HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO:

FCC CFR 47 PART 15 Subpart C, §15.225 and RSS-210, Issue 8, Annex 2.6

FOR:

Orex Computed Radiography Ltd. (A Carestream Health Company)

Medical Computed Radiography System

Model: CS7600

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1 Applicant information

Client name:	Orex Computed Radiography Ltd. (A Carestream Health Company)
Address:	P.O.B. 505, Yokneam Star building, Yokneam, 20692, Israel
Telephone:	+972 4909 9717
Fax:	+972 4959 1262
E-mail:	odedw@orex-cr.com
Contact name:	Mr. Oded Wigderson

2 Equipment under test attributes

Product name:	Medical Computed Radiography System
Product type:	Scanner
Model:	CS7600
Serial number:	EM103
Hardware version:	AB (Controller)
Software release:	02 (Embedded)
Receipt date:	8/31/2010

3 Manufacturer information

Manufacturer name:	Orex Computed Radiography Ltd. (A Carestream Health Company)
Address:	P.O.B. 505, Yokneam Star building, Yokneam, 20692, Israel
Telephone:	+972 4909 9717
Fax:	+972 4959 1262
E-mail:	odedw@orex-cr.com
Contact name:	Mr. Oded Wigderson

4 Test details

Project ID:	21161
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	8/31/2010
Test completed:	2/8/2011
Test specifications:	FCC CFR 47 PART 15 Subpart C, §15.225 and RSS-210, Issue 8, Annex 2.6

5 Tests summary

Test	Status
Transmitter characteristics	
FCC sections 15.225(a) (b) (c) / RSS-210, Annex A2.6(a), In band radiated emissions	Pass
FCC section 15.225(d) / RSS-Gen, Sections 4.9(a), 7.2.5, Out of band radiated emissions	Pass
FCC section 15.225(e) / RSS-210, Annex A2.6, RSS-Gen, Section 7.2.6, Frequency stability	Pass
FCC section 15.207(a) / RSS-Gen, Section 7.2.4, Conducted emission	Pass
FCC section 15.215(c) / RSS-Gen, Section 4.6.3, Occupied bandwidth	Pass
FCC section 15.203 / RSS-Gen, Section 7.1.2, Antenna requirements	Pass

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. E. Plotnichenko, test engineer	February 8, 2011	
	Mr. S. Samokha, test engineer		
Reviewed by:	Ms. N. Averin, certification engineer	February 21, 2011	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	February 28, 2011	

6 EUT description

6.1 General information

The EUT is a CR based stand alone scanner that scans, displays, saves and sends over the Ethernet intra-oral images. A red LED light source is used to erase the data residuals from the plate after scanning for reuse. The EUT comprises RFID module operating at 13.56 MHz to read patient plate data. The EUT is powered via external medical grade PS and connected to PC via external Ethernet switch. 10 sec scanner's cycle with erasing was used during the tests.
The EUT operates in transceive mode.

6.2 EUT parts

Description	Manufacturer	Model or P/N	Serial number
Medical Computed Radiography System	Orex Computed Radiography	CS7600	EM103
Medical Power Supply	SL Power	P/N MW174KB2403F01	NA
Image Plate	Carestream	NA	NA
RFID module	Logitag	LT-HFS02	L-HF2-1010-PM-023
Integral antenna	Logitag	LT-HFA-85x45	L-HA85-0910-LT-040
RFID tag	UPM	3001059	NA

6.3 Ports and lines

Port type	Port description	Conncted from	Conncted to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	AC power	Medical PS	AC mains	1	Unshielded	1.5 m	Indoor
Power	DC power	EUT	Medical PS	1	Shielded	1.5 m	Indoor
Telecom	Ethernet	EUT	Ethernet switch	1	Shielded	10 m*	Indoor

* May be up to 100 m long.

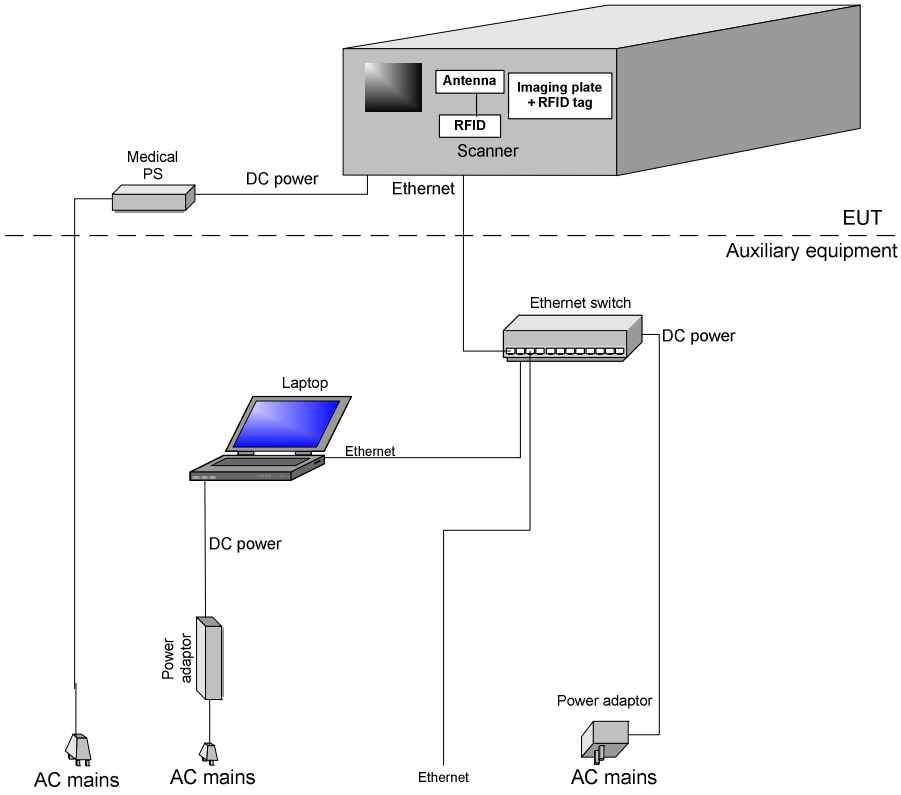
6.4 Auxiliary equipment

Description	Manufacturer	Model number	Serial number
Laptop	Lenovo	ThinkPad X6 IltraBase	1S40Y8116LVFX593
AC/DC Combo Adapter	Lite-On Thechnology Corp	40Y7657	7700507201
Ethernet switch	TP-Link	TL-SF1008D	09970400424
I.T.E. Power Supply	Laeder Electronics Inc.	MU05-N090060-C5	090556-11

6.5 Operating frequencies

Source	Frequency, MHz				
Motion CPU Oscillator	8	NA	NA	NA	NA
iMX 257 CPU Oscillator	0.032768	NA	NA	NA	NA
iMX 257 CPU Oscillator	24	NA	NA	NA	NA
Ethernet I/F Oscillator	50	NA	NA	NA	NA
RFID Oscillator	13.56	NA	NA	NA	NA

6.6 Test configuration



6.7 Transceiver 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					
	mobile	Always at a distance more than 20 cm from all people					
X	portable	May operate at a distance closer than 20 cm to human body					
Assigned frequency ranges		13.553 – 13.567 MHz					
Operating frequencies		13.56 MHz					
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		standard connector		X	integral		with temporary RF connector
						X	without temporary RF connector
Type of modulation		FSK					
Transmitter power source							
X	AC mains	**Nominal rated voltage**	120 VAC				
Common power source for transmitter and receiver				X	yes		No
Receiver class				3			

6.8 Changes made in EUT

To withstand the standard requirements, the following changes were made in the EUT during the testing.

