

Hermon Laboratories Ltd.
Harakevet Industrial Zone, Binyamina 30500,
Israel
Tel. +972-4-6288001
Fax. +972-4-6288277
E-mail: mail@hermonlabs.com

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 15 Subpart C, section 15.225 and subpart B

FOR:

On Track Innovations Ltd.

Card reader

Model:SCI6100M

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.



Table of contents

1	Applicant information	3
2	Equipment under test attributes	3
3	Manufacturer information	3
4	Test details	3
5	Tests summary	4
6	EUT description	5
6.1	General information	5
6.2	Ports and lines	5
6.3	Support and test equipment	5
6.4	Operating frequencies	5
6.5	Changes made in the EUT	5
6.6	Test configuration	6
6.7	Transmitter characteristics	7
7	Transmitter tests according to 47CFR part 15 subpart C requirements	8
7.1	In band radiated emissions	8
7.2	Out of band radiated emissions	14
7.3	Frequency stability test	19
7.4	Conducted emissions	21
7.5	Occupied bandwidth	25
8	Emission tests according to 47CFR part 15 subpart B requirements	27
8.1	Conducted emissions	27
8.2	Radiated emission measurements	31
9	APPENDIX A Test equipment and ancillaries used for tests	36
10	APPENDIX B Measurement uncertainties	37
11	APPENDIX C Test laboratory description	38
12	APPENDIX D Specification references	38
13	APPENDIX E Test equipment correction factors	39
14	APPENDIX F Abbreviations and acronyms	45

1 Applicant information

Client name: On Track Innovations Ltd.
Address: P.O.B. 32, ZHR Industrial Zone, Rosh Pina 12000, Israel
Telephone: +972 4686 8000
Fax: +972 4693 8887
E-mail: h_itay@otiglobal.com
Contact name: Mr. Hemy Itay

2 Equipment under test attributes

Product name: Card reader
Product type: Transceiver
Model(s): SCI6100M
Serial number: 99300F49A0
Hardware version: V1.1
Receipt date 7/28/2008

3 Manufacturer information

Manufacturer name: On Track Innovations Ltd.
Address: P.O.B. 32, ZHR Industrial Zone, Rosh Pina 12000, Israel
Telephone: +972 4686 8000
Fax: +972 4693 8887
E-Mail: h_itay@otiglobal.com
Contact name: Mr. Hemy Itay

4 Test details




Project ID: 18966
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 7/28/2008
Test completed: 9/02/2008
Test specification(s): FCC Part 15, subpart C, §15.225; subpart B

5 Tests summary

Test	Status
Transmitter characteristics	
Sections 15.225(a) (b) (c), In band radiated emissions	Pass
Sections 15.225(d), Out of band radiated emissions	Pass
Section 15.225(e), Frequency stability	Pass
Section 15.207(a), Conducted emission	Pass
Unintentional emissions	
Section 15.107, Conducted emission at AC power port	Pass
Section 15.109, Radiated emission	Pass

Testing was completed against all relevant requirements of the test standard.
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:OTIRAD_FCC.18966.

	Name and Title	Date	Signature
Tested by:	Mr.E. Plotnichenko, test engineer	September 28, 2008	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	October 6, 2008	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	October 7, 2008	



6 EUT description

6.1 General information

The product is a smart card reader designed for contactless (proximity transceiver 13.56 MHz) payment and loyalty applications. The device is powered from 6 VDC.

6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length
		From	To				
Power	DC power	EUT	DC power supply	Terminal block	1	unshielded	0.2 m
Signal	USB	EUT	Laptop	USB	1	shielded	0.5 m
Signal	USB	Laptop	Mouse	USB	1	shielded	1.5 m
Power	DC power	Laptop	Adapter	DC jack	1	unshielded	1.5 m
Power	AC power	Adapter	mains	IEC 60320	1	unshielded	0.8 m

6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	Dell	Latitude D420	NA
Mouse	Microsoft	V1.1.A	2806113-7
DC power supply	TTi	PL330	227031
AC/DC adapter	Dell	DA65NS0-00	CN-OCF745

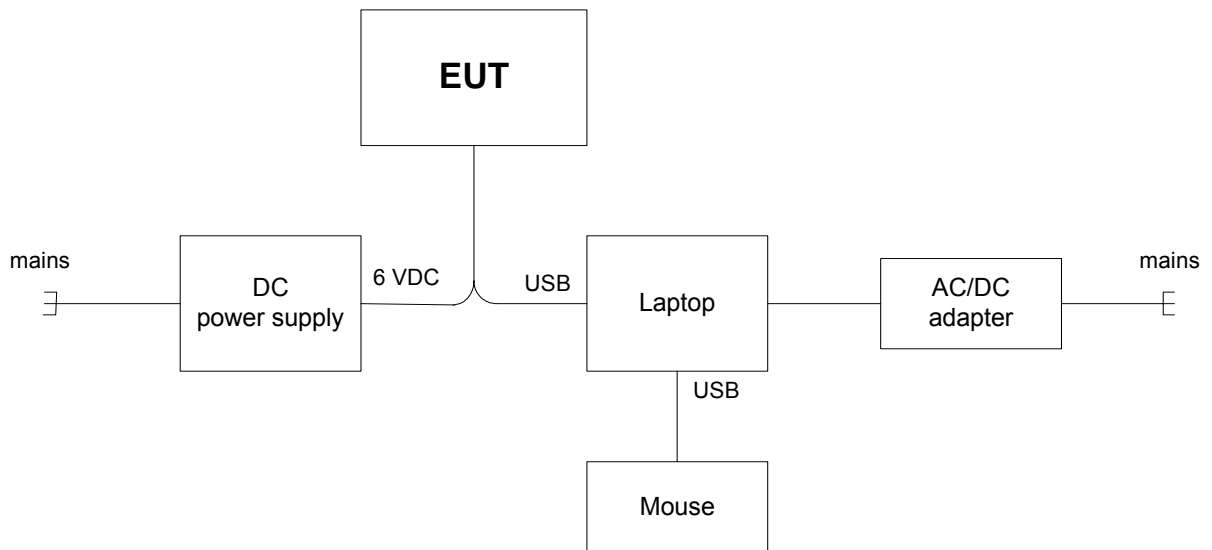
6.4 Operating frequencies

Source	Frequency, MHz
Controller SCR	13.56
Laptop CPU	1200
Controller	14.7456

6.5 Changes made in the EUT

No changes were implemented.

6.6 Test configuration





6.7 Transmitter characteristics

Type of equipment					
	Stand-alone (Equipment with or without its own control provisions)				
V	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			
V	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		13.110-14.01 MHz			
Operating frequency		13.56 MHz			
RF channel spacing		NA			
		Equivalent isotropically radiated power			0.05 mW
Is transmitter output power variable?		V	No		
			Yes	continuous variable	
				stepped variable with stepsize	dB
				minimum RF power	dBm
				maximum RF power	dBm
Antenna connection					
V	unique coupling	standard connector	integral	with temporary RF connector	
				without temporary RF connector	
Antenna/s technical characteristics					
Type	Manufacturer	Model number	Gain		
Loop	On Track Innovations	NA	NA		
Type of modulation		ASK			
Type of multiplexing		TDMA			
Maximum transmitter duty cycle in normal use		90 %			
Transmitter duty cycle supplied for test		90 %			
Transmitter power source					
	Battery	Nominal rated voltage	VDC	Battery type	
V	DC	Nominal rated voltage	5 VDC (for test purposes 6 VDC supplied)		
	AC mains	Nominal rated voltage	VAC	Frequency	Hz
Common power source for transmitter and receiver		V	yes	no	

Test specification:		Sections 15.225(a) (b) (c), In band radiated emissions	
Test procedure:		ANSI C63.4, Sections 5.3 and 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:53:37 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C 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:

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

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

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 EUT was tested in 3 orthogonal positions.

