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839.01
Electrical

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TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 subpart Z; part 15 subpart B

FOR:

WiNetworks Ltd.

Subscriber unit operating in 3.65-3.675 GHz

Model: WiN5235

Table of contents

1	Applicant information	3
2	Equipment under test attributes	3
3	Manufacturer information	3
4	Test details	3
5	Tests summary	4
6	EUT description	5
6.1	General information	5
6.2	Ports and lines	5
6.3	Support and test equipment	5
6.4	Changes made in the EUT	5
6.5	Test configuration	5
6.6	Transmitter characteristics	6
7	Transmitter tests according to 47CFR part 90 requirements	7
7.1	Peak output power test	7
7.2	Occupied bandwidth test	22
7.3	Emission mask test	37
7.4	Radiated spurious emission measurements	52
7.5	Spurious emissions at RF antenna connector test	73
7.6	Frequency stability test	86
7.7	RF exposure	88
8	Emissions tests according to FCC 47CFR part 15 subpart B requirements	89
8.1	Conducted emissions	89
8.2	Radiated emission measurements	93
9	APPENDIX A Test equipment and ancillaries used for tests	99
10	APPENDIX B Measurement uncertainties	101
11	APPENDIX C Test facility description	102
12	APPENDIX D Specification references	102
13	APPENDIX E Test equipment correction factors	103
14	APPENDIX F Abbreviations and acronyms	111

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1 Applicant information

Client name:	WiNetworks Ltd.
Address:	32 Maskit Street, P.O.Box 12412, Herzeliya 46733, Israel
Telephone:	+972 9951 9556
Fax:	+972 9951 9557
E-mail:	shayc@winetworks.com
Contact name:	Mr. Shay Chaim

2 Equipment under test attributes

Product name:	Subscriber unit operating in 3.65-3.675 GHz
Product type:	Transceiver
Model(s):	WiN5235
Receipt date	10/5/2008

3 Manufacturer information

Manufacturer name:	WiNetworks Ltd.
Address:	32 Maskit Street, P.O.Box 12412, Herzeliya 46733, Israel
Telephone:	+972 9951 9556
Fax:	+972 9951 9557
E-Mail:	shayc@winetworks.com
Contact name:	Mr. Shay Chaim

4 Test details

Project ID:	19118
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	10/05/2008
Test completed:	11/01/2008
Test specification(s):	47CFR part 90 subpart Z; part 15 subpart B

5 Tests summary

Test	Status
Transmitter characteristics	
Section 90.205, 90.1321, Maximum output power and peak power spectral density	Pass
Section 90.209, Occupied bandwidth	Pass
Section 90.210, Emission mask	Pass
Section 90.1323, Conducted spurious emissions	Pass
Section 90.1323, Radiated spurious emissions	Pass
Section 90.213, Frequency stability	Pass
Section 2.1091, 90.1335, RF radiation exposure evaluation	Pass
Unintentional emissions	
Section 15.107, Conducted emission at AC power port	Pass
Section 15.109, Radiated emission	Pass

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

	Name and Title	Date	Signature
Tested by:	Mr. E. Plotnichenko, test engineer Mr. L. Markel, test engineer	November 1, 2008	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	November 23, 2008	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	November 24, 2008	

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6 EUT description

6.1 General information

The EUT, WiN 5235, is a subscriber unit of WiMAX system, installed at the customer premises. It comprises an Outdoor Unit (ODU) that includes modem, radio, data processing and management components, serving as an efficient platform for a wide range of services. It provides a wireless connection to the base station as well as a connection to the satellite antenna.

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	IDU	RJ45	1	Shielded	1.5 m
RF	Antenna	EUT	50 Ohm termination	MCX	2	NA	NA
Power	AC power	EUT	mains	IEC 60320	1	inshielded	1.5 m

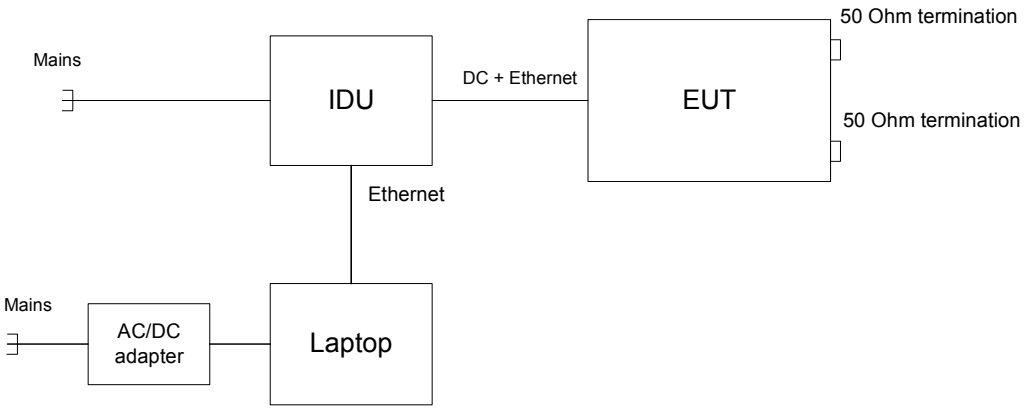
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	Dell	PP22L	JX190A00
Adapter to laptop	Dell	0334B4848	0507049

6.4 Changes made in the EUT

No changes were implemented.

6.5 Test configuration



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6.6 Transmitter characteristics

Type of equipment								
V	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**						
V	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		3650 – 3675 MHz						
Operating frequency range		3653.5 – 3671.5 MHz						
RF channel bandwidth		7 MHz, 10 MHz						
Maximum rated output power		At transmitter 50 Ω RF output connector - under 16 dBm transmitter output power settings					14.3 dBm	
Is transmitter output power variable?			No					
		V	Yes		continuous variable			
				V	0.5 dB		0.5 dB	
				minimum power at output connector			-10 dBm	
				maximum EIRP power			32.3 dBm	
Antenna connection								
unique coupling	standard connector		**V** Integral		**V** with temporary RF connector			
					without temporary RF connector			
Antenna/s technical characteristics								
Type	Manufacturer		Model number		Gain			
Integrated	MTI Wireless Edge Ltd.		MT – 385002/CD		18 dBi			
Transmitter 99% power bandwidth		7 MHz, 10 MHz						
Transmitter aggregate data rate/s		7 MHz BW: QPSK - 4.19 MBps, 16QAM – 12.565 MBps, 64QAM – 18.85 MBps 10 MHz BW: QPSK - 8.38 MBps, 16QAM – 25.13 MBps, 64QAM – 37.7 MBps						
Type of modulation		QPSK, 16QAM, 64QAM						
Type of multiplexing		OFDM						
Modulating test signal (baseband)		PRBS						
Maximum transmitter duty cycle in normal use		75%						
Transmitter power source								
		Nominal rated voltage		Battery type				
V	DC	**Nominal rated voltage**	48 V (PoE or via DC power supply from the mains)					
	AC mains	**Nominal rated voltage**		Frequency				
Common power source for transmitter and receiver			**V** yes		no			
Receiver local oscillator frequency		3200 MHz						

Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 90 requirements

7.1 Peak output power test

7.1.1 General

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

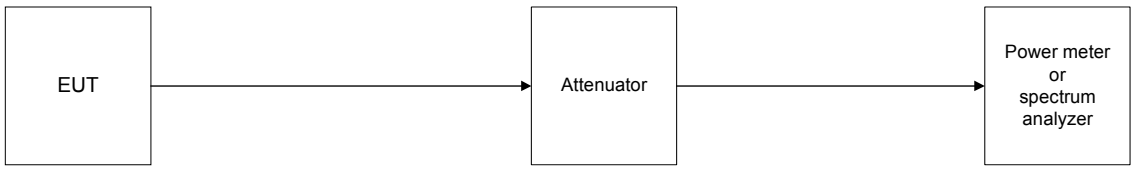
Table 7.1.1 Peak output power and spectral density limits

Assigned frequency range, MHz	Channel bandwidth, MHz	Maximum peak output power		Power spectral density, dBm/MHz
		W	dBm	
3650.0 – 3700.0	7	7.0	38.45	30.0
	10	10.0	40.00	

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 and spectral density was measured with a power meter and spectrum analyzer respectively as provided in Table 7.1.2, Table 7.1.4, Table 7.1.3, Table 7.1.5 and associated plots.

Figure 7.1.1 Peak output power test setup



Test specification:	**Section 90.1321, Maximum output power**		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks: 7 MHz CBW			

Table 7.1.2 Peak output power test results for 7 MHz channel bandwidth

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK, 16QAM, 64QAM
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: 16 dBm

Carrier frequency, MHz	Power meter reading, dBm	External attenuation, dB	Antenna gain dBi	EIRP,* dBm	Limit, dBm	Margin dB	Verdict
64QAM, Bit Rate: 18.85 Mbps							
3653.5	15.41	included	18.0	33.41	38.45	-5.04	Pass
3662.5	15.33	included	18.0	33.33	38.45	-5.12	Pass
3671.5	15.18	included	18.0	33.18	38.45	-5.27	Pass
16QAM, Bit Rate : 12.565 Mbps							
3653.5	15.38	included	18.0	33.38	38.45	-5.07	Pass
3662.5	15.33	included	18.0	33.33	38.45	-5.12	Pass
3671.5	15.13	included	18.0	33.13	38.45	-5.32	Pass
QPSK, Bit Rate: 4.19 Mbps							
3653.5	15.4	included	18.0	33.4	38.45	-5.05	Pass
3662.5	15.35	included	18.0	33.35	38.45	-5.10	Pass
3671.5	15.16	included	18.0	33.16	38.45	-5.29	Pass

* - EIRP (dBm) = Power meter reading (dBm) + antenna gain (18 dBi)

Reference numbers of test equipment used

HL 3301	HL 3302						

Full description is given in Appendix A.

Test specification:	**Section 90.1321, Maximum output power**		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks: 7 MHz CBW			

Table 7.1.3 Power spectral density test results for 7 MHz channel bandwidth

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK, 16QAM, 64QAM
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: 16 dBm

Carrier frequency, MHz	Spectrum analyzer reading, dBm/MHz	Attenuation, dB	Antenna Gain dBi	Power density**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
64QAM,Bit Rate: 18.85 Mbps							
3653.5	11.11	included	18.0	29.11	30	-0.89	Pass
3662.5	10.99	included	18.0	28.99	30	-1.01	Pass
3671.5	10.81	included	18.0	28.81	30	-1.19	Pass
16QAM, Bit Rate: 12.565 Mbps							
3653.5	11.03	included	18.0	29.03	30	-0.97	Pass
3662.5	10.99	included	18.0	28.99	30	-1.01	Pass
3671.5	10.8	included	18.0	28.8	30	-1.2	Pass
QPSK, Bit Rate: 4.19 Mbps							
3653.5	11.05	included	18.0	29.05	30	-0.95	Pass
3662.5	10.92	included	18.0	28.92	30	-1.08	Pass
3671.5	10.73	included	18.0	28.73	30	-1.27	Pass

** - Power density = Spectrum analyzer reading + antenna gain (18 dBi)

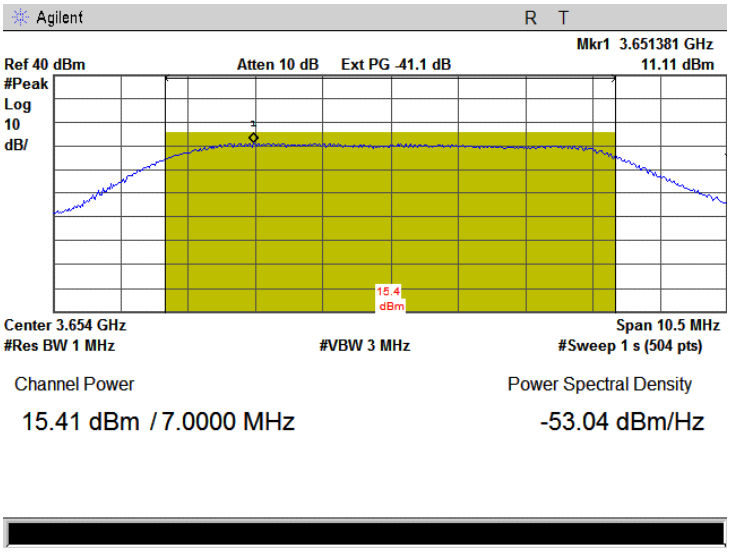
Reference numbers of test equipment used

HL 2909	HL 3385						

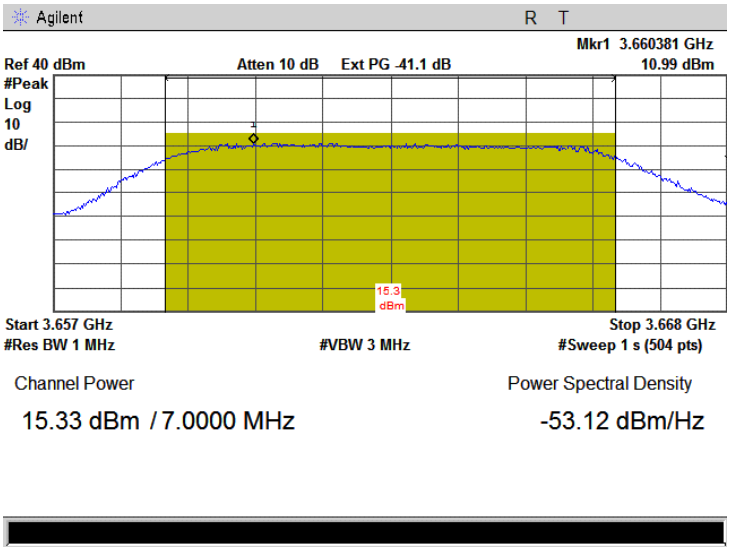
Full description is given in Appendix A.

Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.1.1 Peak output power test results at low frequency, 64QAM, bit rate 18.85 Mbps

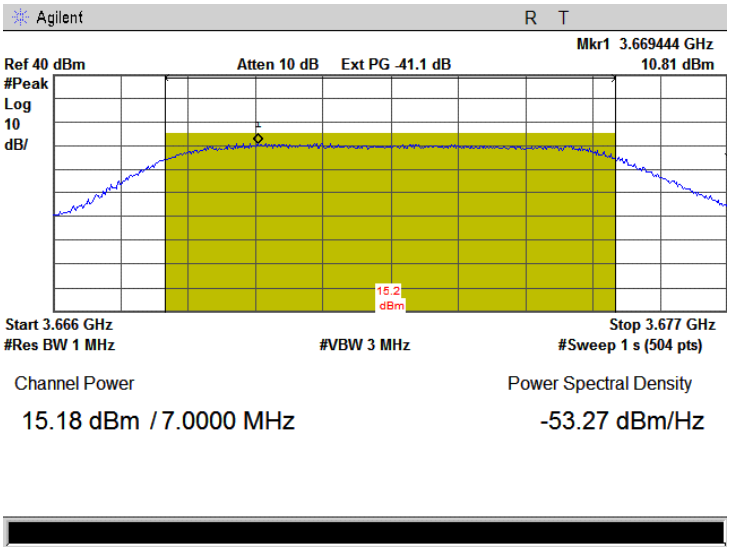


Plot 7.1.2 Peak output power test results at mid frequency, 64QAM, bit rate 18.85 Mbps

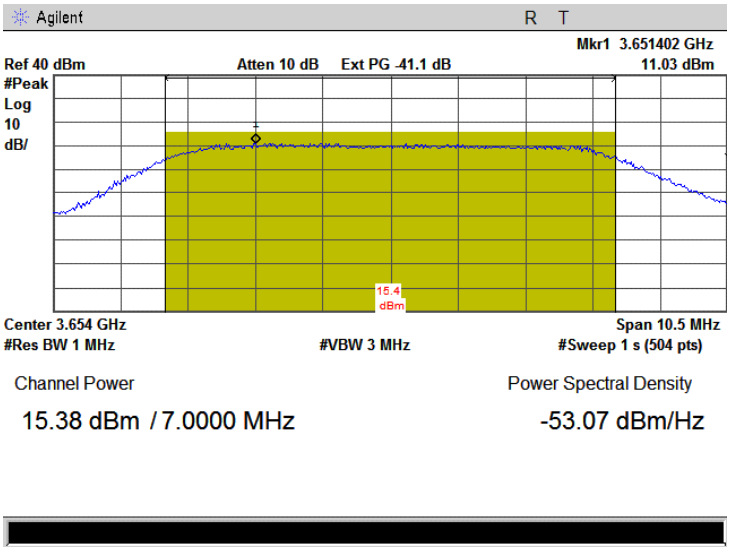


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.1.3 Peak output power test results at high frequency, 64QAM bit rate 18.85 Mbps

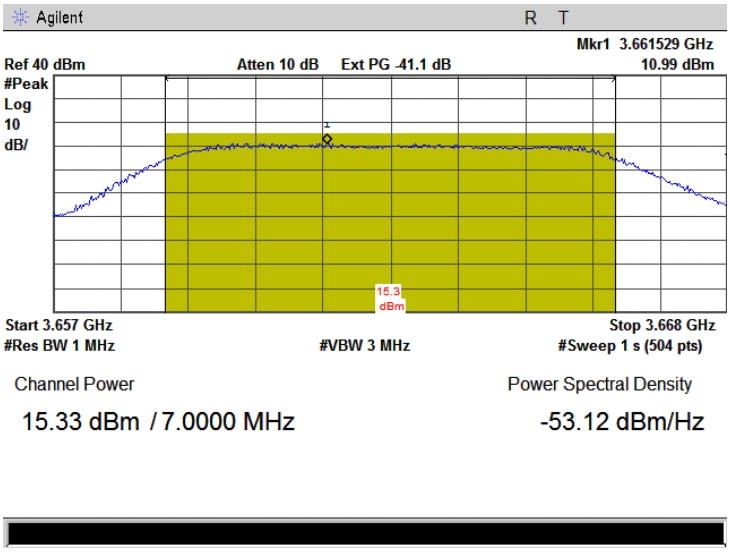


Plot 7.1.4 Peak output power test results at low frequency, 16QAM bit rate 12.565 Mbps

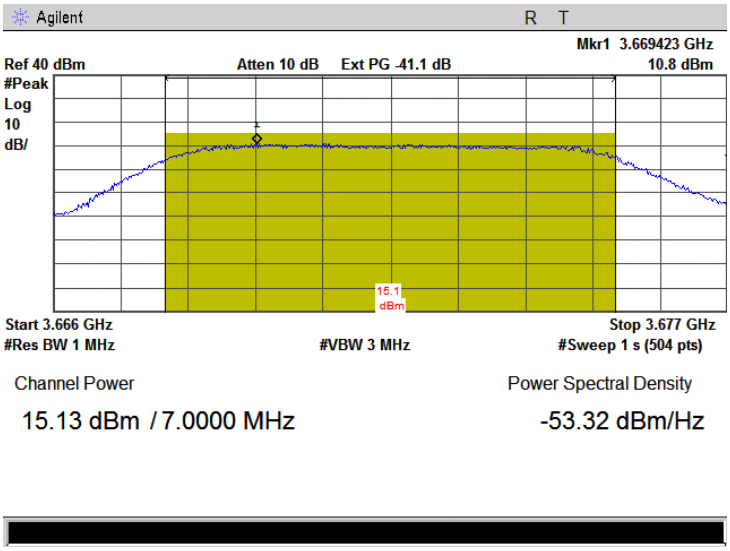


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.1.5 Peak output power test results at mid frequency, 16QAM bit rate 12.565 Mbps

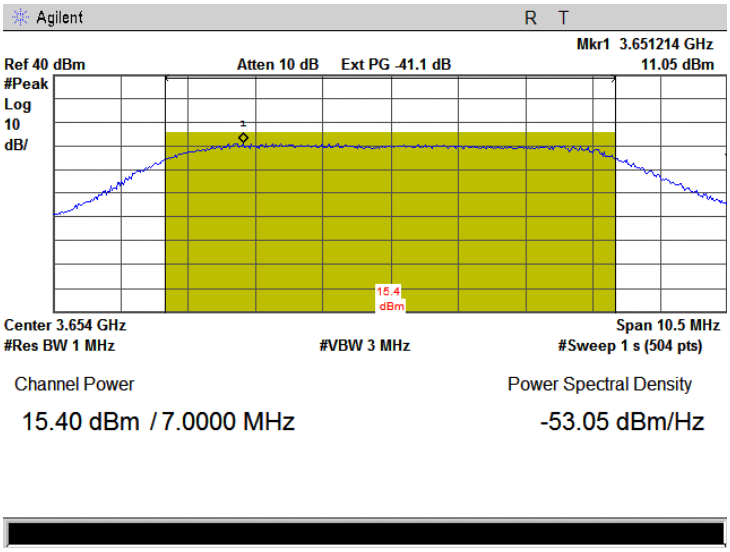


Plot 7.1.6 Peak output power test results at high frequency, 16QAM bit rate 12.565 Mbps

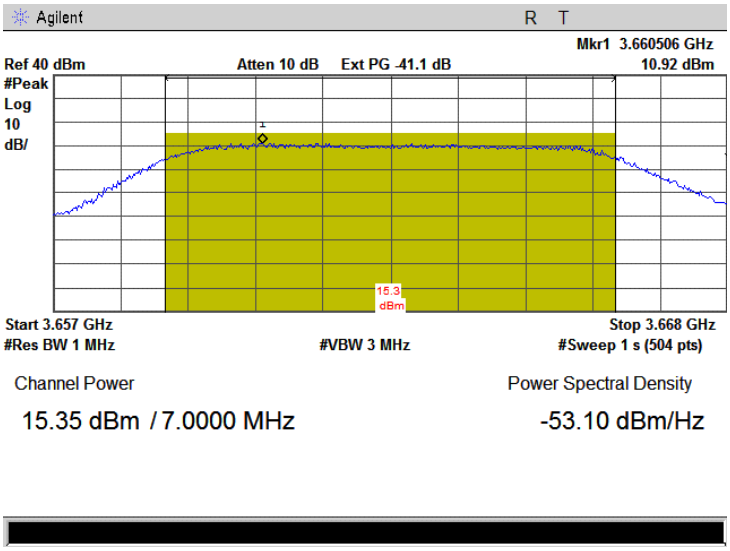


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.1.7 Peak output power test results at low frequency, QPSK bit rate 4.19 Mbps

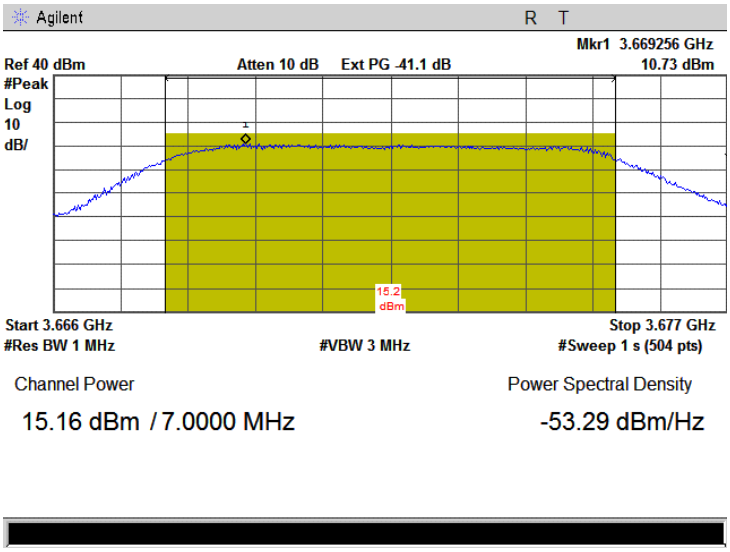


Plot 7.1.8 Peak output power test results at mid frequency, QPSK bit rate 4.19 Mbps



Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.1.9 Peak output power test results at high frequency, QPSK bit rate 4.19 Mbps



Test specification:	**Section 90.1321, Maximum output power**		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks: 10 MHz CBW			

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

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK, 16QAM, 64QAM
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: 16 dBm

Carrier frequency, MHz	Power meter reading, dBm	External attenuation, dB	Antenna Gain dBi	EIRP,* dBm	Limit, dBm	Margin dB	Verdict
64QAM, Bit Rate: 37.7 Mbps							
3655.0	14.34	included	18	32.34	40	-7.66	Pass
3662.5	14.21	included	18	32.21	40	-7.79	Pass
3670.0	14.12	included	18	32.12	40	-7.88	Pass
16QAM, Bit Rate : 25.13 Mbps							
3655.0	14.34	included	18	32.34	40	-7.66	Pass
3662.5	14.23	included	18	32.23	40	-7.77	Pass
3670.0	14.10	included	18	32.10	40	-7.90	Pass
QPSK, Bit Rate: 8.38 Mbps							
3655.0	14.29	included	18	32.29	40	-7.71	Pass
3662.5	14.24	included	18	32.24	40	-7.76	Pass
3670.0	14.10	included	18	32.10	40	-7.90	Pass

* - EIRP (dBm) = Power meter reading (dBm) + antenna gain (18 dBi)

Reference numbers of test equipment used

HL 3301	HL 3302						

Full description is given in Appendix A.

Test specification:	**Section 90.1321, Maximum output power**		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks: 10 MHz CBW			

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

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK, 16QAM, 64QAM
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: 16 dBm

Carrier frequency, MHz	Spectrum analyzer reading, dBm/MHz	Attenuation, dB	Antenna Gain dBi	Power density**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
64QAM,Bit Rate: 37.7 Mbps							
3655.0	9.044	included	18	27.044	30	-2.956	Pass
3662.5	9.115	included	18	27.115	30	-2.885	Pass
3670.0	9.038	included	18	27.038	30	-2.962	Pass
16QAM, Bit Rate: 25.13 Mbps							
3655.0	9.247	included	18	27.247	30	-2.753	Pass
3662.5	9.134	included	18	27.134	30	-2.866	Pass
3670.0	9.078	included	18	27.078	30	-2.922	Pass
QPSK, Bit Rate: 8.38 Mbps							
3655.0	9.230	included	18	27.23	30	-2.770	Pass
3662.5	9.036	included	18	27.036	30	-2.964	Pass
3670.0	8.910	included	18	26.910	30	-3.090	Pass

** - Power density = Spectrum analyzer reading + antenna gain (18 dBi)

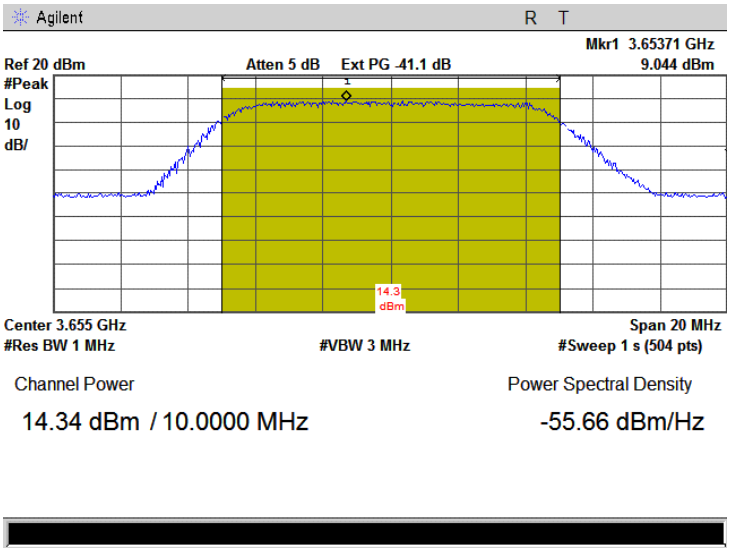
Reference numbers of test equipment used

HL 2909	HL 3385						

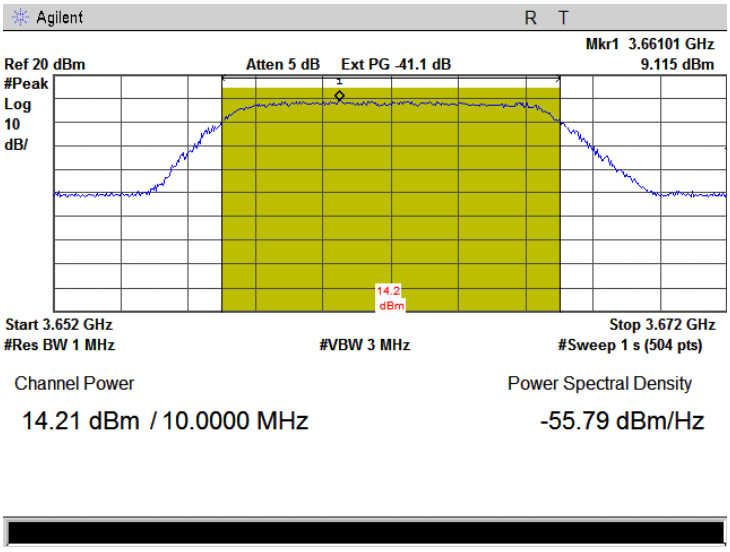
Full description is given in Appendix A.

Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.1.10 Peak output power test results at low frequency, 64QAM, bit rate 37.7 Mbps

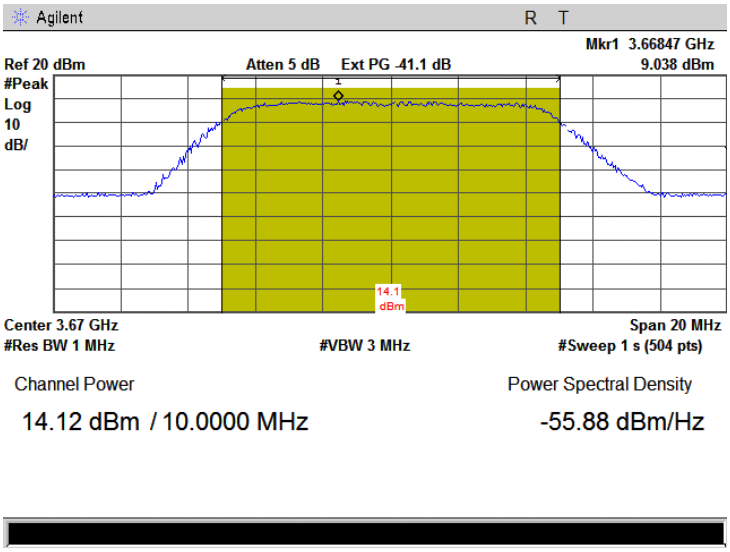


Plot 7.1.11 Peak output power test results at mid frequency, 64QAM, bit rate 37.7 Mbps

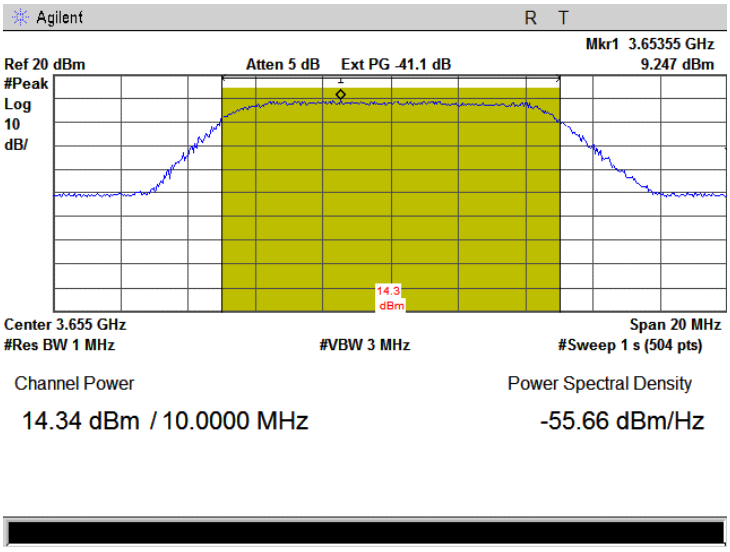


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.1.12 Peak output power test results at high frequency, 64QAM bit rate 37.7 Mbps

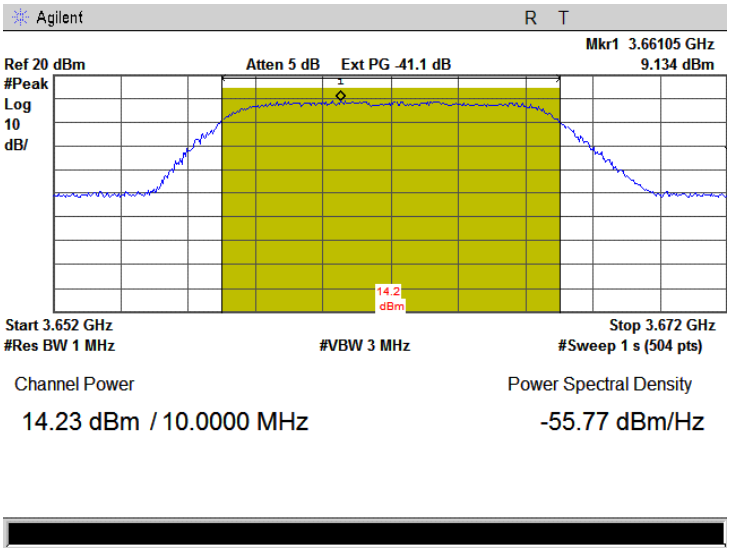


Plot 7.1.13 Peak output power test results at low frequency, 16QAM bit rate 25.13 Mbps

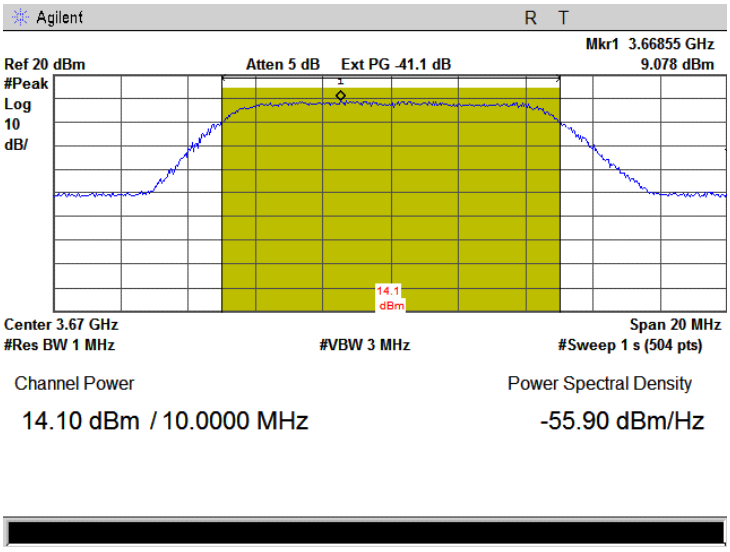


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.1.14 Peak output power test results at mid frequency, 16QAM bit rate 25.13 Mbps

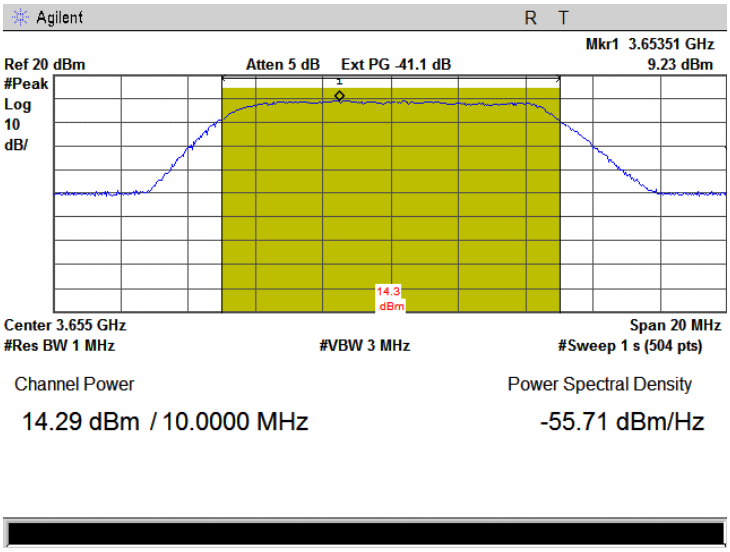


Plot 7.1.15 Peak output power test results at high frequency, 16QAM bit rate 25.13 Mbps

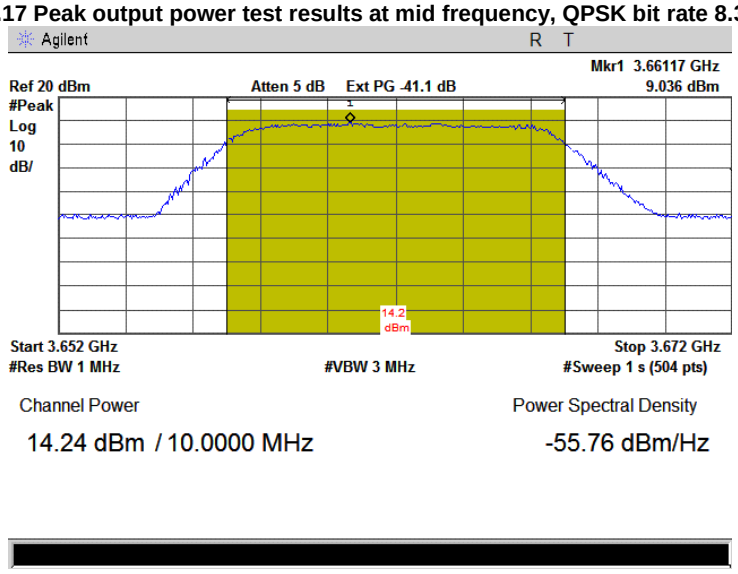


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.1.16 Peak output power test results at low frequency, QPSK bit rate 8.38 Mbps

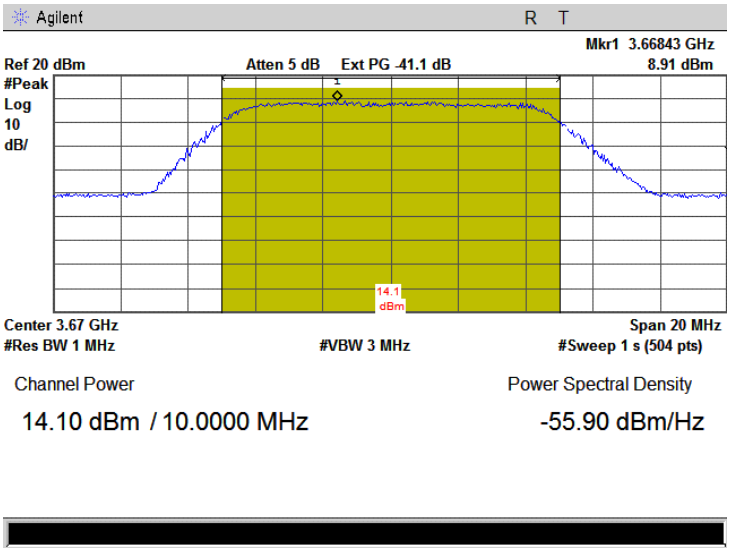


Plot 7.1.17 Peak output power test results at mid frequency, QPSK bit rate 8.38 Mbps



Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:14:31 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.1.18 Peak output power test results at high frequency, QPSK bit rate 8.38 Mbps



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

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
3650.0-3675.0	26	7	7
		10	10

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

7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.
7.2.2.2 The EUT was set to transmit the unmodulated carrier and the reference peak power level was measured.
7.2.2.3 The EUT was set to transmit the normally modulated carrier.
7.2.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in the associated tables and the associated plots. The test results are provided in Table 7.2.2 and 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 & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Table 7.2.2 Occupied bandwidth test results for 7 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 18.85Mbps				
3653.5	6.750	7	-0.250	Pass
3662.5	6.750	7	-0.250	Pass
3671.5	6.725	7	-0.275	Pass
16QAM ,Bit Rate 12.565Mbps				
3653.5	6.750	7	-0.250	Pass
3662.5	6.725	7	-0.275	Pass
3671.5	6.725	7	-0.275	Pass
QPSK ,Bit Rate 4.19Mbps				
3653.5	6.750	7	-0.250	Pass
3662.5	6.750	7	-0.250	Pass
3671.5	6.750	7	-0.250	Pass

RBW ≥ 1% of OBW; 1 % of 7 MHz is 70 kHz, hence, RBW=100 kHz was chosen for the measurements

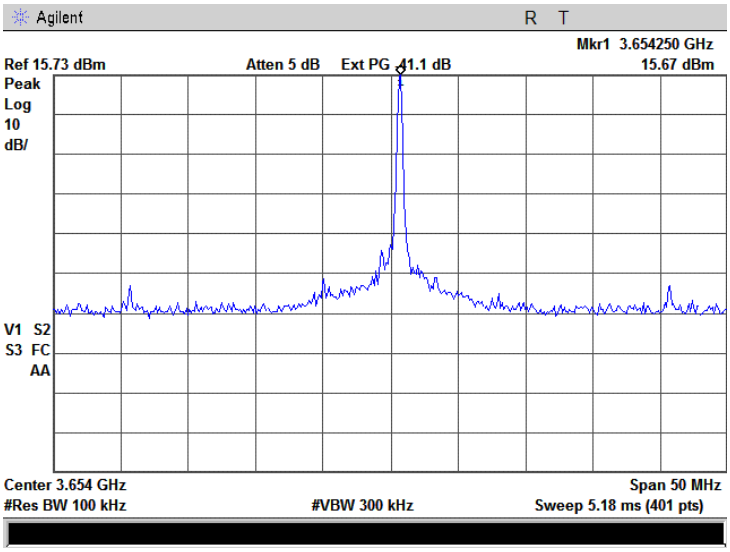
Reference numbers of test equipment used

HL 2909	HL 3179	HL 3181	HL 3385				

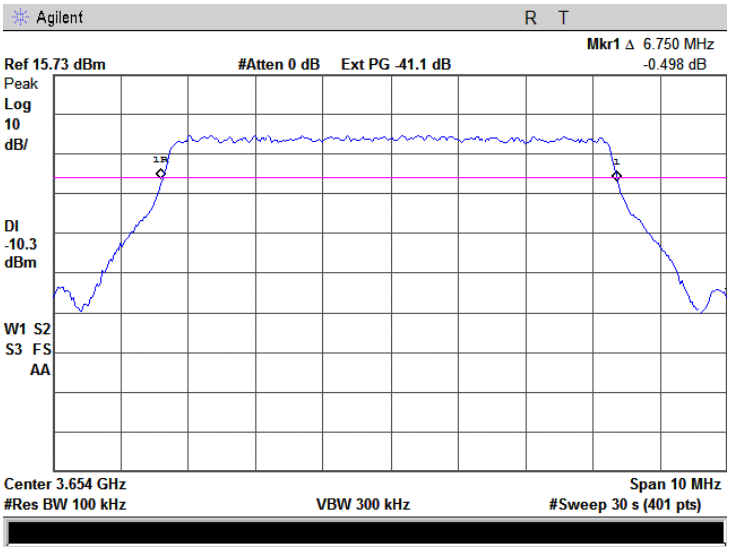
Full description is given in Appendix A.

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.2.1 Unmodulated signal for reference level at low frequency

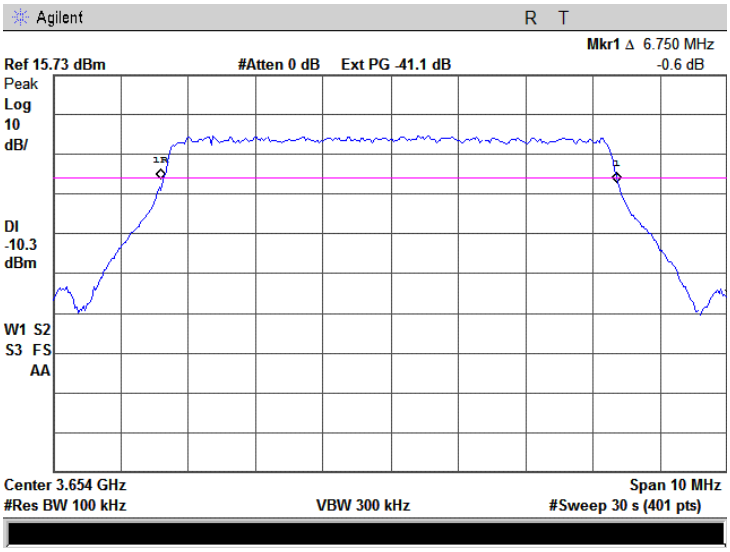


Plot 7.2.2 Occupied bandwidth test result at low frequency, 64QAM, bit rate 18.85 Mbps

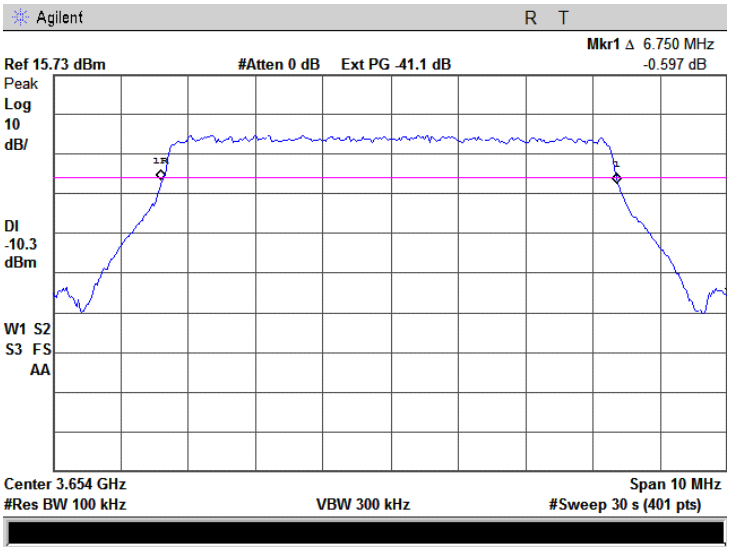


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.2.3 Occupied bandwidth test result at low frequency, 16QAM, bit rate 12.565 Mbps

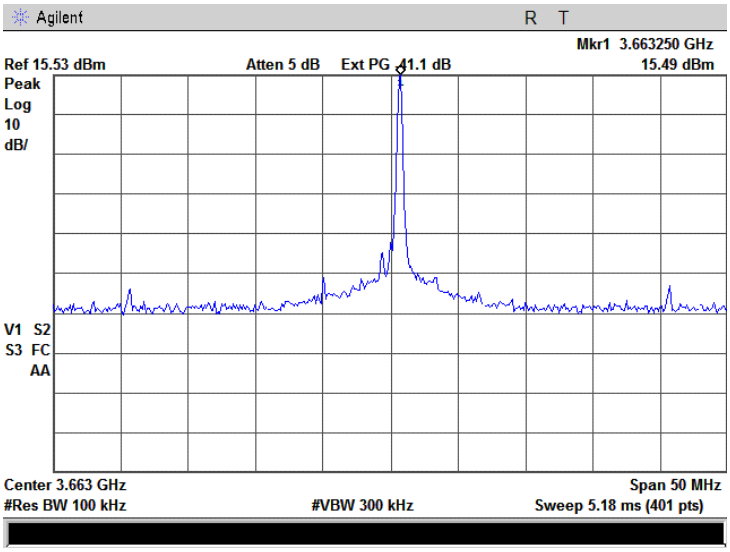


Plot 7.2.4 Occupied bandwidth test result at low frequency, QPSK, bit rate 4.19 Mbps

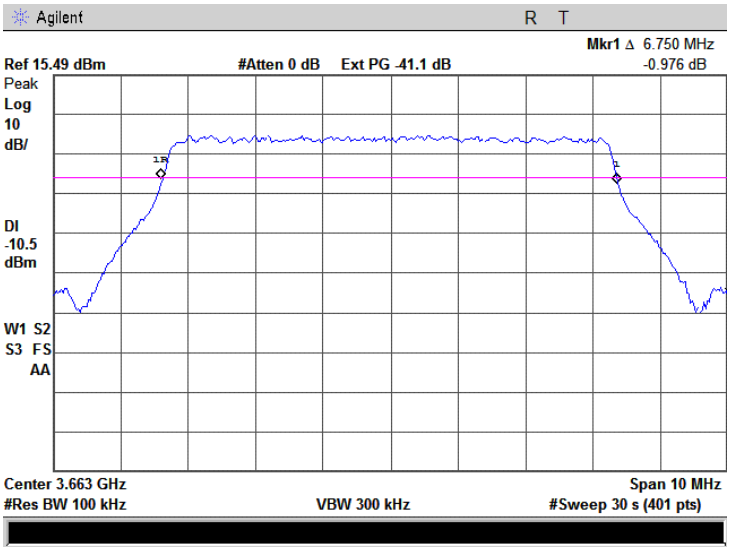


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.2.5 Unmodulated signal for reference level at mid frequency

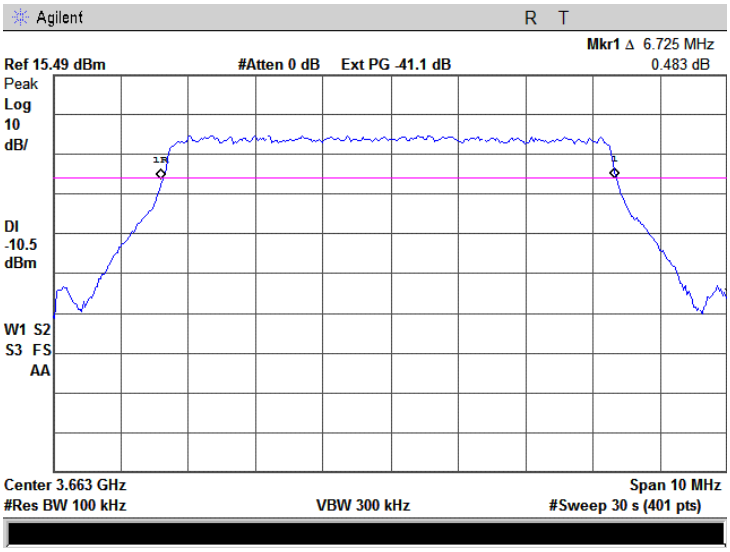


Plot 7.2.6 Occupied bandwidth test result at mid frequency, 64QAM, bit rate 18.85 Mbps

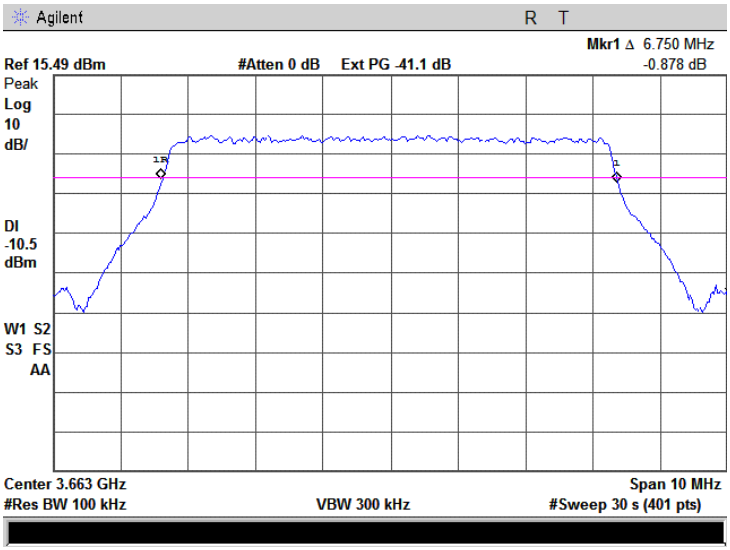


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.2.7 Occupied bandwidth test result at mid frequency, 16QAM, bit rate 12.565 Mbps

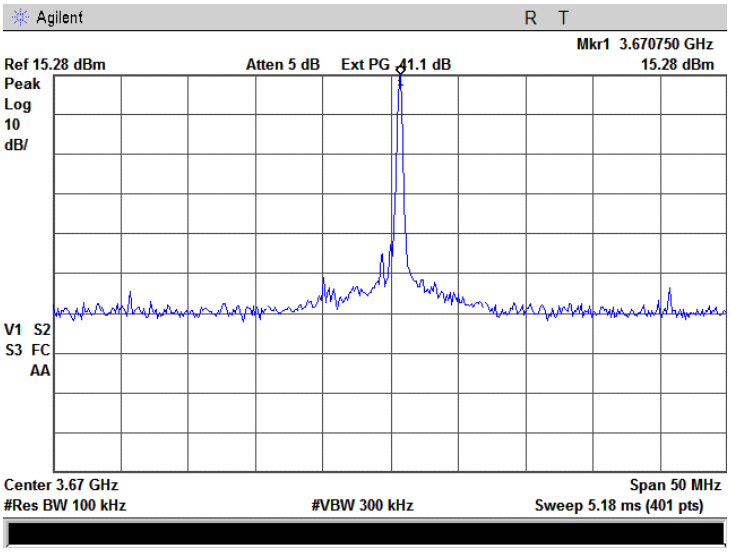


Plot 7.2.8 Occupied bandwidth test result at mid frequency, QPSK, bit rate 4.19 Mbps

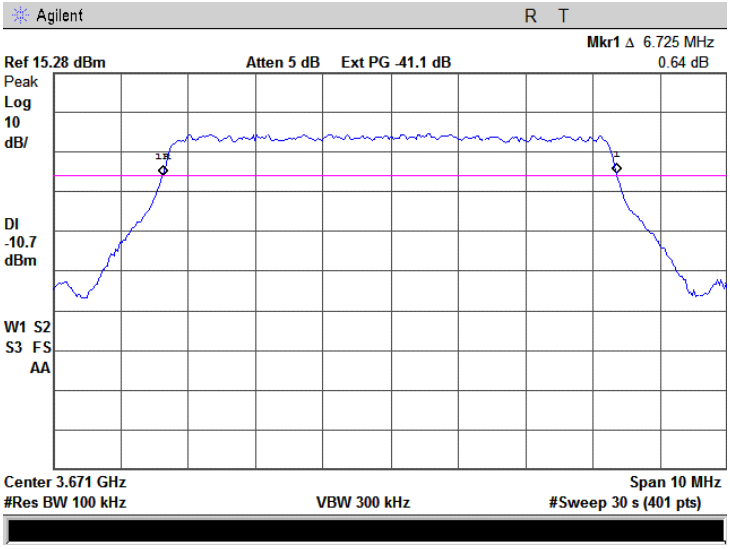


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.2.9 Unmodulated signal for reference level at high frequency

