

# TEST REPORT

ACCORDING TO: FCC part 27: 2004  
FCC part 15: 2005 subpart B

FOR:

**Vyyo Ltd.**  
**Wireless modem**  
**Model:V284+C**

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

## Table of contents

1	Applicant information .....	3
2	Equipment under test attributes .....	3
3	Manufacturer information .....	3
4	Test details .....	3
5	Tests summary .....	4
6	EUT description .....	5
6.1	General information .....	5
6.2	Ports and lines .....	5
6.3	Support and test equipment .....	5
6.4	Operating frequencies .....	5
6.5	Changes made in the EUT .....	5
6.6	Test configuration .....	6
6.7	Transmitter characteristics .....	7
7	Transmitter characteristics .....	8
7.1	Peak output power test .....	8
7.2	RF exposure .....	13
7.3	Spurious emissions at RF antenna connector test .....	15
7.4	Radiated spurious emission measurements .....	39
7.5	Frequency stability test .....	52
7.6	Occupied bandwidth test .....	60
8	Emissions tests according to 47CFR part 15 subpart B requirements .....	68
8.1	Conducted emissions .....	68
8.2	Radiated emission measurements .....	73
8.3	Antenna power conducted measurements for receiver .....	81
9	APPENDIX A Test equipment and ancillaries used for tests .....	84
10	APPENDIX B Measurement uncertainties .....	86
11	APPENDIX C Test facility description .....	87
12	APPENDIX D Specification references .....	87
13	APPENDIX E Abbreviations and acronyms .....	88
14	APPENDIX F Test equipment correction factors .....	89

## 1 Applicant information

**Client name:** Vyyo Ltd.  
**Address:** Airport City, POB 197, Ben Gurion Airport, 70100, Israel  
**Telephone:** +972 3976 9999  
**Fax:** +972 3976 9998  
**E-mail:** hcohen@vyyo.com  
**Contact name:** Mrs. Hila Cohen

## 2 Equipment under test attributes

**Product name:** Wireless modem  
**Operating frequency range:** 710.2 – 715.75 MHz  
**Model:** V284+C  
**Serial number:** 1344348  
**Receipt date:** 10/31/2005

## 3 Manufacturer information

**Manufacturer name:** Vyyo Ltd.  
**Address:** Airport City, POB 197, Ben Gurion Airport, 70100, Israel  
**Telephone:** +972 3976 9999  
**Fax:** +972 3976 9998  
**E-Mail:** hcohen@vyyo.com  
**Contact name:** Mrs. Hila Cohen

## 4 Test details

**Project ID:** 16751  
**Location:** Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel  
**Test started:** 10/31/2005  
**Test completed:** 11/24/2005  
**Test specifications:** FCC part 27:2004  
FCC part 15: 2005 subpart B

## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
Section 27.50c(1)(i), Peak output power at RF antenna connector	Pass
Section 2.1091, RF radiation exposure evaluation	Pass
Section 27.53f, Spurious emissions RF antenna connector	Pass
Section 27.53f, Radiated spurious emissions	Pass
Section 27.54, Frequency stability	Pass
Section 2.1049, Occupied bandwidth	Pass
<b>Unintentional emissions</b>	
Section 15.107, Conducted emission at AC power port	Pass
Section 15.109, Radiated emission	Pass
Section 15.111, Antenna power conducted measurements for receiver	Pass

The test results relate only to the items tested. Pass / fail decision was based on nominal values.

**This test report replaces the previously issued test report identified by Doc ID:VYYRAD\_FCC.16751.**

	Name and Title	Date	Signature
<b>Tested by:</b>	Mr. A. Lane, test engineer	November 24, 2005	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	November 29, 2005	
<b>Approved by:</b>	Mr. M. Nikishin, EMC & Radio group leader	November 29, 2005	

## 6 EUT description

### 6.1 General information

The EUT is a broadband wireless data modem used by cable and wireless operators to deliver telephony services (T1/E1) and high-speed data connections to business and residential subscribers. The EUT operates within 710 to 716 MHz band and is powered from AC mains through a power adaptor.

### 6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length	Indoor / outdoor
		From	To					
Power	AC mains	Power adaptor	AC mains	2 pole	1	NA	NA	Indoor
Power	VDC	EUT	Power adaptor	DC jack	1	Unshielded	1.5 m	Indoor
Signal	Ethernet	EUT	Laptop	RJ 45	1	UTP Cat.5	1.5 m	Indoor
Signal	Antenna	EUT	Attenuator	F-type	1	Coax 75 Ohm	12.0 m	Outdoor
Power	AC mains	Power adaptor	AC mains	3 pole	1	Unshielded	1.5 m	Indoor
Power	VDC	Laptop	Power adaptor	DC jack	1	Unshielded	1.5 m	Indoor
Signal	Mouse	Laptop	Mouse	PS2	1	Shielded	2 m	Indoor
Signal	Parallel	Laptop	Printer	D type 25	1	Shielded	5 m	Indoor

### 6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
E1/T1 Broadband hub	Vyyo	V3000	5036408
Laptop	COMPAQ	presario 2500	CNF4021N5Y
Up/Down converter	Vyyo	UDC	NA
Mouse	Microsoft	Mouse 2.1A	03306271
Printer	Epson	LX-810	44B1127035
Power adaptor for EUT	DEER Computer	A02512G	NA
Power adaptor for laptop	COMPAQ	PPP0122	3ZD1196002
PC	AAV System	NA	16832
Monitor	Belinea	103020	AA1030200044 AC80302840
Keyboard	Quantum	KWD-840	OD16100775
Mouse	Logitech	M-S48a	LZA95210998

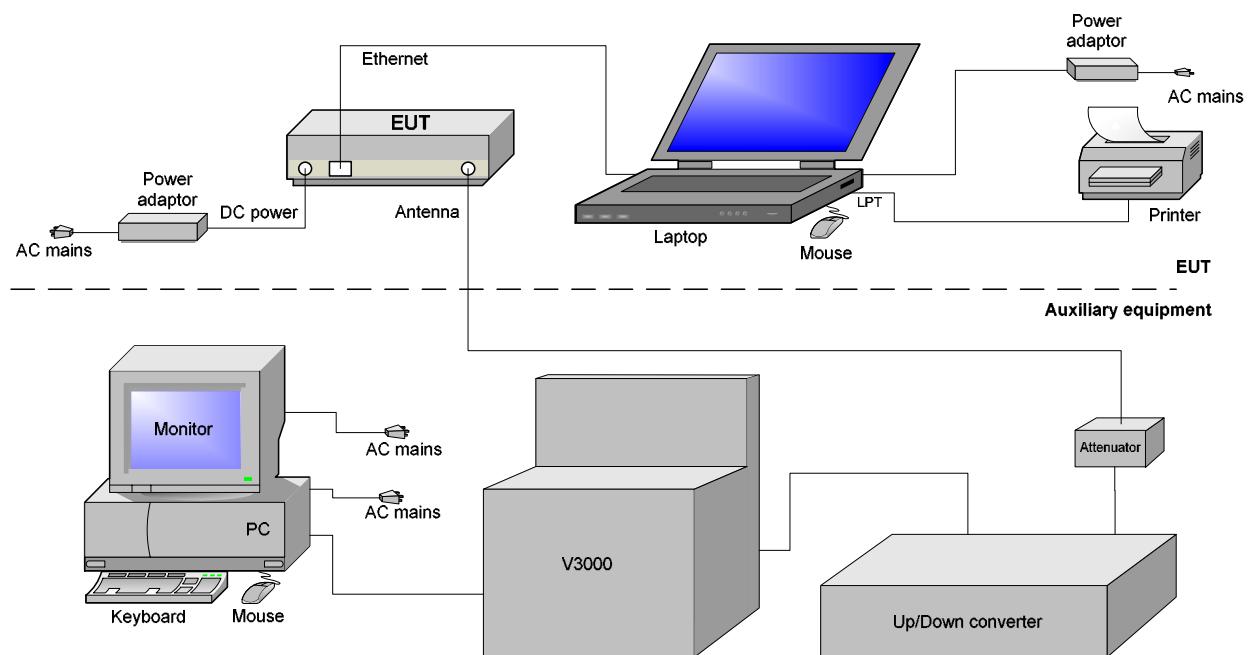
### 6.4 Operating frequencies

Source	Frequency, MHz		
Receiver	669.0 (LO)	44.0 (IF)	743.0-745.125 (Rx)
Transmitter	13.0 (VCTXO)	44.0 (IF)	710.2-715.75 (Tx)

### 6.5 Changes made in the EUT

No changes were implemented.

## 6.6 Test configuration



## 6.7 Transmitter characteristics

Type of equipment									
<input checked="" type="checkbox"/>	Stand-alone (Equipment with or without its own control provisions)								
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)								
	Plug-in card (Equipment intended for a variety of host systems)								
Intended use	Condition of use								
fixed	Always at a distance more than 2 m from all people								
<input checked="" type="checkbox"/>	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		710.0 – 716.0 MHz							
Operating frequency range		710.4 – 715.6 MHz							
Maximum rated output power		At transmitter 50 Ω RF output connector			27.8 dBm				
		Effective radiated power (for equipment with no RF connector)			NA dBm				
Is transmitter output power variable?		No							
		continuous variable							
		<input checked="" type="checkbox"/>	stepped variable with stepsize						
		X	0.25 dB						
			minimum RF power						
			-11.0 dBm						
			maximum RF power						
			+27.8 dBm						
Antenna connection									
unique coupling	<input checked="" type="checkbox"/>	standard F-type connector	integral	with temporary RF connector					
				without temporary RF connector					
Antenna/s technical characteristics									
Type	Manufacturer		Model number	Gain					
Yagi	Shenglu		TDJ-700B12G13.5	13.5 dBi					
Transmitter 99% power bandwidth									
200 / 400 / 800 / 1600 / 3200 kHz									
Type of multiplexing									
TDMA									
Modulating test signal (baseband)									
PRBS									
Maximum transmitter duty cycle in normal use									
50 %									
Transmitter duty cycle supplied for test									
50 %									
Transmitter power source									
Battery	Nominal rated voltage		VDC	Battery type					
DC	Nominal rated voltage		VDC						
<input checked="" type="checkbox"/>	AC mains	Nominal rated voltage		120 VAC	Frequency 60 Hz				
Common power source for transmitter and receiver									
			<input checked="" type="checkbox"/>	yes	no				
Type of modulation	Modulation states (constellation)	Payload bit rate	Symbol (baud) rate	RF channel spacing	Frequency channel				
					Low	Mid	High		
QAM	16	0.64 Mbps	0.16 Msps	200 kHz	710.3	713.0	715.75		
QPSK	4	0.32 Mbps	0.16 Msps	200 kHz	710.2	713.0	715.6		
QAM	16	1.28 Mbps	0.32 Msps	400 kHz	710.5	713.0	715.5		
QPSK	4	0.64 Mbps	0.32 Msps	400 kHz	710.5	713.0	715.6		
QAM	16	2.56 Mbps	0.64 Msps	800 kHz	710.5	713.0	715.55		
QPSK	4	1.28 Mbps	0.64 Msps	800 kHz	710.5	713.0	715.55		
QAM	16	5.12 Mbps	1.28 Msps	1600 kHz	710.8	713.0	715.2		
QPSK	4	2.56 Mbps	1.28 Msps	1600 kHz	710.8	713.0	715.2		
QAM	16	10.24 Mbps	2.56 Msps	3200 kHz	711.6	713.0	714.4		
QPSK	4	5.12 Mbps	2.56 Msps	3200 kHz	711.6	713.0	714.4		

<b>Test specification:</b>	<b>Section 27.50c(1)(i), Peak output power at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 39 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 7 Transmitter characteristics

### 7.1 Peak output power test

#### 7.1.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.1.1. The test results are provided in Table 7.1.2 and the associated plots.

**Table 7.1.1 Peak output power limits**

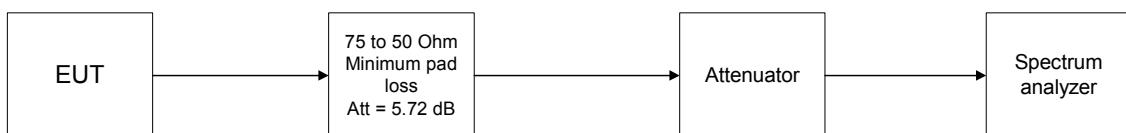
Assigned frequency range, MHz	Maximum peak output power*	
	W	dBm
710.0 – 716.0	2.198	33.42

\* The peak output power limit was calculated by subtracting of antenna gain in dBd from maximum allowed ERP 44.77 dBm (30 W).

#### 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 spectrum analyzer as provided in Table 7.1.2 and associated plots.

**Figure 7.1.1 Peak output power test setup**



<b>Test specification:</b>	<b>Section 27.50c(1)(i), Peak output power at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 39 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.1.2 Peak output power test results

ASSIGNED FREQUENCY RANGE: 710.0 – 716.0 MHz  
 DETECTOR USED: AVERAGE RMS  
 RESOLUTION BANDWIDTH: 3000 kHz  
 VIDEO BANDWIDTH: 3000 kHz  
 MODULATION: QPSK  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 0.32 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	RF output power, dBm	Limit, dBm	Margin, dB	Verdict
710.2	27.08	Included		27.08	33.42	-6.34	Pass
713.0	27.77	Included		27.77	33.42	-5.65	Pass
715.8	27.29	Included		27.29	33.42	-6.13	Pass

ASSIGNED FREQUENCY RANGE: 710.0 – 716.0 MHz  
 DETECTOR USED: AVERAGE RMS  
 RESOLUTION BANDWIDTH: 3000 kHz  
 VIDEO BANDWIDTH: 3000 kHz  
 MODULATION: 16QAM  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 0.64 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	RF output power, dBm	Limit, dBm	Margin, dB	Verdict
710.3	27.15	Included		27.15	33.42	-6.27	Pass
713.0	27.24	Included		27.24	33.42	-6.18	Pass
715.8	27.01	Included		27.01	33.42	-6.41	Pass

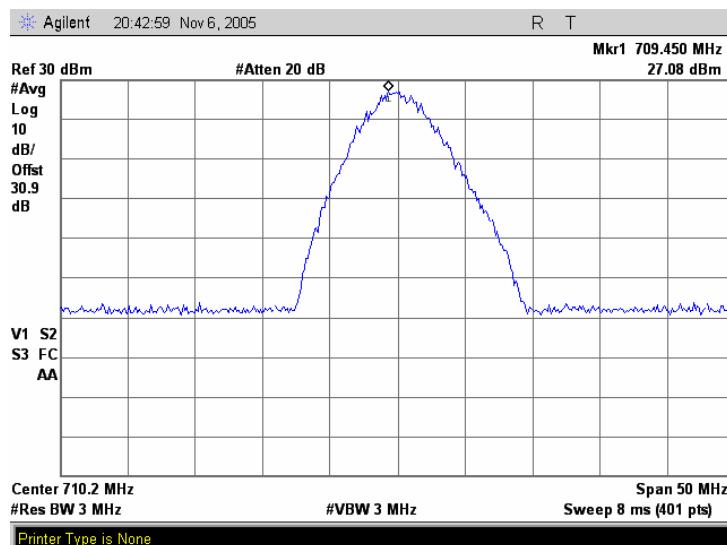
## Reference numbers of test equipment used

HL 2399	HL 2524	HL 2780					
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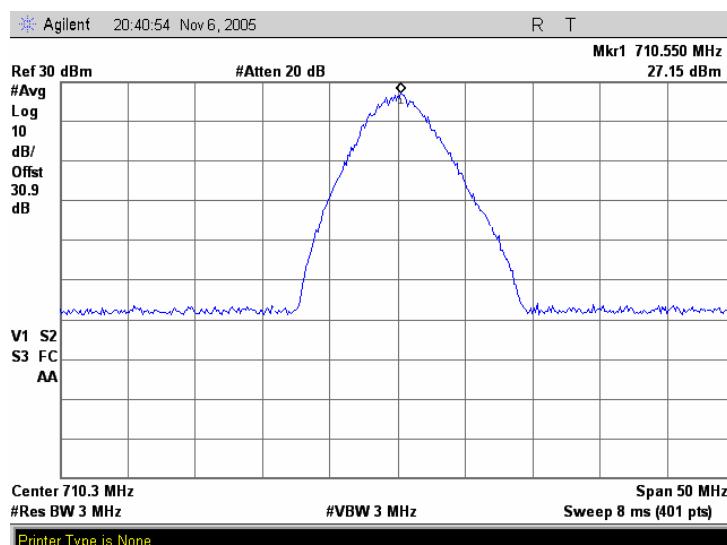
Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 27.50c(1)(i), Peak output power at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 39 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.1.1 Peak output power test results at low frequency QPSK**

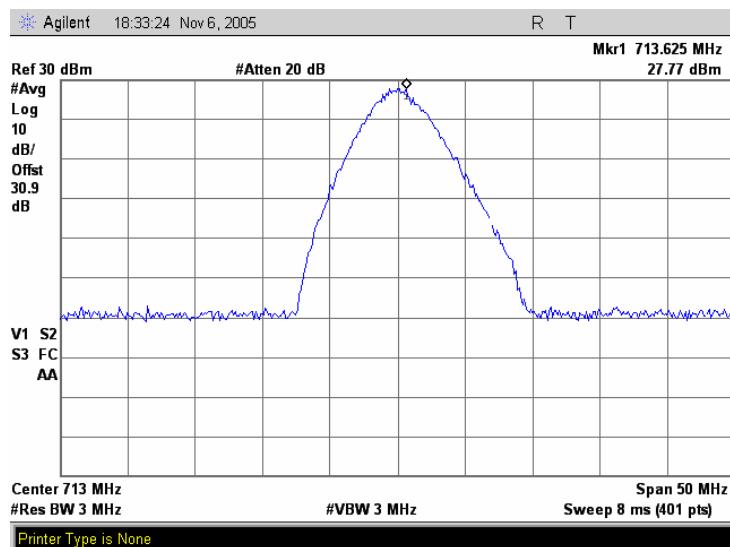


**Plot 7.1.2 Peak output power test results at low frequency 16QAM**

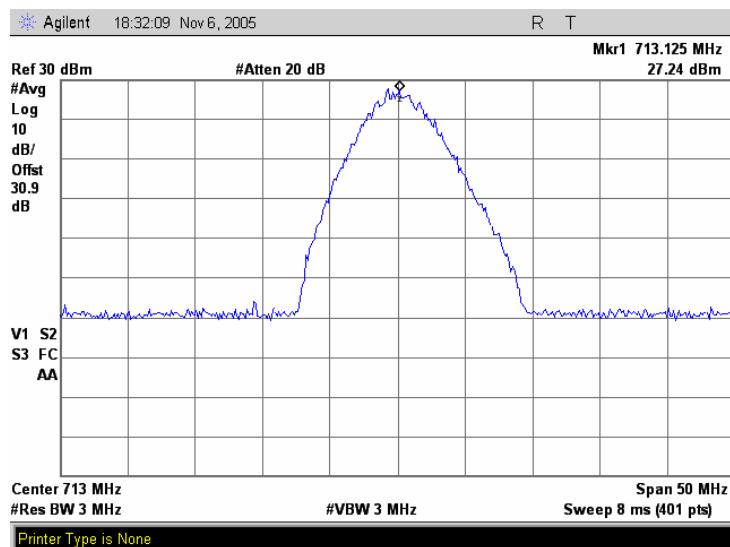


<b>Test specification:</b>	<b>Section 27.50c(1)(i), Peak output power at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 39 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.1.3 Peak output power test results at mid frequency QPSK**

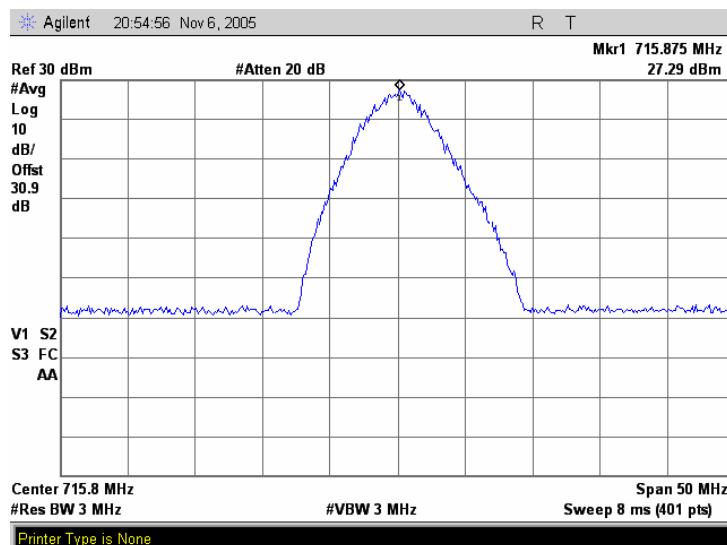


**Plot 7.1.4 Peak output power test results at mid frequency 16QAM**

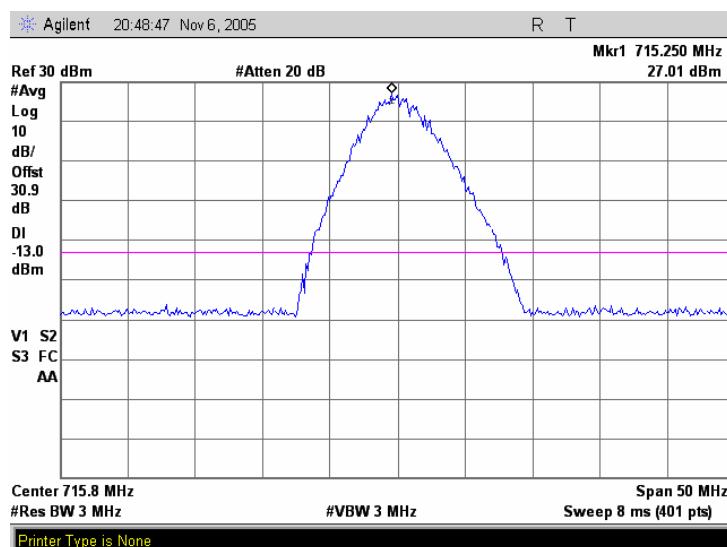


<b>Test specification:</b>	<b>Section 27.50c(1)(i), Peak output power at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 22 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 39 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.1.5 Peak output power test results at high frequency QPSK**



**Plot 7.1.6 Peak output power test results at high frequency 16QAM**



<b>Test specification:</b>	<b>Section 2.1091, RF radiation exposure evaluation</b>		
<b>Test procedure:</b>	47 CFR, Section 1.1307(b)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005	<b>Relative Humidity:</b>	40 %
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Power Supply:</b> 120 VAC	
<b>Remarks:</b>			

## 7.2 RF exposure

### 7.2.1 General

This test was performed to determine the minimum safe distance between the transmitter antenna and human to avoid public exposure in excess of limits for general population (uncontrolled exposure). Specification test limits are given in Table 7.2.1.

Table 7.2.1 RF exposure limits

Frequency range, MHz	Power density*		Electric field strength**, V/m
	mW/cm <sup>2</sup>	W/m <sup>2</sup>	
710.2	0.47	4.7	42.1
715.75	0.47	4.7	42.1

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

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

### 7.2.2 Test procedure

- 7.2.2.1 The EUT, connected to the antenna providing the maximum directional gain, was set up as shown in .
- 7.2.2.2 The E-field probe was pointed to the EUT antenna zero azimuth at a 3 m distance, the maximum field strength reading was recorded in Table 7.2.2.
- 7.2.2.3 The E-field probe was slowly moved toward the EUT until E-field equivalent to the maximum permitted power density was measured.
- 7.2.2.4 The obtained antenna to probe distance was recorded in Table 7.2.2 as a minimum separation distance.
- 7.2.2.5 The test was repeated at the rest of test distances according to Table 7.2.2.

