Engineering and Testing for EMC and Safety Compliance

TYPE CERTIFICATION REPORT

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MODEL: M7100(IP) VHF Mobile Radio

FCC ID: OWDTR-0019-E

November 6, 2003

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 2001	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 2001	RADIO FREQUENCY DEVICES - §15.109: RADIATED EMISSIONS LIMITS
PART 22: 1998	PUBLIC MOBILE SERVICES
PART 80: 1998	STATIONS IN MARITIME SERVICES
PART 90: 2001	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	Maximum Measured Output Power (W) Conducted	Frequency Tolerance (ppm)	Emission Designator
136-174 MHz	109.9	5.0	16K0F3E (Voice)
136-174 MHz	109.9	5.0	11K0F3E (Voice)
136-174 MHz	109.9	5.0	10K0F1D (2 level WB) measured
136-174 MHz	109.9	5.0	10K0F1D (2 level WB) measured
136-174 MHz	109.9	5.0	7K7F1D (2 level NB 9600) measured
136-174 MHz	109.9	5.0	7K7F1E (2 level NB 9600) measured
136-174 MHz	109.9	5.0	4K8F1D (2 level NB 4800) measured
136-174 MHz	109.9	5.0	4K8F1E (2 level NB 4800) measured
136-174 MHz	109.9	5.0	8K0F1D (C4FM) measured
136-174 MHz	109.9	5.0	8K0F1E (C4FM) measured

REPORT PREPARED BY TEST ENGINEER: DAN BIGGS

Document Number: 2003067/ QRTL03-779

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1 GENERAL INFORMATION

The following Type Certification Report 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 **M7100(IP) VHF Mobile Radio; FCC ID: OWDTR-0019-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.

2 CONFORMANCE STATEMENT

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 2001	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 2001	§15.109: RADIATED EMISSIONS LIMITS
PART 22: 1998	PUBLIC MOBILE SERVICES
PART 80: 1998	STATIONS IN MARITIME SERVICES
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ANSI C63.4-1992	STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS
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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	109.9	5.0	16K0F3E (Voice)
136-174 MHz	109.9	5.0	11K0F3E (Voice)
136-174 MHz	109.9	5.0	10K0F1D (2 level WB) measured
136-174 MHz	109.9	5.0	10K0F1D (2 level WB) measured
136-174 MHz	109.9	5.0	7K7F1D (2 level NB 9600) measured
136-174 MHz	109.9	5.0	7K7F1E (2 level NB 9600) measured
136-174 MHz	109.9	5.0	4K8F1D (2 level NB 4800) measured
136-174 MHz	109.9	5.0	4K8F1E (2 level NB 4800) measured
136-174 MHz	109.9	5.0	8K0F1D (C4FM) measured
136-174 MHz	109.9	5.0	8K0F1E (C4FM) measured

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: Richard B. Mc Murray Date: November 6, 2003

Typed/Printed Name: Rick McMurray Position: Vice President of Operations

Signature: Daniel Biggs Date: November 6, 2003

Typed/Printed Name: Daniel W. Biggs Position: Test Engineer

NVLAP *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.

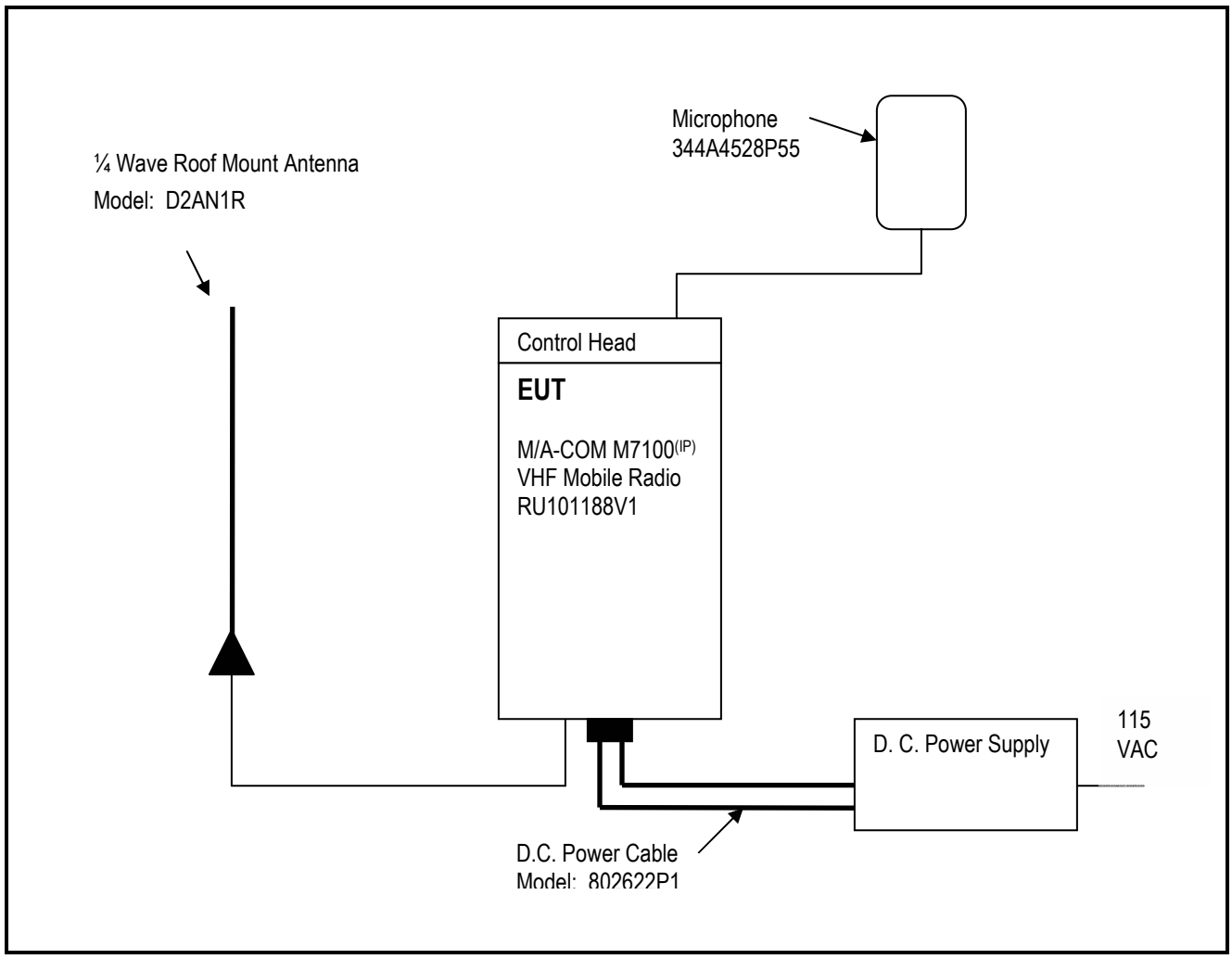
3 TESTED SYSTEM DETAILS

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

TABLE 3-1: EQUIPMENT UNDER TEST (EUT)

Part	Manufacturer	Model	PN/Serial Number	FCC ID	RTL Bar Code
VHF Mobile Radio	M/A-COM, INC.	M7100(IP)	RU101188V1	OWDTR-0019-E	15190
Control Head	M/A-COM, INC.	MAHG-CP7V	KRY1011632/13	N/A	15190
Microphone	M/A-COM, INC.	MAHG-BMC7T	344A4528P55	N/A	N/A
Power Cable	M/A-COM, INC.	802622P1	19B802622P3	N/A	N/A
¼ Wave Roof Mount Antenna	M/A-COM, INC.	D2AN1R	19B209568P6	N/A	15194

FIGURE 3-1: CONFIGURATION OF TESTED SYSTEM



4 FCC RULES AND REGULATIONS PART 2 §2.1033(C)(8) VOLTAGES AND CURRENTS THROUGH THE FINAL AMPLIFYING STAGE

Nominal DC Voltage: 13.8 VDC
Current: 30 AMPS or less

5 FCC RULES AND REGULATIONS PART 2 §2.1046 (A): RF POWER OUTPUT: CONDUCTED

5.1 TEST PROCEDURE

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

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

5.2 TEST DATA

The following channels (in MHz) were tested: 136, 154, and 174

TABLE 5-1: RF POWER OUTPUT (HIGH POWER): CARRIER OUTPUT POWER (UNMODULATED)

Channel	Frequency (MHz)	RF Power Measured (Watt)*
1	136	108.6
2	154	109.9
3	174	108.4

* Measurement accuracy: +/- .02 dB (logarithmic mode)

TABLE 5-2: RF POWER OUTPUT (RATED POWER)

Rated Power (W)
110

TABLE 5-3: TEST EQUIPMENT USED FOR TESTING (RF POWER OUTPUT - CONDUCTED)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184/901186	Agilent	E4416A/E9323A	Power Meter / Sensor	GB41050573/US15410380	07/30/04

TEST PERSONNEL:

DANIEL BIGGS		NOVEMBER 5, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

6 FCC RULES AND REGULATIONS PART 2 §2.1051: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

6.1 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 1,000 Hz.

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

6.2 TEST DATA

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

Limits: Mask D (dBm): P(dBm) – (50+10xLOG P(W))

The following channels (in MHz) were investigated: 136.0, 154.0, and 174.0. 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 6-1: CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 – 136.0 MHz

(136.0 MHz); 12.5 kHz channel spacing; Mask D; Conducted power = 108.6W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
272	103.37	70.36	-33.01
408	92.33	70.36	-21.97
544	104.31	70.36	-33.95
680	94.48	70.36	-24.12
816	104.38	70.36	-34.02
952	102.37	70.36	-32.01
1088	101.03	70.36	-30.67
1224	100.35	70.36	-29.99
1360	82.47	70.36	-12.11
1496	97.57	70.36	-27.21

TABLE 6-2: CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 154.0 MHz

(154.0 MHz); 12.5 kHz channel spacing; Mask D; Conducted power = 109.9W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
308	90.81	70.41	-20.40
462	91.75	70.41	-21.34
616	104.74	70.41	-34.33
770	102.05	70.41	-31.64
924	109.71	70.41	-39.30
1078	95.07	70.41	-24.66
1232	99.60	70.41	-29.19
1386	98.80	70.41	-28.39
1540	80.83	70.41	-10.42

TABLE 6-3: CONDUCTED SPURIOUS EMISSIONS CHANNEL 3 – 174.0 MHz

(174.0 MHz); 12.5 kHz channel spacing; Mask D; Conducted power = 108.4 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
348	92.15	70.35	-21.80
522	86.39	70.35	-16.04
696	108.82	70.35	-38.47
870	101.13	70.35	-30.78
1044	104.63	70.35	-34.28
1218	98.67	70.35	-28.32
1392	76.21	70.35	-5.86
1566	97.46	70.35	-27.11
1740	91.21	70.35	-20.86

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

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM (9 kHz-12.8 GHz)	EMC Analyzer	3826A00144	08/27/04
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	08/06/04
901054	Hewlett Packard	HP 3586B	Selective Level Meter	1928A01892	09/09/04

TEST PERSONNEL:

DANIEL BIGGS		NOVEMBER 5, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

7 FCC RULES AND REGULATIONS PART 2 §2.1053 (A): FIELD STRENGTH OF SPURIOUS RADIATION

7.1 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 1,000 Hz.