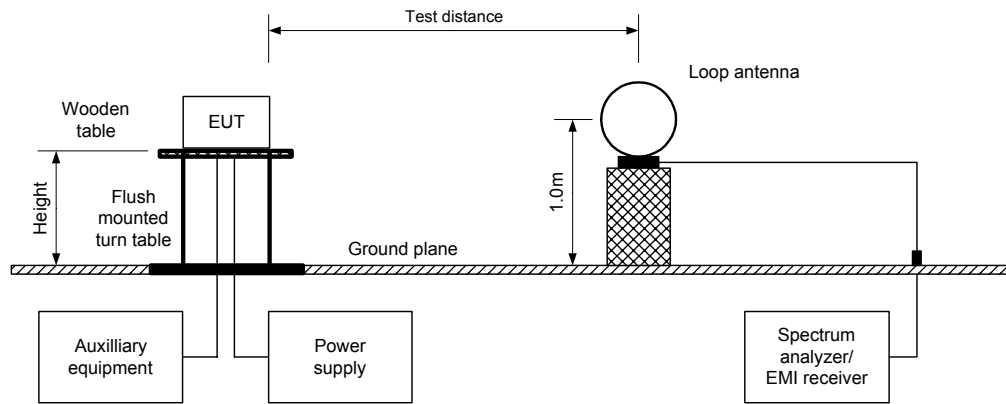
7.1.2.3 The specified frequency range was investigated with loop antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna was rotated around its vertical axis and the measuring antenna polarization was switched from vertical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

7.1.2.4 The worst test results (the lowest margins) were found in the EUT X-axis position, recorded in Table 7.1.2 and shown in the associated plots.

7.1.2.5 The test was repeated at ±15% change of power supply voltage outside the semianechoic chamber. The test results were recorded in Table 7.1.2 and shown in the associated plots.

Test specification:		Sections 15.225(a) (b) (c), In band radiated emissions	
Test procedure:		ANSI C63.4, Sections 5.3 and 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:53:37 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
Remarks:			

Figure 7.1.1 Setup for in band radiated emission measurements





Test specification:		Sections 15.225(a) (b) (c), In band radiated emissions	
Test procedure:		ANSI C63.4, Sections 5.3 and 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:53:37 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
Remarks:			

Table 7.1.2 In band radiated emission test results

TEST SITE: Semianechoic chamber
 TEST DISTANCE: 3 m
 EUT POSITION: 3 orthogonal (X / Y / Z)
 MODULATION: ASK
 MODULATING SIGNAL: NA
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 INVESTIGATED FREQUENCY RANGE: 13.110 – 14.010 MHz
 RESOLUTION BANDWIDTH: 9.0 kHz
 VIDEO BANDWIDTH: 30.0 kHz

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*			
13.560	82.92	82.15	124.0	-31.85	Vertical	0	Pass

The recorded result was obtained in the EUT X-axis position.

TEST SITE: Outside the semianechoic chamber

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*			
Equivalent measuring @ 6 VDC							
13.560	52.69	52.55	NA	NA	NA	NA	NA
Equivalent measuring @ 5 VDC							
13.560	50.51	50.41	NA	NA	NA	NA	NA
Equivalent measuring @ 5.75 VDC							
13.560	51.99	51.85	NA	NA	NA	NA	NA
Equivalent measuring @ 4.25 VDC							
13.560	49.42	49.25	NA	NA	NA	NA	NA

The recorded result was obtained in the EUT X-axis position.

*- Margin = Measured emission - specification limit.

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

NOTE: the worst case in respect to the field strength of carrier is 6 VDC power supply voltage (as it was measured in the chamber).

Reference numbers of test equipment used

HL 0465	HL 0521	HL 1947	HL 3123				
---------	---------	---------	---------	--	--	--	--

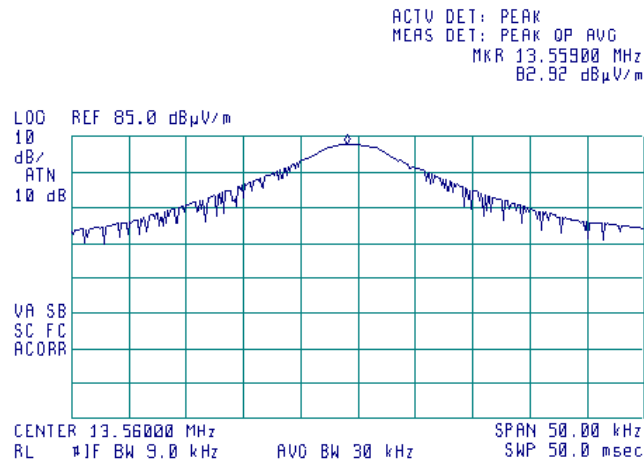
Full description is given in Appendix A.

Test specification:	Sections 15.225(a) (b) (c), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:53:37 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
Remarks:			

Plot 7.1.1 Fundamental emission test result

TEST SITE: Semi anechoic chamber
 TEST DISTANCE: 3 m
 DETECTOR: Peak hold
 EUT POSITION: X (as worst from 3 orthogonal positions)

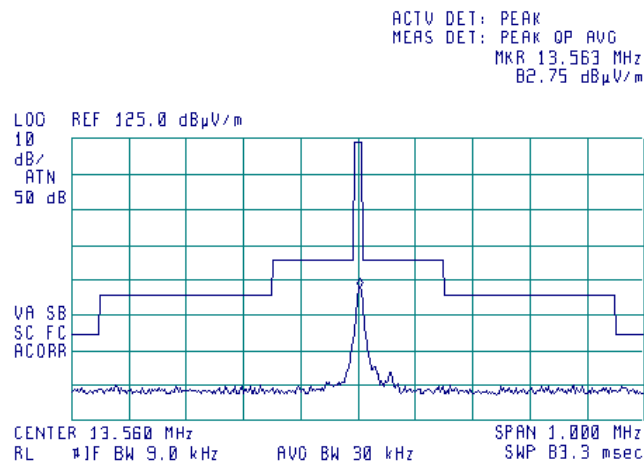
13:07:56 JUL 29, 2008



Plot 7.1.2 In band radiated emission test results

TEST SITE: Semi anechoic chamber
 TEST DISTANCE: 3 m
 DETECTOR: Peak hold
 EUT POSITION: X (as worst from 3 orthogonal positions)

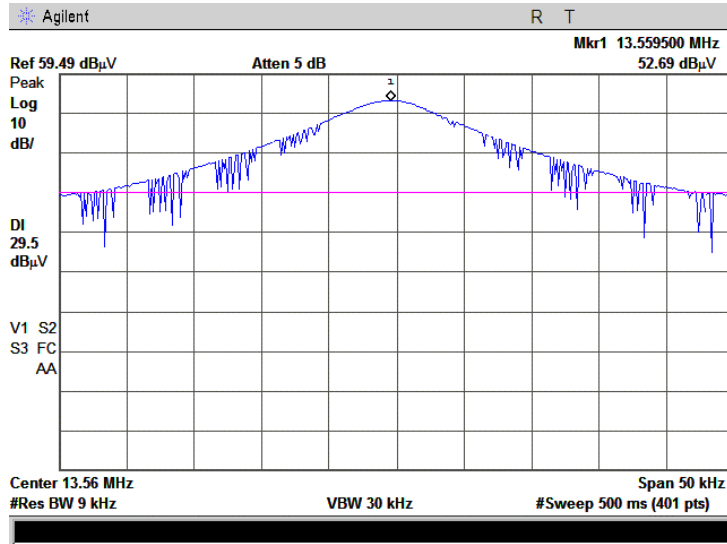
12:24:14 JUL 29, 2008



Test specification:	Sections 15.225(a) (b) (c), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:53:37 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
Remarks:			

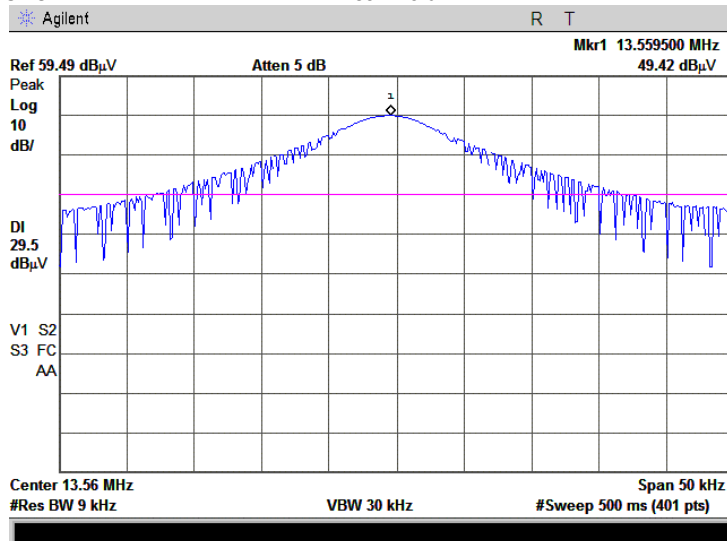
Plot 7.1.3 Field strength of carrier reference test result measured outside the semianechoic chamber

POWER SUPPLY VOLTAGE: 6 VDC
DETECTOR: Peak hold



Plot 7.1.4 Field strength of carrier at extreme voltage test result measured outside the semianechoic chamber

