HERMON LABORATORIES

ACCREDITED
839.01
Electrical

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# RADIO TEST REPORT

**ACCORDING TO 47 CFR Part 15 SUBPART C §15.231, §15.205, §15.209 and SUBPART B**
**for**

## VISONIC Ltd.

**EQUIPMENT UNDER TEST:**

## Personal security transmitter
## Model: MDT-122 (433.92)

**Approved by: _____**
**Mr. Arick Elshtein, International Standards Department Manager**
**Visonic Ltd.**

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# Contents

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# 1 Project information

## Description of equipment under test

| | |
|---|---|
| Test item | : Personal security transmitter |
| Manufacturer | : Visonic Ltd. |
| Type (Model) | : MDT-122 (433.92) |
| Equipment FCC code[1] | : DSC |

## Applicant information

| | |
|---|---|
| Applicant's responsible person | : Mr. Arick Elshtein, International Standards Department Manager |
| Company | : Visonic Ltd. |
| Address | : 27, Habarzel street |
| City | : Tel Aviv |
| Postal code | : 69710 |
| Country | : Israel |
| Telephone number | : +972 3645 6714 |
| Telefax number | : +972 3645 6891 |

## Test performance

| | |
|---|---|
| Project number: | : 15421 |
| Location | : Hermon Laboratories |
| Receipt date | : January 23, 2003 |
| Test performed | : March 20, 2003 |
| Purpose of test | : Apparatus compliance verification in accordance with emission requirements |
| Test specifications | : 47CFR Part 15, subpart C, §15.231, §15.205, §15.209, and subpart B §15.109 |

[1] FCC Equipment codes – see Appendix E

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# 2 Summary of tests and requirements

| Parameter | Subclause | C | NC | NT | NA | Tested by | Date tested | Remarks |
|---|---|---|---|---|---|---|---|---|
| **Transmitter characteristics, §15.231** | | | | | | | | |
| Periodic operation | 15.231(a) | **X** | | | | Refer to Operational Description | | |
| Bandwidth of emission | 15.231(c) | **X** | | | | Mrs. E. Pitt, test engineer | March 19, 2003 | |
| Field strength of fundamental | 15.231(b)(2) | **X** | | | | Mrs. E. Pitt, test engineer | March 19, 2003 | |
| Field strength of spurious radiation | 15.231(b)(3) | **X** | | | | Mrs. E. Pitt, test engineer | March 19, 2003 | |
| | | | | | | Mr. M. Feldman, test engineer | March 3, 2003 | |
| Conducted emissions | 15.207(a) | | | | **X** | | | |
| **Unintentional radiation, §15.107, §15.109** | | | | | | | | |
| Conducted emissions | 15.107 | | | | **X** | | | |
| Radiated emissions | 15.109 | **X** | | | | Mrs. E. Pitt, test engineer | March 20, 2003 | |
| **General conditions under §15.231, Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz** | | | | | | | | |
| The intentional radiator does not operate in the restricted bands of operation. | 15.205 | **X** | | | | | | |
| The intentional radiator has permanently attached antenna or antenna that uses a unique coupling to the intentional radiator. | 15.203 | **X** | | | | Refer to Operational Description | | |
| No antenna other than that furnished by the responsible party can be used with the device. | 15.203 | **X** | | | | | | |
| The intentional radiator has no standard antenna jack or electrical connector. | 15.203 | **X** | | | | This requirement does not apply to intentional radiators that must be professionally installed | | |
| The intentional radiator must be professionally installed. | 15.203 | | | | **X** | | | |
| The Intentional radiator operates at 433.92 MHz. | 15.231 (a) | **X** | | | | | | |
| Intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. | 15.231 (a) | **X** | | | | Refer to Installation instructions | | |

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| Parameter | Subclause | C | NC | NT | NA | Tested by | Date tested | Remarks |
|---|---|---|---|---|---|---|---|---|
| Radio control of toys is not permitted. | 15.231 (a) | **X** | | | | Refer to Installation instructions | | |
| Continuous transmissions, such as voice or video, and data transmissions are not permitted. | 15.231 (a) | **X** | | | | Refer to Installation instructions | | |
| A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. | 15.231 (a) (1) | **X** | | | | | | |
| A transmitter activated automatically shall cease transmission within 5 seconds after activation. | 15.231 (a) (2) | **X** | | | | | | |
| Periodic transmissions at regular predetermined intervals are not permitted. | 15.231 (a) (3) | **X** | | | | Refer to Operational Description | | |
| The intentional radiator polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter. | 15.231 (a) (3) | **X** | | | | Refer to Installation instructions | | |
| The intentional radiators, employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition. | 15.231 (a) (4) | **X** | | | | Refer to Installation instructions | | |
| NOTE: C: The parameter is compliant with the requirements.<br>NC: The parameter is not compliant with the requirements.<br>NT: The parameter is not tested.<br>NA: The test of this parameter is not applicable. | | | | | | | | |

**Test report prepared by:** Ms. N. Averin, MA, certification engineer

**Test report approved by:** Mr. M. Nikishin, MSc, EMC group leader

Mr. E. Usoskin, PhD, CEO

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# 3 EUT description

## 3.1 General description

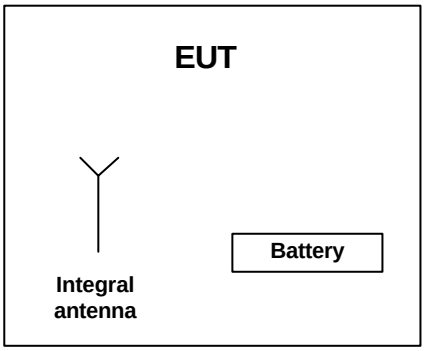
The EUT, MDT-122 (433.92), is a personal security transmitter, which includes RFT-3A module operating at 433.92 MHz.
The device is powered by 3.6 V DC lithium battery.

## 3.2 EUT test configuration

Test configuration is provided in Figure 3.2.1.

**Figure 3.2.1**

**EUT test configuration**



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## 3.3 Transmitter description

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Operating frequency:** | | | | 433.92 MHz | | | |
| **Maximum rated output power** | | | | | | | |
| | At transmitter permanent external 50Ω RF output connector (dBm) | | | NA | | | |
| | Effective radiated power (for equipment with integral antenna) (dBm) | | | -16 | | | |
| **Transmitter duty cycle (worst case)** | | | | | | | |
| | Tx on (seconds) | | | 0.067 | | | |
| | Tx off (seconds) | | | 0.033 | | | |
| **Modulation** | | | | | | | |
| | Amplitude | | | | | | |
| | Frequency | | | | | | |
| X | Other (specify): ASK (ON/OFF KEYING) | | | | | | |
| Can the transmitter be operated without modulation | | | | | yes | X | no |
| **Transmitter power source** | | | | | | | |
| X | **Battery** | | **Nominal rated voltage (VDC)** | **3.6** | | | |
| | Nickel Cadmium | | | | | | |
| X | Lithium | | | | | | |
| | Other: | | | | | | |
| | **DC** | | **Nominal rated voltage (VDC)** | | | | |
| | **AC mains** | | **Nominal rated voltage (VAC)** | | | | |
| **Antenna type** | | | | | | | |
| X | Integral | | | | | | |
| | External | | | | | | |
| **Type of antenna jack[1]- NA** | | | | | | | |
| | standard | | connector type | | Male | | Female |
| | unique | | connector type | | Male | | Female |

[1] Standard antenna jack use is prohibited excluding devices, which must be professionally installed.

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# 4 Test results

## 4.1 Bandwidth of emission according to § 15.231 (c)

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.7
DATE: March 19, 2003
RELATIVE HUMIDITY: 56%
AMBIENT TEMPERATURE: 22°C
AIR PRESSURE: 1008 hPa
MODULATION: ON
DETECTOR USED: PEAK

| Carrier frequency MHz | Occupied bandwidth, kHz | Reference to plot in Appendix A |
|---|---|---|
| 433.92 | 393 | A1 |
| Measurement uncertainty, ppm | 0.2 | |

**TEST EQUIPMENT USED:**

| | | | | | | |
|---|---|---|---|---|---|---|
| HL 0032 | HL 0038 | HL 0415 | HL 0812 | HL 1430 | | |

**LIMIT (§ 15.231 (c))**

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

**For 433.92 MHz carrier frequency the specified limit is 1.08 MHz**

**TEST PROCEDURE**

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

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## 4.2 Field strength of fundamental, § 15.231

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.5
DATE: March 19, 2003
RELATIVE HUMIDITY: 56%
AMBIENT TEMPERATURE: 22°C
AIR PRESSURE: 1008 hPa
SITE DESCRIPTION: OATS
TEST DISTANCE: 3 m
MODULATION: ON
DETECTOR USED: PEAK

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

**Peak detector**

| Frequency, MHz | Measured field strength, dB(uV/m) | Specification limit, dB(uV/m) | Margin, dB | Reference to plot in Appendix A |
|---|---|---|---|---|
| 433.963 | 79.06 | 100.83 | 21.77 | A2 |
| Measurement uncertainty, dB | | ± 5.3 dB | | |

**Peak detector + average factor**

| Frequency, MHz | Measured field strength, dB(uV/m) | Average factor, dB | Calculated result, dB(uV/m) | Specification limit, dB(uV/m) | Margin, dB | Reference to plot in Appendix A |
|---|---|---|---|---|---|---|
| 433.963 | 79.06 | -3.5 | 75.56 | 80.83 | 5.27 | A2 |
| Measurement uncertainty, dB | | | ± 5.3 dB | | | |

### 4.2.1 Average factor calculation, §15.35

| Tx ON | Duty cycle | Average factor | Reference to plot in Appendix A |
|---|---|---|---|
| 66.7 | 0.667 | -3.5 | A3 |

**TEST EQUIPMENT USED:**

| | | | | | | |
|---|---|---|---|---|---|---|
| HL 0034 | HL 0038 | HL 0415 | HL 0812 | HL 1430 | | |

**LIMIT § 15.231 (b)**

| Fundamental frequency, MHz | Field strength of fundamental, mV/m @ 3 m |
|---|---|
| 260 – 470 | 3,750 to 12,500 |

**The specified average limit for 433.92 MHz frequency is 80.83 dB(■V/m)**
**The specified peak limit for 433.92 MHz frequency is 100.83 dB(■V/m)**

**TEST PROCEDURE**

The EUT was tested, being placed on a wooden 80 cm height turntable in each of three orthogonal planes in turn. To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antenna polarization was changed from vertical to horizontal.