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

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.

7.2 TEST DATA

7.2.1 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 7-1: FIELD STRENGTH OF SPURIOUS RADIATION CHANNEL 2 – 154.0 MHz; NARROW BAND

Radiated Spurious Emissions
Mid Band Channel 2 (154 MHz, Narrowband)
Limit = 50 + 10 Log P = 70.41 dBc
Conducted Power = 50.41 dBm = 109.9 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss (dB)*	Notch Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
308	54.2	-71.3	0.2	0.16	-0.6	120.8	-50.4
462	57.8	-61.4	0.3	0.34	-0.6	110.6	-40.2
616	50.0	-67.7	0.3	0.34	-1.2	116.3	-45.9
770	74.7	-42.1	0.4	0.13	-1.2	90.8	-20.3
924	50.8	-63.3	0.4	0.71	-1.2	111.5	-41.0
1078	48.5	-58.7	0.5	5.02	0.6	104.2	-33.8
1232	48.5	-55.0	0.4	0.98	2.1	106.1	-35.7
1386	44.8	-59.0	0.5	1.99	3.6	110.5	-40.1
1540	43.2	-59.0	0.5	19.94	4.7	93.6	-23.2
1694	24.0	-77.8	0.6	6.06	4.7	126.3	-55.9

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

TABLE 7-2: TEST EQUIPMENT USED FOR TESTING (FIELD STRENGTH OF SPURIOUS RADIATION)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901053	Schaffner-Chase	CBL6112	Antenna (25 MHz – 2 GHz)	2648	07/03/04
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1-26.5 GHz)	3008A00505	N/A
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	07/15/04
900917	Hewlett Packard	8648C	Synthesized. Signal Generator (9 kHz to 3200 MHz)	3537A01741	05/02/04
900928	Hewlett Packard	HP 83752A	Synthesized Sweeper (.01 – 20 GHz)	3610A00866	08/05/04

TEST PERSONNEL:

DANIEL BIGGS		SEPTEMBER 5, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

8 FCC RULES AND REGULATIONS PART 2 §2.1049 (C) (1): OCCUPIED BANDWIDTH

OCCUPIED BANDWIDTH - COMPLIANCE WITH THE EMISSION MASKS

8.1 TEST PROCEDURE

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

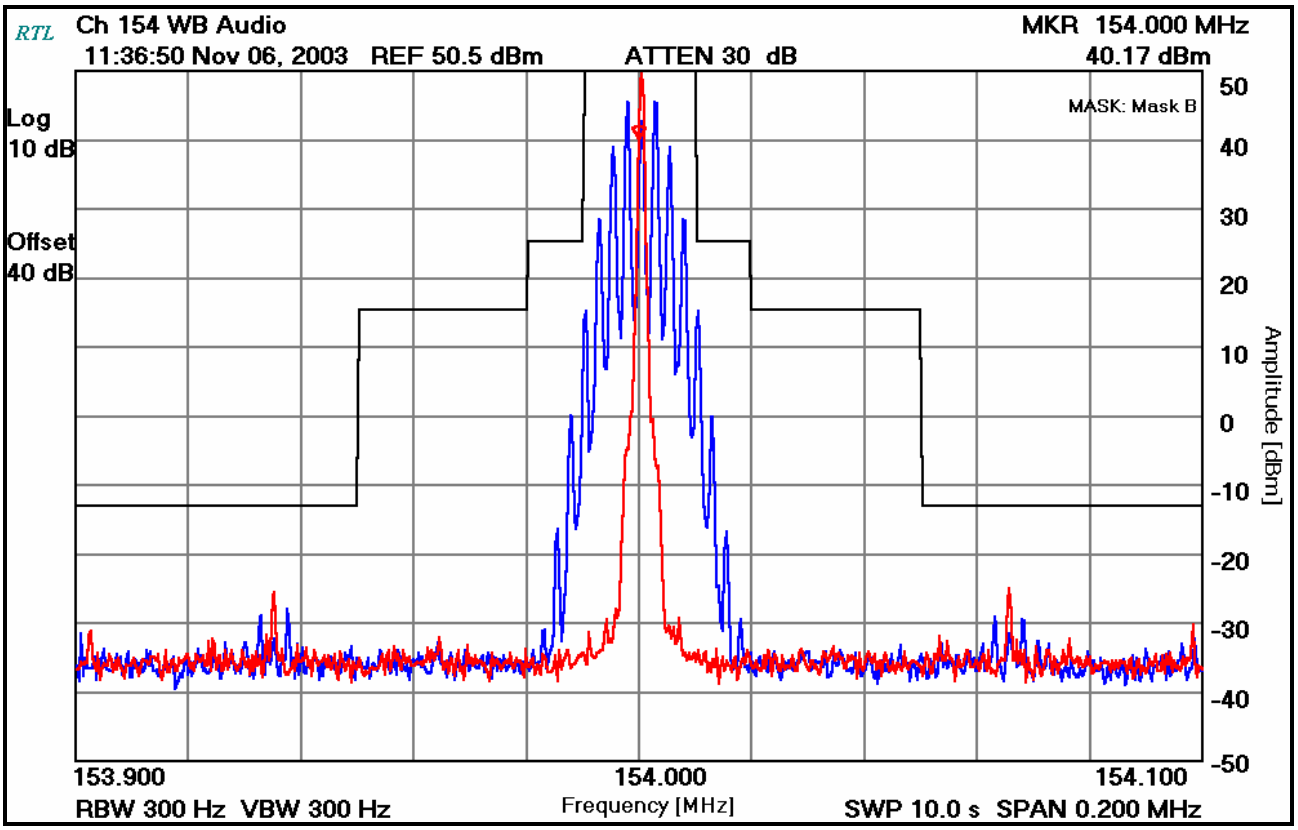
Device with audio modulation: Transmitter was modulated with a 2,500 Hz sine wave at an input level of 16 dB greater than that required to produce 50% of rated system deviation at 1,000 Hz.

