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# **ELECTROMAGNETIC EMISSIONS TEST REPORT**

according to 47CFR Part 90, subpart I and part 15, subpart B  
for

**Hi-G-TEK Ltd.**

EQUIPMENT UNDER TEST:

**Data reader**

**Models: IG-RS-46D9-916, IG-RS-43D9-916**

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## 1 Project information

### Equipment under test attributes

|                |                                  |
|----------------|----------------------------------|
| Test items     | : Data reader                    |
| Manufacturer   | : Hi-G-Tek Ltd.                  |
| Types (Models) | : IG-RS-46D9-916, IG-RS-43D9-916 |

### Applicant information

|                                |                                               |
|--------------------------------|-----------------------------------------------|
| Applicant's responsible person | : Mr. Rony Cohen, hardware department manager |
| Company                        | : Hi-G-Tek Ltd.                               |
| Address                        | : 16, Hacharoshet street                      |
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### Test performance

|                       |                                                                                       |
|-----------------------|---------------------------------------------------------------------------------------|
| Project number:       | : 15758                                                                               |
| Location              | : Hermon Laboratories                                                                 |
| Test started          | : December 7, 2003                                                                    |
| Test completed        | : December 22, 2003                                                                   |
| Purpose of test       | : Apparatus compliance verification in accordance with emission requirements          |
| Test specification(s) | : 47CFR part 90, §§90.205, 90.209, 90.210, 90.213,<br>part 15 §15.109, 15.107, 15.207 |



## 2 Summary and signatures

The EUT, data reader, was tested according to FCC part 90 subpart I, §§90.205(k), 90.209, 90.210(k)(3), part 15 §15.109, 15.107, 15.207 and found to comply with the standard requirements.

| Test description             | Specification reference | Tested by                    | Date tested          | Test report paragraph | Verdict |
|------------------------------|-------------------------|------------------------------|----------------------|-----------------------|---------|
| RF output power              | 90.205(k); 2.1046       | Mr. Y. Neuman, test engineer | December 8, 2003     | 4.1                   | Pass    |
| Occupied bandwidth           | 90.209; 2.1049          | Mr. Y. Neuman, test engineer | December 8, 2003     | 4.2                   | Pass    |
| Emission mask                | 90.210(k)(3); 2.1051    | Mr. Y. Neuman, test engineer | December 7, 8, 2003  | 4.3                   | Pass    |
| Conducted spurious emissions | 90.210; 2.1051          | Mr. Y. Neuman, test engineer | December 7, 8, 2003  | 4.3                   | Pass    |
| Radiated spurious emissions  | 90.210; 2.1053          | Mr. Y. Neuman, test engineer | December 7, 8, 2003  | 4.3                   | Pass    |
| Frequency stability          | 90.213, 2.1055          | Mr. Y. Neuman, test engineer | December 9, 2003     | 4.4                   | Tested  |
| Radiated emissions           | 15.109                  | Mr. Y. Neuman, test engineer | December 7, 22 2003  | 4.5                   | Pass    |
| Conducted emissions          | 15.107                  | Mr. Y. Neuman, test engineer | December 7, 22, 2003 | 4.6                   | Pass    |

**Test report prepared by:**

Mrs. M. Cherniavsky, MScEE, certification engineer

**Test report approved by:**

Mr. Michael Nikishin, MScEE, group leader

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



### 3 EUT description

#### 3.1 General description

The EUT, data reader, model names IG-RS-46D9-916 and IG-RS-43D9-916, is an interrogator for electronic tags operating at 916.5 MHz, FSK modulated with 40 kHz deviation and 15625 bps data rate. The two models have the same RF board, the differences are in digital board. The IG-RS46D9-916 device has RS485 serial communication interface, the IG-RS43D9-916 model - RS232, so readers can be connected to a host.

An interrogation sequence can be initiated either by the host or by the data reader independently. When an interrogation cycle starts, the data reader transmits a header for typically 0.5 - 3 s. Then it opens a receiving window for typically 2 seconds. In this window, each tag receiving the EUT message, replies with a short message, typically 10 ms. The data reader includes standard TNC connector for external antenna, is powered by an external 24 VDC power supply and intended for outdoor installation.

The following frequencies are used or generated in the EUT: 32.768 kHz, 4 MHz, 10.7 MHz, 26.641176 MHz, 28.64062 MHz, 905.8 MHz (LO).

#### 3.2 EUT test configuration

The EUT ports and lines description is given in Tables 3.2.1, 3.2.2, support/test equipment list is provided in Table 3.2.3, test configuration is shown in Figure 3.2.1.

Table 3.2.1

IG-RS-46D9-916 ports and lines

| Port type      | Port description | Connector type         | Quantity | Cable type description | Cable length, m | Connected to                 |
|----------------|------------------|------------------------|----------|------------------------|-----------------|------------------------------|
| Power + signal | 24 V DC + RS485  | Terminal block TB1     | 1        | Shielded               | 12              | Converter                    |
| Power + signal | 24 V DC + RS485  | Terminal block TB2     | 1        | Unshielded             | 1               | Open circuit                 |
| Signal         | I/O and GND      | Terminal block TB3     | 1        | Unshielded             | 1               | Open circuit                 |
| Signal         | Antenna          | TNC                    | 1        | NA                     | NA              | 50 Ohm termination           |
| Power          | 24 V DC          | DC jack (on converter) | 1        | Unshielded             | 1.5             | AC/DC adapter from converter |
| Power          | AC               | Non-detachable         | 1        | Unshielded             | 1.5             | AC mains from adapter        |



**Table 3.2.2**  
**IG-RS-43D9-916 ports and lines**

| Port type      | Port description | Connector type     | Quantity | Cable type description | Cable length, m | Connected to          |
|----------------|------------------|--------------------|----------|------------------------|-----------------|-----------------------|
| Power + signal | 24 V DC + RS232  | Terminal block TB1 | 1        | Shielded, splitted     | 12              | Laptop, adapter       |
| Power + signal | 24 V DC + RS232  | Terminal block TB2 | 1        | Unshielded             | 1               | Open circuit          |
| Signal         | I/O and GND      | Terminal block TB3 | 1        | Unshielded             | 1               | Open circuit          |
| Signal         | Antenna          | TNC                | 1        | NA                     | NA              | 50 Ohm termination    |
| Power          | AC               | Non-detachable     | 1        | Unshielded             | 1.5             | AC mains from adapter |

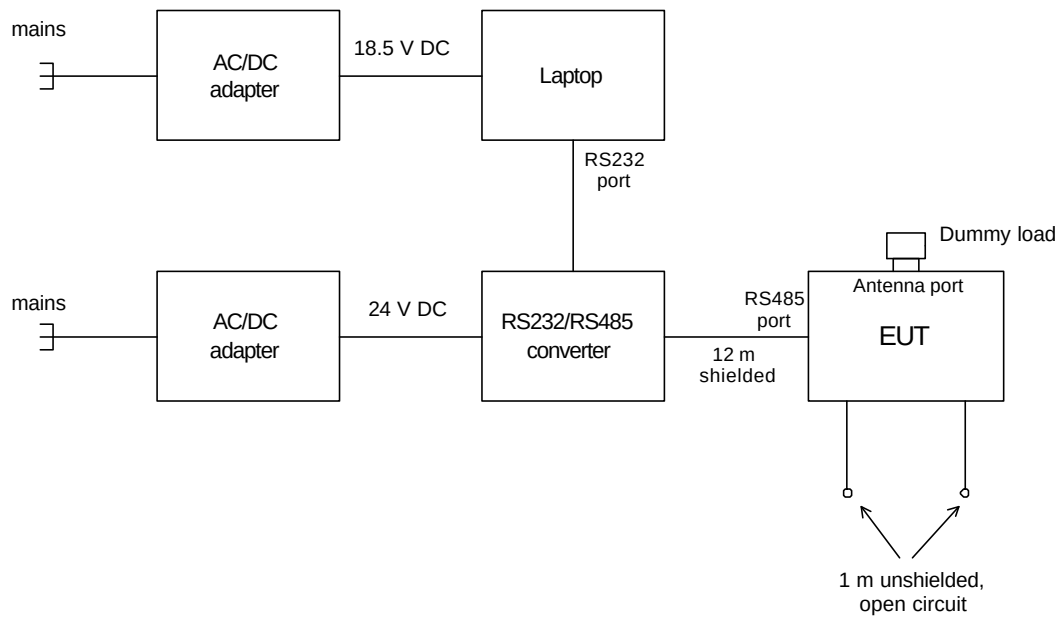
**Table 3.2.3**  
**EUT support/test equipment**

| Description                       | Manufacturer  | Model number           | Serial number |
|-----------------------------------|---------------|------------------------|---------------|
| Laptop (IG-RS-46D9-916 setup)     | Compaq        | Armada V300            | 1J9BCXX1V442  |
| Laptop (IG-RS-43D9-916 setup)     | Toshiba       | Tecra PA1221U          | 08638791      |
| RS232/RS485 converter             | MOXA          | A51                    | T01AD2300252  |
| Power supply (adapter) for EUT    | AK Technology | A25B1-24MB, 24 V/1 A   | A023918968    |
| Power supply (adapter) for laptop | Compaq        | ADP50-UB, 18.5 V/2.7 A | NA            |

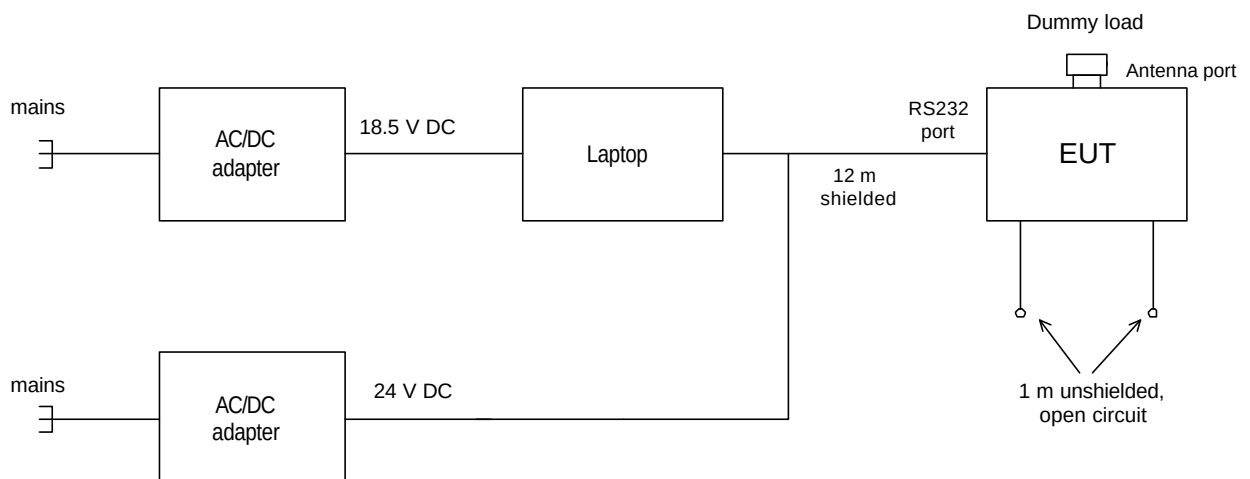


**Figure 3.2.1**  
**EUT test configuration**

**a) IG-RS-46D9-916 model**



**b) IG-RS-43D9-916 model**





## 4 Test results

### 4.1 Peak output power test according to part 90 §90.205(k)

DATE of TEST: December 8, 2003  
AMBIENT TEMPERATURE: 23°C  
RELATIVE HUMIDITY: 52 %  
AIR PRESSURE: 1018 hPa  
MEASUREMENT UNCERTAINTY: ±4.5 dB

| Carrier frequency,<br>MHz | Peak output power,<br>W |       | Verdict | Reference to plot in Appendix A |
|---------------------------|-------------------------|-------|---------|---------------------------------|
|                           | Measured                | Limit |         |                                 |
| 916.392                   | 0.0195                  | 30    | Pass    | A1                              |

#### LIMITATION ON POWER

| Operating frequency range,<br>MHz | Maximum effective radiated power (ERP) |
|-----------------------------------|----------------------------------------|
| 902 - 927.25                      | 30 W (44.7 dBm)                        |

#### TEST PROCEDURE

The EUT main antenna port was connected via attenuator to spectrum analyzer and peak output power was measured.

#### TEST EQUIPMENT USED:

|         |         |         |  |  |  |  |
|---------|---------|---------|--|--|--|--|
| HL 1424 | HL 1991 | HL 2254 |  |  |  |  |
|---------|---------|---------|--|--|--|--|





## 4.2 Occupied bandwidth according to part 90 §90.209(5)

DATE of TEST: December 8, 2003  
AMBIENT TEMPERATURE: 23°C  
RELATIVE HUMIDITY: 52 %  
AIR PRESSURE: 1018 hPa  
MEASUREMENT UNCERTAINTY: ±2.6 dB  
CARRIER FREQUENCY: 916.5 MHz

| Measured<br>23 dB bandwidth,<br><br>MHz | Authorized bandwidth,<br><br>MHz | Reference to Plots in<br>Appendix A | Verdict |
|-----------------------------------------|----------------------------------|-------------------------------------|---------|
| 0.138                                   | 12                               | A2                                  | Pass    |

### LIMIT

| Operating frequency range,<br>MHz | Authorized bandwidth,<br>MHz |
|-----------------------------------|------------------------------|
| 909.75 – 921.75                   | 12                           |

### TEST PROCEDURE

The EUT RF output was connected to the spectrum analyzer, which settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss.

### TEST EQUIPMENT USED:

|         |         |         |  |  |  |
|---------|---------|---------|--|--|--|
| HL 1430 | HL 1991 | HL 2254 |  |  |  |
|---------|---------|---------|--|--|--|



### 4.3 Emission mask and radiated spurious emissions test according to part 90 §90.210(k)(3)

|                          |                                                         |
|--------------------------|---------------------------------------------------------|
| DATE of TEST:            | December 8, 2003                                        |
| AMBIENT TEMPERATURE:     | 23°C                                                    |
| RELATIVE HUMIDITY:       | 52 %                                                    |
| AIR PRESSURE:            | 1018 hPa                                                |
| FREQUENCY RANGE:         | 9 kHz – 9.2 GHz                                         |
| MEASUREMENT UNCERTAINTY: | ±4.3 dB (conducted method)<br>±4.5 dB (radiated method) |

The peak power of any emission shall be attenuated below the power of the highest emission contained within the licensee's sub-band in accordance with the following schedule:

- 1) On any frequency within the authorized bandwidth: zero dB;
- 2) On any frequency outside the licensee's sub-band edges:  $55 + 10 \log (P)$  dB, where (P) is the highest emission (in watts) of the transmitter inside the licensee's sub-band.

#### 4.3.1 Test procedure

**Conducted spurious emissions** were measured at the EUT antenna terminal in the frequency range from 9 kHz up to 9.2 GHz.

The following calculated limit was applied to spurious emissions throughout the testing in transmit mode: the specified limit for attenuation  $55 + 10 \log (P)$  is equivalent to  $-25$  dBm.

This limit was applied to spurious emissions throughout the following frequency ranges:

9 kHz to 909.75 MHz and 921.75 MHz to 9.2 GHz, test results were recorded in Table 4.3.1. Emissions at the lower band edge and at the higher band edge were tested.

The full test results in transmit mode are shown in plots A3 to A15.

The test results in receive mode are depicted in plots A16 to A18.

**Radiated spurious emissions** were measured at 3m test distance in the anechoic chamber from 9 kHz up to 6.5 GHz and at OATS from 6.5 GHz up to 9.2 GHz:

with the loop antenna in the 9 kHz to 30 MHz range,

the biconilog - in the 30 MHz to 1000 MHz range,

the double ridged guide – in 1 GHz to 9.2 GHz range.

The EUT was set up on the 80 cm height wooden table as shown in Figures 4.3.1 and 4.3.2.

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

**30 MHz – 9.2 GHz frequency range.** 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.

The specified limit  $55 + 10 \log (P)$  was converted in 70 dB(μV/m) equivalent field strength at 3 m

$E = \sqrt{30P} / r$ , where  $P = -25$  dBm =  $3 \times 10^{-6}$  W.

$E [\text{dB}\mu\text{V/m}] = 20 \log \{10^6 \times \sqrt{(30 \times 3 \times 10^{-6}) / 3}\} = 70 \text{ dB}\mu\text{V/m}$ .

The test results were recorded in Table 4.3.2 and shown in Plots A19 to A27.

The spurious emissions found in 1.0 GHz – 6.5 GHz range were retested by substitution method.

