, towers, etc.

The EUT models WIN5158-V, WIN5158-V-GPS, WIN5158-AC-IS and WIN5258-IS are electrically/electronically/mechanically identical except of GPS receiver incorporated into WIN5158-V-GPS model. The only change is the power supply circuitry, which has new generation components, and no changes were made to output voltages or output currents. The RF board remains the exactly the same, without any changes to frequency or output power.

The EUT model WIN5158-AC powered by power adapter unit was tested.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	DC power*	EUT	Power supply	1	Shielded	2 m**	Outdoor
Telecom	Ethernet	EUT	PC	1	Shielded	10 m***	Outdoor
RF	GPS	EUT	GPS antenna	1	Coax	10 m	Outdoor
RF	Tx/Rx	EUT	Simulator	1	Coax	10 m	Outdoor
Interconnecting	Rx	EUT	Simulator	1	Coax	10 m	Outdoor

* Intended to be powered from DC power network and has no direct or indirect connection to AC mains.

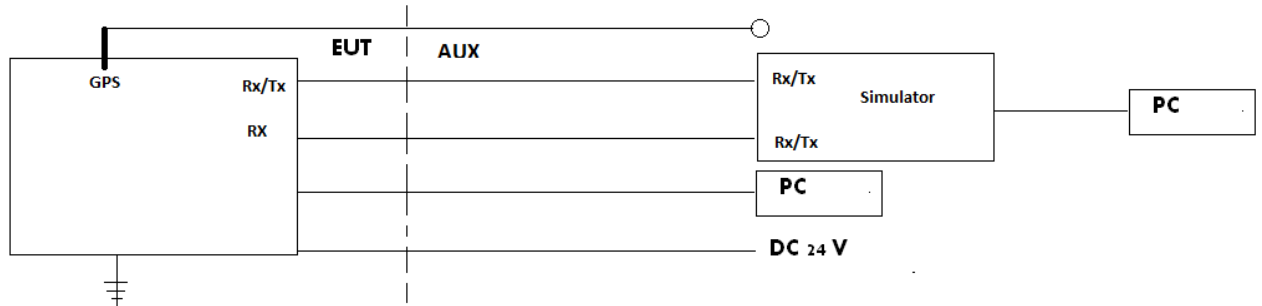
** May be up to 10 m long.

*** May be up to 100 m long.

6.3 Auxiliary equipment

Description	Manufacturer	Model number	Serial number
PC	Fujitsu	CP552519-01	DCCB007118
PC	Toshiba	Y7082270H	PTM91E-04G045G3
Simulator	NETCOM SYSTEM	SMARTBITS200	NA

6.4 Test configuration



6.5 Transmitter characteristics

Type of equipment				
☒	Stand-alone (Equipment with or without its own control provisions)			
☐	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)			
☐	Plug-in card (Equipment intended for a variety of host systems)			
Intended use		Condition of use		
☒	fixed	Always at a distance more than 2 m from all people		
☒	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		5725.0 – 5850.0 MHz		
Operating frequency range		5730 – 5845 MHz		
RF channel bandwidth		5 MHz, 10 MHz		
Maximum rated output power		At transmitter 50 Ω RF output connector		23.12 dBm for 5 MHz CBW 23.08 dBm for 10 MHz CBW
Is transmitter output power variable?		☐ No		
		☒ Yes	☐ continuous variable	
			☒ stepped variable with stepsize	0.5 dB
			minimum RF power	
		maximum RF power		23.12 dBm
Antenna connection				
unique coupling	☒ standard connector	Integral	☒ with temporary RF connector without temporary RF connector	
Antenna/s technical characteristics				
Type	Manufacturer	Model number	Gain	
Dual slant antenna	MTI Wireless Edge Ltd.	MT-465017/SVH/B (ANTN0072)	22.5 dBi	
Dual slant antenna	MTI Wireless Edge Ltd.	MT-465017/NVH (ANTN0073, NTYPE)	22.5 dBi	
Omnidirectional	MTI Wireless Edge Ltd.	MT 462008/N/A (ANTN0076, N-Female)	9.5 dBi	
Omnidirectional	HUBER-SUHNER	SWA-0860/360/4/0/V_2, 1399.17.0099 (ANTN0075, N Female)	9.5 dBi	
Transmitter 99% power bandwidth		5 MHz, 10 MHz		
Type of modulation		QPSK 1/2, 16QAM 3/4, 64QAM 5/6		
Transmitter aggregate data rate/s, Mbps				
Bandwidth, MHz	Direction	QPSK 1/2	16QAM 3/4	64QAM 5/6
5	DL	4.608	13.824	23.04
	UL	1.4688	4.4064	7.344
10	DL	9.216	27.648	46.08
	UL	3.024	9.072	15.12
Type of multiplexing		OFDMA		
Modulating test signal (baseband)		PRBS		
Maximum transmitter duty cycle in normal use		33%	Tx ON time	Period
Transmitter duty cycle supplied for test		30%	Tx ON time	Period
Transmitter power source				
		Nominal rated voltage	Battery type	
☒	DC	Nominal rated voltage	48 V (via DC power supply from the mains)	
	AC mains	Nominal rated voltage	Frequency	

Test specification: FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak output power	
Test procedure: FCC section 15.407(a)(4); ANSI C63.10, section 11.9	
Test mode: Compliance	Verdict: PASS
Date(s): 18-Apr-16	
Temperature: 23.2 °C	Air Pressure: 1016 hPa
	Relative Humidity: 48 %
	Power Supply: 48 VDC
Remarks:	

7 Transmitter tests according to 47CFR part 15 subpart E and RSS-247 requirements

7.1 Peak output power

7.1.1 General

This test was performed to measure the maximum peak output power at the transmitter RF antenna connector. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Peak output power limits

Assigned frequency range, MHz	Maximum peak transmit power	Used limit
5725 - 5850	1 W	30.0 dBm

Note: If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value by the amount in dB that the directional gain of antenna exceeds 6 dBi.

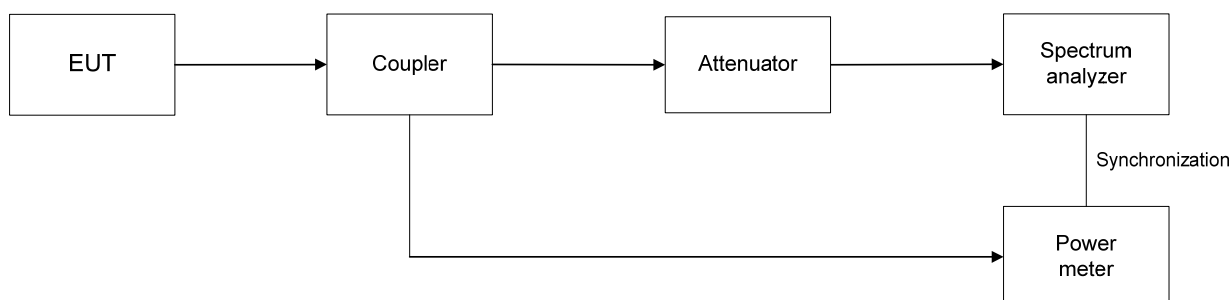
7.1.2 Test procedure

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

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

7.1.2.3 The measurements were performed in continuous transmission mode of operation for carrier (channel) frequency at low, mid and high edges with a peak detector. The power was computed by integrating the spectrum across the 26 dB bandwidth of the signal as provided in the associated tables and plots.

Figure 7.1.1 Peak output power test setup





Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak output power	
Test procedure:		FCC section 15.407(a)(4); ANSI C63.10, section 11.9	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.2 °C	Air Pressure: 1016 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.2 Output power test results

ASSIGNED FREQUENCY RANGE:

5725-5850 MHz

DETECTOR USED:

Power Meter

MODULATING SIGNAL:

Averaged within RF burst

TRANSMITTER OUTPUT POWER SETTINGS:

PRBS

ANTENNA GAIN:

Maximum

9.5 dBi

EBW:

5 MHz

Modulation	Carrier frequency, MHz	SA Reading, dBm	Antenna Gain, dBi	Output power, dBm	Limit, ** dBm	Margin***, dB	Verdict
QPSK	5732.5	23.04	9.5	23.04	26.50	-3.46	Pass
	5787.5	23.09	9.5	23.09	26.50	-3.41	Pass
	5842.5	22.32	9.5	22.32	26.50	-4.18	Pass
64 QAM	5732.5	22.52	9.5	22.52	26.50	-3.98	Pass
	5787.5	23.12	9.5	23.12	26.50	-3.38	Pass
	5842.5	22.33	9.5	22.33	26.50	-4.17	Pass

EBW:

10 MHz

QPSK	5735.0	21.98	9.5	21.98	26.50	-4.52	Pass
	5787.5	23.08	9.5	23.08	26.50	-3.42	Pass
	5845.0	22.62	9.5	22.62	26.50	-3.88	Pass
64 QAM	5735.0	21.99	9.5	21.99	26.50	-4.51	Pass
	5787.5	23.07	9.5	23.07	26.50	-3.43	Pass
	5845.0	22.63	9.5	22.63	26.50	-3.87	Pass

* - Output Power, dBm = SA Reading

** Limit, dBm = 30 - (Antenna gain - 6) = 26.5 dBm

***- Margin, dB = Output Power, dBm – specified limit, dBm.



Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak output power	
Test procedure:		FCC section 15.407(a)(4); ANSI C63.10, section 11.9	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.2 °C	Air Pressure: 1016 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.3 EIRP test results

ASSIGNED FREQUENCY RANGE: 5725-5850 MHz
 DETECTOR USED: Power Meter
 MODULATING SIGNAL: Average
 TRANSMITTER OUTPUT POWER SETTINGS: PRBS
 ANTENNA GAIN: Maximum
 9.5 dBi

EBW: 5 MHz

Modulation	Carrier frequency, MHz	SA Reading, dBm	Antenna Gain, dBi	EIRP result*, dBm	Limit, dBm	Margin**, dB	Verdict
QPSK	5732.5	23.04	9.5	32.54	36.00	-3.46	Pass
	5787.5	23.09	9.5	32.59	36.00	-3.41	Pass
	5842.5	22.32	9.5	31.82	36.00	-4.18	Pass
64 QAM	5732.5	22.52	9.5	32.02	36.00	-3.98	Pass
	5787.5	23.12	9.5	32.62	36.00	-3.38	Pass
	5842.5	22.33	9.5	31.83	36.00	-4.17	Pass

EBW: 10 MHz

Modulation	Carrier frequency, MHz	SA Reading, dBm	Antenna Gain, dBi	EIRP result*, dBm	Limit, dBm	Margin**, dB	Verdict
QPSK	5735.0	21.98	9.5	31.48	36.00	-4.52	Pass
	5787.5	23.08	9.5	32.58	36.00	-3.42	Pass
	5845.0	22.62	9.5	32.12	36.00	-3.88	Pass
64 QAM	5735.0	21.99	9.5	31.49	36.00	-4.51	Pass
	5787.5	23.07	9.5	32.57	36.00	-3.43	Pass
	5845.0	22.63	9.5	32.13	36.00	-3.87	Pass

* - EIRP Result, dBm = SA Reading + Antenna Gain (dBi)

** - Margin, dB = EIRP Result, dBm – specified limit, dBm



Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak output power	
Test procedure:		FCC section 15.407(a)(4); ANSI C63.10, section 11.9	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.2 °C	Air Pressure: 1016 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.4 Output power test results

ASSIGNED FREQUENCY RANGE:

5725-5850 MHz

DETECTOR USED:

Power Meter

MODULATING SIGNAL:

Average gated to the RF burst

TRANSMITTER OUTPUT POWER SETTINGS:

PRBS

ANTENNA GAIN:

Maximum

22.5 dBi

EBW:

5 MHz

Modulation	Carrier frequency, MHz	SA Reading, dBm	Antenna Gain, dBi	Output Power, dBm	Limit, ** dBm	Margin***, dB	Verdict
QPSK	5732.5	13.40	22.5	13.40	13.50	-0.10	Pass
	5787.5	13.24	22.5	13.24	13.50	-0.26	Pass
	5842.5	13.43	22.5	13.43	13.50	-0.07	Pass
64 QAM	5732.5	13.38	22.5	13.38	13.50	-0.12	Pass
	5787.5	13.44	22.5	13.44	13.50	-0.06	Pass
	5842.5	13.37	22.5	13.39	13.50	-0.11	Pass

