

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 subpart Y and RSS-111 Issue 2

FOR:

RadWin Ltd.

**Outdoor radio unit operating
in the 4.9 GHz band**

**Model: ODU-HE/F49/FCC/INT,
ODU-HE/F49/FCC/EXT**

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested.
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1 Applicant information

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E-mail: shlomo_weiss@radwin.com
Contact name: Mr. Shlomo Weiss

2 Equipment under test attributes

Product name: Outdoor radio unit operating in the 4.9 GHz band
Product type: Point to point transceiver
Model(s): ODU-HE/F49/FCC/INT, ODU-HE/F49/FCC/EXT
Receipt date 9/09/2008

3 Manufacturer information

Manufacturer name: RadWin Ltd.
Address: 32 Habarzel str., Tel Aviv, Israel, 69710
Telephone: +972 3766 2988
Fax: +972 3766 2922
E-Mail: shlomo_weiss@radwin.com
Contact name: Mr. Shlomo Weiss




4 Test details

Project ID: 19057
Location: Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started: 9/09/2008
Test completed: 10/07/2008
Test specification(s): 47CFR part 90 subpart Y:2007; RSS-111 issue 2

5 Tests summary

Test	Status
Transmitter characteristics	
FCC sections 90.205, 90.1215, RSS-111 section 4.3, Maximum output power and peak power spectral density	Pass
FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth	Pass
FCC section 90.210 (m), RSS-111 section 4.4, Emission mask	Pass
FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	Pass
FCC section 90.210, RSS-111 section 4.4, Radiated spurious emissions	Pass
RSS-111 section 4.5, Receiver spurious emissions	Pass, provided in the test report RDWEMC_18061
FCC section 90.213, RSS-111 section 4.2, Frequency stability	Tested without limit
FCC section 90.214, Transient frequency behaviour	Not required
FCC section 2.1091, RSS-Gen section 5.5, RF radiation exposure evaluation	Pass, provided in Application for certification exhibit

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	October 7, 2008	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	October 23, 2008	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	October 25, 2008	

6 EUT description

6.1 General information

The EUT is an outdoor unit radio unit. The EUT provides high capacity connectivity of up to 54 Mbps. The ODU may be used with integral or external antenna.

6.2 Ports and lines

Port type	Port description	Connected		Connector type	Q-ty	Cable type	Cable length, m	Indoor / outdoor
		From	To					
Power	-48 VDC	AC/DC adapter	IDU	Terminal block	1	unshielded	1.5	Indoor
Power	AC power	mains	AC/DC adapter	IEC 60320	1	unshielded	1.5	Indoor
RF	Antenna	EUT	antenna	N-type	1	shielded	1	Outdoor*
Signal	DC+ Ethernet	IDU	EUT	RJ45	1	shielded	20	Outdoor
Signal	Sync	EUT	Laptop	RJ45	1	unshielded	1.5	Indoor**
Signal	Ethernet	IDU	Laptop	RJ45	1	FTP	20	Indoor

* - for external antenna configuration only, 1 dB loss

** - for configuration prior the test

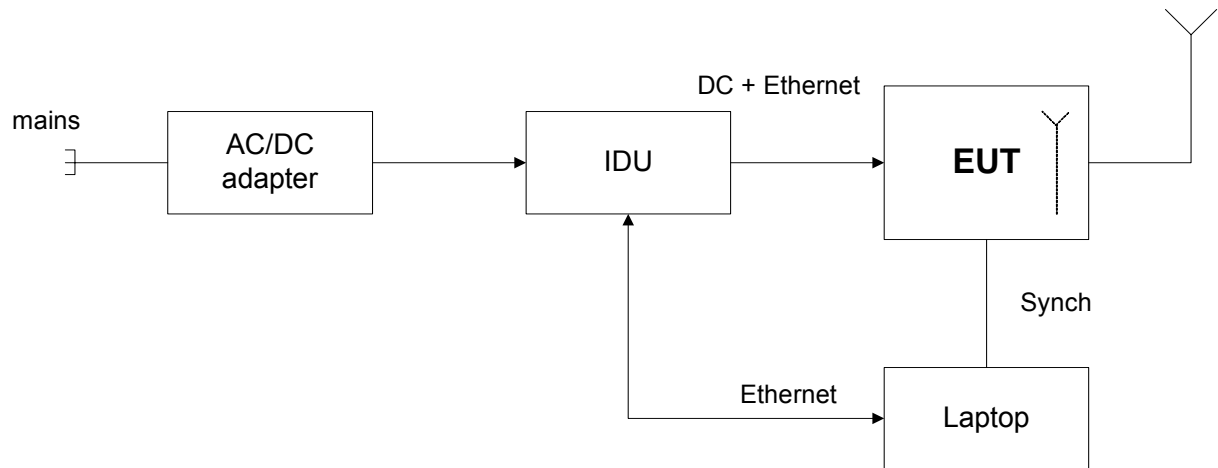
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	Dell	Latitude/D530	NA
IDU (for configuration with ODU)	RadWin Ltd.	IDU-E	DE2E2000123
AC/DC	YCL	WMB480042-5G	S0714002271

6.4 Changes made in the EUT

No changes were implemented.

6.5 Test configuration



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		4940 – 4990 MHz	
Operating frequency range		4942.5 – 4987.5 MHz	
RF channel bandwidth		5 MHz, 10 MHz, 20 MHz	
Maximum rated output power		At transmitter 50 Ω RF output connector 25 dBm for 5 MHz CBW; 25 dBm for 10 MHz CBW; 21 dBm for 20 MHz CBW	
Is transmitter output power variable?		No	
		V	Yes
			continuous variable
			stepped variable with stepsize
		minimum RF power	0 dBm
		maximum RF power	25 dBm
Antenna connection			
unique coupling	V	standard connector	Integral with temporary RF connector without temporary RF connector
Antenna/s technical characteristics			
Type	Manufacturer	Model number	Antenna assembly gain
External	MTI Wireless Edge Ltd.	MT-466003/N	26 dBi (antenna gain 27 dBi, feeder loss 1 dB)
External, dish	Kenbotong Communication Ltd.	TDJ-4900P6	26 dBi (antenna gain 27 dBi, feeder loss 1 dB)
Integral	MTI Wireless Edge Ltd.	MT-485028/C/A	18.5 dBi
Transmitter 99% power bandwidth	Transmitter aggregate data rate/s, MBps		Type of modulation (OFDM)
5 MHz	1.5; 2.25		BPSK
	3; 4.5		QPSK
	6; 9		16QAM
10 MHz	12; 13.5		64QAM
	3; 4.5		BPSK
	6; 9		QPSK
20 MHz	12; 18		16QAM
	24; 27		64QAM
	6; 9		BPSK
	12; 18		QPSK
	24; 36		16QAM
	48; 54		64QAM
Modulating test signal (baseband)		OFDM	
Maximum transmitter duty cycle in normal use		50%	
Maximum transmitter duty cycle for test purposes		100%	
Transmitter power source			
	Nominal rated voltage	Battery type	
V	DC	Nominal rated voltage	48 VDC from IDU unit powered by 120 VAC
	AC mains	Nominal rated voltage	Frequency Hz
Common power source for transmitter and receiver		V	yes no

Test specification:		FCC section 90.1215, RSS-111 section 4.3, Maximum output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks:			

7 Transmitter tests according to 47CFR part 90 and RSS-111 requirements

7.1 Peak output power and power spectral density tests

7.1.1 General

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

Table 7.1.1 Peak output power and spectral density limits

Assigned frequency range, MHz	Channel bandwidth, MHz	Maximum peak output power		Power spectral density, dBm/MHz
		mW	dBm	
4940.0 – 4990.0	5	500	27.0	21
	10	1000	30.0	
	20	2000	33.0	

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

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

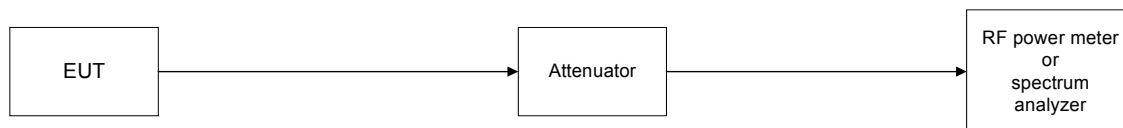
7.1.2 Test procedure

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

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

7.1.2.3 The peak output power was measured with a peak power meter as provided in Table 7.1.2, Table 7.1.4, Table 7.1.6 and associated plots. The power spectral density was measured with spectrum analyzer as provided in Table 7.1.3, Table 7.1.5, Table 7.1.7 and the associated plots.

Figure 7.1.1 Peak output power test setup



Test specification:		FCC section 90.1215, RSS-111 section 4.3, Maximum output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

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

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
DETECTOR USED: Peak power meter
MODULATION: BPSK/64QAM
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER: Maximum

Carrier frequency, MHz	Power meter reading, dBm	External attenuation, dB	Antenna assembly gain, dB	RF output power*, dBm	Limit, dBm	Margin, dB**	Verdict
64QAM, Bit Rate: 13.5 Mbps							
4942.5	3.71	20.85	26	24.56	27	-2.44	Pass
4965.0	3.77	20.85	26	24.62	27	-2.38	Pass
4987.5	3.78	20.85	26	24.63	27	-2.37	Pass
BPSK, Bit Rate: 1.5 Mbps							
4942.5	3.72	20.85	26	24.57	27	-2.43	Pass
4965.0	3.81	20.85	26	24.66	27	-2.34	Pass
4987.5	4.00	20.85	26	24.85	27	-2.15	Pass

* - RF output power = Power meter reading + external attenuation

** - Margin = Calculated output power – specified limit.

Reference numbers of test equipment used

HL 3178	HL 3301	HL 3302	HL 3386				
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Full description is given in Appendix A.

Test specification:		FCC section 90.1215, RSS-111 section 4.3, Maximum output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

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

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: BPSK/64QAM
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER: Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm/Hz	Integration factor*, dB	Antenna assembly gain, dB	Power density**, dBm/MHz	Limit, dBm/MHz	Margin, dB***	Verdict
64QAM, Bit Rate: 13.5 Mbps							
4942.5	-42.74	60	26	17.26	21	-3.74	Pass
4965.0	-42.16	60	26	17.84	21	-3.16	Pass
4987.5	-42.48	60	26	17.52	21	-3.48	Pass
BPSK, Bit Rate: 1.5 Mbps							
4942.5	-43.09	60	26	16.91	21	-4.09	Pass
4965.0	-43.11	60	26	16.89	21	-4.11	Pass
4987.5	-43.77	60	26	16.23	21	-4.77	Pass

* - Integration factor = $10 \cdot \log(\text{MHz/Hz}) = 10 \cdot \log(1000000) = 60 \text{ dB}$

** - Power density = Spectrum analyzer reading + Integration factor

***- Margin = Calculated power density –specified limit.

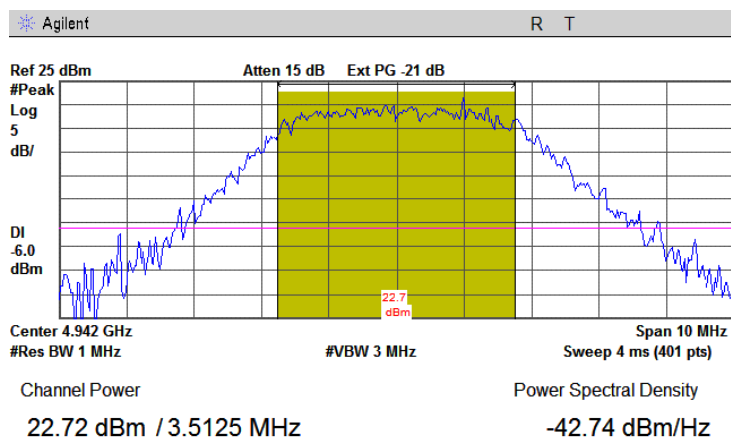
Reference numbers of test equipment used

HL 2909	HL 3178	HL 3386					
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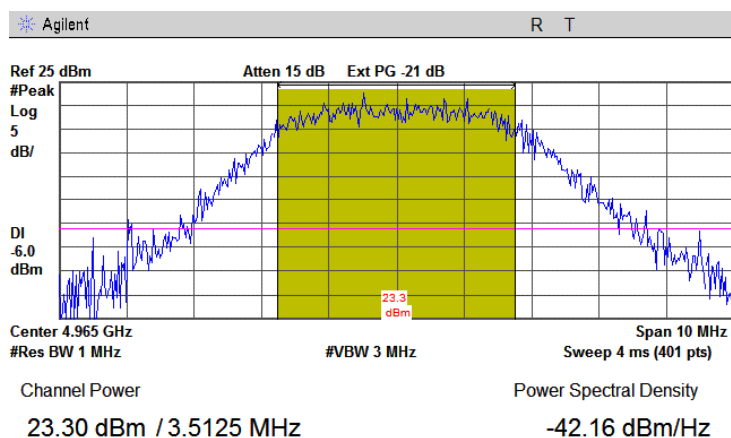
Full description is given in Appendix A.

Test specification:	FCC section 90.1215, RSS-111 section 4.3, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.1 Peak output power test results at low frequency, 64QAM, Bit Rate: 13.5 Mbps

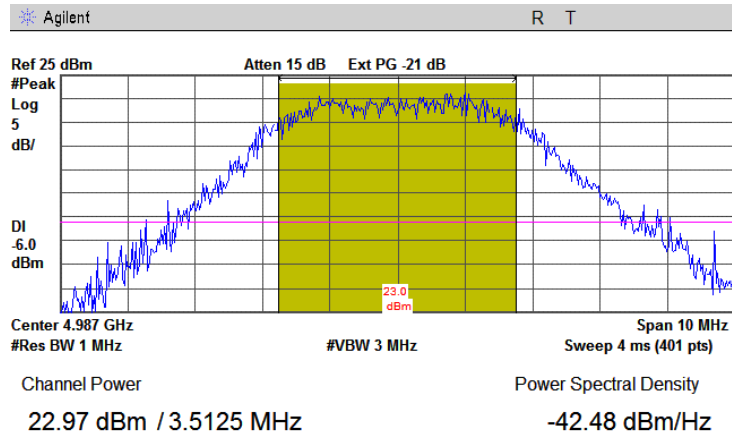


Plot 7.1.2 Peak output power test results at mid frequency, 64QAM, Bit Rate: 13.5 Mbps

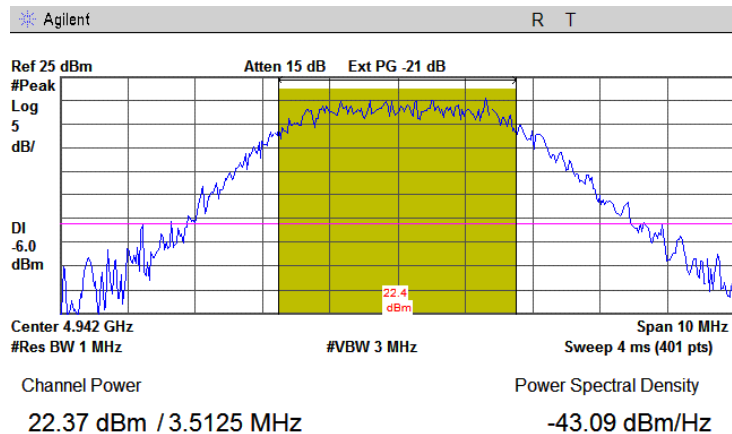


Test specification:	FCC section 90.1215, RSS-111 section 4.3, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.3 Peak output power test results at high frequency, 64QAM Bit Rate: 13.5 Mbps

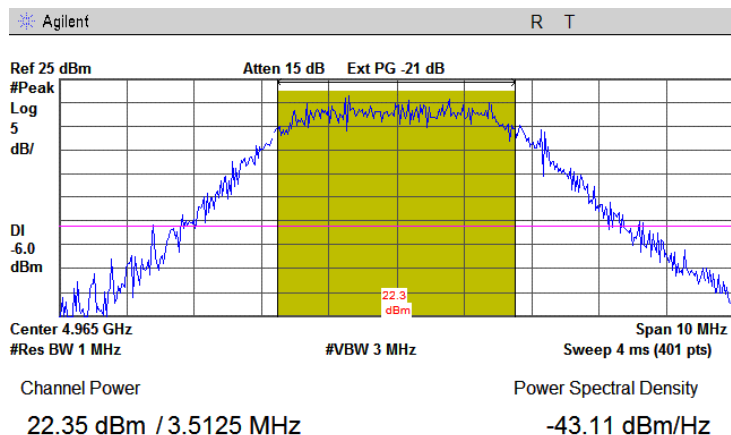


Plot 7.1.4 Peak output power test results at low frequency, BPSK Bit Rate: 1.5 Mbps

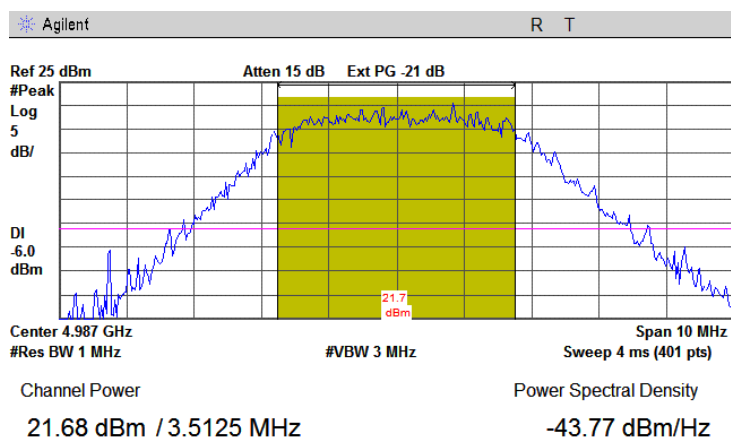


Test specification:	FCC section 90.1215, RSS-111 section 4.3, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.1.5 Peak output power test results at mid frequency, BPSK Bit Rate: 1.5 Mbps



Plot 7.1.6 Peak output power test results at high frequency, BPSK Bit Rate: 1.5 Mbps



Test specification:	FCC section 90.1215, RSS-111 section 4.3, Maximum output power				
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1				
Test mode:	Compliance	Verdict:		PASS	
Date:	9/09/2008				
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC		
Remarks: 10 MHz CBW					

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

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
DETECTOR USED: Peak power meter
MODULATION: BPSK/64QAM
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER: Maximum

Carrier frequency, MHz	Power meter reading, dBm	External attenuation, dB	Antenna assembly gain, dB	RF output power*, dBm	Limit, dBm	Margin, dB**	Verdict
64QAM, Bit Rate: 27 Mbps							
4945.0	3.55	20.85	26	24.40	30	-5.60	Pass
4965.0	3.75	20.85	26	24.60	30	-5.40	Pass
4985.0	3.62	20.85	26	24.47	30	-5.53	Pass
BPSK, Bit Rate: 3 Mbps							
4945.0	3.71	20.85	26	24.56	30	-5.44	Pass
4965.0	3.67	20.85	26	24.52	30	-5.48	Pass
4985.0	3.82	20.85	26	24.67	30	-5.33	Pass

* - RF output power = Power meter reading + external attenuation

** - Margin = Calculated output power – specified limit.

Reference numbers of test equipment used

HL 3178	HL 3301	HL 3302	HL 3386				
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Full description is given in Appendix A.

Test specification:		FCC section 90.1215, RSS-111 section 4.3, Maximum output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

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

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: BPSK/ 64QAM
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER: Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm/Hz	Integration factor, dB*	Antenna assembly gain, dB	Power density, dBm/MHz**	Limit, dBm/MHz	Margin, dB***	Verdict
64QAM, Bit Rate: 27 Mbps							
4945.0	-45.37	60	26	14.63	21	-6.37	Pass
4965.0	-44.55	60	26	15.45	21	-5.55	Pass
4985.0	-45.61	60	26	14.39	21	-6.61	Pass
BPSK, Bit Rate: 3 Mbps							
4945.0	-45.73	60	26	14.27	21	-6.73	Pass
4965.0	-45.23	60	26	14.77	21	-6.23	Pass
4985.0	-46.57	60	26	13.43	21	-7.57	Pass

* - Integration factor = $10 \cdot \log(\text{MHz/Hz}) = 10 \cdot \log(1000000) = 60 \text{ dB}$

** - Power density = Spectrum analyzer reading + Integration factor

***- Margin = Calculated power density – specified limit.

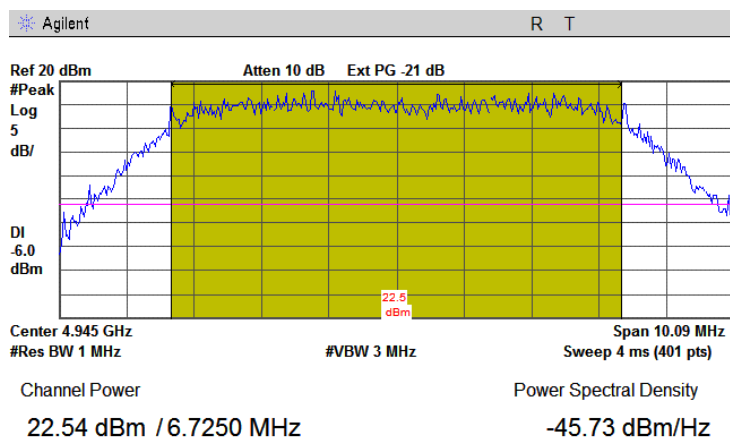
Reference numbers of test equipment used

HL 2909	HL 3178	HL 3386					
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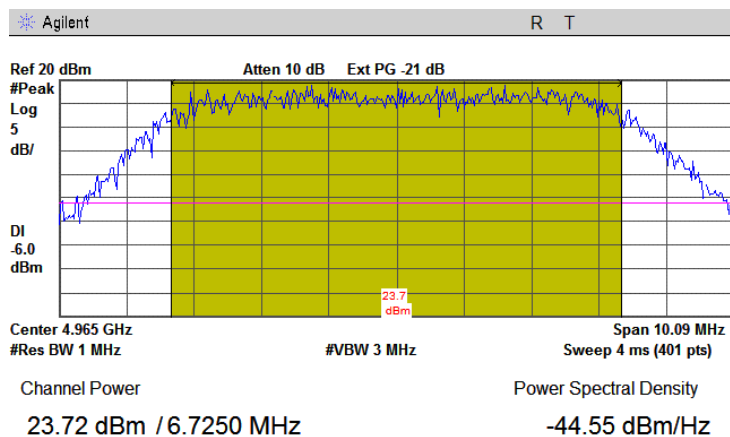
Full description is given in Appendix A.

