HERMON LABORATORIES

ACCREDITED
839.01
Electrical

Hermon Laboratories Ltd.
P.O.Box 23, Binyamina 30500, Israel
Tel. +972 4628 8001
Fax. +972 4628 8277
E-mail: mail@hermonlabs.com

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 §90.217 AND PART 15 SUBPART B

FOR:

Miltel Communications Ltd.

Repeater / Receiver

Model: 2A

Transceiver

450 – 470 MHz

Table of contents

1 Applicant information

Client name:	Miltel Communications Ltd.
Address:	7, Leshem street, P.O.Box 7374, Petach Tikva, 49170, Israel
Telephone:	+972 3926 9550
Fax:	+972 3924 6550
E-mail:	erez1@miltelcom.com
Contact name:	Mr. Erez Sharabi

2 Equipment under test attributes

Product name:	Repeater / Receiver
Product type:	Transceiver
Model:	2A
Frequency range:	450 – 470 MHz
Hardware version:	B
Serial number:	R-0004
Receipt date:	11/25/2004

3 Manufacturer information

Manufacturer name:	Miltel Communications Ltd.
Address:	7, Leshem street, P.O.Box 7374, Petach Tikva, 49170, Israel
Telephone:	+972 3926 9550
Fax:	+972 3924 6550
E-Mail:	erez1@miltelcom.com
Contact name:	Mr. Erez Sharabi

4 Test details

Project ID:	16184
Location:	Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started:	11/25/2004
Test completed:	12/13/2004
Test specification:	47CFR part 90, §§90.217(b), part 15 , subpart B
Test suite:	FCC_90_BS_with_RF_connector_below_120mW (7/15/2004 12:12:42 AM, modified)

5 Tests summary

Test	Status
Transmitter characteristics	
Section 90.205, Maximum output power	Pass
Section 90.209, Occupied bandwidth*	Pass
Section 90.213, Frequency stability*	Pass
Section 90.214, Transient frequency behaviour*	Pass
Section 90.217, Band edge emission*	Pass
Section 90.217, Conducted spurious emissions*	Pass
Section 90.217, Radiated spurious emissions	Pass
Unintentional emissions	
Section 15.107, Conducted emission at AC power port, Class B	Pass
Section 15.109, Radiated emission, Class B	Pass
Section 15.111, Conducted emission at receiver antenna port*	Pass

* The test was performed at antenna port 4 with the highest peak output power.

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

	Name and Title	Date	Signature
Tested by:	Mr. M. Lerman, test engineer	December 13, 2004	
Reviewed by:	Ms. N. Averin, certification engineer	December 16, 2004	
	Mr. M. Nikishin, EMC group leader	December 21, 2004	
Approved by:	Mr. A. Usoskin, CEO	December 22, 2004	

6 EUT description

6.1 General information

The EUT is a repeater / receiver powered from AC mains through 12 VDC / 100-240 VAC adapter manufactured by Asian Power Devices Inc., model DA-36A12, serial number 136113414.

6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length	Indoor / outdoor
		From	To					
Power / signal	12 VDC / Communication	EUT	AC/DC adapter / PC	4 pin	1	Shielded	30 m	Outdoor
RF	Antenna	EUT	50 Ohm termination	SMA	4	Coax	1 m	Outdoor
Power	120 VAC	AC/DC adapter	AC mains	2 pin	1	Unshielded	1.5 m	Indoor
Power	120 VAC	PC	AC mains	IEC 320	1	Unshielded	1.5 m	Indoor

6.3 Auxiliary equipment

Description	Manufacturer	Model number	Serial number
PC	Unknown	Unknown	106598
Monitor	ACER	7134E	9178502006
Keyboard	Fujitsu	FKB8729	OZ614979
Mouse	Logitech	M-SF15	LCA52001040
Printer	Epson	P70RA	OFOE121698

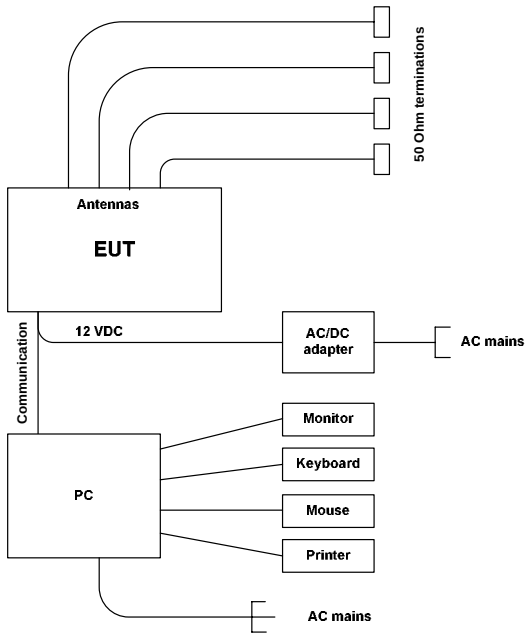
6.4 Operating frequencies

Source	Frequency, MHz					
Digital portion	4	13.2256	20	NA	NA	NA
Receiver	450 – 470	NA	NA	NA	NA	NA
Transmitter	450 – 470	NA	NA	NA	NA	NA

6.5 Changes made in the EUT

No changes were implemented.

6.6 Test configuration



6.7 Transmitter characteristics

Type of equipment	
X	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
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	450 - 470 MHz
Operating frequency range	450 - 470 MHz
RF channel spacing	12.5 kHz

Maximum rated output power	At transmitter 50 Ω RF output connector	19.67 dBm
	Effective radiated power (for equipment with no RF connector)	dBm

Is transmitter output power variable?	X	No		
		Yes		continuous variable
				stepped variable with stepsize dB
			minimum RF power	dBm
			maximum RF power	dBm

Antenna connection				
unique coupling	X	standard connector (SMA)	integral	with temporary RF connector
				without temporary RF connector

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Dipole	Mars Antennas	M216	2.2 dBi
Dipole	Antenex	OEM2326-110	2.2 dBi

Transmitter 99% power bandwidth	10.33 kHz					
Transmitter aggregate data rate/s	600 bps					
Transmitter aggregate symbol (baud) rate/s	600 Bps (Baud per second)					
Type of modulation	FSK					
Type of multiplexing	TDMA					
Modulating test signal (baseband)	Alternating symbol					
Maximum transmitter duty cycle in normal use	16.7 %	**Tx ON time**	450 ms	**Period**	2700 ms	
Transmitter duty cycle supplied for test	100 %	**Tx ON time**	NA	**Period**	NA	

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
Emission designator	10K8F1D		

Test specification:	Section 90.205, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 4:19:42 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

7 Transmitter tests according to 47CFR part 90 requirements

7.1 Peak output power test

7.1.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.1.1. 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	
	mW	dBm
450.0 – 470.0	120	20.8

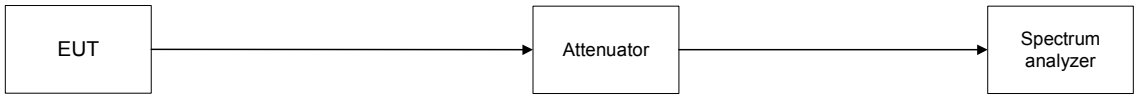
7.1.2 Test procedure

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



Test specification:	Section 90.205, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 4:19:42 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.2 Peak output power test results

OPERATING FREQUENCY RANGE: 450 – 470 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 2000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: FSK
MODULATING SIGNAL: Alternating symbol
BIT RATE: 600 bps
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
Port 1							
450.000	18.67	Included	Included	18.67	20.8	-2.13	Pass
460.000	19.00	Included	Included	19.00	20.8	-1.80	Pass
470.000	19.00	Included	Included	19.00	20.8	-1.80	Pass
Port 2							
450.000	18.00	Included	Included	18.00	20.8	-2.80	Pass
460.000	18.00	Included	Included	18.00	20.8	-2.80	Pass
470.000	18.17	Included	Included	18.17	20.8	-2.63	Pass
Port 3							
450.000	18.17	Included	Included	18.17	20.8	-2.63	Pass
460.000	18.50	Included	Included	18.50	20.8	-2.30	Pass
470.000	18.50	Included	Included	18.50	20.8	-2.30	Pass
Port 4							
450.000	19.67	Included	Included	19.67	20.8	-1.13	Pass
460.000	19.17	Included	Included	19.17	20.8	-1.63	Pass
470.000	18.83	Included	Included	18.83	20.8	-1.97	Pass

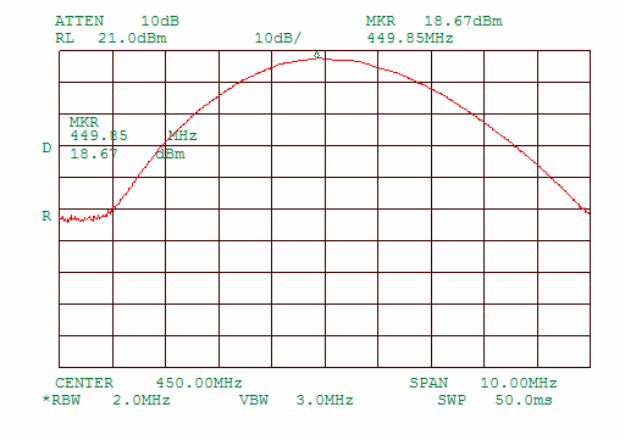
Reference numbers of test equipment used

HL 1424	HL 2399						

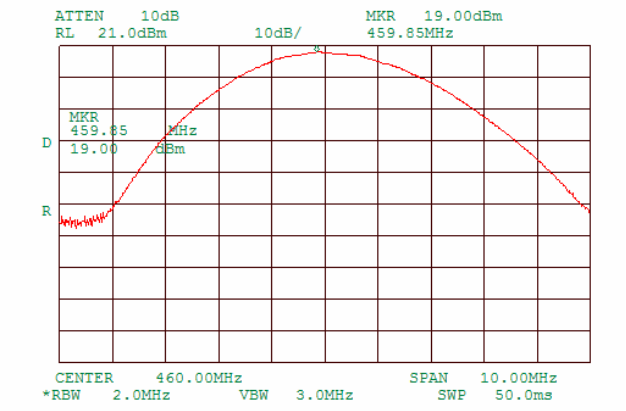
Full description is given in Appendix A.

Test specification:	Section 90.205, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 4:19:42 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.1 Peak output power test results at low frequency, Port 1

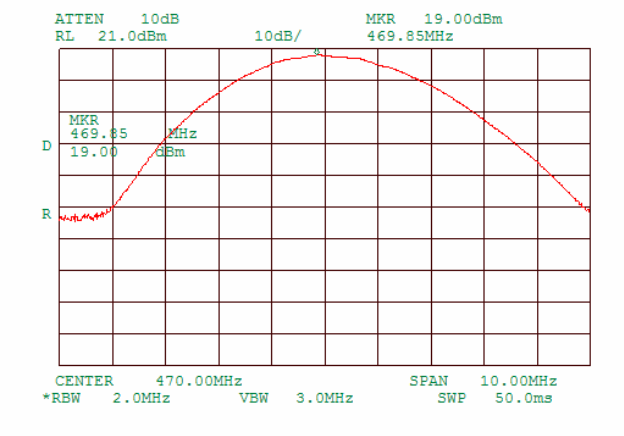


Plot 7.1.2 Peak output power test results at mid frequency, Port 1

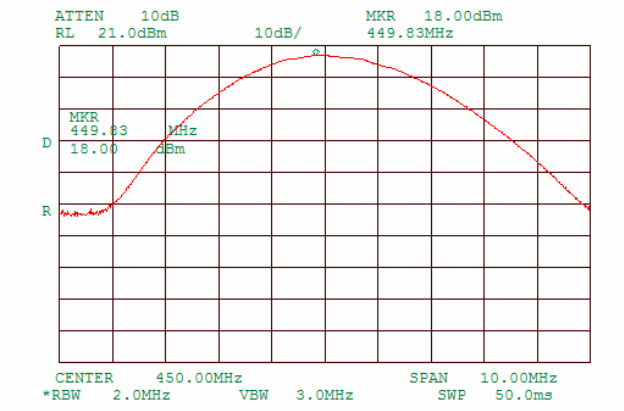


Test specification:	Section 90.205, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 4:19:42 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.3 Peak output power test results at high frequency, Port 1

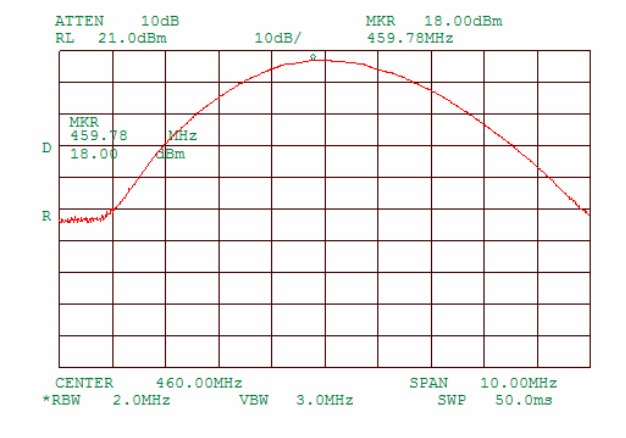


Plot 7.1.4 Peak output power test results at low frequency, Port 2

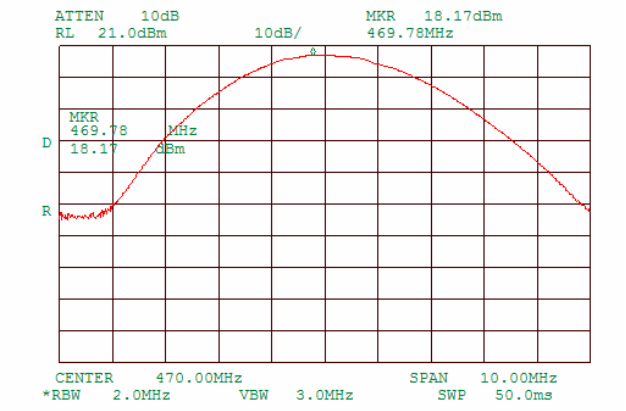


Test specification:	Section 90.205, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 4:19:42 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.5 Peak output power test results at mid frequency, Port 2

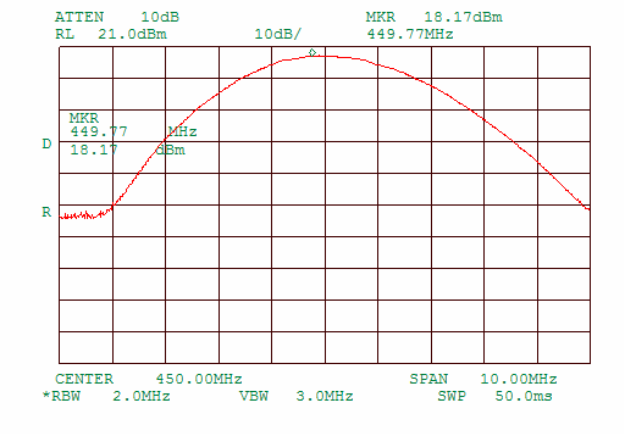


Plot 7.1.6 Peak output power test results at high frequency, Port 2

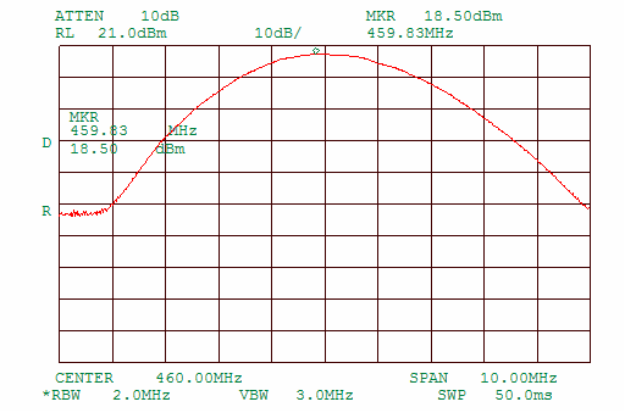


Test specification:	Section 90.205, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 4:19:42 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.7 Peak output power test results at low frequency, Port 3

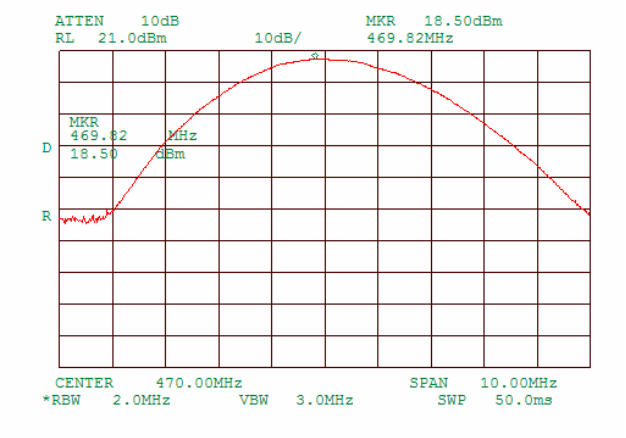


Plot 7.1.8 Peak output power test results at mid frequency, Port 3

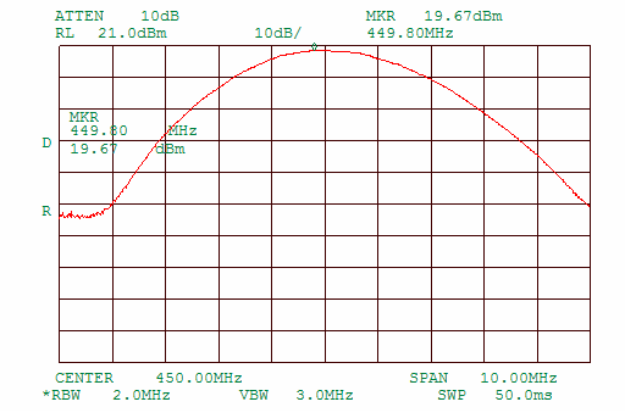


Test specification:	Section 90.205, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 4:19:42 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.9 Peak output power test results at high frequency, Port 3

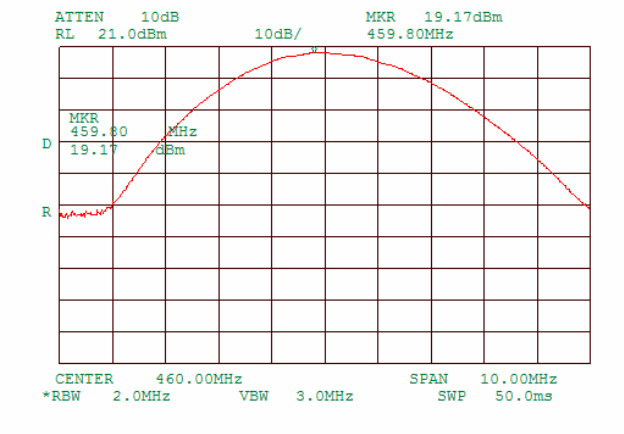


Plot 7.1.10 Peak output power test results at low frequency, Port 4

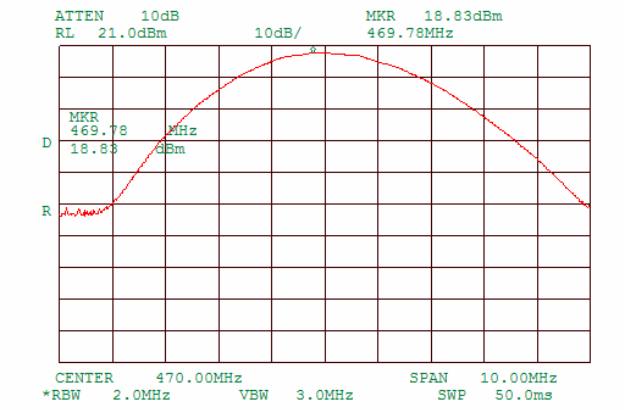


Test specification:	Section 90.205, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 4:19:42 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.11 Peak output power test results at mid frequency, Port 4



Plot 7.1.12 Peak output power test results at high frequency, Port 4



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 5:58:38 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1. The test results are provided in Table 7.2.2 and the associated plots.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, kHz
450 - 470	26	11.25

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

7.2.2 Test procedure

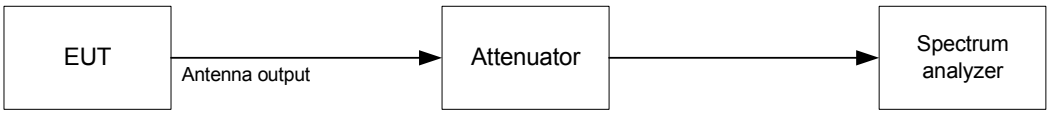
7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was set to transmit the unmodulated carrier and the reference peak power level was measured.