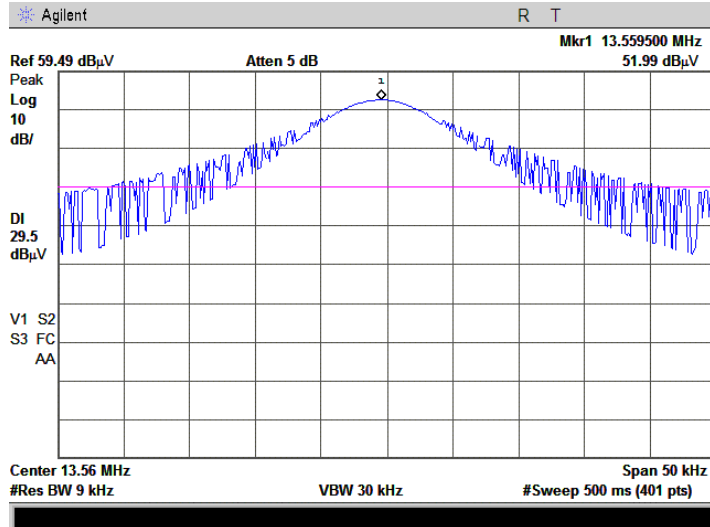
POWER SUPPLY VOLTAGE: 4.25 VDC
DETECTOR: Peak hold



Test specification:	Sections 15.225(a) (b) (c), In band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:53:37 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
Remarks:			

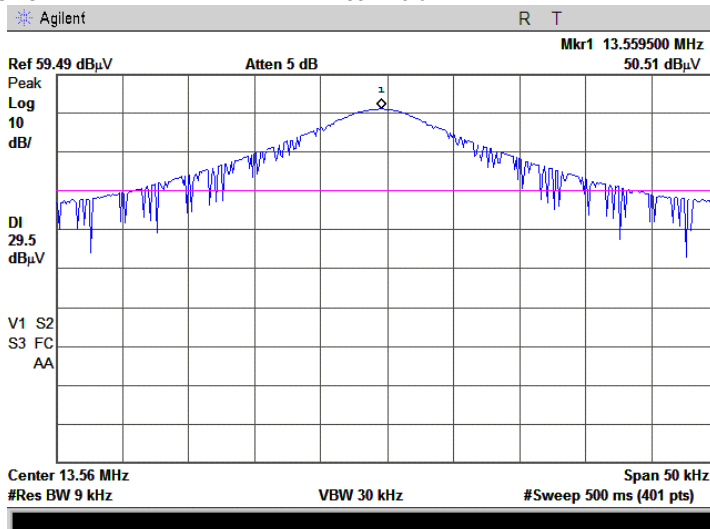
Plot 7.1.5 Field strength of carrier at extreme voltage test result measured outside the semianechoic chamber

POWER SUPPLY VOLTAGE: 5.75 VDC
DETECTOR: Peak hold



Plot 7.1.6 Field strength of carrier at nominal voltage test result measured outside the semianechoic chamber

POWER SUPPLY VOLTAGE: 5 VDC
DETECTOR: Peak hold



Test specification:		Sections 15.225(d), Out of band radiated emissions	
Test procedure:		ANSI C63.4, Sections 5.3 and 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:55:12 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
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:

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

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

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

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°, 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°, 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: Sections 15.225(d), Out of band radiated emissions			
Test procedure: ANSI C63.4, Sections 5.3 and 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date & Time: 7/29/2008 1:55:12 PM			
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
Remarks:			

Figure 7.2.1 Radiated emissions below 30 MHz test set up

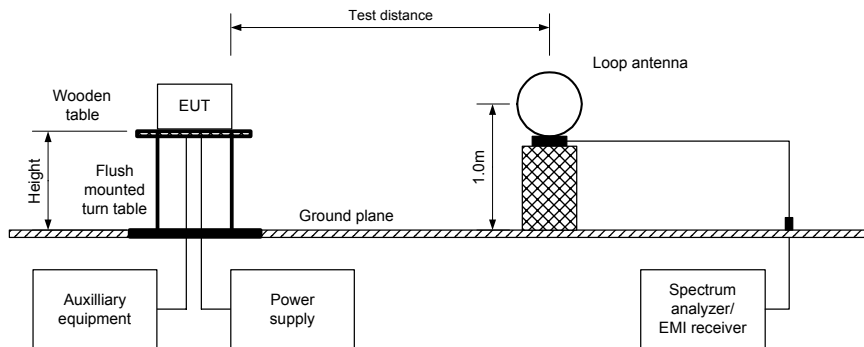
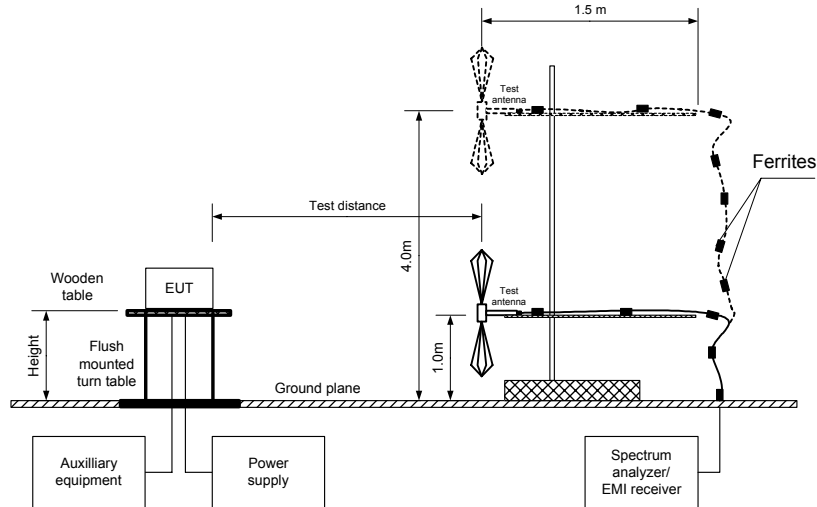


Figure 7.2.2 Radiated emissions above 30 MHz test set up





Test specification:		Sections 15.225(d), Out of band radiated emissions	
Test procedure:		ANSI C63.4, Sections 5.3 and 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:55:12 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
Remarks:			

Table 7.2.2 Out of band radiated emissions test results

TEST DISTANCE: 3 m
 EUT POSITION: X-axis
 MODULATION: ASK
 MODULATING SIGNAL: NA
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 RESOLUTION BANDWIDTH: 1 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*				
60.005000	34.54	27.60	40.00	-12.40	Vertical	1.0	0	Pass
72.005000	37.37	34.64	40.00	-5.36	Vertical	1.0	0	
365.296250	43.77	40.21	46.00	-5.79	Vertical	1.0	0	
431.987500	45.67	42.35	46.00	-3.65	Vertical	1.0	330	
499.639500	41.95	39.05	46.00	-6.95	Vertical	1.0	0	
566.029200	44.87	42.18	46.00	-3.82	Vertical	1.0	0	
779.078750	38.01	36.18	46.00	-9.82	Horizontal	1.0	30	
839.026250	37.69	35.11	46.00	-10.89	Horizontal	1.0	330	

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

Reference numbers of test equipment used

HL 0465	HL 0521	HL 0604	HL 1947	HL 2432	HL 3123		
---------	---------	---------	---------	---------	---------	--	--

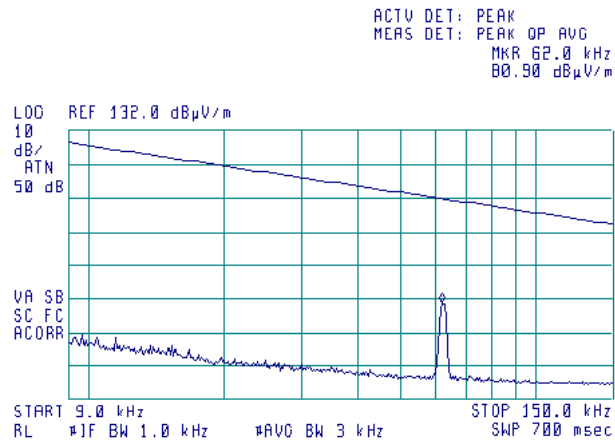
Full description is given in Appendix A.

