

# TEST REPORT

ACCORDING TO: FCC CFR part 27

FOR:

**Arcadian Networks Inc.**

**UHF Wireless Modem**

**Model names:V487, AE11V, AP11V**

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## Table of contents

1	Applicant information .....	3
2	Equipment under test attributes .....	3
3	Manufacturer information .....	3
4	Test details .....	3
5	Tests summary.....	4
6	EUT description.....	5
6.1	General information.....	5
6.2	Ports and lines .....	5
6.3	Support and test equipment .....	5
6.4	Changes made in the EUT .....	6
6.5	Test configuration.....	7
6.6	Transmitter characteristics .....	8
7	Transmitter characteristics .....	9
7.1	Peak output power test.....	9
7.2	Occupied bandwidth test.....	11
7.3	Band edge emissions at RF antenna connector test.....	15
7.4	Radiated spurious emission measurements.....	28
7.5	Radiated spurious emission measurements in 1559-1610 MHz band .....	35
7.6	Spurious emissions at RF antenna connector test in 763-775 MHz and 793 – 805 MHz.....	41
7.7	Spurious emissions at RF antenna connector test.....	47
7.8	Frequency stability test.....	58
7.9	RF exposure.....	69
8	APPENDIX A Test equipment and ancillaries used for tests.....	70
9	APPENDIX B Measurement uncertainties.....	71
10	APPENDIX C Test laboratory description .....	72
11	APPENDIX D Specification references .....	72
12	APPENDIX E Test equipment correction factors.....	73
13	APPENDIX F Abbreviations and acronyms.....	82



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## 1 Applicant information

**Client name:** Arcadian Networks Inc  
**Address:** 400 Columbus Avenue, Suite 210E, Valhalla NY 10595, USA  
**Telephone:** +972 3976 9847  
**Fax:** +972 3976 9998  
**E-mail:** hillel.hendler@arcadiannetworks.com  
**Contact name:** Mr. Hillel Hendler

## 2 Equipment under test attributes

**Product name:** UHF wireless modem  
**Model(s):** V487  
**Serial number:** H93400003  
**Software version:** M1.7a\_R0.6  
**Receipt date** 10/15/2009

## 3 Manufacturer information

**Manufacturer name:** Arcadian Networks Inc  
**Address:** 400 Columbus Avenue, Suite 210E, Valhalla NY 10595, USA  
**Telephone:** +972 3976 9847  
**Fax:** +972 3976 9998  
**E-Mail:** hillel.hendler@arcadiannetworks.com  
**Contact name:** Mr. Hillel Hendler

## 4 Test details

**Project ID:** 20119  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 10/15/2009  
**Test completed:** 11/8/2009  
**Test specification(s):** FCC 90\_BS\_with RF connector



## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
Section 27.50(b)(9), Peak output power at RF antenna connector	Pass
Section 2.1091, 27.52, RF safety	Pass
Section 27.53(c)(2), Spurious emissions RF antenna connector	Pass
Section 27.53(c)(3), Spurious emissions RF antenna connector in 763-775MHz and 793-805 MHz	Pass
Section 27.53(c)(2), Radiated spurious emissions	Pass
Section 27.53(f), Radiated spurious emissions in 1559-1610 MHz band	Pass
Section 27.54, Frequency stability	Pass
Section 2.1049, Occupied bandwidth	Pass

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

This test report replaces the previously issued test report identified by Doc ID:ARCRAD\_FCC.20119.

	Name and Title	Date	Signature
<b>Tested by:</b>	Mr. L. Markel, test engineer	November 8, 2009	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	November 9, 2009	
<b>Approved by:</b>	Mr. M. Nikishin, EMC and Radio group leader	November 10, 2009	



## 6 EUT description

### 6.1 General information

The EUT is a broadband wireless data modem used by cable and wireless operators to deliver data services and high-speed data connections to business and residential subscribers. The EUT operates within 787 to 788 MHz band and is powered from AC mains through a customer power adaptor. According to the manufacturer's declaration of identity the models V487, AE11V, AP11V are electronically and electrically identical, the base model V487 was tested.

### 6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	DC power	Power supply	EUT	1	Unshielded	1.5	Outdoor
RF	Antenna	EUT	Termination/Antenna	1	Coax	NA	Outdoor
Signal	Ethernet	PC	EUT	1	Shielded	15	Outdoor
Signal	RS-232	EUT	Not connected	1	NA	NA	For maintenance only
Power	Ground	EUT	Ground connection	1	Unshielded	1.5	Outdoor

### 6.3 Support and test equipment

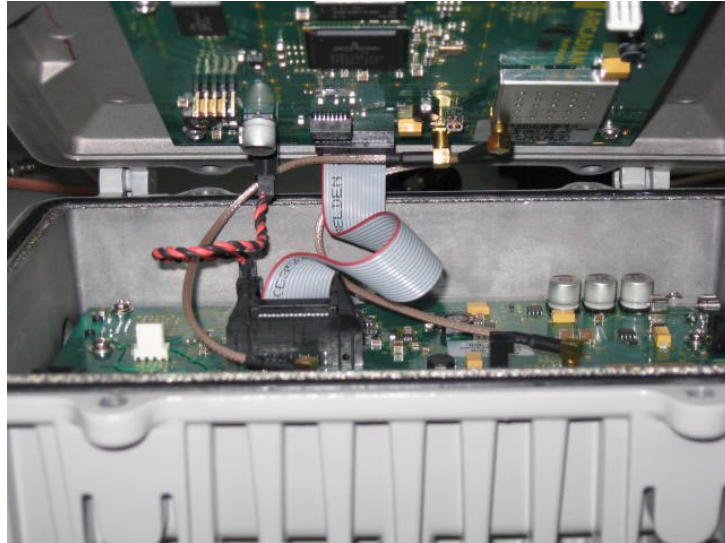
Description	Manufacturer	Model number	Serial number
Pattern generator	SmartBits	SMB-0200	#3643
PC desktop	NA	NA	TZ0206033059 6
Up converter	Wavecom	UC4040D	163387
Down converter	Vyyo	V3300	H64908161
Base station	Vyyo	V300-WMTS	3035296



## 6.4 Changes made in the EUT

To withstand the standard requirements the coax cables inside the EUT were arranged as shown below in Photograph 6.5.1.

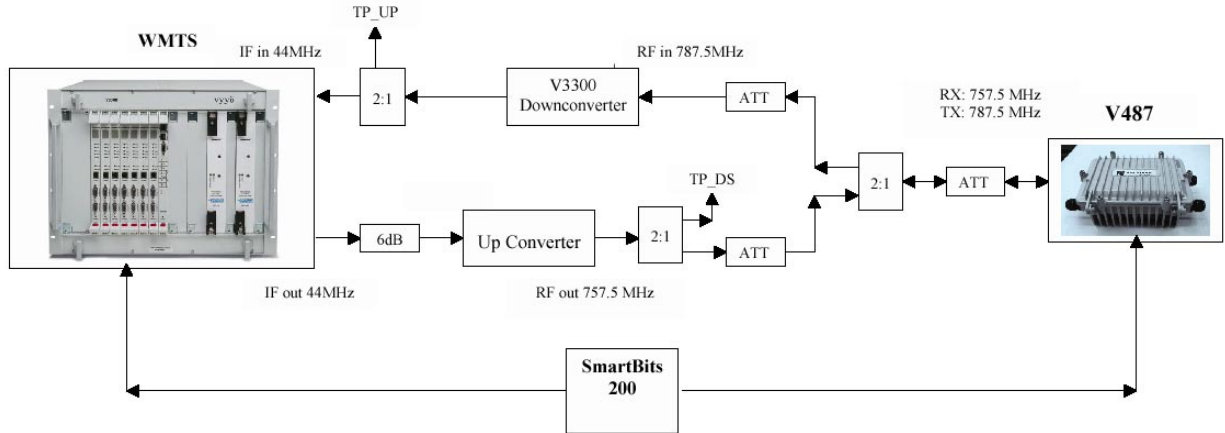
**Photograph 6.4.1 Coax cables arrangement**



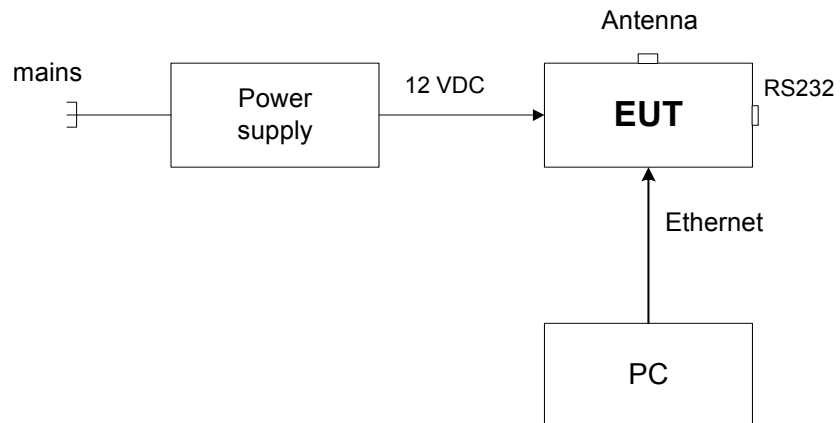


## 6.5 Test configuration

### 6.5.1 Conducted method



### 6.5.2 Radiated method





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## 6.6 Transmitter characteristics

<b>Type of equipment</b>					
	Stand-alone (Equipment with or without its own control provisions)				
<b>X</b>	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)				
	Plug-in card (Equipment intended for a variety of host systems)				
<b>Intended use</b>		<b>Condition of use</b>			
<b>X</b>	fixed	Always at a distance more than 2 m from all people			
	mobile	Always at a distance more than 20 cm from all people			
	portable	May operate at a distance closer than 20 cm to human body			
<b>Assigned frequency range</b>		787.0 – 788.0 MHz			
<b>Receive frequency range</b>		757.0 – 758.0 MHz			
<b>Transmit frequency range</b>		787.125 – 787.875 MHz for 250 kHz channel bandwidth 787.170 – 787.830 MHz for 330 kHz channel bandwidth			
<b>Maximum rated output power</b>		At transmitter 50 Ω RF output connector		28.22 dBm	
		Effective radiated power (for equipment with no RF connector)		NA	
<b>Is transmitter output power variable?</b>		No			
		continuous variable			
		<b>X</b>	Yes	Stepped variable with stepsize	0.25 dB
				minimum RF power	-17.0 dBm
		maximum RF power	28.22 dBm		
<b>Antenna connection</b>					
unique coupling	<b>X</b>	standard N-type connector	integral	with temporary RF connector without temporary RF connector	
<b>Antenna/s technical characteristics</b>					
Type	Manufacturer		Model number		Gain
Yagi	A&D assembly		PAN690M012PF		14 dBi
<b>Transmitter 99% power bandwidth</b>	<b>Bit rate, kbps</b>		<b>Symbol rate, kSym/s</b>		<b>Type of modulation (OFDM)</b>
250 kHz	400		200		QPSK
	800		200		16QAM
330 kHz	520		260		QPSK
	1040		260		16QAM
<b>Type of multiplexing</b>			TDMA		
<b>Modulating test signal (baseband)</b>			PRBS		
<b>Maximum transmitter duty cycle supplied for test</b>			100%		
<b>RF channel spacing</b>	<b>Frequency channel</b>				
	<b>Low</b>	<b>Mid</b>		<b>High</b>	
250 kHz	787.125	787.375		787.875	
330 kHz	787.170	787.500		787.830	
<b>Transmitter power source</b>					
	Battery	<b>Nominal rated voltage</b>	VDC	Battery type	
<b>X</b>	DC	<b>Nominal rated voltage</b>	12 VDC from mains via power supply		
	AC mains	<b>Nominal rated voltage</b>	120 VAC	Frequency	60 Hz
<b>Common power source for transmitter and receiver</b>			<b>X</b>	yes	no





<b>Test specification:</b>		<b>Section 27.50(b)(9), Peak output power at RF antenna connector</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	11/3/2009 2:45:45 PM		
<b>Temperature:</b> 25.9 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

## 7 Transmitter characteristics

### 7.1 Peak output power test

#### 7.1.1 General

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

Table 7.1.1 Peak output power limits

Assigned frequency range, MHz	Maximum peak output power, ERP	
	dBm	W
787.0 – 788.0	44.77	30.0

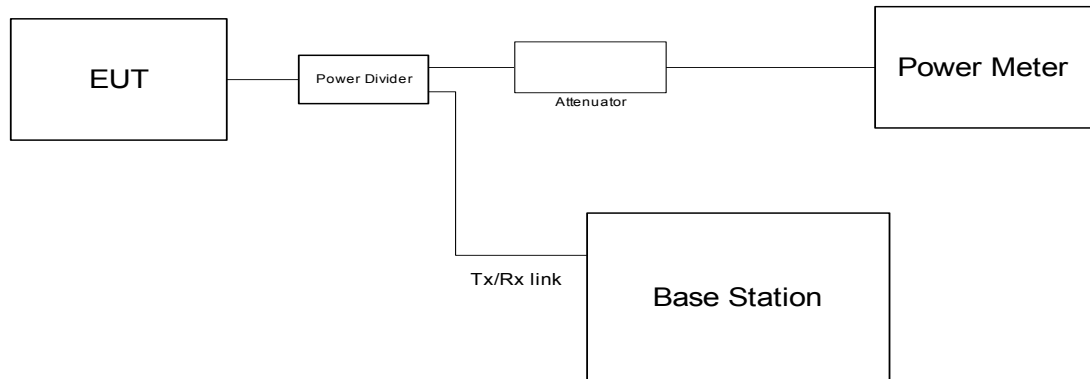
#### 7.1.2 Test procedure

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

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

7.1.2.3 The peak output power was measured with a power meter as provided in Table 7.1.2 and associated plots.

Figure 7.1.1 Peak output power test setup





<b>Test specification:</b> Section 27.50(b)(9), Peak output power at RF antenna connector			
<b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 2:45:45 PM			
<b>Temperature:</b> 25.9 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Table 7.1.2 Peak output power test results

OPERATING FREQUENCY RANGE: 787.0 – 788.0 MHz  
DETECTOR USED: Peak / Average  
RESOLUTION BANDWIDTH: NA  
VIDEO BANDWIDTH: NA  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
ANTENNA GAIN: 14 dBi = 11.85 dBd

Carrier frequency, MHz	Channel bandwidth, kHz	Power meter reading, Peak, dBm	Power meter reading, Average, dBm	RF output power, Average ERP*, Bm	Limit ERP, dBm	Margin, dB	Verdict
16QAM, 800 kbps							
787.375	250	34.64	28.22	40.07	44.77	-4.70	Pass
QPSK, 400 kbps							
787.375	250	33.54	27.29	39.14	44.77	-5.63	Pass
16QAM, 1040 kbps							
787.500	330	34.71	28.08	39.93	44.77	-4.84	Pass
QPSK, 520 kbps							
787.500	330	32.85	27.04	38.89	44.77	-5.88	Pass

\* - RF output power ERP, dBm = Powermeter reading average, dBm + Antenna gain, dBd  
\*\* - Margin, dB = Limit ERP, dBm - RF output power ERP\*, dBm

Reference numbers of test equipment used

HL 3301	HL 3302	HL 3440	HL 3439				
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Full description is given in Appendix A.



<b>Test specification:</b>		<b>Section 2.1049, Occupied bandwidth</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1049	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/4/2009 9:45:29 AM		
<b>Temperature:</b> 25.4 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

## 7.2 Occupied bandwidth test

### 7.2.1 General

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

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc
787.0 – 788.0	26

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

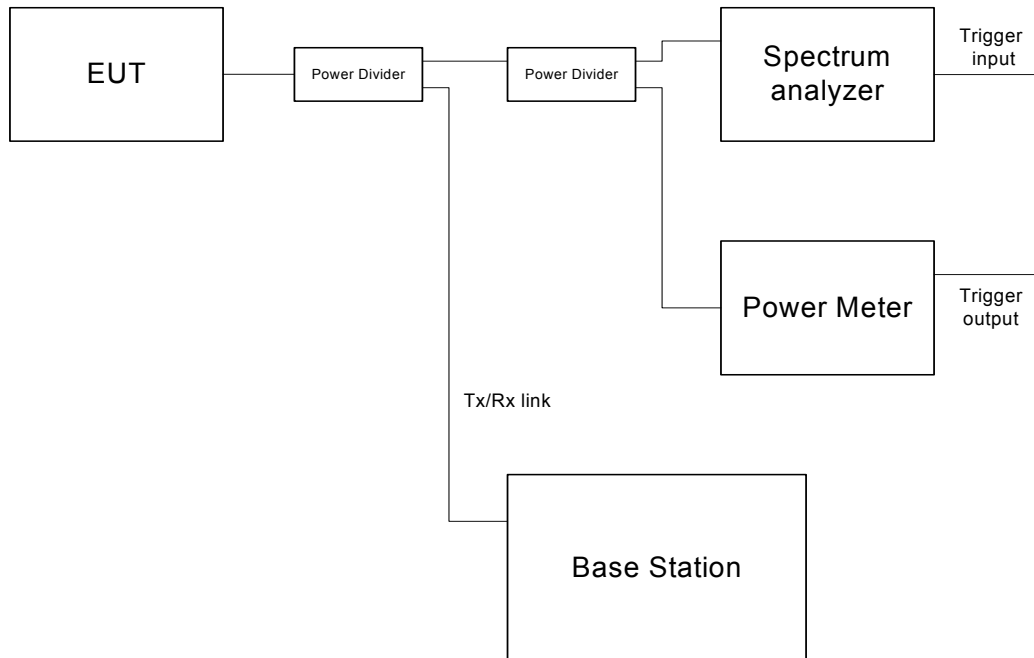
### 7.2.2 Test procedure

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

7.2.2.2 The EUT was set to transmit the normally modulated carrier.

7.2.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope, the test results provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup





<b>Test specification:</b>		<b>Section 2.1049, Occupied bandwidth</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1049	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/4/2009 9:45:29 AM		
<b>Temperature:</b> 25.4 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Table 7.2.2 Occupied bandwidth test results**

DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 3.6 kHz  
 VIDEO BANDWIDTH: 36 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 26 dBc  
 MODULATING SIGNAL: PRBS

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
250 kHz Channel spacing, QPSK, 400 kbps				
787.375	225.30	NA	NA	Pass
250 kHz Channel spacing, 16QAM, 800 kbps				
787.375	220.30	NA	NA	Pass
330 kHz Channel spacing, QPSK, 520 kbps				
787.500	283.30	NA	NA	Pass
330 kHz Channel spacing, 16QAM, 1040 kbps				
787.500	286.60	NA	NA	Pass

**Reference numbers of test equipment used**

HL 1906	HL 2015	HL 2953	HL 3301	HL 3302	HL 3439	HL 3440	HL 3818
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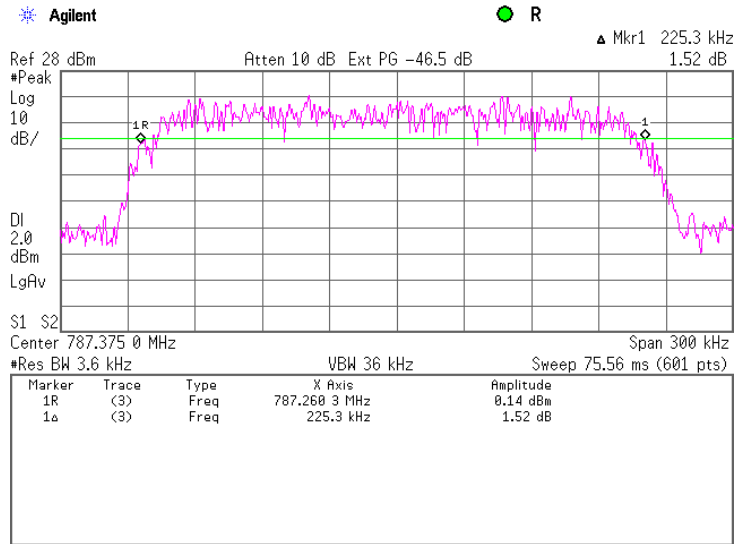
Full description is given in Appendix A.