Test specification:	FCC section 90.1215, RSS-111 section 4.3, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.7 Peak output power test results at low frequency, 64QAM, Bit Rate: 27 Mbps

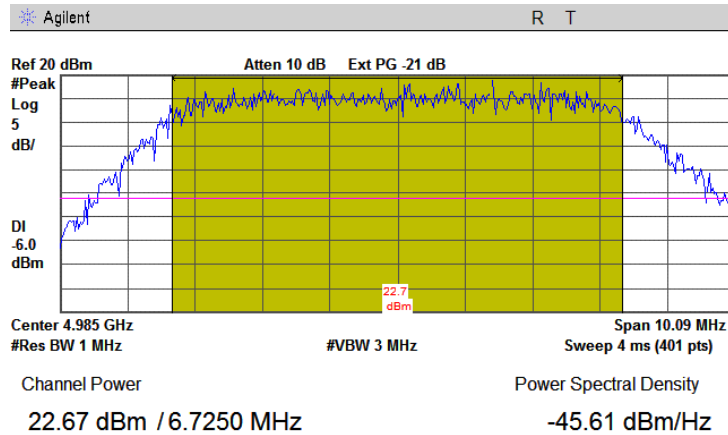


Plot 7.1.8 Peak output power test results at mid frequency, 64QAM, Bit Rate: 27 Mbps

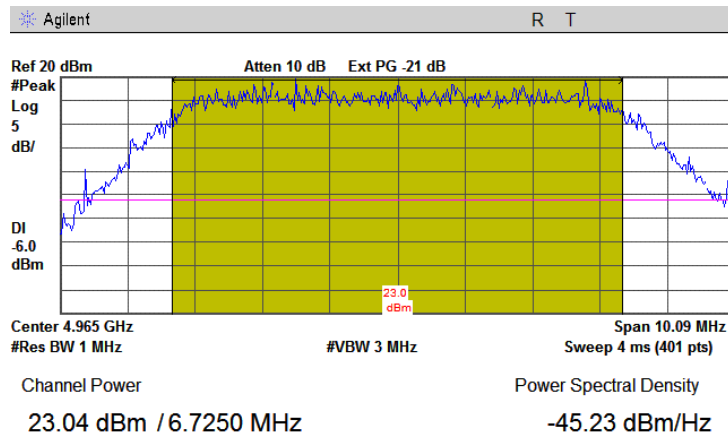


Test specification:		FCC section 90.1215, RSS-111 section 4.3, Maximum output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.9 Peak output power test results at high frequency, 64QAM Bit Rate: 27 Mbps

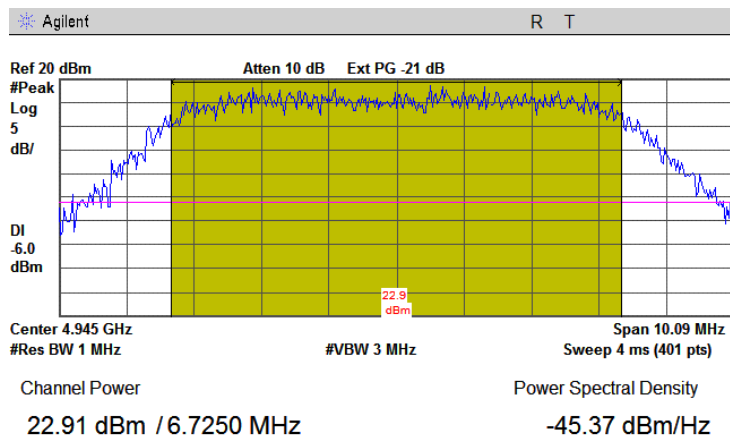


Plot 7.1.10 Peak output power test results at low frequency, BPSK, Bit Rate: 3 Mbps

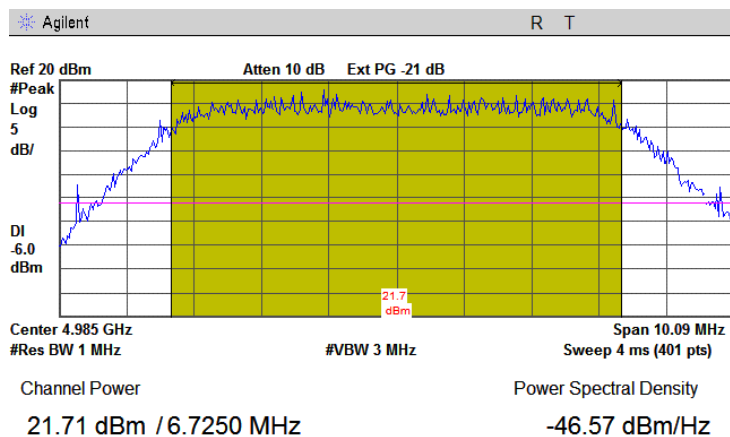


Test specification:	FCC section 90.1215, RSS-111 section 4.3, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.1.11 Peak output power test results at mid frequency, BPSK, Bit Rate: 3 Mbps



Plot 7.1.12 Peak output power test results at high frequency, BPSK, Bit Rate: 3 Mbps



Test specification:		FCC section 90.1215, RSS-111 section 4.3, Maximum output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Table 7.1.6 Peak output power test results for 20 MHz channel bandwidth

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
DETECTOR USED: Peak power meter
MODULATION: BPSK/64QAM
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER: Maximum

Carrier frequency, MHz	Power meter reading, dBm	External attenuation, dB	Antenna assembly gain, dB	RF output power, dBm*	Limit, dBm	Margin, dB**	Verdict
64QAM, Bit Rate: 54 Mbps							
4950.0	0.45	20.85	26	21.30	33	11.70	Pass
4965.0	-0.15	20.85	26	20.70	33	12.30	Pass
4980.0	-1.01	20.85	26	19.84	33	13.16	Pass
BPSK, Bit Rate: 6 Mbps							
4950.0	-0.85	20.85	26	20.00	33	13.00	Pass
4965.0	-0.98	20.85	26	19.87	33	13.13	Pass
4980.0	-1.58	20.85	26	19.27	33	13.73	Pass

* - RF output power = Power meter reading + external attenuation

** - Margin = Calculated output power – specified limit.

Reference numbers of test equipment used

HL 3178	HL 3301	HL 3302	HL 3386				
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Full description is given in Appendix A.

Test specification:		FCC section 90.1215, RSS-111 section 4.3, Maximum output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Table 7.1.7 Power spectral density test results for 20 MHz channel bandwidth

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: BPSK/ 64QAM
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER: Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm/Hz	Integration factor, dB*	Antenna assembly gain, dB	Power density, dBm/MHz**	Limit, dBm/MHz	Margin, dB***	Verdict
64QAM, Bit Rate: 54 Mbps							
4950.0	-55.77	60	26	4.23	21	-16.77	Pass
4965.0	-57.14	60	26	2.86	21	-18.14	Pass
4980.0	-57.69	60	26	2.31	21	-18.69	Pass
BPSK, Bit Rate: 6 Mbps							
4950.0	-57.39	60	26	2.61	21	-18.39	Pass
4965.0	-58.43	60	26	1.57	21	-19.43	Pass
4980.0	-58.57	60	26	1.43	21	-19.57	Pass

* - Integration factor = $10 \cdot \log(\text{MHz/Hz}) = 10 \cdot \log(1000000) = 60 \text{ dB}$

** - Power density = Spectrum analyzer reading + Integration factor

***- Margin = Calculated power density – specified limit.

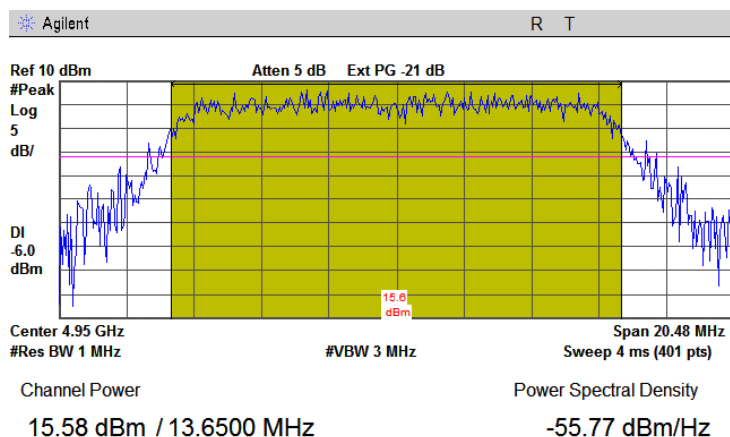
Reference numbers of test equipment used

HL 2909	HL 3178	HL 3386					
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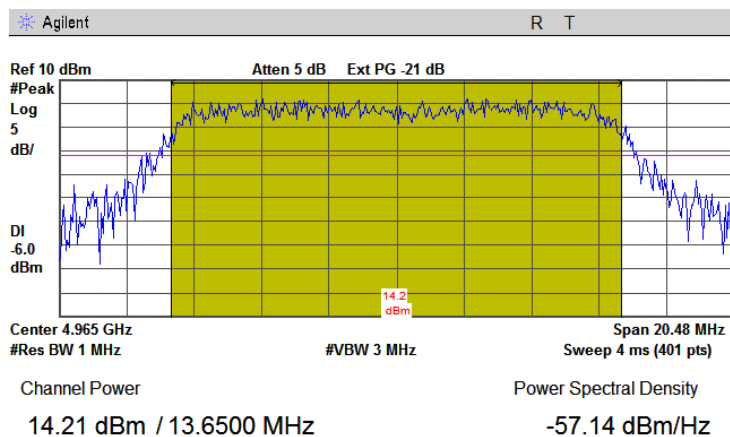
Full description is given in Appendix A.

Test specification:	FCC section 90.1215, RSS-111 section 4.3, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Plot 7.1.13 Peak output power test results at low frequency, 64QAM, Bit Rate: 54 Mbps

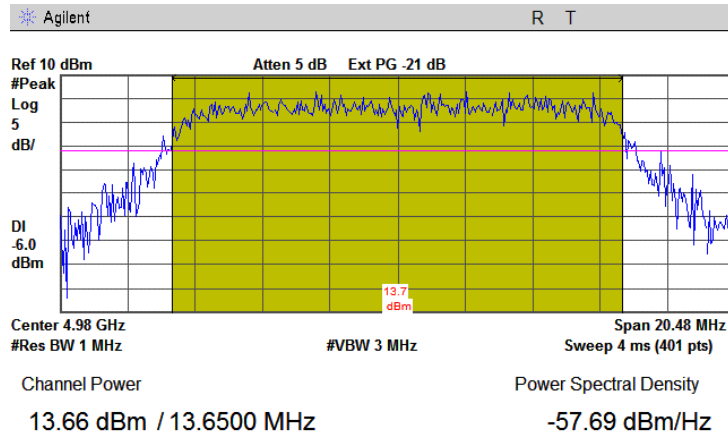


Plot 7.1.14 Peak output power test results at mid frequency, 64QAM, Bit Rate: 54 Mbps

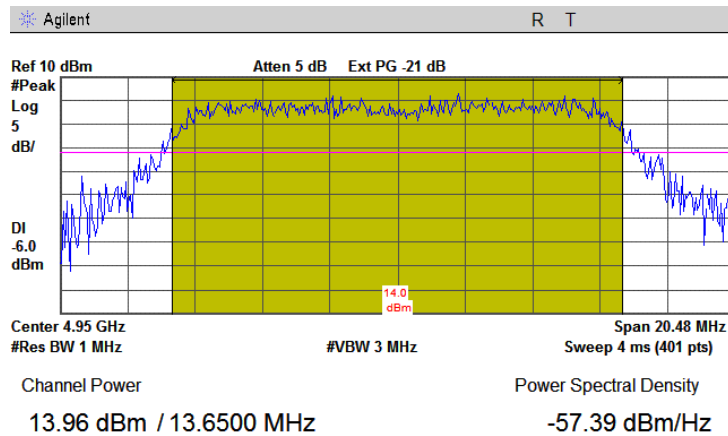


Test specification:	FCC section 90.1215, RSS-111 section 4.3, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Plot 7.1.15 Peak output power test results at high frequency, 64QAM Bit Rate: 54 Mbps

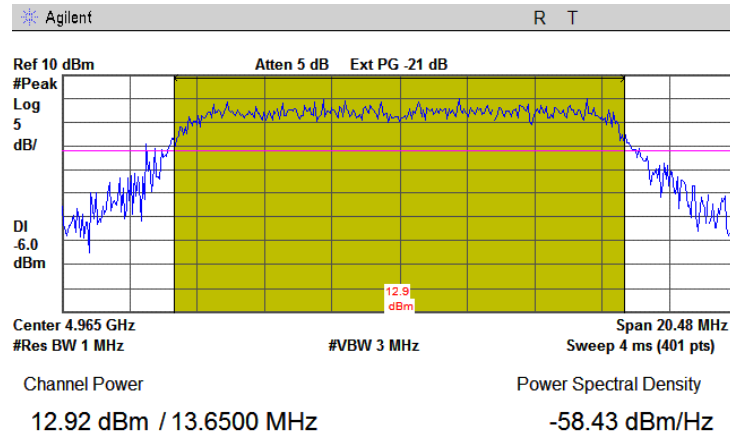


Plot 7.1.16 Peak output power test results at low frequency, BPSK, Bit Rate: 6 Mbps

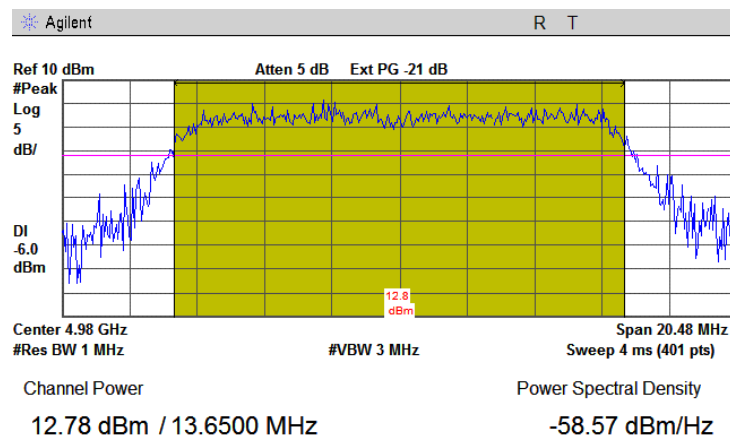


Test specification:		FCC section 90.1215, RSS-111 section 4.3, Maximum output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Plot 7.1.17 Peak output power test results at mid frequency, BPSK, Bit Rate: 6 Mbps



Plot 7.1.18 Peak output power test results at high frequency, BPSK, Bit Rate: 6 Mbps



Test specification:		FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

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

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Channel bandwidth, MHz	Maximum allowed bandwidth, MHz
4940 – 4990	26	5	5
		10	10
		20	20

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

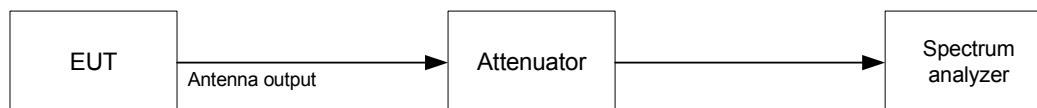
7.2.2 Test procedure

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

7.2.2.2 The total output power integrated over the emission bandwidth of carrier was taken as the reference level.

7.2.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.2.2, Table 7.2.3, Table 7.2.4 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup



Test specification:		FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Table 7.2.2 Occupied bandwidth test results for 5 MHz channel bandwidth

RESOLUTION BANDWIDTH: 100 kHz*
VIDEO BANDWIDTH: 300 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
MODULATING SIGNAL: OFDM

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin**, MHz	Verdict
64QAM, Bit Rate 13.5 Mbps				
4942.5	3.4625	5	-1.5375	Pass
4965.0	3.4250	5	-1.5750	Pass
4987.5	3.4375	5	-1.5625	Pass
BPSK ,Bit Rate 1.5 Mbps				
4942.5	3.4250	5	-1.5750	Pass
4965.0	3.4000	5	-1.6000	Pass
4987.5	3.4000	5	-1.6000	Pass

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

** Margin = OBW - Limit

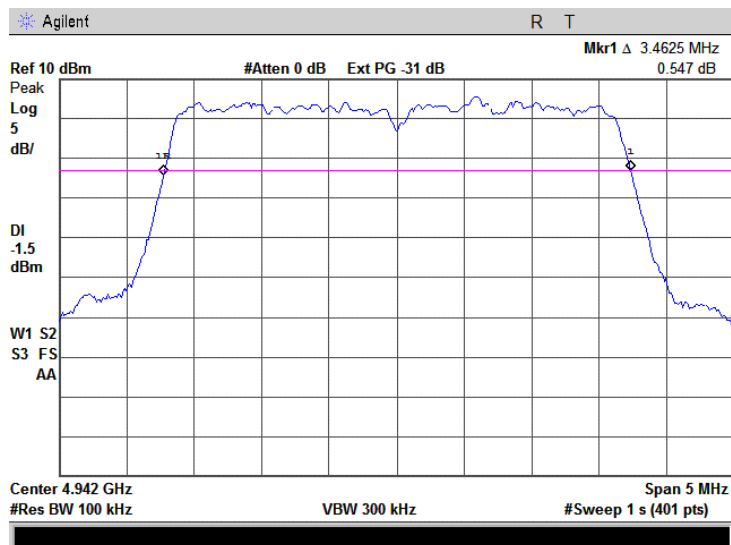
Reference numbers of test equipment used

HL 2909	HL 3178	HL 3386					
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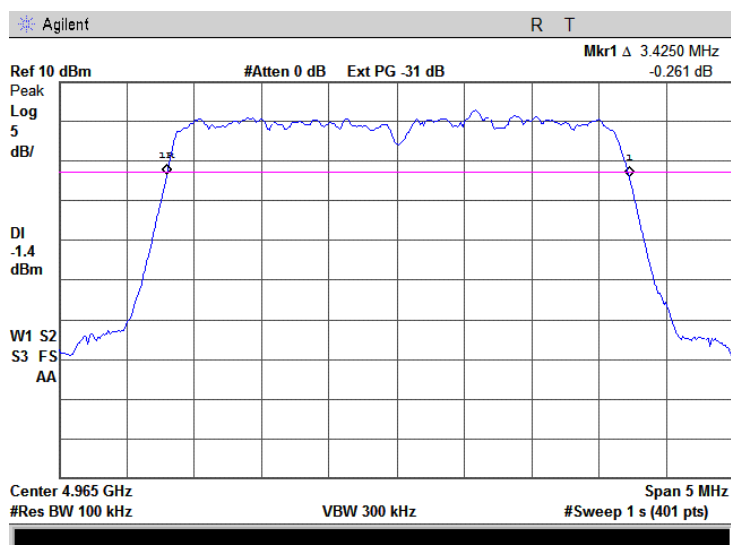
Full description is given in Appendix A.

