

PARTIAL TEST REPORT

ACCORDING TO: FCC part 27: 2004

FCC part 15: 2005 subpart B

FOR:

VYYO-XTEND Ltd.

Wireless modem

Model:V284i

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1 Applicant information

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Contact name: Mr. Hillel Hendler

2 Equipment under test attributes

Product name: Wireless modem
Operating frequency range: 776.1 – 776.9 MHz
Model: V284i
Serial number: 1325114
Receipt date: 6/21/2005

3 Manufacturer information

Manufacturer name: VYYO - XTEND Ltd.
Address: Airport City, POB 197, Ben Gurion Airport, 70100, Israel
Telephone: +972 3976 9999
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E-Mail: hhendler@vyvo.com
Contact name: Mr. Hillel Hendler




4 Test details

Project ID: 16544
Location: Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started: 6/21/2005
Test completed: 8/15/2004
Test specifications: FCC part 27: 2003
FCC part 15: 2004 subpart B

5 Tests summary

| Test | Status |
|---|------------|
| Transmitter characteristics | |
| Section 27.50c(1)(i), Peak output power at RF antenna connector | Pass |
| Section 2.1091, RF radiation exposure evaluation | Pass |
| Section 27.53d, Spurious emissions RF antenna connector | Pass |
| Section 27.53d, Adjacent channel power | Not tested |
| Section 27.53d, Radiated spurious emissions | Pass |
| Section 27.54, Frequency stability | Pass |
| Section 2.1049, Occupied bandwidth | Pass |
| Unintentional emissions | |
| Section 15.107, Conducted emission at AC power port | Pass |
| Section 15.109, Radiated emission | Pass |
| Section 15.111, Antenna power conducted measurements for receiver | Pass |

The test results relate only to the items tested. Pass / fail decision was based on nominal values.

| | Name and Title | Date | Signature |
|---------------------|---|-----------------|---|
| Tested by: | Mr. A. Adelberg, test engineer | August 15, 2005 |  |
| Reviewed by: | Mrs. M. Cherniavsky, certification engineer | August 18, 2005 |  |
| Approved by: | Mr. M. Nikishin, EMC group leader | August 19, 2005 |  |



6 EUT description

6.1 General information

The EUT is a broadband wireless data modem used by cable and wireless operators to deliver telephony services (T1/E1) and high-speed data connections to business and residential subscribers. The EUT operates within 776.1 to 776.9 MHz band and is powered from AC mains through a power adaptor.

6.2 Ports and lines

| Port type | Port description | Connected | | Connector type | Qty. | Cable type | Cable length | Indoor / outdoor |
|-----------|------------------|---------------|---------------|----------------|------|-------------|--------------|------------------|
| | | From | To | | | | | |
| Power | AC mains | Power adaptor | AC mains | 2 pole | 1 | NA | NA | Indoor |
| Power | VDC | EUT | Power adaptor | DC jack | 1 | Unshielded | 1.5 m | Indoor |
| Signal | Ethernet | EUT | Laptop | RJ 45 | 1 | UTP Cat.5 | 1.5 m | Indoor |
| Signal | USB | EUT | Laptop | USB | 1 | Shielded | 1.5 m | Indoor |
| Signal | Antenna | EUT | Attenuator | F-type | 1 | Coax 75 Ohm | 12.0 m | Outdoor |
| Power | AC mains | Power adaptor | AC mains | 3 pole | 1 | Unshielded | 1.5 m | Indoor |
| Power | VDC | Laptop | Power adaptor | DC jack | 1 | Unshielded | 1.5 m | Indoor |
| Signal | Mouse | Laptop | Mouse | USB | 1 | Shielded | 2 m | Indoor |
| Signal | Parallel | Laptop | Printer | D type 25 | 1 | Shielded | 5 m | Indoor |
| Signal | Keyboard | Laptop | Keyboard | PS2 | 1 | Unshielded | 2 m | Indoor |

6.3 Support and test equipment

| Description | Manufacturer | Model number | Serial number |
|-----------------------------------|----------------|---------------|----------------|
| E1/T1 Broadband hub | Vyco | V3000 | NA |
| External Laptop | IBM | ThinkPad 600x | 5573MWV02/99 |
| Power adaptor for external laptop | IBM | 02K6654 | 4062298 |
| Up converter | Wavecom | UC4040D | 169532 |
| Signal generator | Rohde&Schwartz | SML01 | 836817/091 |
| Mouse | Microsoft | Mouse 2.1A | 03306271 |
| Printer | Epson | LX-810 | 44B1127035 |
| Keyboard | Quantum | KWD-840 | OC11401283 |
| Power adaptor for EUT | DVE | DSA-0151A | 3604 |
| Laptop | IBM | ThinkPad T40 | KP-DPM50 04/03 |
| Power adaptor for laptop | IBM | 02K6654 | 150HN9 |

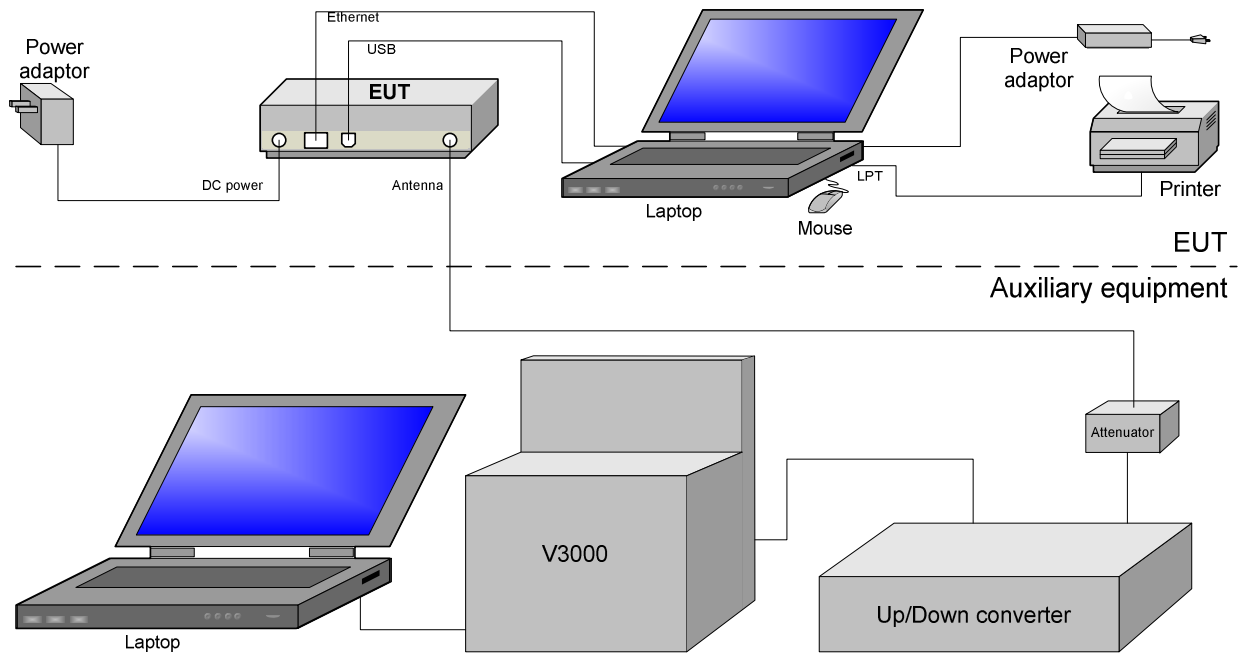
6.4 Operating frequencies

| Source | Frequency, MHz | | |
|-------------|----------------|-----------|--------------------|
| Receiver | 702.0 (LO) | 44.0 (IF) | 746.1 – 746.9 (Rx) |
| Transmitter | 10.0 (VCTXO) | 44.0 (IF) | 776.1 - 776.9 (Tx) |

6.5 Changes made in the EUT

No changes were implemented.

6.6 Test configuration





6.7 Transmitter characteristics

| | | | | | | |
|---|--|---|-------------------------------------|-------------------------------------|--------------------------------|-------------|
| Type of equipment | | | | | | |
| <input checked="" type="checkbox"/> | Stand-alone (Equipment with or without its own control provisions) | | | | | |
| | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) | | | | | |
| | Plug-in card (Equipment intended for a variety of host systems) | | | | | |
| Intended use | | Condition of use | | | | |
| <input checked="" type="checkbox"/> | 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 | | | | |
| Assigned frequency range | | 776.0 – 777.0 MHz | | | | |
| Operating frequency range | | 776.1 – 776.9 MHz | | | | |
| Maximum rated output power | | At transmitter 50 Ω RF output connector | | 24.9.0 dBm | | |
| | | Effective radiated power (for equipment with no RF connector) | | NA dBm | | |
| Is transmitter output power variable? | | No | | | | |
| | | <input checked="" type="checkbox"/> | Yes | continuous variable | | |
| | | | | <input checked="" type="checkbox"/> | stepped variable with stepsize | 0.25 dB |
| | | | | minimum RF power | | -11.0 dBm |
| | | maximum RF power | | +24.89 dBm | | |
| Antenna connection | | | | | | |
| unique coupling | <input checked="" type="checkbox"/> | standard F-type connector | integral | with temporary RF connector | | |
| | | | | without temporary RF connector | | |
| Antenna/s technical characteristics | | | | | | |
| Type | Manufacturer | Model number | Gain | | | |
| Yagi | Shenglu | TDJ-700B12G13.5 | 13.5 dBi | | | |
| Transmitter 99% power bandwidth | | 200 / 400 kHz | | | | |
| Type of multiplexing | | TDMA | | | | |
| Modulating test signal (baseband) | | PRBS | | | | |
| Maximum transmitter duty cycle in normal use | | 50 % | | | | |
| Transmitter duty cycle supplied for test | | 50 % | | | | |
| Transmitter power source | | | | | | |
| | Battery | Nominal rated voltage | VDC | Battery type | | |
| | DC | Nominal rated voltage | VDC | | | |
| <input checked="" type="checkbox"/> | AC mains | Nominal rated voltage | 120 VAC | Frequency | 60 Hz | |
| Common power source for transmitter and receiver | | | <input checked="" type="checkbox"/> | yes | no | |
| Emission designator | | | | | | |
| Type of modulation | Modulation states (constellation) | | RF channel spacing | Frequency channel | | |
| | | | | Low | Mid | High |
| QAM | 16 | | 200 kHz | 776.1 | 776.5 | 776.9 |
| QPSK | 4 | | 200 kHz | 776.1 | 776.5 | 776.9 |
| QAM | 16 | | 400 kHz | 776.2 | 776.5 | 776.8 |
| QPSK | 4 | | 400 kHz | 776.2 | 776.5 | 776.8 |



| | | | |
|----------------------------|--|--------------------------------|------------------------------|
| Test specification: | Section 27.50c(1)(i), Peak output power at RF antenna connector | | |
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/26/2005 | | |
| Temperature: 26 °C | Air Pressure: 1006 hPa | Relative Humidity: 44 % | Power Supply: 120 VAC |
| Remarks: | | | |

7 Transmitter characteristics

7.1 Peak output power test

7.1.1 General

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

Table 7.1.1 Peak output power limits

| Assigned frequency range, MHz | Maximum peak output power* | |
|-------------------------------|----------------------------|------|
| | W | dBm |
| 776.0 – 777.0 | 1.34 | 31.3 |

* The peak output power limit was calculated by subtracting of antenna gain in dBd from maximum allowed ERP 44.8 dBm (30 W).

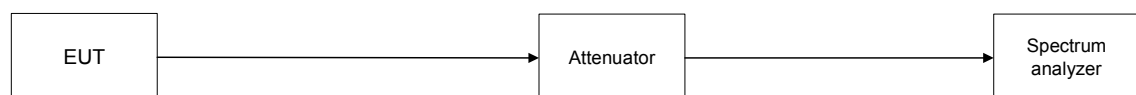
7.1.2 Test procedure

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.

Figure 7.1.1 Peak output power test setup





| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.50c(1)(i), Peak output power at RF antenna connector | | |
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/26/2005 | | |
| Temperature: 26 °C | Air Pressure: 1006 hPa | Relative Humidity: 44 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 7.1.2 Peak output power test results

ASSIGNED FREQUENCY RANGE: 776.0 – 777.0 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 5000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: 16QAM
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

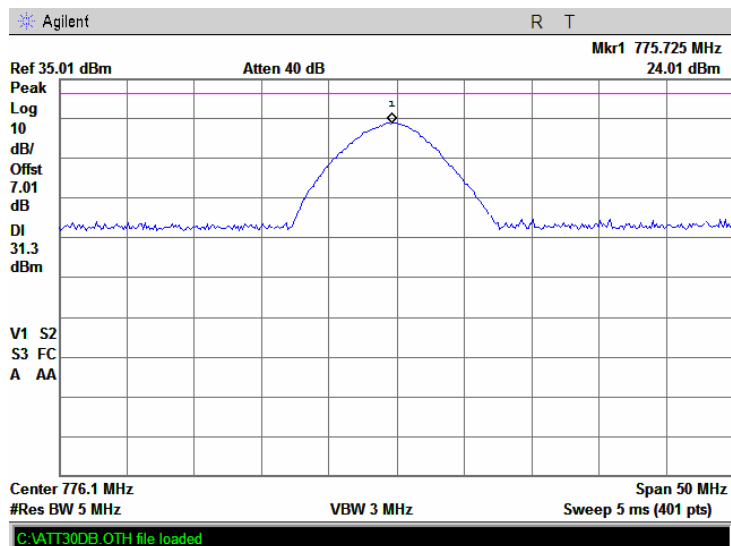
| Carrier frequency, MHz | Spectrum analyzer reading, dBm | External attenuation, dB | Cable loss, dB | RF output power, dBm | Limit, dBm | Margin, dB | Verdict |
|------------------------|--------------------------------|--------------------------|----------------|----------------------|------------|------------|---------|
| 776.1 | 24.01 | Included | | 24.01 | 31.3 | -7.29 | Pass |
| 776.5 | 24.89 | Included | | 24.89 | 31.3 | -6.41 | Pass |
| 776.9 | 24.69 | Included | | 24.69 | 31.3 | -6.61 | Pass |

Reference numbers of test equipment used

| | | | | | | | |
|---------|---------|---------|---------|--|--|--|--|
| HL 1097 | HL 1523 | HL 1653 | HL 2287 | | | | |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.

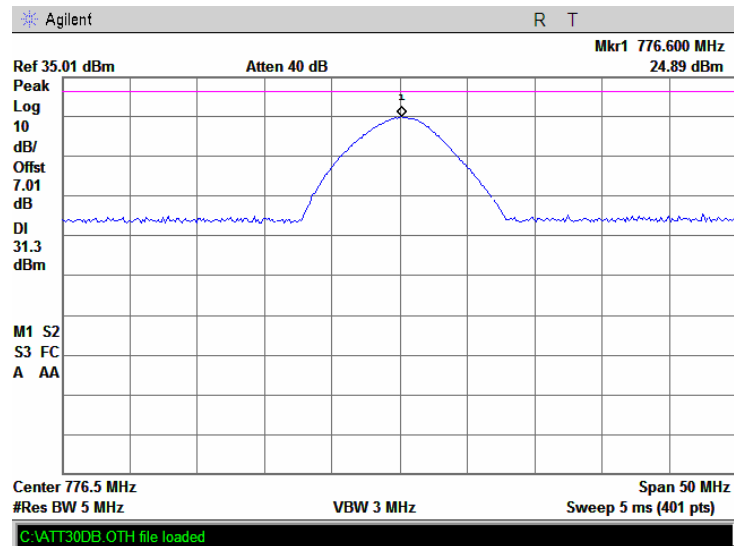
Plot 7.1.1 Peak output power test results at low frequency



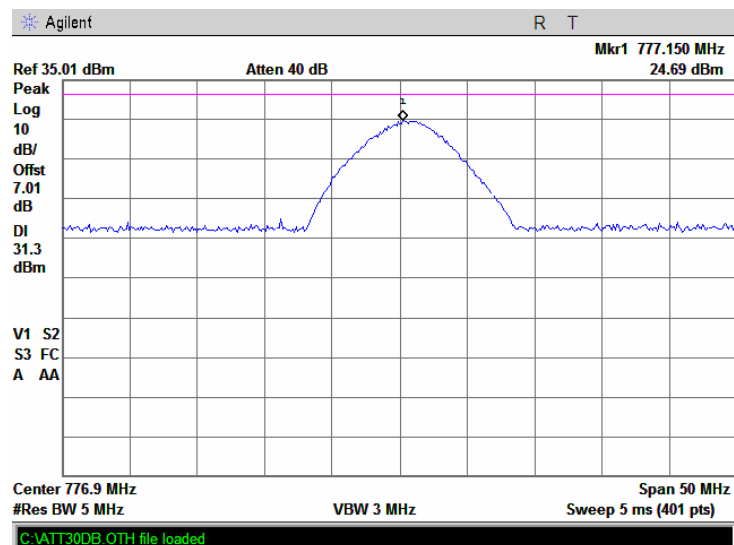


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.50c(1)(i), Peak output power at RF antenna connector | | |
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/26/2005 | | |
| Temperature: 26 °C | Air Pressure: 1006 hPa | Relative Humidity: 44 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.1.2 Peak output power test results at mid frequency



Plot 7.1.3 Peak output power test results at high frequency





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 2.1091, RF radiation exposure evaluation | | |
| Test procedure: | 47 CFR, Section 1.1307(b) | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/27/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks: | | | |

7.2 RF exposure

7.2.1 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 7.2.1.

Table 7.2.1 RF exposure limits

| Frequency range, MHz | Power density* | | Electric field strength**, V/m |
|----------------------|--------------------|------------------|--------------------------------|
| | mW/cm ² | W/m ² | |
| 776.1 | 0.52 | 5.2 | 44.2 |
| 776.9 | 0.52 | 5.2 | 44.2 |

* - Power density limit within 300 - 1500 MHz was calculated according to the following equation: $S = F / 1500$, where S is power density in mW/cm² 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/m²

7.2.2 Test procedure

7.2.2.1 The EUT, connected to the antenna providing the maximum directional gain, was set up as shown in .

7.2.2.2 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 7.2.2.

