

TEST REPORT

ACCORDING TO: FCC part 27: 2005, sections 27.53(d)(3), 27.53(e) and
part 15: 2005 subpart B

FOR:

Vyyo Ltd.

**UHF industrial modem with
Wi-Fi access point**

Model:V290iA

FCC ID:PBJV284-PLUS-A

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.
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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: adahan@vyyo.com
Contact name: Mr. Avihai Dahan

2 Equipment under test attributes

Product name: UHF industrial modem with Wi-Fi access point
Operating frequency range: 776.075 – 776.925 MHz
Model: V290iA, FCC ID: PBJV284-PLUS-A
Serial number: 0067
Receipt date: 4/26/2006

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: adahan@vyyo.com
Contact name: Mr. Avihai Dahan




4 Test details

Project ID: 17088
Location: Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started: 5/01/2006
Test completed: 5/23/2006
Test specifications: FCC 47CFR:2005 part 27, §27.53(d)(3), §27.53(e);
FCC part 15, subpart B

5 Tests summary

Test	Status
Transmitter characteristics	
Section 27.53(d)(3), Spurious emissions RF antenna connector	Pass
Section 27.53(d)(3), Radiated spurious emissions	Pass
Section 27.53(e), Radiated spurious emissions in 1559-1610 MHz band	Pass
Unintentional emissions	
Section 15.107, Conducted emission at AC power port	Pass
Section 15.109, Radiated emission	Pass

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

	Name and Title	Date	Signature
Tested by:	Mr. A. Adelberg, test engineer	May 18, 2006	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	May 28, 2006	
Approved by:	Mr. M. Nikishin, EMC and Radio group leader	May 29, 2006	

6 EUT description

6.1 General information

The EUT is a router including 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 776.1 to 776.9 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	IEC 60320	1	Unshielded	1.5 m	Indoor
Power	VDC	EUT	Power adaptor	DC jack	1	Unshielded	1.5 m	Indoor
Signal	Antenna	EUT	Attenuator	F-type	1	Coax 75 Ohm	10.0 m	Outdoor
Signal	Ethernet	EUT	Open circuit	RJ 45	3	FTP Cat.5	1.5 m	Indoor
Signal	RS232 (SCADA)	EUT	Loop	D type 9	4	Unshielded	2 m	Outdoor
Signal	AUX	EUT	Open circuit	D type 9	1	Unshielded	2 m	Indoor
Signal	Power Supply Control	EUT	Open circuit	D type 9	2	Unshielded	2 m	Indoor

6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Wireless modem termination system	Vyvo	V3000	5036408
Up converter (256 QAM)	Wavecom	UC4040D	216450
Down converter	Vyvo	XTB VHF	1348529
Laptop	IBM	ThinkPad 600x	5573MWV02/99
Power adaptor for EUT	DVE	DSA-0151A	3604
Power adaptor for laptop	IBM	02K6654	150HN9
Switch 24 ports	Super Stack	3C16980	0602/72NV4990A 1

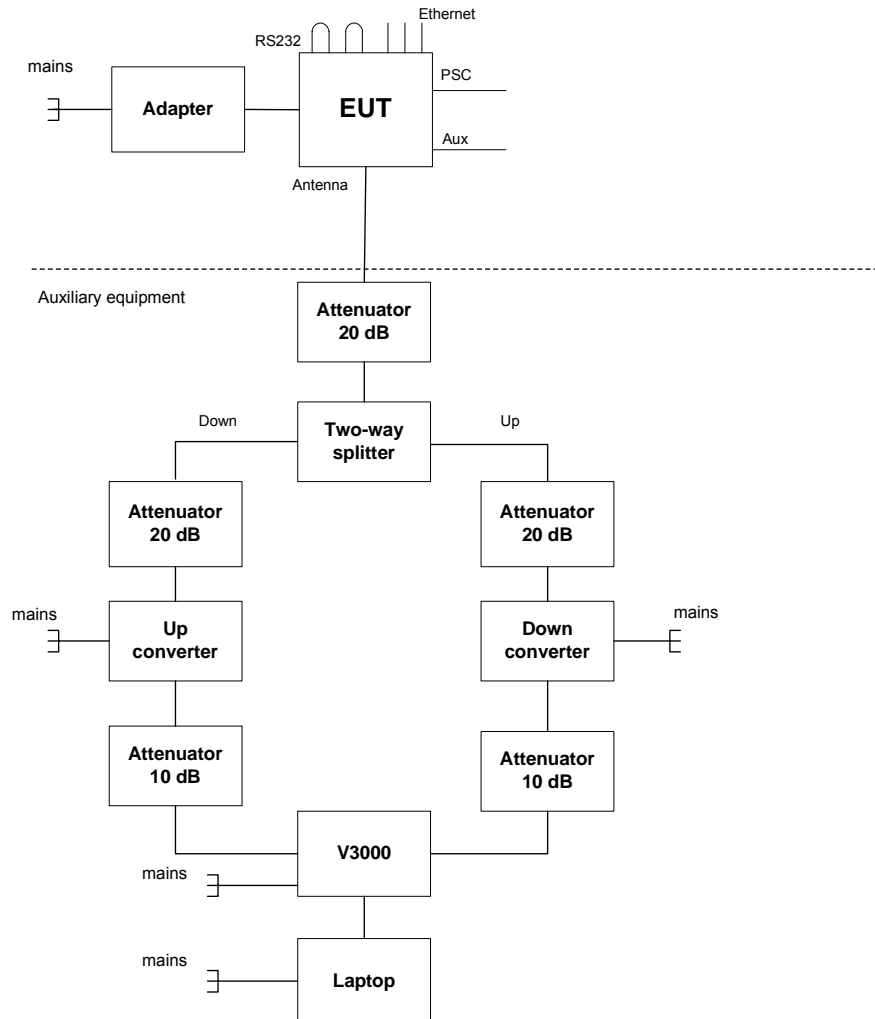
6.4 Operating frequencies

Source	Frequency, MHz		
Receiver	702.0 (LO)	44.0 (IF)	746.075 – 746.925 (Rx)
Transmitter	10.0 (VCTXO)	44.0 (IF)	776.075 – 776.925 (Tx)

6.5 Changes made in the EUT

No changes were implemented.

6.6 Test configuration



6.7 Transmitter characteristics

Type of equipment						
Stand-alone (Equipment with or without its own control provisions)						
X 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				
X 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		776.0 – 777.0 MHz				
Wi-Fi frequency range		2412 – 2462 MHz				
Operating frequency range		776.075 – 776.925 MHz				
Maximum rated output power		At transmitter 50 Ω RF output connector				28.16 dBm
		Effective radiated power (for equipment with no RF connector)				NA
Is transmitter output power variable?		No				
		X	Yes	continuous variable		
				X	stepped variable with stepsize	0.25 dB
				minimum RF power		-17.0 dBm
				maximum RF power		+28.16 dBm
Antenna connection						
unique coupling	X	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			150 / 200 / 325 / 400kHz			
Type of multiplexing			TDMA			
Modulating test signal (baseband)			PRBS			
Maximum transmitter duty cycle in normal use			50 %			
Transmitter duty cycle supplied for test			100 %			
Transmitter power source						
	Battery	Nominal rated voltage	VDC	Battery type		
	DC	Nominal rated voltage	VDC			
X	AC mains	Nominal rated voltage	120 VAC	Frequency	60 Hz	
Common power source for transmitter and receiver				X	yes	no
Type of modulation	Modulation states (constellation)		RF channel spacing	Frequency channel		
				Low	Mid	High
QAM	16		150 kHz	776.075	776.5	776.925
QPSK	4		150 kHz	776.075	776.5	776.925
QAM	16		200 kHz	776.1	776.5	776.9
QPSK	4		200 kHz	776.1	776.5	776.9
QAM	16		325 kHz	776.1625	776.5	776.8375
QPSK	4		325 kHz	776.1625	776.5	776.8375
QAM	16		400 kHz	776.2	776.5	776.8
QPSK	4		400 kHz	776.2	776.5	776.8

Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

7 Transmitter characteristics

7.1 Spurious emissions at RF antenna connector test

7.1.1 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 7.1.1 Spurious emission limits

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

* - P is transmitter output power in Watts.

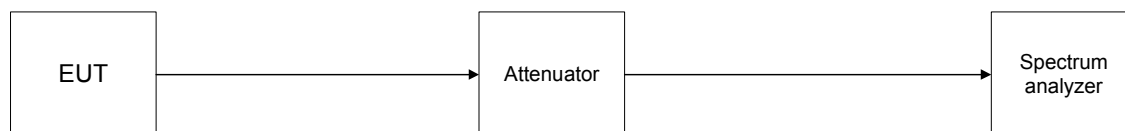
7.1.2 Test procedure

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

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

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

Figure 7.1.1 Spurious emission test setup



Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 776.0 – 777.0 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 8000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATION: 16QAM and QPSK
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Bit rate, Mbps	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low channel						
All emissions found more than 20 dB below limit						Pass
Mid channel						
All emissions found more than 20 dB below limit						Pass
High channel						
All emissions found more than 20 dB below limit						Pass

*- Margin = Spurious emission – specification limit.

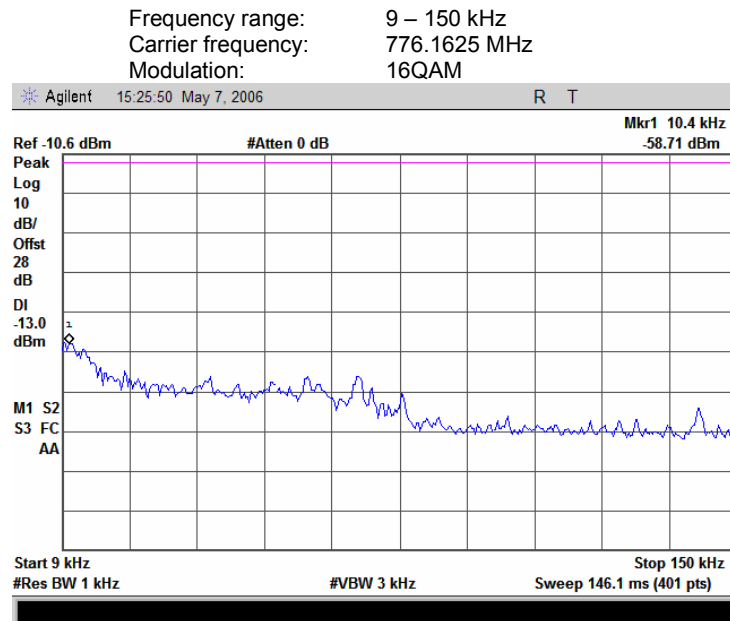
Reference numbers of test equipment used

HL 0186	HL 1474	HL 1475	HL 1653	HL 1942			
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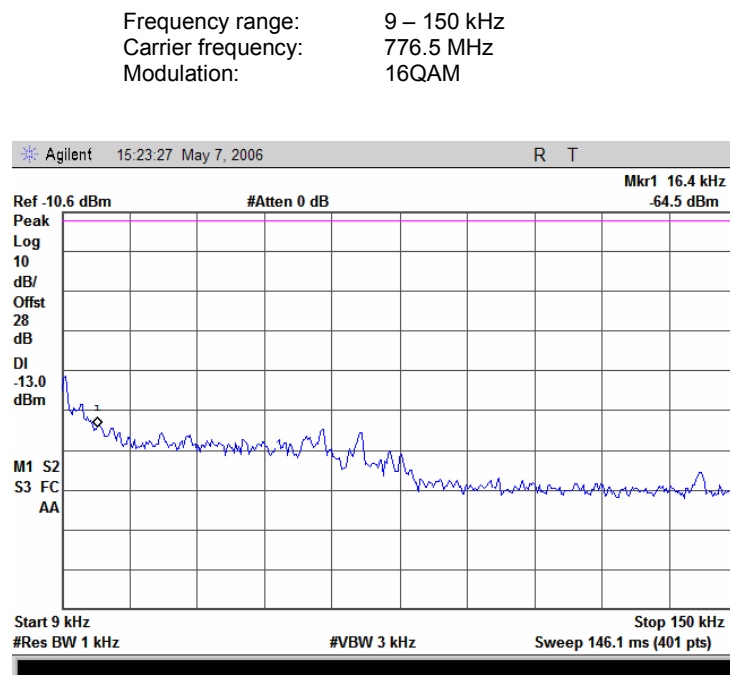
Full description is given in Appendix A.

Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.1 Spurious emission measurements at RF antenna connector, low channel



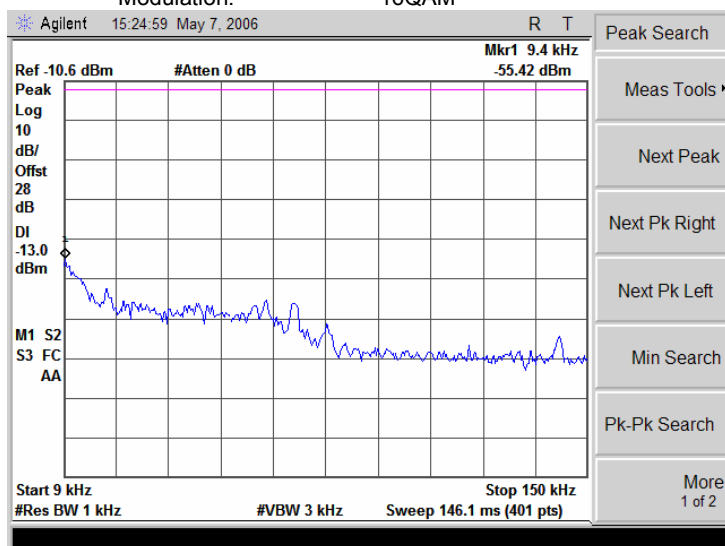
Plot 7.1.2 Spurious emission measurements at RF antenna connector, mid channel



Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

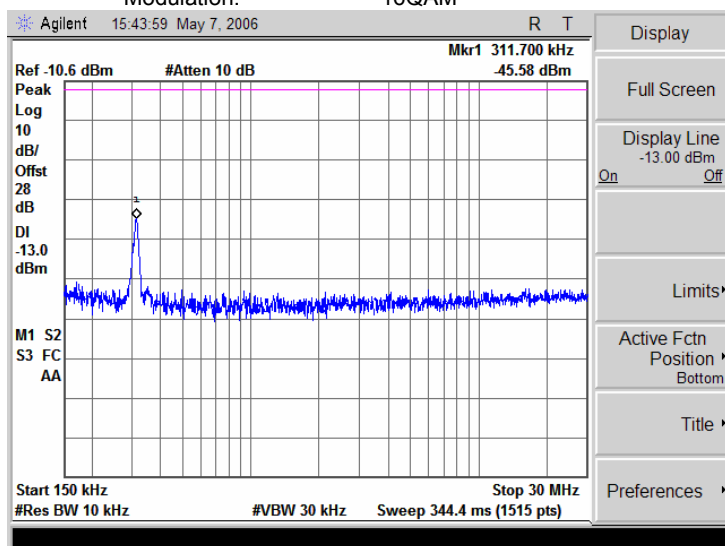
Plot 7.1.3 Spurious emission measurements at RF antenna connector, high channel

