

# TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 and part 15 subpart B

FOR:

**RadWin Ltd.**

**Wireless Radio Transmission System**

**Model: WinLink 1000/F49 (AirMux-200/F49,  
FibAir 4849, MRL-500)**

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## 1 Applicant information

**Client name:** RadWin Ltd.  
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**Telephone:** +972 3766 2971  
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**E-mail:** e\_menashe@radwin.com  
**Contact name:** Mr. Menashe Ezra

## 2 Equipment under test attributes

**Product name:** Wireless Radio Transmission System  
**Product type:** Point to point  
**Model(s):** WinLink 1000/F49 (AirMux-200/F49, FibAir 4849, MRL-500)  
**Serial number:** E490616500002  
**Receipt date:** 2/20/2005

## 3 Manufacturer information

**Manufacturer name:** RadWin Ltd.  
**Address:** 32 Habarzel str., Tel Aviv, Israel, 69710  
**Telephone:** +972 3766 2971  
**Fax:** +972 3766 2902  
**E-Mail:** e\_menashe@radwin.com  
**Contact name:** Mr. Menashe Ezra

## 4 Test details

**Project ID:** 16288  
**Location:** Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel  
**Test started:** 2/20/2005  
**Test completed:** 3/2/2005  
**Test specification(s):** 47CFR part 90  
**Test suite:** FCC\_90\_BS\_with\_RF\_connector (7/15/2004 12:12:27 AM, modified)

## 5 Tests summary

| Test                                                             | Status       |
|------------------------------------------------------------------|--------------|
| <b>Transmitter characteristics</b>                               |              |
| Section 90.1215, Maximum output power and power spectral density | Pass         |
| Section 90.209, Occupied bandwidth                               | Pass         |
| Section 90.210, Emission mask                                    | Pass         |
| Section 90.210, Conducted spurious emissions                     | Pass         |
| Section 90.210, Radiated spurious emissions                      | Pass         |
| Section 90.213, Frequency stability                              | Pass         |
| Section 90.214, Transient frequency behaviour                    | Not required |
| Section 2.1091, RF radiation exposure evaluation                 | Pass         |
| <b>Unintentional emissions</b>                                   |              |
| Section 15.107, Conducted emission at AC power port              | Pass         |
| Section 15.109, Radiated emission                                | Pass         |
| Section 15.111, Conducted emission at receiver antenna port      | Not required |

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

|                     | Name and Title                              | Date           | Signature                                                                             |
|---------------------|---------------------------------------------|----------------|---------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mr. A. Adelberg, test engineer              | March 2, 2005  |  |
| <b>Reviewed by:</b> | Mrs. M. Cherniavsky, certification engineer | March 24, 2005 |  |
|                     | Mr. M. Nikishin, EMC group leader           | March 25, 2005 |  |
| <b>Approved by:</b> | Mr. A. Usoskin, C.E.O.                      | March 27, 2005 |  |

## 6 EUT description

### 6.1 General information

The EUT is a carrier class, high capacity and low cost point-to-point broadband wireless transmission system. It provides high capacity connectivity of up to 48 Mbps. The EUT is powered from mains via AC/DC power adapter.

### 6.2 Ports and lines

| Port type        | Port description              | Connected |               | Connector type | Q-ty | Cable type                                            | Cable length, m | Indoor / outdoor |
|------------------|-------------------------------|-----------|---------------|----------------|------|-------------------------------------------------------|-----------------|------------------|
|                  |                               | From      | To            |                |      |                                                       |                 |                  |
| Signal           | Ethernet                      | IDU       | LAPTOP        | RJ45           | 1    | FTP                                                   | 100             | Indoor           |
| Power            | DC power                      | IDU       | AC/DC adapter | Terminal block | 1    | 2 wire                                                | 2               | Indoor           |
| RF               | Antenna                       | ODU       | Load 50Ω      | N-type         | 1    | NA                                                    | NA              | NA               |
| Signal           | WAN PoE (power over Ethernet) | IDU       | ODU           | RJ45           | 1    | See note*                                             | 100             | Outdoor          |
| Functional earth | Functional earth              | ODU       | GND           | Screw          | 1    | NA                                                    | NA              | NA               |
| Functional earth | Functional earth              | IDU       | GND           | Screw          | 1    | NA                                                    | NA              | NA               |
| Signal           | Monitor/RS232                 | ODU       | PC            | RJ45           | 1    | Not connected, for configuration and service use only |                 |                  |
| Signal           | Monitor/RS232                 | IDU       | PC            | RJ45           | 1    | Not connected, for configuration and service use only |                 |                  |

\*Four-pair category 5e, double jacket 4x2x24 AWG FTP type

### 6.3 Support and test equipment

| Description   | Manufacturer | Model number  | Serial number           |
|---------------|--------------|---------------|-------------------------|
| AC/DC adapter | HITRON       | HE551-58007   | 0022                    |
| Lap top       | Compaq       | Armada PP2060 | AESP3600T4X12<br>DC6458 |

### 6.4 Operating frequencies

| Source          | Frequency, MHz |       |      |             |
|-----------------|----------------|-------|------|-------------|
| Digital portion | (clock)        | 2.048 | 10   | 16.38       |
| Receiver        | (LO)           | 40    | (IF) | 4940 – 4990 |
| Transmitter     | (LO)           | 40    | (IF) | 4940 – 4990 |

### 6.5 Changes made in the EUT

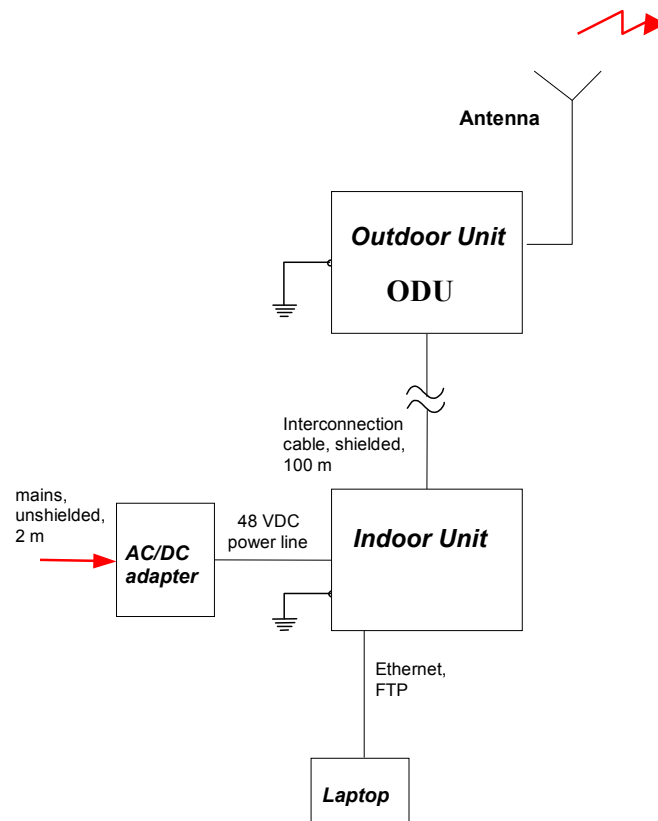
No changes were implemented.



|                                                         |                                                                                                          |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------|------------------------------------------------|-------------------|----------|--------------------------------|-----------------------------|---------------------------------------|--|--|-----|
| <b>Type of equipment</b>                                |                                                                                                          |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| X                                                       | Stand-alone (Equipment with or without its own control provisions)                                       |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
|                                                         | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
|                                                         | Plug-in card (Equipment intended for a variety of host systems)                                          |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| <b>Intended use</b>                                     |                                                                                                          |                                                           | <b>Condition of use</b>                 |                                                |                   |          |                                |                             |                                       |  |  |     |
| X                                                       | fixed                                                                                                    | Always at a distance more than 2 m from all people        |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
|                                                         | mobile                                                                                                   | Always at a distance more than 20 cm from all people      |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
|                                                         | portable                                                                                                 | May operate at a distance closer than 20 cm to human body |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| <b>Assigned frequency range</b>                         |                                                                                                          |                                                           | 4940 - 4990 MHz                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| <b>Operating frequency range</b>                        |                                                                                                          |                                                           | 4950 - 4980 MHz                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| <b>RF channel spacing</b>                               |                                                                                                          |                                                           | 5 MHz                                   |                                                |                   |          |                                |                             |                                       |  |  |     |
| <b>Maximum rated output power</b>                       |                                                                                                          |                                                           | At transmitter 50 Ω RF output connector |                                                |                   |          |                                |                             | +12.8 dBm @ 6, 9, 12, 24, 36, 48 Mbps |  |  |     |
|                                                         |                                                                                                          |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| <b>Is transmitter output power variable?</b>            |                                                                                                          |                                                           | X                                       | No                                             |                   |          |                                |                             |                                       |  |  |     |
|                                                         |                                                                                                          |                                                           |                                         | Yes                                            |                   |          | continuous variable            |                             |                                       |  |  |     |
|                                                         |                                                                                                          |                                                           |                                         |                                                |                   |          | stepped variable with stepsize |                             |                                       |  |  | dB  |
|                                                         |                                                                                                          |                                                           |                                         |                                                |                   |          | minimum RF power               |                             |                                       |  |  | dBm |
|                                                         |                                                                                                          |                                                           |                                         | maximum RF power                               |                   |          |                                |                             | dBm                                   |  |  |     |
| <b>Antenna connection</b>                               |                                                                                                          |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| unique coupling                                         |                                                                                                          | X                                                         | standard connector                      |                                                | N-Type            | integral | X                              | with temporary RF connector |                                       |  |  |     |
|                                                         |                                                                                                          |                                                           |                                         |                                                |                   |          | without temporary RF connector |                             |                                       |  |  |     |
| <b>Antenna/s technical characteristics</b>              |                                                                                                          |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| <b>Type</b>                                             |                                                                                                          | <b>Manufacturer</b>                                       |                                         | <b>Model number</b>                            |                   |          | <b>Gain</b>                    |                             |                                       |  |  |     |
| Planar Array (external)                                 |                                                                                                          | MTI                                                       |                                         | MT-466003-N                                    |                   |          | 27 dBi                         |                             |                                       |  |  |     |
|                                                         |                                                                                                          |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
| <b>Transmitter 99% power bandwidth</b>                  |                                                                                                          |                                                           |                                         | 20 MHz                                         |                   |          |                                |                             |                                       |  |  |     |
| <b>Transmitter aggregate data rate/s</b>                |                                                                                                          |                                                           |                                         | 16.25; 31.25; 61.25; 91.25 Mbps depend on rate |                   |          |                                |                             |                                       |  |  |     |
| <b>Transmitter aggregate symbol (baud) rate/s</b>       |                                                                                                          |                                                           |                                         | 16.25 MBaud                                    |                   |          |                                |                             |                                       |  |  |     |
| <b>Type of modulation</b>                               |                                                                                                          |                                                           |                                         | BPSK, 4QAM, 16QAM, 64QAM                       |                   |          |                                |                             |                                       |  |  |     |
| <b>Type of multiplexing</b>                             |                                                                                                          |                                                           |                                         | OFDM                                           |                   |          |                                |                             |                                       |  |  |     |
| <b>Modulating test signal (baseband)</b>                |                                                                                                          |                                                           |                                         | PRBS                                           |                   |          |                                |                             |                                       |  |  |     |
| <b>Maximum transmitter duty cycle in normal use</b>     |                                                                                                          |                                                           |                                         | 100%                                           | <b>Tx ON time</b> | msec     | <b>Period</b>                  | msec                        |                                       |  |  |     |
| <b>Transmitter duty cycle supplied for test</b>         |                                                                                                          |                                                           |                                         | 100 %                                          | <b>Tx ON time</b> | msec     | <b>Period</b>                  | msec                        |                                       |  |  |     |
| <b>Transmitter power source</b>                         |                                                                                                          |                                                           |                                         |                                                |                   |          |                                |                             |                                       |  |  |     |
|                                                         | Battery                                                                                                  | <b>Nominal rated voltage</b>                              | VDC                                     | Battery type                                   |                   |          |                                |                             |                                       |  |  |     |
|                                                         | DC                                                                                                       | <b>Nominal rated voltage</b>                              | VDC                                     |                                                |                   |          |                                |                             |                                       |  |  |     |
|                                                         | AC mains                                                                                                 | <b>Nominal rated voltage</b>                              | 100/240 VAC                             | Frequency                                      | 50/60 Hz          |          |                                |                             |                                       |  |  |     |
| <b>Common power source for transmitter and receiver</b> |                                                                                                          |                                                           |                                         |                                                |                   |          | yes                            | no                          |                                       |  |  |     |
| <b>Emission designator</b>                              |                                                                                                          |                                                           |                                         | 20M0D2WEF                                      |                   |          |                                |                             |                                       |  |  |     |
| <b>Spread spectrum technique used</b>                   |                                                                                                          |                                                           |                                         | Digital transmission system (DTS)              |                   |          |                                |                             |                                       |  |  |     |



## 6.7 Test configuration





|                            |                               |                                                      |                              |
|----------------------------|-------------------------------|------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.1215, Maximum output power</b>         |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 2/24/2005 9:40:08 AM          |                                                      |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 43 %                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                      |                              |

## 7 Transmitter tests according to 47CFR part 90

### 7.1 Peak output power and power spectral density test

#### 7.1.1 General

This test was performed to measure the peak output power and power spectral density at RF antenna connector. Specification test limits are given in Table 7.1.1. The test results are provided in Table 7.1.2, Table 7.1.3 and the associated plots.

Table 7.1.1 Peak output power limits

| Assigned frequency range,<br>MHz | Maximum peak output power |      | Power spectral density,<br>dBm/MHz |
|----------------------------------|---------------------------|------|------------------------------------|
|                                  | W                         | dBm  |                                    |
| 4950.0 – 4980.0                  | 1.995262                  | 33.0 | 20                                 |

\*- If transmitting antennas of directional gain greater than 9 dBi are used, both the peak output power and peak power spectral density limit should be reduced below the stated value as follows:

by the amount in dB that the directional gain of antenna exceeds 9 dBi;  
without any corresponding reduction for fixed point-to-point and point-to-multipoint transmitters employing antennas with directional gain up to 26 dBi;  
corresponding reduction in the peak output power and peak power spectral density limit should be the amount in dB that the directional gain of antenna exceeds 26 dBi.

#### 7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.

7.1.2.3 The peak output power was measured with spectrum analyzer as provided in Table 7.1.2 and associated plots.

7.1.2.4 The power spectral density was measured with spectrum analyzer as provided in Table 7.1.3 and associated plots.

Figure 7.1.1 Peak output power test setup





|                            |                                                      |                                |                              |
|----------------------------|------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.1215, Maximum output power</b>         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                                |                              |
| <b>Test mode:</b>          | Compliance                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 2/24/2005 9:40:08 AM                                 |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                      |                                |                              |

Table 7.1.2 Peak output power test results

OPERATING FREQUENCY RANGE: 4950 – 4980 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 100 kHz  
 VIDEO BANDWIDTH: 3000 kHz  
 MODULATION: BPSK, 4QAM, 16QAM, 64QAM  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 6, 9, 12, 18, 24, 36, 48 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Carrier frequency, MHz | Spectrum analyzer reading, dBm | External attenuation, dB | Cable loss, dB | RF output power, dBm | Limit, dBm | Margin, dB | Verdict |
|------------------------|--------------------------------|--------------------------|----------------|----------------------|------------|------------|---------|
| Bit Rate: 6 Mbps       |                                |                          |                |                      |            |            |         |
| 4950.000               | 12.6                           | included                 | included       | 12.6                 | 32.0       | -19.4      | Pass    |
| 4965.000               | 12.7                           | included                 | included       | 12.7                 | 32.0       | -19.3      | Pass    |
| 4980.000               | 12.6                           | included                 | included       | 12.6                 | 32.0       | -19.4      | Pass    |
| Bit Rate: 9 Mbps       |                                |                          |                |                      |            |            |         |
| 4950.000               | 12.5                           | included                 | included       | 12.5                 | 32.0       | -19.5      | Pass    |
| 4965.000               | 12.7                           | included                 | included       | 12.7                 | 32.0       | -19.3      | Pass    |
| 4980.000               | 12.8                           | included                 | included       | 12.8                 | 32.0       | -19.2      | Pass    |
| Bit Rate: 12 Mbps      |                                |                          |                |                      |            |            |         |
| 4950.000               | 12.5                           | included                 | included       | 12.5                 | 32.0       | -19.5      | Pass    |
| 4965.000               | 12.3                           | included                 | included       | 12.3                 | 32.0       | -19.7      | Pass    |
| 4980.000               | 12.7                           | included                 | included       | 12.7                 | 32.0       | -19.3      | Pass    |
| Bit Rate: 18 Mbps      |                                |                          |                |                      |            |            |         |
| 4950.000               | 12.5                           | included                 | included       | 12.5                 | 32.0       | -19.5      | Pass    |
| 4965.000               | 12.1                           | included                 | included       | 12.1                 | 32.0       | -19.9      | Pass    |
| 4980.000               | 12.5                           | included                 | included       | 12.5                 | 32.0       | -19.5      | Pass    |
| Bit Rate: 24 Mbps      |                                |                          |                |                      |            |            |         |
| 4950.000               | 12.7                           | included                 | included       | 12.7                 | 32.0       | -19.3      | Pass    |
| 4965.000               | 11.5                           | included                 | included       | 11.5                 | 32.0       | -20.5      | Pass    |
| 4980.000               | 12.0                           | included                 | included       | 12.0                 | 32.0       | -20.0      | Pass    |
| Bit Rate: 36 Mbps      |                                |                          |                |                      |            |            |         |
| 4950.000               | 12.4                           | included                 | included       | 12.4                 | 32.0       | -19.6      | Pass    |
| 4965.000               | 12.4                           | included                 | included       | 12.4                 | 32.0       | -19.6      | Pass    |
| 4980.000               | 11.5                           | included                 | included       | 11.5                 | 32.0       | -20.5      | Pass    |
| Bit Rate: 48 Mbps      |                                |                          |                |                      |            |            |         |
| 4950.000               | 12.4                           | included                 | included       | 12.4                 | 32.0       | -19.6      | Pass    |
| 4965.000               | 12.5                           | included                 | included       | 12.5                 | 32.0       | -19.5      | Pass    |
| 4980.000               | 12.2                           | included                 | included       | 12.2                 | 32.0       | -19.8      | Pass    |

The equipment is used with the 27 dBi external antenna, the peak output limit was reduced by 1 dB.

#### Reference numbers of test equipment used

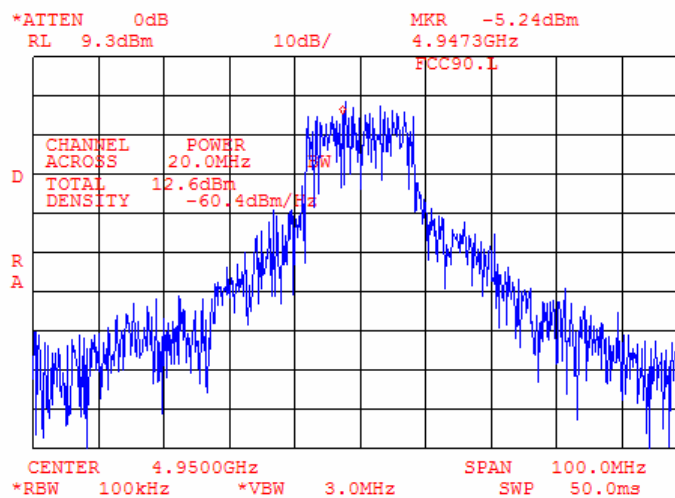
|         |         |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|
| HL 1424 | HL 2254 |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|

Full description is given in Appendix A.

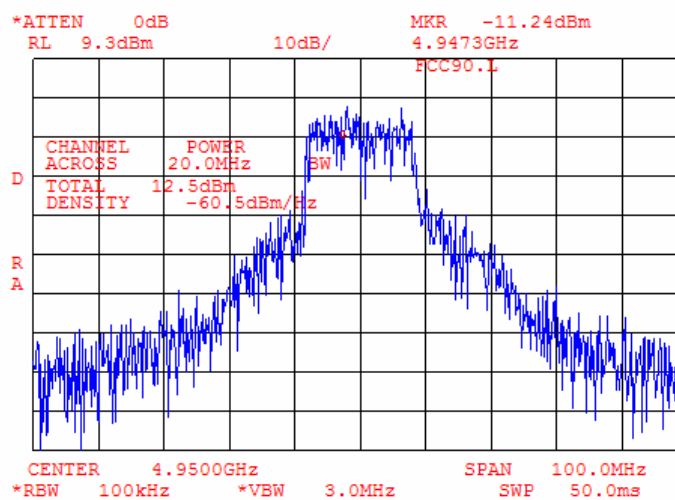


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.1 Peak output power test results at low frequency, Bit Rate: 6 Mbps



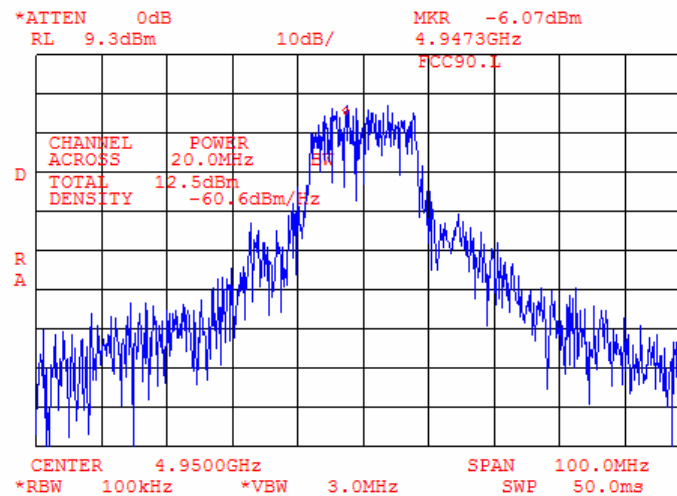
Plot 7.1.2 Peak output power test results at low frequency, Bit Rate: 9 Mbps



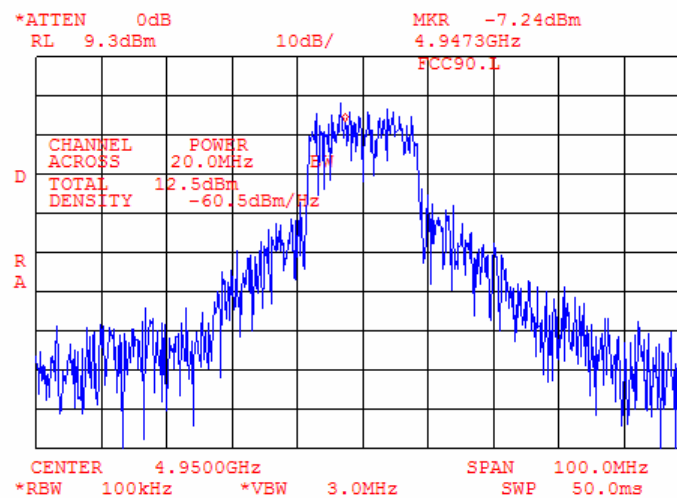


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.3 Peak output power test results at low frequency, Bit Rate: 12 Mbps



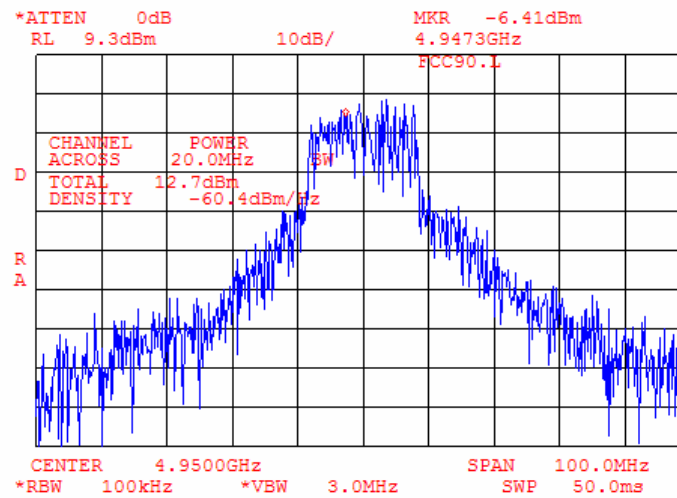
Plot 7.1.4 Peak output power test results at low frequency, Bit Rate: 18 Mbps



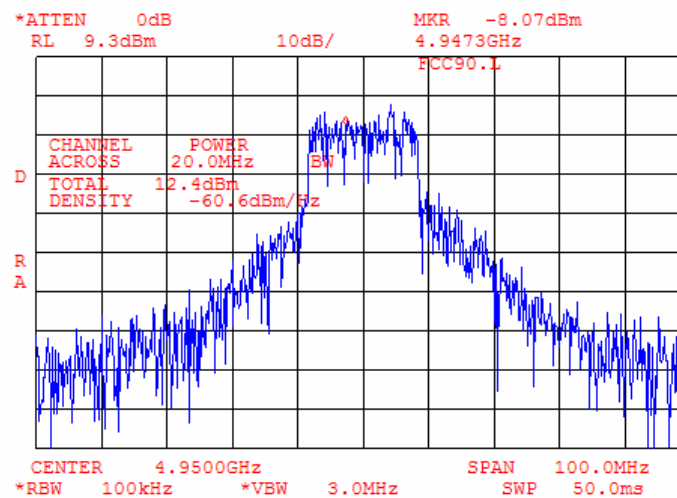


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.5 Peak output power test results at low frequency, Bit Rate: 24 Mbps



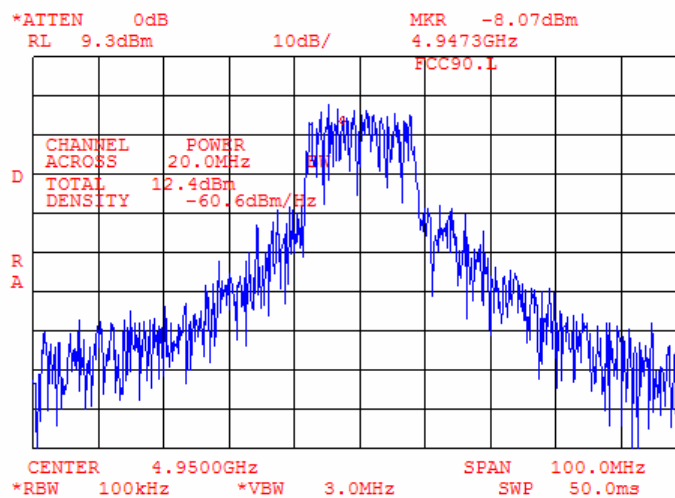
Plot 7.1.6 Peak output power test results at low frequency, Bit Rate: 36 Mbps





|                            |                               |                                                      |                              |
|----------------------------|-------------------------------|------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.1215, Maximum output power</b>         |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                              |
| <b>Test mode:</b>          |                               | Compliance                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 2/24/2005 9:40:08 AM                                 |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 43 %                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                      |                              |

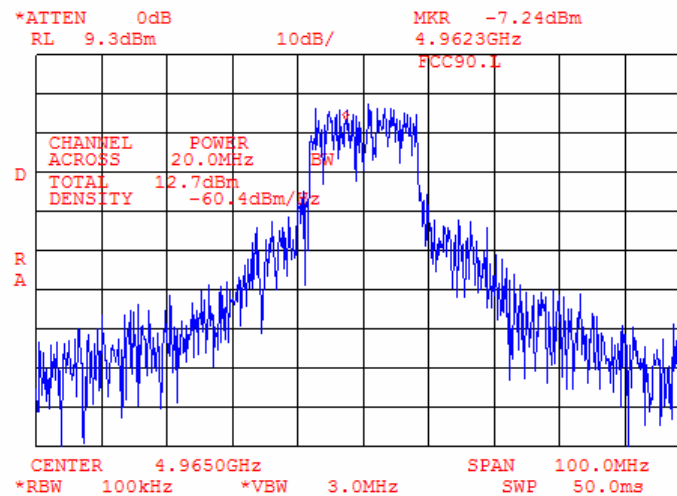
Plot 7.1.7 Peak output power test results at low frequency, Bit Rate: 48 Mbps



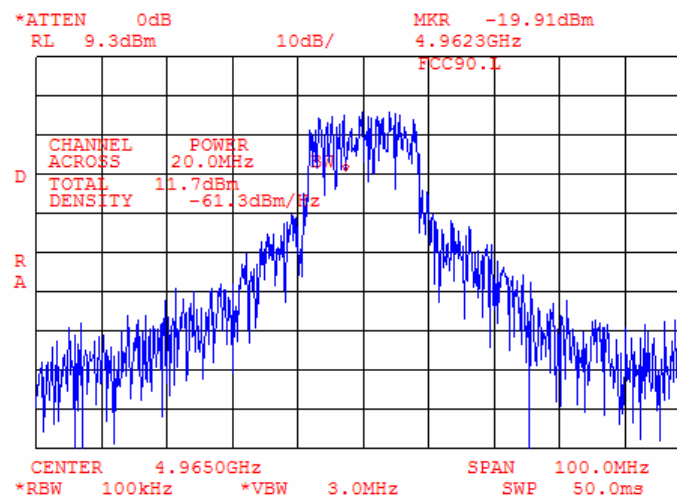


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.8 Peak output power test results at mid frequency, Bit Rate: 6 Mbps



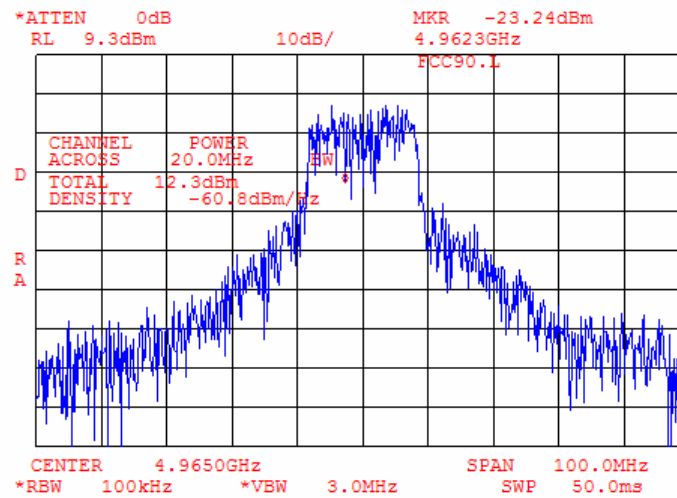
Plot 7.1.9 Peak output power test results at mid frequency, Bit Rate: 9 Mbps



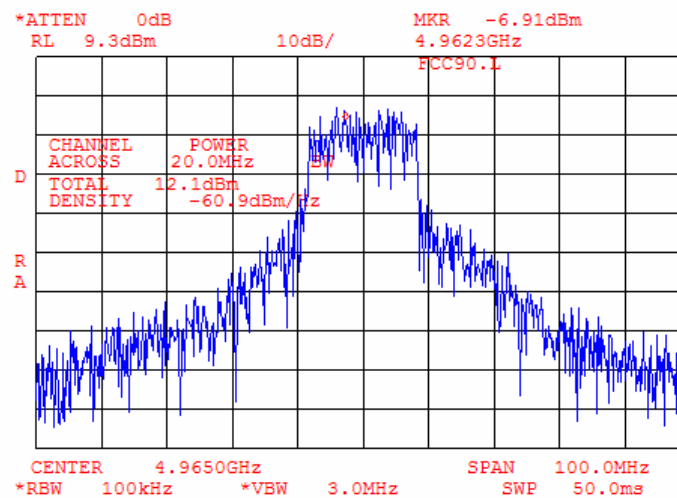


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.10 Peak output power test results at mid frequency, Bit Rate: 12 Mbps



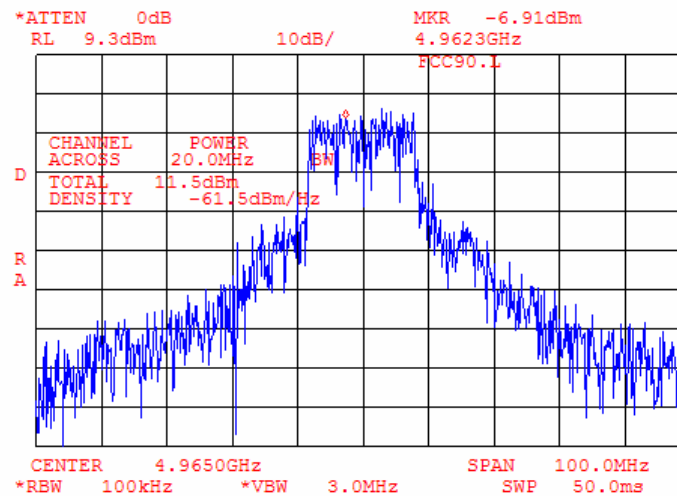
Plot 7.1.11 Peak output power test results at mid frequency, Bit Rate: 18 Mbps



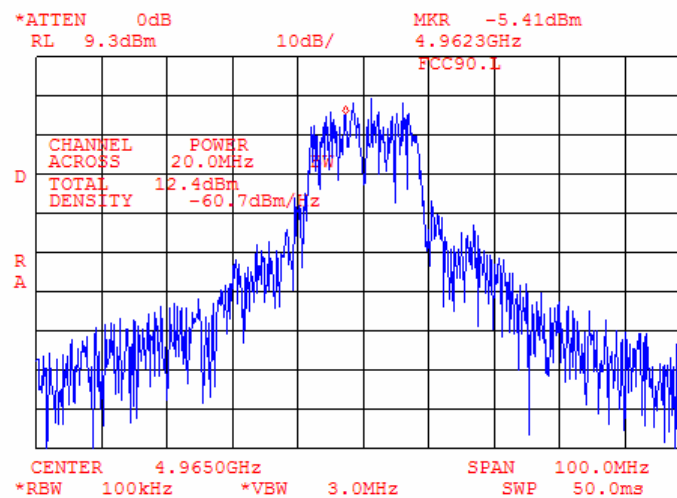


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.12 Peak output power test results at mid frequency, Bit Rate: 24 Mbps



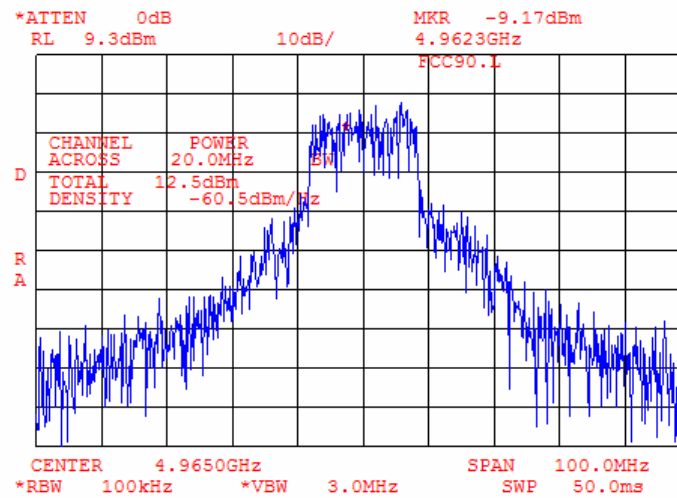
Plot 7.1.13 Peak output power test results at mid frequency, Bit Rate: 36 Mbps





|                            |                               |                                                      |                              |
|----------------------------|-------------------------------|------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.1215, Maximum output power</b>         |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                              |
| <b>Test mode:</b>          |                               | Compliance                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 2/24/2005 9:40:08 AM                                 |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 43 %                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                      |                              |

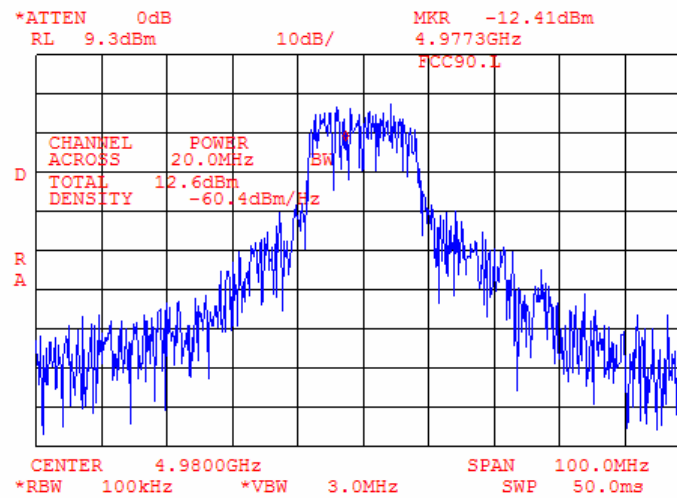
Plot 7.1.14 Peak output power test results at mid frequency, Bit Rate: 48 Mbps



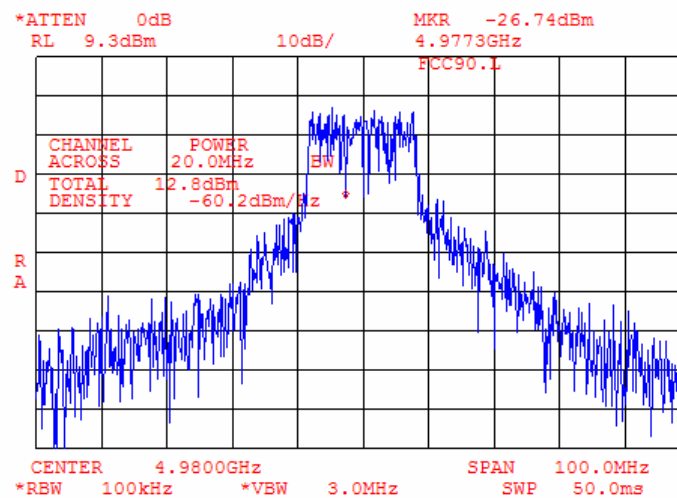


|                            |                                                      |                                |                              |
|----------------------------|------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.1215, Maximum output power</b>         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                                |                              |
| <b>Test mode:</b>          | Compliance                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 2/24/2005 9:40:08 AM                                 |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                      |                                |                              |

Plot 7.1.15 Peak output power test results at high frequency, Bit Rate: 6 Mbps



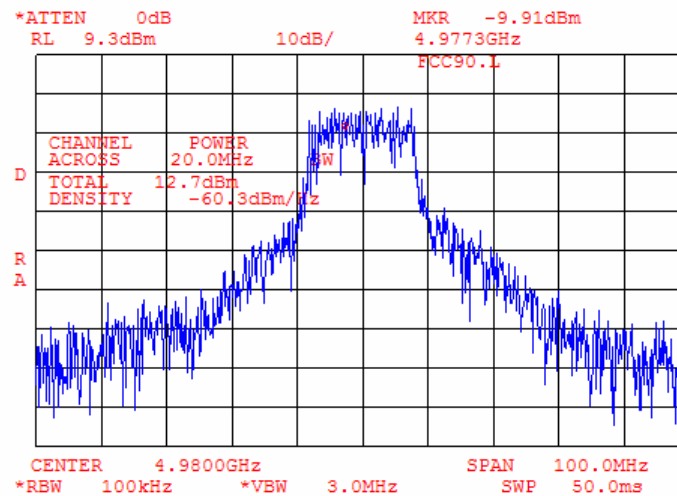
Plot 7.1.16 Peak output power test results at high frequency, Bit Rate: 9 Mbps



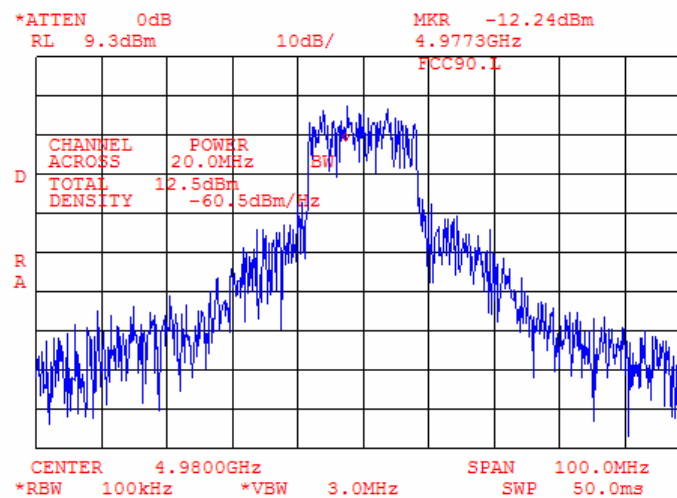


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.17 Peak output power test results at high frequency, Bit Rate: 12 Mbps



