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Electrical

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

RADIO TEST REPORT

According to 47 CFR Part 15 subpart C §15.231 and subpart B;
RSS-210 Issue 5:2001; ICES-003 Issue 3:1997
for

VISONIC Ltd.

EQUIPMENT UNDER TEST:

Wireless siren
Model: MCS-700

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Contents

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

1 Project information

EUT attributes

Test item	: Wireless siren
Serial number	: W0904SN00001
Operating frequency	: 315 MHz
Type (Model)	: MCS-700
Equipment FCC code	: DSR

Applicant information

Applicant's responsible person	: Mr. Arick Elshtein, international standards department manager
Applicant/Manufacturer	: Visonic Ltd.
Address	: 30, Habarzel street
City	: Tel Aviv
Postal code	: 69710
Country	: Israel
Telephone number	: +972 3645 6714
Telefax number	: +972 3645 6891

Test details

Project Number:	: 15722
Location	: Hermon Laboratories
Receipt date	: October 30, 2003
Test performed	: November 16, 2003
Purpose of test	: Apparatus compliance verification in accordance with emission requirements
Test specification(s)	: 47CFR Part 15, subpart C, §§15.231, 15.205, 15.207, 15.209, and subpart B §§15.107, 15.109; RSS-210 Issue 5: 2001 and ICES-003 Issue 3: 1997

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

2 Summary and signatures

The EUT, wireless siren, was tested according to FCC part 15 subparts B, C, and found to comply with the standard requirements.

Test description	Specification reference	Tested by	Date tested	Test report paragraph	Verdict
Field strength of fundamental	15.231(b)(2)	Mr. Y. Neuman, test engineer	November 9, 2003	4.1	Pass
Field strength of spurious radiation	15.231(b)(3)	Mr. Y. Neuman, test engineer	November 12, 2003	4.2	Pass
Bandwidth of emission	15.231(c)	Mr. Y. Neuman, test engineer	November 12, 2003	4.3	Pass
Radiated emissions	15.109	Mr. Y. Neuman, test engineer	November 9, 2003	4.4	Pass
Conducted emissions	15.207, 15.107	Mr. Y. Neuman, test engineer	November 11, 2003	4.5	Pass

Test report prepared by:

Mrs. Marina Cherniavsky, MScEE, certification engineer _____

Test report approved by:

Mr. Michael Nikishin, MScEE, group leader _____

Mr. Edward Usoskin, PhD, C.E.O. _____

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

3 EUT description

3.1 General description

The EUT, MCS-700, is an outdoor wireless siren, including a receiver for alarm activation and a transmitter operating at 315 MHz to deliver periodic status message to alarm system. The device is powered from mains via 120 V AC/9 V AC adapter and contains an internal rechargeable back up battery.

3.2 EUT test configuration

The EUT ports and lines description is given in Table 3.2.1, test configuration - in Figure 3.2.1.

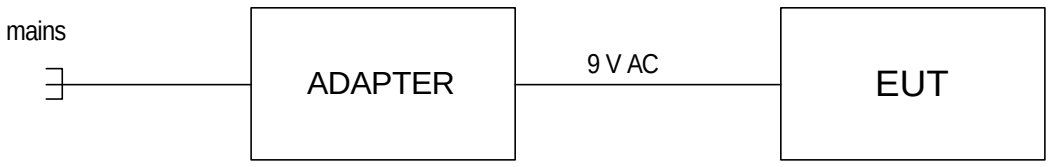
Table 3.2.1

EUT ports and lines

Port type	Port description	Connected from / to		Connector type	Qty.	Cable type	Cable length, m
Power	9 V AC	EUT	AC/DC adapter	Non-detachable	1	unshielded	3
Power	AC	AC/DC adapter	mains	Non-detachable	1	unshielded	2

Figure 3.2.1

EUT test configuration



Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

4 Test results

4.1 Field strength of fundamental, § 15.231 and RSS-210 § 6.1.1(b)

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.5
DATE of TEST: November 9, 2003
AMBIENT TEMPERATURE: 25°C
RELATIVE HUMIDITY: 55 %
AIR PRESSURE 1007 hPa
SITE DESCRIPTION: OATS
MODE OF OPERATION: Continuous
MODULATION: ON
DETECTOR USED: Peak
MEASUREMENT UNCERTAINTY: ± 5.3 dB

	§ 15.231 (b)	§ 15.231 (e)
The EUT complies with the requirements of	X	

Peak detector

Frequency, MHz	Measured field strength, dB(mV/m)	Specification limit, dB(mV/m)	Margin, dB	Reference to plot in Appendix A
315.068	72.84	95.6	22.76	A1

Average detector (Peak detector measurement + average factor)

Frequency, MHz	Measured field strength, dB(mV/m)	Average factor, dB	Calculated result, dB(mV/m)	Specification limit, dB(mV/m))	Margin, dB	Reference to plot in Appendix A
315.068	72.84	-3.23	69.6	75.6	6.0	A1

4.1.1 Average factor calculation, §15.35

Tx ON	Duty cycle	Average factor	Reference to plot in Appendix A	Rationale
68.95 ms	68.95%	-3.23 dB	A11-A13	Manufacturer statement provided in Application documents*

*The transmit signal consists of a preamble and a message. The total duration of the preamble is 54.8 msec, the total ON time during the preamble is 38.8 msec

In 100 msec interval the message time is: 100 – 54.8 = 45.2 (msec),
the message ON time is 45.2 x 66.667% = 30.15 (msec) – Manchester code is used.

Total ON time in 100 msec interval is equal to 38.8 + 30.15 = 68.95 (msec).

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

LIMIT § 15.231 (b)

Fundamental frequency, MHz	Field strength of fundamental @ 3 m, dB(mV/m)
315	75.6

The above field strength limits are based on average limits.
The provisions of section 15.35 for limiting peak emissions apply.

TEST PROCEDURE

The EUT was tested, being placed on a wooden 80 cm height turntable in vertical and horizontal position in turn. To find maximum radiation the turntable was rotated 360^{o}, measuring antenna height was changed from 1 to 4 m, and the antenna polarization was changed from vertical to horizontal.

TEST EQUIPMENT USED:

HL 0034	HL 0038	HL 0091	HL 0287	HL 0415	HL 0812	HL 1430

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

4.2 Field strength of spurious radiation, § 15.231 and RSS-210 § 6.1.1(b)

METHOD OF MEASUREMENT:	ANSI 63.4 §13.1.4
TEST PERFROMED IN:	Anechoic chamber, OATS
DATE of TEST:	November 9, 2003
AMBIENT TEMPERATURE:	25°C
RELATIVE HUMIDITY:	55 %
AIR PRESSURE	1007 hPa
MODULATION	ON
DETECTOR USED:	Peak
RANGE OF MEASUREMENTS	9 kHz to 3200 MHz
MEASUREMENT UNCERTAINTY:	± 6 dB

Frequency, MHz	RBW, kHz	VBW, kHz	TT position °	Radiated emission (peak), dB(mV/m)	Limit (peak) @ 3 m, dB(mV/m)	Radiated emission (average)*, dB (mV/m)	Limit (average) @ 3 m, dB(mV/m)	Reference to plot in Appendix A
945.208	120	300	215	48.85	75.6	45.62	55.6	A7
1260.277	1000	3000	0	48.00	75.6**	44.77	55.6**	A9
1575.347	1000	3000	0	41.55	74	38.32	54	A10

The listed test results were obtained during measurements at 1 m antenna height. Antenna polarization is shown in associated plots.
For full test results refer to Plots A2 to A10**.**
Emissions found in 30 - 1000 MHz range were due to the contained digital device and are brought in section 4.4 of this test report.