Frequency range: 9 – 150 kHz
Carrier frequency: 776.8375 MHz
Modulation: 16QAM



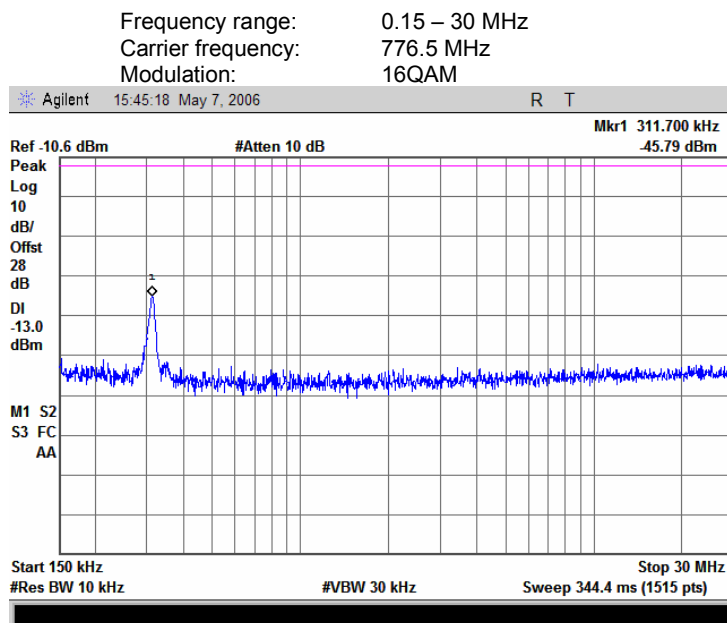
Plot 7.1.4 Spurious emission measurements at RF antenna connector, low channel

Frequency range: 0.15 – 30 MHz
Carrier frequency: 776.1625 MHz
Modulation: 16QAM

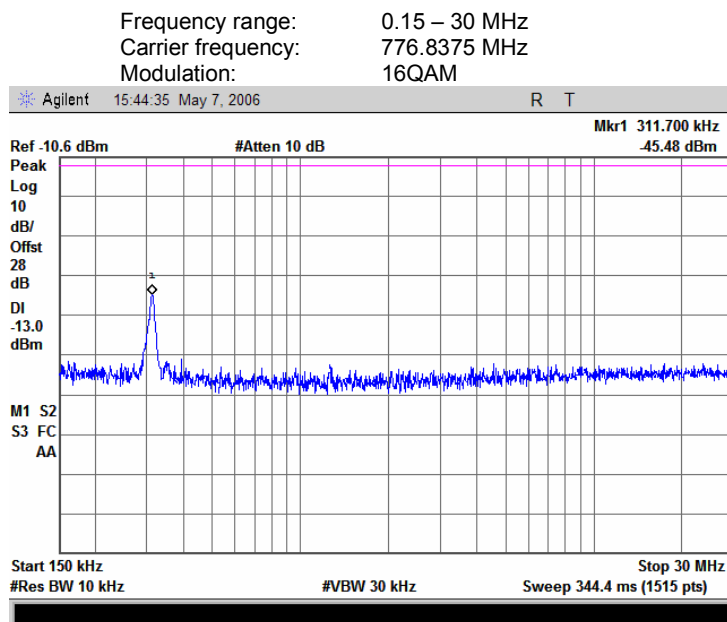


Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.5 Spurious emission measurements at RF antenna connector, mid channel

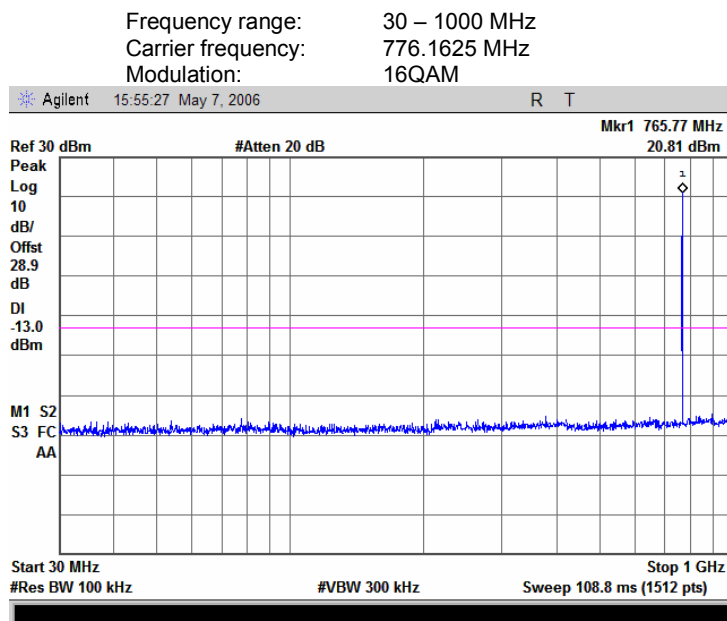


Plot 7.1.6 Spurious emission measurements at RF antenna connector, high channel

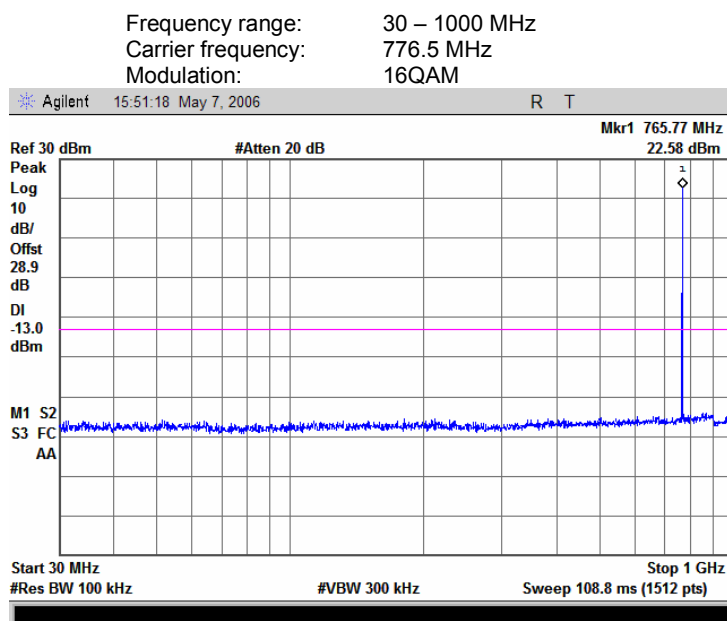


Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.7 Spurious emission measurements at RF antenna connector, low channel

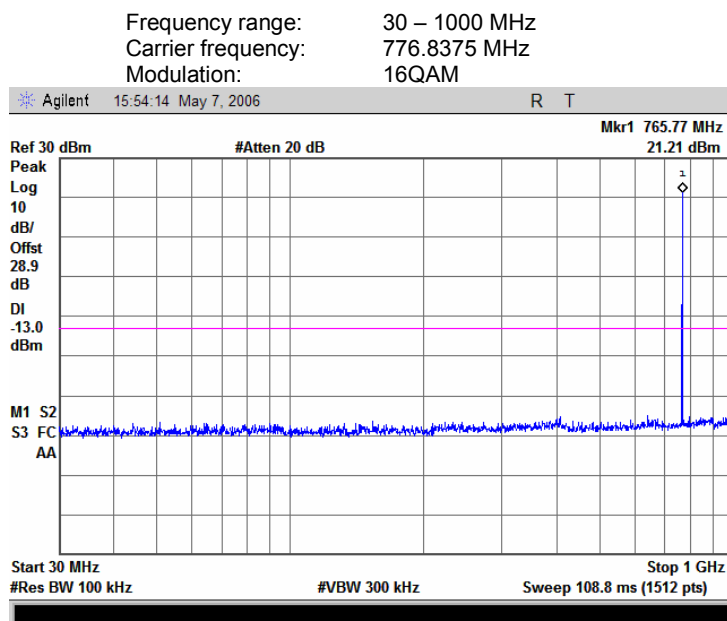


Plot 7.1.8 Spurious emission measurements at RF antenna connector, mid channel

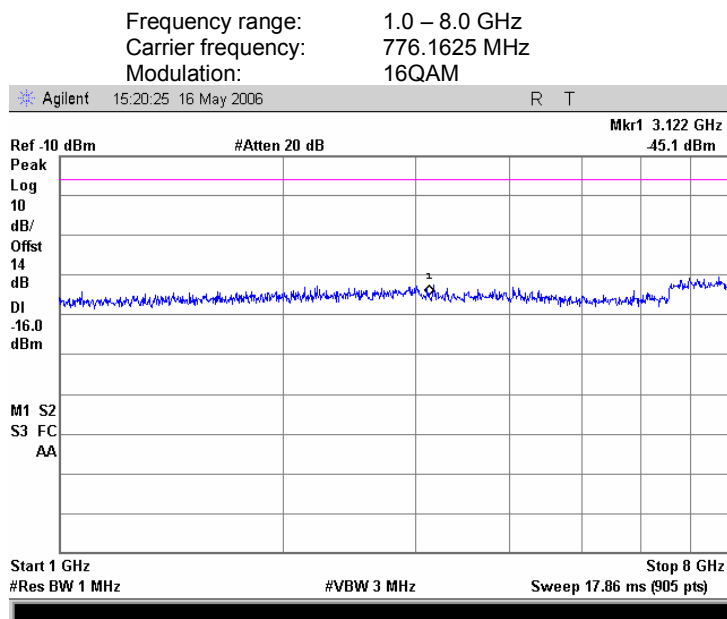


Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.9 Spurious emission measurements at RF antenna connector, high channel



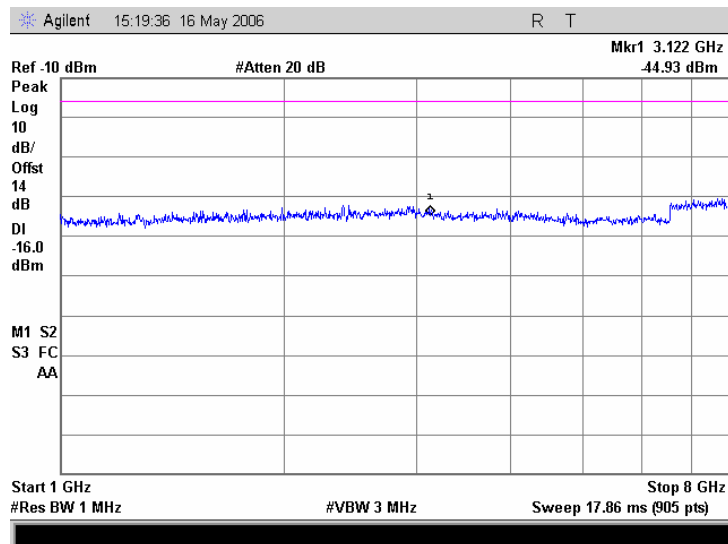
Plot 7.1.10 Spurious emission measurements at RF antenna connector, low channel



Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

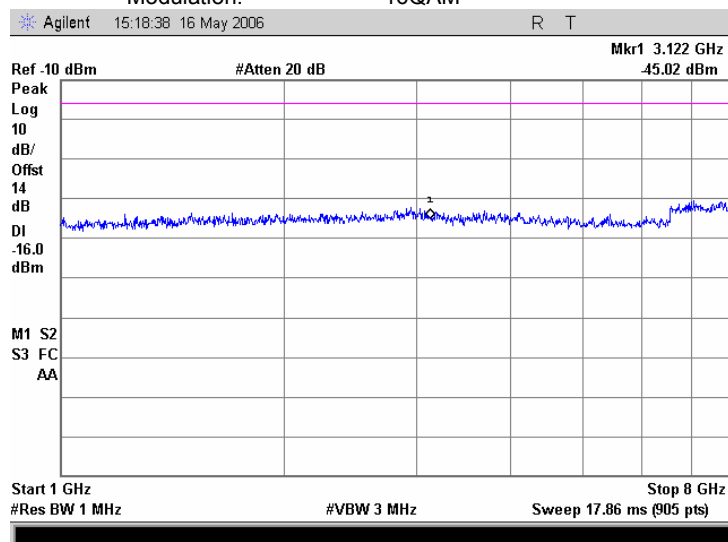
Plot 7.1.11 Spurious emission measurements at RF antenna connector, mid channel

Frequency range: 1.0 – 8.0 GHz
Carrier frequency: 776.5 MHz
Modulation: 16QAM



Plot 7.1.12 Spurious emission measurements at RF antenna connector, high channel

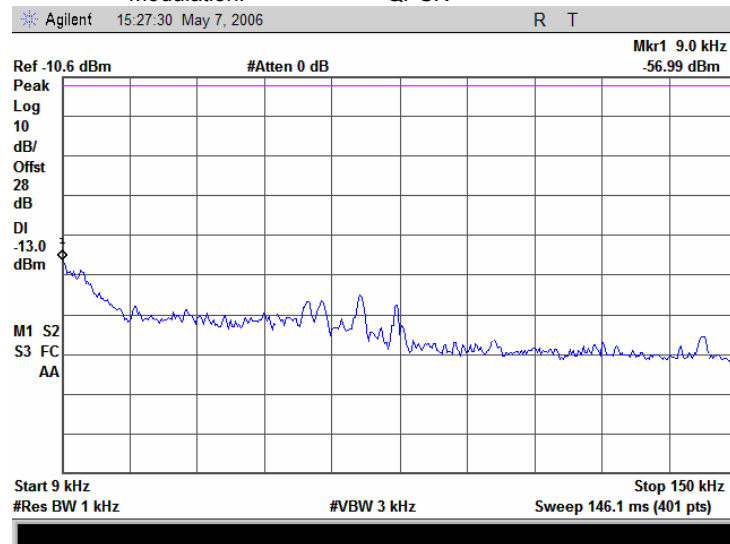
Frequency range: 1.0 – 8.0 GHz
Carrier frequency: 776.8375 MHz
Modulation: 16QAM



Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

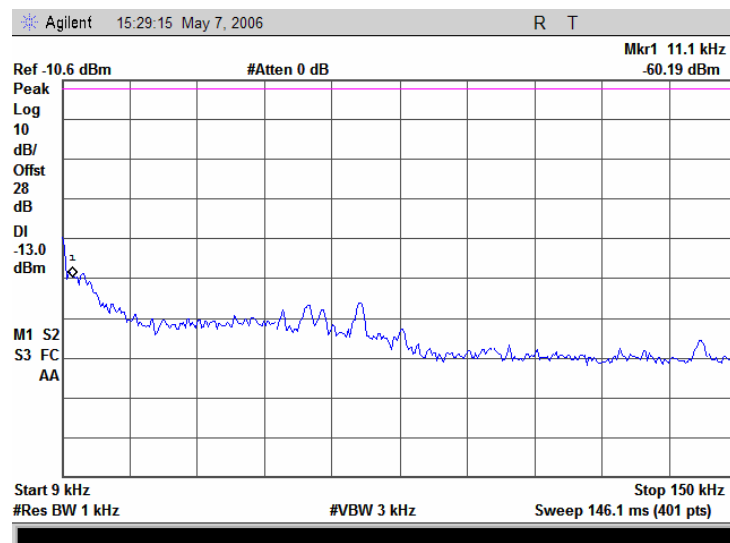
Plot 7.1.13 Spurious emission measurements at RF antenna connector, low channel

Frequency range: 9 – 150 kHz
Carrier frequency: 776.1625 MHz
Modulation: QPSK



Plot 7.1.14 Spurious emission measurements at RF antenna connector, mid channel

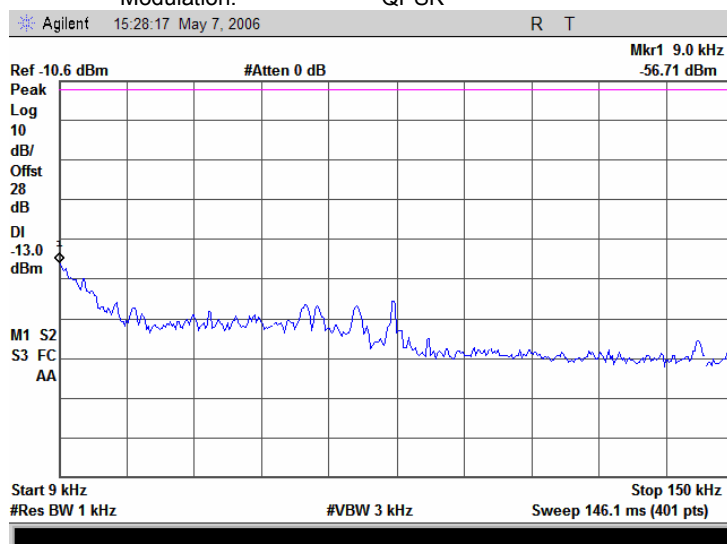
Frequency range: 9 – 150 kHz
Carrier frequency: 776.5 MHz
Modulation: QPSK



Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

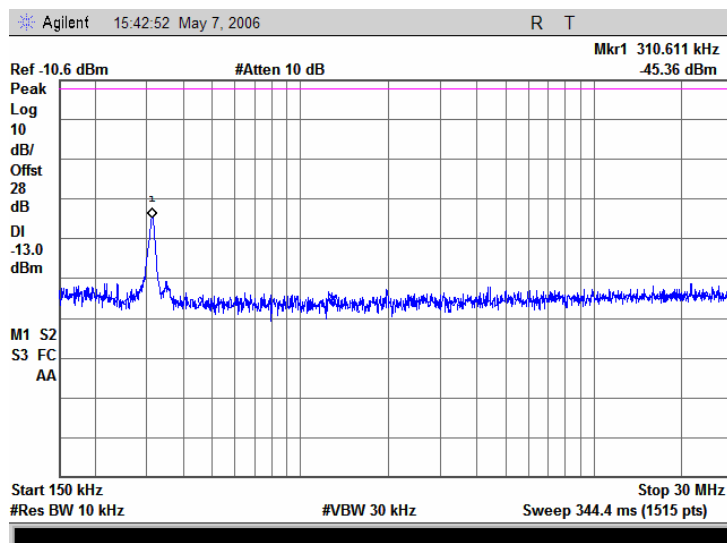
Plot 7.1.15 Spurious emission measurements at RF antenna connector, high channel

Frequency range: 9 – 150 kHz
Carrier frequency: 776.8375 MHz
Modulation: QPSK



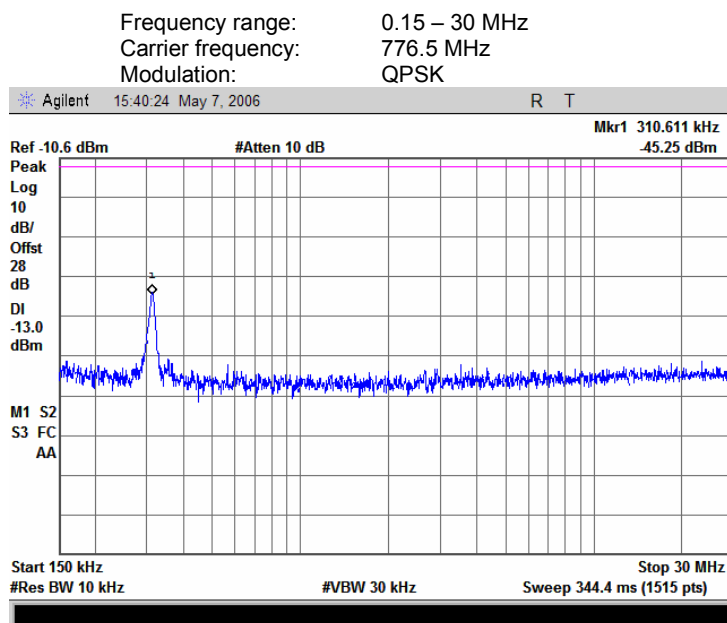
Plot 7.1.16 Spurious emission measurements at RF antenna connector, low channel

Frequency range: 0.15 – 30 MHz
Carrier frequency: 776.1625 MHz
Modulation: QPSK

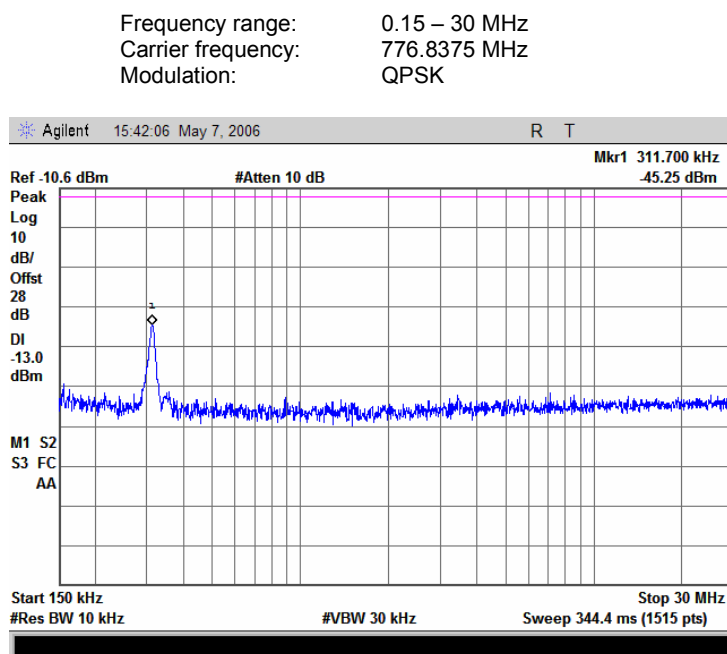


Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.17 Spurious emission measurements at RF antenna connector, mid channel

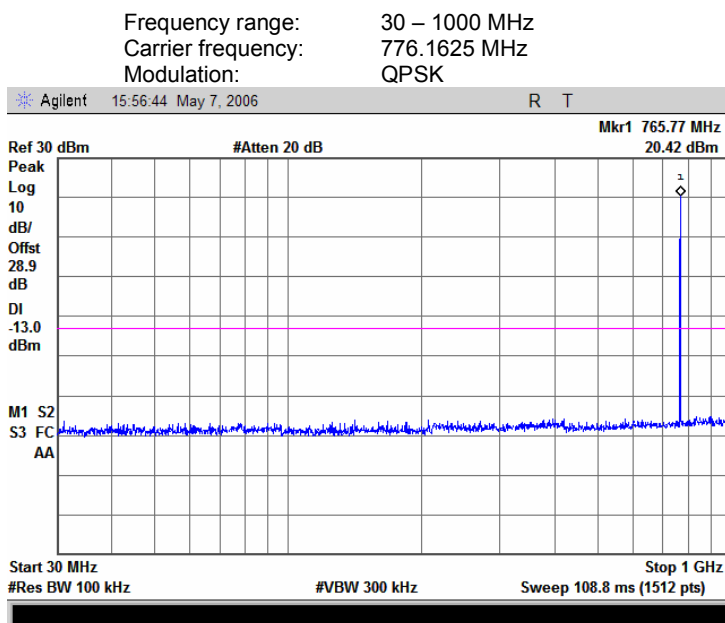


Plot 7.1.18 Spurious emission measurements at RF antenna connector, high channel

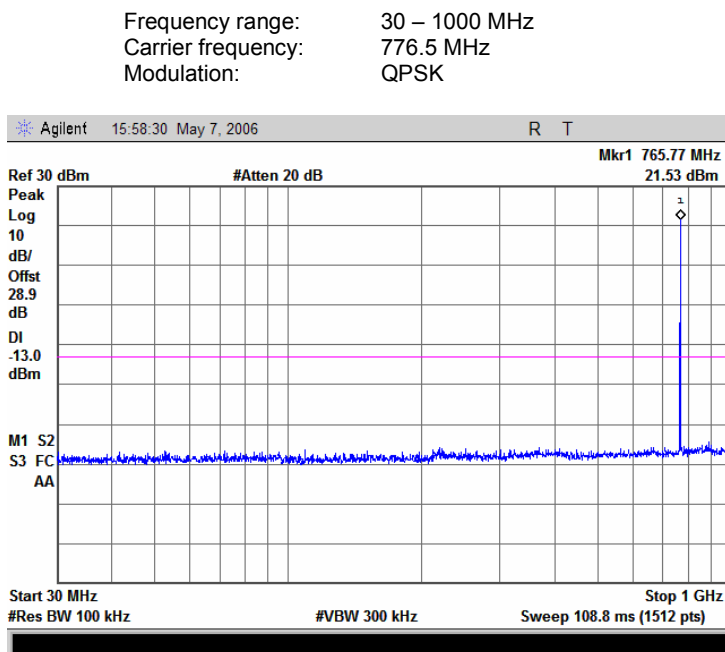


Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.19 Spurious emission measurements at RF antenna connector, low channel



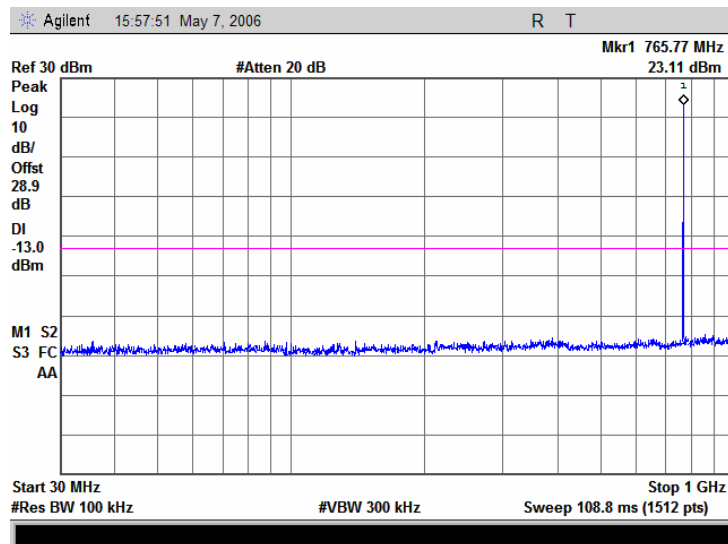
Plot 7.1.20 Spurious emission measurements at RF antenna connector, mid channel



Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

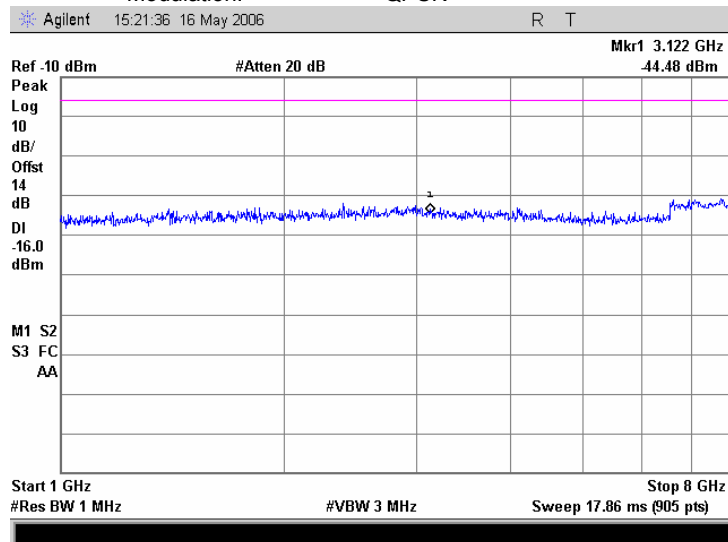
Plot 7.1.21 Spurious emission measurements at RF antenna connector, high channel

Frequency range: 30 – 1000 MHz
Carrier frequency: 776.8375 MHz
Modulation: QPSK



Plot 7.1.22 Spurious emission measurements at RF antenna connector, low channel

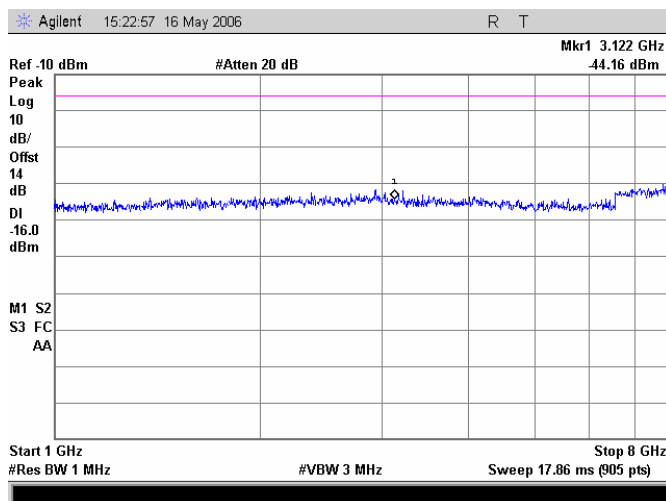
Frequency range: 1.0 – 8.0 GHz
Carrier frequency: 776.1625 MHz
Modulation: QPSK



Test specification:	Section 27.53(d)(3), Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	5/07/2006		
Temperature: 21 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

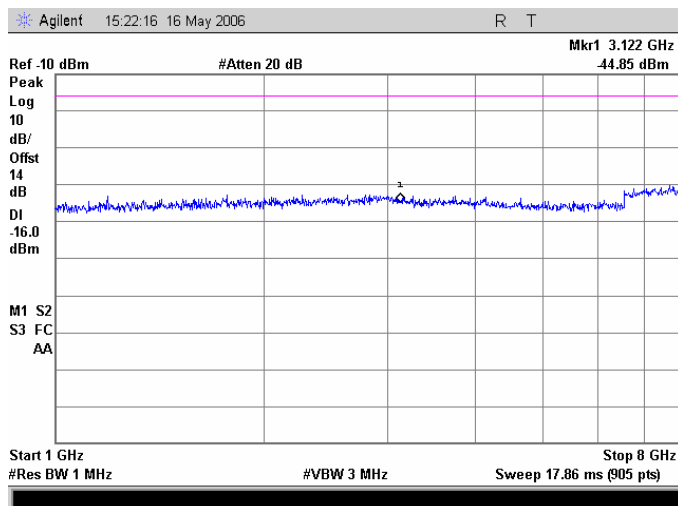
Plot 7.1.23 Spurious emission measurements at RF antenna connector, mid channel

Frequency range: 1.0 – 8.0 GHz
Carrier frequency: 776.5 MHz
Modulation: QPSK



Plot 7.1.24 Spurious emission measurements at RF antenna connector, high channel

Frequency range: 1.0 – 8.0 GHz
Carrier frequency: 776.8375 MHz
Modulation: QPSK



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.2 Radiated spurious emission measurements

7.2.1 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 7.2.1.

Table 7.2.1 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 th 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.

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

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the EUT performance was checked.

7.2.2.2 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.

7.2.2.3 The test results were recorded in Table 7.2.2 and shown in the associated plots.

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

7.2.3.1 The EUT was set up as shown in Figures 7.5.2, energized and the EUT performance was checked.

7.2.3.2 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.

7.2.3.3 The worst test results with respect to the limits were recorded in Table 7.2.2 and shown in the associated plots.

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

7.2.3.5 The worst test results with respect to the limits were recorded in Table 7.2.2 and shown in the associated plots.

Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Figure 7.2.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz range

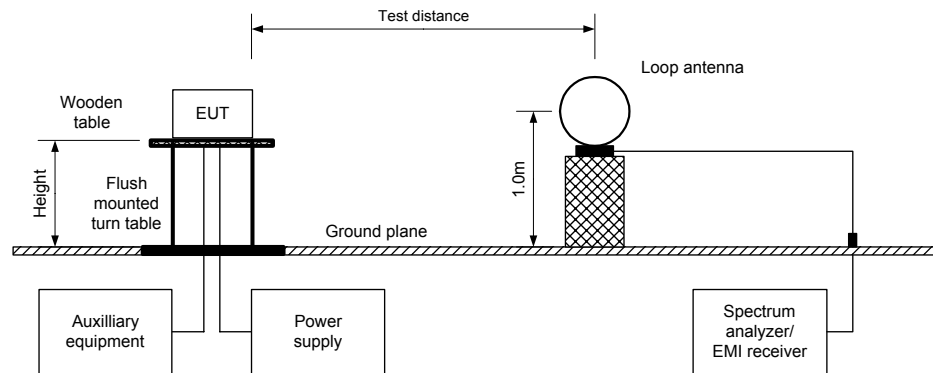
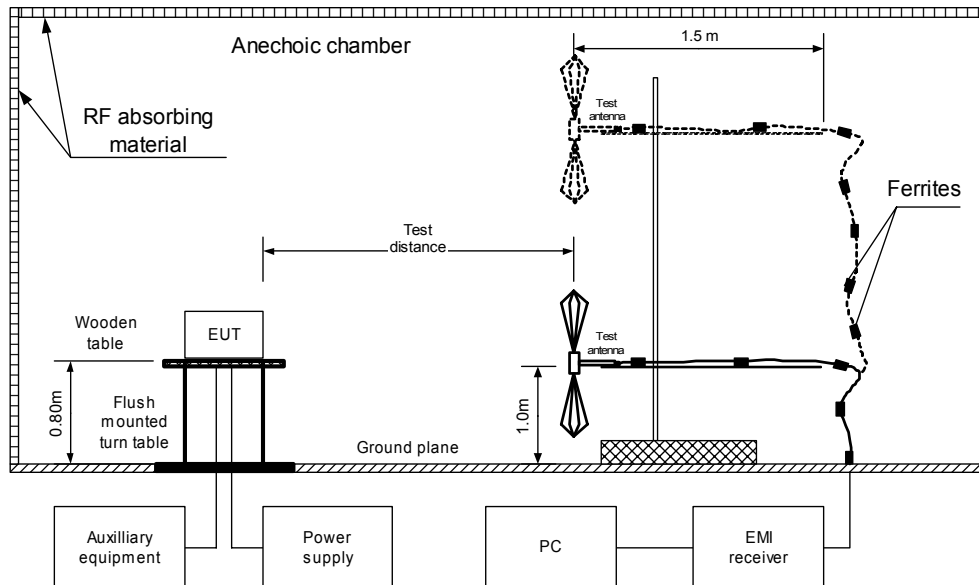
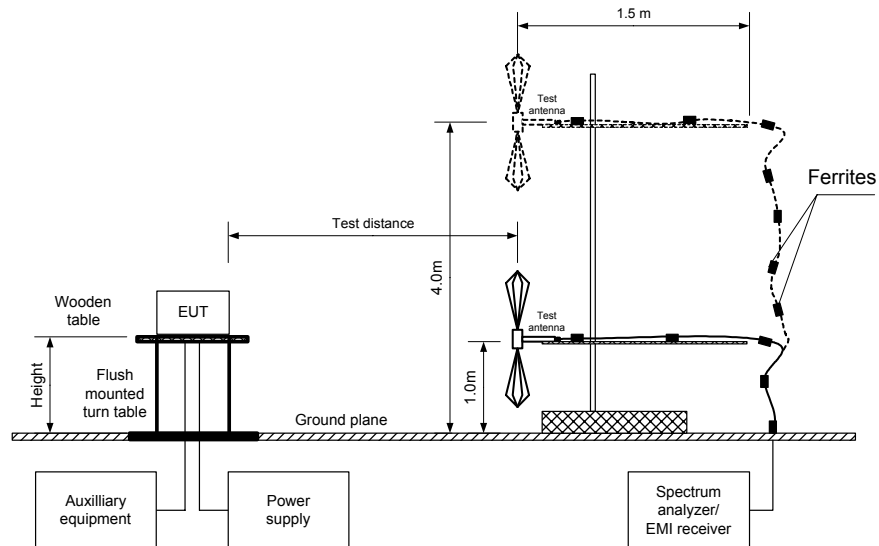


Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Figure 7.2.3 Setup for spurious emission field strength measurements in 1 to 8 GHz range



Photograph 7.2.1 Setup for spurious emission field strength measurements in 1 to 8 GHz range



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Photograph 7.2.2 Setup for spurious emission field strength measurements in the anechoic chamber



Photograph 7.2.3 Setup for spurious emission field strength measurements in 1 to 8 GHz range at OATS



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.2.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 776.0 – 777.0 MHz
TEST DISTANCE: 3 m
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 8000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: 16QAM
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Antenna polarization	RBW, kHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Verdict
0.311265	-	150	69.4	84.4	-15	Pass
All other found emissions were more than 20 dB below the limit						Pass

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

Reference numbers of test equipment used

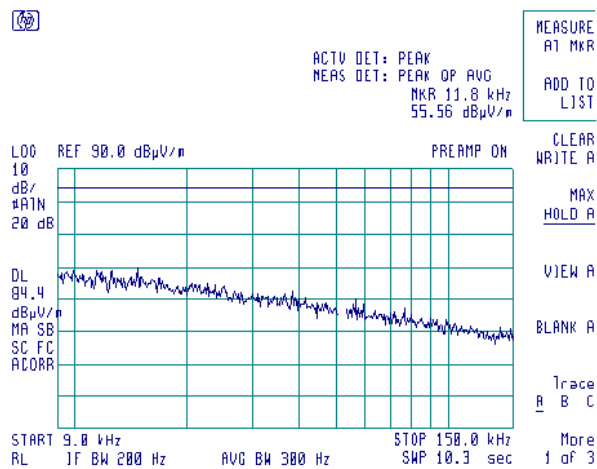
HL 0446	HL 0465	HL 0521	HL 0589	HL 0604	HL 1004	HL 1200	HL 1424
HL 1942	HL 1947	HL 1984	HL 2009	HL 2258	HL 2780		

Full description is given in Appendix A.

Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

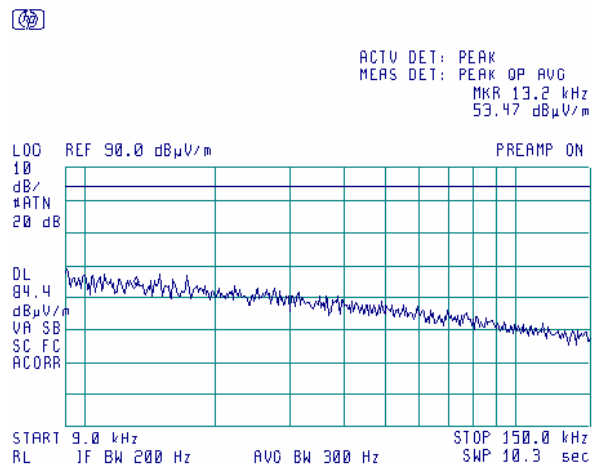
Plot 7.2.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.2.2 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m
MODULATION: 16QAM

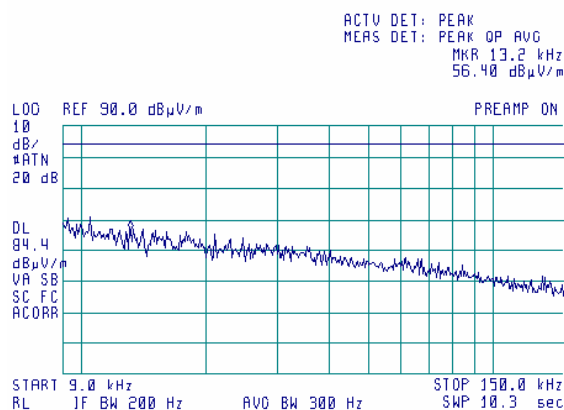


Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.3 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m
MODULATION: QPSK

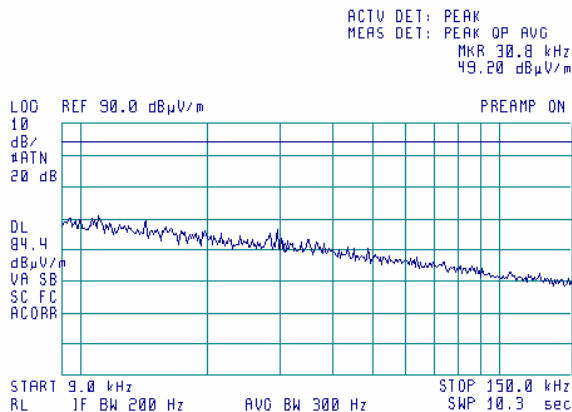
(45)



Plot 7.2.4 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m
MODULATION: 16QAM

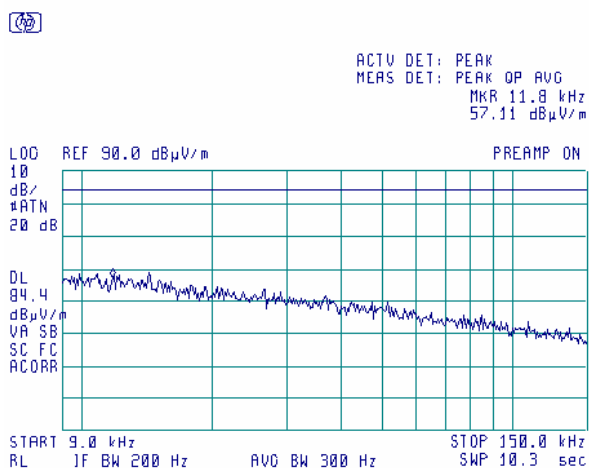
(46)



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

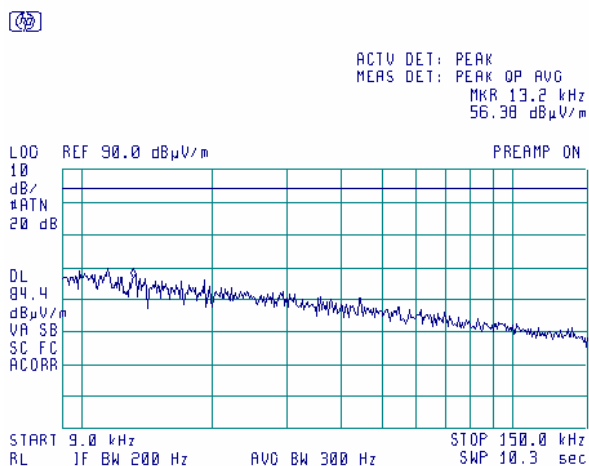
Plot 7.2.5 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.2.6 Radiated emission measurements in 9 - 150 kHz range

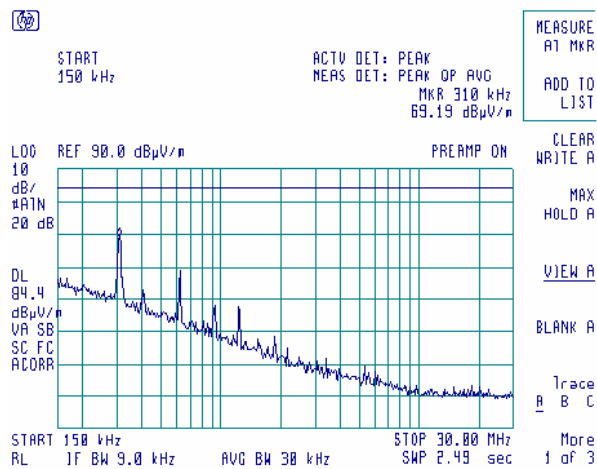
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

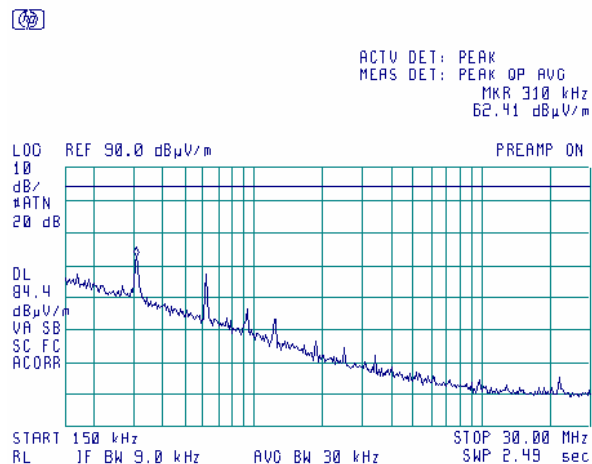
Plot 7.2.7 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.2.8 Radiated emission measurements in 0.15 - 30 MHz range

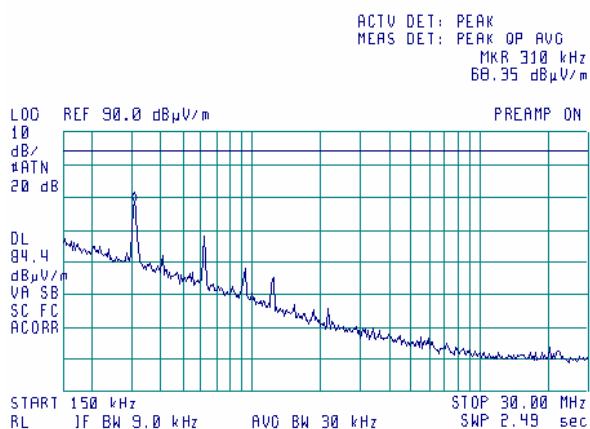
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

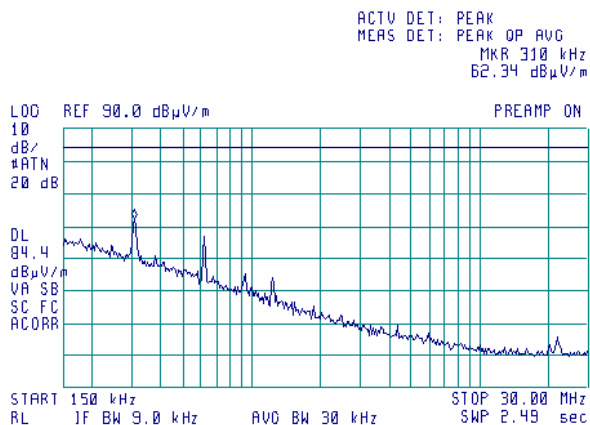
Plot 7.2.9 Radiated emission measurements in 0.15 - 30 MHz range

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m
MODULATION: QPSK



Plot 7.2.10 Radiated emission measurements in 0.15 - 30 MHz range

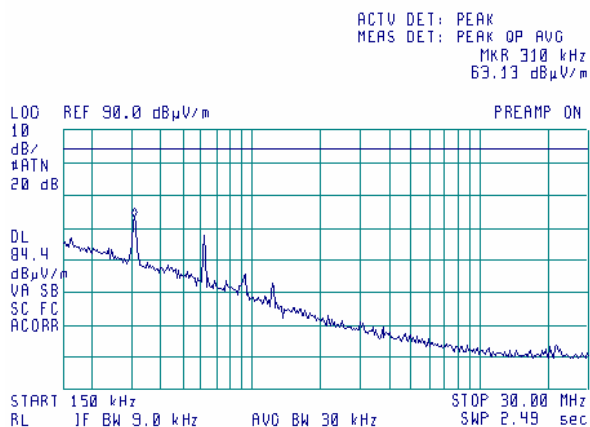
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

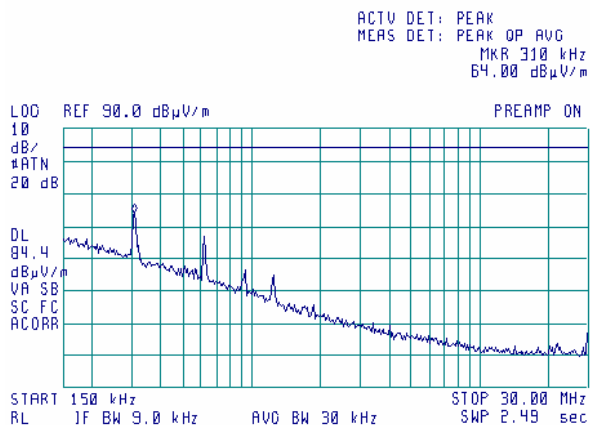
Plot 7.2.11 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.2.12 Radiated emission measurements in 0.15 - 30 MHz range

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m
MODULATION: 16QAM

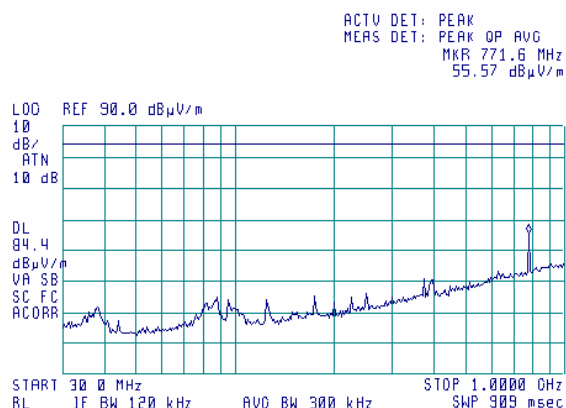


Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.13 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
MODULATION: QPSK

