

## TEST REPORT

ACCORDING TO: FCC CFR 47 Part 15 subpart C, section 15.245 and  
subpart B; RSS-210 issue 7 Annex 7 and ICES-003:2004

FOR:

**CROW Electronic Engineering Ltd.**  
**Outdoor PIR & MW detector (10.525 GHz),**  
**model EDS-2000, part number 0018206**

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



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## 1 Applicant information

**Client name:** CROW Electronic Engineering Ltd.  
**Address:** 12 Kineret Street, P.O.Box 293, Ben Gurion Airport, Airport City, 70100, Israel  
**Telephone:** +972 3972 6000  
**Fax:** +972 3972 6001  
**E-mail:** shukis@crow.co.il  
**Contact name:** Mr. Shuki Segal

## 2 Equipment under test attributes

**Product definition:** Outdoor PIR & MW detector (10.525 GHz)  
**Model:** EDS-2000  
**Part number:** 0018206  
**Receipt date:** 1/4/2007

## 3 Manufacturer information

**Manufacturer name:** CROW Electronic Engineering Ltd.  
**Address:** 12 Kineret Street, P.O.Box 293, Ben Gurion Airport, Airport City, 70100, Israel  
**Telephone:** +972 3972 6000  
**Fax:** +972 3972 6001  
**E-Mail:** shukis@crow.co.il  
**Contact name:** Mr. Shuki Segal

## 4 Test details




**Project ID:** 17641  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 1/4/2007  
**Test completed:** 1/16/2007  
**Test specification(s):** FCC Part 15, subpart C, §15.245; RSS-210 Issue 7:2007, Annex 7

## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
FCC Part 15, Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions	Pass
FCC Part 15, Section 15.245(b)(3)/ RSS-210, Annex 7, Band edge emissions	Pass
FCC Part 15, Section 15.207(a)/ RSS-Gen, Section 7.2.2, Conducted emission	Pass
FCC Part 15, Section 15.203/ RSS-Gen, Section 7.1.4, Antenna requirement	Pass
<b>Unintentional emissions</b>	
FCC Section 15.107/ICES-003, Conducted emission at AC power port	Pass
FCC Section 15.109/ RSS-Gen, Section 7.2.3.2/ICES-003, Radiated emission	Pass
FCC Section 15.111/ RSS-Gen, Section 6(b), Section 7.2.3.1, Conducted emission at receiver antenna port	Not required

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.

**This test report replaces the previously issued test report identified by Doc ID:CRORAD\_FCC.17641\_1.**

	Name and Title	Date	Signature
<b>Tested by:</b>	Mr. A. Lane, test engineer	February 8, 2007	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	January 18, 2009	
<b>Approved by:</b>	Mr. M. Nikishin, EMC and radio group leader	January 19, 2009	

## 6 EUT description

### 6.1 General information

The EUT is an outdoor PIR & MW detector operating at 10.525 GHz. The EUT is powered from 12 VDC supplied by a control panel. The unit has a 5 VDC voltage regulator on DC power.

### 6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length	Indoor / outdoor
		From	To					
Power In	-12 VDC (GND)	EUT	Control Panel	Terminal Block	1	Unshielded	10 m	Indoor
Power In	+12 VDC	EUT	Control Panel	Terminal Block	1	Unshielded	10 m	Indoor
Signal Out	NC	EUT	Control Panel	Terminal Block	1	Unshielded	10 m	Indoor
Signal Out	C	EUT	Control Panel	Terminal Block	1	Unshielded	10 m	Indoor
Signal Out	Tamper	EUT	Open circuit	Terminal Block	2	Unshielded	10 m	Indoor
Signal Out	EOL	EUT	Open circuit	Terminal Block	1	Unshielded	10 m	Indoor
Signal Out	NO	EUT	Open circuit	Terminal Block	1	Unshielded	10 m	Indoor

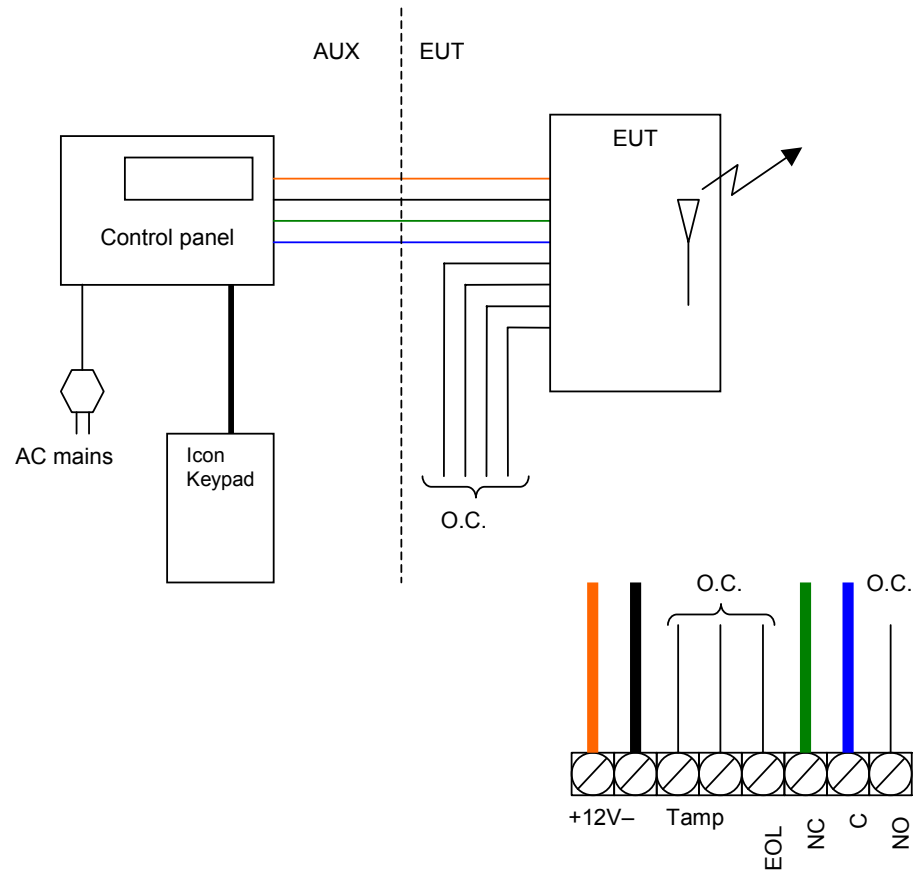
### 6.3 Auxiliary equipment

Description	Manufacturer	Model number	Serial number
Control Panel	CROW	RUNNER 8 COMPACT	01003163
ICON Keypad	CROW	CR-16 RUNNER	3706

### 6.4 Operating frequencies

Source	Frequency, MHz
Tx/Rx	10525

## 6.5 Test configuration



## 6.6 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		10500 - 10550 MHz	
Operating frequency		10525 MHz	
Maximum rated output power		At transmitter 50 $\Omega$ RF output connector	dBm
		Effective radiated power (for equipment with no RF connector)	5.9 dBm
Is transmitter output power variable?		X	No
			Yes
			continuous variable
			stepped variable with stepsize
		minimum RF power	dBm
		maximum RF power	dBm
Antenna connection			
	unique coupling	standard connector	X integral
			X with temporary RF connector
			without temporary RF connector
Transmitter duty cycle supplied for test		100%	
Transmitter power source			
X	DC	Nominal rated voltage	12 VDC

## 6.7 Changes made in EUT

No changes were made in the EUT.

<b>Test specification:</b>	<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/14/2007 10:48:03 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

## 7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 requirements

### 7.1 Field strength of emissions

#### 7.1.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.1.1 and Table 7.1.2.

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
10500 – 10550	148.0	128.0

Table 7.1.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m)*				
	Within restricted bands			Harmonics outside restricted bands	
	Peak	Quasi Peak	Average	Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	108.0	88.0
0.090 – 0.110	NA	108.5 – 106.8**	NA		
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**		
0.490 – 1.705	NA	73.8 – 63.0**	NA		
1.705 – 30.0*		69.5			
30 – 88		40.0			
88 – 216		43.5			
216 – 960		46.0			
960 – 1000		54.0			
1000 – 17700	74.0	NA	54.0		
Above 17700	108.0 (sensors within building) 97.5 (all other sensors)	NA	88.0 (sensors within building) 77.5 (all other sensors)		

\*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log(S_1/S_2),$$

where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

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

Note: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.



<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

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

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and the performance check was conducted.

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

7.1.2.3 The worst test results (the lowest margins) were recorded in Table 7.1.3, Table 7.1.5 and shown in the associated plots.

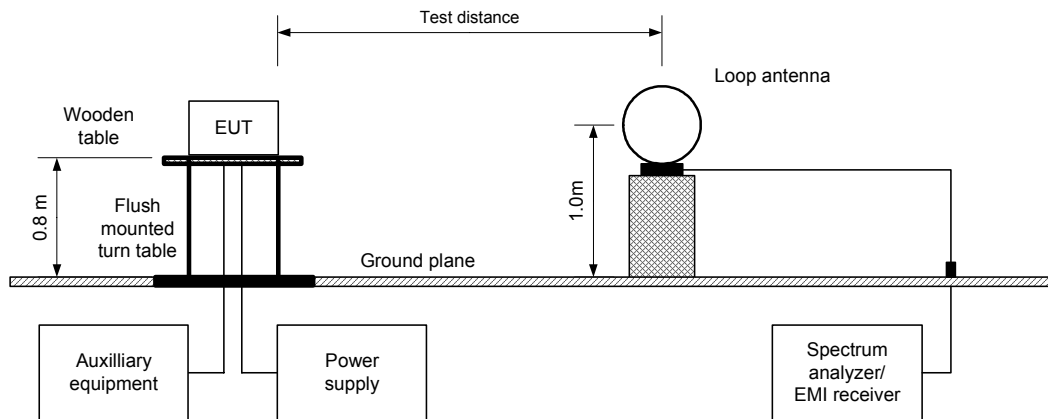
**7.1.3 Test procedure for spurious emission field strength measurements above 30 MHz**

7.1.3.1 The EUT was set up as shown in Figure 7.1.2, energized and the performance check was conducted.

7.1.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.1.3.3 The worst test results (the lowest margins) were recorded in Table 7.1.3, Table 7.1.5 and shown in the associated plots.

