



Engineering and Testing for EMC and Safety Compliance

TYPE CERTIFICATION REPORT

M/A-COM, Inc.
221 Jefferson Ridge Parkway
Lynchburg, VA 24501
Bryan McWatters (434) 455-9377

MODEL: MASTRIII/Sitepro Base Station

FCC ID: OWDTR-0017-E

February 5, 2003

| STANDARDS REFERENCED FOR THIS REPORT | |
|--------------------------------------|---|
| PART 2: 1999 | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS |
| PART 22: 2001 | PUBLIC MOBILE SERVICES |
| PART 74: 2001 | EXPERIMENTAL RADIO AUXILIARY, SPECIAL BROADCAST AND OTHER PROGRAM DISTRIBUTIONAL SERVICES |
| PART 80: 2001 | STATIONS IN THE MARITIME SERVICES |
| PART 90: 1998 | PRIVATE LAND MOBILE RADIO SERVICES |
| ANSI C63.4-1992 | STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS |
| ANSI/TIA/EIA603- 1992 | LAND MOBILE FM OR PM COMMUNICATIONS EQUIPMENT MEASUREMENT AND PERFORMANCE STANDARDS |
| ANSI/TIA/EIA 603-1-1998 | ADDENDUM TO ANSI/TIA/EIA 603-1992 |
| ANSI/TIA/EIA -102.CAAA; 1999 | DIGITAL C4FM/CQPSK TRANSCEIVER MEASUREMENT METHODS |
| RSS-119; Issue 6; 2000 | LAND MOBILE AND FIXED RADIO TRANSMITTERS AND RECEIVERS 27.41 TO 960.0 MHz |

| Frequency Range | Output Power (W) Conducted | Frequency Tolerance (ppm) | Emission Designator |
|-----------------|-------------------------------|---------------------------|---------------------|
| 136-174 MHz | 10-110 | 1.1 | 16K0F3E |
| 136-174 MHz | 10-110 | 1.1 | 11K0F3E |
| 136-174 MHz | 10-110 | 1.1 | 15K6F1D |
| 136-174 MHz | 10-110 | 1.1 | 15K6F1E |
| 136-174 MHz | 10-110 | 1.1 | 9K25F1D |
| 136-174 MHz | 10-110 | 1.1 | 9K25F1E |
| 136-174 MHz | 10-110 | 1.1 | 8K50F1D |
| 136-174 MHz | 10-110 | 1.1 | 8K50F1E |

REPORT PREPARED BY:

TEST ENGINEER: DANIEL BALTZELL

Document Number: 2003013 / QRTL03-715

No part of this report may be reproduced without the full written approval of Rhein Tech Laboratories, Inc.

360 Herndon Parkway, Suite 1400
Herndon, VA 20170
Phone: 703-689-0368; Fax: 703-689-2056; Metro: 703-471-6441

TABLE OF CONTENTS

| | | |
|-------|---|----|
| 1 | GENERAL INFORMATION..... | 6 |
| 1.1 | Test Facility..... | 6 |
| 1.2 | Related Submittal(s)/Grant(s)..... | 6 |
| 1.3 | Conformance Statement..... | 7 |
| 1.4 | Tested System Details..... | 8 |
| 2 | RADIATED EMISSIONS..... | 9 |
| 2.1 | Radiated Measurement..... | 9 |
| 3 | FCC RULES AND REGULATIONS PART 2 §2.1046 (A); IC RSS-119 §6.2: RF POWER OUTPUT: CONDUCTED..... | 10 |
| 3.1 | Test Procedure..... | 10 |
| 3.2 | Test Data..... | 10 |
| 4 | FCC RULES AND REGULATIONS PART 2 §2.1051; IC RSS-119 §6.3: SPURIOUS EMISSIONS AT ANTENNA TERMINALS..... | 11 |
| 4.1 | Test Procedure..... | 11 |
| 4.2 | Test Data..... | 11 |
| 5 | FCC RULES AND REGULATIONS PART 2 §2.1053 (A) ; IC RSS-119 §6.3: FIELD STRENGTH OF SPURIOUS RADIATION..... | 15 |
| 5.1 | Test Procedure..... | 15 |
| 5.2 | Test Data..... | 15 |
| 5.2.1 | CFR 47 Part 90.210 Requirements..... | 15 |
| 6 | FCC RULES AND REGULATIONS PART 2 §2.1049 (C) (1) ; IC RSS-119 §6.4: OCCUPIED BANDWIDTH..... | 17 |
| 6.1 | Test Procedure..... | 17 |
| 6.2 | Test Data..... | 17 |
| 7 | FCC RULES AND REGULATION PART 2 §2.1055; IC RSS-119 §7.0: FREQUENCY STABILITY..... | 22 |
| 7.1 | Test Procedure..... | 22 |
| 7.2 | Test Data..... | 22 |
| 7.2.1 | Frequency Stability/Temperature Variation..... | 22 |
| 7.2.2 | Frequency Stability/Voltage Variation..... | 24 |
| 8 | FCC PART 2 §2.1047 (A): MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE..... | 25 |
| 8.1 | Test Procedure..... | 25 |
| 8.2 | Test Data..... | 26 |
| 9 | FCC PART 2 §2.1047 (A) ; IC RSS-119 §6.6: MODULATION CHARACTERISTICS – AUDIO LOW PASS FILTER..... | 27 |
| 9.1 | Test Procedure..... | 27 |
| 9.2 | Test Data..... | 27 |
| 10 | FCC RULES AND REGULATIONS PART 2 §2.1047 (B) ; IC RSS-119 §6.6: MODULATION CHARACTERISTICS - MODULATION LIMITING..... | 28 |
| 10.1 | Test Procedure..... | 28 |
| 10.2 | Test Data..... | 28 |
| 11 | FCC RULES AND REGULATIONS PART 90 §90.214; IC RSS-119 §6.5: TRANSIENT FREQUENCY BEHAVIOR..... | 32 |
| 11.1 | Test Procedure..... | 32 |
| 11.2 | test data..... | 32 |
| 12 | FCC RULES AND REGULATIONS PART2 §2.202: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH..... | 36 |
| 13 | CONCLUSION..... | 41 |

TABLE OF TABLES

| | | |
|-------------|--|----|
| TABLE 1-1: | EQUIPMENT UNDER TEST (EUT) | 8 |
| TABLE 3-1: | RF POWER OUTPUT: CARRIER OUTPUT POWER | 10 |
| TABLE 3-2: | RF POWER OUTPUT (RATED POWER) | 10 |
| TABLE 3-3: | TEST EQUIPMENT USED FOR TESTING (RF POWER OUTPUT - CONDUCTED) | 10 |
| TABLE 4-1: | CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 – 136.025 MHZ | 11 |
| TABLE 4-2: | CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 152.025 MHZ | 12 |
| TABLE 4-3: | CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 152.025 MHZ | 12 |
| TABLE 4-4: | CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 152.025 MHZ | 13 |
| TABLE 4-5: | CONDUCTED SPURIOUS EMISSIONS CHANNEL 3 – 172.975 MHZ | 13 |
| TABLE 4-6: | TEST EQUIPMENT USED FOR TESTING (CONDUCTED SPURIOUS EMISSIONS) | 14 |
| TABLE 5-1: | FIELD STRENGTH OF SPURIOUS RADIATION – MID CHANNEL (152.025 MHZ) | 15 |
| TABLE 5-2: | TEST EQUIPMENT USED FOR TESTING (FIELD STRENGTH OF SPURIOUS RADIATION) | 16 |
| TABLE 6-1: | TEST EQUIPMENT USED FOR TESTING (OCCUPIED BANDWIDTH) | 21 |
| TABLE 7-1: | FREQUENCY TEMPERATURE STABILITY; 152.025 MHZ | 23 |
| TABLE 7-2: | TEST EQUIPMENT USED FOR TESTING (FREQUENCY STABILITY/TEMPERATURE) | 23 |
| TABLE 7-3: | FREQUENCY STABILITY/VOLTAGE VARIATION | 24 |
| TABLE 7-4: | TEST EQUIPMENT USED FOR TESTING (FREQUENCY STABILITY/VOLTAGE) | 24 |
| TABLE 8-1: | TEST EQUIPMENT USED FOR TESTING (AUDIO FREQUENCY RESPONSE) | 26 |
| TABLE 9-1: | TEST EQUIPMENT USED FOR TESTING (AUDIO LOW PASS FILTER RESPONSE) | 27 |
| TABLE 10-1: | TEST EQUIPMENT USED FOR TESTING (MODULATION LIMITING) | 31 |
| TABLE 11-1: | TEST EQUIPMENT USED FOR TESTING (TRANSIENT FREQUENCY BEHAVIOR) | 35 |
| TABLE 12-1: | TEST EQUIPMENT USED FOR NECESSARY AND EMISSION BANDWIDTH MEASUREMENTS | 40 |

TABLE OF PLOTS

| | | |
|------------|---|----|
| PLOT 6-1: | OCCUPIED BANDWIDTH {25 kHz CHANNEL BANDWIDTH; MASK B; (AUDIO MODULATION: 2500 Hz)} | 17 |
| PLOT 6-2: | OCCUPIED BANDWIDTH {12.5 kHz CH. BANDWIDTH; MASK D; (AUDIO MODULATION: 2500 Hz)} | 18 |
| PLOT 6-3: | OCCUPIED BANDWIDTH {25 kHz CHANNEL BANDWIDTH; MASK C; (2 LEVEL DIGITAL MODULATION)} | 19 |
| PLOT 6-4: | OCCUPIED BANDWIDTH {12.5 kHz CHANNEL SPACING; MASK D; (2 LEVEL DIGITAL MODULATION)} | 20 |
| PLOT 6-5: | OCCUPIED BANDWIDTH; MASK D (C4FM DIGITAL MODULATION) | 21 |
| PLOT 7-1: | TEMPERATURE FREQUENCY STABILITY | 22 |
| PLOT 7-2: | VOLTAGE FREQUENCY STABILITY | 24 |
| PLOT 8-1: | MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE | 26 |
| PLOT 9-1: | MODULATION CHARACTERISTICS – AUDIO LOW PASS FILTER RESPONSE | 27 |
| PLOT 10-1: | MODULATION CHARACTERISTICS – MODULATION LIMITING: WIDE BAND POSITIVE PEAK | 28 |
| PLOT 10-2: | MODULATION CHARACTERISTICS – MODULATION LIMITING: WIDE BAND NEGATIVE PEAK | 29 |
| PLOT 10-3: | MODULATION CHARACTERISTICS – MODULATION LIMITING: NARROW BAND POSITIVE PEAK | 30 |
| PLOT 10-4: | MODULATION CHARACTERISTICS – MODULATION LIMITING: NARROW BAND NEGATIVE PEAK | 31 |
| PLOT 11-1: | TRANSIENT FREQUENCY BEHAVIOR – 152.025 MHZ; WIDE BAND; CARRIER ON TIME | 32 |
| PLOT 11-2: | TRANSIENT FREQUENCY BEHAVIOR – 15.2025 MHZ; WIDE BAND; CARRIER OFF TIME | 33 |
| PLOT 11-3: | TRANSIENT FREQUENCY BEHAVIOR – 152.025 MHZ; NARROW BAND; CARRIER ON TIME | 34 |
| PLOT 11-4: | TRANSIENT FREQUENCY BEHAVIOR – 152.025 MHZ; NARROW BAND; CARRIER OFF TIME | 35 |
| PLOT 12-1: | 26 dB EMISSION BANDWIDTH; WIDEBAND 2 LEVEL DIGITAL MODULATION; 12.75 kHz | 38 |
| PLOT 12-2: | 26 dB EMISSION BANDWIDTH; NARROWBAND 2 LEVEL DIGITAL MODULATION; 8.5 kHz | 39 |
| PLOT 12-3: | 26 dB EMISSION BANDWIDTH; C4FM DIGITAL MODULATION; 9.25 kHz | 40 |

TABLE OF FIGURES

| | | |
|-------------|-------------------------------------|---|
| FIGURE 1-1: | CONFIGURATION OF TESTED SYSTEM..... | 8 |
|-------------|-------------------------------------|---|

TABLE OF APPENDICES

| | | |
|-------------|---|----|
| APPENDIX A: | FCC PART 1.1307, 1.1310, 2.1091, 2.1093; IC RSS-119 §9.0: RF EXPOSURE | 42 |
| APPENDIX B: | PRODUCT DESCRIPTION..... | 43 |
| APPENDIX C: | LABEL INFORMATION | 44 |
| APPENDIX D: | PARTS LIST..... | 45 |
| APPENDIX E: | SCHEMATICS..... | 46 |
| APPENDIX F: | BLOCK DIAGRAM | 47 |
| APPENDIX G: | MANUAL | 48 |
| APPENDIX H: | TEST CONFIGURATION PHOTOGRAPHS | 49 |
| APPENDIX I: | EXTERNAL PHOTOGRAPHS | 51 |
| APPENDIX J: | INTERNAL PHOTOGRAPHS | 54 |

