



Engineering and Testing for EMC and Safety Compliance

TYPE CERTIFICATION REPORT

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MODEL: M7100^{IP} UHF-H Mobile Radio
450-512 MHz

FCC ID: OWDTR-0021-E

April 6, 2004

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 2003	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 2003	RADIO FREQUENCY DEVICES - §15.109: RADIATED EMISSIONS LIMITS
PART 90: 2003	PRIVATE LAND MOBILE RADIO SERVICES
ANSI C63.4-2001	AMERICAN NATIONAL STANDARD FOR METHODS OF MEASUREMENT OF RADIO NOISE EMISSIONS FROM LOW-VOLTAGE ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9 kHz – 40 GHz
ANSI/TIA/EIA603- 2002	LAND MOBILE FM OR PM COMMUNICATIONS EQUIPMENT - MEASUREMENT AND PERFORMANCE STANDARDS
ANSI/TIA/EIA –102.CAAA; 2002	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	Measured Frequency Tolerance (ppm)	Emission Designator
450-512 MHz	54.0	0.2	16K0F3E (Voice)
450-512 MHz	54.0	0.2	11K0F3E (Voice)
450-512 MHz	54.0	0.2	8K3F1D (2 level NB 9600) measured
450-512 MHz	54.0	0.2	8K3F1E (2 level NB 9600) measured
450-512 MHz	54.0	0.2	5K3F1D (2 level NB 4800) measured
450-512 MHz	54.0	0.2	5K3F1E (2 level NB 4800) measured
450-512 MHz	54.0	0.2	10K3F1D (2 level WB 9600) measured
450-512 MHz	54.0	0.2	10K3F1E (2 level WB 9600) measured
450-512 MHz	54.0	0.2	8K1F1D (4 Level) measured
450-512 MHz	54.0	0.2	8K1F1E (4 Level) measured

REPORT PREPARED BY TEST ENGINEER: DAN BIGGS

Document Number: 2003157/ QRTL03-964A

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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^P UHF-H Mobile Radio; FCC ID: OWDTR-0021-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.

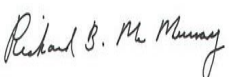
2 CONFORMANCE STATEMENT

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 2003	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 2003	RADIO FREQUENCY DEVICES - § 15.109: RADIATED EMISSIONS LIMITS
PART 90: 2003	PRIVATE LAND MOBILE RADIO SERVICES
ANSI C63.4-2001	AMERICAN NATIONAL STANDARD FOR METHODS OF MEASUREMENT OF RADIO NOISE EMISSIONS FROM LOW-VOLTAGE ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9 kHz – 40 GHz
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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	Maximum Measured Output Power (W) Conducted	Measured Frequency Tolerance (ppm)	Emission Designator
450-512 MHz	54.0	0.2	16K0F3E (Voice)
450-512 MHz	54.0	0.2	11K0F3E (Voice)
450-512 MHz	54.0	0.2	8K3F1D (2 level NB 9600) measured
450-512 MHz	54.0	0.2	8K3F1E (2 level NB 9600) measured
450-512 MHz	54.0	0.2	5K3F1D (2 level NB 4800) measured
450-512 MHz	54.0	0.2	5K3F1E (2 level NB 4800) measured
450-512 MHz	54.0	0.2	10K3F1D (2 level WB 9600) measured
450-512 MHz	54.0	0.2	10K3F1E (2 level WB 9600) measured
450-512 MHz	54.0	0.2	8K1F1D (4 Level) measured
450-512 MHz	54.0	0.2	8K1F1E (4 Level) 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.

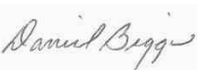
Furthermore, there was no deviation from, additions to or exclusions from the above standards for Certification methodology.

Signature: 

Date: April 6, 2004

Typed/Printed Name: Rick McMurray

Position: Vice President of Operations

Signature: 

Date: April 6, 2004

Typed/Printed Name: Daniel W. Biggs

Position: Test Engineer

3 TESTED SYSTEM DETAILS

The test sample was received on October 7, 2003. 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/SN	FCC ID	RTL Bar Code
UHF-H M7100 Mobile Radio	M/A-COM, INC.	M7100 ^P	RU101188V22	OWDTR-0021-E	15462
Control Head	M/A-COM, INC.	N/A	KRY1011632/13	N/A	N/A
Control Head	M/A-COM, INC.	N/A	KRY1011632/14	N/A	N/A
Motorcycle Kit	M/A-COM, INC.	N/A	188D6803	N/A	15557
Antenna	M/A-COM, INC.	Coil/Whip	LE-OM440BK/TNC	N/A	N/A
Antenna	M/A-COM, INC.	Coil/Whip	LE-OM450BK/TNC	N/A	N/A
Antenna	M/A-COM, INC.	Coil/Whip	LE-OM470BK/TNC	N/A	N/A
Antenna	M/A-COM, INC.	Coil/Whip	LE-OM490BK/TNC	N/A	N/A
Microphone	M/A-COM, INC.	N/A	MC101616V1	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	AN102800V1	N/A	N/A
Control Cable	M/A-COM, INC.	N/A	19B802554P23	N/A	N/A
Speaker	M/A-COM, INC.	N/A	LS102824V1	N/A	N/A

3.1 CONFIGURATIONS OF TEST SYSTEMS

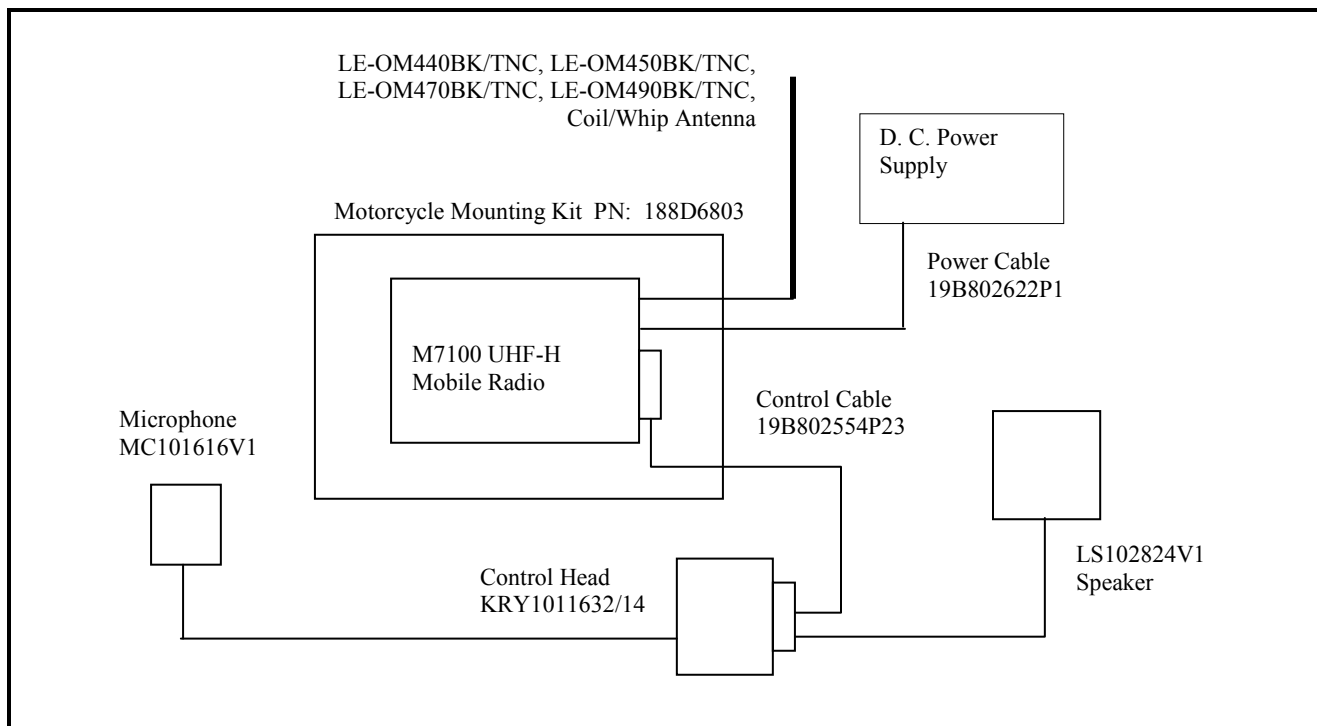


FIGURE 3-1: MOTORCYCLE OPTION CONFIGURATION

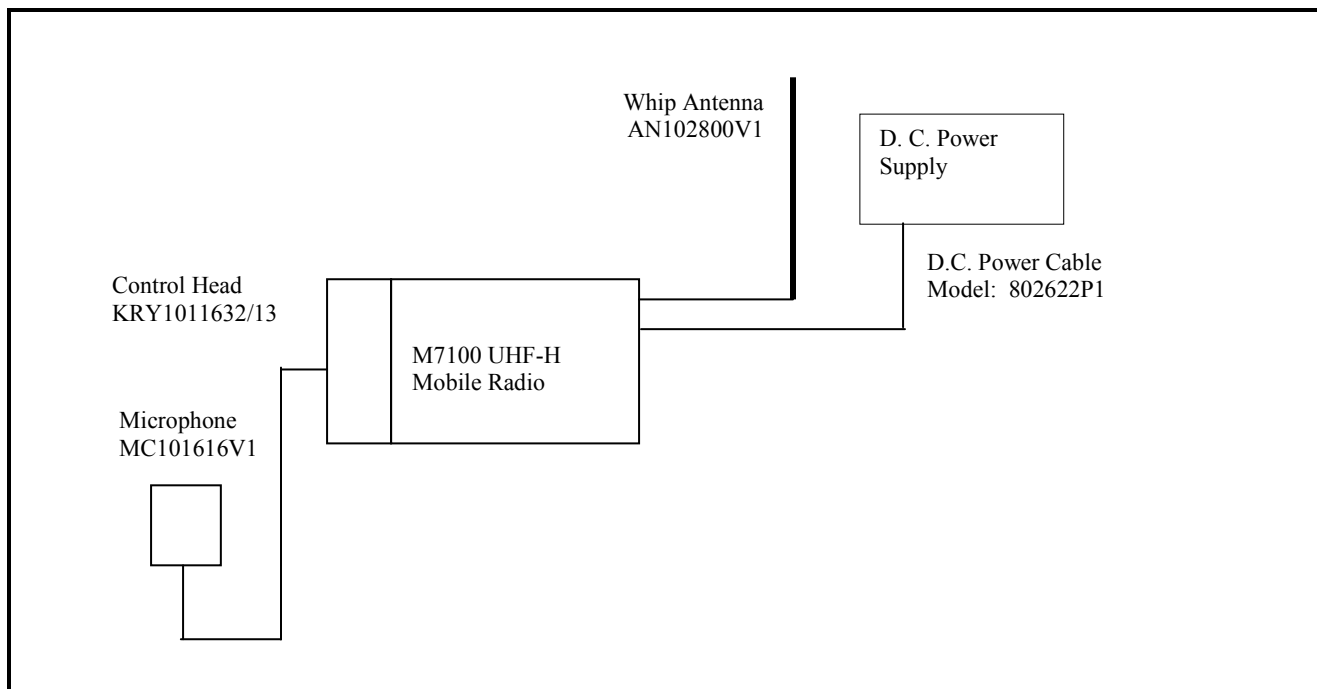


FIGURE 3-2: STANDARD CONFIGURATION

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: 11.1 AMPS

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: 450, 500, and 512

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

Channel	Frequency (MHz)	RF Power Measured (Watt)*
1 (High Power)	450	53.8
2 (High Power)	500	51.9
3 (High Power)	512	52.2
1 (Low Power)	450	7.7
2 (Low Power)	500	7.9
3 (Low Power)	512	8.1

