

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 15 Subpart C, section 15.231

FOR:

Visonic Ltd.

Wireless CO gas detector

Model: MCT-442

This report is in conformity with ISO/ IEC 17025. The A2LA logo endorsement applies only to the test methods and the standards that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested.
This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

Table of contents

| | | |
|-----|---|----|
| 1 | Applicant information | 3 |
| 2 | Equipment under test attributes | 3 |
| 3 | Manufacturer information | 3 |
| 4 | Test details | 3 |
| 5 | Tests summary | 4 |
| 6 | EUT description | 5 |
| 6.1 | General information | 5 |
| 6.2 | Operating frequencies | 5 |
| 6.3 | Changes made in the EUT | 5 |
| 6.4 | Transmitter characteristics | 6 |
| 7 | Transmitter tests according to 47CFR part 15 subpart C requirements | 7 |
| 7.1 | Periodic operation requirements | 7 |
| 7.2 | Field strength of emissions | 14 |
| 7.3 | Occupied bandwidth test | 25 |
| 7.4 | Antenna requirements | 27 |
| 7.5 | Radiated emission measurements | 28 |
| 8 | APPENDIX A Test equipment and ancillaries used for tests | 32 |
| 9 | APPENDIX B Measurement uncertainties | 33 |
| 10 | APPENDIX C Test facility description | 34 |
| 11 | APPENDIX D Specification references | 34 |
| 12 | APPENDIX E Abbreviations and acronyms | 35 |
| 13 | APPENDIX F Test equipment correction factors | 36 |

1 Applicant information

Client name: Visonic Ltd.
Address: 24 Habarzel st., Tel Aviv 61920, Israel
Telephone: 03-6456714
Fax: 03-6456788
E-mail: aelshtein@visonic.com
Contact name: Mr. Elshtein Arik

2 Equipment under test attributes

Product name: Wireless CO gas detector
Product type: Transmitter
Model(s): MCT-442
Receipt date 9/28/2006

3 Manufacturer information

Manufacturer name: Visonic Ltd.
Address: 24 Habarzel st., Tel Aviv 61920, Israel
Telephone: 03-6456714
Fax: 03-6456788
E-Mail: aelshtein@visonic.com
Contact name: Mr. Elshtein Arik

4 Test details




Project ID: 17420
Location: Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30550, Israel
Test started: 9/28/2006
Test completed: 11/16/2006
Test specification(s): FCC Part 15, subpart C, §15.231; subpart B

5 Tests summary

| Test | Status |
|---|--------------|
| Transmitter characteristics | |
| Section 15.231(a), Periodic operation requirements | Pass |
| Section 15.231(b), Field strength of emissions | Pass |
| Section 15.231(c), Occupied bandwidth | Pass |
| Section 15.207(a), Conducted emission | Not required |
| Section 15.203, Antenna requirement | Pass |
| Unintentional emissions | |
| Section 15.107, Conducted emission at AC power port | Not required |
| Section 15.109, Radiated emission | Pass |
| Section 15.111, Conducted emission at receiver antenna port | Not required |

Testing was completed against the 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.

This test report replaces the previously issued test report identified by Doc ID:VISRAD_FCC.17420.

| | Name and Title | Date | Signature |
|---------------------|---|-------------------|---|
| Tested by: | Mr. P. Kagan, test engineer | November 16, 2006 |  |
| Reviewed by: | Mrs. M. Cherniavsky, certification engineer | December 26, 2006 |  |
| Approved by: | Mr. M. Nikishin, EMC and radio group leader | December 27, 2006 |  |

6 EUT description

6.1 General information

The EUT is a carbon monoxide (CO) detector designed to monitor the CO gas level in residential dwellings and to give early warning before potentially dangerous levels exist. The CO alarm is transmitted to the controlling center of a wireless intrusion/burglar alarm system. The EUT is powered by 9 V internal lithium battery.

6.2 Operating frequencies

| Source | Frequency, MHz |
|-----------------|----------------|
| Digital portion | 13.582 |
| Transmitter | 315 |

6.3 Changes made in the EUT

No changes were implemented.

6.4 Transmitter characteristics

| | | | | | |
|---|--|---|--------------------------------|---------------------|--------------------------------|
| Type of equipment | | | | | |
| X | Stand-alone (Equipment with or without its own control provisions) | | | | |
| | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) | | | | |
| | Plug-in card (Equipment intended for a variety of host systems) | | | | |
| Intended use | | Condition of use | | | |
| | fixed | Always at a distance more than 2 m from all people | | | |
| X | mobile | Always at a distance more than 20 cm from all people | | | |
| | portable | May operate at a distance closer than 20 cm to human body | | | |
| Operating frequency | | 315 MHz | | | |
| Maximum rated output power | | At transmitter 50 Ω RF output connector | | | dBm |
| | | Effective radiated power (for equipment with no RF connector) | | | -20 dBm |
| Is transmitter output power variable? | | X | No | | |
| | | | continuous variable | | |
| | | | stepped variable with stepsize | | |
| | | Yes | minimum RF power | | |
| | | | maximum RF power | | |
| Antenna connection | | | | | |
| unique coupling | | standard connector | | X | integral |
| | | | | X | with temporary RF connector |
| | | | | | without temporary RF connector |
| Antenna/s technical characteristics | | | | | |
| Type | | Manufacturer | | Model number | |
| Helicoil | | Visonic Ltd. | | NA | |
| Gain | | NA | | | |
| Type of modulation | | | | | |
| ASK | | | | | |
| Modulating test signal (baseband) | | | | | |
| ID code | | | | | |
| Transmitter duty cycle supplied for test | | 56% | Tx ON time | msec | Period |
| | | | | | msec |
| Transmitter power source | | | | | |
| X | Battery | Nominal rated voltage | 9 VDC | Battery type | Lithium |
| | DC | Nominal rated voltage | VDC | | |
| | AC mains | Nominal rated voltage | VAC | Frequency | Hz |

| | | | |
|----------------------------|-------------------------------|---|----------------------------------|
| Test specification: | | Section 15.231(a), Periodic operation requirements | |
| Test procedure: | | Supplier declaration | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 1:21:03 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

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

7.1 Periodic operation requirements

7.1.1 General

The EUT was verified for compliance with periodic operation requirements listed below:

- Continuous transmissions such as voice, video and the radio control of toys are not permitted;
- A transmitter activated automatically shall cease transmission within 5 seconds after activation;
- Periodic transmissions, excluding polling or supervision transmissions, at regular predetermined intervals are not permitted;
- Polling or supervision transmissions, including data, to determine system integrity in security or safety applications shall not last longer than 2 seconds per hour.

The rationale for compliance with the above requirements was either test results or supplier declaration. The summary of results is provided in Table 7.1.1.

7.1.2 Test procedure for transmitter shut down test

7.1.2.1 The EUT was set up as shown in Figure 7.1.1.

7.1.2.2 The spectrum analyzer center frequency was adjusted to the EUT carrier, span set to zero and video triggered for transmission.

7.1.2.3 The transmitter was activated either manually or automatically. Once manually operated transmitter was activated, the switch was immediately released.

7.1.2.4 The transmission time was captured and shown in Plot 7.1.1, Plot 7.1.2, Plot 7.1.3.

7.1.3 Test procedure for measurements of polling / supervision transmission duration

7.1.3.1 The EUT was set up as shown in Figure 7.1.1.

7.1.3.2 The spectrum analyzer center frequency was adjusted to the EUT carrier, span set to zero and video triggered for transmission.

