HERMON LABORATORIES

ACCREDITED
839.01
Electrical

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# TEST REPORT

**ACCORDING TO: FCC 47CFR part 15: 2005, subpart B, Class B**

**FOR:**

## Motorola Israel Ltd.

## QuadBand GSM/GPRS/EGPRS module

## Model:G24EDGE

# Table of contents

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# 1 Applicant information

| | |
|---|---|
| **Client name:** | Motorola Israel Ltd. |
| **Address:** | 3 Kremenetski street, P.O.B. 25016, 67899 Tel Aviv, Israel |
| **Telephone:** | +972 3565 8888 |
| **Fax:** | +972 3565 9968 |
| **E-mail:** | alfred.firouz@motorola.com |
| **Contact name:** | Mr. Alfred Firouz |

# 2 Equipment under test attributes

| | |
|---|---|
| **Product name:** | QuadBand GSM/GPRS/EGPRS module |
| **Model:** | G24EDGE |
| **Serial number:** | 074SGDB286 |
| **Hardware version:** | FCN5752A |
| **Software release:** | 0C.13.01D |
| **Receipt date:** | 5/25/2006 |

# 3 Manufacturer information

| | |
|---|---|
| **Client name:** | Motorola Israel Ltd. |
| **Address:** | 3 Kremenetski street, P.O.B. 25016, 67899 Tel Aviv, Israel |
| **Telephone:** | +972 3565 8888 |
| **Fax:** | +972 3565 9968 |
| **E-mail:** | alfred.firouz@motorola.com |
| **Contact name:** | Mr. Alfred Firouz |

# 4 Test details

| | |
|---|---|
| **Project ID:** | 17052 |
| **Location:** | Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel |
| **Test started:** | 5/25/2006 |
| **Test completed:** | 5/29/2006 |
| **Test specification:** | FCC 47CFR part 15: 2005, subpart B, Class B |

# 5 Tests summary

| Test | Status |
|---|---|
| **FCC 47 CFR part 15, subpart B** | |
| Section 15.107 Class B, AC power lines conducted emissions | Pass |
| Section 15.109 Class B, Radiated emissions | Pass |

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass / fail decision was based on nominal values.

| | Name and Title | Date | Signature |
|---|---|---|---|
| **Tested by:** | Mr. E. Plotnichenko, test engineer | May 29, 2006 |  |
| **Reviewed by:** | Ms. N. Averin, certification engineer | May 30, 2006 |  |
| **Approved by:** | Mr. M. Nikishin, EMC and radio group leader | May 30, 2006 |  |

# 6 EUT description

## 6.1 General information

The EUT is a QuadBand GSM module, powered by DC power supply. Throughout the testing the EUT was installed into an evaluation board.

## 6.2 Ports and lines

| Port type | Port description | Connected | | Connector type | Qty. | Cable type | Cable length | Indoor / outdoor |
|---|---|---|---|---|---|---|---|---|
| | | From | To | | | | | |
| Power | 3.8 VDC | EUT | Power supply | Terminal block | 1 | Unshielded | 0.5 m | Indoor |
| Power | AC power | Power supply | AC mains | IEC 320 | 1 | Unshielded | 1.5 m | Indoor |
| Signal | USB | EUT | Laptop | USB | 1 | Shielded | 1.5 m | Indoor |
| Signal | RS 232 | Evaluation board | Open circuit | D type 9 pin | 1 | Unshielded | 1.5 m | Indoor |
| Power | 16 VDC | Laptop | AC/DC adapter | DC jack | 1 | Unshielded | 1 m | Indoor |
| Power | AC power | AC/DC adapter | AC mains | 2-pole | 1 | Unshielded | 1 m | Indoor |
| Telecom | Phone | Laptop | Open circuit | RJ 11 | 1 | Unshielded | 1.5 m | Indoor |
| Signal | Mouse | Laptop | Mouse | PS/2 | 1 | Unshielded | 1 m | Indoor |

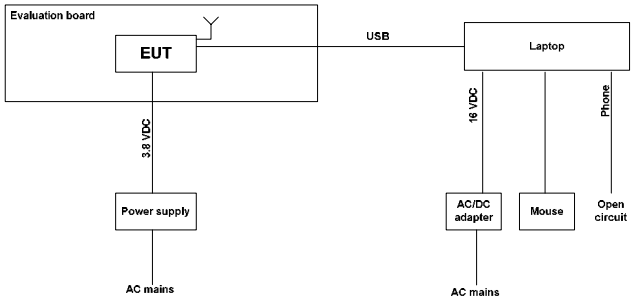
## 6.3 Auxiliary equipment

| Description | Manufacturer | Model number | Serial number |
|---|---|---|---|
| Power supply | Horizon Electronics | DHR3655D | 767469 |
| Evaluation board | Motorola | G24eboard | 8488899V01P1 |
| Laptop | IBM | 600E | 5560NZV |
| AC/DC adapter | IBM | AA20530 | J16AW838BYK |

