SUBMITTED MEASURED DATA INDEX

RF POWER OUTPUT DATA

The input supply to the transmitter was set at 4.8 Volts. The voltage at the final amplifying device voltage was 4.7V. The RF power output was measured with the indicated voltage and current applied into the final RF amplifying device(s).

ANALOG MODE:

Measured RF Output: 0.391 Watts
Measured DC Voltage: 4.7 Volts
Measured DC Current: 498 mA
Measured RF Input: 0.92 Mw

800MHz DIGITAL MODE:

In Digital Mode the values measured for RF Output, DC Current and RF Input Power are all average values which reflect the 1/3 duty cycle of TDMA operation.

Measured RF Output: 0.573 Watts
Measured DC Voltage: 4.7 Volts
Measured DC Current: 230 mA
Measured RF Input: 0.59 mW

ERP:

The input supply to the transmitter was set at 4.8 Volts. Measurements were made relative to a dipole with a known gain of 2.14dB relative to an isotropic source.

ANALOG MODE:
Measured ERP (Relative to Half-Wavelength Dipole): 171mW (22.32dBm);

800MHz DIGITAL MODE:
Measured ERP (Relative to a Half-Wavelength Dipole): 251mW (23.99dBm).

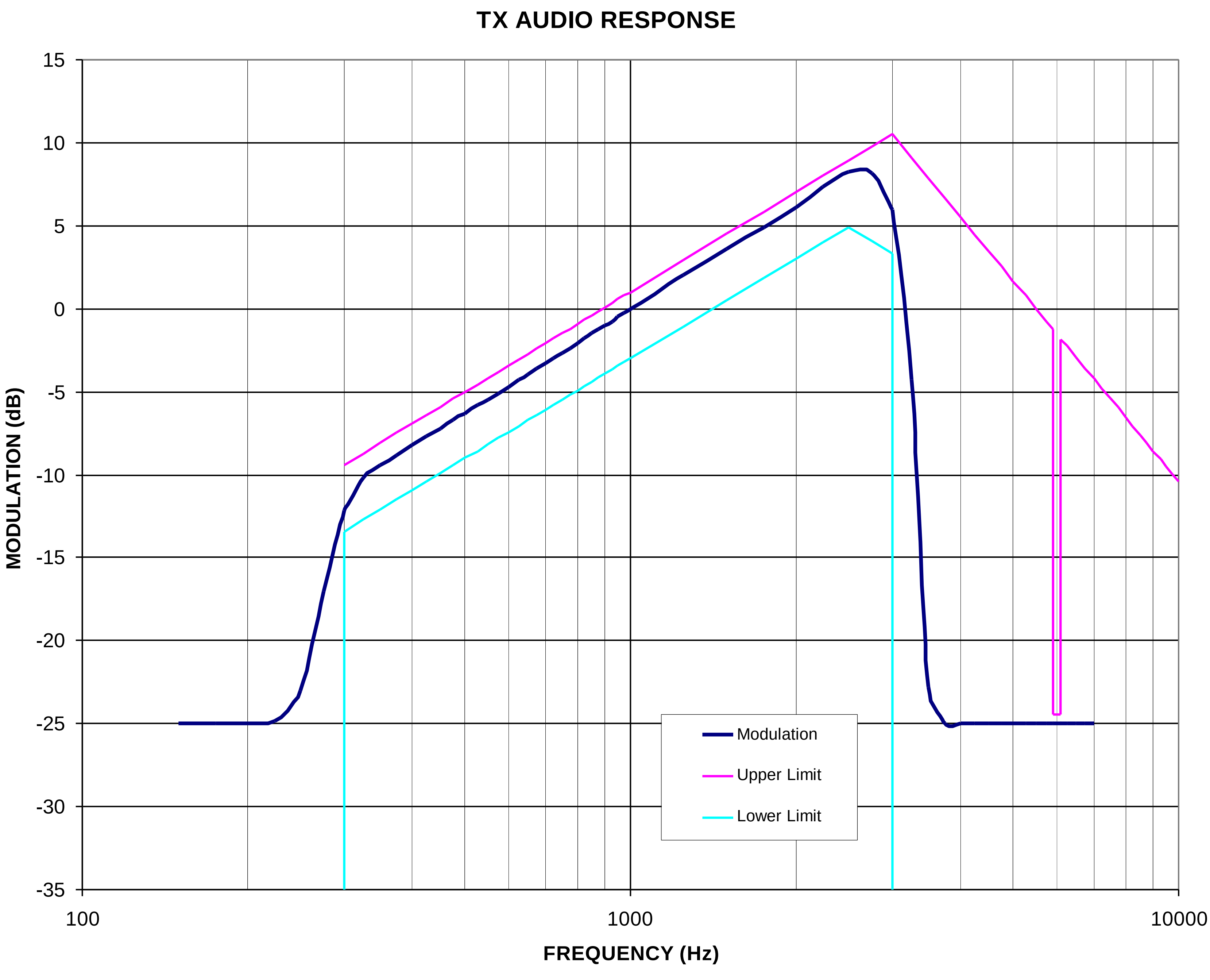
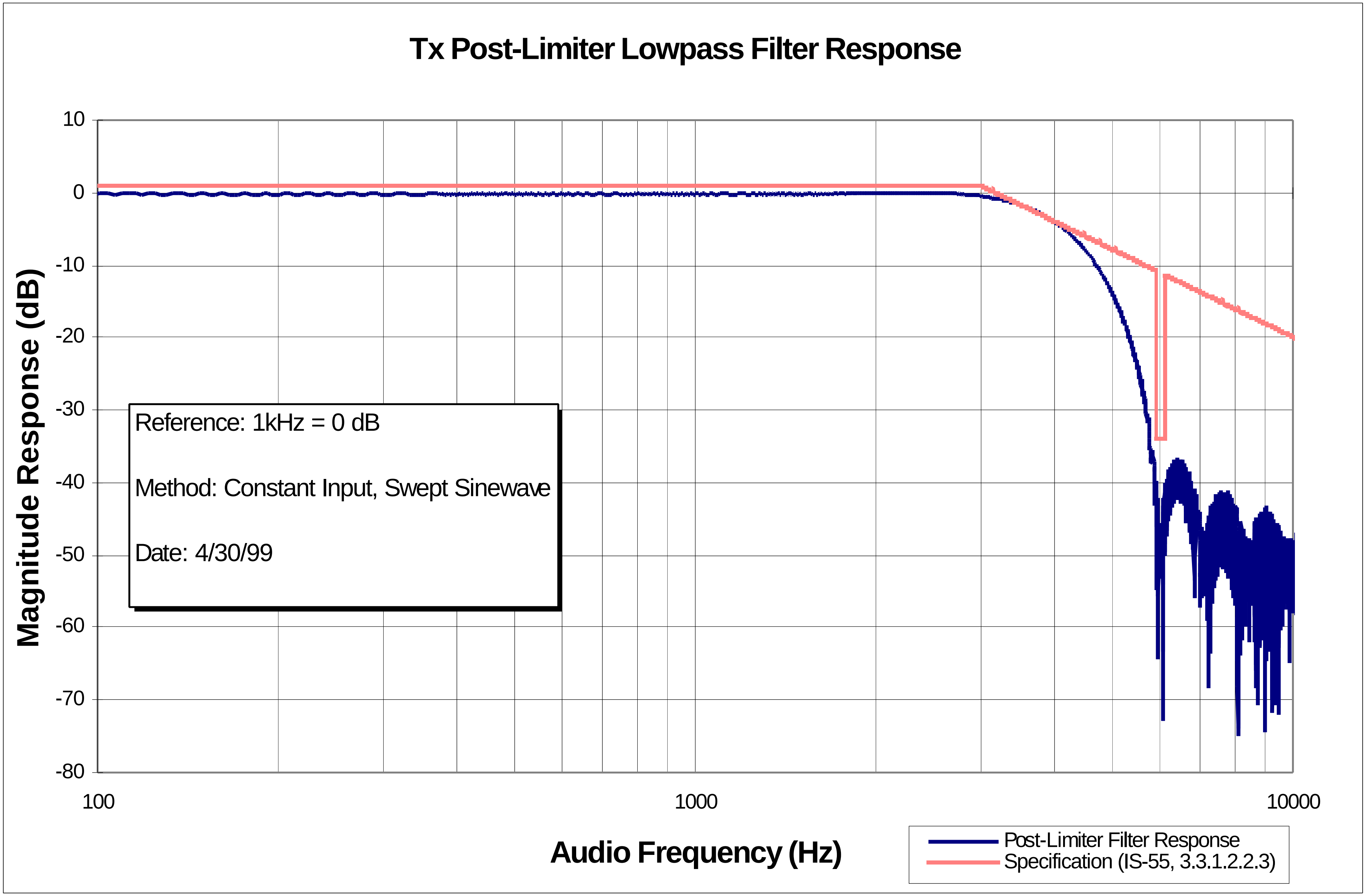
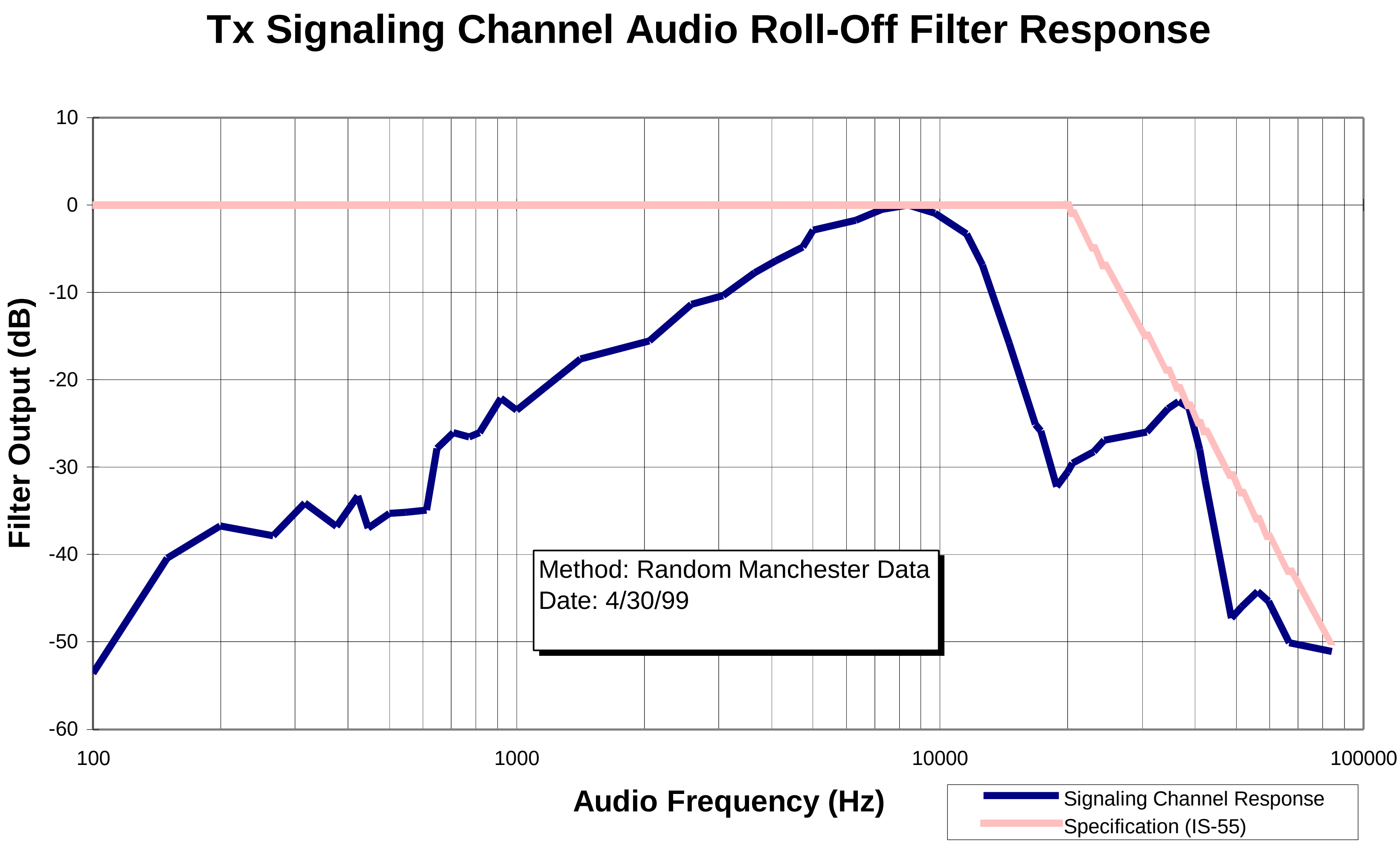
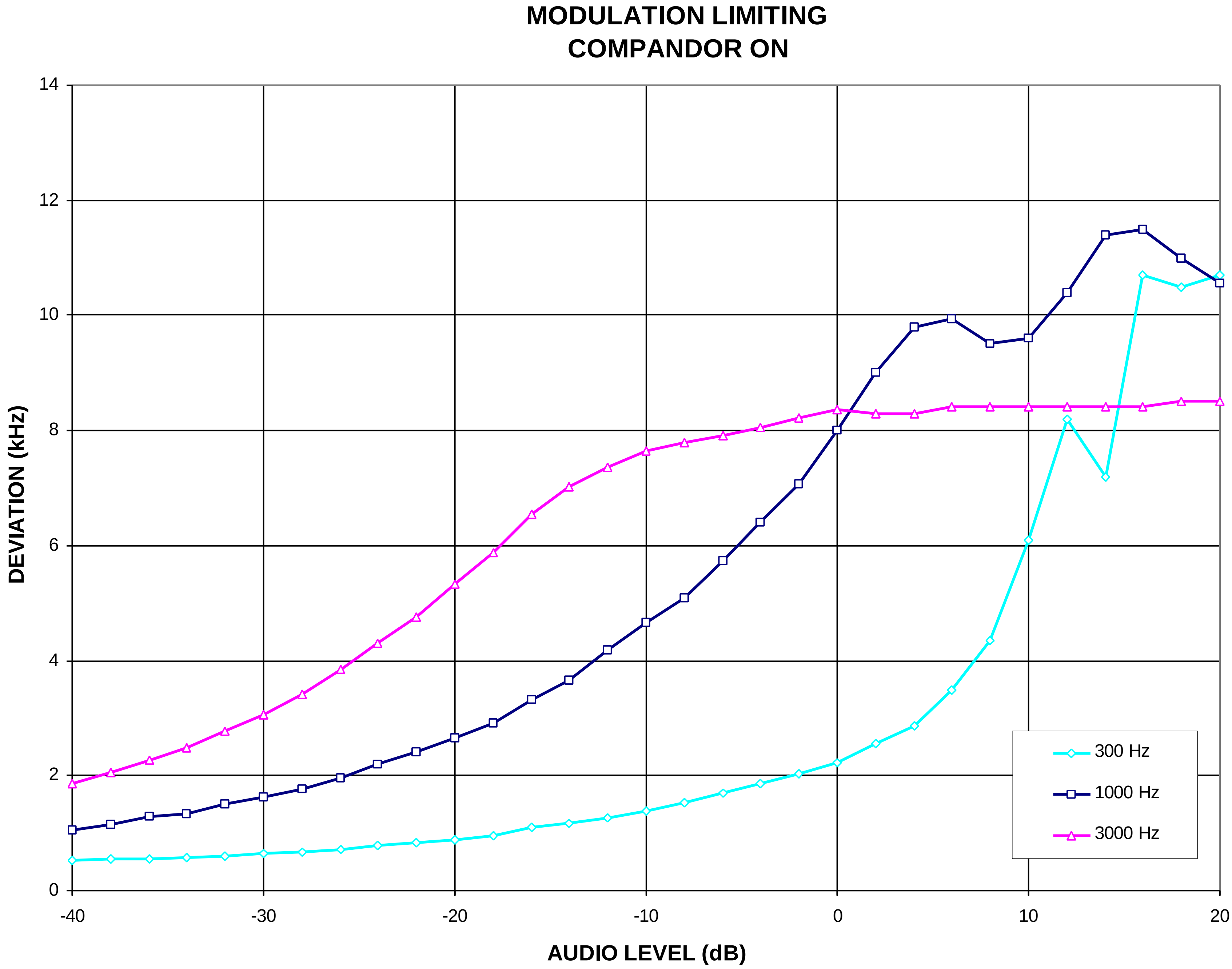
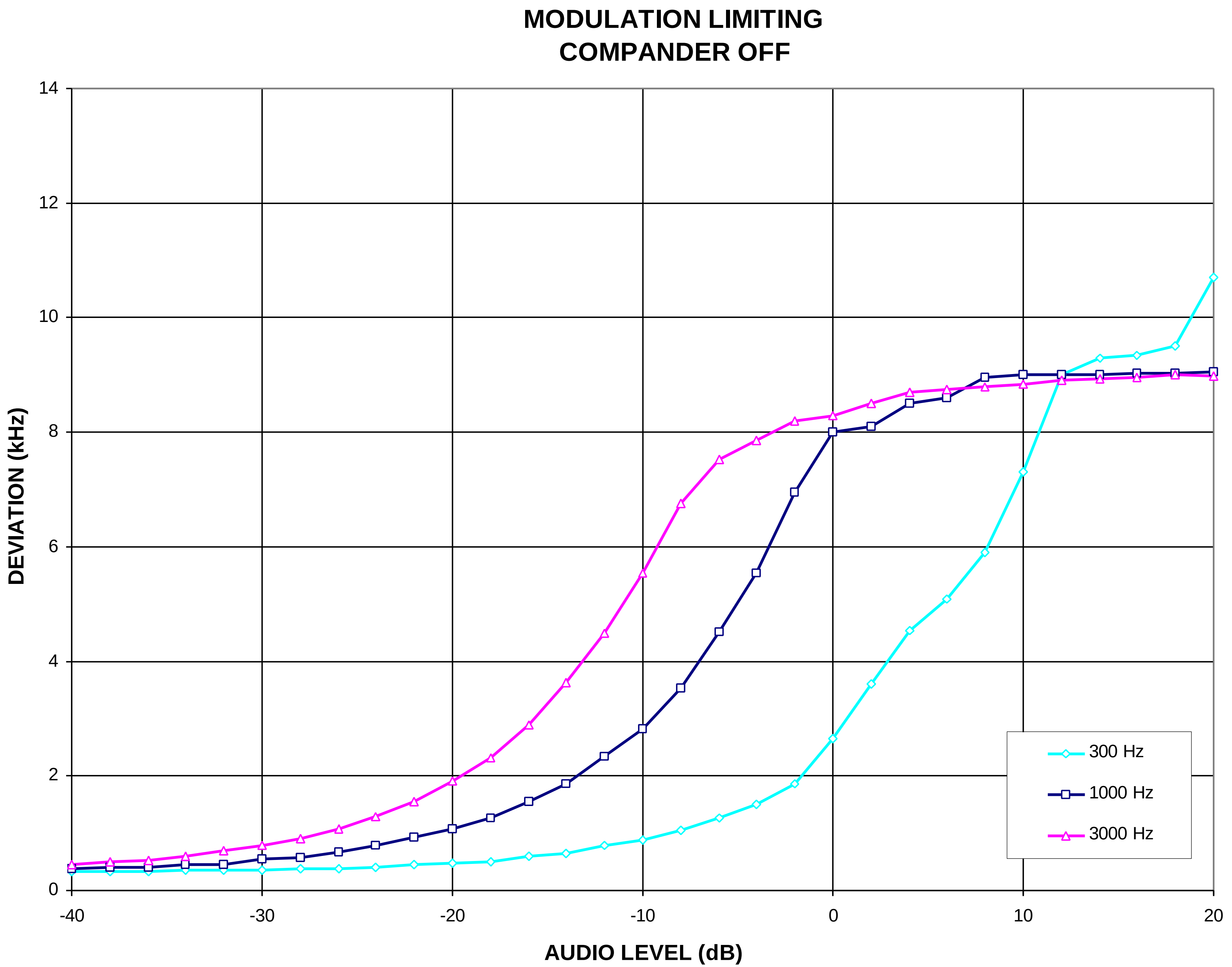