The EUT was replaced with a substitution antenna (double ridge guide for the mentioned range) connected to signal generator. The measuring antenna height was changed from 1 to 4 m to find a maximum radiation. The level of the signal generator output was adjusted until the previously recorded field strength maximum reading was obtained as depicted in Table 4.3.2.

$$\text{ERP (dBm)} = P_{\text{out gen}} (\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$



Table 4.3.1

## Conducted spurious emissions test results

| Frequency,<br>MHz | Spurious emission level,<br>dBm |       | Margin,<br>dB | Verdict | Reference to<br>Plots in<br>Appendix A |
|-------------------|---------------------------------|-------|---------------|---------|----------------------------------------|
|                   | Measured                        | Limit |               |         |                                        |
| 887.885           | -36.73                          | -25   | 11.73         | Pass    | A7                                     |
| 909.701           | -30.91                          | -25   | 5.91          | Pass    | A8                                     |
| 921.750           | -28.60                          | -25   | 3.60          | Pass    | A9                                     |
| 945.167           | -38.29                          | -25   | 13.29         | Pass    | A10                                    |
| 1833.045          | -53.35                          | -25   | 28.35         | Pass    | A12                                    |
| 2749.555          | -36.58                          | -25   | 11.58         | Pass    | A14                                    |
| 3665.917          | -46.47                          | -25   | 21.47         | Pass    | A15                                    |

Table 4.3.2

## Radiated emissions measurement results

| Frequency,<br>MHz | Radiated<br>measured<br>result,<br>dB(uV/m) | Generator<br>$P_{out}$ ,<br>dBm | Cable<br>loss,<br>dB | Antenna<br>gain,<br>dBd | Equivalent<br>radiated<br>power,<br>dBm | Limit,<br>dBm | Margin,<br>dB | Verdict |
|-------------------|---------------------------------------------|---------------------------------|----------------------|-------------------------|-----------------------------------------|---------------|---------------|---------|
| 1833              | 57.8                                        | -44.3                           | 0.8                  | 4.7                     | -40.4                                   | -25           | 15.4          | Pass    |
| 2749.5            | 58.5                                        | -44.5                           | 0.9                  | 5.5                     | -39.9                                   | -25           | 14.9          | Pass    |

## TEST EQUIPMENT USED FOR CONDUCTED METHOD:

|         |         |         |  |  |  |  |
|---------|---------|---------|--|--|--|--|
| HL 1430 | HL 1991 | HL 2254 |  |  |  |  |
|---------|---------|---------|--|--|--|--|

## TEST EQUIPMENT USED IN ANECHOIC CHAMBER:

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 0465 | HL 0521 | HL 0589 | HL 0592 | HL 0593 | HL 0594 |
| HL 0604 | HL 1004 | HL 2009 |         |         |         |         |

## TEST EQUIPMENT USED AT OPEN AREA TEST SITE:

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0038 | HL 0091 | HL 0287 | HL 1200 | HL 1424 | HL 1942 | HL 1984 |
| HL 2254 | HL 2259 |         |         |         |         |         |

## TEST EQUIPMENT USED AT OPEN AREA TEST SITE FOR SUBSTITUTION METHOD:

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0038 | HL 0091 | HL 0287 | HL 0661 | HL 1116 | HL 1365 | HL 1430 |
| HL 1947 | HL 1984 | HL 2400 |         |         |         |         |



Figure 4.3.1

Set up for radiated emissions measurement with loop antenna

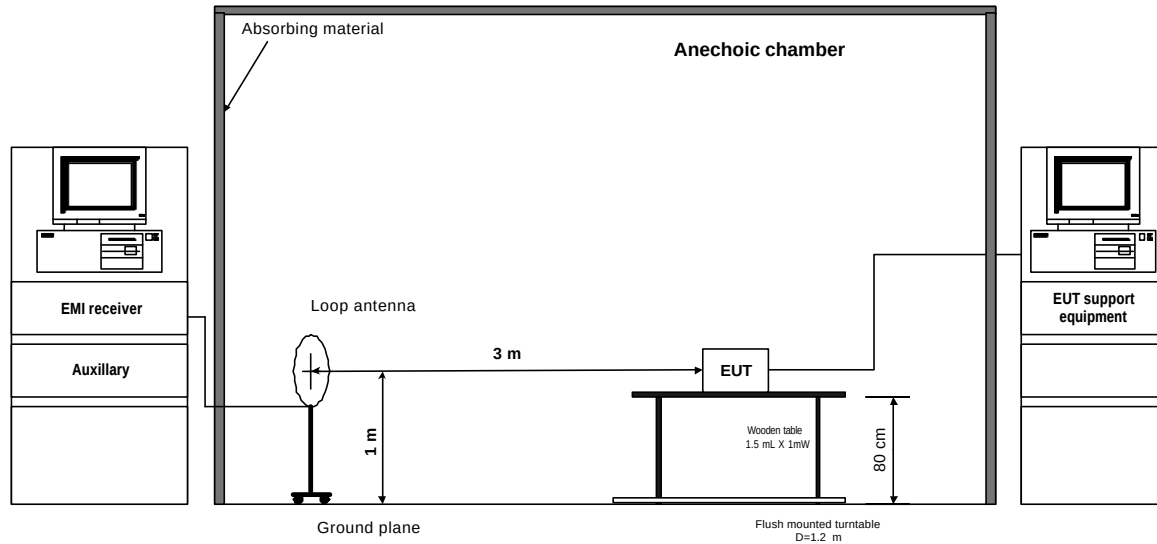
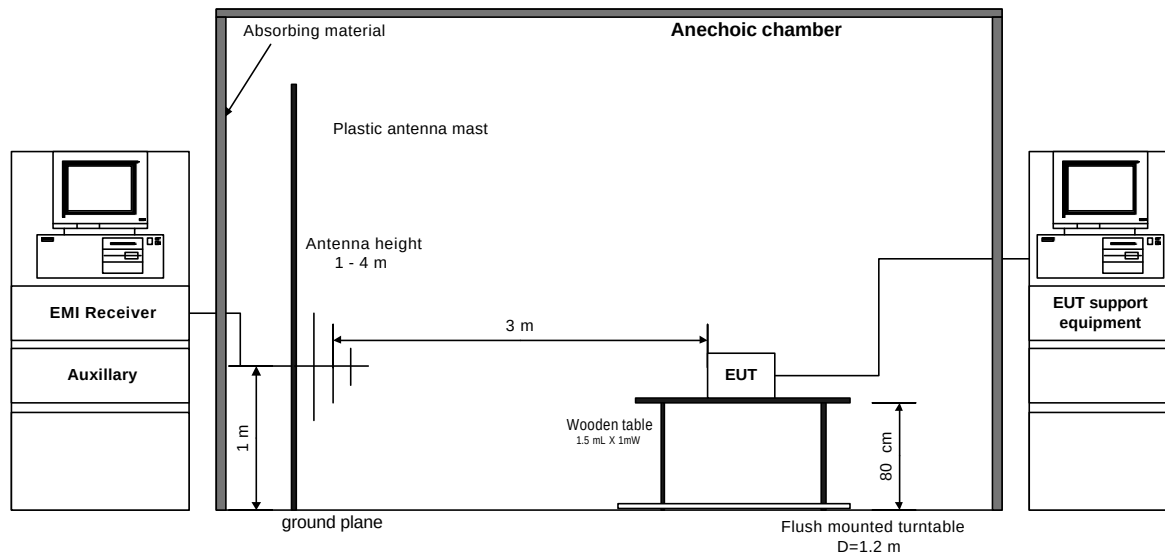


Figure 4.3.2

Set up for radiated emissions measurement with biconilog antenna





#### 4.4 Unintentional radiated emissions test according to §15.109

METHOD OF MEASUREMENT: ANSI 63.4 §11.6 / ANSI 63.4 §12.1.4  
DATE of TEST: December 7, 22, 2003  
AMBIENT TEMPERATURE: 21°C  
RELATIVE HUMIDITY: 59 %  
AIR PRESSURE: 1013 hPa  
DISTANCE BETWEEN ANTENNA AND EUT: 3 m  
THE EUT WAS TESTED AS: Table-top  
FREQUENCY RANGE: 30 MHz – 5 GHz  
DETECTOR TYPE: Peak  
MEASUREMENT UNCERTAINTY:  $\pm 6$  dB max

For test procedure and setup refer to section 4.3, radiated emissions.

##### Model number: IG-RS-46D9-916, test performed in anechoic chamber

| Frequency,<br>MHz | Detector<br>type | RBW<br>kHz | Antenna<br>type | Antenna<br>polariz. | Antenna<br>height,<br>m | TT<br>position<br>(°) | Radiated<br>emissions,<br>dB(mV/m) | Limit,<br>dB (mV/m) | Margin,<br>dB | Verdict |
|-------------------|------------------|------------|-----------------|---------------------|-------------------------|-----------------------|------------------------------------|---------------------|---------------|---------|
| 40.000            | QP               | 120        | Biconilog       | Vertical            | 1.0                     | 195                   | 33.46                              | 40.00               | 6.54          | Pass    |
| 48.000            | QP               | 120        | Biconilog       | Vertical            | 1.0                     | 116                   | 36.72                              | 40.00               | 3.28          | Pass    |
| 58.075            | QP               | 120        | Biconilog       | Vertical            | 1.1                     | 164                   | 34.97                              | 40.00               | 5.03          | Pass    |
| 248.058           | QP               | 120        | Biconilog       | Horizontal          | 1.0                     | 243                   | 44.50                              | 46.00               | 1.50          | Pass    |
| 344.087           | QP               | 120        | Biconilog       | Horizontal          | 2.7                     | 206                   | 42.46                              | 46.00               | 3.54          | Pass    |
| 360.083           | QP               | 120        | Biconilog       | Horizontal          | 1.0                     | 191                   | 43.35                              | 46.00               | 2.65          | Pass    |
| 1079.965          | AVRG             | 1000       | DRG             | Vertical            | 1.0                     | 353                   | 45.53                              | 54.00               | 8.47          | Pass    |
| 1560.000          | AVRG             | 1000       | DRG             | Vertical            | 1.0                     | 228                   | 35.67                              | 54.00               | 18.33         | Pass    |

For full test results refer to plots A28-A30.

##### Table abbreviations:

Detector type QP- quasi-peak, AVRG – average  
RBW resolution bandwidth  
Antenna type Bic - biconical, LP - log periodic, DRG – double ridged guide  
Antenna polariz. antenna polarization  
TT position turntable position in degrees, (EUT front panel = 0°).  
Margin dB below (negative if above) specification limit.

##### TEST EQUIPMENT USED IN THE ANECHOIC CHAMBER:

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0465 | HL 0521 | HL 0589 | HL 0592 | HL 0593 | HL 0594 | HL 0604 |
| HL 1004 | HL 1947 | HL 1984 | HL 2009 |         |         |         |



**Model number: IG-RS-43D9-916, test performed at OATS**

| Frequency,<br>MHz | Detector<br>type | RBW<br>kHz | Antenna<br>type | Antenna<br>polariz. | Antenna<br>height,<br>m | TT<br>position<br>(°) | Radiated<br>emissions,<br>dB(μV/m) | Limit,<br>dB (μV/m) | Margin,<br>dB | Verdict |
|-------------------|------------------|------------|-----------------|---------------------|-------------------------|-----------------------|------------------------------------|---------------------|---------------|---------|
| 195.430           | QP               | 120        | Bic             | Vertical            | 1.0                     | 264                   | 38.51                              | 43.50               | 4.99          | Pass    |
| 199.943           | QP               | 120        | Bic             | Vertical            | 1.0                     | 238                   | 38.76                              | 43.50               | 4.74          | Pass    |
| 325.707           | QP               | 120        | LP              | Vertical            | 1.2                     | 319                   | 41.71                              | 46.00               | 4.29          | Pass    |
| 328.075           | QP               | 120        | LP              | Horizontal          | 1.0                     | 44                    | 42.49                              | 46.00               | 3.51          | Pass    |
| 336.074           | QP               | 120        | LP              | Vertical            | 1.2                     | 302                   | 40.46                              | 46.00               | 5.54          | Pass    |
| 344.076           | QP               | 120        | LP              | Horizontal          | 1.0                     | 200                   | 42.67                              | 46.00               | 3.33          | Pass    |
| 373.350           | QP               | 120        | LP              | Vertical            | 1.0                     | 311                   | 45.24                              | 46.00               | 0.76          | Pass    |
| 466.640           | QP               | 120        | LP              | Vertical            | 1.0                     | 63                    | 43.32                              | 46.00               | 2.68          | Pass    |
| 1267.040          | AVRG             | 1000       | DRG             | Horizontal          | 1.0                     | 9                     | 31.00                              | 54.00               | 23.00         | Pass    |
| 1399.950          | AVRG             | 1000       | DRG             | Vertical            | 1.0                     | 240                   | 35.04                              | 54.00               | 18.96         | Pass    |

**Table abbreviations:**

Detector type            QP- quasi-peak, AVRG – average  
RBW                        resolution bandwidth  
Antenna type            Bic - biconical, LP - log periodic, DRG – double ridged guide  
Antenna polariz.        antenna polarization  
TT position                turntable position in degrees, (EUT front panel = 0°).  
Margin                     dB below (negative if above) specification limit.

**LIMIT (§ 15.109)**

| Frequency,<br>MHz | Class B equipment @ 3 m<br>dB(μV/m) |
|-------------------|-------------------------------------|
| 30 - 88           | 40.0                                |
| 88 - 216          | 43.5                                |
| 216 - 960         | 46.0                                |
| 960 - 5000        | 54.0                                |

**TEST EQUIPMENT USED AT THE OATS:**

|         |         |         |         |         |         |  |
|---------|---------|---------|---------|---------|---------|--|
| HL 0032 | HL 0034 | HL 0287 | HL 0415 | HL 0812 | HL 1942 |  |
|         |         |         |         |         |         |  |



## 4.5 Frequency stability measurement according to §90.213

DATE of TEST: December 9, 2003  
AMBIENT TEMPERATURE: 20°C  
RELATIVE HUMIDITY: 52 %  
AIR PRESSURE: 1016 hPa

### TEST PROCEDURE

The EUT frequency stability was measured with variation of supply voltage or ambient temperature in the range from – 30°C to +50°C.

#### Frequency stability test results vs supply voltage

| Voltage, V | Frequency, Hz      | Displacement, Hz | Time, min |
|------------|--------------------|------------------|-----------|
| Uac=120 V  | 916 526 334        | 3647             | startup   |
|            | 916 524 683        | 1996             | +2        |
|            | 916 523 606        | 919              | +5        |
|            | <b>916 522 687</b> | <b>0</b>         | +10       |
| Uac=102 V  | 916 525 379        | 2692             | startup   |
|            | 916 524 011        | 1324             | +2        |
|            | 916 523 106        | 419              | +5        |
|            | 916 522 352        | -335             | +10       |
| Uac=138 V  | 916 525 942        | 3255             | startup   |
|            | 916 524 346        | 1659             | +2        |
|            | 916 523 367        | 680              | +5        |
|            | 916 522 541        | -146             | +10       |

Reference frequency: **916 522 687 Hz**

For information only: 2.5 ppm = ± 2291 Hz

### TEST EQUIPMENT USED:

|         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|--|--|
| HL 0026 | HL 0493 | HL 0558 | HL 1097 | HL 1207 |  |  |
|         |         |         |         |         |  |  |

**Frequency stability test results vs ambient temperature**

| Temperature,<br>°C | Frequency,<br>Hz | Displacement,<br>Hz | Time,<br>min |
|--------------------|------------------|---------------------|--------------|
| t°=30°C            | 916 523 512      | 825                 | startup      |
|                    | 916 521 803      | -884                | +2           |
|                    | 916 520 491      | -2196               | +5           |
|                    | 916 519 266      | -3421               | +10          |
| t°=40°C            | 916 519 776      | -2911               | startup      |
|                    | 916 518 177      | -4510               | +2           |
|                    | 916 516 887      | -5800               | +5           |
|                    | 916 515 674      | -7013               | +10          |
| t°=50°C            | 916 515 725      | -6962               | startup      |
|                    | 916 514 414      | -8273               | +2           |
|                    | 916 513 347      | -9340               | +5           |
|                    | 916 512 411      | -10276              | +10          |
| t°=10°C            | 916 524 046      | 1359                | startup      |
|                    | 916 523 559      | 872                 | +2           |
|                    | 916 523 631      | 944                 | +5           |
|                    | 916 523 833      | 1146                | +10          |
| t°=0°C             | 916 535 193      | 12506               | startup      |
|                    | 916 533 944      | 11257               | +2           |
|                    | 916 533 028      | 10341               | +5           |
|                    | 916 532 214      | 9527                | +10          |
| t°=-10°C           | 916 536 979      | 14292               | startup      |
|                    | 916 536 325      | 13638               | +2           |
|                    | 916 535 699      | 13012               | +5           |
|                    | 916 535 247      | 12560               | +10          |
| t°=-20°C           | 916 538 512      | 15825               | startup      |
|                    | 916 538 257      | 15570               | +2           |
|                    | 916 538 129      | 15442               | +5           |
|                    | 916 537 955      | 15268               | +10          |
| t°=-30°C           | 916 537 913      | 15226               | startup      |
|                    | 916 537 860      | 15173               | +2           |
|                    | 916 538 752      | 16065               | +5           |
|                    | 916 538 901      | 16214               | +10          |





## 4.6 Conducted emissions test according to §15.107

**EUT MODEL NUMBER:** IG-RS-46D9-916  
**METHOD OF MEASUREMENTS:** ANSI 63.4 §13.1.3  
**DATE of TEST:** December 7, 2003  
**RELATIVE HUMIDITY:** 49%  
**AMBIENT TEMPERATURE:** 22°C  
**AIR PRESSURE:** 1018 hPa  
**THE EUT WAS TESTED AS:** TABLE-TOP  
**FREQUENCY RANGE:** 150 kHz – 30 MHz  
**RESOLUTION BANDWIDTH:** 9 kHz  
**MEASUREMENT UNCERTAINTY, dB**  
± 3.9 dB in 9 – 150 kHz  
± 3.8 dB in 150 kHz – 30 MHz

### EUT power lines, transmit and receive modes

#### Quasi-peak detector

| Frequency, MHz | Line identification | Measured emissions, dB (mV) | Specification QP limit, dB (mV) | Margin, dB | Verdict | Reference to Plots in Appendix A |
|----------------|---------------------|-----------------------------|---------------------------------|------------|---------|----------------------------------|
| 0.177          | 1                   | 49.18                       | 64.67                           | 15.49      | Pass    | A31, A33                         |
| 0.769          | 1                   | 39.99                       | 56.00                           | 16.01      | Pass    | A31, A33                         |
| 0.947          | 2                   | 39.65                       | 56.00                           | 16.35      | Pass    | A32, A34                         |
| 1.006          | 1                   | 40.09                       | 56.00                           | 15.91      | Pass    | A31, A33                         |
| 1.243          | 1                   | 39.39                       | 56.00                           | 16.61      | Pass    | A31, A33                         |
| 29.998         | 2                   | 45.87                       | 60.00                           | 14.13      | Pass    | A32, A34                         |