TABLE OF PHOTOGRAPHS

| | | |
|----------------|---------------------------------------|----|
| PHOTOGRAPH 1: | RADIATED EMISSIONS FRONT VIEW | 49 |
| PHOTOGRAPH 2: | RADIATED EMISSIONS REAR VIEW | 50 |
| PHOTOGRAPH 3: | MASTR III FRONT VIEW | 51 |
| PHOTOGRAPH 4: | MASTR III BACK TOP | 52 |
| PHOTOGRAPH 5: | MASTR III SIDE TOP | 53 |
| PHOTOGRAPH 6: | BACK PLANE TOP | 54 |
| PHOTOGRAPH 7: | BACK PLANE BOTTOM | 55 |
| PHOTOGRAPH 8: | DSP | 56 |
| PHOTOGRAPH 9: | DSP BOARD TOP | 57 |
| PHOTOGRAPH 10: | DSP BOARD BOTTOM | 58 |
| PHOTOGRAPH 11: | INTERFACE BOARD TOP | 59 |
| PHOTOGRAPH 12: | INTERFACE BOARD BOTTOM | 60 |
| PHOTOGRAPH 13: | VHF PA | 61 |
| PHOTOGRAPH 14: | VHF PA INPUT | 62 |
| PHOTOGRAPH 15: | VHF PA OUTPUT | 63 |
| PHOTOGRAPH 16: | VHF PA FINALS | 64 |
| PHOTOGRAPH 17: | PA BOARDS MOUNTED IN CHASSIS | 65 |
| PHOTOGRAPH 18: | VHF PA PCB #1 TOP | 66 |
| PHOTOGRAPH 19: | VHF PA PCB#1 BOTTOM | 67 |
| PHOTOGRAPH 20: | VHF PA PCB #2 TOP | 68 |
| PHOTOGRAPH 21: | VHF PA PCB #2 BOTTOM | 69 |
| PHOTOGRAPH 22: | VHF PA PCB #3 TOP | 70 |
| PHOTOGRAPH 23: | VHF PA PCB #3 BOTTOM | 71 |
| PHOTOGRAPH 24: | VHF PA PCB #4 TOP | 72 |
| PHOTOGRAPH 25: | VHF PA PCB #4 BOTTOM | 73 |
| PHOTOGRAPH 26: | VHF PA PCB #5 TOP | 74 |
| PHOTOGRAPH 27: | VHF PA PCB #5 BOTTOM | 75 |
| PHOTOGRAPH 28: | SYSTEM MODULE | 76 |
| PHOTOGRAPH 29: | SYSTEM MODULE COVER REMOVED | 77 |
| PHOTOGRAPH 30: | SYSTEM MODULE MAIN BOARD TOP | 78 |
| PHOTOGRAPH 31: | SYSTEM MODULE MAIN BOARD BOTTOM | 79 |
| PHOTOGRAPH 32: | SYSTEM MODULE, DSP BOARD TOP | 80 |
| PHOTOGRAPH 33: | SYSTEM MODULE, DSP BOTTOM | 81 |
| PHOTOGRAPH 34: | POWER MODULE | 82 |
| PHOTOGRAPH 35: | POWER MODULE BOARD TOP | 83 |
| PHOTOGRAPH 36: | POWER MODULE BOARD BOTTOM | 84 |
| PHOTOGRAPH 37: | RX FRONT END | 85 |
| PHOTOGRAPH 38: | RX FRONT END BOARD TOP | 86 |
| PHOTOGRAPH 39: | RX FRONT END BOARD BOTTOM | 87 |
| PHOTOGRAPH 40: | RX IF | 88 |
| PHOTOGRAPH 41: | RX IF BOARD TOP | 89 |
| PHOTOGRAPH 42: | RX IF BOARD BOTTOM | 90 |
| PHOTOGRAPH 43: | RX SYNTH | 91 |
| PHOTOGRAPH 44: | RX SYNTH VCO | 92 |
| PHOTOGRAPH 45: | RX SYNTH BOARD TOP | 93 |
| PHOTOGRAPH 46: | RX SYNTH BOARD BOTTOM | 94 |
| PHOTOGRAPH 47: | TX SYNTH | 95 |
| PHOTOGRAPH 48: | TX SYNTH VCO | 96 |
| PHOTOGRAPH 49: | TX SYNTH BOARD TOP | 97 |
| PHOTOGRAPH 50: | TX SYNTH BOARD BOTTOM | 98 |

1 GENERAL INFORMATION

The following Report of a Type Certification is prepared on behalf of **M/A COM, Inc.** in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the **MASTRIII VHF Basestation with Sitepro; FCC ID: OWDTR-0017-E**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47, Industry Canada RSS-119, and ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

1.1 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report dated March 3, 1994, submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

1.2 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application report.

1.3 CONFORMANCE STATEMENT

| STANDARDS REFERENCED FOR THIS REPORT | |
|--------------------------------------|---|
| PART 2: 1999 | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS |
| PART 22: 2001 | PUBLIC MOBILE SERVICES |
| PART 74: 2001 | EXPERIMENTAL RADIO AUXILLARY, SPECIAL BROADCAST AND OTHER PROGRAM DISTRIBUTIONAL SERVICES |
| PART 80: 2001 | STATIONS IN THE MARITIME SERVICES |
| PART 90: 1998 | PRIVATE LAND MOBILE RADIO SERVICES |
| ANSI C63.4-1992 | STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS |
| ANSI/TIA/EIA603- 1992 | LAND MOBILE FM OR PM COMMUNICATIONS EQUIPMENT MEASUREMENT AND PERFORMANCE STANDARDS |
| ANSI/TIA/EIA 603-1-1998 | ADDENDUM TO ANSI/TIA/EIA 603-1992 |
| ANSI/TIA/EIA -102.CAAA; 1999 | DIGITAL C4FM/CQPSK TRANSCEIVER MEASUREMENT METHODS |
| RSS-119; Issue 6; 2000 | LAND MOBILE AND FIXED RADIO TRANSMITTERS AND RECEIVERS 27.41 TO 960.0 MHz |

| Frequency Range | Output Power (W) Conducted | Frequency Tolerance (ppm) | Emission Designator |
|-----------------|----------------------------|---------------------------|---------------------|
| 136-174 MHz | 10-110 | 1.1 | 16K0F3E |
| 136-174 MHz | 10-110 | 1.1 | 11K0F3E |
| 136-174 MHz | 10-110 | 1.1 | 15K6F1D |
| 136-174 MHz | 10-110 | 1.1 | 15K6F1E |
| 136-174 MHz | 10-110 | 1.1 | 9K25F1D |
| 136-174 MHz | 10-110 | 1.1 | 9K25F1E |
| 136-174 MHz | 10-110 | 1.1 | 8K50F1D |
| 136-174 MHz | 10-110 | 1.1 | 8K50F1E |

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to or exclusions from the above standards for Certification methodology.

Signature: 

Date: February 5, 2003

Typed/Printed Name: Desmond A. Fraser


Position: President

Signature: 

Date: February 5, 2003

Typed/Printed Name: Daniel W. Baltzell

Position: Test Engineer

 Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 200061-0.

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

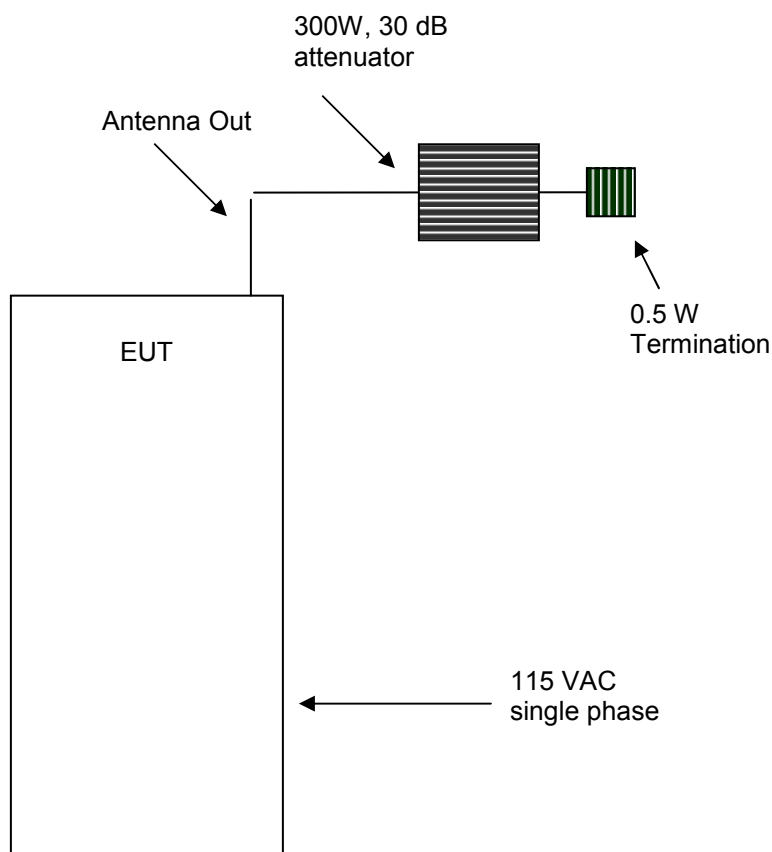
1.4 TESTED SYSTEM DETAILS

Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

TABLE 1-1: EQUIPMENT UNDER TEST (EUT)

| Part | Manufacturer | Model | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|----------------------------------|---------------|-------|---------------|--------------|-------------------|--------------|
| MASRTIII/SITEPRO VHF BASESTATION | M/A-COM, INC. | N/A | N/A | OWDTR-0017-E | N/A | 14605 |
| MASRTIII/SITEPRO VHF BASESTATION | M/A-COM, INC. | N/A | N/A | OWDTR-0017-E | N/A | 14999 |

FIGURE 1-1: CONFIGURATION OF TESTED SYSTEM



2 RADIATED EMISSIONS

2.1 RADIATED MEASUREMENT

Final radiated emissions measurements were made on the three-meter, open-field test site. The EUT was placed on a nonconductive turntable at ground plane level.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

3 FCC RULES AND REGULATIONS PART 2 §2.1046 (A); IC RSS-119 §6.2: RF POWER OUTPUT: CONDUCTED

3.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50Ω load impedance.

3.2 TEST DATA

The following channels (in MHz) were tested: 136.025, 150.025, and 172.975.

TABLE 3-1: RF POWER OUTPUT: CARRIER OUTPUT POWER

| Channel | Frequency (MHz) | RF Power measured (Watt)* |
|---------|-----------------|---------------------------|
| 1 | 136.025 | 110 |
| 2 | 152.025 | 110 |
| 3 | 172.975 | 110 |


* MEASUREMENT ACCURACY: +/- 3%

TABLE 3-2: RF POWER OUTPUT (RATED POWER)

| Rated Power (W) |
|-----------------|
| 110.0 |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER



 SIGNATURE

FEBRUARY 3, 2003
 DATE OF TEST

TABLE 3-3: TEST EQUIPMENT USED FOR TESTING (RF POWER OUTPUT - CONDUCTED)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|----------------------|---------------------|-----------------------------------|---------------|----------------------|
| 901184 | Agilent Technologies | E4416A | EPM-P Power Meter, single channel | GB41050573 | 7/19/03 |
| 901118 | Hewlett Packard | 8901A Opt. 002-003 | Modulation Analyzer | 2406A00178 | 06/14/03 |
| 901186 | Agilent Technologies | E9323A (50MHz-6GHz) | Peak & Avg. Power Sensor | US40410380 | 7/19/03 |
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator | 2514A02585 | 07/31/03 |
| 901228 | Pasternack | PE7031-30 | 300W 30 dB Attenuator | DC 1 GHz | Not Required |
| 901140 | Weinschel Corp. | 47-10-34 DC-18GHz | Attenuator, 50W 10dB | BK6203 | Not Required |

4 FCC RULES AND REGULATIONS PART 2 §2.1051; IC RSS-119 §6.3: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

4.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, Section 2.2.13

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.

The transmitter is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1000 Hz.

Digital Modulation: Modulated to its maximum extent using a pseudo random data sequence - 9600bps

4.2 TEST DATA

Frequency range of measurement per Part 2.1057: 9kHz to 10 x Fc

Limits: Mask D (dBm): $P(\text{dBm}) - (50 + 10 \times \text{LOG } P(\text{W}))$

The following channels (in MHz) were investigated: 136.025, 150.675, and 172.975MHz. The worse case (unwanted emissions) channels are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

TABLE 4-1: CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 – 136.025 MHZ

(136.025MHz); 12.5kHz channel spacing; Mask D; Conducted power = 110 W

| Frequency (MHz) | Spectrum Analyzer Level (dBm) | Notch Filter Insertion Loss (dB) | Level (dBc) | Limit (dBc) | Margin(dB) |
|-----------------|-------------------------------|----------------------------------|-------------|-------------|------------|
| 272.050 | -63.6 | 1.2 | 112.8 | 70.4 | -42.4 |
| 408.075 | -49.5 | 1.2 | 98.7 | 70.4 | -28.3 |
| 544.100 | -70.5 | 1.4 | 119.5 | 70.4 | -49.1 |
| 680.125 | -70.4 | 1.6 | 119.2 | 70.4 | -48.8 |
| 816.150 | -70.5 | 2.1 | 118.8 | 70.4 | -48.4 |
| 952.175 | -70.8 | 2.9 | 118.3 | 70.4 | -47.9 |
| 1088.200 | -71.2 | 3.1 | 118.5 | 70.4 | -48.1 |
| 1224.225 | -48.5 | 4.9 | 94.0 | 70.4 | -23.6 |
| 1360.250 | -67.5 | 20.4 | 97.5 | 70.4 | -27.1 |

TABLE 4-2: CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 152.025 MHZ

(152.025MHz); 12.5kHz channel spacing; Mask D; Conducted power = 110 W

| Frequency (MHz) | Spectrum Analyzer Level (dBm) | Notch Filter Insertion Loss (dB) | Level (dBc) | Limit (dBc) | Margin(dB) |
|-----------------|-------------------------------|----------------------------------|-------------|-------------|------------|
| 304.050 | -60.1 | 0.9 | 109.6 | 70.4 | -39.2 |
| 456.075 | -50.1 | 1.3 | 99.2 | 70.4 | -28.8 |
| 608.100 | -70.6 | 1.7 | 119.3 | 70.4 | -48.9 |
| 760.125 | -68.2 | 2.1 | 116.5 | 70.4 | -46.1 |
| 912.150 | -69.7 | 21.8 | 98.3 | 70.4 | -27.9 |
| 1064.175 | -69.9 | 3.9 | 116.4 | 70.4 | -46.0 |
| 1216.200 | -66.2 | 4.7 | 111.9 | 70.4 | -41.5 |
| 1368.225 | -69.4 | 21.0 | 98.8 | 70.4 | -28.4 |
| 1520.250 | -69.9 | 8.3 | 112.0 | 70.4 | -41.6 |

TABLE 4-3: CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 152.025 MHZ

(152.025MHz); 12.5kHz channel spacing; Mask D; Conducted power = 55 W (mid-power)

| Frequency (MHz) | Spectrum Analyzer Level (dBm) | Notch Filter Insertion Loss (dB) | Level (dBc) | Limit (dBc) | Margin(dB) |
|-----------------|-------------------------------|----------------------------------|-------------|-------------|------------|
| 304.050 | -51.2 | 0.9 | 97.7 | 67.4 | -30.3 |
| z456.075 | -41.7 | 1.3 | 87.8 | 67.4 | -20.4 |
| 608.100 | -81.7 | 1.7 | 127.4 | 67.4 | -60.0 |
| 760.125 | -68.4 | 2.1 | 113.7 | 67.4 | -46.3 |
| 912.150 | -89.8 | 21.8 | 115.4 | 67.4 | -48.0 |
| 1064.175 | -81.6 | 3.9 | 125.1 | 67.4 | -57.7 |
| 1216.200 | -71.1 | 4.7 | 113.8 | 67.4 | -46.4 |
| 1368.225 | -89.3 | 21.0 | 115.7 | 67.4 | -48.3 |
| 1520.250 | -89.2 | 8.3 | 128.3 | 67.4 | -60.9 |