7.2.2.3 The EUT was set to transmit the normally modulated carrier.

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

Figure 7.2.1 Occupied bandwidth test setup



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 5:58:38 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	100 Hz
VIDEO BANDWIDTH:	300 Hz
MODULATION ENVELOPE REFERENCE POINTS:	26 dBc
MODULATION:	FSK
MODULATING SIGNAL:	Alternating symbols
BIT RATE:	600 bps

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
450	10.25	11.25	-1.00	Pass
460	10.25	11.25	-1.00	Pass
470	10.33	11.25	-0.92	Pass

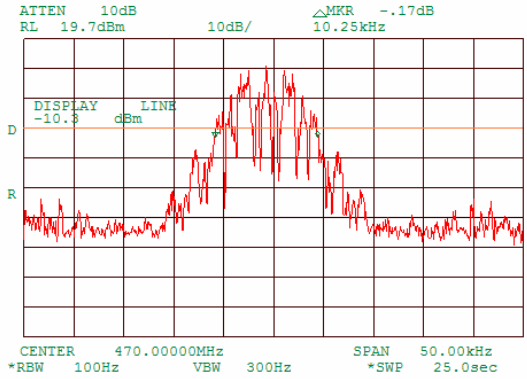
Reference numbers of test equipment used

HL 1424	HL 2399						

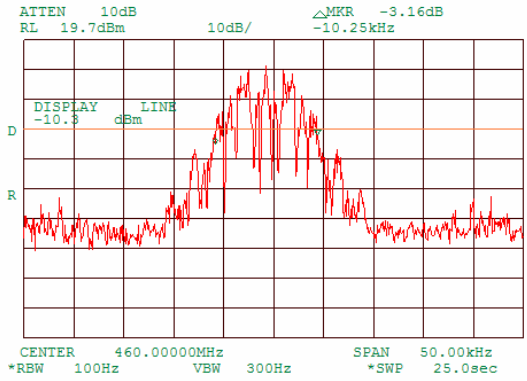
Full description is given in Appendix A.

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/8/2004 5:58:38 PM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

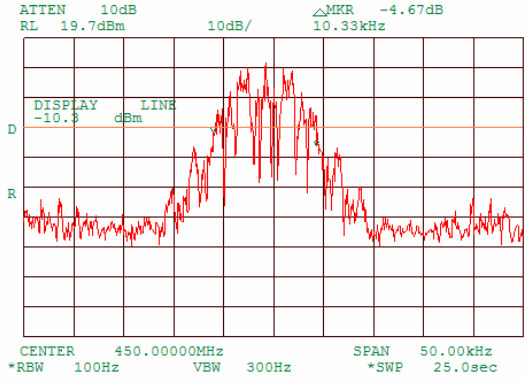
Plot 7.2.1 Occupied bandwidth test result at low frequency



Plot 7.2.2 Occupied bandwidth test result at mid frequency



Plot 7.2.3 Occupied bandwidth test result at high frequency



Test specification:	Section 90.213, Frequency stability		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:36:52 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.3 Frequency stability test

7.3.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.3.1. The test results are provided in Table 7.3.2.

Table 7.3.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
450	NA	NA
460		NA
470		NA

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 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.

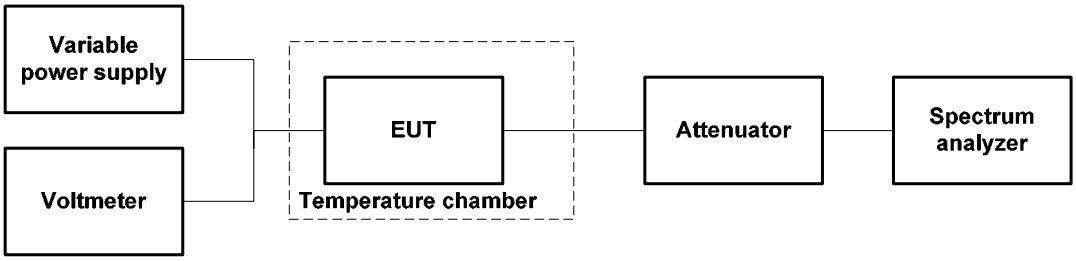
7.3.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.

7.3.2.4 The above procedure was repeated at 0˚C and at the lowest test temperature.

7.3.2.5 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.

7.3.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.3.2.

Figure 7.3.1 Frequency stability test setup



Test specification:	**Section 90.213, Frequency stability**		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	12/14/2004 11:36:52 AM		
Temperature: 23 ºC	**Air Pressure:** 1022 hPa	**Relative Humidity:** 48 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.3.2 Frequency stability test results

OPERATING FREQUENCY: 450 - 470 MHz
NOMINAL POWER VOLTAGE: 120 VAC
TEMPERATURE STABILIZATION PERIOD: 20 min
POWER DURING TEMPERATURE TRANSITION: Off
SPECTRUM ANALYZER MODE: Counter
RESOLUTION BANDWIDTH: 1 Hz
VIDEO BANDWIDTH: 1 Hz
MODULATION: Unmodulated

T, ºC	Voltage, V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Margin, Hz	Verdict
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative			
Low frequency 450 MHz													
-30	nominal	450.000235	450.000213	450.000225	450.000230	450.000233	450.000237	450.000240	974	0		NA	NA
-20	nominal	449.999548	NA	NA	NA	NA	NA	449.999443	282	0		NA	NA
-10	nominal	449.999438	NA	NA	NA	NA	NA	449.999457	191	0		NA	NA
0	nominal	449.999473	449.999482	449.999484	449.999488	449.999501	449.999510	449.999534	268	0		NA	NA
10	nominal	449.999621	NA	NA	NA	NA	NA	449.999402	355	0		NA	NA
20	+15%	449.998847	NA	NA	NA	NA	NA	449.998860	0	-419	NA	NA	NA
20	nominal	449.999260	NA	NA	NA	NA	NA	449.999266*	0	-6		NA	NA
20	-15%	449.998807	NA	NA	NA	NA	NA	449.998819	0	-459		NA	NA
30	nominal	449.999156	449.999157	449.999180	449.999216	449.999269	449.999315	449.999361	95	-110		NA	NA
40	nominal	449.999639	NA	NA	NA	NA	NA	449.999495	373	0		NA	NA
50	nominal	449.999987	NA	NA	NA	NA	NA	449.999864	721	0		NA	NA
Mid frequency 460 MHz													
-30	nominal	459.999810	459.999908	459.999991	460.000043	460.000096	460.000105	460.000139	823	0		NA	NA
-20	nominal	459.999541	NA	NA	NA	NA	NA	459.999915	599	0		NA	NA
-10	nominal	459.999432	NA	NA	NA	NA	NA	459.999675	359	0		NA	NA
0	nominal	459.999307	459.999315	459.999321	459.999346	459.999388	459.999402	459.999487	171	-9		NA	NA
10	nominal	459.999229	NA	NA	NA	NA	NA	459.999308	0	-87		NA	NA
20	+15%	459.998916	NA	NA	NA	NA	NA	459.998930	0	-400	NA	NA	NA
20	nominal	459.999270	NA	NA	NA	NA	NA	459.999316*	0	-46		NA	NA
20	-15%	459.998836	NA	NA	NA	NA	NA	459.998852	0	-480		NA	NA
30	nominal	459.999448	459.999512	459.999529	459.999551	459.999570	459.999612	459.999596	296	0		NA	NA
40	nominal	459.999702	NA	NA	NA	NA	NA	459.999482	386	0		NA	NA
50	nominal	459.999513	NA	NA	NA	NA	NA	459.999030	197	-286		NA	NA
High frequency 470 MHz													
-30	nominal	469.999680	469.999888	469.999858	469.999812	469.999780	469.999762	469.999751	568	0		NA	NA
-20	nominal	469.999541	NA	NA	NA	NA	NA	469.999615	295	0		NA	NA
-10	nominal	469.999467	NA	NA	NA	NA	NA	469.999507	187	0		NA	NA
0	nominal	469.999118	469.999129	469.999135	469.999140	469.999157	469.999161	469.999188	0	-202		NA	NA
10	nominal	469.999034	NA	NA	NA	NA	NA	469.999103	0	-286		NA	NA
20	+15%	469.998925	NA	NA	NA	NA	NA	469.998958	0	-395	NA	NA	NA
20	nominal	469.999316	NA	NA	NA	NA	NA	469.999320*	0	-4		NA	NA
20	-15%	469.998874	NA	NA	NA	NA	NA	469.998907	0	-446		NA	NA
30	nominal	469.999687	469.999730	469.999759	469.999784	469.999803	469.999816	469.999821	501	0		NA	NA
40	nominal	469.999798	NA	NA	NA	NA	NA	469.999520	478	0		NA	NA
50	nominal	469.999467	NA	NA	NA	NA	NA	469.999132	147	-188		NA	NA

* - Reference frequency

Reference numbers of test equipment used

HL 0493	HL 1204	HL 1424	HL 2399	HL 2524			

Full description is given in Appendix A.

Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	TIA/EIA-603-A, Section 2.2.19		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:44:26 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

7.4 Transient frequency behavior test

7.4.1 General

This test was performed to measure carrier frequency drift as function of time during transmitter start up and shut down. Specification test limits are given in Table 7.4.1. The test results are provided in Table 7.4.2 and shown in the associated plots.

Table 7.4.1 Transient frequency limits

Channel bandwidth, kHz	Carrier frequency tolerance, kHz	Duration, ms	Time interval*
12.5	± 12.5	10.0	t_1
	± 6.25	25.0	t_2
	± 12.5	10.0	t_3

* - t_{on} is the instant when a 1 kHz test signal is completely suppressed;
t_1 is the time period immediately following t_{on};
t_2 is the time period immediately following t_1;
t_3 is the time period from the instant when the transmitter is turned off until t_{off};
t_{off} is the instant when the 1 kHz test signal starts to rise.

7.4.2 Test procedure

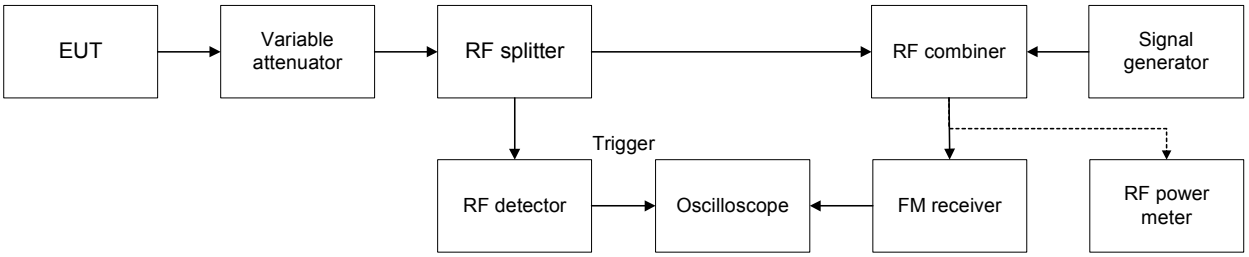
7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked. Variable attenuator was adjusted to provide signal level approximately 40 dB below the FM receiver maximum allowed level as measured with RF power meter. The EUT was turned off.

7.4.2.2 The signal generator was set to the assigned transmitter frequency modulated with 1 kHz tone at 25 kHz deviation and the output power was adjusted to provide the same as the EUT signal level at the FM receiver input as measured with power meter.

7.4.2.3 The storage oscilloscope was set to provide horizontal sweep rate 5 milliseconds per division. Amplitude control of the storage oscilloscope was adjusted to obtain 1 kHz sinusoidal signal vertically centered with ± 4 divisions amplitude.

7.4.2.4 The variable attenuator was adjusted to increase RF level supplied to splitter by 30 dB and the EUT was consequently turned on and off. Transient frequency during power switching was captured and shown in the associated plots.

Figure 7.4.1 Transient frequency test setup



Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	TIA/EIA-603-A, Section 2.2.19		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:44:26 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Table 7.4.2 Transient frequency behavior test results

Carrier frequency, MHz	Time interval	Duration, ms	Frequency tolerance, kHz	Limit, kHz	Margin, kHz	Verdict
450.000	t_1	10.0	-2.2	± 12.5	10.3	Pass
	t_2	25.0	0	± 6.25	12.5	
	t_3	10.0	0	± 12.5	12.5	
460.000	t_1	10.0	-2.6	± 12.5	9.9	Pass
	t_2	25.0	0	± 6.25	12.5	
	t_3	10.0	0	± 12.5	12.5	
470.000	t_1	10.0	-2.2	± 12.5	10.3	Pass
	t_2	25.0	0	± 6.25	12.5	
	t_3	10.0	0	± 12.5	12.5	

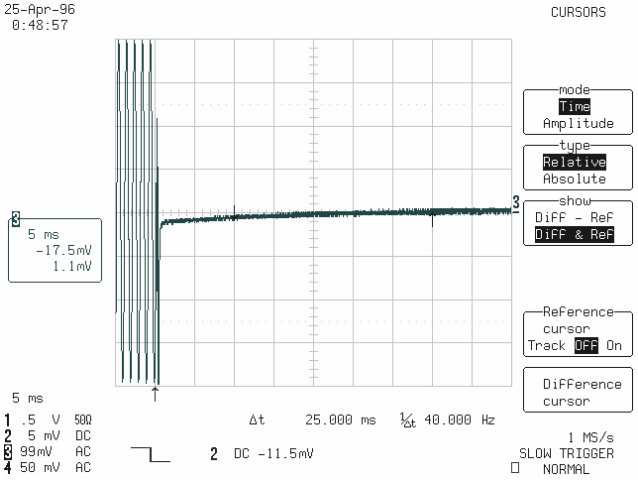
Reference numbers of test equipment used

HL 0557	HL 0670	HL 0788	HL 0808	HL 1907	HL 2014	HL 2399	

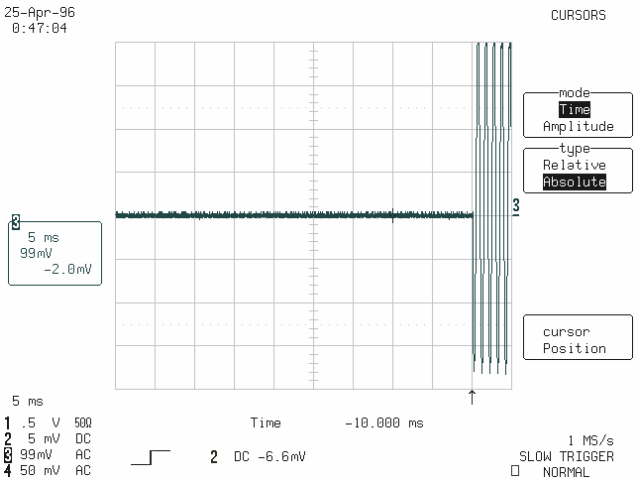
Full description is given in Appendix A.

Test specification:	**Section 90.214, Transient frequency behaviour**		
Test procedure:	TIA/EIA-603-A, Section 2.2.19		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	12/14/2004 11:44:26 AM		
Temperature: 23 ºC	**Air Pressure:** 1021 hPa	**Relative Humidity:** 40 %	**Power Supply:** 120 VAC
Remarks:			

Plot 7.4.1 Transient frequency during power ON test results at low carrier frequency

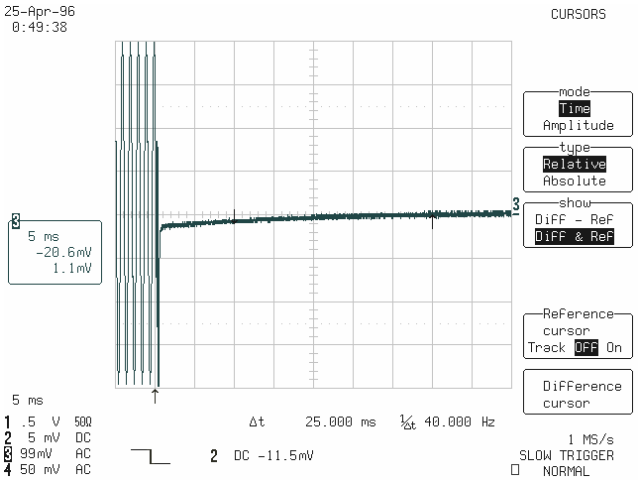


Plot 7.4.2 Transient frequency during power OFF test results at low carrier frequency

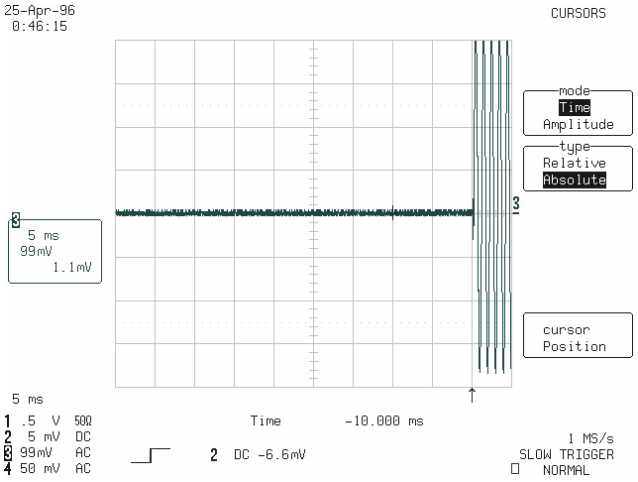


Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	TIA/EIA-603-A, Section 2.2.19		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:44:26 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.3 Transient frequency during power ON test results at mid carrier frequency

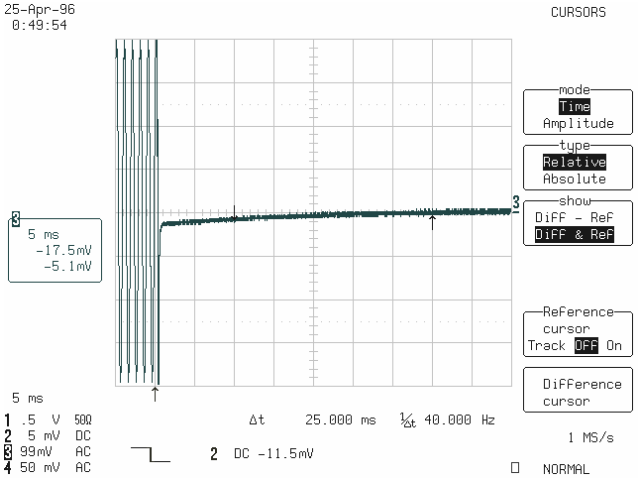


Plot 7.4.4 Transient frequency during power OFF test results at mid carrier frequency

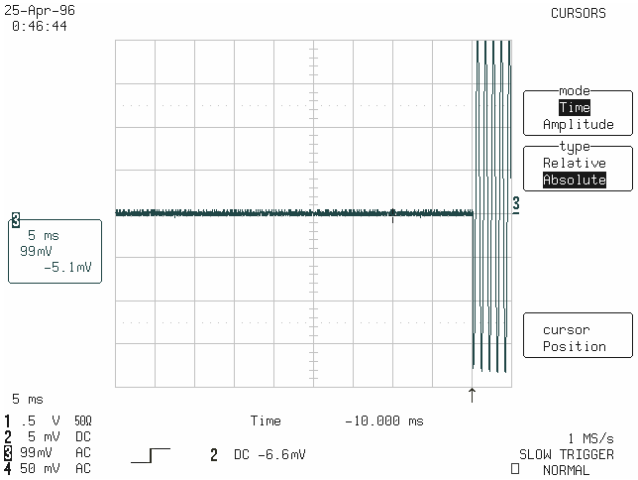


Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	TIA/EIA-603-A, Section 2.2.19		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:44:26 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.5 Transient frequency during power ON test results at high carrier frequency



Plot 7.4.6 Transient frequency during power OFF test results at high carrier frequency



Test specification:	Section 90.217, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:57:26 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

7.5 Band edge emission

7.5.1 General

This test was performed to verify the EUT band edge emission, including all associated side bands and frequency drift under extreme test conditions, was attenuated at least 30 dB below the unmodulated carrier level. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Band edge emission limits

Band edge frequency shift from carrier, kHz	Channel bandwidth, kHz	Attenuation below carrier, dBc
± 25.0	12.5	30

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.