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

8.2 TEST DATA

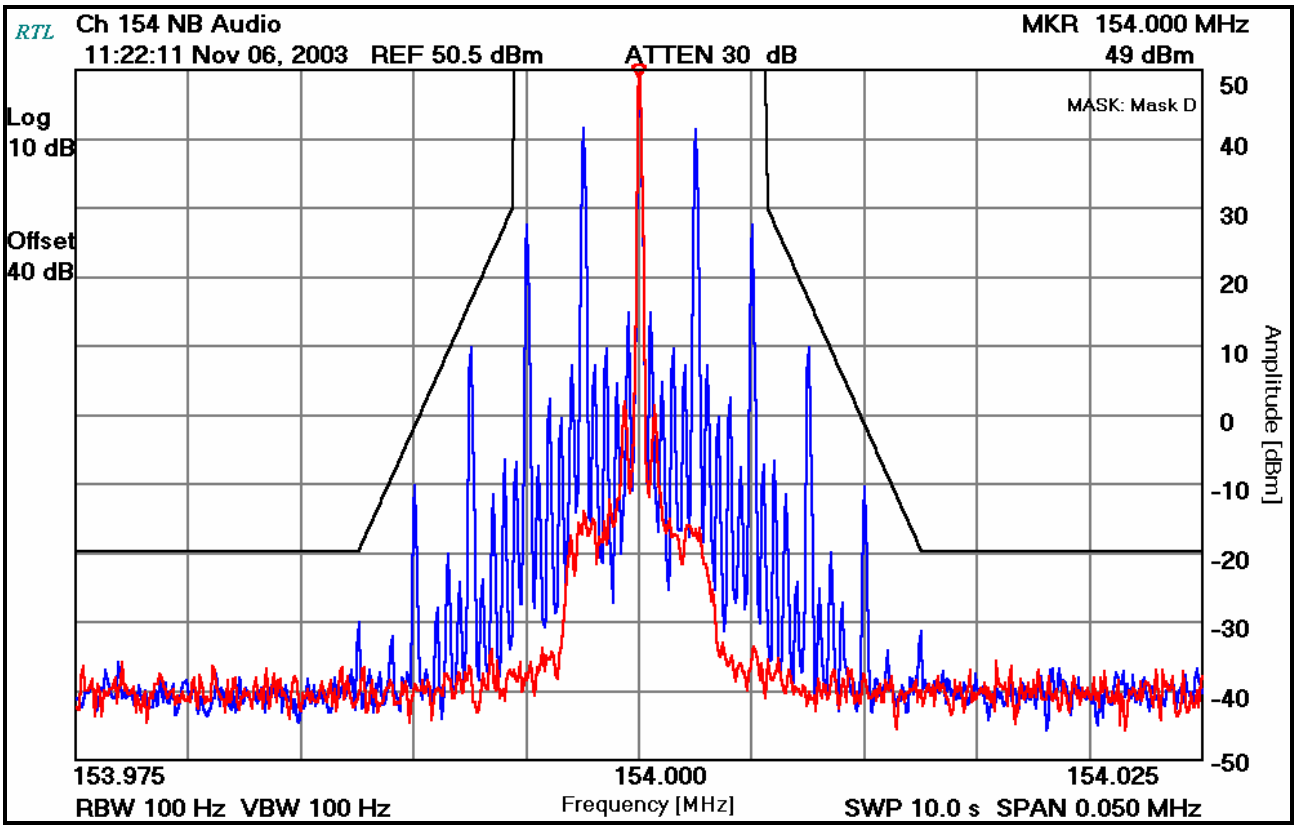
PLOT 8-1: OCCUPIED BANDWIDTH; WIDE BAND; AUDIO MODULATION: 2,500 Hz

MKR 154 MHz

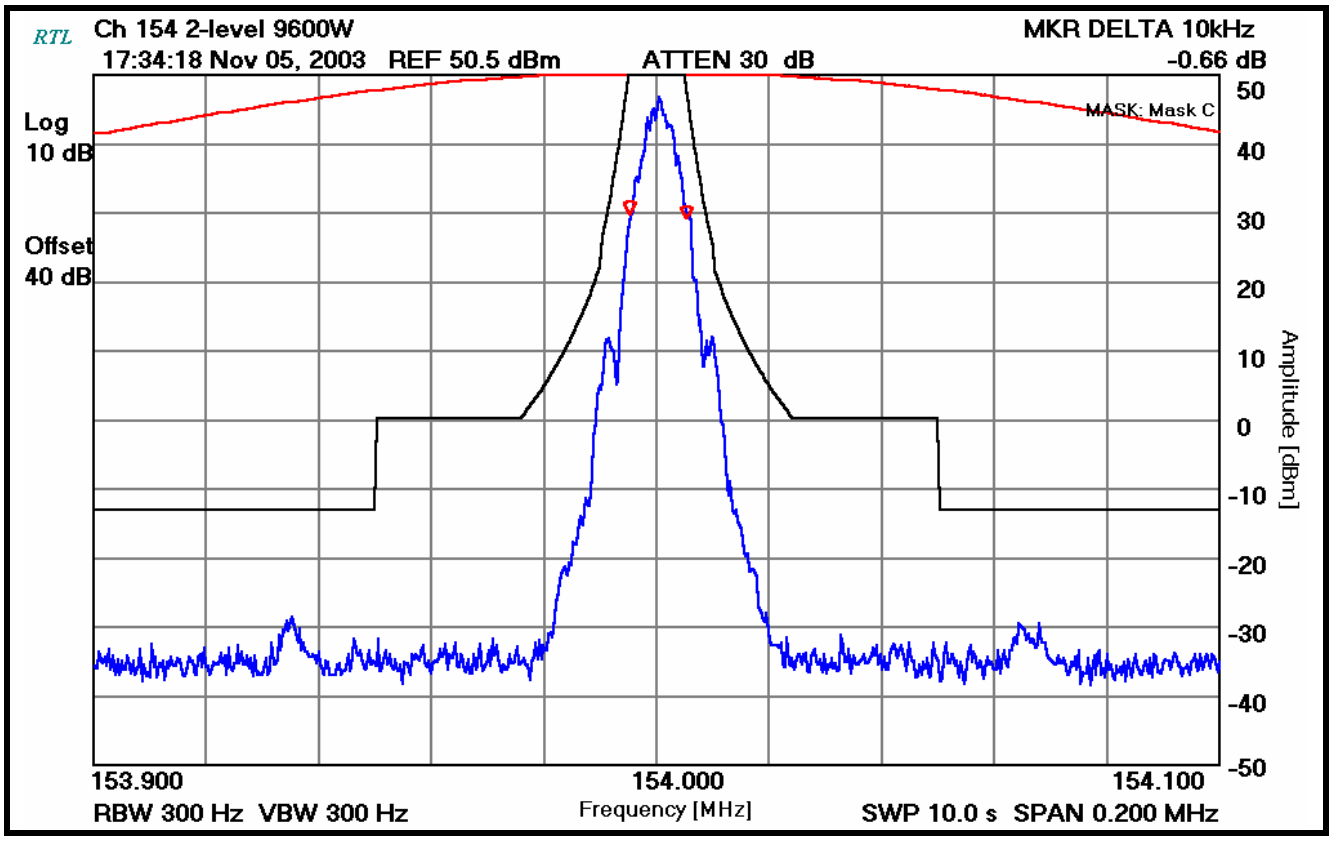


PLOT 8-2: OCCUPIED BANDWIDTH; NARROW BAND; AUDIO MODULATION: 2,500 Hz

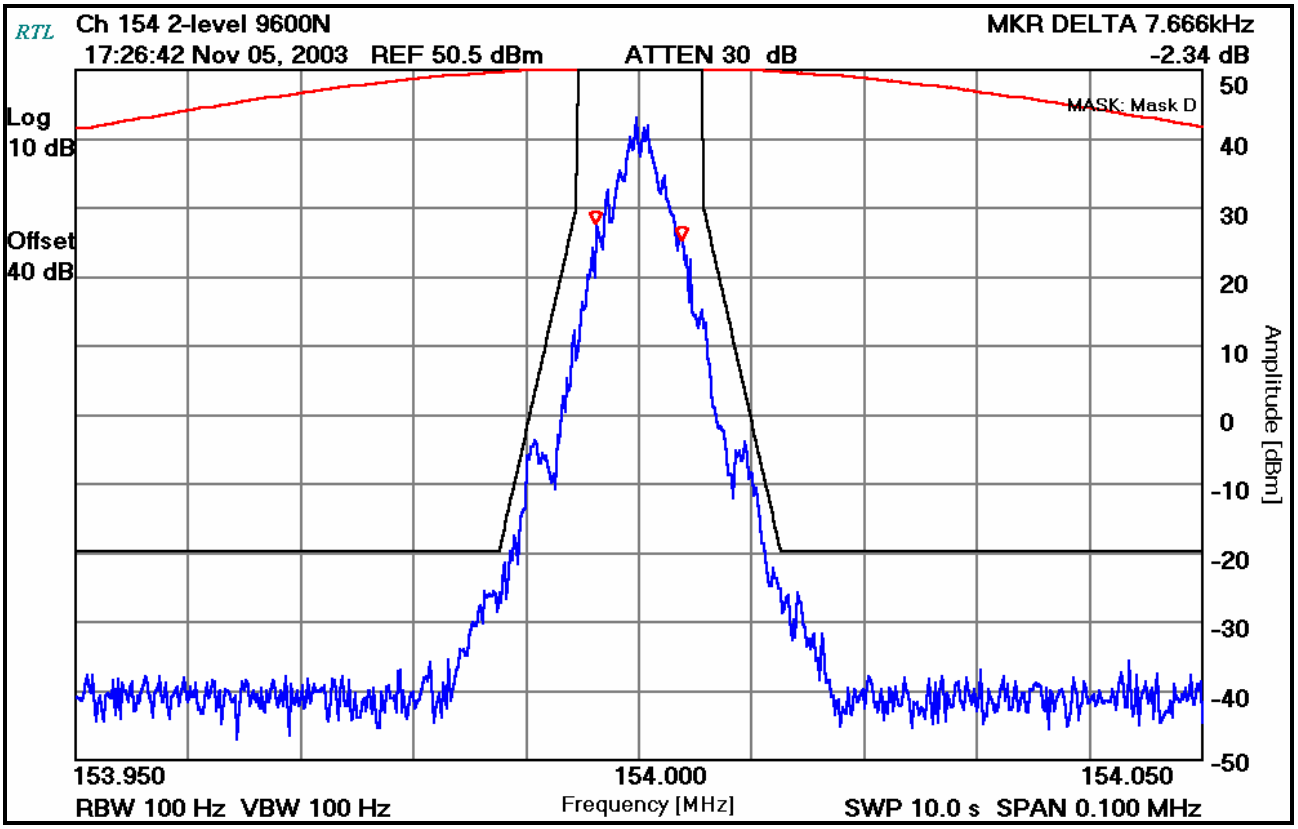
MKR 154 MHz



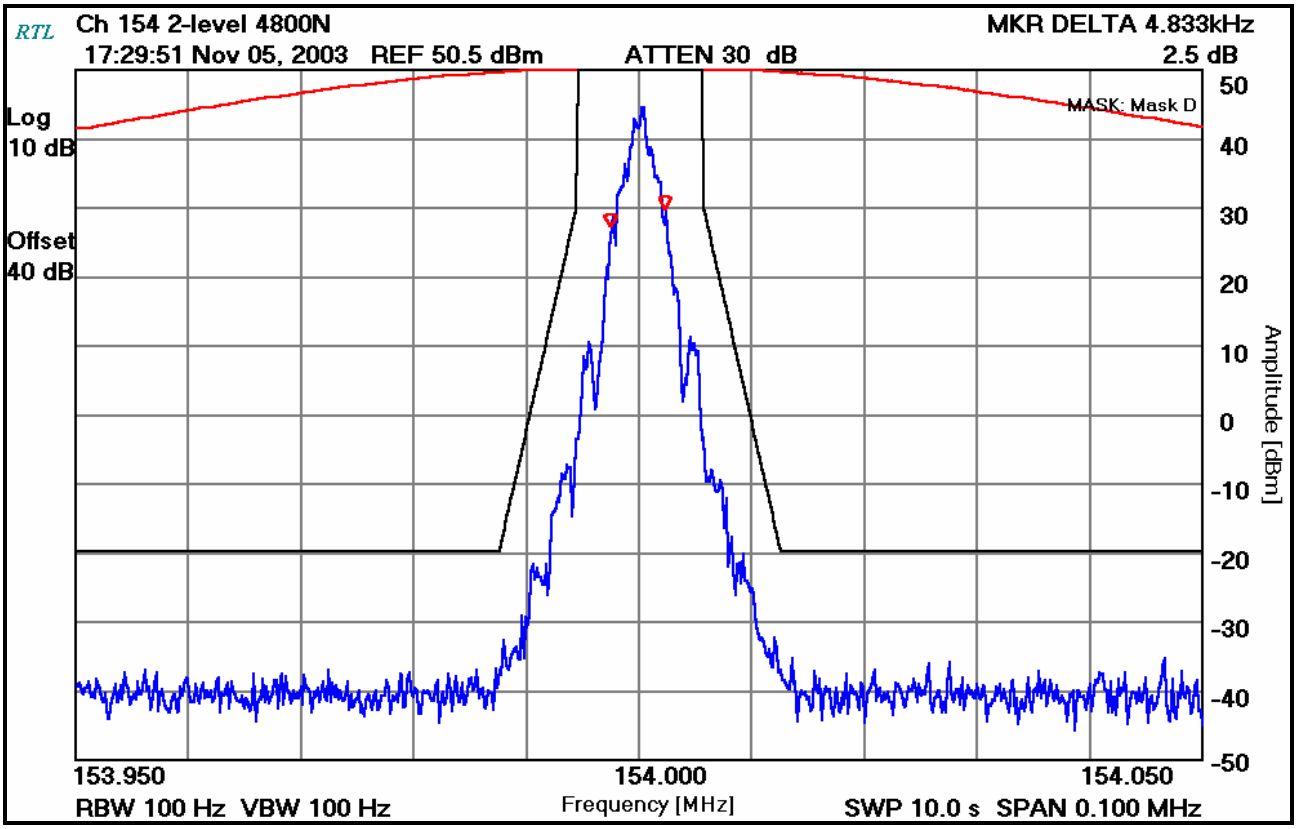
PLOT 8-3: 99% OCCUPIED BANDWIDTH; 9600 BAUD WIDE BAND; 2 LEVEL DIGITAL MODULATION



