

TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247

FOR:

Ruggedcom Ltd.
Subscriber unit operating
in 5.8 GHz band
Models: WiN5258
WiN5158-AC
WiN5158-DC
FCC ID:VG5WIN5X58

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1 Applicant information

Client name: Ruggedcom Ltd.
Address: 32 Maskit Street, P.O.Box 12412, Herzeliya 46733, Israel
Telephone: +972 9951 9556
Fax: +972 9951 9557
E-mail: AmnonAssulin@ruggedcom.com
Contact name: Mr. Amnon Assulin

2 Equipment under test attributes

Product name: Subscriber unit operating in 5.8 GHz band
Product type: Transceiver
Model(s): WIN5158-AC
Serial number: 55813712001
Hardware version: RFID =20
Software release: SS4.3.4624.21
Receipt date 9/5/2012

3 Manufacturer information

Manufacturer name: Ruggedcom Ltd.
Address: 32 Maskit Street, P.O.Box 12412, Herzeliya 46733, Israel
Telephone: +972 9951 9556
Fax: +972 9951 9557
E-Mail: AmnonAssulin@ruggedcom.com
Contact name: Mr. Amnon Assulin





4 Test details

Project ID: 23641
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 9/6/2012
Test completed: 10/25/2012
Test specification(s): FCC 47CFR part 15, subpart C §15.247

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.247(a)(2), 6 dB bandwidth	Pass
Section 15.247(b)(3), Peak output power	Pass
Section 15.247(b)5, RF exposure	Pass, exhibit provided in Application for certification
Section 15.247(d), Conducted spurious emissions	Pass
Section 15.247(d), Radiated spurious emissions	Pass
Section 15.247(d), Band edge emissions	Pass
Section 15.247(e), Peak power density	Pass
Section 15.207(a), Conducted emission	Pass
Section 15.203, Antenna requirement	Pass

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

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer Mr. S. Samokha, test engineer	October 25, 2012	 
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	October 30, 2012	
Approved by:	Mr. M. Nikishin, EMC and radio group manager	October 30, 2012	



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 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, m
Power	AC power	PoE adapter	AC mains	1	Unshielded	3
Power and telecom	48 VDC + Ethernet	EUT	PoE adapter	1	Shielded	3
RF	Antenna	EUT	50 Ohm termination	2	NA	NA

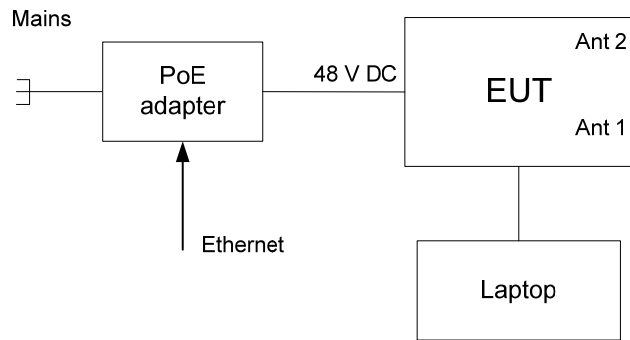
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	Lenovo	T410	2522WZN
PoE adapter (CPE)	RuggedWireless Ltd.	WiN1010 (0334B4848)	0507047

6.4 Changes made in EUT

No changes were implemented in the EUT.

6.5 Test configuration





6.6 Transmitter characteristics

Type of equipment				
<input checked="" type="checkbox"/>	Stand-alone (Equipment with or without its own control provisions)			
<input type="checkbox"/>	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)			
<input type="checkbox"/>	Plug-in card (Equipment intended for a variety of host systems)			
Intended use		Condition of use		
<input checked="" type="checkbox"/>	fixed	Always at a distance more than 2 m from all people		
<input checked="" type="checkbox"/>	mobile	Always at a distance more than 20 cm from all people		
<input type="checkbox"/>	portable	May operate at a distance closer than 20 cm to human body		
Assigned frequency range		5725.0 – 5850.0 MHz		
Operating frequency range		5728.0 – 5846.5 MHz		
RF channel bandwidth		5 MHz, 10 MHz		
Maximum rated output power		At transmitter 50 Ω RF output connector		23.38 dBm for 5 MHz CBW 23.24 dBm for 10 MHz CBW
Is transmitter output power variable?		<input type="checkbox"/> No		
		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> continuous variable
				<input checked="" type="checkbox"/> stepped variable with stepsize 0.5 dB
				minimum RF power -21 dBm
		maximum RF power 23.38 dBm		
Antenna connection				
<input type="checkbox"/> unique coupling	<input checked="" type="checkbox"/>	standard connector	<input type="checkbox"/> Integral	<input checked="" type="checkbox"/> with temporary RF connector <input type="checkbox"/> 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	
<input checked="" type="checkbox"/>	DC	Nominal rated voltage	48 V (via DC power supply from the mains)	
	AC mains	Nominal rated voltage	Frequency	
Transmitter power source 2				
		Nominal rated voltage	Battery type	
<input checked="" type="checkbox"/>	DC	Nominal rated voltage	12 VDC from power supply	
	AC mains	Nominal rated voltage	Frequency	
Common power source for transmitter and receiver		<input checked="" type="checkbox"/>	yes	no



Test specification:		Section 15.247(a)(2), 6 dB bandwidth	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
Relative Humidity: 48 %		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

7 Transmitter tests according to 47CFR part 15 subpart C requirements

7.1 Minimum 6 dB bandwidth

7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 6 dB bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum bandwidth, kHz
902.0 – 928.0	6.0	500.0
2400.0 – 2483.5		
5725.0 – 5850.0		

* - Modulation envelope reference points provided in terms of attenuation below the peak of modulated carrier.

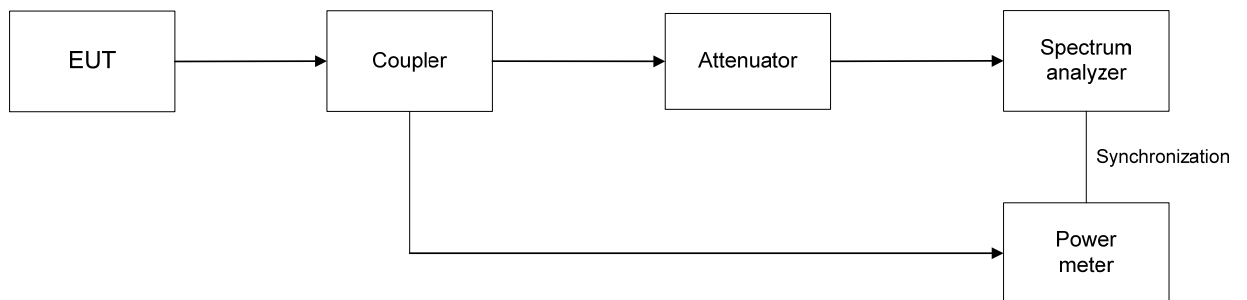
7.1.2 Test procedure

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 modulated carrier.

7.1.2.3 The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer RBW=100 kHz as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and the associated plots.

Figure 7.1.1 The 6 dB bandwidth test setup





Test specification:		Section 15.247(a)(2), 6 dB bandwidth	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 48 %	
		Power Supply: 48 VDC	
Remarks:			

Table 7.1.2 The 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 5725-5850 MHz
 DETECTOR USED: Peak
 SWEEP TIME: Auto
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 6.0 dBc; 99% OBW
 MODULATING SIGNAL: PRBS

CHANNEL BANDWIDTH 5 MHz

Carrier frequency, MHz	6 dB bandwidth, MHz	Limit, kHz	99%OBW, MHz	Verdict
QPSK				
5728.0	4.48	500	4.46	Pass
5787.5	4.45	500	4.47	Pass
5846.5	4.46	500	4.48	Pass
64 QAM				
5728.0	4.39	500	4.45	Pass
5787.5	4.36	500	4.64	Pass
5846.5	4.46	500	4.47	Pass

CHANNEL BANDWIDTH 10 MHz

Carrier frequency, MHz	6 dB bandwidth, MHz	Limit, kHz	Margin, kHz	Verdict
QPSK				
5730.5	9.08	500	9.08	Pass
5787.5	9.09	500	9.10	Pass
5844.0	9.17	500	9.13	Pass
64 QAM				
5730.5	9.09	500	9.09	Pass
5787.5	9.10	500	9.09	Pass
5844.0	9.17	500	9.13	Pass

Reference numbers of test equipment used

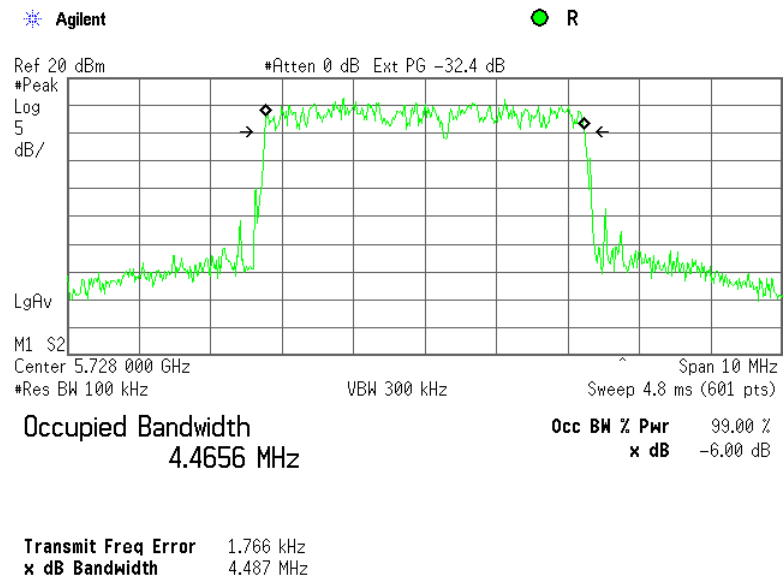
HL 3301	HL 3302	HL 3442	HL 3781	HL 3818	HL 3868	HL 3903		
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Full description is given in Appendix A.

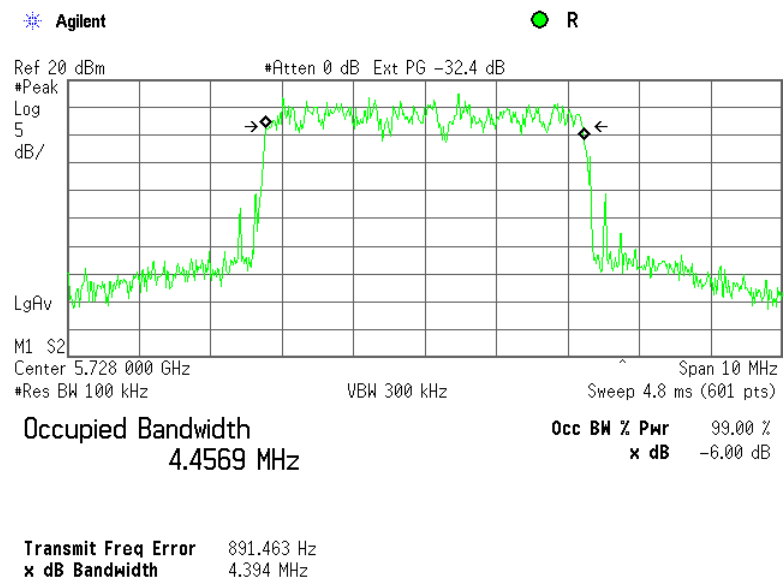


Test specification:		Section 15.247(a)(2), 6 dB bandwidth	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 48 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.1.1 The 6 dB bandwidth test result at low frequency, 5 MHz BW, QPSK modulation



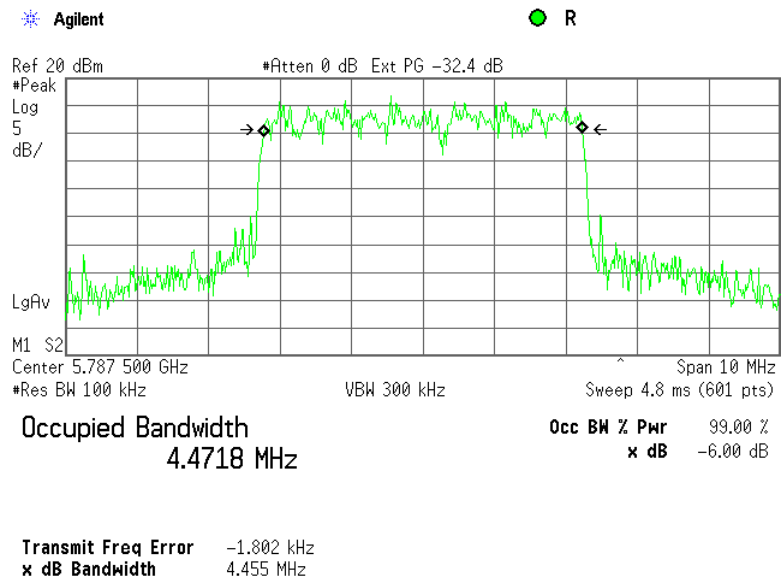
Plot 7.1.2 The 6 dB bandwidth test result at low frequency, 5 MHz BW, 64QAM modulation



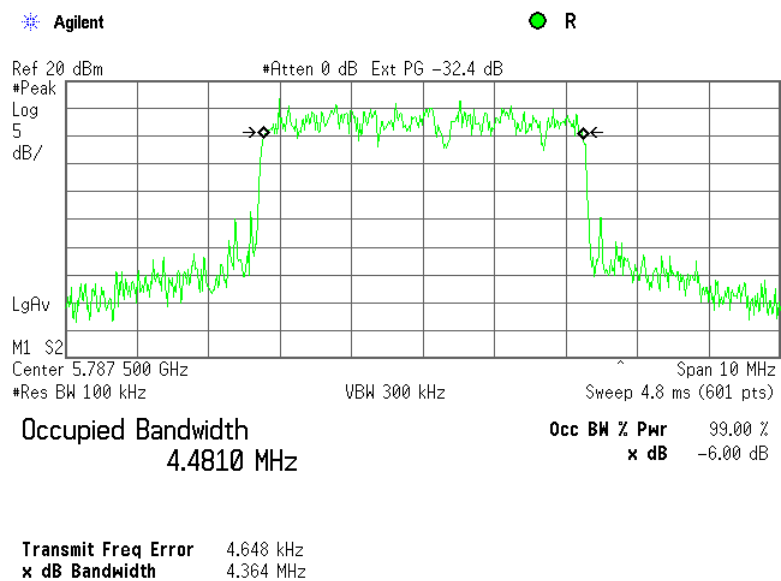


Test specification:		Section 15.247(a)(2), 6 dB bandwidth	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 48 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.1.3 The 6 dB bandwidth test result at mid frequency, 5 MHz BW, QPSK modulation



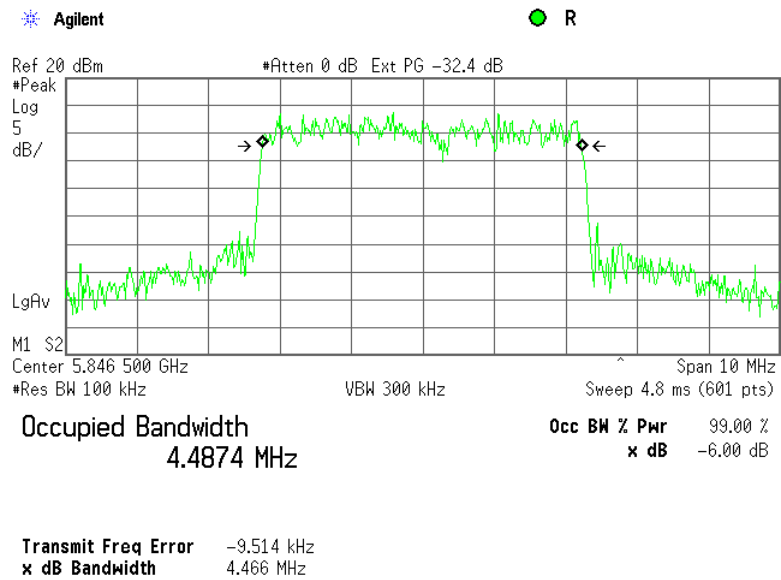
Plot 7.1.4 The 6 dB bandwidth test result at mid frequency, 5 MHz BW, 64QAM modulation



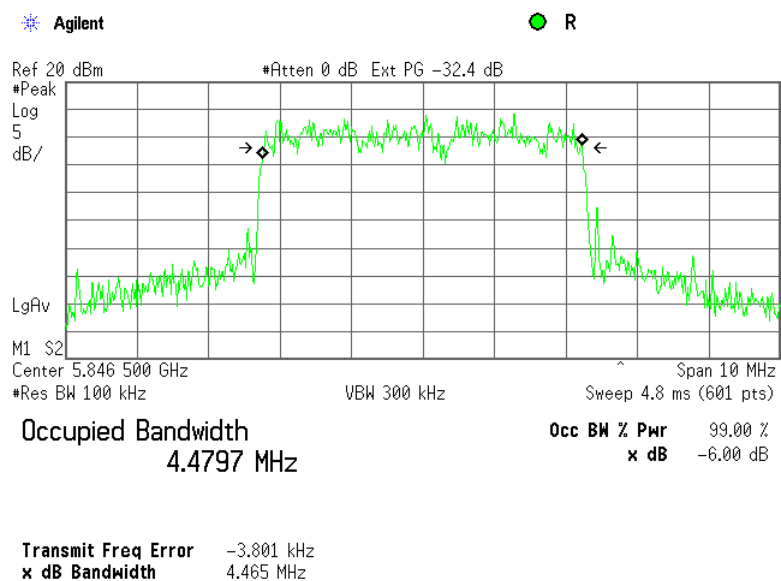


Test specification:		Section 15.247(a)(2), 6 dB bandwidth	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 48 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.1.5 The 6 dB bandwidth test result at high frequency, 5 MHz BW, QPSK modulation



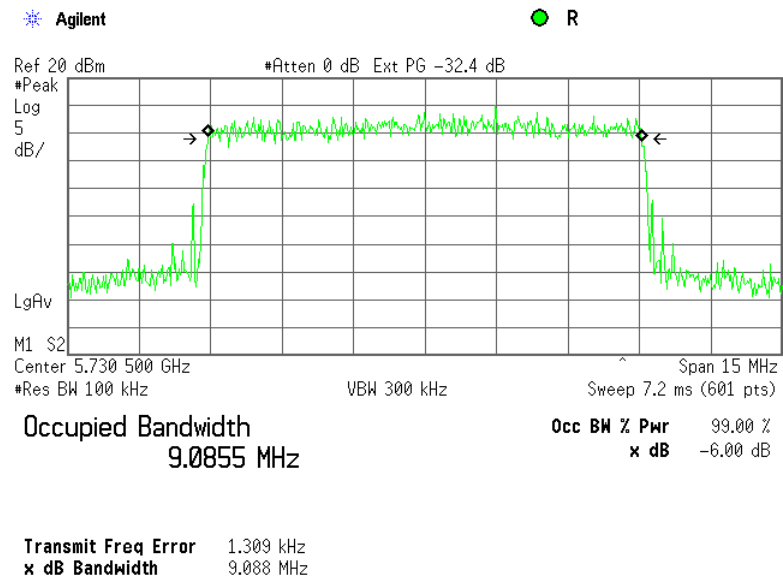
Plot 7.1.6 The 6 dB bandwidth test result at high frequency, 5 MHz BW, 64QAM modulation



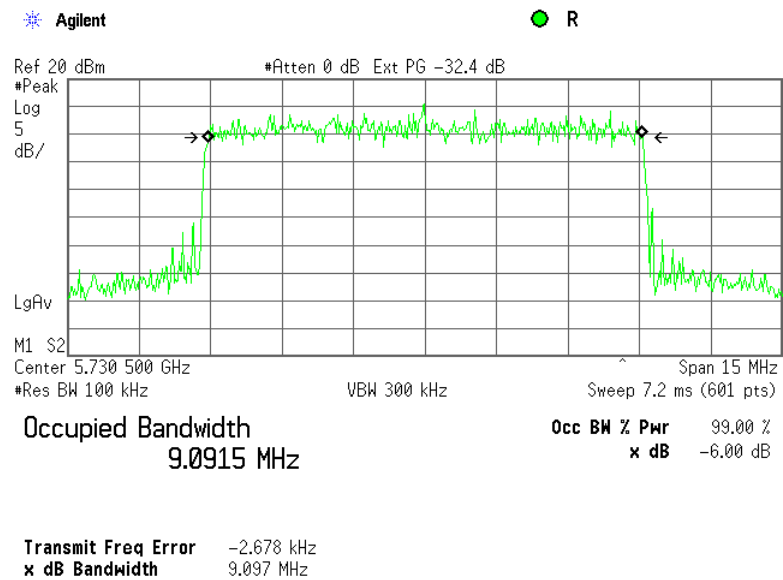


Test specification:		Section 15.247(a)(2), 6 dB bandwidth	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
Relative Humidity: 48 %		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.1.7 The 6 dB bandwidth test result at low frequency, 10 MHz BW, QPSK modulation



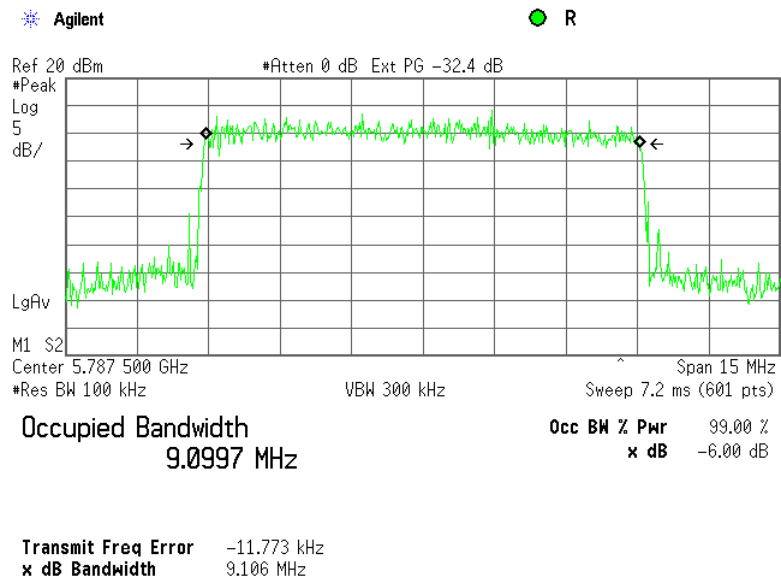
Plot 7.1.8 The 6 dB bandwidth test result at low frequency, 10 MHz BW, 64QAM modulation



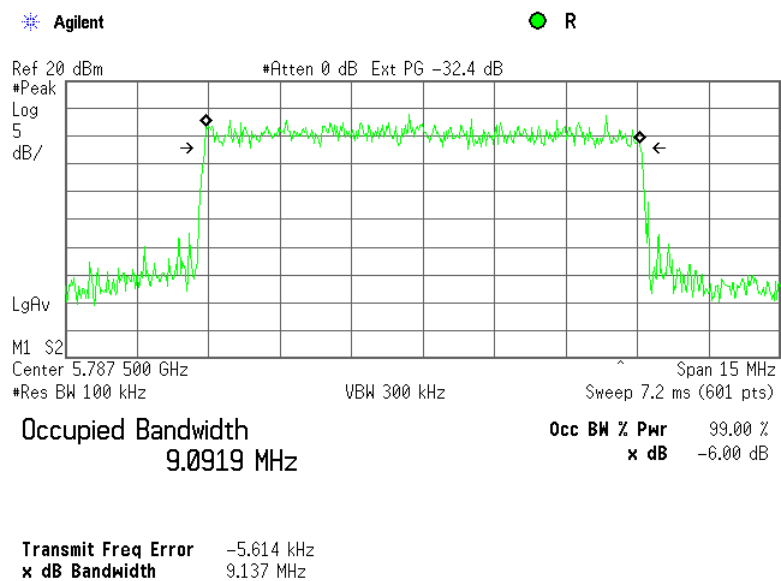


Test specification:		Section 15.247(a)(2), 6 dB bandwidth	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
Relative Humidity: 48 %		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.1.9 The 6 dB bandwidth test result at mid frequency, 10 MHz BW, QPSK modulation



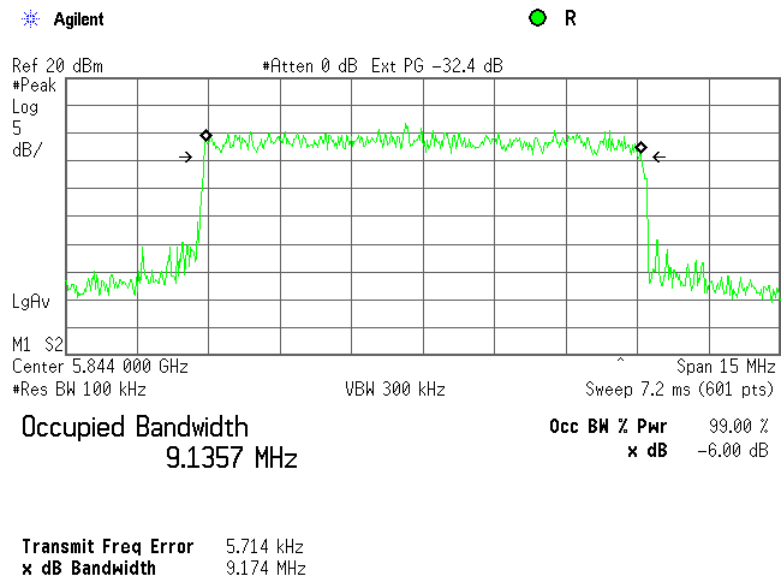
Plot 7.1.10 The 6 dB bandwidth test result at mid frequency, 10 MHz BW, 64QAM modulation



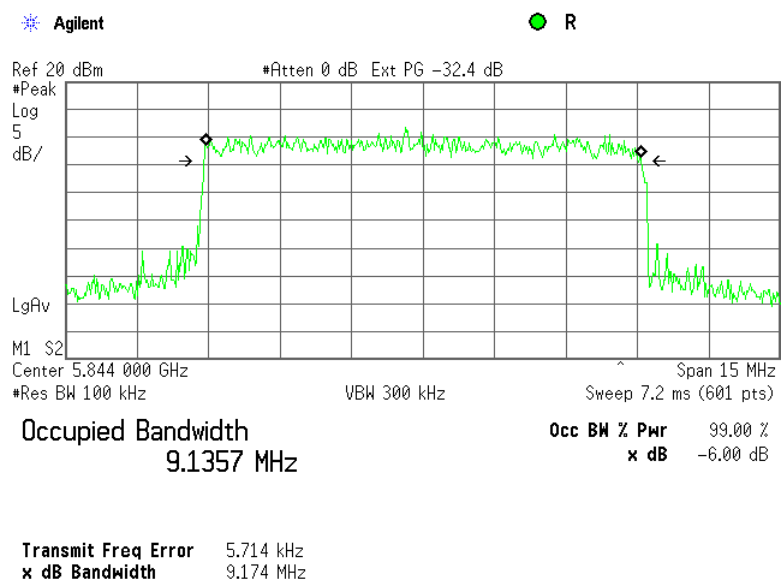


Test specification:		Section 15.247(a)(2), 6 dB bandwidth	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
Relative Humidity: 48 %		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.1.11 The 6 dB bandwidth test result at high frequency, 10 MHz BW, QPSK modulation



Plot 7.1.12 The 6 dB bandwidth test result at high frequency, 10 MHz BW, 64QAM modulation





Test specification:		Section 15.247(b)(3), Peak output power	
Test procedure:		ANSI C63.10-2009 section 6.10.3.1	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 24 °C		Air Pressure: 1008 hPa	
Remarks:		Verdict: PASS	
		Relative Humidity: 48 %	
		Power Supply: 48 VDC	

7.2 Output power

7.2.1 General

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

Table 7.2.1 Output power limits

Assigned frequency range, MHz	Maximum antenna gain, dBi	Peak output power*	
		W	dBm
902.0 – 928.0	6.0	1.0	30.0
2400.0 – 2483.5			
5725.0 – 5850.0			

*- If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;

without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;

by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

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.

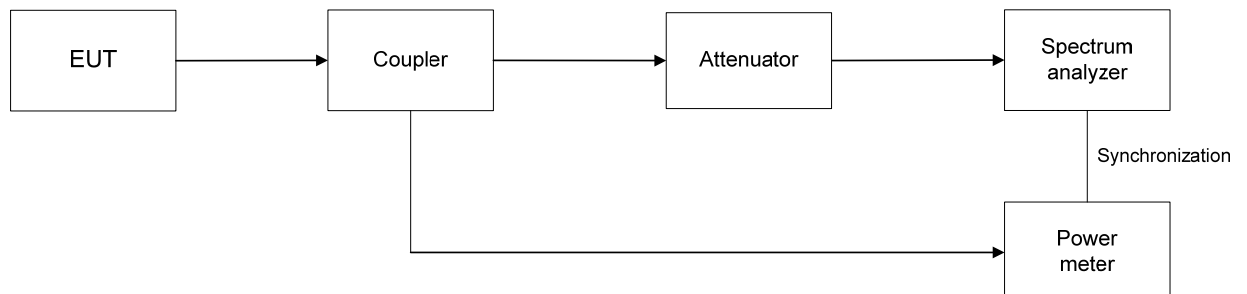
7.2.2.2 The EUT was adjusted to produce maximum available for end user RF output power.

7.2.2.3 The resolution bandwidth of spectrum analyzer was set to 1 MHz, VBW ≥3 MHz.

7.2.2.4 The peak power 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.

7.2.2.5 The test results were recorded in Table 7.2.2 and shown in the associated plots.

Figure 7.2.1 Output power test setup





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Test specification: Section 15.247(b)(3), Peak output power	
Test procedure:	ANSI C63.10-2009 section 6.10.3.1
Test mode:	Compliance
Date(s):	9/6/2012
Temperature: 24 °C	Air Pressure: 1008 hPa
Remarks:	Relative Humidity: 48 % Power Supply: 48 VDC
Verdict: PASS	

Table 7.2.2 Output power test results

ASSIGNED FREQUENCY RANGE: 5725-5850 MHz
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Sample
 RESOLUTION BANDWIDTH: 1 MHz
 VIDEO BANDWIDTH: > 3 MHz

EUT BANDWIDTH: 5 MHz

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	Output power, dBm	Limit, dBm	Margin*, dB	Verdict
QPSK							
5728.0	23.21	included	included	23.21	30	6.79	Pass
5787.5	22.84	included	included	22.84	30	7.16	Pass
5846.5	21.21	included	included	21.21	30	8.79	Pass
64 QAM							
5728.0	23.38	included	included	23.38	30	6.62	Pass
5787.5	23.12	included	included	23.12	30	6.88	Pass
5846.5	21.15	included	included	21.15	30	8.85	Pass

EUT BANDWIDTH: 10 MHz

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	Output power, dBm	Limit, dBm	Margin*, dB	Verdict
QPSK							
5730.5	23.20	included	included	23.20	30	6.80	Pass
5787.5	23.19	included	included	23.19	30	6.81	Pass
5844.0	21.20	included	included	21.20	30	8.80	Pass
64 QAM							
5730.5	23.21	included	included	23.21	30	6.79	Pass
5787.5	23.24	included	included	23.24	30	6.76	Pass
5844.0	21.32	included	included	21.32	30	8.68	Pass

* - Margin, dB = Output power, dBm – specification limit, dBm.
 Note: Maximum output power was obtained at Unom input power voltage.

Reference numbers of test equipment used

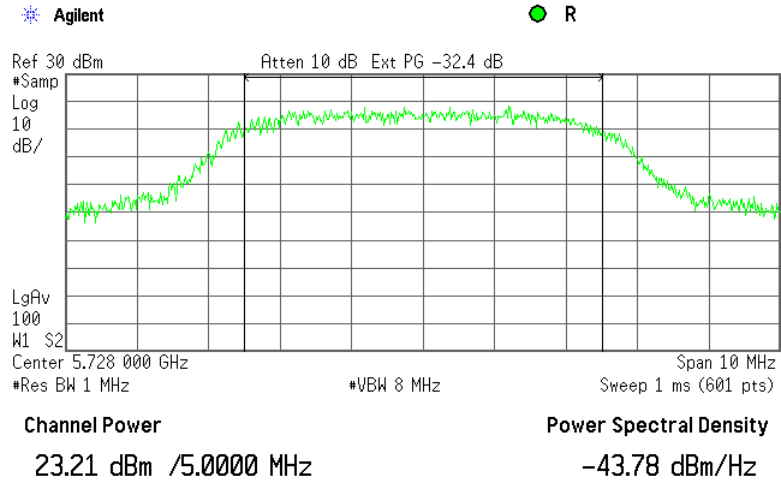
HL 3301	HL 3302	HL 3442	HL 3781	HL 3818	HL 3868		
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Full description is given in Appendix A.

