

# TEST REPORT

ACCORDING TO: FCC 47CFR, Section 15.231  
RSS-210, Section 6.1.1

FOR:

**Visonic Ltd.**  
**Pendant transmitter**  
**MCT-241 MD RL**  
**315 MHz**

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## 1 Applicant information

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**Contact name:** Mr. Arick Elshtein

## 2 Equipment under test attributes

**Product name:** Pendant transmitter  
**Operating frequency:** 315 MHz  
**Model:** MCT-241 MD RL  
**Serial number:** 2704-10  
**Receipt date:** 10/6/2004

## 3 Manufacturer information

**Manufacturer name:** Visonic Ltd.  
**Address:** 30, Habarzel street, Tel Aviv, 69710, Israel  
**Telephone:** +972 3645 6714  
**Fax:** +972 3645 6891  
**E-Mail:** aelshtein@visonic.com  
**Contact name:** Mr. Arick Elshtein

## 4 Test details

**Project ID:** 16101  
**Location:** Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel  
**Test started:** 10/6/2004  
**Test completed:** 12/23/2004  
**Test specifications:** FCC 47CFR, Section 15.231  
RSS-210, Section 6.1.1  
**Test suite:** FCC\_15.231(a) and RSS-210\_6.1.1 (5/10/2004 8:29:24 AM, modified)

## 5 Tests summary

| Test                                                                                            | Status       |
|-------------------------------------------------------------------------------------------------|--------------|
| <b>Transmitter characteristics</b>                                                              |              |
| FCC Part 15, Section 231(a) / RSS-210, Section 6.1.1(a), Periodic operation requirements        | Pass         |
| FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions            | Pass         |
| FCC Part 15, Section 231(c) / RSS-210, Section 6.1.1(c), Occupied bandwidth                     | Pass         |
| FCC Part 15, Section 207 / RSS-210, Section 6.6, Conducted emission                             | Not required |
| FCC Part 15, Section 203 / RSS-210, Section 5.5, Antenna requirements                           | Pass         |
| <b>Unintentional emissions</b>                                                                  |              |
| FCC Part 15, Section 107 / RSS-210, Section 7.4 / ICES-003, Conducted emission at AC power port | Not required |
| FCC Part 15, Section 109 / RSS-210, Section 7.3 / ICES-003, Radiated emission                   | Pass         |
| FCC Part 15, Section 111 / RSS-210, Section 7.2, Conducted emission at receiver antenna port    | Not required |

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                                                                             |
|---------------------|-----------------------------------|-------------------|---------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mr. B. Efros, test engineer       | October 20, 2004  |  |
| <b>Reviewed by:</b> | Mr. M. Nikishin, EMC group leader | December 23, 2004 |  |
| <b>Approved by:</b> | Mr. A. Usoskin, CEO               | December 23, 2004 |  |

## 6 EUT description

### 6.1 General information

The MCT-241 MD RL is a PowerCode™ miniature, microprocessor-controlled personal UHF transmitter. It is designed to transmit coded alert signal in distress or in other emergency situations. The transmitter is waterproof and suitable for wearing in a shower.

The EUT is powered from 3V Lithium battery.

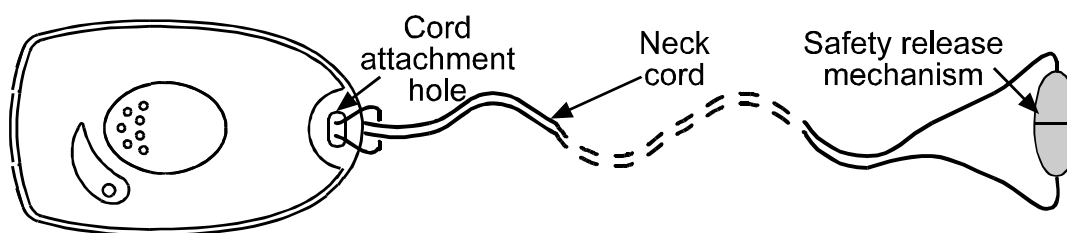
### 6.2 Operating frequencies

| Source          | Frequency, MHz |  |  |  |  |  |
|-----------------|----------------|--|--|--|--|--|
| Digital portion | 4              |  |  |  |  |  |

### 6.3 Changes made in the EUT

No changes were implemented.

### 6.4 Test configuration



## 6.5 Transmitter characteristics

|                                                     |                                                                                                          |                                                               |                                |                     |                           |                             |                                |  |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------|---------------------|---------------------------|-----------------------------|--------------------------------|--|
| <b>Type of equipment</b>                            |                                                                                                          |                                                               |                                |                     |                           |                             |                                |  |
| 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)                                          |                                                               |                                |                     |                           |                             |                                |  |
| <b>Intended use</b>                                 |                                                                                                          | <b>Condition of use</b>                                       |                                |                     |                           |                             |                                |  |
|                                                     | fixed                                                                                                    | Always at a distance more than 2 m from all people            |                                |                     |                           |                             |                                |  |
|                                                     | mobile                                                                                                   | Always at a distance more than 20 cm from all people          |                                |                     |                           |                             |                                |  |
| X                                                   | portable                                                                                                 | May operate at a distance closer than 20 cm to human body     |                                |                     |                           |                             |                                |  |
| <b>Assigned frequency range</b>                     |                                                                                                          | 40.66 – 40.70 MHz and above 70 MHz                            |                                |                     |                           |                             |                                |  |
| <b>Operating frequency</b>                          |                                                                                                          | 315.00 MHz                                                    |                                |                     |                           |                             |                                |  |
| <b>RF channel spacing</b>                           |                                                                                                          | NA                                                            |                                |                     |                           |                             |                                |  |
| <b>Maximum rated output power</b>                   |                                                                                                          | At transmitter 50 $\Omega$ RF output connector                |                                |                     |                           | NA                          |                                |  |
|                                                     |                                                                                                          | Effective radiated power (for equipment with no RF connector) |                                |                     |                           | -18.75 dBm                  |                                |  |
| <b>Is transmitter output power variable?</b>        |                                                                                                          | X                                                             | No                             |                     |                           |                             |                                |  |
|                                                     |                                                                                                          |                                                               | continuous variable            |                     |                           |                             |                                |  |
|                                                     |                                                                                                          |                                                               | stepped variable with stepsize |                     |                           |                             |                                |  |
|                                                     |                                                                                                          | Yes                                                           | minimum RF power               |                     |                           |                             | dBm                            |  |
|                                                     |                                                                                                          |                                                               | maximum RF power               |                     |                           |                             | dBm                            |  |
| <b>Antenna connection</b>                           |                                                                                                          |                                                               |                                |                     |                           |                             |                                |  |
| unique coupling                                     |                                                                                                          | standard connector                                            |                                | X                   | integral                  | with temporary RF connector |                                |  |
|                                                     |                                                                                                          |                                                               |                                |                     |                           | X                           | without temporary RF connector |  |
| <b>Type of modulation</b>                           |                                                                                                          |                                                               |                                | A.S.K.              |                           |                             |                                |  |
| <b>Maximum transmitter duty cycle in normal use</b> |                                                                                                          | 33.45 %                                                       |                                | <b>Tx ON time</b>   | 1.092 s                   | <b>Period</b>               | 3.264 s                        |  |
| <b>Transmitter duty cycle supplied for test</b>     |                                                                                                          | 100 %                                                         |                                | <b>Tx ON time</b>   | CW                        | <b>Period</b>               | CW                             |  |
| <b>Transmitter power source</b>                     |                                                                                                          |                                                               |                                |                     |                           |                             |                                |  |
| X                                                   | Battery                                                                                                  | <b>Nominal rated voltage</b>                                  | 3 VDC                          | <b>Battery type</b> | CR-2 type Lithium battery |                             |                                |  |
|                                                     | DC                                                                                                       | <b>Nominal rated voltage</b>                                  | VDC                            |                     |                           |                             |                                |  |
|                                                     | AC mains                                                                                                 | <b>Nominal rated voltage</b>                                  | VAC                            | <b>Frequency</b>    | Hz                        |                             |                                |  |

|                     |                                                                                          |                         |                     |
|---------------------|------------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(a) / RSS-210, Section 6.1.1(a), Periodic operation requirements |                         |                     |
| Test procedure:     | Supplier declaration                                                                     |                         |                     |
| Test mode:          | Compliance                                                                               | Verdict:                | PASS                |
| Date & Time:        | 10/19/2004 7:17:03 PM                                                                    |                         |                     |
| Temperature: 24 °C  | Air Pressure: 1010 hPa                                                                   | Relative Humidity: 44 % | Power Supply: 3 VDC |
| 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 manually operated transmitter shall employ switch that will automatically deactivate the transmitter within not more than 5 seconds of being released;
- 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;
- Total duration of polling or supervision transmissions, including data, to determine system integrity in security or safety applications shall not exceed 2 seconds per hour according to FCC 15.231(a) requirements;
- Periodic rate of polling or supervision transmissions, to determine system integrity in security or safety applications shall not exceed one transmission of not more than 1 second duration per hour according to RSS-210, section 6.1.1(a)(3) requirements;

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 the associated plots.

Figure 7.1.1 Setup for transmitter shut down test



|                            |                                                                                                 |                                |                            |
|----------------------------|-------------------------------------------------------------------------------------------------|--------------------------------|----------------------------|
| <b>Test specification:</b> | <b>FCC Part 15, Section 231(a) / RSS-210, Section 6.1.1(a), Periodic operation requirements</b> |                                |                            |
| <b>Test procedure:</b>     | Supplier declaration                                                                            |                                |                            |
| <b>Test mode:</b>          | Compliance                                                                                      | <b>Verdict:</b>                | <b>PASS</b>                |
| <b>Date &amp; Time:</b>    | 10/19/2004 7:17:03 PM                                                                           |                                |                            |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1010 hPa                                                                   | <b>Relative Humidity:</b> 44 % | <b>Power Supply:</b> 3 VDC |
| <b>Remarks:</b>            |                                                                                                 |                                |                            |

**Table 7.1.1 Periodic operation requirements**

| <b>Requirement</b>                                                                                           | <b>Rationale</b>     | <b>Verdict</b> |
|--------------------------------------------------------------------------------------------------------------|----------------------|----------------|
| Continuous transmissions are not permitted                                                                   | Supplier declaration | Comply         |
| A manually operated transmitter shall be deactivated within not more than 5 seconds of switch being released | Plot 7.1.1           | Comply         |
| Transmitter activated automatically shall cease transmission within 5 seconds                                | Plot 7.1.2           | Comply         |
| Periodic transmissions at regular predetermined intervals are not permitted                                  | NA                   | NA             |
| Polling or supervision transmission rate shall not exceed one per hour                                       | Supplier declaration | Comply         |

**Reference numbers of test equipment used**

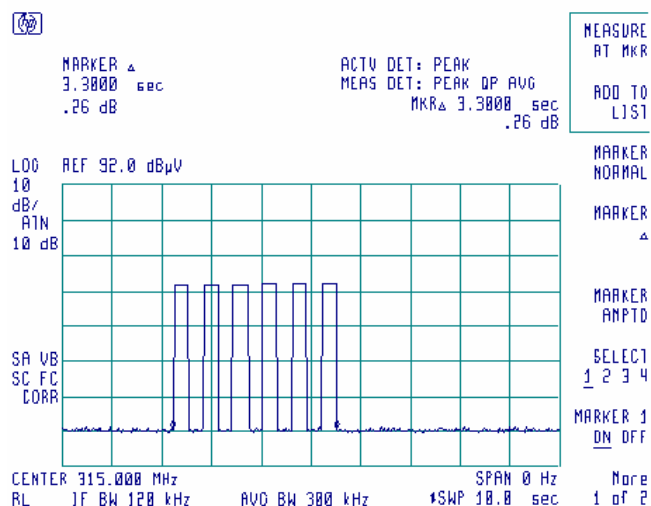
|         |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|
| HL 1430 |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|

Full description is given in Appendix A.