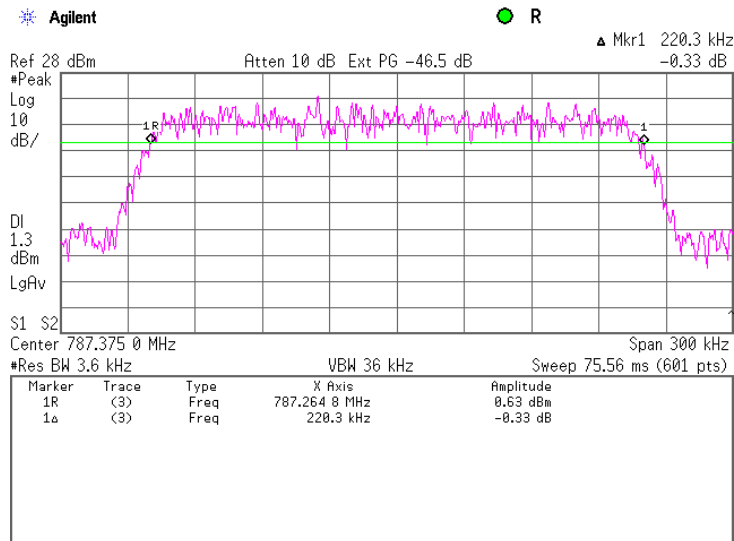
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<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/4/2009 9:45:29 AM		
<b>Temperature:</b> 25.4 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.2.1 Occupied bandwidth test result at mid frequency 250 kHz CBW, 16QAM



Plot 7.2.2 Occupied bandwidth test result at mid frequency 250 kHz CBW, QPSK

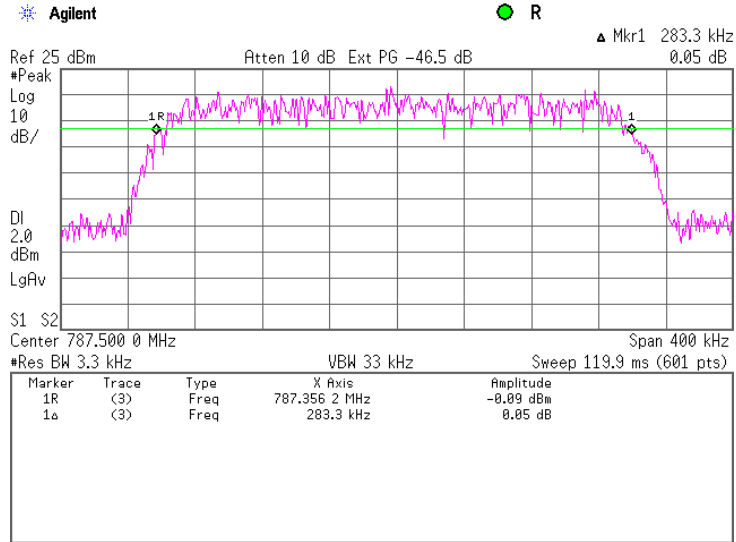




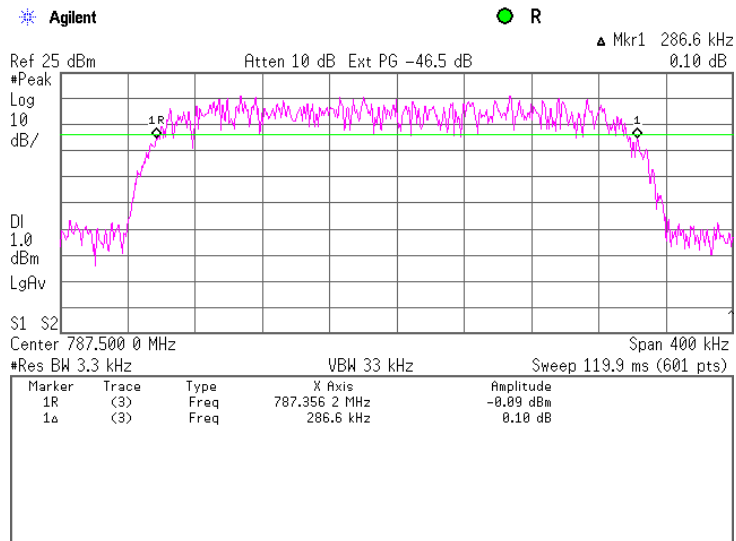
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<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/4/2009 9:45:29 AM		
<b>Temperature:</b> 25.4 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.2.3 Occupied bandwidth test result at mid frequency 330 kHz CBW, 16QAM



Plot 7.2.4 Occupied bandwidth test result at mid frequency 330 kHz CBW, QPSK





<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

### 7.3 Band edge emissions at RF antenna connector test

#### 7.3.1 General

This test was performed to measure band edge emissions at RF antenna connector. Specification test limits are given in Table 7.3.1, Table 7.3.2.

**Table 7.3.1 Spurious emission limits for 250 kHz CBW**

Investigated frequency range, MHz	Attenuation below carrier, dBc	Spurious emissions, dBm	Measurement technique
876.9 - 877.0 878.0 - 878.1	43+10logP*	-13	RBW=30kHz; VBW=100 kHz; Average detector + Power average 100 sweeps
876.0 - 876.9 878.1 - 879.0	43+10logP*	-13	RBW=100 kHz; VBW=300kHz; Average detector + Power average 100 sweeps

NOTE1: In case of QPSK and 16QAM at low channel the RBW was reduced to 3 kHz and correction factor of  $10\log(30/3) = 10$  dB was added to the measured value.

**Table 7.3.2 Spurious emission limits for 330 kHz CBW**

Investigated frequency range, MHz	Attenuation below carrier, dBc	Spurious emissions, dBm	Measurement technique
876.9 - 877.0 878.0 - 878.1	43+10logP*	-13	RBW=30kHz; VBW=100 kHz; Average detector + Power average 100 sweeps
876.0 - 876.9 878.1 - 879.0	43+10logP*	-13	RBW=100 kHz; VBW=300kHz; Average detector + Power average 100 sweeps

\* - P is transmitter output power in Watts.

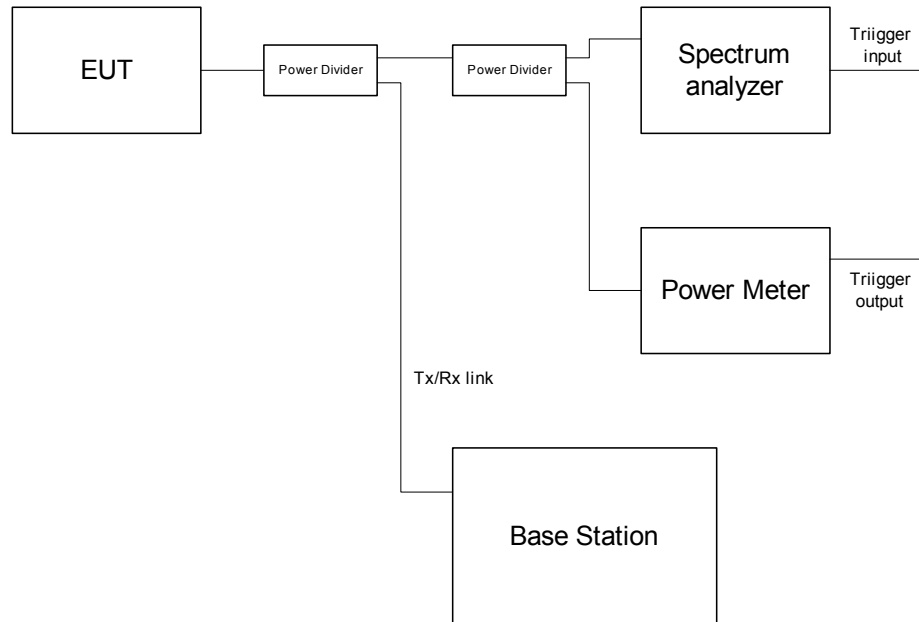
#### 7.3.2 Test procedure

- 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 for end user RF output power.
- 7.3.2.3 The spurious emission was measured with spectrum analyzer as provided in the associated plots.



<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Figure 7.3.1 Spurious emission test setup







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<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Table 7.3.3 Band edges emission test results

ASSIGNED FREQUENCY RANGE: 787.00 – 788.00 MHz  
 INVESTIGATED FREQUENCY RANGE: See Table 7.3.1  
 DETECTOR USED: Average  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATING SIGNAL: PRBS  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 CHANNEL SPACING: 250 kHz

Investigated Frequency range, MHz	SA reading, dBm	Required RBW, kHz	Used RBW, kHz	Correction factor*, dB	Spurious emission**, dBm	Limit, dBm	Margin, dB***	Verdict
<b>787.125 MHz – Low channel</b>								
<b>QPSK</b>								
786.9 – 787.0	-34.160	30	3	10.0	-24.160	-13.00	-11.16	Pass
786.0 – 786.9	-28.993	100	30	5.23	-23.763	-13.00	-10.76	Pass
<b>787.875 MHz – High channel</b>								
<b>QPSK</b>								
788.0 – 788.1	-20.859	30	10	5.23	-15.629	-13.00	-2.63	Pass
788.1 – 789.0	-31.913	100	30	5.23	-26.683	-13.00	-13.68	Pass
<b>787.125 MHz – Low channel</b>								
<b>16QAM</b>								
786.9 – 787.0	-33.881	30	3	10.0	-23.881	-13.00	-10.88	Pass
786.0 – 786.9	-26.982	100	30	5.23	-21.752	-13.00	-8.75	Pass
<b>787.875 MHz – High channel</b>								
<b>16QAM</b>								
788.0 – 788.1	-19.872	30	10	5.23	-14.642	-13.00	-1.64	Pass
788.1 – 789.0	-29.193	100	30	5.23	-23.963	-13.00	-10.96	Pass

CHANNEL SPACING: 330 kHz

Frequency, MHz	SA reading, dBm	Required RBW, kHz	Used RBW, kHz	Correction factor*, dB	Spurious emission**, dBm	Limit, dBm	Margin, dB***	Verdict
<b>787.170 MHz – Low channel</b>								
<b>QPSK</b>								
786.9 – 787.0	-32.090	30	10	5.23	-26.860	-13.00	-13.86	Pass
786.0 – 786.9	-28.669	100	30	5.23	-23.439	-13.00	-10.44	Pass
<b>787.830 MHz – High channel</b>								
<b>QPSK</b>								
788.0 – 788.1	-34.885	30	10	5.23	-29.655	-13.00	-16.66	Pass
788.1 – 789.0	-32.406	100	30	5.23	-27.176	-13.00	-14.18	Pass
<b>787.170 MHz – Low channel</b>								
<b>16QAM</b>								
786.9 – 787.0	-29.717	30	10	5.23	-24.487	-13.00	-11.49	Pass
786.0 – 786.9	-26.993	100	30	5.23	-21.763	-13.00	-8.76	Pass
<b>787.830 MHz – High channel</b>								
<b>16QAM</b>								
788.0 – 788.1	-30.040	30	10	5.23	-24.810	-13.00	-11.81	Pass
788.1 – 789.0	-28.613	100	30	5.23	-23.383	-13.00	-10.38	Pass

\* - Correction factor, dB = 10 log (Required RBW, kHz / Used RBW, kHz)

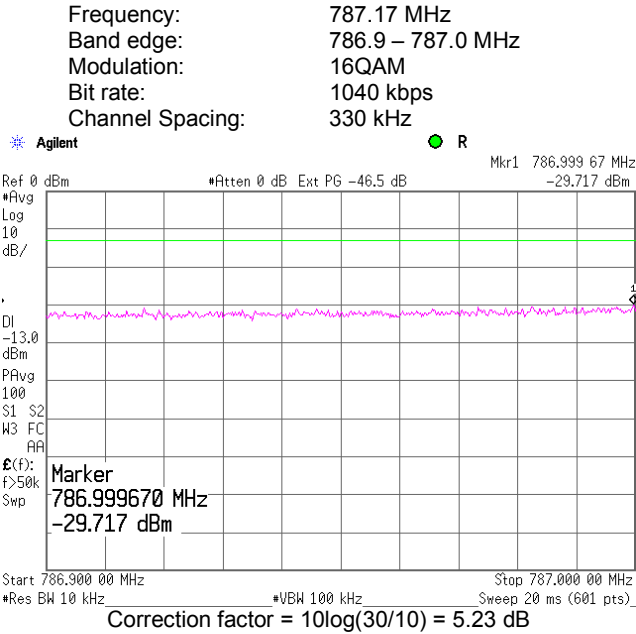
\*\* - Spurious emission, dBm = SA reading, dBm + Correction factor, dB.

\*- Margin = Spurious emission – specification limit.

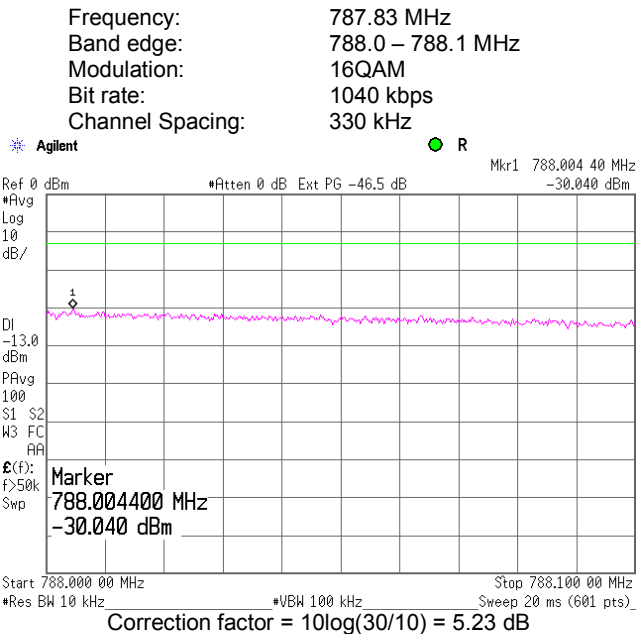


<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.1 Spurious emissions at RF antenna connector, low channel band edge measurements



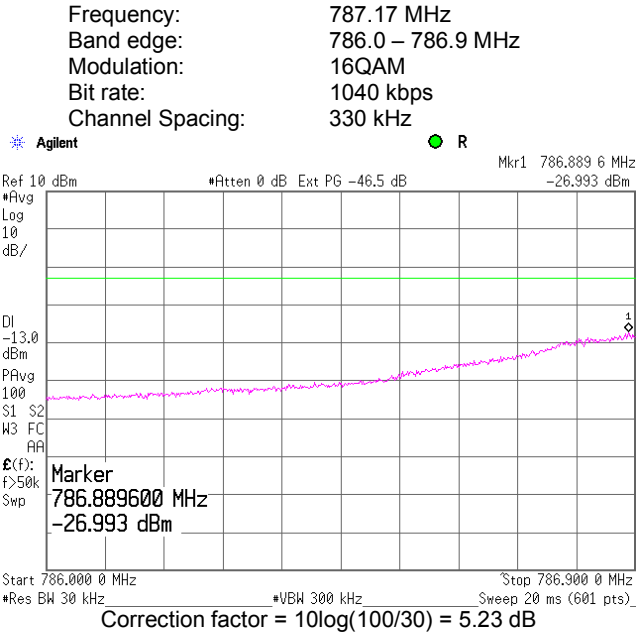
Plot 7.3.2 Spurious emissions at RF antenna connector, high channel band edge measurements



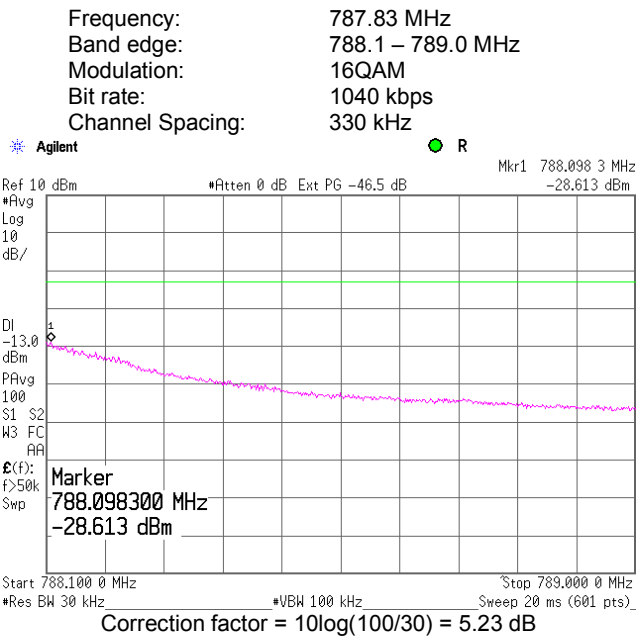


<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.3 Spurious emissions at RF antenna connector, low channel band edge measurements



Plot 7.3.4 Spurious emissions at RF antenna connector, high channel band edge measurements

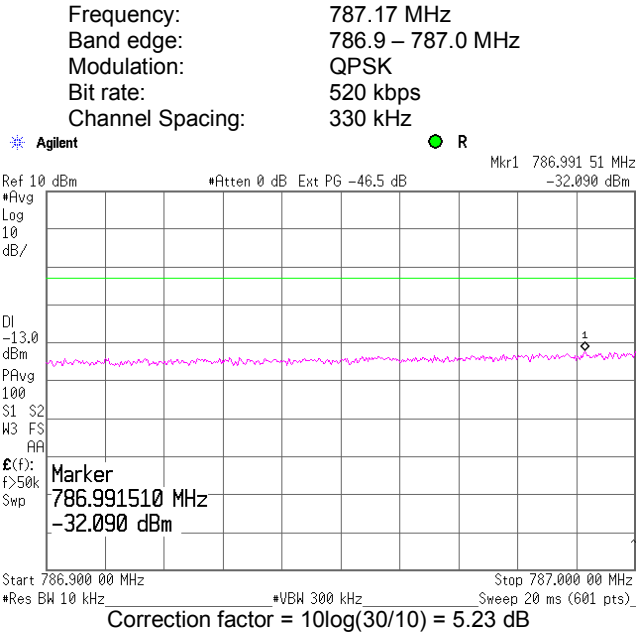




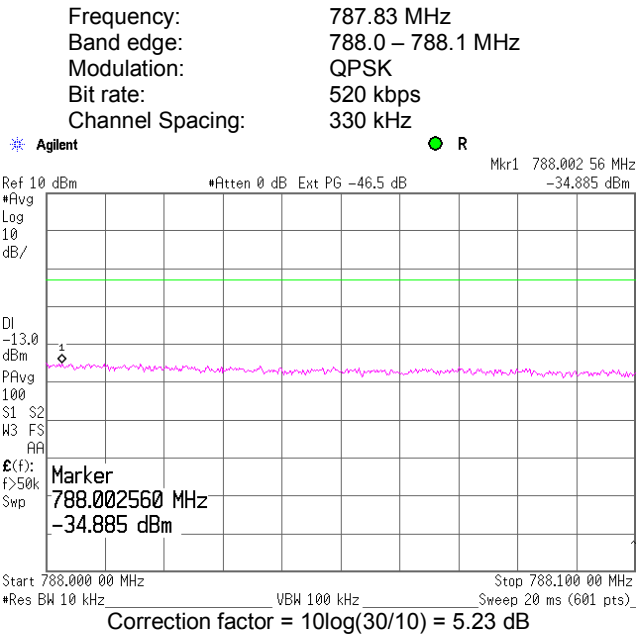
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.5 Spurious emissions at RF antenna connector, low channel band edge measurements



Plot 7.3.6 Spurious emissions at RF antenna connector, high channel band edge measurements

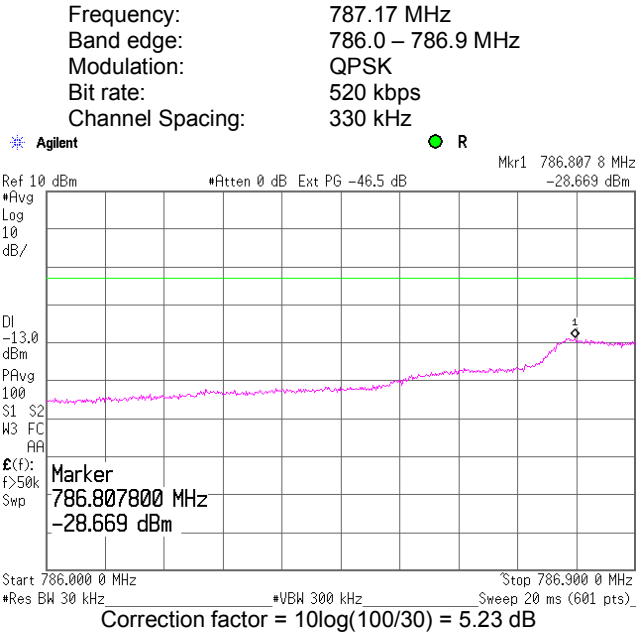




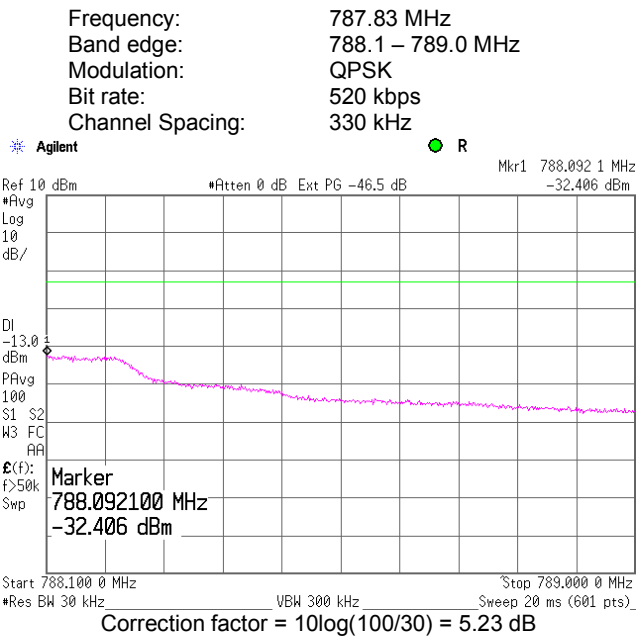
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.7 Spurious emissions at RF antenna connector, low channel band edge measurements