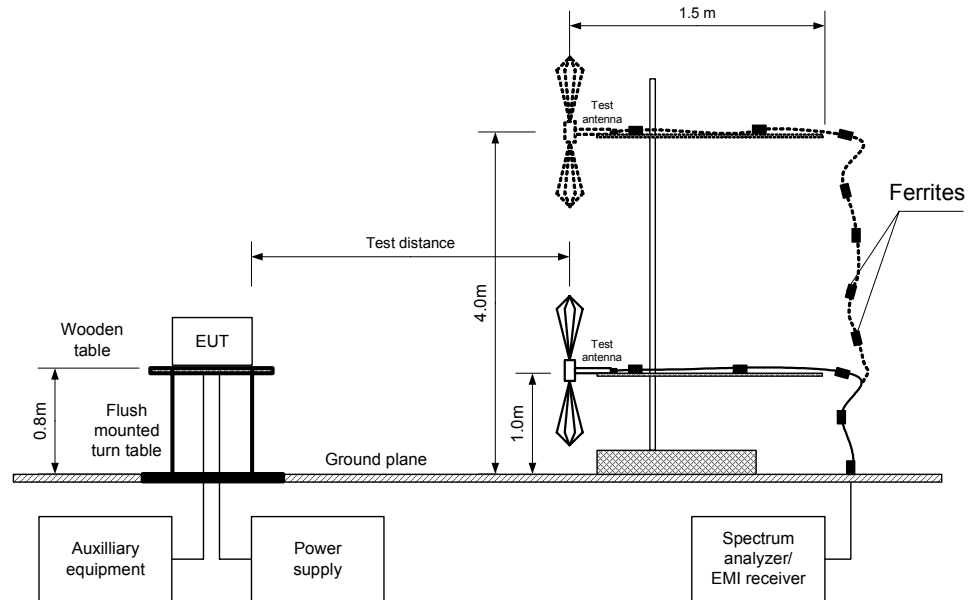
**Figure 7.1.1 Setup for spurious emission field strength measurements below 30 MHz**





<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>		Compliance	
<b>Date &amp; Time:</b>		1/14/2007 10:48:03 PM	
<b>Temperature:</b> 21°C		<b>Air Pressure:</b> 1010 hPa	
<b>Relative Humidity:</b> 48%		<b>Power Supply:</b> 12 VDC	
<b>Remarks:</b>			

Figure 7.1.2 Setup for spurious emission field strength measurements above 30 MHz





<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>		Compliance	
<b>Date &amp; Time:</b>		1/14/2007 10:48:03 PM	
<b>Temperature:</b> 21°C		<b>Air Pressure:</b> 1010 hPa	
<b>Remarks:</b>		<b>Relative Humidity:</b> 48%	
		<b>Power Supply:</b> 12 VDC	
<b>Verdict: PASS</b>			

**Table 7.1.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz**

TEST DISTANCE: 3 m  
 EUT POSITION: Typical (Vertical)  
 MODULATION: OOK  
 MODULATING SIGNAL: ID code  
 BIT RATE: NA  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 INVESTIGATED FREQUENCY RANGE: 0.009 - 100000MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1 kHz (9 kHz – 150 kHz)  
 9.0 kHz (150 kHz – 30 MHz)  
 120 kHz (30 MHz – 1000 MHz)  
 1.0 MHz (above 1000 MHz)  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)

Frequency GHz	Antenna		Azimuth, degrees*	Peak field strength			Avr factor, dB	Average field strength			Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
<b>Fundamental emission</b>											
10.52395	H	1.6	10	111.10	148.00	-36.90	-32.67	78.43	128.00	-49.57	Pass
<b>Spurious emissions</b>											
21.048	H	1.2	230	63.23	97.50	-34.27	-32.67	30.56	77.50	-46.94	Pass
31.572	H	1.2	220	69.33	97.50	-28.17	-32.67	36.66	77.50	-40.84	Pass

\*- EUT front panel refers to 0 degrees position of turntable.  
 \*\*- Margin = dB below (negative if above) specification limit.

**Table 7.1.4 Average factor calculation**

Transmission pulse		Number of RF pulses within 100 ms	Transmission duration within 100 ms, ms	Average factor, dB
Duration, ms	Period, ms			
0.155	7.075	15	2.325	-32.67

\*- Average factor was calculated as follows:

$$Average\ factor = 20 \times \log_{10} \left( \frac{Pulse\ duration \times Number\ of\ pulses\ within\ 100\ ms}{100\ ms} \right) = 20 \times \log_{10} \left( \frac{2.325}{100} \right) = -32.67 [dB]$$



<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Table 7.1.5 Field strength of emissions below 1 GHz within restricted bands**

TEST DISTANCE: 3 m  
 EUT POSITION: Typical (Vertical)  
 MODULATION: OOK  
 MODULATING SIGNAL: ID code  
 BIT RATE: NA  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)  
 9.0 kHz (150 kHz – 30 MHz)  
 120 kHz (30 MHz – 1000 MHz)  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)

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*				
No spurious were found								Pass

\*- Margin = Measured emission - specification limit.

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

**Table 7.1.6 Restricted bands**

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

**Reference numbers of test equipment used**

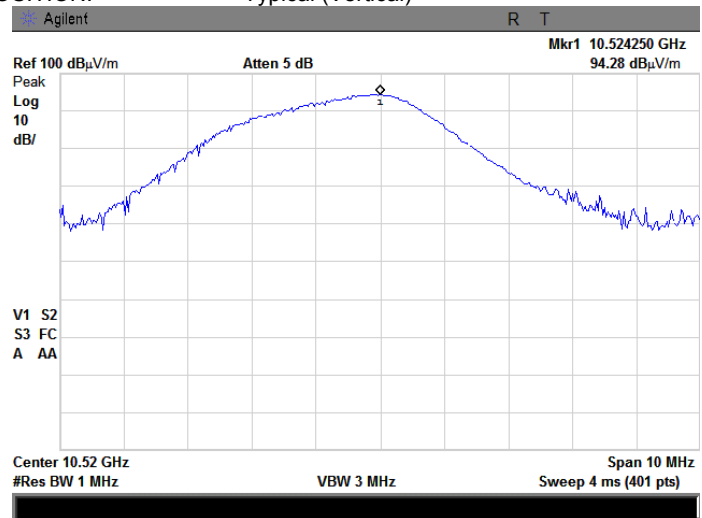
HL 0446	HL 0521	HL 0768	HL 0769	HL 0770	HL 1424	HL 1826	HL 1849
HL 1850	HL 1947	HL 1984	HL 2009	HL 2254	HL 2399	HL 2697	

Full description is given in Appendix A.

<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

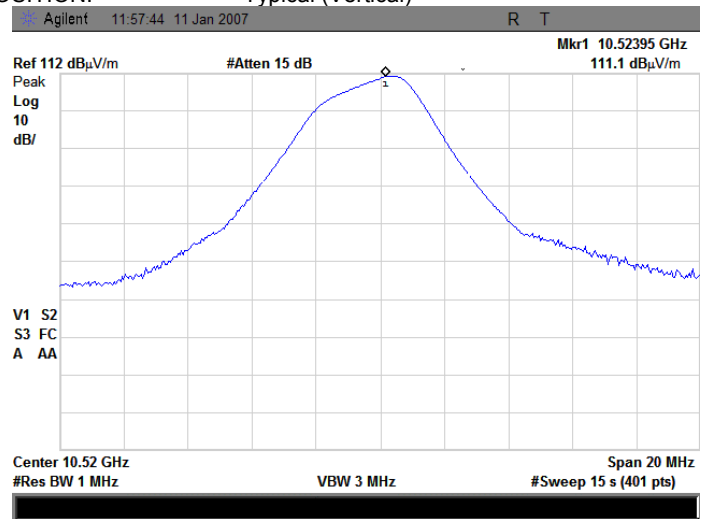
**Plot 7.1.1 Radiated emission measurements at the fundamental frequency**

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Typical (Vertical)



**Plot 7.1.2 Radiated emission measurements at the fundamental frequency**

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: Typical (Vertical)



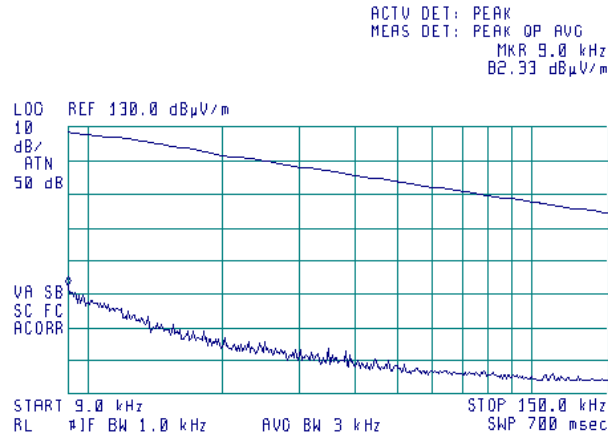


<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.1.3 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Typical (Vertical)

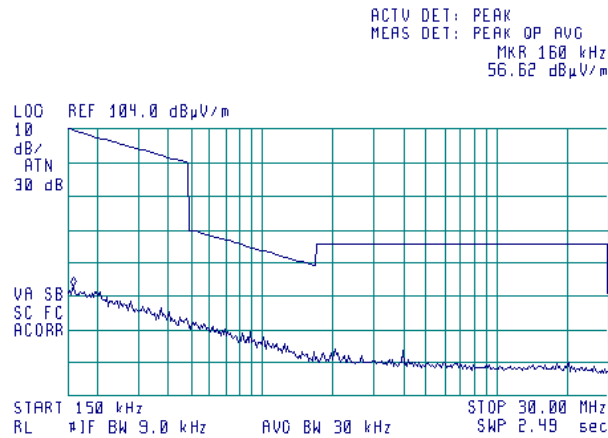
10:59:20 12 JAN 2007



Plot 7.1.4 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE: Anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: Typical (Vertical)

10:56:55 12 JAN 2007



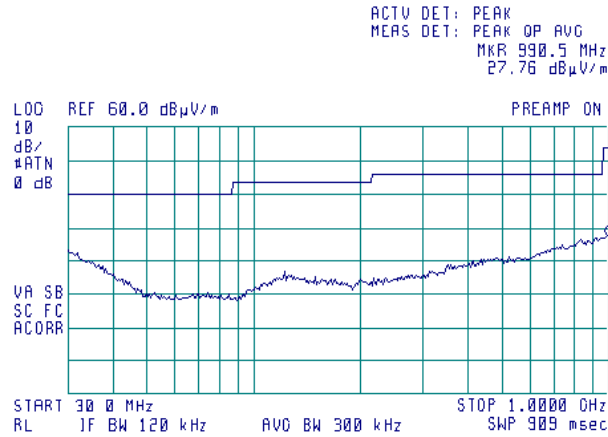


<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.1.5 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: Anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)

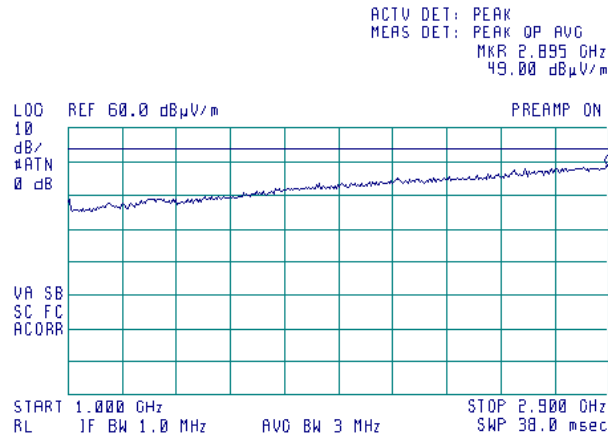
09:59:43 12 JAN 2007



Plot 7.1.6 Radiated emission measurements from 1000 to 2900 MHz

TEST SITE: Anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)