TX AUDIO RESPONSE
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
MODULATION (dB)
100
1000
10000
FREQUENCY (Hz)
Modulation
Upper Limit
Lower Limit

Exhibit 6B


Tx Post-Limiter Lowpass Filter Response
Magnitude Response (dB)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
100
1000
10000
Audio Frequency (Hz)
Reference: 1kHz = 0 dB
Method: Constant Input, Swept Sinewave
Date: 4/30/99
Post-Limiter Filter Response
Specification (IS-55, 3.3.1.2.2.3)


Tx Signaling Channel Audio Roll-Off Filter Response
10
0
-10
-20
-30
-40
-50
-60
100
1000
10000
100000
Filter Output (dB)
Audio Frequency (Hz)
Method: Random Manchester Data
Date: 4/30/99
Signaling Channel Response
Specification (IS-55)


MODULATION LIMITING
COMPANDOR ON
DEVIATION (kHz)
AUDIO LEVEL (dB)
0
2
4
6
8
10
12
14
-40
-30
-20
-10
0
10
20
300 Hz
1000 Hz
3000 Hz

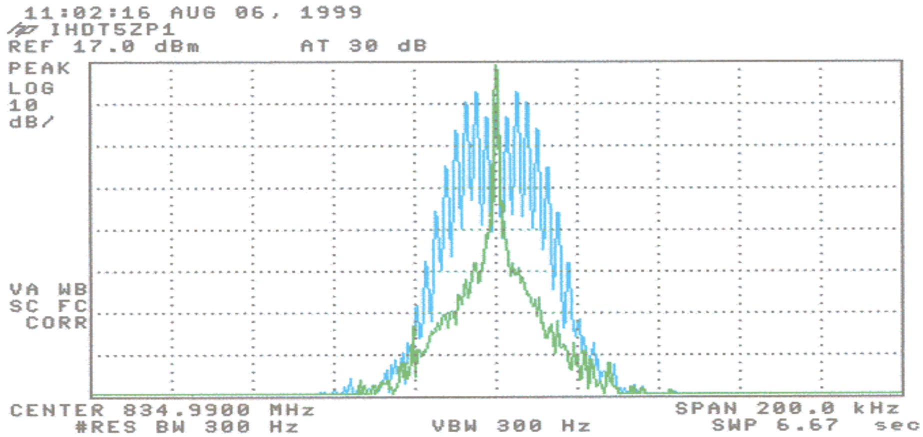

MODULATION LIMITING
COMPANDER OFF
DEVIATION (kHz)
0
2
4
6
8
10
12
14
-40
-30
-20
-10
0
10
20
AUDIO LEVEL (dB)
300 Hz
1000 Hz
3000 Hz

BANDWIDTH MEASUREMENT DATA
FOR TRANSMITTER TYPES F8W

DEVIATION OF THE CARRIER WITH 2500 Hz AUDIO MODULATION

HORIZONTAL SCALE = 20 kHz/ DIVISION
VERTICAL SCALE = 10 dB/ DIVISION (ATTENUATION)
RESOLUTION BANDWIDTH = 300 Hz
AUDIO LEVEL = 16 dB GREATER THAN LEVEL REQUIRED TO PRODUCE +/- 6 kHz
POWER LEVEL = 0.6 W

MEASURED DATA:



1. Instantaneous Deviation Control set for a maximum of +/- 12 kHz.

2. Tune and adjust to obtain unmodulated carrier on the analyzer scope. Save trace of unmodulated carrier.

3. Modulate the Transmitter with the 2.5 kHz tone, 16 dB greater than that required to produce +/- 6 kHz modulation. Photograph the sideband display while it is superimposed upon the unmodulated carrier.

SPEC LIMITS:

a. On any frequency removed from the assigned carrier frequency by more than 20 kHz, up to and including 45 kHz, the sideband is at least 26 dB below the carrier.

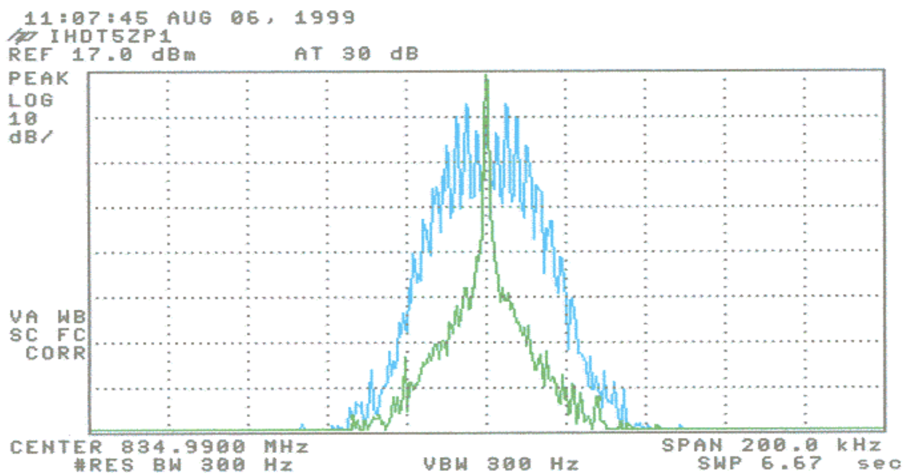
b. On a any frequency removed from the assigned carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60 dB below the carrier or 43 + log10(mean power output in Watts) dB, whichever is smaller attenuation.

BANDWIDTH MEASUREMENT DATA
FOR TRANSMITTER TYPES F8W

DEVIATION OF THE CARRIER WITH 2500 Hz AUDIO MODULATION AND SUPERVISORY AUDIO TONE

HORIZONTAL SCALE = 20 kHz/ DIVISION
VERTICAL SCALE = 10 dB/ DIVISION (ATTENUATION)
RESOLUTION BANDWIDTH = 300 Hz
AUDIO LEVEL = 16 dB GREATER THAN LEVEL REQUIRED TO PRODUCE +/- 6 kHz
POWER LEVEL = 0.6 W

MEASURED DATA:



1. Instantaneous Deviation Control set for a maximum of +/- 12 kHz.

2. Tune and adjust to obtain unmodulated carrier on the analyzer scope. Save trace of unmodulated carrier.

3. Modulate the Transmitter with the 2.5 kHz tone, 16 dB greater than that required to produce +/- 6 kHz modulation and add SAT with +/- 2 kHz deviation. Photograph the sideband display while it is superimposed upon the unmodulated carrier.