Plot 7.3.8 Spurious emissions at RF antenna connector, high channel band edge measurements

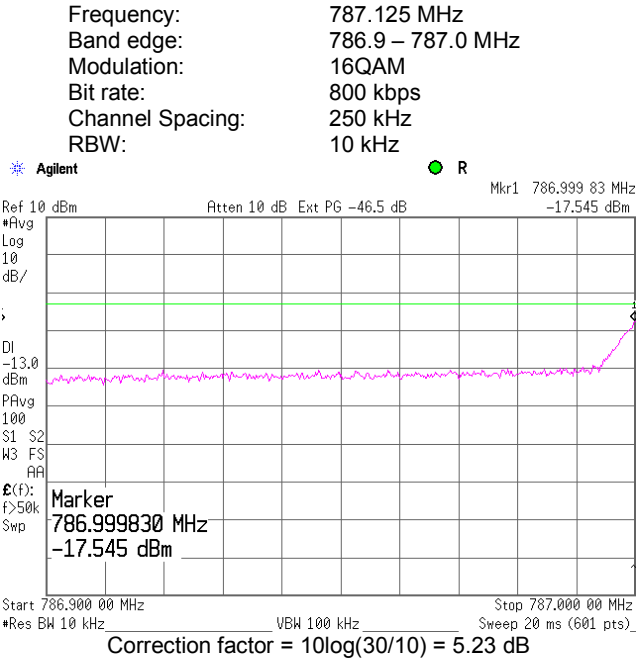




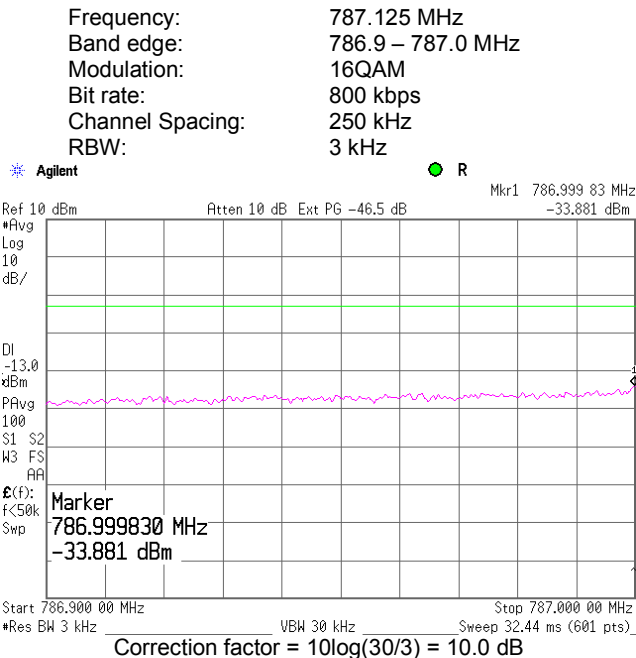
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.9 Spurious emissions at RF antenna connector, low channel band edge measurements



Plot 7.3.10 Spurious emissions at RF antenna connector, low channel band edge measurements

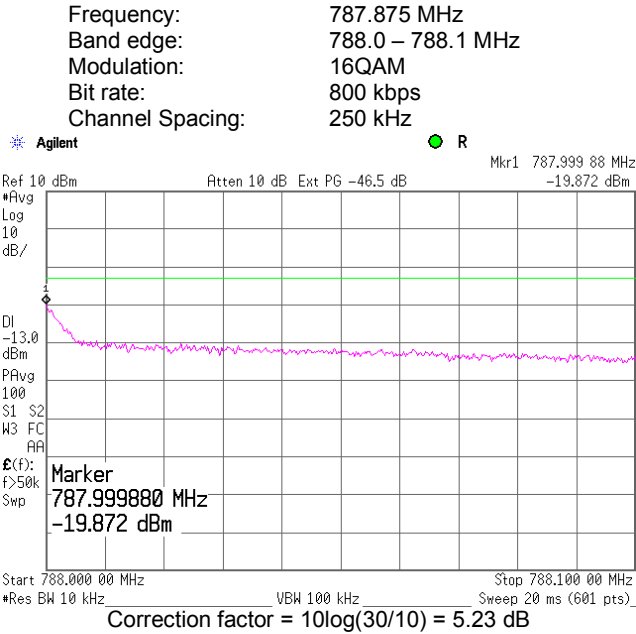




HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.11 Spurious emissions at RF antenna connector, high channel band edge measurements

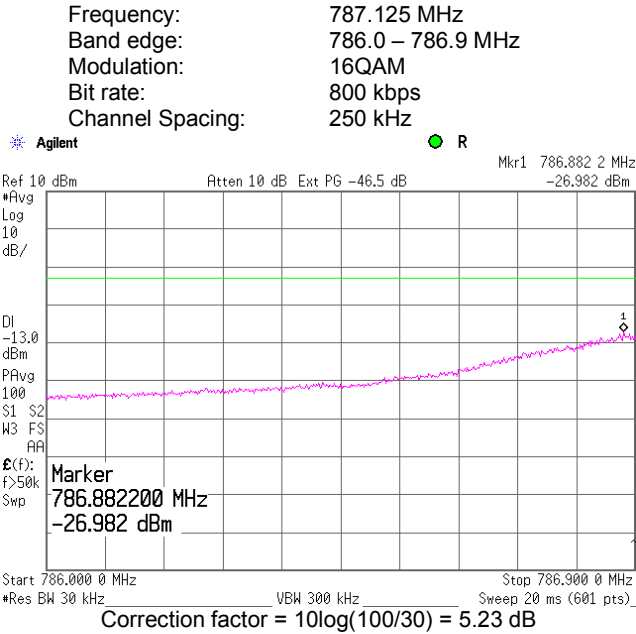




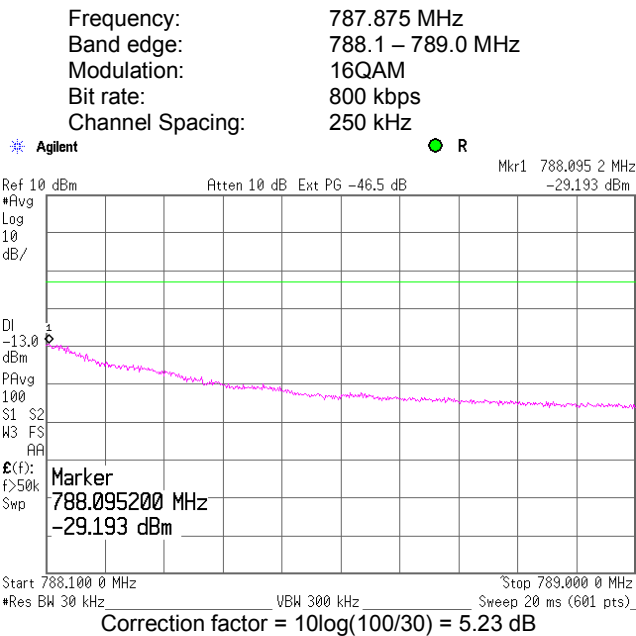
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.12 Spurious emissions at RF antenna connector, low channel band edge measurements



Plot 7.3.13 Spurious emissions at RF antenna connector, high channel band edge measurements





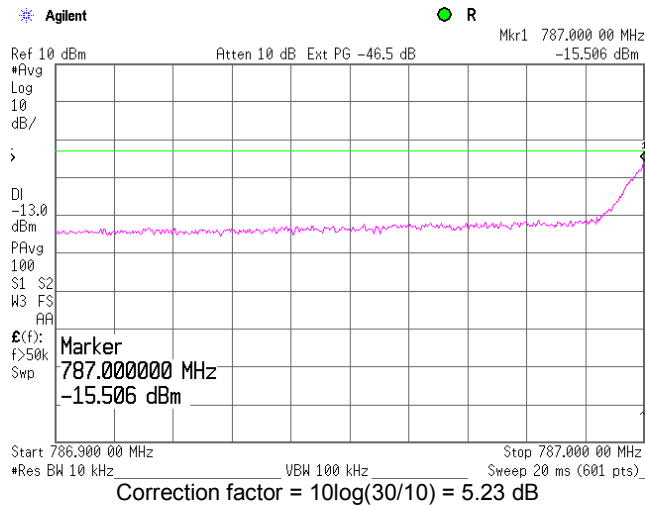


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

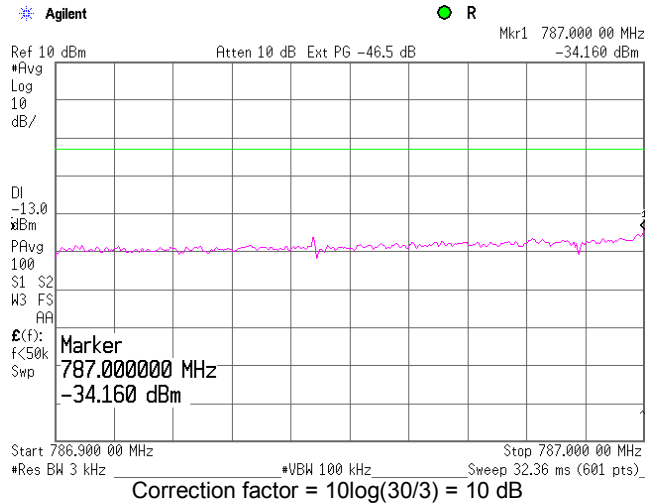
Plot 7.3.14 Spurious emissions at RF antenna connector, low channel band edge measurements

Frequency: 787.125 MHz  
 Band edge: 786.9 – 787.0 MHz  
 Modulation: QPSK  
 Bit rate: 400 kbps  
 Channel Spacing: 250 kHz  
 RBW: 10 kHz



Plot 7.3.15 Spurious emissions at RF antenna connector, low channel band edge measurements

Frequency: 787.125 MHz  
 Band edge: 786.9 – 787.0 MHz  
 Modulation: QPSK  
 Bit rate: 400 kbps  
 Channel Spacing: 250 kHz  
 RBW: 3 kHz

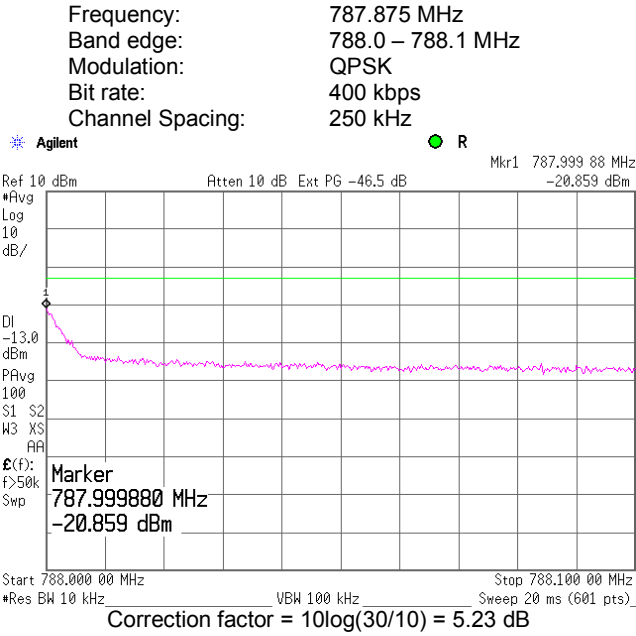




HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.16 Spurious emissions at RF antenna connector, high channel band edge measurements

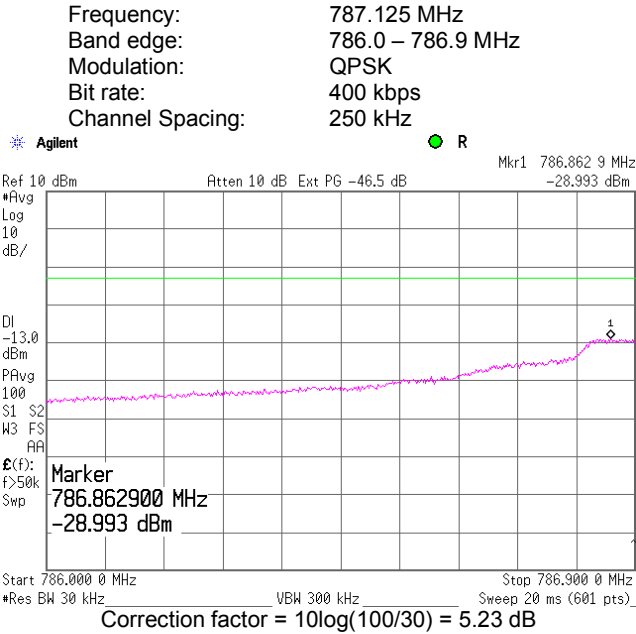




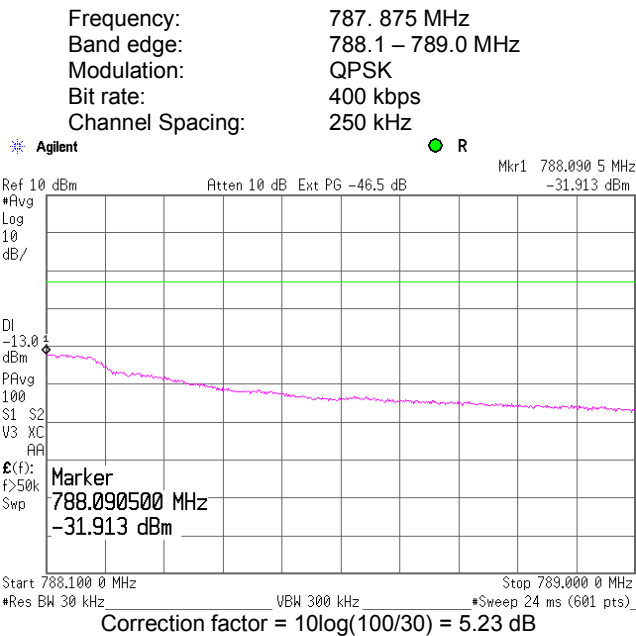
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 3:47:01 PM		
<b>Temperature:</b> 25.8 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12VDC
<b>Remarks:</b> band edges			

Plot 7.3.17 Spurious emissions at RF antenna connector, low channel band edge measurements



Plot 7.3.18 Spurious emissions at RF antenna connector, high channel band edge measurements





<b>Test specification:</b>		<b>Section 27.53(c)(2), Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053, TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	11/3/2009 3:48:50 PM		
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b> 250 kHz EBW, 16QAM			

## 7.4 Radiated spurious emission measurements

### 7.4.1 General

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

**Table 7.4.1 Radiated spurious emission test limits**

Frequency, MHz	Attenuation below carrier dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB( $\mu$ V/m) <sup>***</sup>
0.009 – 10 <sup>th</sup> harmonic*	43+10logP**	-13	84.4

\* - Excluding the in band emission within  $\pm 250$  % of the authorized bandwidth from the carrier

\*\* - P is transmitter output power in Watts

\*\*\* - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows:  $E = \sqrt{30 \times P \times 1.64} / r$ , where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

### 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. 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 in Table 7.4.2 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. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

7.4.3.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

### 7.4.4 Test procedure for substitution ERP measurements of spurious

7.4.4.1 The test equipment was set up as shown in Figure 7.4.3 and energized.

7.4.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.

7.4.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.

7.4.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.

7.4.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm and antenna gain in dBd reduced by cable loss in dB.

7.4.4.6 The above procedure was repeated at the rest of investigated frequencies.

7.4.4.7 The worst test results (the lowest margins) were recorded in Table 7.4.3 and shown in the associated plots.



<b>Test specification:</b> Section 27.53(c)(2), Radiated spurious emissions			
<b>Test procedure:</b> 47 CFR, Section 2.1053, TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 3:48:50 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b> 250 kHz EBW, 16QAM			

Figure 7.4.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

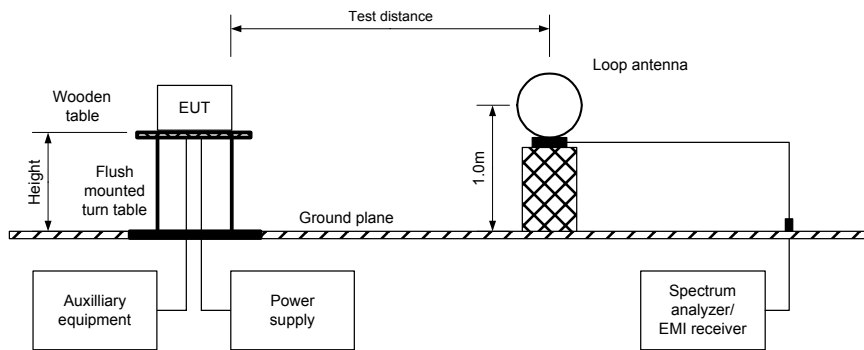
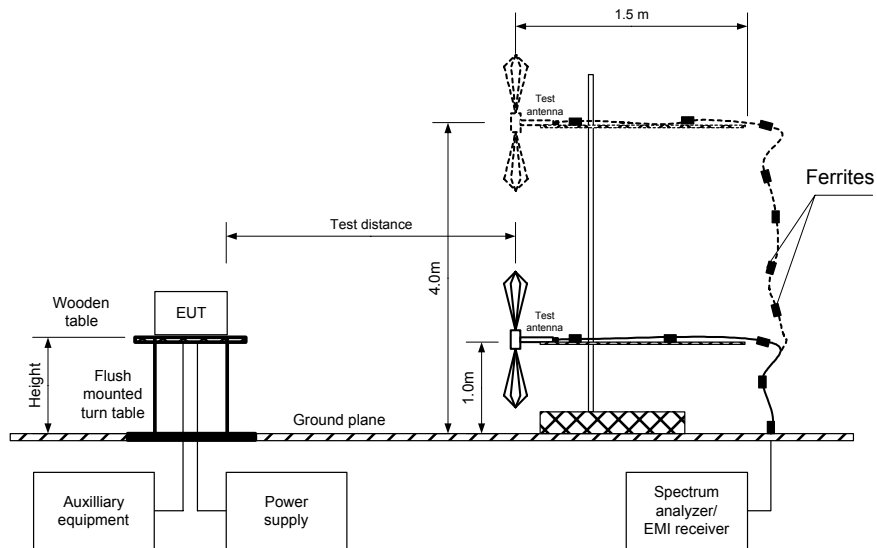


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz

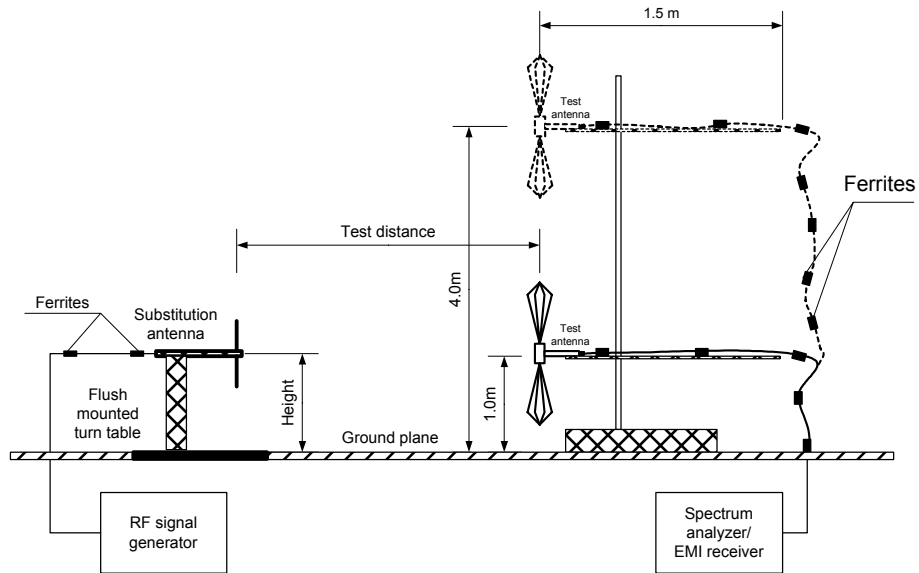




HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Radiated spurious emissions			
<b>Test procedure:</b> 47 CFR, Section 2.1053, TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 3:48:50 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b> 250 kHz EBW, 16QAM			

Figure 7.4.3 Setup for substitution ERP measurements of spurious





<b>Test specification:</b> Section 27.53(c)(2), Radiated spurious emissions	
<b>Test procedure:</b> 47 CFR, Section 2.1053, TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date &amp; Time:</b> 11/3/2009 3:48:50 PM	
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa
<b>Relative Humidity:</b> 53 %	
<b>Power Supply:</b> 120VAC/12VDC	
<b>Remarks:</b> 250 kHz EBW, 16QAM	

**Table 7.4.2 Spurious emission field strength test results**

ASSIGNED FREQUENCY RANGE: 787.0 – 788.0 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: Semi anechoic chamber  
 EUT HEIGHT: 0.8 m  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 8000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: > Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)  
 16QAM (worst case output power)  
 MODULATION: 16QAM (worst case output power)  
 MODULATING SIGNAL: PRBS  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
No emissions were found except of the second harmony of the EUT transmitter carrier that is falling into 1559.0 – 1610.0 MHz band and was tested against 27.53 (f) limit.							