(15)

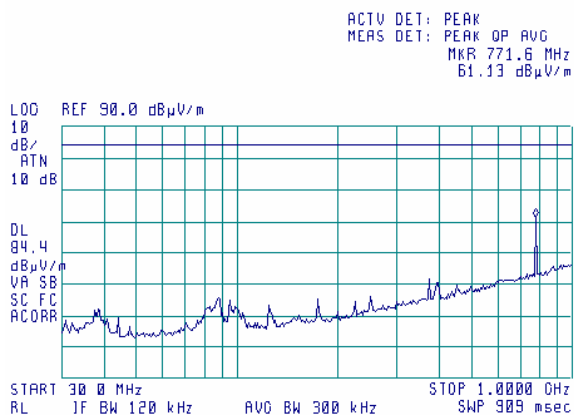


Note: 776.075 MHz – intentional radiation of RF module

Plot 7.2.14 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
MODULATION: 16QAM

(15)

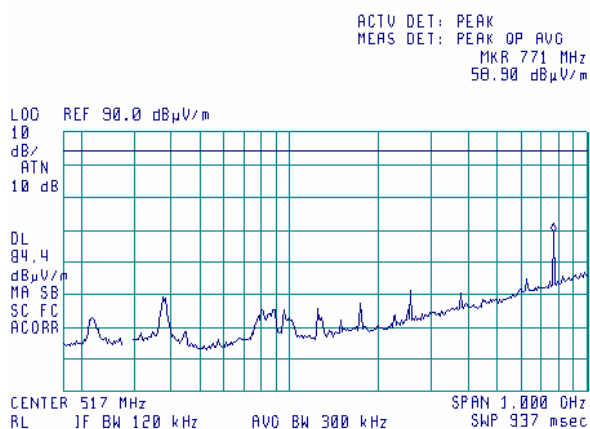


Note: 776.075 MHz – intentional radiation of RF module

Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.15 Radiated emission measurements in 30 - 1000 MHz range

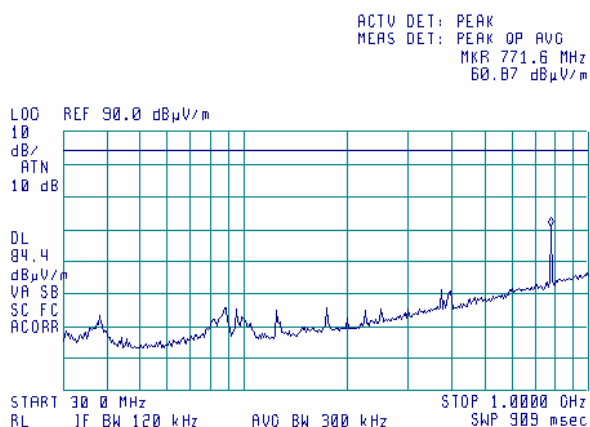
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: QPSK



Note: 776.5 MHz – intentional radiation of RF module

Plot 7.2.16 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: 16QAM



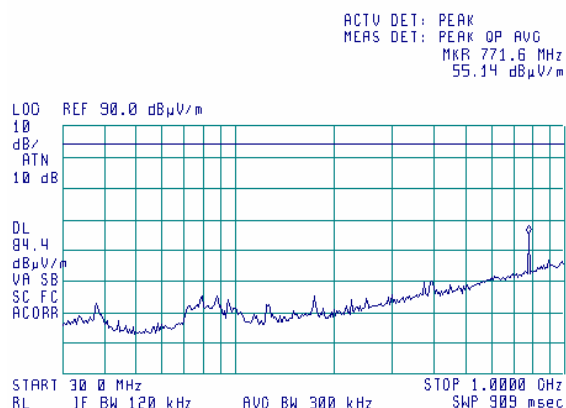
Note: 776.5 MHz – intentional radiation of RF module

Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.17 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
MODULATION: QPSK

(15)

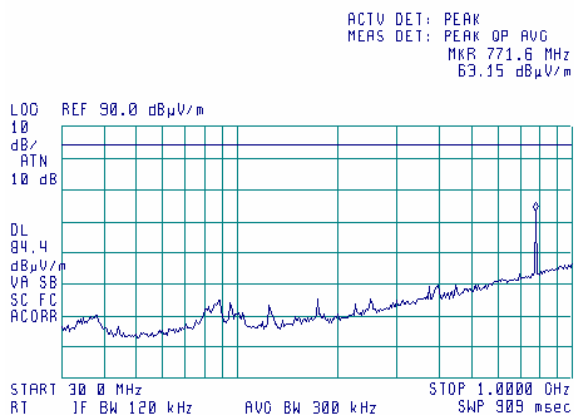


Note: 776.925 MHz – intentional radiation of RF module

Plot 7.2.18 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
MODULATION: 16QAM

(15)

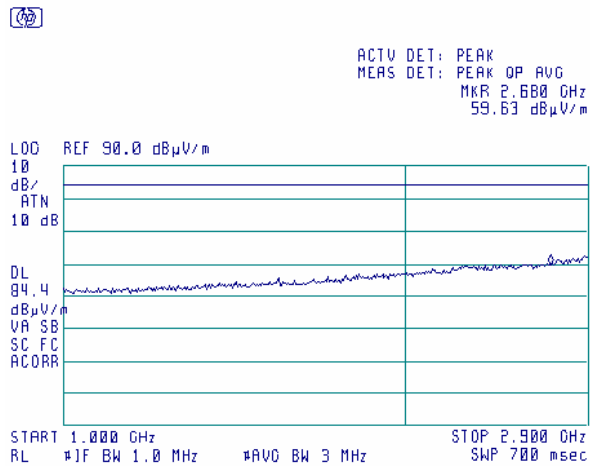


Note: 776.925 MHz – intentional radiation of RF module

Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

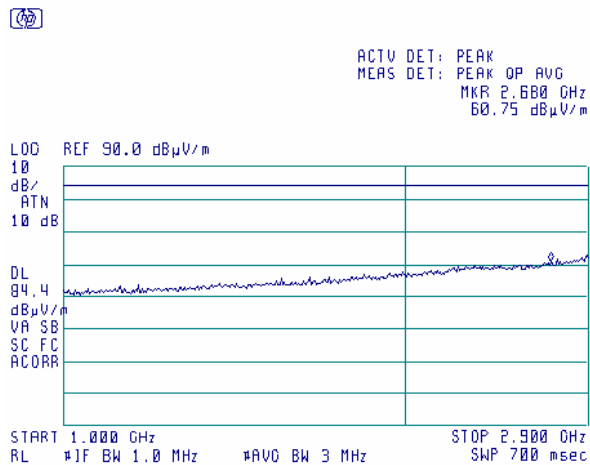
Plot 7.2.19 Radiated emission measurements in 1 – 2.9 GHz range

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



Plot 7.2.20 Radiated emission measurements in 1 – 2.9 GHz range

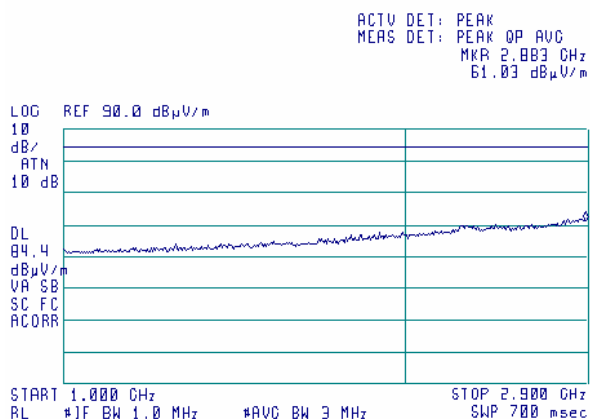
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

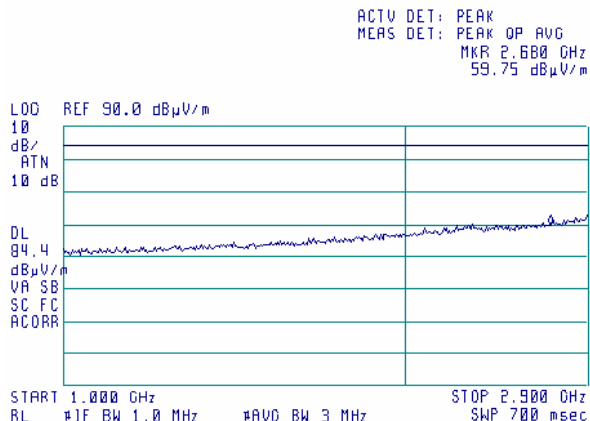
Plot 7.2.21 Radiated emission measurements in 1 – 2.9 GHz range

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



Plot 7.2.22 Radiated emission measurements in 1 – 2.9 GHz range

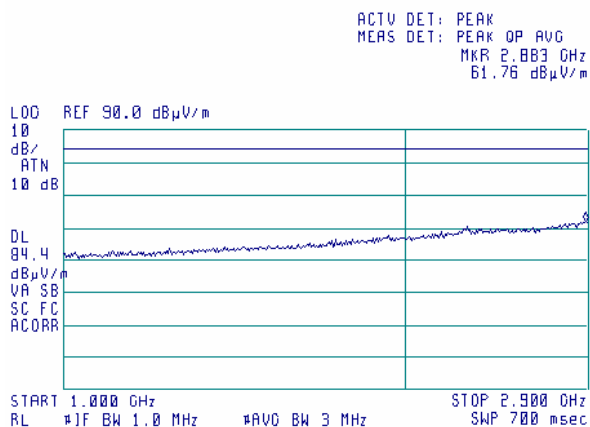
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

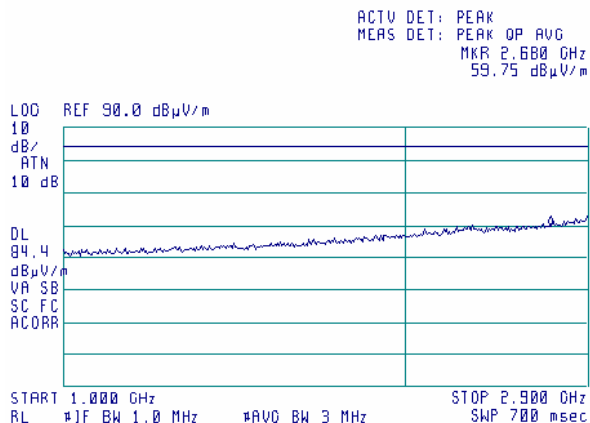
Plot 7.2.23 Radiated emission measurements in 1 – 2.9 GHz range

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



Plot 7.2.24 Radiated emission measurements in 1 – 2.9 GHz range

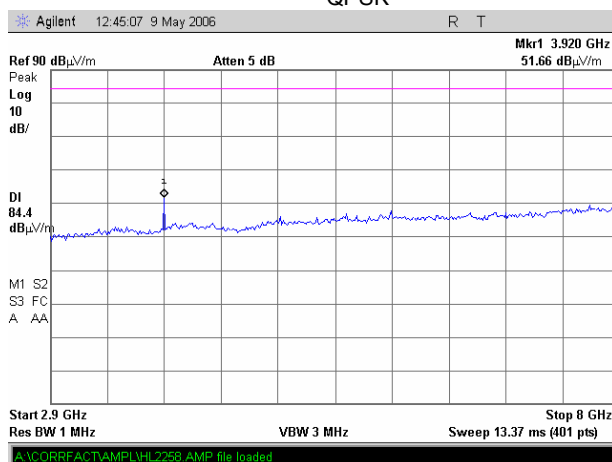
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

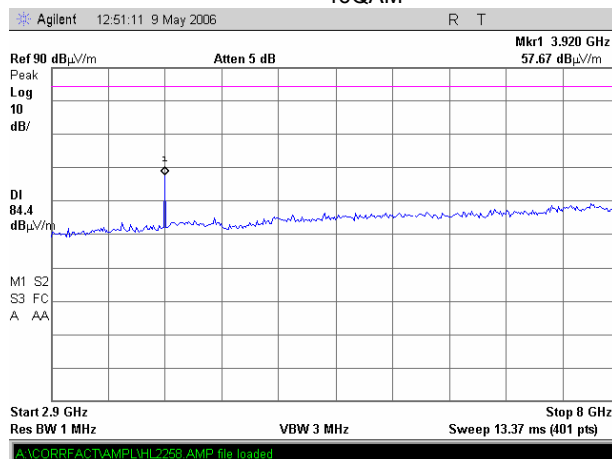
Plot 7.2.25 Radiated emission measurements in 2.9 – 8.0 GHz range

TEST SITE: Anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: QPSK



Plot 7.2.26 Radiated emission measurements in 2.9 – 8.0 GHz range

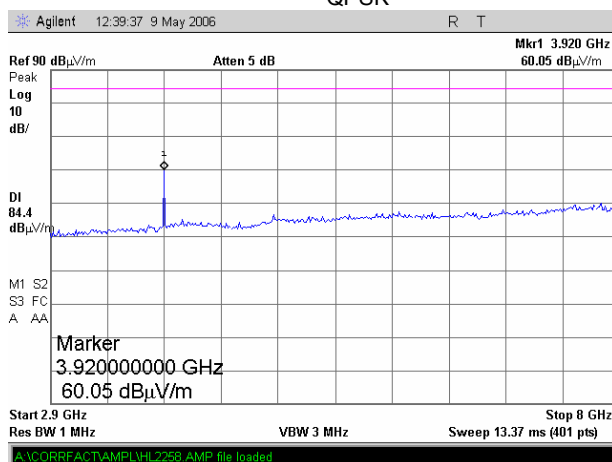
TEST SITE: Anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

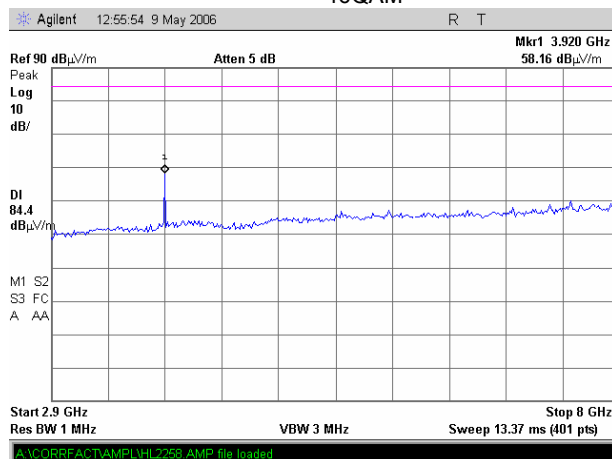
Plot 7.2.27 Radiated emission measurements in 2.9 – 8.0 GHz range

TEST SITE: Anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: QPSK



Plot 7.2.28 Radiated emission measurements in 2.9 – 8.0 GHz range

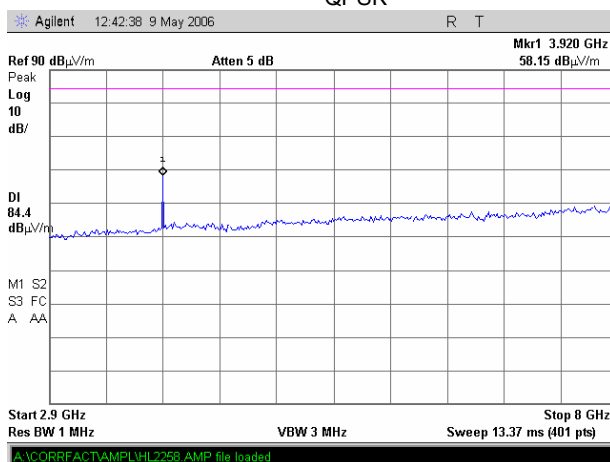
TEST SITE: Anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