10:02:45 12 JAN 2007

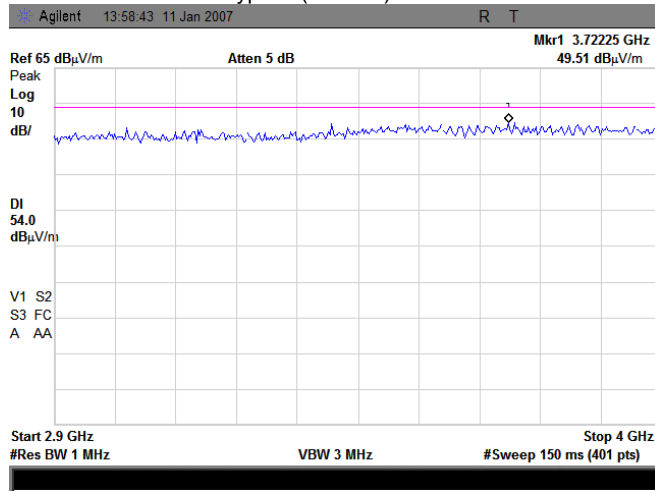




<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	1/14/2007 10:48:03 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.1.7 Radiated emission measurements from 2.9 to 4.0 MHz

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)

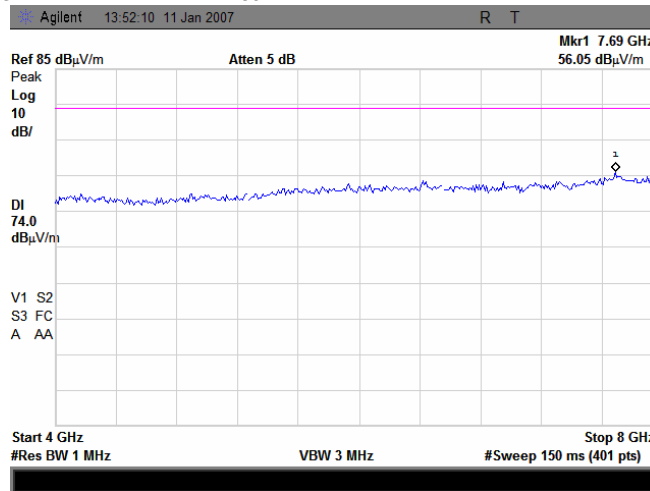




<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

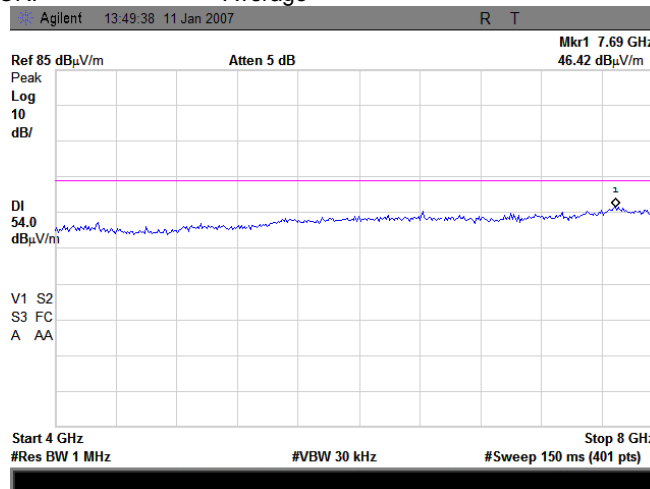
Plot 7.1.8 Radiated emission measurements from 4.0 to 8.0 GHz

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Typical (Vertical)  
DETECTOR: Peak



Plot 7.1.9 Radiated emission measurements from 4.0 to 8.0 GHz

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Typical (Vertical)  
DETECTOR: Average

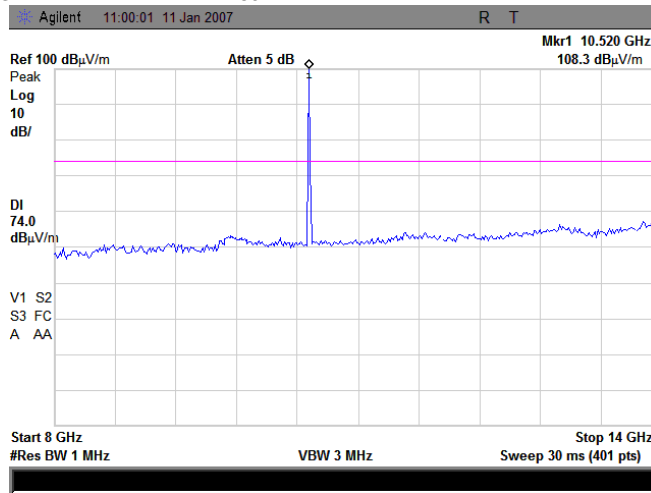




<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

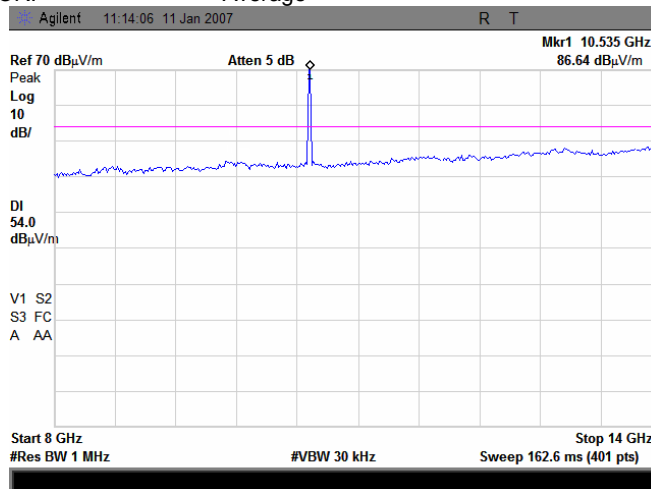
Plot 7.1.10 Radiated emission measurements from 8.0 to 14.0 GHz

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Peak



Plot 7.1.11 Radiated emission measurements from 8.0 to 14.0 GHz

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Average

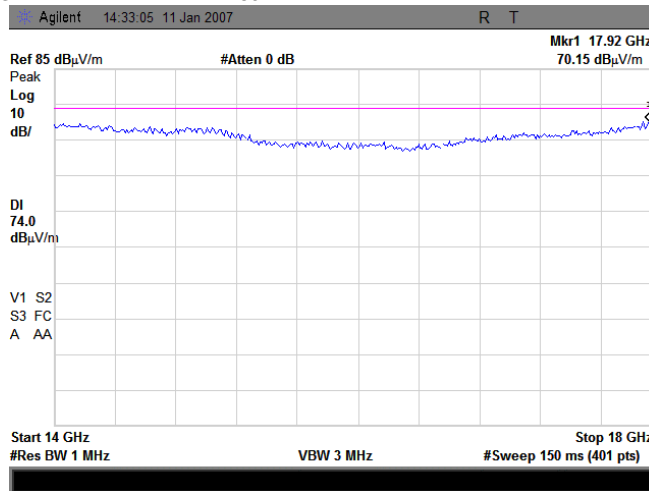




<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

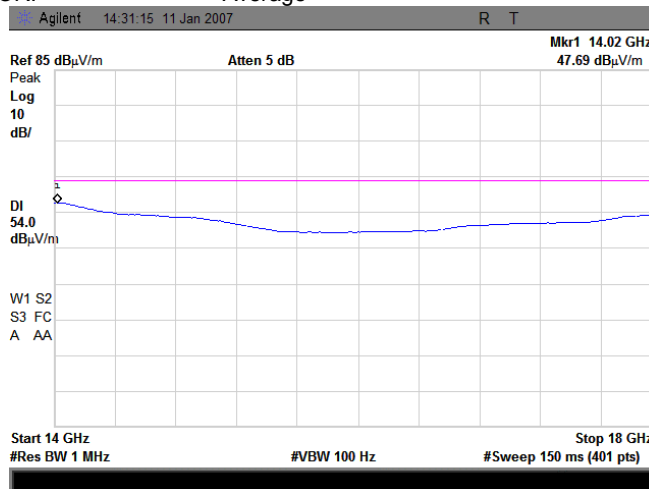
Plot 7.1.12 Radiated emission measurements from 14.0 to 18.0 GHz

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Typical (Vertical)  
DETECTOR: Peak



Plot 7.1.13 Radiated emission measurements from 14.0 to 18.0 GHz

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Typical (Vertical)  
DETECTOR: Average

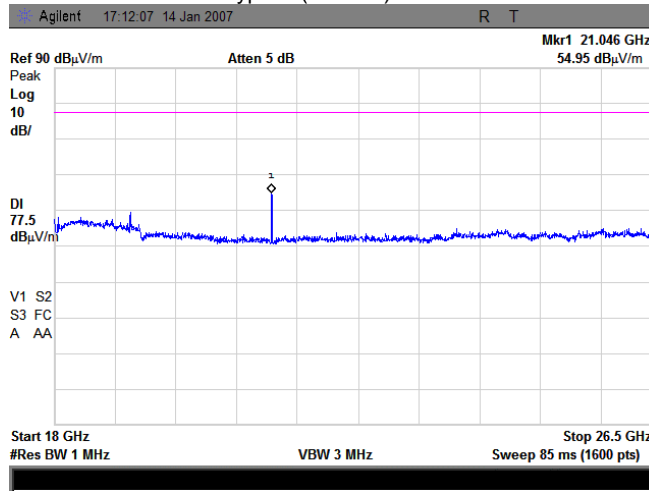




<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

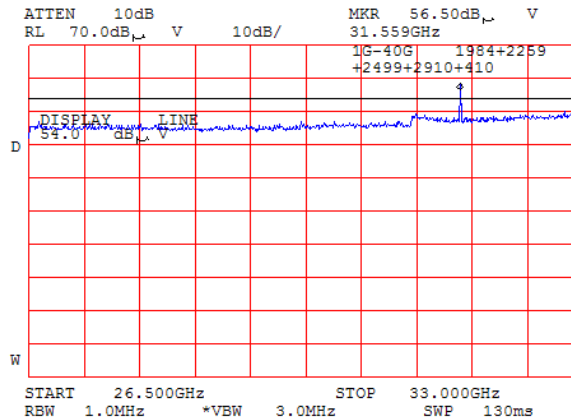
Plot 7.1.14 Radiated emission measurements from 18.0 to 26.5 GHz

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)



Plot 7.1.15 Radiated emission measurements from 26.5 to 33.0 GHz

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)