#### Average detector

| Frequency, MHz | Line identification | Measured emissions, dB (mV) | Specification AVRG limit, dB (mV) | Margin, dB | Verdict | Reference to Plots in Appendix A |
|----------------|---------------------|-----------------------------|-----------------------------------|------------|---------|----------------------------------|
| 0.177          | 1                   | 44.31                       | 54.67                             | 10.36      | Pass    | A31, A33                         |
| 0.769          | 1                   | 37.26                       | 46.00                             | 8.74       | Pass    | A31, A33                         |
| 0.947          | 2                   | 37.64                       | 46.00                             | 8.36       | Pass    | A32, A34                         |
| 1.006          | 1                   | 38.51                       | 46.00                             | 7.49       | Pass    | A31, A33                         |
| 1.243          | 1                   | 37.56                       | 46.00                             | 8.44       | Pass    | A31, A33                         |
| 29.998         | 2                   | 44.11                       | 50.00                             | 5.89       | Pass    | A32, A34                         |



### Laptop power lines, transmit and receive modes

#### Quasi-peak detector

| Frequency, MHz | Line identification | Measured emissions, dB (mV) | Specification QP limit, dB (mV) | Margin, dB | Verdict | Reference to Plots in Appendix A |
|----------------|---------------------|-----------------------------|---------------------------------|------------|---------|----------------------------------|
| 0.203          | 1                   | 53.37                       | 63.54                           | 10.17      | Pass    | A35, A37                         |
| 0.272          | 1                   | 45.50                       | 61.12                           | 15.62      | Pass    | A35, A37                         |
| 0.405          | 2                   | 41.37                       | 57.77                           | 16.40      | Pass    | A36, A38                         |
| 0.541          | 2                   | 36.16                       | 56.00                           | 19.84      | Pass    | A36, A38                         |
| 3.648          | 1                   | 38.16                       | 56.00                           | 17.84      | Pass    | A35, A37                         |
| 4.354          | 1                   | 43.61                       | 56.00                           | 12.39      | Pass    | A35, A37                         |

#### Average detector

| Frequency, MHz | Line identification | Measured emissions, dB (mV) | Specification AVRG limit, dB (mV) | Margin, dB | Verdict | Reference to Plots in Appendix A |
|----------------|---------------------|-----------------------------|-----------------------------------|------------|---------|----------------------------------|
| 0.203          | 1                   | 44.48                       | 53.54                             | 9.06       | Pass    | A35, A37                         |
| 0.272          | 1                   | 37.53                       | 51.12                             | 13.59      | Pass    | A35, A37                         |
| 0.405          | 2                   | 39.44                       | 47.77                             | 8.33       | Pass    | A36, A38                         |
| 0.541          | 2                   | 32.67                       | 46.00                             | 13.33      | Pass    | A36, A38                         |
| 3.648          | 1                   | 31.16                       | 46.00                             | 14.84      | Pass    | A35, A37                         |
| 4.354          | 1                   | 43.10                       | 46.00                             | 2.90       | Pass    | A35, A37                         |

#### LIMIT

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

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

#### TEST PROCEDURE

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

#### TEST EQUIPMENT USED:

|         |         |         |         |         |         |  |
|---------|---------|---------|---------|---------|---------|--|
| HL 0447 | HL 0495 | HL 0521 | HL 0787 | HL 1003 | HL 1503 |  |
|---------|---------|---------|---------|---------|---------|--|



## Conducted emissions test according to §15.107 (continued)

**EUT MODEL NUMBER:** IG-RS-43D9-916  
**METHOD OF MEASUREMENTS:** ANSI 63.4 §13.1.3  
**DATE of TEST:** December 22, 2003  
**RELATIVE HUMIDITY:** 38%  
**AMBIENT TEMPERATURE:** 25°C  
**AIR PRESSURE:** 1012 hPa  
**THE EUT WAS TESTED AS:** TABLE-TOP  
**FREQUENCY RANGE:** 150 kHz – 30 MHz  
**RESOLUTION BANDWIDTH:** 9 kHz  
**MEASUREMENT UNCERTAINTY, dB**  
± 3.9 dB in 9 – 150 kHz  
± 3.8 dB in 150 kHz – 30 MHz

### EUT power lines, transmit and receive modes

#### Quasi-peak detector

| Frequency,<br>MHz | Line<br>identification | Measured<br>emissions,<br>dB (mV) | Specification<br>QP limit,<br>dB (mV) | Margin,<br>dB | Verdict | Reference to<br>Plots in<br>Appendix A |
|-------------------|------------------------|-----------------------------------|---------------------------------------|---------------|---------|----------------------------------------|
| 0.177             | 2                      | 49.27                             | 64.68                                 | 15.41         | Pass    | A40                                    |
| 0.236             | 1                      | 42.40                             | 62.27                                 | 19.87         | Pass    | A39                                    |
| 0.472             | 1                      | 42.86                             | 56.53                                 | 13.67         | Pass    | A39                                    |
| 0.532             | 2                      | 43.99                             | 56.00                                 | 12.01         | Pass    | A40                                    |
| 0.828             | 2                      | 43.43                             | 56.00                                 | 12.57         | Pass    | A40                                    |
| 0.887             | 2                      | 44.20                             | 56.00                                 | 11.80         | Pass    | A40                                    |
| 0.943             | 1                      | 42.52                             | 56.00                                 | 13.48         | Pass    | A39                                    |
| 1.242             | 2                      | 43.37                             | 56.00                                 | 12.63         | Pass    | A40                                    |
| 5.189             | 1                      | 45.39                             | 60.00                                 | 14.61         | Pass    | A39                                    |
| 5.261             | 2                      | 44.72                             | 60.00                                 | 15.28         | Pass    | A40                                    |

#### Average detector

| Frequency,<br>MHz | Line<br>identification | Measured<br>emissions,<br>dB (mV) | Specification<br>AVRG limit,<br>dB (mV) | Margin,<br>dB | Verdict | Reference to<br>Plots in<br>Appendix A |
|-------------------|------------------------|-----------------------------------|-----------------------------------------|---------------|---------|----------------------------------------|
| 0.177             | 2                      | 44.45                             | 54.68                                   | 10.23         | Pass    | A40                                    |
| 0.236             | 1                      | 40.36                             | 52.27                                   | 11.91         | Pass    | A39                                    |
| 0.472             | 1                      | 41.84                             | 46.53                                   | 4.69          | Pass    | A39                                    |
| 0.532             | 2                      | 41.95                             | 46.00                                   | 4.05          | Pass    | A40                                    |
| 0.828             | 2                      | 41.85                             | 46.00                                   | 4.15          | Pass    | A40                                    |
| 0.887             | 2                      | 42.32                             | 46.00                                   | 3.68          | Pass    | A40                                    |
| 0.943             | 1                      | 40.90                             | 46.00                                   | 5.10          | Pass    | A39                                    |
| 1.242             | 2                      | 41.68                             | 46.00                                   | 4.32          | Pass    | A40                                    |
| 5.189             | 1                      | 42.81                             | 50.00                                   | 7.19          | Pass    | A39                                    |
| 5.261             | 2                      | 40.85                             | 50.00                                   | 9.15          | Pass    | A40                                    |



### Laptop power lines, transmit and receive modes

#### Quasi-peak detector

| Frequency, MHz | Line identification | Measured emissions, dB (mV) | Specification QP limit, dB (mV) | Margin, dB | Verdict | Reference to Plots in Appendix A |
|----------------|---------------------|-----------------------------|---------------------------------|------------|---------|----------------------------------|
| 0.163          | 1                   | 46.48                       | 65.34                           | 18.86      | Pass    | A41                              |
| 0.203          | 2                   | 49.71                       | 63.52                           | 13.81      | Pass    | A42                              |
| 0.268          | 2                   | 44.09                       | 61.23                           | 17.14      | Pass    | A42                              |
| 0.403          | 1                   | 42.75                       | 57.80                           | 15.05      | Pass    | A41                              |
| 0.470          | 1                   | 35.68                       | 56.56                           | 20.88      | Pass    | A41                              |
| 0.540          | 2                   | 36.84                       | 56.00                           | 19.16      | Pass    | A42                              |

#### Average detector

| Frequency, MHz | Line identification | Measured emissions, dB (mV) | Specification AVR limit, dB (mV) | Margin, dB | Verdict | Reference to Plots in Appendix A |
|----------------|---------------------|-----------------------------|----------------------------------|------------|---------|----------------------------------|
| 0.163          | 1                   | 16.38                       | 55.34                            | 38.96      | Pass    | A41                              |
| 0.203          | 2                   | 41.30                       | 53.52                            | 12.22      | Pass    | A42                              |
| 0.268          | 2                   | 37.79                       | 51.23                            | 13.44      | Pass    | A42                              |
| 0.403          | 1                   | 41.25                       | 47.80                            | 6.55       | Pass    | A41                              |
| 0.470          | 1                   | 33.34                       | 46.56                            | 13.22      | Pass    | A41                              |
| 0.540          | 2                   | 35.58                       | 46.00                            | 10.42      | Pass    | A42                              |

#### LIMIT

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

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

#### TEST PROCEDURE

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

#### TEST EQUIPMENT USED:

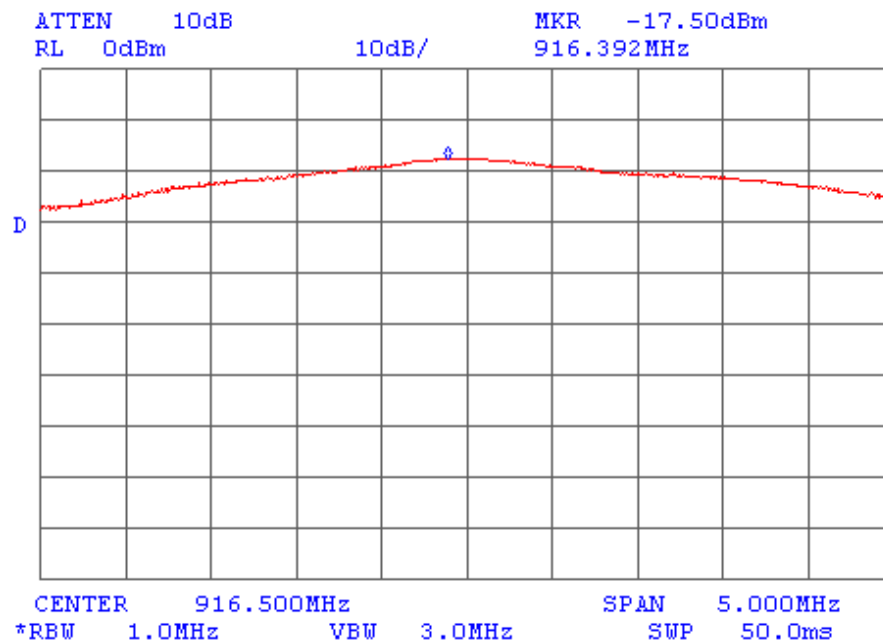
|         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|--|--|
| HL 0163 | HL 0787 | HL 1430 | HL 1502 | HL 1510 |  |  |
|---------|---------|---------|---------|---------|--|--|



## Appendix A Plots

Plot A 1

Output power measurement result



External attenuation (attenuator + cable loss) 30.4 dB  
Output power=-17.5 dBm+30.4 dB = 12.9 dBm = 19.5 mW

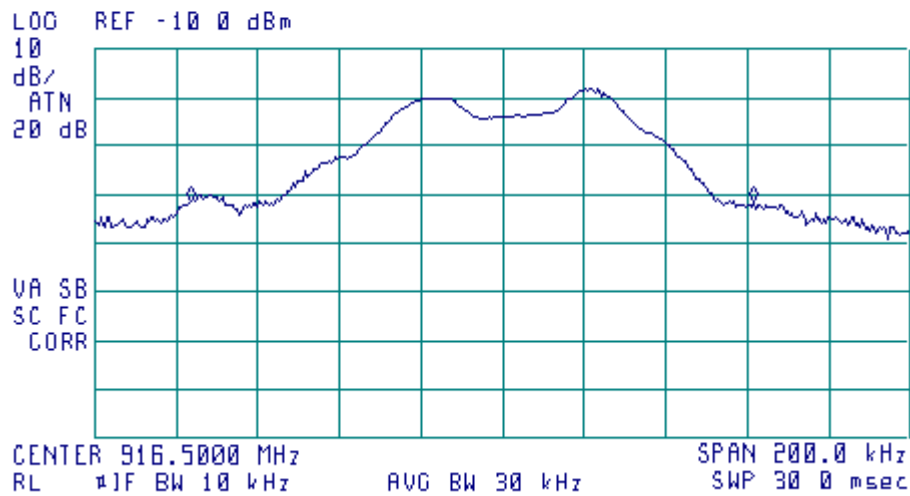


Plot A 2

23 dB bandwidth measurement result

14:05:33 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKRΔ 138.0 kHz  
-.05 dB



Limit=12 MHz

Note: Measurement was performed in continuous transmission mode

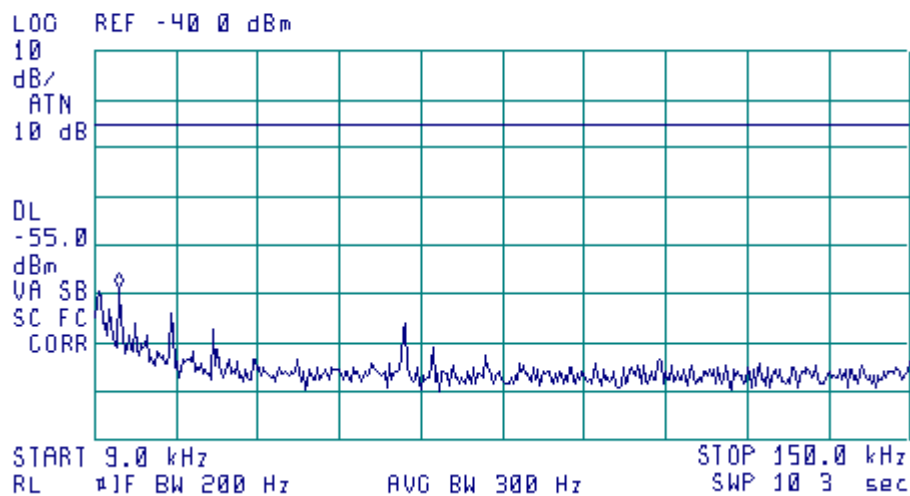


Plot A 3

Conducted spurious emission measurements in Tx mode from 9 kHz to 150 kHz

13:42:30 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 13.2 kHz  
-88.58 dBm



All spurious emissions were found more than 30 dB below the limit

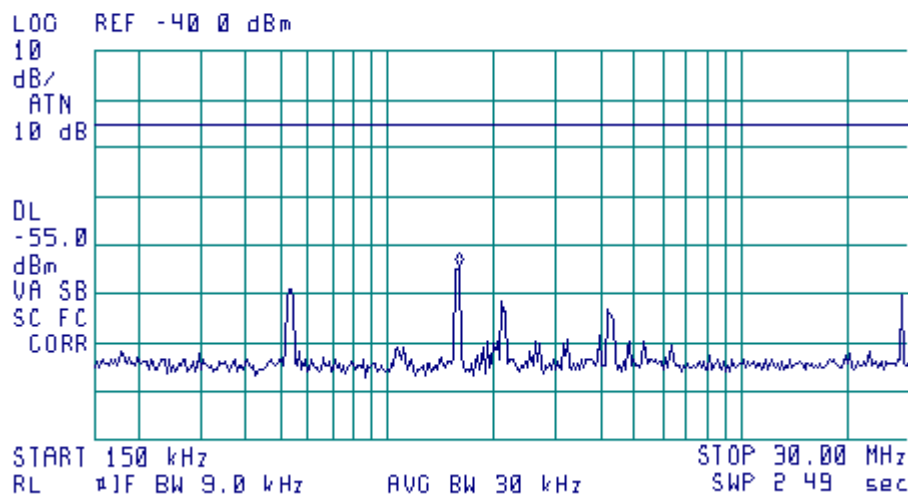


Plot A 4

Conducted spurious emission measurements in Tx mode from 150 kHz to 30 MHz

13:38:06 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 1.62 MHz  
-84.44 dBm



All spurious emissions were found more than 25 dB below the limit



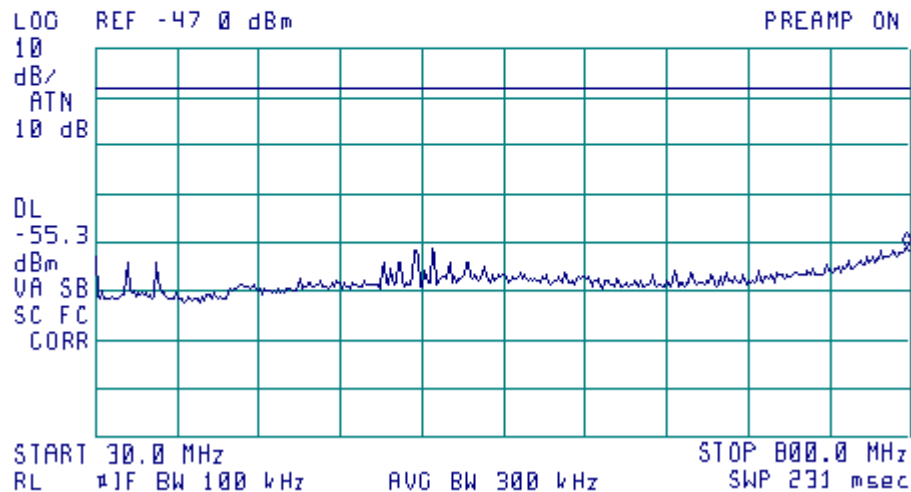


Plot A 5

Conducted spurious emission measurements in Tx mode from 30 MHz to 800 MHz

13:31:27 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 796.2 MHz  
-87.86 dBm



