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# TEST REPORT

ACCORDING TO: FCC CFR 47 Part 90 subpart Y, Part 15 subpart B

FOR:

**Alvarion Ltd.**

**WiMAX subscriber unit**

**Model: BreezeMAX Extreme 5GHz CPE**

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



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## 1 Applicant information

**Client name:** Alvarion Ltd.  
**Address:** 21A Habarzel street, Ramat Hachayal, Tel Aviv 69710, Israel  
**Telephone:** +972 3645 7859  
**Fax:** +972 3645 6222  
**E-mail:** avner.ruta@alvarion.com  
**Contact name:** Mr. Avner Ruta

## 2 Equipment under test attributes

**Product name:** WiMAX subscriber unit  
**Product type:** Transceiver  
**Model(s):** BreezeMAX Extreme 5GHz CPE  
**Serial number:** 7828420  
**Hardware version:** BA 1540-01 rev 7  
**Receipt date:** 8/24/2009

## 3 Manufacturer information

**Manufacturer name:** Alvarion Ltd.  
**Address:** 21A Habarzel street, Ramat Hachayal, Tel Aviv 69710, Israel  
**Telephone:** +972 3645 7859  
**Fax:** +972 3645 6222  
**E-Mail:** avner.ruta@alvarion.com  
**Contact name:** Mr. Avner Ruta

## 4 Test details

**Project ID:** 19946  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 8/13/2009  
**Test completed:** 10/06/2009  
**Test specification(s):** FCC 47CFR Part 90 subpart Y, Part 15 subpart B class B



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## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
Section 90.205, 90.1215, Maximum output power and peak power spectral density	Pass
Section 90.209, Occupied bandwidth	Pass
Section 90.210(l), Emission mask	Pass
Section 90.210, Radiated spurious emissions	Pass
Section 90.210, Conducted spurious emissions	Pass
Section 90.213, Frequency stability	Tested without limit
Section 90.214, Transient frequency behaviour	Not required
Section 2.1091, RF radiation exposure evaluation	Pass
<b>Unintentional emissions</b>	
Section 15.107, Class B, Conducted emission at AC power port	Pass
Section 15.109, Class B, Radiated emission	Pass
Section 15.111, Conducted emission at receiver antenna port	Not required

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:ALVRAD\_FCC.19946.

	Name and Title	Date	Signature
<b>Tested by:</b>	Mr. L. Markel, test engineer	September 21, 2009, October 6, 2009	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	October 11, 2009	
<b>Approved by:</b>	Mr. M. Nikishin, EMC and Radio group leader	October 11, 2009	



## 6 EUT description

### 6.1 General information

The EUT is a subscriber unit of BreezeMAX Extreme 5GHz high capacity, IP services oriented Broadband Wireless Access system.

The basic system subscriber unit has a two-box configuration that contains

- 1) indoor unit that includes a power supply and an Ethernet 10/100BaseT (RJ 45) interface;
- 2) outdoor unit including the entire radio and digital section;
- 3) a single CAT5 cable connecting the indoor and outdoor unit serves for carrying the data as well as for transferring power, management and control signals.

### 6.2 EUT modules and sub-assemblies

Description	Manufacturer	Model or P/N	Hardware rev.	Serial number	Slot
Power supply (IDU)	Alvarion	PS1065 0334B5555	Rev A	A20414022523	Data/Power
Power supply (IDU) (CE test)	Alvarion	PS1065 0334B5555	Rev A	A20414022924	Data/Power

### 6.3 Ports and lines

Port type	Port description	Conn. from	Conn. to	Qty.	Cable type	Cable length	Indoor / outdoor
Power+Data	DC power+ Ethernet	Power supply	EUT	1	Shielded	3 m	Outdoor
RF	Antenna	Antenna	Termination	2	NA	NA	NA
Signal	Mini USB	EUT	Not connected*	1	NA	NA	NA
Signal	Ethernet	Power supply	Laptop	1	Unshielded	7 m	Indoor

\* - for maintenance only

### 6.4 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	Lenovo	T60	L3-DZK37-07/01

### 6.5 Operating frequencies

Source	Frequency, MHz
Tx/Rx	4942.5 – 4987.5
LO	4930 - 4980
Clock	40

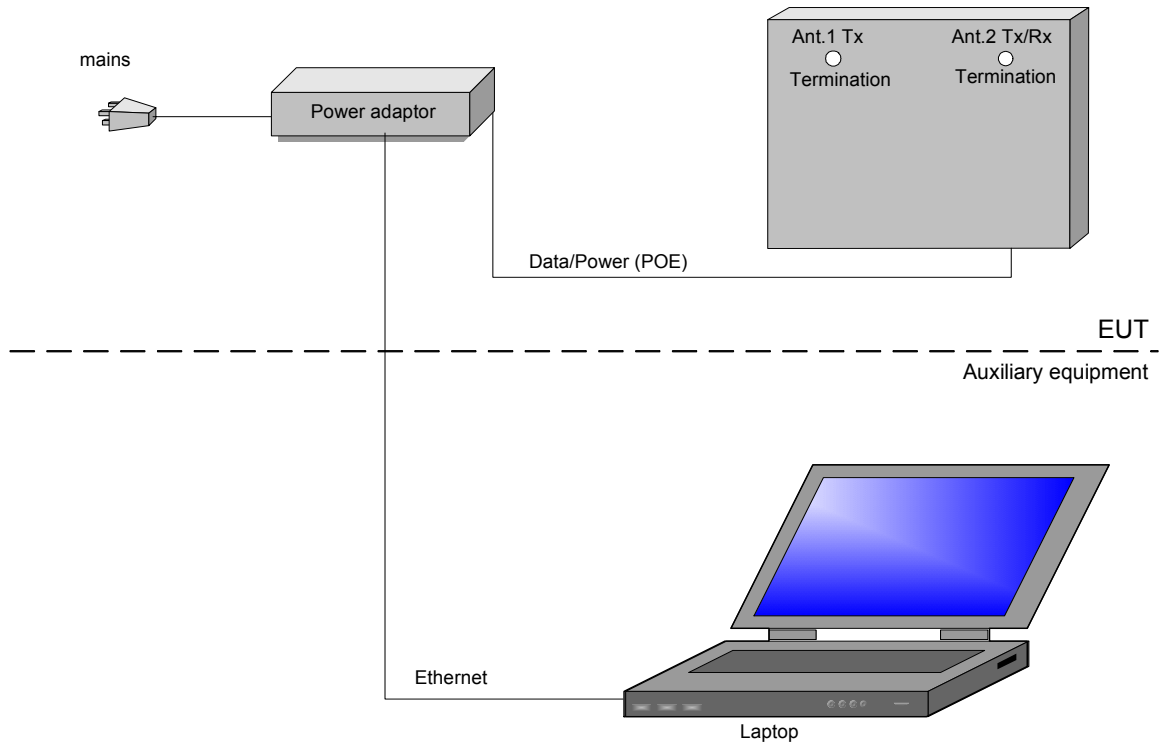
### 6.6 Changes made in the EUT

No changes were implemented in the EUT.



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## 6.7 Test configuration





### 6.8 Transmitter characteristics

<b>Type of equipment</b>						
<input checked="" type="checkbox"/>	Stand-alone (Equipment with or without its own control provisions)					
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)					
	Plug-in card (Equipment intended for a variety of host systems)					
<b>Intended use</b>		<b>Condition of use</b>				
<input checked="" type="checkbox"/>	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>		4940 – 4990 MHz				
<b>Operating frequency range</b>		4942.5 – 4987.5 MHz				
<b>RF channel spacing</b>		2.5 MHz for 5MHz BW, 5MHz for 10MHz BW				
<b>Maximum rated output power</b>		At transmitter 50 Ω RF output connectors		5.58 dBm for 5 MHz CBW 7.87 dBm for 10 MHz CBW		
<b>Is transmitter output power variable?</b>		No				
		<input checked="" type="checkbox"/>	Yes	continuous variable		
				<input checked="" type="checkbox"/>	stepped variable with stepsize	1 dB
					minimum RF power	-26 dBm
	maximum RF power	7.87 dBm				
<b>Antenna connection</b>						
<input type="checkbox"/>	unique coupling	<input type="checkbox"/>	standard connector	<input checked="" type="checkbox"/>	Integral	
		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	with temporary RF connector without temporary RF connector	
<b>Antenna/s technical characteristics</b>						
Type	Manufacturer	Model number		Gain		
Integral antenna, dual slant	Laird Technologies	AN1417-02		17dBi		
<b>Transmitter 99% power bandwidth</b>		5 MHz, 10 MHz				
<b>Transmitter aggregate data rate/s</b>		4.2 Mbps @ 64QAM5/6 for 5MHz BW; 8.4 Mbps @ 64QAM5/6 for 10MHz BW				
<b>Transmitter aggregate symbol (baud) rate/s</b>		0.7 Msps @ 64QAM5/6 for 5MHz BW; 1.4 Msps @ 64QAM5/6 for 10MHz BW				
<b>Type of modulation</b>		QPSK 1/2    UL: 1.68 Mbps; DL-8Km cell radius: 3.74 Mbps QPSK 3/4    UL: 2.52 Mbps; DL-8Km cell radius: 5.61 Mbps 16QAM 1/2    UL: 3.36 Mbps; DL-8Km cell radius: 7.48 Mbps 16QAM 3/4    UL: 5.04 Mbps; DL-8Km cell radius: 11.23 Mbps 64 QAM2/3    UL: 6.72 Mbps; DL-8Km cell radius: 14.97 Mbps 64QAM 3/4    UL: 7.56 Mbps; DL-8Km cell radius: 16.84 Mbps 64QAM 5/6    UL: 8.40 Mbps; DL-8Km cell radius: 18.72 Mbps				
<b>Type of multiplexing</b>		OFDMA				
<b>Modulating test signal (baseband)</b>		PRBS				
<b>Maximum transmitter duty cycle in normal use</b>		40%	<b>Tx ON time</b>	2 msec	<b>Period</b> 5 msec	
<b>Transmitter duty cycle supplied for test</b>		40%	<b>Tx ON time</b>	2 msec	<b>Period</b> 5 msec	
<b>Transmitter power source</b>						
		<b>Nominal rated voltage</b>		<b>Battery type</b>		
	DC	<b>Nominal rated voltage</b>				
<input checked="" type="checkbox"/>	AC mains	<b>Nominal rated voltage</b>		120 V	<b>Frequency</b> 60 Hz	
<b>Common power source for transmitter and receiver</b>			<input checked="" type="checkbox"/>	yes	no	



<b>Test specification:</b>		<b>Section 90.1215, Maximum output power</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>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 7 Transmitter tests according to 47CFR part 90 requirements

### 7.1 Peak output power test

#### 7.1.1 General

This test was performed to measure the peak output power and peak power spectral density at RF antenna connector. Specification test limits are given in Table 7.1.1 and Table 7.1.2.

Table 7.1.1 Peak output power limits

Assigned frequency range, MHz	Maximum peak output power		
	Channel bandwidth, MHz	dBm	W
4940.00 – 4990.00	5	14	0.025
	10	17	0.050

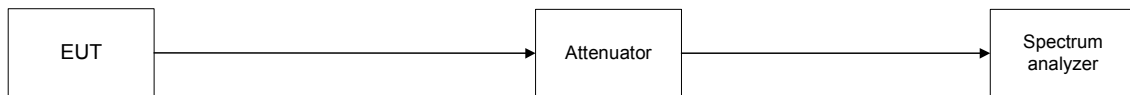
Table 7.1.2 Peak output power spectral density limits

Assigned frequency range, MHz	Maximum peak output power spectral density		
	Channel bandwidth, MHz	dBm/MHz	W/MHz
4940.00 – 4990.00	5	8	0.063
	10		

#### 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 power meter as provided in Table 7.1.3 and Table 7.1.5.
- 7.1.2.4 The peak output power spectral density was measured with spectrum analyzer as provided in Table 7.1.4, Table 7.1.6 and the associated plots.

Figure 7.1.1 Peak output power test setup







<b>Test specification:</b>		<b>Section 90.1215, Maximum output power</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>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.1.3 Peak output power test results

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Power Meter (Average)  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	Power Meter reading, dBm	External attenuation, dB	Cable loss, dB	RF output power, dBm	Limit*, dBm	Margin, dB	Verdict
<b>QPSK</b>							
4942.50	5.25	Included	Included	5.25	6.0	-0.75	Pass
4962.50	5.52	Included	Included	5.52	6.0	-0.48	Pass
4987.50	5.49	Included	Included	5.49	6.0	-0.51	Pass
<b>64QAM</b>							
4942.50	4.85	Included	Included	4.85	6.0	-1.15	Pass
4962.50	5.23	Included	Included	5.23	6.0	-0.77	Pass
4987.50	5.58	Included	Included	5.58	6.0	-0.42	Pass

\* - NOTE: Maximum declared antenna gain is 17 dBi exceeding maximum permissible antenna gain by 8 dB. The limit is reduced accordingly to 6.0 dBm

Table 7.1.4 Peak output power spectral density test results

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Average  
RESOLUTION BANDWIDTH: 1 MHz  
VIDEO BANDWIDTH: 3 MHz  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	Spectrum Analyzer reading dBm/MHz	External attenuation, dB	Cable loss, dB	RF output power spectral density, dBm/MHz	Limit*, dBm/MHz	Margin, dB	Verdict
<b>QPSK</b>							
4942.50	-0.067	Included	Included	-0.067	0.0	-0.067	Pass
4962.50	-0.059	Included	Included	-0.059	0.0	-0.059	Pass
4987.50	-0.164	Included	Included	-0.164	0.0	-0.164	Pass
<b>64QAM</b>							
4942.50	-0.211	Included	Included	-0.211	0.0	-0.211	Pass
4962.50	-0.082	Included	Included	-0.082	0.0	-0.082	Pass
4987.50	-0.194	Included	Included	-0.194	0.0	-0.194	Pass

\* - NOTE: Maximum declared antenna gain is 17 dBi exceeding maximum permissible antenna gain by 8 dB. The limit is reduced accordingly to 0.0 dBm



<b>Test specification:</b>		<b>Section 90.1215, Maximum output power</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>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.1.5 Peak output power test results

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Power Meter (Average)  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	Power Meter reading, dBm	External attenuation, dB	Cable loss, dB	RF output power, dBm	Limit*, dBm	Margin, dB	Verdict
<b>QPSK</b>							
4947.50	7.81	Included	Included	7.81	9.0	-1.19	Pass
4962.50	7.70	Included	Included	7.70	9.0	-1.30	Pass
4982.50	7.87	Included	Included	7.87	9.0	-1.13	Pass
<b>64QAM</b>							
4947.50	7.34	Included	Included	7.34	9.0	-1.66	Pass
4962.50	7.26	Included	Included	7.26	9.0	-1.74	Pass
4982.50	7.45	Included	Included	7.45	9.0	-1.55	Pass

\* - NOTE: Maximum declared antenna gain is 17 dBi exceeding maximum permissible antenna gain by 8 dB. The limit is reduced accordingly to 9.0 dBm

Table 7.1.6 Peak output power spectral density test results

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Average  
RESOLUTION BANDWIDTH: 1 MHz  
VIDEO BANDWIDTH: 3 MHz  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	Spectrum analyzer reading dBm/MHz	External attenuation, dB	Cable loss, dB	RF output power spectral density, dBm/MHz	Limit*, dBm/MHz	Margin, dB	Verdict
<b>QPSK</b>							
4947.50	-0.255	Included	Included	-0.255	0.0	-0.255	Pass
4962.50	-0.162	Included	Included	-0.162	0.0	-0.162	Pass
4982.50	-0.375	Included	Included	-0.375	0.0	-0.375	Pass
<b>64QAM</b>							
4947.50	-0.334	Included	Included	-0.334	0.0	-0.334	Pass
4962.50	-0.363	Included	Included	-0.363	0.0	-0.363	Pass
4982.50	-0.533	Included	Included	-0.533	0.0	-0.533	Pass

\* - NOTE: Maximum declared antenna gain is 17 dBi exceeding maximum permissible antenna gain by 8 dB. The limit is reduced accordingly to 0.0 dBm/MHz

## Reference numbers of test equipment used

HL 2389	HL 2952	HL 3301	HL 3302	HL 3814		
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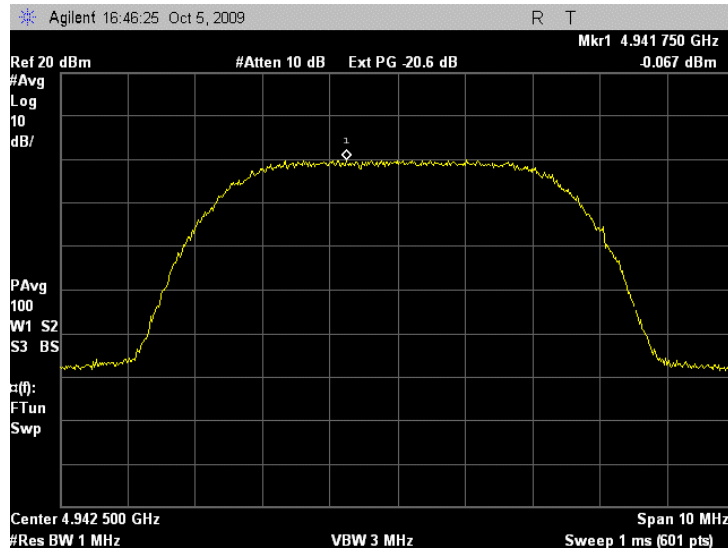
Full description is given in Appendix A.



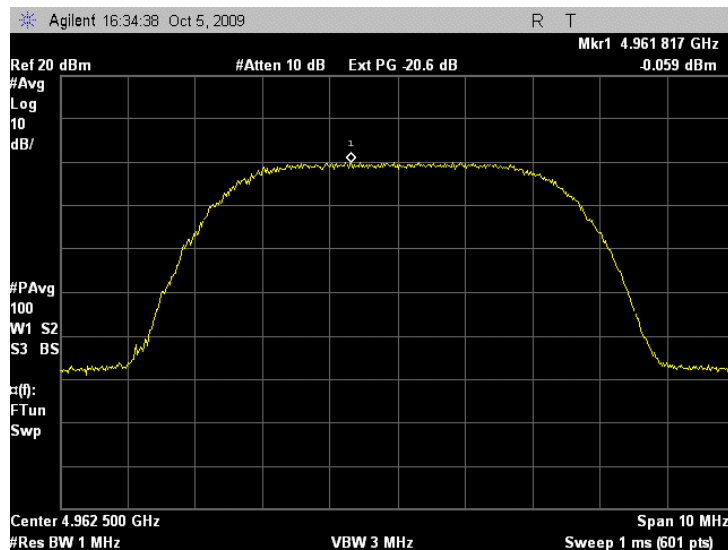
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<b>Test specification:</b>	<b>Section 90.1215, Maximum output power</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.1 Peak output power spectral density test results at low frequency, QPSK modulation, 5 MHz CBW



Plot 7.1.2 Peak output power spectral density test results at mid frequency, QPSK modulation, 5 MHz CBW

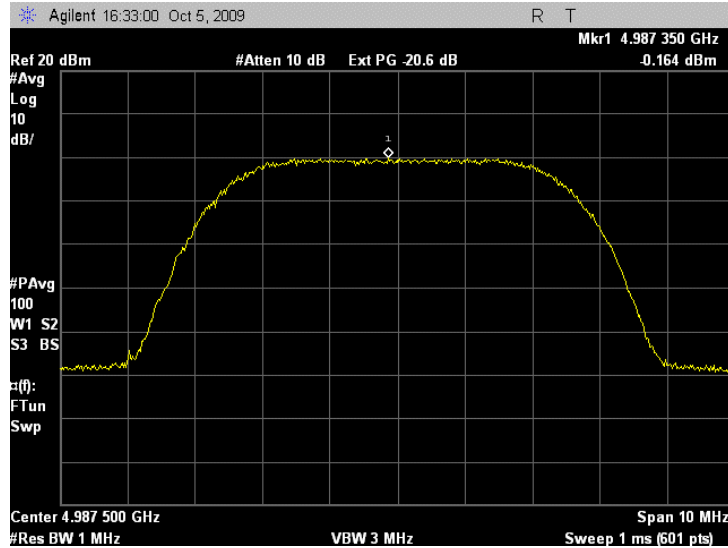




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<b>Test specification:</b>	<b>Section 90.1215, Maximum output power</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.3 Peak output power spectral density test results at high frequency, QPSK modulation, 5 MHz CBW

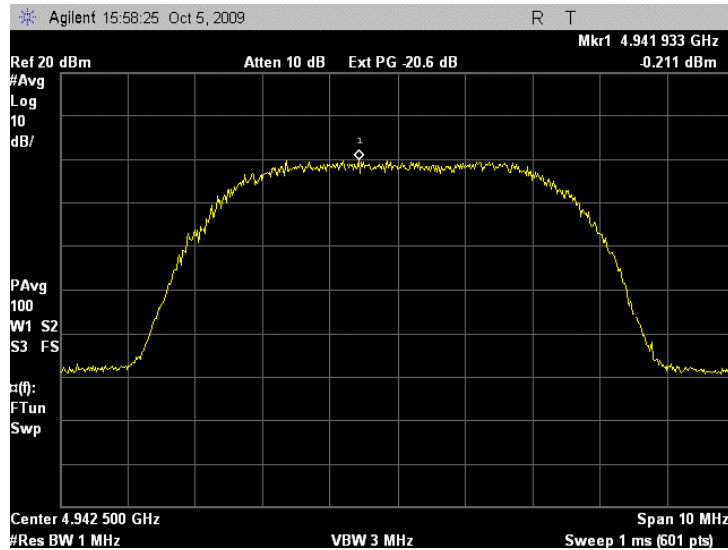




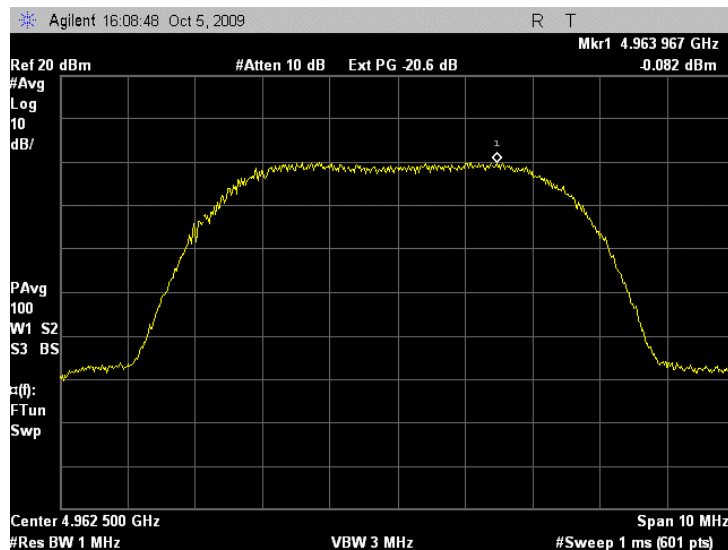
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<b>Test specification:</b>	<b>Section 90.1215, Maximum output power</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.4 Peak output power spectral density test results at low frequency, 64QAM modulation, 5 MHz CBW