EBW:

10 MHz

QPSK	5735.0	13.48	22.5	13.48	13.50	-0.02	Pass
	5787.5	13.47	22.5	13.47	13.50	-0.03	Pass
	5845.0	13.46	22.5	13.46	13.50	-0.04	Pass
64 QAM	5735.0	13.44	22.5	13.46	13.50	-0.04	Pass
	5787.5	13.33	22.5	13.33	13.50	-0.17	Pass
	5845.0	13.10	22.5	13.12	13.50	-0.38	Pass

* - Output Power, dBm = SA Reading

** Limit, dBm = 30 - (Antenna gain - 6) = 13.5 dBm

***- Margin, dB = Output Power, dBm – specified limit, dBm.



Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak output power	
Test procedure:		FCC section 15.407(a)(4); ANSI C63.10, section 11.9	
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.2 °C	Air Pressure: 1016 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.5 EIRP test results

ASSIGNED FREQUENCY RANGE: 5725-5850 MHz
Power Meter
DETECTOR USED: Average
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
ANTENNA GAIN: 22.5 dBi

EBW: 5 MHz

Modulation	Carrier frequency, MHz	SA Reading, dBm	Antenna Gain, dBi	EIRP result*, dBm	Limit, dBm	Margin**, dB	Verdict
QPSK	5732.5	13.40	22.5	35.90	36.00	-0.10	Pass
	5787.5	13.24	22.5	35.74	36.00	-0.26	Pass
	5842.5	13.43	22.5	35.93	36.00	-0.07	Pass
64 QAM	5732.5	13.38	22.5	35.88	36.00	-0.12	Pass
	5787.5	13.44	22.5	35.94	36.00	-0.06	Pass
	5842.5	13.37	22.5	35.87	36.00	-0.13	Pass

EBW: 10 MHz

QPSK	5735.0	13.48	22.5	35.98	36.00	-0.02	Pass
	5787.5	13.47	22.5	35.97	36.00	-0.03	Pass
	5845.0	13.46	22.5	35.96	36.00	-0.04	Pass
64 QAM	5735.0	13.44	22.5	35.94	36.00	-0.06	Pass
	5787.5	13.33	22.5	35.83	36.00	-0.17	Pass
	5845.0	13.1	22.5	35.60	36.00	-0.40	Pass

* - EIRP Result, dBm = SA Reading + Antenna Gain (dBi)

** - Margin, dB = EIRP Result, dBm – specified limit, dBm

Reference numbers of test equipment used

HL 2214	HL 3301	HL 3302	HL 3768	HL 3903	HL 4275		
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Full description is given in Appendix A.

Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

7.2 Peak spectral power density

7.2.1 General

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

Table 7.2.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm
5725.0 – 2850.0	500.0	30.0

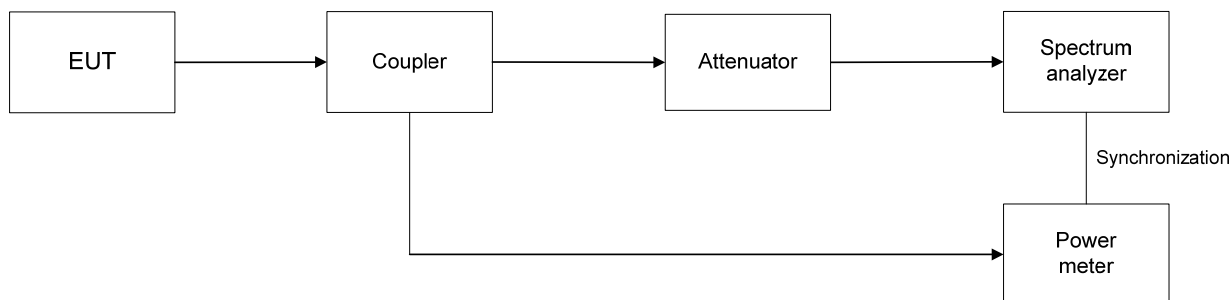
7.2.2 Test procedure

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

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

7.2.2.3 The peak power spectral density was measured using a sample detector and power averaging mode to find the highest level across the emission in any 1-MHz band after 100 sweeps of averaging. The test results are provided in the associated tables and plots.

Figure 7.2.1 Peak spectral power density test setup





Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.2 Peak spectral power density test results

ASSIGNED FREQUENCY RANGE: 5725-5850 MHz
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Average gated to the RF burst
 RESOLUTION BANDWIDTH: 510 kHz
 VIDEO BANDWIDTH: 1500 kHz
 RF CHAIN: Antenna connector 1 (the highest output power)
 ANTENNA GAIN: 9.5 dBi

CHANNEL BANDWIDTH 5 MHz

Carrier frequency, MHz	SA Reading, dBm/500 kHz	Peak power density*, dBm/500 kHz	Limit, dBm/500 kHz	Margin*, dB	Verdict
Modulation QPSK					
5732.5	18.75	18.75	26.5	-7.75	Pass
5787.5	17.41	17.41	26.5	-9.09	Pass
5842.5	17.21	17.21	26.5	-9.29	Pass
Modulation 64 QAM					
5732.5	19.10	19.10	26.5	-7.40	Pass
5787.5	17.83	17.83	26.5	-8.67	Pass
5842.5	16.98	16.98	26.5	-9.52	Pass

CHANNEL BANDWIDTH 10 MHz

Carrier frequency, MHz	SA Reading, dBm/500 kHz	Peak power density*, dBm/500 kHz	Limit, dBm/500 kHz	Margin*, dB	Verdict
Modulation QPSK					
5735.0	14.45	14.45	26.5	-12.05	Pass
5787.5	14.65	14.65	26.5	-11.85	Pass
5845.0	14.14	14.14	26.5	-12.36	Pass
Modulation 64 QAM					
5735.0	14.47	14.47	26.5	-12.03	Pass
5787.5	14.10	14.10	26.5	-12.40	Pass
5845.0	13.51	13.51	26.5	-12.99	Pass

* - Peak power density = Spectrum Analyzer Reading + 10*Log(N)

**- Due to 9.5 dBi antenna gain the limits of peak power spectral density were reduced by 3.5 dB;

*** - Margin, dB = Peak power density – specification limit



Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.3 Peak spectral power density test results

ASSIGNED FREQUENCY RANGE: 5725-5850 MHz
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Average gated to the RF burst
 RESOLUTION BANDWIDTH: 510 kHz
 VIDEO BANDWIDTH: 1500 kHz
 RF CHAIN: Antenna connector 1 (the highest output power)
 ANTENNA GAIN: 22.5 dBi

CHANNEL BANDWIDTH 5 MHz

Carrier frequency, MHz	SA Reading, dBm/500 kHz	Peak power density*, dBm/500 kHz	Limit**, dBm/500 kHz	Margin***, dB	Verdict
Modulation QPSK					
5732.5	6.81	6.81	13.5	-6.69	Pass
5787.5	6.65	6.65	13.5	-6.85	Pass
5842.5	7.13	7.13	13.5	-6.37	Pass
Modulation 64 QAM					
5732.5	7.81	7.81	13.5	-5.69	Pass
5787.5	7.13	7.13	13.5	-6.37	Pass
5842.5	6.36	6.36	13.5	-7.14	Pass

CHANNEL BANDWIDTH 10 MHz

Carrier frequency, MHz	SA Reading, dBm/500 kHz	Peak power density*, dBm/500 kHz	Limit, dBm/500 kHz	Margin*, dB	Verdict
Modulation QPSK					
5735.0	4.66	4.66	13.5	-8.84	Pass
5787.5	5.60	5.60	13.5	-7.90	Pass
5845.0	4.19	4.19	13.5	-9.31	Pass
Modulation 64 QAM					
5735.0	3.97	3.97	13.5	-9.53	Pass
5787.5	4.22	4.22	13.5	-9.28	Pass
5845.0	4.46	4.46	13.5	-9.04	Pass

* - Peak power density = Spectrum Analyzer Reading + 10*Log(N)

**- Due to 22.5 dBi antenna gain the limits of peak power spectral density were reduced by 16.5 dB;

*** - Margin, dB = Peak power density – specification limit.

Reference numbers of test equipment used

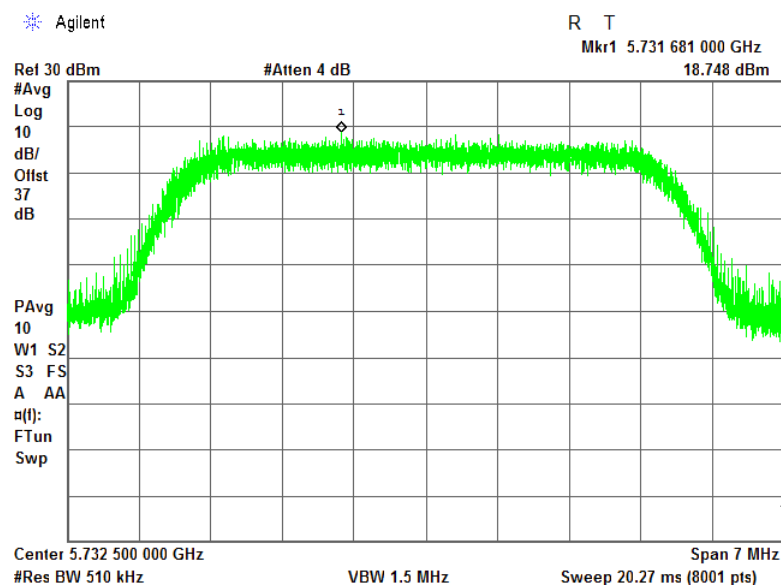
HL 2214	HL 3301	HL 3302	HL 3768	HL 3818	HL 3903	HL 4275	
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Full description is given in Appendix A.

Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

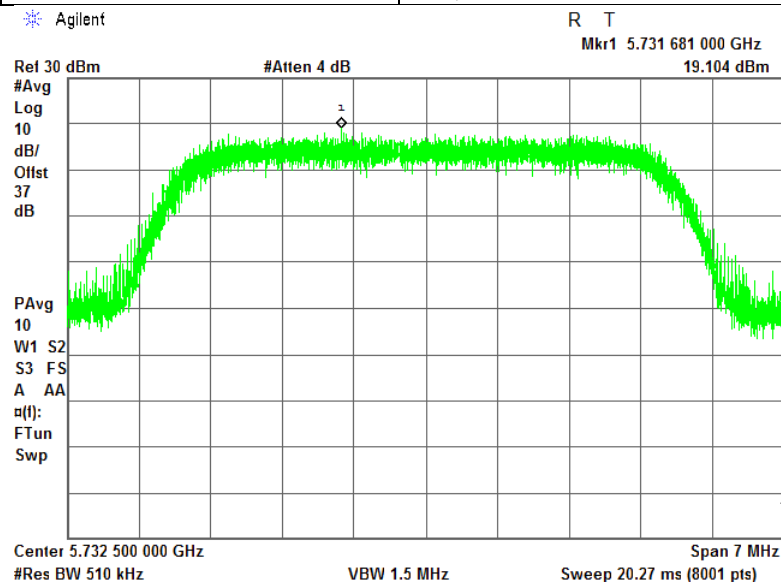
Plot 7.2.1 Peak spectral power density at low frequency within 6 dB band, antenna gain 9.5 dBi