\*- Margin = Field strength of spurious – calculated field strength limit.

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

**Table 7.4.3 Substitution ERP of spurious test results**

ASSIGNED FREQUENCY RANGE: 787.0 – 788.0 MHz  
 TRANSMITTER CARRIER ERP: 28.08 dBm at mid frequency  
 TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 SUBSTITUTION ANTENNA HEIGHT: 0.8 m  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: > Resolution bandwidth  
 SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)

Frequency MHz	Field strength dB(µV/m)	RBW, kHz	Antenna polarization	RF generator output, dBm	Ant gain dBd	Cable loss, dB	ERP, dBm	Attenuation below carrier dBc	Limit, dBc	Margin dB*	Verdict
No emissions were found except of the second harmony of the EUT transmitter carrier that is falling into 1559.0 – 1610.0 MHz band and was tested against 27.53 (f) limit											

\*- Margin = Spurious emission – specification limit.

**Reference numbers of test equipment used**

HL 0446	HL 0521	HL 0604	HL 1984	HL 2432	HL 2667	HL 3121	HL 3385
HL 3616	HL 3634						

Full description is given in Appendix A.

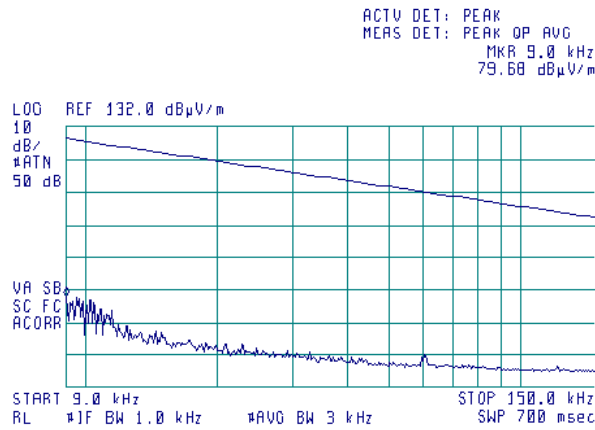


HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Radiated spurious emissions			
<b>Test procedure:</b> 47 CFR, Section 2.1053, TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 3:48:50 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b> 250 kHz EBW, 16QAM			

Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

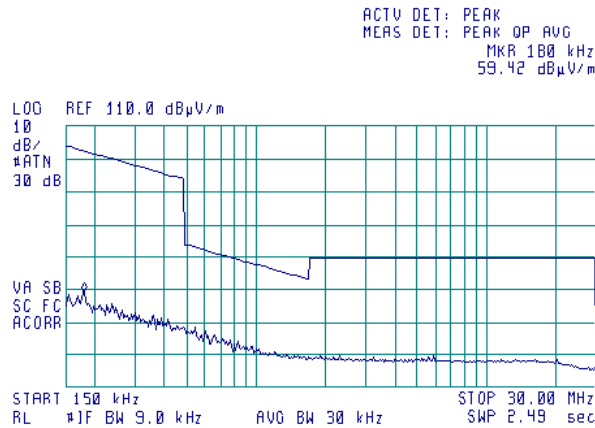
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



§15.209 limit was used

Plot 7.4.2 Radiated emission measurements in 0.15 - 30 MHz range

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



§15.209 limit was used



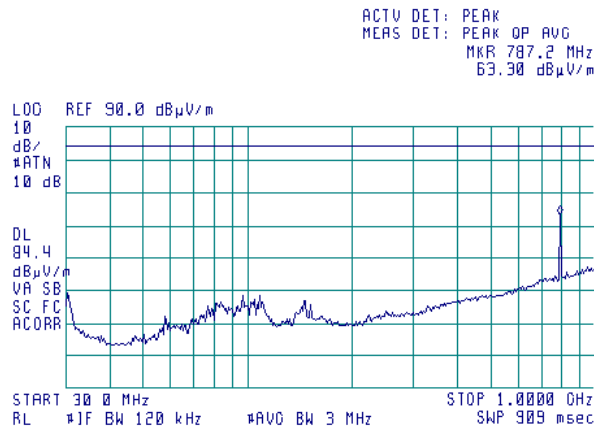


HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Radiated spurious emissions			
<b>Test procedure:</b> 47 CFR, Section 2.1053, TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 3:48:50 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b> 250 kHz EBW, 16QAM			

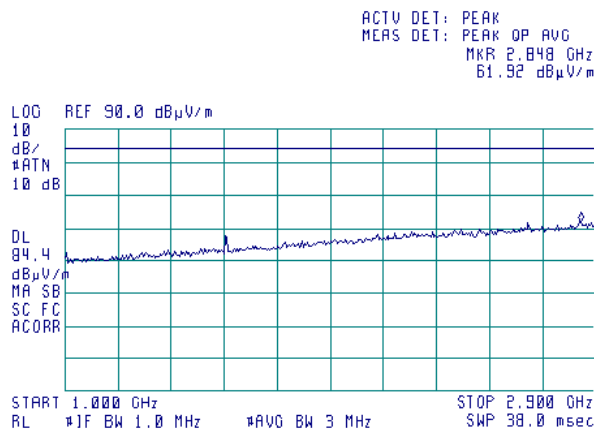
Plot 7.4.3 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.4.4 Radiated emission measurements in 1000 – 2900 MHz range

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



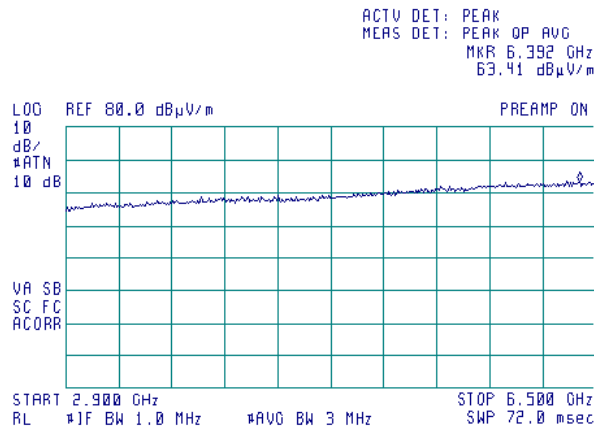


HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Radiated spurious emissions			
<b>Test procedure:</b> 47 CFR, Section 2.1053, TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 3:48:50 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b> 250 kHz EBW, 16QAM			

Plot 7.4.5 Radiated emission measurements in 2900 – 6500 MHz range

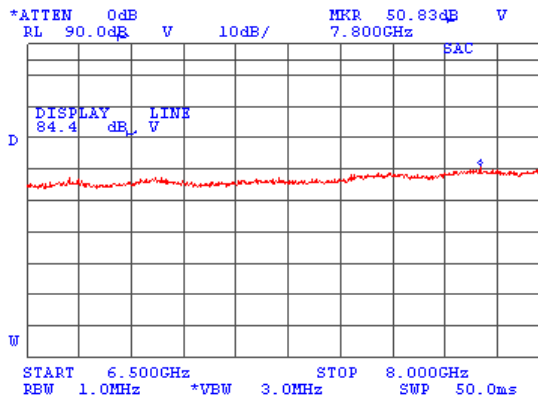
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Mid  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



84.4 dBuV/m limit was used

Plot 7.4.6 Radiated emission measurements in 6500 – 8000 MHz range

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





<b>Test specification:</b> Section 27.53(f), Radiated emissions in the 1559-1610 MHz band			
<b>Test procedure:</b> ANSI C63.4, Sections 11.5 and 12.1.3; TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b> 11/3/2009 3:51:07 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

## 7.5 Radiated spurious emission measurements in 1559-1610 MHz band

### 7.5.1 General

This test was performed to measure radiated spurious emissions from the EUT enclosure with antenna. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Radiated spurious emission test limits

Frequency, MHz	Type of signal	EIRP of spurious emissions, dBW/MHz	Spurious emissions, dBm
1559 - 1610	Wideband	-70	-40
	Discrete or less than 700 Hz BW	-80	-50

### 7.5.2 Test procedure for spurious emission field strength measurements above 30 MHz

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and the EUT performance was checked.

7.5.2.2 The specified frequency range was investigated with antennas connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

7.5.2.3 The worst test results with respect to the limits were recorded in Table 7.5.2 and shown in the associated plots.

### 7.5.3 Test procedure for substitution EIRP measurements of spurious

7.5.3.1 The test equipment was set up as shown in Figure 7.5.2 and energized.

7.5.3.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.

7.5.3.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.

7.5.3.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.

7.5.3.5 The EIRP of spurious emissions was calculated as a sum of signal generator output power in dBm and antenna gain in dBi reduced by cable loss in dB.

7.5.3.6 The above procedure was repeated at the rest of investigated frequencies.

7.5.3.7 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.



<b>Test specification:</b> Section 27.53(f), Radiated emissions in the 1559-1610 MHz band			
<b>Test procedure:</b> ANSI C63.4, Sections 11.5 and 12.1.3; TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b> 11/3/2009 3:51:07 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Figure 7.5.1 Setup for spurious emission field strength measurements

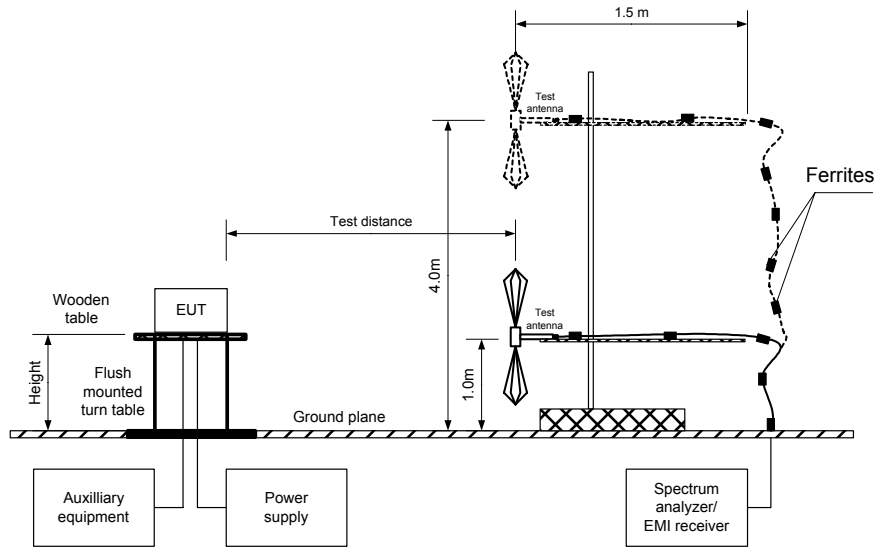
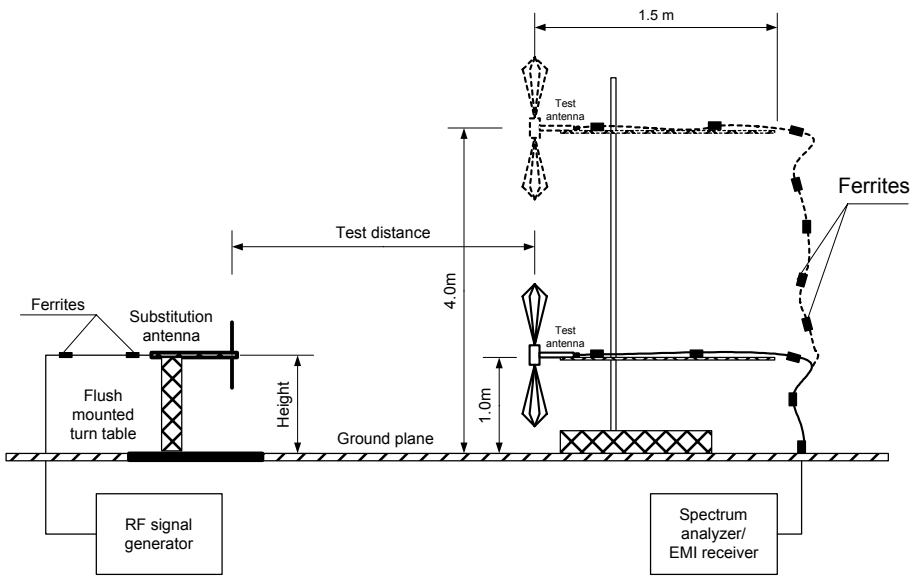


Figure 7.5.2 Setup for substitution EIRP measurements of spurious





<b>Test specification:</b> Section 27.53(f), Radiated emissions in the 1559-1610 MHz band			
<b>Test procedure:</b> ANSI C63.4, Sections 11.5 and 12.1.3; TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b> 11/3/2009 3:51:07 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

**Table 7.5.2 Substitution EIRP of spurious test results**

ASSIGNED FREQUENCY RANGE: 787.0 – 788.0 MHz  
 TRANSMITTER CARRIER ERP: 28.23 dBm at mid frequency  
 TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 SUBSTITUTION ANTENNA HEIGHT: 0.8 m  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: > Resolution bandwidth  
 SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength, dB(μV/m)	RBW, kHz	Antenna polarization	RF generator output, dBm	Ant gain, dBi	Cable loss, dB	EIRP, dBm	Limit, dBm	Margin, dB*	Verdict
<b>EUT Antenna: Vertical</b>										
<b>Mid carrier frequency 787.375 MHz</b>										
1575.275	54.84	1000	H	-50.38	8.56	2.40	-44.22	-40.00	-4.22	Pass
1575.173	57.25	1000	V	-47.51	8.56	2.40	-41.35	-40.00	-1.35	
<b>EUT Antenna: Horizontal</b>										
<b>Mid carrier frequency 787.375 MHz</b>										
1575.263	54.20	1000	H	-51.02	8.56	2.40	-44.86	-40.00	-4.86	Pass
1575.260	57.58	1000	V	-47.13	8.56	2.40	-40.97	-40.00	-0.97	

\*- Margin = Spurious emission – specification limit.

**Reference numbers of test equipment used**

HL 0521	HL 0604	HL 1984	HL 2432	HL 2667	HL 3121	HL 3385	HL 3616
HL 3634							

Full description is given in Appendix A.



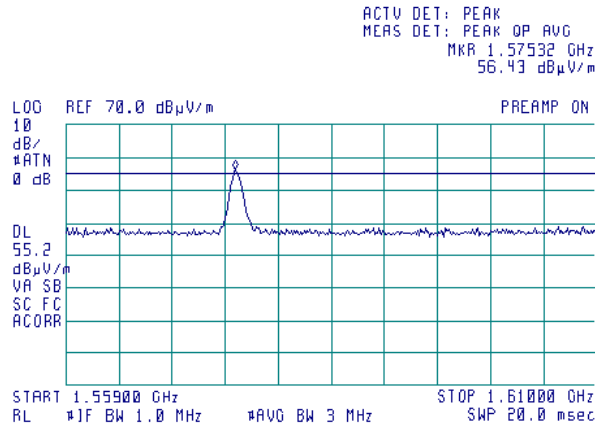
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(f), Radiated emissions in the 1559-1610 MHz band			
<b>Test procedure:</b> ANSI C63.4, Sections 11.5 and 12.1.3; TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 3:51:07 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Plot 7.5.1 Radiated emission measurements in 1559 - 1610 MHz range

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Mid  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 RBW/VBW: 1000/3000 kHz  
 EUT ANTENNA: Vertical

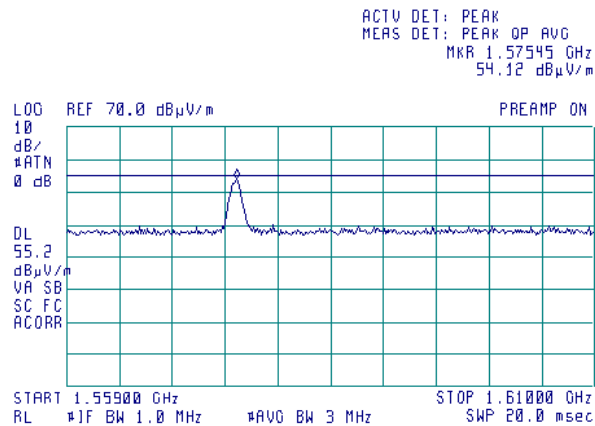
15:37:04 NOV 02, 2009



Plot 7.5.2 Radiated emission measurements in 1559 - 1610 MHz range

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Mid  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 RBW/VBW: 1000/3000 kHz  
 EUT ANTENNA: Horizontal

15:37:04 NOV 02, 2009





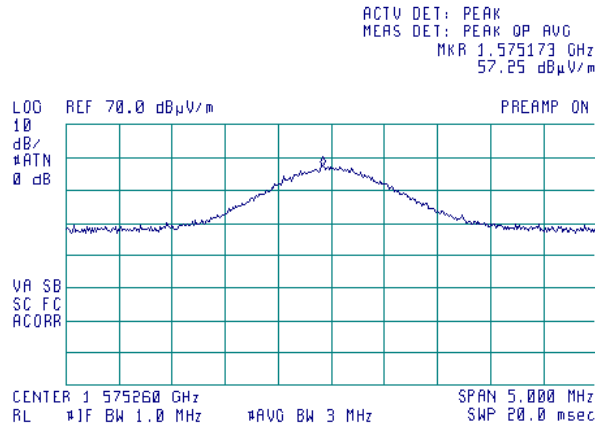
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(f), Radiated emissions in the 1559-1610 MHz band			
<b>Test procedure:</b> ANSI C63.4, Sections 11.5 and 12.1.3; TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 3:51:07 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

**Plot 7.5.3 Radiated emission measurements at the 2<sup>nd</sup> harmonic**

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
EUT ANTENNA:	Vertical

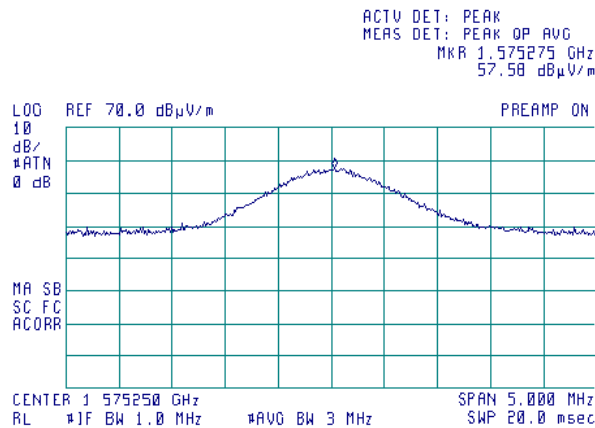
15:35:38 NOV 02, 2009



**Plot 7.5.4 Radiated emission measurements at the 2<sup>nd</sup> harmonic**

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical
TEST DISTANCE:	3 m
EUT ANTENNA:	Horizontal

15:35:38 NOV 02, 2009





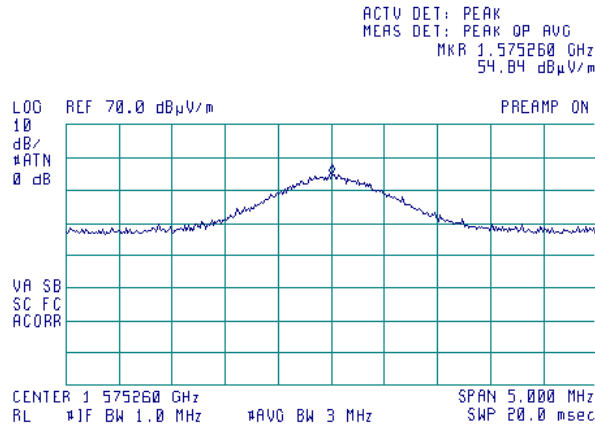
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(f), Radiated emissions in the 1559-1610 MHz band			
<b>Test procedure:</b> ANSI C63.4, Sections 11.5 and 12.1.3; TIA/EIA-603-C, Section 2.2.12			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 3:51:07 PM			
<b>Temperature:</b> 22.5 °C	<b>Air Pressure:</b> 1009 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

**Plot 7.5.5 Radiated emission measurements at the 2<sup>nd</sup> harmonic**

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m
EUT ANTENNA:	Vertical

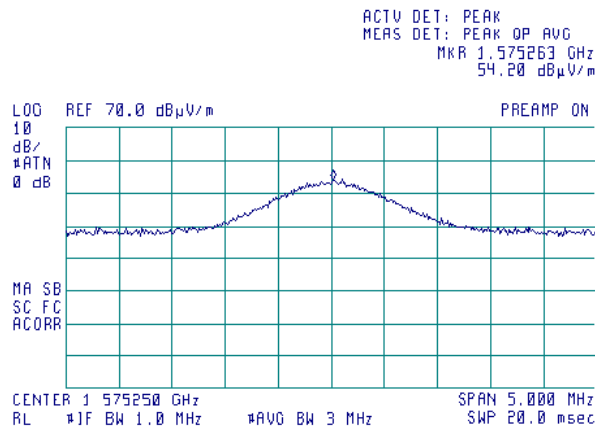
15:29:40 NOV 02, 2009



**Plot 7.5.6 Radiated emission measurements at the 2<sup>nd</sup> harmonic**

TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m
EUT ANTENNA:	Horizontal

15:29:40 NOV 02, 2009







<b>Test specification:</b>		<b>Section 27.53(c)(3), Spurious emissions at RF antenna connector in 763-775 MHz and 793 – 805 MHz</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	11/3/2009 4:07:30 PM		
<b>Temperature:</b> 25.9 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

## 7.6 Spurious emissions at RF antenna connector test in 763-775 MHz and 793 – 805 MHz

### 7.6.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Spurious emission limits

Frequency, MHz*	Attenuation below carrier, dBc	Spurious emissions, dBm
763 – 775 MHz	76+10logP*	-46
793 – 805 MHz	76+10logP*	-46

\* - P is transmitter output power in Watts.

