

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90

FOR:

**Airspan Networks (Israel) Ltd.
Base station
Model: MicroMax 4.9 GHz TDD Int.**

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.
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1 Applicant information

Client name: Airspan Networks (Israel) Ltd.
Address: 1, Harava street, "Unitronics" building, POB 199, Airport City, 70100, Israel
Telephone: +972 3977 7444
Fax: +972 3977 7400
E-mail: zlevi@Airspan.com
Contact name: Mr. Zion Levi

2 Equipment under test attributes

Product name: Base station
Product type: Transceiver
Model(s): MicroMax 4.9 GHz TDD Int.
Receipt date 2/20/2008

3 Manufacturer information

Manufacturer name: Airspan Networks (Israel) Ltd.
Address: 1, Harava street, "Unitronics" building, POB 199, Airport City, 70100, Israel
Telephone: +972 3977 7444
Fax: +972 3977 7400
E-Mail: zlevi@Airspan.com
Contact name: Mr. Zion Levi

4 Test details

Project ID: 18559
Location: Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started: 2/20/2008
Test completed: 4/6/2008
Test specification(s): 47CFR part 90 subpart Y:2007

5 Tests summary

Test	Status
Transmitter characteristics	
Section 90.205, 90.1215 Maximum output power and peak power spectral density	Pass
Section 90.209, Occupied bandwidth	Pass
Section 90.210 (m), Emission mask	Pass
Section 90.210, Conducted spurious emissions	Pass
Section 90.210, Radiated spurious emissions	Pass
Section 90.213, Frequency stability	Pass
Section 90.214, Transient frequency behaviour	Not required
Section 2.1091, RF radiation exposure evaluation	Pass, provided in Application for certification exhibit

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: AIRRAD_FCC.18559.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	April 6, 2008	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	April 8, 2008	
Approved by:	Mr. M. Nikishin, EMC and Radio group leader	April 9, 2008	

6 EUT description

6.1 General information

The EUT, base station radio, MicroMAX 4.9GHz TDD Int., is part of a WiMAX broadband fixed cellular wireless access system. The system provides a radio link between an end-user (a subscriber) and a network to give high-speed data access. The MicroMAX's transceiver/receiver (Up to 64 QAM modulation, data rate up to 37Mbps) uses OFDM and operating in TDD duplexing mode. The EUT is an outdoor unit powered from the mains via AC/DC adapter

6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length
		From	To				
Signal	48 V DC& Ethernet	EUT	SDA	D-type 15 pin	1	unshielded	10 m
Signal	RS232	EUT	Laptop	D-type 9 pin	1	unshielded	0.2 m
RF	Antenna	EUT	50 Ohm termination	N-type	1	NA	NA

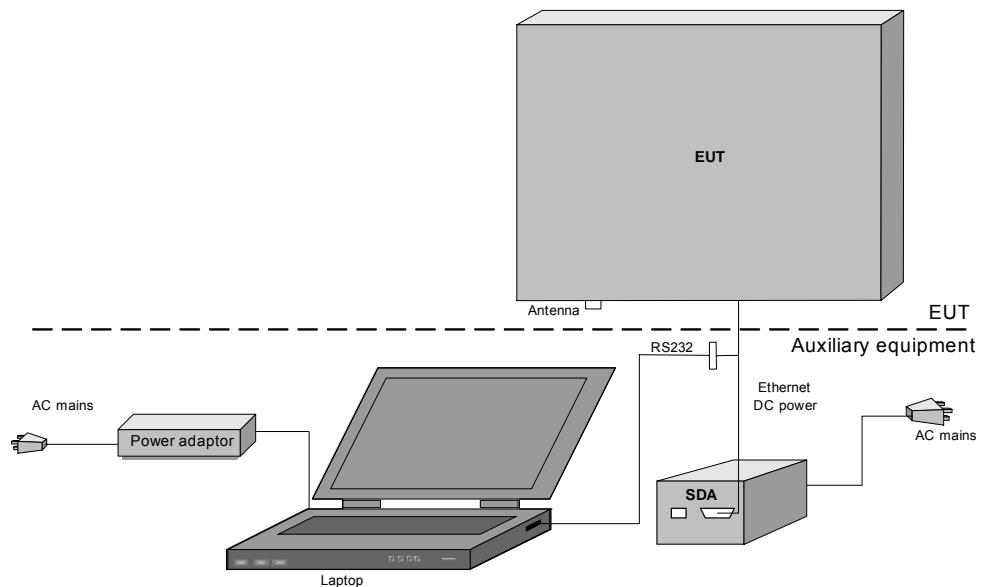
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	IBM	T42	99FXZFK
SDA	Airspan	SDA-4S	752D6C0444
AC/DC adapter	IBM	92P1044	APT6A84Y6

6.4 Changes made in the EUT

No changes were implemented.

6.5 Test configuration



6.6 Transmitter characteristics

Type of equipment			
<input checked="" type="checkbox"/> Stand-alone (Equipment with or without its own control provisions)			
Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)			
Plug-in card (Equipment intended for a variety of host systems)			
Intended use	Condition of use		
<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		
Assigned frequency range		4940 – 4990 MHz	
Operating frequency range		4942.5 – 4987.5 MHz (5 MHz CBW), 4947.5 – 4982.5 MHz (10 MHz CBW)	
RF channel spacing		5 MHz, 10 MHz	
Maximum rated output power		At transmitter 50 Ω RF output connector	26.4 dBm
Is transmitter output power variable?		No	
			continuous variable
		<input checked="" type="checkbox"/> V	stepped variable with stepsize 0.5 dB
			minimum RF power 0 dBm
			maximum RF power 26.4 dBm
Antenna connection			
unique coupling	standard connector	<input checked="" type="checkbox"/> V	Integral with temporary RF connector without temporary RF connector
Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Integral	MARS	MA-WC55-AS16	14.5 dBi
Transmitter 99% power bandwidth		5 MHz, 10 MHz	
Transmitter aggregate data rate/s		5 MHz BW: BPSK – 2.095 MBps, QPSK - 4.19 MBps, 16QAM – 12.565 MBps, 64QAM – 18.85 MBps 10 MHz BW: BPSK - 4.19 MBps, QPSK-8.38 MBps, 16QAM - 25.13 MBps, 64QAM - 37.7 MBps	
Type of modulation		BPSK, QPSK, 16QAM, 64QAM	
Type of multiplexing		OFDM	
Modulating test signal (baseband)		PRBS	
Maximum transmitter duty cycle in normal use		90%	
Transmitter power source			
	Nominal rated voltage		Battery type
<input checked="" type="checkbox"/> V DC	Nominal rated voltage	48 VDC from SDA unit powered by 120 VAC	
AC mains	Nominal rated voltage	Frequency	Hz
Common power source for transmitter and receiver		<input checked="" type="checkbox"/> V	yes
			no

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks:			

7 Transmitter tests according to 47CFR part 90 requirements

7.1 Peak output power and power spectral density tests

7.1.1 General

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

Table 7.1.1 Peak output power and spectral density limits

Assigned frequency range, MHz	Channel bandwidth, MHz	Maximum peak output power		Power spectral density, dBm/MHz
		mW	dBm	
4940.0 – 4990.0	5	500	27.0	21
	10	1000	30.0	

*- If transmitting antennas of directional gain greater than 9 dBi are used, both the peak output power and peak power spectral density limit should be reduced below the stated value as follows:

by the amount in dB that the directional gain of antenna exceeds 9 dBi;
without any corresponding reduction for fixed point-to-point and point-to-multipoint transmitters employing antennas with directional gain up to 26 dBi;
corresponding reduction in the peak output power and peak power spectral density limit should be the amount in dB that the directional gain of antenna exceeds 26 dBi.

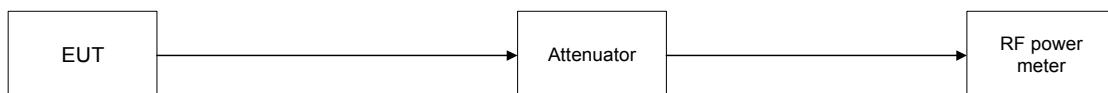
7.1.2 Test procedure

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

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

7.1.2.3 The peak output power was measured with a peak power meter as provided in Table 7.1.2, Table 7.1.4, and associated plots. The power spectral density was measured with power meter as provided in Table 7.1.3, Table 7.1.5 and associated plots.

Figure 7.1.1 Peak output power test setup



Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Table 7.1.2 Peak output power test results for 5 MHz channel bandwidth

ASSIGNED FREQUENCY RANGE:

4940 – 4990 MHz

DETECTOR USED:

Peak power meter

MODULATION:

BPSK, 4QAM (QPSK), 16QAM, 64QAM

MODULATING SIGNAL:

PRBS

TRANSMITTER OUTPUT POWER SETTINGS:

Maximum

Carrier frequency, MHz	Power meter reading, dBm	External attenuation, dB	Cable loss, dB	RF output power, dBm	Limit, dBm	Margin, dB	Verdict
64QAM, Bit Rate: 18.85 Mbps							
4942.5	23.01	included	included	23.01	27.00	-3.99	Pass
4967.5	22.81	included	included	22.81	27.00	-4.19	Pass
4987.5	22.68	included	included	22.68	27.00	-4.32	Pass
16QAM, Bit Rate: 12.565 Mbps							
4942.5	21.82	included	included	21.82	27.00	-5.18	Pass
4967.5	22.13	included	included	22.13	27.00	-4.87	Pass
4987.5	21.77	included	included	21.77	27.00	-5.23	Pass
4QAM (QPSK), Bit Rate: 4.19 Mbps							
4942.5	22.07	included	included	22.07	27.00	-4.93	Pass
4967.5	21.94	included	included	21.94	27.00	-5.06	Pass
4987.5	21.30	included	included	21.30	27.00	-5.70	Pass
BPSK, Bit Rate: 2.095 Mbps							
4942.5	21.13	included	included	21.13	27.00	-5.87	Pass
4967.5	21.32	included	included	21.32	27.00	-5.68	Pass
4987.5	21.24	included	included	21.24	27.00	-5.76	Pass

Reference numbers of test equipment used

HL 1424	HL 3208	HL 3437	HL 3440				
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Full description is given in Appendix A.

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/02/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Table 7.1.3 Power spectral density test results for 5 MHz channel bandwidth

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 VIDEO BANDWIDTH: 3000 kHz
 MODULATION: BPSK, 4QAM, 16QAM, 64QAM
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm	Attenuation, dB	Cable loss, dB	Power density, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
64QAM, Bit Rate: 18.85 Mbps							
4942.5	14.83	included	included	14.83	21	-6.17	Pass
4967.5	14.33	included	included	14.33	21	-6.67	Pass
4987.5	14.00	included	included	14.00	21	-7.00	Pass
16QAM, Bit Rate: 12.565 Mbps							
4942.5	14.00	included	included	14.00	21	-7.00	Pass
4967.5	14.17	included	included	14.17	21	-6.83	Pass
4987.5	13.83	included	included	13.83	21	-7.17	Pass
4QAM, Bit Rate: 4.19 Mbps							
4942.5	14.17	included	included	14.17	21	-6.83	Pass
4967.5	14.33	included	included	14.33	21	-6.67	Pass
4987.5	13.83	included	included	13.83	21	-7.17	Pass
BPSK, Bit Rate: 2.095 Mbps							
4942.5	14.33	included	included	14.33	21	-6.67	Pass
4967.5	14.17	included	included	14.17	21	-6.83	Pass
4987.5	14.00	included	included	14.00	21	-7.00	Pass

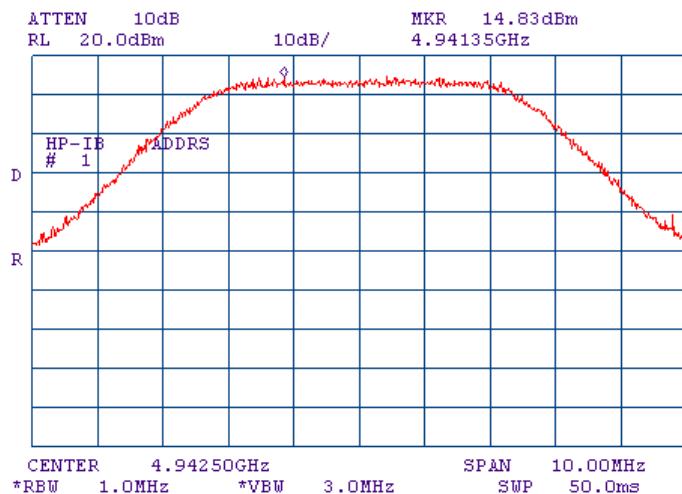
Reference numbers of test equipment used

HL 3208	HL 3301	HL 3302	HL 3437	HL 3440			
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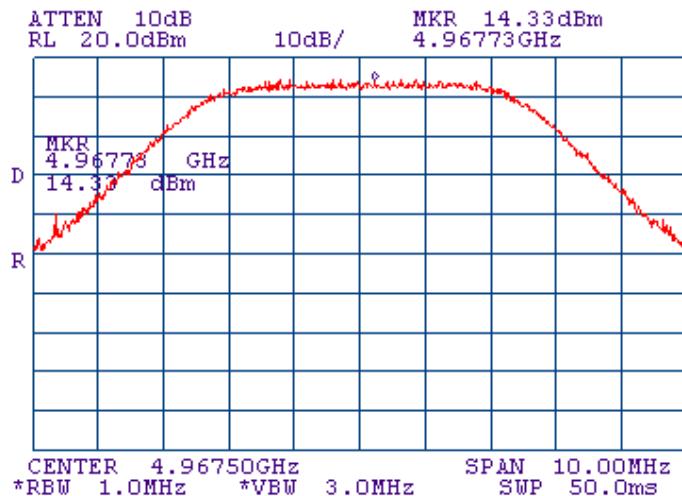
Full description is given in Appendix A.

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/02/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.1 Peak output power test results at low frequency, 64QAM, Bit Rate: 18.85 Mbps

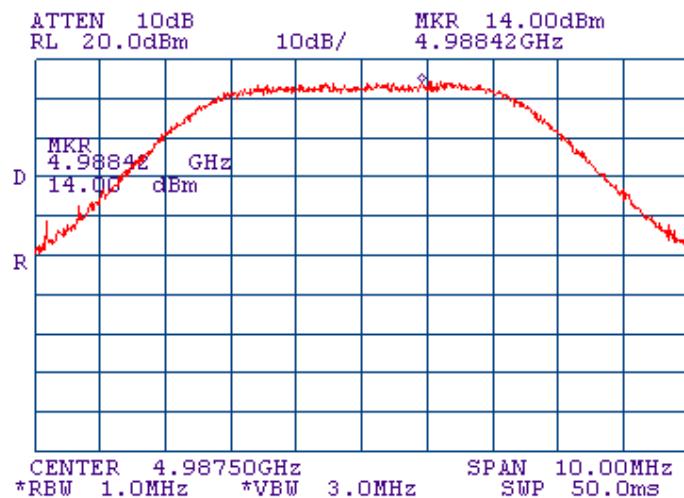


Plot 7.1.2 Peak output power test results at mid frequency, 64QAM, Bit Rate: 18.85 Mbps

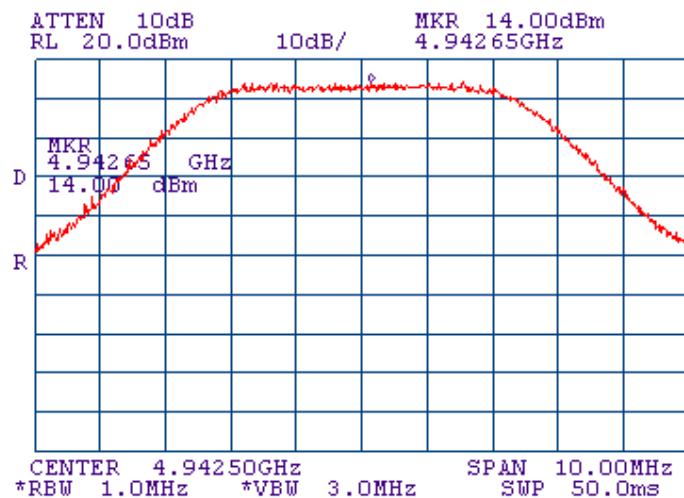


Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/02/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.3 Peak output power test results at high frequency, 64QAM Bit Rate: 18.85 Mbps



Plot 7.1.4 Peak output power test results at low frequency, 16QAM Bit Rate:12.565 Mbps



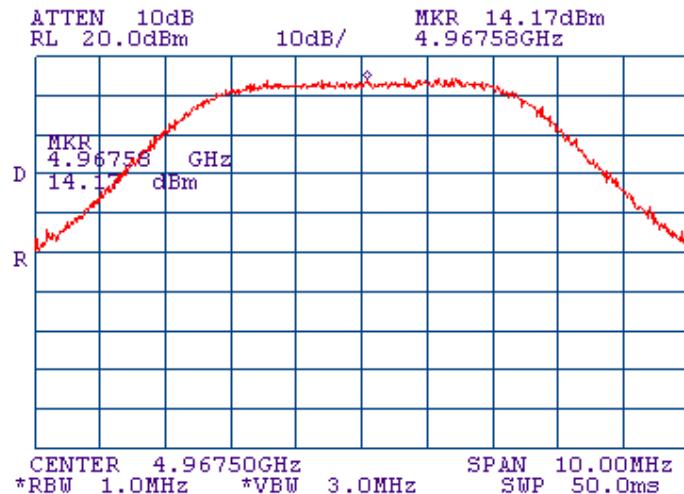


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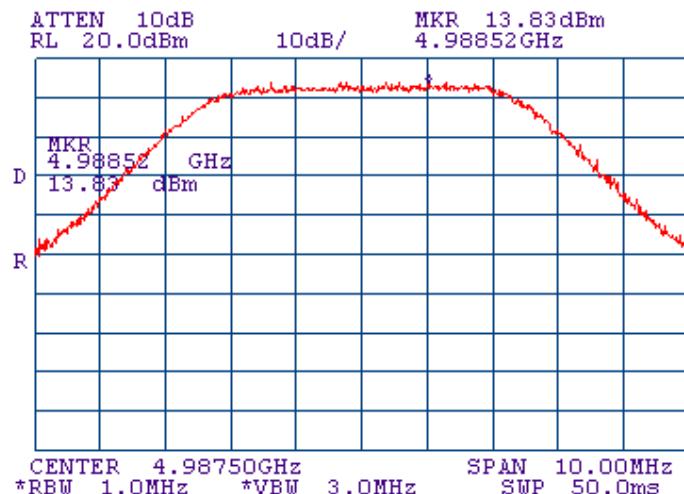
Report ID: AIRRAD_FCC.18559_rev1.doc
Date of Issue: April 2008

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/02/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.5 Peak output power test results at mid frequency, 16QAM Bit Rate: 12.565 Mbps

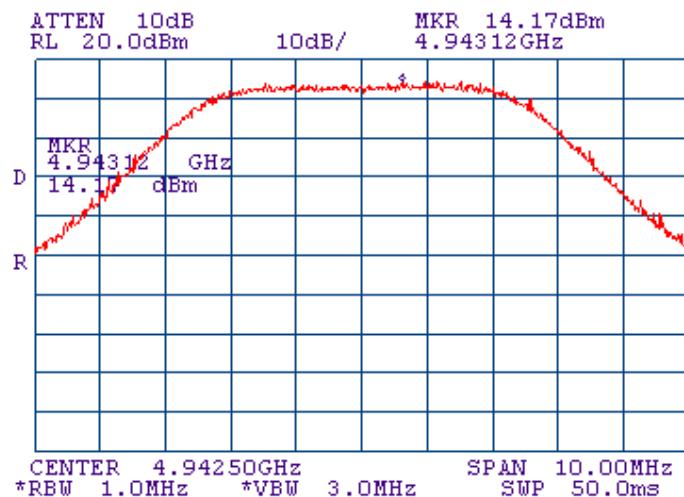


Plot 7.1.6 Peak output power test results at high frequency, 16QAM Bit Rate: 12.565 Mbps

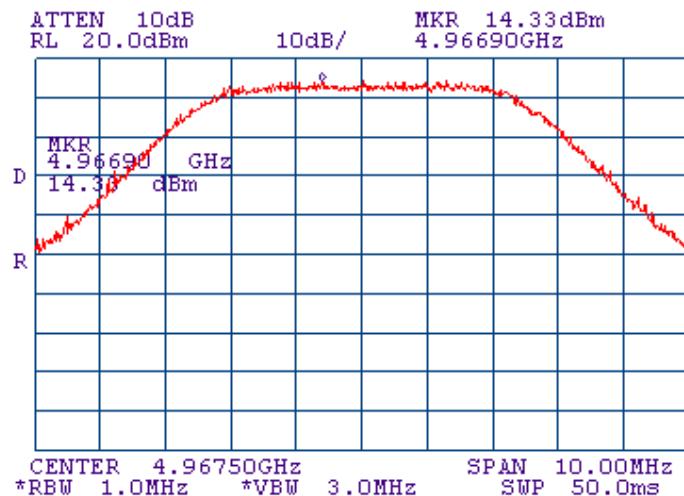


Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.7 Peak output power test results at low frequency, QPSK Bit Rate: 4.19 Mbps

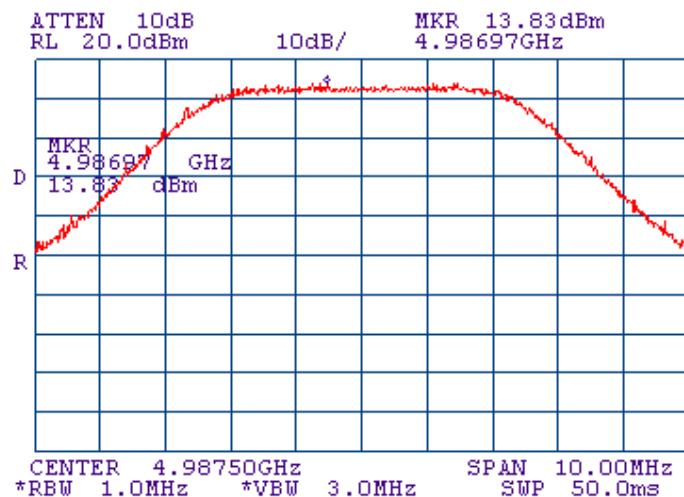


Plot 7.1.8 Peak output power test results at mid frequency, QPSK Bit Rate: 4.19 Mbps

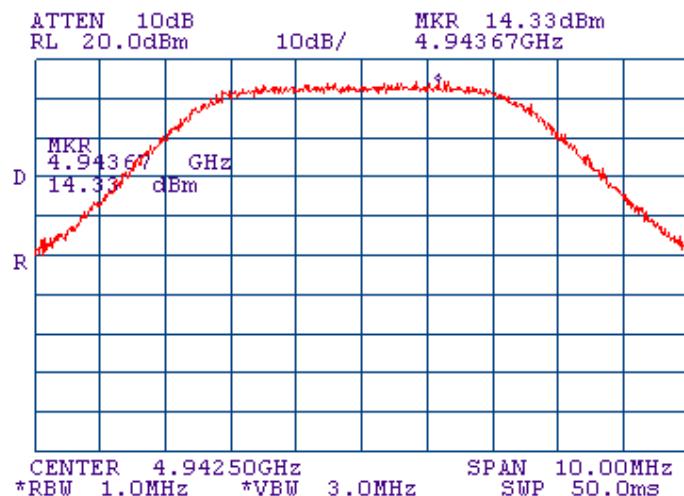


Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.9 Peak output power test results at high frequency, QPSK Bit Rate: 4.19 Mbps

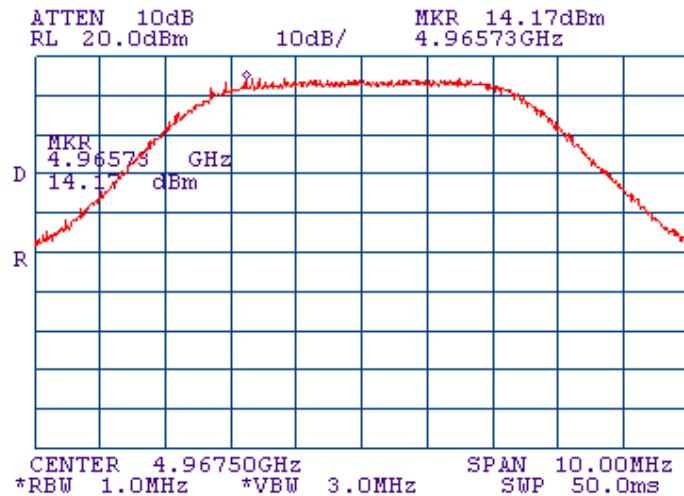


Plot 7.1.10 Peak output power test results at low frequency, BPSK, Bit Rate: 2.095 Mbps

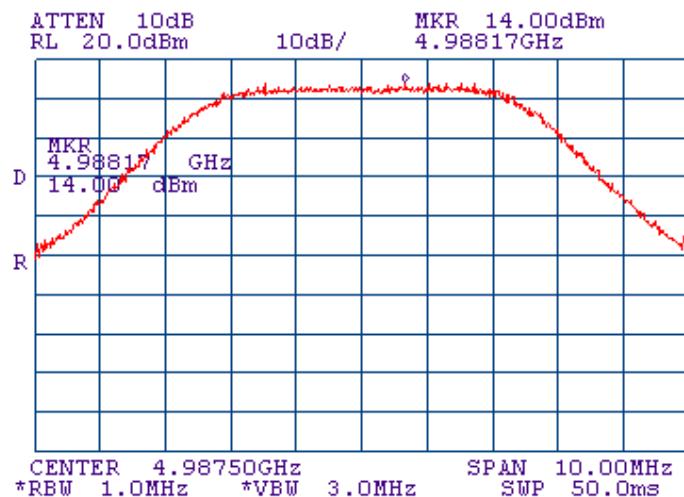


Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/02/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.11 Peak output power test results at mid frequency, BPSK Bit Rate: 2.095 Mbps



Plot 7.1.12 Peak output power test results at high frequency, BPSK Bit Rate: 2.095 Mbps



Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Table 7.1.4 Peak output power test results for 10 MHz channel bandwidth

ASSIGNED FREQUENCY RANGE:

4940 – 4990 MHz

DETECTOR USED:

Peak power meter

MODULATION:

BPSK, 4QAM, 16QAM, 64QAM

MODULATING SIGNAL:

PRBS

TRANSMITTER OUTPUT POWER SETTINGS:

Maximum

Carrier frequency, MHz	Power meter reading, dBm	External attenuation, dB	Cable loss, dB	RF output power, dBm	Limit, dBm	Margin, dB	Verdict
64QAM, Bit Rate: 37.7 Mbps							
4947.5	25.10	included	included	25.10	30.00	-4.90	Pass
4967.5	24.85	included	included	24.85	30.00	-5.15	Pass
4982.5	25.32	included	included	25.32	30.00	-4.68	Pass
16QAM, Bit Rate: 25.13 Mbps							
4947.5	25.10	included	included	25.10	30.00	-4.90	Pass
4967.5	24.85	included	included	24.85	30.00	-5.15	Pass
4982.5	25.32	included	included	25.32	30.00	-4.68	Pass
4QAM (QPSK), Bit Rate: 8.38 Mbps							
4947.5	26.42	included	included	26.42	30.00	-3.58	Pass
4967.5	26.22	included	included	26.22	30.00	-3.78	Pass
4982.5	26.18	included	included	26.18	30.00	-3.82	Pass
BPSK, Bit Rate: 4.19 Mbps							
4947.5	26.01	included	included	26.01	30.00	-3.99	Pass
4967.5	25.93	included	included	25.93	30.00	-4.07	Pass
4982.5	25.81	included	included	25.81	30.00	-4.19	Pass

Reference numbers of test equipment used

HL 1424	HL 3208	HL 3437	HL 3440				
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Full description is given in Appendix A.