All spurious emissions were found more than 30 dB below the limit

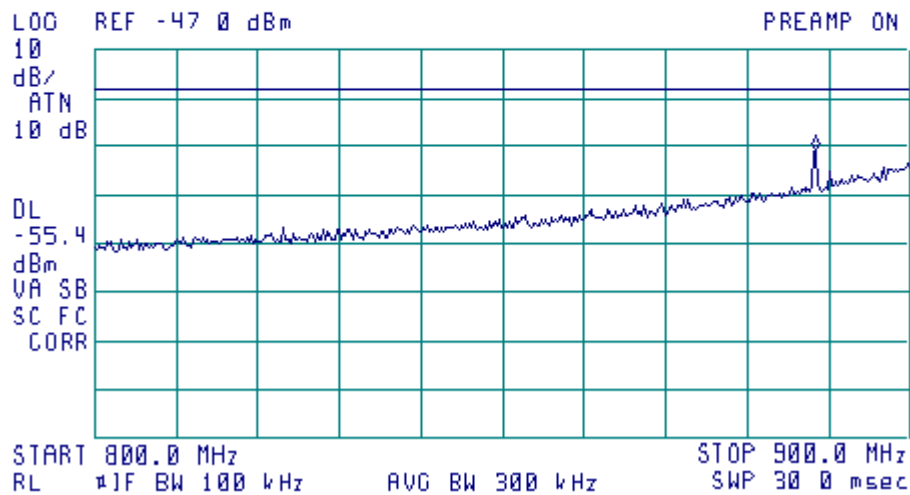


Plot A 6

Conducted spurious emission measurements in Tx mode from 800 MHz to 900 MHz

13:25:25 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 888.3 MHz  
-67.88 dBm



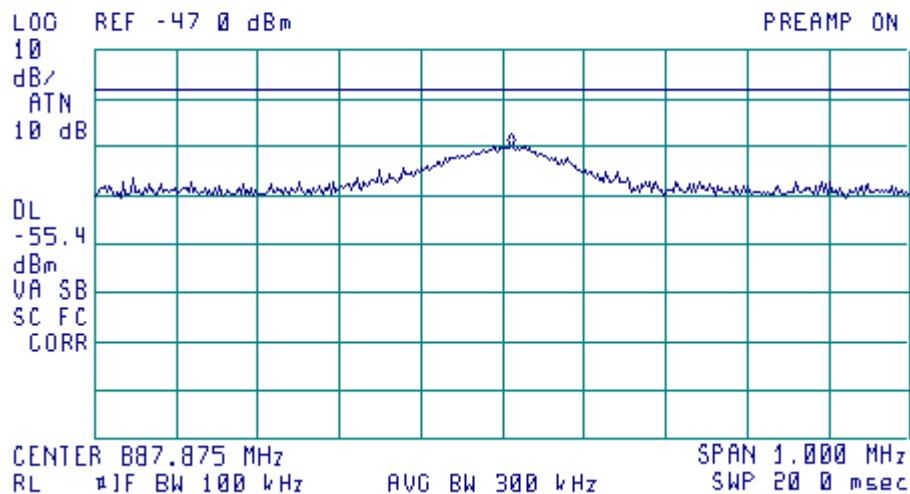


Plot A 7

Conducted spurious emission measurements in Tx mode

13:26:55 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 887.885 MHz  
-67.13 dBm



External attenuation (attenuator + cable loss) is 30.4 dB  
 $P = -67.13 \text{ dBm} + 30.4 \text{ dB} = -36.73 \text{ dBm}$   
Limit=-25 dBm  
Verdict: PASS

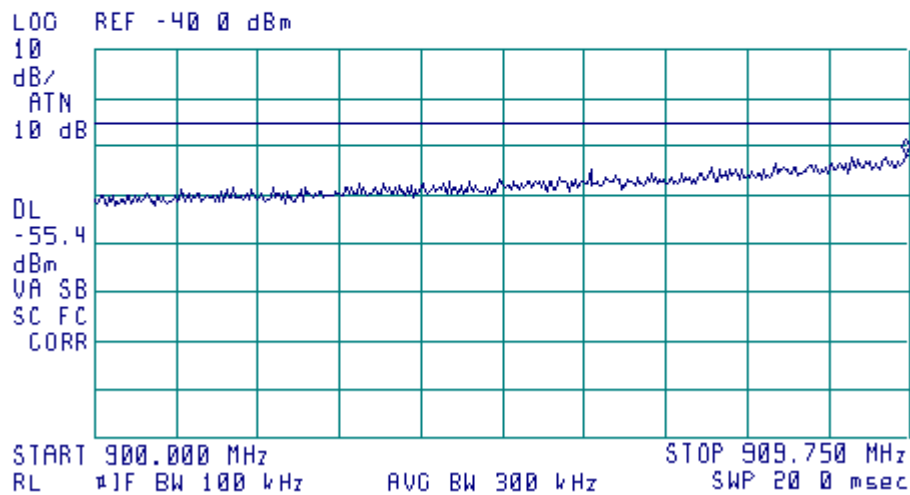


Plot A 8

Conducted spurious emission measurements in Tx mode from 900 MHz to 909.75 MHz (band edges)

14:19:53 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 909.701 MHz  
-61.31 dBm



External attenuation (attenuator + cable loss) is 30.4 dB  
 $P = -61.31 \text{ dBm} + 30.4 \text{ dB} = -30.91 \text{ dBm}$   
Limit = -25 dBm  
Verdict: PASS

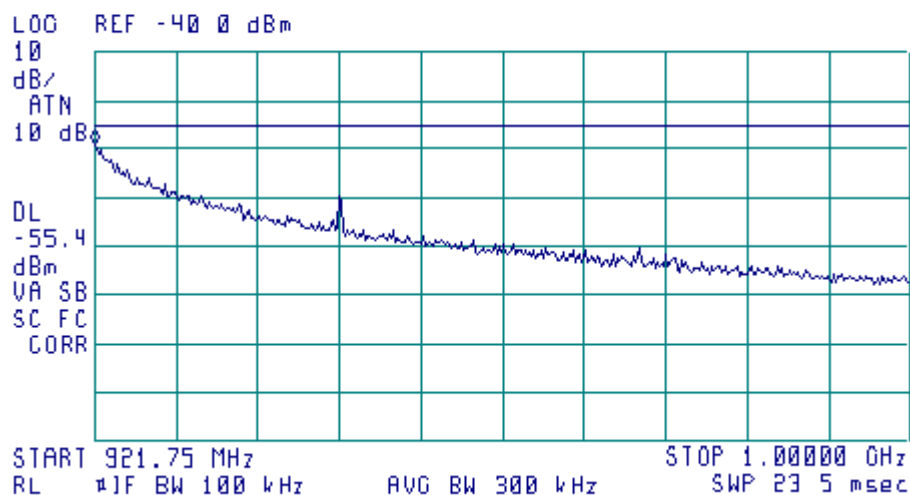


Plot A 9

Conducted spurious emission measurements in Tx mode from 921.75 MHz to 1000 MHz (band edges)

14:23:41 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 921.75 MHz  
-59.00 dBm



External attenuation (attenuator + cable loss) is 30.4 dB  
 $P = -59 \text{ dBm} + 30.4 \text{ dB} = -28.6 \text{ dBm}$   
Limit=-25 dBm  
Verdict: PASS

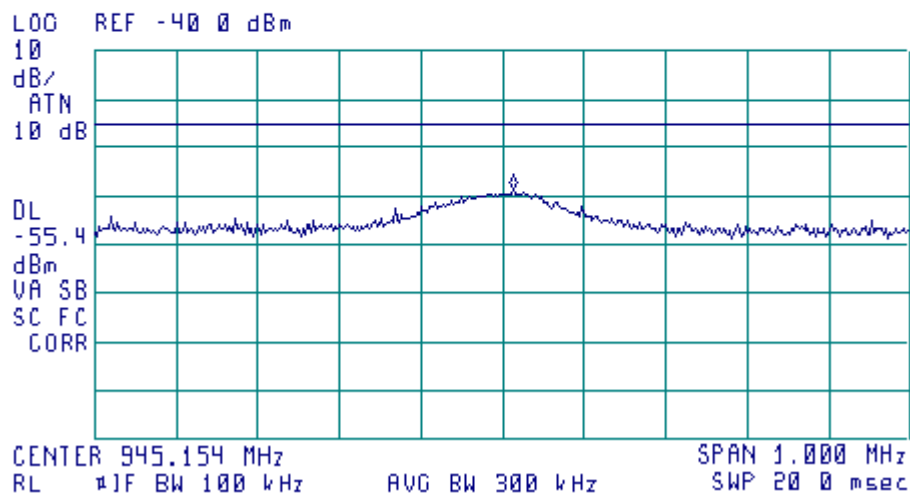


Plot A 10

Conducted spurious emission measurements in Tx mode

14:50:28 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 945.167 MHz  
-68.69 dBm



External attenuation (attenuator + cable loss) is 30.4 dB  
 $P = -68.69 \text{ dBm} + 30.4 \text{ dB} = -38.29 \text{ dBm}$   
Limit=-25 dBm  
Verdict: PASS

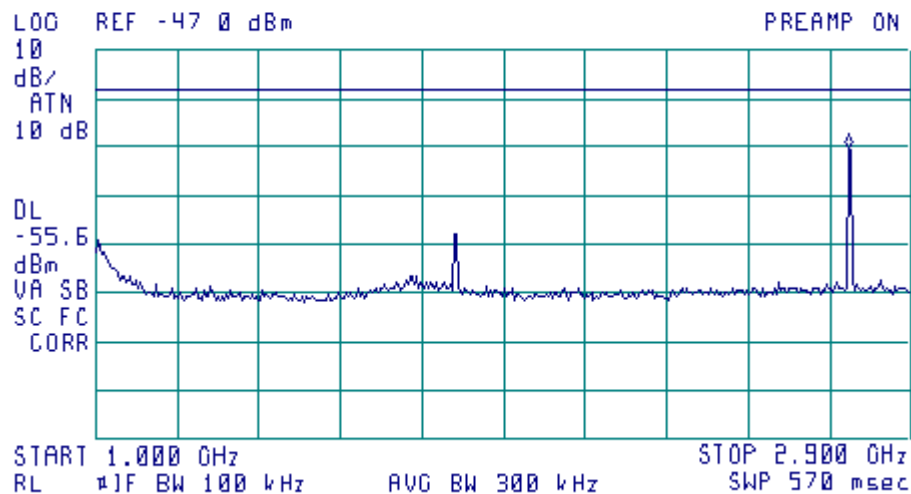


Plot A 11

Conducted spurious emission measurements in Tx mode from 1000 MHz to 2.900 GHz

12:21:54 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.753 GHz  
-67.55 dBm



External attenuation (attenuator + cable loss) is 30.6 dB

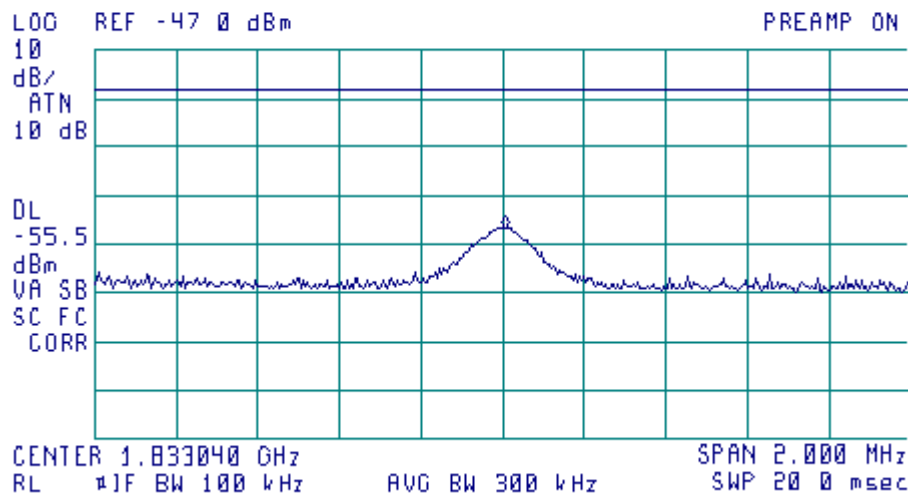


Plot A 12

Conducted spurious emission measurements in Tx mode, 2<sup>nd</sup> harmonic of fundamental

12:28:29 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 1.833045 GHz  
-83.85 dBm



External attenuation (attenuator + cable loss) is 30.5 dB

$P = -83.85 \text{ dBm} + 30.5 \text{ dB} = -53.35 \text{ dBm}$

Limit=-25 dBm

Verdict: PASS



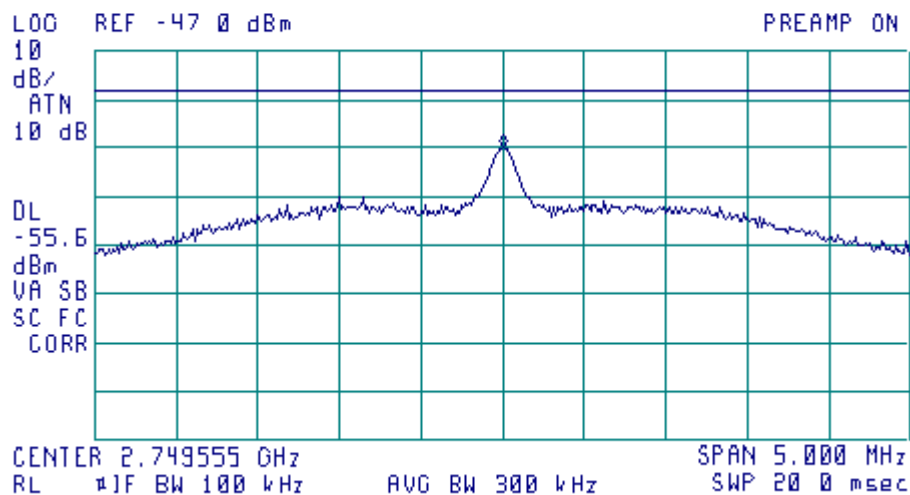


Plot A 13

Conducted spurious emission measurements in Tx mode, 3<sup>rd</sup> harmonic of fundamental

12:33:16 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.749555 GHz  
-67.18 dBm

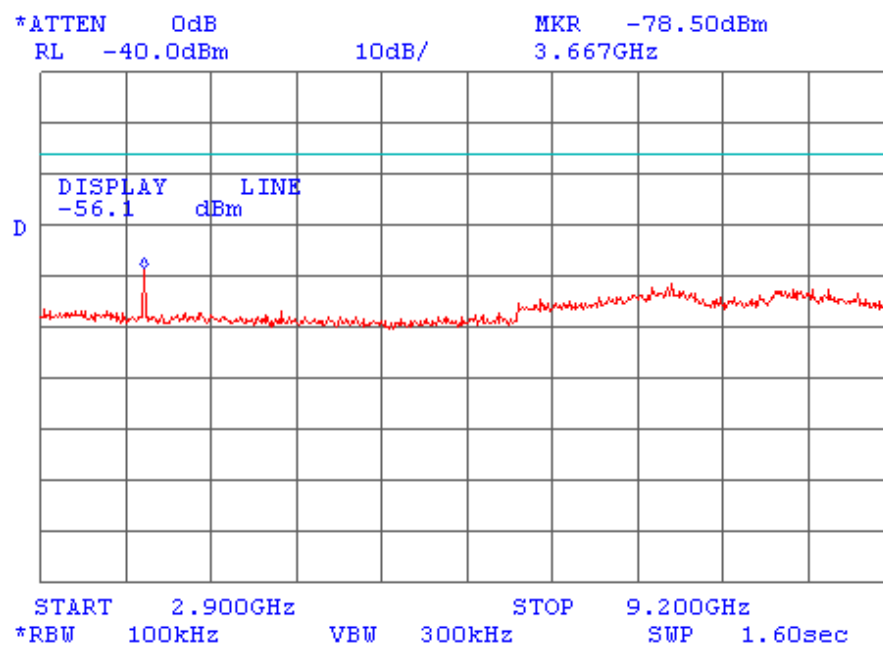


External attenuation (attenuator + cable loss) is 30.6 dB  
 $P = -67.18 \text{ dBm} + 30.6 \text{ dB} = -36.58 \text{ dBm}$   
Limit = -25 dBm  
verdict: PASS



Plot A 14

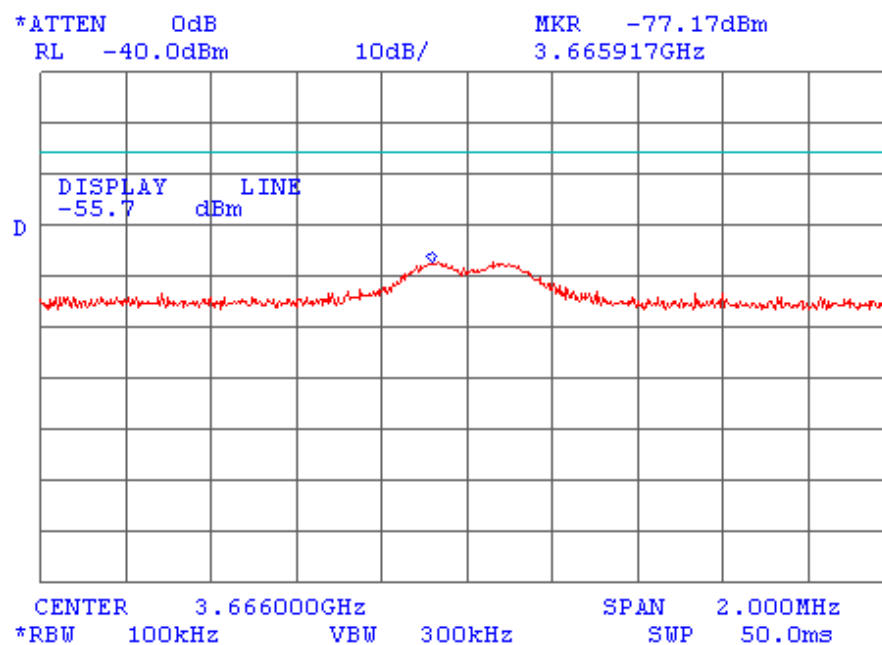
Conducted spurious emission measurements in Tx mode from 2.900 GHz to 9.200 GHz