Verdict: Pass

Notes to table:
* Radiated emission value was calculated: peak value + average factor (-3.23 dB)
** In accordance with RSS-210 the restricted band limits were used: 74 dB (μV/m) peak and 54 dB (μV/m) average
RBW: resolution bandwidth; VBW: video bandwidth; TT – turntable.

LIMIT § 15.231 (b)

Fundamental frequency, MHz	Field strength of spurious emissions @ 3 m, dB(mV/m)
315	55.6

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

TEST PROCEDURE

The EUT was tested, being placed on a wooden 80 cm height turntable in vertical and horizontal position in turn.

9 kHz – 30 MHz range. The test was performed in the anechoic chamber. The loop antenna was positioned with its plane vertical. The loop center was 1 meter above the ground plane. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated about its vertical axis.

30 MHz – 3.2 GHz range. Preliminary test was performed in anechoic chamber with biconilog antenna in 30 – 1000 MHz range and with double ridged guide antenna in 1000 – 3200 MHz range; the final test was performed at the OATS. To find maximum radiation the turntable was rotated 360^{o}, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

TEST EQUIPMENT USED IN ANECHOIC CHAMBER:

HL 0446	HL 0465	HL 0521	HL 0589	HL 0592	HL 0593	HL 0594
HL 0604	HL 1004	HL 1947	HL 2009	HL 2432		

TEST EQUIPMENT USED AT OATS:

HL 0038	HL 0091	HL 0287	HL 1365	HL 1430	HL 1947	HL 1984

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

4.3 Bandwidth of emission according to § 15.231(c) and RSS-210 § 6.1.1(c)

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.7
DATE of TEST: November 12, 2003
AMBIENT TEMPERATURE: 23°C
RELATIVE HUMIDITY: 45 %
AIR PRESSURE 1006 hPa
SITE DESCRIPTION: OATS
MODULATION: ON
DETECTOR USED: Peak

Carrier frequency MHz	Occupied bandwidth, kHz		Reference to plot in Annex A
	Measured	Limit	
315	468	787.5	A14
Measurement uncertainty	0.56 ppm		

The maximum allowed occupied bandwidth was calculated as 0.0025 of the center frequency.
Verdict: Pass

LIMIT § 15.231 ©

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

TEST PROCEDURE

The spectrum trace data around transmitter fundamental frequency was obtained with the spectrum analyzer in “Max Hold” mode. The bandwidth value was determined between two points 20 dB down from the modulated carrier.

TEST EQUIPMENT USED:

HL 0034	HL 0038	HL 0091	HL 0287	HL 1365	HL 1430	HL 1947

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

4.4 Unintentional radiated emissions test according to §15.109 and ICES-003

METHOD OF MEASUREMENT:	ANSI 63.4 §11.6 / ANSI 63.4 §12.1.4
TEST PERFORMED IN:	Anechoic chamber
DATE of TEST:	November 9, 2003
AMBIENT TEMPERATURE:	25°C
RELATIVE HUMIDITY:	55 %
AIR PRESSURE	1007 hPa
SITE DESCRIPTION:	Anechoic chamber
DISTANCE BETWEEN ANTENNA AND EUT:	3 m
THE EUT WAS TESTED AS:	TABLE-TOP
FREQUENCY RANGE:	30 MHz – 2 GHz

The EUT highest used frequency (including operating frequency), MHz	Upper frequency of measurement range, MHz
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

The EUT was tested in Tx mode, refer to Plots A4, A8 in Appendix A.

Frequency, MHz	Radiated emissions, dB (mV/ m)	Limit, dB (mV/m)	Margin, dB	Verdict
32.263	31.97	40.00	8.03	Pass
36.293	38.90	40.00	1.10	Pass
37.293	30.72	40.00	9.28	Pass
40.323	38.30	40.00	1.70	Pass
44.353	37.51	40.00	2.49	Pass
48.383	30.09	40.00	9.91	Pass
76.610	32.37	40.00	7.63	Pass

The recorded test results were obtained throughout measurements with quasi-peak detector and resolution bandwidth 120 kHz, biconilog antenna in horizontal polarization at 1 m height and 0° turntable position**.**

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

LIMIT

Frequency, MHz	Class B equipment @ 3 m dB(µV/m)	
	FCC § 15.109	**ICES-003**
30 – 88	40	40
88 – 216	43.5	44
216 – 960	46	46
960 - 1000	54	46
1000 - 5000	54	NA

TEST PROCEDURE

The EUT was placed on a wooden 80 cm height turntable. To find maximum radiation the turntable was rotated 360^{o}, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

TEST EQUIPMENT USED:

HL 0465	HL 0521	HL 0589	HL 0592	HL 0593	HL 0594	HL 0604
HL 1004	HL 2009					

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

4.5 Conducted emissions test according to §15.107, 15.207

METHOD OF MEASUREMENTS:	ANSI 63.4 §13.1.3
DATE of TEST:	November 11, 2003
AMBIENT TEMPERATURE:	23°C
RELATIVE HUMIDITY:	44 %
AIR PRESSURE:	1013 hPa
FREQUECNY RANGE:	150 kHz – 30 MHz
RESOLUTION BANDWIDTH:	9 kHz
MEASUREMENT UNCERTAINTY, dB	± 3.9 dB in 9 – 150 kHz ± 3.8 dB in 150 kHz – 30 MHz

Measurements in transmit mode

Quasi-peak detector

Frequency, MHz	Line identification	Measured emissions, dB (mV)	Specification QP limit, dB (mV)	Margin, dB	Verdict	Reference to Plots in Appendix A
17.131055	1	31.72	60.00	28.28	Pass	A15
17.895825	2	37.97	60.00	22.03	Pass	A16
24.191375	1	33.71	60.00	26.29	Pass	A15
28.223075	2	42.14	60.00	17.86	Pass	A16
28.553040	1	33.81	60.00	26.19	Pass	A15

Average detector

Frequency, MHz	Line identification	Measured emissions, dB (mV)	Specification AVRG limit, dB (mV)	Margin, dB	Verdict	Reference to Plots in Appendix A
17.131055	1	31.05	50.00	18.95	Pass	A15
17.895825	2	38.19	50.00	11.81	Pass	A16
24.191375	1	32.29	50.00	17.71	Pass	A15
28.223075	2	41.02	50.00	8.98	Pass	A16
28.553040	1	31.64	50.00	18.36	Pass	A15

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Measurements with Tx disconnected

Quasi-peak detector

Frequency, MHz	Line identification	Measured emissions, dB (mV)	Specification QP limit, dB (mV)	Margin, dB	Verdict	Reference to Plots in Appendix A
24.190700	1	34.30	60.00	25.70	Pass	A17
28.221340	1	38.82	60.00	21.18	Pass	A17

Average detector

Frequency, MHz	Line identification	Measured emissions, dB (mV)	Specification AVRG limit, dB (mV)	Margin, dB	Verdict	Reference to Plots in Appendix A
24.190700	1	34.20	50.00	15.80	Pass	A17
28.221340	1	37.74	50.00	12.26	Pass	A17

Limit

Frequency, MHz	Class B equipment, dB(mV)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50

*The limit decreases linearly with the logarithm of frequency.

TEST PROCEDURE

The measurements were performed at mains terminals by means of LISN, connected to spectrum analyzer in the frequency range as referred to in the table above. The unused coaxial connector of the LISN was terminated with 50 Ω.
The measurements were made with quasi-peak and average detectors as referred to in the tables.
The position of the EUT cables was varied to determine maximum emission level.