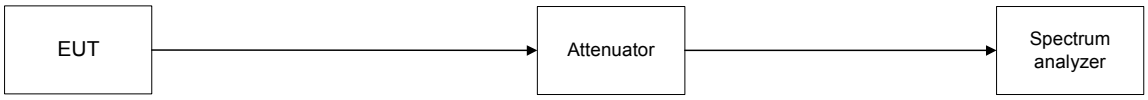
7.5.2.2 The spectrum analyzer sweep time and bandwidth were set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure the peak measurements. The spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.5.2.3 The frequency of modulation envelope points beyond which the modulation envelope power drops below the band edge emission limit was measured.

7.5.2.4 The total bandwidth was calculated by adding of the negative frequency drift to the lower measured frequency and the positive frequency drift to the higher measured frequency. The obtained bandwidth was verified to be within the allowed frequency range.

7.5.2.5 The test results were recorded in Table 7.5.2 and shown in the associated plots.

Figure 7.5.1 Band edge emission measurement setup



Test specification:	Section 90.217, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:57:26 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Band edge emission test results

OPERATING FREQUENCY RANGE: 450 – 470 MHz
DETECTOR USED: Peak hold
SWEEP RATE: 2 kHz/s
RESOLUTION BANDWIDTH: 100 Hz
VIDEO BANDWIDTH: 300 Hz
MODULATION: FSK
MODULATING SIGNAL: Alternating symbols
BIT RATE: 600 bps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
ATTENUATION BELOW CARRIER: 30 dBc

Band edge	Measured frequency, MHz*	Frequency drift, Hz		Band edge frequency, MHz**	Band edge limit, MHz	Margin, kHz***	Verdict
		Negative	Positive				
Low carrier frequency							
Low	449.994000	459	NA	449.993541	449.975	18.541	Pass
High	450.004250	NA	974	450.005224	450.025	-19.776	Pass
Mid carrier frequency							
Low	459.994000	480	NA	459.993520	459.975	18.520	Pass
High	460.004330	NA	823	460.005153	460.025	-19.847	Pass
High carrier frequency							
Low	469.994080	446	NA	469.993634	469.975	18.634	Pass
High	470.004330	NA	568	470.004898	470.025	-20.102	Pass

* - Measured frequency beyond which the emission level is attenuated at least 30 dB below the unmodulated carrier
** - Band edge frequency = Measured frequency ± Frequency drift under extreme conditions
*** - Margin = Band edge limit – Band edge frequency

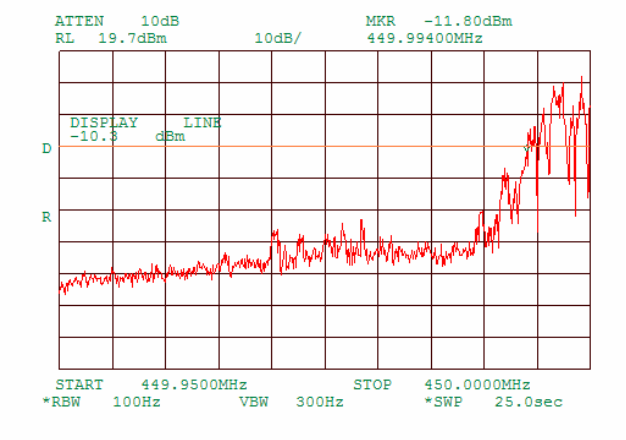
Reference numbers of test equipment used

HL 1424	HL 2399						

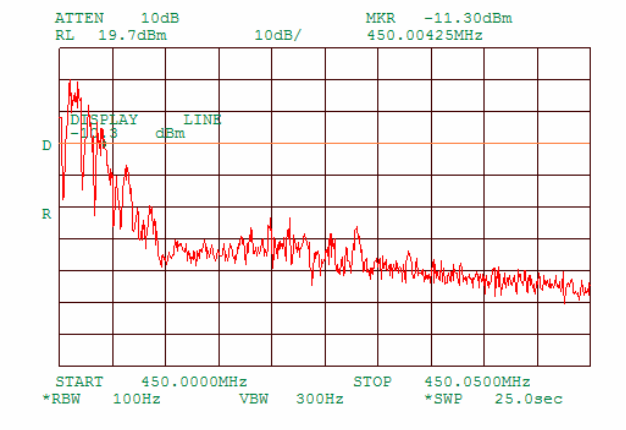
Full description is given in Appendix A.

Test specification:	Section 90.217, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:57:26 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.1 Low band edge emission test results at 450 MHz

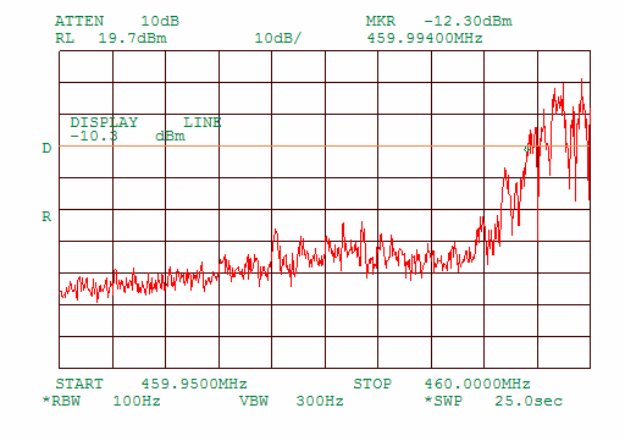


Plot 7.5.2 High band edge emission test results at 450 MHz

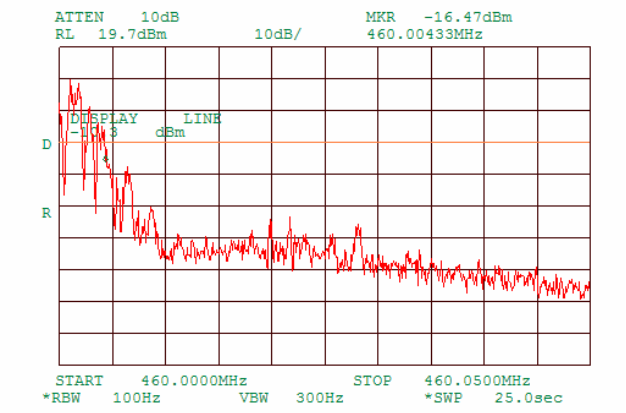


Test specification:	Section 90.217, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:57:26 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.3 Low band edge emission test results at 460 MHz

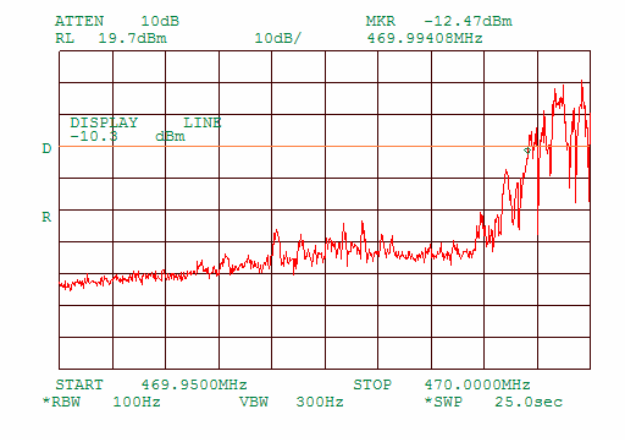


Plot 7.5.4 High band edge emission test results at 460 MHz

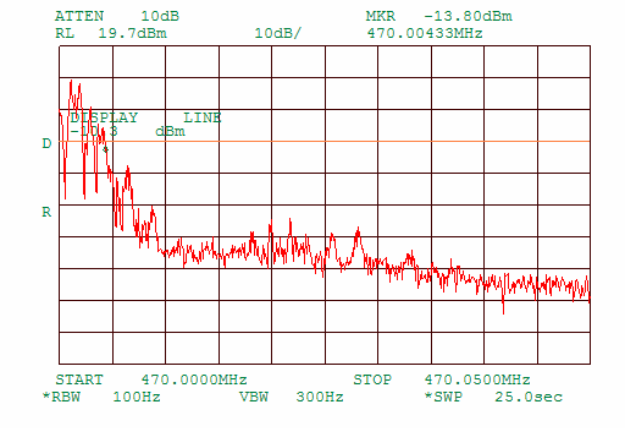


Test specification:	Section 90.217, Band edge emission		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/14/2004 11:57:26 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.5 Low band edge emission test results at 470 MHz



Plot 7.5.6 High band edge emission test results at 470 MHz



Test specification:	Section 90.217, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/9/2004 10:37:08 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

7.6 Spurious emissions at RF antenna connector test

7.6.1 General

This test was performed to measure spurious emissions at RF antenna connector. 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 Spurious emission limits

Frequency, MHz	Attenuation below carrier, dBc	Spurious emission, dBm
0.009 – 10th harmonic*	30	-12

* - spurious emission limits do not apply to the in band emission within:
± 40 kHz from the carrier for equipment designed to operate with 25 kHz channel bandwidth
± 25 kHz from the carrier for equipment designed to operate with 12.5 kHz channel bandwidth
± 12.5 kHz from the carrier for equipment designed to operate with 6.25 kHz channel bandwidth

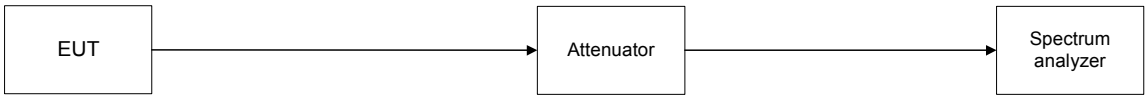
7.6.2 Test procedure

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 adjusted to produce maximum available for end user RF output power.

7.6.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.6.2 and associated plots.

Figure 7.6.1 Spurious emission test setup



Test specification:	**Section 90.217, Conducted spurious emissions**		
Test procedure:	47 CFR, Sections 2.1051 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	12/9/2004 10:37:08 AM		
Temperature: 23 ºC	**Air Pressure:** 1021 hPa	**Relative Humidity:** 40 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.6.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 450 - 470 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 5000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATION: FSK
MODULATING SIGNAL: Alternating symbols
BIT RATE: 600 bps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Low carrier frequency 450 MHz									
All spurious emissions were found more than 20 dB below the limit.									Pass
Mid carrier frequency 460 MHz									
All spurious emissions were found more than 20 dB below the limit.									Pass
High carrier frequency 470 MHz									
All spurious emissions were found more than 20 dB below the limit.									Pass

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

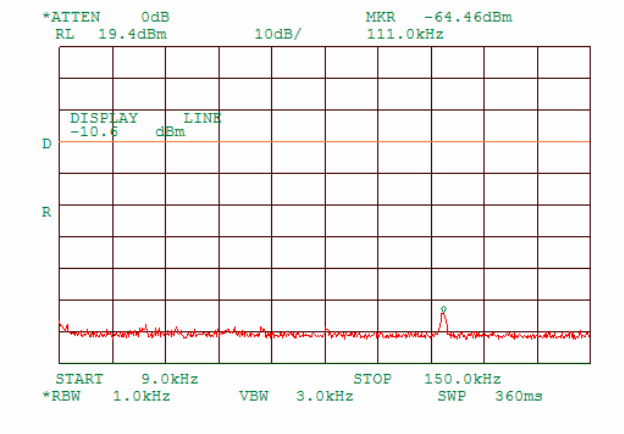
Reference numbers of test equipment used

HL 1424	HL 2399						

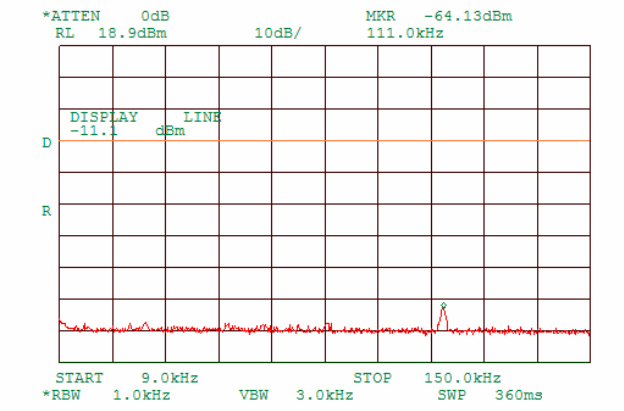
Full description is given in Appendix A.

Test specification:	Section 90.217, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/9/2004 10:37:08 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

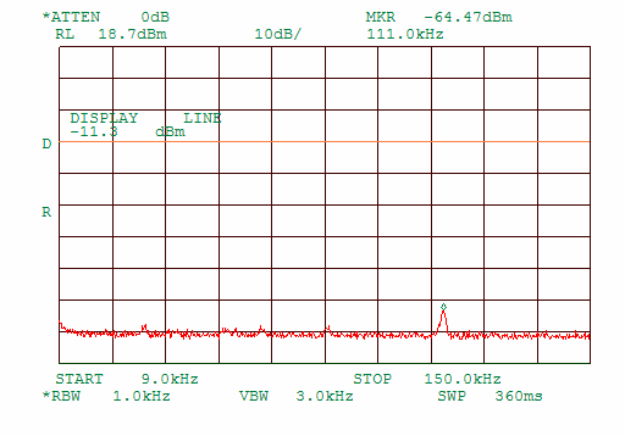


Plot 7.6.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

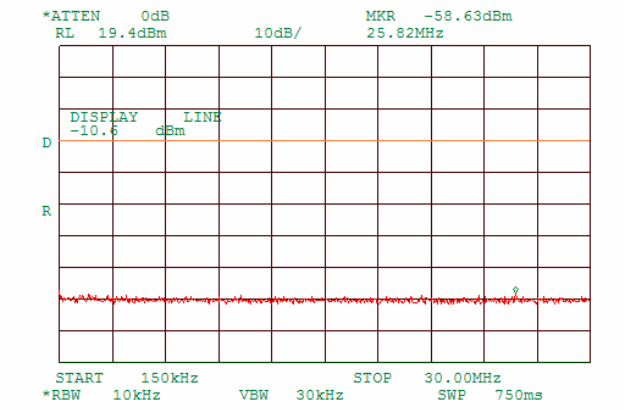


Test specification:	Section 90.217, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/9/2004 10:37:08 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

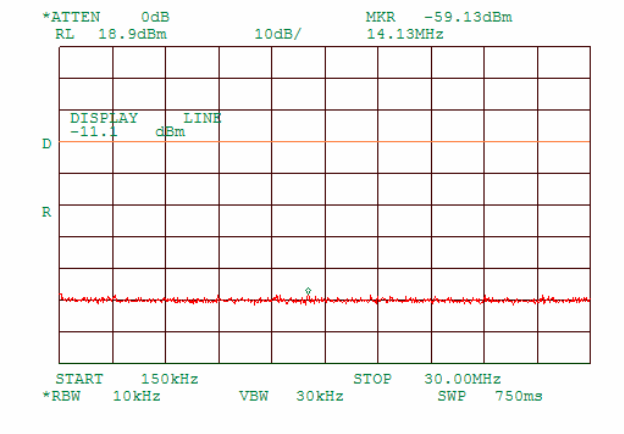


Plot 7.6.4 Spurious emission measurements in 0.15 - 30 MHz range at low carrier frequency

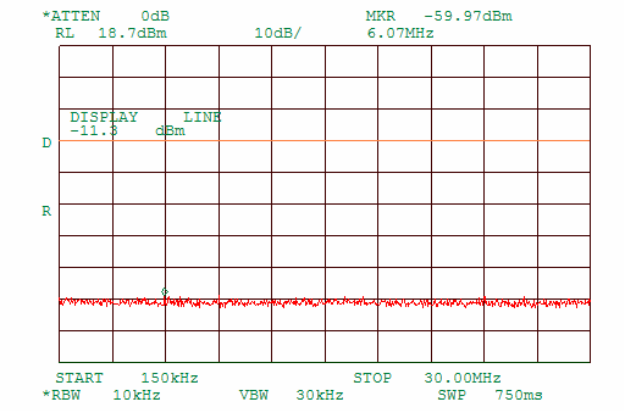


Test specification:	Section 90.217, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/9/2004 10:37:08 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.5 Spurious emission measurements in 0.15 - 30 MHz range at mid carrier frequency

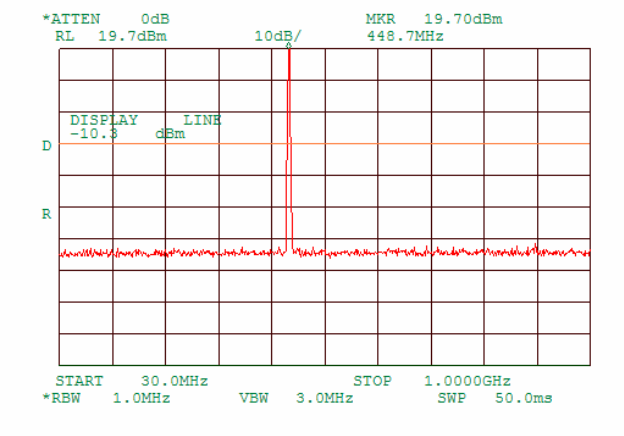


Plot 7.6.6 Spurious emission measurements in 0.15 – 30 MHz range at high carrier frequency

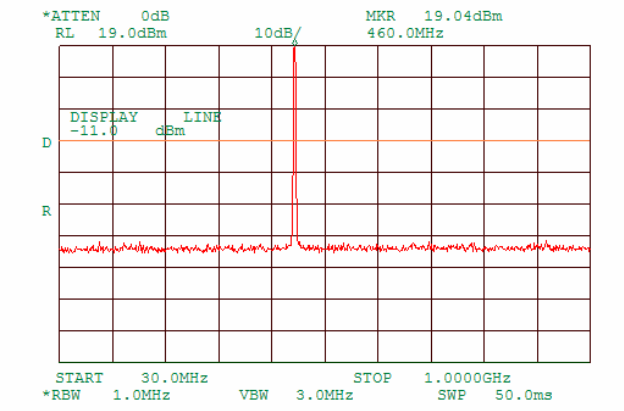


Test specification:	Section 90.217, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/9/2004 10:37:08 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.7 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency

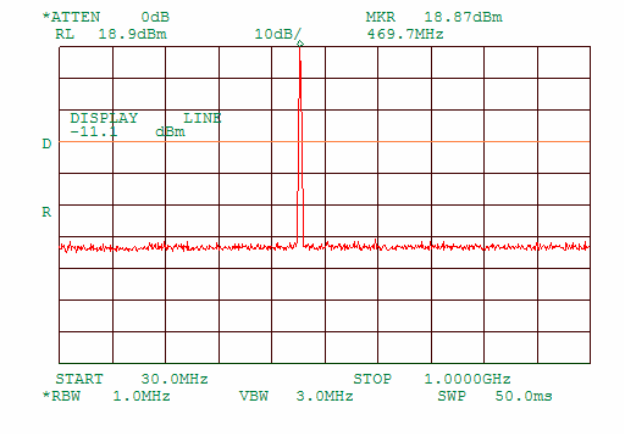


Plot 7.6.8 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency

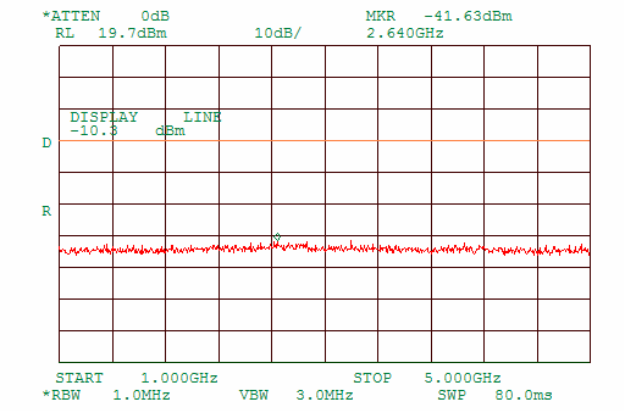


Test specification:	Section 90.217, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/9/2004 10:37:08 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.9 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency

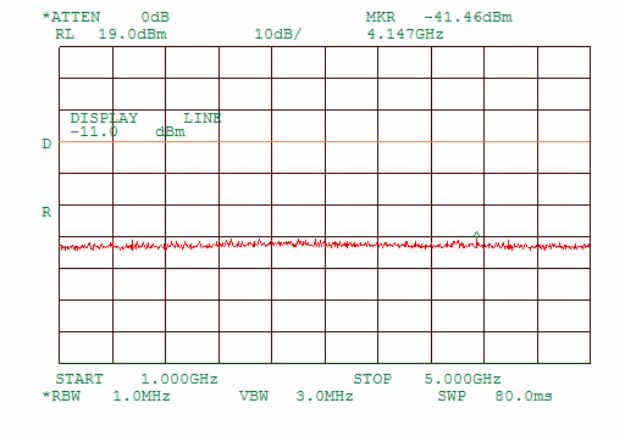


Plot 7.6.10 Spurious emission measurements in 1000 - 5000 MHz range at low carrier frequency

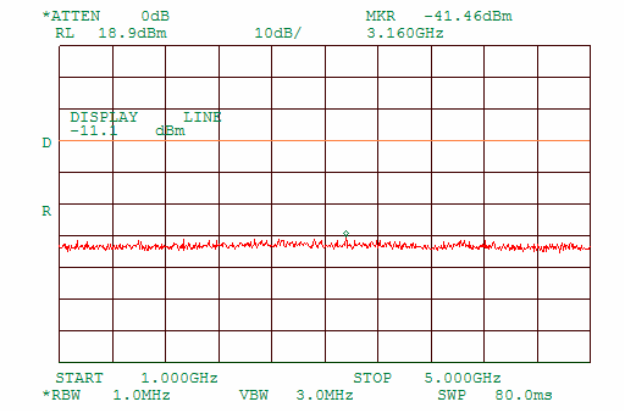


Test specification:	Section 90.217, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.217; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/9/2004 10:37:08 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.11 Spurious emission measurements in 1000 - 5000 MHz at mid carrier frequency



Plot 7.6.12 Spurious emission measurements in 1000 - 5000 MHz at high carrier frequency



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

7.7 Radiated spurious emission measurements

7.7.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Radiated spurious emission test limits

Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(µV/m)**
0.009 – 10th harmonic*	30	18	85.38

* - spurious emission limits do not apply to the in band emission within:
± 25 kHz from the carrier for equipment designed to operate with 12.5 kHz channel bandwidth

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

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

7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and the performance check was conducted.