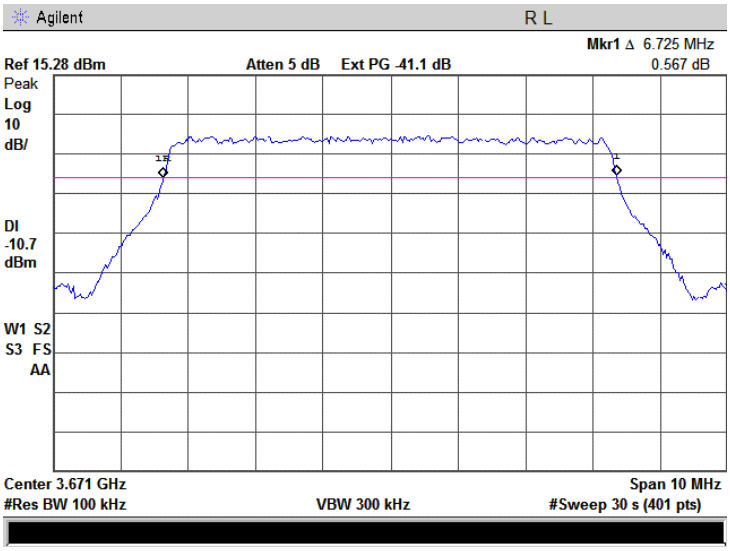


Plot 7.2.10 Occupied bandwidth test result at high frequency, 64QAM, bit rate 18.85 Mbps

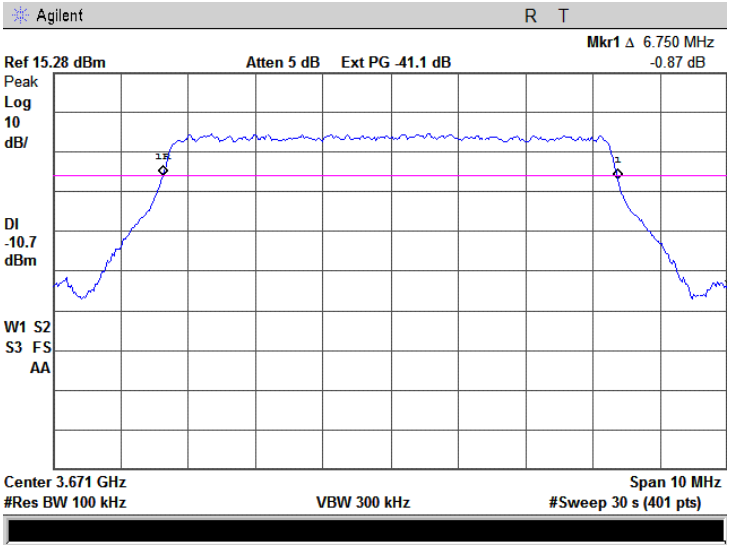


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.2.11 Occupied bandwidth test result at high frequency, 16QAM, bit rate 12.565 Mbps



Plot 7.2.12 Occupied bandwidth test result at high frequency, QPSK, bit rate 4.19 Mbps



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
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
Antenna 1				
64QAM,Bit Rate 37.7Mbps				
3655.0	9.3	10	-0.7	Pass
3662.5	9.3	10	-0.7	Pass
3670.0	9.3	10	-0.7	Pass
16QAM ,Bit Rate 25.13Mbps				
3655.0	9.3	10	-0.7	Pass
3662.5	9.3	10	-0.7	Pass
3670.0	9.3	10	-0.7	Pass
QPSK, Bit Rate 8.38Mbps				
3655.0	9.3	10	-0.7	Pass
3662.5	9.3	10	-0.7	Pass
3670.0	9.3	10	-0.7	Pass

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

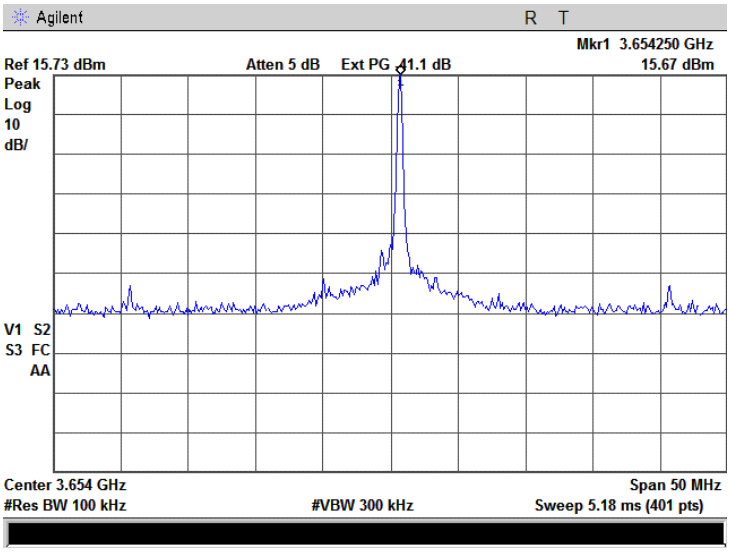
Reference numbers of test equipment used

HL 2909	HL 3179	HL 3181	HL 3335				

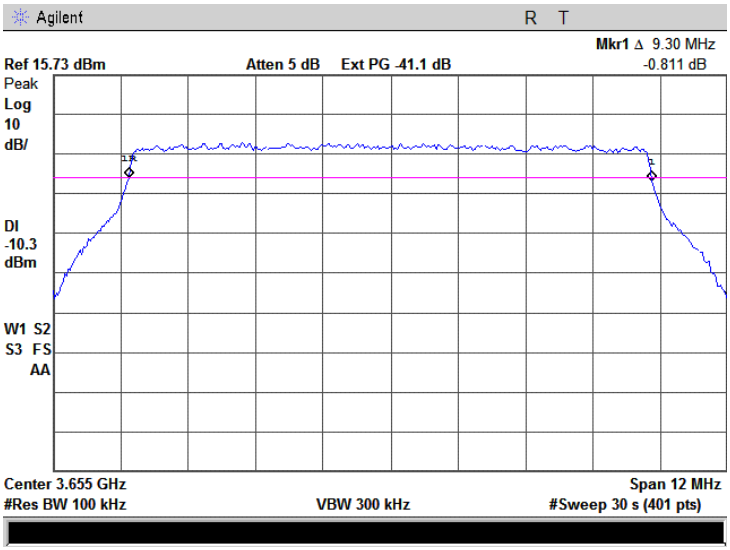
Full description is given in Appendix A.

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.2.13 Unmodulated signal for reference level at low frequency

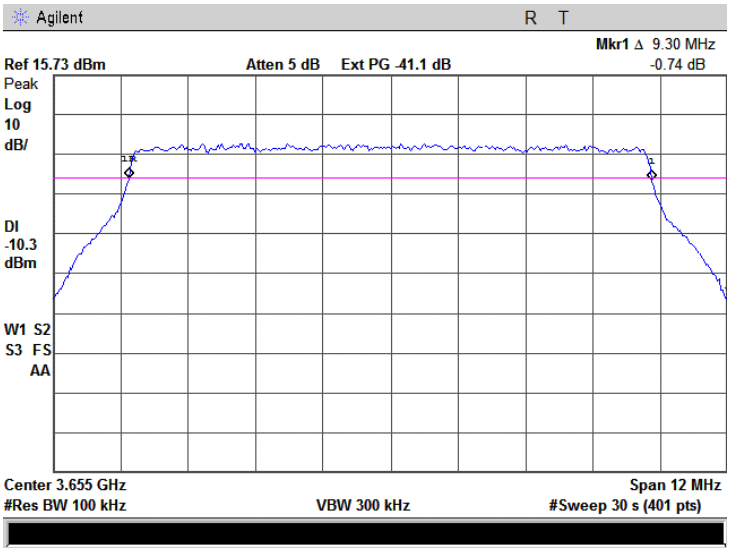


Plot 7.2.14 Occupied bandwidth test result at low frequency, 64QAM, bit rate 37.7 Mbps

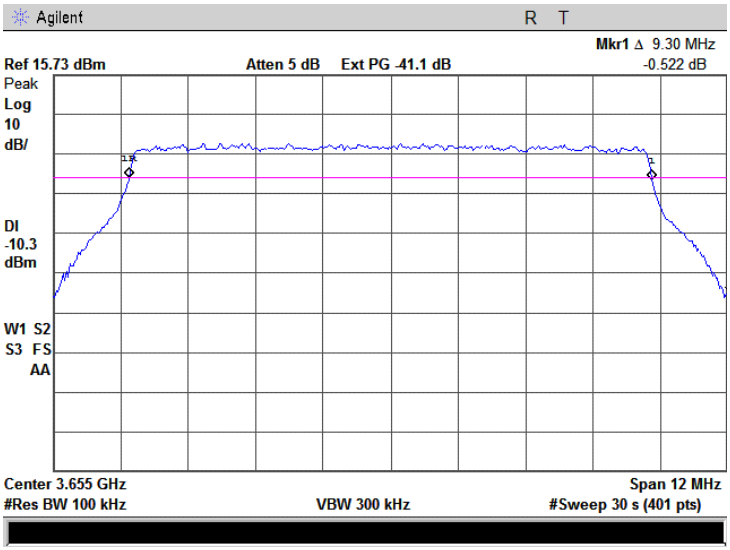


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.2.15 Occupied bandwidth test result at low frequency, 16QAM, bit rate 24.13 Mbps

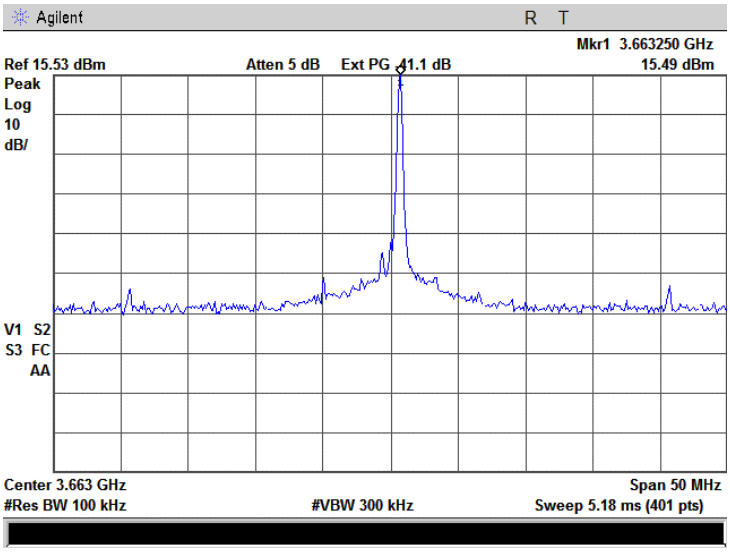


Plot 7.2.16 Occupied bandwidth test result at low frequency, QPSK, bit rate 8.38 Mbps

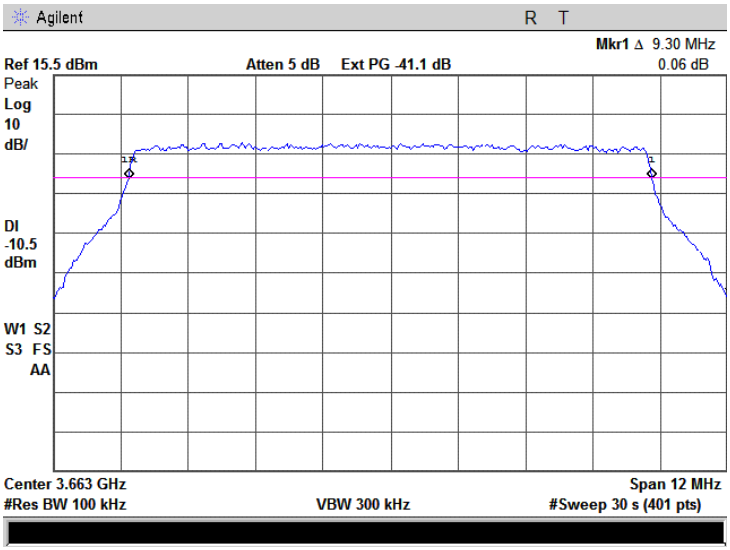


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.2.17 Unmodulated signal for reference level at mid frequency

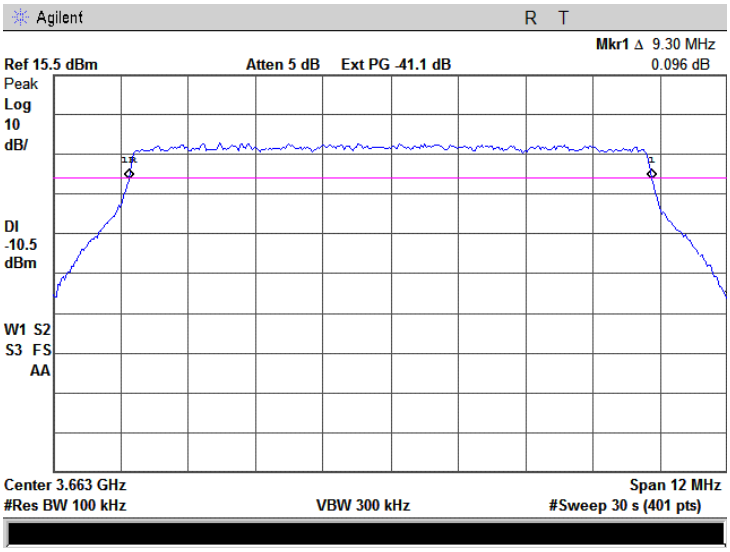


Plot 7.2.18 Occupied bandwidth test result at mid frequency, 64QAM, bit rate 37.7 Mbps

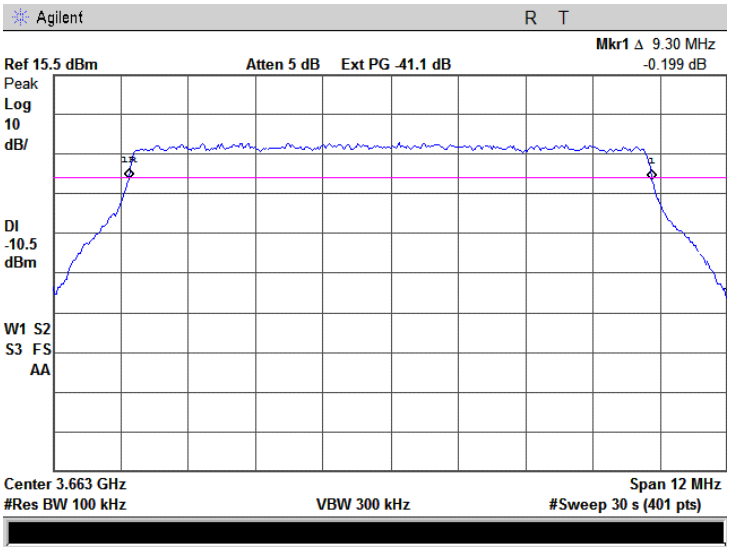


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.2.19 Occupied bandwidth test result at mid frequency, 16QAM, bit rate 25.13 Mbps

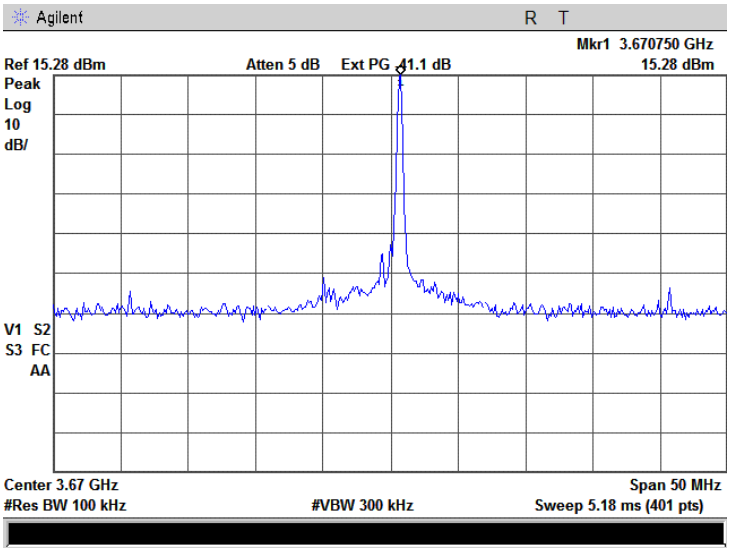


Plot 7.2.20 Occupied bandwidth test result at mid frequency, QPSK, bit rate 8.38 Mbps

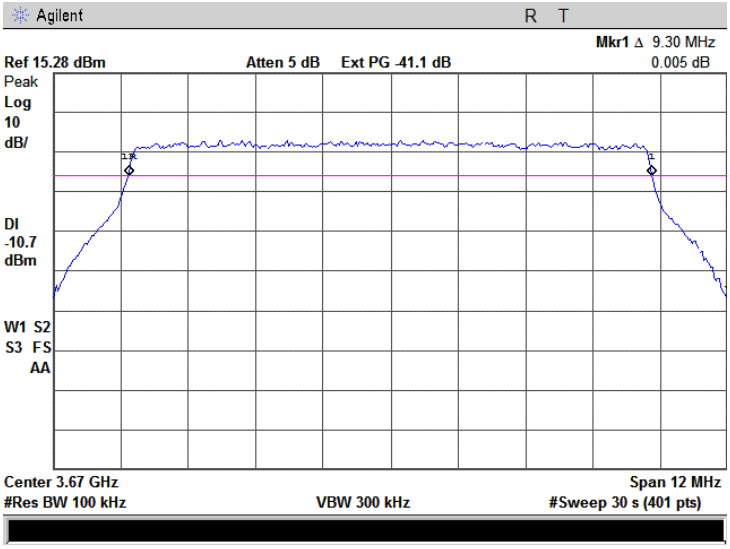


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.2.21 Unmodulated signal for reference level, at high frequency

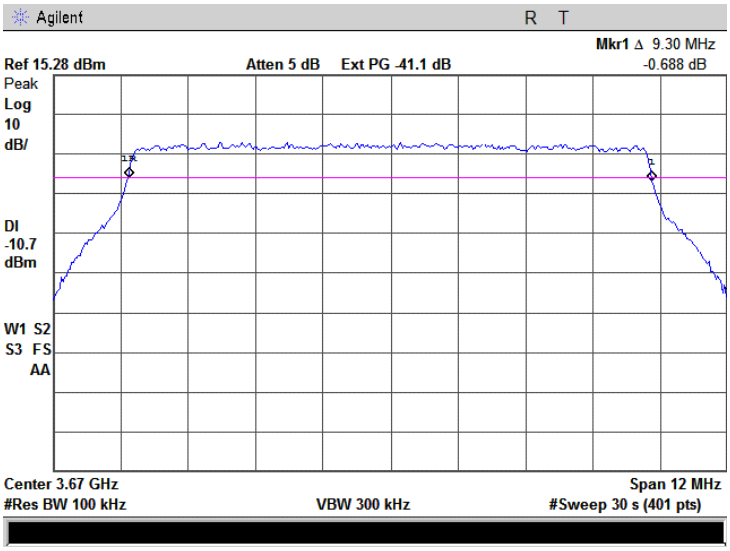


Plot 7.2.22 Occupied bandwidth test result at high frequency, 64QAM, bit rate 37.7 Mbps

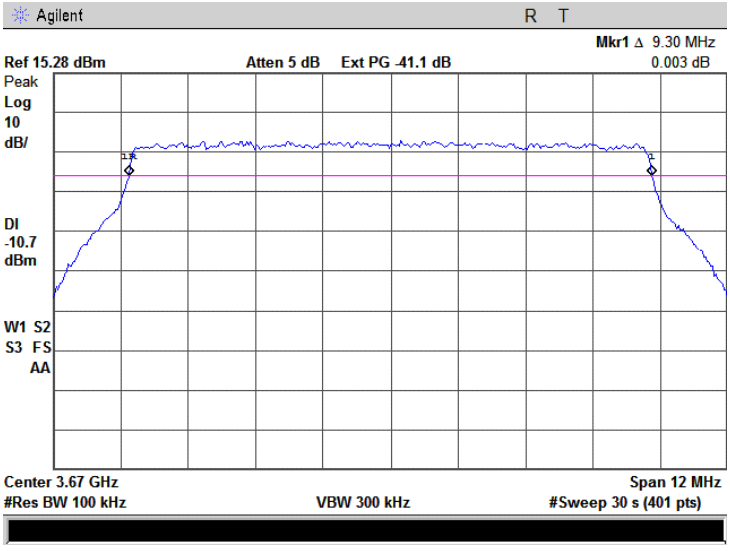


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 9:22:35 AM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.2.23 Occupied bandwidth test result at high frequency, 16QAM, bit rate 25.13 Mbps



Plot 7.2.24 Occupied bandwidth test result at high frequency, QPSK, bit rate 8.38 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 & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

7.3 Emission mask test

7.3.1 General

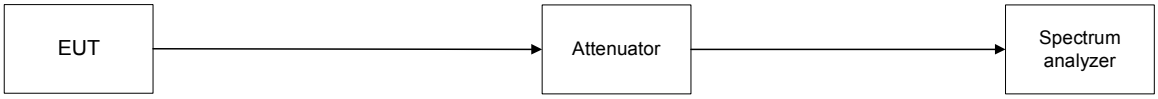
This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1, Table 7.3.3.

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 and in the associated plots.

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 & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 48 %	**Power Supply:** 48 VDC
Remarks: 7 MHz CBW			

Table 7.3.1 Emission mask limits for 7 MHz channel bandwidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask B (Channel bandwidth 5 MHz)	
0 – 3.5 MHz	0
3.5 – 7.0 MHz	25
7.0 – 17.5 MHz	35
More than** 17.5 MHz	43 + 10 log(P)

* - F – frequency in MHz removed from center
** - emission mask includes carrier modulation envelope within ± 250 % of the authorized bandwidth; the frequency range removed beyond ± 250 % of the authorized bandwidth from carrier was investigated as spurious emission

Table 7.3.2 Emission mask test results for 7 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
3653.5	Emission mask B	Pass
3662.5		
3671.5		

The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth

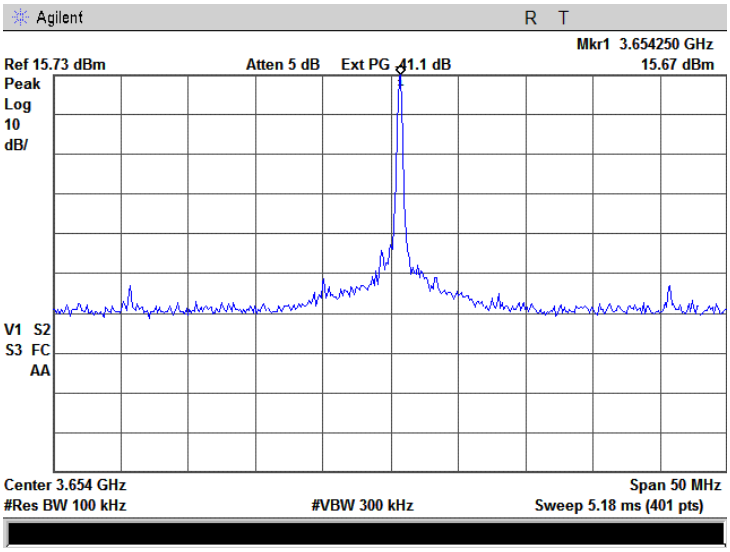
Reference numbers of test equipment used

HL 2909	HL 3179	HL 3181	HL 3385				

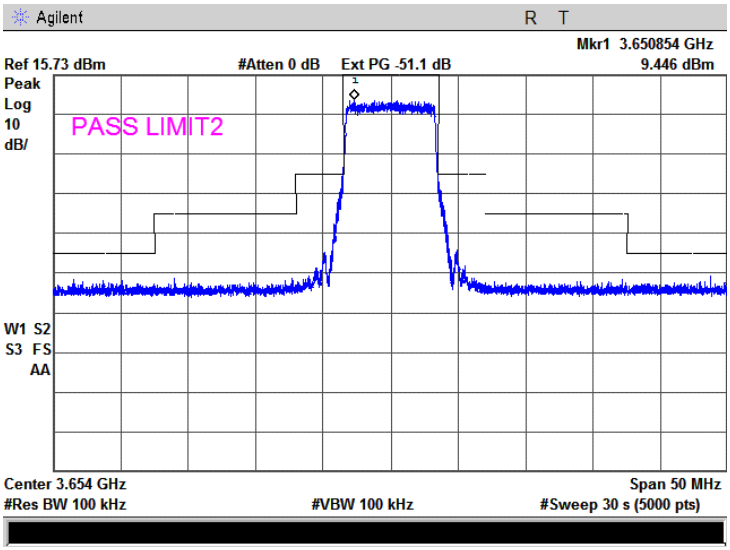
Full description is given in Appendix A.