TABLE 4-4: CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 152.025 MHZ

(152.025MHz); 12.5kHz channel spacing; Mask D; Conducted power = 10 W (low power)

| Frequency (MHz) | Spectrum Analyzer Level (dBm) | Notch Filter Insertion Loss (dB) | Level (dBc) | Limit (dBc) | Margin(dB) |
|-----------------|-------------------------------|----------------------------------|-------------|-------------|------------|
| 304.050 | -50.0 | 0.9 | 89.1 | 60.0 | -29.1 |
| 456.075 | -51.7 | 1.3 | 90.4 | 60.0 | -30.4 |
| 608.100 | -80.4 | 1.7 | 118.7 | 60.0 | -58.7 |
| 760.125 | -73.6 | 2.1 | 111.5 | 60.0 | -51.5 |
| 912.150 | -79.6 | 21.8 | 97.8 | 60.0 | -37.8 |
| 1064.175 | -81.4 | 3.9 | 117.5 | 60.0 | -57.5 |
| 1216.200 | -86.3 | 4.7 | 121.6 | 60.0 | -61.6 |
| 1368.225 | -90.2 | 21.0 | 109.2 | 60.0 | -49.2 |
| 1520.250 | -88.7 | 8.3 | 120.4 | 60.0 | -60.4 |

TABLE 4-5: CONDUCTED SPURIOUS EMISSIONS CHANNEL 3 – 172.975 MHZ

(172.975MHzMHz); 12.5kHz channel spacing; Mask D; Conducted power = 110 W

| Frequency (MHz) | Spectrum Analyzer Level (dBm) | Notch Filter Insertion Loss (dB) | Level (dBc) | Limit (dBc) | Margin(dB) |
|-----------------|-------------------------------|----------------------------------|-------------|-------------|------------|
| 345.950 | -92.1 | 38.1 | 104.4 | 70.4 | -34.0 |
| 518.925 | -86.6 | 30.6 | 106.4 | 70.4 | -36.0 |
| 691.900 | -99.9 | 30.9 | 119.4 | 70.4 | -49.0 |
| 864.875 | -92.2 | 30.6 | 112.0 | 70.4 | -41.6 |
| 1037.850 | -99.7 | 27.6 | 122.5 | 70.4 | -52.1 |
| 1210.825 | -96.9 | 29.3 | 118.0 | 70.4 | -47.6 |
| 1383.800 | -98.5 | 43.7 | 105.2 | 70.4 | -34.8 |
| 1556.775 | -98.6 | 23.1 | 125.9 | 70.4 | -55.5 |
| 1729.750 | -99.8 | 34.0 | 116.2 | 70.4 | -45.8 |

TABLE 4-6: TEST EQUIPMENT USED FOR TESTING (CONDUCTED SPURIOUS EMISSIONS)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|-------------------|--------------------------------------|---------------|----------------------|
| 900931 | Hewlett Packard | 8566B | Spectrum Analyzer (100 Hz - 22 GHz) | 3138A07771 | 5/10/03 |
| 900930 | Hewlett Packard | 85662A | Spectrum Analyzer Display Section | 3144A20839 | 5/10/03 |
| 900969 | Hewlett Packard | 85650A | Quasi-Peak Adapter | 2412A00414 | 5/10/03 |
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator | 2514A02585 | 07/31/03 |
| 901129 | Par Electronics | 118-174 (25W) | VHF Notch Filters | N/A | Not Required |
| 901228 | Pasternack | PE7031-30 | 300W dBi Attenuator | DC 1 GHz | Not Required |
| 900928 | Hewlett Packard | 83752A | Synthesized Sweeper (0.01 to 20 GHz) | 3610A00866 | 06/19/03 |
| 901140 | Weinschel Corp. | 47-10-34 DC-18GHz | Attenuator, 50W 10dB | BK6203 | Not Required |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER



 SIGNATURE

FEBRUARY 3, 2003
 DATE OF TEST

5 FCC RULES AND REGULATIONS PART 2 §2.1053 (A) ; IC RSS-119 §6.3: FIELD STRENGTH OF SPURIOUS RADIATION

5.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.12

Analog Modulation: The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1000 Hz.

Digital Modulation: Modulated to its maximum extent using a pseudo random data sequence - 9600bps

The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator and the gain of the antenna was further corrected to a half wave dipole.

5.2 TEST DATA

5.2.1 CFR 47 PART 90.210 REQUIREMENTS

The worst-case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

TABLE 5-1: FIELD STRENGTH OF SPURIOUS RADIATION – MID CHANNEL (152.025 MHZ)

(152.025 MHz) 12.5k channel spacing; Conducted power = 110W; Limit (50+10LogP)= -20 dBm or 70.4 dBc (Mask D)

| Frequency (MHz) | S/G level (dBm) | Cable Loss* (dB) | Difference in gain (ref. To 1/2 wave dipole) | Emission level (dBc) | Margin (dB) |
|-----------------|-----------------|------------------|--|----------------------|-------------|
| 304.050 | -71.4 | 0.2 | -0.7 | 122.3 | -51.9 |
| 456.075 | -65.1 | 0.3 | -0.6 | 116.0 | -45.6 |
| 608.100 | -63.6 | 0.3 | -1.2 | 115.1 | -44.7 |
| 760.125 | -66.0 | 0.4 | -1.2 | 117.6 | -47.2 |
| 912.150 | -64.1 | 0.4 | -1.1 | 115.6 | -45.2 |
| 1064.175 | -57.3 | 0.4 | 0.4 | 107.3 | -36.9 |
| 1216.200 | -57.8 | 0.4 | 1.8 | 106.4 | -36.0 |
| 1368.225 | -58.1 | 0.5 | 3.3 | 105.3 | -34.9 |
| 1520.250 | -56.4 | 0.5 | 4.7 | 102.3 | -31.9 |


*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

TABLE 5-2: TEST EQUIPMENT USED FOR TESTING (FIELD STRENGTH OF SPURIOUS RADIATION)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|------------------------|----------------|--|---------------|----------------------|
| 901053 | Schaffner Chase | CBL6112B | Bi-Log Antenna (20 MHz - 2 GHz) | 2648 | 6/17/03 |
| 900905 | Rhein Tech Labs | PR-1040 | Amplifier | 900905 | N/A |
| 900931 | Hewlett Packard | 8566B | Spectrum Analyzer (100 Hz - 22 GHz) | 3138A07771 | 5/10/03 |
| 900930 | Hewlett Packard | 85662A | Spectrum Analyzer Display Section | 3144A20839 | 5/10/03 |
| 900969 | Hewlett Packard | 85650A | Quasi-Peak Adapter | 2412A00414 | 5/10/03 |
| 900917 | Hewlett Packard | 8648C | Synthesized. Signal Generator (9 KHz to 3200 MHz) | 3537A01741 | 04/19/03 |
| 900928 | Hewlett Packard | 83752A | Synthesized Sweeper (0.01 to 20 GHz) | 3610A00866 | 06/19/03 |
| 900154 | Compliance Design Inc. | Roberts Dipole | Adjustable Elements Dipole Antenna (30-1000 MHz) | N/A | 9/16/03 |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER



 SIGNATURE

FEBRUARY 3, 2003
 DATE OF TEST

6 FCC RULES AND REGULATIONS PART 2 §2.1049 (C) (1) ; IC RSS-119 §6.4: OCCUPIED BANDWIDTH

OCCUPIED BANDWIDTH - COMPLIANCE WITH THE EMISSION MASKS

6.1 TEST PROCEDURE

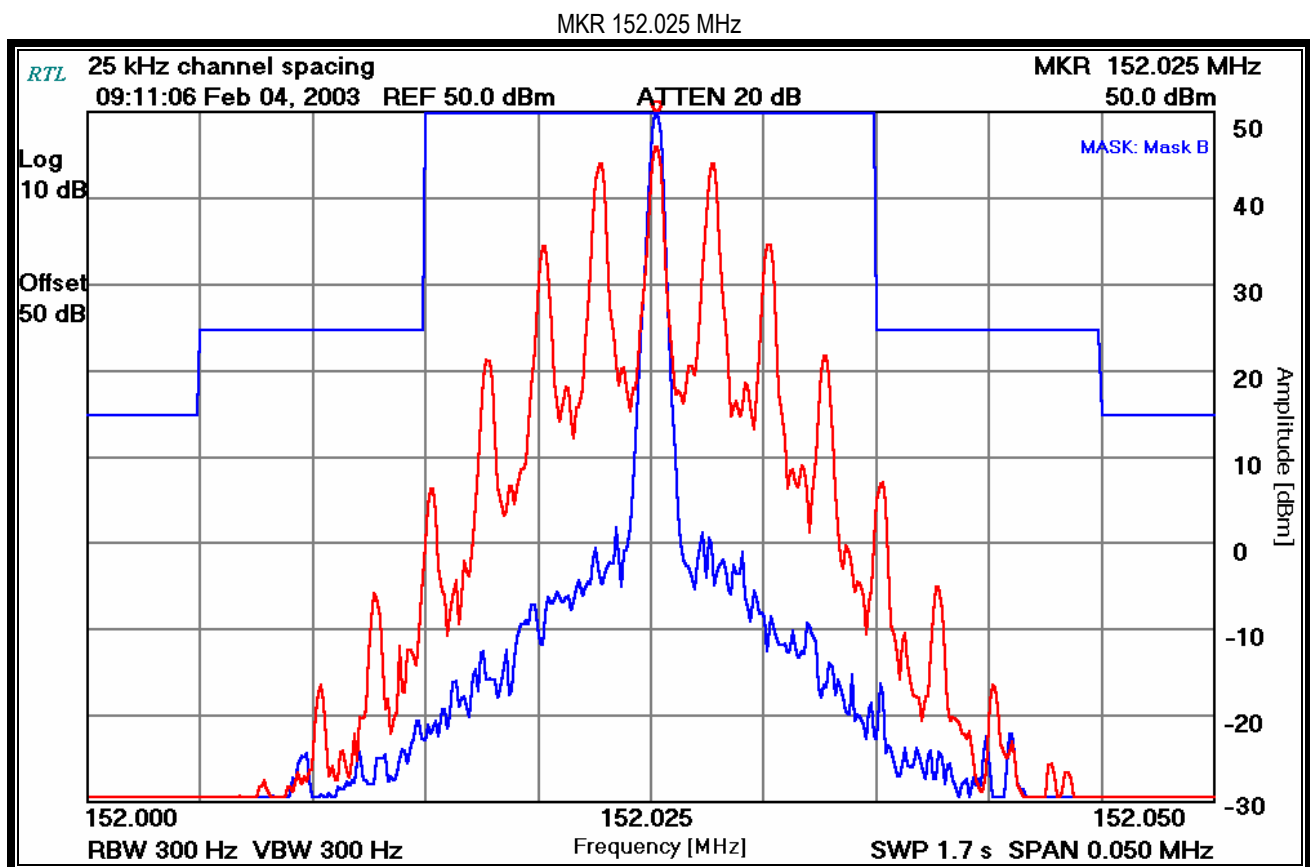
ANSI/TIA/EIA-603-1992, section 2.2.11 and TIA/EIA-102.CAAA-1999 section 2.2.5

Device with audio modulation: Transmitter is modulated with a 2500 Hz sine wave at an input level of 16 dB greater than that required to produce 50% of rated system deviation at 1000 Hz.

Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence - 9600bps

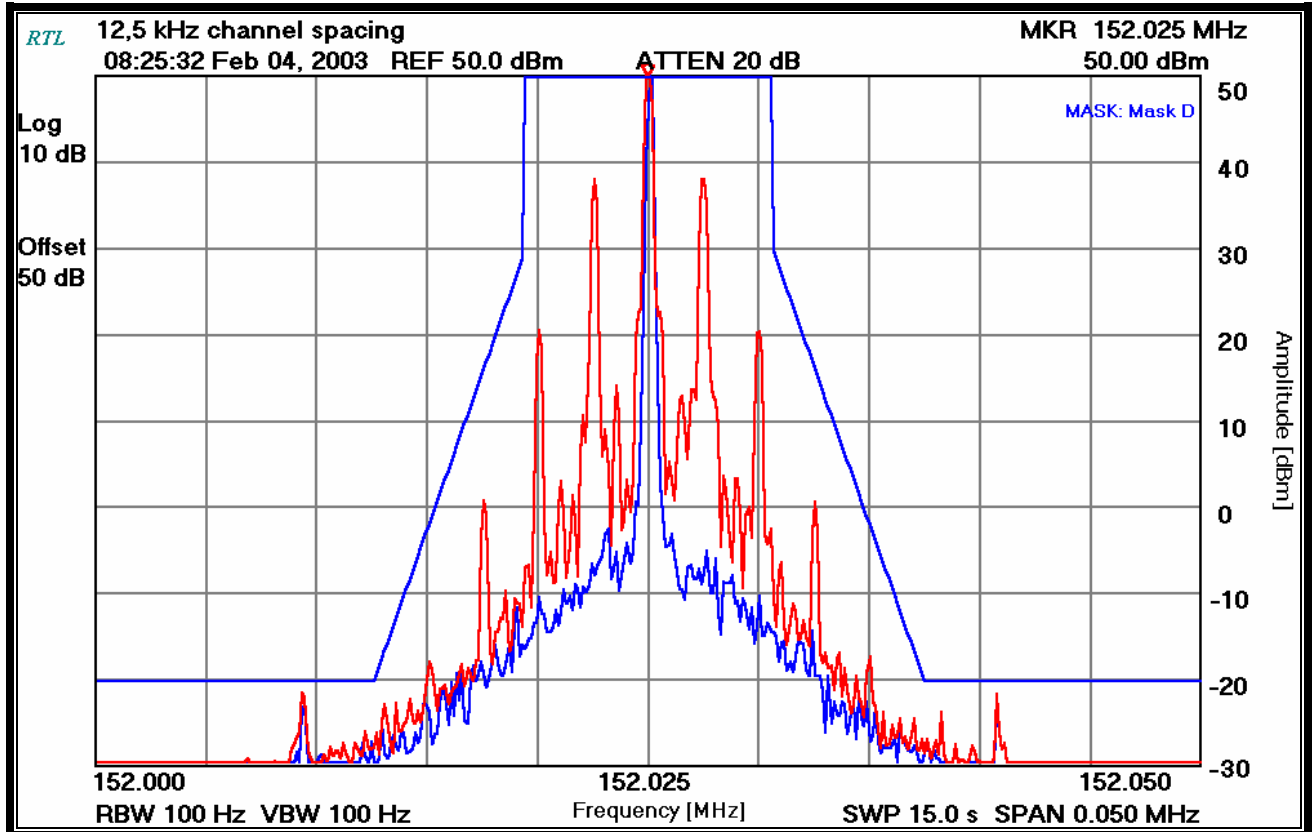
6.2 TEST DATA

PLOT 6-1: OCCUPIED BANDWIDTH {25 KHZ CHANNEL BANDWIDTH; MASK B; (AUDIO MODULATION: 2500 HZ)}

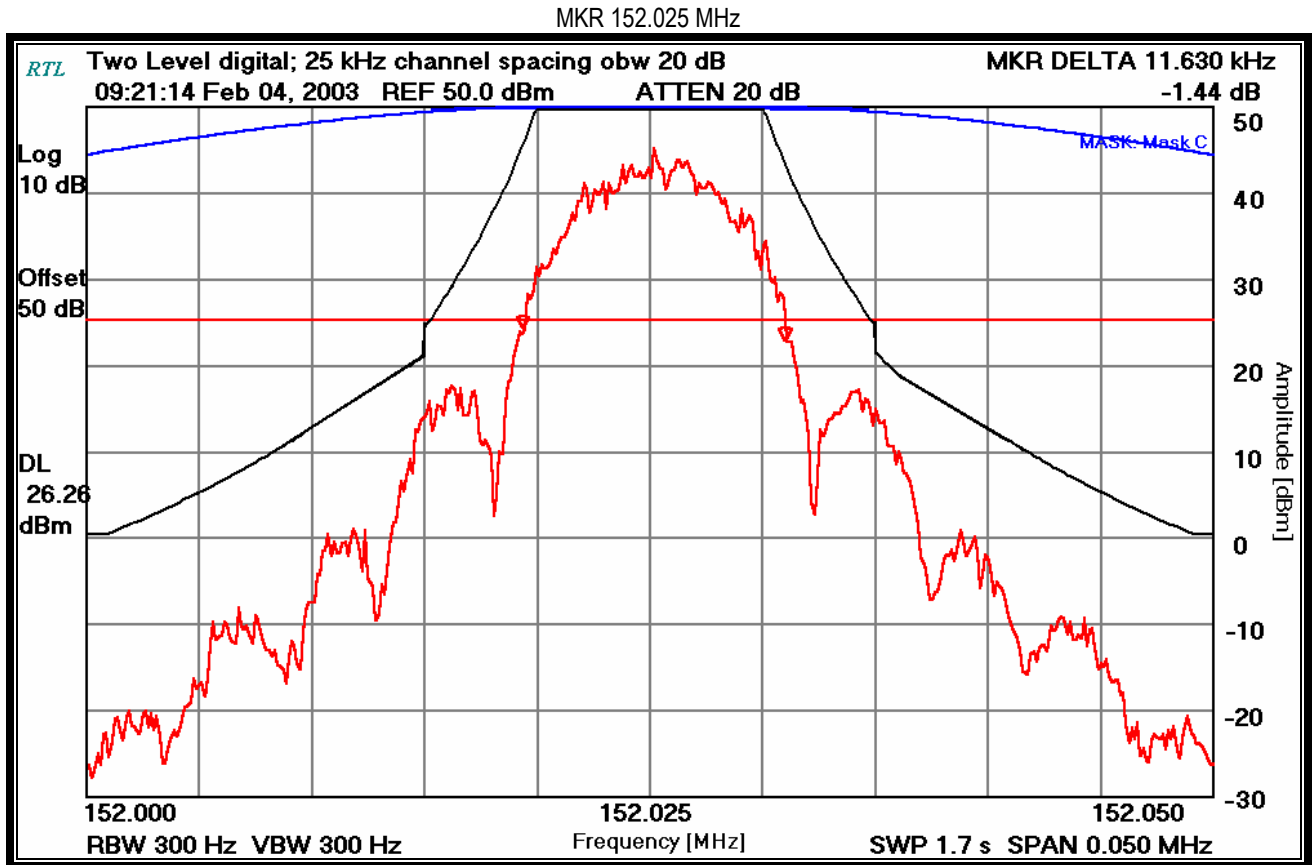


PLOT 6-2: OCCUPIED BANDWIDTH {12.5 KHZ CH. BANDWIDTH; MASK D; (AUDIO MODULATION: 2500 HZ)}

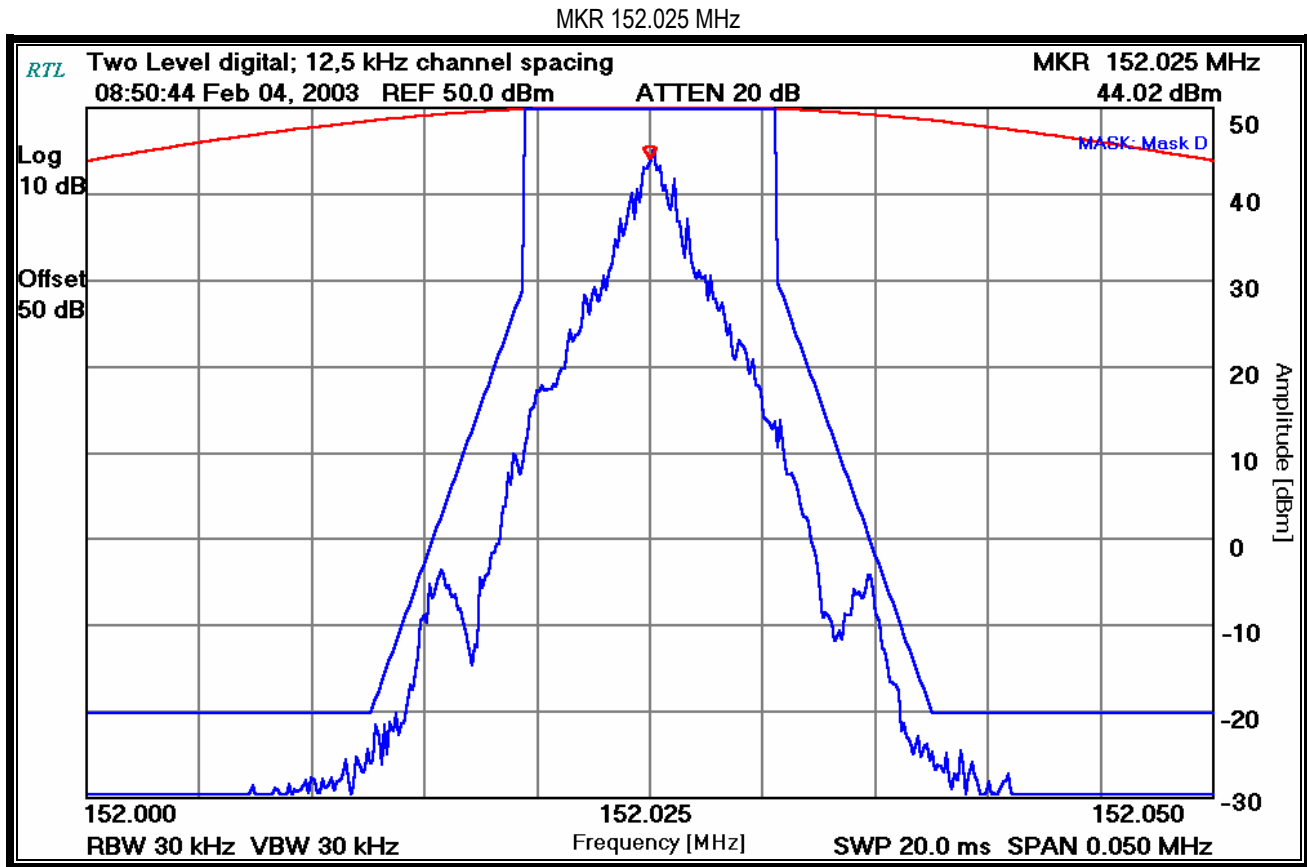
MKR 152.025 MHz



PLOT 6-3: OCCUPIED BANDWIDTH {25 KHZ CHANNEL BANDWIDTH; MASK C; (2 LEVEL DIGITAL MODULATION)}



PLOT 6-4: OCCUPIED BANDWIDTH {12.5 KHZ CHANNEL SPACING; MASK D; (2 LEVEL DIGITAL MODULATION)}



PLOT 6-5: OCCUPIED BANDWIDTH; MASK D (C4FM DIGITAL MODULATION)

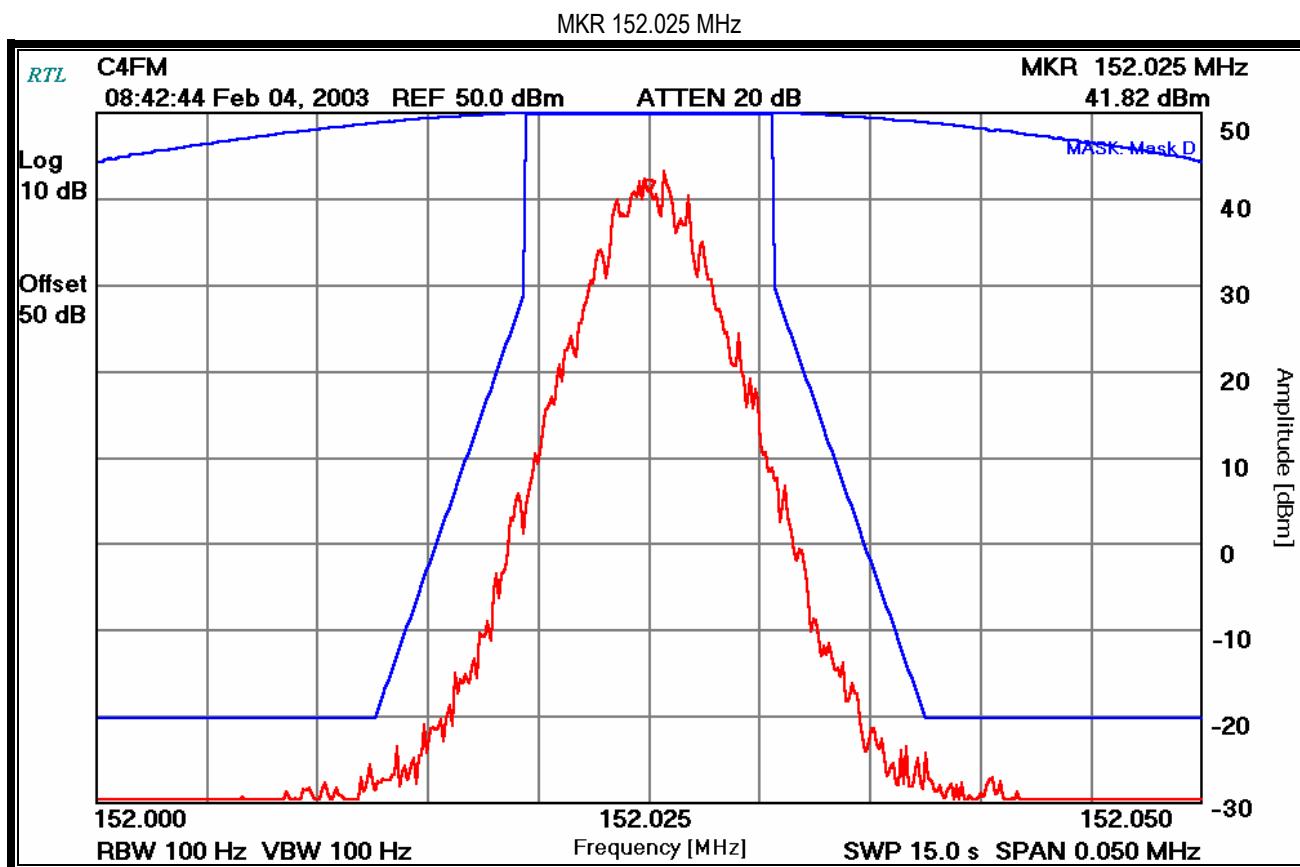



TABLE 6-1: TEST EQUIPMENT USED FOR TESTING (OCCUPIED BANDWIDTH)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|-----------------------|-----------------------------|---------------|----------------------|
| 901215 | Hewlett Packard | 8596EM (9kHz-12.8GHz) | EMC Analyzer | 3826A00144 | 8/23/03 |
| 901228 | Pasternack | PE7031-30 | 300W 30dB Attenuator | DC 1 GHz | Not Required |
| 901139 | Weinschel Corp. | 48-20-34 DC-18GHz | Attenuator, 100W 20dB | BK5859 | Not Required |
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator | 2514A02585 | 07/31/03 |
| 901055 | Hewlett Packard | 8901A Opt. 002-003 | Modulation Analyzer | 2545A04102 | 06/14/03 |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER



 SIGNATURE

FEBRUARY 4, 2003
 DATE OF TEST

7 FCC RULES AND REGULATION PART 2 §2.1055; IC RSS-119 §7.0: FREQUENCY STABILITY

7.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +50°C.

The temperature was initially set to -30°C and a 2-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½ an hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied from 85% to 115% of the nominal voltage.

The worst-case test data are shown.

7.2 TEST DATA

7.2.1 FREQUENCY STABILITY/TEMPERATURE VARIATION

Limit is 2.5 ppm for device with a 12.5 kHz channel bandwidth. Worst case deviation was found to be 1.07 ppm at -30°C.