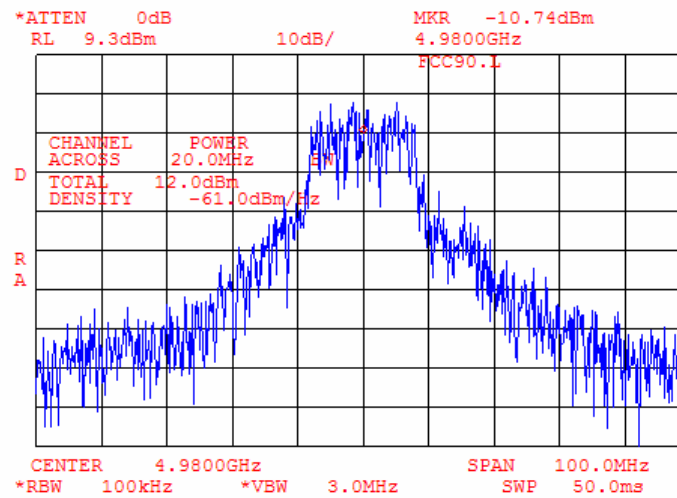
Plot 7.1.18 Peak output power test results at high frequency, Bit Rate: 18 Mbps



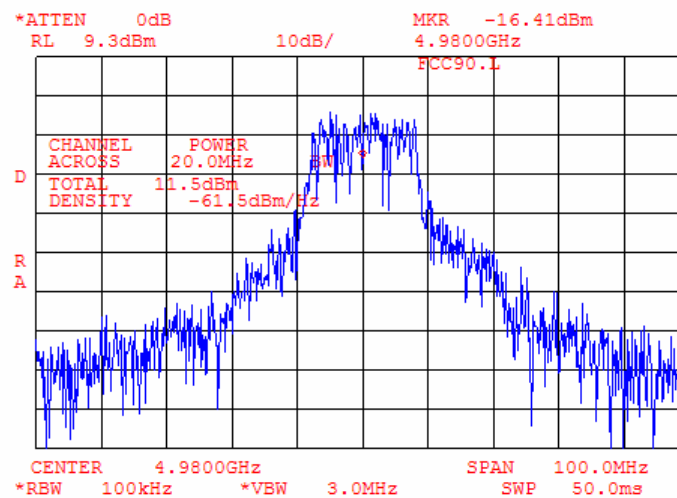


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.19 Peak output power test results at high frequency, Bit Rate: 24 Mbps



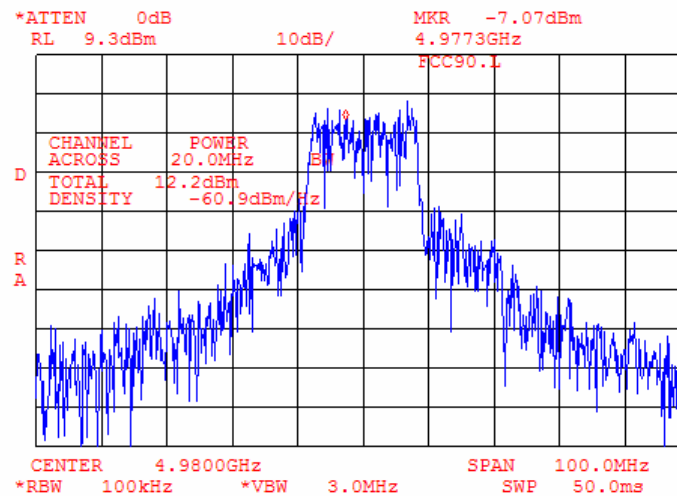
Plot 7.1.20 Peak output power test results at high frequency, Bit Rate: 36 Mbps





|                            |                               |                                                      |                              |
|----------------------------|-------------------------------|------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.1215, Maximum output power</b>         |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                              |
| <b>Test mode:</b>          |                               | Compliance                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 2/24/2005 9:40:08 AM                                 |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 43 %                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                      |                              |

Plot 7.1.21 Peak output power test results at high frequency, Bit Rate: 48 Mbps





|                            |                                                      |                                |                              |
|----------------------------|------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.1215, Maximum output power</b>         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                                |                              |
| <b>Test mode:</b>          | Compliance                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 2/24/2005 9:40:08 AM                                 |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                      |                                |                              |

Table 7.1.3 Power spectral density test results

OPERATING FREQUENCY RANGE: 4950 – 4980 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1000 kHz  
 VIDEO BANDWIDTH: 3000 kHz  
 MODULATION: BPSK, 4QAM, 16QAM, 64QAM  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 6, 9, 12, 18, 24, 36, 48 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Carrier frequency, MHz | Spectrum analyzer reading, dBm/Hz | External attenuation, dB | Factor, dB | RF power spectral density, dBm/MHz | Limit, dBm/MHz | Margin, dB | Verdict |
|------------------------|-----------------------------------|--------------------------|------------|------------------------------------|----------------|------------|---------|
| Bit Rate: 6 Mbps       |                                   |                          |            |                                    |                |            |         |
| 4950.000               | -63.3                             | included                 | 60.0       | -3.3                               | 19.0           | -22.3      | Pass    |
| 4965.000               | -63.4                             | included                 | 60.0       | -3.4                               | 19.0           | -22.4      | Pass    |
| 4980.000               | -63.3                             | included                 | 60.0       | -3.3                               | 19.0           | -22.3      | Pass    |
| Bit Rate: 9 Mbps       |                                   |                          |            |                                    |                |            |         |
| 4950.000               | -63.7                             | included                 | 60.0       | -3.7                               | 19.0           | -22.7      | Pass    |
| 4965.000               | -63.4                             | included                 | 60.0       | -3.4                               | 19.0           | -22.4      | Pass    |
| 4980.000               | -63.5                             | included                 | 60.0       | -3.5                               | 19.0           | -22.5      | Pass    |
| Bit Rate: 12 Mbps      |                                   |                          |            |                                    |                |            |         |
| 4950.000               | -63.0                             | included                 | 60.0       | -3.0                               | 19.0           | -22.0      | Pass    |
| 4965.000               | -63.3                             | included                 | 60.0       | -3.3                               | 19.0           | -22.3      | Pass    |
| 4980.000               | -63.5                             | included                 | 60.0       | -3.5                               | 19.0           | -22.5      | Pass    |
| Bit Rate: 18 Mbps      |                                   |                          |            |                                    |                |            |         |
| 4950.000               | -63.1                             | included                 | 60.0       | -3.1                               | 19.0           | -22.1      | Pass    |
| 4965.000               | -63.3                             | included                 | 60.0       | -3.3                               | 19.0           | -22.3      | Pass    |
| 4980.000               | -63.3                             | included                 | 60.0       | -3.3                               | 19.0           | -22.3      | Pass    |
| Bit Rate: 24 Mbps      |                                   |                          |            |                                    |                |            |         |
| 4950.000               | -63.2                             | included                 | 60.0       | -3.2                               | 19.0           | -22.2      | Pass    |
| 4965.000               | -63.2                             | included                 | 60.0       | -3.2                               | 19.0           | -22.2      | Pass    |
| 4980.000               | -62.9                             | included                 | 60.0       | -2.9                               | 19.0           | -21.9      | Pass    |
| Bit Rate: 36 Mbps      |                                   |                          |            |                                    |                |            |         |
| 4950.000               | -63.2                             | included                 | 60.0       | -3.2                               | 19.0           | -22.2      | Pass    |
| 4965.000               | -64.0                             | included                 | 60.0       | -4.0                               | 19.0           | -23.0      | Pass    |
| 4980.000               | -63.7                             | included                 | 60.0       | -3.7                               | 19.0           | -22.7      | Pass    |
| Bit Rate: 48 Mbps      |                                   |                          |            |                                    |                |            |         |
| 4950.000               | -63.0                             | included                 | 60.0       | -3.0                               | 19.0           | -22.0      | Pass    |
| 4965.000               | -63.1                             | included                 | 60.0       | -3.1                               | 19.0           | -22.1      | Pass    |
| 4980.000               | -63.0                             | included                 | 60.0       | -3.0                               | 19.0           | -22.0      | Pass    |

The equipment is used with the 27 dBi external antenna, the peak power spectral density limit was reduced by 1 dB.

## Reference numbers of test equipment used

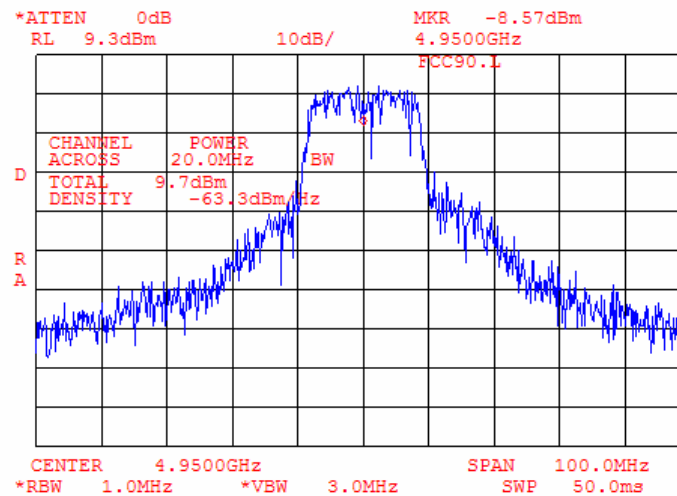
|         |         |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|
| HL 1424 | HL 2254 |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|

Full description is given in Appendix A.

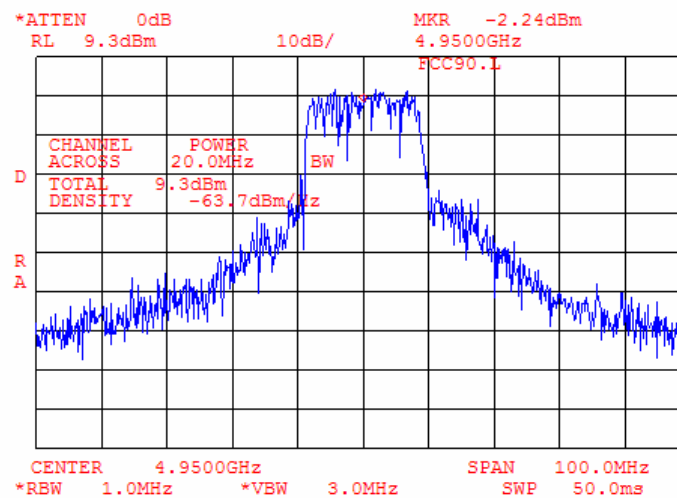


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.22 Power spectral density test results at low frequency, Bit Rate: 6 Mbps



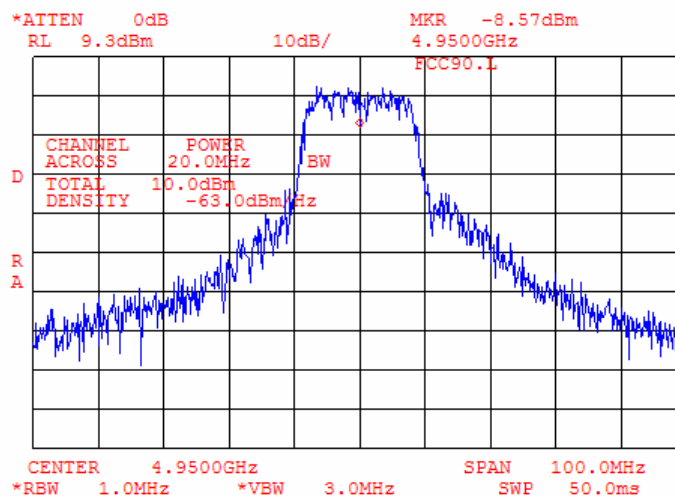
Plot 7.1.23 Power spectral density test results at low frequency, Bit Rate: 9 Mbps



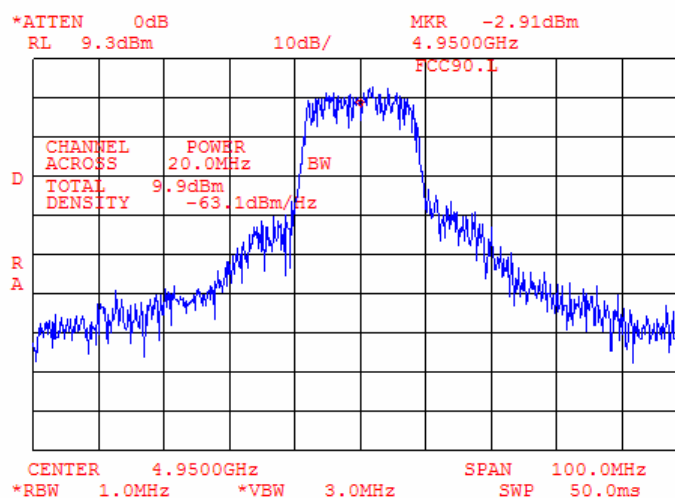


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.24 Power spectral density test results at low frequency, Bit Rate: 12 Mbps



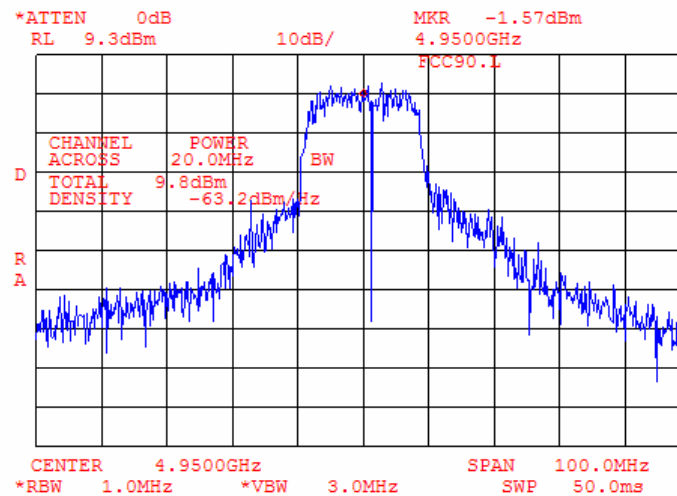
Plot 7.1.25 Power spectral density test results at low frequency, Bit Rate: 18 Mbps



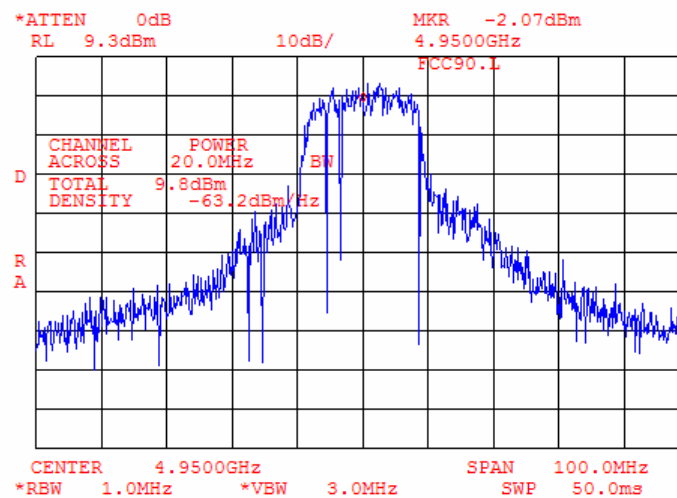


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.26 Power spectral density test results at low frequency, Bit Rate: 24 Mbps



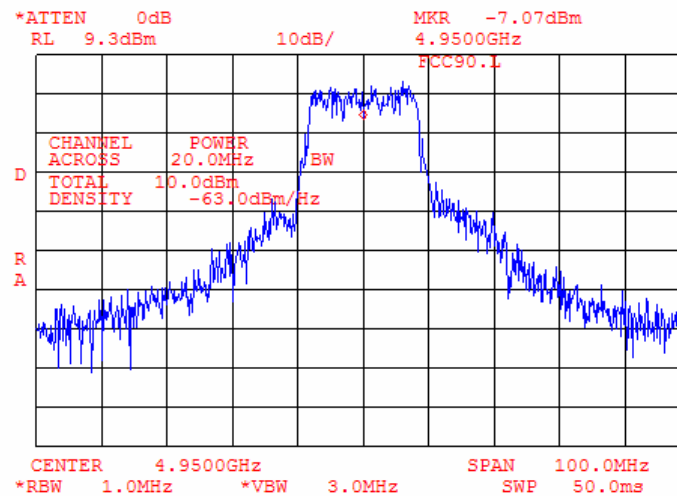
Plot 7.1.27 Power spectral density test results at low frequency, Bit Rate: 36 Mbps





|                            |                               |                                                      |                              |
|----------------------------|-------------------------------|------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.1215, Maximum output power</b>         |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                              |
| <b>Test mode:</b>          |                               | Compliance                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 2/24/2005 9:40:08 AM                                 |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 43 %                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                      |                              |

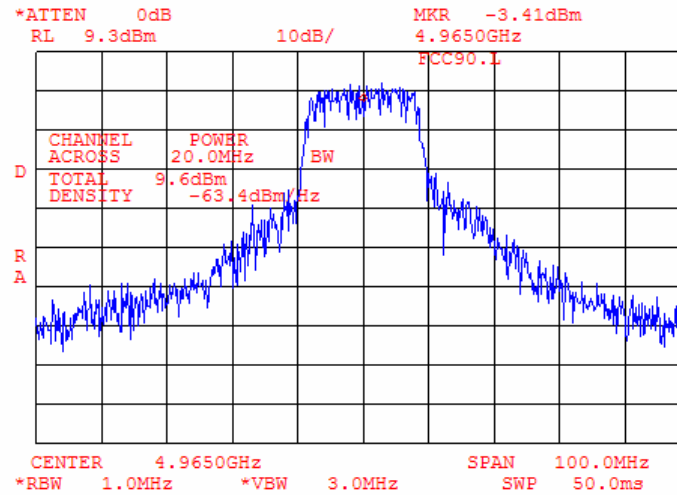
Plot 7.1.28 Power spectral density test results at low frequency, Bit Rate: 48 Mbps



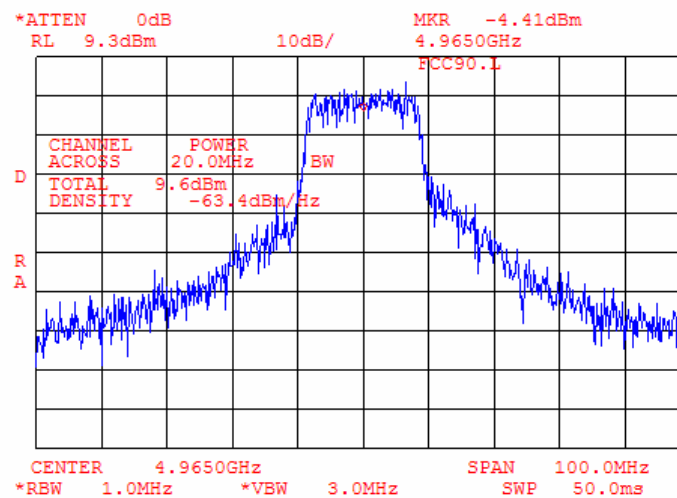


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.29 Power spectral density test results at middle frequency, Bit Rate: 6 Mbps



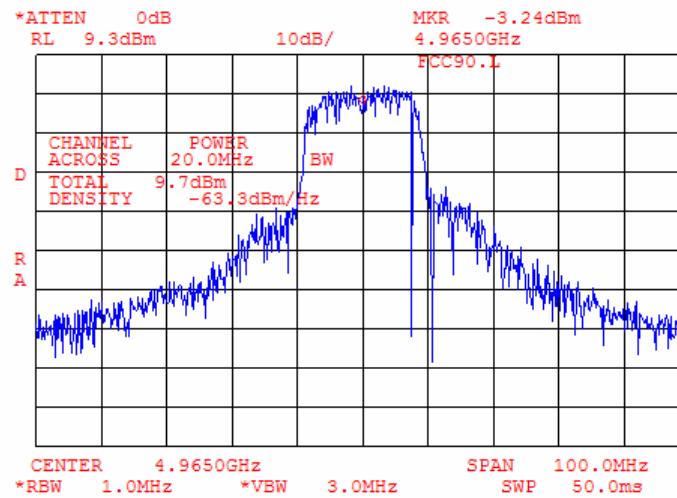
Plot 7.1.30 Power spectral density test results at middle frequency, Bit Rate: 9 Mbps



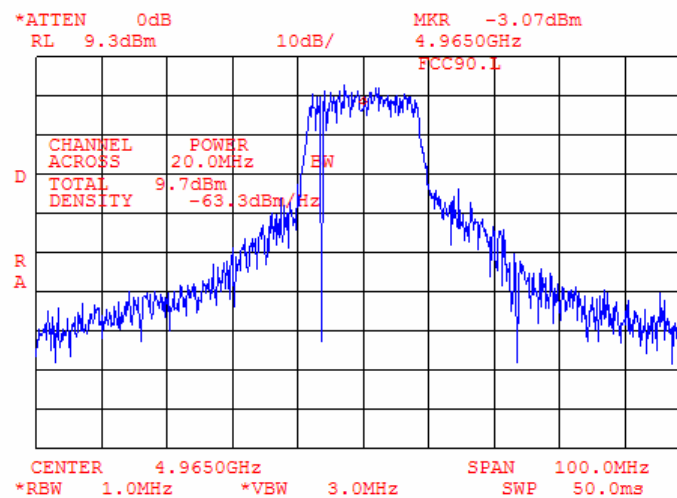


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.31 Power spectral density test results at middle frequency, Bit Rate: 12 Mbps



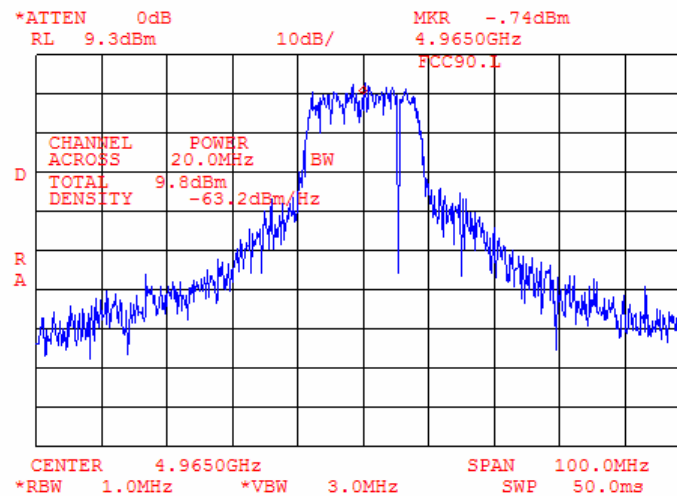
Plot 7.1.32 Power spectral density test results at middle frequency, Bit Rate: 18 Mbps



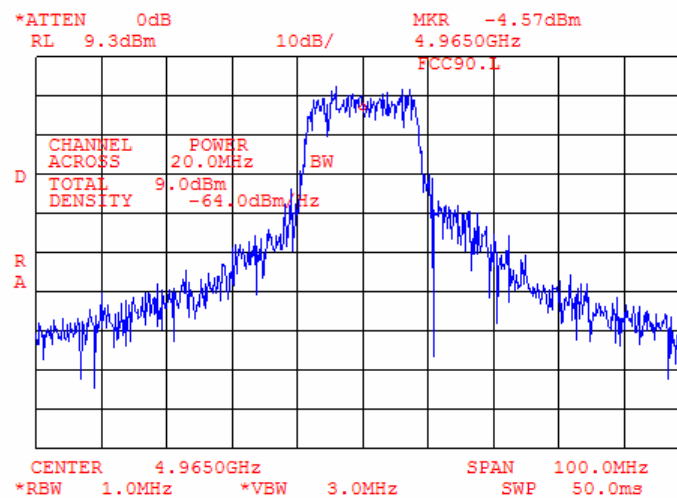


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.33 Power spectral density test results at middle frequency, Bit Rate: 24 Mbps



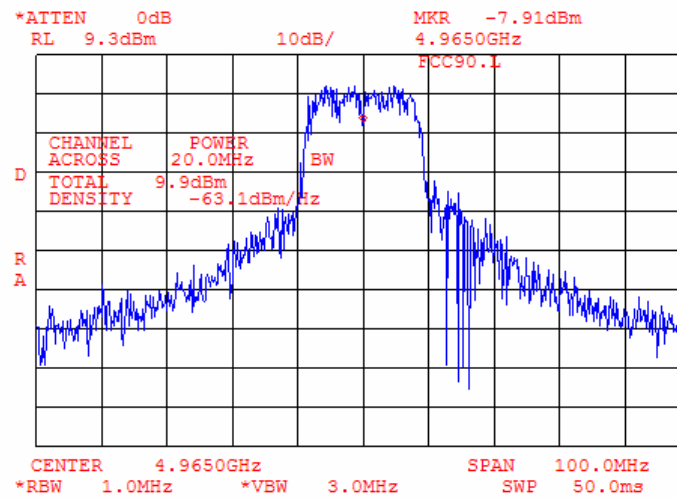
Plot 7.1.34 Power spectral density test results at middle frequency, Bit Rate: 36 Mbps





|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

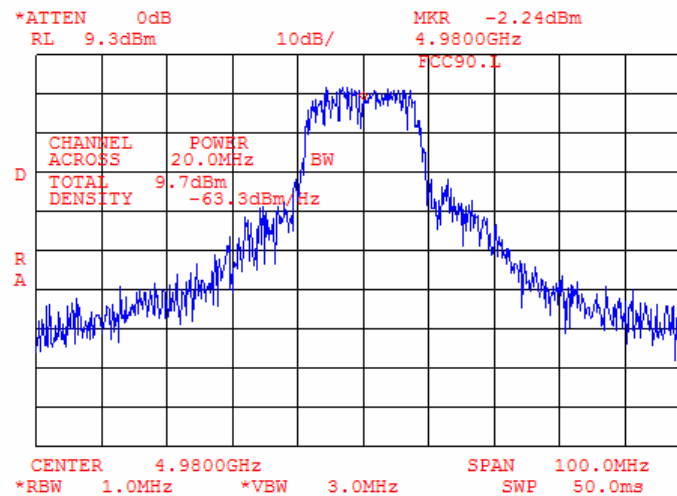
Plot 7.1.35 Power spectral density test results at middle frequency, Bit Rate: 48 Mbps



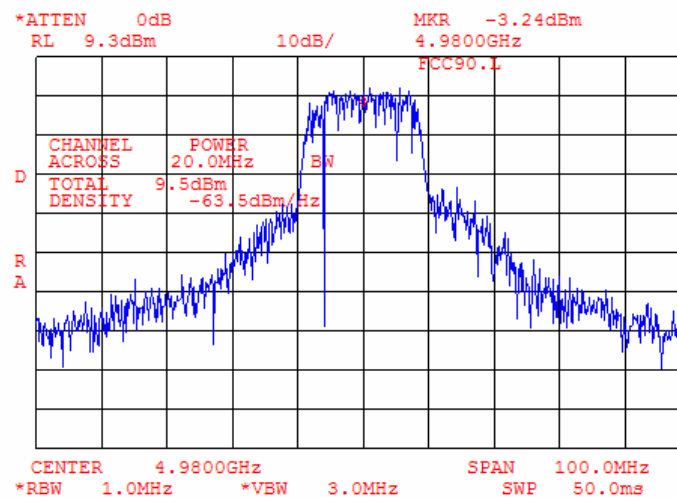


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.36 Power spectral density test results at high frequency, Bit Rate: 6 Mbps



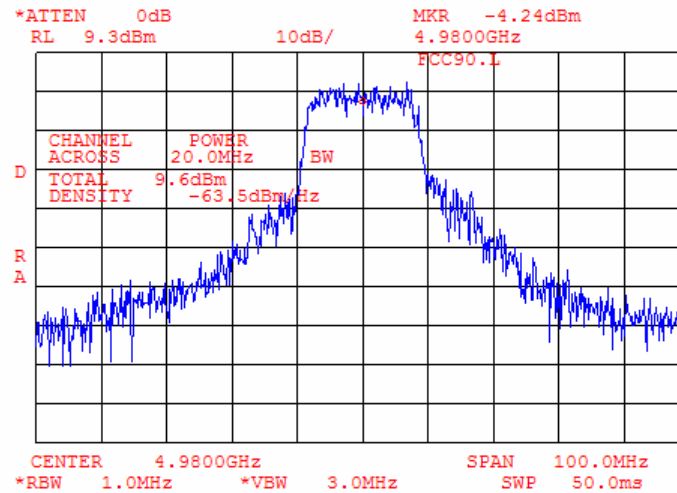
Plot 7.1.37 Power spectral density test results at high frequency, Bit Rate: 9 Mbps



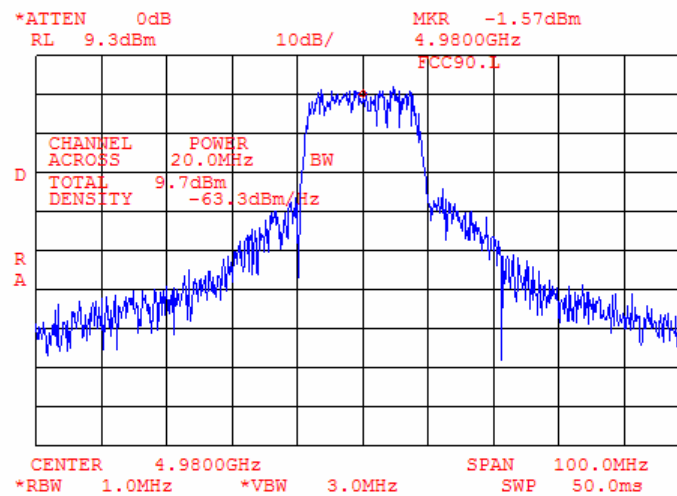


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.38 Power spectral density test results at high frequency, Bit Rate: 12 Mbps



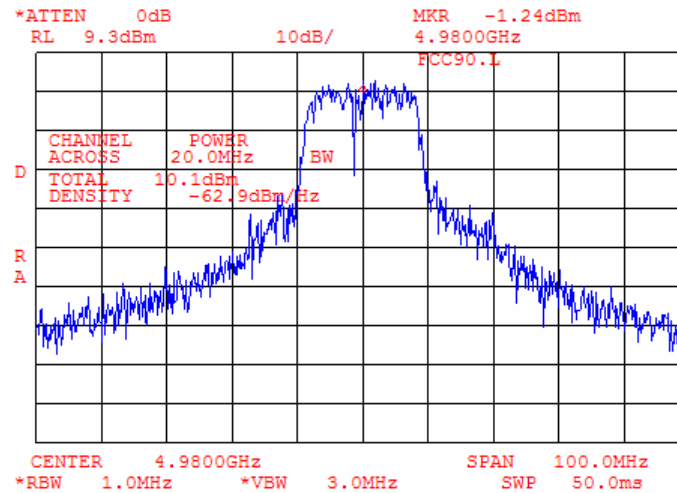
Plot 7.1.39 Power spectral density test results at high frequency, Bit Rate: 18 Mbps



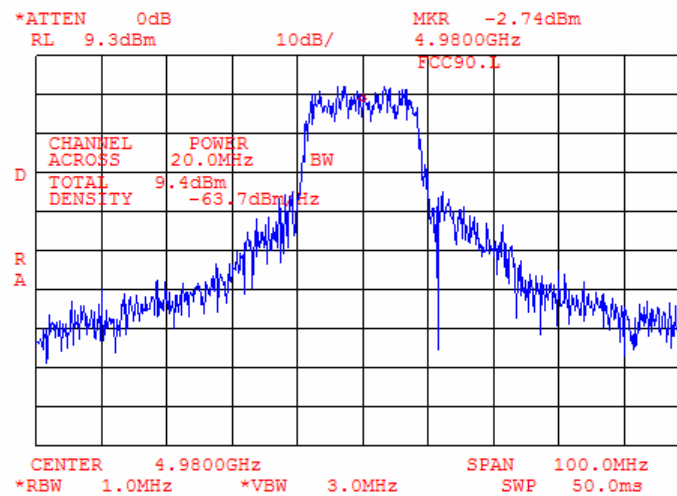


|                     |                                                      |                         |                       |
|---------------------|------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Maximum output power                |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                         |                       |
| Test mode:          | Compliance                                           | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:40:08 AM                                 |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                      |                         |                       |

Plot 7.1.40 Power spectral density test results at high frequency, Bit Rate: 24 Mbps



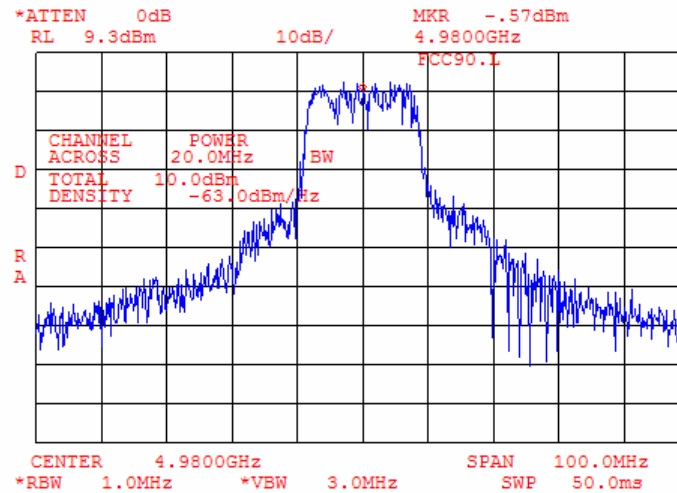
Plot 7.1.41 Power spectral density test results at high frequency, Bit Rate: 36 Mbps





|                            |                               |                                                      |                              |
|----------------------------|-------------------------------|------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.1215, Maximum output power</b>         |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 |                              |
| <b>Test mode:</b>          |                               | Compliance                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 2/24/2005 9:40:08 AM                                 |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa | <b>Relative Humidity:</b> 43 %                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                      |                              |

Plot 7.1.42 Power spectral density test results at high frequency, Bit Rate: 48 Mbps





|                            |                               |                                            |                              |
|----------------------------|-------------------------------|--------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.1215, Occupied bandwidth</b> |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 2.1049                     |                              |
| <b>Test mode:</b>          |                               | Compliance                                 | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 2/24/2005 9:54:59 AM                       |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1016 hPa | <b>Relative Humidity:</b> 46 %             | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                            |                              |

## 7.2 Occupied bandwidth test

### 7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1. The test results are provided in Table 7.2.2 and the associated plots.

Table 7.2.1 Occupied bandwidth limits

| Assigned frequency, MHz | Modulation envelope reference points*, dBc | Maximum allowed bandwidth, MHz |
|-------------------------|--------------------------------------------|--------------------------------|
| 4950 - 4980             | 26                                         | 20.0                           |

\* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

### 7.2.2 Test procedure

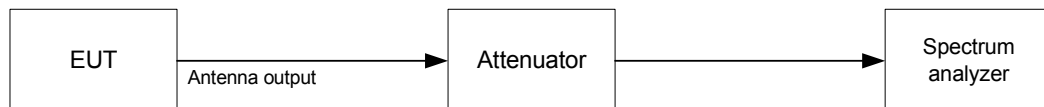
7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was set to transmit the unmodulated carrier and the reference peak power level was measured.

7.2.2.3 The EUT was set to transmit the normally modulated carrier.

7.2.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup





|                            |                                            |                                |                              |
|----------------------------|--------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.1215, Occupied bandwidth</b> |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Section 2.1049                     |                                |                              |
| <b>Test mode:</b>          | Compliance                                 | <b>Verdict:</b> PASS           |                              |
| <b>Date &amp; Time:</b>    | 2/24/2005 9:54:59 AM                       |                                |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1016 hPa              | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                            |                                |                              |

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 300 kHz  
 VIDEO BANDWIDTH: 1000 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 26 dBc  
 MODULATION: BPSK, 4QAM, 16QAM, 64QAM  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 6, 9, 12, 18, 24, 36, 48 Mbps

| Carrier frequency, MHz | Occupied bandwidth, MHz | Limit, MHz | Margin, MHz | Verdict |
|------------------------|-------------------------|------------|-------------|---------|
| <b>Rate 6 Mbps</b>     |                         |            |             |         |
| 4950.000               | 17.5                    | 20.0       | -2.5        | Pass    |
| 4965.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| 4980.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| <b>Rate 9 Mbps</b>     |                         |            |             |         |
| 4950.000               | 17.5                    | 20.0       | -2.5        | Pass    |
| 4965.000               | 17.5                    | 20.0       | -2.5        | Pass    |
| 4980.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| <b>Rate 12 Mbps</b>    |                         |            |             |         |
| 4950.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| 4965.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| 4980.000               | 17.5                    | 20.0       | -2.5        | Pass    |
| <b>Rate 18 Mbps</b>    |                         |            |             |         |
| 4950.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| 4965.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| 4980.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| <b>Rate 24 Mbps</b>    |                         |            |             |         |
| 4950.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| 4965.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| 4980.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| <b>Rate 36 Mbps</b>    |                         |            |             |         |
| 4950.000               | 17.5                    | 20.0       | -2.5        | Pass    |
| 4965.000               | 17.5                    | 20.0       | -2.5        | Pass    |
| 4980.000               | 17.5                    | 20.0       | -2.5        | Pass    |
| <b>Rate 48 Mbps</b>    |                         |            |             |         |
| 4950.000               | 17.2                    | 20.0       | -2.8        | Pass    |
| 4965.000               | 17.3                    | 20.0       | -2.7        | Pass    |
| 4980.000               | 17.3                    | 20.0       | -2.7        | Pass    |

## Reference numbers of test equipment used

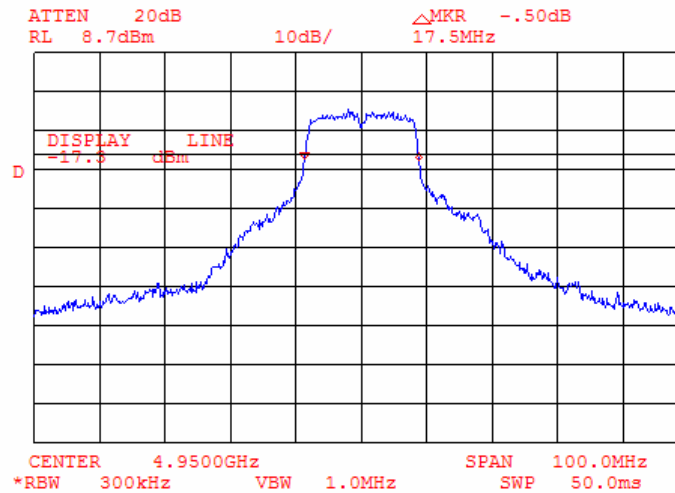
|         |         |         |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|
| HL 1424 | HL 2399 | HL 2524 |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|

Full description is given in Appendix A.

