Engineering and Testing for EMC and Safety Compliance

TYPE CERTIFICATION REPORT

Com-Net Ericsson Critical Radio Systems, Inc.
3315 Old Forest Road
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804-385 2580 (Bryan McWatters)

MODEL: TR-0002-A
{Panther 300P VHF (150-174MHz)}
FCC ID: OWDTR-0002-A

March 23, 2001

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 1999	§15.109: RADIATED EMISSIONS LIMITS
PART 22: 1998	PUBLIC MOBILES SERVICES
PART 74: 1998	LOW POWER AUXILIARY STATION
PART 90: 1998	PRIVATE LAND MOBILE RADIO SERVICES
PART 95 (A): 1998	GENERAL 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
RSS-119, Issue 6 2000	LAND MOBILE AND FIXED RADIO TRANSMITTERS AND RECEIVERS 27.41 TO 960.0 MHZ
RSS-102, Issue 1 1999	EVALUATION PROCEDURE FOR MOBILE AND PORTABLE RADIO TRANSMITTERS WITH RESPECT TO HEALTH CANADA'S SAFETY CODE 6 FOR EXPOSURE OF HUMANS TO RADIO FREQUENCY FIELDS

FCC Rules Parts	Frequency Range	Output Power (W)	Freq. Tolerance	Emission Designator
22, 74, 90, 95 (A)	150-174 MHz	5.6	2.5 ppm	11K0F3E
22, 74, 90, 95 (A)	150-174 MHz	5.6	5 ppm	16K0F3E
Industry Canada	**Frequency Range**	**Output Power (W)**	**Freq. Tolerance**	**Emission Designator**
RSS-119	150-174 MHz	5.6	2.5 ppm	11K0F3E
RSS-119	150-174 MHz	5.6	5 ppm	16K0F3E

REPORT PREPARED BY:

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Document Number: 2001055 / QRTL01-032

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1 GENERAL INFORMATION

The following Report of an Application for Certification, is prepared on behalf of Com-Net Ericsson Critical Radio Systems, Inc. in accordance with the Federal Communications Commissions Regulations and Industry Canada Standards. The Equipment Under Test (EUT) was the **TR-0002-A {Panther 300P VHF (150-174MHz)}; FCC ID: OWDTR-0002-A**. The test results reported in this document relate only to the item that was tested.
The digital interface portion of this transceiver, including the receiver, was tested and found in compliance with Part 15 Class B limits. A DoC report was prepared and is available upon request.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47, 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 and approved by the Federal Communication 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 for Certification

1.3 CONFORMANCE STATEMENT

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
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RSS-119	150-174 MHz	5.6	2.5 ppm	11K0F3E
RSS-119	150-174 MHz	5.6	5.0 ppm	16K0F3E

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 standards identified in this report.

Signature: Date: March 23, 2001

Typed/Printed Name: Bruno Clavier

Position: Vice President of Operations
(NVLAP Signatory)

Signature: Date: March 23, 2001

Typed/Printed Name: Daniel Baltzell

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.

1.4 TESTED SYSTEM DETAILS

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

TABLE 1: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID
RADIO	COM NET ERICSSON	300P	VHP-1	OWDTR-0002-A

TABLE 2: EXTERNAL COMPONENTS OF TEST CONFIGURATION

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID
ANTENNA	COM NET ERICSSON	HELICAL STUB SPRING WHIP	KRE1011219/1	N/A
ANTENNA	COM NET ERICSSON	HELICAL STUB SPRING WHIP	KRE1011219/2	N/A
ANTENNA	COM NET ERICSSON	HELICAL STUB SPRING WHIP	KRE1011219/3	N/A
LOW PROFILE SPEAKER/MICROPHONE	COM NET ERICSSON		KRY 101 1640/1	N/A
LOW TIER SPEAKER/MICROPHONE	COM NET ERICSSON		KRY 101 1655/1	N/A
BATTERIES	COM NET ERICSSON		BKB 191 213/1	N/A
CHARGER BASE	COM NET ERICSSON		BML 161 70/1	N/A
AC ADAPTER	COM NET ERICSSON		BML 161 70/11	N/A

1.5 CONFIGURATION OF TESTED SYSTEM

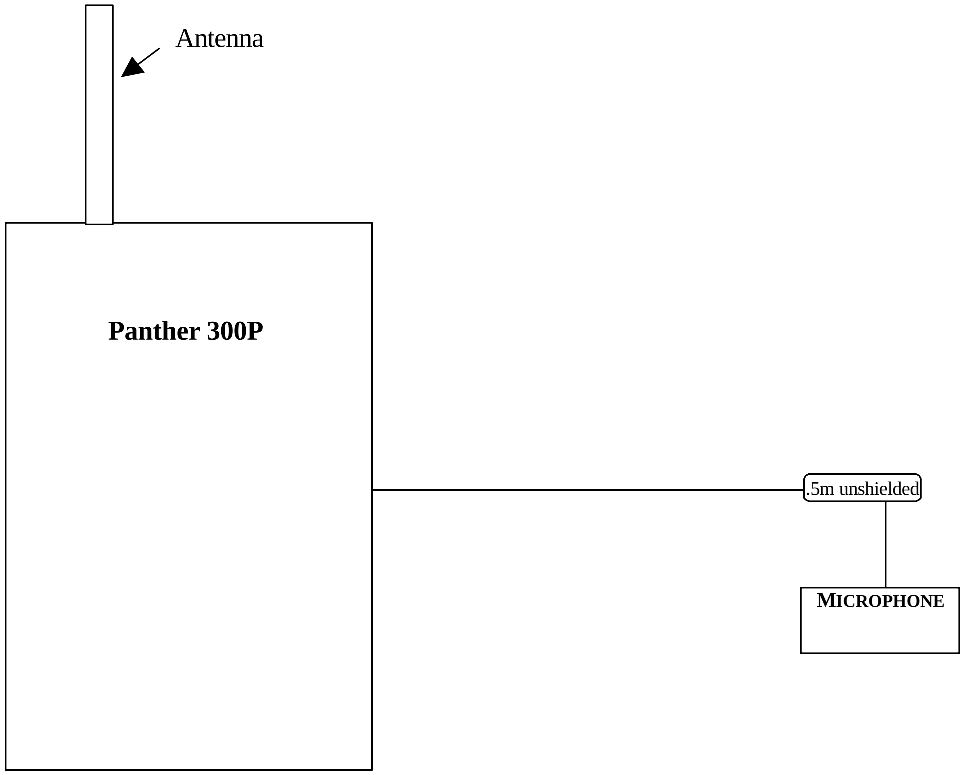

FIGURE 1: TEST CONFIGURATION

1.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FI(dBuV/m) = SAR(dBuV) + SCF(dB/m)
FI = Field Intensity
SAR = Spectrum Analyzer Reading
SCF = Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

SCF(dB/m) = - PG(dB) + AF(dB/m) + CL(dB)

SCF = Site Correction Factor
PG = Pre-amplifier Gain
AF = Antenna Factor
CL = Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(uV/m) = 10^{FI(dBuV/m)/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

49.3 dBuV - 11.5 dB/m = 37.8 dBuV/m

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$

1.7 CONDUCTED MEASUREMENT

The Equipment Under Test (EUT) is a battery operated device.

1.8 RADIATED MEASUREMENT

Before final measurements of radiated emissions were made on the open-field three meter range, the EUT was scanned indoors at a three meter distance in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three-meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane.

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.

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

2.1 TEST PROCEDURE

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

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

2.2 TEST DATA

The following channel (in MHz) were tested: 136.025; 162.0125; 173.9875
The worst-case Output Power (highest) levels are shown.

TABLE 3: CARRIER OUTPUT POWER (UNMODULATED)

RF Power measured (Watt)*
5.6

*Measurement accuracy: +/- 3%

TABLE 4: RATED POWER:

Rated Power (W)
5.2

2.3 TEST EQUIPMENT

Power Meter	HP437B	s/n 2949A02966
	HP 8901A	s/n 2545A04102 (power mode)
Power Sensor	HP8481B	s/n 2702A05059
Frequency Counter	HP8901A	s/n 2545A04102 (Frequency mode)

3 PART 2.1046 (A) RF POWER OUTPUT: RADIATED - ERP

3.1 TEST PROCEDURE

Substitution Method:

The EUT was setup at an antenna to EUT distance of 3 meters on an open area test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane.