Table 7.2.2 Maximum permissible exposure (MPE) measurement

Test distance, m	Field strength, V/m	Equivalent power density, $\text{mW/cm}^2$	Limit, $\text{mW/cm}^2$	Margin, $\text{mW/cm}^2$	Verdict
3.0	0.8	0.00016976	0.47	-0.46983	Pass
2.5	1.6	0.00067905	0.47	-0.46932	Pass
2.0	2.3	0.00140318	0.47	-0.46860	Pass
1.5	3.1	0.00254907	0.47	-0.46745	Pass
1.0	3.2	0.00271618	0.47	-0.46728	Pass
0.5	5.2	0.00717241	0.47	-0.46283	Pass
0.4	6.5	0.01120690	0.47	-0.45879	Pass
0.3	7.1	0.01337135	0.47	-0.45663	Pass
0.2	7.8	0.01613793	0.47	-0.45386	Pass
0.1	8.5	0.01916446	0.47	-0.45084	Pass
0.05	9.1	0.02196552	0.47	-0.44803	Pass

\* - Equivalent power density was calculated from electric field strength as follows:  $S = 0.1 \times E^2 / (120 \times \pi)$ , where E is electric field strength in V/m and S is power density in  $\text{mW/cm}^2$

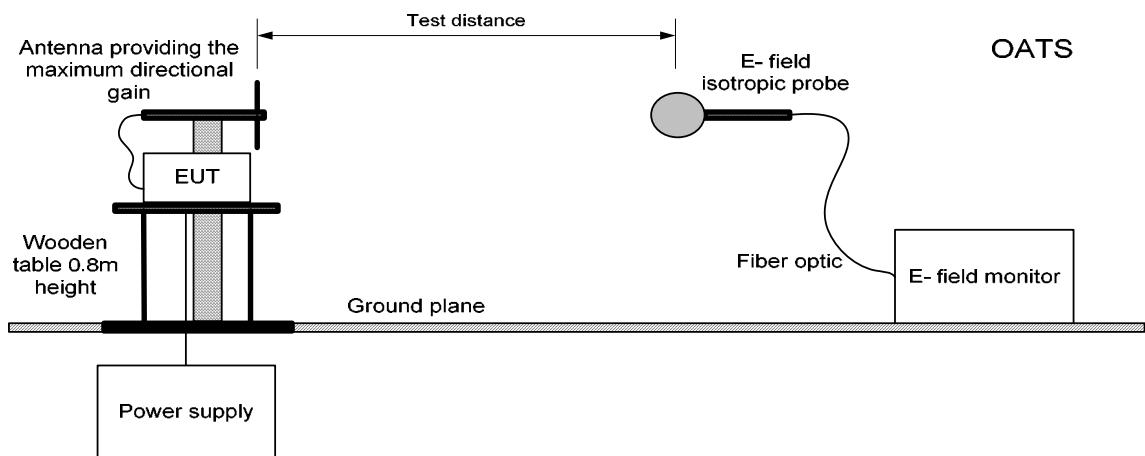
### Reference numbers of test equipment used

HL 0613	HL 1629					
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Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 2.1091, RF radiation exposure evaluation</b>		
<b>Test procedure:</b>	47 CFR, Section 1.1307(b)		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Figure 7.2.1 Maximum permissible exposure (MPE) measurement setup**



<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

### 7.3 Spurious emissions at RF antenna connector test

#### 7.3.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.3.1. The test results are provided in Table 7.3.2 and associated plots.

Table 7.3.1 Spurious emission limits

Frequency, MHz*	Attenuation below carrier, dBc	Spurious emissions, dBm
0.009 – 10 <sup>th</sup> harmonic	43+10logP*	-13

\* - P is transmitter output power in Watts.

#### 7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

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

7.3.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.3.2 and associated plots.

Figure 7.3.1 Spurious emission test setup



<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Table 7.3.2 Spurious emission test results**

ASSIGNED FREQUENCY RANGE: 710.0 – 716.0 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 7500 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: QPSK  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 0.32 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Bit rate, Mbps	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
<b>Low channel</b>						
0.009 - 1000			More than 20 dB below limit			Pass
1420.217	0.32	100	-34.29	-13.00	-21.29	Pass
2130.267	0.32	100	-34.10	-13.00	-21.10	Pass
<b>High channel</b>						
0.009 - 1000			More than 20 dB below limit			Pass
1431.805	0.32	100	-28.62	-13.00	-15.62	Pass
2147.670	0.32	100	-32.88	-13.00	-19.88	Pass

\*- Margin = Spurious emission – specification limit.

ASSIGNED FREQUENCY RANGE: 710.0 – 716.0 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 7500 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: 16QAM  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 0.64 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Bit rate, Mbps	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
<b>Low channel</b>						
0.009 - 1000			More than 20 dB below limit			Pass
1420.195	0.64	100	-34.78	-13.00	-21.78	Pass
2130.025	0.64	100	-31.56	-13.00	-18.56	Pass
<b>High channel</b>						
0.009 - 1000			More than 20 dB below limit			Pass
1431.822	0.64	100	-28.25	-13.00	-15.25	Pass
2147.645	0.64	100	-32.87	-13.00	-19.87	Pass

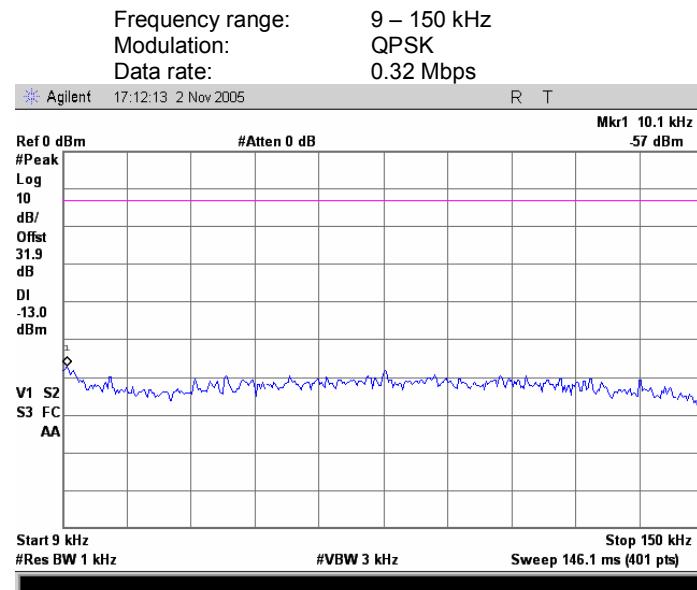
**Reference numbers of test equipment used**

HL 2399	HL 2524	HL 2780				
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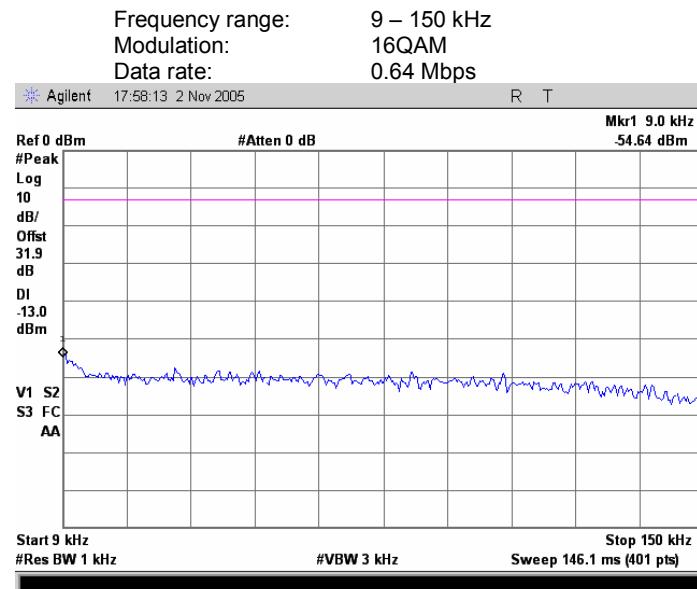
Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.1 Spurious emission measurements at RF antenna connector, low channel**

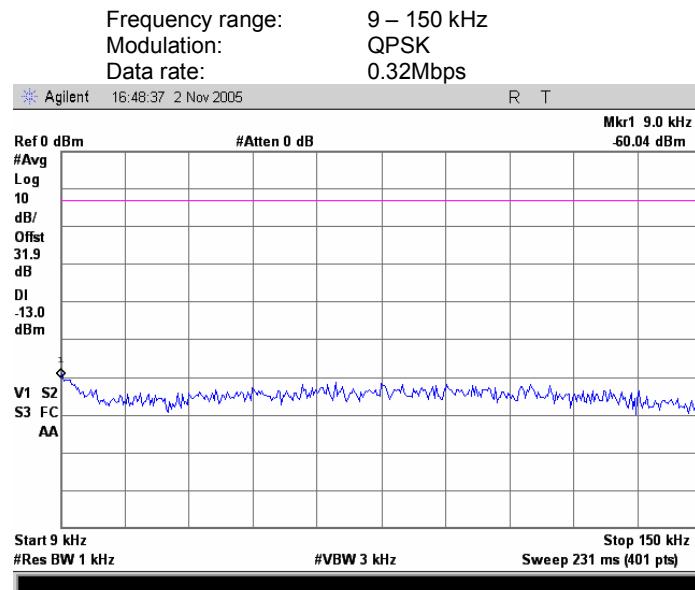


**Plot 7.3.2 Spurious emission measurements at RF antenna connector, low channel**

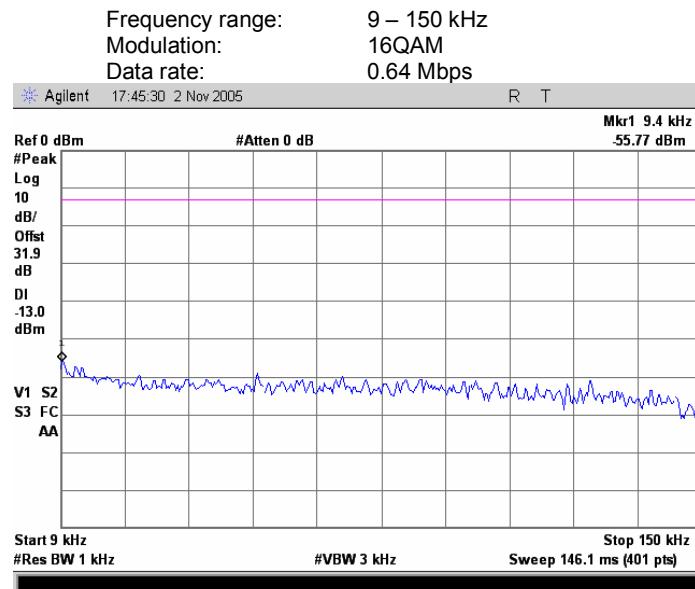


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.3 Spurious emission measurements at RF antenna connector, high channel**

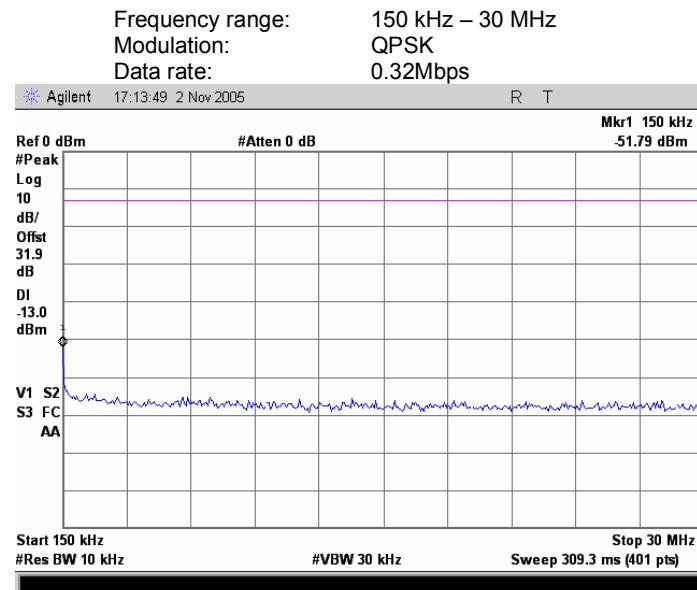


**Plot 7.3.4 Spurious emission measurements at RF antenna connector, high channel**

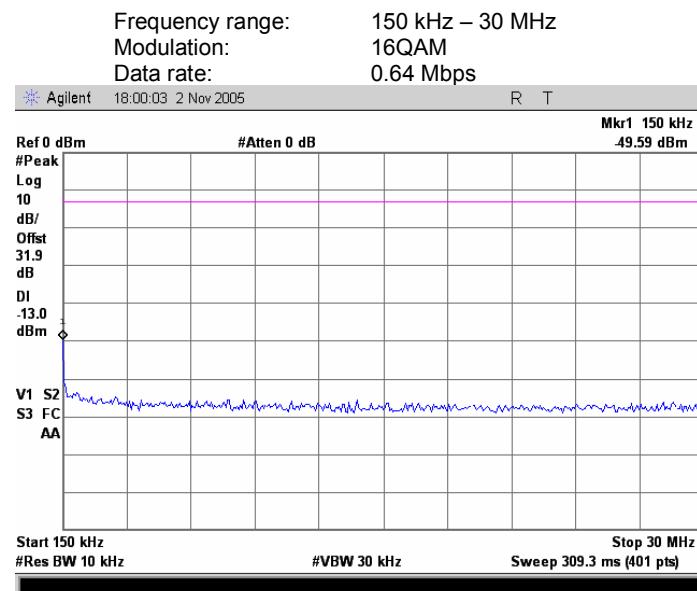


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.5 Spurious emission measurements at RF antenna connector, low channel**

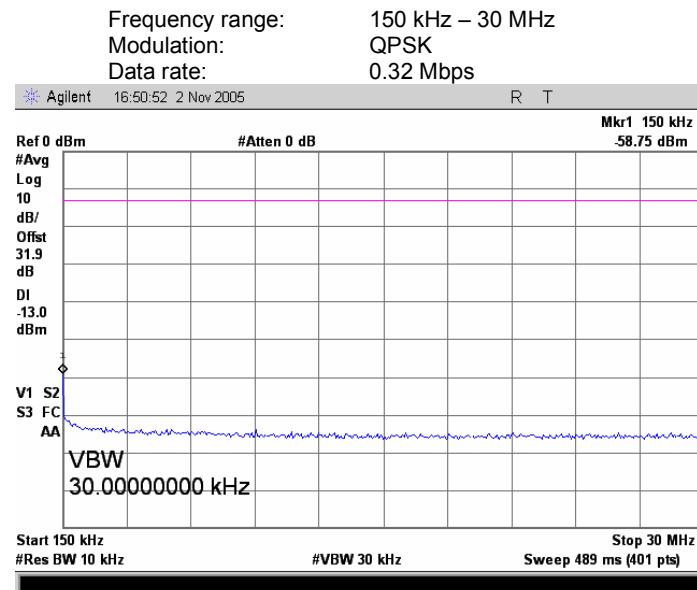


**Plot 7.3.6 Spurious emission measurements at RF antenna connector, low channel**

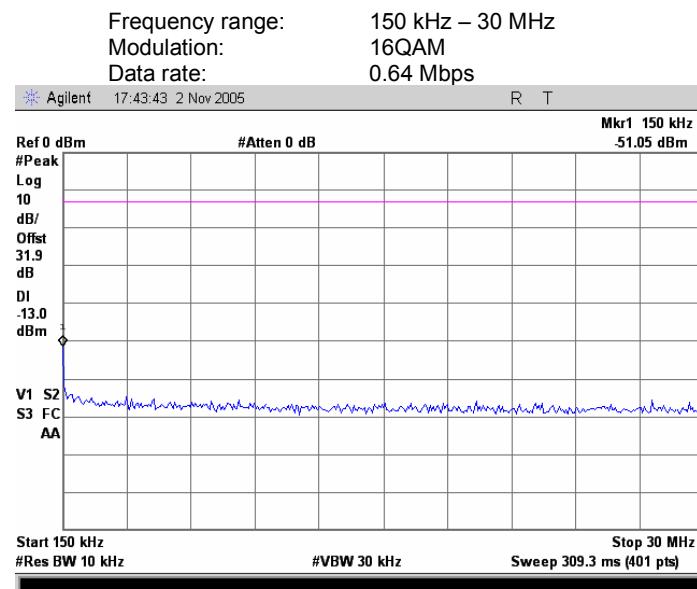


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.7 Spurious emission measurements at RF antenna connector, high channel**

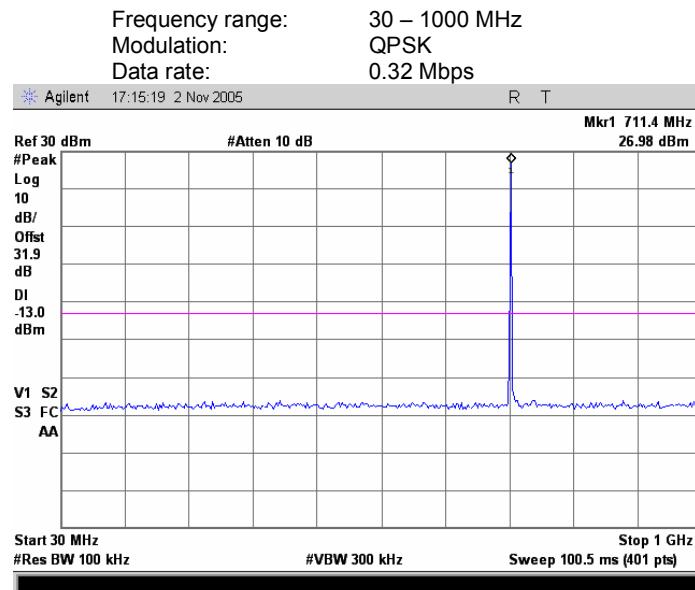


**Plot 7.3.8 Spurious emission measurements at RF antenna connector, high channel**

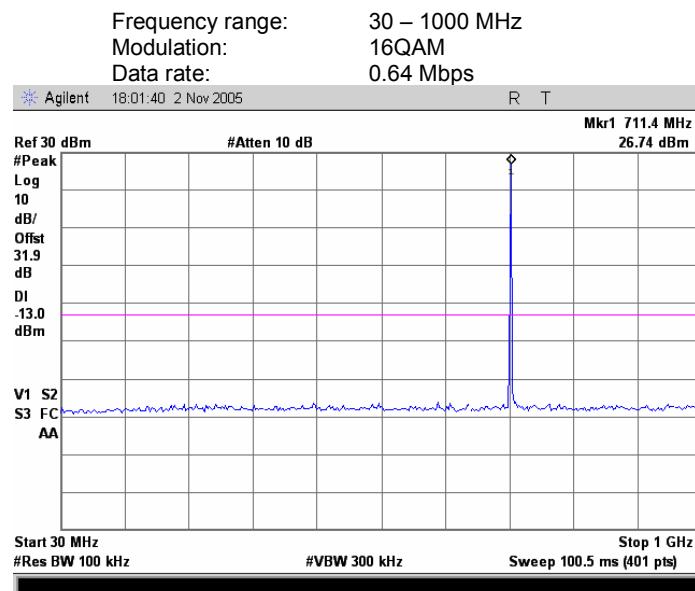


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.9 Spurious emission measurements at RF antenna connector, low channel**

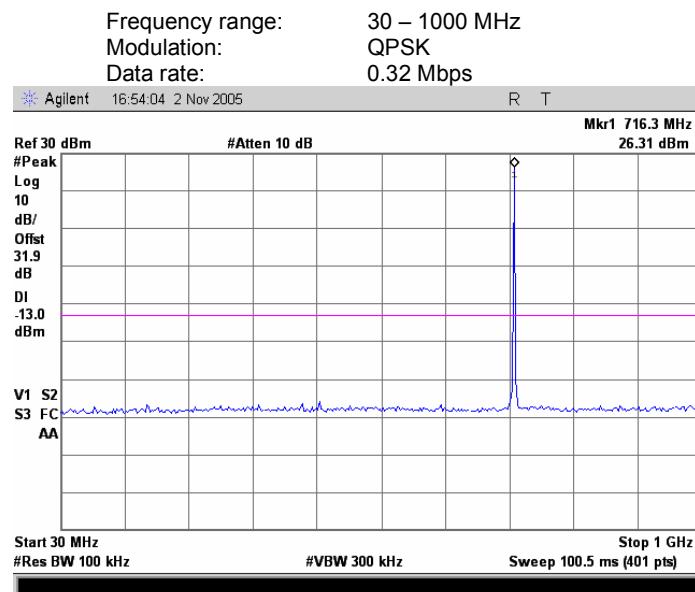


**Plot 7.3.10 Spurious emission measurements at RF antenna connector, low channel**

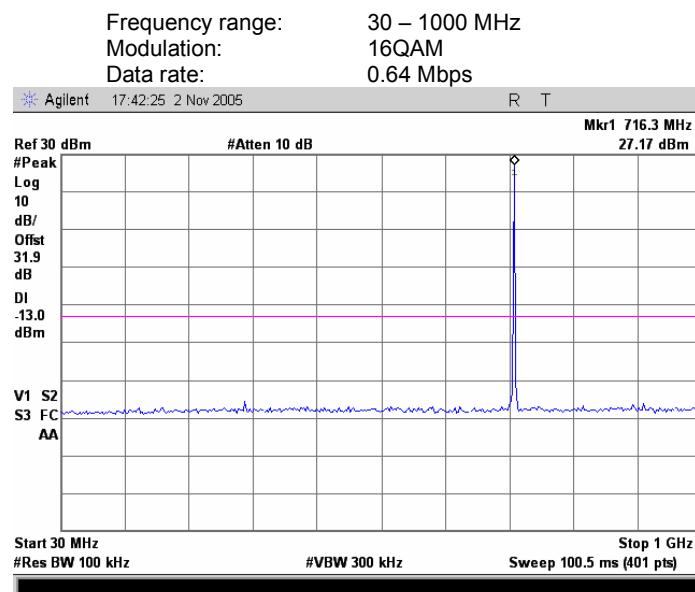


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.11 Spurious emission measurements at RF antenna connector, high channel**

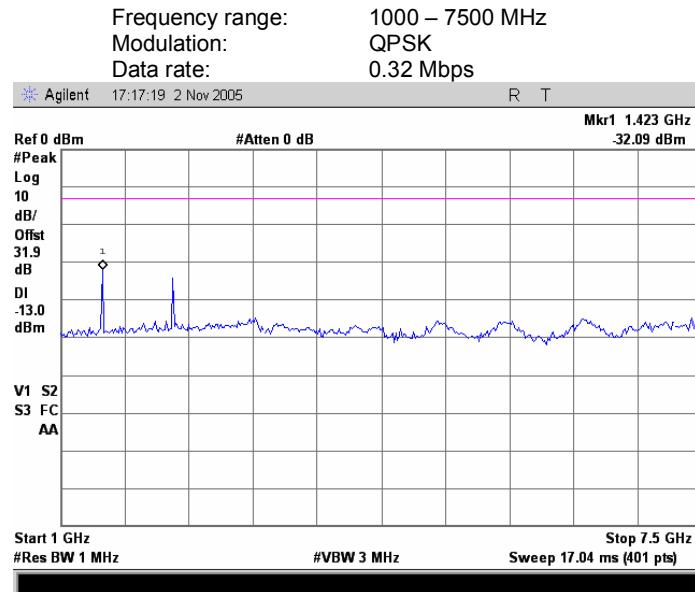


**Plot 7.3.12 Spurious emission measurements at RF antenna connector, high channel**

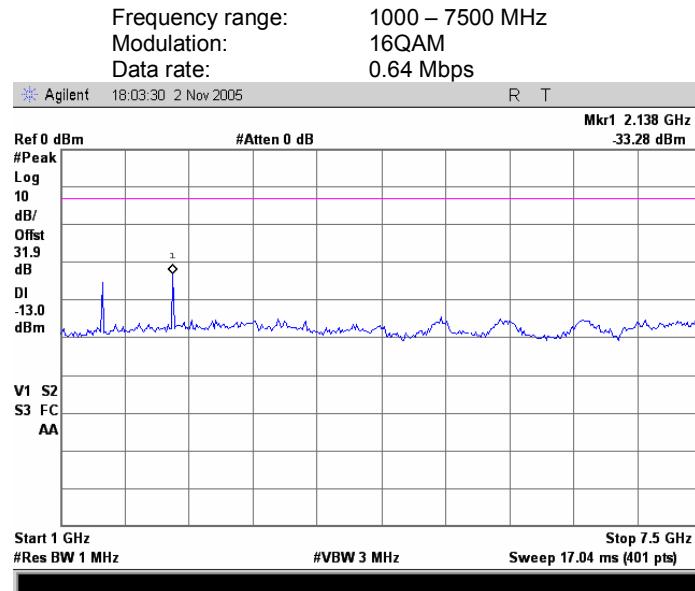


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.13 Spurious emission measurements at RF antenna connector, low channel**

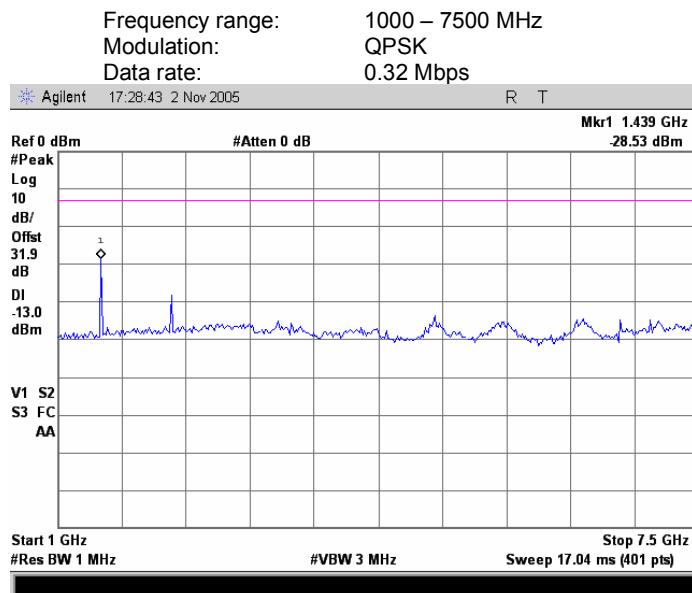


**Plot 7.3.14 Spurious emission measurements at RF antenna connector, low channel**

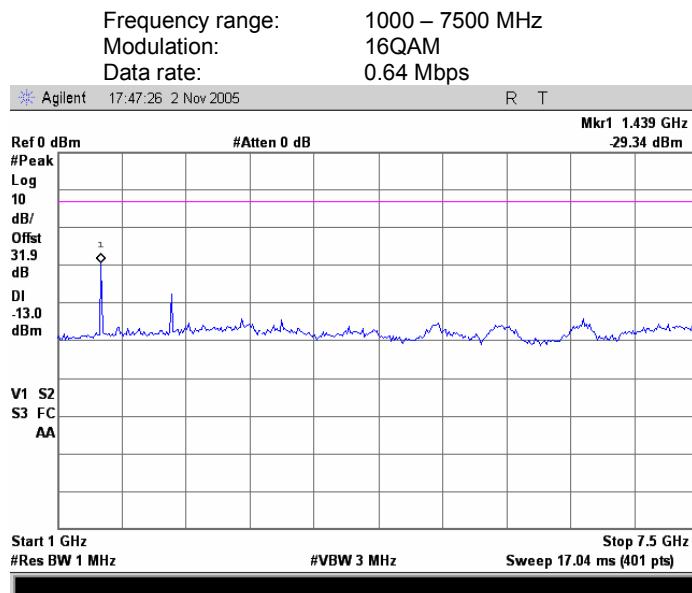


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.15 Spurious emission measurements at RF antenna connector, high channel**