## 6.4 Operating frequencies

| Frequency, MHz | | | | | | |
|---|---|---|---|---|---|---|
| 400 | NA | NA | NA | NA | NA | NA |

## 6.5 Test configuration




## 6.6 Changes made in the EUT

No changes were implemented.

| Test specification: | Section 15.107 Class B, AC power lines conducted emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 7.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:11:02 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

# 7 Emissions tests according to FCC 47CFR part 15 subpart B requirements

## 7.1 Conducted emissions

### 7.1.1 General

This test was performed to measure the common mode conducted emissions at the AC power ports. The specification test limits are given in Table 7.1.1.

**Table 7.1.1 Limits for conducted emissions**

| Frequency, MHz | Class B limit, dB(µV) | | Class A limit, dB(µV) | |
|---|---|---|---|---|
| | 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.

### 7.1.2 Test procedure

**7.1.2.1** The EUT was set up as shown in Figure 7.1.1 and the associated photograph, energized and the EUT performance was checked.

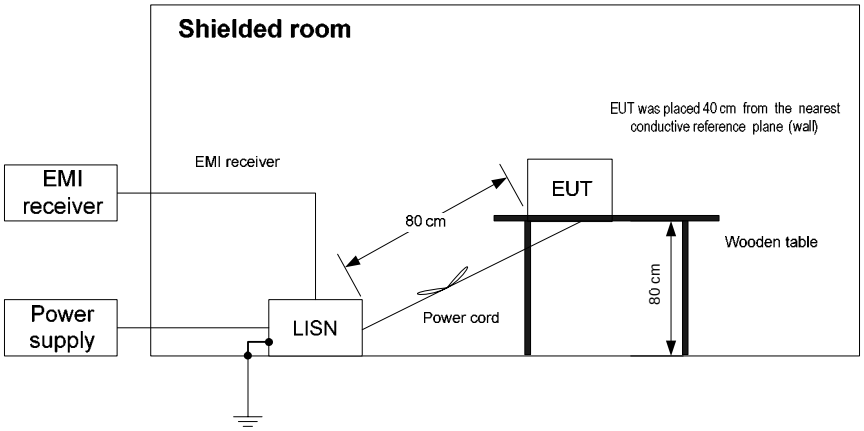
**7.1.2.2** The measurements were performed at the AC power terminals with the LISN connected to the EMI receiver in the frequency range referred to in Table 7.1.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

**7.1.2.3** The position of the EUT cables was varied to find the highest emission.

**7.1.2.4** The worst test results with respect to the limits were recorded in Table 7.1.2 and shown in the associated plots.

| Test specification: | Section 15.107 Class B, AC power lines conducted emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 7.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:11:02 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

**Figure 7.1.1 Setup for conducted emission measurements, table-top EUT**




**Photograph 7.1.1 Setup for conducted emission measurements**

| Test specification: | Section 15.107 Class B, AC power lines conducted emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 7.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:11:02 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