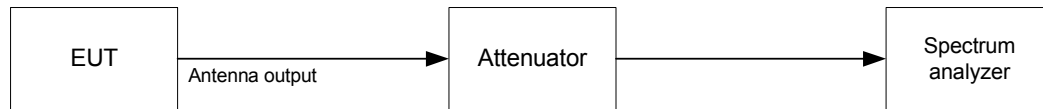
### 7.6.2 Test procedure

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 for end user RF output power.

7.6.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.6.2 and the associated plots.

Figure 7.6.1 Occupied bandwidth test setup





<b>Test specification:</b> Section 27.53(c)(3), Spurious emissions at RF antenna connector in 763-775 MHz and 793 – 805 MHz			
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b> 11/3/2009 4:07:30 PM			
<b>Temperature:</b> 25.9 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Table 7.6.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 787.0 – 788.0 MHz  
 INVESTIGATED FREQUENCY RANGE: 763 – 775 MHz, 793 – 805 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATING SIGNAL: PRBS  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

MODULATION: QPSK

Frequency, MHz	Channel Spacing, kHz	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
<b>Low channel</b>						
763 – 775	250	10	-58.00	-46.00	-12.00	Pass
763 – 775	330	10	-58.33	-46.00	-12.33	Pass
<b>High channel</b>						
793 - 805	250	10	-53.33	-46.00	-7.33	Pass
793 - 805	330	10	-53.00	-46.00	-7.00	Pass

MODULATION: 16QAM

Frequency, MHz	Bit rate, Mbps	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
<b>Low channel</b>						
763 – 775	250	10	-56.83	-46.00	-10.83	Pass
763 – 775	330	10	-57.67	-46.00	-11.67	Pass
<b>High channel</b>						
793 - 805	250	10	-54.83	-46.00	-8.83	Pass
793 - 805	330	10	-54.00	-46.00	-8.00	Pass

NOTE: Additional correction factor for external attenuator and cable loss of 12.5 dB was added to spectrum analyzer reading  
 \*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

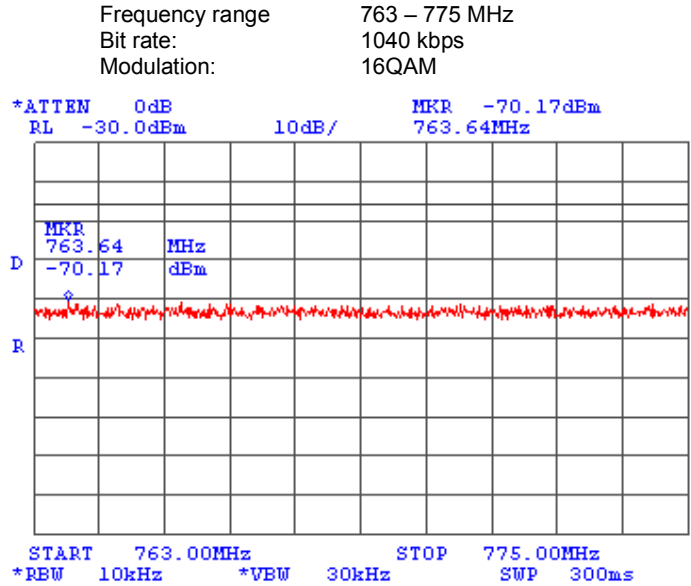
HL 1424	HL 2953	HL 3439	HL 3440				
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Full description is given in Appendix A.

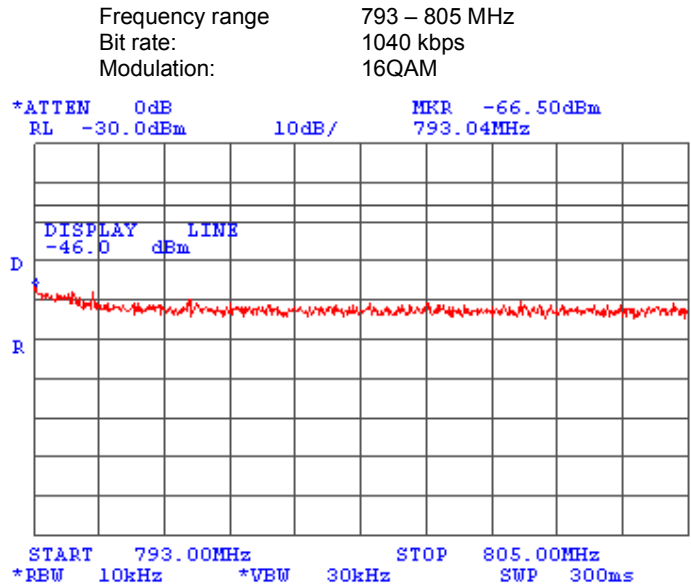


<b>Test specification:</b>	<b>Section 27.53(c)(3), Spurious emissions at RF antenna connector in 763-775 MHz and 793 – 805 MHz</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	11/3/2009 4:07:30 PM		
<b>Temperature:</b> 25.9 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.6.1 Spurious emission test results at low frequency, 330 kHz channel spacing



Plot 7.6.2 Spurious emission test results at high frequency, 330 kHz channel spacing

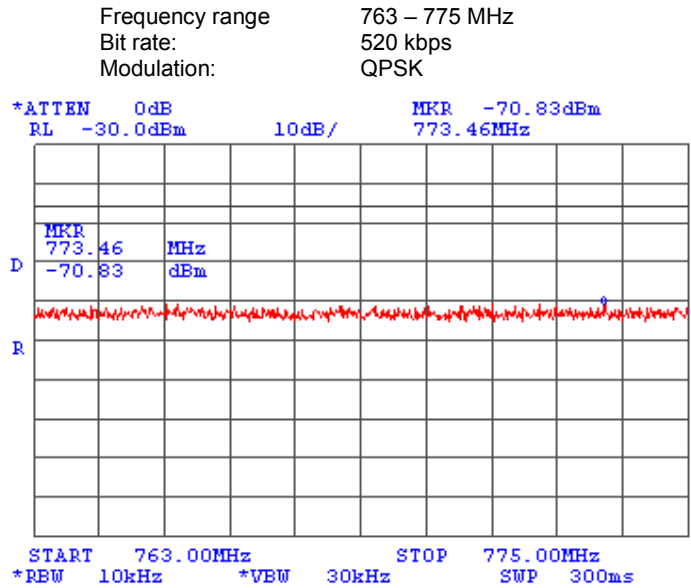




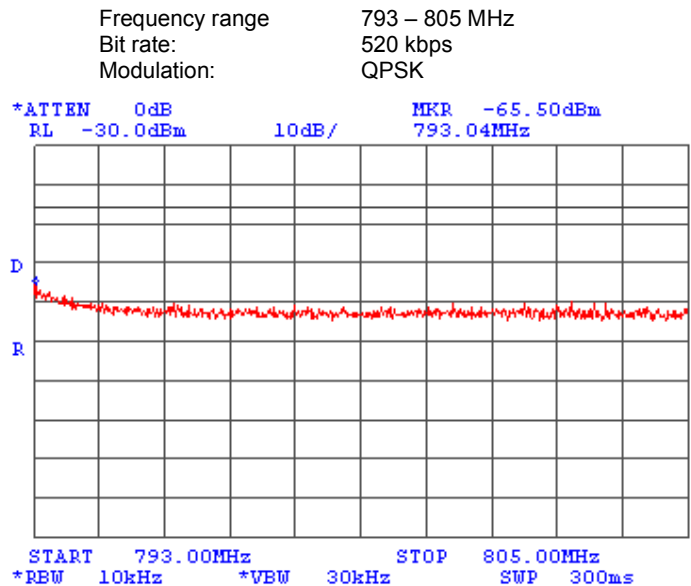
HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 27.53(c)(3), Spurious emissions at RF antenna connector in 763-775 MHz and 793 – 805 MHz</b>	
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b> 11/3/2009 4:07:30 PM			
<b>Temperature:</b> 25.9 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.6.3 Spurious emission test results at low frequency, 330 kHz channel spacing



Plot 7.6.4 Spurious emission test results at high frequency, 330 kHz channel spacing

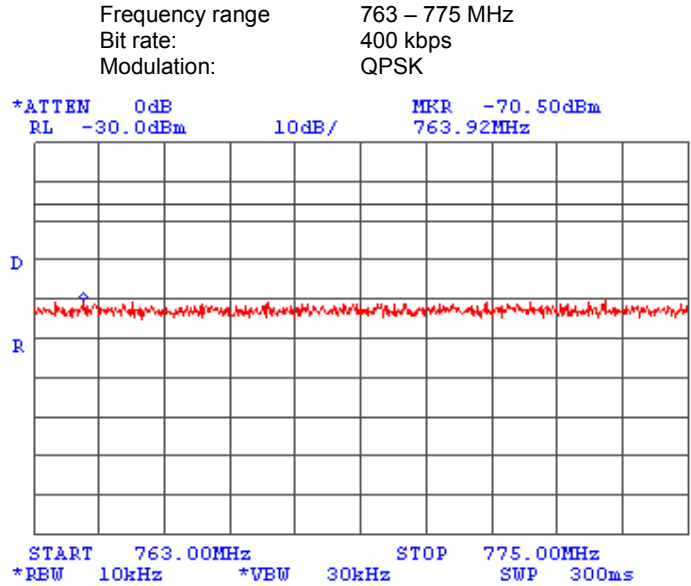




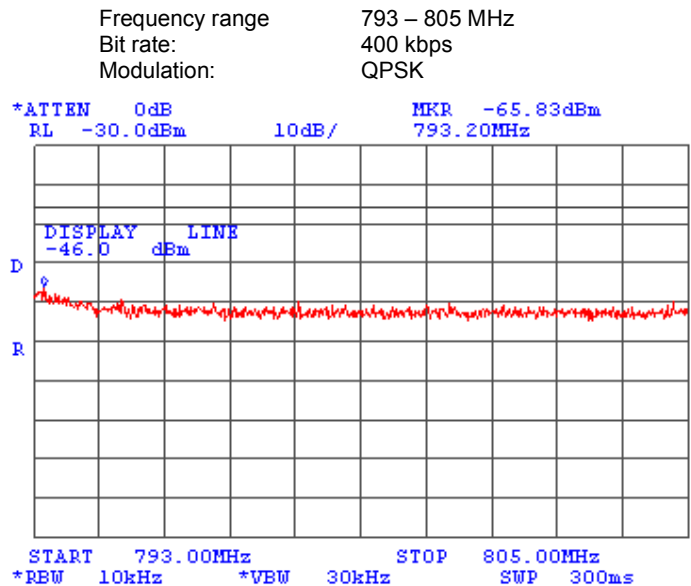


<b>Test specification:</b>		<b>Section 27.53(c)(3), Spurious emissions at RF antenna connector in 763-775 MHz and 793 – 805 MHz</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	11/3/2009 4:07:30 PM		
<b>Temperature:</b>	25.9 °C	<b>Air Pressure:</b>	1008 hPa
		<b>Relative Humidity:</b>	47 %
		<b>Power Supply:</b>	12 VDC
<b>Remarks:</b>			

**Plot 7.6.7 Spurious emission test results at low frequency, 250 kHz channel spacing**



**Plot 7.6.8 Spurious emission test results at high frequency, 250 kHz channel spacing**





<b>Test specification:</b>		<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b>	11/3/2009 4:07:39 PM		
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

## 7.7 Spurious emissions at RF antenna connector test

### 7.7.1 General

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

Table 7.7.1 Spurious emission limits

Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm
0.009 – 10th harmonic	43+10logP*	-13.0

\* - P is transmitter output power in Watts

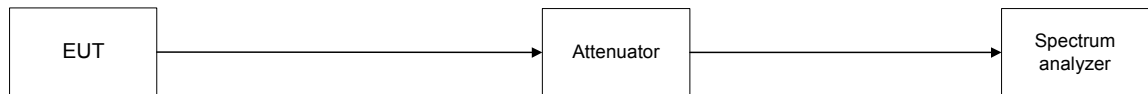
### 7.7.2 Test procedure

7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and its proper operation was checked.

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

7.7.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.7.2, Table 7.7.3 and the associated plots.

Figure 7.7.1 Spurious emission test setup





<b>Test specification:</b>		<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b>	11/3/2009 4:07:39 PM		
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Table 7.7.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 787.00 – 788.00 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 8000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: QPSK (worst case of output power)  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 800 kbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 CHANNEL SPACING: 250 kHz  
 TRANSMITTER OUTPUT POWER: 28.23 dBm at mid frequency

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
<b>Mid carrier frequency</b>									
No emissions were found									Pass

\*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

HL 0763	HL 0911	HL 1905	HL 2015	HL 2953	HL 3301	HL 3302	HL 3439
HL 3440	HL 3818						

Full description is given in Appendix A.

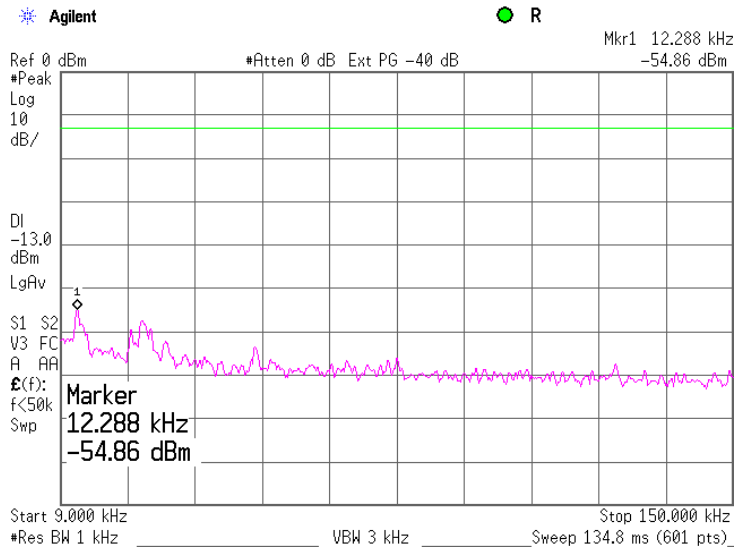




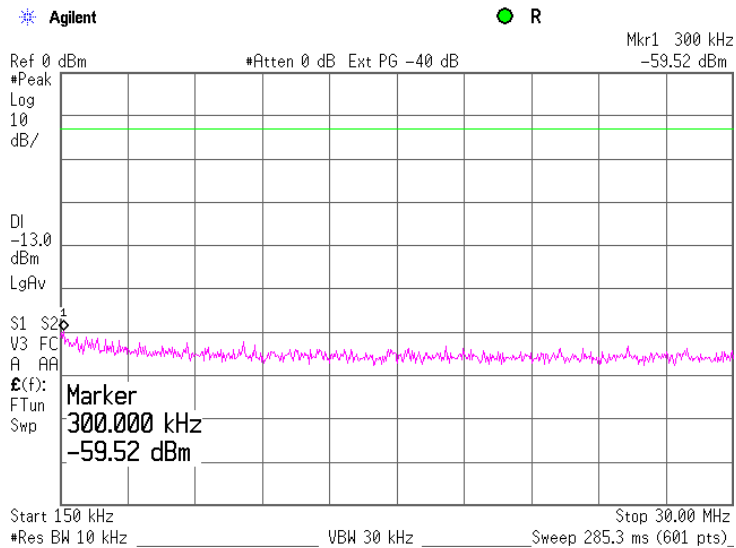
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Spurious emissions at RF antenna connector			
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 4:07:39 PM			
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Plot 7.7.1 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency, 250 kHz channel spacing



Plot 7.7.2 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency, 250 kHz channel spacing

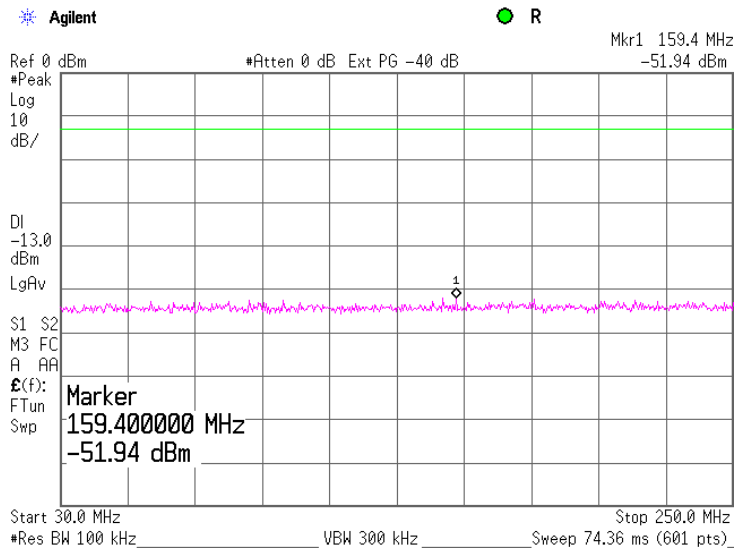




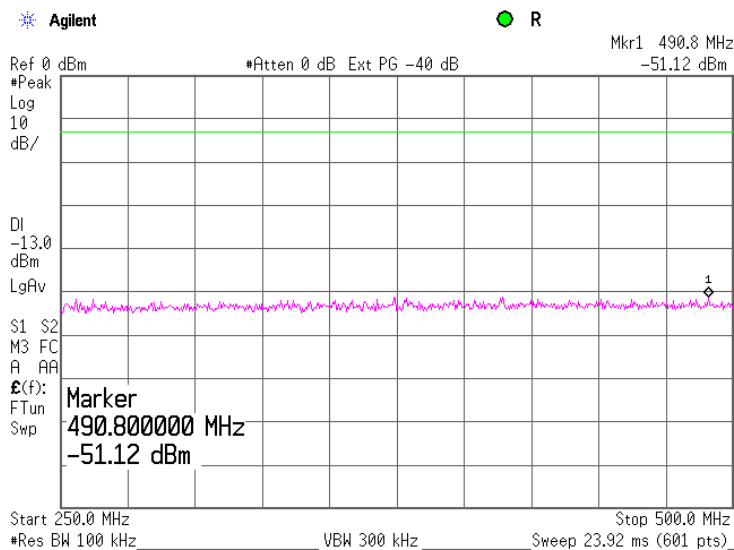
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Spurious emissions at RF antenna connector			
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 4:07:39 PM			
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