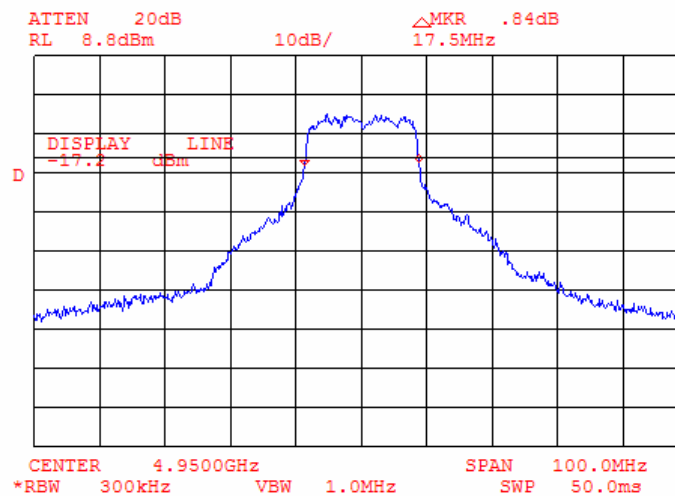


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.1 Occupied bandwidth test result at low frequency, 6 Mbps



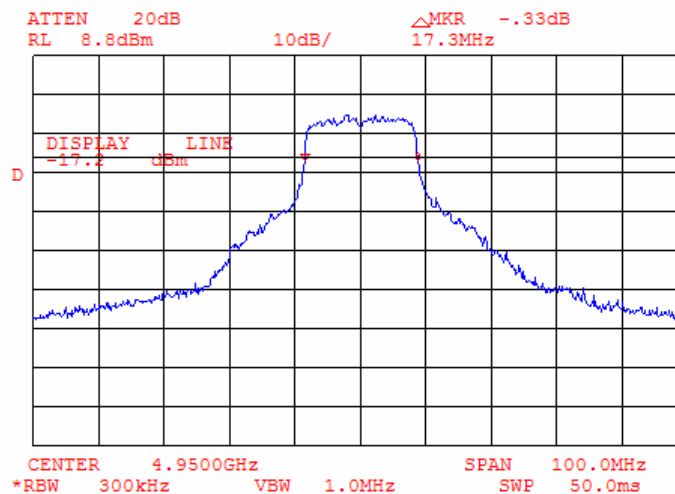
Plot 7.2.2 Occupied bandwidth test result at low frequency, 9 Mbps



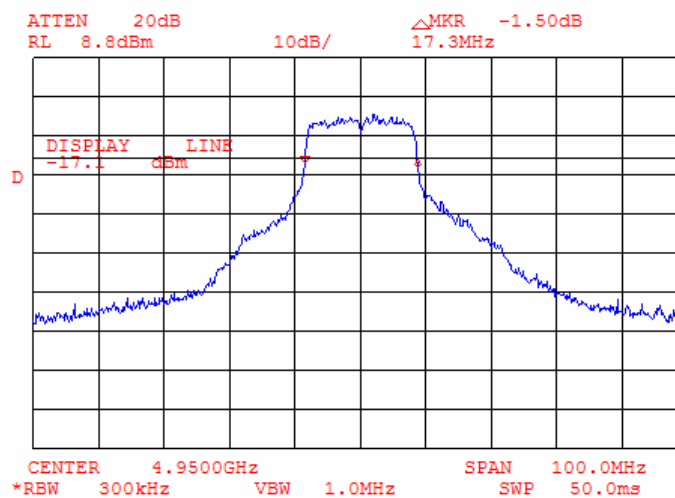


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.3 Occupied bandwidth test result at low frequency, 12 Mbps



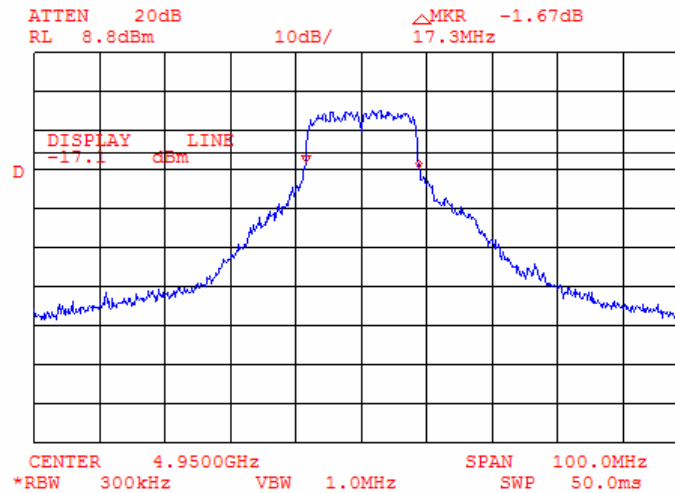
Plot 7.2.4 Occupied bandwidth test result at low frequency, 18 Mbps



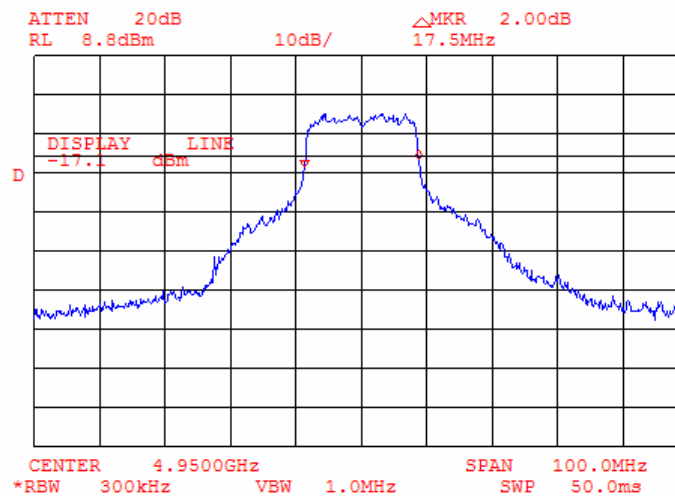


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.5 Occupied bandwidth test result at low frequency, 24 Mbps



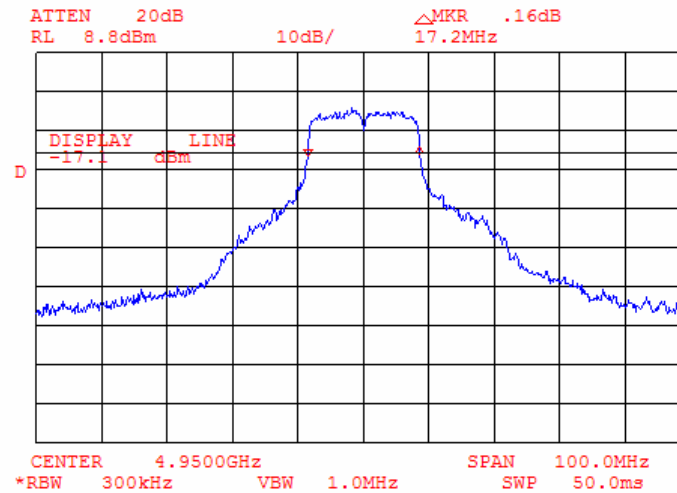
Plot 7.2.6 Occupied bandwidth test result at low frequency, 36 Mbps





|                            |  |                                            |                                |
|----------------------------|--|--------------------------------------------|--------------------------------|
| <b>Test specification:</b> |  | <b>Section 90.1215, Occupied bandwidth</b> |                                |
| <b>Test procedure:</b>     |  | 47 CFR, Section 2.1049                     |                                |
| <b>Test mode:</b>          |  | Compliance                                 | <b>Verdict:</b> PASS           |
| <b>Date &amp; Time:</b>    |  | 2/24/2005 9:54:59 AM                       |                                |
| <b>Temperature:</b> 24 °C  |  | <b>Air Pressure:</b> 1016 hPa              | <b>Relative Humidity:</b> 46 % |
| <b>Remarks:</b>            |  | <b>Power Supply:</b> 120 VAC               |                                |

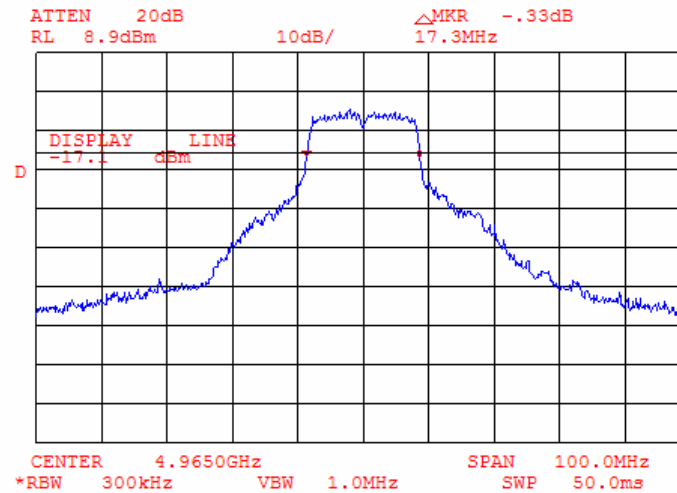
Plot 7.2.7 Occupied bandwidth test result at low frequency, 48 Mbps



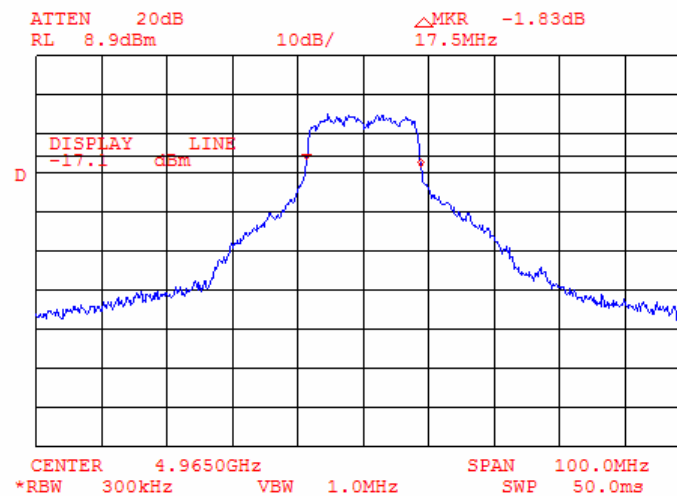


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.8 Occupied bandwidth test result at mid frequency, 6 Mbps



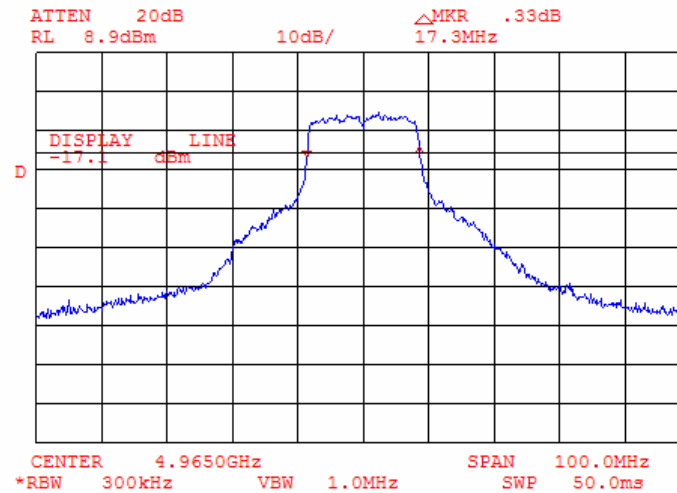
Plot 7.2.9 Occupied bandwidth test result at mid frequency, 9 Mbps



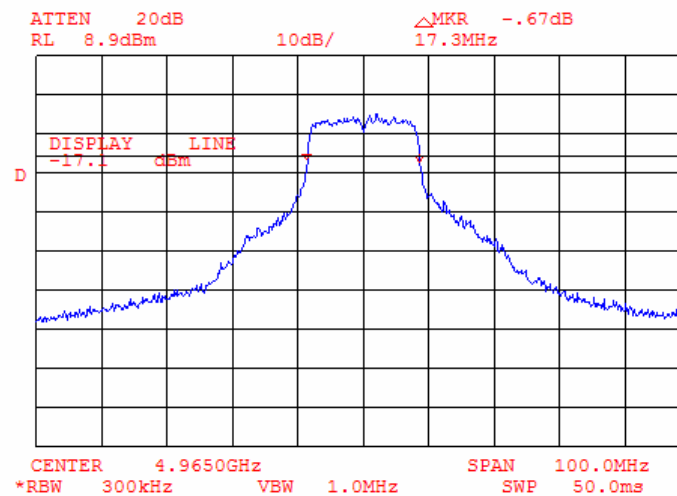


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.10 Occupied bandwidth test result at mid frequency, 12 Mbps



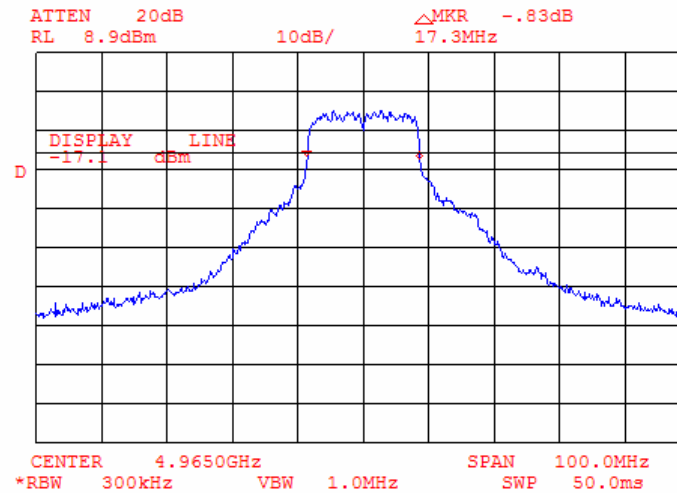
Plot 7.2.11 Occupied bandwidth test result at mid frequency, 18 Mbps



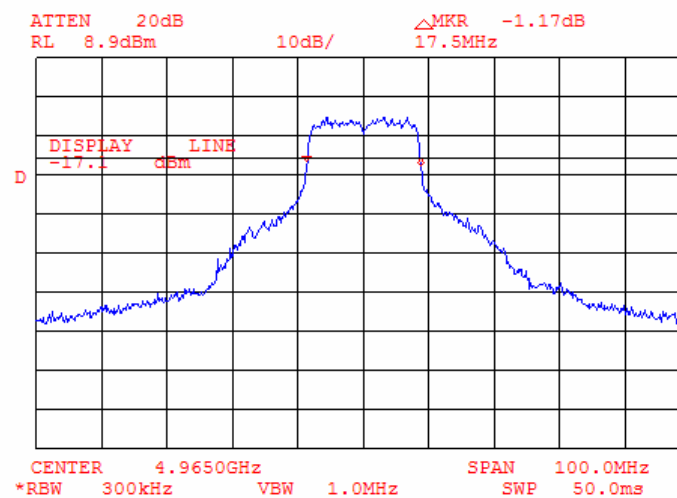


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.12 Occupied bandwidth test result at mid frequency, 24 Mbps



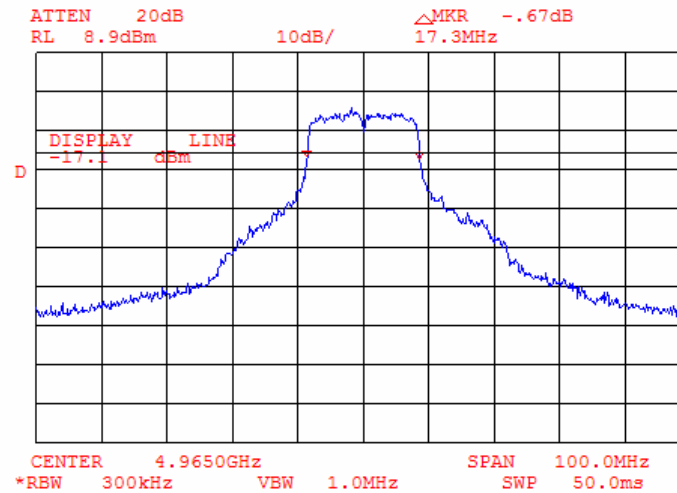
Plot 7.2.13 Occupied bandwidth test result at mid frequency, 36 Mbps





|                            |  |                                            |                                |
|----------------------------|--|--------------------------------------------|--------------------------------|
| <b>Test specification:</b> |  | <b>Section 90.1215, Occupied bandwidth</b> |                                |
| <b>Test procedure:</b>     |  | 47 CFR, Section 2.1049                     |                                |
| <b>Test mode:</b>          |  | Compliance                                 | <b>Verdict:</b> PASS           |
| <b>Date &amp; Time:</b>    |  | 2/24/2005 9:54:59 AM                       |                                |
| <b>Temperature:</b> 24 °C  |  | <b>Air Pressure:</b> 1016 hPa              | <b>Relative Humidity:</b> 46 % |
| <b>Remarks:</b>            |  | <b>Power Supply:</b> 120 VAC               |                                |

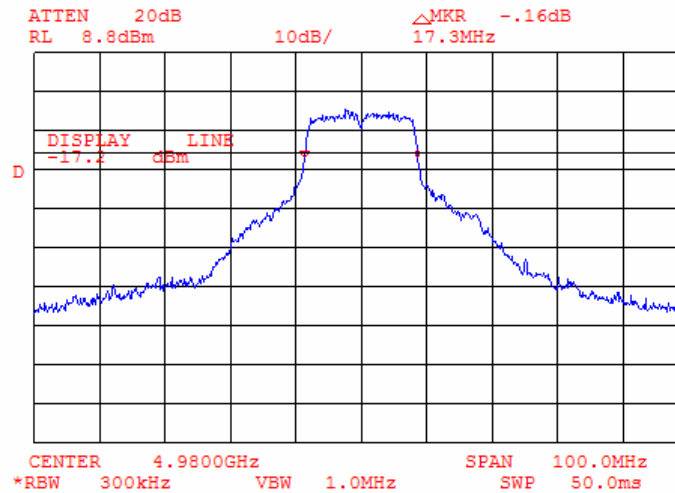
Plot 7.2.14 Occupied bandwidth test result at mid frequency, 48 Mbps



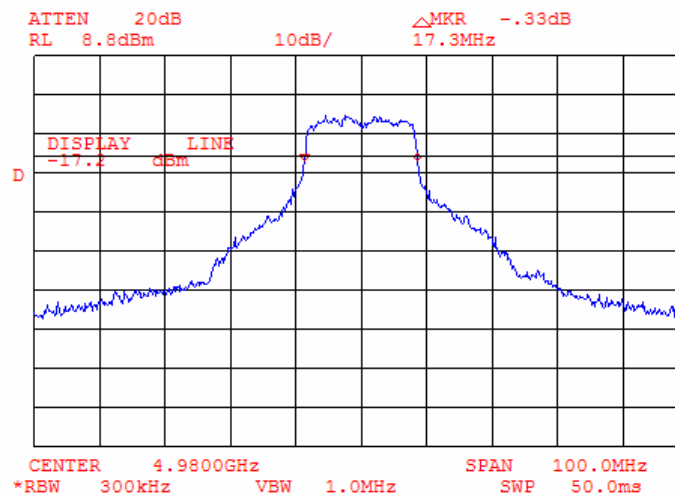


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.15 Occupied bandwidth test result at high frequency, 6 Mbps



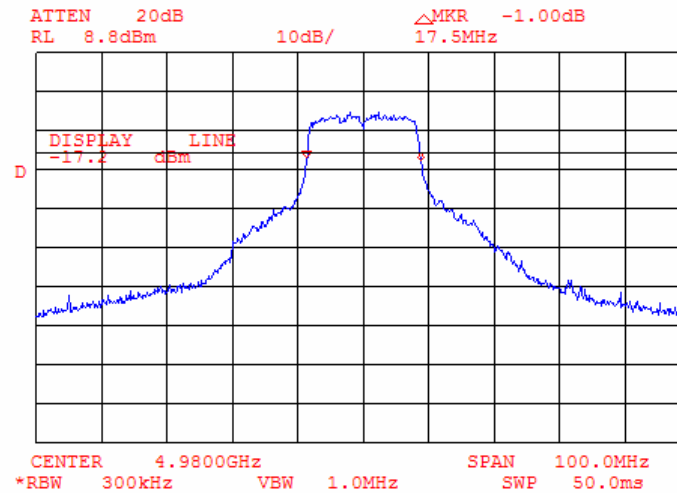
Plot 7.2.16 Occupied bandwidth test result at high frequency, 9 Mbps



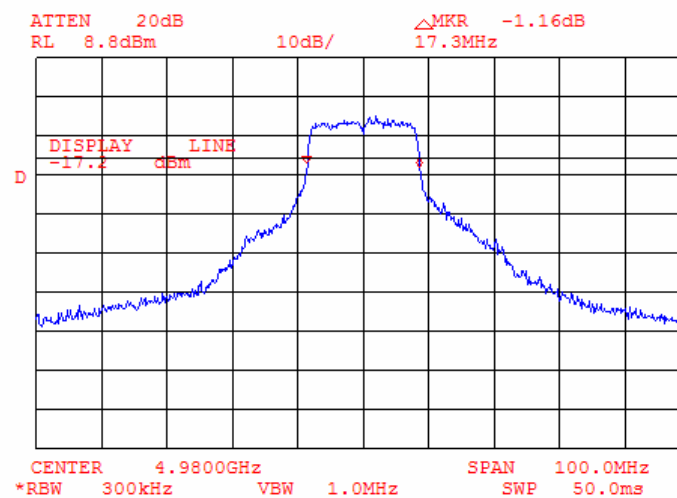


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.17 Occupied bandwidth test result at high frequency, 12 Mbps



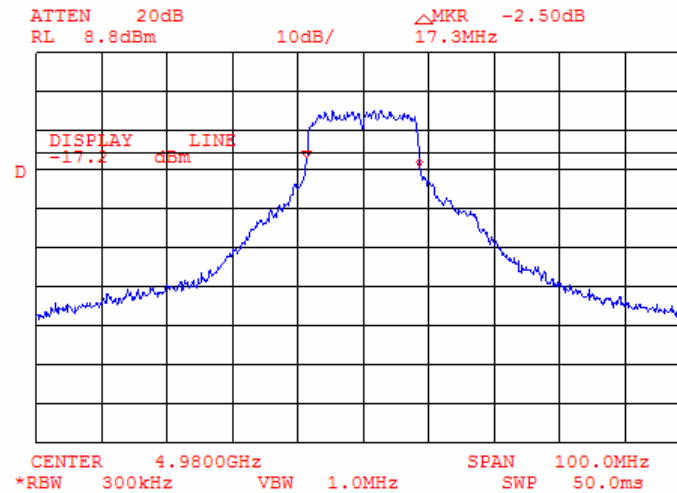
Plot 7.2.18 Occupied bandwidth test result at high frequency, 18 Mbps



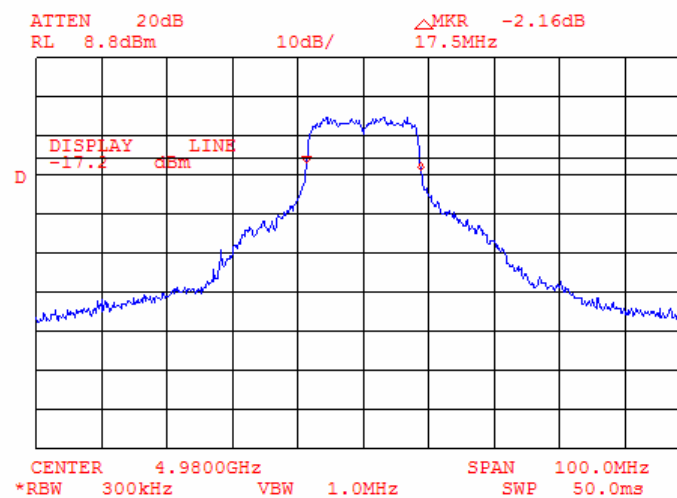


|                     |                                     |                         |                       |
|---------------------|-------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.1215, Occupied bandwidth |                         |                       |
| Test procedure:     | 47 CFR, Section 2.1049              |                         |                       |
| Test mode:          | Compliance                          | Verdict:                | PASS                  |
| Date & Time:        | 2/24/2005 9:54:59 AM                |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1016 hPa              | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks:            |                                     |                         |                       |

Plot 7.2.19 Occupied bandwidth test result at high frequency, 24 Mbps



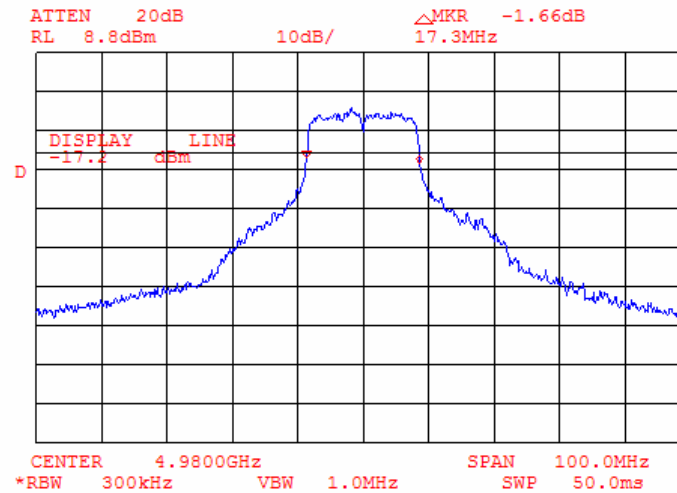
Plot 7.2.20 Occupied bandwidth test result at high frequency, 36 Mbps





|                            |  |                                            |                                |
|----------------------------|--|--------------------------------------------|--------------------------------|
| <b>Test specification:</b> |  | <b>Section 90.1215, Occupied bandwidth</b> |                                |
| <b>Test procedure:</b>     |  | 47 CFR, Section 2.1049                     |                                |
| <b>Test mode:</b>          |  | Compliance                                 | <b>Verdict:</b> PASS           |
| <b>Date &amp; Time:</b>    |  | 2/24/2005 9:54:59 AM                       |                                |
| <b>Temperature:</b> 24 °C  |  | <b>Air Pressure:</b> 1016 hPa              | <b>Relative Humidity:</b> 46 % |
| <b>Remarks:</b>            |  | <b>Power Supply:</b> 120 VAC               |                                |

Plot 7.2.21 Occupied bandwidth test result at high frequency, 48 Mbps





|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

## 7.3 Emission mask test

### 7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1. The test results are provided in the associated plots.

**Table 7.3.1 Emission mask limits**

| Frequency displacement from carrier | Attenuation below carrier, dBc |
|-------------------------------------|--------------------------------|
| Emission mask L                     |                                |
| 0 – 20.0 MHz                        | 0                              |
| 20.0 – 37.5 MHz                     | 28.0                           |
| 37.5 – 62.5 MHz                     | 37.0                           |
| 62.5 – 75.0 MHz                     | 41.0                           |
| More than 75.0 MHz                  | 53.0                           |

\* - linearly increase with frequency

\*\* - emission mask includes carrier modulation envelope within  $\pm 250$  % of the authorized bandwidth; the frequency range removed beyond  $\pm 250$  % of the authorized bandwidth from carrier was investigated as spurious emission

### 7.3.2 Test procedure

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

**7.3.2.2** The emission mask was measured with spectrum analyzer as provided in the associated plots.

**Figure 7.3.1 Emission mask test setup**



**Table 7.3.2 Emission mask test results**

| Carrier frequency, MHz | Limit           | Verdict |
|------------------------|-----------------|---------|
| 4950.0                 | Emission mask L | Pass    |
| 4965.0                 |                 |         |
| 4980.0                 |                 |         |

### Reference numbers of test equipment used

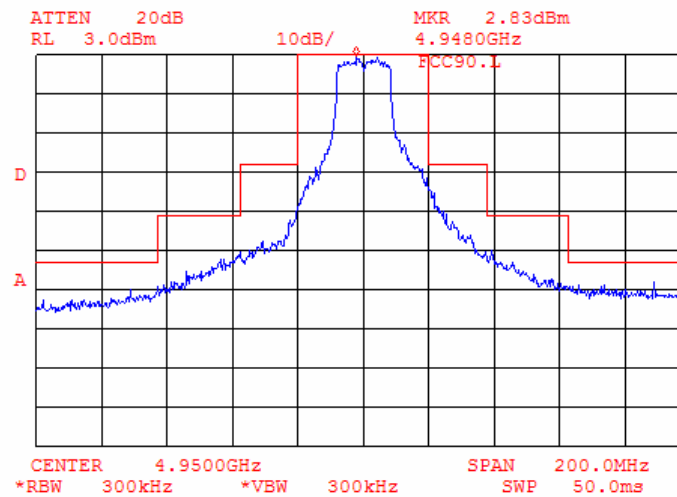
|         |         |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|
| HL 1424 | HL 2254 |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|

Full description is given in Appendix A.

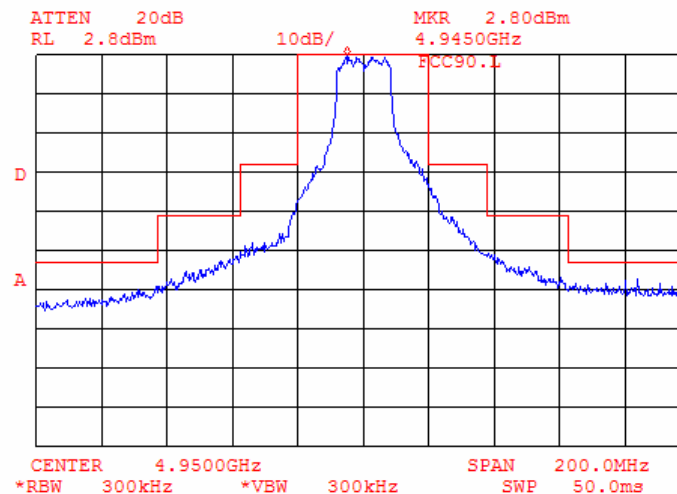


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.1 Emission mask test results at low carrier frequency, 4950 MHz, Rate: 6 Mbps



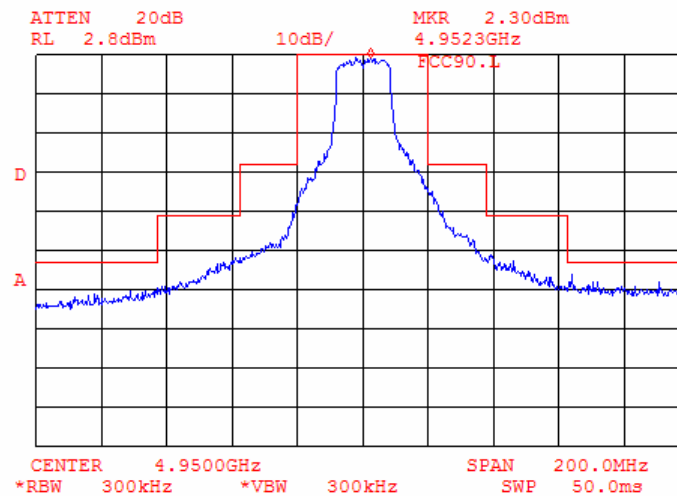
Plot 7.3.2 Emission mask test results at low carrier frequency, 4950 MHz, Rate: 9 Mbps



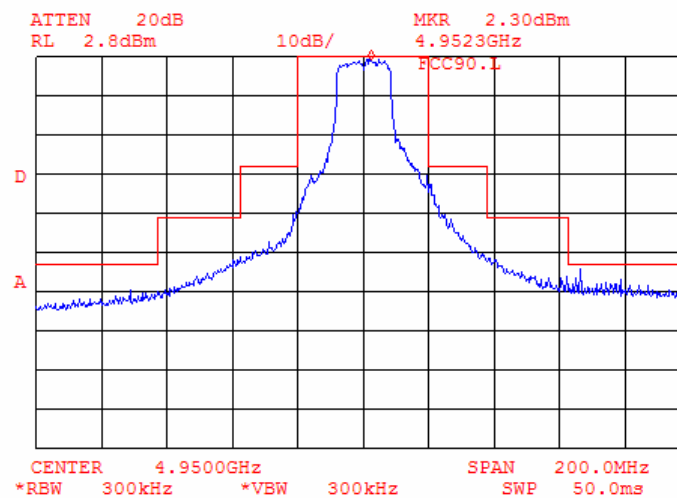


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.3 Emission mask test results at low carrier frequency, 4950 MHz, Rate: 12 Mbps



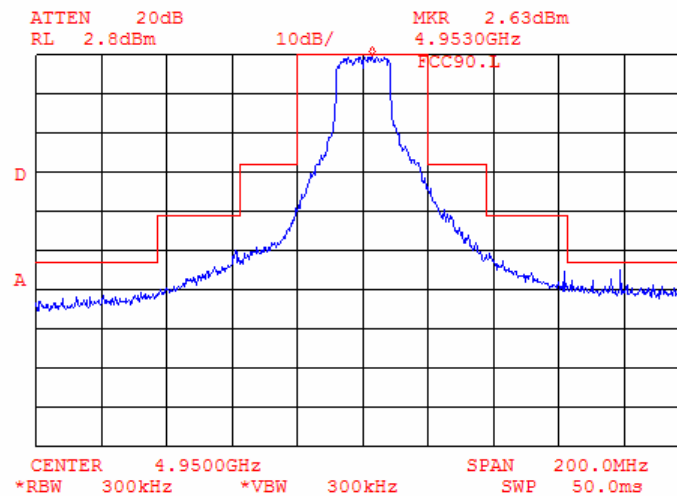
Plot 7.3.4 Emission mask test results at low carrier frequency, 4950 MHz, Rate: 18 Mbps



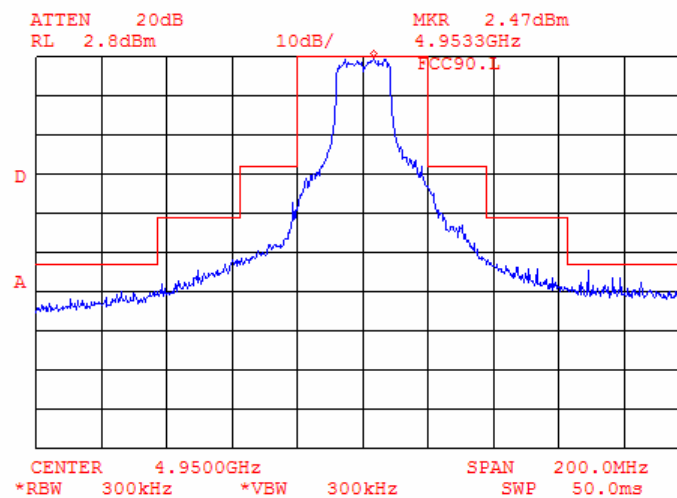


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.5 Emission mask test results at low carrier frequency, 4950 MHz, Rate: 24 Mbps



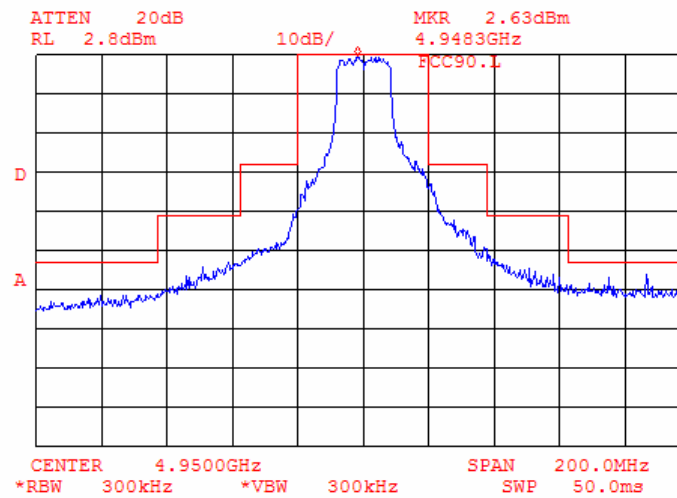
Plot 7.3.6 Emission mask test results at low carrier frequency, 4950 MHz, Rate: 36 Mbps





|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

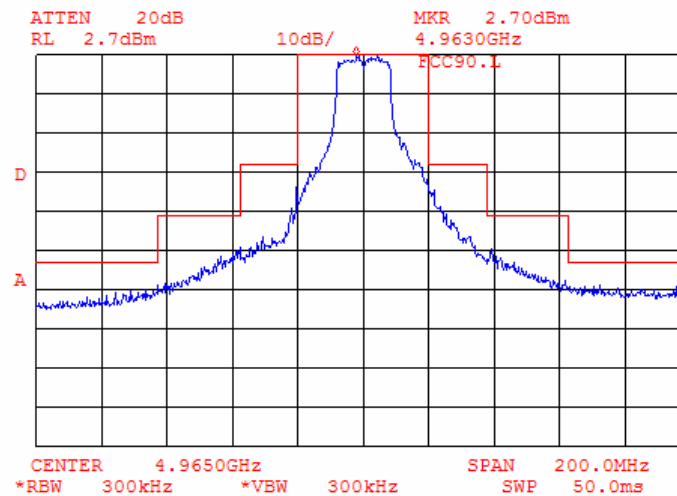
Plot 7.3.7 Emission mask test results at low carrier frequency, 4950 MHz, Rate: 48 Mbps



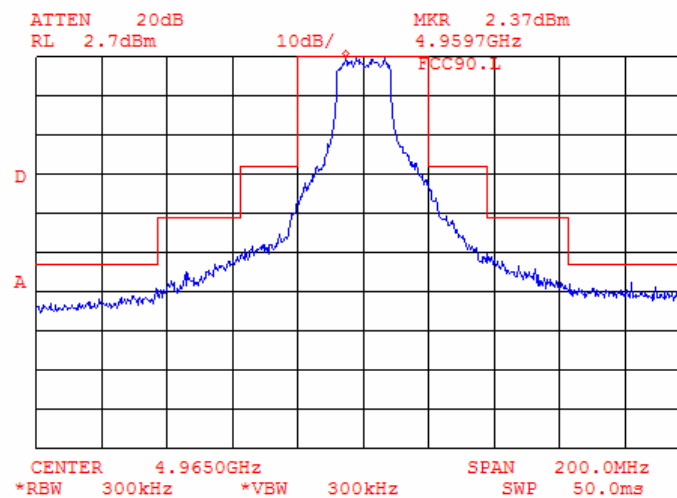


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.8 Emission mask test results at mid carrier frequency, 4965 MHz, Rate: 6 Mbps



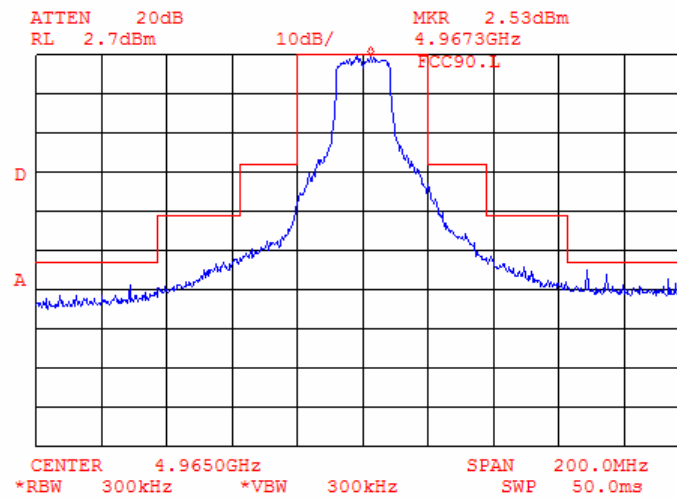
Plot 7.3.9 Emission mask test results at mid carrier frequency, 4965 MHz, Rate: 9 Mbps



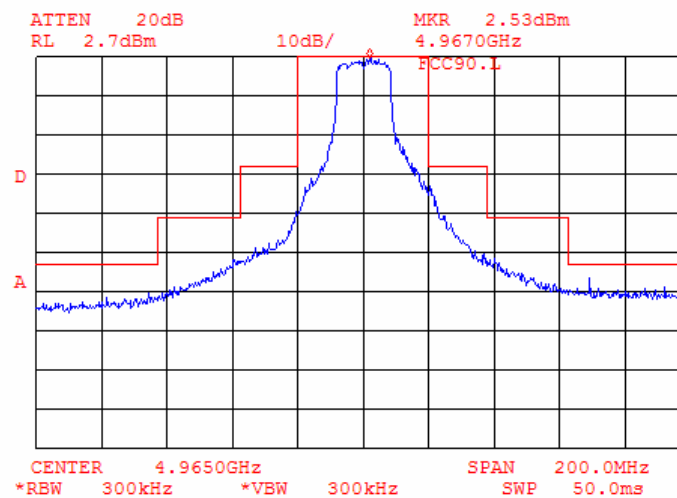


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.10 Emission mask test results at mid carrier frequency, 4965 MHz, Rate: 12 Mbps



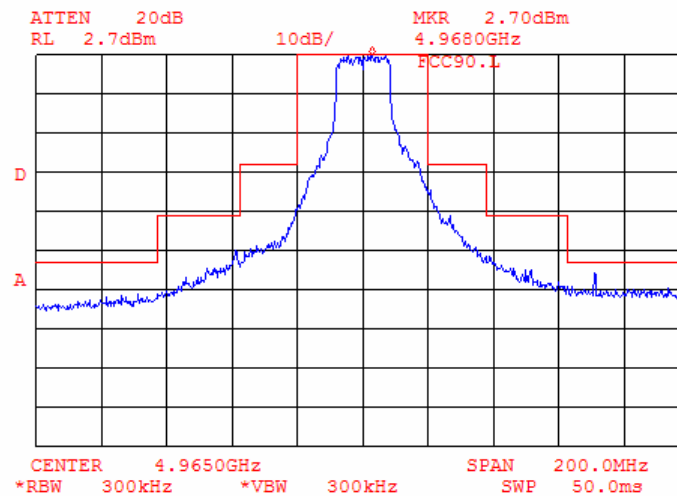
Plot 7.3.11 Emission mask test results at mid carrier frequency, 4965 MHz, Rate: 18 Mbps



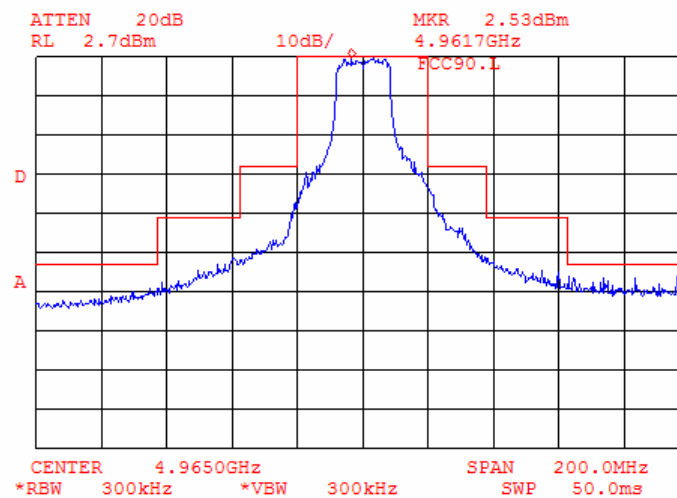


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.12 Emission mask test results at mid carrier frequency, 4965 MHz, Rate: 24 Mbps