**Table 7.1.2 Conducted emission test results**

LINE: AC mains
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* | | |
| **AC mains input of EUT power supply** | | | | | | | | | |
| 2.786115 | 36.88 | 27.49 | -28.51 | 56.00 | 9.38 | 46.00 | -36.62 | L1 | Pass |
| 3.074355 | 37.50 | 28.57 | -27.43 | 56.00 | 22.90 | 46.00 | -23.10 | | |
| 5.199598 | 38.35 | 27.63 | -32.37 | 60.00 | 6.68 | 50.00 | -43.32 | | |
| 5.960920 | 40.80 | 39.95 | -20.05 | 60.00 | 35.66 | 50.00 | -14.34 | | |
| 4.998844 | 32.98 | 22.51 | -33.49 | 56.00 | 6.98 | 46.00 | -39.02 | L2 | Pass |
| 5.914745 | 40.98 | 40.43 | -19.57 | 60.00 | 44.15 | 50.00 | -5.85 | | |
| 13.579235 | 35.65 | 37.91 | -22.09 | 60.00 | 31.64 | 50.00 | -18.36 | | |
| 15.630520 | 37.83 | 36.00 | -24.00 | 60.00 | 36.17 | 50.00 | -13.83 | | |
| **AC mains input of laptop power adapter** | | | | | | | | | |
| 0.211945 | 61.40 | 59.87 | -3.32 | 63.19 | 46.63 | 53.19 | -6.56 | L1 | Pass |
| 0.316260 | 49.18 | 46.42 | -13.41 | 59.83 | 34.59 | 49.83 | -15.24 | | |
| 0.335650 | 47.76 | 45.04 | -14.33 | 59.37 | 35.19 | 49.37 | -14.18 | | |
| 0.420770 | 41.95 | 38.86 | -18.62 | 57.48 | 28.25 | 47.48 | -19.23 | | |
| 4.853508 | 37.61 | 32.00 | -24.00 | 56.00 | 19.34 | 46.00 | -26.66 | | |
| 0.211098 | 60.53 | 58.40 | -4.83 | 63.23 | 45.06 | 53.23 | -8.17 | L2 | Pass |
| 0.223243 | 59.68 | 57.62 | -5.14 | 62.76 | 45.36 | 52.76 | -7.40 | | |
| 0.315460 | 46.78 | 44.68 | -15.17 | 59.85 | 35.67 | 49.85 | -14.18 | | |
| 0.421145 | 42.65 | 39.15 | -18.32 | 57.47 | 28.56 | 47.47 | -18.91 | | |
| 0.559858 | 37.73 | 34.41 | -21.59 | 56.00 | 23.71 | 46.00 | -22.29 | | |
| 4.920793 | 38.53 | 32.93 | -23.07 | 56.00 | 21.28 | 46.00 | -24.72 | | |

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

**Reference numbers of test equipment used**

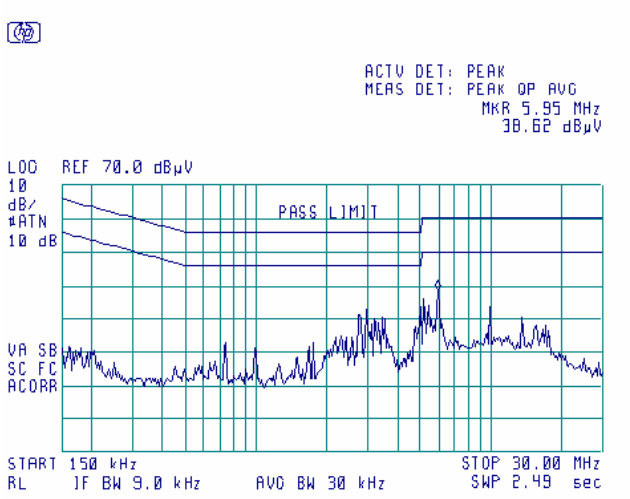
| HL 0163 | HL 0447 | HL 0672 | HL 0787 | HL 1430 | HL 1512 | HL 2358 | |
|---|---|---|---|---|---|---|---|

Full description is given in Appendix A.

| Test specification: | Section 15.107 Class B, AC power lines conducted emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 7.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:11:02 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

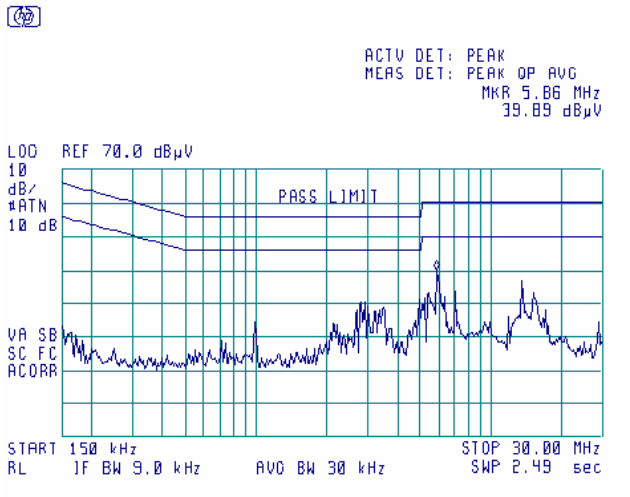
**Plot 7.1.1 Conducted emission measurements, AC mains input of EUT power supply**