Emission Bandwidth	5 MHz
Modulation	QPSK



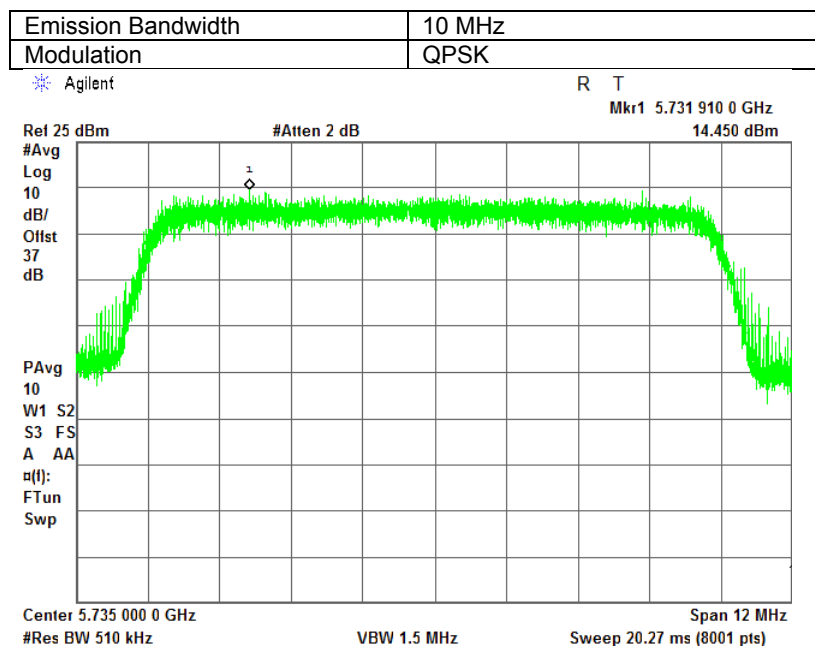
Plot 7.2.2 Peak spectral power density at low frequency within 6 dB band, antenna gain 9.5 dBi

Emission Bandwidth	5 MHz
Modulation	64QAM

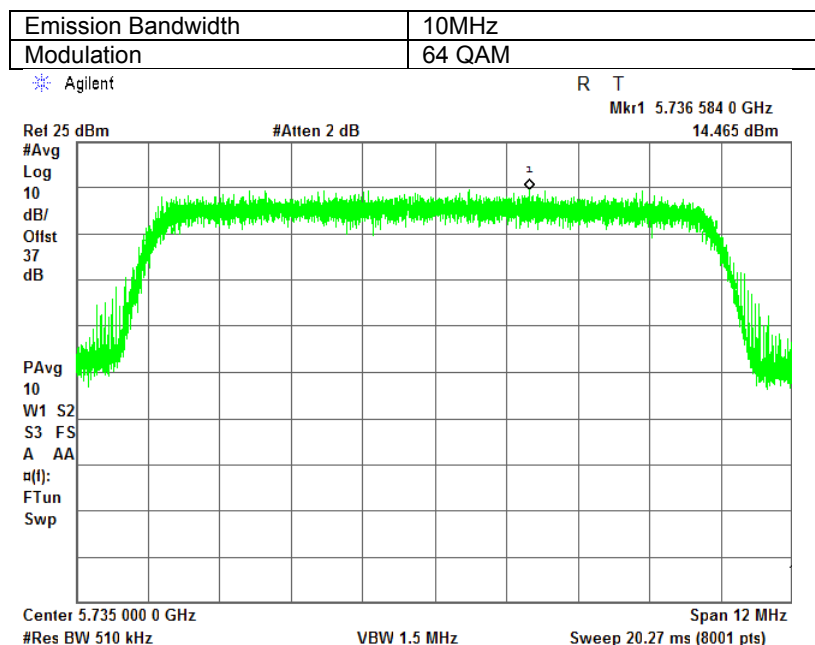


Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C		Air Pressure: 1016 hPa	Relative Humidity: 49 %
Remarks:		Power Supply: 48 VDC	

Plot 7.2.3 Peak spectral power density at low frequency within 6 dB band, antenna gain 9.5 dBi



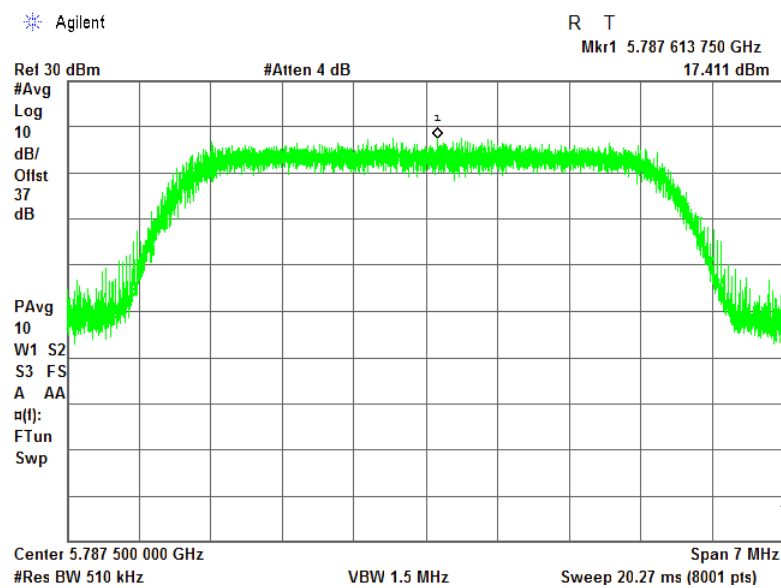
Plot 7.2.4 Peak spectral power density at low frequency within 6 dB band, antenna gain 9.5 dBi



Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

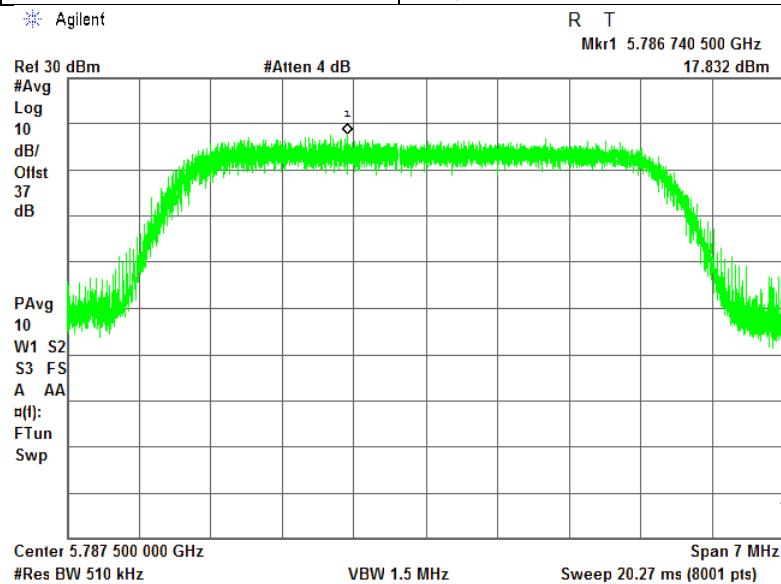
Plot 7.2.5 Peak spectral power density at mid frequency within 6 dB band, antenna gain 9.5 dBi

Emission Bandwidth	5 MHz
Modulation	QPSK



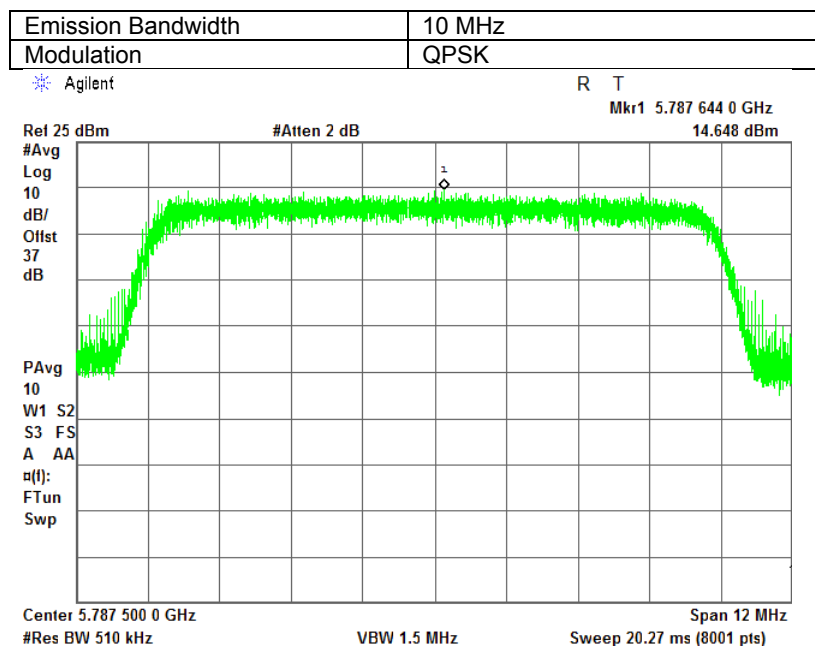
Plot 7.2.6 Peak spectral power density at mid frequency within 6 dB band, antenna gain 9.5 dBi

Emission Bandwidth	5 MHz
Modulation	64QAM

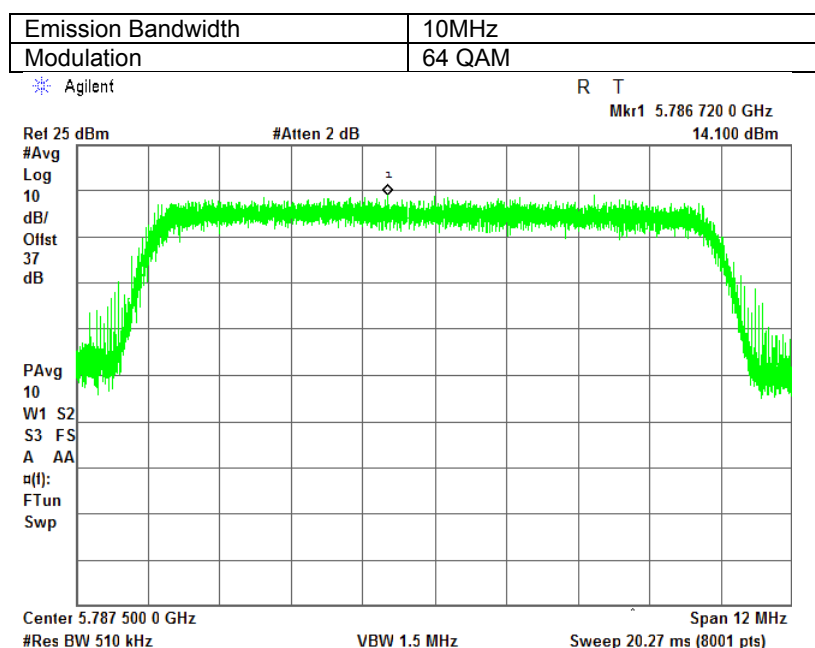


Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.7 Peak spectral power density at mid frequency within 6 dB band, antenna gain 9.5 dBi



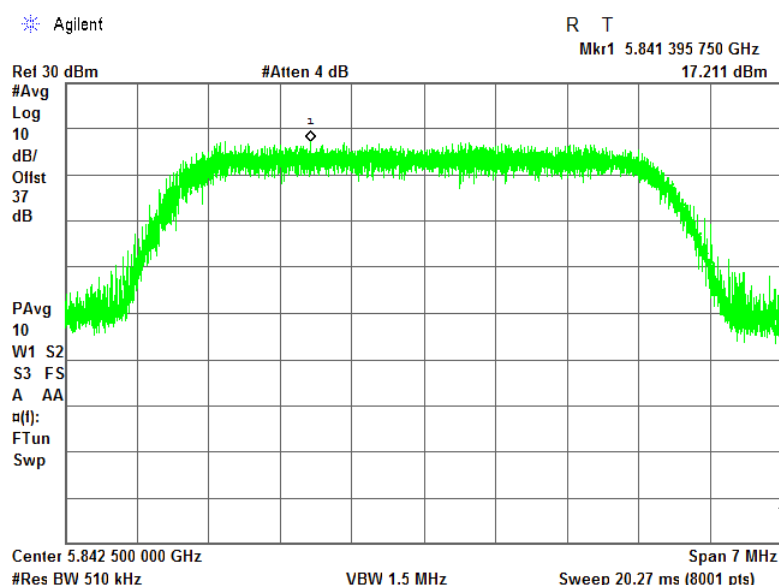
Plot 7.2.8 Peak spectral power density at mid frequency within 6 dB band, antenna gain 9.5 dBi



Test specification:	FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density		
Test procedure:	FCC section 15.407(a)(5); ANSI C63.10, section 11.10		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16	Relative Humidity:	49 %
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Power Supply:	48 VDC
Remarks:			