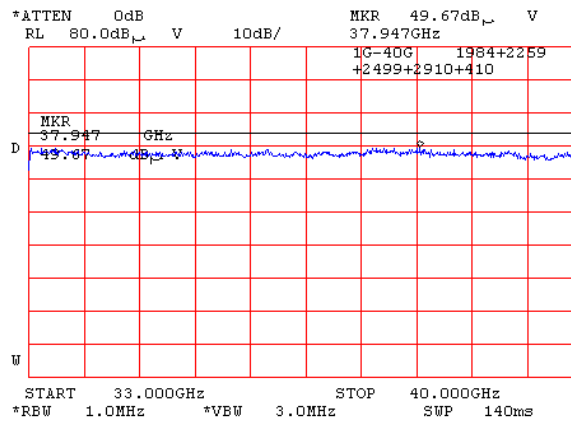




<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	1/14/2007 10:48:03 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.1.16 Radiated emission measurements from 33.0 to 40.0 GHz**

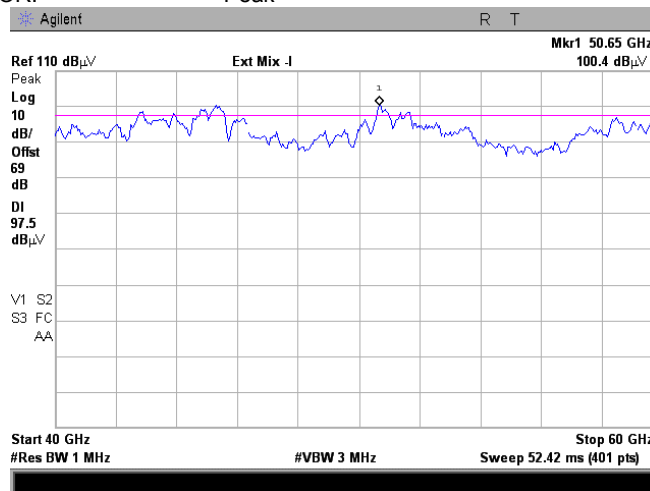
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: Typical (Vertical)



<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	1/14/2007 10:48:03 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

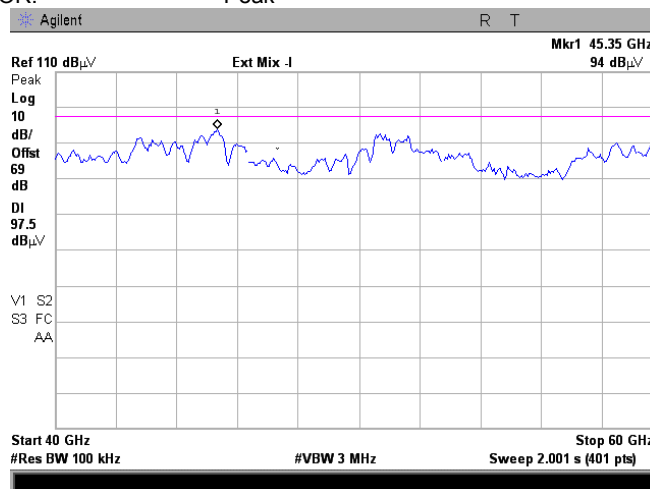
Plot 7.1.17 Radiated emission measurements from 40.0 to 60.0 GHz

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Peak



Plot 7.1.18 Radiated emission measurements from 40.0 to 60.0 GHz

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Peak

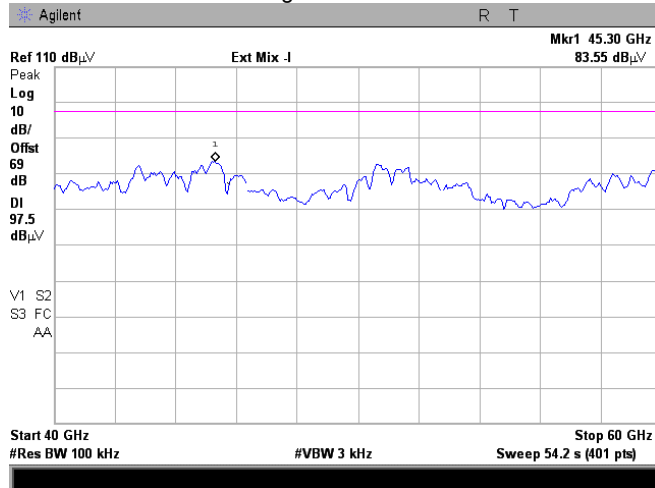




<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	1/14/2007 10:48:03 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.1.19 Radiated emission measurements from 40.0 to 60.0 GHz

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Average

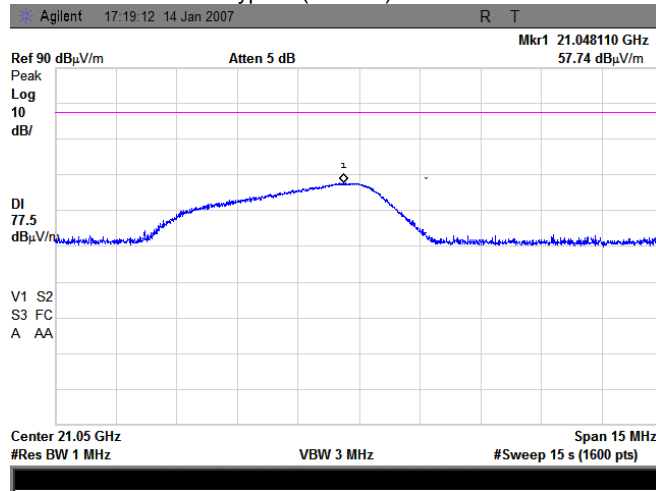




<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

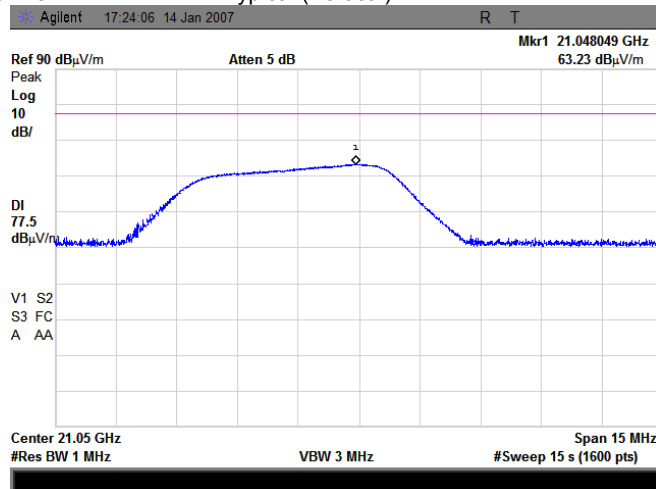
Plot 7.1.20 Radiated emission measurements at the second harmonic frequency

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical  
 EUT POSITION: Typical (Vertical)



Plot 7.1.21 Radiated emission measurements at the second harmonic frequency

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Horizontal  
 EUT POSITION: Typical (Vertical)



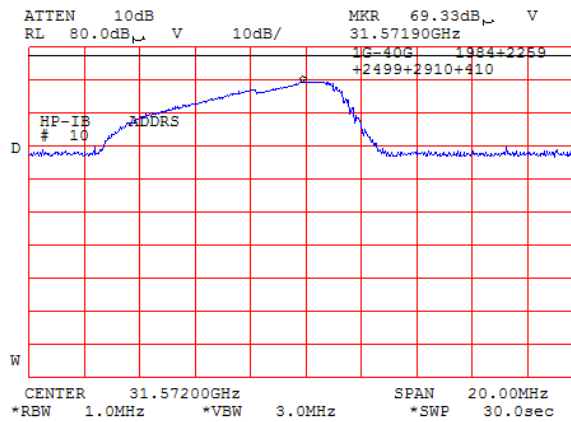




<b>Test specification:</b> Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/14/2007 10:48:03 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.1.22 Radiated emission measurements at the third harmonic frequency

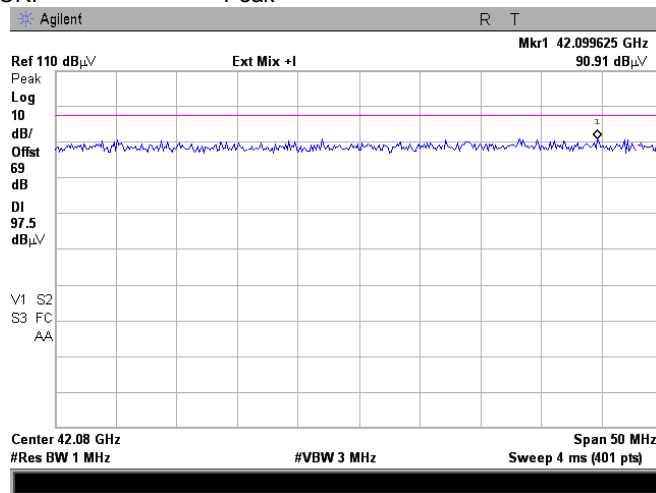
TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)



<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	1/14/2007 10:48:03 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

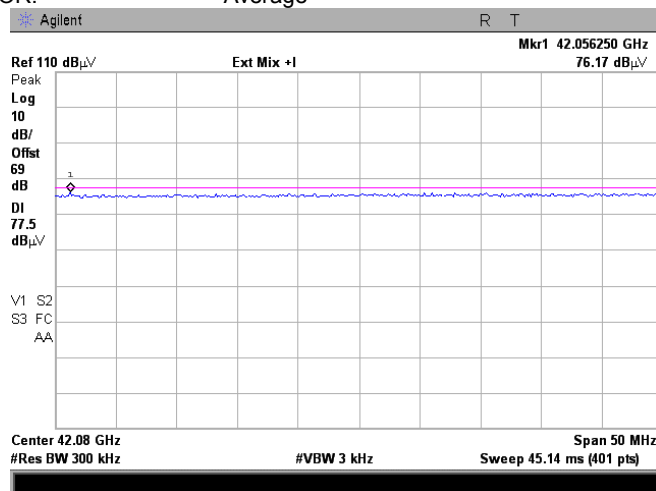
**Plot 7.1.23 Radiated emission measurements at the forth harmonic frequency**

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Peak



**Plot 7.1.24 Radiated emission measurements at the forth harmonic frequency**

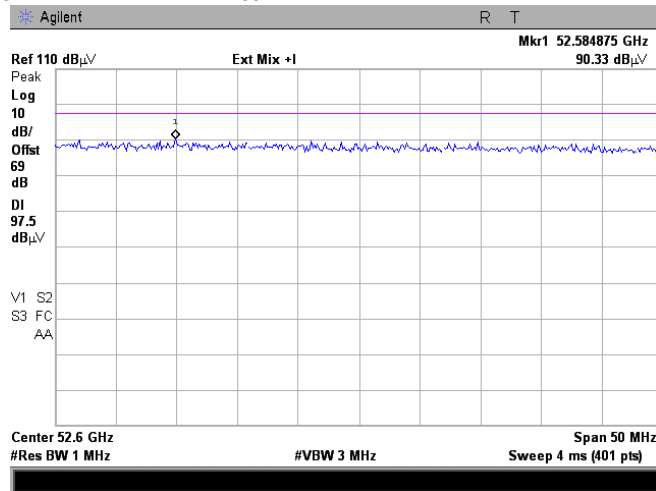
TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Average



