HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.209

FOR:

Elpas Solutions Ltd.
Desk-Top reader with USB interface
Model: RDR-PXT (USB)
FCC ID:O4X3-63290

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1 Applicant information

Client name:	Elpas Solutions Ltd.
Address:	23 Habarzel street, Tel Aviv 69710, Israel
Telephone:	+972 3768 1421
Fax:	+972 3768 1415
E-mail:	MErenkrantz@tycoint.com
Contact name:	Mr. Meir Erenkrantz

2 Equipment under test attributes

Product name:	Desk-top reader with USB interface
Product type:	Transmitter
Model(s):	RDR-PXT (USB)
Serial number:	3-6329-0
Hardware version:	C30
Software release:	1
Receipt date	8/11/2013

3 Manufacturer information

Manufacturer name:	Visonic Ltd.
Address:	24 Habarzel street, Tel Aviv 69710, Israel
Telephone:	+972 3768 1421
Fax:	+972 3768 1415
E-Mail:	MErenkrantz@tycoint.com
Contact name:	Mr. Meir Erenkrantz

4 Test details

Project ID:	24724
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	8/11/2013
Test completed:	8/14/2013
Test specification(s):	FCC 47CFR part 15, subpart C, §15.209

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.209, Field strength of emissions	Pass
Section 15.207(a), Conducted emission	Pass
Section 15.203, 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:	Mrs. E. Pitt, test engineer	August 14, 2013	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	September 1, 2013	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	October 2, 2013	

6 EUT description

6.1 General information

The EUT, model RDR-PXT (USB) is a proximity reader, designed for batch enrollment of proximity keys in the PC using a USB port. The EUT comprises a transmitter operating at 125 kHz with ASK type of modulation.

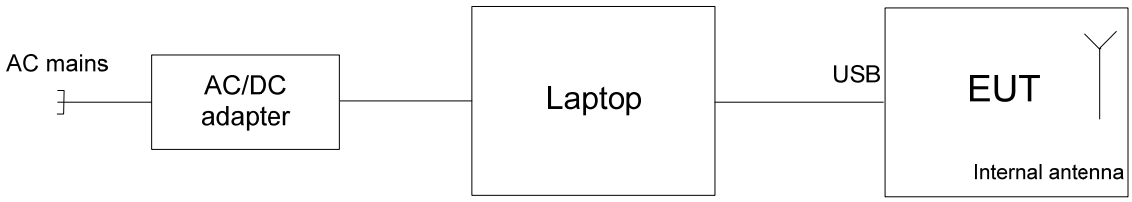
6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Power	AC	AC mains	AC/DC adapter		Unshielded	1
Power	DC	AC/DC adapter	Laptop	1	Unshielded	1
Signal	USB	PDR-PXT USB	Laptop	1	Unshielded	1

6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
AC/DC adaptor (4 CE)	Dell	LA65NSO-00	E85D
Laptop	DELL	LATITUDE D400	DD6RD

6.4 Test configuration



6.5 Changes made in EUT

No changes were performed in the EUT during testing.

Test specification:	Section 15.209, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/12/2013		
Temperature: 25 ºC	Air Pressure: 1006 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

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

7.1 Field strength of emissions

7.1.1 General

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

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, kHz	Field strength at 3 m, dB(μV/m)
	Average
126.7kHz	105.6

Table 7.1.2 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m)		
	Within restricted bands		
	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	
1000 – 10th harmonic	74.0	NA	54.0

*- 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.

7.1.2 Test procedure for fundamental and spurious emission field strength measurements in 9 kHz to 30 MHz

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 a 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. 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 7.1.3 and shown in the associated plots.

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

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

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

7.1.3.3 The worst test results (the lowest margins) were recorded in Table 7.1.4 and shown in the associated plots.

Test specification:	Section 15.209, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/12/2013		
Temperature: 25 ºC	Air Pressure: 1006 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