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Table 7.1.5 Power spectral density test results for 10 MHz channel bandwidth

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 VIDEO BANDWIDTH: 3000 kHz
 MODULATION: BPSK, 4QAM, 16QAM, 64QAM
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm/Hz	Attenuation, dB	Cable loss, dB	Power density, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
64QAM, Bit Rate: 37.7 Mbps							
4947.5	12.00	included	included	12.00	21	-9.00	Pass
4967.5	12.67	included	included	12.67	21	-8.33	Pass
4982.5	11.83	included	included	11.83	21	-9.17	Pass
16QAM, Bit Rate: 25.13 Mbps							
4947.5	12.17	included	included	12.17	21	-8.83	Pass
4967.5	11.67	included	included	11.67	21	-9.33	Pass
4982.5	11.50	included	included	11.50	21	-9.50	Pass
4QAM, Bit Rate: 8.38 Mbps							
4947.5	12.00	included	included	12.00	21	-9.00	Pass
4967.5	12.00	included	included	12.00	21	-9.00	Pass
4982.5	11.50	included	included	11.50	21	-9.50	Pass
BPSK, Bit Rate: 4.19 Mbps							
4947.5	11.67	included	included	11.67	21	-9.33	Pass
4967.5	11.33	included	included	11.33	21	-9.67	Pass
4982.5	11.00	included	included	11.00	21	-10.00	Pass

Reference numbers of test equipment used

HL 3208	HL 3301	HL 3302	HL 3437	HL 3440		
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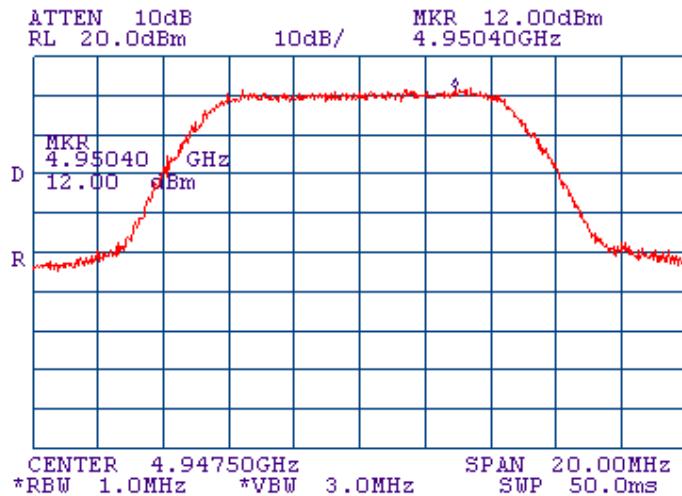
Full description is given in Appendix A.



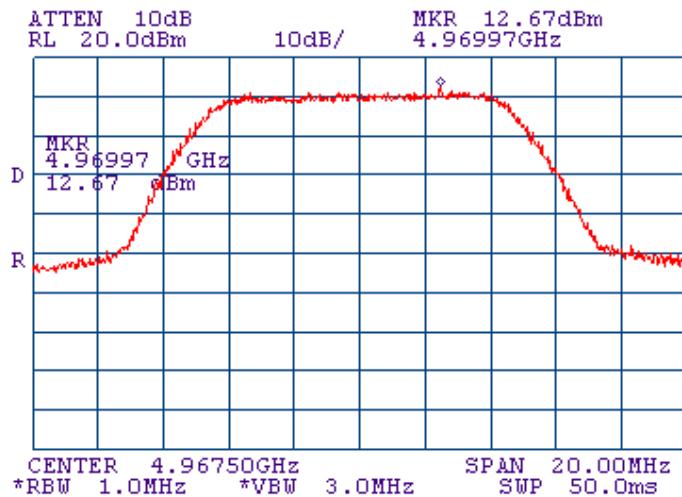
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Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.13 Peak output power test results at low frequency, 64QAM, Bit Rate: 37.7 Mbps



Plot 7.1.14 Peak output power test results at mid frequency, 64QAM, Bit Rate: 37.7 Mbps

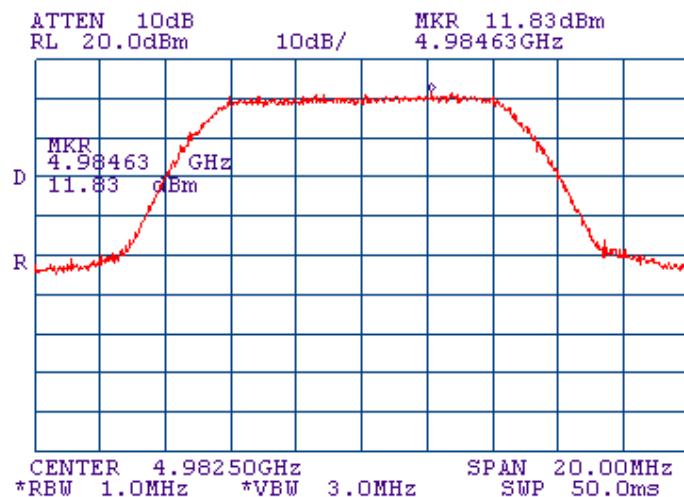




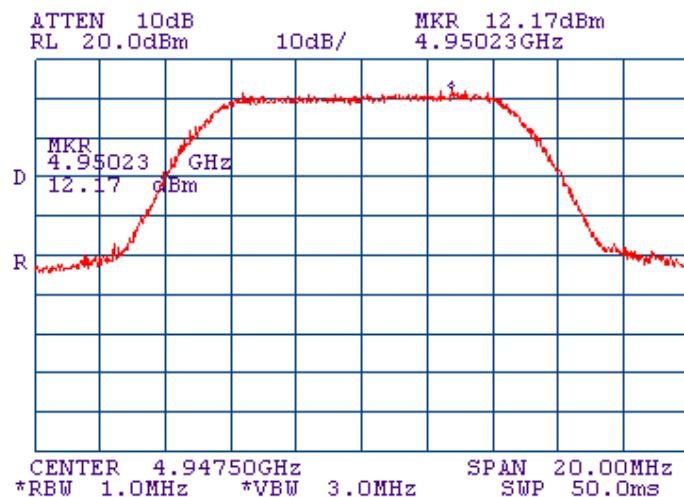
HERMON LABORATORIES

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.15 Peak output power test results at high frequency, 64QAM Bit Rate: 37.7 Mbps

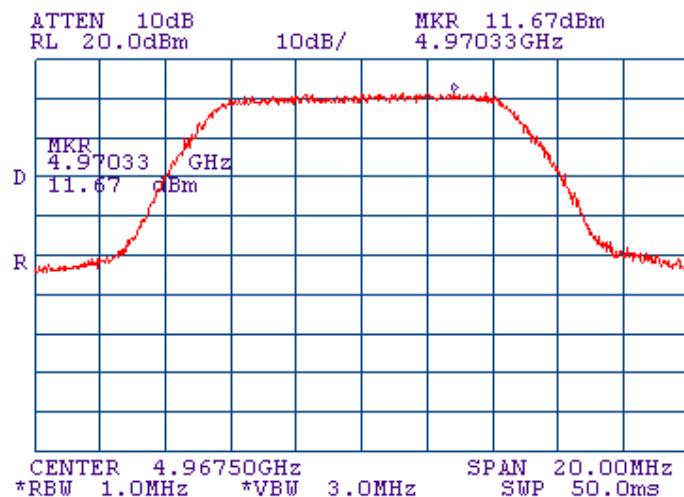


Plot 7.1.16 Peak output power test results at low frequency, 16QAM Bit Rate: 25.13 Mbps

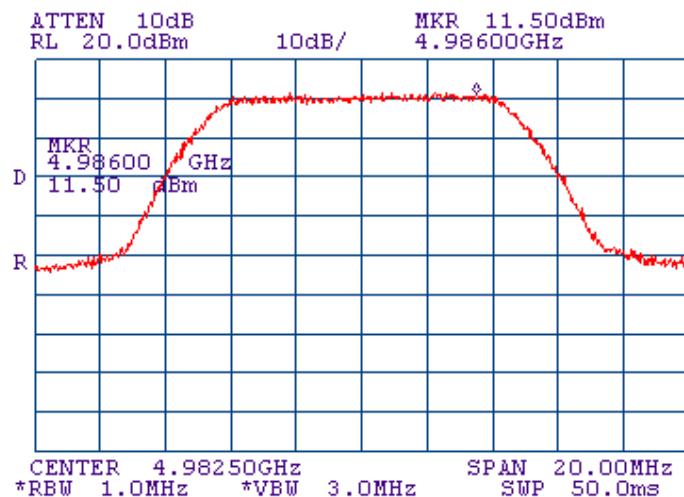


Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.17 Peak output power test results at mid frequency, 16QAM Bit Rate: 25.13 Mbps



Plot 7.1.18 Peak output power test results at high frequency, 16QAM Bit Rate: 25.13 Mbps

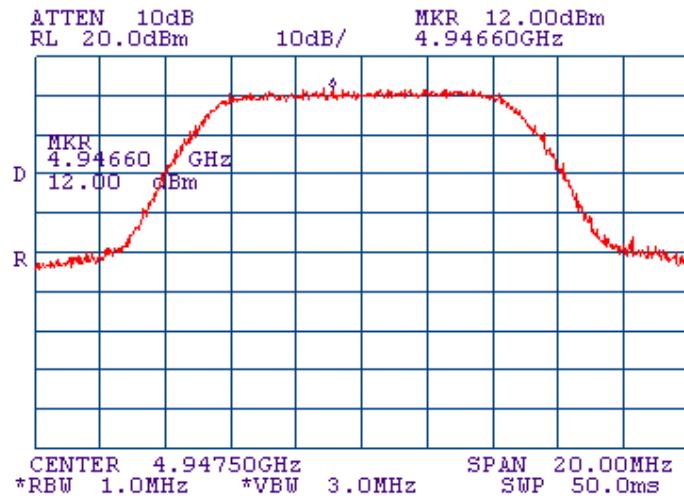




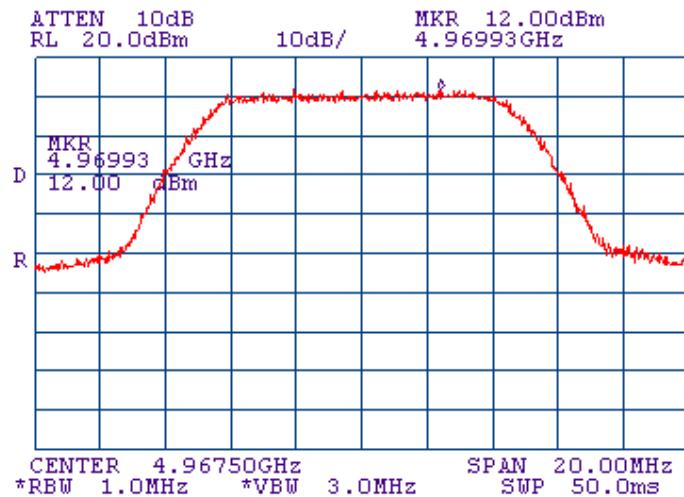
HERMON LABORATORIES

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.19 Peak output power test results at low frequency, QPSK Bit Rate: 8.38 Mbps



Plot 7.1.20 Peak output power test results at mid frequency, QPSK Bit Rate: 8.38 Mbps

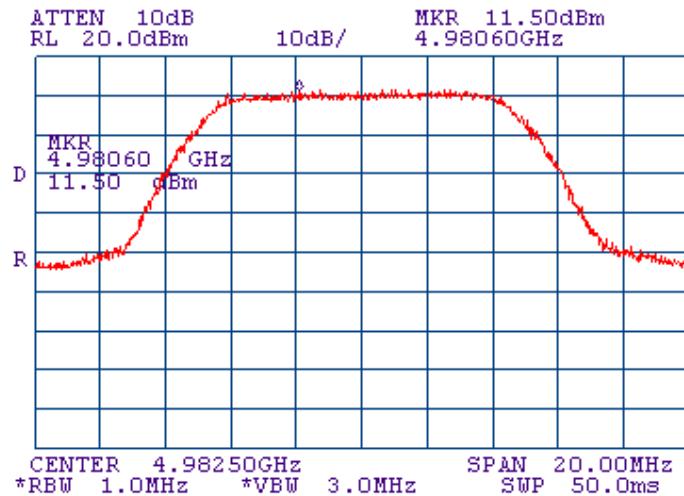




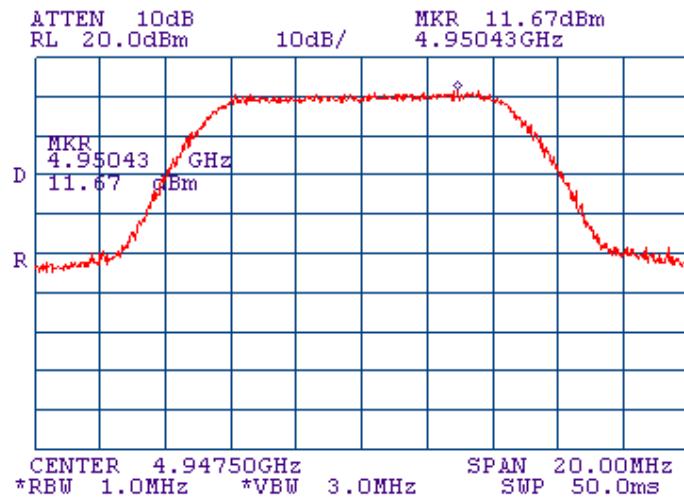
HERMON LABORATORIES

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	
Date:	4/02/2008	PASS	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.21 Peak output power test results at high frequency, QPSK Bit Rate: 8.38 Mbps



Plot 7.1.22 Peak output power test results at low frequency, BPSK, Bit Rate: 4.19 Mbps

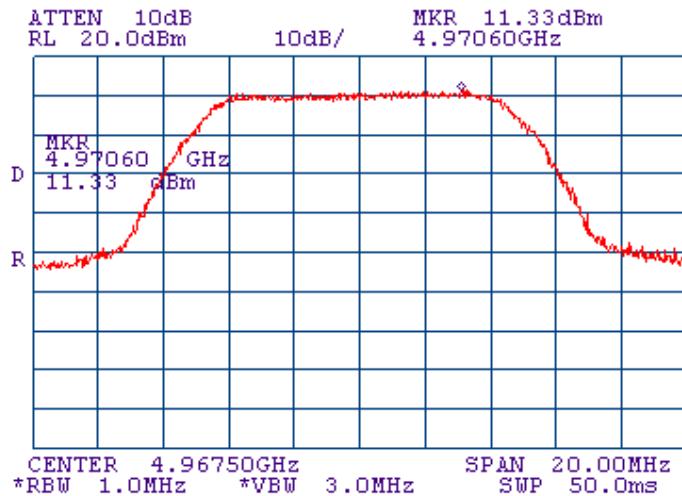




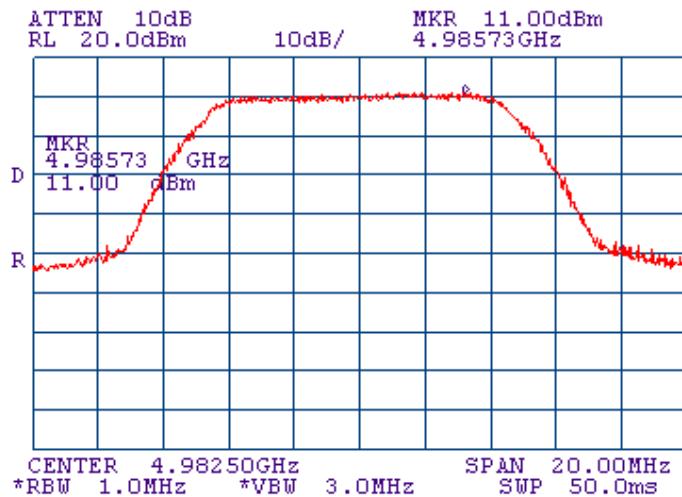
HERMON LABORATORIES

Test specification:	Section 90.1215, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/02/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 42%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.23 Peak output power test results at mid frequency, BPSK Bit Rate: 4.19 Mbps



Plot 7.1.24 Peak output power test results at high frequency, BPSK Bit Rate: 4.19 Mbps



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

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

Table 7.2.1 Occupied bandwidth limits

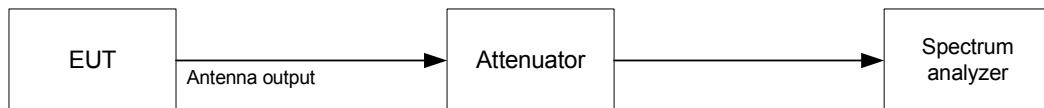
Assigned frequency, MHz	Modulation envelope reference points*, dBc	Channel bandwidth, MHz	Maximum allowed bandwidth, MHz
4940 – 4990	26	5	5
		10	10

* - Modulation envelope reference points are provided in terms of attenuation below the maximum peak output power of carrier.

7.2.2 Test procedure

- 7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.
- 7.2.2.2 The total output power integrated over the emission bandwidth of carrier was taken as the reference level.
- 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, Table 7.2.3 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date:	3/12/2008	Relative Humidity:	39%
Temperature: 24°C	Air Pressure: 1014 hPa	Power Supply:	120 V AC
Remarks: 5 MHz CBW			

Table 7.2.2 Occupied bandwidth test results for 5 MHz channel bandwidth

RESOLUTION BANDWIDTH: 100 kHz*

VIDEO BANDWIDTH: 300 kHz

MODULATION ENVELOPE REFERENCE POINTS: 26 dBc

MODULATING SIGNAL: PRBS

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
64QAM,Bit Rate 18.85 Mbps				
4942.5	4.631	5	-0.369	Pass
4967.5	4.631	5	-0.369	Pass
4987.5	4.650	5	-0.350	Pass
16QAM,Bit Rate 12.565 Mbps				
4942.5	4.688	5	-0.312	Pass
4967.5	4.705	5	-0.295	Pass
4987.5	4.650	5	-0.350	Pass
QPSK, Bit Rate 4.19Mbps				
4942.5	4.669	5	-0.331	Pass
4967.5	4.650	5	-0.350	Pass
4987.5	4.688	5	-0.312	Pass
BPSK ,Bit Rate 2.095Mbps				
4942.5	4.688	5	-0.312	Pass
4967.5	4.688	5	-0.312	Pass
4987.5	4.669	5	-0.331	Pass

* - RBW \geq 1% of OBW; 1 % of 5 MHz is 50 kHz, hence, RBW=100 kHz was chosen for the measurements.

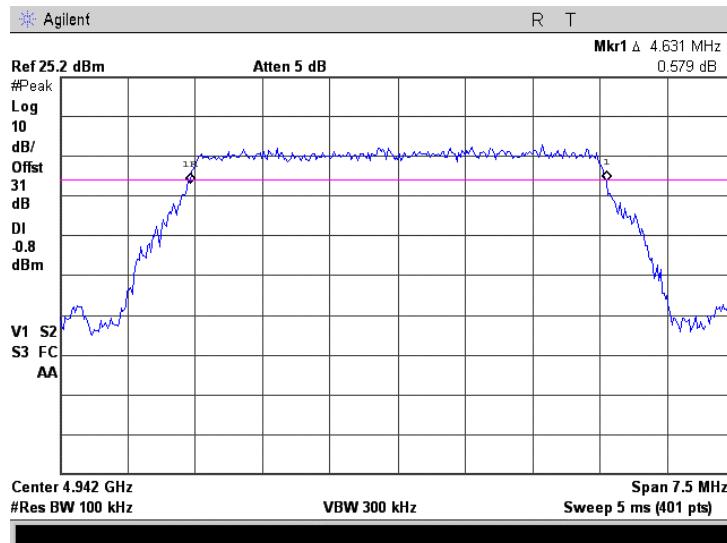
Reference numbers of test equipment used

HL 2909	HL 2953	HL 3176	HL 3180			
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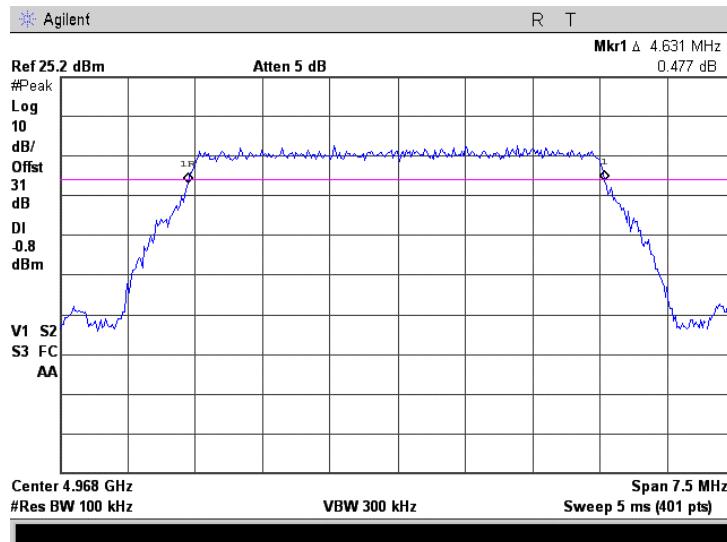
Full description is given in Appendix A.