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK




**Plot 7.1.2 Conducted emission measurements, AC mains input of EUT power supply**

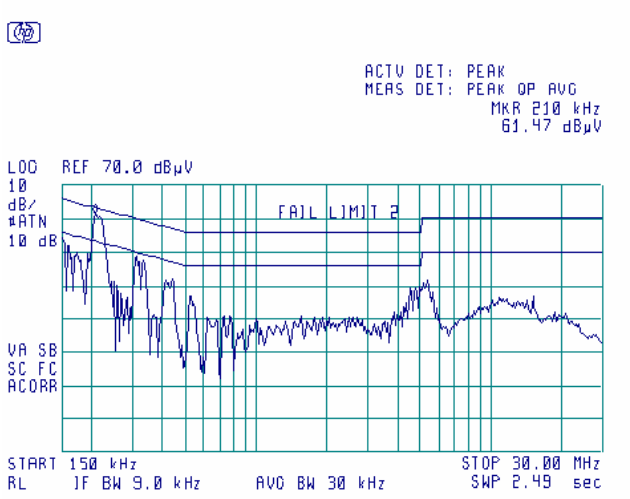
LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



| Test specification: | Section 15.107 Class B, AC power lines conducted emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 7.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:11:02 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

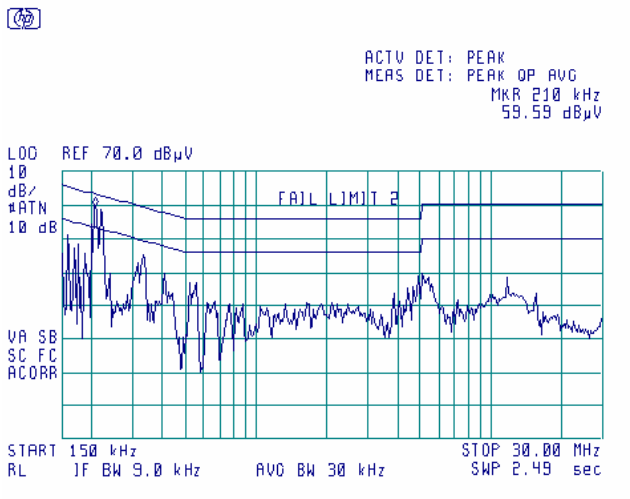
**Plot 7.1.3 Conducted emission measurements, AC mains input of laptop power adapter**

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK




**Plot 7.1.4 Conducted emission measurements, AC mains input of laptop power adapter**

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



| Test specification: | Section 15.109 Class B, Radiated emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 8.3 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:22:31 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

## 7.2 Radiated emission measurements

### 7.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. The specification test limits are given in Table 7.2.1.

**Table 7.2.1 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 a test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where $S_1$ and $S_2$ – the standard defined and the test distance respectively in meters.

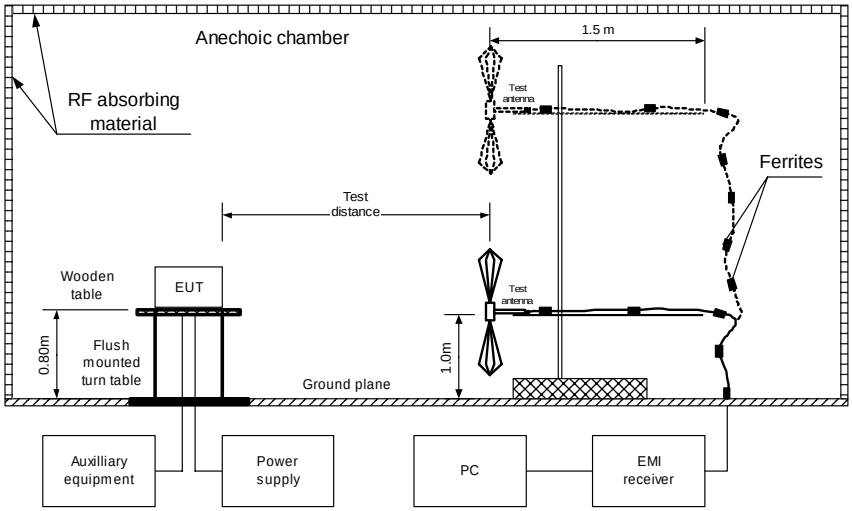
### 7.2.2 Test procedure

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

**7.2.2.2** The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated $360^0$ and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.

**7.2.2.3** The worst test results with respect to the limits were recorded in Table 7.2.2 and shown in the associated plots.