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

7.2.2.4 The obtained antenna to probe distance was recorded in Table 7.2.2 as a minimum separation distance.

7.2.2.5 The test was repeated at the rest of test distances according to Table 7.2.2.

Table 7.2.2 Maximum permissible exposure (MPE) measurement

| Test distance, m | Field strength, V/m | Equivalent power density, mW/cm ² | Limit, mW/cm ² | Margin, mW/cm ² | Verdict |
|------------------|---------------------|--|---------------------------|----------------------------|---------|
| 2.0 | 0.48 | 0.0000611 | 0.52 | -0.5199389 | Pass |
| 1.5 | 0.98 | 0.0002548 | 0.52 | -0.5197452 | Pass |
| 1.0 | 1.32 | 0.0004622 | 0.52 | -0.5195378 | Pass |
| 0.5 | 1.84 | 0.0008981 | 0.52 | -0.5191019 | Pass |
| 0.3 | 2.12 | 0.0011922 | 0.52 | -0.5188078 | Pass |
| 0.2 | 2.76 | 0.0020206 | 0.52 | -0.5179794 | Pass |
| 0.1 | 3.78 | 0.0037901 | 0.52 | -0.5162099 | Pass |
| 0.05 | 4.26 | 0.0048138 | 0.52 | -0.5151862 | 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/cm²

Reference numbers of test equipment used

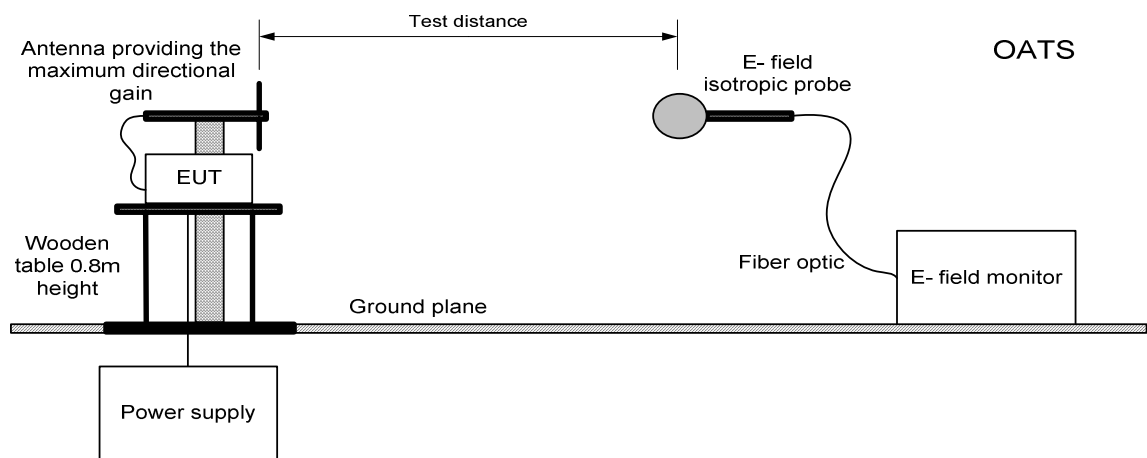
| | | | | | | |
|---------|---------|--|--|--|--|--|
| HL 0613 | HL 1629 | | | | | |
|---------|---------|--|--|--|--|--|

Full description is given in Appendix A.



| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 2.1091, RF radiation exposure evaluation | | |
| Test procedure: | 47 CFR, Section 1.1307(b) | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/27/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks: | | | |

Figure 7.2.1 Maximum permissible exposure (MPE) measurement setup





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

7.3 Spurious emissions at RF antenna connector test

7.3.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.3.1. The test results are provided in Table 7.3.2 and associated plots.

Table 7.3.1 Spurious emission limits

| Frequency, MHz* | Attenuation below carrier, dBc | Spurious emissions, dBm |
|-----------------------------------|--------------------------------|-------------------------|
| 0.009 – 10 th harmonic | 43+10logP* | -13 |

* - P is transmitter output power in Watts.

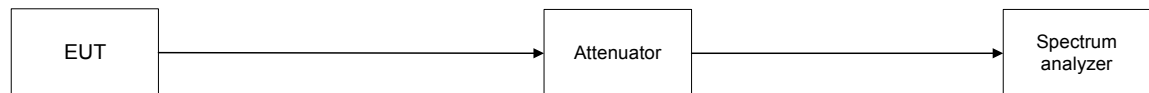
7.3.2 Test procedure

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

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

7.3.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.3.2 and associated plots.

Figure 7.3.1 Spurious emission test setup





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 7.3.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 776.0 – 777.0 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 8000 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: \geq Resolution bandwidth
 MODULATION: 16QAM
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Frequency, MHz | Bit rate, Mbps | RBW, kHz | Spurious emission, dBm | Limit, dBm | Margin, dB* | Verdict |
|----------------|----------------|----------|-----------------------------|------------|-------------|---------|
| Low channel | | | | | | |
| 0.009 - 1000 | | | More than 20 dB below limit | | | Pass |
| Mid channel | | | | | | |
| 0.009 - 1000 | | | More than 20 dB below limit | | | Pass |
| High channel | | | | | | |
| 0.009 - 1000 | | | More than 20 dB below limit | | | Pass |

*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

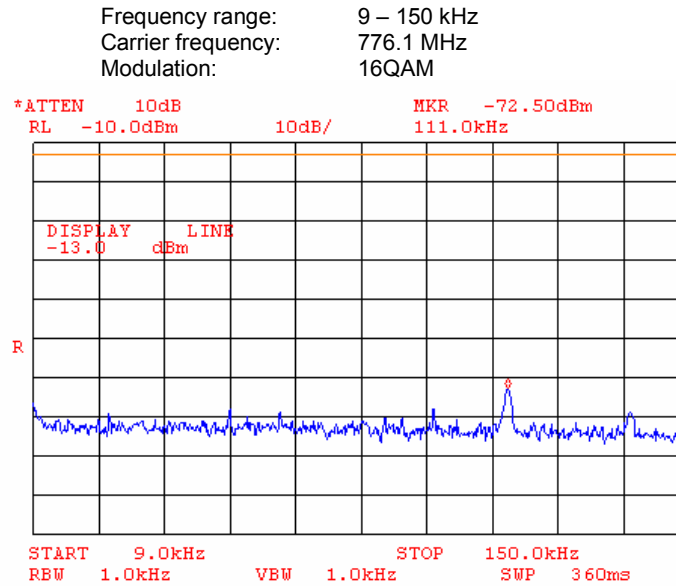
| | | | | | | | |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 1097 | HL 1424 | HL 1455 | HL 1488 | HL 1653 | HL 1942 | | |
|---------|---------|---------|---------|---------|---------|--|--|

Full description is given in Appendix A.

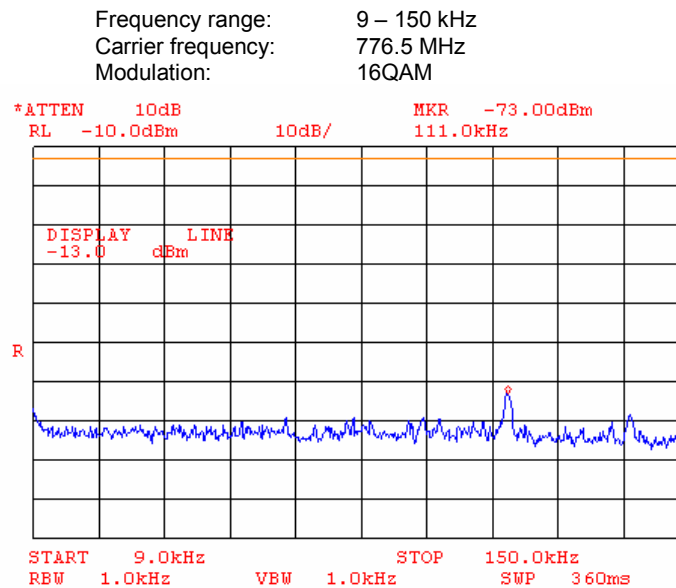


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.3.1 Spurious emission measurements at RF antenna connector, low channel



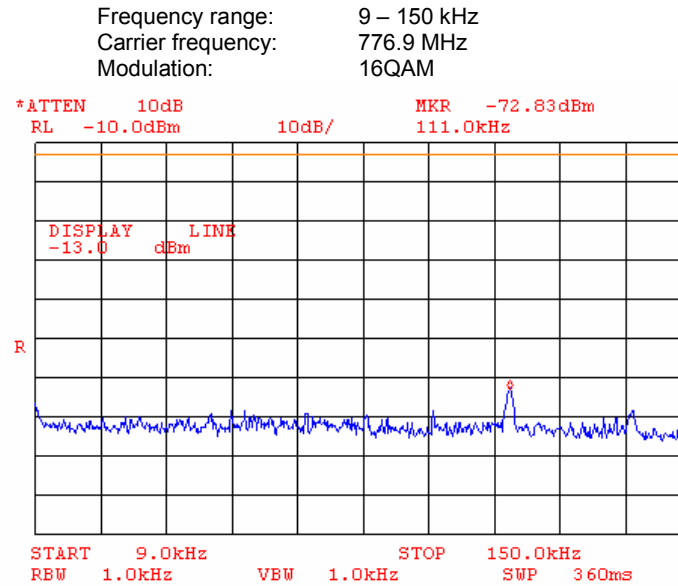
Plot 7.3.2 Spurious emission measurements at RF antenna connector, mid channel



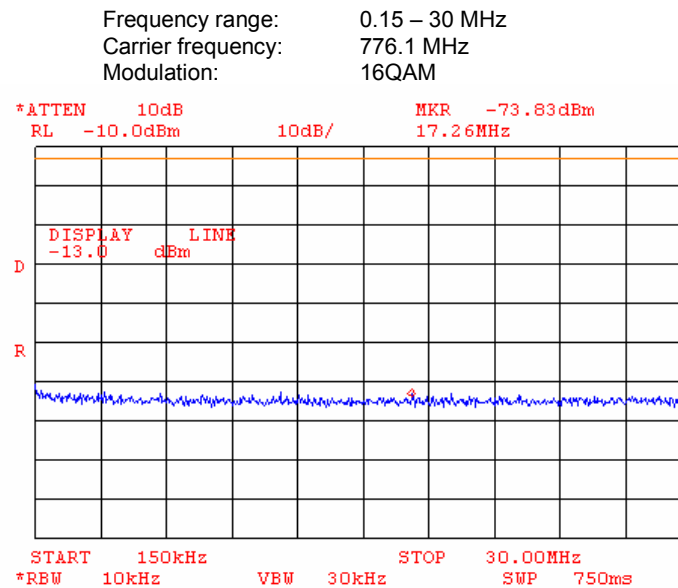


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.3.3 Spurious emission measurements at RF antenna connector, high channel



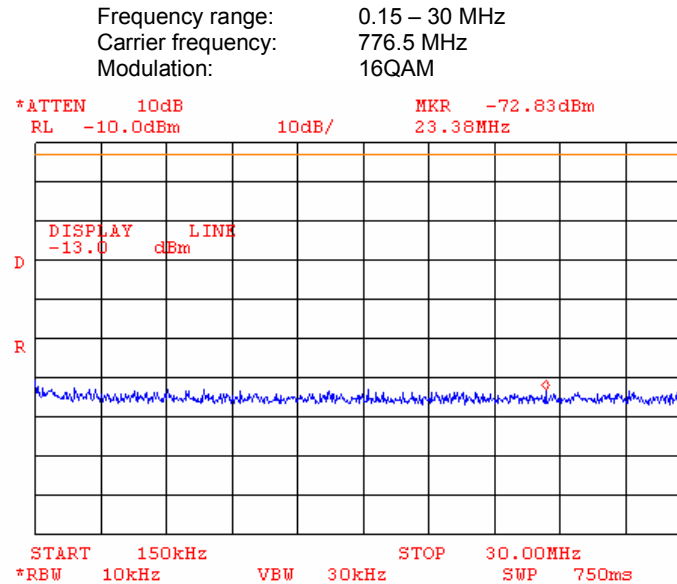
Plot 7.3.4 Spurious emission measurements at RF antenna connector, low channel



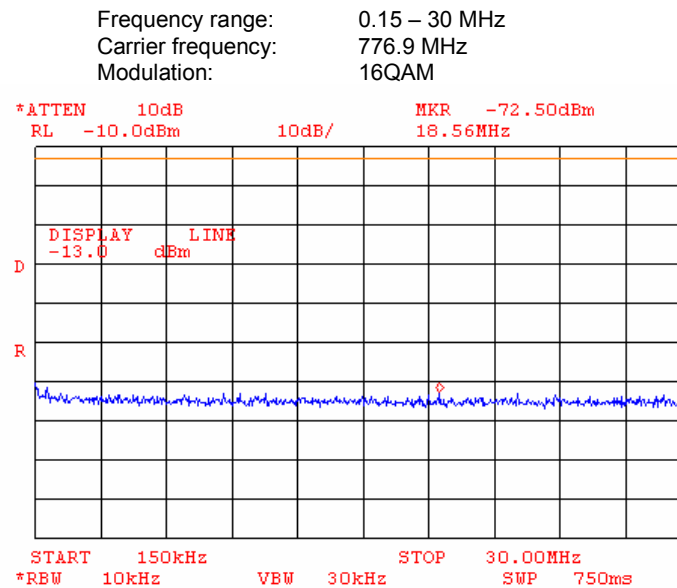


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.3.5 Spurious emission measurements at RF antenna connector, mid channel



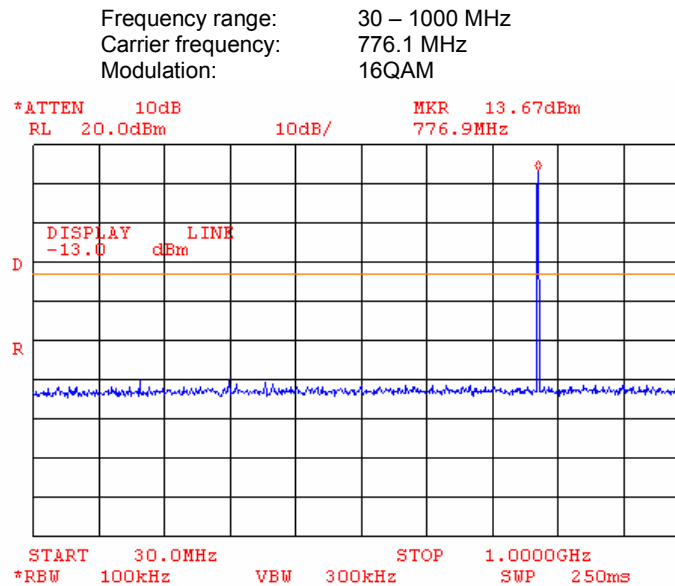
Plot 7.3.6 Spurious emission measurements at RF antenna connector, high channel



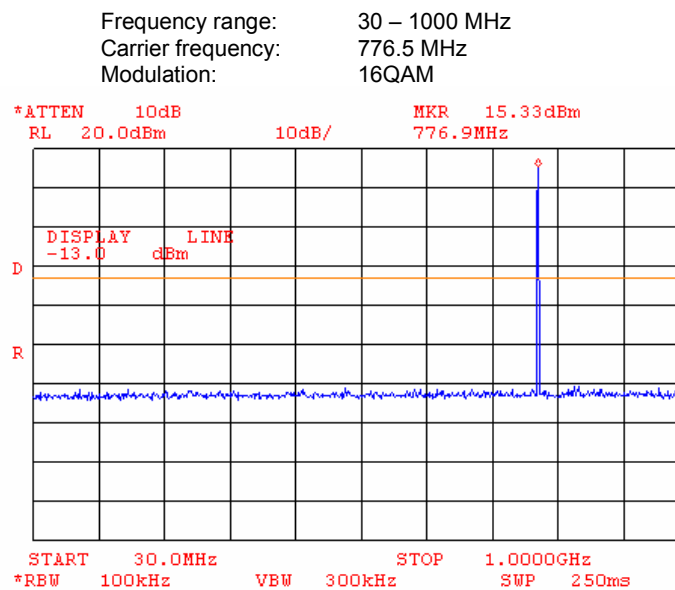


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.3.7 Spurious emission measurements at RF antenna connector, low channel



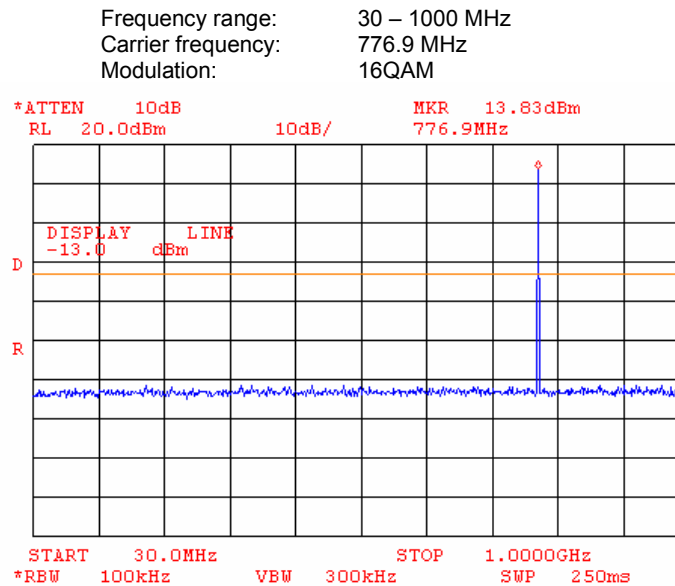
Plot 7.3.8 Spurious emission measurements at RF antenna connector, mid channel





| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

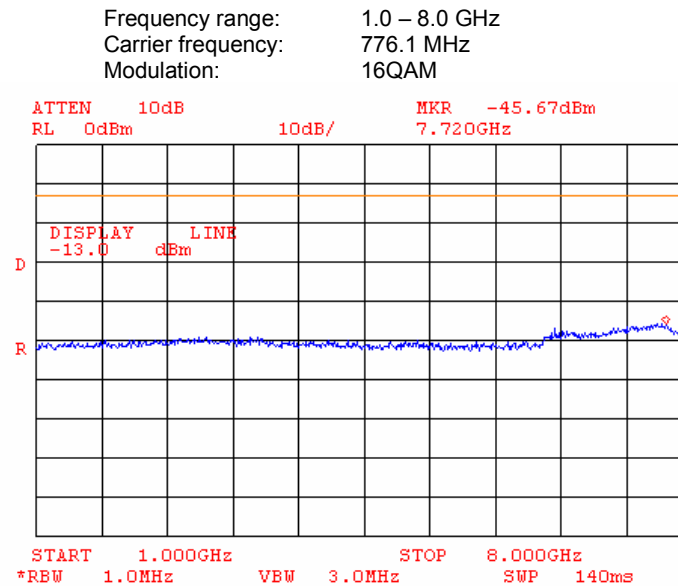
Plot 7.3.9 Spurious emission measurements at RF antenna connector, high channel