7.7.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

7.7.2.3 The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.

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

7.7.3.1 The EUT was set up as shown in Figure 7.7.2, energized and the performance check was conducted.

7.7.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

7.7.3.3 The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.

7.7.4 Test procedure for substitution ERP measurements of spurious

7.7.4.1 The test equipment was set up as shown in Figure 7.7.3 and energized.

7.7.4.2 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.

7.7.4.3 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.

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

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

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

7.7.4.7 The worst test results (the lowest margins) were recorded in Table 7.7.3 and shown in the associated plots.

Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Figure 7.7.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

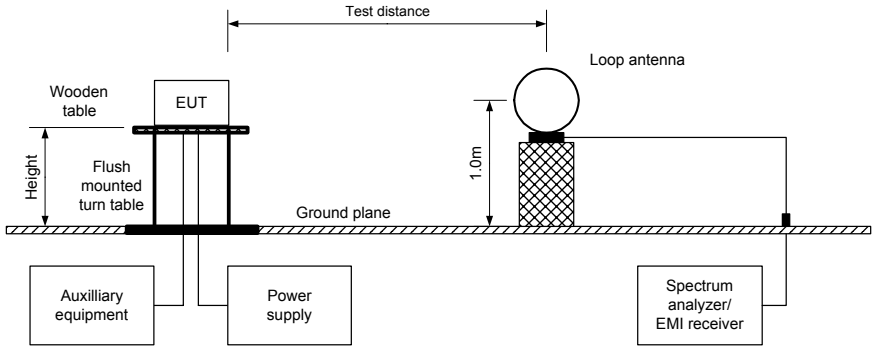
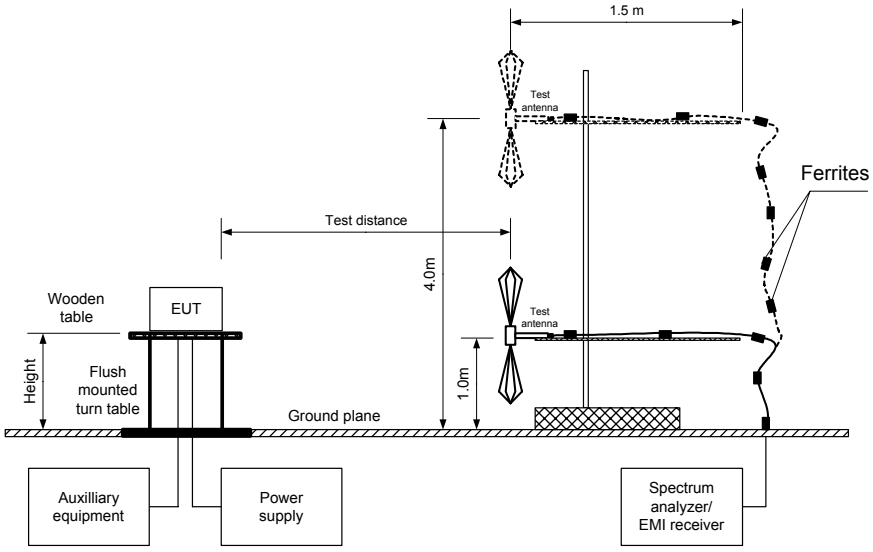
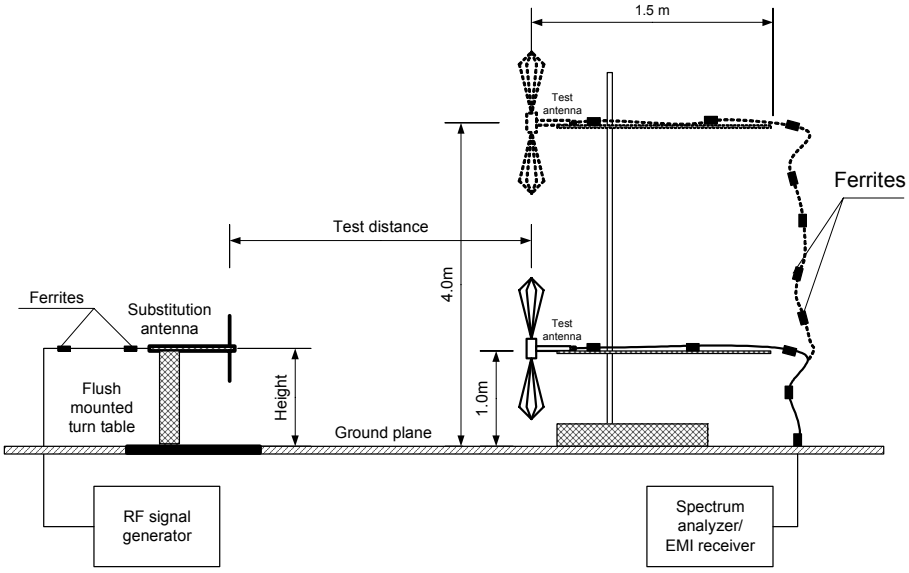


Figure 7.7.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Figure 7.7.3 Setup for substitution ERP measurements of spurious



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Table 7.7.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 450 - 470 MHz
TEST DISTANCE: 3 m
TEST SITE: OATS
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 5000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Log periodic (200 MHz – 1000 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: FSK
MODULATING SIGNAL: Alternating symbol
BIT RATE: 600 bps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
Low carrier frequency 450 MHz							
1349.87	62.00	85.38	-23.38	1000	Vertical	1.1	257
1349.75	59.67	85.38	-25.71	1000	Horizontal	1.0	230
2250.18	65.67	85.38	-19.71	1000	Vertical	1.0	324
2249.93	65.50	85.38	-19.88	1000	Horizontal	1.56	360
Mid carrier frequency 460 MHz							
1379.93	62.00	85.38	-23.38	1000	Vertical	1.0	160
1380.23	60.17	85.38	-25.21	1000	Horizontal	1.8	177
2300.02	63.50	85.38	-21.88	1000	Vertical	1.0	134
2300.35	63.17	85.38	-22.21	1000	Horizontal	1.0	170
High carrier frequency 470 MHz							
1409.98	61.17	85.38	-24.21	1000	Vertical	1.2	237
1409.97	60.67	85.38	-24.71	1000	Horizontal	1.1	330
2349.85	62.67	85.38	-22.71	1000	Vertical	1.8	276
2350.08	62.00	85.38	-23.38	1000	Horizontal	1.0	215

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

Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Table 7.7.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 450 - 470 MHz
TRANSMITTER CARRIER ERP: 19.67 dBm at low frequency
19.17 dBm at mid frequency
18.83 dBm at high frequency
TEST SITE: OATS
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
SUBSTITUTION ANTENNA TYPE: Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength, dB(µV/m)	RBW, kHz	Antenna polarization	RF generator output, dBm	Ant gain, dBd	Cable loss, dB	ERP, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Low carrier frequency 450 MHz											
1349.87	62.00	1000	V	-40.11	7.25	0.64	-35.65	55.32	30	25.32	Pass
1349.75	59.67	1000	H	-42.44	7.25	0.64	-37.98	57.65	30	27.65	Pass
2250.18	65.67	1000	V	-37.83	8.85	0.84	-31.97	51.64	30	21.64	Pass
2249.93	65.50	1000	H	-38.00	8.85	0.84	-32.14	51.81	30	21.81	Pass
Mid carrier frequency 460 MHz											
1379.93	62.00	1000	V	-40.11	7.40	0.64	-35.51	54.67	30	24.67	Pass
1380.23	60.17	1000	H	-41.94	7.40	0.65	-37.33	56.51	30	26.51	Pass
2300.02	63.50	1000	V	-40.00	8.94	0.85	-34.06	53.23	30	23.23	Pass
2300.35	63.17	1000	H	-40.33	8.94	0.85	-34.39	53.56	30	23.56	Pass
High carrier frequency 470 MHz											
1409.98	61.17	1000	V	-41.50	7.53	0.65	-36.77	55.60	30	25.60	Pass
1409.97	60.67	1000	H	-42.00	7.53	0.65	-37.27	56.10	30	26.10	Pass
2349.85	62.67	1000	V	-40.83	9.03	0.86	-34.81	53.64	30	23.64	Pass
2350.08	62.00	1000	H	-41.50	9.03	0.86	-35.48	54.31	30	24.31	Pass

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

Reference numbers of test equipment used

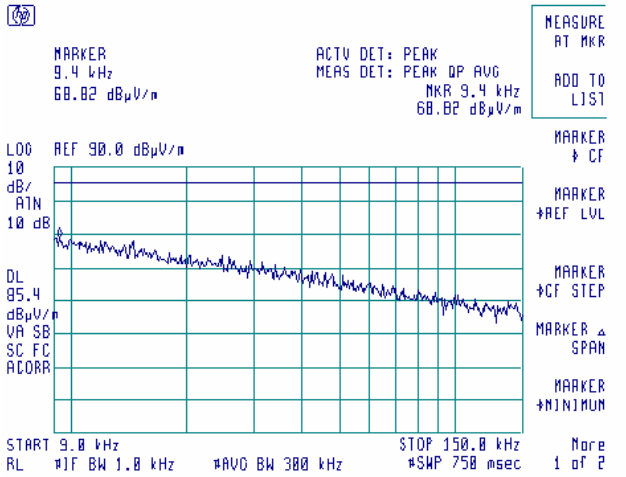
HL 0034	HL 0446	HL 0465	HL 0521	HL 0589	HL 0604	HL 0813	HL 1004
HL 1424	HL 1430	HL 1552	HL 1942	HL 1984	HL 2009	HL 2399	HL 2400
HL 2432							

Full description is given in Appendix A.

Test specification:	**Section 90.217, Radiated spurious emissions**		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	**Air Pressure:** 1022 hPa	**Relative Humidity:** 44 %	**Power Supply:** 120 VAC
Remarks:			

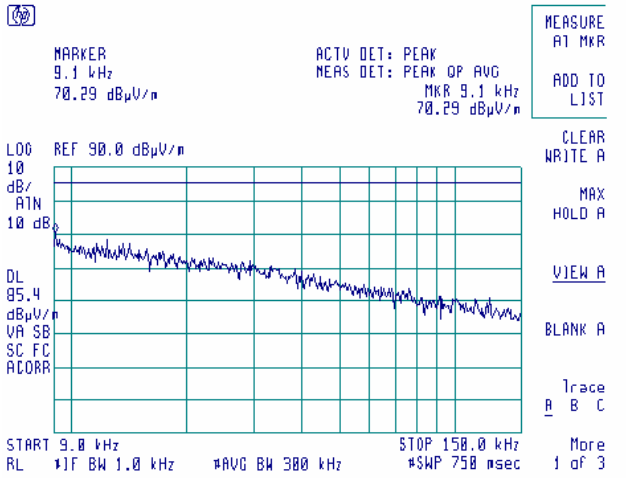
Plot 7.7.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.7.2 Radiated emission measurements in 9 - 150 kHz range

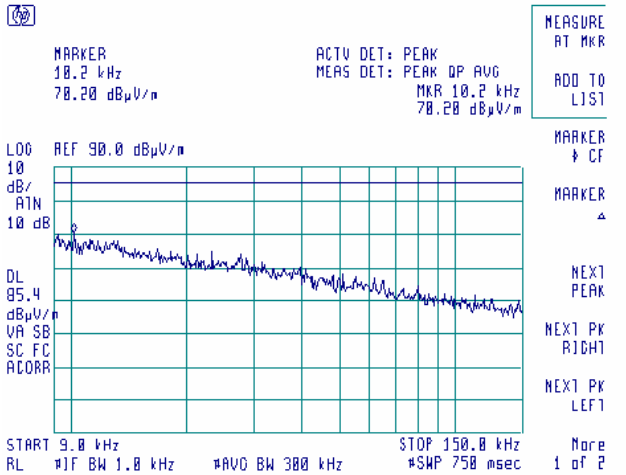
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	**Section 90.217, Radiated spurious emissions**		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	**Air Pressure:** 1022 hPa	**Relative Humidity:** 44 %	**Power Supply:** 120 VAC
Remarks:			

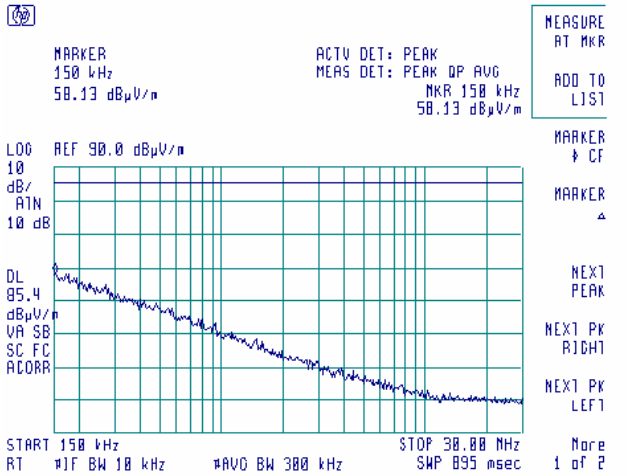
Plot 7.7.3 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.7.4 Radiated emission measurements in 0.15 - 30 MHz range

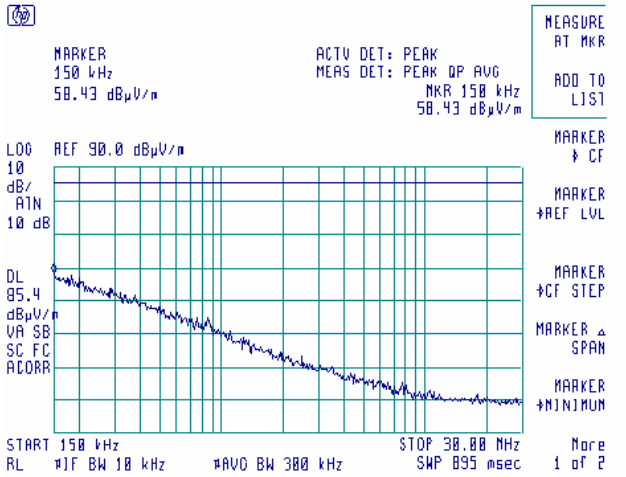
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

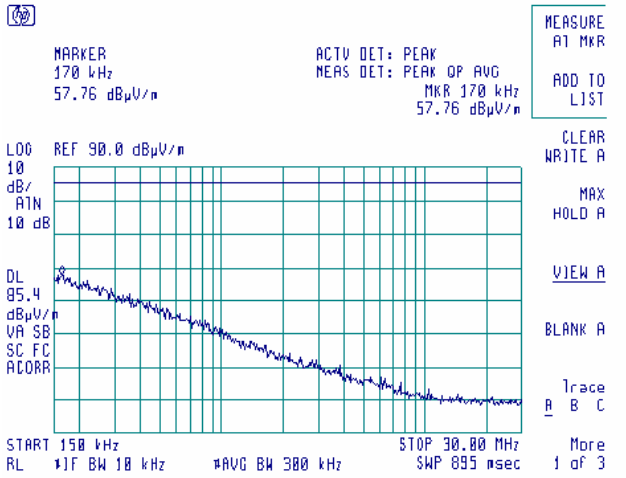
Plot 7.7.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.7.6 Radiated emission measurements in 0.15 - 30 MHz range

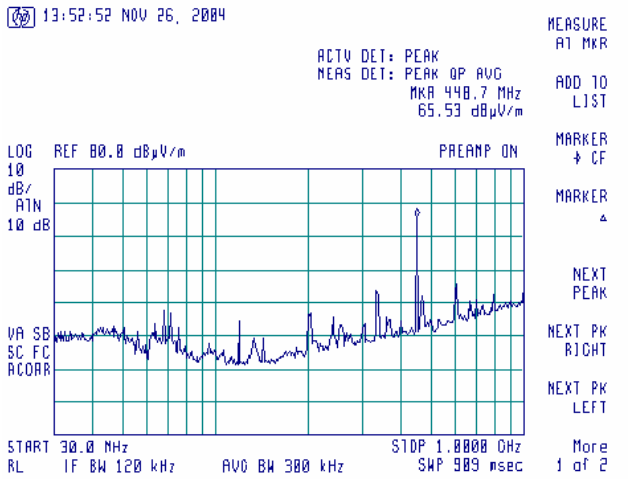
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

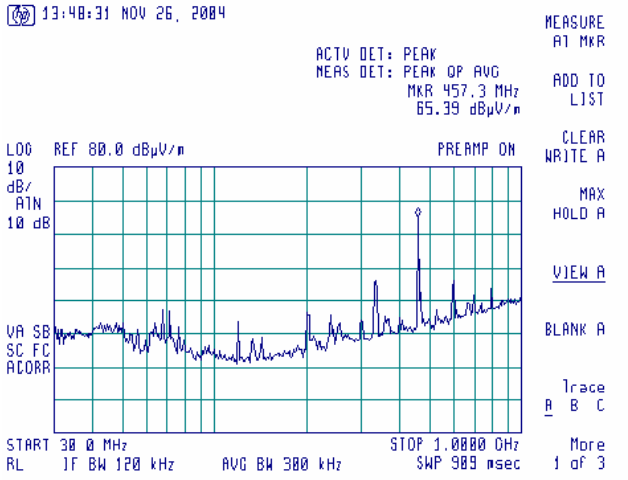
Plot 7.7.7 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.7.8 Radiated emission measurements in 30 - 1000 MHz range

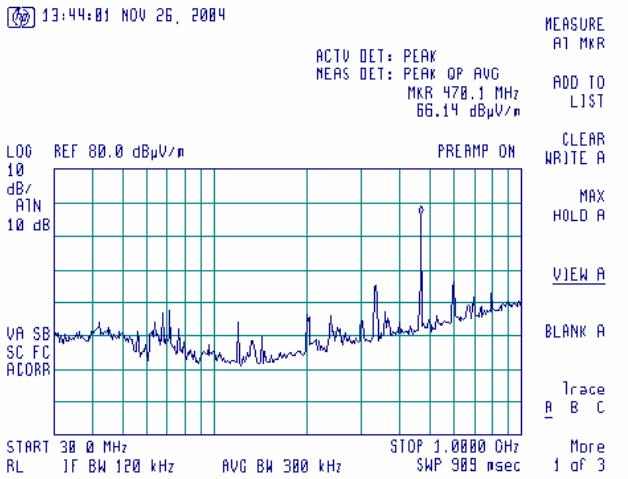
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