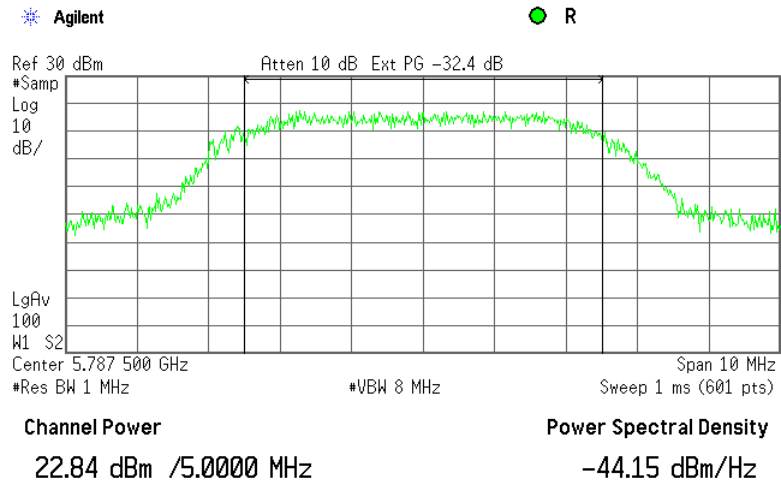


Test specification: Section 15.247(b)(3), Peak output power			
Test procedure: ANSI C63.10-2009 section 6.10.3.1			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.1 Output power at low frequency, 5 MHz BW, QPSK modulation



Plot 7.2.2 Output power at mid frequency, 5 MHz BW, QPSK modulation

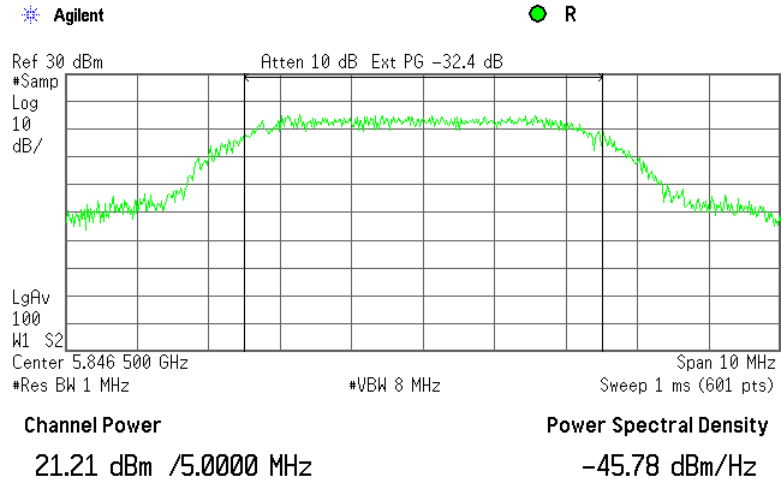




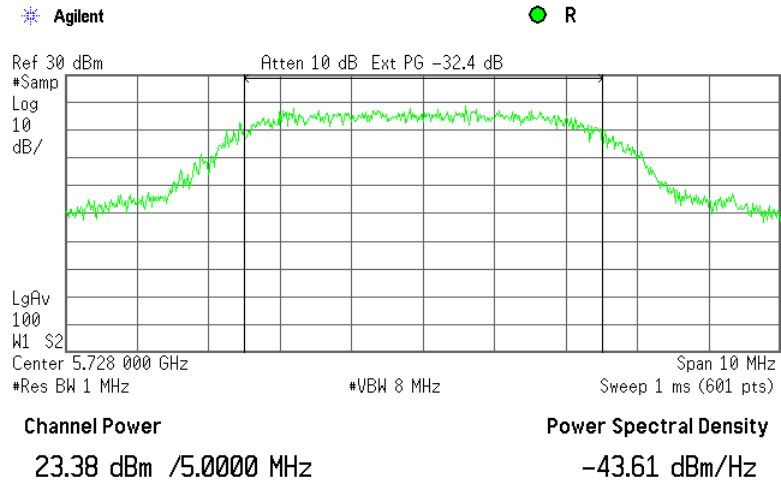
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Test specification: Section 15.247(b)(3), Peak output power			
Test procedure: ANSI C63.10-2009 section 6.10.3.1			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.3 Output power at high frequency, 5 MHz BW, QPSK modulation



Plot 7.2.4 Output power at low frequency, 5 MHz BW, 64QAM modulation

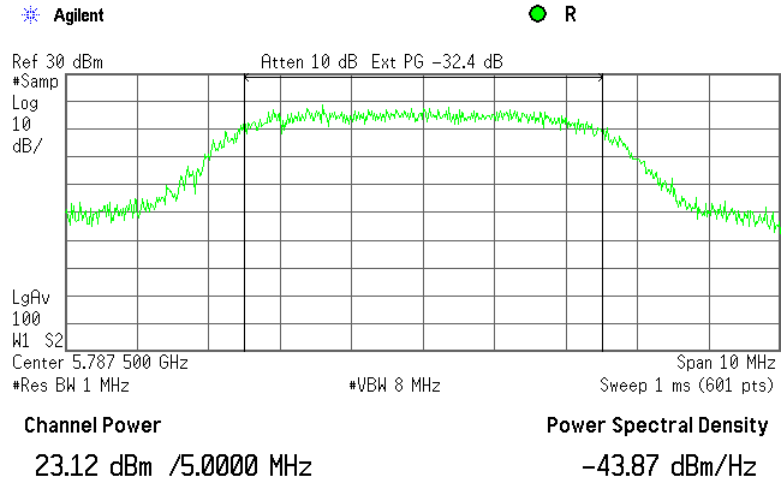




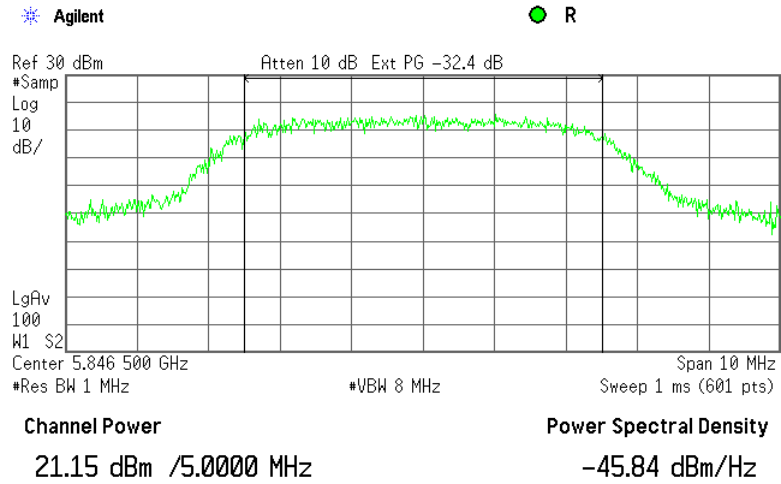
HERMON LABORATORIES

Test specification: Section 15.247(b)(3), Peak output power			
Test procedure: ANSI C63.10-2009 section 6.10.3.1			
Test mode: Compliance			Verdict: PASS
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.5 Output power at mid frequency, 5 MHz BW, 64QAM modulation



Plot 7.2.6 Output power at high frequency, 5 MHz BW, 64QAM modulation

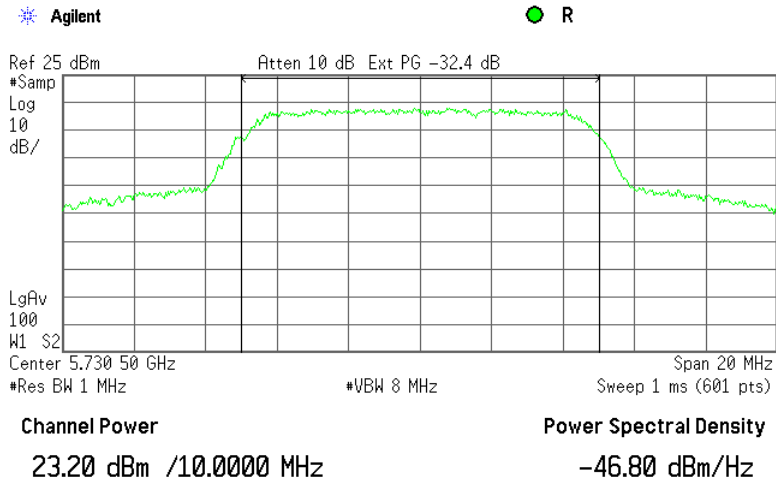




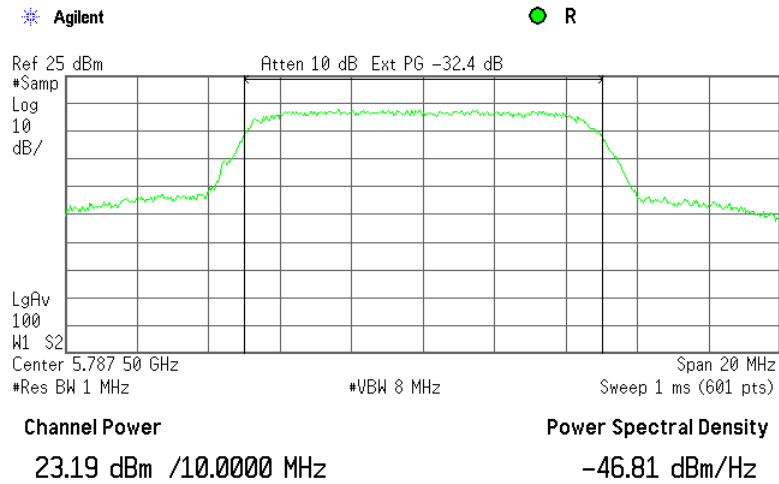
HERMON LABORATORIES

Test specification: Section 15.247(b)(3), Peak output power			
Test procedure: ANSI C63.10-2009 section 6.10.3.1			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.7 Output power at low frequency, 10 MHz BW, QPSK modulation



Plot 7.2.8 Output power at mid frequency, 10 MHz BW, QPSK modulation

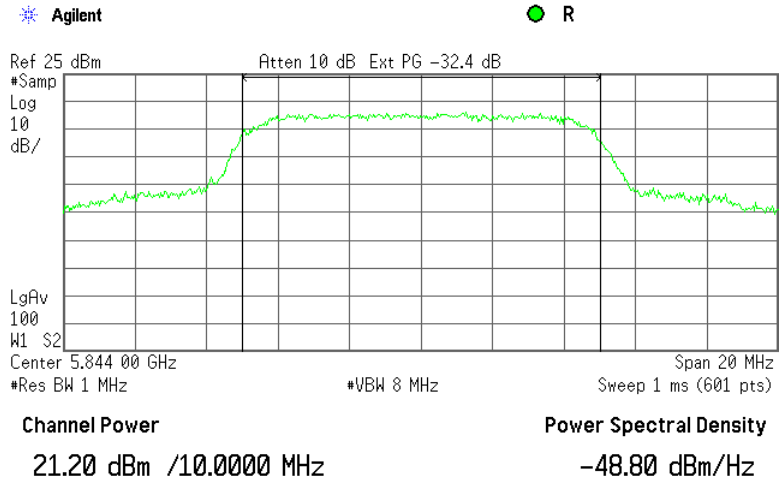




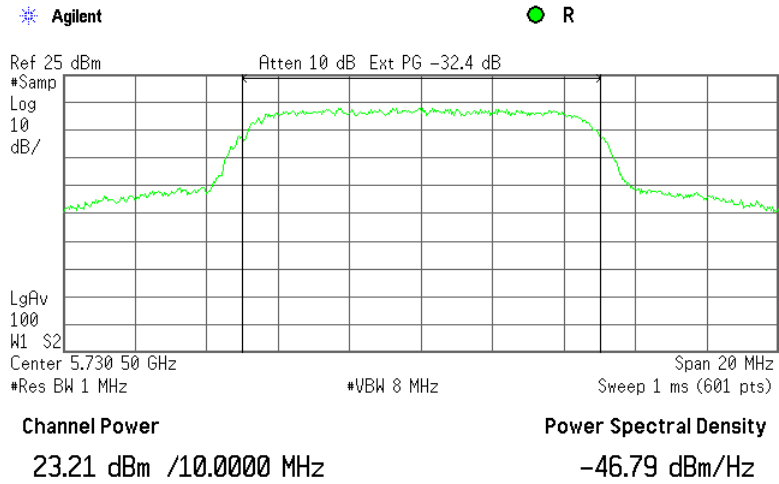
HERMON LABORATORIES

Test specification: Section 15.247(b)(3), Peak output power			
Test procedure: ANSI C63.10-2009 section 6.10.3.1			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.9 Output power at high frequency, 10 MHz BW, QPSK modulation



Plot 7.2.10 Output power at low frequency, 10 MHz BW, 64QAM modulation

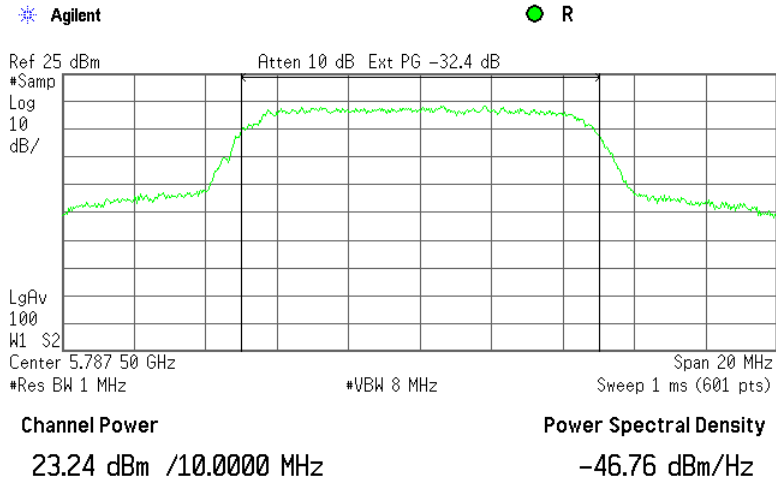




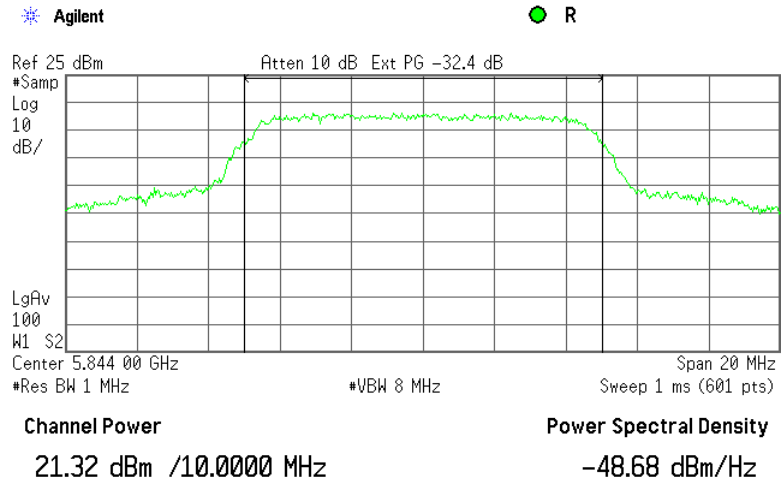
HERMON LABORATORIES

Test specification: Section 15.247(b)(3), Peak output power			
Test procedure: ANSI C63.10-2009 section 6.10.3.1			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.11 Output power at mid frequency, 10 MHz BW, 64QAM modulation



Plot 7.2.12 Output power at high frequency, 10 MHz BW, 64QAM modulation





Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
		Relative Humidity: 44 %	
		Power Supply: 48 VDC	
Remarks:			

7.3 Spurious emissions at RF antenna connector

7.3.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Spurious emission limits out of restricted band

Frequency*, MHz	Attenuation below carrier**, dBc
0.009 – 10 th harmonic	30.0

* - The above limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

** - Spurious emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth (100 kHz).

7.3.2 Test procedure

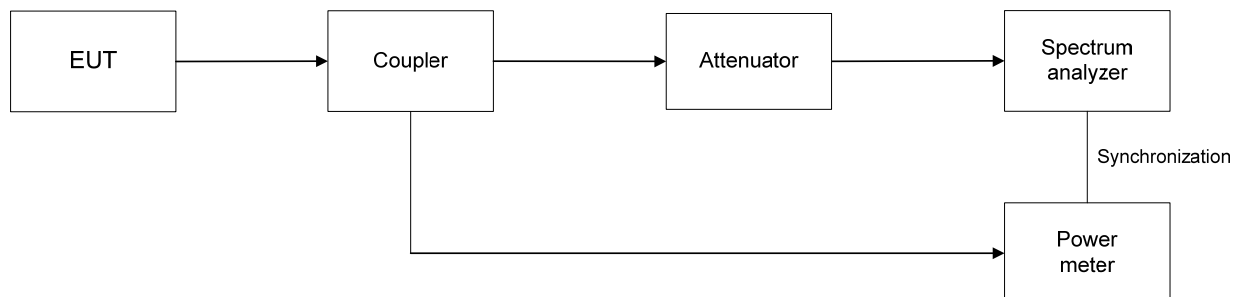
7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

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

7.3.2.3 The highest emission level within the authorized band was measured.

7.3.2.4 The spurious emission was measured with spectrum analyzer and referenced to the highest emission level measured within the authorized band. The test results provided in Table 7.3.2 and the associated plots.

Figure 7.3.1 Spurious emission test setup





Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
		Relative Humidity: 44 %	
		Power Supply: 48 VDC	
Remarks:			

Table 7.3.2 Spurious emission test results outside restricted bands

ASSIGNED FREQUENCY RANGE: 5725-5850 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 -40000 MHz
 DETECTOR USED: Average
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 MODULATION: 64 QAM
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Spurious emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Low carrier frequency						
5724.8	-29.629	12.902	42.531	30.0	12.531	Pass
17190	-36.500	12.902	49.402	30.0	19.402	Pass
Mid carrier frequency						
17364	-34.490	10.390	44.880	30.0	14.880	Pass
High carrier frequency						
5850.25	-29.290	9.311	38.601	30.0	8.601	Pass
17538	-34.360	9.311	43.671	30.0	13.671	Pass

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

Reference numbers of test equipment used

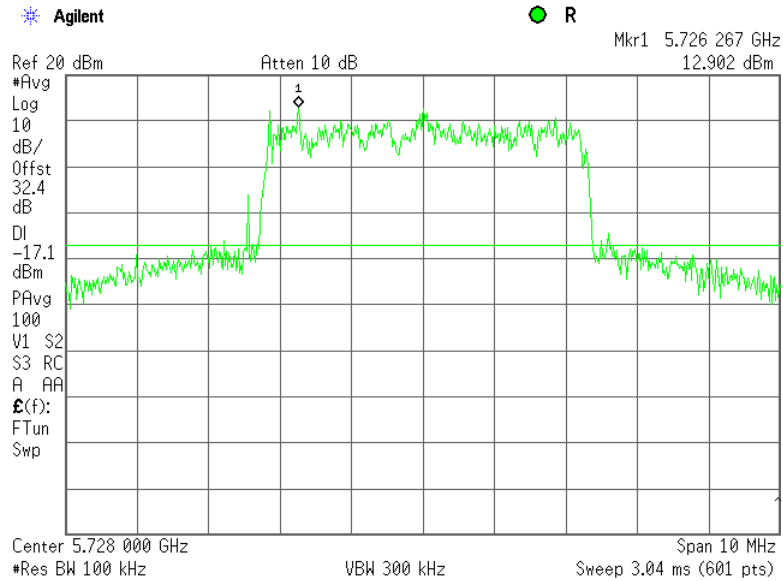
HL 3301	HL 3302	HL 3442	HL 3786	HL 3818	HL 3868	HL 3903	HL 4342
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Full description is given in Appendix A.



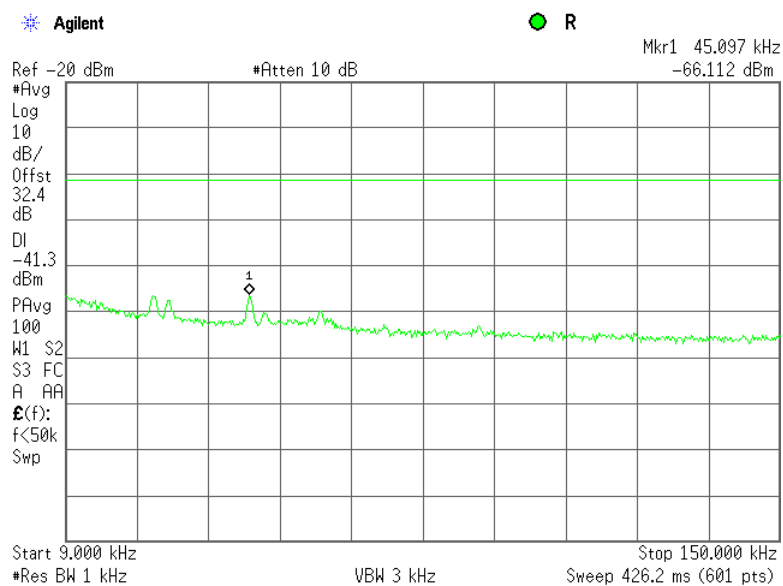
Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01, section 5.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/10/2012		
Temperature: 24 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.1 The highest emission level within the assigned band at low carrier frequency



DL=-17.1 dBm (12.9 dBm – 30 dB) according to 30 dBc spurious limit outside restricted band

Plot 7.3.2 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

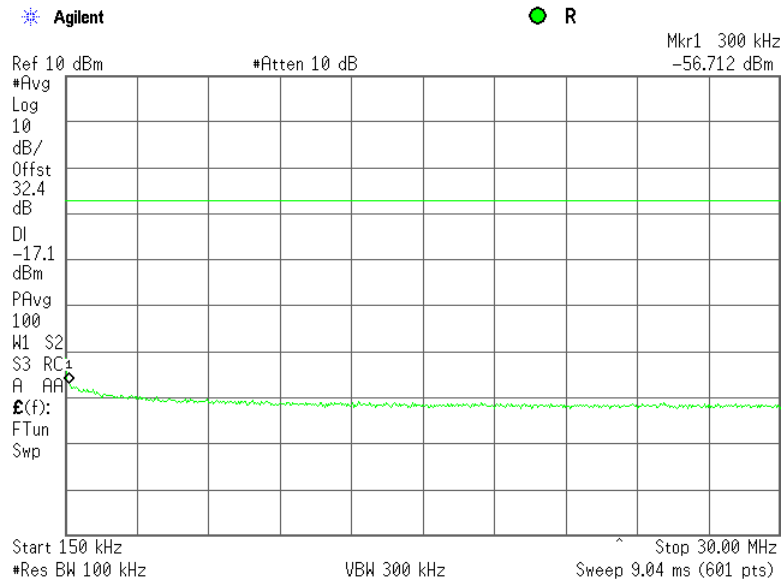


Note: the -17.1 dBm limit shall be applied

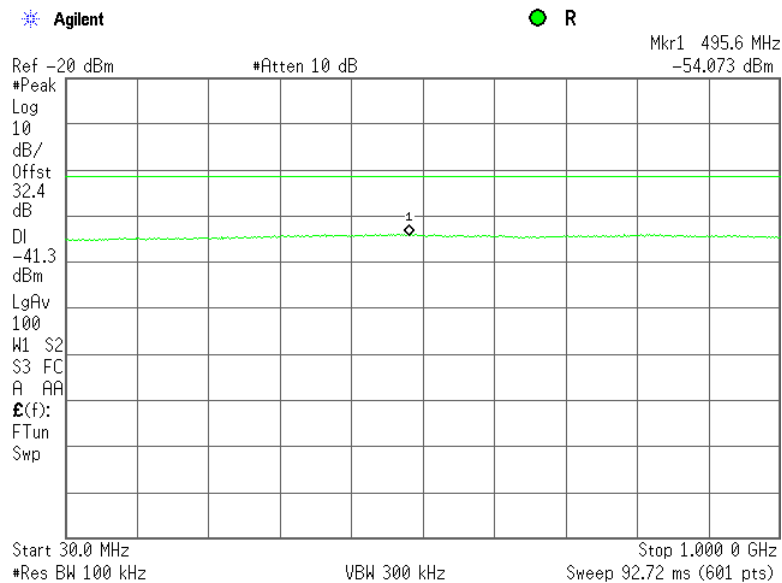


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01, section 5.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/10/2012		
Temperature: 24 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.3 Spurious emission measurements in 0.15 - 30 MHz range at low carrier frequency



Plot 7.3.4 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency

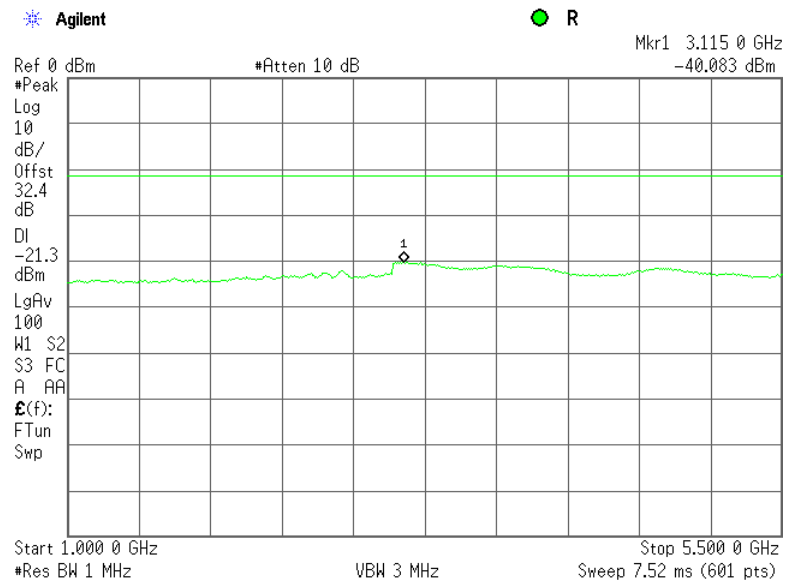


Note: the -17.1 dBm limit shall be applied



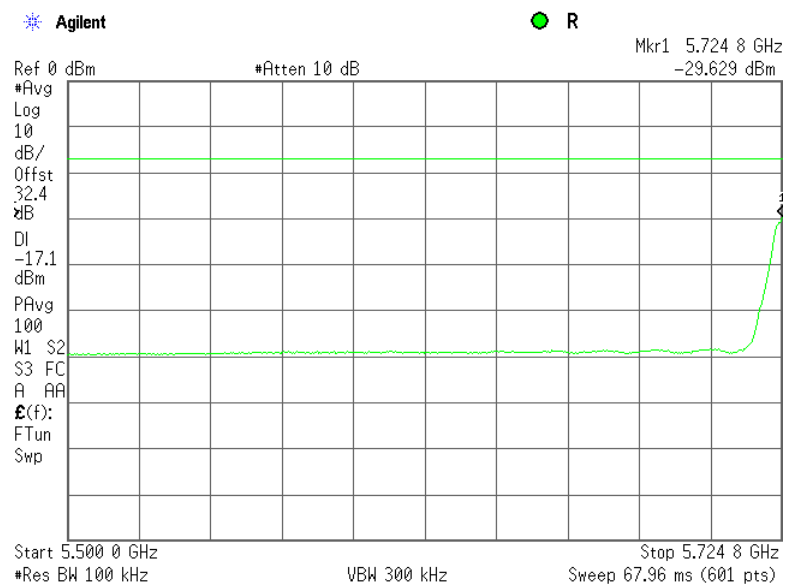
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
		Relative Humidity: 44 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.3.5 Spurious emission measurements in 1000 – 5500 MHz range at low carrier frequency



Note: the -17.1 dBm limit shall be applied

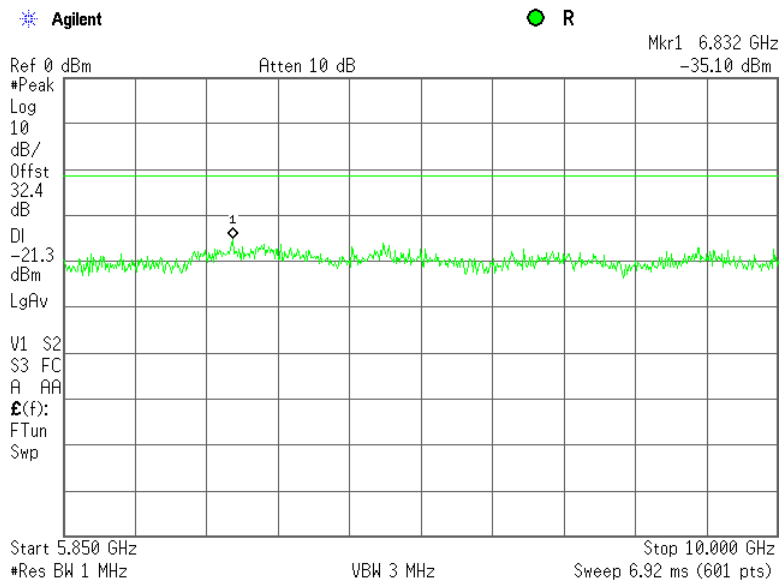
Plot 7.3.6 Spurious emission measurements in 5500 – 5724.75 MHz range at low carrier frequency





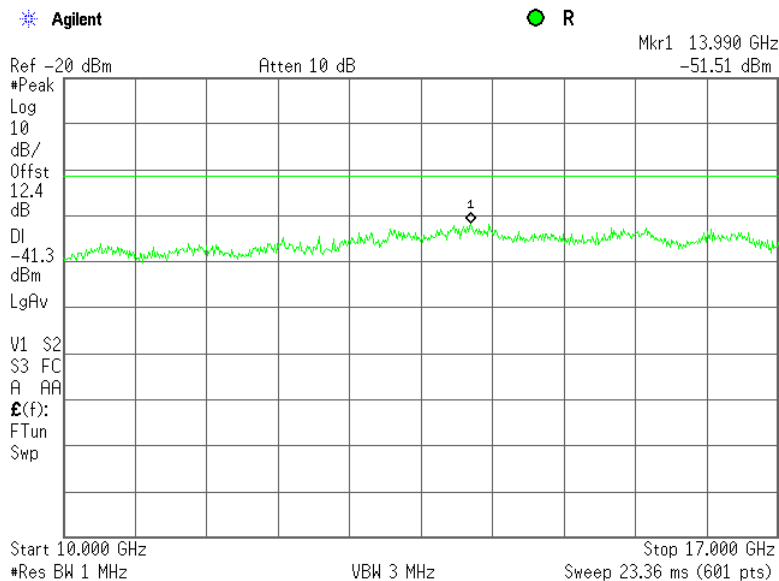
Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01, section 5.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/10/2012		
Temperature: 24 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.7 Spurious emission measurements in 5850 – 10000 MHz range at low carrier frequency



Note: the -17.1 dBm limit shall be applied

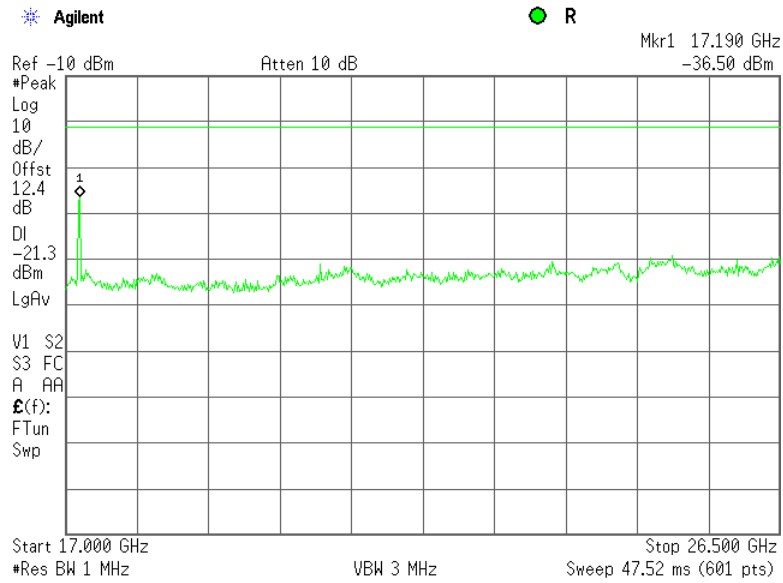
Plot 7.3.8 Spurious emission measurements in 10000 – 17000 MHz range at low carrier frequency





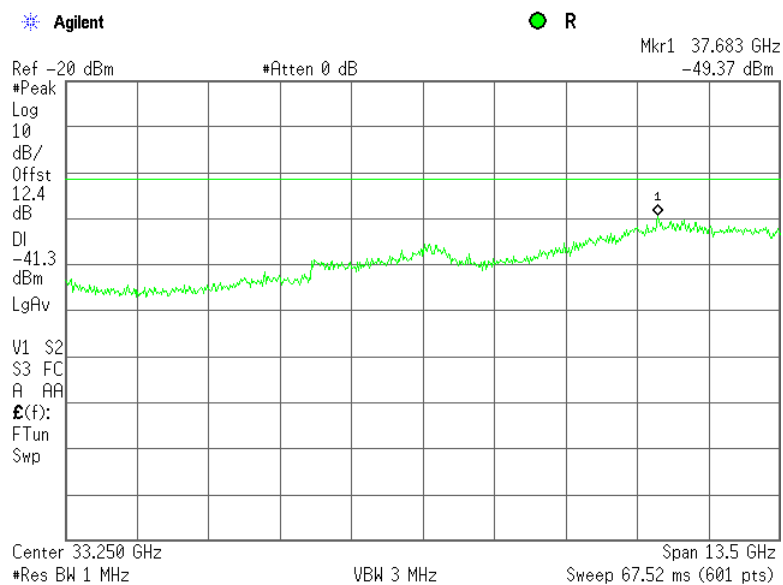
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
		Relative Humidity: 44 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.3.9 Spurious emission measurements in 17000 – 26500 MHz range at low carrier frequency



Note: the -17.1 dBm limit shall be applied

Plot 7.3.10 Spurious emission measurements in 26500-40000 MHz range at low carrier frequency

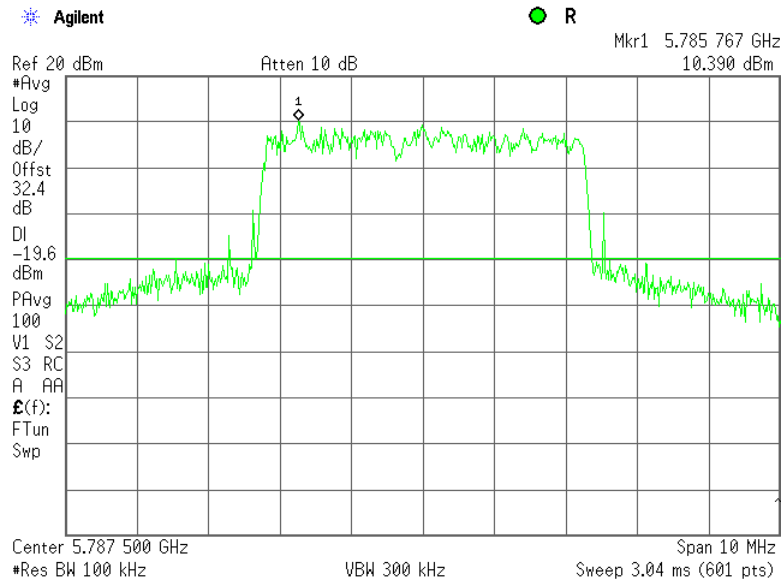


Note: the -17.1 dBm limit shall be applied



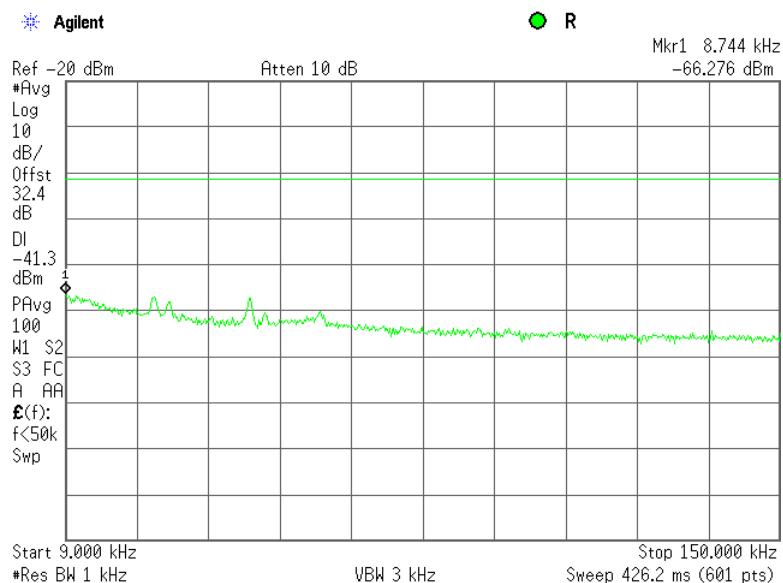
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
Relative Humidity: 44 %		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.3.11 The highest emission level within the assigned band at mid carrier frequency