Test specification:	Sections 15.225(d), Out of band radiated emissions		
Test procedure:	ANSI C63.4, Sections 5.3 and 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	7/29/2008 1:55:12 PM		
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
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
 DETECTOR: Peak hold

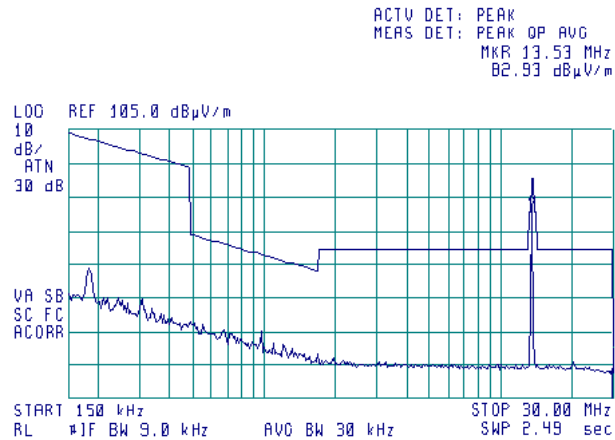
13:57:43 JUL 29, 2008



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
 DETECTOR: Peak hold

13:48:20 JUL 29, 2008





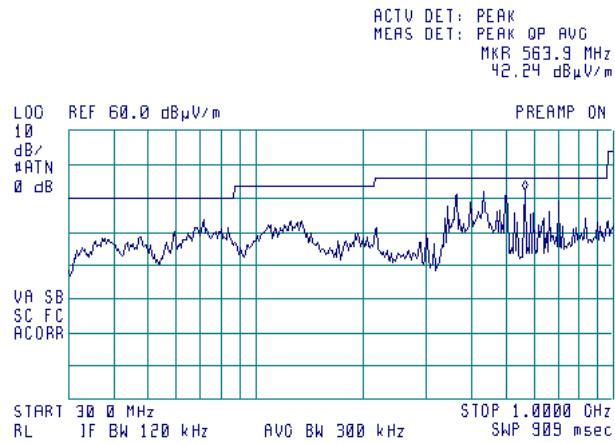
HERMON LABORATORIES

Test specification: Sections 15.225(d), Out of band radiated emissions			
Test procedure: ANSI C63.4, Sections 5.3 and 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date & Time: 7/29/2008 1:55:12 PM			
Temperature: 20°C	Air Pressure: 1010 hPa	Relative Humidity: 43%	Power Supply: 6 VDC
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
 DETECTOR: Peak hold

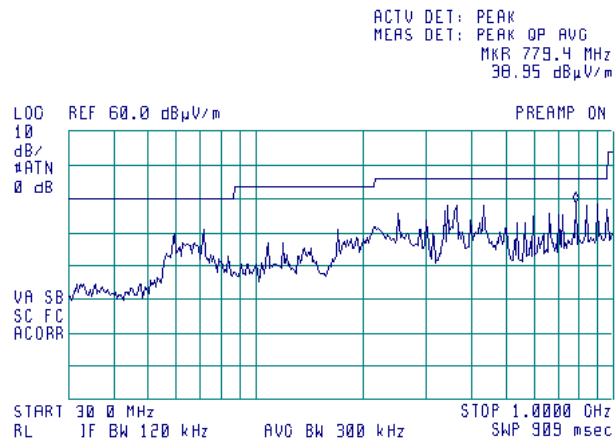
09:46:55 JUL 29, 2008



Plot 7.2.4 Radiated emission measurements from 30 to 1000 MHz

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

09:53:47 JUL 29, 2008



Test specification:		Section 15.225(e), Frequency stability	
Test procedure:		ANSI C63.4, Section 13.1.6	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/24/2008 4:35:40 PM		
Temperature: 23°C	Air Pressure: 1012 hPa	Relative Humidity: 54%	Power Supply: 6 VDC
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.

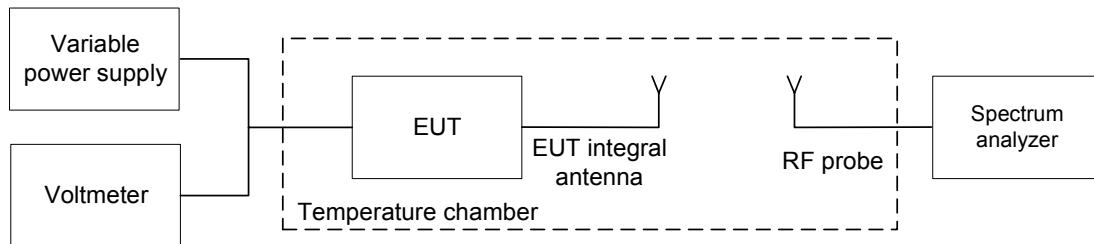
Table 7.3.1 Frequency stability limits

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:		Section 15.225(e), Frequency stability	
Test procedure:		ANSI C63.4, Section 13.1.6	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/24/2008 4:35:40 PM		
Temperature: 23°C	Air Pressure: 1012 hPa	Relative Humidity: 54%	Power Supply: 6 VDC
Remarks:			

Table 7.3.2 Frequency stability test results

OPERATING FREQUENCY: 13.560 MHz
 NOMINAL POWER VOLTAGE: 5 VDC
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 SPECTRUM ANALYZER MODE: Counter
 RESOLUTION BANDWIDTH: 0.1 kHz
 VIDEO BANDWIDTH: 1 kHz
 MODULATION: Unmodulated

Temperature °C	Voltage, V	Frequency, MHz				Max frequency drift, Hz		Limit, Hz	Margin Hz	Verdict
		Start up	2 nd min	5 th min	10 th min	Positive	Negative			
-20	nominal	13.559615	13.559621	13.559621	13.559620	141	0	1356	1215	Pass
20	nominal +15%	13.559521	13.559502	13.559500	13.559498	41	0		1315	
20	nominal	13.559495	13.559482	13.559478	13.559480*	15	2		1341	
20	nominal -15%	13.559461	13.559456	13.559456	13.559457	0	23		1333	
50	nominal	13.559478	13.559445	13.559440	13.559438	0	42		1314	

* - Reference frequency

Reference numbers of test equipment used

HL 0493	HL 1454	HL 3001					
---------	---------	---------	--	--	--	--	--

Full description is given in Appendix A.

Test specification:		Section 15.207(a), Conducted emission	
Test procedure:		ANSI C63.4, Section 13.1.3	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2008 9:30:20 AM		
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	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.

Table 7.4.1 Limits for conducted emissions

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

* The limit decreases linearly with the logarithm of frequency.

7.4.2 Test procedure

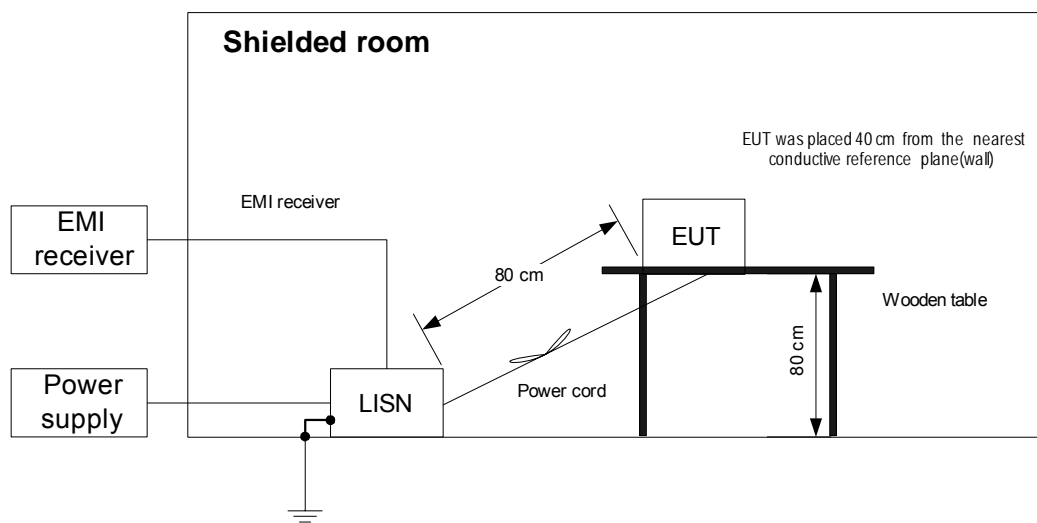
7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

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 (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

Figure 7.4.1 Setup for conducted emission measurements, table-top equipment





HERMON LABORATORIES

Test specification: Section 15.207(a), Conducted emission			
Test procedure: ANSI C63.4, Section 13.1.3			
Test mode: Compliance	Verdict: PASS		
Date & Time: 8/25/2008 9:30:20 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

Table 7.4.2 Conducted emission test results

LINE: EUT power port
 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*		
0.170125	35.14	26.85	65.02	-38.17	5.62	55.02	-49.40	L1	Pass
13.559870	42.16	41.69	60.00	-18.31	39.81	50.00	-10.19		
27.110548	21.89	19.75	60.00	-40.20	13.05	50.00	-36.95		
21.480843	32.32	29.16	60.00	-30.84	24.39	50.00	-25.61		
0.158870	35.95	26.88	65.57	-38.69	4.30	55.57	-51.27	L2	Pass
13.558905	45.00	44.61	60.00	-15.39	43.10	50.00	-6.90		
21.483145	29.64	26.26	60.00	-33.74	20.91	50.00	-29.09		
27.104395	22.29	18.79	60.00	-41.21	12.90	50.00	-37.10		

*- Margin = Measured emission - specification limit.