Plot 7.1.5 Peak output power spectral density test results at mid frequency, 64QAM modulation, 5 MHz CBW

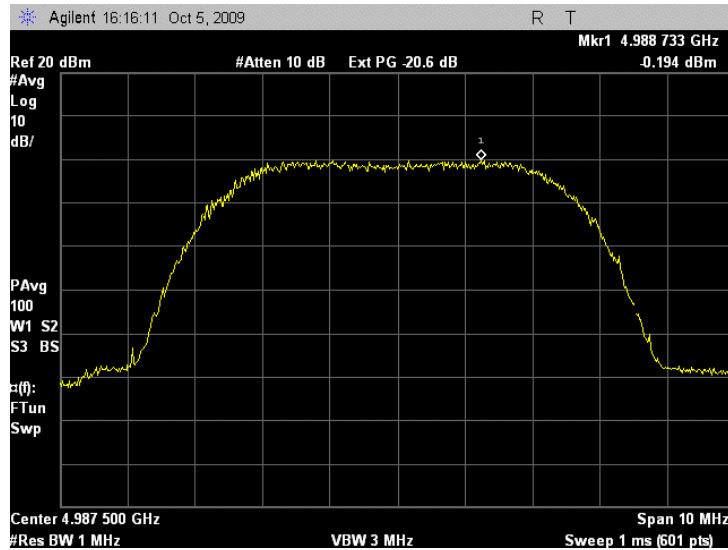




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<b>Test specification:</b>	<b>Section 90.1215, Maximum output power</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.6 Peak output power spectral density test results at high frequency, 64QAM modulation, 5 MHz CBW

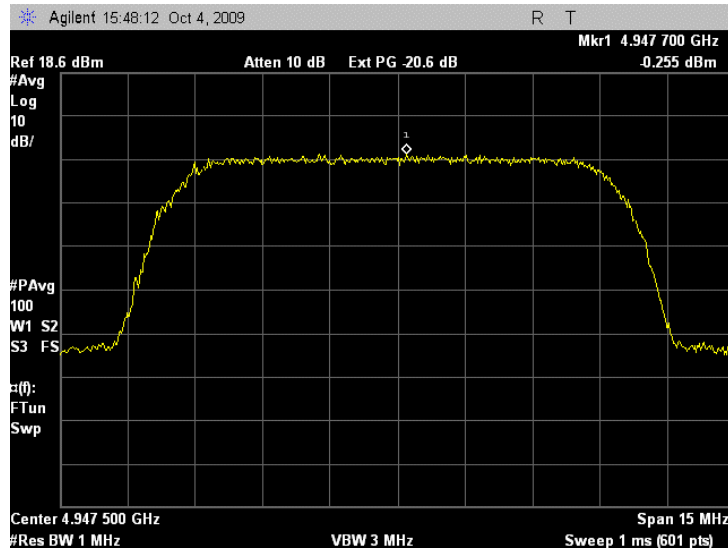




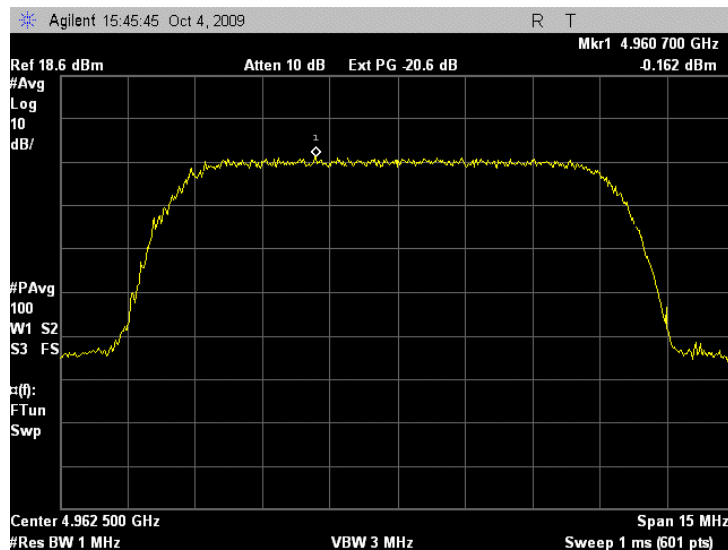
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<b>Test specification:</b>	<b>Section 90.1215, Maximum output power</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.7 Peak output power spectral density test results at low frequency, QPSK modulation, 10 MHz CBW



Plot 7.1.8 Peak output power spectral density test results at mid frequency, QPSK modulation, 10 MHz CBW

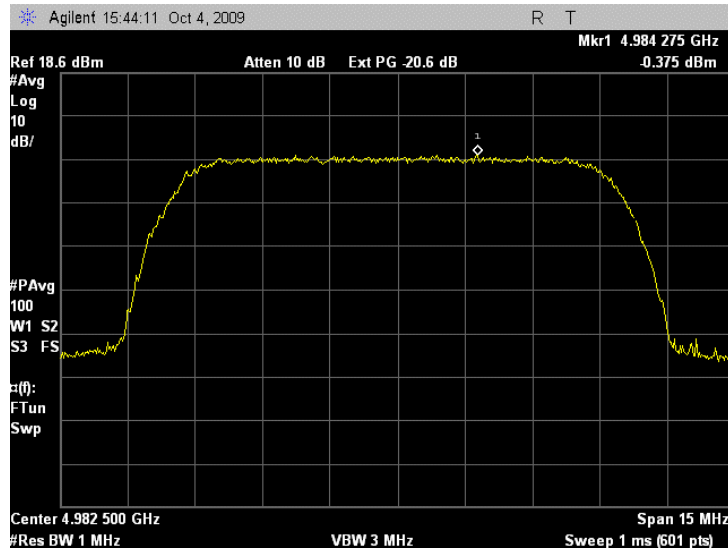




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<b>Test specification:</b>	<b>Section 90.1215, Maximum output power</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.9 Peak output power spectral density test results at high frequency, QPSK modulation, 10 MHz CBW



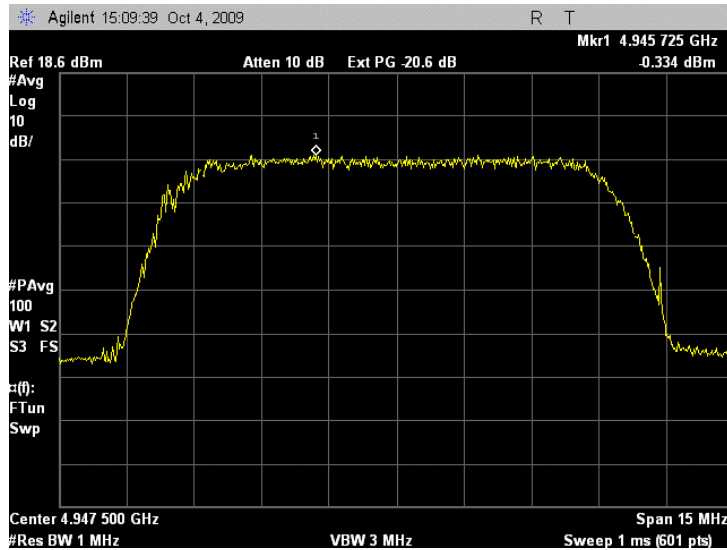




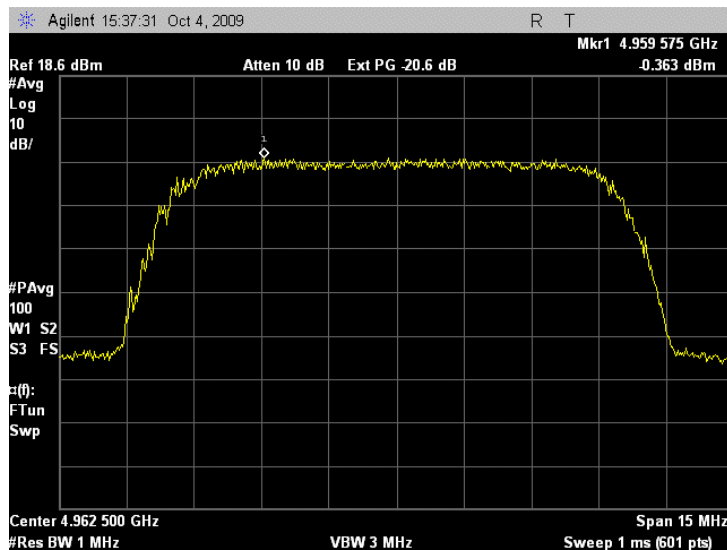
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<b>Test specification:</b>	<b>Section 90.1215, Maximum output power</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.10 Peak output power spectral density test results at low frequency, 64QAM modulation, 10 MHz CBW



Plot 7.1.11 Peak output power spectral density test results at mid frequency, 64QAM modulation, 10 MHz CBW

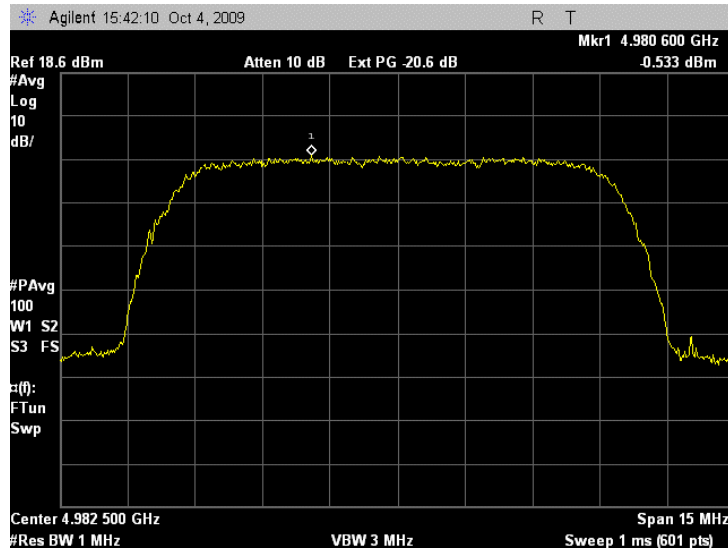




HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.1215, Maximum output power</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>	<b>PASS</b>
<b>Date &amp; Time:</b>	10/6/2009 2:26:30 PM		
<b>Temperature:</b> 24°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 49 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.1.12 Peak output power spectral density test results at high frequency, 64QAM modulation, 10 MHz CBW





<b>Test specification:</b>		<b>Section 90.209, 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>	9/6/2009 2:26:55 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<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. The test results are provided in Table 7.2.2 and the associated plots.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, kHz
4940.0 – 4990.0	26	NA

\* - Modulation envelope reference points are provided in terms of attenuation below the total output power.

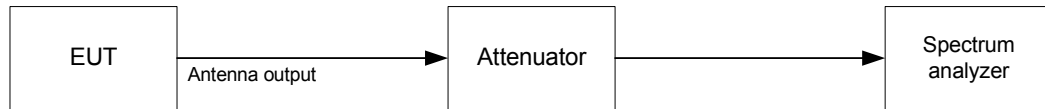
### 7.2.2 Test procedure

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 and provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup





<b>Test specification:</b> Section 90.209, Occupied bandwidth	
<b>Test procedure:</b> 47 CFR, Section 2.1049	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date &amp; Time:</b> 9/6/2009 2:26:55 PM	
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa
<b>Relative Humidity:</b> 42 %	
<b>Power Supply:</b> 120 VAC	
<b>Remarks:</b>	

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 0.5 – 2 % of the emission bandwidth  
 VIDEO BANDWIDTH: 1000 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 26 dBc  
 MODULATION: QPSK  
 MODULATING SIGNAL: PRBS

CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
4942.500	4602.50	NA	NA	Pass
4962.500	4585.00	NA	NA	Pass
4987.500	4620.00	NA	NA	Pass

CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
4947.500	9750.00	NA	NA	Pass
4962.500	9712.50	NA	NA	Pass
4982.500	9675.00	NA	NA	Pass

Reference numbers of test equipment used

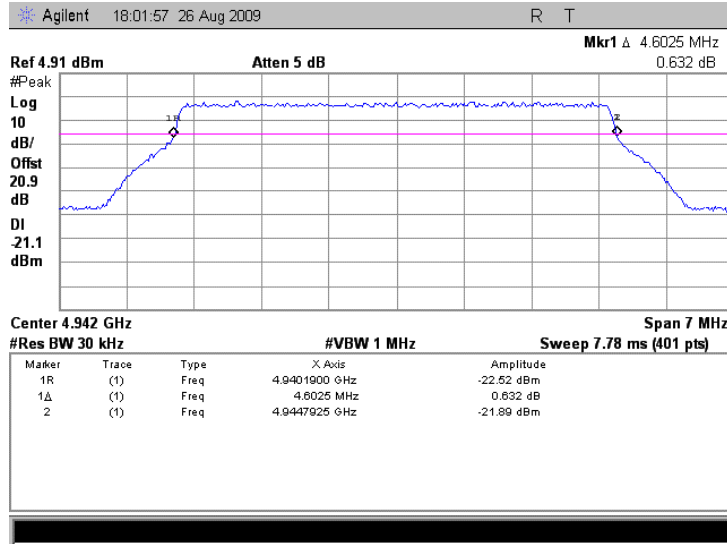
HL 2909	HL 2953	HL 3439					
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Full description is given in Appendix A.

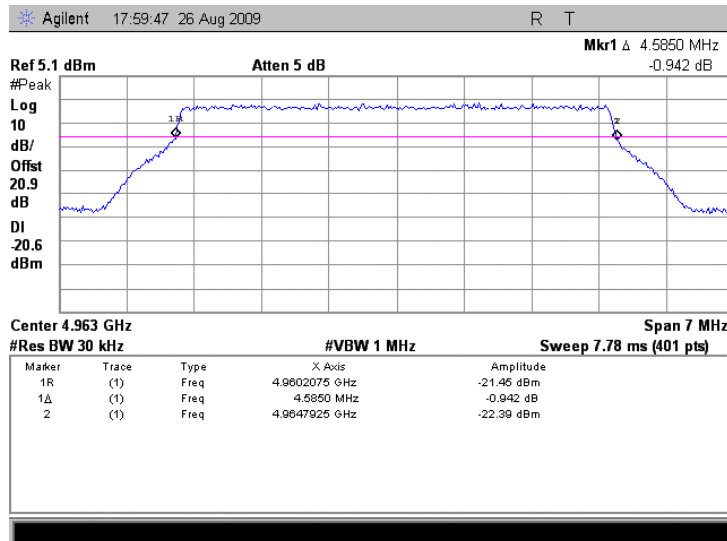


<b>Test specification:</b>	<b>Section 90.209, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:26:55 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.2.1 Occupied bandwidth test result at low frequency, QPSK modulation, 5 MHz CBW



Plot 7.2.2 Occupied bandwidth test result at mid frequency QPSK modulation, 10 MHz CBW

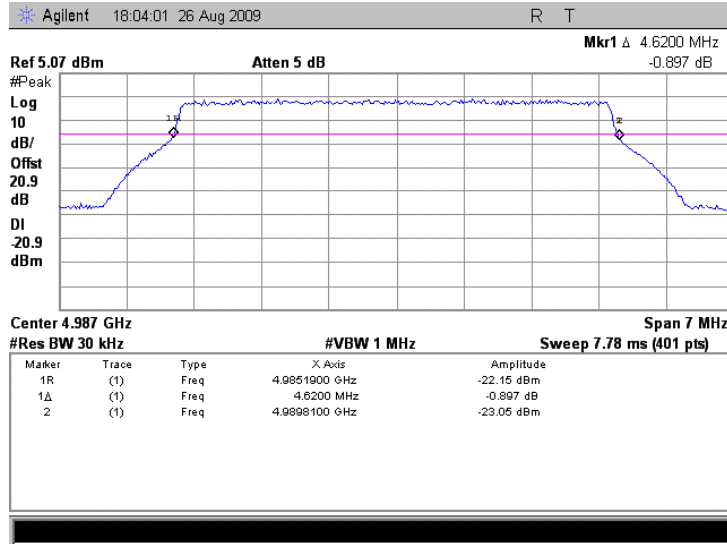




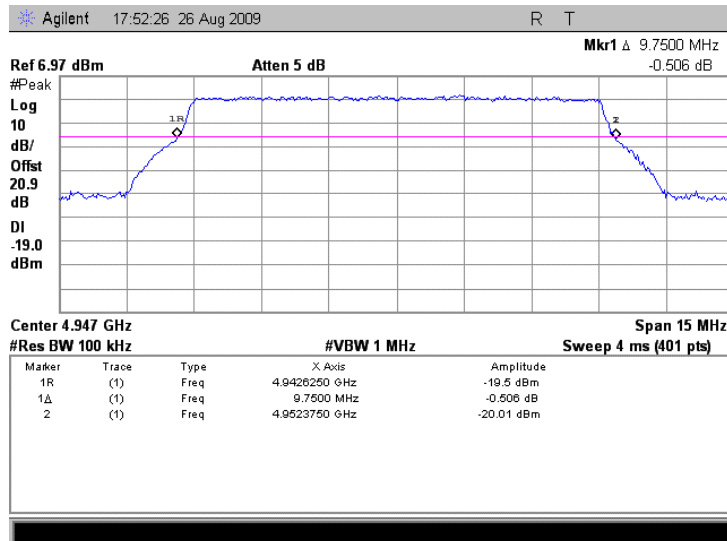
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.209, 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>	9/6/2009 2:26:55 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.2.3 Occupied bandwidth test result at high frequency QPSK modulation, 10 MHz CBW



Plot 7.2.4 Occupied bandwidth test result at low frequency, QPSK modulation, 10 MHz CBW

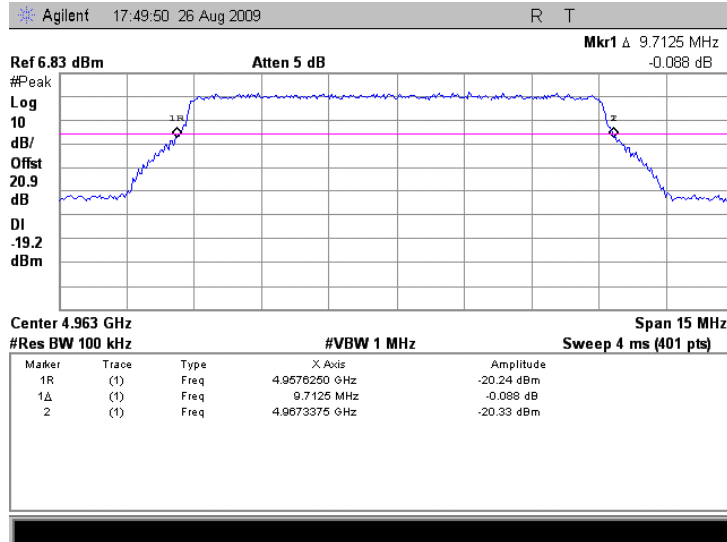




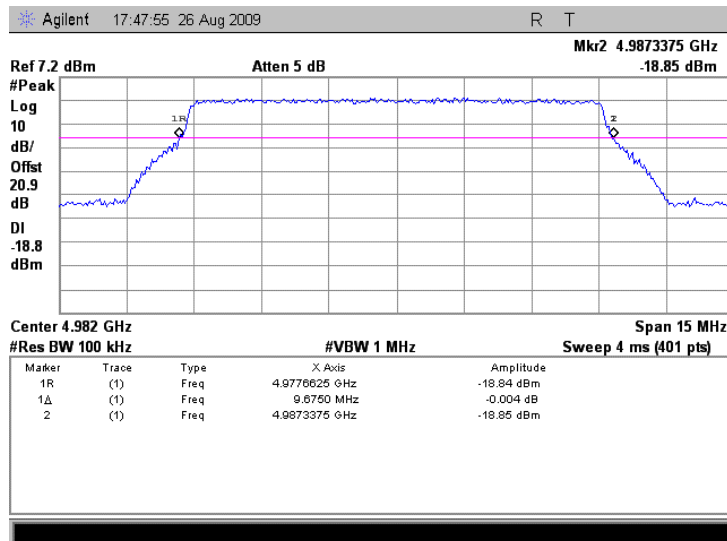
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.209, 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>	9/6/2009 2:26:55 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.2.5 Occupied bandwidth test result at mid frequency, QPSK modulation, 10 MHz CBW



Plot 7.2.6 Occupied bandwidth test result at high frequency, QPSK modulation, 10 MHz CBW





<b>Test specification:</b> Section 90.210, Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047 and 90.210(l); TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 9/6/2009 2:40:48 PM			
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

### 7.3 Emission mask test

#### 7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1 and Table 7.3.2.

Table 7.3.1 Emission mask limits for 5 MHz channel bandwidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask L (Channel bandwidth 5 MHz)	
0 – 2.25 MHz	0
2.25 – 2.5 MHz	$219\log(F^*/2.25)$
2.5 – 2.75 MHz	$10+242\log(F^*/2.5)$
2.75 – 5.0 MHz	$20+31\log(F^*/2.75)$
5.0 – 7.5 MHz	$28+68\log(F^*/5.0)$
More than** 7.5 MHz	40

\* - F – frequency in MHz removed from center

\*\* - emission mask includes carrier modulation envelope within ± 150 % of the authorized bandwidth; the frequency range removed beyond ± 150 % of the authorized bandwidth from carrier was investigated as spurious emission

Table 7.3.2 Emission mask limits for 10 MHz channel bandwidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask L (Channel bandwidth 10 MHz)	
0 – 4.5 MHz	0***
4.5 – 5.0 MHz	$219\log(F^*/4.5)$
5.0 – 5.5 MHz	$10+242\log(F^*/5.0)$
5.5 – 10.0 MHz	$20+31\log(F^*/5.5)$
10.0 – 15.0 MHz	$28+68\log(F^*/10.0)$
More than** 15.0 MHz	40

\* - F – frequency in MHz removed from center

\*\* - emission mask includes carrier modulation envelope within ± 150 % of the authorized bandwidth; the frequency range removed beyond ± 150 % of the authorized bandwidth from carrier was investigated as spurious emission

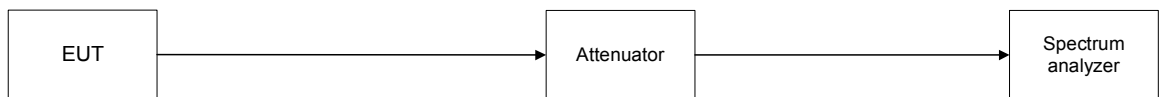
\*\*\* - Zero dB reference measured relative to the highest average power of the fundamental emission measured across designated channel bandwidth

#### 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 emission mask was measured with spectrum analyzer with RBW set to 1% of emission bandwidth and VBW = 30 kHz as provided in the associated plots. The test results are provided in the associated plots.