Test specification: FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance		Verdict: PASS	
Date: 9/09/2008			
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.1 Occupied bandwidth test result at low frequency 4942.5 MHz, 64QAM, rate 13.5 Mbps

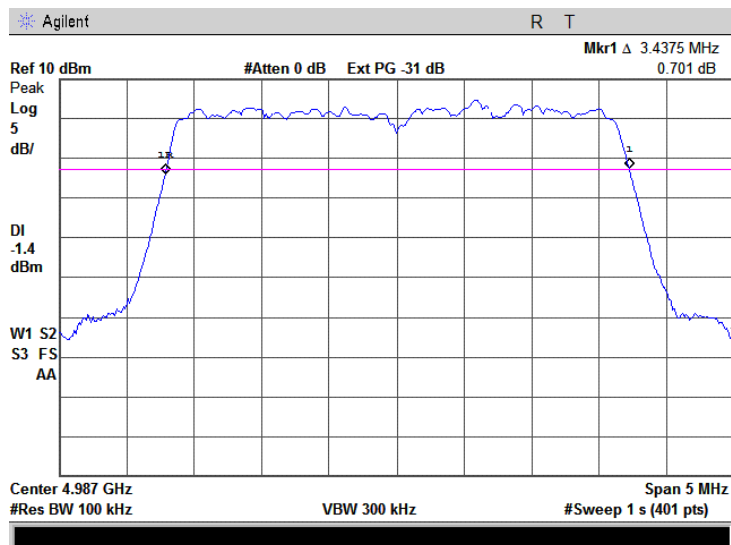


Plot 7.2.2 Occupied bandwidth test result at mid frequency 4965 MHz, 64QAM, rate 13.5 Mbps

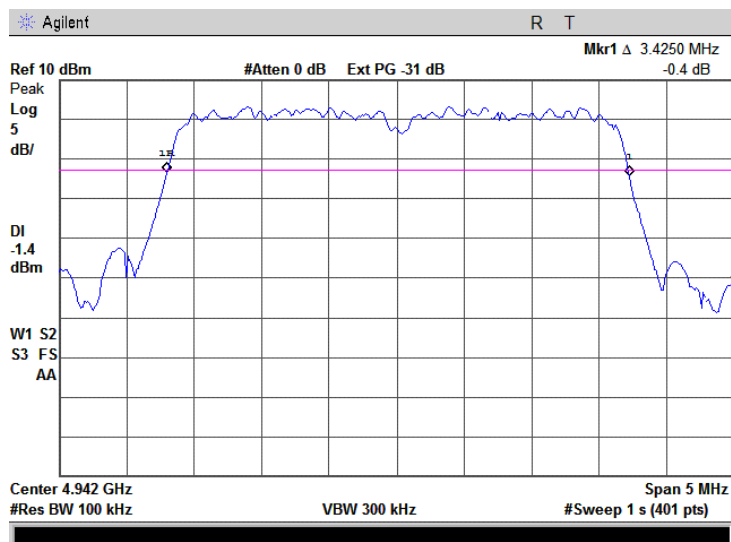


Test specification: FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance		Verdict: PASS	
Date: 9/09/2008			
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.3 Occupied bandwidth test result at high frequency 4987.5 MHz, 64QAM, rate 13.5 Mbps

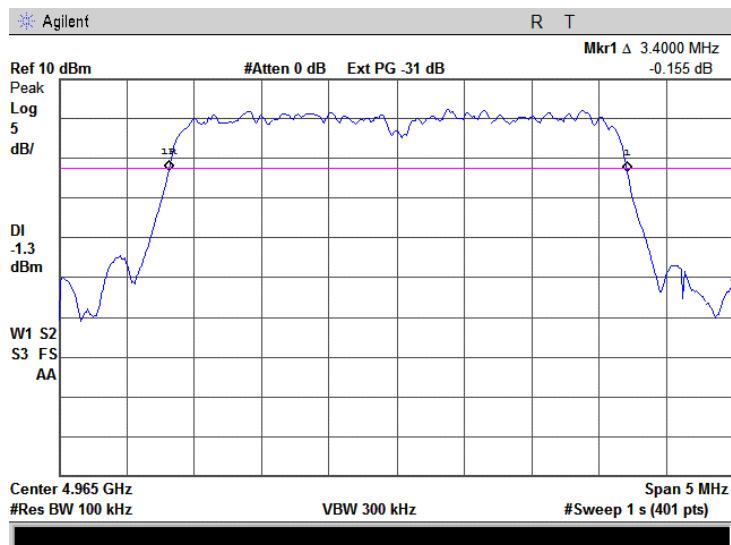


Plot 7.2.4 Occupied bandwidth test result at low frequency 4942.5 MHz, BPSK, rate 1.5 Mbps

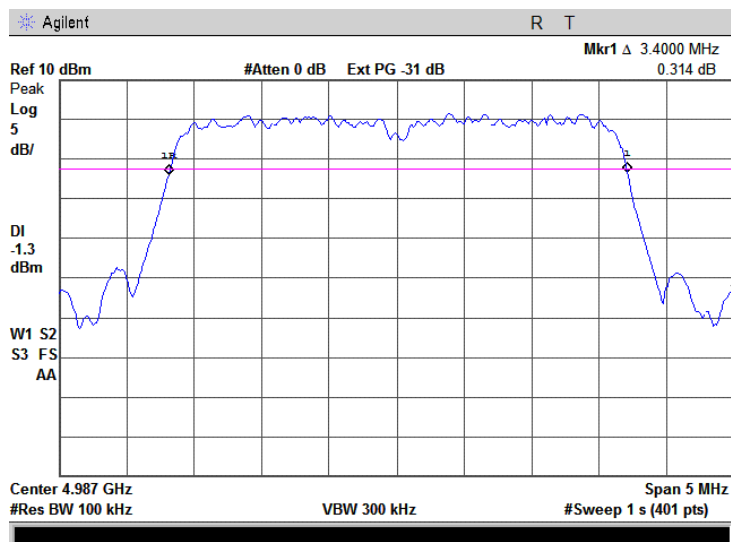


Test specification: FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance		Verdict: PASS	
Date: 9/09/2008			
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.2.5 Occupied bandwidth test result at mid frequency 4965 MHz, BPSK, rate 1.5 Mbps



Plot 7.2.6 Occupied bandwidth test result at high frequency 4987.5 MHz, BPSK, rate 1.5 Mbps



Test specification:		FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Table 7.2.3 Occupied bandwidth test results 10 MHz channel bandwidth

RESOLUTION BANDWIDTH: 100 kHz*
VIDEO BANDWIDTH: 300 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
MODULATING SIGNAL: OFDM

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin**, MHz	Verdict
64QAM, Bit Rate 27 Mbps				
4945.0	6.625	10	-3.375	Pass
4965.0	6.625	10	-3.375	Pass
4985.0	6.625	10	-3.375	Pass
BPSK , Bit Rate 3 Mbps				
4945.0	6.600	10	-3.375	Pass
4965.0	6.600	10	-3.375	Pass
4985.0	6.600	10	-3.375	Pass

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

** Margin = OBW - Limit

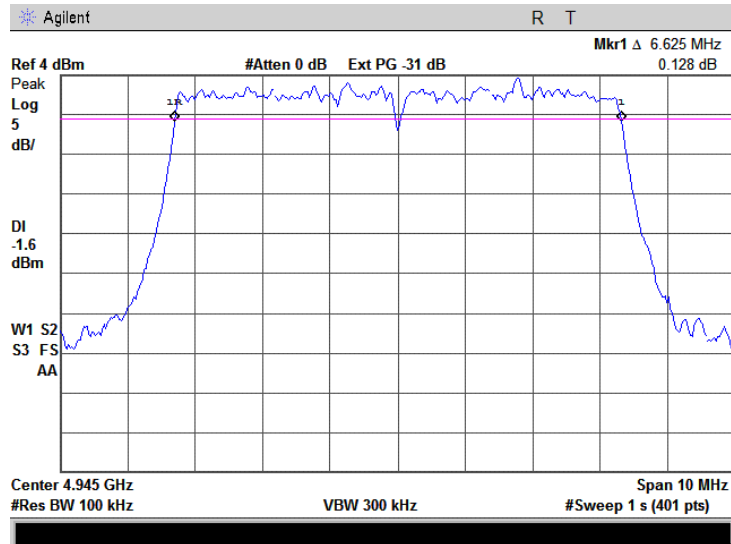
Reference numbers of test equipment used

HL 2909	HL 3178	HL 3386					
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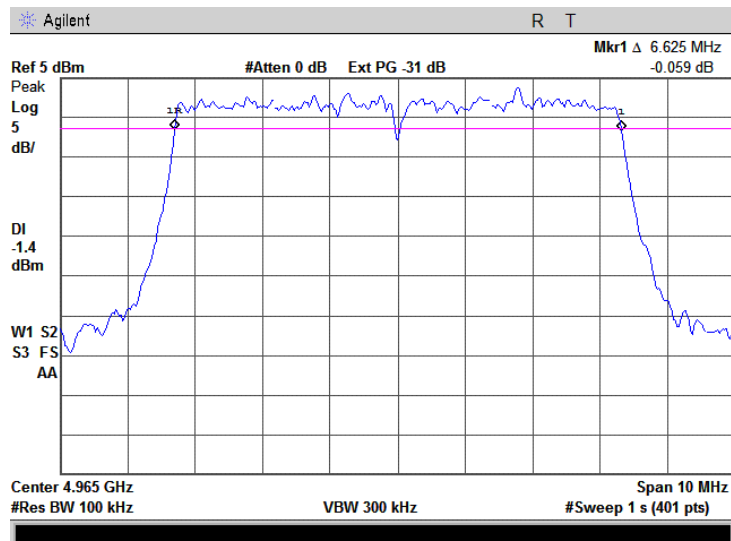
Full description is given in Appendix A.

Test specification:		FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.7 Occupied bandwidth test result at low frequency 4945 MHz, 64QAM, rate 27 Mbps

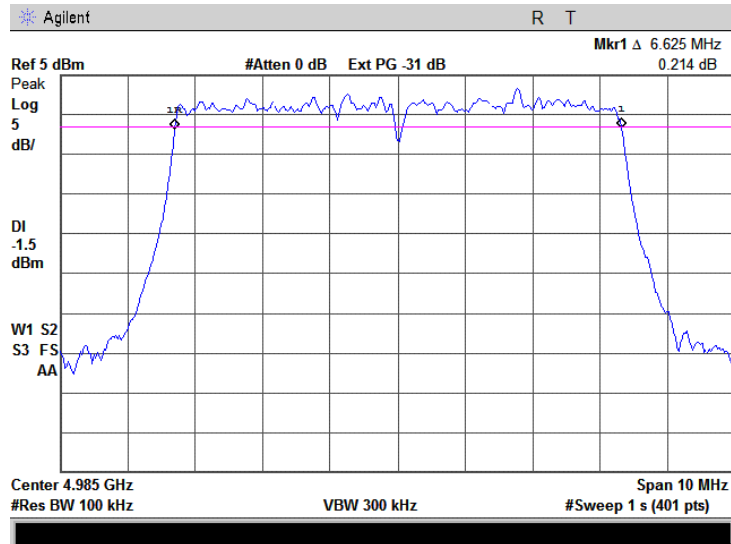


Plot 7.2.8 Occupied bandwidth test result at mid frequency 4965 MHz, 64QAM, rate 27 Mbps

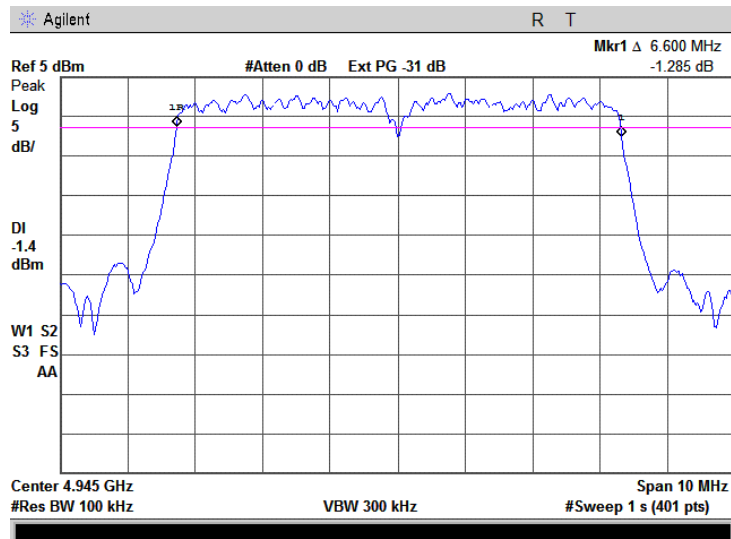


Test specification: FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance		Verdict: PASS	
Date: 9/09/2008			
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.9 Occupied bandwidth test result at high frequency 4985 MHz, 64QAM, rate 27 Mbps

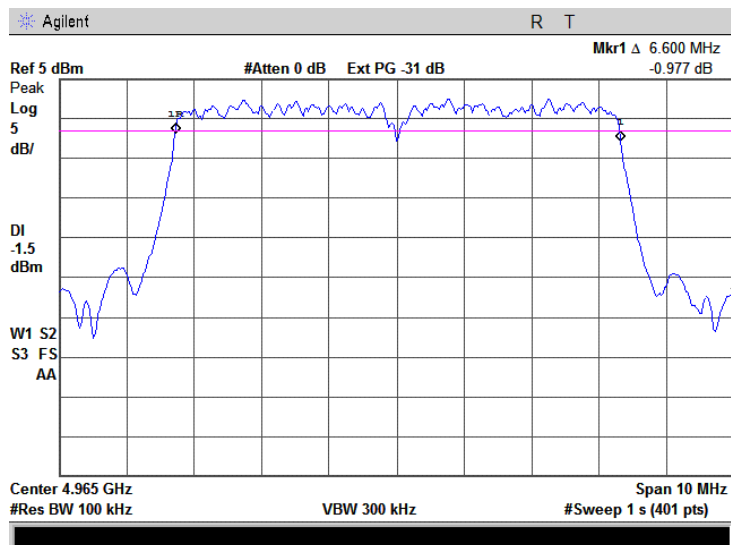


Plot 7.2.10 Occupied bandwidth test result at low frequency 4945 MHz, BPSK, rate 3 Mbps

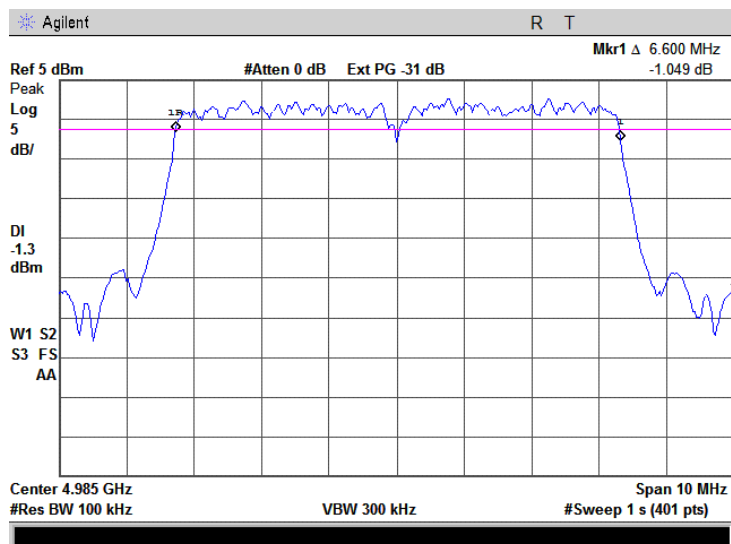


Test specification: FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance		Verdict: PASS	
Date: 9/09/2008			
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

Plot 7.2.11 Occupied bandwidth test result at mid frequency 4965 MHz, BPSK, rate 3 Mbps



Plot 7.2.12 Occupied bandwidth test result at high frequency 4985 MHz, BPSK, rate 3 Mbps



Test specification:		FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Table 7.2.4 Occupied bandwidth test results 20 MHz channel bandwidth

RESOLUTION BANDWIDTH: 300 kHz*
VIDEO BANDWIDTH: 1000 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
MODULATING SIGNAL: OFDM

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin**, MHz	Verdict
64QAM, Bit Rate 54 Mbps				
4950.0	13.30	20	-6.70	Pass
4965.0	13.35	20	-6.65	Pass
4980.0	13.35	20	-6.65	Pass
BPSK ,Bit Rate 6 Mbps				
4950.0	13.32	20	-6.68	Pass
4965.0	13.15	20	-6.85	Pass
4980.0	13.25	20	-6.75	Pass

* - RBW \geq 1% of OBW; 1 % of 20 MHz is 200 kHz, hence, RBW=300 kHz was chosen for the measurements.

** Margin = OBW - Limit

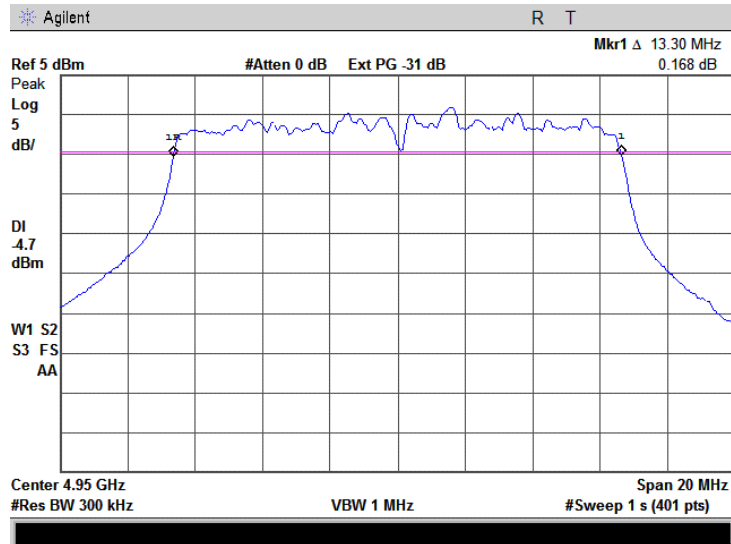
Reference numbers of test equipment used

HL 2909	HL 3178	HL 3386					
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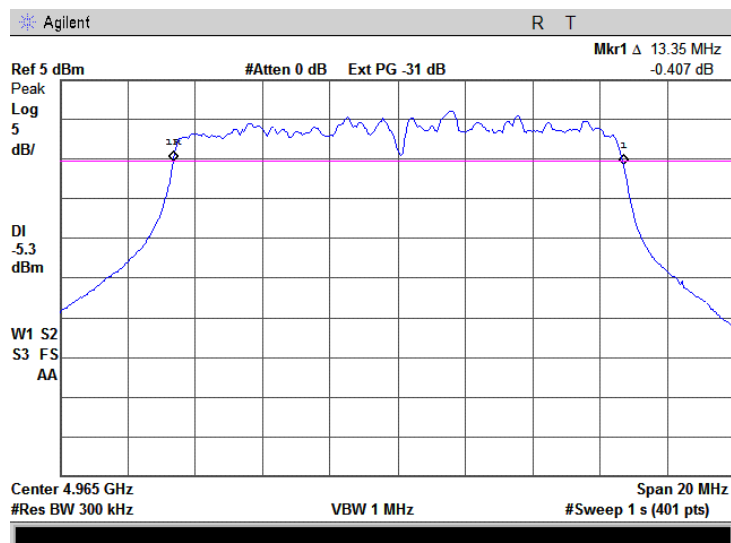
Full description is given in Appendix A.

Test specification:		FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:		Compliance	Verdict: PASS
Date:		9/09/2008	
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Plot 7.2.13 Occupied bandwidth test result at low frequency 4950 MHz, 64QAM, rate 54 Mbps

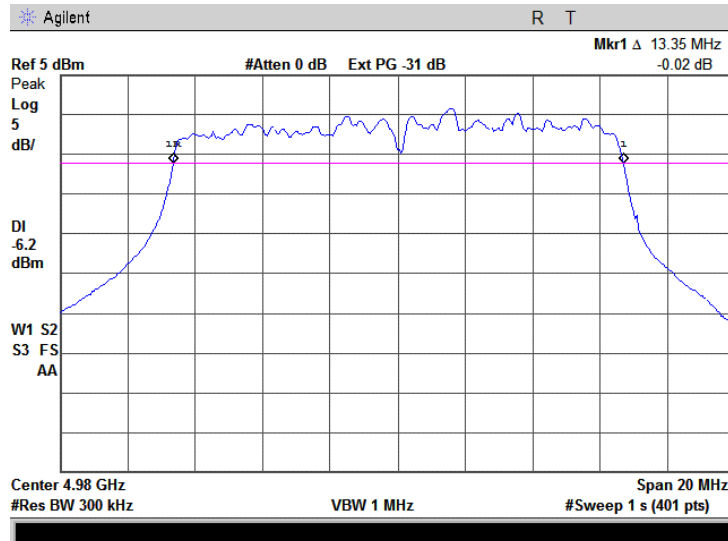


Plot 7.2.14 Occupied bandwidth test result at mid frequency 4965 MHz, 64QAM, rate 54 Mbps

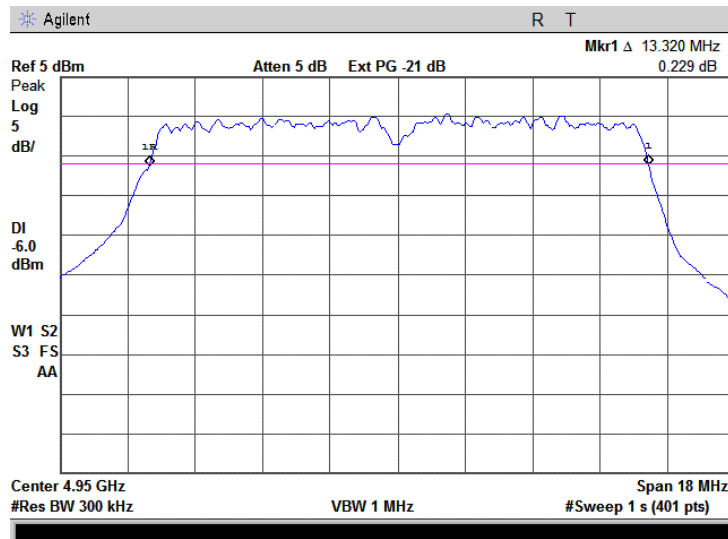


Test specification:		FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict: PASS	
Date:	9/09/2008		
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Plot 7.2.15 Occupied bandwidth test result at high frequency 4980 MHz, 64QAM, rate 54 Mbps

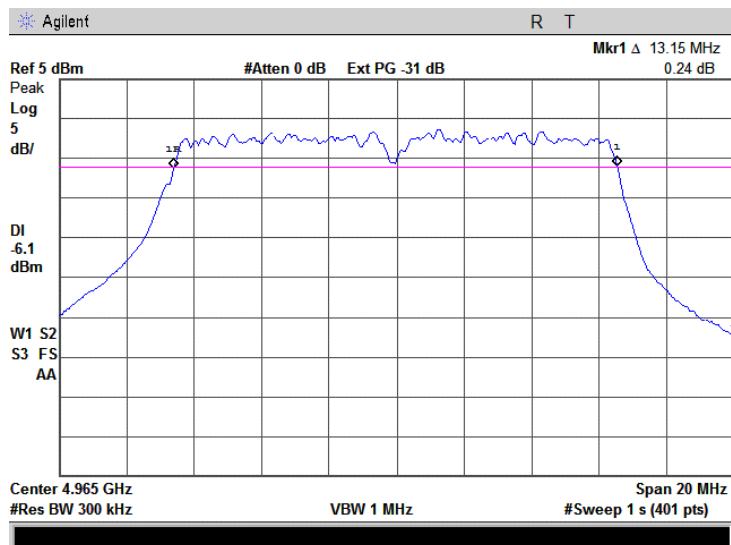


Plot 7.2.16 Occupied bandwidth test result at low frequency 4950 MHz, BPSK, rate 6 Mbps

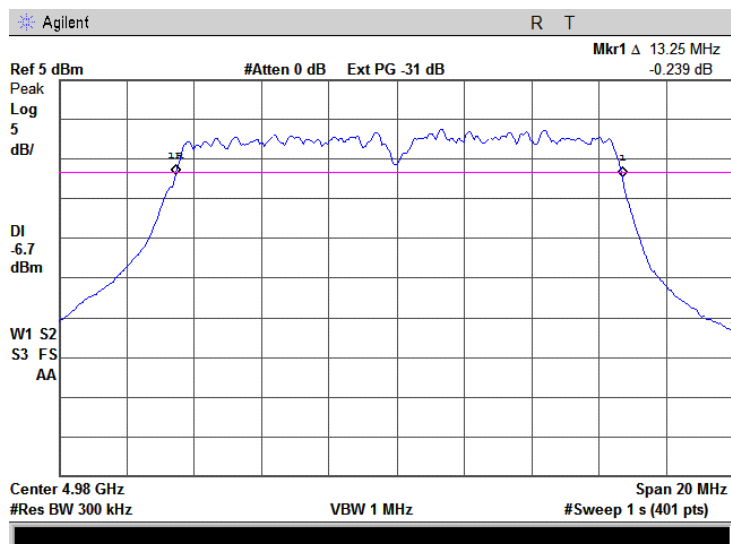


Test specification: FCC section 90.209, RSS-Gen section 4.6.1, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance		Verdict: PASS	
Date: 9/09/2008			
Temperature: 22°C	Air Pressure: 1012 hPa	Relative Humidity: 48%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Plot 7.2.17 Occupied bandwidth test result at mid frequency 4965 MHz, BPSK, rate 6 Mbps



Plot 7.2.18 Occupied bandwidth test result at high frequency 4980 MHz, BPSK, rate 6 Mbps



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:		10/02/2008	
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

7.3 Emission mask test

7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1, Table 7.3.3, Table 7.3.5.