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

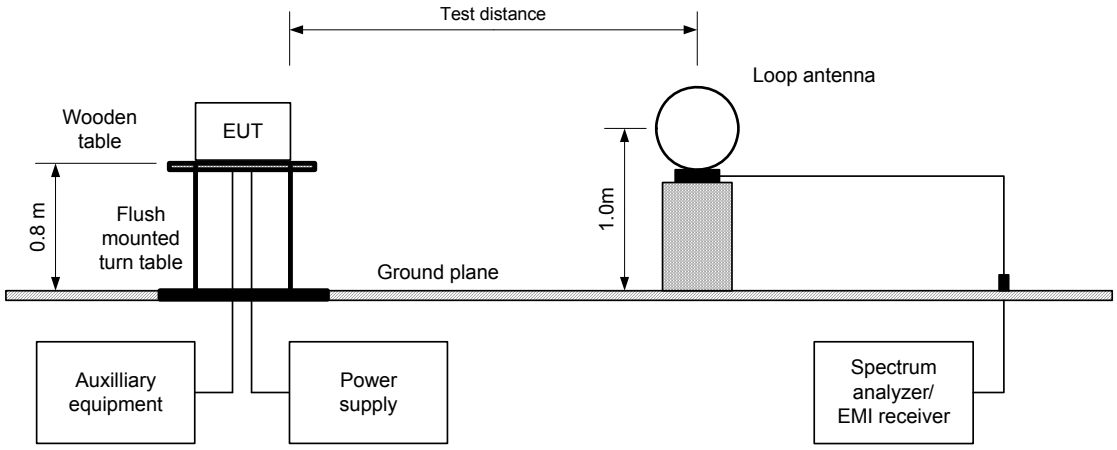
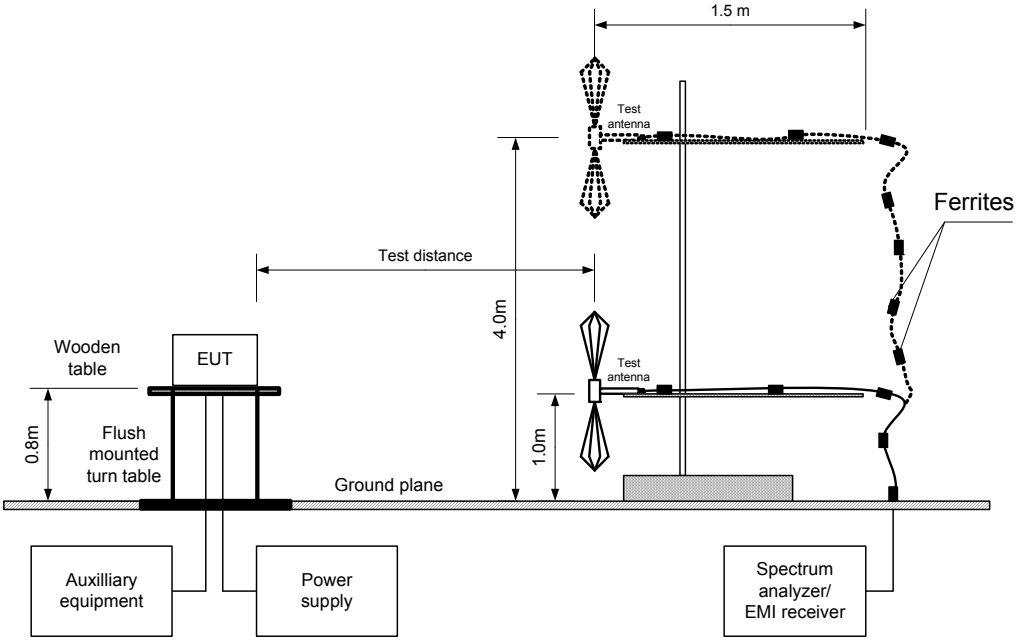


Figure 7.1.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/12/2013		
Temperature: 25 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 52 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.1.3 Field strength of fundamental emission

TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT POSITION: Typical (Vertical)
MODULATION: ASK
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
DETECTOR USED: Peak
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)

F, kHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength			Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
126.565	Ver	1	310	66.56	125.6	-59	66.56	105.6	-39	Pass

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin (dB) = measured result - specification limit.

Reference numbers of test equipment used

HL 0446	HL 2432	HL 2697	HL 2780	HL 4150	HL 4292	HL 4347	

Full description is given in Appendix A.