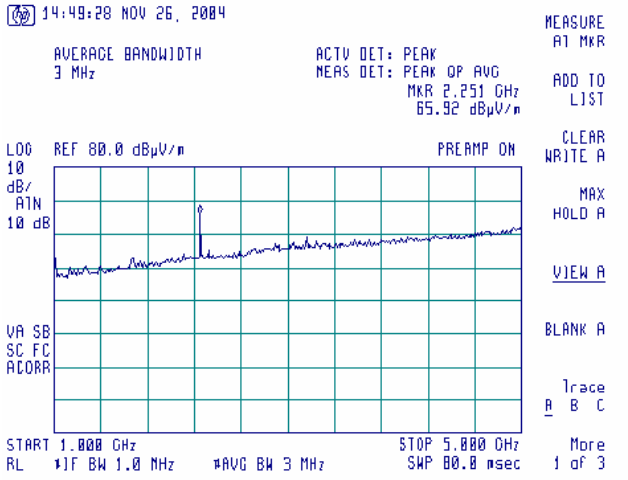
Plot 7.7.9 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.7.10 Radiated emission measurements in 1000 – 5000 MHz range

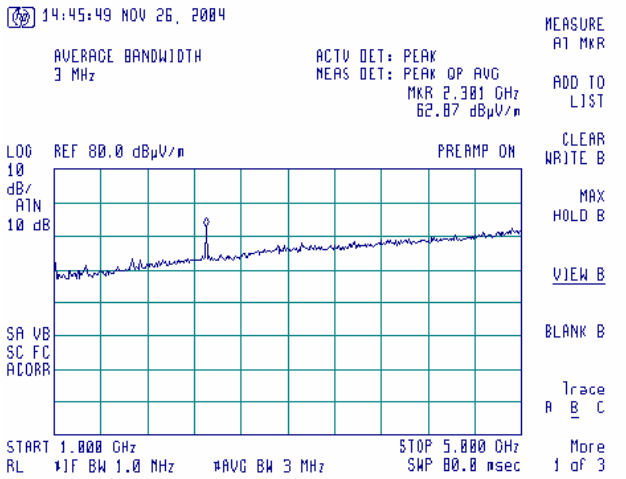
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

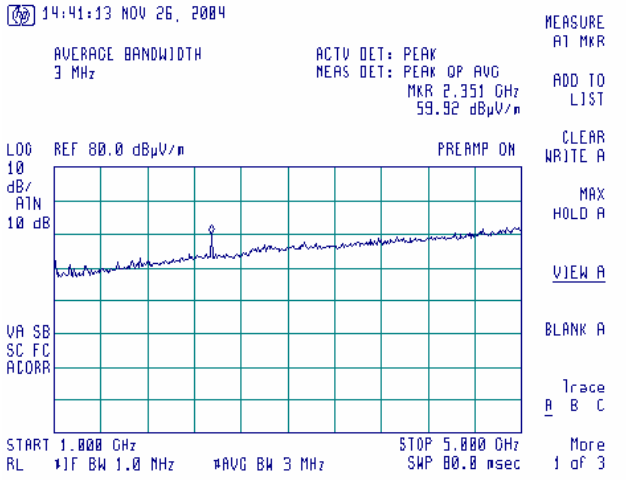
Plot 7.7.11 Radiated emission measurements in 1000 – 5000 MHz range

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



Plot 7.7.12 Radiated emission measurements in 1000 – 5000 MHz range

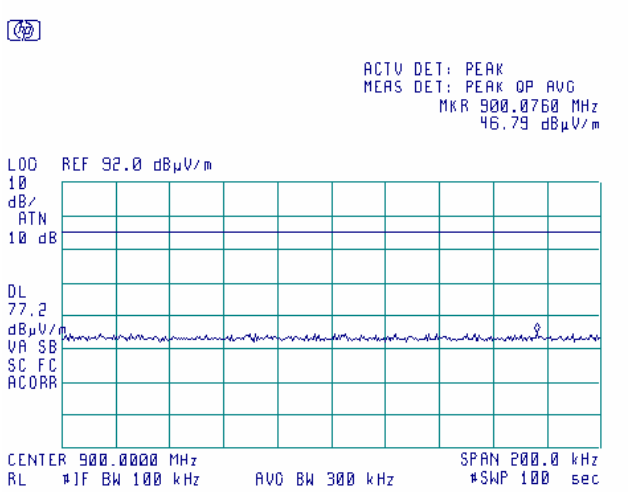
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

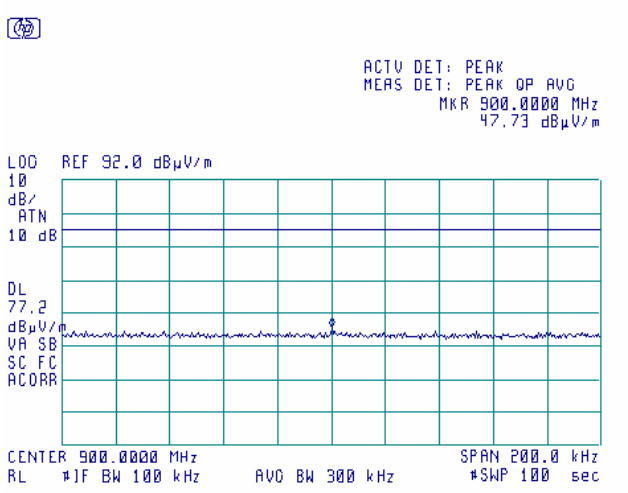
Plot 7.7.13 Radiated emission measurements at the 2nd harmonic

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



Plot 7.7.14 Radiated emission measurements at the 2nd harmonic

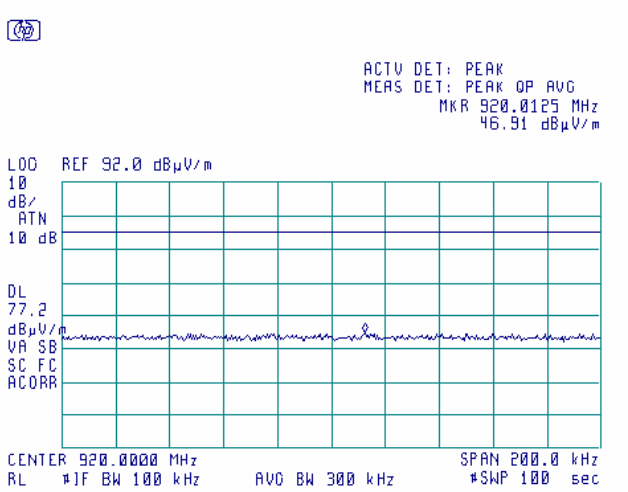
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

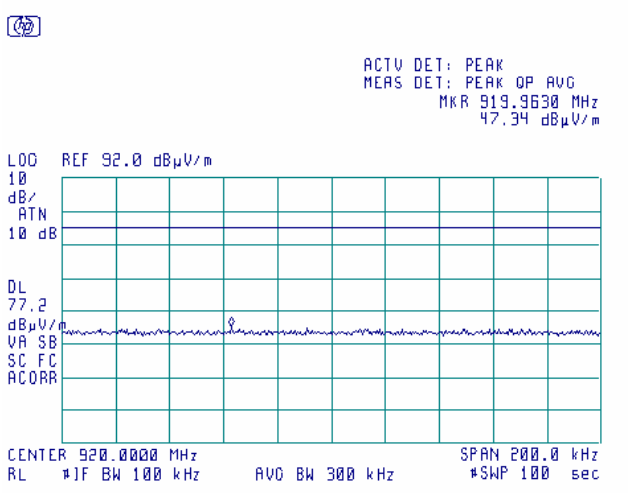
Plot 7.7.15 Radiated emission measurements at the 2nd harmonic

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



Plot 7.7.16 Radiated emission measurements at the 2nd harmonic

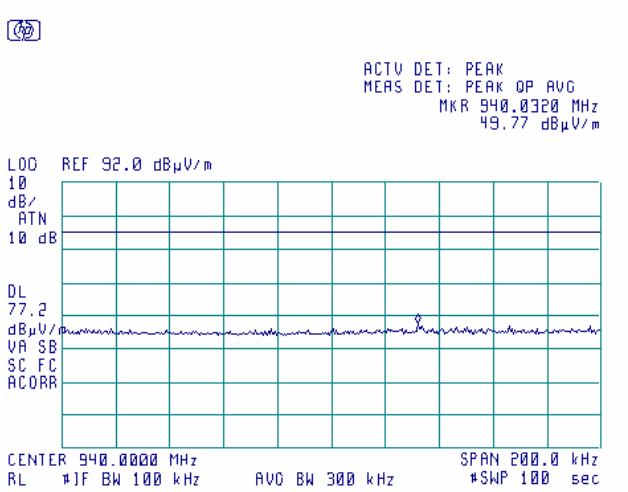
TEST SITE:	OATS
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

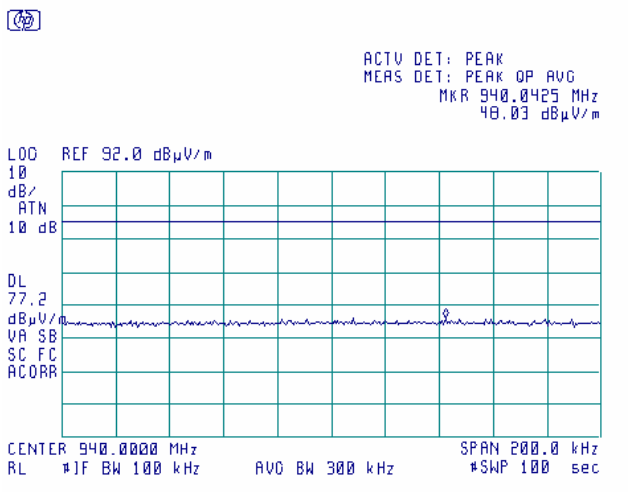
Plot 7.7.17 Radiated emission measurements at the 2nd harmonic

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



Plot 7.7.18 Radiated emission measurements at the 2nd harmonic

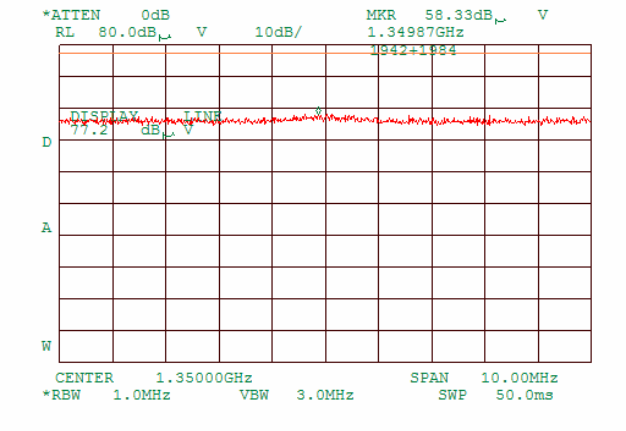
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m



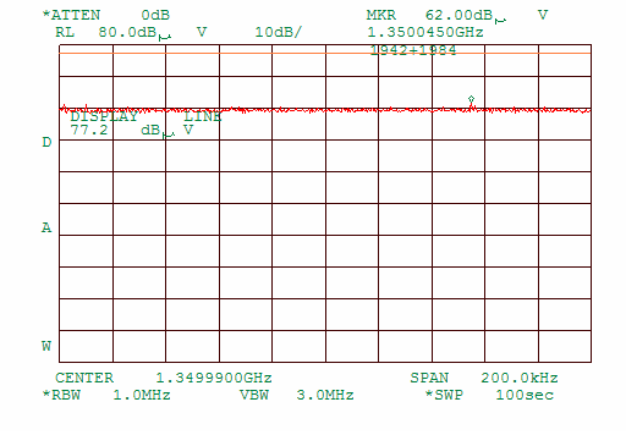
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.19 Radiated emission measurements at the 3rd harmonic

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



Span: 10 MHz
Sweep time: 50 ms

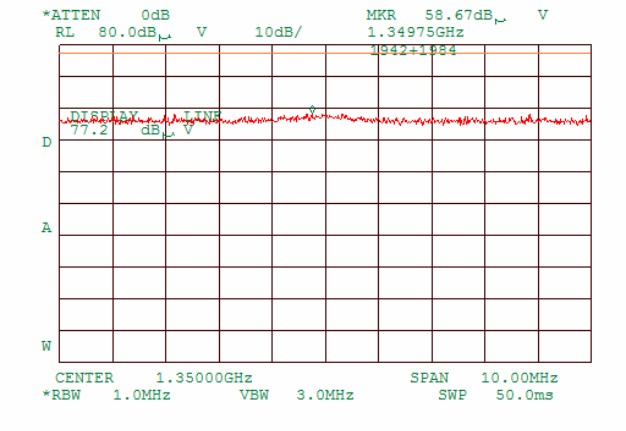


Span: 200 kHz
Sweep time: 100 s

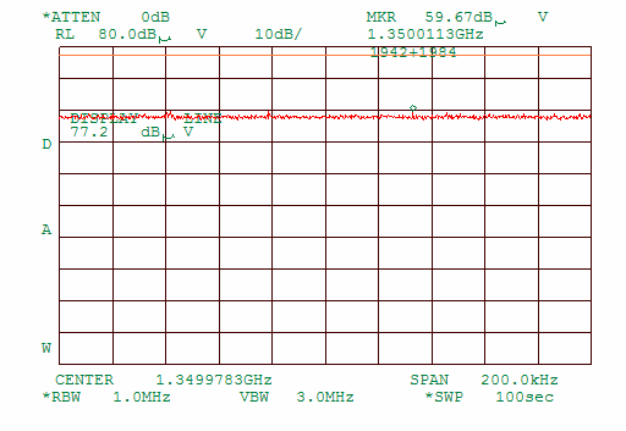
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.20 Radiated emission measurements at the 3rd harmonic

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



Span: 10 MHz
Sweep time: 50 ms

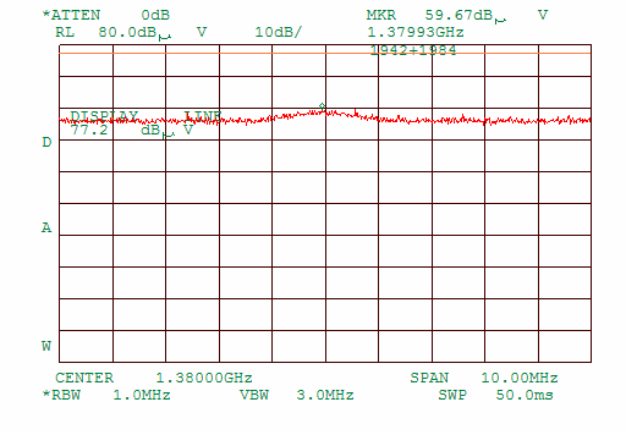


Span: 200 kHz
Sweep time: 100 s

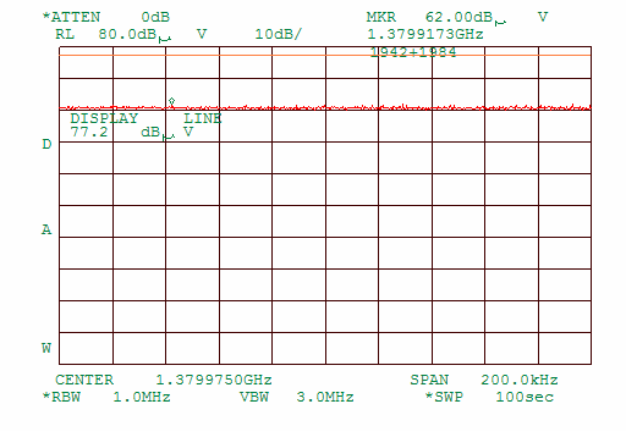
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.21 Radiated emission measurements at the 3rd harmonic

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



Span: 10 MHz
Sweep time: 50 ms

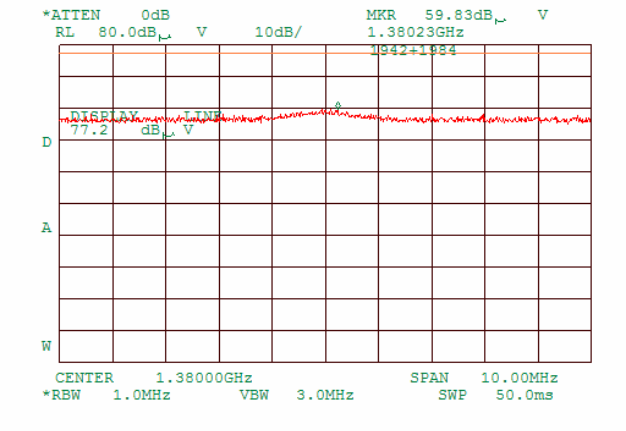


Span: 200 kHz
Sweep time: 50 ms

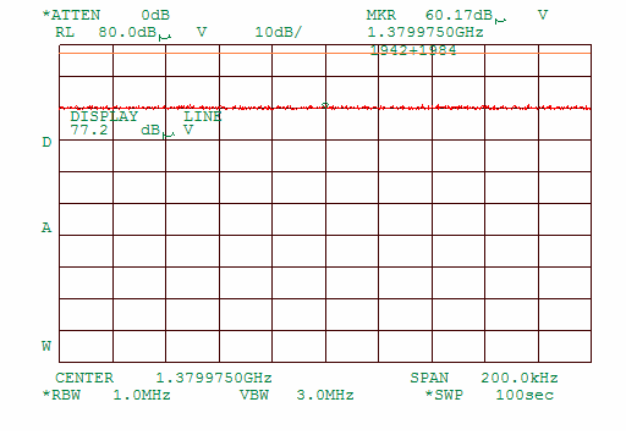
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.22 Radiated emission measurements at the 3rd harmonic

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



Span: 10 MHz
Sweep time: 50 ms

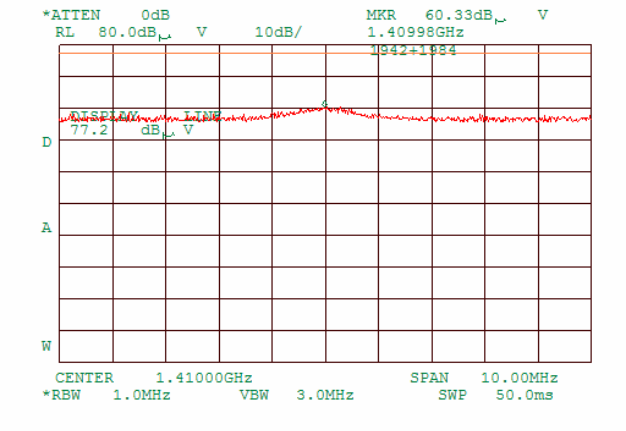


Span: 200 kHz
Sweep time: 50 ms

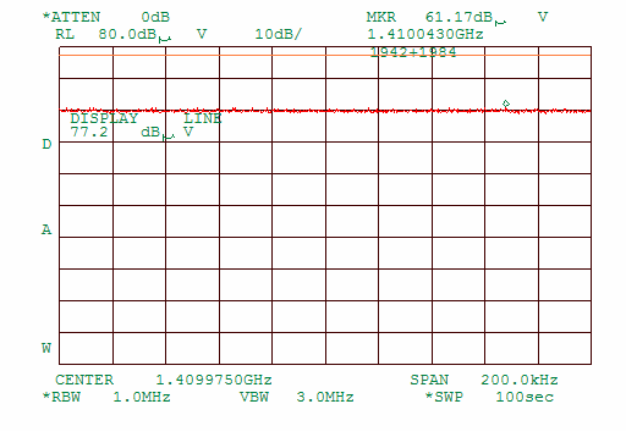
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.23 Radiated emission measurements at the 3rd harmonic