DL=-19.6 dBm (10.4 dBm – 30 dB) according to 30 dBc spurious limit outside restricted band

Plot 7.3.12 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

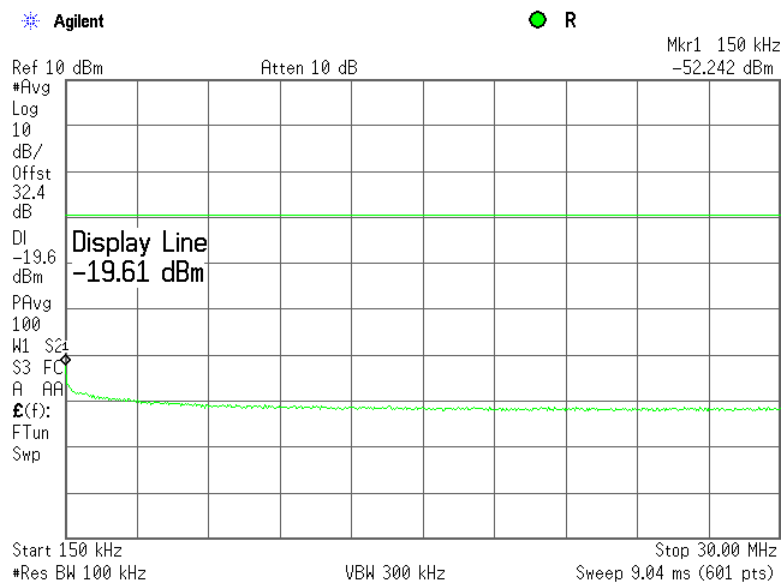


Note: the -19.6 dBm limit shall be applied

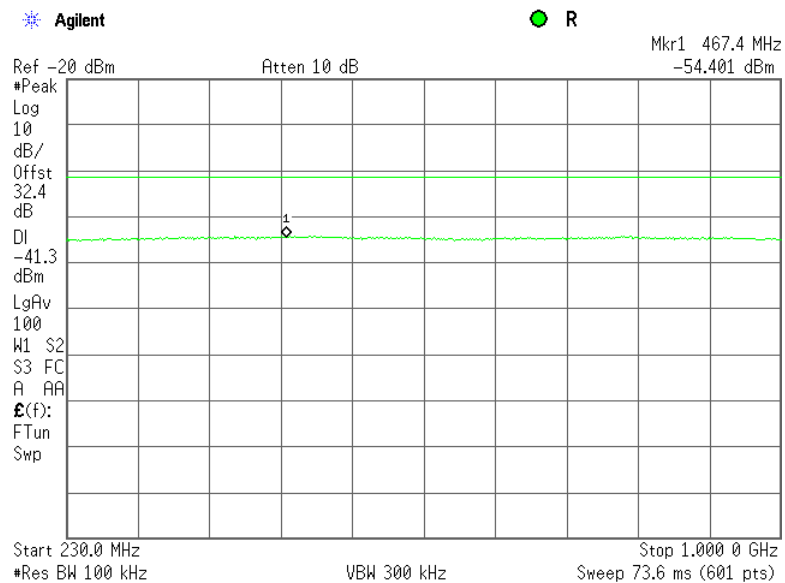


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01, section 5.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/10/2012		
Temperature: 24 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.13 Spurious emission measurements in 0.15 - 30 MHz range at mid carrier frequency



Plot 7.3.14 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency

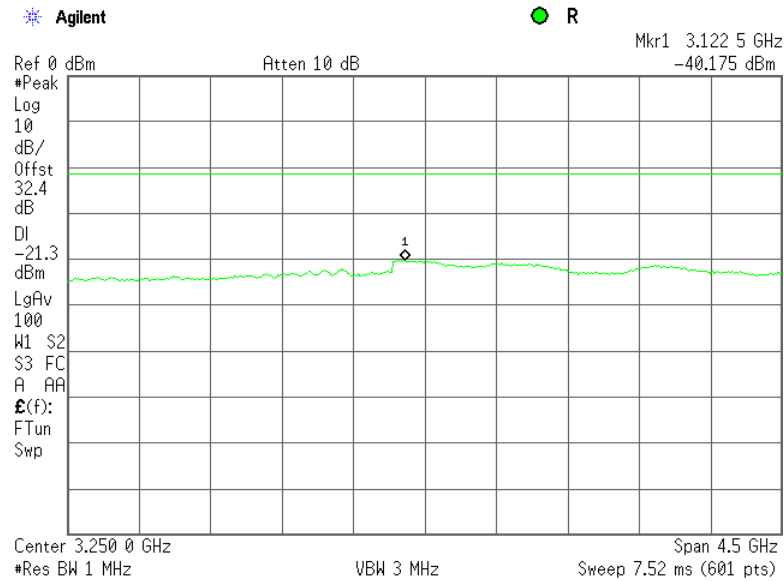


Note: the -19.6 dBm limit shall be applied



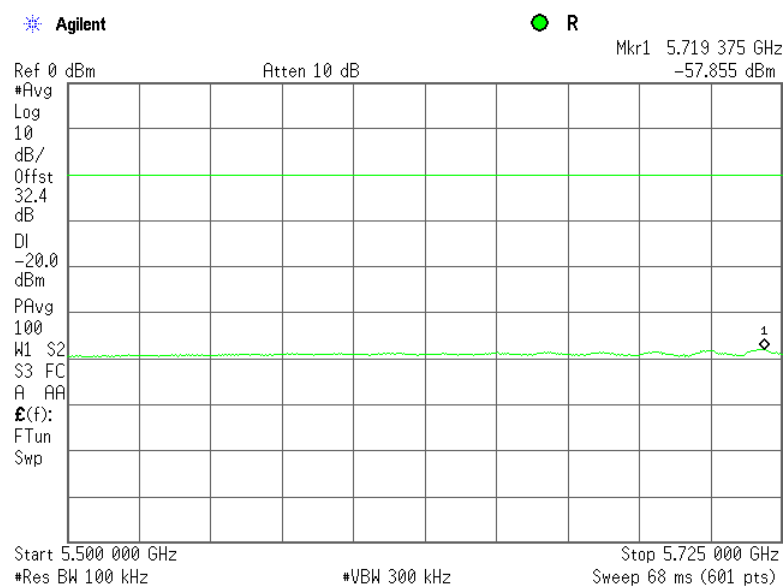
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
		Relative Humidity: 44 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.3.15 Spurious emission measurements in 1000 – 5500 MHz range at mid carrier frequency



Note: the -19.6 dBm limit shall be applied

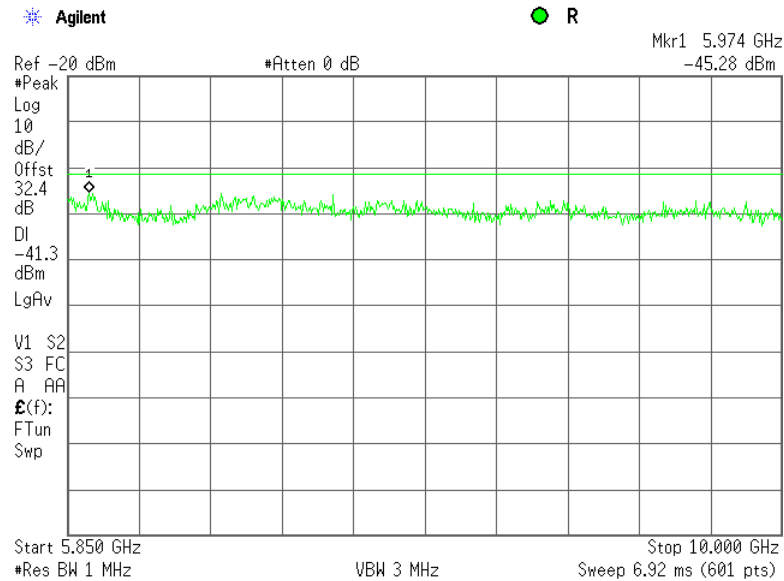
Plot 7.3.16 Spurious emission measurements in 5500 – 5725 MHz range at mid carrier frequency





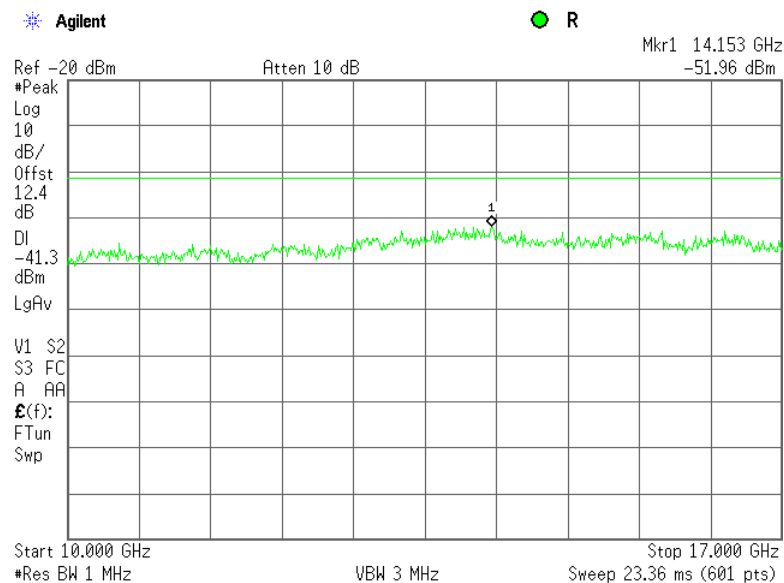
Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01, section 5.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/10/2012		
Temperature: 24 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.17 Spurious emission measurements in 5850 – 10000 MHz range at mid carrier frequency



Note: the -19.6 dBm limit shall be applied

Plot 7.3.18 Spurious emission measurements in 10000 – 17000 MHz range at mid carrier frequency

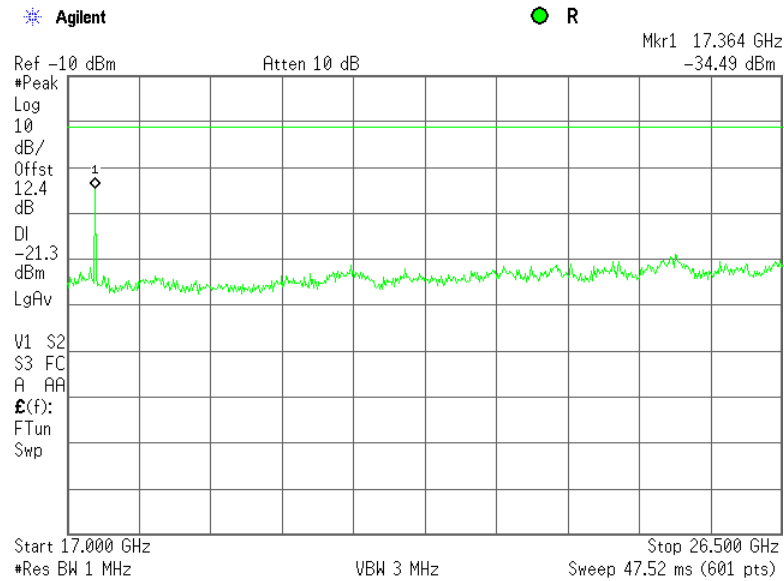


Note: the -19.6 dBm limit shall be applied



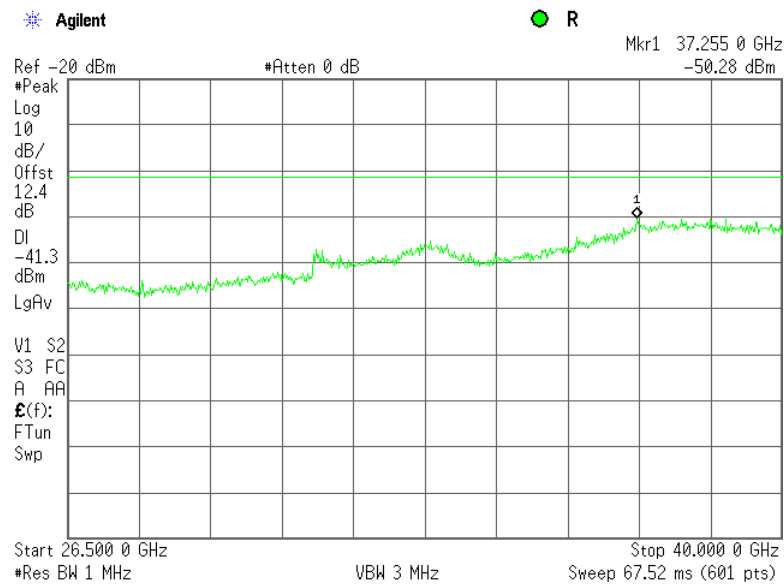
Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01, section 5.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/10/2012		
Temperature: 24 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.19 Spurious emission measurements in 17000 – 26500 MHz range at mid carrier frequency



Note: the -19.6 dBm limit shall be applied

Plot 7.3.20 Spurious emission measurements in 26500-40000 MHz range at mid carrier frequency

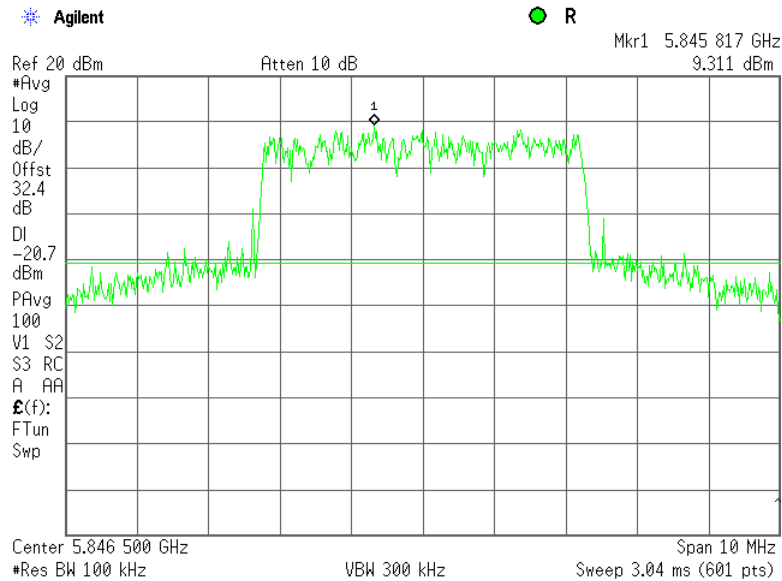


Note: the -19.6 dBm limit shall be applied



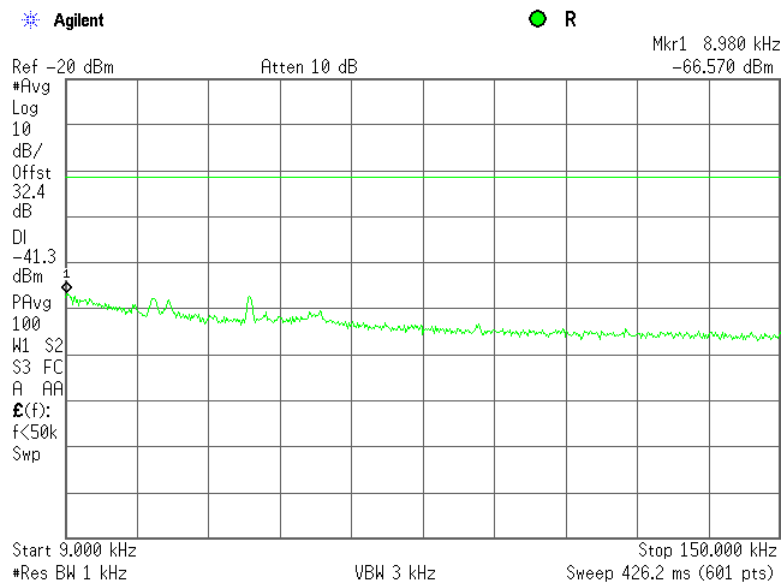
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			
		Verdict: PASS	

Plot 7.3.21 The highest emission level within the assigned band at high carrier frequency



DL=-20.7 dBm (9.3 dBm – 30 dB) according to 30 dBc spurious limit outside restricted band

Plot 7.3.22 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

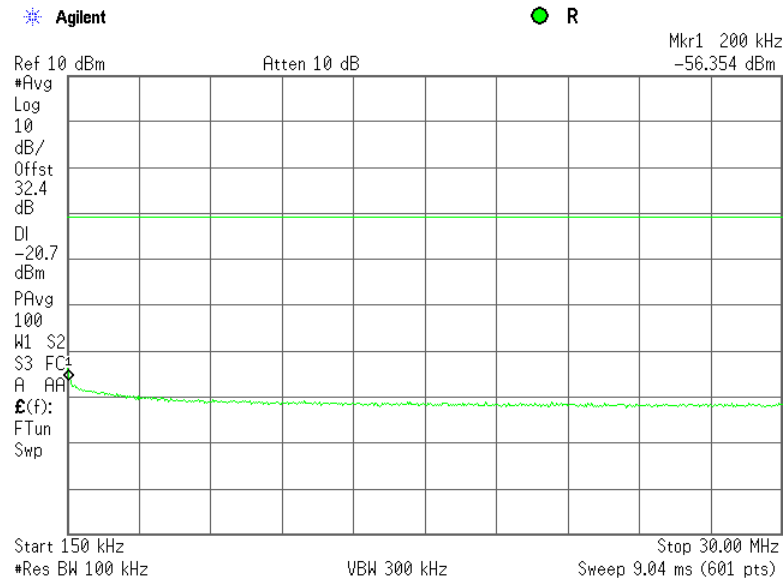


Note: the -20.7 dBm limit shall be applied



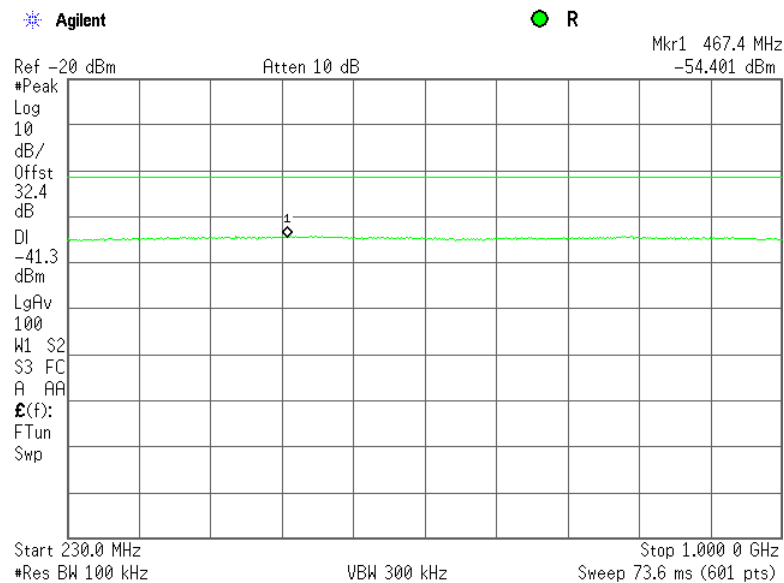
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
		Relative Humidity: 44 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.3.23 Spurious emission measurements in 0.15 - 30 MHz range at high carrier frequency



Note: the -20.7 dBm limit shall be applied

Plot 7.3.24 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency

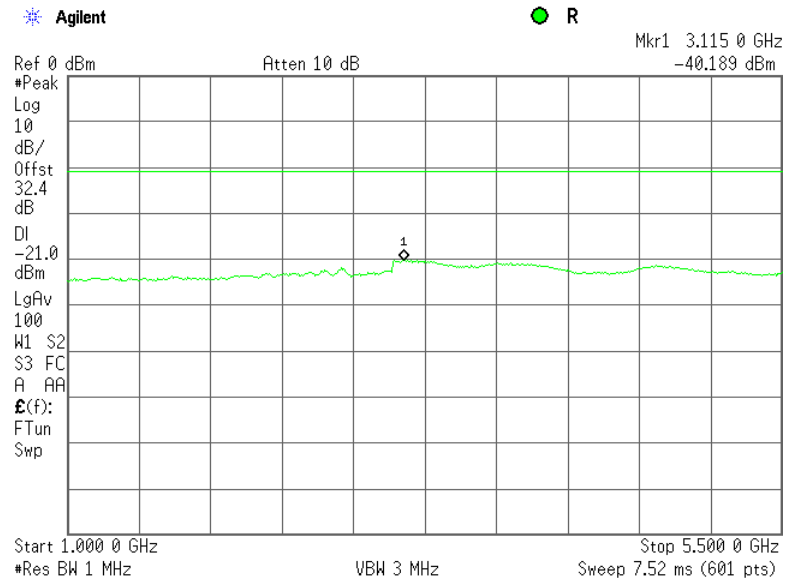


Note: the -20.7 dBm limit shall be applied



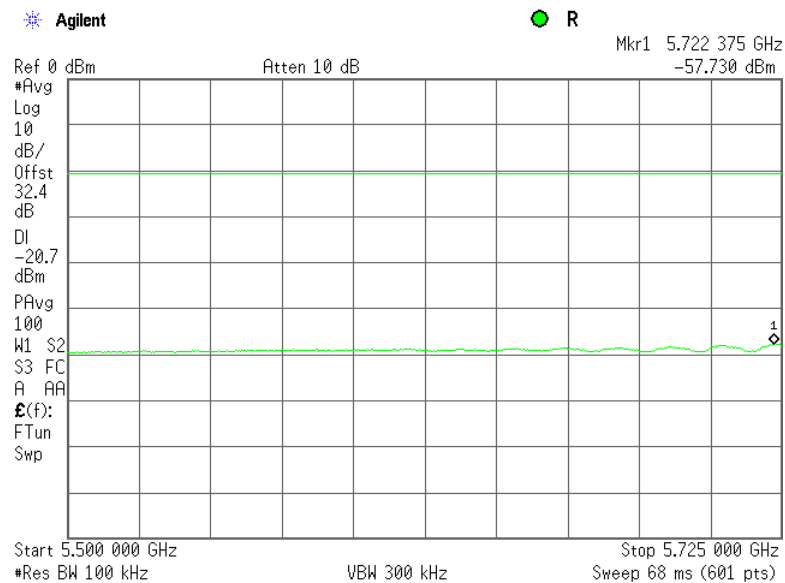
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
		Relative Humidity: 44 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.3.25 Spurious emission measurements in 1000 – 5500 MHz range at high carrier frequency



Note: the -20.7 dBm limit shall be applied

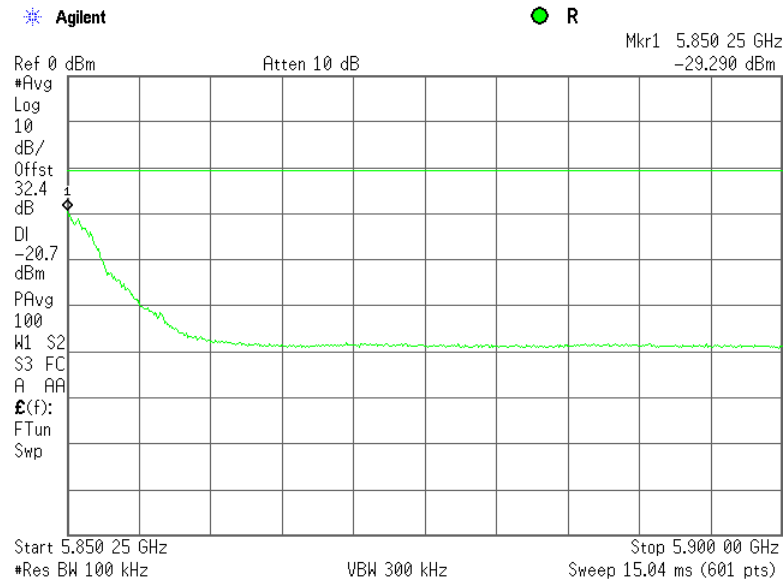
Plot 7.3.26 Spurious emission measurements in 5500 – 5725 MHz range at high carrier frequency



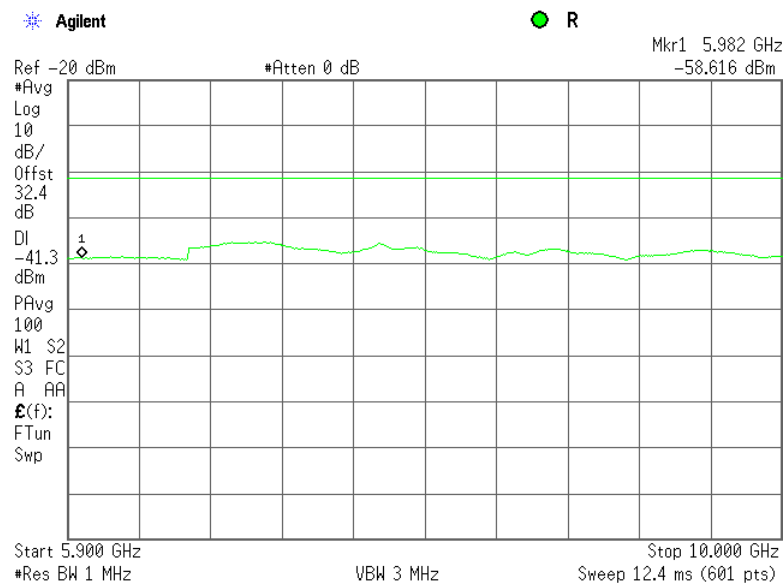


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01, section 5.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/10/2012		
Temperature: 24 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.27 Spurious emission measurements in 5850.25 – 5900 MHz range at high carrier frequency



Plot 7.3.28 Spurious emission measurements in 5900-10000 MHz range at high carrier frequency

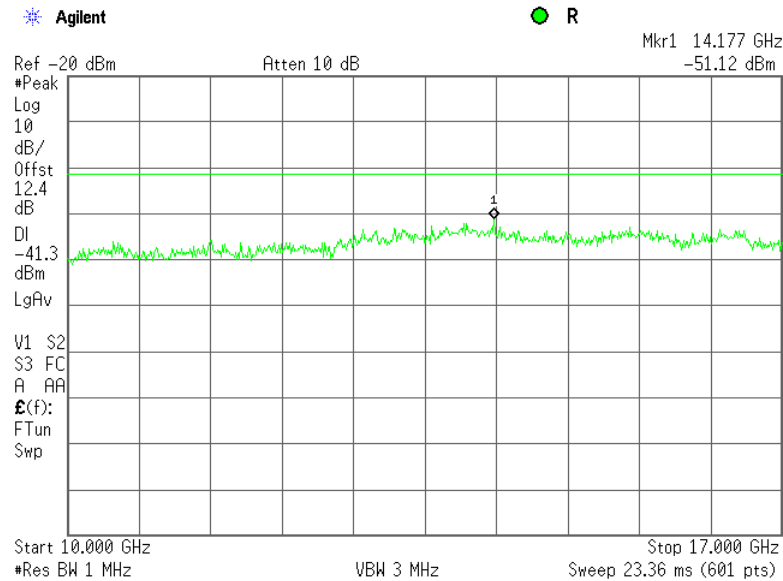


Note: the -20.7 dBm limit shall be applied



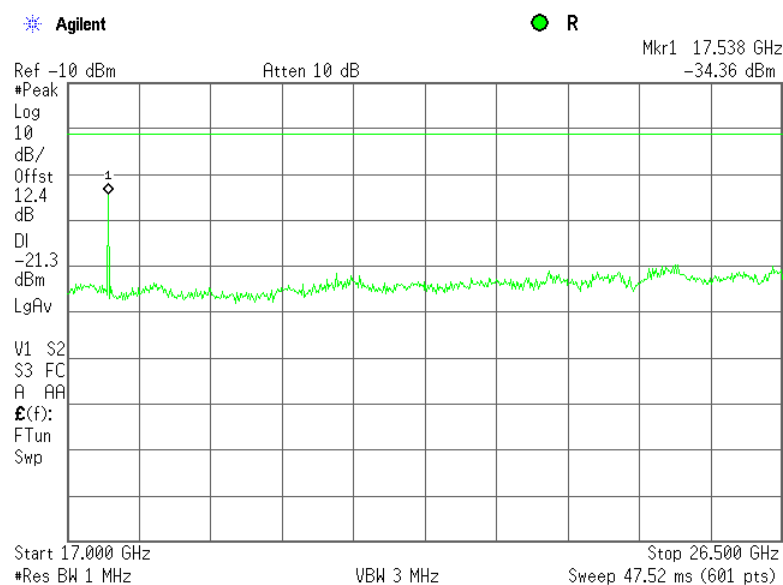
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
		Relative Humidity: 44 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.3.29 Spurious emission measurements in 10000 – 17000 MHz range at high carrier frequency



Note: the -20.7 dBm limit shall be applied

Plot 7.3.30 Spurious emission measurements in 17000 – 26500 MHz range at high carrier frequency



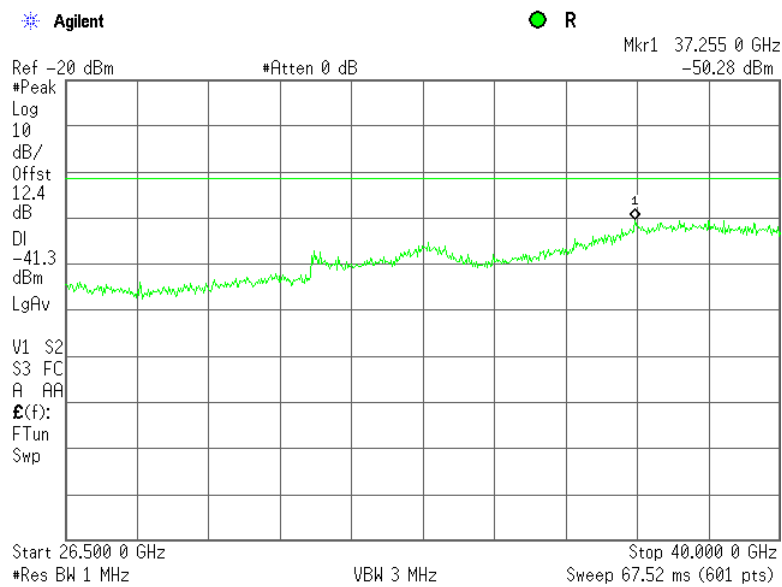
Note: the -20.7 dBm limit shall be applied



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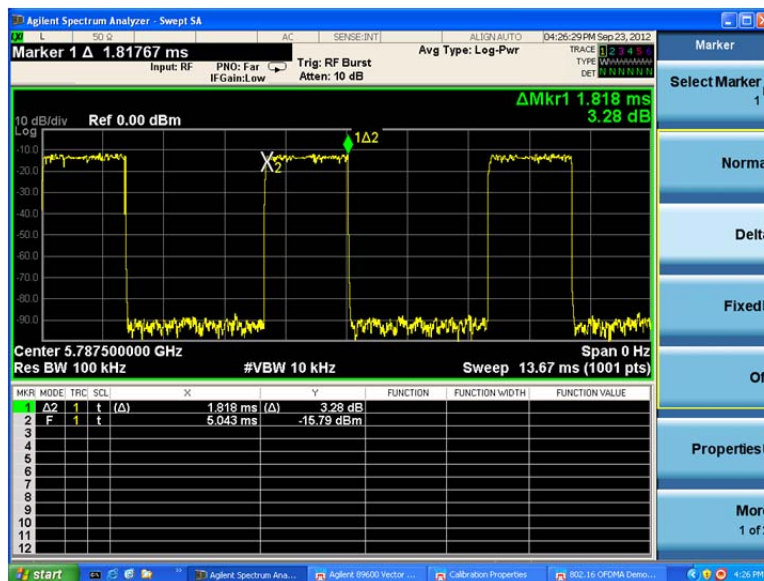
Test specification:		Section 15.247(d), Conducted spurious emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01, section 5.4	
Test mode:		Compliance	
Date(s):		9/10/2012	
Temperature: 24 °C		Air Pressure: 1006 hPa	
Relative Humidity: 44 %		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.3.31 Spurious emission measurements in 26500-40000 MHz range at high carrier frequency



Note: the -20.7 dBm limit shall be applied

Plot 7.3.32 Transmission pulse duration and pulse period





Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance		Verdict: PASS	
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

7.4 Field strength of spurious emissions

7.4.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)*			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc***
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	30.0
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
1000 – 10 th harmonic	74.0	NA	54.0	

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log (S_1/S_2),$$

where S₁ and S₂ – standard defined and test distance respectively in meters.

** - The limit decreases linearly with the logarithm of frequency.

*** - The field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

7.4.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

7.4.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.4.2.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.

7.4.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.4.3.1 The EUT was set up as shown in Figure 7.4.2, energized and the performance check was conducted.

7.4.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.4.3.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.



Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance		Verdict: PASS	
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Figure 7.4.1 Setup for spurious emission field strength measurements below 30 MHz

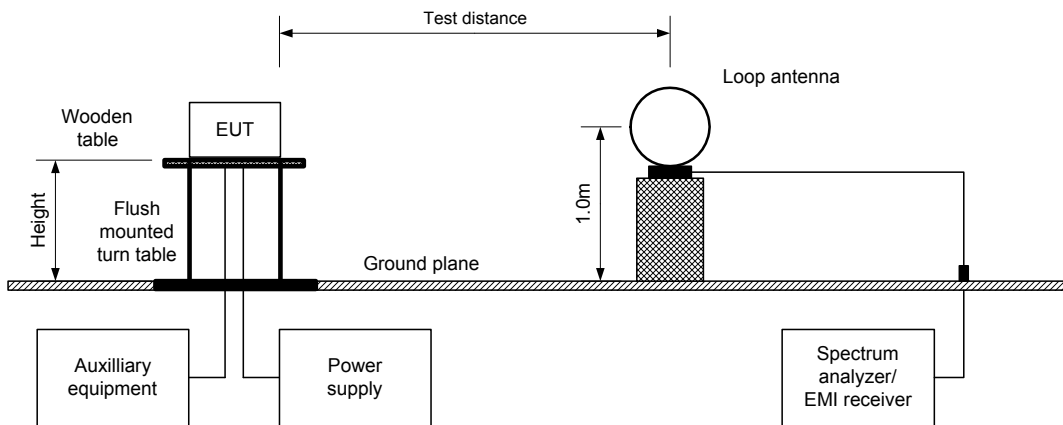
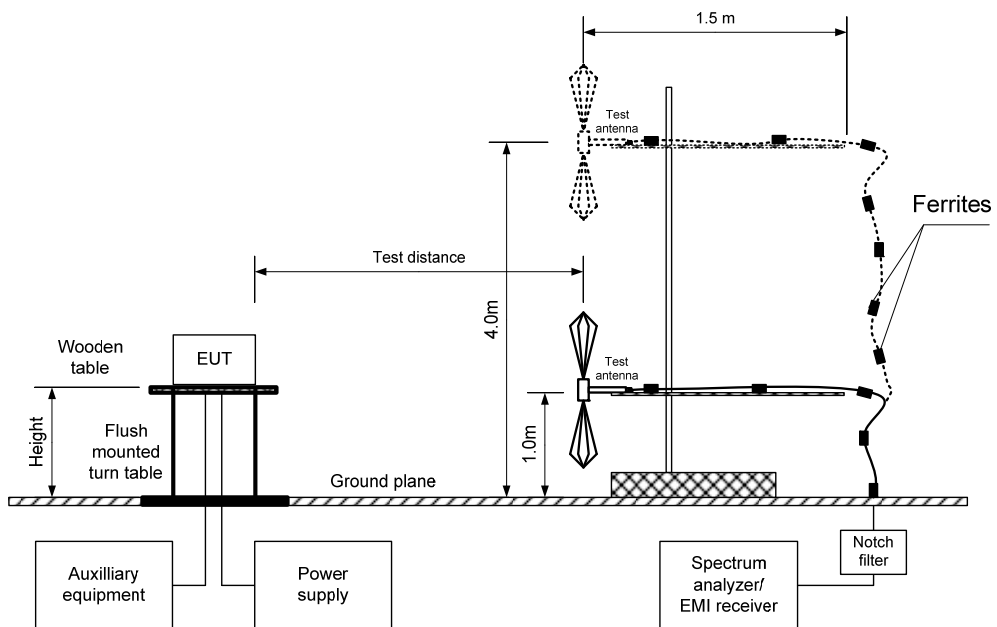


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz





Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10/24/2012 - 10/25/2012		
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

Table 7.4.2 Field strength of emissions outside restricted bands with 9.5 dBi antenna

ASSIGNED FREQUENCY BAND: 5725 - 5850 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 - 40000 MHz
 TEST DISTANCE: 3 m
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 23.04Mbps
 DUTY CYCLE: 40 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 TRANSMITTER OUTPUT POWER: 23.38 dBm at low carrier frequency
 23.12 dBm at mid carrier frequency
 21.15 dBm at high carrier frequency
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
No emissions were found									Pass
Mid carrier frequency									
No emissions were found									Pass
High carrier frequency									
No emissions were found									Pass

*- EUT front panel refers to 0 degrees position of turntable.

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

Table 7.4.3 Restricted bands

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10/24/2012 - 10/25/2012		
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

Table 7.4.4 Field strength of spurious emissions above 1 GHz within restricted bands with 9.5 dBi antenna

ASSIGNED FREQUENCY BAND: 5725 - 5850 MHz
 INVESTIGATED FREQUENCY RANGE: 1000 - 40000 MHz
 TEST DISTANCE: 3 m
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 23.04Mbps
 DUTY CYCLE: 40 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 TRANSMITTER OUTPUT POWER: 23.38 dBm at low carrier frequency
 23.12 dBm at mid carrier frequency
 21.15 dBm at high carrier frequency
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	Polarization	Height, m		Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	Measured, dB(µV/m)	Calculated, dB(µV/m)	Limit, dB(µV/m)	Margin, dB***	
Low carrier frequency											
11456.00	Hor	1.6	210	60.77	74.0	-13.2	47.31	40.29	54.0	-13.71	Pass
17183.93	Vert	1.1	80	62.33	74.0	-11.7	48.25	41.23	54.0	-12.77	
Mid carrier frequency											
11574.95	Hor	1.3	96	53.55	74.0	-20.5	40.49	33.47	54.0	-20.53	Pass
17362.32	Vert	1.1	10	65.00	74.0	-9.0	48.45	41.43	54.0	-12.57	
High carrier frequency											
11693.00	Vert	1.0	185	49.91	74.0	-24.1	41.52	34.50	54.0	-19.50	Pass

*- EUT front panel refers to 0 degrees position of turntable.
 **- Margin = Measured field strength - specification limit.
 ***- Margin = Calculated field strength - specification limit,
 where Calculated field strength = Measured field strength + average factor.

Table 7.4.5 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
2.24	5.029	NA	NA	NA	-7.02

*- Average factor was calculated as follows
 for pulse train shorter than 100 ms: $Average\ factor = 20 \times \log_{10} \left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train \right)$
 for pulse train longer than 100 ms: $Average\ factor = 20 \times \log_{10} \left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100ms} \times Number\ of\ bursts\ within\ 100ms \right)$



Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

Table 7.4.6 Field strength of spurious emissions below 1 GHz within restricted bands with 9.5 dBi antenna

ASSIGNED FREQUENCY BAND: 5725 - 5850 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 TEST DISTANCE: 3 m
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 23.04Mbps
 DUTY CYCLE: 40 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 TRANSMITTER OUTPUT POWER: 23.38 dBm at low carrier frequency
 23.12 dBm at mid carrier frequency
 21.15 dBm at high carrier frequency
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
 9.0 kHz (150 kHz – 30 MHz)
 120 kHz (30 MHz – 1000 MHz)
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
Low carrier frequency								
37.528	34.4	33.0	40.0	-7.0	Vert	1.0	39	Pass
117.0524	34.5	31.8	43.5	-11.7	Vert	1.0	0	
136.9065	34.4	32.8	43.5	-10.7	Vert	1.2	60	
Mid carrier frequency								
37.528	34.5	33.2	40.0	-6.8	Vert	1.0	39	Pass
117.0524	34.5	31.8	43.5	-11.7	Vert	1.0	0	
136.9065	34.4	32.8	43.5	-10.7	Vert	1.2	60	
275.0221	38.8	35.0	46.0	-11.0	Vert	1.0	45	
High carrier frequency								
37.528	34.5	33.2	40.0	-6.8	Vert	1.0	39	Pass
117.0524	34.5	31.8	43.5	-11.7	Vert	1.0	0	
136.9065	34.4	32.8	43.5	-10.7	Vert	1.2	60	
275.0221	38.8	35.0	46.0	-11.0	Vert	1.0	45	

*- Margin = Measured emission - specification limit.
 **- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0604	HL 0768	HL 0769	HL 1984	HL 2909	HL 3533
HL 3535	HL 3818	HL 3901	HL 4114	HL 4276	HL 4352	HL 4353	

Full description is given in Appendix A.



HERMON LABORATORIES

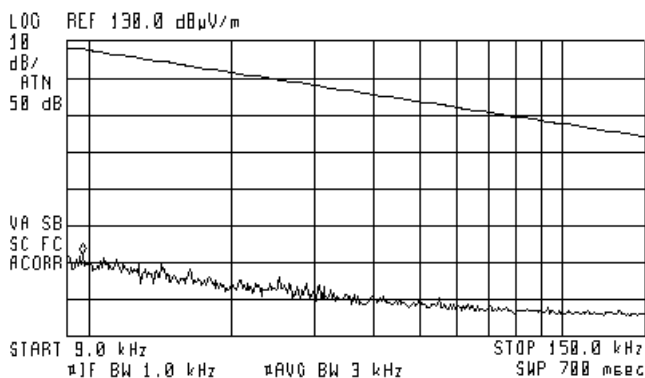
Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

Plot 7.4.1 Radiated emission measurements from 9 to 150 kHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 9.8 kHz
72.16 dBµV/m

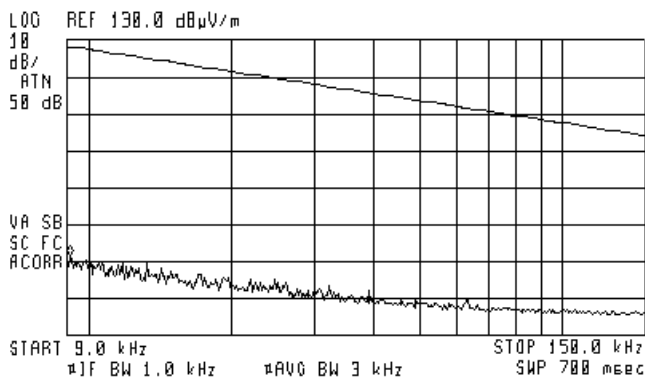


Plot 7.4.2 Radiated emission measurements from 9 to 150 kHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 9.2 kHz
71.42 dBµV/m

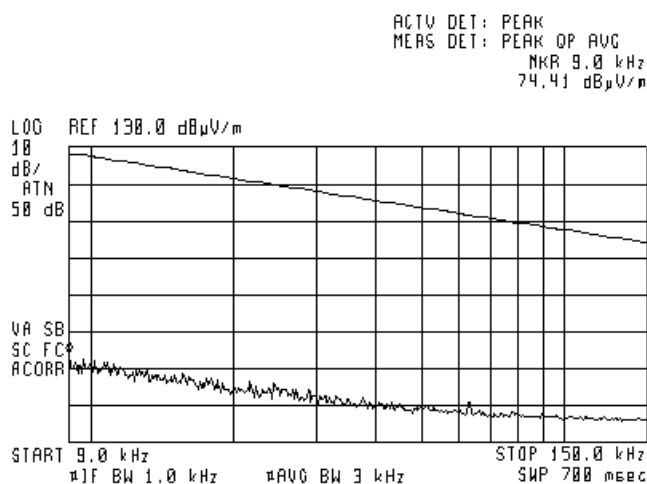




Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

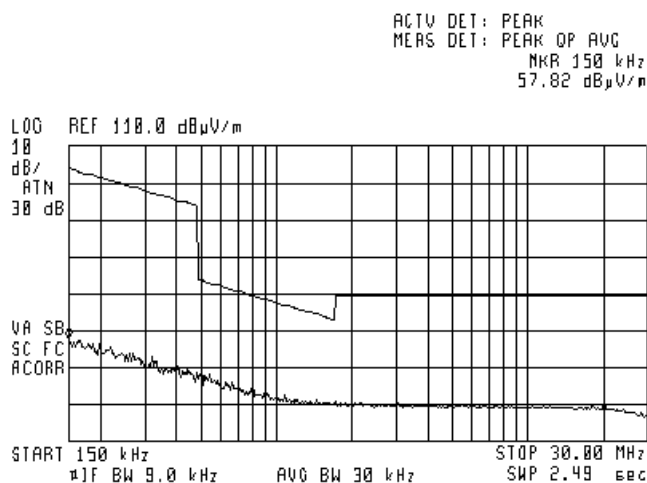
Plot 7.4.3 Radiated emission measurements from 9 to 150 kHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.4.4 Radiated emission measurements from 0.15 to 30 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical





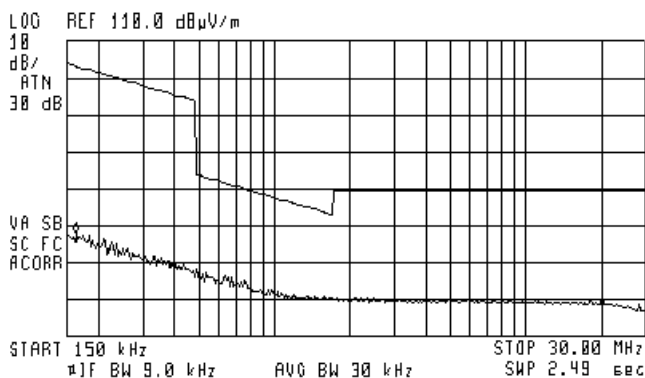
Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

Plot 7.4.5 Radiated emission measurements from 0.15 to 30 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



ACTV DET: PEAK
MERS DET: PEAK OP AVG
NKR 160 kHz
58.00 dBµV/m

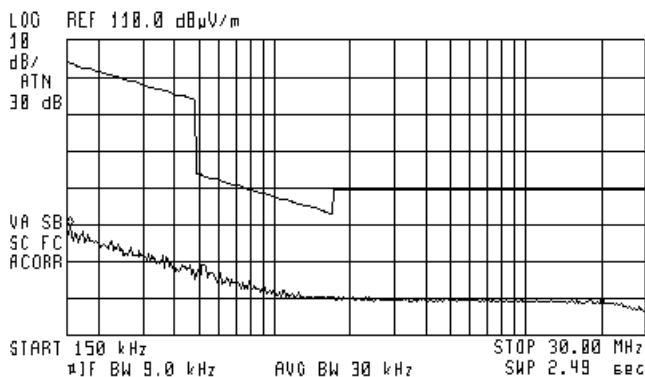


Plot 7.4.6 Radiated emission measurements from 0.15 to 30 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



ACTV DET: PEAK
MERS DET: PEAK OP AVG
NKR 150 kHz
59.34 dBµV/m

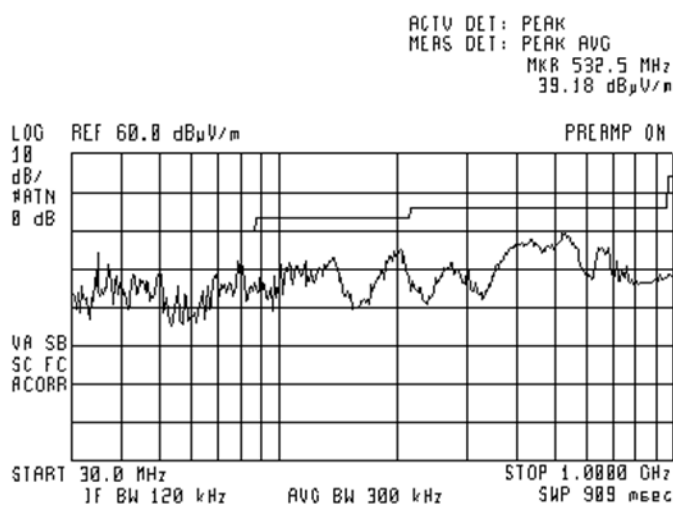




Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10/24/2012 - 10/25/2012		
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

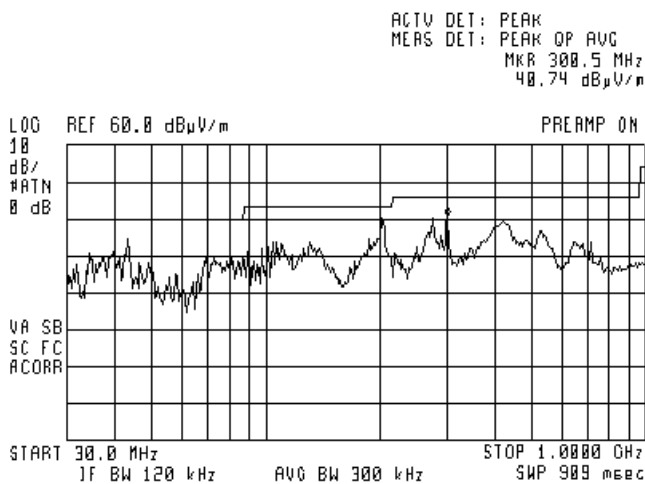
Plot 7.4.7 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.4.8 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



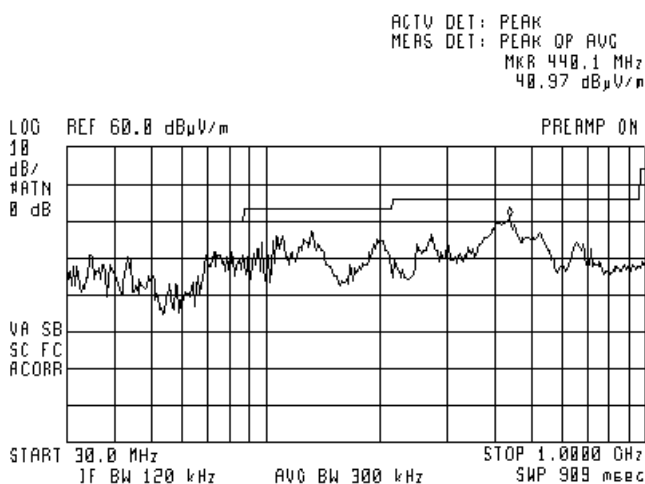


HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

Plot 7.4.9 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

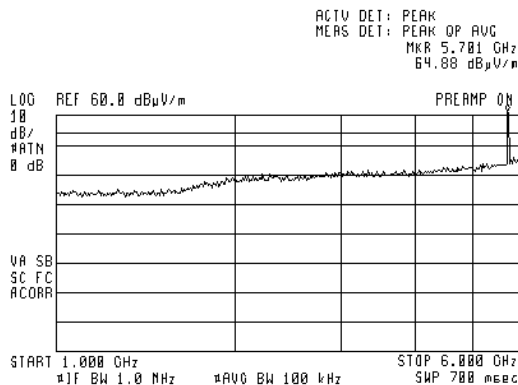
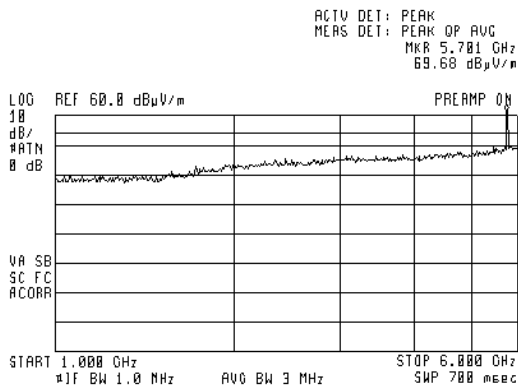
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.4.10 Radiated emission measurements from 1000 to 6000 MHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

Semi anechoic chamber
3 m
Vertical and Horizontal
DETECTOR: Average

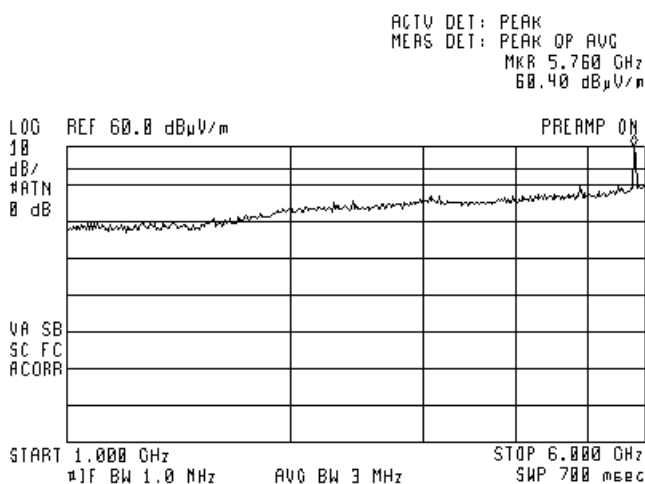




Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

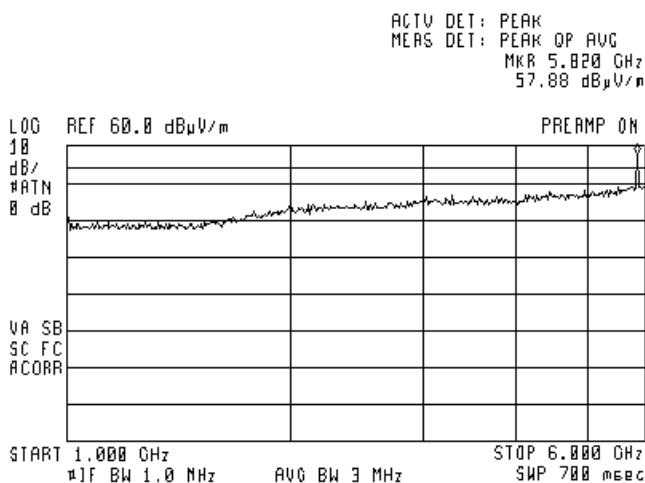
Plot 7.4.11 Radiated emission measurements from 1000 to 6000 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.4.12 Radiated emission measurements from 1000 to 6000 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

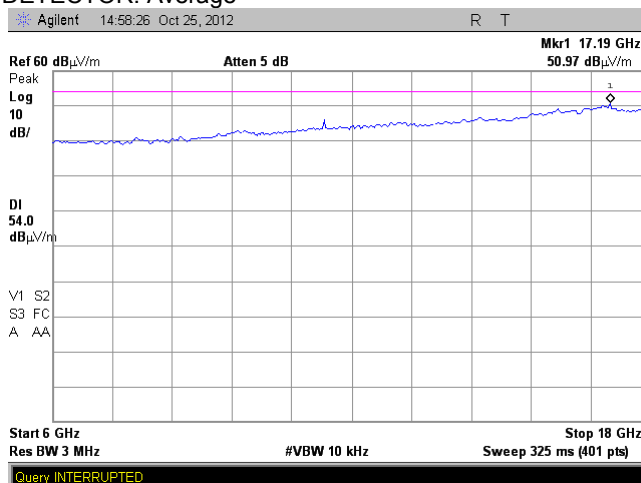
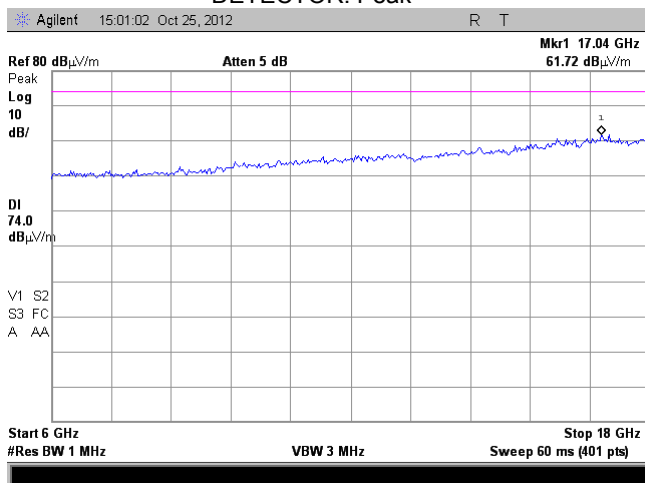




Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

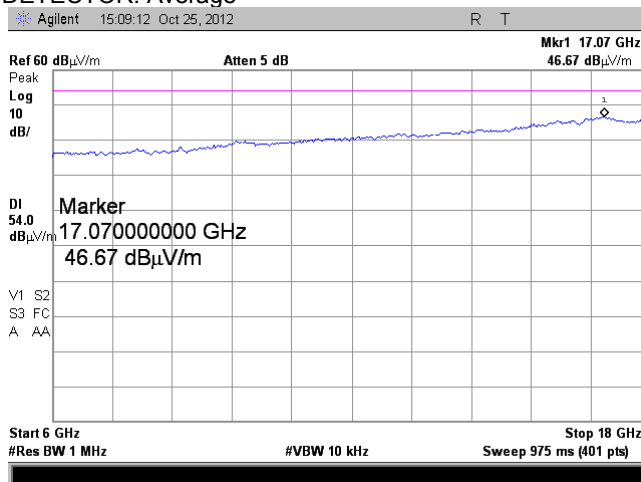
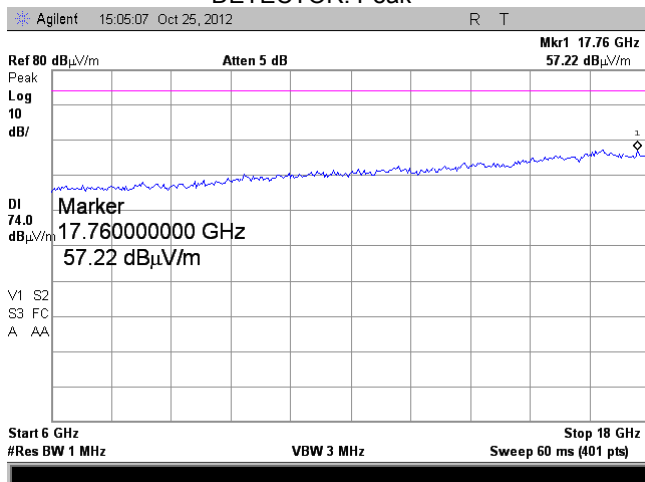
Plot 7.4.13 Radiated emission measurements from 6000 to 18000 MHz at the low carrier frequency

TEST SITE: Anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical and Horizontal
 DETECTOR: Peak
 DETECTOR: Average



Plot 7.4.14 Radiated emission measurements from 6000 to 18000 MHz at the mid carrier frequency

TEST SITE: Anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical and Horizontal
 DETECTOR: Peak
 DETECTOR: Average

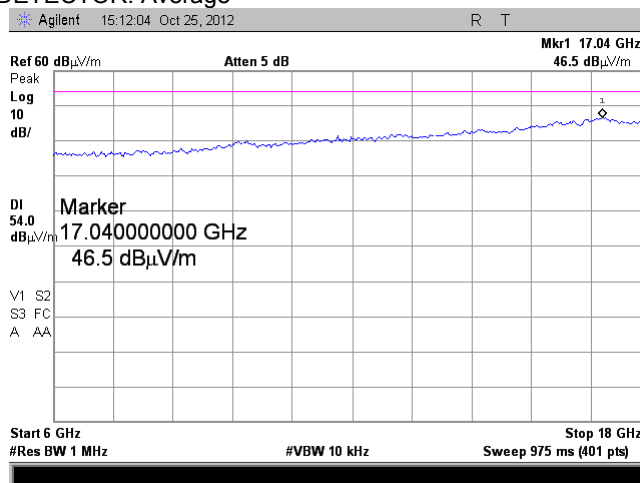
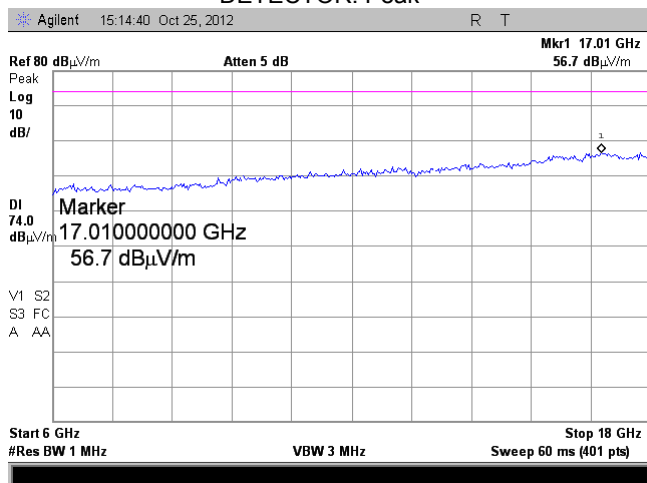




Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

Plot 7.4.15 Radiated emission measurements from 6000 to 18000 MHz at the high carrier frequency

TEST SITE: Anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical and Horizontal
 DETECTOR: Peak
 DETECTOR: Average

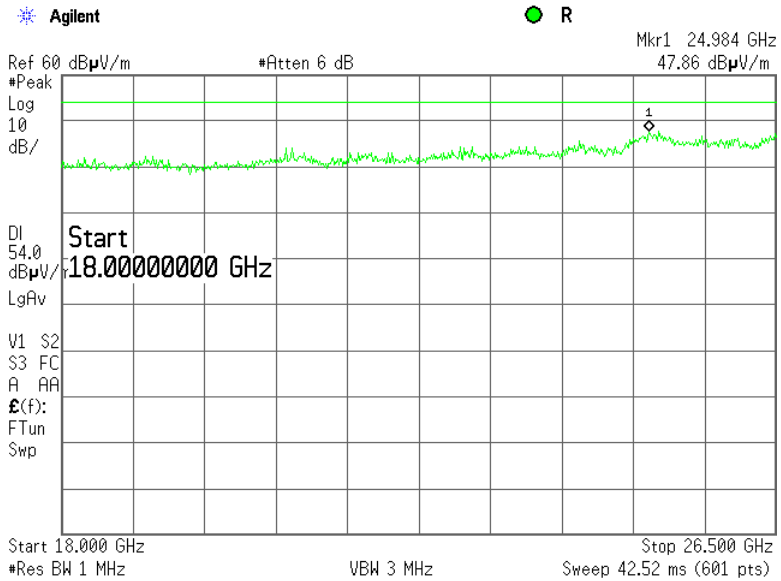




Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

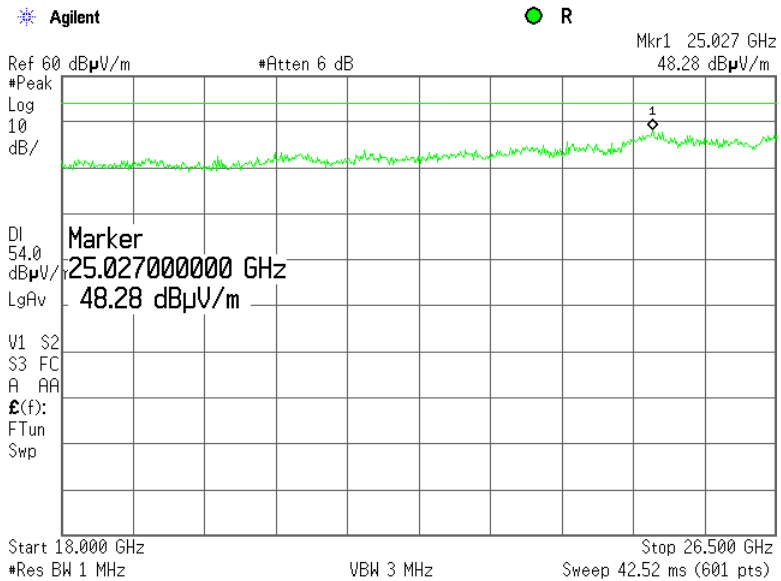
Plot 7.4.16 Radiated emission measurements from 18000 to 26500 MHz at the low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.4.17 Radiated emission measurements from 18000 to 26500 MHz at the mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



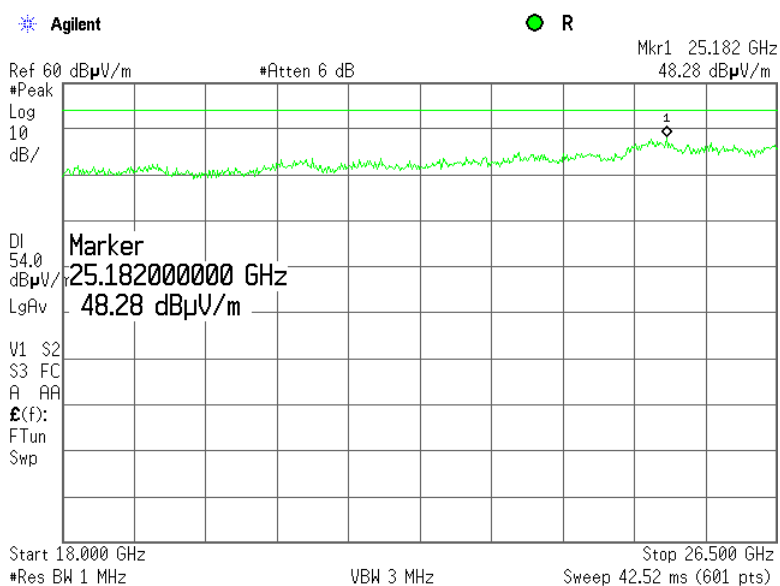


HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

Plot 7.4.18 Radiated emission measurements from 18000 to 26500 MHz at the high carrier frequency

TEST SITE: OATS
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical and Horizontal



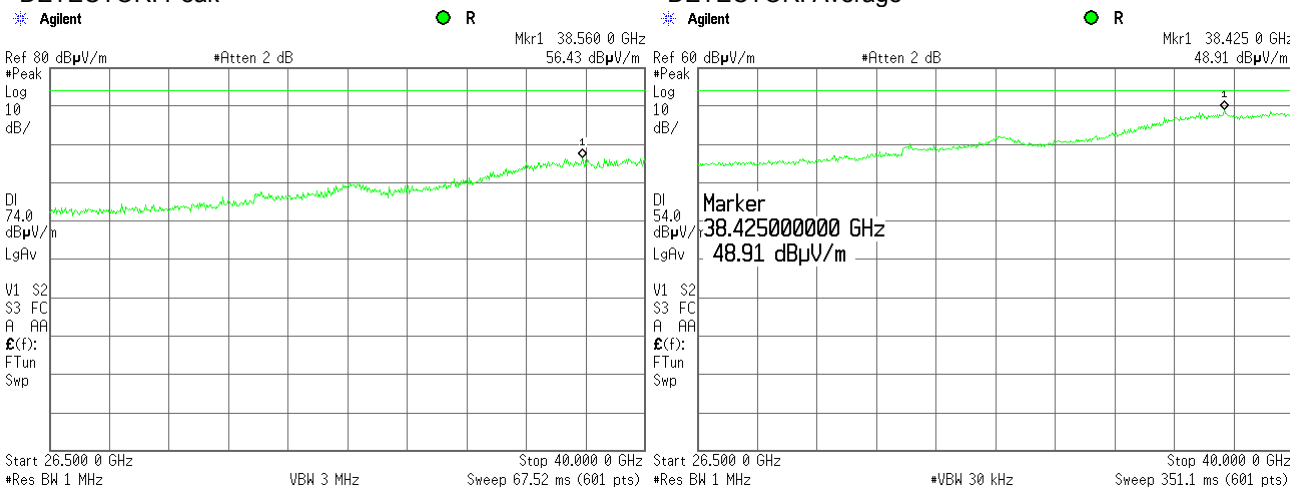


Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

Plot 7.4.19 Radiated emission measurements from 26500 to 40000 MHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