**Plot 7.7.3 Spurious emission measurements in 30 - 250 MHz range at mid carrier frequency, 250 kHz channel spacing**



**Plot 7.7.4 Spurious emission measurements in 250 - 500 MHz range at mid carrier frequency, 250 kHz channel spacing**

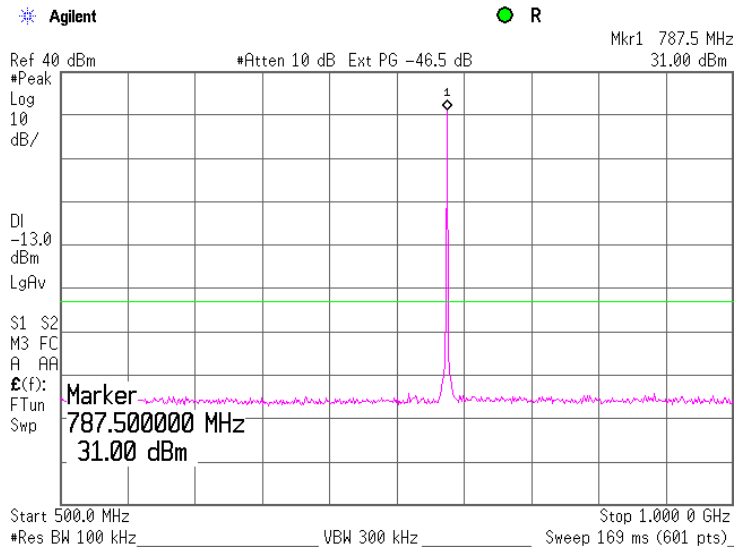




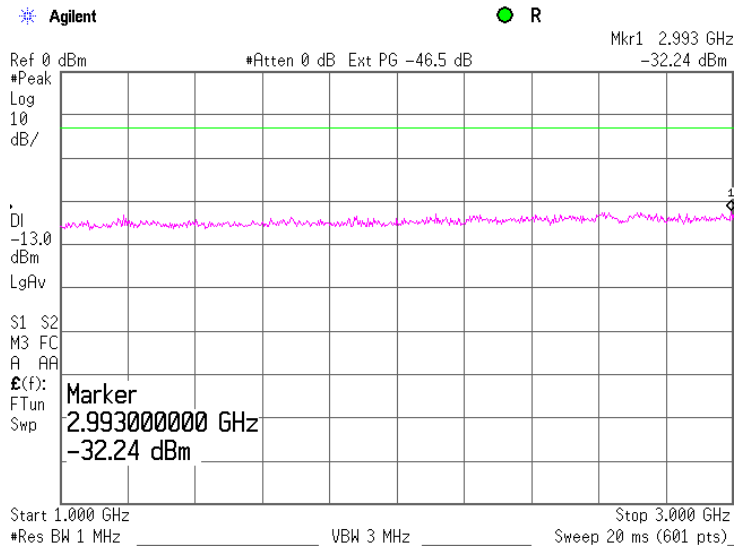
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Spurious emissions at RF antenna connector			
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 4:07:39 PM			
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Plot 7.7.5 Spurious emission measurements in 500 - 1000 MHz at mid carrier frequency, 250 kHz channel spacing



Plot 7.7.6 Spurious emission measurements in 1000 - 3000 MHz at mid carrier frequency, 250 kHz channel spacing

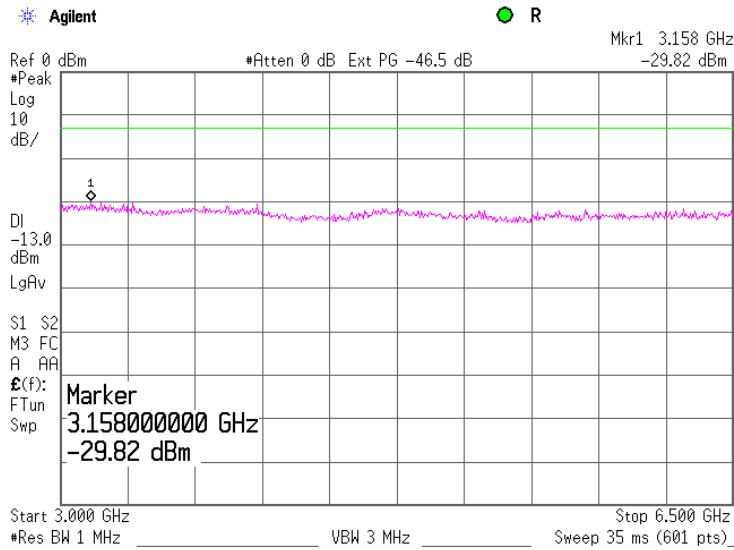




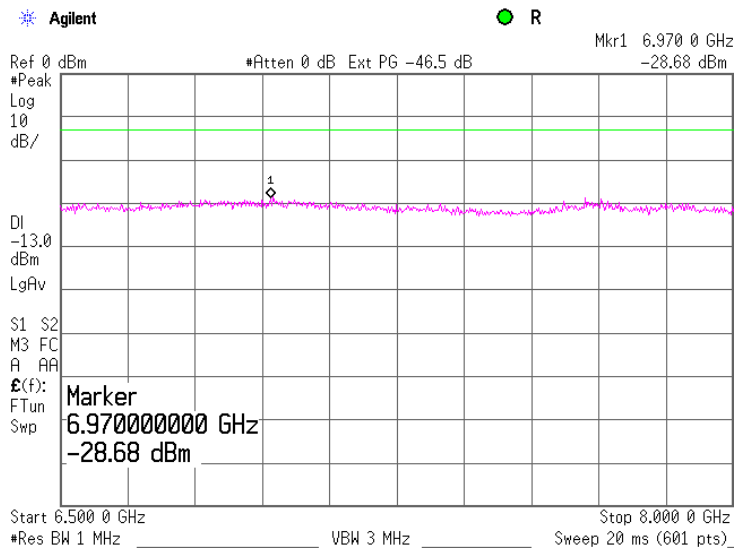
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Spurious emissions at RF antenna connector	
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date &amp; Time:</b> 11/3/2009 4:07:39 PM	
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa
	<b>Relative Humidity:</b> 47 %
	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>	

Plot 7.7.7 Spurious emission measurements in 3000 - 6500 MHz at mid carrier frequency, 250 kHz channel spacing



Plot 7.7.8 Spurious emission measurements in 6500 - 8000 MHz at mid carrier frequency, 250 kHz channel spacing





<b>Test specification:</b> Section 27.53(c)(2), Spurious emissions at RF antenna connector	
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date &amp; Time:</b> 11/3/2009 4:07:39 PM	
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa
<b>Relative Humidity:</b> 47 %	
<b>Power Supply:</b> 120VAC/12VDC	
<b>Remarks:</b>	

Table 7.7.3 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 787.00 – 788.00 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 8000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: QPSK (worst case of output power)  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 1040 kbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 CHANNEL SPACING: 330 kHz  
 TRANSMITTER OUTPUT POWER: 28.08 dBm at mid frequency

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
<b>Mid carrier frequency</b>									
No emissions were found									
Pass									

\*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

HL 0763	HL 0911	HL 1905	HL 2015	HL 2953	HL 3301	HL 3302	HL 3439
HL 3440	HL 3818						

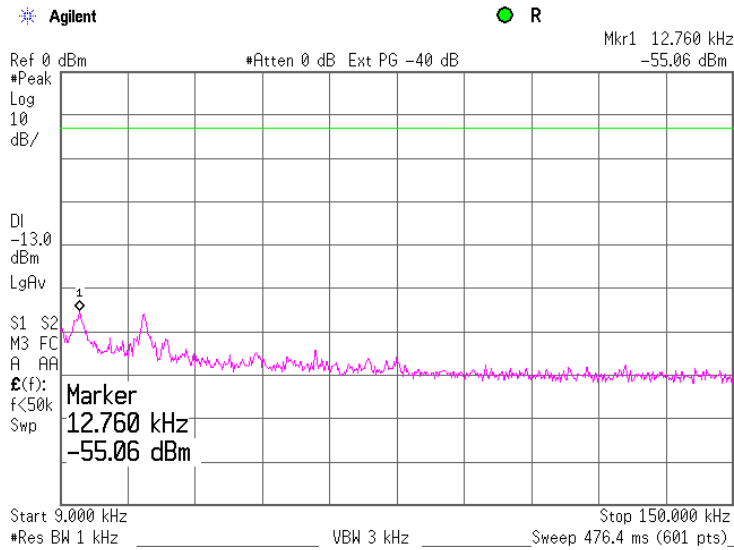
Full description is given in Appendix A.



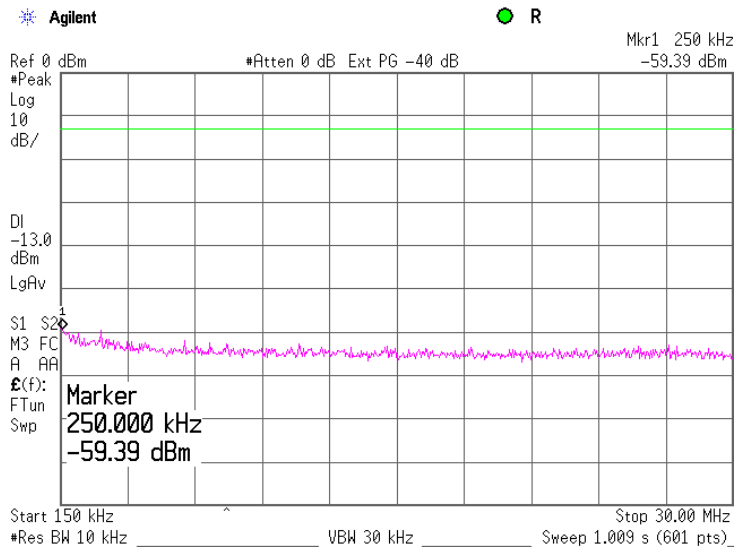
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.53(c)(2), Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 4:07:39 PM		
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Plot 7.7.9 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency, 330 kHz channel spacing



Plot 7.7.10 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency, 330 kHz channel spacing

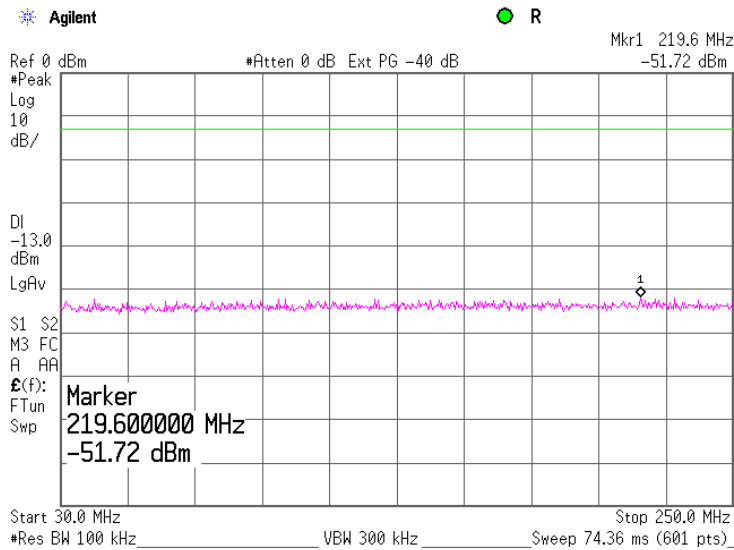




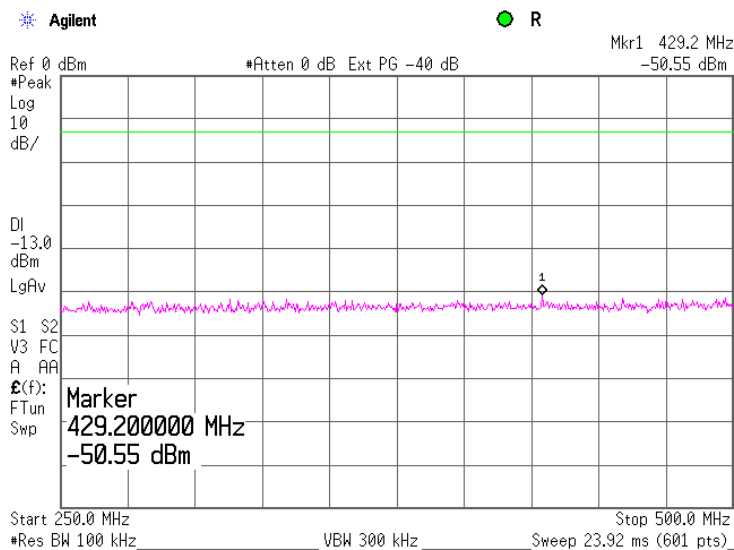
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Spurious emissions at RF antenna connector			
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 4:07:39 PM			
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Plot 7.7.11 Spurious emission measurements in 30.0 - 250 MHz range at mid carrier frequency, 330 kHz channel spacing



Plot 7.7.12 Spurious emission measurements in 250 - 500 MHz range at mid carrier frequency, 330 kHz channel spacing

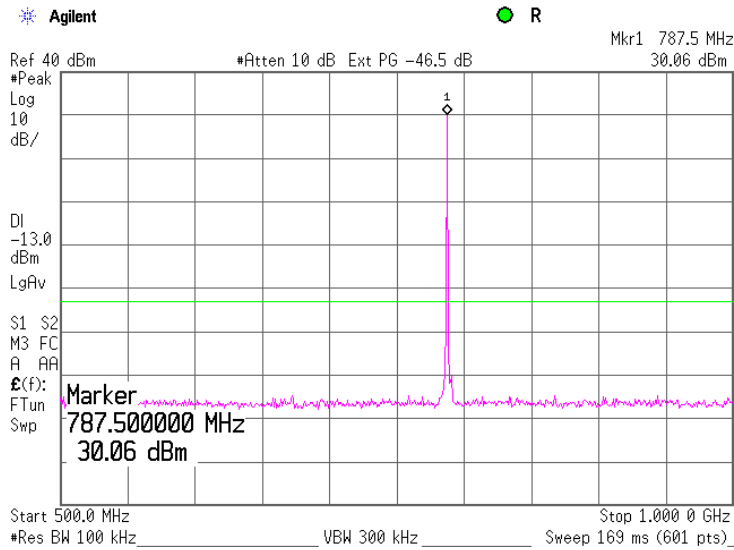




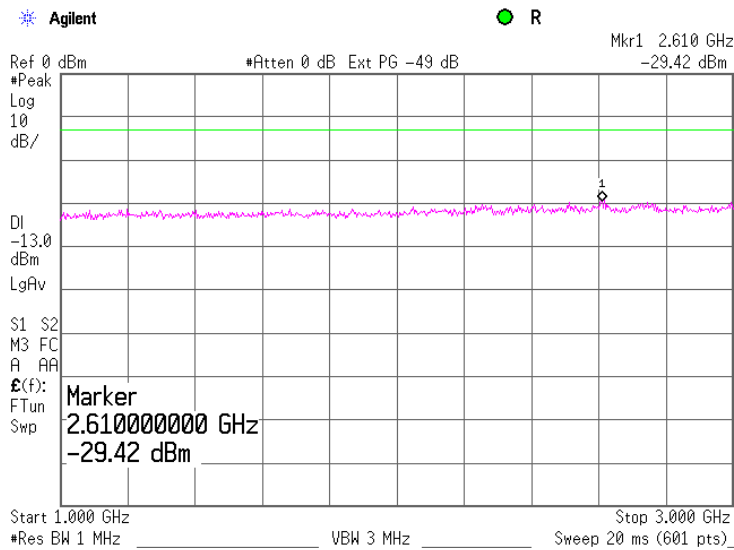
HERMON LABORATORIES

<b>Test specification:</b> Section 27.53(c)(2), Spurious emissions at RF antenna connector			
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 4:07:39 PM			
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Plot 7.7.13 Spurious emission measurements in 500 - 1000 MHz at mid carrier frequency, 330 kHz channel spacing



Plot 7.7.14 Spurious emission measurements in 1000 - 3000 MHz at mid carrier frequency, 330 kHz channel spacing

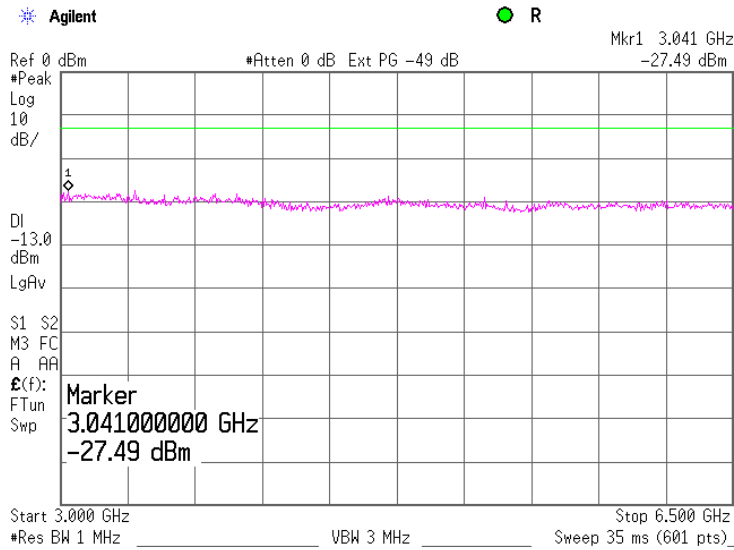




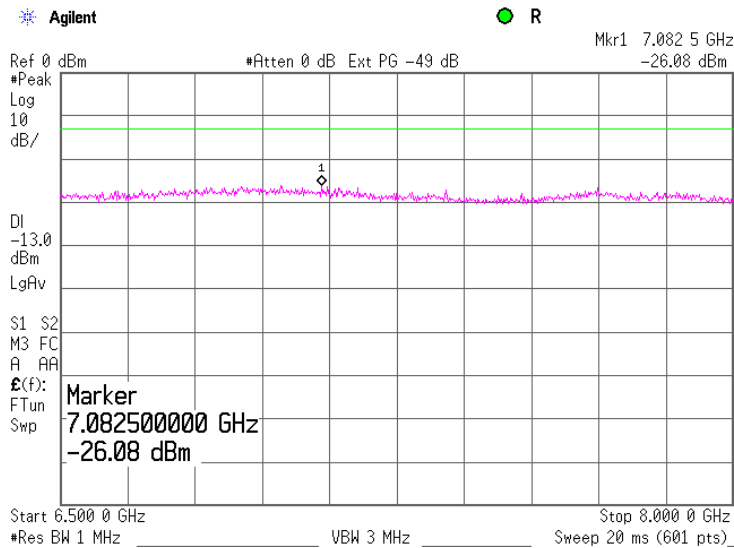


<b>Test specification:</b> Section 27.53(c)(2), Spurious emissions at RF antenna connector			
<b>Test procedure:</b> 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 11/3/2009 4:07:39 PM			
<b>Temperature:</b> 25.6 °C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 120VAC/12VDC
<b>Remarks:</b>			

Plot 7.7.15 Spurious emission measurements in 3000 - 6500 MHz at mid carrier frequency, 330 kHz channel spacing



Plot 7.7.16 Spurious emission measurements in 6500 - 8000 MHz at mid carrier frequency, 330 kHz channel spacing





<b>Test specification:</b>		<b>Section 27.54, Frequency stability</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

## 7.8 Frequency stability test

### 7.8.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.8.1.

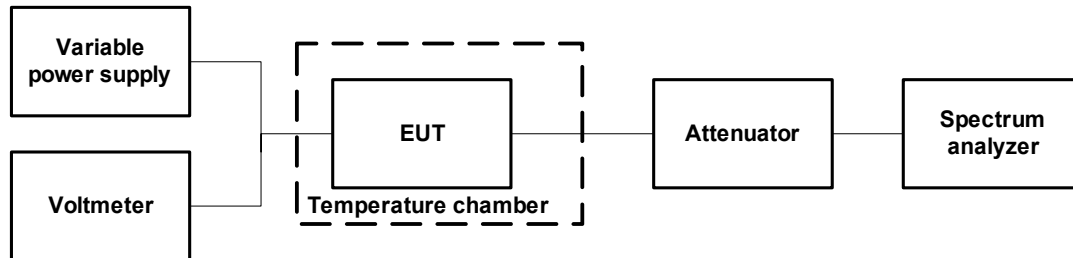
Table 7.8.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement
787.0 – 788.0	26 dBc points including frequency tolerance shall remain within the assigned band

### 7.8.2 Test procedure

- 7.8.2.1 The EUT was set up as shown in Figure 7.8.1, energized and its proper operation was checked.
- 7.8.2.2 The EUT power was turned off. Temperature within test chamber was set to +30°C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.
- 7.8.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.
- 7.8.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.8.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.
- 7.8.2.6 Frequency displacement was calculated as provided in Table 7.8.2 and Table 7.8.3.