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## 4.3 Field strength of spurious radiation, § 15.231, § 15.205

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.4
TEST DISTANCE: 3 m
TEST PERFORMED AT FIELD STRENGTH: 79.06 dB(µV/m)
MODULATION ON
DETECTOR USED: PEAK

**9 kHz – 30 MHz range**

TEST PERFORMED IN: ANECHOIC CHAMBER
DATE: March 19, 2003
RELATIVE HUMIDITY: 56%
AMBIENT TEMPERATURE: 22°C
AIR PRESSURE: 1008 hPa
ANTENNA TYPE: LOOP

| **Frequency, MHz** | **Radiated emission level** | **Reference to plot in Appendix A** |
|---|---|---|
| 0.009 – 0.15 | No spurious emissions were found. | A4 |
| 0.15 - 30 | No spurious emissions were found. | A5 |
| Measurement uncertainty | ± 6.0 dB | |

**TEST EQUIPMENT USED:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HL 0446 | HL 0465 | HL 1425 | HL 1553 | HL 1566 | | | |

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**30 – 1000 MHz range**

| | |
|---|---|
| TEST PERFORMED IN: | ANECHOIC CHAMBER (PRELIMINARY), OATS (FINAL) |
| DATE: | March 19, 2003 |
| RELATIVE HUMIDITY: | 56% |
| AMBIENT TEMPERATURE: | 22°C |
| AIR PRESSURE: | 1008 hPa |
| ANTENNA TYPE: | BICONILOG, LOG PERIODIC |

**Peak detector**

| Frequency, MHz | RBW, kHz | VBW, kHz | Ant. pol. | Ant. hgt., m | TT pos., ($^o$) | Measured radiated emission, dB(μV/m) | Specification limit, dB(μV/m) | Margin, dB | Reference to plot in Appendix A |
|---|---|---|---|---|---|---|---|---|---|
| 867.93 | 120 | 300 | H | 1.0 | 0 | 39.19 | 80.83 | 41.64 | A7 |
| Measurement uncertainty | | | | | | ± 5.3 dB (horizontal polarization)<br>± 6.0 dB (vertical polarization) | | | |

**Peak detector + average factor**

| Frequency, MHz | RBW, kHz | VBW, kHz | Ant. pol. | Ant. hgt., m | TT pos., ($^o$) | Calculated radiated emission*, dB(μV/m) | Specification limit, dB(μV/m) | Margin, dB | Reference to plot in Appendix A |
|---|---|---|---|---|---|---|---|---|---|
| 867.93 | 120 | 300 | H | 1.0 | 0 | 35.69 | 60.83 | 25.14 | A7 |
| Measurement uncertainty | | | | | | ± 5.3 dB (horizontal polarization)<br>± 6.0 dB (vertical polarization) | | | |

*** Radiated emission value was calculated: Peak value + Average factor (= -3.5 dB)**

**Table calculations and abbreviations:**

| | |
|---|---|
| RBW | = resolution bandwidth |
| VBW | = video bandwidth |
| Ant. pol. | = antenna polarization (H-horizontal) |
| Ant. hgt. | = antenna height |
| TT pos. | = turntable position in degrees, (EUT front panel = 0$^o$) |
| Margin | = dB below (negative if above) specification limit |

**TEST EQUIPMENT USED:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HL 0034 | HL 0038 | HL 0415 | HL 0465 | HL 0521 | HL 0589 | HL 0592 | HL 0593 |
| HL 0594 | HL 0604 | HL 0812 | HL 1004 | HL 1430 | | | |

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**1000 – 5000 MHz range**

| | |
|---|---|
| TEST PERFORMED IN: | ANECHOIC CHAMBER |
| DATE: | March 3, 2003 |
| RELATIVE HUMIDITY: | 52% |
| AMBIENT TEMPERATURE: | 22°C |
| AIR PRESSURE: | 1007 hPa |
| ANTENNA TYPE: | DOUBLE RIDGED GUIDE |

**Peak detector**

| Frequency, MHz | RBW, MHz | VBW, MHz | Ant. pol. | Ant. hgt., m | TT pos., ($^o$) | Measured radiated emission, dB(μV/m) | Specification limit, dB(μV/m) | Margin, dB | Reference to plot in Appendix A |
|---|---|---|---|---|---|---|---|---|---|
| 1301.94* | 1 | 3 | H | 1.0 | 0 | 34.95 | 74.00 | 39.05 | A8 |
| Measurement uncertainty | | | | | | ± 5.3 dB (horizontal polarization)<br>± 6.0 dB (vertical polarization) | | | |

**Peak detector + average factor**

| Frequency, MHz | RBW, MHz | VBW, MHz | Ant. pol. | Ant. hgt., m | TT pos., ($^o$) | Calculated radiated emission**, dB(μV/m) | Specification limit, dB(μV/m) | Margin, dB | Reference to plot in Appendix A |
|---|---|---|---|---|---|---|---|---|---|
| 1301.94* | 1 | 3 | H | 1.0 | 0 | 31.45 | 54.00 | 22.55 | A8 |
| Measurement uncertainty | | | | | | ± 5.3 dB (horizontal polarization)<br>± 6.0 dB (vertical polarization) | | | |

*** Falls into restricted bands**
**** Radiated emission value was calculated: Peak value + Average factor (= -3.5 dB)**

**Table calculations and abbreviations:**

| | |
|---|---|
| RBW | = resolution bandwidth |
| VBW | = video bandwidth |
| Ant. pol. | = antenna polarization (H-horizontal) |
| Ant. hgt. | = antenna height |
| TT pos. | = turntable position in degrees, (EUT front panel = 0$^o$) |
| Margin | = dB below (negative if above) specification limit |

**TEST EQUIPMENT USED:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HL 0465 | HL 1424 | HL 1425 | HL 1942 | HL 1984 | | | |

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**LIMIT § 15.231 (b)**

| Fundamental frequency, MHz | Field strength of harmonics, dB(µV/m) @ 3 m |
|---|---|
| 433.92 | 60.83 |

**TEST PROCEDURE**

The EUT was tested, being placed on a wooden 80 cm height turntable in each of three orthogonal planes in turn.

**9 kHz – 30 MHz range**

The measurements were performed in the anechoic chamber at 3m test distance. The loop antenna was positioned with its plane vertical. The loop center was 1 meter above the ground plane. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated about its vertical axis.

**30 – 1000 MHz range**

Preliminary measurements were performed in the anechoic chamber at 3m test distance. Final measurements (harmonic emissions) were made at the open field test site at 3m test distance. To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

**1 – 5 GHz range**

The measurements were performed in the anechoic chamber at 3m test distance. To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

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## 4.4 Unintentional radiated emissions test, §15.109

| | |
|---|---|
| METHOD OF MEASUREMENT: | ANSI 63.4 §11.6 / ANSI 63.4 §12.1.4 |
| TEST PERFORMED IN: | ANECHOIC CHAMBER |
| DATE: | March 20, 2003 |
| RELATIVE HUMIDITY: | 54% |
| AMBIENT TEMPERATURE: | 22°C |
| AIR PRESSURE: | 1007 hPa |
| DISTANCE BETWEEN ANTENNA AND EUT: | 3 m |
| THE EUT WAS TESTED AS: | TABLE-TOP |
| FREQUENCY RANGE: | 30 MHz – 2 GHz |
| DETECTOR TYPE: | PEAK |
| RESOLUTION BANDWIDTH: | 120 kHz below 1 GHz, 1 MHz above 1 GHz |

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

| Frequency, MHz | Radiated emission level | Reference to plot in Appendix A |
|---|---|---|
| 30 - 200 | All emissions measured in standby mode were found below the limit | A10 |
| 200 - 1000 | All emissions measured in standby mode were found below the limit | A11 |
| 1000 - 2000 | All emissions measured in standby mode were found below the limit | A12 |
| Measurement uncertainty | ± 5.3 dB (horizontal polarization)<br>± 6.0 dB (vertical polarization) | |

**TEST EQUIPMENT USED:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HL 0032 | HL 0034 | HL 0038 | HL 0041 | HL 0465 | HL 1424 | HL 1425 | HL 1553 |
| HL 1566 | | | | | | | |

**LIMIT § 15.109**

| Frequency, MHz | Class B equipment @ 3 m dB(μV/m) |
|---|---|
| 30 - 88 | 40 |
| 88 - 216 | 43.5 |
| 216 - 960 | 46 |
| 960 - 2000 | 54 |

**TEST PROCEDURE**

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

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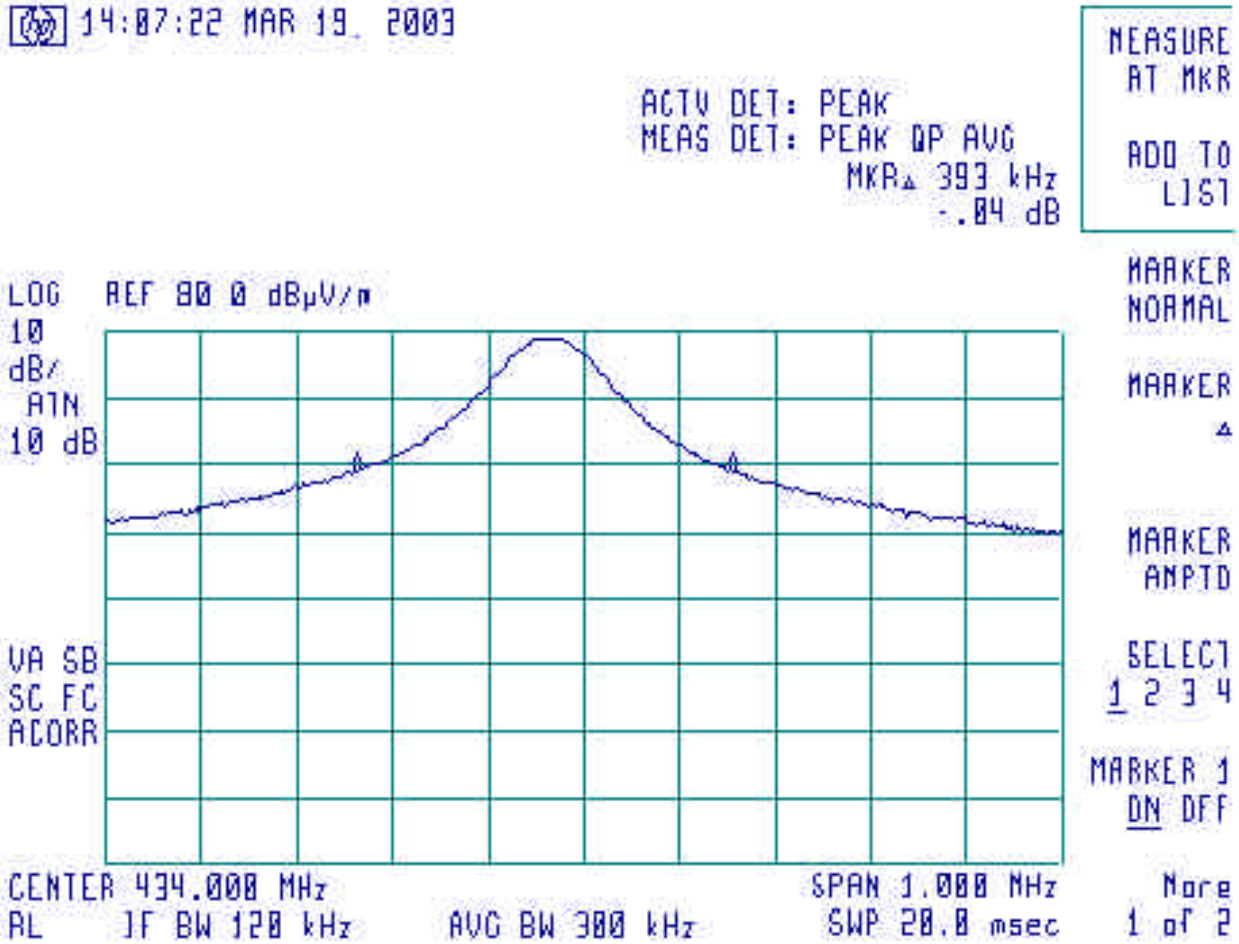
# Appendix A Plots