Plot A 15

Conducted spurious emission measurements in Tx mode, 4<sup>th</sup> harmonic of fundamental



External attenuation (attenuator + cable loss) is 30.7 dB  
 $P = -77.17 \text{ dBm} + 30.7 \text{ dB} = -46.47 \text{ dBm}$   
Limit = -25 dBm  
Verdict: PASS

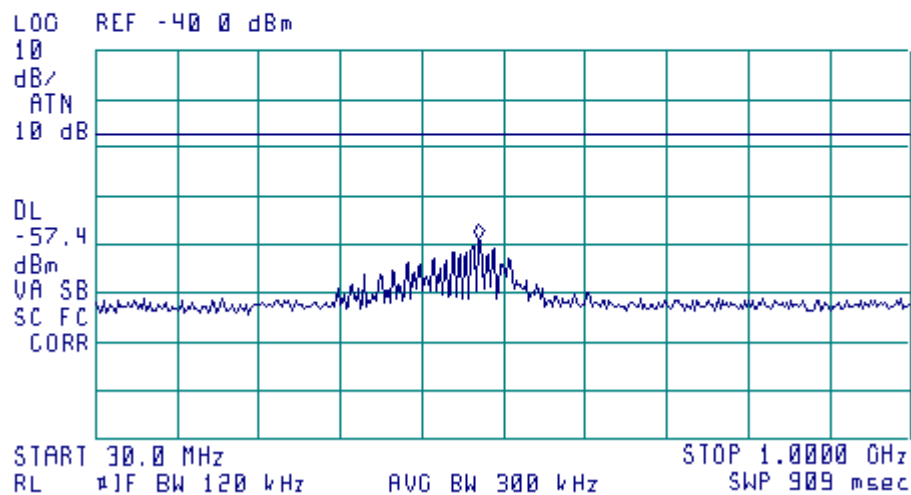


Plot A 16

Conducted spurious emission measurements in Rx mode from 30 MHz to 1000 MHz

15:05:18 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 485.9 MHz  
-78.78 dBm



Limit = 2 nW = -57 dBm

Cable loss 0.4 dB

All spurious emissions found more than 20 dB below the limit

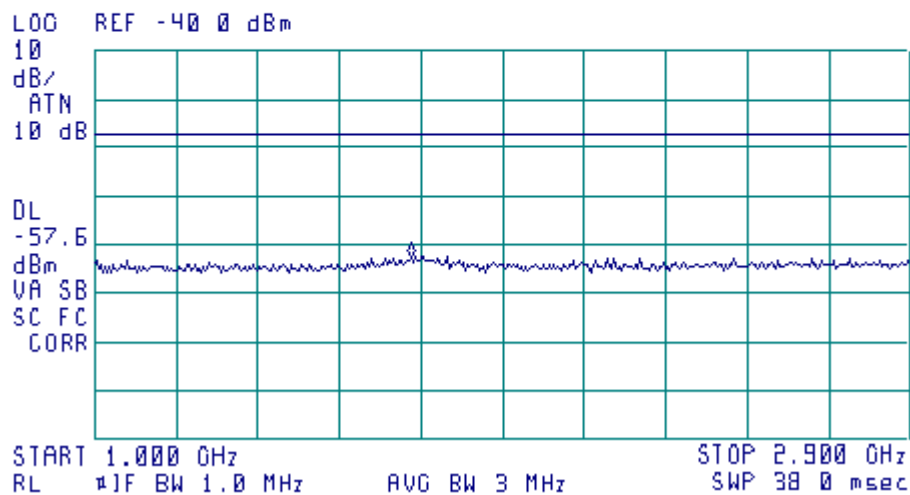


Plot A 17

Conducted spurious emission measurements in Rx mode from 1.000 GHz to 2.900 GHz

15:07:34 DEC 08, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 1.736 GHz  
-82.47 dBm



Limit=2 nW=-57 dBm

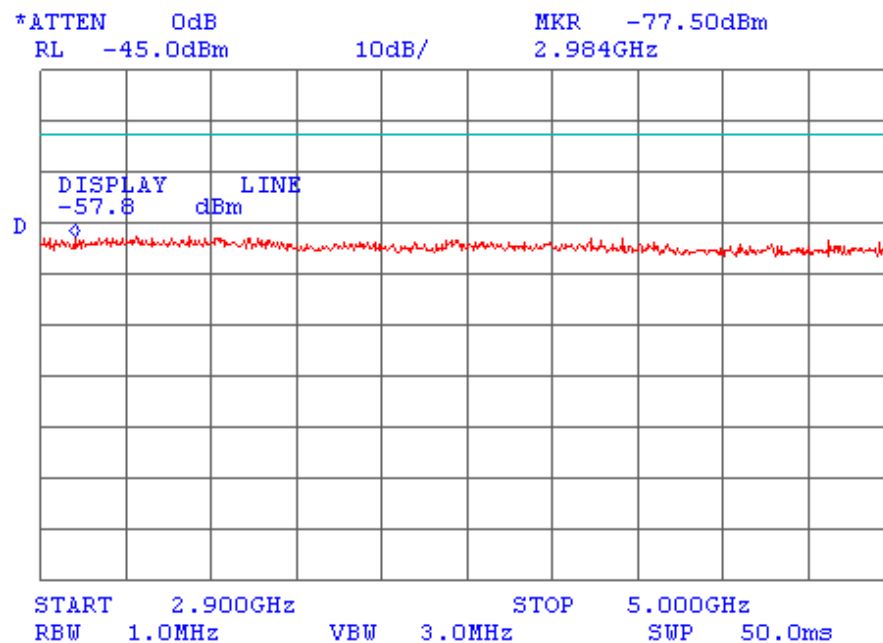
Cable loss 0.6 dB

No spurious emissions were found



Plot A 18

Conducted spurious emission measurements in Rx mode from 2.900 GHz to 5.000 GHz



Limit=2 nW=-57 dBm

Cable loss 0.8 dB

No spurious emissions were found

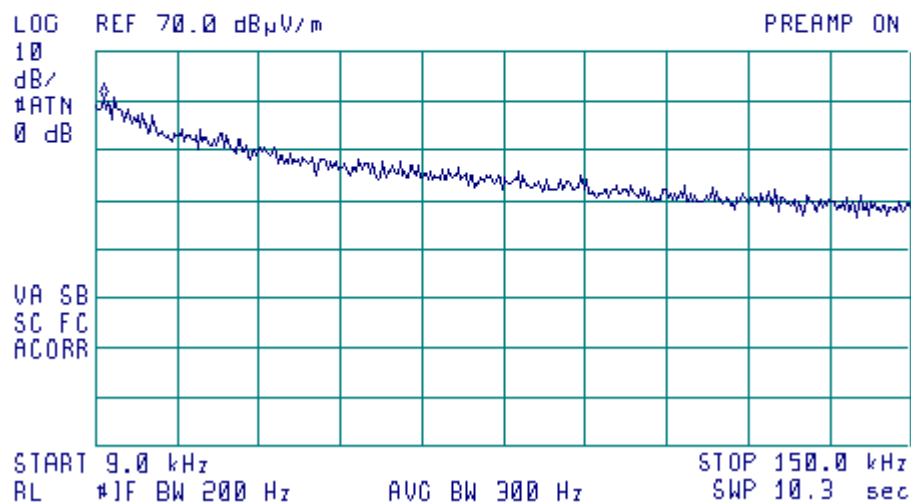


Plot A 19

Radiated spurious emission measurements in Tx mode in the anechoic chamber from 9 kHz to 150 kHz

13:58:29 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 10.4 kHz  
60.65 dB $\mu$ V/m



No spurious emissions were found.

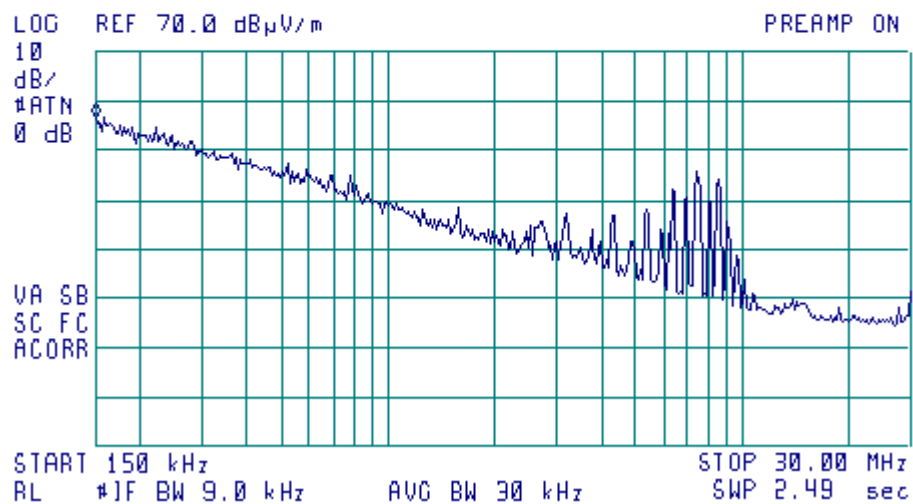


Plot A 20

Radiated spurious emission measurements in Tx mode in the anechoic chamber from 150 kHz to 30 MHz

13:46:48 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKA 150 kHz  
56.58 dB $\mu$ V/m





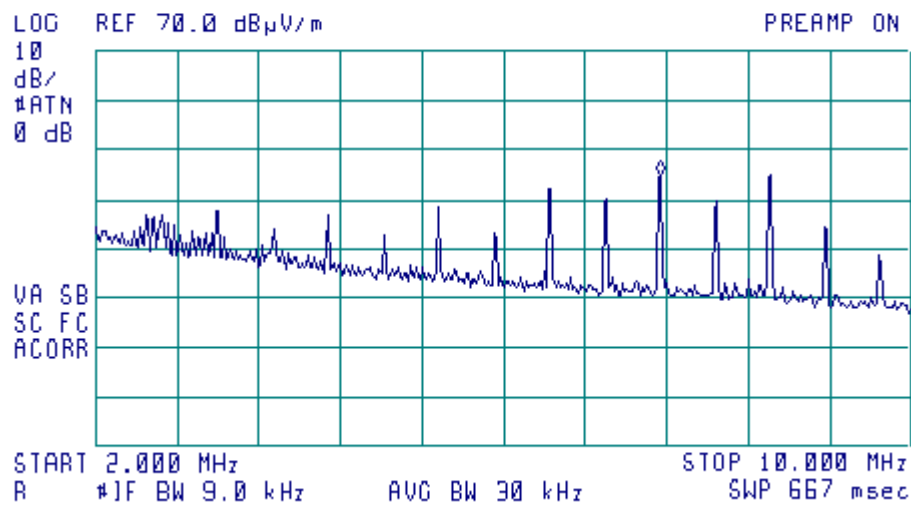


Plot A 21

Radiated spurious emission measurements in Tx mode in the anechoic chamber from 2 MHz to 10 MHz

13:53:35 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 7.540 MHz  
45.12 dB $\mu$ V/m



All found spurious emissions are more than 20 dB below the limit.

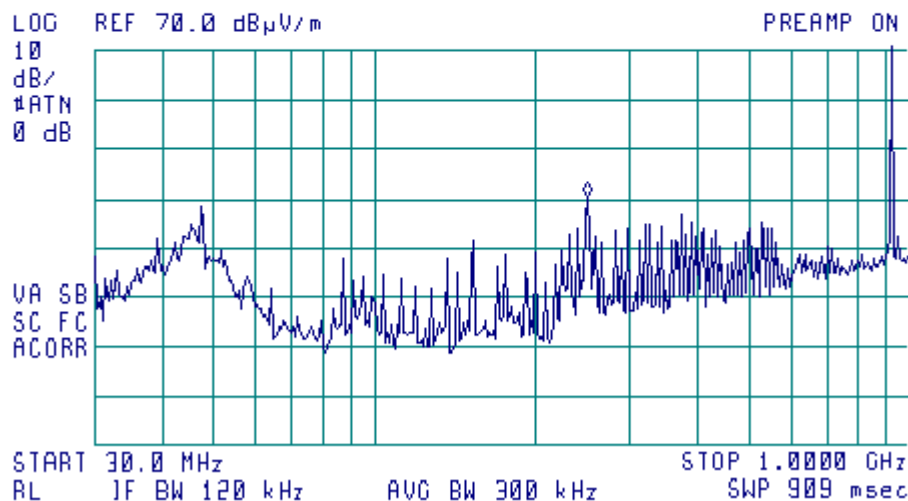


Plot A 22

Radiated spurious emission measurements in Tx mode in the anechoic chamber from 30 MHz to 1000 MHz

11:11:19 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 248.5 MHz  
40.33 dB $\mu$ V/m



Limit: -25 dBm ERP {70 dB( $\mu$ V/m)}

All spurious emissions were found at least 30 dB below the limit.

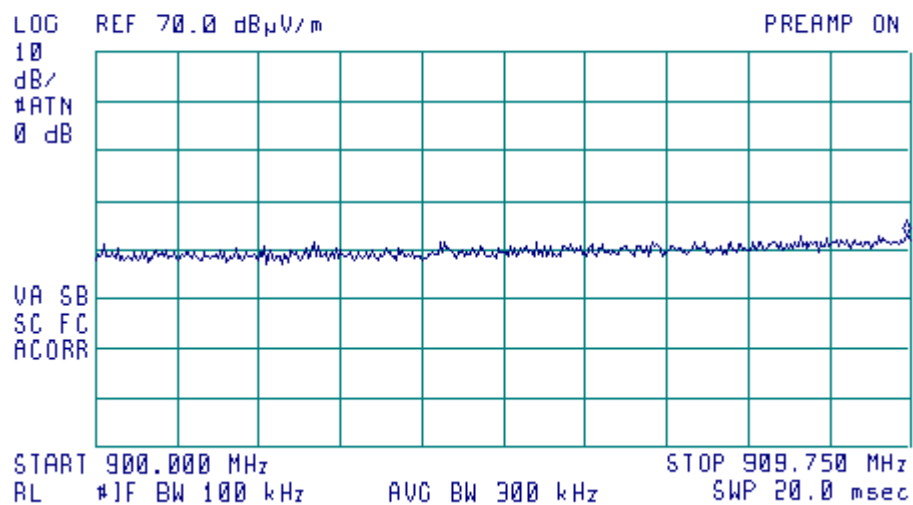


Plot A 23

Radiated spurious emission measurements in Tx mode in the anechoic chamber

14:28:26 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 909.701 MHz  
32.90 dB $\mu$ V/m



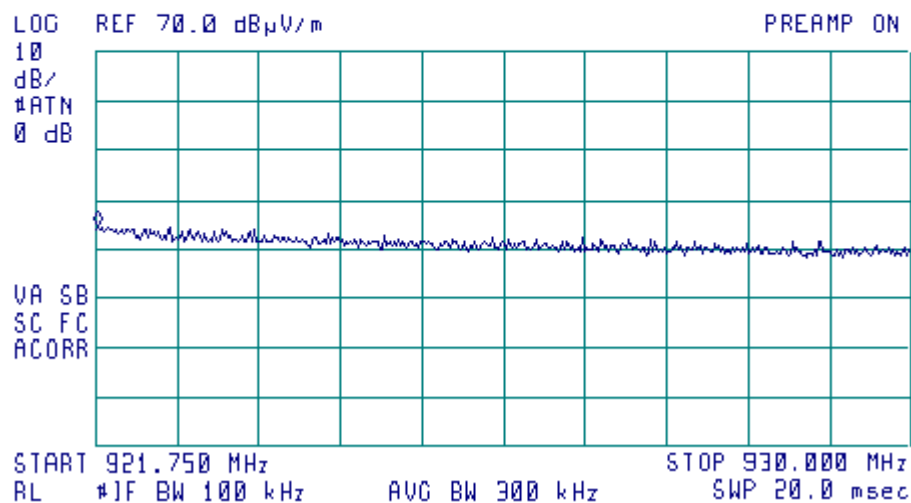


Plot A 24

Radiated spurious emission measurements in Tx mode in the anechoic chamber

14:30:29 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 921.771 MHz  
34.00 dB $\mu$ V/m



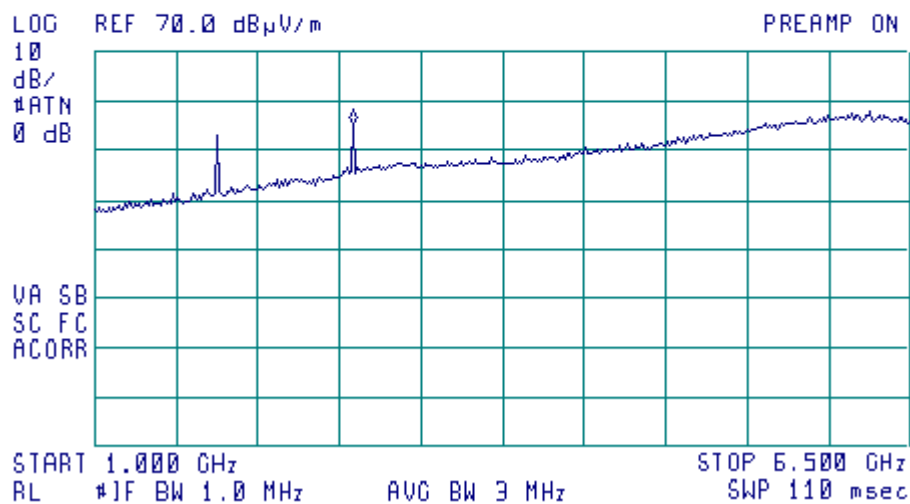


Plot A 25

Radiated spurious emission measurements in Tx mode in the anechoic chamber from 1 GHz to 6.5 GHz