Two ferrite beads manufactured by Fair-Rite Products Corp., part number 0461167281 and 0431167281 were installed at the flat LCD cable inside the EUT as shown in Photograph 6.8.1.

It is manufacturer responsibility to implement the changes in the production version of the EUT. In any case the test report applies to the tested item only.

Photograph 6.8.1 Changes made in the EUT

Test specification:	FCC sections 15.225(a) (b) (c) / RSS-210, Annex A2.6(a), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	11/24/2010		
Temperature: 23.3 ºC	Air Pressure: 1015 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

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

7.1 In band radiated emissions

7.1.1 General

This test was performed to measure field strength of fundamental emission and modulation products from the EUT within the assigned band. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Radiated emission limits

Frequency, MHz	Field strength at 30 m distance*		Field strength at 3 m distance*	
	µV/m	dB(µV/m)	µV/m	dB(µV/m)**
13.110 – 13.410	106	40.5	10600	80.5
13.410 – 13.553	334	50.5	33400	90.5
13.553 – 13.567	**15848**	**84.0**	**1584800**	**124.0**
13.567 – 13.710	334	50.5	33400	90.5
13.710 – 14.010	106	40.5	10600	80.5

*- The limit is provided in quasi peak values.

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

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

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

7.1.2 Test procedure

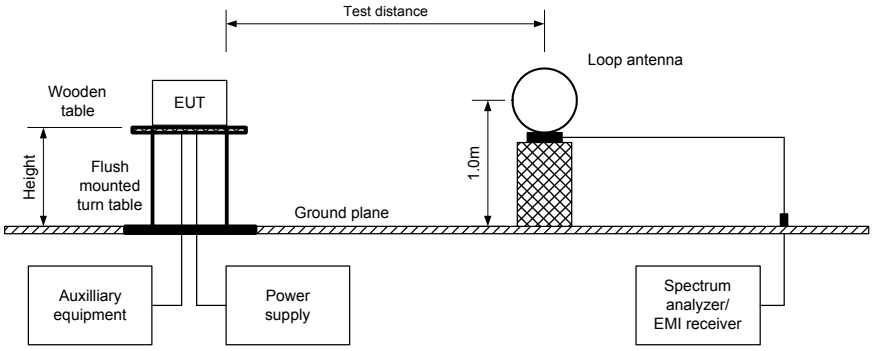
7.1.2.1 The EUT was set up as shown in Figure 7.1.1 energized and the performance check was conducted.

7.1.2.2 The specified frequency range was investigated with loop antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna was rotated around its vertical axis and the measuring antenna polarization was switched from vertical to horizontal.

7.1.2.3 The worst test results (the lowest margins) were recorded in Table 7.1.2 and shown in the associated plots.

Test specification:	FCC sections 15.225(a) (b) (c) / RSS-210, Annex A2.6(a), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	11/24/2010		
Temperature: 23.3 ºC	Air Pressure: 1015 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Figure 7.1.1 Setup for in band radiated emission measurements



Test specification:	FCC sections 15.225(a) (b) (c) / RSS-210, Annex A2.6(a), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	11/24/2010		
Temperature: 23.3 ºC	Air Pressure: 1015 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.2 In band radiated emission test results

TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
MODULATION: Unmodulated
MODULATING SIGNAL: ID code
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 13.110 – 14.010 MHz
RESOLUTION BANDWIDTH: 9.0 kHz
VIDEO BANDWIDTH: 30.0 kHz

Carrier frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Azimuth**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*			
Unom							Pass
13.56	75.67	75.67	124.0	-48.33	Vertical	90	
115%Unom							
13.56	75.65	75.65	124.0	-48.35	Vertical	90	
85%Unom							
13.56	75.65	75.65	124.0	-48.35	Vertical	90	

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

Reference numbers of test equipment used

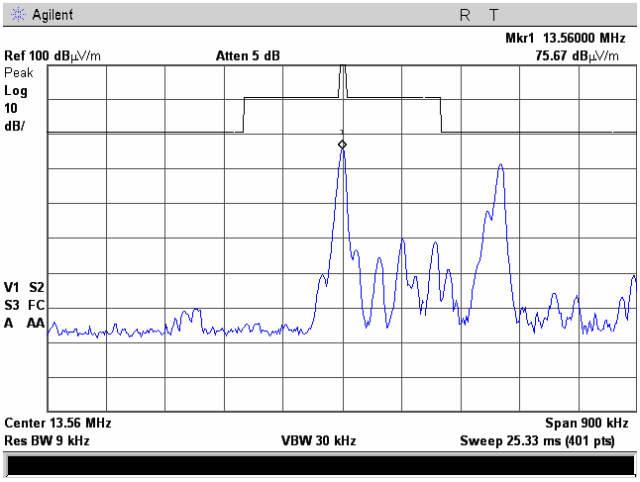
HL 0415	HL 0446	HL 0465	HL 0812	HL 2780			

Full description is given in Appendix A.