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.1 Occupied bandwidth test result at low frequency 4942.5 MHz, 64QAM, rate 18.85 Mbps

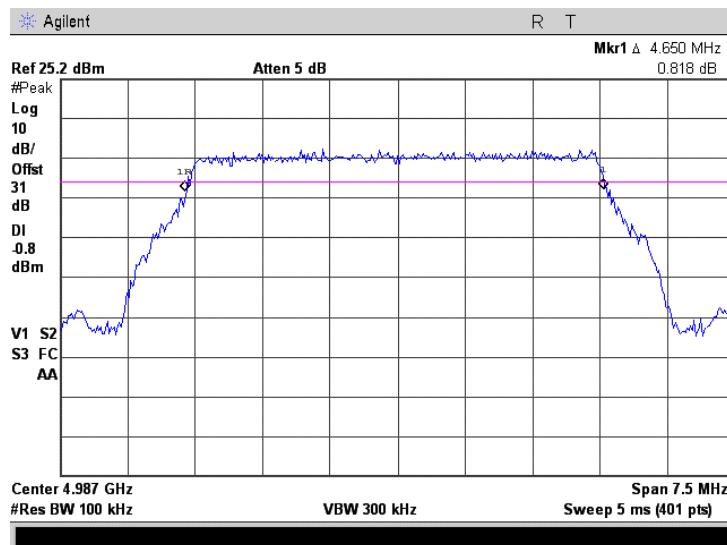


Plot 7.2.2 Occupied bandwidth test result at mid frequency 4967.5 MHz, 64QAM, rate 18.85 Mbps

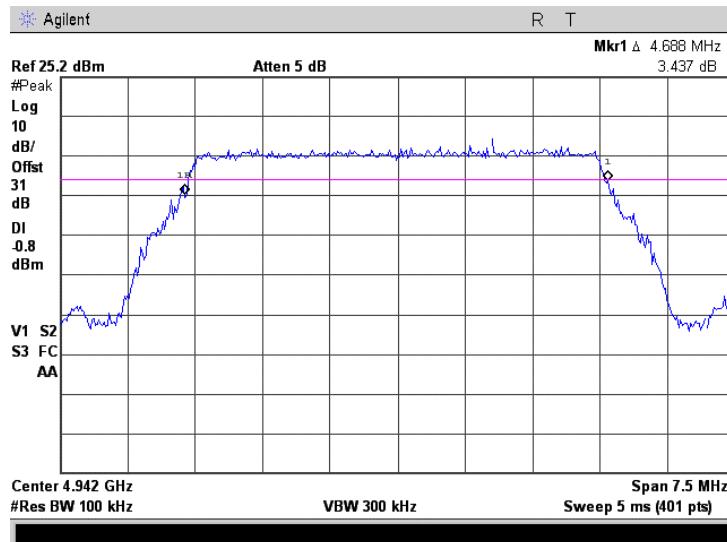


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.3 Occupied bandwidth test result at high frequency 4987.5 MHz, 64QAM, rate 18.85 Mbps

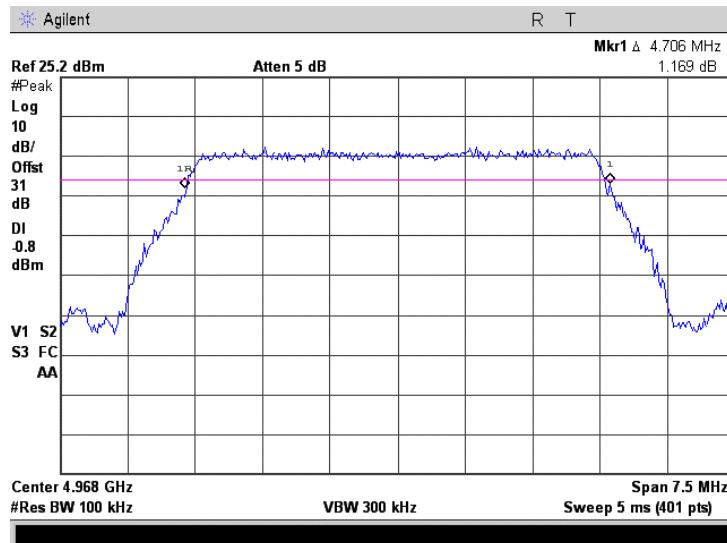


Plot 7.2.4 Occupied bandwidth test result at low frequency 4942.5 MHz, 16QAM, rate 12.565 Mbps

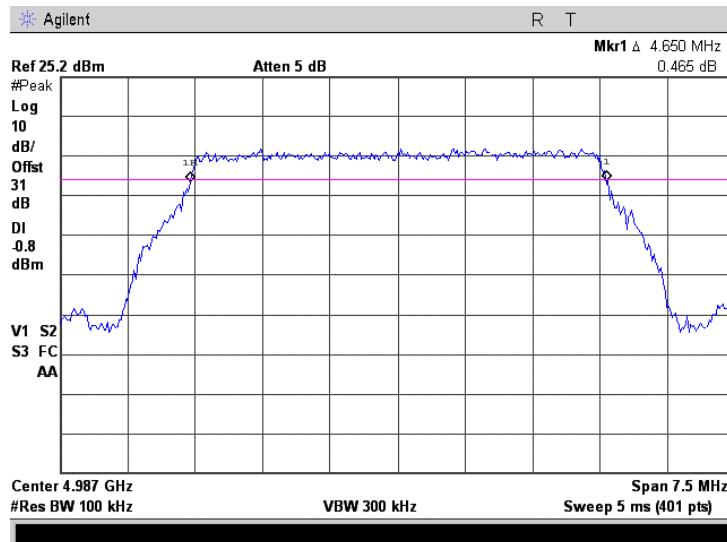


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.5 Occupied bandwidth test result at mid frequency 4967.5 MHz, 16QAM, rate 12.565 Mbps

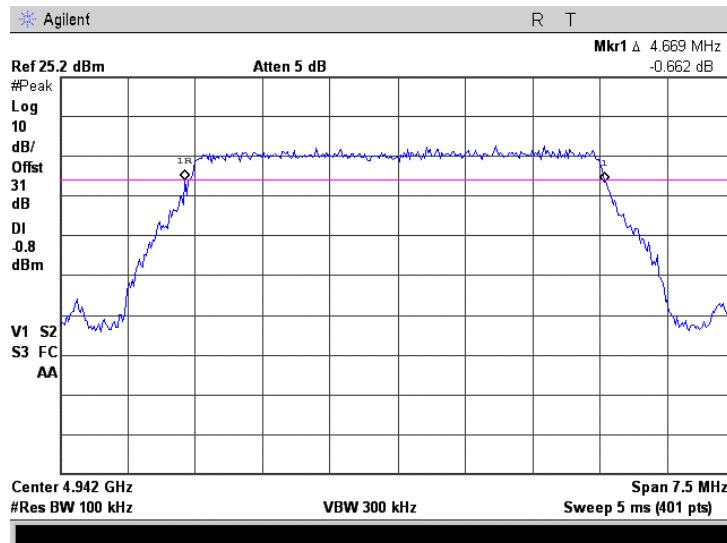


Plot 7.2.6 Occupied bandwidth test result at high frequency 4987.5 MHz, 16QAM, rate 12.565 Mbps

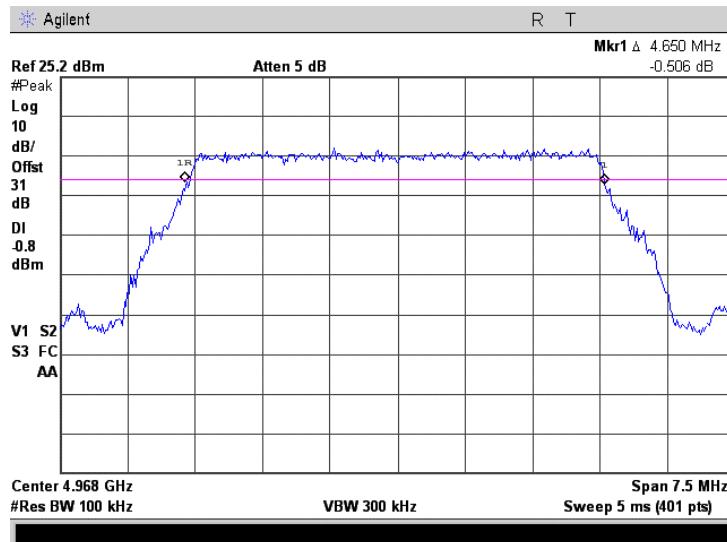


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.7 Occupied bandwidth test result at low frequency 4942.5 MHz, QPSK, rate 4.19 Mbps

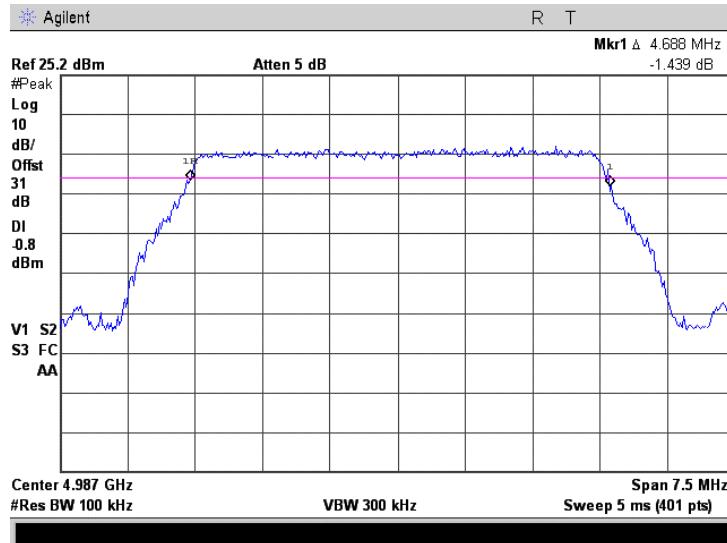


Plot 7.2.8 Occupied bandwidth test result at mid frequency 4967.5 MHz, QPSK, rate 4.19 Mbps

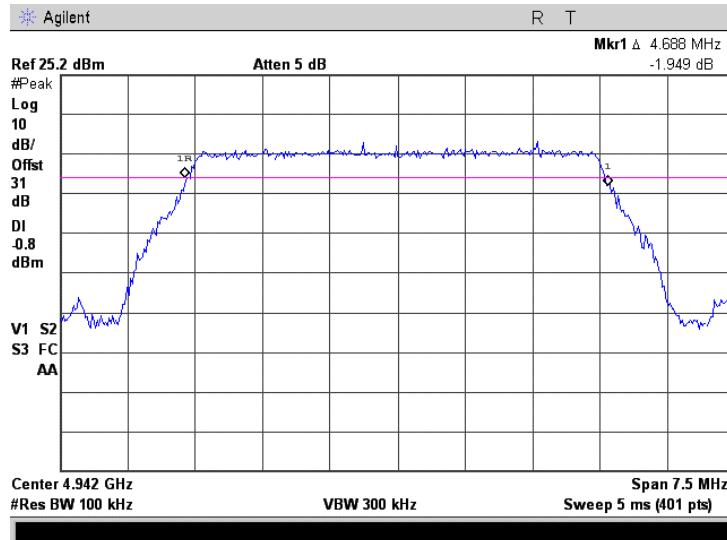


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.9 Occupied bandwidth test result at high frequency 4987.5 MHz, QPSK, rate 4.19 Mbps

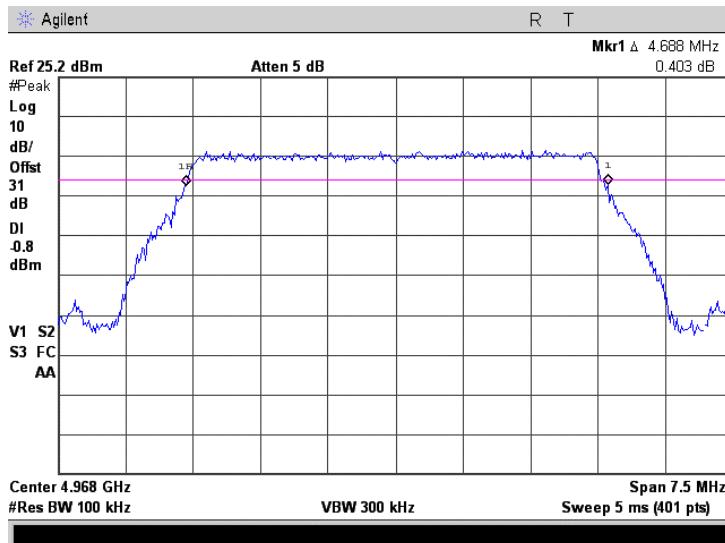


Plot 7.2.10 Occupied bandwidth test result at low frequency 4942.5 MHz, BPSK, rate 2.095 Mbps

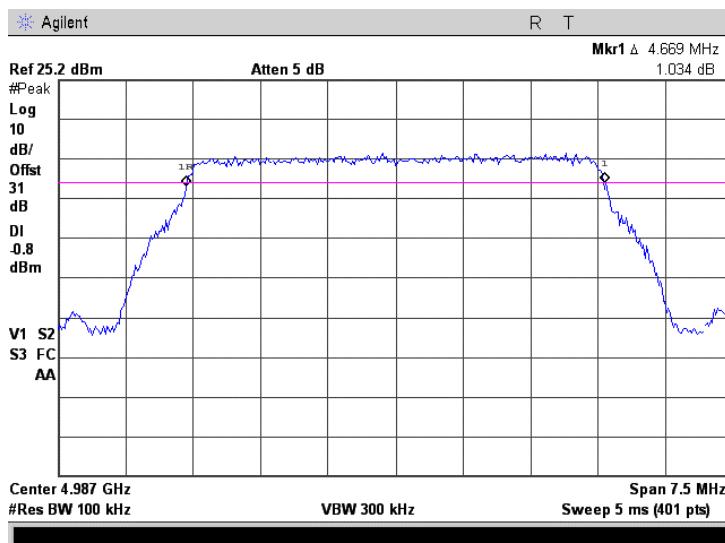


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.11 Occupied bandwidth test result at mid frequency 4967.5 MHz, BPSK, rate 2.095 Mbps



Plot 7.2.12 Occupied bandwidth test result at high frequency 4987.5 MHz, BPSK, rate 2.095 Mbps



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date:	3/12/2008		
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Table 7.2.3 Occupied bandwidth test results 10 MHz channel bandwidth

RESOLUTION BANDWIDTH:

100 kHz*

VIDEO BANDWIDTH:

300 kHz

MODULATION ENVELOPE REFERENCE POINTS:

26 dBc

MODULATING SIGNAL:

PRBS

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
64QAM, Bit Rate 37.7 Mbps				
4947.5	9.1500	10	-0.8500	Pass
4967.5	9.0750	10	-0.9250	Pass
4982.5	9.1125	10	-0.8875	Pass
16QAM, Bit Rate 25.13 Mbps				
4947.5	9.1825	10	-0.8175	Pass
4967.5	9.1125	10	-0.8875	Pass
4982.5	9.0750	10	-0.9250	Pass
QPSK, Bit Rate 8.38 Mbps				
4947.5	9.0750	10	-0.9250	Pass
4967.5	9.1125	10	-0.8875	Pass
4982.5	9.0750	10	-0.9250	Pass
BPSK, Bit Rate 4.19Mbps				
4947.5	9.0750	10	-0.9250	Pass
4967.5	9.0375	10	-0.9625	Pass
4982.5	9.0375	10	-0.9625	Pass

* - RBW \geq 1% of OBW; 1 % of 10 MHz is 100 kHz, hence, RBW=100 kHz was chosen for the measurements.

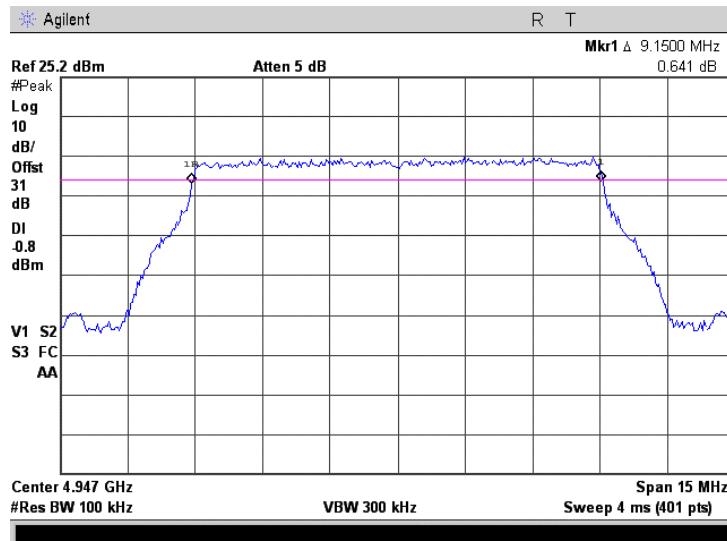
Reference numbers of test equipment used

HL 2909	HL 2953	HL 3176	HL 3180			
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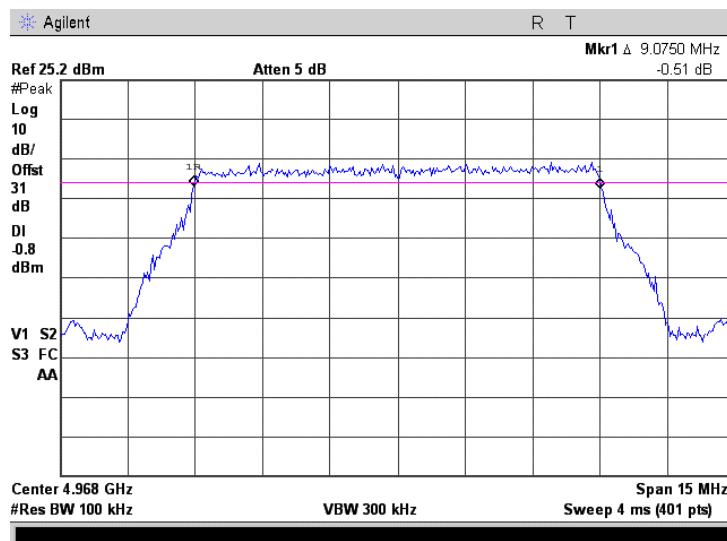
Full description is given in Appendix A.

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.13 Occupied bandwidth test result at low frequency 4947.5 MHz, 64QAM, rate 37.7 Mbps

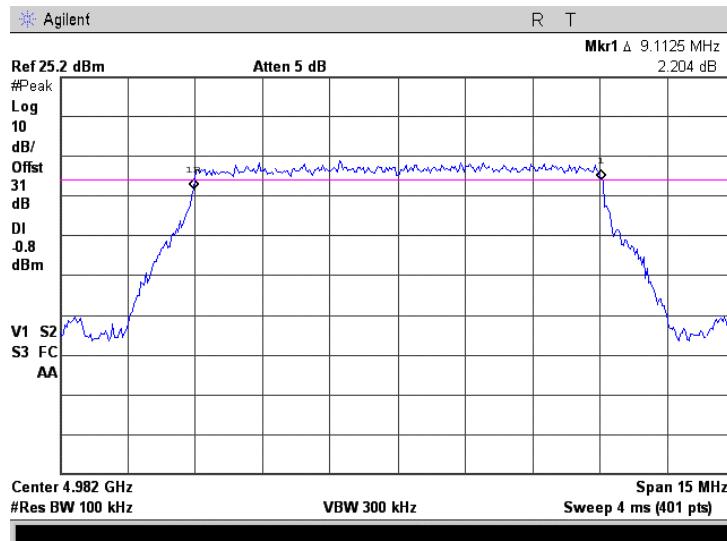


Plot 7.2.14 Occupied bandwidth test result at mid frequency 4967.5 MHz, 64QAM, rate 37.7 Mbps

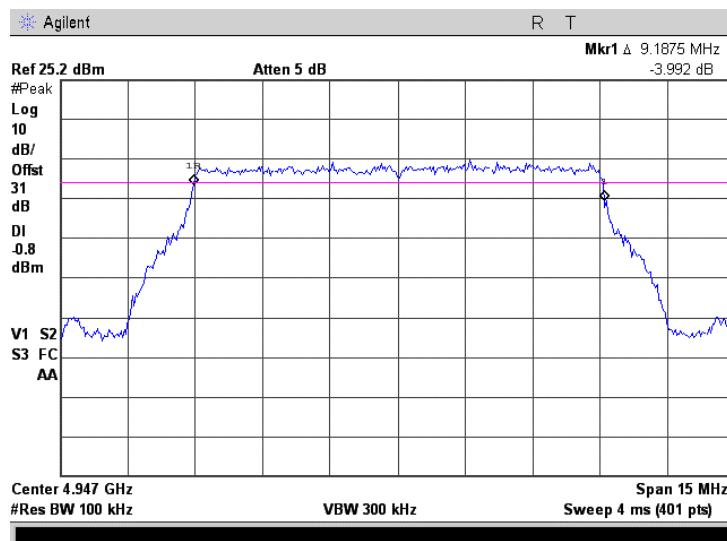


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.15 Occupied bandwidth test result at high frequency 4982.5 MHz, 64QAM, rate 37.7 Mbps

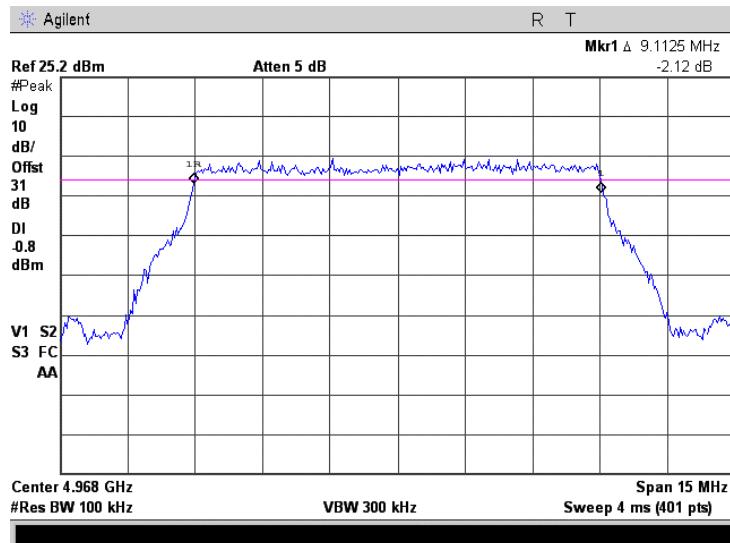


Plot 7.2.16 Occupied bandwidth test result at low frequency 4947.5 MHz, 16QAM, rate 25.13 Mbps

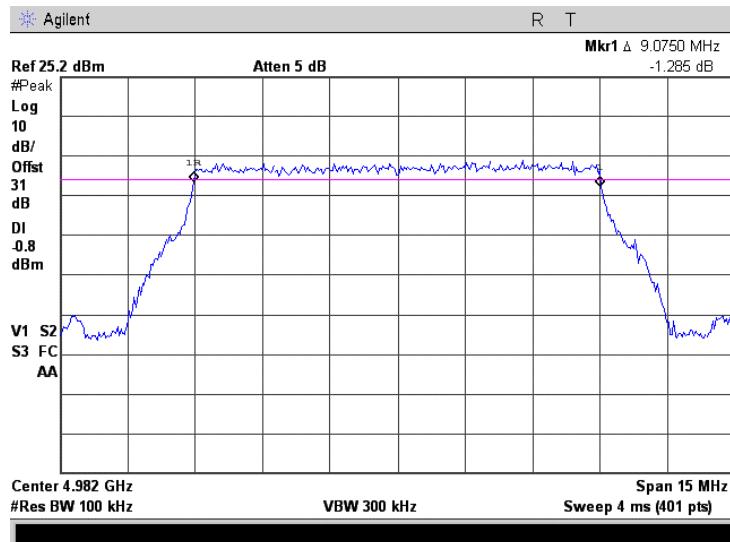


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.17 Occupied bandwidth test result at mid frequency 4967.5 MHz, 16QAM, rate 25.13 Mbps

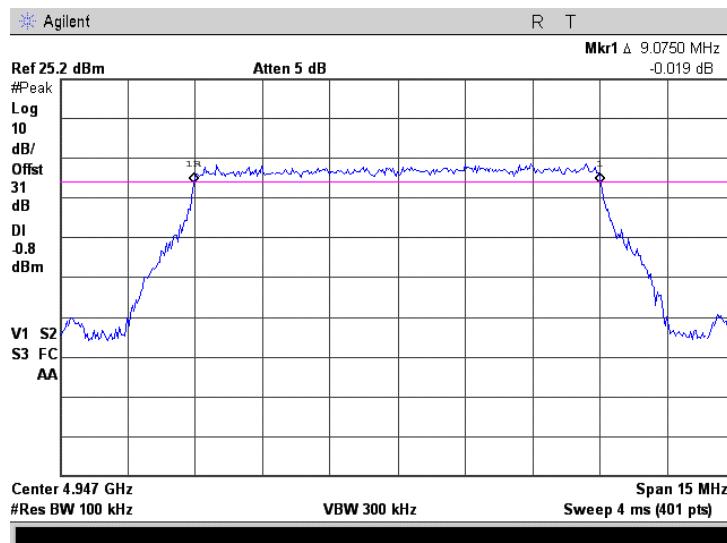


Plot 7.2.18 Occupied bandwidth test result at high frequency 4982.5 MHz, 16QAM, rate 25.13 Mbps

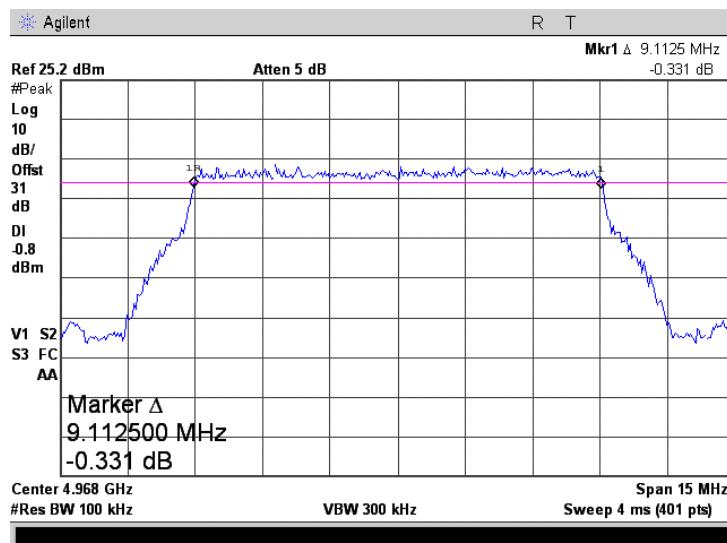


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.19 Occupied bandwidth test result at low frequency 4947.5 MHz, QPSK, rate 8.38 Mbps