13:21:18 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.756 GHz  
55.24 dB $\mu$ V/m

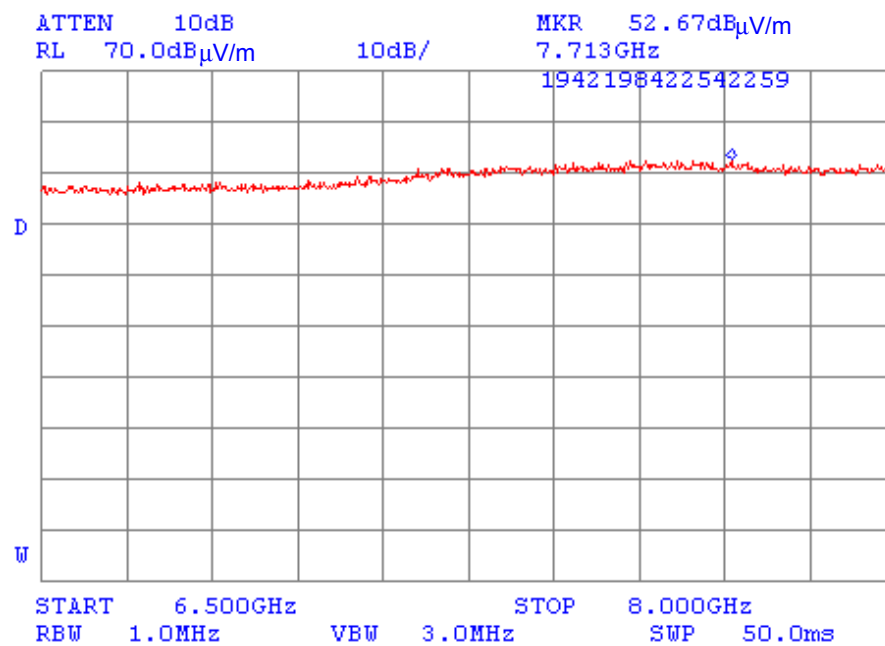


No spurious emissions were found except the 2<sup>nd</sup> and 3<sup>rd</sup> harmonics of fundamental.  
Tested by substitution method at OATS, for test results refer to Table 4.3.2.



Plot A 26

Radiated spurious emission measurements in Tx mode at the OATS from 6.5 GHz to 8 GHz

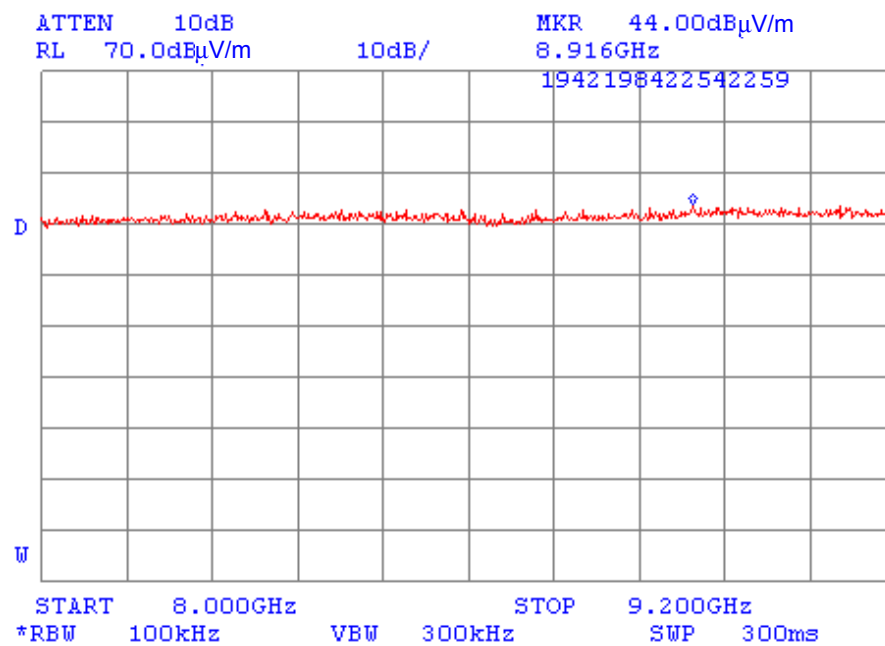


No spurious emissions were found.



Plot A 27

Radiated spurious emission measurements in Tx mode at the OATS from 8 GHz to 9.2 GHz



No spurious emissions were found.

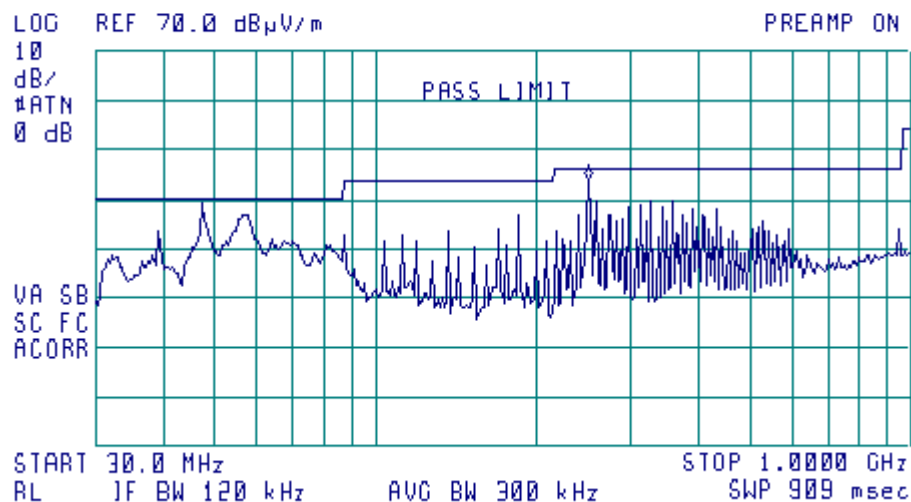


Plot A 28

Radiated emission measurements in the anechoic chamber from 30 MHz to 1000 MHz,  
test distance 3 m, vertical & horizontal antenna polarization, model number IG-RS-46D9-916

11:50:21 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 248.5 MHz  
44.11 dB $\mu$ V/m





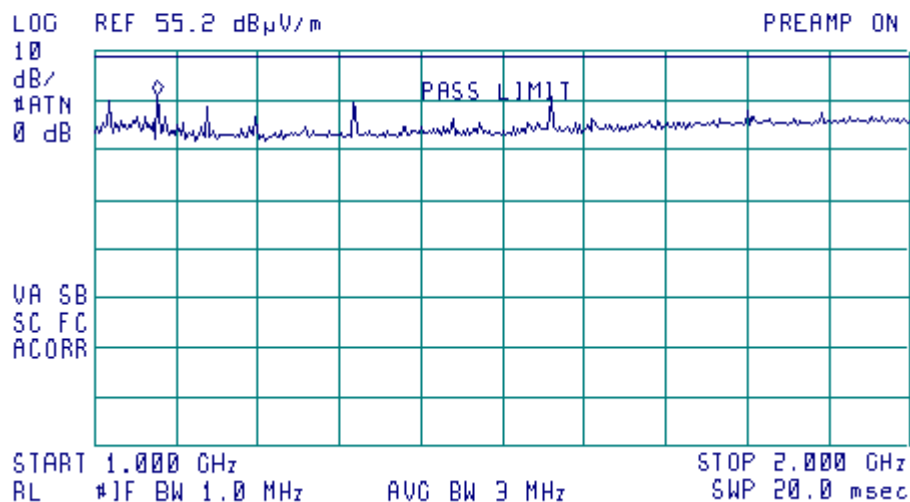


Plot A 29

Radiated emission measurements in the anechoic chamber from 1 GHz to 2 GHz,  
test distance 3 m, vertical & horizontal antenna polarization, model number IG-RS-46D9-916

11:58:16 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 1.078 GHz  
46.27 dB $\mu$ V/m



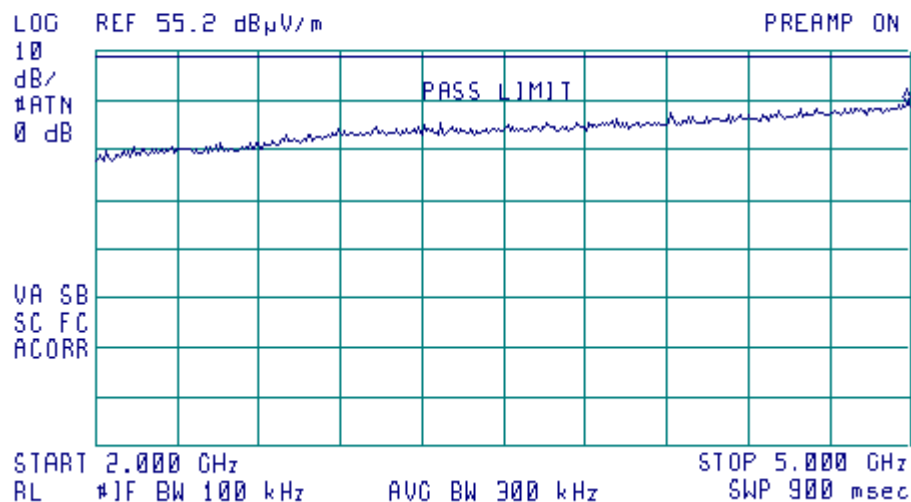


Plot A 30

Radiated emission measurements in the anechoic chamber from 2 GHz to 5 GHz,  
test distance 3 m, vertical & horizontal antenna polarization, model number IG-RS-46D9-916

12:52:09 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 4.985 GHz  
44.57 dB $\mu$ V/m



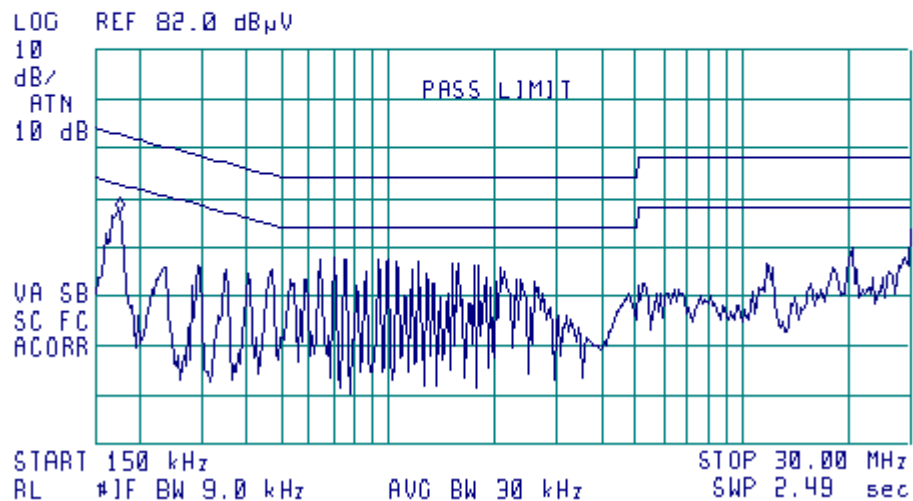


Plot A 31

Conducted emission measurements test results at the EUT AC first line,  
model IG-RS-46D9-916 in receive mode

15:26:57 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKA 100 kHz  
49.35 dB $\mu$ V



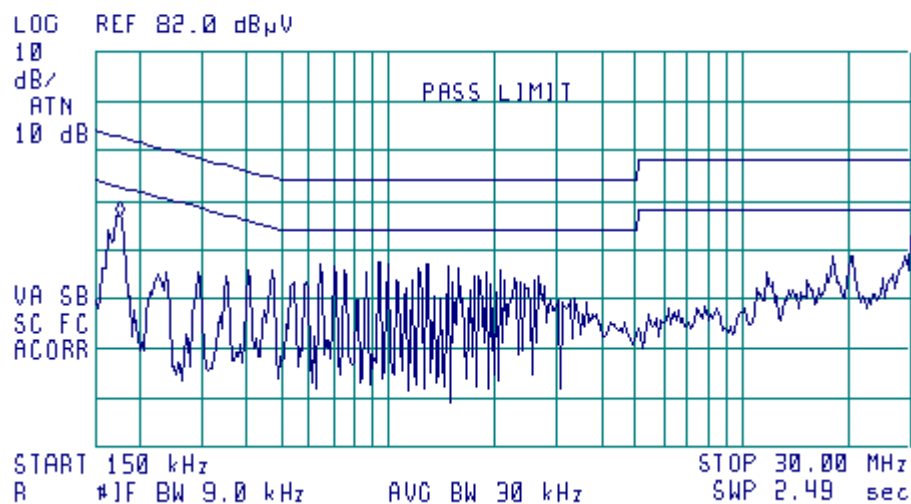


Plot A 32

Conducted emission measurements test results at the EUT AC second line,  
model IG-RS-46D9-916 in receive mode

15:41:27 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKA 100 kHz  
48.77 dBμV



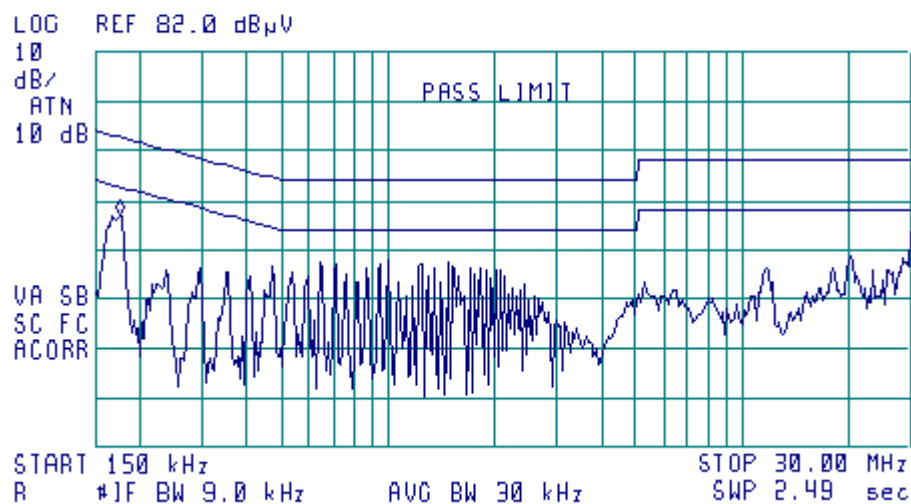


Plot A 33

Conducted emission measurements test results at the EUT AC first line,  
model IG-RS-46D9-916 in transmit mode

15:58:32 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKA 100 kHz  
49.12 dBμV



The same results as in receive mode

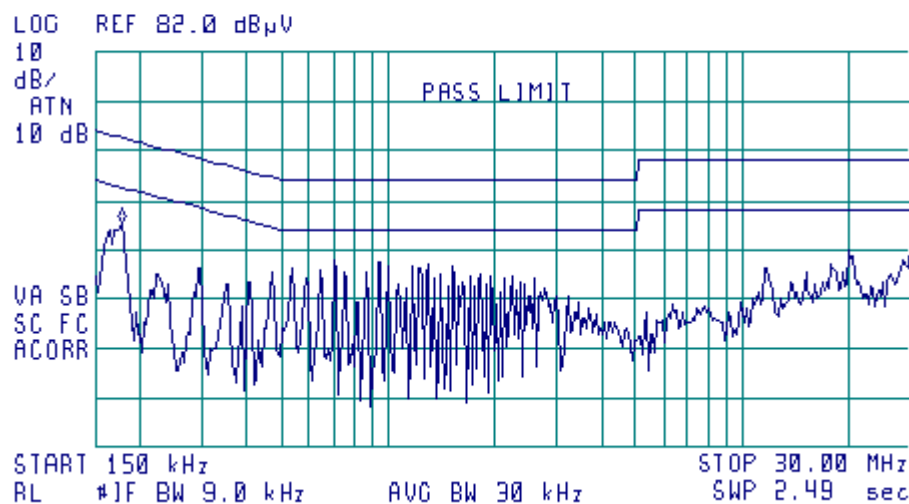


Plot A 34

Conducted emission measurements test results at the EUT AC second line,  
model IG-RS-46D9-916 in transmit mode

15:50:59 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKA 100 kHz  
47.45 dBμV



The same results as in receive mode

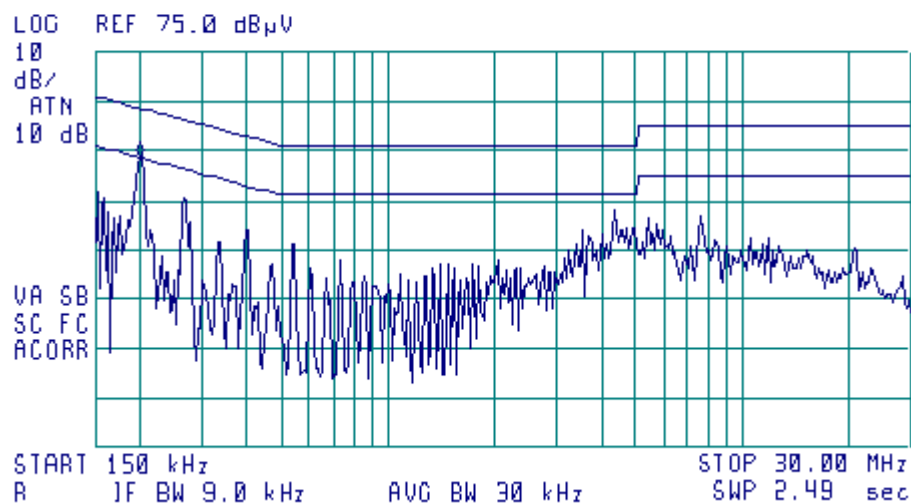


Plot A 35

Conducted emission measurements test results at the laptop AC first line,  
model IG-RS-46D9-916 in receive mode