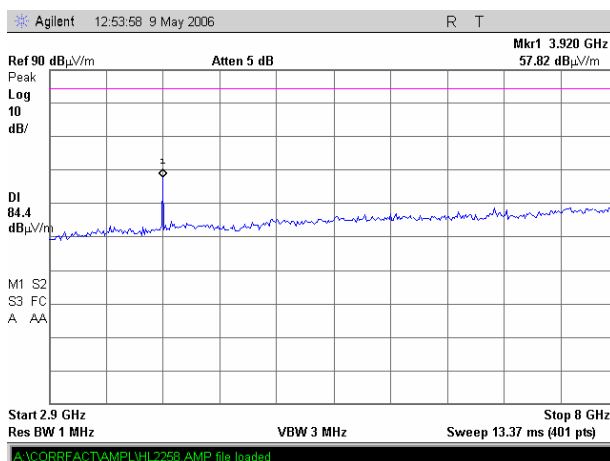
Plot 7.2.29 Radiated emission measurements in 2.9 – 8.0 GHz range

TEST SITE: Anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: QPSK



Plot 7.2.30 Radiated emission measurements in 2.9 – 8.0 GHz range

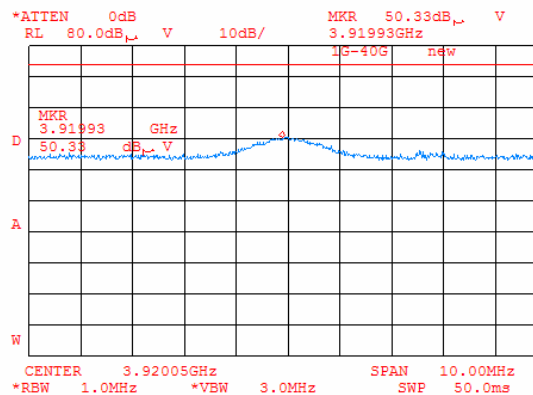
TEST SITE: Anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.31 Radiated emission measurements 3.9GHz frequency

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



Note: The measurement was taken after the change was implemented

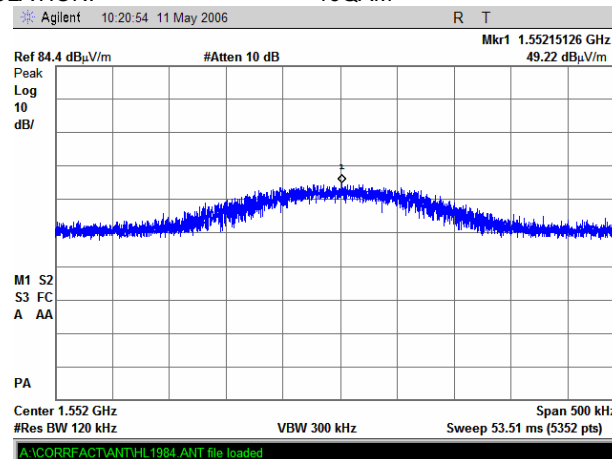
Change: Connector tightening

Note: The emission was more than 20dB below the limit (margin ~34db). There for substitution method was not preformed.

Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

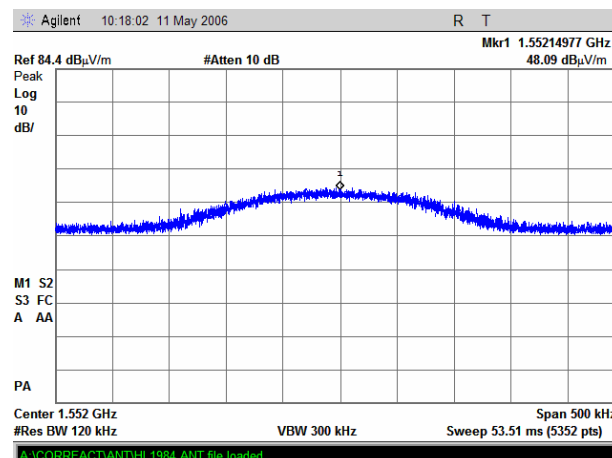
Plot 7.2.32 Spurious emission measurements, the 2nd harmonic of the low channel

ANTENNA POLARIZATION: Vertical
CARRIER FREQUENCY: 776.075 MHz
MODULATION: 16QAM



Plot 7.2.33 Spurious emission measurements, the 2nd harmonic of the low channel

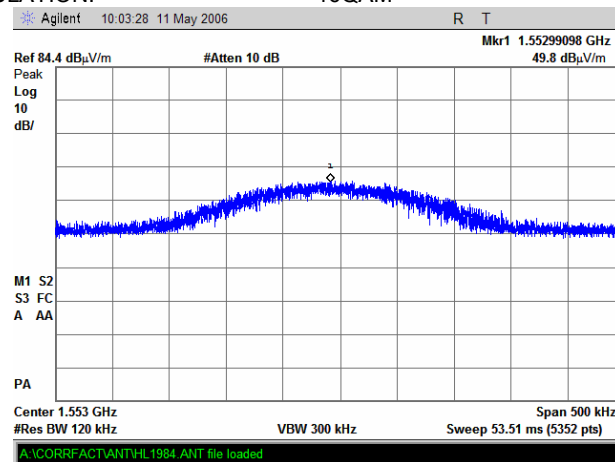
ANTENNA POLARIZATION: Horizontal
CARRIER FREQUENCY: 776.075 MHz
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

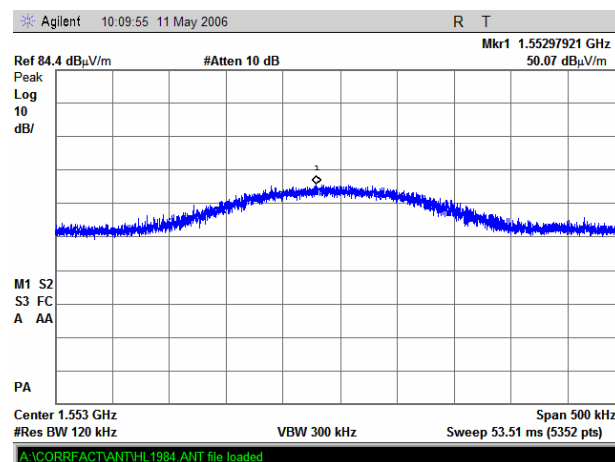
Plot 7.2.34 Spurious emission measurements, the 2nd harmonic of the mid channel

ANTENNA POLARIZATION: Vertical
CARRIER FREQUENCY: 776.5 MHz
MODULATION: 16QAM



Plot 7.2.35 Spurious emission measurements, the 2nd harmonic of the mid channel

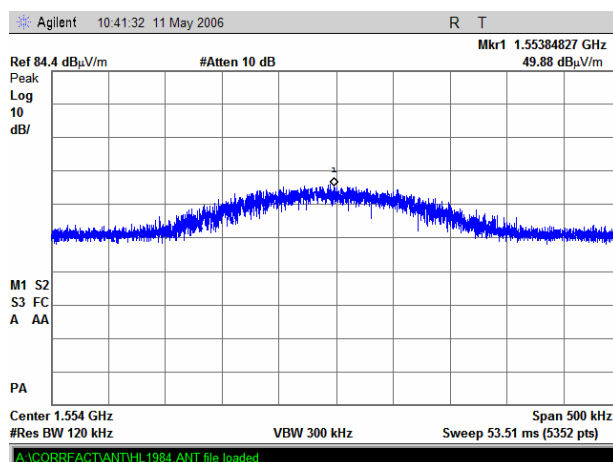
ANTENNA POLARIZATION: Horizontal
CARRIER FREQUENCY: 776.5 MHz
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

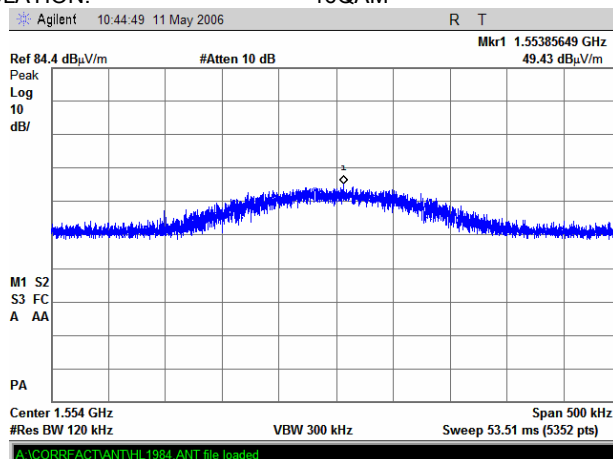
Plot 7.2.36 Spurious emission measurements, the 2nd harmonic of the high channel

ANTENNA POLARIZATION: Vertical
CARRIER FREQUENCY: 776.925 MHz
MODULATION: 16QAM



Plot 7.2.37 Spurious emission measurements, the 2nd harmonic of the high channel

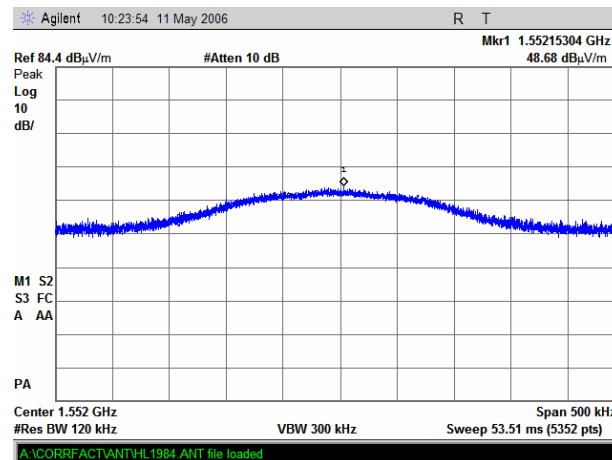
ANTENNA POLARIZATION: Horizontal
CARRIER FREQUENCY: 776.925 MHz
MODULATION: 16QAM



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

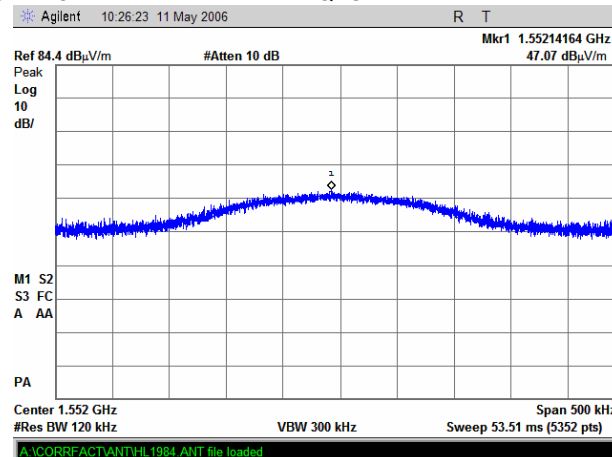
Plot 7.2.38 Spurious emission measurements, the 2nd harmonic of the low channel

ANTENNA POLARIZATION: Vertical
CARRIER FREQUENCY: 776.075 MHz
MODULATION: QPSK



Plot 7.2.39 Spurious emission measurements, the 2nd harmonic of the low channel

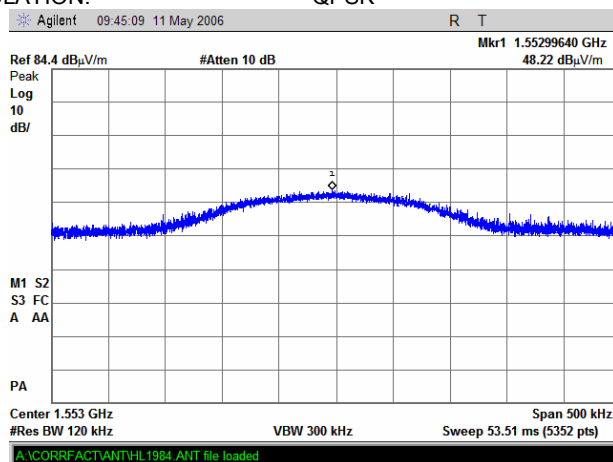
ANTENNA POLARIZATION: Horizontal
CARRIER FREQUENCY: 776.075 MHz
MODULATION: QPSK



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

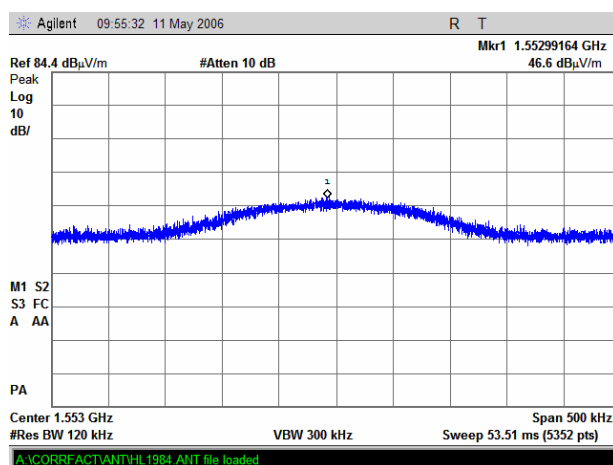
Plot 7.2.40 Spurious emission measurements, the 2nd harmonic of the mid channel

ANTENNA POLARIZATION: Vertical
CARRIER FREQUENCY: 776.5 MHz
MODULATION: QPSK



Plot 7.2.41 Spurious emission measurements, the 2nd harmonic of the mid channel

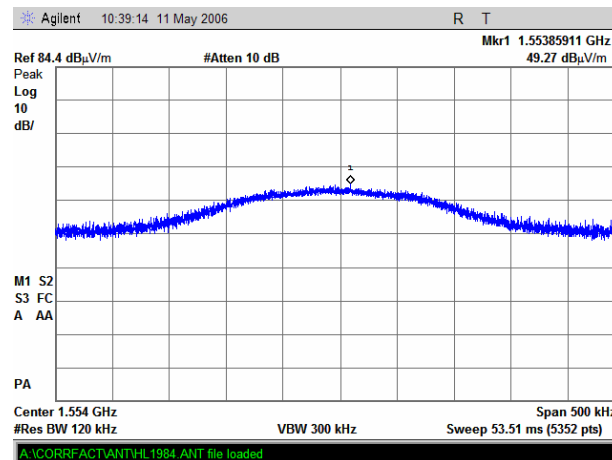
ANTENNA POLARIZATION: Horizontal
CARRIER FREQUENCY: 776.5 MHz
MODULATION: QPSK



Test specification:	Section 27.53(d)(3), Radiated spurious emissions		
Test procedure:	47 CFR, Section 2.1053		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

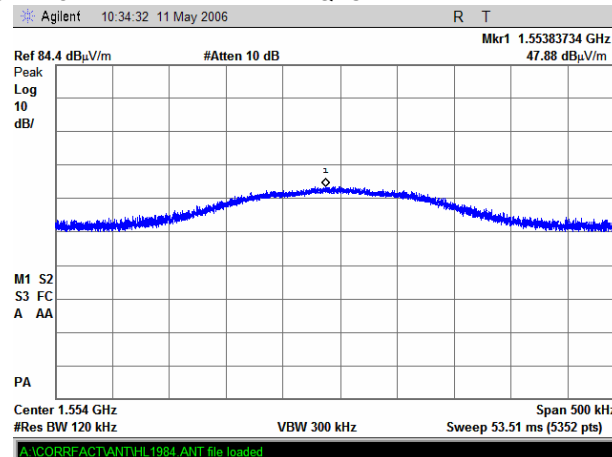
Plot 7.2.42 Spurious emission measurements, the 2nd harmonic of the high channel

ANTENNA POLARIZATION: Vertical
CARRIER FREQUENCY: 776.925 MHz
MODULATION: QPSK



Plot 7.2.43 Spurious emission measurements, the 2nd harmonic of the high channel

ANTENNA POLARIZATION: Horizontal
CARRIER FREQUENCY: 776.925 MHz
MODULATION: QPSK



Test specification:	Section 27.53(e), Radiated emissions in the 1559-1610 MHz band		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.3 Radiated spurious emission measurements in 1559-1610 MHz band

7.3.1 General

This test was performed to measure radiated spurious emissions from the EUT enclosure with antenna. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Radiated spurious emission test limits

Frequency, MHz	EIRP of spurious emissions, dBW/MHz	Spurious emissions, dBm	Equivalent field strength limit @ 3m, dB(μV/m)
1559 - 1610	-80	-50	45.23

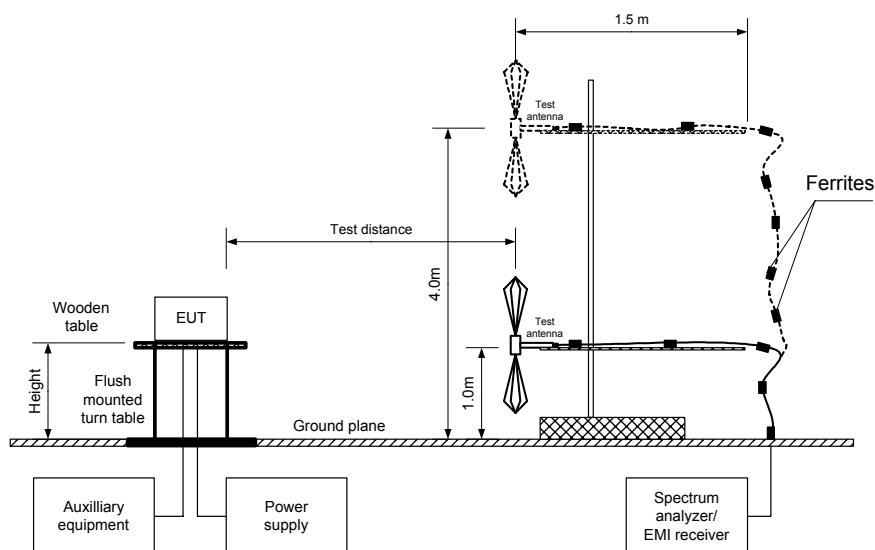
7.3.2 Test procedure for spurious emission field strength measurements above 30 MHz

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and the EUT performance was checked.