PLOT 8-4: 99% OCCUPIED BANDWIDTH; 9600 BAUD NARROW BAND; 2 LEVEL DIGITAL MODULATION



PLOT 8-5: 99% OCCUPIED BANDWIDTH; 4800 BAUD NARROW BAND; 2 LEVEL DIGITAL MODULATION



PLOT 8-6: 99% OCCUPIED BANDWIDTH; C4FM DIGITAL MODULATION

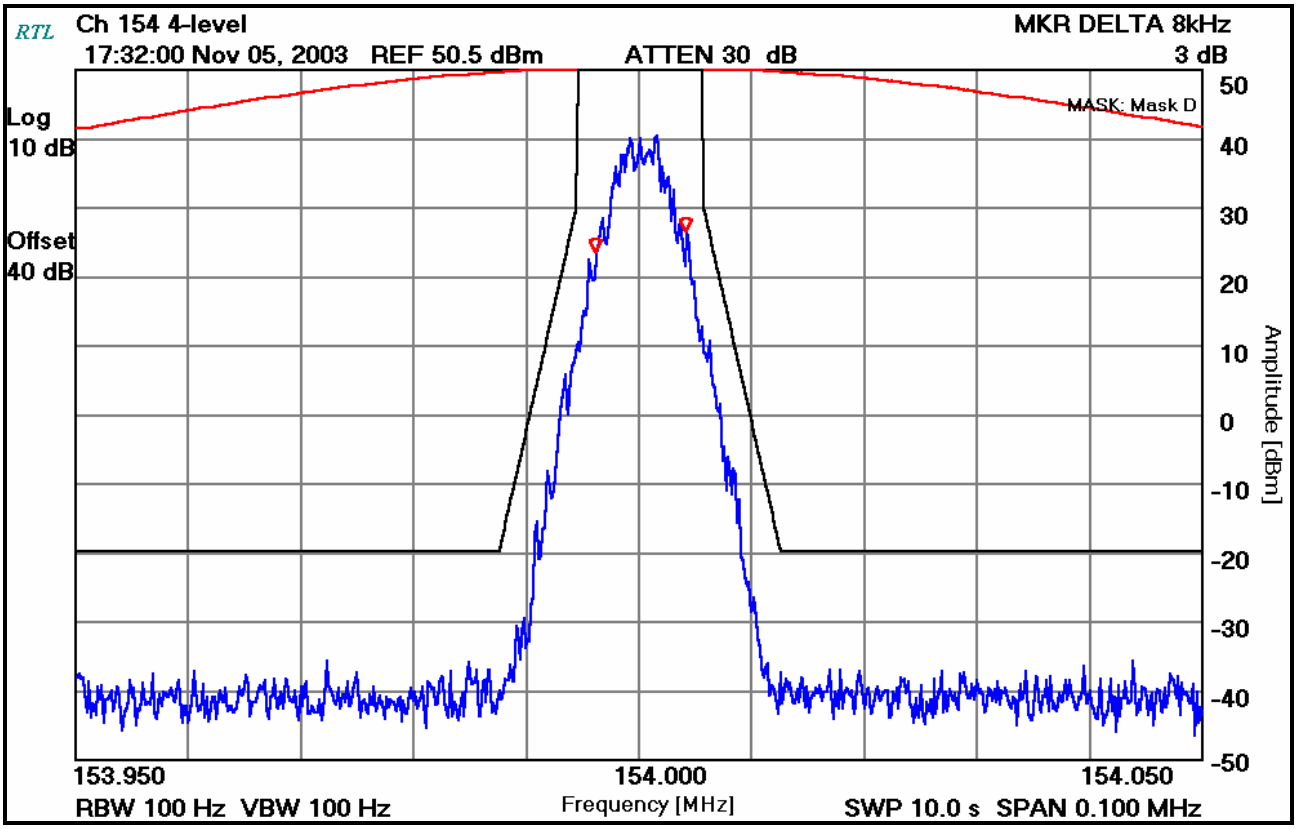


TABLE 8-1: TEST EQUIPMENT USED FOR TESTING (OCCUPIED BANDWIDTH)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	07/15/04
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/18/04

TEST PERSONNEL:

DANIEL BIGGS	Daniel Biggs	NOVEMBER 6, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

9 FCC RULES AND REGULATION PART 2 §2.1055: FREQUENCY STABILITY

9.1 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 +60°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 one half 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 the battery end point to maximum voltage.

The worst-case test data are shown below in Table 9-1.

9.2 TEST DATA

9.2.1 FREQUENCY STABILITY/TEMPERATURE VARIATION

Limit is 5.0 ppm for mobile device with a 12.5 kHz channel bandwidth. Worst-case deviation was found to be 0.55 ppm at -10°C.

PLOT 9-1: TEMPERATURE FREQUENCY STABILITY

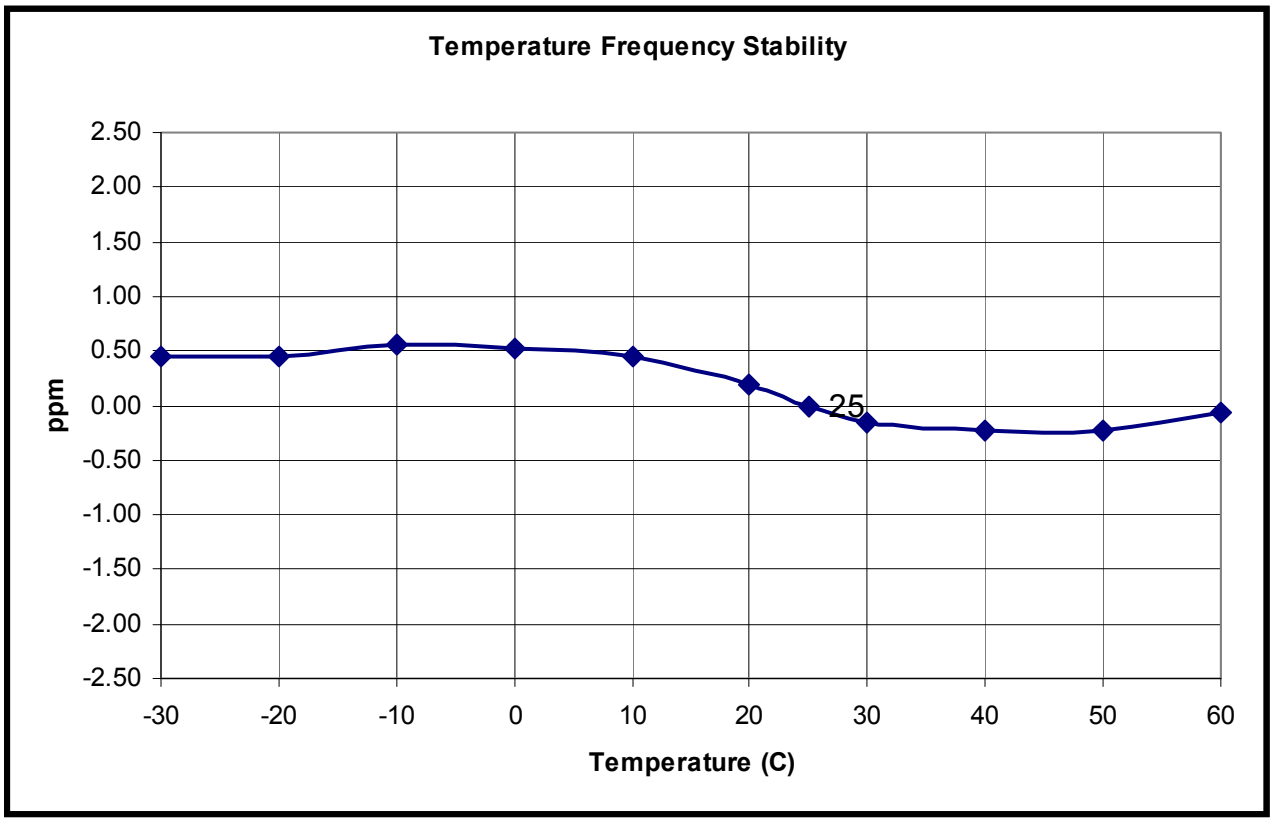


TABLE 9-1: TEMPERATURE FREQUENCY STABILITY CHANNEL 2, 154.0 MHz

Temperature C	Measured Frequency (MHz)	ppm
-30	154.000020	0.45
-20	154.000020	0.45
-10	154.000035	0.55
0	154.000030	0.52
10	154.000020	0.45
20	153.999980	0.19
25 reference	153.999950	0.00
30	153.999925	-0.16
40	153.999915	-0.23
50	153.999915	-0.23
60	153.999940	-0.06

TABLE 9-2: 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 with Humidity	11380	12/16/03
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/14/03
901215	Hewlett Packard	8596EM (9 kHz-12.8 GHz)	EMC Analyzer	3826A00144	08/23/03

TEST PERSONNEL:

DANIEL BIGGS		APRIL 4, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

9.2.2 FREQUENCY STABILITY/VOLTAGE VARIATION

Worst-case variation is 0.23 ppm at the 9.9 VDC.

PLOT 9-2: VOLTAGE FREQUENCY STABILITY

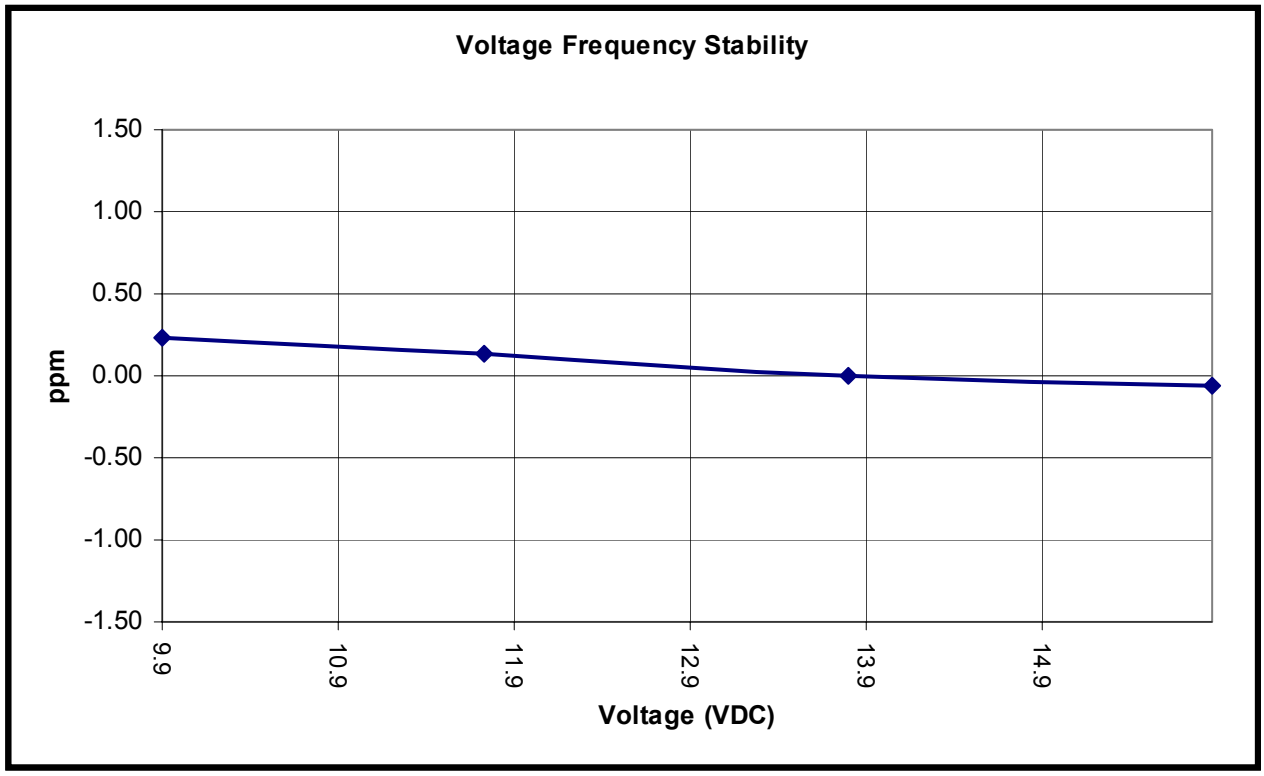


TABLE 9-3: FREQUENCY STABILITY/VOLTAGE VARIATION CHANNEL 2, 154.0 MHZ

Voltage (Vdc)	Measured Frequency (MHz)	ppm
9.9	153.999960	0.23
11.73	153.999945	0.13
13.8 reference	153.999925	0.00
15.87	153.999915	-0.06