**Plot A1**

**Occupied bandwidth measurements**



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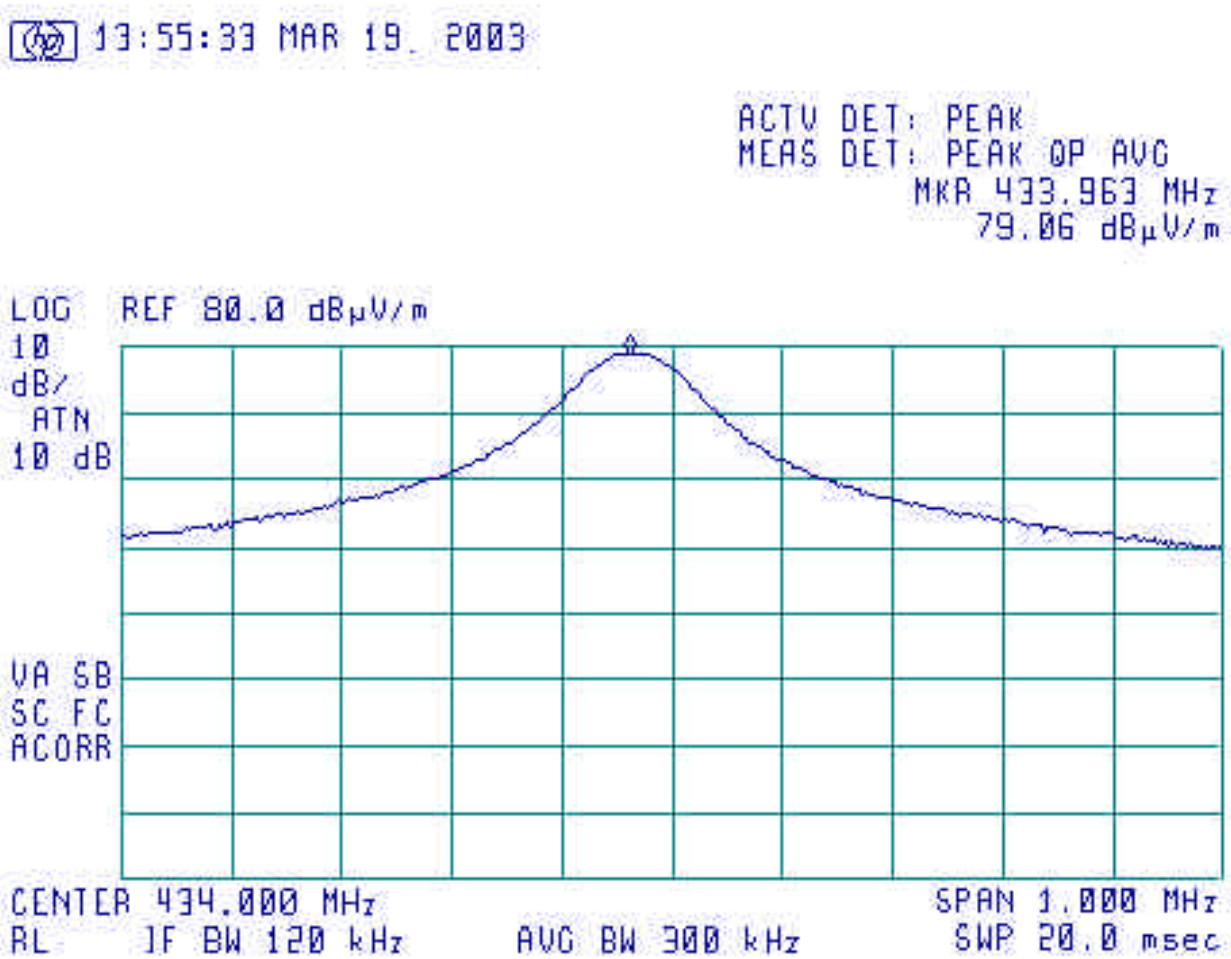
**Plot A2**

**Field strength of fundamental measurements**

POLARIZATION: HORIZONTAL




**Peak result = 79.06 dB(µV/m) (Limit$_{PEAK}$ = 100.83 dB(µV/m) @3m)**
**Average factor = 20log(Tx ON /100) = 20log(66.7/100) = -3.5 dB**
**Average result = peak result + average factor = 79.06 – 3.5 = 75.56 dB(µV/m) (Limit$_{AVR}$ = 80.83 dB(µV/m) @3m)**

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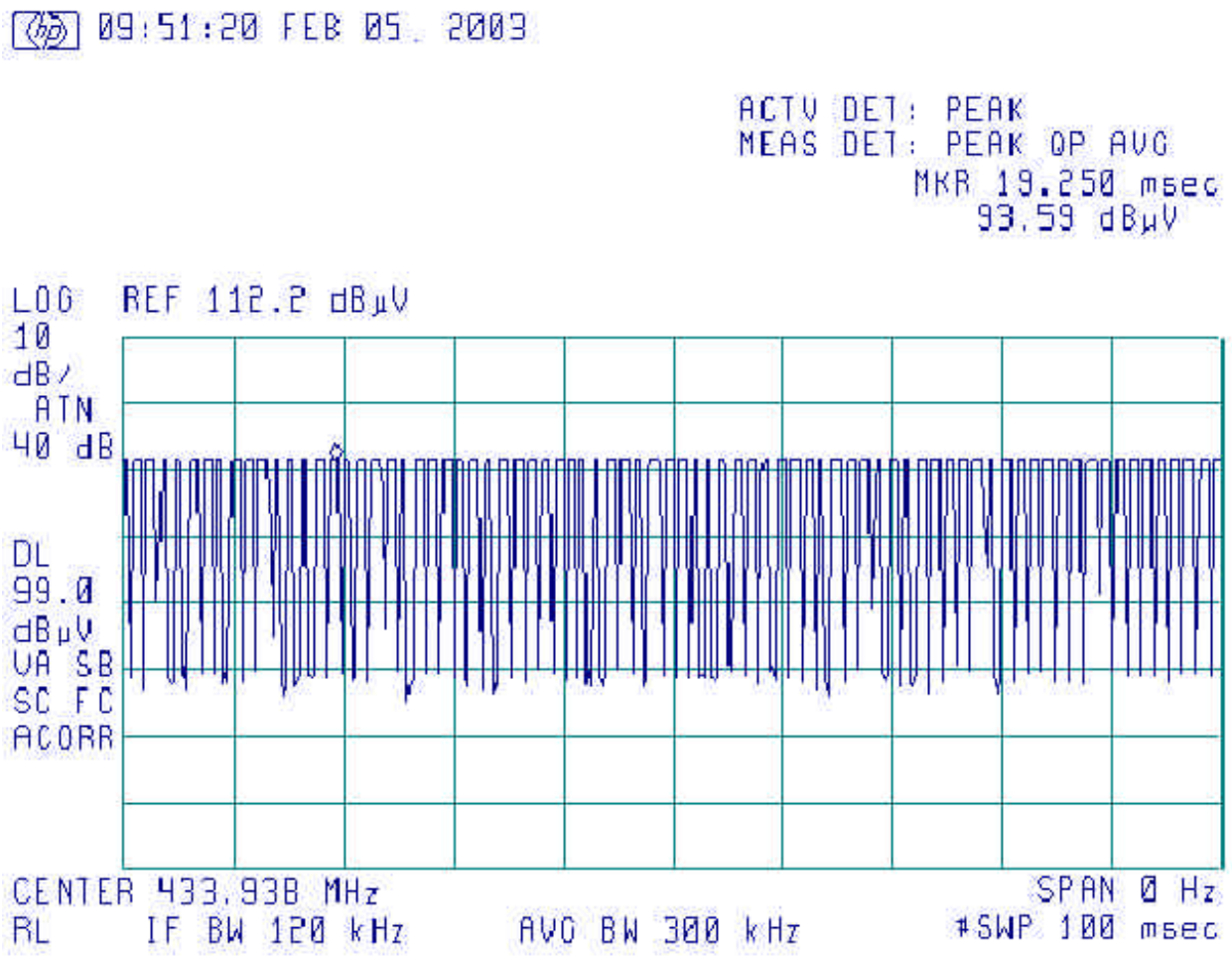
**Plot A3**

**Duty cycle measurements**




**A transmission consists of a preamble signal (12 pulses: each pulse is 400 ■s ON and 400 ■s OFF) and a sequence of "0" (800 ■s ON; 400 ■s OFF) or "1" (400 ■s ON; 800 ■s OFF).**
**The worst case is when all "0" are transmitted.**

**During the test the transmitter operated in continuous mode.**

**Tx ON in 100 ms interval = 100 x 2/3 = 66.7 ms.**

**Average factor = 20log(Tx ON /100) = 20log(66.7/100) = -3.5 dB**

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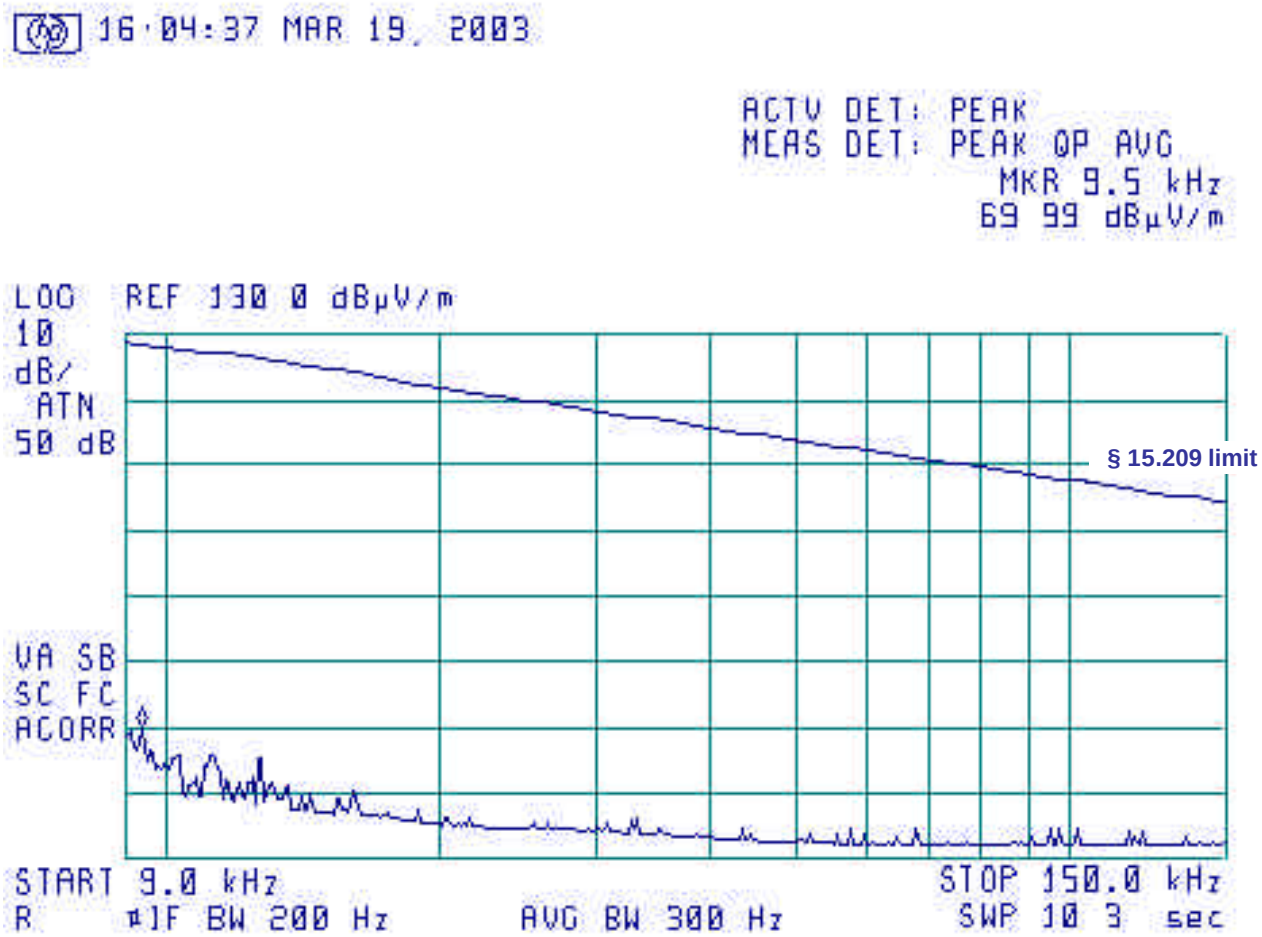
**Plot A4**