7.1.3.3 The transmission time was captured and shown in Plot 7.1.4 to Plot 7.1.6.

Figure 7.1.1 Setup for transmitter shut down test



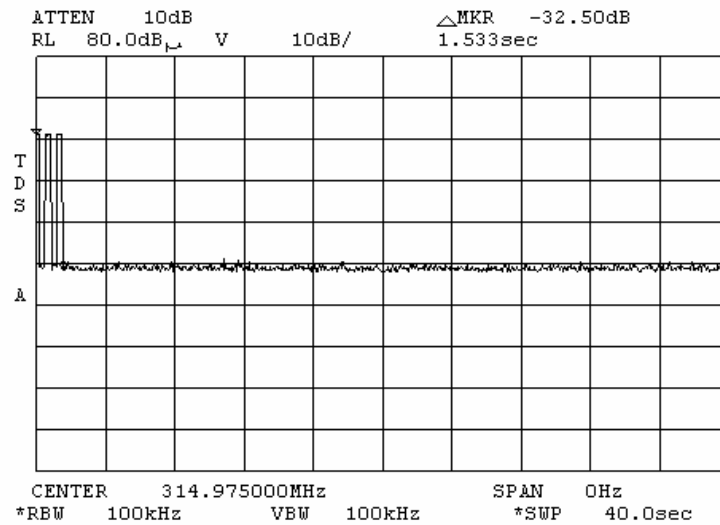
| | | | |
|----------------------------|-------------------------------|---|----------------------------------|
| Test specification: | | Section 15.231(a), Periodic operation requirements | |
| Test procedure: | | Supplier declaration | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 1:21:03 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Table 7.1.1 Periodic operation requirements

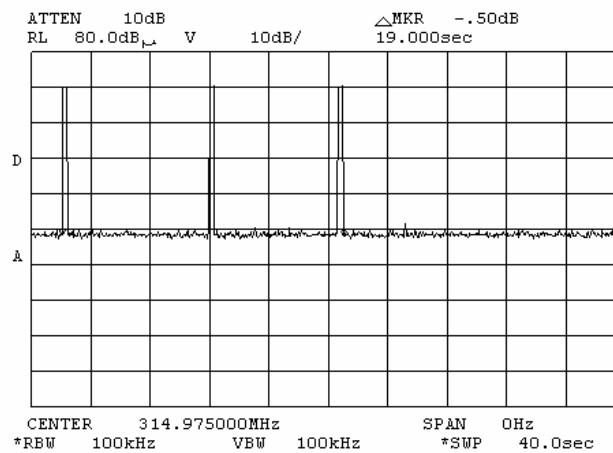
| Requirement | Rationale | Verdict |
|--|--------------------------|---------|
| Continuous transmissions are not permitted | Supplier declaration | Comply |
| Periodic transmissions at regular predetermined intervals are not permitted | Supplier declaration | Comply |
| Total duration of polling or supervision transmissions shall not exceed 2 seconds per hour | Plot 7.1.2 to Plot 7.1.8 | Comply |

| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(a), Periodic operation requirements | | |
| Test procedure: | Supplier declaration | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 1:21:03 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Plot 7.1.1 Transmitter shut down test result. Alarm mode for CO gas detection

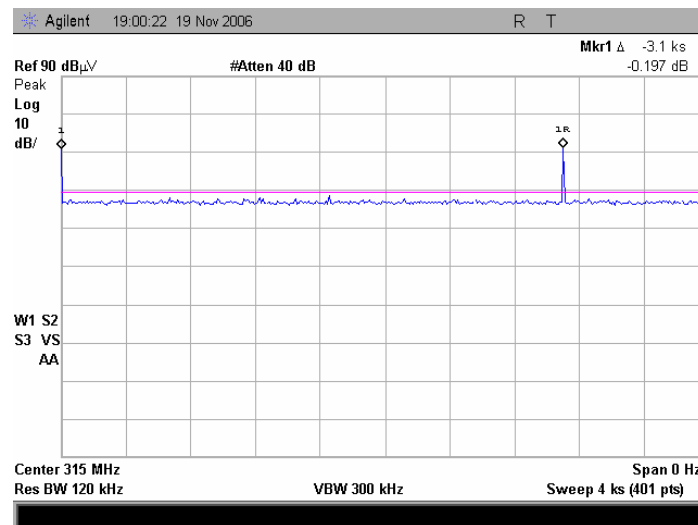


Plot 7.1.2 Transmitter shut down test result. Tamper mode (supervision)



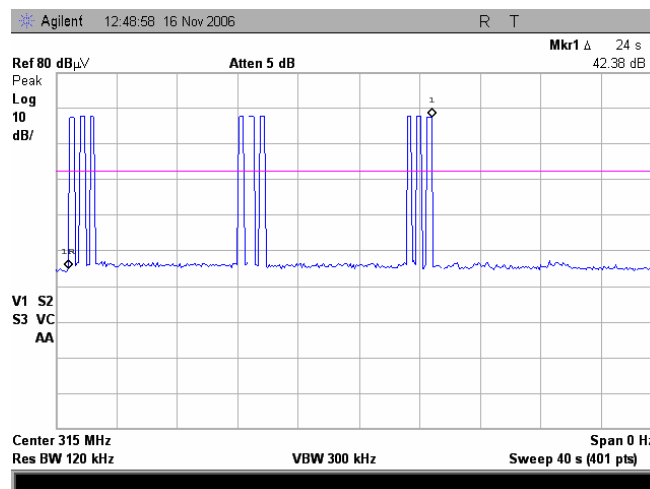
| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(a), Periodic operation requirements | | |
| Test procedure: | Supplier declaration | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 1:21:03 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Plot 7.1.3 Polling / supervision 1 hour transmissions



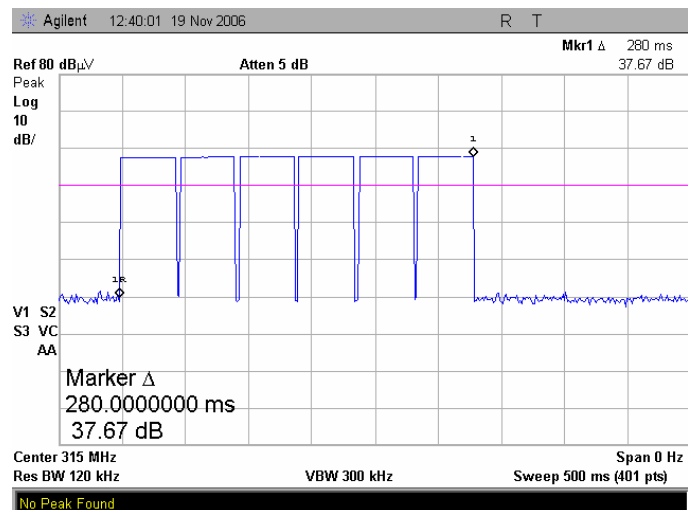
First signal occurs at the device "Turn ON" (shown in Plot 7.1.4, contains a train of 9 transmissions), the second – a supervision signal, contains 1 transmission – for calculated results refer to Table 7.1.2

Plot 7.1.4 Turn on mode (supervision)

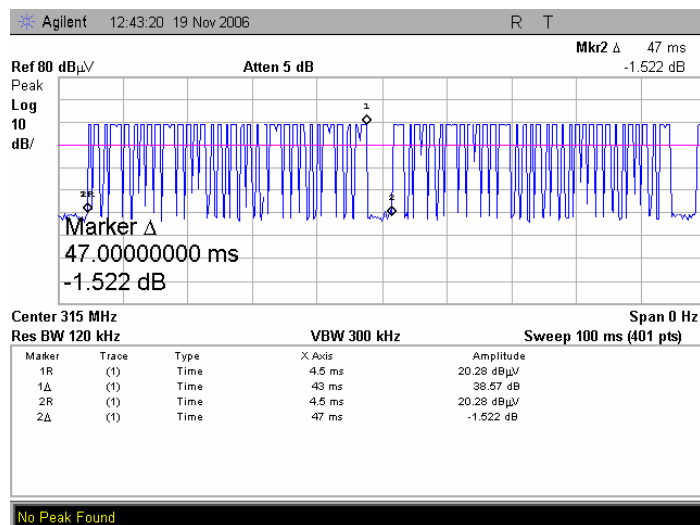


| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(a), Periodic operation requirements | | |
| Test procedure: | Supplier declaration | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 1:21:03 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Plot 7.1.5 Polling / supervision one transmission duration