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:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.3.1 Unmodulated signal for reference level

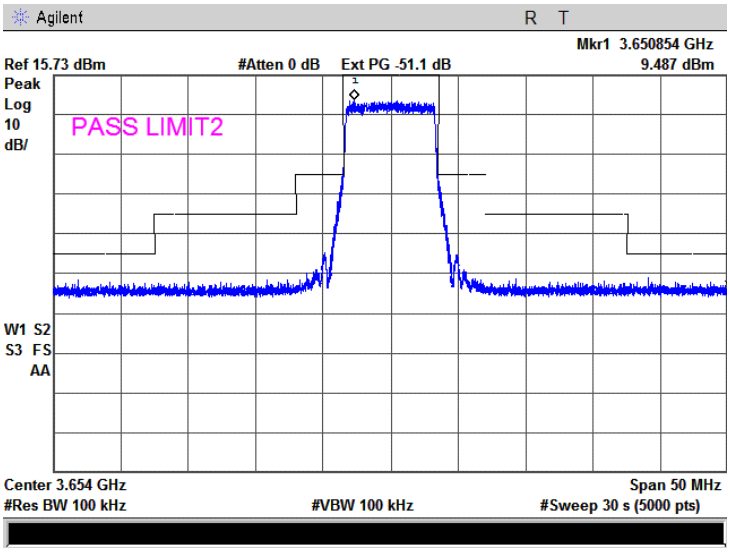


Plot 7.3.2 Emission mask test results at low carrier frequency, 64QAM, bit rate 18.85 Mbps

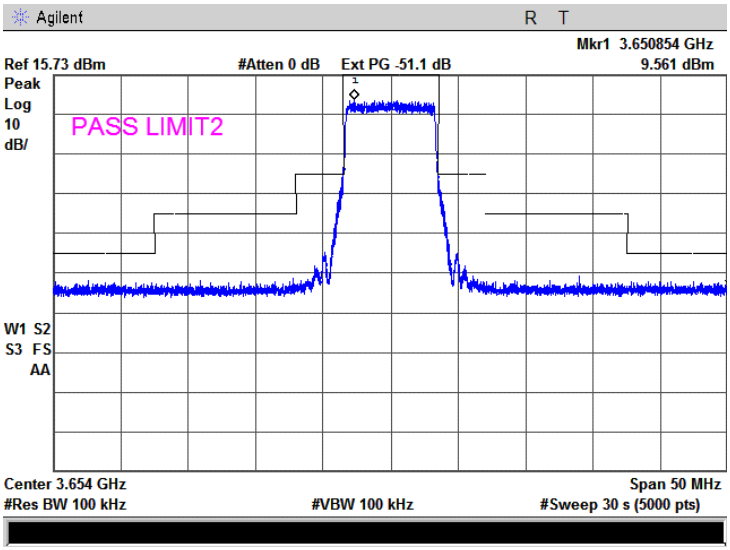


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.3.3 Emission mask test results at low carrier frequency, 16QAM, bit rate 12.565 Mbps

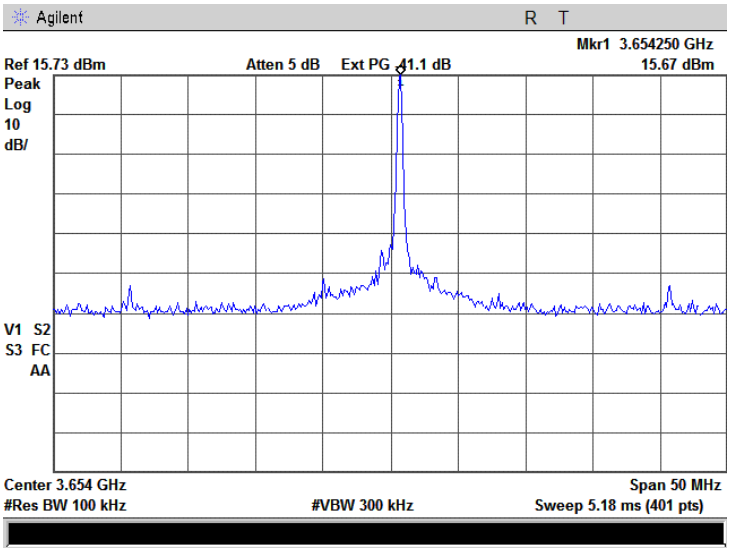


Plot 7.3.4 Emission mask test results at low carrier frequency, QPSK, bit rate 4.19 Mbps

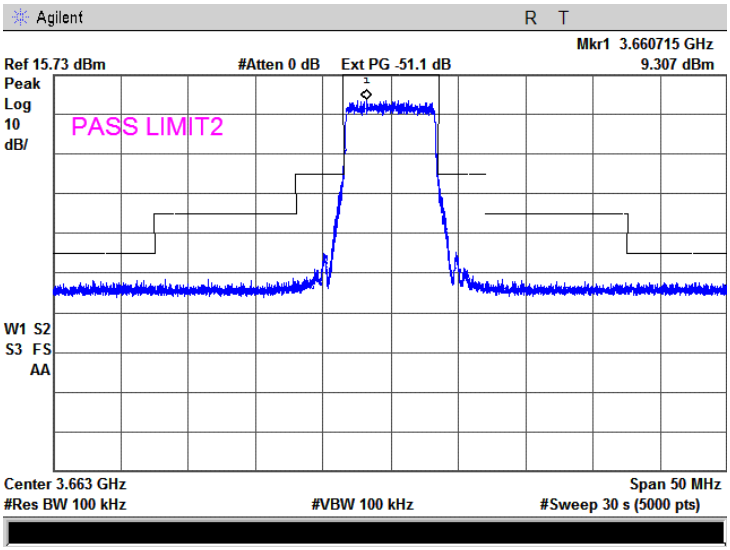


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.3.5 Unmodulated signal for reference level

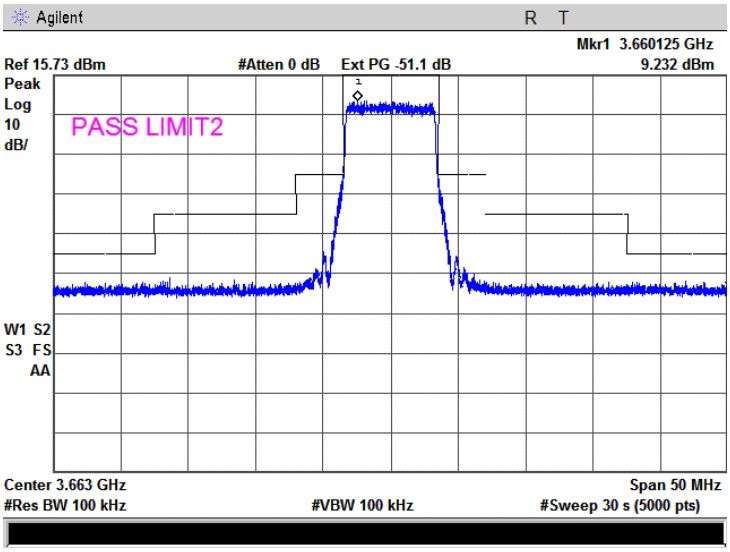


Plot 7.3.6 Emission mask test results at mid carrier frequency, 64QAM, bit rate 18.85 Mbps

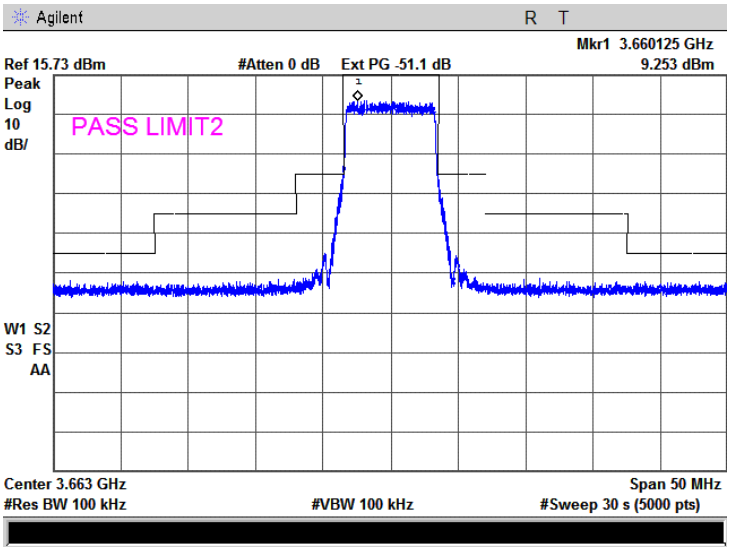


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.3.7 Emission mask test results at mid carrier frequency, 16QAM, bit rate 12.565 Mbps

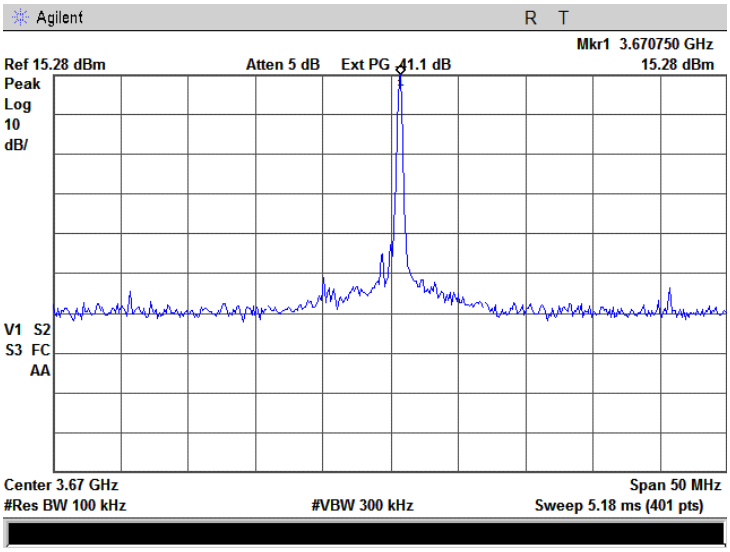


Plot 7.3.8 Emission mask test results at mid carrier frequency, QPSK, bit rate 4.19 Mbps

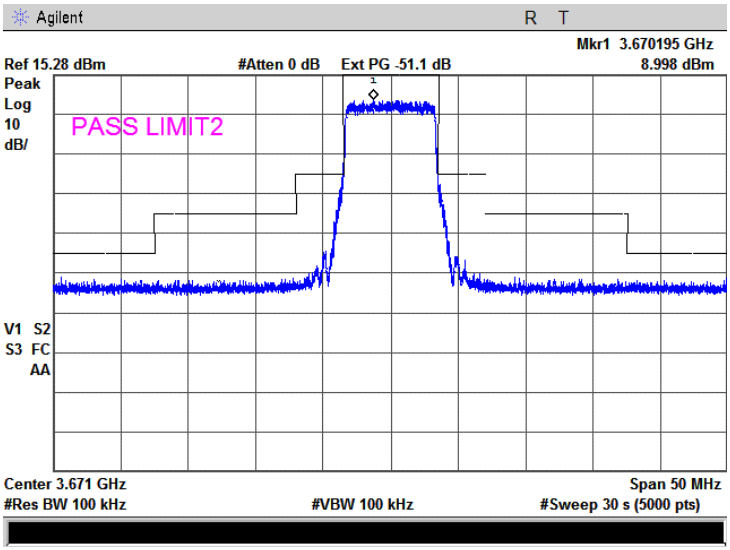


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.3.9 Unmodulated signal for reference level

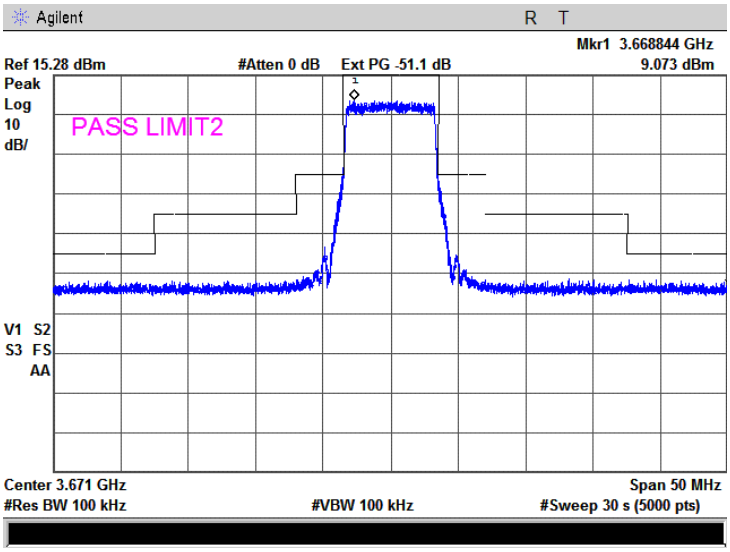


Plot 7.3.10 Emission mask test results at high carrier frequency, 64QAM, bit rate 18.85 Mbps

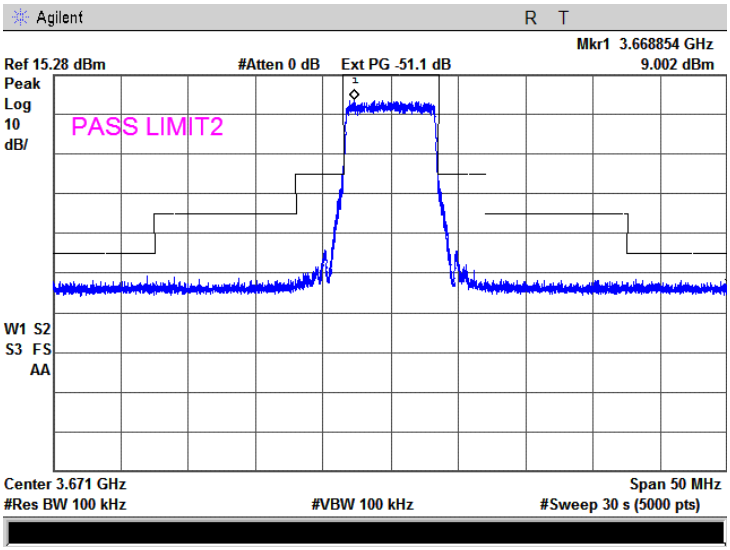


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 7 MHz CBW			

Plot 7.3.11 Emission mask test results at high carrier frequency, 16QAM, bit rate 12.565 Mbps



Plot 7.3.12 Emission mask test results at high carrier frequency, QPSK, bit 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 & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
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 B (Channel bandwidth 10 MHz)	
0 – 5 MHz	0
5 – 10 MHz	25
10.0 – 25 MHz	35
More than** 25 MHz	43 + 10 log(P)

* - F – frequency in MHz removed from center
** - emission mask includes carrier modulation envelope within ± 250 % of the authorized bandwidth; the frequency range removed beyond ± 250 % of the authorized bandwidth from carrier was investigated as spurious emission

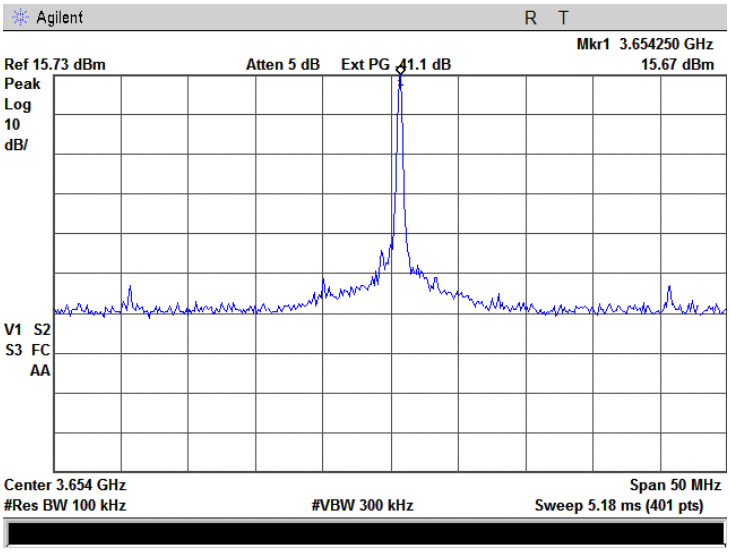
Table 7.3.4 Emission mask test results for 10 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
3655.0	Emission mask B	Pass
3662.5		
3670.0		

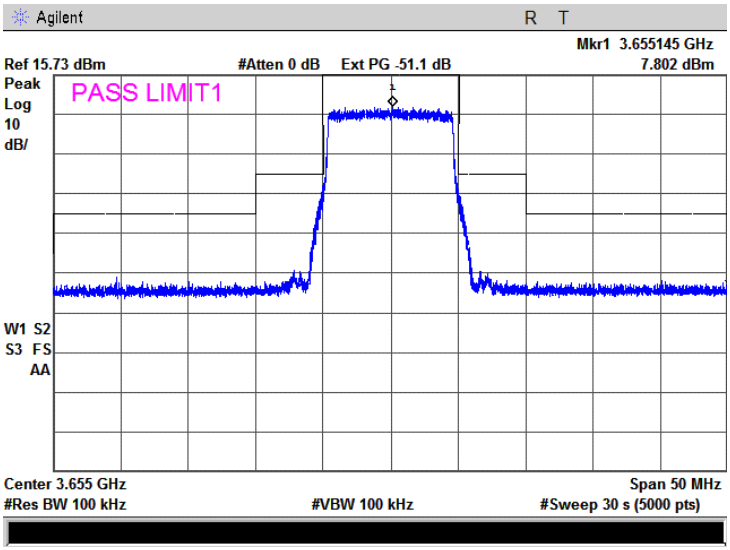
The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth.

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 & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.3.13 Unmodulated signal for reference level

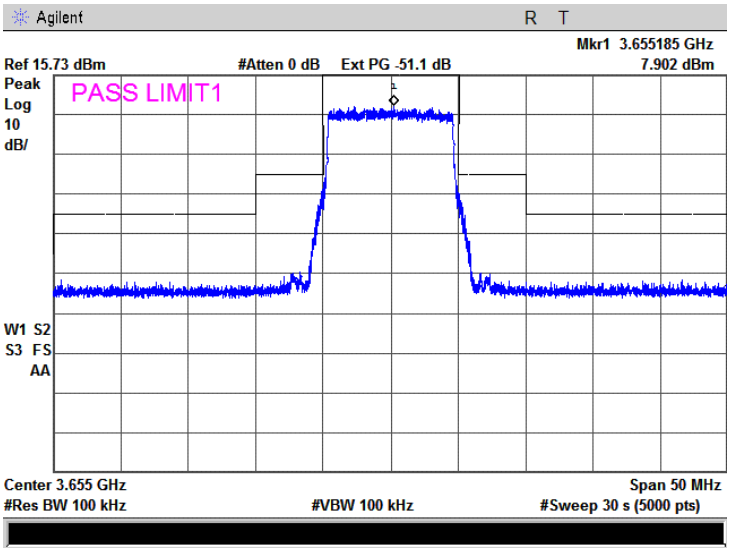


Plot 7.3.14 Emission mask test results at low carrier frequency, 64QAM, bit rate 37.7 Mbps

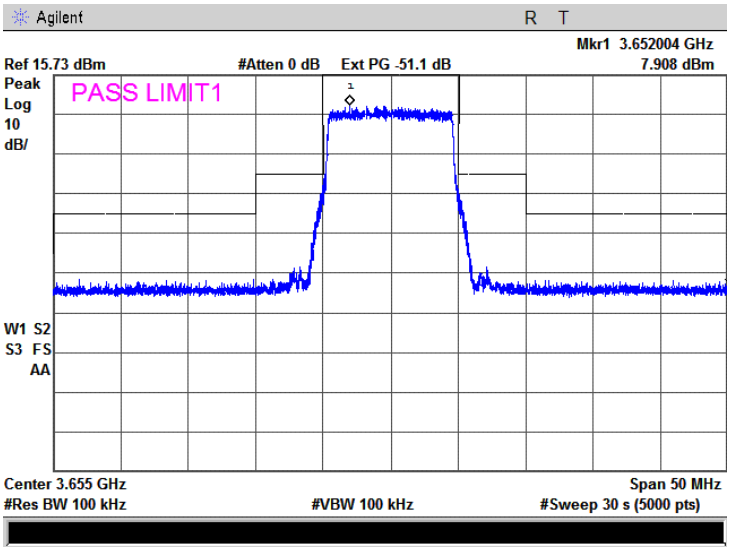


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.3.15 Emission mask test results at low carrier frequency, 16QAM, bit rate 25.13 Mbps

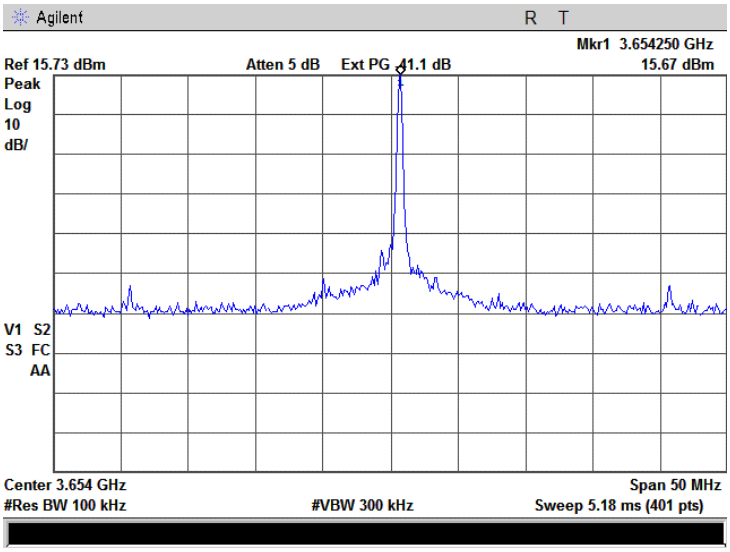


Plot 7.3.16 Emission mask test results at low carrier frequency, QPSK, bit rate 8.38 Mbps

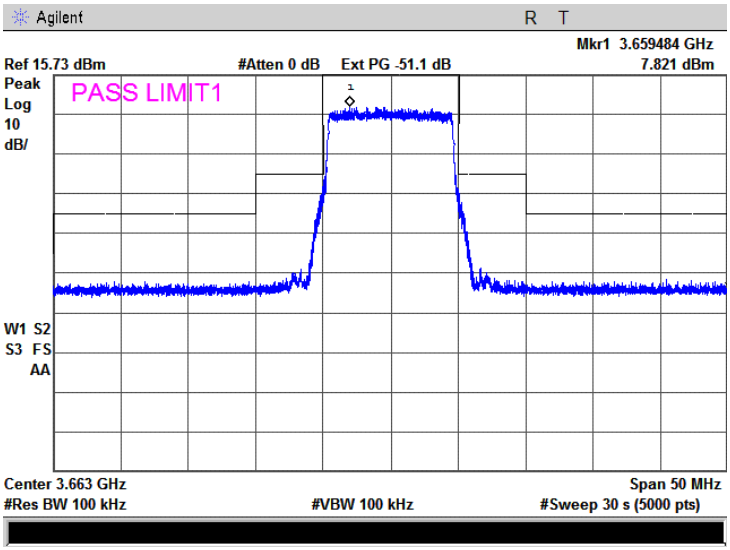


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.3.17 Unmodulated signal for reference level

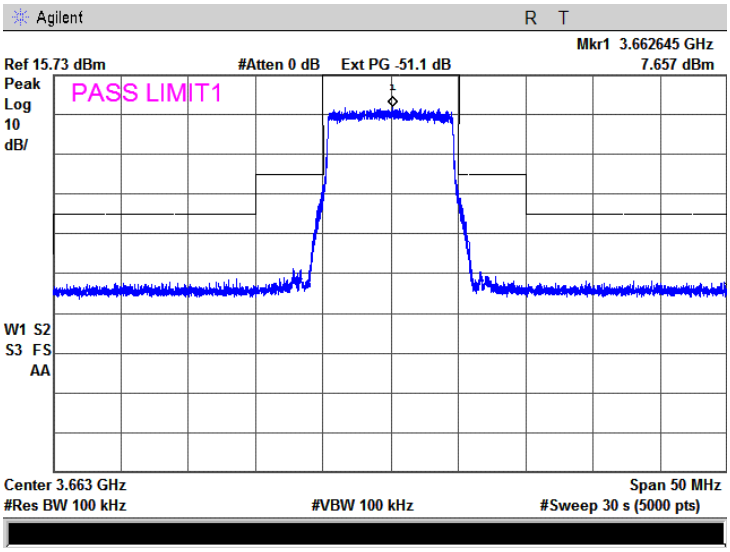


Plot 7.3.18 Emission mask test results at mid carrier frequency, 64QAM, bit rate 37.7 Mbps

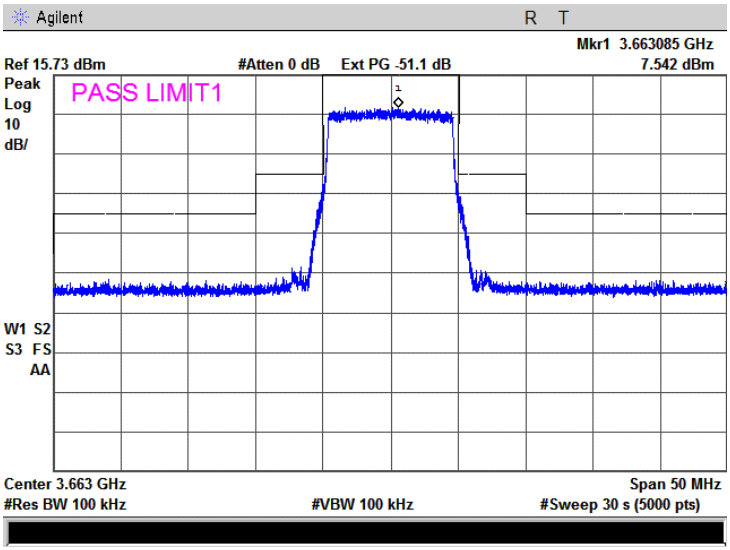


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.3.19 Emission mask test results at mid carrier frequency,16QAM, bit rate 25.13 Mbps

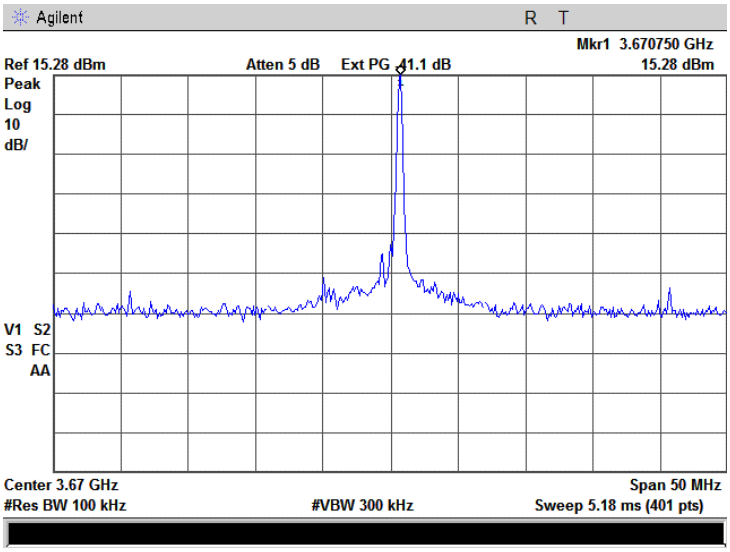


Plot 7.3.20 Emission mask test results at mid carrier frequency, QPSK, bit rate 8.38 Mbps

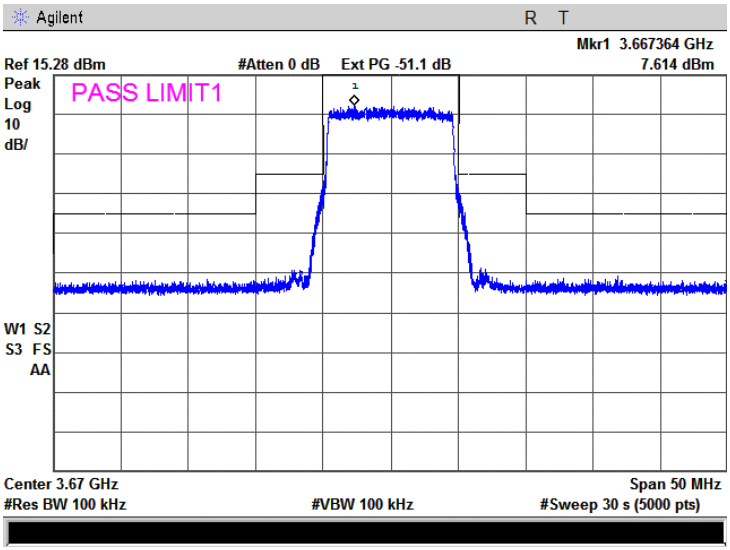


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.3.21 Unmodulated signal for reference level

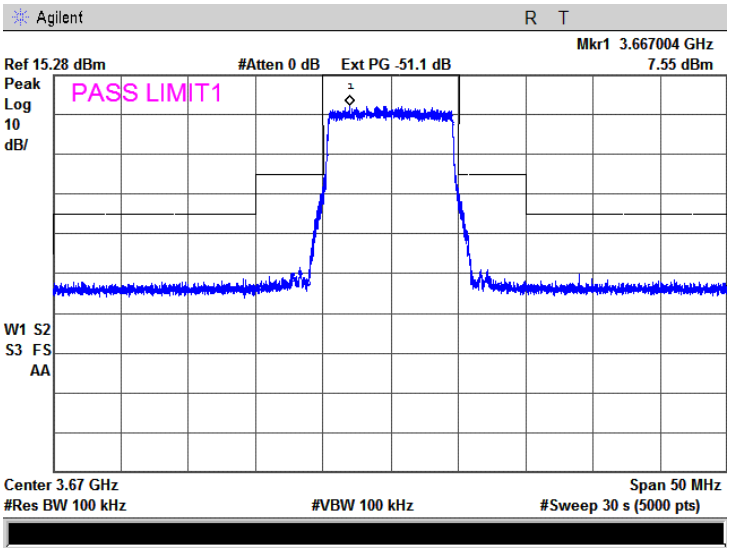


Plot 7.3.22 Emission mask test results at high carrier frequency, 64QAM, bit rate 37.7 Mbps

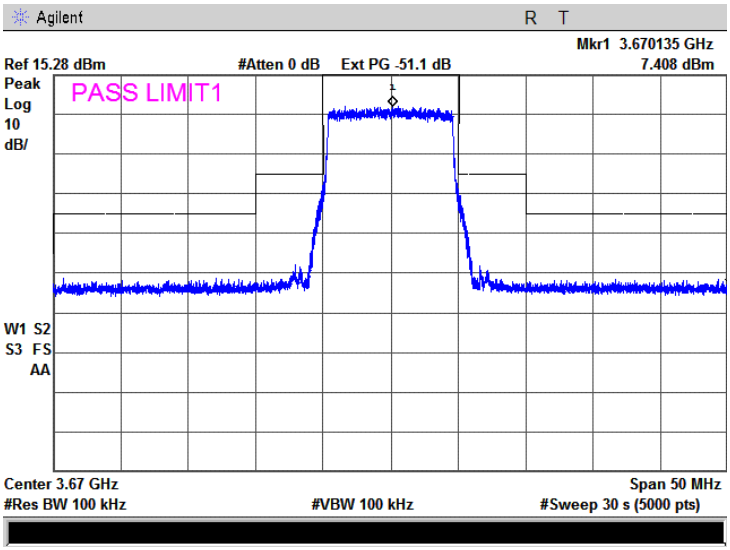


Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:45:31 PM		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks: 10 MHz CBW			

Plot 7.3.23 Emission mask test results at high carrier frequency, 16QAM, bit rate 25.13 Mbps



Plot 7.3.24 Emission mask test results at high carrier frequency, QPSK, bit rate 8.38 Mbps



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

7.4 Radiated spurious emission measurements

7.4.1 General

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

Table 7.4.1 Radiated spurious emission test limits

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

* - Excluding the in band emission within ± 250 % of the authorized bandwidth from the carrier
** - P is transmitter output power in Watts
*** - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows: E=sqrt(30×P×1.64)/r, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

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

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.
7.4.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.
7.4.2.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

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

7.4.3.1 The EUT was set up as shown in Figure 7.4.2, energized and the performance check was conducted.
7.4.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.
7.4.3.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

7.4.4 Test procedure for substitution ERP measurements of spurious

7.4.4.1 The test equipment was set up as shown in Figure 7.4.3 and energized.
7.4.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.
7.4.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.
7.4.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.
7.4.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm and antenna gain in dBd reduced by cable loss in dB.
7.4.4.6 The above procedure was repeated at the rest of investigated frequencies.
7.4.4.7 The worst test results (the lowest margins) were recorded in Table 7.4.3 and shown in the associated plots.