**Spurious emission measurements**

FREQUENCY RANGE: 9 – 150 kHz



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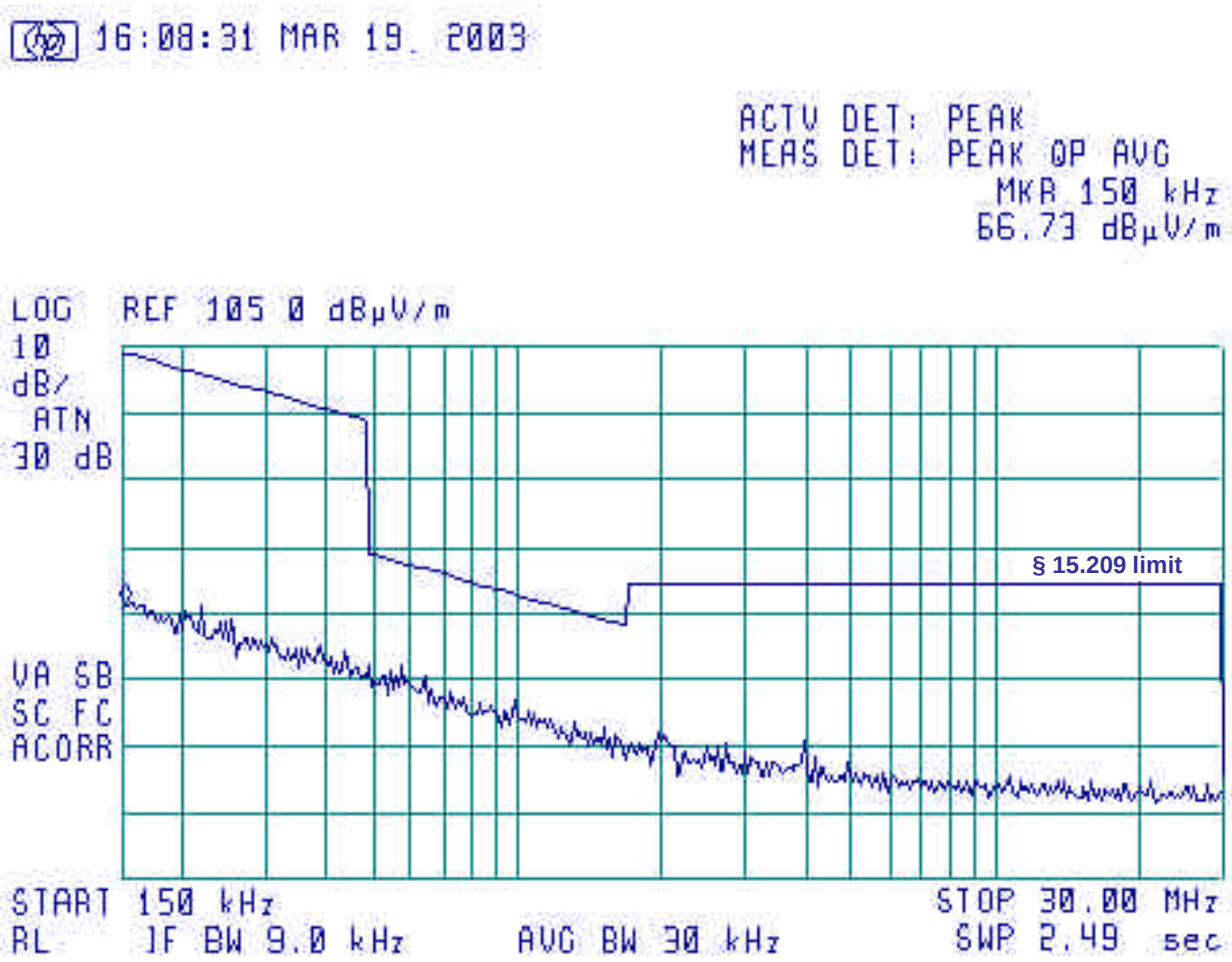
**Plot A5**

**Spurious emission measurements**

FREQUENCY RANGE: 150 kHz – 30 MHz



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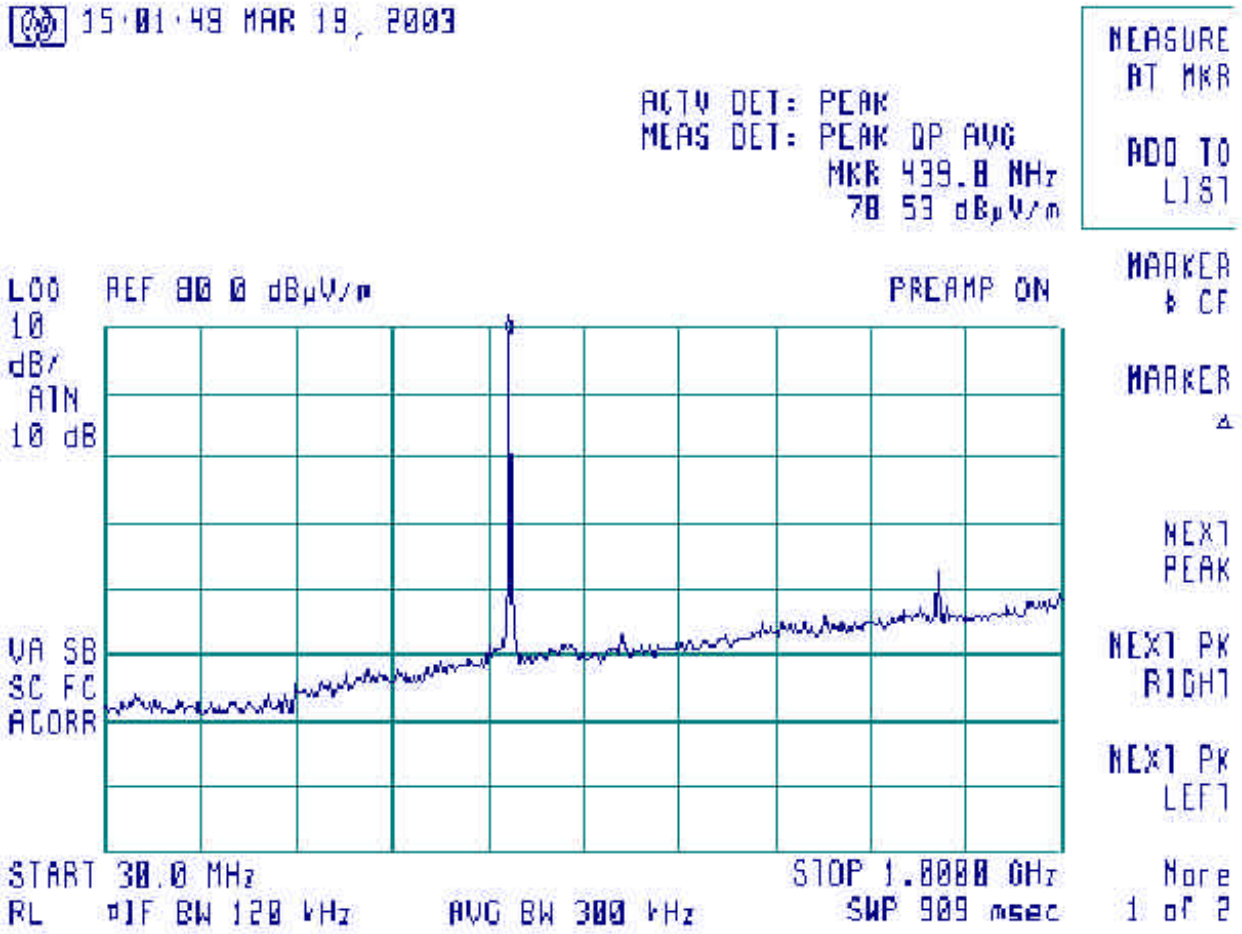
**Plot A6**

**Spurious emission measurements**

FREQUENCY RANGE: 30 – 1000 MHz
POLARIZATION: VERTICAL & HORIZONTAL




**§ 15.231 peak limit = 80.83 dB(µV/m)@3m**
**§ 15.231 average limit = 60.83 dB(µV/m)@3m**

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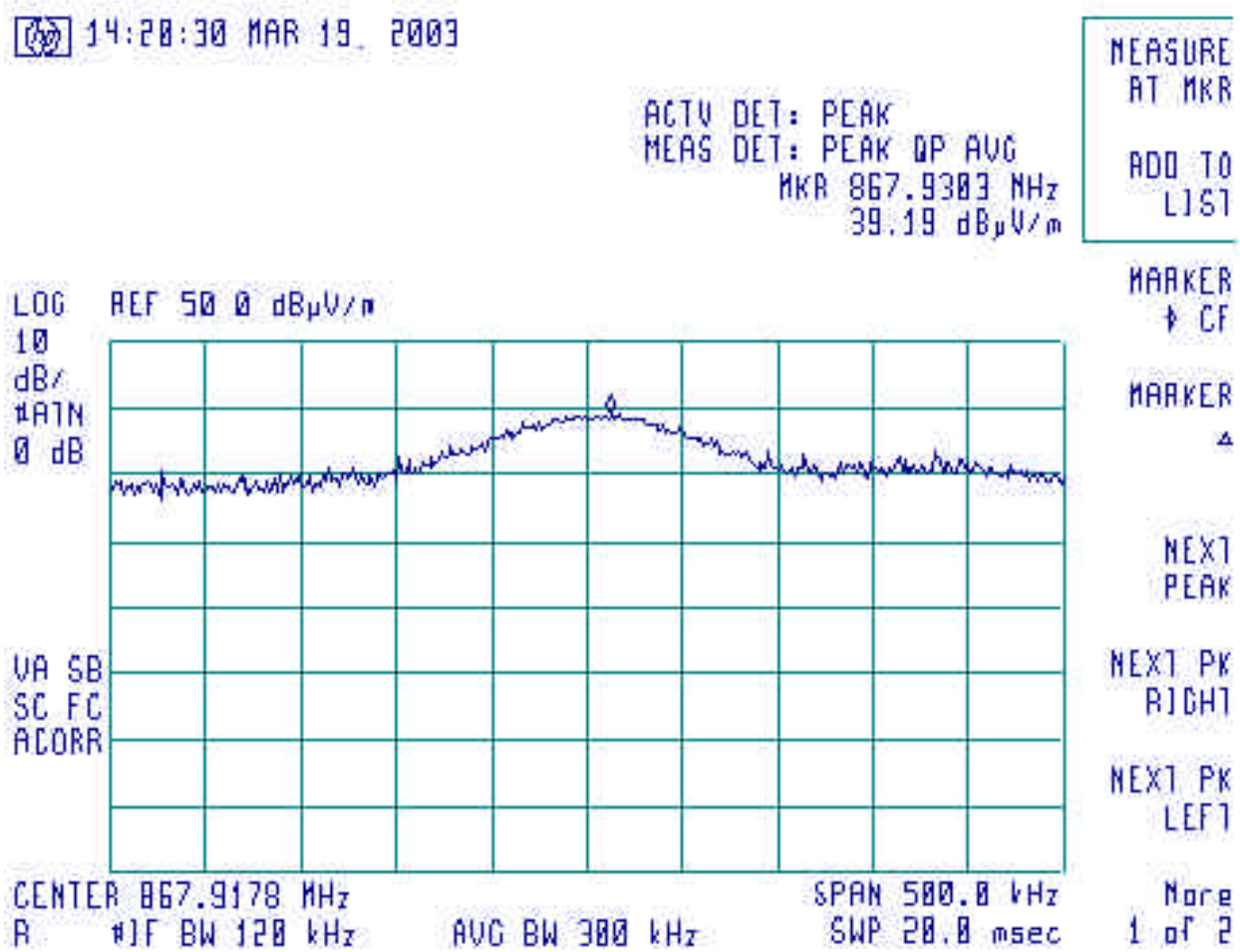
**Plot A7**