Figure 7.3.1 Emission mask test setup







<b>Test specification:</b>	<b>Section 90.210, Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:40:48 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.3.3 Emission mask test results 5 MHz CS

Carrier frequency, MHz	Limit	Verdict
4942.5	Emission mask L	Pass
4962.5		
4987.5		

Table 7.3.4 Emission mask test results 10 MHz CS

Carrier frequency, MHz	Limit	Verdict
4947.5	Emission mask L	Pass
4962.5		
4982.5		

**Reference numbers of test equipment used**

HL 2909	HL 2953	HL 3442					
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Full description is given in Appendix A.

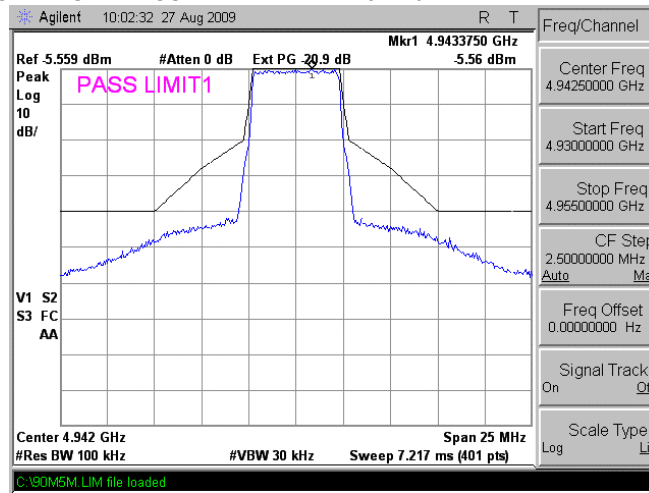


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:40:48 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

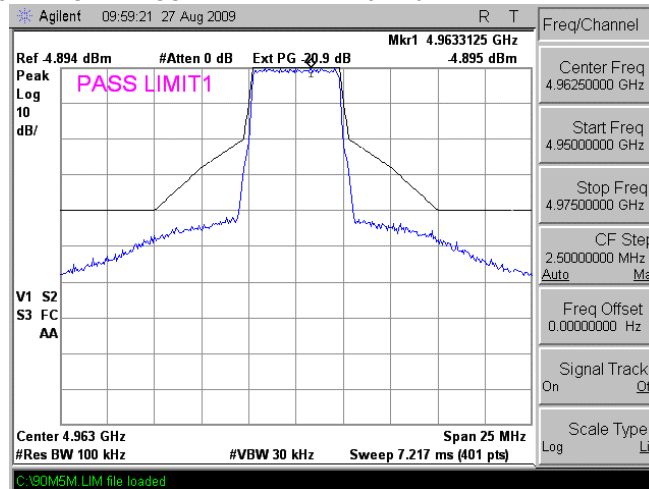
Plot 7.3.1 Emission mask test results at low carrier frequency, 5 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.2 Emission mask test results at mid carrier frequency, 5 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



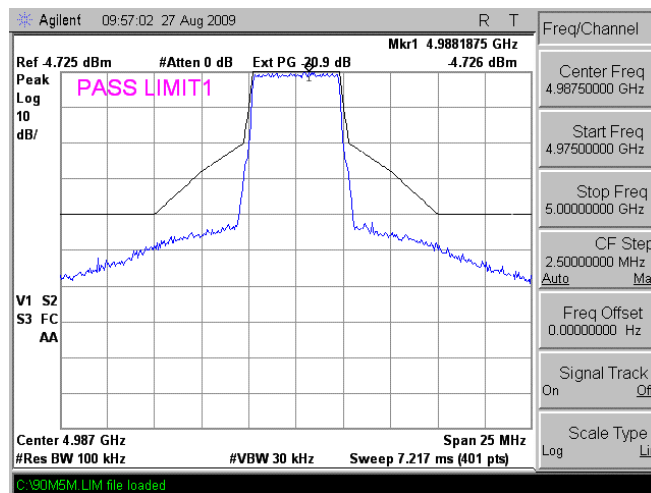


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:40:48 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

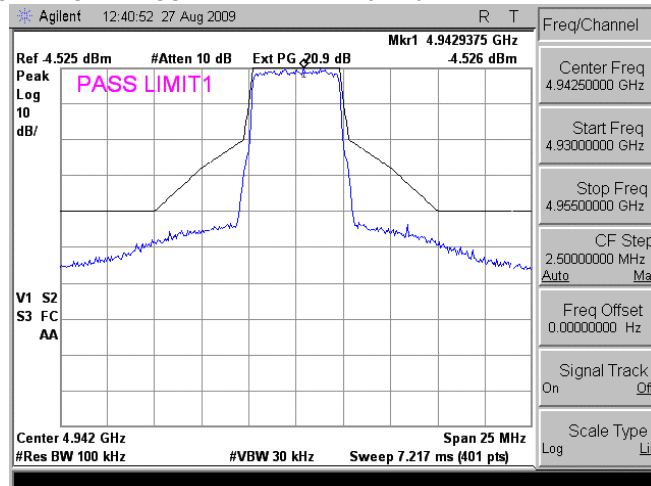
Plot 7.3.3 Emission mask test results at high carrier frequency, 5 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.4 Emission mask test results at low carrier frequency, 5 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



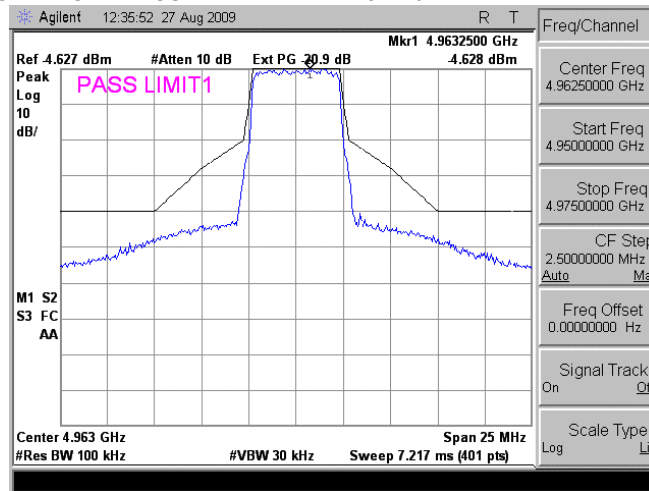


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:40:48 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

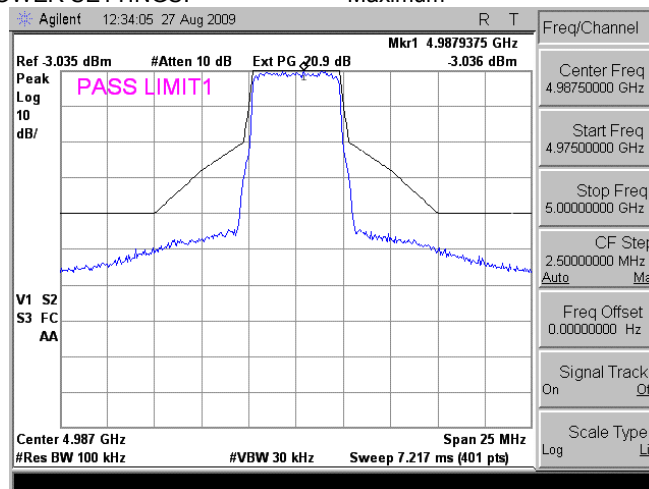
Plot 7.3.5 Emission mask test results at mid carrier frequency, 5 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.6 Emission mask test results at high carrier frequency, 5 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



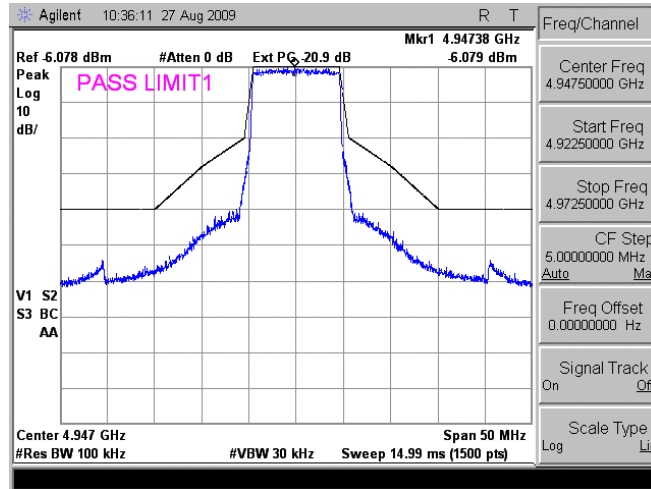


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/6/2009 2:40:48 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

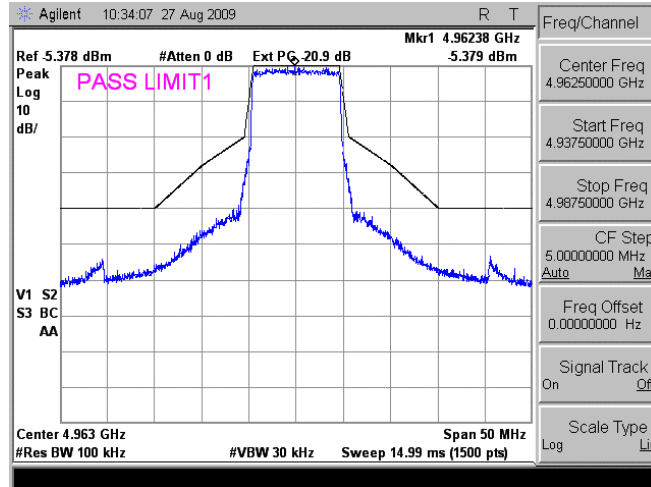
Plot 7.3.7 Emission mask test results at low carrier frequency, 10 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.8 Emission mask test results at mid carrier frequency, 10 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



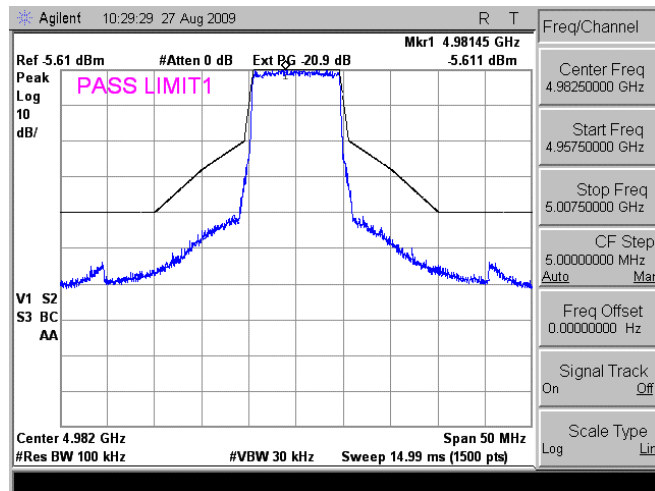


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/6/2009 2:40:48 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

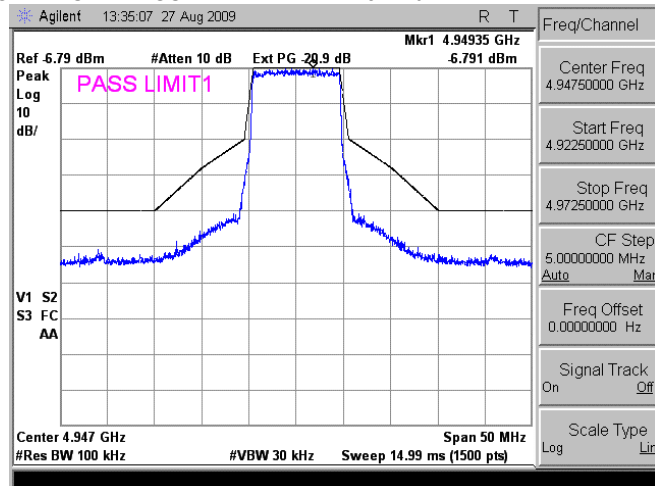
Plot 7.3.9 Emission mask test results at high carrier frequency, 10 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.10 Emission mask test results at low carrier frequency, 10 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



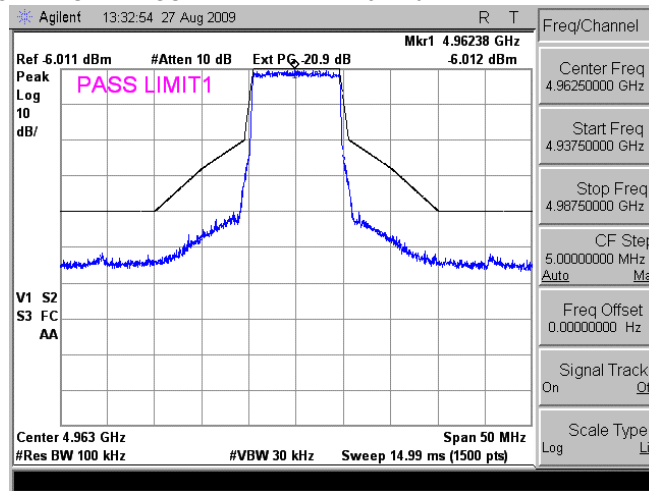


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:40:48 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

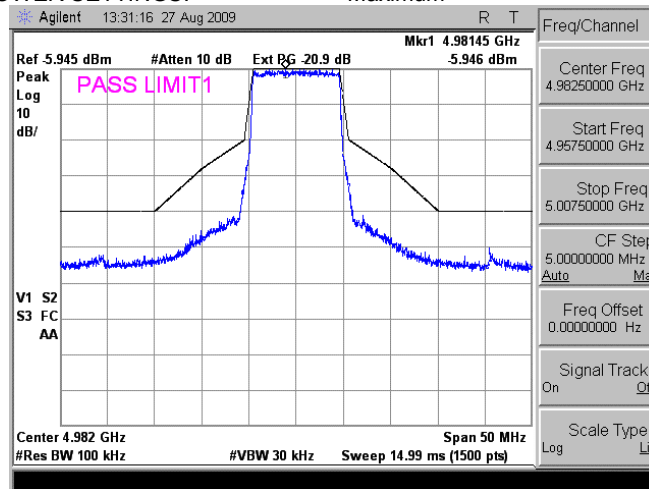
Plot 7.3.11 Emission mask test results at mid carrier frequency, 10 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.12 Emission mask test results at high carrier frequency, 10 MHz CBW

OPERATING FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
DETECTOR USED: Peak  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum





<b>Test specification:</b>		<b>Section 90.210, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 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*	40	-33.2**	64.22

\* - Excluding the in band emission within  $\pm 150$  % of the authorized bandwidth from the carrier

\*\* - Calculated relative to 6.83 dBm transmitter power at mid channel as the worst case spurious limit

\*\*\* - 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.





<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

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

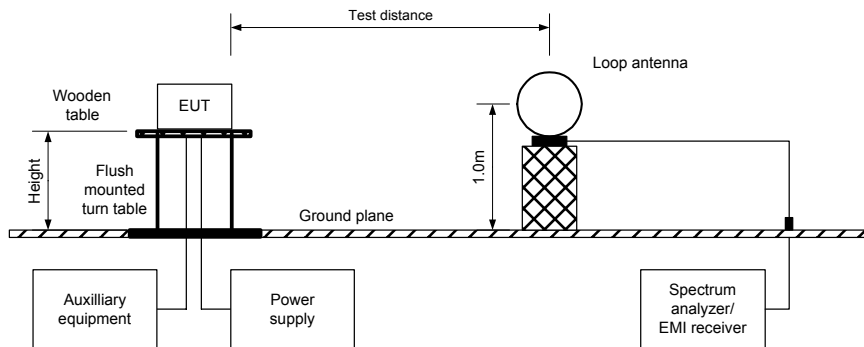
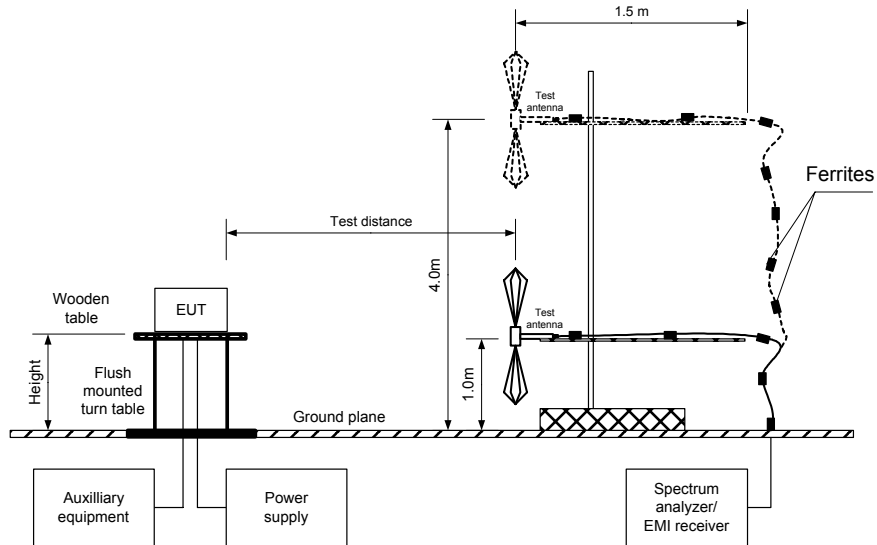


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz





<b>Test specification:</b>		<b>Section 90.210, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.4.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
TEST DISTANCE: 3 m  
TEST SITE: Anechoic chamber / OATS  
EUT HEIGHT: 0.8 m  
INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 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)  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
CHANNEL BANDWIDTH: 10 MHz\*

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position***, degrees
All emissions were found at least 20 dB below spurious limit							

**Verdict: Pass**

\* - the 10 MHz channel bandwidth is configuration with the greatest aggregate power.

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

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

**Reference numbers of test equipment used**

HL 0446	HL 0768	HL 0769	HL 1424	HL 1425	HL 2432	HL 2697	HL 2780
HL 2882	HL 2883	HL 3531	HL 3533	HL 3535			

Full description is given in Appendix A.

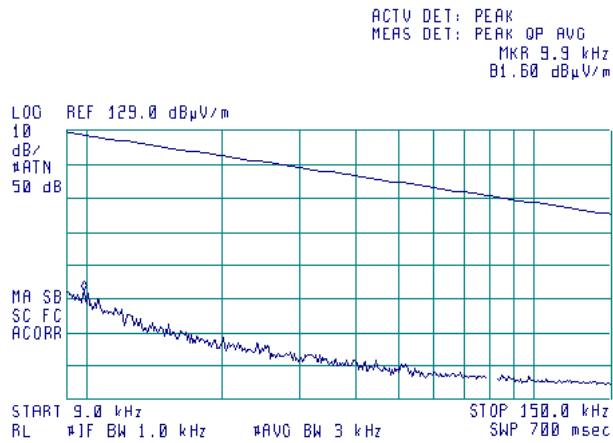


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

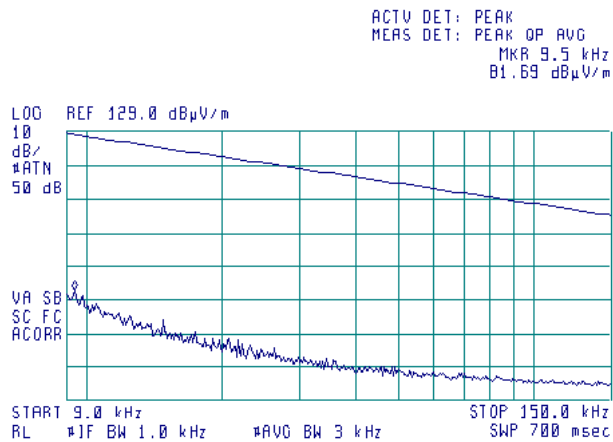
TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



FCC §15.209 limit

Plot 7.4.2 Radiated emission measurements in 9 - 150 kHz range

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



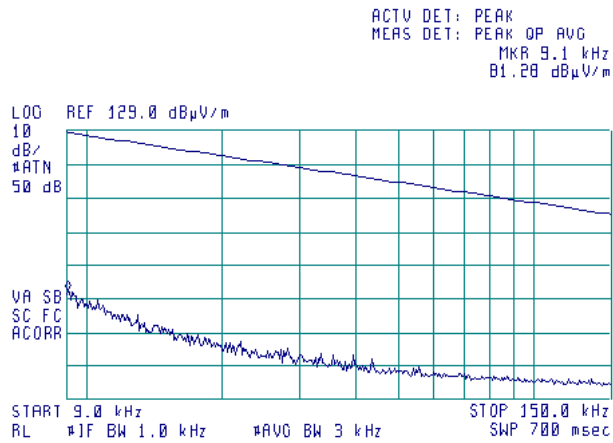


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

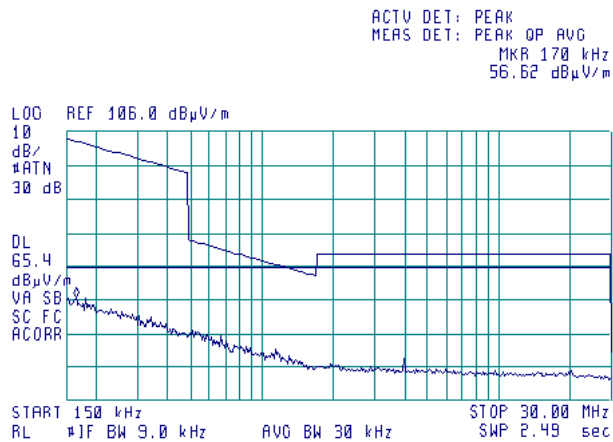
**Plot 7.4.3 Radiated emission measurements in 9 - 150 kHz range**