LINE: Laptop 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*		
0.197821	55.86	52.74	63.74	-11.00	40.39	53.74	-13.35	L1	Pass
0.261331	48.46	44.25	61.44	-17.19	31.75	51.44	-19.69		
0.330588	41.96	36.95	59.49	-22.54	25.18	49.49	-24.31		
0.395610	38.32	34.03	57.95	-23.92	26.59	47.95	-21.36		
0.458775	35.68	33.14	56.77	-23.63	23.08	46.77	-23.69		
13.559195	37.12	35.83	60.00	-24.17	34.74	50.00	-15.26	L2	Pass
0.195705	55.15	52.19	63.82	-11.63	40.30	53.82	-13.52		
0.263554	47.52	43.12	61.38	-18.26	32.66	51.38	-18.72		
0.326625	41.05	36.42	59.58	-23.16	29.45	49.58	-20.13		
0.392730	39.07	36.34	58.01	-21.67	28.10	48.01	-19.91		
0.525060	33.64	31.10	56.00	-24.90	24.05	46.00	-21.95		
13.558830	36.33	35.18	60.00	-24.82	34.08	50.00	-15.92		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

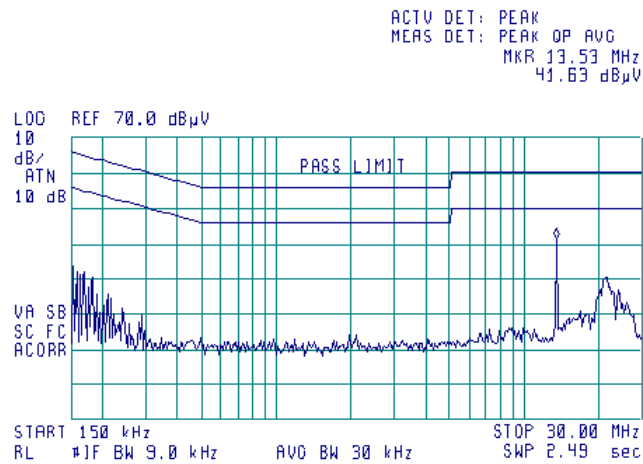
HL 0.447	HL 0521	HL 0580	HL 1003	HL 2924		
----------	---------	---------	---------	---------	--	--

Full description is given in Appendix A.

Test specification: Section 15.207(a), Conducted emission			
Test procedure: ANSI C63.4, Section 13.1.3			
Test mode: Compliance	Verdict: PASS		
Date & Time: 8/25/2008 9:30:20 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

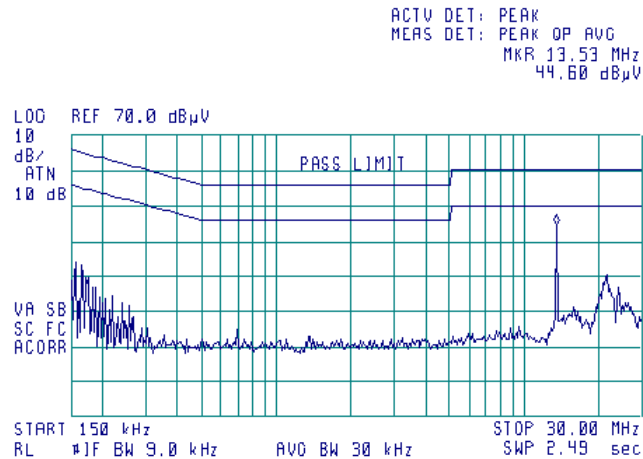
Plot 7.4.1 Conducted emission measurements at the EUT power port

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



Plot 7.4.2 Conducted emission measurements at the EUT power port

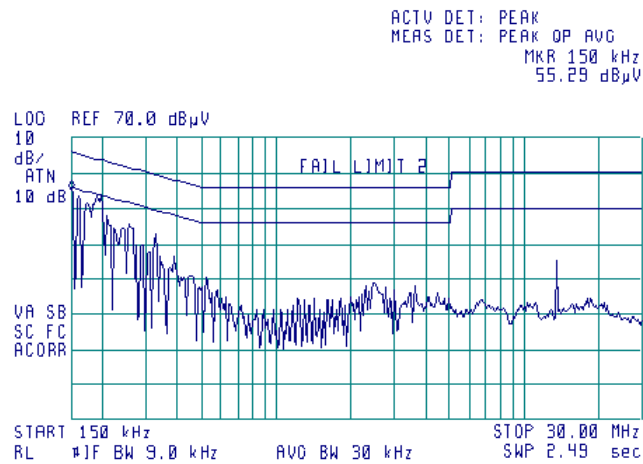
LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2008 9:30:20 AM		
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

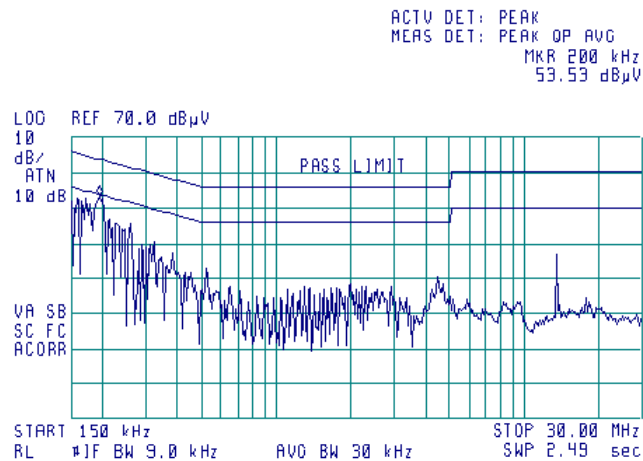
Plot 7.4.3 Conducted emission measurements at the laptop power port

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



Plot 7.4.4 Conducted emission measurements on the laptop power port

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



Test specification:		Section 15.215, Occupied bandwidth	
Test procedure:		ANSI C63.4, Section 13.1.7	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	9/28/2008 6:00 PM		
Temperature: 24°C	Air Pressure: 1008 hPa	Relative Humidity: 55%	Power Supply: 6 VDC
Remarks:			

7.5 Occupied bandwidth

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. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Modulation bandwidth limits

Assigned frequency band, MHz	Emission bandwidth limit, dB
13.11 – 14.01	20

7.5.2 Test procedure

- 7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and the performance check was conducted.
- 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 frequency of modulation envelope points at which power level drops below 20 dB level was measured.
- 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.
- 7.5.2.5 The test results were recorded in Table 7.5.2 and shown in the associated plot.

Figure 7.5.1 Range of modulation bandwidth measurements



Test specification:	Section 15.215, Occupied bandwidth		
Test procedure:	ANSI C63.4, Section 13.1.7		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	9/28/2008 6:00 PM		
Temperature: 24°C	Air Pressure: 1008 hPa	Relative Humidity: 55%	Power Supply: 6 VDC
Remarks:			

Table 7.5.2 Range of modulation bandwidth test results

ASSIGNED FREQUENCY RANGE: 13.11 – 14.01 MHz
 DETECTOR USED: Peak hold
 RESOLUTION BANDWIDTH: 9 kHz
 VIDEO BANDWIDTH: 30 kHz
 MODULATION: AM
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

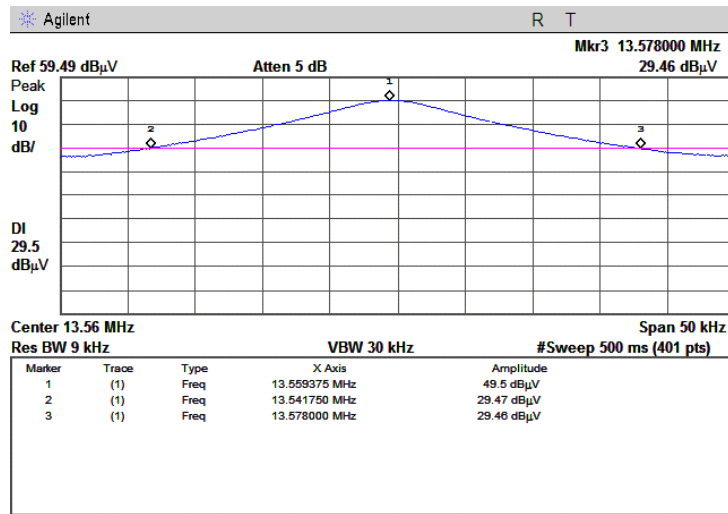
Band edge	Cross point frequency, MHz	Frequency drift, kHz		Modulation band edge, MHz	Assigned band edge, MHz	Verdict
		Negative	Positive			
Low	13.54175	42	NA	13.541708	13.11000	Pass
High	13.57800	NA	141	13.578142	14.01000	Pass

Reference numbers of test equipment used

HL 1461	HL 3001					
---------	---------	--	--	--	--	--

Full description is given in Appendix A.