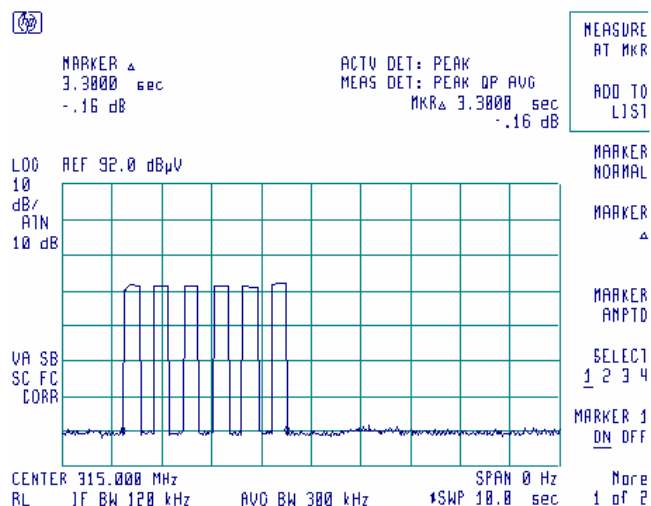


|                     |                                                                                          |                         |                     |
|---------------------|------------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(a) / RSS-210, Section 6.1.1(a), Periodic operation requirements |                         |                     |
| Test procedure:     | Supplier declaration                                                                     |                         |                     |
| Test mode:          | Compliance                                                                               | Verdict:                | PASS                |
| Date & Time:        | 10/19/2004 7:17:03 PM                                                                    |                         |                     |
| Temperature: 24 °C  | Air Pressure: 1010 hPa                                                                   | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                          |                         |                     |

Plot 7.1.1 Transmitter shut down test result, button control

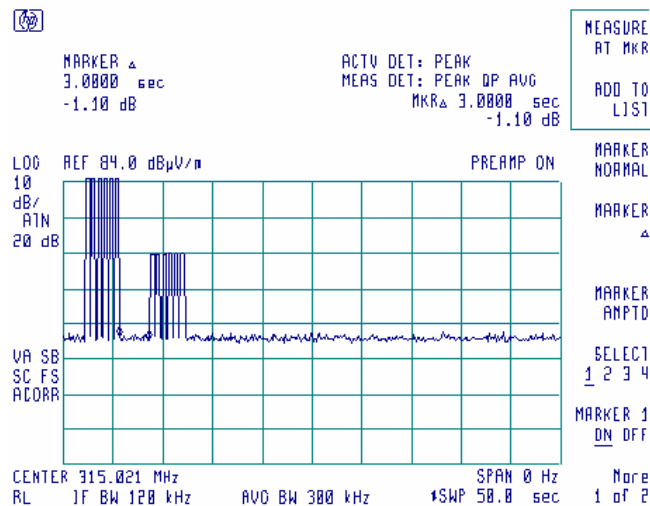


Plot 7.1.2 Transmitter shut down test result, automatic control



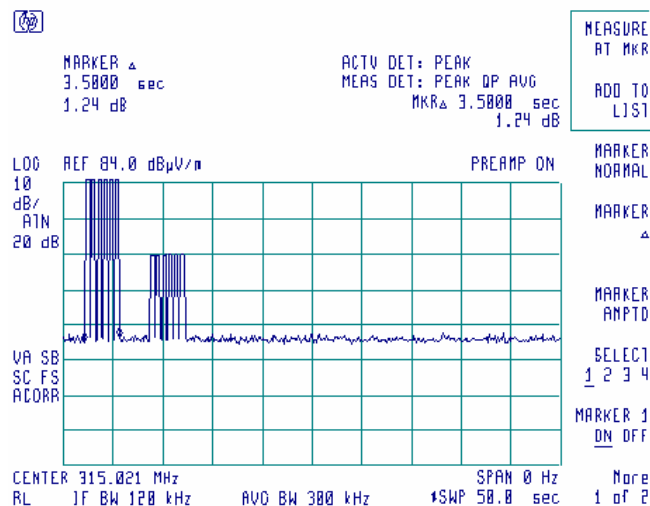
|                     |                                                                                          |                         |                     |
|---------------------|------------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(a) / RSS-210, Section 6.1.1(a), Periodic operation requirements |                         |                     |
| Test procedure:     | Supplier declaration                                                                     |                         |                     |
| Test mode:          | Compliance                                                                               | Verdict:                | PASS                |
| Date & Time:        | 10/19/2004 7:17:03 PM                                                                    |                         |                     |
| Temperature: 24 °C  | Air Pressure: 1010 hPa                                                                   | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                          |                         |                     |

Plot 7.1.3 Transmitter shut down test result, tilt alarm and tilt restore transmissions  
Pause duration



To take plots, the transmitter was turned downright and immediately returned to upright position. The first transmission is alarm and the second one is restore.

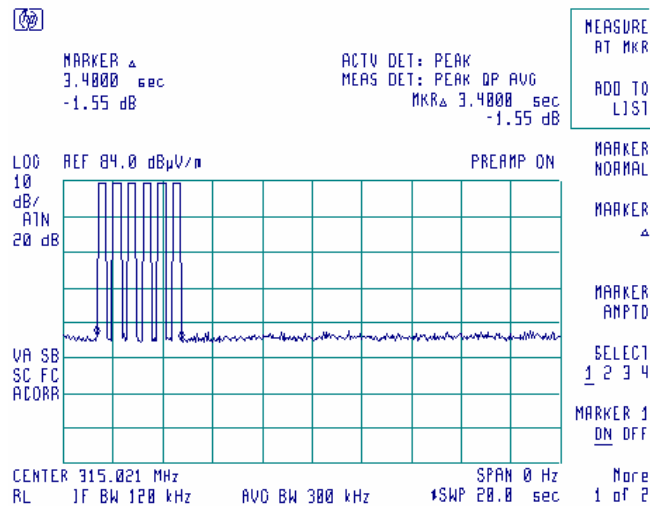
Plot 7.1.4 Transmitter shut down test result, tilt alarm and tilt restore transmissions  
Transmission duration



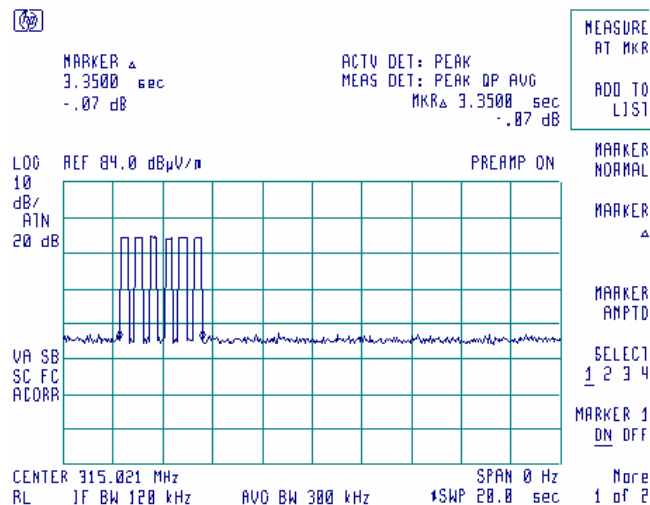
To take plots, the transmitter was turned downright and immediately returned to upright position. The first transmission is alarm and the second one is restore.

|                     |                                                                                          |                         |                     |
|---------------------|------------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(a) / RSS-210, Section 6.1.1(a), Periodic operation requirements |                         |                     |
| Test procedure:     | Supplier declaration                                                                     |                         |                     |
| Test mode:          | Compliance                                                                               | Verdict:                | PASS                |
| Date & Time:        | 10/19/2004 7:17:03 PM                                                                    |                         |                     |
| Temperature: 24 °C  | Air Pressure: 1010 hPa                                                                   | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                          |                         |                     |

Plot 7.1.5 Transmitter shut down test result, tilt alarm transmission duration



Plot 7.1.6 Transmitter shut down test result, tilt restore transmission duration



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| 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. The 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                        | 95.6                            | 75.6    |

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 – 0.490* | NA                              | 128.5 – 93.8** | NA      | 75.6                     | 55.6    |
| 0.490 – 1.705* |                                 | 73.8 – 63.0**  |         |                          |         |
| 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:

$$\text{Lim}_{S2} = \text{Lim}_{S1} + 40 \log(S_1/S_2),$$

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

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

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.

|                            |                                                                                             |                                |                            |
|----------------------------|---------------------------------------------------------------------------------------------|--------------------------------|----------------------------|
| <b>Test specification:</b> | <b>FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions</b> |                                |                            |
| <b>Test procedure:</b>     | ANSI C63.4, Section 13.1.4                                                                  |                                |                            |
| <b>Test mode:</b>          | Compliance                                                                                  | <b>Verdict:</b>                | <b>PASS</b>                |
| <b>Date &amp; Time:</b>    | 10/20/2004 11:28:14 AM                                                                      |                                |                            |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa                                                               | <b>Relative Humidity:</b> 44 % | <b>Power Supply:</b> 3 VDC |
| <b>Remarks:</b>            |                                                                                             |                                |                            |

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

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

**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. The EUT was tested in three orthogonal positions.

**7.2.2.3** The worst test results with respect to the limits 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 Figure 7.2.2, energized and the EUT performance was checked.

**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. The EUT was tested in three orthogonal positions.

**7.2.3.3** The worst test results with respect to the limits were recorded in Table 7.2.3, Table 7.2.5 and shown in the associated plots.

|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

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

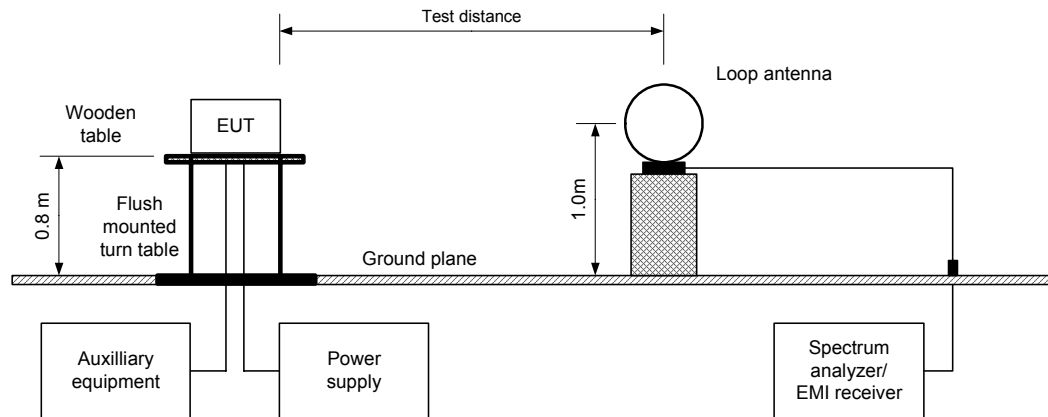
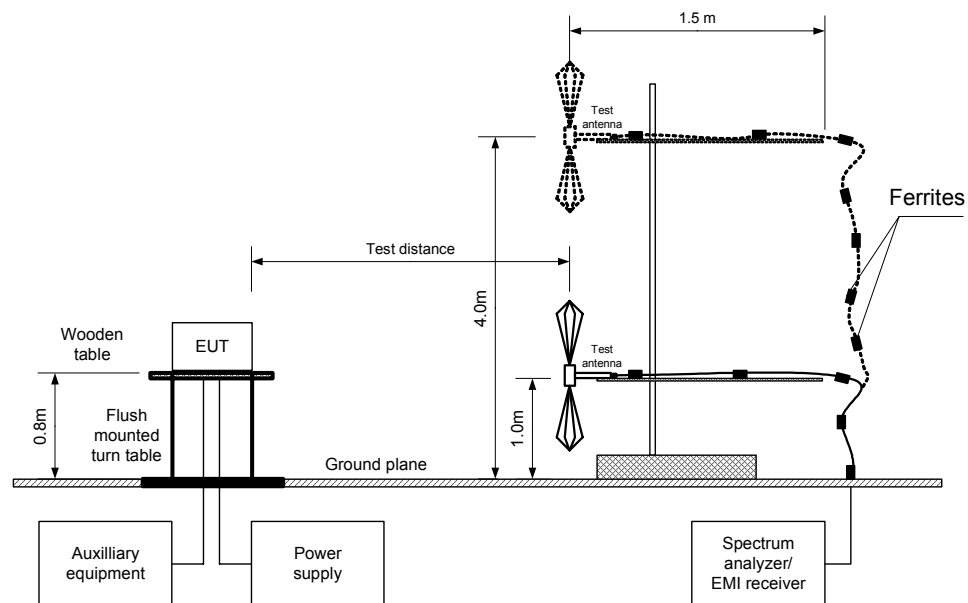


Figure 7.2.2 Setup for spurious emission field strength measurements above 30 MHz