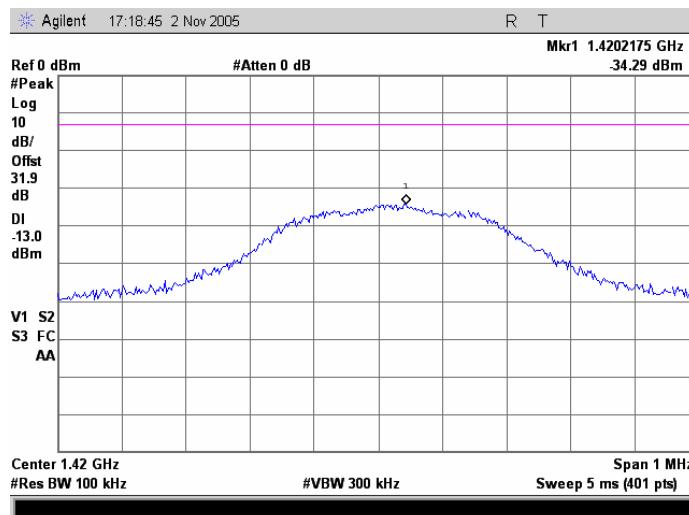
**Plot 7.3.16 Spurious emission measurements at RF antenna connector, high channel**



<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

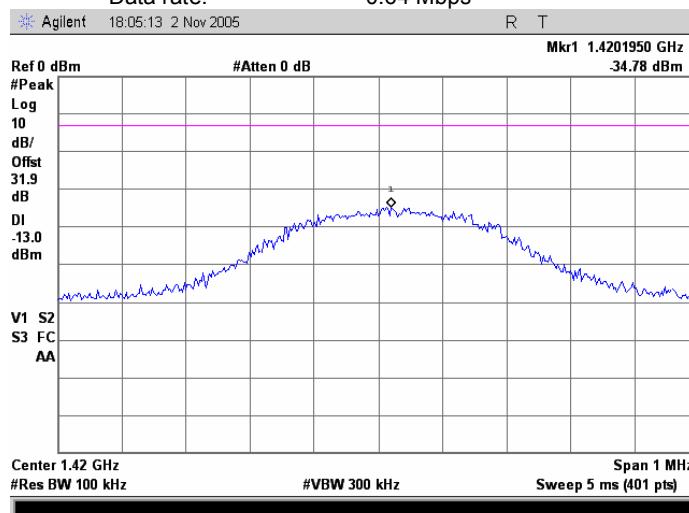
**Plot 7.3.17 Spurious emission measurements at RF antenna connector, the 2<sup>nd</sup> harmonic of the low channel**

Carrier frequency: 710.1 MHz  
Modulation: QPSK  
Data rate: 0.32Mbps



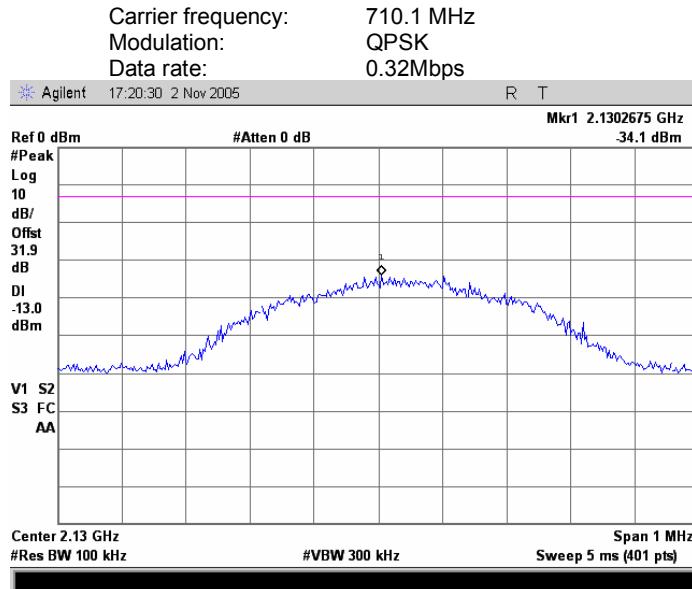
**Plot 7.3.18 Spurious emission measurements at RF antenna connector, the 2<sup>nd</sup> harmonic of the low channel**

Carrier frequency: 710.1 MHz  
Modulation: 16QAM  
Data rate: 0.64 Mbps

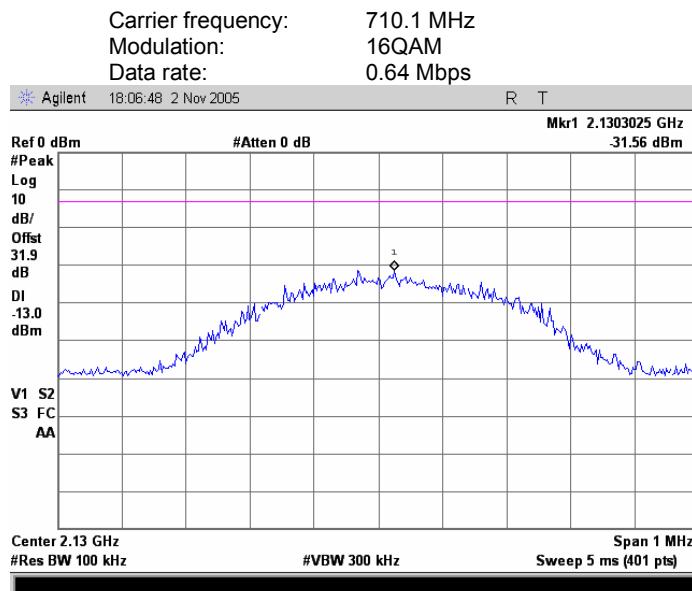


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.19 Spurious emission measurements at RF antenna connector, the 3<sup>rd</sup> harmonic of the low channel**

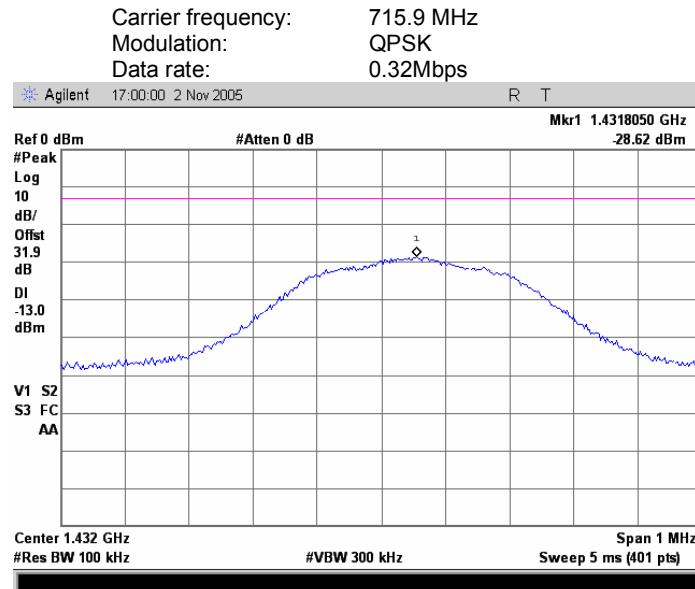


**Plot 7.3.20 Spurious emission measurements at RF antenna connector, the 3<sup>rd</sup> harmonic of the low channel**

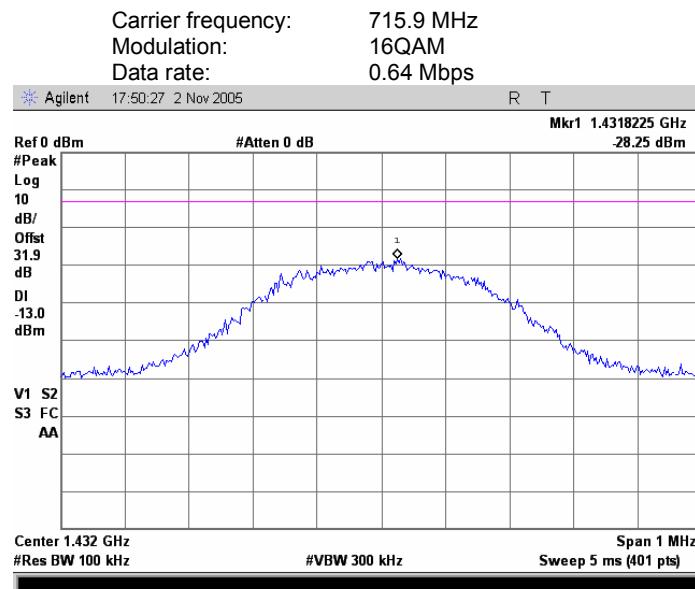


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.21 Spurious emission measurements at RF antenna connector, the 2<sup>nd</sup> harmonic of the high channel**

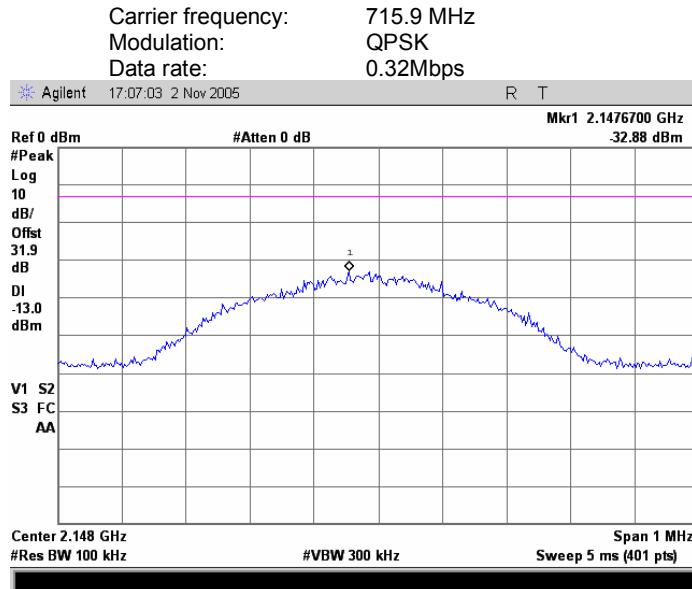


**Plot 7.3.22 Spurious emission measurements at RF antenna connector, the 2<sup>nd</sup> harmonic of the high channel**

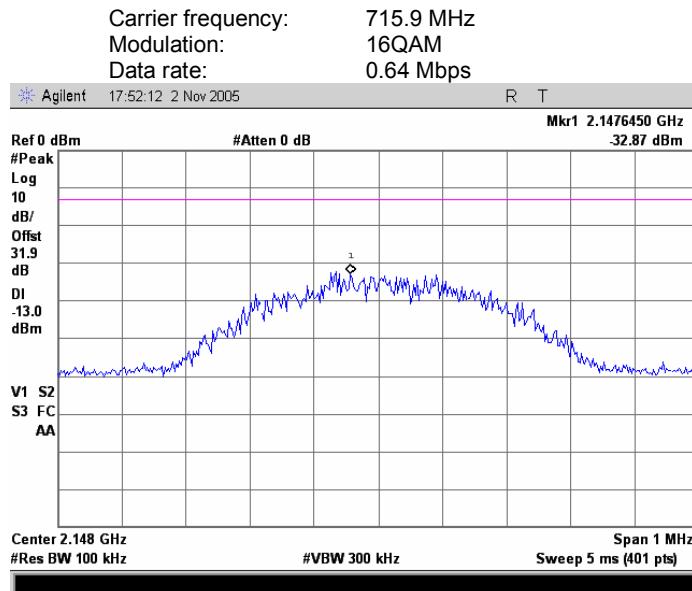


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.23 Spurious emission measurements at RF antenna connector, the 3<sup>rd</sup> harmonic of the high channel**

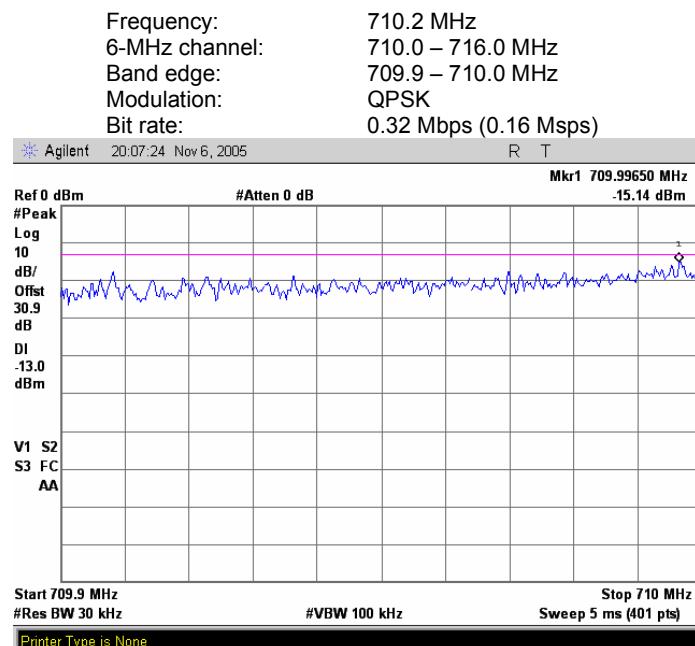


**Plot 7.3.24 Spurious emission measurements at RF antenna connector, the 3<sup>rd</sup> harmonic of the high channel**

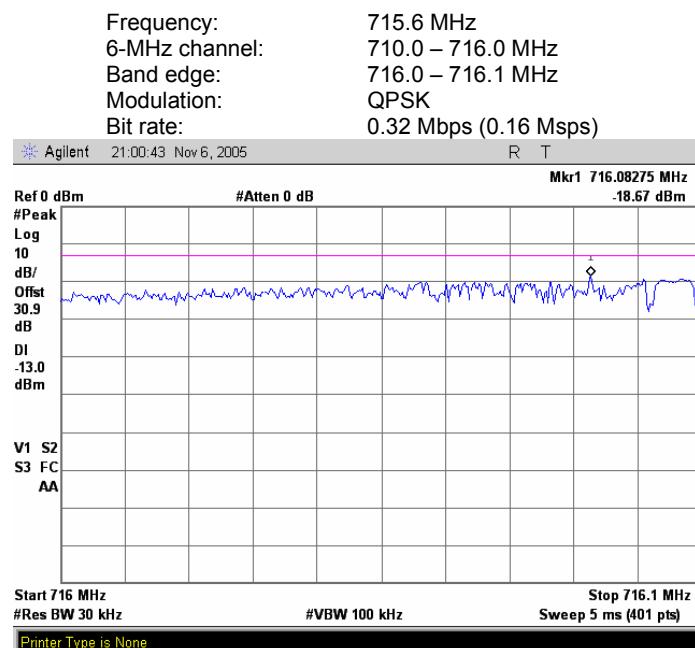


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

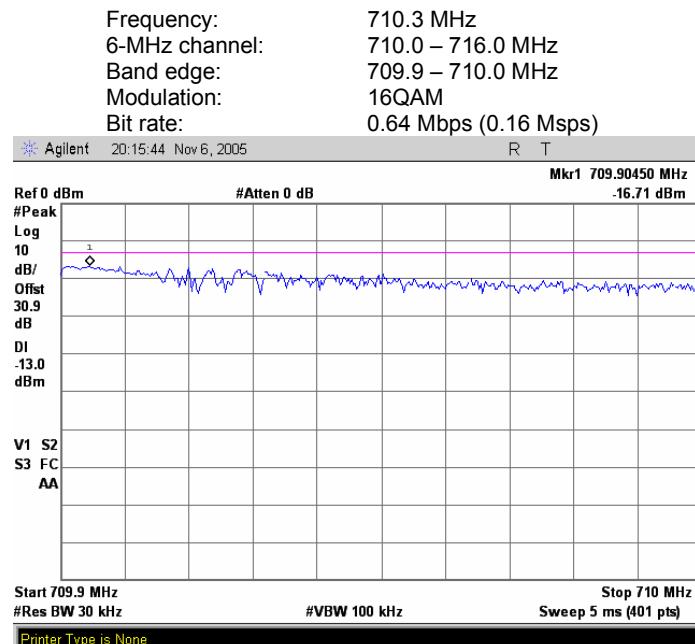
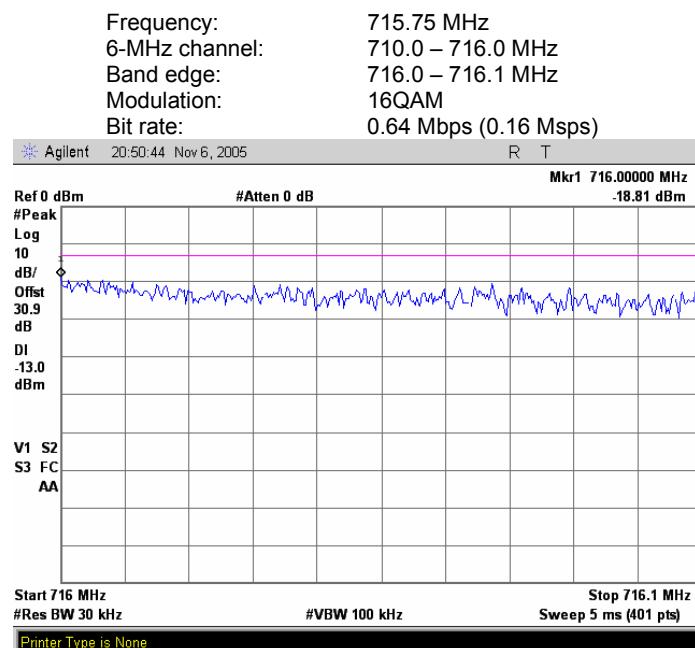
**Plot 7.3.25 Spurious emissions at RF antenna connector, low channel band edge measurements**



**Plot 7.3.26 Spurious emissions at RF antenna connector, high channel band edge measurements**

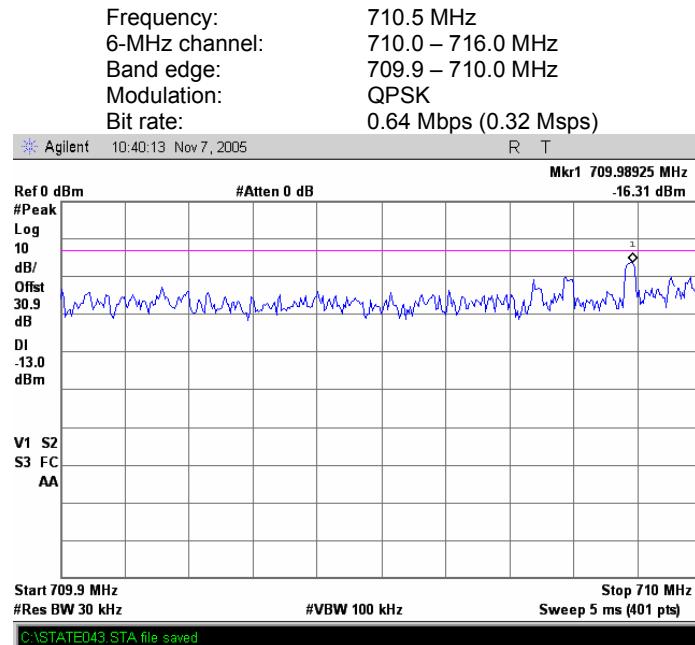


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

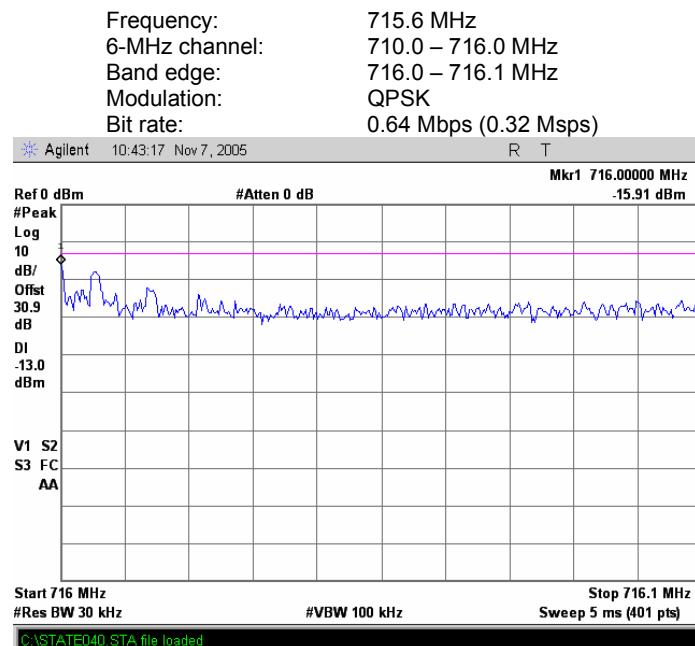
**Plot 7.3.27 Spurious emissions at RF antenna connector, low channel band edge measurements**

**Plot 7.3.28 Spurious emissions at RF antenna connector, high channel band edge measurements**


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.29 Spurious emissions at RF antenna connector, low channel band edge measurements**

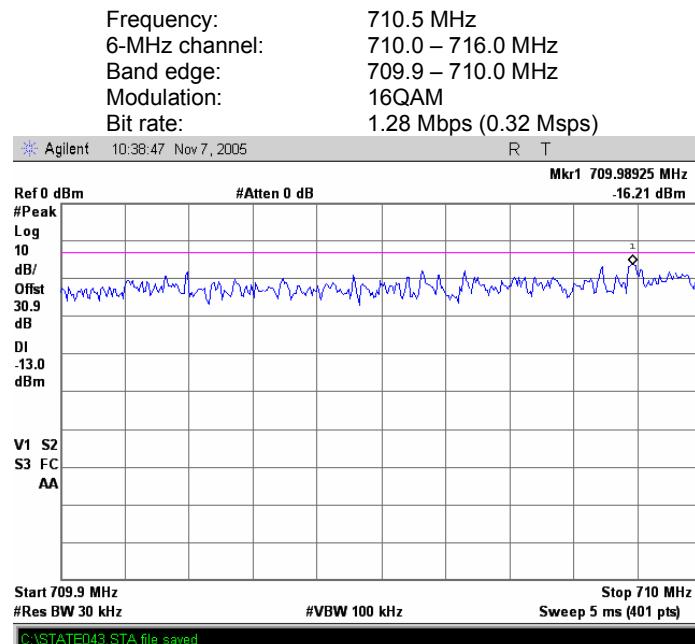


**Plot 7.3.30 Spurious emissions at RF antenna connector, high channel band edge measurements**

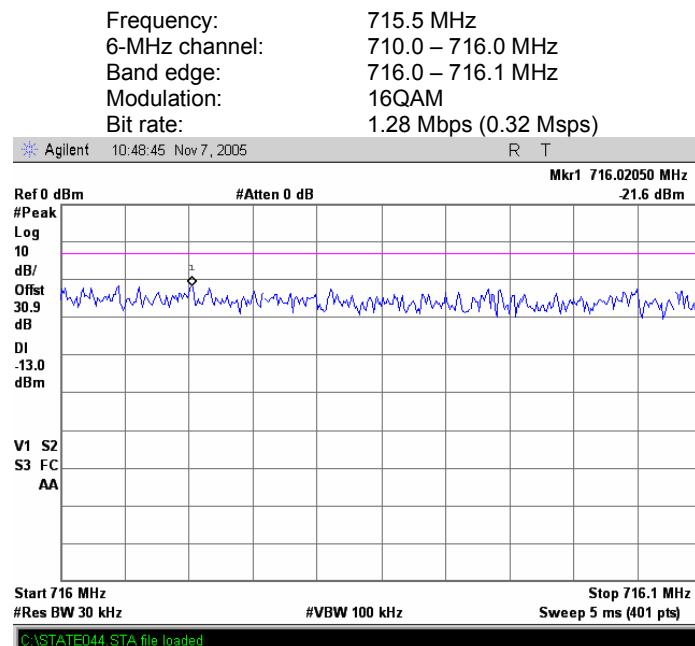


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.31 Spurious emissions at RF antenna connector, low channel band edge measurements**