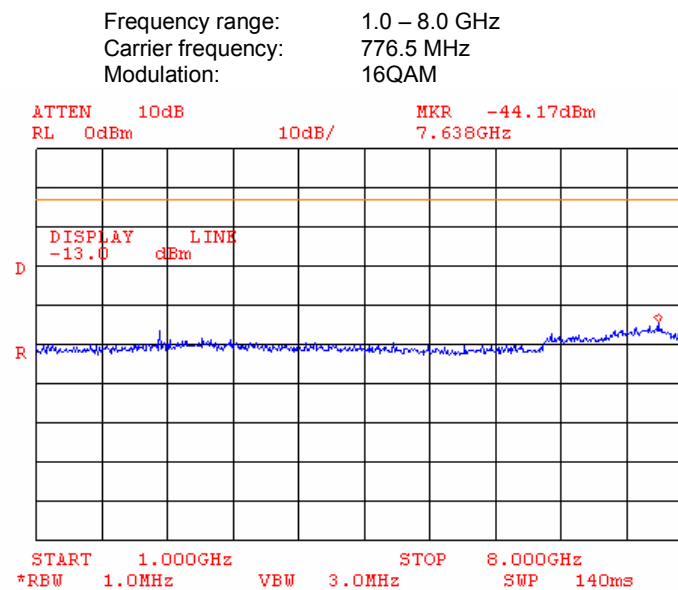


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.3.10 Spurious emission measurements at RF antenna connector, low channel



Plot 7.3.11 Spurious emission measurements at RF antenna connector, mid channel

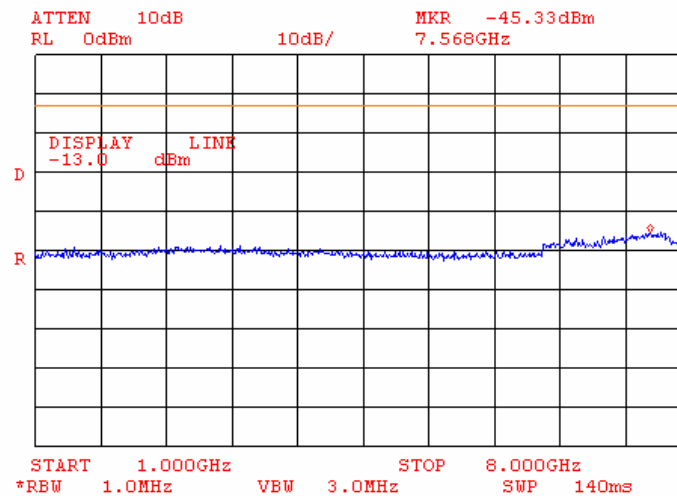




| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

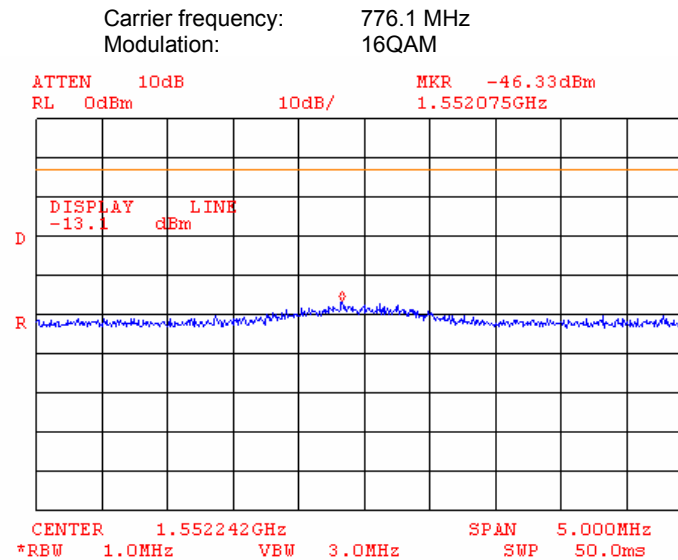
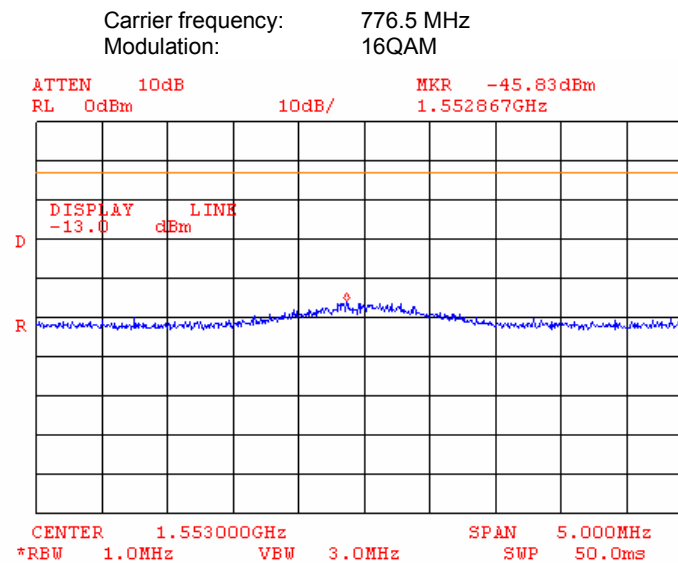
Plot 7.3.12 Spurious emission measurements at RF antenna connector, high channel

Frequency range: 1.0 – 8.0 GHz
Carrier frequency: 776.9 MHz
Modulation: 16QAM



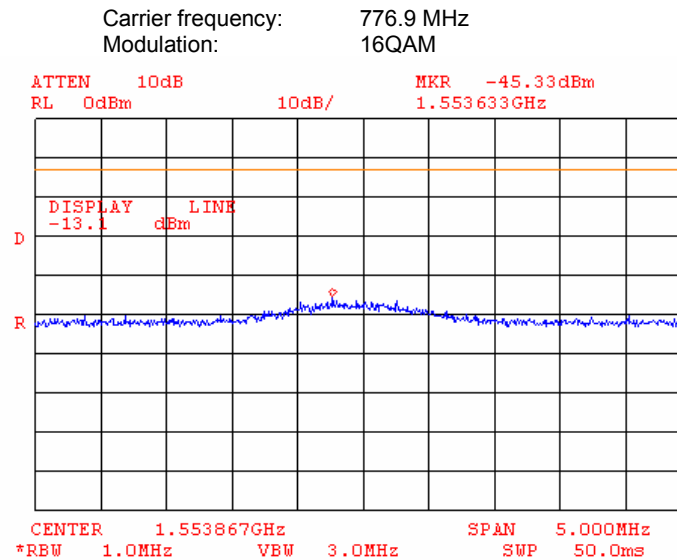


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.3.13 Spurious emission measurements at RF antenna connector, the 2nd harmonic of the low channelPlot 7.3.14 Spurious emission measurements at RF antenna connector, the 2nd harmonic of the mid channel



| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Spurious emissions at RF antenna connector | | |
| Test procedure: | 47 CFR, Sections 2.1047, 2.1051, TIA/EIA-603-A, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 23 °C | Air Pressure: 1011 hPa | Relative Humidity: 40 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.3.15 Spurious emission measurements at RF antenna connector, the 2nd harmonic of the high channel



| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

7.4 Radiated spurious emission measurements

7.4.1 General

This test was performed to measure radiated spurious emissions from the EUT enclosure with antenna connector terminated with 50 Ohm dummy load. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Radiated spurious emission test limits

| Frequency, MHz* | Attenuation below carrier, dBc | Spurious emissions, dBm | Equivalent field strength limit @ 3m, dB(μV/m)** |
|-----------------------------------|--------------------------------|-------------------------|--|
| 0.009 – 10 th harmonic | 43+10logP* | -13 | 84.4 |

* - 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.

7.4.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz range

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the EUT performance was checked.

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

7.4.2.3 The test results were recorded in Table 7.4.2 and shown in the associated plots.

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

7.4.3.1 The EUT was set up as shown in Figures 7.4.2, 7.4.3, energized and the EUT performance was checked.

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

7.4.3.3 The worst test results with respect to the limits were recorded in Table 7.4.2 and shown in the associated plots.

7.4.4 Test procedure for substitution ERP measurements of spurious

7.4.4.1 The test equipment was set up as shown in Figure 7.4.4 and energized.

7.4.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.

7.4.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.

7.4.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.

7.4.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm, antenna gain in dBd and cable loss in dB.

7.4.4.6 The above procedure was repeated at the rest of investigated frequencies.

7.4.4.7 The worst test results with respect to the limits were recorded in Table 7.4.3 and shown in the associated plots.



| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Figure 7.4.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz range

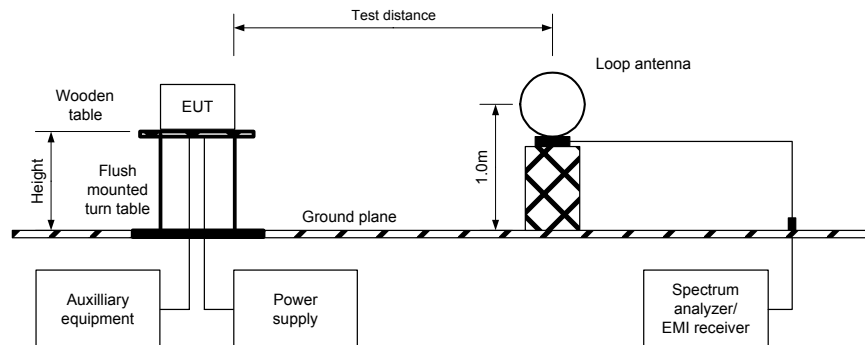
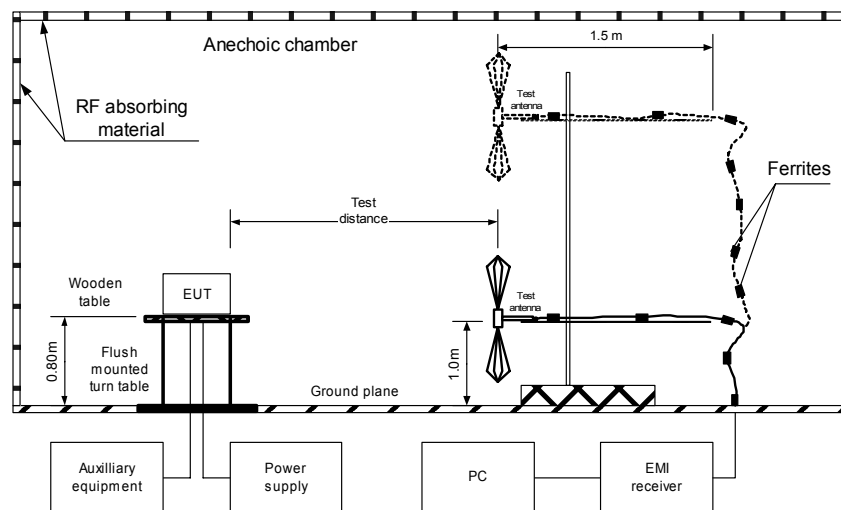


Figure 7.4.2 Setup for spurious emission field strength measurements in 30 MHz to 6.5 GHz range





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Figure 7.4.3 Setup for spurious emission field strength measurements in 1 to 7.5 GHz range

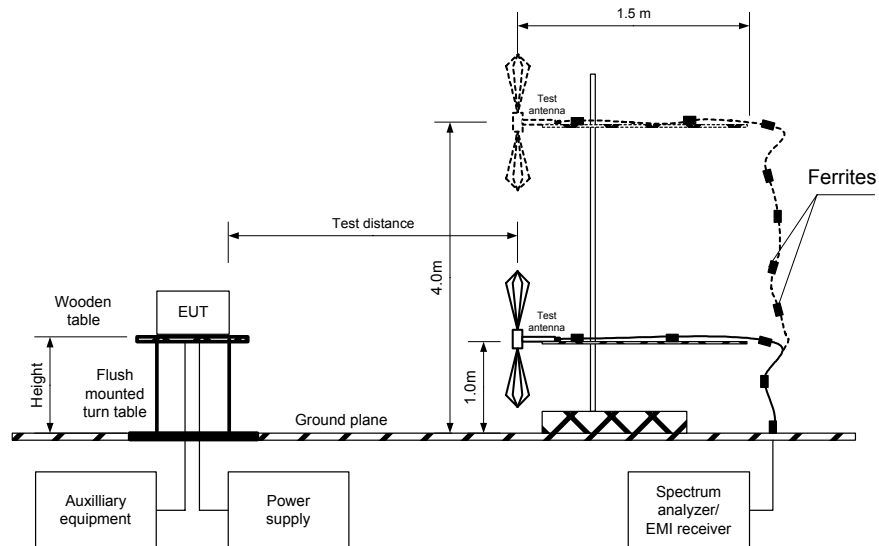
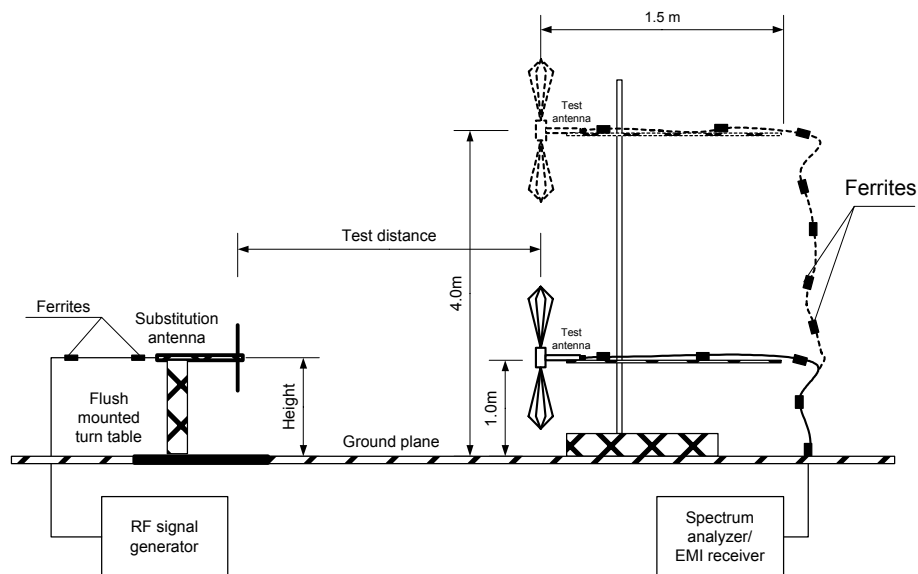


Figure 7.4.4 Setup for substitution ERP measurements of spurious





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 7.4.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 776.0 – 777.0 MHz
 TEST DISTANCE: 3 m
 EUT HEIGHT: 0.8 m
 INVESTIGATED FREQUENCY RANGE: 0.009 – 8000 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)
 MODULATION: 16QAM
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Frequency, MHz | Antenna polarization | RBW, kHz | Field strength, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* | Verdict |
|-------------------------------|----------------------|----------|--------------------------|-----------------|-------------|---------|
| Low carrier frequency | | | | | | |
| 214.775000 | Vertical | 120 | 30.86 | 84.4 | -53.54 | Pass |
| 400.500000 | Horizontal | 120 | 35.98 | 84.4 | -48.42 | Pass |
| 500.000000 | Vertical | 120 | 31.92 | 84.4 | -52.48 | Pass |
| 750.000000 | Vertical | 120 | 35.96 | 84.4 | -48.44 | Pass |
| 800.978750 | Vertical | 120 | 38.30 | 84.4 | -46.10 | Pass |
| 916.332000 | Horizontal | 120 | 29.55 | 84.4 | -54.85 | Pass |
| 1551.280000 | Vertical | 1000 | 43.82 | 84.4 | -40.58 | Pass |
| Mid carrier frequency | | | | | | |
| 73.012000 | Vertical | 120 | 32.17 | 84.4 | -52.23 | Pass |
| 200.125600 | Vertical | 120 | 30.52 | 84.4 | -53.88 | Pass |
| 398.000000 | Vertical | 120 | 38.66 | 84.4 | -45.74 | Pass |
| 596.130000 | Vertical | 120 | 32.10 | 84.4 | -52.30 | Pass |
| 699.410000 | Horizontal | 120 | 35.81 | 84.4 | -48.59 | Pass |
| 801.200000 | Vertical | 120 | 36.39 | 84.4 | -48.01 | Pass |
| 1552.725000 | Vertical | 1000 | 43.12 | 84.4 | -41.28 | Pass |
| High carrier frequency | | | | | | |
| 31.240000 | Vertical | 120 | 43.39 | 84.4 | -41.01 | Pass |
| 87.492500 | Vertical | 120 | 41.01 | 84.4 | -43.39 | Pass |
| 249.960000 | Vertical | 120 | 51.89 | 84.4 | -32.51 | Pass |
| 262.462500 | Vertical | 120 | 46.04 | 84.4 | -38.36 | Pass |
| 437.428000 | Horizontal | 120 | 49.34 | 84.4 | -35.06 | Pass |
| 612.402500 | Vertical | 120 | 44.06 | 84.4 | -40.34 | Pass |
| 1554.613000 | Vertical | 1000 | 43.24 | 84.4 | -41.16 | Pass |