<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	PASS
<b>Date &amp; Time:</b>	1/14/2007 10:48:03 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

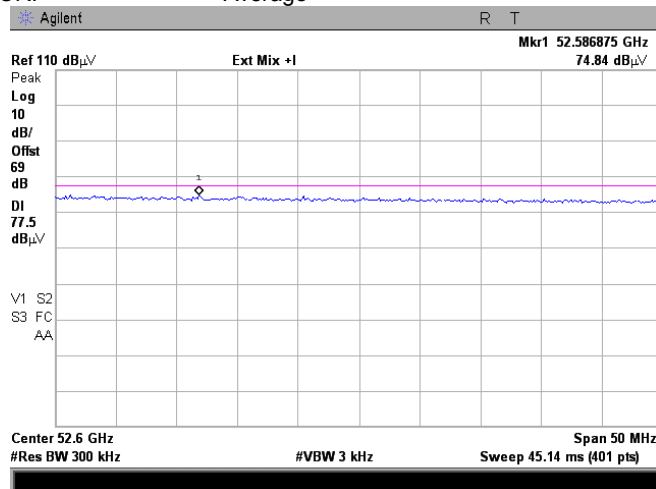
**Plot 7.1.25 Radiated emission measurements at the fifth harmonic frequency**

TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Peak



**Plot 7.1.26 Radiated emission measurements at the fifth harmonic frequency**

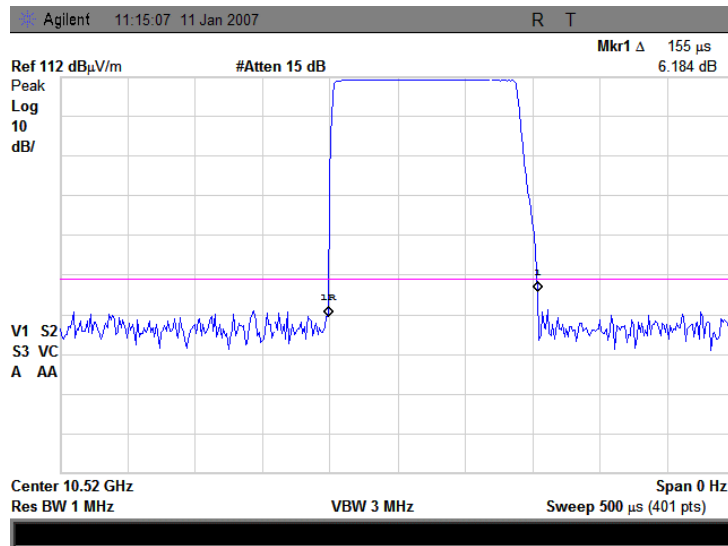
TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: Typical (Vertical)  
 DETECTOR: Average



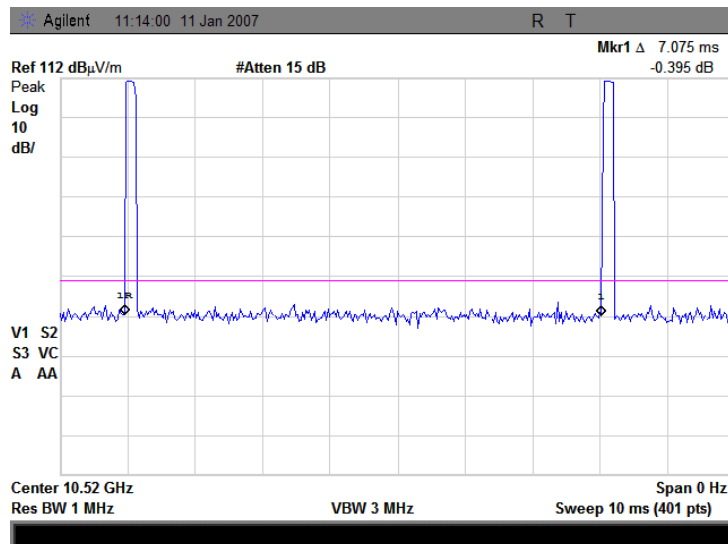


<b>Test specification:</b>		<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>	
<b>Test procedure:</b>		ANSI C63.4, Section 13.1.4	
<b>Test mode:</b>		Compliance	
<b>Date &amp; Time:</b>		1/14/2007 10:48:03 PM	
<b>Temperature:</b> 21°C		<b>Air Pressure:</b> 1010 hPa	
<b>Remarks:</b>		<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
		<b>Verdict:</b>	<b>PASS</b>

Plot 7.1.27 Transmission pulse duration



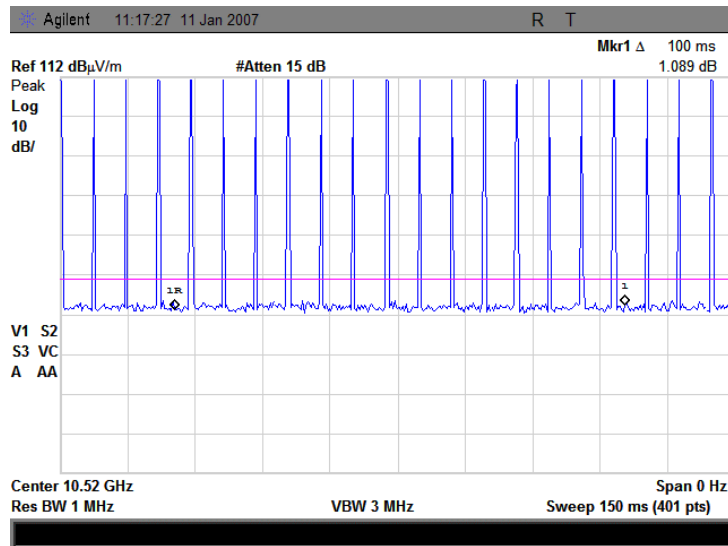
Plot 7.1.28 Transmission pulse period





<b>Test specification:</b>	<b>Section 15.245(b) / RSS-210, Annex 7, Field strength of emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/14/2007 10:48:03 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1010 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.1.29 Number of RF pulses within 100 ms (14 pulses)**





<b>Test specification:</b>	<b>FCC part 15, Section 15.245(b)(3) / RSS-210 Annex 7, Band edge emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/11/2007 1:11:00 PM		
<b>Temperature:</b> 20°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

## 7.2 Band edge emission

### 7.2.1 General

This test was performed to verify the EUT band edge emission including all associated side bands and was attenuated at least 50 dB below the unmodulated carrier level or below the general spurious emission limit. Specification test limits are given in Table 7.2.1.

**Table 7.2.1 Band edge emission limits**

Frequency band, MHz	Field strength limit at 3 m, dB $\mu$ V/m		Attenuation below carrier, dBc
	Peak	Average	
10500 - 10550	74.0	54.0	50

### 7.2.2 Test procedure

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

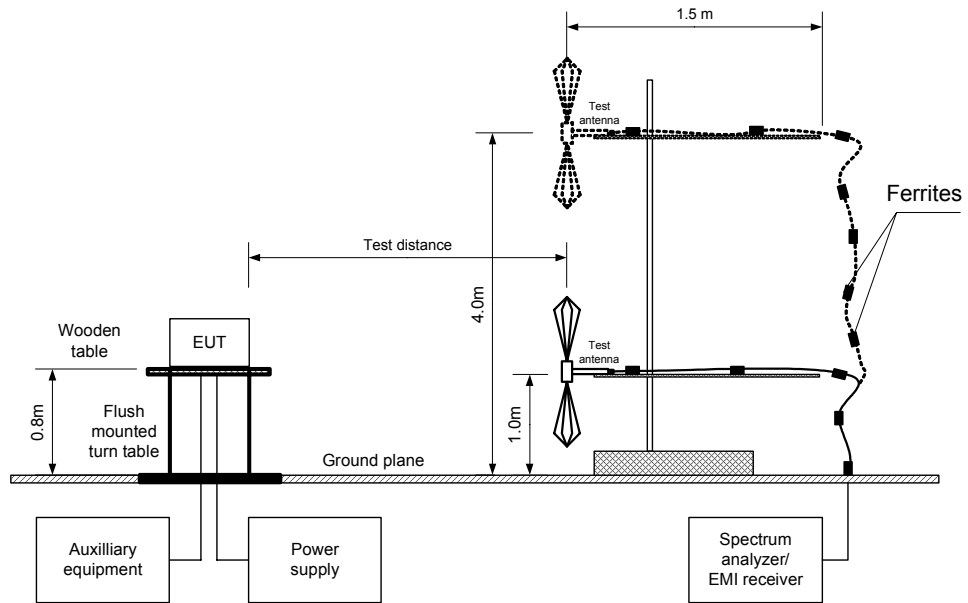
**7.2.2.2** The spectrum analyzer frequency span was set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

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

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

<b>Test specification:</b> FCC part 15, Section 15.245(b)(3) / RSS-210 Annex 7, Band edge emissions			
<b>Test procedure:</b> ANSI C63.4, Section 13.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/11/2007 1:11:00 PM			
<b>Temperature:</b> 20°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Figure 7.2.1 Band edge emission measurement set up





<b>Test specification:</b>	<b>FCC part 15, Section 15.245(b)(3) / RSS-210 Annex 7, Band edge emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/11/2007 1:11:00 PM		
<b>Temperature:</b> 20°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Table 7.2.2 Band edge emission test results**

OPERATING FREQUENCY RANGE: 10500 – 10550 MHz  
DETECTOR USED: Peak hold  
RESOLUTION BANDWIDTH: 1000 kHz  
VIDEO BANDWIDTH: 3000 kHz  
MODULATION: OOK  
MODULATING SIGNAL: ID code  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
ATTENUATION BELOW CARRIER: 50 dBc

Modulation envelope		Band edge limit, MHz	Margin, kHz***	Verdict
Edge	Frequency, MHz*			
Low	10516.925	10500.000	16925	Pass
High	10533.175	10550.000	16825	Pass

\* - Measured frequency beyond which the emission dropped 50 dB below the carrier emission or below the field strength limit whichever was a less stringent

\*\* - Margin = Band edge limit – Band edge frequency

**Reference numbers of test equipment used**

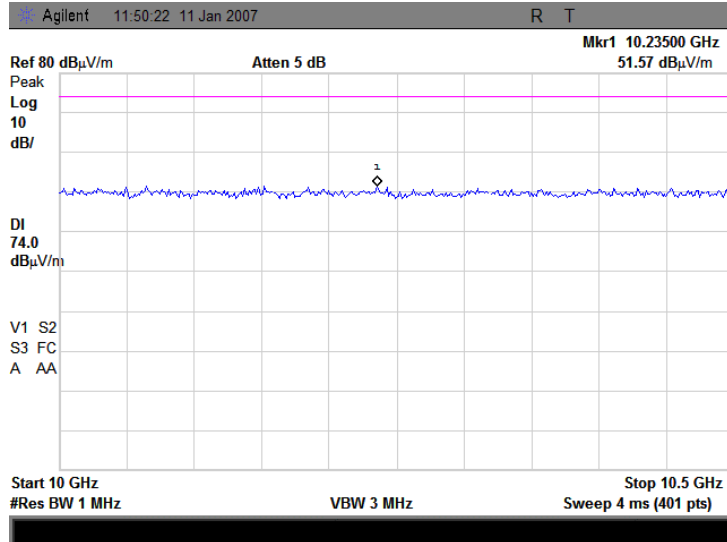
HL 1984	HL 2259	HL 2387	HL 2909	HL 2910			
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Full description is given in Appendix A.