PLOT 7-1: TEMPERATURE FREQUENCY STABILITY

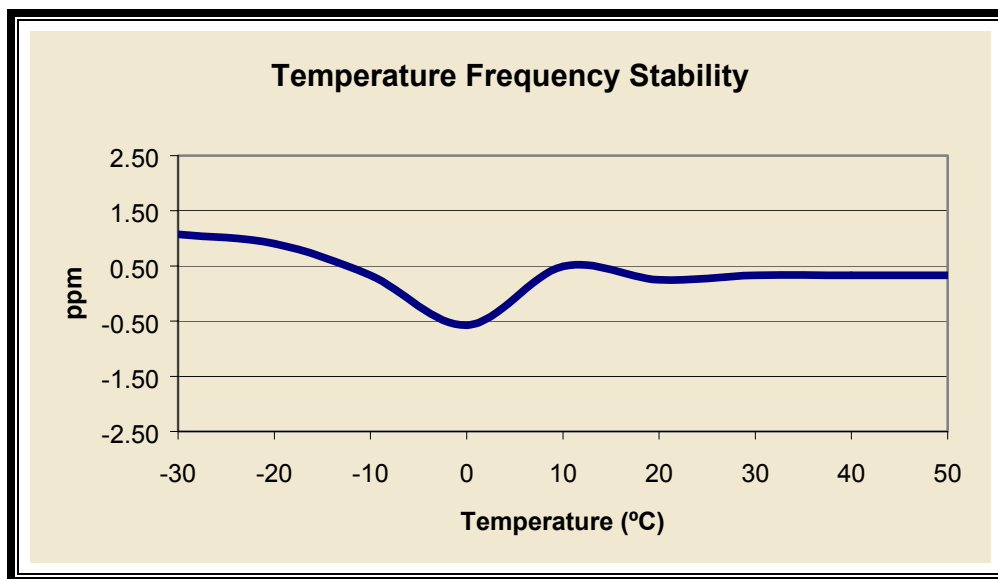


TABLE 7-1: FREQUENCY TEMPERATURE STABILITY; 152.025 MHZ

| Temperature (°C) | Measured Frequency (MHz) | ppm |
|------------------|--------------------------|-------|
| -30 | 152.025163 | 1.07 |
| -20 | 152.025138 | 0.91 |
| -10 | 152.025050 | 0.33 |
| 0 | 152.024913 | -0.57 |
| 10 | 152.025075 | 0.49 |
| 20 | 152.025038 | 0.25 |
| 30 | 152.025050 | 0.33 |
| 40 | 152.025050 | 0.33 |
| 50 | 152.025050 | 0.33 |

TABLE 7-2: TEST EQUIPMENT USED FOR TESTING (FREQUENCY STABILITY/TEMPERATURE)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|--------------------------|-----------------------|-----------------------|---------------|----------------------|
| 900946 | Tenney Engineering, Inc. | TH65 | Temperature Chamber | 11380 | 02/04/03 |
| 901215 | Hewlett Packard | 8596EM (9kHz-12.8GHz) | EMC Analyzer | 3826A00144 | 8/23/03 |
| 901228 | Pasternack | PE7031-30 | 300W 30 dB Attenuator | DC 1 GHz | Not Required |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER



SIGNATURE

FEBRUARY 5, 2003
 DATE OF TEST

7.2.2 FREQUENCY STABILITY/VOLTAGE VARIATION

Worst case deviation was found to be at 102VAC and 138VAC.

PLOT 7-2: VOLTAGE FREQUENCY STABILITY

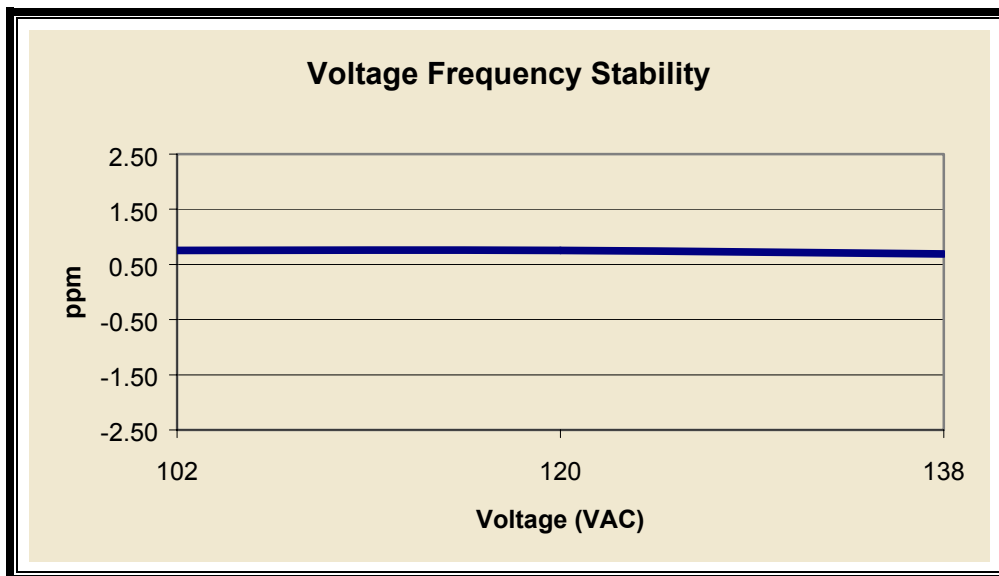


TABLE 7-3: FREQUENCY STABILITY/VOLTAGE VARIATION

Channel 2, 152.025 MHz was measured and found to be as follows:


| Voltage (VAC) | Measured Frequency (MHz) | ppm |
|---------------|--------------------------|------|
| 102 | 152.025115 | 0.76 |
| 120 | 152.025115 | 0.76 |
| 138 | 152.025105 | 0.69 |

TABLE 7-4: TEST EQUIPMENT USED FOR TESTING (FREQUENCY STABILITY/VOLTAGE)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|-----------------------|-----------------------|---------------|----------------------|
| 901215 | Hewlett Packard | 8596EM (9kHz-12.8GHz) | EMC Analyzer | 3826A00144 | 8/23/03 |
| 901228 | Pasternack | PE7031-30 | 300W 30 dB Attenuator | DC 1 GHz | Not Required |
| 901014 | Kikusui | PCR4000L | Power Supply | DB001921 | Not Required |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER


 SIGNATURE

FEBRUARY 5, 2003
 DATE OF TEST

8 FCC PART 2 §2.1047 (A): MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE

8.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.6

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The input audio level at 1000 Hz is set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference level, noted DEVref.

The audio signal generator was varied from 100Hz to 5kHz with the input level held constant.

The deviation in kHz was recorded using a modulation analyzer as DEVfreq.

The response in dB relative to 1 kHz was calculated as follows:

Audio Frequency Response = $20 \text{ LOG } (\text{DEVfreq}/\text{DEVref})$

8.2 TEST DATA

PLOT 8-1: MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE

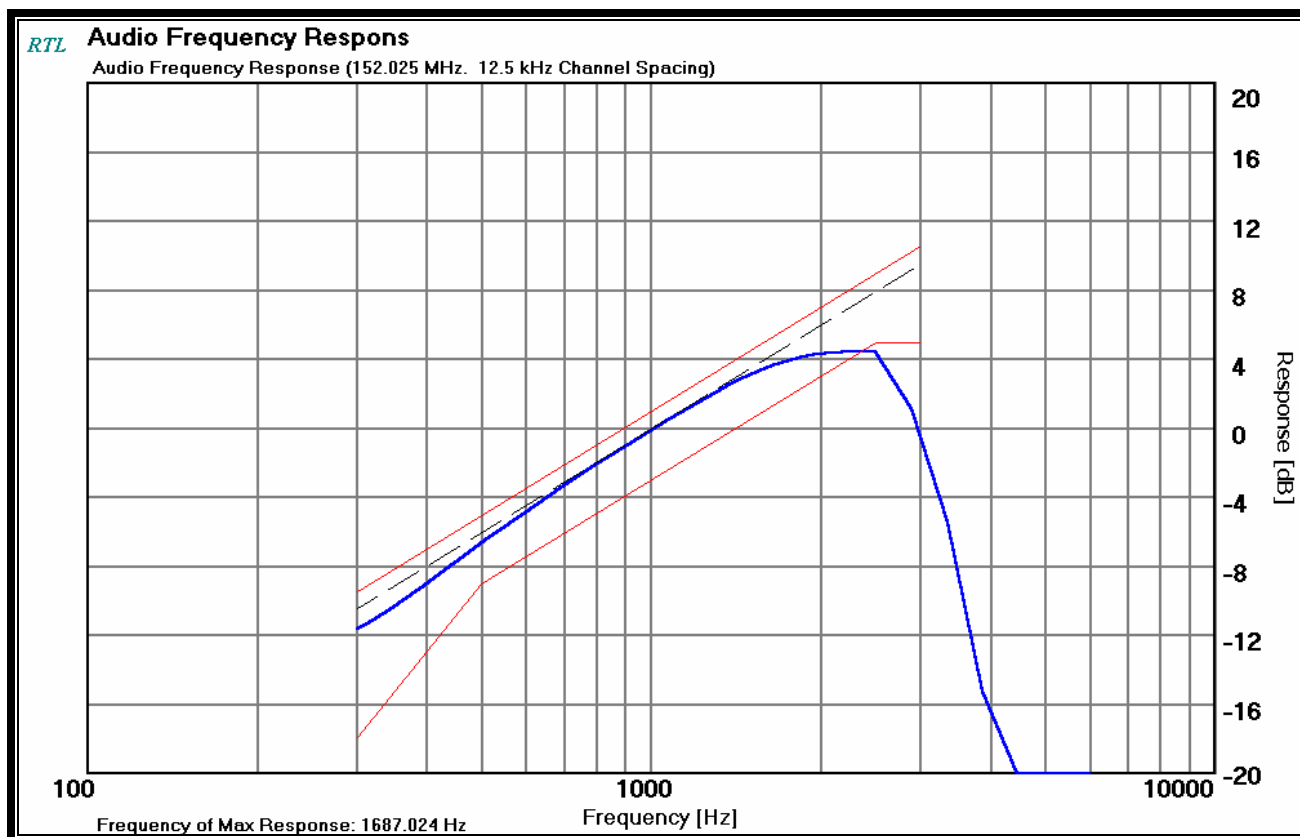


TABLE 8-1: TEST EQUIPMENT USED FOR TESTING (AUDIO FREQUENCY RESPONSE)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|--------------------|-----------------------------|---------------|----------------------|
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator | 2514A02585 | 07/31/03 |
| 901118 | Hewlett Packard | 8901A Opt. 002-003 | Modulation Analyzer | 2406A00178 | 06/04/03 |
| 901054 | Hewlett Packard | 3586B | Selective Level Meter | 1928A01892 | 08/31/03 |
| 901139 | Weinschel Corp. | 48-20-34 DC-18GHz | Attenuator, 100W 20dB | BK5859 | Not Required |
| 901228 | Pasternack | PE7031-30 | 300W 30 dB Attenuator | DC 1 GHz | Not Required |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER

Daniel W. Baltzell
 SIGNATURE

FEBRUARY 4, 2003
 DATE OF TEST

9 FCC PART 2 §2.1047 (A) ; IC RSS-119 §6.6: MODULATION CHARACTERISTICS – AUDIO LOW PASS FILTER

9.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, 2.2.15. The Audio Low Pass Filter Response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

9.2 TEST DATA

PLOT 9-1: MODULATION CHARACTERISTICS – AUDIO LOW PASS FILTER RESPONSE

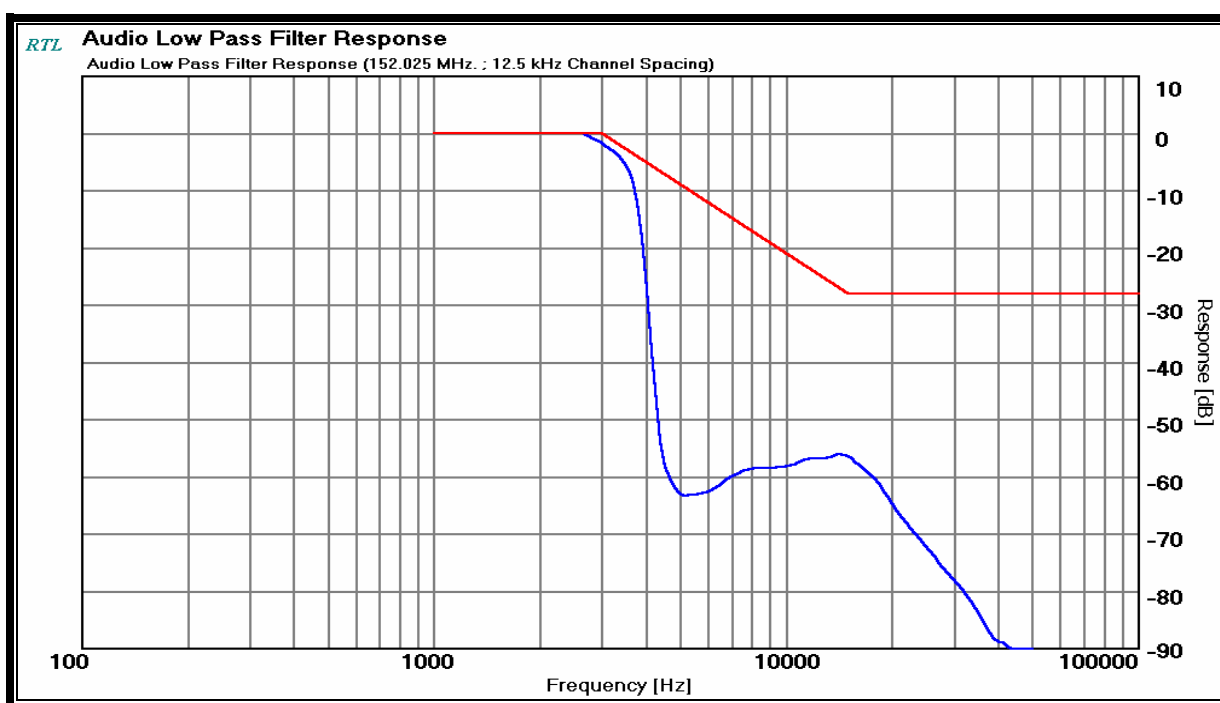


TABLE 9-1: TEST EQUIPMENT USED FOR TESTING (AUDIO LOW PASS FILTER RESPONSE)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|--------------------|-----------------------------|---------------|----------------------|
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator | 2514A02585 | 07/31/03 |
| 901118 | Hewlett Packard | 8901A Opt. 002-003 | Modulation Analyzer | 2406A00178 | 06/04/03 |
| 901054 | Hewlett Packard | 3586B | Selective Level Meter | 1928A01892 | 08/31/03 |
| 901139 | Weinschel Corp. | 48-20-34 DC-18GHz | Attenuator, 100W 20dB | BK5859 | Not Required |
| 901228 | Pasternack | PE7031-30 | 300W 30 dB Attenuator | DC 1 GHz | Not Required |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER