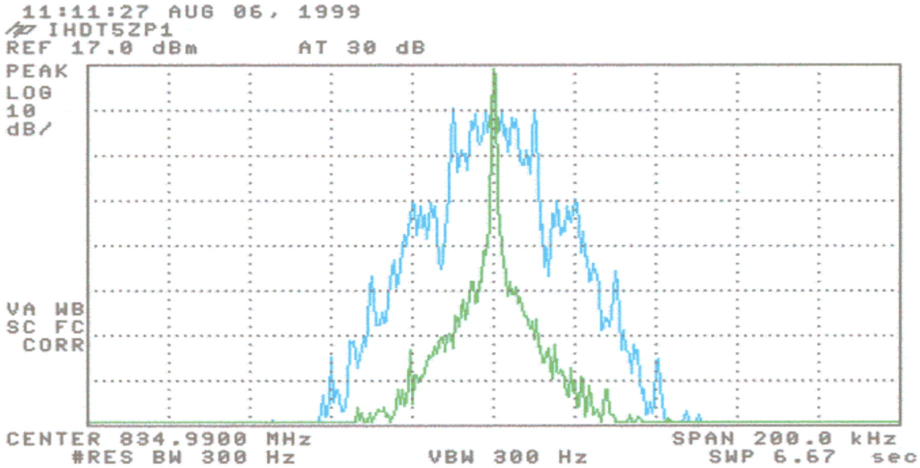
SPEC LIMITS:
a. On any frequency removed from the assigned carrier frequency by more than 20 kHz, up to and including 45 kHz, the sideband is at least 26 dB below the carrier.
b. On a any frequency removed from the assigned carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60 dB below the carrier or 43 + log10(mean power output in Watts) dB, whichever is smaller attenuation.

BANDWIDTH MEASUREMENT DATA
FOR TRANSMITTER TYPES F1D

DEVIATION OF THE CARRIER WITH 10 kBIT/ SECOND DATA

HORIZONTAL SCALE = 20 kHz/ DIVISION
VERTICAL SCALE = 10 dB/ DIVISION (ATTENUATION)
RESOLUTION BANDWIDTH = 300 Hz
POWER LEVEL = 0.6 W

MEASURED DATA:



1. Instantaneous Deviation Control set for a maximum of +/- 12 kHz.

2. Tune and adjust to obtain unmodulated carrier on the analyzer scope. Save trace of unmodulated carrier.

3. Modulate the Transmitter with the wideband data with +/- 8 kHz deviation Photograph the sideband display while it is superimposed upon the unmodulated carrier.

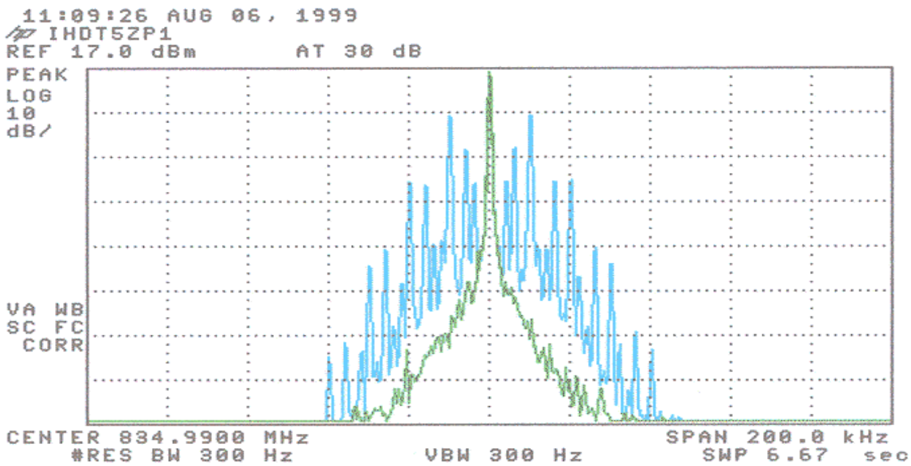
SPEC LIMITS:
a. On any frequency removed from the assigned carrier frequency by more than 20 kHz, up to and including 45 kHz, the sideband is at least 26 dB below the carrier.
b. On a any frequency removed from the assigned carrier frequency by more than 45 kHz, up to and including 90 kHz, the sideband is at least 45 dB below the carrier.
c. On any frequency removed from the assigned carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60 dB below the carrier or 43 + log10(mean power output in Watts) dB, whichever is smaller attenuation.

BANDWIDTH MEASUREMENT DATA
FOR TRANSMITTER TYPES F1D

DEVIATION OF THE CARRIER WITH 10 kHz SIGNALING TONE AND SUPERVISORY AUDIO TONE

HORIZONTAL SCALE = 20 kHz/ DIVISION
VERTICAL SCALE = 10 dB/ DIVISION (ATTENUATION)
RESOLUTION BANDWIDTH = 300 Hz
POWER LEVEL = 0.6 W

MEASURED DATA:



1. Instantaneous Deviation Control set for a maximum of +/- 12 kHz.

2. Tune and adjust to obtain unmodulated carrier on the analyzer scope. Save trace of unmodulated carrier.

3. Modulate the Transmitter with the wideband data with +/- 8 kHz deviation and add SAT with +/- 2 kHz. Photograph the sideband display while it is superimposed upon the unmodulated carrier.

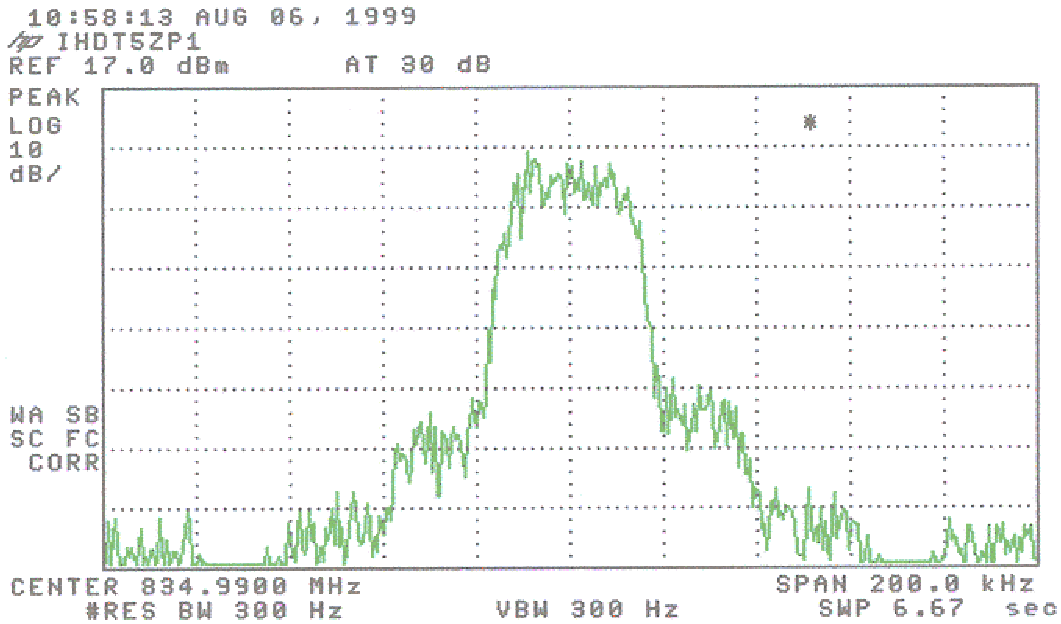
SPEC LIMITS:
a. On any frequency removed from the assigned carrier frequency by more than 20 kHz, up to and including 45 kHz, the sideband is at least 26 dB below the carrier.
b. On a any frequency removed from the assigned carrier frequency by more than 45 kHz, up to and including 90 kHz, the sideband is at least 45 dB below the carrier.
c. On any frequency removed from the assigned carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60 dB below the carrier or 43 + log10(mean power output in Watts) dB, whichever is smaller attenuation.