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

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

Rated Power (W)
50

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/US420.52510380	07/30/04

TEST PERSONNEL:

DANIEL BIGGS		OCTOBER 7, 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 $50\ \Omega$ 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 $10 \times F_c$

Limit: $50 + (10 \times \log P(W))$

The following channels (in MHz) were investigated: 450, 500, and 512. 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 – 450 MHZ - HIGH POWER

(450 MHz); 12.5 kHz channel spacing; Conducted power = 53.8 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
900	89.64	67.31	-22.33
1350	92.48	67.31	-25.17
1800	105.64	67.31	-38.33
2250	105.81	67.31	-38.50
2700	103.14	67.31	-35.83
3150	102.14	67.31	-34.83
3600	82.14	67.31	-14.83
4050	84.31	67.31	-17.00
4500	97.14	67.31	-29.83
4950	101.48	67.31	-34.17

TABLE 6-2: CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 – 450 MHZ – LOW POWER

(450 MHz); 12.5 kHz channel spacing; Conducted power = 7.7 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
900	92.03	58.86	-33.17
1350	94.37	58.86	-35.51
1800	99.87	58.86	-41.01
2250	99.04	58.86	-40.18
2700	97.20	58.86	-38.34
3150	95.03	58.86	-36.17
3600	91.20	58.86	-32.34
4050	79.87	58.86	-21.01
4500	97.03	58.86	-38.17
4950	98.54	58.86	-39.68

TABLE 6-3: CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 – 500 MHZ – HIGH POWER

(500 MHz); 12.5 kHz channel spacing; Conducted power = 51.9 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
1000	92.15	67.15	-25.00
1500	89.81	67.15	-22.66
2000	102.82	67.15	-35.67
2500	98.65	67.15	-31.50
3000	105.48	67.15	-38.33
3500	67.98	67.15	-0.83
4000	83.48	67.15	-16.33
4500	92.52	67.15	-25.37
5000	99.98	67.15	-32.83
5500	105.98	67.15	-38.83

TABLE 6-4: CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 – 500 MHZ – LOW POWER

(500 MHz); 12.5 kHz channel spacing; Conducted power = 7.9 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
1000	93.17	58.98	-34.19
1500	91.00	58.98	-32.02
2000	99.67	58.98	-40.69
2500	95.66	58.98	-36.68
3000	97.66	58.98	-38.68
3500	84.00	58.98	-25.02
4000	89.33	58.98	-30.35
4500	96.84	58.98	-37.86
5000	99.17	58.98	-40.19
5500	97.66	58.98	-38.68

TABLE 6-5: CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 512 MHZ – HIGH POWER

(512 MHz); 12.5 kHz channel spacing; Conducted power = 52.2 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
1024	91.85	67.18	-24.67
1536	90.18	67.18	-23.00
2048	108.52	67.18	-41.34
2560	94.85	67.18	-27.67
3072	106.34	67.18	-39.16
3584	69.18	67.18	-2.00
4096	81.35	67.18	-14.17
4608	86.68	67.18	-19.50
5120	101.01	67.18	-33.83
5632	107.85	67.18	-40.67

TABLE 6-6: CONDUCTED SPURIOUS EMISSIONS CHANNEL 2 – 512 MHZ – LOW POWER

(512 MHz); 12.5 kHz channel spacing; Conducted power = 8.1 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
1024	92.74	59.08	-33.66
1536	90.40	59.08	-31.32
2048	101.41	59.08	-42.33
2560	98.74	59.08	-39.66
3072	96.90	59.08	-37.82
3584	80.23	59.08	-21.15
4096	80.74	59.08	-21.66
4608	94.40	59.08	-35.32
5120	96.57	59.08	-37.49
5632	97.24	59.08	-38.16

TABLE 6-7: TEST EQUIPMENT USED FOR TESTING (CONDUCTED SPURIOUS EMISSIONS)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration 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		OCTOBER 9, 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 – 500 MHZ; NARROW BAND

Mid Band Channel 2 (500 MHz, Narrowband)
Limit = $50 + 10 \log P = 67.15 \text{ dBc}$
Conducted Power = 47.15 dBm = 51.9 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
1000.0	73.5	-34.8	0.4	-0.2	82.5	-15.4
1500.0	57.6	-45.1	0.4	4.7	88.0	-20.8
2000.0	42.9	-55.3	0.6	4.9	98.1	-31.0
2500.0	29.9	-61.3	6.8	5.2	110.1	-42.9
3000.0	27.1	-65.1	7.6	6.3	113.5	-46.4
3500.0	27.2	-64.6	7.7	5.0	114.4	-47.3
4000.0	27.0	-62.2	8.0	5.9	111.5	-44.3
4500.0	25.2	-62.9	8.3	7.1	111.3	-44.1
5000.0	25.1	-62.1	8.0	7.0	110.3	-43.1
5500.0	24.8	-62.4	7.8	8.2	109.2	-42.0

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

TABLE 7-2: FIELD STRENGTH OF SPURIOUS RADIATION CHANNEL 2 – 500 MHZ; NARROW BAND

Mid Band Channel 2 (500 MHz, Narrowband)
Limit = $50 + 10 \log P = 58.98 \text{ dBc}$
Conducted Power = 39.0 dBm = 7.9 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
1000.0	66.0	-42.3	0.4	-0.2	90.0	-31.0
1500.0	45.1	-57.6	0.4	4.7	100.5	-41.5
2000.0	36.9	-61.3	0.6	4.9	104.1	-45.1
2500.0	26.5	-64.7	6.8	5.2	113.5	-54.5
3000.0	26.9	-65.3	7.6	6.3	113.7	-54.8
3500.0	25.8	-66.0	7.7	5.0	115.8	-56.8
4000.0	26.5	-62.7	8.0	5.9	112.0	-53.0
4500.0	25.0	-63.1	8.3	7.1	111.5	-52.5
5000.0	25.8	-61.4	8.0	7.0	109.6	-50.6
5500.0	23.9	-63.3	7.8	8.2	110.1	-51.1

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

TABLE 7-3: TEST EQUIPMENT USED FOR TESTING (FIELD STRENGTH OF SPURIOUS RADIATION)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration 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 - 3200 MHz)	3537A01741	05/02/04
900928	Hewlett Packard	HP 83752A	Synthesized Sweeper (.01 – 20 GHz)	3610A00866	08/05/04

TEST PERSONNEL:

DANIEL BIGGS		OCTOBER 9, 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

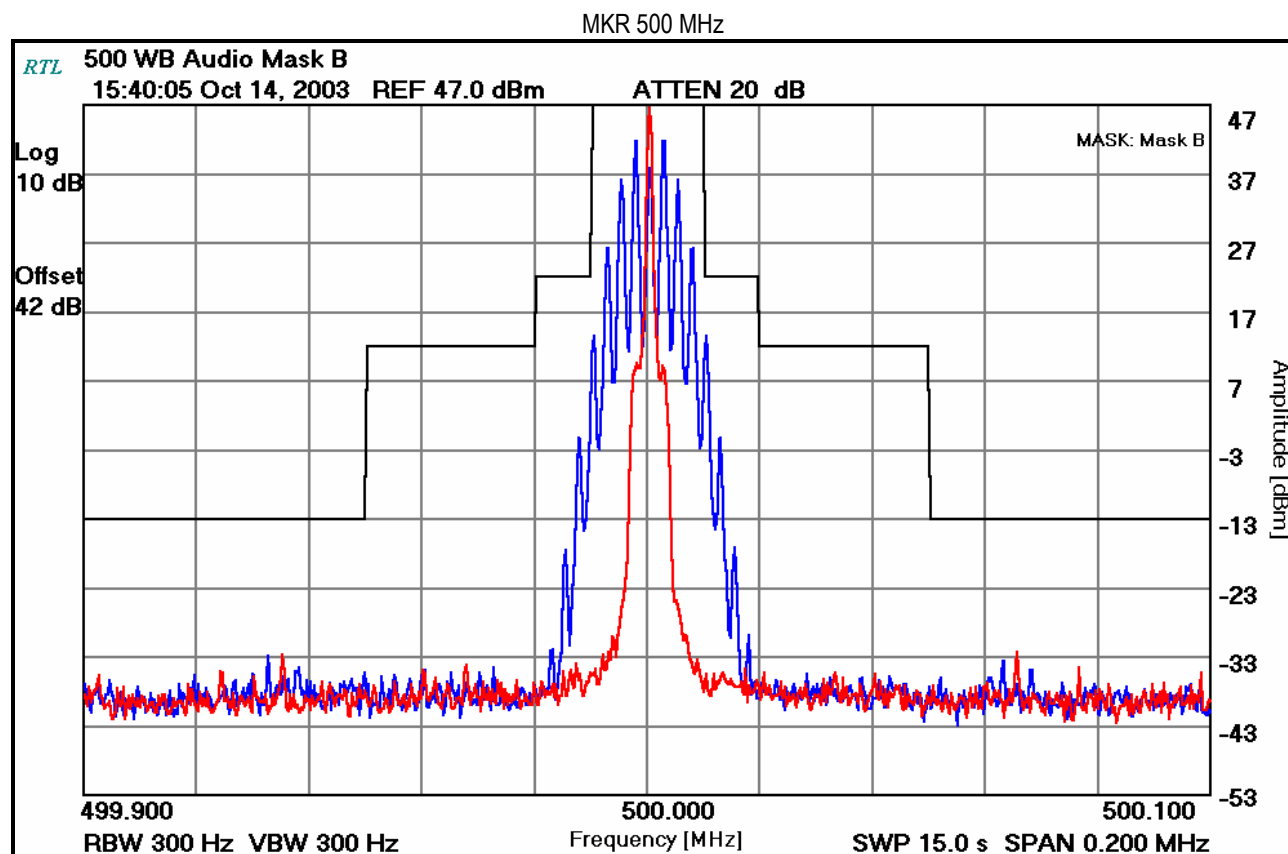
ANSI/TIA/EIA-603-1992, section 2.2.11 and TIA/EIA-102.CAAA-1999 section 2.2.5

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.