The physical arrangement of the EUT and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. 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.

The worst-case, maximum radiated emission was recorded and used as reference for the ERP measurement.

The EUT was then replaced by an ½wave dipole antenna and polarized in accordance with the EUT's antenna polarization. The ½wave dipole antenna was connected to a RF signal generator with a coaxial cable.

The search antenna height, and search antenna polarity was set to levels that produced the maximum reading obtained in step 3. The signal generator was adjusted to a level that produced the radiated emission level obtained in step 3.

The signal generator level was recorded and corrected by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal ½wave dipole antenna. The signal generator corrected level is the ERP level

3.2 TEST EQUIPMENT

Spectrum Analyser	HP8566B
Antenna	Roberts ½wave dipoles

3.3 TEST DATA

Settings:

- 5W Panther 300P radiated power measurements (3 meter)

TABLE 5: RF POWER OUTPUT MEASUREMENT - HELICAL STUB SPRING WHIP ANTENNA {KRE1011219/1}

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)	Corrected Antenna Gain (dB)	ERP** Substitution Method (dBm)	ERP (W)
150.7600	35.47	2.4	-0.24	32.83	2.0
162.0125	34.61	2.4	0.06	32.27	1.8
173.9875	30.40	2.4	-0.04	27.96	0.6

*Antenna as specified by manufacturer (unity gain)
**Measurement accuracy is +/- 1.5 dB

TABLE 6: RF POWER OUTPUT MEASUREMENT - HELICAL STUB SPRING WHIP ANTENNA {KRE1011219/1}

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)	Corrected Antenna Gain (dB)	ERP** Substitution Method (dBm)	ERP (W)
150.7600	36.01	2.4	-0.24	33.37	2.173
162.0125	38.81	2.4	0.06	36.47	4.436
173.9875	37.41	2.4	-0.04	34.97	3.140

*Antenna as specified by manufacturer (unity gain)
**Measurement accuracy is +/- 1.5 dB

TABLE 7: RF POWER OUTPUT MEASUREMENT - HELICAL STUB SPRING WHIP ANTENNA {KRE1011219/1}

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)	Corrected Antenna Gain (dB)	ERP** Substitution Method (dBm)	ERP (W)
150.7600	33.11	2.4	-0.24	30.47	1.114
162.0125	37.81	2.4	0.06	35.47	3.523
173.9875	36.81	2.4	-0.04	34.37	2.735

*Antenna as specified by manufacturer (unity gain)
**Measurement accuracy is +/- 1.5 dB

4 FCC RULES AND REGULATIONS PART 2 §2.1051: 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.

4.2 TEST EQUIPMENT

Audio Generator:

Synthesized Level Generator	HP3336B	s/n 2127A00559
Audio Signal Analyzer Tektronix	ASG 100	s/n B032374

Spectrum Analyzer:

HP8564E	s/n 3943A01719
HP8546A	s/n 3525A00159

4.3 TEST DATA

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

Limits: Mask B (dBm): P(dBm) – (43+10xLOG P(W))
Mask D (dBm): P(dBm) – (50+10xLOG P(W))

The following channel (in MHz) were investigated: 136.025, 162.0125, 173.9875 MHz

The worst case (unwanted emissions) channels are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

TABLE 8: CONDUCTED SPURIOUS EMISSIONS - CHANNEL 2 (162.0125 MHZ) – 5 WATT AND 25 KHZ CHANNEL BANDWIDTH: MASK B

Frequency (MHz)	Level Measured (dBm)*	Limit (dBm)	Margin (dB)
291.050	-49.3	-13.0	-36.3
436.575	-62.0	-13.0	-49.0
582.100	-55.6	-13.0	-42.6
727.625	-45.7	-13.0	-32.7
873.150	-53.8	-13.0	-40.8
1018.675	-62.3	-13.0	-49.3
1164.200	-69.0	-13.0	-56.0
1309.725	-65.9	-13.0	-52.9
1455.250	-67.7	-13.0	-54.7

TABLE 9: CONDUCTED SPURIOUS EMISSIONS - CHANNEL 5 (162.0125 MHZ) – 5 WATT AND 12.5 KHZ CHANNEL BANDWIDTH: MASK D

Frequency (MHz)	Level Measured (dBm)*	Limit (dBm)	Margin (dB)
291.050	-49.4	-20.0	-29.4
436.575	-61.0	-20.0	-41.0
582.100	-55.4	-20.0	-35.4
727.625	-45.3	-20.0	-25.3
873.150	-55.7	-20.0	-35.7
1018.675	-63.9	-20.0	-43.9
1164.200	-68.8	-20.0	-48.8
1309.725	-66.3	-20.0	-46.3
1455.250	-67.7	-20.0	-47.7

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

5.1 TEST PROCEDURE

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

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.

Refer to section “Radiated Measurement” in this report for further information.

5.2 TEST EQUIPMENT

Antenna:	CHASE CBL6112	s/n 2099
Amplifier:	HP8449B	s/n 3008A00505
Spectrum analyzer:	HP8564E	s/n 3943A01719
RF Signal Generator	HP8648C	s/n 3537A01741
Synthesized Sweeper	HP83752A	s/n 3610A00846

5.3 TEST DATA

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 10: FIELD STRENGTH OF SPURIOUS RADIATION – CHANNEL 2 AT 162.0125 MHZ (SUBSTITUTION METHOD)

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)*	Corrected Antenna Gain (dB)**	Corrected Signal Generator Level (dBm)	Limit (dBm)	Margin (dB)
324.0250	-51.2	3.5	-0.4	-55.1	-20.0	-35.1
486.0375	-63.4	4.6	-0.5	-68.5	-20.0	-48.5
648.0500	-46.5	4.9	-1.0	-52.4	-20.0	-32.4
810.0625	-41.5	3.3	-1.3	-46.1	-20.0	-26.1
972.0750	-39.2	4.2	-1.3	-44.7	-20.0	-24.7
1134.0875	-48.2	5.1	1.3	-52.0	-20.0	-32.0
1296.1000	-53.5	6.2	2.7	-57.0	-20.0	-37.0
1458.1125	-66.3	6.7	4.3	-68.7	-20.0	-48.7
1620.1250	-62.3	6.9	5.9	-63.3	-20.0	-43.3

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½wave dipole antenna.
** Difference in gain (ref. To a 1/2 wave dipole)

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

OCCUPIED BANDWIDTH - COMPLIANCE WITH THE EMISSION MASKS

6.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.11

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.