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

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: Y  
MODULATION: A.S.K.  
MODULATING SIGNAL: ID code  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
INVESTIGATED FREQUENCY RANGE: 0.009 - 3200 MHz  
DETECTOR USED: Peak  
RESOLUTION BANDWIDTH: 0.2 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  
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
Biconical (30 MHz – 200 MHz)  
Log periodic (200 MHz – 1000 MHz)  
Double ridged guide (above 1000 MHz)

| Frequency,<br>MHz    | Antenna |              | Azimuth,<br>degrees* | Peak field strength   |                    |                 | Avr.<br>factor,<br>dB | Average field strength |                    |                 | Verdict |
|----------------------|---------|--------------|----------------------|-----------------------|--------------------|-----------------|-----------------------|------------------------|--------------------|-----------------|---------|
|                      | Pol.    | Height,<br>m |                      | Measured,<br>dB(μV/m) | Limit,<br>dB(μV/m) | Margin,<br>dB** |                       | Measured,<br>dB(μV/m)  | Limit,<br>dB(μV/m) | Margin,<br>dB** |         |
| Fundamental emission |         |              |                      |                       |                    |                 |                       |                        |                    |                 |         |
| 315.01               | H       | 1.0          | 32                   | 76.48                 | 95.60              | -18.82          | -3.38                 | 73.10                  | 75.60              | -2.50           | Pass    |
| Spurious emissions   |         |              |                      |                       |                    |                 |                       |                        |                    |                 |         |
| 630.02               | V       | 1.1          | 45                   | 33.87                 | 75.60              | -41.73          | -3.38                 | 30.49                  | 55.60              | -25.11          | Pass    |
| 945.03               | V       | 1.2          | 278                  | 42.18                 | 75.60              | -33.42          | -3.38                 | 38.80                  | 55.60              | -16.80          |         |
| 1260.04              | H       | 1.0          | 267                  | 42.20                 | 75.60              | -33.4           | -3.38                 | 38.82                  | 55.60              | -16.78          |         |
| 1575.05              | V       | 1.0          | 273                  | 41.72                 | 74.00              | -32.28          | -3.38                 | 38.34                  | 54.00              | -15.66          |         |

\*- 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 |            | Preamble burst duration, ms | Transmission burst duration, ms | Number of transmissions | Duty cycle % | Average factor, dB |
|--------------------|------------|-----------------------------|---------------------------------|-------------------------|--------------|--------------------|
| Duration, ms       | Period, ms |                             |                                 |                         |              |                    |
| 0.820              | 1.2        | 44.48                       | 286.4                           | 6                       | 67.7         | -3.38              |

\*- Average factor was calculated as follows:

for pulse train shorter than 100 ms:

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

for pulse train longer than 100 ms:

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

|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

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

TEST DISTANCE: 3 m  
EUT POSITION: 3 orthogonal ( X / Y / Z )  
MODULATION: A.S.K.  
MODULATING SIGNAL: ID code  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz  
DETECTOR USED: Peak  
RESOLUTION BANDWIDTH: 0.2 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)  
Biconical (30 MHz – 200 MHz)  
Log periodic (200 MHz – 1000 MHz)

| Frequency,<br>MHz                 | Antenna |              | Azimuth,<br>degrees* | Peak field strength   |                    |                 | Avr.<br>factor,<br>dB | Average field strength |                    |                 | Verdict |
|-----------------------------------|---------|--------------|----------------------|-----------------------|--------------------|-----------------|-----------------------|------------------------|--------------------|-----------------|---------|
|                                   | Pol.    | Height,<br>m |                      | Measured,<br>dB(µV/m) | Limit,<br>dB(µV/m) | Margin,<br>dB** |                       | Measured,<br>dB(µV/m)  | Limit,<br>dB(µV/m) | Margin,<br>dB** |         |
| No spurious emissions were found. |         |              |                      |                       |                    |                 |                       |                        |                    |                 |         |

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

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

Table 7.2.6 Restricted bands according to FCC 15, Section 205

| MHz               | MHz                 | MHz                   | MHz             | MHz           | GHz           |
|-------------------|---------------------|-----------------------|-----------------|---------------|---------------|
| 0.09 - 0.11       | 8.37625 - 8.38675   | 73 - 74.6             | 399.9 - 410     | 2655 - 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   | 12.290 - 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     | 16.420 - 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 0038 | HL 0287 | HL 0415 | HL 0446 | HL 0465 | HL 0521 | HL 0566 | HL 0569 |
| HL 0589 | HL 0593 | HL 0594 | HL 0812 | HL 1004 | HL 1365 | HL 1430 | HL 1552 |
| HL 1848 | HL 1942 | HL 1947 | HL 1984 | HL 2009 | HL 2254 | HL 2259 |         |

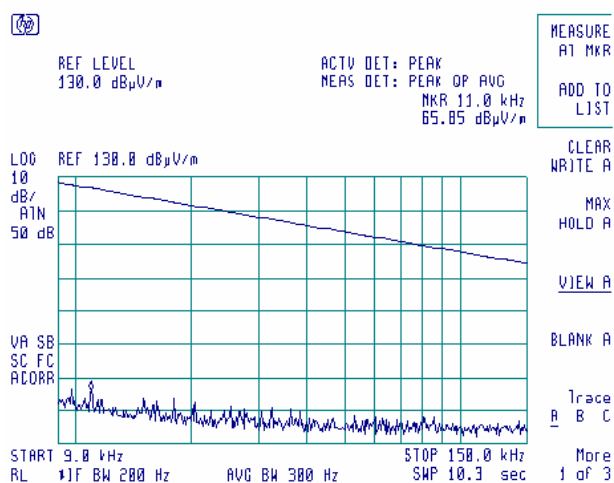
Full description is given in Appendix A.



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

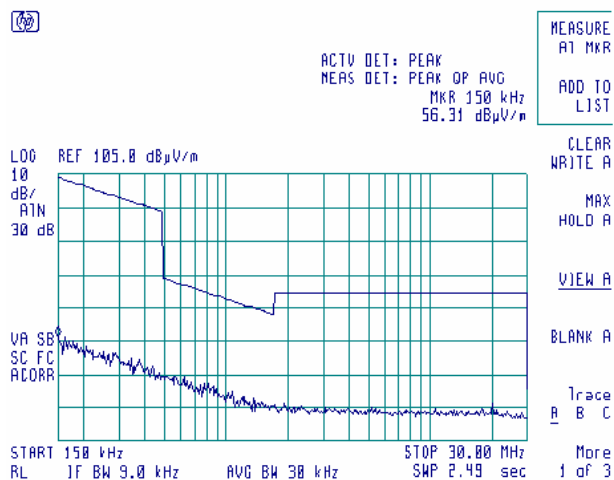
#### Plot 7.2.1 Radiated emission measurements from 9 to 150 kHz

TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



#### Plot 7.2.2 Radiated emission measurements from 0.15 to 30 MHz

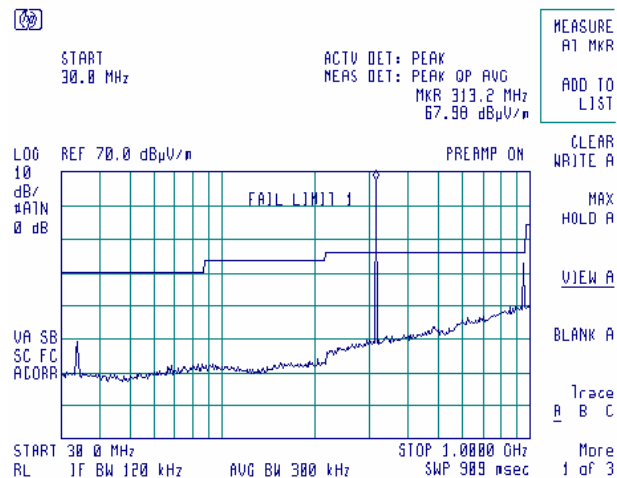
TEST SITE: Semi anechoic chamber  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

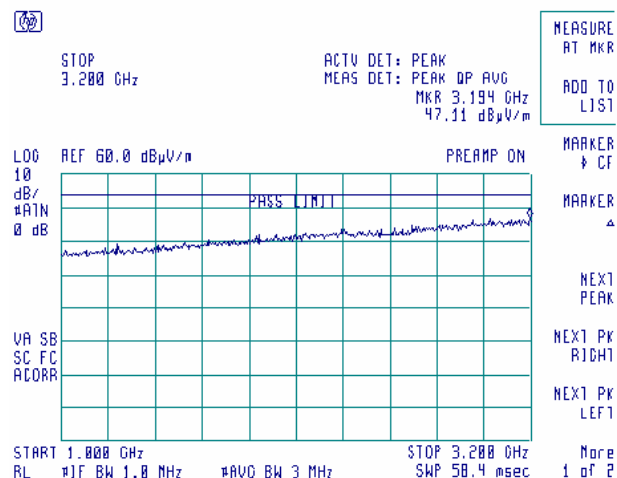
Plot 7.2.3 Radiated emission measurements from 30 to 1000 MHz

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.4 Radiated emission measurements from 1000 to 3200 MHz

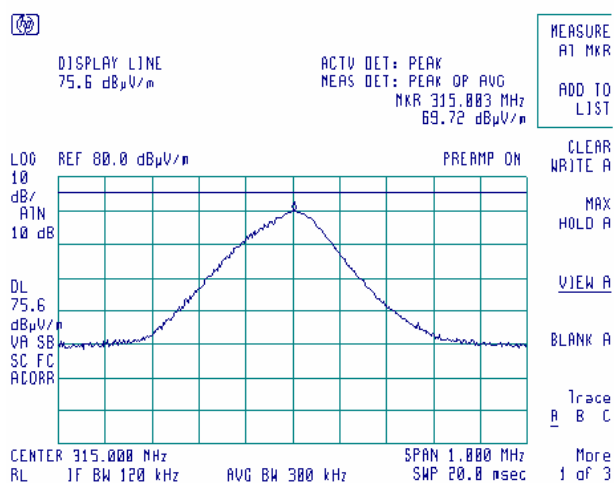
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical and Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

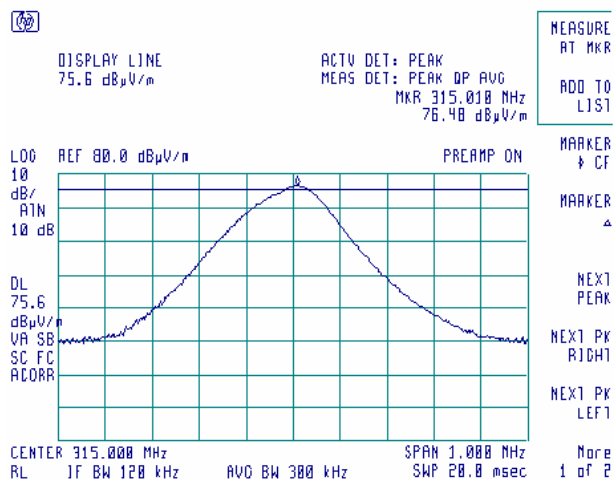
#### Plot 7.2.5 Field strength of fundamental measurements

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



#### Plot 7.2.6 Field strength of fundamental measurements

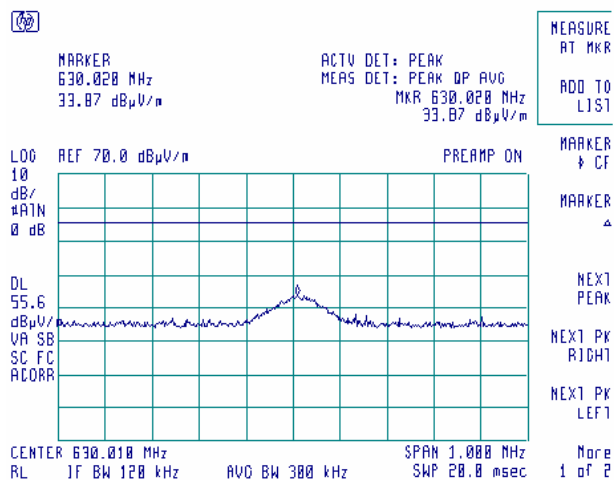
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

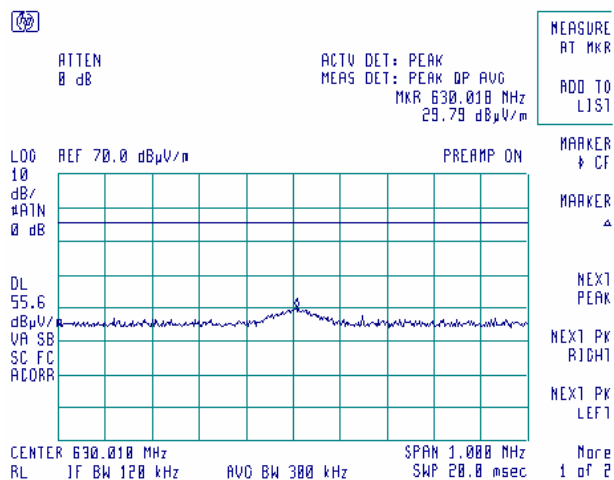
Plot 7.2.7 Radiated emission measurements, the second harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.8 Radiated emission measurements, the second harmonic