SIGNATURE

FEBRUARY 4, 2003
 DATE OF TEST

10 FCC RULES AND REGULATIONS PART 2 §2.1047 (B) ; IC RSS-119 §6.6: MODULATION CHARACTERISTICS - MODULATION LIMITING

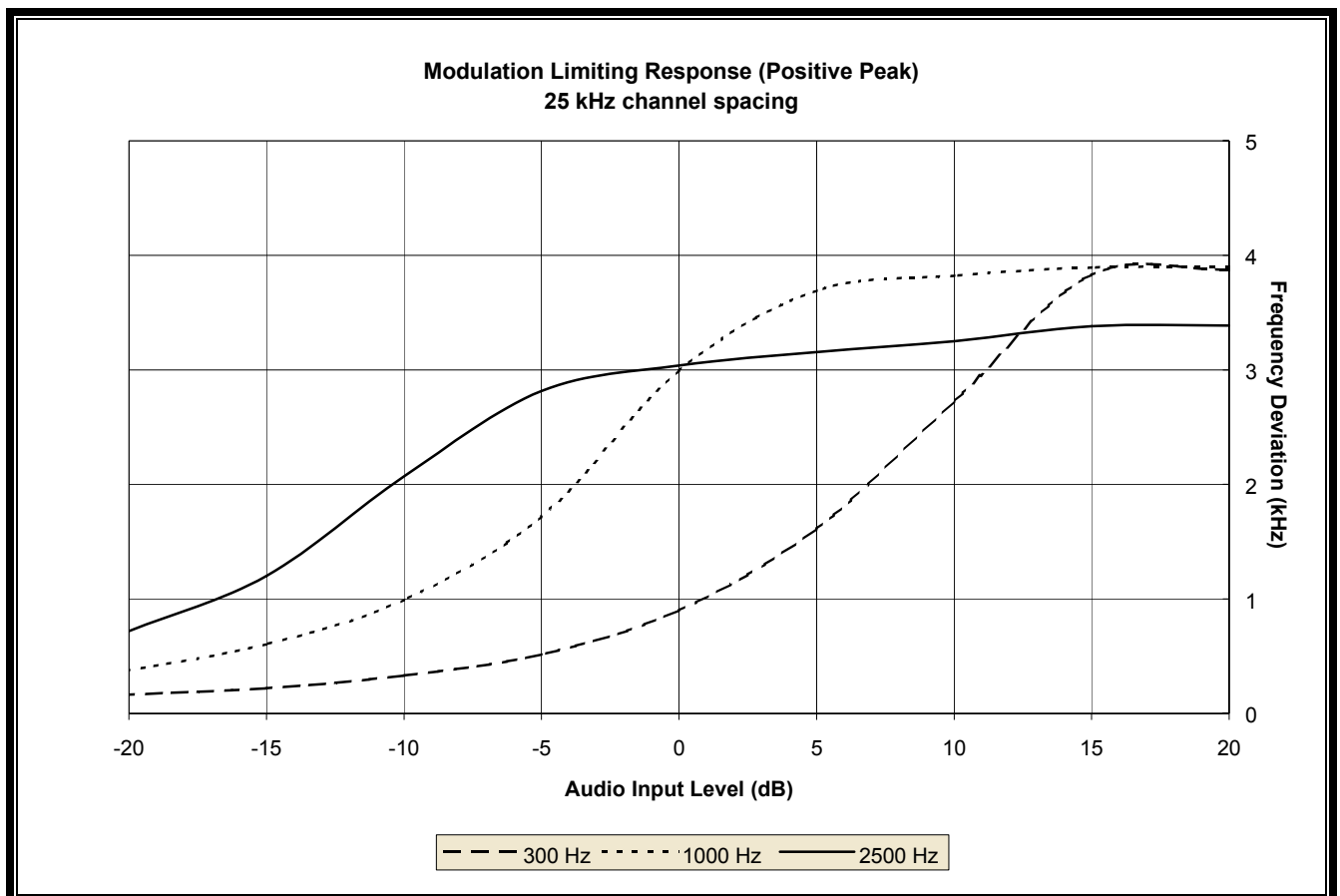
10.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.3

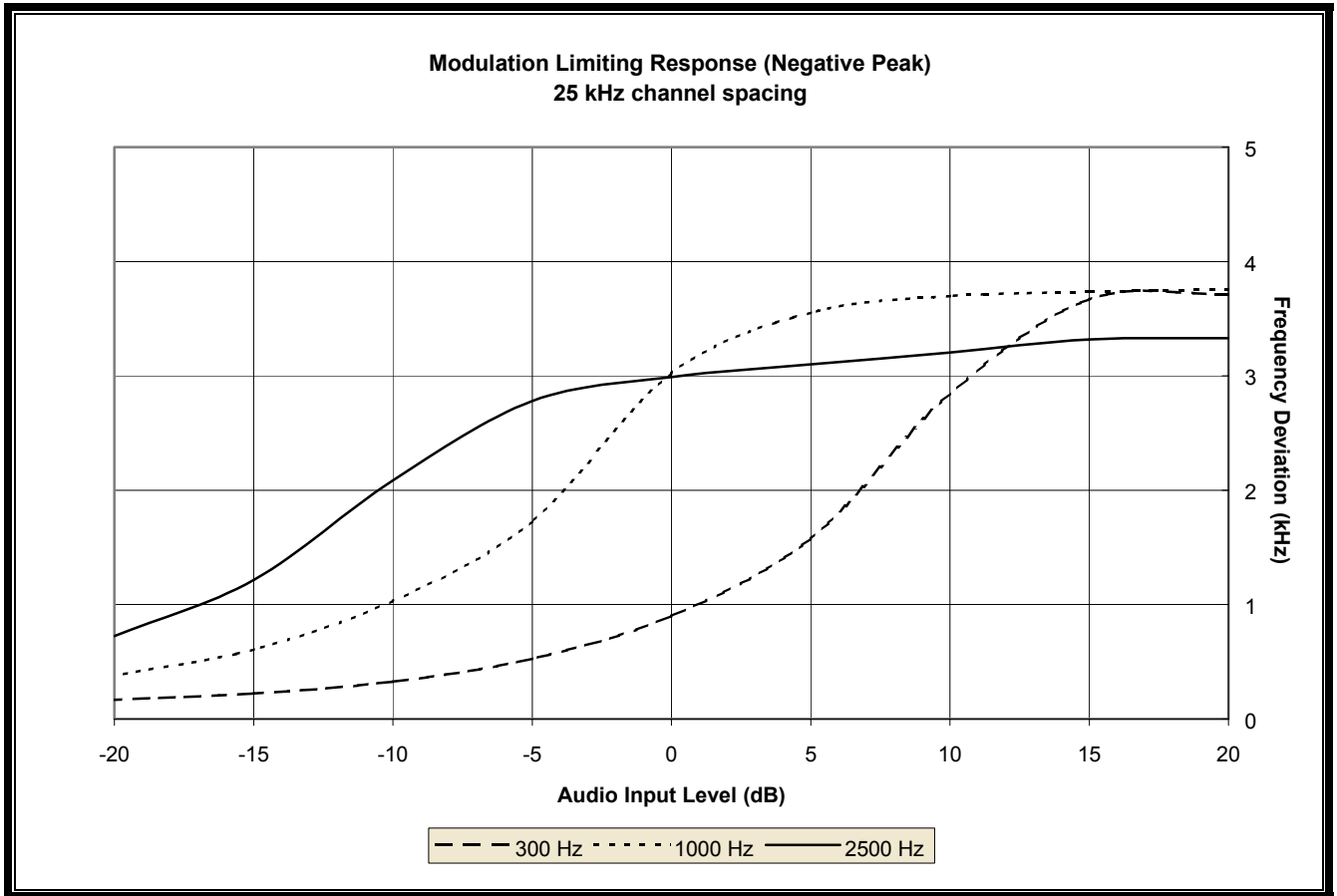
The transmitter is adjusted for full rated system deviation. The audio input level is adjusted for 60% of rated system deviation at 1000Hz. Using this level as a reference (0dB), the audio input level is varied from the reference to a level +20 dB above it, and -20 dB under it, for modulation frequencies of 300Hz, 1,000Hz, and 2,500Hz. The system deviation obtained as a function of the input level is recorded. Both Positive and Negative Peak deviations were recorded.

10.2 TEST DATA

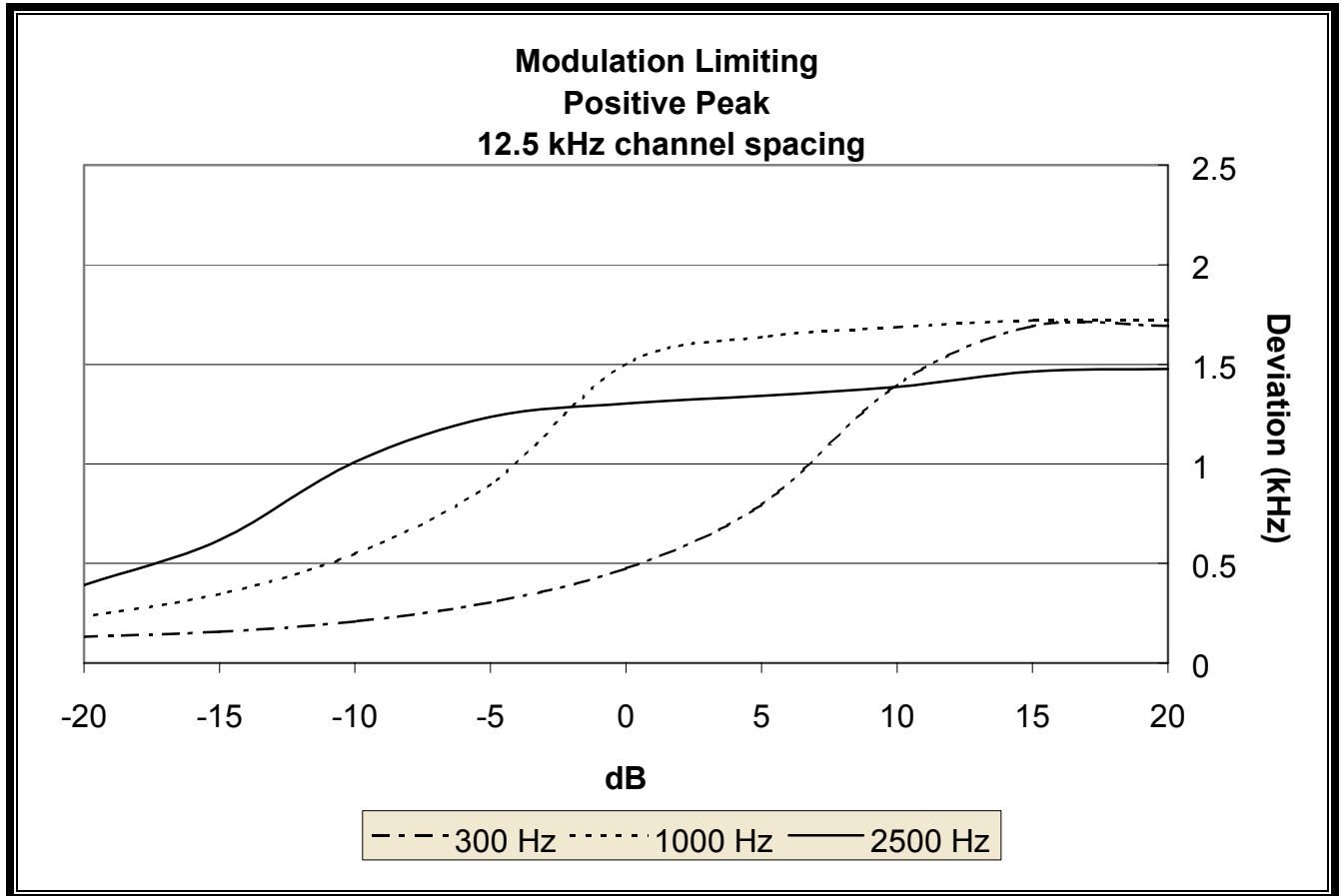
PLOT 10-1: MODULATION CHARACTERISTICS – MODULATION LIMITING: WIDE BAND POSITIVE PEAK