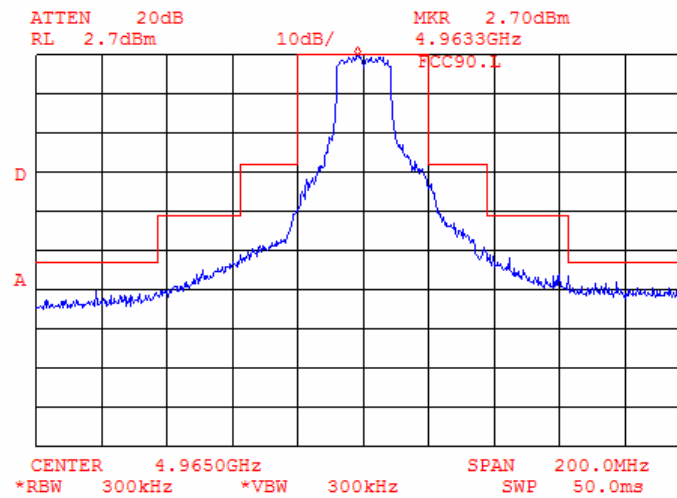
Plot 7.3.13 Emission mask test results at mid carrier frequency, 4965 MHz, Rate: 36 Mbps





|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

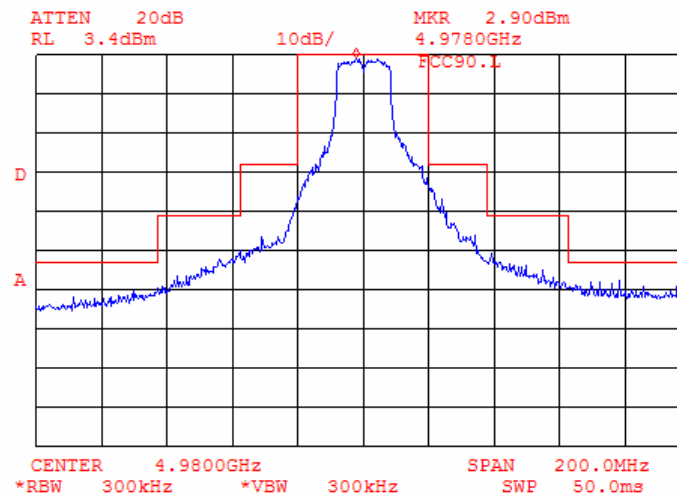
Plot 7.3.14 Emission mask test results at mid carrier frequency, 4965 MHz, Rate: 48 Mbps



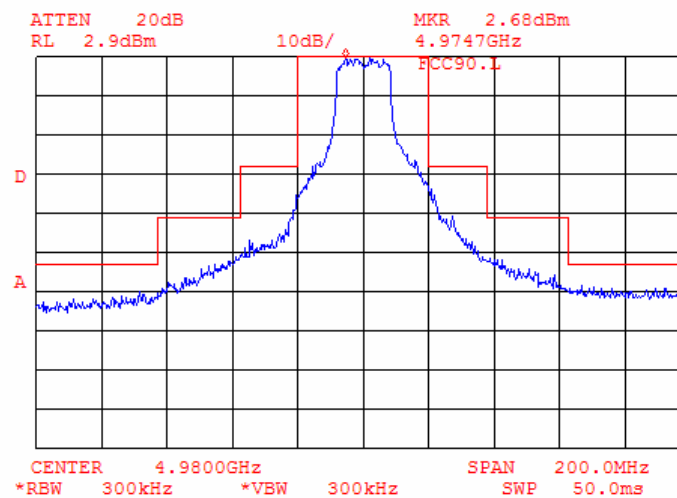


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.15 Emission mask test results at high carrier frequency, 4980 MHz, Rate: 6 Mbps



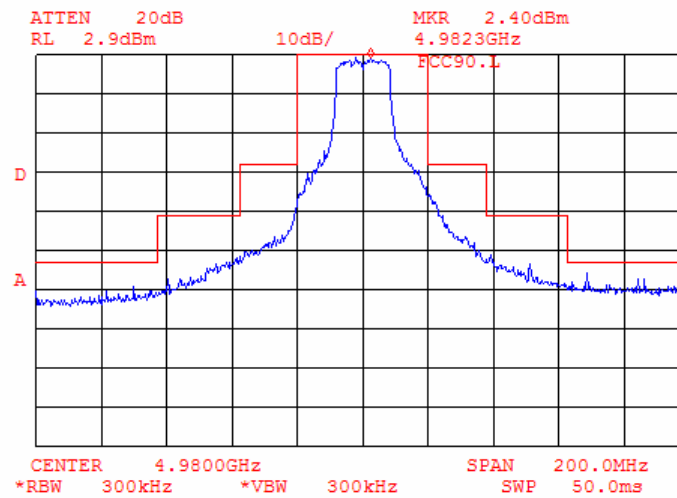
Plot 7.3.16 Emission mask test results at high carrier frequency, 4980 MHz, Rate: 9 Mbps



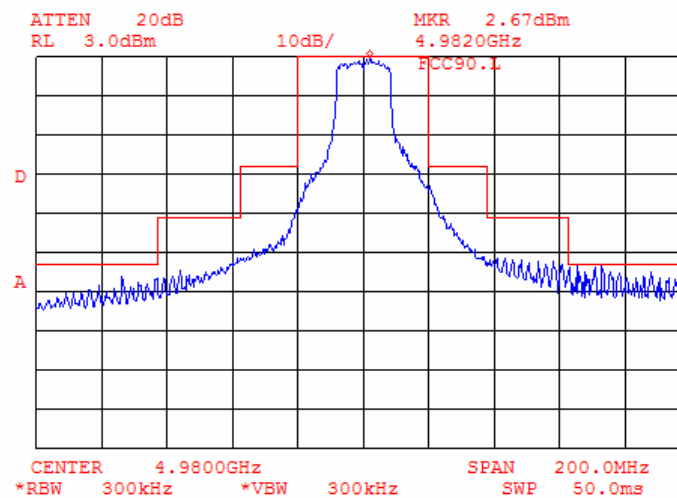


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.17 Emission mask test results at high carrier frequency, 4980 MHz, Rate: 12 Mbps



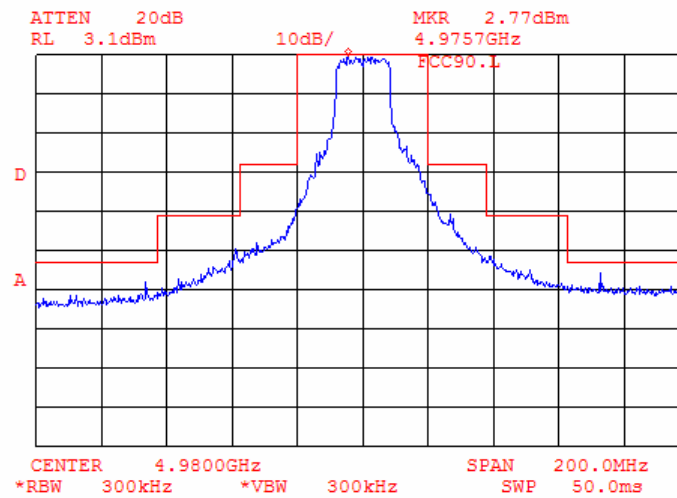
Plot 7.3.18 Emission mask test results at high carrier frequency, 4980 MHz, Rate: 18 Mbps



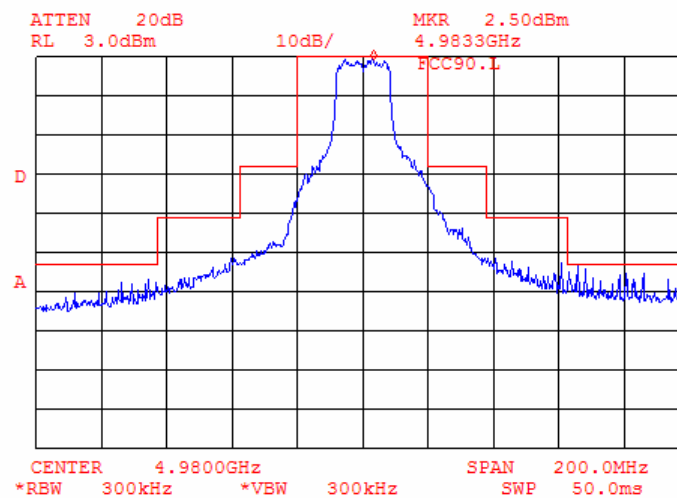


|                            |                                                                              |                                |                              |
|----------------------------|------------------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Emission mask</b>                                         |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                                   | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/1/2005 4:24:06 PM                                                          |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1013 hPa                                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                              |                                |                              |

Plot 7.3.19 Emission mask test results at high carrier frequency, 4980 MHz, Rate: 24 Mbps



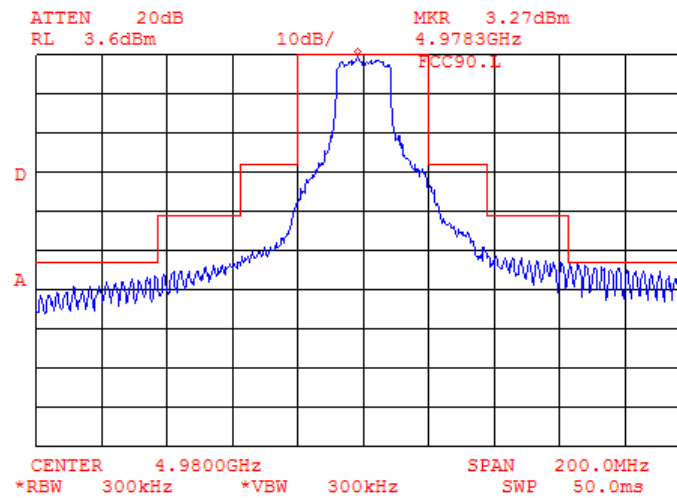
Plot 7.3.20 Emission mask test results at high carrier frequency, 4980 MHz, Rate: 36 Mbps





|                     |                                                                              |                         |                       |
|---------------------|------------------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Emission mask                                                |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                         |                       |
| Test mode:          | Compliance                                                                   | Verdict:                | PASS                  |
| Date & Time:        | 3/1/2005 4:24:06 PM                                                          |                         |                       |
| Temperature: 25 °C  | Air Pressure: 1013 hPa                                                       | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                                              |                         |                       |

Plot 7.3.21 Emission mask test results at high carrier frequency, 4980 MHz, Rate: 48 Mbps





|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Conducted spurious emissions</b>                  |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                              |
| <b>Test mode:</b>          |                               | Compliance                                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 3/2/2005 8:41:49 PM                                                  |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa | <b>Relative Humidity:</b> 43 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

## 7.4 Spurious emissions at RF antenna connector test

### 7.4.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.4.1. The test results are provided in Table 7.4.2 and associated plots.

Table 7.4.1 Spurious emission limits

| Frequency, MHz         | Attenuation below carrier, dBc |
|------------------------|--------------------------------|
| 0.009 – 10th harmonic* | 53.0                           |

\* - spurious emission limits do not apply to the in band emission within  $\pm 250$  % of the authorized bandwidth from the carrier; investigated in course of emission mask testing

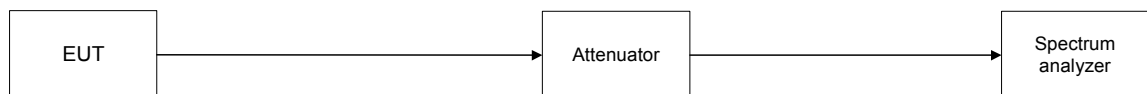
### 7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.

7.4.2.2 The EUT was adjusted to produce maximum available for end user RF output power.

7.4.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.4.2 and associated plots.

Figure 7.4.1 Spurious emission test setup





|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b> PASS           |                              |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Table 7.4.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 4950 - 4980 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATING SIGNAL: PRBS  
 TRANSMITTER OUTPUT POWER: 12.7 dBm at low frequency  
 12.7 dBm at mid frequency  
 12.8 dBm at high frequency

| Frequency, MHz                | SA reading, dBm | Attenuator, dB | Cable loss, dB | RBW, kHz | Spurious emission, dBm | Attenuation below carrier, dBc | Limit, dBc | Margin, dB* | Verdict |
|-------------------------------|-----------------|----------------|----------------|----------|------------------------|--------------------------------|------------|-------------|---------|
| <b>Low carrier frequency</b>  |                 |                |                |          |                        |                                |            |             |         |
| 400.0030                      | -52.83          | Included       | Included       | 100      | -52.83                 | 65.23                          | 53.00      | 12.23       | Pass    |
| 608.3130                      | -54.50          | Included       | Included       | 100      | -54.50                 | 66.90                          | 53.00      | 13.90       | Pass    |
| 649.9570                      | -52.83          | Included       | Included       | 100      | -52.83                 | 65.23                          | 53.00      | 12.23       | Pass    |
| 3300.8000                     | -59.00          | Included       | Included       | 1000     | -59.00                 | 71.40                          | 53.00      | 18.40       | Pass    |
| 6599.8700                     | -45.50          | Included       | Included       | 1000     | -45.50                 | 57.90                          | 53.00      | 4.90        | Pass    |
| 9897.0000                     | -51.67          | Included       | Included       | 1000     | -51.67                 | 64.07                          | 53.00      | 11.07       | Pass    |
| 14850.0000                    | -47.33          | Included       | Included       | 1000     | -47.33                 | 59.73                          | 53.00      | 6.73        | Pass    |
| <b>Mid carrier frequency</b>  |                 |                |                |          |                        |                                |            |             |         |
| 1066.8000                     | -51.17          | Included       | Included       | 1000     | -51.17                 | 62.67                          | 53.00      | 9.67        | Pass    |
| 6265.7000                     | -53.00          | Included       | Included       | 1000     | -53.00                 | 64.50                          | 53.00      | 11.50       | Pass    |
| 6620.0300                     | -42.33          | Included       | Included       | 1000     | -42.33                 | 53.83                          | 53.00      | 0.83        | Pass    |
| 9931.3000                     | -44.50          | Included       | Included       | 1000     | -44.50                 | 56.00                          | 53.00      | 3.00        | Pass    |
| <b>High carrier frequency</b> |                 |                |                |          |                        |                                |            |             |         |
| 1067.0000                     | -50.00          | Included       | Included       | 1000     | -50.00                 | 61.50                          | 53.00      | 8.50        | Pass    |
| 4630.7000                     | -56.33          | Included       | Included       | 1000     | -56.33                 | 67.83                          | 53.00      | 14.83       | Pass    |
| 6323.7000                     | -46.50          | Included       | Included       | 1000     | -46.50                 | 58.00                          | 53.00      | 5.00        | Pass    |
| 6639.9700                     | -46.33          | Included       | Included       | 1000     | -46.33                 | 57.83                          | 53.00      | 4.83        | Pass    |
| 9961.2500                     | -43.00          | Included       | Included       | 1000     | -43.00                 | 54.50                          | 53.00      | 1.50        | Pass    |

\*- Margin = Spurious emission – specification limit.

## Reference numbers of test equipment used

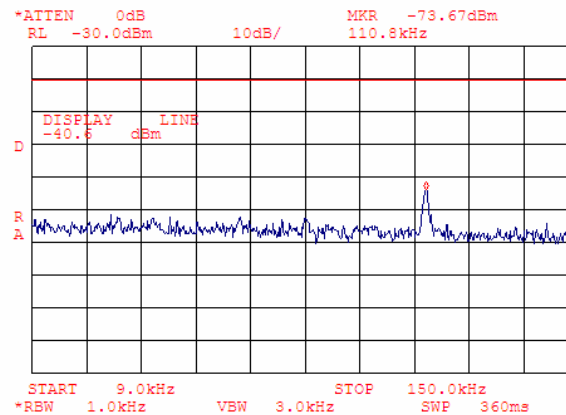
|         |         |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|
| HL 1424 | HL 2254 |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|

Full description is given in Appendix A.

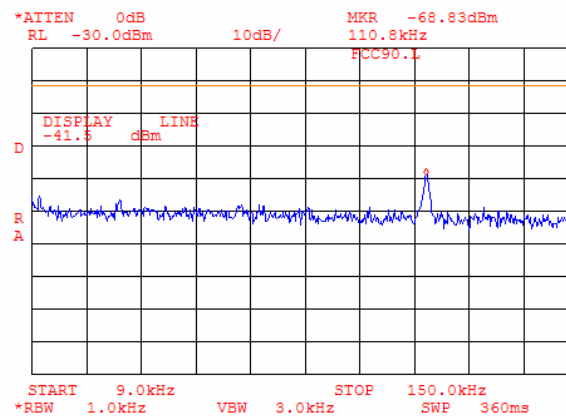


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency



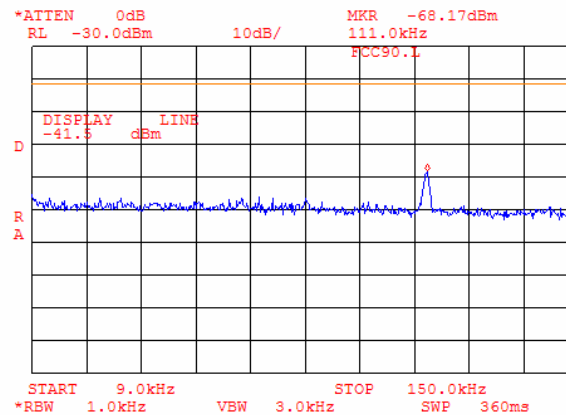
Plot 7.4.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency



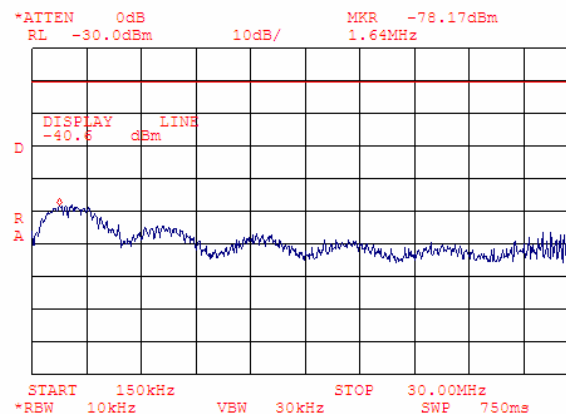


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency



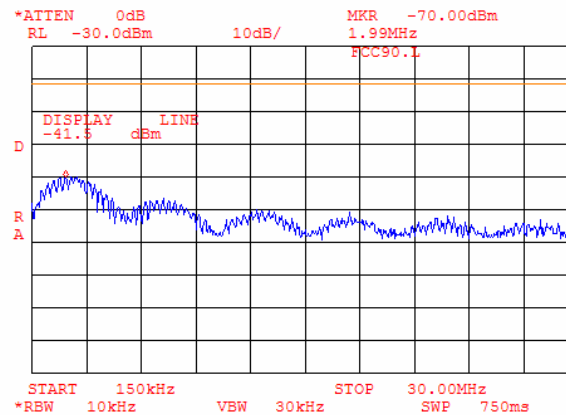
Plot 7.4.4 Spurious emission measurements in 0.15 - 30 MHz range at low carrier frequency



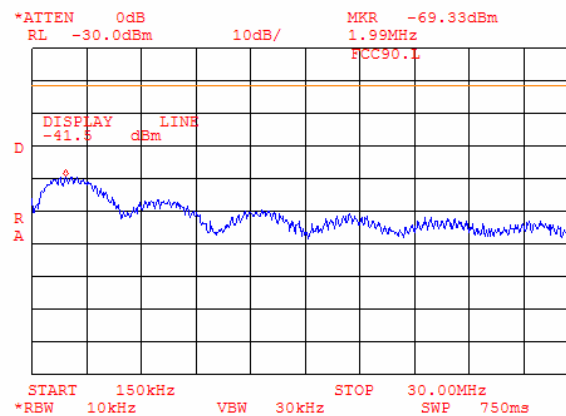


|                     |                                                                      |                         |                       |
|---------------------|----------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Conducted spurious emissions                         |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                         |                       |
| Test mode:          | Compliance                                                           | Verdict:                | PASS                  |
| Date & Time:        | 3/2/2005 8:41:49 PM                                                  |                         |                       |
| Temperature: 26 °C  | Air Pressure: 1015 hPa                                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                                      |                         |                       |

Plot 7.4.5 Spurious emission measurements in 0.15 - 30 MHz range at mid carrier frequency



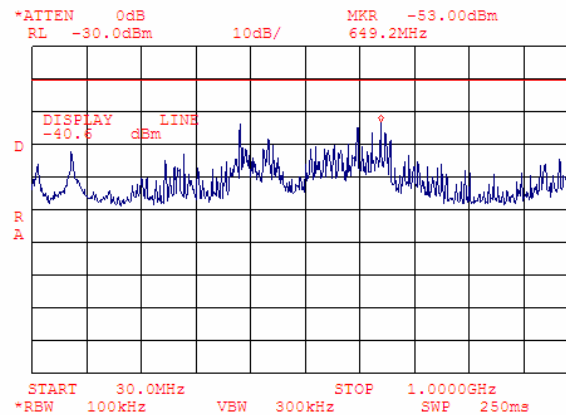
Plot 7.4.6 Spurious emission measurements in 0.15 - 30 MHz range at high carrier frequency



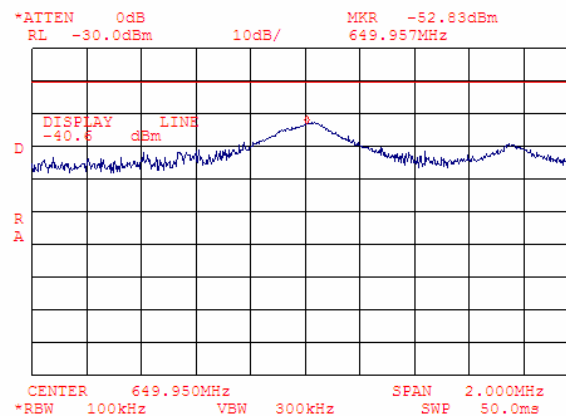


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.7 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency



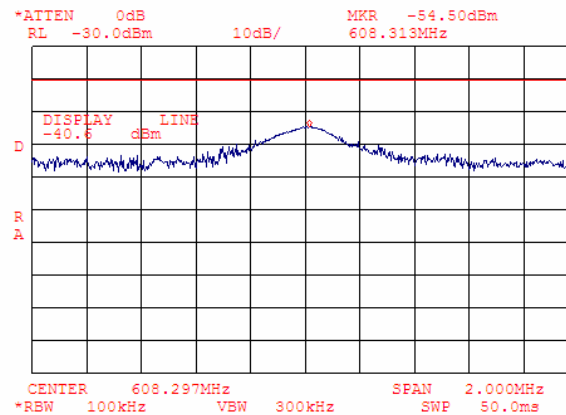
Plot 7.4.8 Spurious emission measurement at 649.9 MHz at low carrier frequency



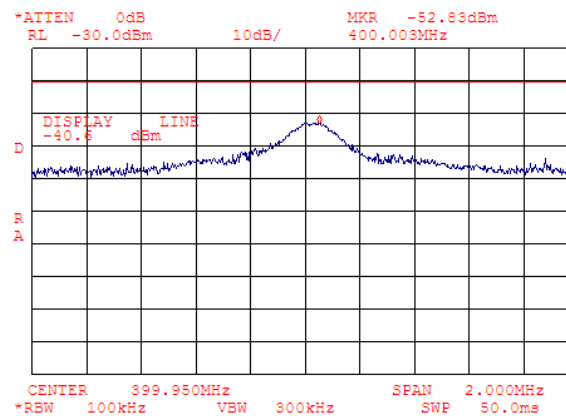


|                     |                                                                      |                         |                       |
|---------------------|----------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Conducted spurious emissions                         |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                         |                       |
| Test mode:          | Compliance                                                           | Verdict:                | PASS                  |
| Date & Time:        | 3/2/2005 8:41:49 PM                                                  |                         |                       |
| Temperature: 26 °C  | Air Pressure: 1015 hPa                                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                                      |                         |                       |

Plot 7.4.9 Spurious emission measurement at 608.3 MHz at low carrier frequency



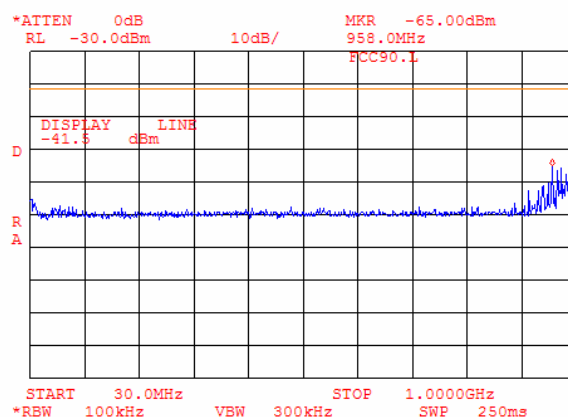
Plot 7.4.10 Spurious emission measurement at 400.0 MHz at low carrier frequency



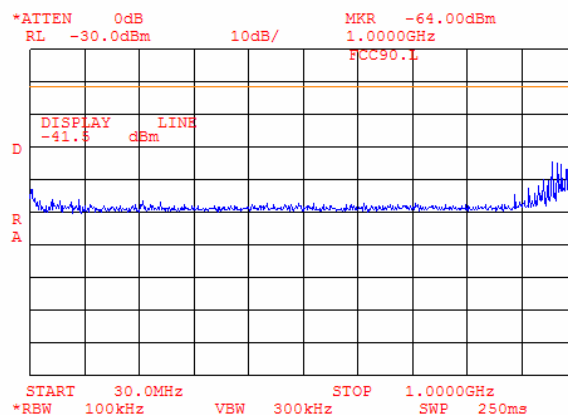


|                     |                                                                      |                         |                       |
|---------------------|----------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Conducted spurious emissions                         |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                         |                       |
| Test mode:          | Compliance                                                           | Verdict:                | PASS                  |
| Date & Time:        | 3/2/2005 8:41:49 PM                                                  |                         |                       |
| Temperature: 26 °C  | Air Pressure: 1015 hPa                                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                                      |                         |                       |

Plot 7.4.11 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency



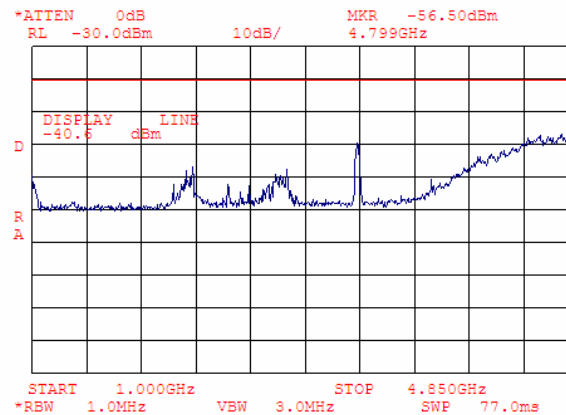
Plot 7.4.12 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency



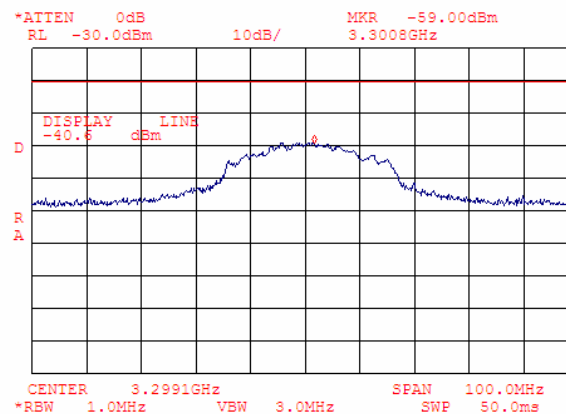


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.13 Spurious emission measurements in 1000 - 4850 MHz range at low carrier frequency



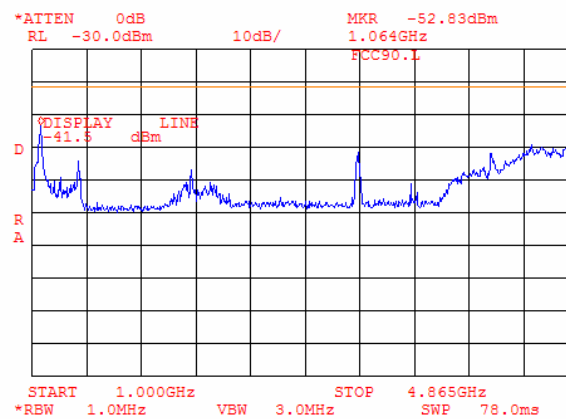
Plot 7.4.14 Spurious emission measurement at 3.30 GHz at low carrier frequency



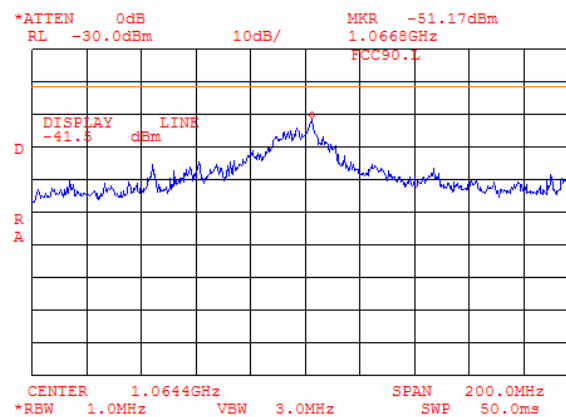


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.15 Spurious emission measurements in 1000 - 4865 MHz range at mid carrier frequency



Plot 7.4.16 Spurious emission measurement at 1.06 GHz at mid carrier frequency



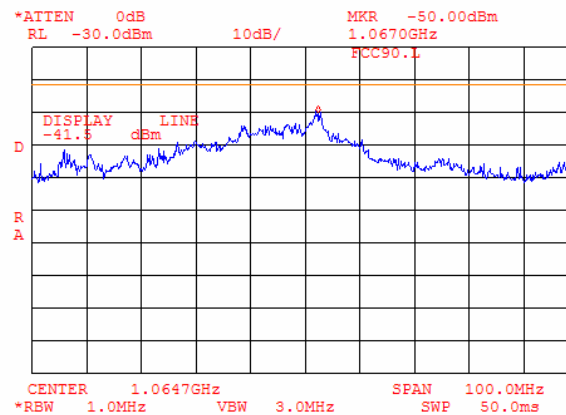


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.17 Spurious emission measurements in 30 - 4880 MHz range at high carrier frequency



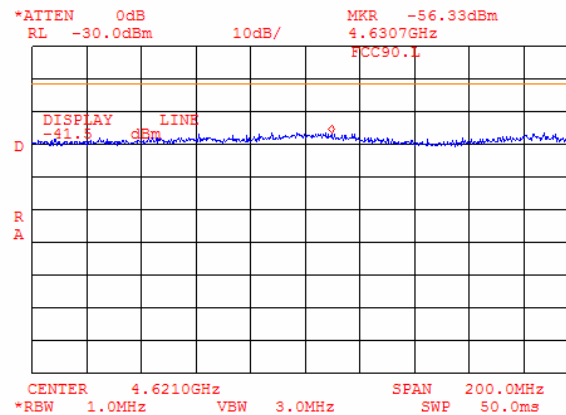
Plot 7.4.18 Spurious emission measurement at 1.07 GHz at high carrier frequency





|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Conducted spurious emissions</b>                  |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                              |
| <b>Test mode:</b>          |                               | Compliance                                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 3/2/2005 8:41:49 PM                                                  |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa | <b>Relative Humidity:</b> 43 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

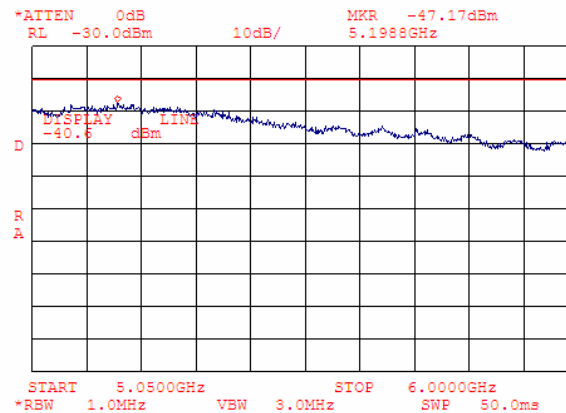
Plot 7.4.19 Spurious emission measurement at 4.6 GHz at high carrier frequency



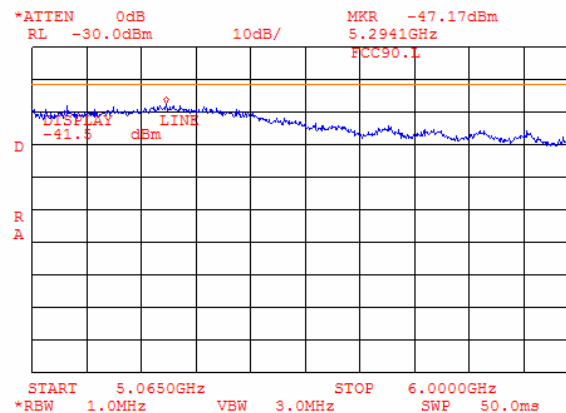


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.20 Spurious emission measurements in 5050 - 6000 MHz range at low carrier frequency



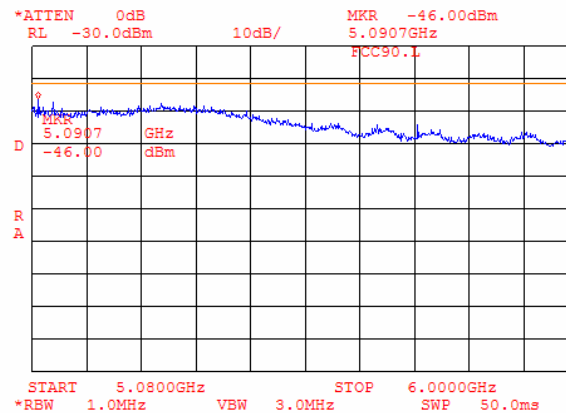
Plot 7.4.21 Spurious emission measurements in 5065 - 6000 MHz range at mid carrier frequency



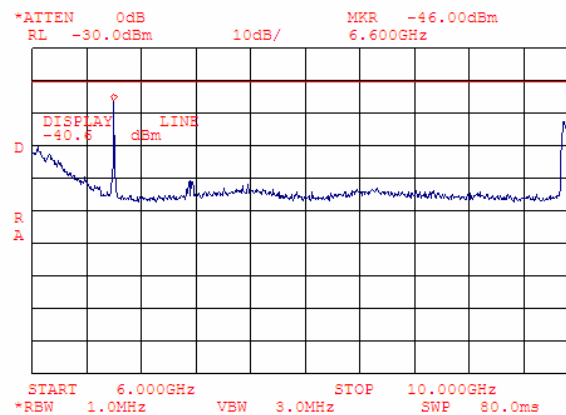


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.22 Spurious emission measurements in 5080 - 6000 MHz range at high carrier frequency



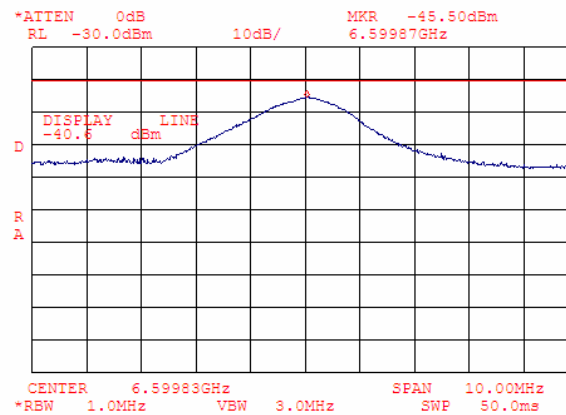
Plot 7.4.23 Spurious emission measurements in 6000 - 10000 MHz range at low carrier frequency



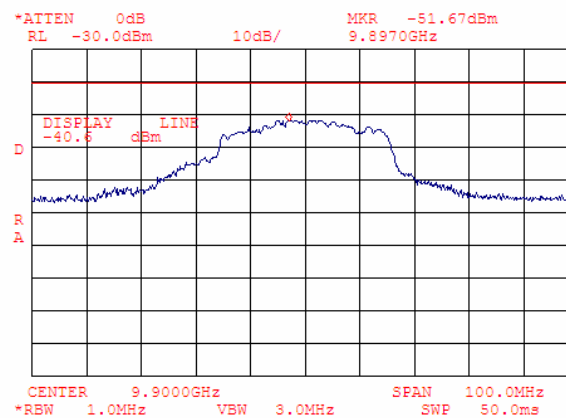


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.24 Spurious emission measurement at 6.6 GHz at low carrier frequency



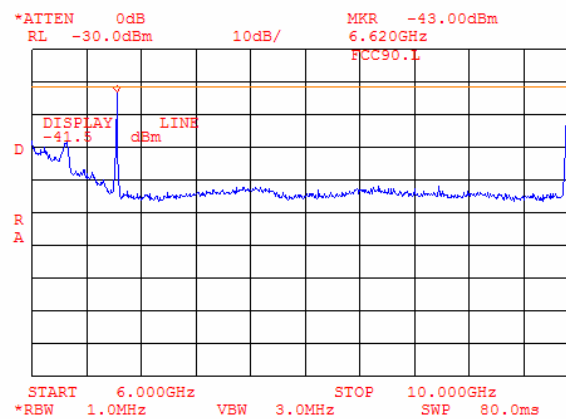
Plot 7.4.25 Spurious emission measurement at 9.9 GHz at low carrier frequency



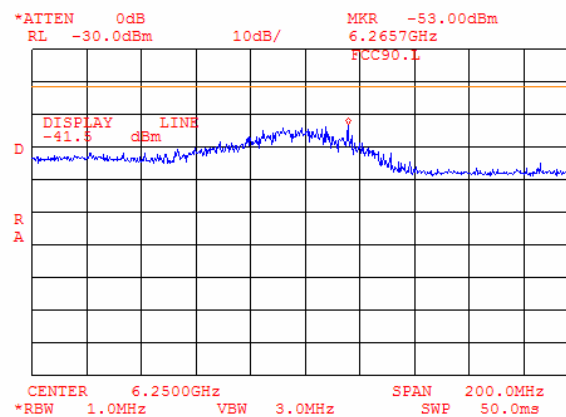


|                     |                                                                      |                         |                       |
|---------------------|----------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Conducted spurious emissions                         |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                         |                       |
| Test mode:          | Compliance                                                           | Verdict:                | PASS                  |
| Date & Time:        | 3/2/2005 8:41:49 PM                                                  |                         |                       |
| Temperature: 26 °C  | Air Pressure: 1015 hPa                                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                                      |                         |                       |

Plot 7.4.26 Spurious emission measurements in 6000 - 10000 MHz range at mid carrier frequency



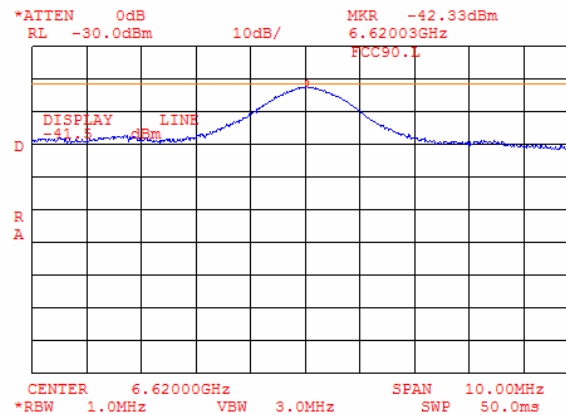
Plot 7.4.27 Spurious emission measurement at 6.26 GHz at mid carrier frequency



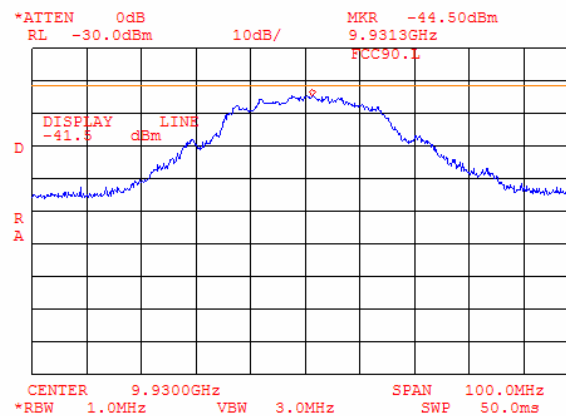


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.28 Spurious emission measurement at 6.62 GHz at mid carrier frequency