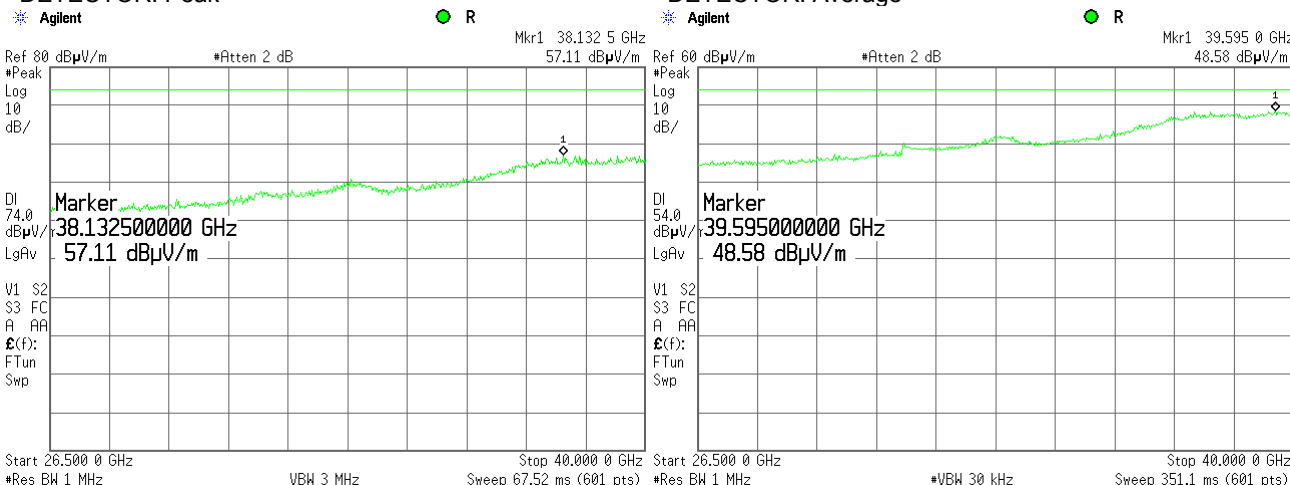
OATS
3 m
Vertical and Horizontal
DETECTOR: Average



Plot 7.4.20 Radiated emission measurements from 26500 to 40000 MHz at the mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Vertical and Horizontal
DETECTOR: Average





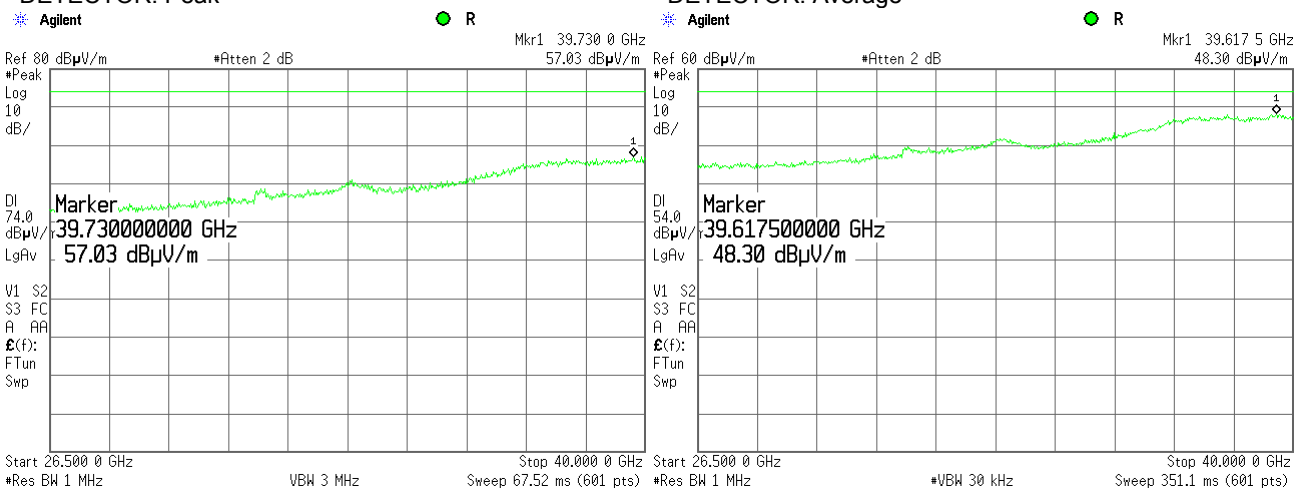
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

Plot 7.4.21 Radiated emission measurements from 26500 to 40000 MHz at the high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Vertical and Horizontal
DETECTOR: Average





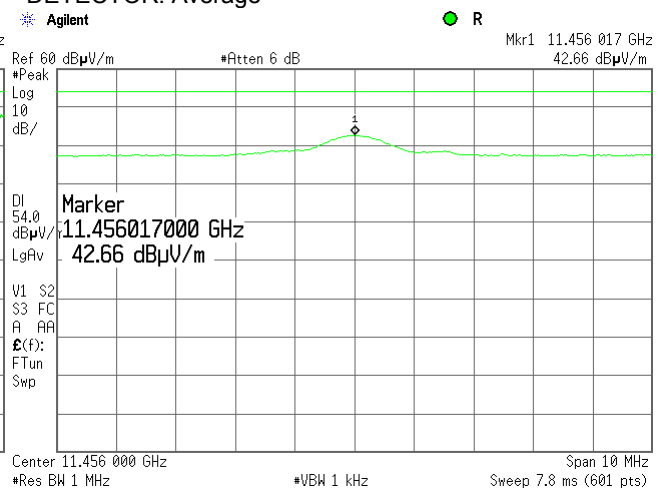
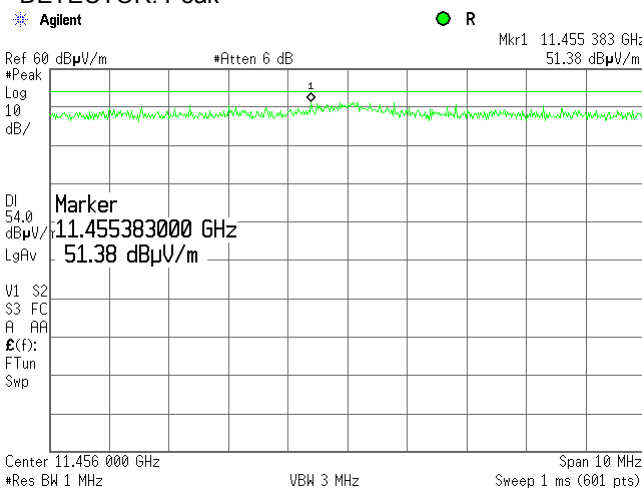
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

Plot 7.4.22 Radiated emission measurements at the second harmonic of low carrier frequency

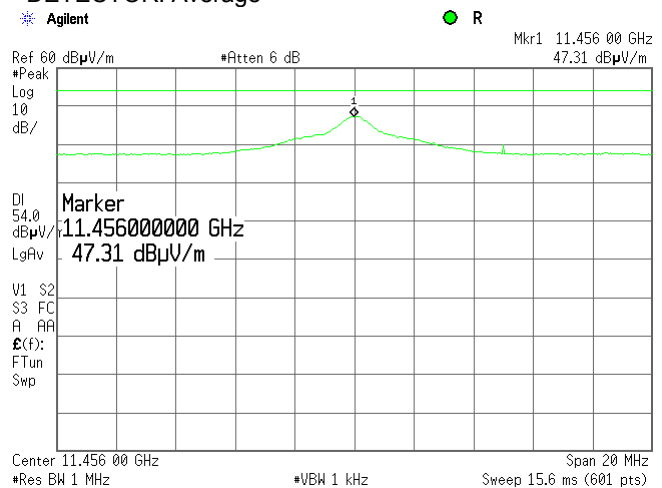
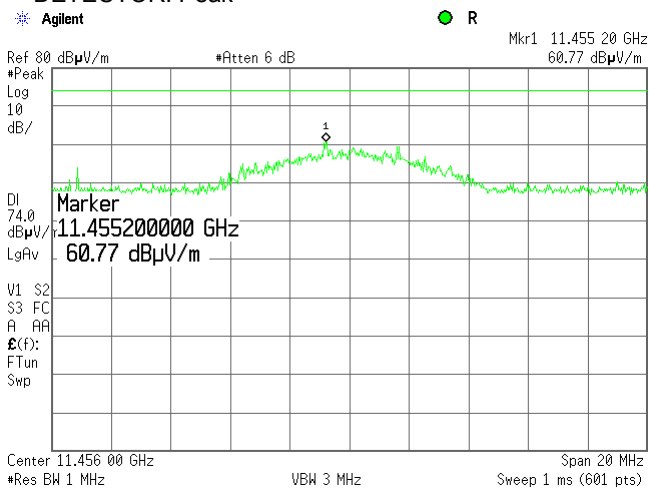
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Vertical
DETECTOR: Average



ANTENNA POLARIZATION:
DETECTOR: Peak

Horizontal
DETECTOR: Average



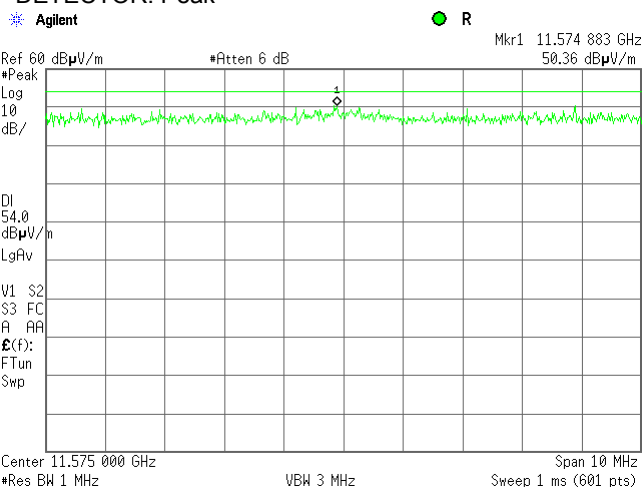


HERMON LABORATORIES

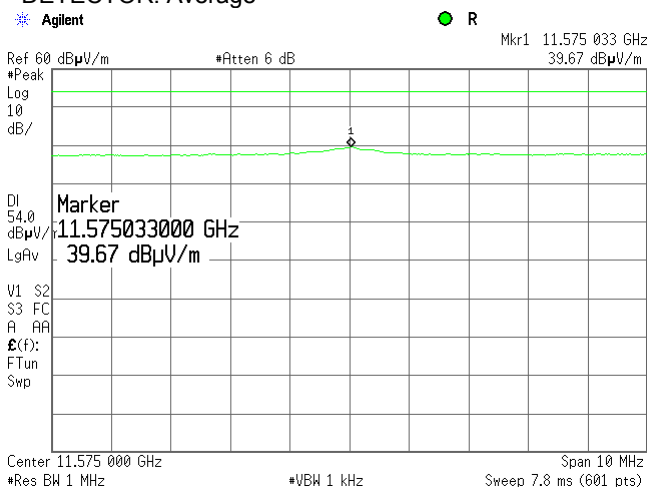
Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna			

Plot 7.4.23 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

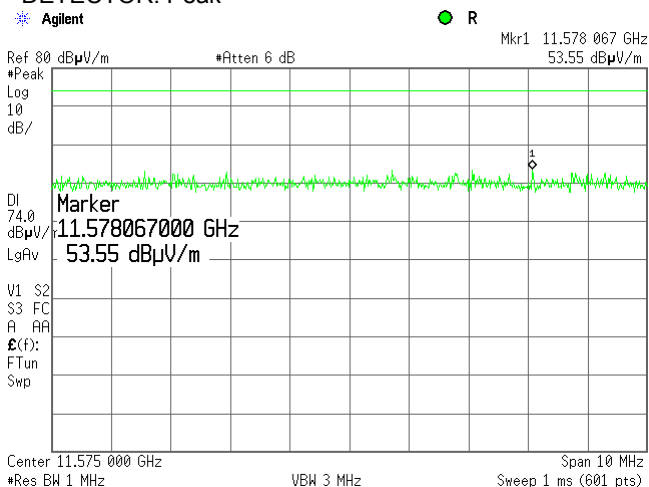


OATS
3 m
Vertical
DETECTOR: Average

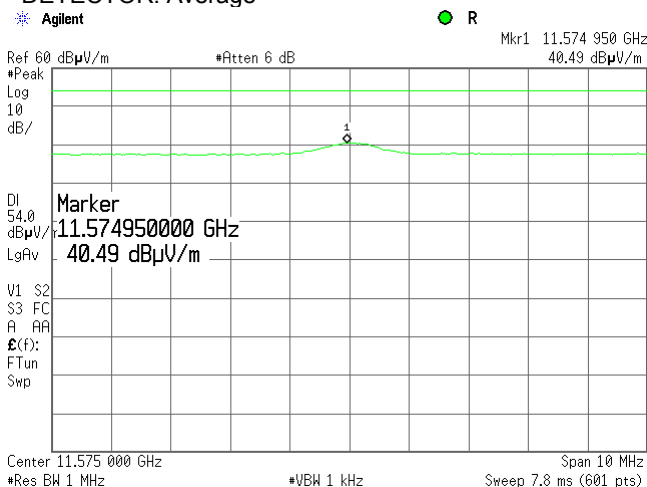


Plot 7.4.24 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak



OATS
3 m
Horizontal
DETECTOR: Average





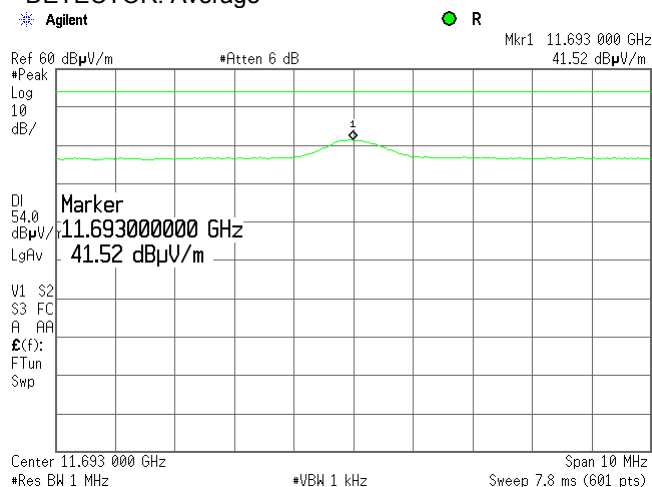
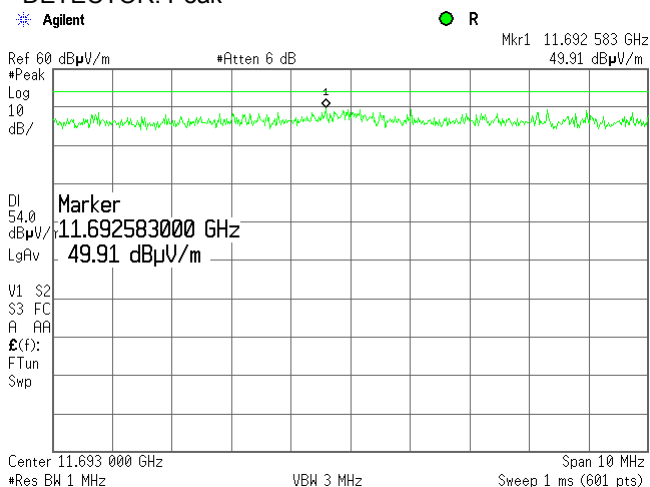
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

Plot 7.4.25 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

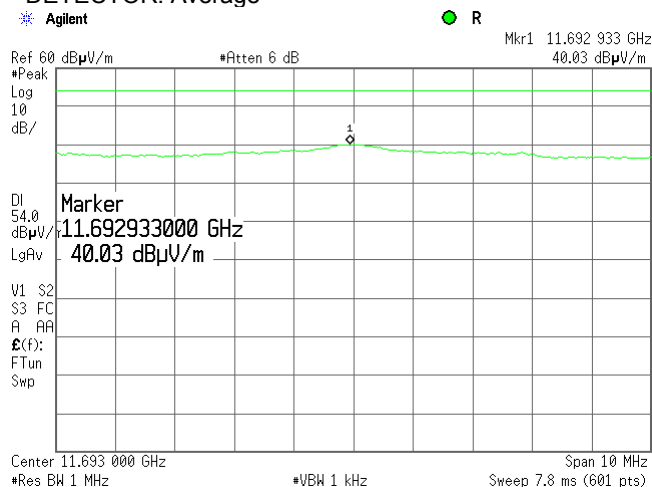
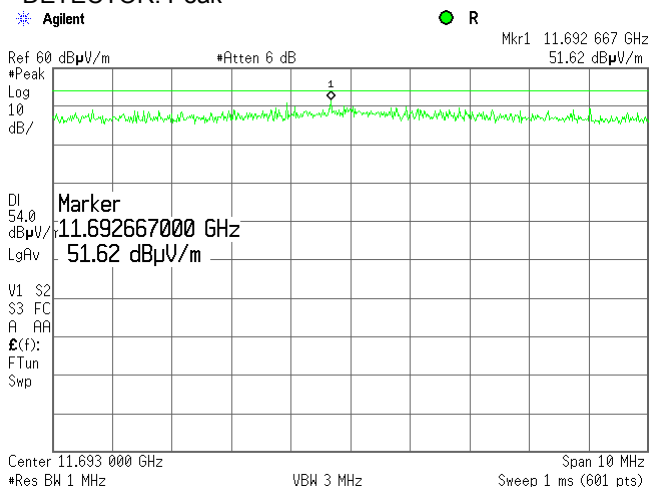
OATS
3 m
Vertical
DETECTOR: Average



Plot 7.4.26 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Horizontal
DETECTOR: Average





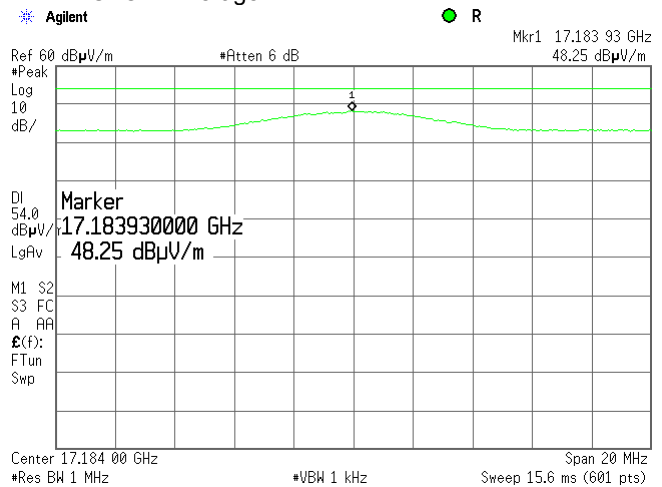
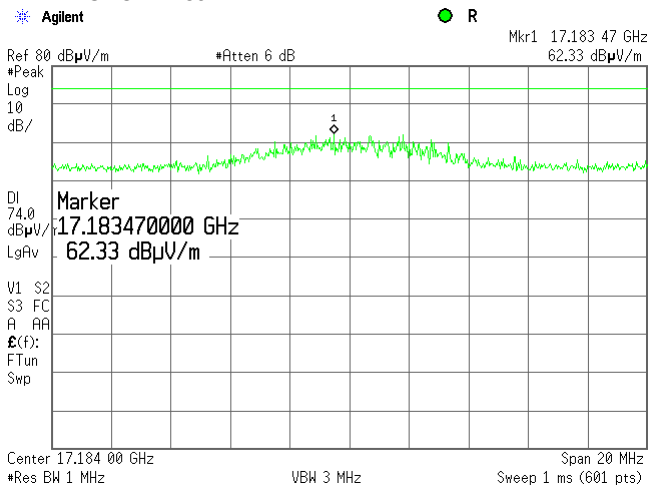
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

Plot 7.4.27 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

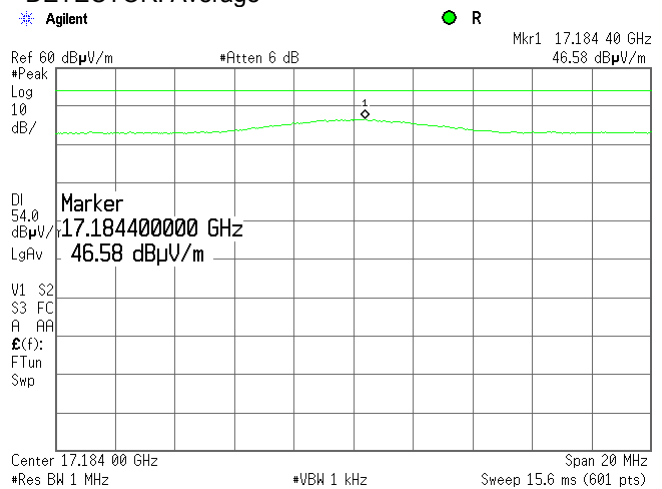
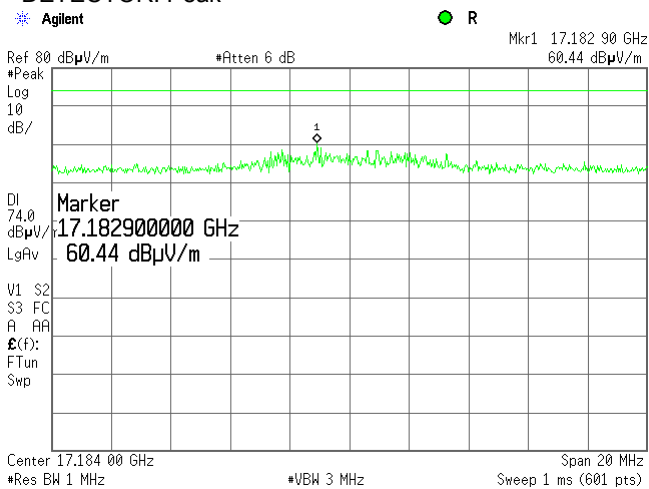
OATS
3 m
Vertical
DETECTOR: Average



Plot 7.4.28 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Horizontal
DETECTOR: Average





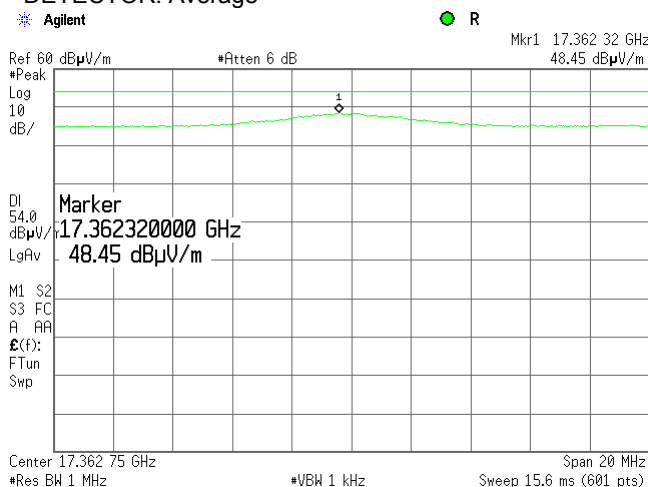
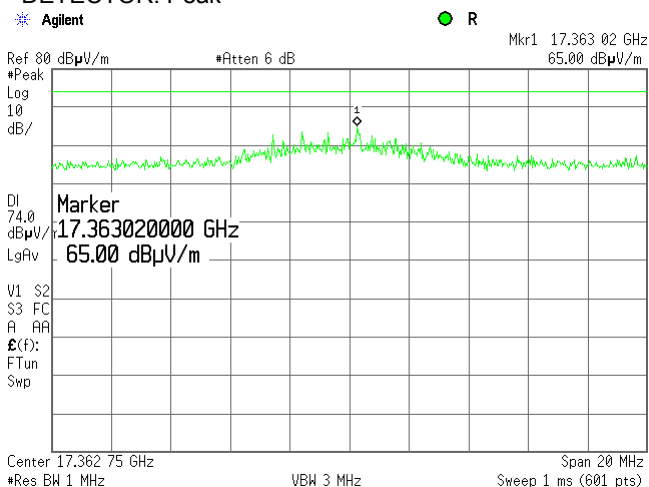
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

Plot 7.4.29 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

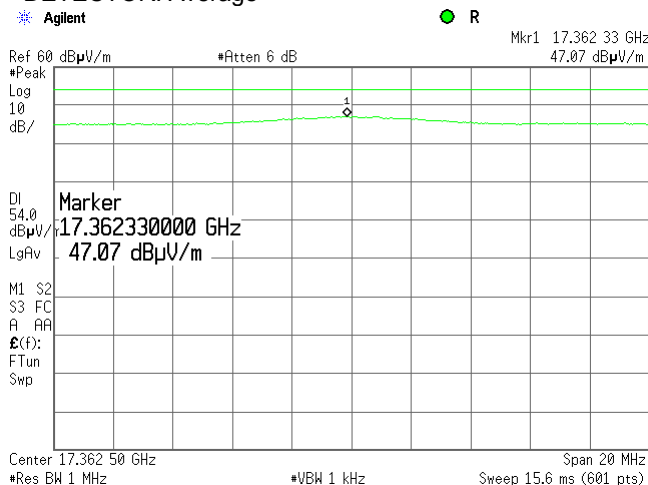
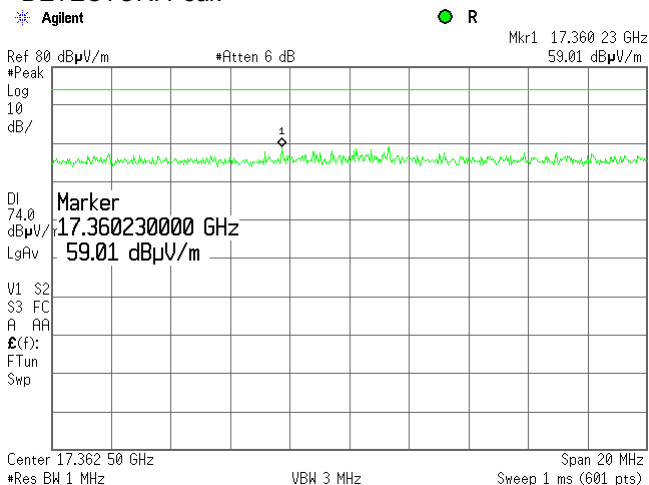
OATS
3 m
Vertical
DETECTOR: Average



Plot 7.4.30 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Horizontal
DETECTOR: Average





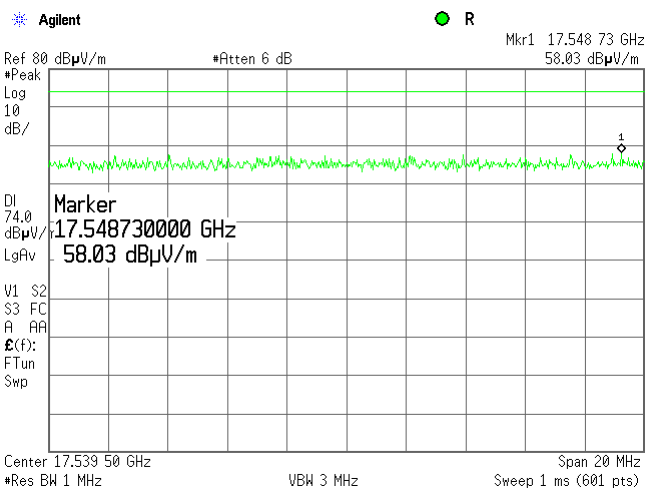
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions	
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4	
Test mode: Compliance	Verdict: PASS
Date(s): 10/24/2012 - 10/25/2012	
Temperature: 24.1 °C	Air Pressure: 1015 hPa
Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 9.5 dBi omnidirectional antenna	

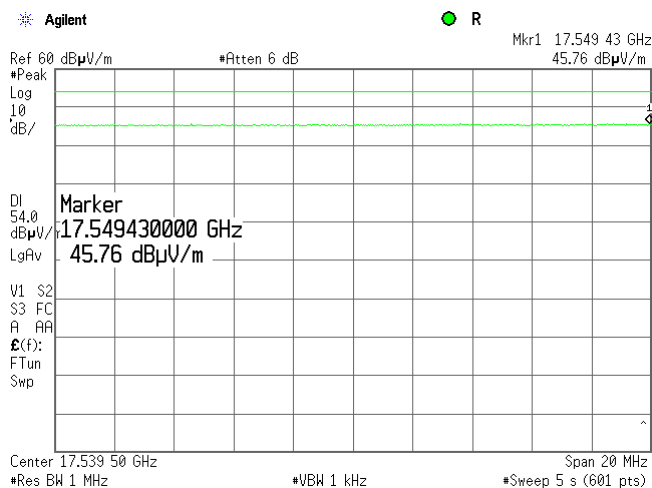
Plot 7.4.31 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

DETECTOR: Peak



DETECTOR: Average





Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10/24/2012 - 10/25/2012		
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Table 7.4.7 Field strength of emissions outside restricted bands with 22.5 dBi antenna

ASSIGNED FREQUENCY BAND: 5725-5850 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
 TEST DISTANCE: 3 m
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 23.04 Mbps
 DUTY CYCLE: 40 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 TRANSMITTER OUTPUT POWER: 23.38 dBm at low carrier frequency
 23.12 dBm at mid carrier frequency
 21.15 dBm at high carrier frequency
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
No emissions were found									Pass
Mid carrier frequency									
No emissions were found									Pass
High carrier frequency									
No emissions were found									Pass

*- EUT front panel refers to 0 degrees position of turntable.
 **- Margin = Attenuation below carrier – specification limit.

Table 7.4.8 Restricted bands

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date(s):	10/24/2012 - 10/25/2012		
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Table 7.4.9 Field strength of spurious emissions above 1 GHz within restricted bands with 22.5 dBi antenna

ASSIGNED FREQUENCY BAND: 5725-5850 MHz
 INVESTIGATED FREQUENCY RANGE: 1000 – 40000 MHz
 TEST DISTANCE: 3 m
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 23.04 Mbps
 DUTY CYCLE: 40 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 TRANSMITTER OUTPUT POWER: 23.38 dBm at low carrier frequency
 23.12 dBm at mid carrier frequency
 21.15 dBm at high carrier frequency
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Low carrier frequency											
11455.73	Hor	1.0	170	63.57	74.0	-10.43	51.32	44.3	54.0	-9.70	Pass
17184.07	Hor	1.0	0	63.37	74.0	-10.63	48.89	41.87	54.0	-12.13	
Mid carrier frequency											
11574.95	Hor	1.0	178	54.10	74.0	-19.90	43.69	36.67	54.0	-17.33	Pass
17362.32	Vert	1.0	0	65.00	74.0	-9.00	48.45	41.43	54.0	-12.57	
High carrier frequency											
11693.07	Hor	1.0	184	59.45	74.0	-14.55	46.54	39.52	54.0	-14.48	Pass

*- EUT front panel refers to 0 degrees position of turntable.
 **- Margin = Measured field strength - specification limit.
 ***- Margin = Calculated field strength - specification limit,
 where Calculated field strength = Measured field strength + average factor.

Table 7.4.10 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
2.24	5.029	NA	NA	NA	-7.02

*- Average factor was calculated as follows
 for pulse train shorter than 100 ms: $Average\ factor = 20 \times \log_{10} \left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train \right)$
 for pulse train longer than 100 ms: $Average\ factor = 20 \times \log_{10} \left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\ ms} \times Number\ of\ bursts\ within\ 100\ ms \right)$



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10/24/2012 - 10/25/2012		
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Table 7.4.11 Field strength of spurious emissions below 1 GHz within restricted bands with 22.5 dBi antenna

ASSIGNED FREQUENCY BAND: 5725-5850 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 TEST DISTANCE: 3 m
 MODULATION: 64 QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 23.04 Mbps
 DUTY CYCLE: 40 %
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 TRANSMITTER OUTPUT POWER: 23.38 dBm at low carrier frequency
 23.12 dBm at mid carrier frequency
 21.15 dBm at high carrier frequency
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
 9.0 kHz (150 kHz – 30 MHz)
 120 kHz (30 MHz – 1000 MHz)
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
Low carrier frequency								
37.528	34.4	33.0	40.0	-7.0	Vert	1.0	39	Pass
117.0524	34.5	31.8	43.5	-11.7	Vert	1.0	0	
136.9065	34.4	32.8	43.5	-10.7	Vert	1.2	60	
Mid carrier frequency								
37.528	34.5	33.2	40.0	-6.8	Vert	1.0	39	Pass
117.0524	34.5	31.8	43.5	-11.7	Vert	1.0	0	
136.9065	34.4	32.8	43.5	-10.7	Vert	1.2	60	
275.022	38.8	35.0	46.0	-11.0	Vert	1.0	45	
High carrier frequency								
37.528	34.5	33.2	40.0	-6.8	Vert	1.0	39	Pass
117.0524	34.5	31.8	43.5	-11.7	Vert	1.0	0	
137.9054	37.9	35.4	43.5	-8.1	Vert	1.2	60	
275.022	38.8	35.0	46.0	-11.0	Vert	1.0	45	

*- Margin = Measured emission - specification limit.
 **- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0604	HL 0768	HL 0769	HL 1984	HL 2909	HL 3533
HL 3535	HL 3818	HL 3901	HL 4114	HL 4276	HL 4352	HL 4353	

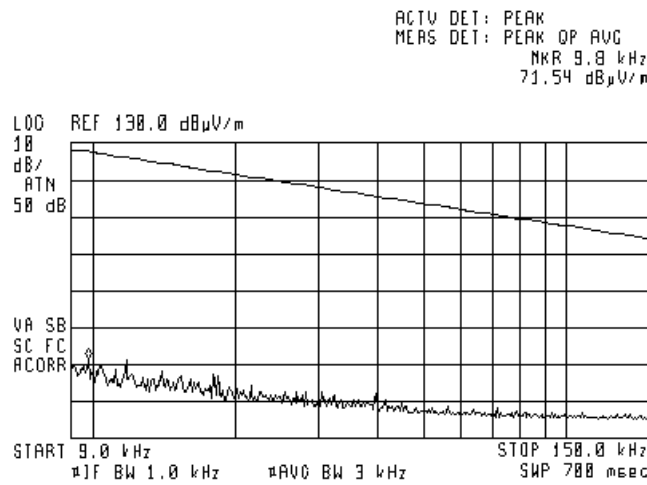
Full description is given in Appendix A.