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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

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

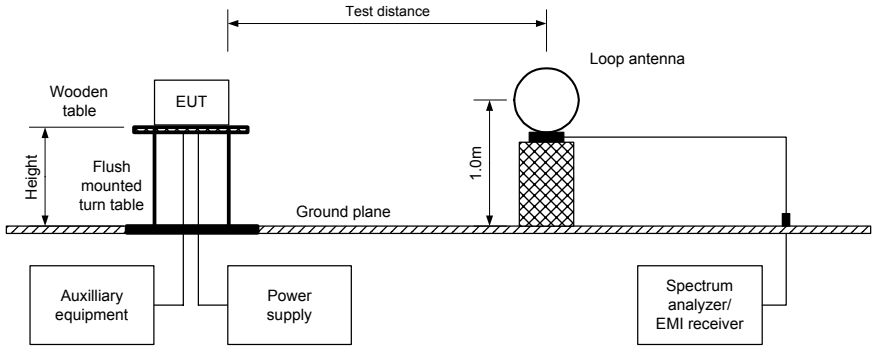
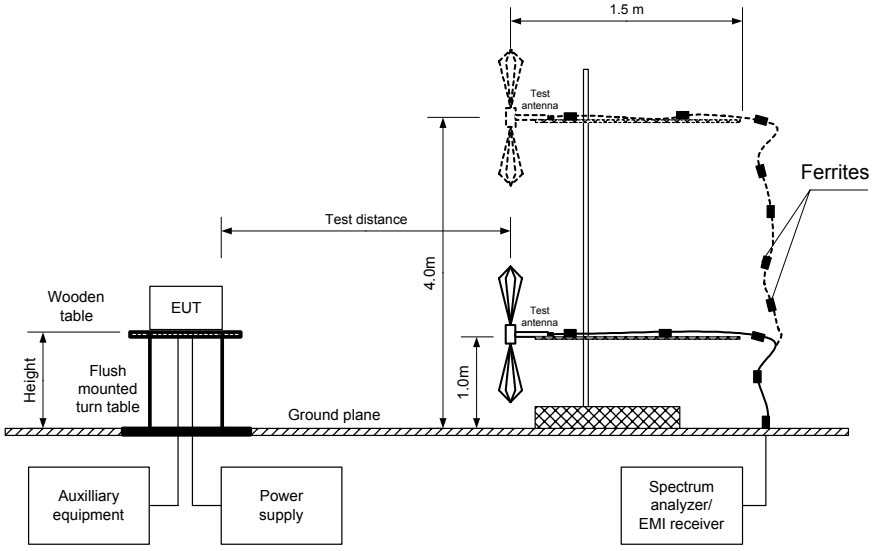
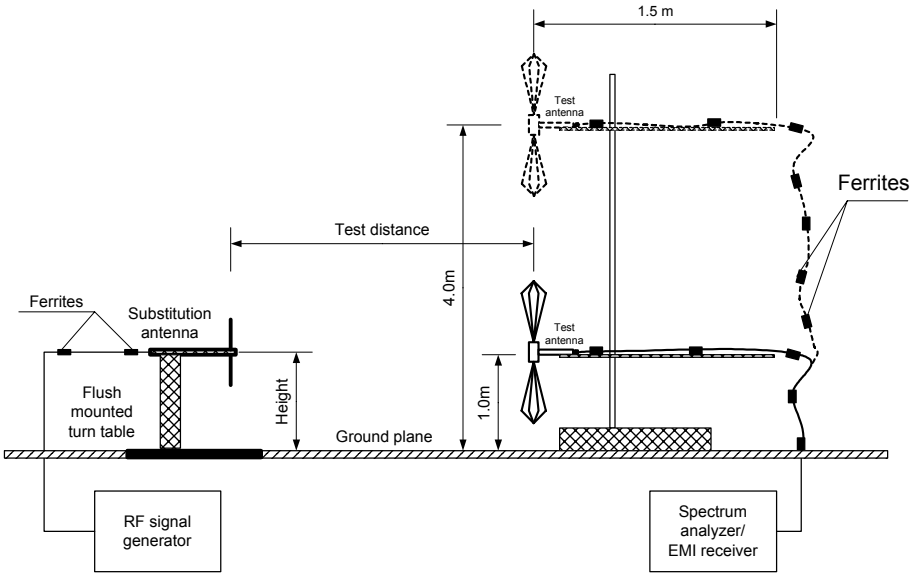


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

Figure 7.4.3 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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 44%	**Power Supply:** 48 VDC
Remarks:			

Table 7.4.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3700.0 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber / OATS
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 2000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: QPSK
MODULATING SIGNAL: OFDM
BIT RATE: 4.19 Mbps
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 3652.5 MHz							
18265.321	42.10	84.40	-42.30	1000	V	1.0	350
Mid carrier frequency 3662.5 MHz							
18312.565	43.83	84.40	-40.57	1000	V	1.0	240
High carrier frequency 3672.5 MHz							
All emissions were found at least 40 dB below the specified limit							

*****- Margin = Field strength of spurious – calculated field strength limit.
******- EUT front panel refers to 0 degrees position of turntable.

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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 44%	**Power Supply:** 48 VDC
Remarks:			

Table 7.4.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3700.0 MHz
TRANSMITTER CARRIER ERP: Maximum
TEST SITE: Semi anechoic chamber / OATS
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

Frequency MHz	Field strength, dB(µV/m)	RBW, kHz	Antenna polarization	RF generator output, dBm	Ant gain, dBd	Cable loss dB	ERP, dBm	Limit, dBm	Margin dB*	Verdict
Low carrier frequency										
18265.312	42.10	1000	V	-64.90	21.12	3.3	-47.11	-13	-34.11	Pass
Mid carrier frequency										
18312.565	43.83	1000	V	-63.17	21.14	3.3	-45.36	-13	-32.36	Pass
High carrier frequency										
All emissions are at least 40 dB below the specified limit										Pass

*****- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

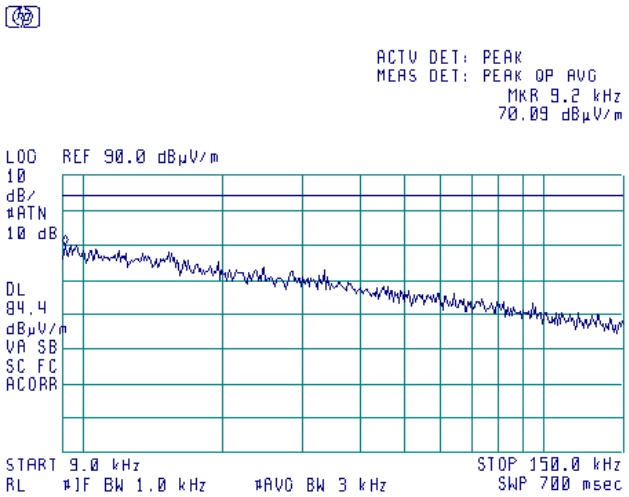
HL 0446	HL 0521	HI 0554	HL 0604	HL 0661	HL 0763	HL 0768	HL 1947
HL 1984	HL 2259	HL 2260	HL 3207				

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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

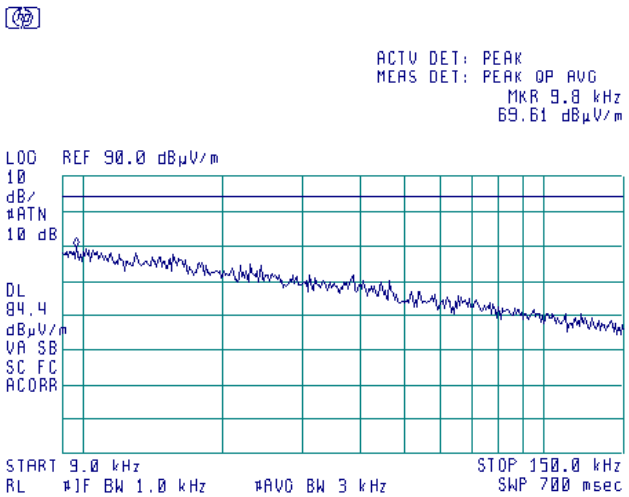
Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.4.2 Radiated emission measurements in 9 - 150 kHz range

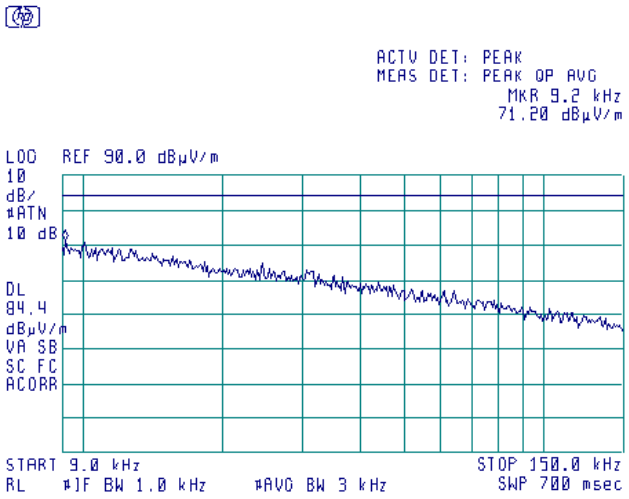
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

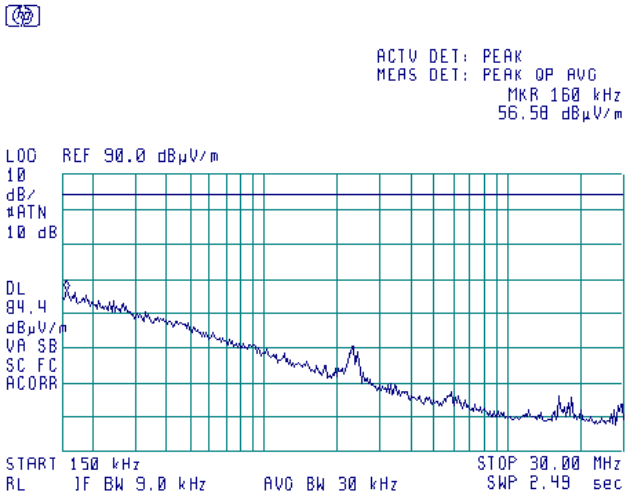
Plot 7.4.3 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.4.4 Radiated emission measurements in 0.15 - 30 MHz range

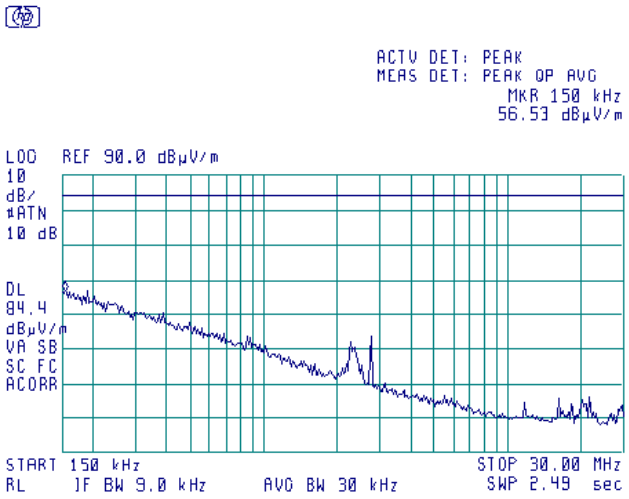
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

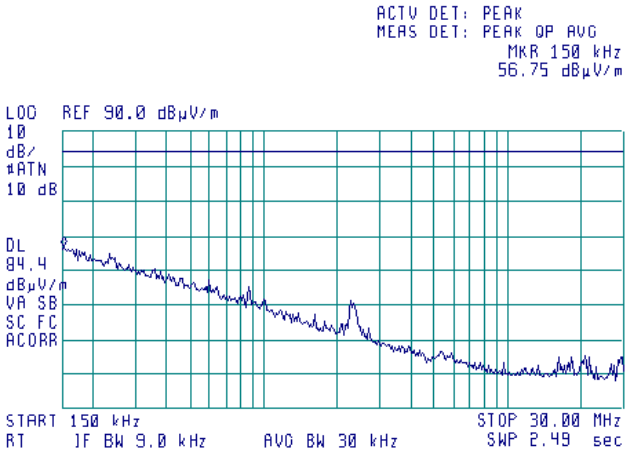
Plot 7.4.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.4.6 Radiated emission measurements in 0.15 - 30 MHz range

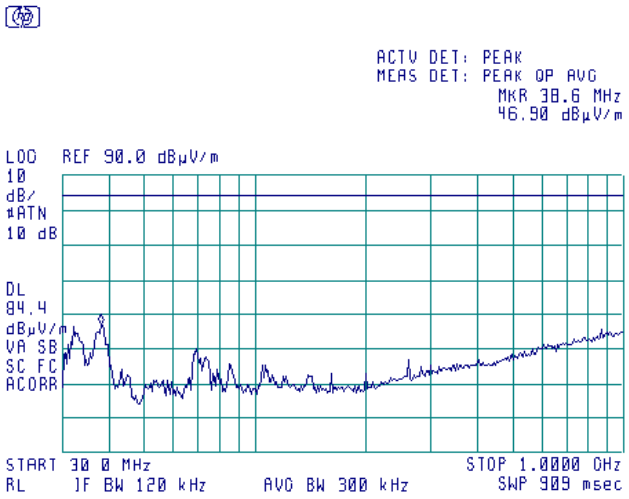
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

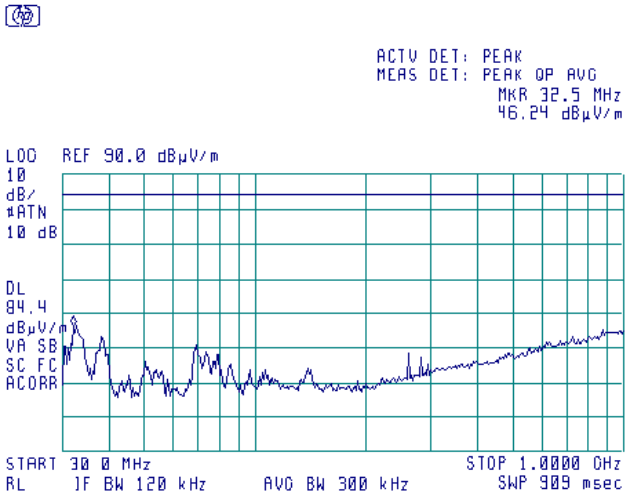
Plot 7.4.7 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.4.8 Radiated emission measurements in 30 - 1000 MHz range

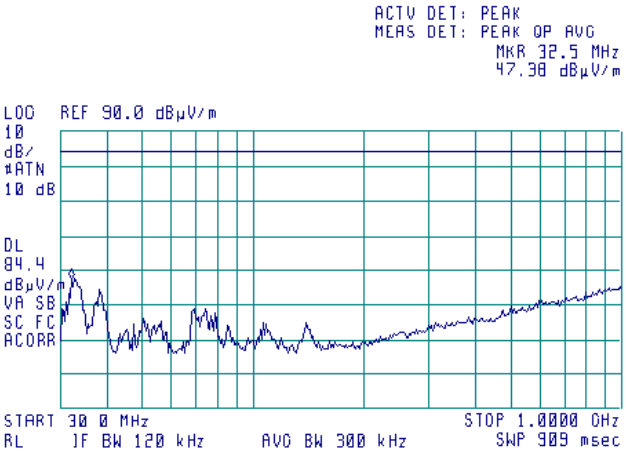
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

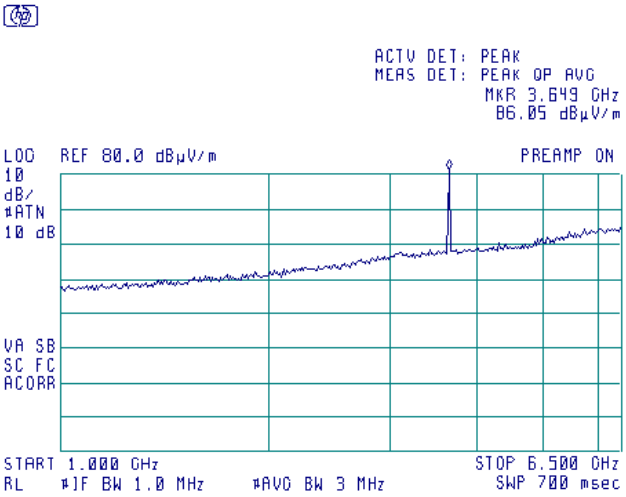
Plot 7.4.9 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.4.10 Radiated emission measurements in 1000 – 6500 MHz range

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

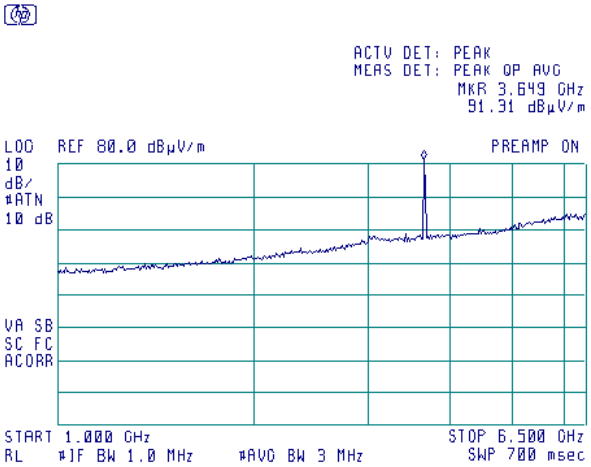


NOTE: 3652.5MHz low fundamental frequency of the transmitter

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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

Plot 7.4.11 Radiated emission measurements in 1000 – 6500 MHz range

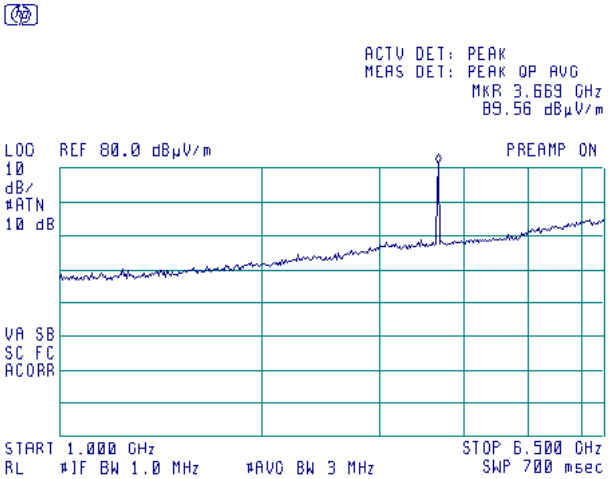
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



NOTE: 3662.5MHz mid fundamental frequency of the transmitter

Plot 7.4.12 Radiated emission measurements in 1000 – 6500 MHz range

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

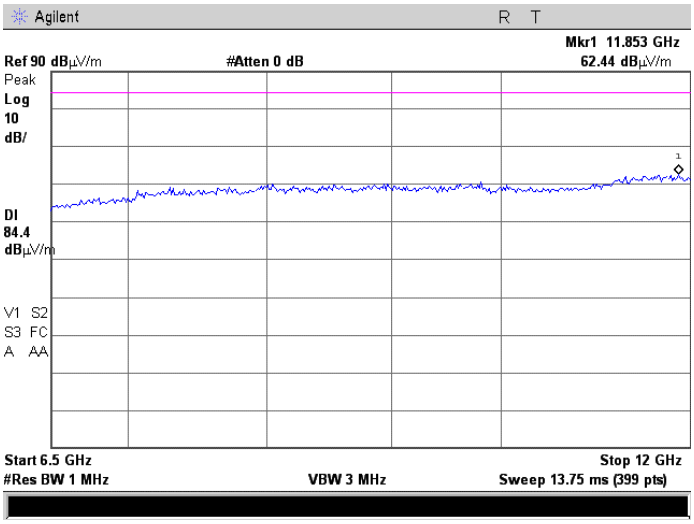


NOTE: 3667.5MHz high fundamental frequency of the transmitter

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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

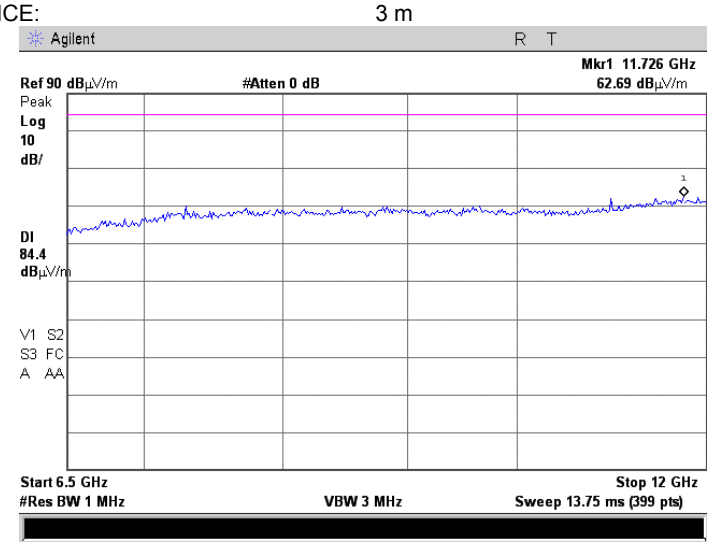
Plot 7.4.13 Radiated emission measurements in 6500 – 12000 MHz range

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



Plot 7.4.14 Radiated emission measurements in 6500 – 12000 MHz range

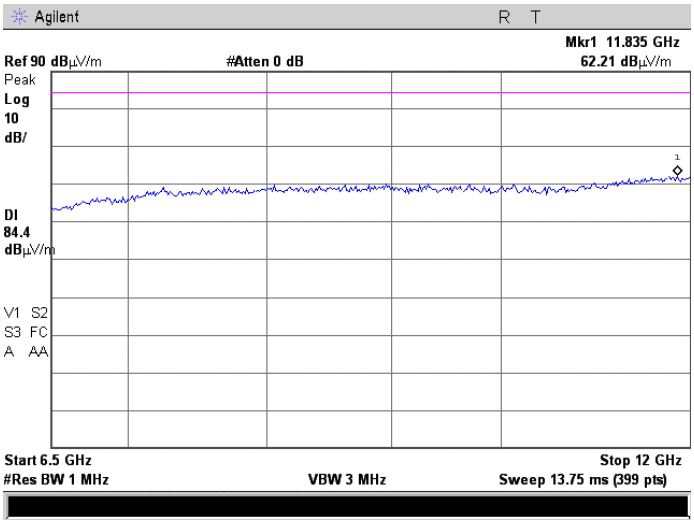
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

Plot 7.4.15 Radiated emission measurements in 6500 – 12000 MHz range

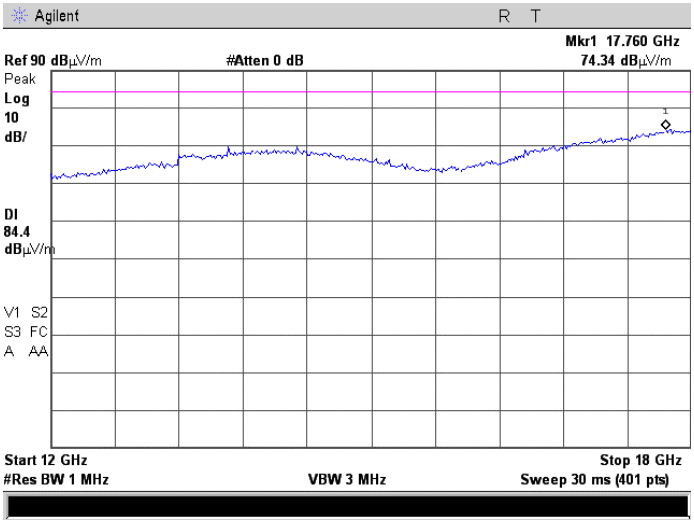
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

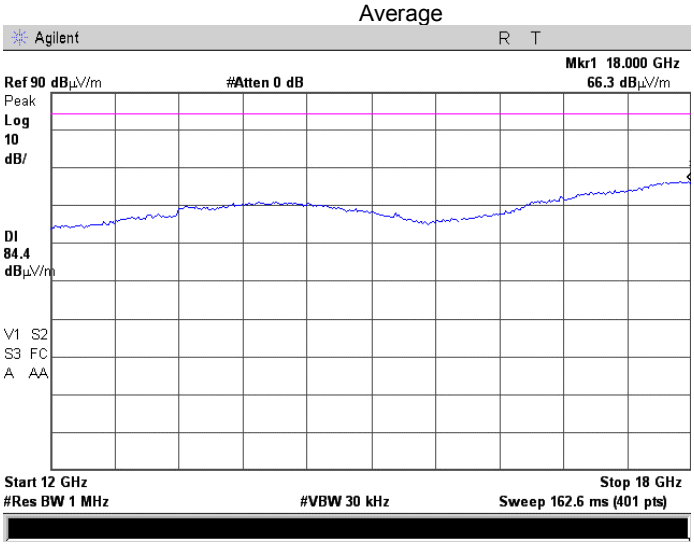
Plot 7.4.16 Radiated emission measurements in 12000 – 18000 MHz range

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



Plot 7.4.17 Radiated emission measurements in 12000 – 18000 MHz range

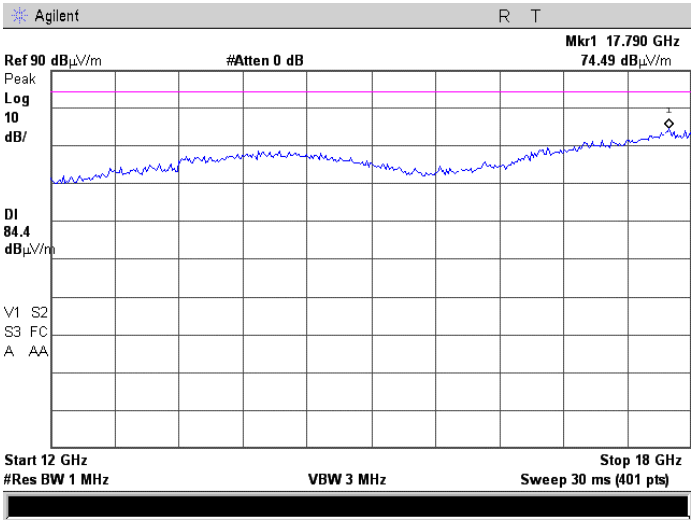
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m
DETECTOR:	Average