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



Span: 10 MHz
Sweep time: 50 ms

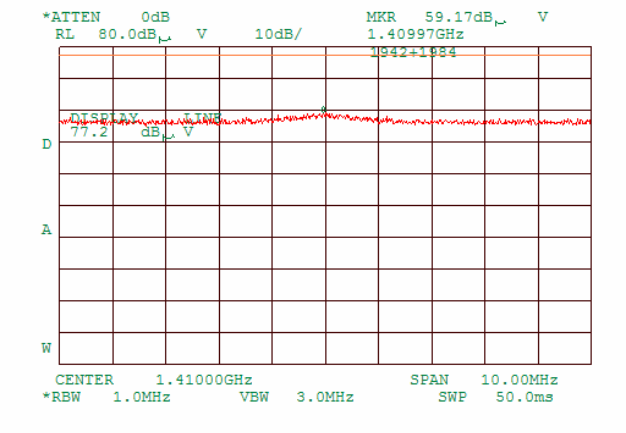


Span: 200 kHz
Sweep time: 50 ms

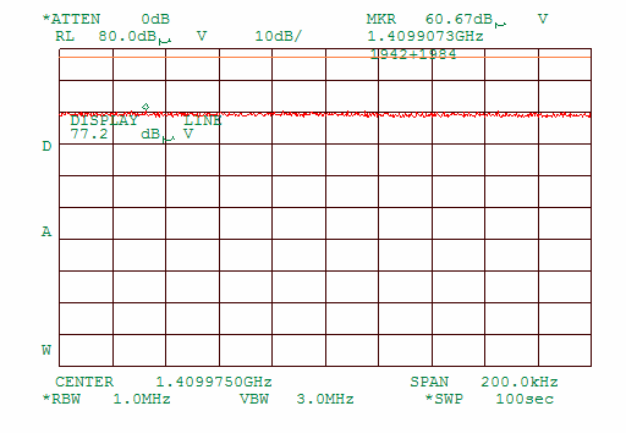
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.24 Radiated emission measurements at the 3rd harmonic

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



Span: 10 MHz
Sweep time: 50 ms

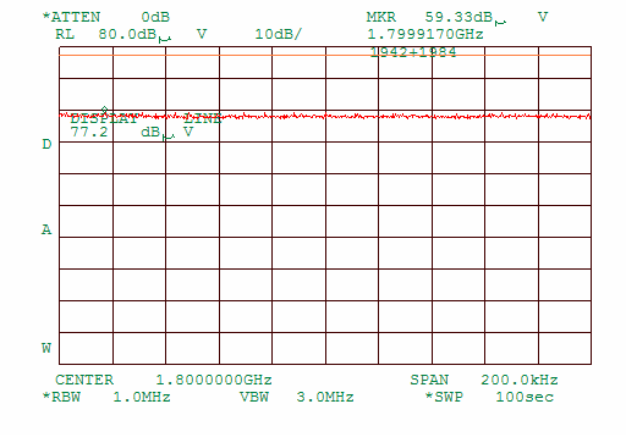


Span: 200 kHz
Sweep time: 50 ms

Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

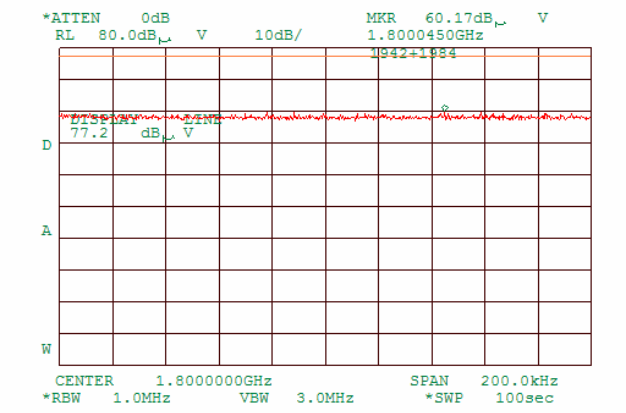
Plot 7.7.25 Radiated emission measurements at the 4th harmonic

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



Plot 7.7.26 Radiated emission measurements at the 4th harmonic

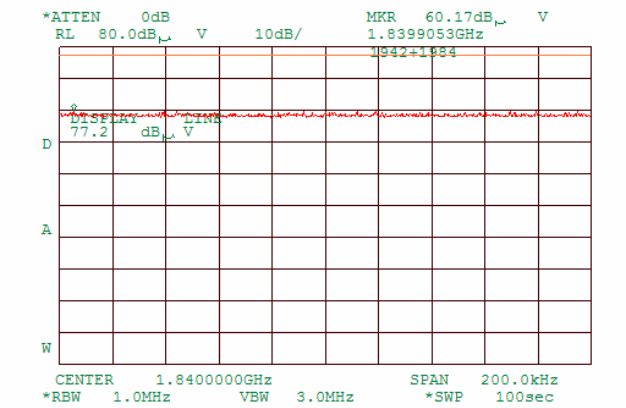
TEST SITE:	OATS
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

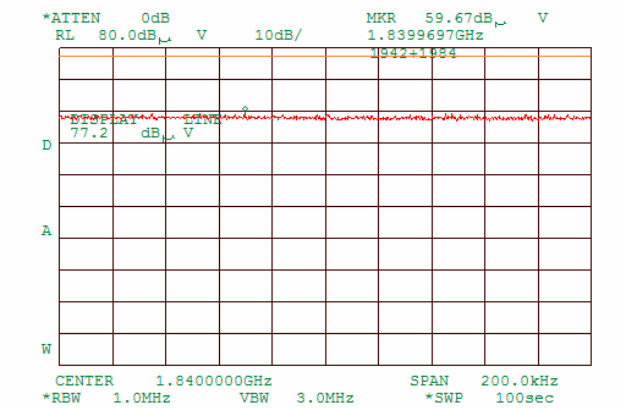
Plot 7.7.27 Radiated emission measurements at the 4th harmonic

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



Plot 7.7.28 Radiated emission measurements at the 4th harmonic

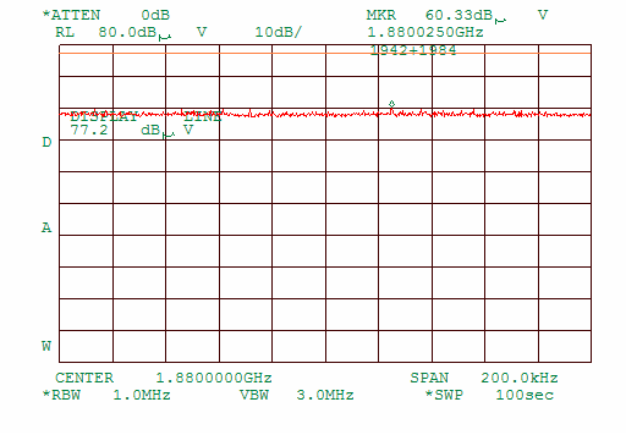
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

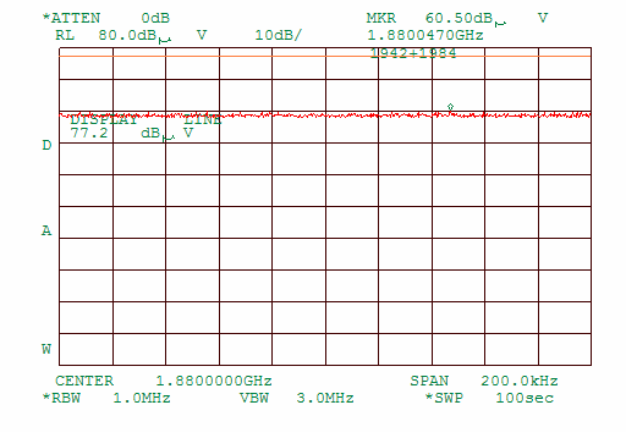
Plot 7.7.29 Radiated emission measurements at the 4th harmonic

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



Plot 7.7.30 Radiated emission measurements at the 4th harmonic

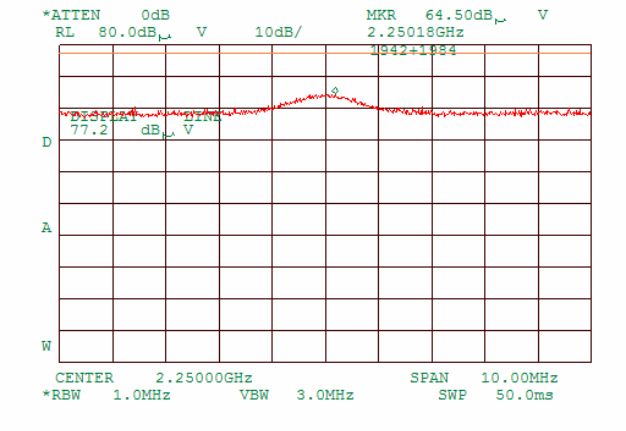
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Horizontal
TEST DISTANCE:	3 m



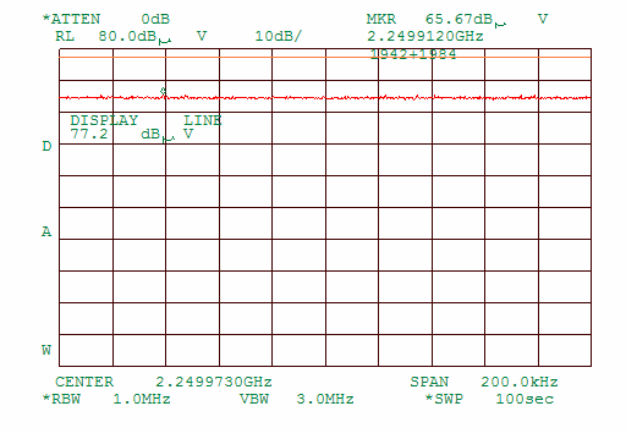
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.31 Radiated emission measurements at the 5th harmonic

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



Span: 10 MHz
Sweep time: 50 ms

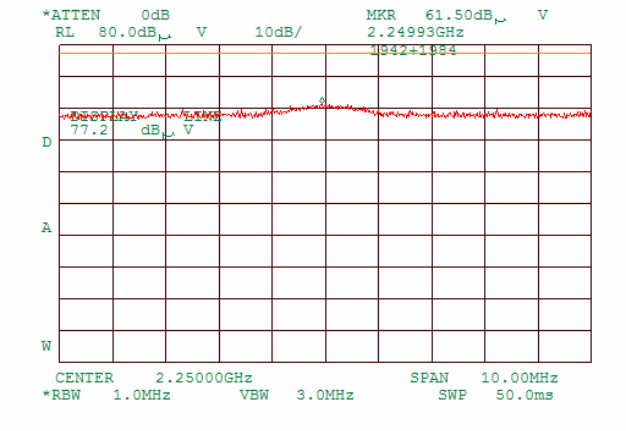


Span: 200 kHz
Sweep time: 100 s

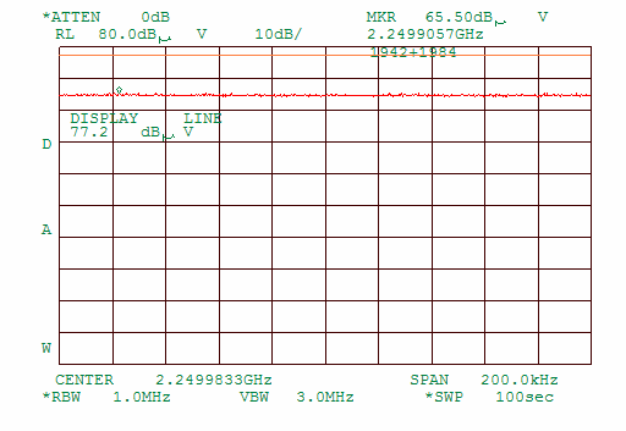
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.32 Radiated emission measurements at the 5th harmonic

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



Span: 10 MHz
Sweep time: 50 ms

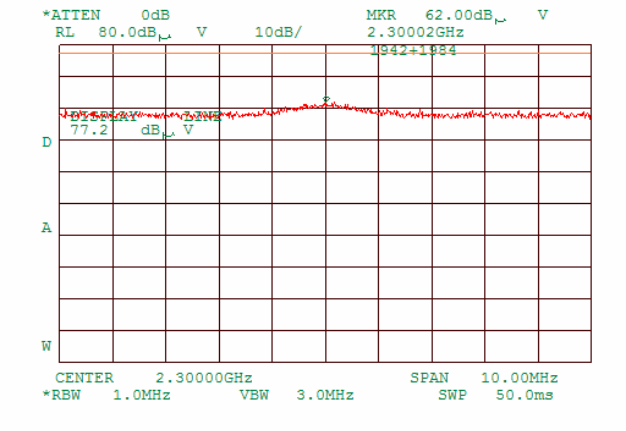


Span: 200 kHz
Sweep time: 100 s

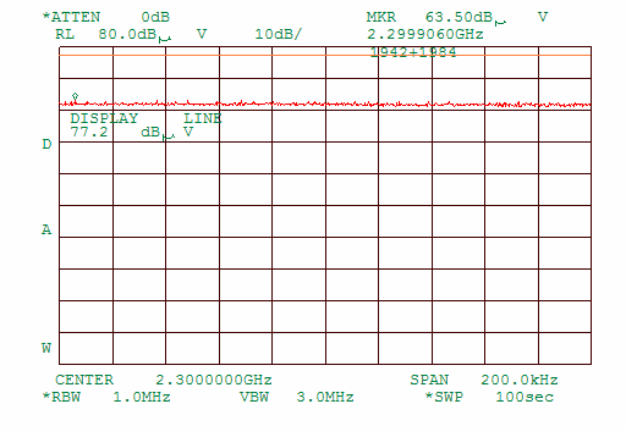
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.33 Radiated emission measurements at the 5th harmonic

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



Span: 10 MHz
Sweep time: 50 ms

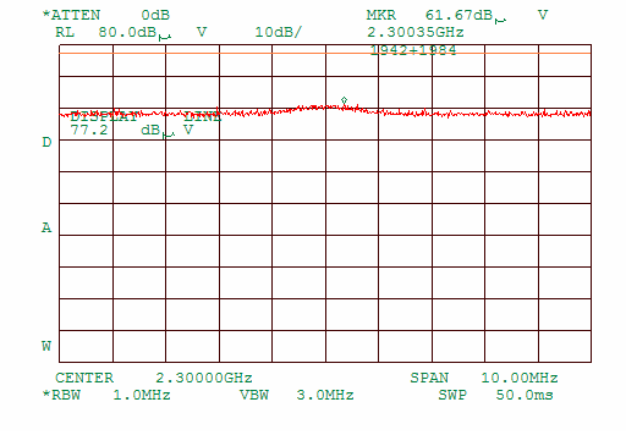


Span: 200 kHz
Sweep time: 100 s

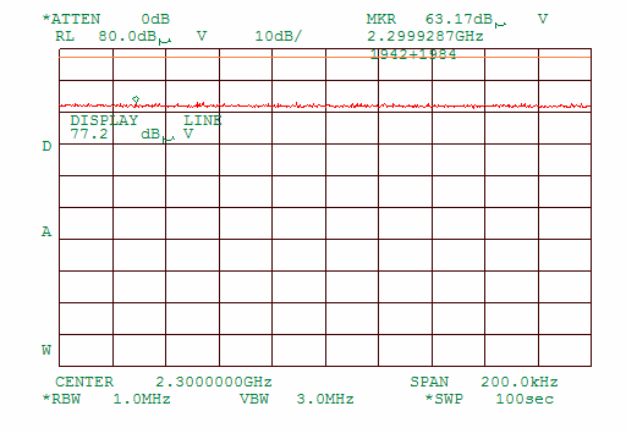
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.34 Radiated emission measurements at the 5th harmonic

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



Span: 10 MHz
Sweep time: 50 ms

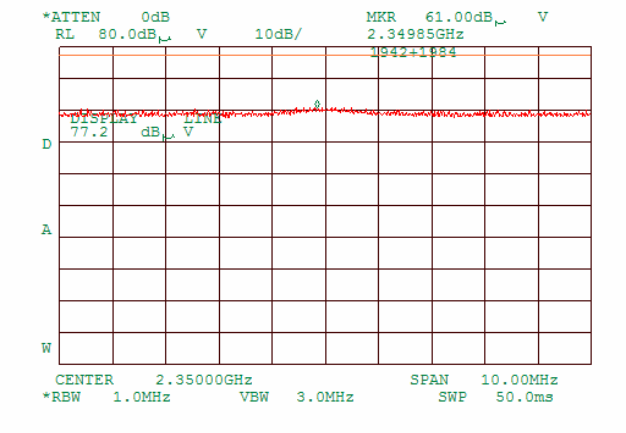


Span: 200 kHz
Sweep time: 100 s

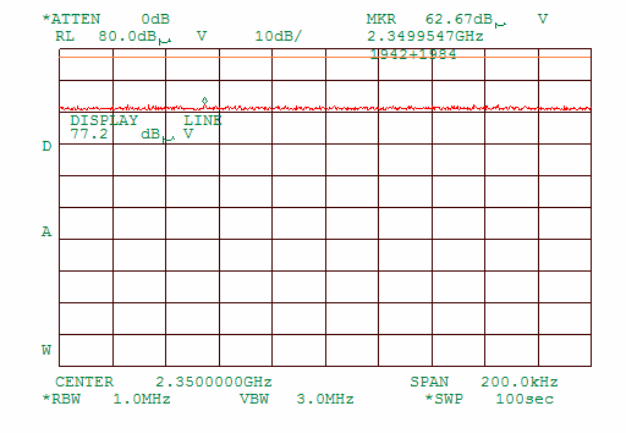
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.35 Radiated emission measurements at the 5th harmonic

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



Span: 10 MHz
Sweep time: 50 ms

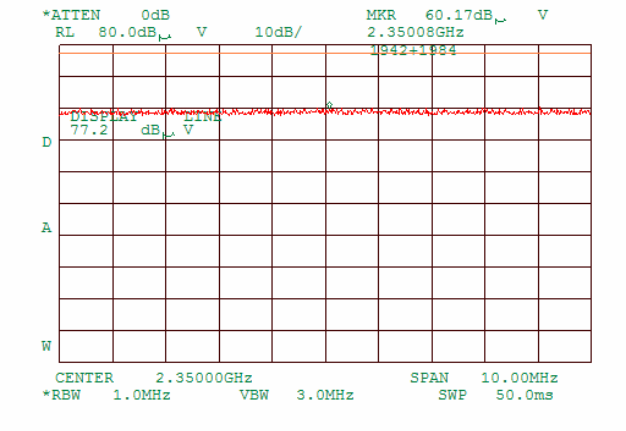


Span: 200 kHz
Sweep time: 100 s

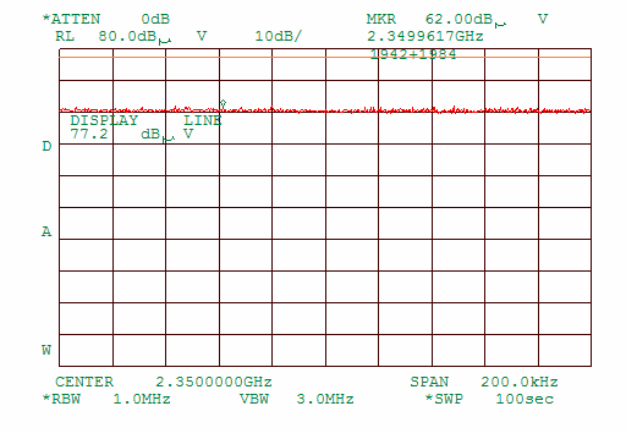
Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 7.7.36 Radiated emission measurements at the 5th harmonic

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



Span: 10 MHz
Sweep time: 50 ms

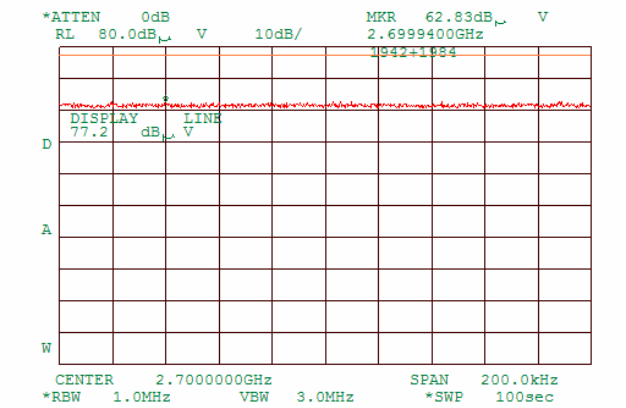


Span: 200 kHz
Sweep time: 100 s

Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

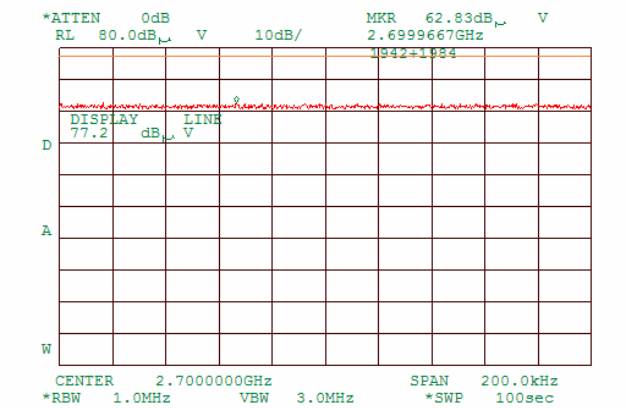
Plot 7.7.37 Radiated emission measurements at the 6th harmonic