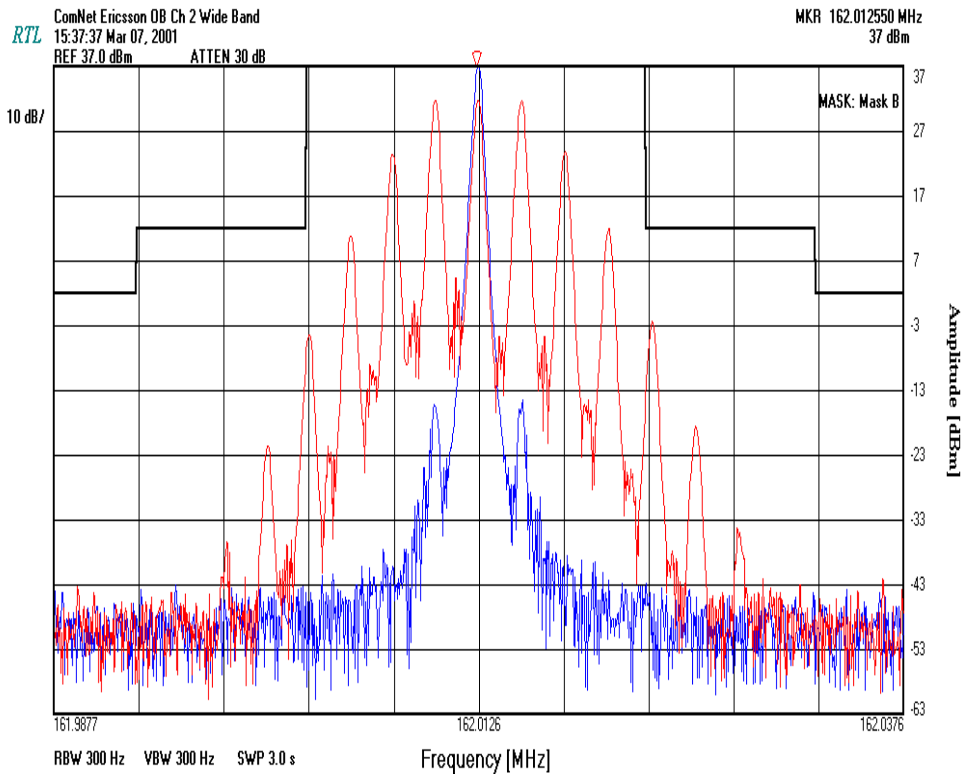
Device with digital modulation: n/a

6.2 TEST EQUIPMENT

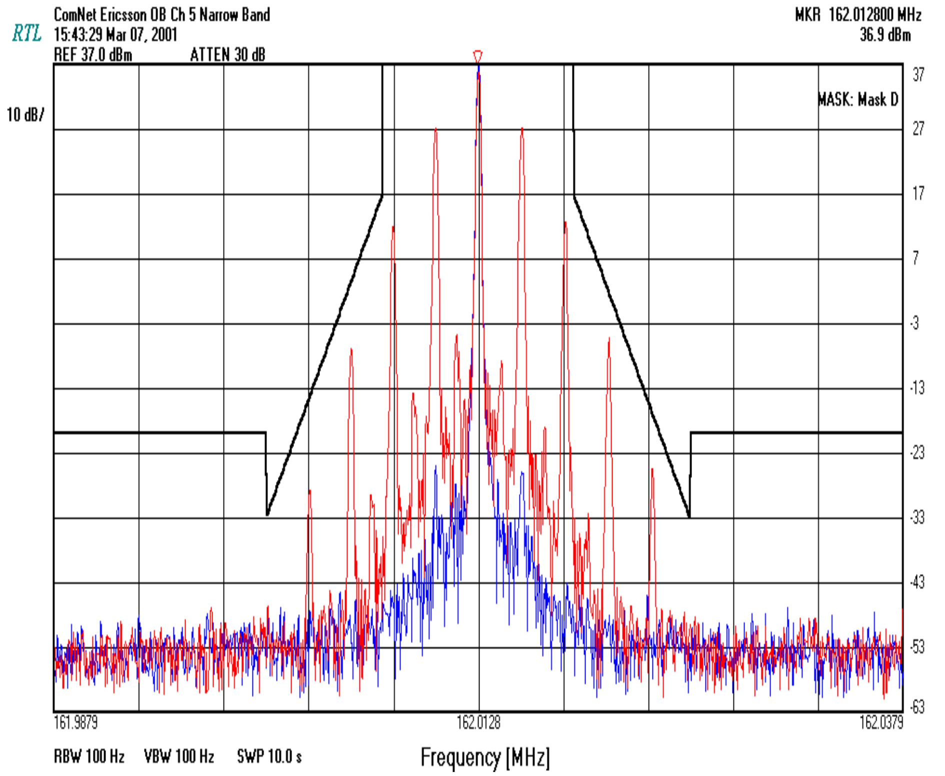
Spectrum Analyzer	HP8564E	s/n 3943A01719

6.3 TEST DATA

PLOT 1: OCCUPIED BANDWIDTH - CHANNEL 2: 5 W FOR 25 KHZ CHANNEL BANDWIDTH: MASK B (AUDIO MODULATION: 2,500 HZ)



PLOT 2: OCCUPIED BANDWIDTH - CHANNEL 5: 5 W FOR 12.5 KHZ CHANNEL BANDWIDTH: MASK D (AUDIO MODULATION: 2,500 HZ)



7 FCC RULES AND REGULATION PART 2 §2.1055: 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.

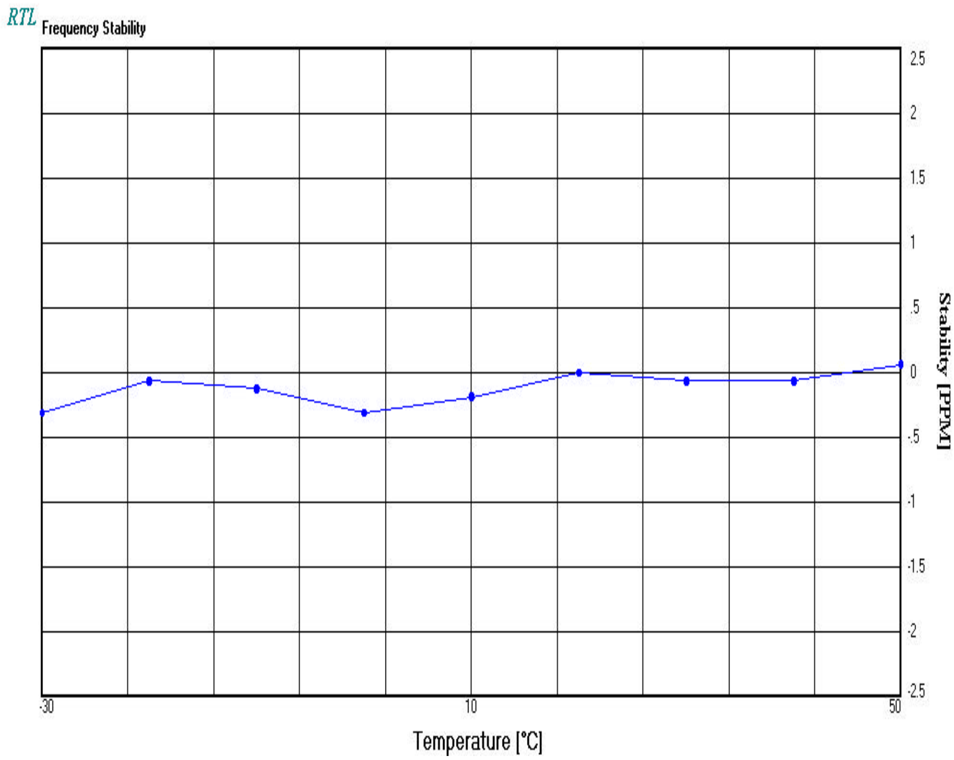
The worst-case test data are shown.

7.2 TEST EQUIPMENT

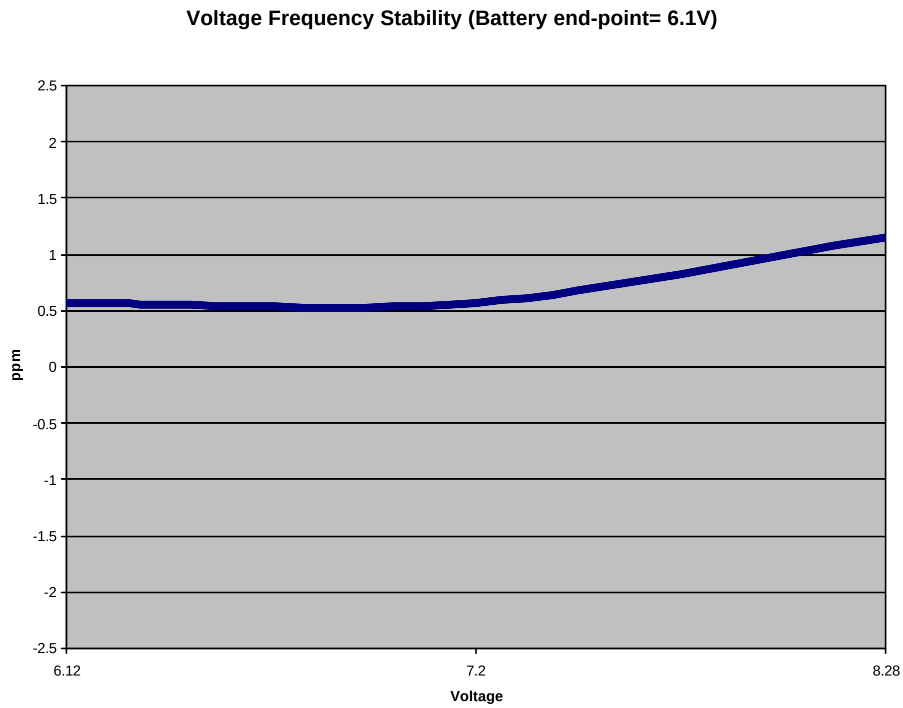
Temperature Chamber	Tenney TH65	s/n 11380
Frequency Counter	HP8901A (Frequency Mode)	s/n 2545A04102