Test specification:	FCC sections 15.225(a) (b) (c) / RSS-210, Annex A2.6(a), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	11/24/2010		
Temperature: 23.3 ºC	Air Pressure: 1015 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.1 Fundamental emission test result

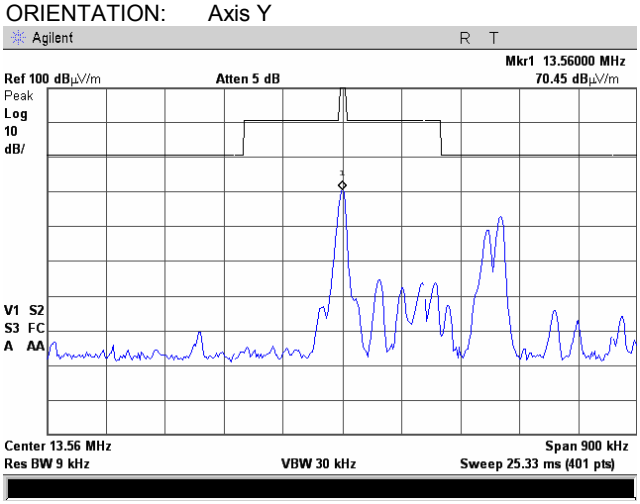
TEST SITE: OATS
TEST DISTANCE: 3 m
DETECTOR: Peak hold
EUT POSITION Typical (Vertical)
INPUT VOLTAGE: Unom
ANTENNA ORIENTATION: Axis X



F = 13.75 MHz - 13.81 MHz: ambient noise

Plot 7.1.2 Fundamental emission test result

TEST SITE: OATS
TEST DISTANCE: 3 m
DETECTOR: Peak hold
EUT POSITION Typical (Vertical)
INPUT VOLTAGE: Unom
ANTENNA ORIENTATION: Axis Y

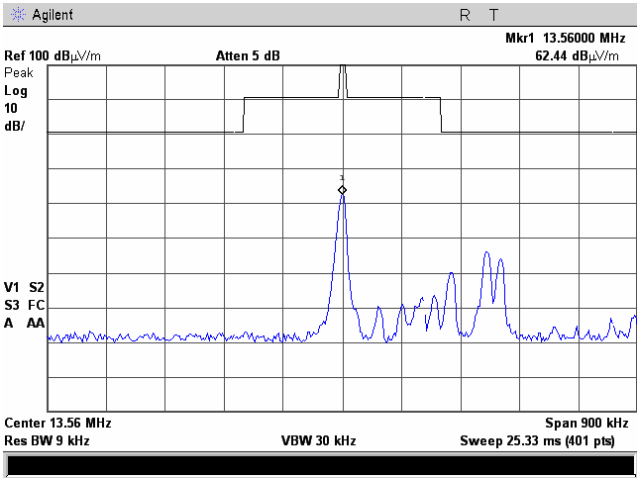


F = 13.75 MHz - 13.81 MHz: ambient noise

Test specification:	FCC sections 15.225(a) (b) (c) / RSS-210, Annex A2.6(a), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	11/24/2010		
Temperature: 23.3 ºC	Air Pressure: 1015 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.3 Fundamental emission test result

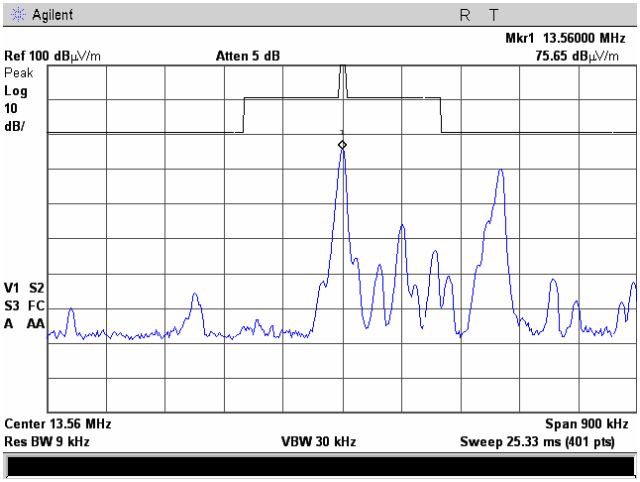
TEST SITE: OATS
TEST DISTANCE: 3 m
DETECTOR: Peak hold
EUT POSITION Typical (Vertical)
INPUT VOLTAGE: Unom
ANTENNA ORIENTATION: Axis Z



F = 13.75 MHz - 13.81 MHz: ambient noise

Plot 7.1.4 Fundamental emission test result

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
DETECTOR: Peak hold
EUT POSITION Typical (Vertical)
INPUT VOLTAGE: 115%Unom

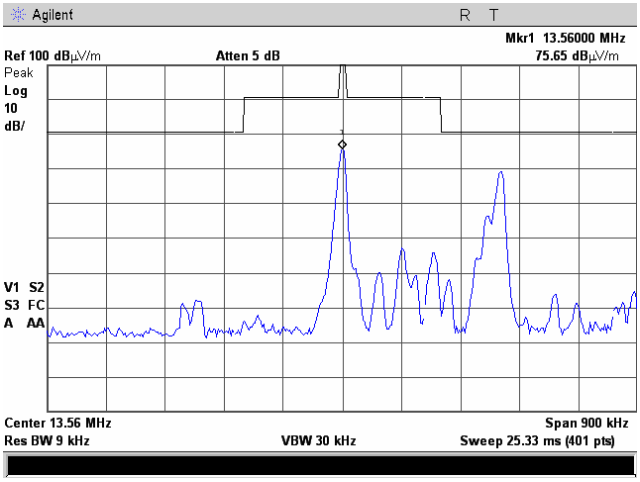


F = 13.75 MHz - 13.81 MHz: ambient noise

Test specification:	FCC sections 15.225(a) (b) (c) / RSS-210, Annex A2.6(a), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	11/24/2010		
Temperature: 23.3 ºC	Air Pressure: 1015 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.5 Fundamental emission test result

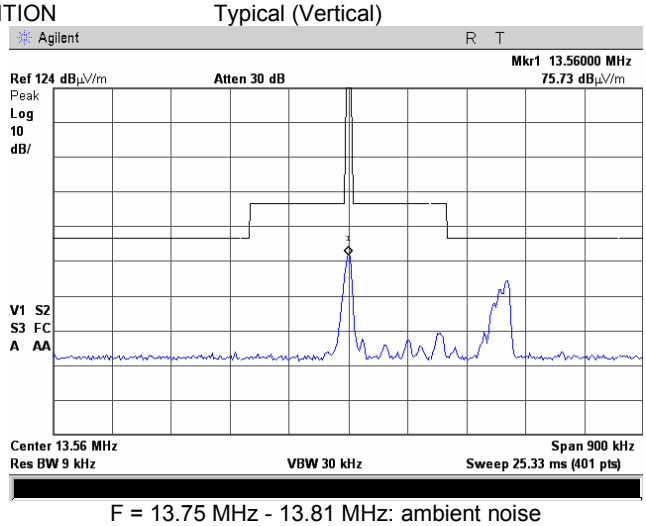
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
DETECTOR: Peak hold
EUT POSITION Typical (Vertical)
INPUT VOLTAGE: 85%Unom



F = 13.75 MHz - 13.81 MHz: ambient noise

Plot 7.1.6 In band radiated emission test results

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
DETECTOR: Peak hold
EUT POSITION Typical (Vertical)



F = 13.75 MHz - 13.81 MHz: ambient noise

Test specification:	FCC section 15.225(d) / RSS-Gen, Sections 4.9(a), 7.2.5, Out of band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/8/2011		
Temperature: 21.4 ºC	Air Pressure: 1012 hPa	Relative Humidity: 51 %	Power Supply: 120 VAC
Remarks:			

7.2 Out of band radiated emissions

7.2.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Radiated emission limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)***		
	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
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	

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

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.
***- The limit decreases linearly with the logarithm of frequency.