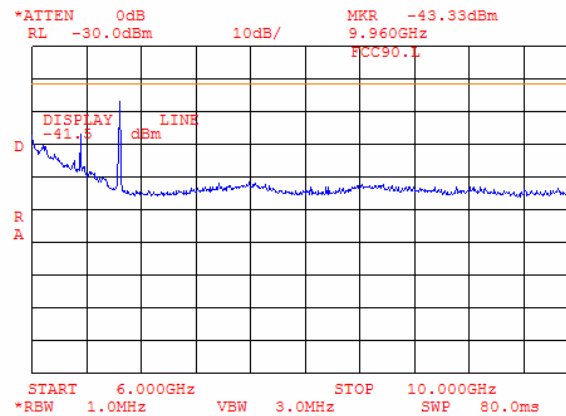
Plot 7.4.29 Spurious emission measurement at 9.93 GHz at mid carrier frequency



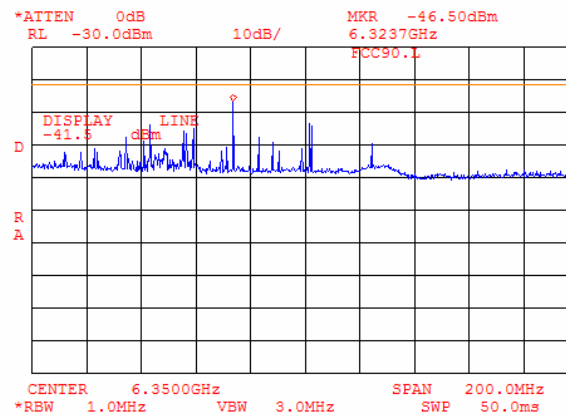


|                     |                                                                      |                         |                       |
|---------------------|----------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Conducted spurious emissions                         |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                         |                       |
| Test mode:          | Compliance                                                           | Verdict:                | PASS                  |
| Date & Time:        | 3/2/2005 8:41:49 PM                                                  |                         |                       |
| Temperature: 26 °C  | Air Pressure: 1015 hPa                                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                                      |                         |                       |

Plot 7.4.30 Spurious emission measurements in 6000 - 10000 MHz range at high carrier frequency



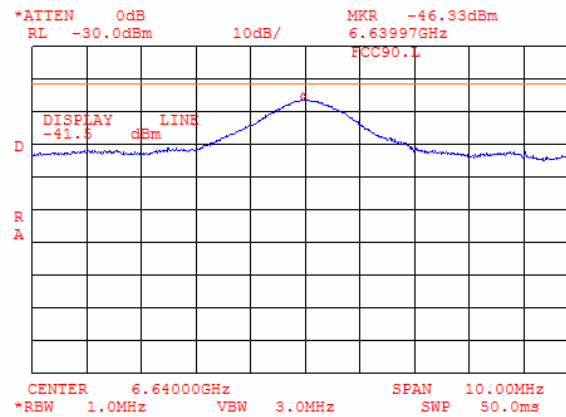
Plot 7.4.31 Spurious emission measurement at 6.32 GHz at high carrier frequency



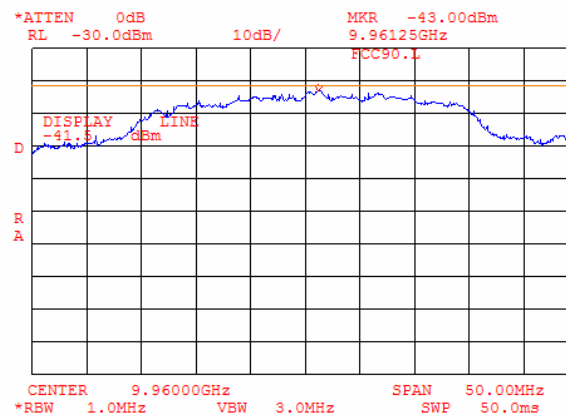


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.32 Spurious emission measurement at 6.64 GHz at high carrier frequency



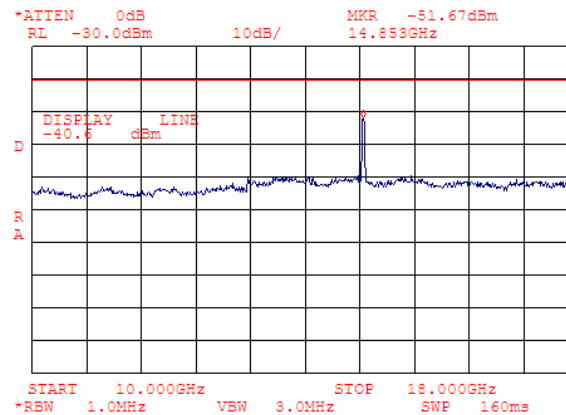
Plot 7.4.33 Spurious emission measurement at 9.96 GHz at high carrier frequency



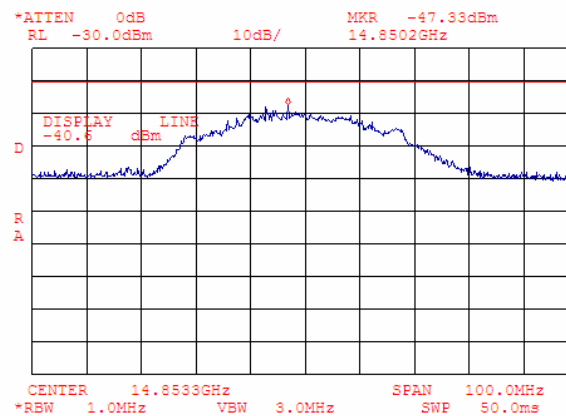


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.34 Spurious emission measurements in 10 - 18 GHz range at low carrier frequency



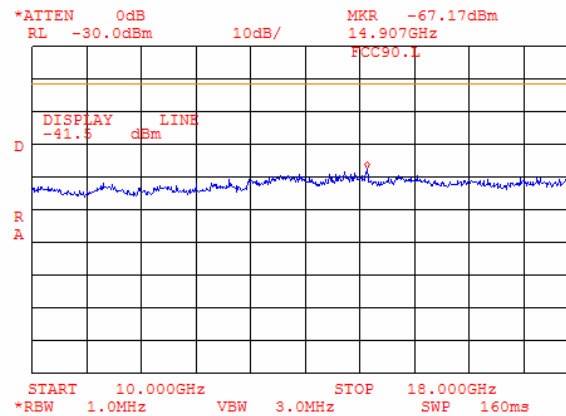
Plot 7.4.35 Spurious emission measurement at 14.85 GHz at low carrier frequency



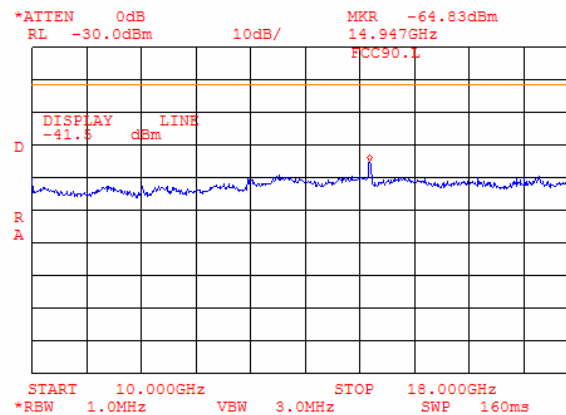


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.36 Spurious emission measurements in 10 - 18 GHz range at mid carrier frequency



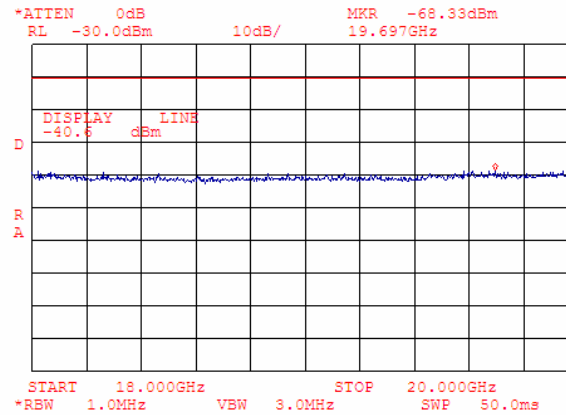
Plot 7.4.37 Spurious emission measurements in 10 - 18 GHz range at high carrier frequency



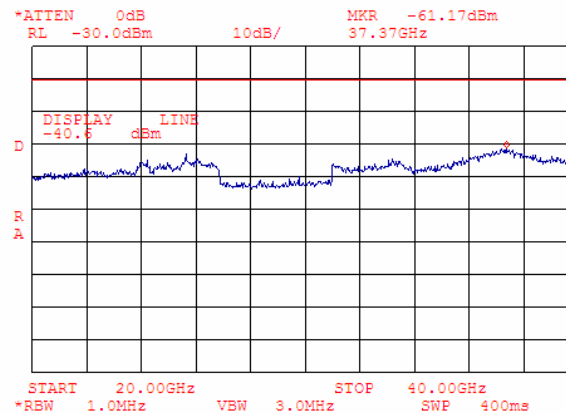


|                     |                                                                      |                         |                       |
|---------------------|----------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Conducted spurious emissions                         |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                         |                       |
| Test mode:          | Compliance                                                           | Verdict:                | PASS                  |
| Date & Time:        | 3/2/2005 8:41:49 PM                                                  |                         |                       |
| Temperature: 26 °C  | Air Pressure: 1015 hPa                                               | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks:            |                                                                      |                         |                       |

Plot 7.4.38 Spurious emission measurements in 18 - 20 GHz range at low carrier frequency



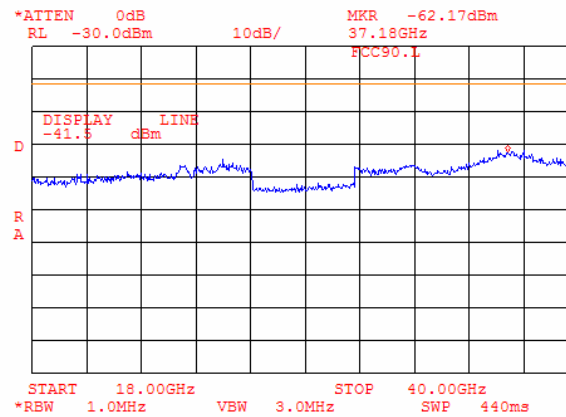
Plot 7.4.39 Spurious emission measurements in 20 - 40 GHz range at low carrier frequency



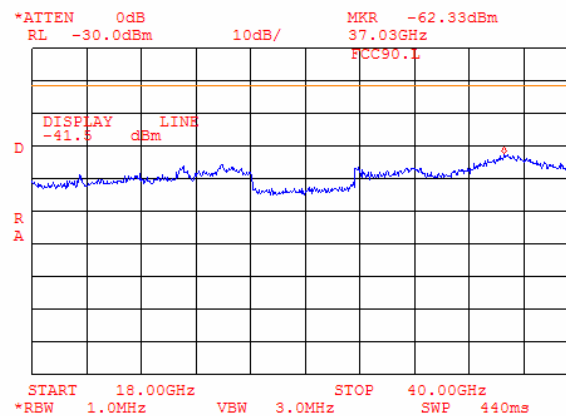


|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Conducted spurious emissions</b>                  |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1051 and 90.210(m); TIA/EIA-603-A, Section 2.2.13 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 8:41:49 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                                        | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

Plot 7.4.40 Spurious emission measurements in 18 - 40 GHz range at mid carrier frequency



Plot 7.4.41 Spurious emission measurements in 18 - 40 GHz range at high carrier frequency





|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

## 7.5 Radiated spurious emission measurements

### 7.5.1 General

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

Table 7.5.1 Radiated spurious emission test limits

| Frequency, MHz         | Attenuation below carrier, dBc | Equivalent field strength limit @ 3m, dB(μV/m)*** |
|------------------------|--------------------------------|---------------------------------------------------|
| 0.009 – 10th harmonic* | 53                             | 53.73                                             |

\* - Excluding the in band emission within  $\pm 250$  % of the authorized bandwidth from the carrier

\*\* - P is transmitter output power in Watts

\*\*\* - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows:  
 $E = \sqrt{30 \times P \times 1.64} / r$ , where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

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

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

7.5.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated  $360^\circ$  and the measuring antenna was rotated around its vertical axis.

7.5.2.3 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

### 7.5.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.5.3.1 The EUT was set up as shown in Figure 7.5.2, energized and the performance check was conducted.

7.5.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated  $360^\circ$  and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

7.5.3.3 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.



|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b> PASS                                                 |                              |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

Figure 7.5.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

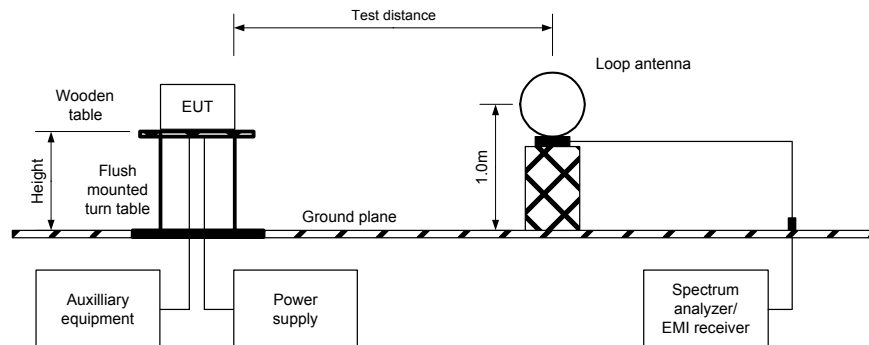
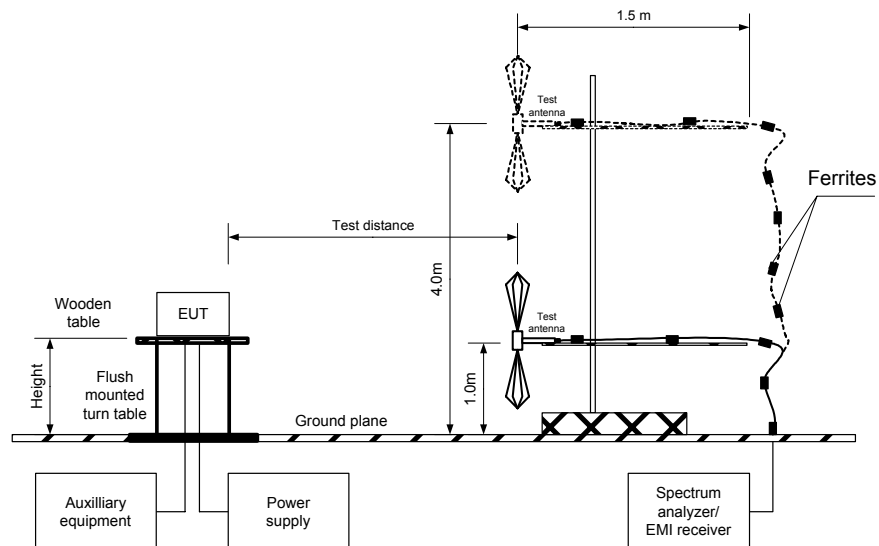


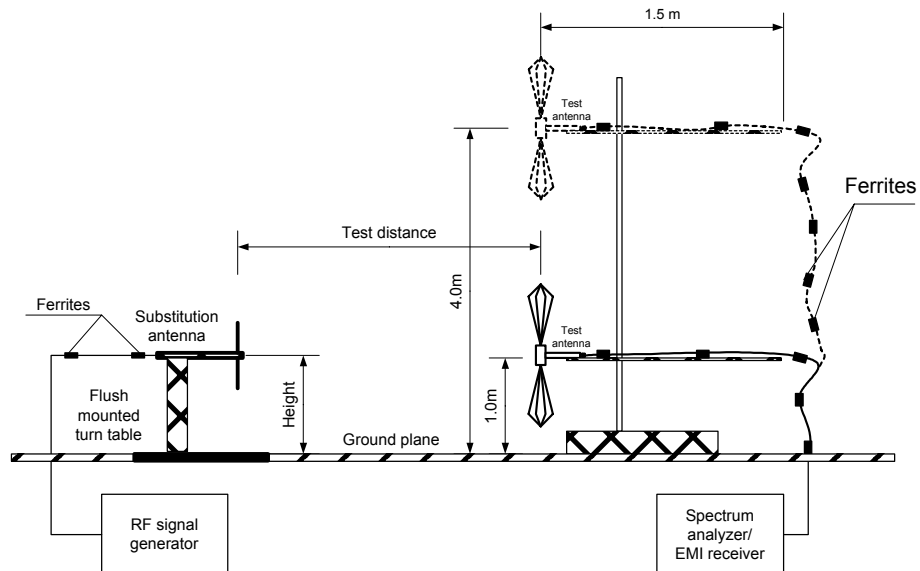
Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz





|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

Figure 7.5.3 Setup for substitution ERP measurements of spurious





|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Table 7.5.2 Spurious emission field strength test results**

ASSIGNED FREQUENCY RANGE: 4950 - 4980 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: Semi anechoic chamber / OATS  
 EUT HEIGHT: 0.8 m  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: > Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 6 – 48 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Frequency, MHz                         | Field strength, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* | RBW, kHz | Antenna polarization | Antenna height, m | Turn-table position**, degrees |
|----------------------------------------|--------------------------|-----------------|-------------|----------|----------------------|-------------------|--------------------------------|
| <b>Low carrier frequency 4950 MHz</b>  |                          |                 |             |          |                      |                   |                                |
| No spurious emissions were found       |                          |                 |             |          |                      |                   |                                |
| <b>Mid carrier frequency 4965 MHz</b>  |                          |                 |             |          |                      |                   |                                |
| No spurious emissions were found       |                          |                 |             |          |                      |                   |                                |
| <b>High carrier frequency 4980 MHz</b> |                          |                 |             |          |                      |                   |                                |
| No spurious emissions were found       |                          |                 |             |          |                      |                   |                                |

\*- Margin = Field strength of spurious – calculated field strength limit.

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

**Reference numbers of test equipment used**

|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 0521 | HL 0589 | HL 0592 | HL 0593 | HL 0594 | HL 0604 | HL 0768 |
| HL 0769 | HL 1424 | HL 1947 | HL 2009 | HL 2259 | HL 2260 | HL 2261 | HL 2387 |
| HL 2432 | HL 2499 |         |         |         |         |         |         |

Full description is given in Appendix A.



HERMON LABORATORIES

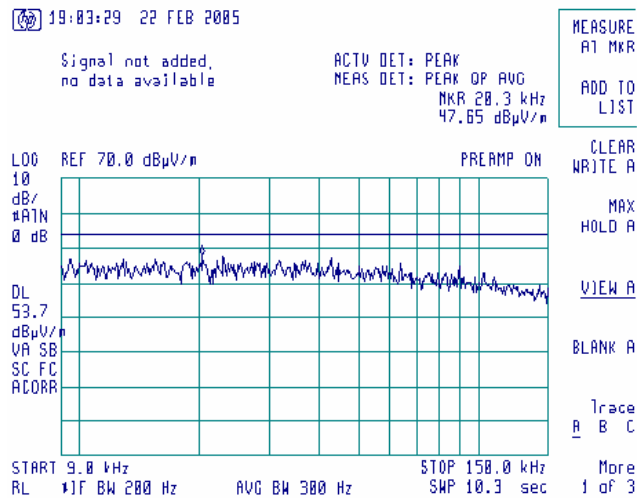
Report ID: RADRAD\_FCC.16288.doc

Date of Issue: 3/20/2005

|                     |                                                                      |                         |                       |
|---------------------|----------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Radiated spurious emissions                          |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                         |                       |
| Test mode:          | Compliance                                                           | Verdict:                | PASS                  |
| Date & Time:        | 3/2/2005 5:58:51 PM                                                  |                         |                       |
| Temperature: 26 °C  | Air Pressure: 1011 hPa                                               | Relative Humidity: 29 % | Power Supply: 120 VAC |
| Remarks:            |                                                                      |                         |                       |

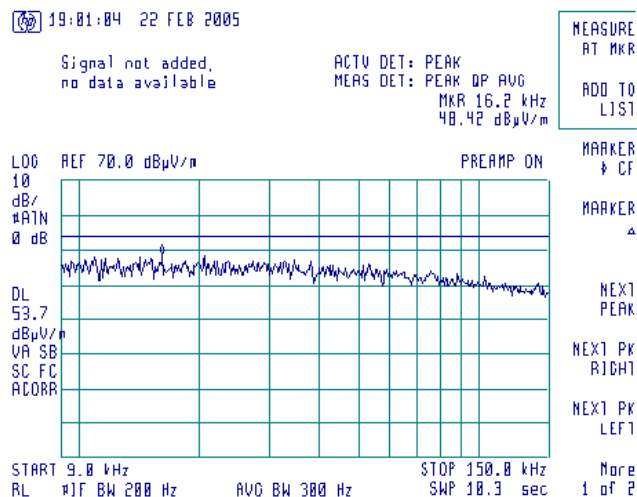
Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



Plot 7.5.2 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

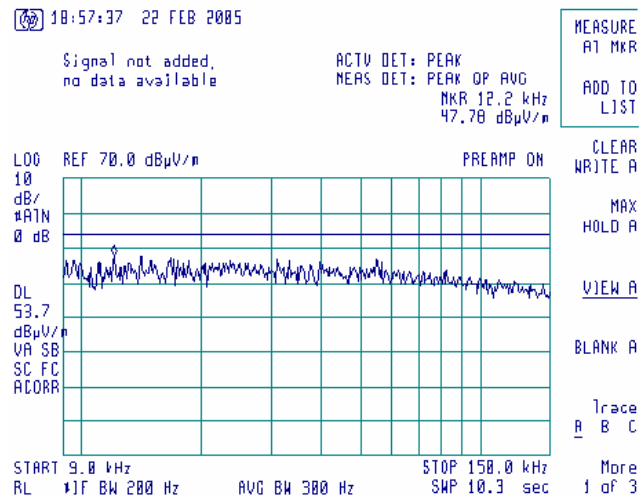




|                     |                                                                      |                         |                       |
|---------------------|----------------------------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 90.210, Radiated spurious emissions                          |                         |                       |
| Test procedure:     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                         |                       |
| Test mode:          | Compliance                                                           | Verdict:                | PASS                  |
| Date & Time:        | 3/2/2005 5:58:51 PM                                                  |                         |                       |
| Temperature: 26 °C  | Air Pressure: 1011 hPa                                               | Relative Humidity: 29 % | Power Supply: 120 VAC |
| Remarks:            |                                                                      |                         |                       |

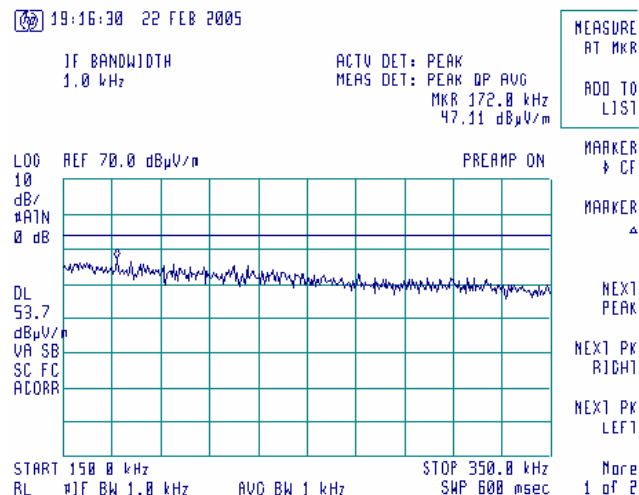
Plot 7.5.3 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



Plot 7.5.4 Radiated emission measurements in 0.15 – 0.35 MHz range

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

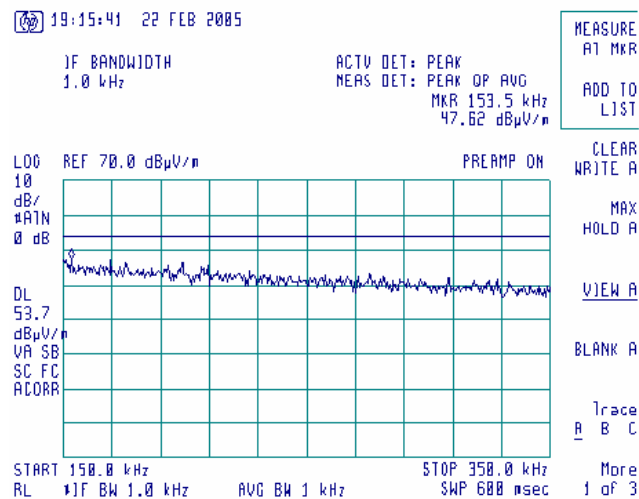




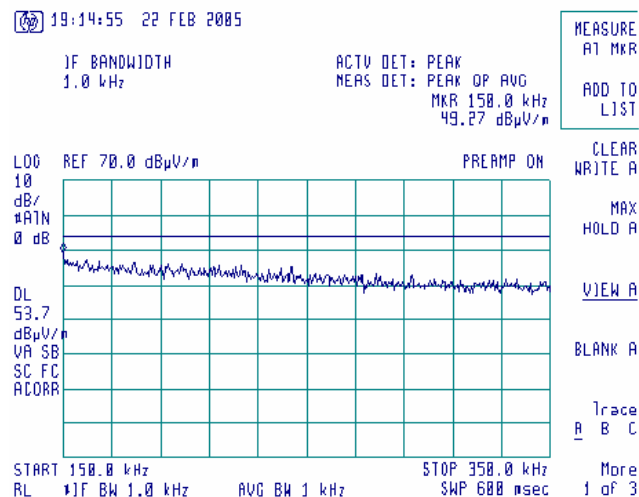
|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.5 Radiated emission measurements in 0.15 – 0.35 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.6 Radiated emission measurements in 0.15 – 0.35 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

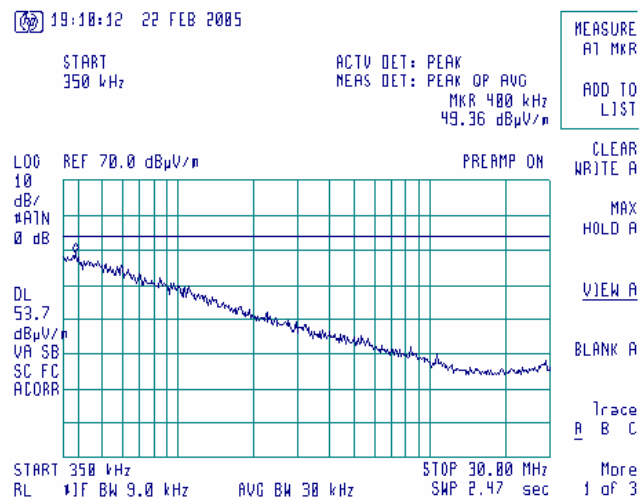




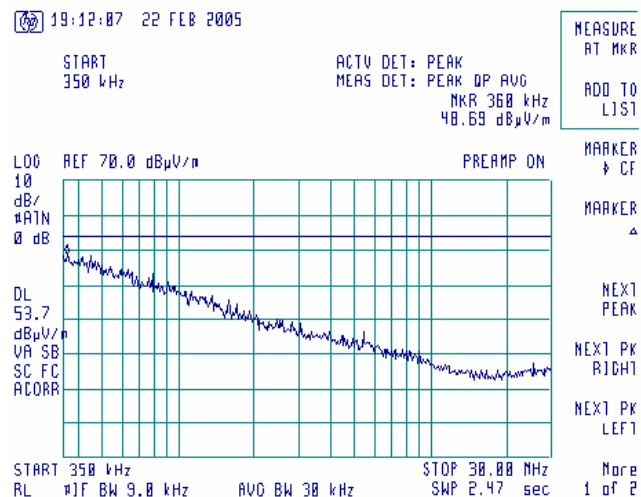
|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.7 Radiated emission measurements in 0.35 - 30 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.8 Radiated emission measurements in 0.35 - 30 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

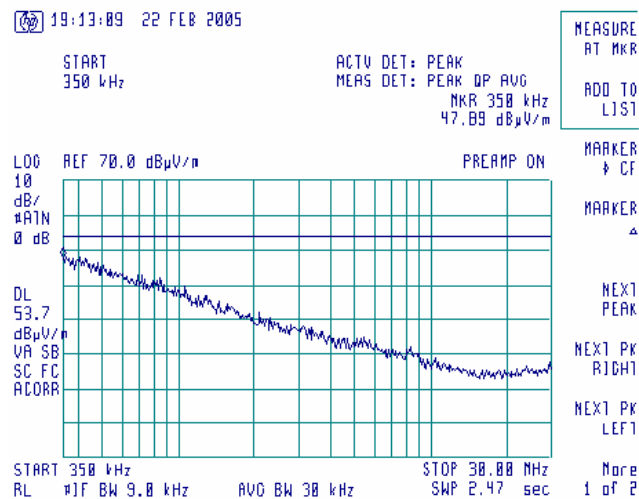




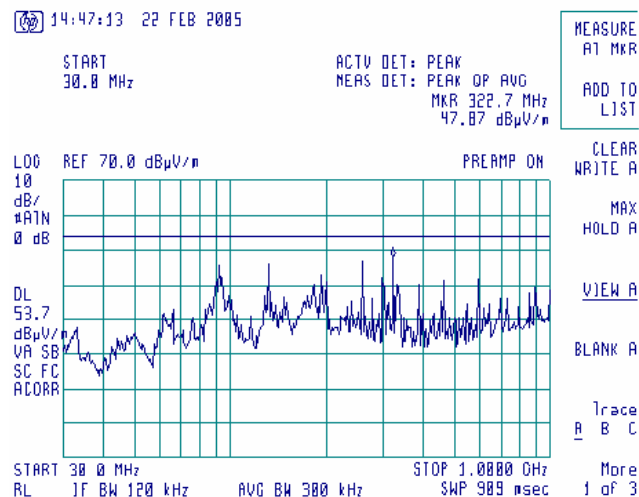
|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.9 Radiated emission measurements in 0.35 - 30 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.10 Radiated emission measurements in 30 - 1000 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

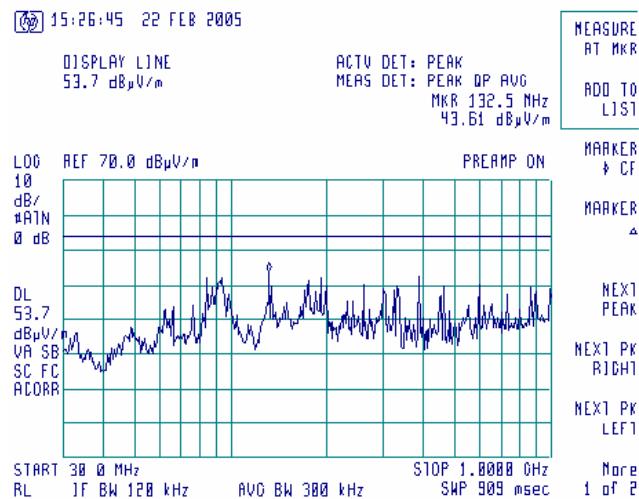




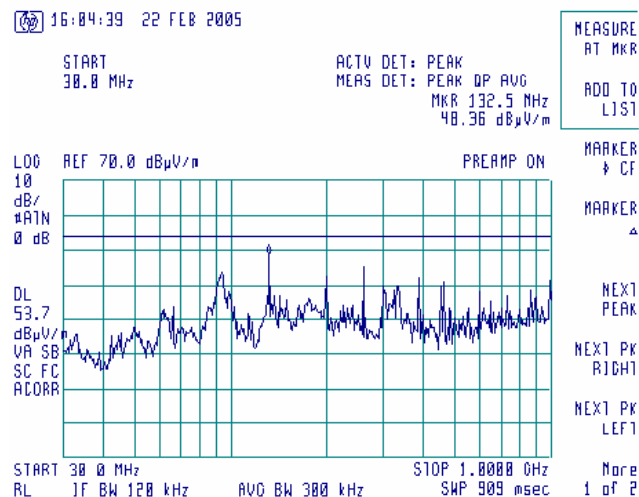
|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.11 Radiated emission measurements in 30 - 1000 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.12 Radiated emission measurements in 30 - 1000 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

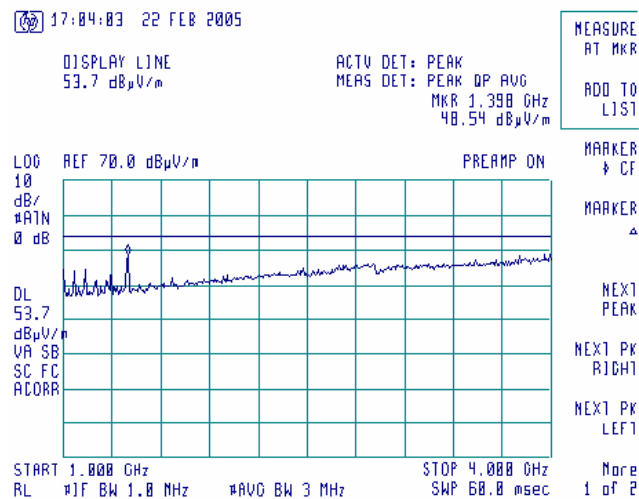




|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

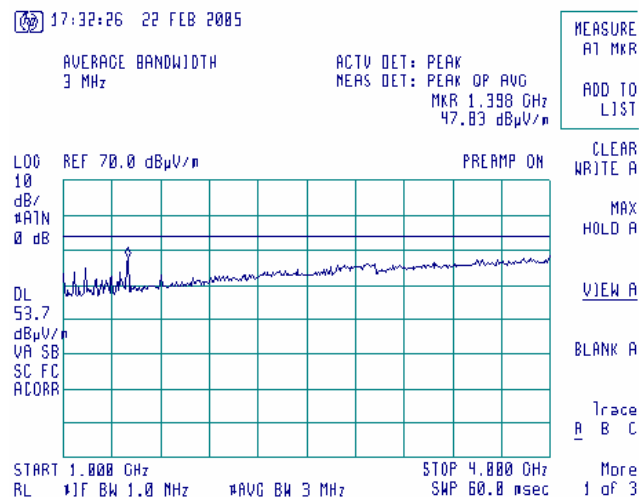
Plot 7.5.13 Radiated emission measurements in 1000 – 4000 MHz range

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



Plot 7.5.14 Radiated emission measurements in 1000 – 4000 MHz range

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

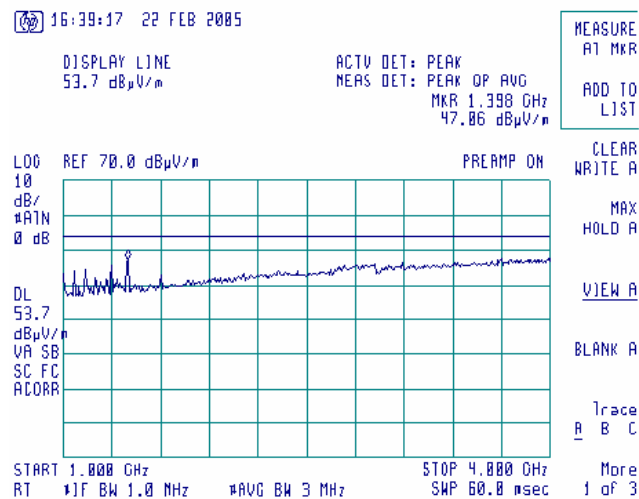




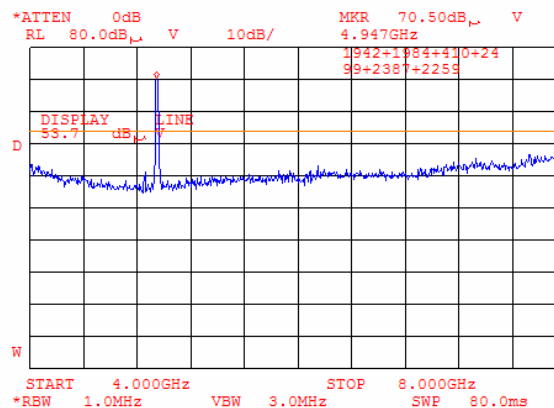
|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                                      | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM           |                                                                      |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.15 Radiated emission measurements in 1000 – 4000 MHz range**

TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.16 Radiated emission measurements in 4 – 8 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

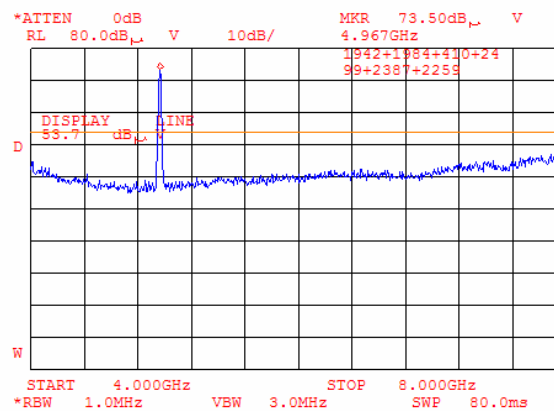




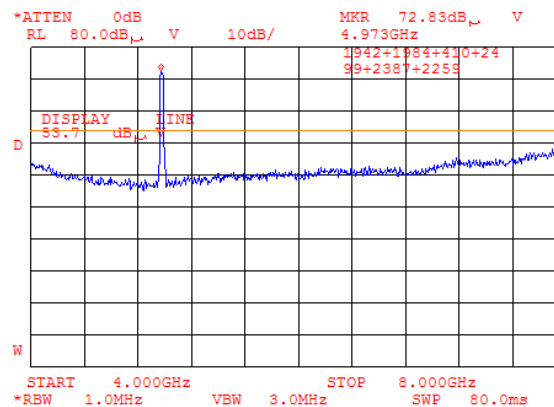
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.17 Radiated emission measurements in 4 – 8 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.18 Radiated emission measurements in 4 – 8 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

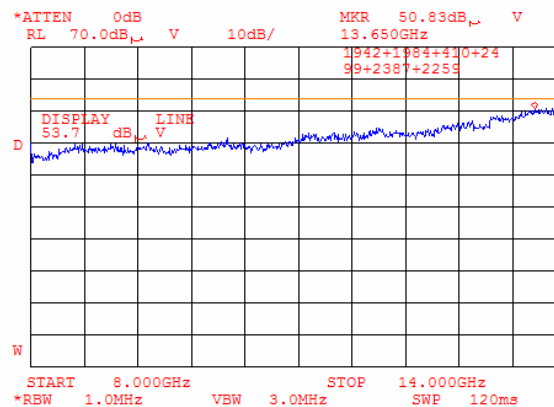




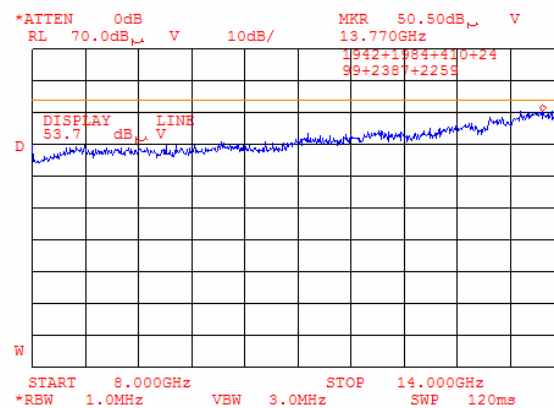
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.19 Radiated emission measurements in 8 – 14 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.20 Radiated emission measurements in 8 – 14 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

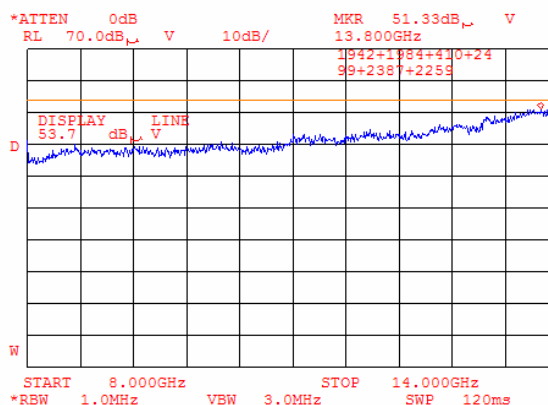




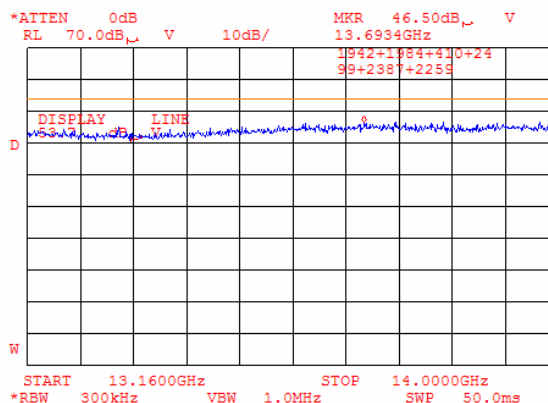
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.21 Radiated emission measurements in 8 – 14 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.22 Radiated emission measurements in 13.16 – 14 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