TEST EQUIPMENT USED:

HL 0163	HL 0466	HL 0521	HL 0787	HL 1503		

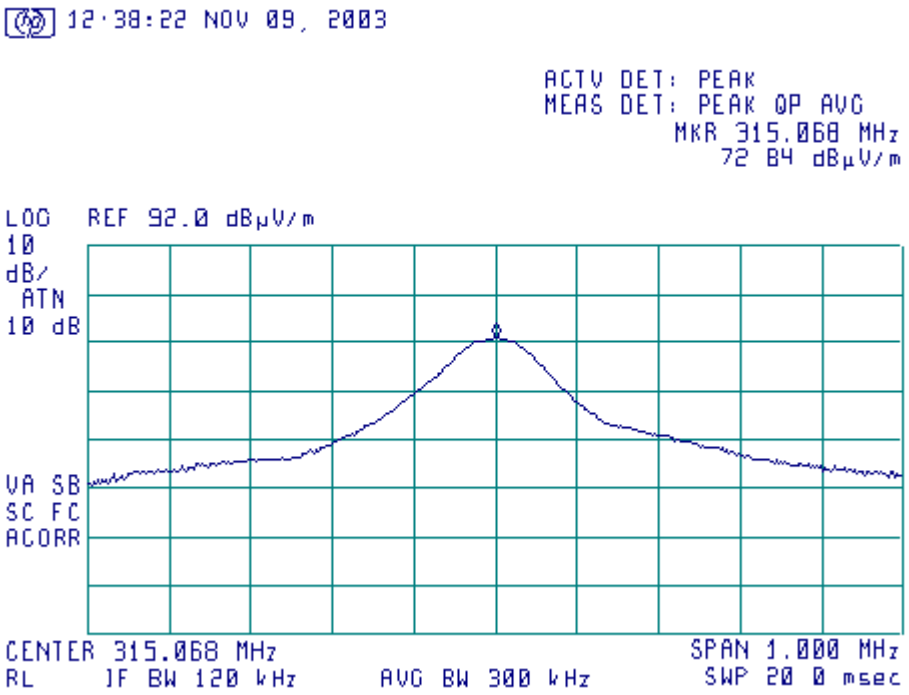
Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Appendix A - Plots

Plot A 1

Field strength of fundamental

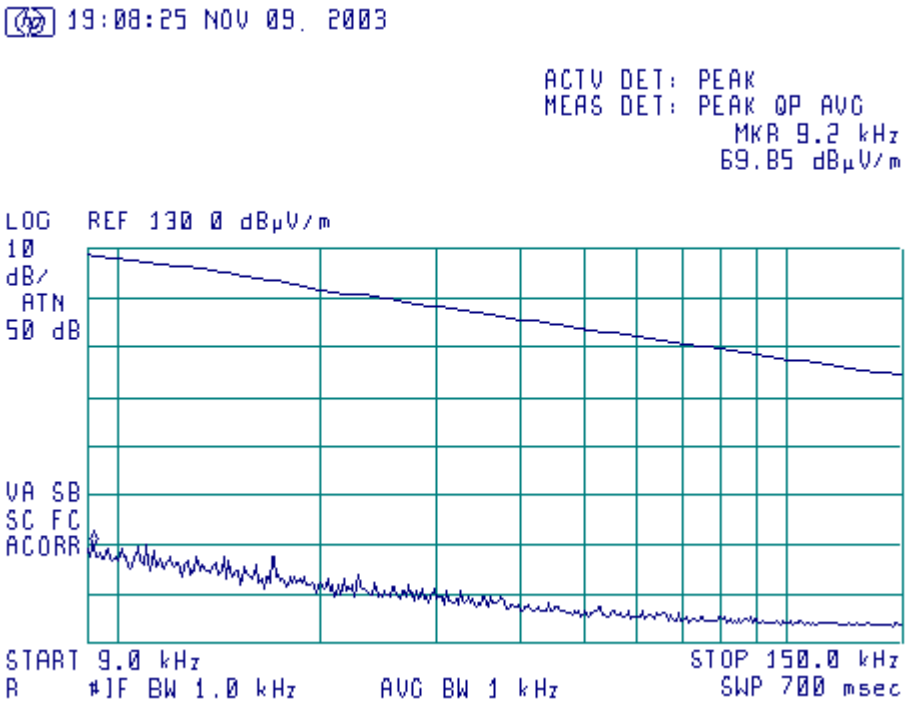
Antenna polarization: horizontal
EUT position: horizontal



Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 2

Spurious emission measurements in anechoic chamber from 9 kHz to 150 kHz

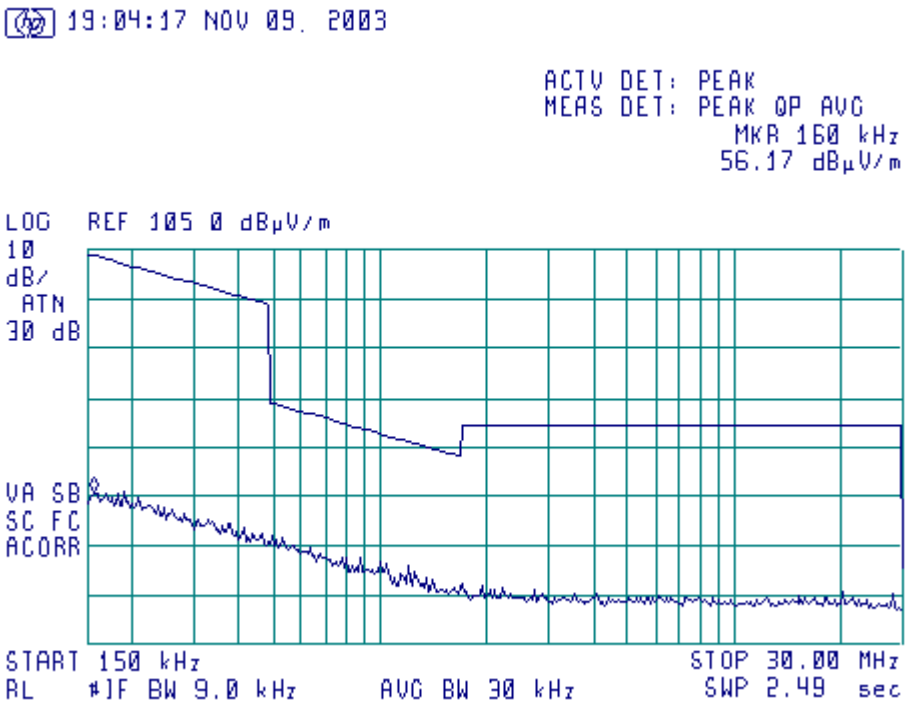


No spurious emissions were found

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 3

Spurious emission measurements in anechoic chamber from 150 kHz – 30 MHz

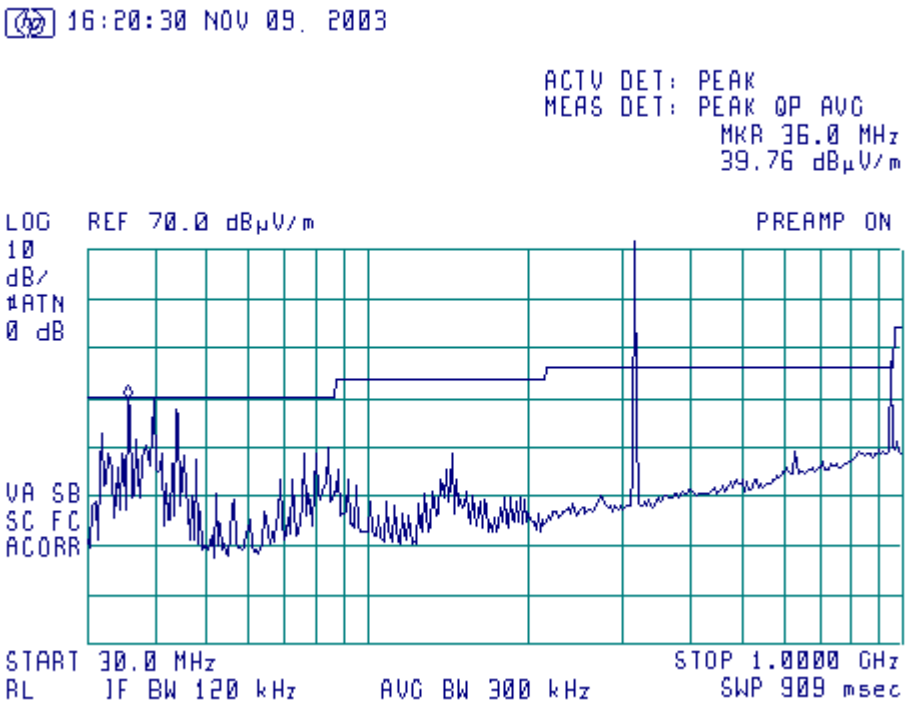


No spurious emissions were found

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 4

Spurious emission measurements in anechoic chamber from 30 MHz to 1000 MHz, vertical and horizontal antenna polarization

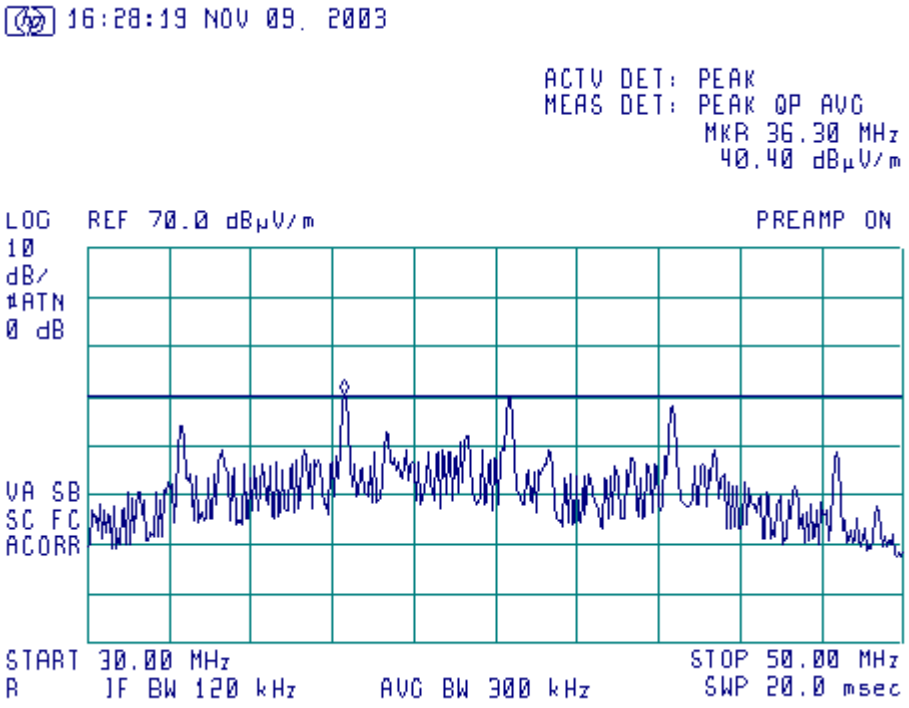


No spurious emissions in restricted bands 73-74.6 MHz, 74.8-75.2 MHz
All spurious emissions in other restricted bands are more than 20 dB below the limit.

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 5

Spurious emission measurements in anechoic chamber from 30 MHz to 50 MHz

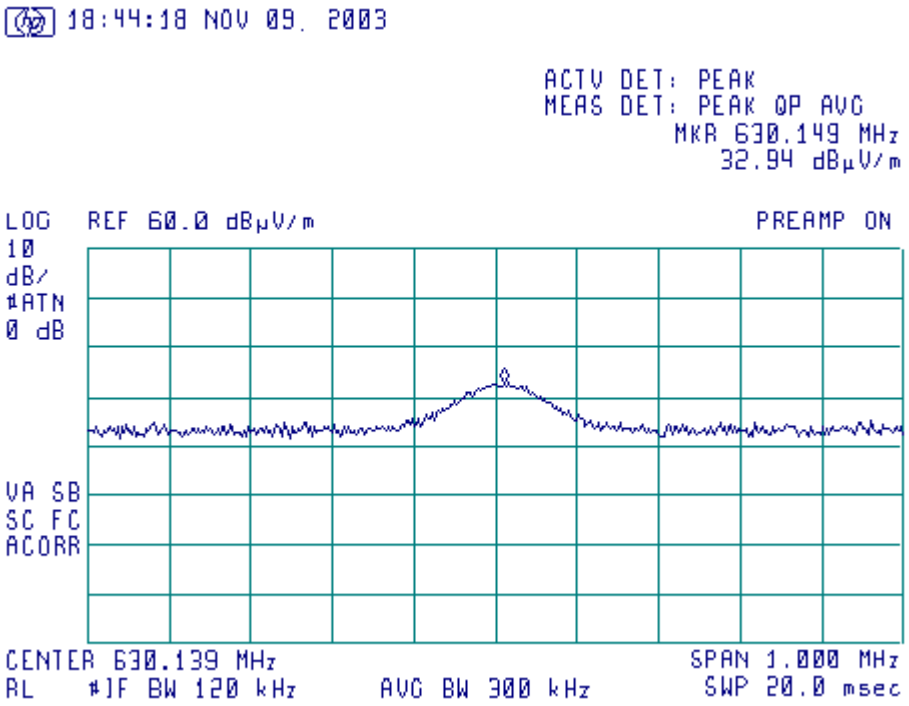


No spurious emissions in restricted band 37.5-38.25 MHz

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 6

Spurious emission measurements in anechoic chamber, 2nd harmonic

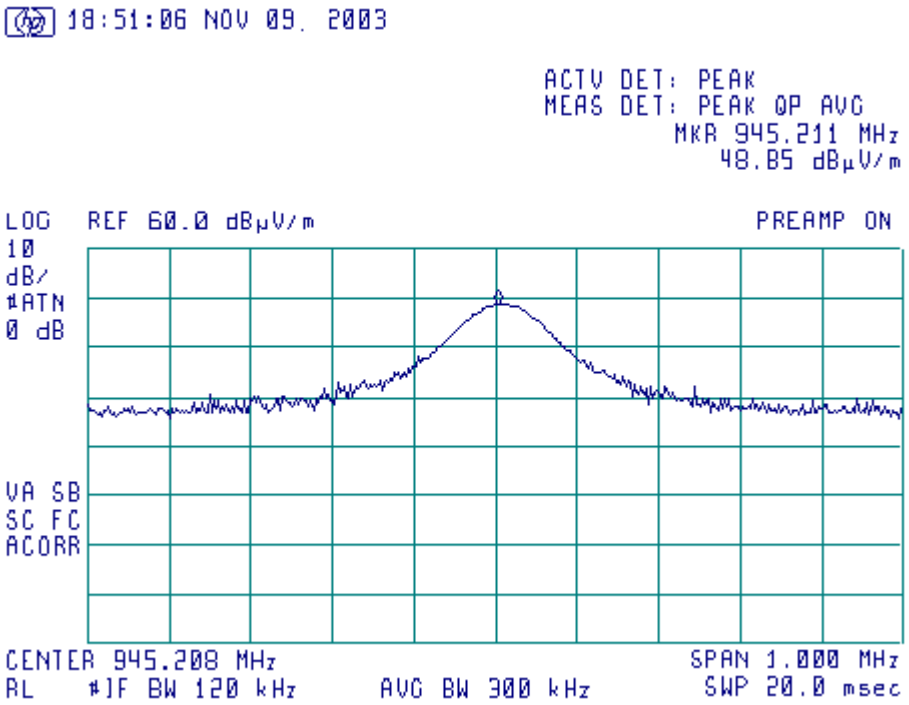


The maximum was found with horizontal antenna polarization, turntable position 0°, antenna height =147 cm