7.3 TEST DATA

PLOT 3: FREQUENCY STABILITY/FREQUENCY VARIATION



PLOT 4: FREQUENCY STABILITY/VOLTAGE VARIATION



8 FCC RULES AND REGULATIONS 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:

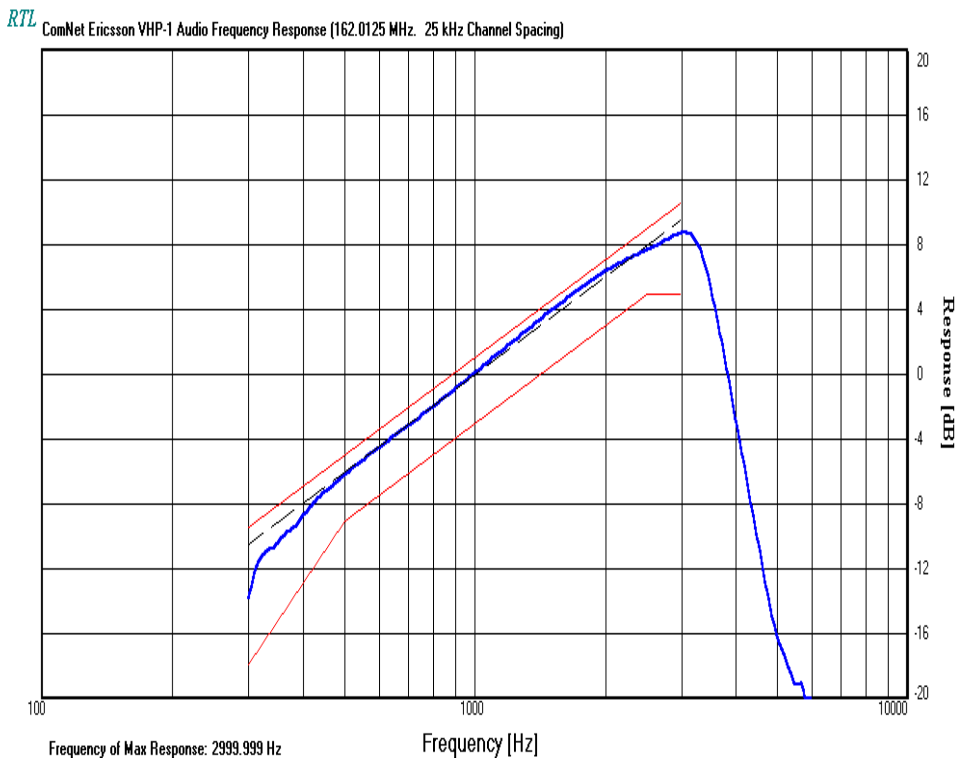
Audio Frequency Response = 20 LOG (DEVfreq/DEVref)

8.2 TEST EQUIPMENT

Audio generator	HP3336B	s/n 2127A00559
Modulation analyzer	HP8901A	s/n 2545A04102

8.3 TEST DATA

PLOT 5: AUDIO FREQUENCY RESPONSE – 162.0125 MHZ {25 KHZ CHANNEL SPACING}



PLOT 6: AUDIO FREQUENCY RESPONSE – 162.0125 MHZ {12.5 KHZ CHANNEL SPACING}

9 FCC RULES AND REGULATIONS PART 2 §2.1047 (A): MODULATION CHARACTERISTICS - AUDIO LOW PASS FILTER RESPONSE

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 EQUIPMENT

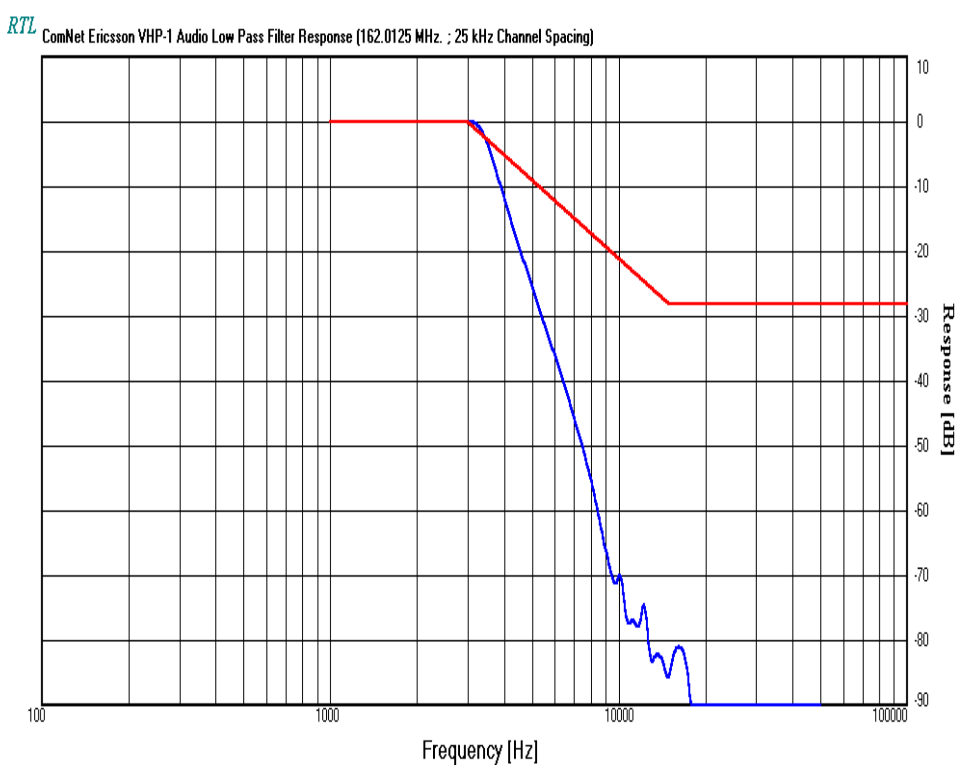
Audio generator	HP3336B	s/n 2127A00559
Modulation analyzer	HP8901A	s/n 2545A04102
Selective level meter	HP3586B	s/n 1928A01892
Synthesizer/Level generator	HP3336B	s/n 2514A02585

9.3 TEST DATA

Note: The vertical scale is in dB relative to 1 kHz.