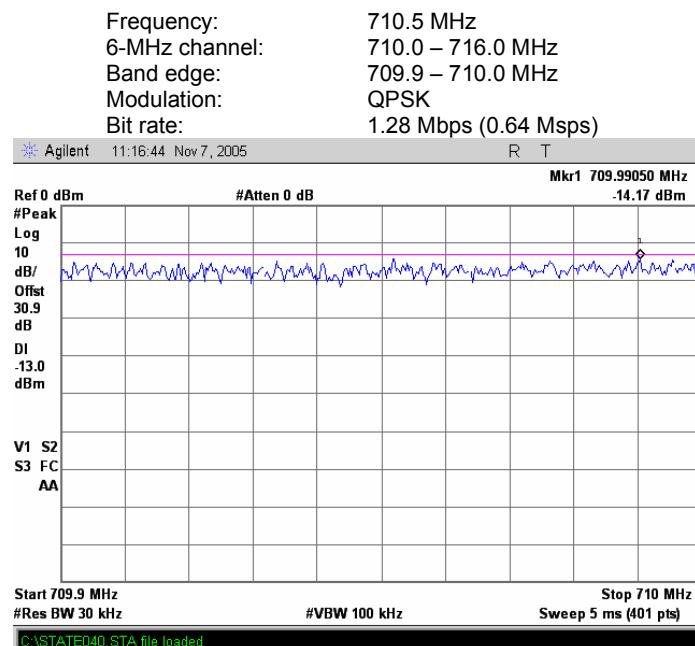


**Plot 7.3.32 Spurious emissions at RF antenna connector, high channel band edge measurements**

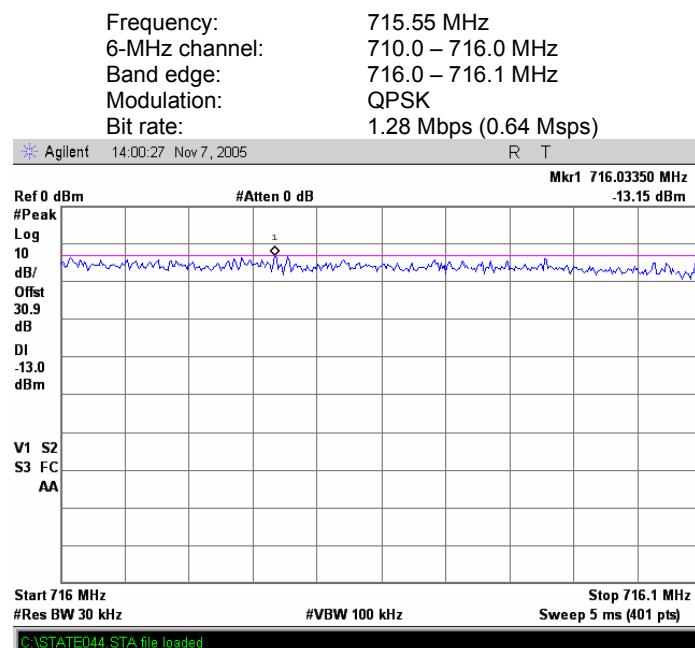


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.33 Spurious emissions at RF antenna connector, low channel band edge measurements**

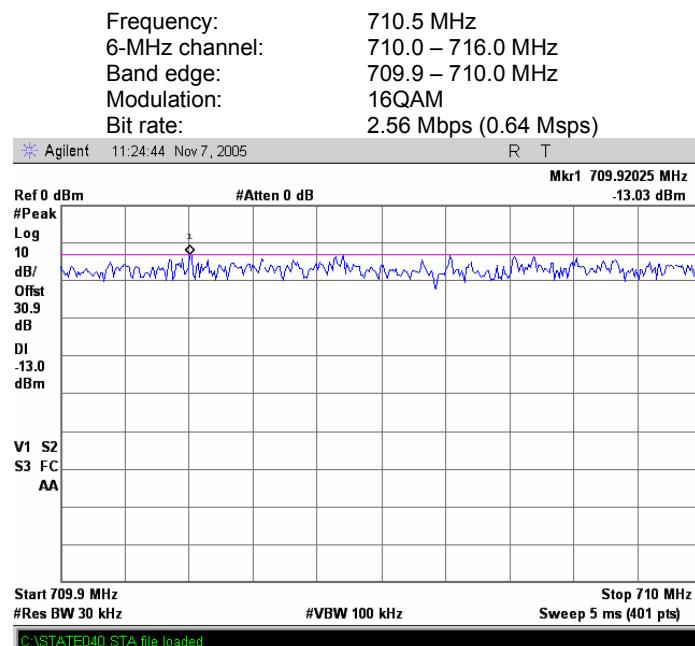


**Plot 7.3.34 Spurious emissions at RF antenna connector, high channel band edge measurements**

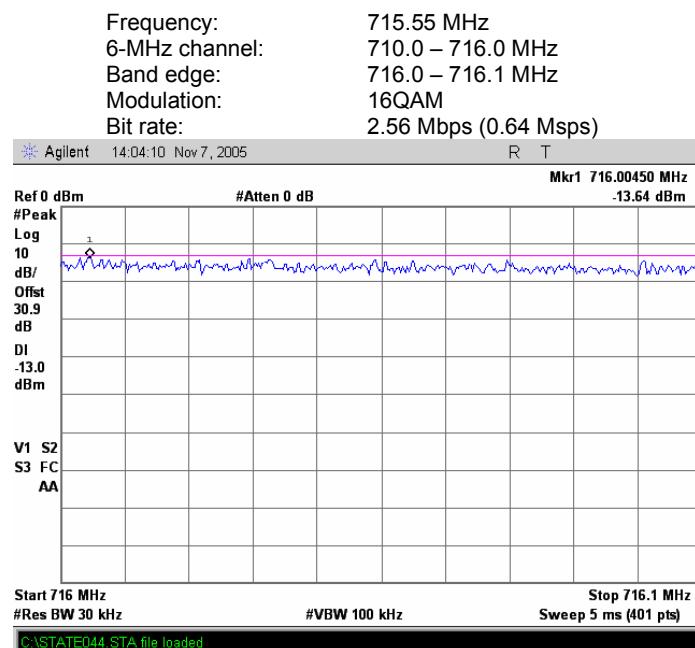


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.35 Spurious emissions at RF antenna connector, low channel band edge measurements**

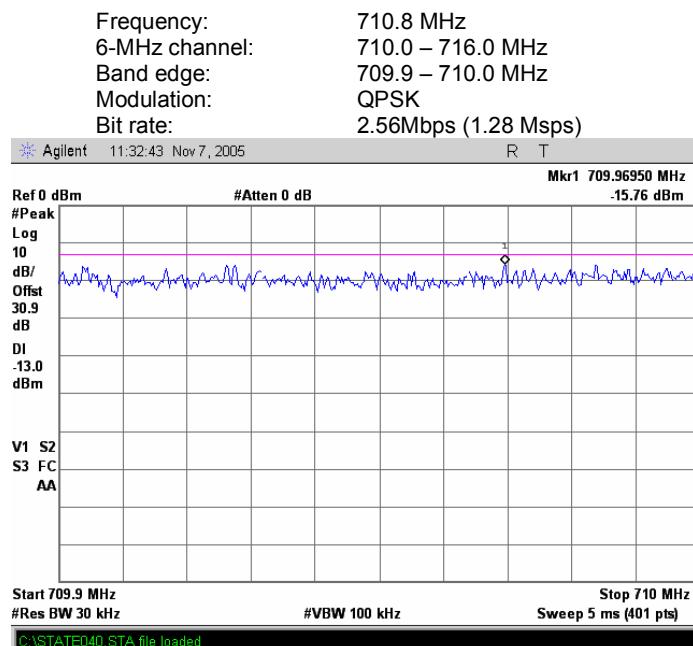


**Plot 7.3.36 Spurious emissions at RF antenna connector, high channel band edge measurements**

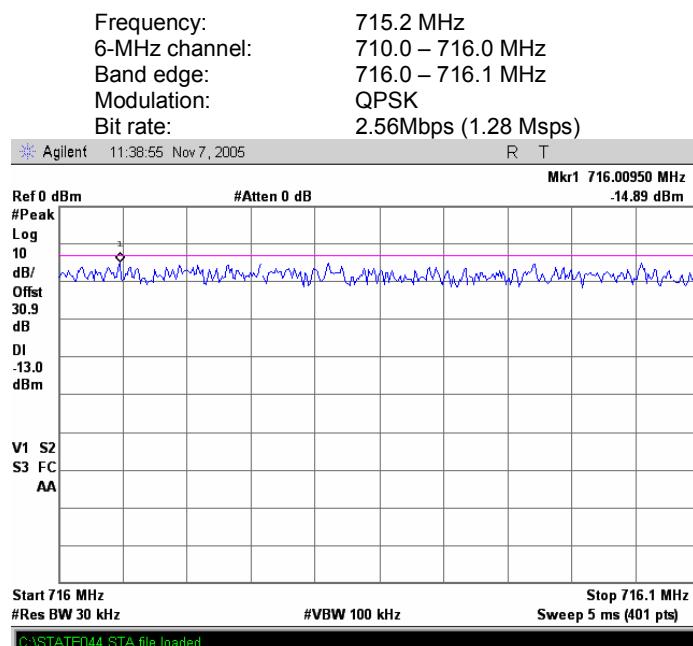


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.37 Spurious emissions at RF antenna connector, low channel band edge measurements**

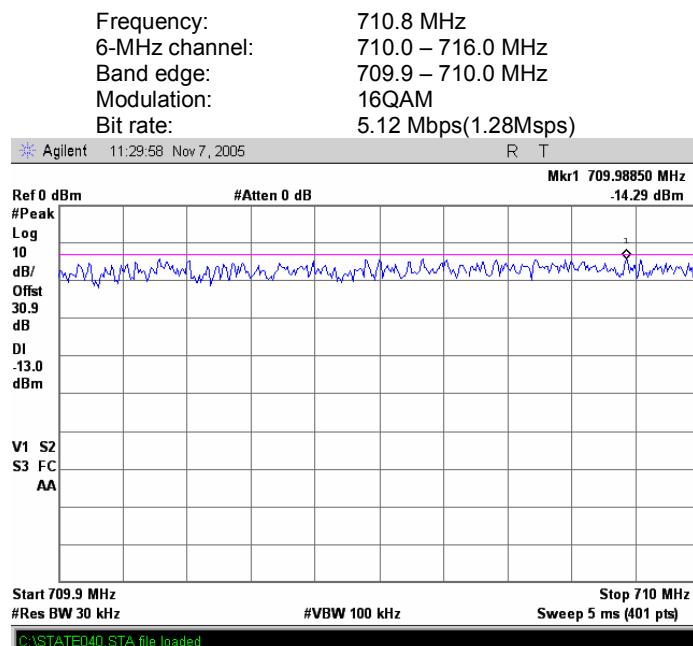


**Plot 7.3.38 Spurious emissions at RF antenna connector, high channel band edge measurements**

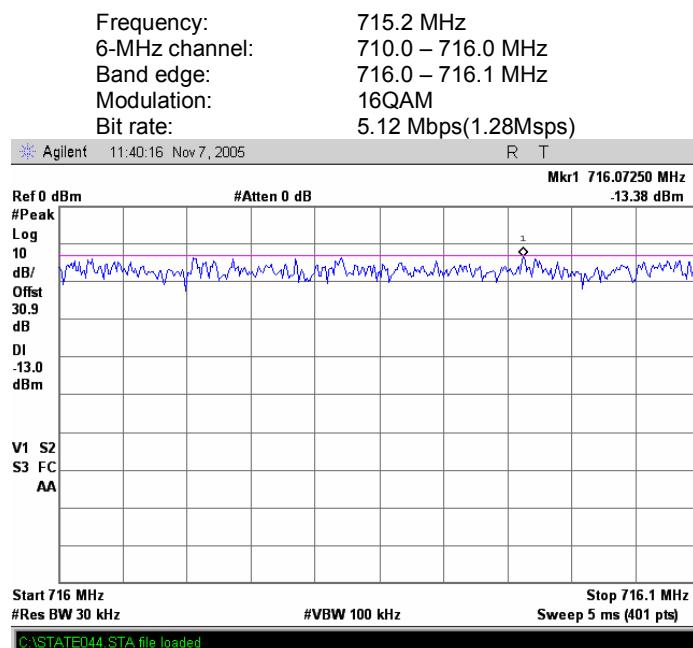


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.39 Spurious emissions at RF antenna connector, low channel band edge measurements**

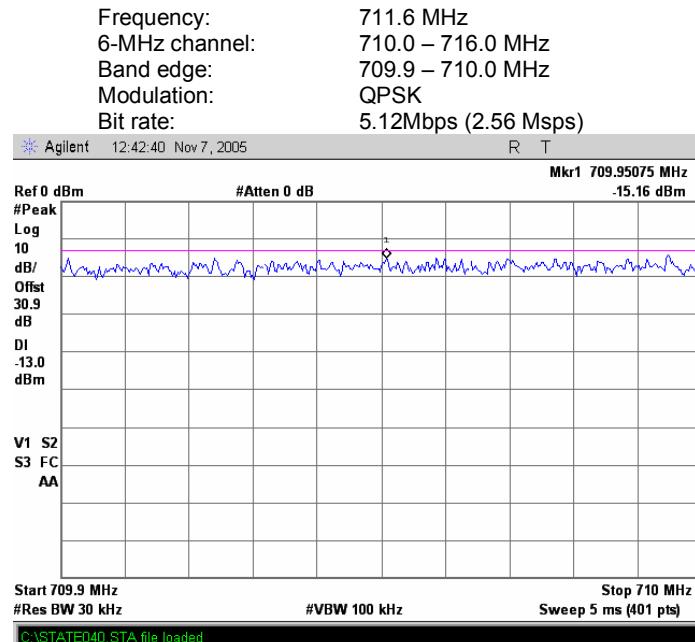


**Plot 7.3.40 Spurious emissions at RF antenna connector, high channel band edge measurements**

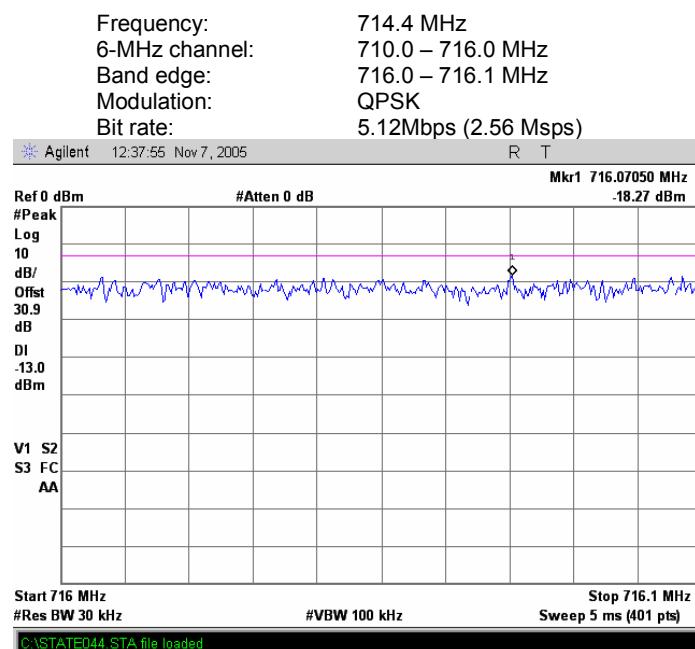


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.41 Spurious emissions at RF antenna connector, low channel band edge measurements**

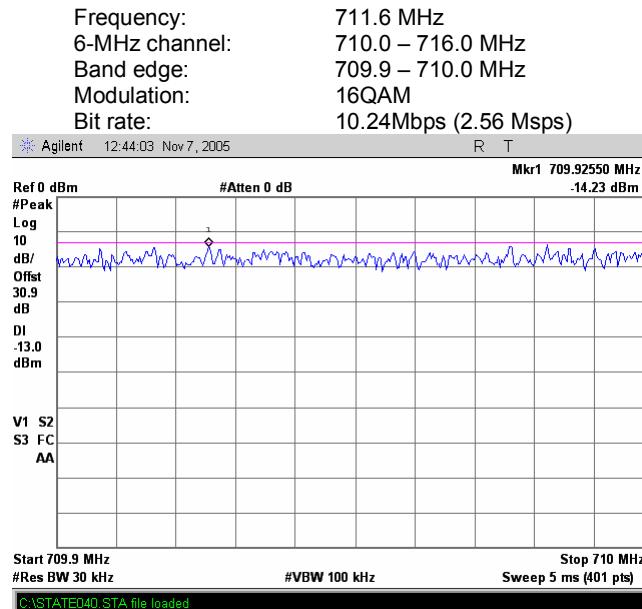


**Plot 7.3.42 Spurious emissions at RF antenna connector, high channel band edge measurements**

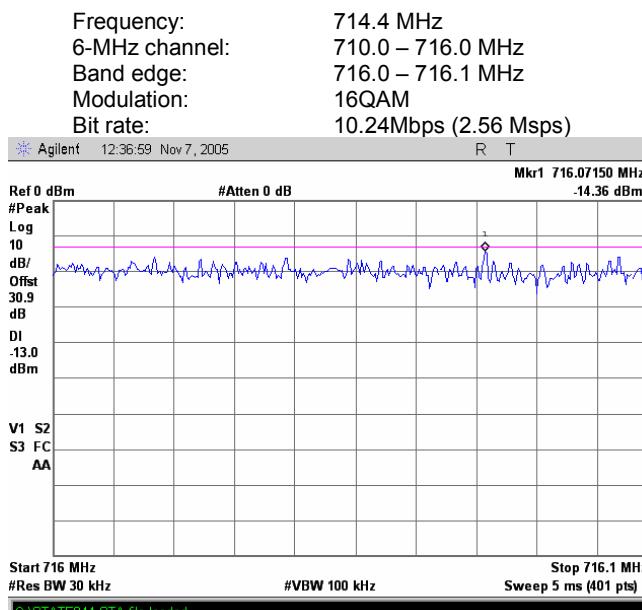


<b>Test specification:</b>	<b>Section 27.53f, Spurious emissions at RF antenna connector</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.3.43 Spurious emissions at RF antenna connector, low channel band edge measurements**



**Plot 7.3.44 Spurious emissions at RF antenna connector, high channel band edge measurements**



<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 7.4 Radiated spurious emission measurements

### 7.4.1 General

This test was performed to measure radiated spurious emissions from the EUT enclosure with antenna connector terminated with 50 Ohm dummy load. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Radiated spurious emission test limits

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

\* - P is transmitter output power in Watts.

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

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

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the EUT performance was checked.

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

7.4.2.3 The test results were recorded in Table 7.4.2 and shown in the associated plots.

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

7.4.3.1 The EUT was set up as shown in Figure 7.4.2, energized and the EUT performance was checked.

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

7.4.3.3 The worst test results with respect to the limits were recorded in Table 7.4.2 and shown in the associated plots.

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

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

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

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

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

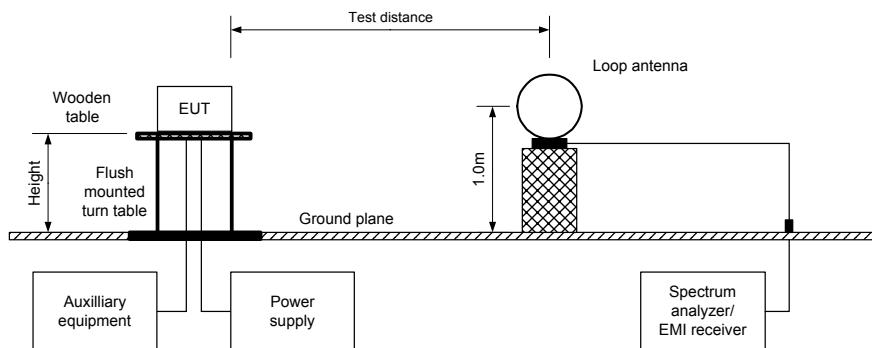
7.4.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm, antenna gain in dBd and cable loss in dB.

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

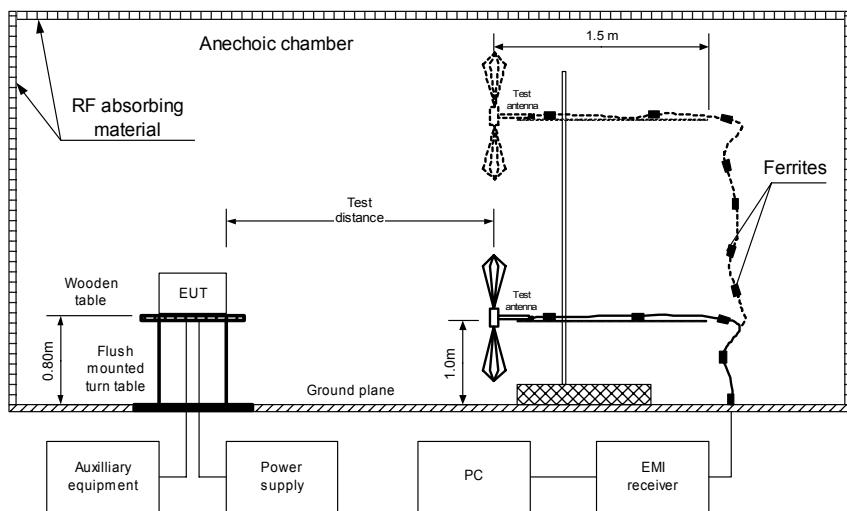
7.4.4.7 The worst test results with respect to the limits were recorded in Table 7.4.3 and shown in the associated plots.

<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

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

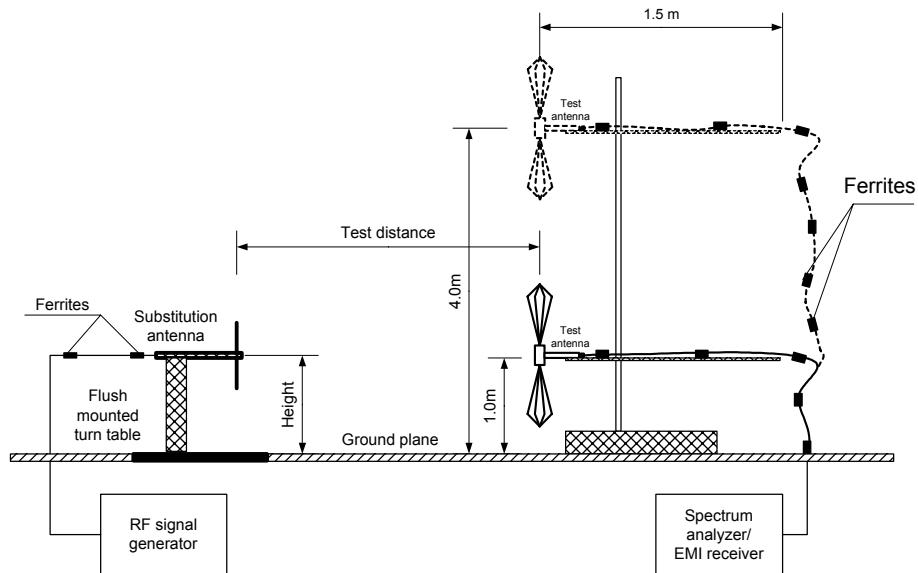


**Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz**



<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Figure 7.4.3 Setup for substitution ERP measurements of spurious**



<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.4.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 710.0 – 716.0 MHz  
 TEST DISTANCE: 3 m  
 EUT HEIGHT: 0.8 m  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 8000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH:  $\geq$  Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)  
 MODULATION: QPSK  
 MODULATING SIGNAL: PRBS  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Antenna polarization	RBW, kHz	Field strength, dB( $\mu$ V/m)	Limit, dB( $\mu$ V/m)	Margin, dB*	Verdict
<b>Low carrier frequency</b>						
0.0528	V	0.20	71.26	84.4	-13.14	Pass
0.1054	V	0.20	53.26	84.4	-31.14	Pass
0.1600	V	0.009	66.18	84.4	-18.22	Pass
38.100	V	120	36.55	84.4	-47.85	Pass
400.130	V	120	45.03	84.4	-39.37	Pass
239.818	H	120	41.68	84.4	-42.72	Pass
266.688	H	120	38.86	84.4	-45.54	Pass
335.810	H	120	37.59	84.4	-46.81	Pass
800.380	V	120	41.69	84.4	-42.71	Pass
1420.210	V	100	58.75	84.4	-25.65	Pass
7839.87	V	100	53.85	84.4	-30.55	Pass
<b>High carrier frequency</b>						
0.0528	V	0.20	77.63	84.4	-6.77	Pass
0.1054	V	0.20	55.01	84.4	-29.39	Pass
38.110	V	120	38.82	84.4	-45.58	Pass
133.350	H	120	38.55	84.4	-45.85	Pass
239.815	H	120	41.53	84.4	-42.87	Pass
265.075	H	120	39.96	84.4	-44.44	Pass
399.900	V	120	46.05	84.4	-38.35	Pass
799.380	V	120	45.55	84.4	-38.85	Pass
1431.775	V	100	53.79	84.4	-30.61	Pass
1459.30	v	100	38.23	84.4	-46.17	Pass
7839.99	V	100	52.32	84.4	-32.08	Pass

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

<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.4.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 710.0 – 716.0 MHz  
 TEST SITE: SEMI-ANCOHIC CHAMBER  
 TEST DISTANCE: 3 m  
 SUBSTITUTION ANTENNA HEIGHT: 0.8 m  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH:  $\geq$  Resolution bandwidth  
 SUBSTITUTION ANTENNA TYPE: Double ridged guide

Frequency, MHz	Antenna polarization	RBW, kHz	Field strength, dB( $\mu$ V/m)	RF generator output, dBm	Antenna gain, dBd	Cable loss, dB	ERP result, dBm**	ERP limit, dBm	Margin, dB*	Verdict
<b>Low carrier frequency</b>										
1420.210	V	100	58.75	-45.57	5.57	1.08	-41.08	-13	-28.08	Pass
2130.275	V	100	42.65	-59.09	6.11	1.26	-54.24	-13	-41.24	Pass
<b>High carrier frequency</b>										
1431.775	V	100	53.79	-51.16	5.57	1.08	-46.67	-13	-33.67	Pass
2147.515	V	100	41.28	-62.30	6.11	1.26	-57.45	-13	-44.45	Pass

\*- Margin = Spurious emission – specification limit.