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



**Plot 7.4.4 Radiated emission measurements in 0.15 - 30 MHz range**

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



FCC §15.209&FCC §90.210 (l) limits

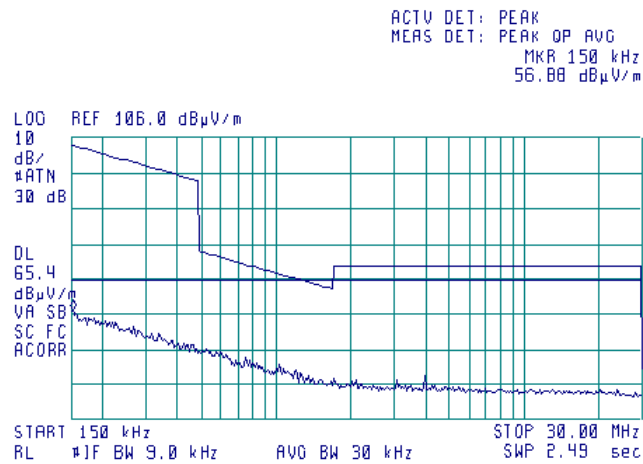


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

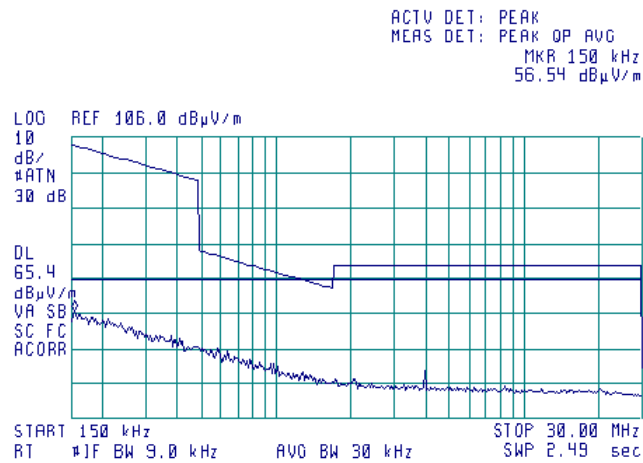
**Plot 7.4.5 Radiated emission measurements in 0.15 - 30 MHz range**

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



**Plot 7.4.6 Radiated emission measurements in 0.15 - 30 MHz range**

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



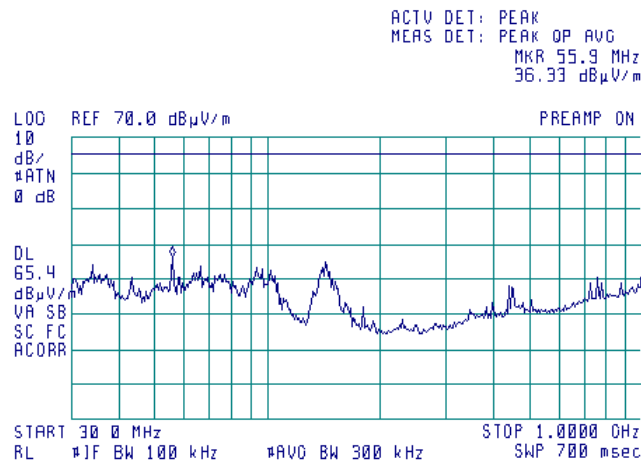


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

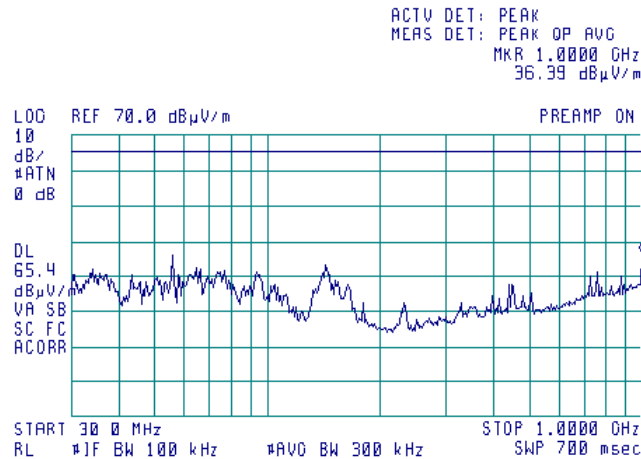
Plot 7.4.7 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



Plot 7.4.8 Radiated emission measurements in 30 - 1000 MHz range

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



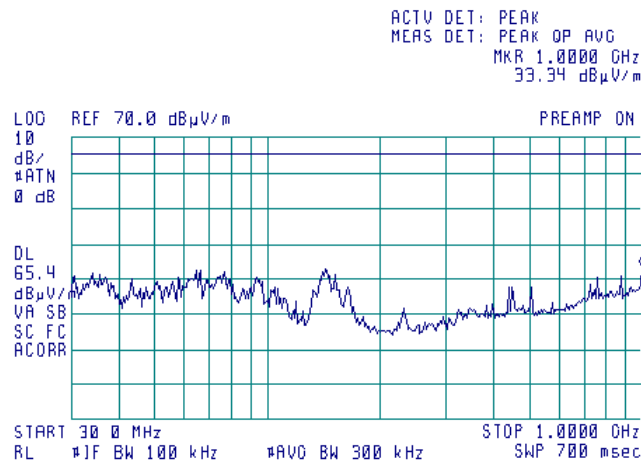


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

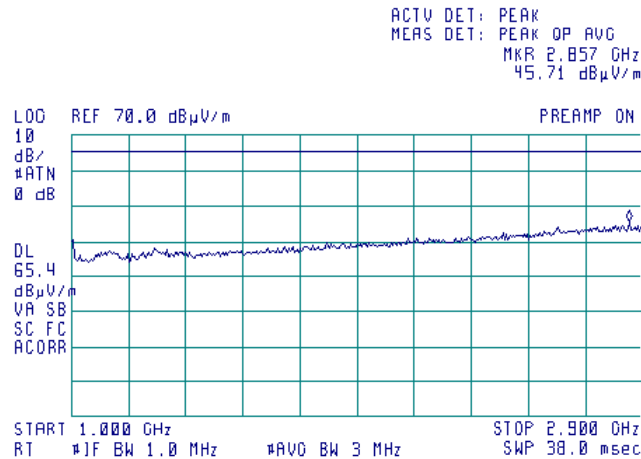
Plot 7.4.9 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



Plot 7.4.10 Radiated emission measurements in 1000 – 2900 MHz range

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



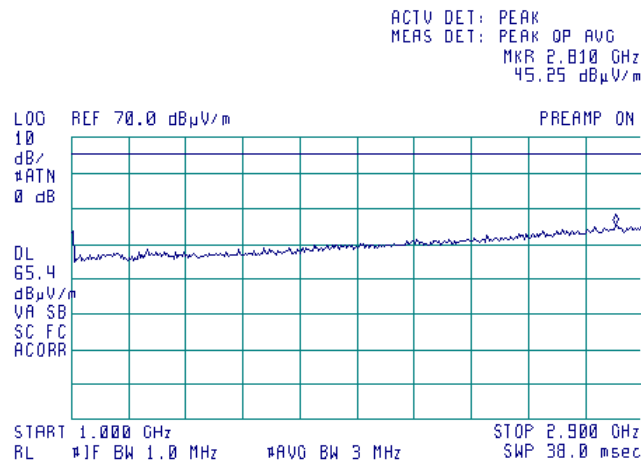


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

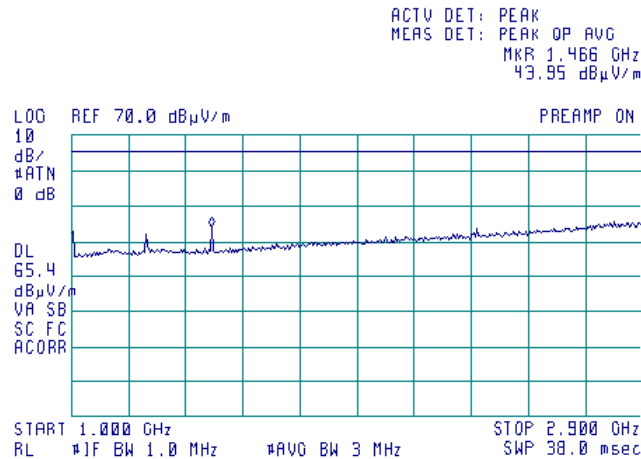
Plot 7.4.11 Radiated emission measurements in 1000 – 2900 MHz range

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



Plot 7.4.12 Radiated emission measurements in 1000 – 2900 MHz range

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m





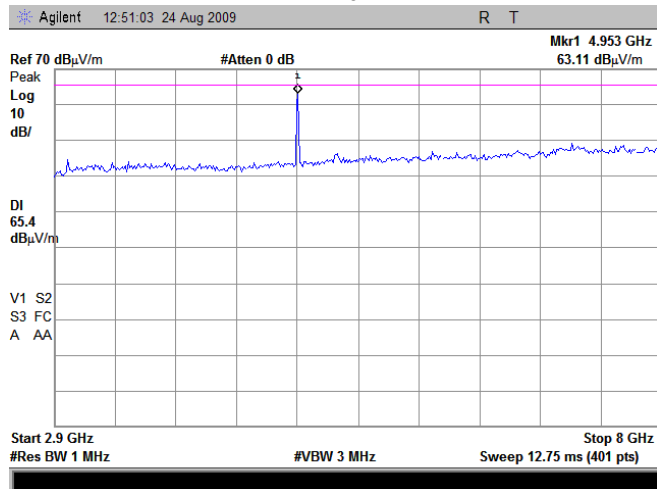


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.4.13 Radiated emission measurements in 2900 – 8000 MHz range

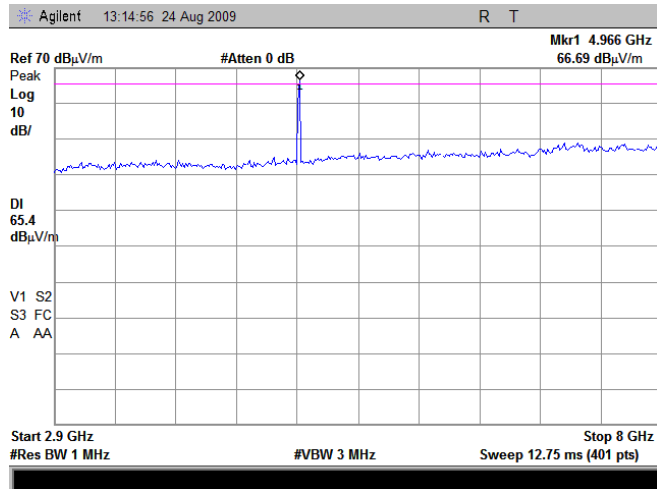
TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



NOTE: 4953 MHz on the plot is the intentional transmission at the low channel (4947.5MHz)

Plot 7.4.14 Radiated emission measurements in 2900 – 8000 MHz range

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



NOTE: 4966 MHz on the plot is the intentional transmission at the mid channel (4962.5MHz)

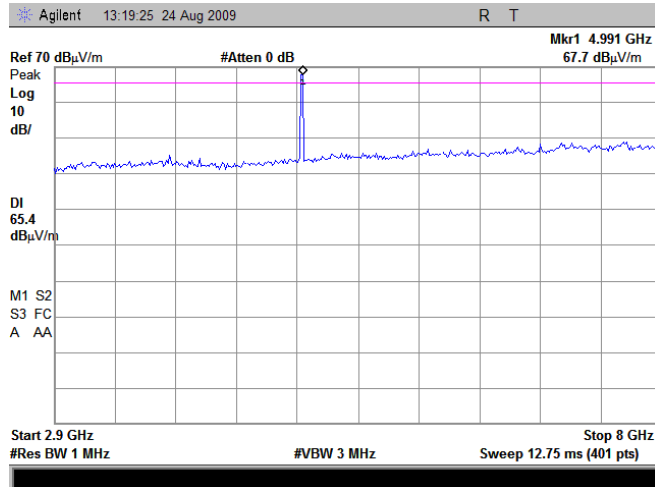


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.4.15 Radiated emission measurements in 2900 – 8000 MHz range**

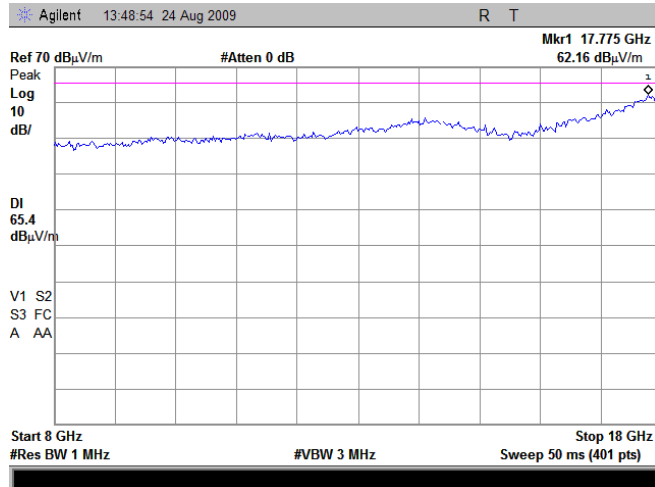
TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



NOTE: 4991 MHz on the plot is the intentional transmission on the high channel (4982.5MHz)

**Plot 7.4.16 Radiated emission measurements in 8000 – 18000 MHz range**

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



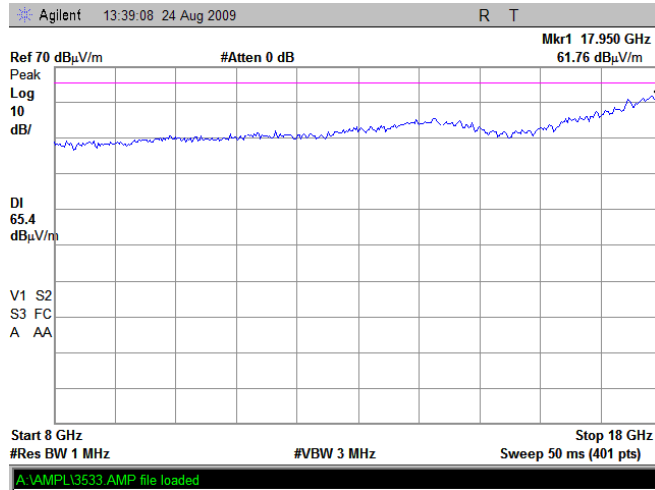


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

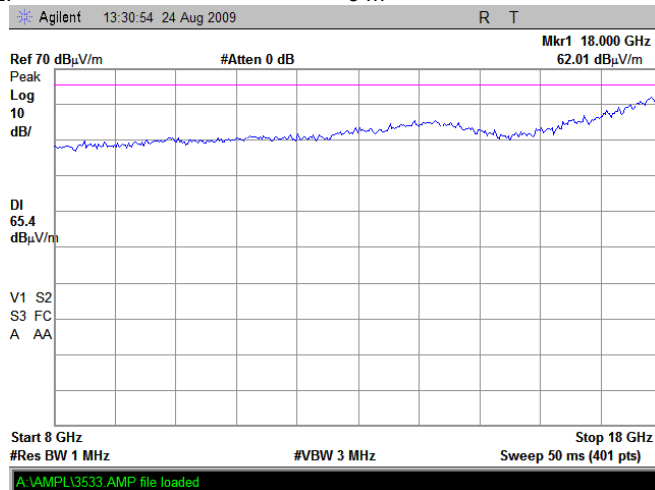
Plot 7.4.17 Radiated emission measurements in 8000 – 18000 MHz range

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



Plot 7.4.18 Radiated emission measurements in 8000 – 18000 MHz range

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



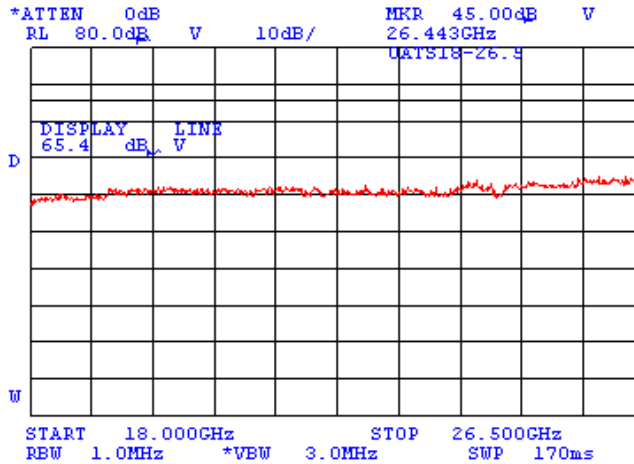


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

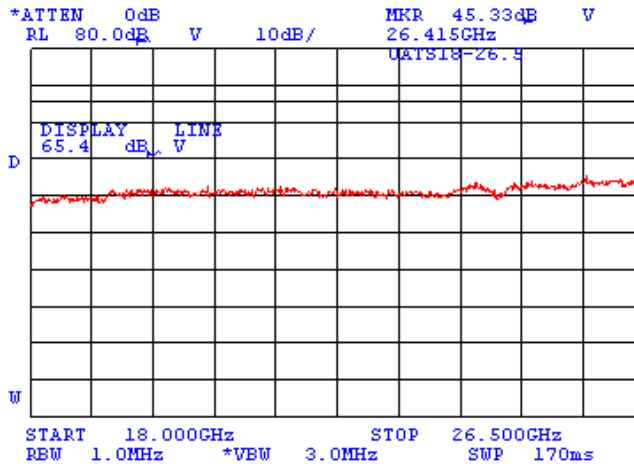
Plot 7.4.19 Radiated emission measurements in 18000 – 26500 MHz range

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



Plot 7.4.20 Radiated emission measurements in 18000 – 26500 MHz range

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



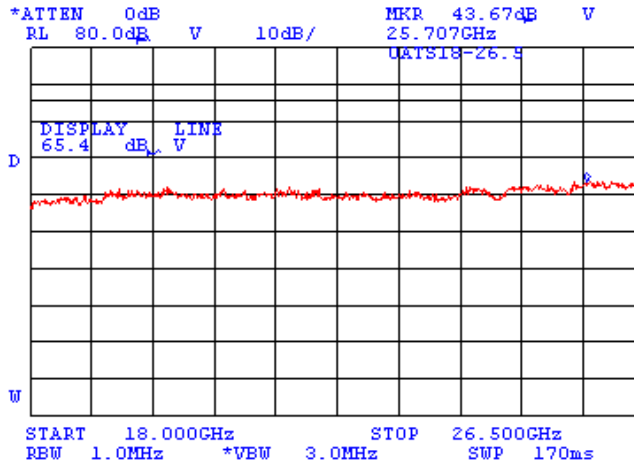


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

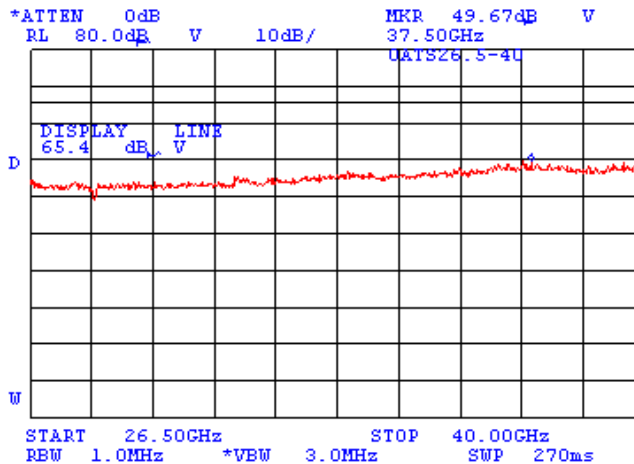
Plot 7.4.21 Radiated emission measurements in 18000 – 26500 MHz range

TEST SITE: Fully anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



Plot 7.4.22 Radiated emission measurements in 26500 – 40000 MHz range

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



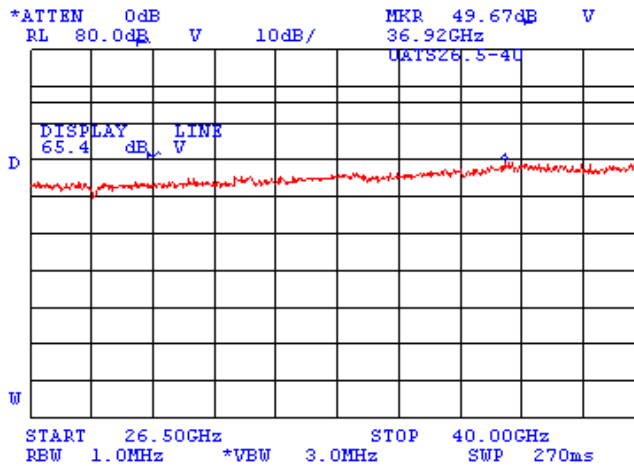


HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1053 and 90.210(l); TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/6/2009 2:49:30 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

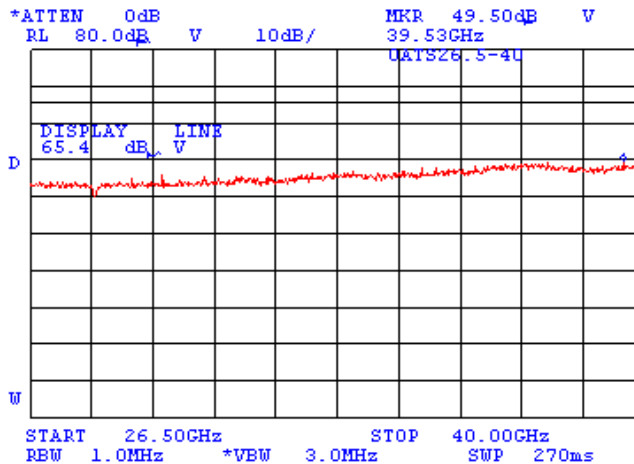
Plot 7.4.23 Radiated emission measurements in 26500 – 40000 MHz range

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



Plot 7.4.24 Radiated emission measurements in 26500 – 40000 MHz range

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





<b>Test specification:</b>		<b>Section 90.210, Conducted spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 7.5 Spurious emissions at RF antenna connector test

### 7.5.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.5.1. The test results are provided in Table 7.5.2 and the associated plots.

Table 7.5.1 Spurious emission limits

Frequency, MHz	Attenuation below carrier, dBc
0.009 – 10th harmonic*	40 dBc

\* - spurious emission limits do not apply to the in band emission within  $\pm 150\%$  of the authorized bandwidth from the carrier; investigated in course of emission mask testing

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

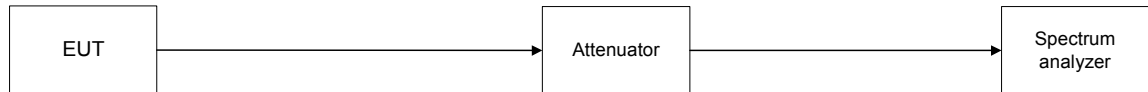
### 7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

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

7.5.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and the associated plots.

Figure 7.5.1 Spurious emission test setup





HERMON LABORATORIES

<b>Test specification:</b>		<b>Section 90.210, Conducted spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Table 7.5.2 Spurious emission test results**

ASSIGNED FREQUENCY RANGE: 4940.0 – 4990.0 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: QPSK  
 MODULATING SIGNAL: PRBS  
 CHANNEL SPACING: 10 MHz  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 TRANSMITTER OUTPUT POWER\*: 4.38 dBm at low frequency  
 5.15 dBm at mid frequency  
 6.00 dBm at high 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>Low carrier frequency</b>									
6596.600	-52.54	Included	Included	1000	-52.54	48.16	40.00	-8.16	Pass
<b>Mid carrier frequency</b>									
6616.543	-52.88	Included	Included	1000	-52.88	47.73	40.00	-7.73	Pass
<b>High carrier frequency</b>									
6643.393	-55.52	Included	Included	1000	-55.52	49.52	40.00	-9.52	Pass

\* - Measured within spurious emissions sweep.  
 \*\* - Margin = Spurious emission – specification limit.