Figure 7.8.1 Frequency stability test setup





<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Table 7.8.2 Frequency stability test results

ASSIGNED FREQUENCY RANGE: 787.0 – 788.0 MHz  
 NOMINAL POWER VOLTAGE: 12 VDC  
 TEMPERATURE STABILIZATION PERIOD: 20 min  
 POWER DURING TEMPERATURE TRANSITION: Off  
 RESOLUTION BANDWIDTH: 1000 Hz  
 VIDEO BANDWIDTH: 1000 Hz  
 FREQUENCY SPAN: 5000 Hz  
 SPECTRUM ANALYZER MODE: Counter  
 MODULATION: Unmodulated

T, °C	Voltage, V	Frequency, MHz							Max frequency drift, Hz		Max frequency drift, ppm	
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative	Positive	Negative
<b>787.5 MHz</b>												
-30	nominal	787.499984	787.499952	787.499952	787.499955	787.499963	787.499980	787.499980	0.00	-138.00	0.00	-0.18
-20	nominal	787.499988	NA	NA	NA	NA	NA	787.500100	10.00	-102.00	0.01	-0.13
-10	nominal	787.500103	NA	NA	NA	NA	NA	787.500029	13.00	-61.00	0.02	-0.08
0	nominal	787.500360	787.500122	787.500105	787.500092	787.500083	787.500071	787.500053	270.00	-37.00	0.34	-0.05
10	nominal	787.500440	NA	NA	NA	NA	NA	787.500105	350.00	0.00	0.44	0.00
20	15%	787.500099	NA	NA	NA	NA	NA	787.500092	9.00	0.00	0.01	0.00
20	nominal	787.500511	NA	NA	NA	NA	NA	787.500090*	421.00	0.00	0.53	0.00
20	-15%	787.500103	NA	NA	NA	NA	NA	787.500086	13.00	-4.00	0.02	-0.01
30	nominal	787.500166	787.500090	787.500064	787.500040	787.500028	787.500005	787.499964	76.00	-126.00	0.10	-0.16
40	nominal	787.499995	NA	NA	NA	NA	NA	787.499787	0.00	-303.00	0.00	-0.38
50	nominal	787.499783	787.499694	787.499659	787.499637	787.499620	787.499606	787.499570	0.00	-520.00	0.00	-0.66

\* - Reference frequency



<b>Test specification:</b>		<b>Section 27.54, Frequency stability</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2	
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Table 7.8.3 Transmitter operating range including frequency drift

Channel, MHz	Lower measured* band edge, MHz	Upper measured* band edge, MHz	Lower calculated** band edge, MHz	Upper calculated** band edge, MHz	Lower specified band edge, MHz	Upper specified band edge, MHz	Lower margin***, MHz	Upper margin***, MHz	Verdict
<b>QPSK 250 kHz BW</b>									
787.125	787.0197	787.2297	787.019	787.230	787.000	788.000	-0.019	-0.770	Pass
787.875	787.7703	787.9790	787.770	787.979	787.000	788.000	-0.770	-0.021	Pass
<b>16QAM 250 kHz BW</b>									
787.125	787.0217	787.2290	787.021	787.229	787.000	788.000	-0.021	-0.771	Pass
787.875	787.7710	787.9783	787.770	787.979	787.000	788.000	-0.770	-0.021	Pass
<b>QPSK 330 kHz BW</b>									
787.170	787.0340	787.3053	787.033	787.306	787.000	788.000	-0.033	-0.694	Pass
787.830	787.6960	787.6940	787.695	787.694	787.000	788.000	-0.695	-0.306	Pass
<b>16QAM 330 kHz BW</b>									
787.170	787.0380	787.3027	787.037	787.303	787.000	788.000	-0.037	-0.697	Pass
787.830	787.6967	787.9620	787.696	787.962	787.000	788.000	-0.696	-0.038	Pass

\* - Lower / Upper measured band edge, MHz – As measured at 26 dBc points

\*\* - Lower / Upper calculated band edge, MHz - Lower / Upper measured band edge, MHz + maximum measured positive / negative drift, MHz

\*\*\* - Lower / Upper Margin, MHz - Lower / Upper calculated band edge, MHz – Lower / Upper specified band edge, MHz

**NOTE: 26 dBc points were measured relative to the total emission power.**

**Reference numbers of test equipment used**

HL 0493	HL 1424	HL 3004					
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Full description is given in Appendix A.



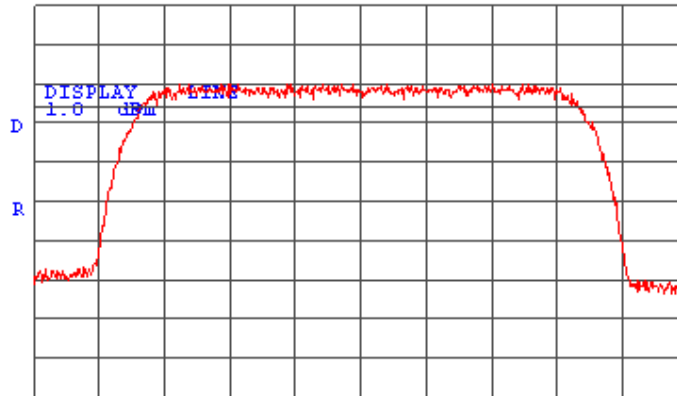
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.8.1 Band edge emission at low frequency, QPSK**

Band edge: Left  
Channel Bandwidth: 330 kHz

ATTEN 10dB VAVG 100 MKR -.29dBm  
RL 27.0dBm 10dB/ 787.0340MHz

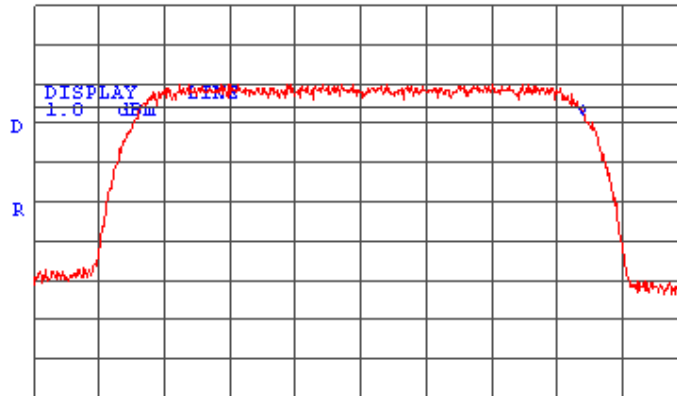


CENTER 787.1700MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms

**Plot 7.8.2 Band edge emission at low frequency, QPSK**

Band edge: Right  
Channel Bandwidth: 330 kHz

ATTEN 10dB VAVG 100 MKR -.63dBm  
RL 27.0dBm 10dB/ 787.3053MHz



CENTER 787.1700MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms

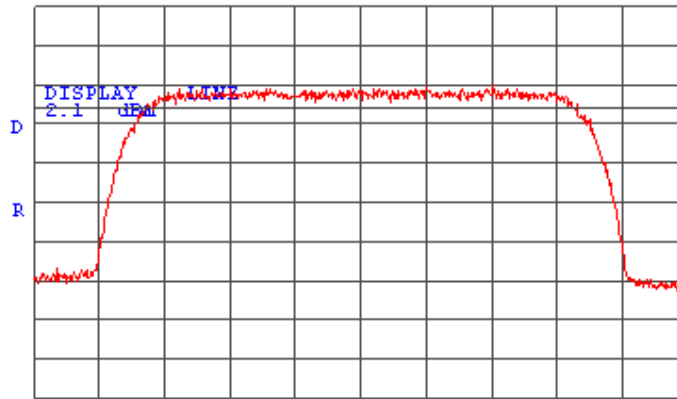


<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.8.3 Band edge emission at low frequency, 16QAM**

Band edge: Left  
Channel Bandwidth: 330 kHz

ATTEN 10dB VAVG 100 MKR .77dBm  
RL 28.1dBm 10dB/ 787.0380MHz

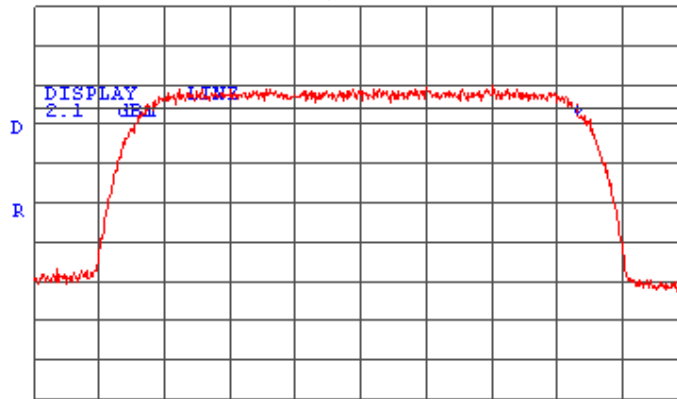


CENTER 787.1700MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms

**Plot 7.8.4 Band edge emission at low frequency, 16QAM**

Band edge: Right  
Channel Bandwidth: 330 kHz

ATTEN 10dB VAVG 100 MKR .77dBm  
RL 28.1dBm 10dB/ 787.3027MHz



CENTER 787.1700MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms



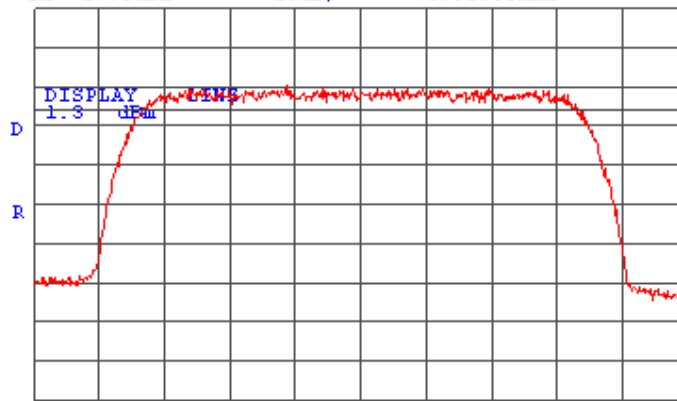
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.8.5 Band edge emission at high frequency, QPSK**

Band edge: Left  
Channel Bandwidth: 330 kHz

ATTEN 10dB VAVG 100 MKR -.03dBm  
RL 27.3dBm 10dB/ 787.6960MHz

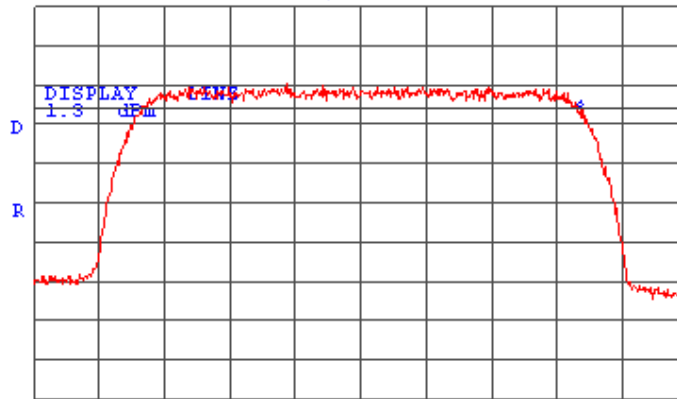


CENTER 787.8300MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms

**Plot 7.8.6 Band edge emission at high frequency, QPSK**

Band edge: Right  
Channel Bandwidth: 330 kHz

ATTEN 10dB VAVG 100 MKR 1.13dBm  
RL 27.3dBm 10dB/ 787.9640MHz



CENTER 787.8300MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms



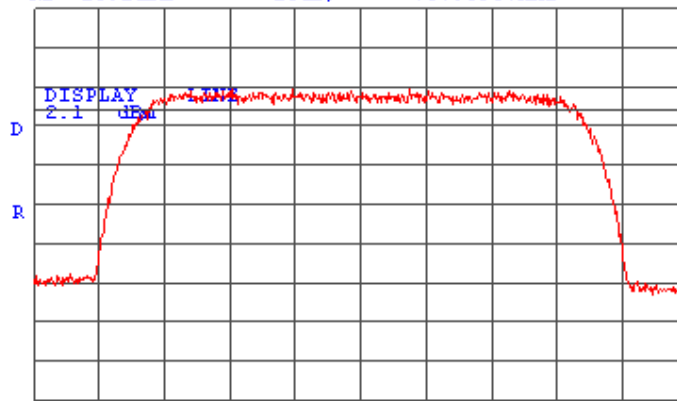
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.8.7 Band edge emission at high frequency, 16QAM**

Band edge: Left  
Channel Bandwidth: 330 kHz

ATTEN 10dB VAVG 100 MKR -.07dBm  
RL 28.1dBm 10dB/ 787.6967MHz

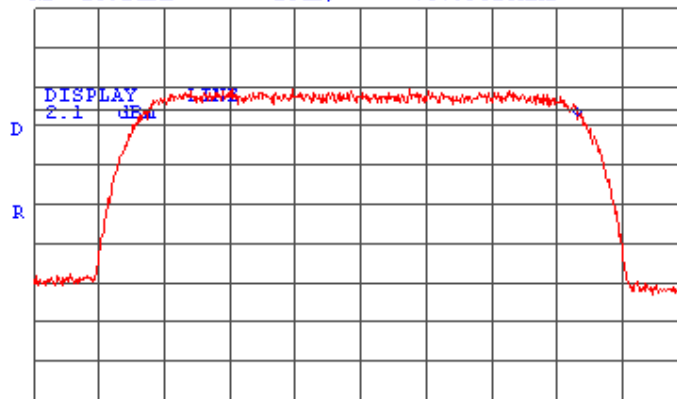


CENTER 787.8300MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms

**Plot 7.8.8 Band edge emission at high frequency, 16QAM**

Band edge: Right  
Channel Bandwidth: 330 kHz

ATTEN 10dB VAVG 100 MKR .77dBm  
RL 28.1dBm 10dB/ 787.9620MHz



CENTER 787.8300MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms





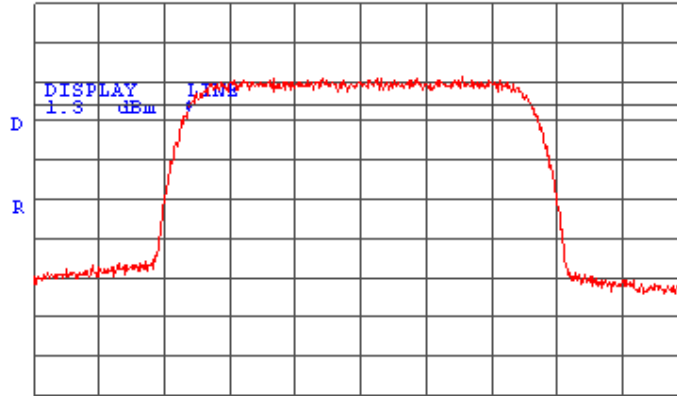
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.8.9 Band edge emission at low frequency, QPSK**

Band edge: Left  
Channel Bandwidth: 250 kHz

ATTEN 10dB VAVG 100 MKR .12dBm  
RL 27.3dBm 10dB/ 787.0197MHz

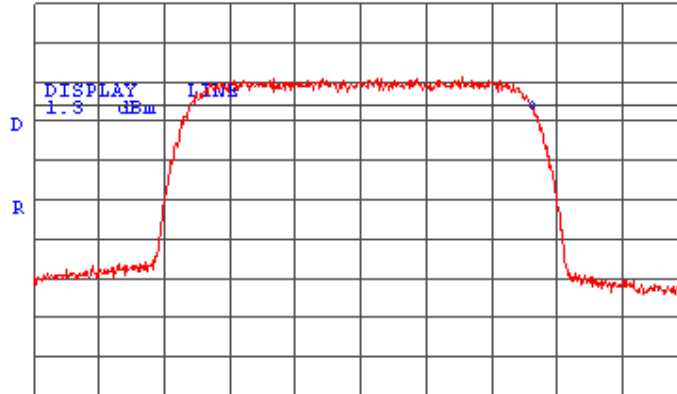


CENTER 787.1250MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms

**Plot 7.8.10 Band edge emission at low frequency, QPSK**

Band edge: Right  
Channel Bandwidth: 250 kHz

ATTEN 10dB VAVG 100 MKR .29dBm  
RL 27.3dBm 10dB/ 787.2297MHz



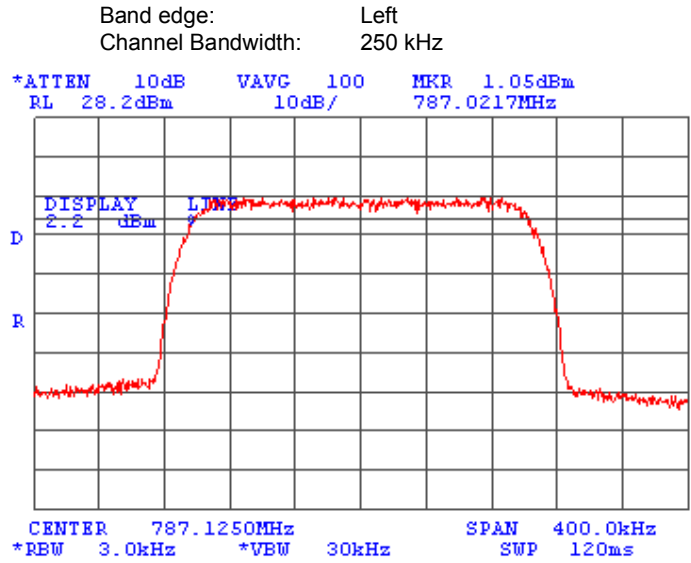
CENTER 787.1250MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms



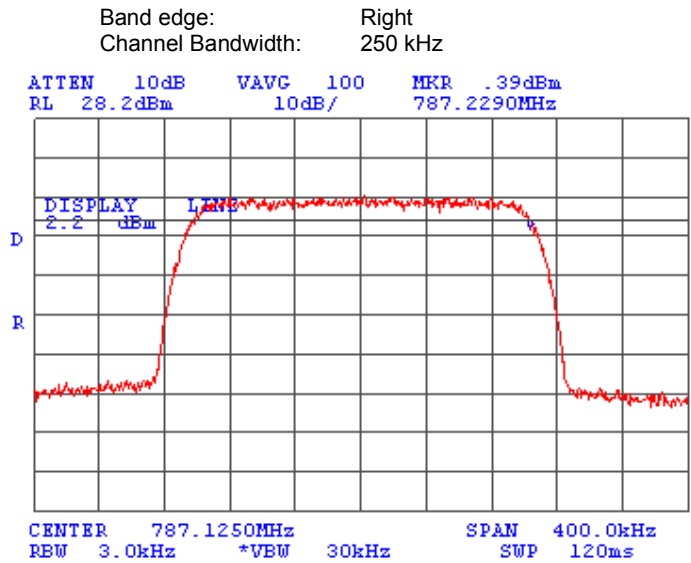
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.8.11 Band edge emission at low frequency, 16QAM



Plot 7.8.12 Band edge emission at low frequency, 16QAM



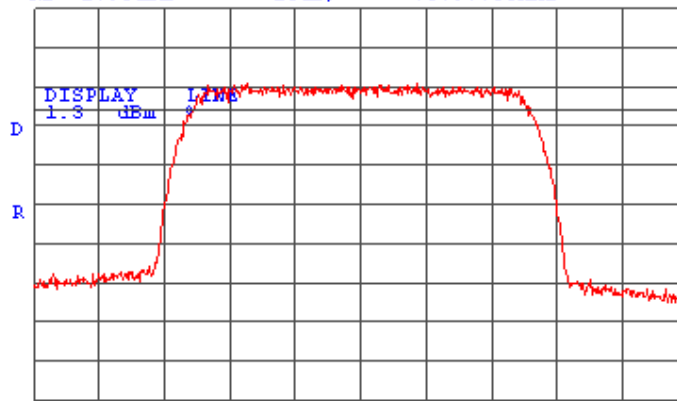


<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.8.13 Band edge emission at high frequency, QPSK**

Band edge: Left  
Channel Bandwidth: 250 kHz

ATTEN 10dB VAVG 100 MKR .29dBm  
RL 27.3dBm 10dB/ 787.7703MHz

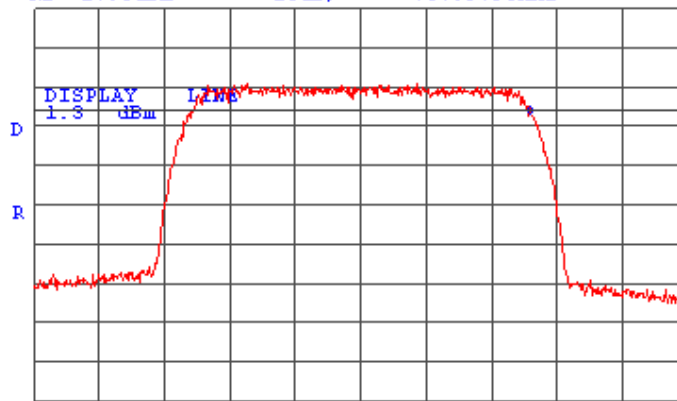


CENTER 787.8750MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms

**Plot 7.8.14 Band edge emission at high frequency, QPSK**

Band edge: Right  
Channel Bandwidth: 250 kHz

ATTEN 10dB VAVG 100 MKR .46dBm  
RL 27.3dBm 10dB/ 787.9790MHz



CENTER 787.8750MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms



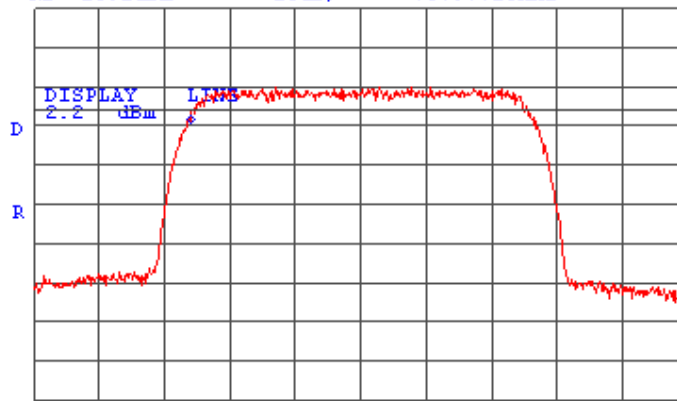
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-C, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/3/2009 2:18:39 PM		
<b>Temperature:</b> 25.2 °C	<b>Air Pressure:</b> 1006 hPa	<b>Relative Humidity:</b> 47 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.8.15 Band edge emission at high frequency, 16QAM**

Band edge: Left  
Channel Bandwidth: 250 kHz

ATTEN 10dB VAVG 100 MKR -1.11dBm  
RL 28.2dBm 10dB/ 787.7710MHz

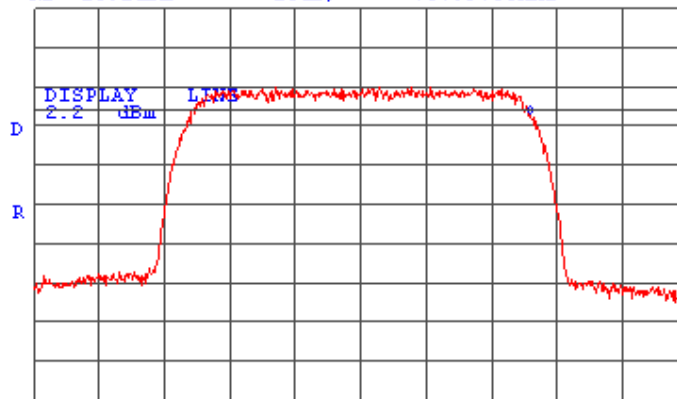


CENTER 787.8750MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms

**Plot 7.8.16 Band edge emission at high frequency, 16QAM**

Band edge: Right  
Channel Bandwidth: 250 kHz

ATTEN 10dB VAVG 100 MKR 1.22dBm  
RL 28.2dBm 10dB/ 787.9783MHz



CENTER 787.8750MHz SPAN 400.0kHz  
RBW 3.0kHz \*VBW 30kHz SWP 120ms



<b>Test specification:</b>	<b>Section 2.1091, RF radiation exposure evaluation</b>		
<b>Test procedure:</b>	47 CFR, Section 1.1307(b)1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	11/8/2009 9:19:56 AM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 45 %	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

## 7.9 RF exposure

### 7.9.1 General

This test was performed to determine the minimum safe distance between the transmitter antenna and human to avoid public exposure in excess of limits for general population (uncontrolled exposure). Specification test limits are given in Table 7.9.1.