\*\* ERP =  $P_{gen} - CL + G_{ant}$ , where

$P_{gen}$  - signal generator output power in dBm

CL - cable loss in dB

$G_{ant}$  - antenna gain in dBd

#### Reference numbers of test equipment used

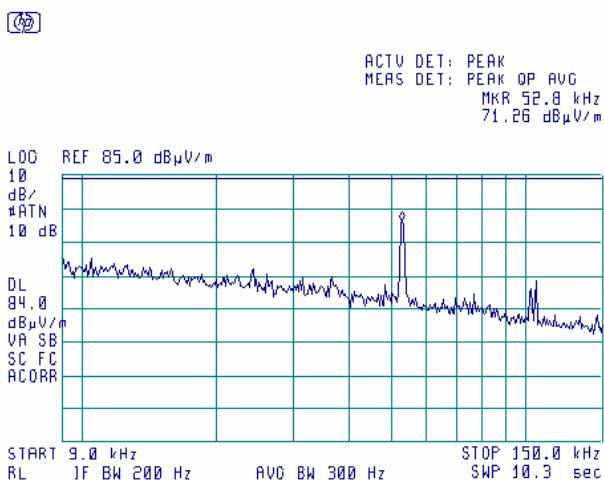
HL 0446	HL 0465	HL 0521	HL 0567	HL 0589	HL 0592	HL 0593	HL 0594
HL 0604	HL 0661	HL 1947	HL 2400	HL 2432	HL 2780		

Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

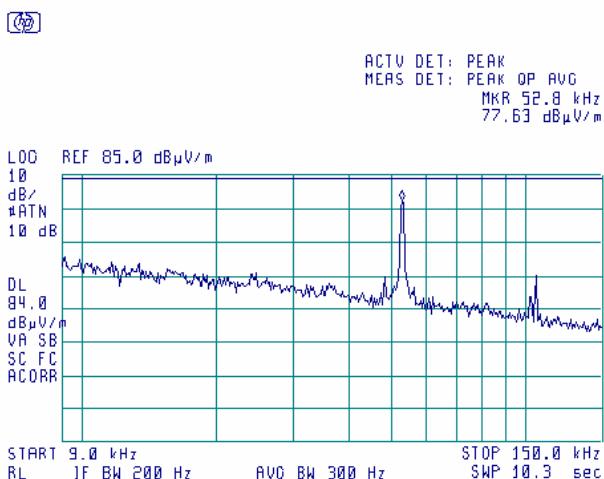
**Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range**

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical & horizontal  
 TEST DISTANCE: 3 m



**Plot 7.4.2 Radiated emission measurements in 9 - 150 kHz range**

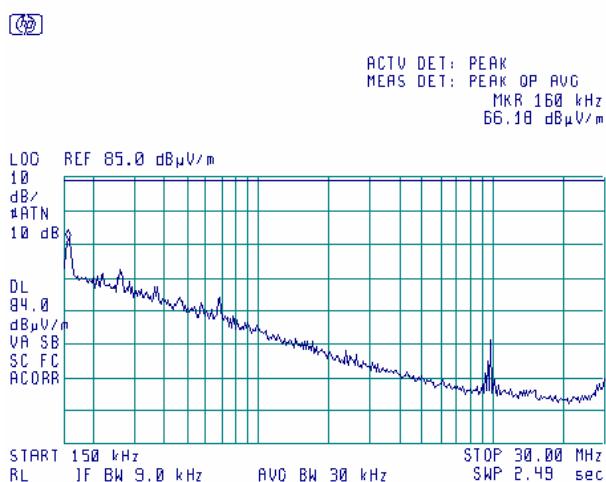
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical & horizontal  
 TEST DISTANCE: 3 m



<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

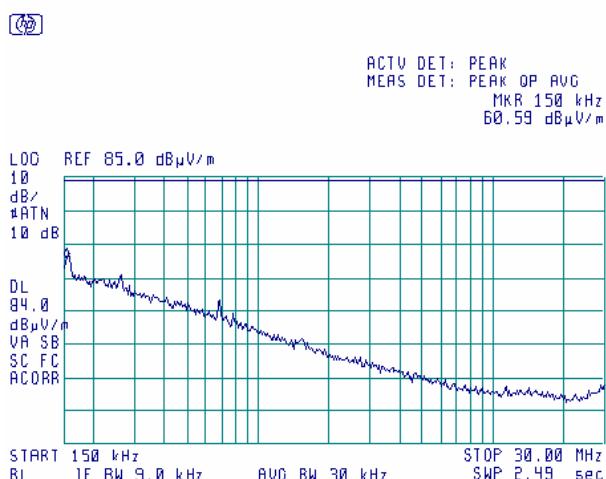
**Plot 7.4.3 Radiated emission measurements in 0.15 - 30 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical & horizontal  
TEST DISTANCE: 3 m



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

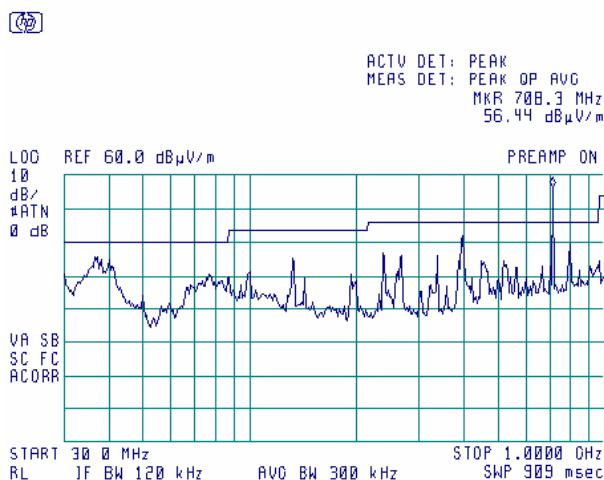
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical & horizontal  
TEST DISTANCE: 3 m



<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

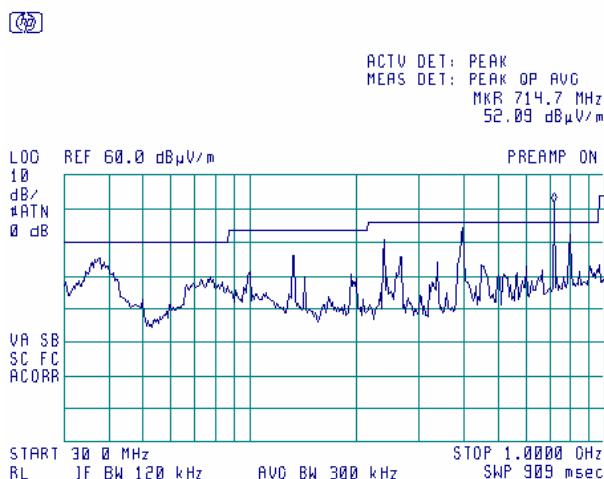
Plot 7.4.5 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.4.6 Radiated emission measurements in 30 - 1000 MHz range

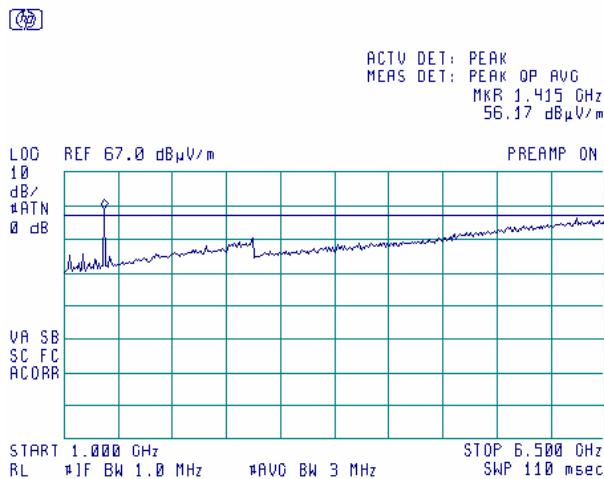
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



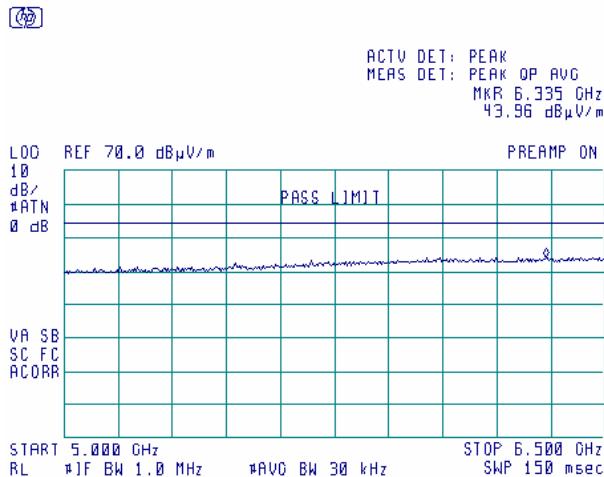
<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.4.7 Radiated emission measurements in 1 – 6.5 GHz range**

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


**Plot 7.4.8 Radiated emission measurements in 1 – 6.5 GHz range**

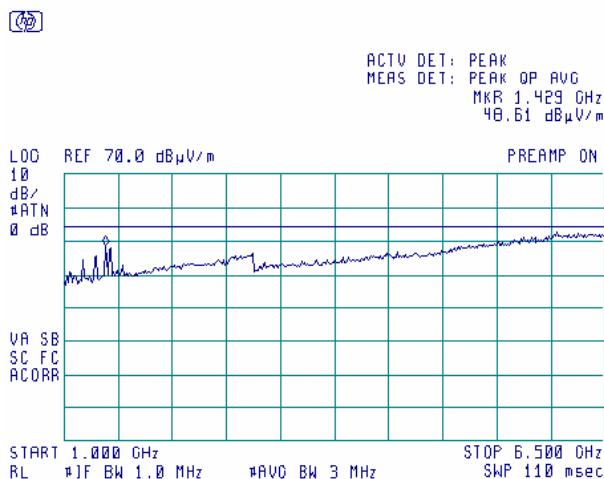
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Horizontal  
 TEST DISTANCE: 3 m



<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

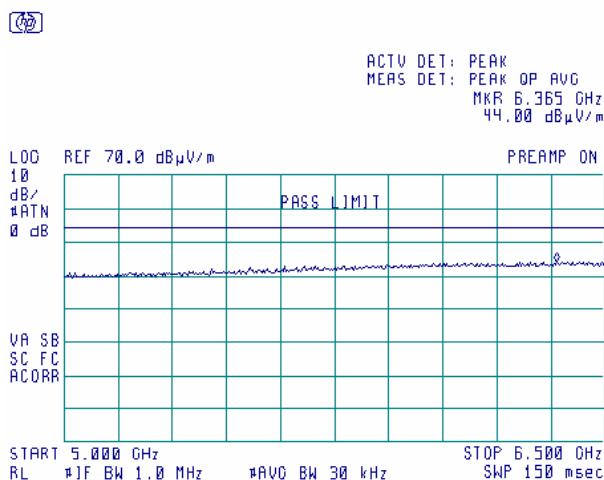
**Plot 7.4.9 Radiated emission measurements in 1 – 6.5 GHz range**

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



**Plot 7.4.10 Radiated emission measurements in 1 – 6.5 GHz range**

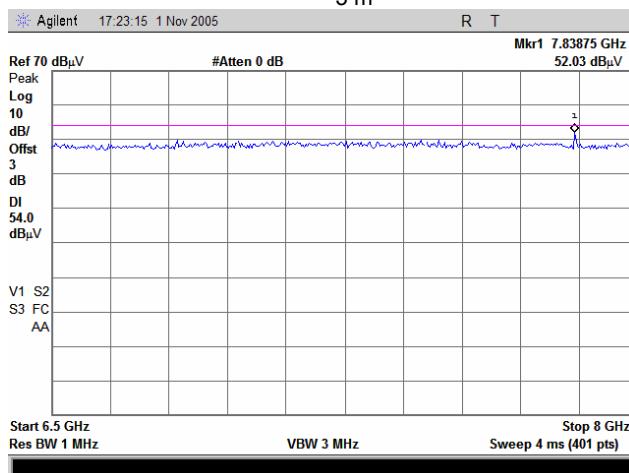
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Horizontal  
 TEST DISTANCE: 3 m



<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

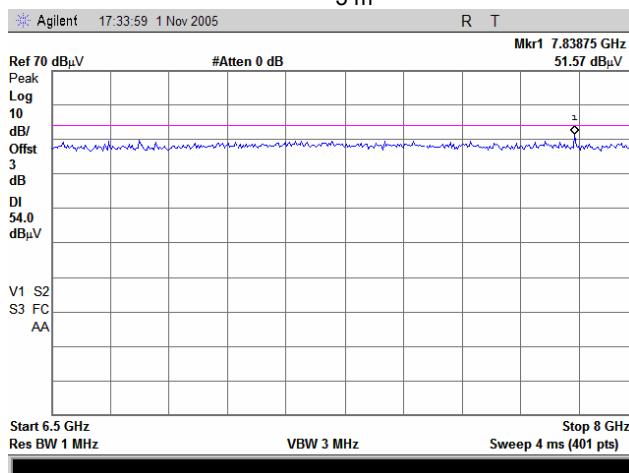
**Plot 7.4.11 Radiated emission measurements in 6.5 – 8 GHz range**

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



**Plot 7.4.12 Radiated emission measurements in 6.5 – 8 GHz range**

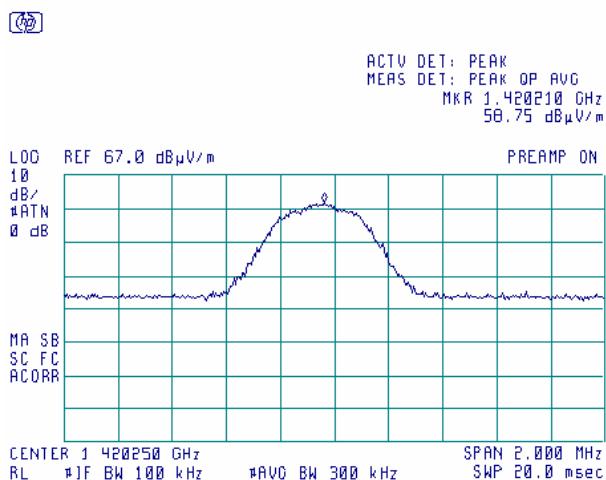
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



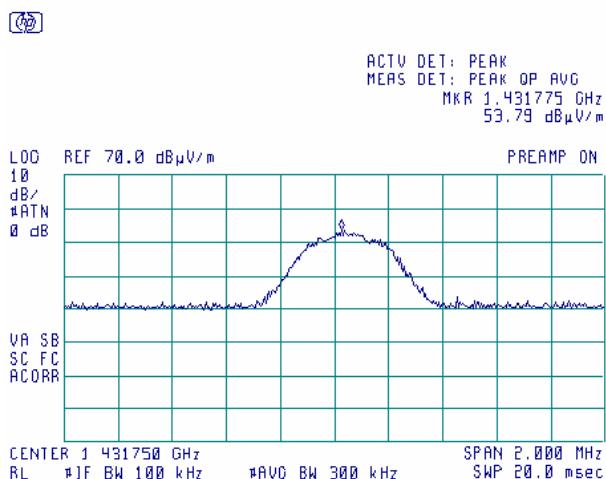
<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

 Plot 7.4.13 Radiated emission measurements at the 2<sup>nd</sup> harmonic of low channel

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: 710.1 MHz  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m


 Plot 7.4.14 Radiated emission measurements at the 2<sup>nd</sup> harmonic of high channel

TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: 715.9 MHz  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m

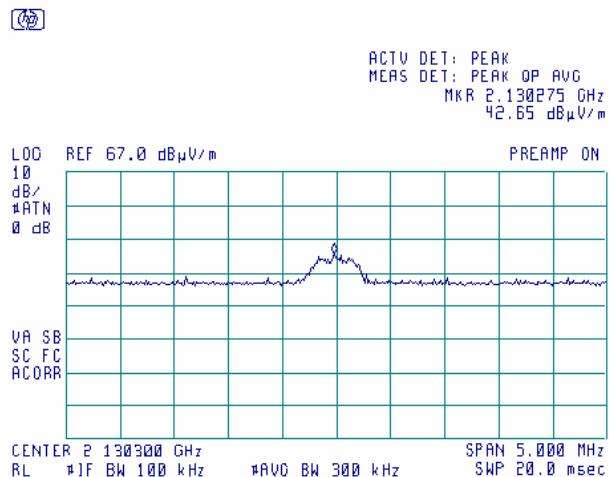




<b>Test specification:</b>	<b>Section 27.53f, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

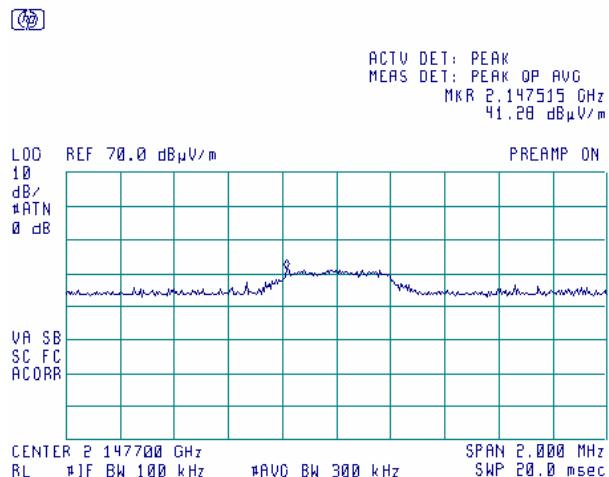
Plot 7.4.15 Radiated emission measurements at the 3<sup>rd</sup> harmonic of low channel

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: 710.1 MHz  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



Plot 7.4.16 Radiated emission measurements at the 3<sup>rd</sup> harmonic of high channel

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: 715.9 MHz  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 7.5 Frequency stability test

### 7.5.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.5.1. The test results are provided in Table 7.5.2, 7.5.3 and shown in the associated plots.

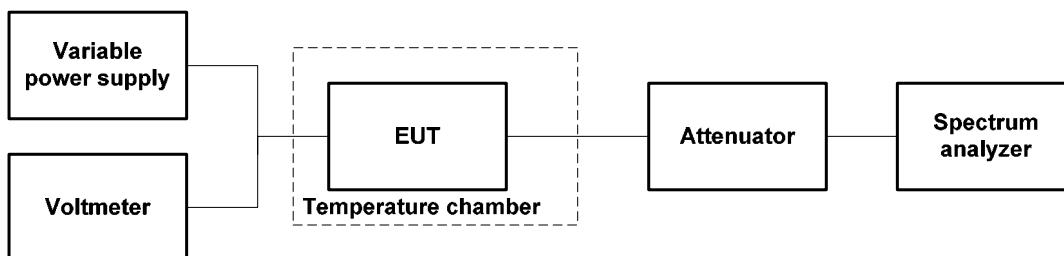
Table 7.5.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement
710.0 – 716.0	26 dBc points including frequency tolerance shall remain within the assigned band

### 7.5.2 Test procedure

- 7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.
- 7.5.2.2 The EUT 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.
- 7.5.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.
- 7.5.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.5.2.5 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.
- 7.5.2.6 Frequency displacement was calculated as provided in Tables 7.5.2 and 7.5.3.

Figure 7.5.1 Frequency stability test setup



<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.5.2 Frequency stability test results

ASSIGNED FREQUENCY RANGE: 710.0 – 716.0 MHz  
 NOMINAL POWER VOLTAGE: 12 VDC  
 TEMPERATURE STABILIZATION PERIOD: 20 min  
 POWER DURING TEMPERATURE TRANSITION: Off  
 RESOLUTION BANDWIDTH: 100 Hz  
 VIDEO BANDWIDTH: 100 Hz  
 FREQUENCY SPAN: 10.0 kHz  
 SPECTRUM ANALYZER MODE: Counter  
 MODULATION: Unmodulated

T, °C	Voltage, V	Frequency, Hz					Positive drift, Hz	Negative drift, Hz	Max frequency drift, Hz	Min frequency drift, Hz
		Start up	1 <sup>st</sup> min	3 <sup>rd</sup> min	5 <sup>th</sup> min	10 <sup>th</sup> min				
<b>Low frequency</b>										
-30	Nominal	710098939	710098962	710098990	710099008	710099036	0	1411	1411	125
-20	Nominal	710099014	NA	NA	NA	710099413	0	1336		
-10	Nominal	710099775	NA	NA	NA	710099850	0	575		
0	Nominal	710099575	710099825	710100150	710100225	710100325	0	775		
10	Nominal	710100475	NA	NA	NA	710100475	125	0		
20	+15%	710100400	NA	NA	NA	710100325	50	25		
20	Nominal	710100400	NA	NA	NA	710100350	50	0		
20	-15%	710100400	NA	NA	NA	710100325	50	25		
30	Nominal	710100163	710100158	710100155	710100152	710100146	0	204		
40	Nominal	710100039	NA	NA	NA	710099942	0	408		
50	Nominal	710099843	NA	NA	NA	710099563	0	787		
<b>High frequency</b>										
-30	Nominal	715898864	715898861	715898840	715898844	715898907	0	1460	1460	175
-20	Nominal	715899404	NA	NA	NA	715899429	0	896		
-10	Nominal	715899525	NA	NA	NA	715899775	0	775		
0	Nominal	715900400	715900400	715900400	715900425	715900425	125	0		
10	Nominal	715900375	NA	NA	NA	715900475	175	0		
20	+15%	715900425	NA	NA	NA	715900350	125	0		
20	Nominal	715900350	NA	NA	NA	715900300	50	0		
20	-15%	715900450	NA	NA	NA	715900350	150	0		
30	Nominal	715900160	715900163	715900165	715900165	715900161	0	140		
40	Nominal	715899959	NA	NA	NA	715899915	0	385		
50	Nominal	715899970	NA	NA	NA	715899665	0	635		

\* - Reference frequency

Table 7.5.3 Transmitter operating range including frequency drift

6-MHz channel, MHz	Measured 26 dBc point, MHz	Frequency drift, Hz		26 dBc point including frequency tolerance, MHz	Verdict
		Positive	Negative		
710.0 – 716.0	710.0150-715.98625	175	1411	710.013589 - 715.986425	Pass

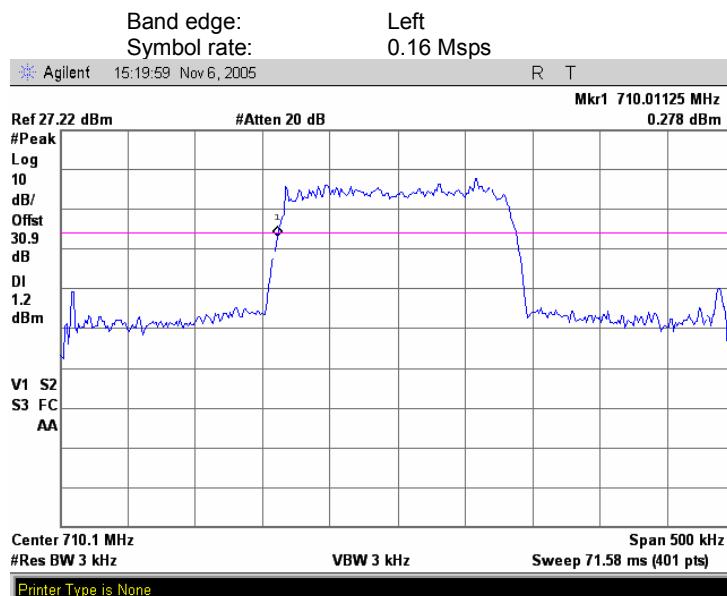
## Reference numbers of test equipment used