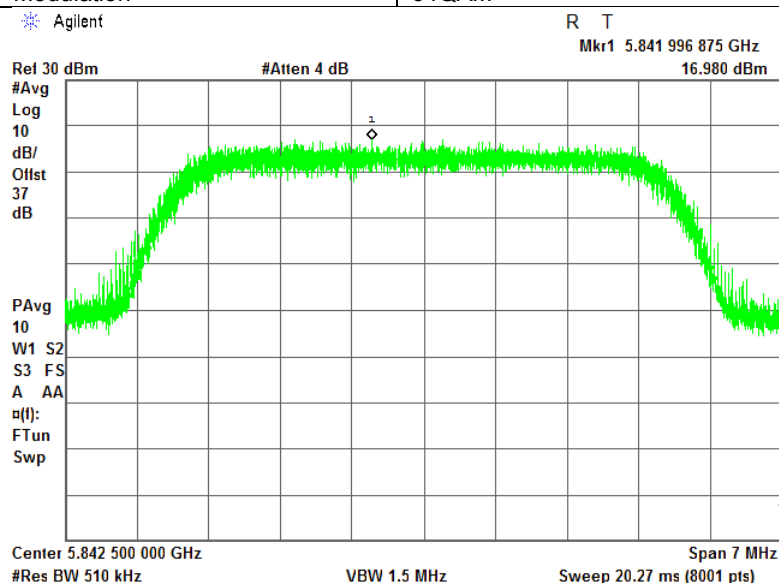
Plot 7.2.9 Peak spectral power density at high frequency within 6 dB band, antenna gain 9.5 dBi

Emission Bandwidth	5 MHz
Modulation	QPSK



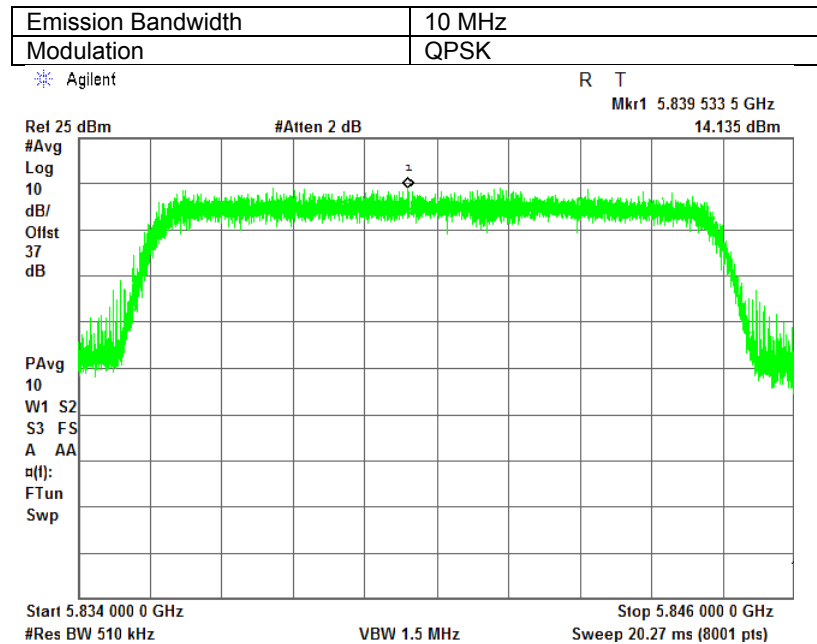
Plot 7.2.10 Peak spectral power density at high frequency within 6 dB band, antenna gain 9.5 dBi

Emission Bandwidth	5 MHz
Modulation	64QAM

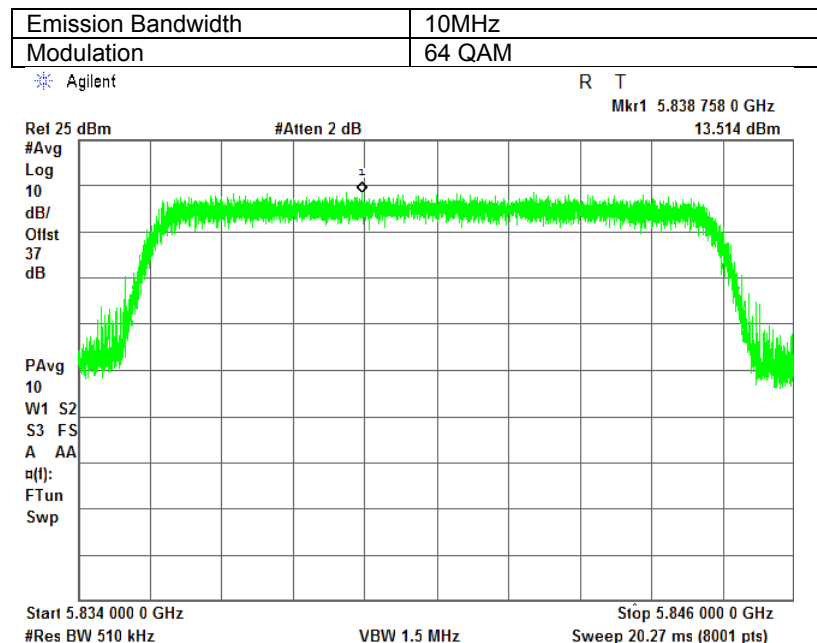


Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.11 Peak spectral power density at high frequency within 6 dB band, antenna gain 9.5 dBi



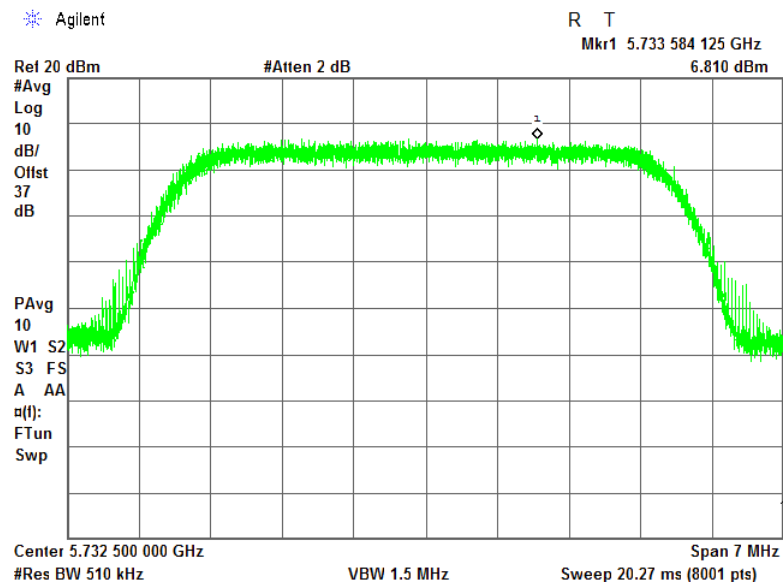
Plot 7.2.12 Peak spectral power density at high frequency within 6 dB band, antenna gain 9.5 dBi



Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

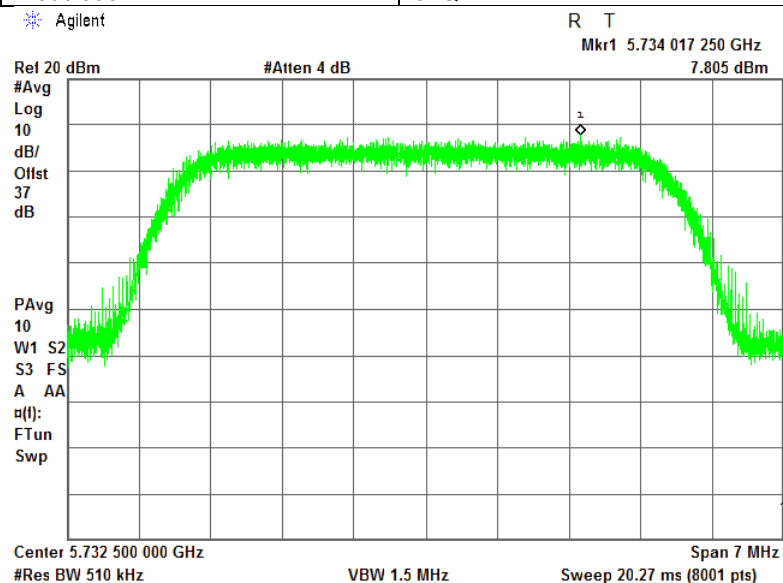
Plot 7.2.13 Peak spectral power density at low frequency within 6 dB band, antenna gain 22.5 dBi

Emission Bandwidth	5 MHz
Modulation	QPSK



Plot 7.2.14 Peak spectral power density at low frequency within 6 dB band, antenna gain 22.5 dBi

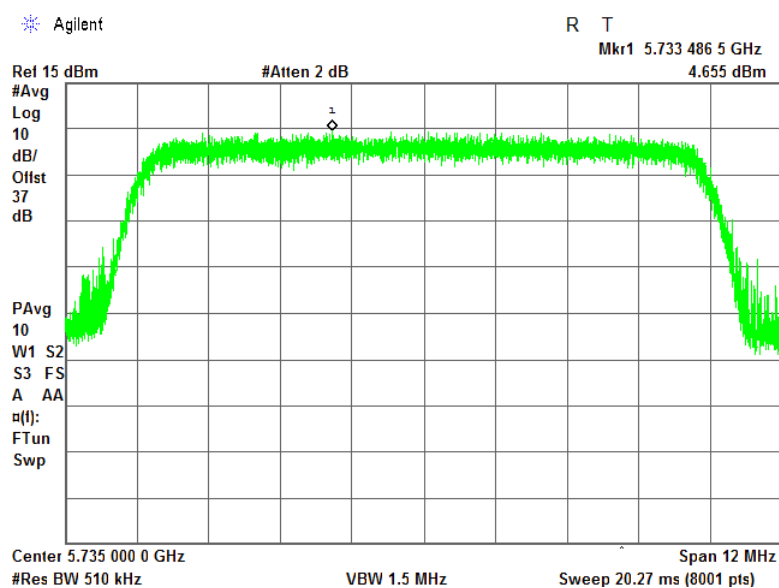
Emission Bandwidth	5 MHz
Modulation	64QAM



Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

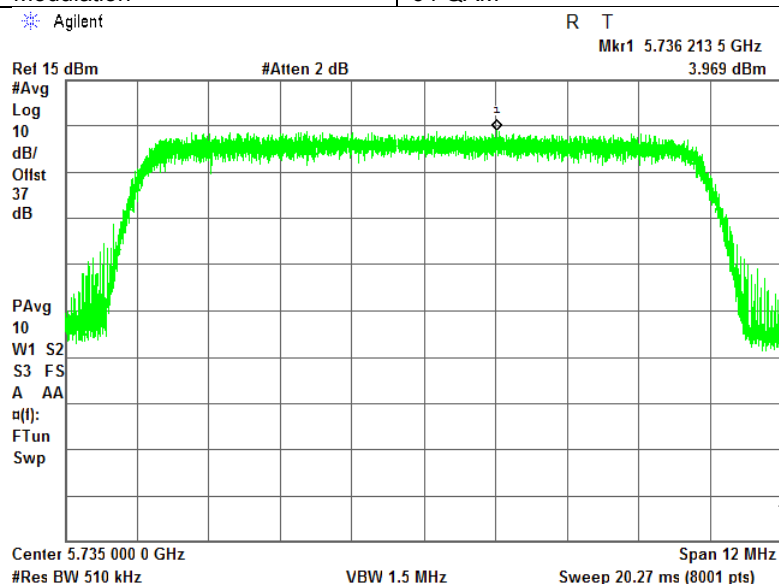
Plot 7.2.15 Peak spectral power density at low frequency within 6 dB band, antenna gain 22.5 dBi

Emission Bandwidth	10 MHz
Modulation	QPSK



Plot 7.2.16 Peak spectral power density at low frequency within 6 dB band, antenna gain 22.5 dBi