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 7

Spurious emission measurements in anechoic chamber, 3rd harmonic

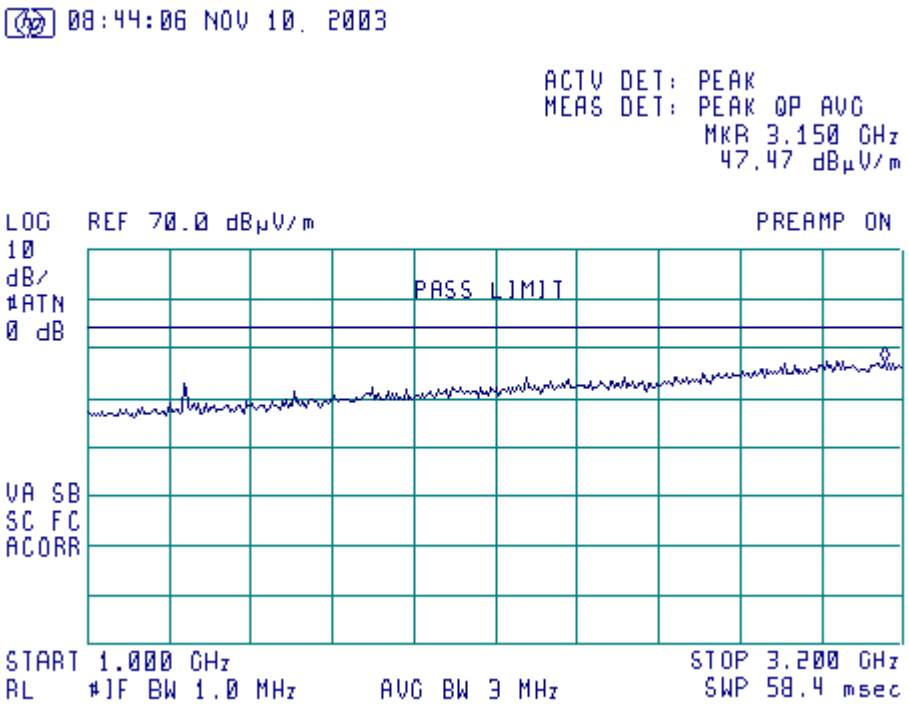


The maximum was found with vertical antenna polarization, turntable position 215°, antenna height =100 cm

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 8

Spurious emission measurements in anechoic chamber from 1 GHz to 3.2 GHz, vertical and horizontal antenna polarization

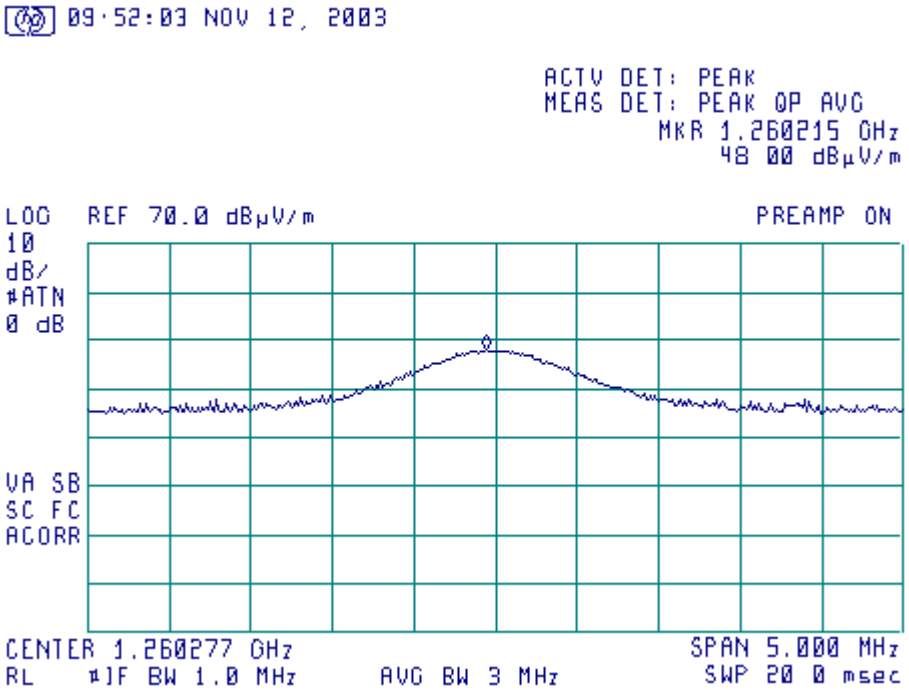


No spurious emissions were found except 4th and 5th harmonics.

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 9

Spurious emission measurements in anechoic chamber, 4th harmonic



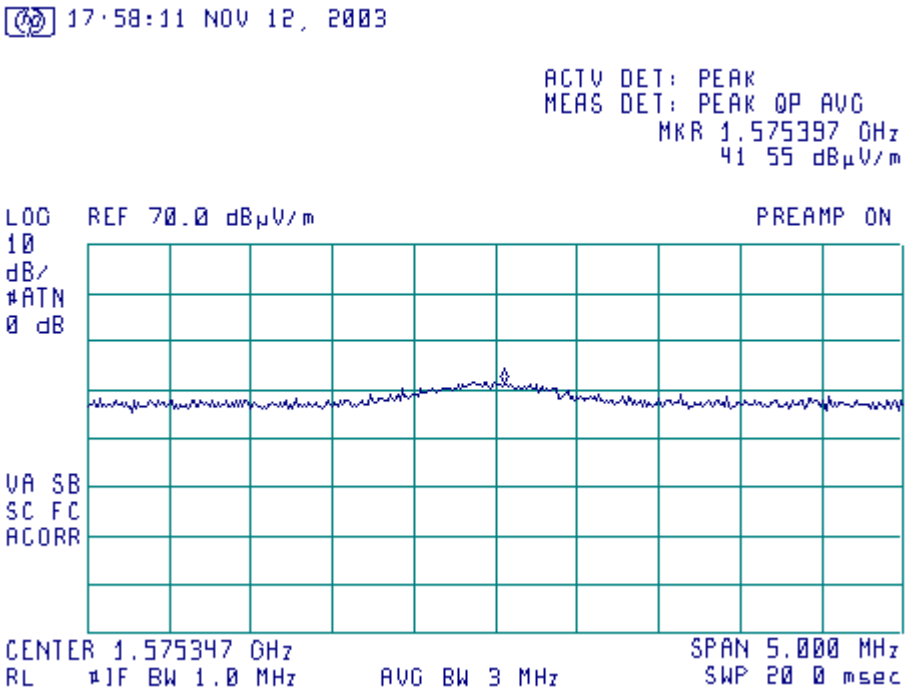
The maximum was found with horizontal antenna polarization, turntable position 0°, antenna height =100 cm