**Reference numbers of test equipment used**

HL 1424	HL 2780	HL 2953	HL 3442	HL 3445	HL 3559		
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Full description is given in Appendix A.

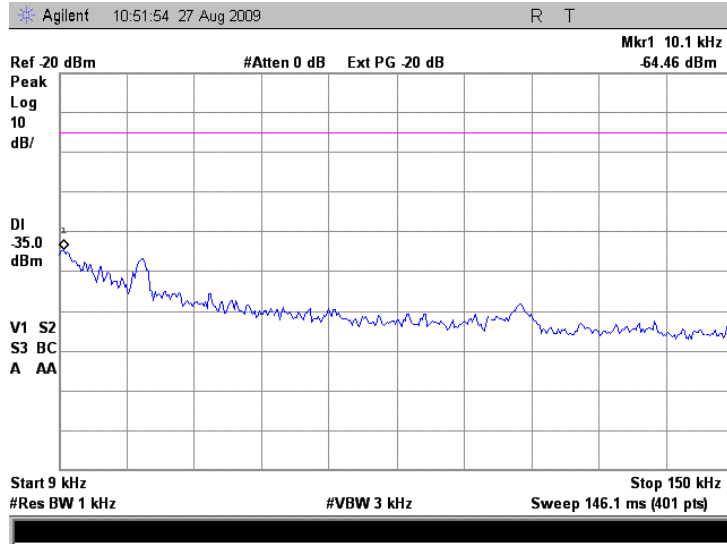




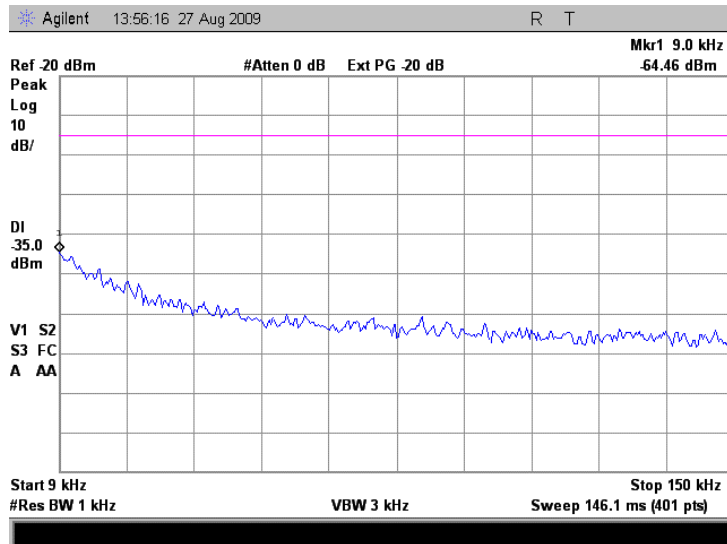
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency



Plot 7.5.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

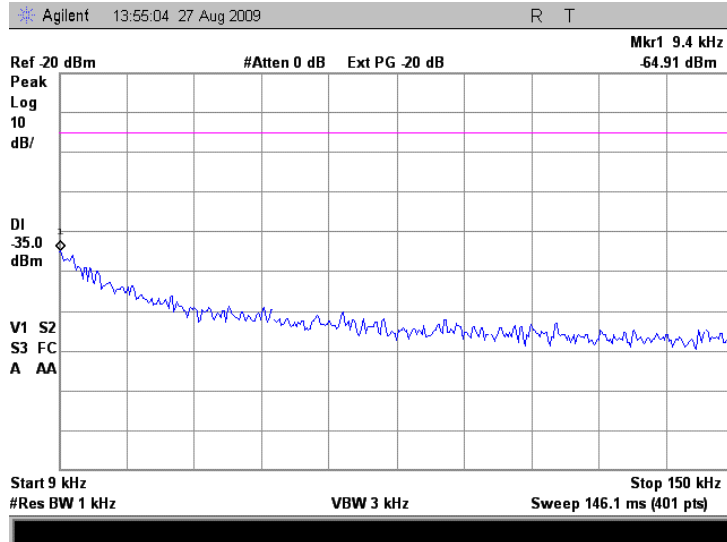




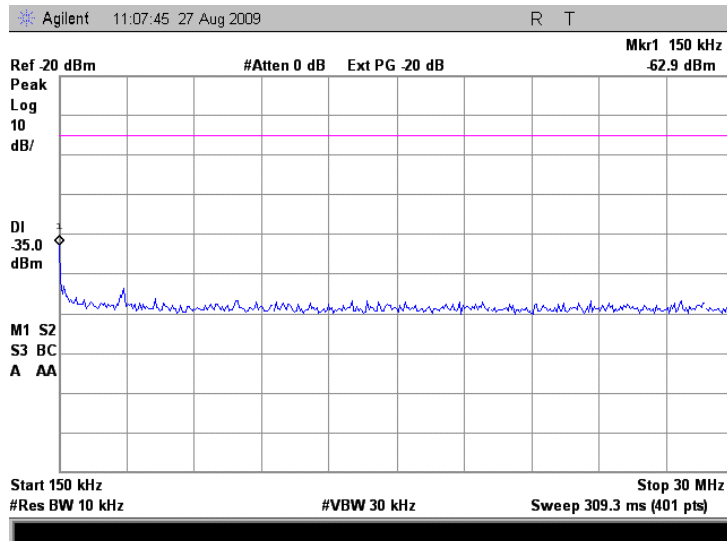
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency



Plot 7.5.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

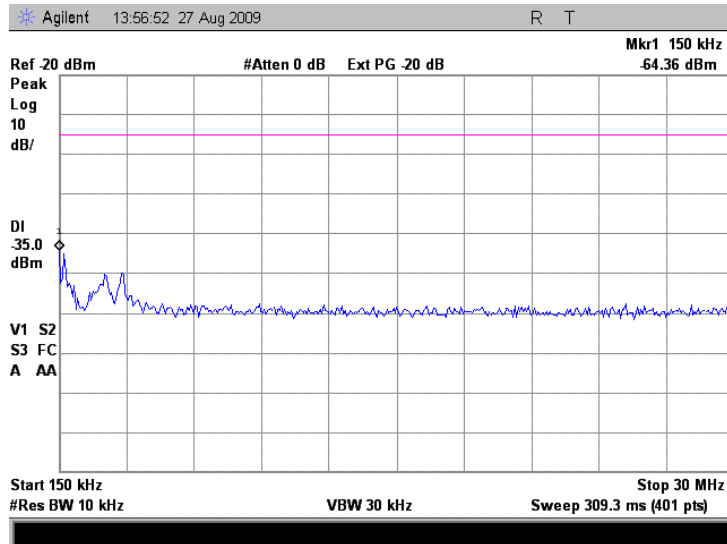




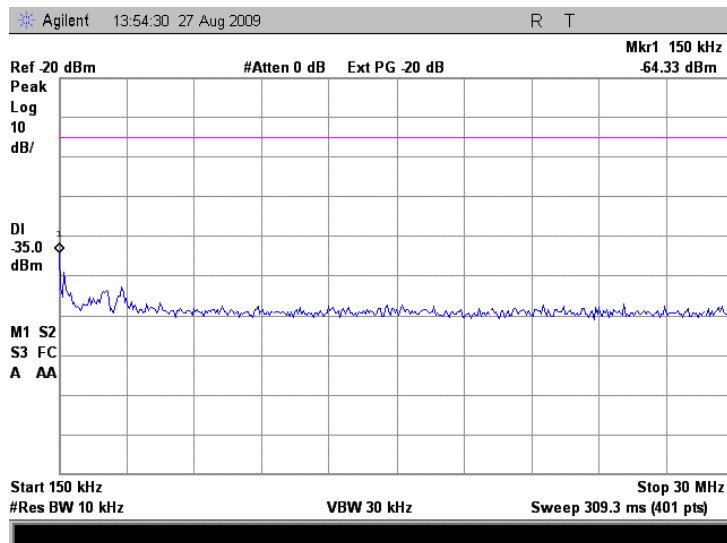
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.5 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency



Plot 7.5.6 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency

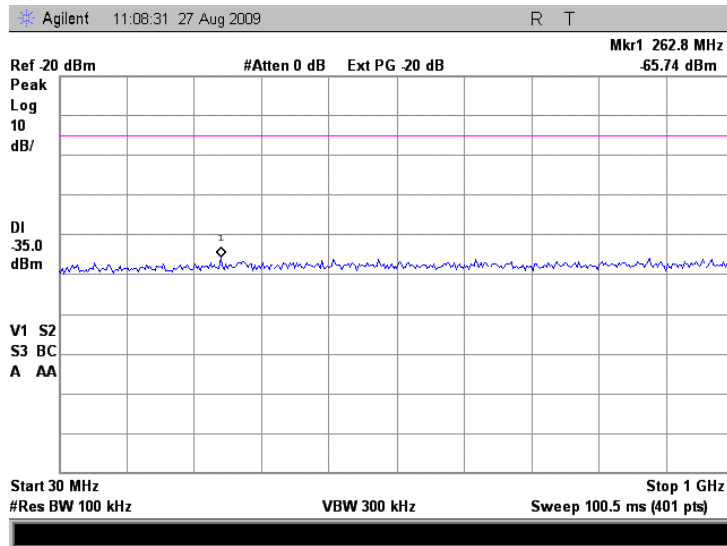




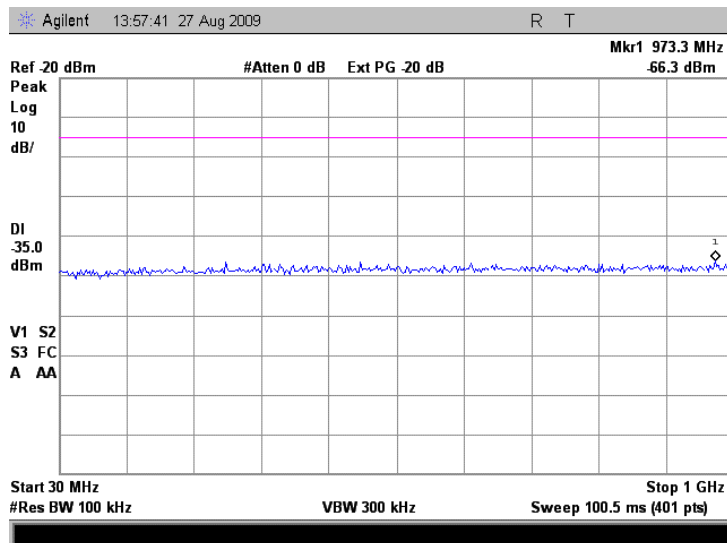
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.7 Spurious emission measurements in 30.0 - 1000 MHz range at low carrier frequency



Plot 7.5.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency

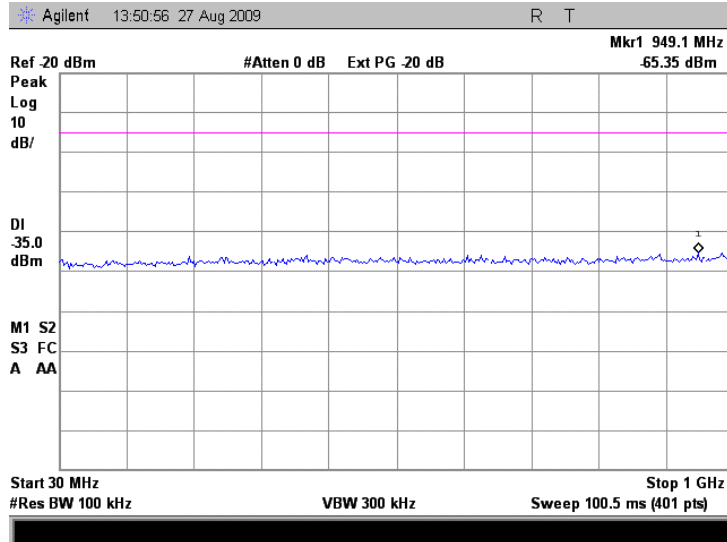




HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.9 Spurious emission measurements in 30.0 - 1000 MHz range at high carrier frequency

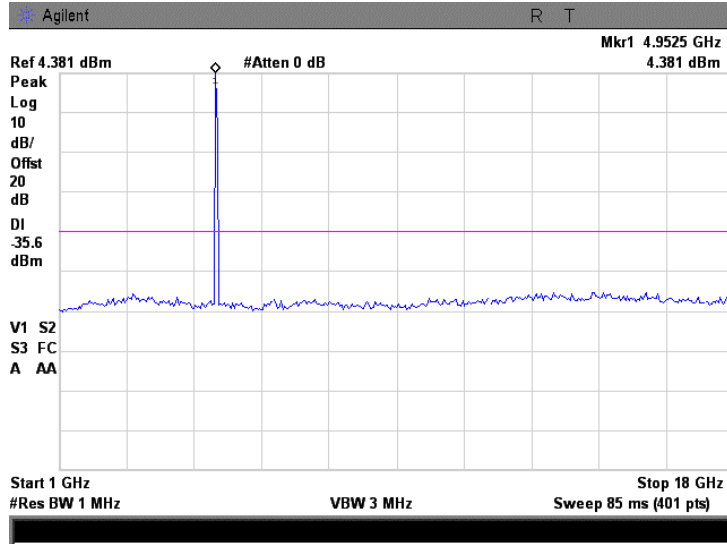




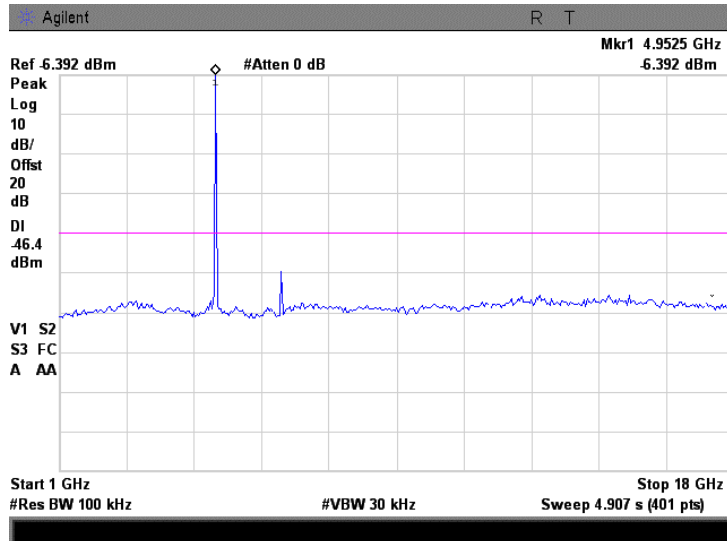
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.10 Spurious emission measurements in 1000 – 18000 MHz at low carrier frequency



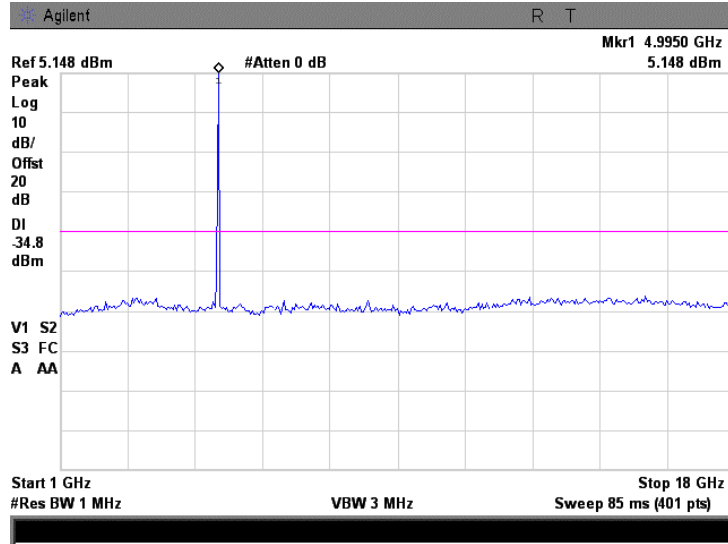
Plot 7.5.11 Spurious emission measurements in 1000 – 18000 MHz at low carrier frequency, RBW=100 kHz



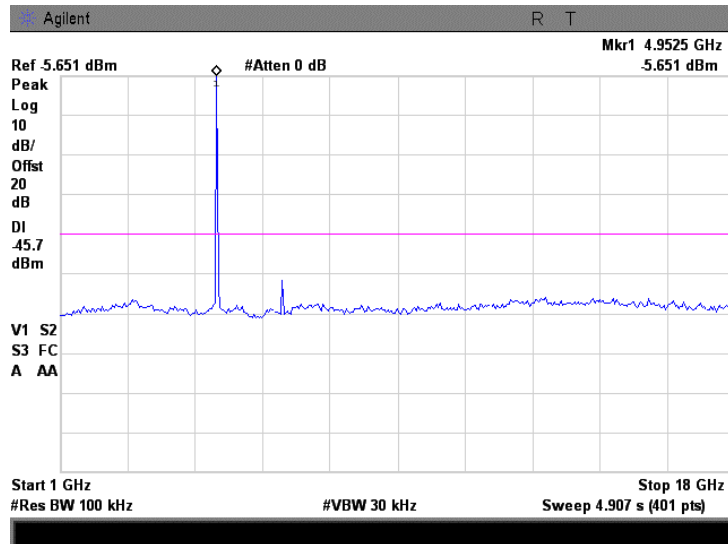


<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.12 Spurious emission measurements in 1000 – 18000 MHz at mid carrier frequency



Plot 7.5.13 Spurious emission measurements in 1000 – 18000 MHz at mid carrier frequency, RBW=100 kHz

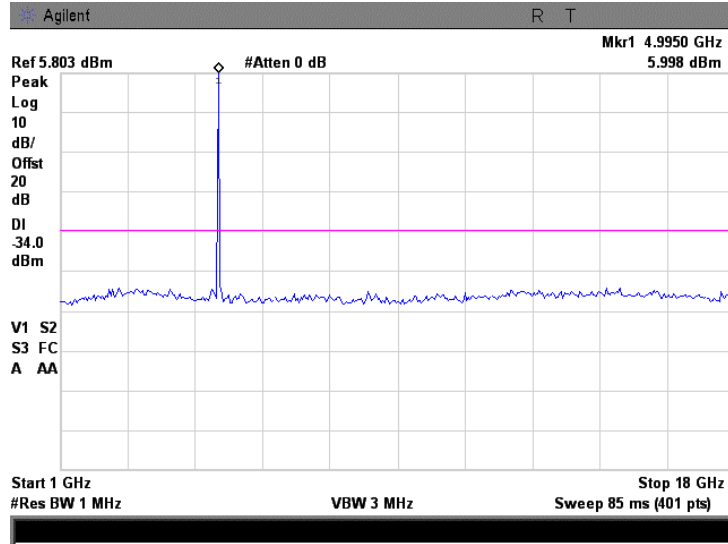




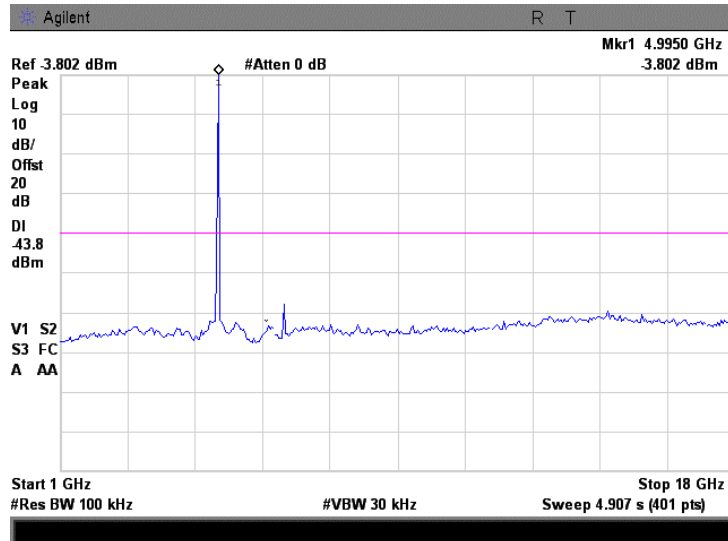
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.14 Spurious emission measurements in 1000 – 18000 MHz at high carrier frequency



Plot 7.5.15 Spurious emission measurements in 1000 – 18000 MHz at high carrier frequency, RBW=100 kHz

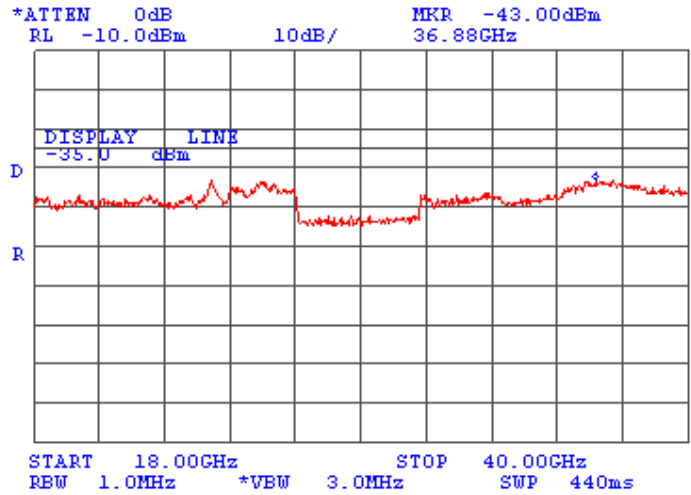




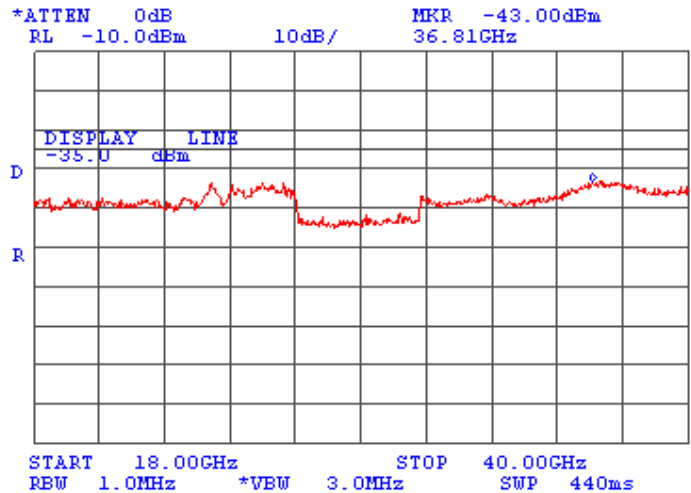


<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.16 Spurious emission measurements in 18 – 40 GHz range at low carrier frequency



Plot 7.5.17 Spurious emission measurements in 18 - 40 GHz at mid carrier frequency

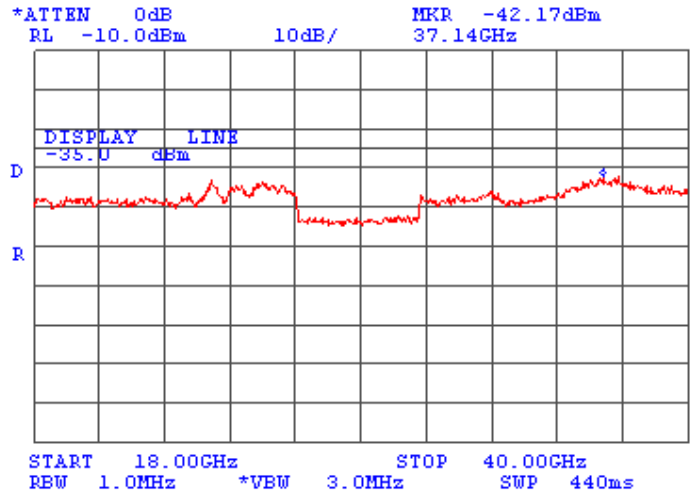




HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.210, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051 and 90.210(l); TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	9/16/2009 2:40:41 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.18 Spurious emission measurements in 18 - 40 GHz at high carrier frequency





<b>Test specification:</b> Section 90.213, Frequency stability			
<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> 9/6/2009 2:56:09 PM			
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 7.6 Frequency stability test

### 7.6.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.6.1.

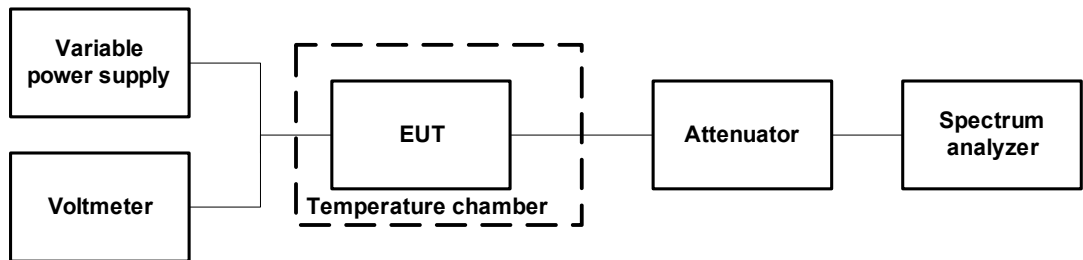
Table 7.6.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
4940.0 – 4990.0	The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation	

### 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 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.
- 7.6.2.3 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.
- 7.6.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.6.2.5 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.
- 7.6.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.6.2.