Plot 7.5.1 The 20 dB bandwidth



The 20 dB bandwidth is 13.57800 – 13.541750 = 0.03625MHz = 36.25 kHz

Assigned frequency band is 14.01 – 13.11 = 0.9 MHz = 900 kHz.

Test specification:		Section 15.107, Conducted emission at AC power port	
Test procedure:		ANSI C63.4, Sections 11.5 and 12.1.3	
Test mode:	Evaluation	Verdict:	PASS
Date & Time:	8/25/2008 9:04:37 AM		
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

8 Emission tests according to 47CFR part 15 subpart B requirements

8.1 Conducted emissions

8.1.1 General

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

Table 8.1.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μ V)		Class A limit, dB(μ 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

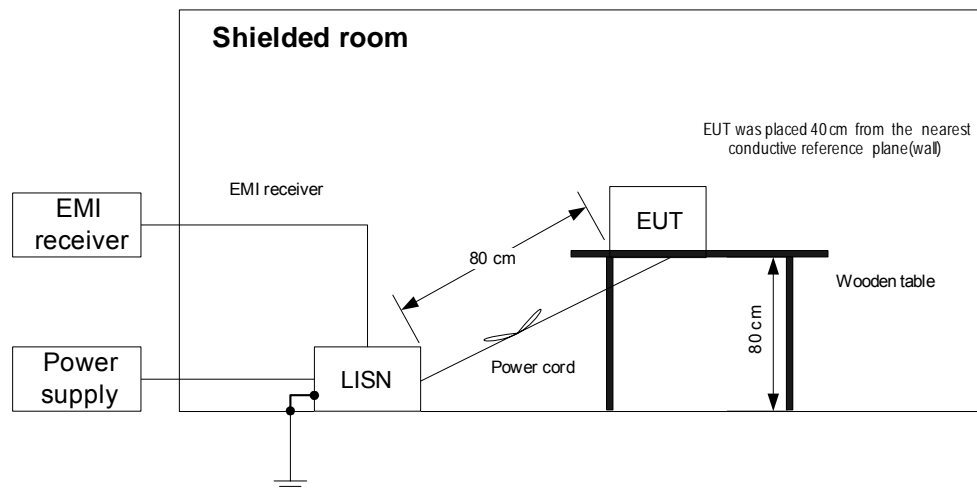
8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and the performance check was conducted.

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.

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





Test specification: Section 15.107, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Evaluation	Verdict: PASS		
Date & Time: 8/25/2008 9:04:37 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

Table 8.1.2 Conducted emission test results

LINE: EUT power port
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*		
All found emissions were at least 20 dB below the average limit								L1	Pass
								L2	

*- Margin = Measured emission - specification limit.

Table 8.1.3 Conducted emission test results

LINE: Laptop 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*		
0.195371	54.69	52.19	63.83	-11.64	39.91	53.83	-13.92	L1	Pass
0.260312	47.74	43.43	61.48	-18.05	30.80	51.48	-20.68		
0.326460	42.25	38.27	59.58	-21.31	26.44	49.58	-23.14		
0.392085	36.88	34.26	58.02	-23.76	27.27	48.02	-20.75		
0.457865	35.45	32.53	56.79	-24.26	22.79	46.79	-24.00		
0.526340	31.74	26.12	56.00	-29.88	23.34	46.00	-22.66		
0.196189	55.56	52.41	63.80	-11.39	40.53	53.80	-13.27	L2	Pass
0.261499	47.60	43.44	61.44	-18.00	33.05	51.44	-18.39		
0.330260	41.28	35.21	59.49	-24.28	28.27	49.49	-21.22		
0.392730	39.14	36.45	58.01	-21.56	28.02	48.01	-19.99		
0.458305	33.15	29.62	56.78	-27.16	26.32	46.78	-20.46		
4.522465	31.61	26.86	56.00	-29.14	20.20	46.00	-25.80		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

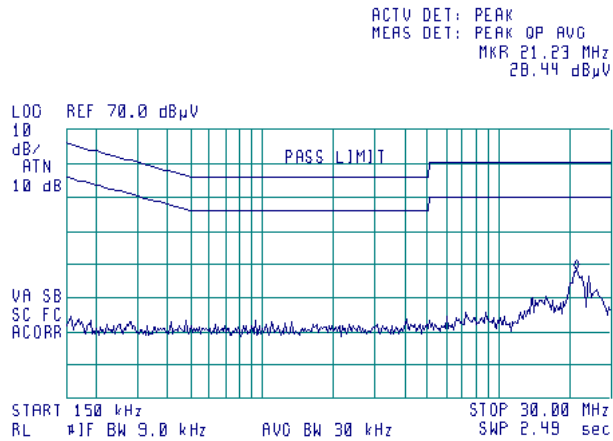
HL 0447	HL 0521	HL 0580	HL 1003	HL 2924			
---------	---------	---------	---------	---------	--	--	--

Full description is given in Appendix A.

Test specification: Section 15.107, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Evaluation	Verdict: PASS		
Date & Time: 8/25/2008 9:04:37 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

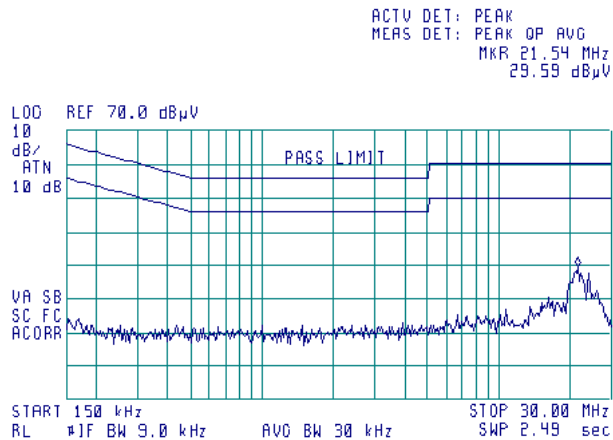
Plot 8.1.1 Conducted emission measurements at the EUT power port

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



Plot 8.1.2 Conducted emission measurements at the EUT power port

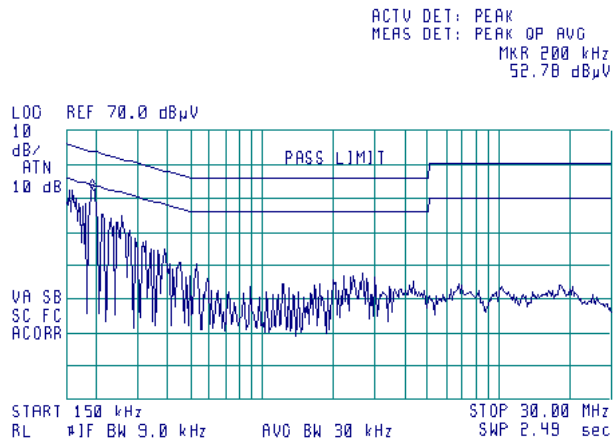
LINE: L2
LIMIT: Class B
EUT OPERATING MODE: Receive / Stand-by
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification: Section 15.107, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Evaluation	Verdict: PASS		
Date & Time: 8/25/2008 9:04:37 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

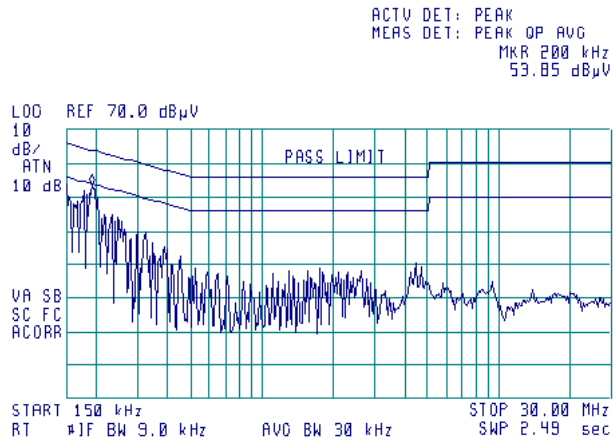
Plot 8.1.3 Conducted emission measurements at the laptop power port

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



Plot 8.1.4 Conducted emission measurements at the laptop power port

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



Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance		Verdict: PASS	
Date & Time: 8/25/2008 9:40:45 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

8.2 Radiated emission measurements

8.2.1 General

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

Table 8.2.1 Radiated emission test limits

Frequency, MHz	Class B limit, dB(μV/m)		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.