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

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 specified frequency range was investigated with loop antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna was rotated around its vertical axis and the measuring antenna polarization was switched from vertical to horizontal.

7.2.2.3 The worst test results (the lowest margins) were recorded in Table 7.2.2 and shown in the associated plots.

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

7.2.3.1 The EUT was set up as shown in Figure 7.2.2, energized and the performance check was conducted.

7.2.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m; its polarization was switched from vertical to horizontal.

7.2.3.3 The worst test results (the lowest margins) were recorded in Table 7.2.2 and shown in the associated plots.

Test specification:	FCC section 15.225(d) / RSS-Gen, Sections 4.9(a), 7.2.5, Out of band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/8/2011		
Temperature: 21.4 ºC	Air Pressure: 1012 hPa	Relative Humidity: 51 %	Power Supply: 120 VAC
Remarks:			

Figure 7.2.1 Radiated emissions below 30 MHz test setup

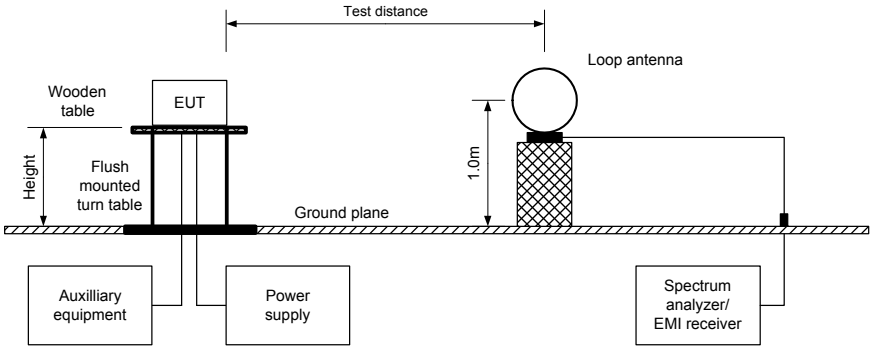
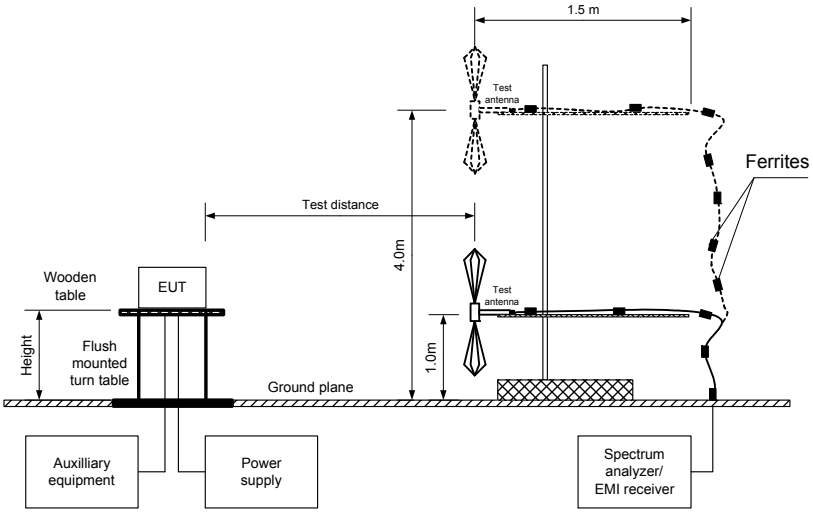


Figure 7.2.2 Radiated emissions above 30 MHz test setup



Test specification:	**FCC section 15.225(d) / RSS-Gen, Sections 4.9(a), 7.2.5, Out of band radiated emissions**		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date:	2/8/2011		
Temperature: 21.4 ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 51 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.2.2 Out of band radiated emissions test results

TEST DISTANCE: 3 m
EUT POSITION: Typical
MODULATION: FSK
MODULATING SIGNAL: ID code
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
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*				
53.7125	42.50	39.10	40.00	-0.90	Vertical	1.0	120	Pass
60.0100	45.20	39.85	40.00	-0.15	Vertical	1.0	90	
85.2800	42.10	35.10	40.00	-4.90	Vertical	1.0	90	
274.7875	51.25	45.25	46.00	-0.75	Vertical	2.5	0	
300.0500	49.60	44.20	46.00	-1.80	Vertical	1.0	180	
325.6125	45.60	39.45	46.00	-6.55	Vertical	1.0	180	

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

Reference numbers of test equipment used

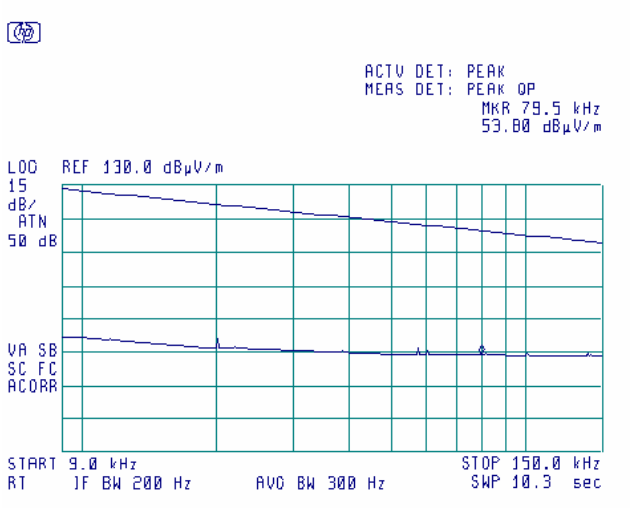
HL 0032	HL 0415	HL 0446	HL 0465	HL 0521	HL 0569	HL 0604	HL 0812
HL 1425	HL 2871	HL 3616					

Full description is given in Appendix A.