HL 1653	HL 2399					
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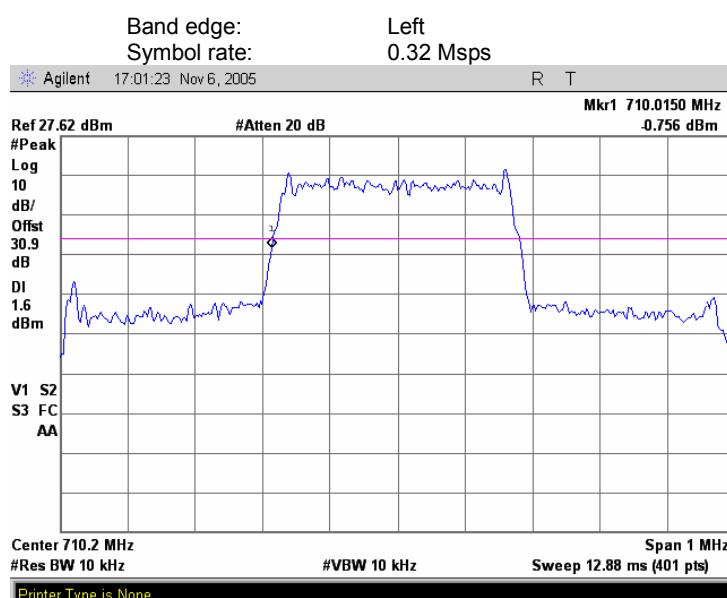
Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.1 Band edge emission at low frequency

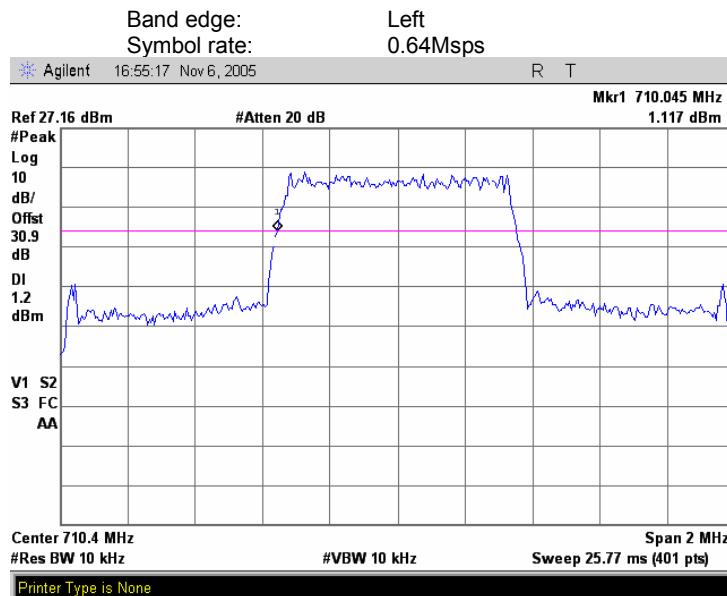


Plot 7.5.2 Band edge emission at low frequency

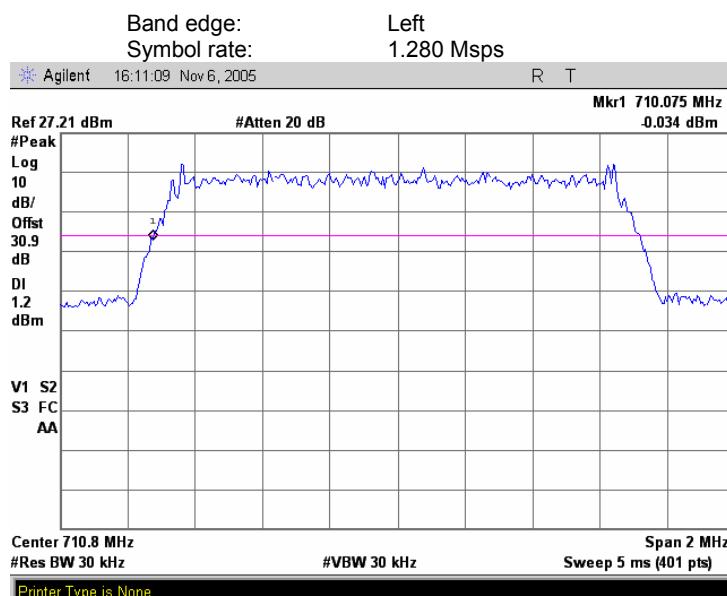


<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.5.3 Band edge emission at low frequency**

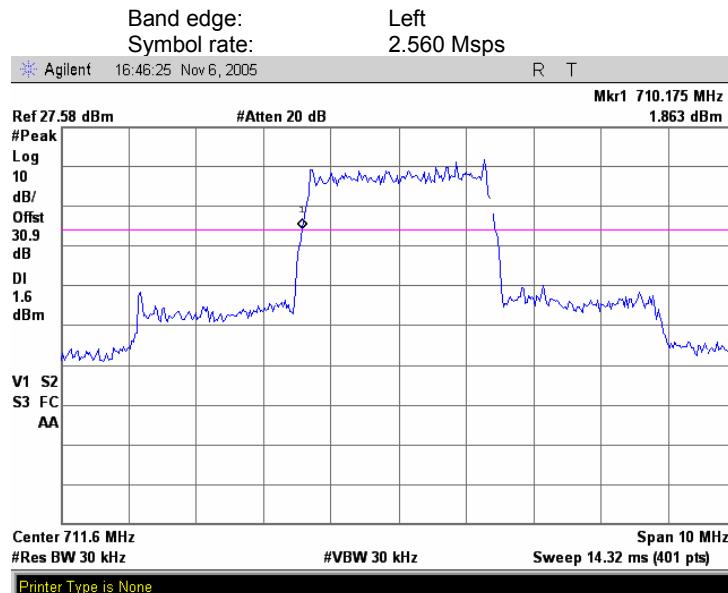


**Plot 7.5.4 Band edge emission at low frequency**



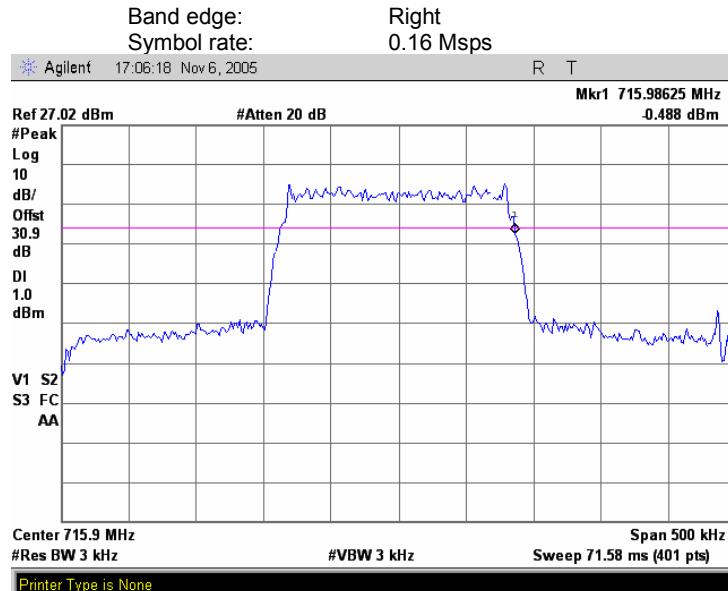
<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.5.5 Band edge emission at low frequency**

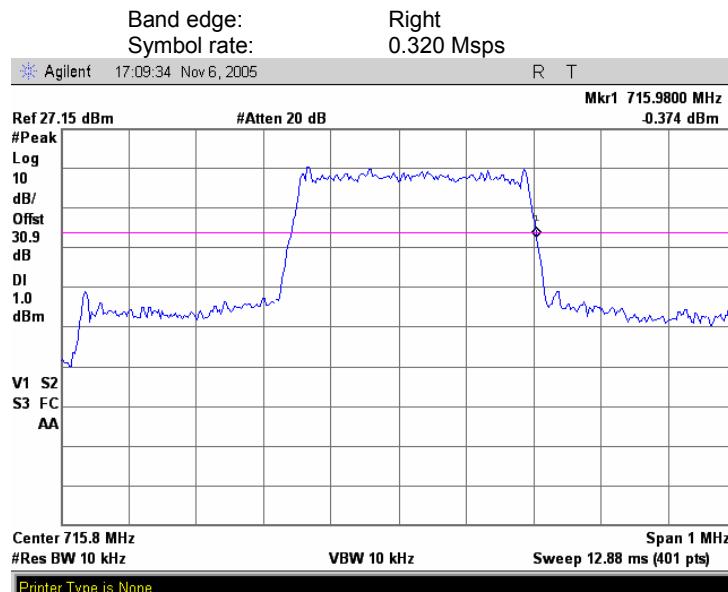


<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.5.6 Band edge emission at high frequency**

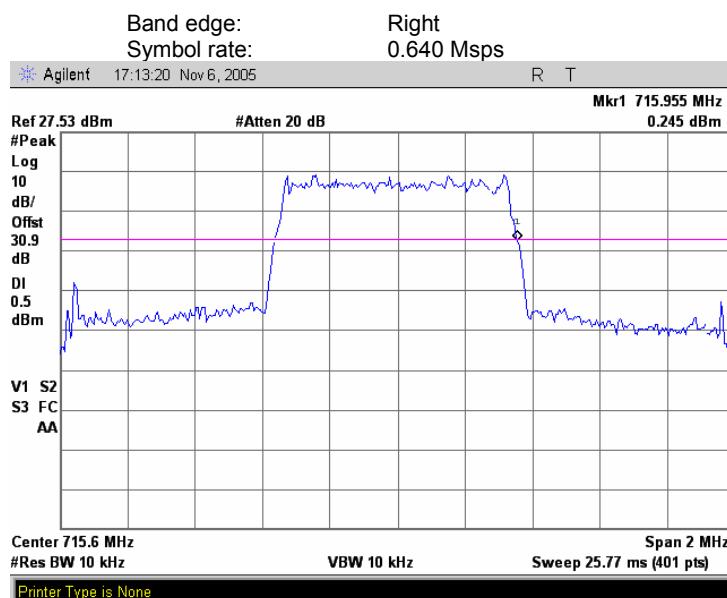


**Plot 7.5.7 Band edge emission at high frequency**

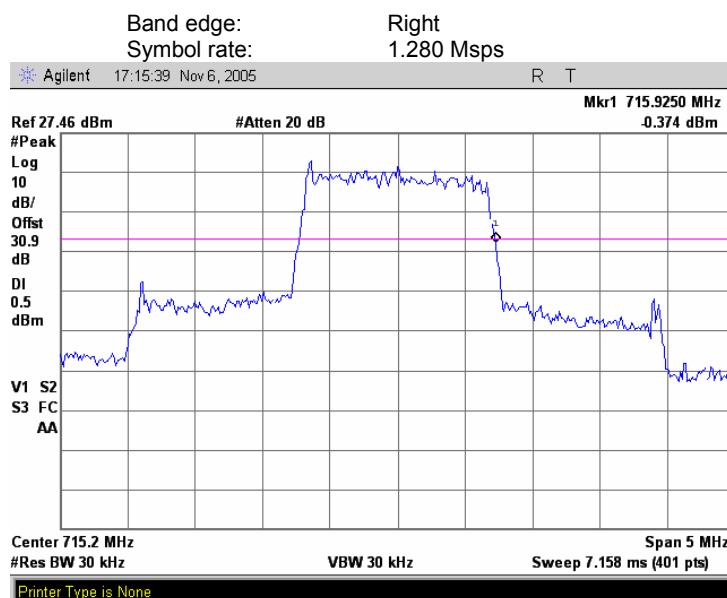


<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.5.8 Band edge emission at high frequency

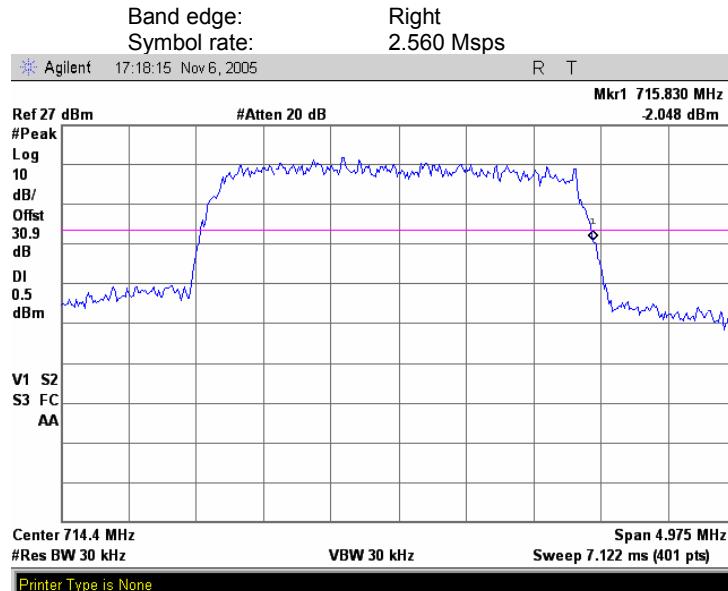


Plot 7.5.9 Band edge emission at high frequency



<b>Test specification:</b>	<b>Section 27.54, Frequency stability</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.5.10 Band edge emission at high frequency**



<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 7.6 Occupied bandwidth test

### 7.6.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.6.1. The test results are provided in Table 7.6.2 and associated plots.

**Table 7.6.1 Occupied bandwidth limits**

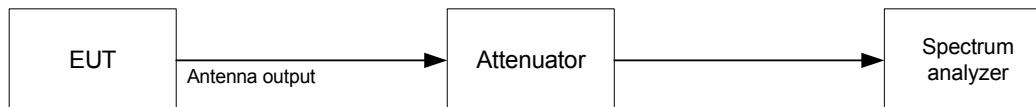
Assigned frequency, MHz	Modulation envelope reference points*, dBc
710.0 – 716.0	26

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

### 7.6.2 Test procedure

- 7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and its proper operation was checked.
- 7.6.2.2 The EUT was set to transmit unmodulated carrier and reference peak power level was measured.
- 7.6.2.3 The EUT was set to transmit modulated carrier.
- 7.6.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.6.2 and associated plots.

**Figure 7.6.1 Occupied bandwidth test setup**



<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Table 7.6.2 Occupied bandwidth test results

DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 30 kHz  
 VIDEO BANDWIDTH: 30 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 26 dBc  
 MODULATING SIGNAL: PRBS

Carrier frequency, MHz	Occupied bandwidth, kHz
<b>Bit rate: 5.12 Mbps / Symbol rate: 2.56 Msps / Modulation: QPSK</b>	
711.6	2987.5
713.0	3012.5
714.4	3025.0
<b>Bit rate: 10.24 Mbps / Symbol rate: 2.56 Msps / Modulation: 16QAM</b>	
713.0	3000.0
<b>Bit rate: 5.12 Mbps / Symbol rate: 1.28 Msps / Modulation: 16QAM</b>	
713.0	1455.0
<b>Bit rate: 2.56 Mbps / Symbol rate: 1.28 Msps / Modulation: QPSK</b>	
713.0	1475.5
<b>Bit rate: 2.56 Mbps / Symbol rate: 0.64 Msps / Modulation: 16QAM</b>	
713.0	705.0
<b>Bit rate: 1.28 Mbps / Symbol rate: 0.64 Msps / Modulation: QPSK</b>	
713.0	715.0
<b>Bit rate: 1.28 Mbps / Symbol rate: 0.32 Msps / Modulation: 16QAM</b>	
713.0	365.0
<b>Bit rate: 0.64 Mbps / Symbol rate: 0.32 Msps / Modulation: QPSK</b>	
713.0	367.5
<b>Bit rate: 0.32 Mbps / Symbol rate: 0.16 Msps / Modulation: QPSK</b>	
	178.5
<b>Bit rate: 0.64 Mbps / Symbol rate: 0.16 Msps / Modulation: 16QAM</b>	
	171.25

The "Bit rate 5.12 Mbps / Symbol rate 2.56 Msps / Modulation: QPSK" was used for full measurements as the worst case.

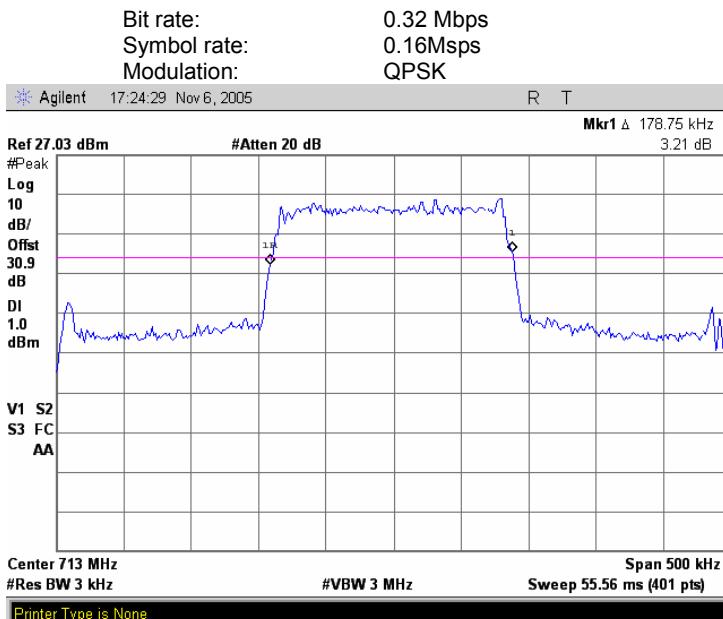
#### Reference numbers of test equipment used

HL 0278	HL 0493	HL 1097	HL 1204	HL 1653		
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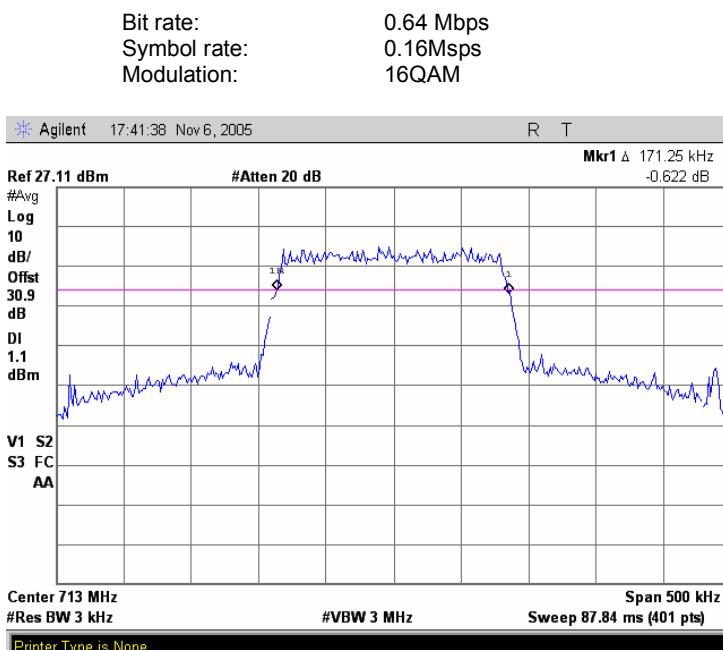
Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.6.1 Occupied bandwidth test results at mid frequency**



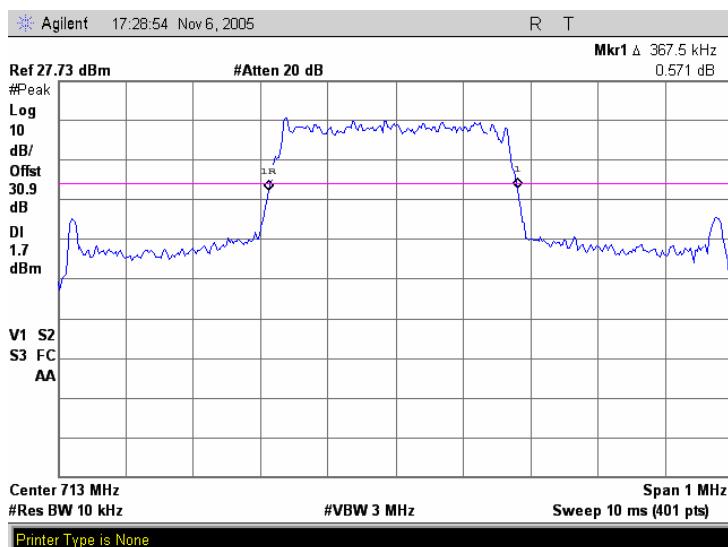
**Plot 7.6.2 Occupied bandwidth test results at mid frequency**



<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

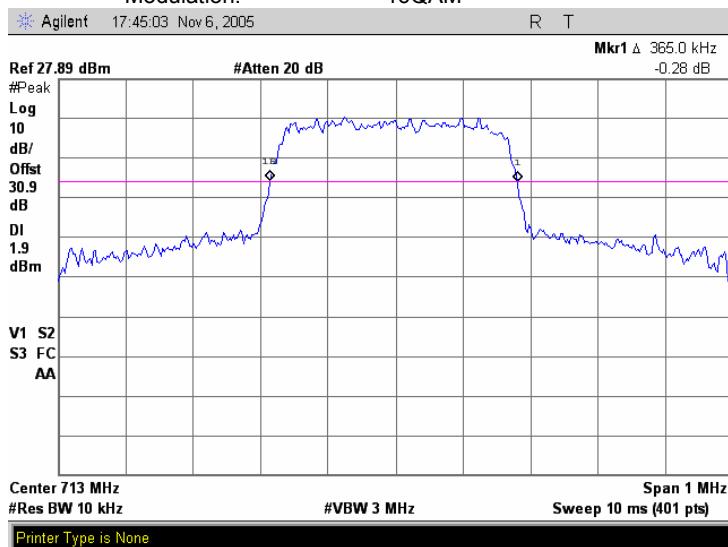
Plot 7.6.3 Occupied bandwidth test results at mid frequency

Bit rate: 0.64 Mbps  
 Symbol rate: 0.32Msps  
 Modulation: QPSK



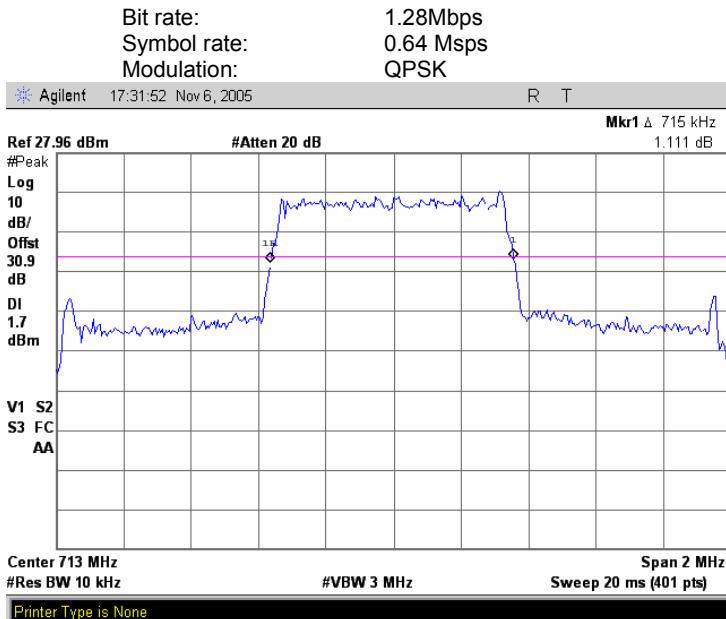
Plot 7.6.4 Occupied bandwidth test results at mid frequency

Bit rate: 1.28Mbps  
 Symbol rate: 0.32Msps  
 Modulation: 16QAM

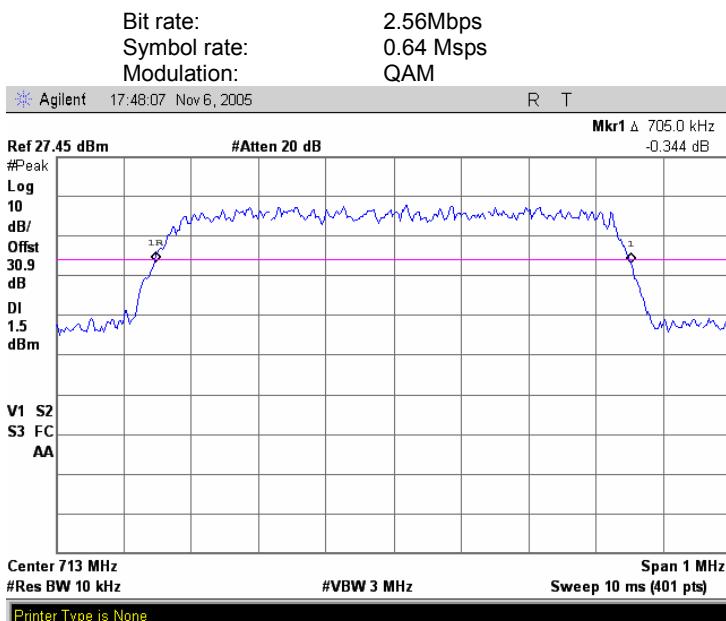


<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.6.5 Occupied bandwidth test results at mid frequency**