TABLE 9-4: TEST EQUIPMENT USED FOR TESTING (FREQUENCY STABILITY/VOLTAGE)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM (9 kHz-12.8 GHz)	EMC Analyzer	3826A00144	08/23/03
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/14/03

TEST PERSONNEL:

DANIEL BIGGS		APRIL 7, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

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

10.1 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 was 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 100 Hz to 5 kHz 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 LOG (DEVfreq/DEVref)

10.2 TEST DATA

PLOT 10-1: MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE {12.5 kHz CHANNEL BANDWIDTH}

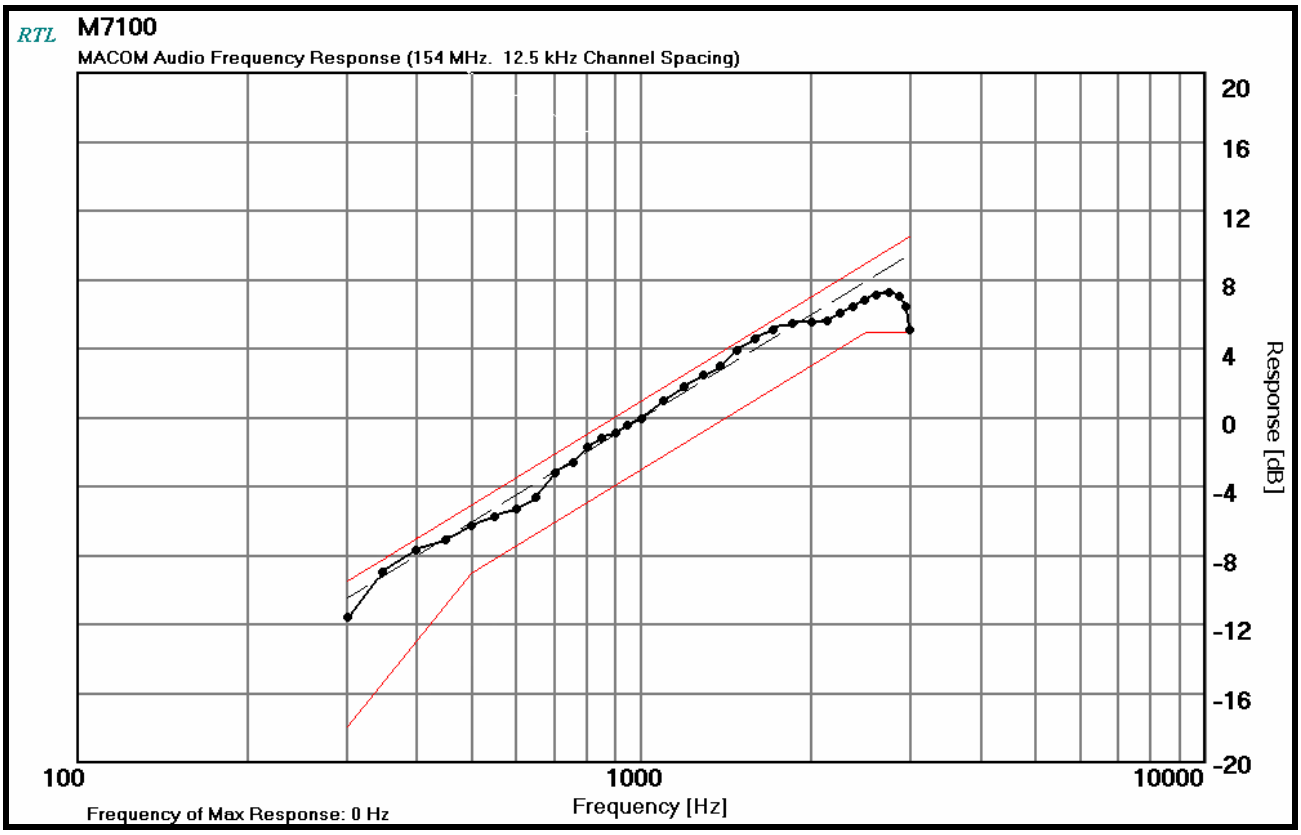


TABLE 10-1: TEST EQUIPMENT USED FOR TESTING (AUDIO FREQUENCY RESPONSE)

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	06/14/03
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	08/31/03

TEST PERSONNEL:

DANIEL BIGGS		MAY 4, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

11 FCC PART 2 §2.1047 (A): MODULATION CHARACTERISTICS – AUDIO LOW PASS FILTER

11.1 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.

11.2 TEST DATA

PLOT 11-1: MODULATION CHARACTERISTICS – AUDIO LOW PASS FILTER

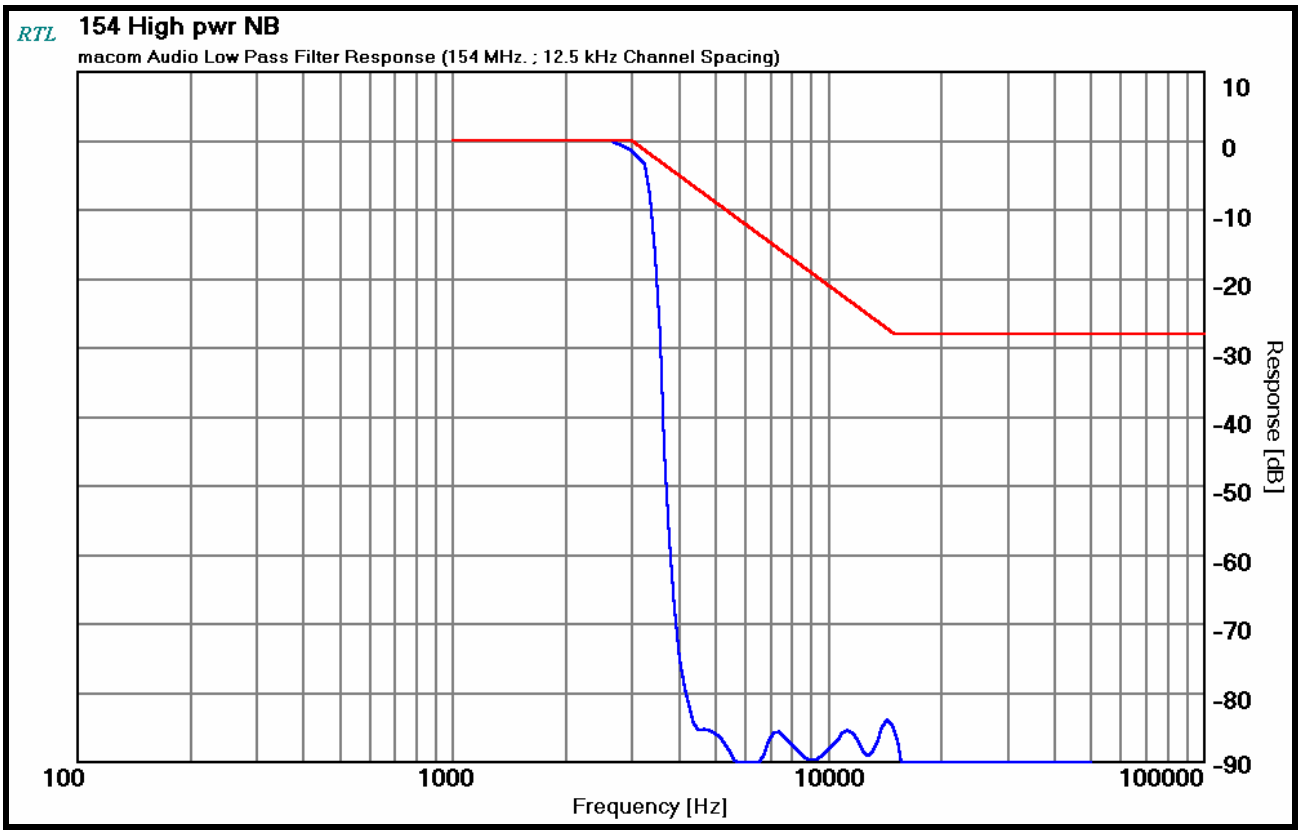


TABLE 11-1: TEST EQUIPMENT USED FOR TESTING (AUDIO LOW PASS FILTER RESPONSE)

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	06/14/03
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	08/31/03

TEST PERSONNEL:

DANIEL BIGGS		MAY 4, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

12 FCC RULES AND REGULATIONS PART 2 §2.1047 (B): MODULATION CHARACTERISTICS - MODULATION LIMITING

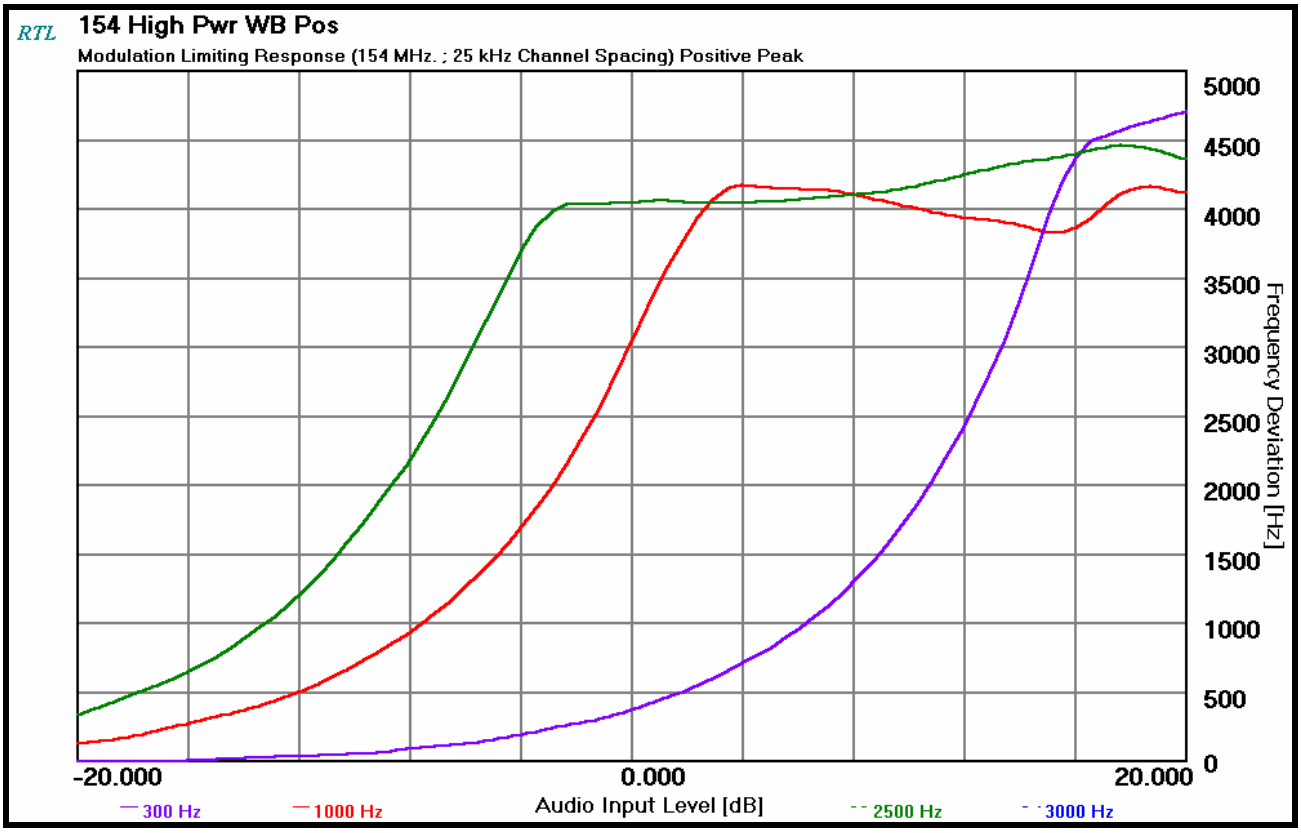
12.1 TEST PROCEDURE

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

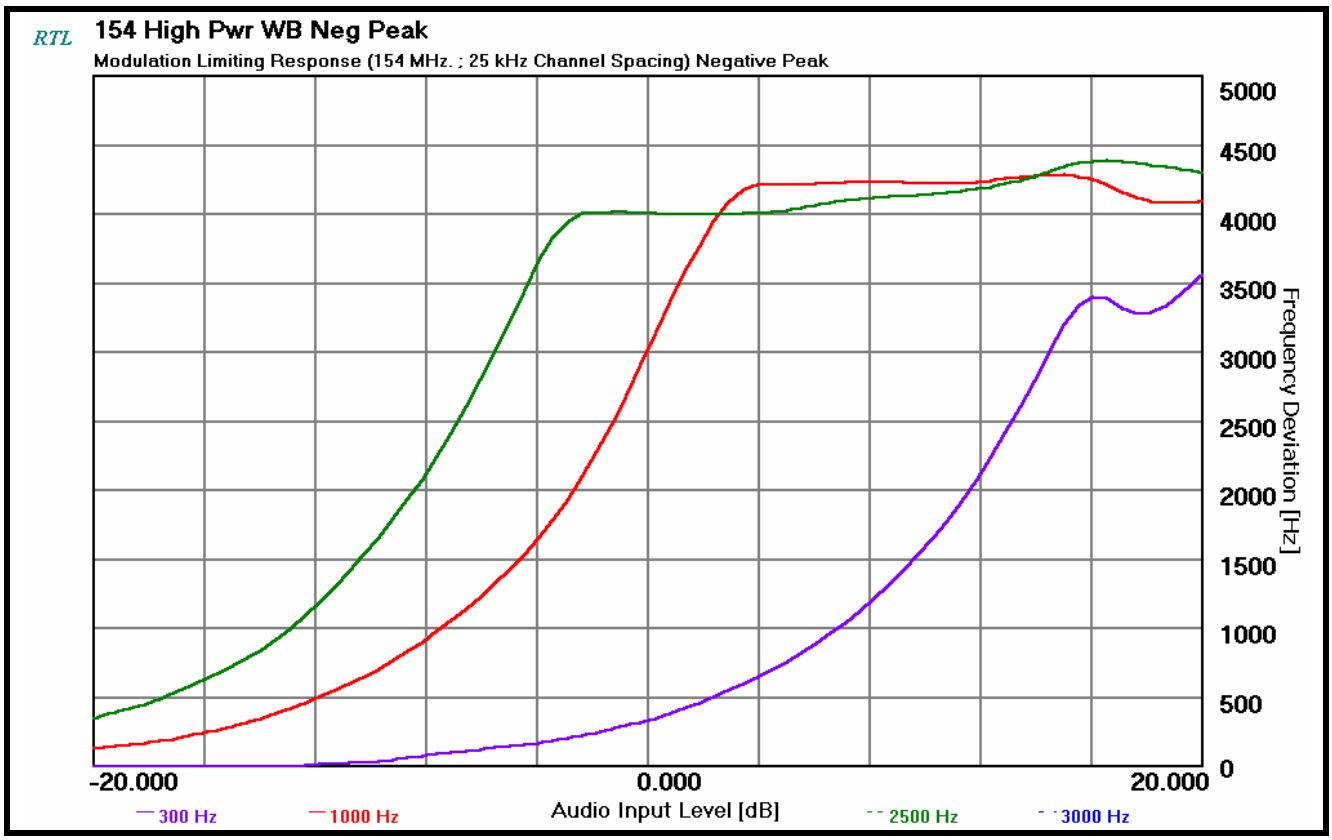
The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level as a reference (0dB) the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz. The system deviation obtained as a function of the input level was recorded. Both positive and negative peak deviations were recorded.

12.2 TEST DATA

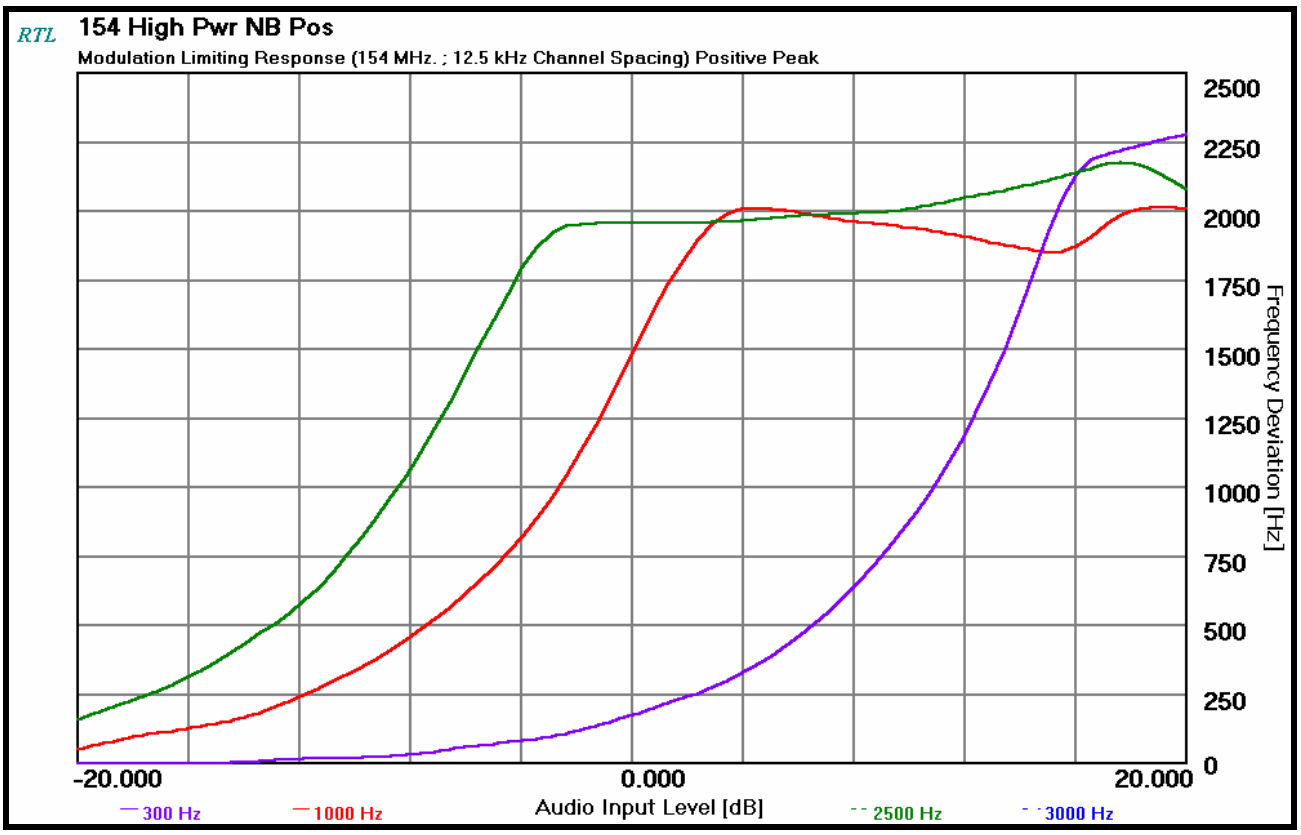
PLOT 12-1: MODULATION CHARACTERISTICS – MODULATION LIMITING: WIDE BAND; POSITIVE PEAK