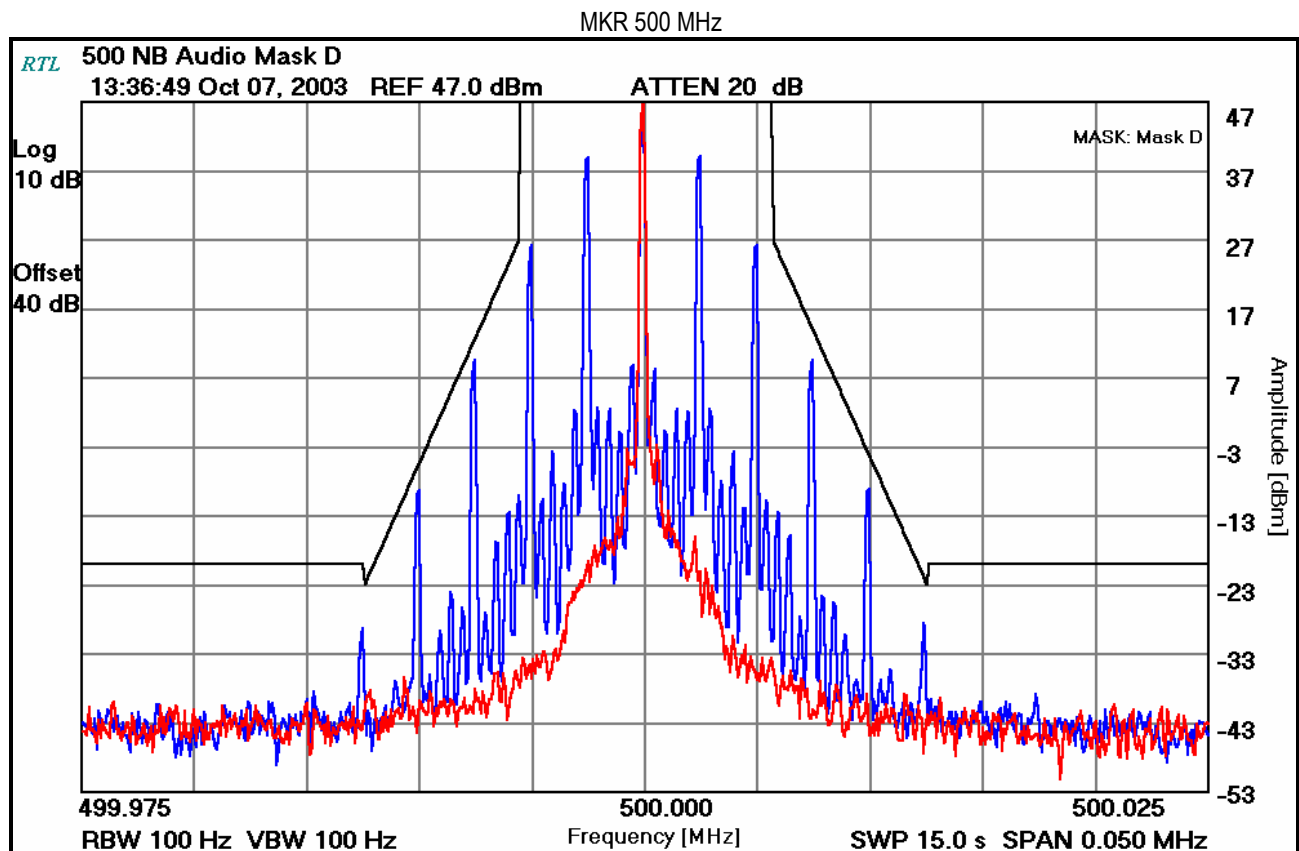
Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence – 9600-bps