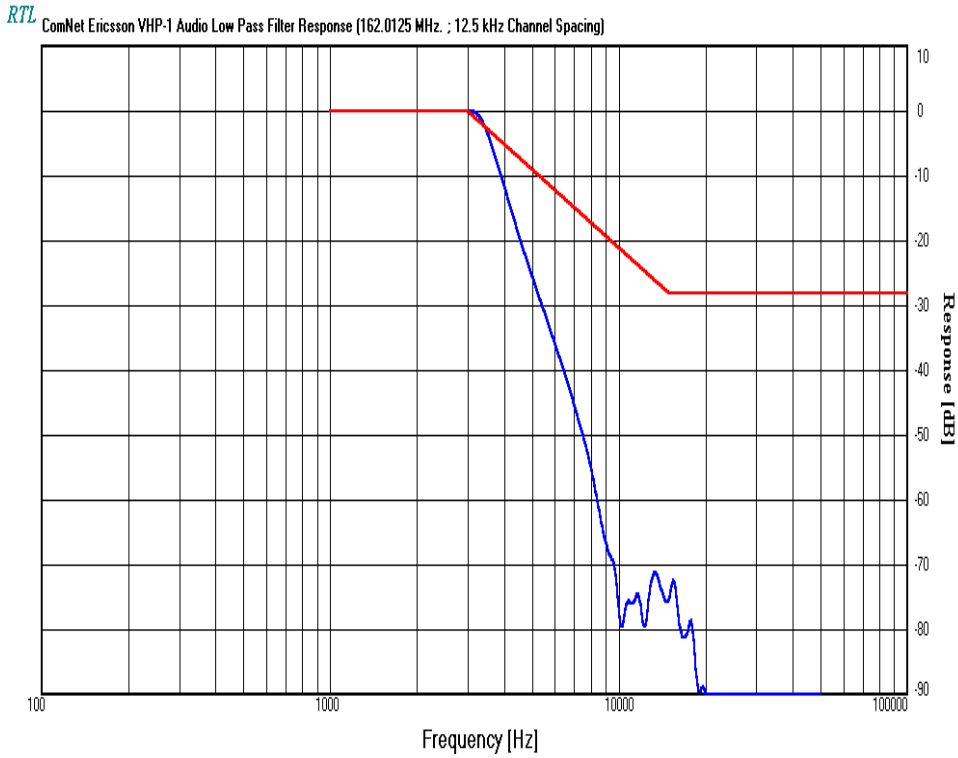
<u>25 kHz channel bandwidth:</u>

PLOT 7: AUDIO LOW PASS FILTER RESPONSE – 162.0125 MHZ {25 KHZ CHANNEL SPACING}



12.5 kHz channel bandwidth:

PLOT 8: AUDIO LOW PASS FILTER RESPONSE – 162.0125 MHZ {12.5 KHZ CHANNEL SPACING}



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

10.1 TEST PROCEDURE

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

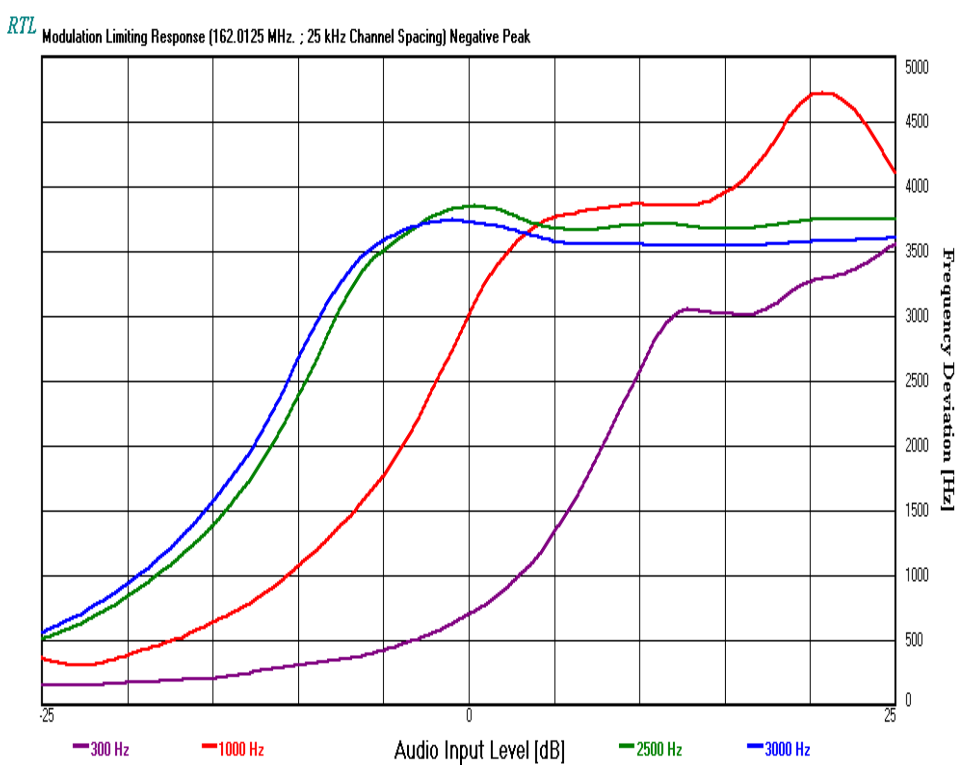
The transmitter is adjusted for full rated system deviation. The audio input level is adjusted for 60% of rated system deviation at 1000Hz. Using this level as a reference (0dB) the audio input level is varied from the reference to a level +20 dB above it and –20 dB under it, for modulation frequencies 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 EQUIPMENT

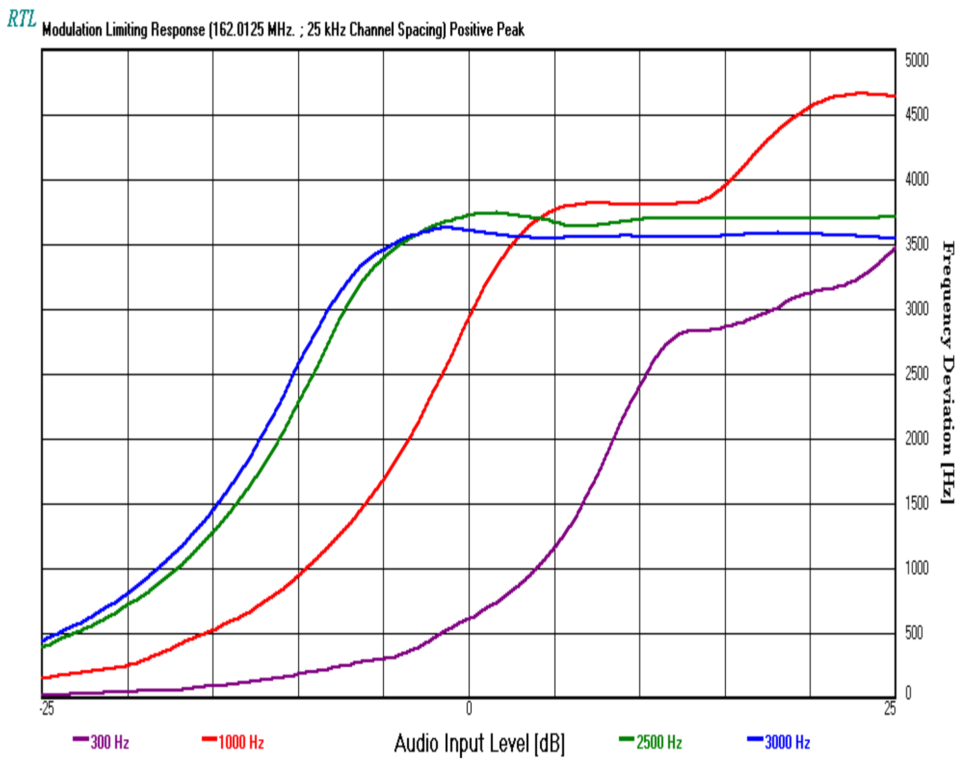
Audio generator	HP3336B	s/n 2127A00559
Modulation analyzer	HP8901A	s/n 2545A04102