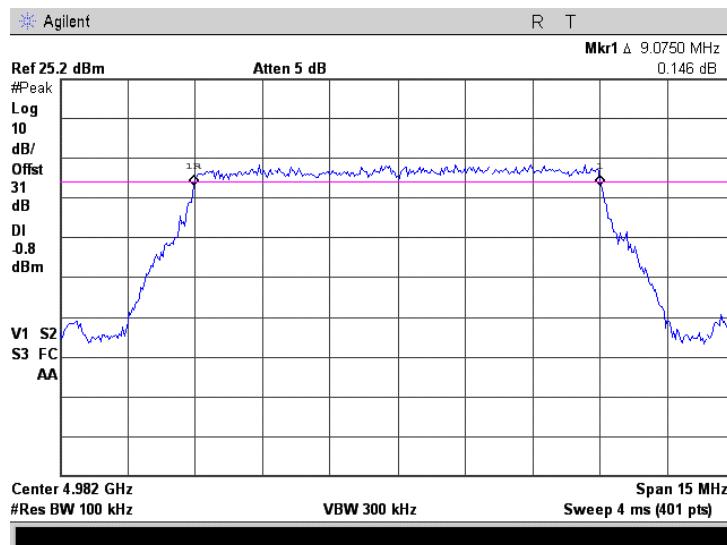


Plot 7.2.20 Occupied bandwidth test result at mid frequency 4967.5 MHz, QPSK, rate 8.38 Mbps

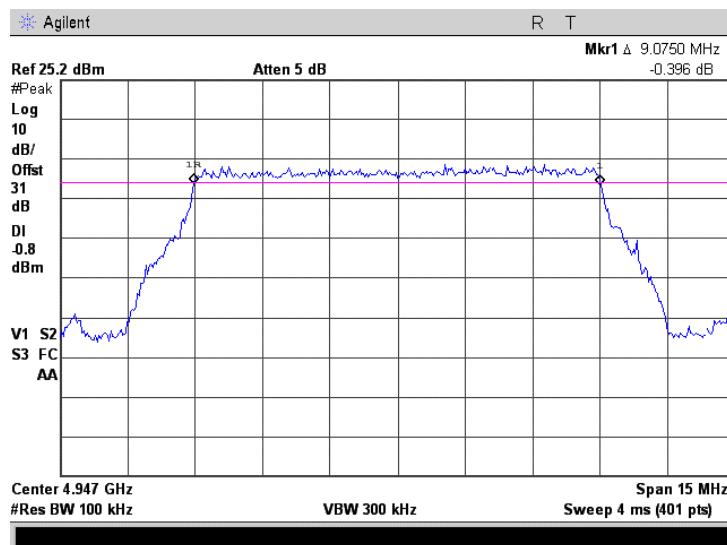


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.21 Occupied bandwidth test result at high frequency 4982.5 MHz, QPSK, rate 8.38 Mbps

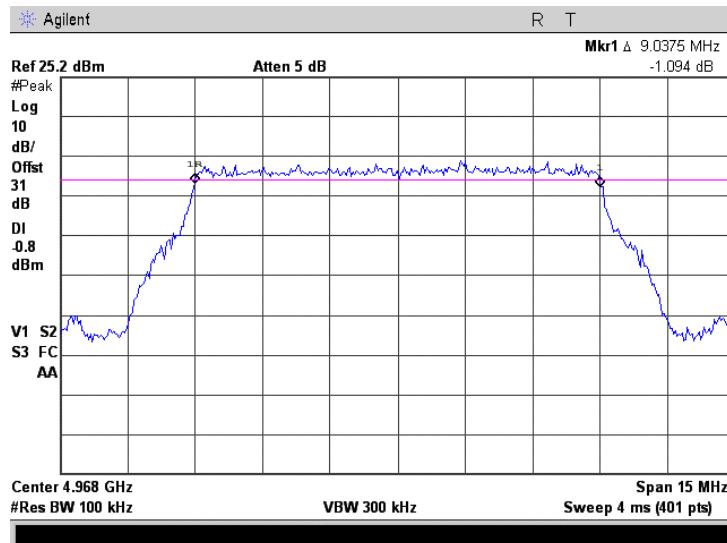


Plot 7.2.22 Occupied bandwidth test result at low frequency 4947.5 MHz, BPSK, rate 4.19 Mbps

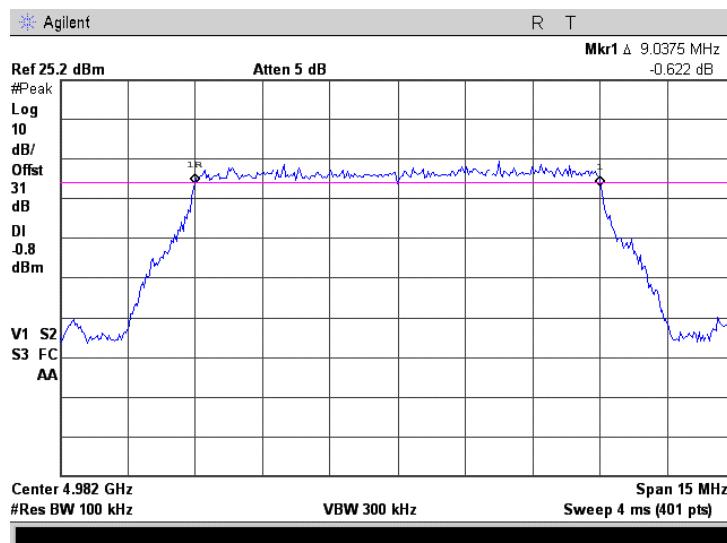


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.23 Occupied bandwidth test result at mid frequency 4967.5 MHz, BPSK, rate 4.19 Mbps



Plot 7.2.24 Occupied bandwidth test result at high frequency 4987.5 MHz, BPSK, rate 4.19 Mbps



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	3/12/2008	Relative Humidity:	39%
Temperature: 24°C	Air Pressure: 1014 hPa	Power Supply:	120 V AC
Remarks:			

7.3 Emission mask test

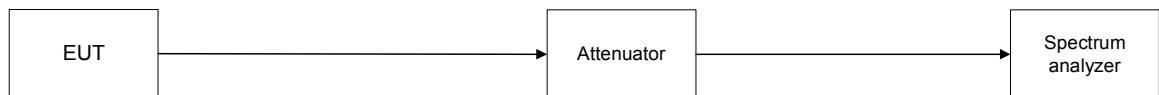
7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1, Table 7.3.3.

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 as provided in the associated plots. The test results are provided in Table 7.3.2, Table 7.3.4.

Figure 7.3.1 Emission mask test setup



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	3/12/2008	Relative Humidity:	39%
Temperature: 24°C	Air Pressure: 1014 hPa	Power Supply:	120 V AC
Remarks: 5 MHz CBW			

Table 7.3.1 Emission mask limits for 5 MHz channel bandwidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask M (Channel bandwidth 5 MHz)	
0 – 2.25 MHz	0
2.25 – 2.5 MHz	$568\log(F^*/2.25)$
2.5 – 2.75 MHz	$26+145\log(F^*/2.5)$
2.75 – 5.0 MHz	$32+31\log(F^*/2.75)$
5.0 – 7.5 MHz	$40+57\log(F^*/5.0)$
More than** 7.5 MHz	50 or $55+10\log P(W)$ (whichever is the lesser attenuation)

* - 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 test results for 5 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
5 MHz channel bandwidth		
4942.5		
4967.5		
4987.5	Emission mask M	Pass

Note: the highest power measured in output power test was 23 dBm, therefore $55+10\log(0.2 \text{ W}) = 48 \text{ dBc}$.

Reference numbers of test equipment used

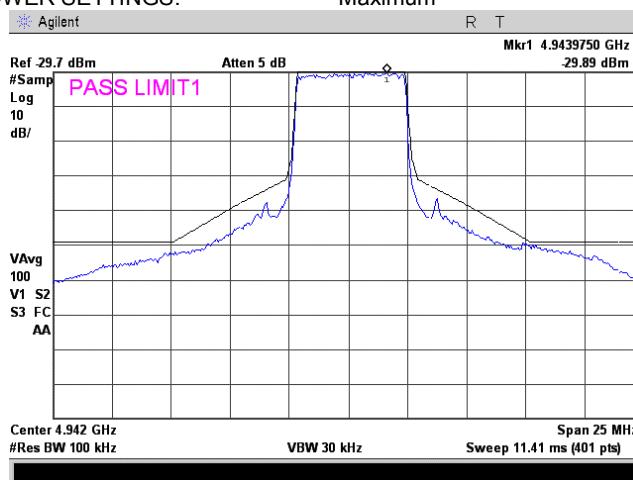
HL 2909	HL 2952	HL 3176	HL 3180			
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Full description is given in Appendix A.

Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

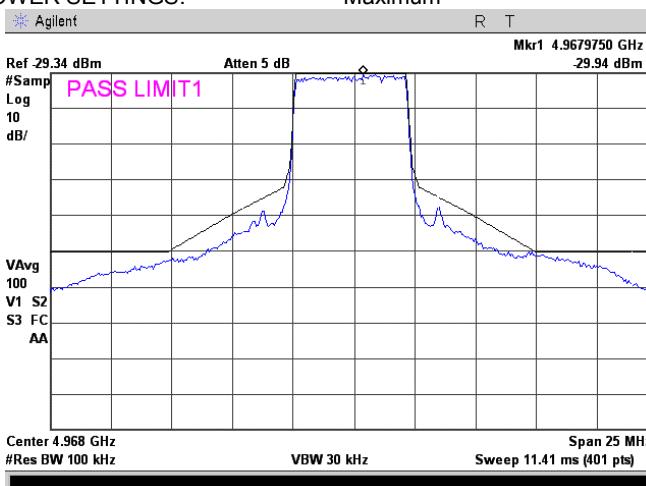
Plot 7.3.1 Emission mask test results at low carrier frequency

OPERATING FREQUENCY RANGE: 4942.5 – 4987.5 MHz
 DETECTOR USED: Peak
 MODULATION: BPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 2.095 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.2 Emission mask test results at mid carrier frequency

OPERATING FREQUENCY RANGE: 4942.5 – 4987.5 MHz
 DETECTOR USED: Peak
 MODULATION: BPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 2.095 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict: PASS	
Date:	3/12/2008		
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.3.3 Emission mask test results at high carrier frequency

OPERATING FREQUENCY RANGE: 4942.5 – 4987.5 MHz

DETECTOR USED: Peak

MODULATION: BPSK

MODULATING SIGNAL: PRBS

BIT RATE: 2.095 Mbps

TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.3.4 Emission mask test results at mid carrier frequency

OPERATING FREQUENCY RANGE: 4942.5 – 4987.5 MHz

DETECTOR USED: Peak

MODULATION: QPSK

MODULATING SIGNAL: PRBS

BIT RATE: 2.095 Mbps

TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.5 Emission mask test results at mid carrier frequency

OPERATING FREQUENCY RANGE: 4942.5 – 4987.5 MHz

DETECTOR USED: Peak

MODULATION: 16 QAM

MODULATING SIGNAL: PRBS

BIT RATE: 2.095 Mbps

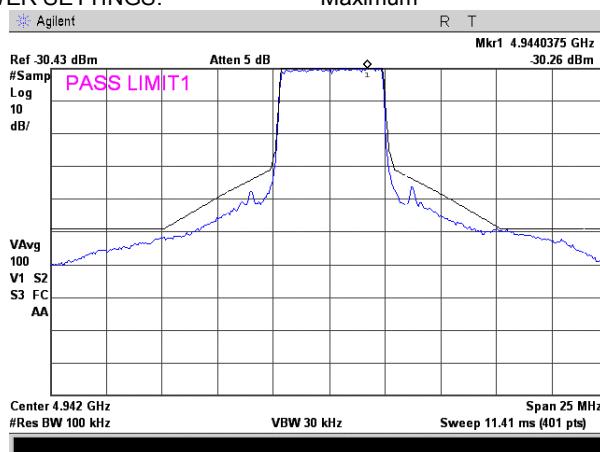
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.3.6 Emission mask test results at low carrier frequency

OPERATING FREQUENCY RANGE: 4942.5 – 4987.5 MHz
 DETECTOR USED: Peak
 MODULATION: 64 QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 2.095 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.7 Emission mask test results at mid carrier frequency

OPERATING FREQUENCY RANGE: 4942.5 – 4987.5 MHz
 DETECTOR USED: Peak
 MODULATION: 64 QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 2.095 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.3.8 Emission mask test results at high carrier frequency

OPERATING FREQUENCY RANGE: 4942.5 – 4987.5 MHz

DETECTOR USED: Peak

MODULATION: 64 QAM

MODULATING SIGNAL: PRBS

BIT RATE: 2.095 Mbps

TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Table 7.3.3 Emission mask limits for 10 MHz channel bandwidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask M (Channel bandwidth 10 MHz)	
0 – 4.5 MHz	0
4.5 – 5 MHz	568log(F*/4.5)
5 – 5.5 MHz	26+145log(F*/5.0)
5.5 – 10.0 MHz	32+31log(F*/5.5)
10.0 – 15 MHz	40+57log(F*/10.0)
More than** 15 MHz	50 or 55+10logP(W) (whichever is the lesser attenuation)

* - 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 7.3.4 Emission mask test results for 10 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
4947.5		
4967.5	Emission mask M	
4982.5		Pass

Note: The highest power measured in output power test was 26.4 dBm, therefore $55+10\log(0.437 \text{ W}) = 51.4 \text{ dBc}$; 50 dBc was used for emission mask.

Reference numbers of test equipment used

HL 2909	HL 2952	HL 3176	HL 3180			
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Full description is given in Appendix A.

Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

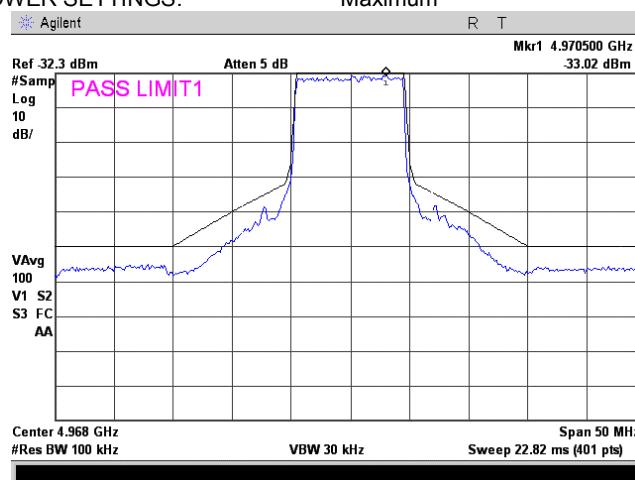
Plot 7.3.9 Emission mask test results at low carrier frequency

OPERATING FREQUENCY RANGE: 4947.5 – 4982.5 MHz
 DETECTOR USED: Peak
 MODULATION: BPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 2.095 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.10 Emission mask test results at mid carrier frequency

OPERATING FREQUENCY RANGE: 4947.5 – 4982.5 MHz
 DETECTOR USED: Peak
 MODULATION: BPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 2.095 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.3.11 Emission mask test results at high carrier frequency

OPERATING FREQUENCY RANGE: 4947.5 – 4982.5 MHz

DETECTOR USED: Peak

MODULATION: BPSK

MODULATING SIGNAL: PRBS

BIT RATE: 2.095 Mbps

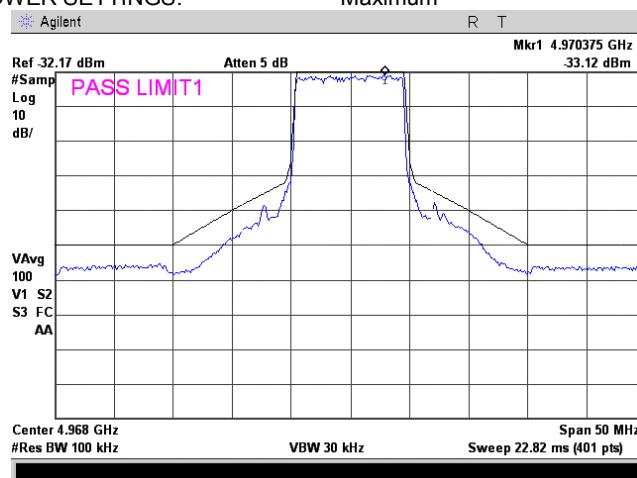
TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

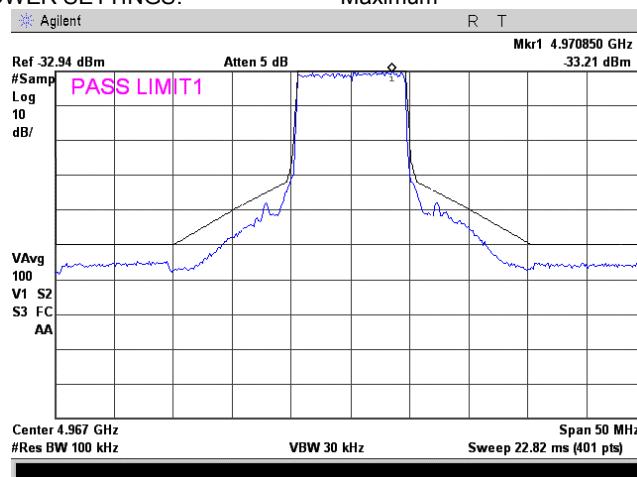
Plot 7.3.12 Emission mask test results at mid carrier frequency

OPERATING FREQUENCY RANGE: 4947.5 – 4982.5 MHz
 DETECTOR USED: Peak
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: 2.095 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.13 Emission mask test results at mid carrier frequency

OPERATING FREQUENCY RANGE: 4947.5 – 4982.5 MHz
 DETECTOR USED: Peak
 MODULATION: 16 QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 2.095 Mbps
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.3.14 Emission mask test results at low carrier frequency

OPERATING FREQUENCY RANGE: 4947.5 – 4982.5 MHz

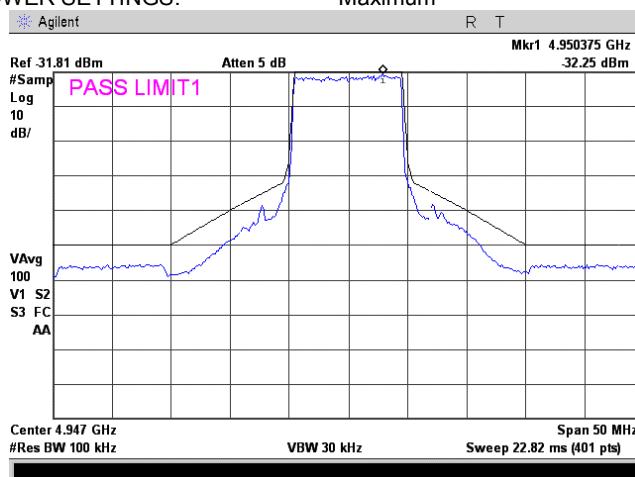
DETECTOR USED: Peak

MODULATION: 64 QAM

MODULATING SIGNAL: PRBS

BIT RATE: 2.095 Mbps

TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.3.15 Emission mask test results at mid carrier frequency

OPERATING FREQUENCY RANGE: 4947.5 – 4982.5 MHz

DETECTOR USED: Peak

MODULATION: 64 QAM

MODULATING SIGNAL: PRBS

BIT RATE: 2.095 Mbps

TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Plot 7.3.16 Emission mask test results at high carrier frequency

OPERATING FREQUENCY RANGE: 4947.5 – 4982.5 MHz

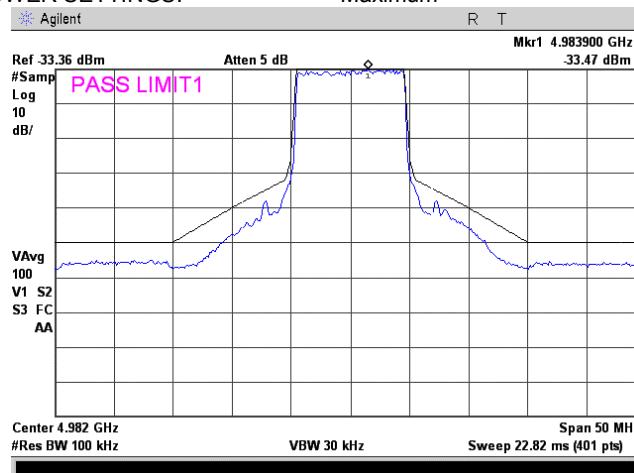
DETECTOR USED: Peak

MODULATION: 64 QAM

MODULATING SIGNAL: PRBS

BIT RATE: 2.095 Mbps

TRANSMITTER OUTPUT POWER SETTINGS: Maximum



Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

7.4 Spurious emissions at RF antenna connector test

7.4.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Spurious emission limits

Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious**, dBm	
0.009 – 10 th harmonic*	50 (mask M) {55 + 10 log P (W)}	Low carrier frequency	-25
		Mid carrier frequency	-25
		High carrier frequency	-25

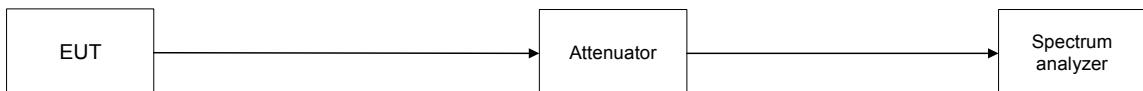
* - spurious emission limits do not apply to the in band emission within ± 150 % of the authorized bandwidth from the carrier; investigated in course of emission mask testing

** - ERP of spurious = P (dBm) - {55 + 10 log P (W)} = -25 dBm

7.4.2 Test procedure

- 7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.
- 7.4.2.2 The EUT was adjusted to produce maximum available for end user RF output power.
- 7.4.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.4.2 and associated plots.

Figure 7.4.1 Spurious emission test setup



Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Table 7.4.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: >Resolution bandwidth
 MODULATING SIGNAL: PRBS
 BIT RATE: 18.85 Mbps, 64QAM*
 CHANNEL BANDWIDTH: 5 MHz
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
No spurious were found									Pass
Mid carrier frequency									
No spurious were found									Pass
High carrier frequency									
No spurious were found									Pass

*- Maximum power density was measured at 64QAM modulation, bit rate 18.85 Mbps.

**- Margin = Spurious emission – specification limit.

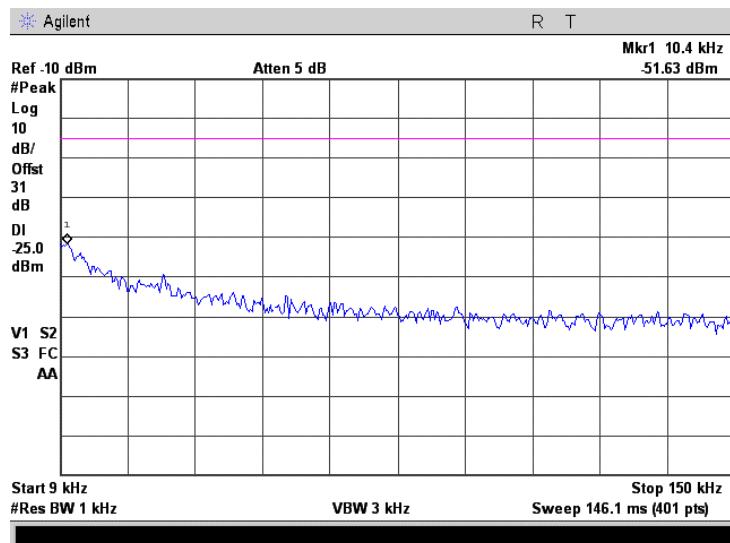
Reference numbers of test equipment used

HL 1292	HL 1378	HL 1424	HL 2254	HL 2909	HL 2951	HL 3176	HL 3180
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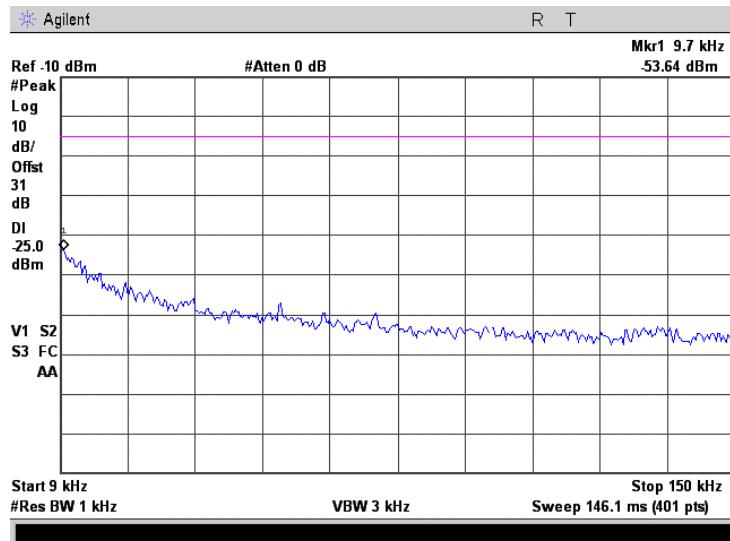
Full description is given in Appendix A.