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



Plot 7.7.38 Radiated emission measurements at the 6th harmonic

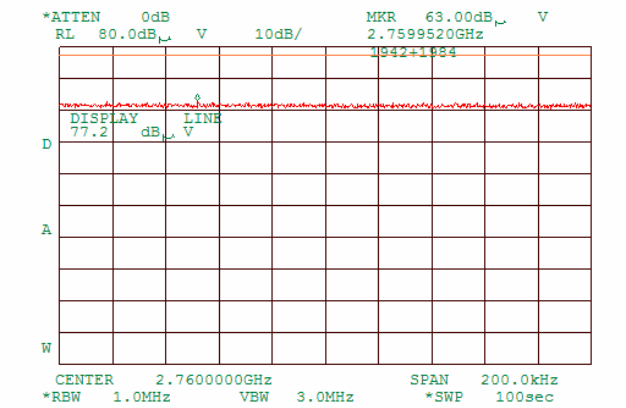
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

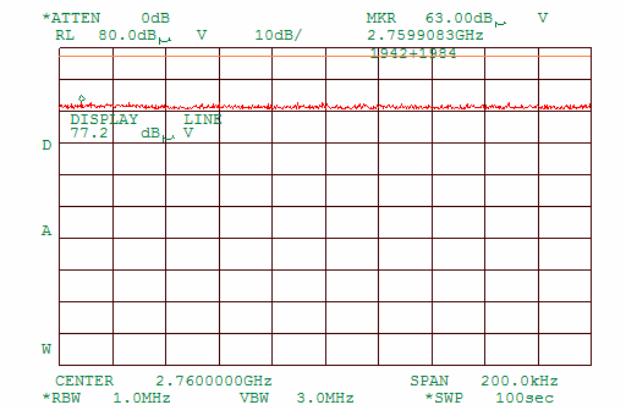
Plot 7.7.39 Radiated emission measurements at the 6th harmonic

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



Plot 7.7.40 Radiated emission measurements at the 6th harmonic

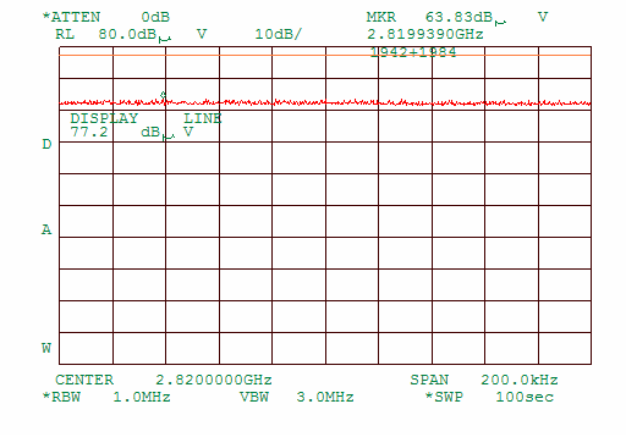
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.217, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.217; TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 8:36:21 AM		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

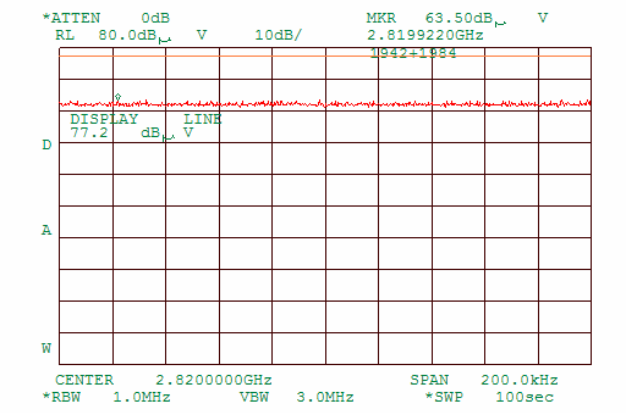
Plot 7.7.41 Radiated emission measurements at the 6th harmonic

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



Plot 7.7.42 Radiated emission measurements at the 6th harmonic

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



Test specification:	Section 15.107, Conducted emission at AC power ports, Class B		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/12/2004 6:51:45 PM		
Temperature: 24 ºC	Air Pressure: 1020 hPa	Relative Humidity: 40 %	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 ports.
Specification test limits are given in Table 8.1.1. The worst test results (the lowest margins) 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(µV)	
	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.

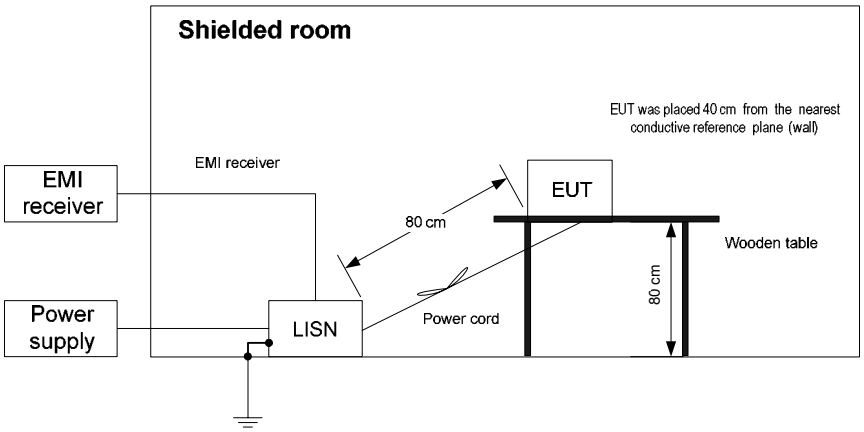
8.1.2 Test procedure

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

8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 8.1.2. 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, table-top EUT



Test specification:	Section 15.107, Conducted emission at AC power ports, Class B		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/12/2004 6:51:45 PM		
Temperature: 24 ºC	Air Pressure: 1020 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Table 8.1.2 Conducted emission test results

LINE: AC mains
EUT OPERATING MODE: Receive / Standby
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*		
AC power input of AC/DC adapter of EUT									
0.177202	48.08	43.95	64.67	-20.72	37.95	54.67	-16.72	L1	Pass
0.210778	44.40	41.30	63.24	-21.94	36.32	53.24	-16.92		
0.278532	42.83	41.73	60.92	-19.19	39.57	50.92	-11.35		
0.313113	43.31	42.42	59.90	-17.48	41.01	49.90	-8.89		
0.694642	35.28	33.56	56.00	-22.44	29.59	46.00	-16.41		
3.652584	38.14	36.04	56.00	-19.96	33.00	46.00	-13.00		
0.175175	47.28	45.44	64.77	-19.33	41.03	54.77	-13.74	L2	Pass
0.210530	44.61	41.23	63.25	-22.02	37.42	53.25	-15.83		
0.312434	42.46	41.35	59.92	-18.57	39.90	49.92	-10.02		
0.347675	40.20	39.51	59.08	-19.57	38.51	49.08	-10.57		
3.508069	35.54	34.37	56.00	-21.63	32.00	46.00	-14.00		
24.300238	30.28	27.53	60.00	-32.47	22.29	50.00	-27.71		
AC power input of PC									
0.173265	48.97	46.13	64.87	-18.74	41.20	54.87	-13.67	L1	Pass
0.207600	44.19	42.02	63.36	-21.34	37.32	53.36	-16.04		
0.278151	43.40	41.96	60.93	-18.97	40.03	50.93	-10.90		
0.313486	44.18	43.03	59.89	-16.86	41.57	49.89	-8.32		
0.726718	42.18	40.64	56.00	-15.36	36.59	46.00	-9.41		
5.571174	40.61	39.28	60.00	-20.72	35.38	50.00	-14.62		
0.173262	48.64	46.40	64.87	-18.47	41.11	54.87	-13.76	L2	Pass
0.207599	43.45	41.96	63.36	-21.40	37.21	53.36	-16.15		
0.278154	43.46	41.97	60.93	-18.96	39.98	50.93	-10.95		
0.313490	44.18	42.93	59.89	-16.96	41.49	49.89	-8.40		
0.726714	42.30	40.70	56.00	-15.30	36.67	46.00	-9.33		
5.571174	40.46	39.57	60.00	-20.43	35.43	50.00	-14.57		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

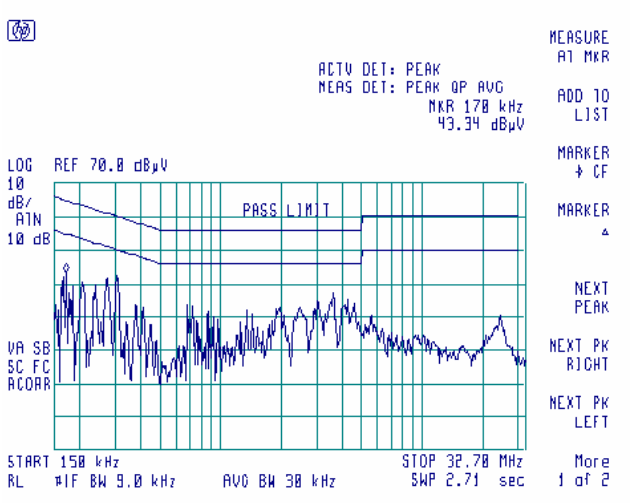
HL 0163	HL 0447	HL 0672	HL 0787	HL 1430	HL 1502	HL 1510	

Full description is given in Appendix A.

Test specification:	Section 15.107, Conducted emission at AC power ports, Class B		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/12/2004 6:51:45 PM		
Temperature: 24 ºC	Air Pressure: 1020 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

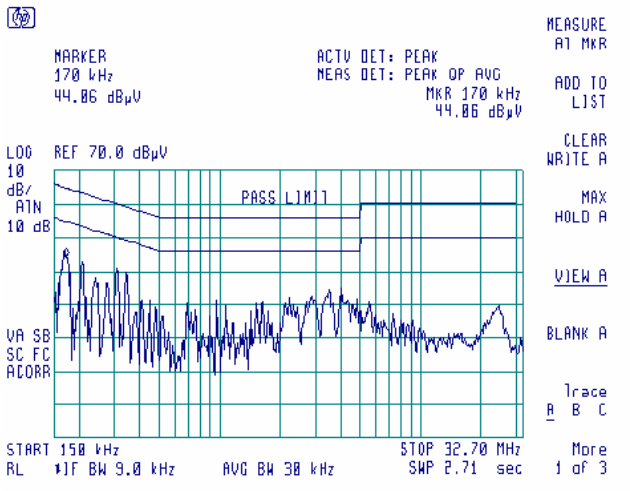
Plot 8.1.1 Conducted emission measurements, AC power input of AC/DC adapter of EUT

LINE: L1
EUT OPERATING MODE: Receive / Standby
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.2 Conducted emission measurements, AC power input of AC/DC adapter of EUT

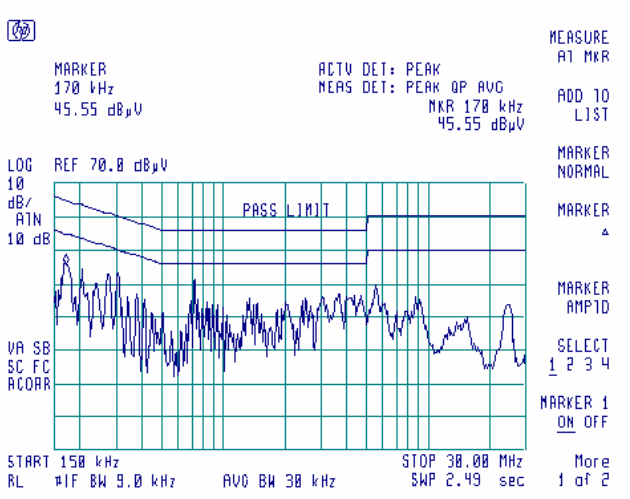
LINE: L2
EUT OPERATING MODE: Receive / Standby
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.107, Conducted emission at AC power ports, Class B		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/12/2004 6:51:45 PM		
Temperature: 24 °C	Air Pressure: 1020 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

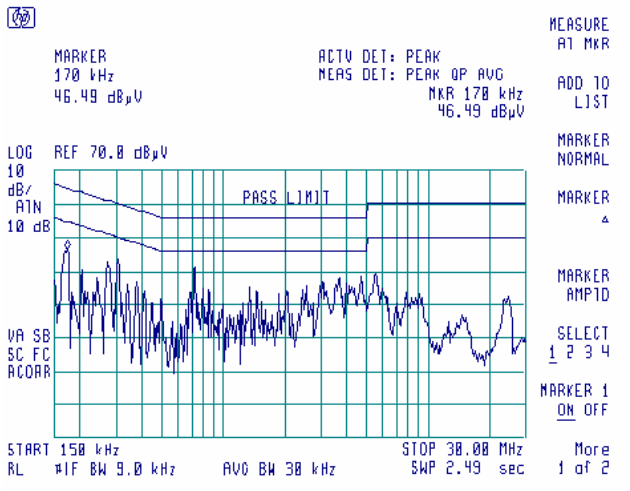
Plot 8.1.3 Conducted emission measurements, AC power input of PC

LINE: L1
EUT OPERATING MODE: Receive / Standby
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.1.4 Conducted emission measurements, AC power input of PC

LINE: L2
EUT OPERATING MODE: Receive / Standby
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 & Time:	12/15/2004 8:40:43 AM		
Temperature: 22 ºC	Air Pressure: 1012 hPa	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. 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: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

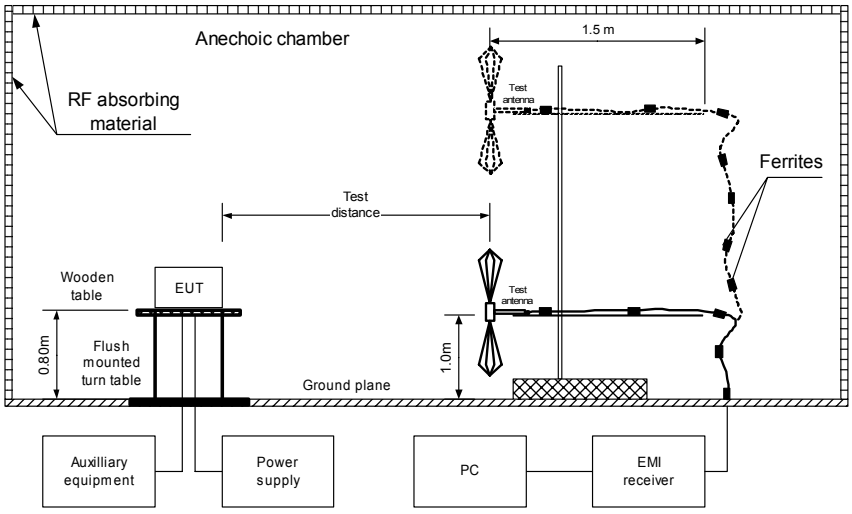
8.2.2 Test procedure

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

8.2.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

8.2.2.3 The worst test results (the lowest margins) were recorded in Table 8.2.2 and shown in the associated plots.

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 & Time:	12/15/2004 8:40:43 AM		
Temperature: 22 ºC	Air Pressure: 1012 hPa	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)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
68.156500	41.08	39.62	40.00	-0.38	Horizontal	1.8	89	Pass
72.113500	40.02	38.39	40.00	-1.61	Horizontal	2.0	267	
200.600000	38.82	35.86	43.50	-7.64	Horizontal	1.2	78	
334.300000	45.01	41.29	46.00	-4.71	Vertical	1.0	120	
467.850000	40.70	35.62	46.00	-10.38	Vertical	1.0	0	
601.435000	48.17	44.91	46.00	-1.09	Horizontal	1.2	162	
697.685000	41.70	37.40	46.00	-8.60	Vertical	1.1	189	
798.357377	47.06	44.19	46.00	-1.81	Horizontal	1.5	177	

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*				
1002.75000	53.68	38.43	54.00	-15.57	Horizontal	1.0	219	Pass
1169.00750	48.11	30.09	54.00	-23.91	Horizontal	1.1	187	
1273.87500	48.38	29.34	54.00	-24.66	Horizontal	1.0	233	
1395.58906	47.66	29.36	54.00	-24.64	Horizontal	1.1	206	
1671.50000	52.96	34.35	54.00	-19.65	Horizontal	1.0	199	
1742.00000	50.44	31.72	54.00	-22.28	Horizontal	1.1	204	

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

Reference numbers of test equipment used

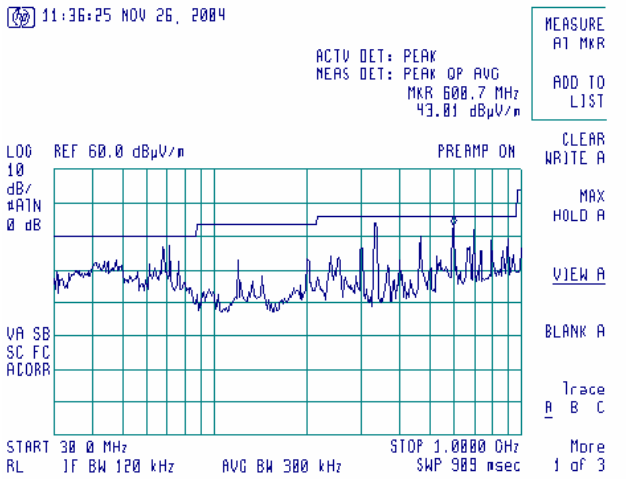
HL 0465	HL 0521	HL 0589	HL 0604	HL 1004	HL 1947	HL 1984	HL 2009

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 & Time:	12/15/2004 8:40:43 AM		
Temperature: 22 ºC	Air Pressure: 1012 hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

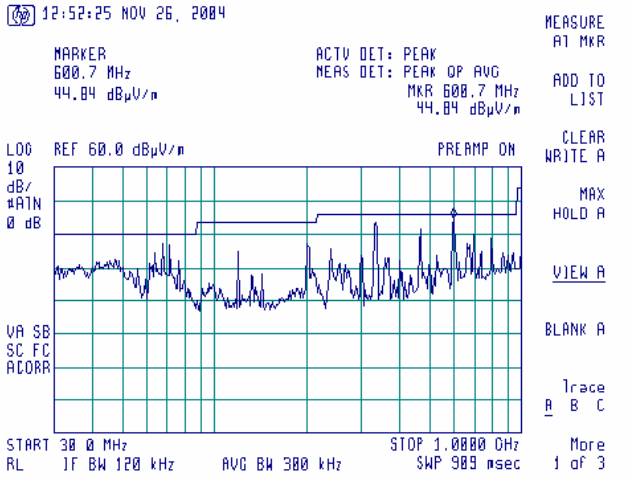
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: Low
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



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

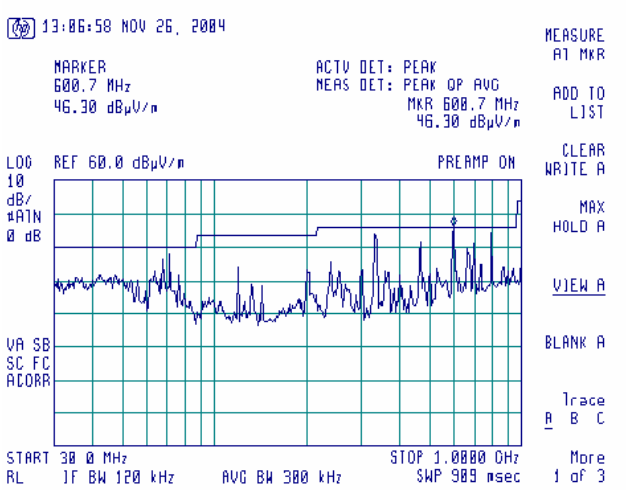
TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: Mid
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



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 & Time:	12/15/2004 8:40:43 AM		
Temperature: 22 ºC	Air Pressure: 1012 hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