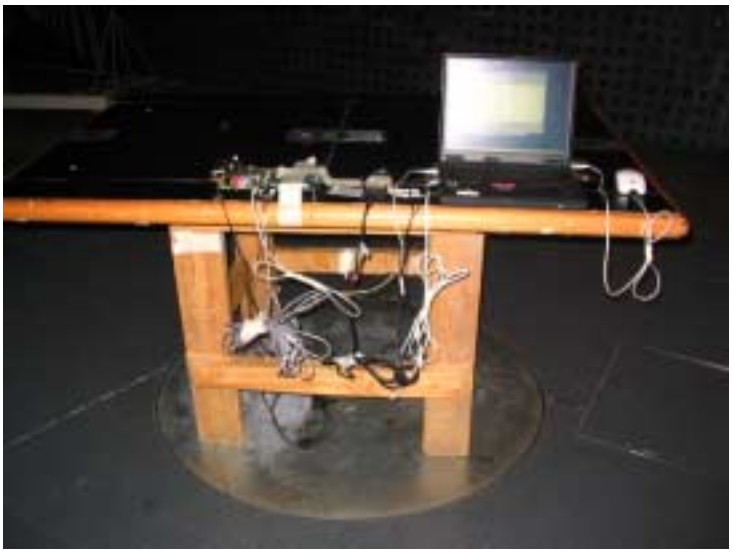
**Figure 7.2.1 Setup for radiated emission measurements in anechoic chamber, table-top EUT**



| Test specification: | Section 15.109 Class B, Radiated emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 8.3 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:22:31 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

**Photograph 7.2.1 Setup for radiated emission measurements, general view**

**Photograph 7.2.2 Setup for radiated emission measurements, EUT cabling**



| Test specification: | Section 15.109 Class B, Radiated emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 8.3 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:22:31 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

**Table 7.2.2 Radiated emission test results**

EUT SET UP: TABLE-TOP
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
FREQUENCY RANGE: 30 MHz – 1000 MHz
DETECTORS USED: PEAK / QUASI-PEAK
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* | | | | |
| 135.473750 | 42.40 | 40.97 | 43.50 | -2.53 | Vertical | 1.0 | 234 | Pass |
| 169.347500 | 37.72 | 36.26 | 43.50 | -7.24 | Vertical | 1.0 | 290 | |
| 203.212500 | 38.85 | 37.91 | 43.50 | -5.59 | Vertical | 1.0 | 270 | |
| 326.115400 | 43.04 | 40.00 | 46.00 | -6.00 | Vertical | 1.0 | 22 | |
| 356.388750 | 40.82 | 27.45 | 46.00 | -18.55 | Vertical | 1.0 | 27 | |
| 733.375000 | 36.87 | 33.06 | 46.00 | -12.94 | Vertical | 1.0 | 315 | |

FREQUENCY RANGE: 1000 MHz – 2900 MHz
DETECTORS USED: PEAK / AVERAGE
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* | | | | |
| 1065.70000 | 47.39 | 25.93 | 54.00 | -28.07 | Vertical | 1.0 | 241 | Pass |
| 1121.03870 | 49.45 | 26.55 | 54.00 | -27.45 | Vertical | 1.0 | 255 | |

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

**Reference numbers of test equipment used**

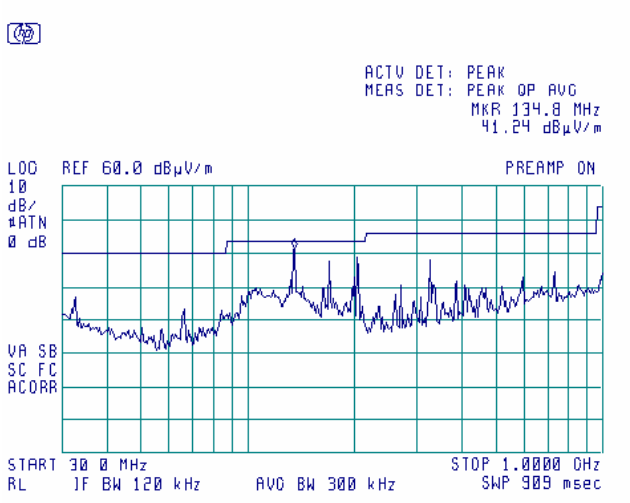
| HL 0465 | HL 0521 | HL 0589 | HL 0593 | HL 0594 | HL 0604 | HL 1947 | HL 1984 |
|---|---|---|---|---|---|---|---|
| HL 2009 | | | | | | | |

Full description is given in Appendix A.