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict: PASS	
Date:	3/12/2008		
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

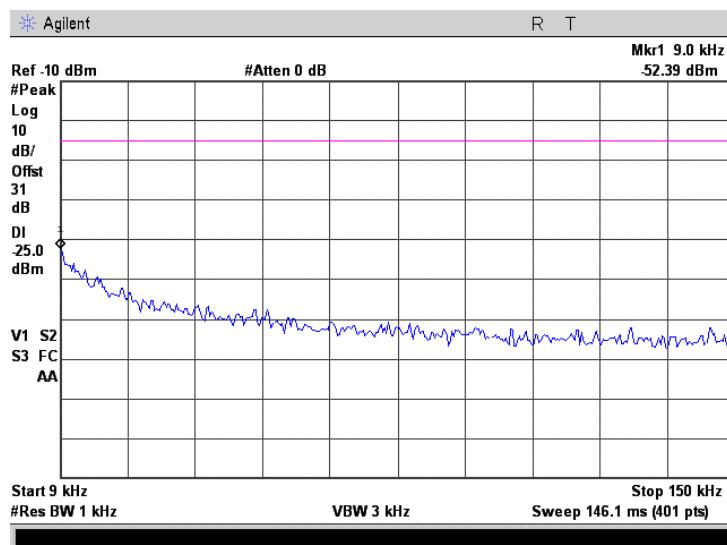


Plot 7.4.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

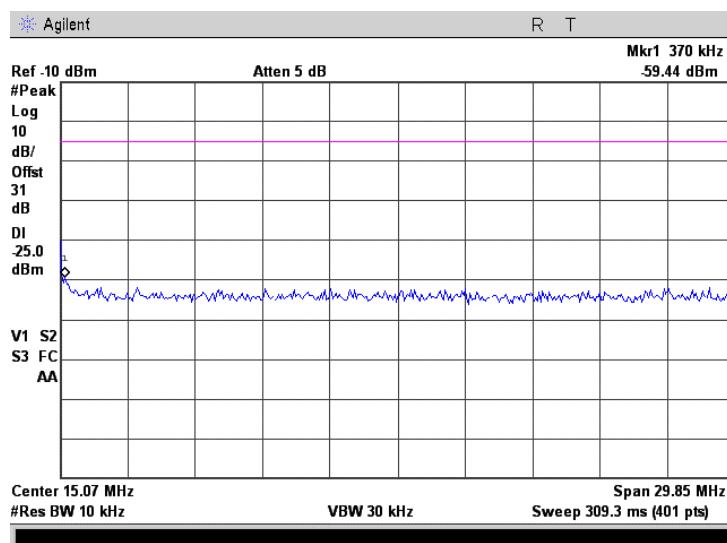


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

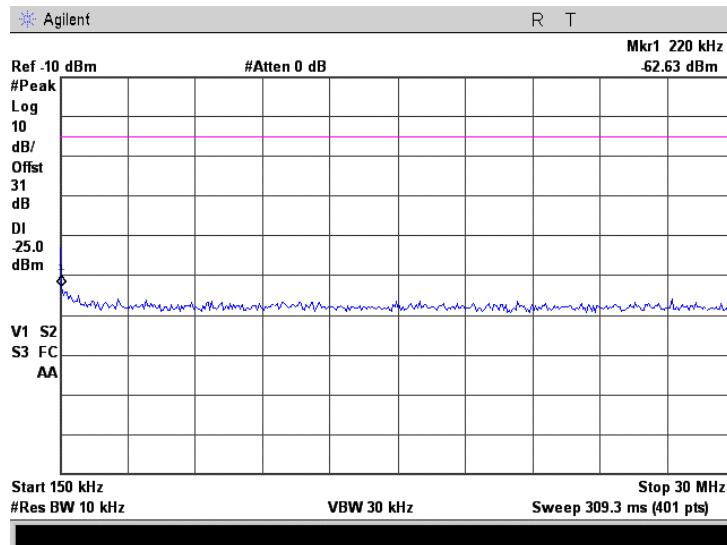


Plot 7.4.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

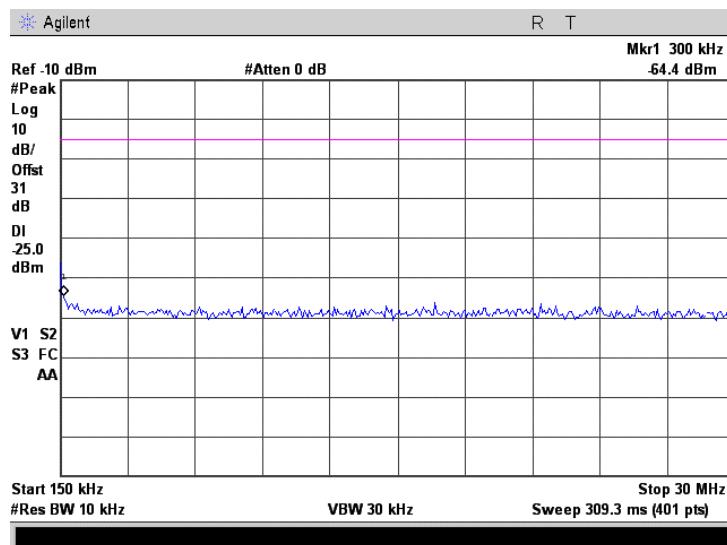


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.5 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency

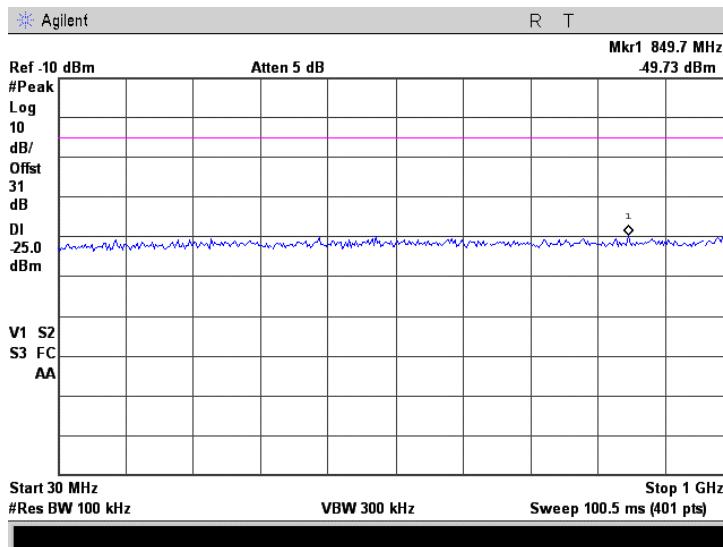


Plot 7.4.6 Spurious emission measurements in 0.15 – 30.0 MHz range at high carrier frequency

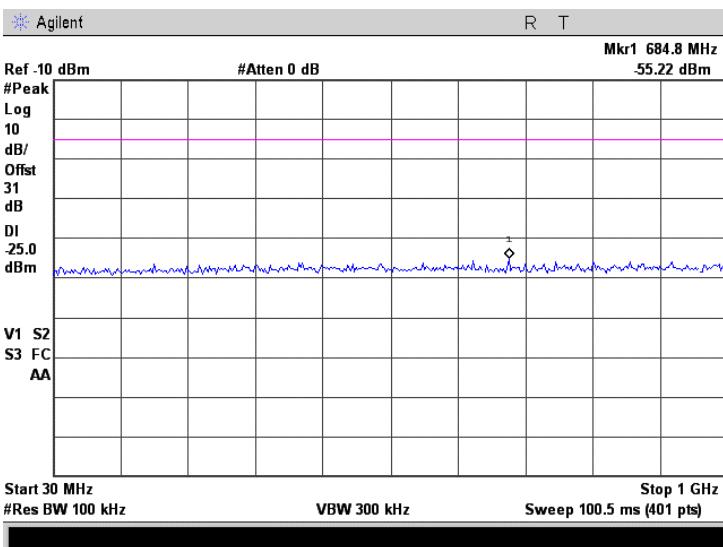


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.7 Spurious emission measurements in 30.0 - 1000 MHz range at low carrier frequency

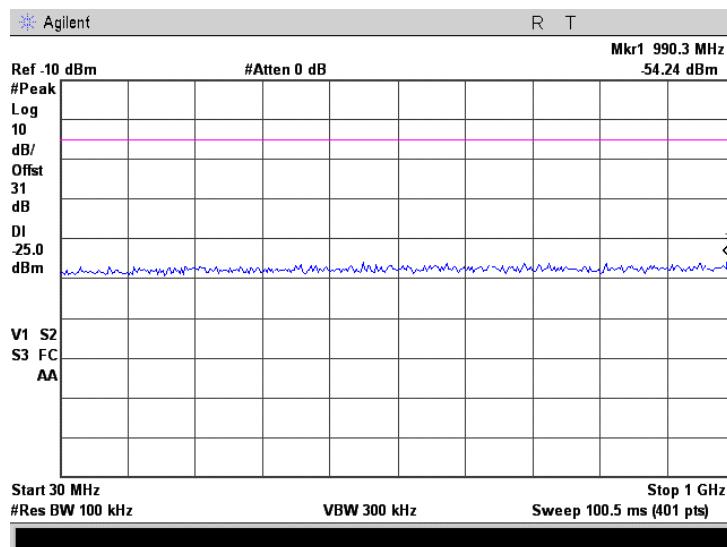


Plot 7.4.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency

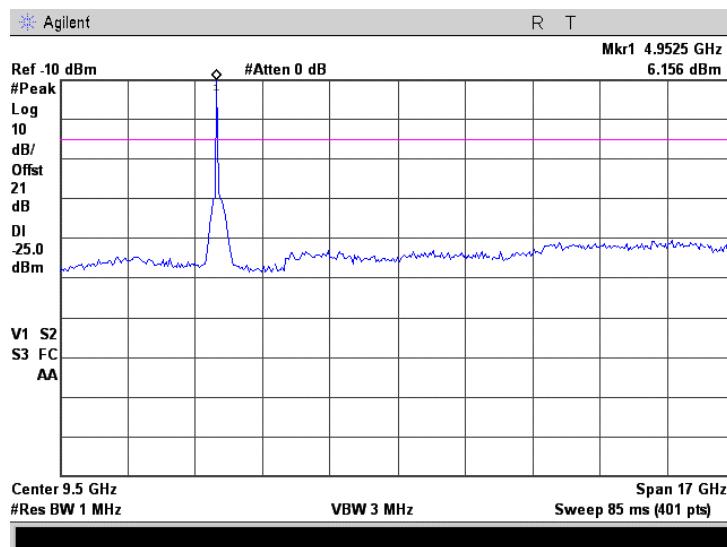


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.9 Spurious emission measurements in 30.0 - 1000 MHz range at high carrier frequency

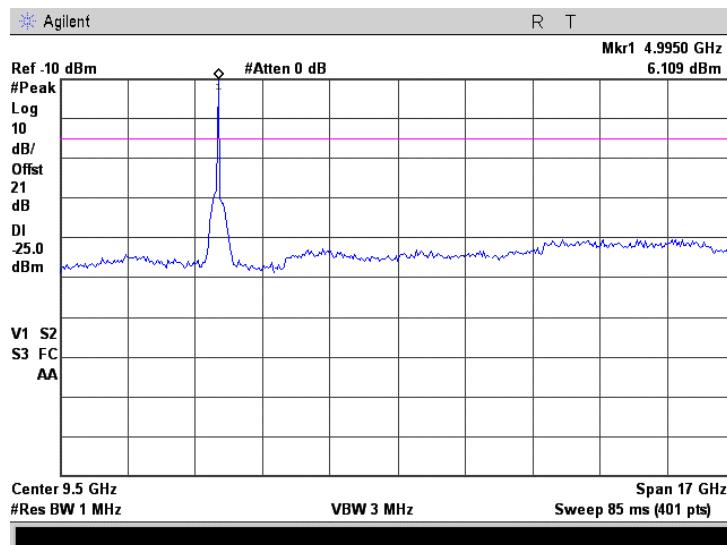


Plot 7.4.10 Spurious emission measurements in 1000 - 18000 MHz range at low carrier frequency

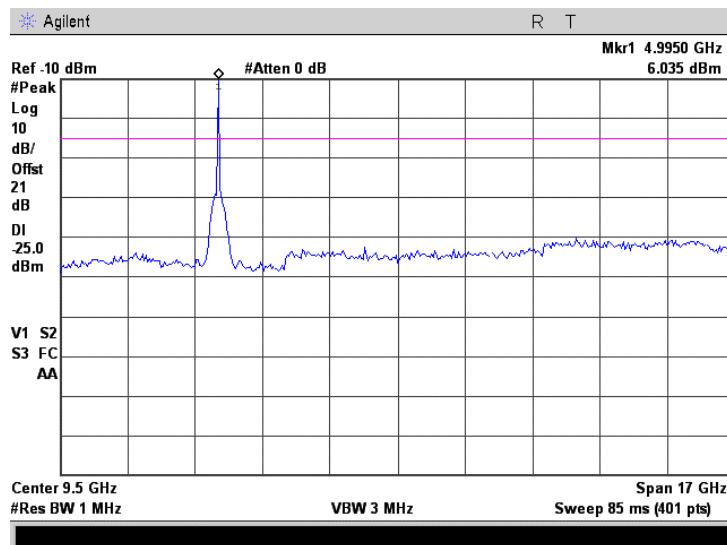


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.11 Spurious emission measurements in 1000 - 18000 MHz at mid carrier frequency

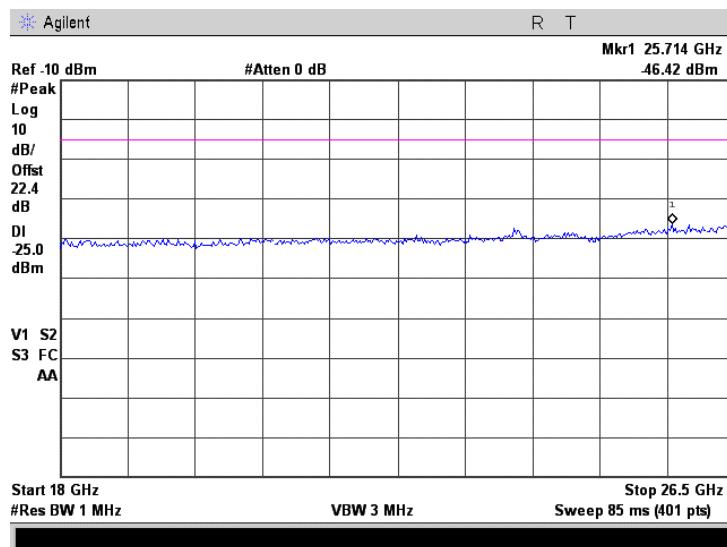


Plot 7.4.12 Spurious emission measurements in 1000 - 18000 MHz at high carrier frequency

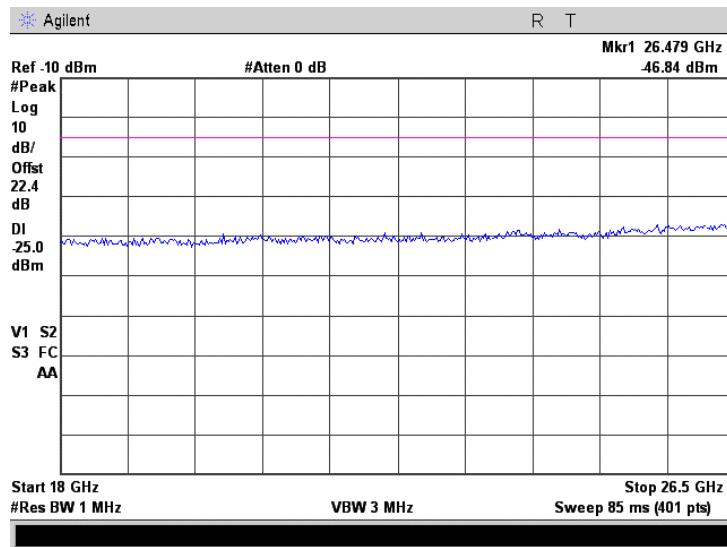


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.13 Spurious emission measurements in 18000 - 26500 MHz range at low carrier frequency

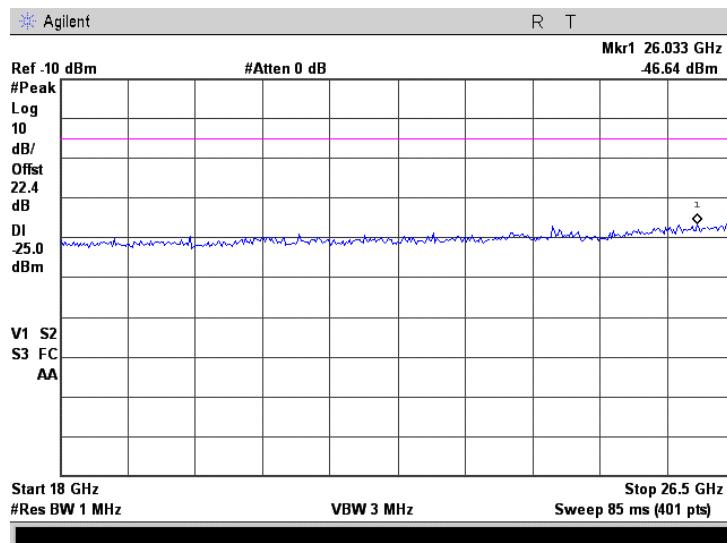


Plot 7.4.14 Spurious emission measurements in 18000 - 26500 MHz range at mid carrier frequency

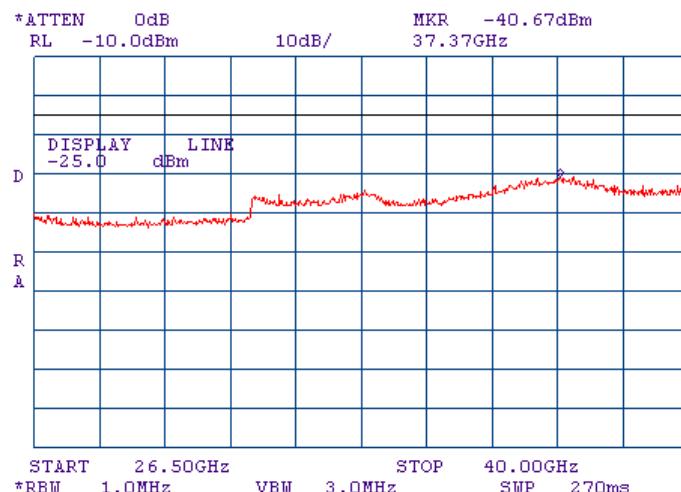


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	
Date:	3/12/2008	PASS	
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.15 Spurious emission measurements in 18000 - 26500 MHz range at high carrier frequency



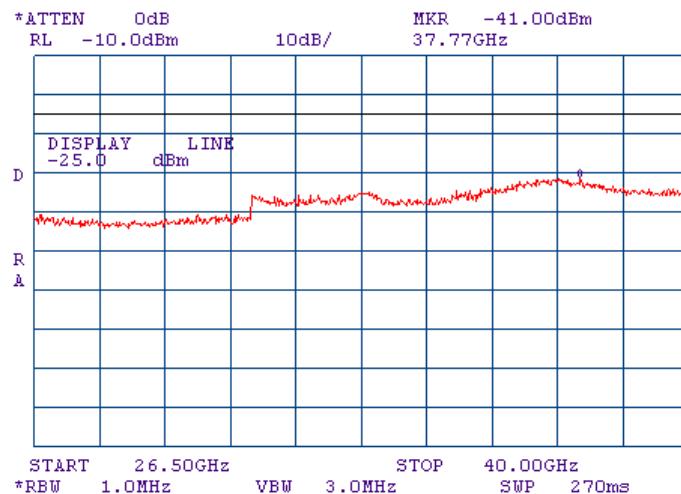
Plot 7.4.16 Spurious emission measurements in 26500 - 40000 MHz range at low carrier frequency



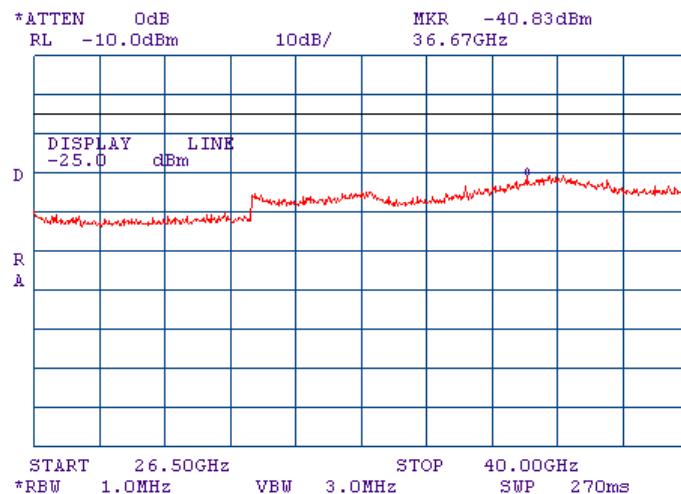


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	3/12/2008		
Temperature: 24°C	Air Pressure: 1014 hPa	Relative Humidity: 39%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.17 Spurious emission measurements in 26500 - 40000 MHz range at mid carrier frequency



Plot 7.4.18 Spurious emission measurements in 26500 - 40000 MHz range at high carrier frequency



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date:	3/13/2008	PASS	
Temperature: 24°C	Air Pressure: 1015 hPa	Relative Humidity: 40%	Power Supply: 120 V AC
Remarks:			

7.5 Radiated spurious emission measurements

7.5.1 General

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

Table 7.5.1 Radiated spurious emission test limits

Frequency, MHz	Attenuation below carrier dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(μ V/m)**
0.009 – 10 th harmonic*	55+10logP	-25	70.23

ERP of spurious = P (dBm) - {55 + 10 log P (W)} = -25 dBm

* - Excluding the in band emission within ± 150 % of the authorized bandwidth from the carrier

** - 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.

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

- 7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and the performance check was conducted.
- 7.5.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360⁰ and the measuring antenna was rotated around its vertical axis.
- 7.5.2.3 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

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

- 7.5.3.1 The EUT was set up as shown in Figure 7.5.2, energized and the performance check was conducted.
- 7.5.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360⁰ and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.
- 7.5.3.3 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

7.5.4 Test procedure for substitution ERP measurements of spurious

- 7.5.4.1 The test equipment was set up as shown in Figure 7.5.3 and energized.
- 7.5.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.
- 7.5.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.
- 7.5.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.
- 7.5.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm and antenna gain in dBd reduced by cable loss in dB.
- 7.5.4.6 The above procedure was repeated at the rest of investigated frequencies.
- 7.5.4.7 The worst test results (the lowest margins) were recorded in Table 7.5.3 and shown in the associated plots.

Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date:	3/13/2008	PASS	
Temperature: 24°C	Air Pressure: 1015 hPa	Relative Humidity: 40%	Power Supply: 120 V AC
Remarks:			

Figure 7.5.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

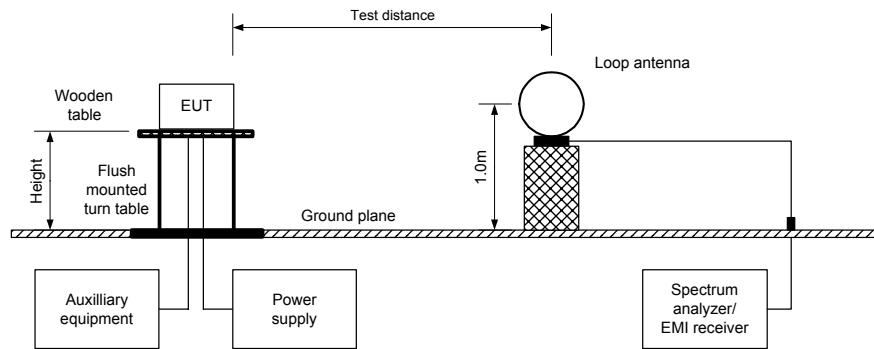
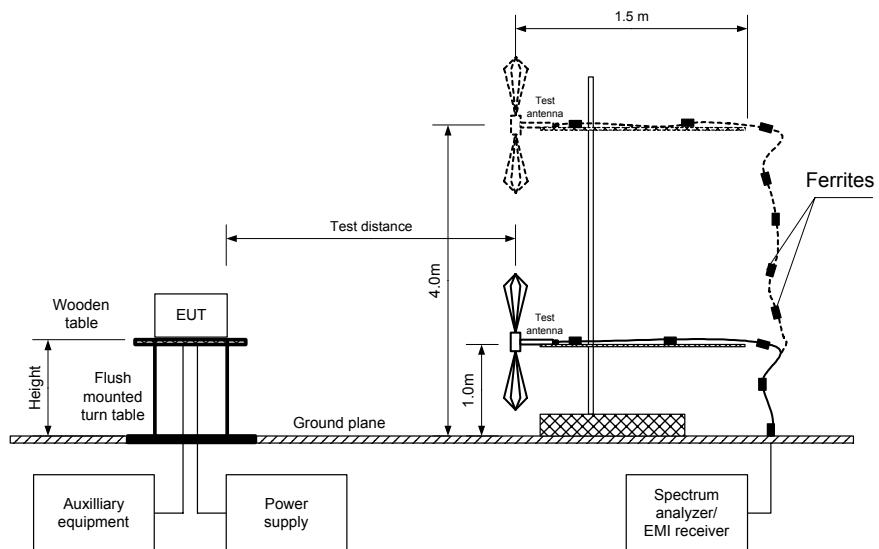


Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz

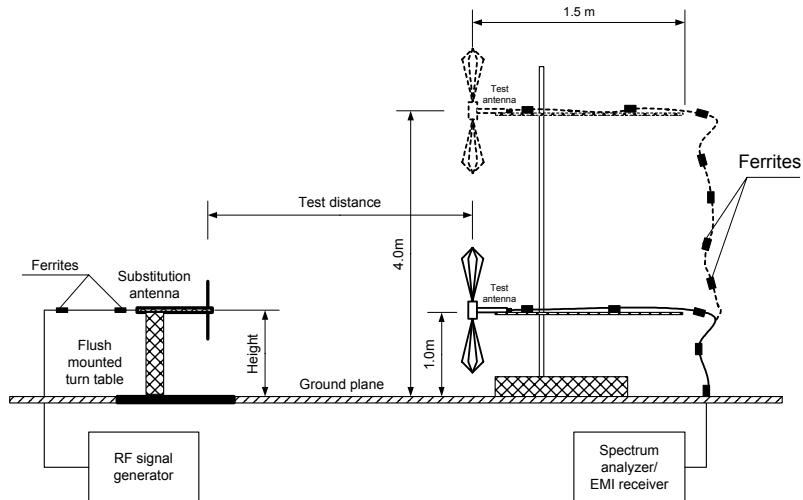




HERMON LABORATORIES

Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict: PASS	
Date:	3/13/2008		
Temperature: 24°C	Air Pressure: 1015 hPa	Relative Humidity: 40%	Power Supply: 120 V AC
Remarks:			

Figure 7.5.3 Setup for substitution ERP measurements of spurious



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance		Verdict: PASS
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 4940 - 4990 MHz
 TEST DISTANCE: 3 m
 TEST SITE: 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 (1000 MHz – 18000 MHz)
 Standard gain horn (above 18000 MHz)
 MODULATING SIGNAL: PRBS
 BIT RATE: 18.85 Mbps 64QAM
 CHANNEL BANDWIDTH: 5 MHz
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
Low carrier frequency							
3790.0	54.88	70.23	-15.35	1000	H	1.1	179
Mid carrier frequency							
4160.8	54.61	70.23	-15.62	1000	H	1.1	176
High carrier frequency							
4175.4	54.69	70.23	-15.54	1000	H	1.1	172

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

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

Table 7.5.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 4940 - 4990 MHz
 TEST SITE: OATS
 TEST DISTANCE: 3 m
 SUBSTITUTION ANTENNA HEIGHT: 0.8 m
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: > Resolution bandwidth
 SUBSTITUTION ANTENNA TYPE: Double ridged guide (1000 MHz – 18000 MHz)

Frequency MHz	Field strength dB(µV/m)	RBW, kHz	Antenna polarization	RF generator output, dBm	Ant gain dBd	Cable loss, dB	ERP, dBr	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency										
3790.0	54.88	1000	H	-47.42	7.42	2.29	-42.29	-25.00	-17.29	Pass
Mid carrier frequency										
4160.8	54.61	1000	H	-47.79	7.83	2.39	-42.35	-25.00	-17.35	Pass
High carrier frequency										
4175.4	54.69	1000	H	-47.61	7.86	2.40	-42.15	-25.00	-17.15	Pass

*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

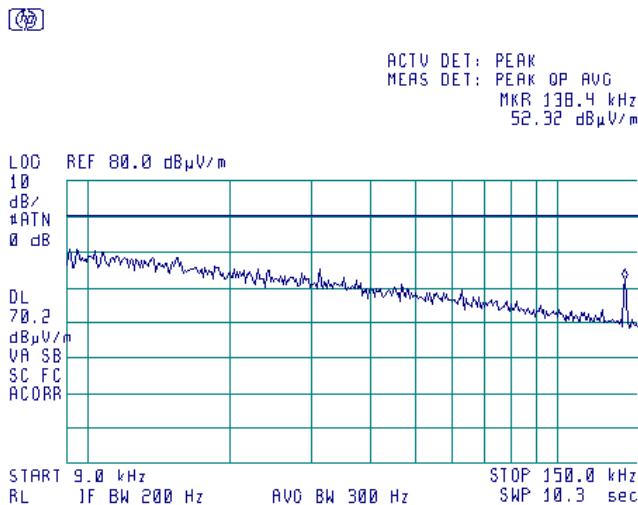
HL 0446	HL 0604	HL 0661	HL 0768	HL 0769	HL 1296	HL 1293	HL 1424
HL 1425	HL 1552	HL 1566	HL 1567	HL 1984	HL 2254	HL 2259	HL 2260
HL 2261	HL 2387	HL 2432	HL 2499	HL 2871	HL 2951	HL 3208	

Full description is given in Appendix A.

Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

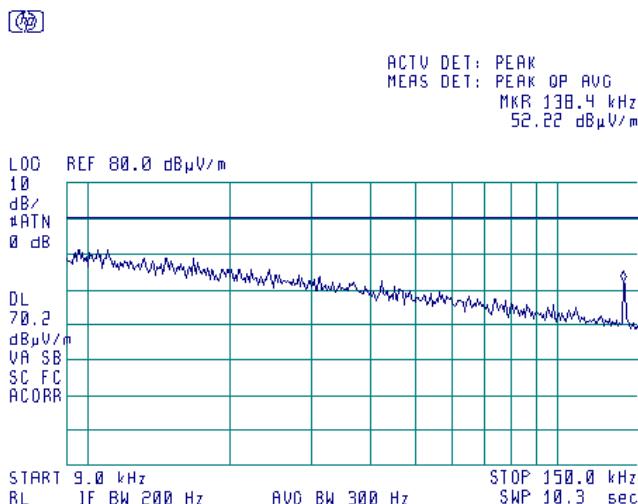
Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.5.2 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



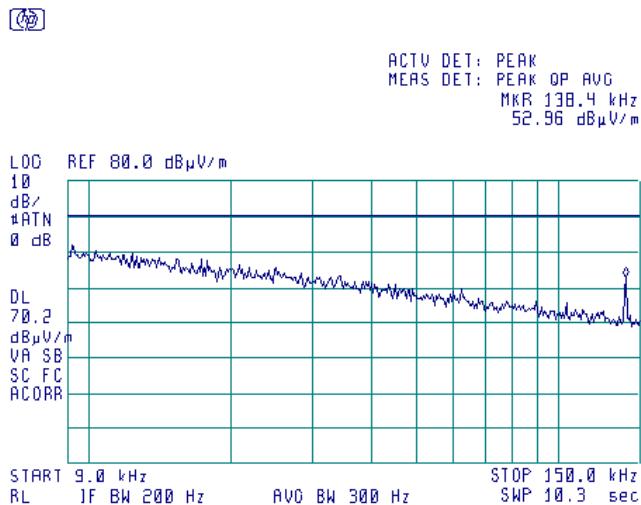


HERMON LABORATORIES

Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

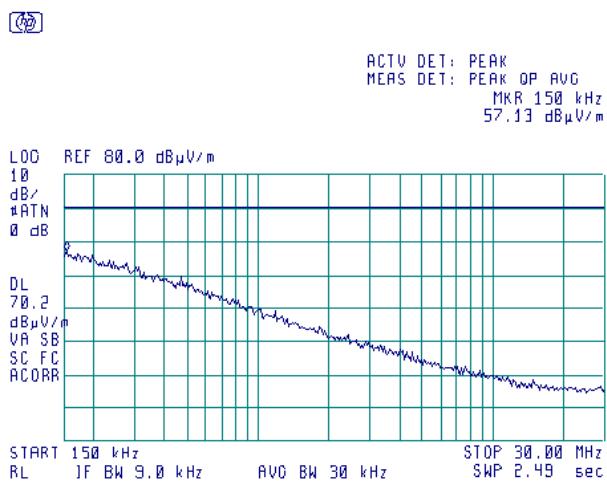
Plot 7.5.3 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.5.4 Radiated emission measurements in 0.15 - 30 MHz range

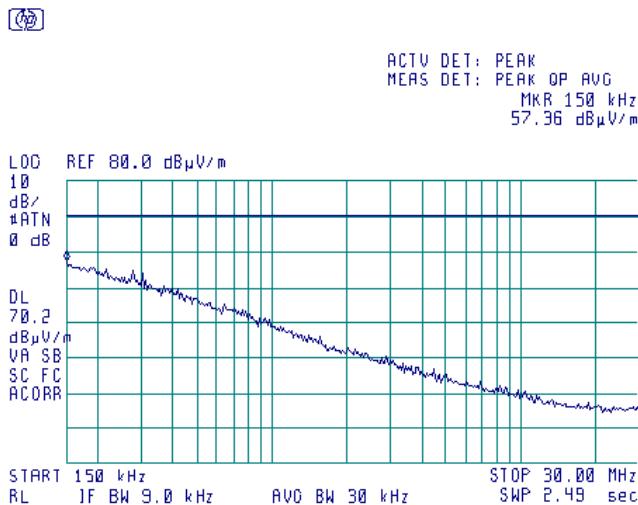
TEST SITE: Fully anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

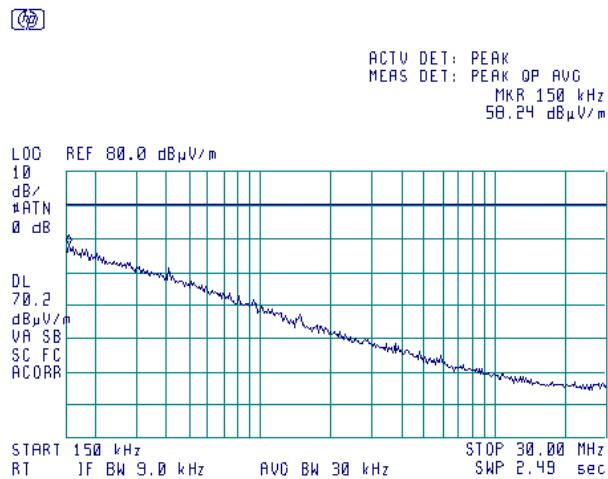
Plot 7.5.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.5.6 Radiated emission measurements in 0.15 - 30 MHz range

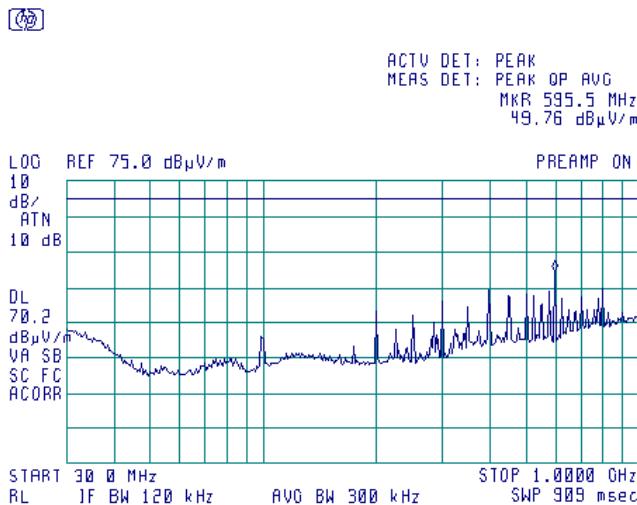
TEST SITE: Fully anechoic chamber
 CARRIER FREQUENCY: High
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

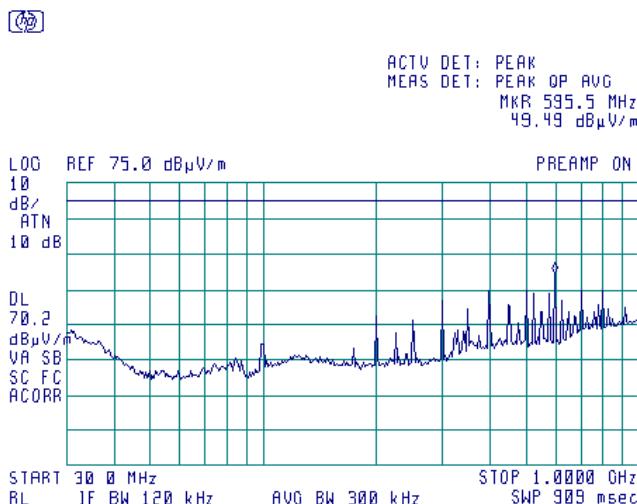
Plot 7.5.7 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.5.8 Radiated emission measurements in 30 - 1000 MHz range

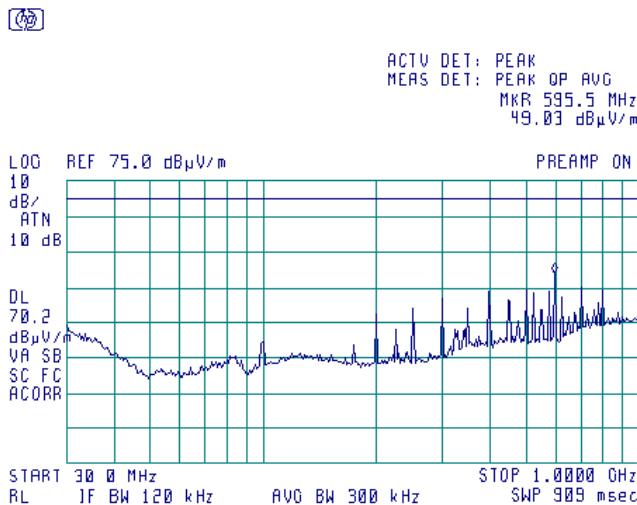
TEST SITE: Fully anechoic chamber
 CARRIER FREQUENCY: Mid
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

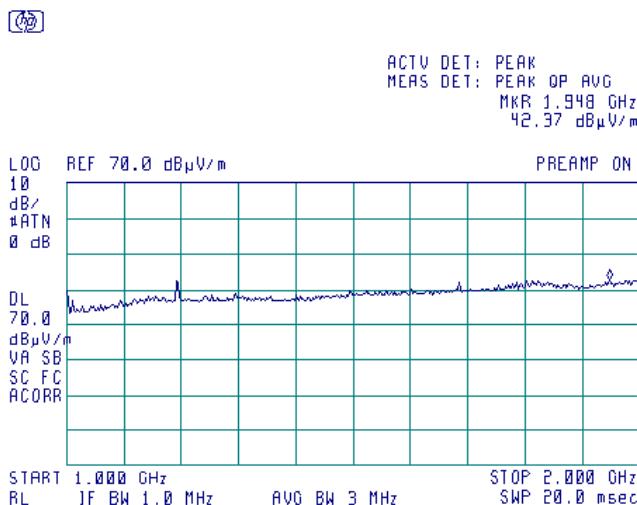
Plot 7.5.9 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.5.10 Radiated emission measurements in 1000 - 2000 MHz range

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



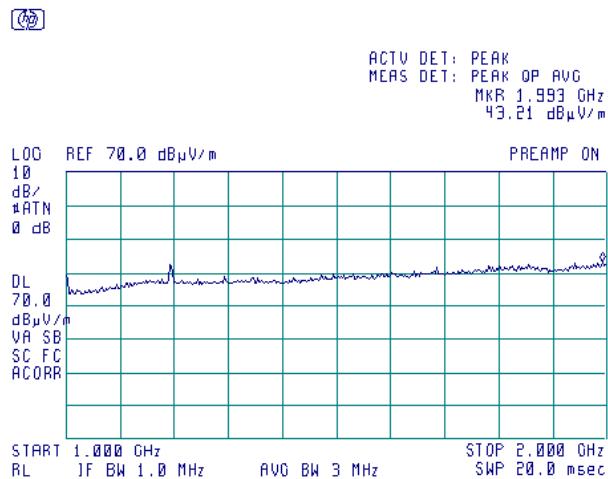


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Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

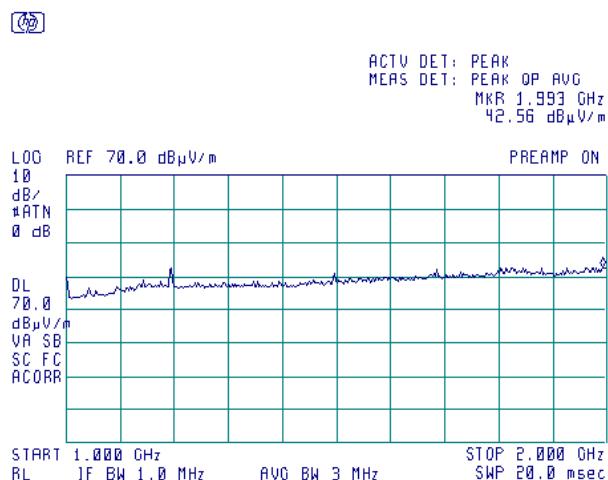
Plot 7.5.11 Radiated emission measurements in 1000 – 2000 MHz range

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



Plot 7.5.12 Radiated emission measurements in 1000 – 2000 MHz range

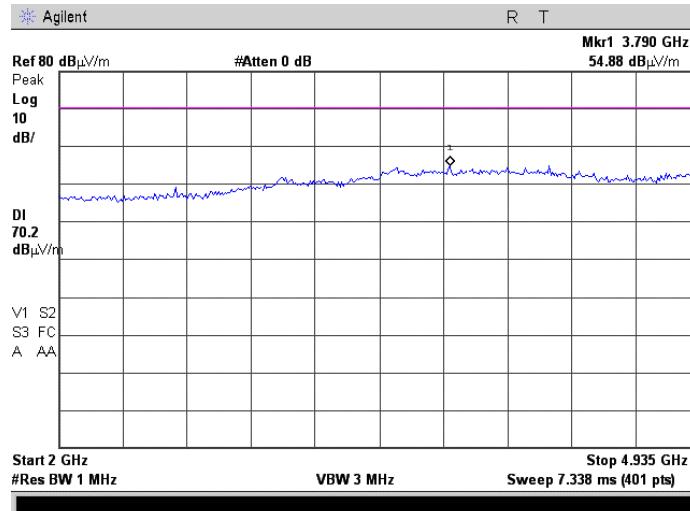
TEST SITE: Fully anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

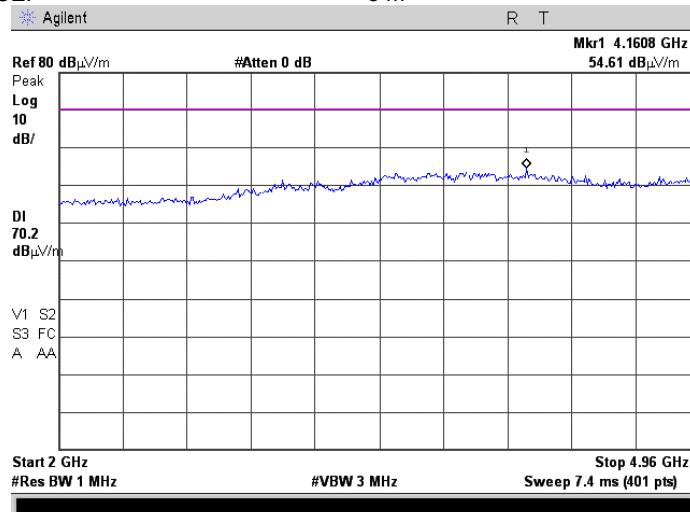
Plot 7.5.13 Radiated emission measurements in 2000 – 4935 MHz range

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



Plot 7.5.14 Radiated emission measurements in 2000 – 4960 MHz range

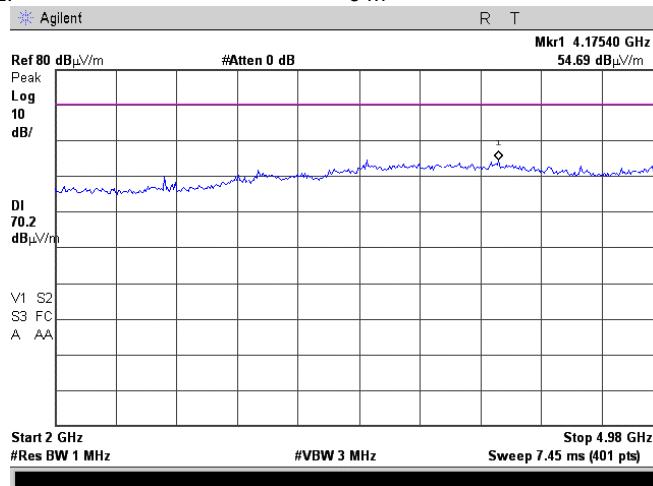
TEST SITE: Fully anechoic chamber
 CARRIER FREQUENCY: Mid
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.15 Radiated emission measurements in 2000 – 4980 MHz range

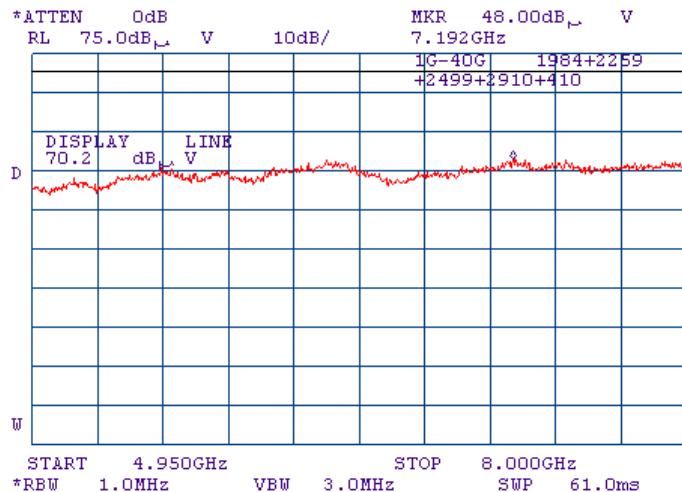
TEST SITE: Fully anechoic chamber
 CARRIER FREQUENCY: High
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

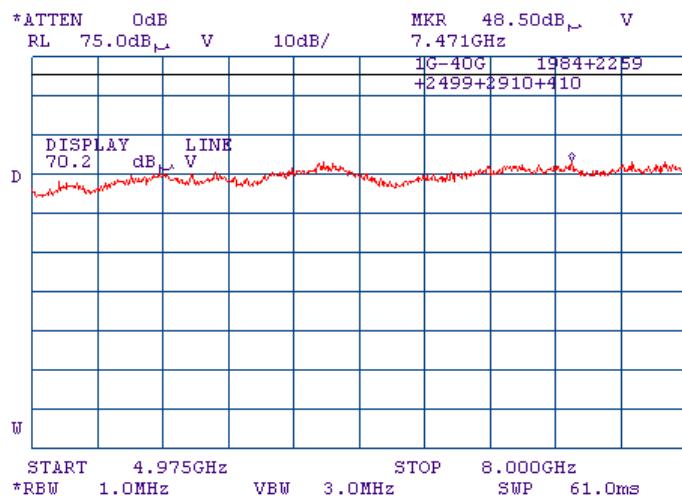
Plot 7.5.16 Radiated emission measurements in 4950 – 8000 MHz range

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



Plot 7.5.17 Radiated emission measurements in 4975 – 8000 MHz range

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



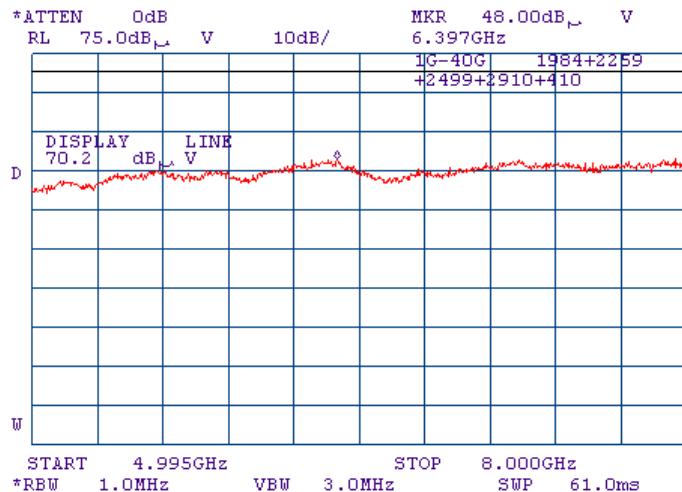


HERMON LABORATORIES

Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	3/26/2008 7:32:03 PM		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

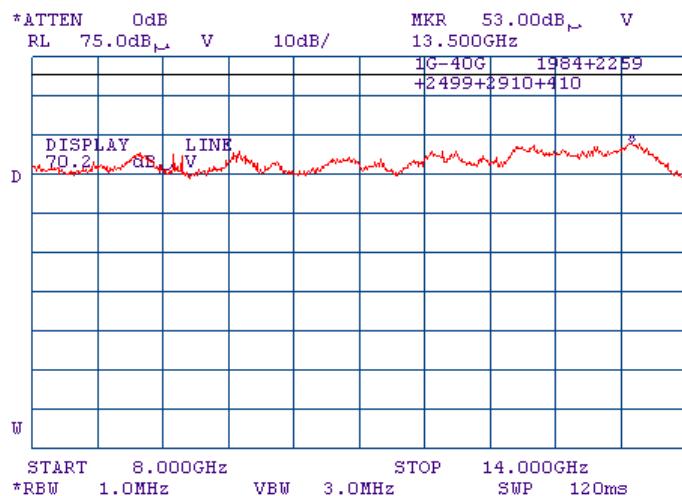
Plot 7.5.18 Radiated emission measurements in 4995 – 8000 MHz range