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



| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 7.4.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 776.0 – 777.0 MHz
 TEST SITE: OATS
 TEST DISTANCE: 3 m
 SUBSTITUTION ANTENNA HEIGHT: 0.8 m
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 SUBSTITUTION ANTENNA TYPE: Double ridged guide

| Frequency, MHz | Antenna polarization | RBW, kHz | Field strength, dB(μV/m) | RF generator output, dBm | Antenna gain, dBd | Cable loss, dB | ERP result, dBm** | ERP limit, dBm | Margin, dB* | Verdict |
|-------------------------------|----------------------|----------|--------------------------|--------------------------|-------------------|----------------|-------------------|----------------|-------------|---------|
| Low carrier frequency | | | | | | | | | | |
| 214.77500 | Vertical | 120 | 30.86 | -61.62 | -0.09 | 1.04 | -62.75 | -13.00 | -49.75 | Pass |
| 400.50000 | Horizontal | 120 | 35.98 | -62.74 | -0.32 | 1.54 | -64.60 | -13.00 | -51.60 | Pass |
| 500.00000 | Vertical | 120 | 31.92 | -60.97 | -1.67 | 1.76 | -64.40 | -13.00 | -51.40 | Pass |
| 750.00000 | Vertical | 120 | 35.96 | -57.58 | -0.22 | 2.27 | -60.07 | -10.83 | -49.24 | Pass |
| 800.97875 | Vertical | 120 | 38.30 | -53.05 | -0.89 | 2.38 | -56.31 | -10.83 | -45.48 | Pass |
| 916.33200 | Horizontal | 120 | 29.55 | -64.32 | 0.17 | 2.94 | -67.09 | -10.83 | -56.26 | Pass |
| 1551.2800 | Vertical | 1000 | 43.82 | -57.08 | 5.07 | 3.55 | -55.56 | -10.83 | -44.73 | Pass |
| Mid carrier frequency | | | | | | | | | | |
| 73.012000 | Vertical | 120 | 32.17 | -65.93 | -0.97 | 0.58 | -67.48 | -10.83 | -56.65 | Pass |
| 200.12560 | Vertical | 120 | 30.52 | -61.96 | -0.03 | 0.99 | -62.98 | -13.00 | -49.98 | Pass |
| 398.00000 | Vertical | 120 | 38.66 | -60.06 | -0.28 | 1.54 | -61.88 | -13.00 | -48.88 | Pass |
| 596.13000 | Vertical | 120 | 32.10 | -60.02 | -0.42 | 1.88 | -62.32 | -10.83 | -51.49 | Pass |
| 699.41000 | Horizontal | 120 | 35.81 | -57.73 | 0.46 | 2.17 | -59.44 | -10.83 | -48.61 | Pass |
| 801.20000 | Vertical | 120 | 36.39 | -54.96 | -0.88 | 2.38 | -58.22 | -10.83 | -47.39 | Pass |
| 1552.7250 | Vertical | 1000 | 43.12 | -57.78 | 5.07 | 3.55 | -56.26 | -10.83 | -45.43 | Pass |
| High carrier frequency | | | | | | | | | | |
| 31.240000 | Vertical | 120 | 43.39 | -56.18 | -0.90 | 0.36 | -57.43 | -10.83 | -46.60 | Pass |
| 87.492500 | Vertical | 120 | 41.01 | -57.02 | -0.85 | 0.64 | -58.51 | -10.83 | -47.68 | Pass |
| 249.96000 | Vertical | 120 | 51.89 | -40.59 | -0.22 | 1.16 | -41.97 | -13.00 | -28.97 | Pass |
| 262.46250 | Vertical | 120 | 46.04 | -46.44 | -0.27 | 1.21 | -47.91 | -13.00 | -34.91 | Pass |
| 437.42800 | Horizontal | 120 | 49.34 | -49.38 | -0.82 | 1.62 | -51.82 | -13.00 | -38.82 | Pass |
| 612.40250 | Vertical | 120 | 44.06 | -48.06 | -0.29 | 1.92 | -50.27 | -10.83 | -39.44 | Pass |
| 1554.6130 | Vertical | 1000 | 43.24 | -57.66 | 5.06 | 3.55 | -56.15 | -10.83 | -45.32 | Pass |

*- Margin = Spurious emission – specification limit.

** ERP = $P_{\text{gen}} - \text{CL} + G_{\text{ant}}$, where

P_{gen} - signal generator output power in dBm

CL - cable loss in dB

G_{ant} - antenna gain in dBd

Reference numbers of test equipment used

| | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 0465 | HL 0521 | HL 0589 | HL 0604 | HL 0661 | HL 1004 | HL 1200 |
| HL 1424 | HL 1942 | HL 1947 | HL 1984 | HL 2009 | HL 2400 | HL 2432 | |

Full description is given in Appendix A.

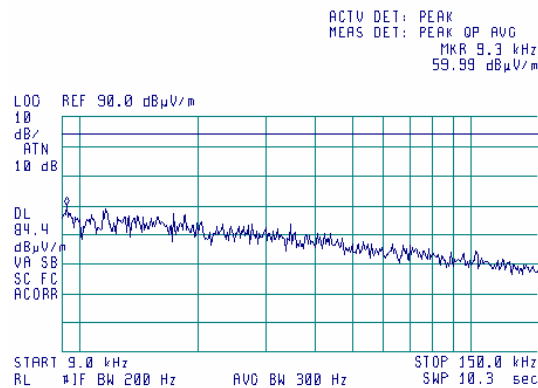


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

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

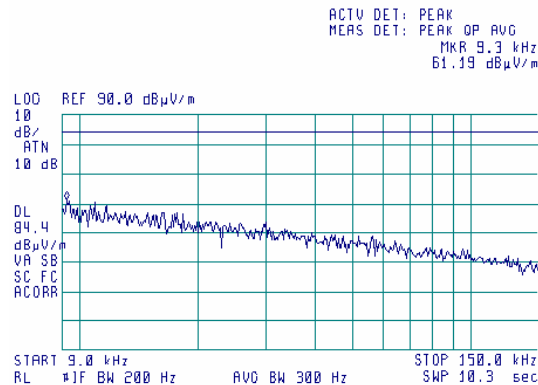
16:44:10 JUN 22, 2005



Plot 7.4.2 Radiated emission measurements in 9 - 150 kHz range

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

16:51:34 JUN 22, 2005





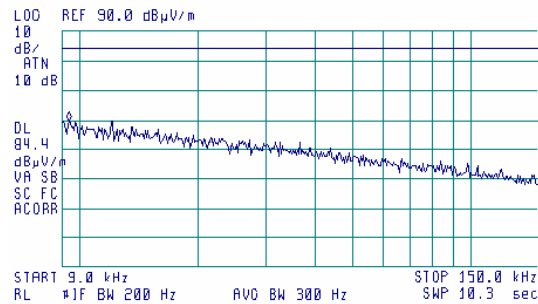
| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.3 Radiated emission measurements in 9 - 150 kHz range

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

16:59:17 JUN 22, 2005

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 9.5 kHz
59.78 dBμV/m



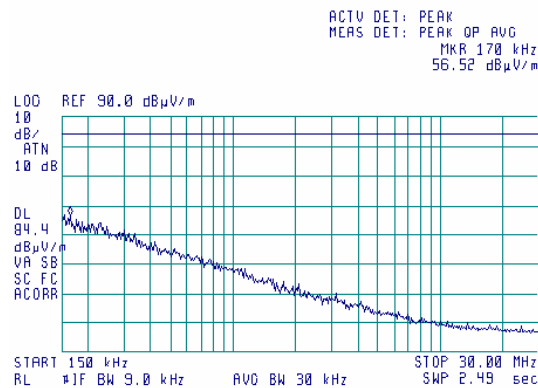


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.4 Radiated emission measurements in 0.15 - 30 MHz range

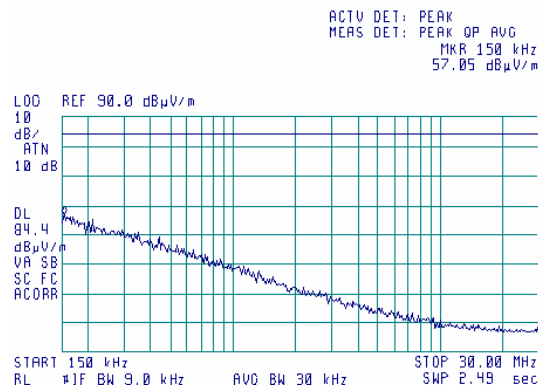
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m

16:45:40 JUN 22, 2005

**Plot 7.4.5 Radiated emission measurements in 0.15 - 30 MHz range**

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

16:49:34 JUN 22, 2005





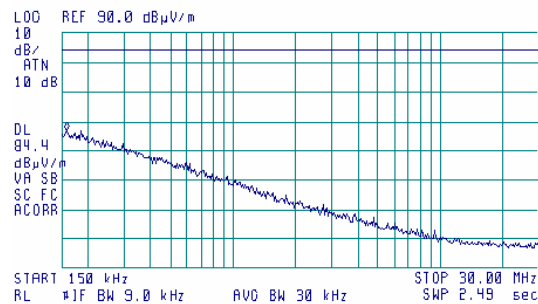
| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.6 Radiated emission measurements in 0.15 - 30 MHz range

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

17:09:06 JUN 22, 2005

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 160 kHz
56.87 dB μ V/m



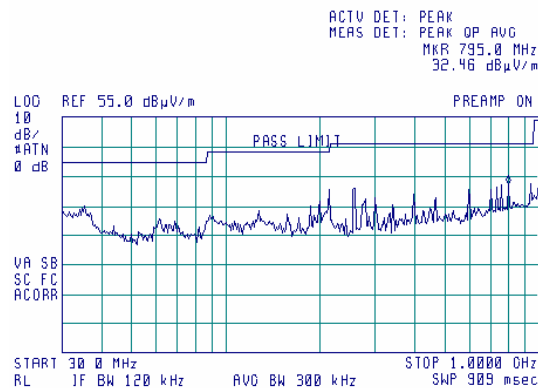


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.7 Radiated emission measurements in 30 - 1000 MHz range

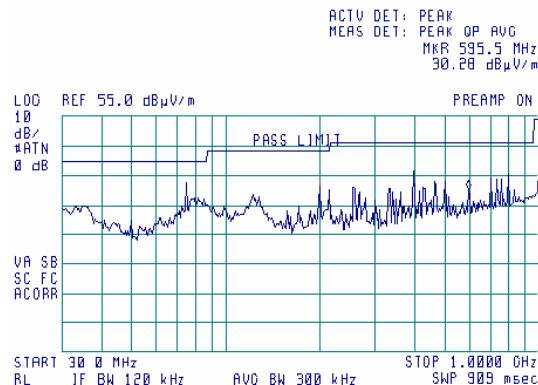
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

14:15:08 JUN 22, 2005

**Plot 7.4.8 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

11:18:48 JUN 22, 2005



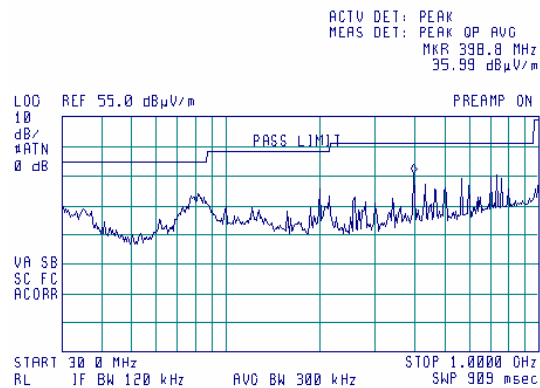


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.9 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

(6) 14:22:09 JUN 22, 2005



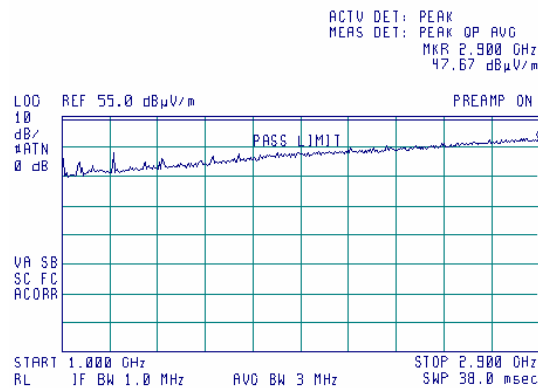


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.10 Radiated emission measurements in 1 – 2.9 GHz range

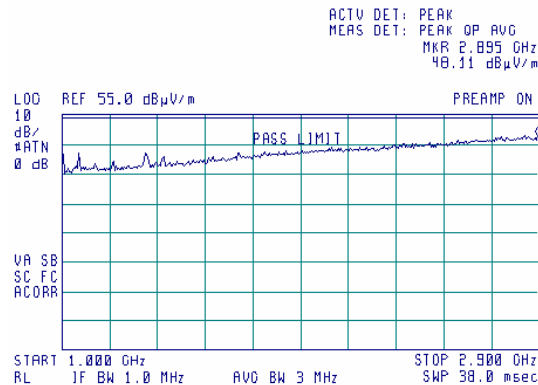
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

14:40:37 JUN 22, 2005

**Plot 7.4.11 Radiated emission measurements in 1 – 2.9 GHz range**

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

14:34:22 JUN 22, 2005



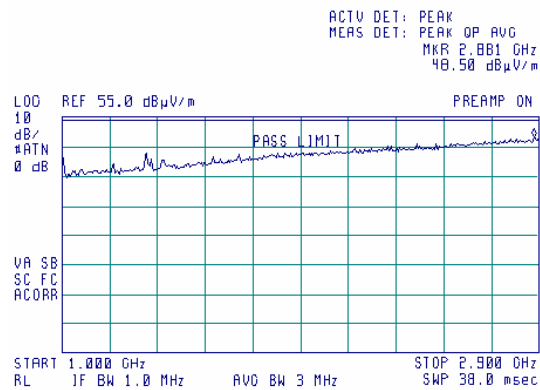


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.12 Radiated emission measurements in 1 – 2.9 GHz range

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

(6) 14:26:54 JUN 22, 2005

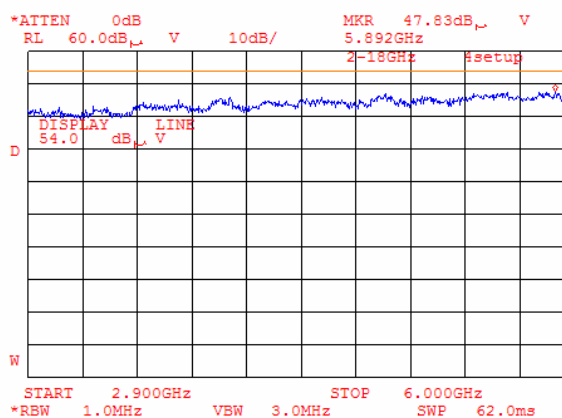




| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

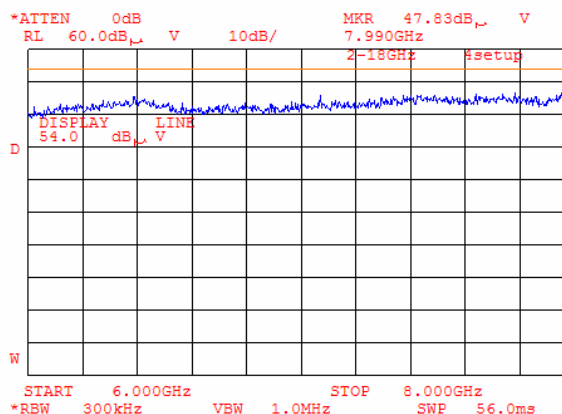
Plot 7.4.13 Radiated emission measurements in 2.9 – 6.0 GHz range

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



Plot 7.4.14 Radiated emission measurements in 6.0 – 8.0 GHz range

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

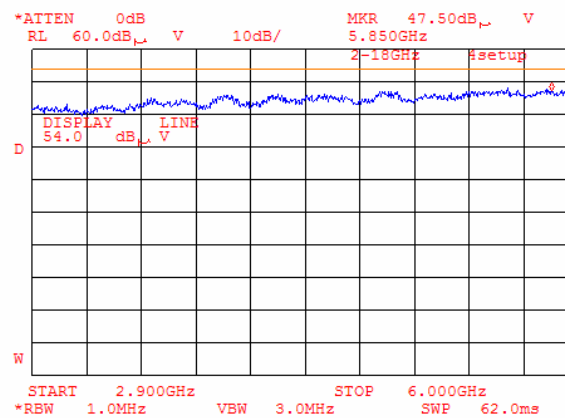




| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

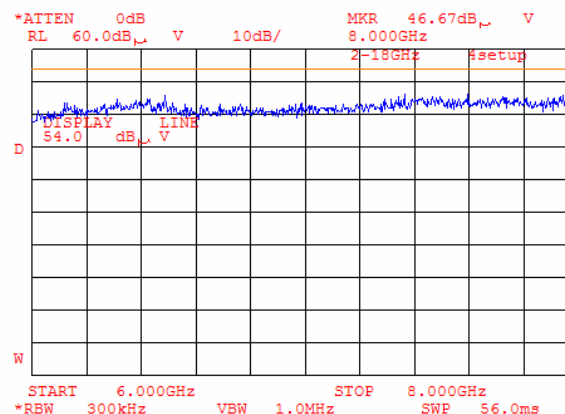
Plot 7.4.15 Radiated emission measurements in 2.9 – 6.0 GHz range

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



Plot 7.4.16 Radiated emission measurements in 6.0 – 8.0 GHz range

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

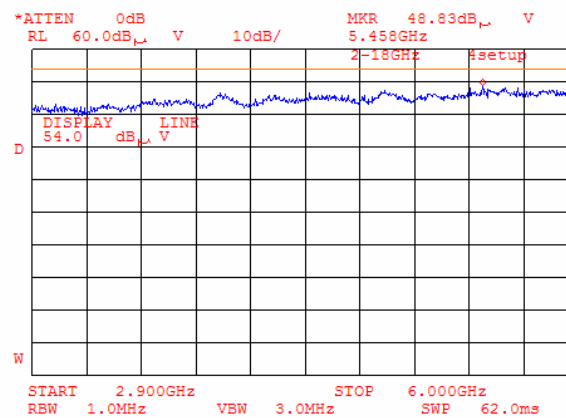




| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

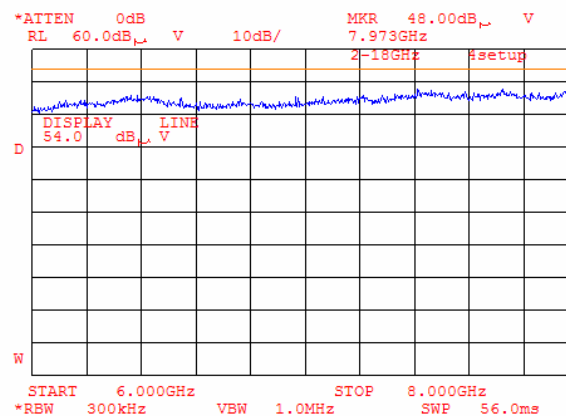
Plot 7.4.17 Radiated emission measurements in 2.9 – 6.0 GHz range