| **Test specification:** | **Section 15.109 Class B, Radiated emissions** | | |
|---|---|---|---|
| **Test procedure:** | ANSI C63.4, Section 8.3 | | |
| **Test mode:** | Compliance | **Verdict:** | PASS |
| **Date & Time:** | 5/25/2006 9:22:31 PM | | |
| **Temperature:** 24 ºC | **Air Pressure:** 1010 hPa | **Relative Humidity:** 40 % | **Power Supply:** 120 VAC |
| **Remarks:** | | | |

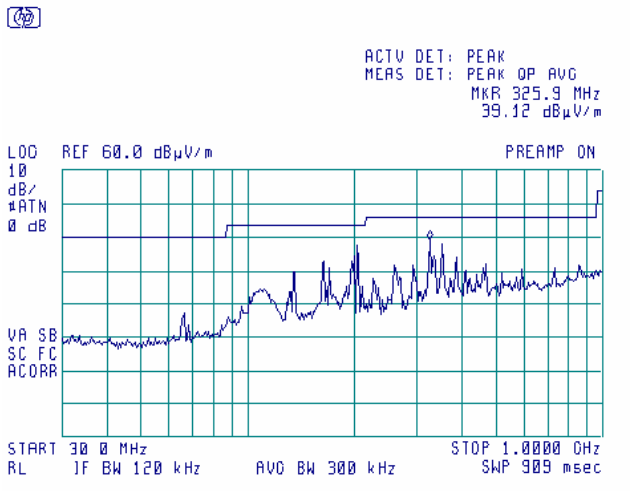
**Plot 7.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization**

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m




**Plot 7.2.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization**

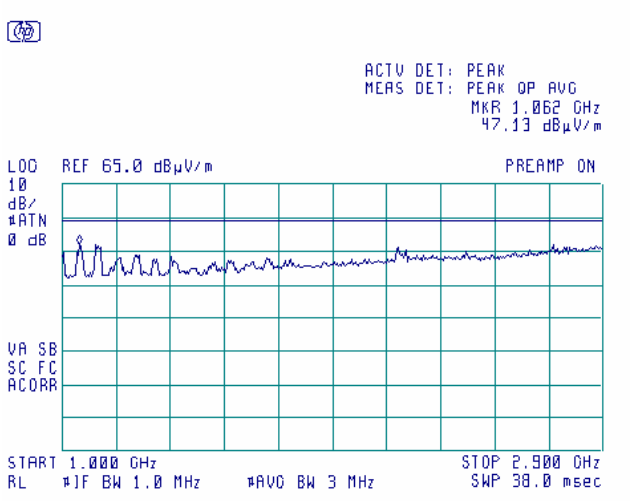
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



| Test specification: | Section 15.109 Class B, Radiated emissions | | |
|---|---|---|---|
| Test procedure: | ANSI C63.4, Section 8.3 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 5/25/2006 9:22:31 PM | | |
| Temperature: 24 ºC | Air Pressure: 1010 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

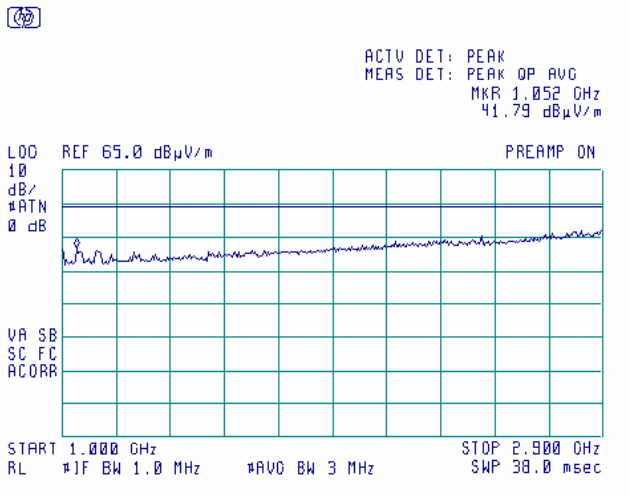
**Plot 7.2.3 Radiated emission measurements in 1000 – 2900 MHz range, vertical antenna polarization**