7.3.2.2 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.

7.3.2.3 The worst test results with respect to the limits were recorded in Table 7.3.2 and shown in the associated plots.

Figure 7.3.1 Setup for spurious emission field strength measurements



Test specification:	Section 27.53(e), Radiated emissions in the 1559-1610 MHz band		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 776.0 – 777.0 MHz
 TEST SITE: OATS
 TEST DISTANCE: 3 m
 EUT HEIGHT: 0.8 m
 INVESTIGATED FREQUENCY RANGE: 1559 – 1610 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 TEST ANTENNA TYPE: Double ridged guide
 MODULATION: QPSK and 16QAM
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Antenna polarization	RBW, kHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Verdict
No emissions were found						Pass

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

Reference numbers of test equipment used

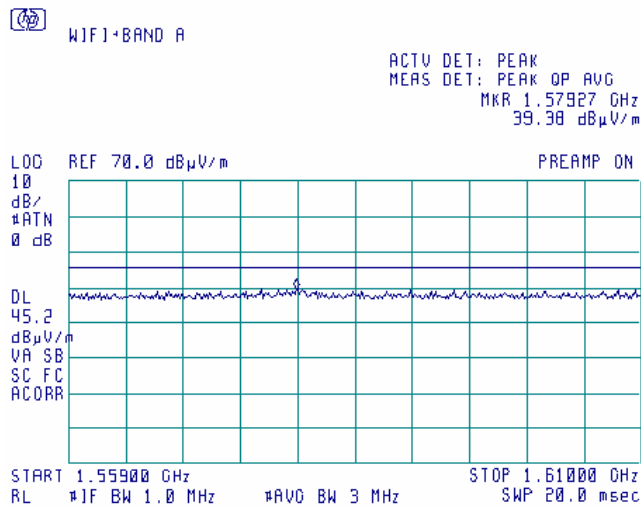
HL 1365	HL 1430	HL 1947	HL 1984				
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Full description is given in Appendix A.

Test specification:	Section 27.53(e), Radiated emissions in the 1559-1610 MHz band		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	5/09/2006		
Temperature: 21 °C	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.1 Radiated emission measurements in 1559 - 1610 MHz range

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



Test specification:	Section 15.107, Conducted emission at AC power port, Class B		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	5/18/2006		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

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(μ 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.

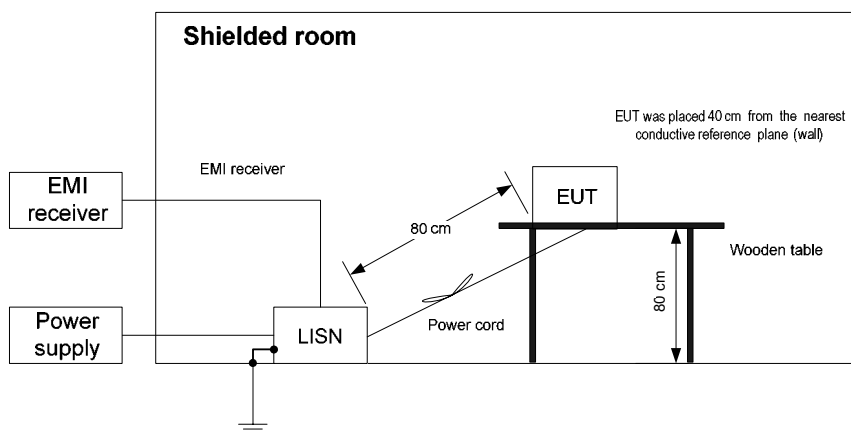
8.1.2 Test procedure

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



Test specification:	Section 15.107, Conducted emission at AC power port, Class B		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	5/18/2006		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Photograph 8.1.1 Setup for conducted emission measurements at the mains power port



Photograph 8.1.2 Setup for conducted emission measurements at the mains power port



Test specification:	Section 15.107, Conducted emission at AC power port, Class B		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	5/18/2006		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Table 8.1.2 Conducted emission test results

LINE: AC mains
 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*		
0.215310	45.86	44.49	63.07	-18.58	42.10	53.07	-10.97	L1	Pass
0.357367	36.27	34.23	58.85	-24.62	30.53	48.85	-18.32		
1.241604	53.34	51.59	56.00	-4.41	44.61	46.00	-1.39		
1.305241	53.80	50.46	56.00	-5.54	42.17	46.00	-3.83		
3.091471	41.54	38.47	56.00	-17.53	29.29	46.00	-16.71		
4.999335	35.56	34.56	56.00	-21.44	34.31	46.00	-11.69	L2	Pass
0.214012	46.43	45.36	63.11	-17.75	43.35	53.11	-9.76		
0.285033	38.16	35.69	60.73	-25.04	29.34	50.73	-21.39		
1.241733	47.69	45.79	56.00	-10.21	38.34	46.00	-7.66		
1.369154	50.32	47.38	56.00	-8.62	39.77	46.00	-6.23		
3.088707	39.08	36.53	56.00	-19.47	27.26	46.00	-18.74	L2	Pass
5.173173	40.53	31.81	60.00	-28.19	10.18	50.00	-39.82		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

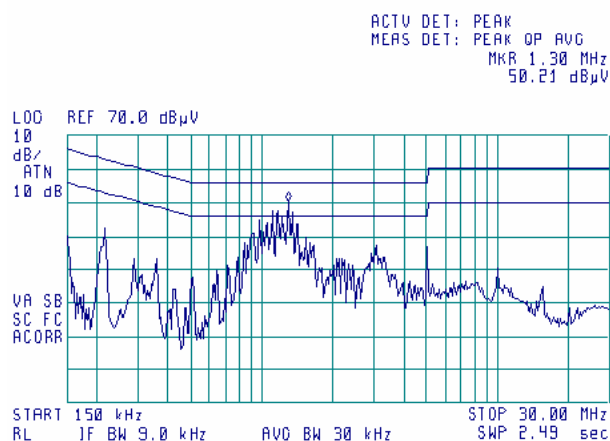
HL 0163	HL 0184	HL 0787	HL 1206	HL 1430	HL 1510		
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Full description is given in Appendix A.

Test specification:	Section 15.107, Conducted emission at AC power port, Class B		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	5/18/2006		
Temperature: 22 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

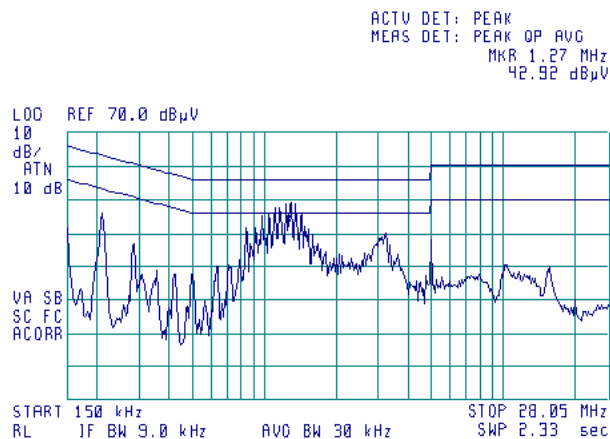
Plot 8.1.1 Conducted emission measurements on AC lines

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.2 Conducted emission measurements on AC lines

LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.109, Radiated emission, Class B		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	5/04/2006		
Temperature: 21 °C	Air Pressure: 1008hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

8.2 Radiated emission measurements

8.2.1 General

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

Table 8.2.1 Radiated emission test limits

Frequency, MHz	Class B limit, dB(μV/m)	
	10 m distance	3 m distance
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: $\text{Lim}_{S_2} = \text{Lim}_{S_1} + 20 \log (S_1/S_2)$, where S_1 and S_2 – standard defined and test distance respectively in meters.

8.2.2 Test procedure

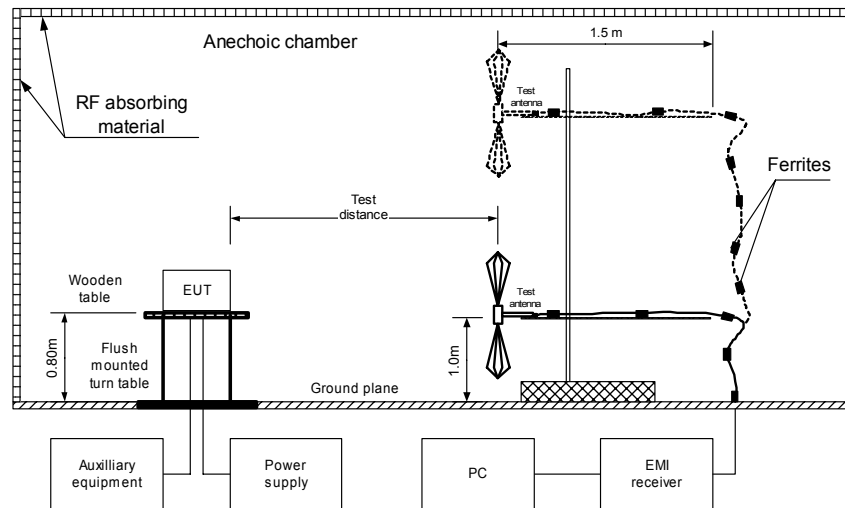
8.2.2.1 The EUT was set up as shown in Figure 8.2.1, energized and the EUT performance was checked.

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.

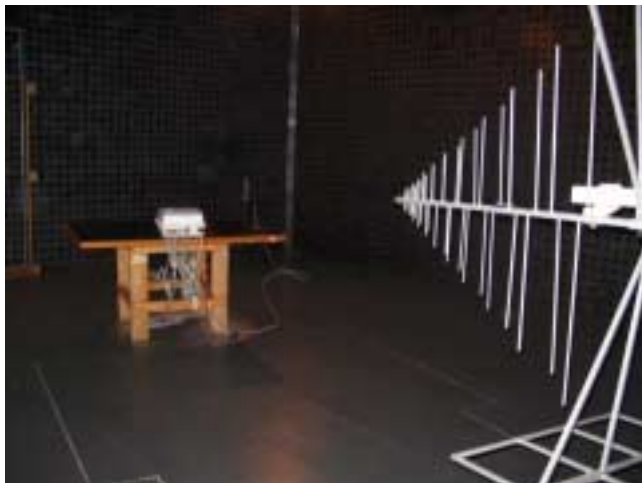
Test specification:	Section 15.109, Radiated emission, Class B		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	5/04/2006		
Temperature: 21 °C	Air Pressure: 1008hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

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



Test specification:	Section 15.109, Radiated emission, Class B		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	5/04/2006		
Temperature: 21 °C	Air Pressure: 1008hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

Photograph 8.2.1 Setup for preliminary radiated emission measurements



Photograph 8.2.2 Setup for final radiated emission measurements, EUT cabling



Test specification:	Section 15.109, Radiated emission, Class B		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	5/04/2006		
Temperature: 21 °C	Air Pressure: 1008hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
EUT OPERATING MODE: Receive / Standby
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		Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
			Limit, dB(μV/m)	Margin, dB*				
37.550000	37.87	37.60	40.00	-2.40	V	1.0	349	Pass
81.770000	36.26	35.30	40.00	-4.70	V	1.0	236	
250.000000	40.94	39.92	46.00	-6.08	H	1.2	20	
425.004000	42.15	41.00	46.00	-5.00	H	1.0	100	
874.975000	44.42	43.18	46.00	-2.82	V	1.2	335	
900.010000	41.75	40.16	46.00	-5.84	V	1.0	180	

DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 5000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
1133.00000	49.77	30.09	54.00	-23.91	Vertical	1.0	130	Pass
1200.00000	44.58	28.21	54.00	-25.79	Horizontal	1.0	221	Pass

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

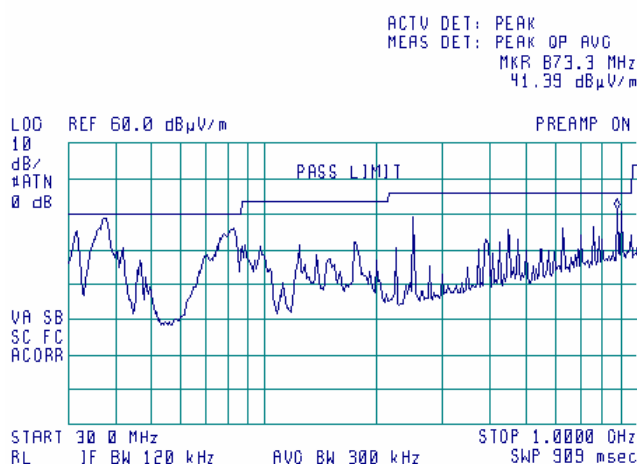
HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604	HL 1116	HL 1947
HL 2009							

Full description is given in Appendix A.