16:26:57 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKA 200 kHz  
53.94 dBμV



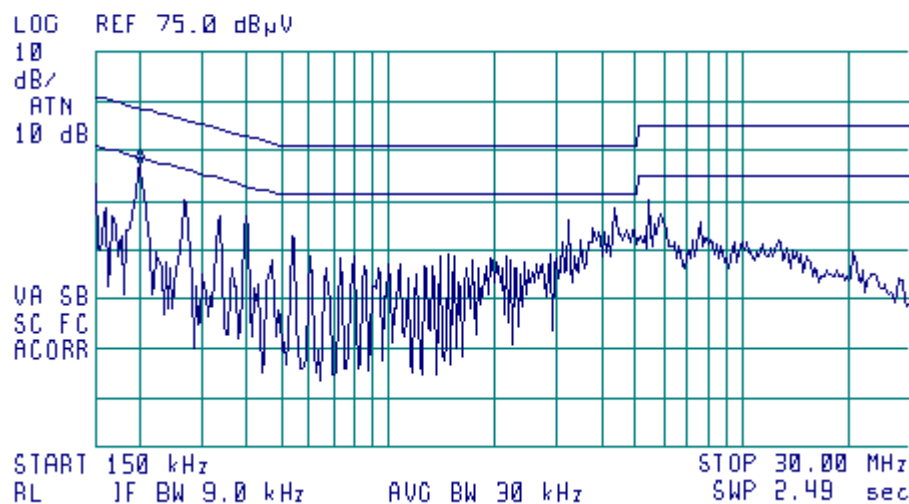


Plot A 36

Conducted emission measurements test results at the laptop AC second line,  
model IG-RS-46D9-916 in receive mode

16:35:36 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 200 kHz  
52.51 dBμV





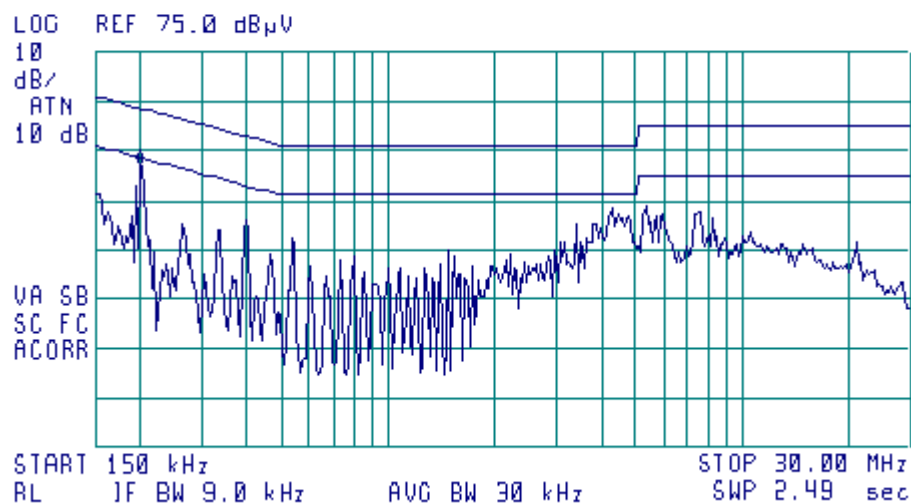


Plot A 37

Conducted emission measurements test results at the laptop AC first line,  
model IG-RS-46D9-916 in transmit mode

16:45:31 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 200 kHz  
52.24 dBμV



The same results as in receive mode

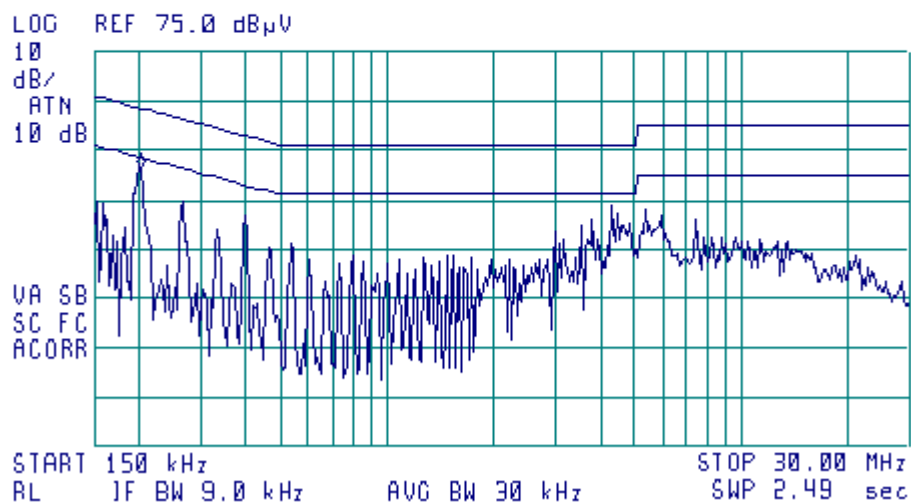


Plot A 38

Conducted emission measurements test results at the laptop AC second line,  
model IG-RS-46D9-916 in transmit mode

16:43:14 DEC 07, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 200 kHz  
51.56 dBμV



The same results as in receive mode

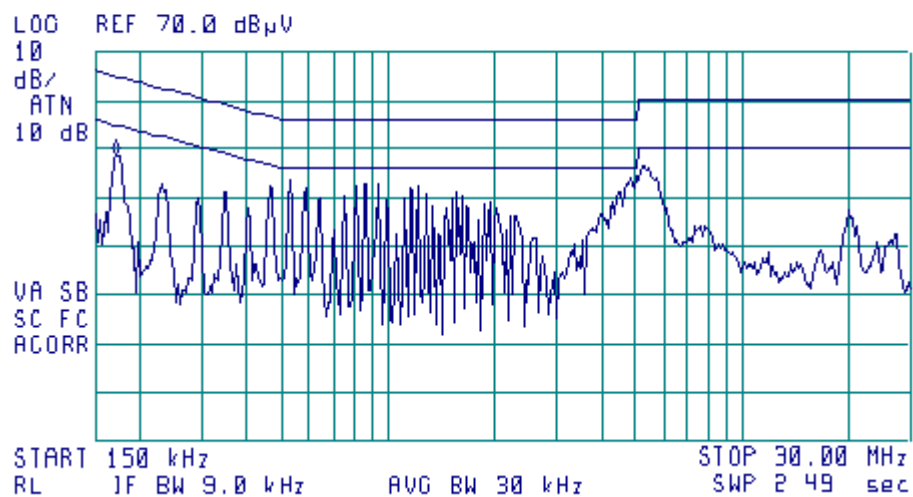


Plot A 39

Conducted emission measurements test results at the EUT AC first line,  
model IG-RS-43D9-916 in transmit and receive mode



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 170 kHz  
4B 87 dB $\mu$ V



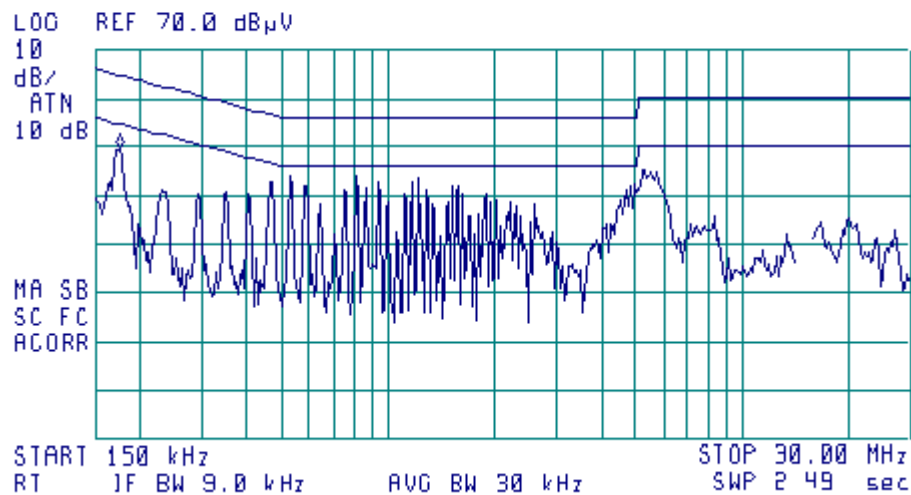


Plot A 40

Conducted emission measurements test results at the EUT AC second line,  
model IG-RS-43D9-916 in transmit and receive mode



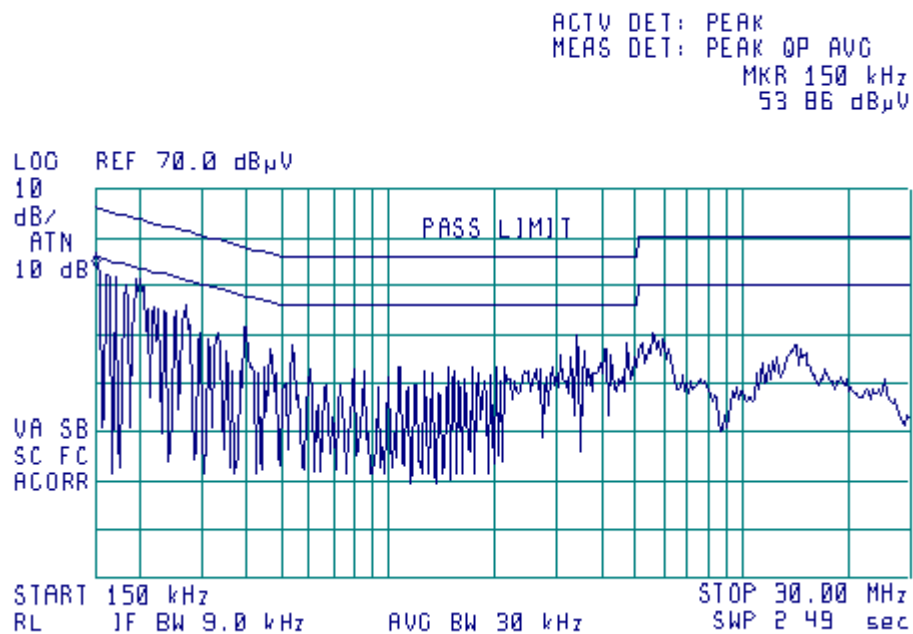
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 100 kHz  
49 43 dB $\mu$ V





Plot A 41

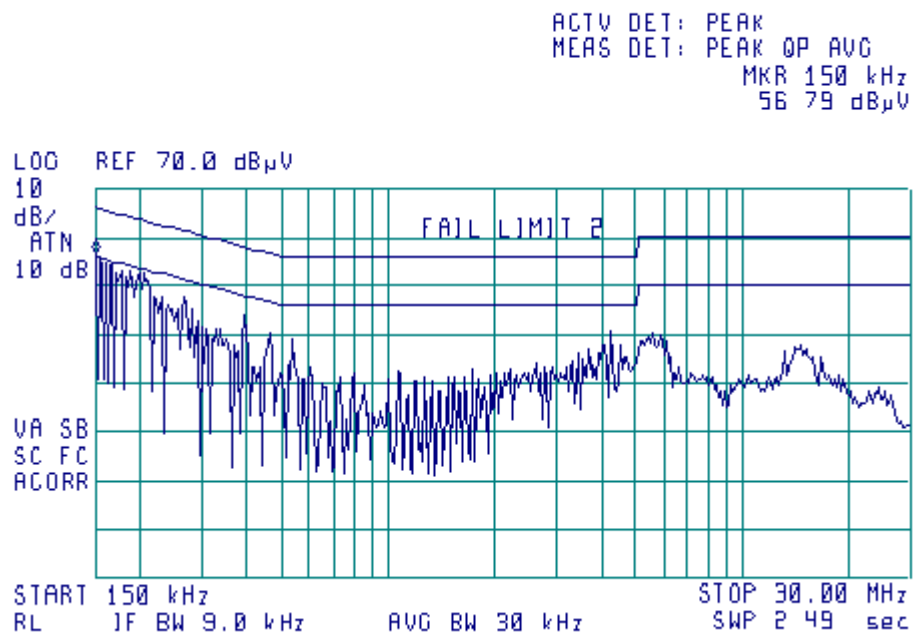
Conducted emission measurements test results at the laptop AC first line,  
model IG-RS-43D9-916 in transmit and receive mode





Plot A 42

Conducted emission measurements test results at the laptop AC second line,  
model IG-RS-43D9-916 in transmit and receive mode





## Appendix B Test equipment used for tests

| HL<br>Serial<br>No. | Description                                                                | Manufacturer information |                |            | Due<br>Calibr.<br>Month/<br>year |
|---------------------|----------------------------------------------------------------------------|--------------------------|----------------|------------|----------------------------------|
|                     |                                                                            | Name                     | Model No.      | Serial No. |                                  |
| 0026                | Spectrum analyzer,<br>100 Hz-2.2 GHz                                       | Anritsu                  | MS 2601A       | 3460       | 9/04                             |
| 0032                | Biconical antenna,<br>20-200 MHz                                           | Electro-Metrics          | BIA-25/30      | 3577       | 4/04                             |
| 0034                | Log periodic antenna,<br>200 - 1000 MHz                                    | Electro-Metrics          | LPA 25/30      | 1988       | 1/05                             |
| 0038                | Antenna mast, 1-4 m                                                        | Hermon Labs              | AM-1           | 028        | 2/04<br>check                    |
| 0091                | Position controller for antenna mast +<br>turntable, OFTS                  | Hermon Labs              | CRL-2          | 091        | 4/04<br>check                    |
| 0163                | LISN FCC/VDE/MIL -STD                                                      | Electro-Metrics          | ANS-25/2       | 1314       | 10/04                            |
| 0287                | Turntable, motorized diameter, 2 m                                         | Hermon Labs              | TMD-2          | 042        | 11/04<br>check                   |
| 0415                | Cable coax RF, RG-58                                                       | Hermon Labs              | CC-3           | 056        | 12/04                            |
| 0446                | Active loop antenna, 10 kHz-30 MHz                                         | Electro-Mechanics        | 6502           | 2857       | 10/04                            |
| 0447                | LISN, 16/2, 300 V RMS                                                      | Hermon Labs              | LISN 16-1      | 447        | 11/04                            |
| 0465                | Anechoic chamber<br>9 (L) x 6.5 (W) x 5.5 (H) m                            | Hermon Labs              | AC-1           | 023        | 10/05<br>check                   |
| 0493                | Oven temperature                                                           | Thermotron               | S-1.2 Mini-Max | 4016       | 9/04                             |
| 0495                | Autotransformer 0-255V, 10A                                                | Variac                   | EAB VARIAC     | 495        | 3/04                             |
| 0521                | Spectrum analyzer with RF filter section<br>(EMI receiver 9 kHz - 6.5 GHz) | Hewlett Packard          | 8546A          | 0319       | 9/04                             |
| 0558                | Multimeter digital                                                         | Fluke                    | 76             | 0904       | 10/04                            |
| 0589                | Cable coaxial, GORE A2POL118.2,<br>3 m                                     | Hermon Labs              | GORE-3         | 589        | 11/04                            |
| 0592                | Position controller                                                        | Hermon Labs              | L2-SR3000      | 100        | 5/04<br>check                    |
| 0593                | Antenna mast, 1-4 m/<br>1-6 m Pneumatic                                    | Hermon Labs              | AM-F1          | 101        | 2/04<br>check                    |
| 0594                | Turntable for Anechoic Chamber, flush<br>mounted, d=1.2 m, pneumatic       | Hermon Labs              | WDC1           | 102        | 1/05<br>check                    |
| 0604                | Antenna biconilog log-periodic/T Bow-<br>Tie, 26 - 2000 MHz                | EMCO                     | 3141           | 9611-1011  | 1/05                             |
| 0661                | Generator Swept Signal, 10MHz to<br>40GHz+ 10dBm                           | Hewlett Packard          | 83640B         | 0266       | 9/04                             |
| 0787                | Transient limiter                                                          | Hewlett Packard          | 11947A-8ZE     | 3107A01877 | 11/04                            |
| 0812                | Cable, coax, RG-214, 11.5 m, N-type<br>connectors                          | Hermon Labs              | C214-11        | 148        | 12/04                            |
| 1003                | Cable coaxial, M17/164, 10 m                                               | Hermon Labs              | C17164-10      | 161        | 11/04                            |
| 1004                | Cable, coaxial ANDREW PSWJ4, 6 m                                           | Hermon Labs              | ANDREW-6       | 163        | 12/04                            |



| HL<br>Serial<br>No. | Description                                                    | Manufacturer information  |                    |            | Due<br>Calibr.<br>Month/<br>year |
|---------------------|----------------------------------------------------------------|---------------------------|--------------------|------------|----------------------------------|
|                     |                                                                | Name                      | Model No.          | Serial No. |                                  |
| 1097                | Attenuator, 50 Ohm, 2 W, DC to 8 GHz, 20 dB                    | Midwest Microwave         | 0793-20-NN-07      | 1097       | 1/05                             |
| 1116                | Antenna horn, 1-18 GHz                                         | Hermon Labs               | A1-18              | 186        | 3/04                             |
| 1200                | Quadruplexer, 1-12 GHz                                         | Elettronica S.p.A. - Roma | UE 84              | 0240       | 4/04<br>check                    |
| 1207                | One phase voltage regulator, 2 kVA, 0-250V                     | Hermon Labs               | TDGC-2             | NA         | 6/04<br>check                    |
| 1365                | Cable coaxial, RG-214, 5 m                                     | Hermon Labs               | C214-5             | 1365       | 4/04                             |
| 1424                | Spectrum analyzer, 30 Hz - 40 GHz                              | Agilent Technologies      | 8564EC             | 3946A00219 | 8/04                             |
| 1430                | EMI receiver system, 9 kHz - 2.9 GHz                           | Agilent Technologies      | 8542E              | 3807A00262 | 9/04                             |
| 1502                | Cable RF, 6 m                                                  | Belden                    | M17/167 MIL-C-17   | 1502       | 12/04<br>check                   |
| 1503                | Cable RF, 6 m                                                  | Belden                    | M17/167 MIL-C-17   | 1503       | 9/04<br>check                    |
| 1510                | Cable RF, 8 m                                                  | Belden                    | M17/167 MIL-C-17   | 1510       | 12/04                            |
| 1942                | Cable 18 GHz, 4 m, blue                                        | Rhophase Microwave Ltd    | SPS-1803A-4000-NPS | T4658      | 10/04                            |
| 1947                | Cable 18 GHz, 6.5 m, blue                                      | Rhophase Microwave Ltd    | NPS-1803A-6500-NPS | T4974      | 10/04                            |
| 1984                | Antenna, double ridged waveguide horn, 1-18 GHz, 300 W, N-type | EMC Test Systems          | 3115               | 9911-5964  | 3/04                             |
| 1991                | Attenuator, DC – 18 GHz, 30 dB, 2 W                            | Midwest Microwave         | ATT 0290-30-SMA-02 | NA         | 11/04                            |
| 2009                | Cable RF, 8 m                                                  | Alpha Wire                | RG-214             | C-56       | 12/04                            |
| 2254                | Cable 40 GHz, 0.8 m, blue                                      | Rhophase Microwave        | KPS-1503A-800-KPS  | W4907      | 11/04                            |
| 2259                | Amplifier Low Noise 2-20 GHz                                   | Sophia Wireless           | LNA0220-C          | 0223       | 11/04                            |
| 2400                | Cable 40 GHz, 1.5 m, green                                     | Rhophase Microwave Ltd.   | KPS-1503A-1500-KPS | X2946      | 6/04                             |