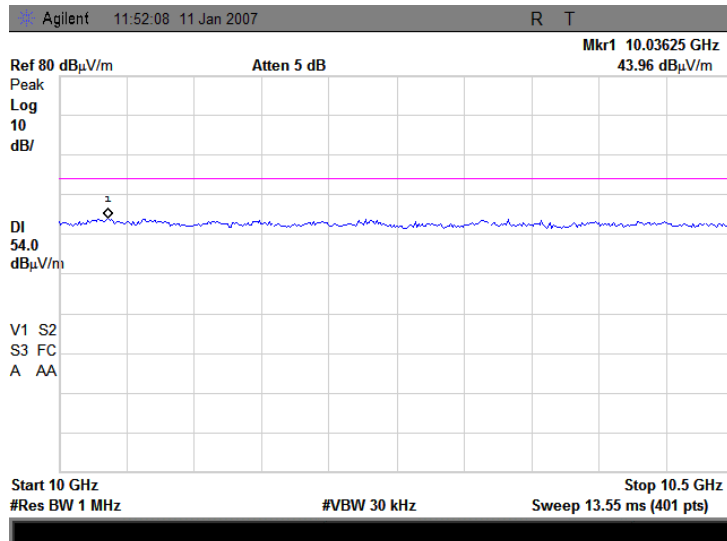


<b>Test specification:</b>	<b>FCC part 15, Section 15.245(b)(3) / RSS-210 Annex 7, Band edge emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/11/2007 1:11:00 PM		
<b>Temperature:</b> 20°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

**Plot 7.2.1 Lower band edge emission test result, peak detector**



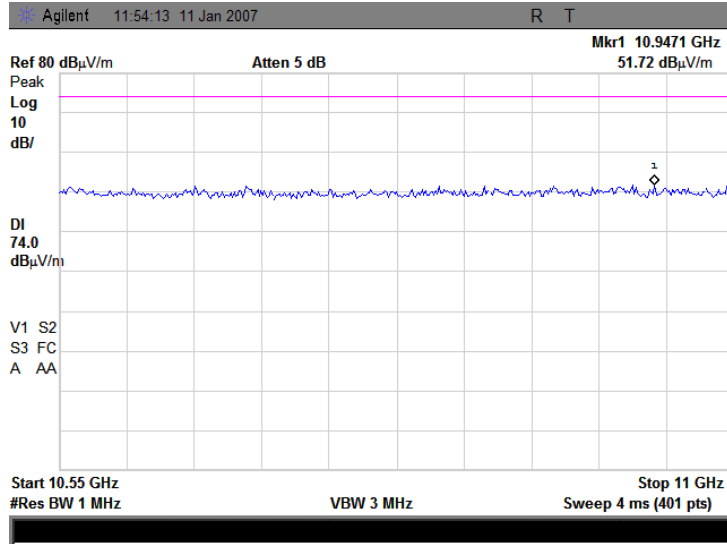
**Plot 7.2.2 Lower band edge emission test result, average detector**



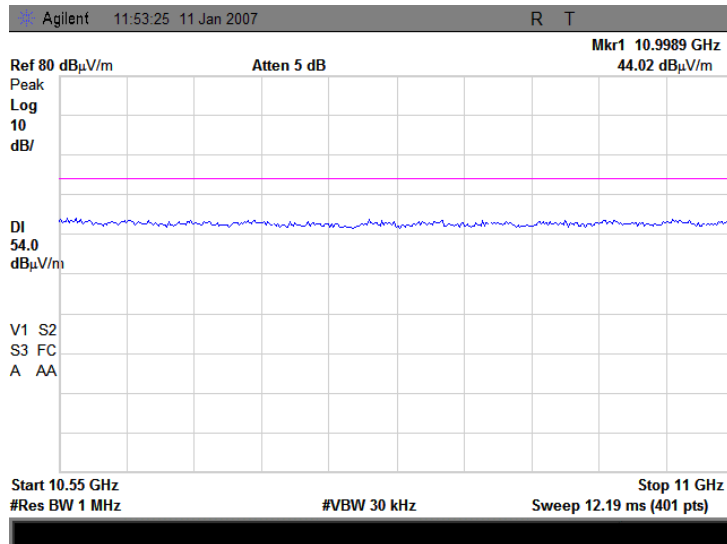


<b>Test specification:</b>	<b>FCC part 15, Section 15.245(b)(3) / RSS-210 Annex 7, Band edge emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/11/2007 1:11:00 PM		
<b>Temperature:</b> 20°C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 48%	<b>Power Supply:</b> 12 VDC
<b>Remarks:</b>			

Plot 7.2.3 Upper band edge emission test result, peak detector



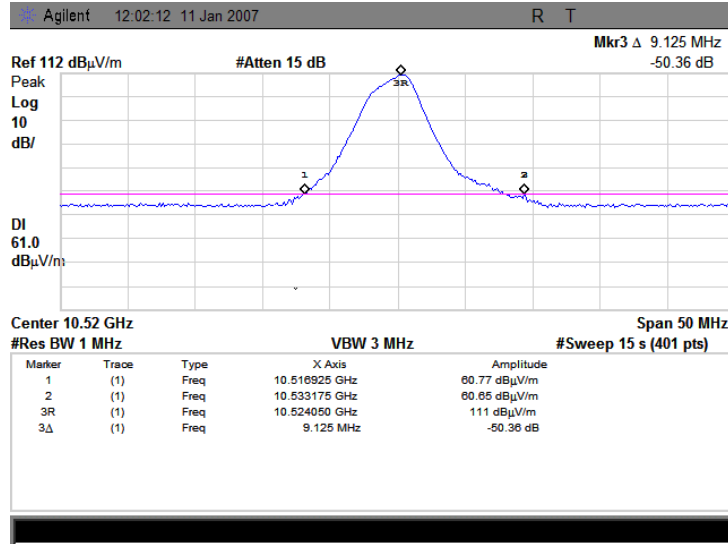
Plot 7.2.4 Upper band edge emission test result, average detector





<b>Test specification:</b>	<b>FCC part 15, Section 15.245(b)(3) / RSS-210 Annex 7, Band edge emissions</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	1/11/2007 1:11:00 PM		
<b>Temperature: 20°C</b>	<b>Air Pressure: 1011 hPa</b>	<b>Relative Humidity: 48%</b>	<b>Power Supply: 12 VDC</b>
<b>Remarks:</b>			

**Plot 7.2.5 Modulation envelope cross points and occupied bandwidth**



OBW = 10533175 kHz – 10516925 kHz = 16250 kHz



<b>Test specification:</b>	<b>FCC part 15, Section 15.207(a) / RSS-Gen, Section 7.2.2, Conducted emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b> PASS	
<b>Date &amp; Time:</b>	1/15/2007 5:07:55 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

## 7.3 Conducted emissions

### 7.3.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.3.1.

**Table 7.3.1 Limits for conducted emissions**

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

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

### 7.3.2 Test procedure

**7.3.2.1** The EUT was set up as shown in Figure 7.3.1 and associated photographs, energized and the performance check was conducted.

**7.3.2.2** The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.3.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

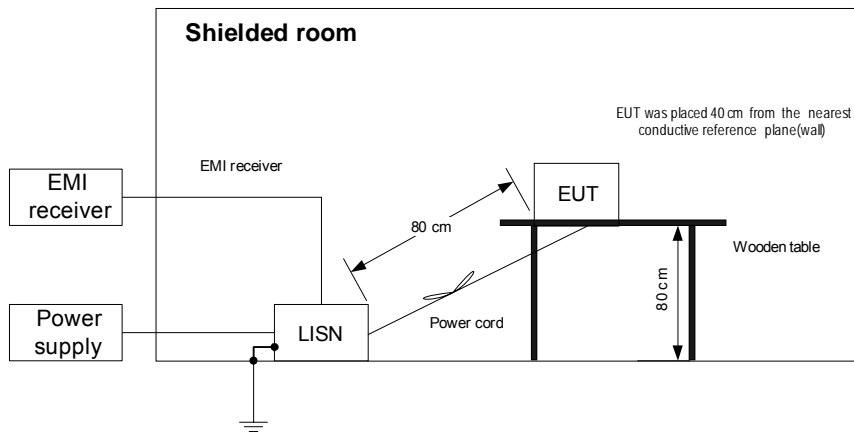
**7.3.2.3** The position of the device cables was varied to determine maximum emission level.

**7.3.2.4** The worst test results (the lowest margins) were recorded in Table 7.3.2 and shown in the associated plots.



<b>Test specification:</b>	<b>FCC part 15, Section 15.207(a) / RSS-Gen, Section 7.2.2, Conducted emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/15/2007 5:07:55 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

Figure 7.3.1 Setup for conducted emission measurements, table-top equipment





<b>Test specification:</b>	<b>FCC part 15, Section 15.207(a) / RSS-Gen, Section 7.2.2, Conducted emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date &amp; Time:</b>	1/15/2007 5:07:55 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

Table 7.3.2 Conducted emission test results

LINE: AC mains  
EUT OPERATING MODE: Transmit  
EUT SET UP: TABLE-TOP  
TEST SITE: SHIELDED ROOM  
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE  
FREQUENCY RANGE: 150 kHz - 30 MHz  
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.153820	44.74	36.84	65.81	-28.97	7.21	55.81	-48.60	L1	Pass
0.159374	43.57	36.00	65.54	-29.54	6.69	55.54	-48.85		
0.170316	42.39	34.26	65.01	-30.75	5.30	55.01	-49.71		
0.154876	44.50	36.78	65.76	-28.98	7.17	55.76	-48.59	L2	Pass
0.167630	42.79	35.18	65.14	-29.96	6.13	55.14	-49.01		
0.169519	42.59	34.67	65.05	-30.38	5.90	55.05	-49.15		

\*- Margin = Measured emission - specification limit.

## Reference numbers of test equipment used

HL 0447	HL 0787	HL 1430	HL 1502	HL 1510			
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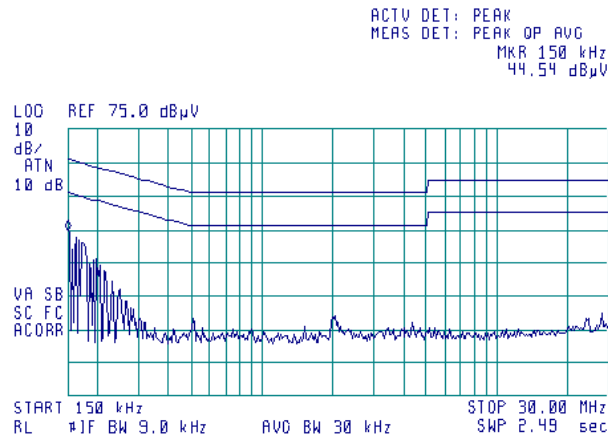
Full description is given in Appendix A.