BANDWIDTH MEASUREMENT DATA
FOR TRANSMITTER TYPES DXW

DEVIATION OF THE CARRIER WITH π/4 DQPSK MODULATION

HORIZONTAL SCALE = 20 kHz/ DIVISION
VERTICAL SCALE = 10 dB/ DIVISION (ATTENUATION)
RESOLUTION BANDWIDTH = 300 Hz
POWER LEVEL = 0.6 W

MEASURED DATA:

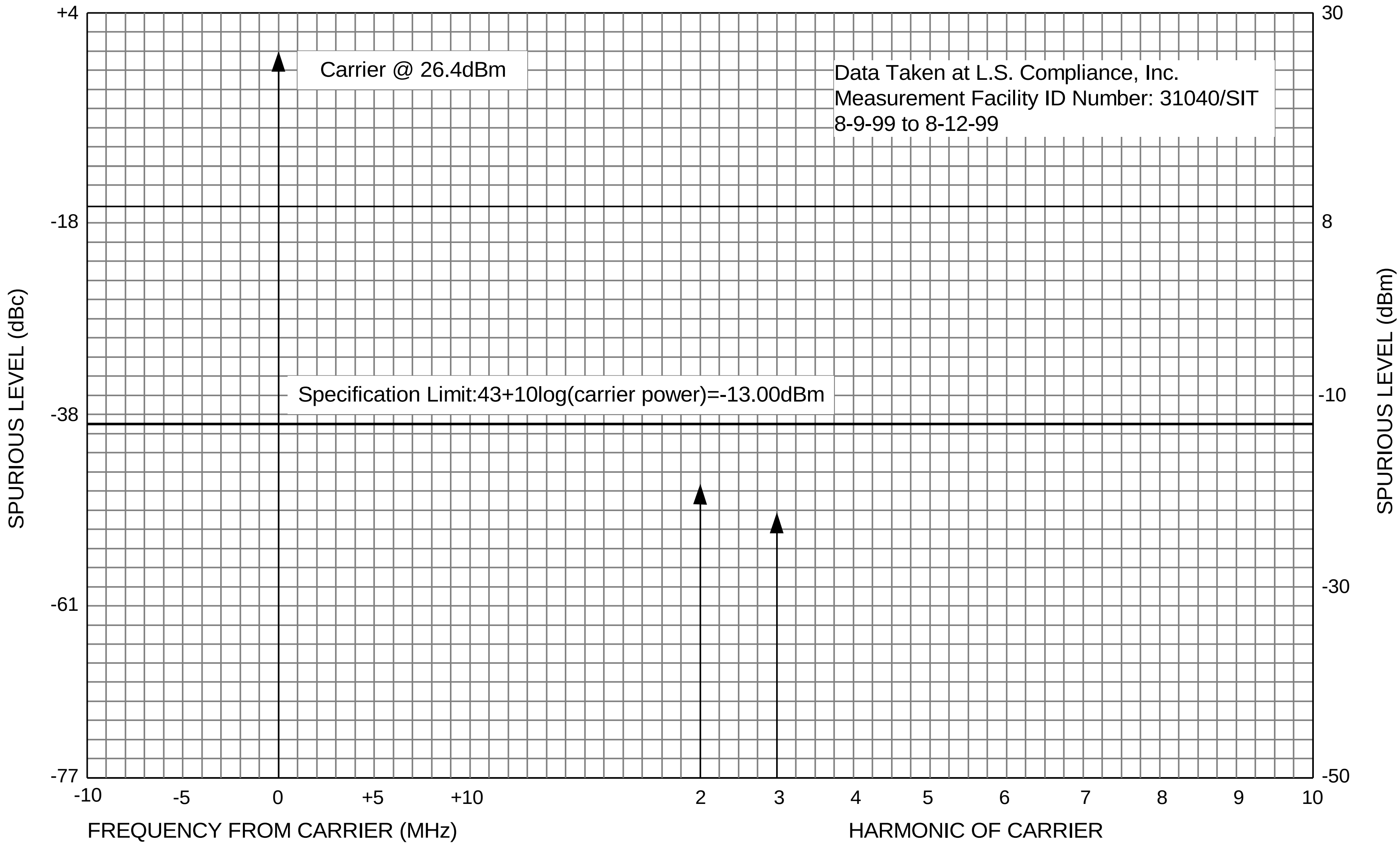


1. Modulate the transmitter with π/4 DQPSK modulation, using pseudo random data. Obtain image on spectrum analyzer.

SPEC LIMITS:

The emission power in either adjacent channel centered +/- 30 kHz from the center frequency, shall not exceed a level of 26 dB below the mean power. The emission power in either alternate channel, centered +/- 60 kHz from the center frequency, shall not exceed a level of 45 dB below the mean output power. The emission power in either channel centered +/- 90 kHz from center frequency, shall not exceed a level of - 13 dB.

TRANSMITTER CONDUCTED SPURIOUS EMISSIONS



Carrier Power: 0.6W to 4.8mW in 4dB steps.

Carrier Frequency: 824.04 to 848.97 MHz in 30kHz steps.

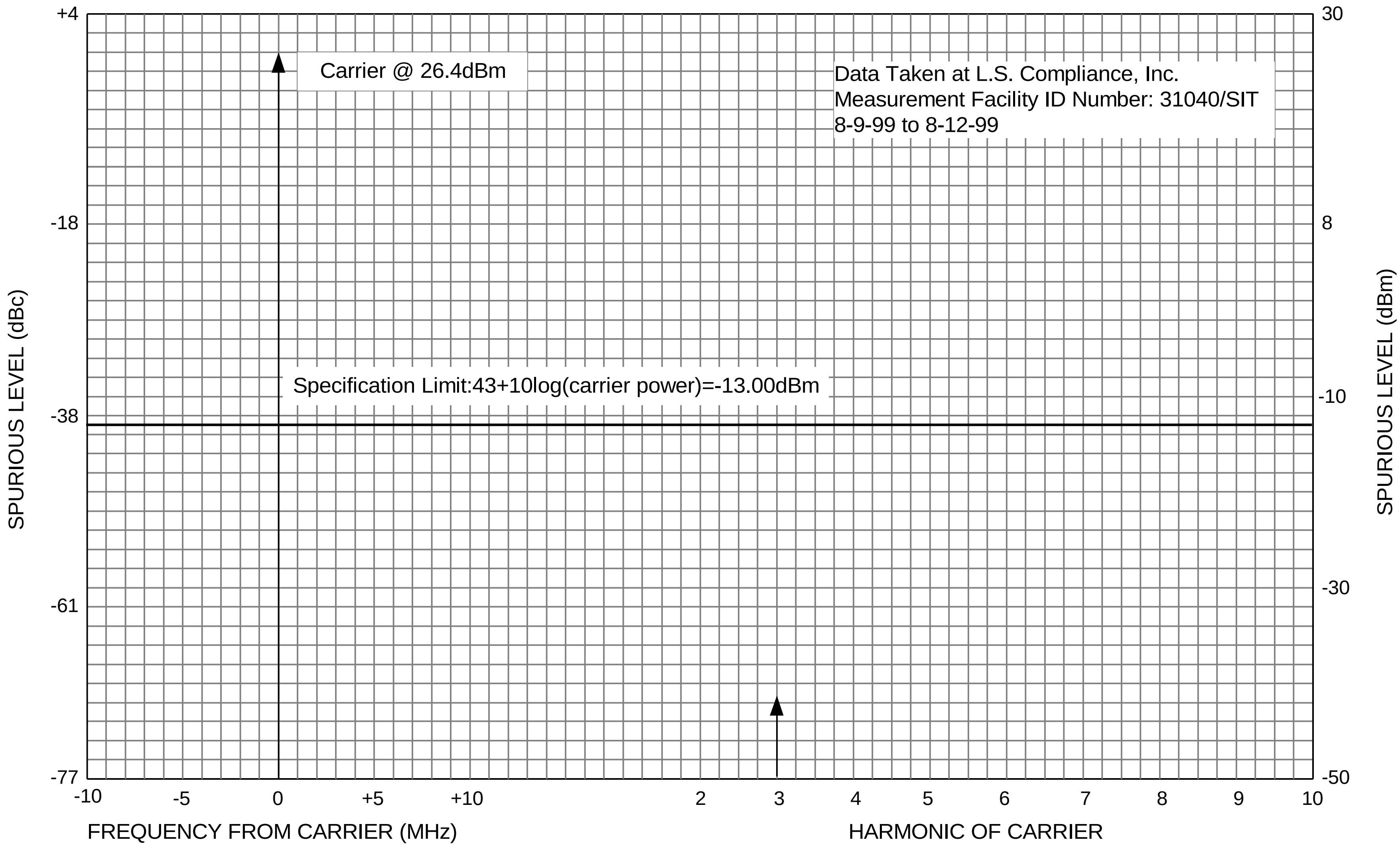
Each reported emission reflects the highest absolute level found among all power levels, channels, and operating mode (Analog or Digital)

All emissions not reported were greater than 20dB below the FCC specification.

No signals greater than –80dBm were found in the 869 to 894 MHz band.

Spectrum was searched from 2.1MHz to the 10th harmonic of the transmitter.