Test specification:	FCC section 15.225(d) / RSS-Gen, Sections 4.9(a), 7.2.5, Out of band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/8/2011		
Temperature: 21.4 ºC	Air Pressure: 1012 hPa	Relative Humidity: 51 %	Power Supply: 120 VAC
Remarks:			

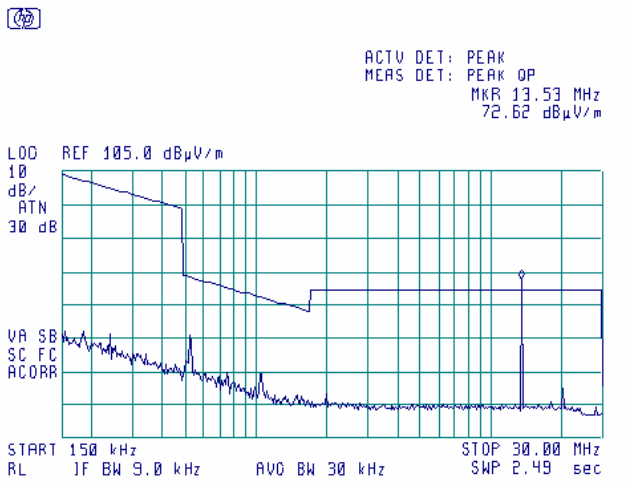
Plot 7.2.1 Radiated emission measurements from 9 to 150 kHz

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



Plot 7.2.2 Radiated emission measurements from 0.15 to 30 MHz

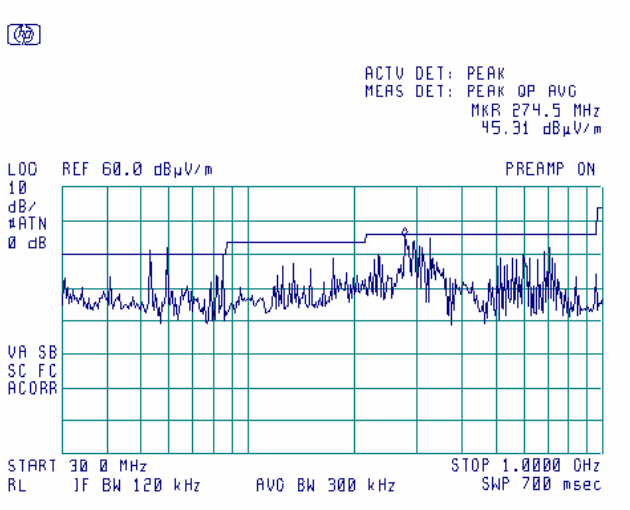
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	FCC section 15.225(d) / RSS-Gen, Sections 4.9(a), 7.2.5, Out of band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	2/8/2011		
Temperature: 21.4 ºC	Air Pressure: 1012 hPa	Relative Humidity: 51 %	Power Supply: 120 VAC
Remarks:			

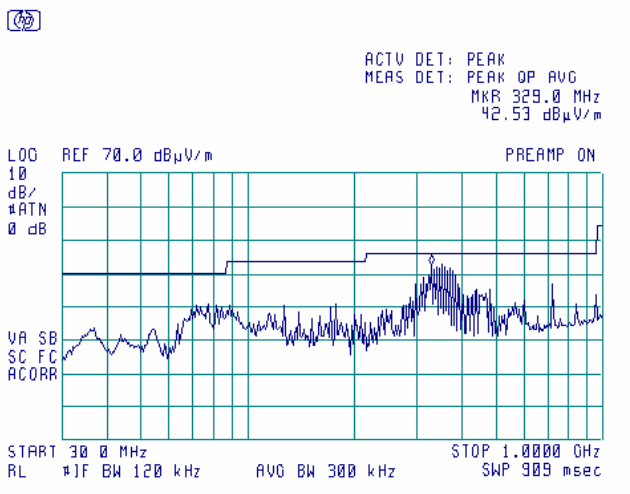
Plot 7.2.3 Radiated emission measurements from 30 to 1000 MHz

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



Plot 7.2.4 Radiated emission measurements from 30 to 1000 MHz

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



Test specification:	FCC section 15.225(e) / RSS-210, Annex A2.6, RSS-Gen, Section 7.2.6, Frequency stability		
Test procedure:	ANSI C63.4, Section 13.1.6		
Test mode:	Compliance	**Verdict:**	PASS
Date:	11/28/2010		
Temperature: 23.2 ºC	**Air Pressure:** 1015 hPa	**Relative Humidity:** 44 %	**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	
	%	Hz
13.560	± 0.01 %	1356

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.

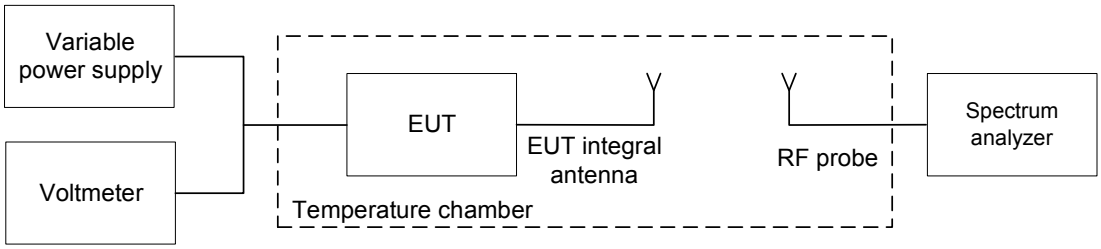
7.3.2.2 The EUT power was turned off. Temperature within test chamber was set to the required one and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.

7.3.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then after 2, 5 and 10 minutes. The EUT was powered off.

7.3.2.4 The above procedure was repeated at the rest of the test temperatures and voltages as provided in Table 7.3.2.

7.3.2.5 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:	**FCC section 15.225(e) / RSS-210, Annex A2.6, RSS-Gen, Section 7.2.6, Frequency stability**		
Test procedure:	ANSI C63.4, Section 13.1.6		
Test mode:	Compliance	**Verdict:**	PASS
Date:	11/28/2010		
Temperature: 23.2 ºC	**Air Pressure:** 1015 hPa	**Relative Humidity:** 44 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.3.2 Frequency stability test results

OPERATING FREQUENCY: 13.560 MHz
NOMINAL POWER VOLTAGE: 120 VAC
TEMPERATURE STABILIZATION PERIOD: 20 min
POWER DURING TEMPERATURE TRANSITION: Off
SPECTRUM ANALYZER MODE: Counter
RESOLUTION BANDWIDTH: 300 Hz
VIDEO BANDWIDTH: 1 kHz
MODULATION: Unmodulated

Temperature, ºC	Voltage, V	Frequency, MHz				Max frequency drift, Hz		Limit, Hz	Margin, Hz	Verdict
		Start up	2nd min	5th min	10th min	Positive	Negative			
-20	nominal	13.558711	13.558711	13.558712	13.558712	40	0	1356	-1315	Pass
20	nominal +15%	13.558671	13.558671	13.558672	13.558671	0	0		-1355	
20	nominal	13.558677	13.558672	13.558671	13.558671*	6	0		-1350	
20	nominal -15%	13.558671	13.558672	13.558672	13.558672	0	0		-1355	
50	nominal	13.558657	13.558653	13.558654	13.558653	0	-18		-1338	

* - Reference frequency

Reference numbers of test equipment used

HL 0337	HL 1461	HL 2780	HL 3286				

Full description is given in Appendix A.