<b>Test specification:</b>	<b>FCC part 15, Section 15.207(a) / RSS-Gen, Section 7.2.2, Conducted emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Section 13.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/15/2007 5:07:55 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

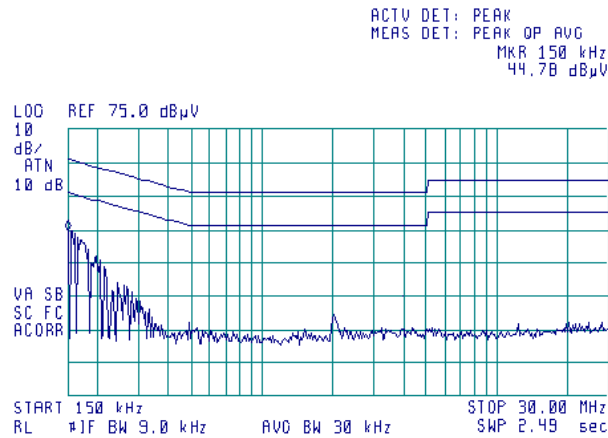
**Plot 7.3.1 Conducted emission measurements**

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



**Plot 7.3.2 Conducted emission measurements**

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



<b>Test specification:</b>	<b>FCC Part 15, Section 15.203/ RSS-Gen, Section 7.1.4, Antenna requirements</b>		
<b>Test procedure:</b>	Visual inspection / supplier declaration		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	6/14/2007 10:15:15 AM		
<b>Temperature:</b> 23°C	<b>Air Pressure:</b> 1013 hPa	<b>Relative Humidity:</b> 52 %	<b>Power Supply:</b> 12 V DC
<b>Remarks:</b>			

## 7.4 Antenna requirements

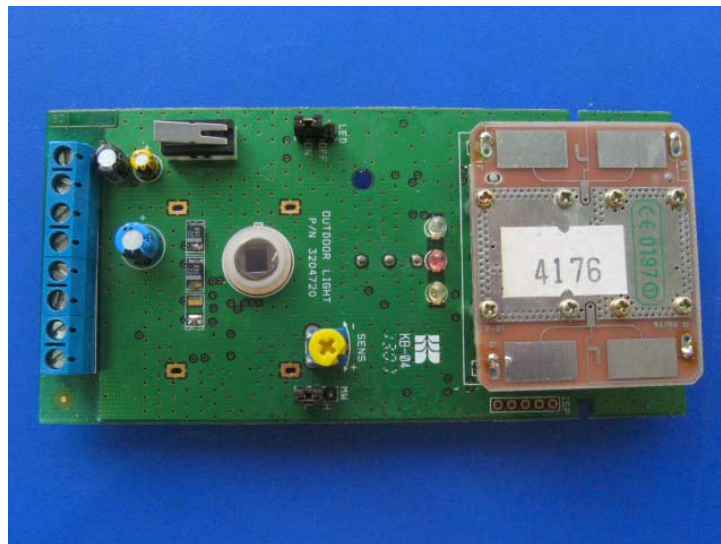
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.4.1.

**Table 7.4.1 Antenna requirements**

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

**Photograph 7.4.1 Printed antenna view**







<b>Test specification:</b>	<b>FCC part 15, Section 15.107/ ICES-003, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/15/2007 5:07:48 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

## 8 Emission tests according to 47CFR part 15 subpart B and ICES-003 requirements

### 8.1 Conducted emissions

#### 8.1.1 General

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

Table 8.1.1 Limits for conducted emissions

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

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

#### 8.1.2 Test procedure

8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, 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. Quasi-peak and average detectors were used throughout the testing.

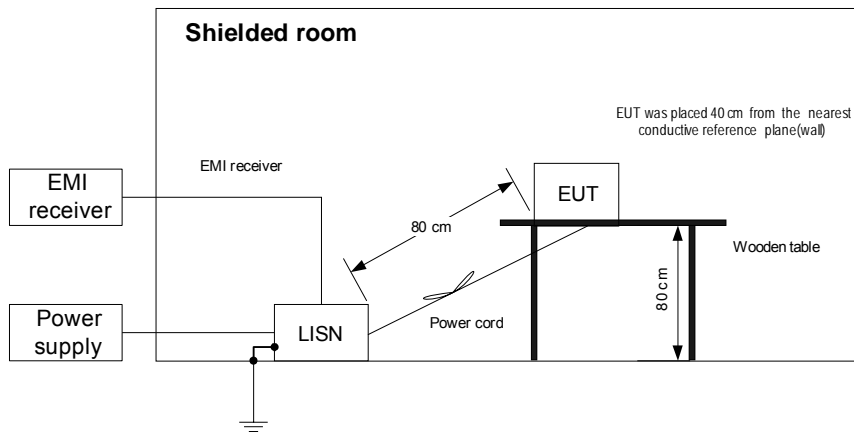
8.1.2.3 The position of the device cables was varied to determine maximum emission level.

8.1.2.4 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.



<b>Test specification:</b>	<b>FCC part 15, Section 15.107/ ICES-003, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/15/2007 5:07:48 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

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





<b>Test specification:</b>	<b>FCC part 15, Section 15.107/ ICES-003, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/15/2007 5:07:48 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

**Table 8.1.2 Conducted emission test results**

LINE: AC mains  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive / Stand-by  
 EUT SET UP: TABLE-TOP  
 TEST SITE: SHIELDED ROOM  
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE  
 FREQUENCY RANGE: 150 kHz - 30 MHz  
 RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.153820	44.74	36.84	65.81	-28.97	7.21	55.81	-48.60	L1	Pass
0.159374	43.57	36.00	65.54	-29.54	6.69	55.54	-48.85		
0.170316	42.39	34.26	65.01	-30.75	5.30	55.01	-49.71		
0.154876	44.50	36.78	65.76	-28.98	7.17	55.76	-48.59	L2	Pass
0.167630	42.79	35.18	65.14	-29.96	6.13	55.14	-49.01		
0.169519	42.59	34.67	65.05	-30.38	5.90	55.05	-49.15		

\*- Margin = Measured emission - specification limit.

**Reference numbers of test equipment used**

HL 0447	HL 0787	HL 1430	HL 1502	HL 1510			
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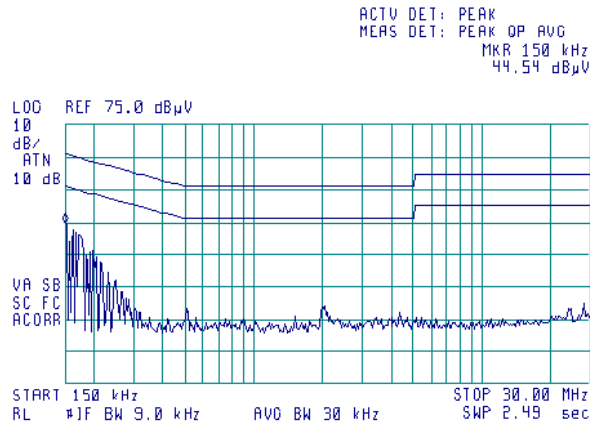
Full description is given in Appendix A.



<b>Test specification:</b>	<b>FCC part 15, Section 15.107/ ICES-003, Conducted emission at AC power port</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.5 and 12.1.3		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/15/2007 5:07:48 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

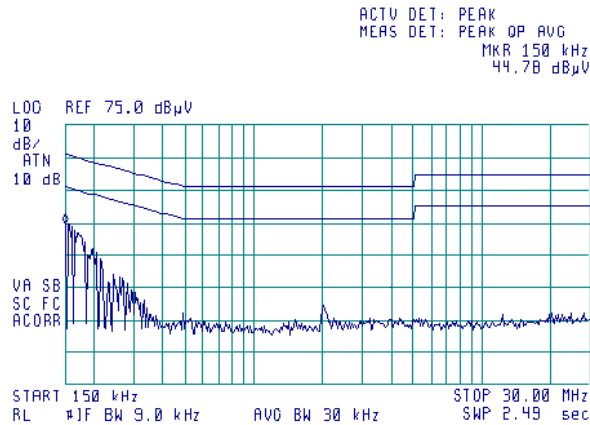
**Plot 8.1.1 Conducted emission measurements**

LINE: L1  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive / Stand-by  
 LIMIT: QUASI-PEAK, AVERAGE  
 DETECTOR: PEAK



**Plot 8.1.2 Conducted emission measurements**

LINE: L2  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive / Stand-by  
 LIMIT: QUASI-PEAK, AVERAGE  
 DETECTOR: PEAK





<b>Test specification:</b>	<b>FCC part 15, Section 15.109/ ICES-003, Radiated emission</b>		
<b>Test procedure:</b>	ANSI C63.4, Sections 11.6 and 12.1.4		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/15/2007 2:08:02 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

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

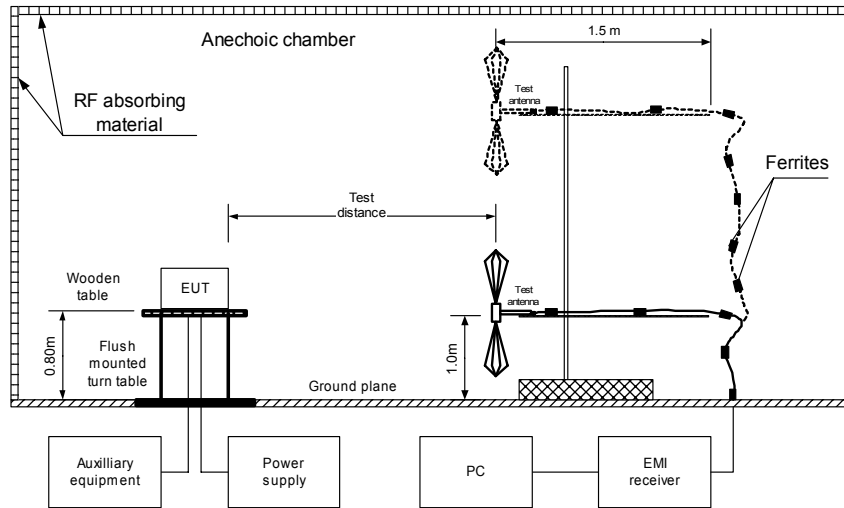
\* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows:  $Lim_{S_2} = Lim_{S_1} + 20 \log(S_1/S_2)$ , where  $S_1$  and  $S_2$  – standard defined and test distance respectively in meters.

### 8.2.2 Test procedure

- 8.2.2.1** The EUT was set up as shown in Figure 8.2.1 and associated photograph, 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°, 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.