10.3 TEST DATA

PLOT 9: MODULATION LIMITING RESPONSE – 162.0125 MHZ {25 KHZ CHANNEL SPACING} NEGATIVE PEAK



PLOT 10: MODULATION LIMITING RESPONSE – 162.0125 MHZ {25 KHZ CHANNEL SPACING} POSITIVE PEAK



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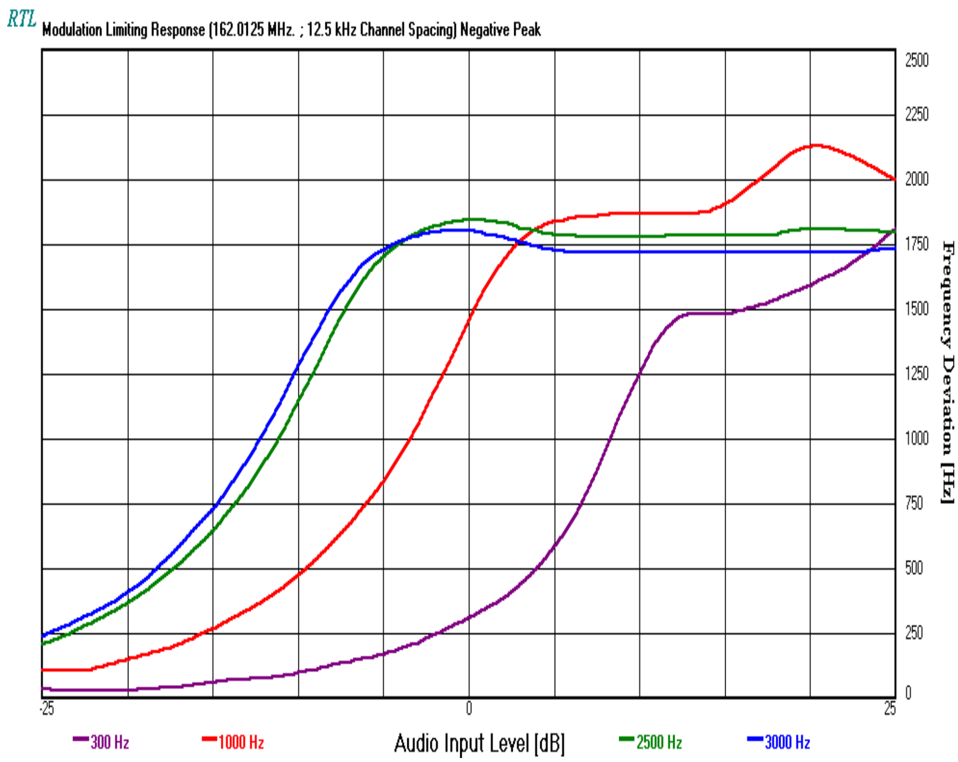
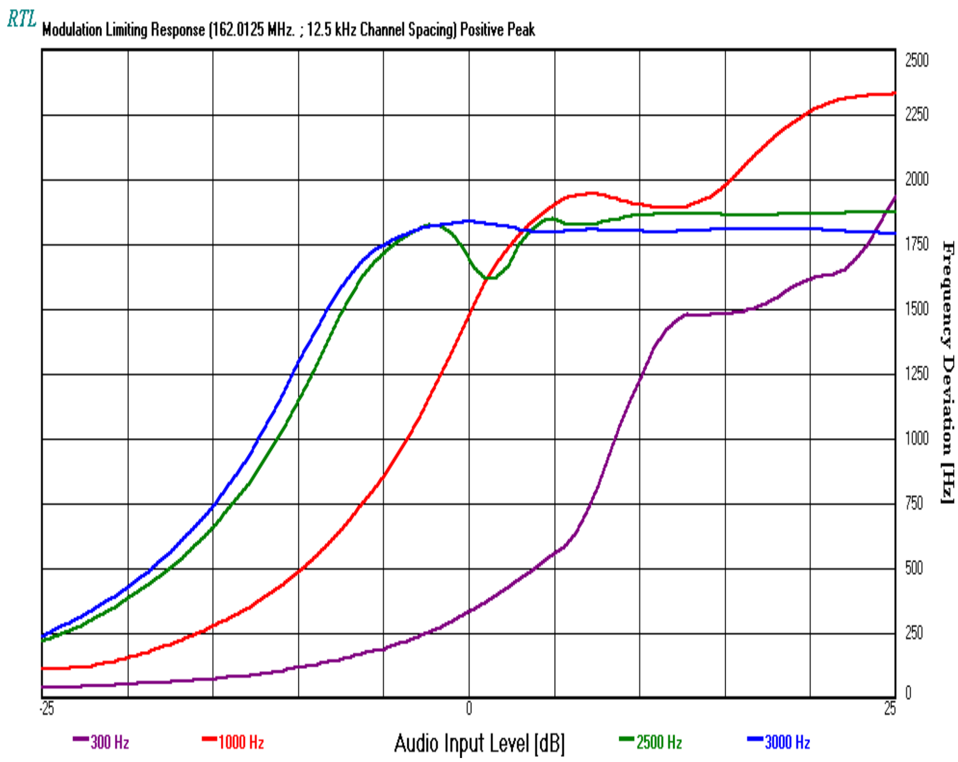
PLOT 11: MODULATION LIMITING RESPONSE – 162.0125 MHZ {12.5 KHZ CHANNEL SPACING} NEGATIVE PEAK



PLOT 12: MODULATION LIMITING RESPONSE – 162.0125 MHZ {12.5 KHZ CHANNEL SPACING} POSITIVE PEAK



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

11.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.19

11.2 TEST EQUIPMENT

Detector: HP8471D s/n 2952A
RF signal generator: HP8648C s/n 3537A01741
Modulation Analyzer: HP8901A s/n 2545A04102
Oscilloscope: Tektronix TDS540B s/n B020129
Receiver: HP 8546A s/n 3525A00159

11.3 TEST DATA

Limits:

Requirements for EUT with 25 kHz channel spacing:

Time Intervals (*)(**)	Maximum Frequency Difference(***)	150-174 MHz	421-512 MHz
t1(****)	± 25 kHz	5.0 mSec	10.0 mSec
t2	± 12.5 kHz	20.0 mSec	25.0 mSec
t3(****)	± 25 kHz	5.0 mSec	10.0 mSec

Requirements for EUT with 12.5 kHz channel spacing:

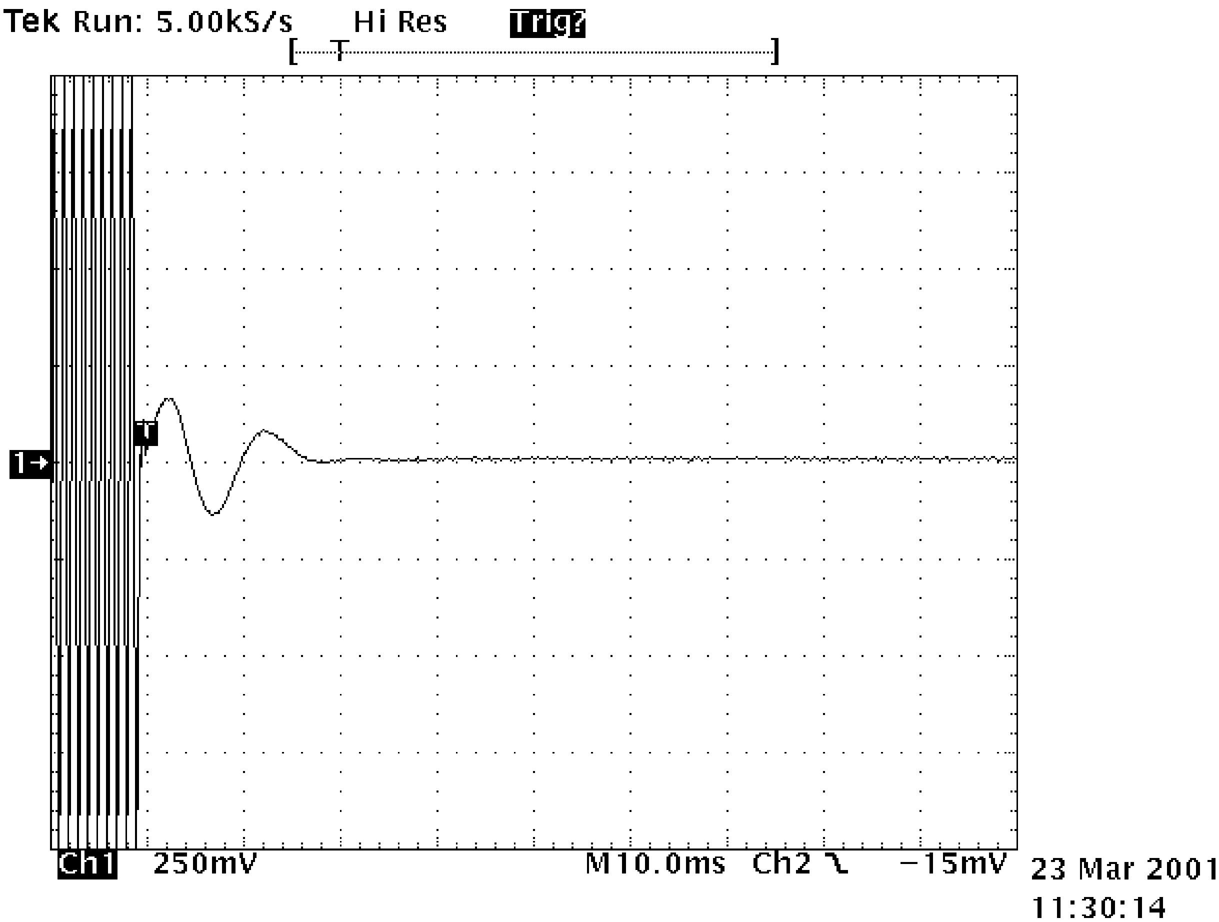
Time Intervals (*)(**)	Maximum Frequency Difference(***)	150-174 MHz	421-512 MHz
t1(****)	± 12.5 kHz	5.0 mSec	10.0 mSec
t2	± 6.25 kHz	20.0 mSec	25.0 mSec
t3(****)	± 12.5 kHz	5.0 mSec	10.0 mSec