8.2 TEST DATA

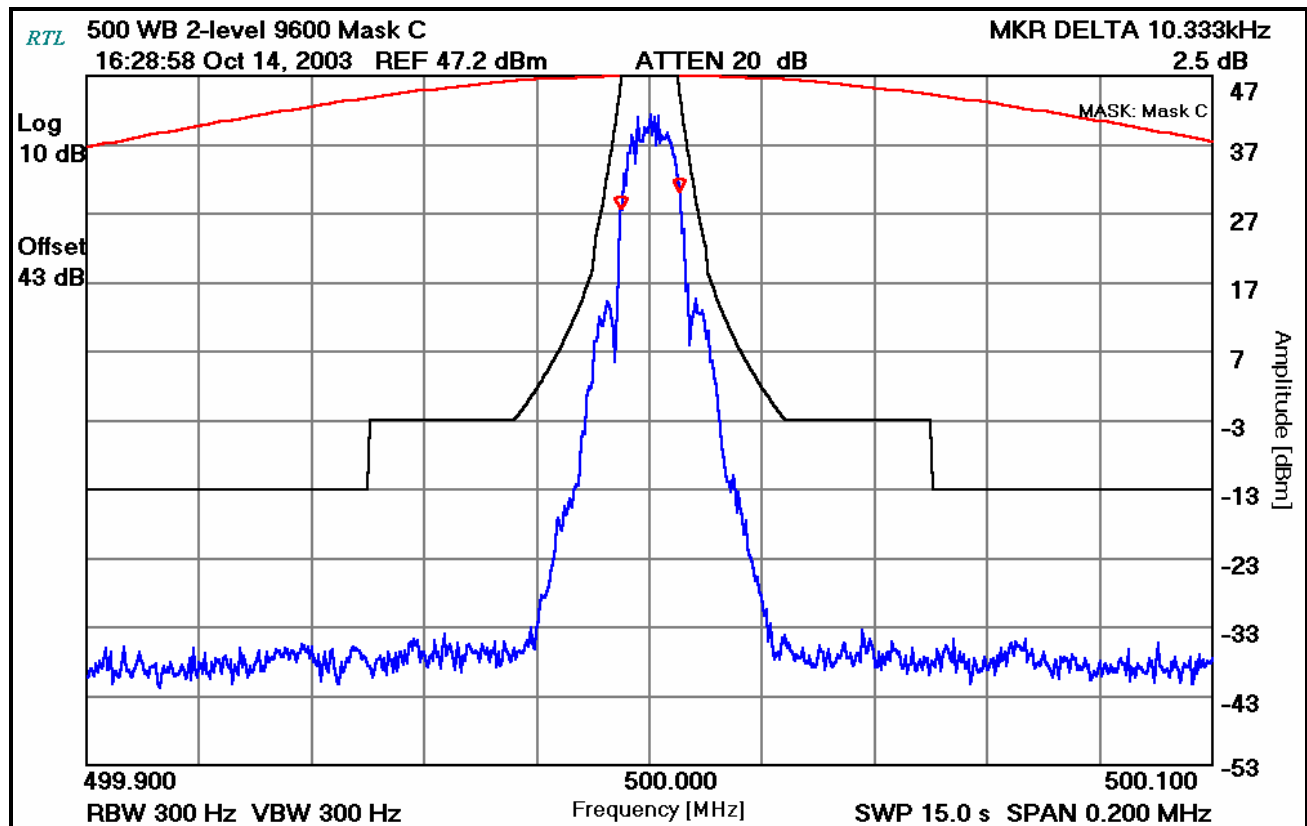
PLOT 8-1: OCCUPIED BANDWIDTH; WIDE BAND; AUDIO MODULATION: 2,500 HZ



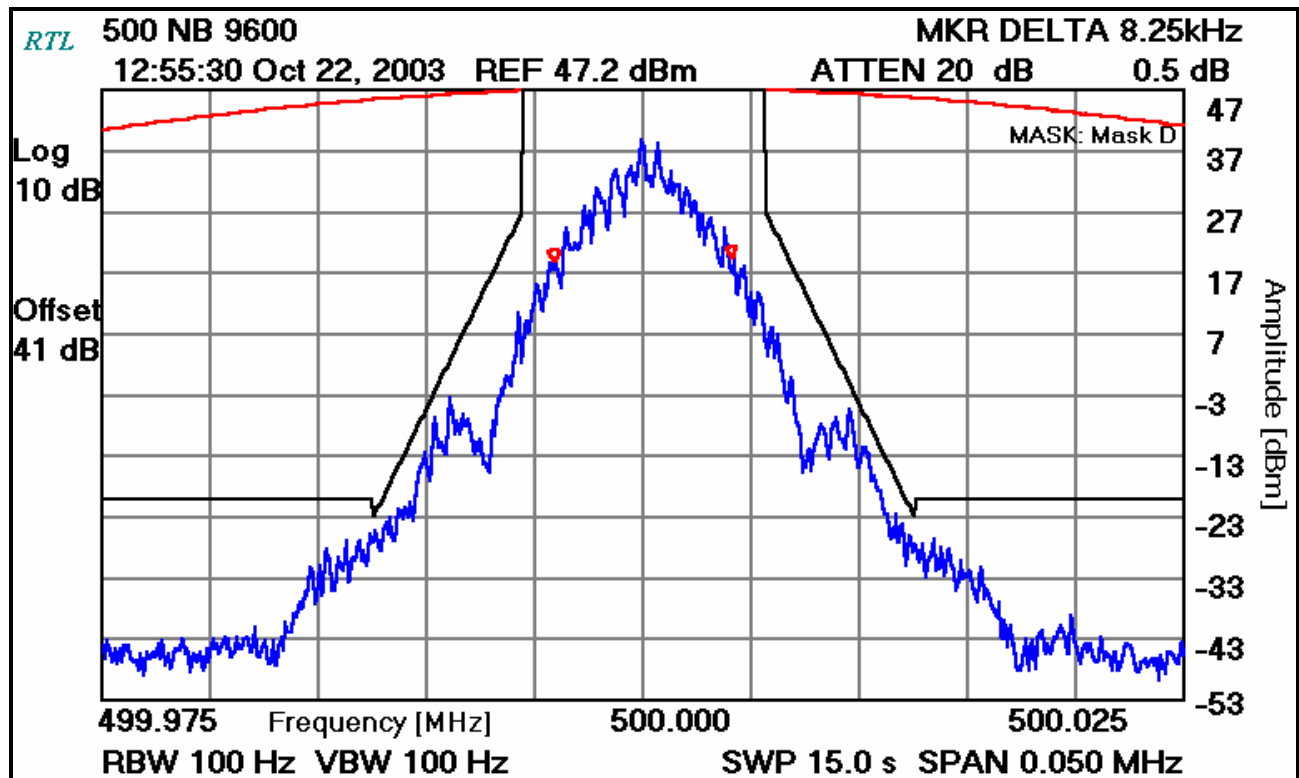
PLOT 8-2: OCCUPIED BANDWIDTH; NARROW BAND; AUDIO MODULATION: 2,500 HZ



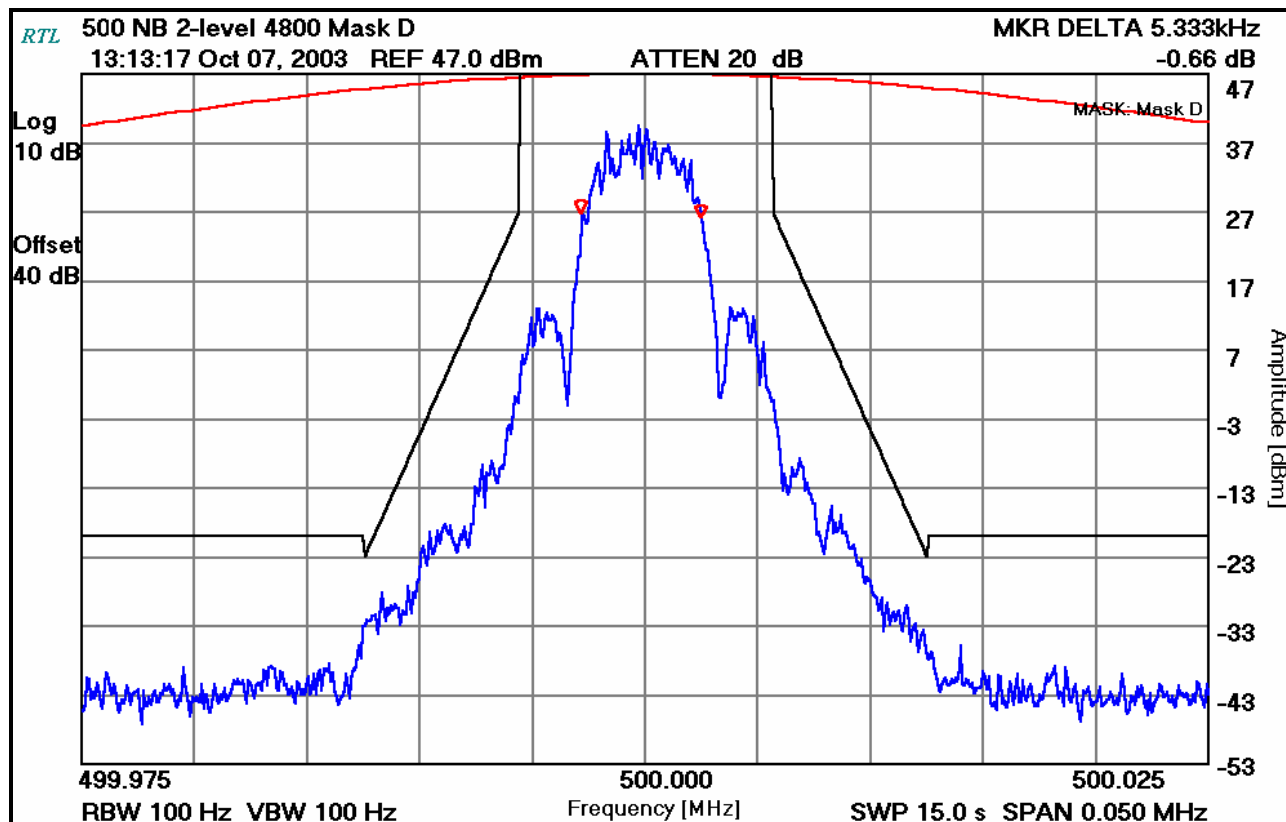
PLOT 8-3: 99% OCCUPIED BANDWIDTH - 2 LEVEL DIGITAL; WIDE BAND; 9600 BAUD



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



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



PLOT 8-6: 99% OCCUPIED BANDWIDTH - C4FM; NARROW BAND; 4800 BAUD

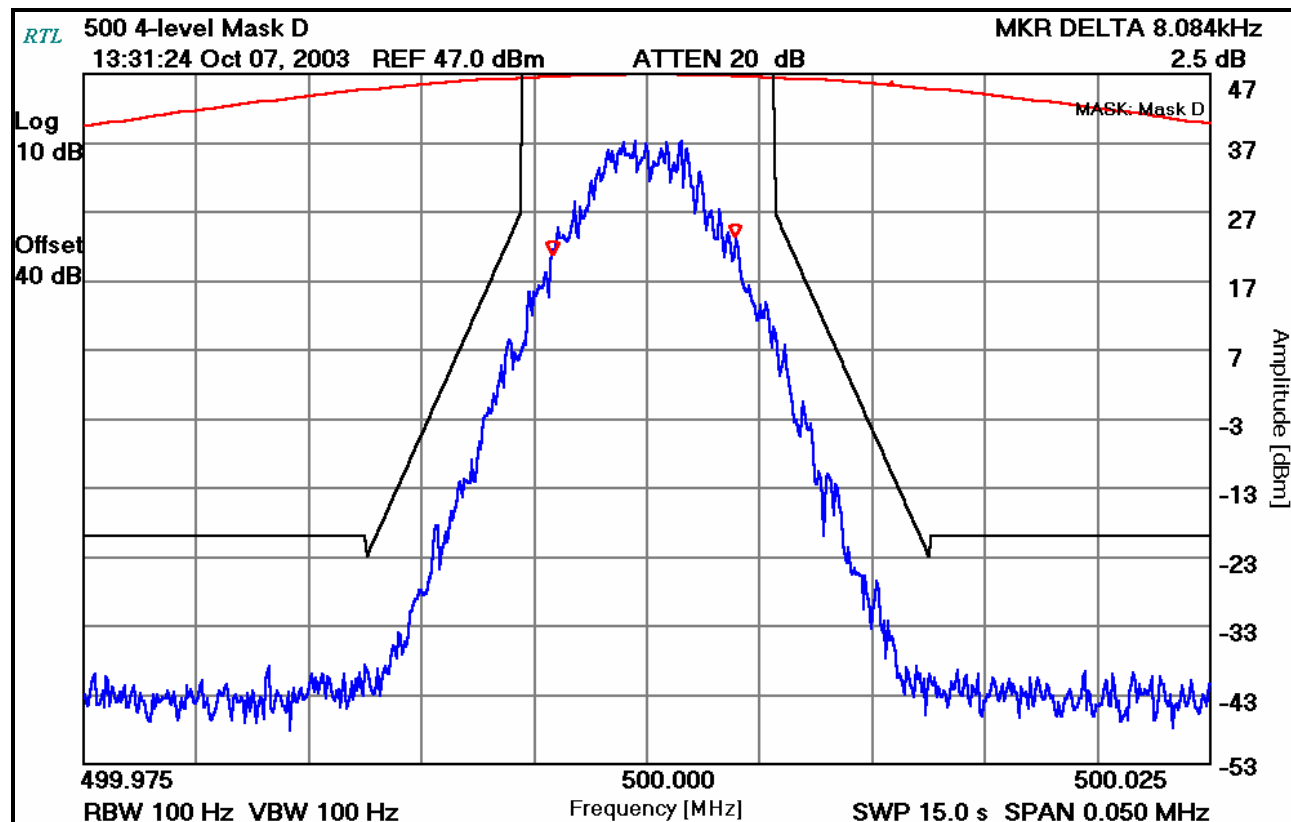


TABLE 8-1: TEST EQUIPMENT USED FOR TESTING (OCCUPIED BANDWIDTH)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration 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	<i>Daniel Biggs</i>	OCTOBER 7, 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 ½ 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 +/-15% nominal input voltage.

The worst-case test data are shown below in Table 9-1 and Table 9-3.

9.2 TEST DATA

9.2.1 FREQUENCY STABILITY/TEMPERATURE VARIATION

Limit is 2.5 ppm for a mobile device with a 12.5 kHz channel bandwidth. Worst-case deviation was found to be .20 ppm.

PLOT 9-1: TEMPERATURE FREQUENCY STABILITY

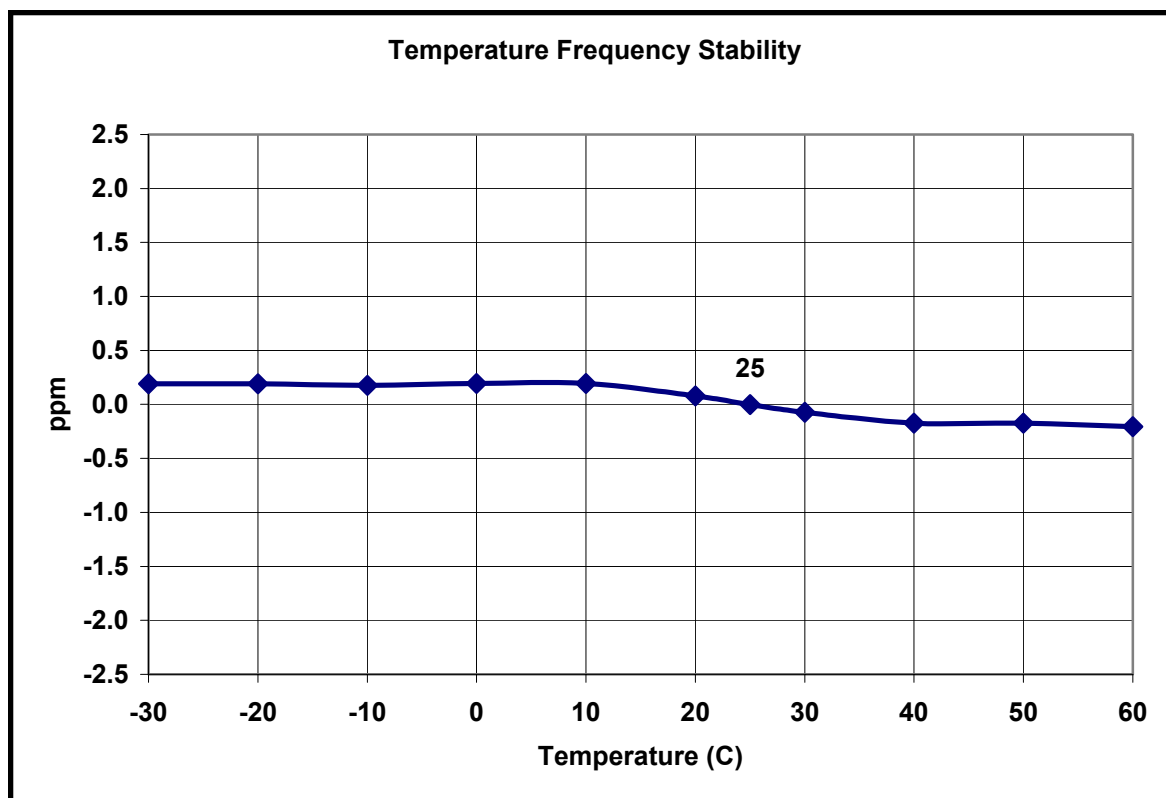


TABLE 9-1: TEMPERATURE FREQUENCY STABILITY CHANNEL 2, 500.000 MHZ

Temperature C	Measured Frequency (MHz)	ppm
-30	500.000416	0.2
-20	500.000416	0.2
-10	500.000408	0.2
0	500.000417	0.2
10	500.000417	0.2
20	500.000359	0.1
25	500.000320	0.0
30	500.000284	-0.1
40	500.000234	-0.2
50	500.000234	-0.2
60	500.000217	-0.2

TABLE 9-2: TEST EQUIPMENT USED FOR TESTING (FREQUENCY STABILITY/TEMPERATURE)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	02/03/05
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/18/04

TEST PERSONNEL:

DANIEL BIGGS		OCTOBER 8, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

9.2.2 FREQUENCY STABILITY/VOLTAGE VARIATION

PLOT 9-2: VOLTAGE FREQUENCY STABILITY

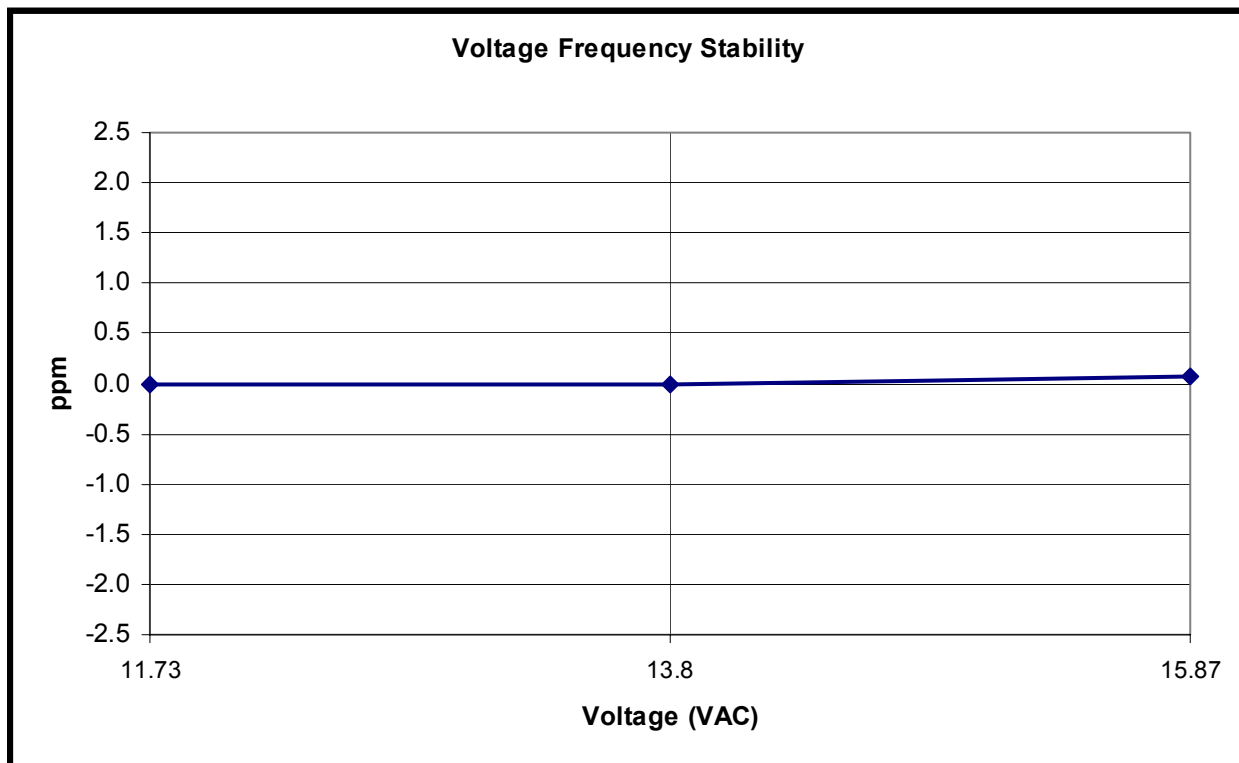


TABLE 9-3: FREQUENCY STABILITY/VOLTAGE VARIATION CHANNEL 2, 500.000 MHZ

Voltage (VDC)	Measured Frequency (MHz)	ppm
11.73	500.000320	0.0
13.8	500.000320	0.0
15.87	500.000350	0.1

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

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration 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		SEPTEMBER 16, 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:

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

10.2 TEST DATA

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

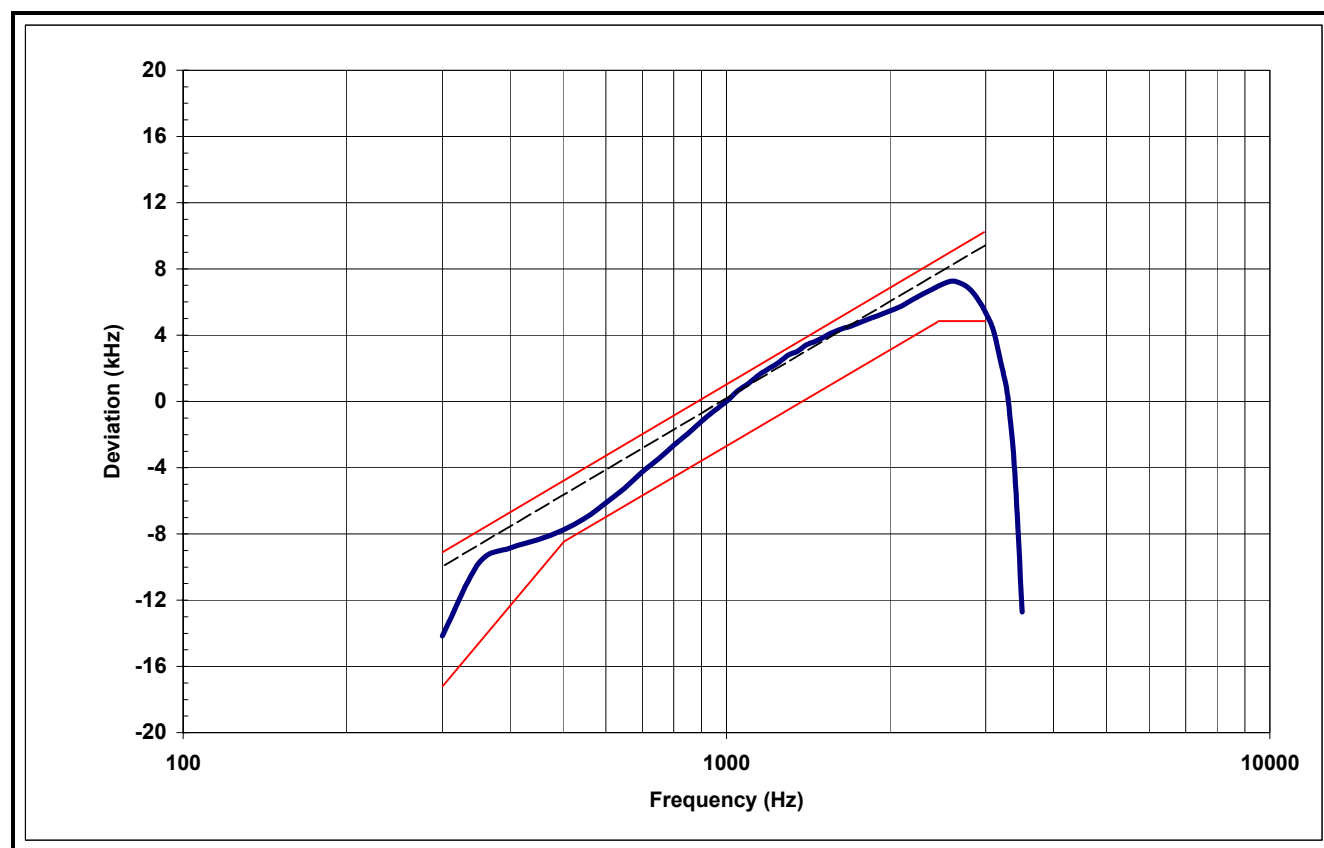


TABLE 10-1: TEST EQUIPMENT USED FOR TESTING (AUDIO FREQUENCY RESPONSE)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	08/06/04
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/18/04
901054	Hewlett Packard	HP 3586B	Selective Level Meter	1928A01892	09/09/04

TEST PERSONNEL:

DANIEL BIGGS		OCTOBER 7, 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

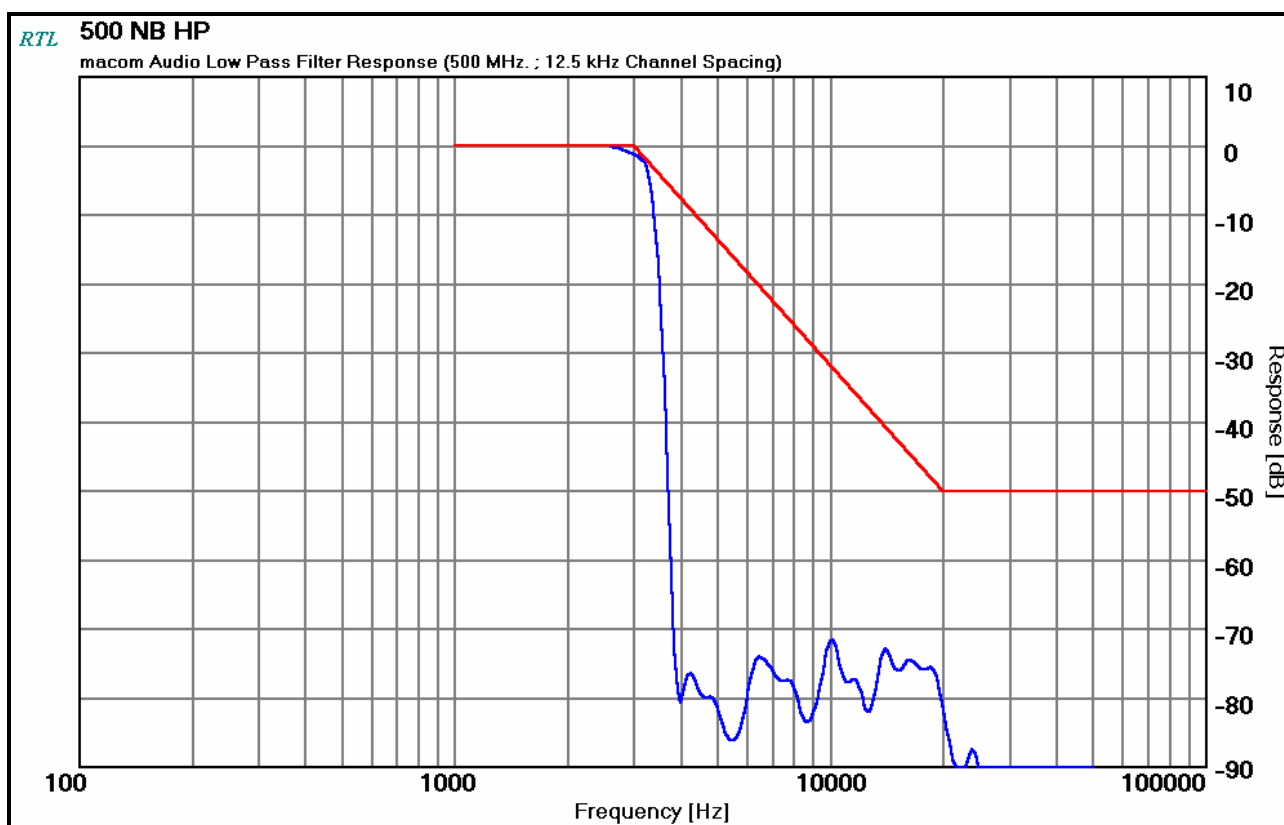


TABLE 11-1: TEST EQUIPMENT USED FOR TESTING (AUDIO LOW PASS FILTER RESPONSE)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	08/06/04
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/18/04
901054	Hewlett Packard	HP 3586B	Selective Level Meter	1928A01892	09/09/04