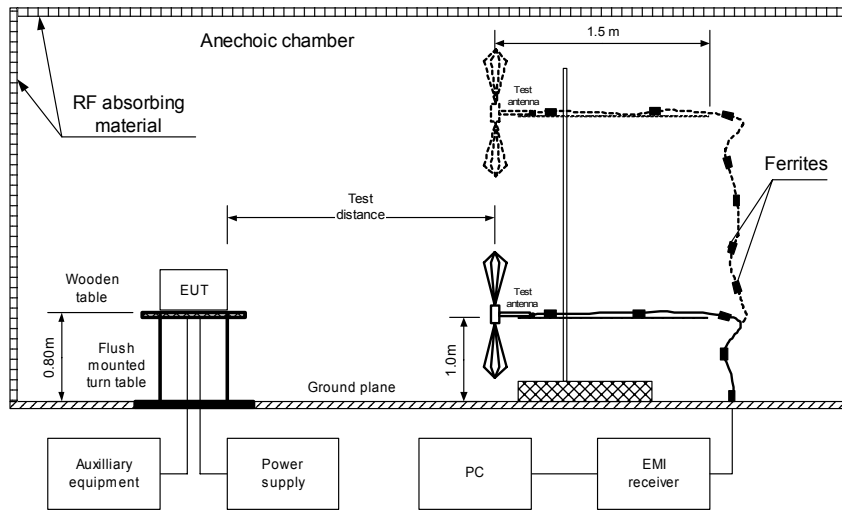
8.2.2 Test procedure for measurements in semi-anechoic chamber

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

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

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

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





HERMON LABORATORIES

Test specification:		Section 15.109, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	8/25/2008 9:40:45 AM		
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Receive / Stand-by
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
72.005000	37.37	34.64	40.00	-5.36	Vertical	1.0	0	Pass
365.296250	43.77	40.21	46.00	-5.79	Vertical	1.1	0	
431.987500	45.67	42.35	46.00	-3.65	Vertical	1.0	330	
499.639500	41.95	39.05	46.00	-6.95	Vertical	1.0	0	
566.029200	44.87	42.18	46.00	-3.82	Vertical	1.0	0	
779.078750	38.01	36.18	46.00	-9.82	Horizontal	1.0	30	

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 – 6000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
1063.03250	48.03	26.40	54.00	-27.60	Vertical	1.0	45	Pass
1242.05000	46.89	25.84	54.00	-28.16	Vertical	1.0	60	
1329.86500	56.42	25.25	54.00	-28.75	Vertical	1.0	0	
1593.95500	57.64	24.50	54.00	-29.50	Vertical	1.0	45	

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

Reference numbers of test equipment used

HL 0465	HL 0521	HL 0604	HL 1947	HL 2432	HL 3123		
---------	---------	---------	---------	---------	---------	--	--

Full description is given in Appendix A.



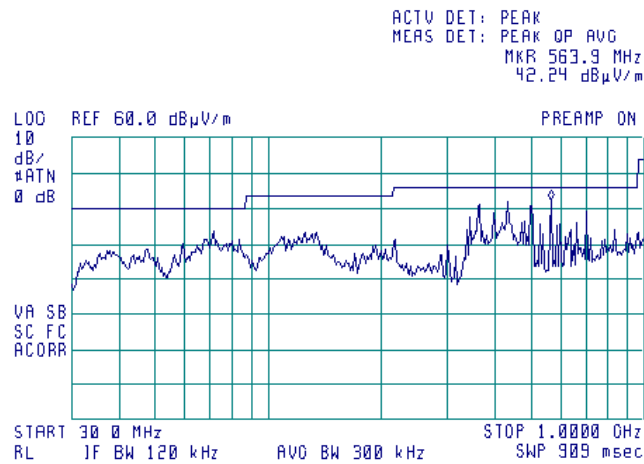
HERMON LABORATORIES

Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance	Verdict: PASS		
Date & Time: 8/25/2008 9:40:45 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

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

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

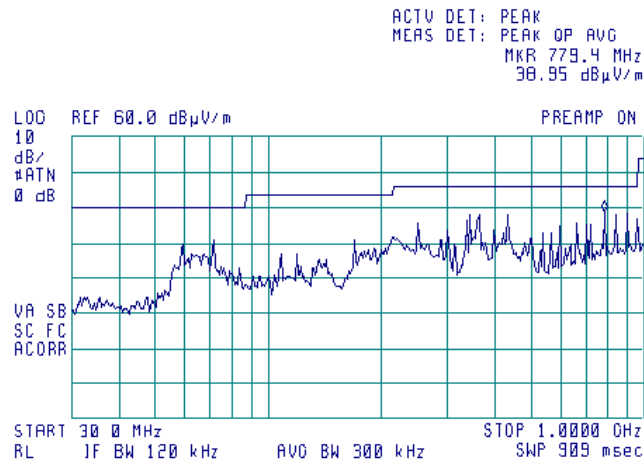
09:46:55 JUL 29, 2008



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

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

09:53:47 JUL 29, 2008

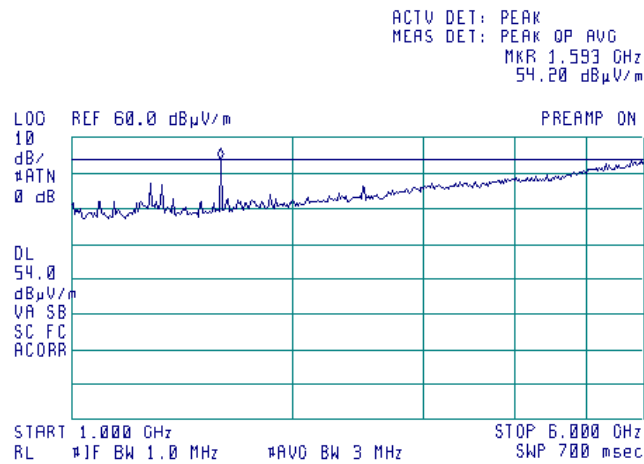


Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance	Verdict: PASS		
Date & Time: 8/25/2008 9:40:45 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

Plot 8.2.3 Radiated emission measurements above 1000 MHz, vertical antenna polarization, VBW=3 MHz

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

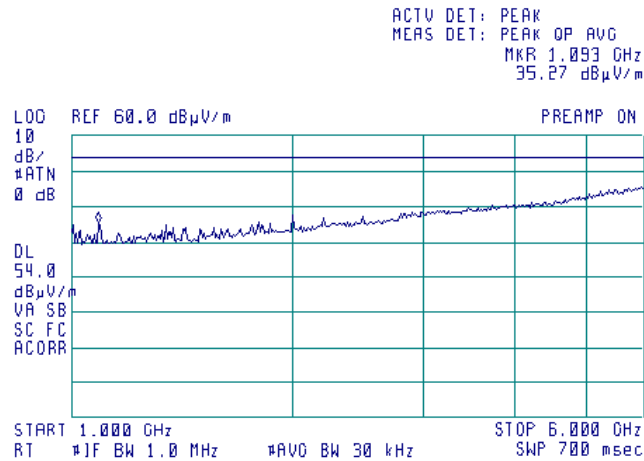
11:12:09 JUL 29, 2008



Plot 8.2.4 Radiated emission measurements above 1000 MHz, vertical antenna polarization, VBW=30 kHz