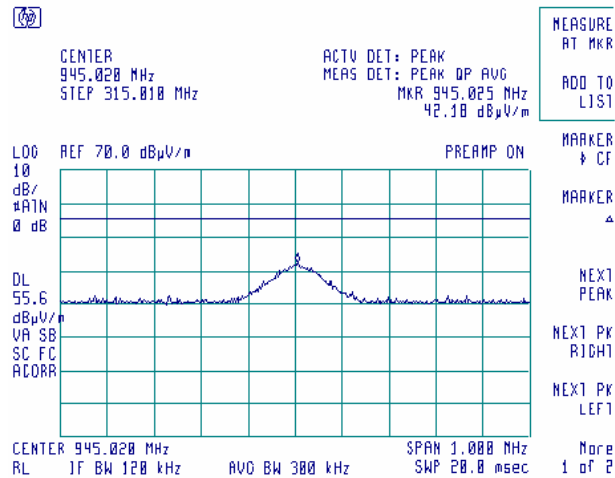
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

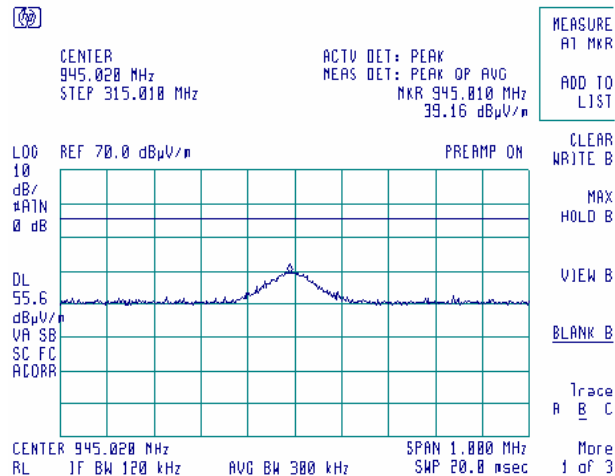
Plot 7.2.9 Radiated emission measurements, the third harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.10 Radiated emission measurements, the third harmonic

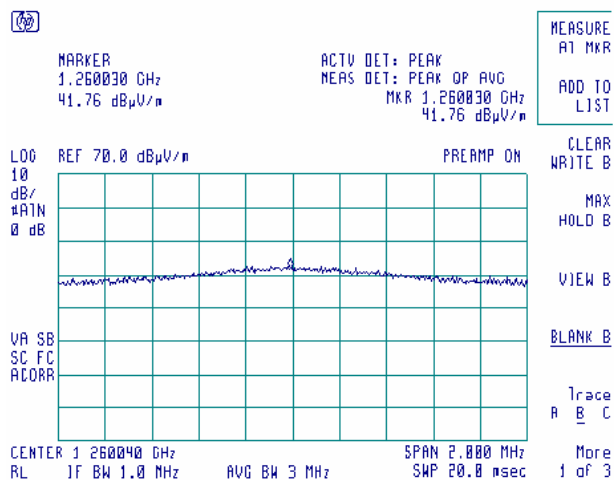
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

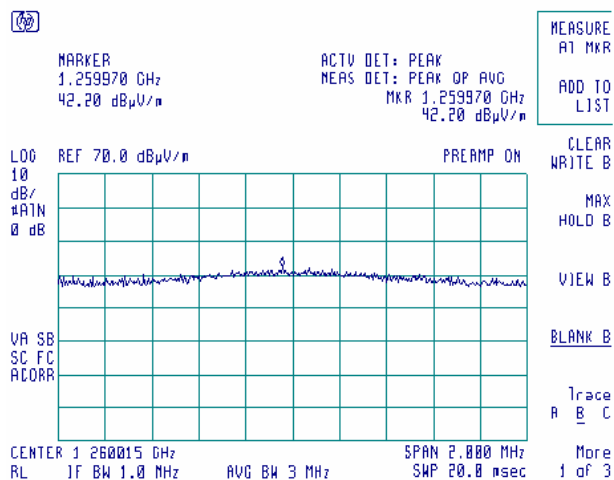
Plot 7.2.11 Radiated emission measurements, the forth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.12 Radiated emission measurements, the forth harmonic

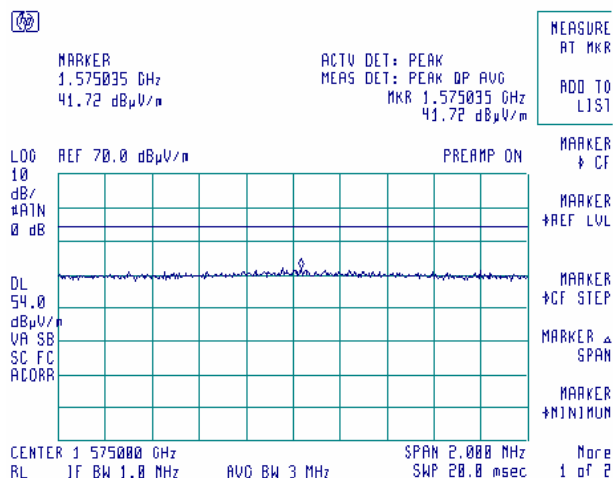
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

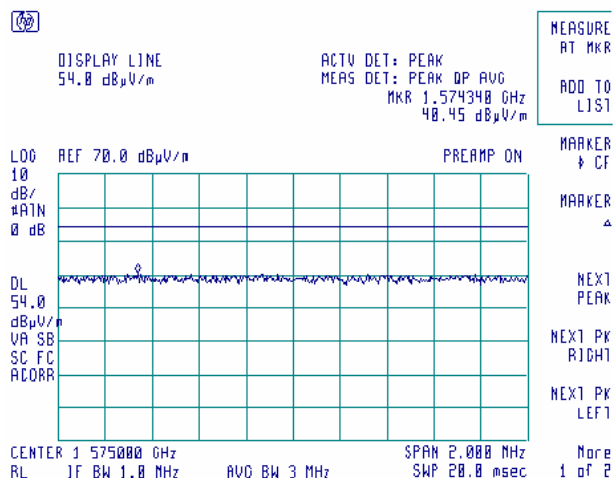
Plot 7.2.13 Radiated emission measurements, the fifth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.14 Radiated emission measurements, the fifth harmonic

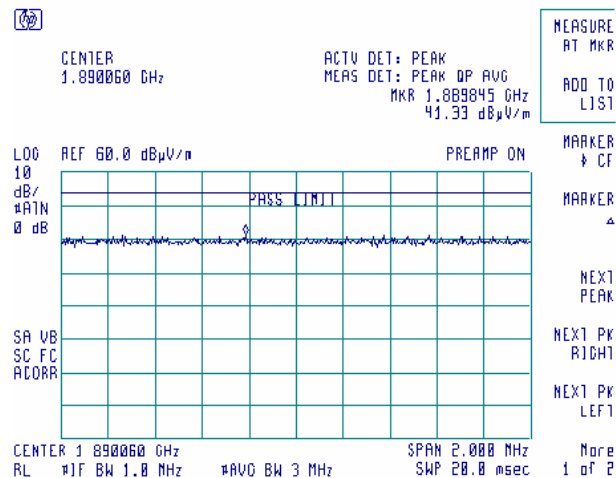
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

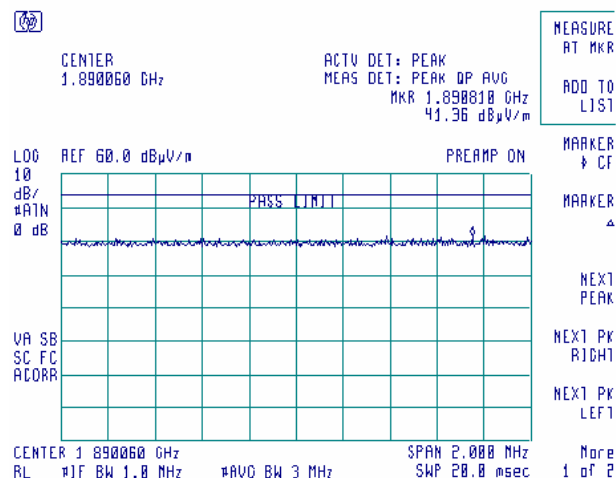
Plot 7.2.15 Radiated emission measurements, the sixth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.16 Radiated emission measurements, the sixth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)

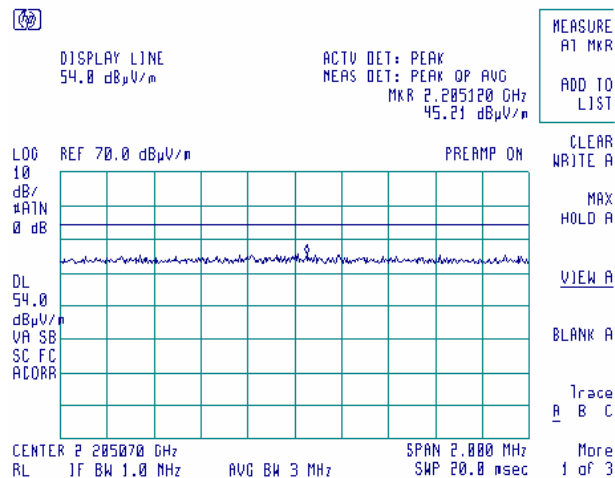




|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

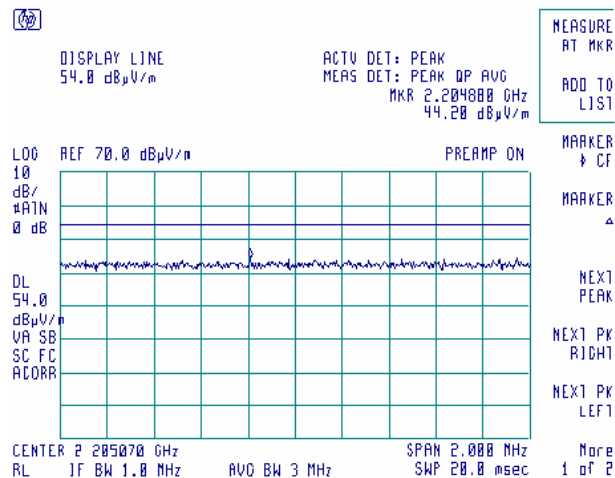
Plot 7.2.17 Radiated emission measurements, the seventh harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.18 Radiated emission measurements, the seventh harmonic

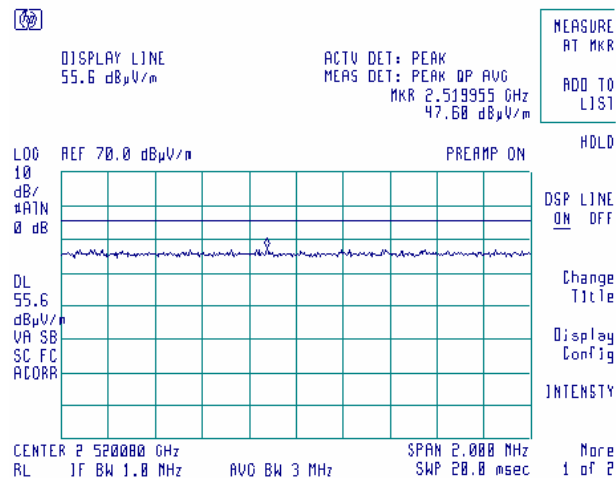
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

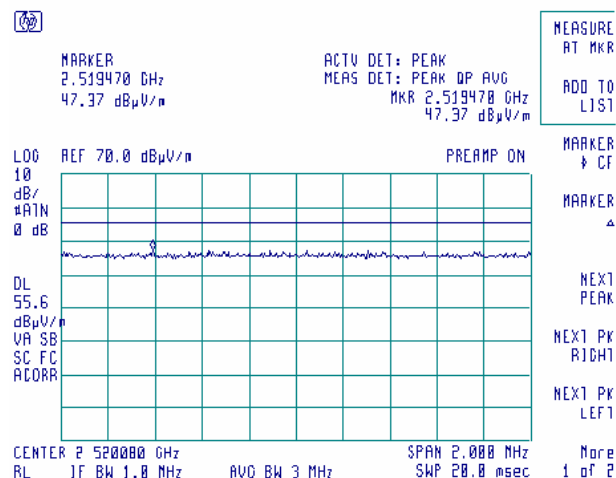
Plot 7.2.19 Radiated emission measurements, the eighth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.20 Radiated emission measurements, the eighth harmonic