TEST PERSONNEL:

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

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

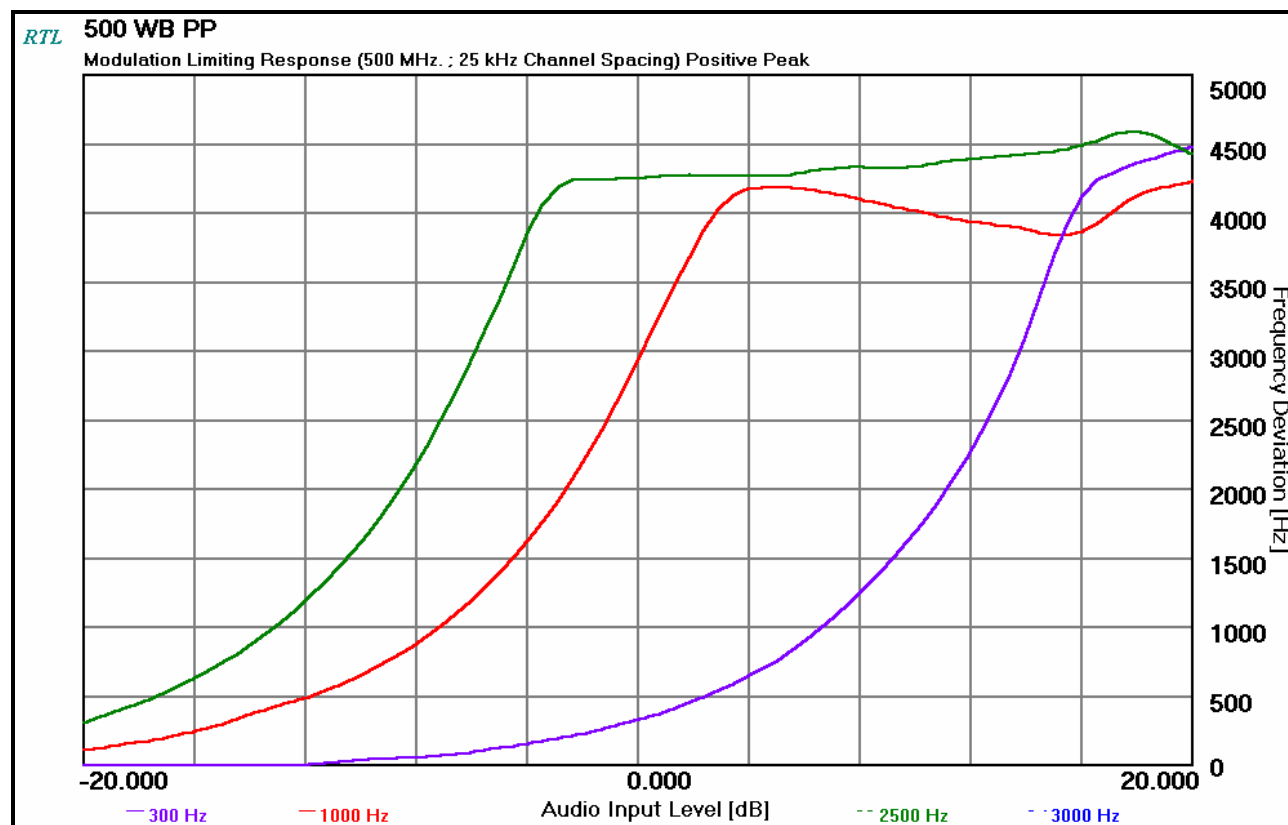
12.1 TEST PROCEDURE

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

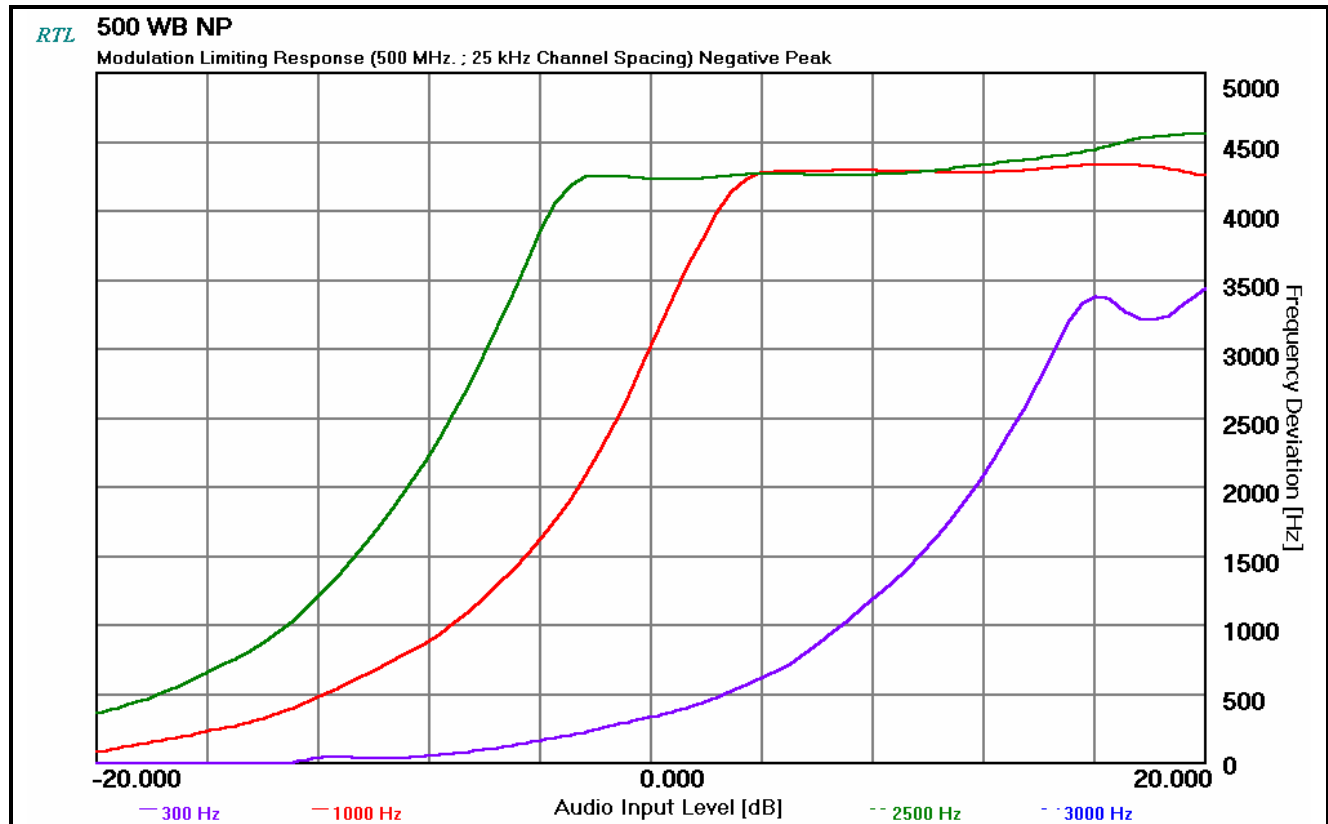
The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level as a reference (0dB) the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz.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

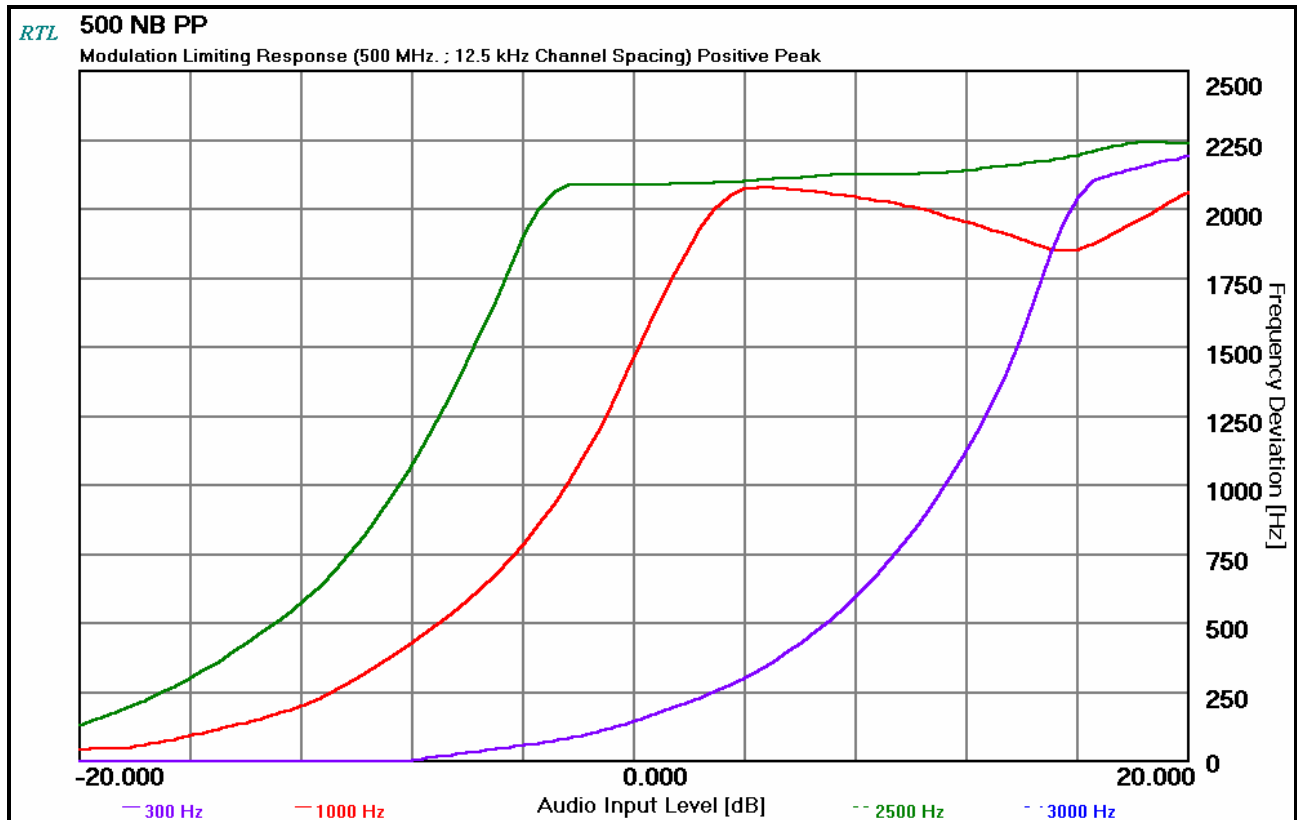
PLOT 12-1: MODULATION CHARACTERISTICS – MODULATION LIMITING: WIDE BAND; POSITIVE PEAK