Test specification:	FCC section 15.207(a) / RSS-Gen, Section 7.2.4, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	2/7/2011		
Temperature: 21.5 ºC	Air Pressure: 1010 hPa	Relative Humidity: 61 %	Power Supply: 120 VAC
Remarks:			

7.4 Conducted emissions

7.4.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.4.1. The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

Table 7.4.1 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.

7.4.2 Test procedure

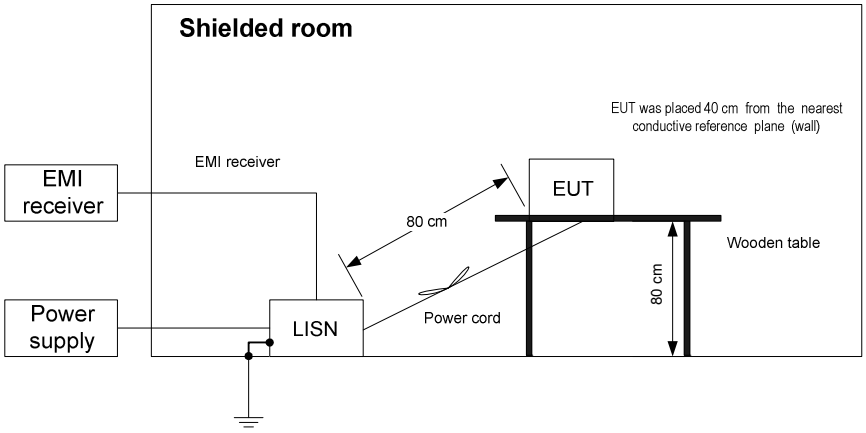
7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

7.4.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.4.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

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

Figure 7.4.1 Setup for conducted emission measurements



Test specification:	FCC section 15.207(a) / RSS-Gen, Section 7.2.4, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	2/7/2011		
Temperature: 21.5 ºC	Air Pressure: 1010 hPa	Relative Humidity: 61 %	Power Supply: 120 VAC
Remarks:			

Table 7.4.2 Conducted emission test results

LINE: AC mains
EUT OPERATING MODE: Transceive
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*		
0.5090	42.07	41.93	56.00	-14.07	41.15	46.00	-4.85	L1	Pass
3.4314	42.35	41.17	56.00	-18.83	37.38	46.00	-8.62		
6.1608	48.40	46.29	60.00	-13.71	42.40	50.00	-7.60		
7.3105	50.96	49.35	60.00	-10.65	47.45	50.00	-2.55		
7.9470	50.06	47.96	60.00	-12.04	45.56	50.00	-4.44		
9.2160	48.34	47.16	60.00	-12.84	44.94	50.00	-5.06		
0.5078	41.43	40.84	56.00	-15.16	40.55	46.00	-5.45	L2	Pass
3.5483	41.21	39.97	56.00	-16.03	37.67	46.00	-8.33		
64118	48.31	47.68	60.00	-12.32	46.83	50.00	-3.17		
6.7946	49.46	46.22	60.00	-13.78	45.31	50.00	-4.69		
7.4308	50.45	49.09	60.00	-10.91	44.02	50.00	-5.98		
7.8744	49.64	48.75	60.00	-13.25	44.53	50.00	-5.47		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

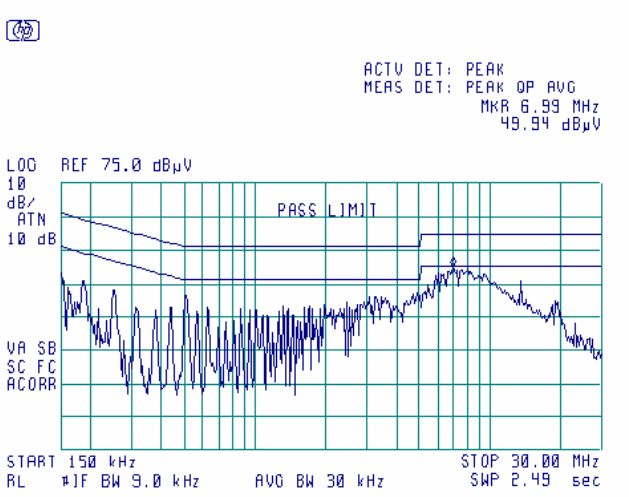
HL 0521	HL 0580	HL 0672	HL 2888	HL 3634	HL 3779		

Full description is given in Appendix A.

Test specification:	FCC section 15.207(a) / RSS-Gen, Section 7.2.4, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date:	2/7/2011		
Temperature: 21.5 ºC	Air Pressure: 1010 hPa	Relative Humidity: 61 %	Power Supply: 120 VAC
Remarks:			

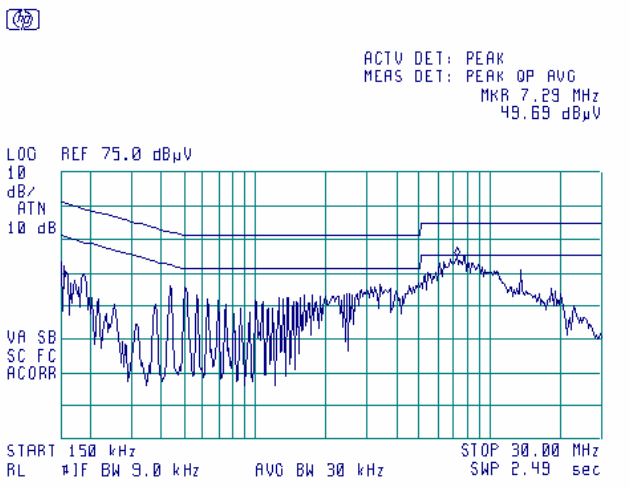
Plot 7.4.1 Conducted emission measurements

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



Plot 7.4.2 Conducted emission measurements

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



Test specification:	FCC section 15.215(c) / RSS-Gen, Section 4.6.3, Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict:	PASS
Date:	11/28/2010		
Temperature: 23.3 ºC	Air Pressure: 1018 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

7.5 Occupied bandwidth test

7.5.1 General

This test was performed to verify that the 20 dB bandwidth of the emissions was contained within the standard specified frequency band according to FCC §15.215 requirements. Specification test limits are given in Table 7.3.1.

Table 7.5.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc
13.110 – 13.410	20.0
13.410 – 13.553	
13.553 – 13.567	
13.567 – 13.710	
13.710 – 14.010	

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

7.5.2 Test procedure

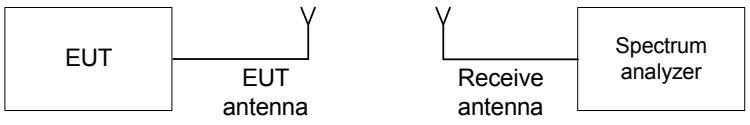
7.5.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

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 peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.5.2.3 The peak of emission was measured. The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.3.2 and associated plot.