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



Plot 7.5.19 Radiated emission measurements in 8000 – 14000 MHz range

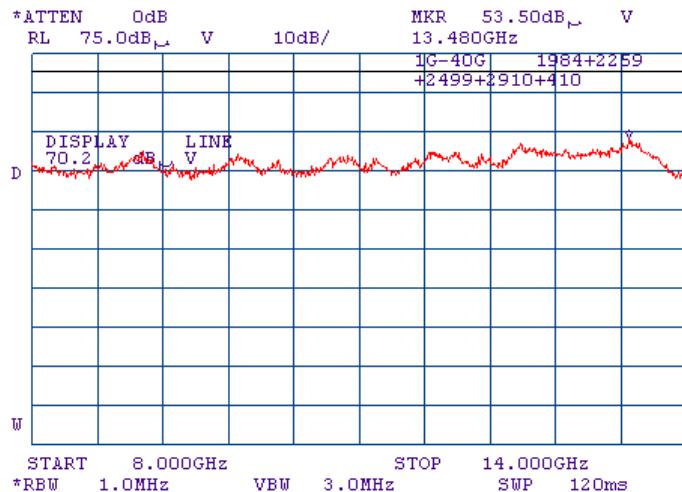
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

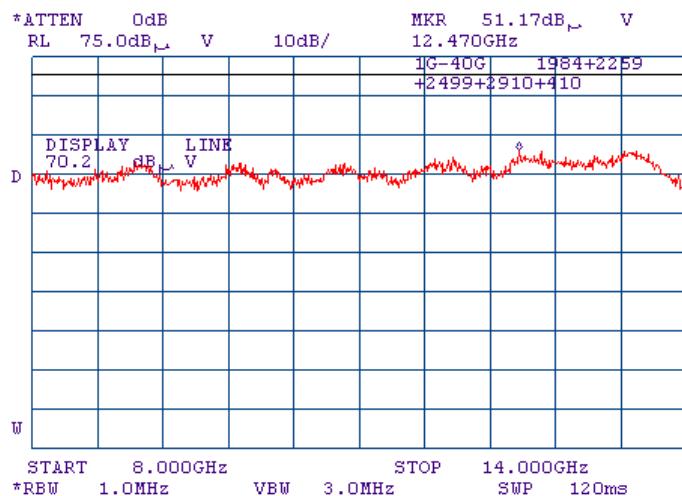
Plot 7.5.20 Radiated emission measurements in 8000 – 14000 MHz range

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



Plot 7.5.21 Radiated emission measurements in 8000 – 14000 MHz range

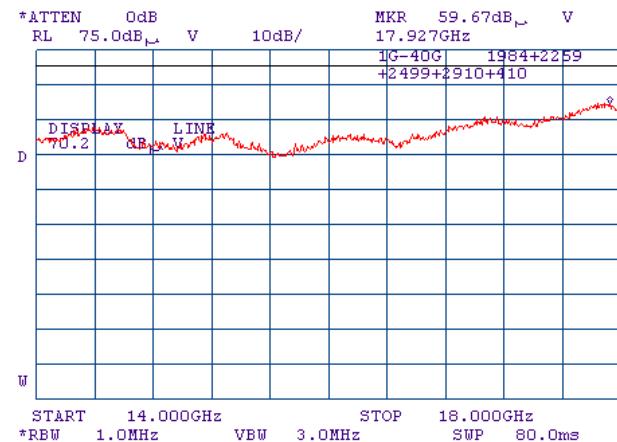
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

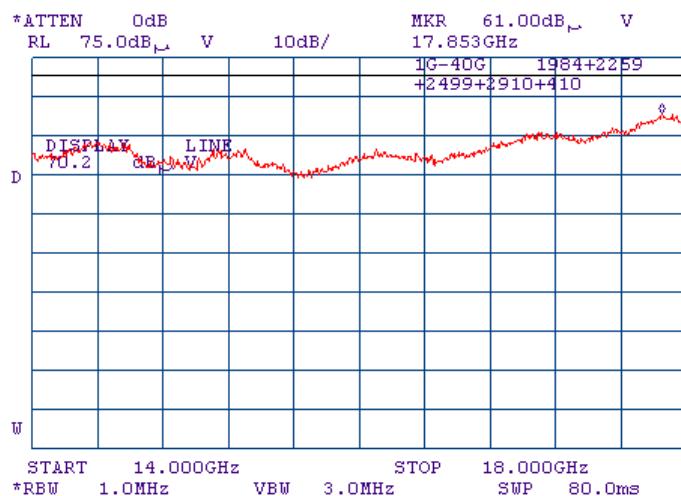
Plot 7.5.22 Radiated emission measurements in 14000 – 18000 MHz range

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



Plot 7.5.23 Radiated emission measurements in 14000 – 18000 MHz range

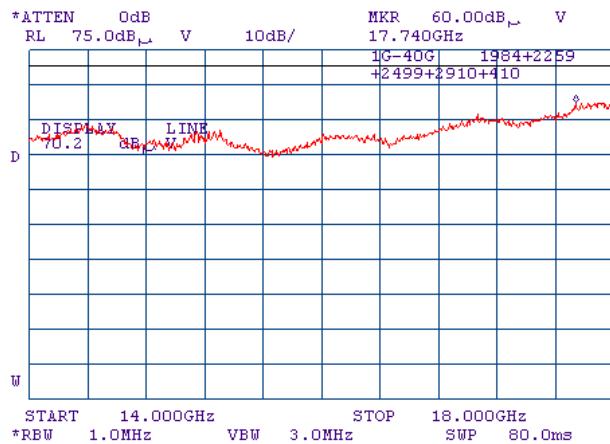
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

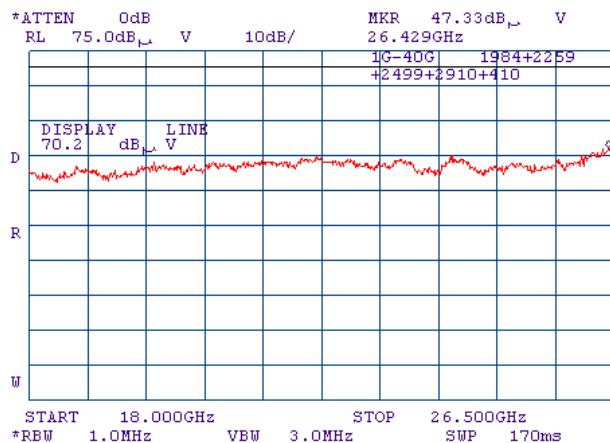
Plot 7.5.24 Radiated emission measurements in 14000 – 18000 MHz range

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



Plot 7.5.25 Radiated emission measurements in 18000 – 26500 MHz range

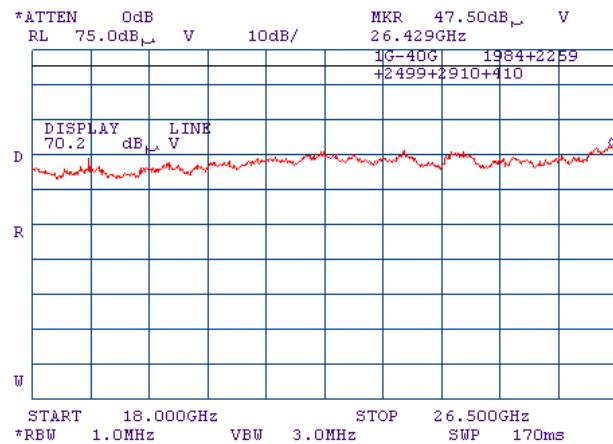
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

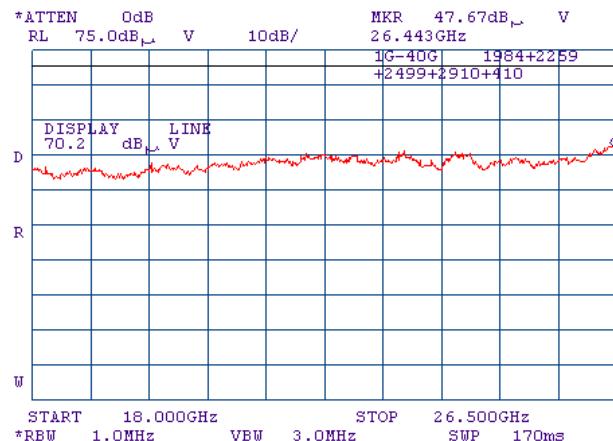
Plot 7.5.26 Radiated emission measurements in 18000 – 26500 MHz range

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



Plot 7.5.27 Radiated emission measurements in 18000 – 26500 MHz range

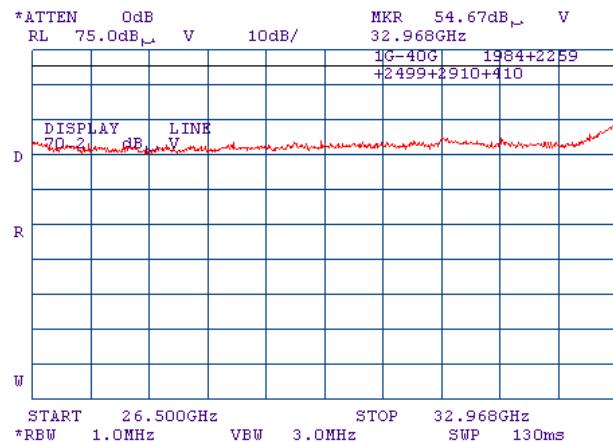
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

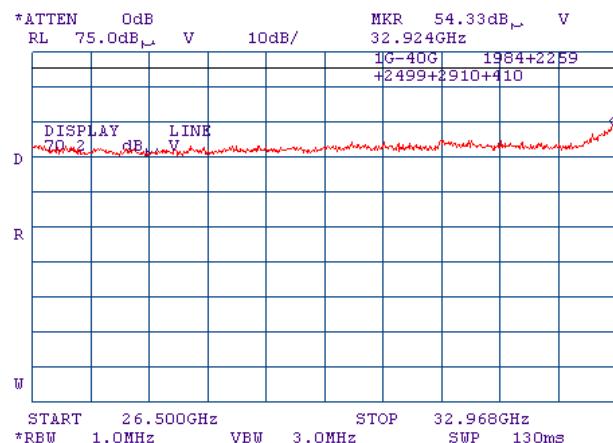
Plot 7.5.28 Radiated emission measurements in 26500 – 33000 MHz range

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



Plot 7.5.29 Radiated emission measurements in 26500 – 33000 MHz range

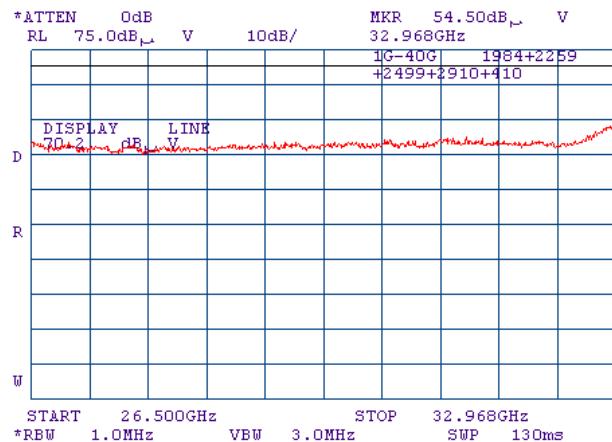
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

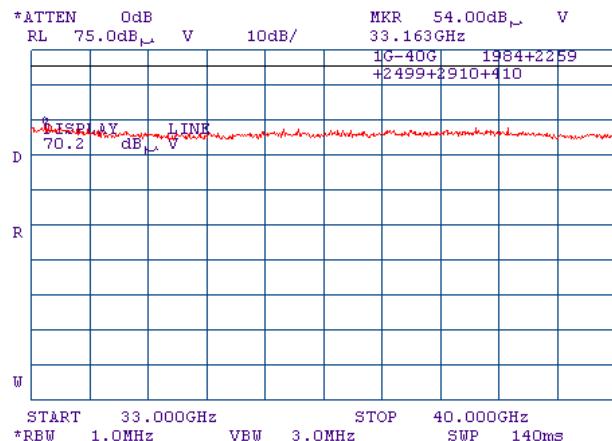
Plot 7.5.30 Radiated emission measurements in 26500 – 33000 MHz range

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



Plot 7.5.31 Radiated emission measurements in 33000 – 40000 MHz range

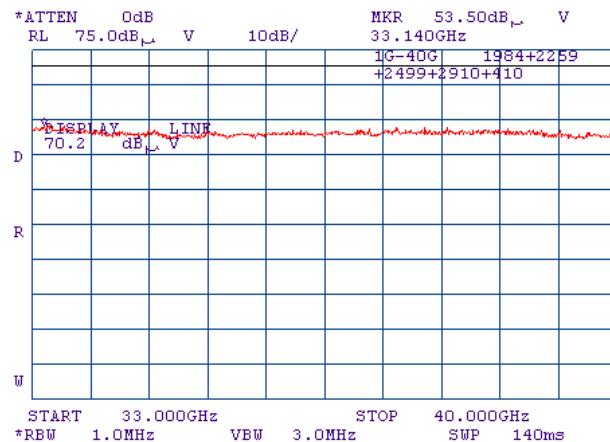
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

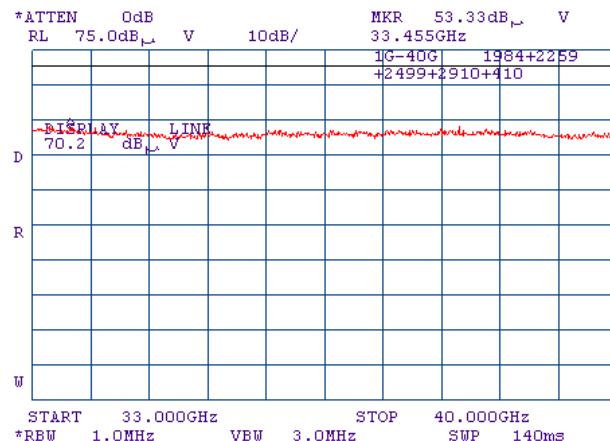
Plot 7.5.32 Radiated emission measurements in 33000 – 40000 MHz range

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



Plot 7.5.33 Radiated emission measurements in 33000 – 40000 MHz range

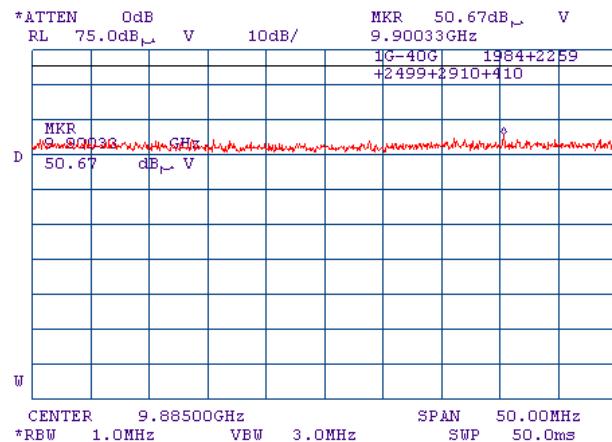
TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

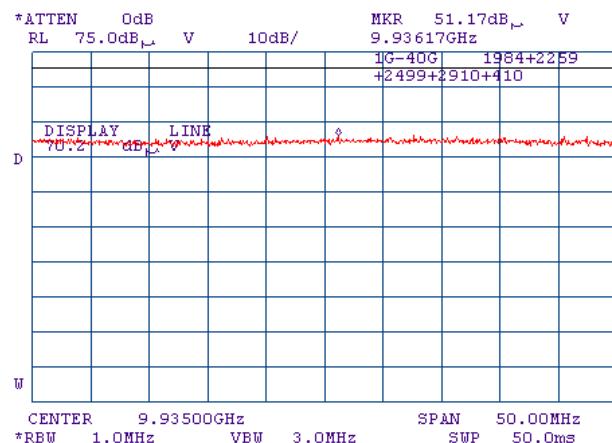
Plot 7.5.34 Radiated emission measurements at the 2nd harmonic

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



Plot 7.5.35 Radiated emission measurements at the 2nd harmonic

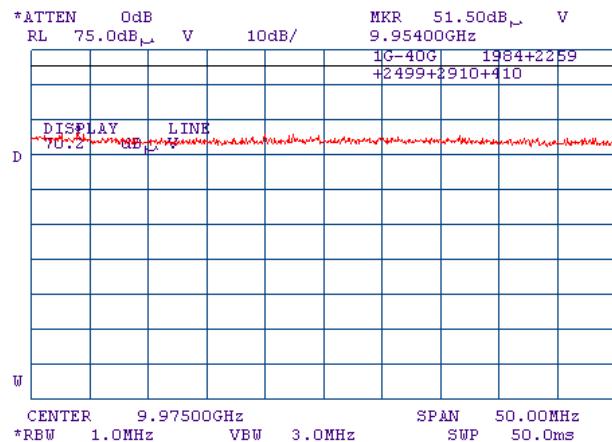
TEST SITE: OATS
 CARRIER FREQUENCY: Mid
 ANTENNA POLARIZATION: Vertical
 TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

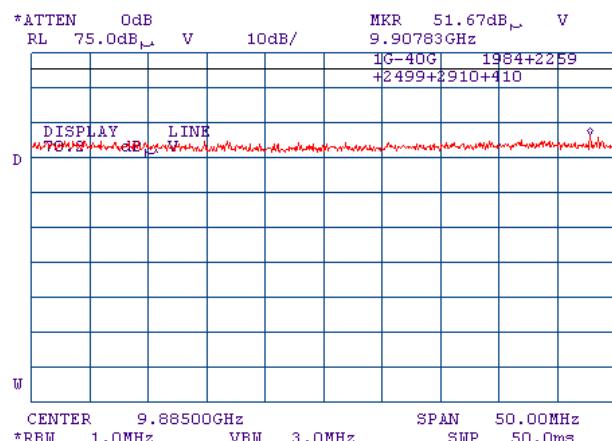
Plot 7.5.36 Radiated emission measurements at the 2nd harmonic

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



Plot 7.5.37 Radiated emission measurements at the 2nd harmonic

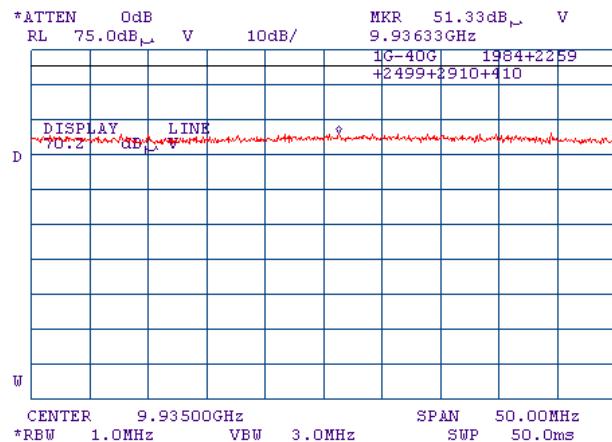
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

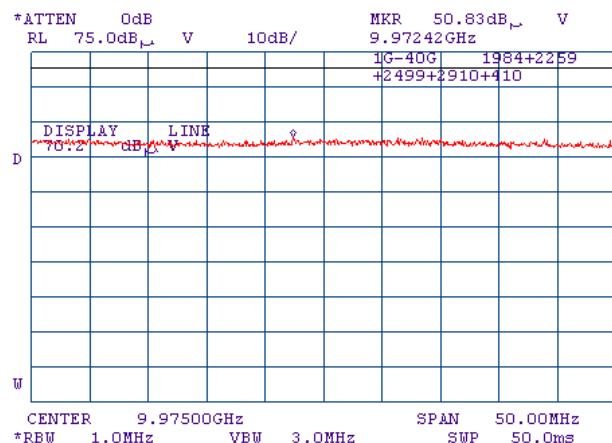
Plot 7.5.38 Radiated emission measurements at the 2nd harmonic

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



Plot 7.5.39 Radiated emission measurements at the 2nd harmonic

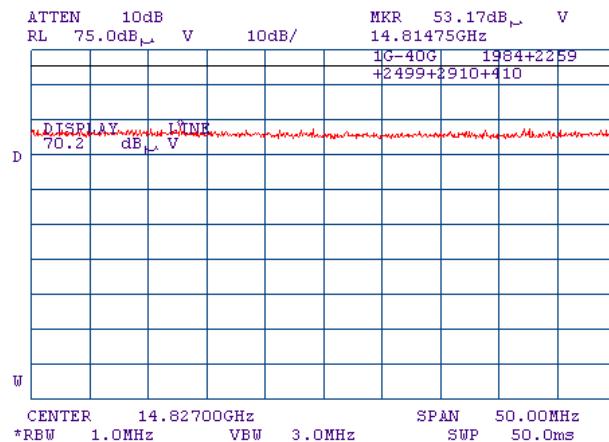
TEST SITE: OATS
 CARRIER FREQUENCY: High
 ANTENNA POLARIZATION: Horizontal
 TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

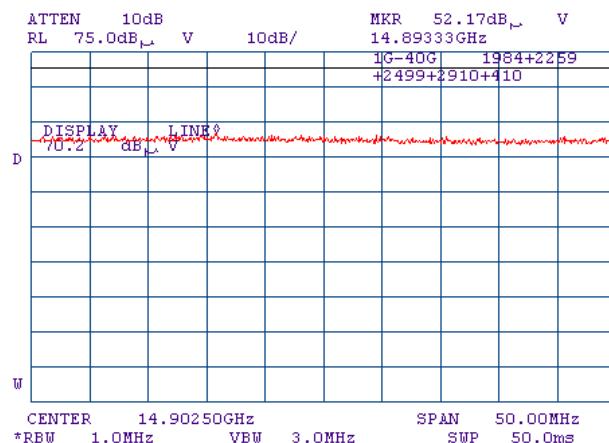
Plot 7.5.40 Radiated emission measurements at the 3rd harmonic

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



Plot 7.5.41 Radiated emission measurements at the 3rd harmonic

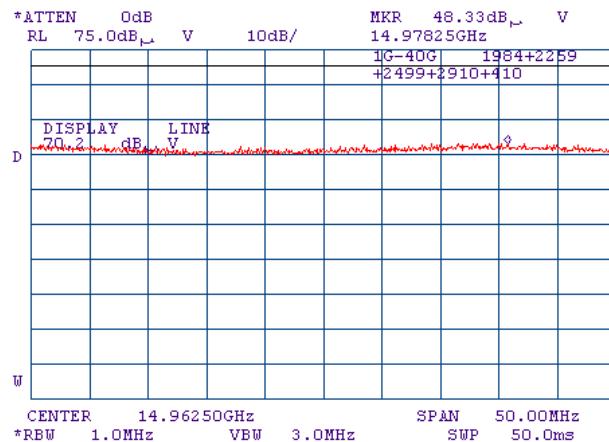
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

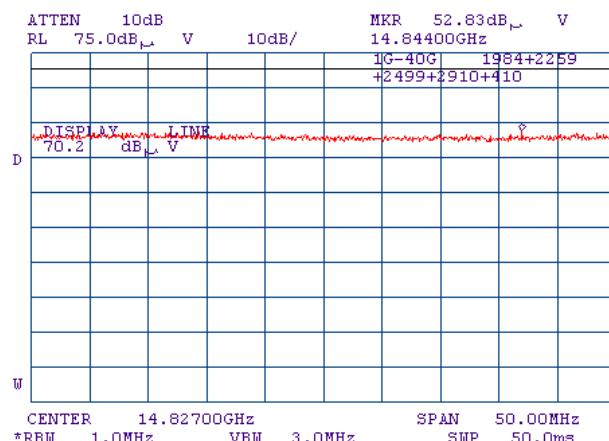
Plot 7.5.42 Radiated emission measurements at the 3rd harmonic

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



Plot 7.5.43 Radiated emission measurements at the 3rd harmonic

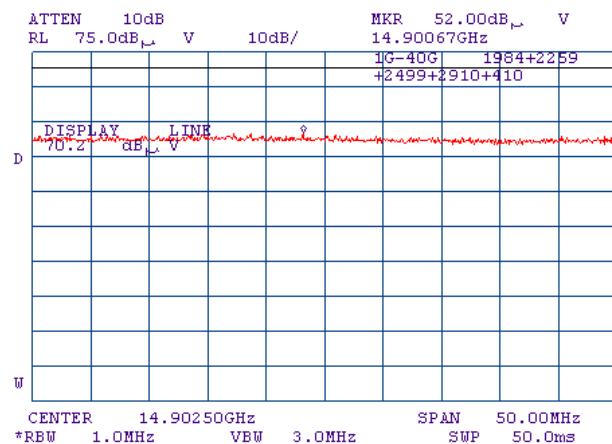
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	
Date & Time:	3/26/2008 7:32:03 PM	PASS	
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

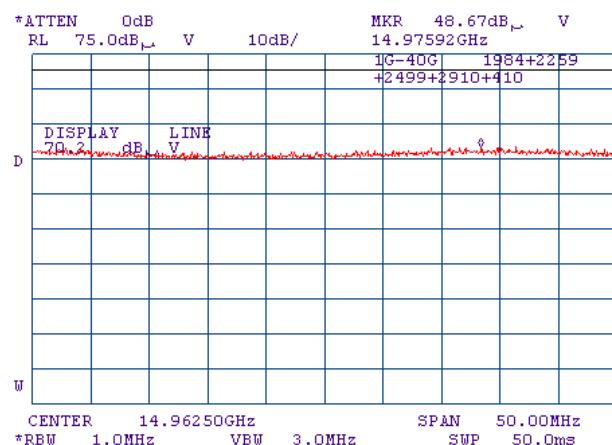
Plot 7.5.44 Radiated emission measurements at the 3rd harmonic

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



Plot 7.5.45 Radiated emission measurements at the 3rd harmonic

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



Test specification:	Section 90.213, Frequency stability		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2		
Test mode:	Compliance	Verdict:	PASS
Date:	3/19/2008		
Temperature: 22°C	Air Pressure: 1017 hPa	Relative Humidity: 41%	Power Supply: 120 VAC
Remarks:			

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.