PLOT 10-2: MODULATION CHARACTERISTICS – MODULATION LIMITING: WIDE BAND NEGATIVE PEAK



PLOT 10-3: MODULATION CHARACTERISTICS – MODULATION LIMITING: NARROW BAND POSITIVE PEAK



PLOT 10-4: MODULATION CHARACTERISTICS – MODULATION LIMITING: NARROW BAND NEGATIVE PEAK

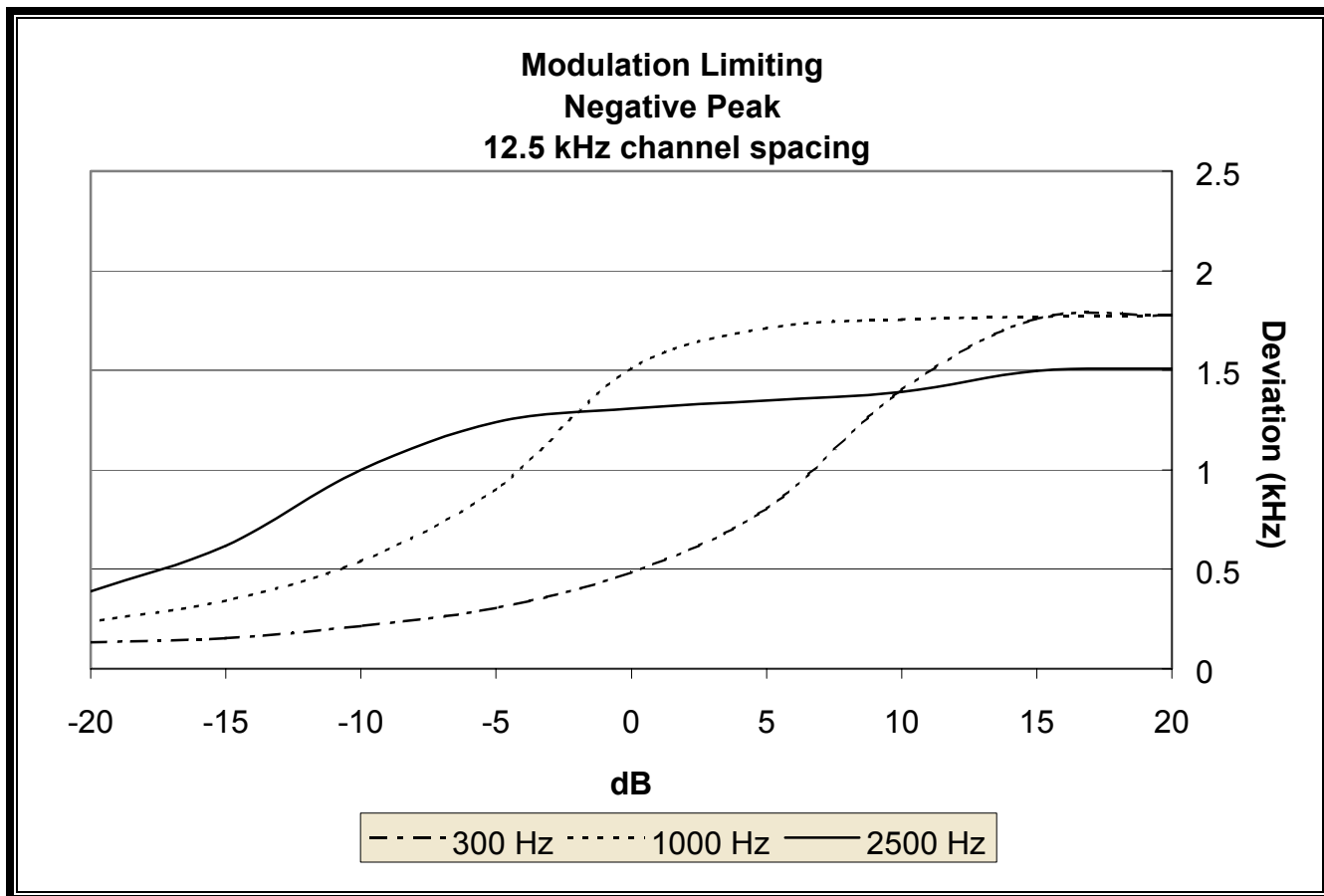
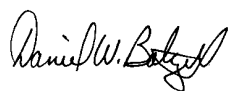


TABLE 10-1: TEST EQUIPMENT USED FOR TESTING (MODULATION LIMITING)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|--------------------|-----------------------------|---------------|----------------------|
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator | 2514A02585 | 07/31/03 |
| 901118 | Hewlett Packard | 8901A Opt. 002-003 | Modulation Analyzer | 2406A00178 | 06/04/03 |
| 901139 | Weinschel Corp. | 48-20-34 DC-18GHz | Attenuator, 100W 20dB | BK5859 | Not Required |
| 901228 | Pasternack | PE7031-30 | 300W 30 dB Attenuator | DC 1 GHz | Not Required |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER



 SIGNATURE

FEBRUARY 4, 2003
 DATE OF TEST

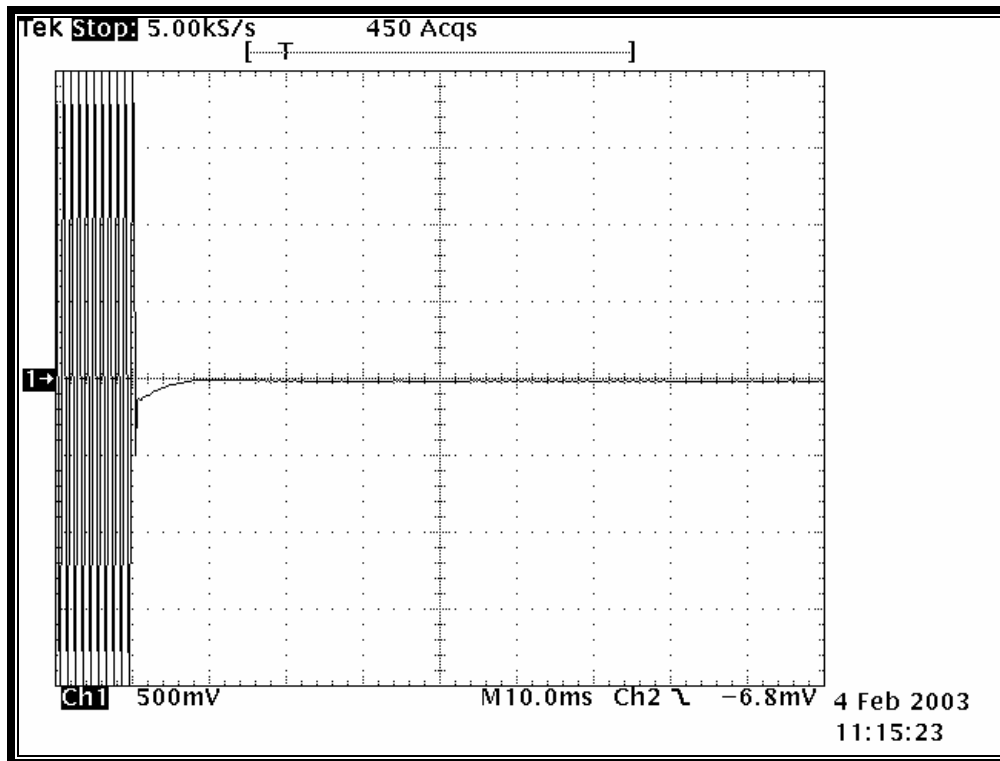
11 FCC RULES AND REGULATIONS PART 90 §90.214; IC RSS-119 §6.5: TRANSIENT FREQUENCY BEHAVIOR

11.1 TEST PROCEDURE

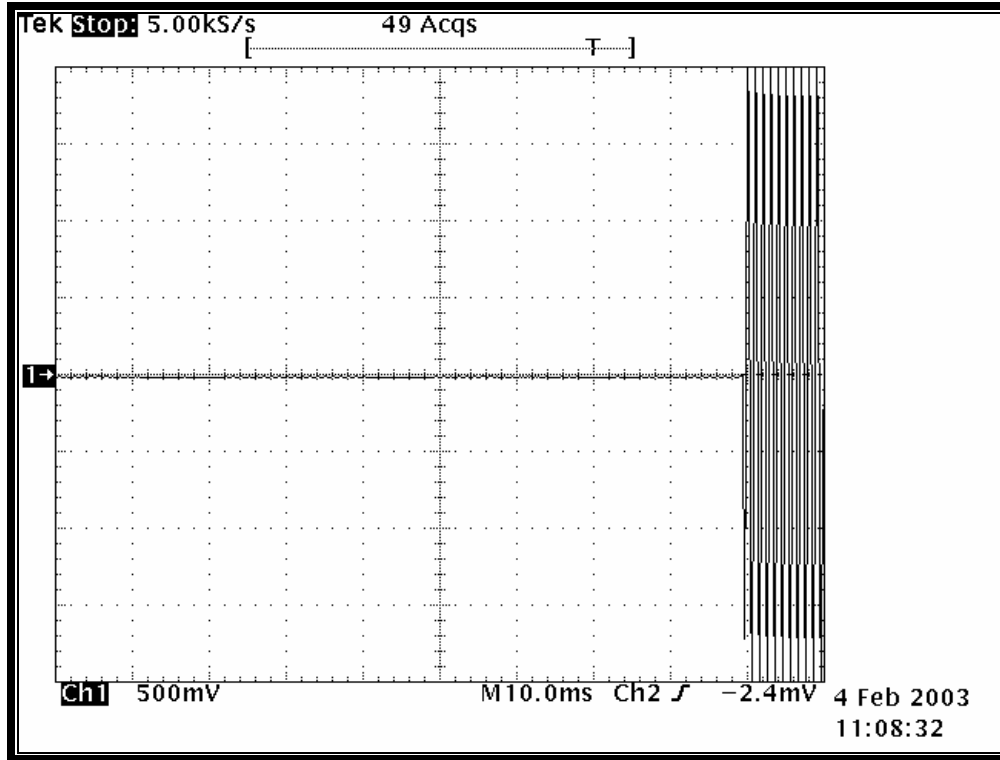
ANSI/TIA/EIA-603-1992, section 2.2.3

11.2 TEST DATA

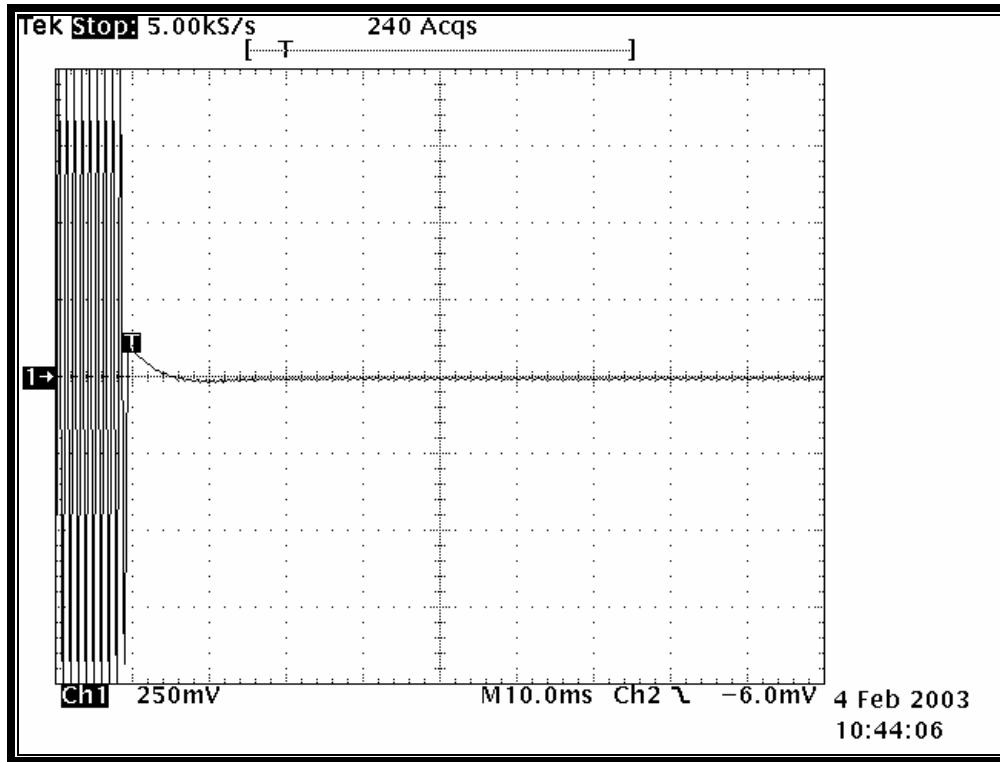
PLOT 11-1: TRANSIENT FREQUENCY BEHAVIOR – 152.025 MHz; WIDE BAND; CARRIER ON TIME



PLOT 11-2: TRANSIENT FREQUENCY BEHAVIOR – 15.2025 MHz; WIDE BAND; CARRIER OFF TIME



PLOT 11-3: TRANSIENT FREQUENCY BEHAVIOR – 152.025 MHz; NARROW BAND; CARRIER ON TIME



PLOT 11-4: TRANSIENT FREQUENCY BEHAVIOR – 152.025 MHZ; NARROW BAND; CARRIER OFF TIME

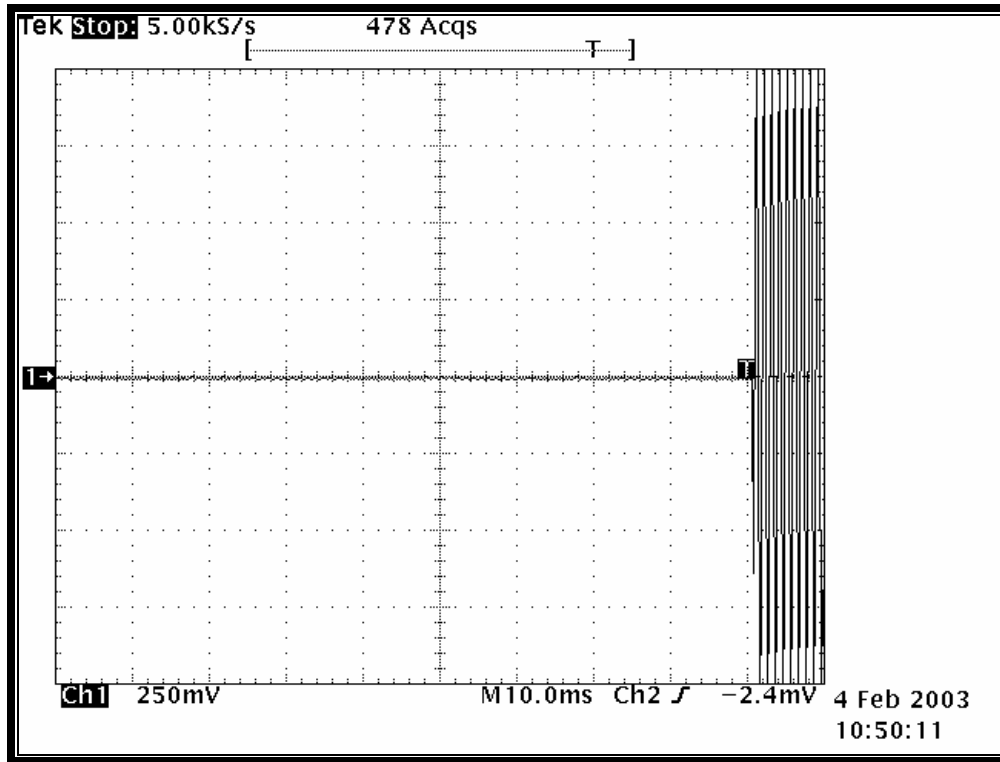



TABLE 11-1: TEST EQUIPMENT USED FOR TESTING (TRANSIENT FREQUENCY BEHAVIOR)