Table 7.9.1 RF exposure limits

Frequency range, MHz	Power density*		Electric field strength**, V/m
	mW/cm <sup>2</sup>	W/m <sup>2</sup>	
787.0 – 788.0	0.525	5.25	

\* - Power density limit within 300 - 1500 MHz was calculated according to the following equation:  $S = F / 1500$ , where S is power density in mW/cm<sup>2</sup> and F is frequency in MHz

\*\* - Electric field strength limit was calculated from power density as follows:  $E = \sqrt{S \times 120 \times \pi}$ , where E is electric field strength in V/m and S is power density in W/m<sup>2</sup>

### 7.9.2 Safe distance calculation for fixed transmitter

The minimum safe distance was calculated from the following equation as provided in Table 7.9.2:

$$r = \sqrt{P \times G / (4 \times \pi \times S)}$$

where S is power density in W/m<sup>2</sup>, P is the transmitter output power in W, G is the transmitter antenna numeric gain and r is distance to transmit antenna in m.

With power density equal to the RF exposure limit the minimum safe distance was calculated according to the following equation:  $r = \sqrt{P \times G / (4 \times \pi \times S)}$

Table 7.9.2 Safe distance calculation

ASSIGNED FREQUENCY: 787.0 – 788.0 MHz

EQUIPMENT INTENDED USE: Fixed\*

Carrier frequency MHz	Peak output power, dBm	Antenna gain, dBi	EIRP		Power density limit, W/m <sup>2</sup>	Safe distance, m**	Intended separation, r	Verdict
			dBm	W				
787.375	28.22	14	42.22	16.67	5.25	0.5	2.0	Pass

\* - The equipment deemed fixed as intended for use at a distance of more than 2.0 m from humans.

**8 APPENDIX A Test equipment and ancillaries used for tests**

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-09	29-Jun-10
0493	Temperature Chamber -45...175 deg C	Thermotron	S-1.2 Mini-Max	14016	20-May-09	20-May-10
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	27-Aug-09	27-Aug-10
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-09	11-Jan-10
0763	Antenna Linear Horn (Optimum Gain) 18 - 26.5 GHz, WR-42, 3.5 adapter	Continental Microwave & Tool Co.	LHA042	980976-002	23-Dec-08	23-Dec-11
0911	Coupler Dual Directional, 20 dB, 0.1 - 2.0 GHz	Hewlett Packard	778D	1144A078 27	05-Mar-09	05-Mar-10
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Aug-09	28-Aug-10
1905	Transformer 230/120 V, 160 W	Hermon Laboratories	230-120	1905	08-Jul-09	08-Jul-10
1906	Power Divider, 0.5-18.0 GHz, 80 W	Omni Spectra	2090-6204-00	1906	01-Dec-08	01-Dec-09
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	24-Aug-09	24-Aug-10
2015	Power Divider, 0.5-18.0 GHz, 80 W	Omni Spectra	2090-6204-00	2015	01-Dec-08	01-Dec-09
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	24-Aug-09	24-Aug-10
2667	Signal generator, 9 kHz - 3.3 GHz	Rohde & Schwarz	SML03	101909	25-Sep-08	25-Sep-10
2953	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-09	05-Oct-10
3004	Analyzer, Spectrum, 9.0 kHz - 2.2 GHz	Anritsu	MS2601A	MT09861	27-Mar-09	27-Mar-10
3121	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3121	07-Dec-08	07-Dec-09
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY451010 57	03-Dec-08	03-Dec-09
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY452405 86	05-Dec-08	05-Dec-09
3385	Microwave Cable Assembly, 18.0 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3385	07-Dec-08	07-Dec-09
3439	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	08-Mar-09	08-Mar-10
3440	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	08-Mar-09	08-Mar-10
3616	Cable RF, 6.5 m, N type-N type, DC-6.5 GHz	Suhner Switzerland	Rg 214/U	NA	07-Dec-08	07-Dec-09
3634	Cable RF, 5.5 m, N type-N type, DC-6.5 GHz	Alpha Wire	RG 214/U	NA	17-Dec-08	17-Dec-09
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	25-Sep-09	25-Sep-10

## 9 APPENDIX B Measurement uncertainties

### Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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

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

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

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

## 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 and IC 2186A-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), 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).

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

47CFR part 27: 2008	Miscellaneous wireless communications services
47CFR part 1: 2008	Practice and procedure
47CFR part 2: 2008	Frequency allocations and radio treaty matters; general rules and regulations
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 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/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards



## 12 APPENDIX E Test equipment correction factors

**Antenna Factor**  
**Active Loop Antenna**  
**EMC Test Systems, model 6502, S/N 2857, HL 0446**

Frequency, MHz	Magnetic Antenna Factor, dB(S/m)	Electric Antenna Factor, dB(1/m)
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	9.7
0.750	-41.9	9.6
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.1
4.000	-41.4	10.1
5.000	-41.5	10.0
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(S/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ A/m).  
Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ 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)
26	7.8	940	24.0
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
920	24.1		

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

**Antenna factor  
Double-ridged wave guide horn antenna  
Model 3115, S/N 9911-5964, HL1984**

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

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

**Antenna factor  
Double-ridged guide horn antenna  
Model 3115, serial number: 00027177, HL 2432**

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

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

**Cable loss**  
Cable coaxial, Gore, 25.5 GHz, 1.2 m, SMA-SMA, S/N 10020014  
HL 2953

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	8750	1.28	18000	1.84
30	0.06	9000	1.30	18250	1.91
100	0.12	9250	1.35	18500	1.94
250	0.19	9500	1.34	18750	1.92
500	0.27	9750	1.36	19000	1.95
750	0.34	10000	1.33	19250	2.00
1000	0.40	10250	1.38	19500	1.96
1250	0.45	10500	1.39	19750	2.02
1500	0.50	10750	1.39	20000	1.92
1750	0.54	11000	1.43	20250	2.04
2000	0.57	11250	1.42	20500	2.00
2250	0.60	11500	1.48	20750	2.09
2500	0.64	11750	1.49	21000	2.01
2750	0.67	12000	1.59	21250	2.07
3000	0.70	12250	1.50	21500	2.20
3250	0.74	12500	1.55	21750	2.10
3500	0.76	12750	1.55	22000	2.24
3750	0.80	13000	1.61	22250	2.25
4000	0.83	13250	1.62	22500	2.12
4250	0.85	13500	1.56	22750	2.05
4500	0.87	13750	1.61	23000	2.10
4750	0.91	14000	1.57	23250	2.03
5000	0.92	14250	1.66	23500	2.08
5250	0.96	14500	1.58	23750	2.14
5500	0.99	14750	1.69	24000	2.16
5750	0.99	15000	1.71	24250	2.25
6000	1.03	15250	1.74	24500	2.17
6250	1.05	15500	1.75	24750	2.32
6500	1.07	15750	1.72	25000	2.32
6750	1.08	16000	1.89	25250	2.32
7000	1.12	16250	1.79	25500	2.41
7250	1.13	16500	1.84	25750	2.31
7500	1.15	16750	1.82	26000	2.28
7750	1.20	17000	1.79	26250	2.32
8000	1.20	17250	1.78	26500	2.29
8250	1.23	17500	1.85		
8500	1.27	17750	1.83		



**Cable loss**  
**Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00**  
**HL 3121**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.08	3600	2.10	7400	3.08	11200	3.85	15100	4.58
30	0.18	3700	2.14	7500	3.11	11300	3.85	15200	4.60
50	0.26	3800	2.18	7600	3.14	11400	3.86	15300	4.63
100	0.34	3900	2.19	7700	3.16	11500	3.86	15400	4.65
200	0.47	4000	2.25	7800	3.18	11600	3.87	15500	4.71
300	0.59	4100	2.25	7900	3.20	11700	3.85	15600	4.70
400	0.66	4200	2.28	8000	3.22	11800	3.96	15700	4.69
500	0.75	4300	2.35	8100	3.26	11900	3.92	15800	4.71
600	0.83	4400	2.35	8200	3.27	12000	3.92	15900	4.74
700	0.90	4500	2.38	8300	3.29	12100	3.94	16000	4.69
800	0.96	4600	2.43	8400	3.30	12200	3.94	16100	4.72
900	1.02	4700	2.43	8500	3.31	12300	3.99	16200	4.71
1000	1.07	4800	2.45	8600	3.33	12400	4.02	16300	4.74
1100	1.12	4900	2.48	8700	3.35	12500	4.10	16400	4.74
1200	1.15	5000	2.55	8800	3.36	12600	4.09	16500	4.75
1300	1.22	5100	2.54	8900	3.38	12700	4.15	16600	4.78
1400	1.28	5200	2.56	9000	3.40	12800	4.15	16700	4.86
1500	1.29	5300	2.58	9100	3.41	12900	4.08	16800	4.84
1600	1.36	5400	2.61	9200	3.45	13000	4.21	16900	4.83
1700	1.40	5500	2.64	9300	3.48	13100	4.19	17000	4.86
1800	1.45	5600	2.69	9400	3.52	13200	4.29	17100	4.83
1900	1.51	5700	2.67	9500	3.54	13300	4.24	17200	4.90
2000	1.50	5800	2.71	9600	3.59	13400	4.26	17300	4.91
2100	1.56	5900	2.73	9700	3.59	13500	4.26	17400	4.94
2200	1.59	6000	2.75	9800	3.62	13600	4.29	17500	4.93
2300	1.63	6100	2.81	9900	3.70	13700	4.35	17600	4.93
2400	1.73	6200	2.80	10000	3.70	13800	4.31	17700	5.00
2500	1.73	6300	2.82	10100	3.72	13900	4.29	17800	5.01
2600	1.78	6400	2.85	10200	3.73	14000	4.32	17900	5.00
2700	1.84	6500	2.87	10300	3.75	14100	4.33	18000	5.00
2800	1.84	6600	2.90	10400	3.76	14200	4.34		
2900	1.91	6700	2.91	10500	3.77	14300	4.36		
3000	1.91	6800	2.94	10600	3.79	14400	4.38		
3100	1.97	6900	2.96	10700	3.80	14600	4.42		
3200	1.98	7000	2.98	10800	3.81	14700	4.42		
3300	2.04	7100	3.01	10900	3.81	14800	4.55		
3400	2.04	7200	3.02	11000	3.83	14900	4.55		
3500	2.10	7300	3.04	11100	3.84	15000	4.55		

**Cable loss**  
**Cable coaxial, Microwave Cable Assembly, 104EA, 18 GHz, 1.0 m**  
**Suhner Sucoflex, HL 3385**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.04	5000	0.89	10200	1.16	15500	1.54
30	0.07	5100	0.88	10300	1.17	15600	1.50
50	0.07	5200	0.88	10400	1.14	15700	1.49
100	0.11	5300	0.90	10500	1.17	15800	1.51
200	0.15	5400	0.90	10600	1.18	15900	1.49
300	0.20	5500	0.91	10700	1.30	16000	1.58
400	0.23	5600	0.96	10800	1.20	16100	1.58
500	0.25	5700	0.97	10900	1.21	16200	1.57
600	0.28	5800	0.97	11000	1.27	16300	1.55
700	0.30	5900	1.01	11100	1.23	16400	1.61
800	0.32	6000	1.05	11200	1.24	16500	1.66
900	0.34	6100	1.05	11300	1.24	16600	1.66
1000	0.36	6200	1.06	11400	1.27	16700	1.70
1100	0.38	6300	1.09	11500	1.26	16800	1.70
1200	0.40	6400	1.09	11600	1.26	16900	1.61
1300	0.40	6500	1.09	11700	1.21	17000	1.63
1400	0.43	6600	1.15	11800	1.24	17100	1.64
1500	0.44	6700	1.16	11900	1.30	17200	1.65
1600	0.46	6800	1.17	12000	1.28	17300	1.65
1700	0.49	6900	1.18	12100	1.26	17400	1.65
1800	0.51	7000	1.21	12200	1.30	17500	1.65
1900	0.53	7100	1.20	12300	1.31	17600	1.63
2000	0.52	7200	1.24	12400	1.30	17700	1.63
2100	0.53	7300	1.24	12500	1.31	17800	1.61
2200	0.55	7400	1.25	12600	1.32	17900	1.62
2300	0.57	7500	1.25	12700	1.35	18000	1.60
2400	0.58	7600	1.26	12800	1.39		
2500	0.59	7700	1.27	12900	1.36		
2600	0.63	7800	1.30	13000	1.39		
2700	0.63	7900	1.29	13100	1.41		
2800	0.64	8000	1.31	13200	1.38		
2900	0.64	8100	1.30	13300	1.40		
3000	0.66	8200	1.29	13400	1.44		
3100	0.66	8300	1.28	13500	1.43		
3200	0.68	8400	1.22	13600	1.45		
3300	0.69	8500	1.22	13700	1.45		
3400	0.72	8600	1.23	13800	1.52		
3500	0.72	8700	1.24	13900	1.53		
3600	0.72	8800	1.26	14000	1.53		
3700	0.74	8900	1.20	14100	1.51		
3800	0.75	9000	1.21	14200	1.50		
3900	0.78	9100	1.19	14300	1.46		
4000	0.77	9200	1.17	14400	1.47		
4100	0.78	9300	1.17	14600	1.51		
4200	0.81	9400	1.13	14700	1.47		
4300	0.80	9500	1.14	14800	1.45		
4400	0.81	9600	1.17	14900	1.45		
4500	0.82	9700	1.17	15000	1.40		
4600	0.85	9800	1.18	15100	1.44		
4700	0.85	9900	1.14	15200	1.44		
4800	0.91	10000	1.16	15300	1.49		
4900	0.89	10100	1.16	15400	1.54		

**Cable loss**  
**Cable coaxial, RG-214/U, N type-N type, 6.5 m**  
**Suhner Switzerland, HL 3616**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	1750	2.66	3550	4.44	5350	6.08
30	0.25	1800	2.72	3600	4.46	5400	6.12
50	0.32	1850	2.78	3650	4.59	5450	6.17
100	0.48	1900	2.81	3700	4.60	5500	6.25
150	0.60	1950	2.86	3750	4.72	5550	6.31
200	0.71	2000	2.94	3800	4.72	5600	6.35
250	0.81	2050	2.97	3850	4.86	5650	6.41
300	0.91	2100	3.01	3900	4.85	5700	6.50
350	1.00	2150	3.06	3950	4.99	5750	6.52
400	1.07	2200	3.11	4000	4.90	5800	6.57
450	1.14	2250	3.16	4050	5.04	5850	6.61
500	1.23	2300	3.21	4100	5.01	5900	6.71
550	1.30	2350	3.26	4150	5.10	5950	6.70
600	1.37	2400	3.31	4200	5.08	6000	6.75
650	1.44	2450	3.35	4250	5.18	6050	6.74
700	1.50	2500	3.39	4300	5.14	6100	6.84
750	1.58	2550	3.46	4350	5.22	6150	6.87
800	1.64	2600	3.48	4400	5.21	6200	6.93
850	1.69	2650	3.55	4450	5.29	6250	6.96
900	1.77	2700	3.59	4500	5.31	6300	7.02
950	1.79	2750	3.66	4550	5.39	6350	7.04
1000	1.87	2800	3.68	4600	5.41	6400	7.10
1050	1.92	2850	3.75	4650	5.49	6450	7.11
1100	1.98	2900	3.79	4700	5.52	6500	7.19
1150	2.05	2950	3.86	4750	5.60		
1200	2.09	3000	3.89	4800	5.64		
1250	2.15	3050	3.94	4850	5.73		
1300	2.21	3100	3.98	4900	5.70		
1350	2.27	3150	4.03	4950	5.73		
1400	2.33	3200	4.06	5000	5.75		
1450	2.38	3250	4.12	5050	5.83		
1500	2.44	3300	4.14	5100	5.82		
1550	2.48	3350	4.22	5150	5.91		
1600	2.52	3400	4.24	5200	5.92		
1650	2.56	3450	4.31	5250	5.98		
1700	2.62	3500	4.35	5300	6.01		



**Cable loss**  
**Cable coaxial, RG-214/U, N type-N type, 5.5 m**  
**Alpha Wire, HL 3634**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.05	1750	2.12	3550	3.43	5350	4.66
30	0.18	1800	2.16	3600	3.50	5400	4.70
50	0.24	1850	2.17	3650	3.53	5450	4.76
100	0.36	1900	2.23	3700	3.55	5500	4.80
150	0.47	1950	2.25	3750	3.57	5550	4.86
200	0.55	2000	2.33	3800	3.63	5600	4.87
250	0.64	2050	2.34	3850	3.67	5650	4.91
300	0.70	2100	2.41	3900	3.73	5700	4.97
350	0.77	2150	2.44	3950	3.73	5750	5.02
400	0.83	2200	2.49	4000	3.78	5800	5.07
450	0.91	2250	2.52	4050	3.79	5850	5.07
500	0.95	2300	2.55	4100	3.90	5900	5.15
550	1.02	2350	2.56	4150	3.88	5950	5.20
600	1.08	2400	2.60	4200	3.88	6000	5.25
650	1.15	2450	2.68	4250	3.98	6050	5.26
700	1.19	2500	2.67	4300	4.00	6100	5.30
750	1.25	2550	2.73	4350	4.02	6150	5.37
800	1.31	2600	2.74	4400	4.03	6200	5.40
850	1.35	2650	2.77	4450	4.06	6250	5.45
900	1.39	2700	2.84	4500	4.14	6300	5.47
950	1.45	2750	2.85	4550	4.16	6350	5.50
1000	1.49	2800	2.89	4600	4.17	6400	5.57
1050	1.56	2850	2.91	4650	4.19	6450	5.62
1100	1.57	2900	2.99	4700	4.21	6500	5.61
1150	1.64	2950	3.00	4750	4.26		
1200	1.66	3000	3.03	4800	4.29		
1250	1.71	3050	3.06	4850	4.30		
1300	1.73	3100	3.14	4900	4.33		
1350	1.80	3150	3.20	4950	4.36		
1400	1.81	3200	3.20	5000	4.45		
1450	1.87	3250	3.22	5050	4.44		
1500	1.94	3300	3.24	5100	4.49		
1550	1.96	3350	3.33	5150	4.53		
1600	1.97	3400	3.35	5200	4.62		
1650	2.03	3450	3.38	5250	4.63		
1700	2.05	3500	3.39	5300	4.64		

### 13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broadband
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB( $\mu$ V)	decibel referred to one microvolt
dB( $\mu$ V/m)	decibel referred to one microvolt per meter
dB( $\mu$ A)	decibel referred to one microampere
dB $\Omega$	decibel referred to one Ohm
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
ITE	information technology equipment
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
$\mu$ s	microsecond
NA	not applicable
NB	narrowband
OATS	open area test site
$\Omega$	Ohm
QP	quasi-peak
PCB	printed circuit board
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

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