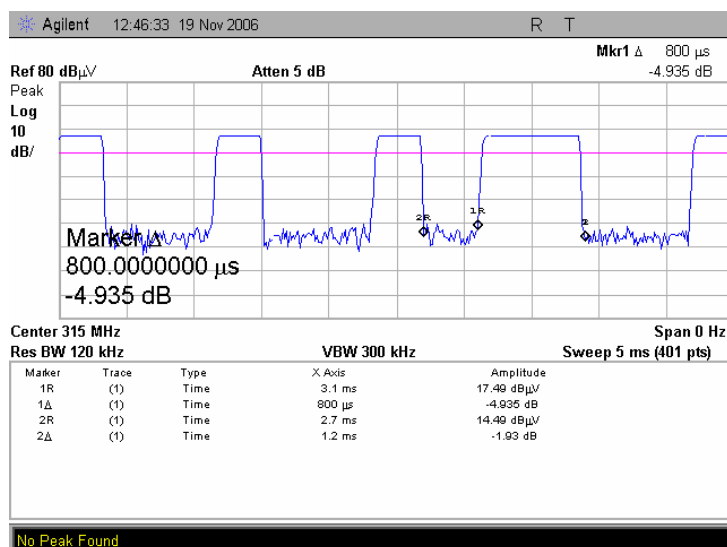


Plot 7.1.6 Polling / supervision burst duration

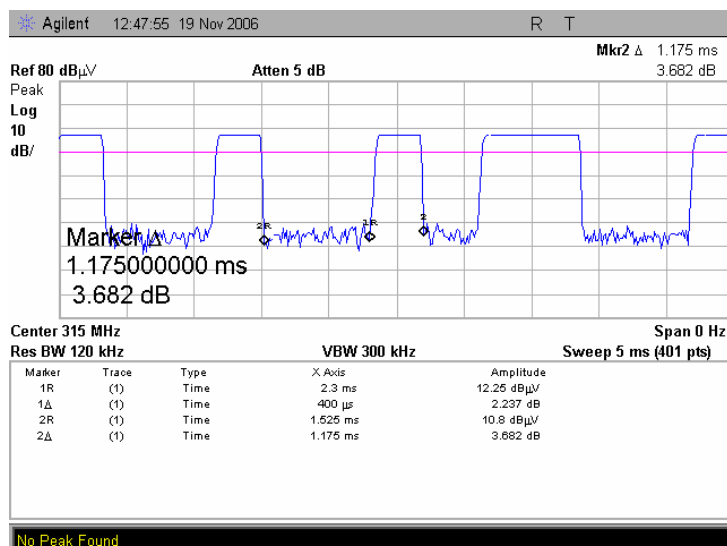


| | | | | |
|---------------------|--|------------------------|---------------------------|------|
| Test specification: | Section 15.231(a), Periodic operation requirements | | | |
| Test procedure: | Supplier declaration | | | |
| Test mode: | Compliance | Verdict: | | PASS |
| Date & Time: | 11/16/2006 1:21:03 PM | | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery | |
| Remarks: | | | | |

Plot 7.1.7 Polling / supervision first pulse duration



Plot 7.1.8 Polling / supervision second pulse duration



| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(a), Periodic operation requirements | | |
| Test procedure: | Supplier declaration | | |
| Test mode: | Compliance | Verdict: PASS | |
| Date & Time: | 11/16/2006 1:21:03 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Table 7.1.2 Total duration of polling / supervision transmissions

| Pulse duration, ms | Repetition period, ms | Number of pulses in the burst | Number of bursts in 1 transmission | Maximum number of transmissions within 1 hour | Total number of pulses | Total duration within 1 hour, ms |
|--------------------|-----------------------|-------------------------------|------------------------------------|---|------------------------|----------------------------------|
| 0.8 | 1.2 | 36 | 6 | 10 | 2160 | 1728 |

Reference numbers of test equipment used

| | | | | | | |
|---------|--|--|--|--|--|--|
| HL 2780 | | | | | | |
|---------|--|--|--|--|--|--|

Full description is given in Appendix A.

| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(b), Field strength of emissions | | |
| Test procedure: | ANSI C63.4, Section 13.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 2:33:40 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

7.2 Field strength of emissions

7.2.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.2.1 and Table 7.2.2.

Table 7.2.1 Radiated fundamental emission limits

| Fundamental frequency, MHz | Field strength at 3 m, dB(μV/m) | |
|----------------------------|---------------------------------|---------|
| | Peak | Average |
| 315 | 95.62 | 75.62 |

Table 7.2.2 Radiated spurious emissions limits

| Frequency, MHz | Field strength at 3 m, dB(μV/m) | | | | |
|----------------|---------------------------------|-----------------|-----------------|--------------------------|---------|
| | Within restricted bands | | | Outside restricted bands | |
| | Peak | Quasi Peak | Average | Peak | Average |
| 0.009 – 0.090 | 148.5 – 128.5 | NA | 128.5 – 108.5** | 75.62 | 55.62 |
| 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 | | | |
| Above 1000 | 74.0 | NA | 54.0 | | |

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

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

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

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

Note 1: The fundamental emission limit in dB(μV/m) was calculated as follows:

$$\text{Lim}_{AVR} = 20 \times \log(56.81818 \times F - 6136.3636) \text{ - within } 130 - 174 \text{ MHz band;}$$

$$\text{Lim}_{AVR} = 20 \times \log(41.6667 \times F - 7083.3333) \text{ - within } 260 - 470 \text{ MHz band,}$$

where F is the carrier frequency in MHz.

The limit for spurious emissions was 20 dB lower than fundamental emission limit.

The above limits provided in terms of average values, peak limit was 20 dB above the average limit.

Note 2: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

| | | | |
|----------------------------|--|---|----------------------------------|
| Test specification: | | Section 15.231(b), Field strength of emissions | |
| Test procedure: | | ANSI C63.4, Section 13.1.4 | |
| Test mode: | | Compliance | |
| Date & Time: | | 11/16/2006 2:33:40 PM | |
| Temperature: 22°C | | Air Pressure: 1010 hPa | |
| Remarks: | | Relative Humidity: 42% | Power Supply: 9 V battery |
| | | Verdict: PASS | |

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

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

7.2.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.2.2.3 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

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

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

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

7.2.3.3 The worst test results (the lowest margins) were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(b), Field strength of emissions | | |
| Test procedure: | ANSI C63.4, Section 13.1.4 | | |
| Test mode: | Compliance | Verdict: PASS | |
| Date & Time: | 11/16/2006 2:33:40 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Figure 7.2.1 Setup for spurious emission field strength measurements below 30 MHz

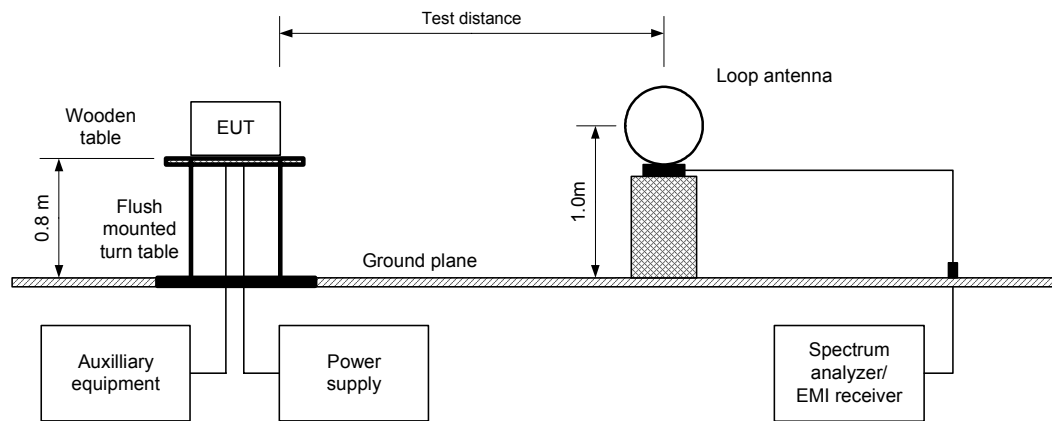
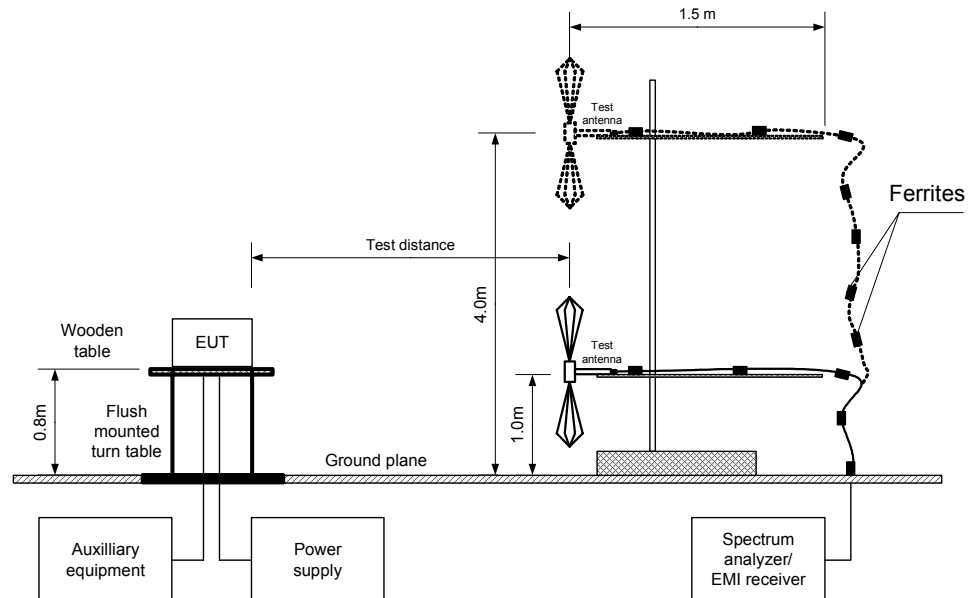


Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz



| | | | | | |
|---------------------|--|--|--|---------------------------|--|
| Test specification: | | Section 15.231(b), Field strength of emissions | | | |
| Test procedure: | | ANSI C63.4, Section 13.1.4 | | | |
| Test mode: | | Compliance | | Verdict: PASS | |
| Date & Time: | | 11/16/2006 2:33:40 PM | | | |
| Temperature: 22°C | | Air Pressure: 1010 hPa | | Relative Humidity: 42% | |
| Remarks: | | | | Power Supply: 9 V battery | |

Table 7.2.3 Field strength of fundamental emission, spurious emissions outside restricted bands and within restricted bands at frequencies above 1 GHz

TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
MODULATION: ASK
MODULATING SIGNAL: ID code
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 0.009 - 3200 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)
1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH: ≥ Resolution bandwidth

| F, MHz | Antenna | | Azimuth, degrees* | Peak field strength | | | Avr factor, dB | 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** | |
| Fundamental emission | | | | | | | | | | | |
| 315 | H | 1 | 0 | 75.18 | 95.62 | -20.44 | -4.3 | 70.88 | 75.62 | -4.77 | Pass |
| Spurious emissions | | | | | | | | | | | |
| All emissions were found at least 20 dB below the specified limit | | | | | | | | | | | Pass |

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

**- Margin = dB below (negative if above) specification limit.

Table 7.2.4 Average factor calculation

| Transmission pulse | | Transmission burst | | Transmission train duration, ms | Average factor, dB |
|--------------------|------------|--------------------|------------|---------------------------------|--------------------|
| Duration, ms | Period, ms | Duration, ms | Period, ms | | |
| 0.8 | 1.2 | 43 | 47 | 280 | -4.3 |

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{\text{Train duration}} \times \text{Number of bursts within pulse train} \right)$$

for pulse train longer than 100 ms:

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{Burst duration}}{100 \text{ ms}} \times \text{Number of bursts within 100 ms} \right)$$

$$\text{Average factor} = 20 \times \log_{10} \left(\frac{0.8}{1.2} \times \frac{43}{100 \text{ ms}} \times \frac{100}{47 \text{ ms}} \right) = -4.3 \text{ dB}$$

| | | | | |
|---------------------|--|------------------------|---------------------------|------|
| Test specification: | Section 15.231(b), Field strength of emissions | | | |
| Test procedure: | ANSI C63.4, Section 13.1.4 | | | |
| Test mode: | Compliance | Verdict: | | PASS |
| Date & Time: | 11/16/2006 2:33:40 PM | | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery | |
| Remarks: | | | | |

Table 7.2.5 Field strength of emissions below 1 GHz within restricted bands

TEST DISTANCE: 3 m
 EUT POSITION: Typical (Vertical)
 MODULATION: ASK
 MODULATING SIGNAL: ID code
 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* | | | | |
| All emissions were found at least 20 dB below the specified limit | | | | | | | | Pass |

*- Margin = Measured emission - specification limit.

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

Table 7.2.6 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

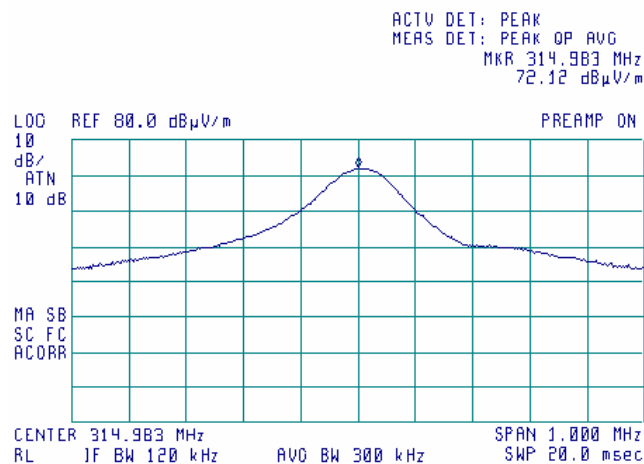
| | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 0465 | HL 0589 | HL 0592 | HL 0593 | HL 0594 | HL 0604 | HL 1430 |
| HL 1553 | HL 1566 | HL 1984 | HL 2009 | HL 2258 | HL 2780 | | |

Full description is given in Appendix A.

| | | | |
|----------------------------|-------------------------------|---|----------------------------------|
| Test specification: | | Section 15.231(b), Field strength of emissions | |
| Test procedure: | | ANSI C63.4, Section 13.1.4 | |
| Test mode: | | Compliance | Verdict: PASS |
| Date & Time: | | 11/16/2006 2:33:40 PM | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

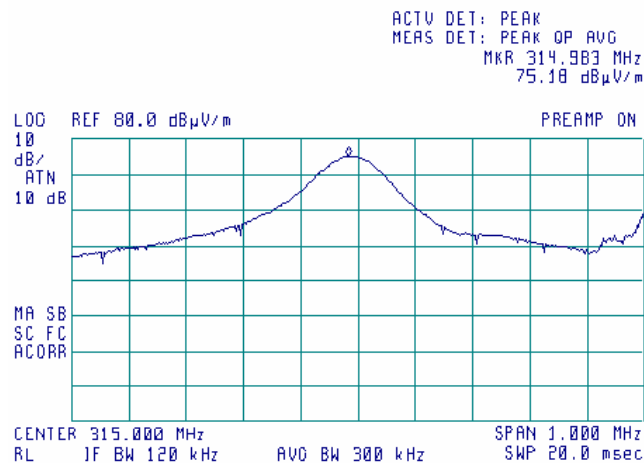
Plot 7.2.1 Radiated emission measurements at the fundamental frequency

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



Plot 7.2.2 Radiated emission measurements at the fundamental frequency

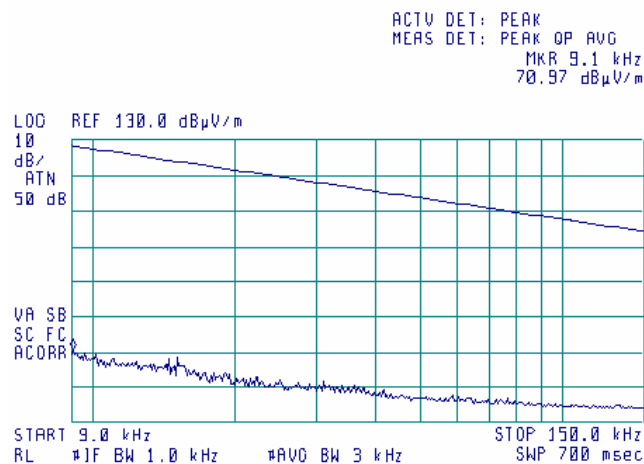
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal
EUT POSITION: Typical (Vertical/ Horizontal)



| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(b), Field strength of emissions | | |
| Test procedure: | ANSI C63.4, Section 13.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 2:33:40 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