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/12/2013		
Temperature: 25 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 52 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.1.4 Field strength of spurious emissions

TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT POSITION: Typical (Vertical)
MODULATION: ASK
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
DETECTOR USED: Peak
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*				
47.54	35	31.91	40.0	-8.09	Ver	1	33.2	Pass
130.7	21	19.4	43.5	-24.1	Ver	1	10.0	
144.3	34.5	33.11	43.5	-10.39	Ver	1	318.5	
189.11	43.6	42.43	43.5	-1.07	Hor	1.58	358	
258.0	33.66	27.87	46.0	-18.13	Hor	1.38	81.1	
335.79	32.31	30.83	46.0	-15.17	Hor	1	23.5	
377.8	36.31	35.42	46.0	-10.58	Ver	1	308.0	
431.8	34.64	33.02	46.0	-12.98	Hor	1.02	345	
453.6	34.08	27.74	46.0	-18.26	Ver	1.20	8.0	

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

Table 7.1.5 Restricted bands

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

Reference numbers of test equipment used

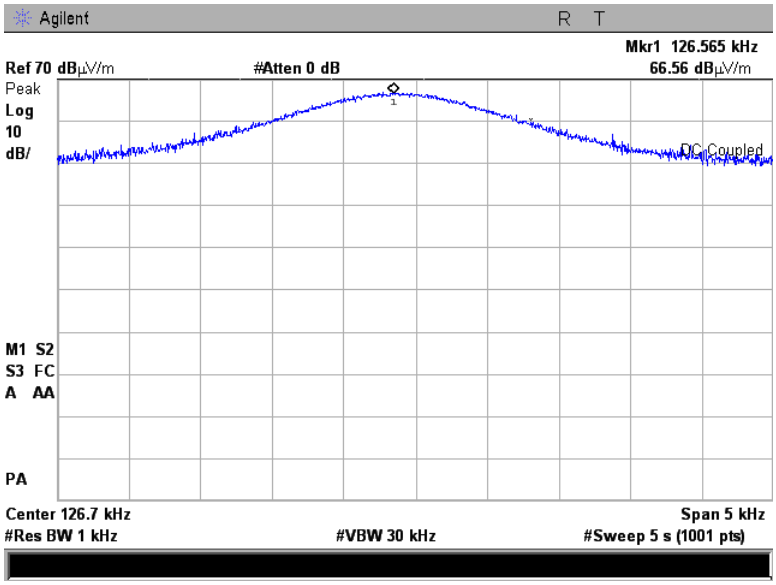
HL 0446	HL 0604	HL 2780	HL 2871	HL 3310	HL 4353		

Full description is given in Appendix A.

Test specification:	Section 15.209, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/12/2013		
Temperature: 25 ºC	Air Pressure: 1006 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.1 Radiated emission measurements at the fundamental frequency

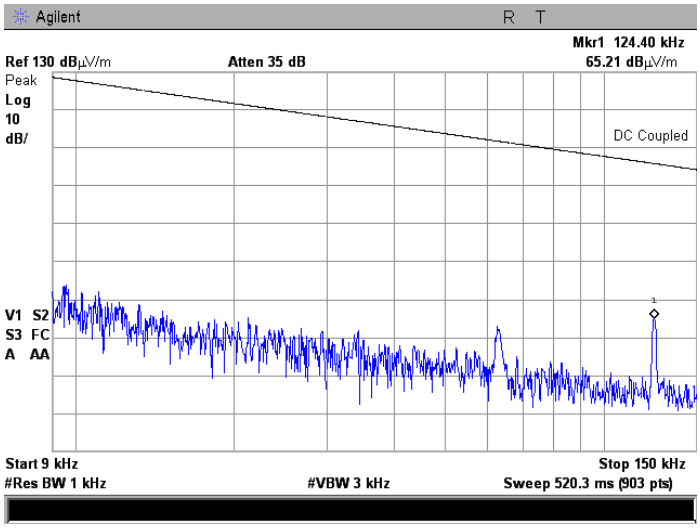
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)



Test specification:	Section 15.209, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/12/2013		
Temperature: 25 ºC	Air Pressure: 1006 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