**Field strength of 2nd harmonic**

POLARIZATION: HORIZONTAL




**§ 15.231 peak limit = 80.83 dB(µV/m)@3m**
**§ 15.231 average limit = 60.83 dB(µV/m)@3m**

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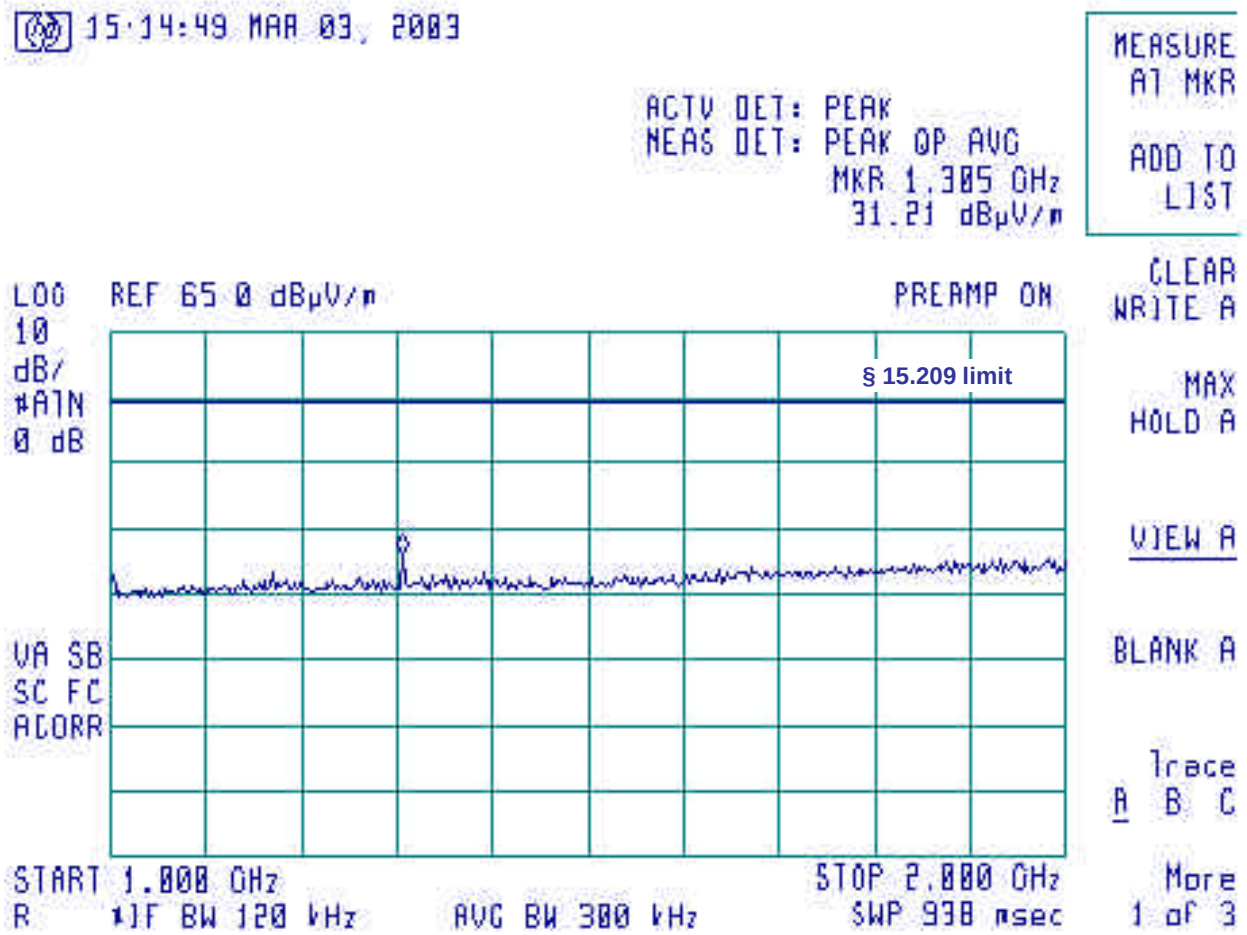
**Plot A8**

**Spurious emission measurements**

FREQUENCY RANGE: 1 – 2 GHz
POLARIZATION: VERTICAL & HORIZONTAL




**§ 15.231 peak limit = 80.83 dB(µV/m)@3m**
**§ 15.231 average limit = 60.83 dB(µV/m)@3m**

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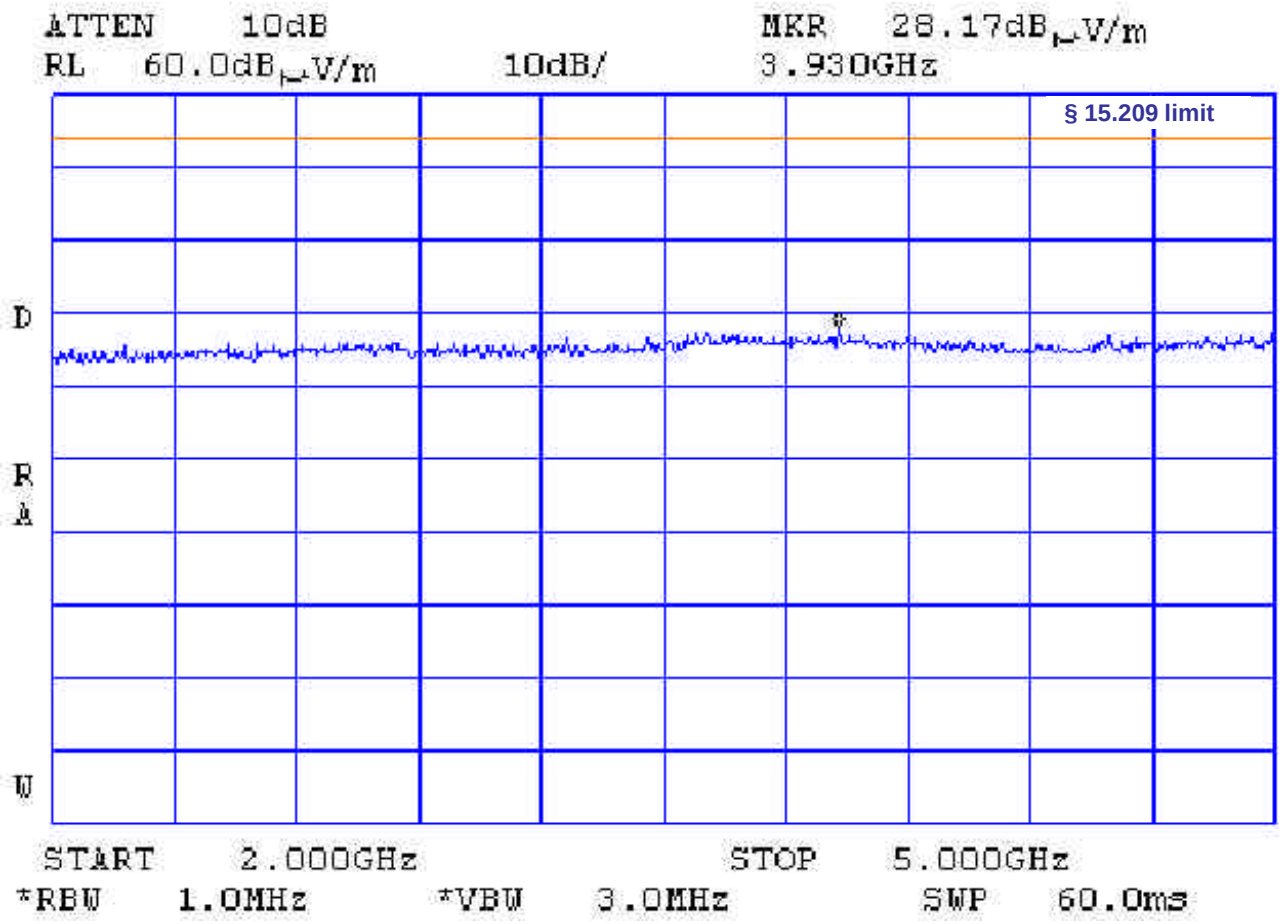
**Plot A9**

**Spurious emission measurements**

FREQUENCY RANGE: 2 – 5 GHz
POLARIZATION: VERTICAL & HORIZONTAL




**§ 15.231 peak limit = 80.83 dB(µV/m)@3m**
**§ 15.231 average limit = 60.83 dB(µV/m)@3m**

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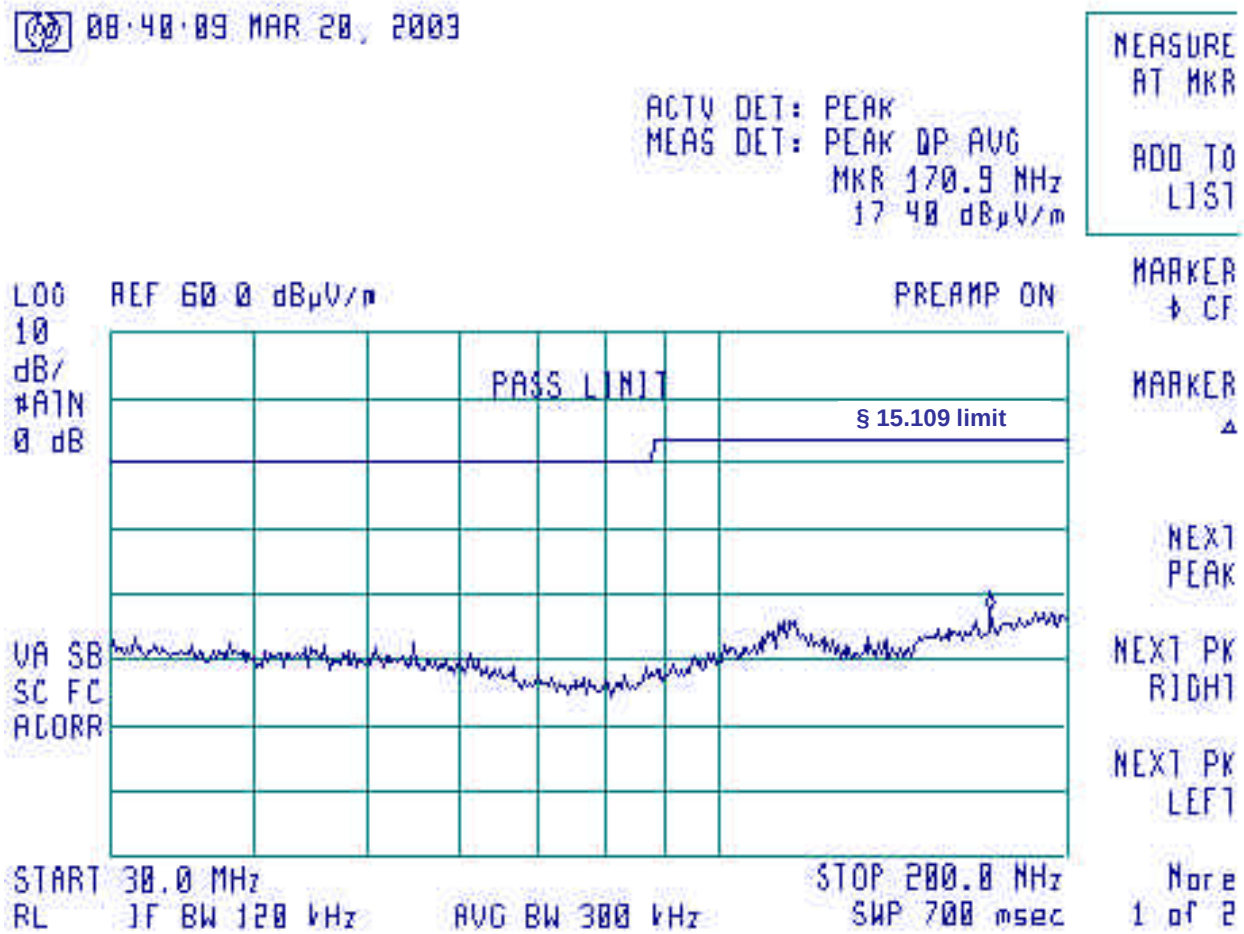
**Plot A10**