Figure 7.6.1 Frequency stability test setup





HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 90.213, 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>	9/6/2009 2:56:09 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY: 4940.0 – 4990.0 MHz  
 NOMINAL POWER VOLTAGE: 120VAC  
 TEMPERATURE STABILIZATION PERIOD: 20 min  
 POWER DURING TEMPERATURE TRANSITION: Off  
 SPECTRUM ANALYZER MODE: Counter  
 RESOLUTION BANDWIDTH: 1000 Hz  
 VIDEO BANDWIDTH: 3000 Hz  
 MODULATION: Unmodulated

T, °C	Voltage V	Frequency, MHz							Max frequency drift Hz		Max frequency drift ppm	
		Start up	1 <sup>st</sup> min	2 <sup>nd</sup> min	3 <sup>rd</sup> min	4 <sup>th</sup> min	5 <sup>th</sup> min	10 <sup>th</sup> min	Positive	Negative	Positive	legativ
<b>Low frequency 4942.500 MHz</b>												
-30	nominal	4942.490167	4942.490100	4942.490093	4942.490093	4942.490091	4942.490087	4942.490078	0.000000	-992.00	0.000	-0.201
-20	nominal	4942.489539	NA	NA	NA	NA	NA	4942.489994	0.000000	-1531.00	0.000	-0.310
-10	nominal	4942.489731	NA	NA	NA	NA	NA	4942.490001	0.000000	-1339.00	0.000	-0.271
0	nominal	4942.489712	4942.489858	4942.489973	4942.490023	4942.490083	4942.490109	4942.490253	0.000000	-1358.00	0.000	-0.275
10	nominal	4942.490418	NA	NA	NA	NA	NA	4942.490915	0.000000	-652.00	0.000	-0.132
20	+15%	4942.491528	NA	NA	NA	NA	NA	4942.491201	458.000000	0.00	0.093	0.000
20	nominal	4942.491060	NA	NA	NA	NA	NA	4942.491070*	0.000000	-10.00	0.000	-0.002
20	-15%	4942.491075	NA	NA	NA	NA	NA	4942.490703	5.000000	-367.00	0.001	-0.074
30	nominal	4942.490561	4942.490514	4942.490500	4942.490477	4942.490461	4942.490448	4942.490387	0.000000	-683.00	0.000	-0.138
40	nominal	4942.489959	NA	NA	NA	NA	NA	4942.489750	0.000000	-1320.00	0.000	-0.267
50	nominal	4942.489456	4942.489503	4942.489536	4942.489562	4942.489584	4942.489600	4942.489675	0.000000	-1614.00	0.000	-0.327
<b>Mid frequency 4962.500</b>												
-30	nominal	4962.490303	4962.490109	4962.490087	4962.490080	4962.490066	4962.490061	4962.490040	0.00	-966.00	0.000	-0.195
-20	nominal	4962.489770	NA	NA	NA	NA	NA	4962.489959	0.00	-1236.00	0.000	-0.249
-10	nominal	4962.489382	NA	NA	NA	NA	NA	4962.489930	0.00	-1624.00	0.000	-0.327
0	nominal	4962.489614	4962.489927	4962.490014	4962.490078	4962.490130	4962.490157	4962.490324	0.00	-1392.00	0.000	-0.281
10	nominal	4962.490675	NA	NA	NA	NA	NA	4962.490900	0.00	-331.00	0.000	-0.067
20	+15%	4962.491338	NA	NA	NA	NA	NA	4962.491081	332.00	0.00	0.067	0.000
20	nominal	4962.491020	NA	NA	NA	NA	NA	4962.491006*	14.00	0.00	0.003	0.000
20	-15%	4962.491044	NA	NA	NA	NA	NA	4962.491028	38.00	0.00	0.008	0.000
30	nominal	4962.490663	4962.490579	4962.490538	4962.490503	4962.490483	4962.490460	4962.490360	0.00	-646.00	0.000	-0.130
40	nominal	4962.489876	NA	NA	NA	NA	NA	4962.489707	0.00	-1299.00	0.000	-0.262
50	nominal	4962.489352	4962.489445	4962.489477	4962.489527	4962.489565	4962.489583	4962.489610	0.00	-1654.00	0.000	-0.333
<b>High frequency 4987.500</b>												
-30	nominal	4987.491135	4987.490525	4987.490333	4987.490250	4987.490167	4987.490122	4987.490011	191.00	-933.00	0.038	-0.187
-20	nominal	4987.489680	NA	NA	NA	NA	NA	4987.489914	0.00	-1264.00	0.000	-0.253
-10	nominal	4987.489236	NA	NA	NA	NA	NA	4987.489615	0.00	-1708.00	0.000	-0.342
0	nominal	4987.489536	4987.489884	4987.489996	4987.490019	4987.490160	4987.490220	4987.490470	0.00	-1408.00	0.000	-0.282
10	nominal	4987.490557	NA	NA	NA	NA	NA	4987.490859	0.00	-387.00	0.000	-0.078
20	+15%	4987.491063	NA	NA	NA	NA	NA	4987.490967	119.00	0.00	0.024	0.000
20	nominal	4987.490957	NA	NA	NA	NA	NA	4987.490944*	13.00	0.00	0.003	0.000
20	-15%	4987.491004	NA	NA	NA	NA	NA	4987.490957	60.00	0.00	0.012	0.000
30	nominal	4987.490571	4987.490463	4987.490429	4987.490395	4987.490384	4987.490368	4987.490277	0.00	-667.00	0.000	-0.134
40	nominal	4987.489713	NA	NA	NA	NA	NA	4987.489633	0.00	-1311.00	0.000	-0.263
50	nominal	4987.489426	4987.489509	4987.489524	4987.489530	4987.489537	4987.489542	4987.489561	0.00	-1518.00	0.000	-0.304

\* - Reference frequency

Reference numbers of test equipment used

HL 1424	HL 2909	HL 3286					
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Full description is given in Appendix A.



<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>	9/6/2009 5:01:50 PM		
<b>Temperature:</b> 24.6°C	<b>Air Pressure:</b> 1008 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 7.7 RF exposure

### 7.7.1 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 7.7.1.

Table 7.7.1 RF exposure limits

Frequency range, MHz	Power density	
	mW/cm <sup>2</sup>	W/m <sup>2</sup>
4940.0 – 4990.0	1.00	10.0

### 7.7.2 Safe distance calculation for fixed transmitter

The minimum safe distance was calculated from the following equation as provided in Table 7.7.2:

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

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 7.7.2 Safe distance calculation

ASSIGNED FREQUENCY: 4940.0 – 4990.0 MHz  
EQUIPMENT INTENDED USE: Fixed\*  
CHANNEL SPACING: 10 MHz

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				
4947.5	7.81	17.0	24.81	0.303	10.0	0.05	2.0	Pass
4962.5	7.70	17.0	24.70	0.295	10.0	0.05	2.0	Pass
4982.5	7.87	17.0	24.87	0.307	10.0	0.05	2.0	Pass

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



<b>Test specification:</b>	<b>Section 15.107, Class B, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/21/2009 10:20:20 AM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 41 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 8 Emissions tests according to 47CFR part 15 subpart B requirements

### 8.1 Conducted emissions

#### 8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μV)		Class A limit, dB(μV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

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

#### 8.1.2 Test procedure

8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.

8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 8.1.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

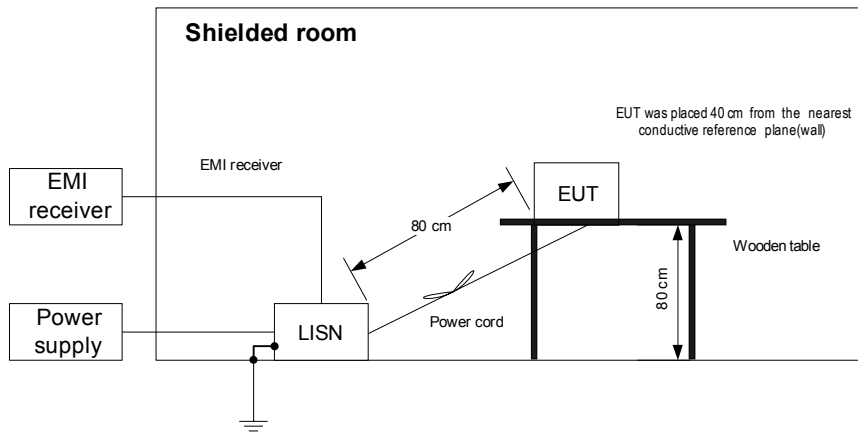
8.1.2.3 The position of the device cables was varied to determine maximum emission level.

8.1.2.4 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

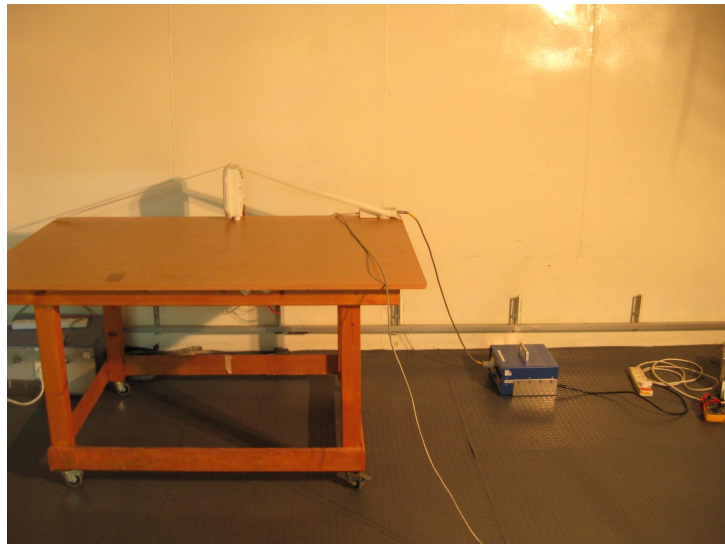


<b>Test specification:</b>	<b>Section 15.107, Class B, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/21/2009 10:20:20 AM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 41 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Figure 8.1.1 Setup for conducted emission measurements, table-top equipment



Photograph 8.1.1 Setup for conducted emission measurements

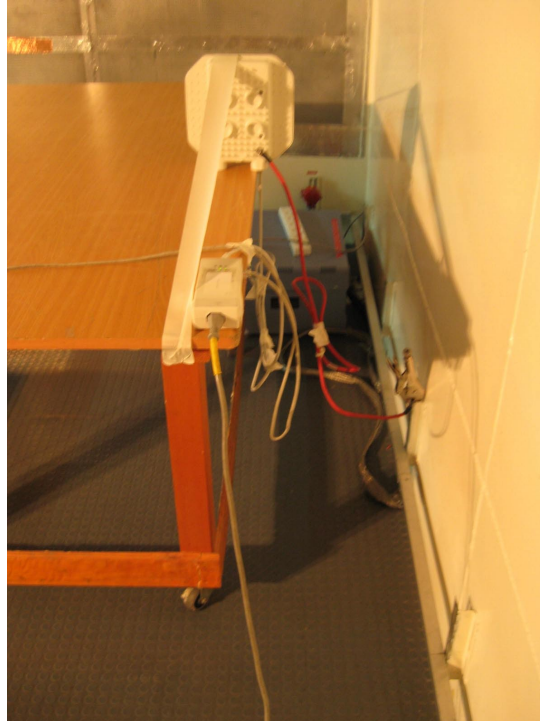




HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 15.107, Class B, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/21/2009 10:20:20 AM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 41 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Photograph 8.1.2 Setup for conducted emission measurements







<b>Test specification:</b>	<b>Section 15.107, Class B, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/21/2009 10:20:20 AM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 41 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 8.1.2 Conducted emission test results

LINE: AC mains  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive / Stand-by  
 EUT SET UP: TABLE-TOP  
 TEST SITE: SHIELDED ROOM  
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE  
 FREQUENCY RANGE: 150 kHz - 30 MHz  
 RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.164915	46.99	45.79	65.27	-19.48	35.98	55.27	-19.29	L1	Pass
0.204778	40.98	38.89	63.47	-24.58	27.28	53.47	-26.19		
0.315545	41.48	40.92	59.84	-18.92	40.20	49.84	-9.64		
0.458243	36.39	34.80	56.78	-21.98	29.71	46.78	-17.07		
27.157448	42.85	40.65	60.00	-19.35	39.40	50.00	-10.60		
29.234798	44.33	43.29	60.00	-16.71	42.44	50.00	-7.56	L2	Pass
0.163625	47.31	46.55	65.34	-18.79	40.21	55.34	-15.13		
0.204810	42.27	41.45	63.47	-22.02	36.43	53.47	-17.04		
0.314995	41.40	40.56	59.86	-19.30	39.83	49.86	-10.03		
0.490345	39.49	38.43	56.18	-17.75	37.25	46.18	-8.93		
26.608785	41.91	40.38	60.00	-19.62	39.22	50.00	-10.78		
29.234100	44.17	43.13	60.00	-16.87	42.45	50.00	-7.55		

\*- Margin = Measured emission - specification limit.

## Reference numbers of test equipment used

HL 0787	HL 1430	HL 1513	HL 2888	HL 3612			
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Full description is given in Appendix A.



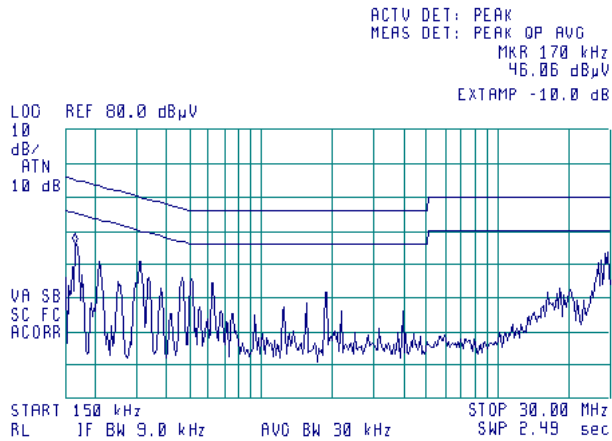
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 15.107, Class B, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/21/2009 10:20:20 AM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 41 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 8.1.1 Conducted emission measurements**

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK

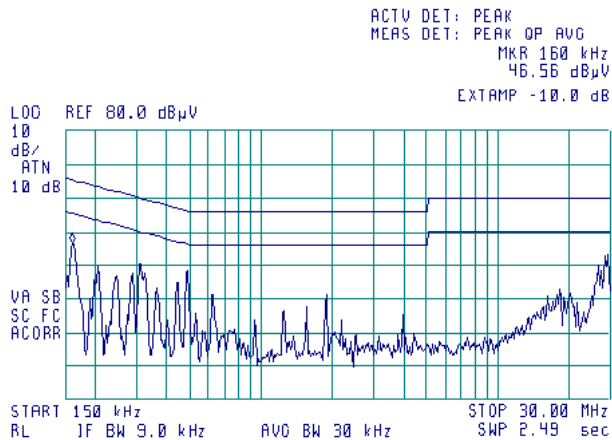
11:32:11 SEP 13, 2009



**Plot 8.1.2 Conducted emission measurements**

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK

11:40:39 SEP 13, 2009





<b>Test specification:</b>		<b>Section 15.109, Class B, Radiated emission</b>	
<b>Test procedure:</b>		ANSI C63.4, Sections 11.6 and 12.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:44:06 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 8.2 Radiated emission measurements

### 8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1.

Table 8.2.1 Radiated emission test limits

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
Above 960	43.5*	54.0	49.5	60.0*

\* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows:  $Lim_{S_2} = Lim_{S_1} + 20 \log(S_1/S_2)$ , where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

### 8.2.2 Test procedure

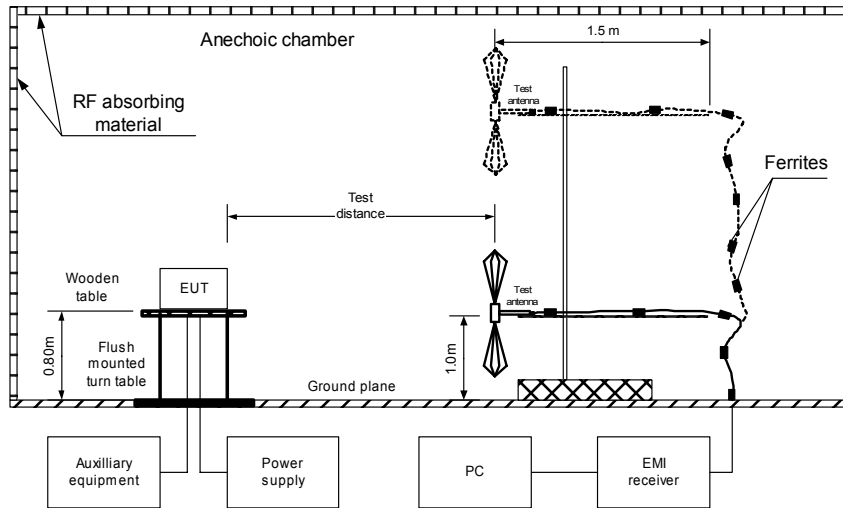
- 8.2.2.1** The EUT was set up as shown in Figure 8.2.1 and associated photographs, energized and the performance check was conducted.
- 8.2.2.2** Preliminary measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with biconical and log periodic antennas connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed, its polarization was switched from vertical to horizontal and the EUT cables position was varied.
- 8.2.2.3** The EUT was set up as shown in Figure 8.2.2, energized and the performance check was conducted.
- 8.2.2.4** Final measurements were performed at the open area test site at 3 m test distance. The EUT wires and cables were arranged to produce maximum emission as it was found during preliminary measurements. The frequencies yield the worst test results (the lowest margins) during preliminary testing were investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m and its polarization was changed from vertical to horizontal. At frequencies where high ambient noise was encountered, the final measurements were taken in the anechoic chamber at 3 m distance.
- 8.2.2.5** The worst test results (the lowest margins) were recorded in Table 8.2.2 and shown in the associated plots.