TRANSMITTER RADIATED SPURIOUS EMISSIONS



Carrier Power: 0.6W to 4.8mW in 4dB steps.

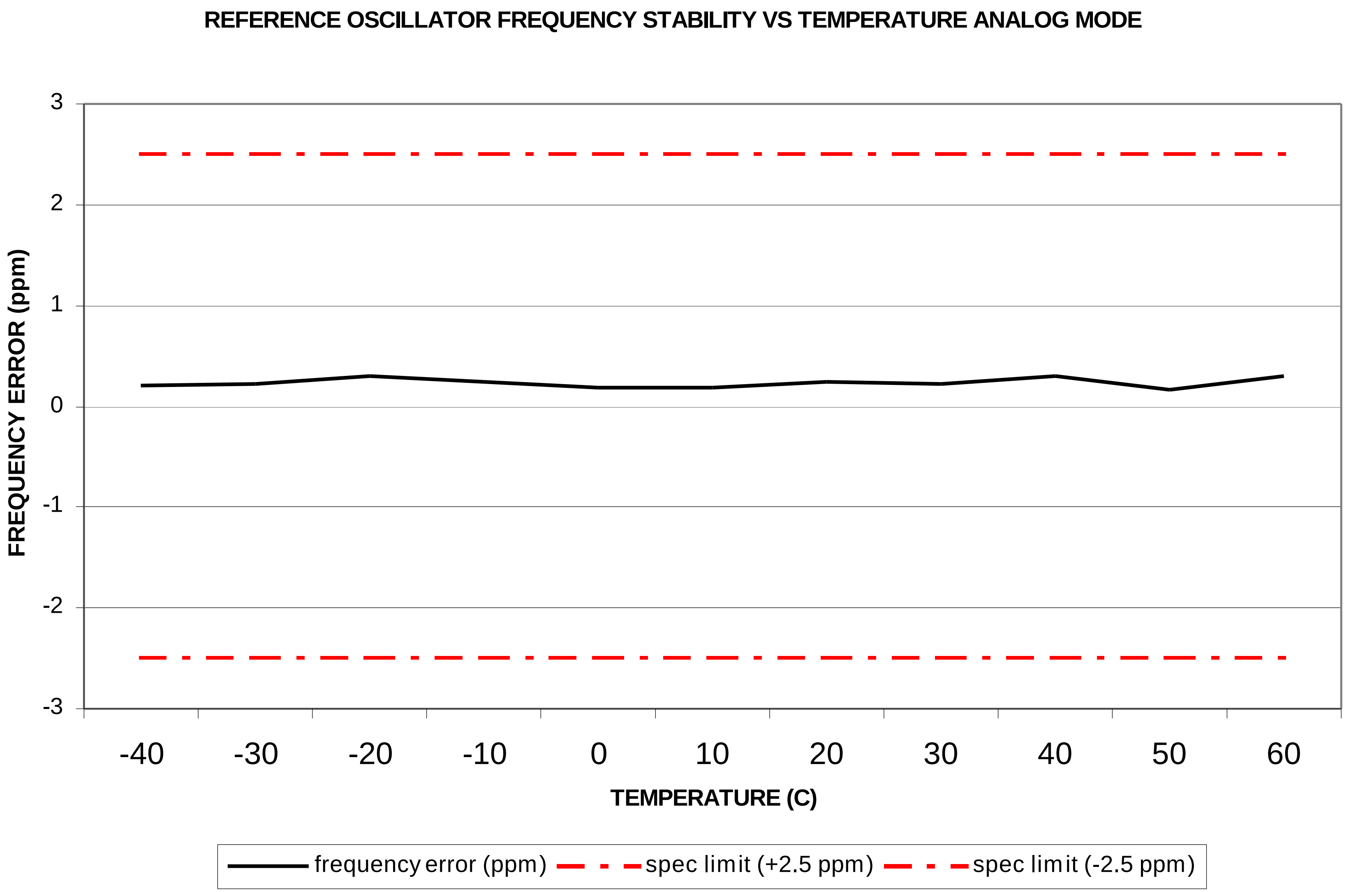
Carrier Frequency: 824.04 to 848.97 MHz in 30kHz steps.

Each reported emission reflects the highest absolute level found among all power levels, channels, and operating mode (Analog or Digital)

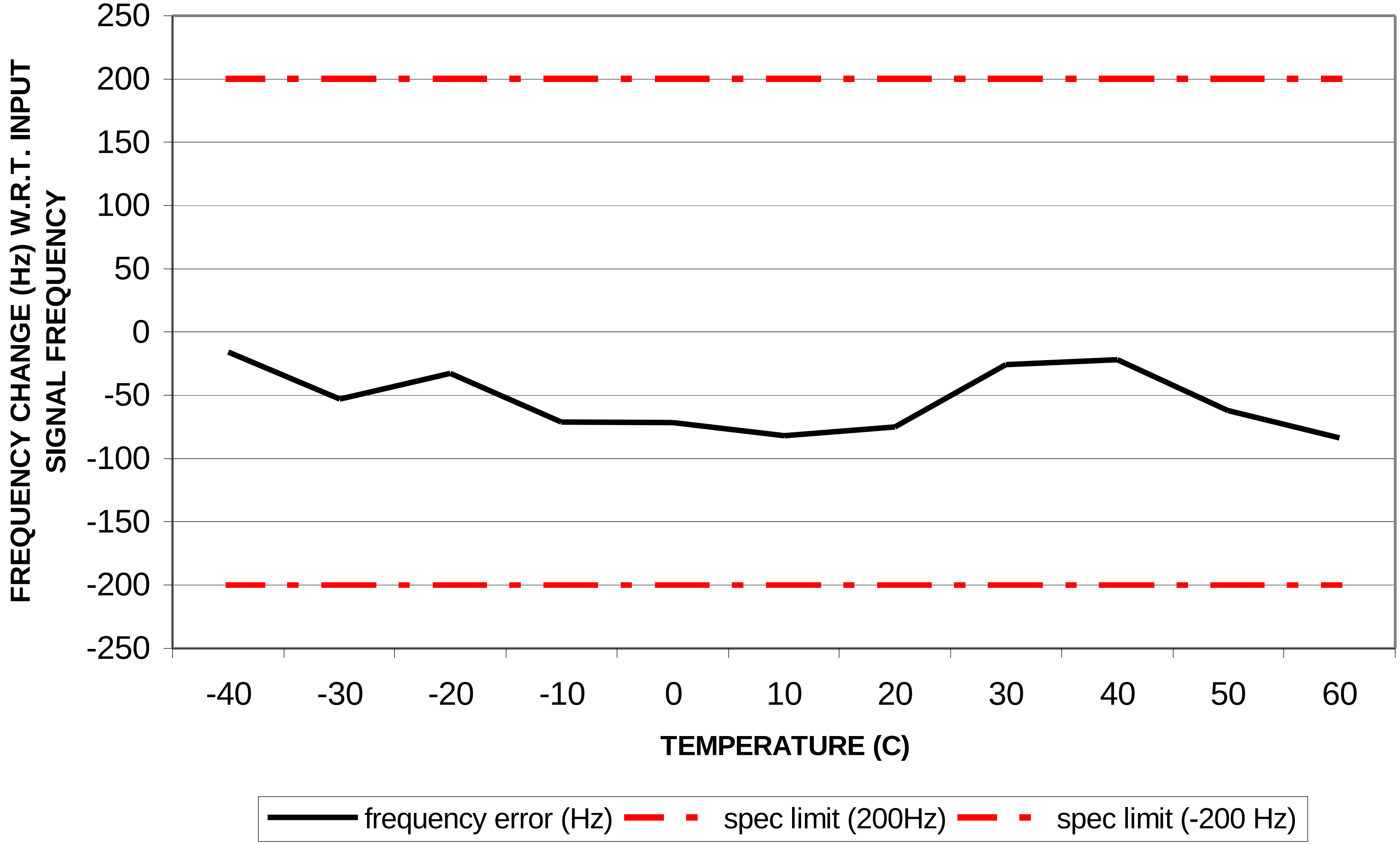
All emissions not reported were greater than 20dB below the FCC specification.

No signals greater than –80dBm were found in the 869 to 894 MHz band.