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, Table 7.3.6.

Figure 7.3.1 Emission mask test setup



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Table 7.3.1 Emission mask limits for 5 MHz channel bandwidth

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

* - F – frequency in MHz removed from center

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

Table 7.3.2 Emission mask test results for 5 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
4942.5	Emission mask M	Pass
4965.0		
4987.5		

Note: 50 dBc was used for emission mask.

Reference numbers of test equipment used

HL 2909	HL 3181	HL 3386					
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Full description is given in Appendix A.

Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

Plot 7.3.1 Emission mask test results at low carrier frequency

DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

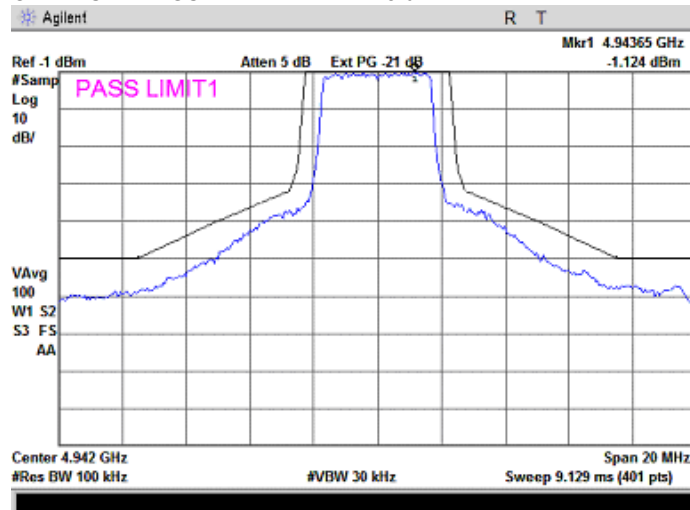
TRANSMITTER OUTPUT POWER SETTINGS:

Sample; 100 video averaging

BPSK; 1.5 Mbps

OFDM

"25 dBm"



Plot 7.3.2 Emission mask test results at mid carrier frequency

DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

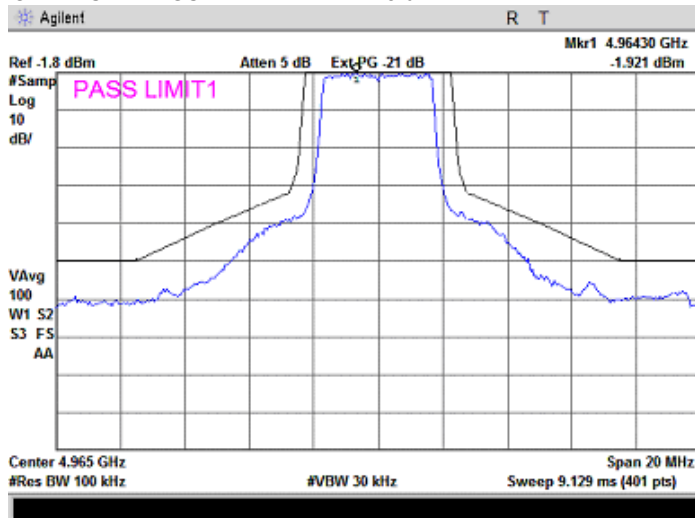
TRANSMITTER OUTPUT POWER SETTINGS:

Sample; 100 video averaging

BPSK; 1.5 Mbps

OFDM

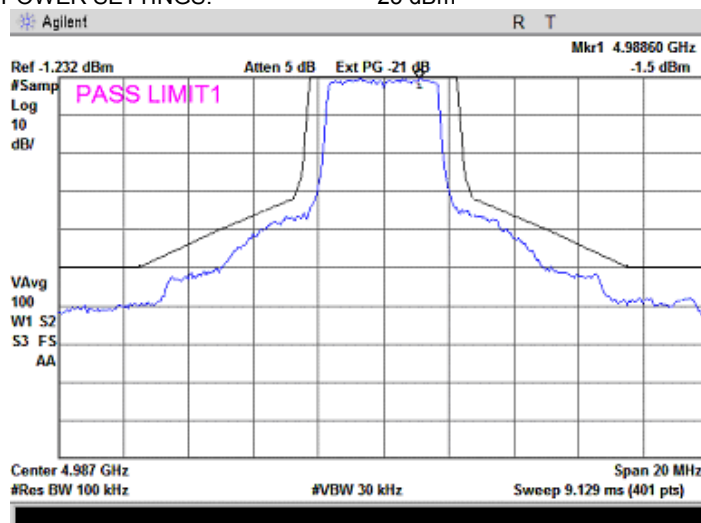
"25 dBm"



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

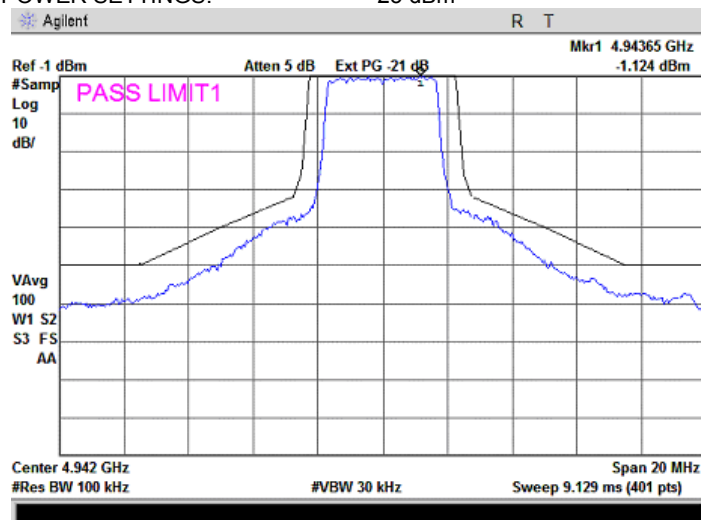
Plot 7.3.3 Emission mask test results at high carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: BPSK; 1.5 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Plot 7.3.4 Emission mask test results at low carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: 64 QAM, 13.5 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 5 MHz CBW			

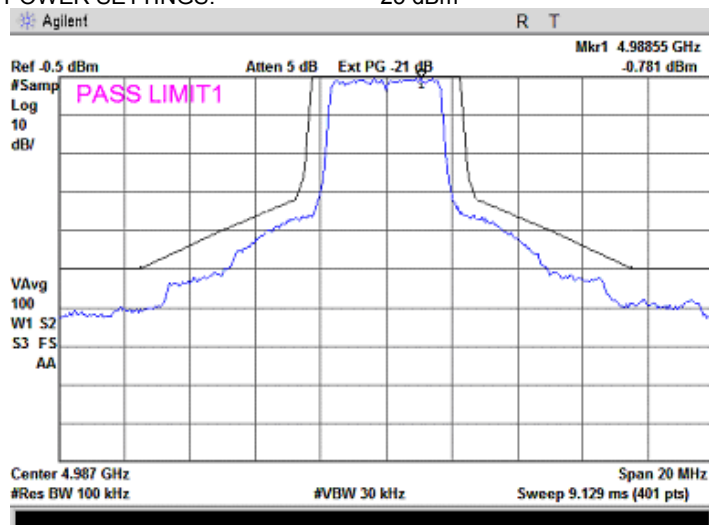
Plot 7.3.5 Emission mask test results at mid carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: 64 QAM, 13.5 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Plot 7.3.6 Emission mask test results at high carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: 64 QAM, 13.5 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Test specification: FCC section 90.210, RSS-111 section 4.4, 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: 10/02/2008	
Temperature: 22°C	Air Pressure: 1014 hPa
Relative Humidity: 52%	
Power Supply: 120 V AC	
Remarks: 10 MHz CBW	

Table 7.3.3 Emission mask limits for 10 MHz channel bandwidth

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

* - F – frequency in MHz removed from center

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

Table 7.3.4 Emission mask test results for 10 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
4945	Emission mask M	
4965		
4985		

Note: 50 dBc was used for emission mask.

Reference numbers of test equipment used

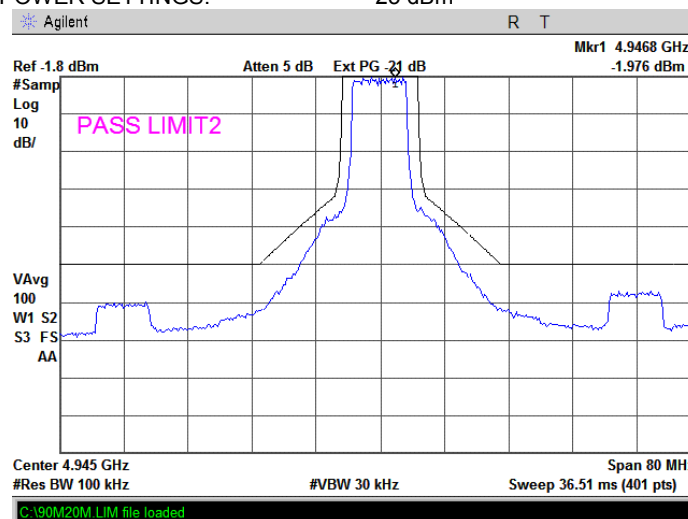
HL 2909	HL 3181	HL 3386					
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Full description is given in Appendix A.

Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

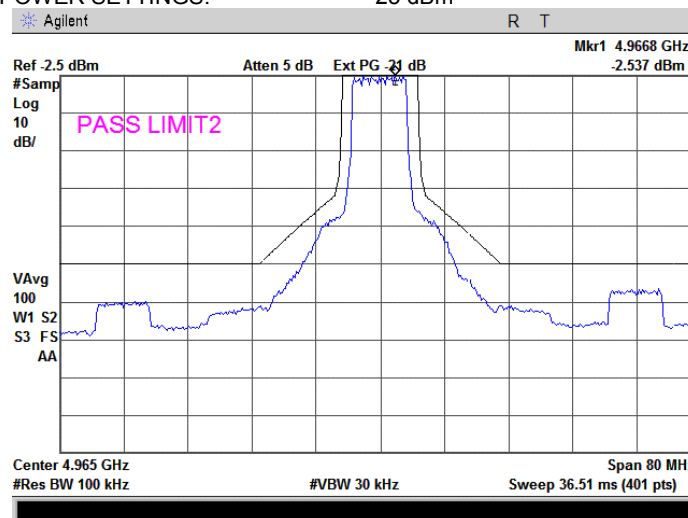
Plot 7.3.7 Emission mask test results at low carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: BPSK, 3 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Plot 7.3.8 Emission mask test results at mid carrier frequency

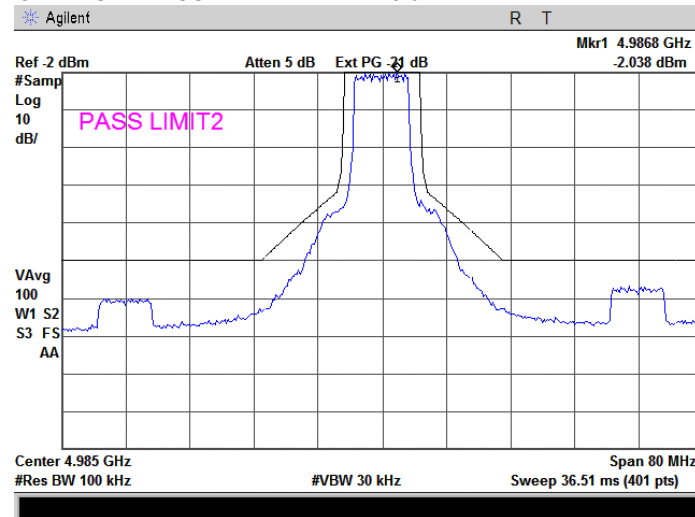
DETECTOR USED: Sample; 100 video averaging
MODULATION: BPSK, 3 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

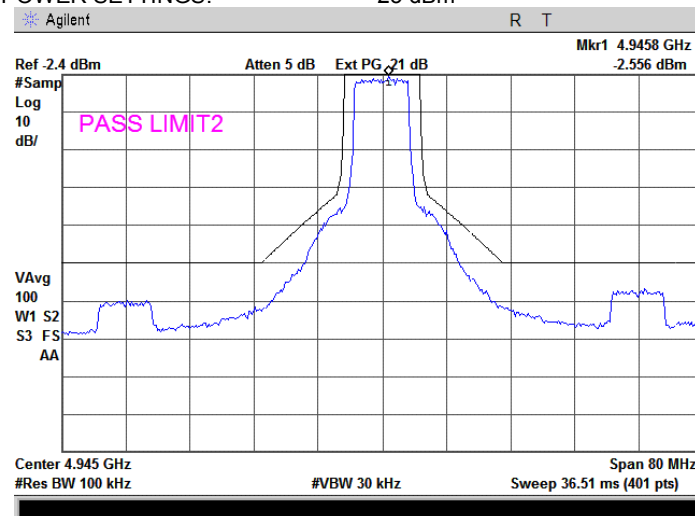
Plot 7.3.9 Emission mask test results at high carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: BPSK, 3 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Plot 7.3.10 Emission mask test results at low carrier frequency

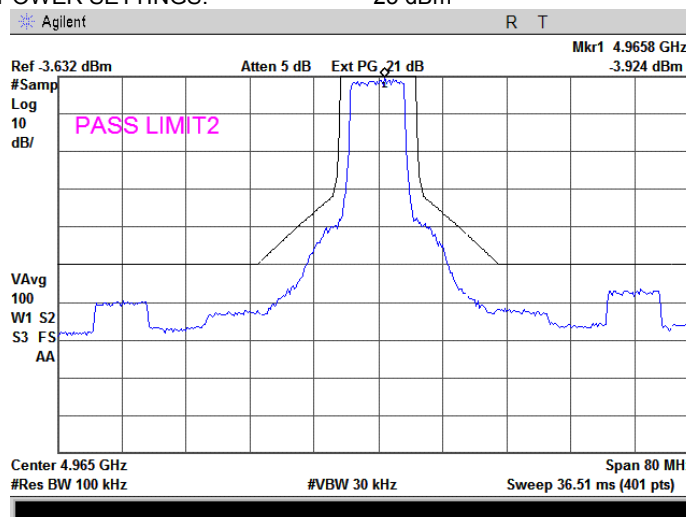
DETECTOR USED: Sample; 100 video averaging
MODULATION: 64 QAM 27Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 10 MHz CBW			

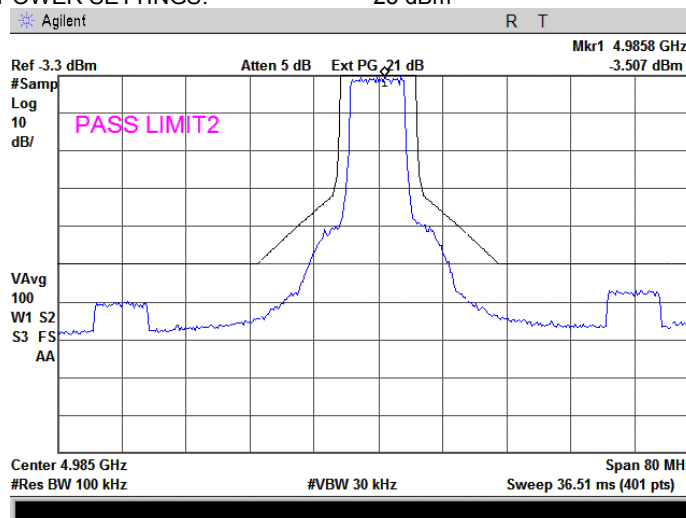
Plot 7.3.11 Emission mask test results at mid carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: 64 QAM 27Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Plot 7.3.12 Emission mask test results at high carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: 64 QAM 27Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "25 dBm"



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

Table 7.3.5 Emission mask limits for 20 MHz channel bandwidth

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask M (Channel bandwidth 20 MHz)	
0 – 9 MHz	0
9 – 10 MHz	$56.8 \log(F^*/4.5)$
10 – 11 MHz	$26 + 14.5 \log(F^*/5.0)$
11 – 20.0 MHz	$32 + 31 \log(F^*/5.5)$
20.0 – 30 MHz	$40 + 57 \log(F^*/10.0)$
More than** 30 MHz	50 or $55 + 10 \log P(W)$ (whichever is the lesser attenuation)

* - F – frequency in MHz removed from center

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

Table 7.3.6 Emission mask test results for 20 MHz channel bandwidth

Carrier frequency, MHz	Limit	Verdict
4950	Emission mask M	Pass
4965		
4980		

Note: 50 dBc was used for emission mask.

Reference numbers of test equipment used

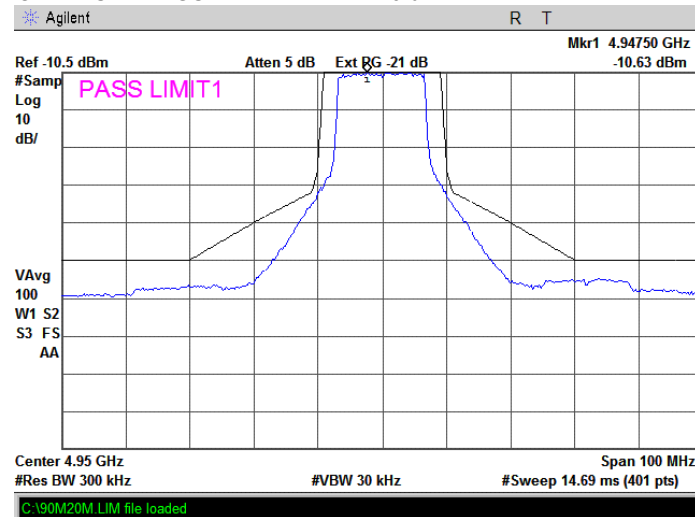
HL 2909	HL 3181	HL 3386					
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Full description is given in Appendix A.

Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

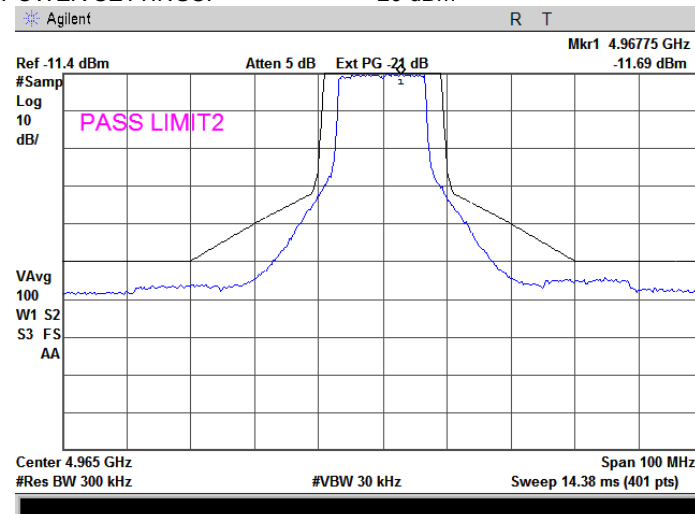
Plot 7.3.13 Emission mask test results at low carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: BPSK, 6 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "20 dBm"



Plot 7.3.14 Emission mask test results at mid carrier frequency

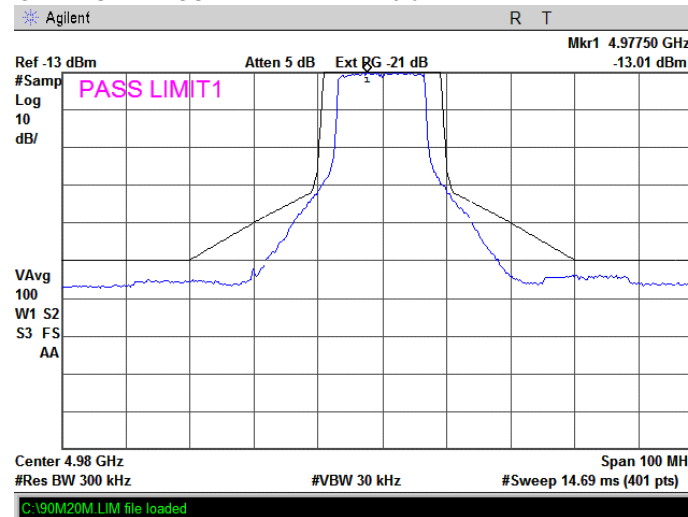
DETECTOR USED: Sample; 100 video averaging
MODULATION: BPSK, 6 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "20 dBm"



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

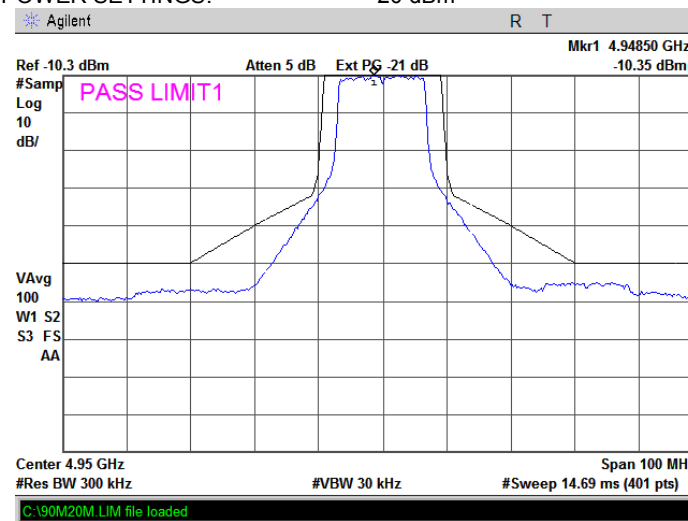
Plot 7.3.15 Emission mask test results at high carrier frequency

DETECTOR USED: Sample; 100 video averaging
MODULATION: BPSK, 6 Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "20 dBm"