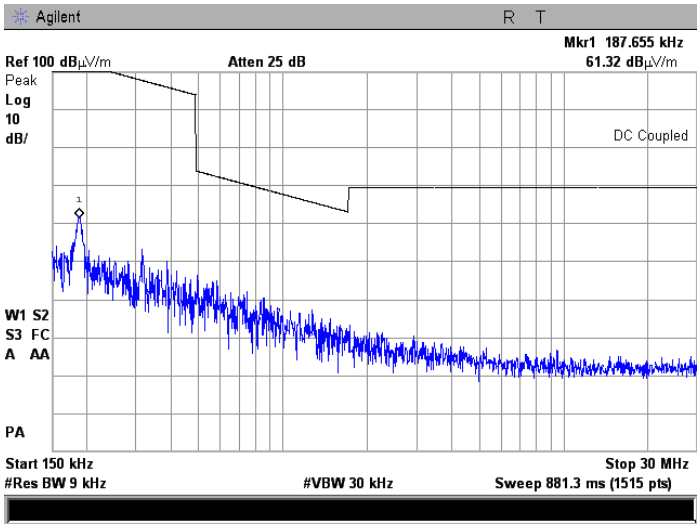
Plot 7.1.2 Radiated emission measurements from 9 to 150 kHz

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



Plot 7.1.3 Radiated emission measurements from 0.15 to 30 MHz

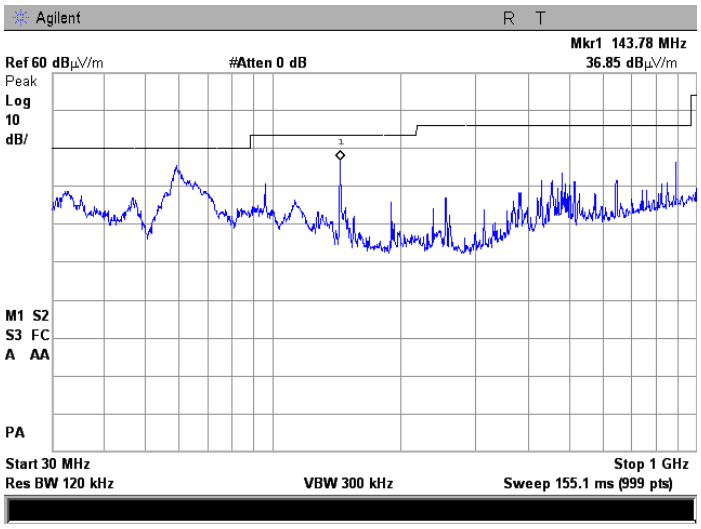
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)



Test specification:	Section 15.209, Field strength of emissions		
Test procedure:	ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/12/2013		
Temperature: 25 ºC	Air Pressure: 1006 hPa	Relative Humidity: 52 %	Power Supply: 120 VAC
Remarks:			

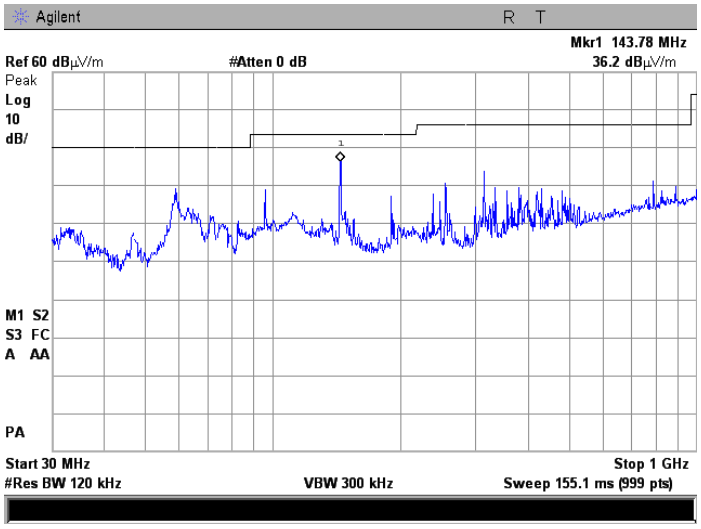
Plot 7.1.4 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Semi-anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)



Plot 7.1.5 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

TEST SITE: Semi-anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/13/2013		
Temperature: 24 ºC	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.2 Conducted emissions

7.2.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.2.1.

Table 7.2.1 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.