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



Plot 7.4.18 Radiated emission measurements in 6.0 – 8.0 GHz range

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



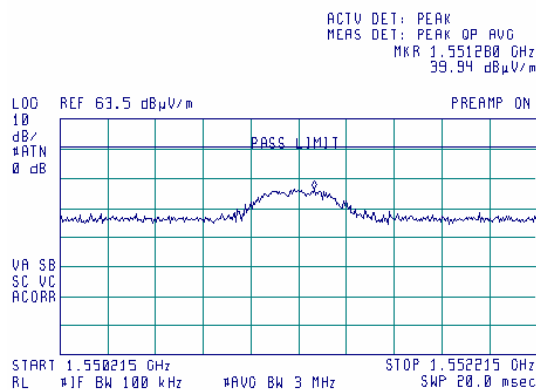


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.19 Radiated emission measurements at the 2nd harmonic of low channel

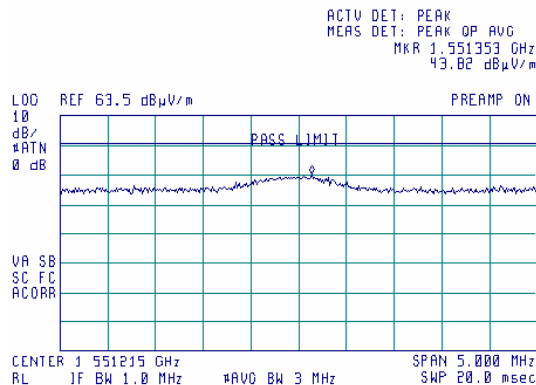
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: 776.1 MHz
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

15:04:46 JUN 22, 2005

**Plot 7.4.20 Radiated emission measurements at the 2nd harmonic of low channel**

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: 776.1 MHz
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

15:00:29 JUN 22, 2005



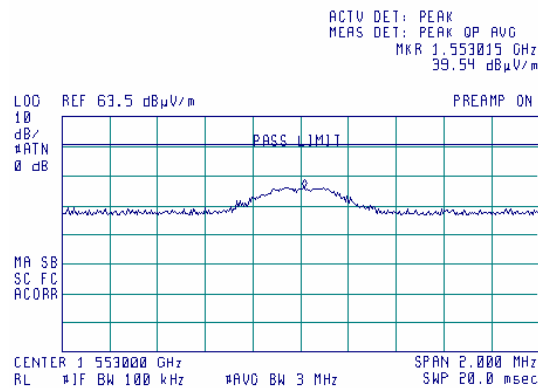


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.21 Radiated emission measurements at the 2nd harmonic of mid channel

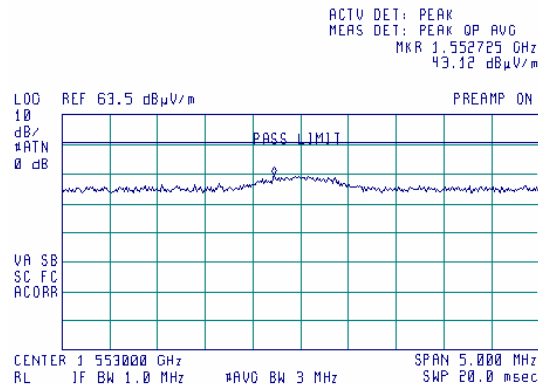
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: 776.5 MHz
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

15:17:17 JUN 22, 2005

Plot 7.4.22 Radiated emission measurements at the 2nd harmonic of mid channel

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: 776.5 MHz
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

15:18:15 JUN 22, 2005



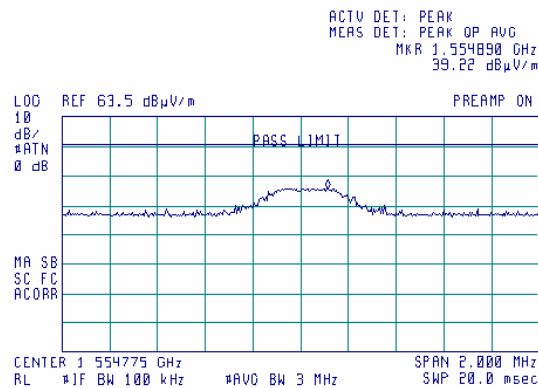


| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 27.53d, Radiated spurious emissions | | |
| Test procedure: | 47 CFR, Section 2.1053, TIA/EIA-603-A, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/22/2005 | | |
| Temperature: 24 °C | Air Pressure: 1008 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.4.23 Radiated emission measurements at the 2nd harmonic of high channel

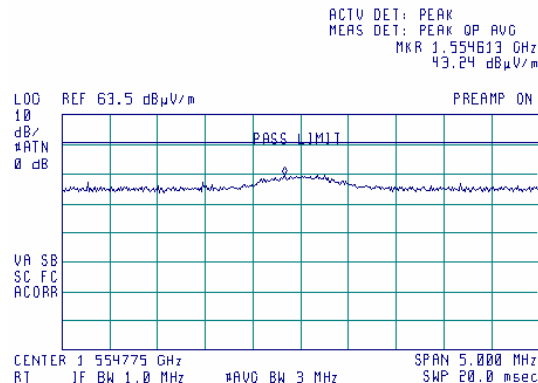
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: 776.9 MHz
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

(G) 15:22:07 JUN 22, 2005

**Plot 7.4.24 Radiated emission measurements at the 2nd harmonic of high channel**

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: 776.9 MHz
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

(G) 15:23:15 JUN 22, 2005





| | | | |
|----------------------------|--|--------------------------------|------------------------------|
| Test specification: | Section 27.54, Frequency stability | | |
| Test procedure: | 47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/26/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

7.5 Frequency stability test

7.5.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.5.1. The test results are provided in Tables 7.5.2, 7.5.3 and shown in the associated plots.

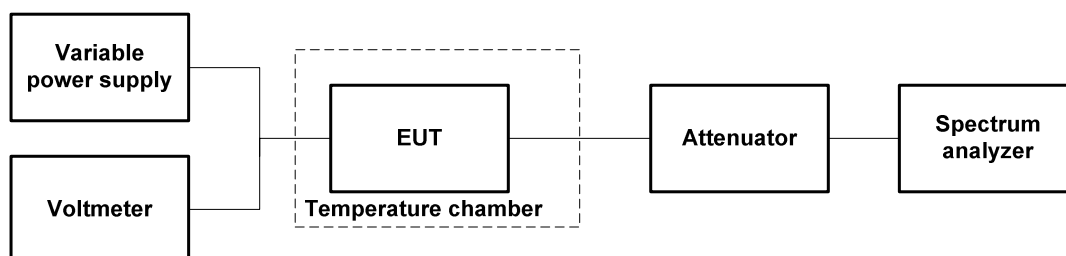
Table 7.5.1 Frequency stability limits

| Assigned frequency, MHz | Maximum allowed frequency displacement |
|-------------------------|---|
| 710.0 – 716.0 | 26 dBc points including frequency tolerance shall remain within the assigned band |

7.5.2 Test procedure

- 7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.
- 7.5.2.2 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.
- 7.5.2.3 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.
- 7.5.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.5.2.5 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.
- 7.5.2.6 Frequency displacement was calculated as provided in Tables 7.5.2 and 7.5.3.

Figure 7.5.1 Frequency stability test setup





| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.54, Frequency stability | | |
| Test procedure: | 47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/26/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 7.5.2 Frequency stability test results

ASSIGNED FREQUENCY RANGE: 776.0– 777.0 MHz
 NOMINAL POWER VOLTAGE: 120 VAC (102 VAC - 138 VAC)
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 RESOLUTION BANDWIDTH: 100 Hz
 VIDEO BANDWIDTH: 100 Hz
 FREQUENCY SPAN: 10.0 kHz
 SPECTRUM ANALYZER MODE: Counter
 MODULATION: Unmodulated

| T, °C | Voltage, V | Frequency, MHz | | | | | | | Max frequency drift, Hz | |
|--------------------------|------------|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|-------------------------|----------|
| | | Start up | 1 st min | 2 nd min | 3 rd min | 4 th min | 5 th min | 10 th min | Positive | Negative |
| Low frequency 776.1 MHz | | | | | | | | | | |
| -30 | nominal | 776.099342 | 776.099355 | 776.099356 | 776.099336 | 776.099356 | 776.099354 | 776.099359 | 802 | 0 |
| -20 | nominal | 776.099502 | NA | NA | NA | NA | NA | 776.099572 | 1015 | 0 |
| -10 | nominal | 776.099718 | NA | NA | NA | NA | NA | 776.099891 | 1334 | 0 |
| 0 | nominal | 776.099877 | 776.099850 | 776.099841 | 776.099829 | 776.099821 | 776.099816 | 776.099790 | 1320 | 0 |
| 10 | nominal | 776.099402 | NA | NA | NA | NA | NA | 776.099214 | 845 | 0 |
| 20 | 15% | 776.098689 | NA | NA | NA | NA | NA | 776.098487 | 132 | -70 |
| 20 | nominal | 776.098700 | NA | NA | NA | NA | NA | 776.098557* | 143 | NA |
| 20 | -15% | 776.098506 | NA | NA | NA | NA | NA | 776.098490 | 0 | -67 |
| 30 | nominal | 776.099469 | 776.099115 | 776.098873 | 776.098651 | 776.098541 | 776.098467 | 776.098455 | 912 | -102 |
| 40 | nominal | 776.098856 | NA | NA | NA | NA | NA | 776.098926 | 369 | 0 |
| 50 | nominal | 776.099041 | NA | NA | NA | NA | NA | 776.099118 | 561 | 0 |
| High frequency 776.9 MHz | | | | | | | | | | |
| -30 | nominal | 776.899366 | 776.899363 | 776.899364 | 776.899364 | 776.899365 | 776.899365 | 776.899365 | 804 | 0 |
| -20 | nominal | 776.899387 | NA | NA | NA | NA | NA | 776.899541 | 979 | 0 |
| -10 | nominal | 776.899859 | NA | NA | NA | NA | NA | 776.899913 | 1351 | 0 |
| 0 | nominal | 776.899800 | 776.899898 | 776.899902 | 776.899896 | 776.899886 | 776.899876 | 776.899834 | 1340 | 0 |
| 10 | nominal | 776.899837 | NA | NA | NA | NA | NA | 776.899373 | 1275 | 0 |
| 20 | 15% | 776.898578 | NA | NA | NA | NA | NA | 776.898367 | 16 | -195 |
| 20 | nominal | 776.898550 | NA | NA | NA | NA | NA | 776.898562* | NA | -12 |
| 20 | -15% | 776.899812 | NA | NA | NA | NA | NA | 776.898696 | 1250 | 0 |
| 30 | nominal | 776.898454 | 776.898467 | 776.898489 | 776.898506 | 776.898518 | 776.898529 | 776.898577 | 15 | -108 |
| 40 | nominal | 776.898406 | NA | NA | NA | NA | NA | 776.898847 | 285 | -156 |
| 50 | nominal | 776.898799 | NA | NA | NA | NA | NA | 776.899077 | 515 | 0 |

* - Reference frequency



| | | | |
|----------------------------|--|--------------------------------|------------------------------|
| Test specification: | Section 27.54, Frequency stability | | |
| Test procedure: | 47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/26/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 7.5.3 Transmitter operating range including frequency drift

| Assigned frequency band, MHz | Measured 26 dBc point, MHz | Frequency drift, Hz | | 26 dBc point including frequency tolerance, MHz | Verdict |
|------------------------------|----------------------------|---------------------|----------|---|---------|
| | | Positive | Negative | | |
| 776.0 – 777.0 | 776.00500 – 776.99500 | 1351 | 195 | 776.004805 – 776.996351 | Pass |

Reference numbers of test equipment used

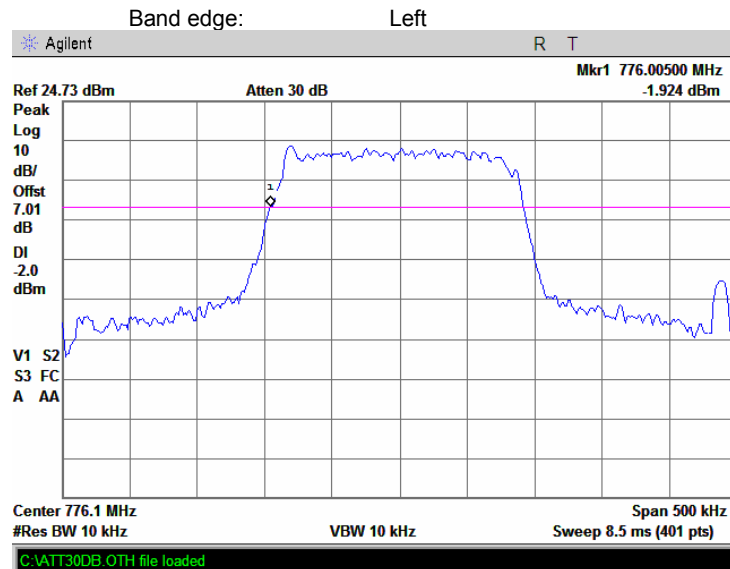
| | | | | | | | |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0278 | HL 0493 | HL 1097 | HL 1204 | HL 1653 | | | |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.

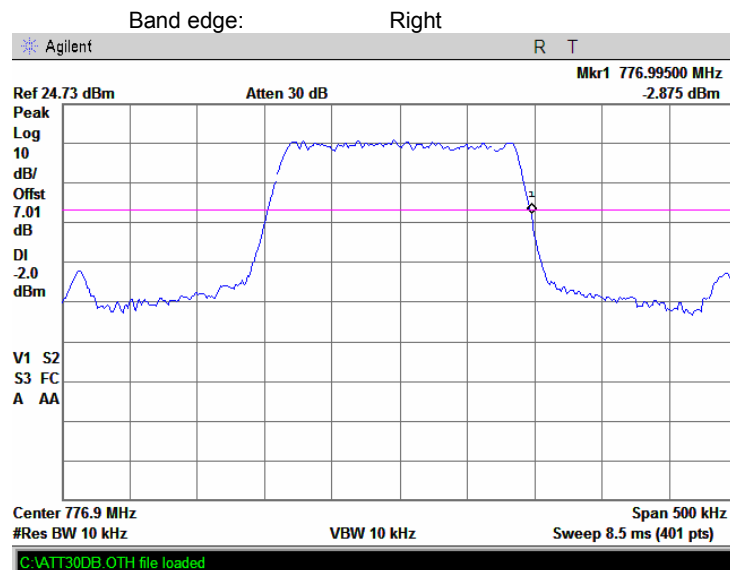


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 27.54, Frequency stability | | |
| Test procedure: | 47 CFR, Section 2.1055, TIA/EIA-603-A, Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/26/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.5.1 Band edge emission at low frequency



Plot 7.5.2 Band edge emission at high frequency





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 2.1049, Occupied bandwidth | | |
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/27/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks: | | | |

7.6 Occupied bandwidth test

7.6.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Occupied bandwidth limits

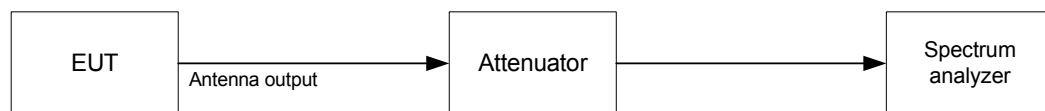
| Assigned frequency, MHz | Modulation envelope reference points*, dBc |
|-------------------------|--|
| 776.0 – 777.0 | 26 |

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

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 was set to transmit unmodulated carrier and reference peak power level was measured.
- 7.6.2.3 The EUT was set to transmit modulated carrier.
- 7.6.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.6.2 and associated plots.

Figure 7.6.1 Occupied bandwidth test setup





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 2.1049, Occupied bandwidth | | |
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/27/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 7.6.2 Occupied bandwidth test results

DETECTOR USED: Peak hold
 RESOLUTION BANDWIDTH: 30 kHz
 VIDEO BANDWIDTH: 100 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
 MODULATING SIGNAL: PRBS

| Carrier frequency, MHz | Occupied bandwidth, kHz |
|--------------------------|-------------------------|
| Modulation: QPSK | |
| 776.1 | 255 |
| 776.5 | 248 |
| 776.9 | 247 |
| Modulation: 16QAM | |
| 776.1 | 260 |
| 776.5 | 250 |
| 776.9 | 253 |

Reference numbers of test equipment used

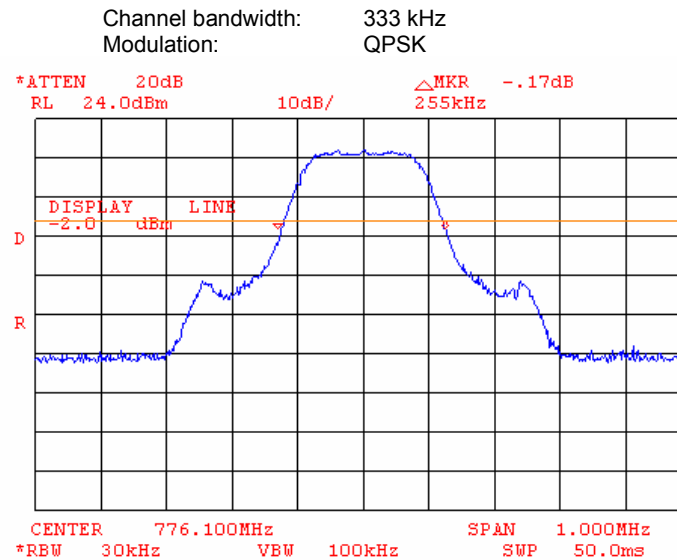
| | | | | | | | |
|---------|---------|---------|---------|--|--|--|--|
| HL 1424 | HL 1650 | HL 2414 | HL 2524 | | | | |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.