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10/24/2012 - 10/25/2012		
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

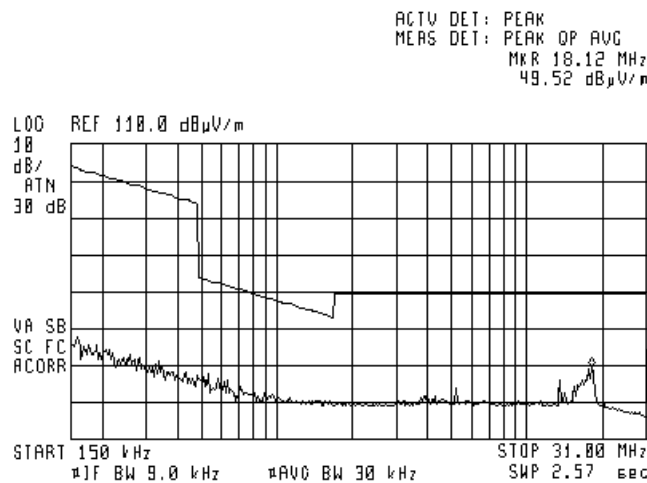
Plot 7.4.32 Radiated emission measurements from 9 to 150 kHz at the low, mid and high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.4.33 Radiated emission measurements from 0.15 to 30 MHz at the low, mid and high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical

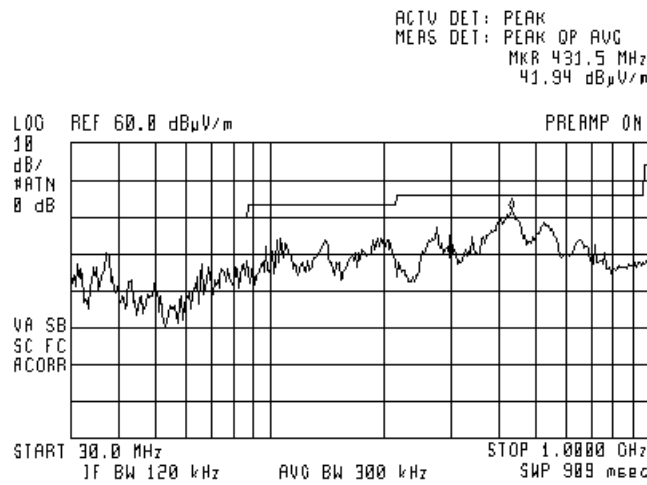




Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

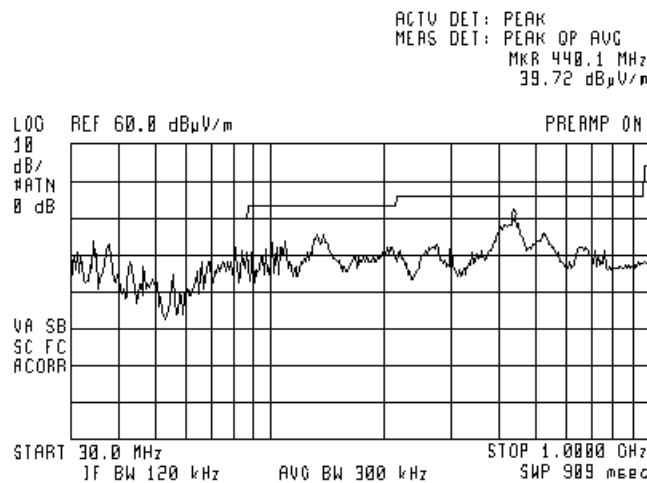
Plot 7.4.34 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.4.35 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

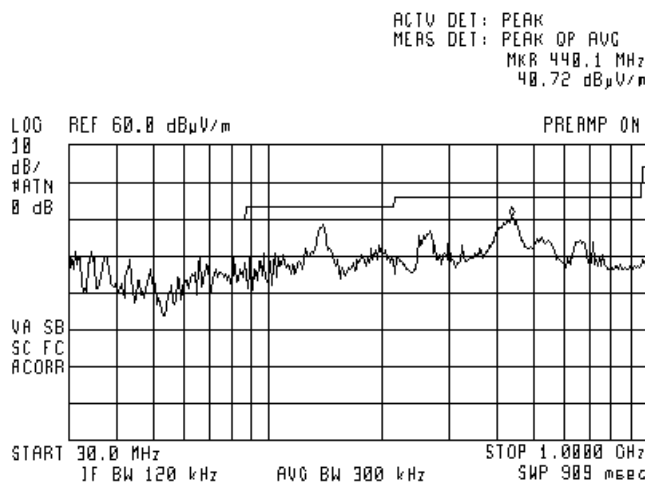




Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.36 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

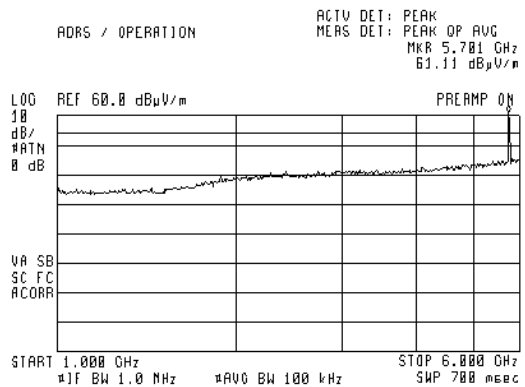
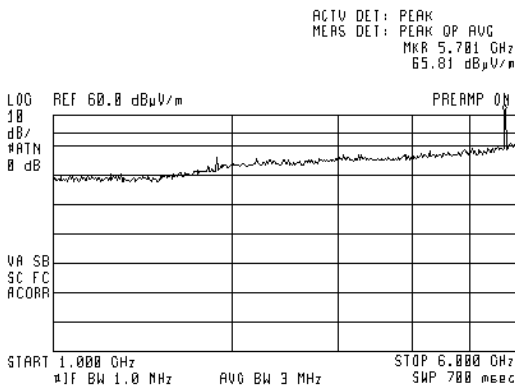
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.4.37 Radiated emission measurements from 1000 to 6000 MHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

Semi anechoic chamber
3 m
Vertical and Horizontal
DETECTOR: Average



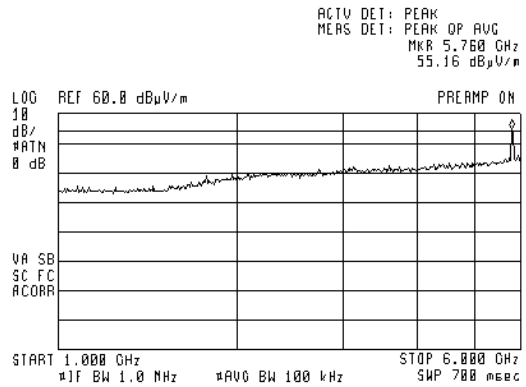
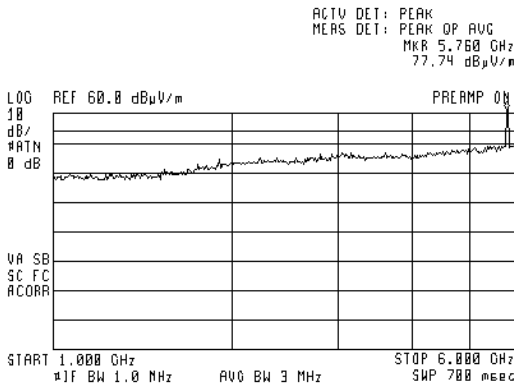


Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.38 Radiated emission measurements from 1000 to 6000 MHz at the mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

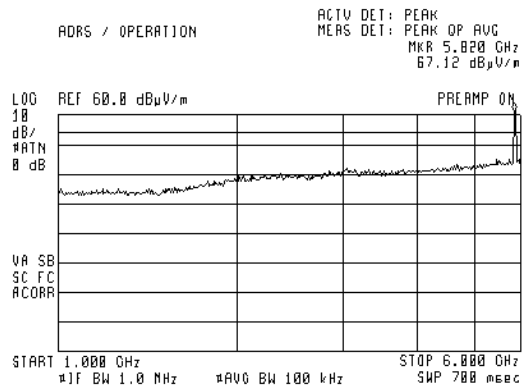
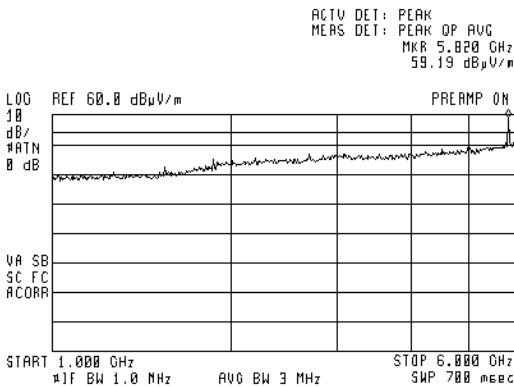
Semi anechoic chamber
3 m
Vertical and Horizontal
DETECTOR: Average



Plot 7.4.39 Radiated emission measurements from 1000 to 6000 MHz at the high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

Semi anechoic chamber
3 m
Vertical and Horizontal
DETECTOR: Average





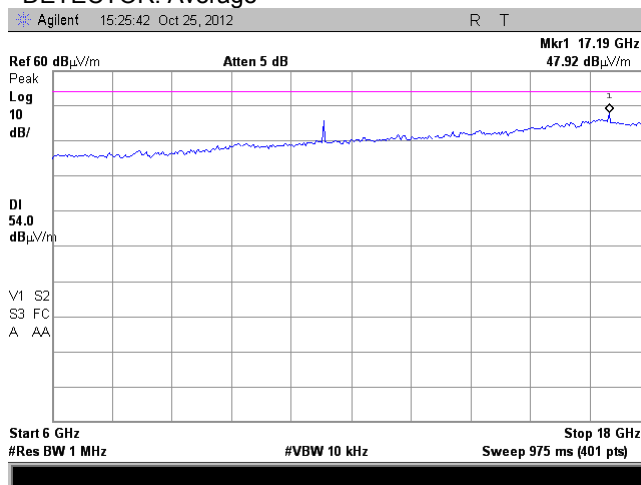
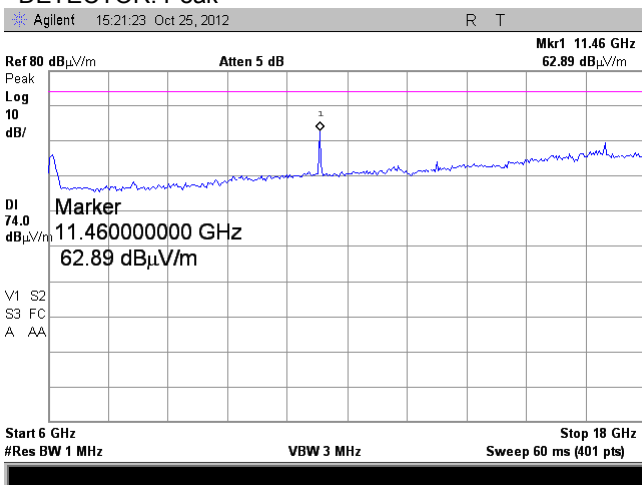
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.40 Radiated emission measurements from 6000 to 18000 MHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

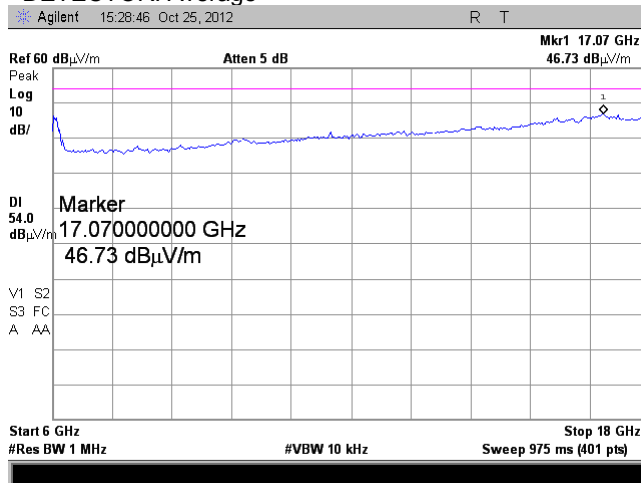
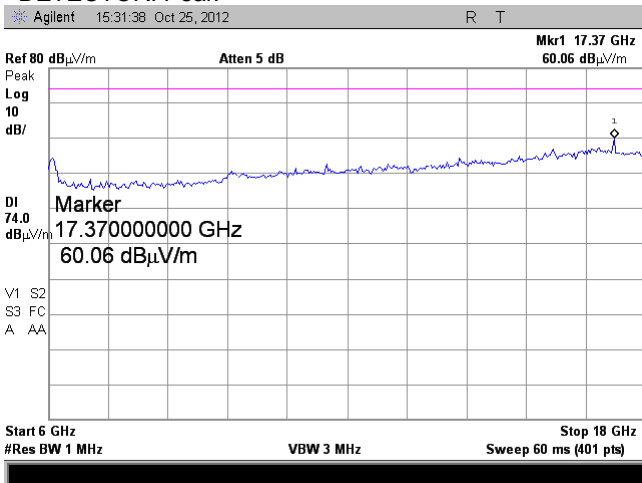
Semi anechoic chamber
3 m
Vertical and Horizontal
DETECTOR: Average



Plot 7.4.41 Radiated emission measurements from 6000 to 18000 MHz at the mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

Semi anechoic chamber
3 m
Vertical and Horizontal
DETECTOR: Average





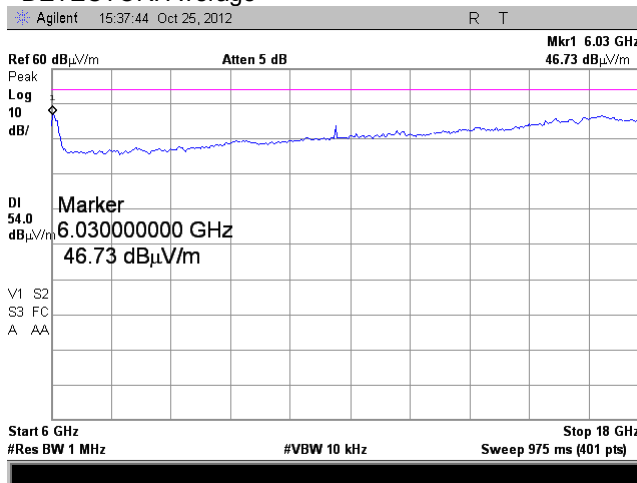
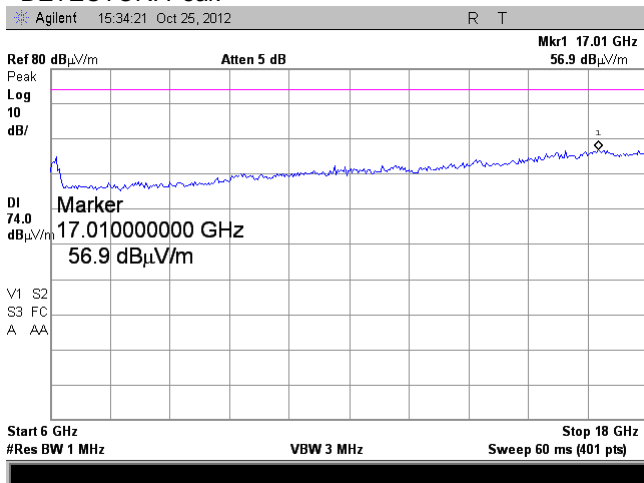
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.42 Radiated emission measurements from 6000 to 18000 MHz at the high carrier frequency

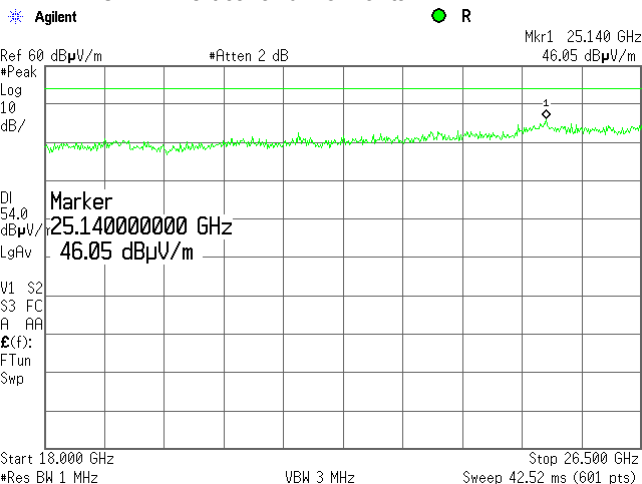
TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

Semi anechoic chamber
3 m
Vertical and Horizontal
DETECTOR: Average



Plot 7.4.43 Radiated emission measurements from 18000 to 26500 MHz at the low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

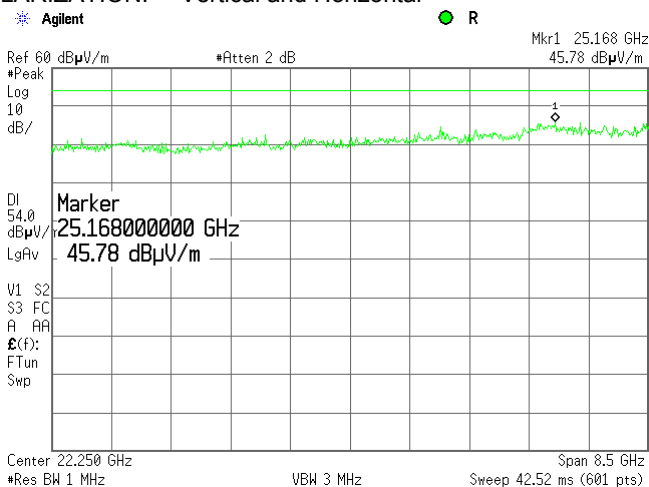




Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

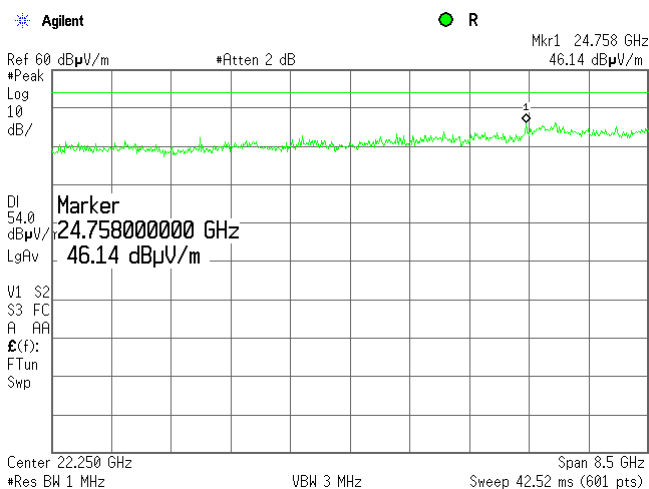
Plot 7.4.44 Radiated emission measurements from 18000 to 26500 MHz at the mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.4.45 Radiated emission measurements from 18000 to 26500 MHz at the high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal





HERMON LABORATORIES

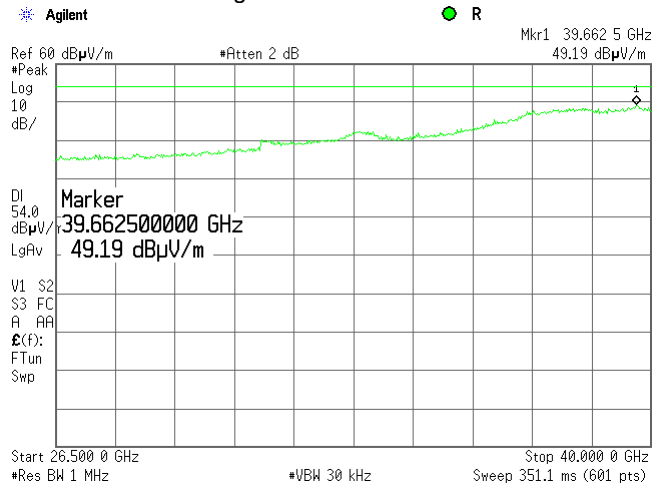
Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.46 Radiated emission measurements from 26500 to 40000 MHz at the low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

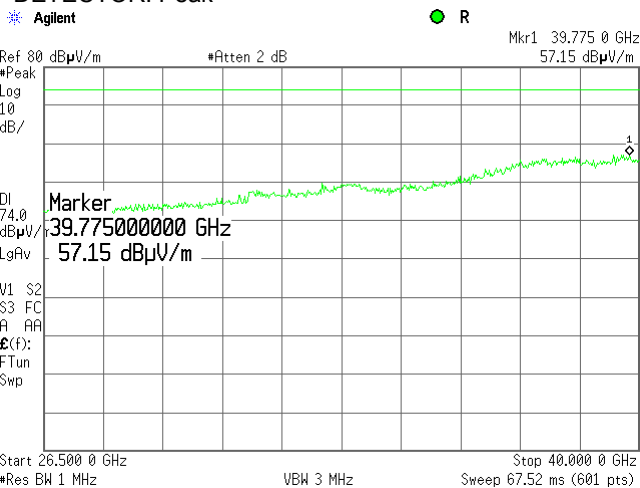


OATS
3 m
Vertical and Horizontal
DETECTOR: Average

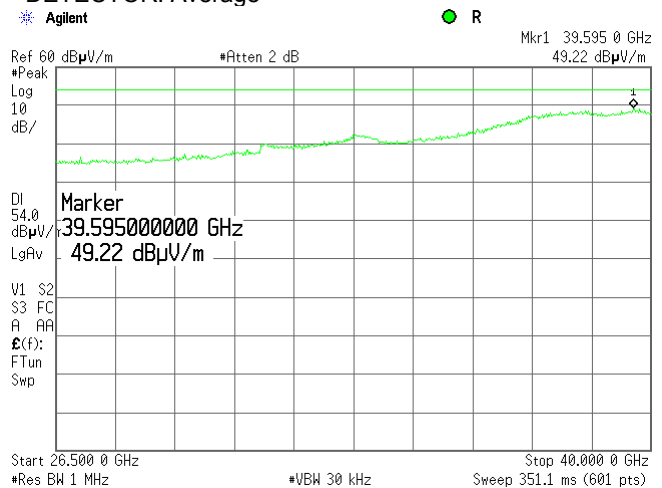


Plot 7.4.47 Radiated emission measurements from 26500 to 40000 MHz at the mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak



OATS
3 m
Vertical and Horizontal
DETECTOR: Average





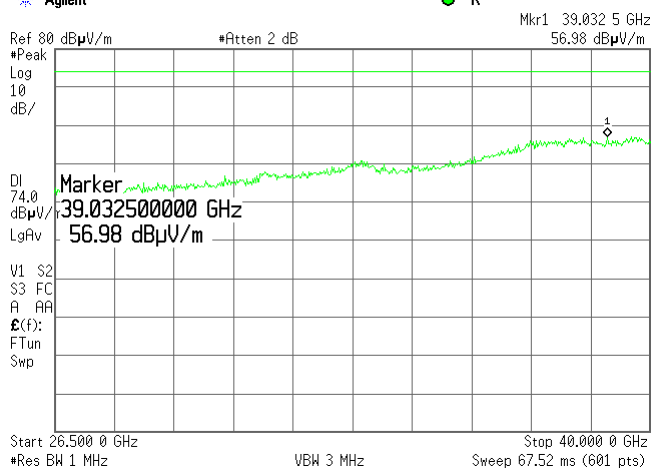
Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.48 Radiated emission measurements from 26500 to 40000 MHz at the high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

Agilent

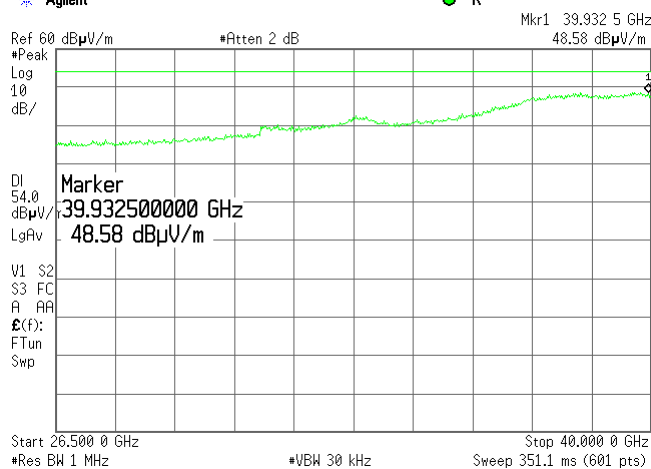
R



OATS
3 m
Vertical and Horizontal
DETECTOR: Average

Agilent

R



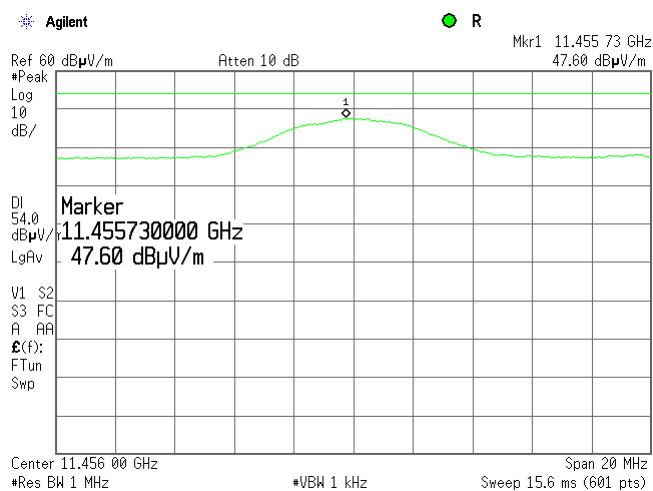
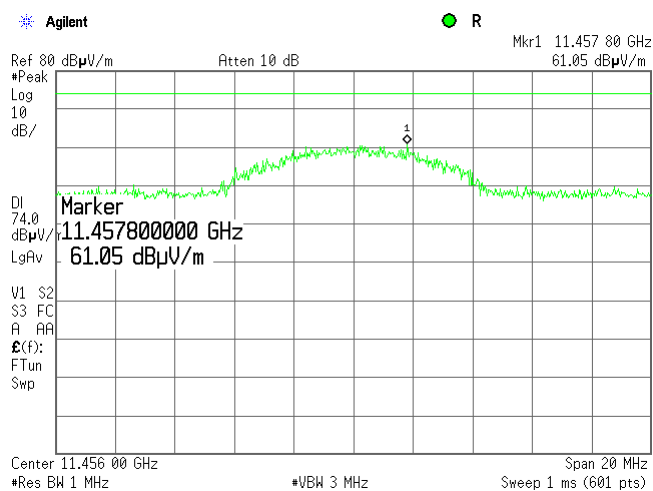


Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.49 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

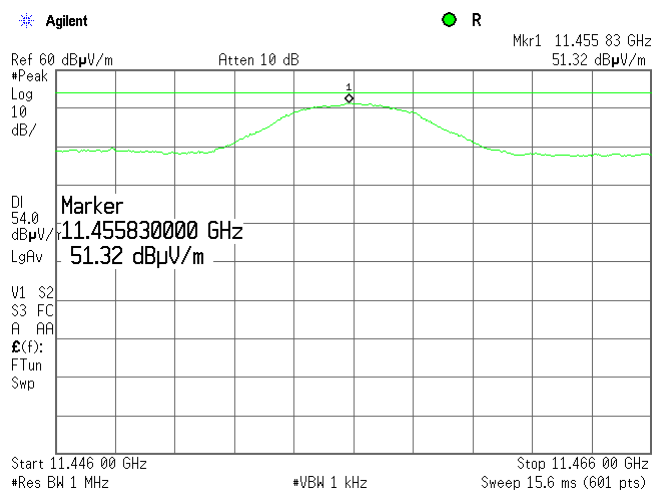
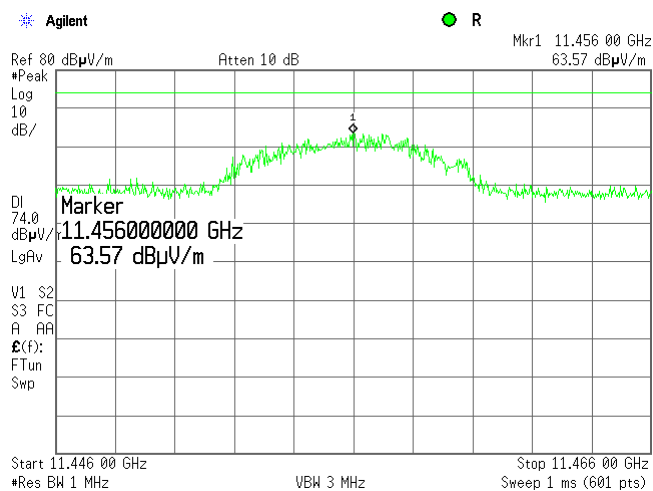
OATS
3 m
Vertical
DETECTOR: Average



Plot 7.4.50 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Horizontal
DETECTOR: Average



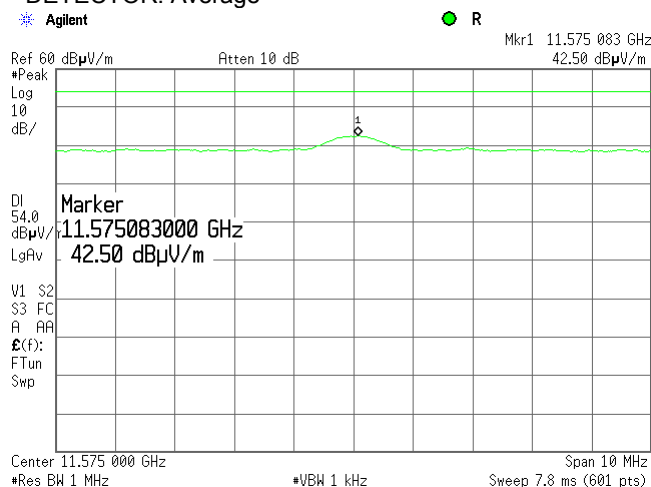
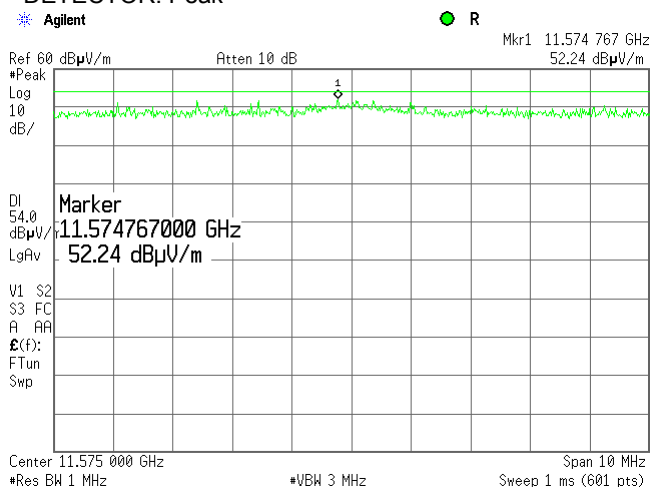


Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.51 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

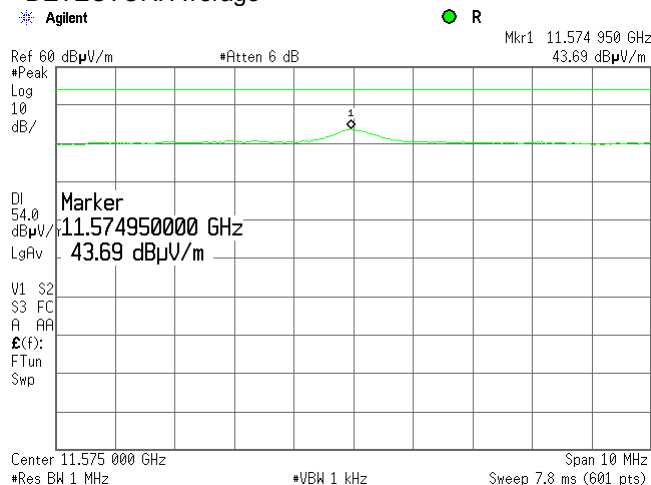
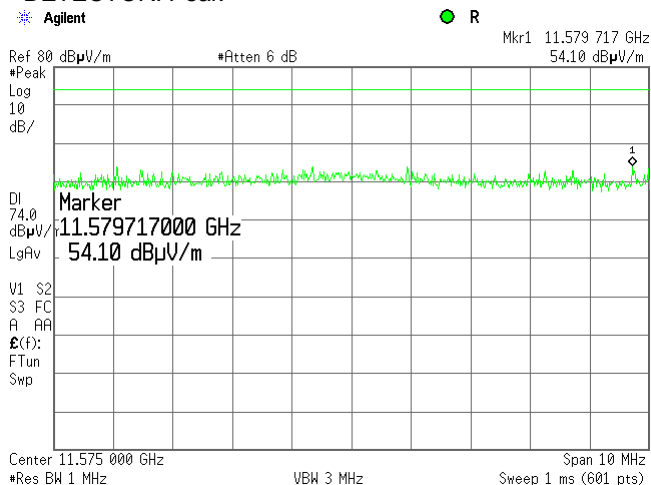
OATS
3 m
Vertical
DETECTOR: Average



Plot 7.4.52 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Horizontal
DETECTOR: Average





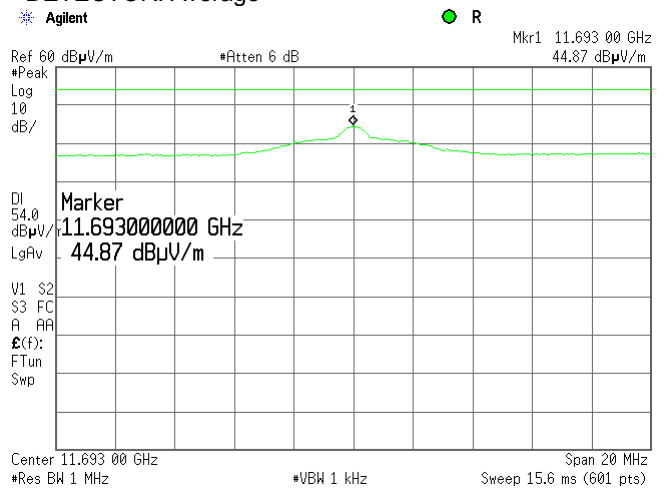
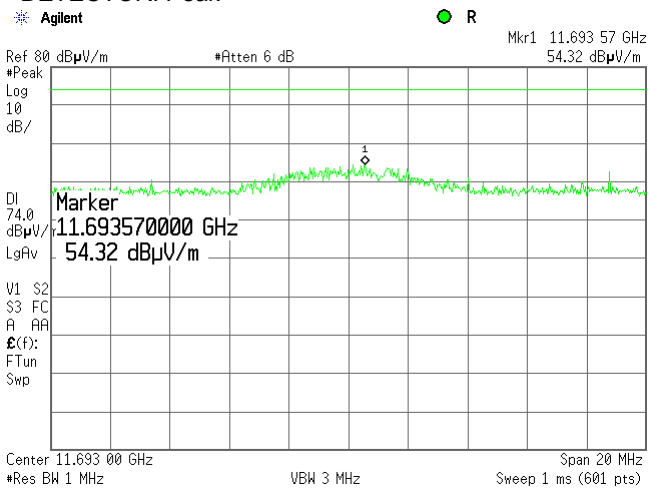
HERMON LABORATORIES

Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.53 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

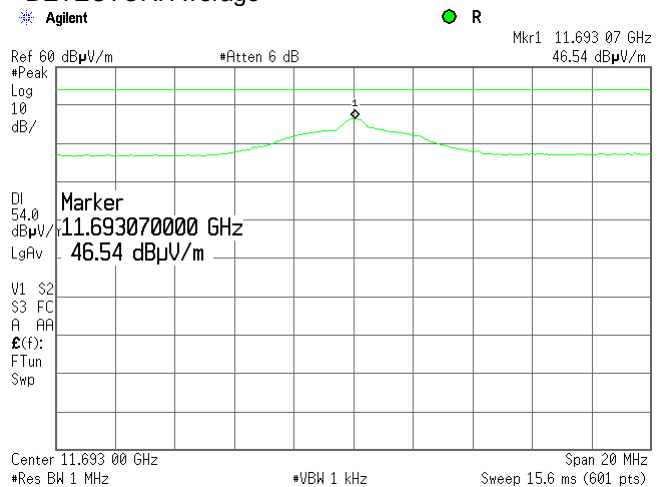
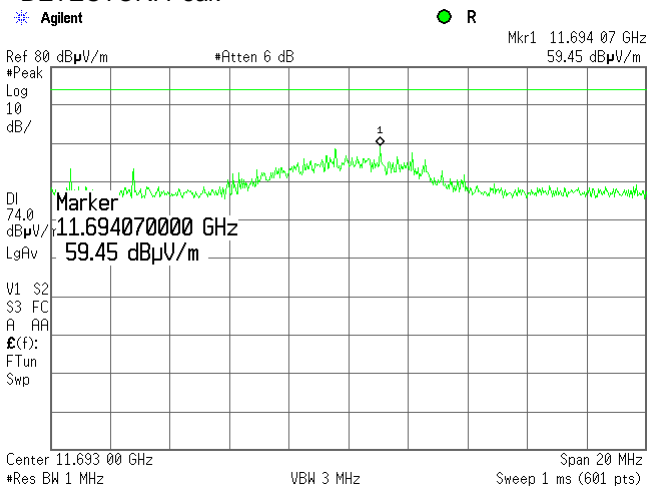
OATS
3 m
Vertical
DETECTOR: Average



Plot 7.4.54 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Horizontal
DETECTOR: Average



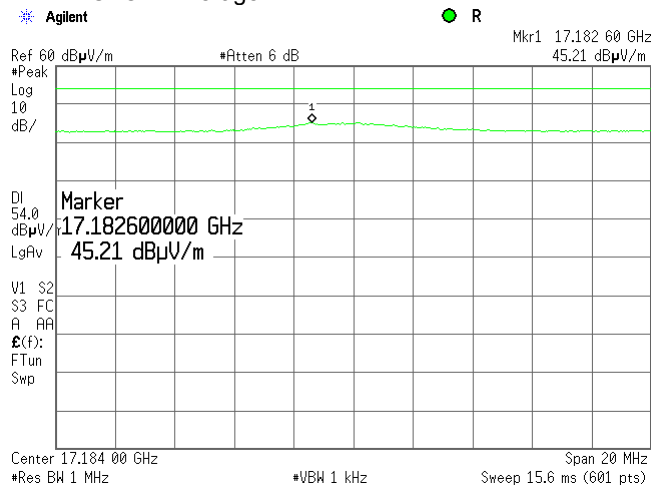
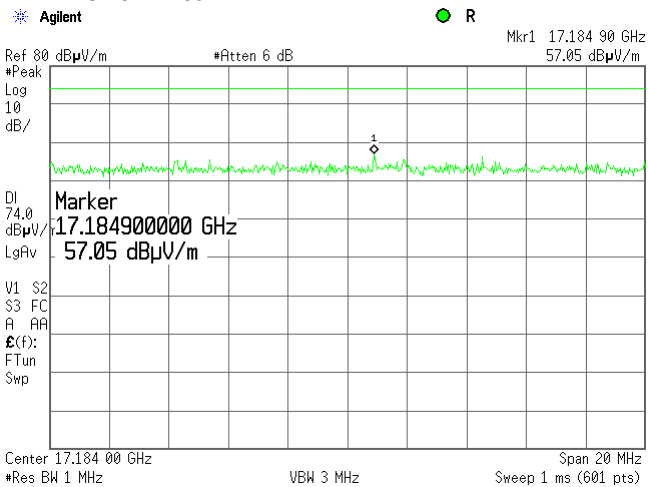


Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.55 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

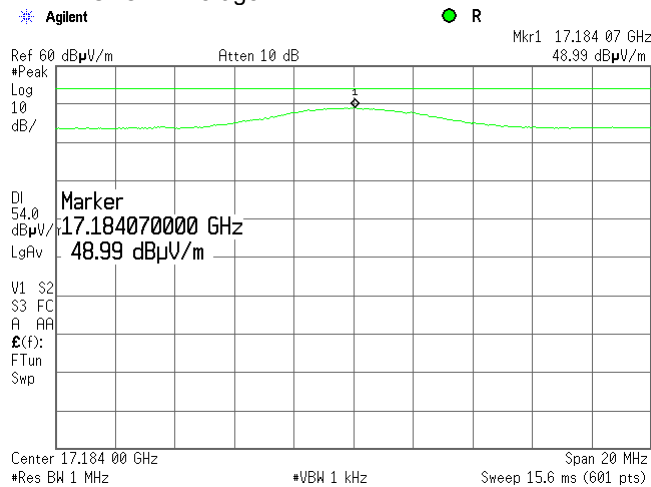
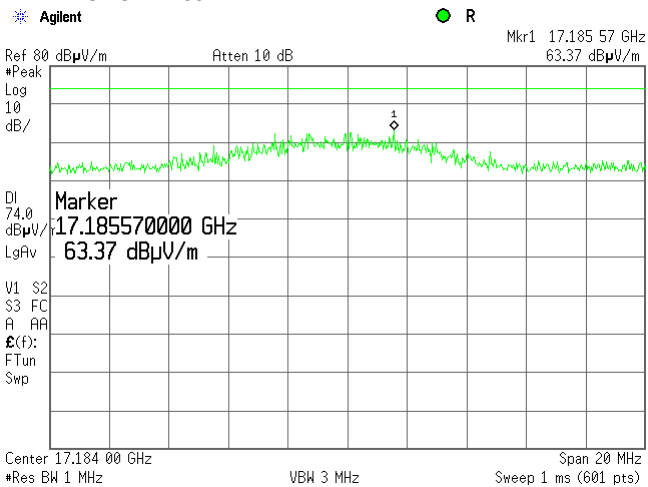
OATS
3 m
Vertical
DETECTOR: Average



Plot 7.4.56 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Horizontal
DETECTOR: Average



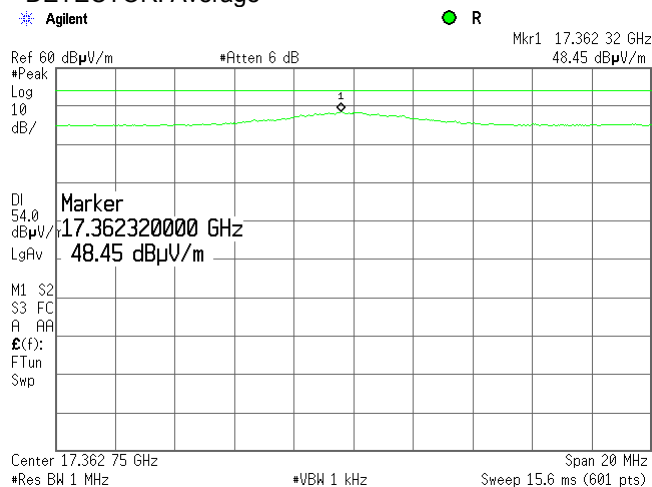
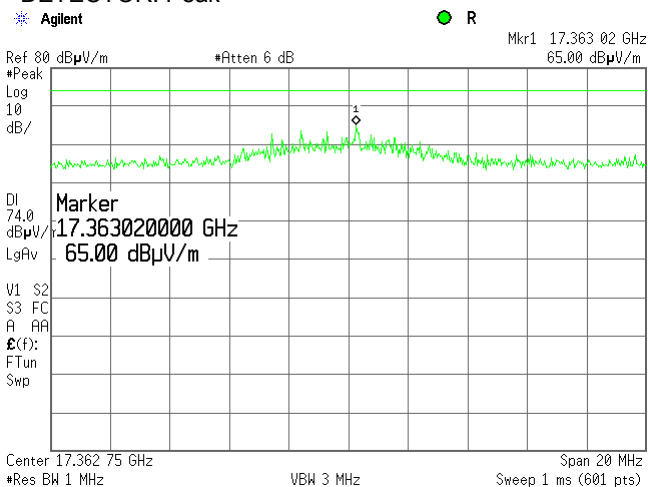


Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

Plot 7.4.57 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

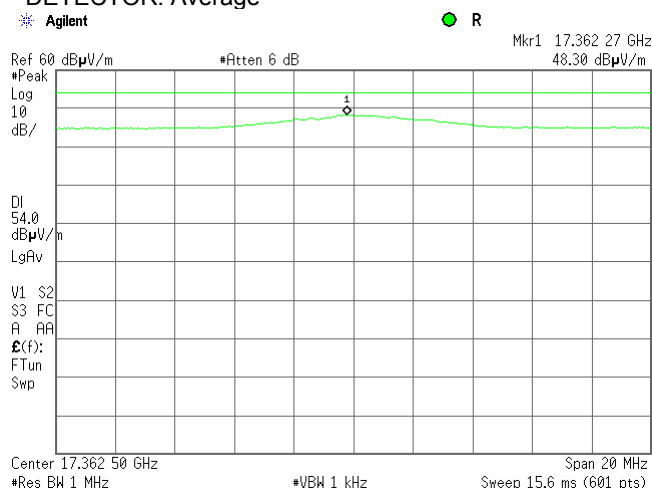
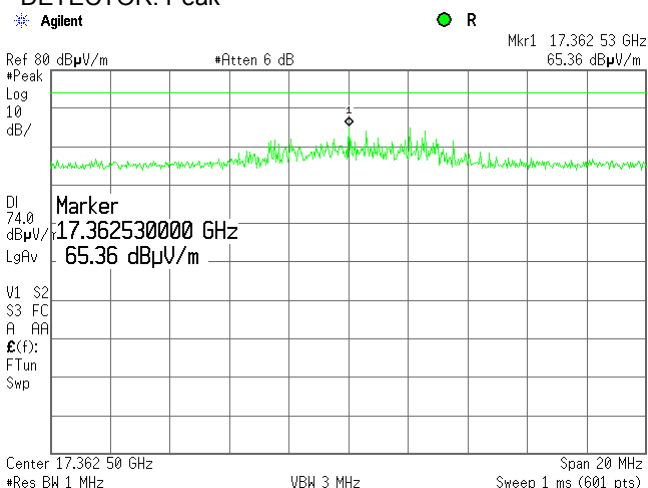
OATS
3 m
Vertical
DETECTOR: Average



Plot 7.4.58 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
DETECTOR: Peak

OATS
3 m
Horizontal
DETECTOR: Average



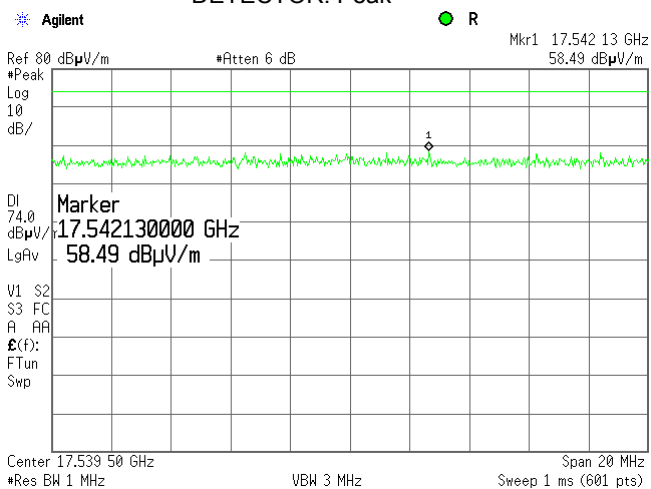


Test specification: Section 15.247(d), Radiated spurious emissions			
Test procedure: 558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 10/24/2012 - 10/25/2012			
Temperature: 24.1 °C	Air Pressure: 1015 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks: EUT with 22.5 dBi dual slant antenna			

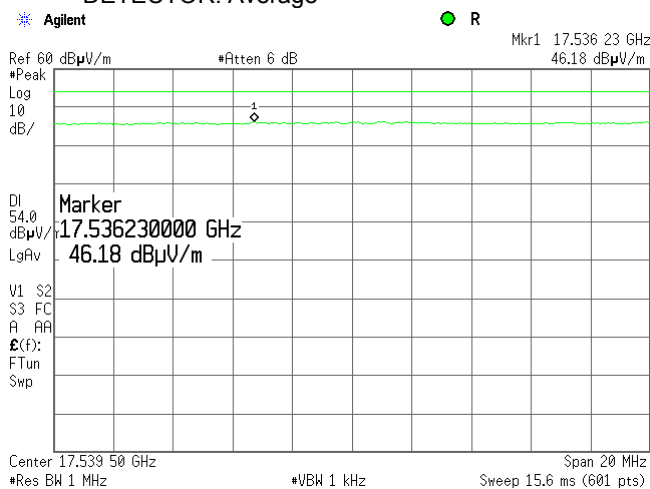
Plot 7.4.59 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

DETECTOR: Peak



DETECTOR: Average





Test specification:		Section 15.247(d), Band edge emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 25.1 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 42 %	
		Power Supply: 48 VDC	
Remarks:			

7.5 Band edge emissions at RF antenna connector

7.5.1 General

This test was performed to measure band edge emissions at RF antenna connector. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Band edge emission limits

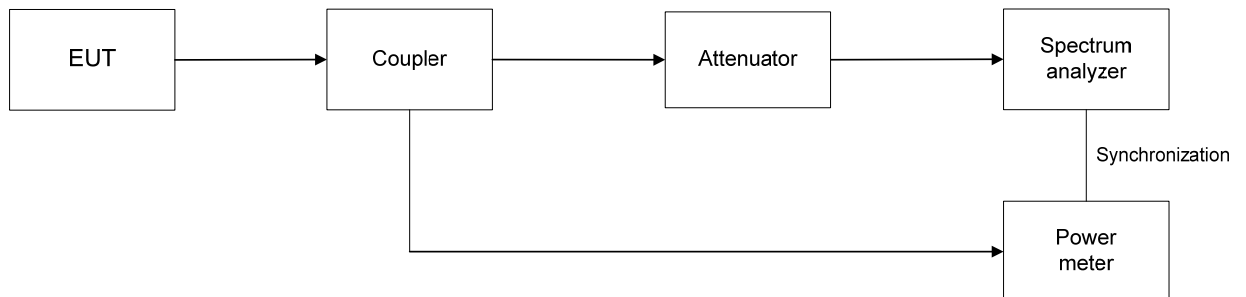
Output power	Assigned frequency, MHz	Attenuation below carrier*, dBc
Peak	902.0 – 928.0	20.0
	2400.0 – 2483.5	
	5725.0 – 5850.0	
Averaged over a time interval	902.0 – 928.0	30.0
	2400.0 – 2483.5	
	5725.0 – 5850.0	

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.5.2 Test procedure

- 7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized normally modulated at the maximum data rate and its proper operation was checked.
- 7.5.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.
- 7.5.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.
- 7.5.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.
- 7.5.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.5.2 and associated plots and referenced to the highest emission level measured within the authorized band.
- 7.5.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

Figure 7.5.1 Band edge emission test setup





Test specification:		Section 15.247(d), Band edge emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 25.1 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 42 %	
		Power Supply: 48 VDC	
Remarks:			
Verdict: PASS			

Table 7.5.2 Band edge emission test results

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

CANNEL BANDWIDTH 5 MHz

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
QPSK						
5728	-21.13	11.893	33.023	30	3.023	Pass
5846.5	-20.01	10.02	30.03		0.03	
64 QAM						
5728	-21.07	11.73	32.80	30.0	2.80	Pass
5846.5	-21.06	9.10	30.16		0.16	

CANNEL BANDWIDTH 10 MHz

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
QPSK						
5730.5	-23.09	7.518	30.608	30	0.608	Pass
5844.0	-26.01	4.94	30.95		0.95	
64 QAM						
5730.5	-23.41	7.220	30.63	30.0	0.63	Pass
5844.0	-25.20	5.68	30.88		0.88	

*- Margin = Attenuation below carrier – specification limit.

Reference numbers of test equipment used

HL 3301	HL 3302	HL 3442	HL 3781	HL 3818	HL 3868		
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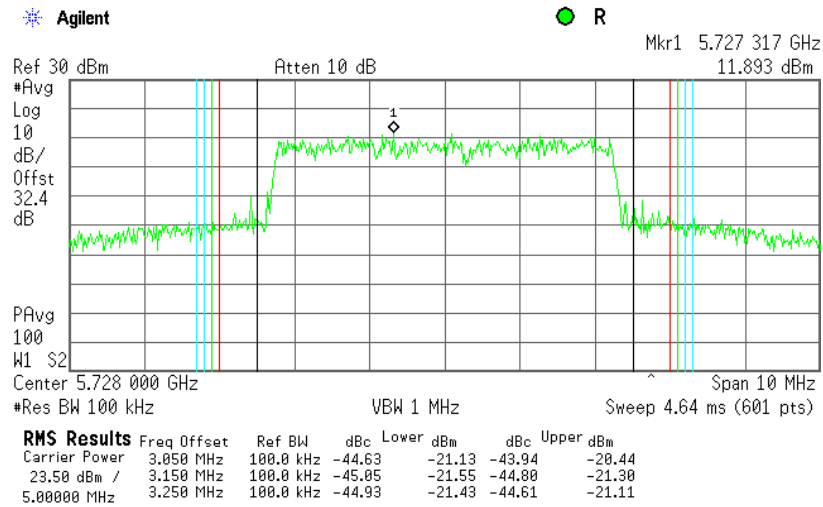
Full description is given in Appendix A.



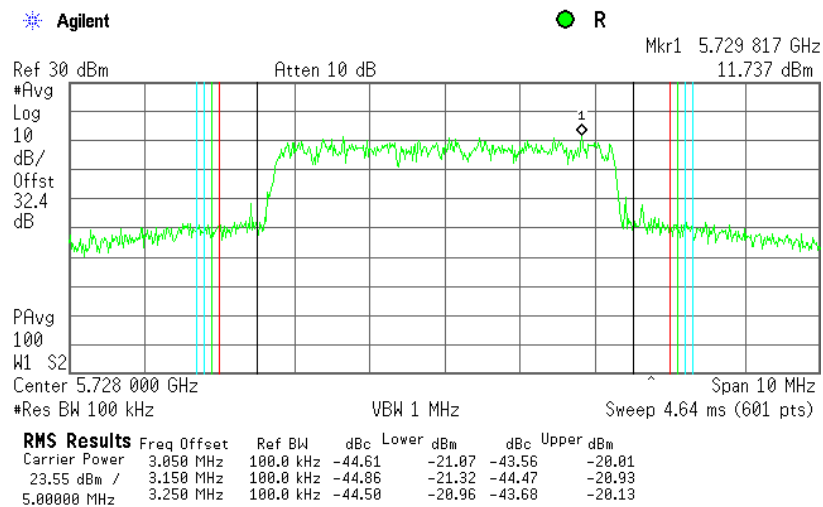
HERMON LABORATORIES

Test specification:		Section 15.247(d), Band edge emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 25.1 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 42 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.5.1 The highest band edge emission at low carrier frequency, 5 MHz BW, QPSK modulation



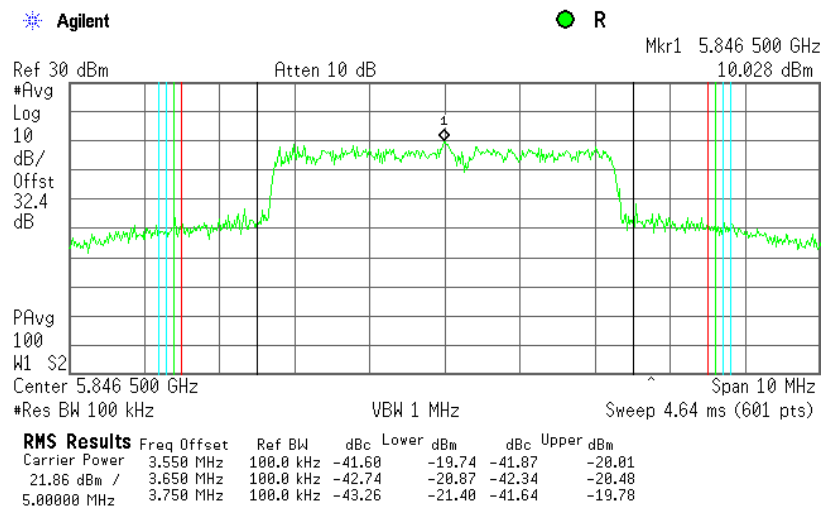
Plot 7.5.2 The highest band edge emission at low carrier frequency, 5 MHz BW, 64QAM modulation



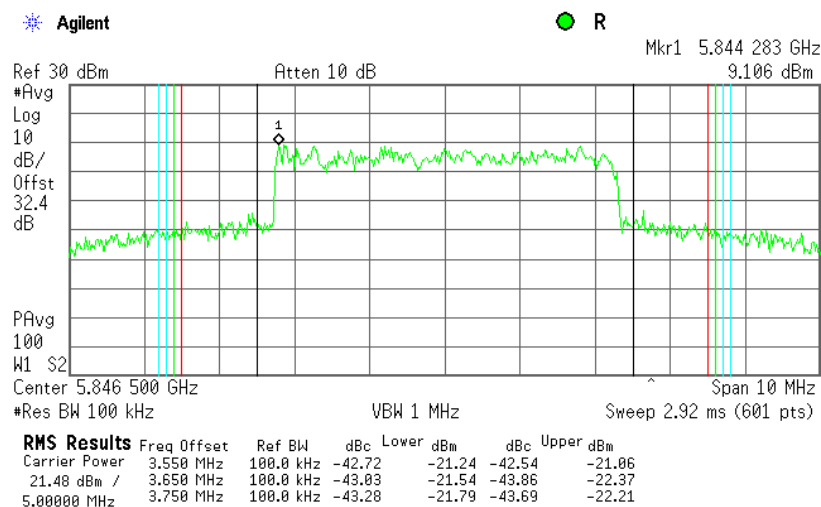


Test specification:		Section 15.247(d), Band edge emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 25.1 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 42 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.5.3 The highest band edge emission at high carrier, 5 MHz BW, QPSK modulation



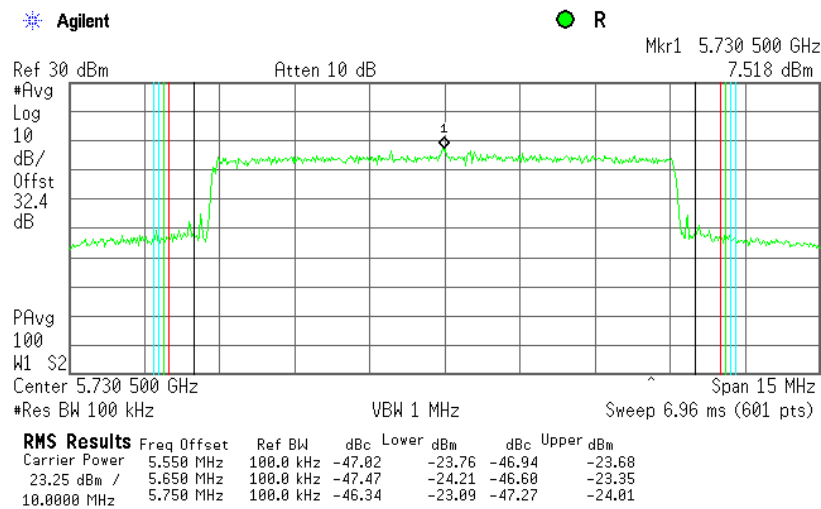
Plot 7.5.4 The highest band edge emission at high carrier frequency, 5 MHz BW, 64QAM modulation



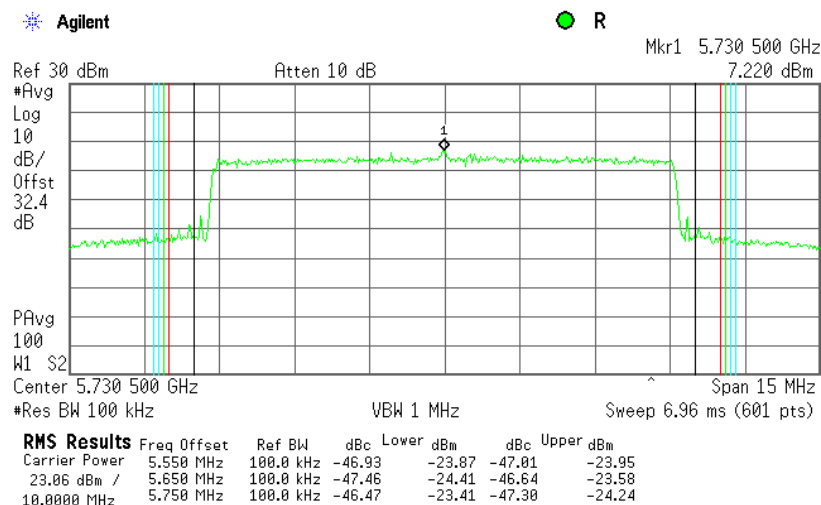


Test specification:		Section 15.247(d), Band edge emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	Verdict: PASS
Date(s):		9/6/2012	
Temperature: 25.1 °C	Air Pressure: 1008 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.5 The highest band edge emission at low carrier frequency, 10 MHz BW, QPSK modulation



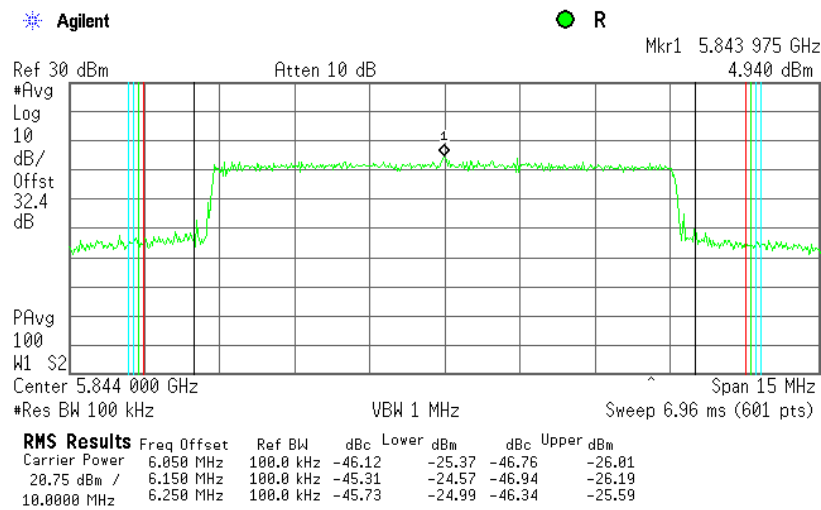
Plot 7.5.6 The highest band edge emission at low carrier frequency, 10 MHz BW, 64QAM modulation



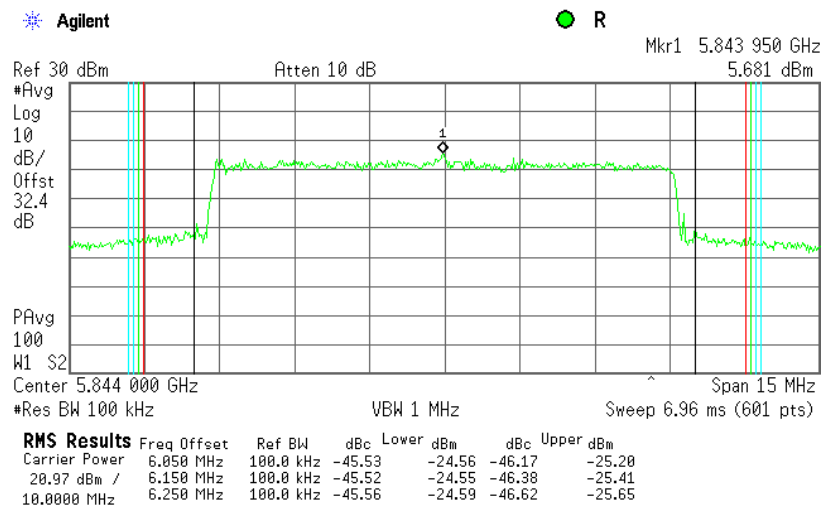


Test specification:		Section 15.247(d), Band edge emissions	
Test procedure:		558074 D01 DTS Meas Guidance v01	
Test mode:		Compliance	
Date(s):		9/6/2012	
Temperature: 25.1 °C		Air Pressure: 1008 hPa	
		Relative Humidity: 42 %	
		Power Supply: 48 VDC	
Remarks:			
		Verdict: PASS	

Plot 7.5.7 The highest band edge emission at high carrier frequency, 10 MHz BW, QPSK modulation



Plot 7.5.8 The highest band edge emission at high carrier frequency, 10 MHz BW, 64QAM modulation





Test specification: Section 15.247(e), Peak power density	
Test procedure:	ANSI C63.10-2009 section 6.11.2.4
Test mode:	Compliance
Date(s):	9/6/2012
Temperature: 24 °C	Air Pressure: 1007 hPa
Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:	
Verdict: PASS	

7.6 Peak spectral power density

7.6.1 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 7.6.1.

Table 7.6.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm
5725-5850	3.0	8.0

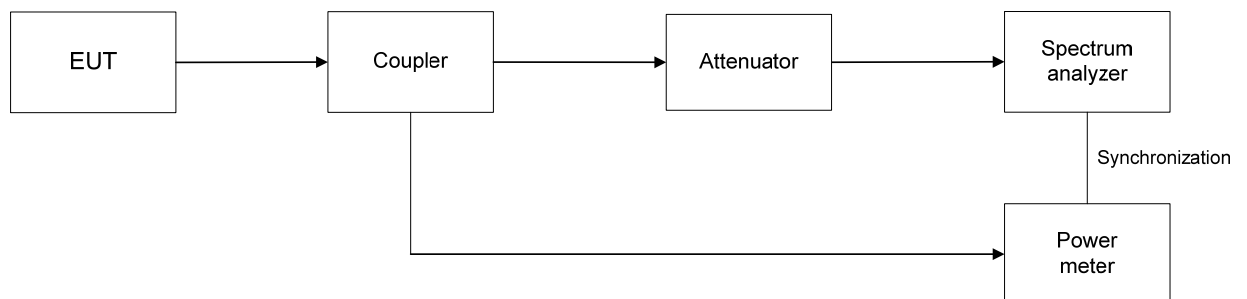
7.6.2 Test procedure

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 end user RF output power.

7.6.2.3 The peak power spectral density was measured using a sample detector and power averaging mode with resolution bandwidth set to 3 kHz, video bandwidth wider than resolution bandwidth to find the highest level across the 100 sweeps of averaging. The test results are provided in Table 7.6.2 and associated plots.

Figure 7.6.1 Peak spectral power density test setup





Test specification: Section 15.247(e), Peak power density	
Test procedure:	ANSI C63.10-2009 section 6.11.2.4
Test mode:	Compliance
Date(s):	9/6/2012
Temperature: 24 °C	Air Pressure: 1007 hPa
Remarks:	Relative Humidity: 48 % Power Supply: 48 VDC
Verdict: PASS	

Table 7.6.2 Peak spectral power density test results

ASSIGNED FREQUENCY: 5725-5850MHz
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Average
 RESOLUTION BANDWIDTH: 3 kHz
 VIDEO BANDWIDTH: 10 kHz

CHANNEL BANDWIDTH 5 MHz

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	Peak power density, dBm/3 kHz	Limit, dBm/3 kHz	Margin*, dB	Verdict
QPSK							
5728.0	-1.55	included	included	-1.55	8	-9.55	Pass
5787.5	-1.95	included	included	-1.95	8	-9.95	Pass
5846.5	-2.90	included	included	-2.90	8	-10.90	Pass
64 QAM							
5728.0	-0.90	included	included	-0.90	8	-8.90	Pass
5787.5	-1.25	included	included	-1.25	8	-9.25	Pass
5846.5	-2.39	included	included	-2.39	8	-10.39	Pass

CHANNEL BANDWIDTH 10 MHz

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	Peak power density, dBm/3 kHz	Limit, dBm/3 kHz	Margin*, dB	Verdict
QPSK							
5730.5	-5.05	included	included	-5.05	8	-13.05	Pass
5787.5	-6.21	included	included	-6.21	8	-14.21	Pass
5844.0	-8.06	included	included	-8.06	8	-16.06	Pass
64 QAM							
5730.5	-4.90	included	included	-4.90	8	-12.90	Pass
5787.5	-6.00	included	included	-6.00	8	-14.00	Pass
5844.0	-6.84	included	included	-6.84	8	-14.84	Pass

* - Margin = Peak power density – specification limit.

Reference numbers of test equipment used

HL 3301	HL 3302	HL 3442	HL 3781	HL 3868	HL 3903	HL 4355	
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Full description is given in Appendix A.