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

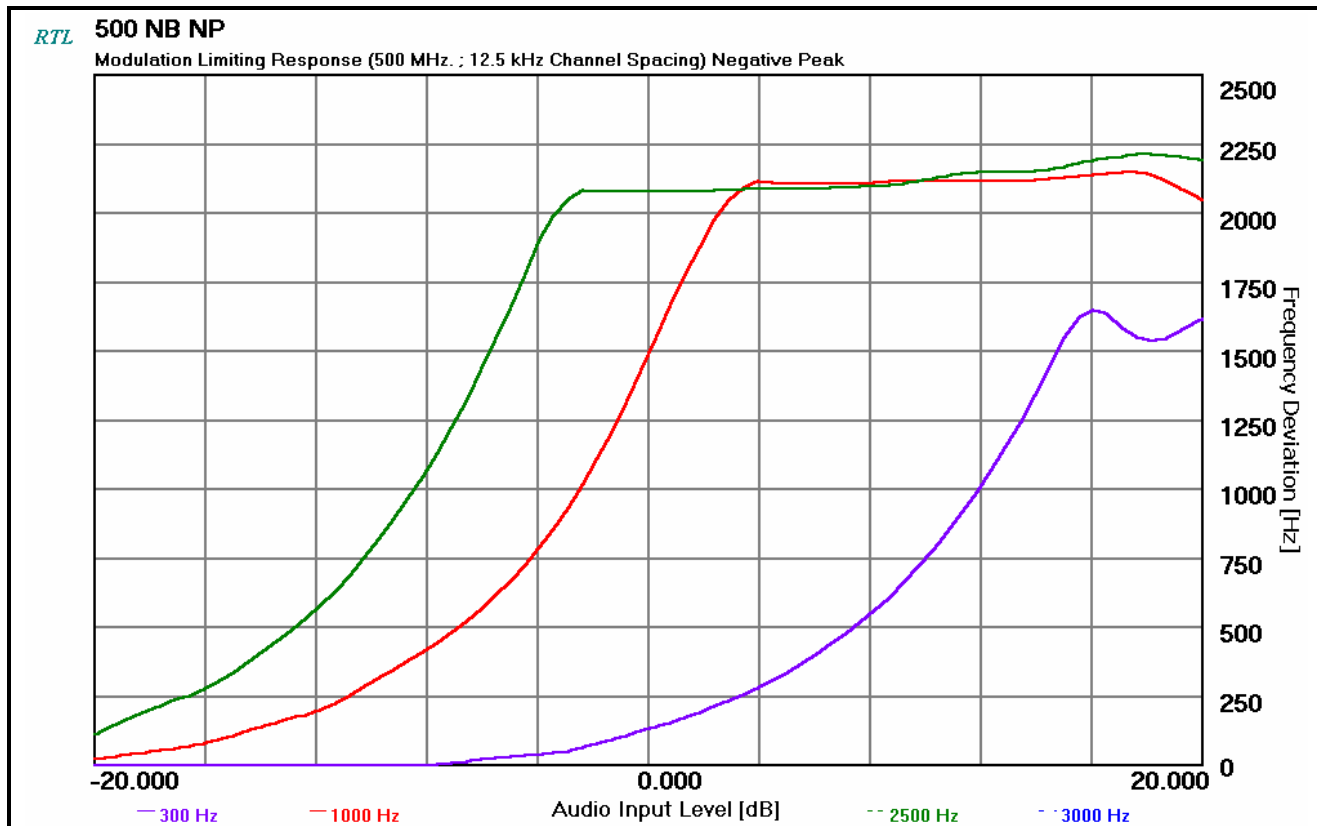


TABLE 12-1: TEST EQUIPMENT USED FOR TESTING (MODULATION LIMITING)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	08/06/04
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/18/04
901054	Hewlett Packard	HP 3586B	Selective Level Meter	1928A01892	09/09/04

TEST PERSONNEL:

DANIEL BIGGS	<i>Daniel Biggs</i>	OCTOBER 7, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