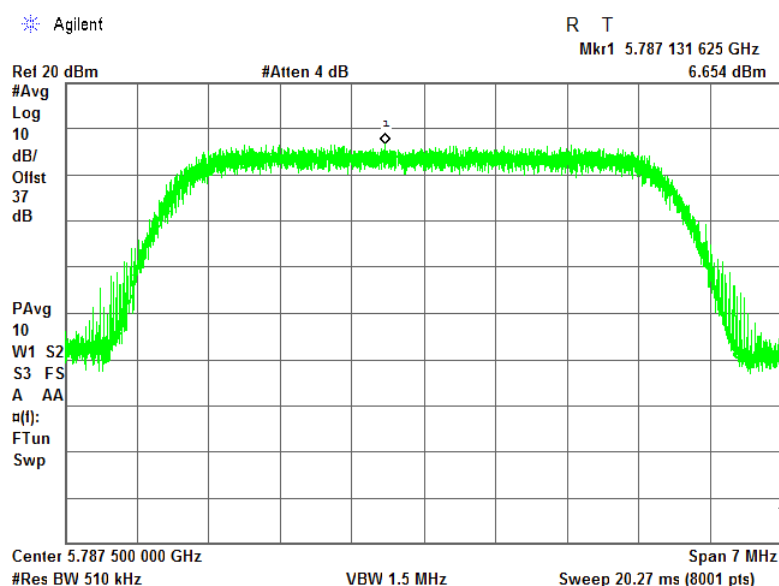
Emission Bandwidth	10MHz
Modulation	64 QAM



Test specification:	FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density		
Test procedure:	FCC section 15.407(a)(5); ANSI C63.10, section 11.10		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

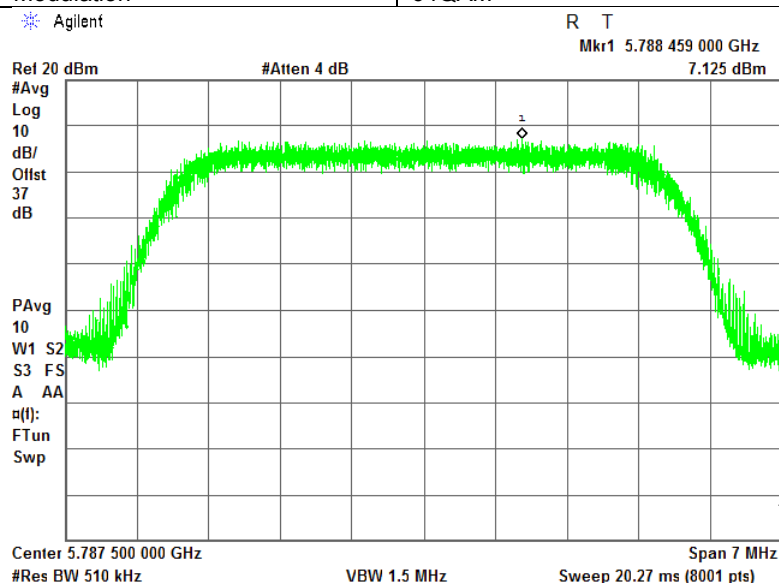
Plot 7.2.17 Peak spectral power density at mid frequency within 6 dB band, antenna gain 22.5 dBi

Emission Bandwidth	5 MHz
Modulation	QPSK



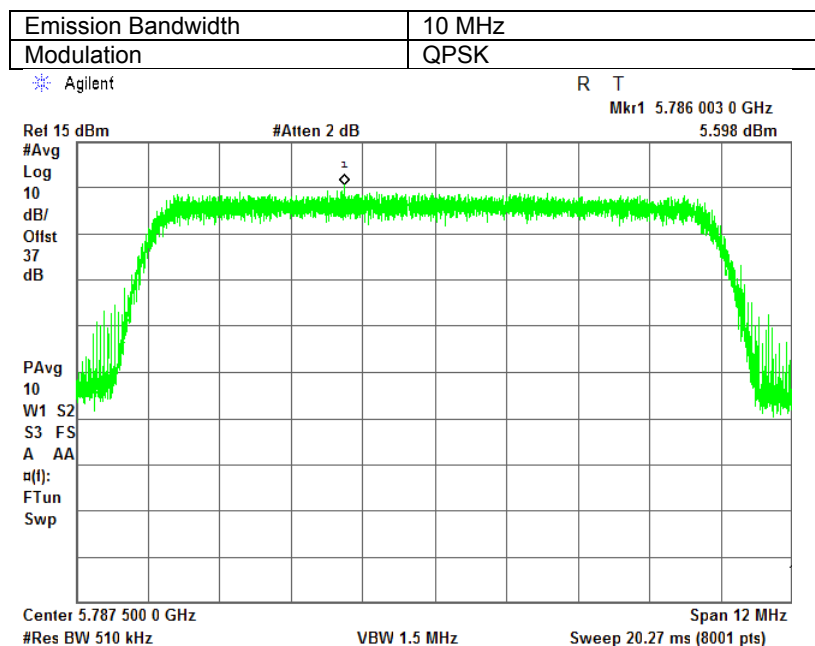
Plot 7.2.18 Peak spectral power density at mid frequency within 6 dB band, antenna gain 22.5 dBi

Emission Bandwidth	5 MHz
Modulation	64QAM

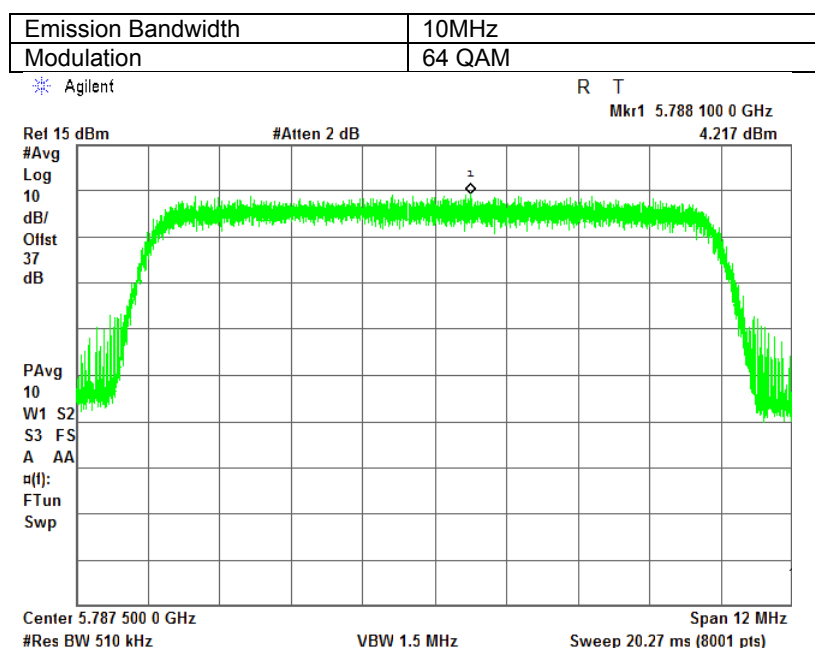


Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.19 Peak spectral power density at mid frequency within 6 dB band, antenna gain 22.5 dBi



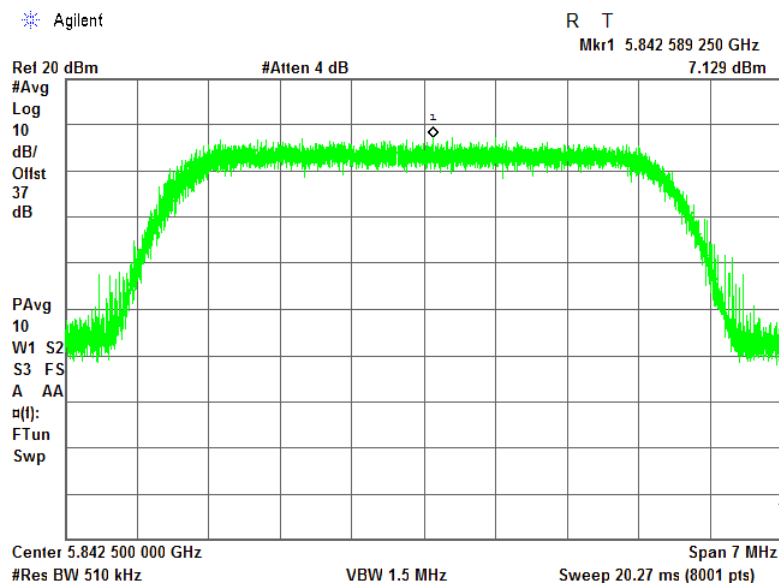
Plot 7.2.20 Peak spectral power density at mid frequency within 6 dB band, antenna gain 22.5 dBi



Test specification:	FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density		
Test procedure:	FCC section 15.407(a)(5); ANSI C63.10, section 11.10		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

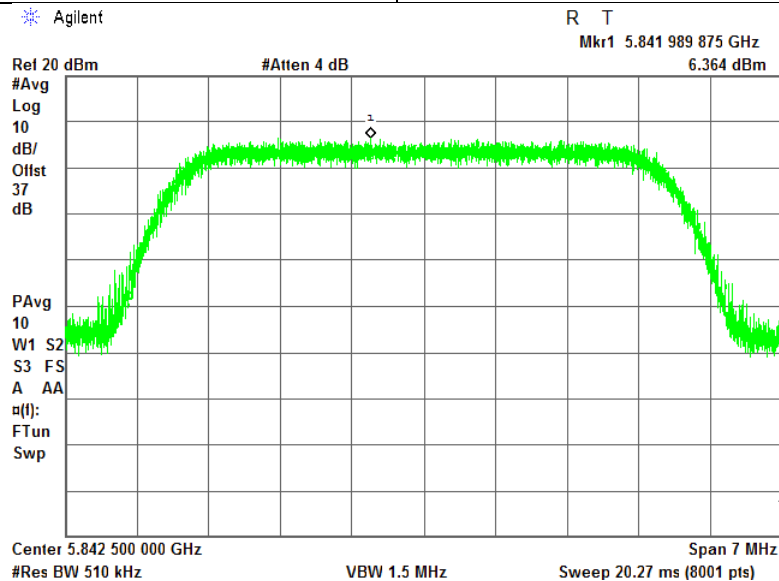
Plot 7.2.21 Peak spectral power density at high frequency within 6 dB band, antenna gain 22.5 dBi

Emission Bandwidth	5 MHz
Modulation	QPSK



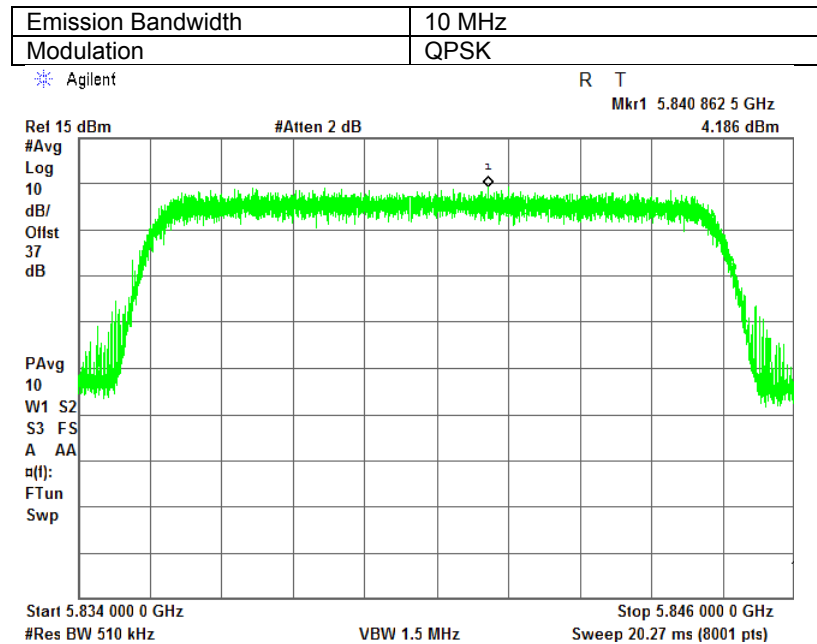
Plot 7.2.22 Peak spectral power density at high frequency within 6 dB band, antenna gain 22.5 dBi

Emission Bandwidth	5 MHz
Modulation	64QAM

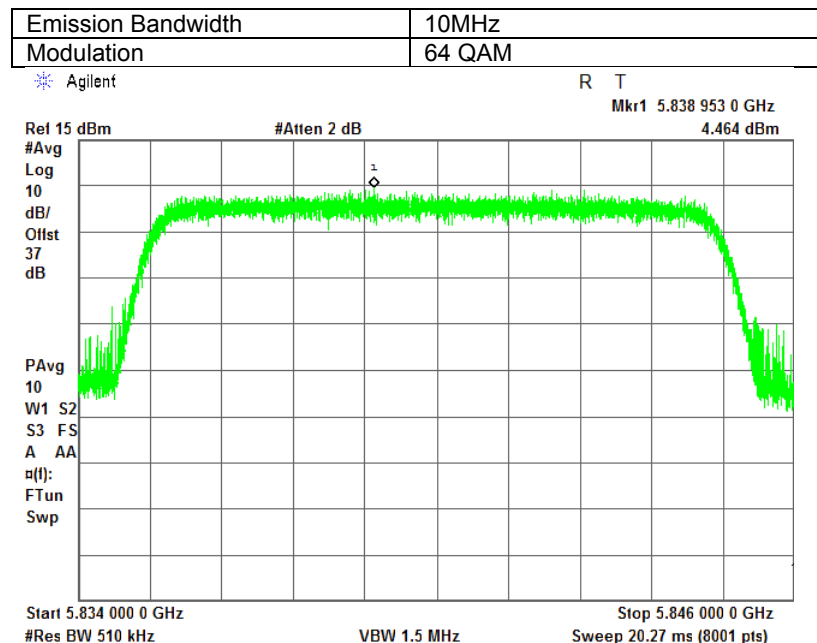


Test specification:		FCC section 15.407(a)(3), RSS-247 section 6.2.4, Peak spectral power density	
Test procedure:		FCC section 15.407(a)(5); ANSI C63.10, section 11.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.23 Peak spectral power density at high frequency within 6 dB band, antenna gain 22.5 dBi



Plot 7.2.24 Peak spectral power density at high frequency within 6 dB band, antenna gain 22.5 dBi





Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

7.3 Conducted out of band emissions

7.3.1 General

This test was performed to measure spurious emissions from the EUT near the band edges and within the pass band of the antenna. Specification test limits are given in Table 7.3.1.