**Unintentional radiated emission measurements**

FREQUENCY RANGE: 30 – 200 MHz
POLARIZATION: VERTICAL & HORIZONTAL



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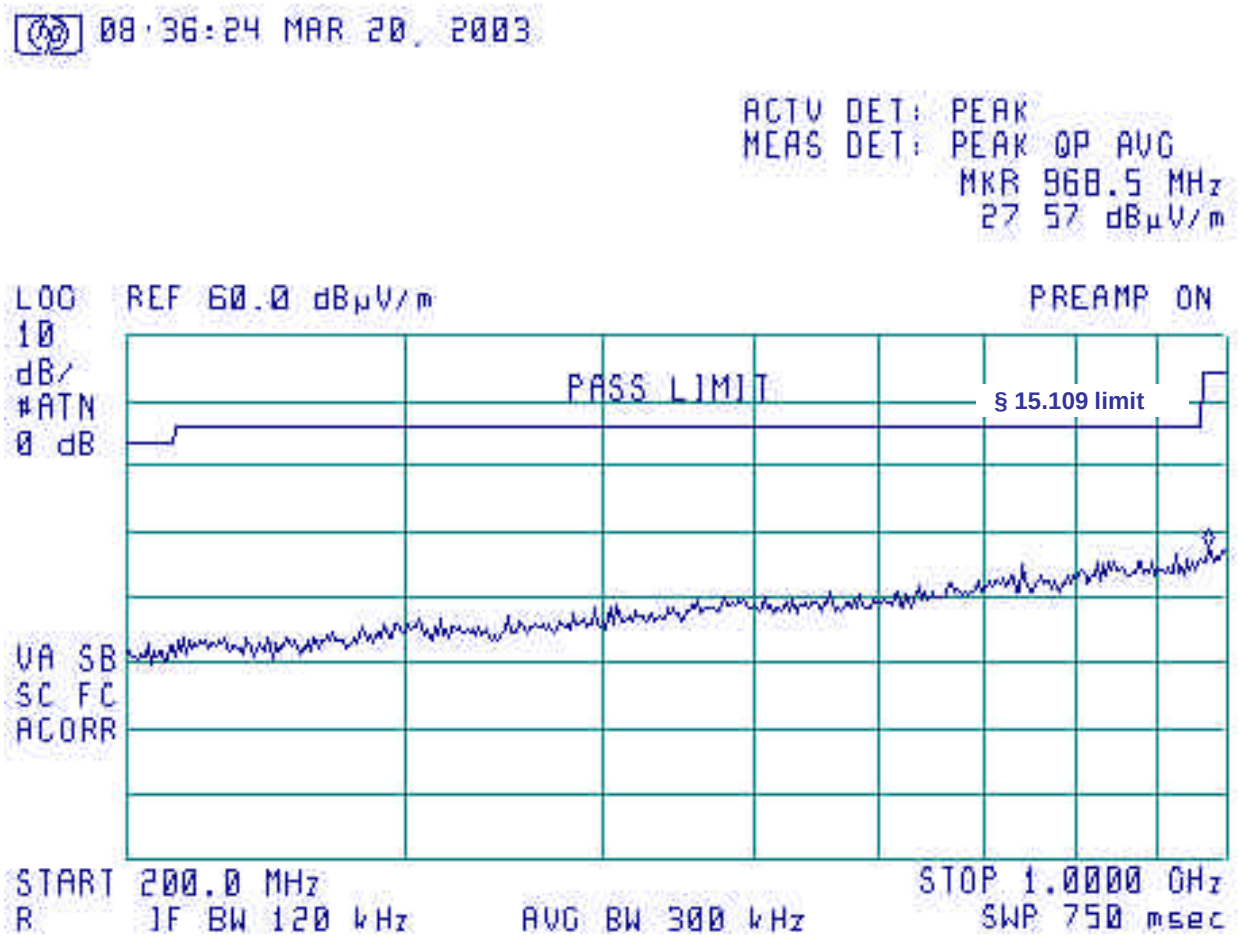
**Plot A11**

**Unintentional radiated emission measurements**

FREQUENCY RANGE: 200 – 1000 MHz
POLARIZATION: VERTICAL & HORIZONTAL



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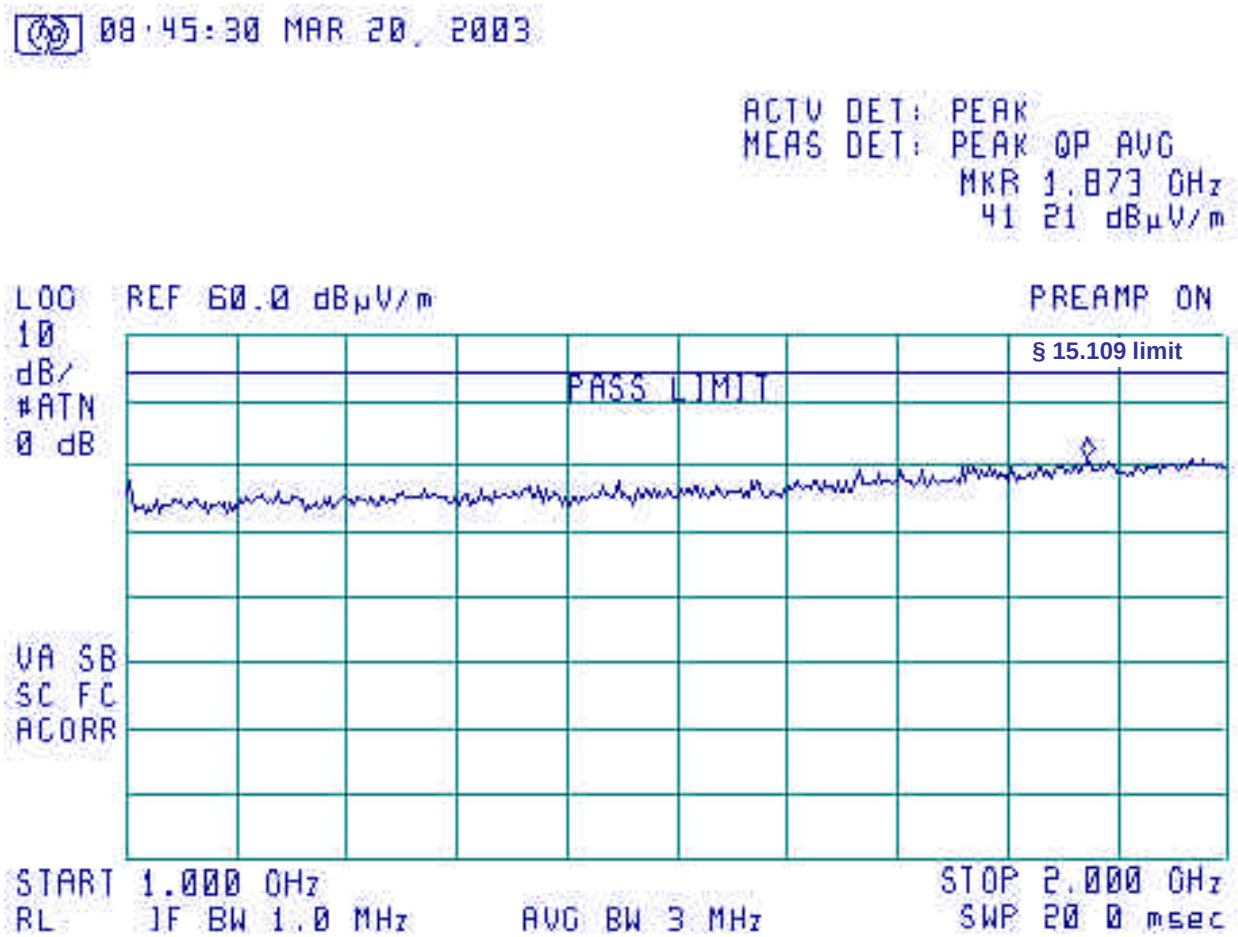
**Plot A12**

**Unintentional radiated emission measurements**

FREQUENCY RANGE: 1 – 2 GHz
POLARIZATION: VERTICAL & HORIZONTAL



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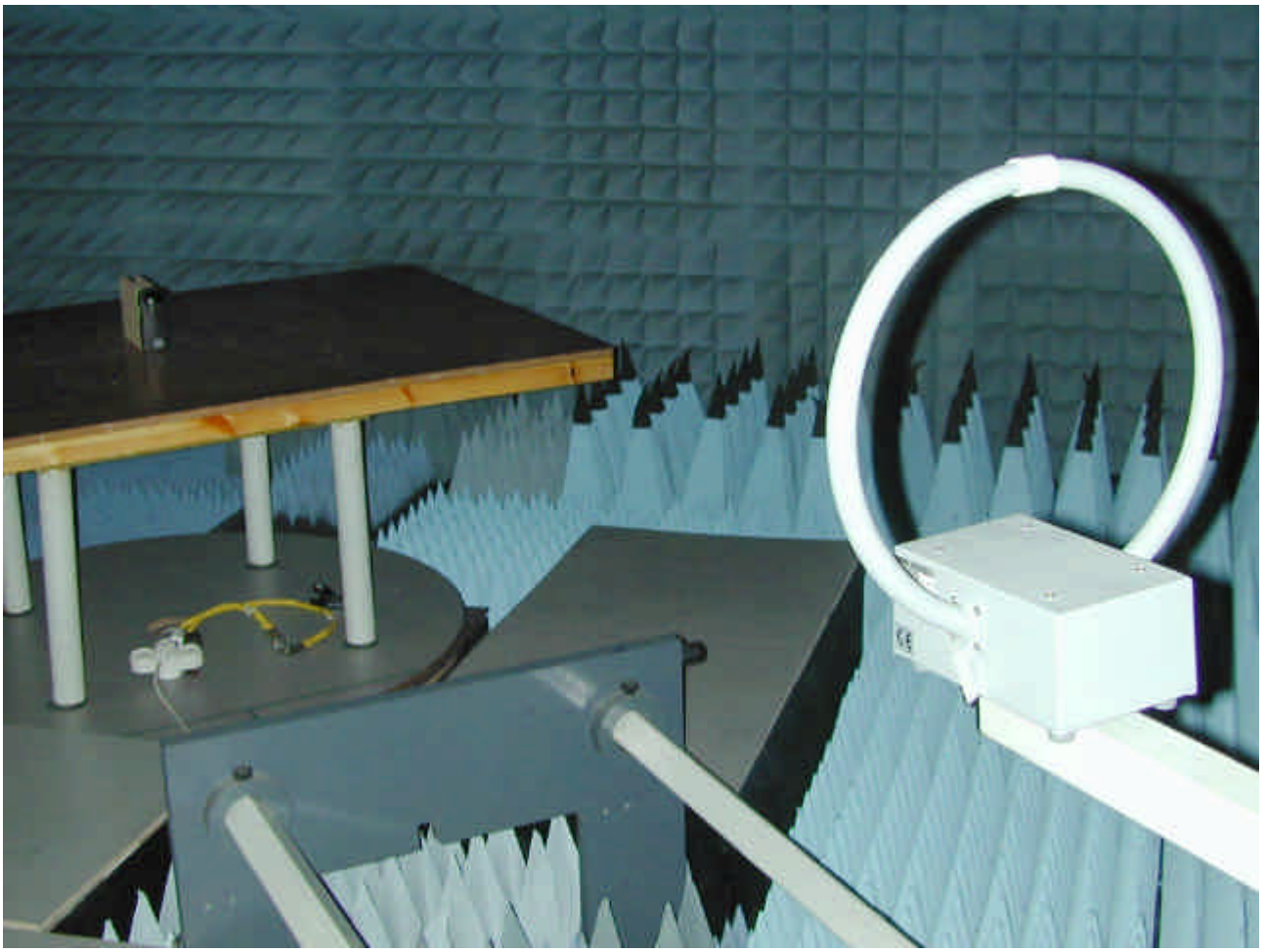
# Appendix B Test setup photographs

**Photograph 1**

**Spurious emission measurements test setup view with loop antenna, performed in anechoic chamber in 9 kHz – 30 MHz range**



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**Photograph 2**

**20 dB bandwidth, field strength of fundamental, harmonics emission measurements test setup view with log periodic antenna, performed at OATS in 200 – 1000 MHz range**