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m




**Plot 7.2.4 Radiated emission measurements in 1000 – 2900 MHz range, horizontal antenna polarization**

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



# 8 APPENDIX A Test equipment and ancillaries used for tests

| HL No | Description | Manufacturer | Model | Ser. No. | Last Cal. | Due Cal. |
|---|---|---|---|---|---|---|
| 0163 | LISN FCC/VDE/MIL-STD | Electro-Metrics | ANS 25/2 | 1314 | 01-Oct-05 | 01-Oct-06 |
| 0447 | LISN, 16/2, 300V RMS | HL | LISN 16 - 1 | 066 | 03-Nov-05 | 03-Nov-06 |
| 0465 | Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m | HL | AC - 1 | 023 | 11-Nov-05 | 11-Nov-06 |
| 0521 | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz | Hewlett Packard | 8546A | 3617A 00319, 3448A002 53 | 26-Sep-05 | 26-Sep-06 |
| 0589 | Cable Coaxial, GORE A2P01POL118, 2.3 m | HL | GORE-3 | 176 | 02-Dec-05 | 02-Dec-06 |
| 0593 | Antenna Mast, 1-4 m Pneumatic | Madgesh | AM-F1 | 101 | 02-Feb-06 | 02-Feb-07 |
| 0594 | Turn Table for anechoic chamber flush mount d=1.2 m Pneumatic | HL | TT-WDC1 | 102 | 26-Jan-06 | 26-Jan-07 |
| 0604 | Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz | EMCO | 3141 | 9611-1011 | 10-Jan-06 | 10-Jan-07 |
| 0672 | Shielded Room 4,6(L) x 4,2(W) x 2,4(H) m | HL | SR - 3 | 027 | 11-Nov-05 | 11-Nov-06 |
| 0787 | Transient Limiter | Hewlett Packard | 11947A | 3107A018 77 | 21-Nov-05 | 21-Nov-06 |
| 1430 | EMI Receiver, 9 kHz - 2.9 GHz | Agilent Technologies | 8542E | 3807A002 62,3705A0 0217 | 01-Sep-05 | 01-Sep-06 |
| 1512 | Cable RF, 8 m | Belden | M17/167 MIL-C-17 | 1512 | 11-Sep-05 | 11-Sep-06 |
| 1947 | Cable 18GHz, 6.5 m, blue | Rhophase Microwave Limited | NPS-1803A-6500-NPS | T4974 | 17-Oct-05 | 17-Oct-06 |
| 1984 | Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W, N-type | EMC Test Systems | 3115 | 9911-5964 | 03-Mar-06 | 03-Mar-07 |
| 2009 | Cable RF, 8 m | Alpha Wire | RG-214 | C-56 | 02-Dec-05 | 02-Dec-06 |
| 2358 | Power Supply, 2 X 0-36VDC / 5A, 5VDC / 5A | Horizon Electronics | DHR3655 D | 767469 | 07-Apr-06 | 07-Apr-07 |

# 9 APPENDIX B Measurement uncertainties

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

| Test description | Expanded uncertainty |
|---|---|
| Conducted emissions at mains port with LISN and HP 8542E or HP 8546A receiver | 9 kHz to 150 kHz: ± 3.9 dB<br>150 kHz to 30 MHz: ± 3.8 dB |
| Radiated emissions at 10 m measuring distance<br>Horizontal polarization<br><br><br><br>Vertical polarization | <br>Biconilog antenna: ± 5.0 dB<br>Biconical antenna: ± 5.0 dB<br>Log periodic antenna: ± 5.1 dB<br>Double ridged horn antenna: ± 5.3 dB<br>Biconilog antenna: ± 5.5 dB<br>Biconical antenna: ± 5.5 dB<br>Log periodic antenna: ± 5.6 dB<br>Double ridged horn antenna: ± 5.8 dB |
| Radiated emissions at 3 m measuring distance<br>Horizontal polarization<br><br><br><br>Vertical polarization | <br>Biconilog antenna: ± 5.3 dB<br>Biconical antenna: ± 5.0 dB<br>Log periodic antenna: ± 5.3 dB<br>Double ridged horn antenna: ± 5.3 dB<br>Biconilog antenna: ± 6.0 dB<br>Biconical antenna: ± 5.7 dB<br>Log periodic antenna: ± 6.0 dB<br>Double ridged horn antenna: ± 6.0 dB |

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of ISO/IEC 17025 (or alternately ANSI/NCSL Z540-1).
The laboratory calibrates its measurement standards by a third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements. The Hermon Labs EMC measurements uncertainty is given in the table above.
Person for contact: Mr. Alex Usoskin, CEO.

# 10 APPENDIX C 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) and approved by Israel Ministry of environmental protection, radiation hazards department (Permit number 1158).