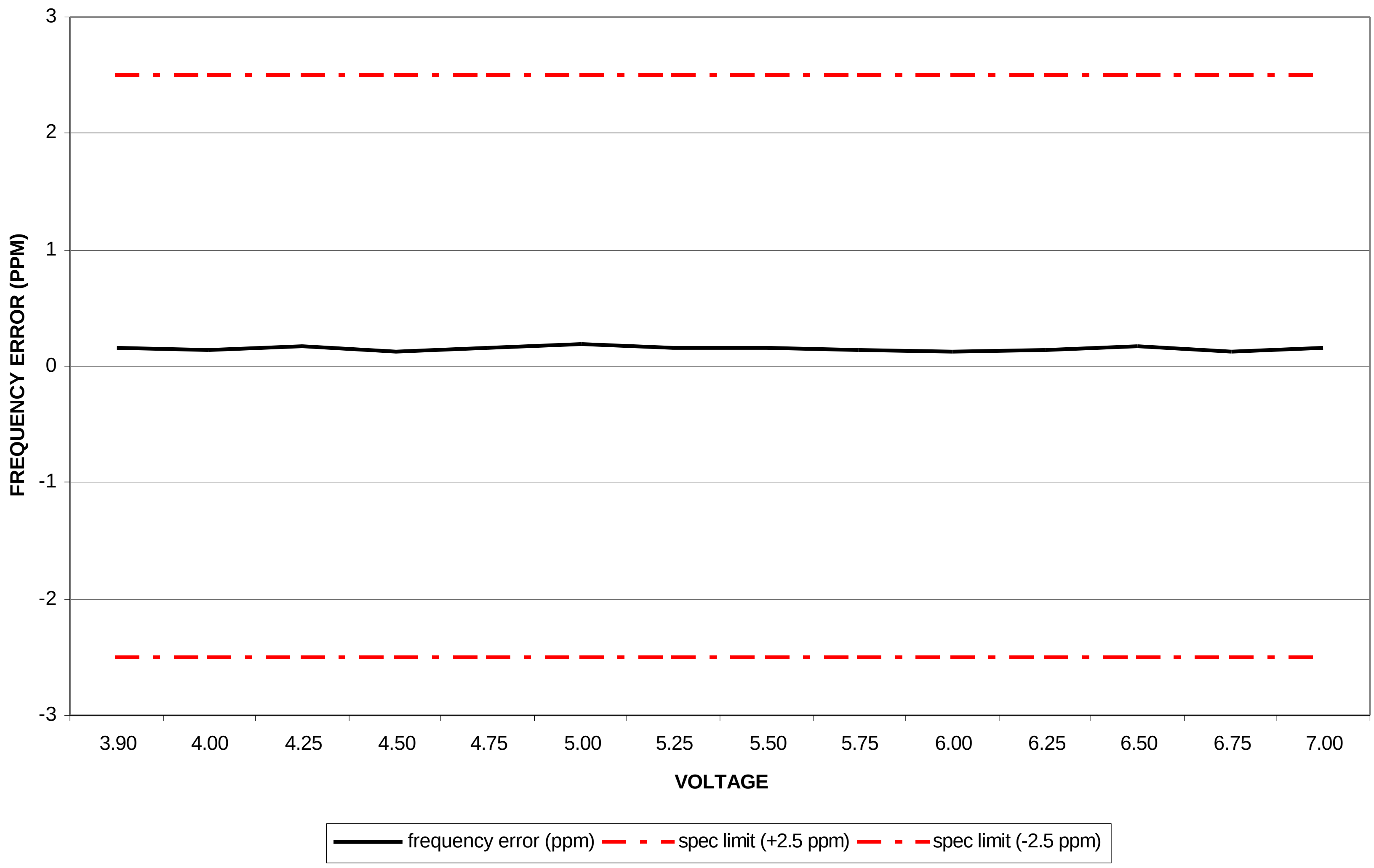
Spectrum was searched from 2.1MHz to the 10^{th} harmonic of the transmitter.


REFERENCE OSCILLATOR FREQUENCY STABILITY VS TEMPERATURE ANALOG MODE
FREQUENCY ERROR (ppm)
3
2
1
0
-1
-2
-3
-40
-30
-20
-10
0
10
20
30
40
50
60
TEMPERATURE (C)
frequency error (ppm)
spec limit (+2.5 ppm)
spec limit (-2.5 ppm)

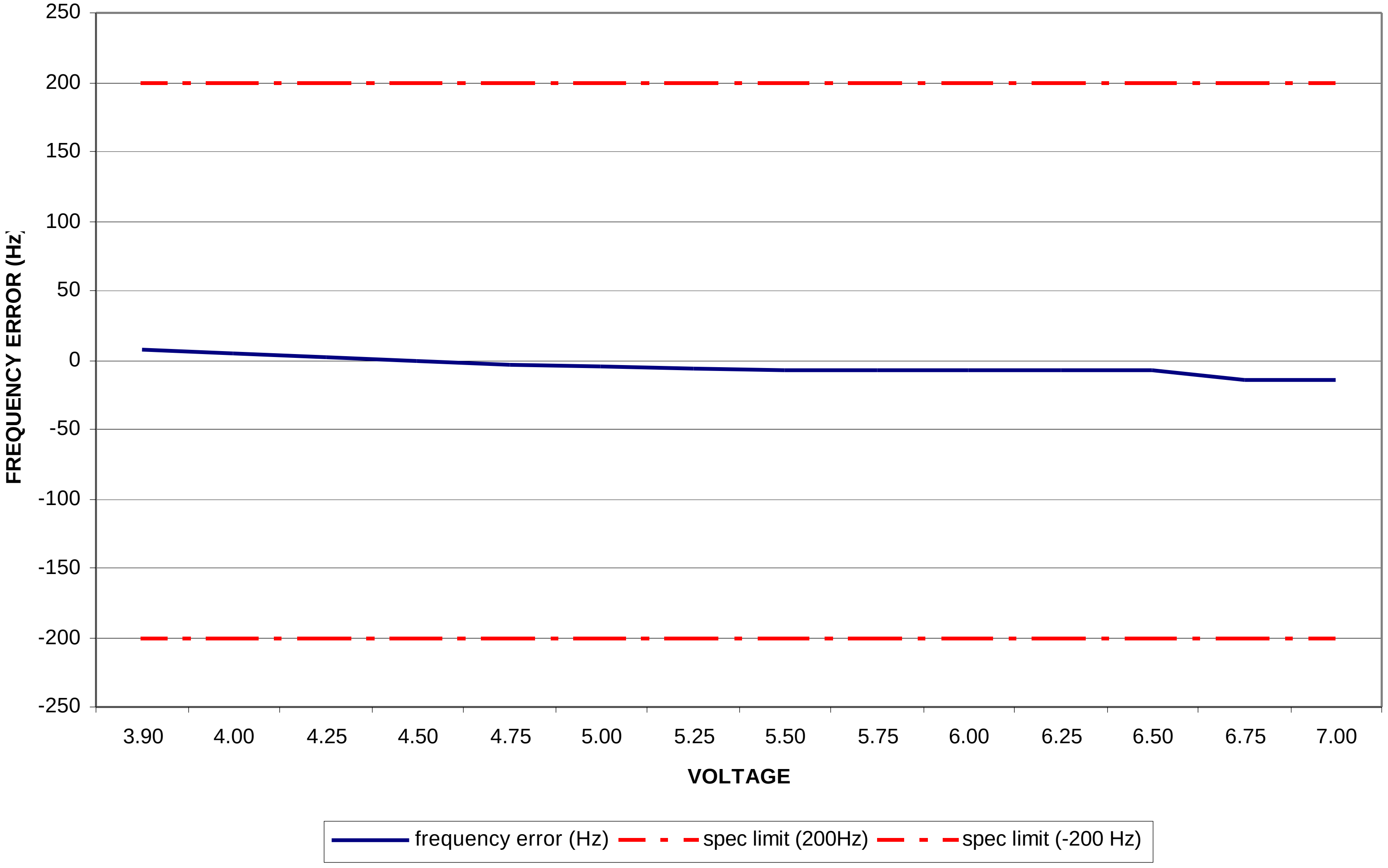
REFERENCE OSCILLATOR FREQUENCY STABILITY VS TEMPERATURE DIGITAL MODE



REFERENCE OSCILLATOR STABILITY VS VOLTAGE CHANGE ANALOG MODE



REFERNCE OSCILLATOR FREQUENCY STABILITY VS VOLTAGE DIGITAL MODE



MEASUREMENT TECHNIQUES

2.1051 Measurements Required: Conducted Spurious and Harmonic Emissions at Antenna Terminals - Analog Mode

Graph Attached
EXHIBIT NO. 6G

Definition - (as used herein) Spurious radiations are the radio frequency voltages or power generated within the equipment and appearing at the equipment's output terminals when properly loaded with its characteristic non-radiating artificial load.

Minimum Standard - Conducted spurious and harmonic emissions shall be attenuated 43 dB - 10Log10(the mean power output). In the frequencies from 869 MHz to 894 MHz, no spur shall exceed -80dBm.