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

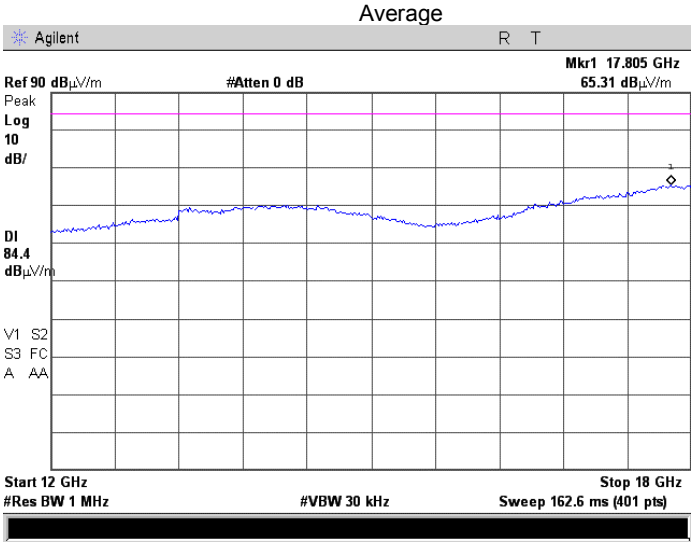
Plot 7.4.18 Radiated emission measurements in 12000 – 18000 MHz range

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



Plot 7.4.19 Radiated emission measurements in 12000 – 18000 MHz range

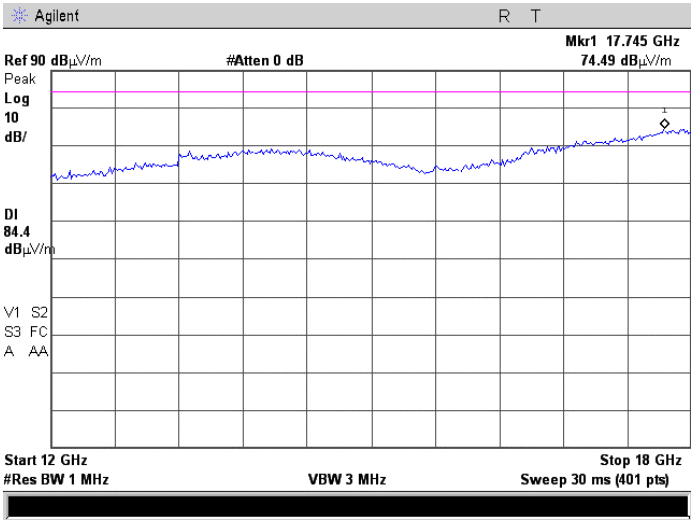
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m
DETECTOR:	Average



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

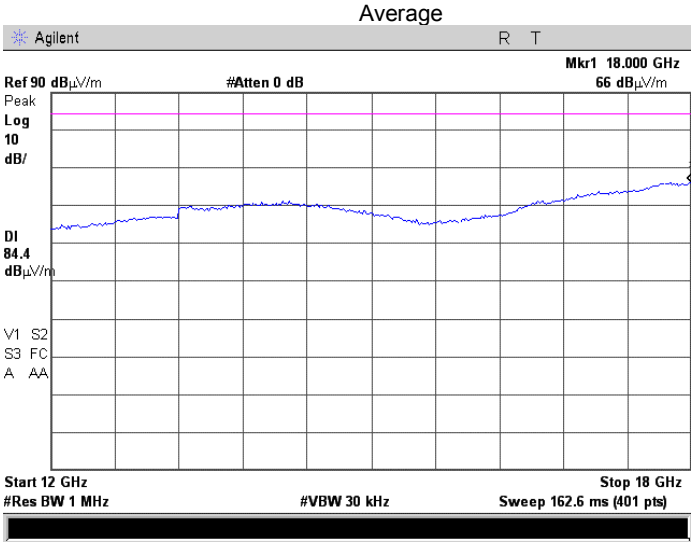
Plot 7.4.20 Radiated emission measurements in 12000 – 18000 MHz range

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



Plot 7.4.21 Radiated emission measurements in 12000 – 18000 MHz range

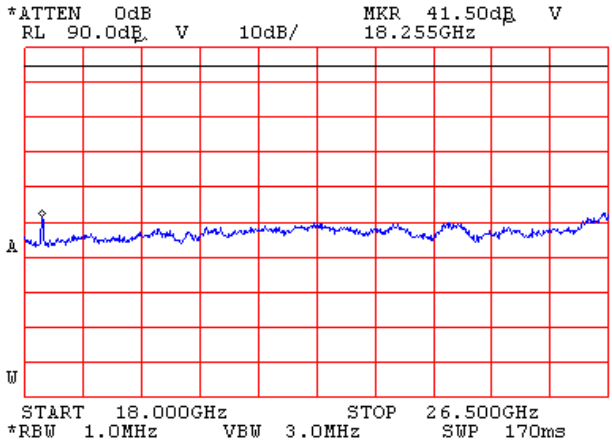
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
DETECTOR: Average



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:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

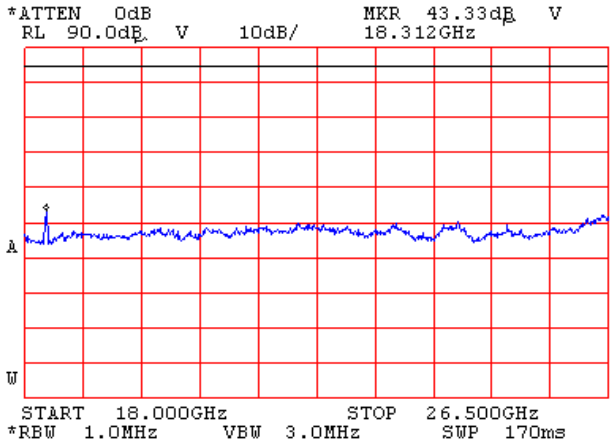
Plot 7.4.22 Radiated emission measurements in 18000 – 26500 MHz range

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



Plot 7.4.23 Radiated emission measurements in 18000 – 26500 MHz range

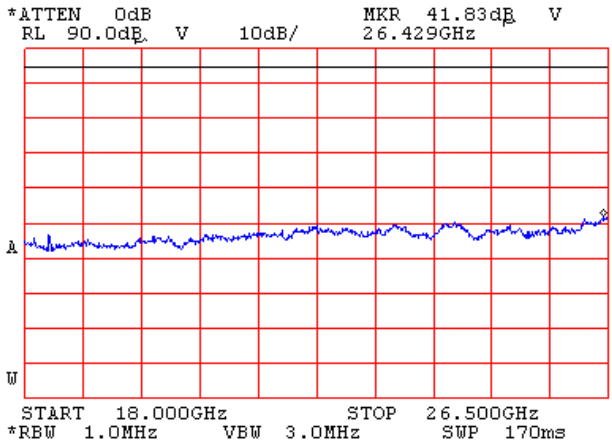
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	PASS
Date & Time:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

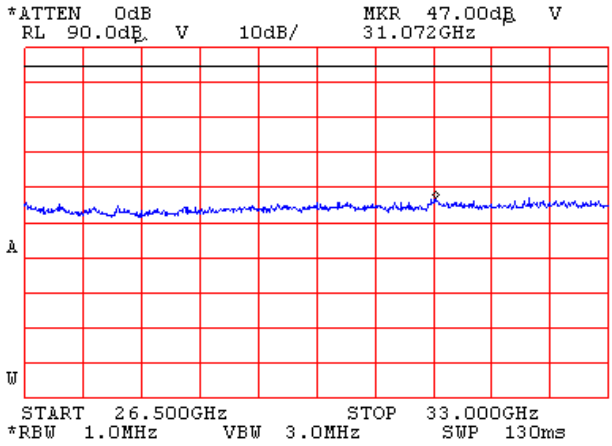
Plot 7.4.24 Radiated emission measurements in 18000 – 26500 MHz range

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



Plot 7.4.25 Radiated emission measurements in 26500 – 33000 MHz range

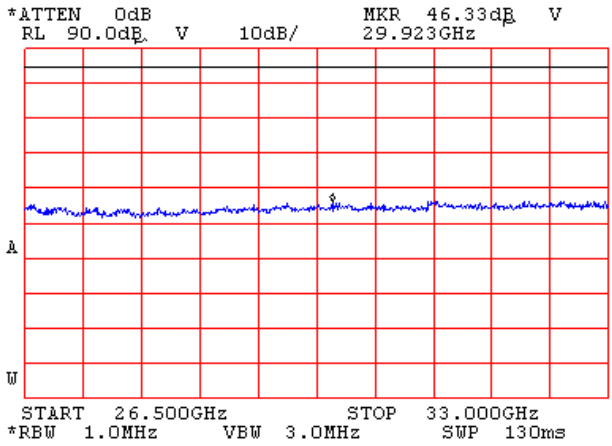
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	PASS
Date & Time:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

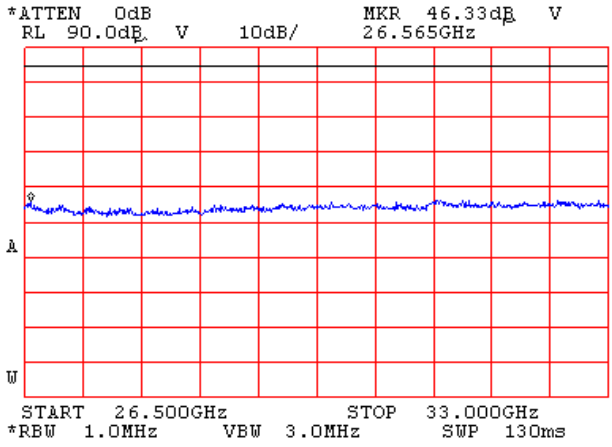
Plot 7.4.26 Radiated emission measurements in 26500 – 33000 MHz range

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



Plot 7.4.27 Radiated emission measurements in 26500 – 33000 MHz range

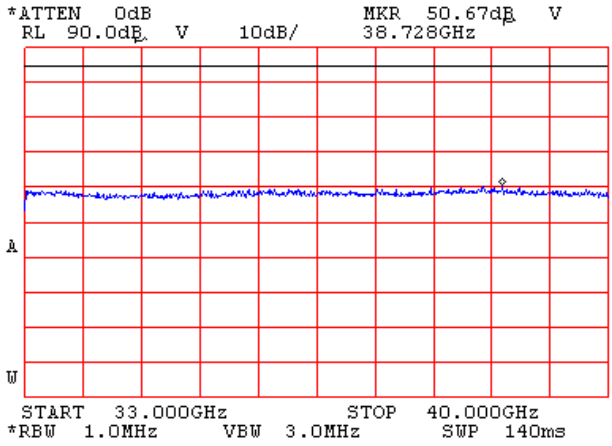
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	PASS
Date & Time:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

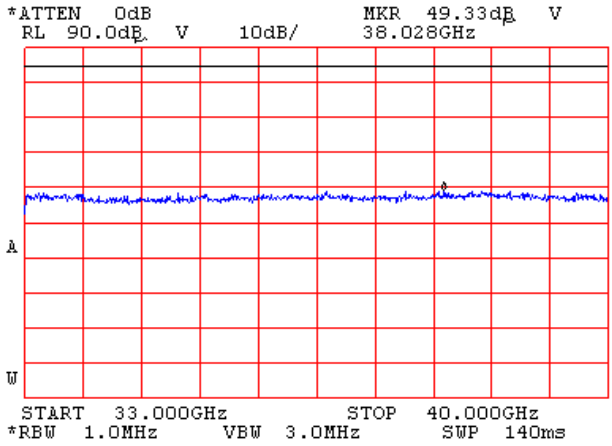
Plot 7.4.28 Radiated emission measurements in 33000 – 40000 MHz range

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



Plot 7.4.29 Radiated emission measurements in 33000 – 40000 MHz range

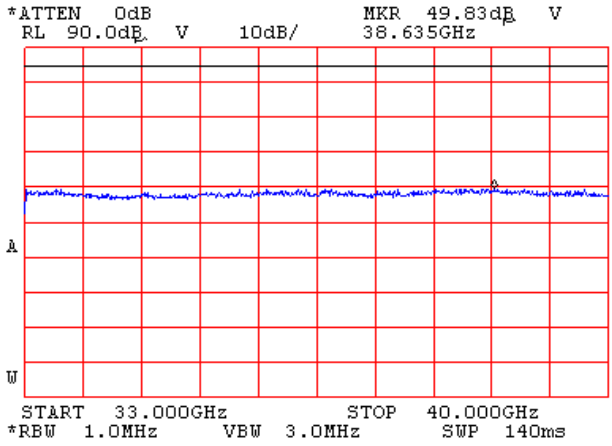
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



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:	PASS
Date & Time:	10/5/2008 5:43:36 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

Plot 7.4.30 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, 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 & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

7.5 Spurious emissions at RF antenna connector test

7.5.1 General

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

Table 7.5.1 Spurious emission limits

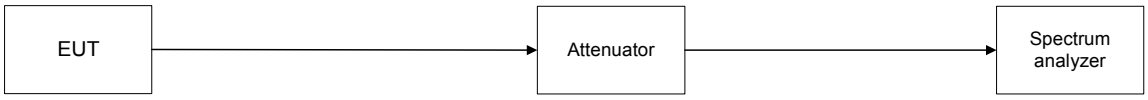
Frequency, MHz	ERP of spurious, dBm	
0.009 – 10th harmonic*	Low carrier frequency	-13
	Mid carrier frequency	-13
	High carrier frequency	-13

* - spurious emission limits do not apply to the in band emission within ± 250 % of the authorized bandwidth from the carrier; investigated in course of emission mask testing.

7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.
7.5.2.2 The EUT was adjusted to produce maximum available for end user RF output power.
7.5.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and associated plots.

Figure 7.5.1 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:**	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Table 7.5.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 3650 - 3675 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 38000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATION: QPSK
MODULATING SIGNAL: OFDM
BIT RATE: 4.19 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: 16 dBm

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 emissions were found									Pass
Mid carrier frequency									
No emissions were found									Pass
High carrier frequency									
No emissions were found									Pass

*****- Margin = Spurious emission – specification limit.

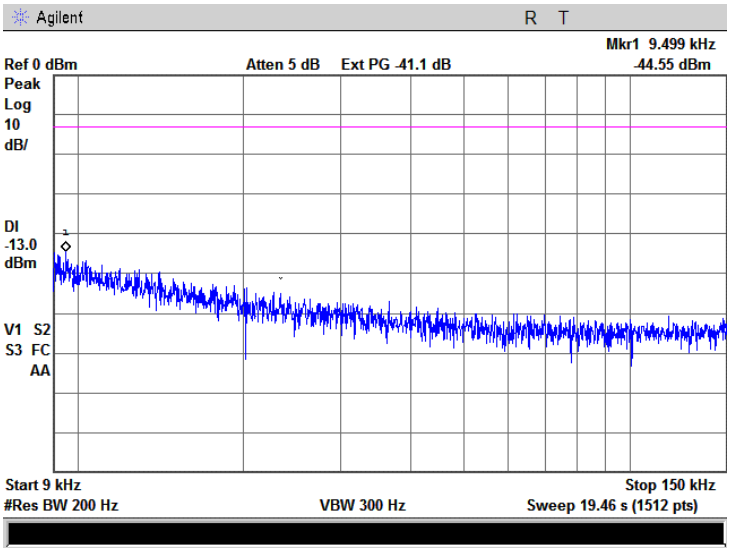
Reference numbers of test equipment used

HL 1424	HL 2909	HL 3179	HL 3181	HL 3206	HL 3385	HL 3440	HL 3442

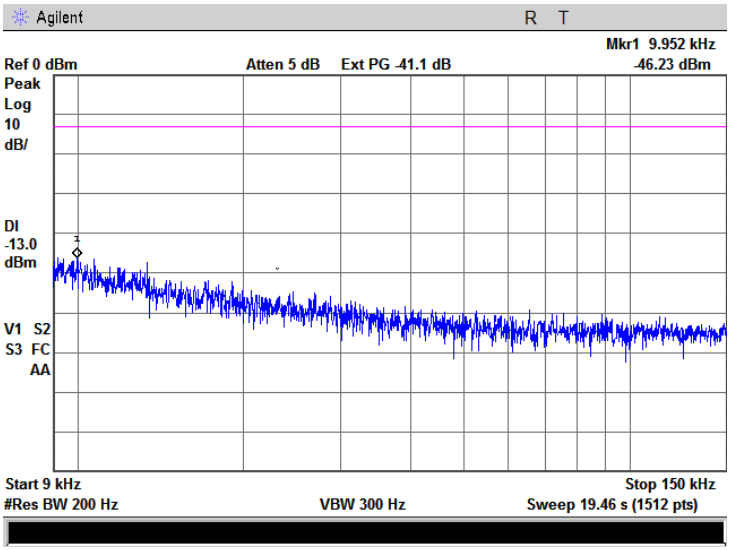
Full description is given in Appendix A.

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 & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

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

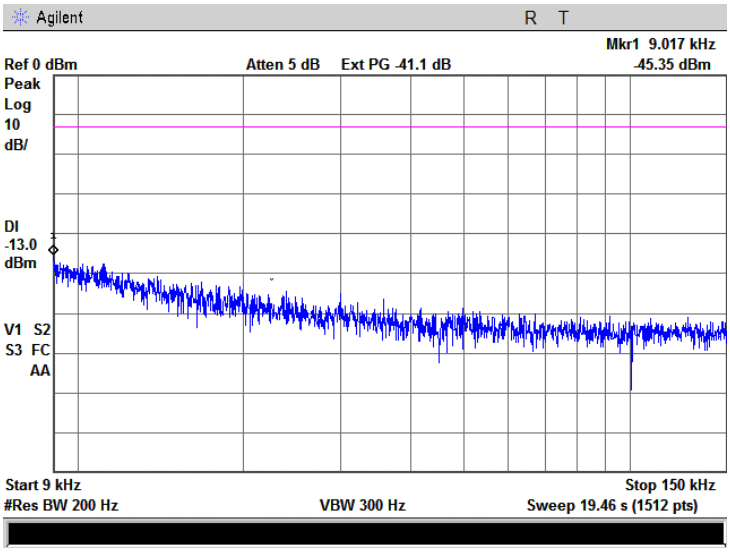


Plot 7.5.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

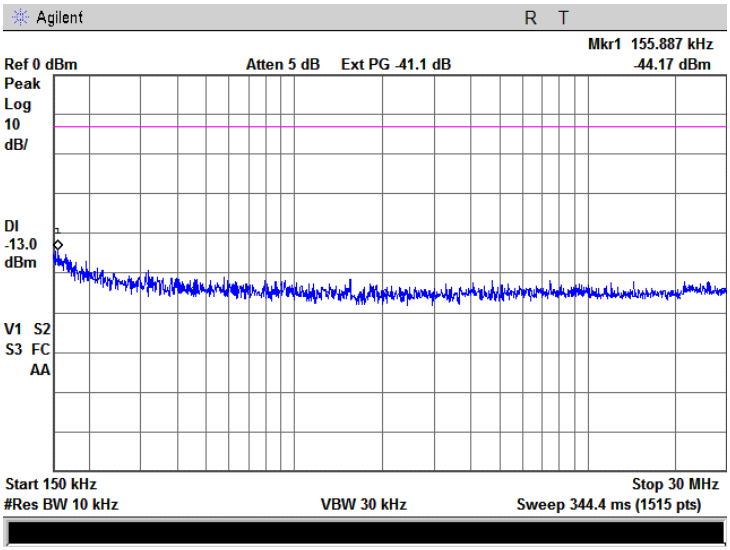


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

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

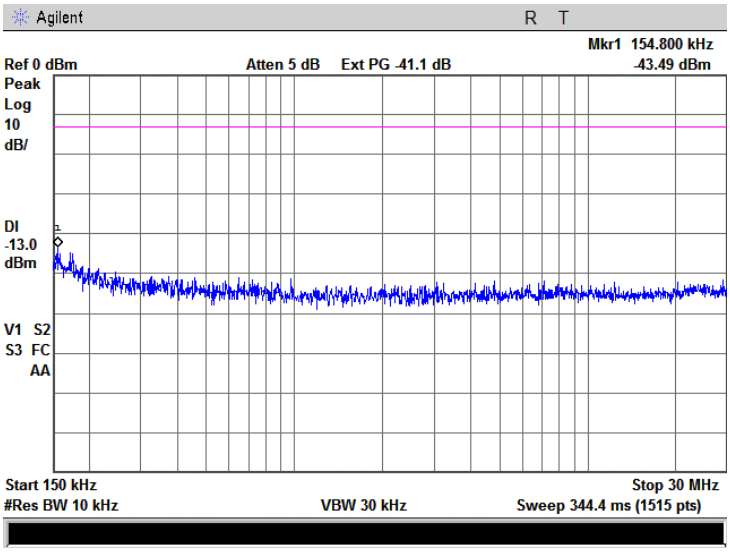


Plot 7.5.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

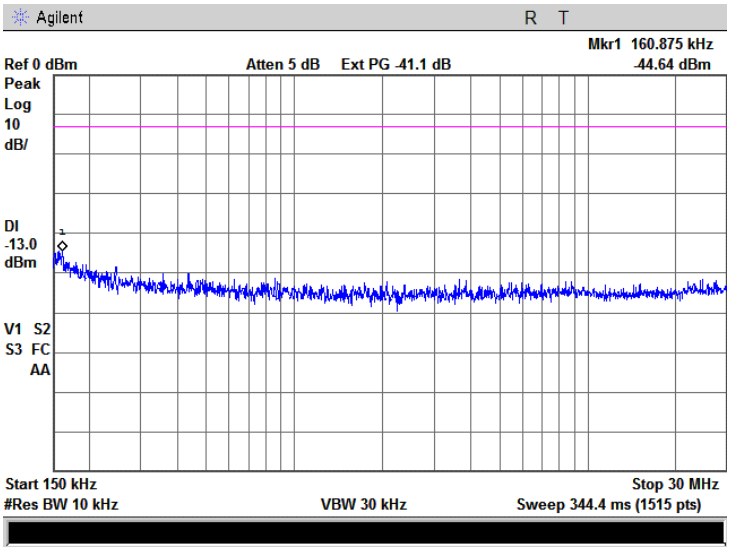


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

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

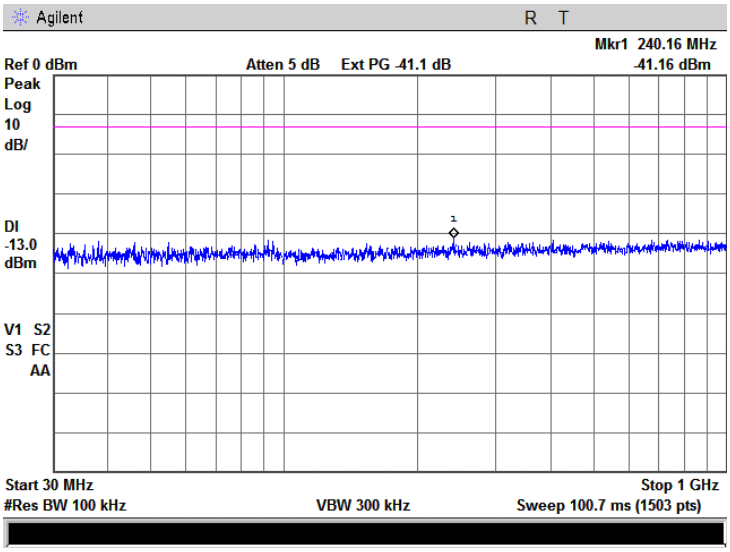


Plot 7.5.6 Spurious emission measurements in 0.15 – 30.0 MHz range at high carrier frequency

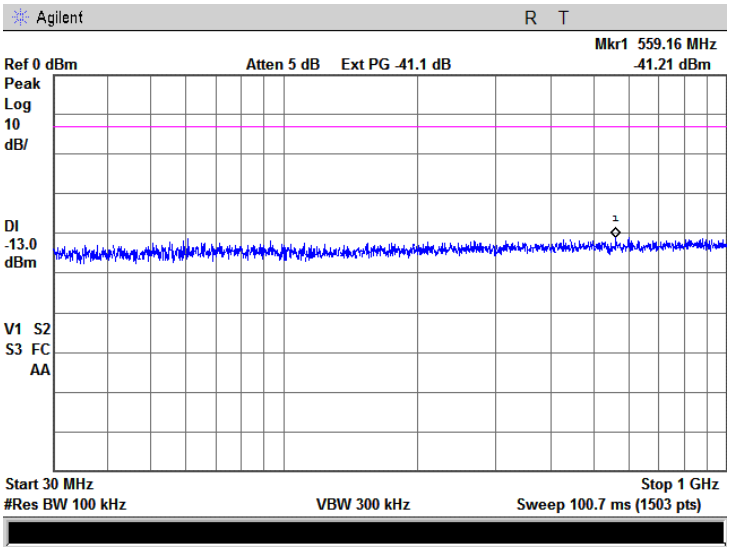


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

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

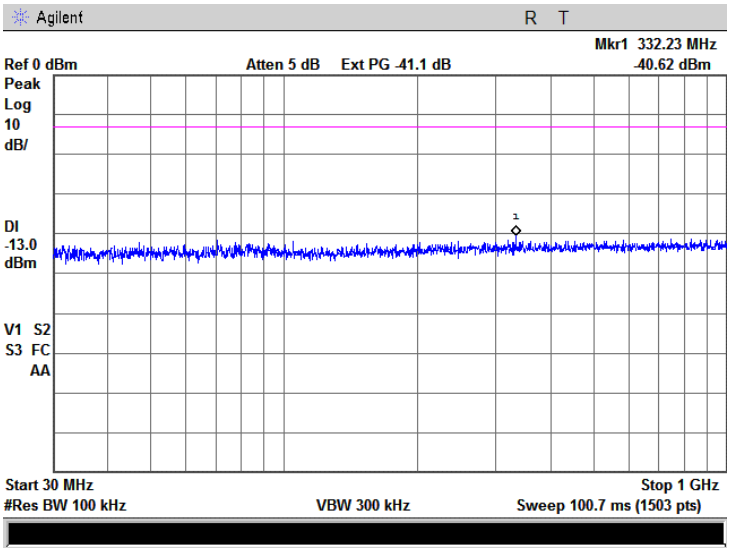


Plot 7.5.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency

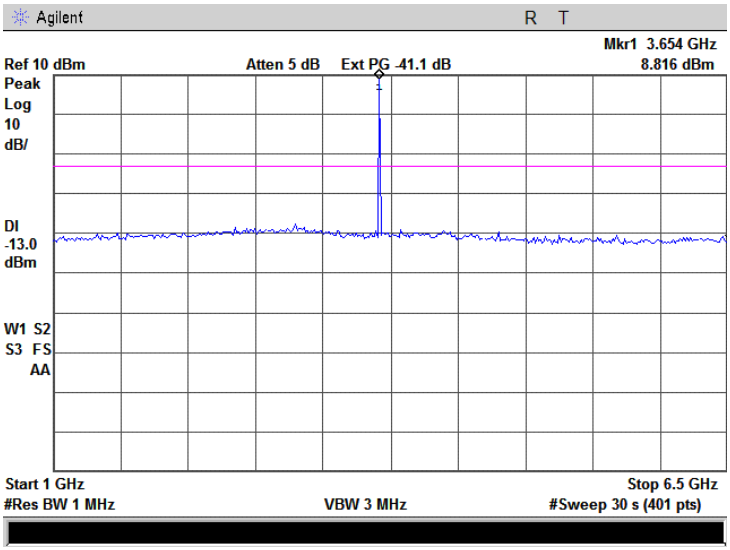


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

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

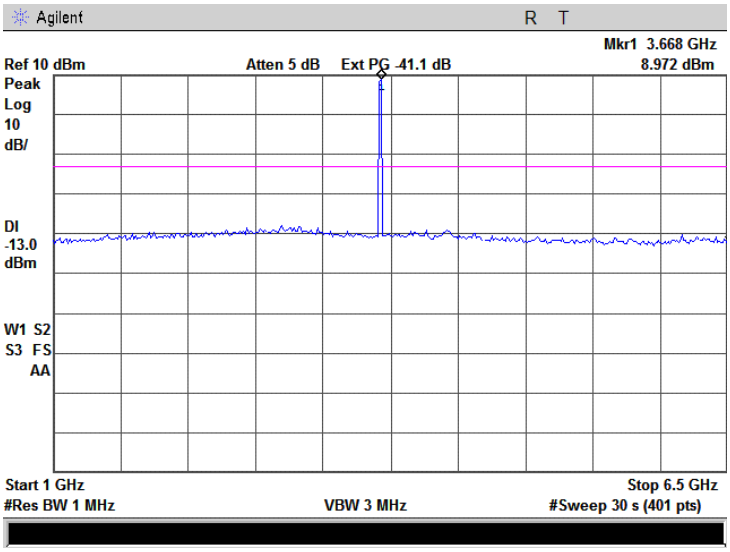


Plot 7.5.10 Spurious emission measurements in 1000 - 6500 MHz range at low carrier frequency