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# 11 APPENDIX D Specification references

| | |
|---|---|
| FCC 47CFR part 15: 2005 subpart B | 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 Abbreviations and acronyms

| | |
|---|---|
| A | ampere |
| AC | alternating current |
| AVRG | average (detector) |
| cm | centimeter |
| CDN | coupling/ decoupling network |
| 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 |
| DC | direct current |
| EMC | electromagnetic compatibility |
| EMI | electromagnetic interference |
| EUT | equipment under test |
| GHz | gigahertz |
| GND | ground |
| H | height |
| HL | Hermon laboratories |
| Hz | hertz |
| ITE | information technology equipment |
| k | kilo |
| kHz | kilohertz |
| kV | kilovolt |
| L | length |
| LISN | line impedance stabilization network |
| m | meter |
| MHz | megahertz |
| min | minute |
| mm | millimeter |
| ms | millisecond |
| μs | microsecond |
| NA | not applicable |
| NP | normal performance |
| OATS | open area test site |
| Ω | Ohm |
| QP | quasi-peak |
| PS | power supply |
| RE | radiated emission |
| RF | radio frequency |
| rms | root mean square |
| s | second |
| V | volt |
| W | width |

# 13 APPENDIX F Test equipment correction factors

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

| Frequency, MHz | Correction factor, dB |
|---|---|
| 0.01 | 5.0 |
| 0.02 | 2.2 |
| 0.03 | 1.1 |
| 0.04 | 0.7 |
| 0.05 | 0.5 |
| 0.1 | 0.2 |
| 0.2 | 0.1 |
| 0.4 | 0.1 |
| 0.6 | 0.1 |
| 0.8 | 0.1 |
| 1 | 0.1 |
| 2 | 0.1 |
| 3 | 0.1 |
| 4 | 0.1 |
| 6 | 0.2 |
| 10 | 0.3 |
| 12 | 0.4 |
| 16 | 0.5 |
| 18 | 0.6 |
| 20 | 0.7 |
| 25 | 0.9 |
| 28 | 1.2 |
| 30 | 1.3 |

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

**Correction factor**
**Line impedance stabilization network**
**Model ANS-25/2**
**Electro-Metrics**

| Frequency, MHz | Correction factor, dB |
|---|---|
| 0.01 | 4.7 |
| 0.02 | 2.1 |
| 0.03 | 1.1 |
| 0.04 | 0.7 |
| 0.05 | 0.5 |
| 0.1 | 0.2 |
| 0.2 | 0.1 |
| 0.4 | 0.1 |
| 0.6 | 0.1 |
| 0.8 | 0.1 |
| 1 | 0.1 |
| 2 | 0.1 |
| 3 | 0.1 |
| 4 | 0.1 |
| 6 | 0.1 |
| 10 | 0.1 |
| 12 | 0.1 |
| 16 | 0.1 |
| 18 | 0.1 |
| 20 | 0.1 |
| 25 | 0.1 |
| 28 | 0.1 |
| 30 | 0.1 |

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

**Antenna factor**

**Biconilog antenna EMCO, model 3141, serial number 1011**

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

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

**Antenna factor**
**Double-ridged wave guide horn antenna**
**Model 3115**
**Serial number: 9911-5964**

| Frequency, MHz | Antenna factor. dB(1/m) |
|---|---|
| 1000.0 | 24.5 |
| 1500.0 | 24.8 |
| 2000.0 | 27.6 |
| 2500.0 | 28.7 |
| 3000.0 | 30.8 |
| 3500.0 | 32.9 |
| 4000.0 | 32.7 |
| 4500.0 | 32.0 |
| 5000.0 | 33.6 |
| 5500.0 | 35.3 |
| 6000.0 | 35.7 |
| 6500.0 | 35.8 |
| 7000.0 | 36.2 |
| 7500.0 | 37.2 |
| 8000.0 | 37.2 |
| 8500.0 | 38.1 |
| 9000.0 | 38.6 |
| 9500.0 | 38.3 |
| 10000.0 | 38.4 |
| 10500.0 | 38.3 |
| 11000.0 | 38.8 |
| 11500.0 | 39.9 |
| 12000.0 | 39.6 |
| 12500.0 | 39.5 |
| 13000.0 | 40.5 |
| 13500.0 | 41.1 |
| 14000.0 | 41.5 |
| 14500.0 | 40.8 |
| 15000.0 | 39.5 |
| 15500.0 | 38.1 |
| 16000.0 | 38.1 |
| 16500.0 | 40.1 |
| 17000.0 | 42.6 |
| 17500.0 | 45.4 |
| 18000.0 | 48.7 |

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