Plot 7.3.16 Emission mask test results at low carrier frequency

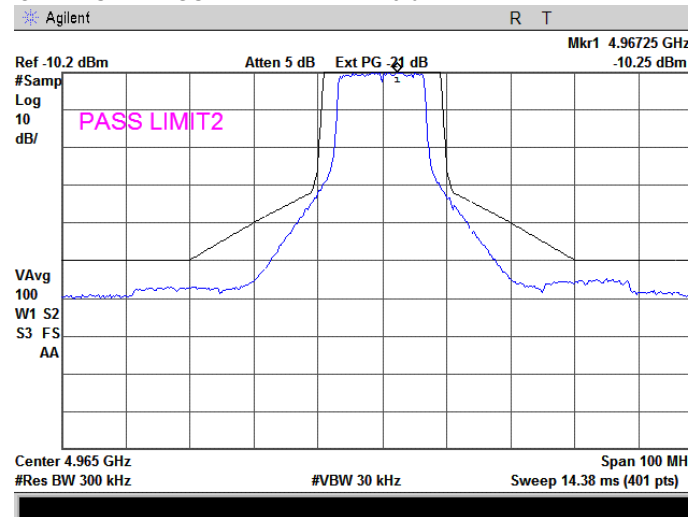
DETECTOR USED: Sample; 100 video averaging
MODULATION: 64 QAM 54Mbps
MODULATING SIGNAL: OFDM
TRANSMITTER OUTPUT POWER SETTINGS: "20 dBm"



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks: 20 MHz CBW			

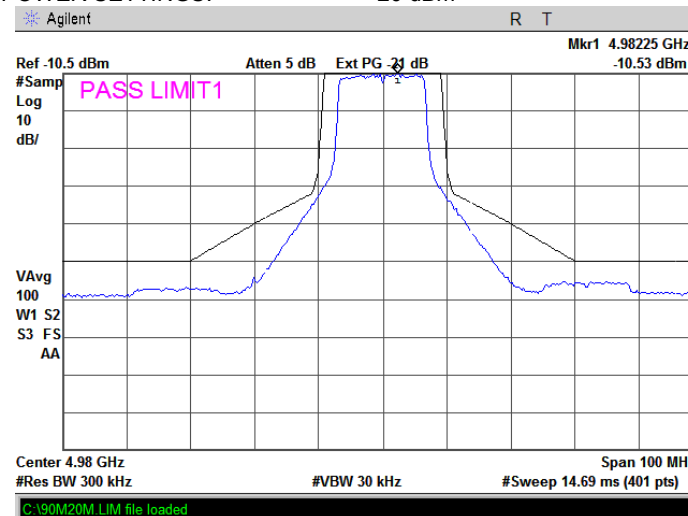
Plot 7.3.17 Emission mask test results at mid carrier frequency

DETECTOR USED: Sample; 100 video averaging
 MODULATION: 64 QAM 54Mbps
 MODULATING SIGNAL: OFDM
 TRANSMITTER OUTPUT POWER SETTINGS: "20 dBm"



Plot 7.3.18 Emission mask test results at high carrier frequency

DETECTOR USED: Sample; 100 video averaging
 MODULATION: 64 QAM 54Mbps
 MODULATING SIGNAL: OFDM
 TRANSMITTER OUTPUT POWER SETTINGS: "20 dBm"



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:		10/02/2008	
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

7.4 Spurious emissions at RF antenna connector test

7.4.1 General

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

Table 7.4.1 Spurious emission limits

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

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

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

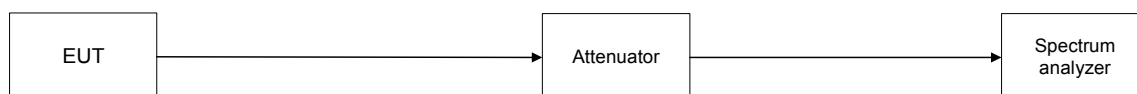
7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.

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

7.4.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.4.2 and associated plots.

Figure 7.4.1 Spurious emission test setup



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Table 7.4.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 4940 – 4990 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: >Resolution bandwidth
 MODULATING SIGNAL: OFDM
 BIT RATE: 13.5 Mbps, 64QAM*
 CHANNEL BANDWIDTH: 5 MHz
 TRANSMITTER OUTPUT POWER: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB**	Verdict
Low carrier frequency								
9884.700	-27.34	Included	Included	1000	-27.34	-25	-2.34	Pass
Mid carrier frequency								
9929.775	-31.35	Included	Included	1000	-31.35	-25	-6.35	Pass
High carrier frequency								
9974.125	-29.37	Included	Included	1000	-29.37	-25	-4.37	Pass

*- Maximum power density was measured at 64QAM modulation, bit rate 13.5 Mbps.

** - Margin = Spurious emission – specification limit.

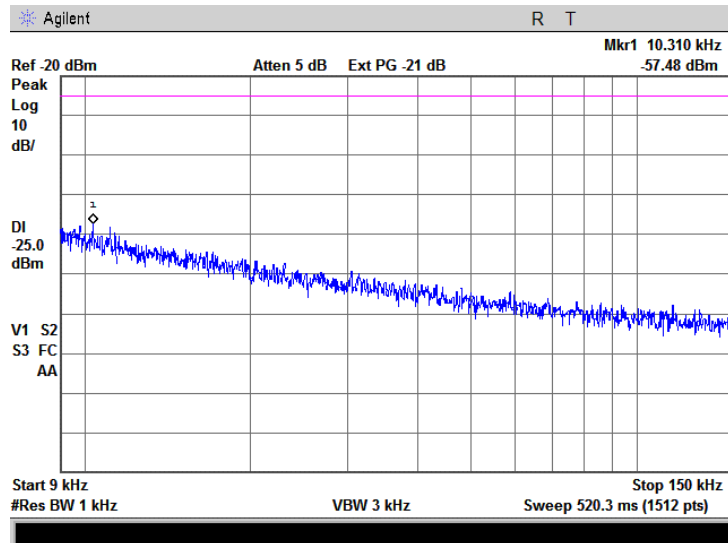
Reference numbers of test equipment used

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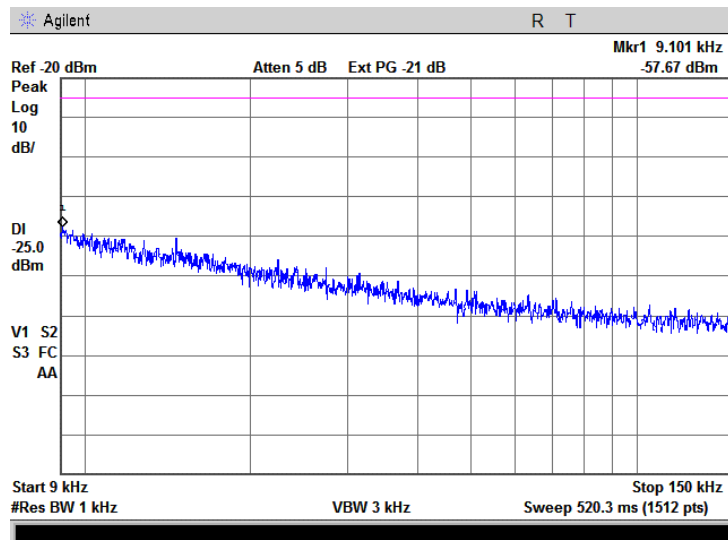
Full description is given in Appendix A.

Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:		10/02/2008	
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

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

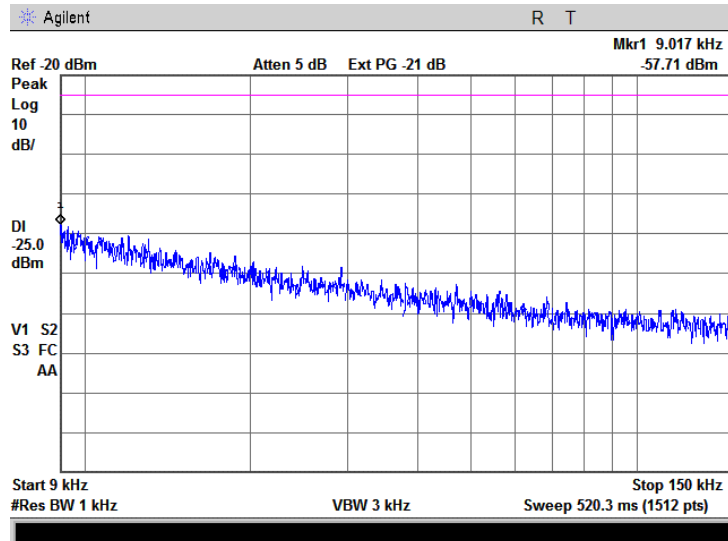


Plot 7.4.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

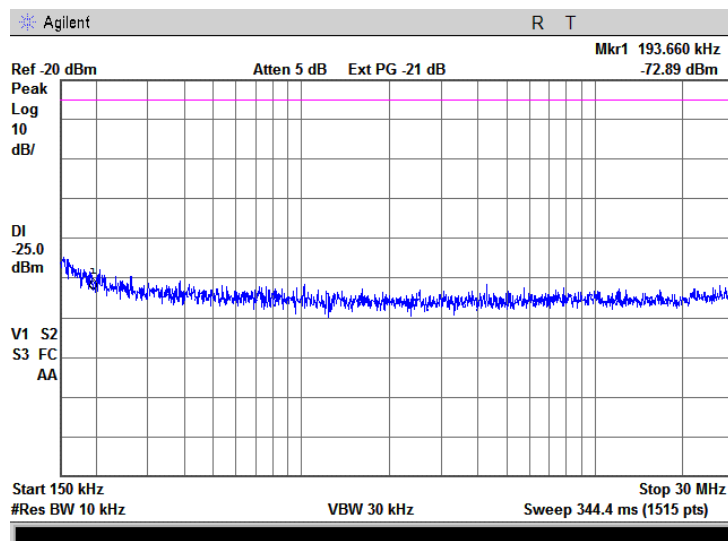


Test specification:	FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

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

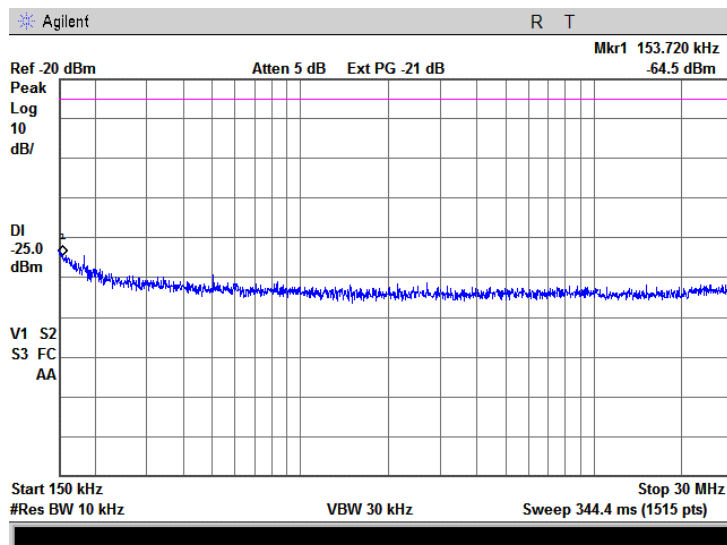


Plot 7.4.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

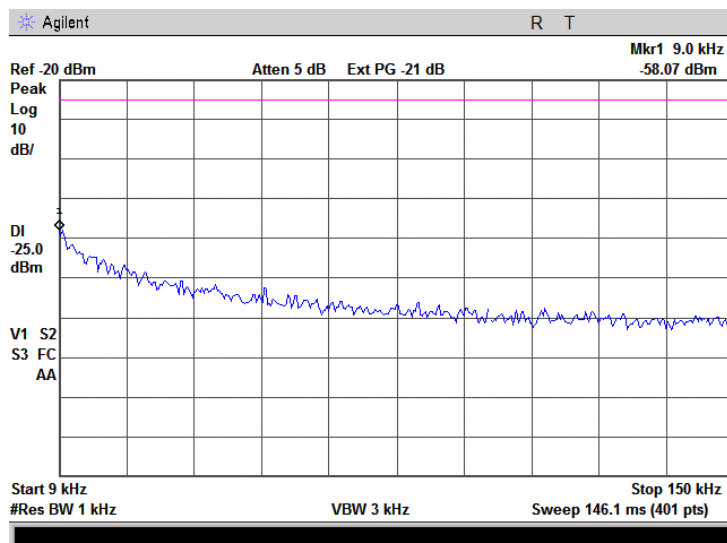


Test specification:		FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date:		10/02/2008	
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

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

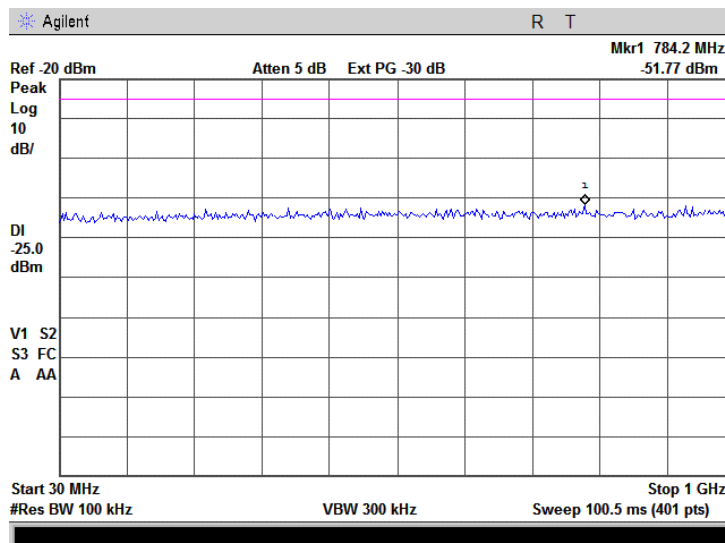


Plot 7.4.6 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency

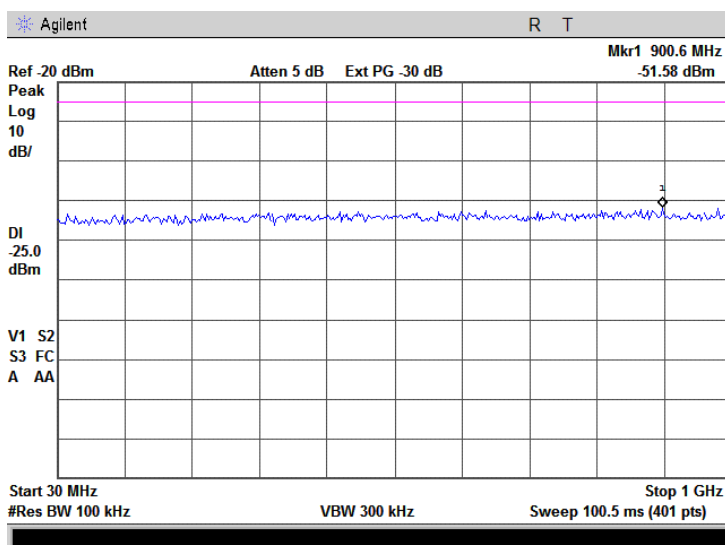


Test specification:	FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

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

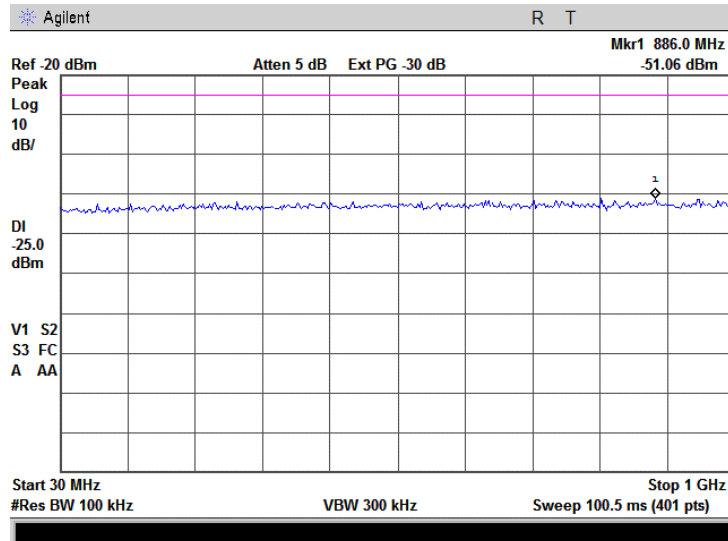


Plot 7.4.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency



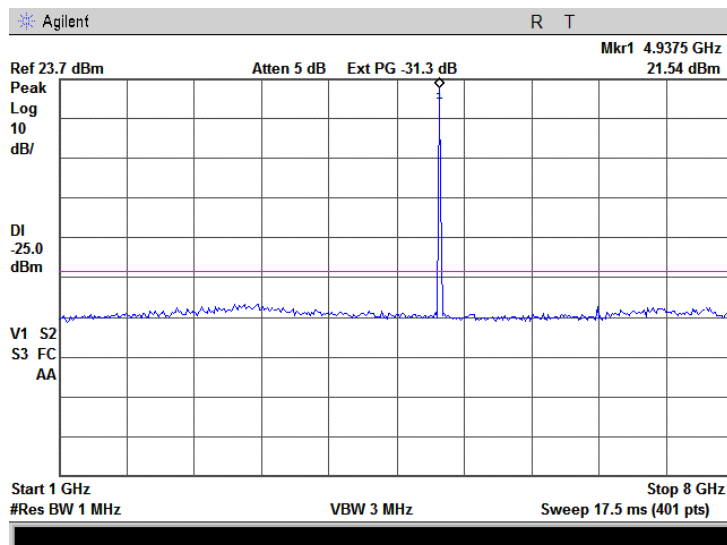
Test specification:		FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date:		10/02/2008	
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

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

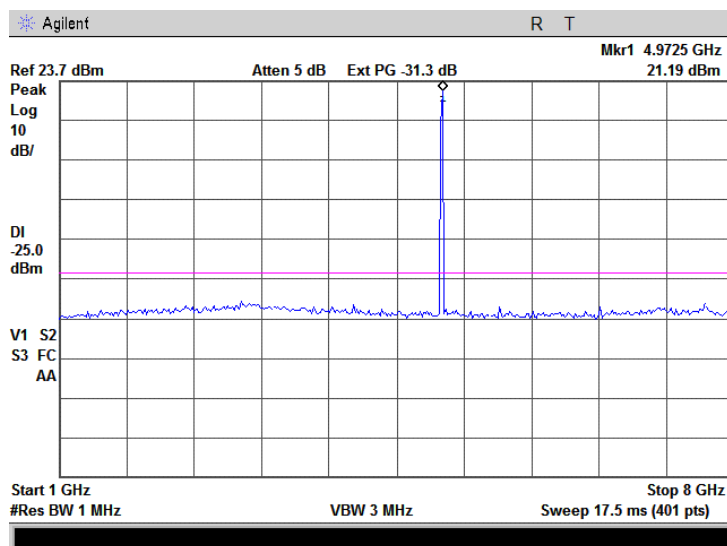


Test specification:	FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.10 Spurious emission measurements in 1000 - 8000 MHz range at low carrier frequency

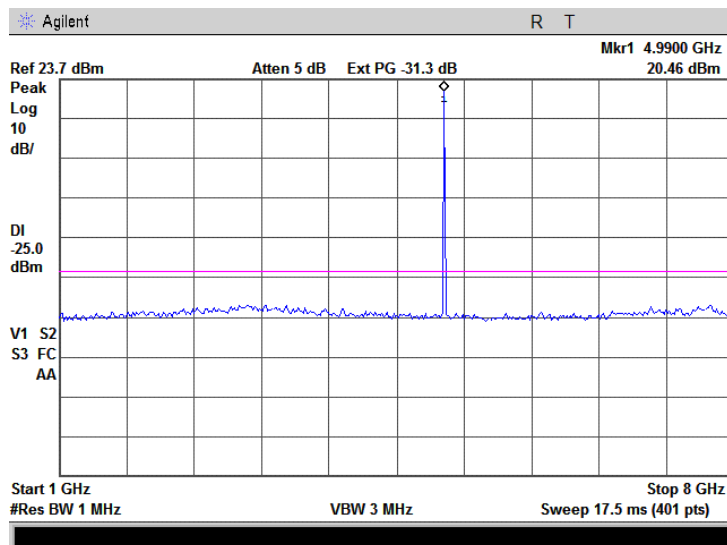


Plot 7.4.11 Spurious emission measurements in 1000 - 8000 MHz range at mid carrier frequency

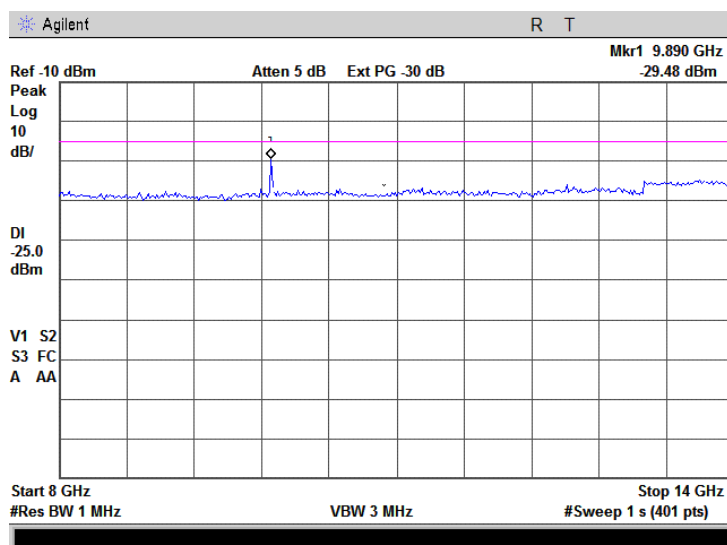


Test specification:	FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.12 Spurious emission measurements in 1000 - 8000 MHz at high carrier frequency

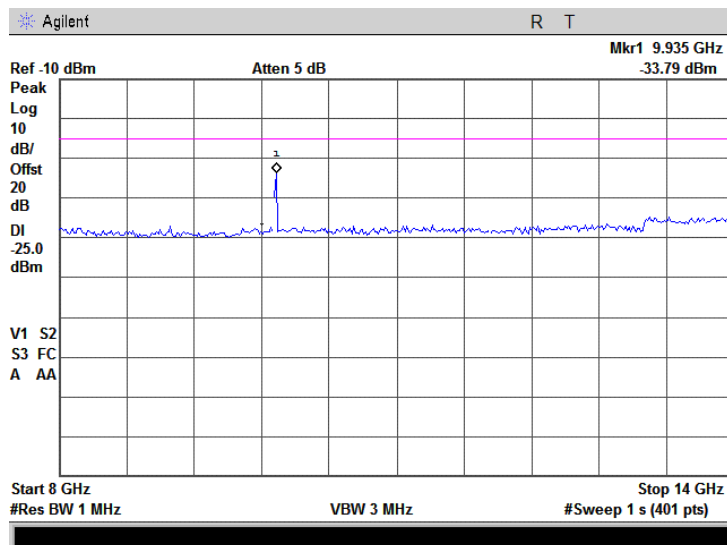


Plot 7.4.13 Spurious emission measurements in 8000 - 14000 MHz range at low carrier frequency