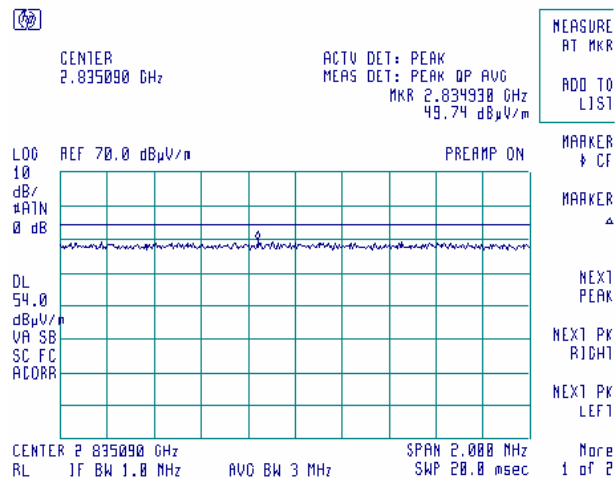
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

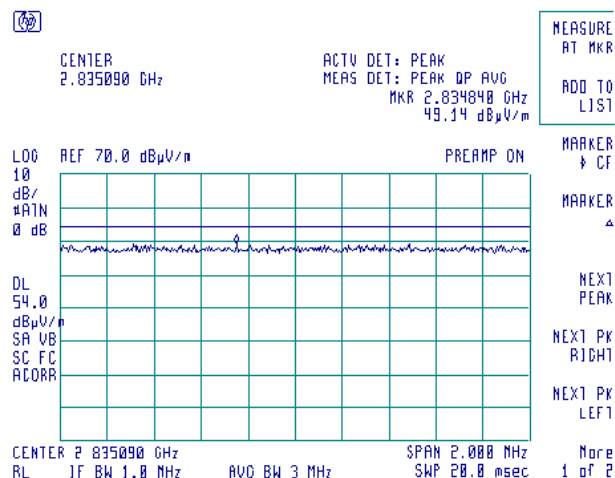
Plot 7.2.21 Radiated emission measurements, the ninth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



Plot 7.2.22 Radiated emission measurements, the ninth harmonic

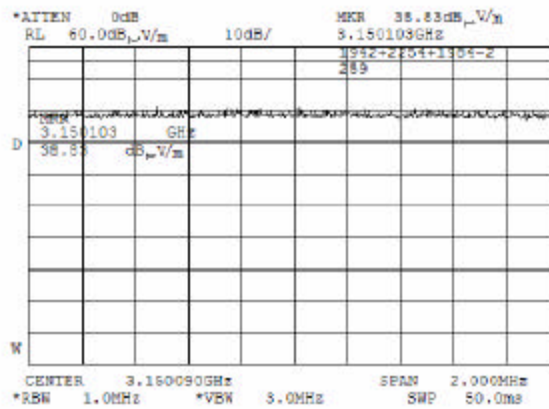
TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

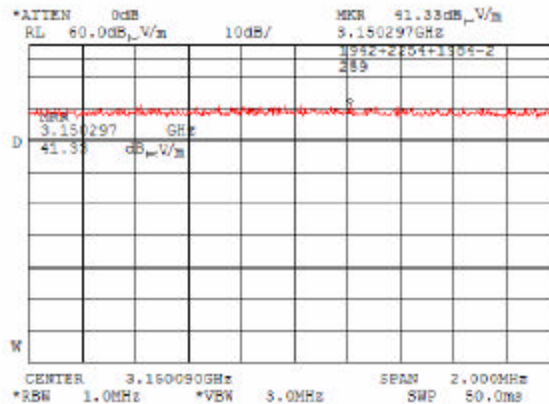
Plot 7.2.23 Radiated emission measurements, the tenth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Vertical  
EUT POSITION: 3 orthogonal (X / Y / Z)



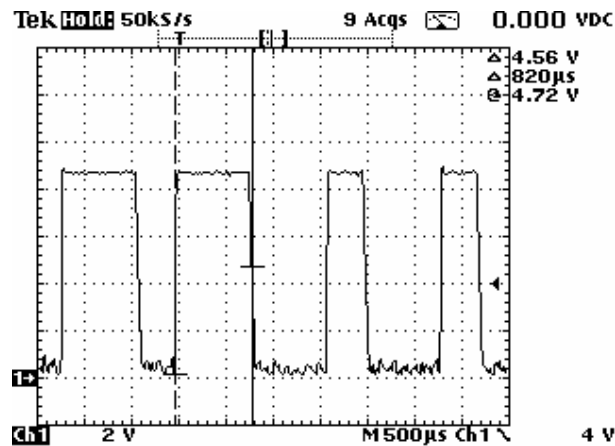
Plot 7.2.24 Radiated emission measurements, the tenth harmonic

TEST SITE: OATS  
TEST DISTANCE: 3 m  
ANTENNA POLARIZATION: Horizontal  
EUT POSITION: 3 orthogonal (X / Y / Z)

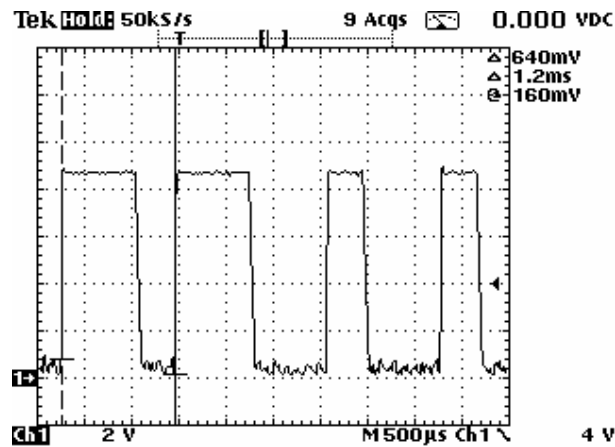


|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

Plot 7.2.25 Duty cycle measurements  
Preamble. Transmission pulse duration, bit "1"

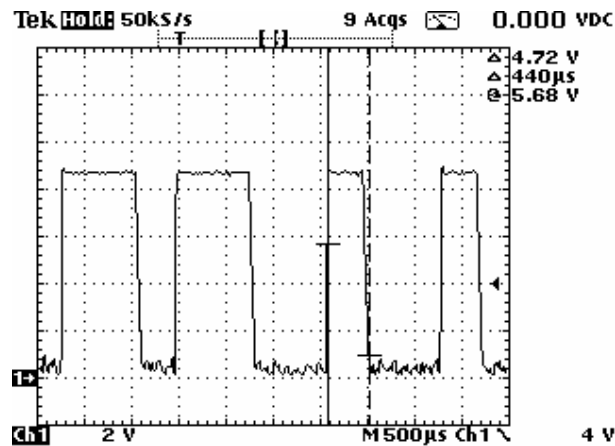


Plot 7.2.26 Duty cycle measurements  
Preamble. Transmission pulse period, bit "1"

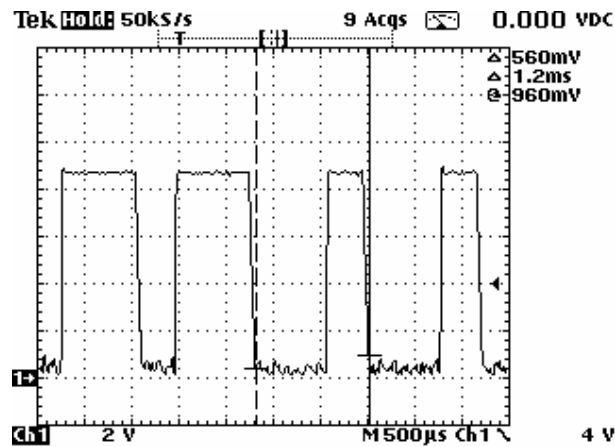


|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

Plot 7.2.27 Duty cycle measurements  
Preamble. Transmission pulse duration, bit "0"

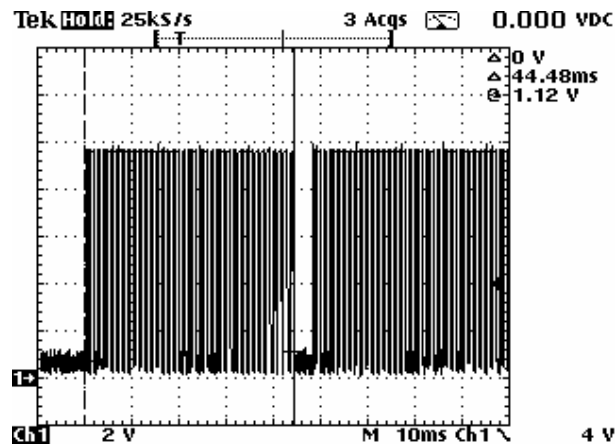


Plot 7.2.28 Duty cycle measurements  
Preamble. Transmission pulse period, bit "0"

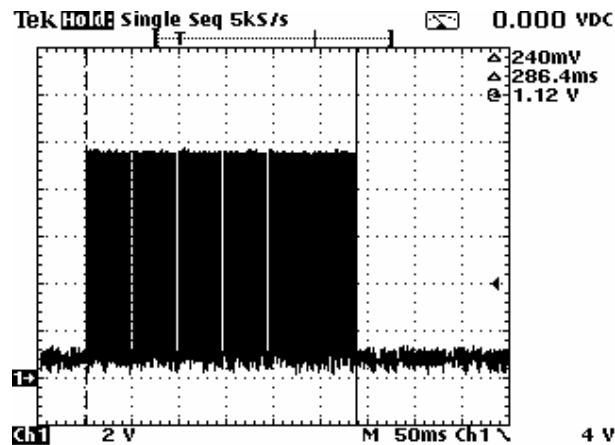


|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

Plot 7.2.29 Duty cycle measurements  
Preamble. Transmission burst duration

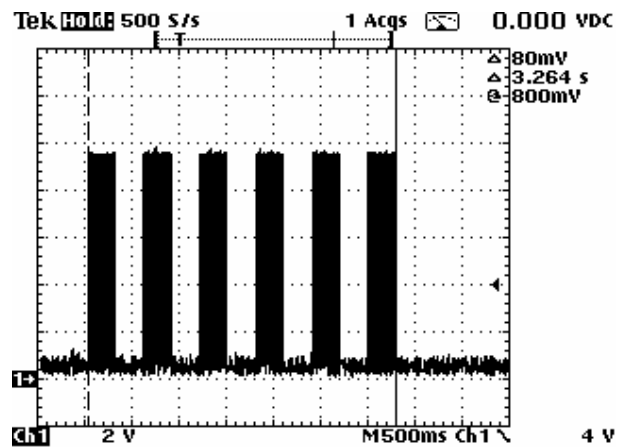


Plot 7.2.30 Duty cycle measurements  
Transmission burst duration



|                     |                                                                                      |                         |                     |
|---------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(b) / RSS-210, Section 6.1.1(b), Field strength of emissions |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.4                                                           |                         |                     |
| Test mode:          | Compliance                                                                           | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 11:28:14 AM                                                               |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                                               | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                                      |                         |                     |

Plot 7.2.31 Duty cycle measurements  
Whole transmission





|                     |                                                                             |                         |                     |
|---------------------|-----------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(c) / RSS-210, Section 6.1.1(c), Occupied bandwidth |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.7                                                  |                         |                     |
| Test mode:          | Compliance                                                                  | Verdict:                | PASS                |
| Date & Time:        | 10/19/2004 7:54:06 PM                                                       |                         |                     |
| Temperature: 24 °C  | Air Pressure: 1012 hPa                                                      | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                             |                         |                     |

## 7.3 Occupied bandwidth test

### 7.3.1 General

This test was performed to measure transmitter occupied bandwidth. The specification test limits are given in Table 7.3.1. The test results are provided in Table 7.3.2 and shown in the associated plot.

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 shown in the associated plot.