## Appendix C Antenna factors and cable loss

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

| Frequency, kHz | Correction factor, dB |
|----------------|-----------------------|
| 10             | 4.9                   |
| 15             | 2.86                  |
| 20             | 1.83                  |
| 25             | 1.25                  |
| 30             | 0.91                  |
| 35             | 0.69                  |
| 40             | 0.53                  |
| 50             | 0.35                  |
| 60             | 0.25                  |
| 70             | 0.18                  |
| 80             | 0.14                  |
| 90             | 0.11                  |
| 100            | 0.09                  |
| 125            | 0.06                  |
| 150            | 0.04                  |

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

| Frequency, kHz | Correction factor, dB |
|----------------|-----------------------|
| 10             | 4.9                   |
| 15             | 2.86                  |
| 20             | 1.83                  |
| 25             | 1.25                  |
| 30             | 0.91                  |
| 35             | 0.69                  |
| 40             | 0.53                  |
| 50             | 0.35                  |
| 60             | 0.25                  |
| 70             | 0.18                  |
| 80             | 0.14                  |
| 90             | 0.11                  |
| 100            | 0.09                  |
| 125            | 0.06                  |
| 150            | 0.04                  |

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



**Antenna factor**  
**Biconical antenna**  
**Electro-Metrics, model BIA-25/30**  
**Ser.No.3577, HL 0032**

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

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

| 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  
Active loop antenna  
Model 6502  
S/N 2857, HL 0446**

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

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



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

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



**Antenna factor**  
**Double ridged guide antenna**  
**Hermon Laboratories, model A1-18, S/N 186, HL 1116**

| Frequency,<br>MHz | Antenna factor.<br>dB(1/m) |
|-------------------|----------------------------|
| 1000.0            | 24.6                       |
| 1500.0            | 26.4                       |
| 2000.0            | 29.7                       |
| 2500.0            | 31.1                       |
| 3000.0            | 31.5                       |
| 3500.0            | 32.7                       |
| 4000.0            | 36.1                       |
| 4500.0            | 36.1                       |
| 5000.0            | 39.9                       |
| 5500.0            | 40.5                       |
| 6000.0            | 40.4                       |
| 6500.0            | 41.0                       |
| 7000.0            | 41.2                       |
| 7500.0            | 41.2                       |
| 8000.0            | 44.3                       |
| 8500.0            | 40.7                       |
| 9000.0            | 39.3                       |
| 9500.0            | 41.3                       |
| 10000.0           | 42.8                       |
| 10500.0           | 43.8                       |
| 11000.0           | 47.0                       |
| 11500.0           | 46.3                       |
| 12000.0           | 43.4                       |
| 12500.0           | 41.8                       |
| 13000.0           | 41.9                       |
| 13500.0           | 44.5                       |
| 14000.0           | 44.8                       |
| 14500.0           | 44.9                       |
| 15000.0           | 44.4                       |
| 15500.0           | 43.4                       |
| 16000.0           | 42.6                       |
| 16500.0           | 43.6                       |
| 17000.0           | 42.3                       |
| 17500.0           | 45.9                       |
| 18000.0           | 45.3                       |

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**  
**Model 3115, S/N 9911-5964, HL1984**

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



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

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



**Cable loss**  
**Cable coaxial, M17/164, model: C17164-10, s/n 161, HL 1003**

| No. | Frequency,<br>MHz | Cable loss,<br>dB | Tolerance,<br>dB | Measurement uncertainty,<br>dB |
|-----|-------------------|-------------------|------------------|--------------------------------|
| 1   | 30                | 0.41              | 12.5             | ±0.12                          |
| 2   | 50                | 0.52              |                  |                                |
| 3   | 100               | 0.75              |                  |                                |
| 4   | 300               | 1.45              |                  |                                |
| 5   | 500               | 2.01              |                  |                                |
| 6   | 800               | 2.71              |                  |                                |
| 7   | 1000              | 3.14              |                  |                                |
| 8   | 1200              | 3.56              |                  |                                |
| 9   | 1400              | 3.93              |                  |                                |
| 10  | 1600              | 4.31              |                  |                                |
| 11  | 1800              | 4.63              |                  |                                |
| 12  | 2000              | 4.97              |                  |                                |
| 13  | 2200              | 5.32              |                  |                                |
| 14  | 2400              | 5.65              |                  |                                |
| 15  | 2600              | 6.01              | 12.5             | ±0.12                          |
| 16  | 2800              | 6.42              |                  |                                |
| 17  | 3000              | 6.76              |                  |                                |
| 18  | 3300              | 7.12              |                  |                                |
| 19  | 3600              | 7.53              |                  |                                |
| 20  | 3900              | 7.95              |                  | ±0.17                          |
| 21  | 4200              | 8.32              |                  |                                |
| 22  | 4500              | 8.72              |                  |                                |
| 23  | 4800              | 9.14              |                  |                                |
| 24  | 5100              | 9.59              |                  |                                |
| 25  | 5400              | 10.00             |                  |                                |
| 26  | 5700              | 10.49             |                  |                                |
| 27  | 6000              | 11.07             |                  |                                |
| 28  | 6500              | 11.80             |                  |                                |



**Cable loss**

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

| No. | Frequency,<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              |                                     |                                   |
| 18  | 3300              | 3.47              |                                     | ±0.17                             |
| 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 loss**  
**Cable coaxial, RG-214, 5m, model: C214-5, HL 1365**

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



**Cable loss**  
**Cable coaxial, 6 m, model: M17/167 MIL-C-17, HL 1502**

| Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|
| 0.1               | 0.02              |
| 1                 | 0.07              |
| 3                 | 0.15              |
| 5                 | 0.17              |
| 10                | 0.26              |
| 30                | 0.43              |
| 50                | 0.57              |
| 80                | 0.72              |
| 100               | 0.81              |
| 300               | 1.48              |
| 500               | 2.00              |
| 800               | 2.70              |
| 1000              | 3.09              |

**Cable loss**  
**Cable M17/167 MIL-C-17, HL 1510**

| No. | Frequency,<br>MHz | Cable loss,<br>dB |
|-----|-------------------|-------------------|
| 1   | 0.1               | 0.05              |
| 2   | 1                 | 0.09              |
| 3   | 3                 | 0.16              |
| 4   | 5                 | 0.18              |
| 5   | 10                | 0.27              |
| 6   | 30                | 0.44              |
| 7   | 50                | 0.58              |
| 8   | 80                | 0.69              |
| 9   | 100               | 0.82              |
| 10  | 300               | 1.48              |
| 11  | 500               | 2.01              |
| 12  | 800               | 2.65              |
| 13  | 1000              | 3.12              |

**Cable loss****Cable 18 GHz, 4 m, blue, model: SPS-1803A-4000-NPS, S/N 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 loss**  
**Cable 18 GHz, 6.5 m, blue, model: NPS-1803A-6500-NPS, S/N T4974, HL 1947**

| Frequency,<br>GHz | Cable 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 | Cable 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, 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              |                                  |                                |



**Cable loss**  
**Cable 40 GHz, 0.8 m, blue, model: KPS-1503A-800-KPS, S/N W4907, HL 2254**

| Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 0.03              | 0.04              | 5.10              | 0.80              | 15.00             | 1.49              |
| 0.05              | 0.07              | 5.30              | 0.83              | 15.50             | 1.49              |
| 0.10              | 0.09              | 5.50              | 0.83              | 16.00             | 1.46              |
| 0.20              | 0.15              | 5.70              | 0.84              | 16.50             | 1.47              |
| 0.30              | 0.19              | 5.90              | 0.87              | 17.00             | 1.50              |
| 0.40              | 0.25              | 6.10              | 0.86              | 17.50             | 1.57              |
| 0.50              | 0.29              | 6.30              | 0.89              | 18.00             | 1.63              |
| 0.60              | 0.33              | 6.50              | 0.90              | 18.50             | 1.57              |
| 0.70              | 0.37              | 6.70              | 0.89              | 19.00             | 1.63              |
| 0.80              | 0.41              | 6.90              | 0.93              | 19.50             | 1.65              |
| 0.90              | 0.44              | 7.10              | 0.92              | 20.00             | 1.64              |
| 1.00              | 0.45              | 7.30              | 0.95              | 20.50             | 1.75              |
| 1.10              | 0.48              | 7.50              | 0.96              | 21.00             | 1.72              |
| 1.20              | 0.51              | 7.70              | 0.97              | 21.50             | 1.78              |
| 1.30              | 0.53              | 7.90              | 1.01              | 22.00             | 1.76              |
| 1.40              | 0.54              | 8.10              | 1.00              | 22.50             | 1.72              |
| 1.50              | 0.57              | 8.30              | 1.05              | 23.00             | 1.83              |
| 1.60              | 0.59              | 8.50              | 1.04              | 23.50             | 1.80              |
| 1.70              | 0.64              | 8.70              | 1.07              | 24.00             | 1.90              |
| 1.80              | 0.67              | 8.90              | 1.11              | 24.50             | 1.81              |
| 1.90              | 0.69              | 9.10              | 1.09              | 25.00             | 1.98              |
| 2.00              | 0.71              | 9.30              | 1.14              | 25.50             | 1.91              |
| 2.10              | 0.73              | 9.50              | 1.12              | 26.00             | 2.02              |
| 2.20              | 0.75              | 9.70              | 1.15              | 26.50             | 1.92              |
| 2.30              | 0.77              | 9.90              | 1.16              | 27.00             | 1.97              |
| 2.40              | 0.79              | 10.10             | 1.16              | 28.00             | 2.02              |
| 2.50              | 0.81              | 10.30             | 1.19              | 29.00             | 1.95              |
| 2.60              | 0.83              | 10.50             | 1.14              | 30.00             | 1.94              |
| 2.70              | 0.85              | 10.70             | 1.19              | 31.00             | 2.11              |
| 2.80              | 0.87              | 10.90             | 1.17              | 32.00             | 2.17              |
| 2.90              | 0.89              | 11.10             | 1.13              | 33.00             | 2.27              |
| 3.10              | 0.91              | 11.30             | 1.20              | 34.00             | 2.27              |
| 3.30              | 0.93              | 11.50             | 1.13              | 35.00             | 2.29              |
| 3.50              | 0.95              | 11.70             | 1.20              | 36.00             | 2.35              |
| 3.70              | 0.97              | 11.90             | 1.18              | 37.00             | 2.37              |
| 3.90              | 0.99              | 12.10             | 1.14              | 38.00             | 2.40              |
| 4.10              | 1.01              | 12.40             | 1.19              | 39.00             | 2.57              |
| 4.30              | 1.03              | 13.00             | 1.34              | 40.00             | 2.36              |
| 4.50              | 1.05              | 13.50             | 1.33              |                   |                   |
| 4.70              | 1.07              | 14.00             | 1.48              |                   |                   |
| 4.90              | 1.09              | 14.50             | 1.45              |                   |                   |

**Cable loss**

**Cable coaxial, 40GHz, 1.5 m, green, Rhophase Microwave Limited, model: KPS-1503A-1500-KPS, HL 2400**

| Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 0.03              | 0.06              | 6.5               | 1.46              | 15.50             | 2.34              |
| 0.05              | 0.08              | 6.7               | 1.49              | 16.00             | 2.34              |
| 0.1               | 0.15              | 6.9               | 1.50              | 16.50             | 2.40              |
| 0.2               | 0.23              | 7.1               | 1.51              | 17.00             | 2.46              |
| 0.3               | 0.29              | 7.3               | 1.55              | 17.50             | 2.54              |
| 0.5               | 0.37              | 7.5               | 1.56              | 18.00             | 2.61              |
| 0.7               | 0.46              | 7.7               | 1.58              | 18.50             | 2.59              |
| 0.9               | 0.53              | 7.9               | 1.60              | 19.00             | 2.59              |
| 1.1               | 0.58              | 8.1               | 1.61              | 19.50             | 2.67              |
| 1.3               | 0.65              | 8.3               | 1.68              | 20.00             | 2.62              |
| 1.5               | 0.66              | 8.5               | 1.68              | 20.50             | 2.73              |
| 1.7               | 0.72              | 8.7               | 1.75              | 21.00             | 2.71              |
| 1.9               | 0.76              | 8.9               | 1.74              | 21.50             | 2.78              |
| 2.1               | 0.79              | 9.1               | 1.81              | 22.00             | 2.83              |
| 2.3               | 0.85              | 9.3               | 1.79              | 22.50             | 2.81              |
| 2.5               | 0.90              | 9.5               | 1.86              | 23.50             | 2.91              |
| 2.7               | 0.91              | 9.7               | 1.85              | 24.00             | 2.97              |
| 2.9               | 0.97              | 9.9               | 1.87              | 24.50             | 2.98              |
| 3.1               | 0.97              | 10.1              | 1.88              | 25.00             | 2.97              |
| 3.3               | 1.03              | 10.30             | 1.82              | 25.50             | 3.03              |
| 3.5               | 1.06              | 10.50             | 1.92              | 26.00             | 3.04              |
| 3.7               | 1.10              | 10.70             | 1.86              | 26.50             | 3.11              |
| 3.9               | 1.13              | 10.90             | 1.96              | 27.00             | 2.97              |
| 4.1               | 1.16              | 11.10             | 1.90              | 28.00             | 3.15              |
| 4.3               | 1.18              | 11.30             | 1.99              | 29.00             | 3.07              |
| 4.5               | 1.21              | 11.50             | 1.95              | 30.00             | 3.13              |
| 4.7               | 1.23              | 11.70             | 2.00              | 31.00             | 3.13              |
| 4.9               | 1.26              | 11.90             | 2.01              | 32.00             | 3.18              |
| 5.1               | 1.28              | 12.10             | 1.99              | 33.00             | 3.31              |
| 5.3               | 1.31              | 12.40             | 2.06              | 34.00             | 3.32              |
| 5.5               | 1.32              | 13.00             | 2.11              | 35.00             | 3.37              |
| 5.7               | 1.36              | 13.50             | 2.17              | 36.00             | 3.36              |
| 5.9               | 1.37              | 14.00             | 2.36              | 37.00             | 3.46              |
| 6.1               | 1.38              | 14.50             | 2.32              | 39.00             | 3.49              |
| 6.3               | 1.44              | 15.00             | 2.30              | 40.00             | 3.52              |





## Appendix D General information

### Test facility description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01) and approved by Israel Ministry of environmental protection, radiation hazards department (Permit number 1158).

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### Abbreviations and acronyms

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

|                |                                             |
|----------------|---------------------------------------------|
| ASK            | amplitude shift keying                      |
| 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 |
| EUT            | equipment under test                        |
| GHz            | gigahertz                                   |
| H              | height                                      |
| Hz             | hertz                                       |
| kHz            | kilohertz                                   |
| kV             | kilovolt                                    |
| L              | length                                      |
| LNA            | low noise amplifier                         |
| LMS            | location and monitoring service             |
| LO             | local oscillator                            |
| m              | meter                                       |
| MHz            | megahertz                                   |
| NA             | not applicable                              |
| QP             | quasi-peak                                  |
| RF             | radio frequency                             |
| Rx             | receiver                                    |
| rms            | root mean square                            |
| s              | second                                      |
| Tx             | transmitter                                 |
| V              | volt                                        |
| W              | width                                       |

### Specification references

|                     |                                                                                                                                                                      |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47CFR part 90: 2002 | Private land mobile radio services                                                                                                                                   |
| ANSI C63.2:96       | 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. |