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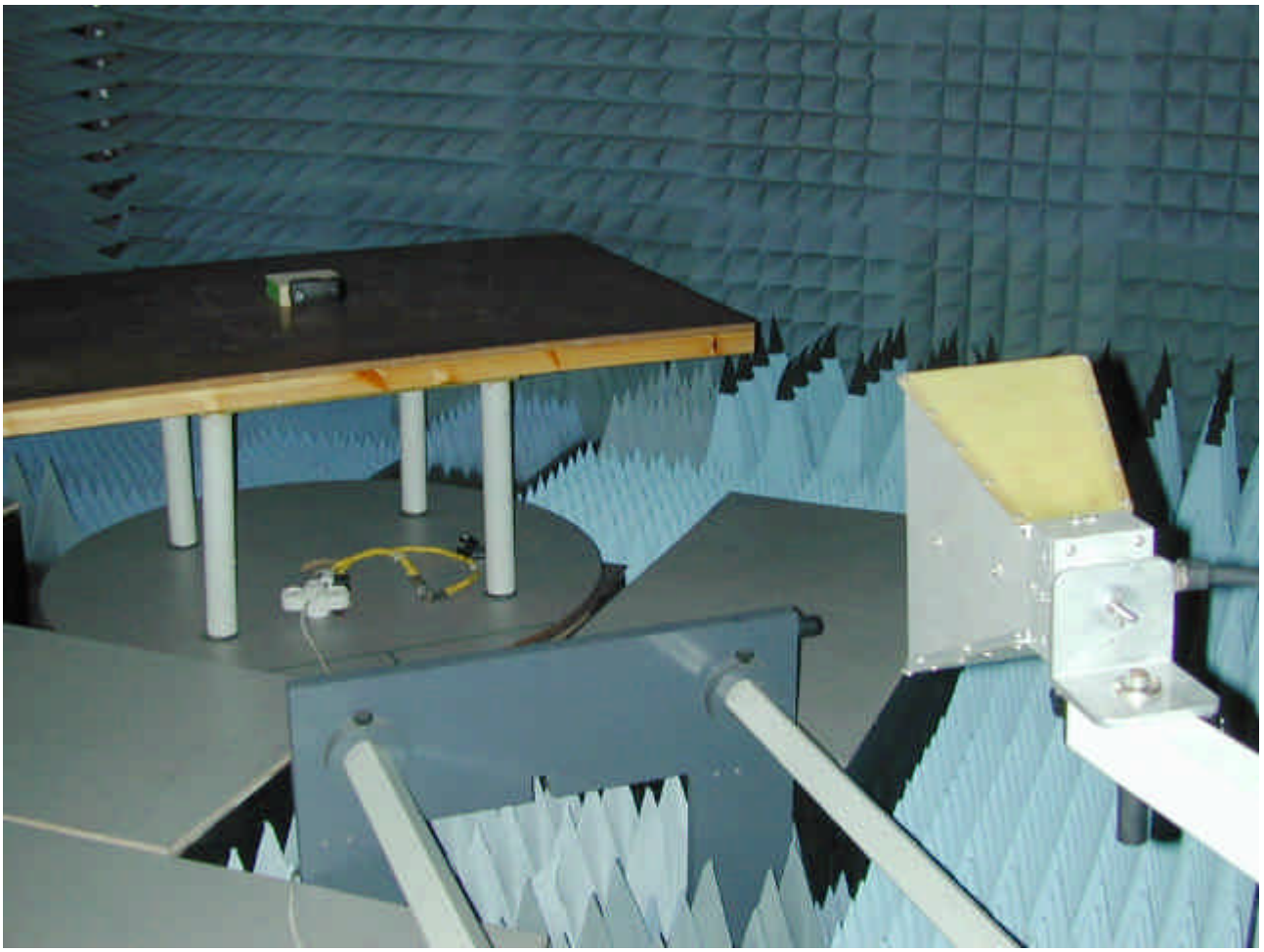
**Photograph 3**

**Spurious emission measurements test setup view with double ridged guide antenna, performed in anechoic chamber in 1 – 5 GHz range**



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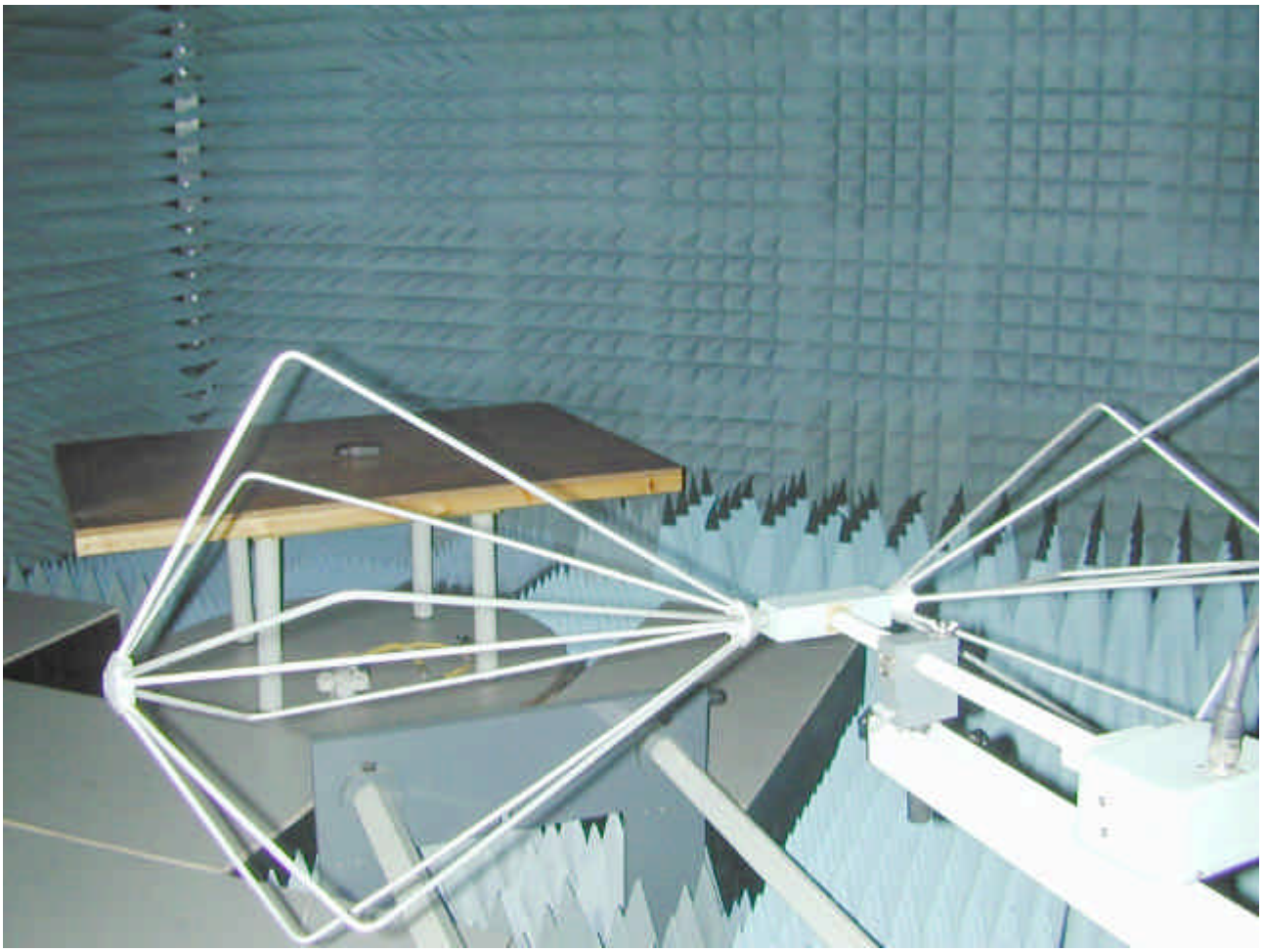
**Photograph 4**

**Unintentional radiated emission measurements test setup view with biconical antenna, performed in anechoic chamber in 30 – 200 MHz range**



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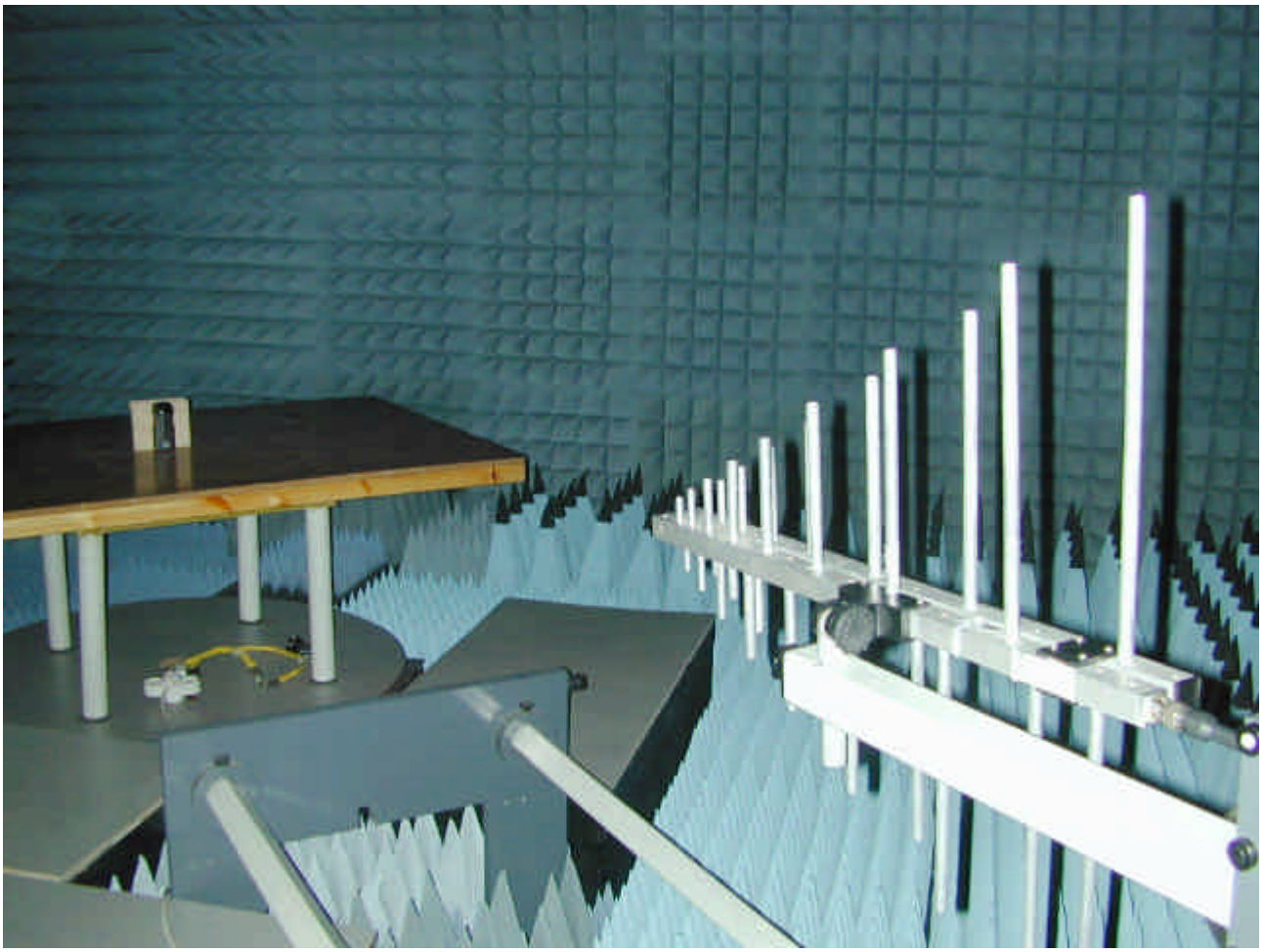
**Photograph 5**

**Unintentional radiated emission measurements test setup view with log periodic antenna, performed in anechoic chamber in 200 – 1000 MHz range**