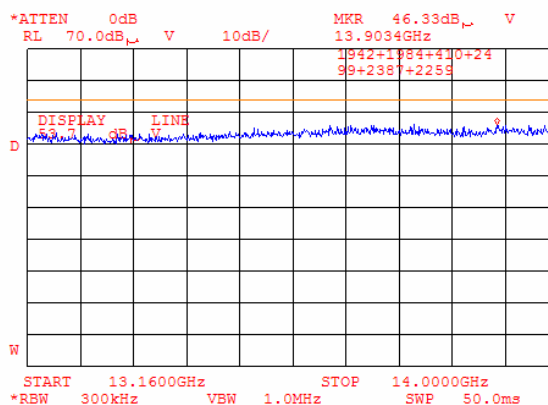




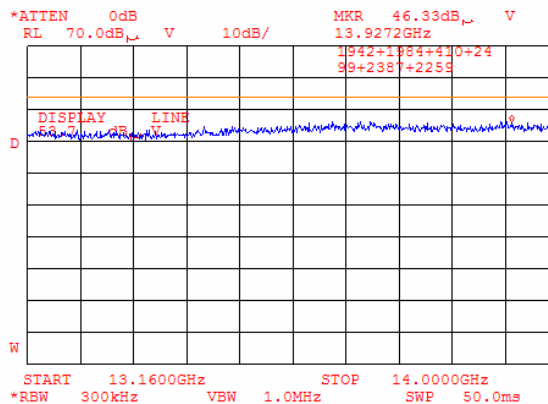
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.23 Radiated emission measurements in 13.16 – 14 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.24 Radiated emission measurements in 13.16 – 14 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

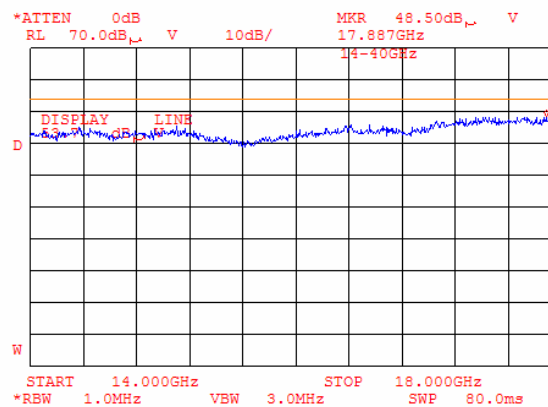




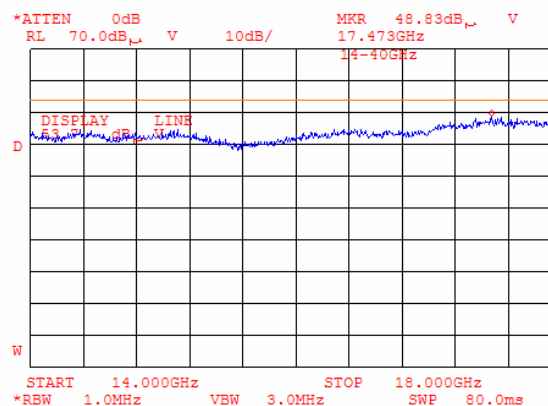
|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          |                               | Compliance                                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 3/2/2005 5:58:51 PM                                                  |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.25 Radiated emission measurements in 14 – 18 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.26 Radiated emission measurements in 14 – 18 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

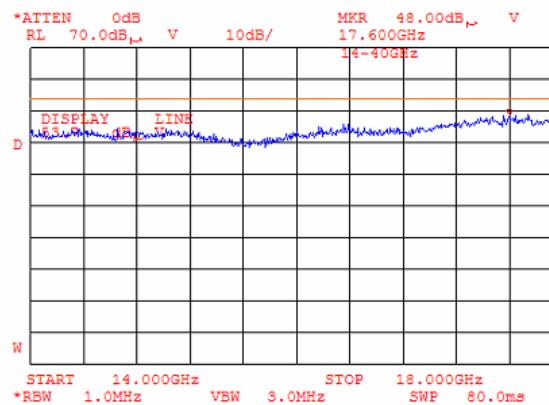




|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          |                               | Compliance                                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 3/2/2005 5:58:51 PM                                                  |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.27 Radiated emission measurements in 14 – 18 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

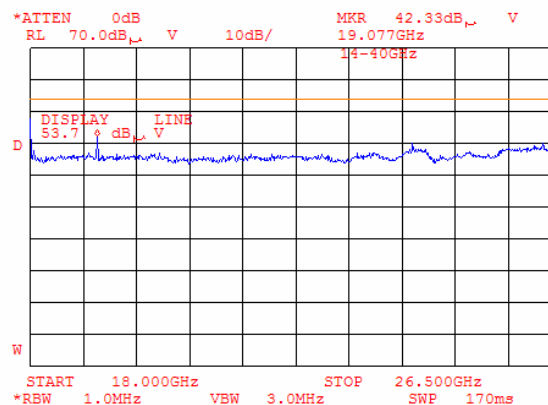




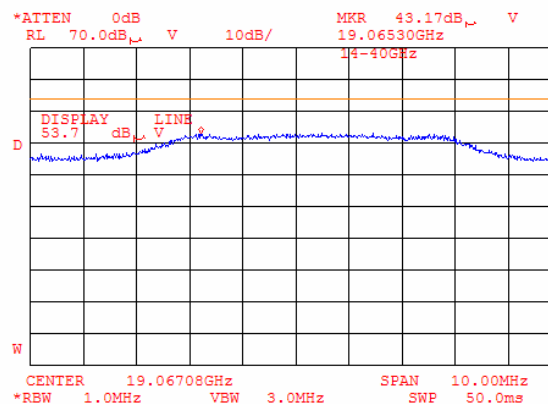
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.28 Radiated emission measurements in 18 – 26.5 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.29 Spurious measurement at 19.065 GHz**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

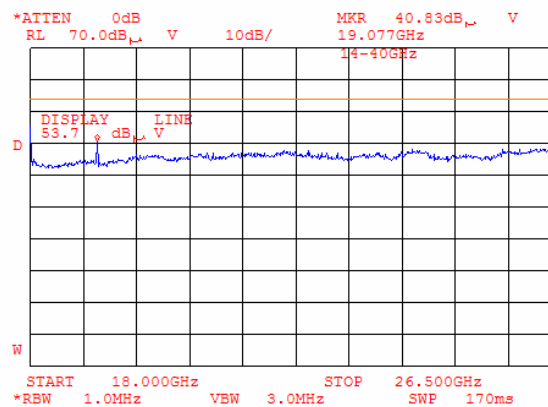




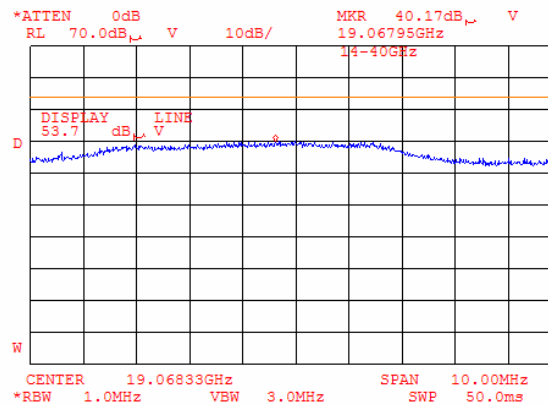
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.30 Radiated emission measurements in 18 – 26.5 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.31 Spurious measurement at 19.068 GHz**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

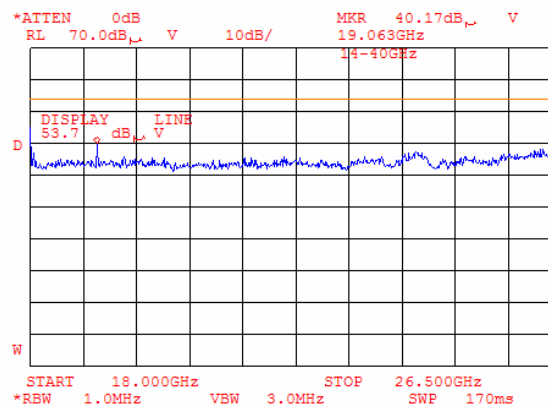




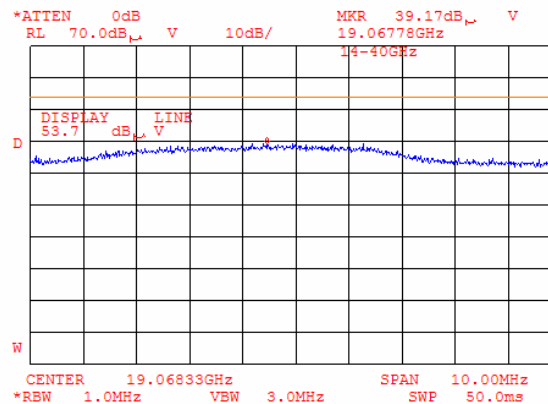
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.32 Radiated emission measurements in 18 – 26.5 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.33 Spurious measurement at 19.067 GHz**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

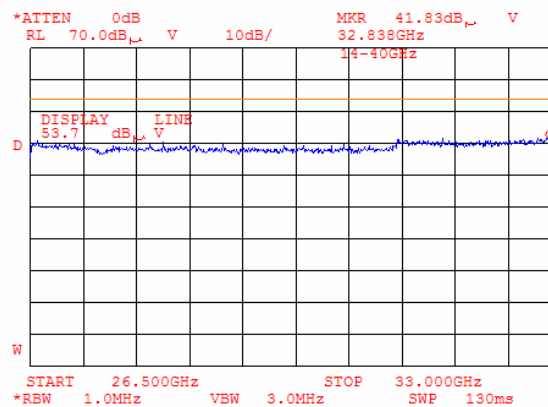




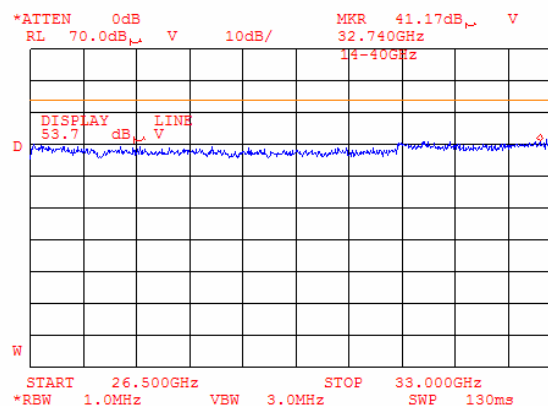
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.34 Radiated emission measurements in 26.5 – 33 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.35 Radiated emission measurements in 26.5 – 33 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

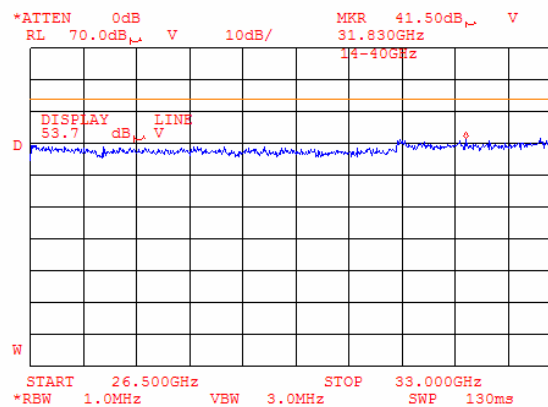




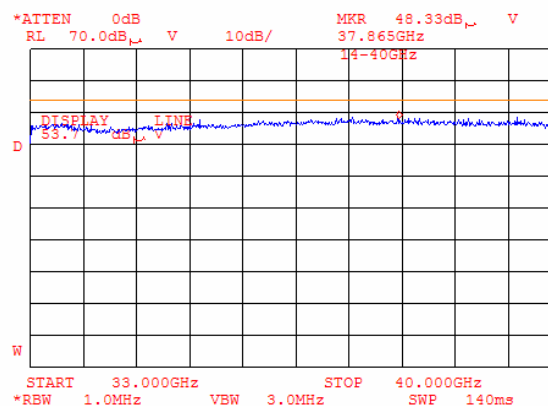
|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          |                               | Compliance                                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 3/2/2005 5:58:51 PM                                                  |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.36 Radiated emission measurements in 26.5 – 33 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.37 Radiated emission measurements in 33 – 40 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

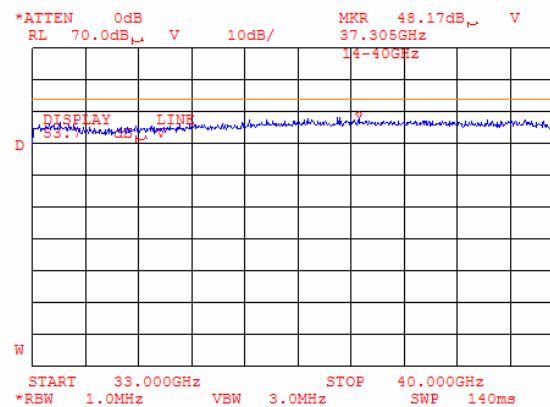




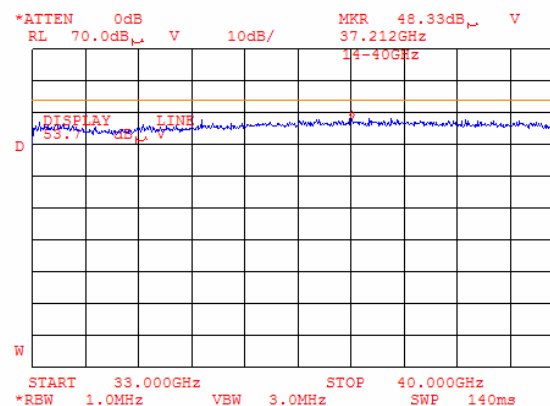
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.38 Radiated emission measurements in 33 – 40 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.39 Radiated emission measurements in 33 – 40 GHz range**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

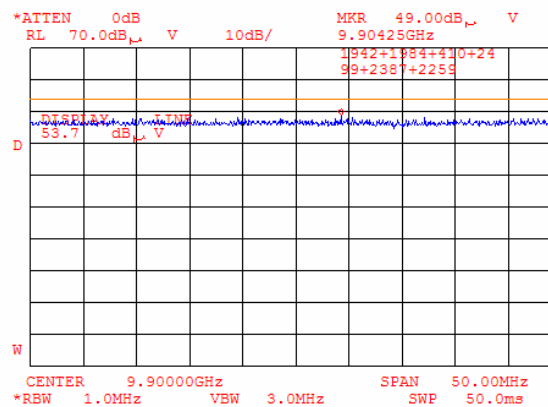




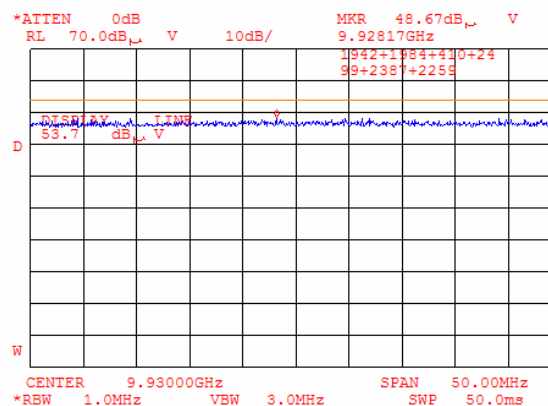
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.40 Radiated emission measurements at the 2<sup>nd</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.41 Radiated emission measurements at the 2<sup>nd</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

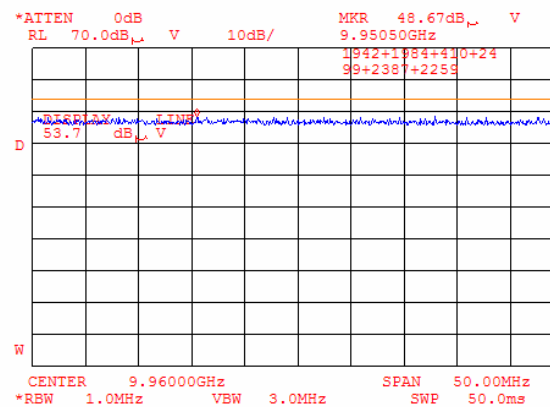




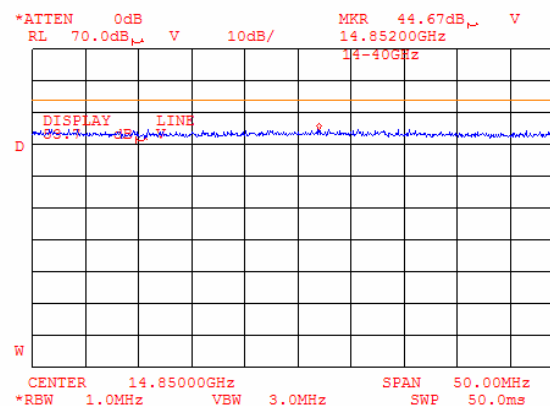
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.42 Radiated emission measurements at the 2<sup>nd</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.43 Radiated emission measurements at the 3<sup>rd</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

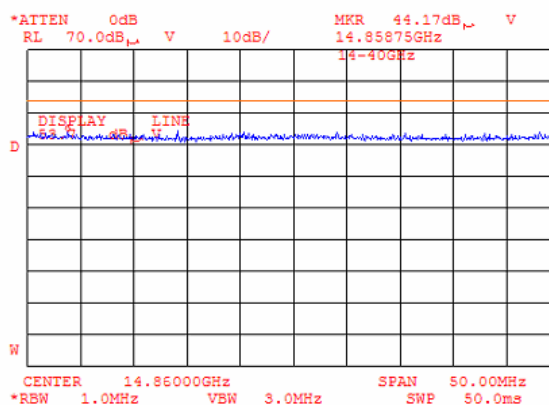




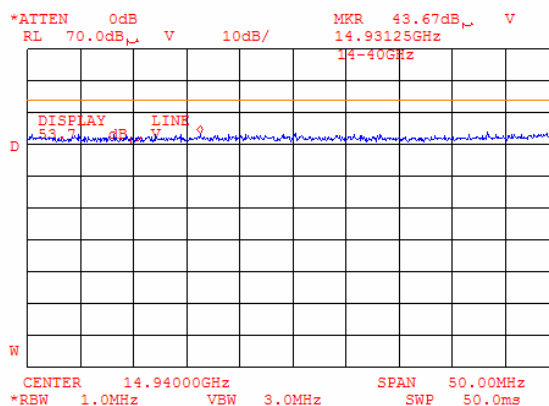
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.44 Radiated emission measurements at the 3<sup>rd</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.45 Radiated emission measurements at the 3<sup>rd</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

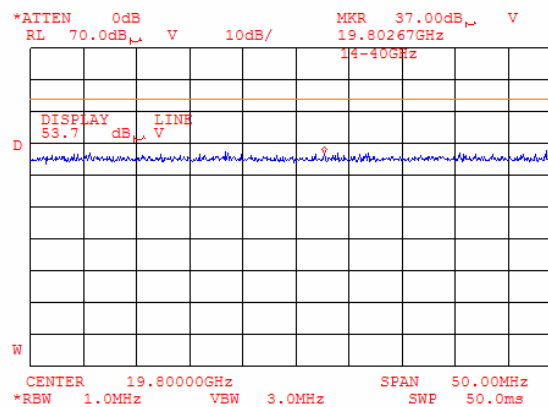




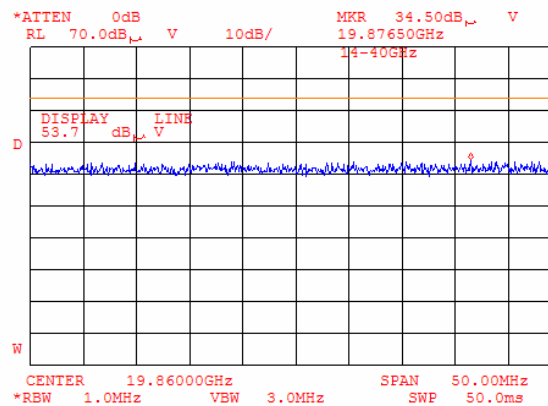
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.46 Radiated emission measurements at the 4<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.47 Radiated emission measurements at the 4<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

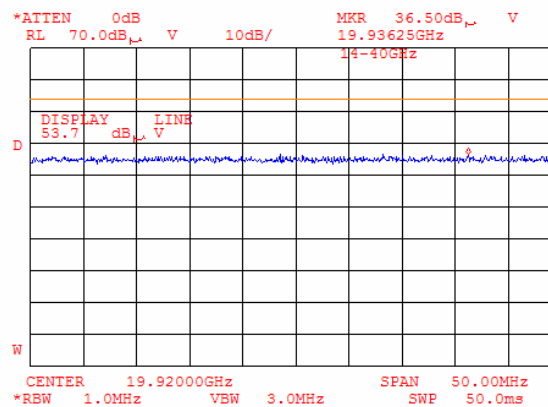




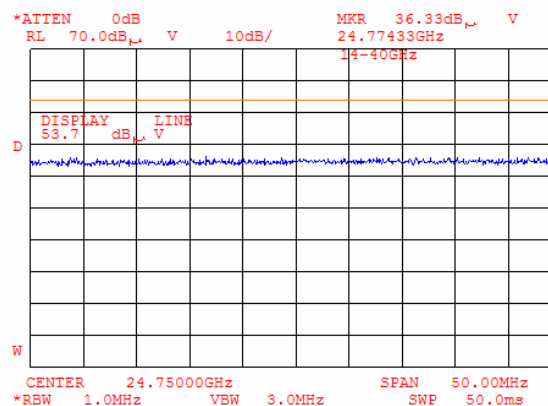
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.48 Radiated emission measurements at the 4<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.49 Radiated emission measurements at the 5<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

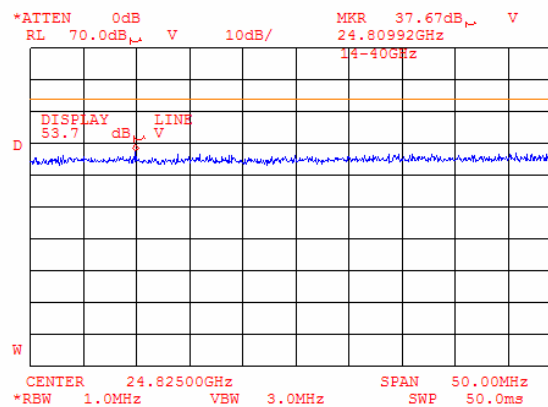




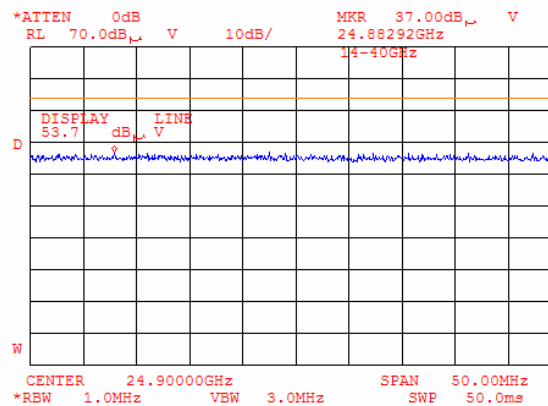
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.50 Radiated emission measurements at the 5<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.51 Radiated emission measurements at the 5<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

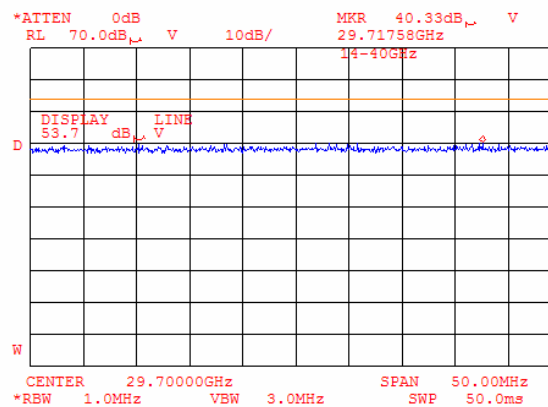




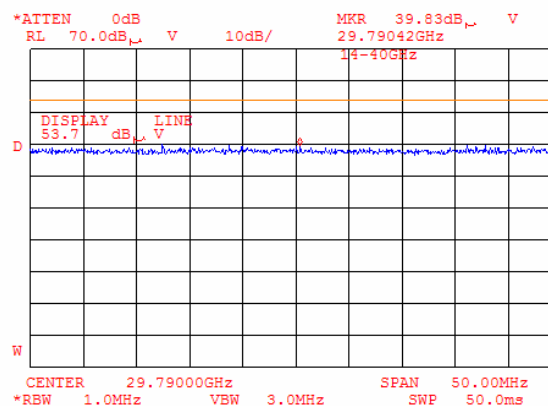
|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          |                               | Compliance                                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 3/2/2005 5:58:51 PM                                                  |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.52 Radiated emission measurements at the 6<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.53 Radiated emission measurements at the 6<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

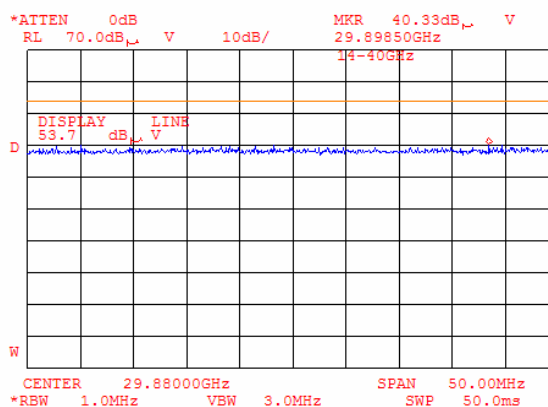




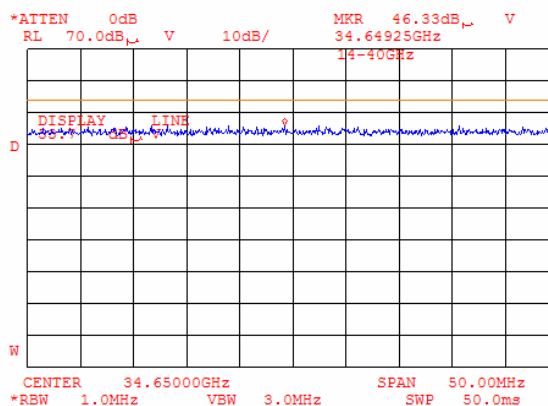
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.54 Radiated emission measurements at the 6<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.55 Radiated emission measurements at the 7<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

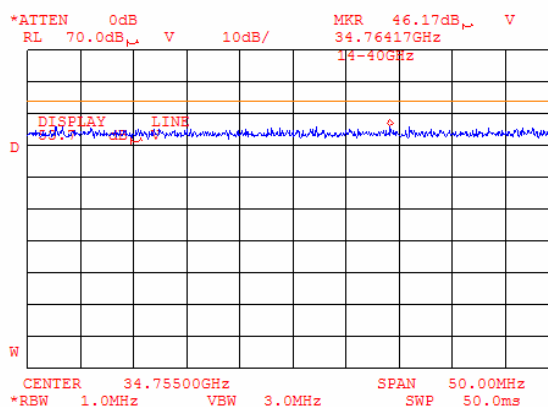




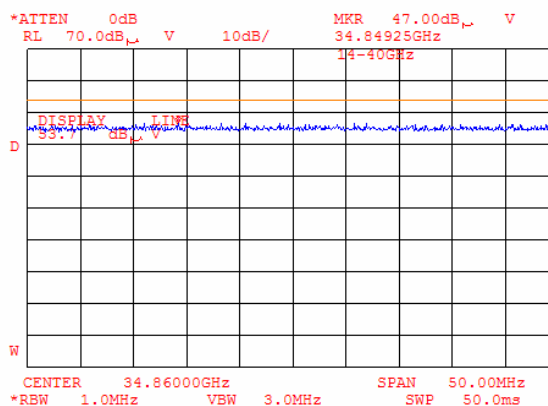
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.56 Radiated emission measurements at the 7<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.57 Radiated emission measurements at the 7<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

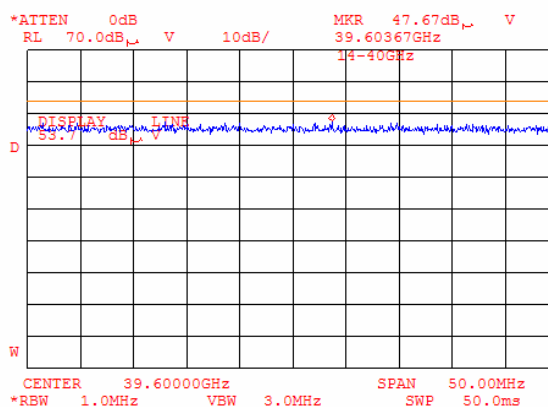




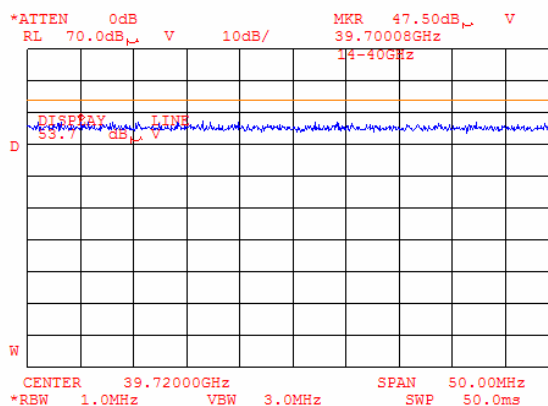
|                            |                                                                      |                                |                              |
|----------------------------|----------------------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 90.210, Radiated spurious emissions</b>                   |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                                |                              |
| <b>Test mode:</b>          | Compliance                                                           | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 5:58:51 PM                                                  |                                |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa                                        | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                                      |                                |                              |

**Plot 7.5.58 Radiated emission measurements at the 8<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

**Plot 7.5.59 Radiated emission measurements at the 8<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m

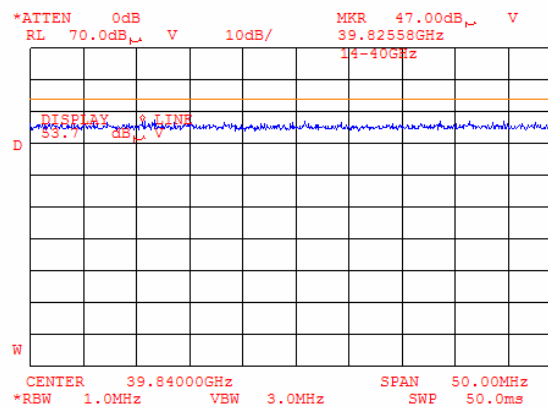




|                            |                               |                                                                      |                              |
|----------------------------|-------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.210, Radiated spurious emissions</b>                   |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12 |                              |
| <b>Test mode:</b>          |                               | Compliance                                                           | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 3/2/2005 5:58:51 PM                                                  |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                                       | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                                      |                              |

**Plot 7.5.60 Radiated emission measurements at the 8<sup>th</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m





|                            |                               |                                                     |                              |
|----------------------------|-------------------------------|-----------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 90.213, Frequency stability</b>          |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2 |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                     | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 2/24/2005 9:58:32 AM          |                                                     |                              |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa | <b>Relative Humidity:</b> 43 %                      | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                     |                              |

## 7.6 Frequency stability test

### 7.6.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.6.1. The test results are provided in Table 7.6.2.

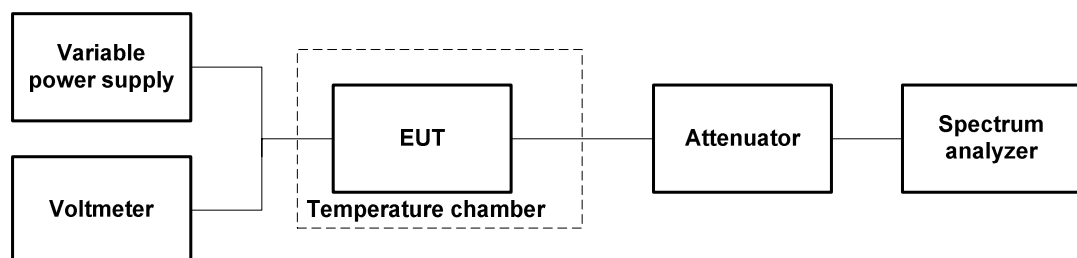
Table 7.6.1 Frequency stability limits

| Assigned frequency, MHz | Maximum allowed frequency displacement |       |
|-------------------------|----------------------------------------|-------|
|                         | ppm                                    | Hz    |
| 4950.000                | 20                                     | 99000 |
| 4965.000                |                                        | 99300 |
| 4980.000                |                                        | 99600 |

### 7.6.2 Test procedure

- 7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and its proper operation was checked.
- 7.6.2.2 The EUT power was turned off. Temperature within test chamber was set to +30°C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.
- 7.6.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.
- 7.6.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.6.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.
- 7.6.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.6.2.

Figure 7.6.1 Frequency stability test setup





|                            |                                                     |                                |                              |             |
|----------------------------|-----------------------------------------------------|--------------------------------|------------------------------|-------------|
| <b>Test specification:</b> | <b>Section 90.213, Frequency stability</b>          |                                |                              |             |
| <b>Test procedure:</b>     | 47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2 |                                |                              |             |
| <b>Test mode:</b>          | Compliance                                          | <b>Verdict:</b>                |                              | <b>PASS</b> |
| <b>Date &amp; Time:</b>    | 2/24/2005 9:58:32 AM                                |                                |                              |             |
| <b>Temperature:</b> 26 °C  | <b>Air Pressure:</b> 1015 hPa                       | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 120 VAC |             |
| <b>Remarks:</b>            |                                                     |                                |                              |             |

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY: 4950 – 4980 MHz  
 NOMINAL POWER VOLTAGE: 120 VAC  
 TEMPERATURE STABILIZATION PERIOD: 20 min  
 POWER DURING TEMPERATURE TRANSITION: Off  
 SPECTRUM ANALYZER MODE: Counter  
 RESOLUTION BANDWIDTH: 1000 Hz  
 VIDEO BANDWIDTH: 3000 Hz  
 MODULATION: Unmodulated

| T, °C                   | Voltage, V | Frequency, MHz |                     |                     |                     |                     |                     |                      |          | Max frequency drift, Hz |       | Limit, Hz | Margin, Hz | Verdict |
|-------------------------|------------|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|----------|-------------------------|-------|-----------|------------|---------|
|                         |            | Start up       | 1 <sup>st</sup> min | 2 <sup>nd</sup> min | 3 <sup>rd</sup> min | 4 <sup>th</sup> min | 5 <sup>th</sup> min | 10 <sup>th</sup> min | Positive | Negative                |       |           |            |         |
| Low frequency 4950 MHz  |            |                |                     |                     |                     |                     |                     |                      |          |                         |       |           |            |         |
| -30                     | nominal    | 4950.005000    | 4950.017000         | 4950.015000         | 4950.01300          | 4950.01200          | 4950.01100          | 4950.010000          | 0        | -14000                  | 99000 | -85000    | Pass       |         |
| -20                     | nominal    | 4950.015000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4950.005000          | 0        | -14000                  |       | -85000    | Pass       |         |
| -10                     | nominal    | 4950.016000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4949.999000          | 0        | -20000                  |       | -79000    | Pass       |         |
| 0                       | nominal    | 4949.996000    | 4949.997000         | 4949.997000         | 4949.99700          | 4949.99700          | 4949.99700          | 4949.997000          | 0        | -23000                  |       | -76000    | Pass       |         |
| 10                      | nominal    | 4950.013000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4950.000000          | 0        | -19000                  |       | -80000    | Pass       |         |
| 20                      | +15%       | 4949.996000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4950.022000          | 3000     | -23000                  |       | -76000    | Pass       |         |
| 20                      | nominal    | 4949.997000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4950.019000*         | 0        | -22000                  |       | -77000    | Pass       |         |
| 20                      | -15%       | 4950.000000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4950.014000          | 0        | -19000                  |       | -80000    | Pass       |         |
| 30                      | nominal    | 4950.001000    | 4950.016000         | 4950.037000         | 4950.03200          | 4950.03200          | 4950.03200          | 4950.034000          | 18000    | -18000                  |       | -81000    | Pass       |         |
| 40                      | nominal    | 4950.039000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4950.063000          | 44000    | 0                       |       | -55000    | Pass       |         |
| 50                      | nominal    | 4950.033000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4950.096000          | 77000    | 0                       |       | -22000    | Pass       |         |
| Mid frequency 4965 MHz  |            |                |                     |                     |                     |                     |                     |                      |          |                         |       |           |            |         |
| -30                     | nominal    | 4965.016000    | 4965.016000         | 4965.014000         | 4965.01300          | 4965.01200          | 4965.01100          | 4965.011000          | 0        | -10000                  | 99300 | -89300    | Pass       |         |
| -20                     | nominal    | 4965.011000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4965.003000          | 0        | -18000                  |       | -81300    | Pass       |         |
| -10                     | nominal    | 4965.011000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4965.000000          | 0        | -21000                  |       | -78300    | Pass       |         |
| 0                       | nominal    | 4964.998000    | 4964.997000         | 4964.998000         | 4964.99800          | 4964.99800          | 4964.99800          | 4964.998000          | 0        | -24000                  |       | -75300    | Pass       |         |
| 10                      | nominal    | 4964.999000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4965.002000          | 0        | -22000                  |       | -77300    | Pass       |         |
| 20                      | +15%       | 4964.997000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4965.020000          | 0        | -24000                  |       | -75300    | Pass       |         |
| 20                      | nominal    | 4964.998000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4965.021000*         | 0        | -23000                  |       | -76300    | Pass       |         |
| 20                      | -15%       | 4964.997000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4965.017000          | 0        | -24000                  |       | -75300    | Pass       |         |
| 30                      | nominal    | 4965.002000    | 4964.999000         | 4965.002000         | 4965.00700          | 4965.02000          | 4965.04100          | 4965.032000          | 20000    | -22000                  |       | -77300    | Pass       |         |
| 40                      | nominal    | 4965.003300    | NA                  | NA                  | NA                  | NA                  | NA                  | 4965.061000          | 40000    | -17700                  |       | -59300    | Pass       |         |
| 50                      | nominal    | 4965.005600    | NA                  | NA                  | NA                  | NA                  | NA                  | 4965.009600          | 0        | -15400                  |       | -83900    | Pass       |         |
| High frequency 4980 MHz |            |                |                     |                     |                     |                     |                     |                      |          |                         |       |           |            |         |
| -30                     | nominal    | 4980.014000    | 4980.014000         | 4980.011000         | 4980.01000          | 4980.00900          | 4980.00900          | 4980.008000          | 0        | -10000                  | 99600 | -89600    | Pass       |         |
| -20                     | nominal    | 4980.015000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4980.003000          | 0        | -15000                  |       | -84600    | Pass       |         |
| -10                     | nominal    | 4980.002000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4979.998000          | 0        | -20000                  |       | -79600    | Pass       |         |
| 0                       | nominal    | 4980.006000    | 4979.998000         | 4979.996000         | 4979.99600          | 4979.99700          | 4979.99600          | 4979.997000          | 0        | -22000                  |       | -77600    | Pass       |         |
| 10                      | nominal    | 4979.997000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4979.999000          | 0        | -21000                  |       | -78600    | Pass       |         |
| 20                      | +15%       | 4979.999500    | NA                  | NA                  | NA                  | NA                  | NA                  | 4980.003100          | 0        | -18500                  |       | -81100    | Pass       |         |
| 20                      | nominal    | 4980.002000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4980.018000*         | 0        | -16000                  |       | -83600    | Pass       |         |
| 20                      | -15%       | 4979.999000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4980.025000          | 7000     | -19000                  |       | -80600    | Pass       |         |
| 30                      | nominal    | 4979.999000    | 4980.027000         | 4980.031000         | 4980.03100          | 4980.03100          | 4980.03200          | 4980.034000          | 16000    | -19000                  |       | -80600    | Pass       |         |
| 40                      | nominal    | 4980.001000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4980.067000          | 49000    | -17000                  |       | -50600    | Pass       |         |
| 50                      | nominal    | 4980.038000    | NA                  | NA                  | NA                  | NA                  | NA                  | 4980.096000          | 78000    | 0                       |       | -21600    | Pass       |         |

\* - Reference frequency

## Reference numbers of test equipment used

|         |         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 0493 | HL 1206 | HL 1453 | HL 1620 | HL 2171 | HL 2287 |  |  |
|---------|---------|---------|---------|---------|---------|--|--|

Full description is given in Appendix A.



|                            |                                                         |                                |                              |
|----------------------------|---------------------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 2.1091, RF radiation exposure evaluation</b> |                                |                              |
| <b>Test procedure:</b>     | 47 CFR, Section 1.1307(b)1                              |                                |                              |
| <b>Test mode:</b>          | Compliance                                              | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 7:14:53 PM                                     |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1011 hPa                           | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                                         |                                |                              |

## 7.7 RF exposure

### 7.7.1 General

This test was performed to determine the minimum safe distance between the transmitter antenna and human to avoid public exposure in excess of limits for general population (uncontrolled exposure). Specification test limits are given in Table 7.7.1.