Figure 7.3.1 Occupied bandwidth test setup



|                     |                                                                             |                         |                     |
|---------------------|-----------------------------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 231(c) / RSS-210, Section 6.1.1(c), Occupied bandwidth |                         |                     |
| Test procedure:     | ANSI C63.4, Section 13.1.7                                                  |                         |                     |
| Test mode:          | Compliance                                                                  | Verdict:                | PASS                |
| Date & Time:        | 10/19/2004 7:54:06 PM                                                       |                         |                     |
| Temperature: 24 °C  | Air Pressure: 1012 hPa                                                      | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                                             |                         |                     |

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Peak hold  
RESOLUTION BANDWIDTH: 100 kHz  
VIDEO BANDWIDTH: 100 kHz  
MODULATION ENVELOPE REFERENCE POINTS: 20 dBc  
MODULATION: A.S.K.  
MODULATING SIGNAL: ID code

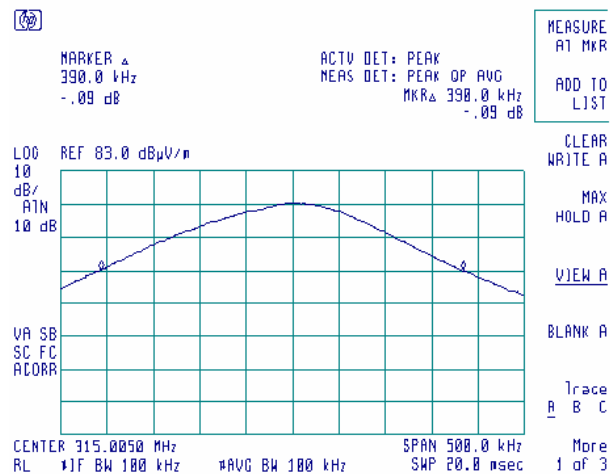
| Carrier frequency, MHz | Occupied bandwidth, kHz | Limit                      |       | Margin, kHz | Verdict |
|------------------------|-------------------------|----------------------------|-------|-------------|---------|
|                        |                         | % of the carrier frequency | kHz   |             |         |
| 315.0                  | 390.0                   | 0.25                       | 787.5 | 397.5       | Pass    |

Reference numbers of test equipment used

|         |         |         |         |  |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|--|
| HL 0034 | HL 0415 | HL 0812 | HL 1430 |  |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|--|

Full description is given in Appendix A.

Plot 7.3.1 Occupied bandwidth test result



|                            |                                                                              |                                |                            |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|----------------------------|
| <b>Test specification:</b> | <b>FCC Part 15, Section 203 / RSS-210, Section 5.5, Antenna requirements</b> |                                |                            |
| <b>Test procedure:</b>     | Visual inspection / supplier declaration                                     |                                |                            |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                |
| <b>Date &amp; Time:</b>    | 10/20/2004 12:02:14 PM                                                       |                                |                            |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1012 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 3 VDC |
| <b>Remarks:</b>            |                                                                              |                                |                            |

## 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**



|                            |                                                               |                                |                            |
|----------------------------|---------------------------------------------------------------|--------------------------------|----------------------------|
| <b>Test specification:</b> | <b>FCC Part 15, Section 109 / ICES-003, Radiated emission</b> |                                |                            |
| <b>Test procedure:</b>     | ANSI C63.4, Sections 11.6 and 12.1.4 / CISPR 22               |                                |                            |
| <b>Test mode:</b>          | Compliance                                                    | <b>Verdict:</b>                | <b>PASS</b>                |
| <b>Date &amp; Time:</b>    | 10/20/2004 12:09:30 PM                                        |                                |                            |
| <b>Temperature: 25 °C</b>  | <b>Air Pressure: 1010 hPa</b>                                 | <b>Relative Humidity: 44 %</b> | <b>Power Supply: 3 VDC</b> |
| <b>Remarks:</b>            |                                                               |                                |                            |

## 7.5 Radiated emission measurements

### 7.5.1 General

This test was performed to measure radiated emissions from the EUT enclosure. The specification test limits according to FCC Part 15, Section 109 are given in Table 7.5.1 and according to ICES-003, Section 5 in Table 7.5.2.

**Table 7.5.1 Radiated emission limits according to FCC Part 15, Section 109**

| 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*        |
| 960 - 5 <sup>th</sup> harmonic** | 43.5*                   | 54.0         | 49.5                    | 60.0*        |

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

**Table 7.5.2 Radiated emission limits according to ICES-003, Section 5**

| 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 - 230       | 30.0                    | 40.5*        | 40.0                    | 50.5*        |
| 230 - 1000     | 37.0                    | 47.5*        | 47.0                    | 57.5*        |

\* - 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

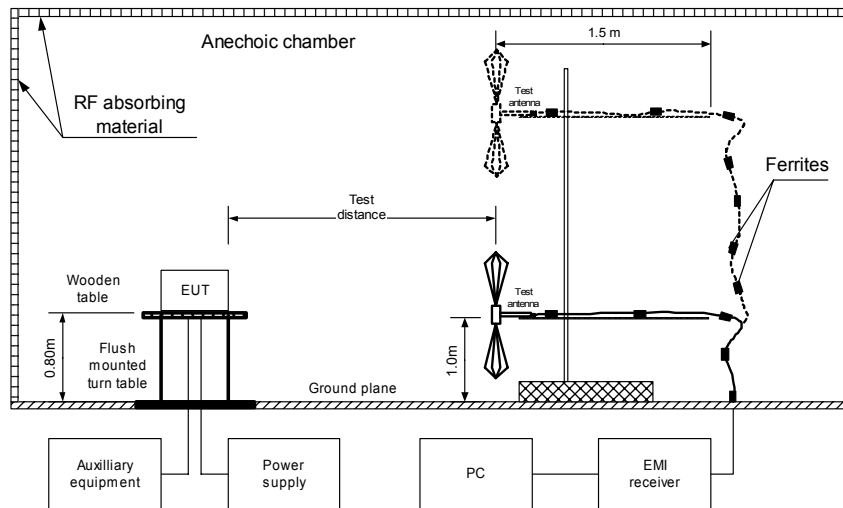
**7.5.2.1** The EUT was set up as shown in Figure 7.5.1, energized and the EUT performance was checked.

**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. The EUT was tested in three orthogonal positions.

**7.5.2.3** The worst test results with respect to the limits were provided in the associated tables and plots.

|                            |                                                               |                                |                            |
|----------------------------|---------------------------------------------------------------|--------------------------------|----------------------------|
| <b>Test specification:</b> | <b>FCC Part 15, Section 109 / ICES-003, Radiated emission</b> |                                |                            |
| <b>Test procedure:</b>     | ANSI C63.4, Sections 11.6 and 12.1.4 / CISPR 22               |                                |                            |
| <b>Test mode:</b>          | Compliance                                                    | <b>Verdict:</b>                | <b>PASS</b>                |
| <b>Date &amp; Time:</b>    | 10/20/2004 12:09:30 PM                                        |                                |                            |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa                                 | <b>Relative Humidity:</b> 44 % | <b>Power Supply:</b> 3 VDC |
| <b>Remarks:</b>            |                                                               |                                |                            |

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



|                            |                                                               |                                |                            |
|----------------------------|---------------------------------------------------------------|--------------------------------|----------------------------|
| <b>Test specification:</b> | <b>FCC Part 15, Section 109 / ICES-003, Radiated emission</b> |                                |                            |
| <b>Test procedure:</b>     | ANSI C63.4, Sections 11.6 and 12.1.4 / CISPR 22               |                                |                            |
| <b>Test mode:</b>          | Compliance                                                    | <b>Verdict:</b>                | <b>PASS</b>                |
| <b>Date &amp; Time:</b>    | 10/20/2004 12:09:30 PM                                        |                                |                            |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1010 hPa                                 | <b>Relative Humidity:</b> 44 % | <b>Power Supply:</b> 3 VDC |
| <b>Remarks:</b>            |                                                               |                                |                            |

**Table 7.5.3 Radiated emission test results according to FCC Part 15, Section 109**

EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Standby  
EUT POSITION: Y  
TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
FREQUENCY RANGE: 30 MHz – 1000 MHz  
RESOLUTION BANDWIDTH: 120 kHz

| Frequency, MHz | Peak emission, dB(μV/m) | Quasi-peak                  |                 |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-------------------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
|                |                         | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* |                      |                   |                                |         |
| 34.358800      | 20.63                   | 17.32                       | 40.00           | -22.68      | V                    | 1                 | 12                             | Pass    |

\*- Margin = Measured emission - specification limit.

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

**Table 7.5.4 Radiated emission test results according to ICES-003, Section 5**

EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Standby  
EUT POSITION: Y  
TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
FREQUENCY RANGE: 30 MHz – 1000 MHz  
RESOLUTION BANDWIDTH: 120 kHz

| Frequency, MHz | Peak emission, dB(μV/m) | Quasi-peak                  |                 |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-------------------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
|                |                         | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* |                      |                   |                                |         |
| 34.358800      | 20.63                   | 17.32                       | 40.50           | -23.18      | V                    | 1                 | 12                             | Pass    |

\*- Margin = Measured emission - specification limit.

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

The radiated emission measurements above 1000 MHz were performed for the EUT in transmit mode. All emissions were found below the limit for unintentional radiated emissions.

**Reference numbers of test equipment used**

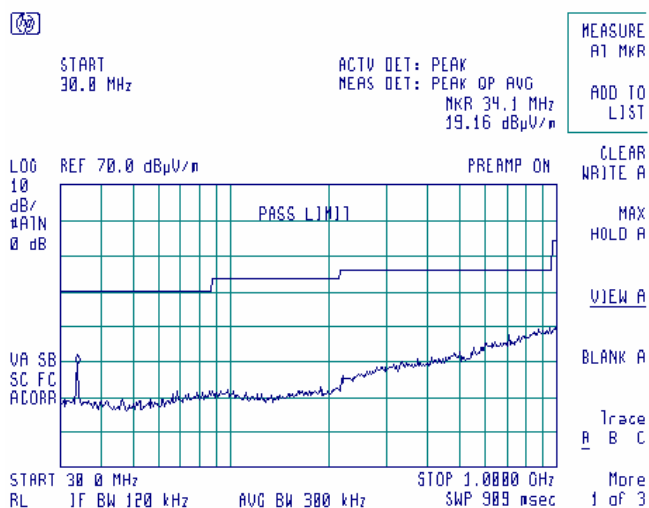
|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0465 | HL 0521 | HL 0589 | HL 0593 | HL 0594 | HL 0604 | HL 1004 | HL 2009 |
|---------|---------|---------|---------|---------|---------|---------|---------|

Full description is given in Appendix A.

|                     |                                                        |                         |                     |
|---------------------|--------------------------------------------------------|-------------------------|---------------------|
| Test specification: | FCC Part 15, Section 109 / ICES-003, Radiated emission |                         |                     |
| Test procedure:     | ANSI C63.4, Sections 11.6 and 12.1.4 / CISPR 22        |                         |                     |
| Test mode:          | Compliance                                             | Verdict:                | PASS                |
| Date & Time:        | 10/20/2004 12:09:30 PM                                 |                         |                     |
| Temperature: 25 °C  | Air Pressure: 1010 hPa                                 | Relative Humidity: 44 % | Power Supply: 3 VDC |
| Remarks:            |                                                        |                         |                     |

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

TEST SITE: Semi anechoic chamber  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Standby  
EUT POSITION: 3 orthogonal (X / Y / Z)