Restricted band in Canada
Peak value = 48 dBuV/m
Limit peak=74 dBuV/m
Verdict: **PASS**
Average value=48 dBuV/m - 3.23 dB(avg factor) = 44.77 dBuV/m
Limit average=54 dBuV/m
Verdict: **PASS**

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 10

Spurious emission measurements in anechoic chamber, 5th harmonic



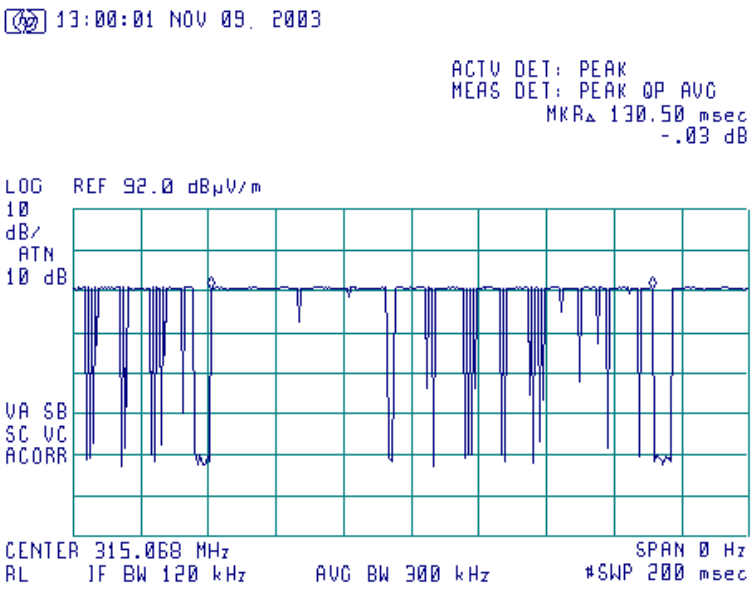
The maximum was found with horizontal antenna polarization, turntable position 0°, antenna height =100 cm

Restricted band
Peak value = 41.55 dBuV/m
Limit peak=74 dBuV/m
Verdict: **PASS**
Average value = 41.55 dBuV/m - 3.23 dB(avg factor) = 38.32 dBuV/m
Limit average=54 dBuV/m
Verdict: **PASS**

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

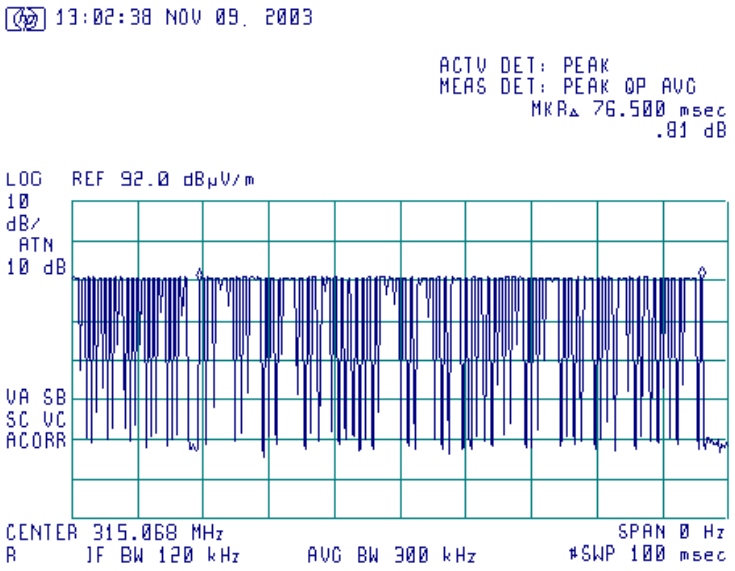
Plot A 11

Transmission duration measurement (preamble + message)



Plot A 12

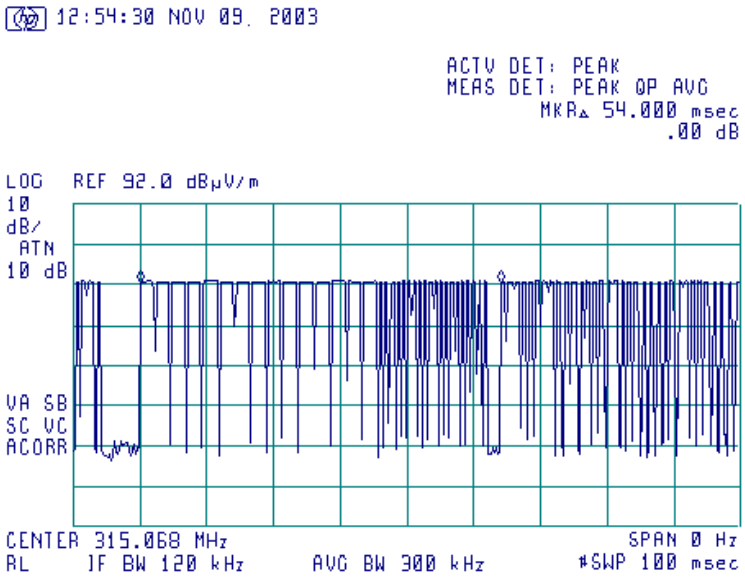
Message duration measurement



Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 13

Preamble duration measurement



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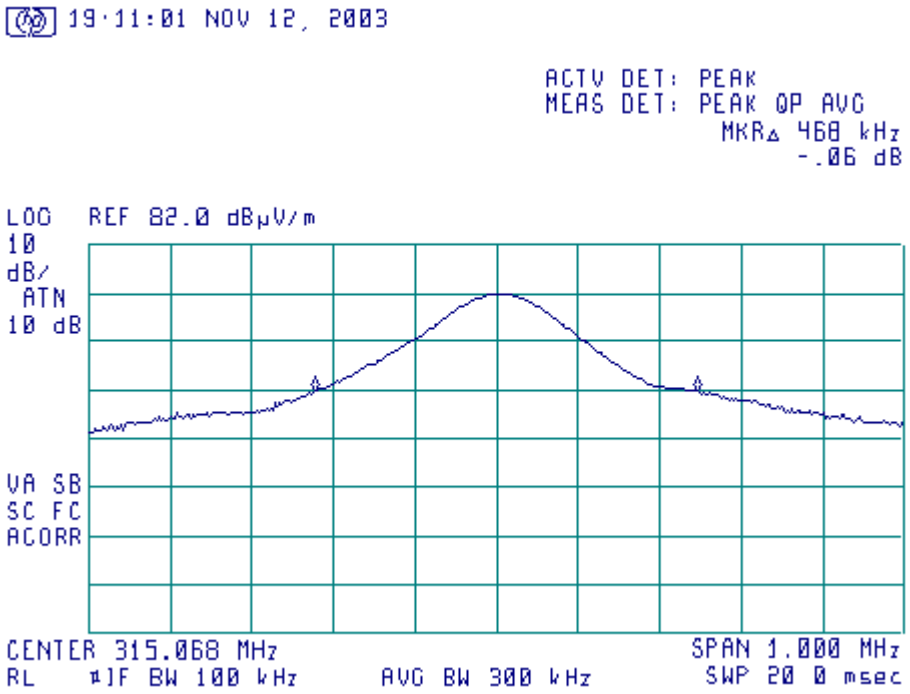
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 14