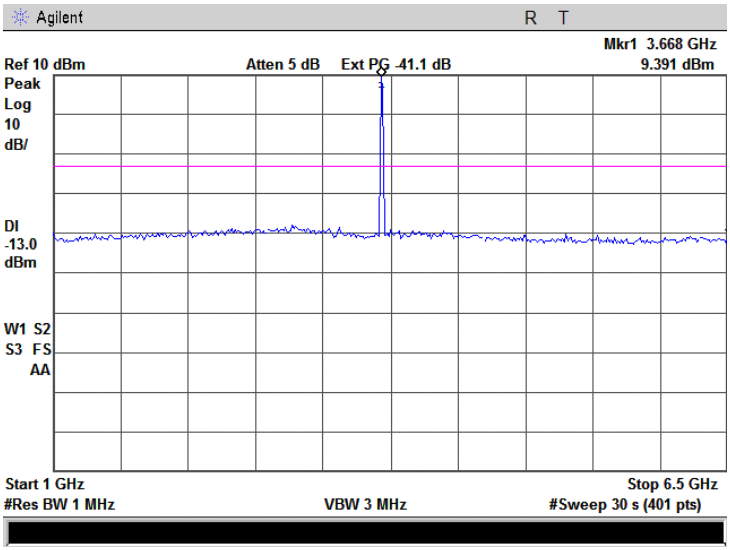


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

Plot 7.5.11 Spurious emission measurements in 1000 - 6500 MHz range at mid carrier frequency

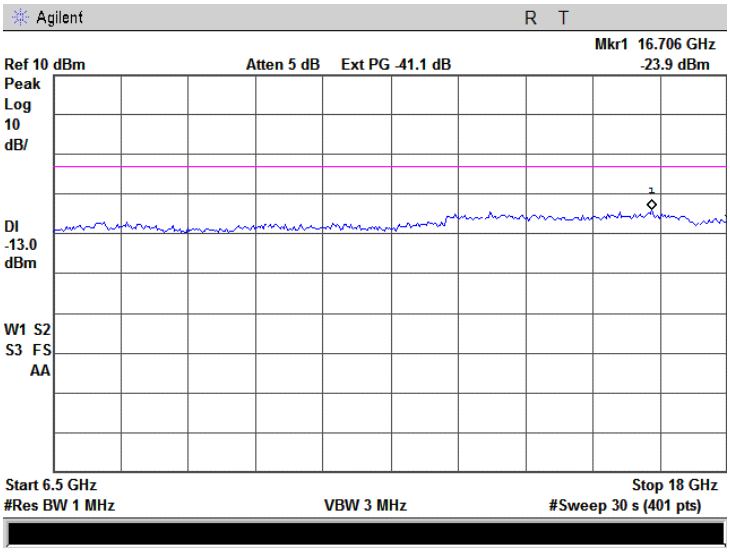


Plot 7.5.12 Spurious emission measurements in 1000 - 6500 MHz range at high carrier frequency

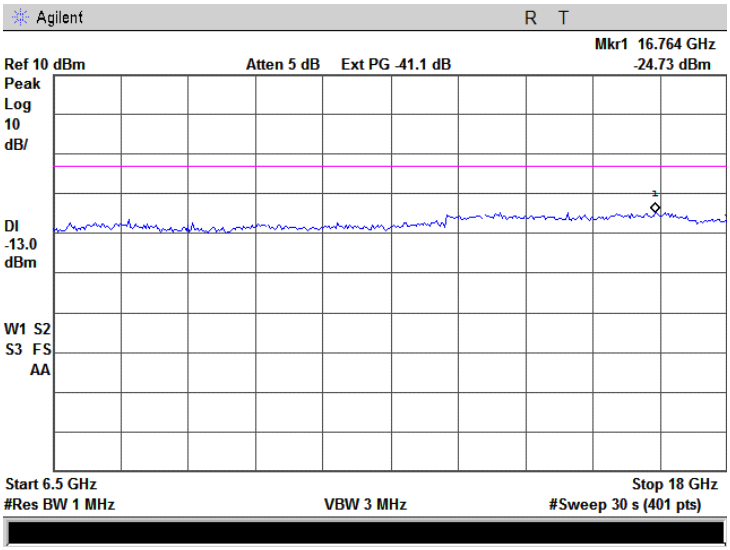


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

Plot 7.5.13 Spurious emission measurements in 6500 - 18000 MHz range at low carrier frequency

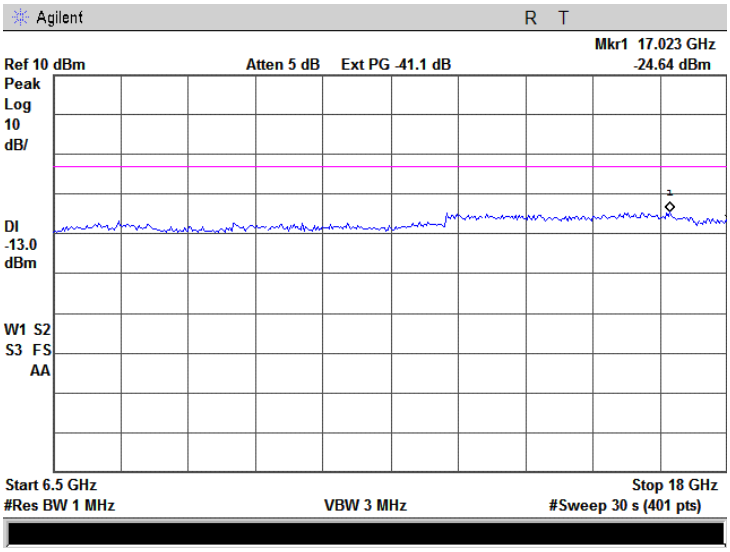


Plot 7.5.14 Spurious emission measurements in 6500 - 18000 MHz range at mid carrier frequency

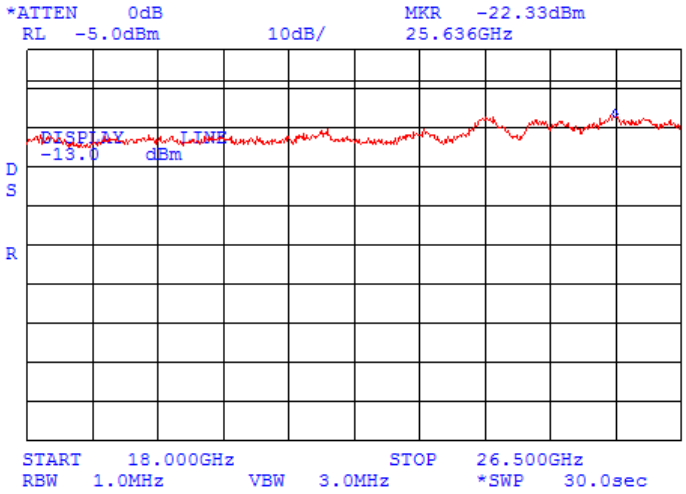


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

Plot 7.5.15 Spurious emission measurements in 6500 - 18000 MHz range at high carrier frequency

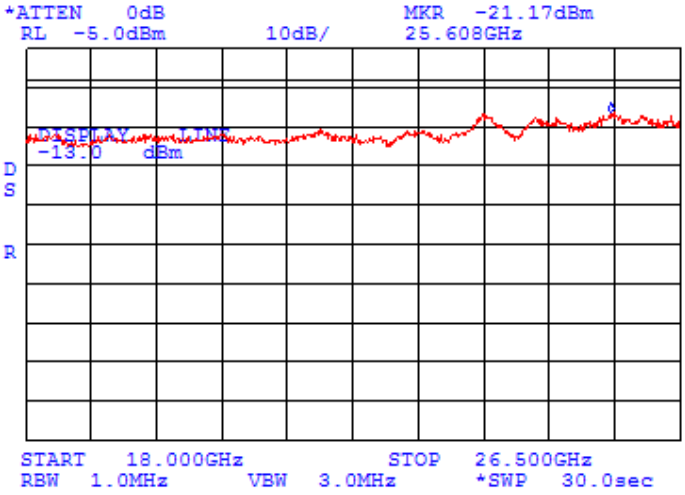


Plot 7.5.16 Spurious emission measurements in 18000 – 26500 MHz range at low carrier frequency

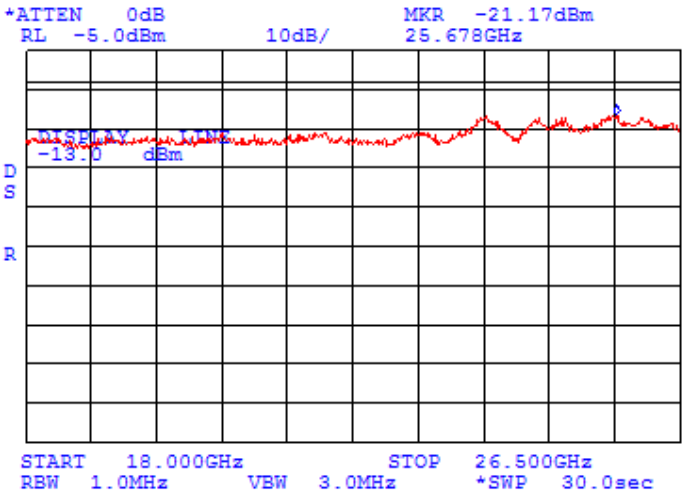


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

Plot 7.5.17 Spurious emission measurements in 18000 – 26500 MHz range at mid carrier frequency

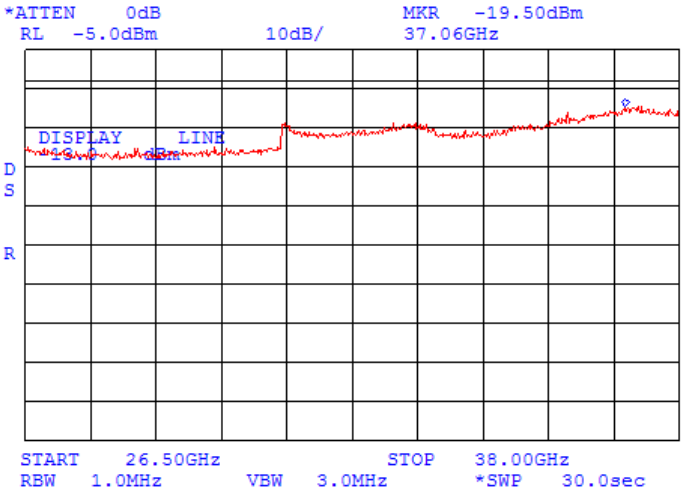


Plot 7.5.18 Spurious emission measurements in 18000 – 26500 MHz range at high carrier frequency

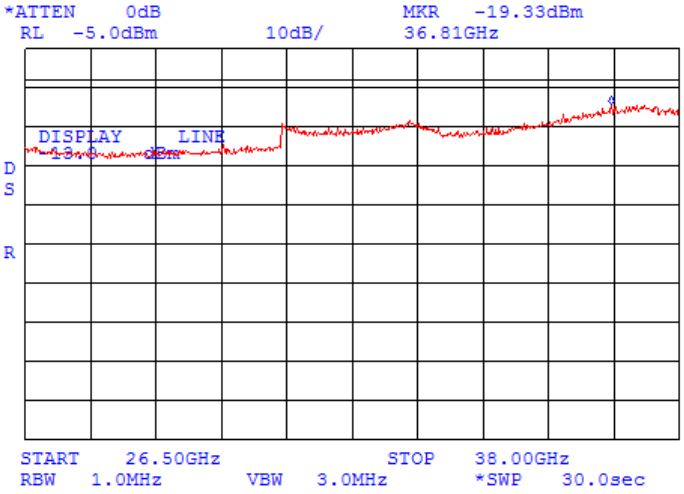


Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

Plot 7.5.19 Spurious emission measurements in 26500 – 38000 MHz range at low carrier frequency

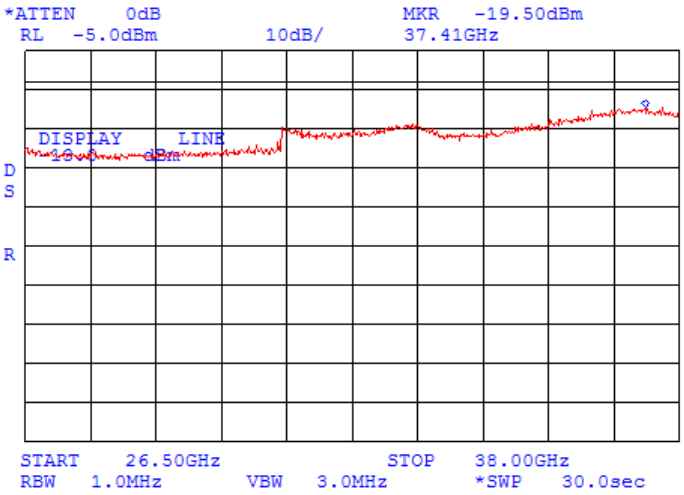


Plot 7.5.20 Spurious emission measurements in 26500 – 38000 MHz range at mid carrier frequency



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:	PASS
Date & Time:	10/7/2008 5:13:17 PM		
Temperature: 25ºC	Air Pressure: 1010 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

Plot 7.5.21 Spurious emission measurements in 26500 – 38000 MHz range at high carrier frequency



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 & Time:	10/12/2008 4:02:54 PM		
Temperature: ºC	Air Pressure: hPa	Relative Humidity: %	Power Supply:
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

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
3652.5	20	73050
3662.5		73300
3672.5		73450

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.

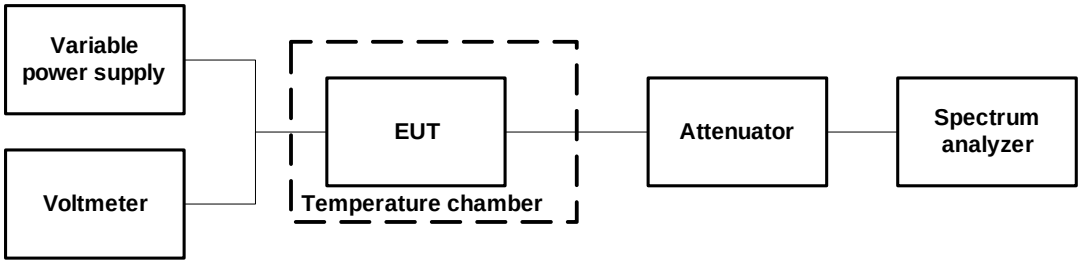
7.6.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.

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 & Time:	10/12/2008 4:02:54 PM		
Temperature: ºC	**Air Pressure:** hPa	**Relative Humidity:** %	**Power Supply:**
Remarks:			

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY RANGE: 3653.5 – 3671.5 MHz
NOMINAL POWER VOLTAGE: 120 VAC (at PoE adaptor input)
TEMPERATURE STABILIZATION PERIOD: 20 min
POWER DURING TEMPERATURE TRANSITION: Off
SPECTRUM ANALYZER MODE: Counter
RESOLUTION BANDWIDTH: 30 Hz
VIDEO BANDWIDTH: 100 Hz
MODULATION: Unmodulated

T, ºC	Voltage V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Margin Hz	Verdict
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative			
Low frequency													
-30	nominal	3653.499560	3653.499820	3653.499468	3653.499456	3653.499447	3653.499440	3653.499424	0	-1533		-71537	Pass
-20	nominal	3653.498854	NA	NA	NA	NA	NA	3653.499218	0	-2103		-70967	Pass
-10	nominal	3653.499990	NA	NA	NA	NA	NA	3653.500137	0	-967		-72103	Pass
0	nominal	3653.500514	3653.500555	3653.500610	3653.500646	3653.500670	3653.500698	3653.500750	0	443		-72627	Pass
10	nominal	3653.499202	NA	NA	NA	NA	NA	3653.501200	243	1755		-71315	Pass
20	+15%	3653.500985	NA	NA	NA	NA	NA	3653.500945	28	12	73070	-73042	Pass
20	nominal	3653.501506	NA	NA	NA	NA	NA	3653.500957*	549	0		-72521	Pass
20	-15%	3653.500958	NA	NA	NA	NA	NA	3653.500946	1	11		-73059	Pass
30	nominal	3653.499971	3653.500147	3653.500139	3653.500136	3653.500135	3653.500132	3653.500130	0	986		-72084	Pass
40	nominal	3653.499977	NA	NA	NA	NA	NA	3653.499330	0	1627		-71443	Pass
50	nominal	3653.498224	NA	NA	NA	NA	NA	3653.498408	0	2733		-70337	Pass
Mid frequency													
-30	nominal	3662.499545	3662.499492	3662.499465	3662.499445	3662.499435	3662.499426	3662.499406	0	-1548		-71752	Pass
-20	nominal	3662.498.987	NA	NA	NA	NA	NA	3662.499282	0	-1672		-71628	Pass
-10	nominal	3662.499957	NA	NA	NA	NA	NA	3662.500117	0	-997		-72303	Pass
0	nominal	3662.500523	3662.500578	3662.500630	3662.500665	3662.500688	3662.500705	3662.500760	0	-431		-72869	Pass
10	nominal	3662.500751	NA	NA	NA	NA	NA	3662.501176	222	-203		-73078	Pass
20	+15%	3662.500955	NA	NA	NA	NA	NA	3662.500950	1	-4	73300	-73296	Pass
20	nominal	3662.501550	NA	NA	NA	NA	NA	3662.500954*	596	0		-72704	Pass
20	-15%	3662.500986	NA	NA	NA	NA	NA	3662.500942	32	-12		-64394	Pass
30	nominal	3662.501004	3662.500211	3662.500201	3662.500188	3662.500180	3662.500172	3662.500143	50	-811		-72489	Pass
40	nominal	3662.499955	NA	NA	NA	NA	NA	3662.499320	0	-1634		-71666	Pass
50	nominal	3662.498162	NA	NA	NA	NA	NA	3662.498430	0	-2792		-70508	Pass
High frequency													
-30	nominal	3671.499229	3671.499345	3671.499325	3671.499310	3671.499294	3671.499292	3671.499280	0	-1729		-71701	Pass
-20	nominal	3671.499050	NA	NA	NA	NA	NA	3671.499320	0	-1908		-71522	Pass
-10	nominal	3671.499905	NA	NA	NA	NA	NA	3671.500062	0	-1053		-72377	Pass
0	nominal	3671.500520	3671.500572	3671.500624	3671.500657	3671.500686	3671.500702	3671.500764	0	-438		-72992	Pass
10	nominal	3671.501136	NA	NA	NA	NA	NA	3671.501200	242	0		-73188	Pass
20	+15%	3671.500934	NA	NA	NA	NA	NA	3671.500955	0	-24	73430	-73406	Pass
20	nominal	3671.501523	NA	NA	NA	NA	NA	3671.500958*	565	0		-72865	Pass
20	-15%	3671.500955	NA	NA	NA	NA	NA	3671.500915	0	-43		-73387	Pass
30	nominal	3671.500783	3671.500681	3671.500565	3671.500484	3671.500438	3671.501390	3671.500213	432	-745		-72685	Pass
40	nominal	3671.499985	NA	NA	NA	NA	NA	3671.499325	0	-1633		-71797	Pass
50	nominal	3671.498673	3671.498620	3671.498594	3671.498570	3671.498544	3671.498515	3671.498462	0	-2496		-70934	Pass

* - Reference frequency

Reference numbers of test equipment used

HL 0493	HL 1194	HL 2867	HL 2909	HL 3332	HL 3440	HL 3442	

Full description is given in Appendix A.

*

Test specification:	Section 2.1091, RF radiation exposure evaluation		
Test procedure:	47 CFR, Section 1.1307(b)1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/12/2008 5:20:56 PM		
Temperature: ºC	Air Pressure: hPa	Relative Humidity: %	Power Supply:
Remarks:			

7.7 RF exposure

7.7.1 General

This test was performed to determine the minimum safe distance between the transmitter antenna and human to avoid public exposure in excess of limits for general population (uncontrolled exposure). Specification test limits are given in Table 7.7.1.

Table 7.7.1 RF exposure limits

Frequency range, MHz	Power density*		Electric field strength**, V/m
	mW/cm^2	W/m^2	
1500 - 100000	1.00	10.0	61.4

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

** - Electric field strength limit was calculated from power density as follows: E = sqrt (S×120×π), where E is electric field strength in V/m and S is power density in W/m^2

7.7.2 Safe distance calculation for fixed transmitter

The minimum safe distance was calculated from the following equation as provided in Table 7.7.3:

$$r = sqrt[P \times G / (4 \times \pi \times S)],$$

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

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

Table 7.7.2 Safe distance calculation

ASSIGNED FREQUENCY: 3650.0 – 3675.0 MHz

EQUIPMENT INTENDED USE: Fixed*

Carrier frequency MHz	Peak output power, dBm	Antenna gain, dBi	EIRP		Power density limit, mW/cm^2	Safe distance, m**	Intended separation, r	Verdict
			dBm	W				
3653.5	15.41**	18	33.41	2.193	1.0	0.132	2.0	Pass

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

** - The maximum peak output power was obtained at low frequency (3653.5 MHz) with 64QAM modulation and 18.85 Mbps bit rate.

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:45:10 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

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

8.1 Conducted emissions

8.1.1 General

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

Table 8.1.1 Limits for conducted emissions

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

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

8.1.2 Test procedure

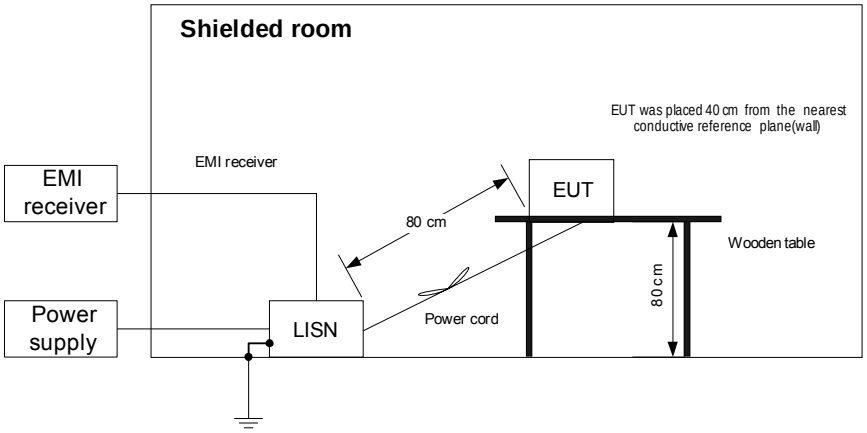
8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and the EUT performance was checked.

8.1.2.2 The measurements were performed at the EUT power terminals with the LISN connected to the EMI receiver in the frequency range referred to in Table 8.1.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

8.1.2.3 The position of the EUT cables was varied to find the highest emission.

8.1.2.4 The worst test results with respect to the limits were recorded in Table 8.1.2 and shown in the associated plots.

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



Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:45:10 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

Table 8.1.2 Conducted emission test results

LINE: IDU power lines
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.151425	50.80	47.46	65.93	-18.47	41.43	55.93	-14.50	L1	Pass
0.202600	41.98	40.89	63.55	-22.66	34.70	53.55	-18.85		
0.250109	36.74	34.55	61.78	-27.23	28.75	51.78	-23.03		
0.462215	38.58	36.15	56.71	-20.56	32.49	46.71	-14.22		
0.500825	39.16	34.37	56.00	-21.63	27.64	46.00	-18.36		
0.151350	51.18	47.68	65.93	-18.25	41.98	55.93	-13.95	L2	Pass
0.203125	43.61	42.25	63.53	-21.28	37.63	53.53	-15.90		
0.254475	41.50	40.02	61.65	-21.63	35.30	51.65	-16.35		
0.304000	37.51	35.48	60.15	-24.67	33.03	50.15	-17.12		
0.458485	38.97	38.15	56.78	-18.63	35.85	46.78	-10.93		
0.508565	37.65	35.44	56.00	-20.56	33.56	46.00	-12.44		

LINE: Laptop power lines
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.184240	46.45	42.61	64.33	-21.72	24.56	54.33	-29.77	L1	Pass
0.193460	46.45	43.53	63.91	-20.38	25.87	53.91	-28.04		
0.299426	42.01	36.90	60.29	-23.39	18.44	50.29	-31.85		
0.431150	40.49	35.20	57.29	-22.09	33.45	47.29	-13.84		
0.624875	36.37	28.69	56.00	-27.31	19.42	46.00	-26.58		
4.528500	35.02	28.17	56.00	-27.83	21.77	46.00	-24.23		
0.176701	42.65	35.02	64.70	-29.68	17.59	54.70	-37.11	L2	Pass
0.183085	46.59	41.87	64.39	-22.52	20.97	54.39	-33.42		
0.242553	43.25	39.62	62.02	-22.40	24.40	52.02	-27.62		
0.318198	41.40	36.50	59.78	-23.28	20.52	49.78	-29.26		
0.431638	40.78	37.24	57.28	-20.04	35.54	47.28	-11.74		
2.103960	38.28	33.51	56.00	-22.49	29.49	46.00	-16.51		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

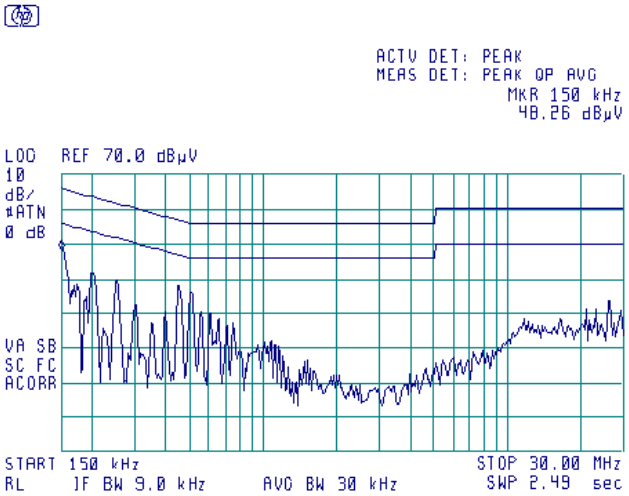
HL 0447	HL 0586	HL 0587	HL 0787	HL 1430	HL 1500	HL 2272	HL 2888

Full description is given in Appendix A.