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**Photograph 6**

**EUT view**

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# Appendix C Test equipment used for tests

| HL Serial No. | Description | Manufacturer information | | | Due Calibration Month/ year |
|---|---|---|---|---|---|
| | | Name | Model No. | Serial No. | |
| 0032 | Biconical antenna, 20-200 MHz | Electro-Metrics | BIA-25/30 | 3577 | 4/04 |
| 0034 | Log periodic antenna, 200 - 1000 MHz | Electro-Metrics | LPA 25/30 | 1988 | 1/04 |
| 0038 | Antenna mast, 1-4 m | Hermon Labs | AM-1 | 028 | 2/04 Check |
| 0041 | Double ridged guide antenna, 1-18 GHz | Electro-Metrics | RGA 50/60 | 2811 | 3/04 |
| 0415 | Cables coax RF, misc., RG-58, RG-214 | Hermon Labs | CC3 | 056 | 5/04 |
| 0446 | Active loop antenna 10 kHz-30 MHz | Electro-Mechanics | 6502 | 2857 | 10/03 |
| 0447 | LISN, 16/2, 300 V RMS | Hermon Labs | LISN 16-1 | 0447 | 11/03 |
| 0465 | Anechoic chamber 9 (L) x 6.5 (W) x 5.5 (H) m | Hermon Labs | AC-1 | 023 | 10/05 |
| 0521 | Spectrum analyzer with RF filter section (EMI receiver 9 kHz - 6.5 GHz) | Hewlett Packard | 8546A | 0319 | 9/03 |
| 0589 | Cable coaxial, GORE A2POL118.2, 3m | Hermon Labs | GORE-3 | 589 | 12/03 |
| 0592 | Position controller | Hermon Labs | L2-SR3000 | 100 | 5/04 Check |
| 0593 | Antenna mast, 1-4 m/ 1-6 m Pneumatic | Hermon Labs | AM-F1 | 101 | 2/04 Check |
| 0594 | Turntable for anechoic chamber, flush mounted, d=1.2 m, pneumatic | Hermon Labs | WDC1 | 102 | 1/04 Check |
| 0604 | Antenna biconilog log-periodic/T Bow-Tie, 26 - 2000 MHz | EMCO | 3141 | 9611-1011 | 1/04 |
| 0812 | Cable, coax, RG-214, 11.5 m, N-type connectors | Hermon Labs | C214-11 | 148 | 5/04 |
| 1004 | Cable, coaxial ANDREW PSWJ4, 6 m | Hermon Labs | ANDREW-6 | 163 | 12/03 |
| 1424 | Spectrum analyzer, 30 Hz – 40 GHz | Agilent Technologies | 8564 EC | 3946A00219 | 8/03 |
| 1425 | EMI receiver, 9 kHz – 2.9 GHz | Agilent Technologies | 8542E | 3710A00222, 3705A00204 | 9/03 |
| 1430 | EMI receiver, 9 kHz – 2.9 GHz | Agilent Technologies | 8542E | 3807A00262, 3705A00217 | 9/03 |
| 1553 | Cable RF, 3.5 m | Alpha Wire | RG-214 | 1553 | 12/03 |
| 1566 | Cable RF, 2 m | Huber-Suhner | Sucoflex 104PE | 13094/4PE | 12/03 |
| 1942 | Cable 18 GHz, 4 m, blue | Rhophase Microwave Ltd. | SPS-1803A-4000-NPS | T4658 | 10/03 |
| 1984 | Antenna, double-ridged waveguide horn, 1-18 GHz, 300 W, N-type | EMC Test Systems | 3115 | 9911-5564 | 3/04 |

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# Appendix D Test equipment correction factors

**Antenna factor, active loop antenna**
**Model 6502**
**S/N 2857**

| Frequency, MHz | Antenna factor, dB |
|---|---|
| 0.009 | -32.8 |
| 0.010 | -33.8 |
| 0.020 | -38.3 |
| 0.050 | -41.1 |
| 0.075 | -41.3 |
| 0.100 | -41.6 |
| 0.150 | -41.7 |
| 0.250 | -41.6 |
| 0.500 | -41.8 |
| 0.750 | -41.9 |
| 1.000 | -41.4 |
| 2.000 | -41.5 |
| 3.000 | -41.4 |
| 4.000 | -41.4 |
| 5.000 | -41.5 |
| 10.000 | -41.9 |
| 15.000 | -41.9 |
| 20.000 | -42.2 |
| 25.000 | -42.8 |
| 30.000 | -44.0 |

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

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**Antenna factor**
**Biconical antenna**
**Electro-Metrics, model BIA-25/30**
**Ser.No.3577**

| Frequency, MHz | Antenna factor, dB(1/m) | Frequency, MHz | Antenna factor, dB(1/m) |
|---|---|---|---|
| 20 | 15.1 | 115 | 16.7 |
| 25 | 14.6 | 120 | 14.1 |
| 30 | 13.7 | 125 | 13.1 |
| 35 | 11.8 | 130 | 13.0 |
| 40 | 11.4 | 135 | 12.9 |
| 45 | 11.7 | 140 | 12.7 |
| 50 | 11.4 | 145 | 12.5 |
| 55 | 10.5 | 150 | 14.3 |
| 60 | 10.3 | 155 | 14.8 |
| 65 | 8.9 | 160 | 14.7 |
| 70 | 7.6 | 165 | 15.1 |
| 75 | 7.3 | 170 | 15.6 |
| 80 | 7.3 | 175 | 16.5 |
| 85 | 7.8 | 180 | 16.7 |
| 90 | 9.4 | 185 | 17.3 |
| 95 | 10.6 | 190 | 17.9 |
| 100 | 11.8 | 195 | 17.6 |
| 105 | 12.5 | 200 | 17.9 |
| 110 | 13.7 | | |

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

**Antenna factor**
**Log periodic antenna**
**Electro-Metrics, model LPA-25/30**
**Ser.No.1988**

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

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

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**Antenna factor**
**Biconilog antenna EMCO, model 3141, Ser.No.1011**

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

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

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**Antenna factor**
**Double ridged guide antenna**
**Model RGA-50/60**
**S/N 2811**

| Frequency, MHz | Antenna factor, dB |
|---|---|
| 1000 | 24.3 |
| 1500 | 25.4 |
| 2000 | 28.4 |
| 2500 | 29.2 |
| 3000 | 30.5 |
| 3500 | 31.6 |
| 4000 | 33.7 |
| 4500 | 32.2 |
| 5000 | 34.5 |
| 5500 | 34.5 |
| 6000 | 34.6 |
| 6500 | 35.3 |
| 7000 | 35.5 |
| 7500 | 35.9 |
| 8000 | 36.6 |
| 8500 | 37.3 |
| 9000 | 37.7 |
| 9500 | 37.7 |
| 10000 | 38.2 |
| 10500 | 38.5 |
| 11000 | 39.0 |
| 11500 | 40.1 |
| 12000 | 40.2 |
| 12500 | 39.3 |
| 13000 | 39.9 |
| 13500 | 40.6 |
| 14000 | 41.1 |
| 14500 | 40.5 |
| 15000 | 39.9 |
| 15500 | 37.8 |
| 16000 | 39.1 |
| 16500 | 41.1 |
| 17000 | 41.7 |
| 17500 | 45.1 |
| 18000 | 44.3 |

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

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**Antenna factor**
**Double-ridged wave guide horn antenna**
**Model 3115**
**Serial no: 9911-5964**

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

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

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**Cable coaxial, RG-58/RG-214, model:CC-3, s/n 056 (HL 0415)**
**+ Cable coaxial, RG-214, 11.5m, model: C214-11, s/n 148 (HL 0812)**
**Calibration data**

| No. | Parameter | Set, MHz | Measured, dB | Deviation, dB | Tolerance (specification), dB | Measured uncertainty 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 | - | | |

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**Cable Coaxial, GORE A2P01POL118, 2.3 m, model:GORE-3, s/n 176 (HL 0589)**
**+ Cable Coaxial, ANDREW PSWJ4, 6m, model: ANDREW-6, s/n 163 (HL 1004)**
**Calibration data**

| No. | Parameter | Set, MHz | Measured, dB | Deviation, dB | Tolerance (specification), dB | Measured uncertainty dB | Notes |
|---|---|---|---|---|---|---|---|
| 1 | Insertion loss | 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 | Insertion loss | 2800 | 3.21 | - | 6.5 | ±0.12 | |
| 17 | | 3000 | 3.32 | - | | | |
| 18 | | 3300 | 3.47 | - | | | |
| 19 | | 3600 | 3.62 | - | | | |
| 20 | | 3900 | 3.84 | - | | | |
| 21 | | 4200 | 3.92 | - | | ±0.17 | |
| 22 | | 4500 | 4.07 | - | | | |
| 23 | | 4800 | 4.36 | - | | | |
| 24 | | 5100 | 4.62 | - | | | |
| 25 | | 5400 | 4.78 | - | | | |
| 26 | | 5700 | 5.16 | - | | | |
| 27 | | 6000 | 5.67 | - | | | |
| 28 | | 6500 | 5.99 | - | | | |

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**Cable RF, 2m, model: Sucoflex 104PE, s/n 13094/4PE (HL 1566)**
**Calibration data**

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

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**Cable 18GHz, 4 m, blue, model: SPS-1803A-4000-NPS, s/nT4658 (HL 1942)**
**Calibration data**

| Frequency, GHz | Insertion loss, 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, GHz | Insertion loss, 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 |

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**Cable, RF, 3.5 m, model: RG-214, s/n 1553 (HL 1553)**
**Calibration data**

| No. | Parameter | Set | | Measured, dBm | Attenuation, dB | Measured uncertainty dB |
|---|---|---|---|---|---|---|
| | | MHz | dBm | | | |
| 1 | Attenuation | 1 | -0.12 | -0.13 | 0.01 | ±0.12 |
| 2 | | 10 | 0.00 | -0.07 | 0.07 | |
| 3 | | 30 | -0.10 | -0.22 | 0.12 | |
| 4 | | 50 | -0.09 | -0.31 | 0.22 | |
| 5 | | 100 | -0.13 | -0.39 | 0.26 | |
| 6 | | 200 | -0.08 | -0.48 | 0.40 | |
| 7 | | 300 | -0.12 | -0.64 | 0.52 | |
| 8 | | 400 | -0.03 | -0.63 | 0.60 | |
| 9 | | 500 | 0.19 | -0.51 | 0.70 | |
| 10 | | 600 | 0.05 | -0.72 | 0.77 | |
| 11 | | 700 | -0.06 | -0.90 | 0.84 | |
| 12 | | 800 | -0.01 | -1.01 | 1.00 | |
| 13 | | 900 | 0.03 | -0.97 | 1.00 | |
| 14 | | 1000 | -0.08 | -1.13 | 1.05 | |
| 15 | | 2000 | -0.19 | -1.89 | 1.70 | |

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# Appendix E General information

## Test facility description

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

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

## Abbreviations and acronyms

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

| | |
|---|---|
| cm | centimeter |
| dB | decibel |
| dBm | decibel referred to one milliwatt |
| dB(µV) | decibel referred to one microvolt |
| dB(µV/m) | decibel referred to one microvolt per meter |
| DC | direct current |
| EUT | equipment under test |
| GHz | gigahertz |
| H | height |
| Hz | hertz |
| kHz | kilohertz |
| kV | kilovolt |
| L | length |
| m | meter |
| MHz | megahertz |
| NA | not applicable |
| QP | quasi-peak |
| RF | radio frequency |
| RE | radiated emission |
| rms | root mean square |
| s | second |
| V | volt |
| W | width |

## Specification references

| | |
|---|---|
| 47CFR part 15: 2002 | 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: 1992 | 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. |

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## FCC equipment codes and descriptions

| | |
|---|---|
| CYY | Communications Receiver used w/ P.15 transmitter |
| DCD | Part 15 Low Power transmitter Below 1705 kHz |
| DSC | Part 15 Security/Remote Control Transmitter |
| DSR | Part 15 Remote Control/Security Device Transceiver |
| DSS | Part 15 Spread Spectrum Transmitter |
| DXX | Part 15 Low Power Communication Device Transmitter |
| EAV | Part 15 Automatic Vehicle Identification System |
| ETB | Part 15 Cordless Telephone Base Transceiver |
| ETR | Part 15 Cordless Telephone Remote Transceiver |
| ETS | Part 15 Cordless telephone system |
| FAP | Part 15 Anti-Pilferage Device |
| FDS | Part 15 Field Disturbance Sensor |
| GAT | Part 15 Auditory Assistance Device (Transmitter) |
| HID | Part 15 TV Interface Device |
| JBC | Part 15 Class B Computing Device/ Personal Computer |
| JBP | Part 15 Class B Computing Device Peripheral |
| PUB | Part 15 Unlicensed PCS base station |
| PUE | Part 15 Unlicensed PCS portable Tx held to ear |
| PUF | Part 15 Unlicensed PCS portable Tx held to face |
| PUT | Part 15 Unlicensed PCS portable Tx worn on body |