**Table 7.7.1 RF exposure limits**

| Frequency range, MHz | Power density*     |                  | Electric field strength**, V/m |
|----------------------|--------------------|------------------|--------------------------------|
|                      | mW/cm <sup>2</sup> | W/m <sup>2</sup> |                                |
| 4940.0 – 4990.0      | 1.00               | 10.0             | 61.4                           |

\* - Power density limit within 300 - 1500 MHz was calculated according to the following equation:  $S = F / 1500$ , where S is power density in mW/cm<sup>2</sup> and F is frequency in MHz

\*\* - Electric field strength limit was calculated from power density as follows:  $E = \sqrt{S \times 120 \times \pi}$ , where E is electric field strength in V/m and S is power density in W/m<sup>2</sup>

### 7.7.2 Test procedure for E-field strength measurements

**7.7.2.1** The EUT, connected to the antenna providing the maximum directional gain, was set up as shown in Figure 7.7.1.

**7.7.2.2** The E-field probe was pointed to the EUT antenna zero azimuth at a 3 m distance, the maximum field strength reading was recorded in Table 7.7.2.

**7.7.2.3** The E-field probe was slowly moved toward the EUT until E-field equivalent to the maximum permitted power density was measured.

**7.7.2.4** The obtained antenna to probe distance was recorded in Table 7.7.2 as a minimum separation distance.

**7.7.2.5** The test was repeated at the rest of test distances according to Table 7.7.2.

**Table 7.7.2 Maximum permissible exposure (MPE) measurement**

| Test distance, m | Field strength, V/m | Equivalent power density, mW/cm <sup>2</sup> | Limit, mW/cm <sup>2</sup> | Margin, mW/cm <sup>2</sup> | Verdict |
|------------------|---------------------|----------------------------------------------|---------------------------|----------------------------|---------|
| 3.0              | 2.00                | 0.0011                                       | 1.0                       | -0.9989                    | Pass    |
| 2.5              | 2.30                | 0.0014                                       | 1.0                       | -0.9986                    | Pass    |
| 2.0              | 3.20                | 0.0027                                       | 1.0                       | -0.9973                    | Pass    |
| 1.5              | 4.50                | 0.0054                                       | 1.0                       | -0.9946                    | Pass    |
| 1.0              | 5.10                | 0.0069                                       | 1.0                       | -0.9931                    | Pass    |
| 0.5              | 5.80                | 0.0089                                       | 1.0                       | -0.9911                    | Pass    |
| 0.3              | 6.20                | 0.0102                                       | 1.0                       | -0.9898                    | Pass    |
| 0.2              | 6.70                | 0.0119                                       | 1.0                       | -0.9881                    | Pass    |
| 0.1              | 7.60                | 0.0153                                       | 1.0                       | -0.9847                    | Pass    |

\* - Equivalent power density was calculated from electric field strength as follows:  $S = 0.1 \times E^2 / (120 \times \pi)$ , where E is electric field strength in V/m and S is power density in mW/cm<sup>2</sup>

### Reference numbers of test equipment used

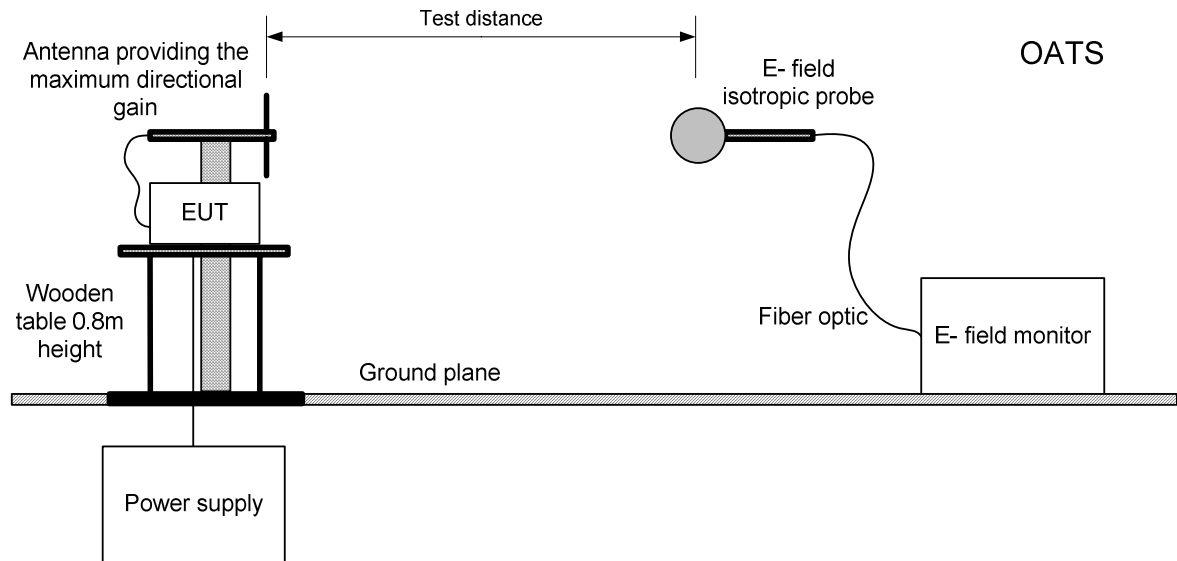
|         |         |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|
| HL 0613 | HL 1629 |  |  |  |  |  |  |
|---------|---------|--|--|--|--|--|--|

Full description is given in Appendix A.



|                            |                               |                                                         |                              |
|----------------------------|-------------------------------|---------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 2.1091, RF radiation exposure evaluation</b> |                              |
| <b>Test procedure:</b>     |                               | 47 CFR, Section 1.1307(b)1                              |                              |
| <b>Test mode:</b>          |                               | Compliance                                              | <b>Verdict:</b> PASS         |
| <b>Date &amp; Time:</b>    |                               | 3/2/2005 7:14:53 PM                                     |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %                          | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                         |                              |

Figure 7.7.1 Maximum permissible exposure (MPE) measurement set up





|                            |                               |                                                            |                              |
|----------------------------|-------------------------------|------------------------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.107, Conducted emission at AC power port</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Sections 11.5 and 12.1.3                       |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                                            | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 2/22/2005 12:46:38 PM         |                                                            |                              |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1017 hPa | <b>Relative Humidity:</b> 42 %                             | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                                            |                              |

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

### 8.1 Conducted emissions

#### 8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 8.1.1. The worst test results (the lowest margins) were recorded in Table 8.1.2, Table 8.1.3 and shown in the associated plots.

Table 8.1.1 Limits for conducted emissions

| Frequency,<br>MHz | Class B limit,<br>dB(μV) |          | Class A limit,<br>dB(μV) |      |
|-------------------|--------------------------|----------|--------------------------|------|
|                   | QP                       | AVRG     | QP                       | AVRG |
| 0.15 - 0.5        | 66 - 56*                 | 56 - 46* | 79                       | 66   |
| 0.5 - 5.0         | 56                       | 46       | 73                       | 60   |
| 5.0 - 30          | 60                       | 50       | 73                       | 60   |

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

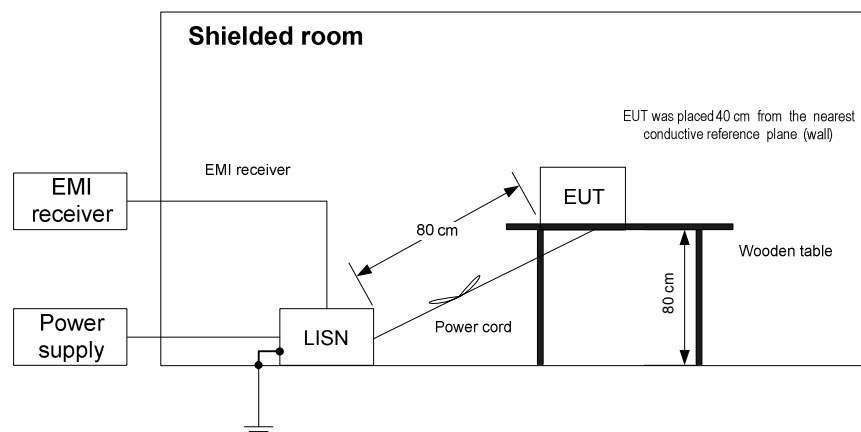
#### 8.1.2 Test procedure

8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and the performance check was conducted.

8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 8.1.2, Table 8.1.3. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

8.1.2.3 The position of the device cables was varied to determine maximum emission level.

Figure 8.1.1 Setup for conducted emission measurements, table-top equipment





|                            |  |                                                            |  |                                |  |
|----------------------------|--|------------------------------------------------------------|--|--------------------------------|--|
| <b>Test specification:</b> |  | <b>Section 15.107, Conducted emission at AC power port</b> |  |                                |  |
| <b>Test procedure:</b>     |  | ANSI C63.4, Sections 11.5 and 12.1.3                       |  |                                |  |
| <b>Test mode:</b>          |  | Compliance                                                 |  | <b>Verdict:</b> PASS           |  |
| <b>Date &amp; Time:</b>    |  | 2/22/2005 12:46:38 PM                                      |  |                                |  |
| <b>Temperature:</b> 24 °C  |  | <b>Air Pressure:</b> 1017 hPa                              |  | <b>Relative Humidity:</b> 42 % |  |
|                            |  | <b>Power Supply:</b> 120 VAC                               |  |                                |  |
| <b>Remarks:</b>            |  |                                                            |  |                                |  |

Table 8.1.2 Conducted emission test results

LINE: AC mains  
 LIMIT: Class B  
 EUT OPERATING MODE: Transmit  
 EUT SET UP: TABLE-TOP  
 TEST SITE: SHIELDED ROOM  
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE  
 FREQUENCY RANGE: 150 kHz - 30 MHz  
 RESOLUTION BANDWIDTH: 9 kHz

| Frequency,<br>MHz | Peak<br>emission,<br>dB(μV) | Quasi-peak                      |                  |                | Average                         |                  |                | Line ID | Verdict |
|-------------------|-----------------------------|---------------------------------|------------------|----------------|---------------------------------|------------------|----------------|---------|---------|
|                   |                             | Measured<br>emission,<br>dB(μV) | Limit,<br>dB(μV) | Margin,<br>dB* | Measured<br>emission,<br>dB(μV) | Limit,<br>dB(μV) | Margin,<br>dB* |         |         |
| Laptop            |                             |                                 |                  |                |                                 |                  |                |         |         |
| 0.151709          | 58.39                       | 51.48                           | 65.92            | -14.44         | 17.69                           | 55.92            | -38.23         | L1      | Pass    |
| 0.203449          | 57.42                       | 52.90                           | 63.52            | -10.62         | 31.34                           | 53.52            | -22.18         |         |         |
| 0.286961          | 53.27                       | 48.49                           | 60.67            | -12.18         | 28.28                           | 50.67            | -22.39         |         |         |
| 0.692052          | 48.47                       | 43.47                           | 56.00            | -12.53         | 21.97                           | 46.00            | -24.03         |         |         |
| 0.908540          | 47.74                       | 40.70                           | 56.00            | -15.30         | 25.14                           | 46.00            | -20.86         |         |         |
| 1.072094          | 46.38                       | 40.96                           | 56.00            | -15.04         | 24.99                           | 46.00            | -21.01         | L2      | Pass    |
| 0.204233          | 49.89                       | 43.75                           | 63.49            | -19.74         | 34.09                           | 53.49            | -19.40         |         |         |
| 0.751541          | 48.98                       | 41.73                           | 56.00            | -14.27         | 20.24                           | 46.00            | -25.76         |         |         |
| 0.977960          | 49.00                       | 42.58                           | 56.00            | -13.42         | 24.22                           | 46.00            | -21.78         |         |         |
| 1.269625          | 47.11                       | 40.60                           | 56.00            | -15.40         | 25.91                           | 46.00            | -20.09         |         |         |
| 1.581623          | 49.02                       | 39.36                           | 56.00            | -16.64         | 23.63                           | 46.00            | -22.37         |         |         |
| 1.797654          | 47.20                       | 39.08                           | 56.00            | -16.92         | 25.41                           | 46.00            | -20.59         |         |         |
| IDU               |                             |                                 |                  |                |                                 |                  |                |         |         |
| 0.150000          | 54.78                       | 54.19                           | 66.00            | -11.81         | 49.71                           | 56.00            | -6.29          | L1      | Pass    |
| 0.221911          | 49.30                       | 48.74                           | 62.81            | -14.07         | 45.99                           | 52.81            | -6.82          |         |         |
| 0.296168          | 41.49                       | 40.50                           | 60.39            | -19.89         | 36.28                           | 50.39            | -14.11         |         |         |
| 0.370143          | 43.82                       | 43.06                           | 58.54            | -15.48         | 41.47                           | 48.54            | -7.07          |         |         |
| 0.445261          | 42.70                       | 41.93                           | 57.02            | -15.09         | 41.04                           | 47.02            | -5.98          |         |         |
| 0.518474          | 40.96                       | 39.89                           | 56.00            | -16.11         | 39.29                           | 46.00            | -6.71          | L2      | Pass    |
| 0.150000          | 55.39                       | 54.72                           | 66.00            | -11.28         | 49.61                           | 56.00            | -6.39          |         |         |
| 0.222108          | 49.18                       | 48.61                           | 62.80            | -14.19         | 46.47                           | 52.80            | -6.33          |         |         |
| 0.370504          | 43.59                       | 42.86                           | 58.54            | -15.68         | 40.45                           | 48.54            | -8.09          |         |         |
| 0.444848          | 42.78                       | 42.20                           | 57.03            | -14.83         | 41.55                           | 47.03            | -5.48          |         |         |
| 0.518794          | 39.98                       | 38.78                           | 56.00            | -17.22         | 37.64                           | 46.00            | -8.36          |         |         |
| 0.889995          | 36.25                       | 35.64                           | 56.00            | -20.36         | 35.26                           | 46.00            | -10.74         |         |         |

\*- Margin = Measured emission - specification limit.



|                            |                                                            |                                |                              |             |
|----------------------------|------------------------------------------------------------|--------------------------------|------------------------------|-------------|
| <b>Test specification:</b> | <b>Section 15.107, Conducted emission at AC power port</b> |                                |                              |             |
| <b>Test procedure:</b>     | ANSI C63.4, Sections 11.5 and 12.1.3                       |                                |                              |             |
| <b>Test mode:</b>          | Compliance                                                 | <b>Verdict:</b>                |                              | <b>PASS</b> |
| <b>Date &amp; Time:</b>    | 2/22/2005 12:46:38 PM                                      |                                |                              |             |
| <b>Temperature:</b> 24 °C  | <b>Air Pressure:</b> 1017 hPa                              | <b>Relative Humidity:</b> 42 % | <b>Power Supply:</b> 120 VAC |             |
| <b>Remarks:</b>            |                                                            |                                |                              |             |

Table 8.1.3 Conducted emission test results

LINE: AC mains  
 LIMIT: Class B  
 EUT OPERATING MODE: Receive / Stand-by  
 EUT SET UP: TABLE-TOP  
 TEST SITE: SHIELDED ROOM  
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE  
 FREQUENCY RANGE: 150 kHz - 30 MHz  
 RESOLUTION BANDWIDTH: 9 kHz

| Frequency,<br>MHz | Peak<br>emission,<br>dB(μV) | Quasi-peak                      |                  |                | Average                         |                  |                | Line ID | Verdict |
|-------------------|-----------------------------|---------------------------------|------------------|----------------|---------------------------------|------------------|----------------|---------|---------|
|                   |                             | Measured<br>emission,<br>dB(μV) | Limit,<br>dB(μV) | Margin,<br>dB* | Measured<br>emission,<br>dB(μV) | Limit,<br>dB(μV) | Margin,<br>dB* |         |         |
| Laptop            |                             |                                 |                  |                |                                 |                  |                |         |         |
| 0.150650          | 63.43                       | 61.46                           | 65.97            | -4.51          | 44.72                           | 55.97            | -11.25         | L1      | Pass    |
| 0.158789          | 62.07                       | 58.89                           | 65.57            | -6.68          | 37.48                           | 55.57            | -18.09         |         |         |
| 0.170987          | 61.02                       | 57.46                           | 64.98            | -7.52          | 34.69                           | 54.98            | -20.29         |         |         |
| 0.210906          | 57.91                       | 53.76                           | 63.23            | -9.47          | 35.83                           | 53.23            | -17.40         |         |         |
| 0.529003          | 49.47                       | 46.52                           | 56.00            | -9.48          | 32.00                           | 46.00            | -14.00         |         |         |
| 0.806191          | 46.86                       | 40.75                           | 56.00            | -15.25         | 28.74                           | 46.00            | -17.26         |         |         |
| 0.807522          | 46.87                       | 40.99                           | 56.00            | -15.01         | 29.18                           | 46.00            | -16.82         |         |         |
| 1.361326          | 47.71                       | 44.12                           | 56.00            | -11.88         | 30.90                           | 46.00            | -15.10         |         |         |
| 0.150000          | 60.17                       | 57.76                           | 66.00            | -8.24          | 37.66                           | 56.00            | -18.34         | L2      | Pass    |
| 0.159118          | 57.79                       | 54.58                           | 65.56            | -10.98         | 32.02                           | 55.56            | -23.54         |         |         |
| 0.293200          | 43.47                       | 40.83                           | 60.48            | -19.65         | 29.90                           | 50.48            | -20.58         |         |         |
| 0.546340          | 47.76                       | 45.49                           | 56.00            | -10.51         | 28.60                           | 46.00            | -17.40         |         |         |
| 0.800964          | 45.40                       | 39.55                           | 56.00            | -16.45         | 23.35                           | 46.00            | -22.65         |         |         |
| 1.806403          | 44.54                       | 39.12                           | 56.00            | -16.88         | 28.38                           | 46.00            | -17.62         |         |         |
| 5.563644          | 44.76                       | 40.55                           | 60.00            | -19.45         | 37.64                           | 50.00            | -12.36         |         |         |
| IDU               |                             |                                 |                  |                |                                 |                  |                |         |         |
| 0.150000          | 55.30                       | 54.60                           | 66.00            | -11.40         | 49.31                           | 56.00            | -6.69          | L1      | Pass    |
| 0.223326          | 49.98                       | 48.78                           | 62.76            | -13.98         | 46.69                           | 52.76            | -6.07          |         |         |
| 0.371638          | 42.76                       | 42.14                           | 58.51            | -16.37         | 39.68                           | 48.51            | -8.83          |         |         |
| 0.445479          | 42.38                       | 42.00                           | 57.02            | -15.02         | 41.42                           | 47.02            | -5.60          |         |         |
| 2.453445          | 37.33                       | 36.73                           | 56.00            | -19.27         | 36.19                           | 46.00            | -9.81          |         |         |
| 6.988552          | 38.85                       | 37.66                           | 60.00            | -22.34         | 36.20                           | 50.00            | -13.80         |         |         |
| 0.150150          | 54.58                       | 53.72                           | 65.99            | -12.27         | 49.28                           | 55.99            | -6.71          | L2      | Pass    |
| 0.223085          | 49.97                       | 48.87                           | 62.77            | -13.90         | 46.37                           | 52.77            | -6.40          |         |         |
| 0.371506          | 43.11                       | 42.48                           | 58.51            | -16.03         | 40.90                           | 48.51            | -7.61          |         |         |
| 0.445027          | 42.55                       | 42.08                           | 57.03            | -14.95         | 41.34                           | 47.03            | -5.69          |         |         |
| 0.520365          | 38.59                       | 37.69                           | 56.00            | -18.31         | 36.59                           | 46.00            | -9.41          |         |         |
| 4.683543          | 36.87                       | 35.84                           | 56.00            | -20.16         | 34.43                           | 46.00            | -11.57         |         |         |

## Reference numbers of test equipment used

|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0447 | HL 0787 | HL 1430 | HL 1502 | HL 1510 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

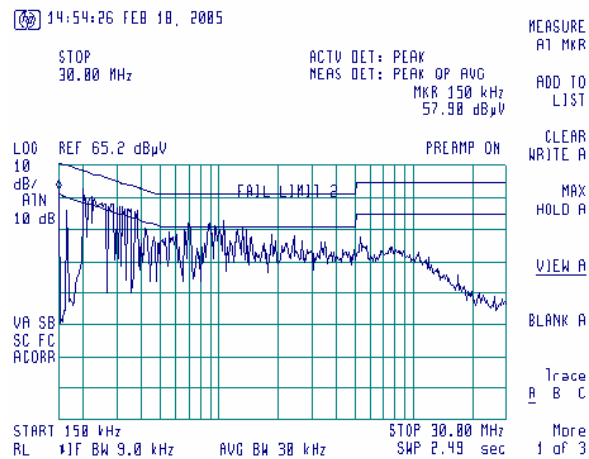
Full description is given in Appendix A.



|                     |                                                     |                         |                       |
|---------------------|-----------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.107, Conducted emission at AC power port |                         |                       |
| Test procedure:     | ANSI C63.4, Sections 11.5 and 12.1.3                |                         |                       |
| Test mode:          | Compliance                                          | Verdict:                | PASS                  |
| Date & Time:        | 2/22/2005 12:46:38 PM                               |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1017 hPa                              | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks:            |                                                     |                         |                       |

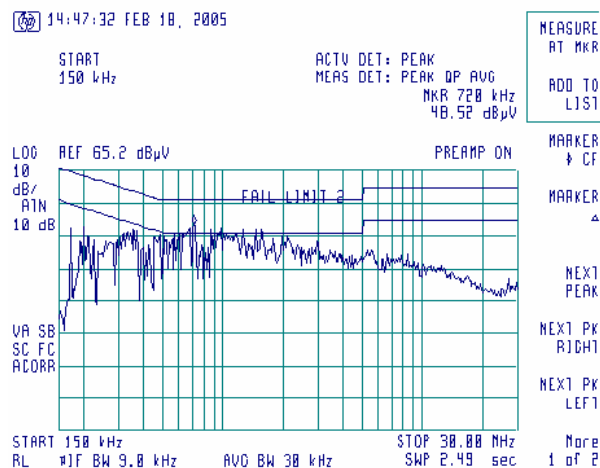
Plot 8.1.1 Conducted emission measurements, at Laptop AC mains

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Transmit  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



Plot 8.1.2 Conducted emission measurements, at Laptop AC mains

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Transmit  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK

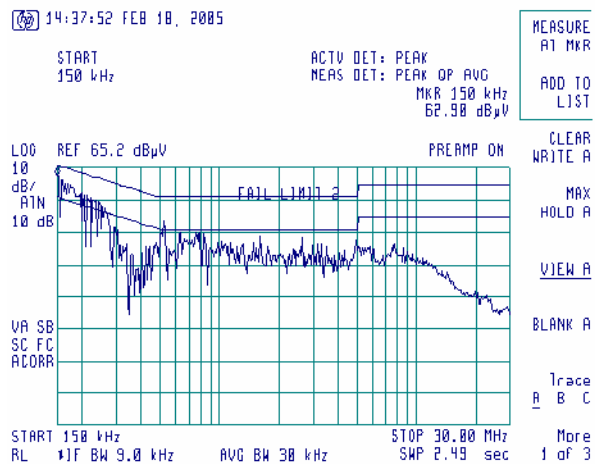




|                     |                                                     |                         |                       |
|---------------------|-----------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.107, Conducted emission at AC power port |                         |                       |
| Test procedure:     | ANSI C63.4, Sections 11.5 and 12.1.3                |                         |                       |
| Test mode:          | Compliance                                          | Verdict:                | PASS                  |
| Date & Time:        | 2/22/2005 12:46:38 PM                               |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1017 hPa                              | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks:            |                                                     |                         |                       |

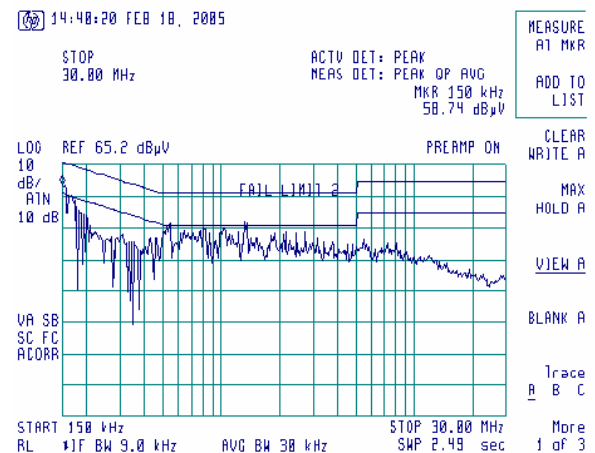
Plot 8.1.3 Conducted emission measurements, at Laptop AC mains

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



Plot 8.1.4 Conducted emission measurements, at Laptop AC mains

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK

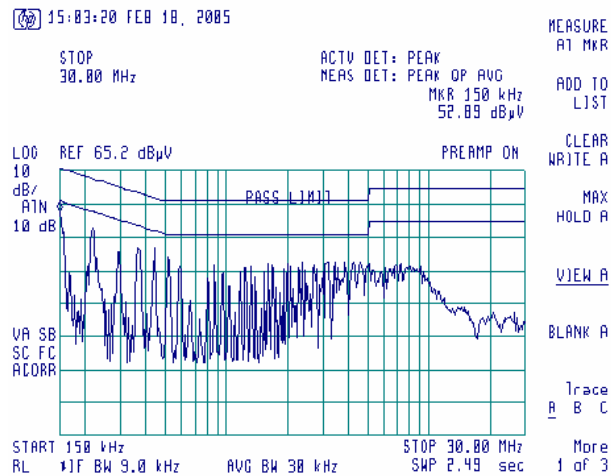




|                     |                                                     |                         |                       |
|---------------------|-----------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.107, Conducted emission at AC power port |                         |                       |
| Test procedure:     | ANSI C63.4, Sections 11.5 and 12.1.3                |                         |                       |
| Test mode:          | Compliance                                          | Verdict:                | PASS                  |
| Date & Time:        | 2/22/2005 12:46:38 PM                               |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1017 hPa                              | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks:            |                                                     |                         |                       |

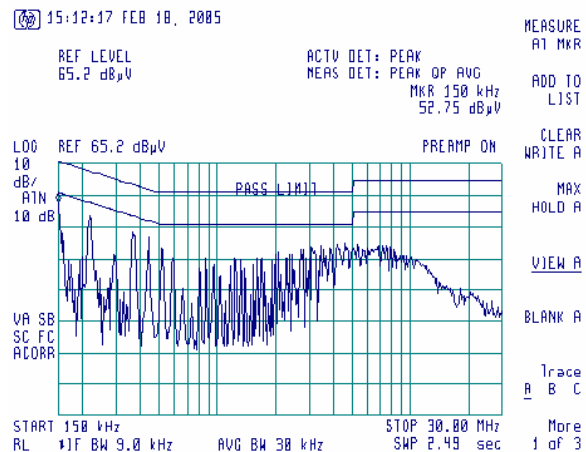
Plot 8.1.5 Conducted emission measurements, at IDU AC mains

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Transmit  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



Plot 8.1.6 Conducted emission measurements, at IDU AC mains

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Transmit  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK

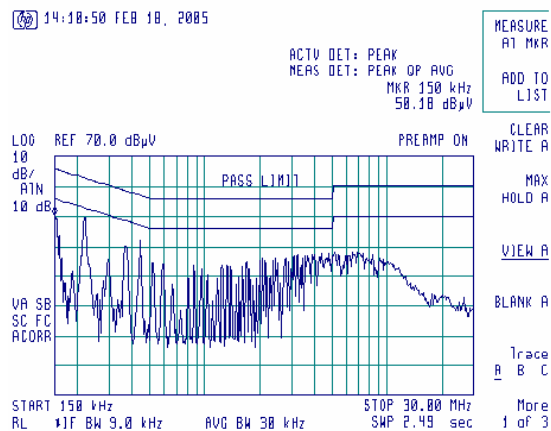




|                     |                                                     |                         |                       |
|---------------------|-----------------------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 15.107, Conducted emission at AC power port |                         |                       |
| Test procedure:     | ANSI C63.4, Sections 11.5 and 12.1.3                |                         |                       |
| Test mode:          | Compliance                                          | Verdict:                | PASS                  |
| Date & Time:        | 2/22/2005 12:46:38 PM                               |                         |                       |
| Temperature: 24 °C  | Air Pressure: 1017 hPa                              | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks:            |                                                     |                         |                       |

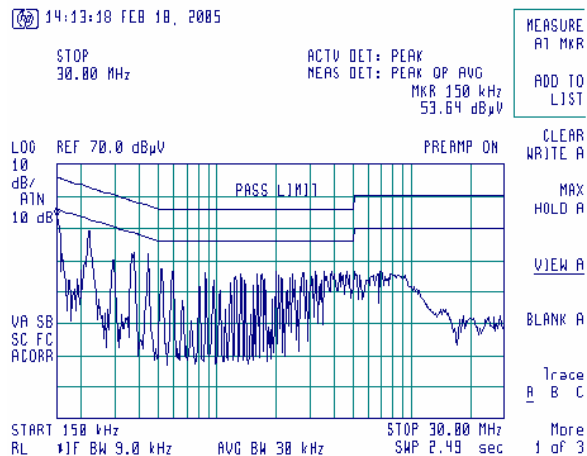
Plot 8.1.7 Conducted emission measurements, at IDU AC mains

LINE: L1  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK



Plot 8.1.8 Conducted emission measurements, at IDU AC mains

LINE: L2  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by  
LIMIT: QUASI-PEAK, AVERAGE  
DETECTOR: PEAK





|                            |                               |                                          |                              |
|----------------------------|-------------------------------|------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.109, Radiated emission</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Sections 11.6 and 12.1.4     |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                          | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 6:01:04 PM           |                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %           | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                          |                              |

## 8.2 Radiated emission measurements

### 8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1.

**Table 8.2.1 Radiated emission test limits**

| Frequency,<br>MHz | Class B limit,<br>dB(μV/m) |              | Class A limit,<br>dB(μV/m) |              |
|-------------------|----------------------------|--------------|----------------------------|--------------|
|                   | 10 m distance              | 3 m distance | 10 m distance              | 3 m distance |
| 30 - 88           | 29.5*                      | 40.0         | 39.0                       | 49.5*        |
| 88 - 216          | 33.0*                      | 43.5         | 43.5                       | 54.0*        |
| 216 - 960         | 35.5*                      | 46.0         | 46.4                       | 56.9*        |
| Above 960         | 43.5*                      | 54.0         | 49.5                       | 60.0*        |

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

### 8.2.2 Test procedure for measurements in semi-anechoic chamber

**8.2.2.1** The EUT was set up as shown in Figure 8.2.1, energized and the performance check was conducted.

**8.2.2.2** The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

**8.2.2.3** The worst test results (the lowest margins) were recorded in Table 8.2.2 and shown in the associated plots.

### 8.2.3 Test procedure for measurements at OATS

**8.2.3.1** The EUT was set up as shown in Figure 8.2.2, energized and the performance check was conducted.

**8.2.3.2** Final measurements were performed at the open area test site at 10 m test distance. The EUT wires and cables were arranged to produce maximum emission as it was found during preliminary measurements. The frequencies yield the worst test results (the lowest margins) during preliminary testing were investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m and its polarization was changed from vertical to horizontal. At frequencies where high ambient noise was encountered, the final measurements were taken in the anechoic chamber at 3 m distance.

**8.2.3.3** The worst test results (the lowest margins) were recorded in Table 8.2.2 and shown in the associated plots.



|                                                              |                               |                                |                              |
|--------------------------------------------------------------|-------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> Section 15.109, Radiated emission |                               |                                |                              |
| <b>Test procedure:</b> ANSI C63.4, Sections 11.6 and 12.1.4  |                               |                                |                              |
| <b>Test mode:</b> Compliance                                 |                               | <b>Verdict:</b> PASS           |                              |
| <b>Date &amp; Time:</b> 3/2/2005 6:01:04 PM                  |                               |                                |                              |
| <b>Temperature:</b> 25 °C                                    | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>                                              |                               |                                |                              |

Figure 8.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment

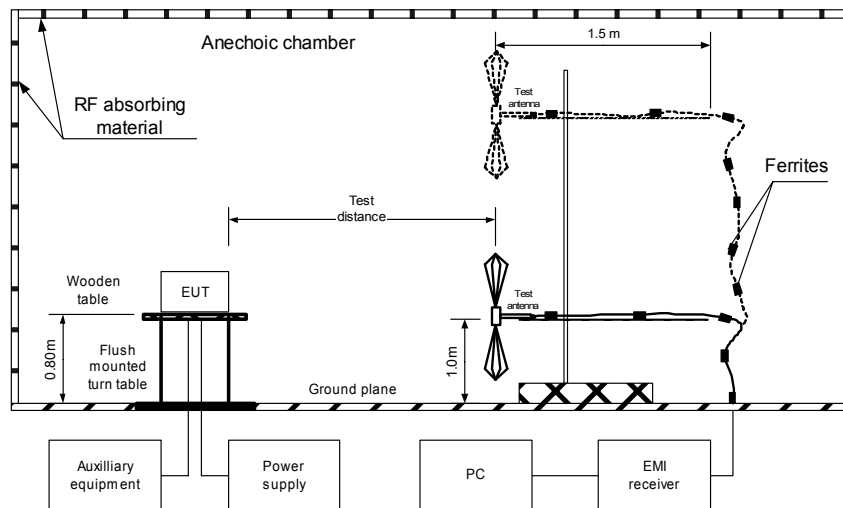
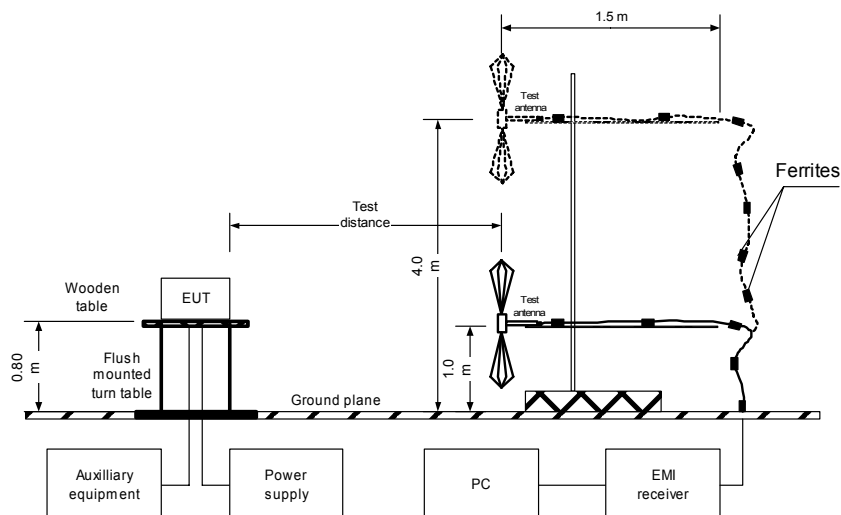


Figure 8.2.2 Setup for radiated emission measurements at OATS, table-top equipment





|                            |                                          |                                |                              |             |
|----------------------------|------------------------------------------|--------------------------------|------------------------------|-------------|
| <b>Test specification:</b> | <b>Section 15.109, Radiated emission</b> |                                |                              |             |
| <b>Test procedure:</b>     | ANSI C63.4, Sections 11.6 and 12.1.4     |                                |                              |             |
| <b>Test mode:</b>          | Compliance                               | <b>Verdict:</b>                |                              | <b>PASS</b> |
| <b>Date &amp; Time:</b>    | 3/2/2005 6:01:04 PM                      |                                |                              |             |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1011 hPa            | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |             |
| <b>Remarks:</b>            |                                          |                                |                              |             |

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP  
LIMIT: Class B  
EUT OPERATING MODE: Receive / Stand-by

TEST SITE: SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / QUASI-PEAK  
FREQUENCY RANGE: 30 MHz – 1000 MHz  
RESOLUTION BANDWIDTH: 120 kHz

| Frequency, MHz | Peak emission, dB(μV/m) | Quasi-peak                  |                 |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-------------------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
|                |                         | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* |                      |                   |                                |         |
| 94.387500      | 43.42                   | 40.85                       | 43.50           | -2.65       | Vertical             | 1.0               | 13                             | Pass    |
| 132.762500     | 44.78                   | 41.55                       | 43.50           | -1.95       | Vertical             | 1.0               | 243                            |         |
| 192.001000     | 40.66                   | 38.89                       | 43.50           | -4.61       | Horizontal           | 1.6               | 103                            |         |
| 259.927500     | 42.99                   | 40.77                       | 46.00           | -5.23       | Horizontal           | 1.0               | 242                            |         |
| 300.002500     | 47.28                   | 44.55                       | 46.00           | -1.45       | Horizontal           | 1.0               | 50                             |         |
| 324.900600     | 42.04                   | 40.26                       | 46.00           | -5.74       | Vertical             | 1.3               | 209                            |         |
| 332.508750     | 42.47                   | 40.90                       | 46.00           | -5.10       | Horizontal           | 1.0               | 360                            |         |
| 389.888750     | 44.64                   | 43.62                       | 46.00           | -2.38       | Vertical             | 1.2               | 206                            |         |
| 598.600000     | 43.16                   | 38.27                       | 46.00           | -7.73       | Vertical             | 1.0               | 79                             |         |

TEST SITE: OATS  
TEST DISTANCE: 10 m  
DETECTORS USED: PEAK / QUASI-PEAK  
FREQUENCY RANGE: 30 MHz – 1000 MHz  
RESOLUTION BANDWIDTH: 120 kHz

| Frequency, MHz | Peak emission, dB(μV/m) | Quasi-peak                  |                 |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-------------------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
|                |                         | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* |                      |                   |                                |         |
| 178.194750     | 32.90                   | 27.44                       | 33.00           | -5.56       | Horizontal           | 3.8               | 60                             | Pass    |

TEST SITE: OATS / SEMI ANECHOIC CHAMBER  
TEST DISTANCE: 3 m  
DETECTORS USED: PEAK / AVERAGE  
FREQUENCY RANGE: 1 GHz – 25 GHz  
RESOLUTION BANDWIDTH: 1000 kHz

| Frequency, MHz | Peak emission, dB(μV/m) | Average                     |                 |             | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-------------------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
|                |                         | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* |                      |                   |                                |         |
| 1130.42500     | 46.60                   | 42.20                       | 54.00           | -11.80      | Horizontal           | 1.2               | 17                             | Pass    |
| 1397.43438     | 48.98                   | 30.40                       | 54.00           | -23.60      | Vertical             | 1.0               | 274                            |         |
| 19065.3000     | 43.17                   | 34.67                       | 54.00           | -19.33      | Vertical             | 1.0               | 90                             |         |

\*- Margin = Measured emission - specification limit.

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

#### Reference numbers of test equipment used

|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0521 | HL 0589 | HL 0592 | HL 0593 | HL 0594 | HL 0604 | HL 0768 | HL 0784 |
| HL 0813 | HL 1430 | HL 1552 | HL 1947 | HL 1984 | HL 2009 |         |         |

Full description is given in Appendix A.