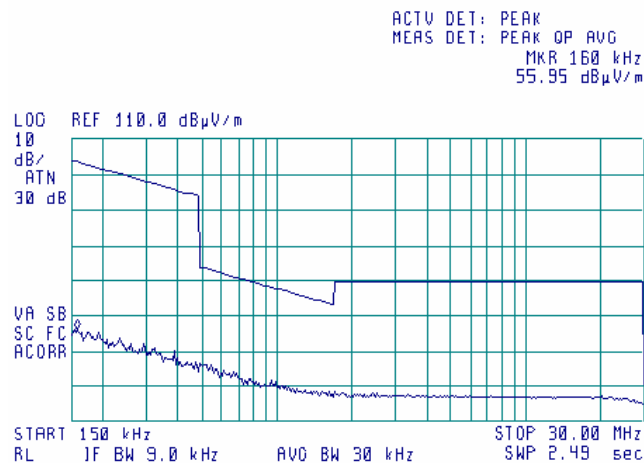
Plot 7.2.3 Radiated emission measurements from 9 to 150 kHz

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



Plot 7.2.4 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)

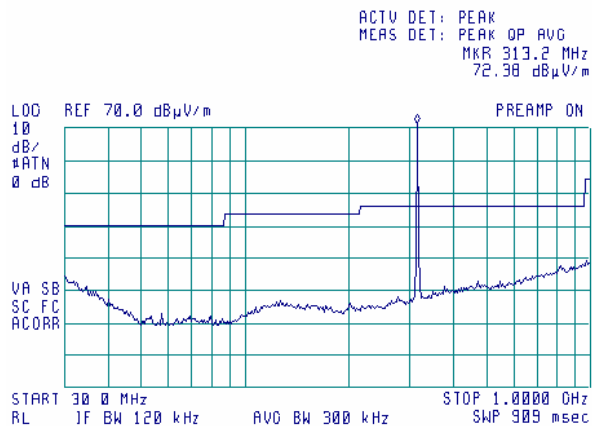


| | | | |
|----------------------------|-------------------------------|---|----------------------------------|
| Test specification: | | Section 15.231(b), Field strength of emissions | |
| Test procedure: | | ANSI C63.4, Section 13.1.4 | |
| Test mode: | | Compliance | Verdict: PASS |
| Date & Time: | | 11/16/2006 2:33:40 PM | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Plot 7.2.5 Radiated emission measurements from 30 to 1000 MHz

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

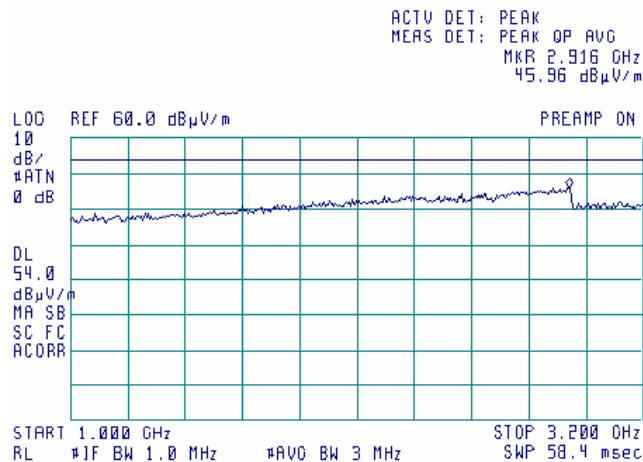
18:27:59 31 OCT 2006



Plot 7.2.6 Radiated emission measurements from 1000 to 3200MHz

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

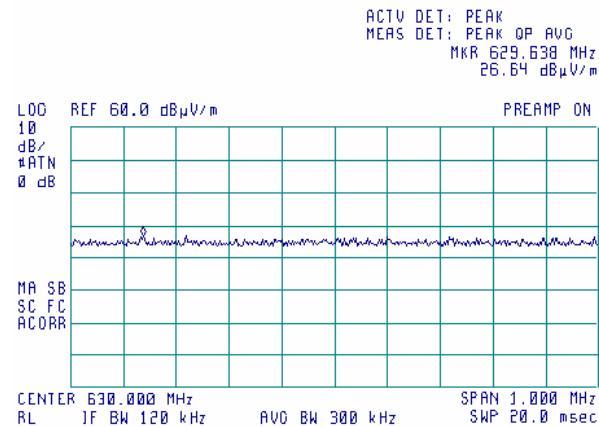
18:27:59 31 OCT 2006



| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(b), Field strength of emissions | | |
| Test procedure: | ANSI C63.4, Section 13.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 2:33:40 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

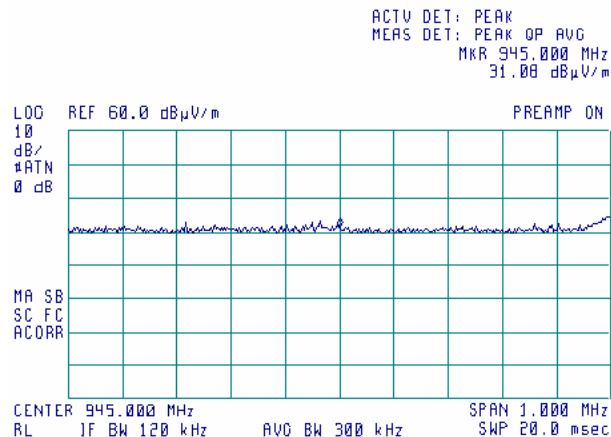
Plot 7.2.7 Radiated emission measurements at the second harmonic frequency

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



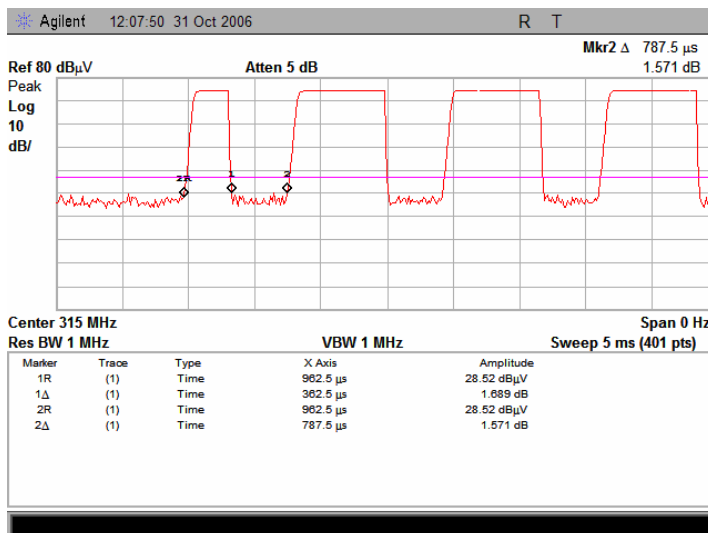
Plot 7.2.8 Radiated emission measurements at the third harmonic frequency

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

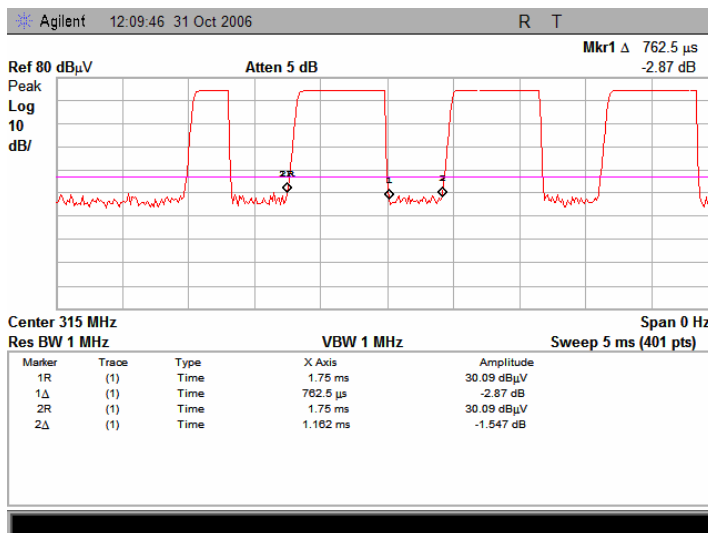


| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(b), Field strength of emissions | | |
| Test procedure: | ANSI C63.4, Section 13.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 2:33:40 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Plot 7.2.9 Transmission pulse1 duration & period