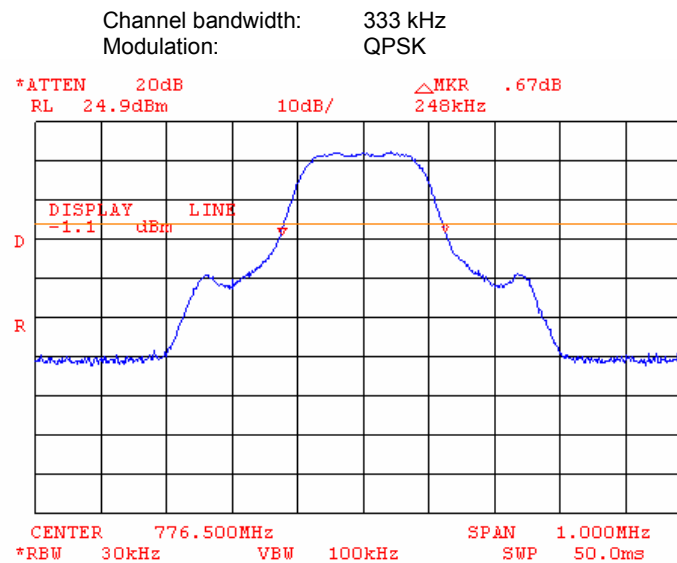


| | | | |
|---------------------|------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 2.1049, Occupied bandwidth | | |
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/27/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.6.1 Occupied bandwidth test results at low frequency



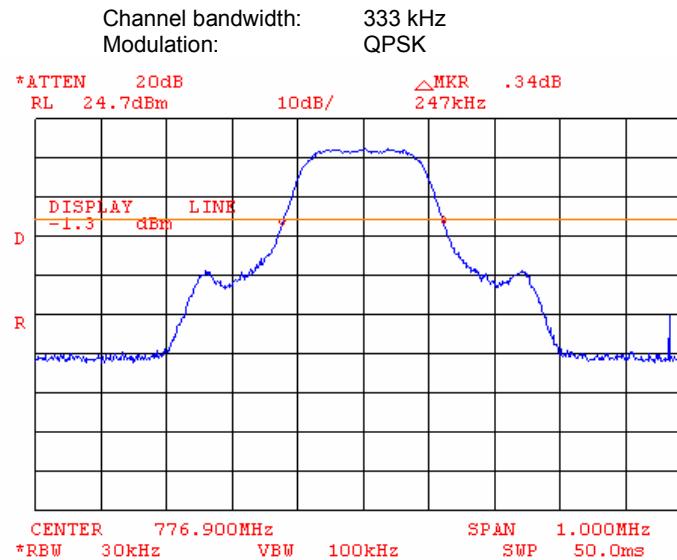
Plot 7.6.2 Occupied bandwidth test results at mid frequency





| | | | |
|---------------------|------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 2.1049, Occupied bandwidth | | |
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/27/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks: | | | |

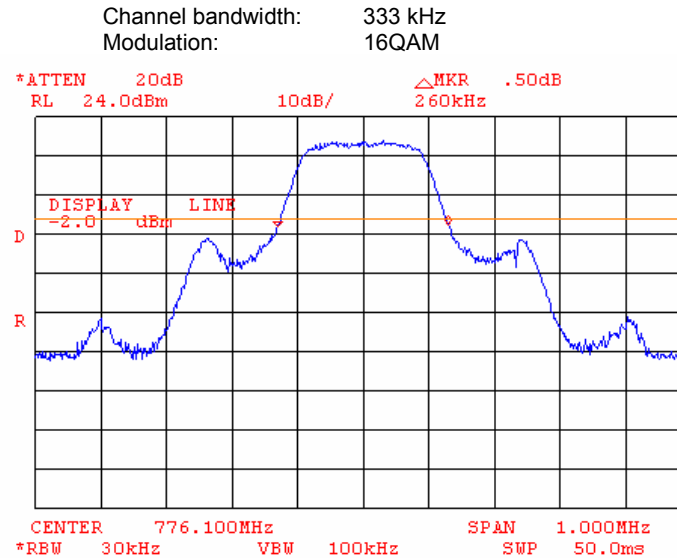
Plot 7.6.3 Occupied bandwidth test results at high frequency



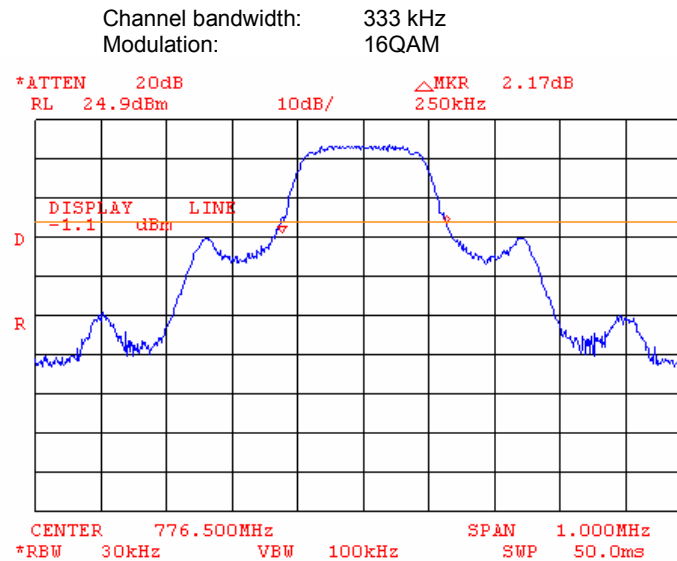


| | | | |
|---------------------|------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 2.1049, Occupied bandwidth | | |
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/27/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.6.4 Occupied bandwidth test results at low frequency



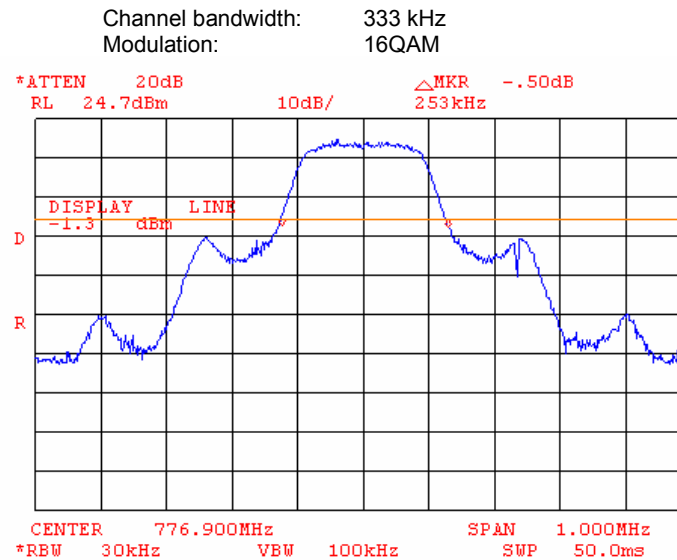
Plot 7.6.5 Occupied bandwidth test results at mid frequency





| | | | |
|---------------------|------------------------------------|-------------------------|-----------------------|
| Test specification: | Section 2.1049, Occupied bandwidth | | |
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/27/2005 | | |
| Temperature: 24 °C | Air Pressure: 1010 hPa | Relative Humidity: 46 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 7.6.6 Occupied bandwidth test results at high frequency





| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 15.107, Conducted emission at AC power port, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.5 and 12.1.3 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks: | | | |

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. The specification test limits are given in Table 8.1.1. The worst test results with respect to the limits were recorded in Table 8.1.2 and shown in the associated plots.

Table 8.1.1 Limits for conducted emissions

| Frequency, MHz | Class B limit, dB(μ V) | |
|-------------------|--------------------------------|----------|
| | QP | AVRG |
| 0.15 - 0.5 | 66 - 56* | 56 - 46* |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30 | 60 | 50 |

* The limit decreases linearly with the logarithm of frequency.

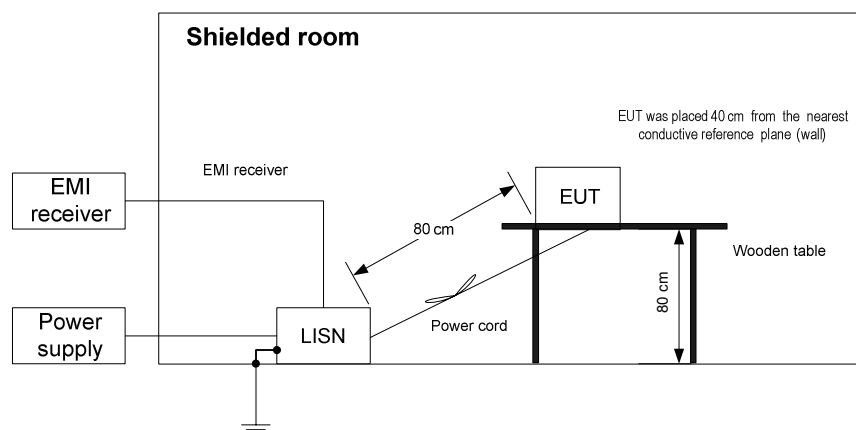
8.1.2 Test procedure

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

8.1.2.2 The measurements were performed at the EUT power terminals with the LISN, connected to the EMI receiver in the frequency range referred to in Table 8.1.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

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 at the mains power port, table-top EUT





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 15.107, Conducted emission at AC power port, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.5 and 12.1.3 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 8.1.2 Conducted emission test results

LINE: AC mains
 EUT OPERATING MODE: Receive / Standby
 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, MHz | Peak emission, dB(μV) | Quasi-peak | | | Average | | | Line ID | Verdict |
|----------------|-----------------------|---------------------------|---------------|-------------|---------------------------|---------------|-------------|---------|---------|
| | | Measured emission, dB(μV) | Limit, dB(μV) | Margin, dB* | Measured emission, dB(μV) | Limit, dB(μV) | Margin, dB* | | |
| 0.176165 | 49.03 | 47.50 | 64.72 | -17.22 | 39.21 | 54.72 | -15.51 | L1 | Pass |
| 0.503043 | 43.56 | 41.77 | 56.00 | -14.23 | 25.47 | 46.00 | -20.53 | | |
| 0.616824 | 44.55 | 43.61 | 56.00 | -12.39 | 34.51 | 46.00 | -11.49 | | |
| 1.329846 | 43.81 | 40.84 | 56.00 | -15.16 | 23.97 | 46.00 | -22.03 | | |
| 2.647810 | 44.81 | 42.42 | 56.00 | -13.58 | 26.30 | 46.00 | -19.70 | | |
| 20.480178 | 52.93 | 51.45 | 60.00 | -8.55 | 49.10 | 50.00 | -0.90 | | |
| 0.176435 | 48.88 | 46.99 | 64.71 | -17.72 | 39.03 | 54.71 | -15.68 | L2 | Pass |
| 0.352985 | 44.18 | 43.35 | 58.95 | -15.60 | 37.37 | 48.95 | -11.58 | | |
| 0.623475 | 43.33 | 42.63 | 56.00 | -13.37 | 30.88 | 46.00 | -15.12 | | |
| 1.040424 | 43.90 | 42.19 | 56.00 | -13.81 | 26.95 | 46.00 | -19.05 | | |
| 1.313686 | 44.20 | 42.69 | 56.00 | -13.31 | 26.96 | 46.00 | -19.04 | | |
| 20.479665 | 43.89 | 42.50 | 60.00 | -17.50 | 40.11 | 50.00 | -9.89 | | |

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

| | | | | | | | |
|---------|---------|---------|---------|---------|--|--|--|
| HL 0163 | HL 0447 | HL 1430 | HL 1502 | HL 1510 | | | |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.

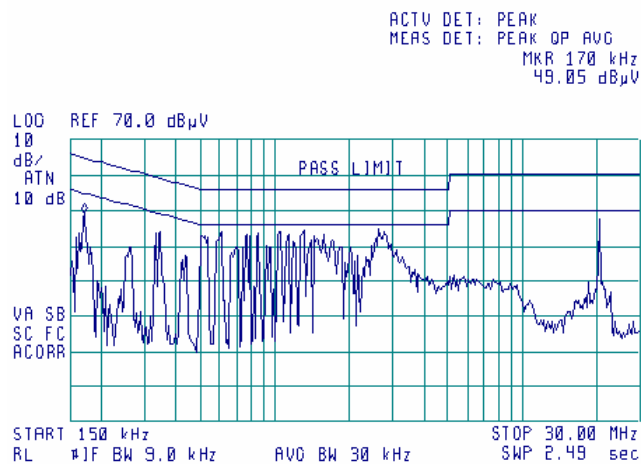


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 15.107, Conducted emission at AC power port, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.5 and 12.1.3 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 06/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 43 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 8.1.1 Conducted emission measurements

LINE: L1
EUT OPERATING MODE: Receive / Standby
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK

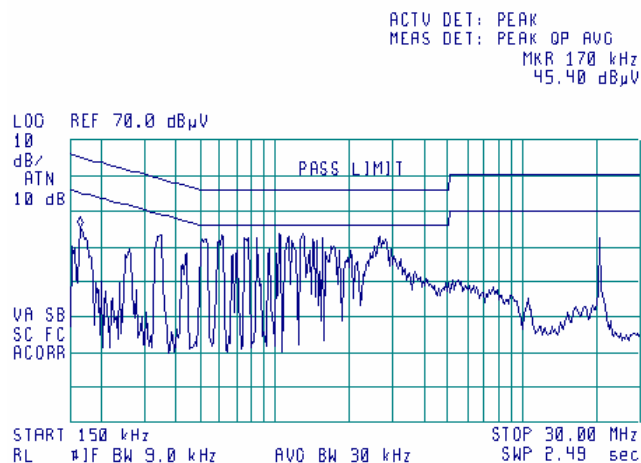
10:43:26 JUN 28, 2005



Plot 8.1.2 Conducted emission measurements

LINE: L2
EUT OPERATING MODE: Receive / Standby
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK

10:55:22 JUN 28, 2005





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

8.2 Radiated emission measurements

8.2.1 General

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

Table 8.2.1 Radiated emission test limits

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

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

8.2.2 Test procedure

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

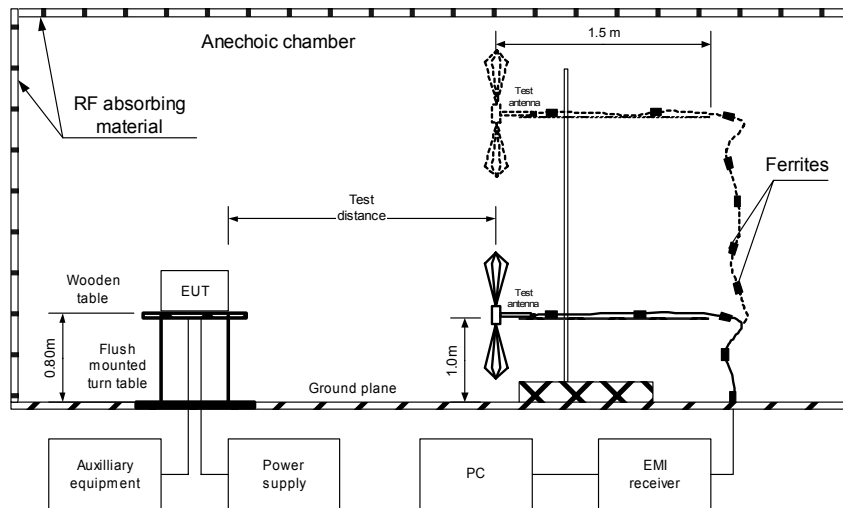
8.2.2.2 The measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.

8.2.2.3 The worst test results with respect to the limits were recorded in Table 8.2.2 and shown in the associated plots.



| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

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





| | | | |
|----------------------------|---|--------------------------------|------------------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
EUT OPERATING MODE: Receive / Standby
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* | | | | |
| 214.766000 | 34.21 | 24.53 | 30.00 | -5.47 | Vertical | 2.0 | 68 | Pass |
| 400.504389 | 32.43 | 30.47 | 37.00 | -6.53 | Vertical | 1.0 | 80 | |
| 599.250000 | 29.50 | 23.62 | 37.00 | -13.38 | Vertical | 1.0 | 347 | |
| 699.675000 | 31.48 | 27.15 | 37.00 | -9.85 | Vertical | 1.0 | 354 | |
| 750.000000 | 36.37 | 33.13 | 37.00 | -3.87 | Vertical | 1.1 | 51 | |
| 800.987500 | 33.83 | 29.44 | 37.00 | -7.56 | Vertical | 1.7 | 46 | |

DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 5000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

| Frequency, MHz | Peak emission, dB(μV/m) | Average | | | Antenna polarization | Antenna height, m | Turn-table position**, degrees | Verdict |
|----------------|-------------------------|-----------------------------|-----------------|-------------|----------------------|-------------------|--------------------------------|---------|
| | | Measured emission, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* | | | | |
| 1202.000 | 41.10 | 33.60 | 54.00 | -20.40 | Vertical | 1.2 | 62 | Pass |

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

| | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0784 | HL 0816 | HL 1365 | HL 1425 | HL 1430 | HL 1552 | HL 1553 | HL 1566 |
| HL 1567 | HL 1941 | HL 1947 | HL 1984 | HL 1984 | HL 2697 | | |

Full description is given in Appendix A.