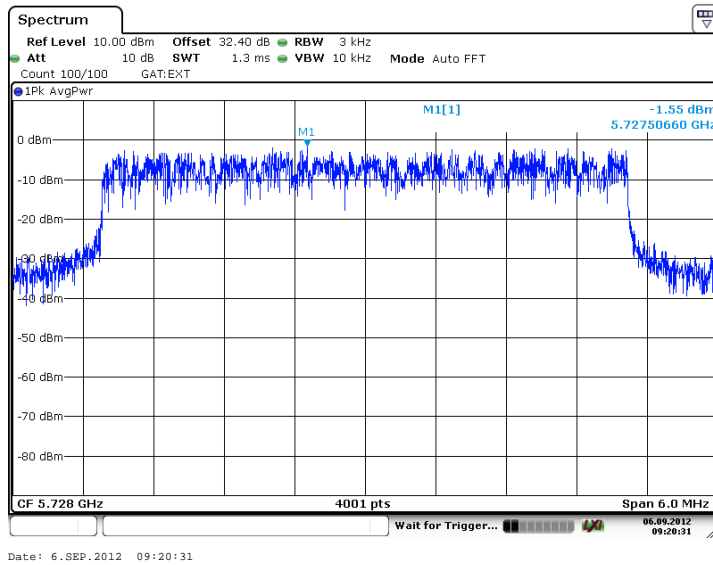


HERMON LABORATORIES

Test specification: Section 15.247(e), Peak power density			
Test procedure: ANSI C63.10-2009 section 6.11.2.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

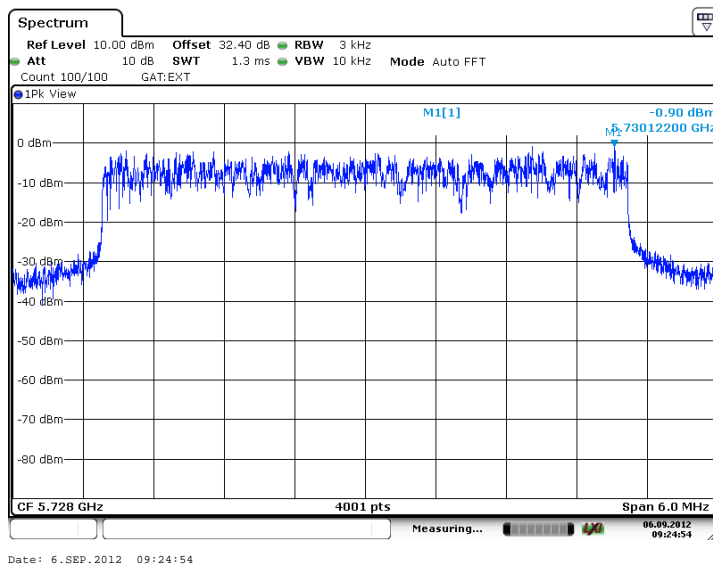
Plot 7.6.1 Peak spectral power density at low frequency within 6 dB band

Emission Bandwidth	5 MHz
Modulation	QPSK



Plot 7.6.2 Peak spectral power density at low frequency within 6 dB band

Emission Bandwidth	5 MHz
Modulation	64QAM



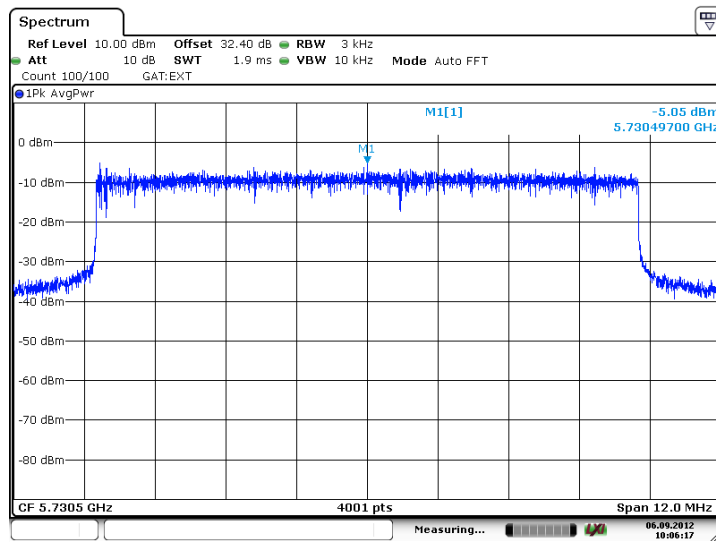


HERMON LABORATORIES

Test specification: Section 15.247(e), Peak power density			
Test procedure: ANSI C63.10-2009 section 6.11.2.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.3 Peak spectral power density at low frequency within 6 dB band

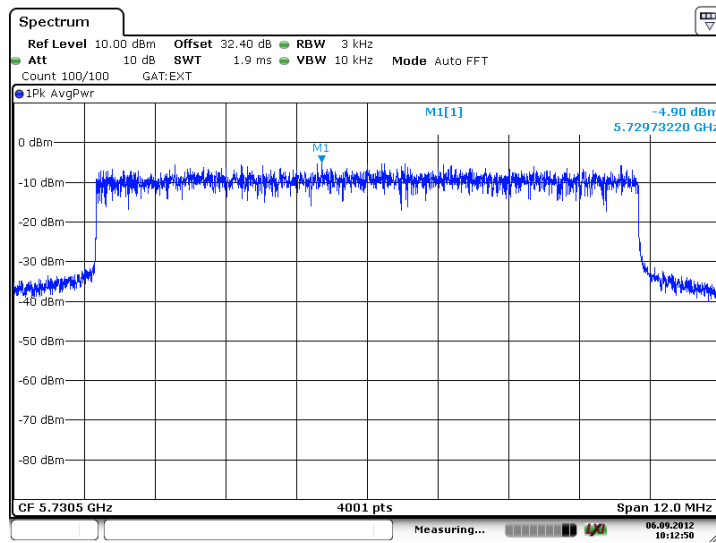
Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK



Date: 6.SEP.2012 10:06:18

Plot 7.6.4 Peak spectral power density at low frequency within 6 dB band

Emission Bandwidth	10MHz
Modulation / Bit rate	64 QAM



Date: 6.SEP.2012 10:12:49

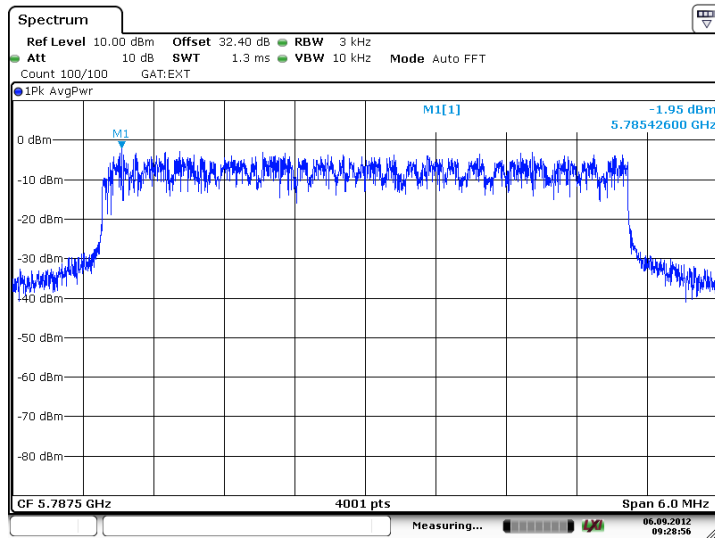


HERMON LABORATORIES

Test specification: Section 15.247(e), Peak power density			
Test procedure: ANSI C63.10-2009 section 6.11.2.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.5 Peak spectral power density at mid frequency within 6 dB band

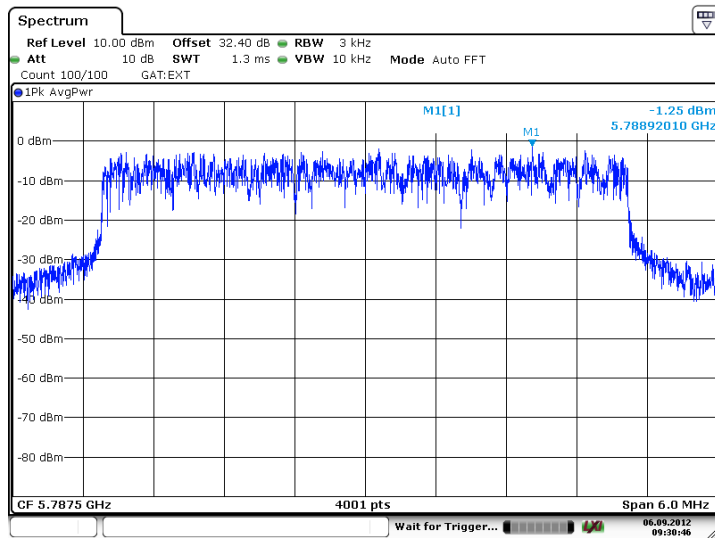
Emission Bandwidth	5 MHz
Modulation	QPSK



Date: 6.SEP.2012 09:28:57

Plot 7.6.6 Peak spectral power density at I mid frequency within 6 dB band

Emission Bandwidth	5 MHz
Modulation	64QAM



Date: 6.SEP.2012 09:30:47

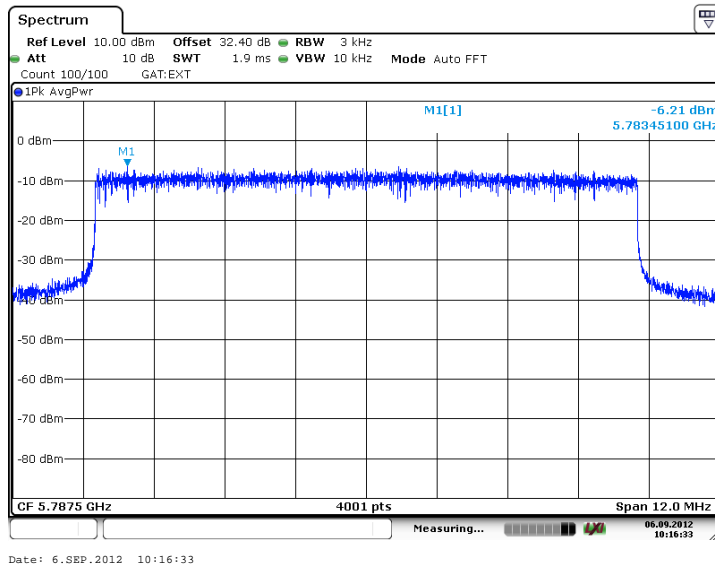


HERMON LABORATORIES

Test specification: Section 15.247(e), Peak power density			
Test procedure: ANSI C63.10-2009 section 6.11.2.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.7 Peak spectral power density at mid frequency within 6 dB band

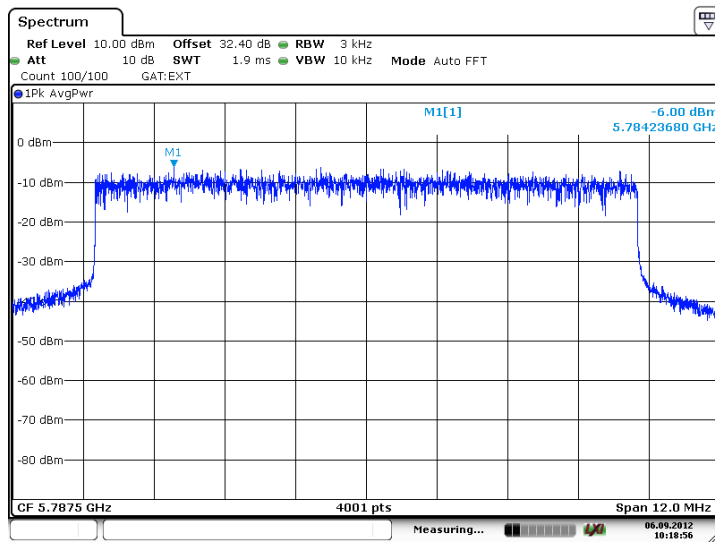
Emission Bandwidth	10 MHz
Modulation	QPSK



Date: 6.SEP.2012 10:16:33

Plot 7.6.8 Peak spectral power density at mid frequency within 6 dB band

Emission Bandwidth	10MHz
Modulation	64 QAM



Date: 6.SEP.2012 10:18:56

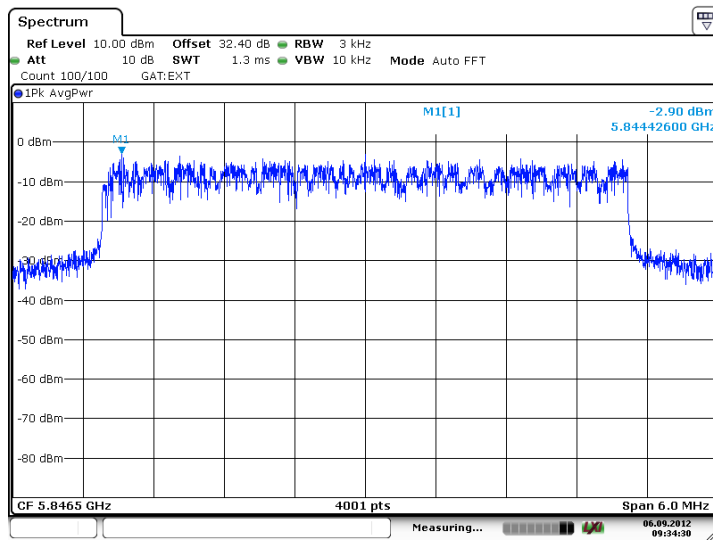


HERMON LABORATORIES

Test specification: Section 15.247(e), Peak power density			
Test procedure: ANSI C63.10-2009 section 6.11.2.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.9 Peak spectral power density at high frequency within 6 dB band

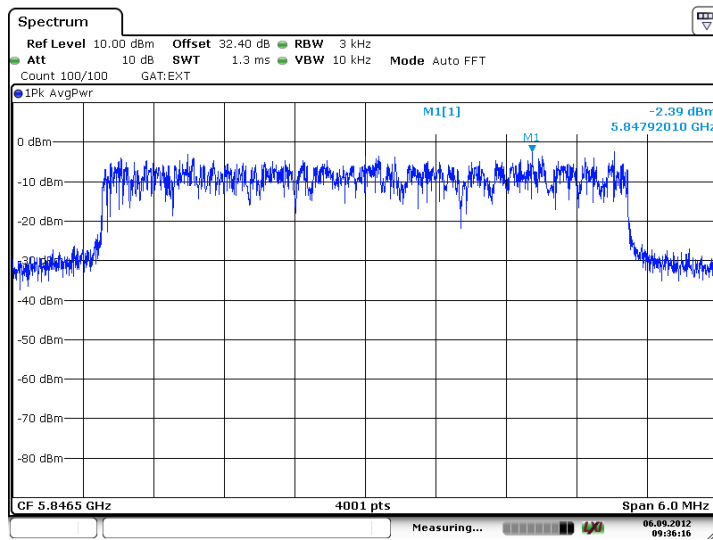
Emission Bandwidth	5 MHz
Modulation	QPSK



Date: 6.SEP.2012 09:34:31

Plot 7.6.10 Peak spectral power density at high frequency within 6 dB band

Emission Bandwidth	5 MHz
Modulation	64QAM



Date: 6.SEP.2012 09:36:16

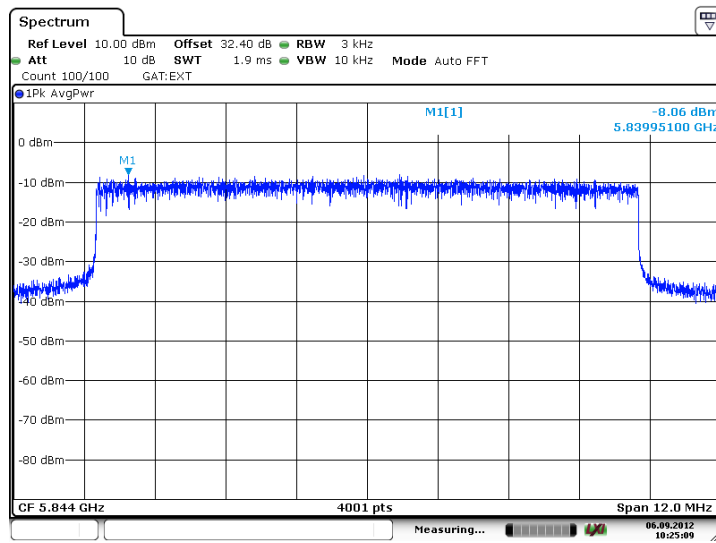


HERMON LABORATORIES

Test specification: Section 15.247(e), Peak power density			
Test procedure: ANSI C63.10-2009 section 6.11.2.4			
Test mode: Compliance	Verdict: PASS		
Date(s): 9/6/2012			
Temperature: 24 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

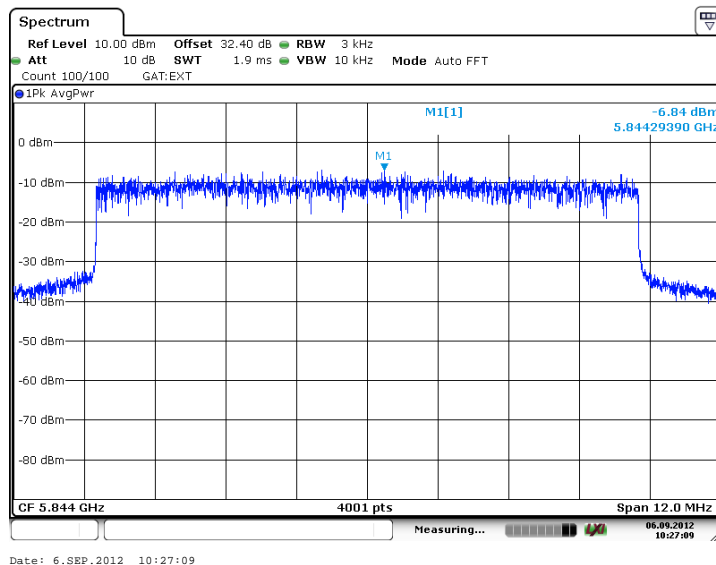
Plot 7.6.11 Peak spectral power density at high frequency within 6 dB band

Emission Bandwidth	10 MHz
Modulation	QPSK



Plot 7.6.12 Peak spectral power density at high frequency within 6 dB band

Emission Bandwidth	10MHz
Modulation	64 QAM





Test specification:		Section 15.207(a), Conducted emission	
Test procedure:		ANSI C63.4, Section 13.1.3	
Test mode:		Compliance	
Date(s):		9/19/2012 - 9/23/2012	
Temperature: 24 °C		Air Pressure: 1009 hPa	
Remarks: with POE		Verdict: PASS	
		Relative Humidity: 39 %	
		Power Supply: 120 VAC	

7.7 Conducted emissions

7.7.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Limits for conducted emissions

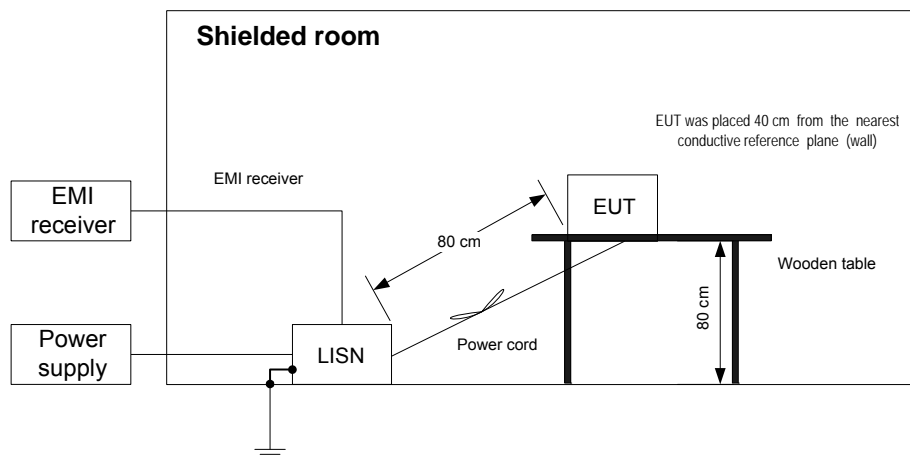
Frequency, MHz	Class B limit, dB(μV)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* The limit decreases linearly with the logarithm of frequency.

7.7.2 Test procedure

- 7.7.2.1 The EUT was set up as shown in Figure 7.7.1 and associated photographs, energized and the performance check was conducted.
- 7.7.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.7.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.
- 7.7.2.3 The position of the device cables was varied to determine maximum emission level.
- 7.7.2.4 The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.

Figure 7.7.1 Setup for conducted emission measurements, table-top equipment





Test specification:		Section 15.207(a), Conducted emission	
Test procedure:		ANSI C63.4, Section 13.1.3	
Test mode:		Compliance	
Date(s):		9/19/2012 - 9/23/2012	
Temperature: 24 °C		Air Pressure: 1009 hPa	
Remarks: with POE		Relative Humidity: 39 %	
		Power Supply: 120 VAC	
Verdict: PASS			

Table 7.7.2 Conducted emission test results

LINE: AC mains
 EUT OPERATING MODE: Transmit
 EUT SET UP: TABLE-TOP with POE
 TEST SITE: SHIELDED ROOM
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
 FREQUENCY RANGE: 150 kHz - 30 MHz
 RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.150232	59.90	59.15	65.99	-6.84	41.52	55.99	-14.47	L1	Pass
0.199700	52.52	48.37	63.67	-15.30	36.27	53.67	-17.40		
0.202770	52.52	51.68	63.55	-11.87	40.20	53.55	-13.35		
0.451550	36.15	33.22	56.91	-23.69	24.29	46.91	-22.62		
1.049120	35.70	32.04	56.00	-23.96	20.24	46.00	-25.76		
0.150256	59.40	58.93	65.99	-7.06	47.84	55.99	-8.15	L2	Pass
0.199421	52.85	51.74	63.68	-11.94	36.27	53.68	-17.41		
0.205021	52.73	51.91	63.46	-11.55	40.25	53.46	-13.21		
0.356950	36.15	34.45	58.86	-24.41	17.75	48.86	-31.11		
0.504665	34.94	30.24	56.00	-25.76	21.67	46.00	-24.33		
0.668735	37.74	33.92	56.00	-22.08	25.08	46.00	-20.92		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0163	HL 0787	HL 1425	HL 1553	HL 3612			
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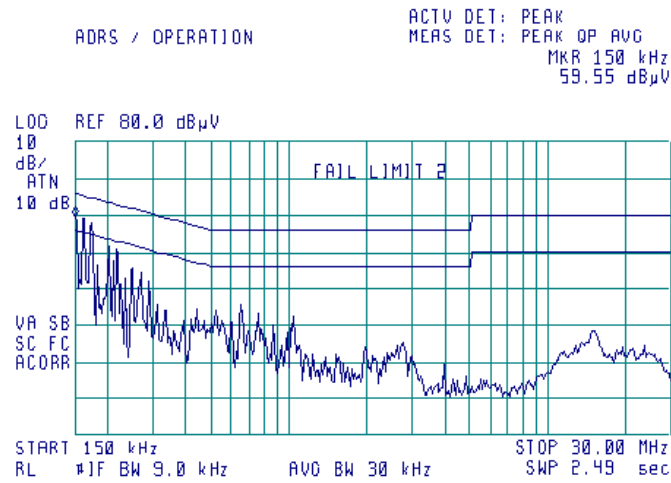
Full description is given in Appendix A.



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/19/2012 - 9/23/2012		
Temperature: 24 °C	Air Pressure: 1009 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks: with POE			

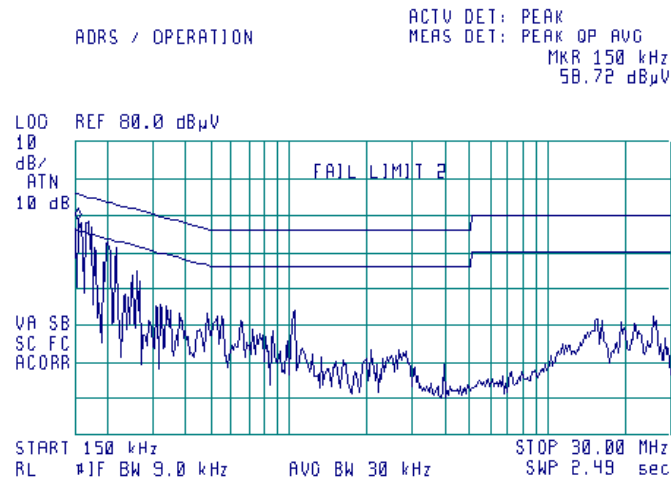
Plot 7.7.1 Conducted emission measurements

LINE: L1
 EUT OPERATING MODE: Transmit
 LIMIT: QUASI-PEAK, AVERAGE
 DETECTOR: PEAK



Plot 7.7.2 Conducted emission measurements

LINE: L2
 EUT OPERATING MODE: Transmit
 LIMIT: QUASI-PEAK, AVERAGE
 DETECTOR: PEAK





Test specification:		Section 15.203, Antenna requirement	
Test procedure:	Visual inspection		
Test mode:	Compliance	Verdict:	PASS
Date(s):	9/23/2012		
Temperature: 24 °C	Air Pressure: 1013 hPa	Relative Humidity: 39 %	Power Supply: 48 VDC
Remarks:			

7.8 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.8.1.

Table 7.8.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	NA	Comply
The transmitter employs a unique antenna connector	Visual inspection	
The transmitter requires professional installation	NA	



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0163	LISN FCC/VDE/50 Ohm/50 uH + 5 Ohm, MIL-STD-461E, CISPR 16-1	Electro-Metrics	ANS 25/2	1314	01-Jul-12	01-Jul-13
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	03-Jul-12	03-Jul-13
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	24-Sep-12	24-Sep-13
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	20-May-12	20-May-14
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	03-Feb-12	03-Feb-15
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	03-Feb-12	03-Feb-15
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	18-Oct-12	18-Oct-13
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	26-Aug-12	26-Aug-13
1553	Cable RF, 3.5 m, N/N-type	Alpha Wire	RG-214	1553	01-Jan-12	01-Jan-13
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY451010 57	14-Dec-11	14-Dec-12
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY452405 86	14-Dec-11	14-Dec-12
3442	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	07-Mar-12	07-Mar-13
3531	Amplifier, low noise, 2 to 8 GHz	Quinstar Technology	QLJ-02084040-J0	111590020 02	25-Dec-11	25-Dec-12
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	111590010 01	25-Dec-11	25-Dec-12
3535	Amplifier, low noise, 18 to 40 GHz	Quinstar Technology	QLJ-18404537-J0	111590030 01	10-Jul-12	10-Jul-13
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	01-Dec-11	01-Dec-12
3781	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW-S10W5+	NA	19-Dec-11	19-Dec-12
3786	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW-S10W5+	NA	19-Dec-11	19-Dec-12
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	16-Feb-12	16-Feb-13
3868	Directional coupler, 2 GHz to 8 GHz, 10 dB, SMA Female	Narda	4203-10	06978	13-Dec-10	13-Dec-12
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	08-Feb-12	08-Feb-13
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1226/2A	08-Feb-12	08-Feb-13
4114	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz	ETS Lindgren	3117	00123515	23-Jan-12	23-Jan-13
4342	High Pass Filter, 50 Ohm, 10.6 to 26.5 GHz, SMA-M / SMA-FM	RLC Electronics	F-5738A	8425	25-Mar-12	25-Mar-13
4352	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 002	06-Jun-12	06-Mar-13



HERMON LABORATORIES

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29- N1N1-244	12025101 003	06-Jun-12	06-Mar-13
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz, with Preamplifier 20 dB	Rohde & Schwarz	FSV 7	191000086 881	08-Mar-12	08-Mar-13

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
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

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 numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, 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 US1003.

Address: P.O. Box 23, Binyamina 30500, Israel.
Telephone: +972 4628 8001
Fax: +972 4628 8277
e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

FCC 47CFR part 15: 2011	Radio Frequency Devices
558074 D01 DTS Meas Guidance v01, 1/18/2012	FCC Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications
ANSI C63.4: 2003	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 C63.10: 2009	American National Standard for Testing Unlicensed Wireless Devices



12 APPENDIX E Test equipment correction factors

Correction factor
Line impedance stabilization network
Model ANS-25/2, Electro-Metrics, HL 0163

Frequency, kHz	Correction factor, dB
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.



**Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446**

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

**Antenna factor
Standard gain horn antenna
Quinstar Technology
Model QWH
Ser.No.112, HL 0768, HL 0769**

Frequency min, GHz	Frequency max, GHz	Antenna factor, dB(1/m)
18.000	26.500	32.01
26.500	40.000	35.48
40.000	60.000	39.03
60.000	90.000	42.55
90.000	140.000	46.23
140.000	220.000	50.11

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field strength in dB(μ V/m).



Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
26	7.8	580	20.6	1320	27.8
28	7.8	600	21.3	1340	28.3
30	7.8	620	21.5	1360	28.2
40	7.2	640	21.2	1380	27.9
60	7.1	660	21.4	1400	27.9
70	8.5	680	21.9	1420	27.9
80	9.4	700	22.2	1440	27.8
90	9.8	720	22.2	1460	27.8
100	9.7	740	22.1	1480	28.0
110	9.3	760	22.3	1500	28.5
120	8.8	780	22.6	1520	28.9
130	8.7	800	22.7	1540	29.6
140	9.2	820	22.9	1560	29.8
150	9.8	840	23.1	1580	29.6
160	10.2	860	23.4	1600	29.5
170	10.4	880	23.8	1620	29.3
180	10.4	900	24.1	1640	29.2
190	10.3	920	24.1	1660	29.4
200	10.6	940	24.0	1680	29.6
220	11.6	960	24.1	1700	29.8
240	12.4	980	24.5	1720	30.3
260	12.8	1000	24.9	1740	30.8
280	13.7	1020	25.0	1760	31.1
300	14.7	1040	25.2	1780	31.0
320	15.2	1060	25.4	1800	30.9
340	15.4	1080	25.6	1820	30.7
360	16.1	1100	25.7	1840	30.6
380	16.4	1120	26.0	1860	30.6
400	16.6	1140	26.4	1880	30.6
420	16.7	1160	27.0	1900	30.6
440	17.0	1180	27.0	1920	30.7
460	17.7	1200	26.7	1940	30.9
480	18.1	1220	26.5	1960	31.2
500	18.5	1240	26.5	1980	31.6
520	19.1	1260	26.5	2000	32.0
540	19.5	1280	26.6		
560	19.8	1300	27.0		

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field strength in dB(μV/m).



Antenna factor
Double-ridged waveguide horn antenna
ETS Lindgren, Model 3117, serial number: 00123515, HL 4114

Frequency, MHz	Antenna factor, dB/m		
	Measured	Manufacturer	Deviation
1000	28.0	28.4	-0.4
1500	28.0	27.4	0.6
2000	31.2	30.9	0.3
2500	32.5	33.4	-0.9
3000	32.9	32.6	0.3
3500	32.7	32.8	-0.1
4000	33.1	33.4	-0.3
4500	33.8	33.9	-0.1
5000	33.8	34.1	-0.3
5500	34.4	34.5	-0.1
6000	35.0	35.2	-0.2
6500	35.4	35.5	-0.1
7000	35.7	35.7	0.0
7500	35.9	35.7	0.2
8000	35.8	35.8	0.0
8500	35.9	35.8	0.1
9000	36.3	36.2	0.1
9500	36.6	36.6	0.0
10000	37.1	37.1	0.0
10500	37.6	37.5	0.1
11000	37.9	37.7	0.2
11500	38.5	38.1	0.4
12000	39.2	38.7	0.5
12500	39.0	38.9	0.1
13000	39.1	39.1	0.0
13500	38.9	38.8	0.1
14000	39.0	38.8	0.2
14500	39.6	39.9	-0.3
15000	39.9	39.7	0.2
15500	39.9	40.1	-0.2
16000	40.7	40.8	-0.1
16500	41.3	41.8	-0.5
17000	42.5	42.1	0.4
17500	41.3	41.2	0.1
18000	41.4	40.9	0.5

Antenna factor is to be added to receiver meter reading in dB(μ V) to convert to field strength in dB(μ V/meter)



Cable loss
RF cable 3.5 m, Alpha Wire, model RG-214, S/N 149, HL 1553

No.	Frequency, MHz	Cable loss, dB	Measurement uncertainty, dB
1	1	0.01	±0.05
2	10	0.07	
3	30	0.12	
4	50	0.22	
5	100	0.26	
6	200	0.40	
7	300	0.52	
8	400	0.60	
9	500	0.70	
10	600	0.77	
11	700	0.84	
12	800	1.00	
13	900	1.00	
14	1000	1.05	
15	2000	1.70	



Cable loss
Cable coaxial, RG-214/U, N type-N type, 17 m
Teldor, HL 3612

Frequency, MHz	Cable loss, dB
0.1	0.05
0.5	0.07
1	0.10
3	0.22
5	0.29
10	0.39
30	0.68
50	0.90
100	1.27
150	1.58
200	1.80
250	2.12
300	2.36
350	2.60
400	2.82
450	2.99
500	3.23
550	3.40
600	3.56
650	3.71
700	3.90
750	4.04
800	4.23
850	4.39
900	4.55
950	4.65
1000	4.79



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



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
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 002,
HL 4352

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.81
100	0.28	9500	2.89
300	0.49	10000	3.00
500	0.63	10500	3.07
1000	0.90	11000	3.15
1500	1.10	11500	3.23
2000	1.28	12000	3.30
2500	1.44	12500	3.38
3000	1.57	13000	3.47
3500	1.71	13500	3.55
4000	1.85	14000	3.61
4500	1.95	14500	3.68
5000	2.05	15000	3.76
5500	2.14	15500	3.86
6000	2.27	16000	3.92
6500	2.38	16500	3.97
7000	2.47	17000	4.03
7500	2.58	17500	4.10
8000	2.65	18000	4.18
8500	2.74		



Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 003,
HL 4353

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.71
100	0.27	9500	2.81
300	0.47	10000	2.90
500	0.61	10500	2.97
1000	0.87	11000	3.06
1500	1.07	11500	3.13
2000	1.24	12000	3.20
2500	1.39	12500	3.26
3000	1.53	13000	3.34
3500	1.65	13500	3.39
4000	1.77	14000	3.47
4500	1.89	14500	3.54
5000	1.99	15000	3.62
5500	2.07	15500	3.69
6000	2.20	16000	3.76
6500	2.30	16500	3.83
7000	2.39	17000	3.86
7500	2.51	17500	3.94
8000	2.58	18000	4.02
8500	2.65		



13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
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
dB(μ A)	decibel referred to one microampere
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
NB	narrow band
OATS	open area test site
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

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