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:45:10 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

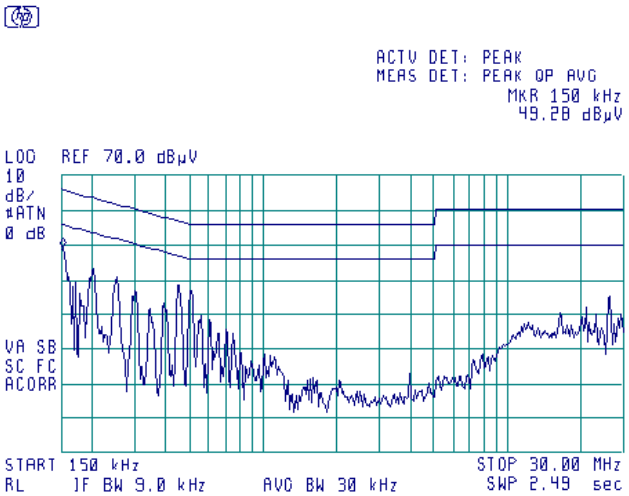
Plot 8.1.1 Conducted emission measurements at IDU power lines

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.2 Conducted emission measurements at IDU power lines

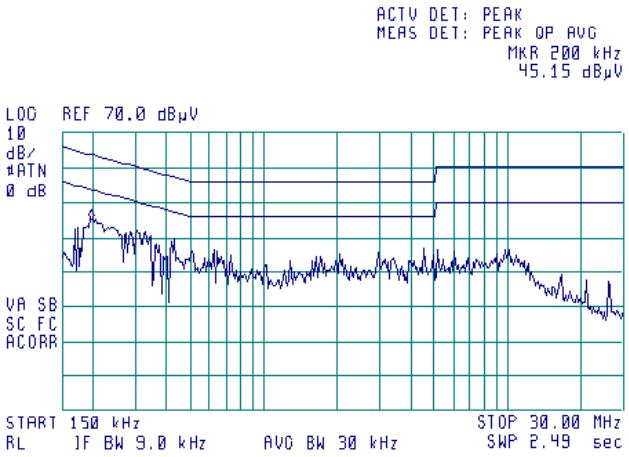
LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:45:10 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

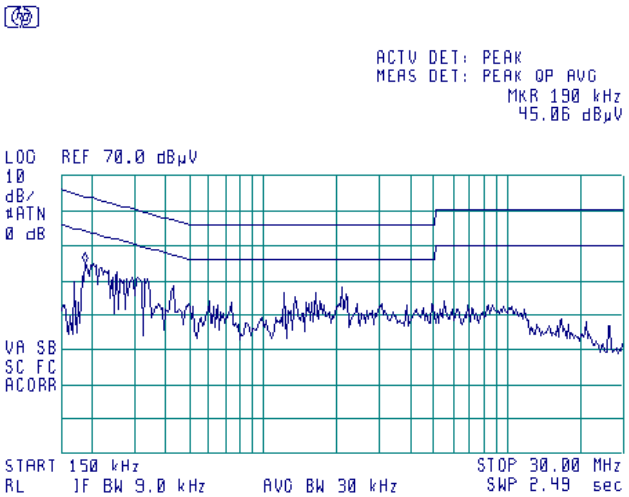
Plot 8.1.3 Conducted emission measurements at laptop power lines

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.4 Conducted emission measurements at laptop power lines

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:46:40 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

8.2 Radiated emission measurements

8.2.1 General

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

Table 8.2.1 Radiated emission test limits

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

* - The limit for a test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – the standard defined and the test distance respectively in meters.

8.2.2 Test procedure for measurements in semi-anechoic chamber

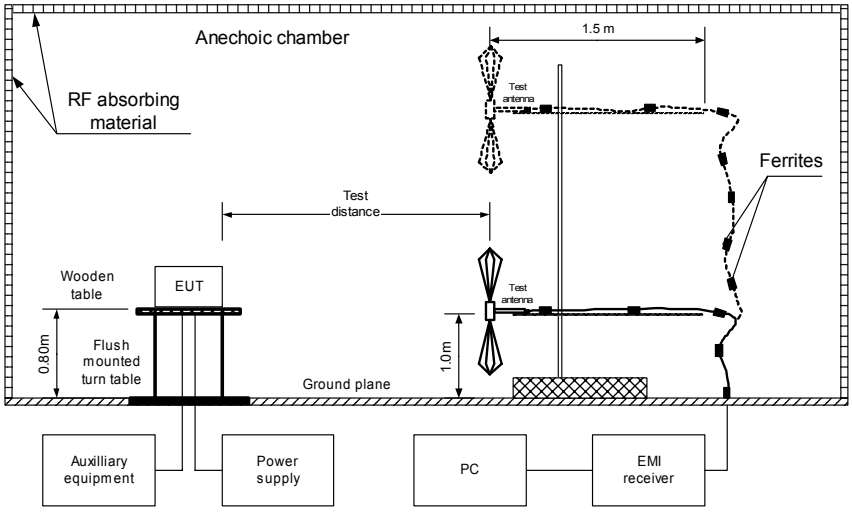
8.2.2.1 The EUT was set up as shown in Figure 8.2.1, energized and the EUT performance was checked.

8.2.2.2 The measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.

8.2.2.3 The worst test results with respect to the limits were recorded in Table 8.2.2 and shown in the associated plots.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:46:40 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

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



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	10/5/2008 5:46:40 PM		
Temperature: 25ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 44%	**Power Supply:** 48 VDC
Remarks:			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
68.209250	35.18	32.55	40.00	-7.45	V	1.1	090	Pass
101.136500	42.00	40.50	43.50	-3.00	H	2.3	070	
110.544500	42.35	39.66	43.50	-3.84	H	2.2	090	
119.959500	35.51	32.19	43.50	-11.31	V	1.2	120	
159.996500	39.79	38.72	43.50	-4.78	V	1.0	040	
210.252000	36.00	32.85	43.50	-10.65	V	1.0	220	

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 6500 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak emission, dB(µV/m)	Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
1875.00	45.60	39.30	54.00	-14.70	V	1.4	030	Pass

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

Reference numbers of test equipment used

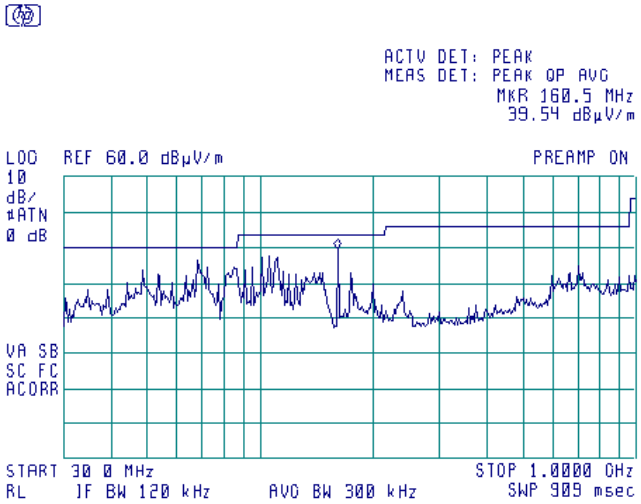
HL 0521	HL 0604	HL 1947	HL 1984	HL 3123			

Full description is given in Appendix A.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:46:40 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

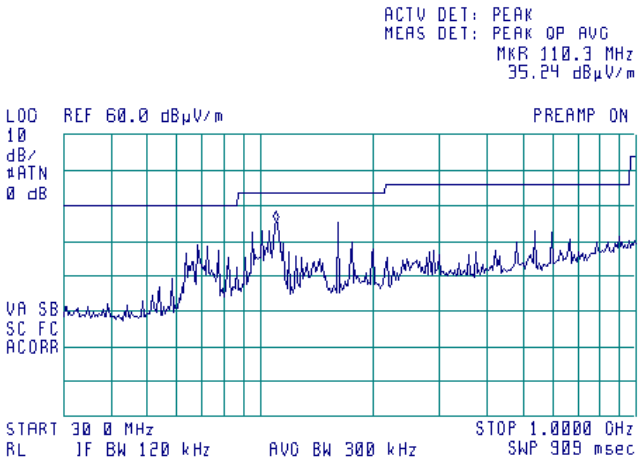
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



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

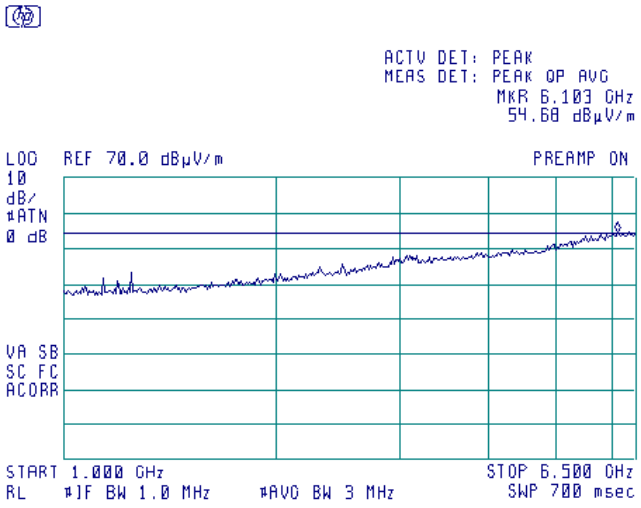
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m

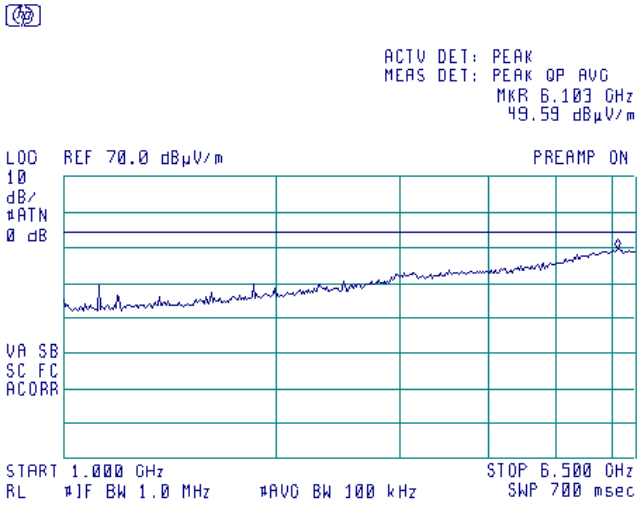


Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:46:40 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

Plot 8.2.3 Radiated emission measurements above 1000 MHz, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m

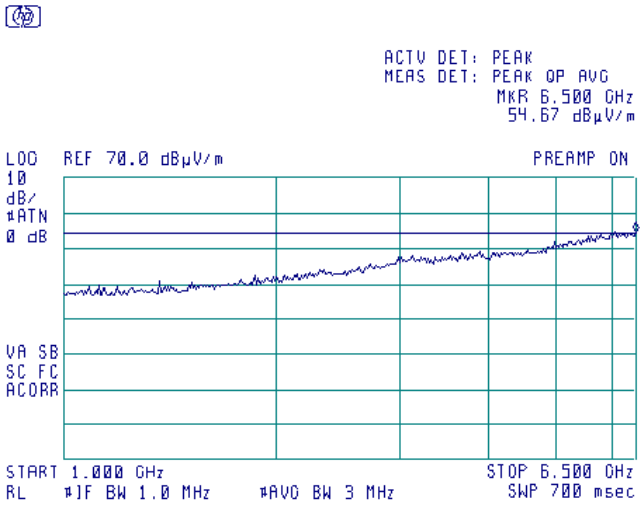


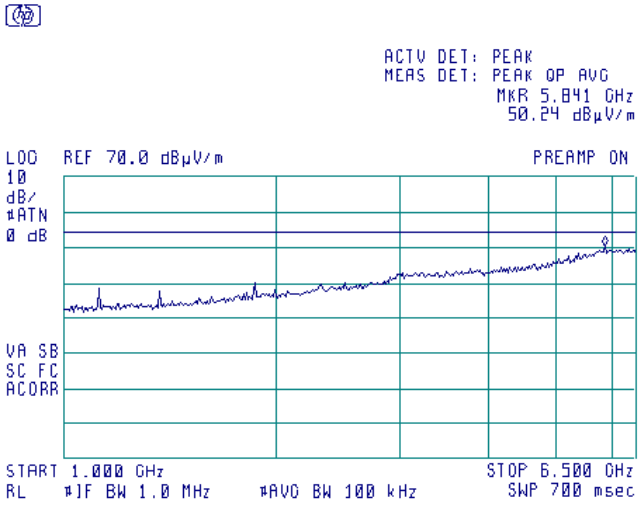


Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	10/5/2008 5:46:40 PM		
Temperature: 25ºC	Air Pressure: 1011 hPa	Relative Humidity: 44%	Power Supply: 48 VDC
Remarks:			

Plot 8.2.4 Radiated emission measurements above 1000 MHz, horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m





9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-08	29-Jun-09
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	04-Nov-08	04-Nov-09
0493	Temperature Chamber -45…175 deg C	Thermotron	S-1.2 Mini-Max	14016	19-May-08	19-May-09
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard Co	8546A	3617A 00319, 3448A002 53	29-Aug-08	29-Aug-09
0586	Load Termination 50 Ohm, 0.5 W, DC-1GHz	RELM	LT-50	095	19-Nov-08	19-Nov-09
0587	Load Termination 50 Ohm, 0.5 W, DC-1GHz	RELM	LT-50	096	19-Nov-08	19-Nov-09
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-Jan-08	10-Jan-09
0661	Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm	HP	83640B	3614A002 66	17-Sep-08	17-Sep-09
0763	Antenna Linear Horn (Optimum Gain) 18 - 26.5 GHz, WR-42, 3.5 adapter	Continental Microwave & Tool Co.	LHA042	980976-002	08-Dec-06	08-Dec-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
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard Co	11947A	3107A018 77	16-Oct-08	16-Oct-09
1194	Variac, 220 V/ 2.5 A	Matsunaga		2962	06-Jan-08	06-Jan-09
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Aug-07	28-Aug-09
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A002 62,3705A0 0217	31-Aug-08	31-Aug-09
1500	Cable RF, 15 m, N/N-type	Suhner Switzerland	RG 214/U	1500	08-Sep-08	08-Sep-09
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	30-Dec-07	30-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
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	30-Dec-07	30-Dec-08
2272	Load Termination 50 Ohm, 0.5 W, DC-1GHz	RELM	LT-50	2272	19-Nov-08	19-Nov-09
2867	Cable, 18 GHz, 0.9 m, SMA - SMA, Right Angle	Gore	NA	91P72076	11-Feb-08	11-Feb-09
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	09-Jul-08	09-Jul-09

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	07-May-07	07-May-09
3123	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3123	13-Dec-07	13-Dec-08
3179	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	0651	07-May-08	07-May-09
3181	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	0651	07-May-08	07-May-09
3206	Cable 40GHz, 0.6 m	Gore	GOR245	05118336	10-Jun-08	10-Jun-09
3207	Cable 40GHz, 1.2 m	Gore	GOR245	05118337	10-Jun-08	10-Jun-09
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY45101057	27-Jul-07	27-Jul-09
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY45240586	25-Jul-07	25-Jul-09
3332	Active Differential Probe 500 MHz,10:1	LeCroy Corporation	AP033	NA	30-Dec-07	30-Dec-08
3335	Current Transformer, 45 Hz to 1 kHz, (1:100, 1:1000), Imax=1000A	Voltech Instruments Ltd.	CT1000	1286	19-Mar-08	19-Mar-09
3385	Microwave Cable Assembly, 18.0 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3385	12-Feb-08	12-Feb-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
3442	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	09-Mar-08	09-Mar-09

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

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

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

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

11 APPENDIX C Test facility 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 2186A-1 for OATS and IC 2186A-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), 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).

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12 APPENDIX D Specification references

FCC 47CFR part 90: 2007	Private land mobile radio services
FCC 47CFR part 1: 2007	Practice and procedure
FCC 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: 2005	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

13 APPENDIX E Test equipment correction factors

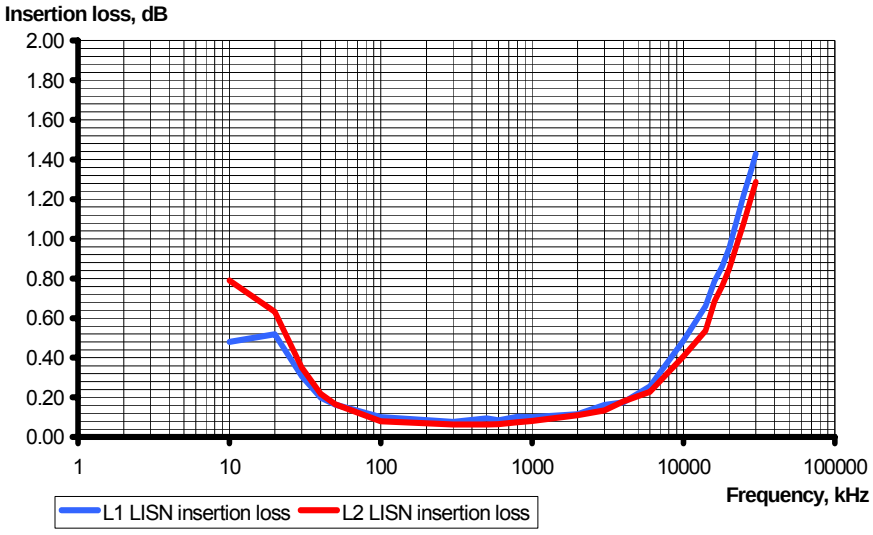
Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories, HL 0447

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

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

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

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



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

Antenna factor
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(μV) to convert it into field intensity in dB(μV/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(μV) to convert it into field intensity in dB(μV/m).

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

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

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

Cable loss
Cable 18 GHz, 6.5 m, blue, model: NPS-1803A-6500-NPS, S/N T4974, HL 1947

Frequency, GHz	Cable loss, dB
0.03	0.30
0.05	0.38
0.10	0.53
0.20	0.74
0.30	0.91
0.40	1.05
0.50	1.18
0.60	1.29
0.70	1.40
0.80	1.50
0.90	1.59
1.00	1.68
1.10	1.77
1.20	1.86
1.30	1.94
1.40	2.01
1.50	2.08
1.60	2.16
1.70	2.22
1.80	2.29
1.90	2.36
2.00	2.42
2.10	2.48
2.20	2.54
2.30	2.60
2.40	2.66
2.50	2.71
2.60	2.77
2.70	2.83
2.80	2.89
2.90	2.95
3.10	3.06
3.30	3.17
3.50	3.28
3.70	3.39
3.90	3.51
4.10	3.62
4.30	3.76
4.50	3.87
4.70	4.01
4.90	4.10
5.10	4.21
5.30	4.31
5.50	4.43
5.70	4.56
5.90	4.71

Frequency, GHz	Cable loss, dB
6.10	4.87
6.30	4.95
6.50	4.94
6.70	4.88
6.90	4.87
7.10	4.83
7.30	4.85
7.50	4.86
7.70	4.91
7.90	4.96
8.10	5.03
8.30	5.08
8.50	5.13
8.70	5.21
8.90	5.22
9.10	5.34
9.30	5.35
9.50	5.52
9.70	5.51
9.90	5.66
10.10	5.70
10.30	5.78
10.50	5.79
10.70	5.82
10.90	5.86
11.10	5.94
11.30	6.06
11.50	6.21
11.70	6.44
11.90	6.61
12.10	6.76
12.40	6.68
13.00	6.66
13.50	6.81
14.00	6.90
14.50	6.90
15.00	6.97
15.50	7.17
16.00	7.28
16.50	7.27
17.00	7.38
17.50	7.68
18.00	7.92

Cable loss
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3123

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.11	3600	1.97	7400	3.12	11200	3.90	15100	4.74
30	0.17	3700	1.97	7500	3.13	11300	3.93	15200	4.70
50	0.25	3800	2.03	7600	3.16	11400	3.88	15300	4.73
100	0.32	3900	2.04	7700	3.18	11500	3.87	15400	4.78
200	0.46	4000	2.10	7800	3.20	11600	3.90	15500	4.75
300	0.58	4100	1.97	7900	3.23	11700	3.86	15600	4.76
400	0.65	4200	1.97	8000	3.25	11800	3.88	15700	4.75
500	0.74	4300	2.03	8100	3.26	11900	3.86	15800	4.78
600	0.82	4400	2.04	8200	3.28	12000	3.89	15900	4.79
700	0.89	4500	2.10	8300	3.31	12100	3.94	16000	4.73
800	0.95	4600	1.97	8400	3.31	12200	3.92	16100	4.78
900	1.01	4700	1.97	8500	3.32	12300	3.96	16200	4.84
1000	1.07	4800	2.03	8600	3.34	12400	4.01	16300	4.90
1100	1.11	4900	2.04	8700	3.35	12500	4.07	16400	4.87
1200	1.17	5000	2.10	8800	3.37	12600	4.08	16500	4.90
1300	1.22	5100	2.53	8900	3.39	12700	4.17	16600	4.98
1400	1.27	5200	2.55	9000	3.42	12800	4.26	16700	5.05
1500	1.29	5300	2.60	9100	3.43	12900	4.16	16800	5.04
1600	1.35	5400	2.61	9200	3.51	13000	4.21	16900	5.02
1700	1.40	5500	2.64	9300	3.52	13100	4.24	17000	5.09
1800	1.44	5600	2.70	9400	3.54	13200	4.27	17100	5.07
1900	1.51	5700	2.67	9500	3.63	13300	4.31	17200	5.10
2000	1.49	5800	2.71	9600	3.61	13400	4.33	17300	5.13
2100	1.55	5900	2.74	9700	3.71	13500	4.25	17400	5.23
2200	1.58	6000	2.80	9800	3.66	13600	4.27	17500	5.21
2300	1.62	6100	2.79	9900	3.77	13700	4.33	17600	5.22
2400	1.72	6200	2.81	10000	3.75	13800	4.33	17700	5.36
2500	1.76	6300	2.83	10100	3.77	13900	4.31	17800	5.35
2600	1.78	6400	2.86	10200	3.80	14000	4.30	17900	5.45
2700	1.80	6500	2.88	10300	3.79	14100	4.30	18000	5.43
2800	1.86	6600	2.90	10400	3.87	14200	4.31		
2900	1.90	6700	2.92	10500	3.83	14300	4.37		
3000	1.90	6800	2.98	10600	3.88	14400	4.35		
3100	1.97	6900	2.98	10700	3.86	14600	4.53		
3200	1.97	7000	3.00	10800	3.87	14700	4.50		
3300	2.03	7100	3.02	10900	3.90	14800	4.62		
3400	2.04	7200	3.04	11000	3.84	14900	4.65		
3500	2.10	7300	3.06	11100	3.88	15000	4.79		

Cable loss
Cable coaxial, GORE-TEX, GOR245, 40 GHz, 1.2 m, SMA-SMA, S/N 05118337, HL 3207

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss,dB	Frequency, MHz	Cable loss,dB
10	0.17	5000	1.54	10200	2.26	15500	2.77	31500	4.07
30	0.14	5100	1.54	10300	2.26	15600	2.78	32000	4.03
50	0.16	5200	1.56	10400	2.24	15700	2.81	32500	3.93
100	0.22	5300	1.59	10500	2.23	15800	2.81	33000	4.00
200	0.30	5400	1.60	10600	2.25	15900	2.84	33500	4.09
300	0.38	5500	1.61	10700	2.31	16000	2.91	34000	4.08
400	0.44	5600	1.63	10800	2.34	16100	2.92	34500	4.13
500	0.48	5700	1.66	10900	2.38	16200	2.88	35000	4.15
600	0.54	5800	1.68	11000	2.38	16300	2.90	35500	4.18
700	0.58	5900	1.68	11100	2.38	16400	2.93	36000	4.22
800	0.62	6000	1.71	11200	2.37	16500	2.92	36500	4.25
900	0.65	6100	1.71	11300	2.38	16600	2.97	37000	4.26
1000	0.69	6200	1.73	11400	2.40	16700	3.02	37500	4.40
1100	0.73	6300	1.75	11500	2.41	16800	3.02	38000	4.40
1200	0.76	6400	1.76	11600	2.44	16900	3.01	38500	4.52
1300	0.78	6500	1.78	11700	2.44	17000	3.04	39000	4.54
1400	0.81	6600	1.77	11800	2.44	17100	3.08	39500	4.36
1500	0.85	6700	1.79	11900	2.45	17200	3.05	40000	4.48
1600	0.87	6800	1.80	12000	2.46	17300	3.06		
1700	0.90	6900	1.83	12100	2.45	17400	3.06		
1800	0.93	7000	1.84	12200	2.45	17500	3.07		
1900	0.96	7100	1.86	12300	2.48	17600	3.08		
2000	0.95	7200	1.88	12400	2.49	17700	3.09		
2100	0.98	7300	1.86	12500	2.51	17800	3.12		
2200	1.00	7400	1.87	12600	2.53	17900	3.09		
2300	1.02	7500	1.90	12700	2.51	18000	3.08		
2400	1.04	7600	1.91	12800	2.52	18500	3.11		
2500	1.06	7700	1.95	12900	2.54	19000	3.14		
2600	1.08	7800	1.98	13000	2.56	19500	3.20		
2700	1.11	7900	1.99	13100	2.56	20000	3.24		
2800	1.14	8000	1.98	13200	2.59	20500	3.31		
2900	1.15	8100	1.98	13300	2.59	21000	3.38		
3000	1.17	8200	2.00	13400	2.60	21500	3.44		
3100	1.19	8300	2.01	13500	2.65	22000	3.45		
3200	1.20	8400	2.05	13600	2.71	22500	3.45		
3300	1.24	8500	2.07	13700	2.71	23000	3.47		
3400	1.26	8600	2.08	13800	2.69	23500	3.47		
3500	1.27	8700	2.09	13900	2.67	24000	3.54		
3600	1.28	8800	2.09	14000	2.68	24500	3.62		
3700	1.32	8900	2.10	14100	2.68	25000	3.73		
3800	1.32	9000	2.12	14200	2.74	25500	3.77		
3900	1.35	9100	2.12	14300	2.77	26000	3.71		
4000	1.36	9200	2.15	14400	2.80	26500	3.73		
4100	1.39	9300	2.13	14600	2.74	27000	3.73		
4200	1.40	9400	2.16	14700	2.73	27500	3.78		
4300	1.41	9500	2.17	14800	2.75	28000	3.81		
4400	1.43	9600	2.17	14900	2.75	28500	3.81		
4500	1.47	9700	2.18	15000	2.77	29000	3.80		
4600	1.46	9800	2.16	15100	2.76	29500	3.81		
4700	1.49	9900	2.17	15200	2.76	30000	3.89		
4800	1.50	10000	2.20	15300	2.77	30500	4.03		
4900	1.52	10100	2.22	15400	2.79	31000	4.01		

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10-6)
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

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