(*) t on is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
t 1 is the time period immediately following ton.
t2 is the time period immediately following t1.
t3 is the time period from the instant when the transmitter is turned off until toff.
toff is the instant when the 1 kHz test signal starts to rise.
(**) During the time from the end of t2 to the beginning of t3, the frequency difference must not exceed the limits specified in § 90.213.
(***) Difference between the actual transmitter frequency and the assigned transmitter frequency.
(****) If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

<u>Maximum frequency difference between time T2 and T3:</u> Calculation for Channel 5:
The frequency stability is required to be 2.5 ppm.
Calculation for Channel 5:
4 div. on scope represent 12.5kHz for narrow band channel.
Therefore, 145.525 MHz times 2.5 ppm times +/- 4 Divisions divided by 12.5kHz equals about +/- 0.12 division. 0.12 Div. correspond to 1.213 kHz

Carrier ON time:
High Power: 5 W rated
Channel 5 : 162.0125 MHz NB(12.5kHz)
RF Signal Generator: Modulation 12.5kHz deviation

PLOT 13: TRASIENT FREQUENCY BEHAVIOR (ON TIME) – CHANNEL 5: 162.0125 MHZ {12.5 KHZ NARROW BAND}



Timebase: 10 ms/div
Trigger: On negative edge of Ch2, level –15mV
Ch1: 250mV/div, Probe 1.000:1
Vertical scale: +/- 4 div. corresponds to +/- 12.5 kHz

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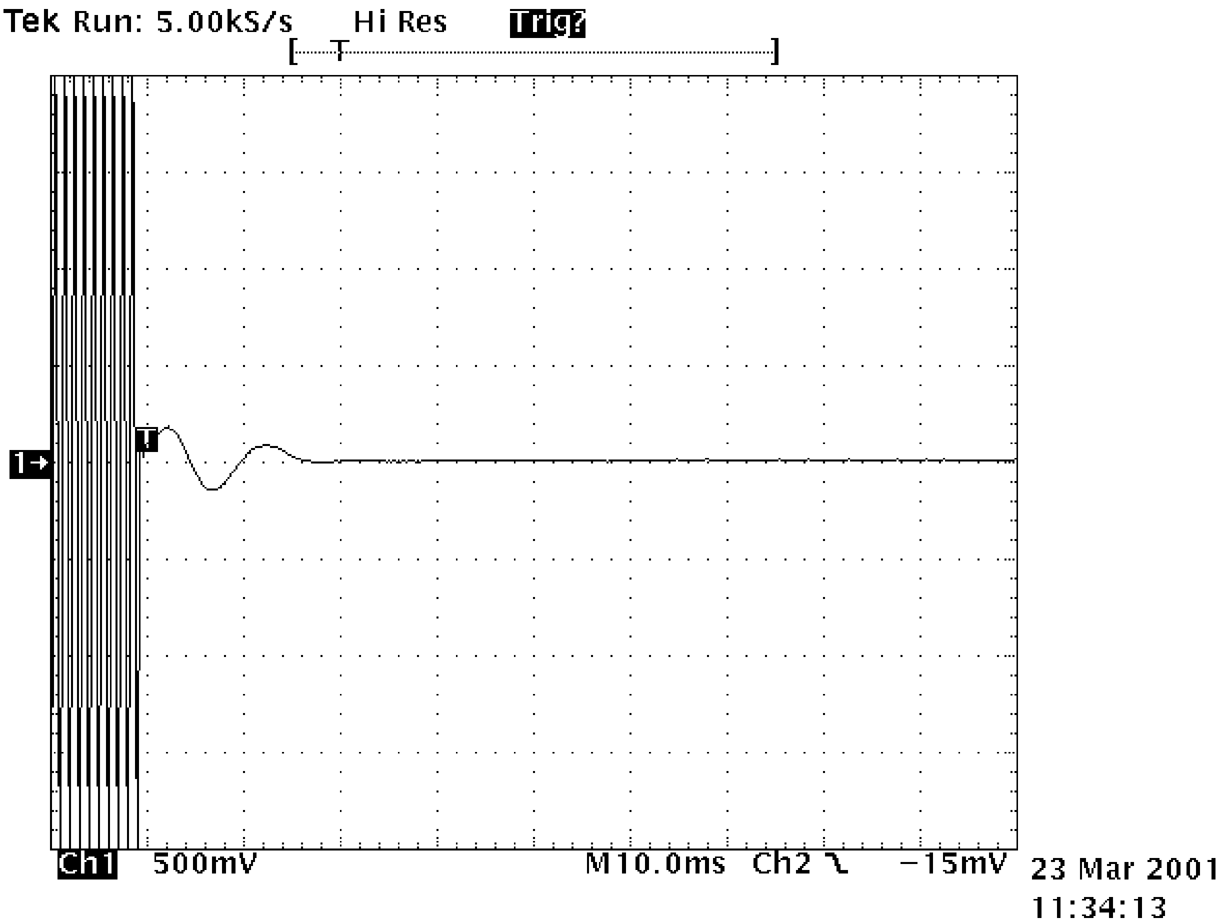
Carrier ON time:
High Power: 5 W rated
Channel 2 : 162.0125 MHz WB(25kHz)
RF Signal Generator: Modulation 25kHz deviation

PLOT 14: TRASIENT FREQUENCY BEHAVIOR (ON TIME) – CHANNEL 2: 162.0125 MHZ {25 KHZ WIDE BAND}



Timebase: 10 ms/div
Trigger: On negative edge of Ch2, level –15mV
Ch1: 500mV/div, Probe 1.000:1
Vertical scale: +/- 4 div. corresponds to +/- 25 kHz