Table 7.3.1 EIRP of undesirable emission limits outside restricted bands (above 1 GHz)

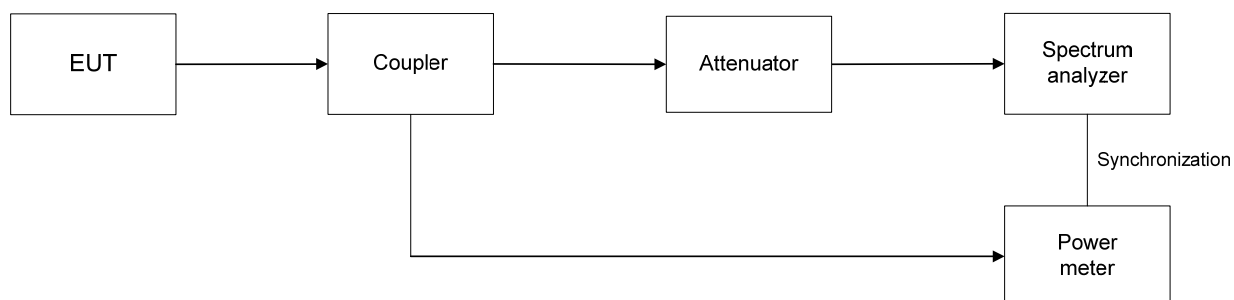
Operating frequency range, MHz	EIRP of spurious, dBm/MHz	Resolution bandwidth, kHz
5725 - 5850	-27 (below 5.715 GHz and above 5.860 GHz) -17 (in 5.715 - 5.725 GHz and 5.850 - 5.860 GHz)	1000

7.3.2 Test procedure

- 7.3.2.1** The EUT was set up as shown in Figure 7.3.1, energized and the performance check was conducted.
- 7.3.2.2** The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.
- 7.3.2.3** The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set to 1 MHz.
- 7.3.2.4** The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.
- 7.3.2.5** The maximum band edge emission and modulation product outside of the band were measured as provided in the associated tables and plots.
- 7.3.2.6** The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the mid and highest carrier frequencies.
- 7.3.2.7** Test results are shown in the Table 7.3.2, Table 7.3.3 and the associated plots.

Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Figure 7.3.1 Setup for conducted spurious emissions





Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Table 7.3.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 5725-5850 MHz
 DETECTOR USED: Average gated to the RF burst
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: ≥ RBW

ANTENNA 1

CANNEL BANDWIDTH 5 MHz
 ANTENNA GAIN: 9.5 dBi

Frequency, MHz	SA reading, dBm	Band edge emission, dBm	Limit, dBm	Margin, dB*	Verdict
Modulation QPSK					
5724.5	-31.85	-31.85	-26.5	-5.35	Pass
5712.5	-50.20	-50.20	-36.5	-13.70	
5850.5	-32.96	-32.96	-26.5	-6.46	
5860.5	-49.21	-49.21	-36.5	-12.71	
Modulation 64 QAM					
5724.5	-32.10	-32.10	-26.5	-5.60	Pass
5714.5	-49.34	-49.34	-36.5	-12.84	
5850.5	-32.55	-32.55	-26.5	-6.05	
5860.5	-49.59	-49.59	-36.5	-13.09	

CANNEL BANDWIDTH 10 MHz

Frequency, MHz	SA reading, dBm	Band edge emission, dBm	Limit, dBm	Margin, dB*	Verdict
Modulation QPSK					
5724.5	-26.71	-26.71	-26.5	-0.21	Pass
5714.5	-47.54	-47.54	-36.5	-11.04	
5851.5	-26.84	-26.84	-26.5	-0.34	
5860.5	-46.28	-46.28	-36.5	-9.78	
Modulation 64 QAM					
5723.5	-27.63	-27.63	-26.5	-1.13	Pass
5713.5	-46.45	-46.45	-36.5	-9.95	
5850.5	-28.53	-28.53	-26.5	-2.03	
5860.5	-45.53	-45.53	-36.5	-9.03	

*- Margin, dB = Attenuation below carrier – specification limit.



Test specification:		FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions	
Test procedure:		FCC section 15.407(b)(5); ANSI C63.10, section 11.11	
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Table 7.3.3 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 5725-5850 MHz
 DETECTOR USED: Average gated to the RF burst
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: ≥ RBW

ANTENNA 1

CANNEL BANDWIDTH

5 MHz

ANTENNA GAIN:

22.5 dBi

Frequency, MHz	SA reading, dBm	Band edge emission, dBm	Limit, dBm	Margin, dB*	Verdict
Modulation QPSK					
5724.5	-48.41	-48.41	-39.5	-8.91	Pass
5715.5	-51.64	-51.64	-49.5	-2.14	
5850.5	-48.53	-48.53	-39.5	-9.03	
5860.5	-51.08	-51.08	-49.5	-1.58	
Modulation 64 QAM					
5724.5	-48.41	-48.41	-39.5	-8.91	Pass
5712.5	-51.05	-51.05	-49.5	-1.55	
5850.5	-49.19	-49.19	-39.5	-9.69	
5860.5	-51.09	-51.09	-49.5	-1.59	

CANNEL BANDWIDTH

10 MHz

Frequency, MHz	SA reading, dBm	Band edge emission, dBm	Limit, dBm	Margin, dB*	Verdict
Modulation QPSK					
5724.5	-42.63	-42.63	-39.5	-3.13	Pass
5712.5	-51.50	-51.50	-49.5	-2.00	
5850.5	-44.07	-44.07	-39.5	-4.57	
5860.5	-50.87	-50.87	-49.5	-1.37	
Modulation 64 QAM					
5724.5	-43.18	-43.18	-39.5	-3.68	Pass
5712.5	-51.26	-51.26	-49.5	-1.76	
5850.5	-45.93	-45.93	-39.5	-6.43	
5860.5	-50.69	-50.69	-49.5	-1.19	

*- Margin, dB = Attenuation below carrier – specification limit.

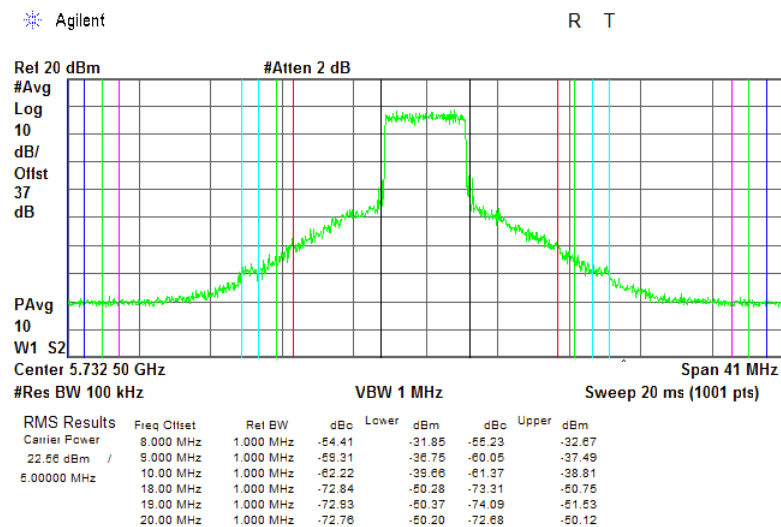
Reference numbers of test equipment used

HL 3301	HL 3302	HL 3768	HL 3818	HL 3903	HL 4275	HL	HL
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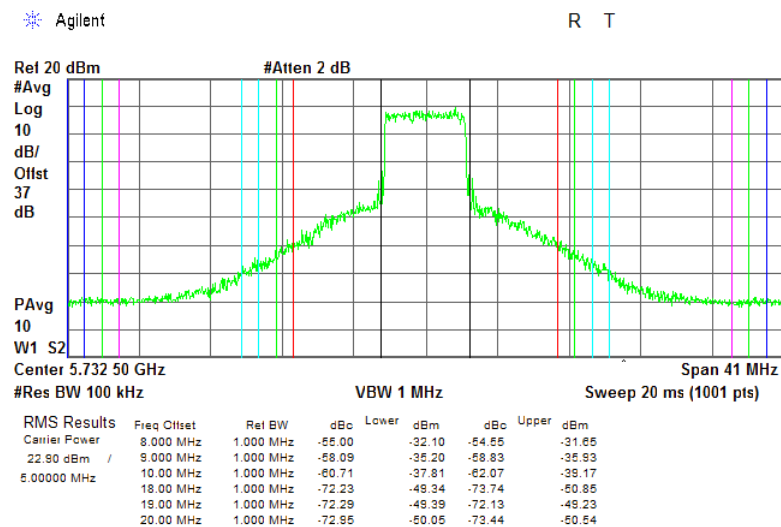
Full description is given in Appendix A.

Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.1 The highest band edge emission at low carrier frequency, 5 MHz BW, QPSK modulation, antenna 9.5 dBi

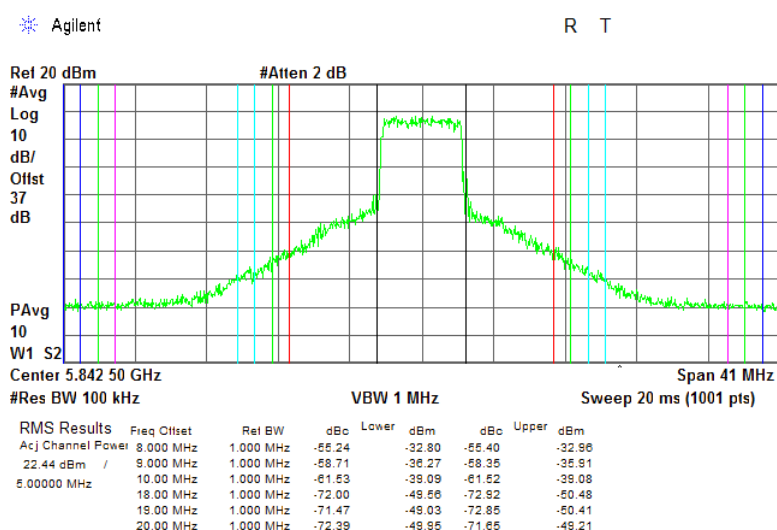


Plot 7.3.2 The highest band edge emission at low carrier frequency, 5 MHz BW, 64QAM modulation, antenna 9.5 dBi