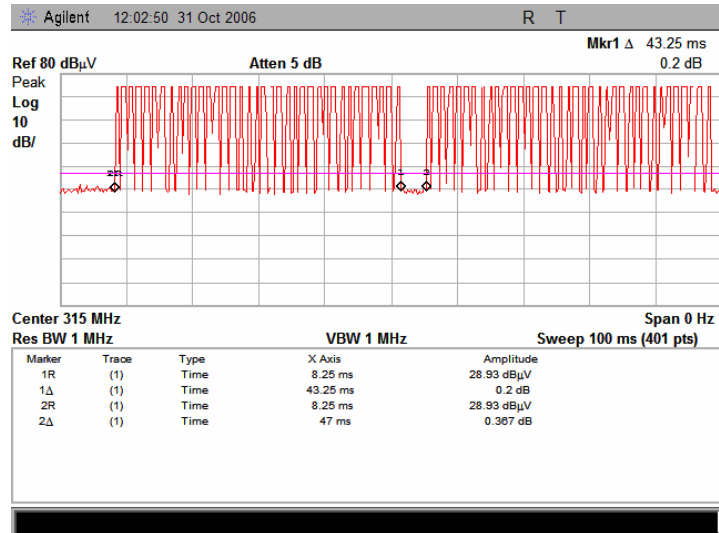


Plot 7.2.10 Transmission pulse2 duration & period

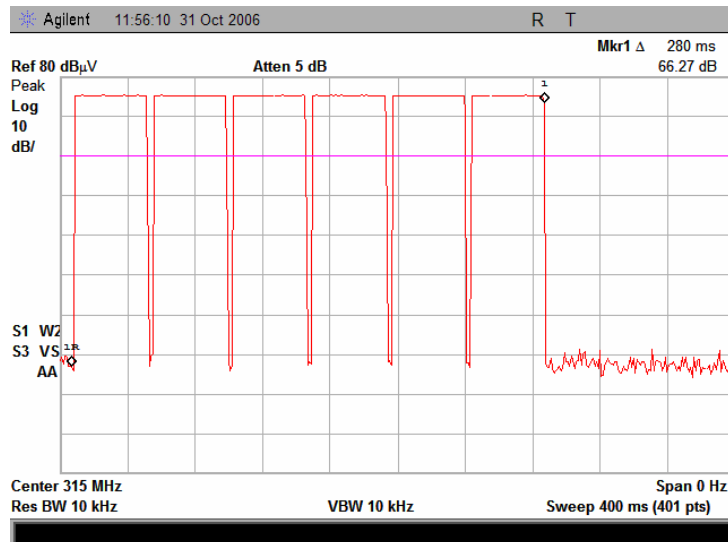


| | | | |
|----------------------------|---|-------------------------------|----------------------------------|
| Test specification: | Section 15.231(b), Field strength of emissions | | |
| Test procedure: | ANSI C63.4, Section 13.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/16/2006 2:33:40 PM | | |
| Temperature: 22°C | Air Pressure: 1010 hPa | Relative Humidity: 42% | Power Supply: 9 V battery |
| Remarks: | | | |

Plot 7.2.11 Transmission burst duration & period



Plot 7.2.12 Transmission train duration



| | | | |
|----------------------------|-------------------------------|--|----------------------------------|
| Test specification: | | Section 15.231(c), Occupied bandwidth | |
| Test procedure: | | ANSI C63.4, Section 13.1.7 | |
| Test mode: | | Compliance | Verdict: PASS |
| Date & Time: | | 10/31/2006 3:04:38 PM | |
| Temperature: 23°C | Air Pressure: 1012 hPa | Relative Humidity: 46% | Power Supply: 9 V battery |
| Remarks: | | | |

7.3 Occupied bandwidth test

7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1. The test results are provided in Table 7.3.2 and associated plots.

Table 7.3.1 Occupied bandwidth limits

| Assigned frequency, MHz | Modulation envelope reference points*, dBc | Maximum allowed bandwidth, % of the carrier frequency |
|-------------------------|--|---|
| 70 - 900 | 20.0 | 0.25 |
| Above 900 | | 0.50 |

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

7.3.2 Test procedure

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

7.3.2.2 The EUT was set to transmit modulated carrier.

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

Figure 7.3.1 Occupied bandwidth test setup



| | | | | | |
|----------------------------|--|--|--|-------------------------------|----------------------------------|
| Test specification: | | Section 15.231(c), Occupied bandwidth | | | |
| Test procedure: | | ANSI C63.4, Section 13.1.7 | | | |
| Test mode: | | Compliance | | Verdict: PASS | |
| Date & Time: | | 10/31/2006 3:04:38 PM | | | |
| Temperature: 23°C | | Air Pressure: 1012 hPa | | Relative Humidity: 46% | Power Supply: 9 V battery |
| Remarks: | | | | | |

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 10 kHz
VIDEO BANDWIDTH: 30 kHz
MODULATION ENVELOPE REFERENCE POINTS: 20 dBc
MODULATION: ASK
MODULATING SIGNAL: ID code

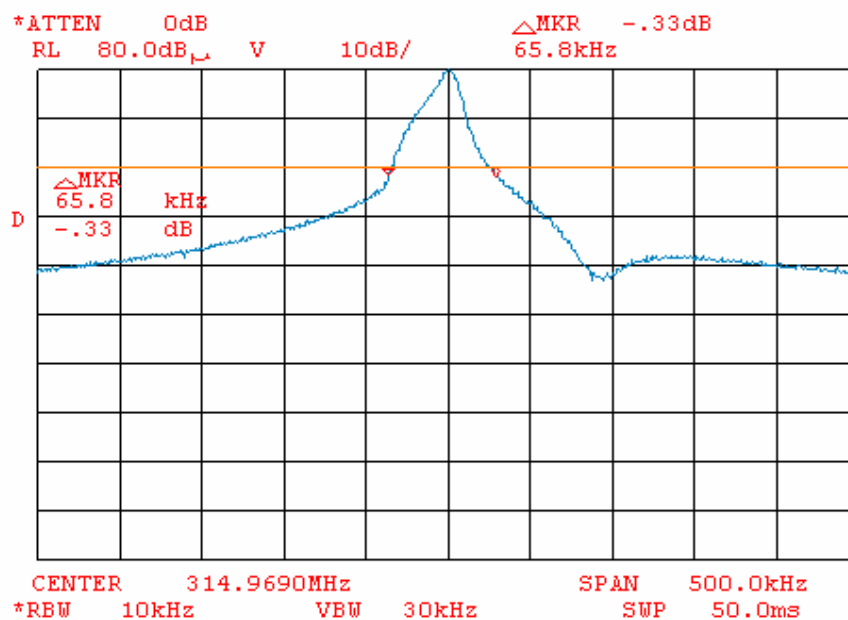
| Carrier frequency, MHz | Occupied bandwidth, kHz | Limit | | Margin, kHz | Verdict |
|---------------------------|----------------------------|----------------------------|-------|----------------|---------|
| | | % of the carrier frequency | kHz | | |
| 315 | 65.8 | 0.25 | 787.5 | -721.7 | Pass |

Reference numbers of test equipment used

| | | | | | | | | |
|---------|--|--|--|--|--|--|--|--|
| HL 1424 | | | | | | | | |
|---------|--|--|--|--|--|--|--|--|

Full description is given in Appendix A.

Plot 7.3.1 Occupied bandwidth test result



| | | | |
|----------------------------|--|-------------------------------|----------------------------------|
| Test specification: | Section 15.203, Antenna requirement | | |
| Test procedure: | Visual inspection / supplier declaration | | |
| Test mode: | Compliance | Verdict: | |
| Date & Time: | 11/19/2006 10:01:50 AM | | |
| Temperature: 22°C | Air Pressure: 1011 hPa | Relative Humidity: 48% | Power Supply: 9 V battery |
| Remarks: | | | |

7.4 Antenna requirements

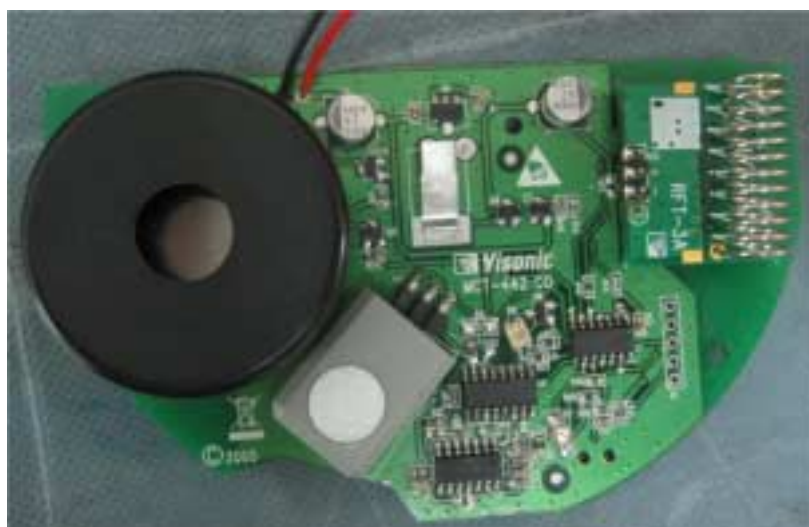
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed 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 7.4.1.