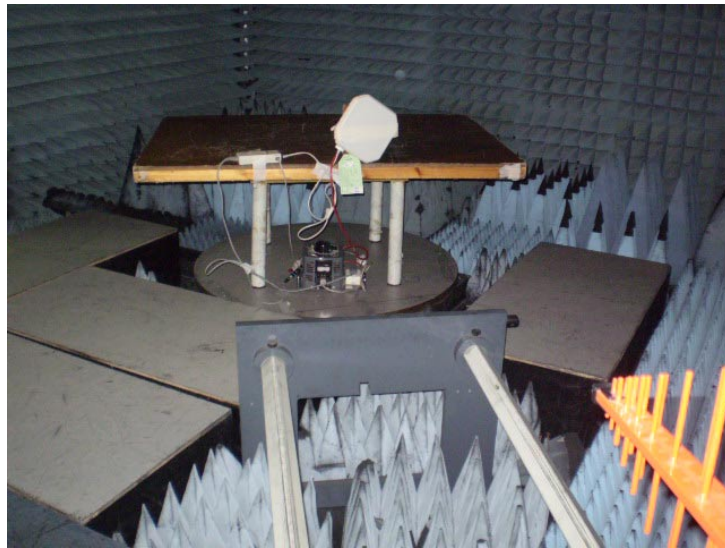
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 15.109, Class B, Radiated emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:44:06 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Figure 8.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment



Photograph 8.2.1 Setup for radiated emission measurements in the anechoic chamber

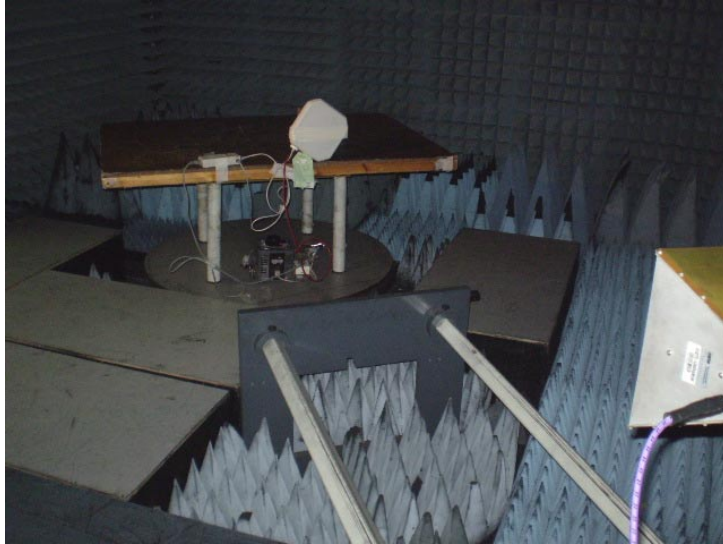




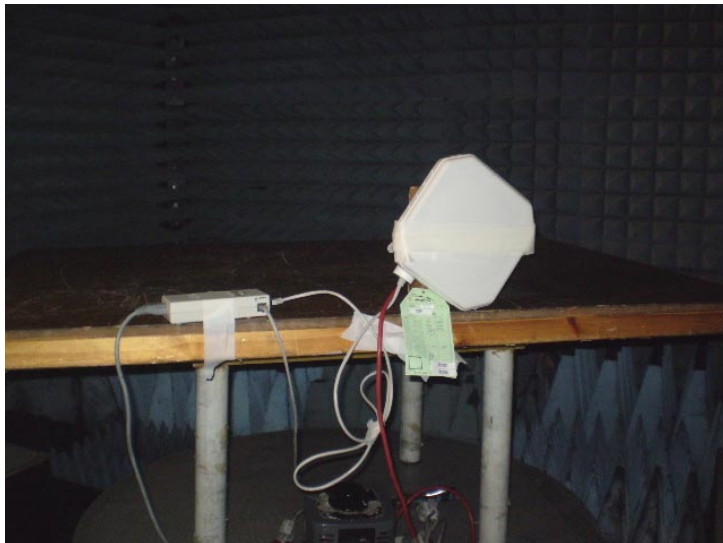
HERMON LABORATORIES

<b>Test specification:</b>	<b>Section 15.109, Class B, Radiated emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:44:06 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Photograph 8.2.2 Setup for radiated emission measurements in the anechoic chamber



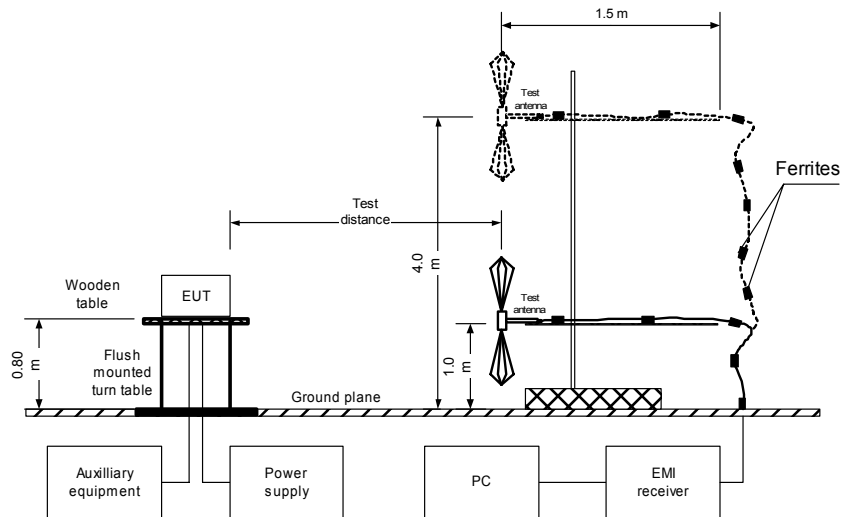
Photograph 8.2.3 Setup for radiated emission measurements in the anechoic chamber





<b>Test specification:</b>	<b>Section 15.109, Class B, Radiated emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:44:06 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Figure 8.2.2 Setup for radiated emission measurements at OATS, table-top equipment



Photograph 8.2.4 Setup for radiated emission measurements at the OATS with biconical antenna







<b>Test specification:</b>	<b>Section 15.109, Class B, Radiated emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:44:06 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Photograph 8.2.5 Setup for radiated emission measurements at the OATS with log-periodic antenna



Photograph 8.2.6 Setup for radiated emission measurements, EUT cabling





<b>Test specification:</b>		<b>Section 15.109, Class B, Radiated emission</b>	
<b>Test procedure:</b>		ANSI C63.4, Sections 11.6 and 12.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	9/16/2009 2:44:06 PM		
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
TEST SITE: OATS / SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / QUASI-PEAK  
FREQUENCY RANGE: 30 MHz – 1000 MHz  
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
143.125000	33.70	27.10	43.50	-16.40	V	340	1.00	Pass
400.000000	31.00	28.20	46.00	-17.80	V	015	1.35	
725.010000	45.40	44.00	46.00	-2.00	V	010	1.50	
749.990000	46.20	42.80	46.00	-3.20	V	010	1.40	
760.002500	39.30	36.60	46.00	-9.40	V	000	1.45	
999.990000	41.00	38.2	54.00	-15.80	V	320	1.00	

TEST SITE: OATS  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / AVERAGE  
FREQUENCY RANGE: 1000 MHz – 18000 MHz  
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, DB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
1250.000	43.37	74.00	-30.63	33.78	54.00	-20.22	H	1.6	010	Pass

TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / AVERAGE  
FREQUENCY RANGE: 1000 MHz – 18000 MHz  
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, DB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
1000.125	47.70	74.00	-26.30	39.40	54.00	-14.60	V	1.0	250	Pass

\*- Margin = Measured emission - specification limit.

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

## Reference numbers of test equipment used

HL 0032	HL 0034	HL 0521	HL 1425	HL 1984	HL 2697	HL 2883	HL 2909
HL 2952	HL 3123	HL 3286	HL 3351	HL 3352	HL 3616		

Full description is given in Appendix A.



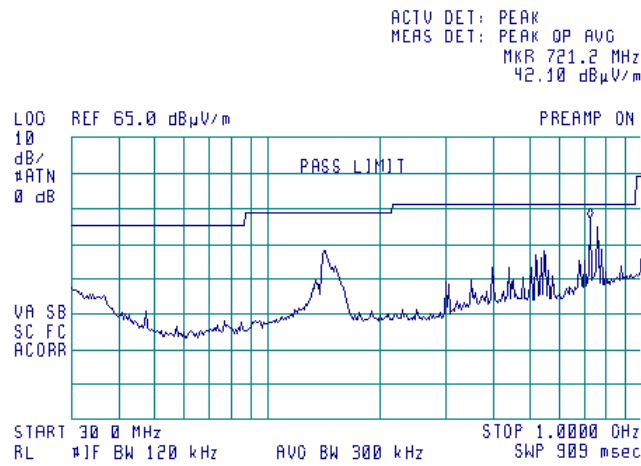


HERMON LABORATORIES

<b>Test specification:</b> Section 15.109, Class B, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 9/16/2009 2:44:06 PM			
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

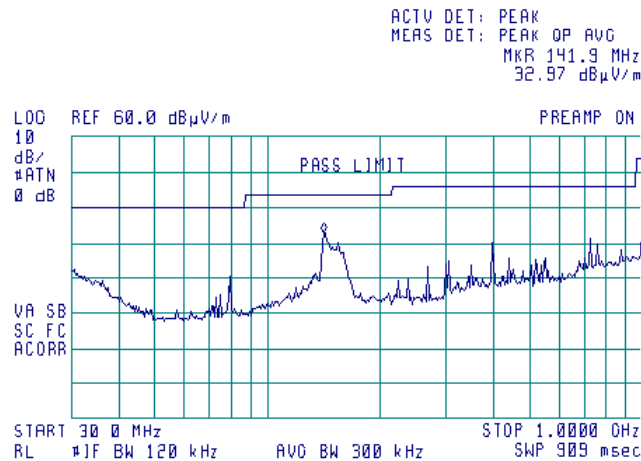
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by



Plot 8.2.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by



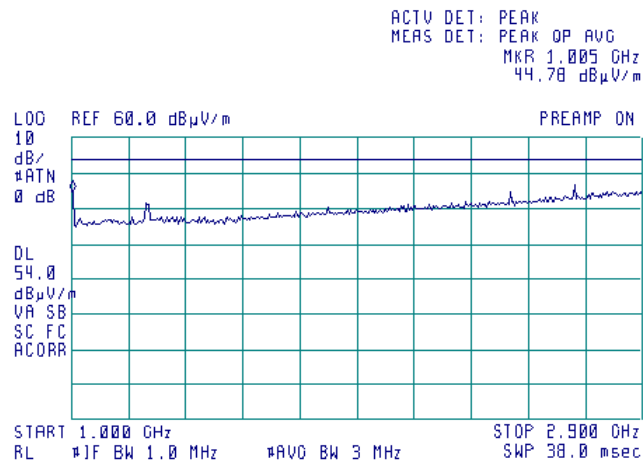


HERMON LABORATORIES

<b>Test specification:</b> Section 15.109, Class B, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 9/16/2009 2:44:06 PM			
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

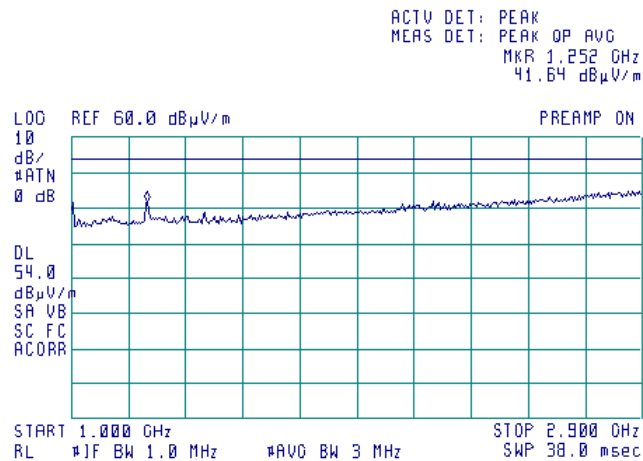
Plot 8.2.3 Radiated emission measurements in 1000 – 2900 range, vertical antenna polarization

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by



Plot 8.2.4 Radiated emission measurements 1000 – 2900 range, horizontal antenna polarization

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by



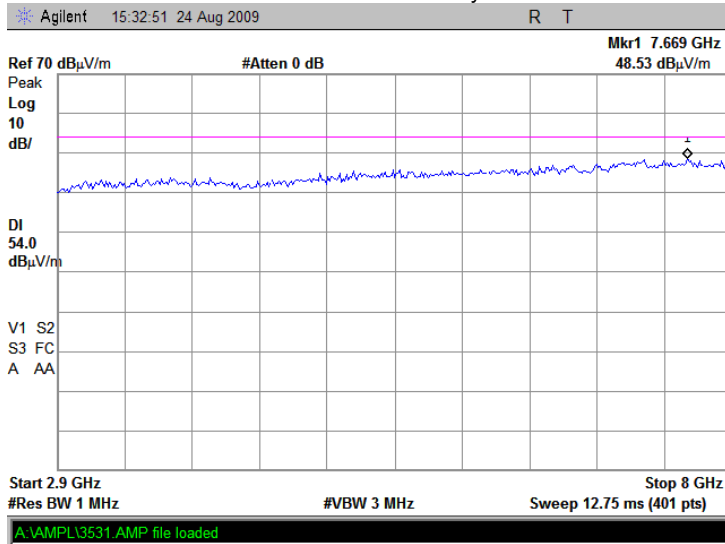


HERMON LABORATORIES

<b>Test specification:</b> Section 15.109, Class B, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 9/16/2009 2:44:06 PM			
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

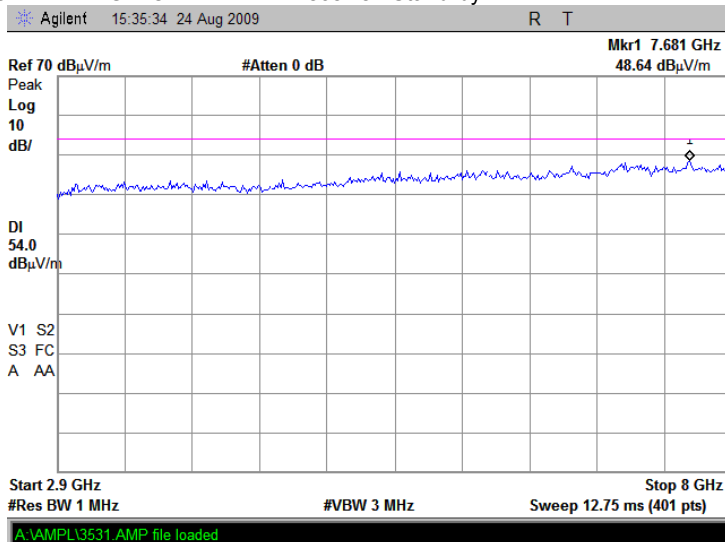
Plot 8.2.5 Radiated emission measurements in 2900 – 8000 range, vertical antenna polarization

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by



Plot 8.2.6 Radiated emission measurements 2900 – 8000 range, horizontal antenna polarization

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by



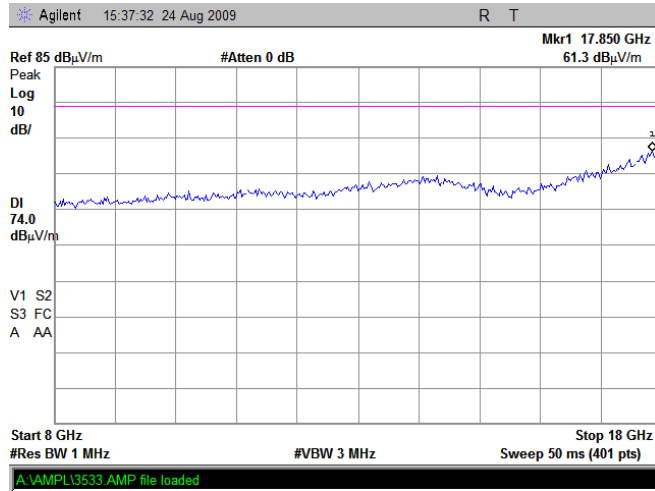


HERMON LABORATORIES

<b>Test specification:</b> Section 15.109, Class B, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 9/16/2009 2:44:06 PM			
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

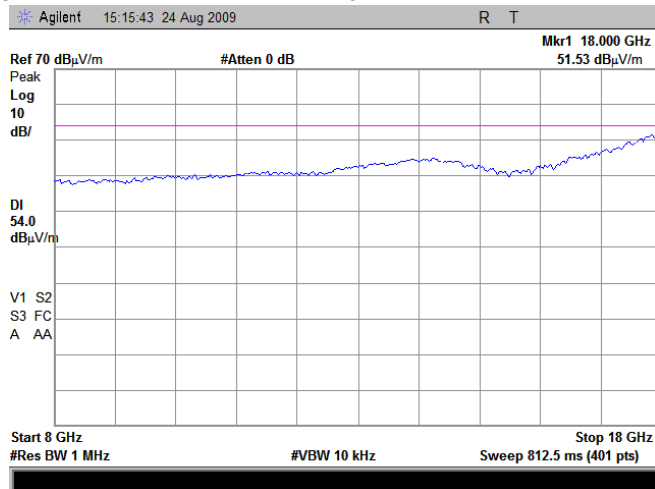
Plot 8.2.7 Radiated emission measurements in 8000 – 18000 range, vertical antenna polarization

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by  
DETECTOR: Peak



Plot 8.2.8 Radiated emission measurements in 8000 – 18000 range, vertical antenna polarization

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by  
DETECTOR: VBW = 10 kHz



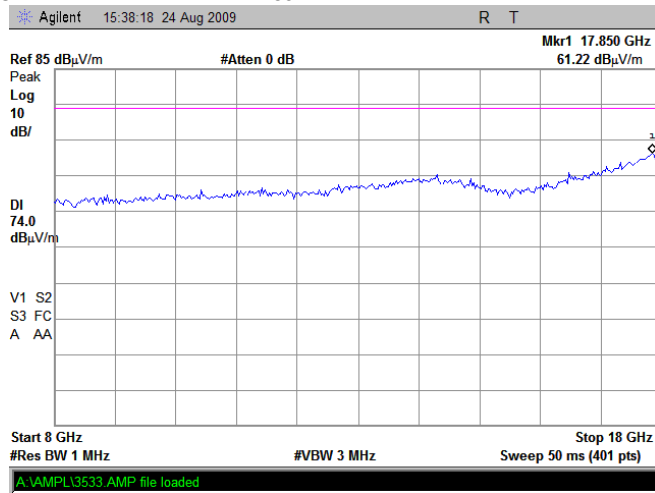


HERMON LABORATORIES

<b>Test specification:</b> Section 15.109, Class B, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 9/16/2009 2:44:06 PM			
<b>Temperature:</b> 25°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 38 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

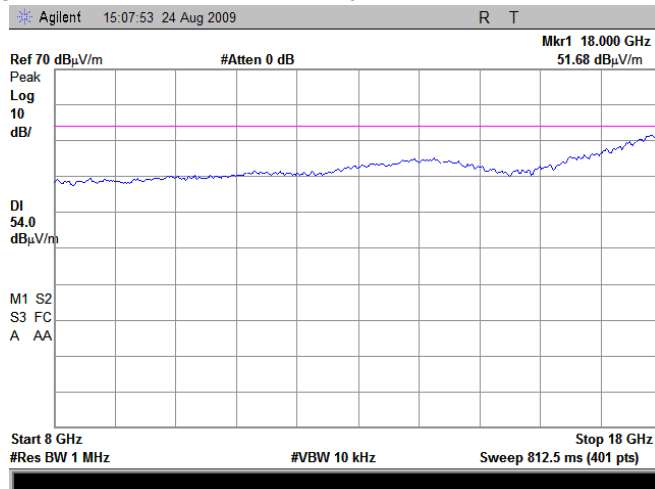
**Plot 8.2.9 Radiated emission measurements 8000 – 18000 range, horizontal antenna polarization**

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by  
DETECTOR: Peak



**Plot 8.2.10 Radiated emission measurements 8000 – 18000 range, horizontal antenna polarization**

TEST SITE: Anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by  
DETECTOR: VBW = 10 kHz



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

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0032	Antenna, Biconical, 20 - 200 MHz	Electro-Metrics	BIA 25/30	3577	25-Sep-08	25-Sep-09
0034	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1988	25-Sep-08	25-Sep-09
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-09	29-Jun-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
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	23-Dec-08	23-Dec-11
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	23-Dec-08	23-Dec-11
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard Co	11947A	3107A018 77	16-Oct-08	16-Oct-09
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Sep-08	28-Sep-09
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	28-Aug-09	28-Aug-10
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A002 62,3705A0 0217	31-Aug-09	31-Aug-10
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	01-Sep-09	01-Sep-10
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	23-Jan-09	23-Jan-10
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	23-Jan-09	23-Jan-10
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp. Pleasanton, California USA	JB3	A022805	11-Jan-09	11-Jan-10
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 6	05-Jul-09	05-Jul-10
2882	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539 001	04-Feb-09	04-Feb-10
2883	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539 003	07-Dec-08	07-Dec-09
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	06-Jul-09	06-Jul-10
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-09	07-May-10
2952	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-08	05-Oct-09
2953	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-08	05-Oct-09
3123	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3123	01-Jan-09	01-Jan-10
3286	Temperature Chamber, (-40 to +170) °C	Thermotron	EL-8-CH-1-1-CO2	21-9048	09-Sep-09	09-Sep-10
3351	Low Pass Filter, 50 Ohm, DC to 400 MHz.	Mini-Circuits	NLP-450+	NA	26-Oct-08	26-Oct-09
3352	Low Pass Filter, 50 Ohm, DC to 580 MHz.	Mini-Circuits	NLP-600+	NA	26-Oct-08	26-Oct-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



HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
3442	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	08-Mar-09	08-Mar-10
3445	LISN FCC/VDE/50 Ohm/50 uH + 5 Ohm, MIL-STD-461E, CISPR 16-1	Electro-Metrics	3825/2	1352	30-Jun-09	30-Jun-10
3531	Amplifier, low noise, 2 to 8 GHz	Quinstar Technology	QLJ-02084040-J0	11159002002	07-Dec-08	07-Dec-09
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	11159001001	07-Dec-08	07-Dec-09
3535	Amplifier, low noise, 18 to 40 GHz	Quinstar Technology	QLJ-18404537-J0	11159003001	07-Dec-08	07-Dec-09
3559	Cable 40 GHz, SMA-SMA, 0.95 m, Blue	Gore	PHASEFL EX	03771245	10-Aug-09	10-Aug-10
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	17-Nov-08	17-Nov-09
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

## 10 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 %
<b>Unintentional radiator tests</b>	
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

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

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

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



## 11 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).

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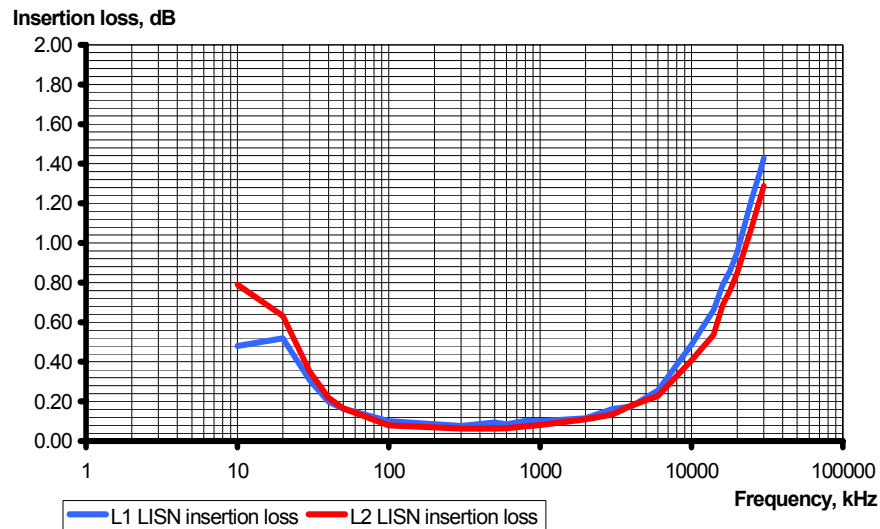
## 12 APPENDIX D Specification references

FCC 47CFR part 90: 2008	Private land mobile radio services
FCC 47CFR part 1: 2008	Practice and procedure
FCC 47CFR part 2: 2008	Frequency allocations and radio treaty matters; general rules and regulations
FCC 47CFR part 15: 2008	Radio Frequency Devices.
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

### 13 APPENDIX E Test equipment correction factors

**Correction factor  
Line impedance stabilization network  
Model NNB-2/16Z, Rolf Heine, HL 2888**

Frequency, kHz	Insertion loss, dB		Measurement Uncertainty, dB
	L1	N	
10	0.48	0.79	±0.6
20	0.52	0.63	
30	0.31	0.35	
40	0.20	0.22	
50	0.16	0.17	
100	0.10	0.08	
300	0.08	0.06	
500	0.10	0.06	
600	0.09	0.07	
800	0.10	0.07	
1000	0.10	0.08	
2000	0.12	0.11	
3000	0.16	0.14	
4000	0.17	0.18	
6000	0.26	0.23	
10000	0.49	0.41	
14000	0.66	0.54	
16000	0.79	0.69	
18000	0.86	0.76	
20000	0.96	0.85	
25000	1.22	1.08	
28000	1.35	1.21	
30000	1.43	1.29	



**Antenna factor  
Biconical antenna  
Electro-Metrics, model BIA-25/30  
Ser.No.3577, HL 0032**

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
20	15.1	115	16.7
25	14.6	120	14.1
30	13.7	125	13.1
35	11.8	130	13.0
40	11.4	135	12.9
45	11.7	140	12.7
50	11.4	145	12.5
55	10.5	150	14.3
60	10.3	155	14.8
65	8.9	160	14.7
70	7.6	165	15.1
75	7.3	170	15.6
80	7.3	175	16.5
85	7.8	180	16.7
90	9.4	185	17.3
95	10.6	190	17.9
100	11.8	195	17.6
105	12.5	200	17.9
110	13.7		

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

**Antenna factor  
Log periodic antenna  
Electro-Metrics, model LPA-25/30  
Ser.No.1988, HL 0034**

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
200	12.6	625	20.4
225	12.2	650	20.9
250	13.4	675	22.0
275	14.3	700	22.2
300	15.2	725	22.7
325	15.7	750	22.5
350	15.9	775	22.7
375	16.4	800	22.8
400	17.0	825	23.2
425	17.4	850	23.5
450	17.9	875	23.9
475	18.6	900	24.0
500	19.1	925	24.0
525	19.3	950	24.2
550	19.6	975	24.7
575	19.8	1000	25.1
600	20.0		

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

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

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

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ 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).