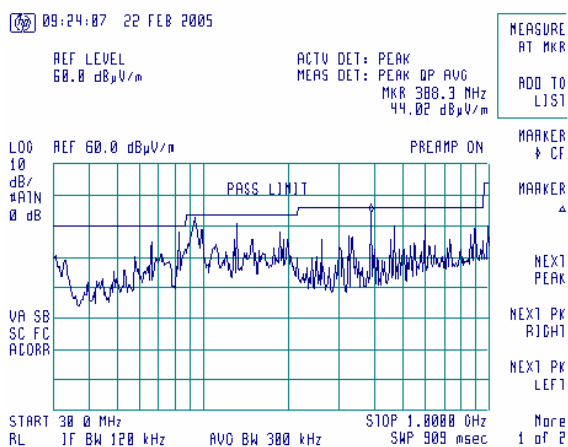
HERMON LABORATORIES

Report ID: RADRAD\_FCC.16288.doc  
Date of Issue: 3/20/2005

|                            |  |                                          |                                |
|----------------------------|--|------------------------------------------|--------------------------------|
| <b>Test specification:</b> |  | <b>Section 15.109, Radiated emission</b> |                                |
| <b>Test procedure:</b>     |  | ANSI C63.4, Sections 11.6 and 12.1.4     |                                |
| <b>Test mode:</b>          |  | Compliance                               | <b>Verdict:</b> PASS           |
| <b>Date &amp; Time:</b>    |  | 3/2/2005 6:01:04 PM                      |                                |
| <b>Temperature:</b> 25 °C  |  | <b>Air Pressure:</b> 1011 hPa            | <b>Relative Humidity:</b> 29 % |
| <b>Remarks:</b>            |  | <b>Power Supply:</b> 120 VAC             |                                |

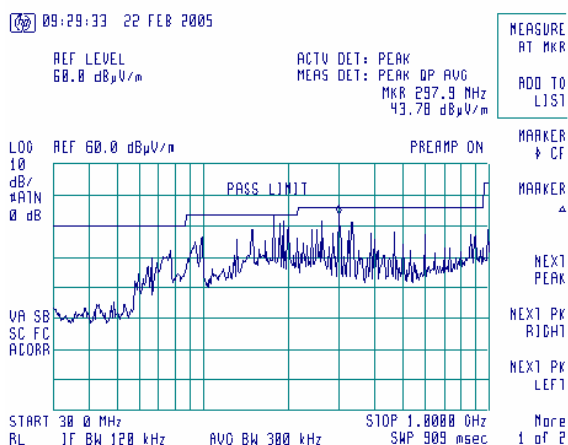
Plot 8.2.1 Radiated emission measurements in 30- 1000 MHz range, vertical antenna polarization

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



Plot 8.2.2 Radiated emission measurements in 30- 1000 MHz range, horizontal antenna polarization

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

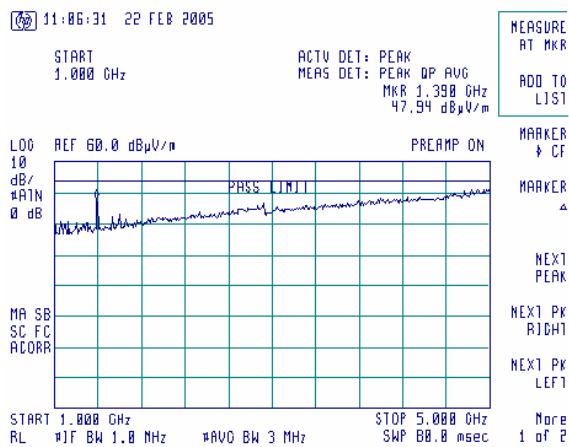




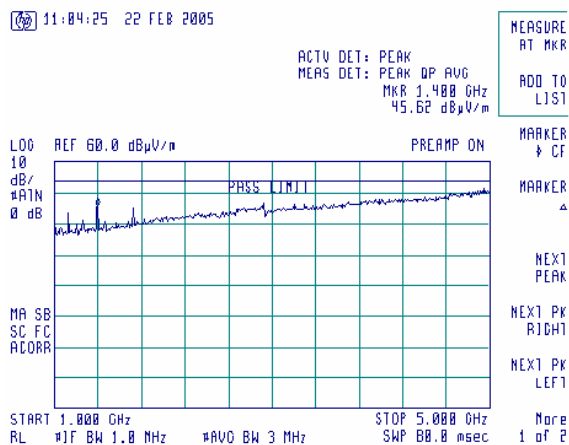
|                            |                               |                                          |                              |
|----------------------------|-------------------------------|------------------------------------------|------------------------------|
| <b>Test specification:</b> |                               | <b>Section 15.109, Radiated emission</b> |                              |
| <b>Test procedure:</b>     |                               | ANSI C63.4, Sections 11.6 and 12.1.4     |                              |
| <b>Test mode:</b>          | Compliance                    | <b>Verdict:</b>                          | PASS                         |
| <b>Date &amp; Time:</b>    | 3/2/2005 6:01:04 PM           |                                          |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1011 hPa | <b>Relative Humidity:</b> 29 %           | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                               |                                          |                              |

**Plot 8.2.3 Radiated emission measurements in 1- 5 GHz range, vertical antenna polarization**

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

**Plot 8.2.4 Radiated emission measurements in 1- 5 GHz range, horizontal antenna polarization**

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

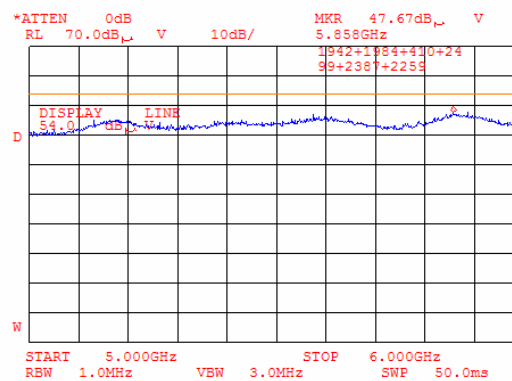




|                            |  |                                          |                                |
|----------------------------|--|------------------------------------------|--------------------------------|
| <b>Test specification:</b> |  | <b>Section 15.109, Radiated emission</b> |                                |
| <b>Test procedure:</b>     |  | ANSI C63.4, Sections 11.6 and 12.1.4     |                                |
| <b>Test mode:</b>          |  | Compliance                               | <b>Verdict:</b> PASS           |
| <b>Date &amp; Time:</b>    |  | 3/2/2005 6:01:04 PM                      |                                |
| <b>Temperature:</b> 25 °C  |  | <b>Air Pressure:</b> 1011 hPa            | <b>Relative Humidity:</b> 29 % |
| <b>Remarks:</b>            |  | <b>Power Supply:</b> 120 VAC             |                                |

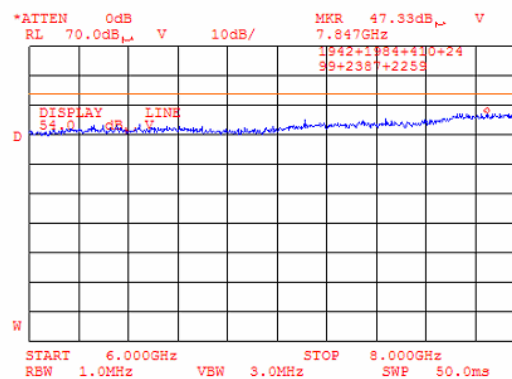
Plot 8.2.5 Radiated emission measurements in 5- 6 GHz range, vertical and horizontal antenna polarization

TEST SITE: OATS  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by



Plot 8.2.6 Radiated emission measurements in 6- 8 GHz range, vertical and horizontal antenna polarization

TEST SITE: OATS  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by

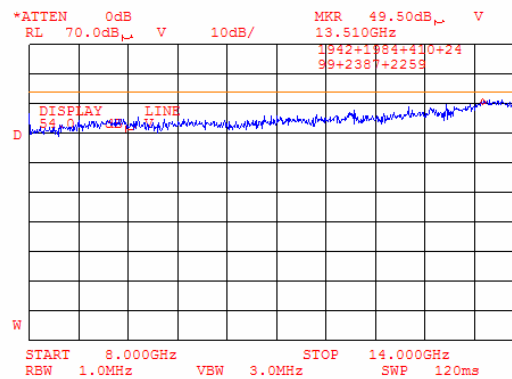




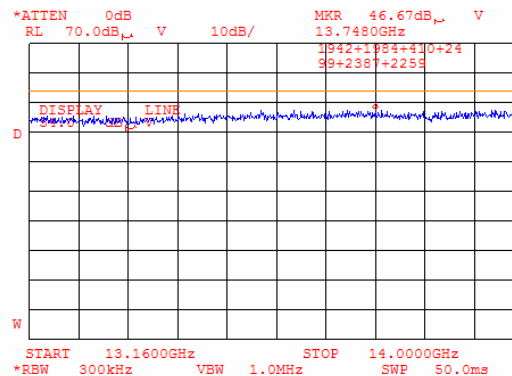
|                            |  |                                          |                                |
|----------------------------|--|------------------------------------------|--------------------------------|
| <b>Test specification:</b> |  | <b>Section 15.109, Radiated emission</b> |                                |
| <b>Test procedure:</b>     |  | ANSI C63.4, Sections 11.6 and 12.1.4     |                                |
| <b>Test mode:</b>          |  | Compliance                               | <b>Verdict:</b> PASS           |
| <b>Date &amp; Time:</b>    |  | 3/2/2005 6:01:04 PM                      |                                |
| <b>Temperature:</b> 25 °C  |  | <b>Air Pressure:</b> 1011 hPa            | <b>Relative Humidity:</b> 29 % |
| <b>Remarks:</b>            |  | <b>Power Supply:</b> 120 VAC             |                                |

**Plot 8.2.7 Radiated emission measurements in 8- 14 GHz range, vertical and horizontal antenna polarization**

TEST SITE: OATS  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by

**Plot 8.2.8 Radiated emission measurements in 13.16- 14 GHz range, vertical and horizontal antenna polarization**

TEST SITE: OATS  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by

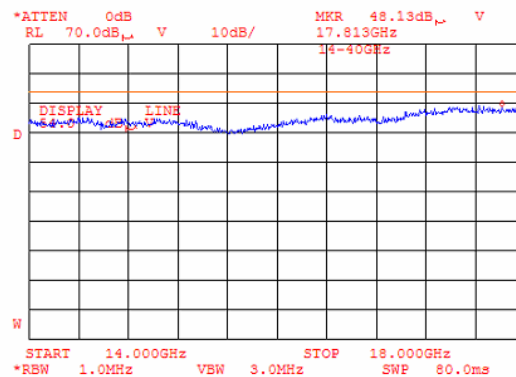




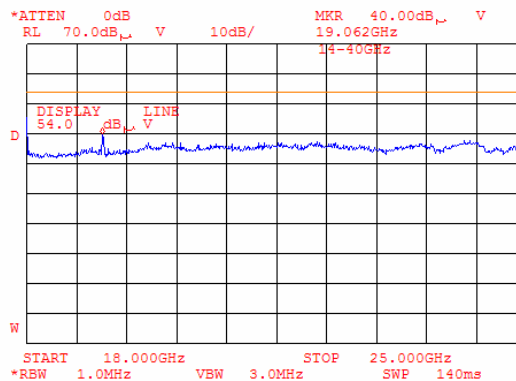
|                            |                                          |                                |                              |
|----------------------------|------------------------------------------|--------------------------------|------------------------------|
| <b>Test specification:</b> | <b>Section 15.109, Radiated emission</b> |                                |                              |
| <b>Test procedure:</b>     | ANSI C63.4, Sections 11.6 and 12.1.4     |                                |                              |
| <b>Test mode:</b>          | Compliance                               | <b>Verdict:</b>                | <b>PASS</b>                  |
| <b>Date &amp; Time:</b>    | 3/2/2005 6:01:04 PM                      |                                |                              |
| <b>Temperature:</b> 25 °C  | <b>Air Pressure:</b> 1011 hPa            | <b>Relative Humidity:</b> 29 % | <b>Power Supply:</b> 120 VAC |
| <b>Remarks:</b>            |                                          |                                |                              |

**Plot 8.2.9 Radiated emission measurements in 14- 18 GHz range, vertical and horizontal antenna polarization**

TEST SITE: OATS  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by

**Plot 8.2.10 Radiated emission measurements in 18- 25 GHz range, vertical and horizontal antenna polarization**

TEST SITE: OATS  
LIMIT: Class B  
TEST DISTANCE: 3 m  
EUT OPERATING MODE: Receive / Stand-by





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

| HL No | Description                                                           | Manufacturer              | Model                | Ser. No.                 | Last Cal. | Due Cal.  |
|-------|-----------------------------------------------------------------------|---------------------------|----------------------|--------------------------|-----------|-----------|
| 0446  | Antenna, Loop active, 10kHz-30MHz                                     | EMCO                      | 6502                 | 2857                     | 28-Jun-04 | 28-Jun-05 |
| 0447  | LISN, 16/2, 300V RMS                                                  | HL                        | LISN 16 - 1          | 066                      | 03-Nov-04 | 03-Nov-05 |
| 0493  | Oven temperature -45...175 deg C                                      | Thermotron                | S-1.2 Mini-Max       | 14016                    | 23-Sep-04 | 23-Sep-05 |
| 0521  | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz | Hewlett Packard           | 8546A                | 3617A 00319, 3448A002 53 | 26-Sep-04 | 26-Sep-05 |
| 0589  | Cable Coaxial, GORE A2P01POL118, 2.3 m                                | HL                        | GORE-3               | 176                      | 02-Dec-04 | 02-Dec-05 |
| 0592  | Position Controller                                                   | HL                        | L2-SR3000 (HL CRL-3) | 100                      | 02-Dec-04 | 02-Dec-05 |
| 0593  | Antenna Mast, 1-4 m Pneumatic                                         | Madgesh                   | AM-F1                | 101                      | 03-Feb-05 | 03-Feb-06 |
| 0594  | Turn Table FOR ANECHOIC CHAMBER flush mount d=1.2 m Pneumatic         | HL                        | TT-WDC1              | 102                      | 27-Jan-05 | 27-Jan-06 |
| 0604  | Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz                | EMCO                      | 3141                 | 9611-1011                | 27-Jan-05 | 27-Jan-06 |
| 0613  | Sensor Electric Field 10 kHz-1.0 GHz, 1-300 V/m (probe), w/charger    | Amplifier Research        | FP2000               | 18677                    | 27-Feb-05 | 27-Feb-06 |
| 0768  | Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, K-band, Gain - 25 dB  | Quinstar Technology       | QWH-4200-BA          | 110                      | 27-Feb-05 | 27-Feb-06 |
| 0769  | Antenna Standard Gain Horn, 26.5-40 GHz, WR28, Ka band, Gain 25 dB    | Quinstar Technology       | QWH-2800-BA          | 112                      | 27-Feb-05 | 27-Feb-06 |
| 0784  | Antenna X-WING BILOG 20 MHz - 2 GHz                                   | Schaffner-Chase EMC       | CBL6140 A            | 1120                     | 10-Jan-05 | 10-Jan-06 |
| 0787  | Transient Limiter                                                     | Hewlett Packard           | 11947A               | 3107A018 77              | 21-Nov-04 | 21-Nov-05 |
| 0813  | Cable Coax, RG-214, 12 m, N-type connectors                           | HL                        | C214-12              | 149                      | 02-Dec-04 | 02-Dec-05 |
| 1206  | One phase voltage regulator, 2kVA, 0-250V                             | HL                        | TDGC-2               | 142                      | 02-Dec-04 | 02-Dec-05 |
| 1424  | Spectrum Analyzer, 30 Hz- 40 GHz                                      | Agilent Technologies (HP) | 8564EC               | 3946A002 19              | 30-Aug-04 | 30-Aug-05 |
| 1430  | EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432                 | Agilent Technologies (HP) | 8542E                | 3807A002 62,3705A0 0217  | 01-Sep-04 | 01-Sep-05 |
| 1453  | Cable, 1 m                                                            | Harbour Industries        | MIL 17/60-RG142      | 1453                     | 23-Sep-04 | 23-Sep-05 |
| 1502  | Cable RF, 6 m                                                         | Belden                    | M17/167 MIL-C-17     | 1502                     | 12-Feb-05 | 12-Feb-06 |
| 1510  | Cable RF, 8 m                                                         | Belden                    | M17/167 MIL-C-17     | 1510                     | 02-Dec-04 | 02-Dec-05 |
| 1552  | Cable RF, 8 m                                                         | Alpha Wire                | RG-214               | 1552                     | 02-Dec-04 | 02-Dec-05 |
| 1620  | Attenuator, 50 Ohm, 2W, DC to 8 GHz, 10 dB                            | Midwest Microwave         | 0217-10-NNN-02       | 1620                     | 15-Jan-05 | 15-Jan-06 |
| 1629  | Isotropic Field Monitor                                               | Amplifier Research        | FM2000               | 23308                    | 13-Feb-05 | 13-Feb-06 |



| HL No | Description                                                    | Manufacturer               | Model              | Ser. No.  | Last Cal. | Due Cal.  |
|-------|----------------------------------------------------------------|----------------------------|--------------------|-----------|-----------|-----------|
| 1947  | Cable 18GHz, 6.5 m, blue                                       | Rhophase Microwave Limited | NPS-1803A-6500-NPS | T4974     | 13-Feb-05 | 13-Feb-06 |
| 1984  | Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W, N-type | EMC Test Systems           | 3115               | 9911-5964 | 22-Mar-05 | 22-Mar-06 |
| 2009  | Cable RF, 8 m                                                  | Alpha Wire                 | RG-214             | C-56      | 13-Feb-05 | 13-Feb-06 |
| 2171  | Multimeter                                                     | Fluke                      | 177                | 79960418  | 13-Feb-05 | 13-Feb-06 |
| 2254  | Cable 40GHz, 0.8 m, blue                                       | Rhophase Microwave Limited | KPS-1503A-800-KPS  | W4907     | 13-Feb-05 | 13-Feb-06 |
| 2259  | Amplifier Low Noise 2-20 GHz                                   | Sophia Wireless            | LNA0220-C          | 0223      | 13-Feb-05 | 13-Feb-06 |
| 2260  | Amplifier Low Noise 14-33 GHz                                  | Sophia Wireless            | LNA28-B            | 0233      | 13-Feb-05 | 13-Feb-06 |
| 2261  | Amplifier Low Noise 33-40 GHz                                  | Sophia Wireless            | LNA38-B            | 0234      | 13-Feb-05 | 13-Feb-06 |
| 2287  | Attenuator 10 dB, DC-18 GHz                                    | Weinschel                  | NA                 | 5776      | 13-Feb-05 | 13-Feb-06 |
| 2387  | Filter Bandpass, 8-14 GHz                                      | HL                         | FBP8-14            | 2387      | 13-Feb-05 | 13-Feb-06 |
| 2399  | Cable 40GHz, 1.5 m, blue                                       | Rhophase Microwave Limited | KPS-1503A-1500-KPS | X2945     | 13-Feb-05 | 13-Feb-06 |
| 2432  | Antenna, Double-Ridged Waveguide Horn 1-18 GHz                 | EMC Test Systems           | 3115               | 00027177  | 13-Feb-05 | 13-Feb-06 |
| 2499  | Quadruplexer 1-12 GHz (1-2 GHz; 2-4GHz;4-8 GHz; 8-12GHz)       | Elettronica S.p.A. - Roma  | UE 84              | D/00239   | 13-Feb-05 | 13-Feb-06 |
| 2524  | Attenuator, 10 dB, DC-18 GHz                                   | Midwest Microwave          | 263-10             | 2524      | 13-Feb-05 | 13-Feb-06 |



## 10 APPENDIX B Measurement uncertainties

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

| Test description                                                                                     | Expanded uncertainty                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transmitter tests</b>                                                                             |                                                                                                                                                                                                                                                                                                              |
| Carrier power conducted at antenna connector                                                         | $\pm 1.7$ dB                                                                                                                                                                                                                                                                                                 |
| Carrier power radiated (substitution method)                                                         | $\pm 4.5$ dB                                                                                                                                                                                                                                                                                                 |
| Occupied bandwidth                                                                                   | $\pm 8\%$                                                                                                                                                                                                                                                                                                    |
| Conducted emissions at RF antenna connector                                                          | 9 kHz to 2.9 GHz: $\pm 2.6$ dB<br>2.9 GHz to 6.46 GHz: $\pm 3.5$ dB<br>6.46 GHz to 13.2 GHz: $\pm 4.3$ dB<br>13.2 GHz to 22.0 GHz: $\pm 5.0$ dB<br>22.0 GHz to 26.8 GHz: $\pm 5.5$ dB<br>26.8 GHz to 40.0 GHz: $\pm 4.8$ dB                                                                                  |
| Spurious emissions radiated 30 MHz – 40 GHz (substitution method)                                    | $\pm 4.5$ dB                                                                                                                                                                                                                                                                                                 |
| Frequency error                                                                                      | 30 – 300 MHz: $\pm 50.5$ Hz (1.68 ppm)<br>300 – 1000 MHz: $\pm 168$ Hz (0.56 ppm)                                                                                                                                                                                                                            |
| Transient frequency behaviour                                                                        | 187 Hz<br>$\pm 13.9\%$                                                                                                                                                                                                                                                                                       |
| Duty cycle, timing (Tx ON / OFF) and average factor measurements                                     | $\pm 1.0\%$                                                                                                                                                                                                                                                                                                  |
| <b>Unintentional radiator tests</b>                                                                  |                                                                                                                                                                                                                                                                                                              |
| Conducted emissions with LISN                                                                        | 9 kHz to 150 kHz: $\pm 3.9$ dB<br>150 kHz to 30 MHz: $\pm 3.8$ dB                                                                                                                                                                                                                                            |
| Radiated emissions at 3 m measuring distance<br>Horizontal polarization<br><br>Vertical polarization | Biconilog antenna: $\pm 5.3$ dB<br>Biconical antenna: $\pm 5.0$ dB<br>Log periodic antenna: $\pm 5.3$ dB<br>Double ridged horn antenna: $\pm 5.3$ dB<br>Biconilog antenna: $\pm 6.0$ dB<br>Biconical antenna: $\pm 5.7$ dB<br>Log periodic antenna: $\pm 6.0$ dB<br>Double ridged horn antenna: $\pm 6.0$ dB |

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of ISO/IEC 17025 (or alternately ANSI/NCSL Z540-1).

The laboratory calibrates its measurement standards by a third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements. The Hermon Labs EMC measurements uncertainty is given in the table above.



## 11 APPENDIX C Test facility description

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

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## 12 APPENDIX D Specification references

|                         |                                                                                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47CFR part 90: 2004     | Private land mobile radio services                                                                                                                                   |
| 47CFR part 1: 2004      | Practice and procedure                                                                                                                                               |
| 47CFR part 2: 2004      | Frequency allocations and radio treaty matters; general rules and regulations                                                                                        |
| ANSI C63.2: 1996        | American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.                                            |
| ANSI C63.4: 2001        | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| ANSI/TIA/EIA-603-A:2001 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                                                  |

## 13 APPENDIX E Abbreviations and acronyms

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

**14 APPENDIX F Test equipment correction factors****Correction factor  
Line impedance stabilization network  
Model LISN 16 – 1, Hermon Laboratories**

| Frequency,<br>kHz | Correction factor,<br>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  
Active Loop Antenna  
EMC Test Systems, model 6502, serial number 2857**

| Frequency,<br>MHz | Magnetic Antenna Factor,<br>dB(S/m) | Electric Antenna Factor,<br>dB(1/m) |
|-------------------|-------------------------------------|-------------------------------------|
| 0.009             | -32.8                               | 18.7                                |
| 0.010             | -33.8                               | 17.7                                |
| 0.020             | -38.3                               | 13.2                                |
| 0.050             | -41.1                               | 10.4                                |
| 0.075             | -41.3                               | 10.2                                |
| 0.100             | -41.6                               | 9.9                                 |
| 0.150             | -41.7                               | 9.8                                 |
| 0.250             | -41.6                               | 9.9                                 |
| 0.500             | -41.8                               | 9.7                                 |
| 0.750             | -41.9                               | 9.6                                 |
| 1.000             | -41.4                               | 10.1                                |
| 2.000             | -41.5                               | 10.0                                |
| 3.000             | -41.4                               | 10.1                                |
| 4.000             | -41.4                               | 10.1                                |
| 5.000             | -41.5                               | 10.0                                |
| 10.000            | -41.9                               | 9.6                                 |
| 15.000            | -41.9                               | 9.6                                 |
| 20.000            | -42.2                               | 9.3                                 |
| 25.000            | -42.8                               | 8.7                                 |
| 30.000            | -44.0                               | 7.5                                 |

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

**Antenna factor****Biconilog antenna EMCO, model 3141, serial number 1011, HL 0604**

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

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

**Antenna factor****Standard gain horn antenna****Quinstar Technology****Model QWH****Ser.No.112, HL 0768, 0769, 0770**

| Frequency min, GHz | Frequency max, GHz | Antenna factor, dB(1/m) |
|--------------------|--------------------|-------------------------|
| 18.000             | 26.500             | 32.01                   |
| 26.500             | 40.000             | 35.48                   |
| 40.000             | 60.000             | 39.03                   |
| 60.000             | 90.000             | 42.55                   |
| 90.000             | 140.000            | 46.23                   |
| 140.000            | 220.000            | 50.11                   |

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).

**Biconilog antenna factor**  
**Schaffner Chase EMC, model CBL 6140A, serial number 1120, HL 0784**

| Frequency, MHz | Antenna factor, dB(1/m) | Frequency, MHz | Antenna factor, dB(1/m) |
|----------------|-------------------------|----------------|-------------------------|
| 20             | 12.1                    | 600            | 19.1                    |
| 22             | 8.8                     | 620            | 19.8                    |
| 24             | 5.5                     | 640            | 20.6                    |
| 26             | 3.0                     | 660            | 20.7                    |
| 28             | 2.8                     | 680            | 20.9                    |
| 30             | 3.9                     | 700            | 21.0                    |
| 40             | 8.4                     | 720            | 21.4                    |
| 50             | 9.3                     | 740            | 21.7                    |
| 60             | 9.7                     | 760            | 21.6                    |
| 70             | 9.3                     | 780            | 21.6                    |
| 80             | 7.5                     | 800            | 21.9                    |
| 90             | 6.8                     | 820            | 22.2                    |
| 100            | 7.6                     | 840            | 22.6                    |
| 110            | 6.6                     | 860            | 22.7                    |
| 120            | 6.9                     | 880            | 22.7                    |
| 140            | 7.6                     | 900            | 22.9                    |
| 160            | 11.6                    | 920            | 23.2                    |
| 170            | 8.3                     | 940            | 23.7                    |
| 190            | 9.2                     | 960            | 24.3                    |
| 200            | 9.9                     | 980            | 24.6                    |
| 220            | 10.5                    | 1000           | 24.4                    |
| 240            | 11.2                    | 1.060          | 24.3                    |
| 260            | 12.9                    | 1.120          | 24.8                    |
| 280            | 12.1                    | 1.180          | 25.3                    |
| 300            | 12.9                    | 1.240          | 26.1                    |
| 320            | 13.2                    | 1.300          | 26.9                    |
| 340            | 13.9                    | 1.360          | 27.6                    |
| 360            | 15.2                    | 1.420          | 26.8                    |
| 380            | 15.3                    | 1.480          | 26.9                    |
| 400            | 15.7                    | 1.520          | 28.1                    |
| 420            | 16.6                    | 1.560          | 28.1                    |
| 440            | 16.8                    | 1.640          | 28.2                    |
| 460            | 17.6                    | 1.700          | 28.6                    |
| 480            | 18.3                    | 1.760          | 30.0                    |
| 500            | 18.0                    | 1.840          | 31.3                    |
| 520            | 18.0                    | 1.900          | 31.8                    |
| 540            | 18.7                    | 1.960          | 31.6                    |
| 560            | 19.2                    |                |                         |
| 580            | 19.0                    | 2.000          | 32.0                    |

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**  
**Double-ridged wave guide horn antenna**  
**EMC Test Systems, model 3115, serial no: 9911-5964, HL 1984**

| Frequency,<br>MHz | Antenna gain,<br>dBi | Antenna factor.<br>dB(1/m) |
|-------------------|----------------------|----------------------------|
| 1000.0            | 5.8                  | 24.5                       |
| 1500.0            | 9.0                  | 24.8                       |
| 2000.0            | 8.6                  | 27.7                       |
| 2500.0            | 9.5                  | 28.7                       |
| 3000.0            | 8.9                  | 30.8                       |
| 3500.0            | 8.2                  | 32.9                       |
| 4000.0            | 9.6                  | 32.7                       |
| 4500.0            | 11.2                 | 32.1                       |
| 5000.0            | 10.6                 | 33.6                       |
| 5500.0            | 9.8                  | 35.3                       |
| 6000.0            | 10.1                 | 35.7                       |
| 6500.0            | 10.7                 | 35.8                       |
| 7000.0            | 10.9                 | 36.2                       |
| 7500.0            | 10.5                 | 37.2                       |
| 8000.0            | 11.1                 | 37.2                       |
| 8500.0            | 10.8                 | 38.1                       |
| 9000.0            | 10.7                 | 38.6                       |
| 9500.0            | 11.5                 | 38.3                       |
| 10000.0           | 11.8                 | 38.4                       |
| 10500.0           | 12.3                 | 38.3                       |
| 11000.0           | 12.3                 | 38.8                       |
| 11500.0           | 11.5                 | 39.9                       |
| 12000.0           | 12.2                 | 39.6                       |
| 12500.0           | 12.6                 | 39.5                       |
| 13000.0           | 12.0                 | 40.5                       |
| 13500.0           | 11.7                 | 41.1                       |
| 14000.0           | 11.7                 | 41.5                       |
| 14500.0           | 12.7                 | 40.8                       |
| 15000.0           | 14.2                 | 39.5                       |
| 15500.0           | 16.0                 | 38.1                       |
| 16000.0           | 16.2                 | 38.1                       |
| 16500.0           | 14.5                 | 40.1                       |
| 17000.0           | 12.2                 | 42.6                       |
| 17500.0           | 9.7                  | 45.4                       |
| 18000.0           | 6.6                  | 48.7                       |

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



**Antenna factor**  
**Double-ridged wave guide horn antenna**  
**EMC Test Systems, model 3115, serial no: 00027177, HL 2432**

| Frequency,<br>MHz | Antenna gain,<br>dBi | Antenna factor.<br>dB(1/m) |
|-------------------|----------------------|----------------------------|
| 1000.0            | 5.5                  | 24.7                       |
| 1500.0            | 8.0                  | 25.7                       |
| 2000.0            | 8.4                  | 27.8                       |
| 2500.0            | 9.3                  | 28.9                       |
| 3000.0            | 9.0                  | 30.7                       |
| 3500.0            | 9.3                  | 31.8                       |
| 4000.0            | 9.3                  | 33.0                       |
| 4500.0            | 10.4                 | 32.8                       |
| 5000.0            | 10.0                 | 34.2                       |
| 5500.0            | 10.1                 | 34.9                       |
| 6000.0            | 10.6                 | 35.2                       |
| 6500.0            | 11.0                 | 35.4                       |
| 7000.0            | 10.8                 | 36.3                       |
| 7500.0            | 10.4                 | 37.3                       |
| 8000.0            | 10.8                 | 37.5                       |
| 8500.0            | 10.8                 | 38.0                       |
| 9000.0            | 11.0                 | 38.3                       |
| 9500.0            | 11.5                 | 38.3                       |
| 10000.0           | 11.5                 | 38.7                       |
| 10500.0           | 11.9                 | 38.7                       |
| 11000.0           | 12.2                 | 38.9                       |
| 11500.0           | 11.9                 | 39.5                       |
| 12000.0           | 12.3                 | 39.5                       |
| 12500.0           | 12.7                 | 39.4                       |
| 13000.0           | 12.0                 | 40.5                       |
| 13500.0           | 12.0                 | 40.8                       |
| 14000.0           | 11.6                 | 41.5                       |
| 14500.0           | 12.2                 | 41.3                       |
| 15000.0           | 13.6                 | 40.2                       |
| 15500.0           | 15.3                 | 38.7                       |
| 16000.0           | 15.8                 | 38.5                       |
| 16500.0           | 14.8                 | 39.8                       |
| 17000.0           | 12.9                 | 41.9                       |
| 17500.0           | 9.2                  | 45.8                       |
| 18000.0           | 6.2                  | 49.1                       |

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



**Cable loss**  
**Cable RG-214, HL 0813**

| No. | Frequency,<br>MHz | Cable loss,<br>dB |
|-----|-------------------|-------------------|
| 1   | 10                | 0.15              |
| 2   | 20                | 0.40              |
| 3   | 30                | 0.51              |
| 4   | 40                | 0.61              |
| 5   | 50                | 0.68              |
| 6   | 60                | 0.76              |
| 7   | 70                | 0.80              |
| 8   | 80                | 0.92              |
| 9   | 90                | 0.96              |
| 10  | 100               | 0.99              |
| 11  | 200               | 1.60              |
| 12  | 300               | 1.85              |
| 13  | 400               | 2.25              |
| 14  | 500               | 2.43              |
| 15  | 600               | 2.80              |
| 16  | 700               | 3.14              |
| 17  | 800               | 3.34              |
| 18  | 900               | 3.75              |
| 19  | 1000              | 4.05              |
| 20  | 1200              | 4.41              |
| 21  | 1400              | 4.81              |
| 22  | 1600              | 5.18              |
| 23  | 1800              | 5.58              |
| 24  | 2000              | 6.09              |
| 25  | 2500              | 7.27              |
| 26  | 2900              | 8.01              |



## 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              | $\leq 6.5$                          | $\pm 0.12$                        |
| 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              | $\leq 6.5$                          | $\pm 0.12$                        |
| 17  | 3000              | 3.32              |                                     | $\pm 0.17$                        |
| 18  | 3300              | 3.47              |                                     |                                   |
| 19  | 3600              | 3.62              |                                     |                                   |
| 20  | 3900              | 3.84              |                                     |                                   |
| 21  | 4200              | 3.92              |                                     |                                   |
| 22  | 4500              | 4.07              |                                     |                                   |
| 23  | 4800              | 4.36              |                                     |                                   |
| 24  | 5100              | 4.62              |                                     |                                   |
| 25  | 5400              | 4.78              |                                     |                                   |
| 26  | 5700              | 5.16              |                                     |                                   |
| 27  | 6000              | 5.67              |                                     |                                   |
| 28  | 6500              | 5.99              |                                     |                                   |



**Cable 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**  
**RF cable 8 m, model RG-214-8m, HL 1552**

| No. | Frequency,<br>MHz | Cable loss,<br>dB | Measurement uncertainty,<br>dB | Notes |
|-----|-------------------|-------------------|--------------------------------|-------|
| 1   | 0.010             | 0.01              | ±0.05                          |       |
| 2   | 0.1               | 0.01              |                                |       |
| 3   | 1                 | 0.03              |                                |       |
| 4   | 10                | 0.12              |                                |       |
| 5   | 20                | 0.23              |                                |       |
| 6   | 30                | 0.30              |                                |       |
| 7   | 40                | 0.32              |                                |       |
| 8   | 50                | 0.34              |                                |       |
| 9   | 60                | 0.39              |                                |       |
| 10  | 70                | 0.43              |                                |       |
| 11  | 80                | 0.48              |                                |       |
| 12  | 90                | 0.50              |                                |       |
| 13  | 100               | 0.55              |                                |       |
| 14  | 200               | 0.78              |                                |       |
| 15  | 300               | 1.04              |                                |       |
| 16  | 400               | 1.16              |                                |       |
| 17  | 500               | 1.33              |                                |       |
| 18  | 600               | 1.51              |                                |       |
| 19  | 700               | 1.65              |                                |       |
| 20  | 800               | 1.77              |                                |       |
| 21  | 900               | 1.92              |                                |       |
| 22  | 1000              | 2.04              |                                |       |
| 23  | 1200              | 2.26              |                                |       |
| 24  | 1400              | 2.49              |                                |       |
| 25  | 1600              | 2.74              |                                |       |
| 26  | 1800              | 2.94              |                                |       |
| 27  | 2000              | 3.18              |                                |       |
| 28  | 2500              | 3.65              |                                |       |
| 29  | 2900              | 4.08              |                                |       |



## 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              | 0.04              | 8.70              | 1.07              | 24.00             | 1.90              |
| 1.80              | 0.07              | 8.90              | 1.11              | 24.50             | 1.81              |
| 1.90              | 0.09              | 9.10              | 1.09              | 25.00             | 1.98              |
| 2.00              | 0.15              | 9.30              | 1.14              | 25.50             | 1.91              |
| 2.10              | 0.19              | 9.50              | 1.12              | 26.00             | 2.02              |
| 2.20              | 0.25              | 9.70              | 1.15              | 26.50             | 1.92              |
| 2.30              | 0.29              | 9.90              | 1.16              | 27.00             | 1.97              |
| 2.40              | 0.33              | 10.10             | 1.16              | 28.00             | 2.02              |
| 2.50              | 0.37              | 10.30             | 1.19              | 29.00             | 1.95              |
| 2.60              | 0.41              | 10.50             | 1.14              | 30.00             | 1.94              |
| 2.70              | 0.44              | 10.70             | 1.19              | 31.00             | 2.11              |
| 2.80              | 0.45              | 10.90             | 1.17              | 32.00             | 2.17              |
| 2.90              | 0.48              | 11.10             | 1.13              | 33.00             | 2.27              |
| 3.10              | 0.61              | 11.30             | 1.20              | 34.00             | 2.27              |
| 3.30              | 0.64              | 11.50             | 1.13              | 35.00             | 2.29              |
| 3.50              | 0.65              | 11.70             | 1.20              | 36.00             | 2.35              |
| 3.70              | 0.68              | 11.90             | 1.18              | 37.00             | 2.37              |
| 3.90              | 0.69              | 12.10             | 1.14              | 38.00             | 2.40              |
| 4.10              | 0.71              | 12.40             | 1.19              | 39.00             | 2.57              |
| 4.30              | 0.73              | 13.00             | 1.34              | 40.00             | 2.36              |
| 4.50              | 0.75              | 13.50             | 1.33              |                   |                   |
| 4.70              | 0.77              | 14.00             | 1.48              |                   |                   |
| 4.90              | 0.79              | 14.50             | 1.45              |                   |                   |

**Cable loss**

**Cable coaxial, 40GHz, 1.5 m, Blue, Rhopase Microwave Limited, model: KPS-1503A-1500-KPS, HL 2399**

| Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 0.03              | 0.07              | 6.5               | 1.57              | 15.50             | 2.50              |
| 0.05              | 0.10              | 6.7               | 1.60              | 16.00             | 2.51              |
| 0.1               | 0.16              | 6.9               | 1.55              | 16.50             | 2.58              |
| 0.2               | 0.26              | 7.1               | 1.65              | 17.00             | 2.65              |
| 0.3               | 0.33              | 7.3               | 1.65              | 17.50             | 2.73              |
| 0.5               | 0.38              | 7.5               | 1.70              | 18.00             | 2.74              |
| 0.7               | 0.41              | 7.7               | 1.71              | 18.50             | 2.67              |
| 0.9               | 0.58              | 7.9               | 1.73              | 19.00             | 2.67              |
| 1.1               | 0.64              | 8.1               | 1.79              | 19.50             | 2.74              |
| 1.3               | 0.70              | 8.3               | 1.81              | 20.00             | 2.69              |
| 1.5               | 0.75              | 8.5               | 1.84              | 20.50             | 2.80              |
| 1.7               | 0.79              | 8.7               | 1.85              | 21.00             | 2.82              |
| 1.9               | 0.83              | 8.9               | 1.90              | 21.50             | 2.87              |
| 2.1               | 0.88              | 9.1               | 1.95              | 22.00             | 2.87              |
| 2.3               | 0.93              | 9.3               | 1.93              | 22.50             | 2.92              |
| 2.5               | 0.97              | 9.5               | 1.98              | 23.50             | 3.04              |
| 2.7               | 1.01              | 9.7               | 1.96              | 24.00             | 3.05              |
| 2.9               | 1.04              | 9.9               | 2.03              | 24.50             | 3.03              |
| 3.1               | 1.08              | 10.1              | 1.99              | 25.00             | 3.11              |
| 3.3               | 1.14              | 10.30             | 2.02              | 25.50             | 3.10              |
| 3.5               | 1.17              | 10.50             | 2.02              | 26.00             | 3.17              |
| 3.7               | 1.21              | 10.70             | 2.02              | 26.50             | 3.11              |
| 3.9               | 1.24              | 10.90             | 2.08              | 27.00             | 3.16              |
| 4.1               | 1.26              | 11.10             | 2.02              | 28.00             | 3.19              |
| 4.3               | 1.26              | 11.30             | 2.09              | 29.00             | 3.19              |
| 4.5               | 1.29              | 11.50             | 2.05              | 30.00             | 3.30              |
| 4.7               | 1.34              | 11.70             | 2.11              | 31.00             | 3.31              |
| 4.9               | 1.34              | 11.90             | 2.11              | 32.00             | 3.35              |
| 5.1               | 1.40              | 12.10             | 2.12              | 33.00             | 3.46              |
| 5.3               | 1.43              | 12.40             | 2.17              | 34.00             | 3.45              |
| 5.5               | 1.45              | 13.00             | 2.29              | 35.00             | 3.49              |
| 5.7               | 1.47              | 13.50             | 2.31              | 36.00             | 3.54              |
| 5.9               | 1.40              | 14.00             | 2.43              | 37.00             | 3.62              |
| 6.1               | 1.53              | 14.50             | 2.43              | 39.00             | 3.69              |
| 6.3               | 1.55              | 15.00             | 2.46              | 40.00             | 3.75              |