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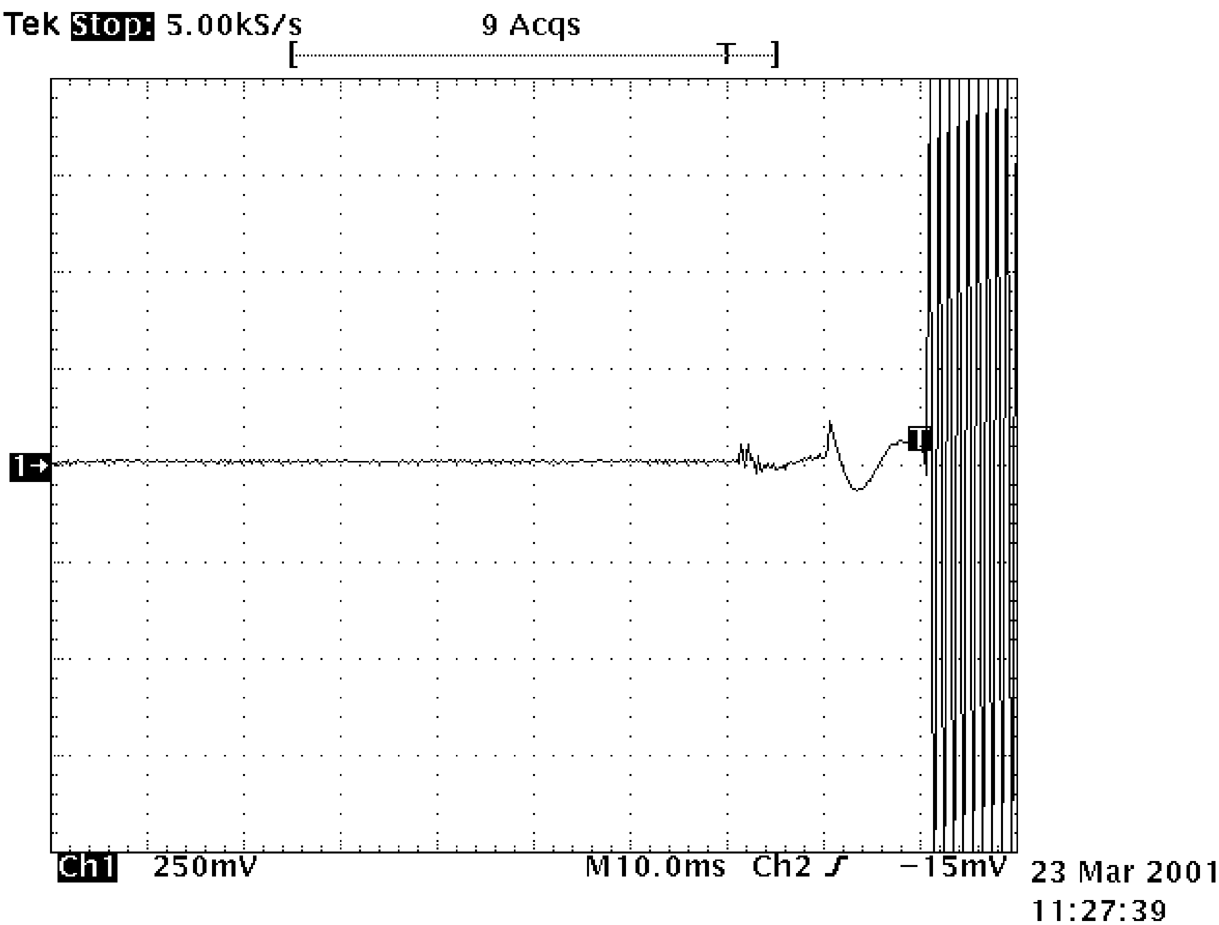
Carrier OFF time:
High Power: 5 W rated
Channel 5 : 162.0125 MHz NB(12.5kHz)
RF Signal Generator: Modulation 12.5kHz deviation

PLOT 15: TRASIENT FREQUENCY BEHAVIOR (OFF TIME) – CHANNEL 5: 162.0125 MHZ {12.5 KHZ NARROW BAND}



Timebase: 10 ms/div
Trigger: On negative edge of Ch2, level -15mV
Ch1: 250 mV/div, Probe 1.000:1
Vertical scale: +/- 4 div. corresponds to +/- 12.5 kHz

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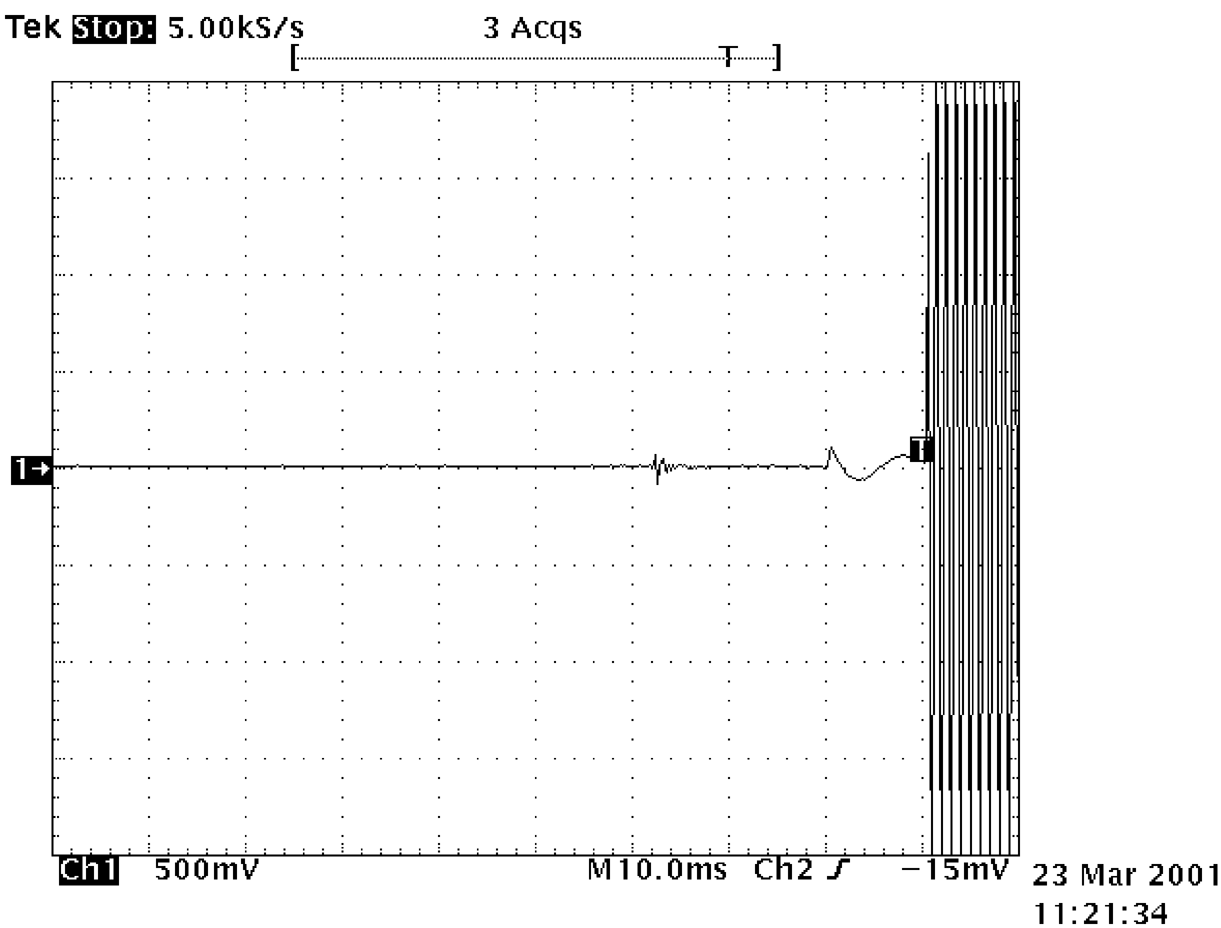
Carrier OFF time:
High Power: 5 W rated
Channel 2 : 162.0125 MHz WB(25kHz)
RF Signal Generator: Modulation 25kHz deviation

PLOT 16: TRASIENT FREQUENCY BEHAVIOR (OFF TIME) – CHANNEL 2: 162.0125 MHZ {25 KHZ WIDE BAND}



Timebase: 10 ms/div
Trigger: On negative edge of Ch2, level –15 mV
Ch1: 500 mV/div, Probe 1.000:1
Vertical scale: +/- 4 div. corresponds to +/- 25 kHz

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

Type of Emission: F3E

Necessary Bandwidth and Emission Bandwidth:
12.5kHz (NB channel) : Bn = 11K0F3E
25kHz (WB channel): Bn = 16K0F3E

Calculation:
Max modulation(M) in kHz : 3
Max deviation (D) in kHz: 2.5 (NB) and 5 (BB)
Constant factor (K) : 1
Bn = 2xM+2xDK