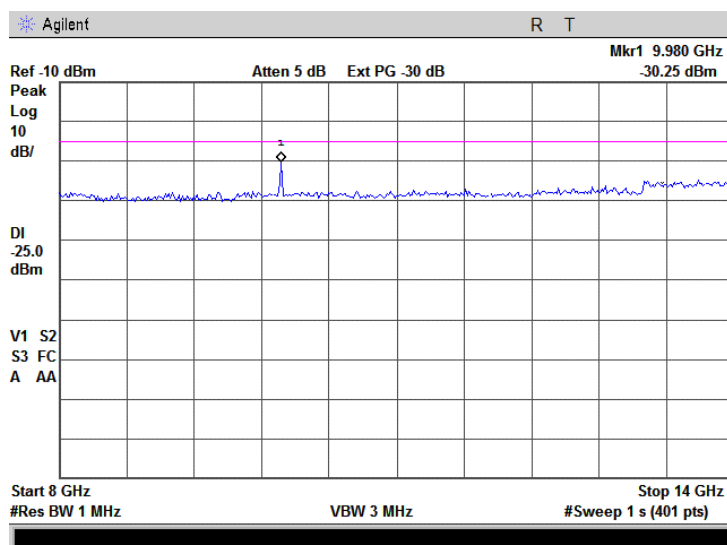


Test specification:	FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.14 Spurious emission measurements in 8000 - 14000 MHz range at mid carrier frequency

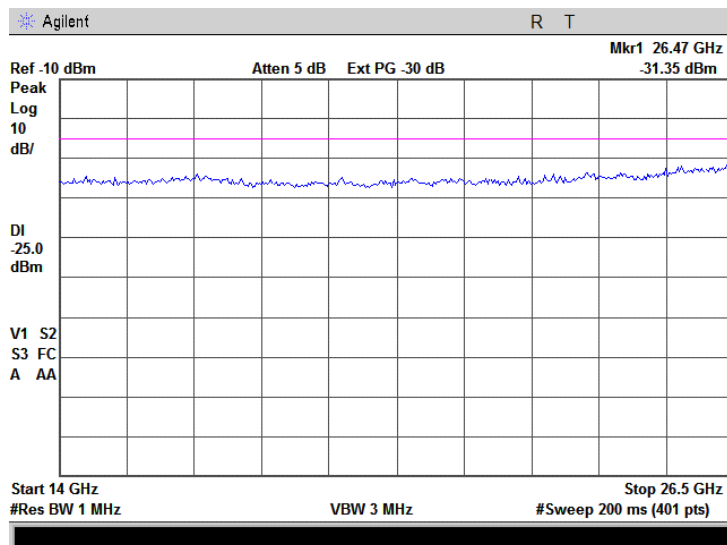


Plot 7.4.15 Spurious emission measurements in 8000 - 14000 MHz range at high carrier frequency

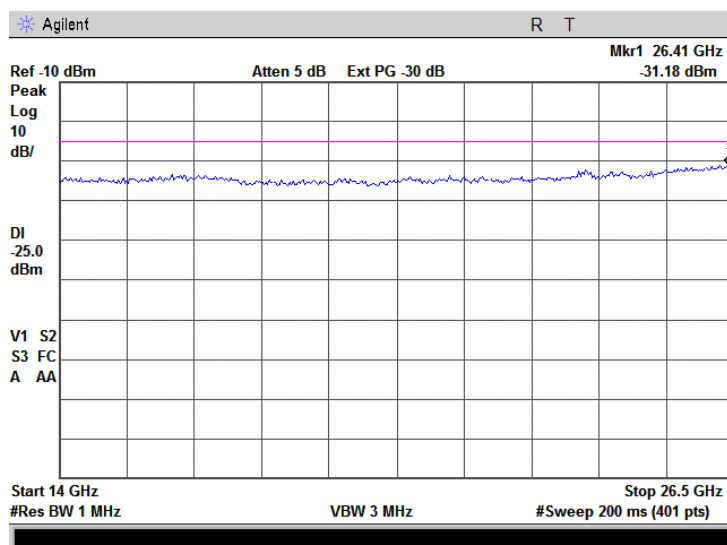


Test specification:		FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date:		10/02/2008	
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.16 Spurious emission measurements in 14000 - 26500 MHz range at low carrier frequency

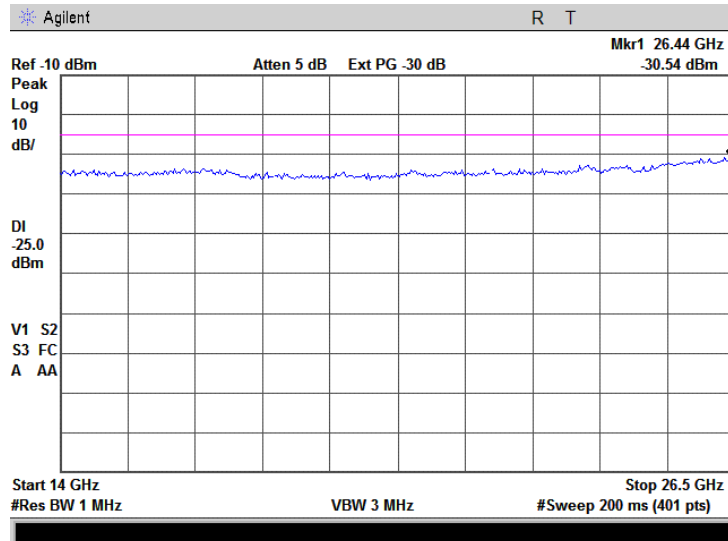


Plot 7.4.17 Spurious emission measurements in 14000 - 26500 MHz range at mid carrier frequency

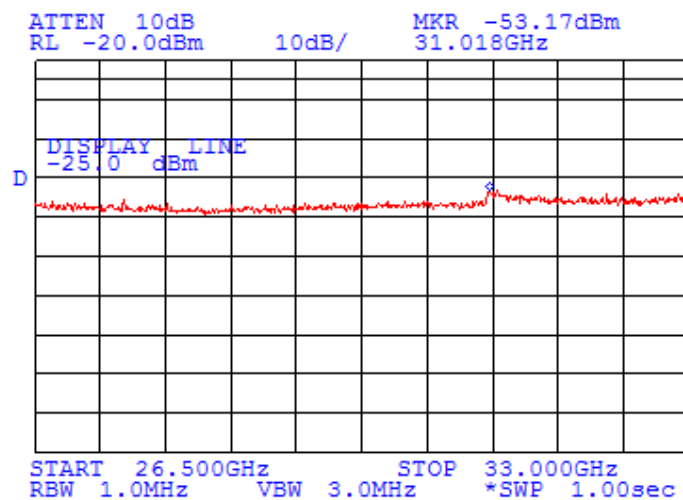


Test specification:		FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.18 Spurious emission measurements in 14000 - 26500 MHz range at high carrier frequency

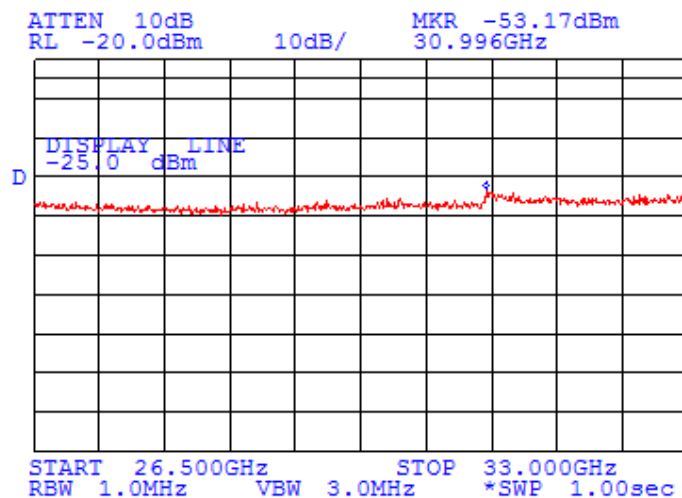


Plot 7.4.19 Spurious emission measurements in 26500 - 33000 MHz range at low carrier frequency

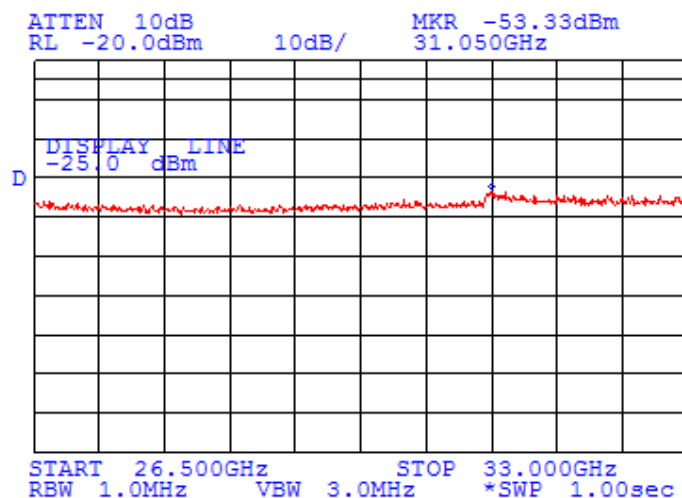


Test specification:		FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.20 Spurious emission measurements in 26500 - 33000 MHz range at mid carrier frequency

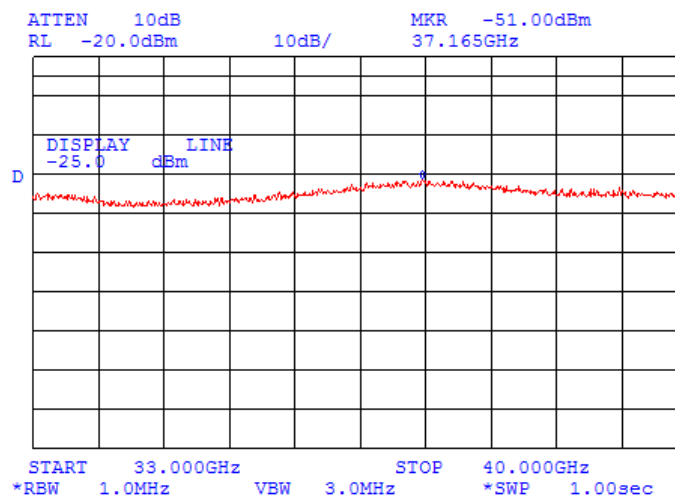


Plot 7.4.21 Spurious emission measurements in 26500 - 33000 MHz range at high carrier frequency

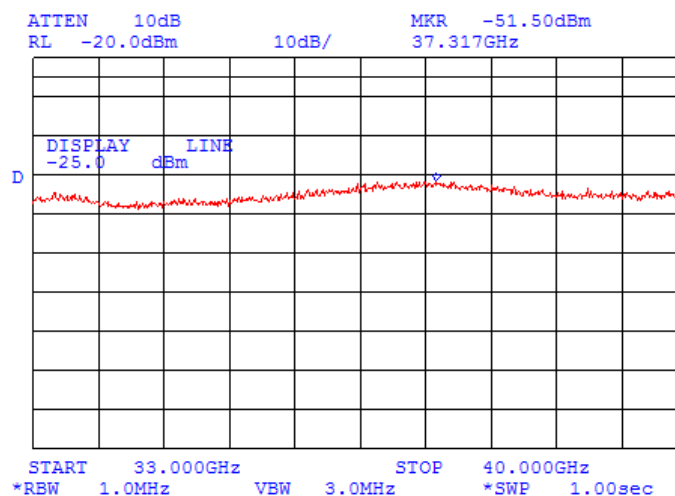


Test specification:		FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.22 Spurious emission measurements in 33000 - 40000 MHz range at low carrier frequency

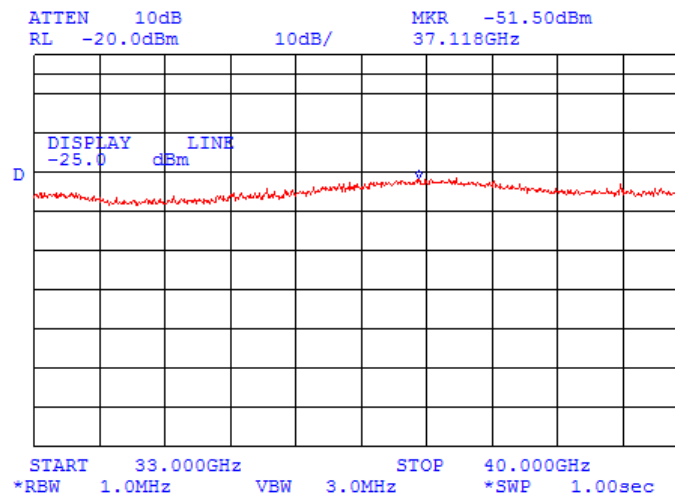


Plot 7.4.23 Spurious emission measurements in 33000 - 40000 MHz range at mid carrier frequency

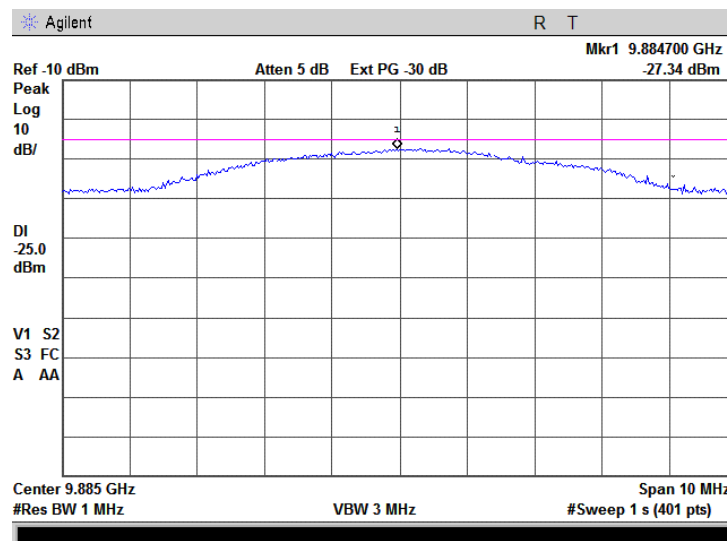


Test specification:		FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date:	10/02/2008		
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.24 Spurious emission measurements in 33000 - 40000 MHz range at high carrier frequency

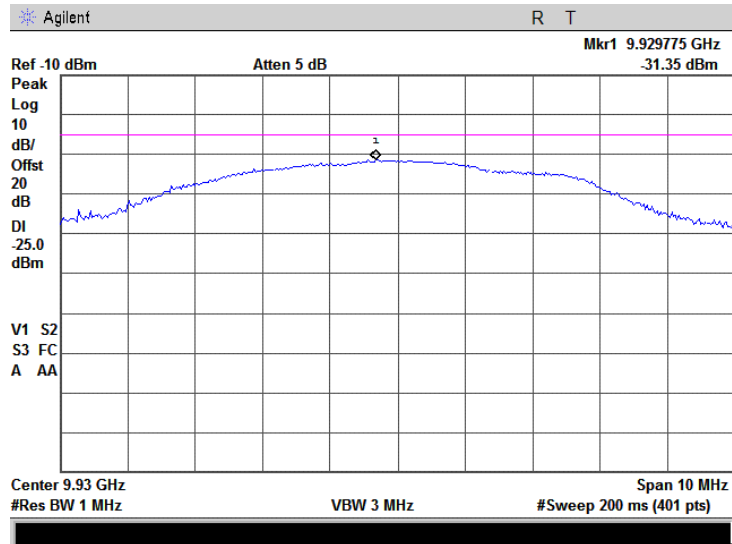


Plot 7.4.25 Spurious emission measurements in 2-nd harmonic at low carrier frequency

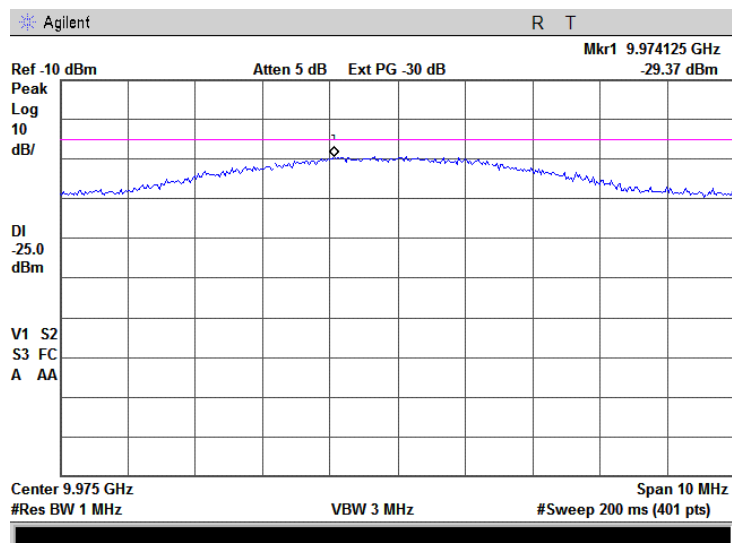


Test specification:		FCC section 90.210, RSS-111 section 4.4, Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date:		10/02/2008	
Temperature: 22°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 V AC
Remarks:			

Plot 7.4.26 Spurious emission measurements in 2-nd harmonic at mid carrier frequency



Plot 7.4.27 Spurious emission measurements in 2-nd harmonic at high carrier frequency



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 V AC
Remarks:			

7.5 Radiated spurious emission measurements

7.5.1 General

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

Table 7.5.1 Radiated spurious emission test limits

Frequency, MHz	Attenuation below carrier dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(μV/m)**
0.009 – 40000	55+10logP	-25	70.23

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

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

** - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows:

$E = \sqrt{30 \times P \times 1.64} / r$, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters.

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

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

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

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

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

7.5.3.1 The EUT was set up as shown in Figure 7.5.2, energized and the performance check was conducted.

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

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

7.5.4 Test procedure for substitution ERP measurements of spurious

7.5.4.1 The test equipment was set up as shown in Figure 7.5.3 and energized.

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

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

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

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

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

7.5.4.7 The worst test results (the lowest margins) were recorded in Table 7.5.3 and shown in the associated plots.

Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 V AC
Remarks:			

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

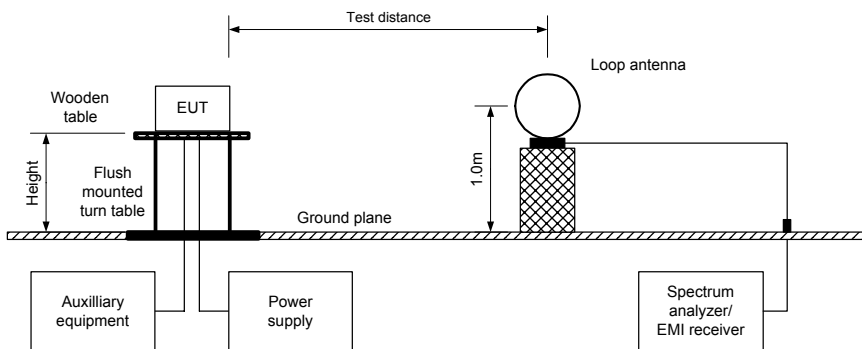
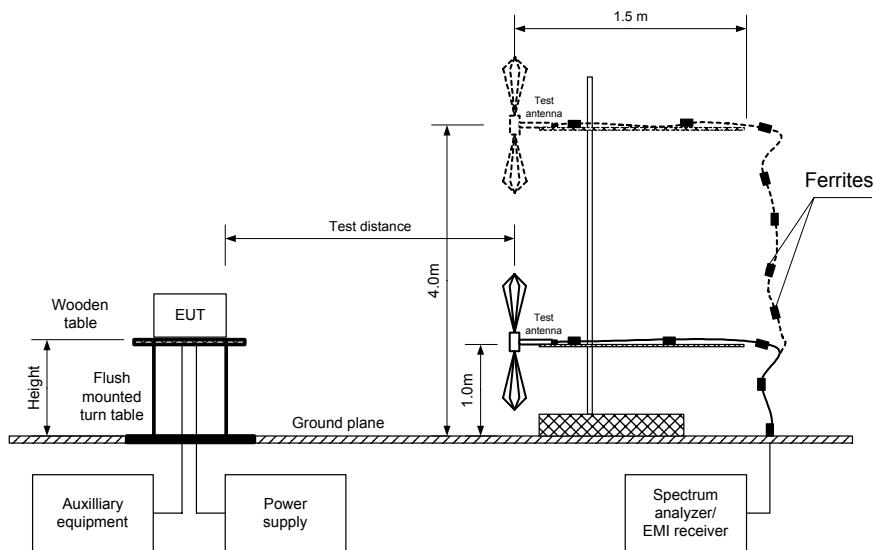
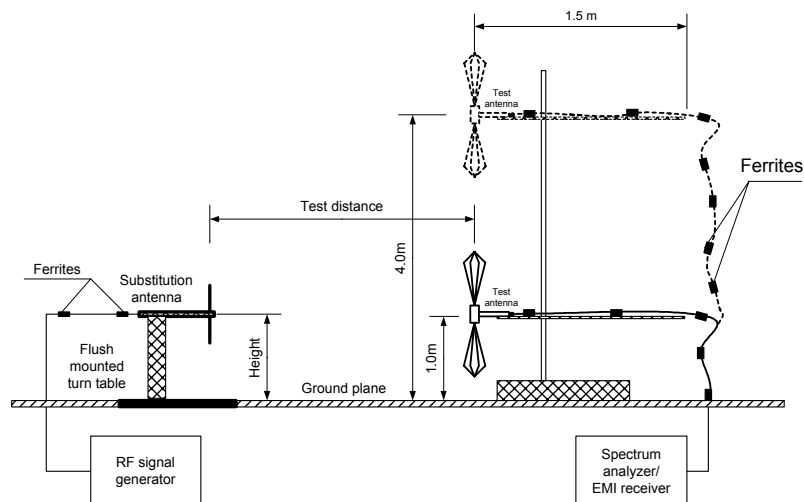


Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 V AC
Remarks:			

Figure 7.5.3 Setup for substitution ERP measurements of spurious



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 4940 - 4990 MHz
 TEST DISTANCE: 3 m
 TEST SITE: OATS
 EUT HEIGHT: 0.8 m
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (1000 MHz – 18000 MHz)
 Standard gain horn (above 18000 MHz)
 MODULATING SIGNAL: OFDM
 BIT RATE: 13.5 Mbps 64QAM
 CHANNEL BANDWIDTH: 5 MHz
 TRANSMITTER OUTPUT POWER: 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							
6590.075	63.95	70.23	-6.28	1000	Vertical	1.0	90
Mid carrier frequency							
6620.075	62.13	70.23	-8.10	1000	Vertical	1.0	90
High carrier frequency							
6650.100	60.64	70.23	-9.59	1000	Vertical	1.0	90

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

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

Table 7.5.3 Substitution ERP of spurious test results

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

Frequency MHz	Field strength dB(μV/m)	RBW, kHz	Antenna polarization	F generator output, dBm	Ant gain dBd	Cable loss dB	ERP, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency										
6590.075	63.95	1000	Vertical	-32.50	9.0	4.82	-28.32	-25.00	-3.32	Pass
Mid carrier frequency										
6620.750	62.13	1000	Vertical	-33.78	9.0	4.82	-29.60	-25.00	-4.60	Pass
High carrier frequency										
6650.100	60.64	1000	Vertical	-35.22	8.9	4.82	-31.14	-25.00	-6.14	Pass

*- Margin = Spurious emission ERP– specification limit.