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

11:29:54 JUL 29, 2008

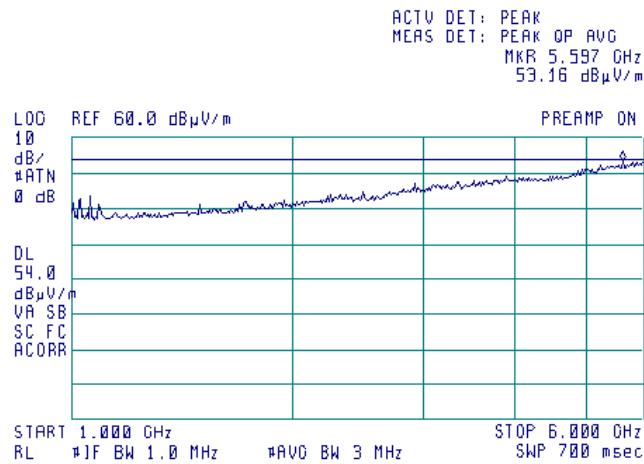


Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance	Verdict: PASS		
Date & Time: 8/25/2008 9:40:45 AM			
Temperature: 23°C	Air Pressure: 1014 hPa	Relative Humidity: 52%	Power Supply: 120 VAC
Remarks:			

Plot 8.2.5 Radiated emission measurements above 1000 MHz, horizontal antenna polarization, VBW=3 MHz

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

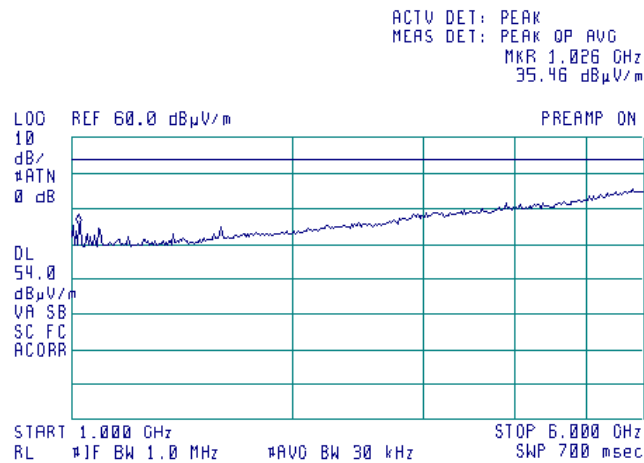
11:34:57 JUL 29, 2008



Plot 8.2.6 Radiated emission measurements above 1000 MHz, horizontal antenna polarization, VBW=30 kHz

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

11:32:46 JUL 29, 2008



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	03-Nov-07	03-Nov-08
0446	Antenna, Loop active, 10 kHz-30 MHz	EMCO	6502	2857	29-Jun-08	29-Jun-09
0465	Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m	Hermon Laboratories	AC - 1	023	27-Oct-06	27-Oct-09
0493	Temperature Chamber -45...175 deg C	Thermotron	S-1.2 Mini-Max	14016	19-May-08	19-May-09
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard Co	8546A	3617A 00319, 3448A002 53	29-Aug-08	29-Aug-09
0580	DC block adaptor 10 kHz - 2.2 GHz	Anritsu	MA8601 A	580	21-Nov-07	21-Nov-08
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-Jan-08	10-Jan-09
1003	Cable Coaxial, M17/164, 10 m	Hermon Laboratories	C17164-10	161	04-Sep-08	04-Sep-09
1451	Cable, 1.5 m	Harbour Industries	MIL 17/60-RG142	1451	03-Sep-08	03-Sep-09
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	05-Oct-07	05-Oct-08
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	03-Mar-08	03-Mar-09
2924	Line Impedance Stabilization Network (LISN), 50Ohm/50 uH+50Ohm, 25 A, 2 lines,STD: MIL-461E,CISPR 16-1	Electro-Metrics	FCC VDE 25-2	1178	16-Jun-08	16-Jun-09
3001	EMC Analyzer, 9 kHz to 3 GHz	Agilent Technologies	E7402A	US39440180	22-Nov-07	22-Nov-08
3123	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3123	13-Dec-07	13-Dec-08

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: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
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.

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 2186-1 for OATS and IC 2186-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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

Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

47CFR part 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

13 APPENDIX E Test equipment correction factors

Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories, HL 0447

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

**Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604**

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

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

**Antenna factor
Double-ridged guide horn antenna
Model 3115, serial number: 00027177, HL 2432**

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

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

Cable loss
Cable coaxial, M17/164, model: C17164-10, s/n 161, HL 1003

No.	Frequency, MHz	Cable loss, dB	Tolerance, dB	Measurement uncertainty, dB
1	30	0.41	≤ 12.5	±0.12
2	50	0.52		
3	100	0.75		
4	300	1.45		
5	500	2.01		
6	800	2.71		
7	1000	3.14		
8	1200	3.56		
9	1400	3.93		
10	1600	4.31		
11	1800	4.63		
12	2000	4.97		
13	2200	5.32		
14	2400	5.65		
15	2600	6.01		
16	2800	6.42		
17	3000	6.76	≤ 12.5	±0.12
18	3300	7.12		
19	3600	7.53		
20	3900	7.95		
21	4200	8.32		
22	4500	8.72		
23	4800	9.14		±0.17
24	5100	9.59		
25	5400	10.00		
26	5700	10.49		
27	6000	11.07		
28	6500	11.80		

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
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3123

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10.0	0.11	3600	1.97	7400	3.12	11200	3.90	15100	4.74
30	0.17	3700	1.97	7500	3.13	11300	3.93	15200	4.70
50	0.25	3800	2.03	7600	3.16	11400	3.88	15300	4.73
100	0.32	3900	2.04	7700	3.18	11500	3.87	15400	4.78
200	0.46	4000	2.10	7800	3.20	11600	3.90	15500	4.75
300	0.58	4100	1.97	7900	3.23	11700	3.86	15600	4.76
400	0.65	4200	1.97	8000	3.25	11800	3.88	15700	4.75
500	0.74	4300	2.03	8100	3.26	11900	3.86	15800	4.78
600	0.82	4400	2.04	8200	3.28	12000	3.89	15900	4.79
700	0.89	4500	2.10	8300	3.31	12100	3.94	16000	4.73
800	0.95	4600	1.97	8400	3.31	12200	3.92	16100	4.78
900	1.01	4700	1.97	8500	3.32	12300	3.96	16200	4.84
1000	1.07	4800	2.03	8600	3.34	12400	4.01	16300	4.90
1100	1.11	4900	2.04	8700	3.35	12500	4.07	16400	4.87
1200	1.17	5000	2.10	8800	3.37	12600	4.08	16500	4.90
1300	1.22	5100	2.53	8900	3.39	12700	4.17	16600	4.98
1400	1.27	5200	2.55	9000	3.42	12800	4.26	16700	5.05
1500	1.29	5300	2.60	9100	3.43	12900	4.16	16800	5.04
1600	1.35	5400	2.61	9200	3.51	13000	4.21	16900	5.02
1700	1.40	5500	2.64	9300	3.52	13100	4.24	17000	5.09
1800	1.44	5600	2.70	9400	3.54	13200	4.27	17100	5.07
1900	1.51	5700	2.67	9500	3.63	13300	4.31	17200	5.10
2000	1.49	5800	2.71	9600	3.61	13400	4.33	17300	5.13
2100	1.55	5900	2.74	9700	3.71	13500	4.25	17400	5.23
2200	1.58	6000	2.80	9800	3.66	13600	4.27	17500	5.21
2300	1.62	6100	2.79	9900	3.77	13700	4.33	17600	5.22
2400	1.72	6200	2.81	10000	3.75	13800	4.33	17700	5.36
2500	1.76	6300	2.83	10100	3.77	13900	4.31	17800	5.35
2600	1.78	6400	2.86	10200	3.80	14000	4.30	17900	5.45
2700	1.80	6500	2.88	10300	3.79	14100	4.30	18000	5.43
2800	1.86	6600	2.90	10400	3.87	14200	4.31		
2900	1.90	6700	2.92	10500	3.83	14300	4.37		
3000	1.90	6800	2.98	10600	3.88	14400	4.35		
3100	1.97	6900	2.98	10700	3.86	14600	4.53		
3200	1.97	7000	3.00	10800	3.87	14700	4.50		
3300	2.03	7100	3.02	10900	3.90	14800	4.62		
3400	2.04	7200	3.04	11000	3.84	14900	4.65		
3500	2.10	7300	3.06	11100	3.88	15000	4.79		

14 APPENDIX F Abbreviations and acronyms

A	ampere
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(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
dB Ω	decibel referred to one Ohm
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NB	narrow band
NT	not tested
OATS	open area test site
Ω	Ohm
PCB	printed circuit board
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere
WB	wideband

END OF DOCUMENT