Method of Measurement -The Antenna port of the sample was directly coupled to the input of the EMI receiver through a special coupling cable and a 10 dB passive attenuator. Scans were then performed from 30 MHz to 6.5 GHz, while observing the fundamental signal level, plus low order harmonics or other spurious signals. The frequency range of 1 to 6.5GHz was then inspected, and the level of the harmonics was measured and recorded. The output of the sample was then switched to a Hewlett Packard HP8563E spectrum analyzer to verify harmonic signal levels out to the tenth harmonic. The bandwidth was initially set to 1 MHz for signature scans, and then reduced to 30 kHz to measure individual signal strengths.

Measurements Required: Conducted Spurious and Harmonic Emissions at Antenna Terminals - Digital Mode

Graph Attached
EXHIBIT NO. 6G

Definition - (as used herein) Spurious radiations are the radio frequency voltages or power generated within the equipment and appearing at the equipment's output terminals when properly loaded with its characteristic non-radiating artificial load.

Minimum Standard - Conducted spurious and harmonic emissions shall be attenuated 43 dB - 10Log10(the mean power output). In the frequencies from 869 MHz to 894 MHz, no spur shall exceed -80dBm.

Method of Measurement - The transmitter was modulated with p/4 DQPSK modulation using pseudo random data. The Antenna port of the sample was directly coupled to the input of the EMI receiver through a special coupling cable and a 10 dB passive attenuator. Scans were then performed from 30 to 6.5GHz, while observing the fundamental signal level, plus low order harmonics or other spurious signals. The frequency range of 1 to 6.5GHz was then inspected, and the level of the harmonics was measured and recorded. The output of the sample, with the attenuator was then switched to a Hewlett Packard HP8563e spectrum analyzer to verify harmonic signal levels out to the tenth harmonic. The bandwidth was initially set to 1 MHz for signature scans, and then reduced to 30 kHz to measure individual signal strengths.

2.1053 Measurement Required: Radiated Spurious and Harmonic Emissions -Analog and Digital Modes.

Graph Attached: EXHIBIT NO. 6H

Definition - Radiated spurious and harmonic emissions from the equipment when loaded into a non-radiating load at a frequency or frequencies which are outside an occupied band sufficient to insure transmission of information of required quality for the class of communications desired. The reduction in the level of these spurious emissions will not effect the quality of information being transmitted.

Minimum Standard - Radiated spurious and harmonic emissions shall be attenuated 43 dB - 10Log10(the mean power output). In the frequencies from 869 MHz to 894 MHz, no spur shall exceed -80dBm.

Method of Measurement:

Test Site - The test sample was operated within the 3 meter Semi-Anechoic, FCC listed chamber located at L.S. Compliance in Cedarburg, WI.

Installation of Equipment – The sample was placed on an 80cm high small wooden pedestal, which was centered on the flush-mounted 2m diameter metal turntable. The test sample was operated on its internal rechargeable battery. The test sample was configured to run in a continuous transmit mode during the Radiated measurements. The test sample was set to operate on standard channels within the Cellular frequency assignment: one at the low end of the band (991), one in the middle of the band (385) and one near the top of the band (799). The test sample was set to operate on standard channels within the PCS frequency assignment: one at the low end of the band (2), one in the middle of the band (1000) and one near the top of the band (1998).

All equipment is calibrated and used according to the user manuals supplied by the manufacturer. All antenna calibrations were performed at a N.I.S.T traceable site, and the resultant correction factors were entered into the Hewlett Packard 8546A EMI receiver software database. The connecting cables used were also measured for loss using a calibrated signal generator and the HP 8546A EMI receiver. The resulting loss factors were entered into the HP 8546A database. This allowed for automatic changes in the antenna correction factor, as well as cable loss or other corrections, to be added to the EMI receiver display while taking measurements. Thus, the resulting data taken from the HP 8546A is an actual reading and can be entered into the database as a corrected meter reading. When a reading is taken using the peak detector, a duty cycle correction factor can be applied for conversion to an average reading. This operation can be used when measuring periodic data transmission, under FCC part 15.231b, and Part 15.35c. The resulting average reading was then compared to the appropriate limit in order to determine compliance. The HP 8546A EMI receiver was operated with a bandwidth of 120kHz when receiving signals below 1GHz, and with a bandwidth of 1MHz when receiving signals above 1GHz, in accordance with CISPR 16. While performing the Part 15 measurements. Other IF and Video bandwidths, narrower than stated above, were used where appropriate and allowable.

Measurement Procedure – The fundamental and spurious (harmonic) emissions of the transmitter were tested for compliance to Title 47 CFR, FCC Part 22.917e limits for transmitters in the Public mobile services, and were also compared with the general limits laid out in Part 15.209. The samples were tested from the lowest frequency generated by the transmitter (without going below 9 kHz) to the 10th harmonic of the fundamental frequency generated by the device. The limits described in part 15.209 were also observed for observation and measurement of spurious signals. The samples were placed on a nonconductive (wooden) pedestal in the 3 Meter chamber and the antenna mast was placed such that the antenna was 3m from the test object. A biconical antenna was used to measure emissions from 30 to 200 MHz, a log periodic was used to measure emissions from 200 to 1000 MHz, a double ridged waveguide horn was used to measure emissions from 1GHz to 6.5 GHz. A double ridged waveguide horn was used to feed an HP8349B amplifier the output of this amp was sent to an HP 8563E spectrum analyzer this line-up was used to measure emissions from 5 GHz to 20 GHz. The test object was programmed to operate in continuous transmit, either in the analog mode or digital mode; and the resultant signals were maximized by rotating the turntable 360 degrees, and by raising and lowering the antenna between 1 and 4 meters using both horizontal and vertical antenna polarities.

2.1055 Measurement Required: Frequency Stability - Analog & Digital Modes

Graph Attached
EXHIBIT NO. 6J1 and 6J2

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

Minimum Standard - The minimum frequency stability shall be +/-0.00025% at any time during normal operation.

Method of Measurement - Frequency measurements shall be made at the extremes of the temperature range -30° to +60° and at intervals of not more than 10° C throughout the range. A period of time sufficient to stabilize all of the components in the equipment shall be allowed prior to each frequency measurement. In the analog mode, the frequency of the transmitter shall be measured by extracting a sample of the carrier and measuring its center frequency by equipment having a degree of accuracy of at least 10 times that of the minimum to be measured. In the digital mode, a received signal shall be supplied to the transceiver and the transmitter carrier frequency offset shall be measured with respect to the received signal frequency. The frequency stability of transmitting equipment shall be checked with variations in:

(a) Temperature:
Vary the ambient temperature from -30 C to +60 C.

Graph Attached
EXHIBIT NO. 6K1 and 6K2

(b) Primary Supply Voltage:
Vary the primary supply voltage over the operational input voltage range normally measured at the input to the power cable supplied or at the power supply terminals if cables are not normally supplied.

TIMING PERIOD AND PROCEDURE

1. The carrier frequency of the transmitter and the individual oscillators were measured at room temperature (usually between 25° and 27° C) to provide a reference.

2. The equipment was then subjected to an overnight "soak" at -30° C without any power applied.

3. After an overnight "soak" at -30° C (usually 14 to 16 hours) the equipment was turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators was made within a three minute interval after applying power to the transmitter.

4. Frequency measurements were made at each 10° C interval up to room temperature (-30°, -20°, -10°, 0°, +10°, +20°). At least a period of one and one half hours was provided to allow stabilization of the equipment at each temperature level.

5. Again the transmitter carrier frequency and the individual oscillators were measured at room temperature to begin measurement of the upper temperature extreme.

6. Frequency measurements were made at 10° intervals starting at +30° C and ending at +60° C allowing at least two hours at each temperature for stabilization. In all measurements the frequency was measured within three minutes after applying power to the transmitter.

7. In all measurements, at the various temperature intervals, the temperature was held to +1° C from the temperature level and the equipment turned on for one minute standby condition before applying transmitter power.

8.The artificial load was mounted external to the temperature chamber.

2.1055 Measurement Required: Modulation characteristics

Graph Attached
EXHIBIT NO. 6C and 6D

Method of Measurement for Analog modulation Filter roll-off Response Graphs:

The plot in Exhibit 6C shows the frequency response of the TX post-limiter lowpass (splatter) filter. The filter's response was measured digitally by injecting a constant amplitude, swept sinewave into the filter's input buffer and measuring the frequency content of the processed samples at the output.

The plot in Exhibit 6D shows a peak spectral response measured on an audio spectrum analyzer at the "To Mod" output resulting from random Manchester Data produced by the Data/ST generator which was active with the SAT processor and the DTMF generator turned off and the TX audio path muted. The plot shows the effective filtering of higher frequency components of the Manchester Data, actually the absence of such components, due to our method of generating the Data/ST as described in paragraph ten (above). The low-pass filter described in paragraph thirteen (above) further attenuates the high-frequency components. The low pass effect shown in the plot is actually due to the randomizing of the input data to the Data/ST generator and the use of the peak holding response of the analyzer which captures the instantaneous lower frequency energy in the random changes of the data.