PLOT 12-2: MODULATION CHARACTERISTICS – MODULATION LIMITING: WIDE BAND; NEGATIVE PEAK



PLOT 12-3: MODULATION CHARACTERISTICS – MODULATION LIMITING: NARROW BAND; POSITIVE PEAK



PLOT 12-4: MODULATION CHARACTERISTICS – MODULATION LIMITING: NARROW BAND; NEGATIVE PEAK

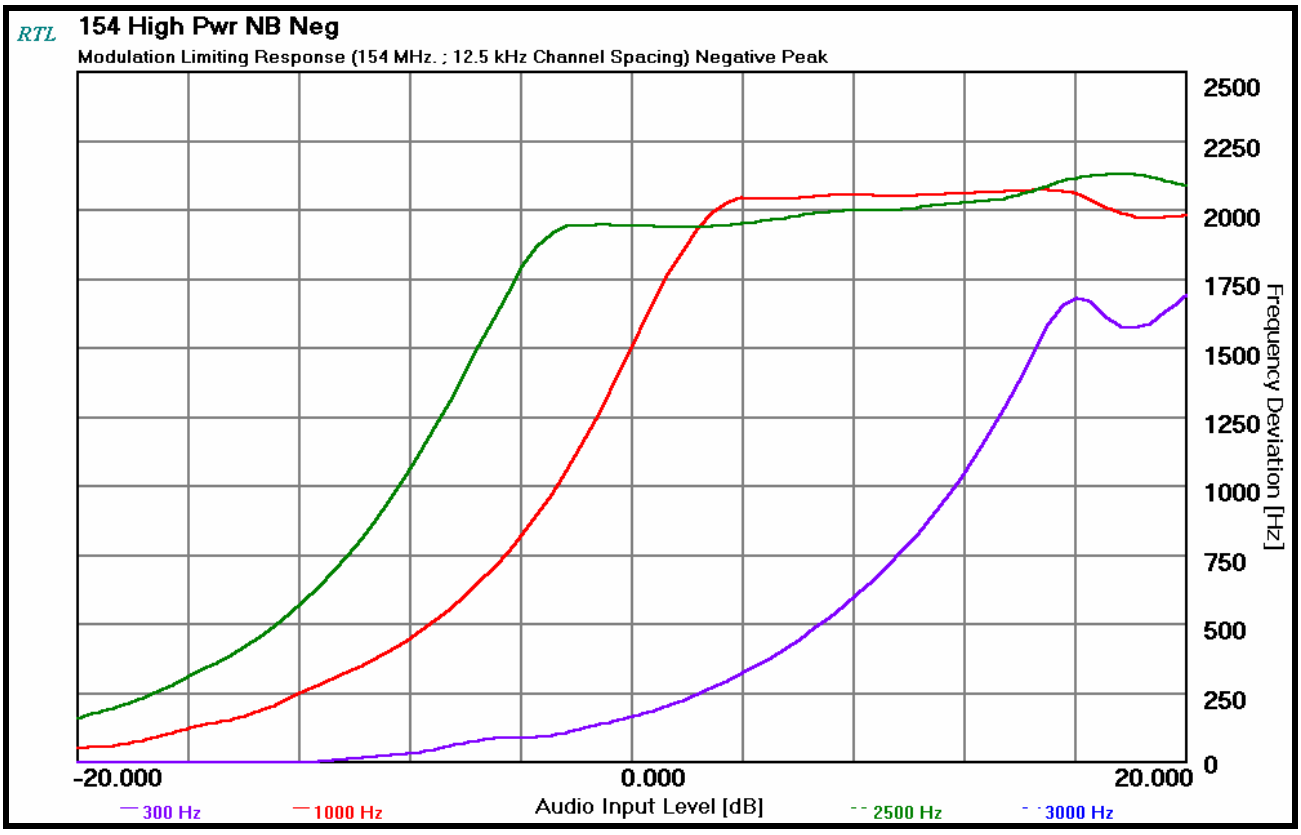


TABLE 12-1: TEST EQUIPMENT USED FOR TESTING (MODULATION LIMITING)

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	06/14/03
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	08/31/03

TEST PERSONNEL:

DANIEL BIGGS	Daniel Biggs	MAY 7, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