7.2.2 Test procedure

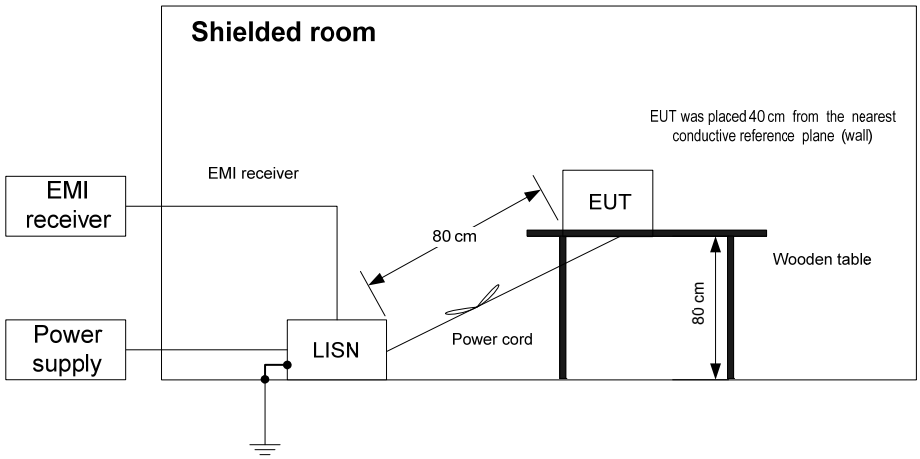
7.2.2.1 The EUT was set up as shown in Figure 7.2.1 and associated photographs, energized and the performance check was conducted.

7.2.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.

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

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

Figure 7.2.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.207(a), Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/13/2013		
Temperature: 24 ºC	**Air Pressure:** 1007 hPa	**Relative Humidity:** 48 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.2.2 Conducted emission test results

LINE: AC mains
EUT OPERATING MODE: Transmit
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
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*		
0.154	55.5	51.6	65.78	-14.18	36.3	55.78	-19.48	L1	Pass
0.199	47.8	45.9	63.65	-17.75	35.5	53.65	-18.15		
3.838	33.3	28.3	56	-27.7	15.9	46	-30.1		
0.192	49.7	45.3	63.95	-18.65	24.5	53.95	-29.45	L2	
0.250	43.7	42.0	61.76	-19.76	30.7	51.76	-21.06		
3.968	34.5	29.1	56	-26.9	17.9	46	-28.1		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

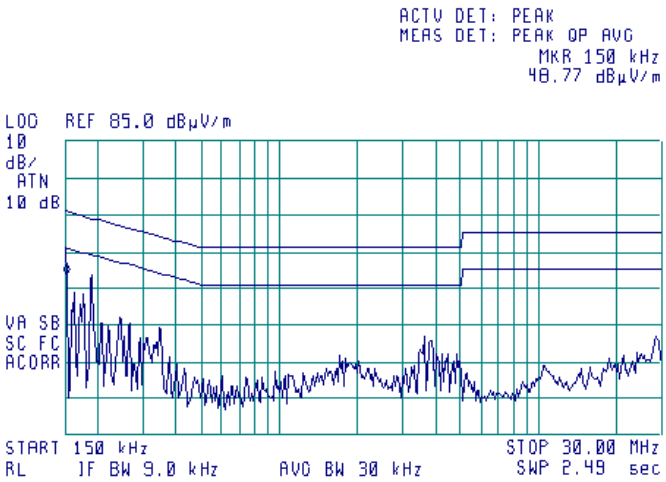
HL 0447	HL 0787	HL 1205	HL 1425	HL 1513	HL 3612		

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(s):	8/13/2013		
Temperature: 24 ºC	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

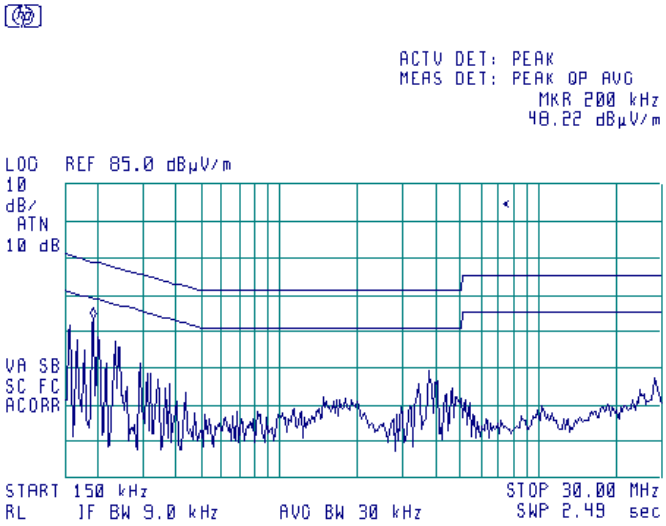
Plot 7.2.1 Conducted emission measurements

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



Plot 7.2.2 Conducted emission measurements

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



Test specification:	Section 15.203, Antenna requirements		
Test procedure:	Visual inspection/supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/13/2013		
Temperature: 25 ºC	Air Pressure: 1005 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

7.3 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 7.3.1.