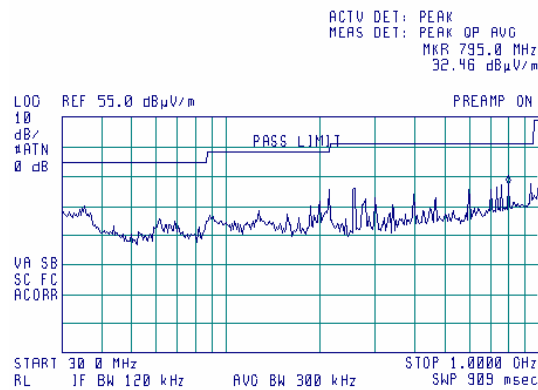


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 8.2.1 Radiated emission measurements in 30- 1000 MHz range at low frequency channel, horizontal and vertical antenna polarization

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

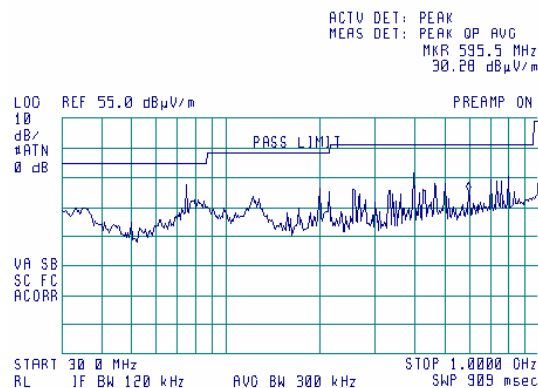
14:15:08 JUN 22, 2005



Plot 8.2.2 Radiated emission measurements in 30- 1000 MHz range at mid frequency channel, horizontal and vertical antenna polarization

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

11:10:48 JUN 22, 2005



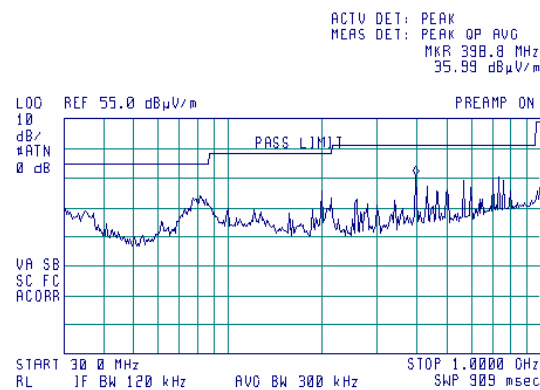


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

**Plot 8.2.3 Radiated emission measurements in 30- 1000 MHz range at high frequency channel,
horizontal and vertical antenna polarization**

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

14:22:09 JUN 22, 2005



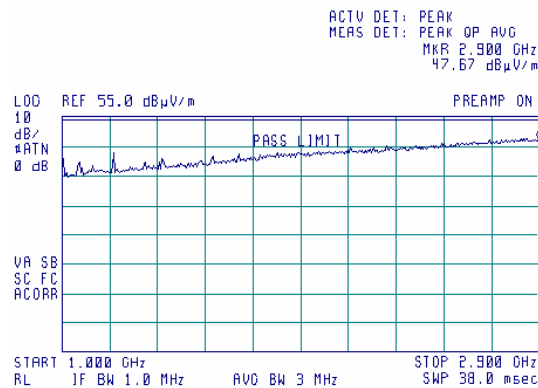


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 8.2.4 Radiated emission measurements in 1.0 – 2.9 GHz range at low frequency channel, horizontal and vertical antenna polarization

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

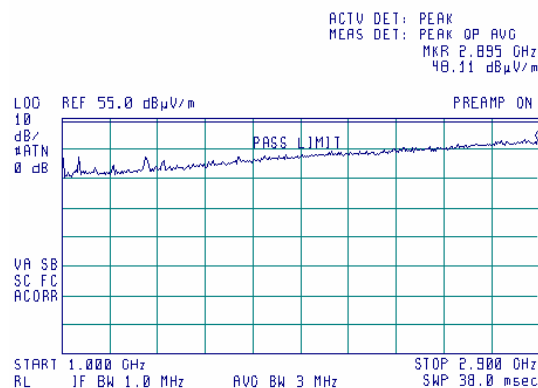
14:40:37 JUN 22, 2005



Plot 8.2.5 Radiated emission measurements in 1.0 – 2.9 GHz range at mid frequency channel, horizontal and vertical antenna polarization

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

14:34:22 JUN 22, 2005



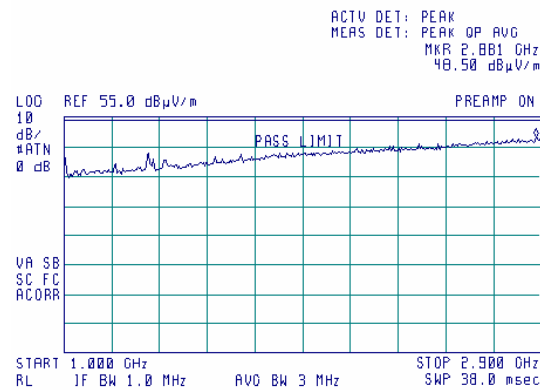


| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

**Plot 8.2.6 Radiated emission measurements in 1.0 – 2.9 GHz range at high frequency channel,
horizontal and vertical antenna polarization**

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

14:26:54 JUN 22, 2005

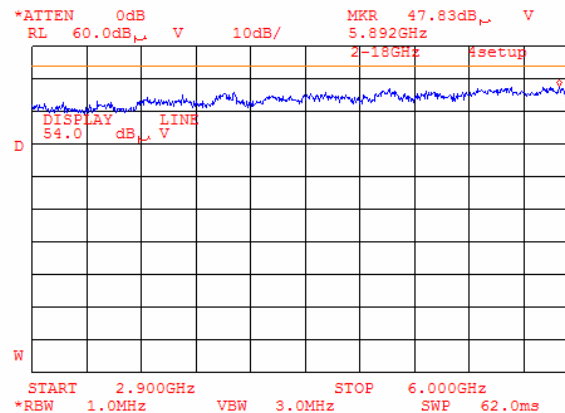




| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

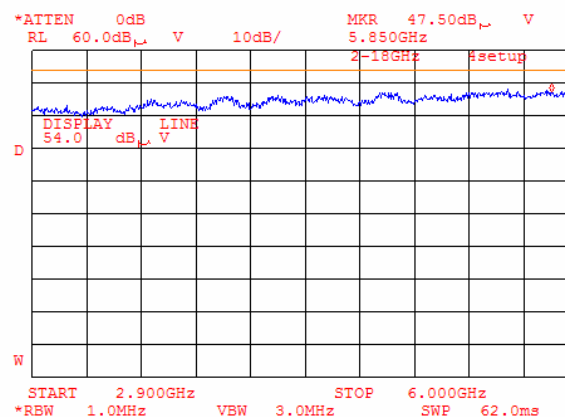
Plot 8.2.7 Radiated emission measurements in 2.9 – 6.0GHz range at low frequency channel, horizontal and vertical antenna polarization

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby



Plot 8.2.8 Radiated emission measurements in 2.9 – 6.0GHz range at mid frequency channel, horizontal and vertical antenna polarization

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

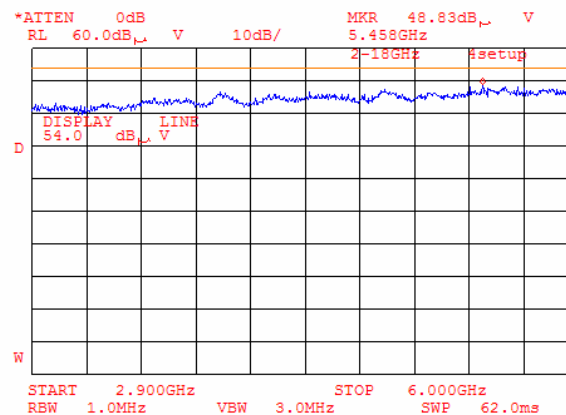




| | | | |
|---------------------|--|-------------------------|-----------------------|
| Test specification: | Section 15.109, Radiated emission, Class B | | |
| Test procedure: | ANSI C63.4, Sections 11.6 and 12.1.4 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 6/28/2005 | | |
| Temperature: 25 °C | Air Pressure: 1010 hPa | Relative Humidity: 42 % | Power Supply: 120 VAC |
| Remarks: | | | |

**Plot 8.2.9 Radiated emission measurements in 2.9 – 6.0GHz range at high frequency channel,
horizontal and vertical antenna polarization**

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby





| | | | |
|----------------------------|--|--------------------------------|------------------------------|
| Test specification: | Section 15.111, Conducted emission at receiver antenna port | | |
| Test procedure: | ANSI C63.4, Section 12.1.5 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 11/25/2004 | | |
| Temperature: 29 °C | Air Pressure: 1012 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

8.3 Antenna power conducted measurements for receiver

8.3.1 General

This test was performed to measure spurious emissions at RF antenna connector of receiver operated within 30 to 960 MHz band which was tested for compliance with radiated emission limits with the antenna port connected to resistive termination. The specification test limits are given in Table 8.3.1.

Table 8.3.1 Spurious emission limits

| Frequency, MHz | EUT type | Power of spurious | |
|------------------------------------|--------------------------|-------------------|-------|
| | | nW | dBm |
| 30 MHz – 2 nd harmonic* | Superheterodyne receiver | 2.0 | -57.0 |

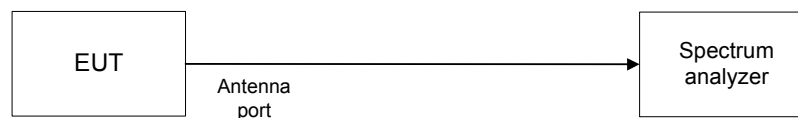
* - harmonic of the local oscillator frequency.

8.3.2 Test procedure

8.3.2.1 The EUT was set up as shown in Figure 8.3.1, energized and its proper operation was checked.

8.3.2.2 The spurious emission was measured with spectrum analyzer as provided in Table 8.3.2 and associated plots.

Figure 8.3.1 Spurious emission test setup





| | | | |
|----------------------------|--|--------------------------------|------------------------------|
| Test specification: | Section 15.111, Conducted emission at receiver antenna port | | |
| Test procedure: | ANSI C63.4, Section 12.1.5 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 11/25/2004 | | |
| Temperature: 29 °C | Air Pressure: 1012 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Table 8.3.2 Spurious emission test results

INVESTIGATED FREQUENCY RANGE: 30 – 1500 MHz
 RECEIVER TYPE: Superheterodyne
 EUT OPERATING MODE: Receive
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 120 kHz
 VIDEO BANDWIDTH: 300 kHz

| Frequency, MHz | Spurious emission, dBm | Limit, dBm | Margin, dB | Verdict |
|-------------------------|------------------------|------------|------------|---------|
| Low channel: 746.1 MHz | | | | |
| 792.59 | -86.09 | -57.0 | -29.09 | Pass |
| 1167.93 | -75.25 | | -18.25 | Pass |
| Mid channel: 746.5 MHz | | | | |
| 792.60 | -83.91 | -57.0 | -26.91 | Pass |
| 1127.38 | -74.03 | | -17.03 | Pass |
| High channel: 746.9 MHz | | | | |
| 792.59 | -85.92 | -57.0 | -28.92 | Pass |
| 1151.58 | -74.99 | | -17.99 | Pass |

Reference numbers of test equipment used

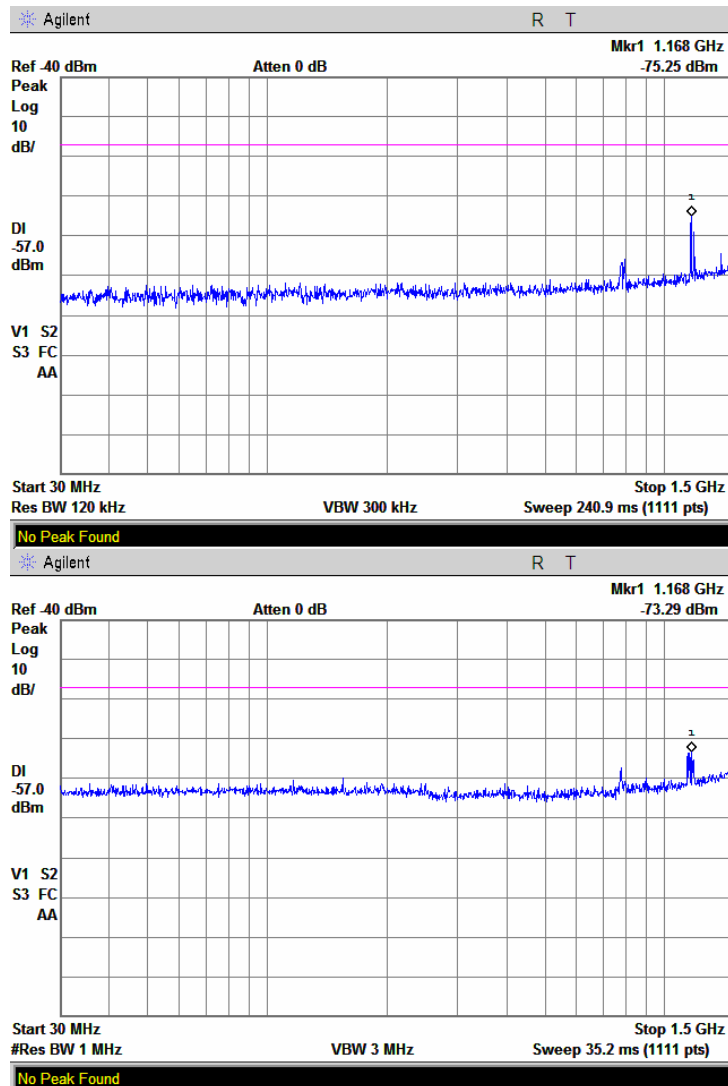
| | | | | | | | |
|---------|---------|--|--|--|--|--|--|
| HL 1653 | HL 2458 | | | | | | |
|---------|---------|--|--|--|--|--|--|

Full description is given in Appendix A.



| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 15.111, Conducted emission at receiver antenna port | | |
| Test procedure: | ANSI C63.4, Section 12.1.5 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 11/25/2004 | | |
| Temperature: 29 °C | Air Pressure: 1012 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

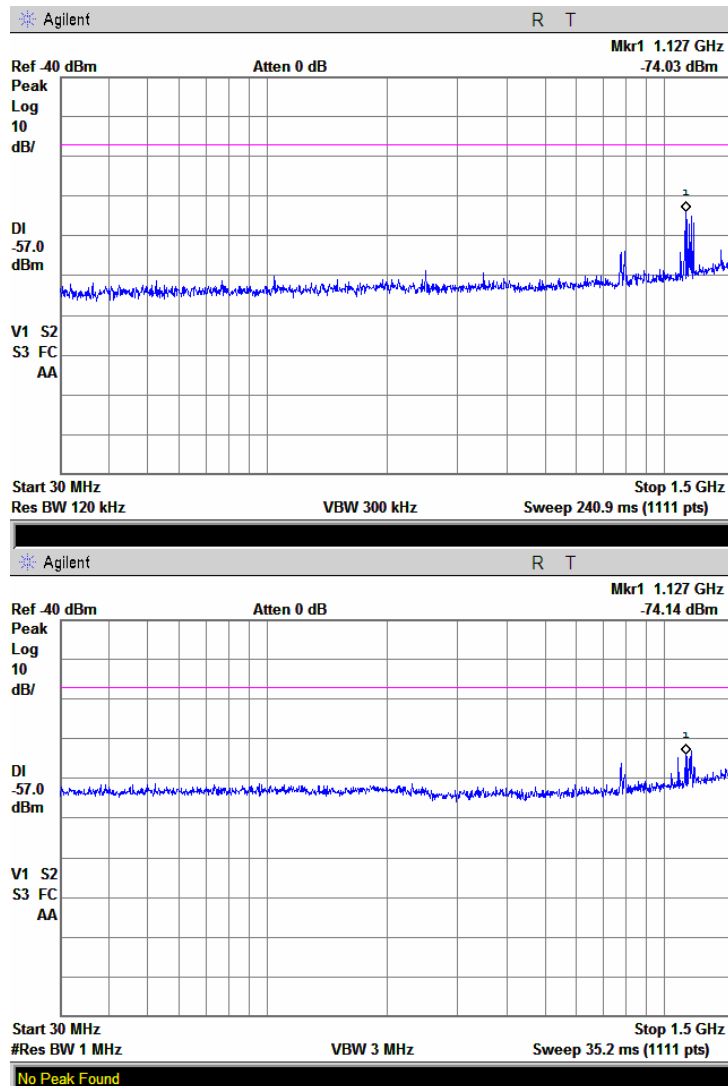
Plot 8.3.1 Spurious emission measurements at low channel





| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 15.111, Conducted emission at receiver antenna port | | |
| Test procedure: | ANSI C63.4, Section 12.1.5 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 11/25/2004 | | |
| Temperature: 29 °C | Air Pressure: 1012 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

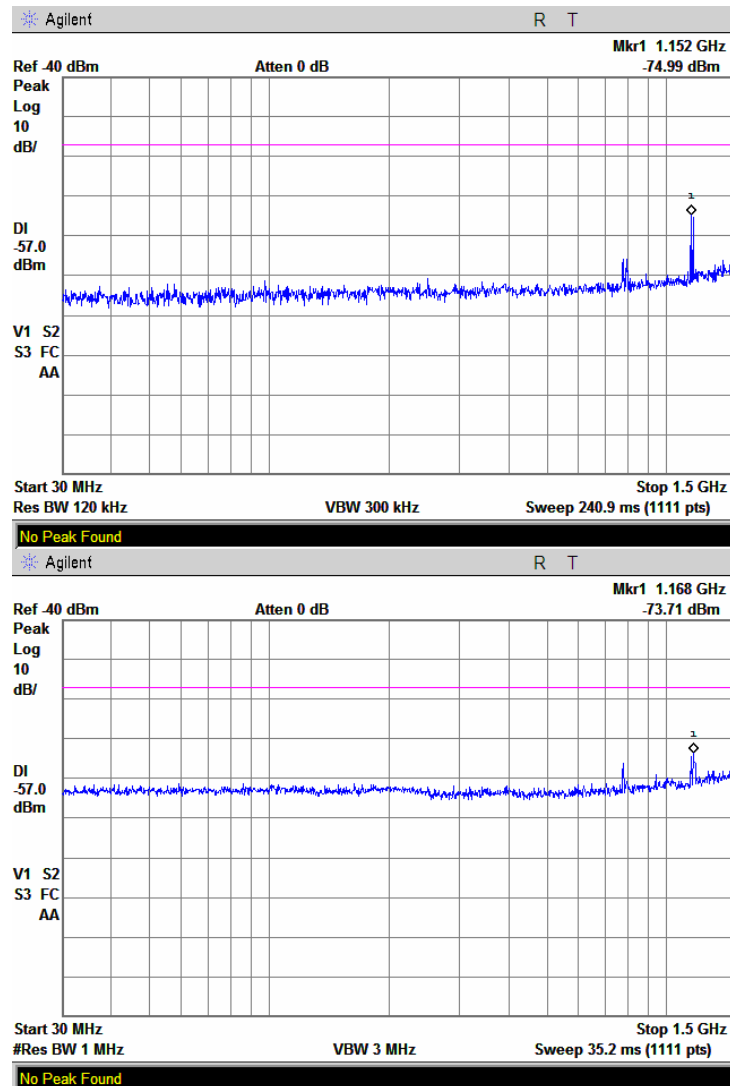
Plot 8.3.2 Spurious emission measurements at mid channel





| | | | |
|---------------------|---|-------------------------|-----------------------|
| Test specification: | Section 15.111, Conducted emission at receiver antenna port | | |
| Test procedure: | ANSI C63.4, Section 12.1.5 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date: | 11/25/2004 | | |
| Temperature: 29 °C | Air Pressure: 1012 hPa | Relative Humidity: 36 % | Power Supply: 120 VAC |
| Remarks: | | | |