<b>Test specification:</b> FCC part 15, Section 15.109/ ICES-003, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/15/2007 2:08:02 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

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





<b>Test specification:</b>		<b>FCC part 15, Section 15.109/ ICES-003, Radiated emission</b>	
<b>Test procedure:</b>		ANSI C63.4, Sections 11.6 and 12.1.4	
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date &amp; Time:</b>	1/15/2007 2:08:02 PM		
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
TEST SITE: 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*				
No emissions were found								Pass

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

Reference numbers of test equipment used

HL 1425	HL 1553	HL 1566	HL 2697				
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Full description is given in Appendix A.

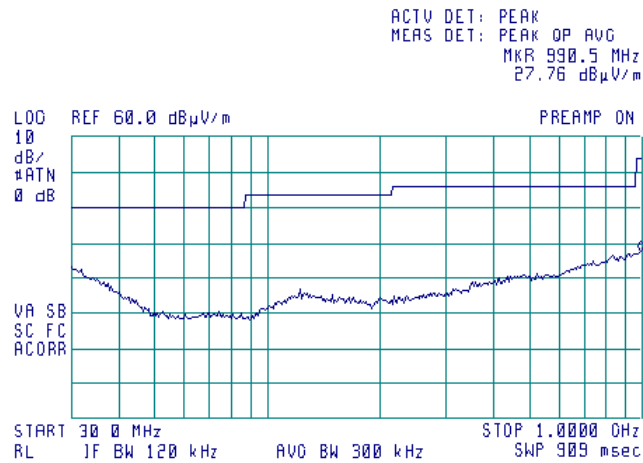


<b>Test specification:</b> FCC part 15, Section 15.109/ ICES-003, Radiated emission			
<b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date &amp; Time:</b> 1/15/2007 2:08:02 PM			
<b>Temperature:</b> 21°C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 45%	<b>Power Supply:</b> 120 V AC
<b>Remarks:</b>			

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

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

09:59:43 12 JAN 2007





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

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	28-Jun-06	28-Jun-07
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	HL	LISN 16 - 1	066	03-Nov-06	03-Nov-07
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	26-Sep-06	26-Sep-07
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	08-Dec-06	08-Dec-08
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	08-Dec-06	08-Dec-08
0770	Antenna Standard Gain Horn, 40-60 GHz WR-19, U-band Gain - 25 dB	Quinstar Technology	QWH-1900-AA	118	21-Jul-04	21-Jul-07
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	21-Nov-06	21-Nov-07
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	30-Aug-06	30-Aug-07
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	01-Sep-06	01-Sep-07
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A002 62,3705A0 0217	01-Sep-06	01-Sep-07
1502	Cable RF, 6 m, BNC/BNC	Belden	M17/167 MIL-C-17	1502	27-Nov-06	27-Nov-07
1510	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1510	30-Dec-06	30-Dec-07
1553	Cable RF, 3.5 m	Alpha Wire	RG-214	1553	22-May-07	22-May-08
1566	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13094/4PE	02-Dec-06	02-Dec-07
1826	Antenna mast and Turntable position controller (Small Anechoic chamber)	Sh. I. Machines	CRL-4	1	13-May-07	13-May-08
1849	Antenna mast with polarity control (Small Anechoic chamber)	Sh. I. Machines	AM-F4	1849	19-Jan-07	19-Jan-08
1850	Turntable	Sh. I. Machines	TT-M-3	1850	11-Nov-06	11-Nov-07
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	17-Oct-06	17-Oct-07
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Mar-07	03-Mar-08
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	20-May-07	20-May-08
2254	Cable 40GHz, 0.8 m, blue	Rhophase Microwave Limited	KPS-1503A-800-KPS	W4907	17-Jun-07	17-Jun-08



HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
2259	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0223	05-Nov-06	05-Nov-07
2387	Filter Bandpass, 8-14 GHz	HL	FBP8-14	2387	05-Jun-07	05-Jun-09
2399	Cable 40GHz, 1.5 m, blue	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2945	30-Dec-06	30-Dec-07
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp. Pleasanton, California USA	JB3	A022805	10-Jan-07	10-Jan-08
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	07-May-07	07-May-08
2910	Cable 18 GHz, 3 m, SMA-SMA	Gore	NA	989370	30-Dec-06	30-Dec-07

\* The above mentioned equipment calibration was valid at the moment of the testing.

## 10 APPENDIX B Measurement uncertainties

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

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: $\pm 3.9$ dB 150 kHz to 30 MHz: $\pm 3.8$ dB
Radiated emissions at 10 m measuring distance Horizontal polarization  Vertical polarization	Biconilog antenna: $\pm 5.0$ dB Biconical antenna: $\pm 5.0$ dB Log periodic antenna: $\pm 5.1$ dB Double ridged horn antenna: $\pm 5.3$ dB Biconilog antenna: $\pm 5.5$ dB Biconical antenna: $\pm 5.5$ dB Log periodic antenna: $\pm 5.6$ dB Double ridged horn antenna: $\pm 5.8$ dB
Radiated emissions at 3 m measuring distance Horizontal polarization  Vertical polarization	Biconilog antenna: $\pm 5.3$ dB Biconical antenna: $\pm 5.0$ dB Log periodic antenna: $\pm 5.3$ dB Double ridged horn antenna: $\pm 5.3$ dB Biconilog antenna: $\pm 6.0$ dB Biconical antenna: $\pm 5.7$ dB Log periodic antenna: $\pm 6.0$ dB Double ridged horn antenna: $\pm 6.0$ dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: $\pm 2.6$ dB 2.9 GHz to 6.46 GHz: $\pm 3.5$ dB 6.46 GHz to 13.2 GHz: $\pm 4.3$ dB 13.2 GHz to 22.0 GHz: $\pm 5.0$ dB 22.0 GHz to 26.8 GHz: $\pm 5.5$ dB 26.8 GHz to 40.0 GHz: $\pm 4.8$ dB

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

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

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

## 11 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS and IC 2186A-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01) and approved by Israel Ministry of environmental protection, radiation hazards department (Permit number 1158).

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e-mail: mail@hermonlabs.com  
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

## 12 APPENDIX D Specification references

FCC 47CFR part 15: 2007	Radio Frequency Devices.
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
RSS-210 Issue 7: 2007	Low Power Licence- Exempt Radiocommunication Devices
RSS-Gen issue 2:2007	General Requirements and Information for the Certification of Radiocommunication Equipment
ICES-003: 2004, Issue 4	Spectrum Management and Telecommunications Policy. Interference-Causing Equipment Standard. Digital Apparatus
CAN/CSA-CEI/IEC CISPR 22: 2002	Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement

**13 APPENDIX E Test equipment correction factors**

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

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

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



**Antenna factor  
Active loop antenna  
Model 6502, S/N 2857, HL 0446**

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
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	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
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(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

**Antenna factor  
Standard gain horn antenna  
Quinstar Technology  
Model QWH  
Ser.No.110, HL 0768, 0769, 0770, 0771, 0772**

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

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

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

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

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



Antenna calibration

Sunol Sciences Inc., model JB3, serial number A022805, HL 2697

Table with 17 columns: Frequency, ACF, Gain, Num gain, Frequency, ACF, Gain, Num gain, Frequency, ACF, Gain, Num gain, Frequency, ACF, Gain, Num gain, Frequency, ACF, Gain, Num gain. Contains 615 rows of calibration data.





**Cable loss**  
**Cable RG-214, HL 0813**

No.	Frequency, MHz	Cable loss, dB
1	10	0.15
2	20	0.40
3	30	0.51
4	40	0.61
5	50	0.68
6	60	0.76
7	70	0.80
8	80	0.92
9	90	0.96
10	100	0.99
11	200	1.60
12	300	1.85
13	400	2.25
14	500	2.43
15	600	2.80
16	700	3.14
17	800	3.34
18	900	3.75
19	1000	4.05
20	1200	4.41
21	1400	4.81
22	1600	5.18
23	1800	5.58
24	2000	6.09
25	2500	7.27
26	2900	8.01



**Cable loss**  
**Cable coaxial, 6 m, model: M17/167 MIL-C-17, HL 1502**

Frequency, MHz	Cable loss, dB
0.1	0.02
1	0.07
3	0.15
5	0.17
10	0.26
30	0.43
50	0.57
80	0.72
100	0.81
300	1.48
500	2.00
800	2.70
1000	3.09

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

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



**Cable loss**  
**RF cable 3.5 m, Alpha Wire, model RG-214, S/N 149, HL 1553**

No.	Frequency, MHz	Cable loss, dB	Measurement uncertainty, dB
1	1	0.01	±0.05
2	10	0.07	
3	30	0.12	
4	50	0.22	
5	100	0.26	
6	200	0.40	
7	300	0.52	
8	400	0.60	
9	500	0.70	
10	600	0.77	
11	700	0.84	
12	800	1.00	
13	900	1.00	
14	1000	1.05	
15	2000	1.70	



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

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

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

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

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



**Cable loss**  
**RF cable 8 m, model RG-214, HL 2009**

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



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

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

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

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





**Cable loss**  
**Cable coaxial, Gore, 18 GHz, 3m, SMA-SMA, S/N 989370**  
**HL 2910**

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
10	0.07	5750	2.97	12000	5.05
30	0.19	6000	2.91	12250	4.44
100	0.36	6250	3.23	12500	4.82
250	0.53	6500	3.42	12750	5.22
500	0.77	6750	3.17	13000	5.02
750	0.94	7000	3.56	13250	5.00
1000	1.10	7250	3.77	13500	5.09
1250	1.19	7500	3.48	13750	4.70
1500	1.35	7750	3.81	14000	5.03
1750	1.51	8000	3.82	14250	5.17
2000	1.57	8250	3.62	14500	4.92
2250	1.69	8500	3.95	14750	4.91
2500	1.76	8750	4.00	15000	5.03
2750	1.83	9000	3.80	15250	4.93
3000	2.02	9250	4.09	15500	5.28
3250	2.17	9500	4.12	15750	5.60
3500	2.13	9750	4.11	16000	5.16
3750	2.23	10000	4.36	16250	5.45
4000	2.40	10250	4.75	16500	5.78
4250	2.31	10500	4.61	16750	5.47
4500	2.52	10750	4.26	17000	5.21
4750	2.77	11000	4.62	17250	5.53
5000	2.82	11250	4.55	17500	5.53
5250	2.77	11500	4.59	17750	5.71
5500	3.04	11750	5.20	18000	5.77



## 14 APPENDIX F Abbreviations and acronyms

AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB( $\mu$ V)	decibel referred to one microvolt
dB( $\mu$ V/m)	decibel referred to one microvolt per meter
dB( $\mu$ A)	decibel referred to one microampere
DC	direct current
EMC	electromagnetic compatibility
EUT	equipment under test
GHz	gigahertz
GND	ground
H	height
HL	Hermon Laboratories
Hz	hertz
k	kilo
kHz	kilohertz
kV	kilovolt
L	length
LISN	line impedance stabilization network
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
$\mu$ s	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
$\Omega$	Ohm
QP	quasi-peak
PM	pulse modulation
PS	power supply
pW	picowatt
RE	radiated emission
RF	radio frequency
rms	root mean square
s	second
V	volt
VA	volt-ampere
W	width

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