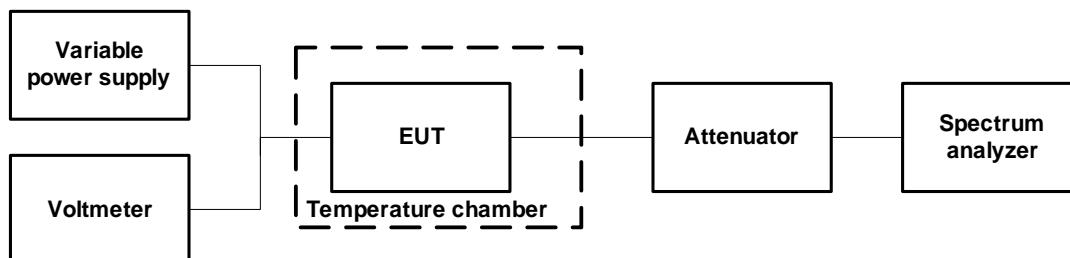
Table 7.6.1 Frequency stability limits

Operating frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
4942.500		98850
4967.500	20	99350
4987.500		99750

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



Test specification:	Section 90.213, Frequency stability		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2		
Test mode:	Compliance		Verdict: PASS
Date:	3/19/2008		
Temperature: 22°C	Air Pressure: 1017 hPa	Relative Humidity: 41%	Power Supply: 120 VAC
Remarks:			

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY: 4942.5 – 4987.5 MHz
 NOMINAL POWER VOLTAGE: 120 VAC
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 SPECTRUM ANALYZER MODE: Peak
 RESOLUTION BANDWIDTH: 300 Hz
 VIDEO BANDWIDTH: 1000 Hz
 MODULATION: Unmodulated

T, °C	Voltage, V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Margin, Hz	Verdict
		Start up	1 st min	2 nd min	3 rd min	4 th min	5 th min	10 th min	Positive	Negative			
Low frequency 4942.5 MHz													
-30	nominal	4942.500208	4942.500208	4942.500208	4942.500216	4942.500191	4942.500216	4942.500216	0	-1168	98850	-97682	Pass
-20	nominal	4942.499725	NA	NA	NA	NA	NA	4942.499725	0	-1634		-97216	Pass
-10	nominal	4942.499692	NA	NA	NA	NA	NA	4942.499683	0	-1676		-97174	Pass
0	nominal	4942.498467	4942.498534	4942.498600	4942.498644	4942.498675	4942.498709	4942.498884	0	-2892		-95958	Pass
10	nominal	4942.501533	NA	NA	NA	NA	NA	4942.501750	391	0		-98459	Pass
20	+15%	4942.500042	NA	NA	NA	NA	NA	4942.499633	0	-1726		-97124	Pass
20	nominal	4942.502609	NA	NA	NA	NA	NA	4942.501359	1250	0		-97600	Pass
20	-15%	4942.499125	NA	NA	NA	NA	NA	4942.499108	0	-2251		-96599	Pass
30	nominal	4942.501050	4942.500967	4942.500892	4942.500808	4942.500775	4942.500733	4942.500608	0	-751		-98099	Pass
40	nominal	4942.499367	NA	NA	NA	NA	NA	4942.499025	0	-2334		-96516	Pass
50	nominal	4942.498583	NA	NA	NA	NA	NA	4942.498392	0	-2967		-95883	Pass
Mid frequency 4967.5 MHz													
-30	nominal	4967.500217	4967.500233	4967.500242	4967.500256	4967.500267	4967.500275	4967.500300	0	-416	99350	-98934	Pass
-20	nominal	4967.499725	NA	NA	NA	NA	NA	4967.499683	0	-950		-98400	Pass
-10	nominal	4967.499675	NA	NA	NA	NA	NA	4967.499675	0	-958		-98392	Pass
0	nominal	4967.498892	4967.498909	4967.498925	4967.498950	4967.498959	4967.498974	4967.499034	0	-1741		-97609	Pass
10	nominal	4967.501808	NA	NA	NA	NA	NA	4967.501875	1242	0		-98108	Pass
20	+15%	4967.499600	NA	NA	NA	NA	NA	4967.499292	0	-1341		-98009	Pass
20	nominal	4967.501275	NA	NA	NA	NA	NA	4967.500633	642	0		-98708	Pass
20	-15%	4967.499083	NA	NA	NA	NA	NA	4967.499083	0	-1550		-97800	Pass
30	nominal	4967.500567	4967.500550	4967.500533	4967.500492	4967.500478	4967.500450	4967.500375	0	-258		-99092	Pass
40	nominal	4967.499008	NA	NA	NA	NA	NA	4967.498900	0	-1733		-97617	Pass
50	nominal	4967.498367	NA	NA	NA	NA	NA	4967.498359	0	-2274		-97076	Pass
High frequency 4987.5 MHz													
-30	nominal	4987.500292	4987.500300	4987.500300	4987.500308	4987.500325	4987.500317	4987.500333	175	0	99750	-99575	Pass
-20	nominal	4987.499675	NA	NA	NA	NA	NA	4987.499667	0	-491		-99259	Pass
-10	nominal	4987.499667	NA	NA	NA	NA	NA	4987.499200	0	-958		-98792	Pass
0	nominal	4987.499067	4987.499034	4987.499042	4987.499067	4987.499075	4987.499067	4987.499075	0	-1124		-98626	Pass
10	nominal	4987.501900	NA	NA	NA	NA	NA	4987.501933	1775	0		-97975	Pass
20	+15%	4987.499258	NA	NA	NA	NA	NA	4987.499133	0	-1025		-98725	Pass
20	nominal	4987.500617	NA	NA	NA	NA	NA	4987.500158	459	0		-99291	Pass
20	-15%	4987.499075	NA	NA	NA	NA	NA	4987.500783	625	-1083		-98667	Pass
30	nominal	4987.500383	4987.500368	4987.500350	4987.500342	4987.500317	4987.500308	4987.500258	225	0		-99525	Pass
40	nominal	4987.498892	NA	NA	NA	NA	NA	4987.498850	0	-1308		-98442	Pass
50	nominal	4987.498358	NA	NA	NA	NA	NA	4987.498366	0	-1800		-97950	Pass

* - Reference frequency

Reference numbers of test equipment used

HL 1424	HL 2358	HL 2910	HL 3436	HL 3441			
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Full description is given in Appendix A.

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	28-Jun-07	28-Jun-08
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-Jan-07	10-Jan-08
0661	Generator Swept Signal, 10 MHz to 40 GHz, +10 dBm	HP	83640B	3614A002 66	23-Sep-07	23-Sep-08
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	08-Dec-06	08-Dec-08
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	08-Dec-06	08-Dec-08
1292	Attenuator, 26.5 - 40 GHz, 0 - 50 dB, 0.5 W	Hughes	45721H-1000	061	03-Sep-07	03-Sep-08
1293	Adapter 35WR42Kf, 18 - 26.5 GHz	Getronics	35WR42K F	1293	30-Aug-07	30-Aug-10
1296	Adapter 35WR28Kf, 26.5-40 GHz	Wiltron	35WR28K F	1296	30-Aug-07	30-Aug-10
1378	Variable Attenuator 18.0-26.5 GHz	Hewlett Packard Co	K382A	1223	01-Apr-08	01-Apr-09
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Aug-07	28-Aug-08
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	31-Aug-07	31-Aug-08
1552	Cable RF, 8 m	Alpha Wire	RG-214	1552	02-Dec-07	02-Dec-08
1566	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13094/4PE	02-Dec-07	02-Dec-08
1567	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13095/4PE	02-Dec-07	02-Dec-08
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Mar-08	03-Mar-09
2254	Cable 40 GHz, 0.8 m, blue	Rhophase Microwave Limited	KPS-1503A-800-KPS	W4907	17-Jun-07	17-Jun-08
2259	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0223	30-Dec-07	30-Dec-08
2260	Amplifier Low Noise 14-33 GHz	Sophia Wireless	LNA28-B	0233	05-Nov-07	05-Nov-08
2261	Amplifier Low Noise 33-40 GHz	Sophia Wireless	LNA38-B	0234	05-Nov-07	05-Nov-08
2358	Power Supply, 2 X 0-36VDC / 5A, 5VDC / 5A	Horizon Electronics	DHR3655 D	767469	06-Mar-08	06-Mar-09
2387	Filter Bandpass, 8-14 GHz	HL	FBP8-14	2387	05-Jun-07	05-Jun-09
2399	Cable 40GHz, 1.5 m, blue	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2945	30-Dec-07	30-Dec-08
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	03-Mar-08	03-Mar-09

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
2499	Quadruplexer 1-12 GHz (1-2 GHz; 2-4GHz;4-8 GHz; 8-12GHz)	Elettronica S.p.A. - Roma	UE 84	D/00239	08-Feb-07	08-Feb-09
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 6	11-Jun-07	11-Jun-08
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	11-Feb-08	11-Feb-09
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-07	07-May-08
2910	Cable 18 GHz, 3 m, SMA-SMA	Gore	NA	989370	05-Oct-07	05-Oct-08
2951	Cable, RF, 18 GHz, 0.9 m, SMA-SMA	Gore	10020014	NA	05-Oct-07	05-Oct-08
2952	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-07	05-Oct-08
2953	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-07	05-Oct-08
3176	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	0708	07-May-07	07-May-08
3180	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	0651	07-May-07	07-May-08
3208	Cable 40 GHz, 1.8 m	Gore	GOR245	05118338	17-Jun-07	17-Jun-08
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY451010 57	27-Jul-07	27-Jul-08
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY452405 86	25-Jul-07	25-Jul-08
3436	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW-S10W5+	NA	30-Dec-07	30-Dec-08
3437	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW-S10W5+	NA	09-Mar-08	09-Mar-09
3440	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	09-Mar-08	09-Mar-09
3441	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	09-Mar-08	09-Mar-09

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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

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

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

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

10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 2186-1 for OATS and IC 2186-2 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), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

47CFR part 90: 2007	Private land mobile radio services
47CFR part 2: 2007	Frequency allocations and radio treaty matters; general rules and regulations
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

12 APPENDIX E Test equipment correction factors

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

Frequency, MHz	Magnetic Antenna Factor, dB(S/m)	Electric Antenna Factor, dB(1/m)
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.7
0.750	-41.9	9.6
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.1
4.000	-41.4	10.1
5.000	-41.5	10.0
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

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

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

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

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

Antenna factor

Biconilog antenna EMCO, model 3141, serial number 1011, HL 0604

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

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

Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL 1984

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(μ V) to convert it into field intensity in dB(μ 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(μ V) to convert it into field intensity in dB(μ V/m).

Cable loss
RF cable 8 m, model RG-214-8m, HL 1552

No.	Frequency, MHz	Cable loss, dB	Measurement uncertainty, dB	Notes
1	0.010	0.01		
2	0.1	0.01		
3	1	0.03		
4	10	0.12		
5	20	0.23		
6	30	0.30		
7	40	0.32		
8	50	0.34		
9	60	0.39		
10	70	0.43		
11	80	0.48		
12	90	0.50		
13	100	0.55		
14	200	0.78		
15	300	1.04		
16	400	1.16		
17	500	1.33		
18	600	1.51		
19	700	1.65		
20	800	1.77		
21	900	1.92		
22	1000	2.04		
23	1200	2.26		
24	1400	2.49		
25	1600	2.74		
26	1800	2.94		
27	2000	3.18		
28	2500	3.65		
29	2900	4.08		

±0.05

Cable loss
Cable RF, 2m, model: Sucoflex 104PE, S/N 13094/4PE, HL 1566

No.	Frequency, MHz	Cable loss, dB	Tolerance, dB	Measurement uncertainty, dB
1	30	0.10	≤ 5.0	±0.12
2	50	0.13		
3	100	0.20		
4	300	0.33		
5	500	0.45		
6	800	0.60		
7	1000	0.65		
8	1500	0.91		
9	2000	1.08		
10	2500	1.19		
11	3000	1.28		
12	3500	1.49		
13	4000	1.63		
14	4500	1.63	≤ 5.0	±0.17
15	5000	1.66		
16	5500	1.88		
17	6000	1.96		
18	6500	1.93		
19	7000	2.07		
20	7500	2.37		
21	8000	2.34		
22	8500	2.64		
23	9000	2.68		
24	9500	2.64		
25	10000	2.70		
26	10500	2.84		
27	11000	2.88		
28	11500	3.19		
29	12000	3.15	≤ 5.0	±0.26
30	12500	3.20		
31	13000	3.22		
32	13500	3.47		
33	14000	3.41		
34	14500	3.59		
35	15000	3.79		
36	15500	4.24		
37	16000	4.12		
38	16500	4.46		
39	17000	4.50		
40	17500	4.49		
41	18000	4.45		

Cable loss
Cable RF, 2 m, model: Sucoflex 104PE, s/n 13095/4PE, HL 1567

No.	Frequency, MHz	Cable loss, dB
1	30	0.09
2	50	0.15
3	100	0.23
4	300	0.31
5	500	0.46
6	800	0.63
7	1000	0.67
8	1500	0.89
9	2000	1.05
10	2500	1.18
11	3000	1.26
12	5300	1.51
13	4000	1.66
14	4500	1.61
15	5000	1.67
16	5500	1.91
17	6000	1.98
18	6500	1.91
19	7000	2.04
20	7500	2.36
21	8000	2.36
22	8500	2.61
23	9000	2.69
24	9500	2.62
25	10000	2.73
26	10500	2.83
27	11000	2.84
28	11500	3.22
29	12000	3.17
30	12500	3.17
31	13000	3.18
32	13500	3.49
33	14000	3.43
34	14500	3.57
35	15000	3.76
36	15500	4.20
37	16000	4.10
38	16500	4.49
39	17000	4.53
40	17500	4.46
41	18000	4.47

Cable loss
Cable 40 GHz, 0.8 m, blue, model: KPS-1503A-800-KPS, S/N W4907, HL 2254

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
0.03	0.04	5.10	0.80	15.00	1.49
0.05	0.07	5.30	0.83	15.50	1.49
0.10	0.09	5.50	0.83	16.00	1.46
0.20	0.15	5.70	0.84	16.50	1.47
0.30	0.19	5.90	0.87	17.00	1.50
0.40	0.25	6.10	0.86	17.50	1.57
0.50	0.29	6.30	0.89	18.00	1.63
0.60	0.33	6.50	0.90	18.50	1.57
0.70	0.37	6.70	0.89	19.00	1.63
0.80	0.41	6.90	0.93	19.50	1.65
0.90	0.44	7.10	0.92	20.00	1.64
1.00	0.45	7.30	0.95	20.50	1.75
1.10	0.48	7.50	0.96	21.00	1.72
1.20	0.51	7.70	0.97	21.50	1.78
1.30	0.53	7.90	1.01	22.00	1.76
1.40	0.54	8.10	1.00	22.50	1.72
1.50	0.57	8.30	1.05	23.00	1.83
1.60	0.59	8.50	1.04	23.50	1.80
1.70	0.04	8.70	1.07	24.00	1.90
1.80	0.07	8.90	1.11	24.50	1.81
1.90	0.09	9.10	1.09	25.00	1.98
2.00	0.15	9.30	1.14	25.50	1.91
2.10	0.19	9.50	1.12	26.00	2.02
2.20	0.25	9.70	1.15	26.50	1.92
2.30	0.29	9.90	1.16	27.00	1.97
2.40	0.33	10.10	1.16	28.00	2.02
2.50	0.37	10.30	1.19	29.00	1.95
2.60	0.41	10.50	1.14	30.00	1.94
2.70	0.44	10.70	1.19	31.00	2.11
2.80	0.45	10.90	1.17	32.00	2.17
2.90	0.48	11.10	1.13	33.00	2.27
3.10	0.61	11.30	1.20	34.00	2.27
3.30	0.64	11.50	1.13	35.00	2.29
3.50	0.65	11.70	1.20	36.00	2.35
3.70	0.68	11.90	1.18	37.00	2.37
3.90	0.69	12.10	1.14	38.00	2.40
4.10	0.71	12.40	1.19	39.00	2.57
4.30	0.73	13.00	1.34	40.00	2.36
4.50	0.75	13.50	1.33		
4.70	0.77	14.00	1.48		
4.90	0.79	14.50	1.45		

Cable loss
**Cable coaxial, 40GHz, 1.5 m, Blue, Rhophase Microwave Limited, model: KPS-1503A-1500-KPS,
 HL 2399**

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
0.03	0.07	6.5	1.57	15.50	2.50
0.05	0.10	6.7	1.60	16.00	2.51
0.1	0.16	6.9	1.55	16.50	2.58
0.2	0.26	7.1	1.65	17.00	2.65
0.3	0.33	7.3	1.65	17.50	2.73
0.5	0.38	7.5	1.70	18.00	2.74
0.7	0.41	7.7	1.71	18.50	2.67
0.9	0.58	7.9	1.73	19.00	2.67
1.1	0.64	8.1	1.79	19.50	2.74
1.3	0.70	8.3	1.81	20.00	2.69
1.5	0.75	8.5	1.84	20.50	2.80
1.7	0.79	8.7	1.85	21.00	2.82
1.9	0.83	8.9	1.90	21.50	2.87
2.1	0.88	9.1	1.95	22.00	2.87
2.3	0.93	9.3	1.93	22.50	2.92
2.5	0.97	9.5	1.98	23.50	3.04
2.7	1.01	9.7	1.96	24.00	3.05
2.9	1.04	9.9	2.03	24.50	3.03
3.1	1.08	10.1	1.99	25.00	3.11
3.3	1.14	10.30	2.02	25.50	3.10
3.5	1.17	10.50	2.02	26.00	3.17
3.7	1.21	10.70	2.02	26.50	3.11
3.9	1.24	10.90	2.08	27.00	3.16
4.1	1.26	11.10	2.02	28.00	3.19
4.3	1.26	11.30	2.09	29.00	3.19
4.5	1.29	11.50	2.05	30.00	3.30
4.7	1.34	11.70	2.11	31.00	3.31
4.9	1.34	11.90	2.11	32.00	3.35
5.1	1.40	12.10	2.12	33.00	3.46
5.3	1.43	12.40	2.17	34.00	3.45
5.5	1.45	13.00	2.29	35.00	3.49
5.7	1.47	13.50	2.31	36.00	3.54
5.9	1.40	14.00	2.43	37.00	3.62
6.1	1.53	14.50	2.43	39.00	3.69
6.3	1.55	15.00	2.46	40.00	3.75

Cable loss
Cable coaxial, Gore, 18 GHz, 3m, SMA-SMA, S/N 989370
HL 2910

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.07	5750	2.97	12000	5.05
30	0.19	6000	2.91	12250	4.44
100	0.36	6250	3.23	12500	4.82
250	0.53	6500	3.42	12750	5.22
500	0.77	6750	3.17	13000	5.02
750	0.94	7000	3.56	13250	5.00
1000	1.10	7250	3.77	13500	5.09
1250	1.19	7500	3.48	13750	4.70
1500	1.35	7750	3.81	14000	5.03
1750	1.51	8000	3.82	14250	5.17
2000	1.57	8250	3.62	14500	4.92
2250	1.69	8500	3.95	14750	4.91
2500	1.76	8750	4.00	15000	5.03
2750	1.83	9000	3.80	15250	4.93
3000	2.02	9250	4.09	15500	5.28
3250	2.17	9500	4.12	15750	5.60
3500	2.13	9750	4.11	16000	5.16
3750	2.23	10000	4.36	16250	5.45
4000	2.40	10250	4.75	16500	5.78
4250	2.31	10500	4.61	16750	5.47
4500	2.52	10750	4.26	17000	5.21
4750	2.77	11000	4.62	17250	5.53
5000	2.82	11250	4.55	17500	5.53
5250	2.77	11500	4.59	17750	5.71
5500	3.04	11750	5.20	18000	5.77

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
Cable coaxial, GORE-TEX, GOR245, 40 GHz, 1.8 m, SMA-SMA, S/N 05118338, HL 3208

Frequency, MHz	Cable loss, dB								
10	0.18	5000	2.25	10200	3.30	15500	4.08	31500	5.80
30	0.18	5100	2.26	10300	3.30	15600	4.15	32000	5.79
50	0.21	5200	2.30	10400	3.31	15700	4.13	32500	5.78
100	0.30	5300	2.31	10500	3.30	15800	4.13	33000	5.91
200	0.42	5400	2.35	10600	3.34	15900	4.17	33500	5.94
300	0.53	5500	2.36	10700	3.36	16000	4.18	34000	5.97
400	0.61	5600	2.40	10800	3.40	16100	4.26	34500	6.05
500	0.68	5700	2.41	10900	3.45	16200	4.23	35000	6.09
600	0.76	5800	2.45	11000	3.42	16300	4.22	35500	6.13
700	0.82	5900	2.45	11100	3.47	16400	4.27	36000	6.22
800	0.88	6000	2.48	11200	3.46	16500	4.25	36500	6.23
900	0.93	6100	2.50	11300	3.48	16600	4.28	37000	6.30
1000	0.98	6200	2.52	11400	3.52	16700	4.32	37500	6.41
1100	1.04	6300	2.55	11500	3.52	16800	4.35	38000	6.42
1200	1.08	6400	2.56	11600	3.56	16900	4.34	38500	6.39
1300	1.12	6500	2.59	11700	3.54	17000	4.36	39000	6.55
1400	1.17	6600	2.60	11800	3.58	17100	4.39	39500	6.58
1500	1.21	6700	2.62	11900	3.61	17200	4.40	40000	6.65
1600	1.25	6800	2.64	12000	3.67	17300	4.37		
1700	1.30	6900	2.66	12100	3.61	17400	4.45		
1800	1.34	7000	2.70	12200	3.65	17500	4.39		
1900	1.37	7100	2.73	12300	3.64	17600	4.44		
2000	1.39	7200	2.74	12400	3.65	17700	4.45		
2100	1.42	7300	2.74	12500	3.67	17800	4.49		
2200	1.46	7400	2.75	12600	3.69	17900	4.53		
2300	1.49	7500	2.77	12700	3.71	18000	4.49		
2400	1.52	7600	2.81	12800	3.69	18500	4.61		
2500	1.55	7700	2.83	12900	3.71	19000	4.63		
2600	1.59	7800	2.88	13000	3.74	19500	4.67		
2700	1.62	7900	2.89	13100	3.75	20000	4.69		
2800	1.67	8000	2.89	13200	3.76	20500	4.82		
2900	1.68	8100	2.89	13300	3.78	21000	4.88		
3000	1.71	8200	2.92	13400	3.78	21500	5.00		
3100	1.74	8300	2.97	13500	3.83	22000	5.08		
3200	1.77	8400	2.99	13600	3.90	22500	5.03		
3300	1.80	8500	3.04	13700	3.88	23000	5.11		
3400	1.84	8600	3.04	13800	3.91	23500	5.06		
3500	1.85	8700	3.03	13900	3.88	24000	5.12		
3600	1.89	8800	3.04	14000	3.89	24500	5.23		
3700	1.92	8900	3.08	14100	3.95	25000	5.38		
3800	1.94	9000	3.09	14200	3.97	25500	5.39		
3900	1.96	9100	3.15	14300	4.08	26000	5.45		
4000	2.00	9200	3.14	14400	3.98	26500	5.48		
4100	2.03	9300	3.14	14600	3.96	27000	5.42		
4200	2.05	9400	3.15	14700	4.00	27500	5.49		
4300	2.07	9500	3.17	14800	4.01	28000	5.57		
4400	2.09	9600	3.20	14900	4.04	28500	5.58		
4500	2.14	9700	3.19	15000	4.10	29000	5.59		
4600	2.15	9800	3.19	15100	4.08	29500	5.56		
4700	2.18	9900	3.21	15200	4.07	30000	5.69		
4800	2.20	10000	3.23	15300	4.09	30500	5.73		
4900	2.23	10100	3.26	15400	4.13	31000	5.81		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
dB Ω	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
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NB	narrow band
NT	not tested
OATS	open area test site
Ω	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