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|--------------------|-----------------------|---------------|----------------------|
| 900917 | Hewlett Packard | 8648C | Signal Generator | 3537A01741 | 04/19/03 |
| 901118 | Hewlett Packard | 8901A Opt. 002-003 | Modulation Analyzer | 2406A00178 | 06/14/03 |
| 900561 | Tektronix | TDS540B | Oscilloscope | B020129 | 02/8/03 |
| 900352 | Werlatone | C1795 | Directional Coupler | 4989 | N/A |
| 901140 | Weinschel Corp. | 47-10-34 DC-18GHz | Attenuator, 50W 10dB | BK6203 | Not Required |
| 901228 | Pasternack | PE7031-30 | 300W 30 dB Attenuator | DC 1 GHz | Not Required |
| 901138 | Weinschel Corp. | 48-40-34 DC-18GHz | Attenuator, 100W 40dB | BK5883 | Not Required |
| 901000 | Pasternack | PE 2003 | Power divider | N/A | Not Required |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER



 SIGNATURE

FEBRUARY 4, 2003
 DATE OF TEST

12 FCC RULES AND REGULATIONS PART 2 §2.202: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

Type of Emission: F3E, F1D, F1E

Necessary Bandwidth and Emission Bandwidth:

Voice – 12.5kHz channel separation:

Calculation:

Max modulation(M) in kHz: 3

Max deviation (D) in kHz: 2.5

Constant factor (K): 1 (assumed)

$B_n = 2 \times M + 2 \times DK = 11 \text{ kHz}$

Emission designator: 11K0F3E

Voice – 25kHz channel separation:

Calculation:

Max modulation(M) in kHz: 3

Max deviation (D) in kHz: 5

Constant factor (K): 1 (assumed)

$B_n = 2 \times M + 2 \times DK = 16 \text{ kHz}$

Emission designator: 16K0F3E

Digital voice and data - 25kHz channel separation:

Calculation:

Max modulation(B) in kHz: 9.6

Max deviation (D) in kHz: 3.0

Constant factor (K): 1 (assumed)

$B_n = 2(B)/2 + 2DK = 15.6 \text{ KHz}$

Emission designator: 15K6F1D, 15K6F1E

Measurement: 99.75% Occupied Bandwidth

$B_n = 12.8 \text{ KHz}$

Emission designator: 12K8F1D, 12K8F1E

C4FM – 9600 bps:

Measurement: 99.75% Occupied Bandwidth

$B_n = 9.25 \text{ KHz}$

Emission designator: 9K25F1D, 9K25F1E

Digital voice and data – 12.5kHz channel separation:

Calculation:

Max modulation(B) in kHz: 4.8

Max deviation (D) in kHz: 1.5

Constant factor (K) : 1(assumed)

$B_n = 2(B)/2+2DK = 7.8 \text{ KHz}$

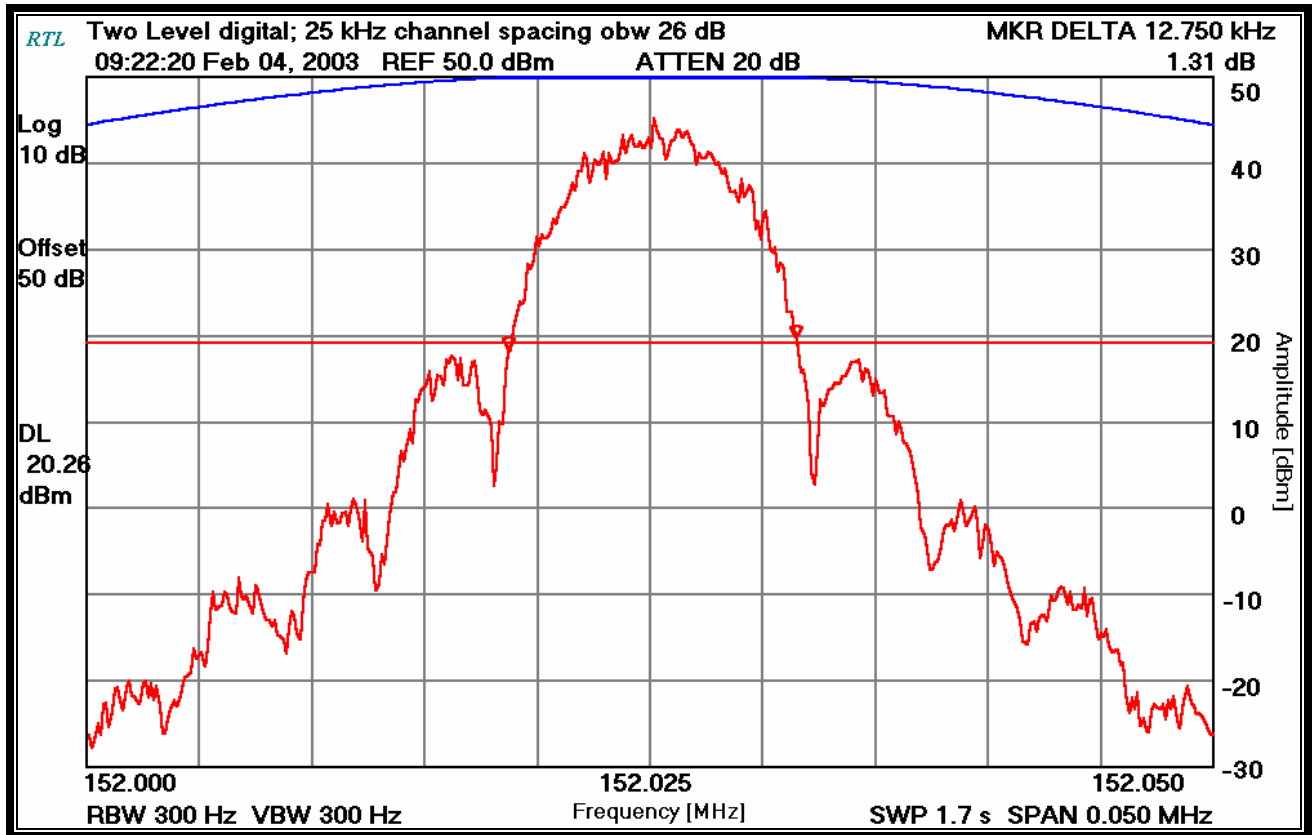
Emission designator: 7K8F1D, 7K8F1E

Measurement: 99.75% Occupied Bandwidth

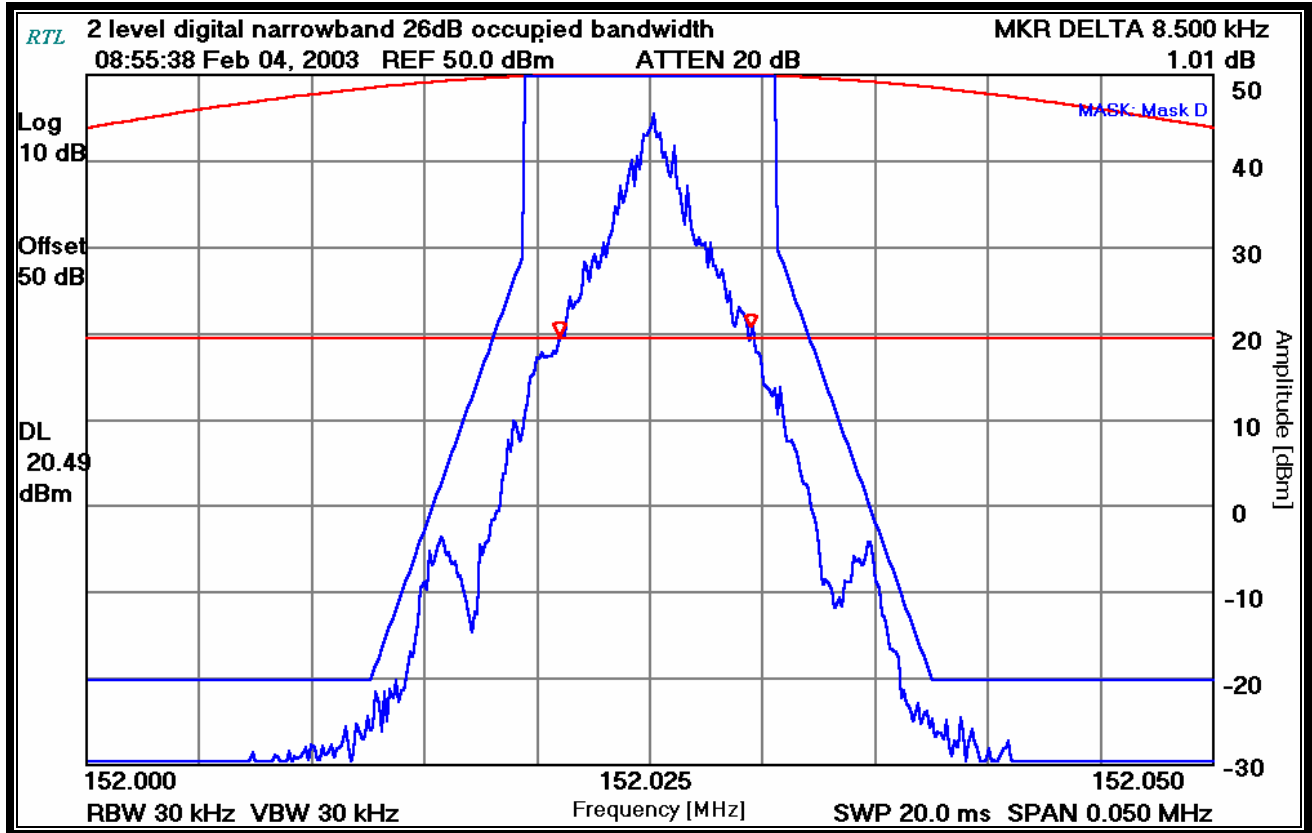
$B_n = 8.5 \text{ KHz}$

Emission designator: 8K5F1D, 8K5F1E

PLOT 12-1: 26 DB EMISSION BANDWIDTH; WIDEBAND 2 LEVEL DIGITAL MODULATION; 12.75 KHZ



PLOT 12-2: 26 DB EMISSION BANDWIDTH; NARROWBAND 2 LEVEL DIGITAL MODULATION; 8.5 KHZ



PLOT 12-3: 26 DB EMISSION BANDWIDTH; C4FM DIGITAL MODULATION; 9.25 KHZ

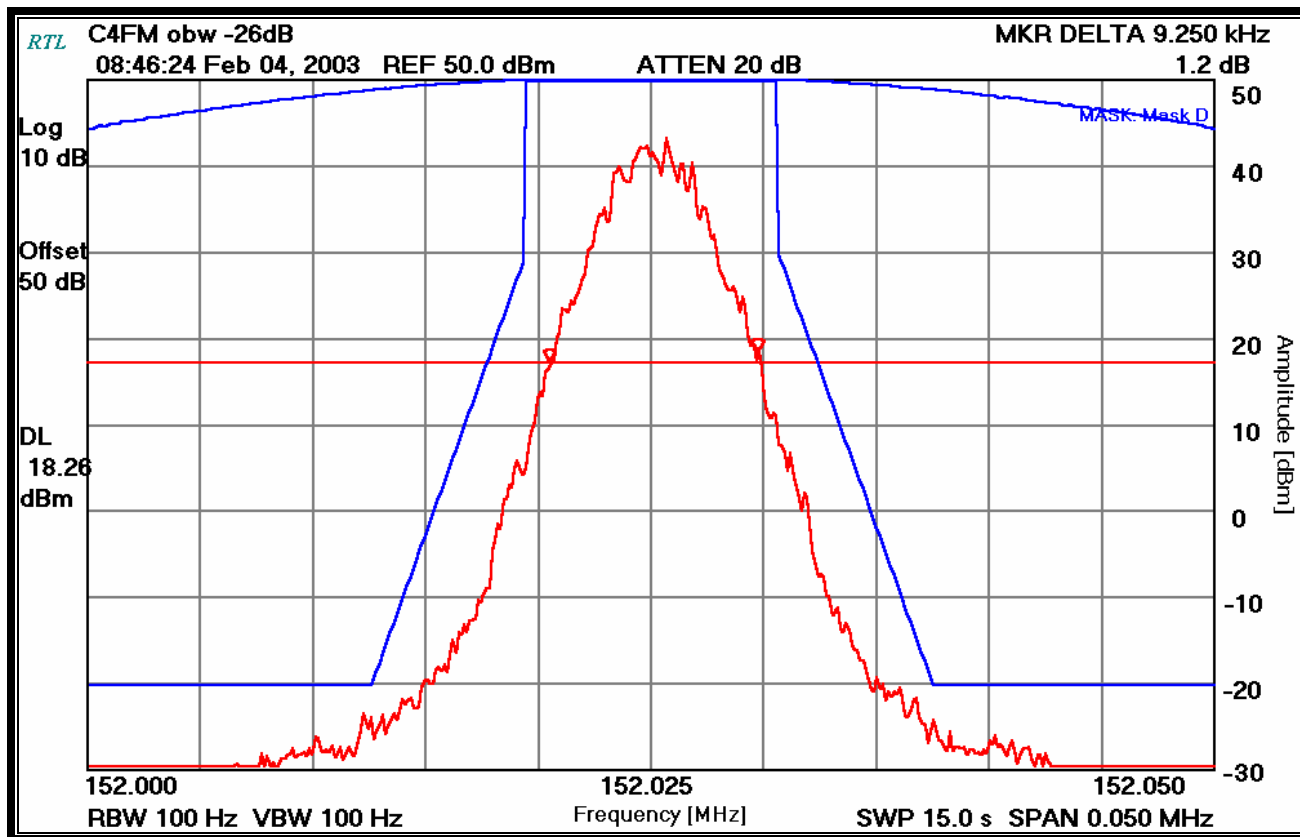



TABLE 12-1: TEST EQUIPMENT USED FOR NECESSARY AND EMISSION BANDWIDTH MEASUREMENTS

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-----------------|-----------------------|-----------------------|---------------|----------------------|
| 901215 | Hewlett Packard | 8596EM (9kHz-12.8GHz) | EMC Analyzer | 3826A00144 | 8/23/03 |
| 901139 | Weinschel Corp. | 48-20-34 DC-18GHz | Attenuator, 100W 20dB | BK5859 | Not Required |
| 901228 | Pasternack | PE7031-30 | 300W 30 dB Attenuator | DC 1 GHz | Not Required |

TEST PERSONNEL:

DANIEL BALTZELL
 TEST ENGINEER



 Signature

FEBRUARY 4, 2003
 Date Of Test

13 CONCLUSION

The data in this measurement report demonstrates that the **M/A COM, Inc. MASTRIII VHF Basestation with Sitepro; FCC ID: OWDTR-0017-E**, complies with all the requirements of FCC Part 90 and Industry Canada RSS-119.