Table 7.3.1 Antenna requirements

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

Photograph 7.3.1 Antenna assembly

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0415	Cable, Coax, RF, RG-214, 12.3 m	Hermon Laboratories	CC-3	056	02-Dec-12	02-Dec-13
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	03-Jul-12	03-Jul-14
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	18-Oct-12	18-Oct-13
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	04-Jun-13	04-Jun-14
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A01877	15-Oct-12	15-Oct-13
0812	Cable Coax, RG-214, 11.5 m, N-type connectors	Hermon Laboratories	C214-11	148	02-Dec-12	02-Dec-13
1205	One phase voltage regulator, 2kVA, 0-250V	Hermon Laboratories	TDGC-2	109	17-Dec-12	17-Dec-13
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A00222, 3705A00204	26-Aug-13	26-Aug-14
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	02-Sep-12	02-Sep-13
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	07-Dec-12	07-Dec-13
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY45102462	10-Jul-13	10-Jul-14
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	04-Dec-12	04-Dec-13
3310	Multimeter	Fluke	115C	94321810	14-Jul-13	14-Jul-14
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	02-Dec-12	02-Dec-13
4150	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out.	Agilent Technologies	87405C	MY47010591	01-Jul-13	01-Jul-14
4292	Microwave Cable Assembly, 18.0 GHz, 3.4 m, SMA/SMA	Huber-Suhner	Sucoflex P103	NA	04-Dec-12	04-Dec-13
4347	Low Loss Armored Test Cable, DC - 18 GHz, 2.0 m, N type-M/N type-M	MegaPhase	NC29-N1N1-79	12025103001	06-Mar-13	06-Mar-14
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101003	06-Mar-13	06-Mar-14

9 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 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

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.

10 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), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. 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). The FCC Designation Number is US1003.

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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

FCC 47CFR part 15: 2012	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

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

Cable loss
Cable coax, RG-214, 12.3 m, s/n 056, HL 0415

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	10	0.23	±0.12
2	30	0.44	±0.12
3	50	0.60	±0.12
4	100	0.89	±0.12
5	150	1.11	±0.13
6	200	1.30	±0.13
7	250	1.45	±0.13
8	300	1.61	±0.13
9	400	1.94	±0.13
10	500	2.18	±0.13
11	600	2.45	±0.14
12	700	2.67	±0.14
13	800	2.94	±0.14
14	900	3.16	±0.14
15	1000	3.38	±0.14

Cable loss
Cable Coaxial, RG-214, 11.5 m, s/n 148, HL 0812

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	10	0.23	±0.12
2	30	0.44	±0.12
3	50	0.60	±0.12
4	100	0.90	±0.12
5	150	1.13	±0.13
6	200	1.34	±0.13
7	250	1.51	±0.13
8	300	1.68	±0.13
9	400	2.01	±0.13
10	500	2.28	±0.13
11	600	2.56	±0.14
12	700	2.80	±0.14
13	800	3.07	±0.14
14	900	3.33	±0.14
15	1000	3.53	±0.14

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, 17 m
Teldor, HL 3612

Frequency, MHz	Cable loss, dB
0.1	0.05
0.5	0.07
1	0.10
3	0.22
5	0.29
10	0.39
30	0.68
50	0.90
100	1.27
150	1.58
200	1.80
250	2.12
300	2.36
350	2.60
400	2.82
450	2.99
500	3.23
550	3.40
600	3.56
650	3.71
700	3.90
750	4.04
800	4.23
850	4.39
900	4.55
950	4.65
1000	4.79

Cable loss
Microwave Cable Assembly, 18.0 GHz, 3.4 m, SMA/SMA, Huber-Suhner, Sucoflex P103, HL 4292