## 8 APPENDIX A Test equipment and ancillaries used for tests

| HL No. | Description                                                           | Manufacturer information   |                    |                        | Due Calibr. Month/Year |
|--------|-----------------------------------------------------------------------|----------------------------|--------------------|------------------------|------------------------|
|        |                                                                       | Name                       | Model No.          | Serial No.             |                        |
| 0034   | Antenna, Log Periodic, 200 - 1000 MHz                                 | Electro-Metrics            | LPA 25/30          | 1988                   | 12-Jan-05              |
| 0038   | Antenna Mast, 1-4 meter, motorized                                    | HL                         | AM - 1             | 028                    | 03-Feb-05              |
| 0287   | Turntable, Motorized Diameter, 2 m (OATS)                             | HL                         | TMD-2              | 042                    | 11-Nov-05              |
| 0415   | Cable, Coax, RF, RG-214                                               | HL                         | CC-3               | 056                    | 02-Dec-05              |
| 0446   | Antenna, Loop active, 10kHz-30MHz                                     | EMCO                       | 6502               | 2857                   | 28-Jun-05              |
| 0465   | Anechoic Chamber 9(L) x 6,5(W) x 5,5(H) m                             | HL                         | AC - 1             | 023                    | 10-Oct-05              |
| 0521   | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-2.9 GHz | Hewlett Packard            | 8546A              | 3617A00319, 3448A00253 | 26-Sep-05              |
| 0566   | Antenna, Biconical, 20 - 200 MHz                                      | Electro-Metrics            | BIA 25/30          | 3566                   | 10-Jan-05              |
| 0569   | Antenna, Log Periodic, 200 - 1000 MHz                                 | Electro-Metrics            | LPA 25/30          | 1953                   | 12-Jan-05              |
| 0589   | Cable Coaxial, GORE A2P01POL118, 2.3 m                                | HL                         | GORE-3             | 176                    | 02-Dec-05              |
| 0593   | Antenna Mast, 1-4 m Pneumatic                                         | Madgesh                    | AM-F1              | 101                    | 03-Feb-05              |
| 0594   | Turn Table for anechoic chamber flush mount d=1.2 m Pneumatic         | HL                         | TT-WDC1            | 102                    | 27-Jan-05              |
| 0604   | Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz                | EMCO                       | 3141               | 9611-1011              | 10-Jan-05              |
| 0812   | Cable Coax, RG-214, 11.5 m, N-type connectors                         | HL                         | C214-11            | 148                    | 02-Dec-05              |
| 1004   | Cable Coaxial, ANDREW PSWJ4, 6m                                       | HL                         | ANDREW-6           | 163                    | 02-Dec-05              |
| 1365   | Cable Coaxial, S-FLC 12-50, 5 m                                       | HL                         | C214-5             | 1365                   | 02-Dec-05              |
| 1430   | EMI Receiver, 9 kHz - 2.9 GHz                                         | Agilent Technologies (HP)  | 8542E              | 3807A00262, 3705A00217 | 01-Sep-05              |
| 1552   | Cable RF, 8 m                                                         | Alpha Wire                 | RG-214             | 1552                   | 02-Dec-05              |
| 1848   | Antenna mast 4m/6m with polarity control (OATS)                       | Sh. I. Machines            | AM-5               | 1                      | 19-Apr-05              |
| 1942   | Cable 18GHz, 4 m, blue                                                | Rhophase Microwave Limited | SPS-1803A-4000-NPS | T4658                  | 17-Oct-05              |
| 1947   | Cable 18GHz, 6.5 m, blue                                              | Rhophase Microwave Limited | NPS-1803A-6500-NPS | T4974                  | 17-Oct-05              |
| 1984   | Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W, N-type        | EMC Test Systems           | 3115               | 9911-5964              | 22-Mar-05              |
| 2009   | Cable RF, 8 m                                                         | Alpha Wire                 | RG-214             | C-56                   | 02-Dec-05              |
| 2254   | Cable 40GHz, 0.8 m, blue                                              | Rhophase Microwave Limited | KPS-1503A-800-KPS  | W4907                  | 24-Jun-05              |
| 2259   | Amplifier Low Noise 2-20 GHz                                          | Sophia Wireless            | LNA0220-C          | 0223                   | 05-Nov-05              |



## 9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

| Test description                                                                                      | Expanded uncertainty                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conducted emissions with LISN                                                                         | 9 kHz to 150 kHz: $\pm 3.9$ dB<br>150 kHz to 30 MHz: $\pm 3.8$ dB                                                                                                                                                                                                                                            |
| Radiated emissions at 10 m measuring distance<br>Horizontal polarization<br><br>Vertical polarization | Biconilog antenna: $\pm 5.0$ dB<br>Biconical antenna: $\pm 5.0$ dB<br>Log periodic antenna: $\pm 5.1$ dB<br>Double ridged horn antenna: $\pm 5.3$ dB<br>Biconilog antenna: $\pm 5.5$ dB<br>Biconical antenna: $\pm 5.5$ dB<br>Log periodic antenna: $\pm 5.6$ dB<br>Double ridged horn antenna: $\pm 5.8$ dB |
| Radiated emissions at 3 m measuring distance<br>Horizontal polarization<br><br>Vertical polarization  | Biconilog antenna: $\pm 5.3$ dB<br>Biconical antenna: $\pm 5.0$ dB<br>Log periodic antenna: $\pm 5.3$ dB<br>Double ridged horn antenna: $\pm 5.3$ dB<br>Biconilog antenna: $\pm 6.0$ dB<br>Biconical antenna: $\pm 5.7$ dB<br>Log periodic antenna: $\pm 6.0$ dB<br>Double ridged horn antenna: $\pm 6.0$ dB |
| Conducted emissions at RF antenna connector                                                           | 9 kHz to 2.9 GHz: $\pm 2.6$ dB<br>2.9 GHz to 6.46 GHz: $\pm 3.5$ dB<br>6.46 GHz to 13.2 GHz: $\pm 4.3$ dB<br>13.2 GHz to 22.0 GHz: $\pm 5.0$ dB<br>22.0 GHz to 26.8 GHz: $\pm 5.5$ dB<br>26.8 GHz to 40.0 GHz: $\pm 4.8$ dB                                                                                  |
| Duty cycle, timing (Tx ON / OFF) and average factor measurements                                      | $\pm 1.0$ %                                                                                                                                                                                                                                                                                                  |
| Occupied bandwidth                                                                                    | $\pm 8.0$ %                                                                                                                                                                                                                                                                                                  |

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).

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e-mail: mail@hermonlabs.com  
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Person for contact: Mr. Alex Usoskin, CEO.

## 11 APPENDIX D Specification references

|                                                                                       |                                                                                                                                                                      |
|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47CFR part 15: 2004                                                                   | 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: 2001                                                                      | 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. |
| RSS-210 Issue 5: 2001 +<br>Amendment: 2002 + Amendment<br>2: 2003 + Amendment 3: 2004 | Low Power Licence- Exempt Radiocommunication Devices                                                                                                                 |
| RSS-212 Issue 1:1999                                                                  | Test Facilities and Test Methods for Radio Equipment                                                                                                                 |
| ICES-003 Issue 4: 2004                                                                | Digital Apparatus                                                                                                                                                    |
| CAN/CSA-CEI/IEC CISPR 22: 02                                                          | Information Technology Equipment- Radio Disturbance Characteristics- Limits and Methods of measurement                                                               |

## 12 APPENDIX E Abbreviations and acronyms

|                |                                             |
|----------------|---------------------------------------------|
| A              | ampere                                      |
| AC             | alternating current                         |
| AVRG           | average (detector)                          |
| cm             | centimeter                                  |
| dB             | decibel                                     |
| dBm            | decibel referred to one milliwatt           |
| dB( $\mu$ V)   | decibel referred to one microvolt           |
| dB( $\mu$ V/m) | decibel referred to one microvolt per meter |
| DC             | direct current                              |
| EIRP           | equivalent isotropically radiated power     |
| ERP            | effective radiated power                    |
| EUT            | equipment under test                        |
| F              | frequency                                   |
| GHz            | gigahertz                                   |
| GND            | ground                                      |
| H              | height                                      |
| HL             | Hermon laboratories                         |
| Hz             | hertz                                       |
| k              | kilo                                        |
| kHz            | kilohertz                                   |
| LISN           | line impedance stabilization network        |
| LO             | local oscillator                            |
| m              | meter                                       |
| MHz            | megahertz                                   |
| min            | minute                                      |
| mm             | millimeter                                  |
| ms             | millisecond                                 |
| $\mu$ s        | microsecond                                 |
| NA             | not applicable                              |
| OATS           | open area test site                         |
| $\Omega$       | Ohm                                         |
| PCB            | printed circuit board                       |
| 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                                        |

## 13 APPENDIX F Test equipment correction factors

Antenna Factor  
Active Loop Antenna  
EMC Test Systems, model 6502, serial number 2857

| Frequency,<br>MHz | Magnetic Antenna Factor,<br>dB(S/m) | Electric Antenna Factor,<br>dB(1/m) |
|-------------------|-------------------------------------|-------------------------------------|
| 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                               | 9.7                                 |
| 0.750             | -41.9                               | 9.6                                 |
| 1.000             | -41.4                               | 10.1                                |
| 2.000             | -41.5                               | 10.0                                |
| 3.000             | -41.4                               | 10.1                                |
| 4.000             | -41.4                               | 10.1                                |
| 5.000             | -41.5                               | 10.0                                |
| 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(S/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ A/m).  
Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

**Biconical antenna factor**

Electro-Metrics, model BIA-25/30, serial number 3566

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|-------------------|----------------------------|
| 20                | 14.1                       | 115               | 15.2                       |
| 25                | 14.5                       | 120               | 14.9                       |
| 30                | 13.8                       | 125               | 13.5                       |
| 35                | 11.9                       | 130               | 13.5                       |
| 40                | 11.5                       | 135               | 13.0                       |
| 45                | 11.7                       | 140               | 12.7                       |
| 50                | 11.4                       | 145               | 12.9                       |
| 55                | 10.6                       | 150               | 14.7                       |
| 60                | 10.4                       | 155               | 15.0                       |
| 65                | 9.0                        | 160               | 15.0                       |
| 70                | 7.8                        | 165               | 15.5                       |
| 75                | 7.6                        | 170               | 15.9                       |
| 80                | 7.5                        | 175               | 16.6                       |
| 85                | 7.9                        | 180               | 17.1                       |
| 90                | 9.5                        | 185               | 17.5                       |
| 95                | 10.9                       | 190               | 17.9                       |
| 100               | 11.9                       | 195               | 18.0                       |
| 105               | 12.4                       | 200               | 18.1                       |
| 110               | 13.5                       |                   |                            |

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

**Log periodic antenna factor**

**Electro-Metrics, model LPA-25/30, serial number 1953**

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|-------------------|----------------------------|
| 200               | 15.2                       | 625               | 25.2                       |
| 225               | 15.1                       | 650               | 25.8                       |
| 250               | 16.3                       | 675               | 27.2                       |
| 275               | 17.2                       | 700               | 27.6                       |
| 300               | 19.6                       | 725               | 27.6                       |
| 325               | 18.4                       | 750               | 27.6                       |
| 350               | 19.0                       | 775               | 28.0                       |
| 375               | 20.0                       | 800               | 28.2                       |
| 400               | 20.9                       | 825               | 29.4                       |
| 425               | 21.3                       | 850               | 29.9                       |
| 450               | 22.1                       | 875               | 30.0                       |
| 475               | 22.7                       | 900               | 30.4                       |
| 500               | 23.2                       | 925               | 30.6                       |
| 525               | 23.9                       | 950               | 30.8                       |
| 550               | 24.2                       | 975               | 31.6                       |
| 575               | 24.6                       | 1000              | 32.1                       |
| 600               | 24.7                       |                   |                            |

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

**Log periodic antenna factor**

**Electro-Metrics, model LPA-25/30, serial number 1988**

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>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( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

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

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>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( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

**Antenna factor**  
**Double-ridged wave guide horn antenna**  
**EMC Test Systems (EMCO), model 3115**

| Frequency,<br>MHz | Antenna factor (s/n 9911-5964),<br>dB(1/m) | Antenna factor (s/n 00027177),<br>dB(1/m) |
|-------------------|--------------------------------------------|-------------------------------------------|
| 1000.0            | 24.5                                       | 24.7                                      |
| 1500.0            | 24.8                                       | 25.7                                      |
| 2000.0            | 27.6                                       | 27.8                                      |
| 2500.0            | 28.7                                       | 28.9                                      |
| 3000.0            | 30.8                                       | 30.7                                      |
| 3500.0            | 32.9                                       | 31.8                                      |
| 4000.0            | 32.7                                       | 33.0                                      |
| 4500.0            | 32.0                                       | 32.8                                      |
| 5000.0            | 33.6                                       | 34.2                                      |
| 5500.0            | 35.3                                       | 34.9                                      |
| 6000.0            | 35.7                                       | 35.2                                      |
| 6500.0            | 35.8                                       | 35.4                                      |
| 7000.0            | 36.2                                       | 36.3                                      |
| 7500.0            | 37.2                                       | 37.3                                      |
| 8000.0            | 37.2                                       | 37.5                                      |
| 8500.0            | 38.1                                       | 38.0                                      |
| 9000.0            | 38.6                                       | 38.3                                      |
| 9500.0            | 38.3                                       | 38.3                                      |
| 10000.0           | 38.4                                       | 38.7                                      |
| 10500.0           | 38.3                                       | 38.7                                      |
| 11000.0           | 38.8                                       | 38.9                                      |
| 11500.0           | 39.9                                       | 39.5                                      |
| 12000.0           | 39.6                                       | 39.5                                      |
| 12500.0           | 39.5                                       | 39.4                                      |
| 13000.0           | 40.5                                       | 40.5                                      |
| 13500.0           | 41.1                                       | 40.8                                      |
| 14000.0           | 41.5                                       | 41.5                                      |
| 14500.0           | 40.8                                       | 41.3                                      |
| 15000.0           | 39.5                                       | 40.2                                      |
| 15500.0           | 38.1                                       | 38.7                                      |
| 16000.0           | 38.1                                       | 38.5                                      |
| 16500.0           | 40.1                                       | 39.8                                      |
| 17000.0           | 42.6                                       | 41.9                                      |
| 17500.0           | 45.4                                       | 45.8                                      |
| 18000.0           | 48.7                                       | 49.1                                      |