Antenna calibration  
Sunol Sciences Inc., model JB3, serial number A022805, HL 2697

Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain
30	22.2	-22.5	0.01	620	19.7	6.3	4.27	1215	24.9	7.0	5.05	1810	28.3	7.1	5.08	2405	30.9	6.9	4.93
35	18.5	-17.4	0.02	625	19.7	6.5	4.42	1220	24.9	7.0	4.99	1815	28.5	6.9	4.91	2410	30.9	6.9	4.89
40	14.7	-12.5	0.06	630	19.6	6.6	4.57	1225	25.1	6.9	4.91	1820	28.6	6.8	4.74	2415	31.0	6.9	4.85
45	11.3	-8.1	0.16	635	19.6	6.5	4.48	1230	25.2	6.8	4.82	1825	28.7	6.8	4.76	2420	31.0	6.8	4.82
45	11.3	-8.1	0.16	640	19.9	6.4	4.40	1235	25.1	7.0	4.96	1830	28.7	6.8	4.76	2425	31.1	6.8	4.81
50	8.9	-4.7	0.34	645	19.9	6.5	4.45	1240	25.0	7.1	5.09	1835	28.7	6.7	4.72	2430	31.0	6.9	4.87
55	7.9	-2.8	0.52	650	19.9	6.5	4.51	1245	25.0	7.1	5.12	1840	28.8	6.7	4.69	2435	31.0	6.9	4.88
60	7.8	-2.1	0.62	655	19.9	6.6	4.60	1250	25.0	7.1	5.15	1845	28.6	6.9	4.90	2440	31.2	6.8	4.74
65	8.5	2.0	0.63	660	19.9	6.7	4.69	1255	25.0	7.2	5.25	1850	28.4	7.1	5.12	2445	31.1	6.9	4.91
70	9.0	-1.9	0.64	665	19.9	6.7	4.70	1260	24.9	7.3	5.36	1855	28.5	7.0	5.07	2450	31.0	7.0	4.96
75	8.8	-1.1	0.78	670	20.0	6.7	4.71	1265	25.0	7.3	5.31	1860	28.6	7.0	5.01	2455	31.0	7.0	5.01
80	8.4	-0.2	0.97	675	20.1	6.7	4.71	1270	25.1	7.2	5.26	1865	28.5	7.1	5.17	2460	30.9	7.2	5.19
85	8.0	0.8	1.20	680	20.1	6.7	4.71	1275	25.3	7.0	5.05	1870	28.4	7.3	5.33	2465	31.1	6.9	4.95
90	8.2	1.1	1.29	685	20.1	6.8	4.79	1280	25.5	6.8	4.94	1875	28.4	7.2	5.28	2470	31.3	6.8	4.76
95	9.2	0.5	1.13	690	20.1	6.9	4.88	1285	25.4	7.0	4.97	1880	28.5	7.2	5.22	2475	31.4	6.7	4.69
100	10.6	-0.4	0.92	695	20.2	6.8	4.82	1290	25.3	7.1	5.10	1885	28.5	7.2	5.22	2480	31.3	6.8	4.79
110	12.6	-1.6	0.70	705	20.4	6.8	4.75	1300	25.2	7.3	5.33	1895	28.6	7.2	5.24	2490	31.1	7.0	4.99
120	13.9	-2.1	0.62	715	20.5	6.8	4.80	1310	25.5	7.1	5.09	1905	28.5	7.3	5.36	2500	30.9	7.2	5.27
125	14.2	-2.0	0.63	720	20.5	6.9	4.85	1315	25.6	7.2	5.23	1910	28.5	7.4	5.45	2505	31.1	7.1	5.15
130	14.2	-1.7	0.68	725	20.6	6.8	4.81	1320	25.3	7.3	5.36	1915	28.5	7.3	5.38	2510	31.0	7.2	5.22
140	13.4	-0.3	0.94	735	20.9	6.7	4.65	1330	25.6	7.0	5.06	1925	28.6	7.3	5.35	2520	31.2	7.0	5.05
150	12.9	0.8	1.21	745	21.0	6.6	4.59	1340	25.7	7.1	5.09	1935	28.5	7.4	5.64	2530	31.0	7.3	5.37
160	12.7	1.6	1.44	755	21.0	6.8	4.74	1350	25.7	7.1	5.09	1945	28.5	7.5	5.59	2540	31.2	7.1	5.08
165	12.0	2.0	1.59	760	21.0	6.8	4.83	1355	25.8	7.2	5.06	1950	28.5	7.4	5.48	2545	31.1	7.3	4.43
170	12.2	2.6	1.83	765	21.1	6.8	4.73	1360	25.9	6.9	4.95	1955	28.6	7.5	5.57	2550	31.0	7.3	5.39
175	11.8	3.3	2.13	770	21.3	6.7	4.64	1365	26.0	6.9	4.95	1960	28.6	7.5	5.65	2555	31.1	7.2	5.30
180	11.6	3.7	2.36	775	21.3	6.7	4.68	1370	26.0	7.0	4.96	1965	28.7	7.4	5.47	2560	31.0	7.4	5.47
185	11.5	4.0	2.54	780	21.3	6.7	4.72	1375	26.0	7.0	5.01	1970	28.9	7.2	5.29	2565	30.8	7.6	5.70
190	11.2	4.2	2.81	785	21.2	6.8	4.77	1380	26.1	7.2	5.27	1975	28.7	7.3	5.22	2570	31.0	7.3	5.32
200	13.1	3.2	2.07	795	21.4	6.8	4.79	1390	26.1	6.9	4.92	1985	29.1	7.1	5.11	2580	31.6	6.9	4.87
205	12.0	4.4	2.76	800	21.5	6.8	4.77	1395	26.2	6.9	4.94	1990	29.1	7.0	5.06	2585	31.6	6.8	4.79
210	11.0	5.6	3.66	805	21.6	6.7	4.71	1400	26.2	7.0	4.96	1995	29.1	7.1	5.09	2590	31.6	6.9	4.88
215	11.3	5.6	3.69	810	21.7	6.7	4.65	1405	26.1	7.0	4.92	2000	29.1	7.1	5.11	2595	31.5	7.0	4.97
220	11.6	5.5	3.53	815	21.7	6.7	4.72	1410	26.1	7.1	5.08	2005	29.5	7.1	5.16	2600	31.6	6.9	4.86
225	11.7	5.5	3.55	820	21.7	6.8	4.80	1415	26.2	7.0	5.02	2010	29.1	7.1	5.15	2605	31.3	7.2	5.30
230	11.9	5.5	3.57	825	21.7	6.8	4.82	1420	26.3	7.0	4.96	2015	29.2	7.1	5.13	2610	31.4	7.1	5.15
235	12.1	5.5	3.56	830	21.7	6.9	4.85	1425	26.2	7.1	5.10	2020	29.2	7.1	5.18	2615	31.7	6.9	4.88
240	12.3	5.5	3.54	835	21.8	6.8	4.82	1430	26.1	7.2	5.25	2025	29.3	7.1	5.08	2620	31.8	7.0	4.97
245	12.3	5.7	3.71	840	21.9	6.8	4.80	1435	26.1	7.2	5.24	2030	29.3	7.0	5.05	2625	31.4	7.1	5.17
250	12.3	5.9	3.88	845	21.9	6.8	4.83	1440	26.2	7.2	5.24	2035	29.3	7.1	5.07	2630	31.6	7.0	5.00
255	12.5	5.9	3.85	850	21.9	6.8	4.86	1445	26.3	7.1	5.11	2040	29.3	7.1	5.13	2635	31.6	6.8	4.82
260	12.7	5.8	3.83	855	22.0	6.8	4.80	1450	26.5	7.0	4.98	2045	29.2	7.2	5.23	2640	31.7	7.0	4.98
265	13.2	5.5	3.54	860	22.1	6.8	4.74	1455	26.4	7.1	5.07	2050	29.2	7.2	5.27	2645	31.7	6.9	4.93
270	13.7	5.2	3.27	865	22.0	6.9	4.92	1460	26.4	7.1	5.17	2055	29.3	7.2	5.21	2650	31.8	6.9	4.85
275	13.7	5.3	3.39	870	21.9	7.1	5.11	1465	26.4	7.2	5.19	2060	29.5	7.0	5.02	2655	31.8	6.9	4.85
280	13.7	5.4	3.50	875	22.0	7.1	5.08	1470	26.4	7.2	5.22	2065	29.4	7.1	5.08	2660	31.7	7.0	5.02
285	13.6	5.6	3.67	880	22.0	7.1	5.05	1475	26.4	7.1	5.14	2070	29.4	7.1	5.10	2665	31.6	6.7	4.71
290	13.7	5.7	3.72	885	22.1	7.0	5.06	1480	26.5	7.1	5.12	2075	29.5	7.0	5.10	2670	32.0	6.7	4.67
295	13.8	5.8	3.77	890	22.1	7.0	5.06	1485	26.5	7.1	5.14	2080	29.8	6.8	4.76	2675	31.9	6.8	4.81
300	13.9	5.8	3.81	895	22.2	7.1	5.09	1490	26.5	7.1	5.17	2085	29.7	6.9	4.89	2680	31.7	7.0	5.04
305	14.0	5.9	3.85	900	22.2	7.1	5.12	1495	26.5	7.2	5.24	2090	29.7	6.9	4.86	2685	31.9	6.8	4.83
310	14.1	5.9	3.88	905	22.3	7.1	5.09	1500	26.5	7.2	5.31	2095	29.8	6.8	4.78	2690	32.1	6.7	4.72
315	14.3	5.9	3.89	910	22.3	7.0	5.05	1505	26.5	7.2	5.27	2100	29.9	6.8	4.75	2695	32.1	6.7	4.71
320	14.4	5.9	3.90	915	22.4	7.0	4.99	1510	26.6	7.2	5.23	2105	29.8	6.8	4.81	2700	32.0	6.8	4.81
325	14.5	5.9	3.92	920	22.6	6.9	4.92	1515	26.6	7.2	5.20	2110	29.9	6.8	4.76	2705	32.0	6.8	4.80
330	14.6	5.9	3.93	925	22.7	6.9	4.85	1520	26.5	7.3	5.38	2115	29.9	6.8	4.76	2710	32.1	6.8	4.79
335	14.7	6.0	4.02	930	22.8	6.8	4.77	1525	26.6	7.3	5.37	2120	29.9	6.8	4.84	2715	32.1	6.7	4.71
340	14.7	6.2	4.12	935	22.8	6.8	4.83	1530	26.6	7.3	5.38	2125	29.9	6.9	4.89	2720	32.4	6.5	4.47
345	14.8	6.1	4.06	940	22.9	6.8	4.89	1535	26.6	7.4	5.44	2130	29.9	6.8	4.80	2725	32.2	6.7	4.63
350	15.1	6.0	3.99	945	22.8	6.9	4.87	1540	26.5	7.4	5.53	2135	29.8	6.9	4.94	2730	31.9	7.0	5.05
355	15.3	5.9	3.88	950	22.9	6.9	4.85	1545	26.5	7.5	5.58	2140	29.8	7.1	5.08	2735	31.6	7.4	5.44
360	15.6	5.8	3.78	955	23.0	6.8	4.81	1550	26.5	7.5	5.63	2145	29.9	6.9	4.92	2740	31.6	7.1	5.46
365	15.5	5.9	3.89	960	23.1	6.8	4.77	1555	26.7	7.3	5.39	2150	29.9	7.0	4.98	2745	31.9	7.0	5.06
370	15.5	6.0	4.01	965	23.1	6.7	4.73	1560	26.9	7.1	5.16	2155	29.8	7.1	5.05	2750	32.0	6.9	4.94
375	15.6	6.1	4.03	970	23.2	6.7	4.69	1565	26.9	7.2	5.23	2160	29.8	7.1	5.09	2755	32.0	7.0	4.98
380	15.7	6.1	4.05	975	23.2	6.8	4.82	1570	26.9	7.2	5.30	2165	29.9	7.0	5.00	2760	32.0	7.0	5.06
385	15.7	6.2	4.15	980	23.5	6.6	4.54	1575	27.0	7.2	5.23	2170	29.9	7.1	5.07	2765	32.2	6.8	4.80
390	15.7	6.3	4.25	985	23.5	6.6	4.52	1580	27.0	7.1	5.17	2175	29.8	7.2	5.20	2770	32.3	6.8	



**Cable loss**  
**Cable coaxial, Bird, 18 GHz, N-type, M-F, model TC-MNFN-3.0, S/N 211539 001**  
**HL 2882**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.08	5750	1.78	12000	2.57
30	0.12	6000	1.84	12250	2.62
100	0.22	6250	1.87	12500	2.66
250	0.35	6500	1.92	12750	2.68
500	0.49	6750	1.96	13000	2.67
750	0.60	7000	2.01	13250	2.75
1000	0.68	7250	2.08	13500	2.77
1250	0.78	7500	2.12	13750	2.90
1500	0.85	7750	2.19	14000	3.00
1750	0.92	8000	2.22	14250	3.12
2000	0.98	8250	2.28	14500	2.98
2250	1.06	8500	2.29	14750	3.03
2500	1.11	8750	2.27	15000	2.99
2750	1.19	9000	2.28	15250	2.99
3000	1.25	9250	2.26	15500	2.98
3250	1.30	9500	2.29	15750	2.98
3500	1.34	9750	2.33	16000	2.99
3750	1.40	10000	2.34	16250	3.05
4000	1.45	10250	2.41	16500	3.11
4250	1.51	10500	2.46	16750	3.18
4500	1.54	10750	2.48	17000	3.23
4750	1.59	11000	2.48	17250	3.21
5000	1.63	11250	2.52	17500	3.22
5250	1.68	11500	2.53	17750	3.22
5500	1.72	11750	2.56	18000	3.25





**Cable loss**  
**Cable coaxial, Bird, 18 GHz, N-type, M-F, model TC-MNFN-3.0, S/N 211539 003**  
**HL 2883**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	5750	1.70	12000	2.46
30	0.12	6000	1.75	12250	2.48
100	0.21	6250	1.80	12500	2.52
250	0.34	6500	1.81	12750	2.50
500	0.47	6750	1.86	13000	2.54
750	0.59	7000	1.86	13250	2.48
1000	0.67	7250	1.92	13500	2.63
1250	0.76	7500	1.96	13750	2.65
1500	0.84	7750	1.98	14000	2.72
1750	0.92	8000	2.02	14250	2.67
2000	0.98	8250	2.03	14500	2.70
2250	1.05	8500	2.05	14750	2.72
2500	1.12	8750	2.11	15000	2.79
2750	1.17	9000	2.17	15250	2.80
3000	1.22	9250	2.17	15500	2.83
3250	1.27	9500	2.20	15750	2.75
3500	1.33	9750	2.19	16000	2.82
3750	1.38	10000	2.22	16250	2.85
4000	1.42	10250	2.25	16500	2.90
4250	1.46	10500	2.30	16750	2.89
4500	1.51	10750	2.28	17000	2.88
4750	1.54	11000	2.32	17250	2.85
5000	1.59	11250	2.34	17500	2.96
5250	1.62	11500	2.39	17750	3.04
5500	1.65	11750	2.42	18000	3.04



**Cable loss**  
**Cable coaxial, Gore, 18 GHz, 1.2 m, SMA-SMA, S/N 10020014**  
**HL 2952**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.03	5750	0.97	12000	1.50
30	0.05	6000	1.01	12250	1.45
100	0.11	6250	1.03	12500	1.48
250	0.19	6500	1.06	12750	1.57
500	0.26	6750	1.08	13000	1.51
750	0.32	7000	1.10	13250	1.64
1000	0.38	7250	1.13	13500	1.60
1250	0.43	7500	1.13	13750	1.63
1500	0.47	7750	1.21	14000	1.59
1750	0.53	8000	1.20	14250	1.66
2000	0.55	8250	1.24	14500	1.60
2250	0.59	8500	1.29	14750	1.65
2500	0.63	8750	1.23	15000	1.72
2750	0.66	9000	1.27	15250	1.68
3000	0.69	9250	1.27	15500	1.73
3250	0.72	9500	1.29	15750	1.70
3500	0.75	9750	1.30	16000	1.82
3750	0.78	10000	1.38	16250	1.79
4000	0.82	10250	1.44	16500	1.81
4250	0.84	10500	1.47	16750	1.91
4500	0.86	10750	1.45	17000	1.92
4750	0.90	11000	1.50	17250	1.98
5000	0.91	11250	1.46	17500	2.05
5250	0.94	11500	1.47	17750	2.04
5500	0.96	11750	1.44	18000	2.05

**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 3123**

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	0.11	3600	1.97	7400	3.12	11200	3.90	15100	4.74
30	0.17	3700	1.97	7500	3.13	11300	3.93	15200	4.70
50	0.25	3800	2.03	7600	3.16	11400	3.88	15300	4.73
100	0.32	3900	2.04	7700	3.18	11500	3.87	15400	4.78
200	0.46	4000	2.10	7800	3.20	11600	3.90	15500	4.75
300	0.58	4100	1.97	7900	3.23	11700	3.86	15600	4.76
400	0.65	4200	1.97	8000	3.25	11800	3.88	15700	4.75
500	0.74	4300	2.03	8100	3.26	11900	3.86	15800	4.78
600	0.82	4400	2.04	8200	3.28	12000	3.89	15900	4.79
700	0.89	4500	2.10	8300	3.31	12100	3.94	16000	4.73
800	0.95	4600	1.97	8400	3.31	12200	3.92	16100	4.78
900	1.01	4700	1.97	8500	3.32	12300	3.96	16200	4.84
1000	1.07	4800	2.03	8600	3.34	12400	4.01	16300	4.90
1100	1.11	4900	2.04	8700	3.35	12500	4.07	16400	4.87
1200	1.17	5000	2.10	8800	3.37	12600	4.08	16500	4.90
1300	1.22	5100	2.53	8900	3.39	12700	4.17	16600	4.98
1400	1.27	5200	2.55	9000	3.42	12800	4.26	16700	5.05
1500	1.29	5300	2.60	9100	3.43	12900	4.16	16800	5.04
1600	1.35	5400	2.61	9200	3.51	13000	4.21	16900	5.02
1700	1.40	5500	2.64	9300	3.52	13100	4.24	17000	5.09
1800	1.44	5600	2.70	9400	3.54	13200	4.27	17100	5.07
1900	1.51	5700	2.67	9500	3.63	13300	4.31	17200	5.10
2000	1.49	5800	2.71	9600	3.61	13400	4.33	17300	5.13
2100	1.55	5900	2.74	9700	3.71	13500	4.25	17400	5.23
2200	1.58	6000	2.80	9800	3.66	13600	4.27	17500	5.21
2300	1.62	6100	2.79	9900	3.77	13700	4.33	17600	5.22
2400	1.72	6200	2.81	10000	3.75	13800	4.33	17700	5.36
2500	1.76	6300	2.83	10100	3.77	13900	4.31	17800	5.35
2600	1.78	6400	2.86	10200	3.80	14000	4.30	17900	5.45
2700	1.80	6500	2.88	10300	3.79	14100	4.30	18000	5.43
2800	1.86	6600	2.90	10400	3.87	14200	4.31		
2900	1.90	6700	2.92	10500	3.83	14300	4.37		
3000	1.90	6800	2.98	10600	3.88	14400	4.35		
3100	1.97	6900	2.98	10700	3.86	14600	4.53		
3200	1.97	7000	3.00	10800	3.87	14700	4.50		
3300	2.03	7100	3.02	10900	3.90	14800	4.62		
3400	2.04	7200	3.04	11000	3.84	14900	4.65		
3500	2.10	7300	3.06	11100	3.88	15000	4.79		

**Cable loss**  
Cable coaxial, GORE, PHASEFLEX, 40 GHz, 0.95 m, SMA-SMA, S/N 03771245  
HL 3559

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
30	0.08	10000	0.96	20500	1.59	31000	2.24
100	0.10	10500	0.99	21000	1.63	31500	2.71
500	0.22	11000	1.02	21500	1.70	32000	2.47
1000	0.32	11500	1.07	22000	1.71	32500	2.37
1500	0.40	12000	1.13	22500	1.60	33000	2.35
2000	0.41	12500	1.16	23000	1.58	33500	2.34
2500	0.44	13000	1.26	23500	1.64	34000	2.31
3000	0.53	13500	1.26	24000	1.68	34500	2.43
3500	0.54	14000	1.22	24500	1.79	35000	2.45
4000	0.62	14500	1.26	25000	1.86	35500	2.48
4500	0.62	15000	1.27	25500	1.77	36000	3.60
5000	0.67	15500	1.29	26000	1.78	36500	2.62
5500	0.70	16000	1.39	26500	1.83	37000	2.45
6000	0.72	16500	1.50	27000	1.87	37500	2.47
6500	0.76	17000	1.49	27500	1.97	38000	2.38
7000	0.83	17500	1.37	28000	2.69	38500	2.41
7500	0.85	18000	1.40	28500	1.94	39000	2.56
8000	0.89	18500	1.41	29000	2.02	39500	2.71
8500	0.91	19000	1.48	29500	2.05	40000	2.69
9000	0.95	19500	1.61	30000	2.11		
9500	0.96	20000	1.59	30500	2.11		

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

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

**Cable loss**  
**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		

## 14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB( $\mu$ 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	narrow band
NT	not tested
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

END OF DOCUMENT