Occupied bandwidth measurement result

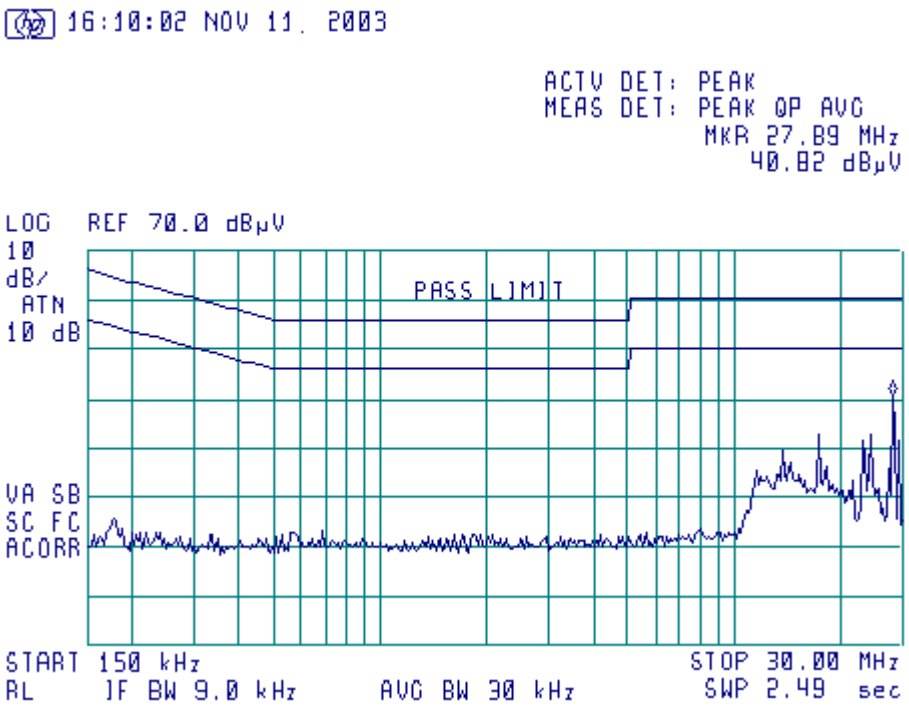


Limit: 315 MHz x 0.25% = 787.5 kHz
RBW>787.5 kHz x 5% = 39.375 kHz

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 15

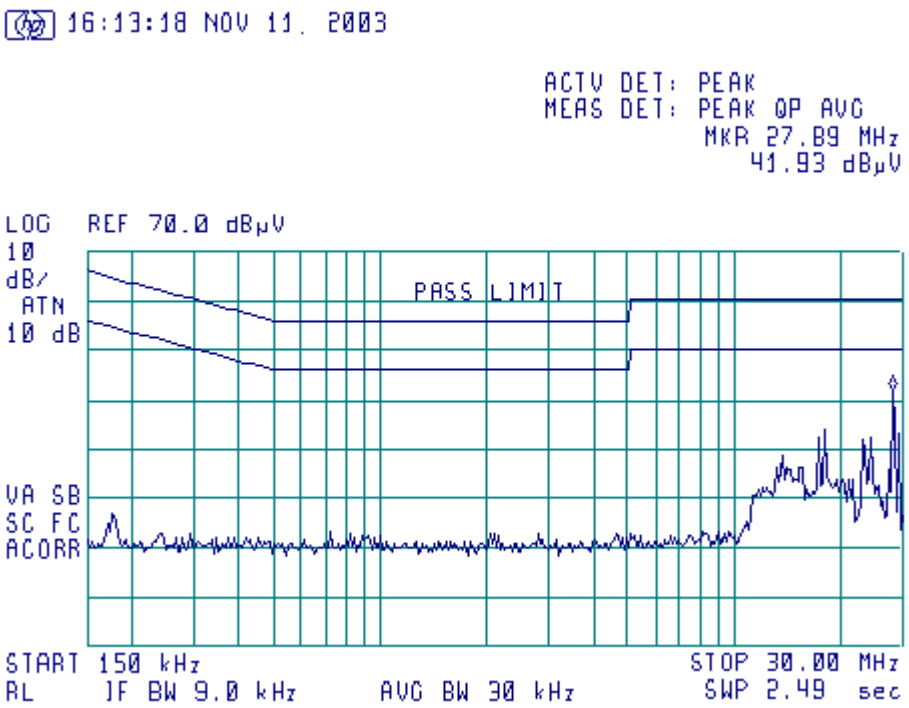
Conducted emission measurements test results at the Line 1 port, EUT in Tx mode



Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 16

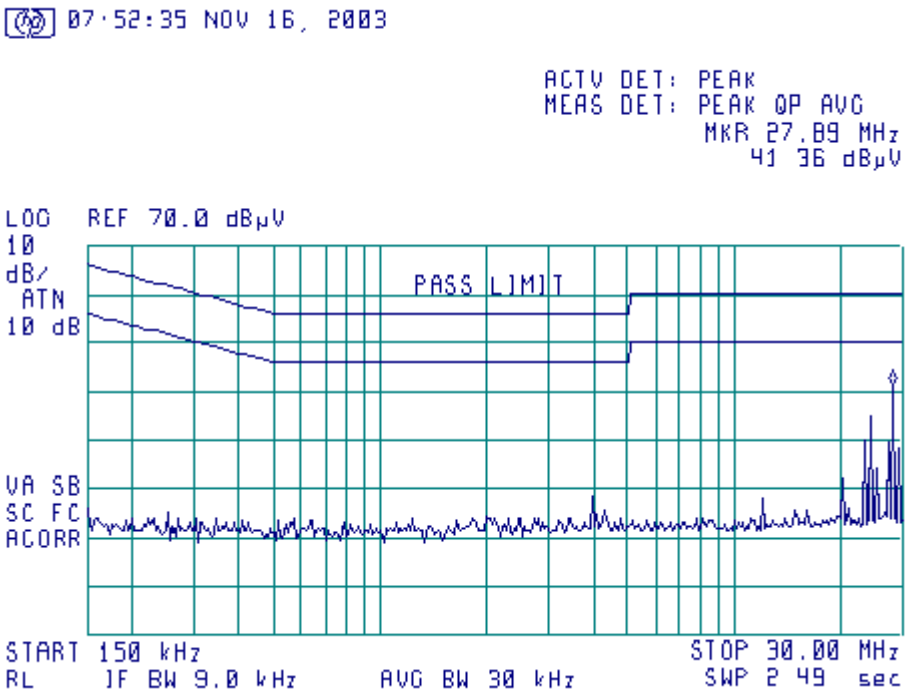
Conducted emission measurements test results at the Line 2 port, EUT in Tx mode



Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 17

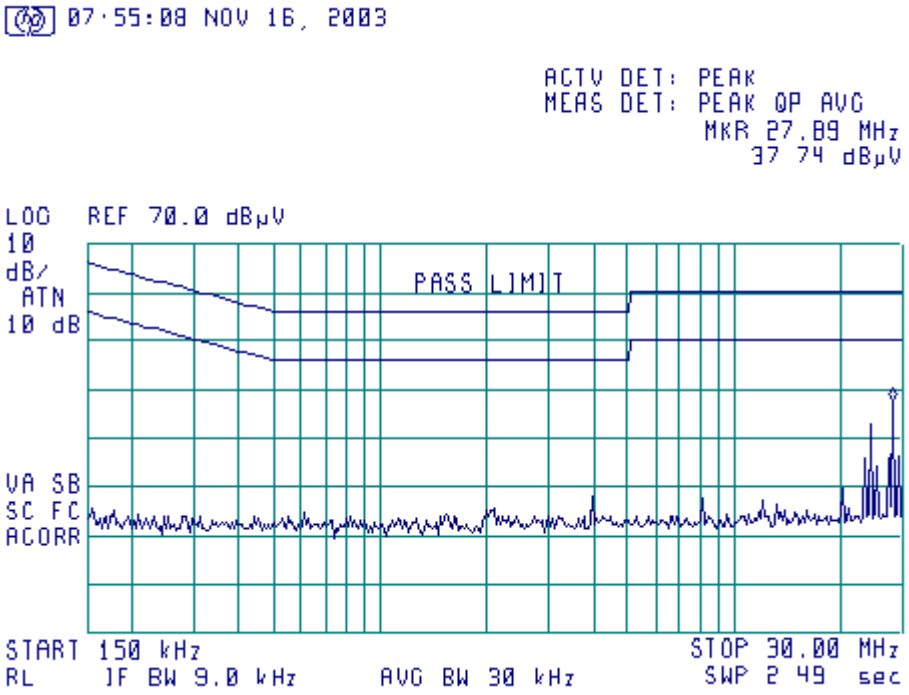
Conducted emission measurements test results at the Line 1 port, Tx disconnected



Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Plot A 18

Conducted emission measurements test results at the Line 2 port, Tx disconnected



Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Appendix B - Test equipment used for tests

HL Serial No.	Description	Manufacturer information			Due Calibration Month/ year
		Name	Model No.	Serial No.	
0034	Log periodic antenna, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1988	1/05
0038	Antenna Mast, 1-4 m	Hermon Labs	AM-1	028	2/05 check
0091	Position controller for antenna mast + turntable, OFTS	Hermon Labs	CRL-2	091	4/04 check
0163	LISN FCC/VDE/MIL -STD	Electro-Metrics	ANS-25/2	1314	10/04
0287	Turntable, motorized diameter, 2 m	Hermon Labs	TMD-2	042	11/04 check
0415	Cable coax RF, RG-58	Hermon Labs	CC-3	056	5/04
0446	Active Loop Antenna 10 kHz-30 MHz	Electro-Mechanics	6502	2857	10/04
0465	Anechoic chamber 9 (L) x 6.5 (W) x 5.5 (H) m	Hermon Labs	AC-1	023	10/05 check
0466	Shielded room 3 (L) x 3 (W) x 2.4 (H) m	Hermon Labs	SR-1	024	11/04 check
0521	Spectrum analyzer with RF filter section (EMI receiver 9 kHz - 6.5 GHz)	Hewlett Packard	8546A	0319	9/04
0589	Cable coaxial, GORE A2POL118.2, 3 m	Hermon Labs	GORE-3	589	11/04
0592	Position controller	Hermon Labs	L2-SR3000	100	5/04 check
0593	Antenna mast, 1-4 m/1-6 m pneumatic	Hermon Labs	AM-F1	101	2/05 check
0594	Turntable for Anechoic Chamber, flush mounted, d=1.2 m, pneumatic	Hermon Labs	WDC1	102	1/05 check
0604	Antenna biconilog log-periodic/T Bow-Tie, 26 - 2000 MHz	EMCO	3141	9611-1011	1/05
0672	Shielded room 4.6(L) x 4.2(W) x2.4(H) m	Hermon Labs	SR-3	027	11/04 check
0787	Transient limiter	Hewlett Packard	11947A-8ZE	3107A01877	11/04
0812	Cable, coax, RG-214, 11.5 m, N-type connectors	Hermon Labs	C214-11	148	5/04
1004	Cable, coaxial ANDREW PSWJ4, 6 m	Hermon Labs	ANDREW-6	163	12/04
1365	Cable coaxial, RG-214, 5 m	Hermon Labs	C214-5	1365	4/04
1430	EMI Receiver System, 9 kHz - 2.9 GHz	Agilent Technologies	8542E	3807A00262	9/04
1503	Cable RF, 6 m	Belden	M17/167 MIL-C-17	1503	9/04 check
1947	Cable 18 GHz, 6.5 m, blue	Rhophase Microwave Ltd.	NPS-1803A-6500-NPS	T4974	10/04
1984	Antenna, double ridged waveguide horn, 1-18 GHz, 300 W, N-type	EMC Test Systems	3115	9911-5964	3/04
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	12/04
2432	Antenna, double-ridged waveguide horn, 1-18 GHz	EMC Test Systems	3115	000271777	7/04

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Appendix C Test equipment correction factors

Correction factor
Line impedance stabilization network, model ANS-25/2
Electro-Metrics

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).

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Antenna factor
Log periodic antenna (HL 0034)
Electro-Metrics, model LPA-25/30
Ser.No.1988

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

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

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011

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).

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

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

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

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

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Antenna factor
Double-ridged guide horn antenna
Model 3115, serial number: 00027177, HL2432

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 intensity in dB(μV/m).

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

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

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

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Cable loss
Cable Coaxial, GORE A2P01POL118, 2.3 m, model:GORE-3, HL 0589
+ Cable Coaxial, ANDREW PSWJ4, 6m, model: ANDREW-6, HL 1004

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	30	0.33	6.5	±0.12
2	50	0.40		
3	100	0.57		
4	300	0.97		
5	500	1.25		
6	800	1.59		
7	1000	1.81		
8	1200	1.97		
9	1400	2.15		
10	1600	2.28		
11	1800	2.43		
12	2000	2.61		
13	2200	2.75		
14	2400	2.89		
15	2600	2.97		
16	2800	3.21	6.5	±0.12
17	3000	3.32		
18	3300	3.47		
19	3600	3.62		
20	3900	3.84		
21	4200	3.92		±0.17
22	4500	4.07		
23	4800	4.36		
24	5100	4.62		
25	5400	4.78		
26	5700	5.16		
27	6000	5.67		
28	6500	5.99		

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Cable loss
Cable coaxial, RG-214, 5m, model: C214-5, HL 1365

No.	Frequency, MHz	Measured, dB	Measured uncertainty dB
1	1000	0.41	±0.12
2	1200	0.44	
3	1400	0.48	
4	1600	0.52	
5	1800	0.55	
6	2000	0.58	
7	2200	0.61	
8	2400	0.64	±0.17
9	2600	0.67	
10	2800	0.7	
11	3000	0.73	
12	3300	0.79	
13	3600	0.84	
14	3900	0.94	
15	4200	1.22	

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

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

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

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

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

Hermon Laboratories Ltd.
P.O.Box 23
Binyamina 30500, Israel
Tel.+972 6628 8001
Fax.+972 6628 8277
e-mail: *mail@hermonlabs.com*

Appendix D - General information

Test facility description

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

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

Person for contact: Mr. Alex Usoskin, QA manager.

Abbreviations and acronyms

The following abbreviations and acronyms are applicable to this test report:

AC	alternating current
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
EUT	equipment under test
GHz	gigahertz
H	height
Hz	hertz
kHz	kilohertz
kV	kilovolt
L	length
LISN	line impedance stabilization network
m	meter
MHz	megahertz
NA	not applicable
QP	quasi-peak
RF	radio frequency
RE	radiated emission
rms	root mean square
s	second
V	volt
W	width

Specification references

47CFR part 15: 2003	Radio Frequency Devices
ANSI C63.2:96	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4:01	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.