7.5.2.4 Modulation 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 modulation bandwidth was verified to be within the allowed frequency range.

Figure 7.5.1 Occupied bandwidth test setup



Test specification:	FCC section 15.215(c) / RSS-Gen, Section 4.6.3, Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict:	PASS
Date:	11/28/2010		
Temperature: 23.3 ºC	Air Pressure: 1018 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Occupied bandwidth test results

ASSIGNED FREQUENCY BAND	13.553 – 13.567 MHz
DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	1 kHz
VIDEO BANDWIDTH:	3 kHz
MODULATION ENVELOPE REFERENCE POINTS:	20 dBc
MODULATION:	FSK
MODULATING SIGNAL:	ID code

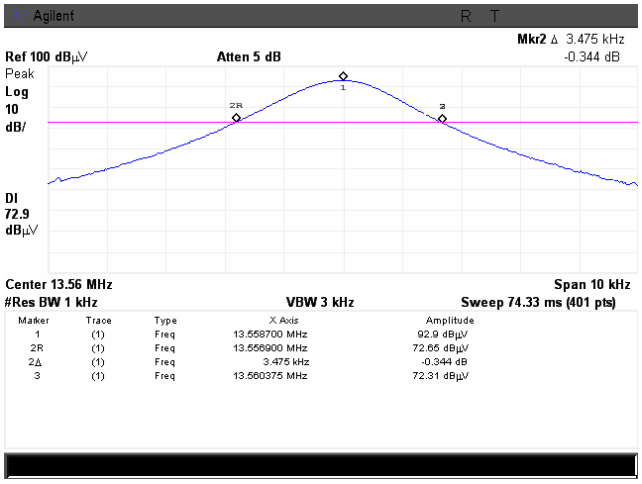
Band edge	Cross point frequency, MHz	Frequency drift, kHz		Modulation band edge, MHz	Assigned band edge, MHz	Verdict
		Negative	Positive			
Low	13.556900	18	NA	13.556882	13.553	Pass
High	13.560375	NA	41	13.560416	13.567	Pass

Reference numbers of test equipment used

HL 0337	HL 2000	HL 2909						

Full description is given in Appendix A.

Plot 7.5.1 Occupied bandwidth test result



Test specification:	FCC section 15.203 / RSS-Gen, Section 7.1.2, Antenna requirement		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date:	11/28/2010		
Temperature: 23.3 ºC	Air Pressure: 1018 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

7.6 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 7.6.1.

Table 7.6.1 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	

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./Check	Due Cal./Check
0032	Antenna, Biconical, 20 - 200 MHz	Electro-Metrics	BIA 25/30	3577	17-Jan-11	17-Jan-12
0337	Probe Set, Hand held, 5 probes	Electro-Metrics	EHFP-30	238	08-Jun-10	08-Jun-11
0415	Cable, Coax, RF, RG-214	Hermon Laboratories	CC-3	056	01-Dec-10	01-Dec-11
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-10	29-Jun-11
0465	Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m	Hermon Laboratories	AC - 1	023	16-Sep-10	16-Sep-11
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	25-Aug-10	25-Aug-11
0569	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1953	11-Jun-10	11-Jun-11
0580	DC block adaptor 10 kHz - 2.2 GHz	Anritsu	MA8601 A	580	23-Nov-10	23-Nov-11
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-11	11-Jan-12
0672	Shielded Room 4,6(L) x 4,2(W) x 2,4(H) m	Hermon Laboratories	SR - 3	027	10-Nov-10	10-Nov-11
0812	Cable Coax, RG-214, 11.5 m, N-type connectors	Hermon Laboratories	C214-11	148	01-Dec-10	01-Dec-11
1425	EMI Receiver, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3710A002 22, 3705A002 04	24-Aug-10	24-Aug-11
1461	Cable, 1 m	Harbour Industries	MIL17/60-RG142	1461	01-Jan-11	01-Jan-12
2000	Cable RF, 20.4 m, BNC/BNC	Alpha Wire	RG-58C/U	123	01-Sep-10	01-Sep-11
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	07-Jul-10	07-Jul-11
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	14-Sep-10	14-Sep-11
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	07-Jul-10	07-Jul-11
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-10	07-May-11
3286	Temperature Chamber, (-50 to +170) °C	Thermotron	EL-8-CH-1-1-CO2	21-9048	12-Sep-10	12-Sep-11
3616	Cable RF, 6.5 m, N type-N type, DC-6.5 GHz	Suhner Switzerland	Rg 214/U	NA	27-May-10	27-May-11
3634	Cable RF, 5.5 m, N type-N type, DC-6.5 GHz	Alpha Wire	RG 214/U	NA	27-May-10	27-May-11
3779	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	NA	31-Aug-10	31-Aug-11

9 APPENDIX B 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 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) and approved by Israel Ministry of environmental protection, radiation hazards department (Permit number 1158). The FCC Designation Number is US1003.

Address: P.O. Box 23, Binyamina 30500, Israel.
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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

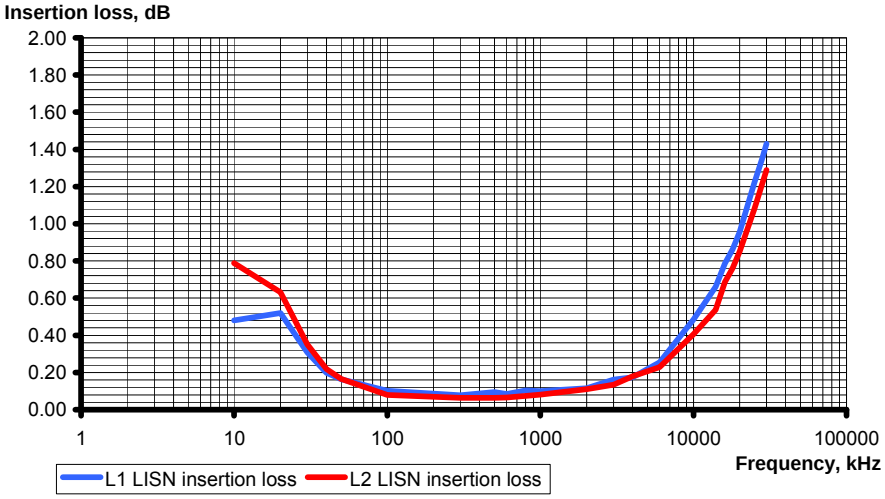
10 APPENDIX C Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	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
μs	microsecond
NA	not applicable
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
s	second
W	width