Table 7.4.1 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 7.4.1 Antenna assembly



| | | | |
|----------------------------|------------------------------|--|----------------------------------|
| Test specification: | | Section 15.109, Radiated emission | |
| Test procedure: | | ANSI C63.4, Sections 11.6 and 12.1.4 | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/1/2006 9:42:20 AM | | |
| Temperature: 23°C | Air Pressure: 1009hPa | Relative Humidity: 52% | Power Supply: 9 V battery |
| Remarks: | | | |

7.5 Radiated emission measurements

7.5.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Radiated emission test limits

| Frequency, MHz | Class B limit, dB(μV/m) | |
|-------------------|-------------------------|--------------|
| | 10 m distance | 3 m distance |
| 30 - 88 | 29.5* | 40.0 |
| 88 - 216 | 33.0* | 43.5 |
| 216 - 960 | 35.5* | 46.0 |
| Above 960 | 43.5* | 54.0 |

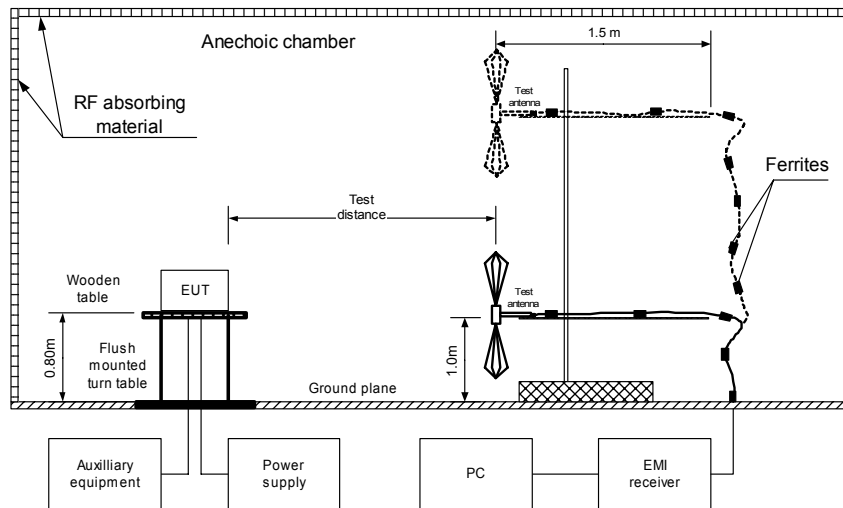
* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $\text{Lim}_{S_2} = \text{Lim}_{S_1} + 20 \log (S_1/S_2)$, where S_1 and S_2 – standard defined and test distance respectively in meters.

7.5.2 Test procedure for measurements in semi-anechoic chamber

- 7.5.2.1** The EUT was set up as shown in Figure 7.5.1 and associated photograph/s, energized and the performance check was conducted.
- 7.5.2.2** The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.
- 7.5.2.3** The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

| | | | |
|---------------------|--|--------------------------------------|------------------------|
| Test specification: | | Section 15.109, Radiated emission | |
| Test procedure: | | ANSI C63.4, Sections 11.6 and 12.1.4 | |
| Test mode: | | Verdict: PASS | |
| Compliance | | | |
| Date & Time: | | 11/1/2006 9:42:20 AM | |
| Temperature: 23°C | | Air Pressure: 1009hPa | Relative Humidity: 52% |
| | | Power Supply: 9 V battery | |
| Remarks: | | | |

Figure 7.5.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment



| | | | | |
|---------------------|--------------------------------------|------------------------|---------------------------|------|
| Test specification: | Section 15.109, Radiated emission | | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | | |
| Test mode: | Compliance | Verdict: | | PASS |
| Date & Time: | 11/1/2006 9:42:20 AM | | | |
| Temperature: 23°C | Air Pressure: 1009hPa | Relative Humidity: 52% | Power Supply: 9 V battery | |
| Remarks: | | | | |

Table 7.5.2 Radiated emission test results

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

| RECESSION 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* | | | | |
| All emissions were found at least 20 dB below the specified limit | | | | | | | | Pass |

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK
FREQUENCY RANGE: 1000 MHz – 2000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

| Frequency, MHz | Peak emission, dB(μV/m) | Average | | | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|---|-------------------------------|-----------------------------------|--------------------|----------------|-------------------------|-------------------------|--------------------------------------|---------|
| | | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* | | | | |
| All emissions were found at least 20 dB below the specified limit | | | | | | | | Pass |

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

| | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0465 | HL 0589 | HL 0592 | HL 0593 | HL 0594 | HL 0604 | HL 1430 | HL 1553 |
| HL 1566 | | | | | | | |

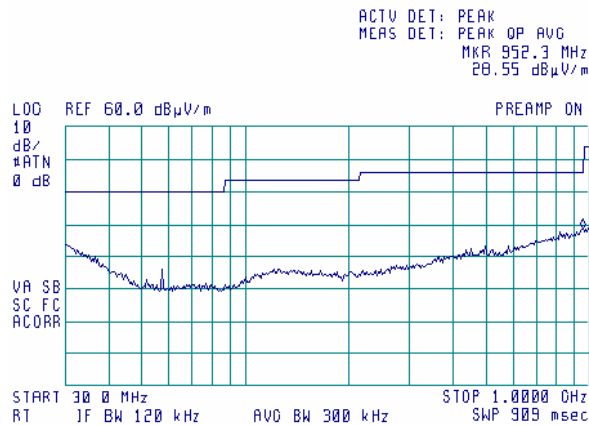
Full description is given in Appendix A.

| | | | |
|----------------------------|--|-------------------------------|----------------------------------|
| Test specification: | Section 15.109, Radiated emission | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date & Time: | 11/1/2006 9:42:20 AM | | |
| Temperature: 23°C | Air Pressure: 1009hPa | Relative Humidity: 52% | Power Supply: 9 V battery |
| Remarks: | | | |

Plot 7.5.1 Radiated emission measurements in 30 - 1000 MHz range, vertical & horizontal antenna polarization

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

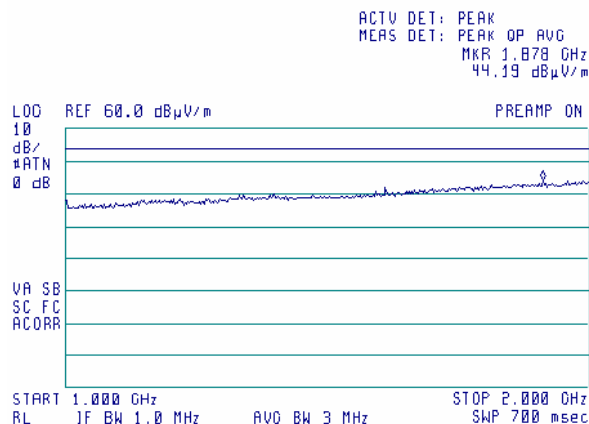
18:40:21 31 OCT 2006



Plot 7.5.2 Radiated emission measurements above 1000 MHz, vertical & horizontal antenna polarization