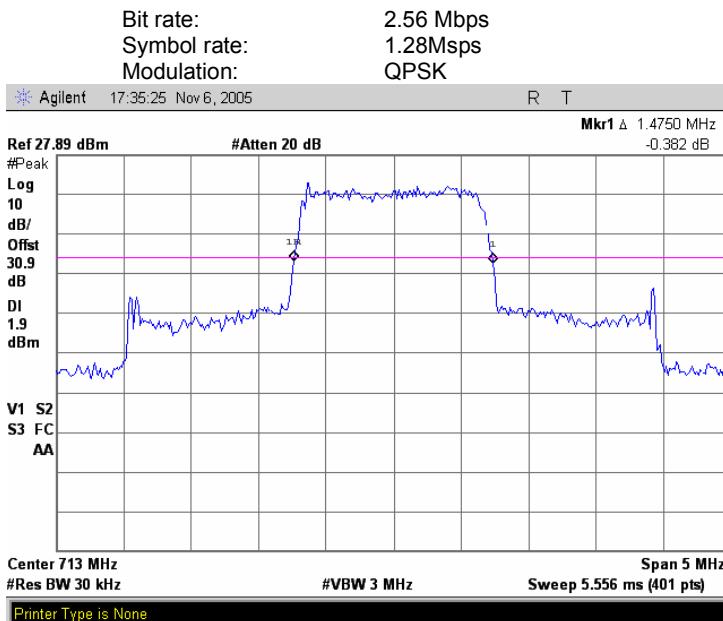


**Plot 7.6.6 Occupied bandwidth test results at mid frequency**

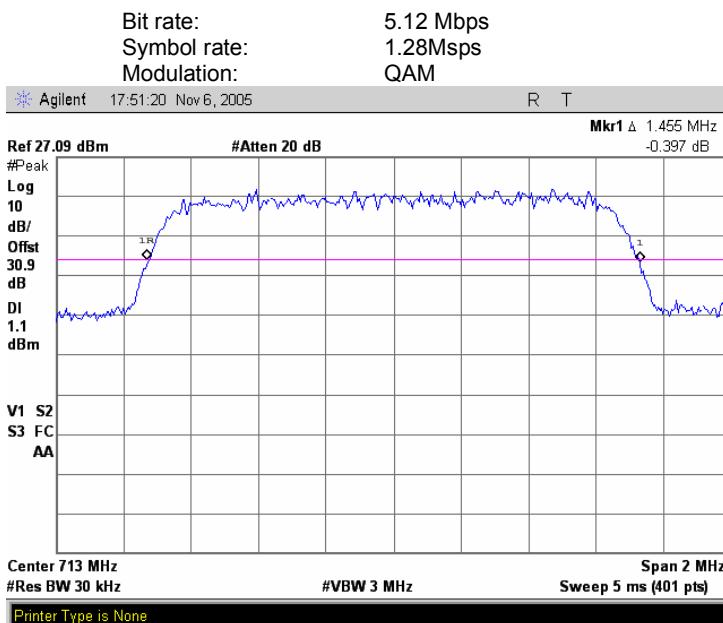


<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.6.7 Occupied bandwidth test results at mid frequency**

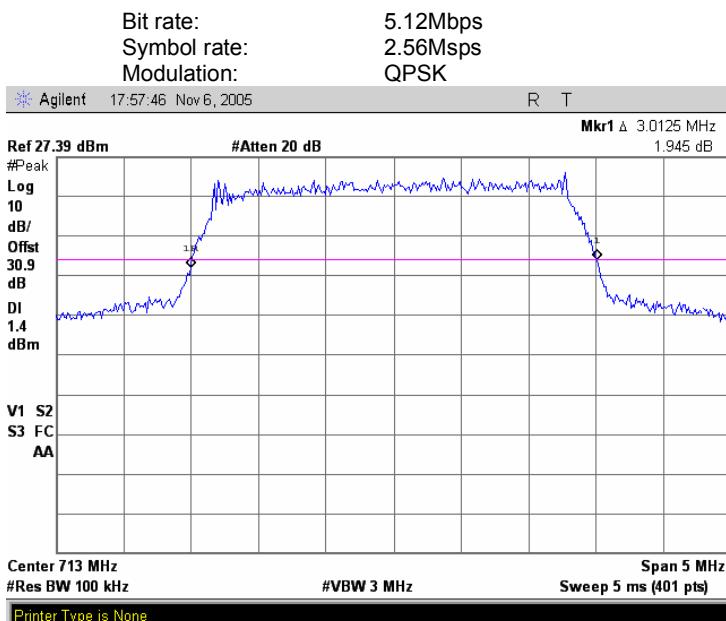


**Plot 7.6.8 Occupied bandwidth test results at mid frequency**

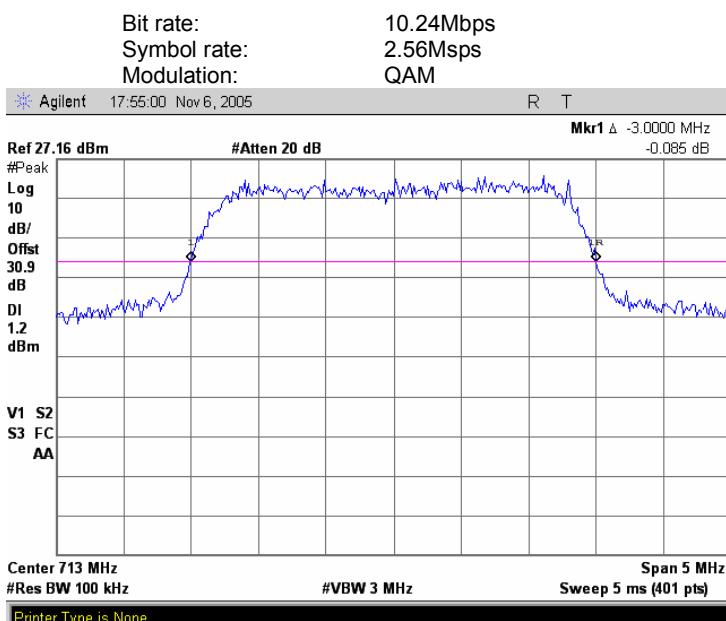


<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

Plot 7.6.9 Occupied bandwidth test results at mid frequency

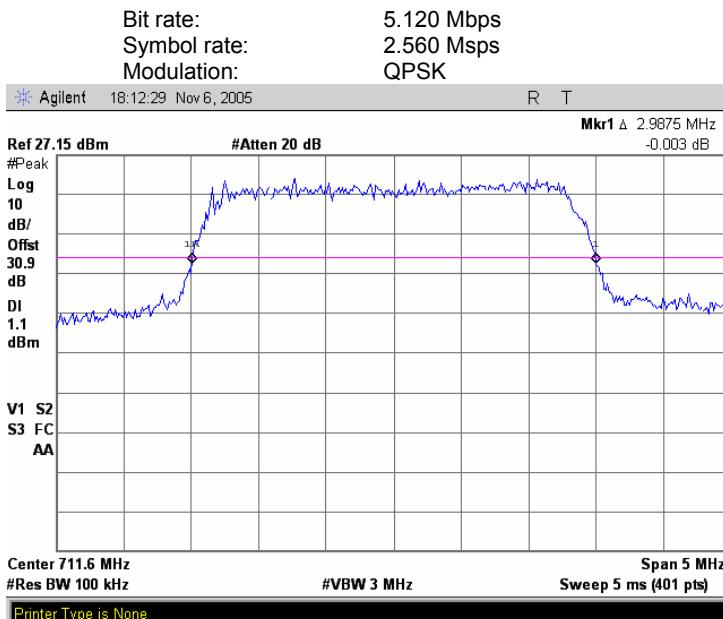


Plot 7.6.10 Occupied bandwidth test results at mid frequency

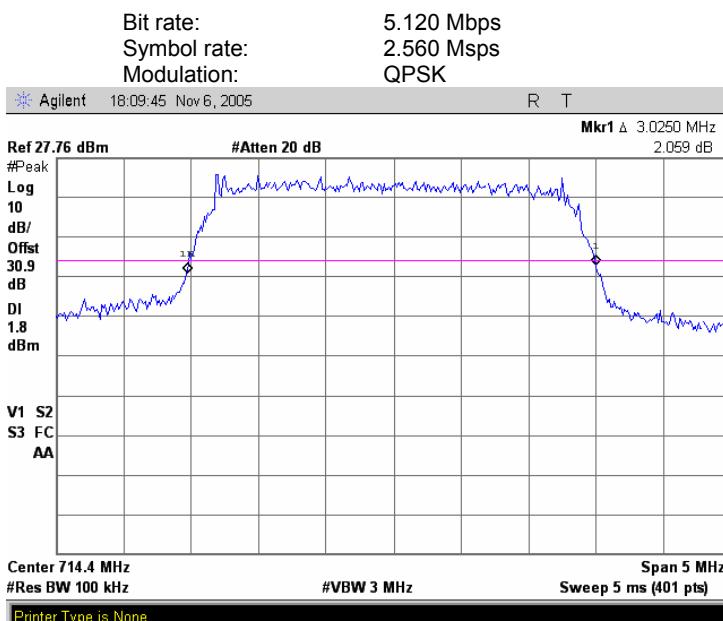


<b>Test specification:</b>	<b>Section 2.1049, Occupied bandwidth</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1049		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/7/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 42 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 7.6.11 Occupied bandwidth test results at low frequency**



**Plot 7.6.12 Occupied bandwidth test results at high frequency**



<b>Test specification:</b>	<b>Section 15.107, Conducted emission at AC power port, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	10/31/2005	<b>Relative Humidity:</b>	40 %
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Power Supply:</b> 120 VAC	
<b>Remarks:</b>			

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

### 8.1 Conducted emissions

#### 8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. The specification test limits are given in Table 8.1.1. The worst test results with respect to the limits were recorded in Table 8.1.2 and shown in the associated plots.

Table 8.1.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB( $\mu$ V)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

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

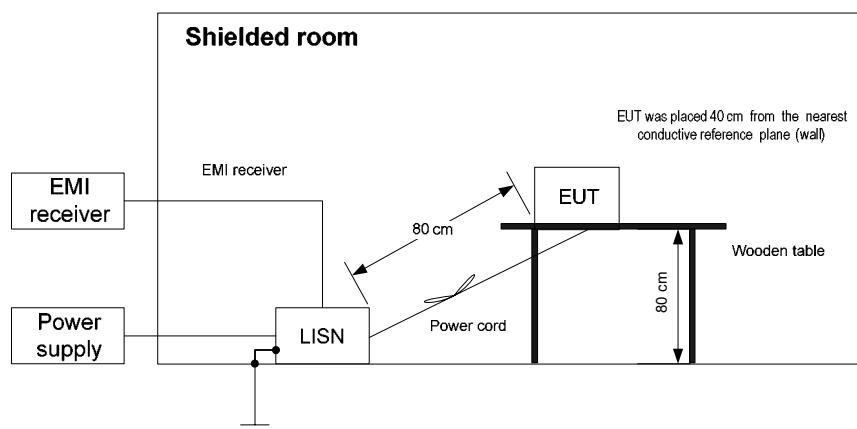
#### 8.1.2 Test procedure

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

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

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

Figure 8.1.1 Setup for conducted emission measurements at the mains power port, table-top EUT



<b>Test specification:</b>	<b>Section 15.107, Conducted emission at AC power port, Class B</b>				
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3				
<b>Test mode:</b>	Compliance		<b>Verdict:</b>		PASS
<b>Date:</b>	10/31/2005				
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa		<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC	
<b>Remarks:</b>					

**Table 8.1.2 Conducted emission test results**

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

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.292852	42.66	41.16	60.49	-19.33	33.86	50.49	-16.63	L1	Pass
0.571861	39.97	38.46	56.00	-17.54	24.07	46.00	-21.93		
0.727123	41.51	40.14	56.00	-15.86	29.85	46.00	-16.15		
0.877956	39.59	37.15	56.00	-18.85	25.79	46.00	-20.21		
1.158483	42.91	41.33	56.00	-14.67	28.33	46.00	-17.67		
3.405344	40.55	35.95	56.00	-20.05	15.95	46.00	-30.05		
3.452671	39.03	34.34	56.00	-21.66	16.93	46.00	-29.07		
0.288946	42.26	40.66	60.61	-19.95	31.40	50.61	-19.21		
0.731379	41.68	39.57	56.00	-16.43	27.91	46.00	-18.09		
1.149535	44.45	42.83	56.00	-13.17	29.17	46.00	-16.83		
1.336022	43.38	41.27	56.00	-14.73	23.62	46.00	-22.38	L2	Pass
1.761285	44.05	40.40	56.00	-15.60	23.92	46.00	-22.08		
2.153642	42.28	39.93	56.00	-16.07	22.26	46.00	-23.74		
3.631591	43.23	40.33	56.00	-15.67	22.59	46.00	-23.41		

\*- Margin = Measured emission - specification limit.

<b>Test specification:</b>	<b>Section 15.107, Conducted emission at AC power port, Class B</b>			
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3			
<b>Test mode:</b>	Compliance	<b>Verdict:</b>		PASS
<b>Date:</b>	10/31/2005			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 40 %		<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>				

Table 8.1.3 Conducted emission test results

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

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.157992	60.05	50.13	65.61	-15.48	36.30	55.61	-19.31	L1	Pass
0.164207	57.45	49.22	65.31	-16.09	34.57	55.31	-20.74		
0.197046	52.37	45.49	63.77	-18.28	29.57	53.77	-24.20		
0.202535	52.40	45.25	63.56	-18.31	30.68	53.56	-22.88		
0.215994	52.92	44.94	63.04	-18.10	31.64	53.04	-21.40		
0.312316	48.22	44.74	59.92	-15.18	25.75	49.92	-24.17		
0.405512	43.75	39.33	57.77	-18.44	31.53	47.77	-16.24		
0.161153	58.75	50.27	65.46	-15.19	35.17	55.46	-20.29		
0.166645	58.55	49.87	65.19	-15.32	35.40	55.19	-19.79		
0.172851	59.00	49.29	64.89	-15.60	30.78	54.89	-24.11		
0.198538	55.10	48.12	63.71	-15.59	31.29	53.71	-22.42	L2	Pass
0.235223	49.93	43.78	62.30	-18.52	31.49	52.30	-20.81		
0.314815	44.73	39.50	59.86	-20.36	20.01	49.86	-29.85		
20.210610	36.09	31.04	60.00	-28.96	21.81	50.00	-28.19		

## Reference numbers of test equipment used

HL 0163	HL 0447	HL 1430	HL 1503	HL 1512			
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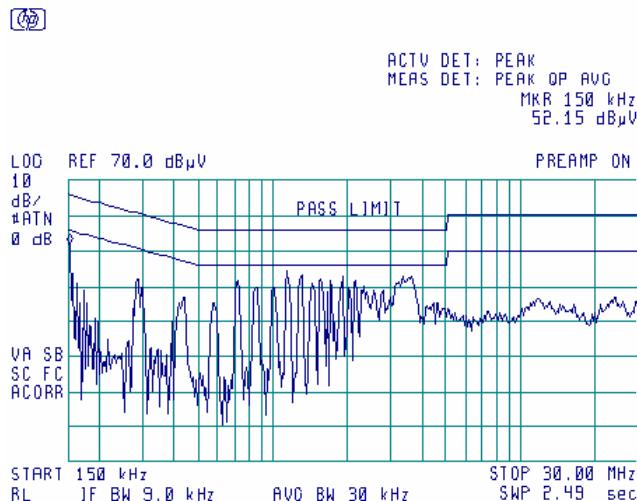
Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 15.107, Conducted emission at AC power port, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	10/31/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 8.1.1 Conducted emission measurements on the EUT power lines**

LINE:  
LIMIT:  
DETECTOR:

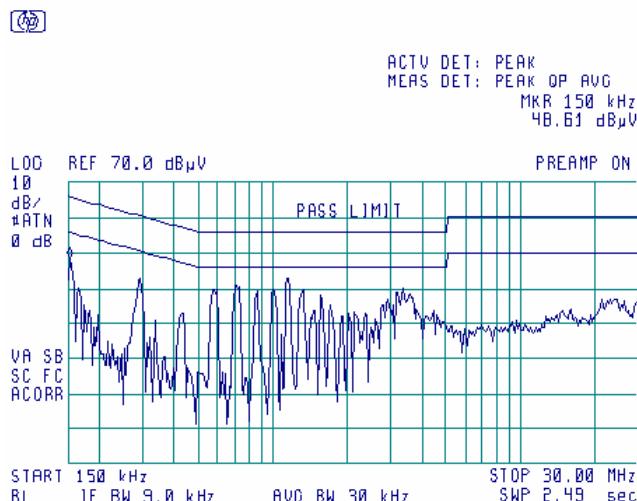
L1  
QUASI-PEAK, AVERAGE  
PEAK



**Plot 8.1.2 Conducted emission measurements on the EUT power lines**

LINE:  
LIMIT:  
DETECTOR:

L2  
QUASI-PEAK, AVERAGE  
PEAK

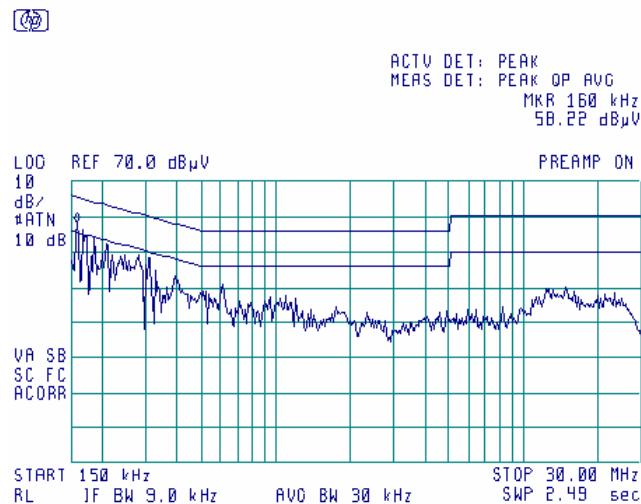




<b>Test specification:</b>	<b>Section 15.107, Conducted emission at AC power port, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date:</b>	10/31/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

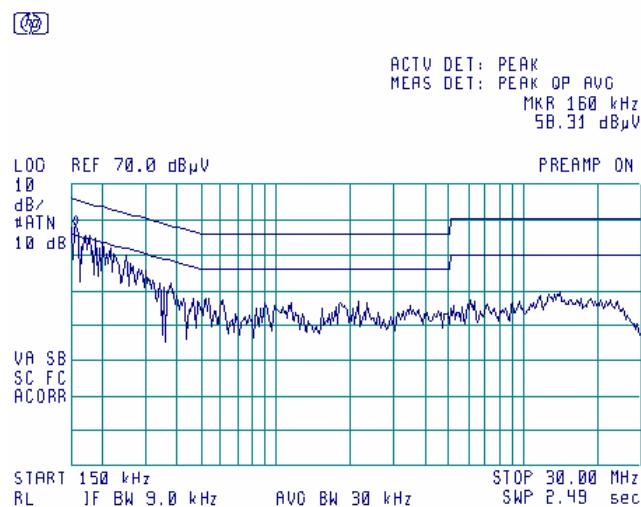
### Plot 8.1.3 Conducted emission measurements on the PC power lines

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



#### Plot 8.1.4 Conducted emission measurements on the PC power lines

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



<b>Test specification:</b>	<b>Section 15.109, Radiated emission, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/2/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

## 8.2 Radiated emission measurements

### 8.2.1 General

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

Table 8.2.1 Radiated emission test limits

<b>Frequency,</b> <b>MHz</b>	<b>Class B limit,</b> <b>dB(µV/m)</b>	
	<b>10 m distance</b>	<b>3 m distance</b>
30 - 88	29.5*	40.0
88 - 216	33.0*	43.5
216 - 960	35.5*	46.0
Above 960	43.5*	54.0

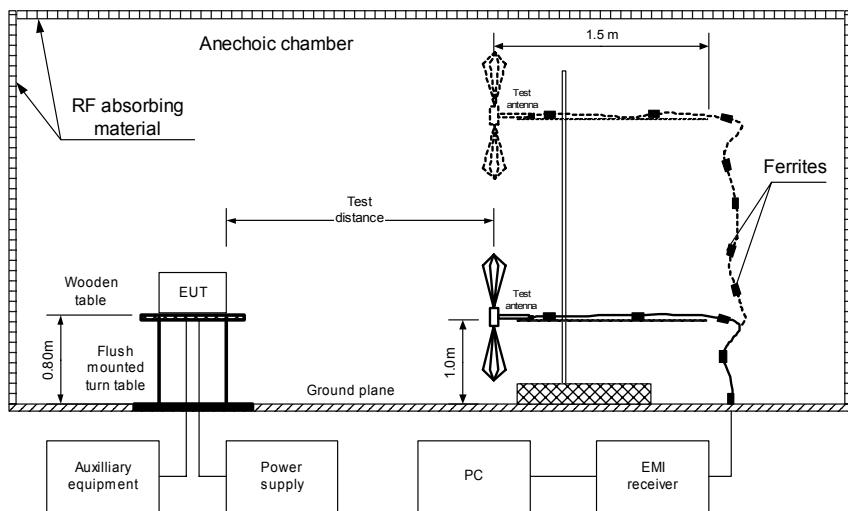
\* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows:  $\text{Lim}_{S2} = \text{Lim}_{S1} + 20 \log (S_1/S_2)$ , where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

### 8.2.2 Test procedure

- 8.2.2.1 The EUT was set up as shown in Figure 8.2.1, energized and the EUT performance was checked.
- 8.2.2.2 The measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.
- 8.2.2.3 The worst test results with respect to the limits were recorded in Table 8.2.2 and shown in the associated plots.

<b>Test specification:</b>	<b>Section 15.109, Radiated emission, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/2/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

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



<b>Test specification:</b>	<b>Section 15.109, Radiated emission, Class B</b>			
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b>	Compliance	<b>Verdict:</b>		PASS
<b>Date:</b>	11/2/2005			
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 40 %		<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>				

Table 8.2.2 Radiated emission test results

EUT SET UP:

TABLE-TOP

TEST SITE:

SEMI ANECHOIC CHAMBER

TEST DISTANCE:

3 m

DETECTORS USED:

PEAK / QUASI-PEAK

FREQUENCY RANGE:

30 MHz – 1000 MHz

RESOLUTION BANDWIDTH:

120 kHz

Frequency, MHz	Peak emission, dB(µV/m)	Measured emission, dB(µV/m)	Quasi-peak Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
<b>Low frequency:</b>								
133.300000	39.41	35.95	43.50	-7.55	H	1.8	177	Pass
239.822500	46.56	45.28	46.00	-0.72	H	1	360	
266.487500	41.69	36.75	46.00	-9.25	H	79	1	
400.012500	46.33	41.27	46.00	-4.73	V	360	1.2	
456.000000	42.00	36.76	46.00	-9.24	V	230	1.5	
522.378200	37.60	28.30	46.00	-17.70	V	2	206	
796.375000	40.56	34.16	46.00	-11.84	H	37	1.7	
<b>High frequency:</b>								
133.220000	37.41	33.49	43.50	-10.01	H	1.8	177	
239.825000	46.28	44.69	46.00	-1.31	H	1	360	
266.480000	37.09	32.38	46.00	-13.62	H	79	1	
399.900000	48.57	42.54	46.00	-3.46	V	360	1.2	
515.100000	36.80	27.47	46.00	-18.53	V	230	1.5	
563.537500	39.60	34.01	46.00	-11.99	V	2	206	
795.450000	42.89	36.62	46.00	-9.38	H	37	1.7	
905.213400	38.06	35.95	46.00	-10.05	V	360	1.2	

<b>Test specification:</b>	<b>Section 15.109, Radiated emission, Class B</b>			
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b>	Compliance			<b>Verdict:</b>
<b>Date:</b>	11/2/2005			<b>PASS</b>
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 40 %		<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>				

Table 8.2.3 Radiated emission test results

TEST SITE: SEMI ANECHOIC CHAMBER

TEST DISTANCE: 3 m

DETECTORS USED: PEAK / AVERAGE

FREQUENCY RANGE: 1000 MHz – 8000MHz

RESOLUTION BANDWIDTH: 1000 KHz

Frequency, MHz	Peak emission, dB(µV/m)	Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict	
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*					
<b>Low frequency:</b>									
1197.50000	48.01	41.20	54.00	-12.80	V	1.2	288	Pass	
1326.36562	47.63	40.08	54.00	-13.92	V	1.2	300		
1463.75000	48.27	40.61	54.00	-13.39	V	1.2	202		
<b>High frequency:</b>									
1195.00000	47.93	41.73	54.00	-12.27	V	1.2	288		
1325.00000	47.40	40.90	54.00	-13.10	V	1.2	300		
1460.00000	50.02	43.23	54.00	-10.77	V	1.2	202		

\*- Margin = Measured emission - specification limit.

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

## Reference numbers of test equipment used

HL 0465	HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604	HL 1947
HL 2432	HL 2780						

Full description is given in Appendix A.