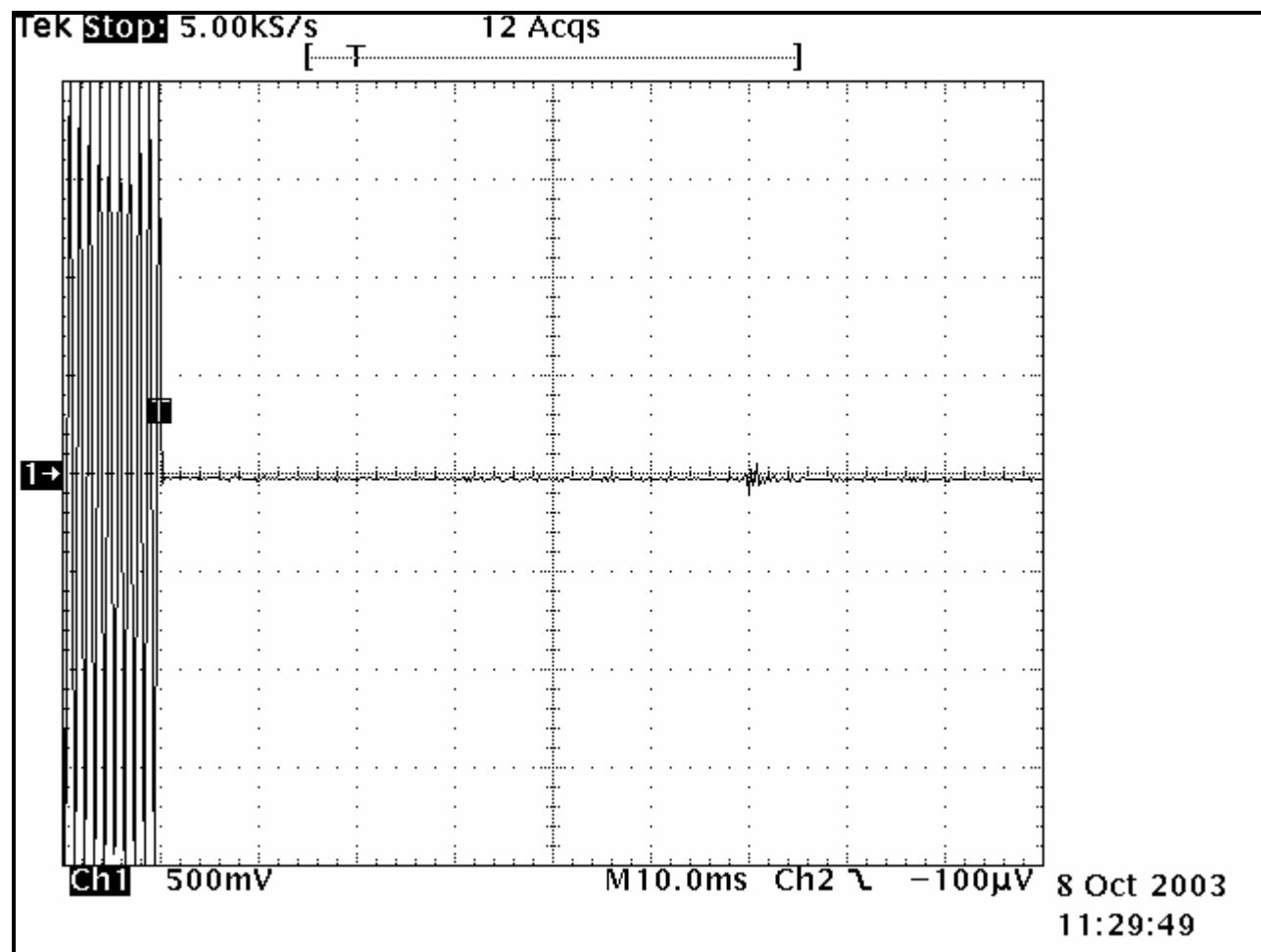
13 FCC RULES AND REGULATIONS PART 90 §90.214: TRANSIENT FREQUENCY BEHAVIOR

13.1 TEST PROCEDURE

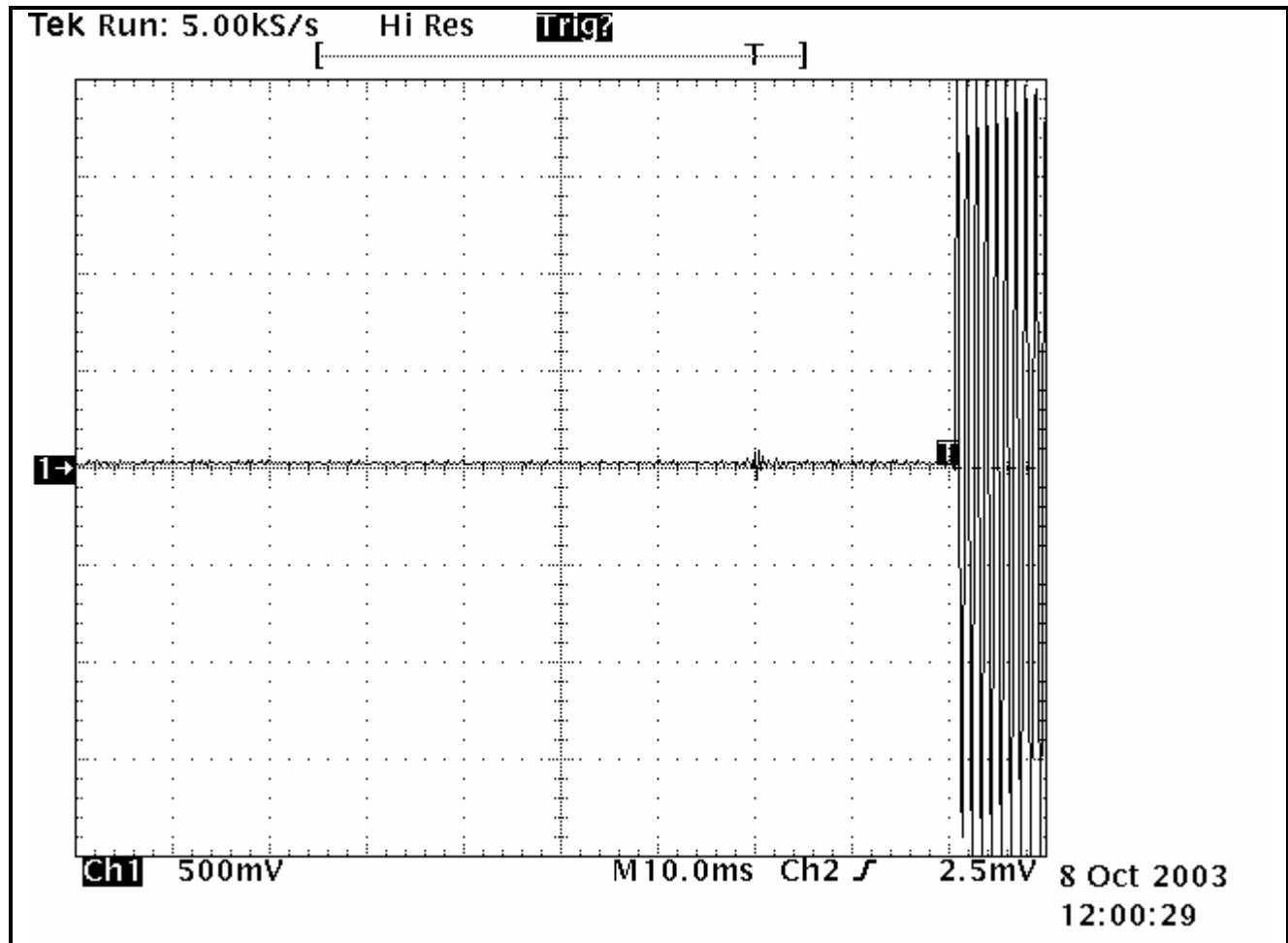
ANSI/TIA/EIA-603-1992, section 2.2.3

13.2 TEST DATA

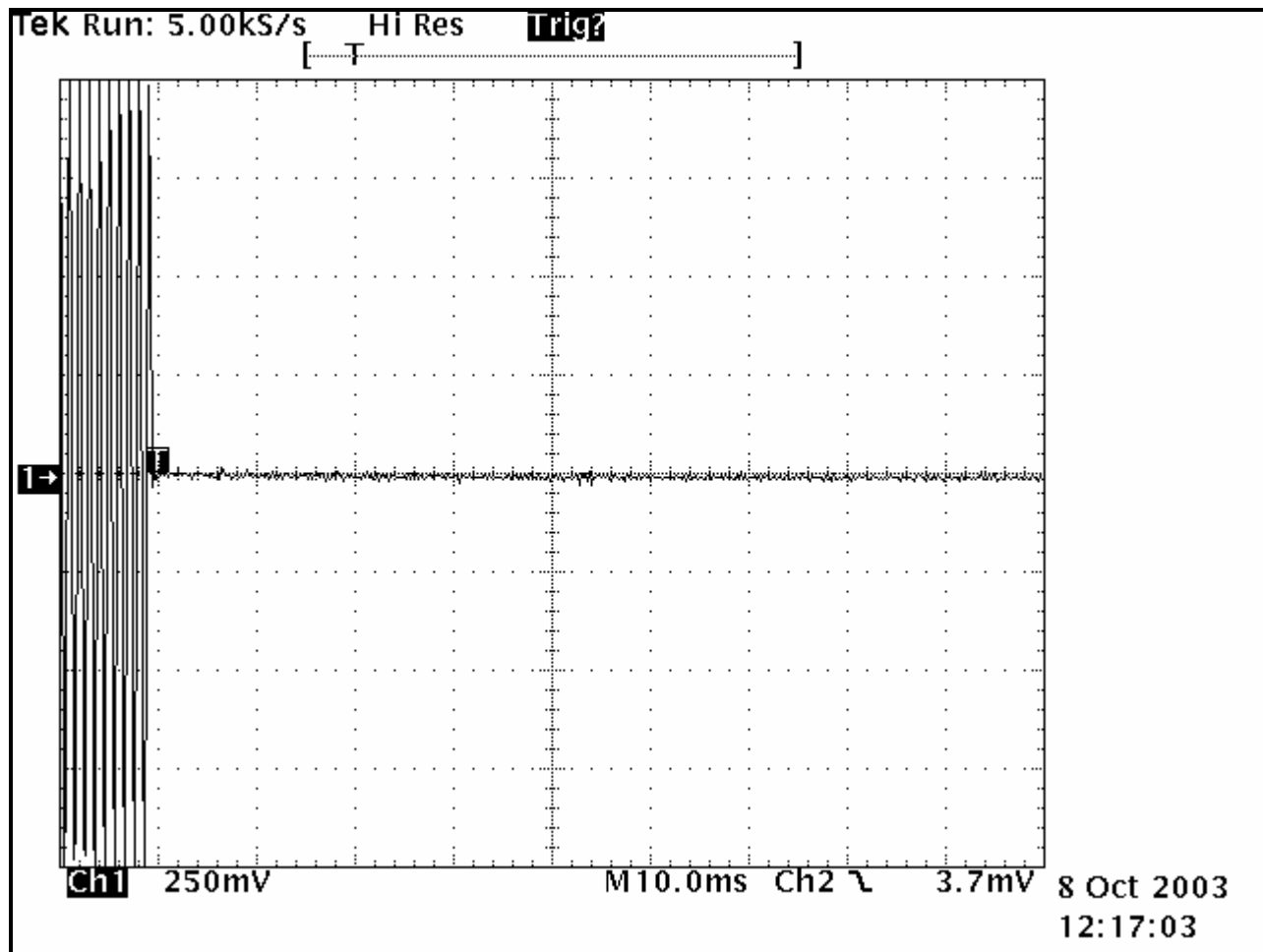
PLOT 13-1: TRANSIENT FREQUENCY BEHAVIOR – 500 MHZ; HIGH POWER; WIDE BAND; CARRIER ON TIME



PLOT 13-2: TRANSIENT FREQUENCY BEHAVIOR – 500 MHZ; HIGH POWER; WIDE BAND; CARRIER OFF TIME



PLOT 13-3: TRANSIENT FREQUENCY BEHAVIOR – 500 MHZ; HIGH POWER; NARROW BAND; CARRIER ON TIME



PLOT 13-4: TRANSIENT FREQUENCY BEHAVIOR – 500 MHZ; HIGH POWER; NARROW BAND; CARRIER OFF TIME

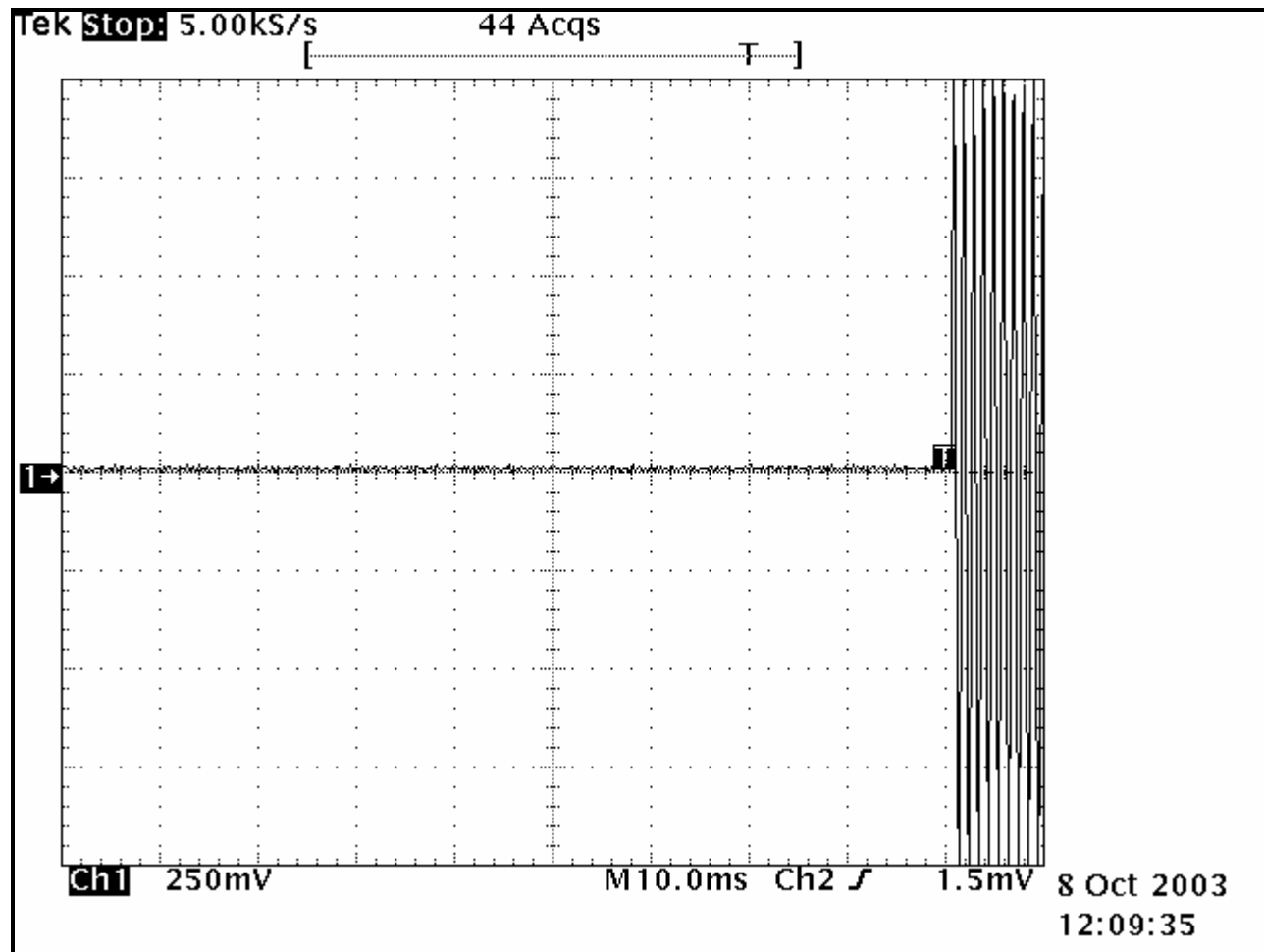


TABLE 13-1: TEST EQUIPMENT USED FOR TESTING (TRANSIENT FREQUENCY BEHAVIOR)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
900917	Hewlett Packard	8648C	Signal Generator	3537A01741	05/02/04
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	06/18/04
900561	Tektronix	TDS540B	Oscilloscope	B020129	02/19/04
900352	Werlatone	C1795	Directional Coupler	4989	N/A

TEST PERSONNEL:

DANIEL BIGGS	<i>Daniel Biggs</i>	OCTOBER 8, 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)

$B_n = 2xM + 2xDK = 16.0 \text{ kHz}$

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)

$B_n = 2xM + 2xDK = 11.0 \text{ kHz}$

Emission designator: 11K0F3E

Digital voice and data – 25 kHz separation

9600 Baud

Measurement: 99.0% Occupied Bandwidth

$B_n = 10.33 \text{ kHz}$

Emission designator: 10K3F1D, 10K3F1E

Digital voice and data – 12.5 kHz separation

9600 Baud

Measurement: 99.0% Occupied Bandwidth

$B_n = 8.25 \text{ kHz}$

Emission designator: 8K3F1D, 8K3F1E

Digital voice and data – 12.5 kHz separation

4800 Baud

Measurement: 99.0% Occupied Bandwidth

$B_n = 5.33 \text{ kHz}$

Emission designator: 5K3F1D, 5K3F1E

C4FM –

Measurement: 99.0% Occupied Bandwidth

$B_n = 8.084 \text{ kHz}$

Emission designator: 8K1F1D, 8K1F1E

15 CONCLUSION

The data in this measurement report shows that the **M/A-COM, Inc. Model M7100^{IP} UHF-H Mobile Radio; FCC ID: OWDTR-0021-E**, complies with all the requirements of Parts 90, 95, 22, 74, 15 and 2 of the FCC Rules, and Industry Canada RSS-119, Issue 6, 2000.