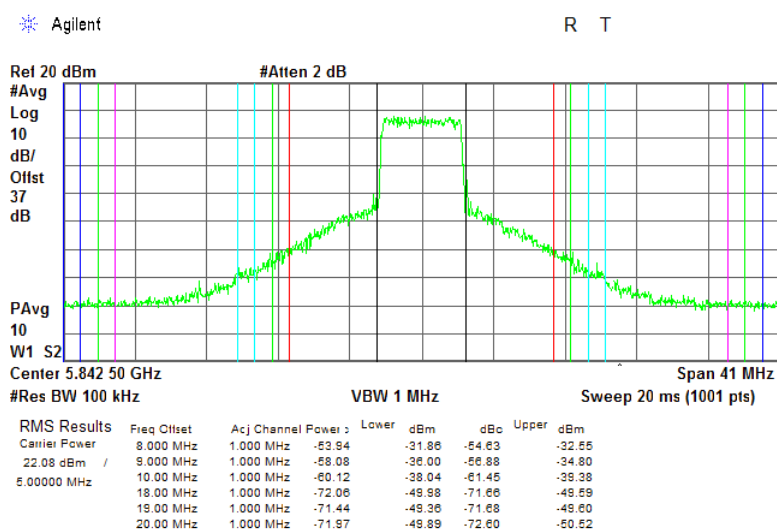


Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.3 The highest band edge emission at high carrier frequency, 5 MHz BW, QPSK modulation, antenna 9.5 dBi

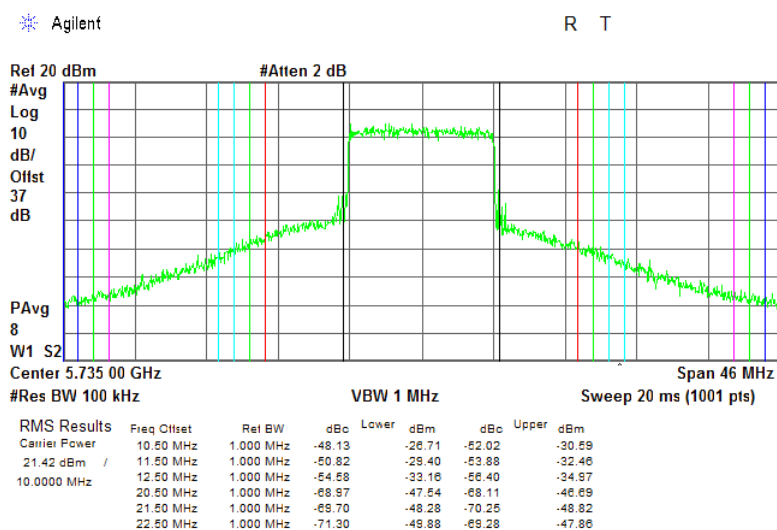


Plot 7.3.4 The highest band edge emission at high carrier frequency, 5 MHz BW, 64QAM modulation, antenna 9.5 dBi

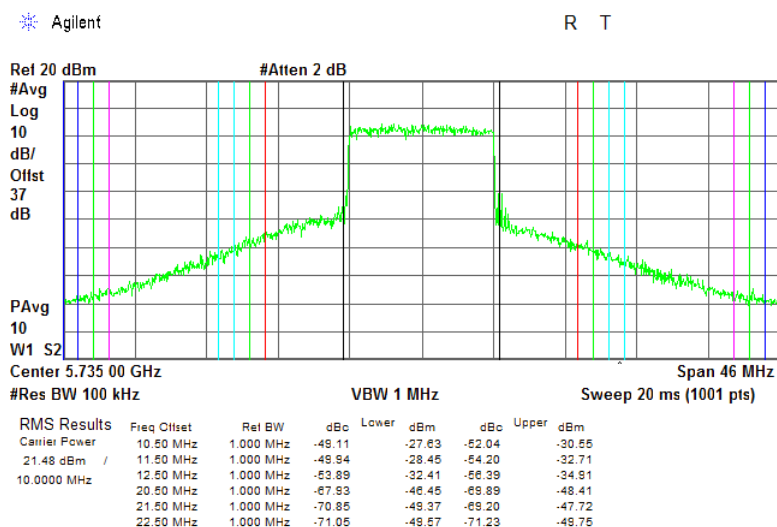


Test specification:		FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions	
Test procedure:		FCC section 15.407(b)(5); ANSI C63.10, section 11.11	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-Apr-16	
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.5 The lowest band edge emission at low carrier frequency, 10 MHz BW, QPSK modulation, antenna 9.5 dBi

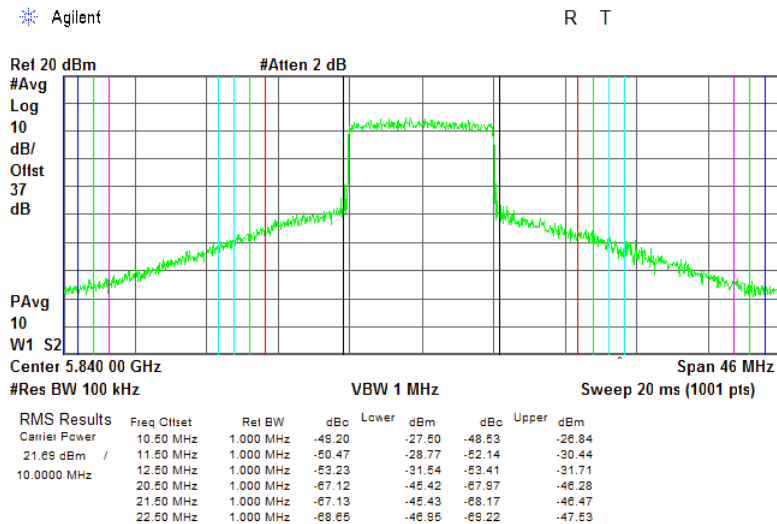


Plot 7.3.6 The lowest band edge emission at low carrier frequency, 10 MHz BW, 64QAM modulation, antenna 9.5 dBi

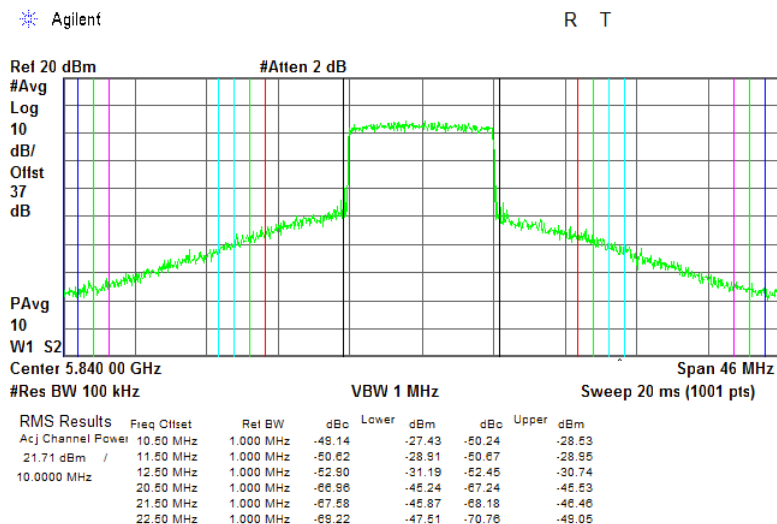


Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.7 The highest band edge emission at high carrier frequency, 10 MHz BW, QPSK modulation, antenna 9.5 dBi

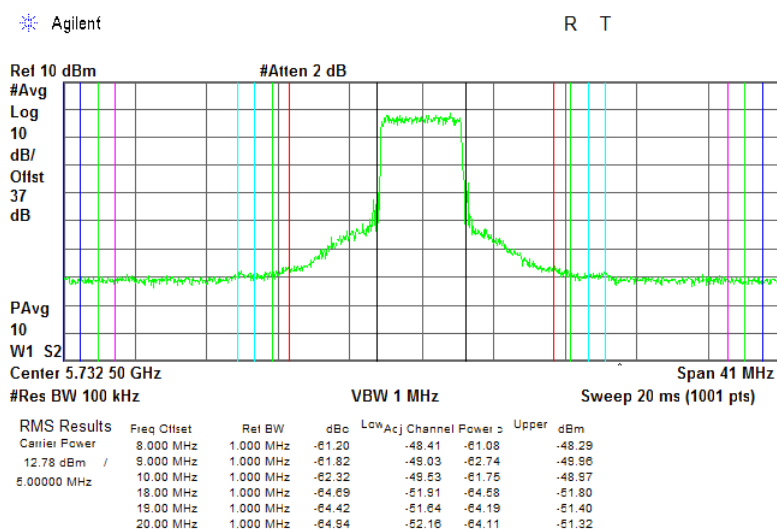


Plot 7.3.8 The highest band edge emission at high carrier frequency, 10 MHz BW, 64QAM modulation, antenna 9.5 dBi

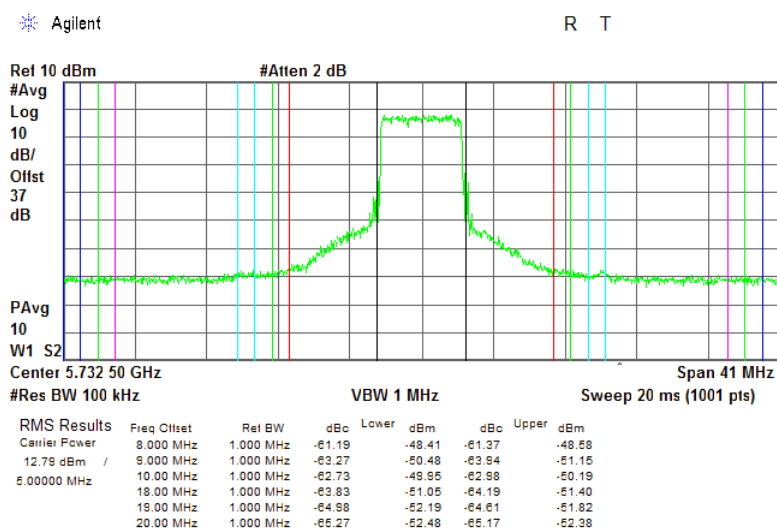


Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.9 The lowest band edge emission at low carrier frequency, 5 MHz BW, QPSK modulation, antenna 22.5 dBi

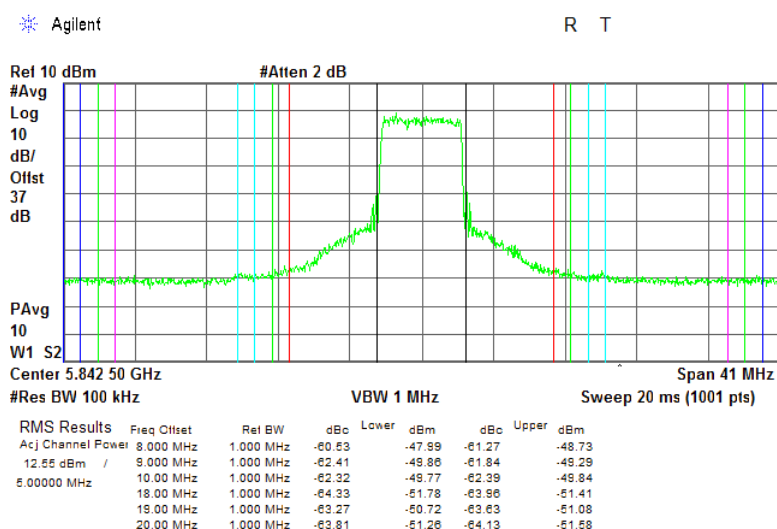


Plot 7.3.10 The lowest band edge emission at low carrier frequency, 5 MHz BW, 64QAM modulation, antenna 22.5 dBi

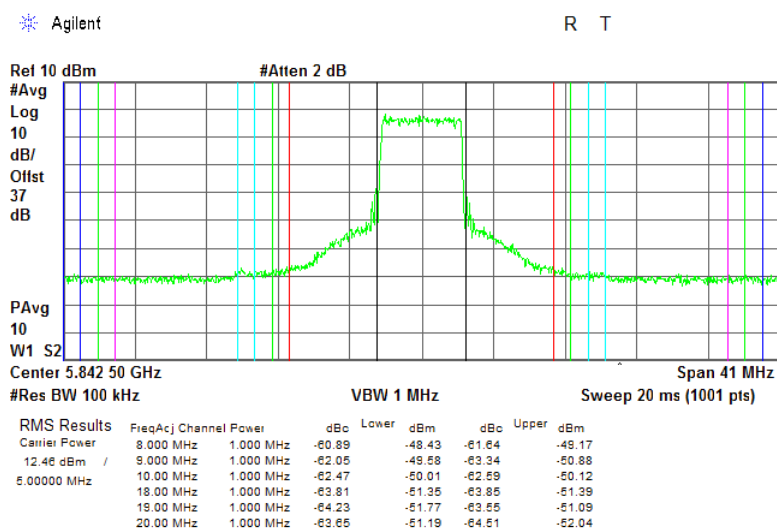


Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.11 The highest band edge emission at high carrier frequency, 5 MHz BW, QPSK modulation, antenna 22.5 dBi