Test specification:	Section 15.109, Radiated emission, Class B		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	5/04/2006		
Temperature: 21 °C	Air Pressure: 1008hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

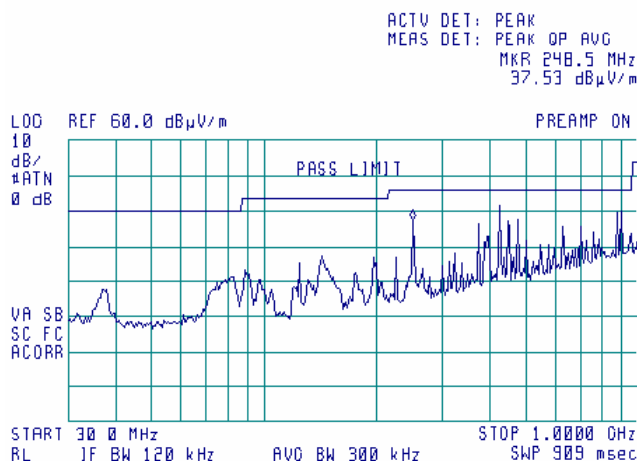
Plot 8.2.1 Radiated emission measurements in 30- 1000 MHz range, vertical antenna polarization

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



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

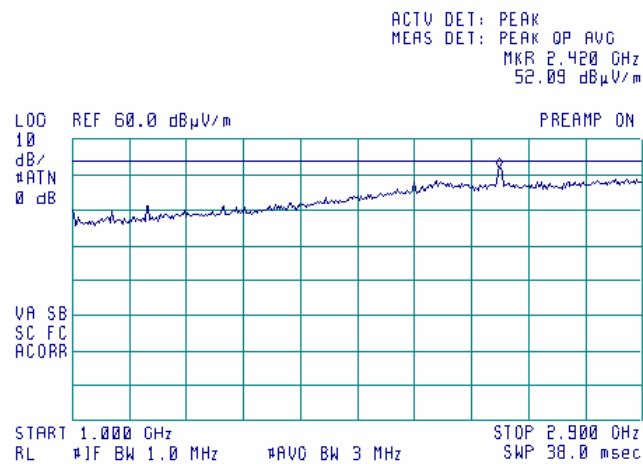
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



Test specification:	Section 15.109, Radiated emission, Class B		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	5/04/2006		
Temperature: 21 °C	Air Pressure: 1008hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

Plot 8.2.3 Radiated emission measurements in 1000 - 2900 MHz, vertical antenna polarization

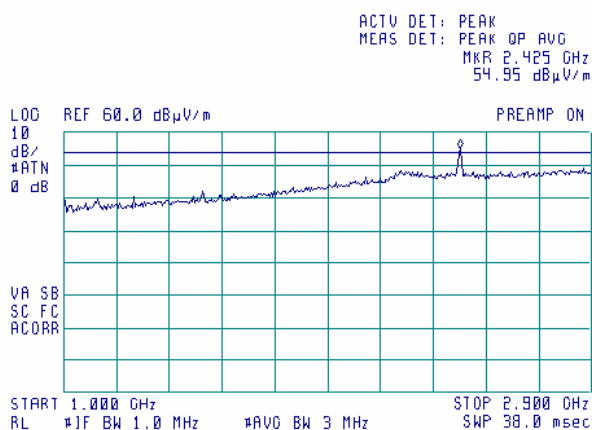
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



Test specification:	Section 15.109, Radiated emission, Class B		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	5/04/2006		
Temperature: 21 °C	Air Pressure: 1008hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

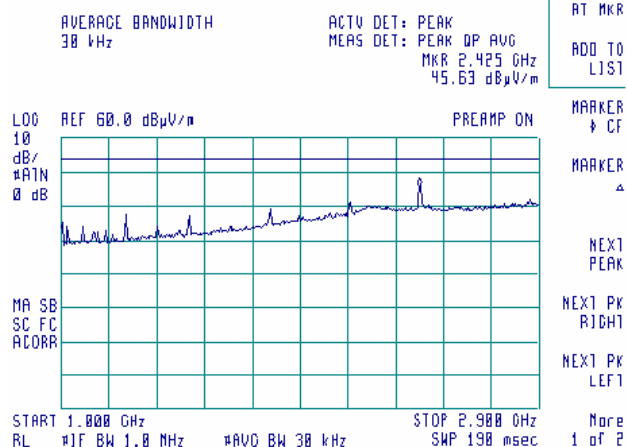
Plot 8.2.4 Radiated emission measurements in1000 - 2900 MHz, horizontal antenna polarization

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



Plot 8.2.5 Radiated emission measurements in1000 - 2900 MHz, horizontal antenna polarization

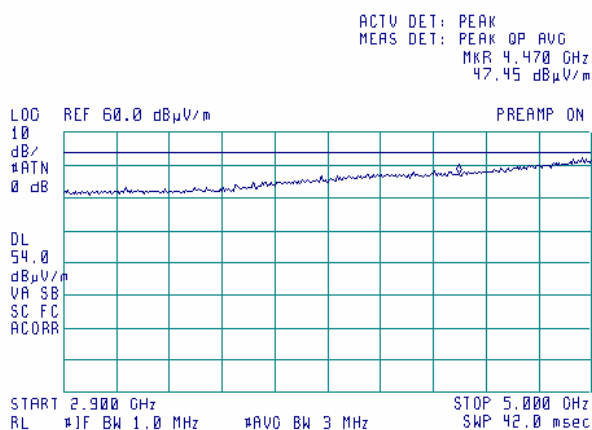
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Stand-by



Test specification:	Section 15.109, Radiated emission, Class B		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	5/04/2006		
Temperature: 21 °C	Air Pressure: 1008hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

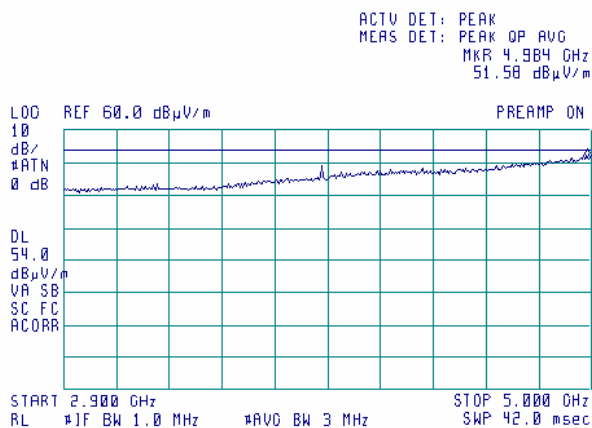
Plot 8.2.6 Radiated emission measurements in 2900 - 5000 MHz, vertical antenna polarization

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



Plot 8.2.7 Radiated emission measurements in 2900 - 5000 MHz, horizontal antenna polarization

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



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-05	01-Oct-06
0174	Monitor, Field, 10kHz-1GHz, 1-300 V/m, w/fiberoptic	Amplifier Research	FM1000	60525	13-Feb-06	13-Feb-07
0184	Patch Panel, 0-110 dB, 300 Hz - 3 kHz	Hewlett Packard	353A	0247A10929	01-Jan-06	01-Jan-07
0186	Power Divider, 50 Ohm, 0.5 W, 0 - 1 GHz	Hewlett Packard	11549A	NA	07-May-06	07-May-07
0446	Antenna, Loop active, 10kHz-30MHz	EMCO	6502	2857	28-Jun-05	28-Jun-06
0465	Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m	HL	AC - 1	023	11-Nov-05	11-Nov-06
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A00319, 3448A00253	26-Sep-05	26-Sep-06
0574	Humidity Chamber, temperature range: -70 to +177 deg C, RH: 10 to 98%.	Tenney Engineering	Tenney 14	19	19-Feb-06	19-Feb-07
0589	Cable Coaxial, GORE A2P01POL118, 2.3 m	HL	GORE-3	176	02-Dec-05	02-Dec-06
0592	Position Controller	HL	L2-SR3000 (HL CRL-3)	100	18-May-06	18-May-07
0593	Antenna Mast, 1-4 m Pneumatic	Madgesh	AM-F1	101	02-Feb-06	02-Feb-07
0594	Turn Table FOR ANECHOIC CHAMBER flush mount d=1.2 m Pneumatic	HL	TT-WDC1	102	26-Jan-06	26-Jan-07
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz	EMCO	3141	9611-1011	10-Jan-06	10-Jan-07
0787	Transient Limiter	Hewlett Packard	11947A	3107A01877	21-Nov-05	21-Nov-06
0808	Analyzer Spectrum 100 Hz to 2.2 GHz	Anritsu	MS2601B	M178731	27-Mar-06	27-Mar-07
1004	Cable Coaxial, ANDREW PSWJ4, 6m	HL	ANDREW-6	163	04-Dec-05	04-Dec-06
1116	Antenna, Horn, 1-18 GHz	HL	A1-18	186	03-Mar-06	03-Mar-07
1200	Quadruplexer 1-12 GHz (1-2 GHz; 2-4GHz;4-8 GHz; 8-12GHz)	Elettronica S.p.A. - Roma	UE 84	D/00240	10-Feb-05	10-Feb-07
1206	One phase voltage regulator, 2kVA, 0-250V	HL	TDGC-2	142	04-Jun-05	04-Jun-06
1365	Cable Coaxial, S-FLC 12-50, 5 m	HL	C214-5	1365	02-Dec-05	02-Dec-06
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A00219	30-Aug-05	30-Aug-06
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A00262,3705A00217	01-Sep-05	01-Sep-06
1474	Cable, 1 m	Harbour Industries	MIL 17/60-RG142	1474	11-Sep-05	11-Sep-06
1475	Cable, 1 m	Harbour Industries	MIL 17/60-RG142	1475	11-Sep-05	11-Sep-06
1510	Cable RF, 8 m	Belden	M17/167 MIL-C-17	1510	02-Dec-05	02-Dec-06
1620	Attenuator, 50 Ohm, 2W, DC to 8 GHz, 10 dB	Midwest Microwave	0217-10-NNN-02	1620	15-Jan-06	15-Jan-07

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
1653	Analyzer EMC 9 kHz - 1.5 GHz	Agilent Technologies	E7401A	US39440281	06-Feb-06	06-Feb-07
1942	Cable 18GHz, 4 m, blue	Rhophase Microwave Limited	SPS-1803A-4000-NPS	T4658	17-Oct-05	17-Oct-06
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	17-Oct-05	17-Oct-06
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W, N-type	EMC Test Systems	3115	9911-5964	03-Mar-06	03-Mar-07
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	02-Dec-05	02-Dec-06
2078	Isotropic Field Probe 80 MHz - 40 GHz	Amplifier Research	FP2080	302541	08-Dec-05	08-Dec-06
2258	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0222	05-Nov-05	05-Nov-06
2358	Power Supply, 2 X 0-36VDC / 5A, 5VDC / 5A	Horizon Electronics	DHR3655D	767469	07-Apr-06	07-Apr-07
2780	EMS analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY4510246	11-Jun-05	11-Jun-06
2875	Power meter RF	Boonton Electronics Corp.	42220A	341703AC	28-Feb-06	28-Feb-07
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	10-Apr-06	10-Apr-07

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	$\pm 8\%$
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency stability	± 168 Hz (0.56 ppm)
Unintentional radiator tests	
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization	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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12 APPENDIX D Specification references

47CFR part 27: 2005	Miscellaneous wireless communications services
47CFR part 1: 2005	Practice and procedure
47CFR part 2: 2005	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(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PCB	printed circuit board
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt

14 APPENDIX F Test equipment correction factors

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

Antenna factor

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

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

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

Antenna factor
Double ridged guide antenna
Hermon Laboratories, model A1-18, S/N 186, HL 1116

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.6
1500.0	26.4
2000.0	29.7
2500.0	31.1
3000.0	31.5
3500.0	32.7
4000.0	36.1
4500.0	36.1
5000.0	39.9
5500.0	40.5
6000.0	40.4
6500.0	41.0
7000.0	41.2
7500.0	41.2
8000.0	44.3
8500.0	40.7
9000.0	39.3
9500.0	41.3
10000.0	42.8
10500.0	43.8
11000.0	47.0
11500.0	46.3
12000.0	43.4
12500.0	41.8
13000.0	41.9
13500.0	44.5
14000.0	44.8
14500.0	44.9
15000.0	44.4
15500.0	43.4
16000.0	42.6
16500.0	43.6
17000.0	42.3
17500.0	45.9
18000.0	45.3

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

Antenna factor
Double-ridged wave guide horn antenna
EMC Test Systems, model 3115, serial no: 9911-5964, HL 1984

Frequency, MHz	Antenna gain, dBi	Antenna factor. dB(1/m)
1000.0	5.8	24.5
1500.0	9.0	24.8
2000.0	8.6	27.7
2500.0	9.5	28.7
3000.0	8.9	30.8
3500.0	8.2	32.9
4000.0	9.6	32.7
4500.0	11.2	32.1
5000.0	10.6	33.6
5500.0	9.8	35.3
6000.0	10.1	35.7
6500.0	10.7	35.8
7000.0	10.9	36.2
7500.0	10.5	37.2
8000.0	11.1	37.2
8500.0	10.8	38.1
9000.0	10.7	38.6
9500.0	11.5	38.3
10000.0	11.8	38.4
10500.0	12.3	38.3
11000.0	12.3	38.8
11500.0	11.5	39.9
12000.0	12.2	39.6
12500.0	12.6	39.5
13000.0	12.0	40.5
13500.0	11.7	41.1
14000.0	11.7	41.5
14500.0	12.7	40.8
15000.0	14.2	39.5
15500.0	16.0	38.1
16000.0	16.2	38.1
16500.0	14.5	40.1
17000.0	12.2	42.6
17500.0	9.7	45.4
18000.0	6.6	48.7

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

Cable loss

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	≤ 6.5	±0.12
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		
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		±0.17
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 coaxial, RG-214, 5m, model: C214-5, HL 1365

No.	Frequency, MHz	Measured, dB	Measured uncertainty dB
1	1000	0.41	±0.12
2	1200	0.44	
3	1400	0.48	
4	1600	0.52	
5	1800	0.55	
6	2000	0.58	
7	2200	0.61	
8	2400	0.64	±0.17
9	2600	0.67	
10	2800	0.7	
11	3000	0.73	
12	3300	0.79	
13	3600	0.84	
14	3900	0.94	
15	4200	1.22	

Cable loss
Cable 18 GHz, 4 m, blue, model SPS-1803A-4000-NPS, serial number T4658, HL 1942

Frequency, GHz	Cable loss, dB
0.03	0.21
0.05	0.26
0.10	0.36
0.20	0.50
0.30	0.61
0.40	0.70
0.50	0.78
0.60	0.85
0.70	0.93
0.80	0.99
0.90	1.04
1.00	1.10
1.10	1.16
1.20	1.22
1.30	1.26
1.40	1.31
1.50	1.35
1.60	1.41
1.70	1.45
1.80	1.49
1.90	1.53
2.00	1.57
2.10	1.61
2.20	1.65
2.30	1.69
2.40	1.72
2.50	1.76
2.60	1.79
2.70	1.83
2.80	1.87
2.90	1.90
3.10	1.97
3.30	2.04
3.50	2.11
3.70	2.18
3.90	2.24
4.10	2.31
4.30	2.38
4.50	2.43
4.70	2.53
4.90	2.53
5.10	2.63
5.30	2.65
5.50	2.72
5.70	2.76
5.90	2.79

Frequency, GHz	Cable loss, dB
6.10	2.88
6.30	2.90
6.50	2.97
6.70	3.02
6.90	3.04
7.10	3.07
7.30	3.12
7.50	3.13
7.70	3.19
7.90	3.24
8.10	3.30
8.30	3.36
8.50	3.45
8.70	3.41
8.90	3.45
9.10	3.42
9.30	3.55
9.50	3.48
9.70	3.58
9.90	3.61
10.10	3.66
10.30	3.68
10.50	3.70
10.70	3.70
10.90	3.75
11.10	3.78
11.30	3.86
11.50	3.98
11.70	4.10
11.90	4.12
12.10	4.09
12.40	4.13
13.00	4.23
13.50	4.35
14.00	4.40
14.50	4.44
15.00	4.57
15.50	4.66
16.00	4.64
16.50	4.66
17.00	4.75
17.50	4.85
18.00	4.93

Cable loss

Cable 18 GHz, 6.5 m, blue, model NPS-1803A-6500-NPS, serial number 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
RF cable 8 m, model RG-214, serial number C-56, HL 2009

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	1	0.10	NA	±0.12
2	10	0.14		
3	30	0.25		
4	50	0.34		
5	100	0.53		
6	300	0.99		
7	500	1.31		
8	800	1.73		
9	1000	1.98		
10	1100	2.11		
11	1200	2.21		
12	1300	2.35		
13	1400	2.46		
14	1500	2.55		
15	1600	2.68		
16	1700	2.78		
17	1800	2.88		
18	1900	2.98		
19	2000	3.09		

Cable loss
Cable M17/167 MIL-C-17, HL 1510

No.	Frequency, MHz	Cable loss, dB
1	0.1	0.05
2	1	0.09
3	3	0.16
4	5	0.18
5	10	0.27
6	30	0.44
7	50	0.58
8	80	0.69
9	100	0.82
10	300	1.48
11	500	2.01
12	800	2.65
13	1000	3.12