Reference numbers of test equipment used

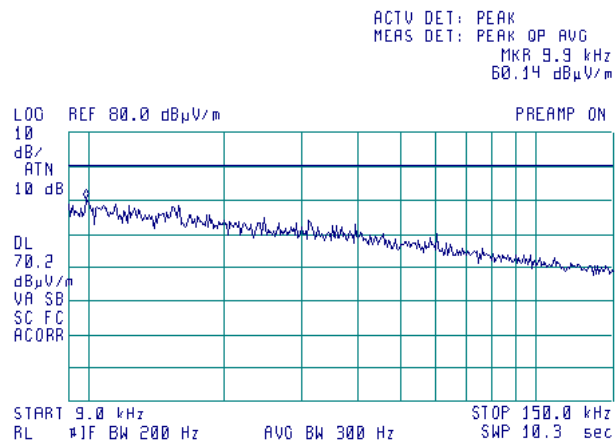
HL 0446	HL 0604	HL 0661	HL 0768	HL 0769	HL 1296	HL 1293	HL 1424
HL 1425	HL 1552	HL 1566	HL 1567	HL 1984	HL 2254	HL 2259	HL 2260
HL 2261	HL 2387	HL 2432	HL 2499	HL 2871	HL 2951	HL 3208	

Full description is given in Appendix A.

Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:		10/05/2008	
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

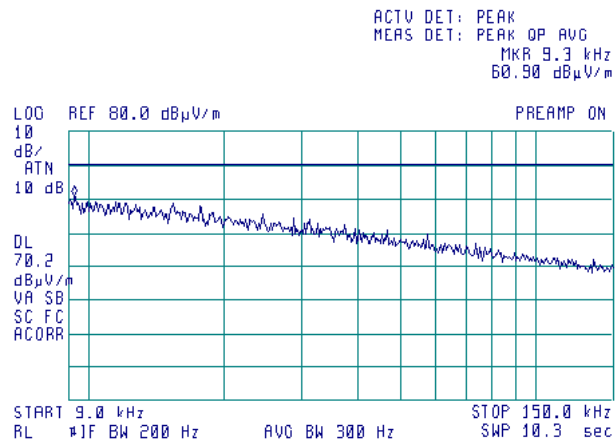
Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.5.2 Radiated emission measurements in 9 - 150 kHz range

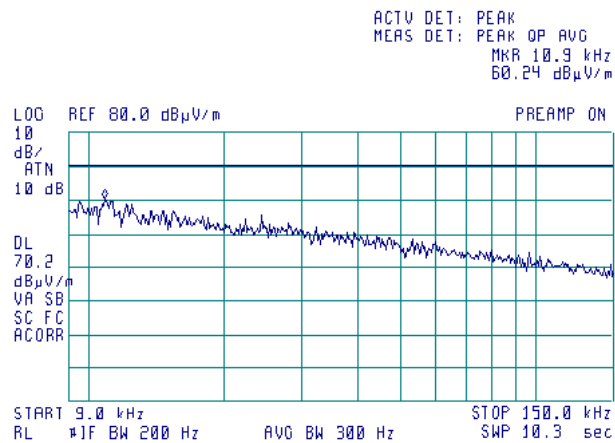
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

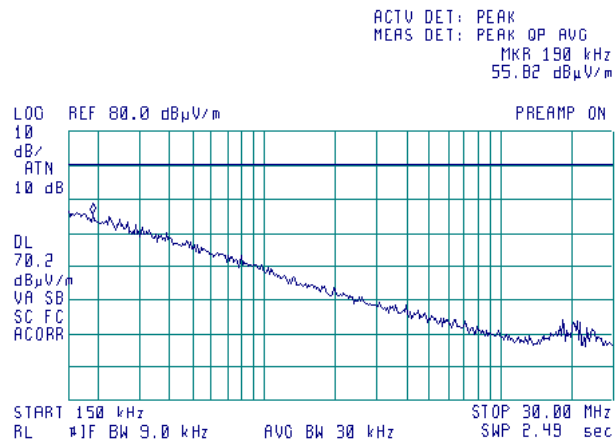
Plot 7.5.3 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.5.4 Radiated emission measurements in 0.15 - 30 MHz range

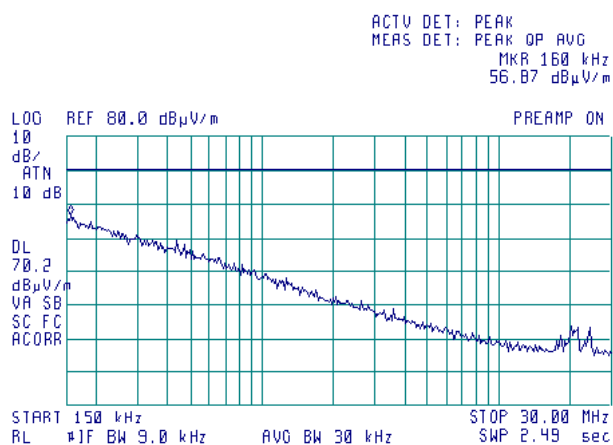
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

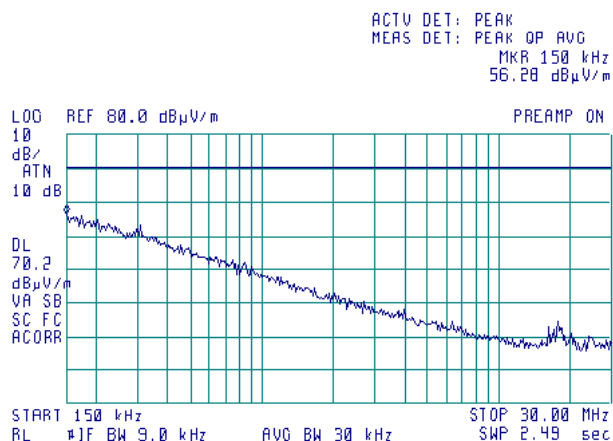
Plot 7.5.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.5.6 Radiated emission measurements in 0.15 - 30 MHz range

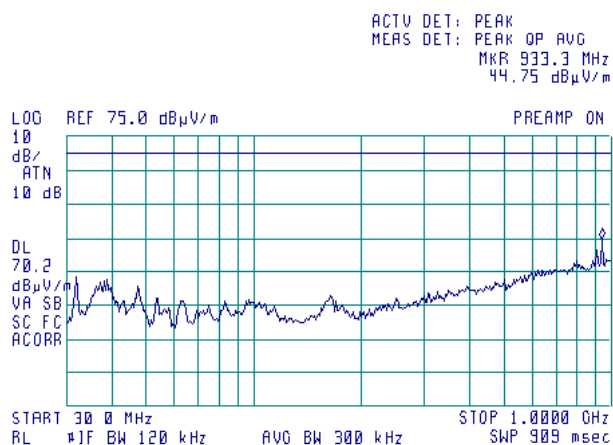
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

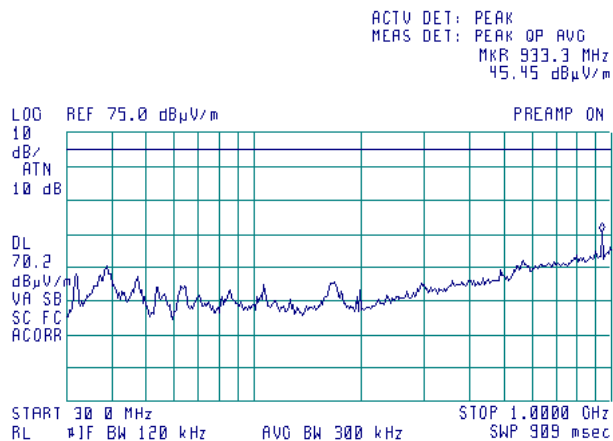
Plot 7.5.7 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.5.8 Radiated emission measurements in 30 - 1000 MHz range

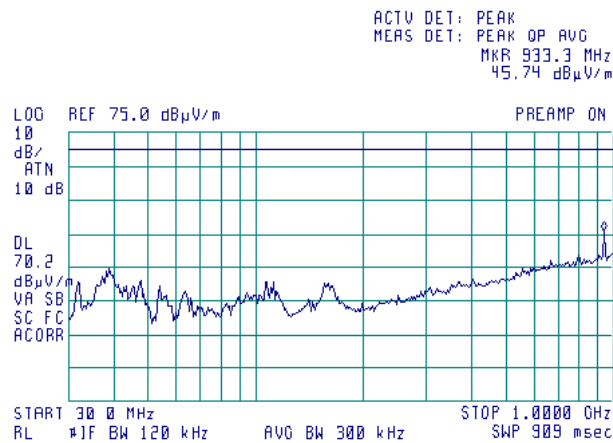
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

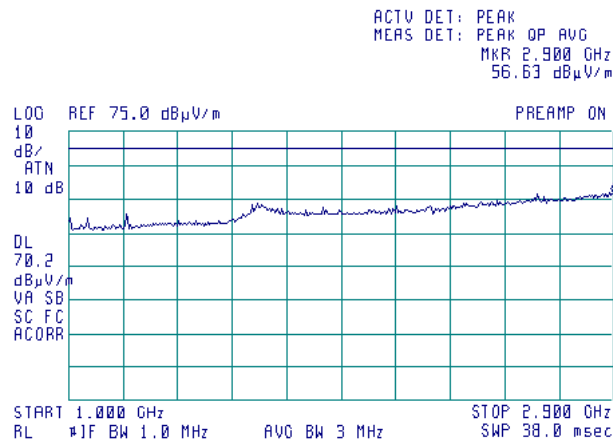
Plot 7.5.9 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.5.10 Radiated emission measurements in 1000 – 2900 MHz range

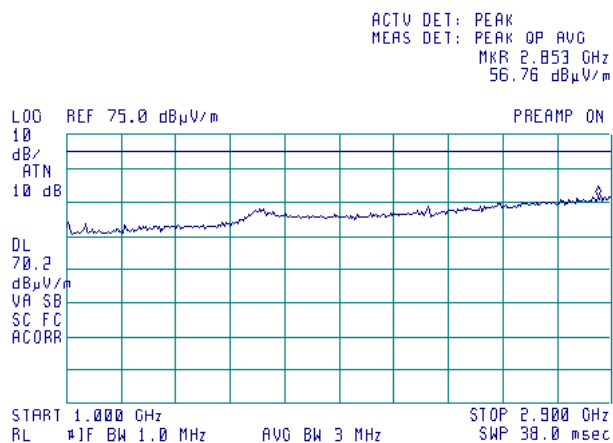
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

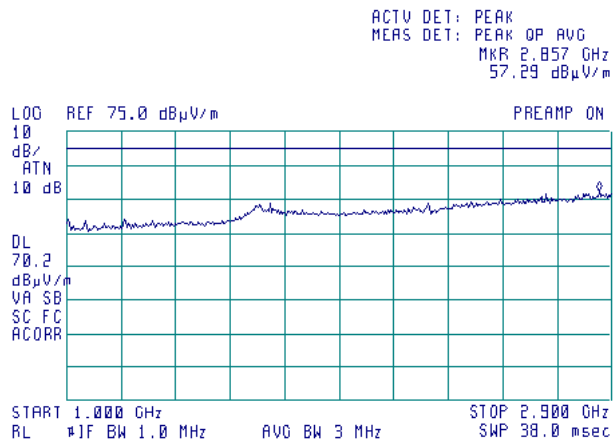
Plot 7.5.11 Radiated emission measurements in 1000 – 2900 MHz range

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



Plot 7.5.12 Radiated emission measurements in 1000 – 2900 MHz range

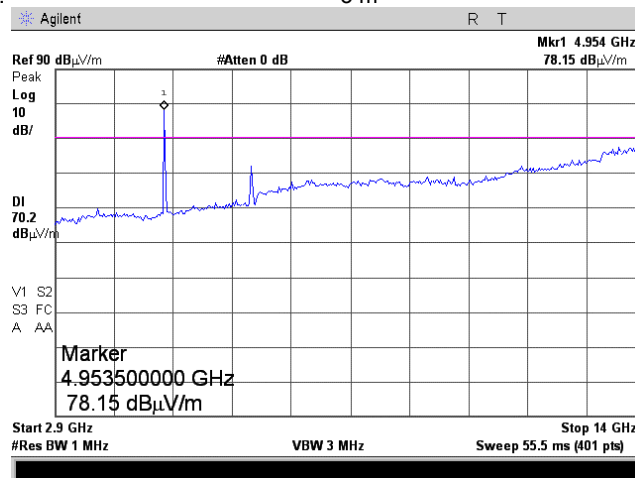
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

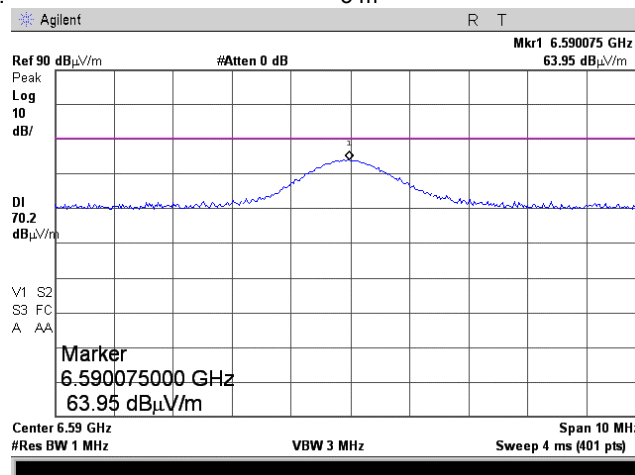
Plot 7.5.13 Radiated emission measurements in 2900 – 14000 MHz range

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



Plot 7.5.14 Radiated emission measurements at 6590.075 MHz

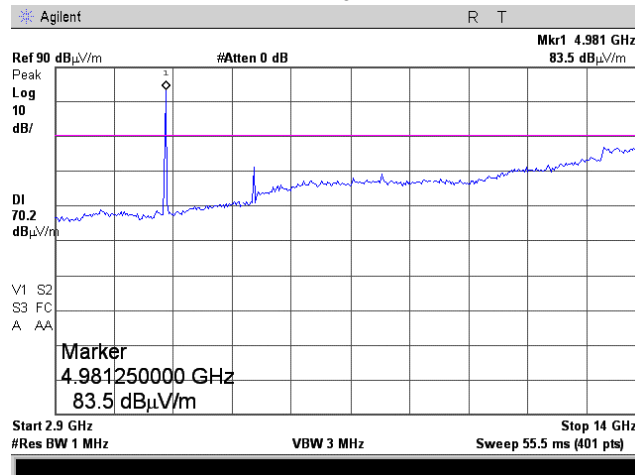
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

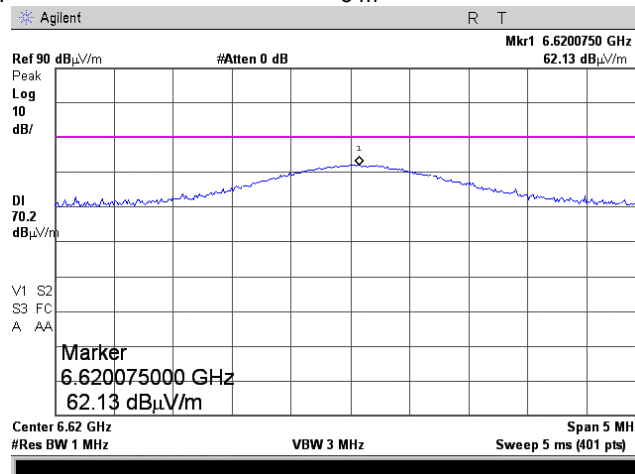
Plot 7.5.15 Radiated emission measurements in 2900 – 14000 MHz range

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



Plot 7.5.16 Radiated emission measurements at 6620.075 MHz

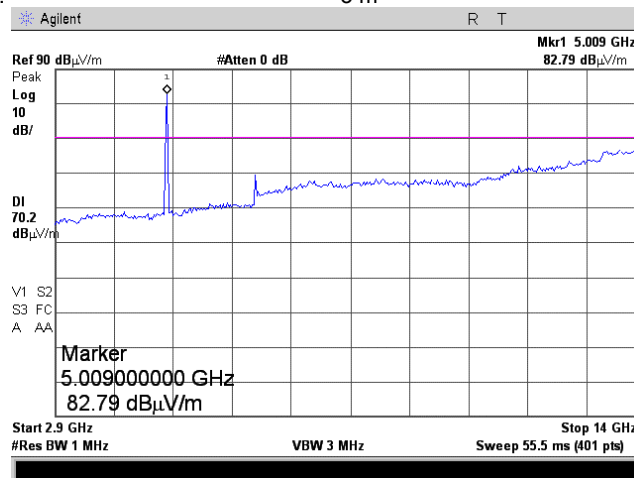
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

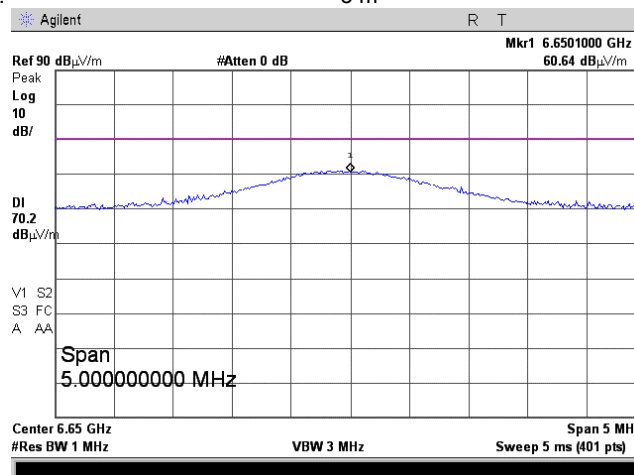
Plot 7.5.17 Radiated emission measurements in 2900 – 14000 MHz range

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



Plot 7.5.18 Radiated emission measurements at 6650.100 MHz

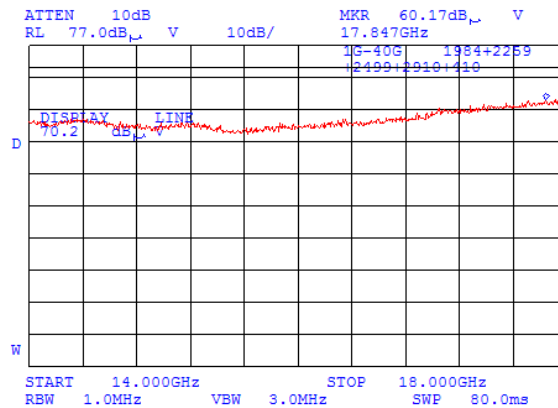
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

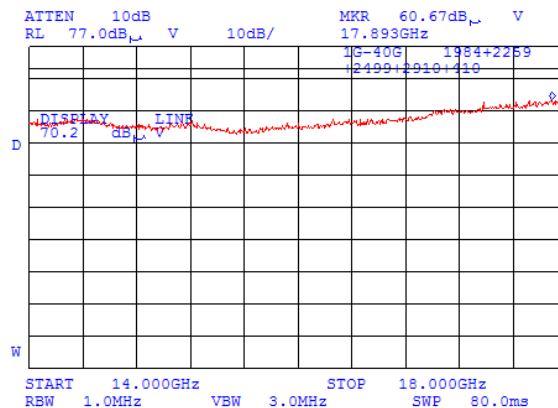
Plot 7.5.19 Radiated emission measurements in 14000 – 18000 MHz range

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



Plot 7.5.20 Radiated emission measurements in 14000 – 18000 MHz range

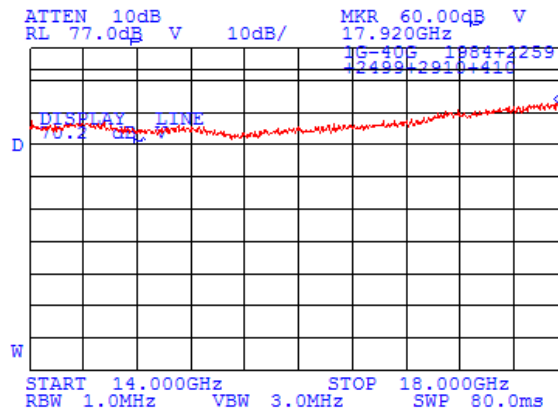
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