Plot 8.3.3 Spurious emission measurements at high channel



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

| HL No. | Description | Manufacturer information | | | Due Calibr. Month/Year |
|--------|--|------------------------------|----------------------|---------------------------|------------------------|
| | | Name | Model No. | Serial No. | |
| 0163 | LISN FCC/VDE/MIL-STD | Electro-Metrics | ANS 25/2 | 1314 | 01-Oct-05 |
| 0278 | Thermometer, -200 - +760C | Fluke | 51K/J | 5045468 | 28-Apr-06 |
| 0446 | Antenna, Loop active, 10kHz-30MHz | EMCO | 6502 | 2857 | 28-Jun-06 |
| 0447 | LISN, 16/2, 300V RMS | HL | LISN 16 - 1 | 066 | 03-Nov-05 |
| 0465 | Anechoic Chamber 9(L) x 6,5(W) x 5,5(H) m | HL | AC - 1 | 023 | 10-Oct-05 |
| 0493 | Oven temperature -45...175 deg C | Thermotron | S-1.2 Mini-Max | 14016 | 23-Sep-05 |
| 0521 | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-2.9 GHz | Hewlett Packard | 8546A | 3617A00319, 3448A00253 | 26-Sep-05 |
| 0589 | Cable Coaxial, GORE A2P01POL118, 2.3 m | HL | GORE-3 | 176 | 2-Dec-05 |
| 0593 | Antenna Mast, 1-4 m Pneumatic | Madgesh | AM-F1 | 101 | 03-Feb-06 |
| 0594 | Turn Table for anechoic chamber flush mount d=1.2 m Pneumatic | HL | TT-WDC1 | 102 | 27-Jan-06 |
| 0604 | Antenna BiconiLog Log-Periodic/T Bow-TIE 26 - 2000 MHz | EMCO | 3141 | 9611-1011 | 10-Jan-06 |
| 0613 | Sensor Electric Field 10 kHz-1.0 GHz, 1-300 V/m (probe), w/charger | Amplifier Research | FP2000 | 18677 | 08-Dec-05 |
| 0661 | Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm | Hewlett Packard | 83640B | 3614A00266 | 14-Sep-05 |
| 1004 | Cable Coaxial, ANDREW PSWJ4, 6m | HL | ANDREW-6 | 163 | 02-Dec-05 |
| 1097 | Attenuator, 50 Ohm, 5 W, DC to 8 GHz, 20 dB | Midwest Microwave | 0793-20-NN-07 | 1097 | 15-Jan-06 |
| 1200 | Quadruplexer 1-12 GHz (1-2 GHz; 2-4GHz;4-8 GHz; 8-12GHz) | Elettronica S.p.A. - Roma | UE 84 | D/00240 | 10-Feb-06 |
| 1204 | One phase Voltage regulator, 2kVA, 0-250V | HL | TDGC-2 | 99 | 04-Jun-06 |
| 1424 | Spectrum Analyzer, 30 Hz- 40 GHz | Agilent Technologies (HP) | 8564EC | 3946A00219 | 30-Aug-06 |
| 1430 | EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432 | Agilent Technologies (HP) | 8542E | 3807A00262, 3705A00217 | 01-Sep-05 |
| 1455 | Cable, 1 m | Harbour Industries | MIL 17/60- RG142 | 1455 | 23-Sep-05 |
| 1476 | Cable, 1 m | Harbour Industries | MIL 17/60- RG142 | 1476 | 23-Sep-05 |
| 1488 | Power Divider 0.5 - 18 GHz | Omni Spectra | 2090-6204-00 | 1488 | 05-Dec-05 |
| 1502 | Cable RF, 6 m | Belden | M17/167 MIL- C-17 | 1502 | 02-Dec-05 |
| 1510 | Cable RF, 8 m | Belden | M17/167 MIL- C-17 | 1510 | 02-Dec-05 |



| HL No. | Description | Manufacturer information | | | Due Calibr. Month/Year |
|--------|--|----------------------------|--------------------|------------|------------------------|
| | | Name | Model No. | Serial No. | |
| 1629 | Isotropic Field Monitor | Amplifier Research | FM2000 | 23308 | 13-Feb-06 |
| 1651 | Attenuators Set (2, 3, 5, 20 dB), DC-18 GHz | M/A-COM | 2082 | 1651 | 03-Jan-06 |
| 1653 | Analyzer EMC 9 kHz - 1.5 GHz | Agilent Technologies (HP) | E7401A | US39440281 | 06-Feb-06 |
| 1942 | Cable 18GHz, 4 m, blue | Rhophase Microwave Limited | SPS-1803A-4000-NPS | T4658 | 17-Oct-05 |
| 1947 | Cable 18GHz, 6.5 m, blue | Rhophase Microwave Limited | NPS-1803A-6500-NPS | T4974 | 17-Oct-05 |
| 1984 | Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W, N-type | EMC Test Systems | 3115 | 9911-5964 | 22-Mar-06 |
| 2009 | Cable RF, 8 m | Alpha Wire | RG-214 | C-56 | 02-Dec-05 |
| 2400 | Cable 40GHz, 1.5 m, green | Rhophase Microwave Limited | KPS-1503A-1500-KPS | X2946 | 24-Jun-06 |
| 2432 | Antenna, Double-Ridged Waveguide Horn 1-18 GHz | EMC Test Systems | 3115 | 00027177 | 02-Jul-06 |

**10 APPENDIX B Measurement uncertainties****Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements**

| Test description | Expanded uncertainty |
|---|---|
| Transmitter tests | |
| Carrier power conducted at antenna connector | ± 1.7 dB |
| Carrier power radiated (substitution method) | ± 4.5 dB |
| Occupied bandwidth | $\pm 8\%$ |
| Conducted emissions at RF antenna connector | 9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB |
| Spurious emissions radiated 30 MHz – 40 GHz (substitution method) | ± 4.5 dB |
| Frequency stability | ± 168 Hz (0.56 ppm) |
| Unintentional radiator tests | |
| Conducted emissions with LISN | 9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB |
| Radiated emissions at 3 m measuring distance Horizontal polarization | Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB |
| Vertical polarization | Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 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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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

| | |
|-------------------------------|--|
| 47CFR part 27: 2004 | Miscellaneous wireless communications services |
| 47CFR part 1: 2004 | Practice and procedure |
| 47CFR part 2: 2004 | Frequency allocations and radio treaty matters; general rules and regulations |
| 47CFR part 15 subpart B: 2005 | Radio Frequency Devices |
| ANSI C63.2: 1996 | American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications. |
| ANSI C63.4: 2003 | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| 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) |
| cm | centimeter |
| dB | decibel |
| dBm | decibel referred to one milliwatt |
| dB(μ V) | decibel referred to one microvolt |
| dB(μ V/m) | decibel referred to one microvolt per meter |
| dB(μ A) | decibel referred to one microampere |
| DC | direct current |
| EIRP | equivalent isotropically radiated power |
| ERP | effective radiated power |
| EUT | equipment under test |
| F | frequency |
| GHz | gigahertz |
| GND | ground |
| H | height |
| HL | Hermon laboratories |
| Hz | hertz |
| ITE | information technology equipment |
| k | kilo |
| kHz | kilohertz |
| LISN | line impedance stabilization network |
| LO | local oscillator |
| m | meter |
| MHz | megahertz |
| min | minute |
| mm | millimeter |
| ms | millisecond |
| μ s | microsecond |
| NA | not applicable |
| OATS | open area test site |
| Ω | 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 |

**14 APPENDIX F Test equipment correction factors**

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

| Frequency, MHz | Correction factor, dB |
|-------------------|--------------------------|
| 0.01 | 5.0 |
| 0.02 | 2.2 |
| 0.03 | 1.1 |
| 0.04 | 0.7 |
| 0.05 | 0.5 |
| 0.1 | 0.2 |
| 0.2 | 0.1 |
| 0.4 | 0.1 |
| 0.6 | 0.1 |
| 0.8 | 0.1 |
| 1 | 0.1 |
| 2 | 0.1 |
| 3 | 0.1 |
| 4 | 0.1 |
| 6 | 0.2 |
| 10 | 0.3 |
| 12 | 0.4 |
| 16 | 0.5 |
| 18 | 0.6 |
| 20 | 0.7 |
| 25 | 0.9 |
| 28 | 1.2 |
| 30 | 1.3 |

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

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

| Frequency, MHz | Correction factor, dB |
|-------------------|--------------------------|
| 0.01 | 4.7 |
| 0.02 | 2.1 |
| 0.03 | 1.1 |
| 0.04 | 0.7 |
| 0.05 | 0.5 |
| 0.1 | 0.2 |
| 0.2 | 0.1 |
| 0.4 | 0.1 |
| 0.6 | 0.1 |
| 0.8 | 0.1 |
| 1 | 0.1 |
| 2 | 0.1 |
| 3 | 0.1 |
| 4 | 0.1 |
| 6 | 0.1 |
| 10 | 0.1 |
| 12 | 0.1 |
| 16 | 0.1 |
| 18 | 0.1 |
| 20 | 0.1 |
| 25 | 0.1 |
| 28 | 0.1 |
| 30 | 0.1 |

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, MHz | Magnetic Antenna Factor, dB(S/m) | Electric Antenna Factor, 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(μ V) to convert it into field intensity in dB(μ A/m).
Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

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

| 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(μ V) to convert it into field intensity in dB(μ V/m).



Antenna factor
Double-ridged wave guide horn antenna
EMC Test Systems, model 3115, serial no: 9911-5964

| Frequency, MHz | Antenna gain, dBi | Antenna factor. 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(μ V) to convert it into field intensity in dB(μ V/m).



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

| Frequency, MHz | Antenna gain, dBi | Antenna factor. 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(μ V) to convert it into field intensity in dB(μ V/m).

**Cable loss**

Cable coaxial, GORE A2P01POL118, 2.3 m, model GORE-3, serial number 176, HL 0589

+ Cable coaxial, ANDREW PSWJ4, 6 m, model: ANDREW-6, serial number 163, HL 1004

| No. | Frequency, MHz | Cable loss, dB | Tolerance (Specification), dB | Measurement uncertainty, dB |
|-----|-------------------|-------------------|-------------------------------------|-----------------------------------|
| 1 | 30 | 0.33 | ≤ 6.5 | ± 0.12 |
| 2 | 50 | 0.40 | | |
| 3 | 100 | 0.57 | | |
| 4 | 300 | 0.97 | | |
| 5 | 500 | 1.25 | | |
| 6 | 800 | 1.59 | | |
| 7 | 1000 | 1.81 | | |
| 8 | 1200 | 1.97 | | |
| 9 | 1400 | 2.15 | | |
| 10 | 1600 | 2.28 | | |
| 11 | 1800 | 2.43 | | |
| 12 | 2000 | 2.61 | | |
| 13 | 2200 | 2.75 | | |
| 14 | 2400 | 2.89 | | |
| 15 | 2600 | 2.97 | | |
| 16 | 2800 | 3.21 | ≤ 6.5 | ± 0.12 |
| 17 | 3000 | 3.32 | | ± 0.17 |
| 18 | 3300 | 3.47 | | |
| 19 | 3600 | 3.62 | | |
| 20 | 3900 | 3.84 | | |
| 21 | 4200 | 3.92 | | |
| 22 | 4500 | 4.07 | | |
| 23 | 4800 | 4.36 | | |
| 24 | 5100 | 4.62 | | |
| 25 | 5400 | 4.78 | | |
| 26 | 5700 | 5.16 | | |
| 27 | 6000 | 5.67 | | |
| 28 | 6500 | 5.99 | | |



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

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

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



Cable loss

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

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



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

| No. | Frequency, MHz | Cable loss, dB | Tolerance (Specification), dB | Measurement uncertainty, dB |
|-----|-------------------|-------------------|----------------------------------|--------------------------------|
| 1 | 1 | 0.10 | NA | ±0.12 |
| 2 | 10 | 0.14 | | |
| 3 | 30 | 0.25 | | |
| 4 | 50 | 0.34 | | |
| 5 | 100 | 0.53 | | |
| 6 | 300 | 0.99 | | |
| 7 | 500 | 1.31 | | |
| 8 | 800 | 1.73 | | |
| 9 | 1000 | 1.98 | | |
| 10 | 1100 | 2.11 | | |
| 11 | 1200 | 2.21 | | |
| 12 | 1300 | 2.35 | | |
| 13 | 1400 | 2.46 | | |
| 14 | 1500 | 2.55 | | |
| 15 | 1600 | 2.68 | | |
| 16 | 1700 | 2.78 | | |
| 17 | 1800 | 2.88 | | |
| 18 | 1900 | 2.98 | | |
| 19 | 2000 | 3.09 | | |



Cable loss

Cable 40 GHz, 1.5 m, green; model KPS-1503A-1500-KPS, serial number X2946 (HL 2400)

| Frequency, GHz | Insertion loss, dB |
|-------------------|-----------------------|
| 0.03 | 0.06 |
| 0.05 | 0.08 |
| 0.1 | 0.15 |
| 0.2 | 0.23 |
| 0.3 | 0.29 |
| 0.5 | 0.37 |
| 0.7 | 0.46 |
| 0.9 | 0.53 |
| 1.1 | 0.58 |
| 1.3 | 0.65 |
| 1.5 | 0.66 |
| 1.7 | 0.72 |
| 1.9 | 0.76 |
| 2.1 | 0.79 |
| 2.3 | 0.85 |
| 2.5 | 0.90 |
| 2.7 | 0.91 |
| 2.9 | 0.97 |
| 3.1 | 0.97 |
| 3.3 | 1.03 |
| 3.5 | 1.06 |
| 3.7 | 1.10 |
| 3.9 | 1.13 |
| 4.1 | 1.16 |
| 4.3 | 1.18 |
| 4.5 | 1.21 |
| 4.7 | 1.23 |
| 4.9 | 1.26 |
| 5.1 | 1.28 |
| 5.3 | 1.31 |
| 5.5 | 1.32 |
| 5.7 | 1.36 |
| 5.9 | 1.37 |
| 6.1 | 1.38 |
| 6.3 | 1.44 |
| 6.5 | 1.46 |
| 6.7 | 1.49 |
| 6.9 | 1.50 |
| 7.1 | 1.51 |
| 7.3 | 1.55 |
| 7.5 | 1.56 |
| 7.7 | 1.58 |
| 7.9 | 1.60 |
| 8.1 | 1.61 |
| 8.3 | 1.68 |
| 8.5 | 1.68 |
| 8.7 | 1.75 |
| 8.9 | 1.74 |
| 9.1 | 1.81 |
| 9.3 | 1.79 |
| 9.5 | 1.86 |
| 9.7 | 1.85 |
| 9.9 | 1.87 |
| 10.1 | 1.88 |

| Frequency, GHz | Insertion loss, dB |
|-------------------|-----------------------|
| 10.30 | 1.82 |
| 10.50 | 1.92 |
| 10.70 | 1.86 |
| 10.90 | 1.96 |
| 11.10 | 1.90 |
| 11.30 | 1.99 |
| 11.50 | 1.95 |
| 11.70 | 2.00 |
| 11.90 | 2.01 |
| 12.10 | 1.99 |
| 12.40 | 2.06 |
| 13.00 | 2.11 |
| 13.50 | 2.17 |
| 14.00 | 2.36 |
| 14.50 | 2.32 |
| 15.00 | 2.30 |
| 15.50 | 2.34 |
| 16.00 | 2.34 |
| 16.50 | 2.40 |
| 17.00 | 2.46 |
| 17.50 | 2.54 |
| 18.00 | 2.61 |
| 18.50 | 2.59 |
| 19.00 | 2.59 |
| 19.50 | 2.67 |
| 20.00 | 2.62 |
| 20.50 | 2.73 |
| 21.00 | 2.71 |
| 21.50 | 2.78 |
| 22.00 | 2.83 |
| 22.50 | 2.81 |
| 23.00 | 2.91 |
| 23.50 | 2.97 |
| 24.00 | 2.98 |
| 24.50 | 2.97 |
| 25.00 | 3.03 |
| 25.50 | 3.04 |
| 26.00 | 3.11 |
| 26.50 | 2.97 |
| 27.00 | 3.15 |
| 28.00 | 3.07 |
| 29.00 | 3.13 |
| 30.00 | 3.13 |
| 31.00 | 3.18 |
| 32.00 | 3.31 |
| 33.00 | 3.32 |
| 34.00 | 3.37 |
| 35.00 | 3.36 |
| 36.00 | 3.46 |
| 37.00 | 3.49 |
| 38.00 | 3.52 |
| 39.00 | 3.62 |
| 40.00 | 3.77 |



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

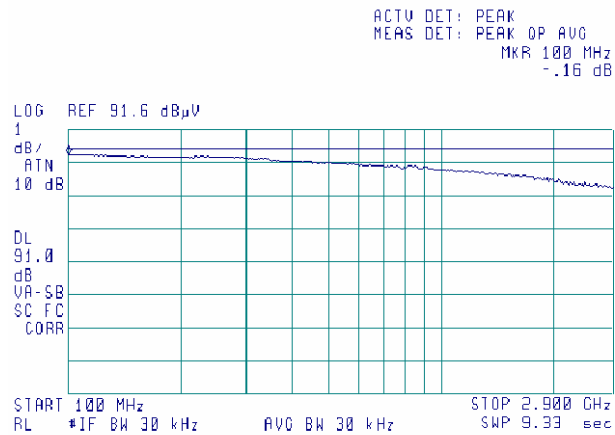
| Frequency, MHz | Cable loss, dB |
|-------------------|-------------------|
| 0.1 | 0.02 |
| 1 | 0.07 |
| 3 | 0.15 |
| 5 | 0.17 |
| 10 | 0.26 |
| 30 | 0.43 |
| 50 | 0.57 |
| 80 | 0.72 |
| 100 | 0.81 |
| 300 | 1.48 |
| 500 | 2.00 |
| 800 | 2.70 |
| 1000 | 3.09 |

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

| No. | Frequency, MHz | Cable loss, 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 RF, 1m, model: MIL 17/60-RG142, serial number 1455 (HL 1455)
Calibration data (100 – 2900 MHz)

| No. | Parameter | SET | Measured | Deviation | Tolerance (Specification) | Meas. Uncert. |
|-----|----------------|-------------------|-------------------|-----------|---------------------------|---------------|
| 1 | Insertion Loss | 100 MHz – 2.9 GHz | See attached plot | | ≤ 2.0 dB | ±0.52 dB |



Cable RF, 1m, model: MIL 17/60-RG142, serial number 1476 (HL 1476)
Calibration data (100 – 2900 MHz)

| No. | Parameter | SET | Measured | Deviation | Tolerance (Specification) | Meas. Uncert. |
|-----|----------------|-------------------|-------------------|-----------|---------------------------|---------------|
| 1 | Insertion Loss | 100 MHz – 2.9 GHz | See attached plot | | ≤ 2.0 dB | ±0.52 dB |