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.11	5000	2.10	10200	2.95	15400	3.64
30	0.17	5100	2.14	10300	2.96	15500	3.68
50	0.22	5200	2.16	10400	2.99	15600	3.71
100	0.30	5300	2.17	10500	2.99	15700	3.74
200	0.36	5400	2.19	10600	3.03	15800	3.71
300	0.42	5500	2.19	10700	3.03	15900	3.74
400	0.51	5600	2.22	10800	3.04	16000	3.71
500	0.59	5700	2.24	10900	3.05	16100	3.73
600	0.66	5800	2.23	11000	3.09	16200	3.76
700	0.72	5900	2.26	11100	3.07	16300	3.82
800	0.77	6000	2.27	11200	3.08	16400	3.90
900	0.82	6100	2.26	11300	3.11	16500	3.81
1000	0.88	6200	2.29	11400	3.12	16600	3.88
1100	0.93	6300	2.30	11500	3.11	16700	3.87
1200	0.98	6400	2.34	11600	3.15	16800	3.89
1300	1.02	6500	2.34	11700	3.16	16900	3.95
1400	1.06	6600	2.36	11800	3.18	17000	4.02
1500	1.10	6700	2.36	11900	3.19	17100	4.04
1600	1.14	6800	2.39	12000	3.23	17200	3.99
1700	1.19	6900	2.39	12100	3.25	17300	4.03
1800	1.23	7000	2.44	12200	3.22	17400	4.03
1900	1.27	7100	2.46	12300	3.25	17500	4.06
2000	1.30	7200	2.44	12400	3.25	17600	4.05
2100	1.35	7300	2.48	12500	3.28	17700	4.12
2200	1.38	7400	2.47	12600	3.27	17800	4.14
2300	1.42	7500	2.48	12700	3.27	17900	4.18
2400	1.45	7600	2.50	12800	3.30	18000	4.14
2500	1.48	7700	2.53	12900	3.30		
2600	1.51	7800	2.56	13000	3.27		
2700	1.55	7900	2.55	13100	3.32		
2800	1.59	8000	2.56	13200	3.32		
2900	1.65	8100	2.56	13300	3.32		
3000	1.66	8200	2.57	13400	3.35		
3100	1.69	8300	2.59	13500	3.38		
3200	1.71	8400	2.62	13600	3.39		
3300	1.74	8500	2.67	13700	3.42		
3400	1.76	8600	2.65	13800	3.47		
3500	1.78	8700	2.68	13900	3.45		
3600	1.80	8800	2.68	14000	3.49		
3700	1.85	8900	2.68	14100	3.50		
3800	1.88	9000	2.74	14200	3.55		
3900	1.90	9100	2.74	14300	3.59		
4000	1.91	9200	2.76	14400	3.58		
4100	1.93	9300	2.78	14500	3.56		
4200	1.96	9400	2.79	14600	3.57		
4300	1.97	9500	2.80	14700	3.57		
4400	1.99	9600	2.83	14800	3.57		
4500	2.02	9700	2.84	14900	3.64		
4600	2.02	9800	2.86	15000	3.64		
4700	2.04	9900	2.92	15100	3.61		
4800	2.05	10000	2.90	15200	3.67		
4900	2.09	10100	2.92	15300	3.63		

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-79 S/N 12025103 001,
HL 4347

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.08	9000	0.92
100	0.11	9500	1.00
300	0.18	10000	1.05
500	0.23	10500	1.04
1000	0.32	11000	1.05
1500	0.39	11500	1.09
2000	0.45	12000	1.13
2500	0.50	12500	1.15
3000	0.54	13000	1.19
3500	0.59	13500	1.19
4000	0.62	14000	1.22
4500	0.65	14500	1.26
5000	0.69	15000	1.32
5500	0.71	15500	1.38
6000	0.77	16000	1.34
6500	0.82	16500	1.36
7000	0.84	17000	1.46
7500	0.85	17500	1.49
8000	0.88	18000	1.46
8500	0.90		

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 003,
HL 4353

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.71
100	0.27	9500	2.81
300	0.47	10000	2.90
500	0.61	10500	2.97
1000	0.87	11000	3.06
1500	1.07	11500	3.13
2000	1.24	12000	3.20
2500	1.39	12500	3.26
3000	1.53	13000	3.34
3500	1.65	13500	3.39
4000	1.77	14000	3.47
4500	1.89	14500	3.54
5000	1.99	15000	3.62
5500	2.07	15500	3.69
6000	2.20	16000	3.76
6500	2.30	16500	3.83
7000	2.39	17000	3.86
7500	2.51	17500	3.94
8000	2.58	18000	4.02
8500	2.65		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
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
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
OATS	open area test site
Ω	Ohm
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

END OF DOCUMENT