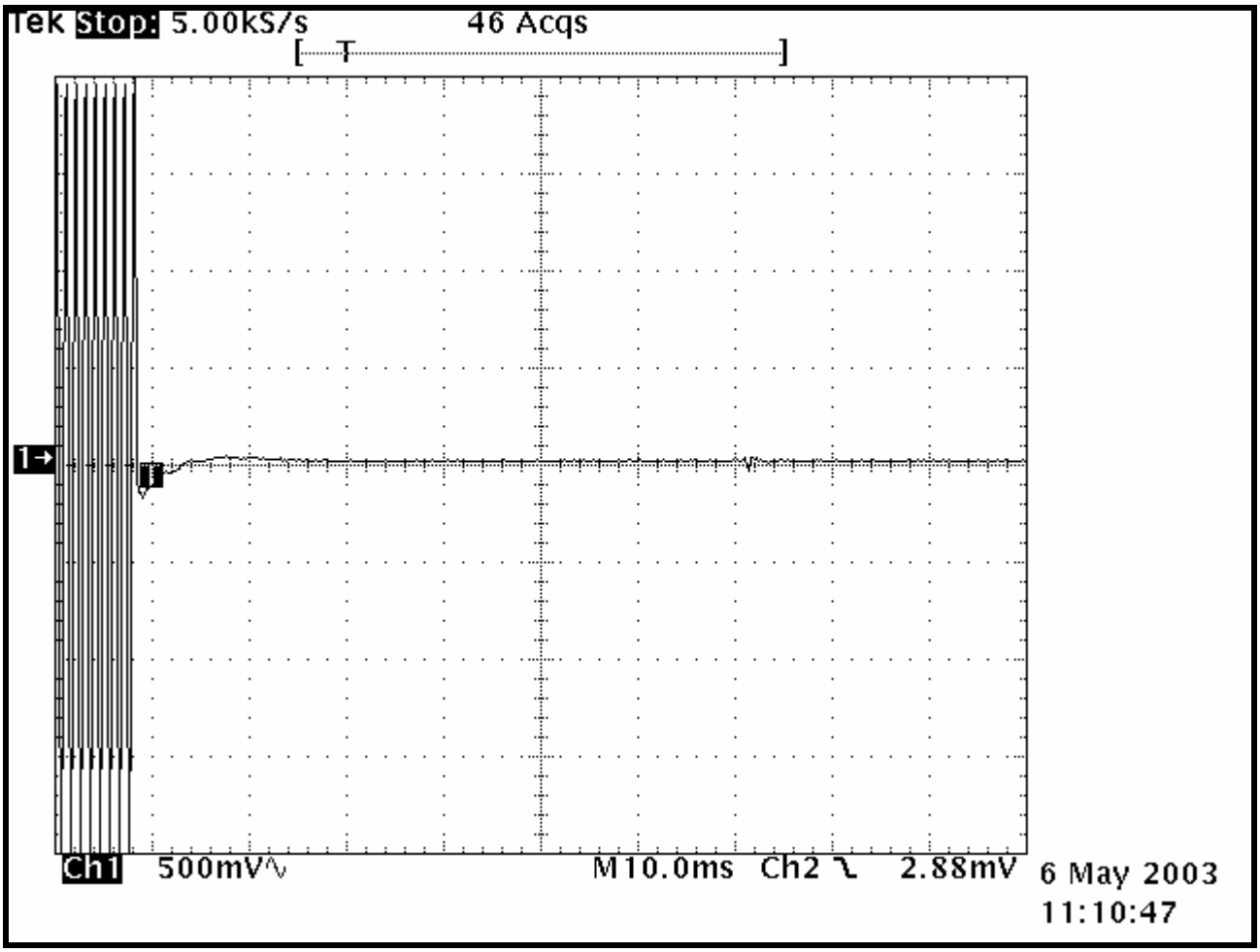
13 FCC RULES AND REGULATIONS PART 90 §90.214: TRANSIENT FREQUENCY BEHAVIOR

13.1 TEST PROCEDURE

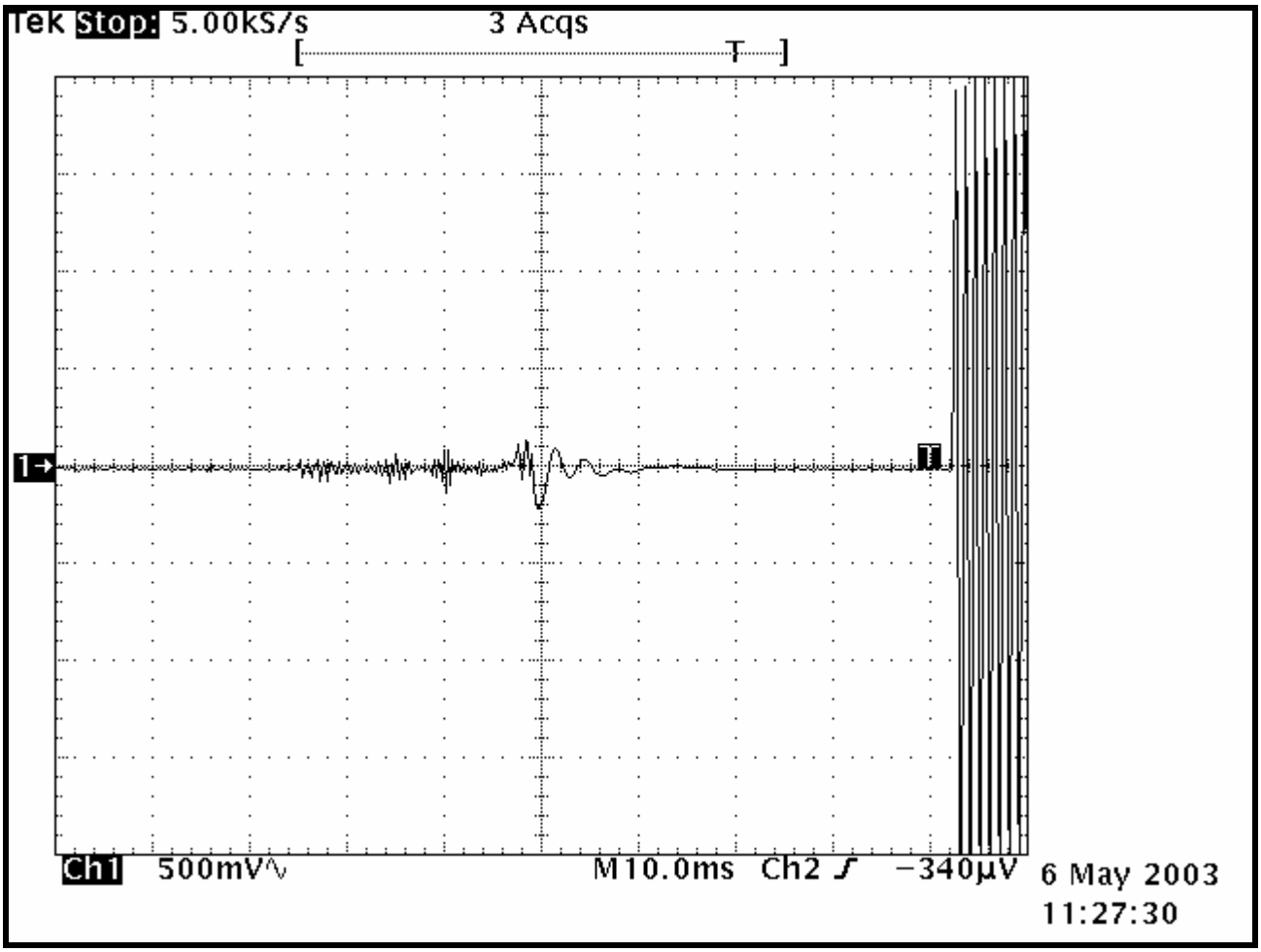
ANSI/TIA/EIA-603-1992, section 2.2.3

13.2 TEST DATA

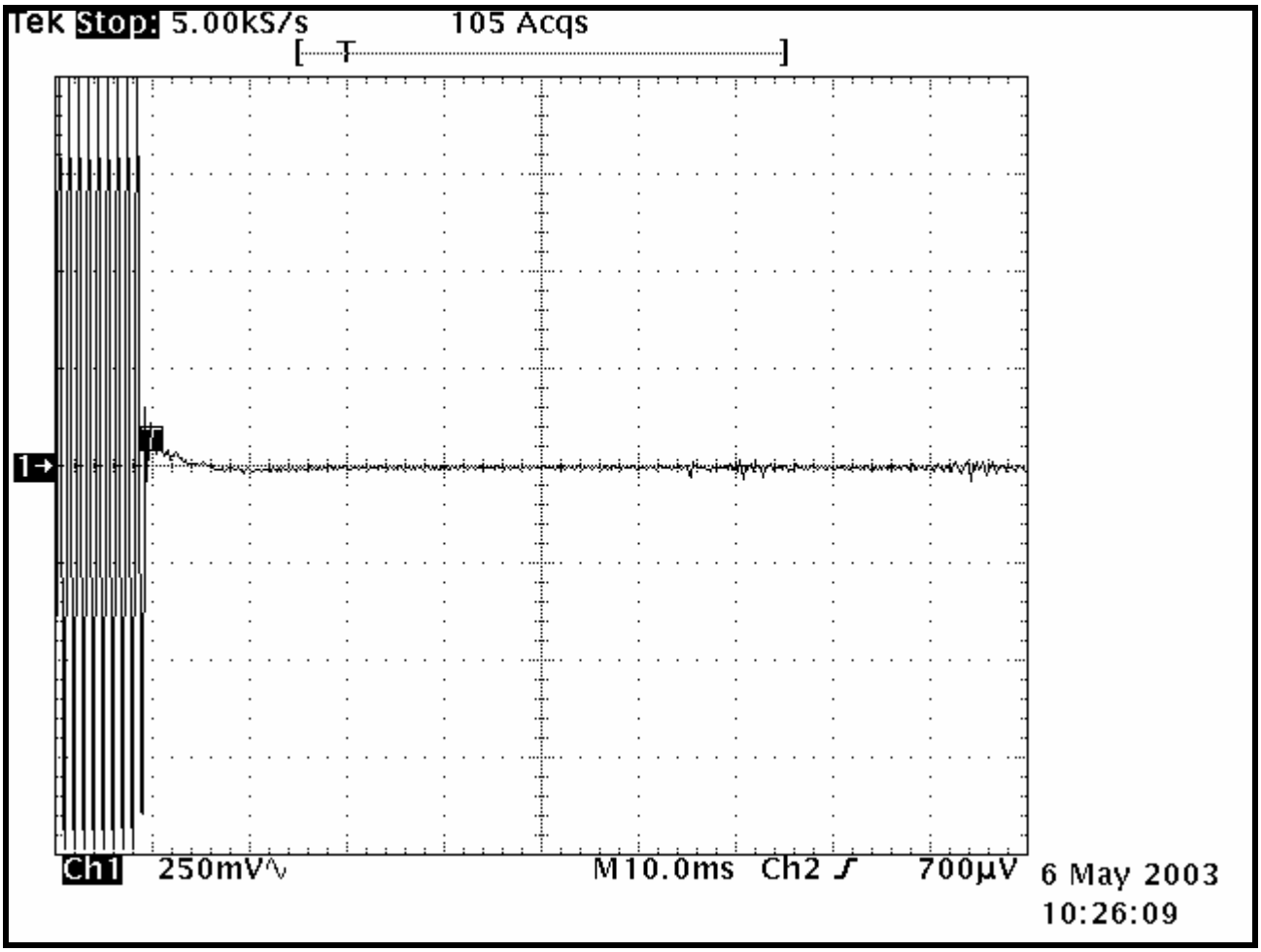
PLOT 13-1: TRANSIENT FREQUENCY BEHAVIOR – 154 MHz; HIGH POWER; WIDE BAND; CARRIER ON TIME



PLOT 13-2: TRANSIENT FREQUENCY BEHAVIOR – 154 MHz; HIGH POWER; WIDE BAND; CARRIER OFF TIME



PLOT 13-3: TRANSIENT FREQUENCY BEHAVIOR – 154 MHz; HIGH POWER; NARROW BAND; CARRIER ON TIME



PLOT 13-4: TRANSIENT FREQUENCY BEHAVIOR – 154 MHz; HIGH POWER; NARROW BAND; CARRIER OFF TIME

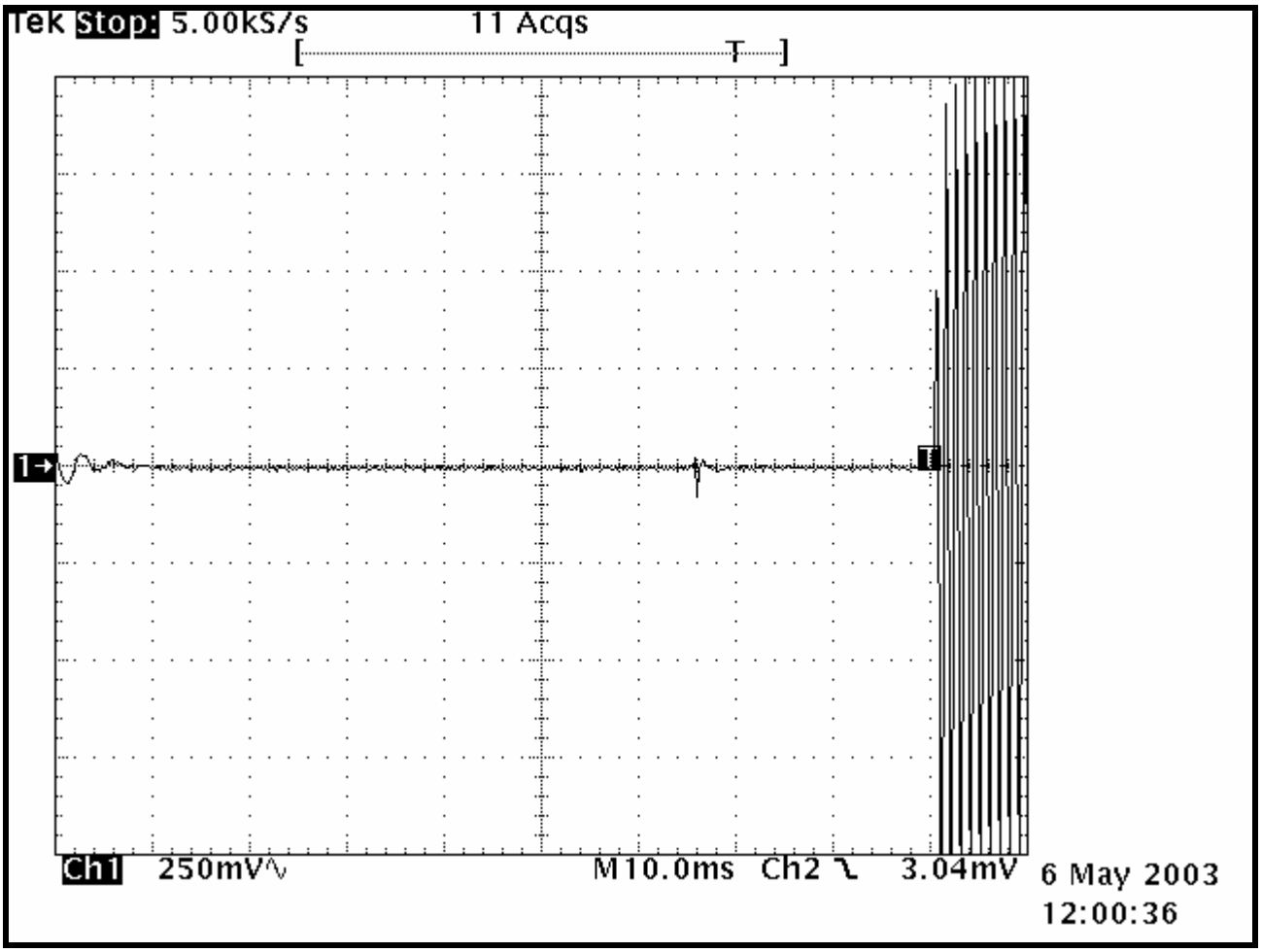


TABLE 13-1: TEST EQUIPMENT USED FOR TESTING (TRANSIENT FREQUENCY BEHAVIOR)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900917	Hewlett Packard	8648C	Signal Generator	3537A01741	05/02/04
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/14/03
900561	Tektronix	TDS540B	Oscilloscope	B020129	02/19/04
900352	Werlatone	C1795	Directional Coupler	4989	N/A

TEST PERSONNEL:

DANIEL BIGGS	Daniel Biggs	MAY 6, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

14 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 – 25 kHz channel separation
Calculation:
Max modulation(M) in kHz: 3.0
Max deviation (D) in kHz: 5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 16.0 kHz
Emission designator: 16K0F3E

Voice – 12.5 kHz channel separation
Calculation:
Max modulation(M) in kHz: 3.0
Max deviation (D) in kHz: 2.5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 11.0 kHz
Emission designator: 11K0F3E

Digital voice and data – 25 kHz separation
9600 Baud
Measurement: 99.0% Occupied Bandwidth
Bn = 10.0 kHz
Emission designator: 10K0F1D, 10K0F1E

Digital voice and data – 12.5 kHz separation
9600 Baud
Measurement: 99.0% Occupied Bandwidth
Bn = 7.67 kHz
Emission designator: 7K7F1D, 7K7F1E

Digital voice and data – 12.5 kHz separation
4800 Baud
Measurement: 99.0% Occupied Bandwidth
Bn = 4.83 kHz
Emission designator: 4K8F1D, 4K8F1E

C4FM –
Measurement: 99.0% Occupied Bandwidth
Bn = 8.0 kHz
Emission designator: 8K0F1D, 8K0F1E

15 CONCLUSION

The data in this measurement report shows that the **M/A-COM, Inc**. Model **M7100(IP) VHF Mobile Radio, FCC ID: OWDTR-0019-E,** complies with all the requirements of Parts 90, 80, 22, 15, and 2 of the FCC Rules, and Industry Canada RSS-119, Issue 6, 2000.