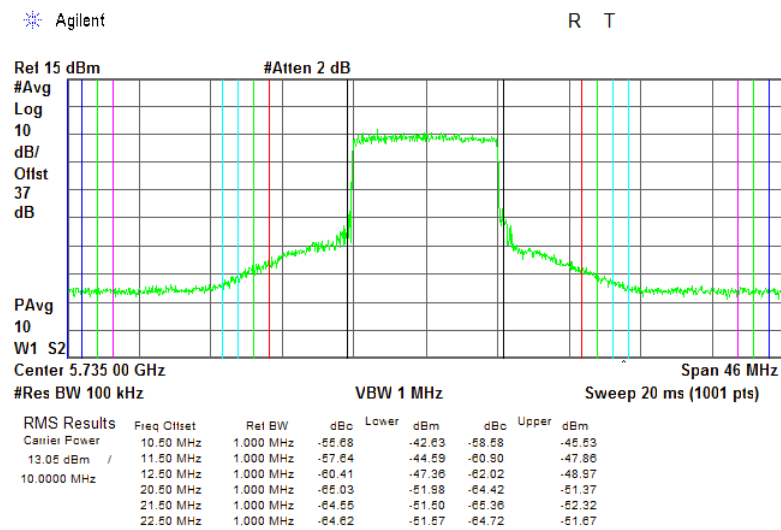


Plot 7.3.12 The highest band edge emission at high carrier frequency, 5 MHz BW, 64QAM modulation, antenna 22.5 dBi

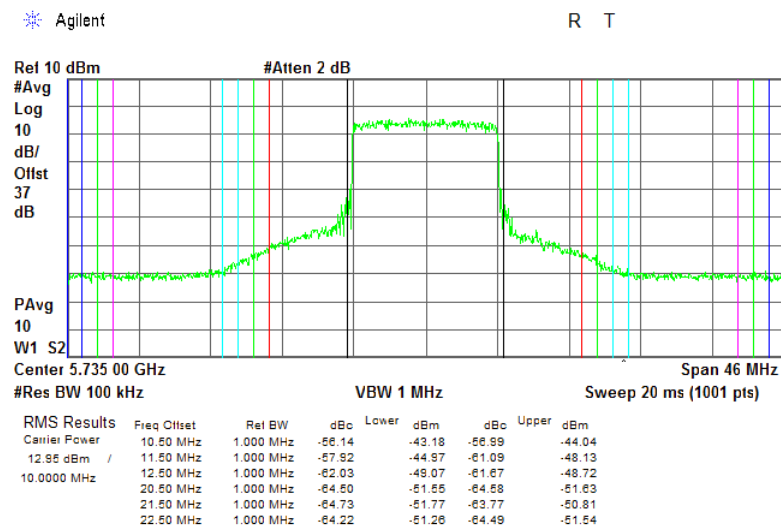


Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.13 The lowest band edge emission at low carrier frequency, 10 MHz BW, QPSK modulation, antenna 22.5 dBi

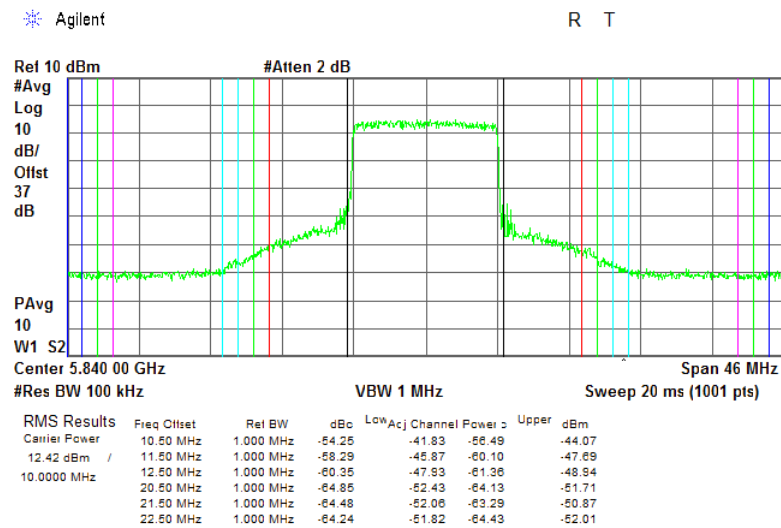


Plot 7.3.14 The lowest band edge emission at low carrier frequency, 10 MHz BW, 64QAM modulation, antenna 22.5 dBi

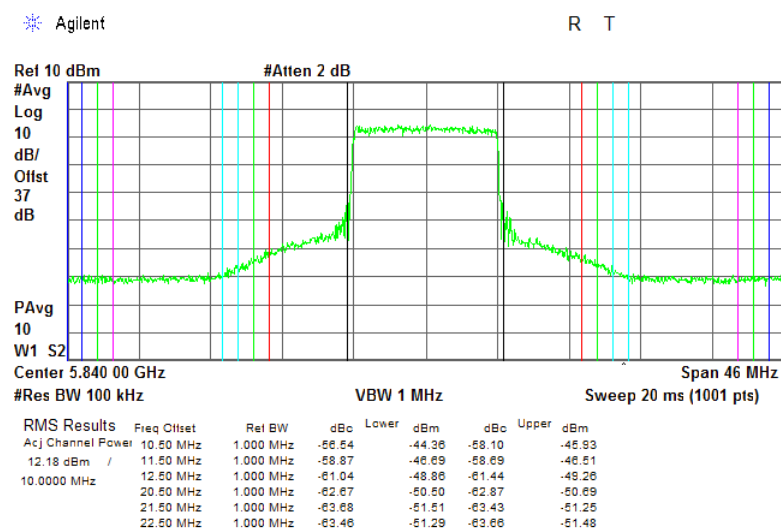


Test specification:	FCC section 15.407(b)(4), RSS-247 section 6.2.4, Conducted out of band emissions		
Test procedure:	FCC section 15.407(b)(5); ANSI C63.10, section 11.11		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23.3 °C	Air Pressure: 1016 hPa	Relative Humidity: 49 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.15 The highest band edge emission at high carrier frequency, 10 MHz BW, QPSK modulation, antenna 22.5 dBi



Plot 7.3.16 The highest band edge emission at high carrier frequency, 10 MHz BW, 64QAM modulation, antenna 22.5 dBi



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	MY45101057	30-Jan-16	30-Apr-17
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY45240586	30-Jan-16	30-Apr-17
3768	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	NA	18-Aug-15	18-Aug-16
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	29-Apr-15	29-Apr-16
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	15-Feb-16	15-Feb-17
4275	Test Cable , DC-18 GHz, 1.8 m, SMA/M - N/M	Mini-Circuits	CBL-6FT-SMNM+	70050	22-Nov-15	22-Nov-16

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB 12.4 GHz to 40 GHz: ± 2.3 dB
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
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Occupied bandwidth	± 8.0 %

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.

10 APPENDIX C Test laboratory description

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

Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; 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, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. 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). The FCC Designation Number is IL1001.

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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

FCC 47CFR part 15: 2015	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-247 Issue 1: 2015	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence- Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4: 2014	General Requirements for Compliance of Radio Apparatus

12 APPENDIX E Test equipment correction factors

Cable loss
Microwave Cable Assembly, Huber-Suhner, 40 GHz, 1.5 m, SMA-SMA, S/N 1226/2A
HL 3903

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	-0.02	9500	1.84	21000	2.98
100	0.15	10000	1.86	22000	3.07
500	0.38	10500	1.93	23000	3.13
1000	0.56	11000	1.99	24000	3.21
1500	0.69	11500	2.04	25000	3.26
2000	0.82	12000	2.10	26000	3.48
2500	0.90	12500	2.15	27000	3.44
3000	0.98	13000	2.21	28000	3.53
3500	1.06	13500	2.25	29000	3.59
4000	1.11	14000	2.29	30000	3.66
4500	1.17	14500	2.34	31000	3.70
5000	1.24	15000	2.36	32000	3.79
5500	1.32	15500	2.40	33000	3.88
6000	1.40	16000	2.45	34000	3.94
6500	1.50	16500	2.48	35000	3.91
7000	1.56	17000	2.56	36000	4.05
7500	1.62	17500	2.58	37000	4.22
8000	1.68	18000	2.60	38000	4.25
8500	1.74	19000	2.84	39000	4.27
9000	1.78	20000	2.88	40000	4.33

Cable loss
Test cable, Mini-Circuits, S/N 70050, 18 GHz, 1.8 m, SMA/M - N/M
CBL-6FT-SMNM+, HL 4275

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.08	5000	1.71	10200	2.64	15400	3.46
30	0.11	5100	1.73	10300	2.65	15500	3.47
50	0.14	5200	1.75	10400	2.66	15600	3.52
100	0.21	5300	1.76	10500	2.67	15700	3.55
200	0.30	5400	1.77	10600	2.70	15800	3.55
300	0.37	5500	1.82	10700	2.71	15900	3.55
400	0.43	5600	1.84	10800	2.72	16000	3.61
500	0.49	5700	1.86	10900	2.73	16100	3.62
600	0.54	5800	1.86	11000	2.75	16200	3.63
700	0.58	5900	1.89	11100	2.77	16300	3.62
800	0.62	6000	1.94	11200	2.78	16400	3.66
900	0.66	6100	1.95	11300	2.80	16500	3.71
1000	0.70	6200	1.96	11400	2.82	16600	3.71
1100	0.74	6300	1.97	11500	2.83	16700	3.67
1200	0.78	6400	2.01	11600	2.84	16800	3.69
1300	0.81	6500	2.03	11700	2.86	16900	3.74
1400	0.84	6600	2.02	11800	2.88	17000	3.73
1500	0.88	6700	2.02	11900	2.89	17100	3.71
1600	0.91	6800	2.05	12000	2.90	17200	3.73
1700	0.94	6900	2.06	12100	2.92	17300	3.77
1800	0.97	7000	2.07	12200	2.93	17400	3.77
1900	1.00	7100	2.07	12300	2.94	17500	3.76
2000	1.02	7200	2.08	12400	2.96	17600	3.76
2100	1.05	7300	2.11	12500	2.98	17700	3.78
2200	1.07	7400	2.13	12600	2.99	17800	3.80
2300	1.10	7500	2.15	12700	3.01	17900	3.79
2400	1.13	7600	2.16	12800	3.03	18000	3.78
2500	1.15	7700	2.18	12900	3.05		
2600	1.18	7800	2.21	13000	3.07		
2700	1.20	7900	2.24	13100	3.09		
2800	1.24	8000	2.25	13200	3.12		
2900	1.26	8100	2.26	13300	3.13		
3000	1.28	8200	2.29	13400	3.14		
3100	1.30	8300	2.31	13500	3.16		
3200	1.33	8400	2.33	13600	3.18		
3300	1.36	8500	2.33	13700	3.19		
3400	1.37	8600	2.34	13800	3.21		
3500	1.39	8700	2.36	13900	3.23		
3600	1.42	8800	2.38	14000	3.25		
3700	1.45	8900	2.39	14100	3.26		
3800	1.46	9000	2.40	14200	3.27		
3900	1.48	9100	2.42	14300	3.30		
4000	1.50	9200	2.45	14400	3.32		
4100	1.53	9300	2.46	14500	3.33		
4200	1.55	9400	2.48	14600	3.34		
4300	1.57	9500	2.50	14700	3.36		
4400	1.59	9600	2.52	14800	3.39		
4500	1.61	9700	2.54	14900	3.40		
4600	1.64	9800	2.56	15000	3.41		
4700	1.66	9900	2.58	15100	3.41		
4800	1.67	10000	2.60	15200	3.44		
4900	1.69	10100	2.61	15300	3.46		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
DC	direct current
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
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

END OF DOCUMENT