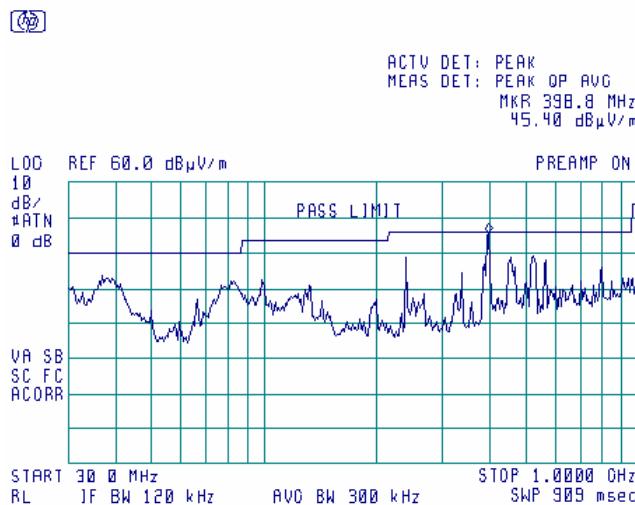
<b>Test specification:</b>	<b>Section 15.109, Radiated emission, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/2/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

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

TEST SITE: Anechoic chamber

TEST DISTANCE: 3 m

Freq: Low

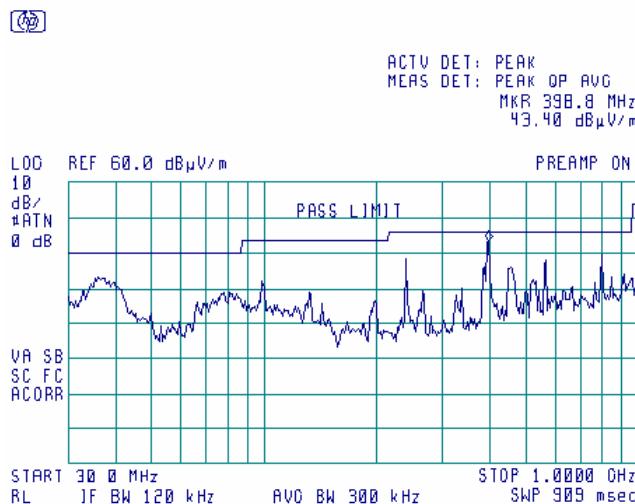


**Plot 8.2.2 Radiated emission measurements in 30- 1000 MHz range, vertical antenna polarization**

TEST SITE: Anechoic chamber

TEST DISTANCE: 3 m

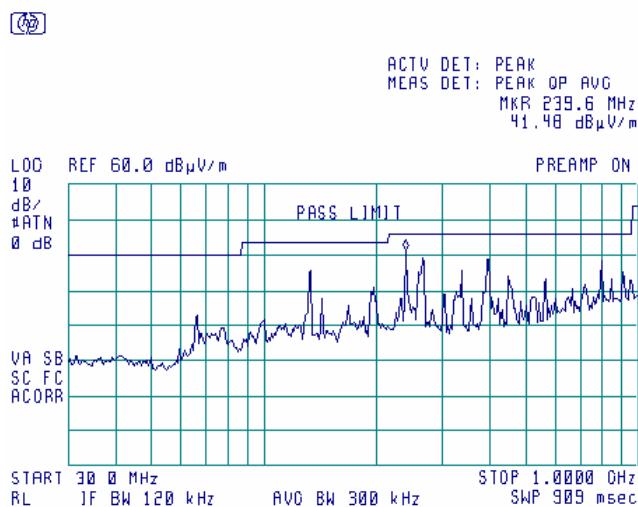
Freq: high



<b>Test specification:</b>	<b>Section 15.109, Radiated emission, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/2/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

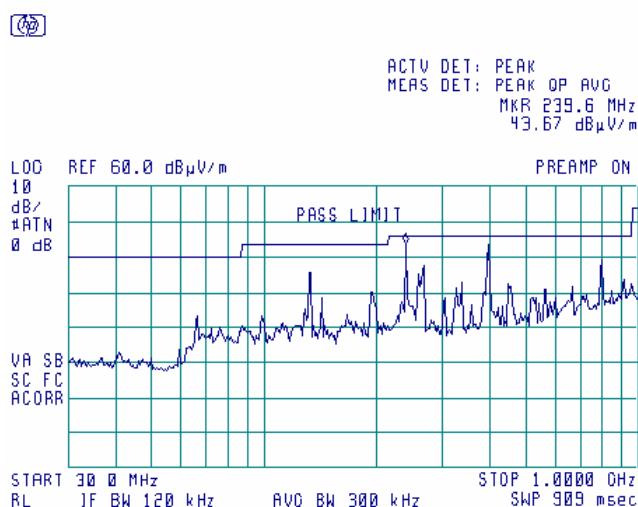
**Plot 8.2.3 Radiated emission measurements in 30- 1000 MHz range, horizontal antenna polarization**

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
Freq: low



**Plot 8.2.4 Radiated emission measurements in 30- 1000 MHz range, horizontal antenna polarization**

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
Freq: high



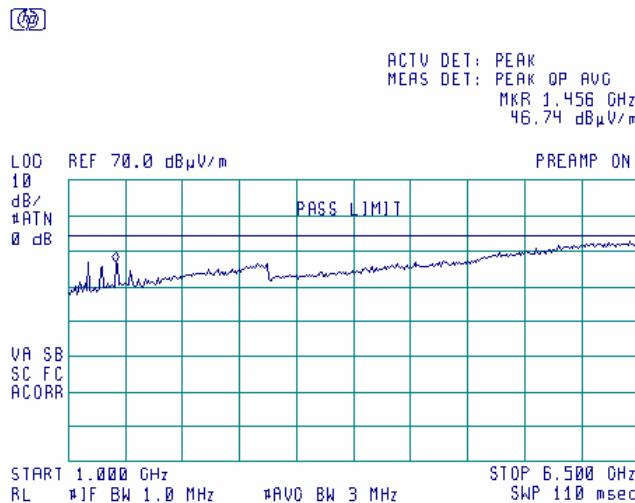
<b>Test specification:</b>	<b>Section 15.109, Radiated emission, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/2/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 8.2.5 Radiated emission measurements above 1000 MHz, vertical antenna polarization**

TEST SITE: Anechoic chamber

TEST DISTANCE: 3 m

Freq: low

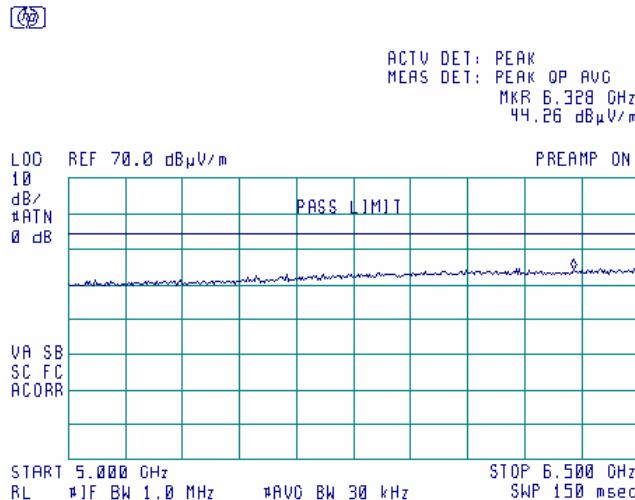


**Plot 8.2.6 Radiated emission measurements above 1000 MHz, horizontal antenna polarization**

TEST SITE: Anechoic chamber

TEST DISTANCE: 3 m

Freq: low



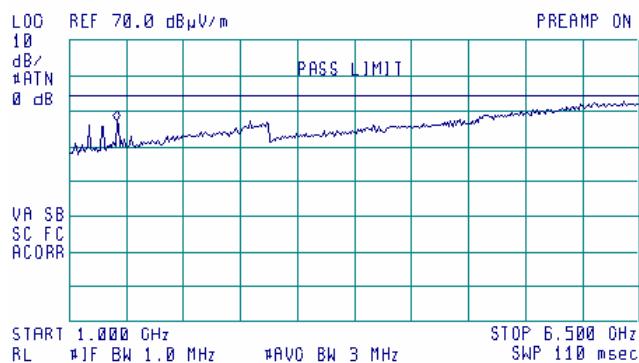
<b>Test specification:</b>	<b>Section 15.109, Radiated emission, Class B</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/2/2005		
<b>Temperature:</b> 23 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 40 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 8.2.7 Radiated emission measurements above 1000 MHz, vertical antenna polarization**

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
Freq: high



ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 1.456 GHz  
47.27 dB $\mu$ V/m

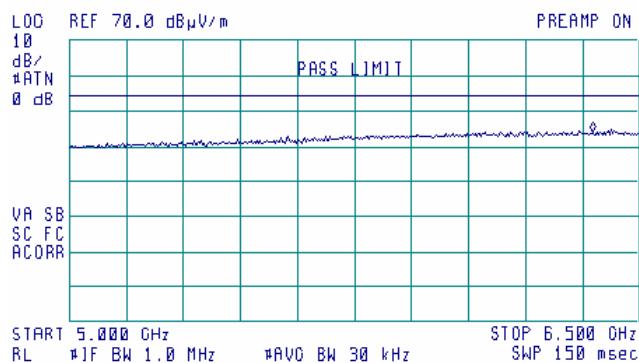


**Plot 8.2.8 Radiated emission measurements above 1000 MHz, horizontal antenna polarization**

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
Freq: high



ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 6.376 GHz  
44.04 dB $\mu$ V/m



<b>Test specification:</b>	<b>Section 15.111, Conducted emission at receiver antenna port</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 12.1.5		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005	<b>Relative Humidity:</b>	36 %
<b>Temperature:</b> 29 °C	<b>Air Pressure:</b> 1012 hPa	<b>Power Supply:</b> 120 VAC	
<b>Remarks:</b>			

### 8.3 Antenna power conducted measurements for receiver

#### 8.3.1 General

This test was performed to measure spurious emissions at RF antenna connector of receiver operated within 30 to 960 MHz band which was tested for compliance with radiated emission limits with the antenna port connected to resistive termination. The specification test limits are given in Table 8.3.1.

**Table 8.3.1 Spurious emission limits**

<b>Frequency, MHz</b>	<b>EUT type</b>	<b>Power of spurious</b>	
		<b>nW</b>	<b>dBm</b>
30 MHz – 2 <sup>nd</sup> harmonic*	Superheterodyne receiver	2.0	-57.0

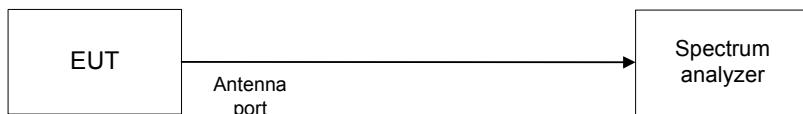
\* - harmonic of the local oscillator frequency.

#### 8.3.2 Test procedure

8.3.2.1 The EUT was set up as shown in Figure 8.3.1, energized and its proper operation was checked.

8.3.2.2 The spurious emission was measured with spectrum analyzer as provided in Table 8.3.2 and associated plots.

**Figure 8.3.1 Spurious emission test setup**



<b>Test specification:</b>	<b>Section 15.111, Conducted emission at receiver antenna port</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 12.1.5		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005	<b>Relative Humidity:</b>	36 %
<b>Temperature:</b> 29 °C	<b>Air Pressure:</b> 1012 hPa	<b>Power Supply:</b> 120 VAC	
<b>Remarks:</b>			

Table 8.3.2 Spurious emission test results

INVESTIGATED FREQUENCY RANGE: 30 – 1500 MHz  
 RECEIVER TYPE: Superheterodyne  
 EUT OPERATING MODE: Receive  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1000 kHz  
 VIDEO BANDWIDTH: 3000 kHz

Frequency, MHz	Spurious emission, dBm	Limit, dBm	Margin, dB	Verdict
<b>Low channel: 740.0 MHz</b>				
719.820	-61.41	-57.0	-4.41	Pass
58.38	-64.92		-7.92	Pass
245.600	-64.88		-7.88	Pass
1022.500	-63.29		-6.29	Pass
1420.256	-58.35		-1.35	Pass
<b>High channel: 746.0MHz</b>				
713.110	-62.74	-57.0	-5.74	Pass
149.900	-64.58		-7.58	Pass
53.400	-64.03		-7.03	Pass
978.400	-64.14		-7.14	Pass
1390.450	-63.00		-6.00	Pass

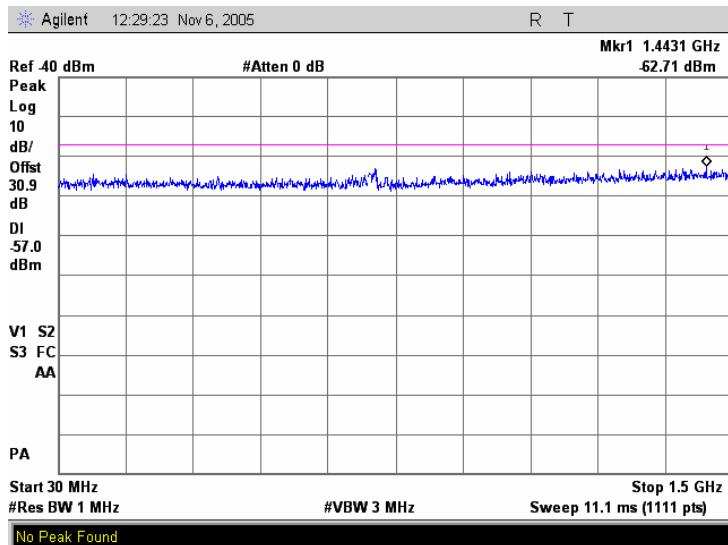
## Reference numbers of test equipment used

HL 2399	HL 1653					
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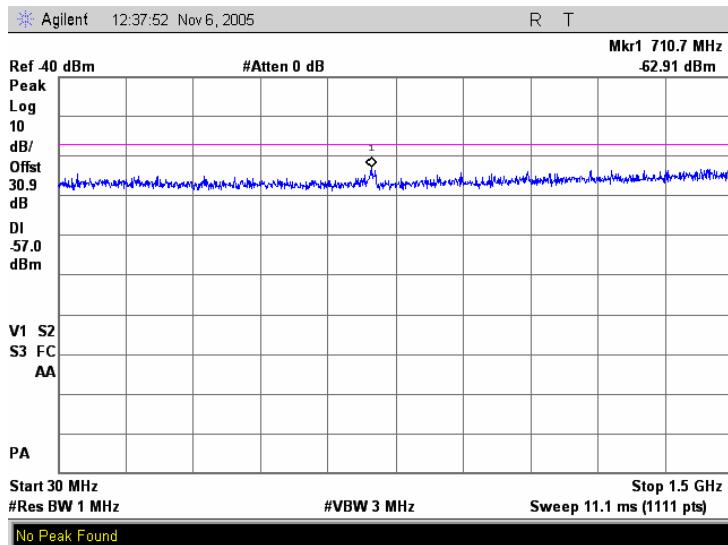
Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 15.111, Conducted emission at receiver antenna port</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 12.1.5		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date:</b>	11/8/2005		
<b>Temperature:</b> 29 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 36 %	<b>Power Supply:</b> 120 VAC
<b>Remarks:</b>			

**Plot 8.3.1 Spurious emission measurements at low channel**



**Plot 8.3.2 Spurious emission measurements at high channel**



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

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0163	LISN FCC/VDE/MIL-STD	Electro-Metrics	ANS 25/2	1314	01-Oct-04	01-Oct-05
0278	Thermometer, -200 - +760C	Fluke	51KJ	5045468	28-Apr-05	28-Apr-06
0446	Antenna, Loop active, 10kHz-30MHz	EMCO	6502	2857	28-Jun-05	28-Jun-06
0447	LISN, 16/2, 300V RMS	HL	LISN 16 - 1	066	03-Nov-04	03-Nov-05
0465	Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m	HL	AC - 1	023	10-Oct-05	10-Oct-06
0493	Oven temperature -45...175 deg C	Thermotron	S-1.2 Mini-Max	14016	10-Oct-05	10-Oct-06
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	10-Oct-05	10-Oct-06
0567	Antenna, Dipole, Tunable 500 - 1000 MHz	Electro-Metrics	TDS-25/30-2	298	10-Oct-05	10-Oct-06
0589	Cable Coaxial, GORE A2P01POL118, 2.3 m	HL	GORE-3	176	10-Oct-05	10-Oct-06
0592	Position Controller	HL	L2-SR3000 (HL CRL-3)	100	18-May-05	18-May-06
0593	Antenna Mast, 1-4 m Pneumatic	Madgesh	AM-F1	101	03-Feb-05	03-Feb-06
0594	Turn Table FOR ANECHOIC CHAMBER flush mount d=1.2 m Pneumatic	HL	TT-WDC1	102	27-Jan-05	27-Jan-06
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz	EMCO	3141	9611-1011	27-Jan-05	27-Jan-06
0613	Sensor Electric Field 10 kHz-1.0 GHz, 1-300 V/m (probe), w/charger	Amplifier Research	FP2000	18677	27-Jan-05	27-Jan-06
0661	Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm	Hewlett Packard	83640B	3614A002 66	27-Jan-05	27-Jan-06
1097	Attenuator, 50 Ohm, 5 W, DC to 8 GHz, 20 dB	Midwest Microwave	0793-20-NN-07	1097	27-Jan-05	27-Jan-06
1204	One phase Voltage regulator, 2kVA, 0-250V	HL	TDGC-2	99	04-Jun-05	04-Jun-06
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies (HP)	8542E	3807A002 62,3705A0 0217	04-Jun-05	04-Jun-06
1503	Cable RF, 6 m	Belden	M17/167 MIL-C-17	1503	11-Sep-05	11-Sep-06
1512	Cable RF, 8 m	Belden	M17/167 MIL-C-17	1512	11-Sep-05	11-Sep-06
1629	Isotropic Field Monitor	Amplifier Research	FM2000	23308	13-Feb-05	13-Feb-06
1653	Analyzer EMC 9 kHz - 1.5 GHz	Agilent Technologies (HP)	E7401A	US394402 81	13-Feb-05	13-Feb-06
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	13-Feb-05	13-Feb-06
2399	Cable 40GHz, 1.5 m, blue	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2945	24-Jun-05	24-Jun-06

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
2400	Cable 40GHz, 1.5 m, green	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2946	24-Jun-05	24-Jun-06
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	22-Mar-05	22-Mar-06
2524	Attenuator, 10 dB, DC-18 GHz	Midwest Microwave	263-10	2524	13-Feb-05	13-Feb-06
2780	EMS analyzer, 100 Hz to 26.5 GHz	Agilent Technologies (HP)	E7405A	MY451024 6	11-Jun-05	11-Jun-06

## 10 APPENDIX B Measurement uncertainties

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

Test description	Expanded uncertainty
<b>Transmitter tests</b>	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	±8%
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency stability	± 168 Hz (0.56 ppm)
<b>Unintentional radiator tests</b>	
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of ISO/IEC 17025 (or alternately ANSI/NCSL Z540-1).

The laboratory calibrates its measurement standards by a third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements. The Hermon Labs EMC measurements uncertainty is given in the table above.

## 11 APPENDIX C Test facility description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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Person for contact: Mr. Alex Usoskin, CEO.

## 12 APPENDIX D Specification references

47CFR part 27: 2004	Miscellaneous wireless communications services
47CFR part 1: 2004	Practice and procedure
47CFR part 2: 2004	Frequency allocations and radio treaty matters; general rules and regulations
47CFR part 15 subpart B: 2005	Radio Frequency Devices
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI/TIA/EIA-603-A:2001	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

## 13 APPENDIX E Abbreviations and acronyms

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

## 14 APPENDIX F Test equipment correction factors

**Correction factor**  
**Line impedance stabilization network**  
**Model LISN 16 - 1**  
**Hermon Laboratories**

Frequency, MHz	Correction factor, dB
0.01	5.0
0.02	2.2
0.03	1.1
0.04	0.7
0.05	0.5
0.1	0.2
0.2	0.1
0.4	0.1
0.6	0.1
0.8	0.1
1	0.1
2	0.1
3	0.1
4	0.1
6	0.2
10	0.3
12	0.4
16	0.5
18	0.6
20	0.7
25	0.9
28	1.2
30	1.3

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

**Correction factor  
Line impedance stabilization network  
Model ANS-25/2  
Electro-Metrics**

Frequency, MHz	Correction factor, dB
0.01	4.7
0.02	2.1
0.03	1.1
0.04	0.7
0.05	0.5
0.1	0.2
0.2	0.1
0.4	0.1
0.6	0.1
0.8	0.1
1	0.1
2	0.1
3	0.1
4	0.1
6	0.1
10	0.1
12	0.1
16	0.1
18	0.1
20	0.1
25	0.1
28	0.1
30	0.1

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

**Antenna Factor**  
**Active Loop Antenna**  
**EMC Test Systems, model 6502, serial number 2857, HL 0446**

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

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

Antenna factor

Biconilog antenna EMCO, model 3141, 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( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

**Antenna factor**  
**Double-ridged wave guide horn antenna**  
**EMC Test Systems, model 3115, serial no: 00027177, HL 2432**

Frequency, MHz	Antenna gain, dBi	Antenna factor. dB(1/m)
1000.0	5.5	24.7
1500.0	8.0	25.7
2000.0	8.4	27.8
2500.0	9.3	28.9
3000.0	9.0	30.7
3500.0	9.3	31.8
4000.0	9.3	33.0
4500.0	10.4	32.8
5000.0	10.0	34.2
5500.0	10.1	34.9
6000.0	10.6	35.2
6500.0	11.0	35.4
7000.0	10.8	36.3
7500.0	10.4	37.3
8000.0	10.8	37.5
8500.0	10.8	38.0
9000.0	11.0	38.3
9500.0	11.5	38.3
10000.0	11.5	38.7
10500.0	11.9	38.7
11000.0	12.2	38.9
11500.0	11.9	39.5
12000.0	12.3	39.5
12500.0	12.7	39.4
13000.0	12.0	40.5
13500.0	12.0	40.8
14000.0	11.6	41.5
14500.0	12.2	41.3
15000.0	13.6	40.2
15500.0	15.3	38.7
16000.0	15.8	38.5
16500.0	14.8	39.8
17000.0	12.9	41.9
17500.0	9.2	45.8
18000.0	6.2	49.1

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

**Cable loss**

Cable coaxial, GORE A2P01POL118, 2.3 m, model GORE-3, serial number 176, HL 0589  
 + Cable coaxial, ANDREW PSWJ4, 6 m, model: ANDREW-6, serial number 163, HL 1004

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	30	0.33		
2	50	0.40		
3	100	0.57		
4	300	0.97		
5	500	1.25		
6	800	1.59		
7	1000	1.81		
8	1200	1.97	≤ 6.5	±0.12
9	1400	2.15		
10	1600	2.28		
11	1800	2.43		
12	2000	2.61		
13	2200	2.75		
14	2400	2.89		
15	2600	2.97		
16	2800	3.21	≤ 6.5	±0.12
17	3000	3.32		
18	3300	3.47		
19	3600	3.62		
20	3900	3.84		
21	4200	3.92		
22	4500	4.07		
23	4800	4.36		
24	5100	4.62		
25	5400	4.78		
26	5700	5.16		
27	6000	5.67		
28	6500	5.99		

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

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

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

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

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

**Cable loss**  
**Cable coaxial, 40GHz, 1.5 m, green, Rhophase Microwave Limited, model: KPS-1503A-1500-KPS,  
 HL 2400**

Frequency, GHz	Insertion loss, dB
0.03	0.06
0.05	0.08
0.1	0.15
0.2	0.23
0.3	0.29
0.5	0.37
0.7	0.46
0.9	0.53
1.1	0.58
1.3	0.65
1.5	0.66
1.7	0.72
1.9	0.76
2.1	0.79
2.3	0.85
2.5	0.90
2.7	0.91
2.9	0.97
3.1	0.97
3.3	1.03
3.5	1.06
3.7	1.10
3.9	1.13
4.1	1.16
4.3	1.18
4.5	1.21
4.7	1.23
4.9	1.26
5.1	1.28
5.3	1.31
5.5	1.32
5.7	1.36
5.9	1.37
6.1	1.38
6.3	1.44
6.5	1.46
6.7	1.49
6.9	1.50
7.1	1.51
7.3	1.55
7.5	1.56
7.7	1.58
7.9	1.60
8.1	1.61
8.3	1.68
8.5	1.68
8.7	1.75
8.9	1.74
9.1	1.81
9.3	1.79
9.5	1.86
9.7	1.85
9.9	1.87
10.1	1.88

Frequency, GHz	Insertion loss, dB
10.30	1.82
10.50	1.92
10.70	1.86
10.90	1.96
11.10	1.90
11.30	1.99
11.50	1.95
11.70	2.00
11.90	2.01
12.10	1.99
12.40	2.06
13.00	2.11
13.50	2.17
14.00	2.36
14.50	2.32
15.00	2.30
15.50	2.34
16.00	2.34
16.50	2.40
17.00	2.46
17.50	2.54
18.00	2.61
18.50	2.59
19.00	2.59
19.50	2.67
20.00	2.62
20.50	2.73
21.00	2.71
21.50	2.78
22.00	2.83
22.50	2.81
23.00	2.91
23.50	2.97
24.00	2.98
24.50	2.97
25.00	3.03
25.50	3.04
26.00	3.11
26.50	2.97
27.00	3.15
28.00	3.07
29.00	3.13
30.00	3.13
31.00	3.18
32.00	3.31
33.00	3.32
34.00	3.37
35.00	3.36
36.00	3.46
37.00	3.49
38.00	3.52
39.00	3.62
40.00	3.77