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



Cable coaxial, RG-58/RG-214, model CC-3, serial number 056, HL 0415  
+ Cable coaxial, RG-214, 11.5 m, model C214-11, serial number 148, HL 0812  
Calibration data

| No. | Parameter      | Set,<br>MHz | Measured,<br>dB | Deviation,<br>dB | Tolerance<br>(specification),<br>dB | Measured<br>uncertainty<br>dB |
|-----|----------------|-------------|-----------------|------------------|-------------------------------------|-------------------------------|
| 1   | Insertion loss | 20          | 0.73            | -                | NA                                  | ±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           | -                |                                     |                               |

### Cable loss

Cable coaxial, GORE A2P01POL118, 2.3 m, model GORE-3, serial number 176, HL 0589  
+ Cable coaxial, ANDREW PSWJ4, 6 m, model: ANDREW-6, serial number 163, HL 1004

| No. | Frequency,<br>MHz | Cable loss,<br>dB | Tolerance<br>(Specification),<br>dB | Measurement<br>uncertainty,<br>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              |                                     |                                   |

Cable coaxial, RG-214, 5 m, model C214-5, serial number 1365, HL 1365  
Calibration data

| No. | Parameter      | Set,<br>MHz | Measured,<br>dB | Deviation,<br>dB | Tolerance<br>(specification),<br>dB | Measured<br>uncertainty<br>dB |
|-----|----------------|-------------|-----------------|------------------|-------------------------------------|-------------------------------|
| 1   | Insertion loss | 1000        | 0.41            | -                | NA                                  | ±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            | -                |                                     |                               |

**Cable loss**  
**Cable 18 GHz, 4 m, blue, model SPS-1803A-4000-NPS, serial number T4658, HL 1942**

| Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|
| 0.03              | 0.21              |
| 0.05              | 0.26              |
| 0.10              | 0.36              |
| 0.20              | 0.50              |
| 0.30              | 0.61              |
| 0.40              | 0.70              |
| 0.50              | 0.78              |
| 0.60              | 0.85              |
| 0.70              | 0.93              |
| 0.80              | 0.99              |
| 0.90              | 1.04              |
| 1.00              | 1.10              |
| 1.10              | 1.16              |
| 1.20              | 1.22              |
| 1.30              | 1.26              |
| 1.40              | 1.31              |
| 1.50              | 1.35              |
| 1.60              | 1.41              |
| 1.70              | 1.45              |
| 1.80              | 1.49              |
| 1.90              | 1.53              |
| 2.00              | 1.57              |
| 2.10              | 1.61              |
| 2.20              | 1.65              |
| 2.30              | 1.69              |
| 2.40              | 1.72              |
| 2.50              | 1.76              |
| 2.60              | 1.79              |
| 2.70              | 1.83              |
| 2.80              | 1.87              |
| 2.90              | 1.90              |
| 3.10              | 1.97              |
| 3.30              | 2.04              |
| 3.50              | 2.11              |
| 3.70              | 2.18              |
| 3.90              | 2.24              |
| 4.10              | 2.31              |
| 4.30              | 2.38              |
| 4.50              | 2.43              |
| 4.70              | 2.53              |
| 4.90              | 2.53              |
| 5.10              | 2.63              |
| 5.30              | 2.65              |
| 5.50              | 2.72              |
| 5.70              | 2.76              |
| 5.90              | 2.79              |

| Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|
| 6.10              | 2.88              |
| 6.30              | 2.90              |
| 6.50              | 2.97              |
| 6.70              | 3.02              |
| 6.90              | 3.04              |
| 7.10              | 3.07              |
| 7.30              | 3.12              |
| 7.50              | 3.13              |
| 7.70              | 3.19              |
| 7.90              | 3.24              |
| 8.10              | 3.30              |
| 8.30              | 3.36              |
| 8.50              | 3.45              |
| 8.70              | 3.41              |
| 8.90              | 3.45              |
| 9.10              | 3.42              |
| 9.30              | 3.55              |
| 9.50              | 3.48              |
| 9.70              | 3.58              |
| 9.90              | 3.61              |
| 10.10             | 3.66              |
| 10.30             | 3.68              |
| 10.50             | 3.70              |
| 10.70             | 3.70              |
| 10.90             | 3.75              |
| 11.10             | 3.78              |
| 11.30             | 3.86              |
| 11.50             | 3.98              |
| 11.70             | 4.10              |
| 11.90             | 4.12              |
| 12.10             | 4.09              |
| 12.40             | 4.13              |
| 13.00             | 4.23              |
| 13.50             | 4.35              |
| 14.00             | 4.40              |
| 14.50             | 4.44              |
| 15.00             | 4.57              |
| 15.50             | 4.66              |
| 16.00             | 4.64              |
| 16.50             | 4.66              |
| 17.00             | 4.75              |
| 17.50             | 4.85              |
| 18.00             | 4.93              |

Cable 18 GHz, 6.5 m, blue, model NPS-1803A-6500-NPS, serial number T4974, HL 1947  
Calibration data

| Frequency,<br>GHz | Insertion loss,<br>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,<br>GHz | Insertion loss,<br>dB |
|-------------------|-----------------------|
| 6.10              | 4.87                  |
| 6.30              | 4.95                  |
| 6.50              | 4.94                  |
| 6.70              | 4.88                  |
| 6.90              | 4.87                  |
| 7.10              | 4.83                  |
| 7.30              | 4.85                  |
| 7.50              | 4.86                  |
| 7.70              | 4.91                  |
| 7.90              | 4.96                  |
| 8.10              | 5.03                  |
| 8.30              | 5.08                  |
| 8.50              | 5.13                  |
| 8.70              | 5.21                  |
| 8.90              | 5.22                  |
| 9.10              | 5.34                  |
| 9.30              | 5.35                  |
| 9.50              | 5.52                  |
| 9.70              | 5.51                  |
| 9.90              | 5.66                  |
| 10.10             | 5.70                  |
| 10.30             | 5.78                  |
| 10.50             | 5.79                  |
| 10.70             | 5.82                  |
| 10.90             | 5.86                  |
| 11.10             | 5.94                  |
| 11.30             | 6.06                  |
| 11.50             | 6.21                  |
| 11.70             | 6.44                  |
| 11.90             | 6.61                  |
| 12.10             | 6.76                  |
| 12.40             | 6.68                  |
| 13.00             | 6.66                  |
| 13.50             | 6.81                  |
| 14.00             | 6.90                  |
| 14.50             | 6.90                  |
| 15.00             | 6.97                  |
| 15.50             | 7.17                  |
| 16.00             | 7.28                  |
| 16.50             | 7.27                  |
| 17.00             | 7.38                  |
| 17.50             | 7.68                  |
| 18.00             | 7.92                  |

**Cable loss**  
**RF cable 8 m, model RG-214, serial number C-56, HL 2009**

| No. | Frequency,<br>MHz | Cable loss,<br>dB | Tolerance (Specification),<br>dB | Measurement uncertainty,<br>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              |                                  |                                |

Calibration data  
RF cable 8 m, model RG-214, serial number 1552, HL 1552

| No. | Parameter      | Set, MHz | Measured, dB | Deviation, dB | Tolerance (Specification), dB | Meas. Uncert., dB |
|-----|----------------|----------|--------------|---------------|-------------------------------|-------------------|
| 1   | Insertion Loss | 20       | 0.27         | -             | NA                            | ±0.12             |
| 2   |                | 30       | 0.31         | -             |                               |                   |
| 3   |                | 50       | 0.40         | -             |                               |                   |
| 4   |                | 80       | 0.49         | -             |                               |                   |
| 5   |                | 100      | 0.55         | -             |                               |                   |
| 6   |                | 200      | 0.80         | -             |                               |                   |
| 7   |                | 300      | 0.99         | -             |                               |                   |
| 8   |                | 400      | 1.17         | -             |                               |                   |
| 9   |                | 500      | 1.32         | -             |                               |                   |
| 10  |                | 600      | 1.45         | -             |                               |                   |
| 11  |                | 700      | 1.60         | -             |                               |                   |
| 12  |                | 800      | 1.72         | -             |                               |                   |
| 13  |                | 900      | 1.84         | -             |                               |                   |
| 14  |                | 1000     | 2.00         | -             |                               |                   |
| 15  |                | 1200     | 2.19         | -             |                               |                   |
| 16  |                | 1400     | 2.40         | -             |                               |                   |
| 17  |                | 1500     | 2.51         | -             |                               |                   |
| 18  |                | 1600     | 2.61         | -             |                               |                   |
| 19  |                | 1800     | 2.82         | -             |                               |                   |
| 20  |                | 2000     | 3.00         | -             |                               |                   |

Cable 40 GHz, 0.8 m, blue, model KPS-1503A-800-KPS, serial number W4907 (HL 2254), insertion loss

| Frequency,<br>GHz | Insertion loss,<br>dB | Frequency,<br>GHz | Insertion loss,<br>dB |
|-------------------|-----------------------|-------------------|-----------------------|
| 0.03              | 0.05                  | 10.30             | 1.20                  |
| 0.05              | 0.09                  | 10.50             | 1.22                  |
| 0.1               | 0.10                  | 10.70             | 1.30                  |
| 0.2               | 0.16                  | 10.90             | 1.21                  |
| 0.3               | 0.21                  | 11.10             | 1.19                  |
| 0.5               | 0.26                  | 11.30             | 1.26                  |
| 0.7               | 0.31                  | 11.50             | 1.25                  |
| 0.9               | 0.36                  | 11.70             | 1.23                  |
| 1.1               | 0.39                  | 11.90             | 1.29                  |
| 1.3               | 0.42                  | 12.10             | 1.25                  |
| 1.5               | 0.46                  | 12.40             | 1.33                  |
| 1.7               | 0.47                  | 13.00             | 1.41                  |
| 1.9               | 0.51                  | 13.50             | 1.42                  |
| 2.1               | 0.55                  | 14.00             | 1.61                  |
| 2.3               | 0.54                  | 14.50             | 1.53                  |
| 2.5               | 0.56                  | 15.00             | 1.63                  |
| 2.7               | 0.60                  | 15.50             | 1.53                  |
| 2.9               | 0.61                  | 16.00             | 1.53                  |
| 3.1               | 0.63                  | 16.50             | 1.54                  |
| 3.3               | 0.66                  | 17.00             | 1.67                  |
| 3.5               | 0.68                  | 17.50             | 1.88                  |
| 3.7               | 0.72                  | 18.00             | 1.76                  |
| 3.9               | 0.70                  | 18.50             | 2.03                  |
| 4.1               | 0.75                  | 19.00             | 1.66                  |
| 4.3               | 0.75                  | 19.50             | 1.71                  |
| 4.5               | 0.80                  | 20.00             | 1.65                  |
| 4.7               | 0.78                  | 20.50             | 1.87                  |
| 4.9               | 0.81                  | 21.00             | 1.75                  |
| 5.1               | 0.82                  | 21.50             | 1.86                  |
| 5.3               | 0.84                  | 22.00             | 1.81                  |
| 5.5               | 0.84                  | 22.50             | 2.03                  |
| 5.7               | 0.86                  | 23.00             | 1.91                  |
| 5.9               | 0.90                  | 23.50             | 1.87                  |
| 6.1               | 0.91                  | 24.00             | 1.97                  |
| 6.3               | 0.95                  | 24.50             | 1.85                  |
| 6.5               | 0.92                  | 25.00             | 2.01                  |
| 6.7               | 0.91                  | 25.50             | 2.02                  |
| 6.9               | 0.95                  | 26.00             | 2.15                  |
| 7.1               | 0.98                  | 26.50             | 2.11                  |
| 7.3               | 1.03                  | 27.00             | 2.00                  |
| 7.5               | 0.98                  | 28.00             | 2.04                  |
| 7.7               | 1.06                  | 29.00             | 1.97                  |
| 7.9               | 1.08                  | 30.00             | 1.97                  |
| 8.1               | 1.06                  | 31.00             | 2.31                  |
| 8.3               | 1.10                  | 32.00             | 2.24                  |
| 8.5               | 1.10                  | 33.00             | 2.31                  |
| 8.7               | 1.12                  | 34.00             | 2.36                  |
| 8.9               | 1.12                  | 35.00             | 2.33                  |
| 9.1               | 1.14                  | 36.00             | 2.47                  |
| 9.3               | 1.18                  | 37.00             | 2.56                  |
| 9.5               | 1.16                  | 38.00             | 2.45                  |
| 9.7               | 1.18                  | 39.00             | 2.68                  |
| 9.9               | 1.17                  | 40.00             | 2.60                  |
| 10.1              | 1.18                  |                   |                       |