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

18:46:22 31 OCT 2006



8 APPENDIX A Test equipment and ancillaries used for tests

| HL No | Description | Manufacturer | Model | Ser. No. | Last Cal. | Due Cal. |
|-------|--|----------------------|----------------------|-----------------------|-----------|-----------|
| 0446 | Antenna, Loop, Active, 10 kHz - 30 MHz | EMCO | 6502 | 2857 | 28-Jun-06 | 28-Jun-07 |
| 0465 | Anechoic Chamber 9(L) x 6.5(W) x 5.5(H) m | HL | AC - 1 | 023 | 11-Nov-06 | 11-Nov-07 |
| 0589 | Cable Coaxial, GORE A2P01POL118, 2.3 m | HL | GORE-3 | 176 | 02-Dec-06 | 02-Dec-07 |
| 0592 | Position Controller | HL | L2-SR3000 (HL CRL-3) | 100 | 18-May-06 | 18-May-07 |
| 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 |
| 1424 | Spectrum Analyzer, 30 Hz- 40 GHz | Agilent Technologies | 8564EC | 3946A00219 | 30-Aug-06 | 30-Aug-07 |
| 1430 | EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432 | Agilent Technologies | 8542E | 3807A00262,3705A00217 | 01-Sep-06 | 01-Sep-07 |
| 1553 | Cable RF, 3.5 m | Alpha Wire | RG-214 | 1553 | 02-Dec-06 | 02-Dec-07 |
| 1566 | Cable RF, 2 m | Huber-Suhner | Sucoflex 104PE | 13094/4PE | 02-Dec-06 | 02-Dec-07 |
| 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-06 | 02-Dec-07 |
| 2258 | Amplifier Low Noise 2-20 GHz | Sophia Wireless | LNA0220-C | 0222 | 01-Jan-06 | 01-Jan-07 |
| 2780 | EMC analyzer, 100 Hz to 26.5 GHz | Agilent Technologies | E7405A | MY4510246 | 11-Jun-06 | 11-Jun-07 |

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

| Test description | Expanded uncertainty |
|---|--|
| Radiated emissions at 10 m measuring distance Horizontal polarization Vertical polarization | Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 dB |
| Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization | Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB |
| Conducted emissions at RF antenna connector | 9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB |
| Duty cycle, timing (Tx ON / OFF) and average factor measurements | ± 1.0 % |
| Occupied bandwidth | ± 8.0 % |

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

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

| | |
|---------------------|--|
| 47CFR part 15: 2006 | 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 |
| A/m | ampere per meter |
| AM | amplitude modulation |
| AVRG | average (detector) |
| BB | broad band |
| cm | centimeter |
| dB | decibel |
| dBm | decibel referred to one milliwatt |
| dB(μ V) | decibel referred to one microvolt |
| dB(μ V/m) | decibel referred to one microvolt per meter |
| dB(μ A) | decibel referred to one microampere |
| dB Ω | decibel referred to one Ohm |
| DC | direct current |
| EIRP | equivalent isotropically radiated power |
| ERP | effective radiated power |
| EUT | equipment under test |
| F | frequency |
| GHz | gigahertz |
| GND | ground |
| H | height |
| HL | Hermon laboratories |
| Hz | hertz |
| ITE | information technology equipment |
| k | kilo |
| kHz | kilohertz |
| LISN | line impedance stabilization network |
| LO | local oscillator |
| m | meter |
| MHz | megahertz |
| min | minute |
| mm | millimeter |
| ms | millisecond |
| μ s | microsecond |
| NA | not applicable |
| NB | narrow band |
| NT | not tested |
| OATS | open area test site |
| Ω | Ohm |
| PCB | printed circuit board |
| PM | pulse modulation |
| PS | power supply |
| ppm | part per million (10^{-6}) |
| QP | quasi-peak |
| RE | radiated emission |
| RF | radio frequency |
| rms | root mean square |
| Rx | receive |
| s | second |
| T | temperature |
| Tx | transmit |
| V | volt |
| VA | volt-ampere |
| WB | wideband |

13 APPENDIX F Test equipment correction factors

Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

| Frequency, MHz | Magnetic antenna factor, dB | Electric antenna factor, dB |
|-------------------|--------------------------------|--------------------------------|
| 0.009 | -32.8 | 18.7 |
| 0.010 | -33.8 | 17.7 |
| 0.020 | -38.3 | 13.2 |
| 0.050 | -41.1 | 10.4 |
| 0.075 | -41.3 | 10.2 |
| 0.100 | -41.6 | 9.9 |
| 0.150 | -41.7 | 9.8 |
| 0.250 | -41.6 | 9.9 |
| 0.500 | -41.8 | 9.8 |
| 0.750 | -41.9 | 9.7 |
| 1.000 | -41.4 | 10.1 |
| 2.000 | -41.5 | 10.0 |
| 3.000 | -41.4 | 10.2 |
| 4.000 | -41.4 | 10.1 |
| 5.000 | -41.5 | 10.1 |
| 10.000 | -41.9 | 9.6 |
| 15.000 | -41.9 | 9.6 |
| 20.000 | -42.2 | 9.3 |
| 25.000 | -42.8 | 8.7 |
| 30.000 | -44.0 | 7.5 |

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

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

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

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

Antenna factor
Double-ridged 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(μ V) to convert it into field intensity in dB(μ V/m).

Cable loss
RF cable 3.5 m, Alpha Wire, model RG-214, S/N 149, HL 1553

| No. | Frequency, MHz | Cable loss, dB | Measurement uncertainty, dB |
|-----|-------------------|-------------------|--------------------------------|
| 1 | 1 | 0.01 | ±0.05 |
| 2 | 10 | 0.07 | |
| 3 | 30 | 0.12 | |
| 4 | 50 | 0.22 | |
| 5 | 100 | 0.26 | |
| 6 | 200 | 0.40 | |
| 7 | 300 | 0.52 | |
| 8 | 400 | 0.60 | |
| 9 | 500 | 0.70 | |
| 10 | 600 | 0.77 | |
| 11 | 700 | 0.84 | |
| 12 | 800 | 1.00 | |
| 13 | 900 | 1.00 | |
| 14 | 1000 | 1.05 | |
| 15 | 2000 | 1.70 | |

Cable loss
Cable RF, 2m, model: Sucoflex 104PE, S/N 13094/4PE, HL 1566

| No. | Frequency, MHz | Cable loss, dB | Tolerance, dB | Measurement uncertainty, dB |
|-----|----------------|----------------|---------------|-----------------------------|
| 1 | 30 | 0.10 | ≤ 5.0 | ±0.12 |
| 2 | 50 | 0.13 | | |
| 3 | 100 | 0.20 | | |
| 4 | 300 | 0.33 | | |
| 5 | 500 | 0.45 | | |
| 6 | 800 | 0.60 | | |
| 7 | 1000 | 0.65 | | |
| 8 | 1500 | 0.91 | | |
| 9 | 2000 | 1.08 | | |
| 10 | 2500 | 1.19 | | |
| 11 | 3000 | 1.28 | | |
| 12 | 3500 | 1.49 | | |
| 13 | 4000 | 1.63 | | |
| 14 | 4500 | 1.63 | ≤ 5.0 | ±0.17 |
| 15 | 5000 | 1.66 | | |
| 16 | 5500 | 1.88 | | |
| 17 | 6000 | 1.96 | | |
| 18 | 6500 | 1.93 | | |
| 19 | 7000 | 2.07 | | |
| 20 | 7500 | 2.37 | | |
| 21 | 8000 | 2.34 | | |
| 22 | 8500 | 2.64 | | |
| 23 | 9000 | 2.68 | | |
| 24 | 9500 | 2.64 | | |
| 25 | 10000 | 2.70 | | |
| 26 | 10500 | 2.84 | | |
| 27 | 11000 | 2.88 | | |
| 28 | 11500 | 3.19 | | |
| 29 | 12000 | 3.15 | | |
| 30 | 12500 | 3.20 | ≤ 5.0 | ±0.26 |
| 31 | 13000 | 3.22 | | |
| 32 | 13500 | 3.47 | | |
| 33 | 14000 | 3.41 | | |
| 34 | 14500 | 3.59 | | |
| 35 | 15000 | 3.79 | | |
| 36 | 15500 | 4.24 | | |
| 37 | 16000 | 4.12 | | |
| 38 | 16500 | 4.46 | | |
| 39 | 17000 | 4.50 | | |
| 40 | 17500 | 4.49 | | |
| 41 | 18000 | 4.45 | | |

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 | | |

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 | | ±0.17 |
| 18 | 3300 | 3.47 | | |
| 19 | 3600 | 3.62 | | |
| 20 | 3900 | 3.84 | | |
| 21 | 4200 | 3.92 | | |
| 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 | | |