11 APPENDIX D Test equipment correction factors

Correction factor
Line impedance stabilization network
Model NNB-2/16Z, Rolf Heine, HL 2888

Frequency, kHz	Insertion loss,dB		Measurement Uncertainty, dB
	L1	N	
10	0.48	0.79	±0.6
20	0.52	0.63	
30	0.31	0.35	
40	0.20	0.22	
50	0.16	0.17	
100	0.10	0.08	
300	0.08	0.06	
500	0.10	0.06	
600	0.09	0.07	
800	0.10	0.07	
1000	0.10	0.08	
2000	0.12	0.11	
3000	0.16	0.14	
4000	0.17	0.18	
6000	0.26	0.23	
10000	0.49	0.41	
14000	0.66	0.54	
16000	0.79	0.69	
18000	0.86	0.76	
20000	0.96	0.85	
25000	1.22	1.08	
28000	1.35	1.21	
30000	1.43	1.29	



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

Biconical antenna factor

Electro-Metrics, model BIA-25/30, serial number 3577

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
20	15.1	115	16.7
25	14.6	120	14.1
30	13.7	125	13.1
35	11.8	130	13.0
40	11.4	135	12.9
45	11.7	140	12.7
50	11.4	145	12.5
55	10.5	150	14.3
60	10.3	155	14.8
65	8.9	160	14.7
70	7.6	165	15.1
75	7.3	170	15.6
80	7.3	175	16.5
85	7.8	180	16.7
90	9.4	185	17.3
95	10.6	190	17.9
100	11.8	195	17.6
105	12.5	200	17.9
110	13.7		

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 1953

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
200	15.2	625	25.2
225	15.1	650	25.8
250	16.3	675	27.2
275	17.2	700	27.6
300	19.6	725	27.6
325	18.4	750	27.6
350	19.0	775	28.0
375	20.0	800	28.2
400	20.9	825	29.4
425	21.3	850	29.9
450	22.1	875	30.0
475	22.7	900	30.4
500	23.2	925	30.6
525	23.9	950	30.8
550	24.2	975	31.6
575	24.6	1000	32.1
600	24.7		

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).

Cable loss
Cable Coaxial, RG-58/RG-214, s/n 056, HL 0415
+ Cable Coaxial, RG-214, 11.5m, s/n 148, HL 0812

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	20	0.73	±0.12
2	30	0.91	
3	50	1.2	
4	80	1.56	
5	100	1.76	
6	200	2.59	
7	300	3.26	
8	400	3.93	
9	500	4.42	
10	600	4.92	
11	700	5.36	
12	800	5.88	
13	900	6.41	
14	1000	6.71	
15	1500	8.63	
16	2000	10.39	

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

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

Cable loss
Cable coaxial, RG-214/U, N type-N type, 6.5 m
Suhner Switzerland, HL 3616

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	1750	2.66	3550	4.44	5350	6.08
30	0.25	1800	2.72	3600	4.46	5400	6.12
50	0.32	1850	2.78	3650	4.59	5450	6.17
100	0.48	1900	2.81	3700	4.60	5500	6.25
150	0.60	1950	2.86	3750	4.72	5550	6.31
200	0.71	2000	2.94	3800	4.72	5600	6.35
250	0.81	2050	2.97	3850	4.86	5650	6.41
300	0.91	2100	3.01	3900	4.85	5700	6.50
350	1.00	2150	3.06	3950	4.99	5750	6.52
400	1.07	2200	3.11	4000	4.90	5800	6.57
450	1.14	2250	3.16	4050	5.04	5850	6.61
500	1.23	2300	3.21	4100	5.01	5900	6.71
550	1.30	2350	3.26	4150	5.10	5950	6.70
600	1.37	2400	3.31	4200	5.08	6000	6.75
650	1.44	2450	3.35	4250	5.18	6050	6.74
700	1.50	2500	3.39	4300	5.14	6100	6.84
750	1.58	2550	3.46	4350	5.22	6150	6.87
800	1.64	2600	3.48	4400	5.21	6200	6.93
850	1.69	2650	3.55	4450	5.29	6250	6.96
900	1.77	2700	3.59	4500	5.31	6300	7.02
950	1.79	2750	3.66	4550	5.39	6350	7.04
1000	1.87	2800	3.68	4600	5.41	6400	7.10
1050	1.92	2850	3.75	4650	5.49	6450	7.11
1100	1.98	2900	3.79	4700	5.52	6500	7.19
1150	2.05	2950	3.86	4750	5.60		
1200	2.09	3000	3.89	4800	5.64		
1250	2.15	3050	3.94	4850	5.73		
1300	2.21	3100	3.98	4900	5.70		
1350	2.27	3150	4.03	4950	5.73		
1400	2.33	3200	4.06	5000	5.75		
1450	2.38	3250	4.12	5050	5.83		
1500	2.44	3300	4.14	5100	5.82		
1550	2.48	3350	4.22	5150	5.91		
1600	2.52	3400	4.24	5200	5.92		
1650	2.56	3450	4.31	5250	5.98		
1700	2.62	3500	4.35	5300	6.01		

Cable loss
Cable RF, RG-214/U, 5.5 m, N type-N type, DC-6.5 GHz
Alpha Wire, HL 3634

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	3500	3.48
50	0.25	3600	3.60
100	0.37	3700	3.63
200	0.56	3800	3.72
300	0.71	3900	3.81
400	0.85	4000	3.90
500	0.97	4100	3.95
600	1.08	4200	3.99
700	1.19	4300	4.10
800	1.28	4400	4.13
900	1.38	4500	4.25
1000	1.48	4600	4.28
1100	1.57	4700	4.43
1200	1.65	4800	4.43
1300	1.74	4900	4.55
1400	1.81	5000	4.59
1500	1.90	5100	4.66
1600	1.97	5200	4.76
1700	2.06	5300	4.82
1800	2.14	5400	4.91
1900	2.23	5500	4.97
2000	2.32	5600	5.07
2100	2.39	5700	5.11
2200	2.47	5800	5.22
2300	2.55	5900	5.28
2400	2.61	6000	5.38
2500	2.70	6100	5.45
2600	2.77	6200	5.55
2700	2.84	6300	5.63
2800	2.94	6400	5.73
2900	3.00	6500	5.81
3000	3.10		
3100	3.15		
3200	3.28		
3300	3.31		
3400	3.42		

12 APPENDIX E 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: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Occupied bandwidth	± 8.0 %
Radiated emissions at 10 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 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
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

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.
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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.

13 APPENDIX F Specification references

47CFR part 15: 2009	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 8: 2010	Low Power Licence- Exempt Radiocommunication Devices
RSS-Gen Issue 3: 2010	General Requirements and Information for the Certification of Radiocommunication Equipment

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