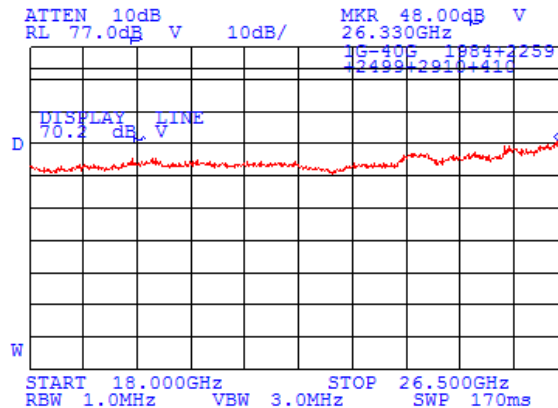
Plot 7.5.21 Radiated emission measurements in 14000 – 18000 MHz range

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



Plot 7.5.22 Radiated emission measurements in 18000 – 26500 MHz range

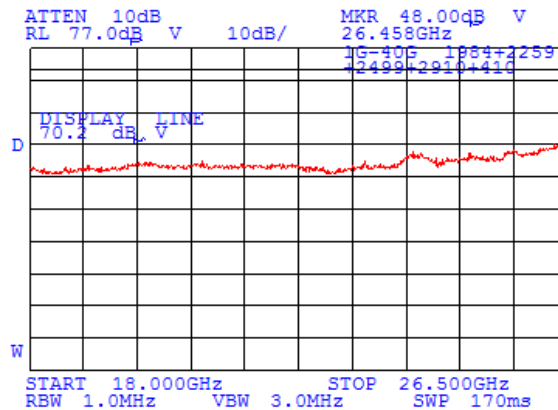
TEST SITE: OATS
 CARRIER FREQUENCY: Low
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

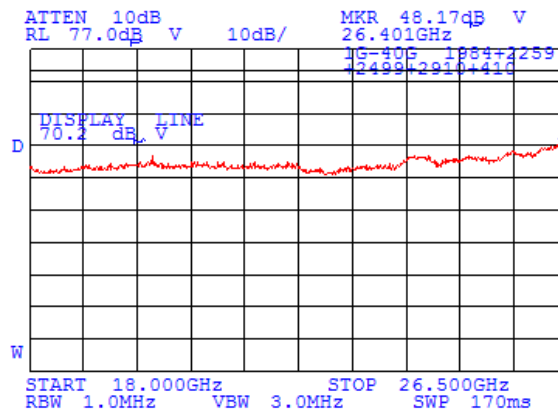
Plot 7.5.23 Radiated emission measurements in 18000 – 26500 MHz range

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



Plot 7.5.24 Radiated emission measurements in 18000 – 26500 MHz range

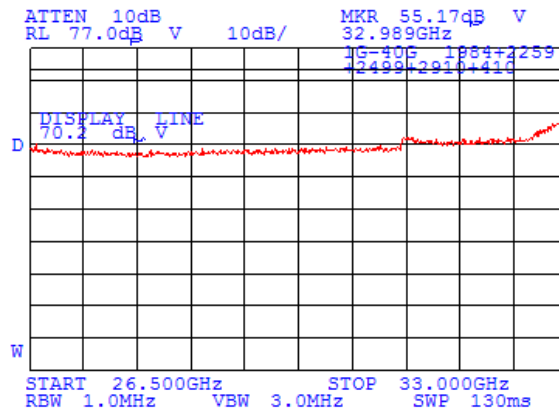
TEST SITE: OATS
 CARRIER FREQUENCY: High
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

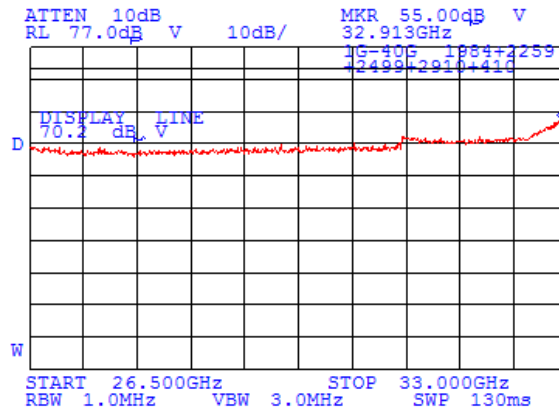
Plot 7.5.25 Radiated emission measurements in 26500 – 33000 MHz range

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



Plot 7.5.26 Radiated emission measurements in 26500 – 33000 MHz range

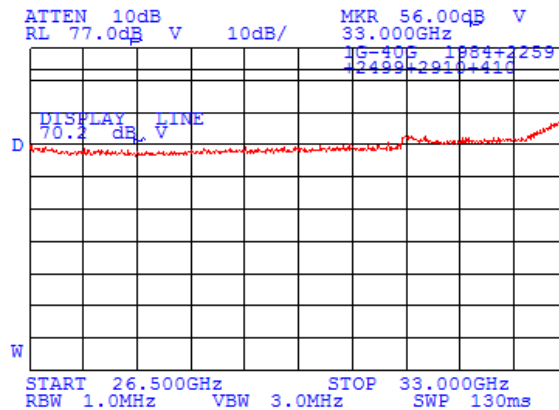
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

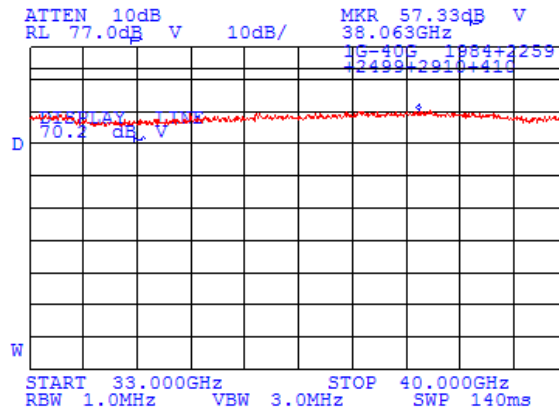
Plot 7.5.27 Radiated emission measurements in 26500 – 33000 MHz range

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



Plot 7.5.28 Radiated emission measurements in 33000 – 40000 MHz range

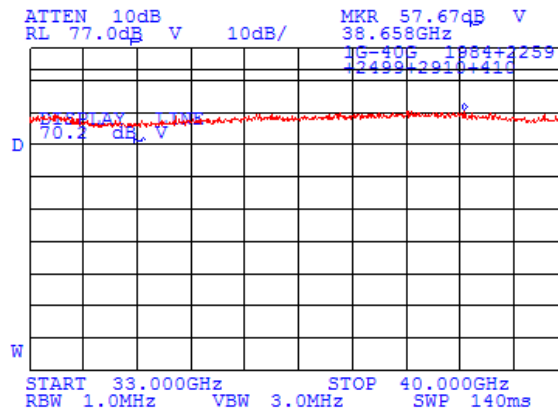
TEST SITE: OATS
 CARRIER FREQUENCY: Low
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:		FCC section 90.210, RSS-111 section 4.4, 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:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

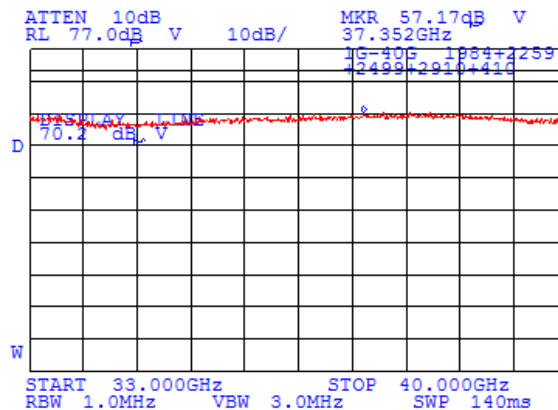
Plot 7.5.29 Radiated emission measurements in 33000 – 40000 MHz range

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



Plot 7.5.30 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: FCC section 90.213, RSS-111 section 4.2, Frequency stability			
Test procedure: 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2			
Test mode:	Compliance	Verdict: PASS	
Date:	10/05/2008		
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%	Power Supply: 120 VAC
Remarks:			

7.6 Frequency stability test

7.6.1 General

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

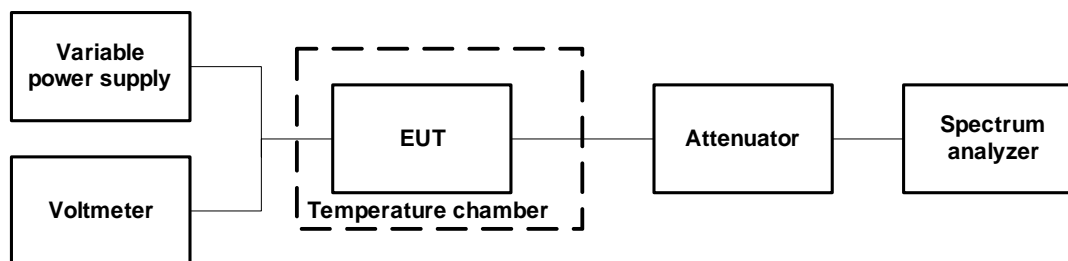
Table 7.6.1 Frequency stability limits

Operating frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
4940 - 4990	NA	NA

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 the 10 dBc level of the power slope 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:		FCC section 90.213, RSS-111 section 4.2, Frequency stability			
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2			
Test mode:		Compliance		Verdict: PASS	
Date:		10/05/2008			
Temperature: 23°C	Air Pressure: 1007 hPa	Relative Humidity: 50%		Power Supply: 120 VAC	
Remarks:					

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY: 4942.5 – 4987.5 MHz
 NOMINAL POWER VOLTAGE: 120 VAC
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 SPECTRUM ANALYZER MODE: Peak
 RESOLUTION BANDWIDTH: 1000 MHz
 VIDEO BANDWIDTH: 3000 Hz
 MODULATION: ON

T, °C	Voltage, V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Margin, Hz	Verdict
		Start up	1 st min	2 nd min	3 rd min	4 th min	5 th min	10 th min	Positive	Negative			
Low frequency 4942.5 MHz													
-30	nominal	4942.485000	4942.497700	4942.502850	4942.502000	4942.501500	4942.501500	4942.505150	0	99650	NA	NA	Tested
-20	nominal	4942.521875	NA	NA	NA	NA	NA	4942.521625	0	63025		NA	Tested
-10	nominal	4942.516250	NA	NA	NA	NA	NA	4942.507500	0	77150		NA	Tested
0	nominal	4942.501875	4942.501250	4942.502500	4942.504375	4942.504375	4942.502375	4942.501750	0	83400		NA	Tested
10	nominal	4942.521250	NA	NA	NA	NA	NA	4942.500375	0	84275		NA	Tested
20	+15%	4942.455625	NA	NA	NA	NA	NA	4942.591625	6975	129025		NA	Tested
20	nominal	4942.452850	NA	NA	NA	NA	NA	4942.584650*	0	131800		NA	Tested
20	-15%	4942.453125	NA	NA	NA	NA	NA	4942.588625	3975	131525		NA	Tested
30	nominal	4942.485000	4942.488125	4942.497500	4942.604375	4942.585000	4942.574375	4942.491105	0	99650		NA	Tested
40	nominal	4942.553750	NA	NA	NA	NA	NA	4942.568750	0	30900		NA	Tested
50	nominal	4942.570250	NA	NA	NA	NA	NA	4942.600000	0	14400		NA	Tested
Mid frequency 4965.0 MHz													
-30	nominal	4964.982500	4964.97665	4964.9799	4964.9855	4964.97585	4964.9783	4965.013800	58150	0	NA	NA	Tested
-20	nominal	4965.019375	NA	NA	NA	NA	NA	4965.022125	66475	0		NA	Tested
-10	nominal	4965.005000	NA	NA	NA	NA	NA	4965.009125	53475	0		NA	Tested
0	nominal	4965.000000	4965.003125	4965.003750	4965.000875	4965.001250	4964.999875	4965.000125	48100	0		NA	Tested
10	nominal	4964.993750	NA	NA	NA	NA	NA	4965.004375	48725	0		NA	Tested
20	+15%	4964.974375	NA	NA	NA	NA	NA	4964.973750	18725	0		NA	Tested
20	nominal	4964.973300	NA	NA	NA	NA	NA	4964.955650*	17650	0		NA	Tested
20	-15%	4964.976875	NA	NA	NA	NA	NA	4964.977500	21850	0		NA	Tested
30	nominal	4965.015150	4965.05985	4965.0495	4965.03665	4965.03535	4965.03015	4965.027500	104200	0		NA	Tested
40	nominal	4965.057500	NA	NA	NA	NA	NA	4965.070000	114350	0		NA	Tested
50	nominal	4965.049375	NA	NA	NA	NA	NA	4965.084375	128725	0		NA	Tested
High frequency 4987.5 MHz													
-30	nominal	4987.489150	4987.501500	4987.502850	4987.499250	4987.500000	4987.503250	4987.503750	47150	0	NA	NA	Tested
-20	nominal	4987.523125	NA	NA	NA	NA	NA	4987.518125	66525	0		NA	Tested
-10	nominal	4987.514375	NA	NA	NA	NA	NA	4987.512500	57775	0		NA	Tested
0	nominal	4987.506250	4987.503750	4987.503125	4987.501250	4987.498750	4987.501250	4987.499375	49650	0		NA	Tested
10	nominal	4987.492500	NA	NA	NA	NA	NA	4987.501875	45275	0		NA	Tested
20	+15%	4987.448563	NA	NA	NA	NA	NA	4987.461200	4600	8037.5		NA	Tested
20	nominal	4987.454300	NA	NA	NA	NA	NA	4987.456600*	0	2300		NA	Tested
20	-15%	4987.449000	NA	NA	NA	NA	NA	4987.458355	1755	0		NA	Tested
30	nominal	4987.465850	4987.452650	4987.453850	4987.49925	4987.463200	4987.577150	4987.538850	120550	3950		NA	Tested
40	nominal	4987.552500	NA	NA	NA	NA	NA	4987.566250	109650	0		NA	Tested
50	nominal	4987.555000	NA	NA	NA	NA	NA	4987.568300	111700	0		NA	Tested

* - Reference frequency

Reference numbers of test equipment used

HL 0493	HL 1424	HL 2911	HL 3179	HL 3181			
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Full description is given in Appendix A.

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-08	29-Jun-09
0493	Temperature Chamber -45...175 deg C	Thermotron	S-1.2 Mini-Max	14016	19-May-08	19-May-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
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	08-Dec-06	08-Dec-08
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	08-Dec-06	08-Dec-08
1292	Attenuator, 26.5 - 40 GHz, 0 - 50 dB, 0.5 W	Hughes	45721H-1000	061	03-Sep-08	03-Sep-09
1293	Adapter 35WR42Kf, 18 - 26.5 GHz	Getronics	35WR42K F	1293	30-Aug-07	30-Aug-10
1296	Adapter 35WR28Kf, 26.5-40 GHz	Wiltron	35WR28K F	1296	30-Aug-07	30-Aug-10
1378	Variable Attenuator 18.0-26.5 GHz	Hewlett Packard Co	K382A	1223	15-Jul-08	15-Jul-09
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Aug-08	28-Aug-09
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	03-Sep-08	03-Sep-09
1552	Cable RF, 8 m	Alpha Wire	RG-214	1552	02-Dec-07	02-Dec-08
1566	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13094/4PE	02-Dec-07	02-Dec-08
1567	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13095/4PE	02-Dec-07	02-Dec-08
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Mar-08	03-Mar-09
2254	Cable 40 GHz, 0.8 m, blue	Rhophase Microwave Limited	KPS-1503A-800-KPS	W4907	10-Jun-08	10-Jun-09
2259	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0223	01-Jan-08	01-Jan-09
2260	Amplifier Low Noise 14-33 GHz	Sophia Wireless	LNA28-B	0233	05-Nov-07	05-Nov-08
2261	Amplifier Low Noise 33-40 GHz	Sophia Wireless	LNA38-B	0234	05-Nov-07	05-Nov-08
2387	Filter Bandpass, 8-14 GHz	Hermon Laboratories	FBP8-14	2387	05-Jun-07	05-Jun-09
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	03-Mar-08	03-Mar-09
2499	Quadruplexer 1-12 GHz (1-2 GHz; 2-4GHz;4-8 GHz; 8-12GHz)	Elettronica S.p.A. - Roma	UE 84	D/00239	08-Feb-07	08-Feb-09
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	11-Feb-08	11-Feb-09
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-07	07-May-09
2911	Cable 18 GHz, 1.5 m, SMA-SMA	Gore	NA	89386	05-Oct-08	05-Oct-09
2951	Cable, RF, 18 GHz, 0.9 m, SMA-SMA	Gore	10020014	NA	05-Oct-08	05-Oct-09

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
3176	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	0708	07-May-08	07-May-09
3178	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	0651	07-May-08	07-May-09
3179	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	0651	07-May-08	07-May-09
3180	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
3208	Cable 40GHz, 1.8 m	Gore	GOR245	05118338	01-Jan-08	01-Jan-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
3386	Microwave Cable Assembly, 26.5 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3386	12-Feb-08	12-Feb-09

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	$\pm 8\%$
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 $\pm 13.9\%$
Duty cycle, timing (Tx ON / OFF) and average factor measurements	$\pm 1.0\%$

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

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

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

10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 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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Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

47CFR part 90: 2007	Private land mobile radio services
RSS-111 issue 2:2007	Broadband Public Safety Equipment Operating in the Band 4940-4990 MHz
47CFR part 2: 2007	Frequency allocations and radio treaty matters; general rules and regulations
RSS-Gen issue 2:2007	General Requirements and Information for the Certification of Radiocommunication Equipment
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

12 APPENDIX E Test equipment correction factors

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

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

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

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

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

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

Antenna factor

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

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

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

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

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

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

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

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

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

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

No.	Frequency, MHz	Cable loss, dB	Measurement uncertainty, dB	Notes
1	0.010	0.01	±0.05	
2	0.1	0.01		
3	1	0.03		
4	10	0.12		
5	20	0.23		
6	30	0.30		
7	40	0.32		
8	50	0.34		
9	60	0.39		
10	70	0.43		
11	80	0.48		
12	90	0.50		
13	100	0.55		
14	200	0.78		
15	300	1.04		
16	400	1.16		
17	500	1.33		
18	600	1.51		
19	700	1.65		
20	800	1.77		
21	900	1.92		
22	1000	2.04		
23	1200	2.26		
24	1400	2.49		
25	1600	2.74		
26	1800	2.94		
27	2000	3.18		
28	2500	3.65		
29	2900	4.08		

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

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

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

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

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

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

Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00,
HL 2871

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.12	5750	2.34	12000	3.55
30	0.14	6000	2.39	12250	3.61
100	0.27	6250	2.46	12500	3.67
250	0.45	6500	2.52	12750	3.74
500	0.63	6750	2.58	13000	3.79
750	0.76	7000	2.64	13250	3.82
1000	0.89	7250	2.68	13500	3.83
1250	1.01	7500	2.73	13750	3.83
1500	1.12	7750	2.78	14000	3.88
1750	1.23	8000	2.83	14250	3.93
2000	1.32	8250	2.88	14500	3.96
2250	1.41	8500	2.94	14750	4.01
2500	1.49	8750	2.97	15000	4.00
2750	1.58	9000	3.02	15250	4.01
3000	1.66	9250	3.07	15500	4.00
3250	1.73	9500	3.13	15750	4.13
3500	1.80	9750	3.18	16000	4.22
3750	1.87	10000	3.21	16250	4.29
4000	1.93	10250	3.26	16500	4.29
4250	2.01	10500	3.30	16750	4.32
4500	2.06	10750	3.36	17000	4.37
4750	2.12	11000	3.39	17250	4.45
5000	2.17	11250	3.44	17500	4.49
5250	2.24	11500	3.48	17750	4.53
5500	2.29	11750	3.52	18000	4.55

Cable loss
Cable coaxial, Gore, 18 GHz, 1.5 m, SMA-SMA, S/N 89386
HL 2911

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	5750	1.32	12000	2.04
30	0.09	6000	1.34	12250	2.04
100	0.16	6250	1.41	12500	2.07
250	0.27	6500	1.43	12750	1.96
500	0.38	6750	1.46	13000	1.97
750	0.49	7000	1.49	13250	2.01
1000	0.55	7250	1.52	13500	2.04
1250	0.62	7500	1.56	13750	2.12
1500	0.68	7750	1.66	14000	2.16
1750	0.74	8000	1.69	14250	2.16
2000	0.78	8250	1.78	14500	2.28
2250	0.83	8500	1.73	14750	2.26
2500	0.88	8750	1.71	15000	2.22
2750	0.97	9000	1.72	15250	2.34
3000	1.00	9250	1.74	15500	2.41
3250	1.03	9500	1.76	15750	2.45
3500	1.05	9750	1.80	16000	2.57
3750	1.09	10000	1.89	16250	2.54
4000	1.14	10250	1.94	16500	2.55
4250	1.17	10500	1.99	16750	2.52
4500	1.21	10750	1.92	17000	2.42
4750	1.22	11000	1.96	17250	2.49
5000	1.24	11250	1.97	17500	2.62
5250	1.28	11500	2.02	17750	2.70
5500	1.30	11750	2.07	18000	2.76

Cable loss
Cable coaxial, Gore, 18 GHz, 0.9 m, SMA-SMA, S/N 10020014
HL 2951

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.07	5750	0.77	12000	1.23
30	0.06	6000	0.78	12250	1.25
100	0.09	6250	0.81	12500	1.26
250	0.15	6500	0.83	12750	1.26
500	0.21	6750	0.84	13000	1.30
750	0.27	7000	0.85	13250	1.30
1000	0.31	7250	0.88	13500	1.30
1250	0.36	7500	0.88	13750	1.29
1500	0.38	7750	0.93	14000	1.23
1750	0.42	8000	0.92	14250	1.32
2000	0.44	8250	0.94	14500	1.27
2250	0.47	8500	0.99	14750	1.27
2500	0.50	8750	0.97	15000	1.34
2750	0.52	9000	1.01	15250	1.36
3000	0.54	9250	1.05	15500	1.35
3250	0.57	9500	1.08	15750	1.36
3500	0.58	9750	1.10	16000	1.43
3750	0.61	10000	1.09	16250	1.38
4000	0.63	10250	1.09	16500	1.42
4250	0.66	10500	1.07	16750	1.49
4500	0.68	10750	1.10	17000	1.53
4750	0.70	11000	1.09	17250	1.59
5000	0.71	11250	1.09	17500	1.65
5250	0.74	11500	1.13	17750	1.82
5500	0.77	11750	1.12	18000	2.09

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

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

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
dB Ω	decibel referred to one Ohm
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NB	narrow band
NT	not tested
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PCB	printed circuit board
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

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