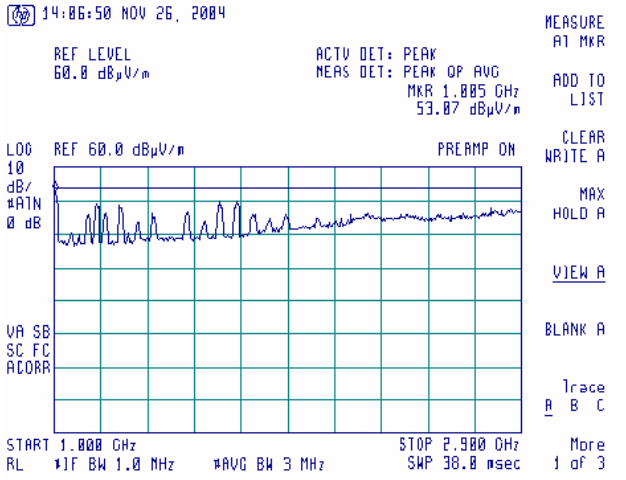
Plot 8.2.3 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: High
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



Plot 8.2.4 Radiated emission measurements in 1000 - 2900 MHz range, vertical and horizontal antenna polarization

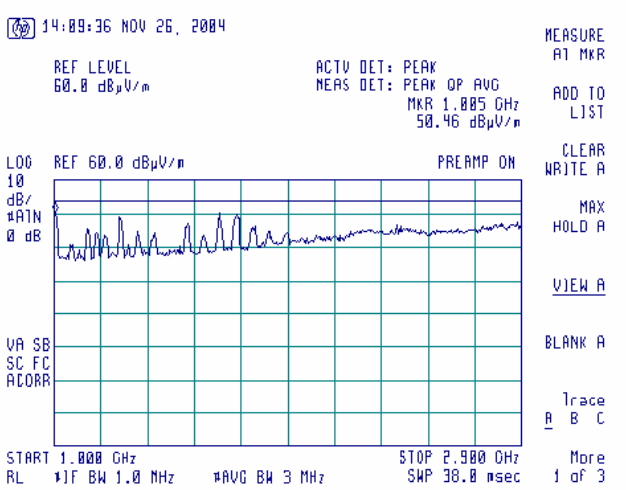
TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: Low
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



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 & Time:	12/15/2004 8:40:43 AM		
Temperature: 22 ºC	Air Pressure: 1012 hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

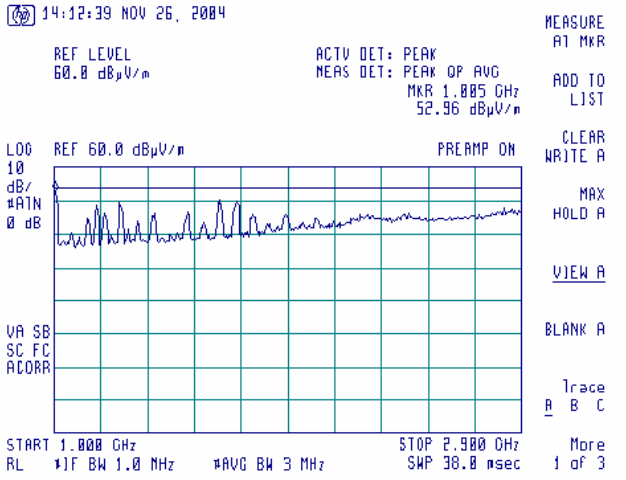
Plot 8.2.5 Radiated emission measurements in 1000 - 2900 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: Mid
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



Plot 8.2.6 Radiated emission measurements in 1000 - 2900 MHz range, vertical and horizontal antenna polarization

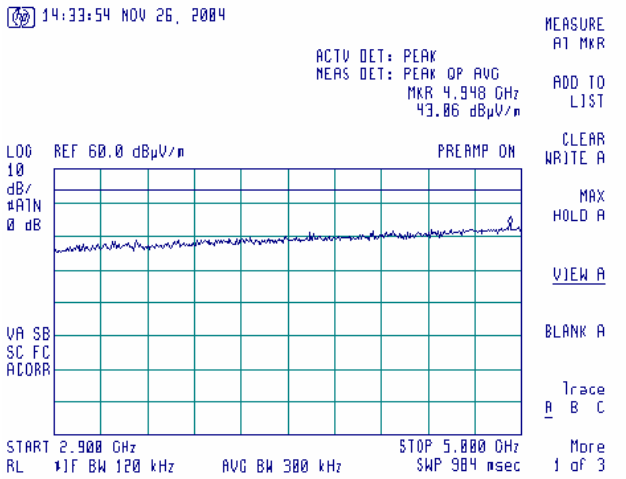
TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: High
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



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 & Time:	12/15/2004 8:40:43 AM		
Temperature: 22 ºC	Air Pressure: 1012 hPa	Relative Humidity: 42 %	Power Supply: 120 VAC
Remarks:			

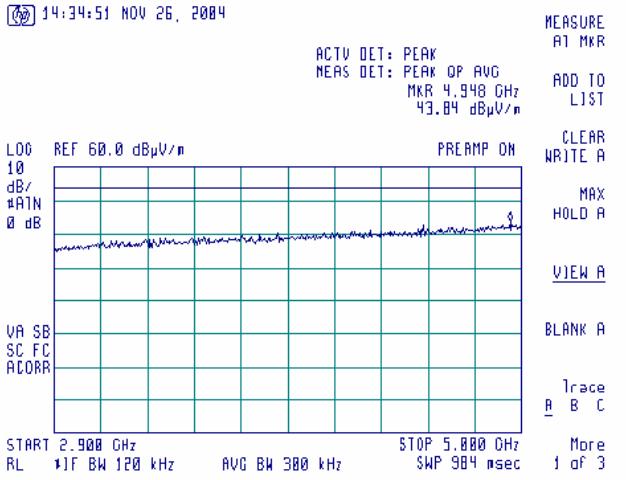
Plot 8.2.7 Radiated emission measurements in 2900 - 5000 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: Low
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



Plot 8.2.8 Radiated emission measurements in 2900 - 5000 MHz range, vertical and horizontal antenna polarization

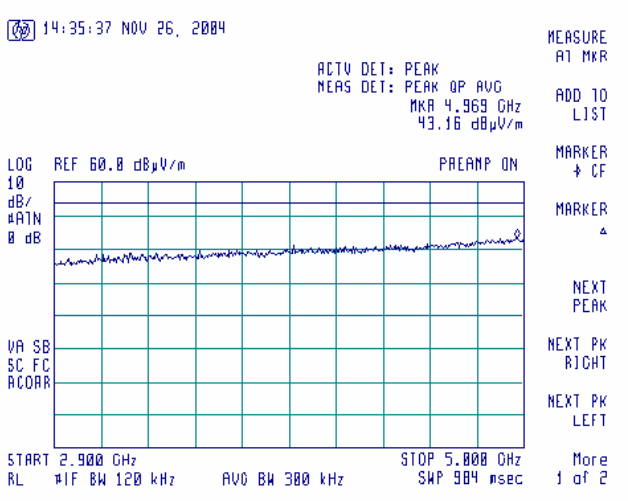
TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: Mid
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



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 & Time:	12/15/2004 8:40:43 AM		
Temperature: 22 ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 42 %	**Power Supply:** 120 VAC
Remarks:			

Plot 8.2.9 Radiated emission measurements in 2900 - 5000 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
RECEIVER FREQUENCY: High
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



Test specification:	Section 15.111, Conducted emission at receiver antenna port		
Test procedure:	ANSI C63.4, Section 12.1.5		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 9:42:42 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

8.3 Spurious emissions at RF antenna connector

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. Specification test limits are given in Table 8.3.1. The test results are provided in Table 8.3.2 and associated plots.

Table 8.3.1 Spurious emission limits

Frequency, MHz	EUT type	Power of spurious	
		nW	dBm
25 MHz – 5th harmonic*	Citizens band (CB) receiver	2.0	-57.0
30 MHz – 2nd harmonic**	Superheterodyne receiver		
30 MHz – 5th harmonic*	Other receiver operates within 30 – 960 MHz		

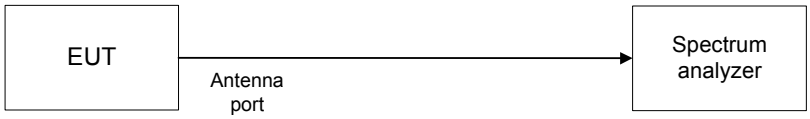
* - harmonic of the highest frequency the EUT generates, uses, operates or tunes to.
** - harmonic of the local oscillator frequency.

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



Test specification:	Section 15.111, Conducted emission at receiver antenna port		
Test procedure:	ANSI C63.4, Section 12.1.5		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 9:42:42 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Table 8.3.2 Spurious emission test results

INVESTIGATED FREQUENCY RANGE:	30 – 2500 MHz
RECEIVER TYPE:	Other than CB or superheterodyne
EUT OPERATING MODE:	Receive
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz

Frequency, MHz	Spurious emission, dBm	Limit, dBm	Margin, dB	Verdict
No spurious emissions were found.				Pass

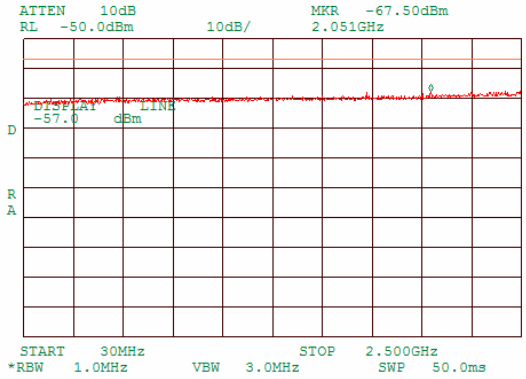
Reference numbers of test equipment used

HL 1424	HL 2399						

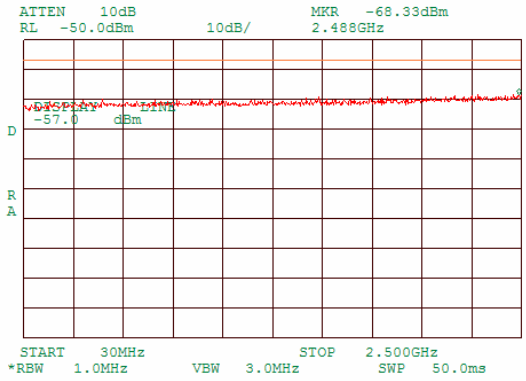
Full description is given in Appendix A.

Test specification:	Section 15.111, Conducted emission at receiver antenna port		
Test procedure:	ANSI C63.4, Section 12.1.5		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2004 9:42:42 AM		
Temperature: 23 ºC	Air Pressure: 1021 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

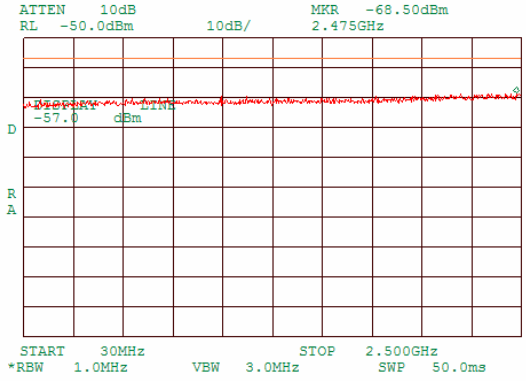
Plot 8.3.1 Spurious emission test results at low frequency



Plot 8.3.2 Spurious emission test results at mid frequency



Plot 8.3.3 Spurious emission test results at high frequency



9 APPENDIX A Test equipment and ancillaries used for tests

HL No.	Description	Manufacturer information			Due Calibr. Month/Year
		Name	Model No.	Serial No.	
0034	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1988	12-Jan-05
0163	LISN FCC/VDE/MIL-STD	Electro-Metrics	ANS 25/2	1314	01-Oct-05
0446	Antenna, Loop active, 10kHz-30MHz	EMCO	6502	2857	28-Jun-05
0447	LISN, 16/2, 300V RMS	HL	LISN 16 - 1	066	03-Nov-05
0465	Anechoic Chamber 9(L) x 6,5(W) x 5,5(H) m	HL	AC - 1	023	10-Oct-05
0493	Oven temperature -45…175 deg C	Thermotron	S-1.2 Mini-Max	14016	23-Sep-05
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-2.9 GHz	Hewlett Packard	8546A	3617A00319, 3448A00253	26-Sep-05
0557	Generator Signal, 9 KHz - 1.2 GHz	Marconi Instruments	2023 (Option 4)	112225/080	27-Jan-05
0589	Cable Coaxial, GORE A2P01POL118, 2.3 m	HL	GORE-3	176	02-Dec-05
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz	EMCO	3141	9611-1011	10-Jan-05
0670	Oscilloscope, Digital storage 500 MHz, with Telecom Mask Tester	LeCroy Corporation	LC 334A	lc33402387	16-Aug-05
0672	Shielded Room 4,6(L) x 4,2(W) x 2,4(H) m	HL	SR - 3	027	11-Nov-05
0787	Transient Limiter	Hewlett Packard	11947A	3107A01877	21-Nov-05
0788	Power splitter/combiner 5-500 MHz	Mini-Circuits	ZFSC-2-1	923705	01-Jul-05
0808	Analyzer Spectrum 100Hz to 2.2GHz	Anritsu	MS2601B	M178731	26-Mar-05
0813	Cable Coax, RG-214, 12 m, N-type connectors	HL	C214-12	149	02-Dec-05
1004	Cable Coaxial , ANDREW PSWJ4, 6m	HL	ANDREW-6	163	02-Dec-05
1204	One phase Voltage regulator, 2kVA, 0-250V	HL	TDGC-2	99	04-Jun-05
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies (HP)	8564EC	3946A00219	30-Aug-05
1430	EMI Receiver, 9 kHz - 2.9 GHz	Agilent Technologies (HP)	8542E	3807A00262, 3705A00217	01-Sep-05
1502	Cable RF, 6 m	Belden	M17/167 MIL-C-17	1502	02-Dec-05
1510	Cable RF, 8 m	Belden	M17/167 MIL-C-17	1510	02-Dec-05
1552	Cable RF, 8 m	Alpha Wire	RG-214	1552	02-Dec-05
1907	Power Splitter/Combiner, 5-500 MHz	Mini-Circuits	ZFSC-2-1	1907	01-Jul-05
1942	Cable 18GHz, 4 m, blue	Rhophase Microwave Limited	SPS-1803A-4000-NPS	T4658	17-Oct-05
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	17-Oct-05
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W, N-type	EMC Test Systems	3115	9911-5964	22-Mar-05
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	02-Dec-05
2014	Attenuator, Manual Step, 0-99/1 dB, 0-4 GHz, 2 W	Weinschel	AC9004-99-11	16924	08-Dec-05
2399	Cable 40GHz, 1.5 m, blue	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2945	24-Jun-05
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	02-Jul-05
2400	Cable 40GHz, 1.5 m, green	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2946	24-Jun-05
2524	Attenuator, 10 dB, DC-18 GHz	Midwest Microwave	263-10	2524	01-Mar-05

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	±8%
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency error	30 – 300 MHz: ± 50.5 Hz (1.68 ppm) 300 – 1000 MHz: ± 168 Hz (0.56 ppm)
Transient frequency behaviour	187 Hz ± 13.9 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Unintentional radiator tests	
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

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).

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

Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

47CFR part 90: 2003	Private land mobile radio services
47CFR part 1: 2003	Practice and procedure
47CFR part 2: 2002	Frequency allocations and radio treaty matters; general rules and regulations
47CFR part 15: 2004	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: 2001	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
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
OATS	open area test site
Ω	Ohm
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

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

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

Log periodic antenna factor

Electro-Metrics, model LPA-25/30, serial number 1988

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
200	12.6	625	20.4
225	12.2	650	20.9
250	13.4	675	22.0
275	14.3	700	22.2
300	15.2	725	22.7
325	15.7	750	22.5
350	15.9	775	22.7
375	16.4	800	22.8
400	17.0	825	23.2
425	17.4	850	23.5
450	17.9	875	23.9
475	18.6	900	24.0
500	19.1	925	24.0
525	19.3	950	24.2
550	19.6	975	24.7
575	19.8	1000	25.1
600	20.0		

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

Antenna factor

Biconilog antenna EMCO, model 3141, serial number 1011

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

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

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

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

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

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(μV) to convert it into field intensity in dB(μV/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		
18	3300	3.47		
19	3600	3.62		
20	3900	3.84		
21	4200	3.92		±0.17
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, 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 18 GHz, 6.5 m, blue, model NPS-1803A-6500-NPS, serial number T4974, HL 1947
Calibration data

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		

Calibration data
RF cable 8 m, model RG-214, serial number 1552, HL 1552

No.	Parameter	Set, MHz	Measured, dB	Deviation, dB	Tolerance (Specification), dB	Meas. Uncert., dB
1	Insertion Loss	20	0.27	-	NA	±0.12
2		30	0.31	-		
3		50	0.40	-		
4		80	0.49	-		
5		100	0.55	-		
6		200	0.80	-		
7		300	0.99	-		
8		400	1.17	-		
9		500	1.32	-		
10		600	1.45	-		
11		700	1.60	-		
12		800	1.72	-		
13		900	1.84	-		
14		1000	2.00	-		
15		1200	2.19	-		
16		1400	2.40	-		
17		1500	2.51	-		
18		1600	2.61	-		
19		1800	2.82	-		
20		2000	3.00	-		

Calibration data
RF cable 12 m, RG-214, model C214-12, serial number 149, HL 813

No.	Parameter	Set, MHz	Measured, dB	Deviation, dB	Tolerance (Specification), dB	Meas. Uncert., dB
1	Insertion Loss	20	0.43	-	NA	±0.12
2		30	0.53	-		
3		50	0.71	-		
4		80	0.92	-		
5		100	1.04	-		
6		200	1.51	-		
7		300	1.90	-		
8		400	2.26	-		
9		500	2.54	-		
10		600	2.83	-		
11		700	3.12	-		
12		800	3.37	-		
13		900	3.61	-		
14		1000	3.85	-		
15		1200	4.31	-		
16		1400	4.74	-		
17		1500	4.92	-		
18		1600	5.17	-		
19		1800	5.58	-		
20		2000	5.95	-		

Cable RF, 6m, model: M17/167 MIL-C-17, s/n 1502 (HL 1502)
Calibration data

No.	Parameter	Set, MHz	Measured, dB	Deviation	Tolerance (specification), dB	Measured uncertainty dB
1	Attenuation	0.1	0.02	NA	NA	±0.12
2		1	0.07			
3		3	0.15			
4		5	0.17			
5		10	0.26			
6		30	0.43			
7		50	0.57			
8		80	0.72			
9		100	0.81			
10		300	1.48			
11		500	2.00			
12		800	2.70			
13		1000	3.09			

Cable RF, 8m, model: M17/167 MIL-C-17, s/n 1510 (HL 1510)
Calibration data

No.	Parameter	Set, MHz	Measured, dB	Deviation	Tolerance (specification), dB	Measured uncertainty dB
1	Attenuation	0.1	0.05	NA	NA	±0.12
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			

Cable RF 40 GHz, 1.5m, blue, model: KPS-1503A-1500-KPS, s/n X2945 (HL 2399)
Insertion loss

Frequency, GHz	Insertion Loss, dB
0.03	0.26
0.05	0.25
0.1	0.34
0.2	0.47
0.3	0.56
0.5	0.71
0.7	0.83
0.9	0.93
1.1	1.01
1.3	1.08
1.5	1.16
1.7	1.22
1.9	1.29
2.1	1.33
2.3	1.38
2.5	1.45
2.7	1.50
2.9	1.55
3.1	1.60
3.3	1.66
3.5	1.71
3.7	1.75
3.9	1.79
4.1	1.84
4.3	1.87
4.5	1.91
4.7	1.95
4.9	1.98
5.1	2.02
5.3	2.04
5.5	2.07
5.7	2.11
5.9	2.12
6.1	2.16
6.3	2.20
6.5	2.23
6.7	2.23
6.9	2.27
7.1	2.32
7.3	2.32
7.5	2.34
7.7	2.38
7.9	2.39
8.1	2.39
8.3	2.43
8.5	2.51
8.7	2.48
8.9	2.51
9.1	2.54
9.3	2.53
9.5	2.56
9.7	2.54
9.9	2.57

Cable 40 GHz, 1.5 m, green; model KPS-1503A-1500-KPS, serial number X2946 (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